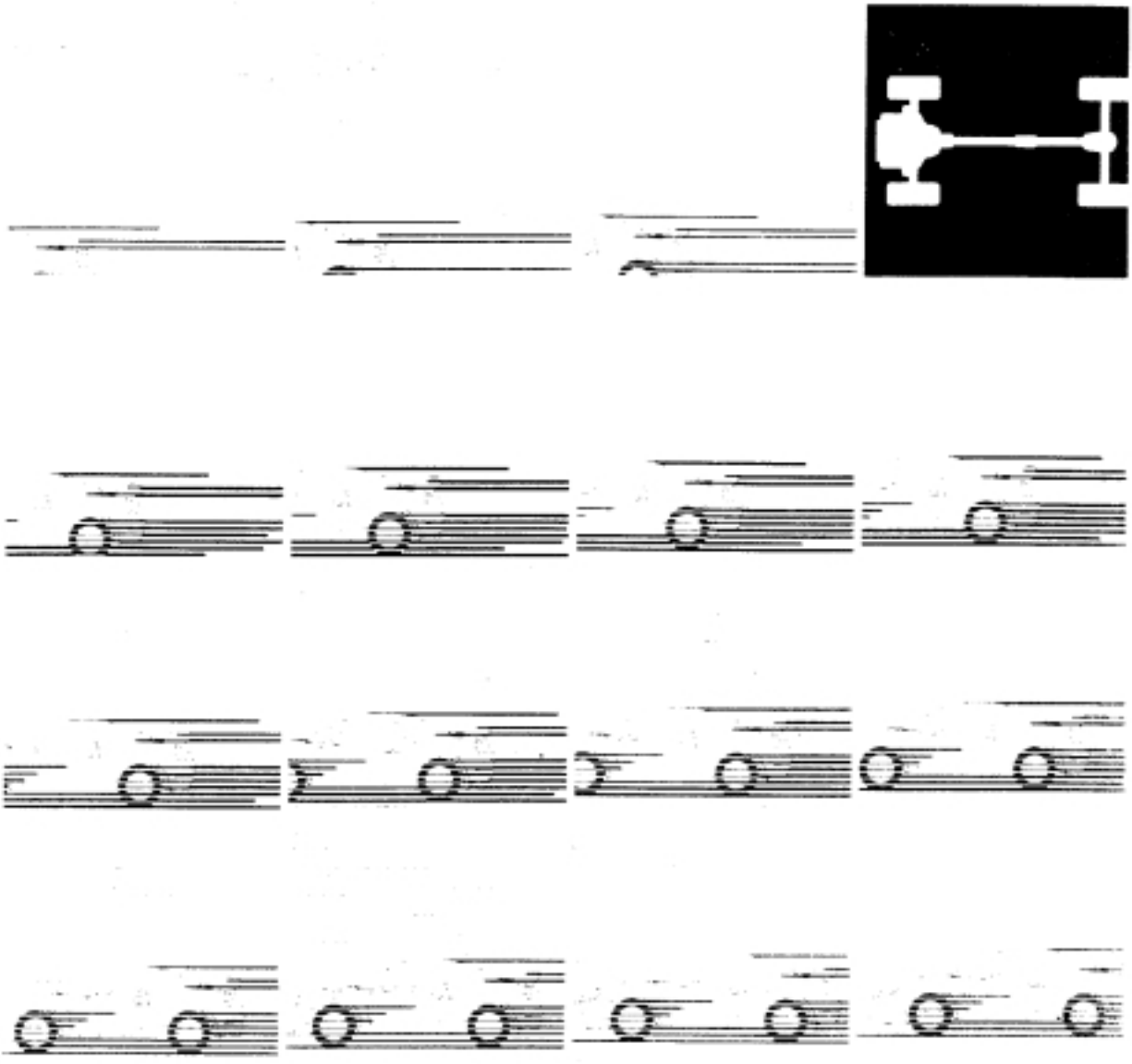
PART 1 of 2

MITSUBISHI MOTORS

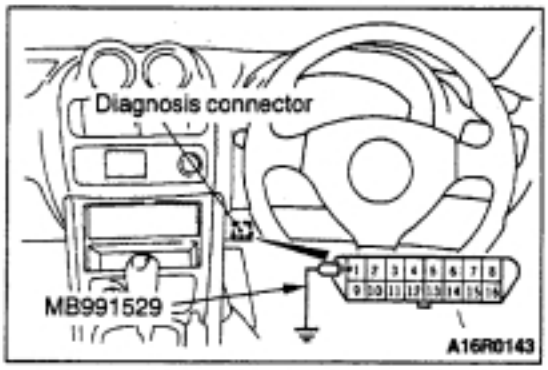
Workshop Manual

chassis

FTO '98



Pub. No. PWME9801



WHEN USING THE WARNING LAMP

1. Use the special tool to earth No.1 terminal (diagnosis control terminal) of the diagnosis connector.
2. To check ABS system, remove the valve relay.

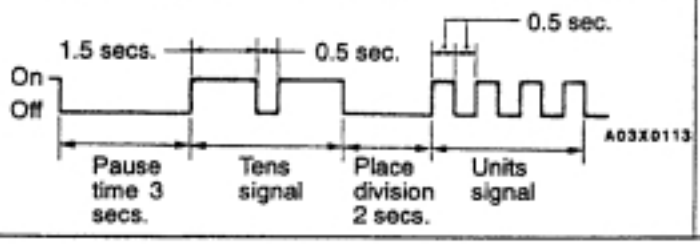
   NOTE
   That is because the valve relay is off and the warning lamp remains illuminated if there is a fault in the ABS system.
3. Turn off the ignition switch.
4. Read out a diagnosis code by observing how the warning lamp flashes.

Applicable systems

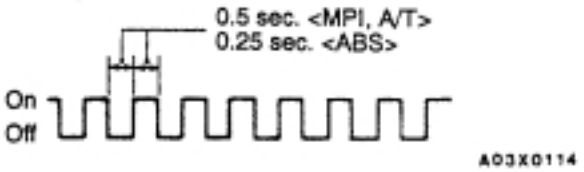
System name	Warning lamp name
MPI	Engine warning lamp
A/T	Neutral position indicator lamp
ABS	ABS warning lamp
TCL	TCL-OFF indicator lamp

Indication of diagnosis code by warning lamp

When the diagnosis code No.24 is output



When no diagnosis code is output*



NOTE
*: Even if the ABS system is normal, removing the valve relay causes the diagnosis code No.52 to be output.

METHOD OF ERASING DIAGNOSIS CODES

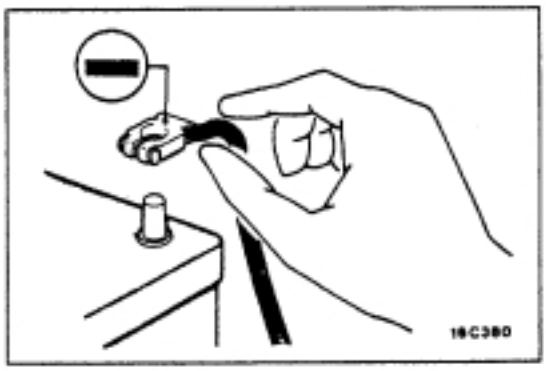
WHEN USING THE MUT-II

Connect the MUT-II to the diagnosis connector and erase the diagnosis code.

Caution
Turn off the ignition switch before connecting or disconnecting the MUT-II.

WHEN NOT USING THE MUT-II

(1) Turn the ignition switch to OFF.
(2) After disconnecting the battery cable from the battery (–) terminal for 10 seconds or more, reconnect the cable.
(3) After the engine has warmed up, run it at idle for about 15 minutes.



SERVICING THE ELECTRICAL SYSTEM

Before replacing a component related to the electrical system and before undertaking any repair procedures involving the electrical system, be sure to first disconnect the negative (–) cable from the battery in order to avoid damage caused by short-circuiting.

Caution
Before connecting or disconnecting the negative (–) cable, be sure to turn off the ignition switch and the lighting switch.
(If this is not done, there is the possibility of semiconductor parts being damaged.)

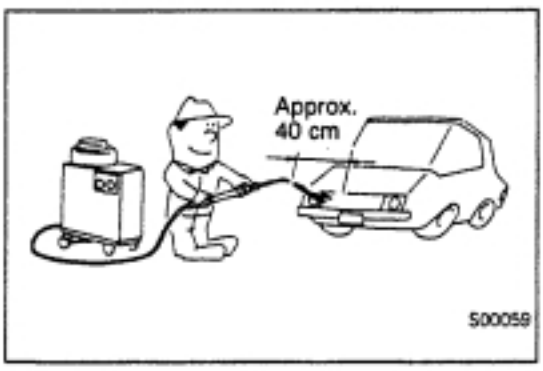
APPLICATION OF ANTI-CORROSION AGENTS AND UNDERCOATS

If oil or grease gets onto the oxygen sensor, it will cause a drop in the performance of the sensor.
Cover the oxygen sensor with a protective cover when applying anti-corrosion agents and undercoats.

PRE-INSPECTION CONDITION

"Pre-inspection condition" refers to the condition that the vehicle must be in before proper engine inspection can be carried out. If you see the words "Set the vehicle to the pre-inspection condition". in this manual, it means to set the vehicle to the following condition.

- Engine coolant temperature: 80–90°C
- Lamps, electric cooling fan and all accessories: OFF
- M/T: Neutral
- A/T: P range



VEHICLE WASHING

If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to note the following information in order to avoid damage to plastic components, etc.

- Spray nozzle distance: Approx. 40 cm or more
- Spray pressure: 3,900 kPa or less
- Spray temperature: 82°C or less
- Time of concentrated spray to one point: within 30 sec.

STANDARD PART/TIGHTENING-TORQUE TABLE

Each torque value in the table is a standard value for tightening under the following conditions.
(1) Bolts, nuts and washers are all made of steel and plated with zinc.
(2) The threads and bearing surface of bolts and nuts are all in dry condition.

