MITSUBISHI MOTORS

Workshop Manual

chassis

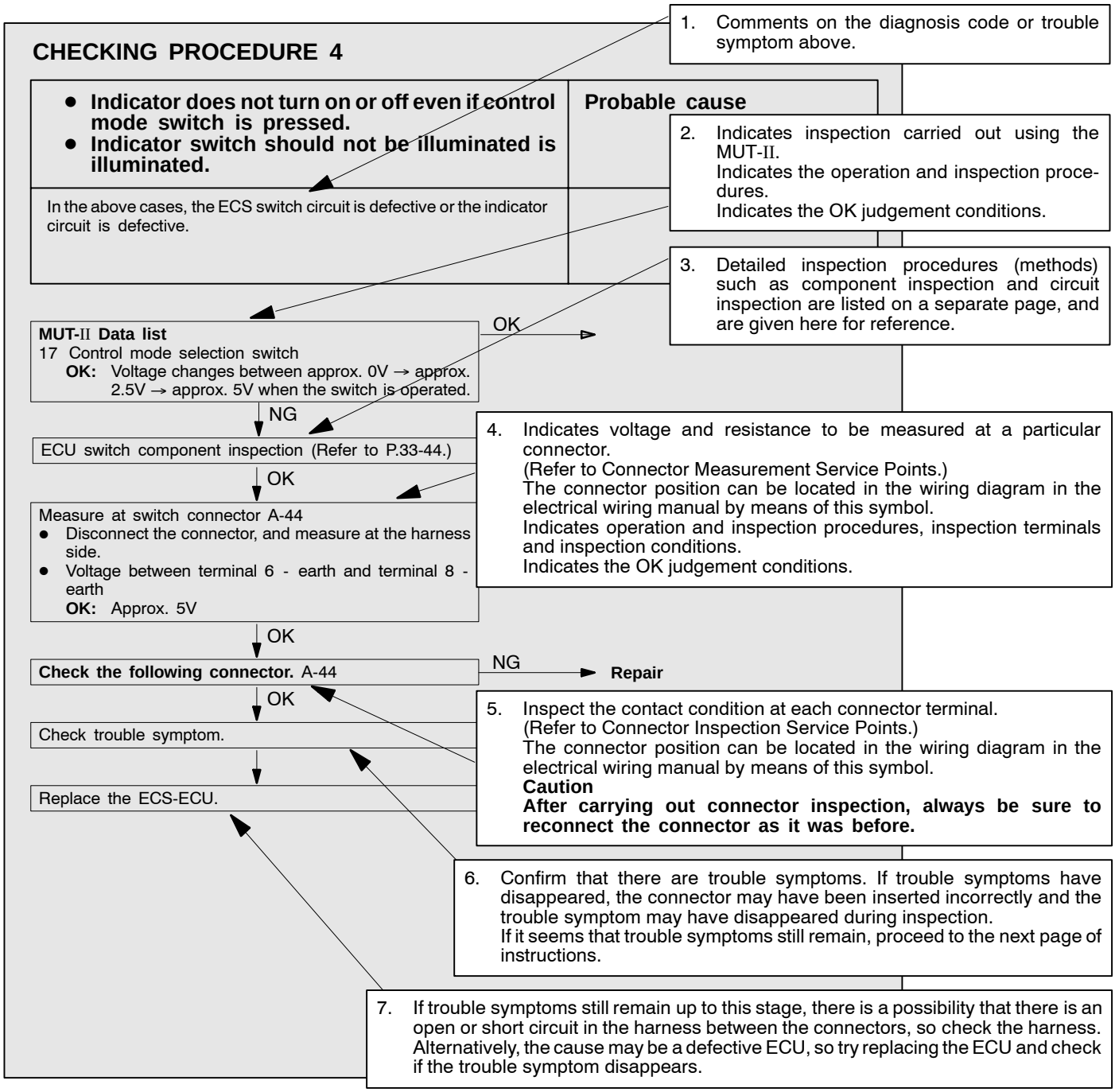
Workshop Manual
Supplement
Service Bulletin

SPACE RUNNER '99
SPACE WAGON '99

Pub. No. PWDE9803

HOW TO USE THE INSPECTION PROCEDURES

The causes of a high frequency of problems occurring in electronic circuitry are generally the connectors, components, the ECU and the harnesses between connectors, in that order. These inspection procedures follow this order, and they first try to discover a problem with a connector or a defective component.



HARNESS INSPECTION

Check for an open or short circuit in the harness between the terminals which were defective according to the connector measurements. Carry out this inspection while referring to the electrical wiring manual. Here, “Check harness between power supply and terminal xx” also includes checking for blown fuses. For inspection service points when there is a blown fuse, refer to “Inspection Service Points for a Blown Fuse.”

MEASURES TO TAKE AFTER REPLACING THE ECU

If the trouble symptoms have not disappeared even after replacing the ECU, repeat the inspection procedure from the beginning.

PRECAUTIONS BEFORE SERVICE

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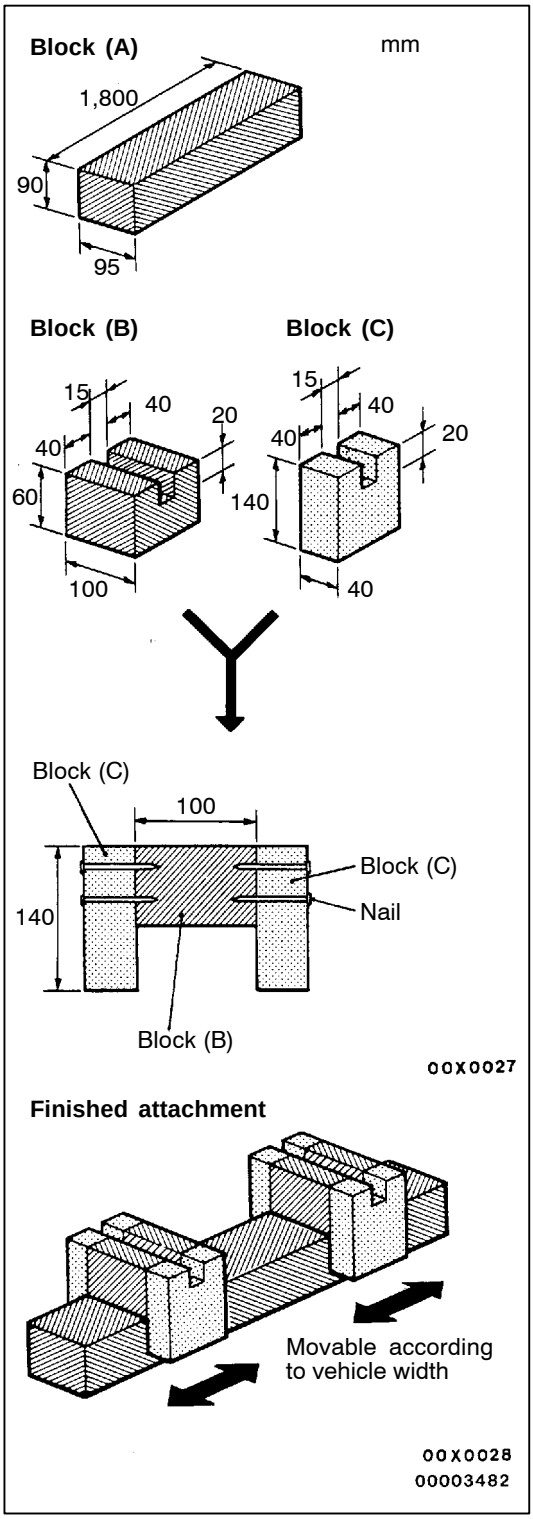
SUPPLEMENTAL RESTRAINT SYSTEM (SRS), SEAT BELT WITH PRE-TENSIONER

1. Items to follow when servicing SRS
   (1) Be sure to read GROUP 52B - Supplemental Restraint System (SRS).
   For safe operations, please follow the directions and heed all warnings.
   (2) Wait at least 60 seconds after disconnecting the battery cable before doing any further work. The SRS system is designed to retain enough voltage to deploy the air bag even after the battery has been disconnected. Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.
   (3) Warning labels must be heeded when servicing or handling SRS components and seat belt with pre-tensioner. Warning labels are located in the following locations.
   - Sun visor
   - Glove box
   - SRS air bag control unit
   - Steering wheel
   - Steering gear and linkage
   - Air bag module (driver's side and front passenger's side)
   - Clock spring
   - Seat belt with pre-tensioner
   - Side air bag module
   - Side impact sensor

   (4) Always use the designated special tools and test equipment.
   (5) Store components removed from the SRS and seat belt with pre-tensioner in a clean and dry place.
   The air bag module and seat belt with pre-tensioner should be stored on a flat surface and placed so that the pad surface is facing upward.
   Do not place anything on top of it.
   (6) Never attempt to disassemble or repair the SRS components (SRS air bag control unit, air bag module, clock spring and side impact sensor) and seat belt with pre-tensioner.
   (7) Whenever you finish servicing the SRS and seat belt with pre-tensioner, check the SRS warning lamp operation to make sure that the system functions properly.
   (8) Be sure to deploy the air bag and seat belt with pre-tensioner before disposing of the air bag module and seat belt with pre-tensioner or disposing of a vehicle equipped with an air bag and seat belt with pre-tensioner. (Refer to GROUP 52B - Air Bag Module and Seat Belt Pre-tensioner Disposal Procedures.)
2. Observe the following when carrying out operations on places where SRS components and seat belt with pre-tensioner are installed, including operations not directly related to the SRS air bag and seat belt with pre-tensioner.
   (1) When removing or installing parts do not allow any impact or shock to the SRS components and seat belt with pre-tensioner.
   (2) SRS components and seat belt with pre-tensioner should not be subjected to heat, so remove the SRS components and seat belt with pre-tensioner before drying or baking the vehicle after painting.
   - SRS air bag control unit, air bag module, clock spring and side impact sensor: 93°C or more
   - Seat belt with pre-tensioner 90°C or more

   After re-installing them, check the SRS warning lamp operation to make sure that the system functions properly.



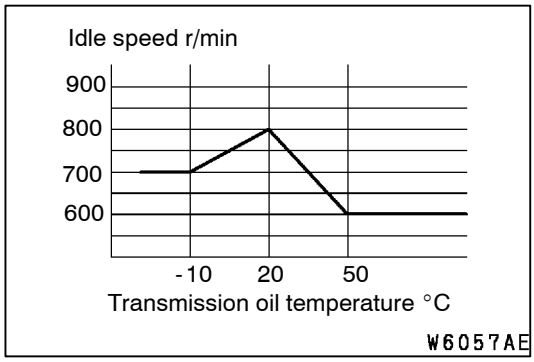
PREPARATION OF "ATTACHMENTS"

1. Prepare the blocks (wooden) and nails as shown in the figure.

Item	Dimensions mm	Quantity
Block (A)	90 × 95 × 1,800	2
Block (B)	60 × 100 × 95	4
Block (C)	140 × 40 × 95	8
Nail	70 or more	32

Caution
The wood selected for the blocks must be hard.

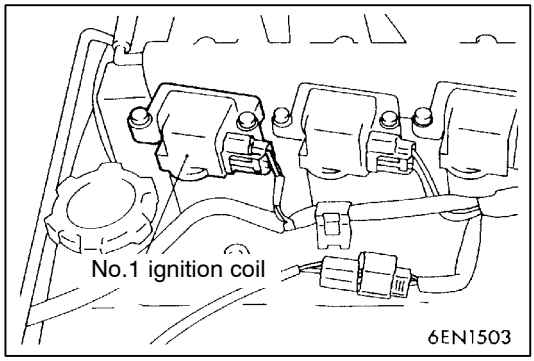
2. For the (B) blocks and (C) blocks, use a saw and chisel or similar tool to make grooves of the dimensions shown in the figure.
3. Make four "ATTACHMENTS" such as shown in the figure nailing (B) and (C) blocks so that each (B) blocks is sandwiches between (C) blocks.



IGNITION TIMING CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
   For vehicles with manual transmission, drive the vehicle for 15 minutes or more to warm the engine, and then carry out the checking while the transmission oil temperature is more than 50°C.

   NOTE
   The idle speed in vehicles with manual transmission varies as shown in the illustration in accordance with the transmission oil temperature.
2. Turn off the ignition switch and then connect the MUT-II to the diagnosis connector.



3. Set the timing light to the power supply line (terminal No.1) of the ignition coil No.1.

   NOTE
   The power supply line is looped and also longer than the other ones.
4. Start the engine and let it run at idle.
5. Use the MUT-II to measure engine idle speed and check that it is within the standard value.

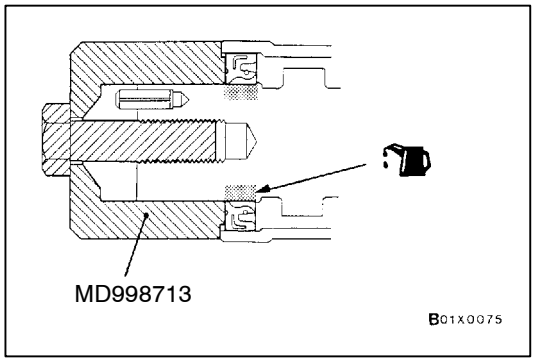
   Standard value:

Items	Idle speed r/min
M/T	600 ± 100 (700 ± 100)*
A/T	650 ± 100 (700 ± 100)*

   NOTE
   *: Indicates the values when more than 4 minutes have passed since the idling condition was started.
6. Select No.17 of the MUT-II Actuator test.

   NOTE
   At this time, the engine speed will become approximately 700 r/min.
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC ± 3°
8. If the basic ignition timing is outside the standard value, inspect the GDI system while referring to GROUP 13A - Troubleshooting.



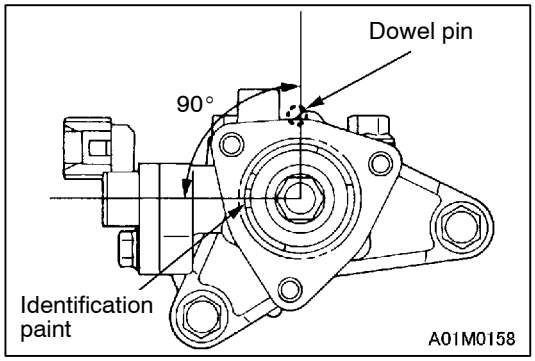
▶C◀ CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the entire circumference of the oil seal lip.
2. Press-fit the oil seal as shown in the illustration.

▶D◀ CAMSHAFT SPROCKET INSTALLATION

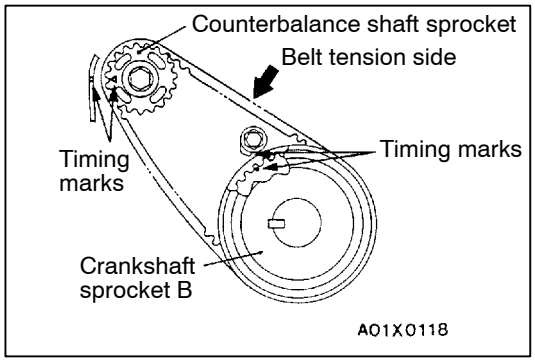
Use the special tool to secure the camshaft sprocket in the same way as during removal, and then tighten the bolt to the specified torque.

Tightening torque: 88 Nm



▶E◀ CAM POSITION SENSING CYLINDER INSTALLATION

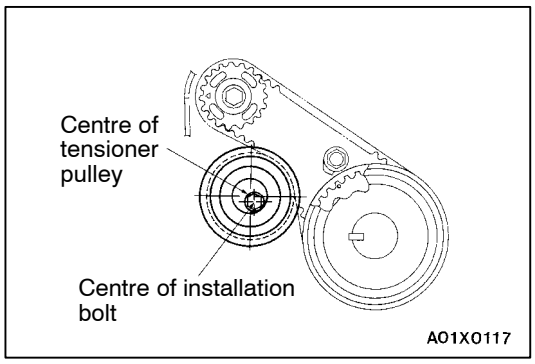
Position the identification paint of cam position sensing cylinder as shown in the illustration.



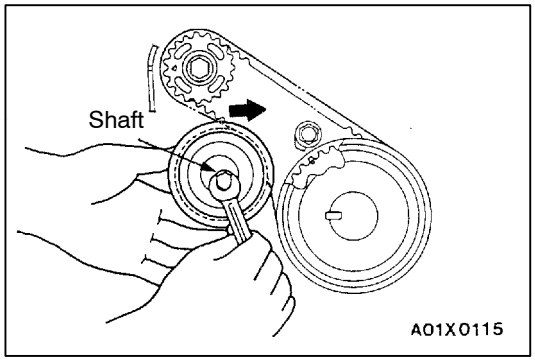
INSTALLATION SERVICE POINTS

▶A◀ TIMING BELT B/TIMING BELT B TENSIONER INSTALLATION

1. Install timing belt B by the following procedure.
   (1) Ensure that crankshaft sprocket B timing mark and the counterbalance shaft sprocket timing mark are aligned.
   (2) Fit timing belt B over crankshaft sprocket B and the counterbalance shaft sprocket. Ensure that there is no slack in the belt.

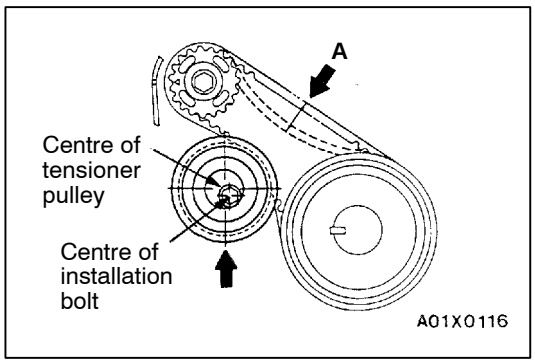


2. Adjust the tension of timing belt B by the following procedure.
   (1) Temporarily fix the timing belt B tensioner such that the centre of the tensioner pulley is to the left and above the centre of the installation bolt, and temporarily attach the tensioner pulley so that the flange is toward the front of the engine.



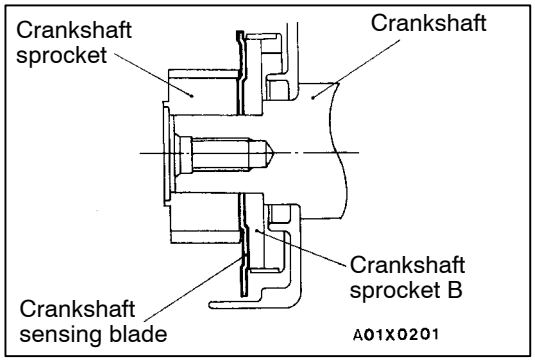
   (2) Holding the timing belt B tensioner up with your finger in the direction of the arrow, place pressure on the timing belt so that the tension side of the belt is taut. Now tighten the bolt to fix the tensioner.

   Caution
   When tightening the bolt, ensure that the tensioner pulley shaft does not rotate with the bolt. Allowing it to rotate with the bolt can cause excessive tension on the belt.



3. To ensure that the tension is correct, depress the belt (point A) with a finger. If not, adjust.

   Standard value: 5 - 7 mm



▶B◀ CRANKSHAFT SENSING BLADE INSTALLATION

Confirm the installation direction of crankshaft sensing blade and install it as shown in the illustration.

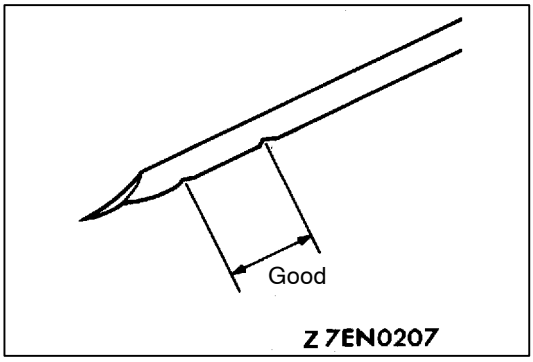
Items			Standard value	Limit
Power steering oil pump and A/C compressor drive belt tension	Vibration frequency Hz	When checked	114 - 139	-
		When a used belt is installed	121 - 133	-
		When a new belt is installed	145 - 166	-
	Tension N	When checked	392 - 588	-
		When a used belt is installed	441 - 539	-
		When a new belt is installed	637 - 833	-
	Deflection (Reference value) mm	When checked	10.0 - 12.0	-
		When a used belt is installed	10.0 - 11.0	-
		When a new belt is installed	7.0 - 9.0	-
Basic ignition timing			5° BTDC ± 3°	-
Ignition timing			Approx. 16°BTDC (Approx. 6°BTDC)*2	-
Idle speed r/min	M/T		600 ± 100*1 (750 ± 100)*2	-
	A/T		650 ± 100 (750 ± 100)*2	-
CO contents %			0.5 or less	-
HC contents ppm			100 or less	-
Compression pressure kPa - r/min			1,790 - 300	1,400 - 300
Compression pressure difference of all cylinder kPa			-	Max. 100
Intake manifold vacuum kPa			-	Min. 37
Cylinder head bolt shank length mm			-	99.4
Timing belt tension torque Nm (Reference value)			2.5 - 4.0	-
Auto-tensioner rod protrusion amount mm			3.8 - 4.5	-

NOTE
*1: Varies depending on the transmission oil temperature. For details, refer to P. 11B-10.
*2: Indicates the value when more than 4 minutes have passed since the engine was started.

4. After the engine has warmed up, run it at idle and check if any noise can be heard.
   If the noise has become smaller or disappeared, oil sludge could make the lash adjusters stick. Clean the lash adjusters. (Refer to the Engine Workshop Manual.) If not improved, go to step 5.
5. Bleed air from the lash adjusters.
6. If the noise has not disappeared even after the air bleeding, clean the lash adjusters. (Refer to the Engine Workshop Manual.)

<LASH ADJUSTER AIR BLEEDING>

NOTE
(1) If the vehicle is parked on a slope for a long period of time, the amount of oil inside the lash adjuster will decrease, and air may get into the high pressure chamber when starting the engine.
(2) After parking the vehicle for long periods, the oil drains out of the oil passage, and it takes time for the oil to be supplied to the lash adjuster, so air can get into the high pressure chamber.
(3) If either of the above situations occur, the abnormal noise can be eliminated by bleeding the air from inside the lash adjusters.



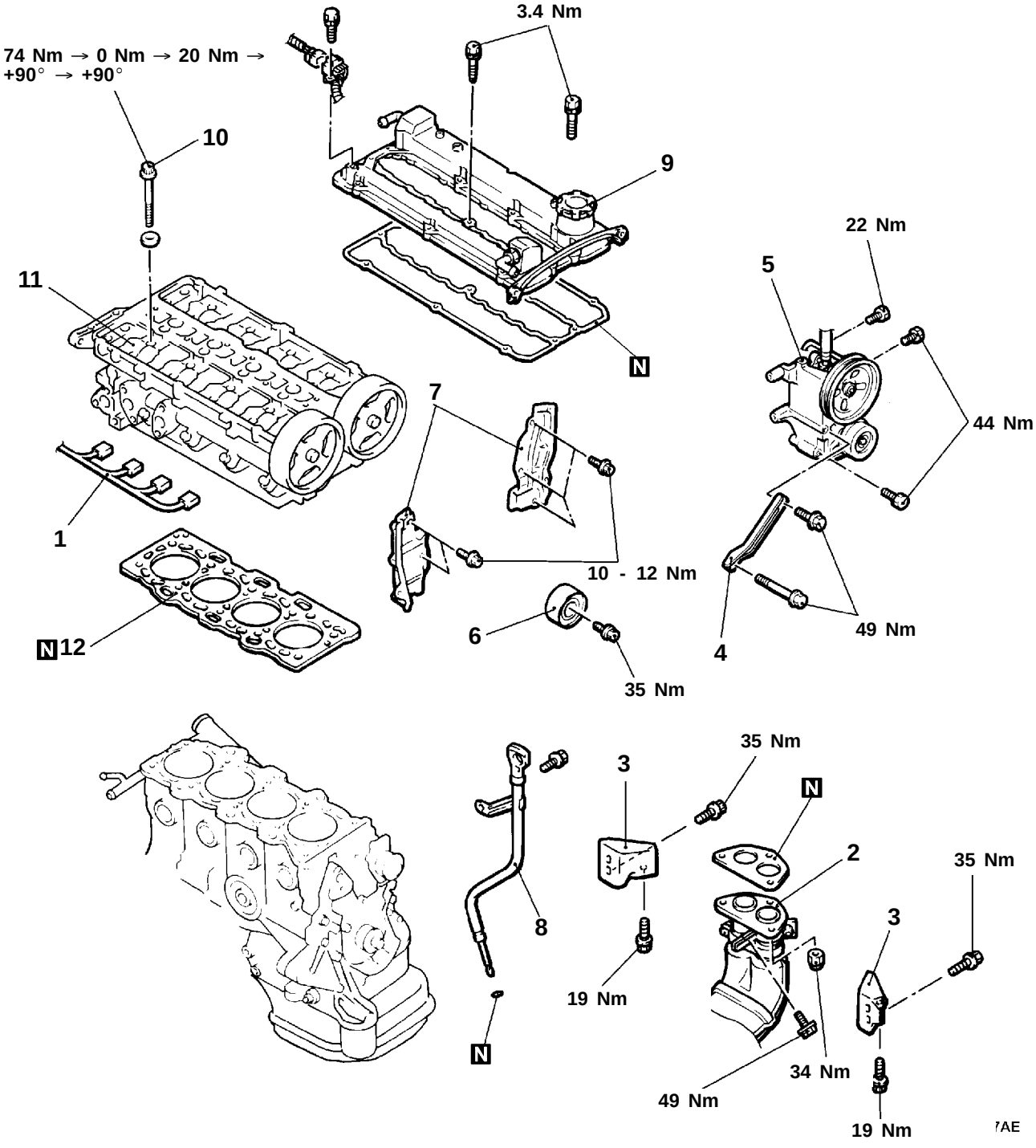
1. Check the engine oil and replenish or replace the oil if necessary.

   NOTE
   (1) If there is a only small amount of oil, air will be drawn in through the oil screen and will get into the oil passage.
   (2) If the amount of oil is greater than normal, then the oil will being mixed by the crankshaft and a large amount of air may get mixed into the oil.
   (3) If the oil is degenerated, air and oil will not separate easily in oil, and the amount of air mixed into the oil will increase.

CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

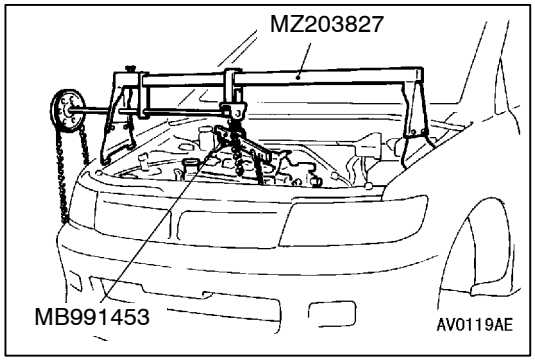
Pre-removal and Post-installation Operation
- Prevention of Fuel Discharge <before removal only> (Refer to GROUP 13B - On-vehicle Service.)
- Engine Coolant Draining and Supplying (Refer to GROUP 14 - On-vehicle Service.)
- Engine Oil Draining and Supplying (Refer to GROUP 12 - On-vehicle Service.)
- Timing Belt Removal and Installation (Refer to P.11B-28.)
- Intake Manifold Removal and Installation (Refer to GROUP 15.)
- Fuel Pump (High pressure) and Fuel Pressure Regulator (High pressure) Removal and Installation (Refer to GROUP 13B.)
- EGR Valve Assembly Removal and Installation (Refer to GROUP 17.)
- Thermostat Case Assembly and Radiator upper hose Removal and Installation (Refer to GROUP 14 - Water Hose and Water Pipe.)



INSTALLATION SERVICE POINTS

▶A◀ ENGINE ASSEMBLY INSTALLATION

Install the engine assembly, checking that the cables, hoses, and harness connectors are not clamped.



▶B◀ ENGINE MOUNT BRACKET INSTALLATION

1. Place a garage jack against the engine oil pan with a piece of wood in between, and install the engine mount bracket while adjusting the position of the engine.
2. Support the engine with the garage jack.
3. Remove the chain block and support the engine assembly with the special tool.

▶C◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

1. Apply a small amount of new engine oil to the O-ring.

   Caution
   Do not let any engine oil get into the delivery pipe.

2. While turning the high-pressure fuel hose to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel hose and check the O-ring for damage. After this, re-insert the delivery pipe and check that the hose turns smoothly.

GENERAL INFORMATION

The Gasoline Direct Injection System consists of sensors which detect the engine conditions, the engine-ECU which controls the system based on signals from these sensors, and actuators which operate under the control of the engine-ECU. The engine-ECU carries out activities such as fuel injection control, idle speed control and ignition timing control. In addition, the engine-ECU is equipped with several diagnosis modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

The injector drive times and injector timing are controlled so that the optimum air/fuel mixture is supplied to the engine to correspond to the continually-changing engine operation conditions.

A single injector for each cylinder is mounted at the cylinder head. The fuel is sent under pressure from the fuel tank to the fuel pressure regulator (low pressure) by the fuel pump (low pressure). The pressure is regulated by the fuel pressure regulator (low pressure) and the fuel regulated is then sent to the fuel pump (high pressure). The fuel under increased pressure generated by the fuel pump (high pressure) is then regulated by the fuel pressure regulator (high pressure) and is then distributed to each of the injectors via the delivery pipes.

Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2. This is called sequential fuel injection.

When the engine is cold or under a severe load, the “open-loop” control keeps the air/fuel ratio at a richer than usual level to maintain driveability. When the engine is under low or medium loads, the air/fuel ratio becomes leaner to reduce fuel consumption. When the engine is running at medium or high loads after having warmed up, the “closed-loop” control uses the signal from the oxygen sensor to keep the air/fuel ratio at the optimum theoretical level.

THROTTLE VALVE OPENING ANGLE CONTROL

This system controls throttle valve opening angle electronically. The engine-ECU determines how deeply the accelerator pedal is depressed by means of the accelerator position sensor (APS). Then the engine-ECU sends a target value of the throttle valve opening angle to the throttle valve controller. The throttle valve control servo operates the throttle valve so that it reaches the target opening angle.

IDLE SPEED CONTROL

This system maintains engine idle speed at a predetermined condition by controlling the air flow that passes through the throttle valve according to engine idling condition and engine loads at idling.

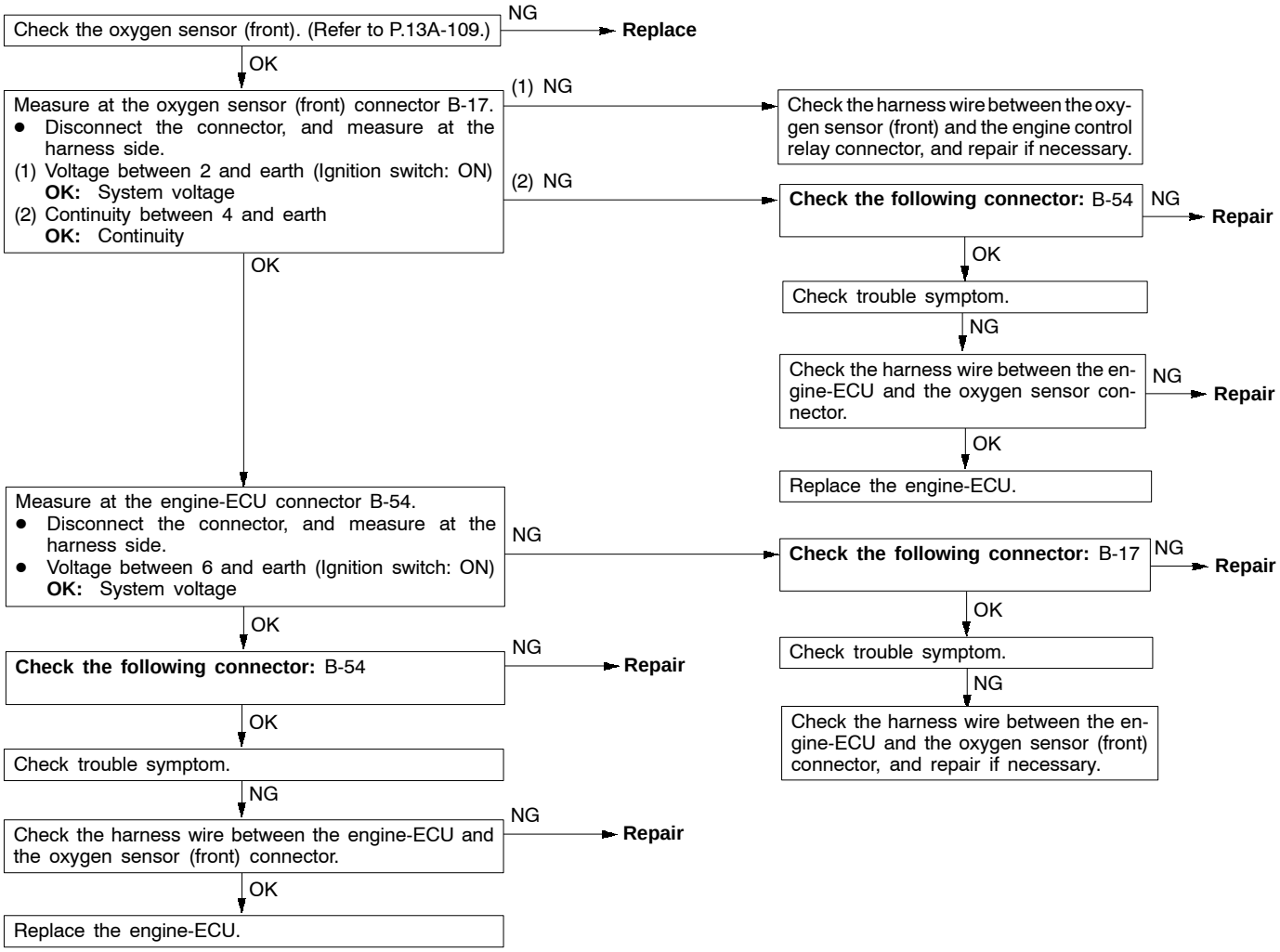
The engine-ECU operates the throttle valve control servo so that engine speed is maintained within a map value. The map value is predetermined according to engine coolant temperature and air-conditioning load.

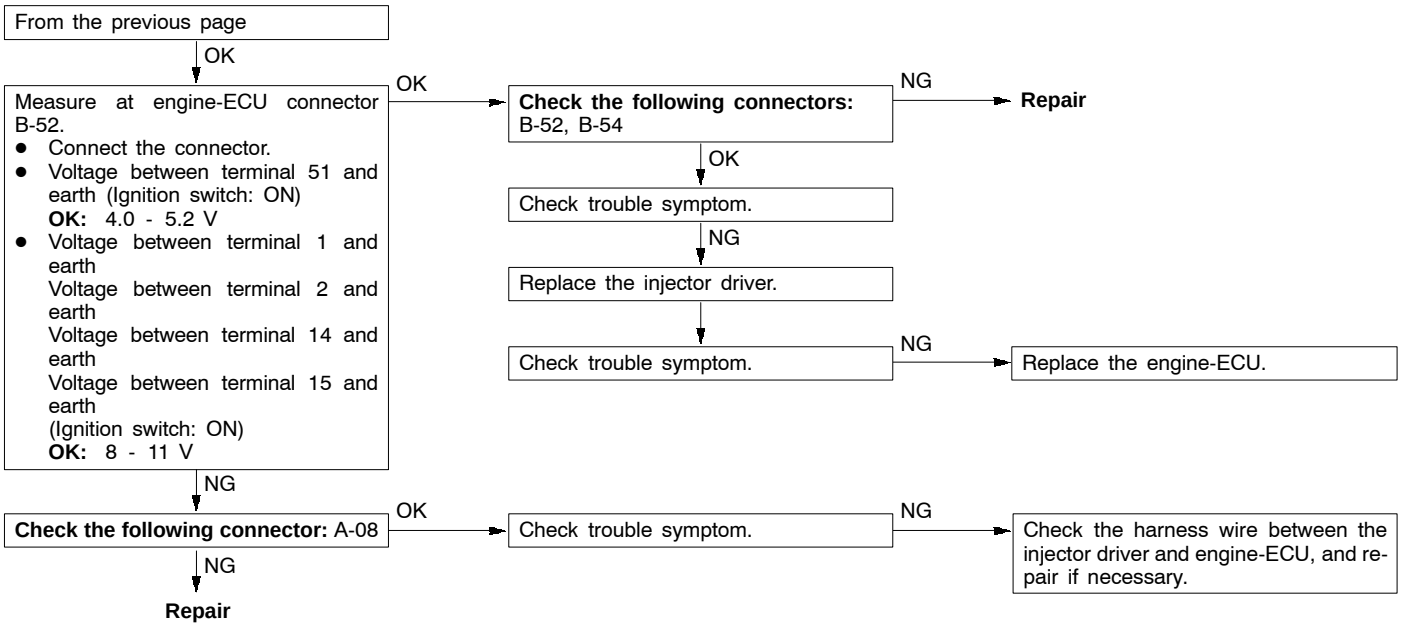
IGNITION TIMING CONTROL

The power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing in order to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the engine-ECU from the engine speed, intake air volume, engine coolant temperature, atmospheric pressure and injection timing (intake stroke or compression stroke).

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 11 Oxygen sensor (front) system	Probable cause
Range of check ● 3 minutes have passed after engine was started. ● Engine coolant temperature is approx. 80°C or more. ● Intake air temperature is 20 - 50°C. ● Engine speed is approx. 2,000 - 3,000 r/min ● Vehicle is moving at constant speed on a flat, level road surface Set conditions ● The oxygen sensor output voltage is around 0.6 V for 30 seconds (does not cross 0.6 V for 30 seconds). ● When the range of check operations given above which accompany starting of the engine are carried out four time in succession, a problem is detected after each operation.	● Malfunction of the oxygen sensor (front) ● Improper connector contact, open circuit or short-circuited harness wire ● Malfunction of the engine-ECU




From the previous page
OK
Measure at engine-ECU connector B-52.
● Connect the connector.
● Voltage between terminal 51 and earth (Ignition switch: ON)
OK: 4.0 - 5.2 V
● Voltage between terminal 1 and earth
Voltage between terminal 2 and earth
Voltage between terminal 14 and earth
Voltage between terminal 15 and earth
(Ignition switch: ON)
OK: 8 - 11 V
OK
Check the following connectors: B-52, B-54
NG
Repair
OK
Check trouble symptom.
NG
Replace the injector driver.
Check trouble symptom.
NG
Replace the engine-ECU.
NG
Check the following connector: A-08
OK
Check trouble symptom.
NG
Check the harness wire between the injector driver and engine-ECU, and repair if necessary.
NG
Repair

Code No.89 Abnormal fuel pressure system	Probable cause
Range of check ● Engine: Idling (during stoichio-feedback operation) Set conditions ● Fuel injection correction value remains excessively low for ten seconds or more. or ● Fuel injection correction value remains excessively high for ten seconds or more.	● Malfunction of the fuel pump (high pressure) ● Malfunction of the intake air temperature sensor ● Malfunction of the barometric pressure sensor ● Malfunction of the air flow sensor ● Malfunction of the engine-ECU

MUT-II Data list
13 Intake air temperature sensor. (Refer to P.13A-75.)
→ NG → Check the intake air temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE No.13.)
↓ OK

MUT-II Data list
25 Barometric air temperature sensor. (Refer to P.13A-77.)
→ NG → Check the barometric air temperature sensor system. (Refer to P.13A-22, INSPECTION PROCEDURE FOR DIAGNOSIS CODE No.25.)
↓ OK

MUT-II Data list
12 Air flow sensor. (Refer to P.13A-75.)
→ NG → Check the air flow sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE No.12.)
↓ OK

Replace the fuel pump (high pressure).

Code No.91 Electronic-controlled throttle valve system	Probable cause
Range of check ● Ignition switch: ON ● Error in communication between the engine-ECU and throttle valve controller Set conditions ● Output voltage of the throttle position sensor (2nd channel) fluctuates significantly (approx. 1 V or more) from an expected value. Range of check ● Ignition switch: ON ● Error in communication between the throttle valve controller and engine-ECU Set conditions ● The throttle valve opening angle (voltage) which the engine-ECU requested of the throttle valve controller is significantly different from output voltage of the (2nd channel) throttle position sensor (approx. one volt).	● Short in communication line ● Malfunction of the engine-ECU ● Malfunction of the throttle valve controller

MUT-II Self-Diag code
Is any other diagnosis code than No.94 output?
→ Yes → Follow INSPECTION PROCEDURE FOR DIAGNOSIS CODE.
↓ No

Check the harness wire between the throttle valve controller and engine-ECU.
→ NG → **Repair**
↓ OK

Replace the throttle valve controller.

From the previous page

OK

Check ignition coil spark for each cylinder.
(1) Remove the ignition coil.
(2) Install a new spark plug to the removed ignition coil.
(3) Disconnect the injector intermediate connector.

Caution
Never touch the connector terminal as approx. 100 V is applied to the injector, or you are seriously injured.

(4) Earth the spark plug electrode securely.
(5) Check that the spark plug ignites when the engine is cranked.

NG → Replace the ignition coil.

OK

Check all the following items:
- Spark plug
- Compression pressure
- Foreign material (such as water or kerosine) entered the fuel lines

OK

Check trouble symptom.

NG → Replace the injector.

INSPECTION PROCEDURE 15

The feeling of impact when decelerating	Probable cause
The cause is probably insufficient intake air due to a faulty electronic-controlled throttle valve system.	• Malfunction of the electronic-controlled throttle valve system

MUT-II Self-Diag code
Is a diagnosis code displayed?
- Yes → (Refer to P.13A-13, INSPECTION CHART FOR DIAGNOSIS CODES.)
- No ↓

MUT-II Data list
79 Throttle position sensor (1st channel) (Refer to P.13A-80.)
- NG → Check the throttle valve position feedback system. (Refer to P.13A-37, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 92.)
- OK ↓

MUT-II Data list
26 Accelerator pedal position switch (Refer to P.13A-77.)
- NG → Check the accelerator pedal position switch system. (Refer to P.13A-67, INSPECTION PROCEDURE 27.)
- OK ↓

Clean around the throttle valve. (Refer to P.13A-97.)

INSPECTION PROCEDURE 16

Knocking	Probable cause
The cause is probably incorrect detonation control or improper heat range of the spark plugs.	• Malfunction of the detonation sensor • Improper heat range of the spark plugs

MUT-II Self-Diag code
Is a diagnosis code displayed?
- Yes → (Refer to P.13A-13, INSPECTION CHART FOR DIAGNOSIS CODES.)
- No ↓

Does knocking occur when the vehicle is driven with the detonation sensor disconnected?
(At this time, use the MUT-II to check whether the ignition timing is retarded from when the detonation sensor connector is connected.)
- No → Check the detonation sensor system. (Refer to P.13A-23, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 31.)
- Yes ↓

Check all the following items:
- Spark plug
- Foreign material (such as water or kerosine) entered the fuel lines

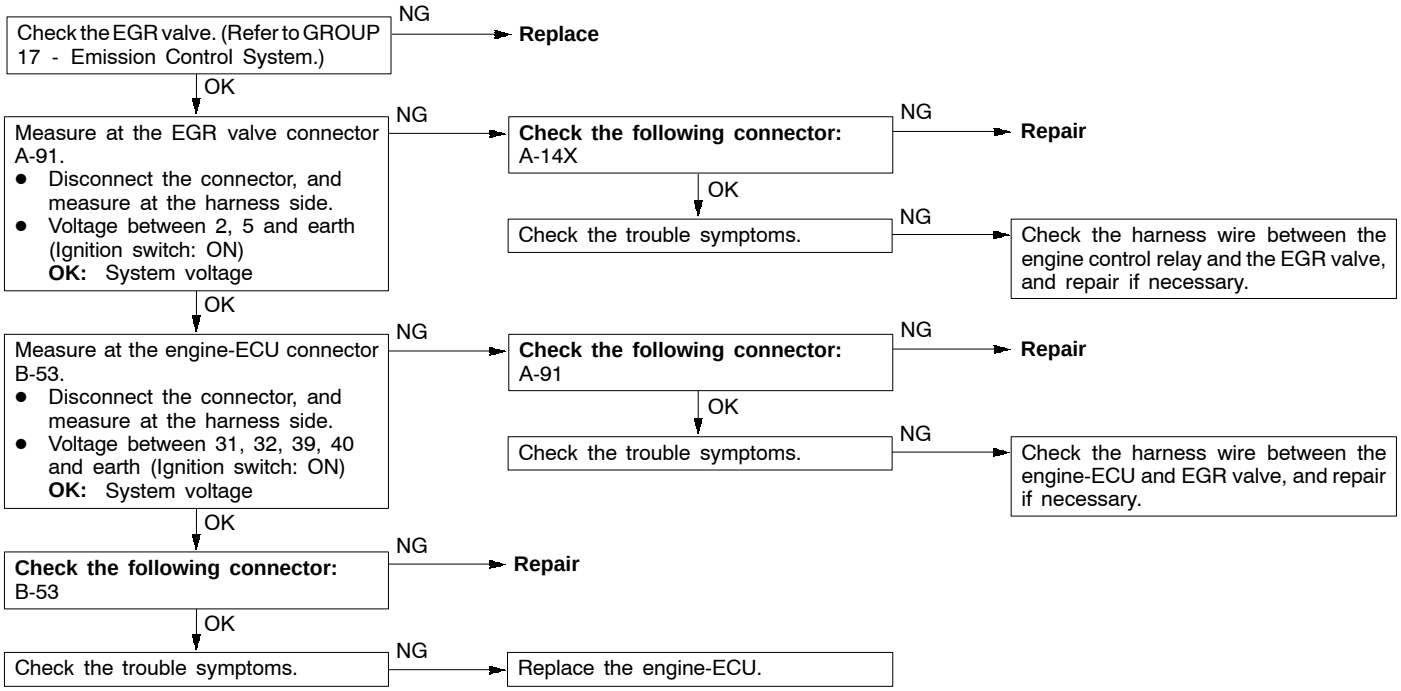
INSPECTION PROCEDURE 17

Run-on (dieseling)	Probable cause
The cause is probably fuel leak from injector(s)	• Malfunction of the injector

Replace the injector.

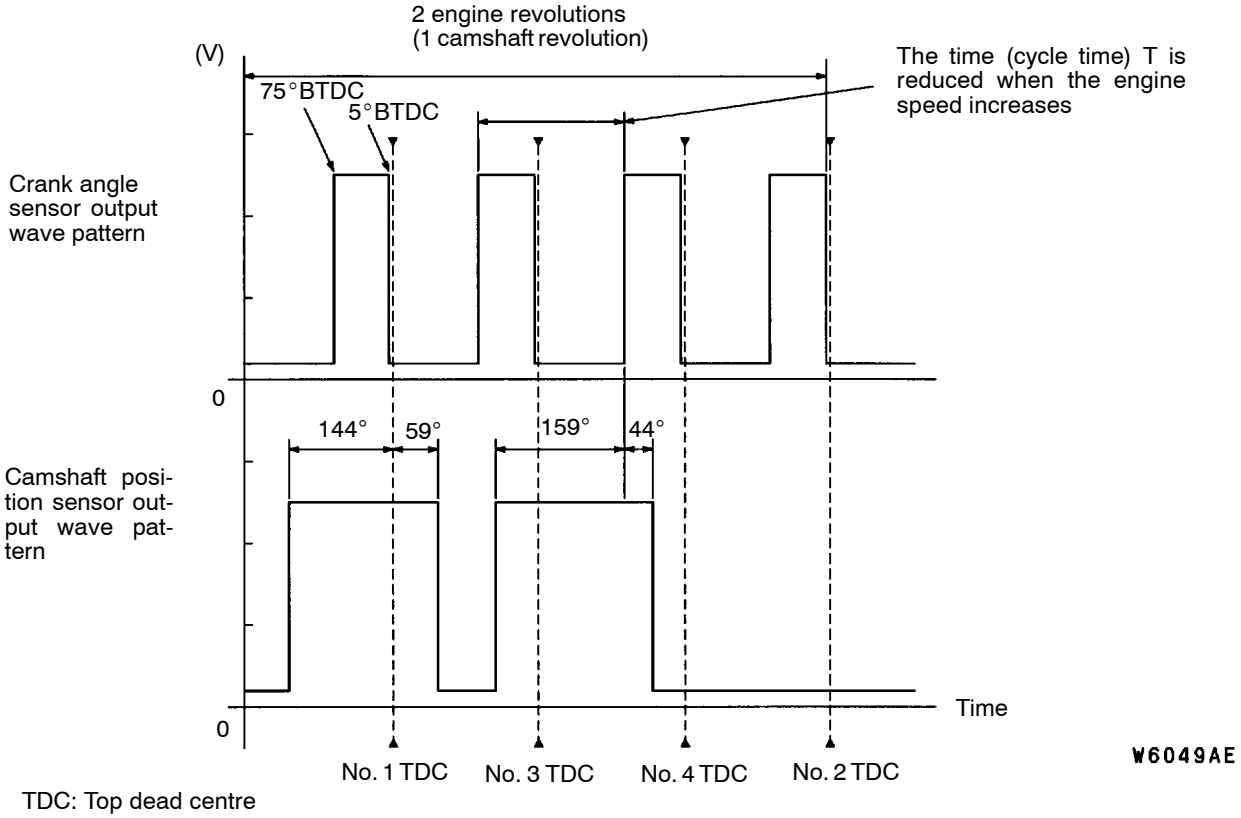
INSPECTION PROCEDURE 29

EGR valve (stepper motor) system	Probable cause
The engine-ECU controls the EGR valve (stepper motor) in order to control the amount of exhaust gas mixed in the intake air.	• Malfunction of the EGR valve • Open circuit or short-circuited harness wire in the EGR valve circuit • Malfunction of the engine-ECU



Item No.	Check items	Requirements		Normal condition	Inspection procedure No.	Reference page
79	Throttle position sensor (1st channel)	• Engine coolant temperature: 80 - 95°C • Ignition switch: ON (Engine stopped)	Release the accelerator pedal.	450 - 800 mV	Code No.79	13A-35
			Depress the accelerator pedal gradually.	Increases in response to pedal depression stroke.		
			4,600 - 5,200 mV	3,900 - 4,900 mV		
		Engine: After warm-up, idling	No load	450 - 1,000 mV		
			A/C switch: OFF → ON	Increases by 100 - 600 mV.		
			Selector lever: N → D range	Increases by 0 - 200 mV.		
99	Fuel injection mode	Engine: After warm up	Idling (for several minutes after engine start)	Lean compression	-	-
			2,500 r/min	Stoichio metric feedback		
			Sudden racing after idle position	Open loop		

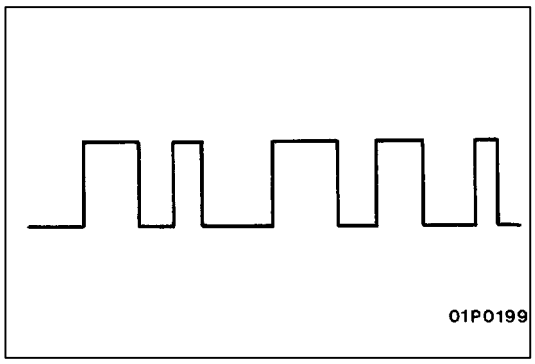
Standard wave pattern



TDC: Top dead centre

Wave Pattern Observation Points

Check that cycle time T becomes shorter when the engine speed increases.



Examples of Abnormal Wave Patterns

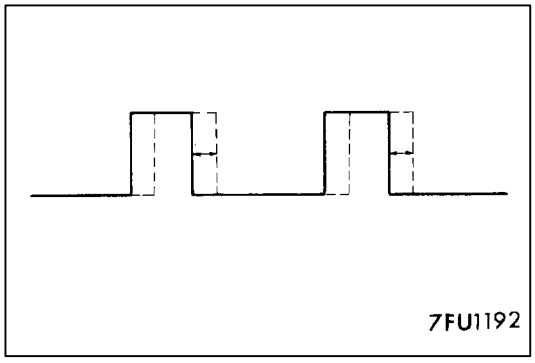
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

  Rectangular wave pattern is output even when the engine is not started.



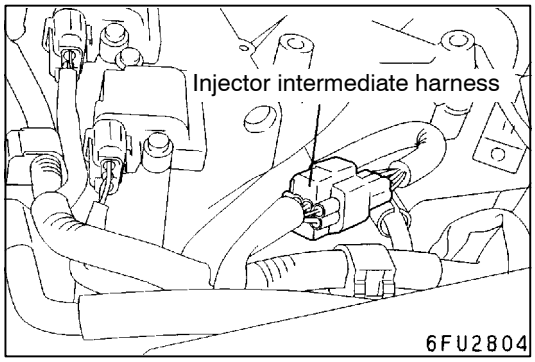
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



MEASUREMENT OF FUEL HIGH PRESSURE BETWEEN FUEL PUMP (HIGH PRESSURE) AND INJECTORS

NOTE
Measurement of the fuel pressure between the fuel pump (high pressure) and the injectors should be carried out after checking that the fuel pressure between the fuel pump (low pressure) and the fuel pump (high pressure) is normal.

1. Connect the MUT-II to the diagnosis connector.
2. Disconnect the injector intermediate harness connector.
3. Turn the ignition switch to ON.
4. Select “Item No.74” from the MUT-II Data list.
5. Crank the engine continuously for 2 seconds or more, and visually check that there are no fuel leaks from any parts.

   Caution
   If any fuel leaks appear, stop cranking immediately and repair the source of the leak.

6. Check if the fuel pressure is more than 1 MPa immediately after 20 seconds have passed since cranking was finished.
7. If the fuel pressure is lower than 1 MPa, it means that there is likely to be a leak in the high-pressure fuel system, so this system should be checked.
8. Turn the ignition switch to OFF.
9. Connect the injector intermediate harness connector.
10. Start the engine and run at idle.
11. Measure fuel pressure while the engine is running at idle.

    Standard value: 4 - 7.5 MPa

12. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
13. If fuel pressure is out of the standard value, troubleshoot and repair according to the table below.

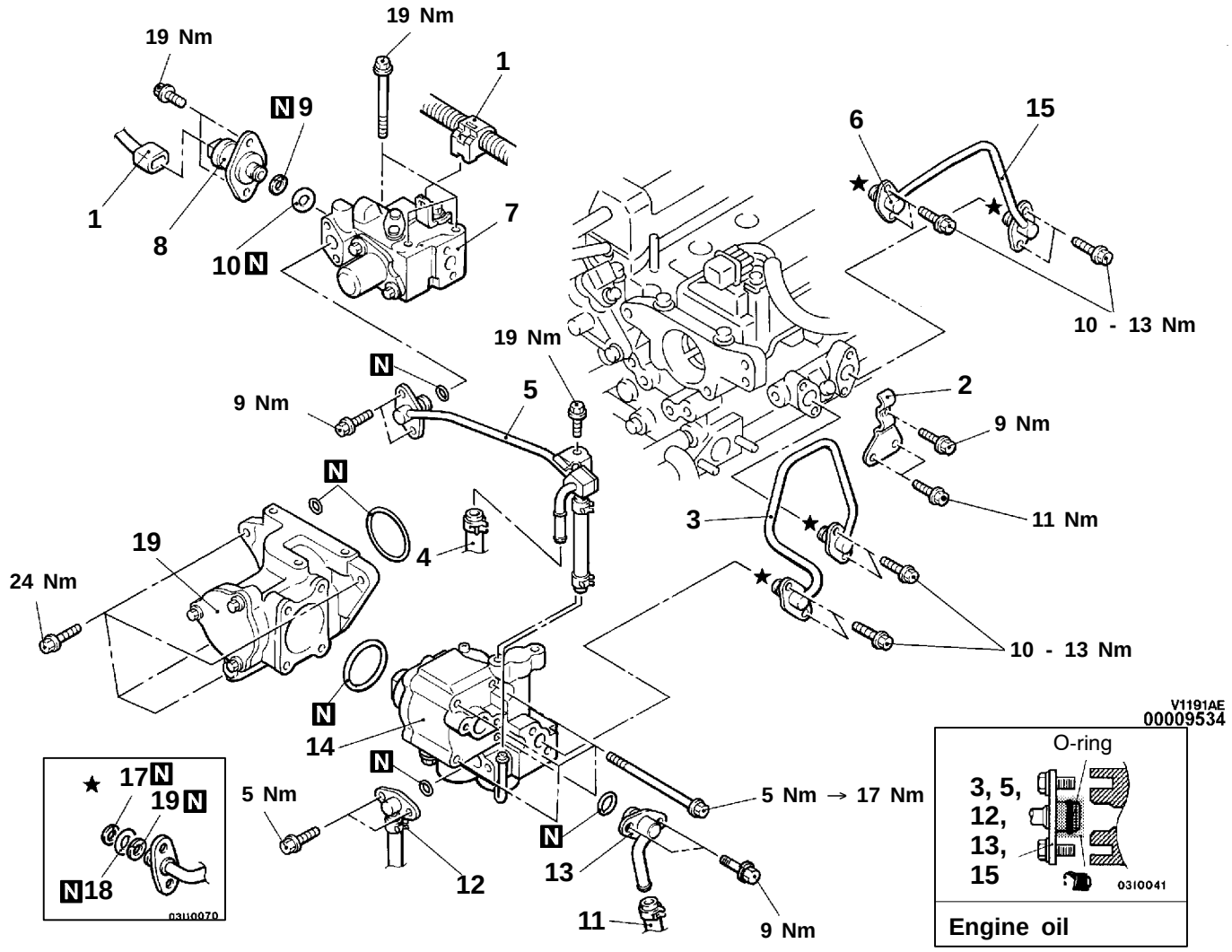
Symptom	Probable cause	Remedy
● Fuel pressure too low ● Fuel pressure drops after racing	Fuel leaking to return side due to poor fuel pressure regulator (high pressure) valve seating or settled spring	Replace fuel pressure regulator (high pressure)
	Low fuel pump (high pressure) delivery pressure	Replace the fuel pump (high pressure)
Fuel pressure too high	Binding valve in fuel pressure regulator (high pressure)	Replace fuel pressure regulator (high pressure)
	Clogged fuel return hose or pipe	Clean or replace hose or pipe

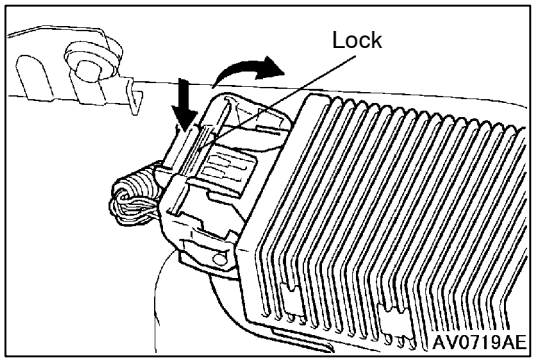
14. Stop the engine and turn the ignition switch to OFF.
15. Disconnect the MUT-II.

FUEL PUMP (HIGH PRESSURE) AND FUEL PRESSURE REGULATOR (HIGH PRESSURE)

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Prevention of fuel discharge <before removal only> (Refer to P.13A-103.)
- Engine Cover Removal and Installation
- Air Cleaner Assembly Removal and Installation
- Fuel Leak Check <after installation only> (Refer to P.13A-103.)





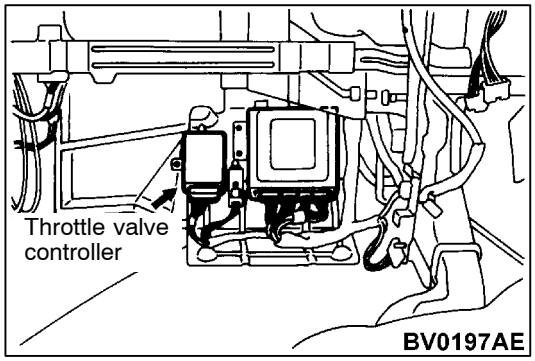
REMOVAL SERVICE POINT

◀A▶ INJECTOR DRIVER REMOVAL

Press the injector driver connector in the place shown in the illustration to disconnect the injector driver connector.

Caution

1. **Disconnect the battery (-) cable from its terminal before carrying out this operation.**
2. **High-tension current is flowing in the harness between the injector driver and the injector while engine is running, and the injector driver will become hot after the vehicle has been driven, so take care when handling it.**



THROTTLE VALVE CONTROLLER

INSTALLATION SERVICE POINT

If the throttle valve controller is replaced, initialize the electronic-controlled throttle valve system.

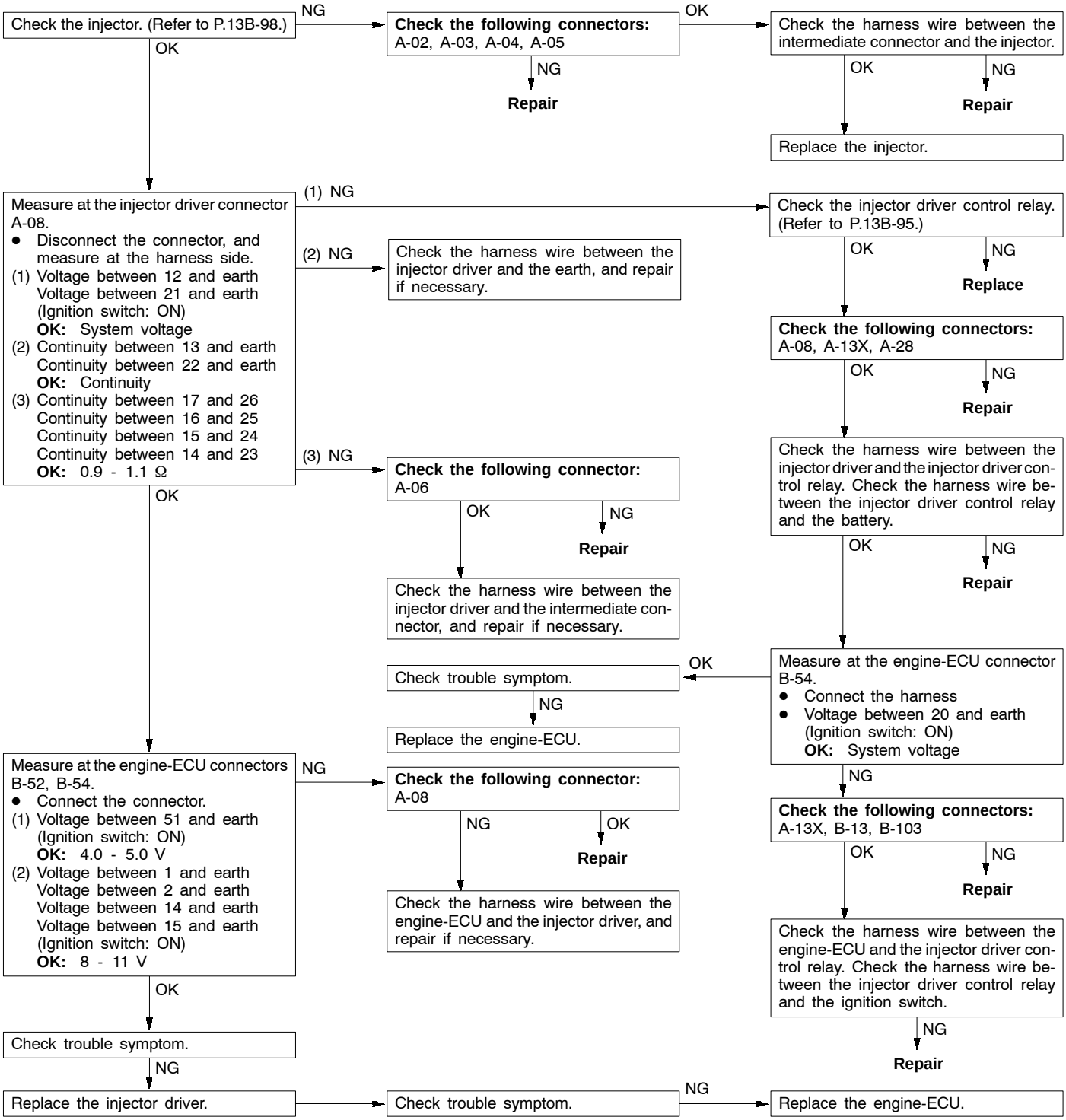
Initialization

Turn on the ignition switch, and turn off it within one second. Then leave it for at least ten seconds with the ignition switch off.

INSPECTION CHART FOR DIAGNOSIS CODES

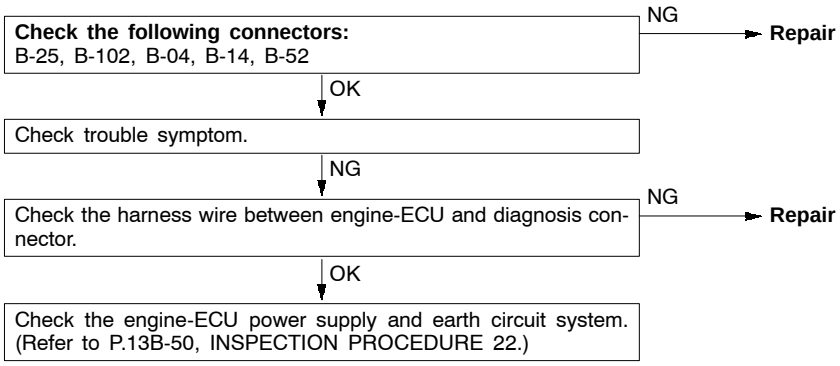
Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13B-12
12	Air flow sensor system	13B-13
13	Intake air temperature sensor system	13B-14
14	Throttle position sensor system	13B-15
21	Engine coolant temperature sensor system	13B-16
22	Crank angle sensor system	13B-17
23	Camshaft position sensor system	13B-18
24	Vehicle speed sensor system	13B-19
25	Barometric pressure sensor system	13B-20
31	Detonation sensor system	13B-21
41	Injector system	13B-22
44	Abnormal combustion	13B-23
54	Immobilizer system	13B-24
56	Abnormal fuel pressure	13B-24
58	Excessive intake air amount	13B-26
61	Communication wire with A/T-ECU system	13B-26
64	Alternator FR terminal system	13B-27
66	Brake vacuum sensor system	13B-28
89	Abnormality in fuel pressure system	13B-29

Code No.41 Injector system	Probable cause
Range of check ● While engine is cranking or running ● Engine speed is 4,000 r/min or less. ● System voltage is 10 V or more. ● While fuel cut and injector forced drive (actuator test) are not being carried out Set conditions ● Injector open circuit check signal is not output by the injector driver for a set number of times.	● Malfunction of the injector ● Malfunction of the injector driver control relay ● Malfunction of the injector driver ● Open circuit or short-circuited harness wire of the injector drive circuit ● Malfunction of the engine-ECU



INSPECTION PROCEDURE 2

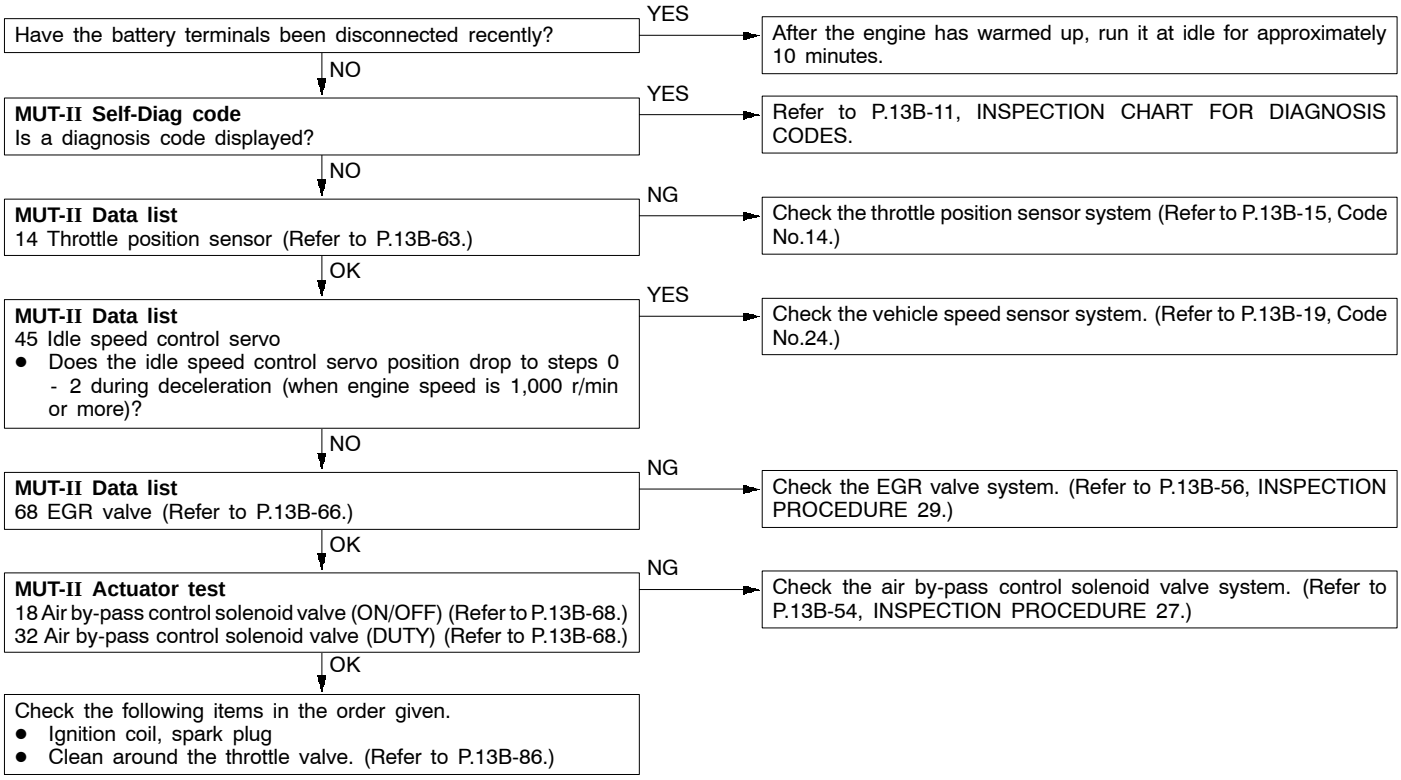
MUT-II communication with engine-ECU is impossible.	Probable cause
One of the following causes may be suspected. ● No power supply to engine-ECU. ● Defective earth circuit of engine-ECU. ● Defective engine-ECU. ● Improper communication line between engine-ECU and MUT-II	● Malfunction of engine-ECU power supply circuit ● Malfunction of engine-ECU ● Open circuit between the engine-ECU and diagnosis connector



NOTE
On vehicles with multi-display, if a malfunction cannot be resolved after the procedure above, check the multi-display and replace if necessary. (Refer to GROUP 54 - Multi-display.)