The values in the table are not applicable:
(1) If toothed washers are inserted.
(2) If plastic parts are fastened.
(3) If bolts are tightened to plastic or die-cast inserted nuts.
(4) If self-tapping screws or self-locking nuts are used.

Standard bolt and nut tightening torque

Thread size		Torque Nm		
Bolt nominal diameter (mm)	Pitch (mm)	Head mark "4"	Head mark "7"	Head mark "8"
M5	0.8	2.5	4.9	5.9
M6	1.0	4.9	8.8	9.8
M8	1.25	12	22	25
M10	1.25	24	44	52
M12	1.25	41	81	96
M14	1.5	72	137	157
M16	1.5	111	206	235
M18	1.5	167	304	343
M20	1.5	226	412	481
M22	1.5	304	559	647
M24	1.5	392	735	853

Flange bolt and nut tightening torque

Thread size		Torque Nm		
Bolt nominal diameter (mm)	Pitch (mm)	Head mark "4"	Head mark "7"	Head mark "8"
M6	1.0	4.9	9.8	12
M8	1.25	13	24	28
M10	1.25	26	49	57
M10	1.5	24	44	54
M12	1.25	46	93	103
M12	1.75	42	81	96

IGNITION TIMING CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Connect the MUT-II to the diagnosis connector.
3. Set up a timing light.
4. Start the engine and run at idle.
5. Check that engine idle speed is within the standard value.

   Standard value: approx. 700

6. Select No.17 of the MUT-II Actuator test.
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 MPI system while referring to GROUP 13A – Troubleshooting.
9. Press the MUT-II clear key (Select a forced driving cancel mode) to release the Actuator test.

   Caution
   If the test is not cancelled, a forced driving will continue for 27 minutes. Driving under this condition may damage the engine.
10. Check that ignition timing is at the standard value.

    Standard value: approx. 10°BTDC

    NOTE
    1. Ignition timing is variable within about ± 7°, even under normal operating.
    2. And it is automatically further advanced by about 5° from standard value at higher altitudes.

IDLE SPEED CHECK

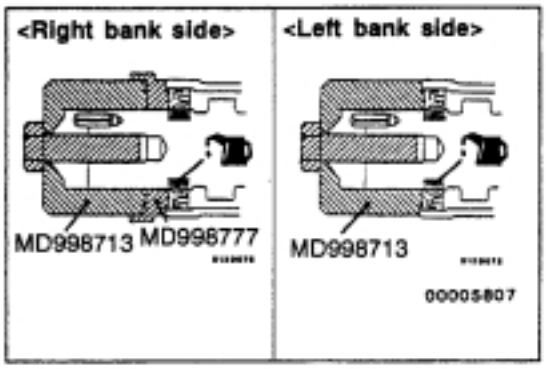
1. Before inspection, set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to OFF and connect the MUT-II to the diagnosis connector.
3. Check the basic ignition timing. Adjust if necessary.

   Standard value: 5° BTDC±3°

4. Run the engine at idle for 2 minutes.
5. Check the idle speed. Select item No. 22 and take a reading of the idle speed.

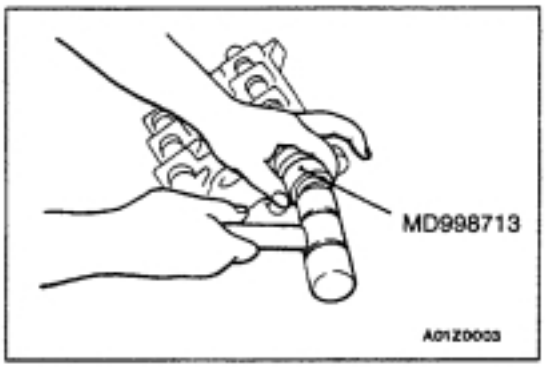
   Curb idle speed: 750 ± 100 r/min

   NOTE
   The idle speed is controlled automatically by the idle speed control (ISC) system.
6. If the idle speed is outside the standard value, check the MPI components by referring to GROUP 13A – Troubleshooting.



▶C◀ CAMSHAFT OIL SEAL INSTALLATION

1. Apply engine oil to the camshaft oil seal lip.
2. Use the special tool to press-fit the camshaft oil seal.

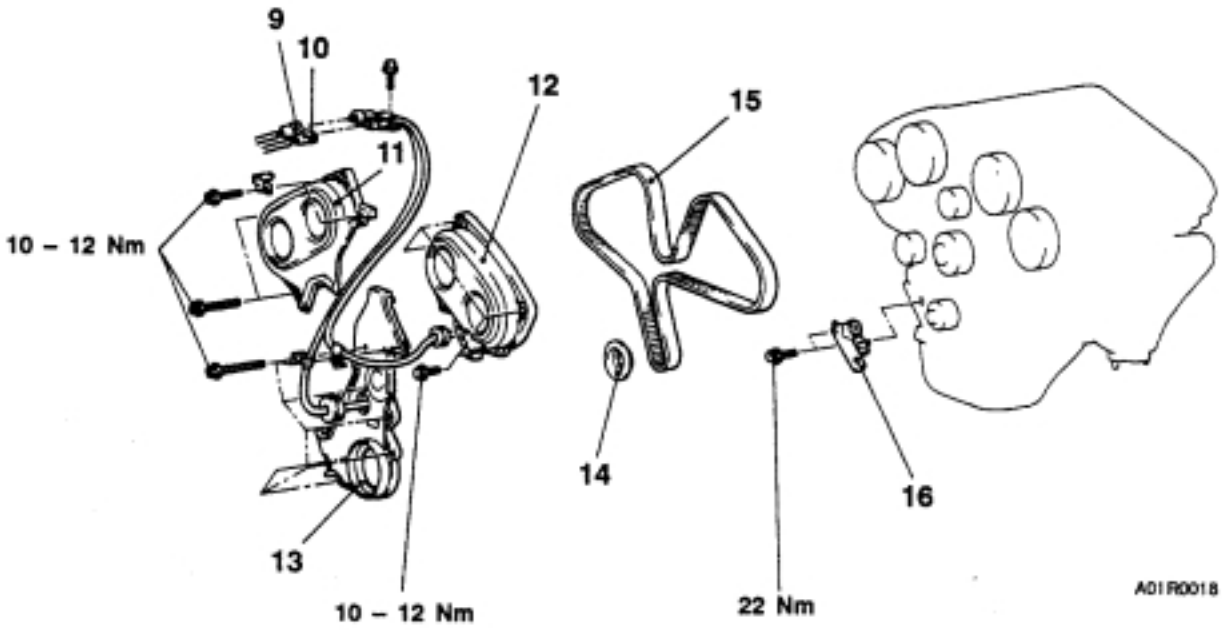


▶D◀ CIRCULAR PACKING INSTALLATION

▶E◀ CAMSHAFT SPROCKET INSTALLATION

Use the special tool to stop the camshaft sprocket from turning in the same way as was done during removal, and then tighten the bolts to the specified torque.

Tightening torque: 88 Nm



Removal steps

9. Crank angle sensor connector
10. Camshaft position sensor connector
11. Timing belt cover (front, upper right)
12. Timing belt cover (front, upper left)
13. Timing belt cover (lower)

◀B▶ ▶C◀ ▶B◀ ▶A◀

14. Front flange
• Timing belt tension adjustment
15. Timing belt
16. Auto tensioner

REMOVAL SERVICE POINTS

◀A▶ TENSIONER PULLEY BRACKET REMOVAL

Loosen the upper side of the alternator, and then remove the tensioner pulley bracket.

LUBRICANTS

Items		Specified Lubricant and Quantity
Engine oil (API classification)		SG or higher
Engine oil quantity ℓ	Oil filter	0.3
	Total	4.2

SPECIAL TOOL

Tool	Number	Name	Use
 B991396	MB991396	Oil filter wrench	Removal and installation of engine oil filter

ON-VEHICLE SERVICE

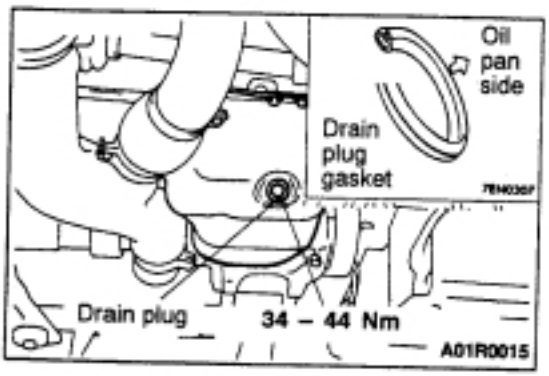
ENGINE OIL CHECK

1. Pull out the level gauge slowly and check that the oil level is in the illustrated range.
2. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it has sufficient viscosity.

ENGINE OIL REPLACEMENT

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C to 90°C.
2. Stop the engine and remove the engine oil filler cap.
3. Remove the drain plug to drain oil.

Caution
Use care as oil could be hot.