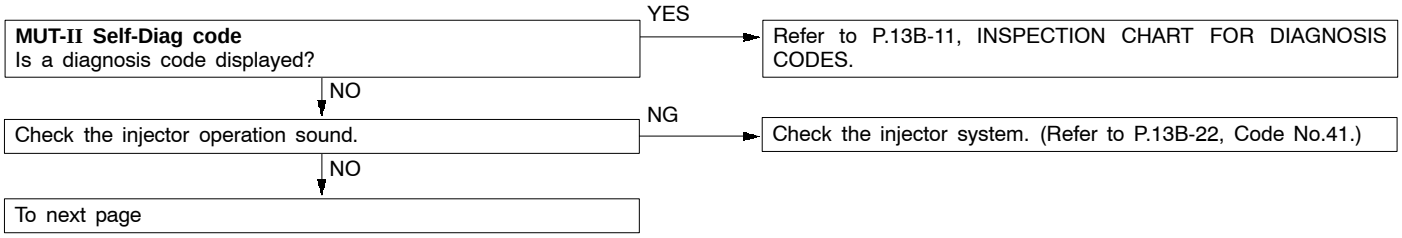
INSPECTION PROCEDURE 12

The engine stalls when decelerating	Probable cause
The cause is probably insufficient intake air due to an idle speed control malfunction, or incorrect air/fuel ratio due to an air by-pass control or EGR malfunction.	• Malfunction of the idle speed control system • Malfunction of the air by-pass control system • Malfunction of the EGR valve



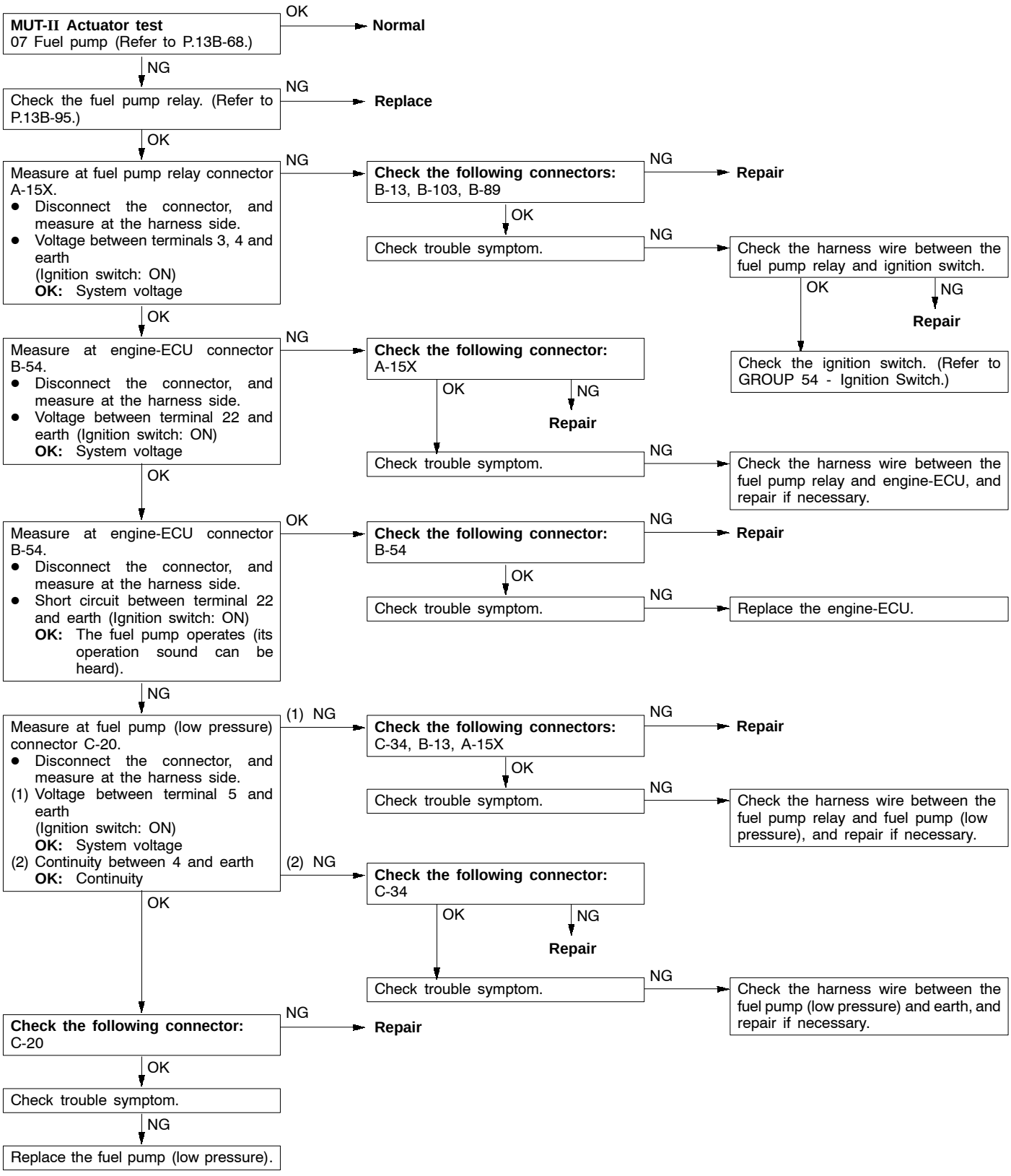
INSPECTION PROCEDURE 13

Hesitation, sag, stumble, poor acceleration or surge	Probable cause
The cause is probably a malfunction of the ignition system, or incorrect air/fuel ratio, air by-pass control or compression pressure.	• Malfunction of the ignition system • Malfunction of the air/fuel ratio control system • Malfunction of the air by-pass control system • Poor compression pressure • Air leaking into air intake system

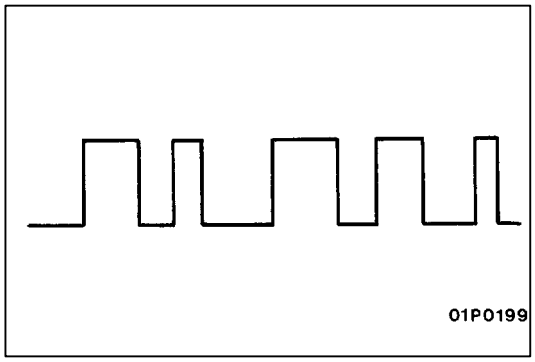


INSPECTION PROCEDURE 28

Fuel pump (low pressure) system	Probable cause
The engine-ECU turns on the fuel pump relay while the engine is cranking or running, and supplies power source to the fuel pump (low pressure).	• Malfunction of the fuel pump relay • Malfunction of the fuel pump (low pressure) • Open circuit or short-circuited harness wire in the fuel pump (low pressure) circuit, or poor connector contact • Malfunction of the engine-ECU



Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC (stepper) motor position *3	• Engine coolant temperature: 80 - 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range) • Engine: Idling • When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	10 - 55 STEP	-	-
			A/C switch: OFF → ON	Increases by 15 - 55 steps		
			• A/C switch: OFF • Select lever: N range → D range	Increases by 10 - 40 steps		
48	M/T oil temperature sensor	Drive after the engine has warmed up.	Drive for 15 minutes or more.	Gradually increases to 50° - 90°C.	Procedure No. 33	13B-59
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 32	13B-58
			A/C switch: ON	ON (Compressor clutch is operating)		
66	Brake vacuum sensor	• Engine coolant temperature: 80 - 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	When the engine is running at idle, stop the engine, and then turn the ignition switch to ON and depress the brake pedal several times.	Displayed pressure increases.	Code No. 66	13B-28
67	Stop lamp switch	Ignition switch: ON	Brake pedal: Depressed	OFF	Procedure No. 34	13B-60
			Brake pedal: Released	ON		
68	EGR valve	• Engine coolant temperature: 80 - 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	5 - 15 STEP	Procedure No. 29	13B-56
			2,500 r/min	0 - 5 STEP		



Examples of Abnormal Wave Patterns

- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

  Rectangular wave pattern is output even when the engine is not started.

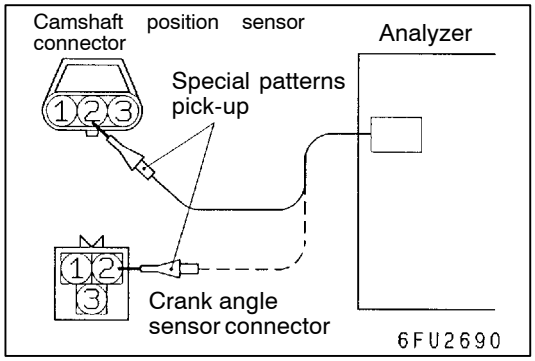
- Example 2

  Cause of problem

  Damaged rectifier or vortex generation column

  Wave pattern characteristics

  Unstable wave pattern with non-uniform frequency. However, when an ignition leak occurs during acceleration, the wave pattern will be distorted temporarily, even if the air flow sensor is normal.



CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

Measurement Method

1. Disconnect the camshaft position sensor connector and connect the special tool (test harness: MB991709) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to camshaft position sensor terminal 2.
3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

Alternate Method (Test harness not available)

1. Connect the analyzer special patterns pickup to engine-ECU terminal 88. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

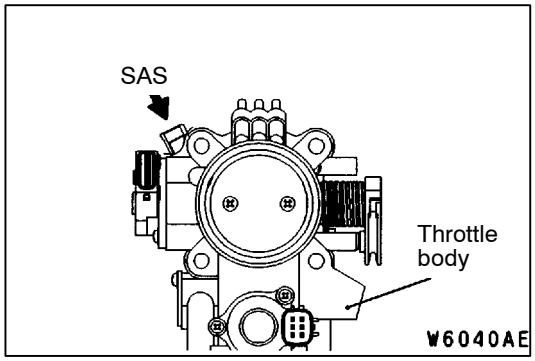
4. Select the item No.30 of the MUT-II Actuator test.

   NOTE
   This holds the idle speed control servo at the basic step to adjust the basic idle speed.

5. Check the basic idle speed.

   Standard value: 750 ± 50 r/min

   NOTE
   (1) The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
   (2) If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it.



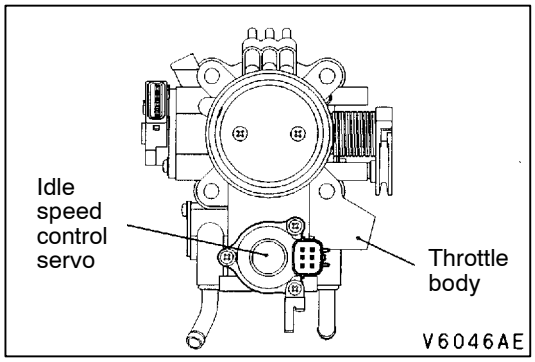
6. If not within the standard value range, turn the speed adjusting screw (SAS) to make the necessary adjustment.

   NOTE
   (1) Use a screwdriver which is shorter than 30 mm to turn the SAS.
   (2) If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS.

7. Press the MUT-II clear key, and release the idle speed control servo from the Actuator test mode.

   NOTE
   Unless the idle speed control servo is released, the Actuator test mode will continue 27 minutes.

8. Turn the ignition switch to OFF.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

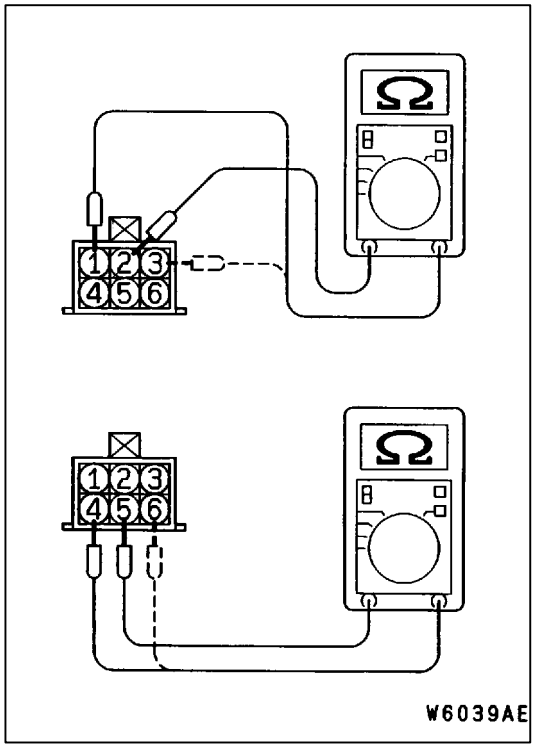


IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR) CHECK

Checking the Operation Sound

1. Check that the engine coolant temperature is 20°C or below.

   NOTE
   Disconnecting the engine coolant temperature sensor connector and connecting the harness-side of the connector to another engine coolant temperature sensor that is at 20°C or below is also okay.
2. Check that the operation sound of the stepper motor can be heard after the ignition is switched ON. (but without starting the motor.)
3. If the operation sound cannot be heard, check the stepper motor's activation circuit.
   If the circuit is normal, it is probable that there is a malfunction of the stepper motor or of the engine control unit.



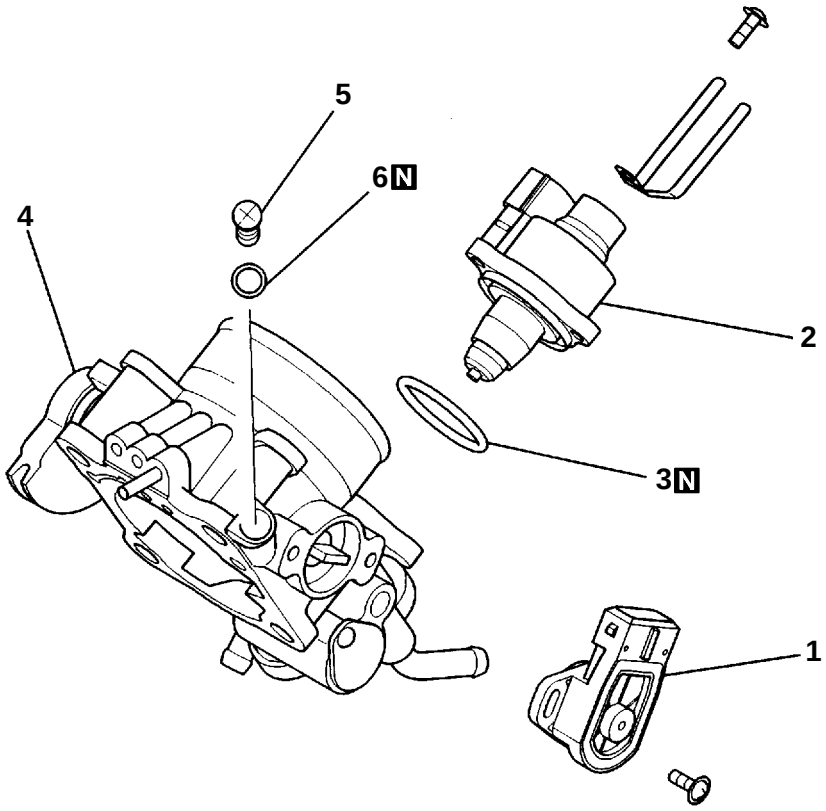
Checking the Coil Resistance

1. Disconnect the idle speed control servo connector.
2. Measure the resistance between terminal 2 and either terminal 1 or terminal 3 of the connector at the idle speed control servo side.

   Standard value: 28 - 33 Ω (at 20°C)
3. Measure the resistance between terminal 5 and either terminal 6 or terminal 4 of the connector at the idle speed control servo side.

   Standard value: 28 - 33 Ω (at 20°C)

DISASSEMBLY AND REASSEMBLY

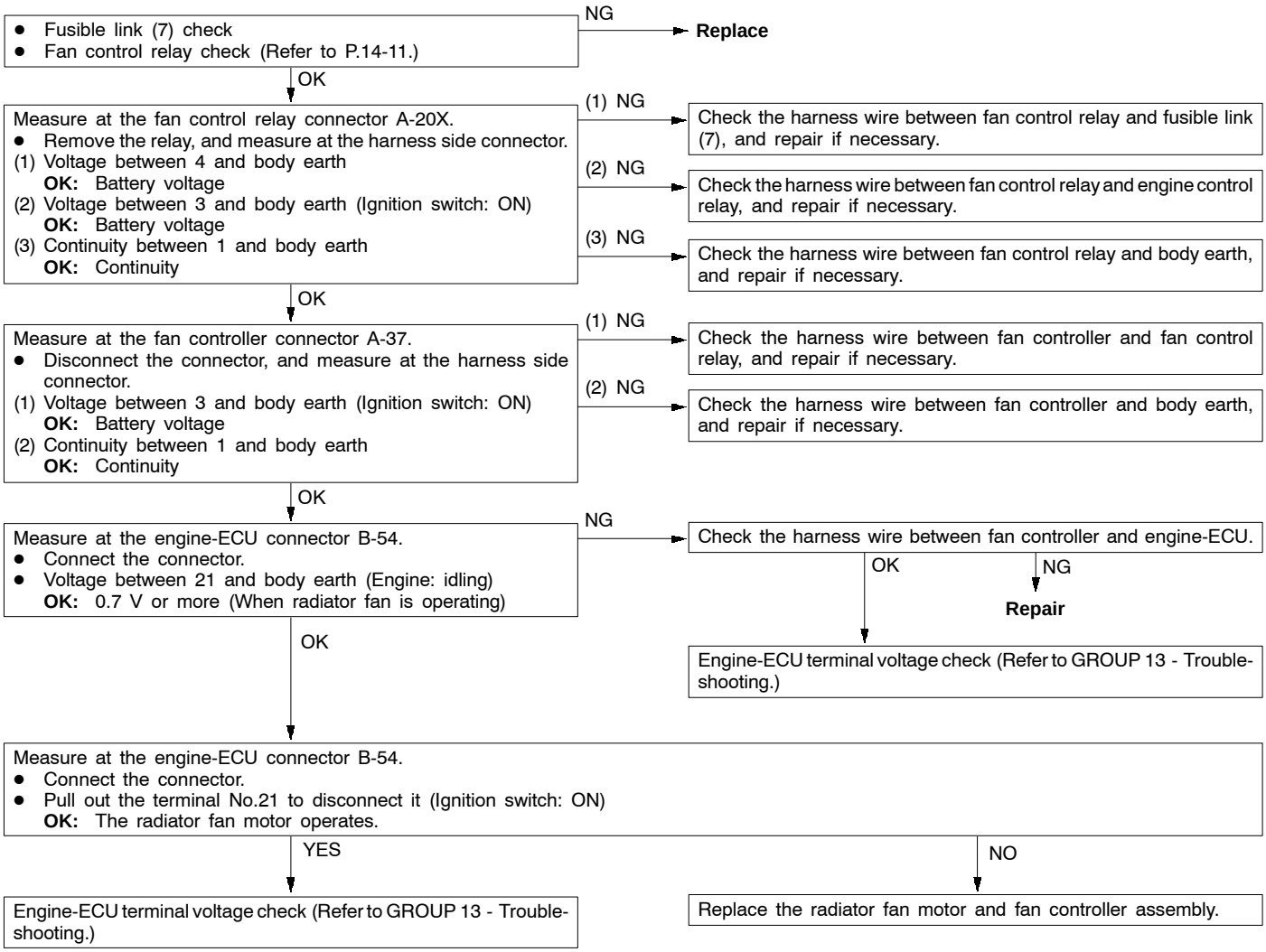


Disassembly steps

▶A◀ 1. Throttle position sensor
2. Idle speed control servo
3. O-ring
4. Throttle body
5. Speed adjusting screw
6. O-ring

NOTE
1. The speed adjusting screw is correctly adjusted at the factory and should not be removed.
2. If the speed adjusting screw has been removed, carry out fixed SAS adjustment.
3. If the speed adjusting screw should happen to have been removed, carry out speed adjusting screw adjustment.

<Vehicles without A/C>



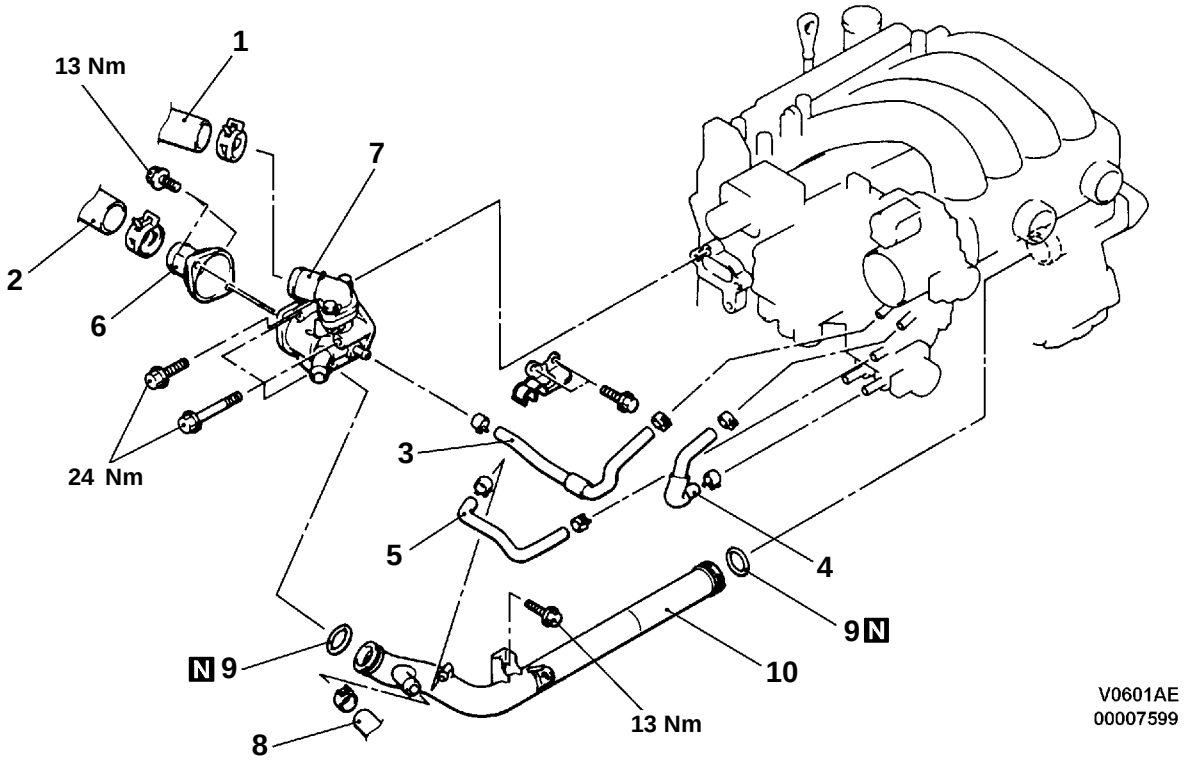
WATER HOSE AND WATER PIPE

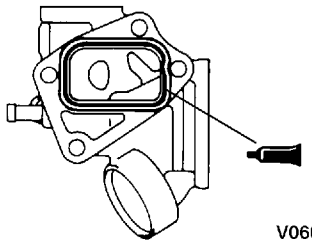
14100330306

REMOVAL AND INSTALLATION

<4G6>

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-9.)
- Engine Cover Removal and Installation
- Air Cleaner Assembly Removal and Installation





Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

Removal steps

◀A▶ ▶C◀ 1. Radiator upper hose connection
◀A▶ ▶C◀ 2. Radiator lower hose connection
3. Water hose
4. Water hose
5. Water hose
6. Water inlet fitting
▶B◀ 7. Thermostat case assembly
8. Heater hose connection
▶A◀ 9. O-ring
10. Water inlet pipe

INSPECTION

15100340061

EXHAUST MANIFOLD CHECK

1. Check for damage or cracking of any part.
2. Using a straight edge and thickness gauge, check for distortion of the cylinder head installation surface.

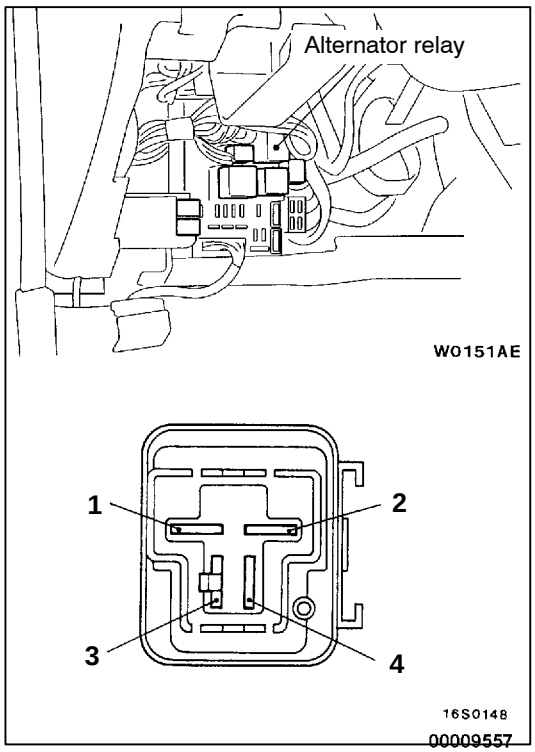
Standard value: 0.15 mm or less

Limit: 0.20 mm

EXAMPLES OF ABNORMAL WAVEFORMS

NOTE
1. The size of the waveform patterns differs largely, depending on the adjustment of the variable knob on the analyzer.
2. Identification of abnormal waveforms is easier when there is a large output current (regulator is not operating). (Waveforms can be observed when the headlamps are illuminated.)
3. Check the conditions of the charging warning lamp (illuminated/not illuminated). Also, check the charging system totally.

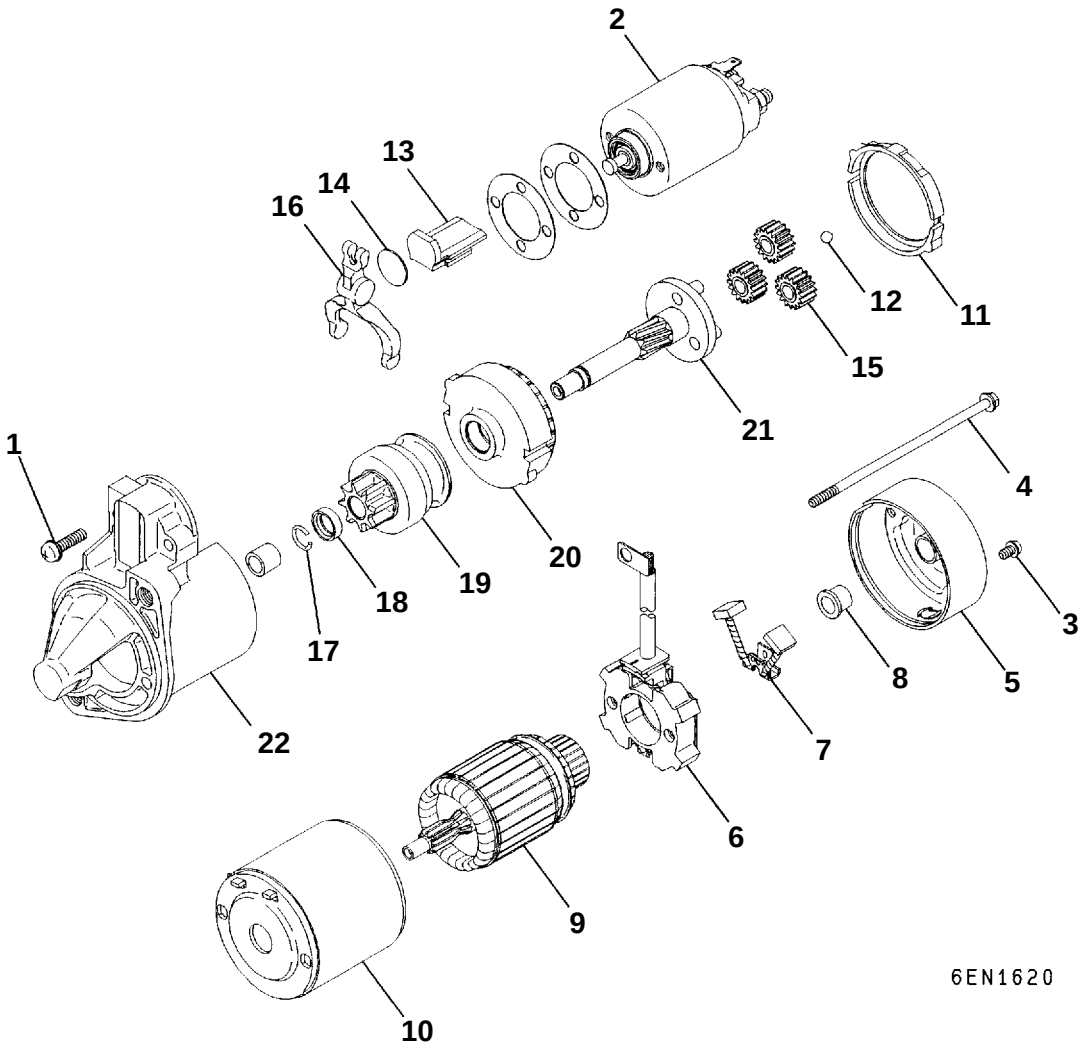
Abnormal waveforms	Problem cause	Abnormal waveforms	Problem cause
Example 1  A7EL0120	• Open diode	Example 4  A7EL0123	• Short in stator coil
Example 2  A7EL0121	• Short in diode	Example 5  A7EL0124 At this time, the charging warning lamp is illuminated.	• Open supplementary diode
Example 3  A7EL0122	• Broken wire in stator coil		



ALTERNATOR RELAY CONTINUITY CHECK

1. Remove the alternator relay from the relay box inside the engine compartment.
2. Set the analogue-type circuit tester to the Ω range and check that there is continuity when the (+) terminal of the tester is connected to terminal 2 of the alternator relay and the (-) terminal is connected to terminal 4.
3. Next, check that there is no continuity when the (+) terminal is connected to terminal 4 and the (-) terminal is connected to terminal 2.
4. If defect is found in steps 2 and 3 above, replace the alternator relay.

DISASSEMBLY AND REASSEMBLY



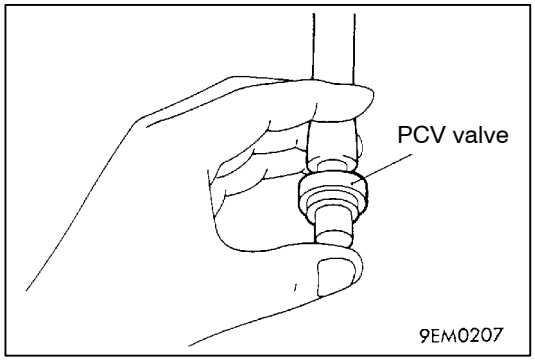
Disassembly steps

1. Screw
◀A▶ 2. Magnetic switch
3. Screw
4. Through bolt
5. Rear bracket
6. Brush holder
7. Brush
8. Rear bearing
◀B▶ 9. Armature
10. Yoke assembly
◀B▶ 11. Ball
12. Packing A
13. Packing B
14. Plate
15. Planetary gear
16. Lever
◀C▶ ▶A◀ 17. Snap ring
◀C▶ ▶A◀ 18. Stop ring
19. Overrunning clutch
20. Internal gear
21. Planetary gear holder
22. Front bracket

NOTES

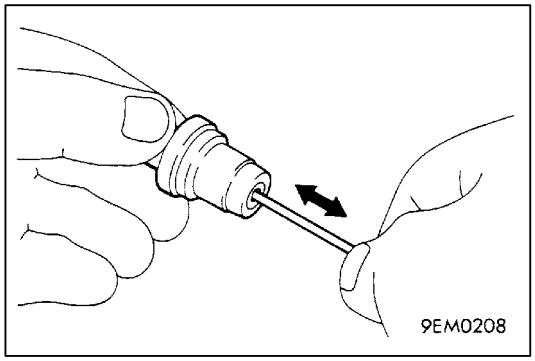
POSITIVE CRANKCASE VENTILATION SYSTEM CHECK

1. Remove the ventilation hose from the PCV valve.
2. Remove the PCV valve from the rocker cover.
3. Reinstall the PCV valve at the ventilation hose.
4. Start the engine and run at idle.



5. Place a finger at the opening of the PCV valve and check that vacuum of the intake manifold is felt.

   NOTE
   At this moment, the plunger in the PCV valve moves back and forth.
6. If vacuum is not felt, clean the PCV valve or replace it.



PCV VALVE CHECK

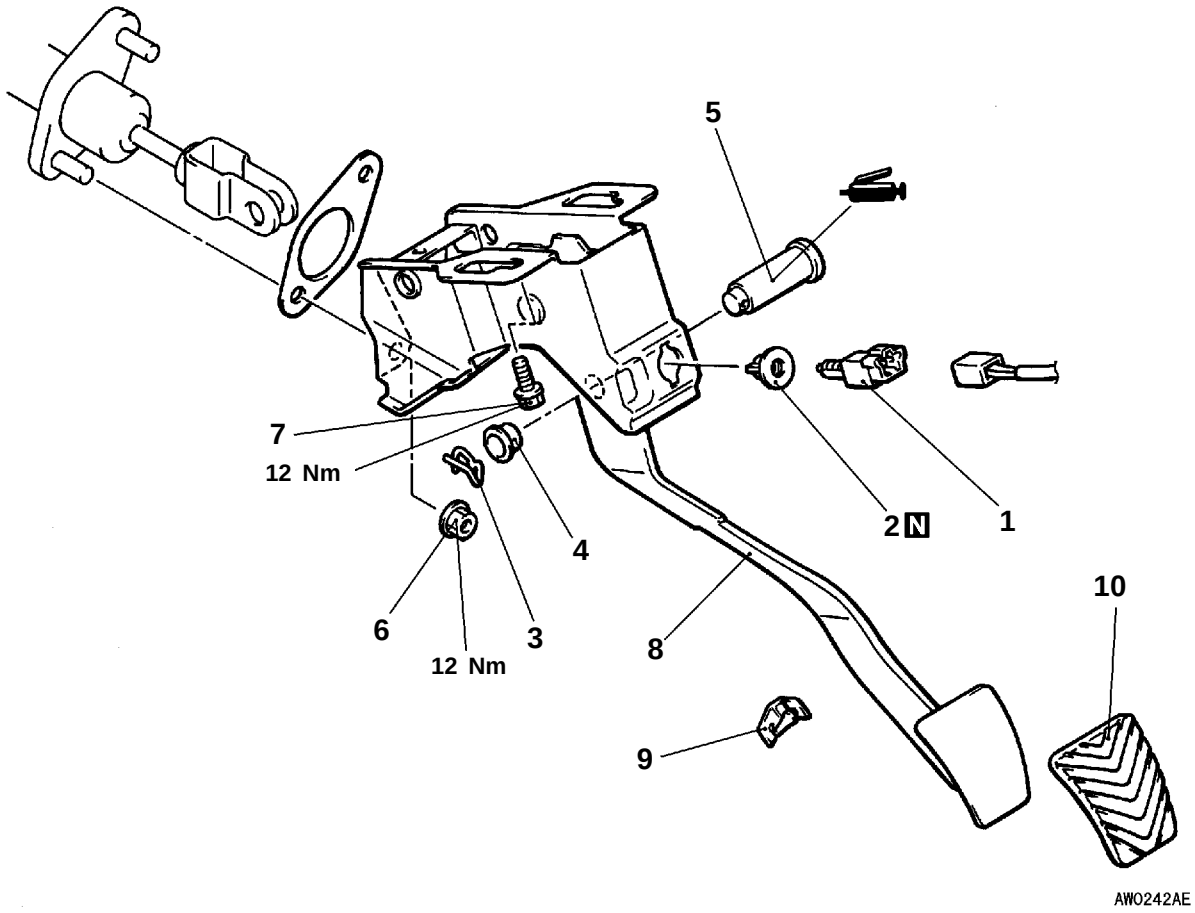
1. Insert a thin rod into the PCV valve from the side shown in the illustration (rocker cover installation side), and move the rod back and forth to check that the plunger moves.
2. If the plunger does not move, there is clogging in the PCV valve. In this case, clean or replace the PCV valve.

CLUTCH PEDAL

21100160224

REMOVAL AND INSTALLATION

Post-installation Operation
Clutch Pedal Adjustment (Refer to P.21-2)

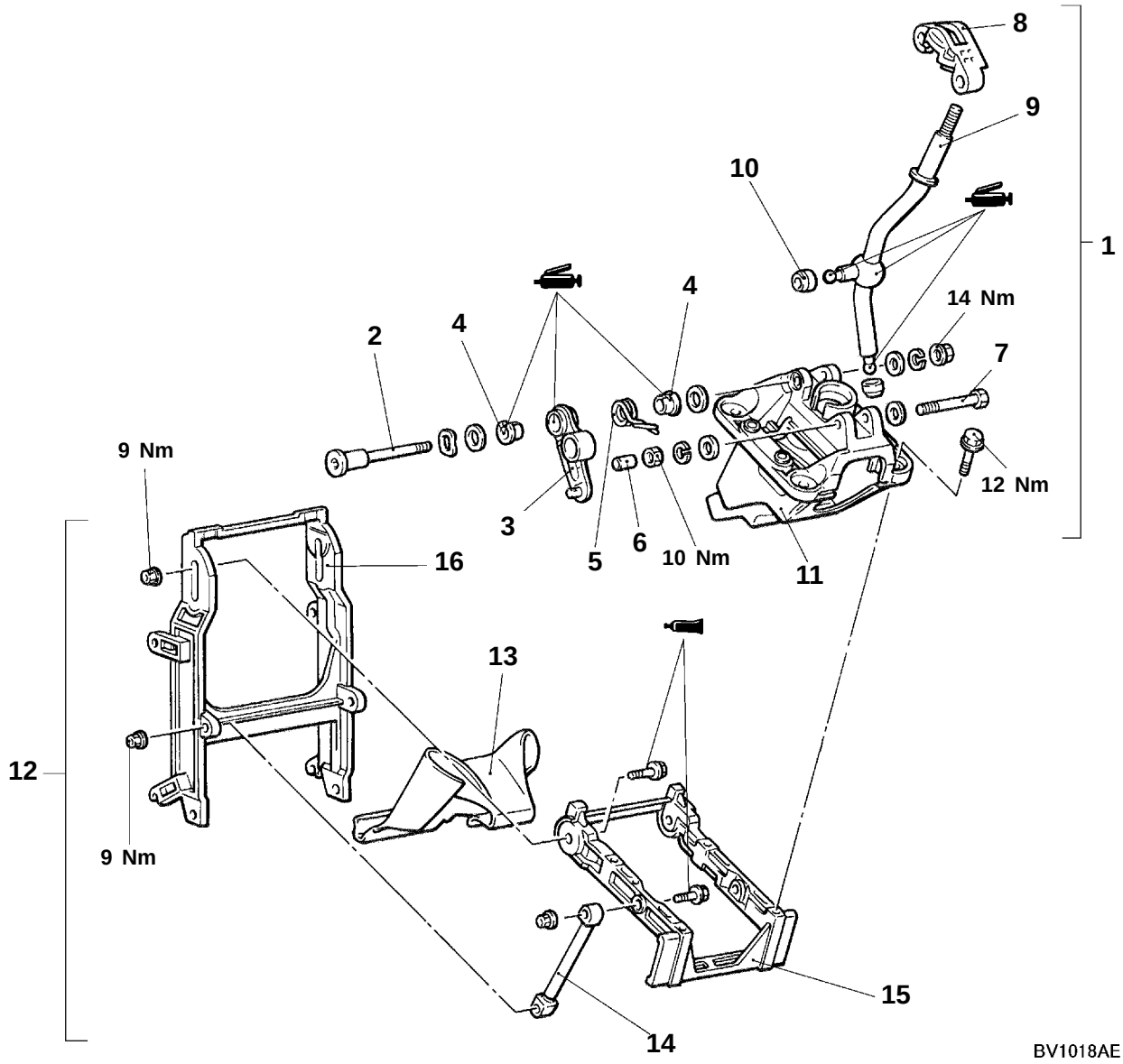


Removal steps

1. Clutch switch
2. Clip
3. Snap pin
4. Bushing
5. Pin assembly
6. Clutch master cylinder mounting nut
7. Master cylinder member mounting bolt
8. Clutch pedal
9. Stopper <R.H. drive vehicles>
10. Pedal pad

SHIFT LEVER ASSEMBLY
DISASSEMBLY AND REASSEMBLY

22100400101



Disassembly steps

1. Lever assembly
2. Bolt
3. Select lever
4. Bushing
5. Return spring
6. Collar
7. Bolt
8. Cap
9. Shift lever
10. Shift lever bushing
11. Base bracket
12. Lever mount bracket assembly
13. Insulator
14. Stay
15. Lever mount bracket
16. Base bracket

SERVICE SPECIFICATIONS

23100030284

Items		Standard value
Oil temperature sensor kΩ	at 0°C	16.5 - 20.5
	at 100°C	0.57 - 0.69
Resistance of damper clutch control solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Resistance of Low-Reverse solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Resistance of second solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Resistance of underdrive solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Resistance of overdrive solenoid valve coil (at 20°C) Ω		2.7 - 3.4
Stall speed r/min	4G93	2,200 - 2,700
	4G64	2,300 - 2,800

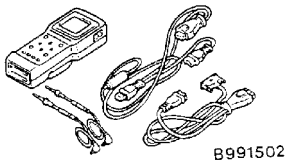
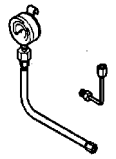
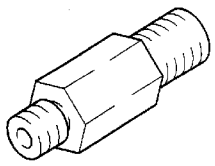
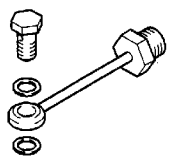
LUBRICANT

23100040270

Items	Specified lubricant	Quantity L
Transmission fluid	DIA QUEEN ATF SPII, ATF SPII M or equivalent	7.8

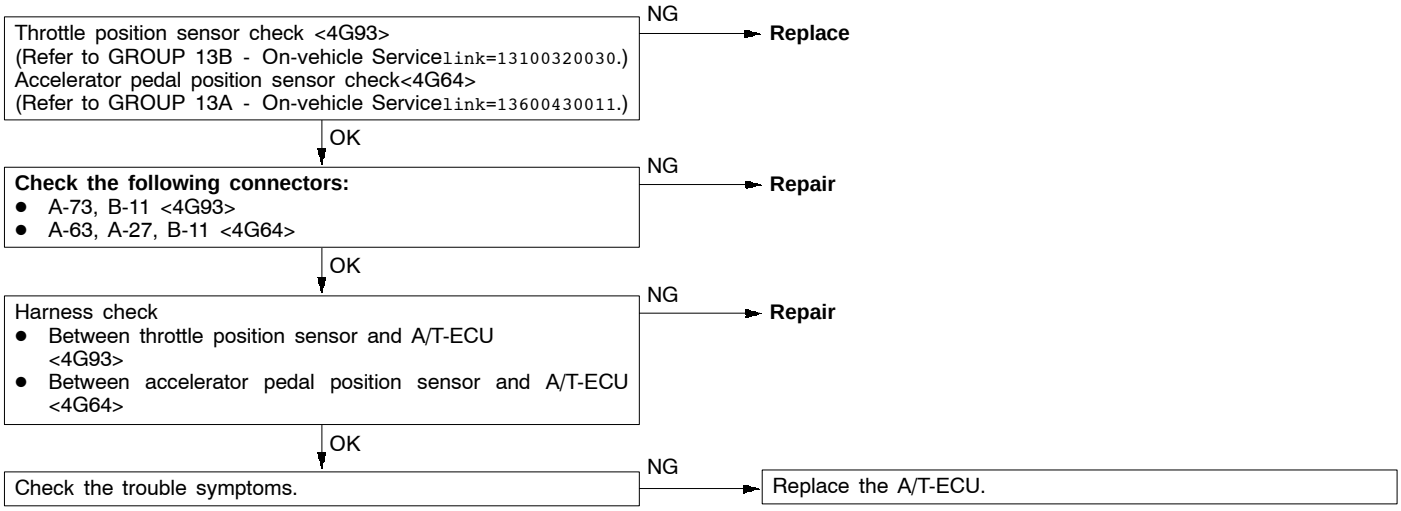
SPECIAL TOOLS

23100060351

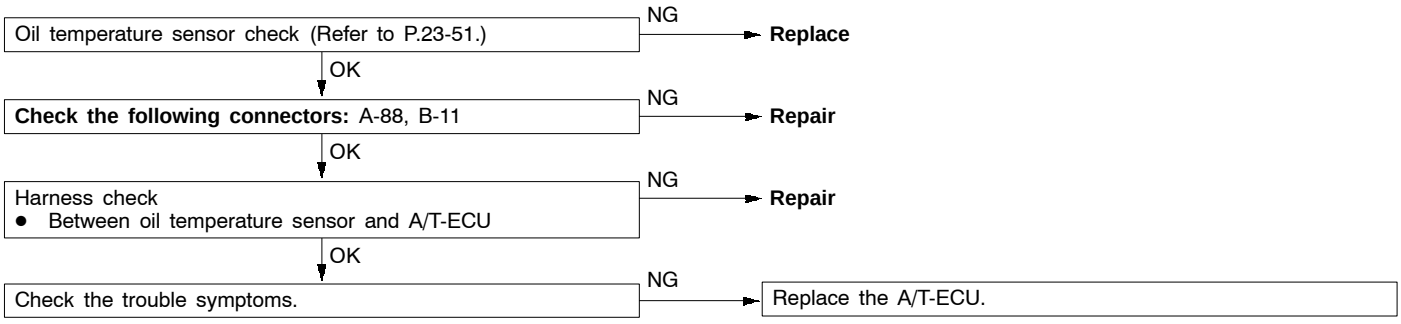
Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	Checking of the diagnosis code
	MD998330 (including MD998331)	Oil pressure gauge (2,942 kPa)	Measurement of oil pressure
	MD998332	Adapter	
	MD998900	Adapter	

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

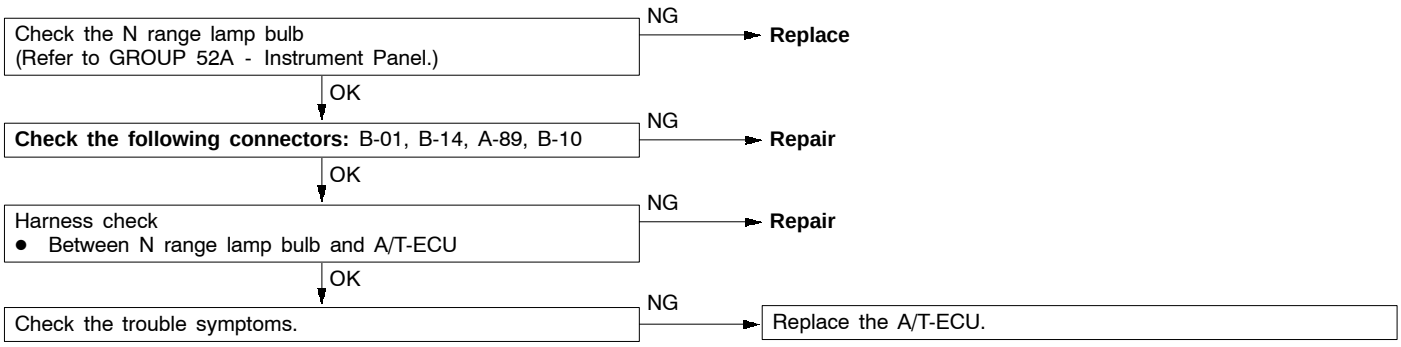
Code No. 11, 12, 14 Throttle position sensor system <4G93>, accelerator pedal position sensor system <4G64>	Probable cause
If the TPS or APS output voltage is 4.8 V or higher when the engine is idling, the output is judged to be too high and diagnosis code No. 11 is output. If the TPS or APS output voltage is 0.2 V or lower at times other than when the engine is idling, the output is judged to be too low and diagnosis code No. 12 is output. If the TPS or APS output voltage is 0.2 V or lower or if it is 1.2 V or higher when the engine is idling, the TPS or APS adjustment is judged to be incorrect and diagnosis code No. 14 is output.	• Malfunction of the throttle position sensor <4G93> • Malfunction of the accelerator pedal position sensor <4G64> • Malfunction of connector • Malfunction of the A/T-ECU



Code No. 15 Oil temperature sensor system	Probable cause
If the oil temperature sensor output voltage is 2.6 V or more even after driving for 10 minutes or more (if the oil temperature does not increase), it is judged that there is an open circuit in the oil temperature sensor and diagnosis code No. 15 is output.	• Malfunction of the oil temperature sensor • Malfunction of connector • Malfunction of the A/T-ECU



Code No. 56 N range lamp system	Probable cause
If the N range signal is off after an N range lamp illumination instruction (ON instruction) has been given, it is judged that there is a short-circuit in the N range lamp earth and diagnosis code No. 56 is output.	• Malfunction of the N range lamp bulb • Malfunction of connector • Malfunction of the A/T-ECU



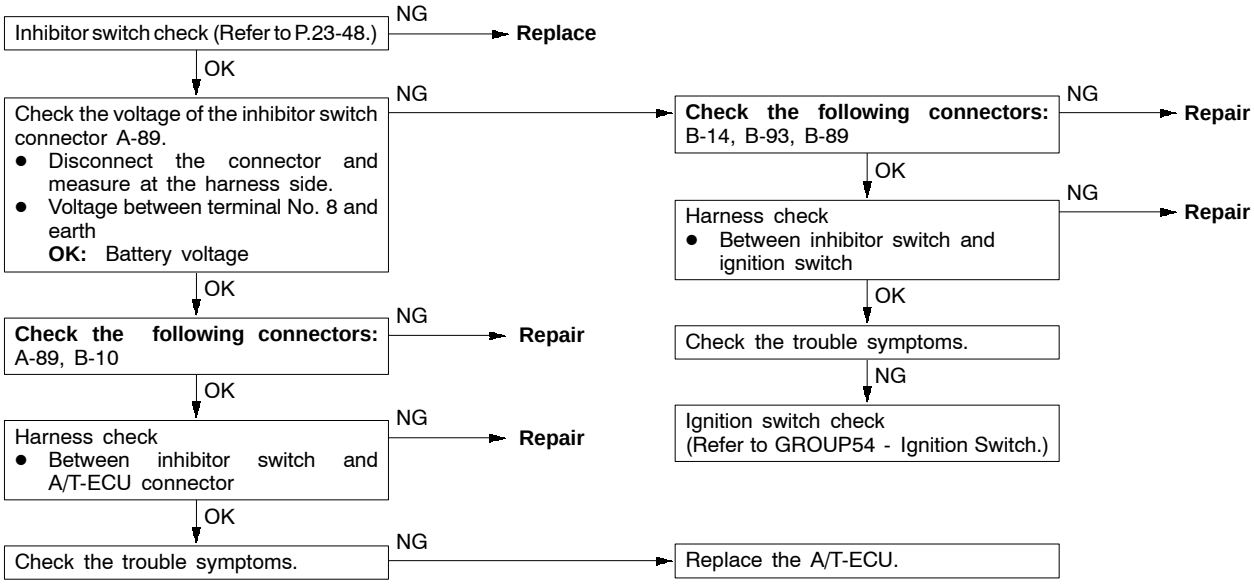
INSPECTION CHART FOR TROUBLE SYMPTOMS

23100800588

Trouble symptom		Inspection procedure No.	Reference page
MUT-II can not communicate with any systems.		1	23-25
MUT-II can not communicate with the A/T-ECU.		2	23-26
Driving impossible	Starting impossible	3	23-27
	Does not move forward	4	23-27
	Does not reverse	5	23-28
	Does not move (forward or reverse)	6	23-28
Malfunction when starting	Engine stalling when shifting	7	23-29
	Shocks when changing from N to D and large time lag	8	23-29
	Shocks when changing from N to R and large time lag	9	23-30
	Shocks when changing from N to D, N to R and large time lag	10	23-31
Malfunction when shifting	Shocks and running up	11	23-31

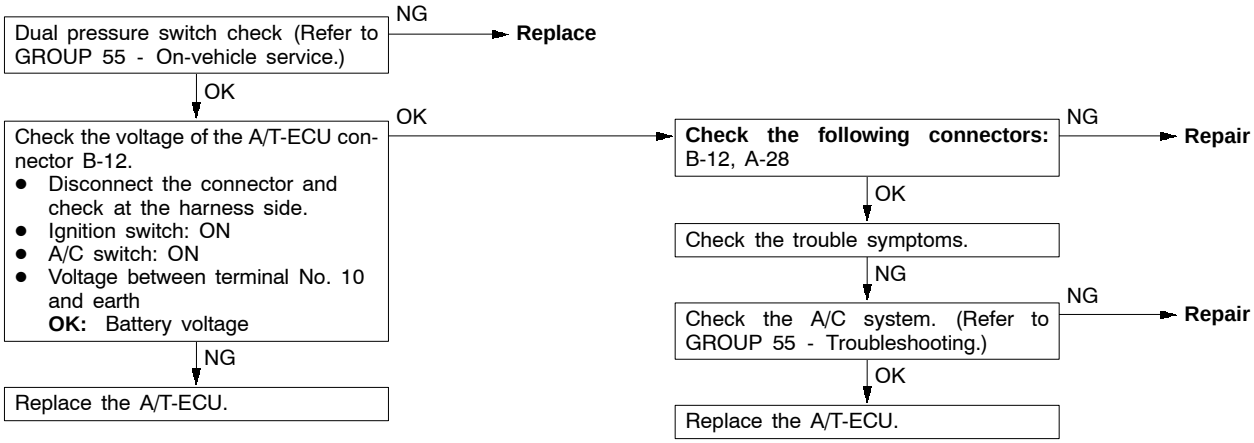
INSPECTION PROCEDURE 17

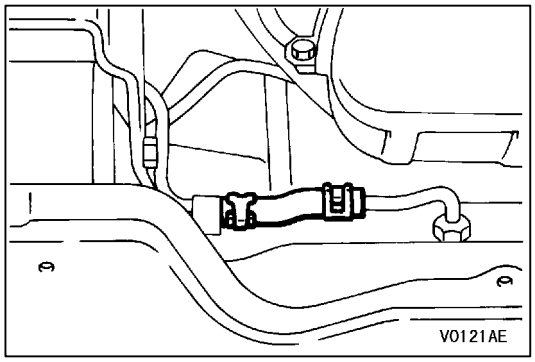
Inhibitor switch system	Probable cause
The cause is probably a malfunction of the inhibitor switch circuit, ignition switch circuit or a defective A/T-ECU.	• Malfunction of the inhibitor switch • Malfunction of the ignition switch • Malfunction of connector • Malfunction of the A/T-ECU



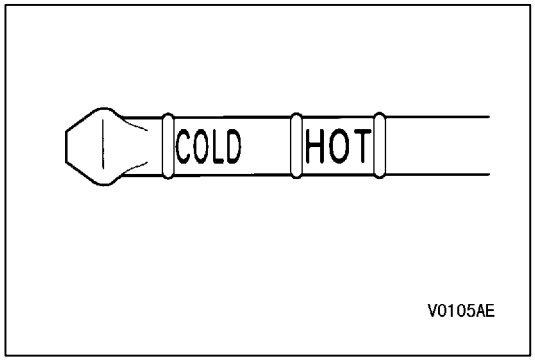
INSPECTION PROCEDURE 18

Dual pressure switch system	Probable cause
The cause is probably a defective dual pressure switch circuit or a defective A/T-ECU.	• Malfunction of the dual pressure switch • Malfunction of connector • Malfunction of A/C system • Malfunction of the A/T-ECU



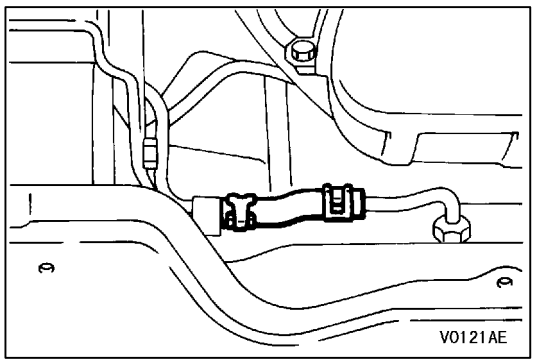


9. Reconnect the hose which was disconnected in step 1 above, and firmly replace the oil level gauge.
10. Start the engine and run it at idle for 1 - 2 minutes.
11. Move the selector lever through all positions, and then move it to the N position.



12. Check that the fluid level is at the COLD mark on the oil level gauge. If the level is lower than this, pour in more fluid.
13. Drive the vehicle until the fluid temperature rises to the normal temperature (70 - 80°C), and then check the fluid level again.
    The fluid level must be at the HOT mark.

    NOTE
    The COLD level is for reference only; the HOT level should be regarded as the standard level.
14. Firmly insert the oil level gauge into the oil filler tube.



AUTOMATIC TRANSMISSION FLUID COOLER LINE FLUSHING

23101300070

Caution
When the transmission has been replaced or overhauled, or automatic transmission fluid is contaminated, the transmission fluid cooler line flushing should always be carried out.

1. Disconnect the hose shown in the illustration which connects the transmission and the oil cooler (inside the radiator).
2. Start the engine and let the fluid drain out.

   Caution
   The engine should be stopped within one minute after it is started. If the fluid has all drained out before then, the engine should be stopped at that point.

   Discharge volume: Approx. 3.5 L

HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE sub=03

Trouble symptom	Probable cause
All hydraulic pressures are high.	Incorrect transmission control cable adjustment
	Malfunction of the regulator valve
All hydraulic pressures are low.	Incorrect transmission control cable adjustment
	Malfunction of the oil pump
	Clogged internal oil filter
	Clogged external oil filter
	Clogged oil cooler
	Malfunction of the regulator valve
	Malfunction of the relief valve
	Incorrect valve body installation
Hydraulic pressure is abnormal in “R” range only.	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
Hydraulic pressure is abnormal in “3” or “4” range only.	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the regulator valve
	Malfunction of the switch valve
	Clogged orifice
	Incorrect valve body installation
Only underdrive hydraulic pressure is abnormal.	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal.	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation

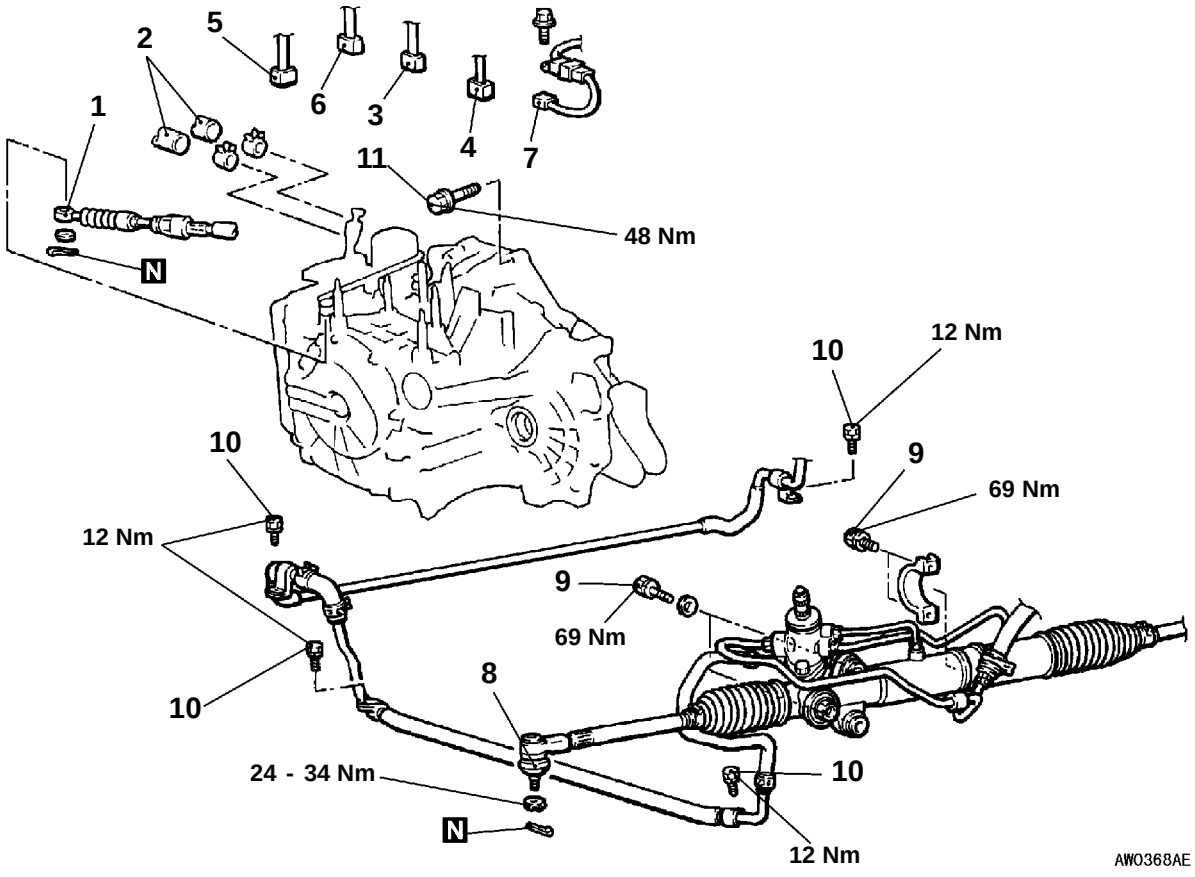
TRANSMISSION ASSEMBLY

23100570274

REMOVAL AND INSTALLATION

Caution
The fasteners indicated by * should be tightened to the specified torque after the engine weight is applied to the vehicle body.

Pre-removal Operation
- Carry out the essential service for the troubleshooting <before removal only> (Refer to P.23-44.)
- Transmission Fluid Draining and Refilling <Refill the Fluid before Starting the Engine> (Refer to P.23-45.)
- Engine Cover Removal and Installation
- Air Cleaner Assembly Removal and Installation
- Battery and Battery Tray Removal and Installation
- Radiator and Reservoir Removal and Installation (Refer to GROUP 14.)
- Starter Removal and Installation (Refer to GROUP 16.)
- Under Cover Removal and Installation
- Front exhaust pipe Removal and Installation (Refer to GROUP 15.)
- Check the Dust Cover for Cracks or Damage by Pushing it with Finger. <after installation only>
- Selector Lever Operation Check <after installation only>
- Operation Check of Instruments <after installation only>
- Wheel Alignment Check and Adjustment (Refer to GROUP 33A - On-vehicle Service.)

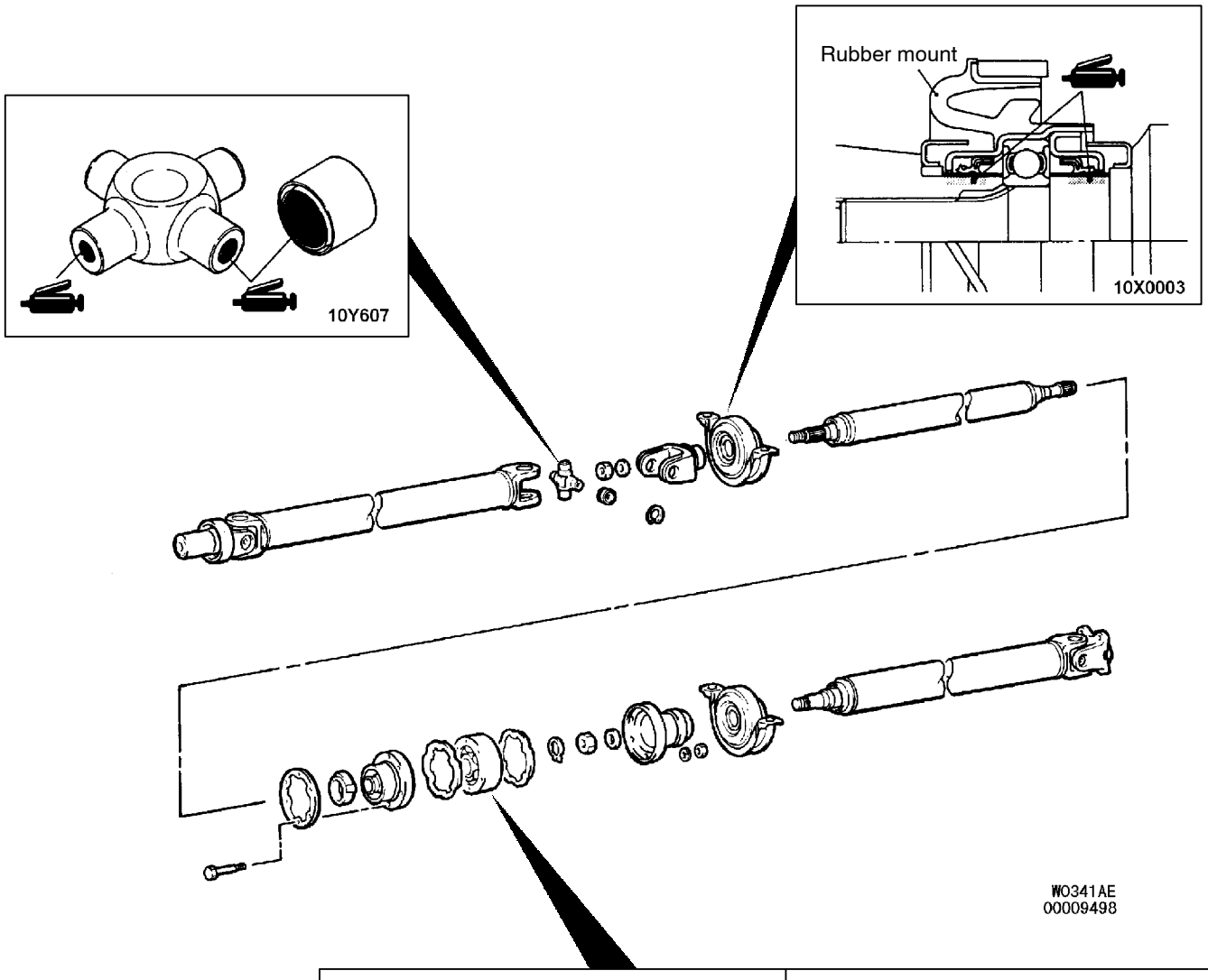


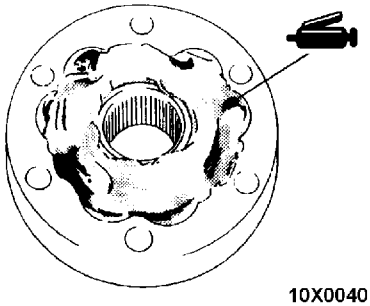
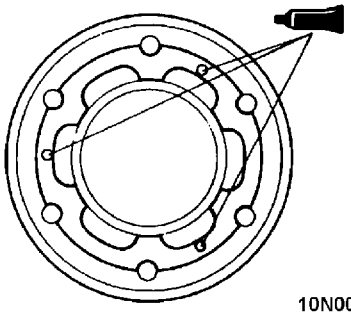
Removal steps
1. Transmission control cable connection
2. Transmission fluid cooler hose connection
3. Bolt
4. Input shaft speed sensor connector
5. Output shaft speed sensor connector
6. A/T control solenoid valve assembly connector

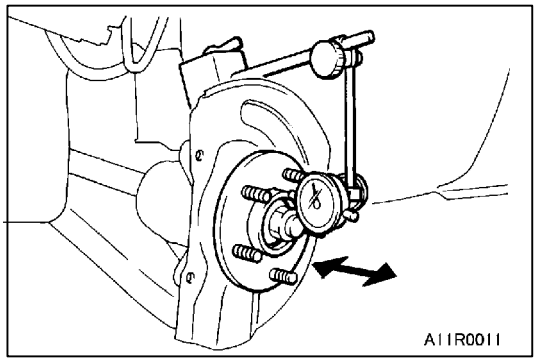
◀A▶
◀B▶

7. Vehicle speed sensor connector
8. Tie rod end connection
9. Steering gear and linkage mounting bolts
10. Oil line connecting bolt
11. Transmission assembly upper connecting bolt

LUBRICATION POINTS



 10X0040	 10N0009
Repair kit grease **Quantity: 45 - 55 g**	**3M ATD Part No.8155 or equivalent**



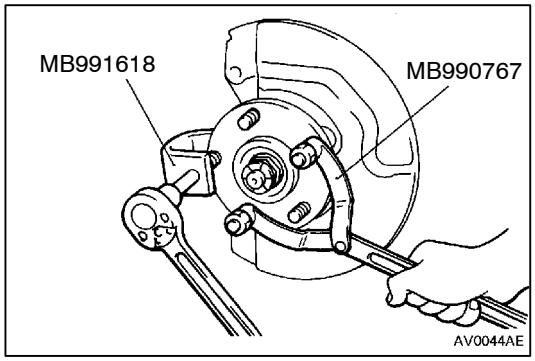
ON-VEHICLE SERVICE

26100090115

WHEEL BEARING AXIAL PLAY CHECK

1. Remove the disc brake caliper and suspend it with a wire.
2. Remove the brake disc from the front hub.
3. Attach a dial gauge as shown in the illustration, and then measure the axial play while moving the hub in the axial direction.

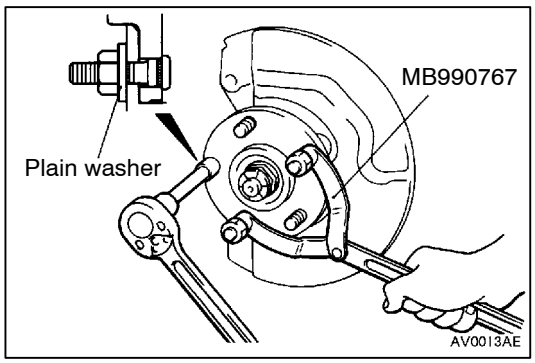
   Limit: 0.05 mm
4. If axial play exceeds the limit, replace the front hub assembly.



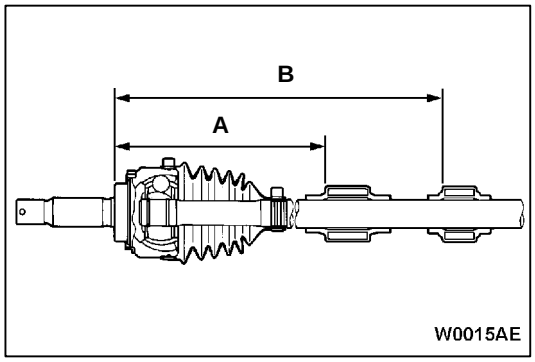
HUB BOLT REPLACEMENT

26100100115

1. Remove the caliper assembly and secure it with wire so that it does not fall.
2. Remove the brake disc.
3. Use the special tools to remove the hub bolts.



4. Install the plain washer to the new hub bolt, and install the bolt with a nut.



REASSEMBLY SERVICE POINTS

▶A◀ DYNAMIC DAMPER/DAMPER BAND/T.J. BOOT INSTALLATION

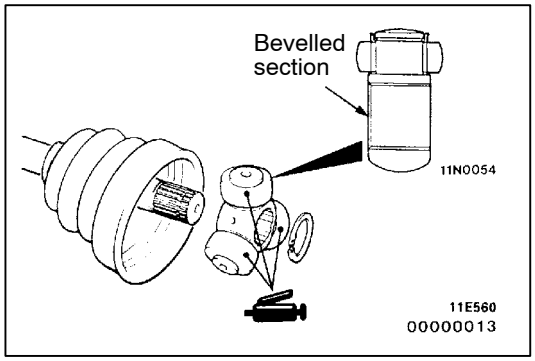
1. Install the dynamic damper in the position shown in the illustration.