4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

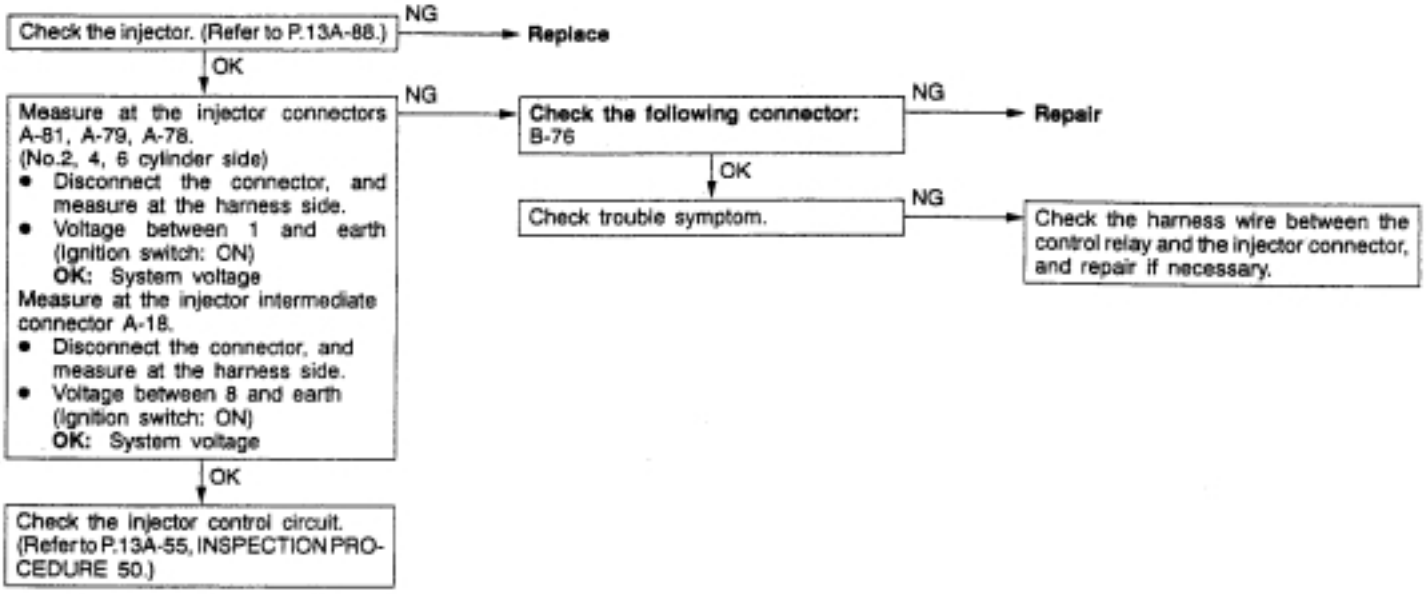
FAIL-SAFE FUNCTION REFERENCE TABLE

When the main sensor malfunctions are detected by the diagnosis function, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
Vacuum sensor	1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C. (This control continues until the ignition switch is turned off even after the sensor signal returns to normal.)
Camshaft position sensor	1. Injects fuel to all cylinders simultaneously. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.) 2. Cuts off the fuel supply 4 seconds after a problem is detected. (However, after the ignition switch is turned to ON, the No.1 cylinder top dead centre is not detected at all.)
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Ignition coil, power transistor	Cuts off the fuel supply to cylinders with an abnormal ignition.
Intake air control valve position sensor	Fully open the intake air control valve.
Communication wire with transmission control unit <A/T>	Ignition timing is not retarded during transmission gear shifting (overall engine and transmission control).
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)

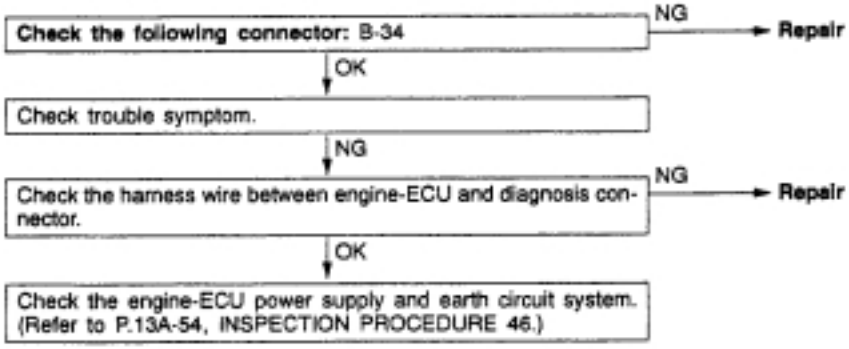
NOTE
When a problem is detected in the vacuum control solenoid valve, ventilation control solenoid valve, crank angle sensor or any of the above items, traction control is not performed <Vehicles with TCL>.

Code No. 41 Injector system	Probable cause
Range of Check • Engine speed is approx. 50–1,000 r/min • The throttle position sensor output voltage is 1.15 V or less. • Actuator test by MUT-II is not carried out. Set conditions • Surge voltage of injector coil is not detected for 4 seconds.	• Malfunction of the injector • Improper connector contact, open circuit or short-circuited harness wire of the injector circuit • Malfunction of the engine-ECU



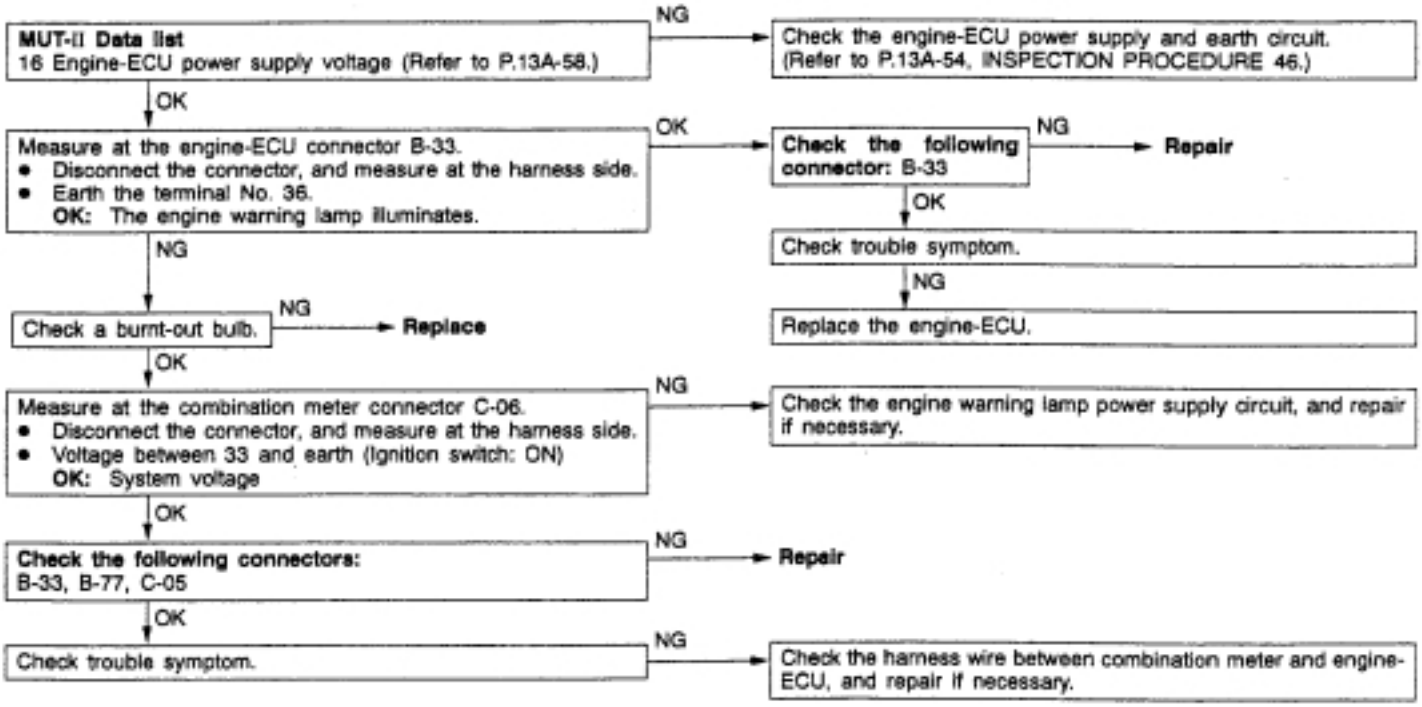
INSPECTION PROCEDURE 2

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 engine-ECU and diagnosis connector



INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
Because there is a burnt-out bulb, the engine-ECU causes the engine warning lamp to illuminate for five seconds immediately after the ignition switch is turned to ON. If the engine warning lamp does not illuminate immediately after the ignition switch is turned to ON, one of the malfunctions listed at right has probably occurred.	• Burnt-out bulb • Defective warning lamp circuit • Malfunction of the engine-ECU



INSPECTION PROCEDURE 17

The feeling of impact or vibration when decelerating.	Probable cause
Malfunction of the ISC system is suspected.	• Malfunction of the ISC system

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ISC servo for operation sound. (Refer to P.13A-90.)
NG → Check the ISC servo system. (Refer to P.13A-47, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-58.)
NG → Check the throttle position sensor system. (Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-59.)
NG → Check the idle position switch system. (Refer to P.13A-42, INSPECTION PROCEDURE 26.) <Vehicles without TCL> (Refer to P.13A-43, INSPECTION PROCEDURE 27.) <Vehicles with TCL>
OK ↓

Clean the throttle valve area. (Refer to P.13A-75.)

INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure, etc. are suspected.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Poor compression pressure • Clogged exhaust system

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-9, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound (left bank).
NG → Check the injector system. (Refer to P.13A-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the crank angle sensor and timing belt cover are installed properly.
OK ↓

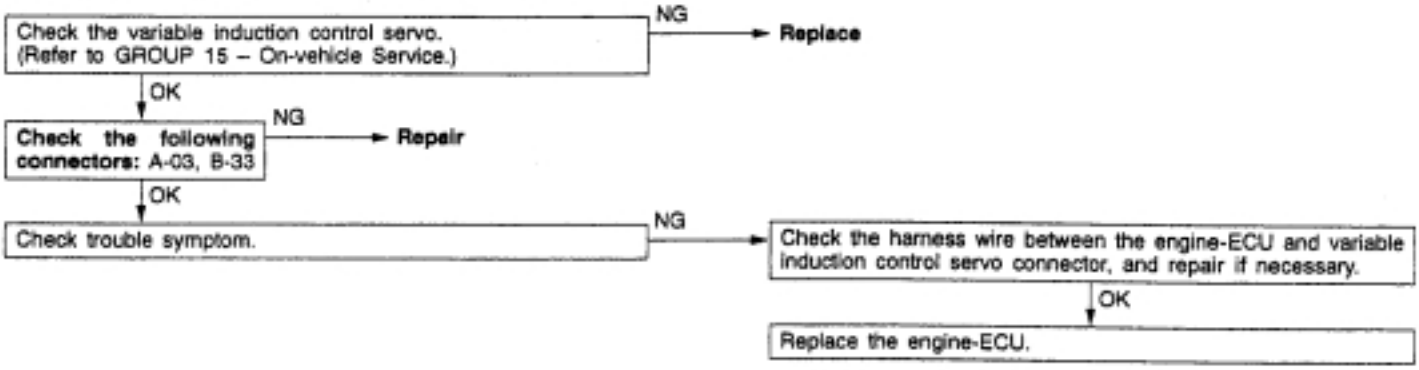
MUT-II: Check if hesitation, sag, stumble or poor acceleration occur. (Refer to P.13A-52, INSPECTION PROCEDURE 44.)
OK ↓