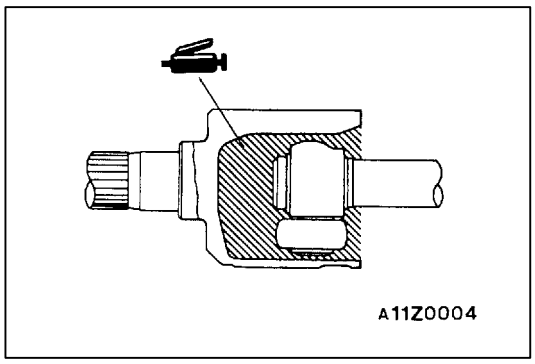
Items		A (large)	B (small)
SPACE RUNNER	L.H.	-	215 mm
	R.H.	395 mm	-
SPACE WAGON	L.H.	-	215 mm
	R.H.	405 mm	585 mm

2. Secure the damper bands.

Caution
There should be no grease adhered to the rubber part of the dynamic damper.

3. Wrap plastic tape around the shaft spline, and then install the T.J. boot band (small) and T.J. boot.





▶B◀ SPIDER ASSEMBLY/T.J. CASE INSTALLATION

1. Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.

Specified grease: Repair kit grease

Caution
(1) The drive shaft joint uses special grease. Do not mix old and new or different types of grease.
(2) If the spider assembly has been cleaned, take special care to apply the specified grease.

2. Install the spider assembly to the shaft from the direction of the spline bevelled section.
3. After applying the specified grease to the T.J. case, insert the drive shaft and apply grease one more time.

Specified grease: Repair kit grease

Amount to use:
<SPACE RUNNER> 110 g
<SPACE WAGON - 2WD> 140 g
<SPACE WAGON - 4WD> 105 g

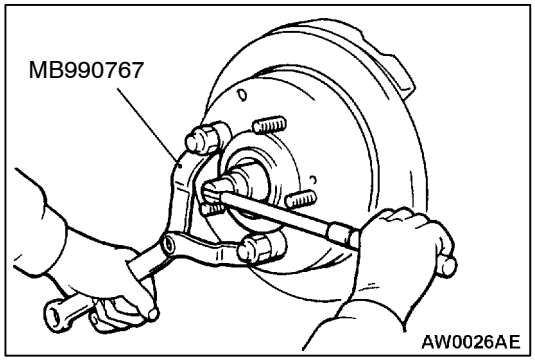
NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.

REMOVAL SERVICE POINTS

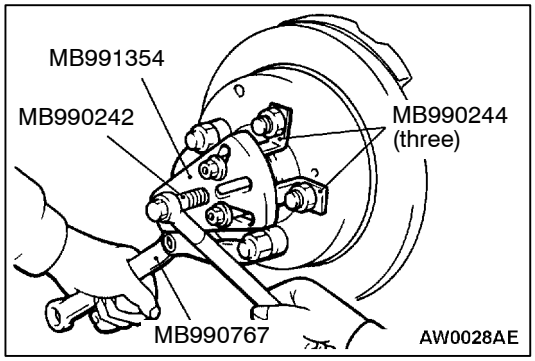
◀A▶ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire, so that it does not fall.



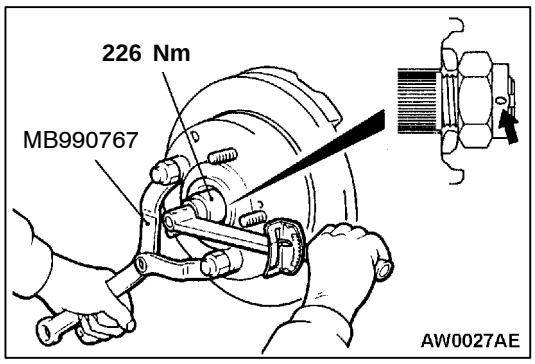
◀B▶ FLANGE NUT REMOVAL

Caution
Do not apply the vehicle weight to the wheel bearing while loosening the flange nut, or the wheel bearing will be damaged.



◀C▶ REAR HUB ASSEMBLY REMOVAL

Use the special tools to remove the hub from the lower arm assembly.



INSTALLATION SERVICE POINT

▶A◀ FLANGE NUT INSTALLATION

1. Using the special tool, tighten the flange nut.

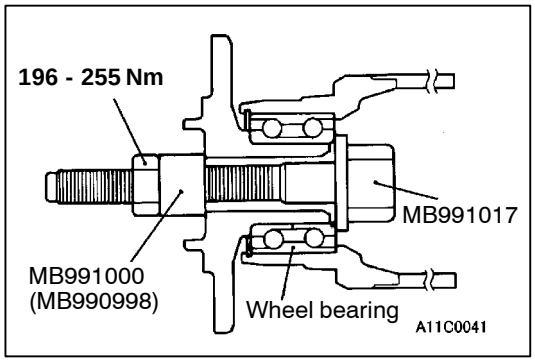
   Caution
   Before securely tightening the flange nuts, make sure there is no load on the wheel bearings. Otherwise the wheel bearing will be damaged.

2. After tightening the flange nut, crimp the nut to meet the concave portion of the spindle.

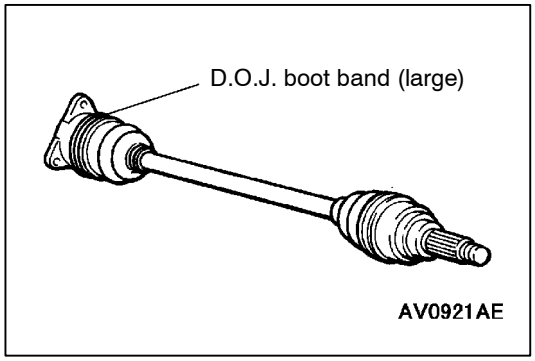
INSPECTION

27100210167

- Check the oil seal for crack or damage.
- Check the rear hub unit bearing for wear or damage.
- Check the rear ABS rotor for chipped teeth.



Caution
Do not apply the vehicle weight to the wheel bearing as possible while loosening the drive shaft nut. Otherwise the wheel bearing may be damaged. If, however, the vehicle weight must be applied to the bearing (because of moving the vehicle), temporarily secure the wheel bearing by using the special tool.



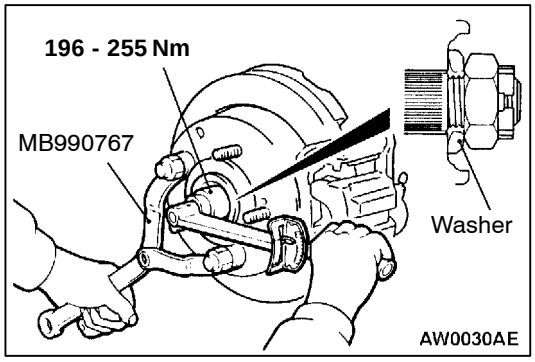
INSTALLATION SERVICE POINTS

▶A◀ DRIVE SHAFT INSTALLATION

NOTE
The left and right drive shafts can also be distinguished from each other by the identification colour of D.O.J. boot band (large).

Identification colours of D.O.J. boot band (large)

Item	Vehicles without ABS	Vehicles with ABS
Left drive shaft	Yellow	Violet
Right drive shaft	Blue	Brown



▶B◀ DRIVE SHAFT NUT INSTALLATION

1. Install the washer and drive shaft nut in specified direction.
2. Using the special tool, tighten the drive shaft nut.

   Caution
   Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings. Otherwise, the wheel bearing will be damaged.
3. If the position of the split pin holes does not match, tighten the nut up to 255 Nm in maximum.
4. Install the split pin in the first matching holes and bend it securely.

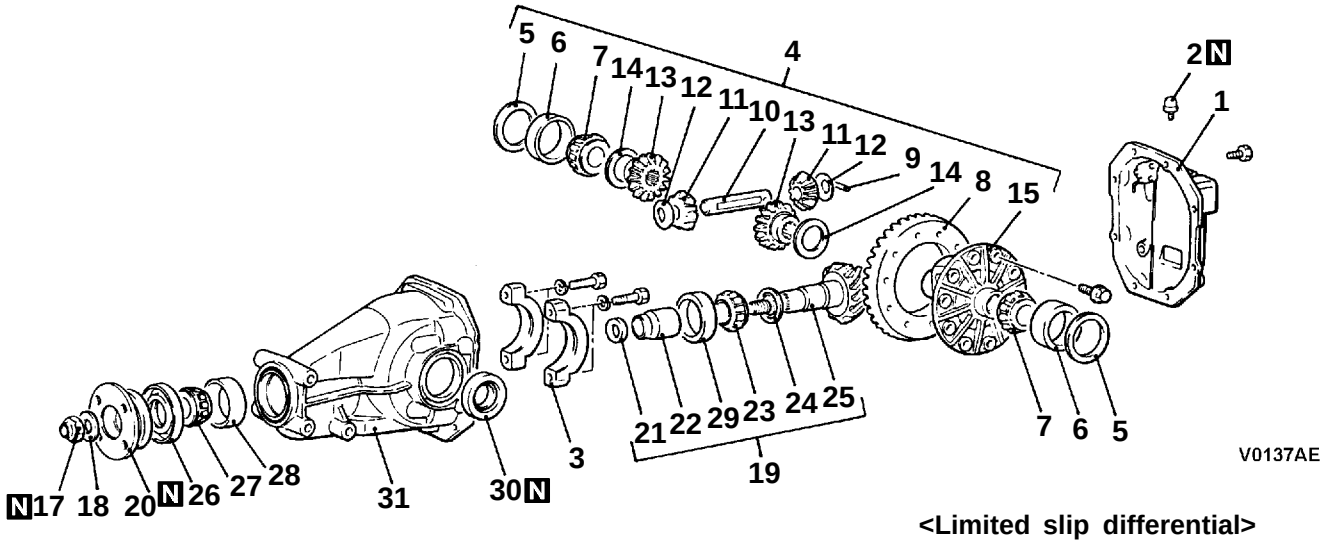
INSPECTION 27100340040

- Check the drive shaft boots for damage or deterioration.
- Check the ball joints (B.J. and D.O.J.) for excessive play or check operation.
- Check the drive shaft spline for wear or damage.

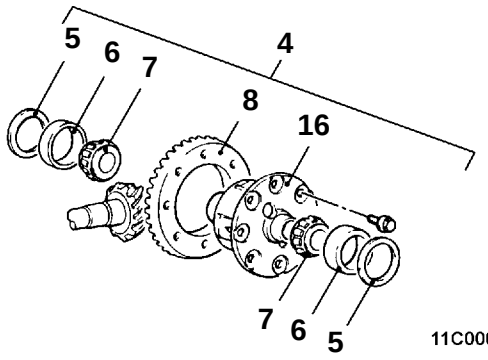
DISASSEMBLY

27200220170

<Conventional differential>



<Limited slip differential>



Disassembly steps

◀A▶ • Inspection before disassembly
1. Differential cover assembly
2. Vent plug
3. Bearing cap

◀B▶ 4. Differential case assembly
5. Side bearing spacer
6. Side bearing outer race

◀C▶ 7. Side bearing inner race

◀D▶ 8. Drive gear

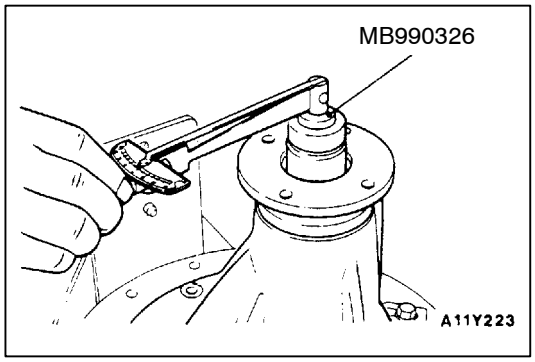
◀E▶ 9. Lock pin
<Conventional differential>
10. Pinion shaft
<Conventional differential>
11. Pinion gear
<Conventional differential>
12. Pinion washer
<Conventional differential>
13. Side gear
<Conventional differential>
14. Side gear spacer
<Conventional differential>
15. Differential case
<Conventional differential>
16. Limited slip differential case assembly (Refer to P.27-37.)

◀F▶ 17. Self-locking nut
18. Washer

◀G▶ 19. Drive pinion assembly
20. Companion flange
21. Drive pinion front shim
(for preload adjustment)
22. Drive pinion spacer

◀H▶ 23. Drive pinion rear bearing inner race
24. Drive pinion rear shim
(for pinion height adjustment)
25. Drive pinion

◀I▶ 26. Oil seal
◀I▶ 27. Drive pinion front bearing inner race
◀I▶ 28. Drive pinion front bearing outer race
◀I▶ 29. Drive pinion rear bearing outer race
30. Oil seal
31. Gear carrier

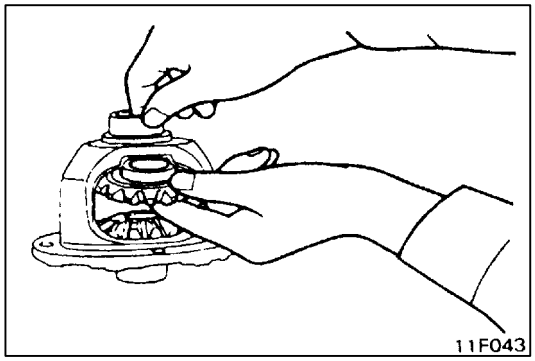


8. Measure the drive pinion turning torque (with the oil seal) by using the special tools to verify that the drive pinion turning torque complies with the standard value.

Standard value:

Bearing division	Bearing lubrication	Turning torque Nm
New	None (with anti-rust agent)	1.0 - 1.3 Nm
New or reusing	Gear oil applied	0.5 - 0.6 Nm

9. If the drive pinion turning torque is not within the standard value, check the tightening torque of the companion flange self-locking nut and the oil seal.

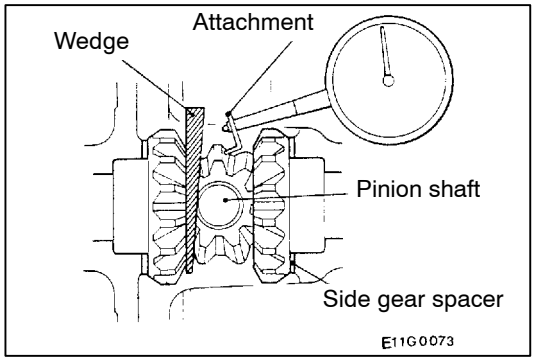


▶E◀ DIFFERENTIAL GEAR BACKLASH ADJUSTMENT <Conventional differential>

Adjust the differential gear backlash by the following procedures:

1. Assemble the side gears, side gear spacers, pinion gears and pinion washers into the differential case.
2. Temporarily install the pinion shaft.

   NOTE
   Do not drive in the lock pin yet.



3. Insert a wedge between the side gear and the pinion shaft to lock the side gear.
4. Measure the differential gear backlash with a dial indicator on the pinion gear.

   NOTE
   (1) The measurement should be made for both pinion gears individually.
   (2) Refer to P.27-37 for measurement of the limited slip differential gear backlash.

   Standard value: 0 - 0.076 mm

   Limit: 0.2 mm

5. If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear spacers. If adjustment is not possible, replace the side gears and pinion gears as a set.
6. After adjustment, check that the backlash does not exceed the limit value and the differential gear turns smoothly.

ON-VEHICLE SERVICE

31100090164

TYRE INFLATION PRESSURE CHECK

NOTE
For information on tyre inflation pressure, refer to the label attached to the driver's side front door.

TYRE WEAR CHECK

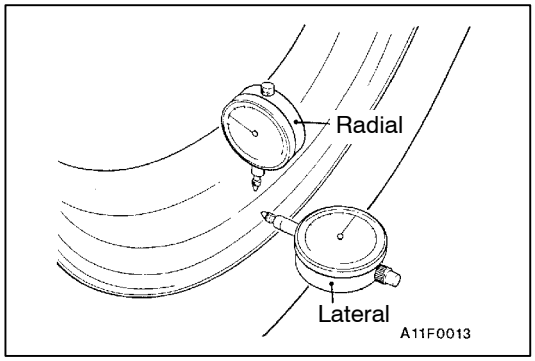
31100100034

Measure the tread depth of tyres.

Limit: 1.6 mm

If the remaining tread depth is less than the limit, replace the tyre.

NOTE
When the tread depth of tyres is reduced to 1.6 mm or less, wear indicators will appear.



WHEEL RUNOUT CHECK

31100110037

Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, measure wheel runout with a dial indicator.

Limit:

Item	Steel wheel	Aluminium wheel
Radial runout mm	1.2	1.0
Lateral runout mm	1.2	1.0

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TYRE

31100130071

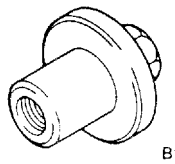
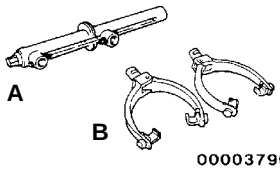
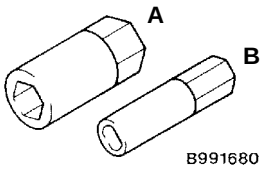
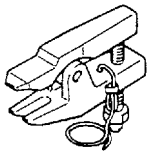
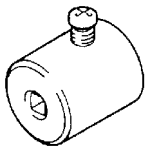
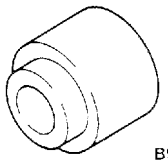
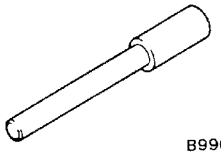
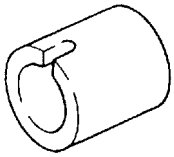
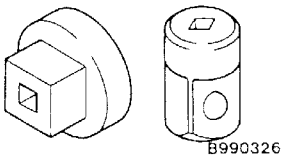
INSTALLATION SERVICE POINT

Tighten the wheel nut to the specified torque.

Tightening torque: 98 Nm

SPECIAL TOOLS

33100060077

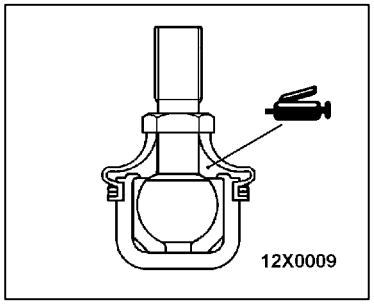
Tools	Number	Name	Use
 B991004	MB991004	Wheel alignment gauge attachment	Wheel alignment measurement <Vehicles with aluminium type wheelsd
 00003796	A: MB991237 B: MB991238	A: Spring compressor body B: Arm set	Coil spring compression
 B991680	A: MB991619 B: MB991682	A: Wrench B: Socket	Strut assembly disassembly and reassembly
 B991113	MB991406, MB990635 or MB991113	Steering linkage puller	Tie rod end disconnection
 B991006	MB991006	Preload socket	Lower arm ball joint rotation starting torque measurement
 B990800	MB990800	Ball joint remover and installer	Lower arm ball joint dust cover installation
 B990651	MB990651	Bar	Driving out and press-fitting of lower arm bushing
	MB998716	Crankshaft wrench	
 B990326	MB990326	Preload socket	Stabilizer link ball joint turning torque measurement

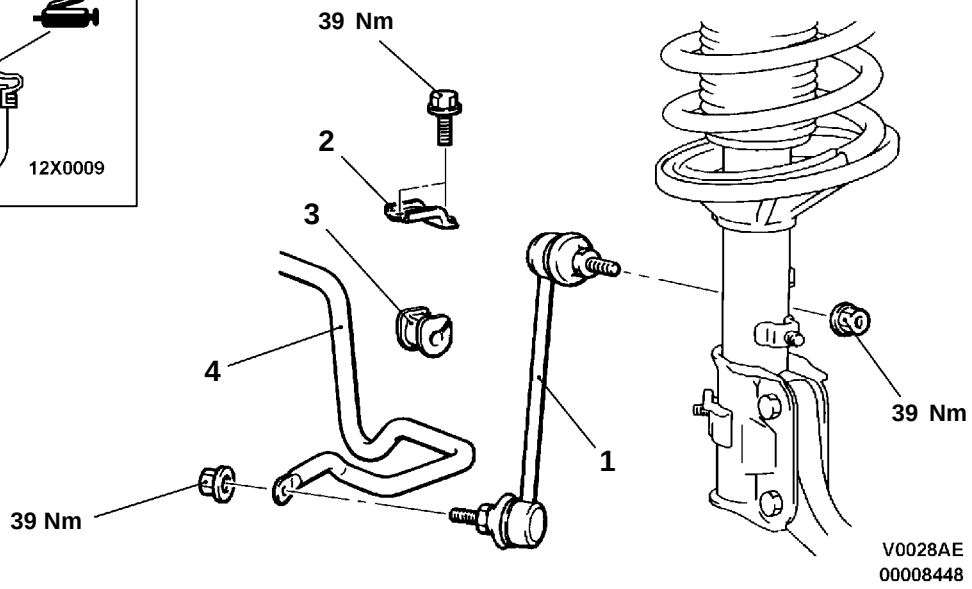
STABILIZER BAR

33200190137

REMOVAL AND INSTALLATION

Post-installation Operation
Check the Dust Cover for Cracks or Damage by Pushing it with Finger.

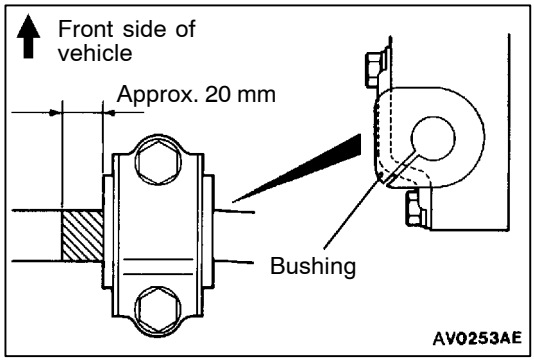




Removal steps

1. Stabilizer link
   - Front member (Refer to GROUP 32.)
2. ▶A◀ Stabilizer bar bracket
3. ▶A◀ Bushing*
4. ▶A◀ Stabilizer bar

NOTE
*: If only the bushing is removed and installed, refer to P.33A-15.



INSTALLATION SERVICE POINT

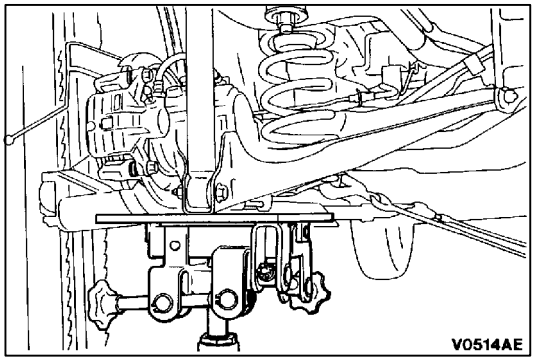
▶A◀ STABILIZER BAR/BUSHING/STABILIZER BAR BRACKET INSTALLATION

1. Position the bushing so that its cut is aligned as shown.
2. Position the stabilizer at the left side of the vehicle so that its identification mark is as shown, and then tighten the stabilizer bar bracket mounting bolts.

REMOVAL SERVICE POINTS

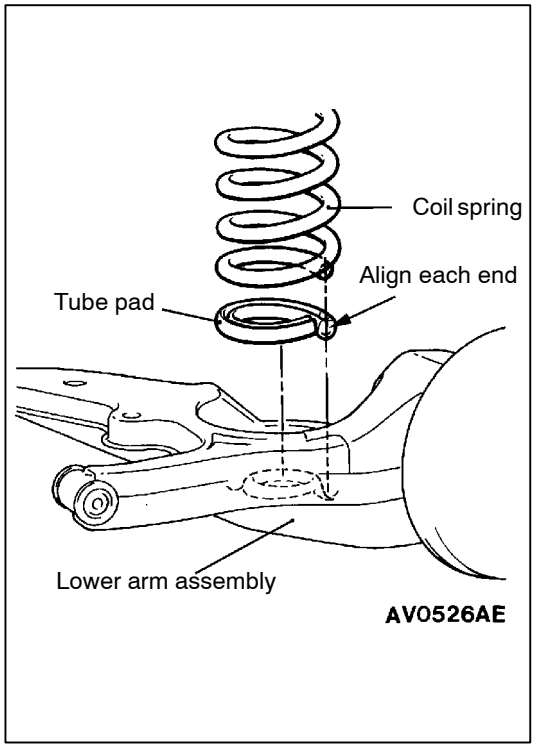
◀A▶ BOLT REMOVAL <4WD>

Remove the bolt, and then hold the drive shaft to the vehicle body with a wire.



◀B▶ SHOCK ABSORBER MOUNTING BOLT REMOVAL

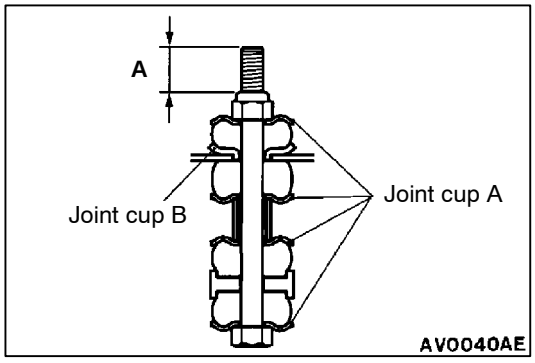
Support the lower arm assembly with a transmission jack, and after compressing the coil spring, remove the shock absorber mounting bolt.



INSTALLATION SERVICE POINTS

▶A◀ TUBE PAD/COIL SPRING INSTALLATION

Install the tube pad to the coil spring while aligning the end of the pad with that of the spring. Then engage the bottom of the coil spring in the spring seat groove of the lower arm assembly properly.



▶B◀SELF-LOCKING NUT INSTALLATION

Check that joint cups A and B face as shown, and then tighten the self-locking nut so that the shown dimension (A) is at the standard value.

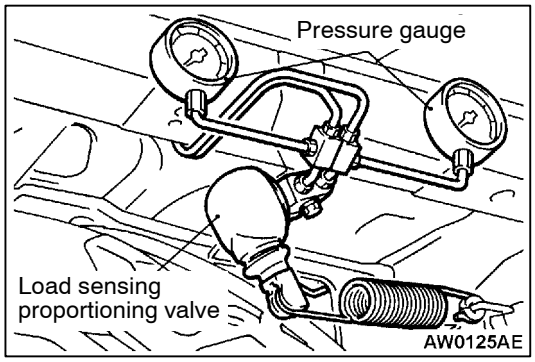
Standard value (A): 15 - 17 mm

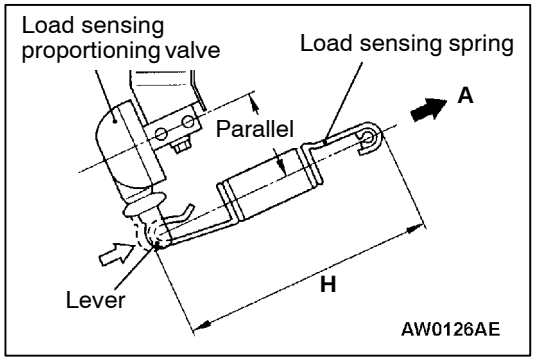
INSPECTION

34100630015

- Check the coil springs for crack, damage or deterioration.
- Check the spring seats for cracks and wear.

NOTES





LOAD SENSING PROPORTIONING VALVE FUNCTION TEST <SPACE WAGON>

35100130048

1. Connect pressure gauges to the input and output ports of the load sensing proportioning valve.
2. Bleed the system. (Refer to P.35A-12.)
3. Disconnect the spring at the support side.
4. Place the spring so that it is in parallel with the load sensing proportioning valve, and then pull in the direction indicated by arrow A so that its length H shown in the figure (the length between its ends) is as noted below.

   NOTE
   At this time the lever is pressed all the way to the load sensing proportioning valve side.
5. Check at this time whether or not the output fluid's pressure, relative to the load sensing proportioning valve's input fluid pressure, is within the standard value.

   Standard value:

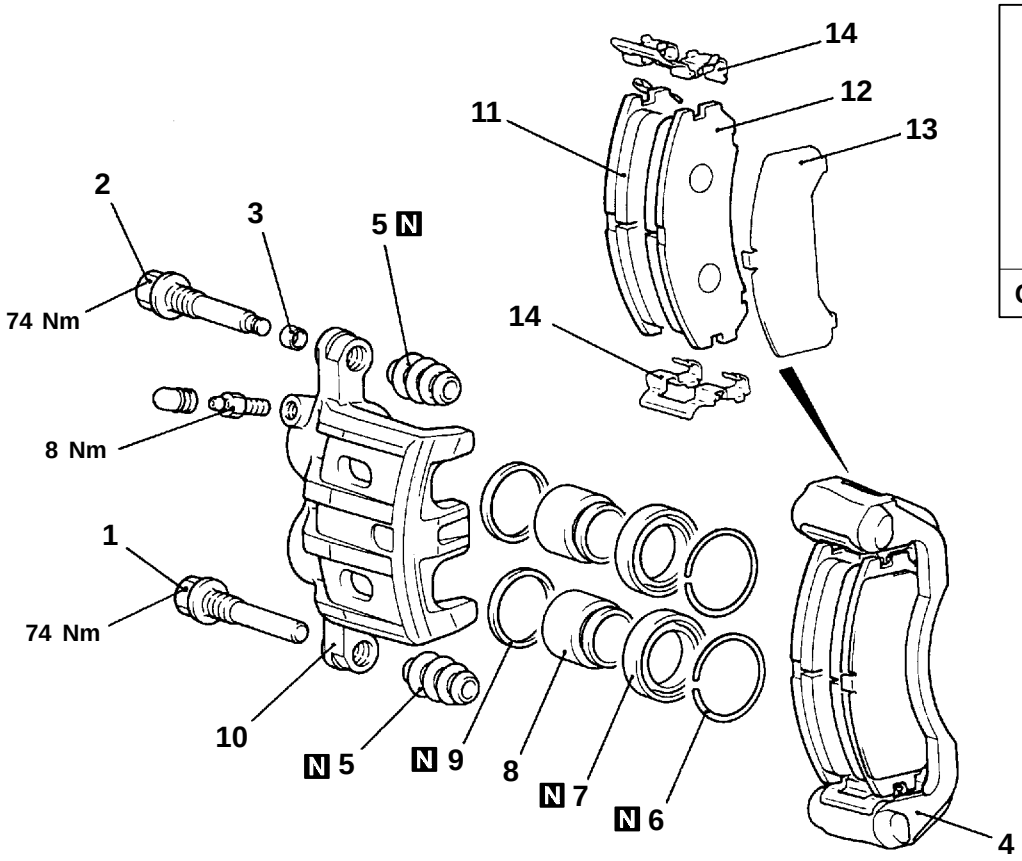
Spring length H mm	Input fluid pressure MPa	Output fluid pressure MPa
202*1	9.8	5.9 - 6.5
209*2	9.8	9.4 - 10.0
	13.7	10.4 - 11.0

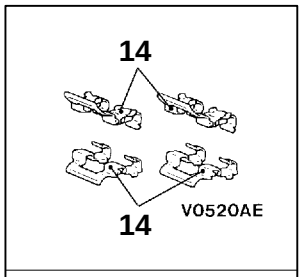
   NOTE
   *1 and *2 indicate the applicable lengths for unladen and laden vehicles respectively.
6. After making the check, install the spring. Disconnect the pressure gauges from the load sensing proportioning valve and bleed the air.
   (Refer to P.35A-12.)

DISASSEMBLY AND REASSEMBLY

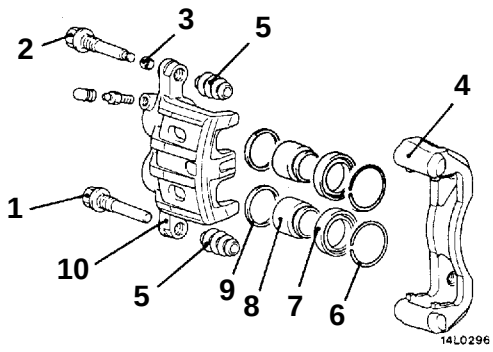
35100820044

<FRONT>

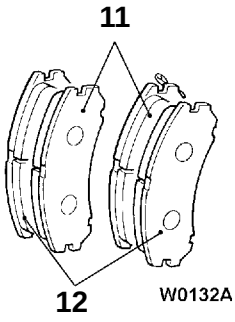




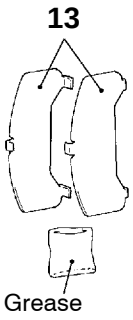
Clip set



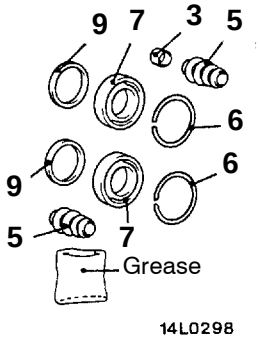
Brake caliper kit



Pad set



Shim set



Seal and boots kit

Disassembly steps

- ▶A◀ 1. Guide pin
- ▶A◀ 2. Lock pin
- 3. Bushing
- 4. Caliper support (pad, clip, shim)
- 5. Pin boot
- 6. Boot ring
- ◀A▶ 7. Piston boot
- ◀A▶ 8. Piston
- ◀B▶ 9. Piston seal
- 10. Caliper body
- 11. Pad and wear indicator assembly
- 12. Pad assembly
- 13. Outer shim
- 14. Clip

INSPECTION CHART FOR DIAGNOSIS CODES

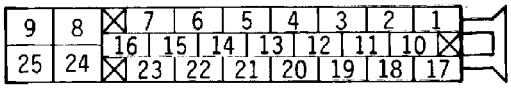
35201130583

Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code No.	Inspection item		Reference page
11	Front right wheel speed sensor (Open circuit or short circuit)		35B-6
12	Front left wheel speed sensor (Open circuit or short circuit)		35B-6
13	Rear right wheel speed sensor (Open circuit or short circuit)		35B-6
14	Rear left wheel speed sensor (Open circuit or short circuit)		35B-6
16	Power supply system (abnormal voltage drop or rise)		35B-7
21	Front right wheel speed sensor		35B-6
22	Front left wheel speed sensor		35B-6
23	Rear right wheel speed sensor		35B-6
24	Rear left wheel speed sensor		35B-6
33	Stop lamp switch system (open circuit or stop lamp stays ON)		35B-7
41	Front right solenoid valve	The diagnosis codes are output when there is no response to the drive signals for respective solenoid valves.	35B-21 (Replace the hydraulic unit and ABS-ECU.)
42	Front left solenoid valve		
43	Rear right solenoid valve		
44	Rear left solenoid valve		
51	Valve relay problem (stays on)		
52	Valve relay problem (stays off)		
53	Motor relay problem (stays off)		
54	Motor relay problem (stays on)		
55	Motor system (seized pump motor)		
63	ABS-ECU		

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

1. Turn the ignition switch off and disconnect the ABS-ECU connectors before checking resistance and continuity.
2. Check them between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustrations below.