Check the fuel pressure. (Refer to P.13A-81.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables.
- Check the injector operating sound at the rear bank.
- Check the operation vacuum of the traction control <TCL>.
- Check the operation of the throttle valve <TCL>.
- Check the vacuum tank and vacuum actuator <TCL>.
- Check the compression pressure.
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner
- Clogged exhaust system

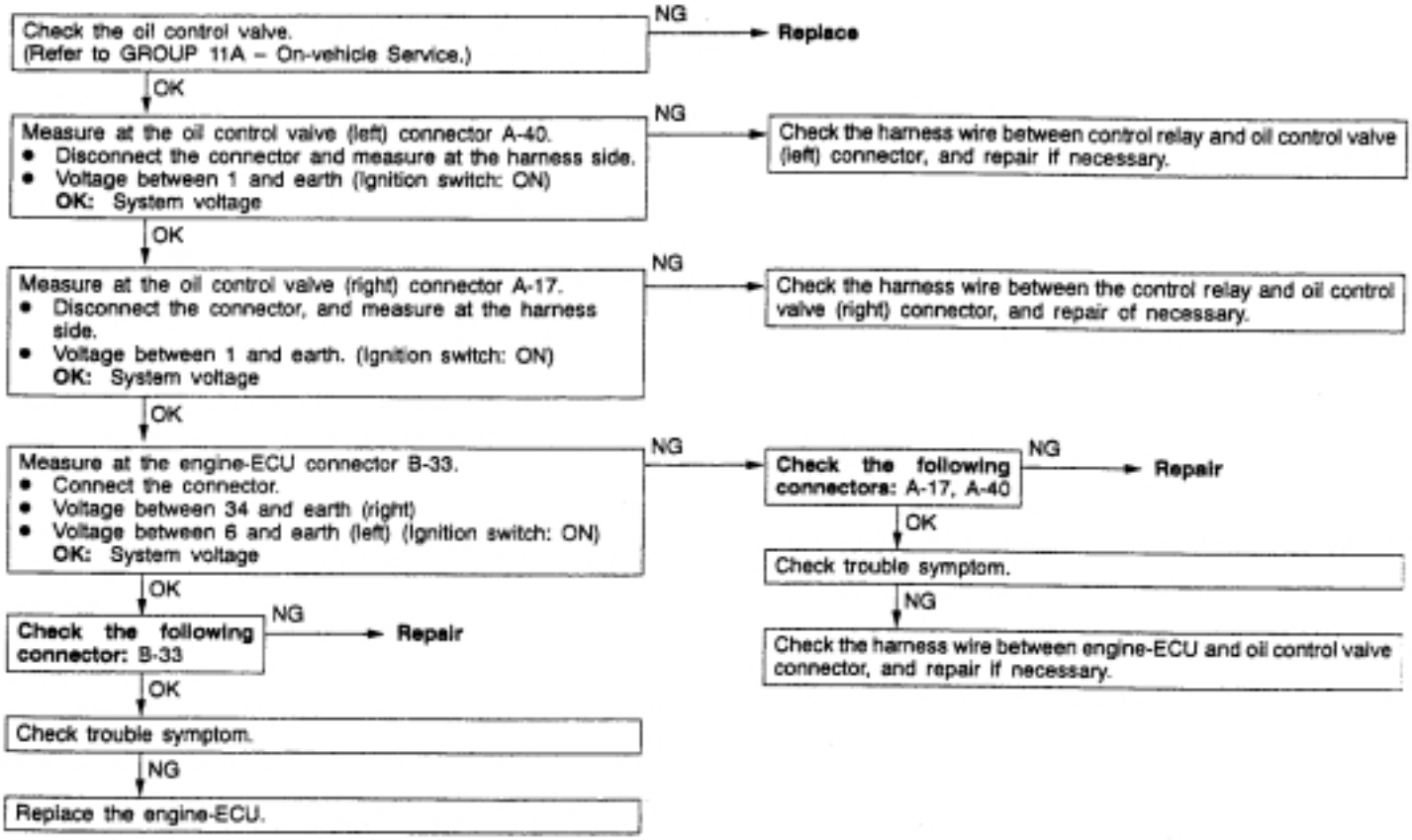
INSPECTION PROCEDURE 36

Variable induction control servo (DC motor) system	Probable cause
The engine-ECU opens or closes the intake air control valve by driving a direct motor.	• Malfunction of variable induction control servo • Improper connector contact, open circuit or short-circuited harness wire. • Malfunction of the engine-ECU



INSPECTION PROCEDURE 37

Oil control valve (valve timing switching) system	Probable cause
The engine-ECU switches the valve timing by controlling the solenoid valve, which is located on the cylinder head.	• Malfunction of oil control valve • Improper connector contact, open circuit or short-circuited harness wire. • Malfunction of the engine-ECU



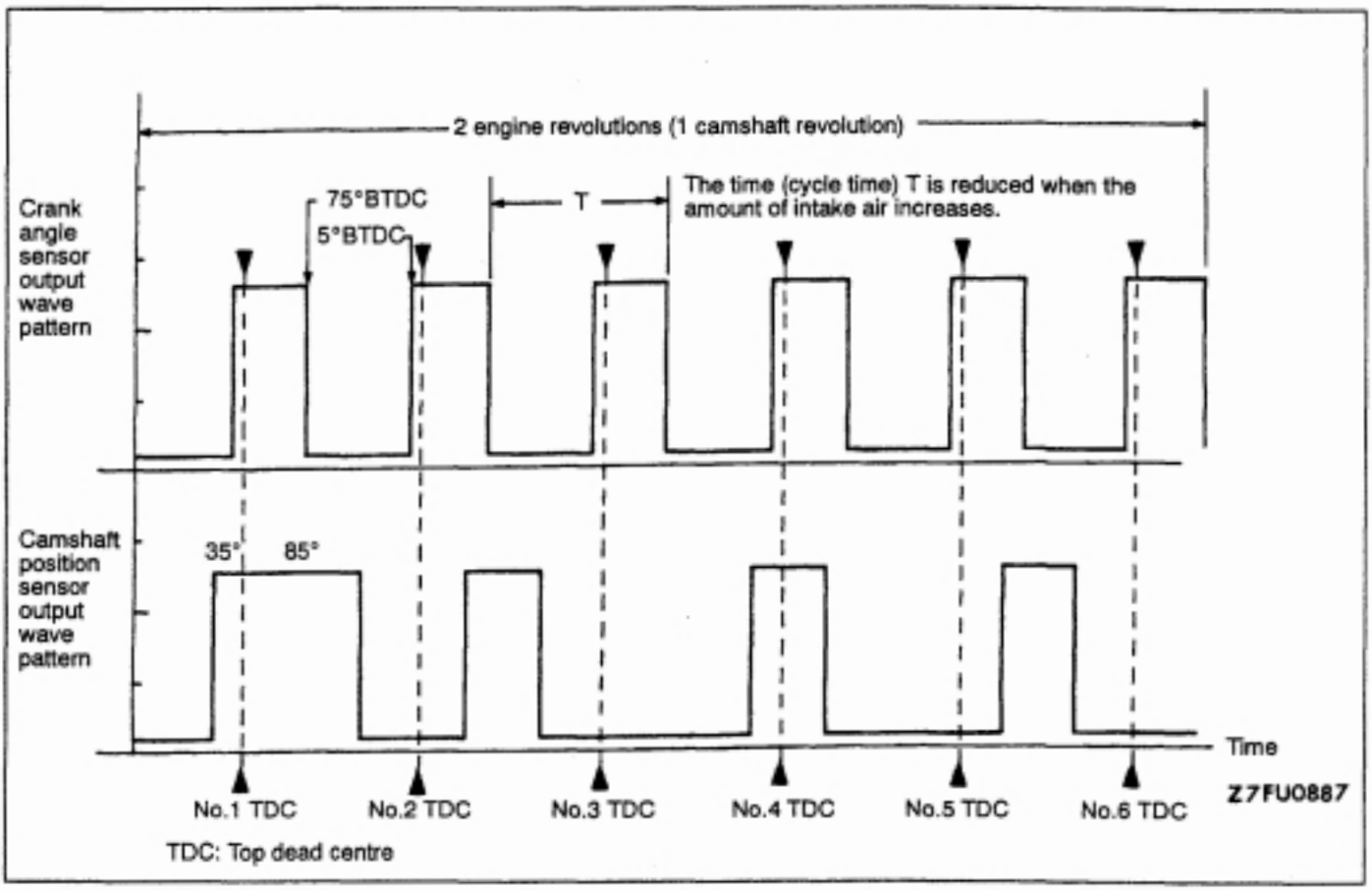
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300 – 1,000 mV	Code No. 14	13A-11
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500 – 5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 24	13A-41
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 28 <M/T> Procedure No. 29 <A/T>	13A-43 <M/T> 13A-44 <M/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13A-12
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	–	–
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,275 – 1,475 r/min		
			When engine coolant temperature is 0°C	1,225 – 1,425 r/min		
			When engine coolant temperature is 20°C	1,100 – 1,300 r/min		

Standard Wave Pattern

Observation conditions

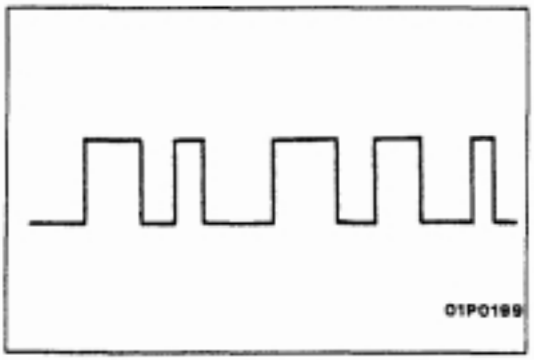
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

Check that cycle time T becomes shorter and the frequency increases when the engine speed is increased.