V0464AE

Terminal No.	Signal	Normal condition
1 - 2	Wheel speed sensor (front left)	1.0 - 1.5 kΩ
5 - 6	Wheel speed sensor (rear left)	1.0 - 1.5 kΩ
19 - 20	Wheel speed sensor (front right)	1.0 - 1.5 kΩ
23 - 22	Wheel speed sensor (rear right)	1.0 - 1.5 kΩ
8 - Body earth	Solenoid valve earth	Continuity
24 - Body earth	Motor earth	

ANTI-SKID BRAKING SYSTEM (ABS) <4WD>

CONTENTS

35209000305

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SERVICE SPECIFICATIONS 3

LUBRICANTS ..... Refer to GROUP 35A

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ON-VEHICLE SERVICE

Brake Pedal Check and Adjustment ..... Refer to GROUP 35A

Brake Booster Operating Test ..... Refer to GROUP 35A

Check Valve Operation Check ..... Refer to GROUP 35A

Load Sensing Spring Length Check and Adjustment ..... Refer to GROUP 35A

Load Sensing Proportioning Valve Function Test ..... Refer to GROUP 35A

Brake Fluid Level Sensor Check ..... Refer to GROUP 35A

Bleeding ..... Refer to GROUP 35A

Disc Brake Pad Check and Replacement ..... Refer to GROUP 35A

Disc Brake Rotor Check ..... Refer to GROUP 35A

Brake Disc Thickness Check ..... Refer to GROUP 35A

Brake Disc Run-out Check ..... Refer to GROUP 35A

Brake Disc Run-out Correction ..... Refer to GROUP 35A

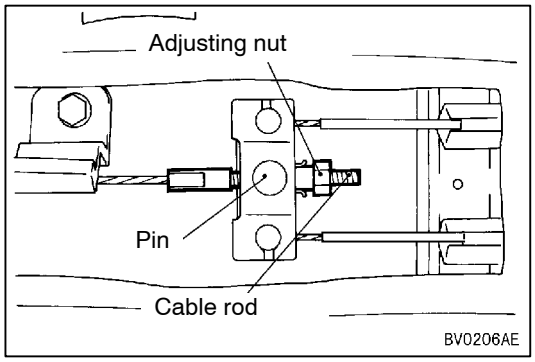
Wheel Speed Sensor Output Voltage Check ..... Refer to GROUP 35B

ABS Warning Lamp Relay Continuity Check ..... Refer to GROUP 35B

Hydraulic Unit Check ..... Refer to GROUP 35B

Remedy for a Flat Battery ..... Refer to GROUP 35B

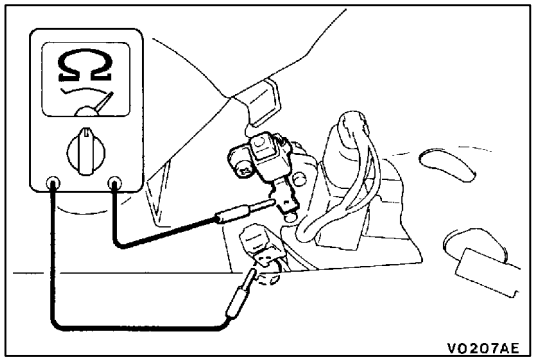
CONTINUED ON NEXT PAGE



(5) Turn the adjusting nut to adjust the parking brake lever stroke to the standard value. After adjusting, check that there is no space between the adjusting nut and the parking brake lever.

Caution
If the parking brake lever stroke is below the standard value and the braking is too firm, the rear brakes may drag.

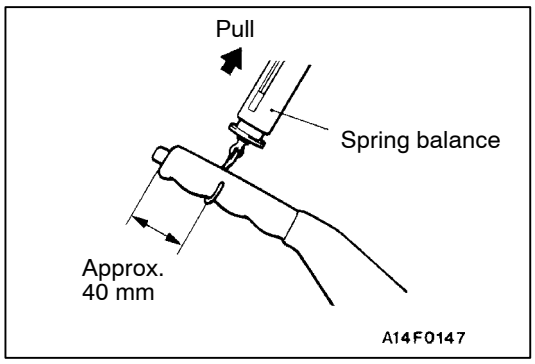
(6) After adjusting the parking brake lever stroke, jack up the rear of the vehicle. Release the parking brake and turn the rear wheels to check that the rear brakes are not dragging.



PARKING BRAKE SWITCH CHECK 36100330179

Check for continuity between the parking brake switch terminal and the switch mounting bolt.

When parking brake lever is pulled	Continuity
When parking brake lever is released	No continuity



LINING RUNNING-IN 36100110087

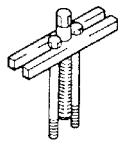
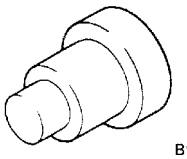
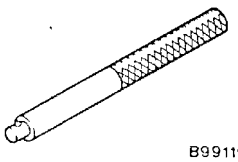
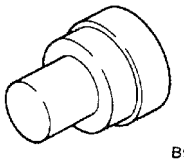
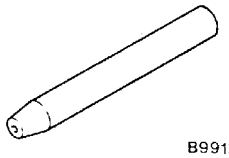
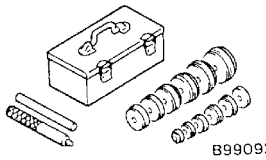
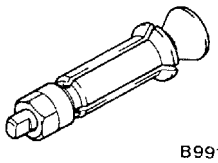
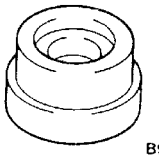
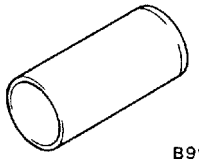
Carry out running-in by the following procedure when replacing the parking brake linings or the rear brake disc rotors, or when brake performance is insufficient.

Caution
Carry out running-in in a place with good visibility, and pay careful attention to safety.

1. Adjust the parking brake stroke to the specified value.

   Standard value [Operation force: Approx. 196 N] : 3 - 5 notches

2. Hook a spring balance onto the centre of the parking brake lever grip and pull it with a force of 98 - 147 N in a direction perpendicular to the handle.
3. Drive the vehicle at a constant speed of 35 - 50 km/h for 100 metres.
4. Release the parking brake and let the brakes cool for 5 - 10 minutes.
5. Repeat the procedure in steps 2. to 4. 4 - 5 times.

Tool	Number	Name	Use
 B990803	MB990803	Steering wheel puller	Disconnection of the steering wheel
 B991202	MB991202	Oil seal and bearing installer	Press fitting of rack housing bearing
 B991197	MB991197	Bar (long type)	To press in the oil seal for the rack
 B991198	MB991199	Oil seal installer	
 B991212	MB991213	Rack installer	Rack installation
 B990925	MB990925	Bearing and oil seal installer set	Installation of the oil seal and bearing (Refer to GROUP 26 - Special Tools.)
 B991120	MB991120	Needle bearing puller	Removal of rack housing needle bearing
 B991203	MB991203	Oil seal and bearing installer	To press in the valve housing oil seal and bearing
 B991317	MB991317	Seal ring installer	Compression of the seal rings after replacement of the pinion seal rings

POWER STEERING GEAR BOX

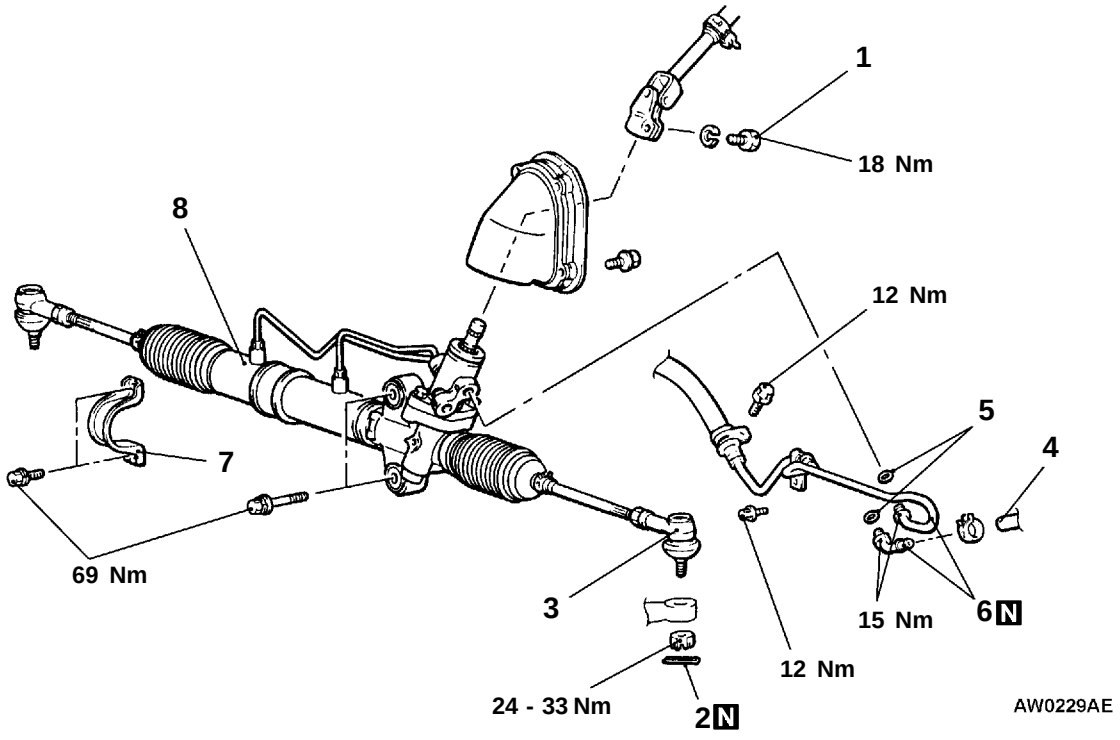
37200390405

REMOVAL AND INSTALLATION

Caution: SRS
For vehicles with SRS, before removal of steering gear box, refer to GROUP 52B, centre front wheels and remove ignition key. Failure to do so may damage SRS clock spring and render SRS system inoperative, risking serious driver injury.

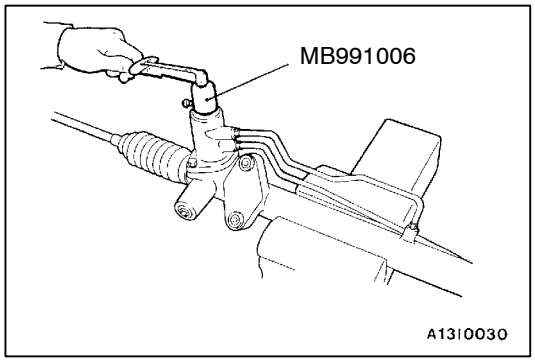
Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-9.)
- Under Cover Removal
- Front Exhaust Pipe Removal (Refer to GROUP 15.)
- Transfer Assembly Removal <4WD> (Refer to GROUP 22.)
- Rear Roll Stopper Removal <L.H. drive vehicles> (Refer to GROUP 32.)

Post-installation Operation
- Check the Dust Cover for Cracks or Damage by Pushing it with Finger.
- Rear Roll Stopper Installation <L.H. drive vehicles> (Refer to GROUP 32.)
- Transfer Assembly Installation <4WD> (Refer to GROUP 22.)
- Front Exhaust Pipe Installation (Refer to GROUP 15.)
- Under Cover Installation
- Power Steering Fluid Supplying (Refer to P.37A-9.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-10.)
- Checking Steering Wheel Position with Wheels Straight Ahead
- Front Wheel Alignment Adjustment (Refer to GROUP 33A.)



Removal steps

1. Steering shaft assembly and gear box connecting bolt
2. Split pin
◀A▶ 3. Tie rod end and knuckle connection
4. Return hose connection
5. Pressure pipe assembly connection
6. O-ring
7. Clamp
◀B▶ 8. Gear box assembly



▶K◀ TOTAL PINION TORQUE ADJUSTMENT

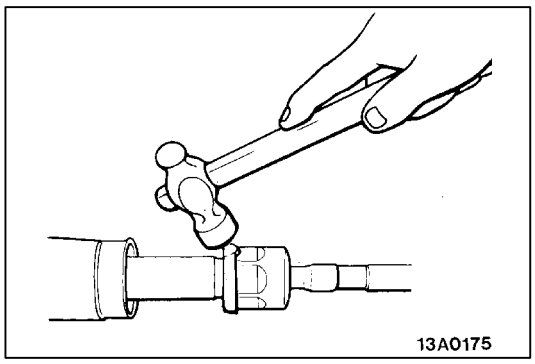
1. Using the special tool, rotate the pinion shaft at the rate of one rotation in 4 to 6 seconds to check the total pinion torque and the change in torque.

   Standard value:
   Total pinion torque: 0.7 - 1.4 Nm
   Change in torque: 0.4 Nm or less

2. If the total pinion torque or the change in torque is outside the standard value, return the rack support cover within 0 to 30°, and adjust again.

   Caution
   (1) When adjusting, set the standard value at its highest value.
   (2) Assure no ratcheting or catching when operating the rack towards the shaft direction.
   (3) Measure the total pinion torque through the whole stroke of the rack.

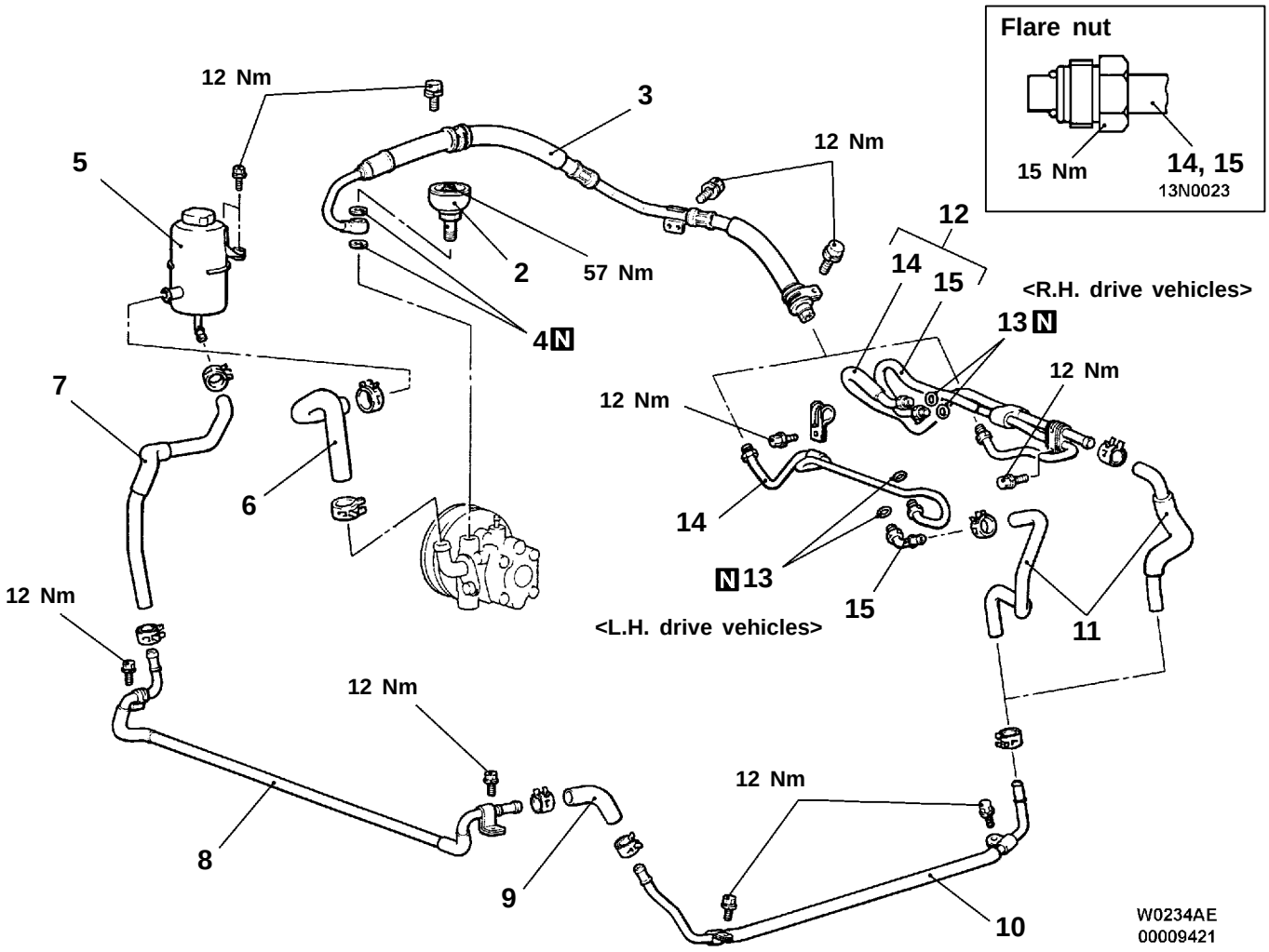
   NOTE
   If the total pinion toque cannot be adjusted to the standard value within the specified return angle, check the rack support cover components and replace any parts if necessary.



▶L◀ TAB WASHER/TIE ROD INSTALLATION

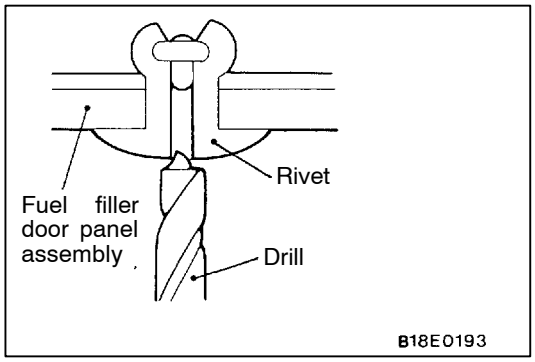
After installing the tie rod to the rack, fold the tab washer end (2 locations) to the tie rod notch.

<SPACE WAGON>



Removal steps

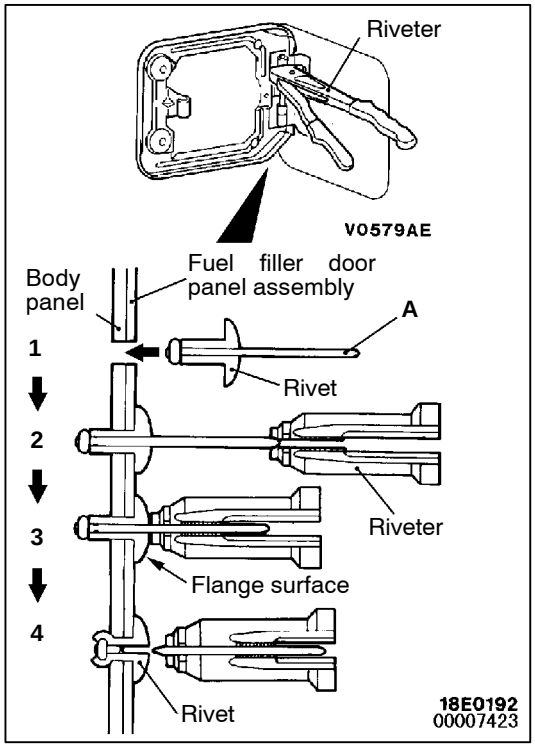
◀A▶ ▶A◀ 1. Eye bolt
2. Accumulator
3. Pressure hose
4. Gasket
5. Oil reservoir
6. Suction hose
7. Return hose
8. Cooler pipe
9. Return hose
10. Return pipe
11. Return hose
12. Pipe assembly
13. O ring
14. Pressure pipe assembly
15. Return pipe assembly



REMOVAL SERVICE POINT

◀A▶ RIVET REMOVAL

Use a drill (Ø4.0 - 5.5 mm) to break the rivet by drilling a hole, and then remove the rivet.



INSTALLATION SERVICE POINT

▶A◀ RIVET INSTALLATION

Use a riveter shown to install the rivet by the following procedure:

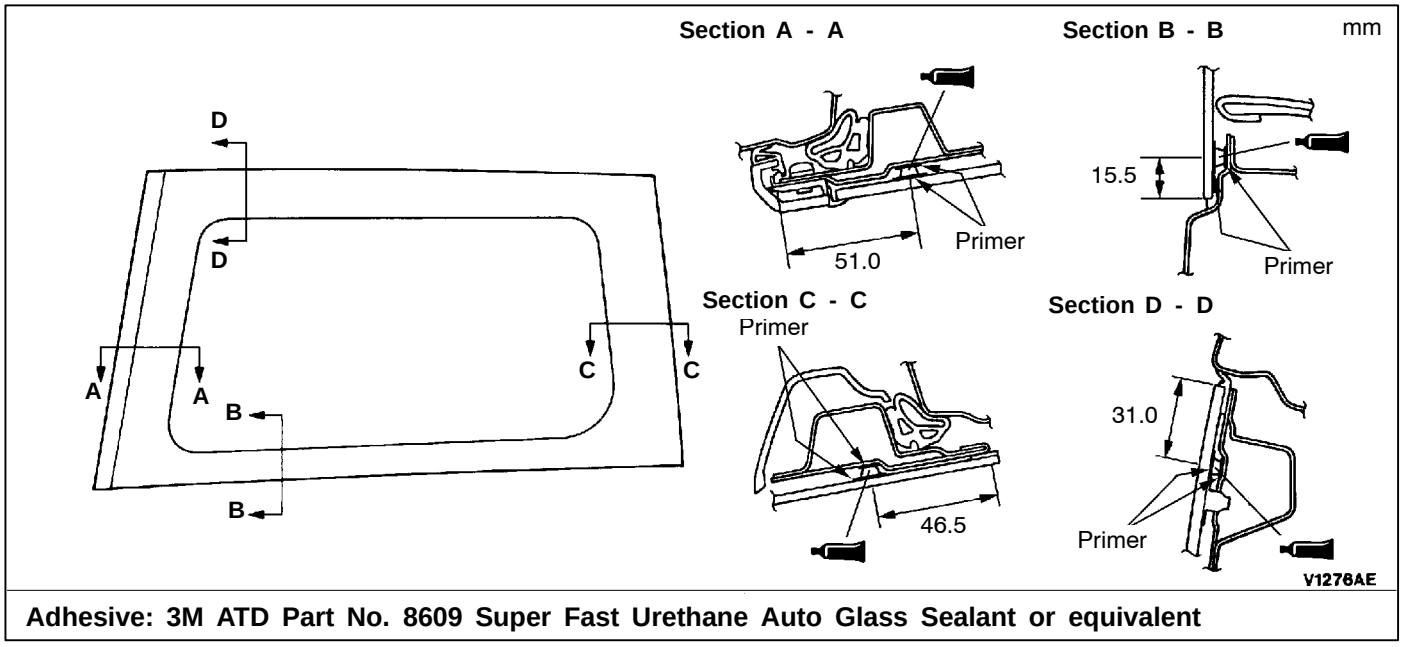
1. Insert the rivet into the body panel and fuel filler door panel assembly.
2. Insert “A” of the rivet into the riveter.
3. Pressing the flange surface of the rivet with the riveter, move the handle of the riveter.
4. The thinnest point of “A” is cut and the rivet is held in the position.

SLIDE DOOR WINDOW GLASS <SPACE RUNNER>

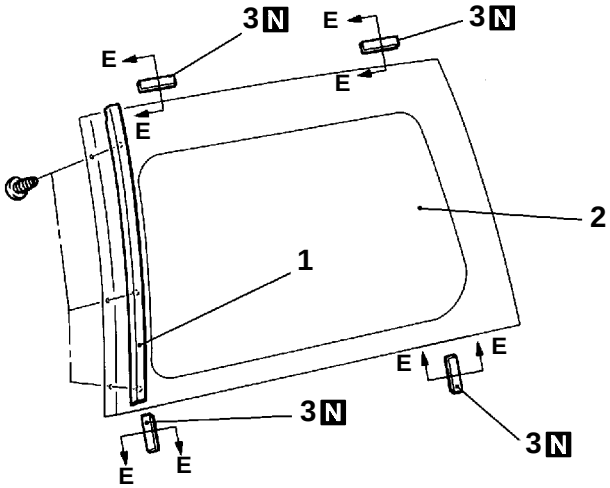
42200250196

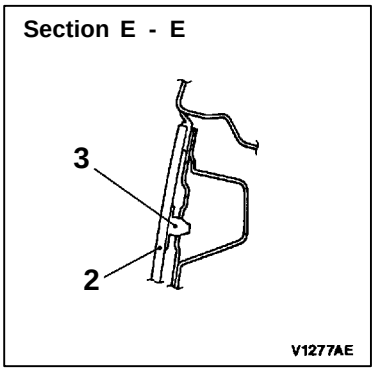
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Slide Door Sash Trim Removal and Installation (Refer to P.42-59.)
- Slide Door Upper Trim Removal and Installation (Refer to P.42-59.)



Adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent

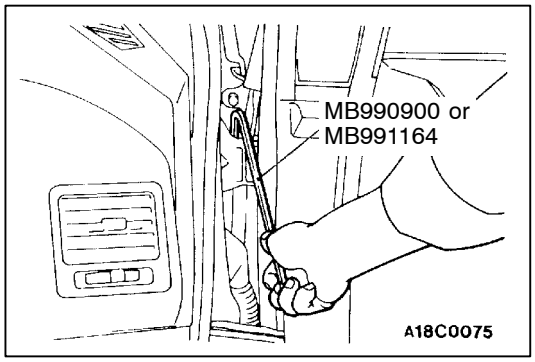




00007702

Removal steps

1. Slide door window garnish
◀A▶ ▶A◀ 2. Slide door window glass assembly
3. Glass stopper

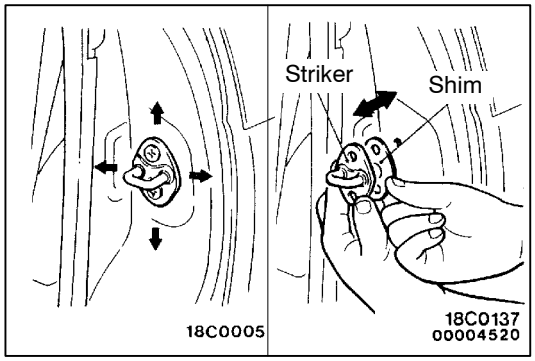


ON-VEHICLE SERVICE 42300090166

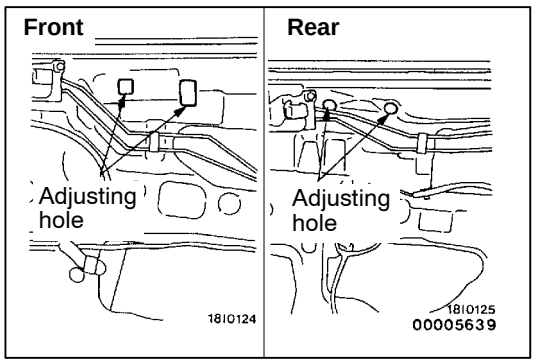
DOOR FIT ADJUSTMENT

1. If the clearance between the door and the vehicle body is uneven, affix protective tape to the fender around the hinge and to the edge of the door. Then use the special tool to loosen the door hinge mounting bolts on the body, and adjust the clearance around the door so that it becomes even.
2. If the door and the body are not flush with each other, use the special tool to loosen the door hinge mounting bolts on the door. Then align the door.

Caution
Do not load more than 98 Nm on the special tool.



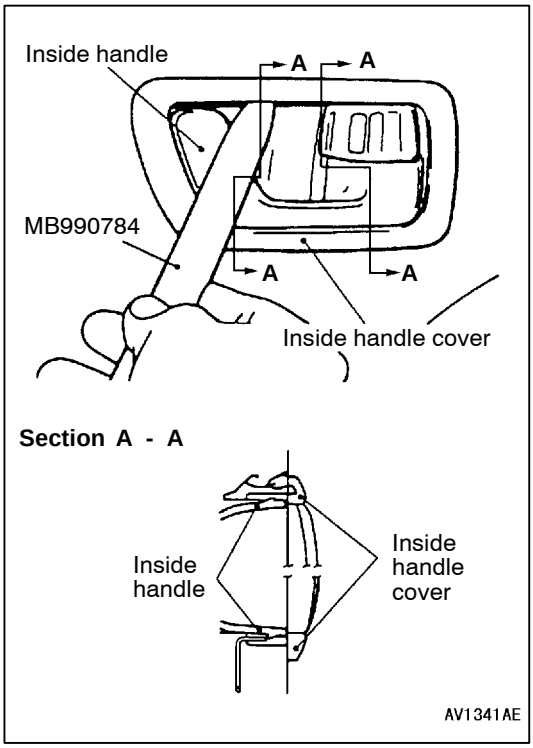
3. If the door opening and closing is heavy, adjust the meshing of the striker and the door latch (in the longitudinal direction) by adding shims to the striker and by moving the striker up and down or to the left and right.



DOOR WINDOW GLASS ADJUSTMENT 42300100302

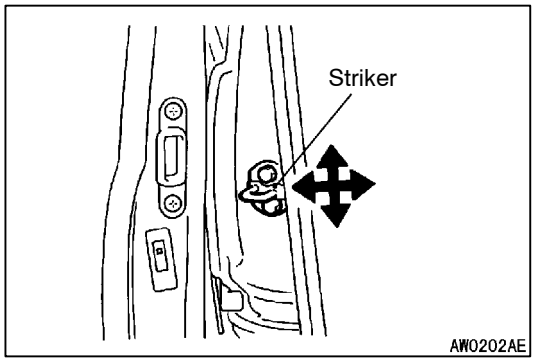
Check that the door glass moves securely along the door glass runchannel when the window glass is fully raised and fully lowered. If the glass does not move correctly, adjust by the following procedure.

1. Remove the door trim and the waterproof film. (Refer to P.42-37, 38, 39.)
2. Loosen the door glass mounting screw through the adjusting hole with the door window glass fully closed, and lower the door window glass slightly.
3. Close the door window glass fully again, and tighten the door glass mounting screw securely through the adjusting hole.



◀C▶ DOOR TRIM/INSIDE HANDLE COVER REMOVAL <SPACE WAGON>

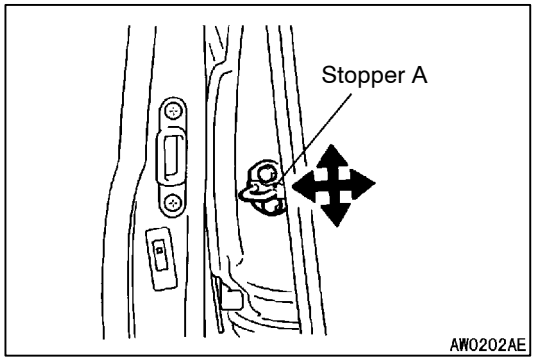
1. Insert the special tool between the inside handle upper end and the inside handle cover, and pry off the inside handle cover from the upper tabs of the inside handle.
2. Insert the special tool between the inside handle lower end and the inside handle cover, and pry off the inside handle cover from the lower tabs of the inside handle.
3. Remove the door trim.
4. Remove the inside handle cover from the door trim.



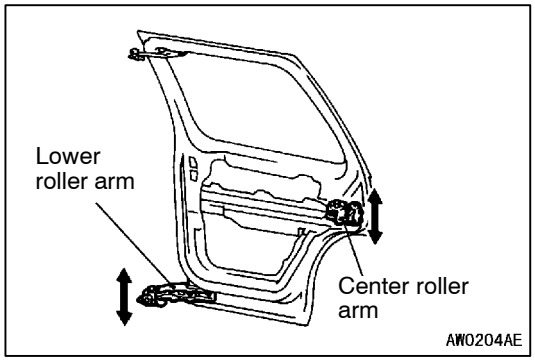
ON-VEHICLE SERVICE

DOOR FIT ADJUSTMENT

1. If the striker is not properly engaged with the latch, adjust the door fit by moving the striker horizontally and vertically.



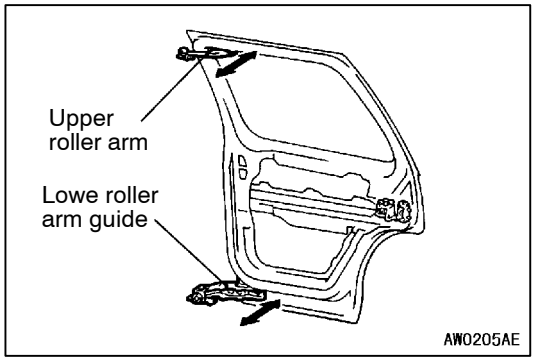
2. Check if the stopper touches the vehicle body properly when the door is closed. If there is a problem, move the stopper A horizontally and vertically to adjust.



3. Close the slide door. If the slide door is not flush with the vehicle body or there is excessive or uneven clearance between the door and body edges, follow the steps below:

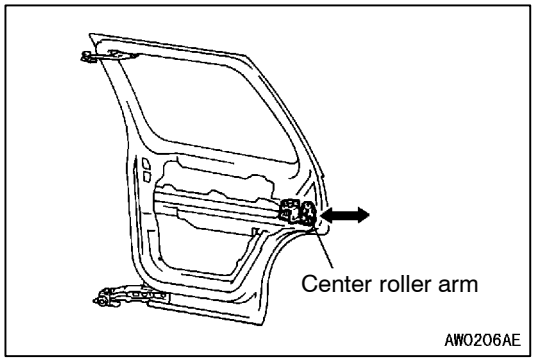
Vertical adjustment

(1) Remove the slide door trim and waterproof film (Refer to P.42-59.)
(2) Loosen the center roller arm and the lower roller arm mounting bolts, and then move the center lower arm and the lower roller arm up and down to adjust.



Inward and outward adjustment

(1) Loosen the upper roller arm and the lower roller arm guide mounting bolts, and then move the upper roller arm the lower roller arm guide inward and outward to adjust.



Forward and backward adjustment

(1) Remove the slide door trim and waterproof film (Refer to P.42-59.)
(2) Loosen the center roller arm mounting bolts, and then insert shim(s) between the center roller arm and the vehicle body to adjust.

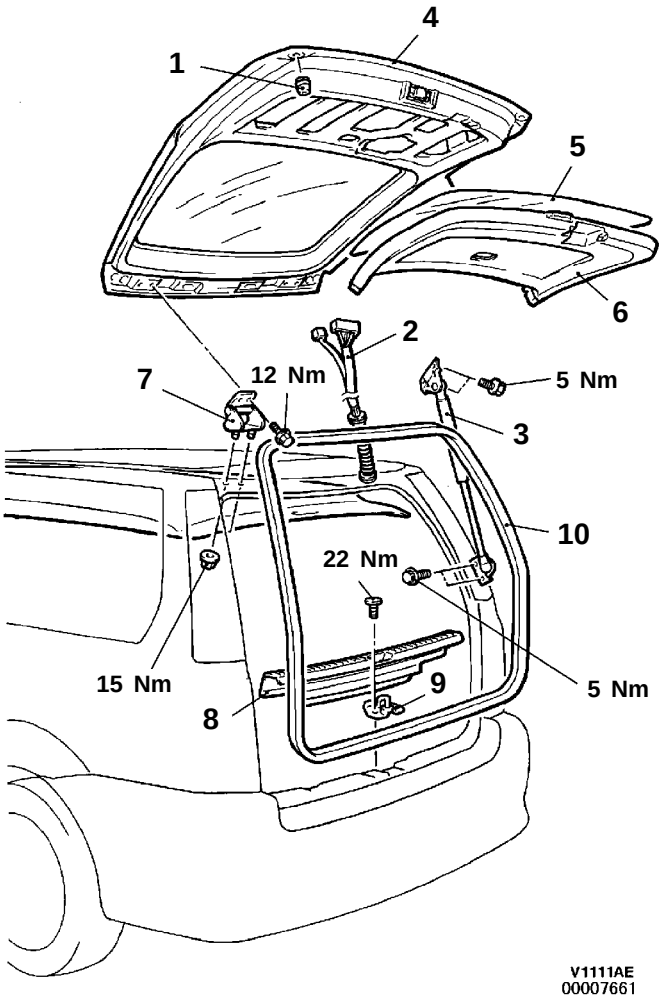
TAILGATE ASSEMBLY

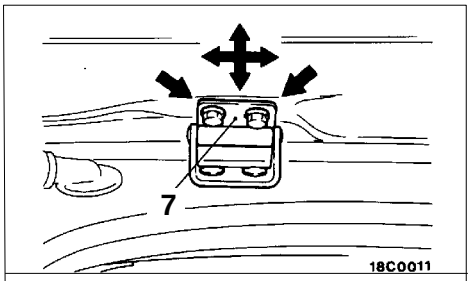
42400110209

REMOVAL AND INSTALLATION

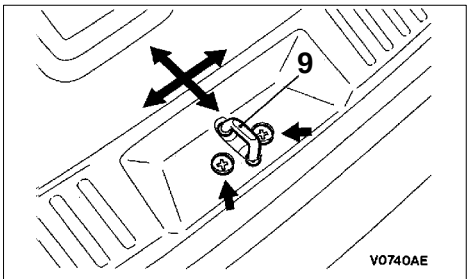
Post-installation Operation
Tailgate fit adjustment (Refer to P.42-63.)