Examples of Abnormal Wave Patterns

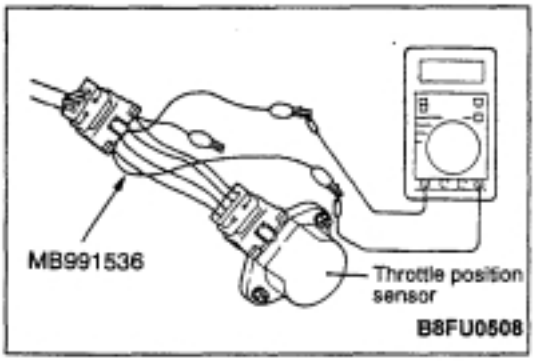
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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

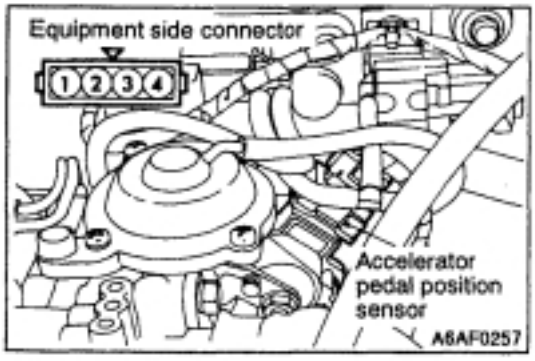


(2) Connect a digital voltmeter between the terminal No.3 (sensor output: yellow clip of special tool) and terminal No.1 (sensor earth: red clip of special tool) of the throttle position sensor connector.

2. Turn the ignition switch to ON (but do not start the engine).
3. Check the throttle position sensor output voltage.

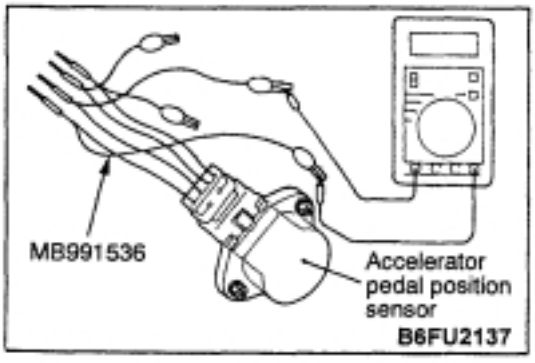
Standard value: 580 – 690 mV

4. If the voltage is outside the standard value, adjust by loosening the throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to OFF.
6. Remove the MUT-II. If the MUT-II is not used, disconnect the special tool, and connect the throttle position sensor connector.
7. If a diagnosis code is output while adjusting the throttle position sensor, use the MUT-II to erase the diagnosis code or disconnect the battery (–) cable from the battery for 10 seconds and reconnect it, run the engine at idle for 10 minutes.



IDLE POSITION SWITCH AND ACCELERATOR PEDAL POSITION SENSOR ADJUSTMENT <Vehicle with TCL>

1. Connect the MUT-II to the diagnosis connector.
   If the MUT-II is not used, follow the steps below.
   (1) Disconnect the accelerator pedal position sensor connector.



(2) Connect the special tool (TPS test harness: MB991536) to the accelerator pedal position sensor connector (Do not connect it to the harness-side connector).
(3) Connect an ohmmeter between the terminal No.3 (idle switch: yellow clip of special tool) and terminal No.4 (sensor earth: black clip of special tool) of the accelerator pedal position sensor connector.

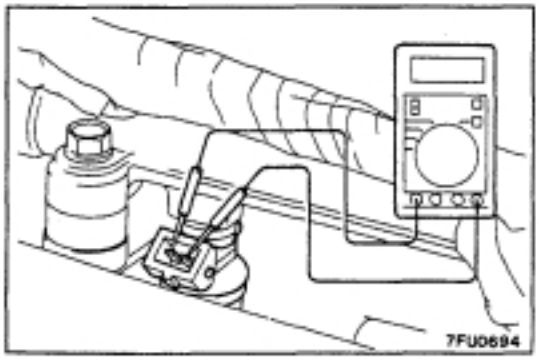
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

Standard value:

Engine	Oxygen sensor output voltage	Remarks
When racing the engine	0.6 – 1.0 V	If making the air/fuel ratio rich by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6 – 1.0 V.

8. If the sensor is defective, replace the oxygen sensor.

NOTE
For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.



INJECTOR CHECK

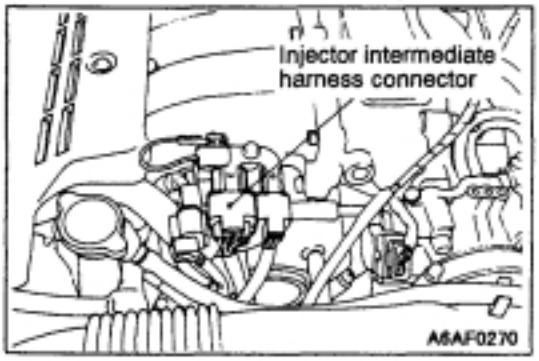
Measurement of Resistance between Terminals

- Left bank side (No.2, No.4, No.6 cylinders)

1. Remove the injector connector.
2. Measure the resistance between terminals.

Standard value: 13 – 16 Ω (at 20°C)

3. Connect the injector connector.



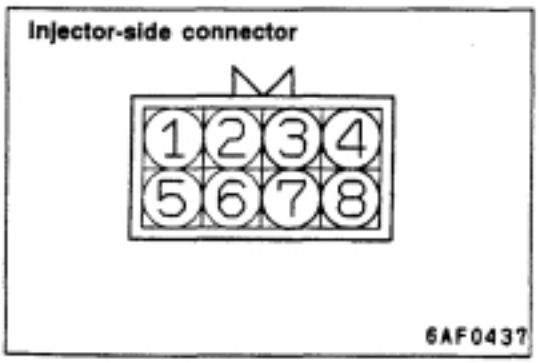
- Right bank side (No.1, No.3, No.5 cylinders)

1. Disconnect the injector intermediate harness connectors.
2. Measure the resistance between terminals.

Standard value: 13 – 16 Ω (at 20°C)

Injector	Measurement probe
No.1 cylinder	3 – 4
No.3 cylinder	3 – 7
No.5 cylinder	3 – 8

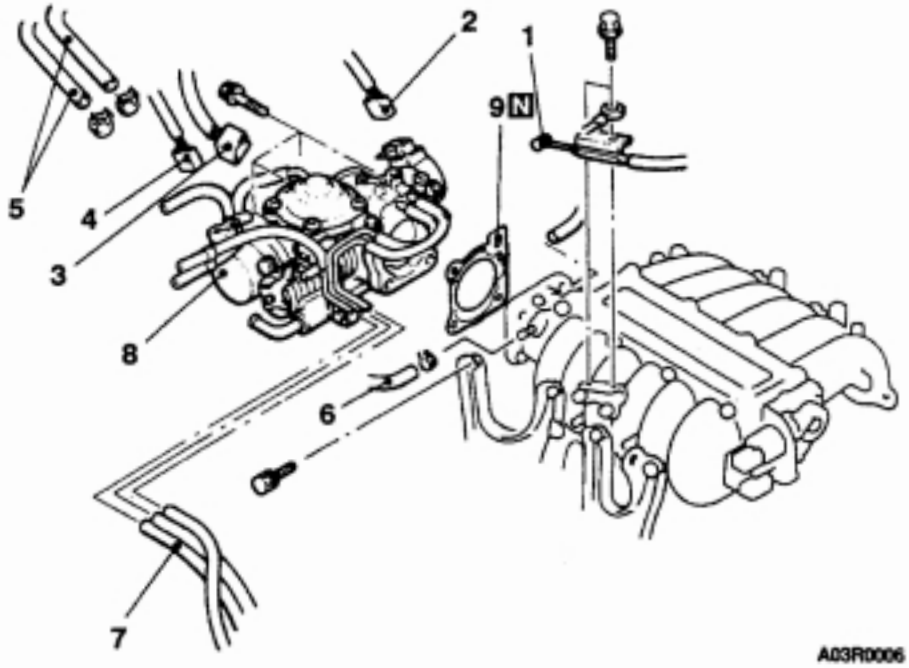
3. Connect the injector intermediate harness connector.



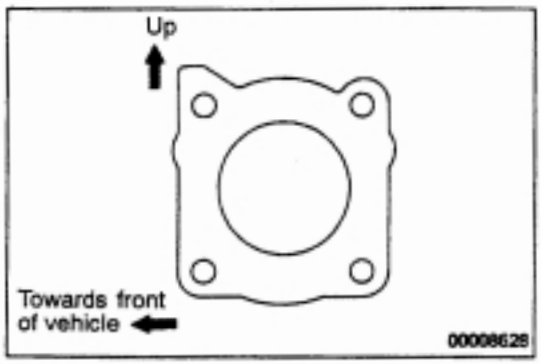
THROTTLE BODY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to GROUP 14 – On-vehicle Service.)
- Air Cleaner Removal and Installation



Removal steps
1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Accelerator pedal position sensor connector
5. Water hose connection
6. Brake booster vacuum hose connection
7. Vacuum hose connection
8. Throttle body
▶A◀ 9. Throttle body gasket



INSTALLATION SERVICE POINT

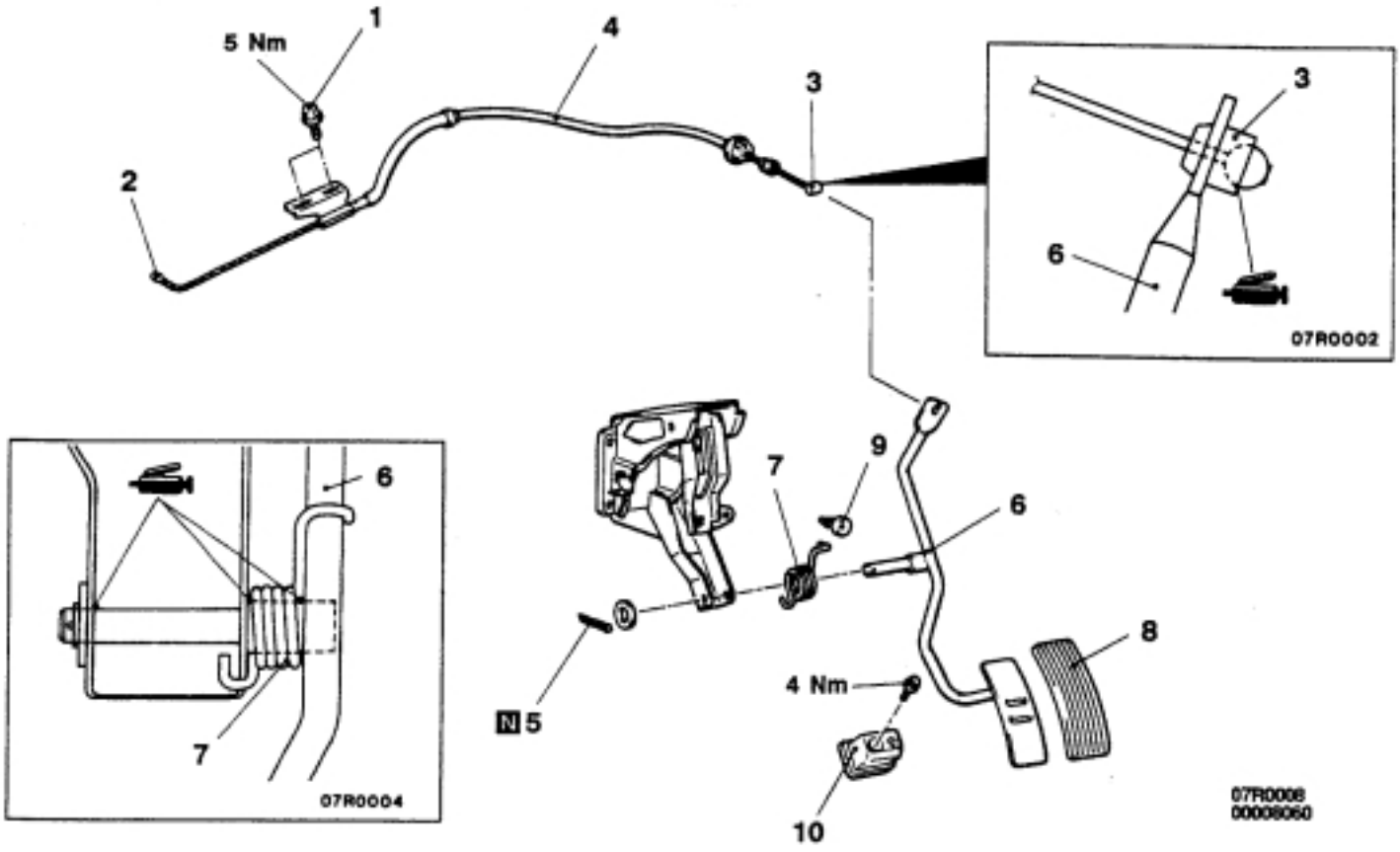
▶A◀ THROTTLE BODY GASKET INSTALLATION

Place the gasket so that the projecting part is positioned as shown in the illustration, and then install it between the intake manifold and the throttle body.

ACCELERATOR CABLE AND PEDAL

REMOVAL AND INSTALLATION

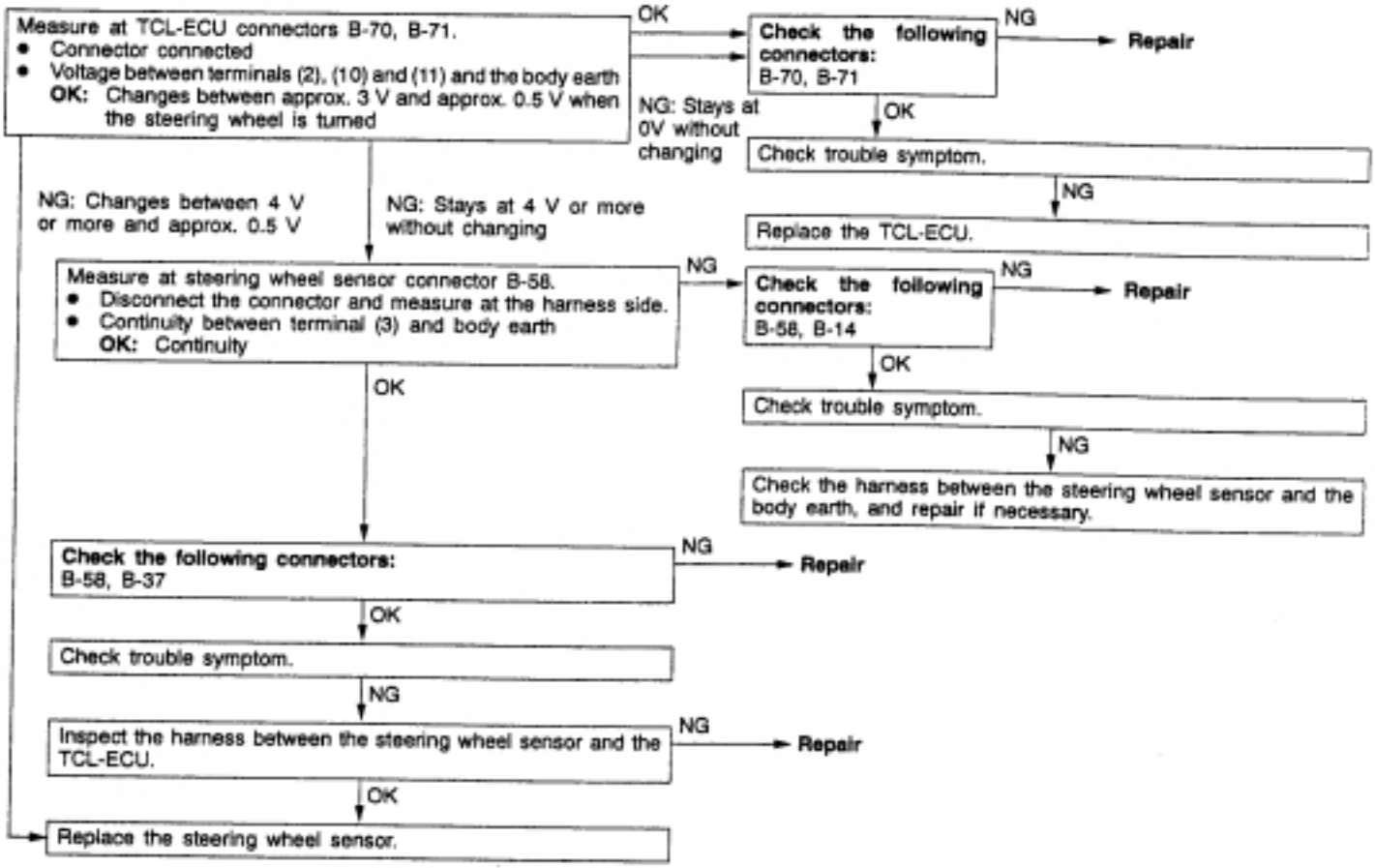
Post-Installation Operation
Adjusting the Accelerator Cable (Refer to P.13B-5.)



Removal steps

1. Adjusting bolt
2. Inner cable connection (throttle body side)
3. Inner cable connection (accelerator pedal side)
4. Accelerator cable
5. Split pin
6. Accelerator pedal
7. Return spring
8. Pedal pad
9. Stopper
10. Accelerator pedal stopper

Code No. 41 Steering wheel sensor (ST-1) circuit system (open circuit) Code No. 42 Steering wheel sensor (ST-2) circuit system (open circuit) Code No. 43 Steering wheel sensor (ST-N) circuit system (open circuit)	Probable cause
These diagnosis codes are output if there is an open circuit in the output wire of the steering wheel sensor circuit.	• Malfunction of harness or connector • Malfunction of steering wheel sensor • Malfunction of TCL-ECU

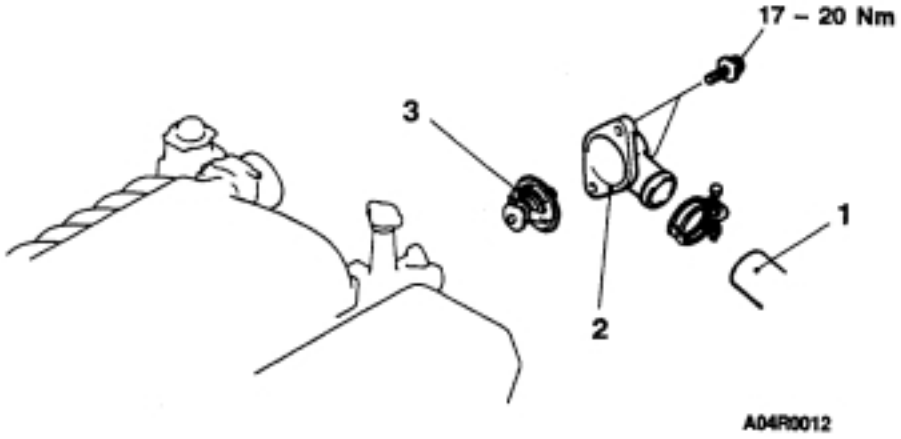


No.	Check item	Check condition		Normal condition
27	ECU power supply voltage	Ignition switch: ON		System voltage
31	Front right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
32	Front left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
33	Rear right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
34	Rear left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
40	Engine speed	Ignition switch: ON	Engine: idling	Engine speeds displayed on the MUT-II and tachometer are identical.
44	Steering angle	Steering wheel position Ignition switch: ON	Turned 90° to the right	R 90 deg
			Turned 90° to the left	L 90 deg
45	Steering straight-ahead point learning	Steering wheel position Ignition switch: ON	Immediately after ignition switch is ON	OFF
			Immediately after city driving	ON
51	Slip control	TCL switch: ON Driving on low frictional resistance road	TCL indicator lamp illuminated	ON
			TCL indicator lamp switched off	OFF
52	Trace control	TCL switch: ON Driving on winding road	TCL indicator lamp illuminated	ON
			TCL indicator lamp switched off	OFF
74	Steering wheel sensor (ST-N)	Steering wheel position Engine idling	Neutral position	LOW
			Steering wheel turned 90° from neutral position	HIGH
75	Steering wheel sensor (ST-1)	Steering wheel position Ignition switch: ON	Steering wheel turned slowly to left	HIGH and LOW display alternately
76	Steering wheel sensor (ST-2)	Steering wheel position Ignition switch: ON	Steering wheel turned slowly to right	HIGH and LOW display alternately
81	Engine model	Ignition switch: ON		6A12
82	Valve type	Ignition switch: ON		DOHC
83	Aspiration type	Ignition switch: ON		N/A
84	Engine classification	Ignition switch: ON		MIVEC

THERMOSTAT

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-3.)
- Air Cleaner Cover and Air Intake Hose Assembly Removal and Installation.