<SPACE RUNNER>

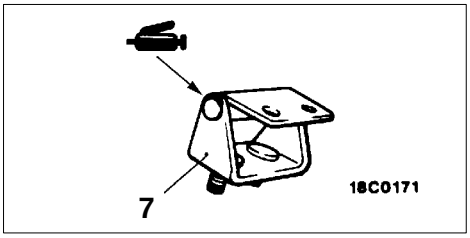




Adjustment of clearance around tailgate



Adjustment of tailgate step and tailgate striker linkage



Tailgate assembly removal steps

- High-mounted stop lamp (Refer to GROUP 54.)

1. Bumper
2. Harness connector

◀A▶

3. Tailgate gas spring
4. Tailgate assembly
5. Waterproof film
6. Lower tailgate trim (Refer to P.42-67, 68.)

Tailgate striker removal steps

8. Rear end trim
9. Tailgate striker

Tailgate opening weatherstrip removal

8. Rear end trim

▶A◀ 10. Tailgate opening weatherstrip

Tailgate hinge removal steps

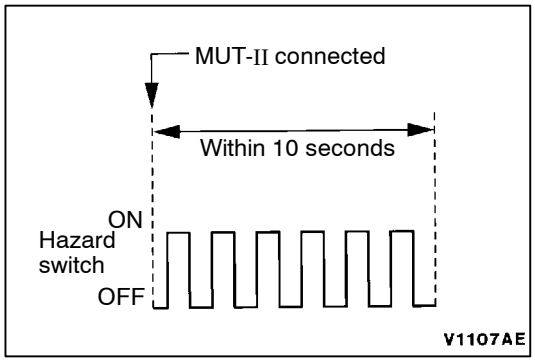
- Washer tube connection (Refer to GROUP 54.)

2. Harness connector

◀A▶

3. Tailgate gas spring
4. Tailgate assembly
- Headlining

7. Tailgate hinge



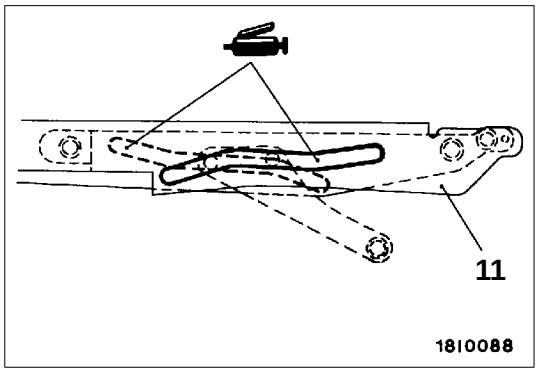
3. Within 10 seconds after connecting the MUT-II, press the hazard switch six times.

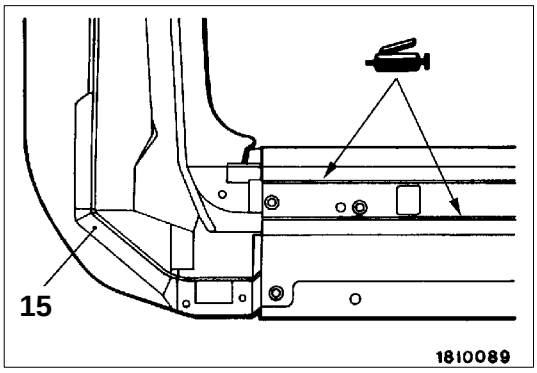
   NOTE
   The doors will lock and unlock once at this time and the system will switch to registration mode.

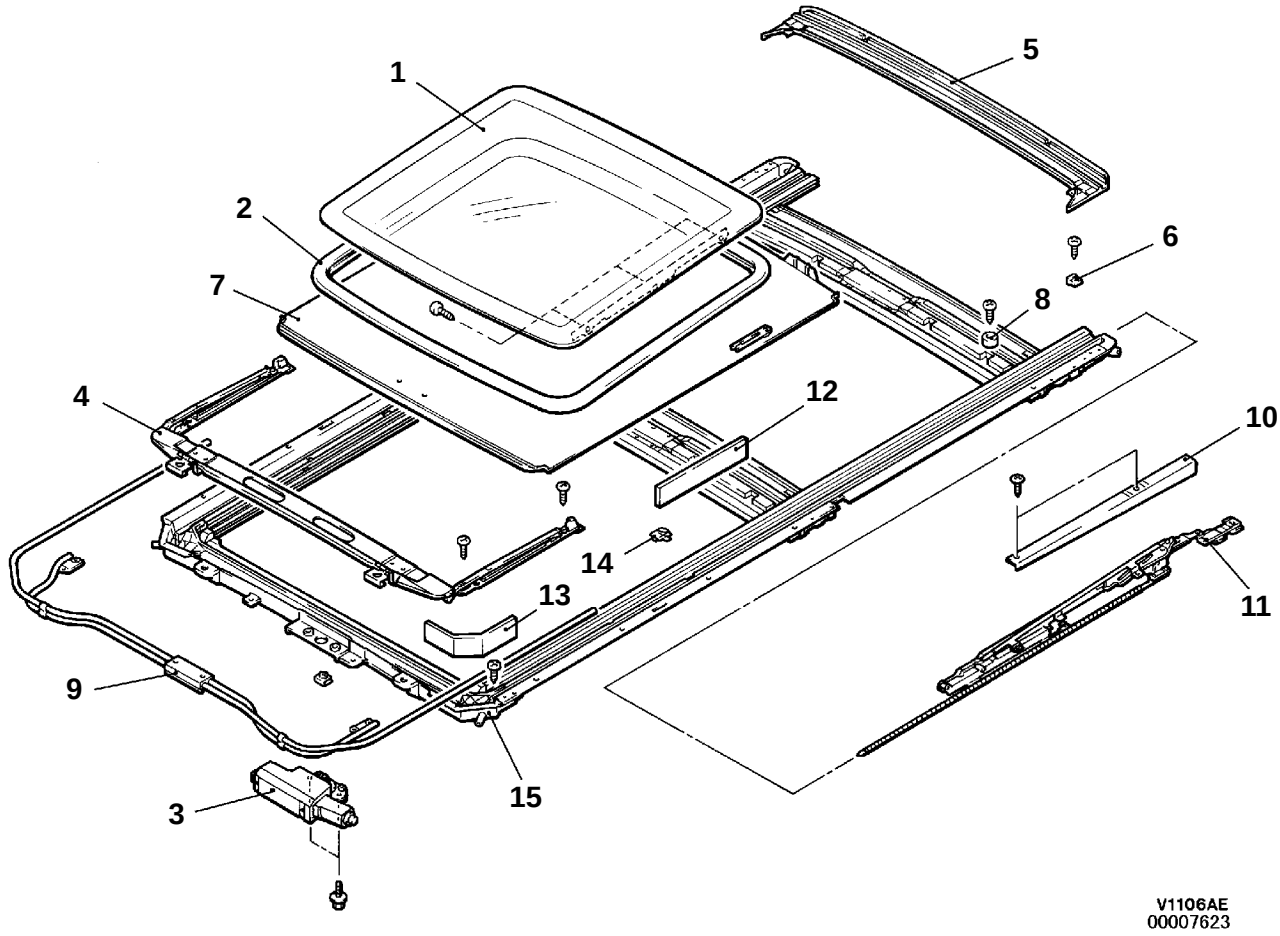
4. Press the lock switch or unlock switch of the transmitter switch, and then press it two times within 10 seconds of the first press. This will register the code.
5. After registration is completed, the doors will be automatically locked and unlocked once.
6. If you are using more than two transmitters or have added a second transmitter, the same registration procedure should be carried out for the remaining transmitters, and it should be carried out within one minute after registration of the code for the first transmitter has been completed. The registration procedure are all the same for all transmitters.
7. Registration mode will be terminated under the following conditions.
   - When the secret codes for four transmitters have been registered;
   - When one minute has passed after registration mode started;
   - If the MUT-II is disconnected (earth is released);
   - If the ignition switch is turned to ON;
8. After registration mode has been completed, carry out the followings to make sure that the keyless entry system operates.
   - Pull the ignition key out.
   - Close the all windows.

DISASSEMBLY AND REASSEMBLY

42600140105



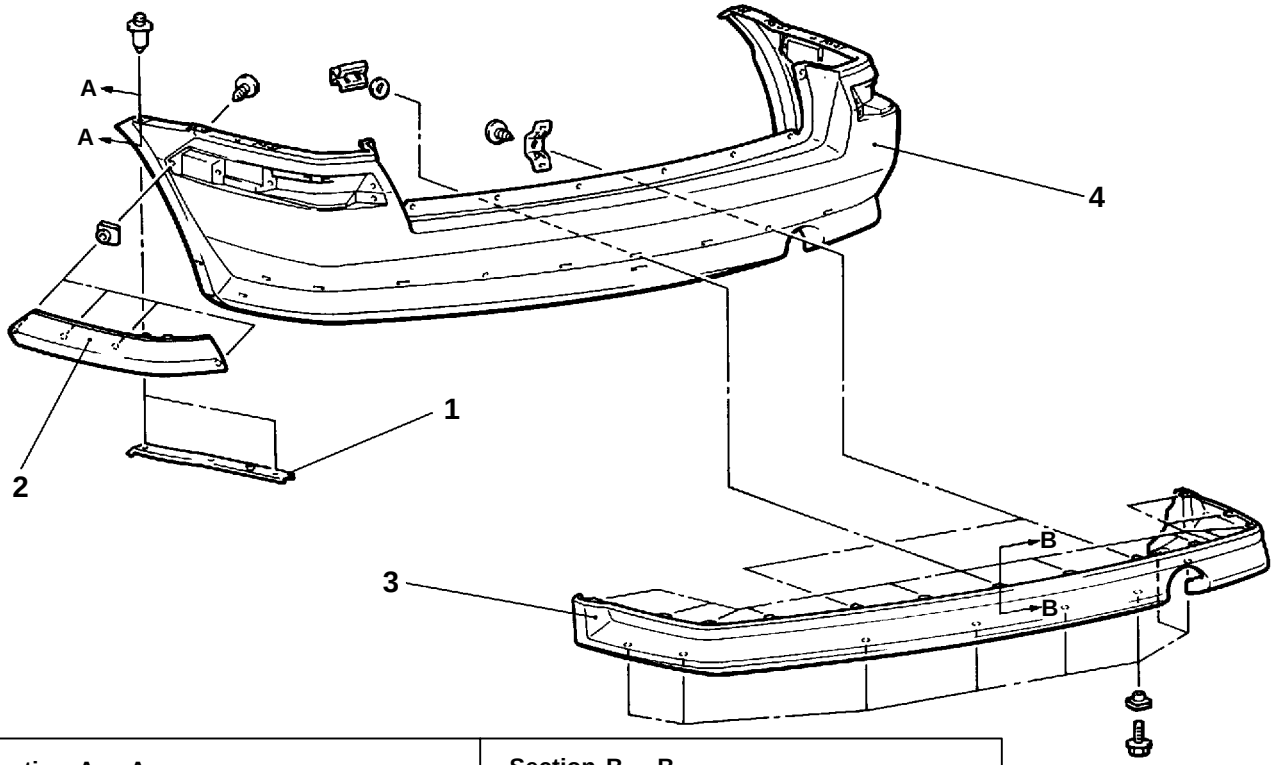


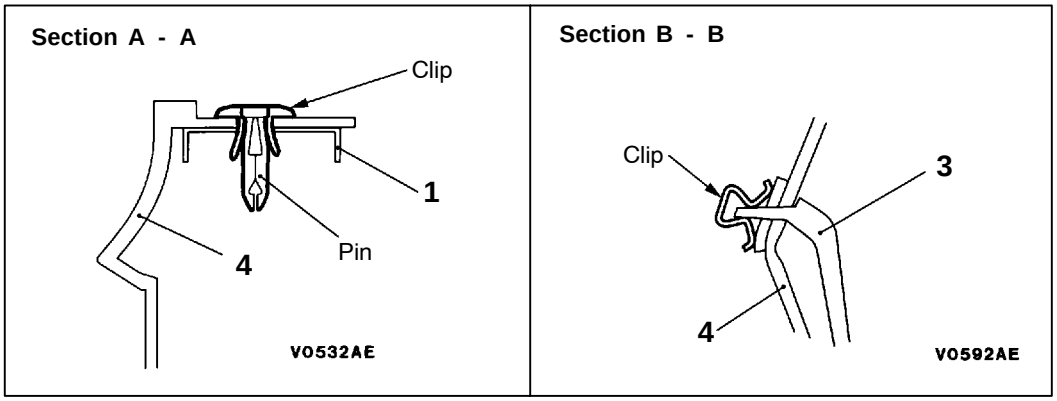


Disassembly steps

1. Roof lid glass assembly
2. Weatherstrip
3. Sunroof motor
4. Roof wind deflector panel
5. Roof drip channel
6. Panel stopper
7. Sunshade assembly
8. Guide rail stopper
9. Cable guide casing
10. Side deflector
11. Drive cable assembly
12. Seal
13. Seal
14. Clamp
15. Guide rail sub assembly

<SPACE WAGON>



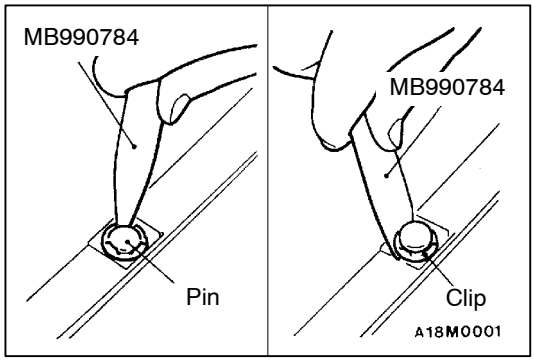


V0524AE
00007205

Disassembly steps

1. Rear bumper side plate
2. Corner protector
3. Rear air dam
4. Rear bumper face

◀A▶



DISASSEMBLY SERVICE POINT

◀A▶ REAR BUMPER FACE REMOVAL

1. Use the special tool to pull up the centre pin in the clip.
2. Remove the clip.

REMOVAL SERVICE POINT

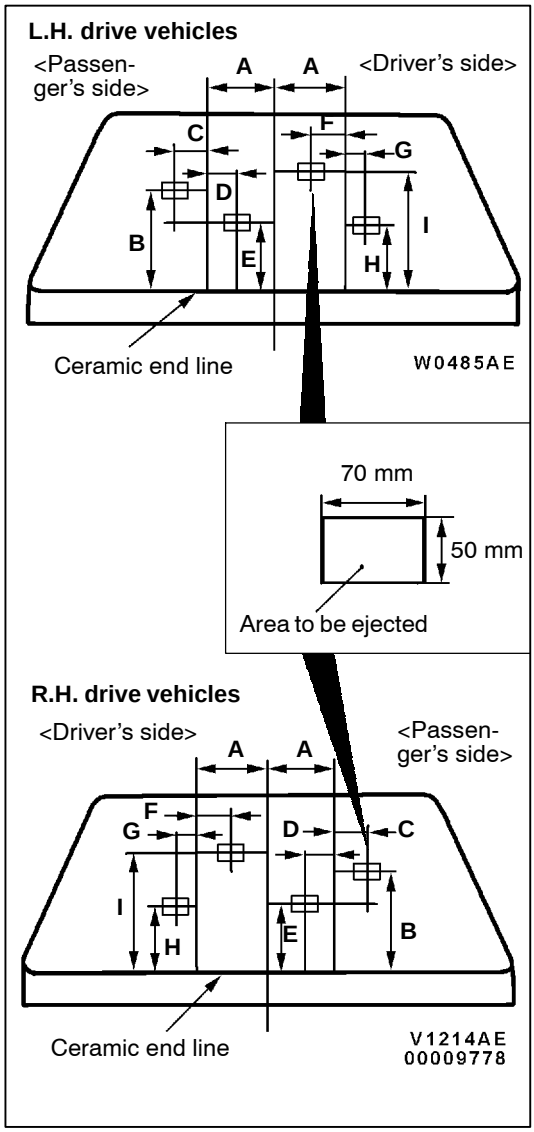
◀A▶ SIDE AIR DAM REMOVAL

Remove the side air dam in the same manner as for the side protect moulding (Refer to P.51-18).

INSTALLATION SERVICE POINT

▶A◀ SIDE AIR DAM INSTALLATION

Install the side air dam in the same manner as for the side protect moulding (Refer to P.51-18).



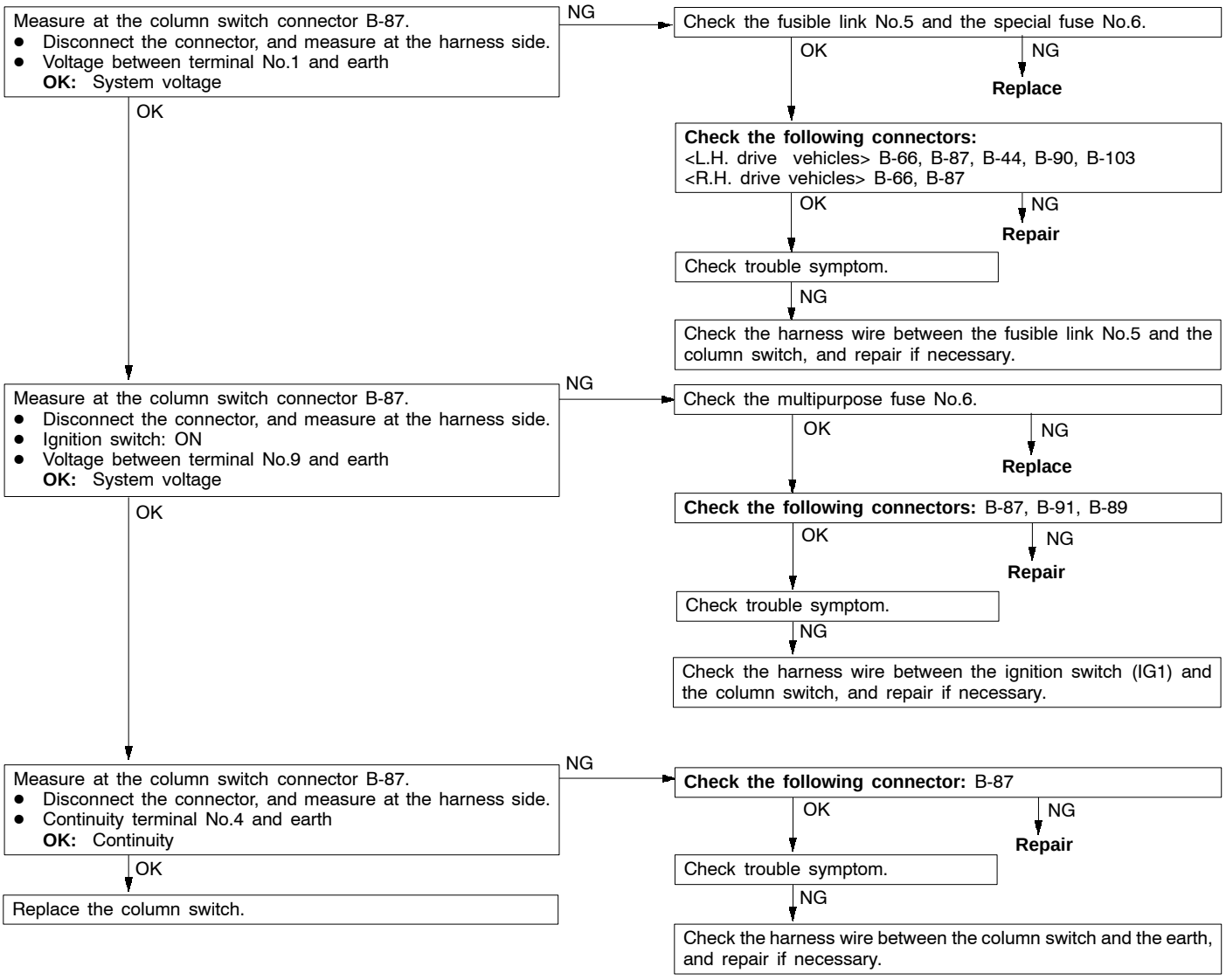
WASHER FLUID EJECTION POINT CHECK 51101270138

Adjust the ejection angle by moving the nozzle.

Item	Distance mm	Item	Distance mm
A	300	F	250
B	450	G	55
C	50	H	325
D	55	I	475
E	340	-	-

Inspection Procedure 2

Headlamp washer switch input circuit system check



INTERIOR AND SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

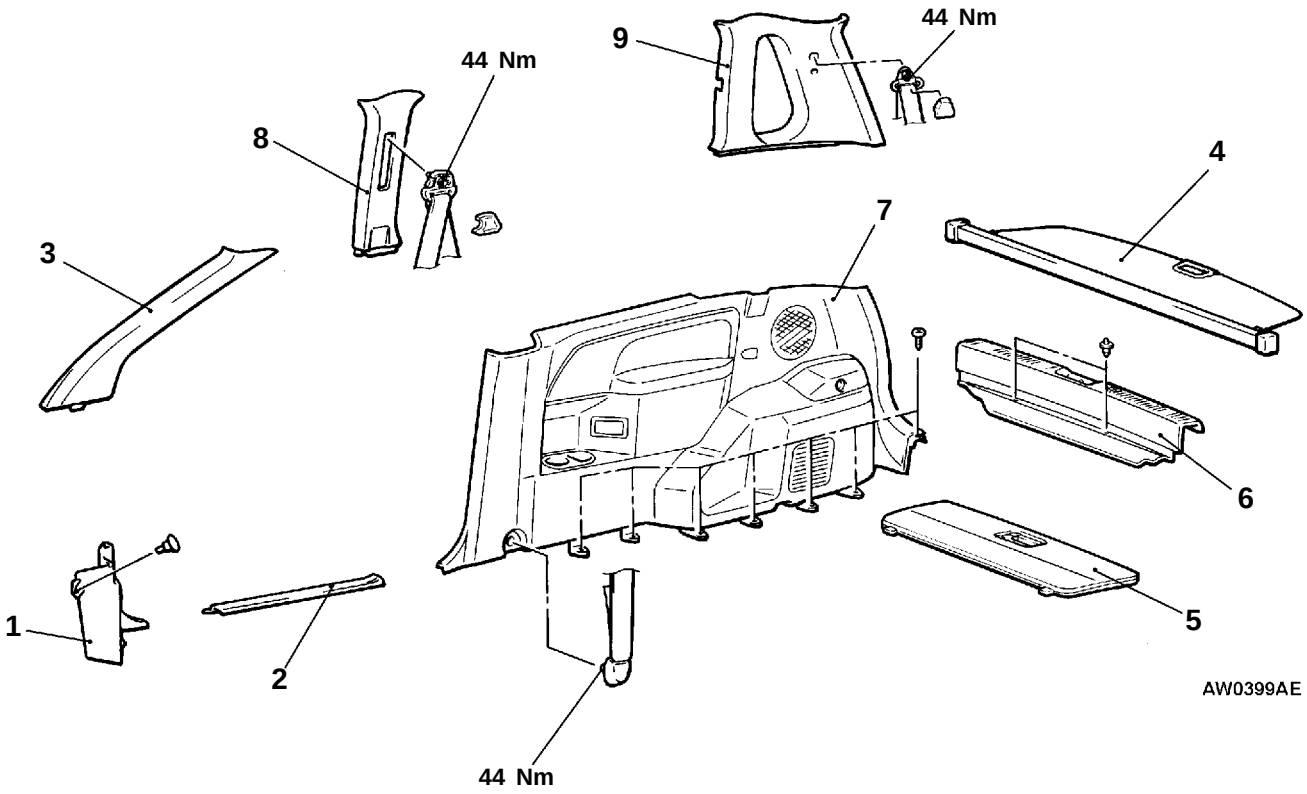
INTERIOR 52A

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) 52B

TRIMS <SPACE RUNNER - R.H. drive vehicles>

REMOVAL AND INSTALLATION

<R.H.>



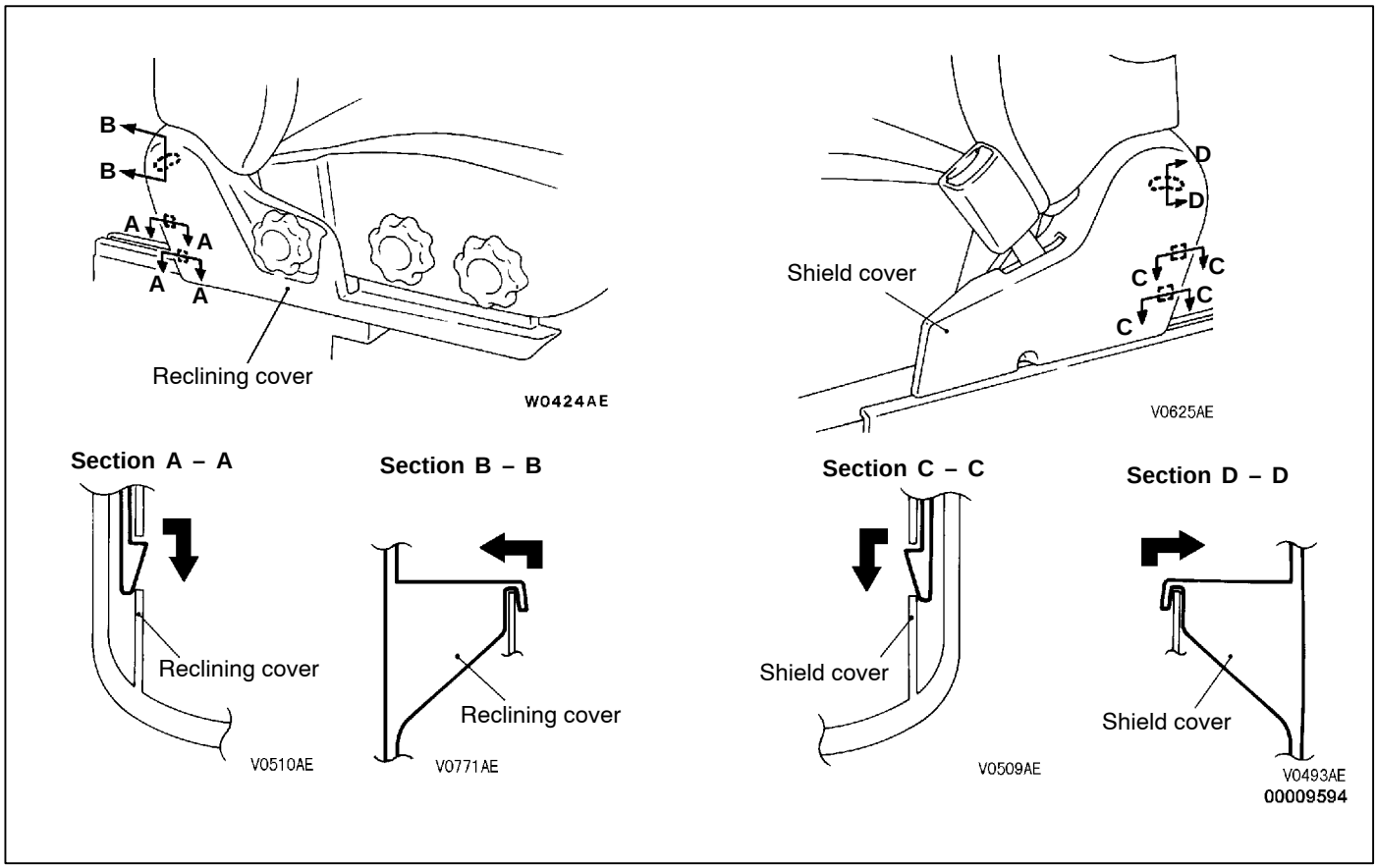
- Rear seat
  (Refer to GROUP 52A-24.)
1. Cowl side trim
2. Front scuff plate
3. Front pillar trim
4. Tonneau cover
5. Luggage tray lid
6. Rear end trim
7. Quarter lower trim assembly
8. Center pillar upper trim
9. Rear pillar trim

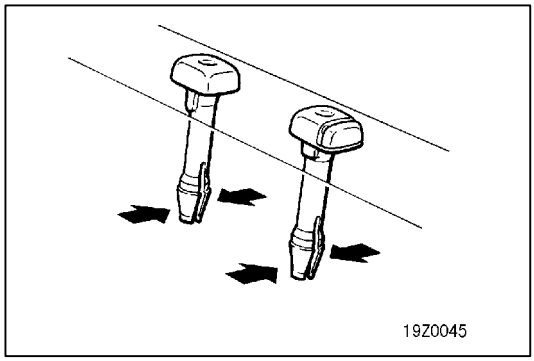
NOTE
For the door trim, refer to GROUP 42.

DISASSEMBLY SERVICE POINTS

◀A▶ RECLINING COVER/SHIELD COVER REMOVAL

For the reclining cover, disengage the claws at section A - A, and then disengage the claw at section B - B.
For the shield cover, disengage the claws at section C - C, and then disengage the claw at section D - D.

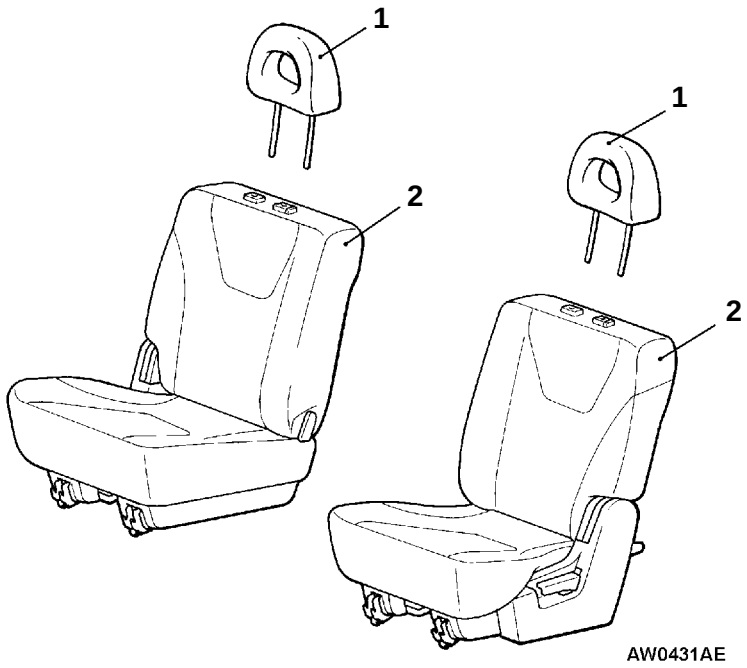




◀B▶ HEADRESTRAINT GUIDE REMOVAL

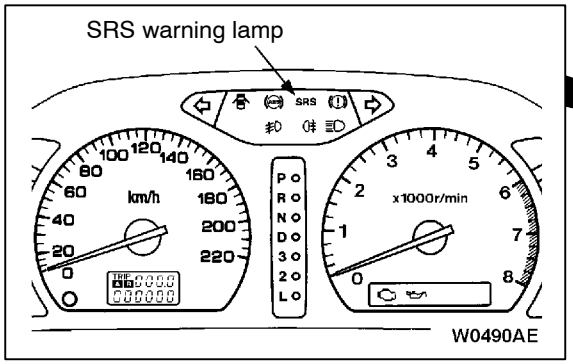
THIRD SEAT <SPACE WAGON>

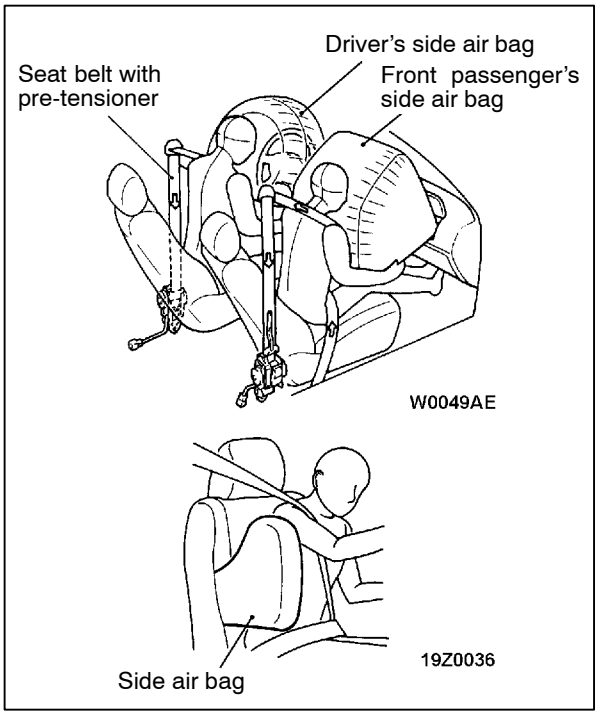
REMOVAL AND INSTALLATION

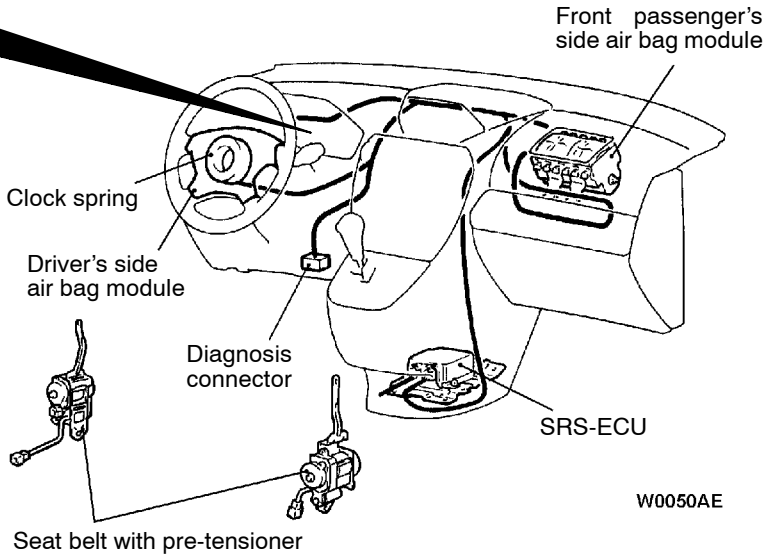


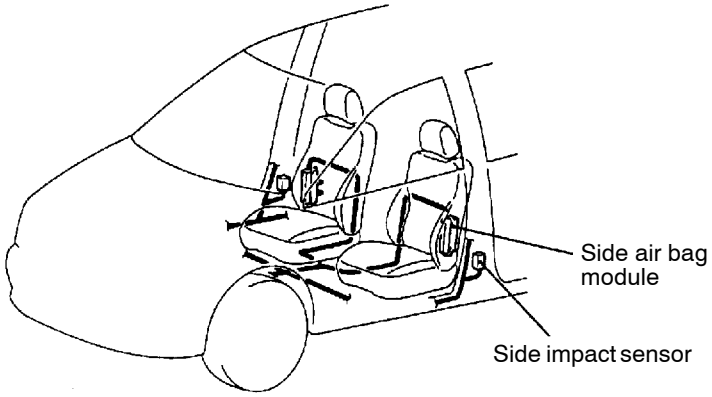
Removal steps

1. Headrestraint
2. Third seat assembly


SRS warning lamp
SRS
km/h
x1000r/min
P
R
N
D
3
2
L
W0490AE

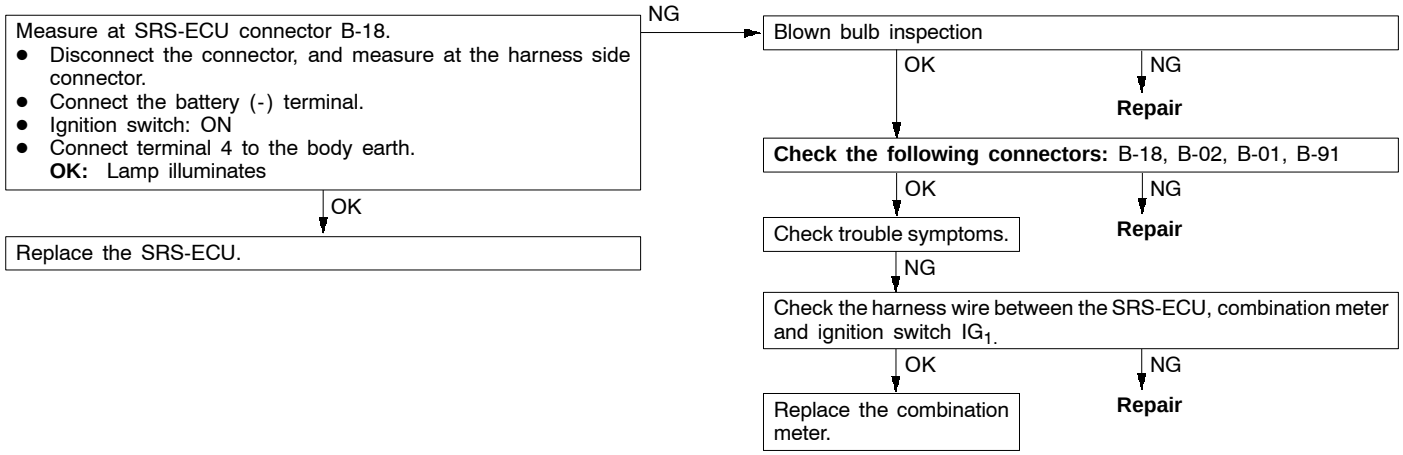

Driver's side air bag
Seat belt with pre-tensioner
Front passenger's side air bag
W0049AE
Side air bag
19Z0036