Removal steps

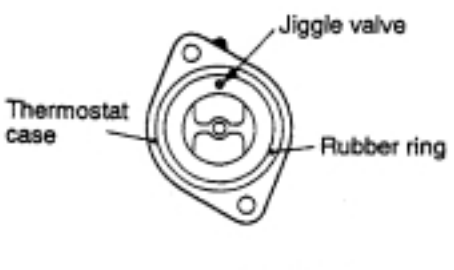
◀A▶ ▶B◀ 1. Radiator lower hose connection
2. Water inlet fitting

▶A◀ 3. Thermostat

REMOVAL SERVICE POINT

◀A▶ RADIATOR LOWER HOSE DISCONNECTION

After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.



INSTALLATION SERVICE POINTS

▶A◀ THERMOSTAT INSTALLATION

Install the thermostat so that the jiggle valve is facing straight up.

Caution
Make absolutely sure that no oil is adhering to the rubber ring of the thermostat. In addition, be careful not to fold over or scratch the rubber ring when inserting. If the rubber ring is damaged, replace the thermostat.

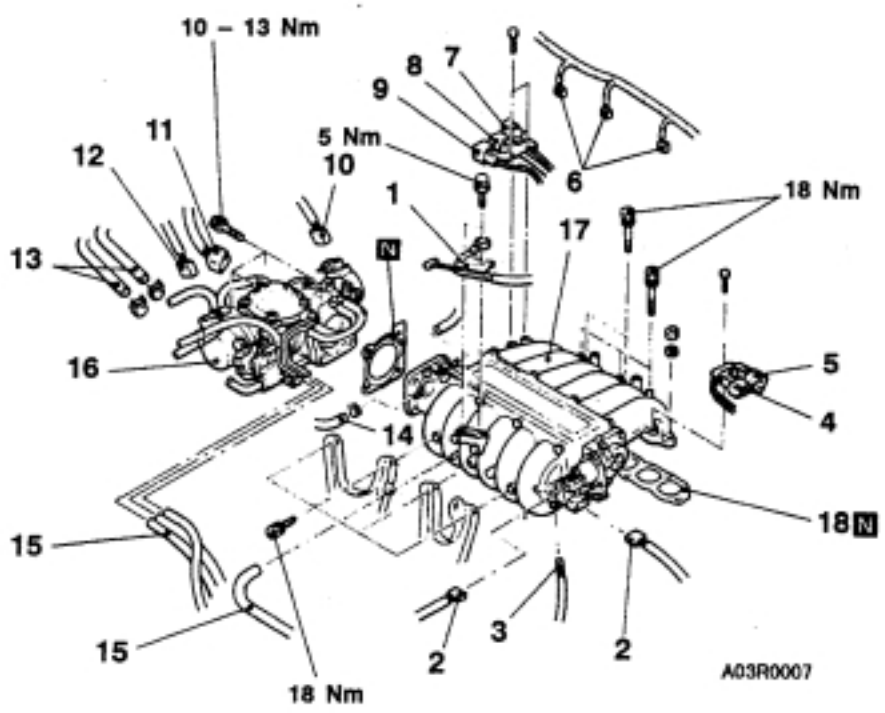
7. Install the air intake hose.
8. Connect the VIC servo connector.

INTAKE MANIFOLD

REMOVAL AND INSTALLATION

Pre-removal Operation
- Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service.)
- Fuel Discharge Prevention (Refer to GROUP 13A – On-vehicle Service.)
- Air Cleaner Removal

Post-Installation Operation
- Engine Coolant Supplying (Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 13B – On-vehicle Service.)
- Air Cleaner Installation

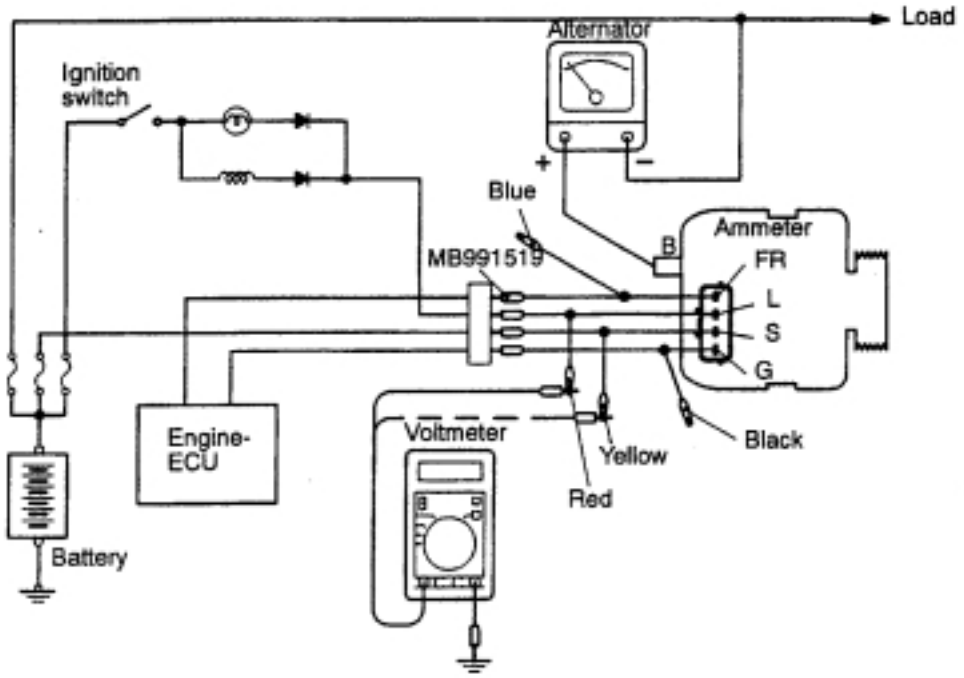


Removal steps

1. Accelerator cable
2. VIC servo motor connector
3. Air temperature sensor connector
4. Camshaft position sensor connector
5. Crank angle sensor connector
6. Injector connector
7. Detonation sensor connector
8. Injector harness connector
9. Oil control valve connector
10. TPS connector
11. ISC servo motor connector
12. APS connector
13. Engine coolant hose connection
14. Brake booster vacuum hose connection
15. Vacuum hose
16. Throttle body
17. Air intake plenum

▶C◀ 18. Air intake plenum gasket

REGULATED VOLTAGE TEST



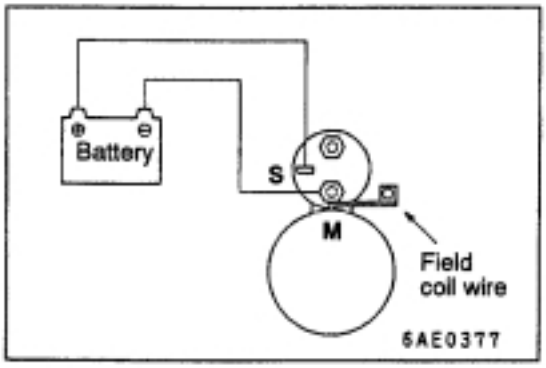
This test determines whether the voltage regulator is correctly controlling the alternator output voltage.

(1) Always be sure to check the following before the test.
- Alternator installation
- Check that the battery installed in the vehicle is fully charged. (Refer to GROUP 54 – Battery.)
- Alternator drive belt tension (Refer to GROUP 11A – On-vehicle Service.)
- Fusible link
- Abnormal noise from the alternator while the engine is running

(2) Turn the ignition switch to the OFF position.
(3) Disconnect the negative battery cable.
(4) Use the special tool (Alternator test harness: MB991519) to connect a digital voltmeter between the alternator S terminal and earth. (Connect the (+) lead of the voltmeter to the "S" terminal, and then connect the lead of the voltmeter to a secure earth.)
(5) Disconnect the alternator output wire from the alternator "B" terminal.
(6) Connect a DC test ammeter with a range of 0–100 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal. Connect the (–) lead of the ammeter to the disconnected output wire.)
(7) Connect a tachometer. (Refer to GROUP 11A – On-vehicle Service.)
(8) Reconnect the negative battery cable.
(9) Turn the ignition switch to the ON position and check that the reading on the voltmeter is equal to the battery voltage.

NOTE
If the voltage is 0 V, the cause is probably an open circuit in the wire or fusible link between the alternator "S" terminal and the battery (+) terminal.