Front passenger's side air bag module
Clock spring
Driver's side air bag module
Diagnosis connector
SRS-ECU
W0050AE
Seat belt with pre-tensioner

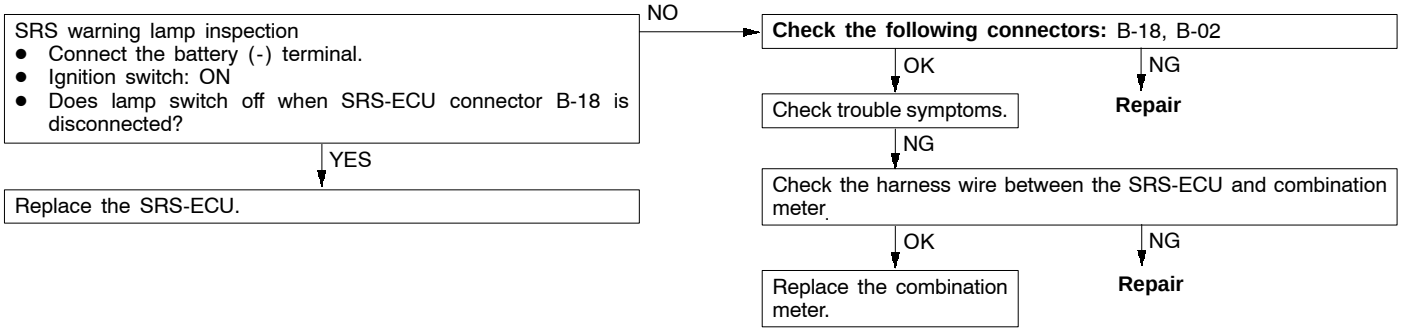

Side air bag module
Side impact sensor
V0012AJ

00009238

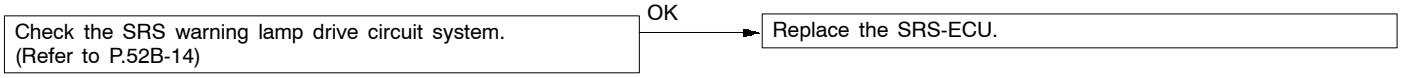
Code No.43 SRS warning lamp drive circuit system (Lamp does not illuminate.)	Probable cause
This diagnosis code is output when an open circuit occurs for a continuous period of 5 seconds while the SRS-ECU in monitoring the SRS warning lamp and the lamp is OFF (transistor OFF). However, if this code is output due to an open circuit, if the vehicle condition returns to normal, this diagnosis code No.43 will be automatically erased, and the SRS warning lamp will return to normal.	• Malfunction of wiring harnesses or connectors • Blown bulb • Malfunction of SRS-ECU • Malfunction of combination meter



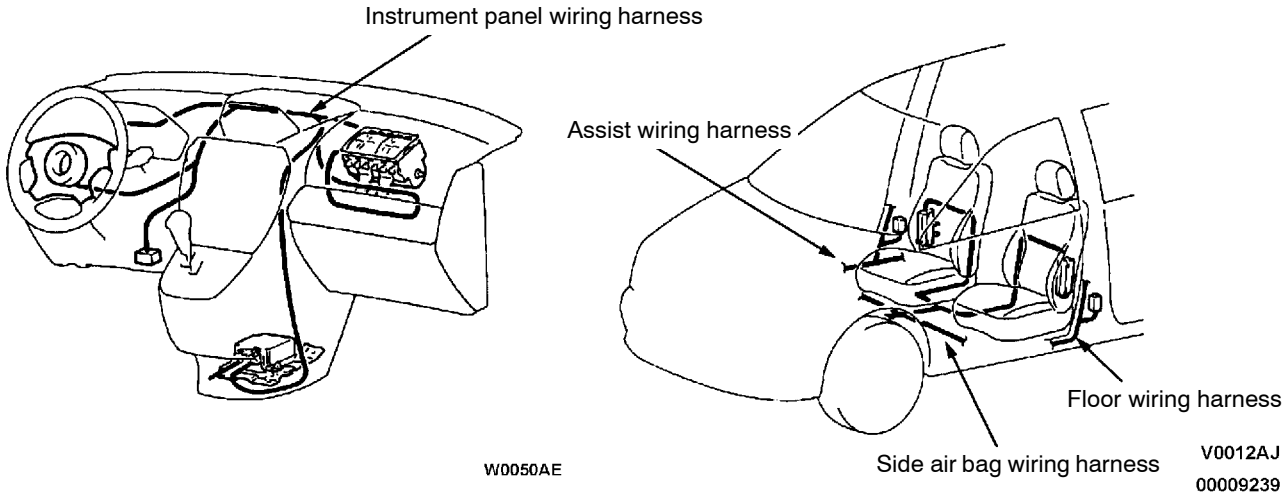
Code No.43 SRS warning lamp drive circuit system (Lamp does not switch off.)	Probable cause
This diagnosis code is output when a short to earth occurs in the harness between the lamp and the SRS-ECU while SRS-ECU is monitoring the SRS warning lamp and the lamp is ON.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU • Malfunction of combination meter



Code No.44 SRS warning lamp drive circuit system	Probable cause
This diagnosis code is output when a short occurs in the lamp drive circuit or a malfunction of the output transistor inside the SRS-ECU is detected while the SRS-ECU is monitoring the SRS warning lamp drive circuit. However, if the vehicle condition returns to normal, diagnosis code No.44 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU

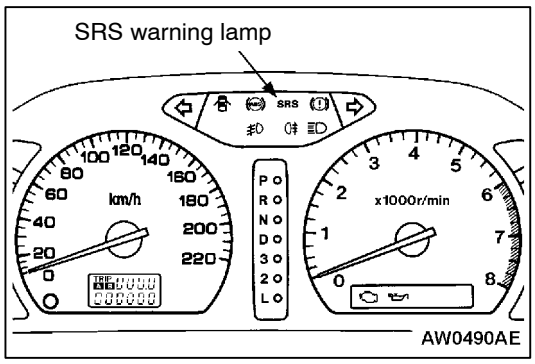


INSTRUMENT PANEL WIRING HARNESS/FLOOR WIRING HARNESS/ASSIST WIRING HARNESS/SIDE AIR BAG WIRING HARNESS



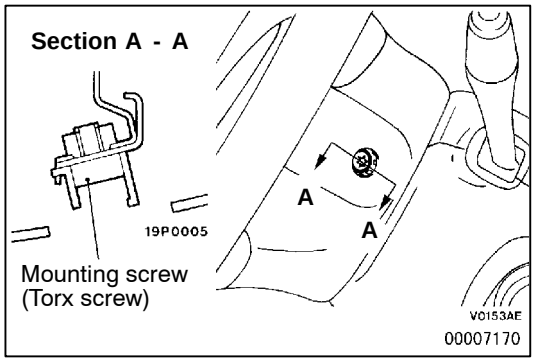
1. Check connector for poor connection.
2. Check harnesses for binds, connectors for damage, and terminals for deformation.
   REPLACE ANY CONNECTORS OR HARNESS THAT FAIL THE VISUAL INSPECTION. (Refer to P.52B-4.)

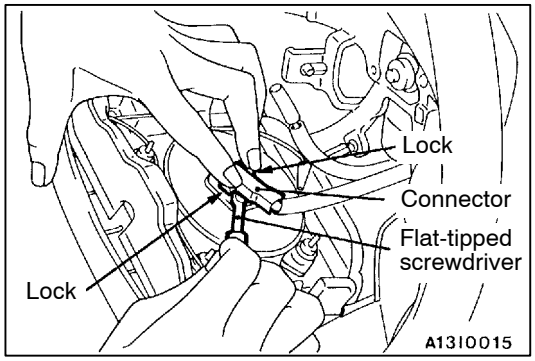
Caution
The SRS may not activate if SRS harnesses or connectors are damaged or improperly connected, which could result in serious injury or death to the vehicle's driver or front passenger.

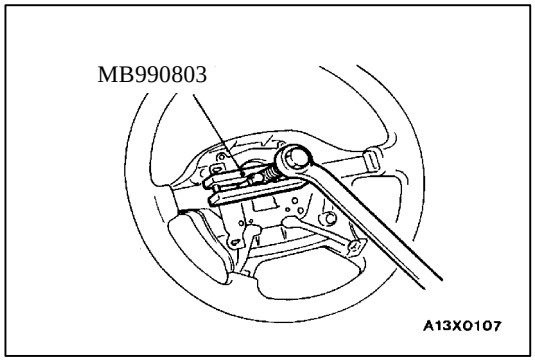


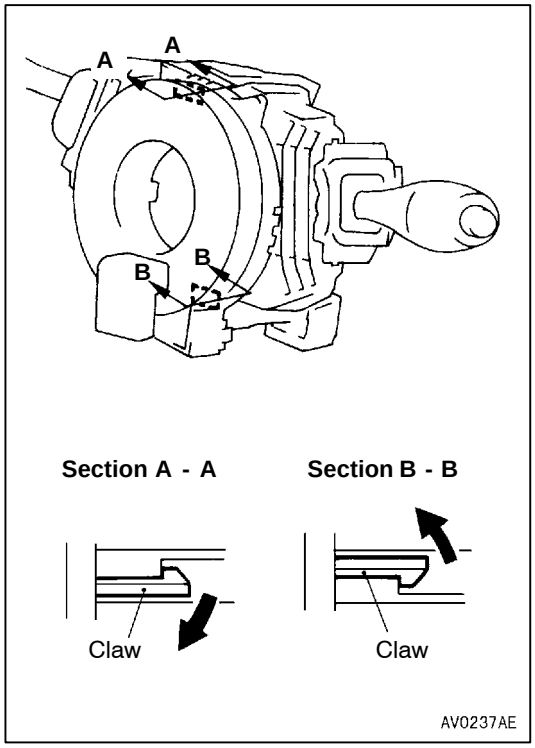
POST-INSTALLATION INSPECTION

Reconnect the negative battery terminal. Turn the ignition switch to the "ON" position. Does the SRS warning lamp illuminate for about 7 seconds, turn off and then remain extinguished for at least 5 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-8.









REMOVAL SERVICE POINTS

◀A▶ DRIVER'S SIDE AIR BAG MODULE REMOVAL

1. Remove the air bag module mounting screws (torx screws) at the sides of the steering wheel. <SPACE WAGON>

   NOTE
   Do not remove the screws from the holders. <SPACE WAGON>

2. When disconnecting the connector of the clock spring from the air bag module, press the air bag's lock towards the outer side to spread it open. Use a flat-tipped screwdriver, as shown in the figure at the left, to pry so as to remove the connector gently.

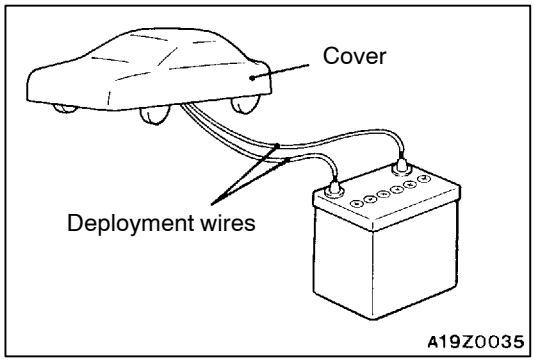
   Caution
   (1) When disconnect the air bag module clock spring connector, take care not to apply excessive force to it.
   (2) The removed air bag module should be stored in a clean, dry place with the pad cover face up.

◀B▶ STEERING WHEEL REMOVAL

Caution
Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.

◀C▶ CLOCK SPRING REMOVAL

Caution
The removed clock spring should be stored in a clean, dry place.



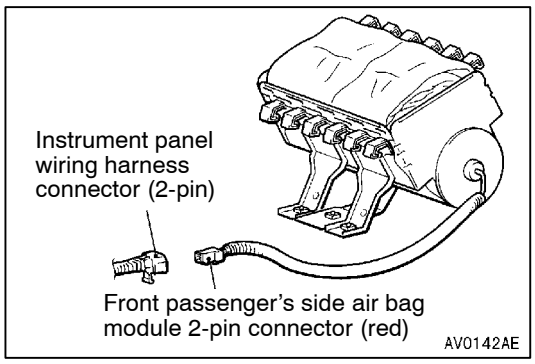
(5) Fully close all door windows, close the doors and place a cover over the vehicle to minimize the amount of noise.

Caution
If the glass is damaged, it may break, so the car must be covered.

(6) Disconnect the deployment wires as far from the vehicle as possible and connect the wires to the terminals of the battery removed from the vehicle. Deploy the driver's side air bag module.

Caution
1) Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.
2) The deployment of the driver's side air bag makes the inflator very hot. Before handling the insulator, wait more than 30 minutes for cooling.
3) If the air bag module fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.

(7) After deployment, dispose of air bag module according to the Deployed Air Bag Module and Seat Belt Pre-tensioner Disposal Procedures. (Refer to P.52B-58.)



Front passenger's side air bag module

(1) Remove the glove box. (Refer to GROUP 52A - Instrument panel.)
(2) Remove the connection between the front passenger's side air bag module 2-pin connector (red) and the instrument panel wiring harness connector (2-pin).

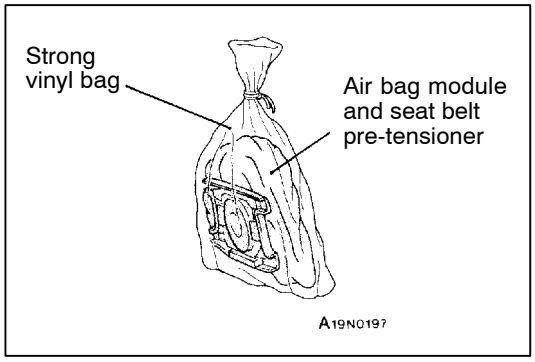
NOTE
If the front passenger's side air bag module connector is disconnected from the instrument panel wiring harness, both electrodes of the front passenger's side air bag module connector will be automatically shorted to prevent unintended deployment of the front passenger's side air bag due to static electricity, etc.

DEPLOYED AIR BAG MODULE OR OPERATED SEAT BELT PRE-TENSIONER DISPOSAL PROCEDURES

After deployment or operation, the air bag module and the seat belt pre-tensioner should be disposed of in the same manner as any other scrap parts, adhering to local laws and/or legislation that may be in force except that the following points should be carefully noted during disposal.

1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it cool before attempting to handle it.
2. Do not put water or oil on the air bag after deployment or on the seat belt pre-tensioner after operation.
3. There may be, adhered to the deployed air bag module or the operated seat belt pre-tensioner, material that could irritate the eye and/or skin, so wear gloves and safety glasses when handling a deployed air bag module or a operated seat belt pre-tensioner.

   Caution
   If after following these precautions, any material does get into the eyes or on the skin, immediately rinse the affected area with a large amount of clean water. If any irritation develops, seek medical attention.



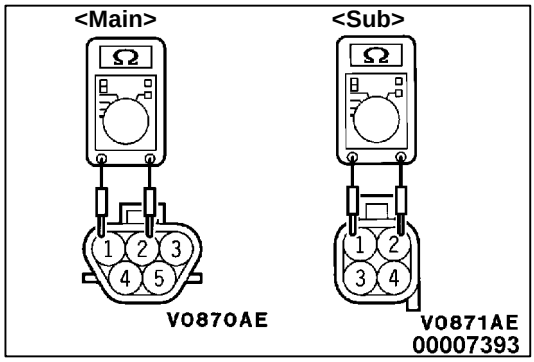
4. Tightly seal the air bag module and seat belt pre-tensioner in a strong vinyl bag for disposal.
5. Be sure to always wash your hands after completing this operation.

CHECK AT IMMOBILIZER-ECU

TERMINAL VOLTAGE CHECK CHART

W0599AE

Terminal No.	Signal	Checking requirements	Terminal voltage
1	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
2	–	–	–
3	Engine-ECU	–	–
4	Immobilizer-ECU earth	Always	0 V



FUEL GAUGE UNIT CHECK

54300120400

Remove the fuel gauge unit from the fuel tank. (Refer to GROUP 13C.)

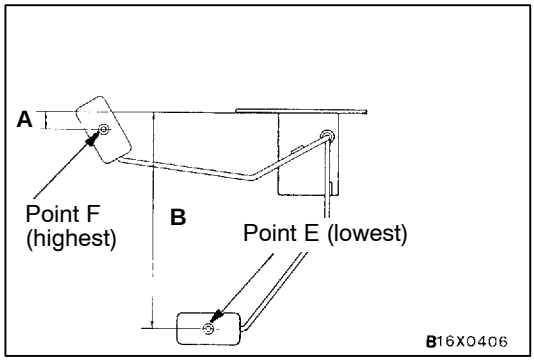
FUEL GAUGE UNIT RESISTANCE

1. Check that resistance value between the fuel gauge terminal and earth terminal is at standard value when fuel gauge unit float is at point F (highest) and point E (lowest).

Standard value:

Items		Standard value Ω
Main	Float point F	1 -3
	Float point E	56.5 - 62.5
Sub	Float point F	1 - 3
	Float point E	48.5 - 54.5

2. Check that resistance value changes smoothly when float moves slowly between point F (highest) and point E (lowest).



FUEL GAUGE UNIT FLOAT HEIGHT

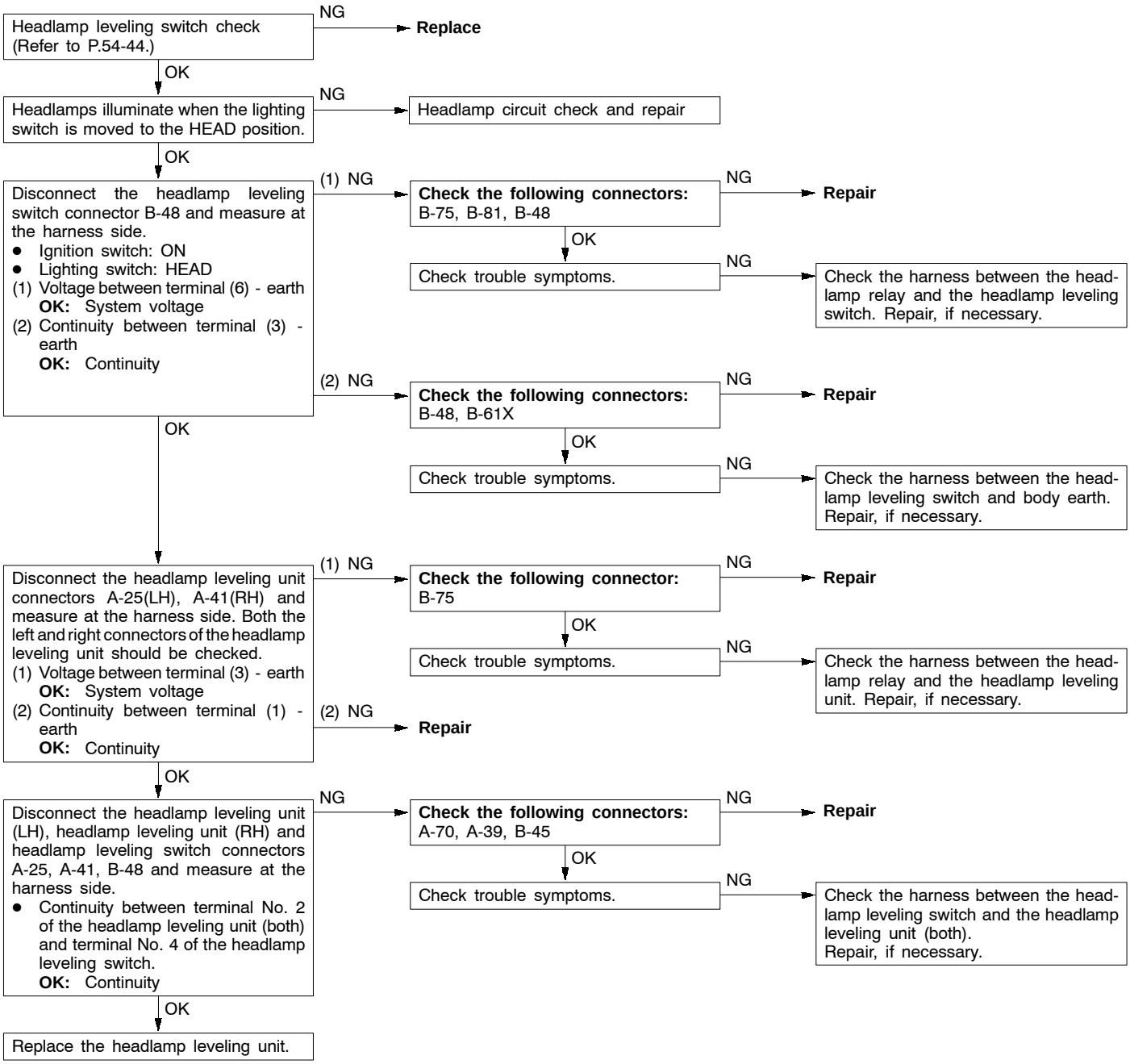
Move float and measure the height A at point F (highest) and B at point E (lowest) with float arm touching stopper.

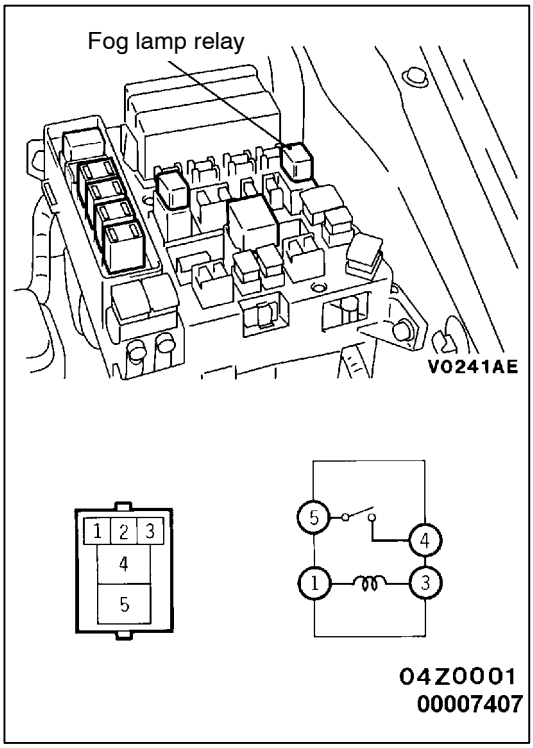
Standard value:

Items		Standard value mm
Main	Float point F	31.8 -37.8
	Float point E	128.7 - 134.7
Sub	Float point F	20.5 - 26.5
	Float point E	133.7 - 139.7

Inspection Procedure 5

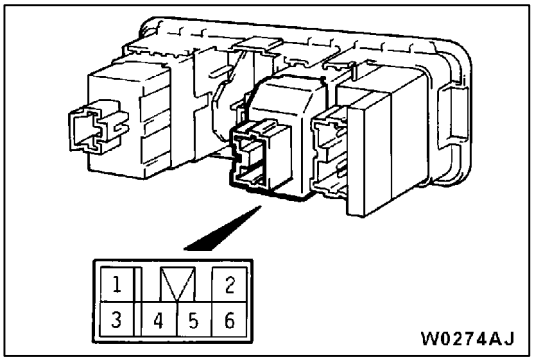
Headlamp angle does not change when the headlamp leveling switch is operated.	Probable cause
The cause is probably a malfunction of the headlamp leveling switch circuit system or a malfunction of the headlamp leveling unit circuit system. If there is a blown fuse, there may also be a short-circuit in a harness.	• Malfunction of fuse • Malfunction the headlamp leveling switch • Malfunction of connector • Malfunction of harness • Malfunction of the headlamp leveling unit





FOG LAMP RELAY CONTINUITY CHECK

Battery voltage	Terminal No.			
	1	3	4	5
Not supplied	○	○		
Supplied	⊕	⊖	○	○

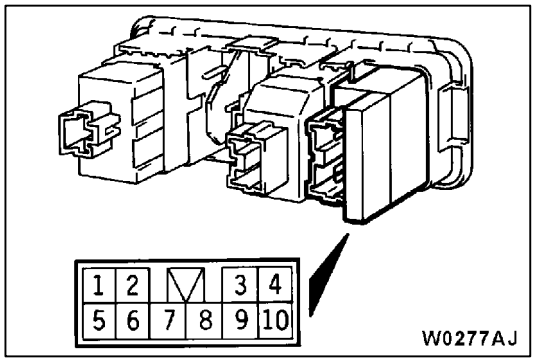


HEADLAMP LEVELING SWITCH CHECK

Check the resistance between the terminals when the headlamp leveling switch is operated.

Standard value:

Resistance measurement terminal No.	Switch position				
	0	1	2	3	4
Between 3 and 4 Ω	1,235	1,114	977	862	747
Between 4 and 6 Ω	548	669	806	921	1,036
Between 3 and 6 Ω	1,003				

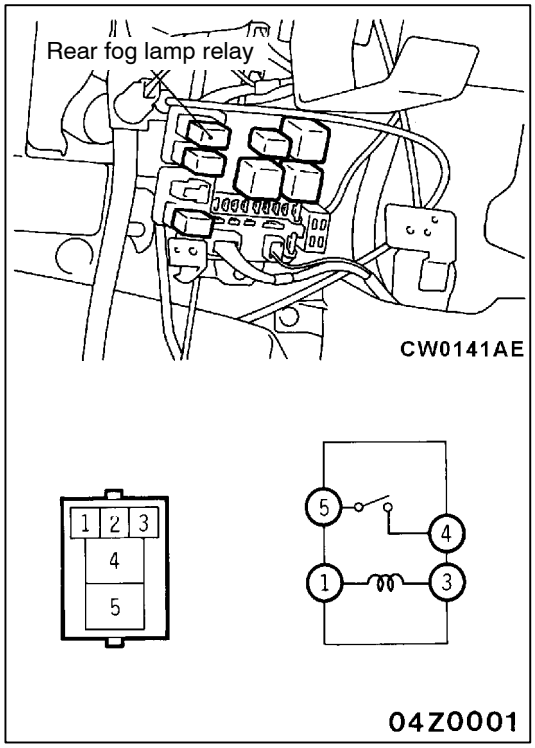


INSPECTION

54200460073

REAR FOG LAMP SWITCH CHECK

Switch position	Terminal No.						
	1	10	2	5	6		7
OFF						ILL	
ON						ILL	



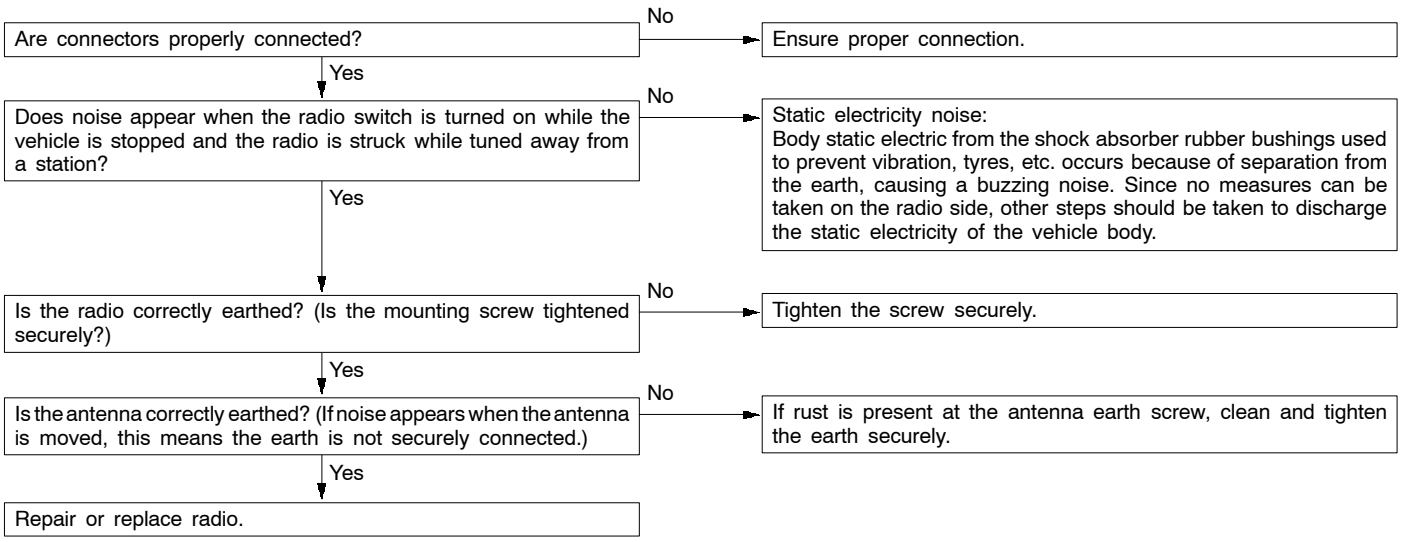
REAR FOG LAMP RELAY CHECK

Battery voltage	Terminal No.			
	1	3	4	5
Supplied	⊕	⊖		
Not supplied				

LIGHTING SWITCH AND TURN-SIGNAL LAMP SWITCH CHECK

Refer to P.54-111.

A-5 Some noise appears when there is vibration or shocks during travelling.



A-6 Ever-present noise.

Noise is often created by the following factors, and often the radio is OK when it is checked individually.

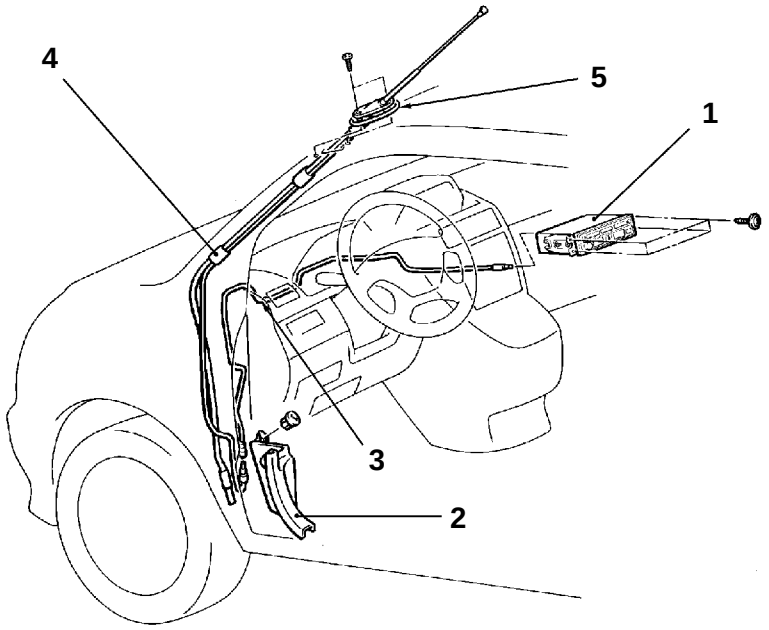
- Travelling conditions of the vehicle
- Terrain of area travelled through
- Surrounding buildings
- Signal conditions
- Time period

For this reason, if there are still problems with noise even after the measures described in steps A-1 to A-8 have been taken, get information on the factors listed above as well as determining whether the problem occurs with UKW/MW/LW, the station names, frequencies, etc., and contact a service centre.

ANTENNA

54400290371

REMOVAL AND INSTALLATION



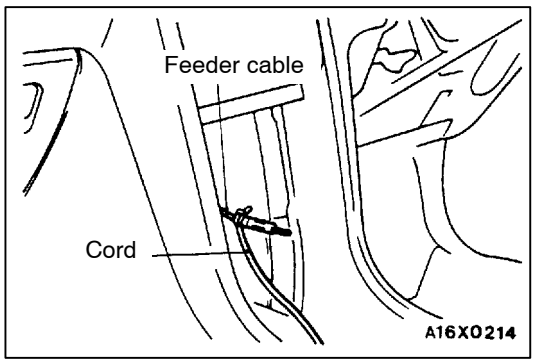
AW0587AE

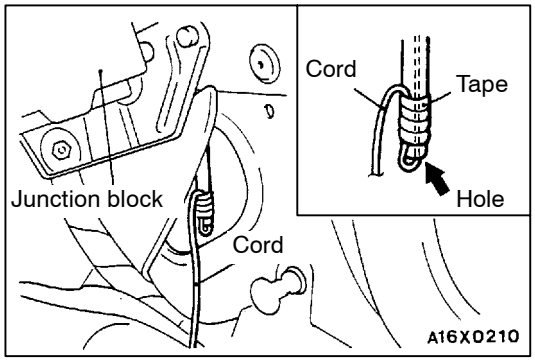
Removal steps

- Center air outlet (Refer to P.54-58.)
1. Radio and tape player (Refer to P.54-74.)
- Under cover assembly (Refer to GROUP 52A.)

◀A▶

2. Cowl side trim (Refer to GROUP 52A)
3. Antenna feeder
4. Antenna assembly
5. Antenna base





REMOVAL SERVICE POINT

◀A▶ ANTENNA ASSEMBLY REMOVAL

Observe the following steps to make the feeder cable of the antenna to be routed easily during reinstallation.

1. Secure a cord to the end of the feeder cable.
2. Pull out the feeder cable slightly until the tube end of the antenna can been seen.
3. Insert a cord into the tube end, and secure the cord with plastic tape as shown.

   Caution
   Make sure that the cord is not loosened.

4. Remove the antenna assembly by pulling it gradually.