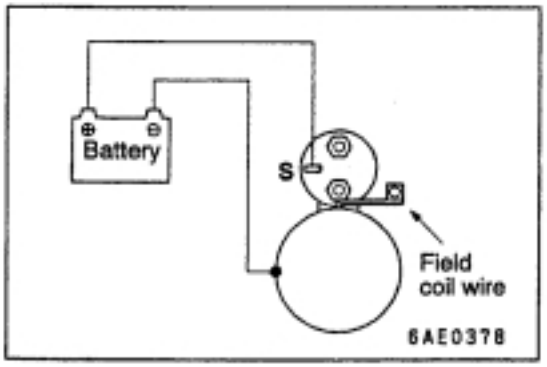
(10) Turn all lamps and accessories off.
(11) Start the engine.
(12) Increase the engine speed to 2,500 r/min.
(13) Read the value displayed on the voltmeter when the alternator output current alternator becomes 10 A or less.
(14) If the voltage reading conforms to the value in the voltage regulation, then the voltage regulator is operating normally.
If the voltage is not within the standard value, there is a malfunction of the voltage regulator or of the alternator.
(15) After the test, lower the engine speed to the idle speed.
(16) Turn the ignition switch off.
(17) Disconnect the negative battery cable.
(18) Disconnect the ammeter, voltmeter and tachometer.
(19) Connect the alternator output wire to the alternator "B" terminal.
(20) Connect the negative battery cable.



MAGNETIC SWITCH PULL-IN TEST

1. Disconnect field coil wire from M-terminal of magnetic switch.
2. Connect a 12V battery between S-terminal and M-terminal.

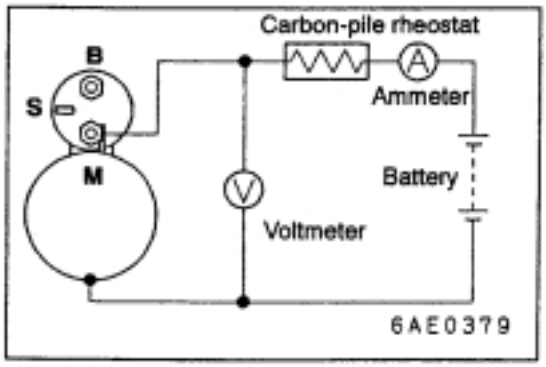
   Caution
   This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.
3. If pinion moves out, then pull-in coil is good. If it doesn't, replace magnetic switch.



MAGNETIC SWITCH HOLD-IN TEST

1. Disconnect field coil wire from M-terminal of magnetic switch.
2. Connect a 12V battery between S-terminal and body.

   Caution
   This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.
3. Manually pull out the pinion as far as the pinion stopper position.
4. If pinion remains out, everything is in order. If pinion moves in, hold-in circuit is open. Replace magnetic switch.



FREE RUNNING TEST

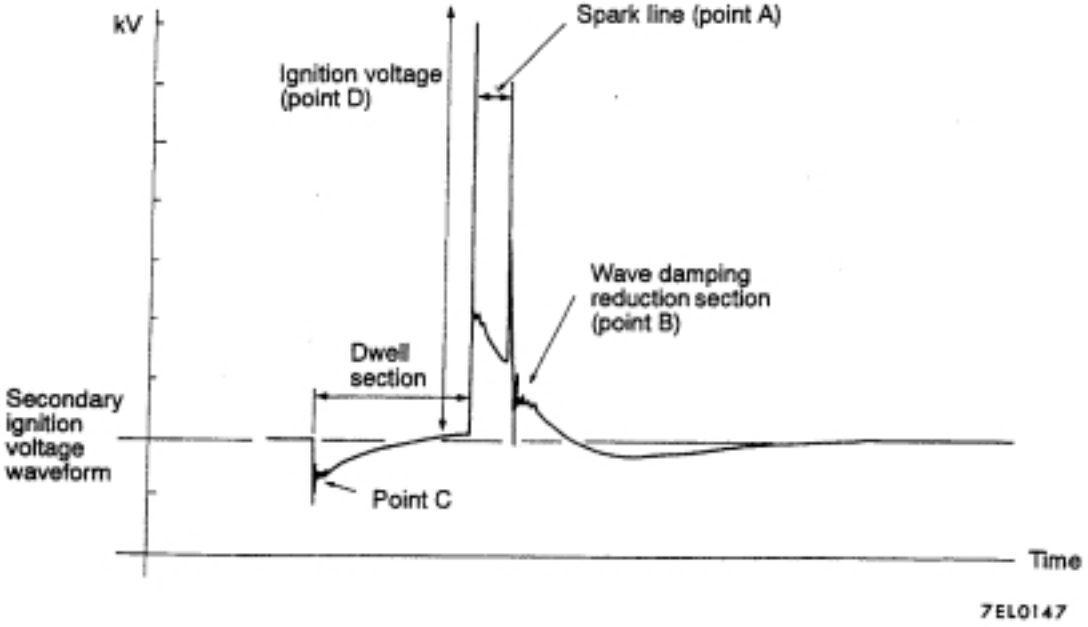
1. Place starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows:
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostat in series with battery positive post and starter motor terminal.
3. Connect a voltmeter (15-volt scale) across starter motor.
4. Rotate carbon pile to full-resistance position.
5. Connect battery cable from battery negative post to starter motor body.
6. Adjust the rheostat until the battery voltage shown by the voltmeter is 11 V.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

   Current: max. 90 Amps

STANDARD WAVEFORM

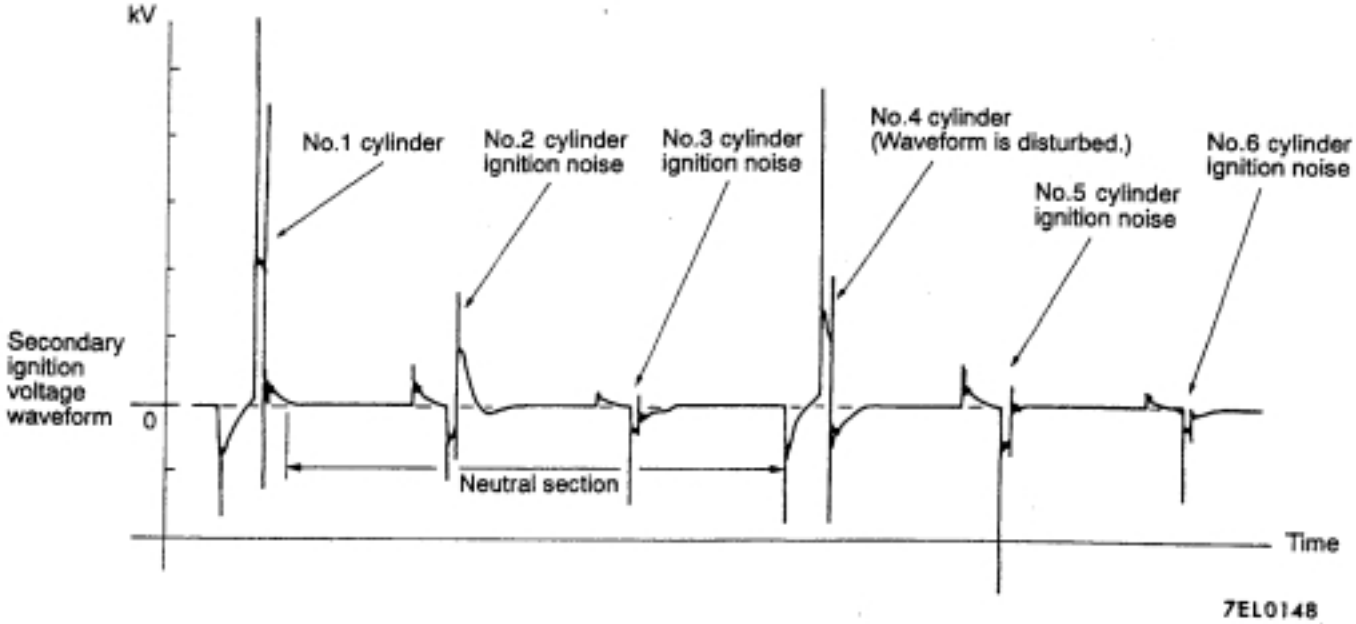
Observation Conditions

Function	Secondary
Pattern height	High (or Low)
Pattern selector	Raster
Engine revolutions	Curb idle speed



Observation Condition (The only change from above condition is the pattern selector.)

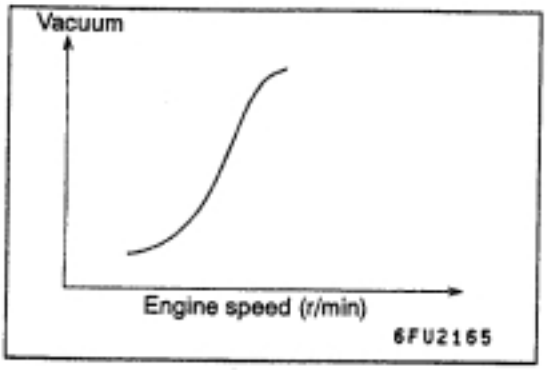
Pattern selector	Display



EVAPORATIVE EMISSION CONTROL SYSTEM

PURGE PORT VACUUM CHECK

1. Disconnect the vacuum hose (vehicles with TCL: red stripe, vehicles without TCL: black stripe) from the throttle body purge vacuum nipple and connect a hand vacuum pump to the nipple.



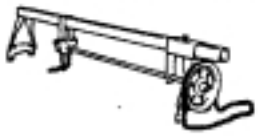
2. Start the engine and check that, after raising the engine speed by racing the engine, purge vacuum raises according to engine speed.

   NOTE
   If there is a problem with the change in vacuum, the throttle body purge port may be clogged and require cleaning.

LUBRICANT

Item	Specified lubricant	Quantity ℓ
Transmission oil	Hypoid gear oil SAE 75W – 90 or 75W – 85W conforming to API GL-4	2.2

SPECIAL TOOLS

Tool	Number	Name	Use
	MB990767	End yoke holder	Fixing the hub
 B991113	MB990635 or MB991113	Steering linkage puller	Tie rod end and lower arm disconnection
 Z203827	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
	MB991602	Foot assembly	
 B991453	MB991453	Engine hanger	

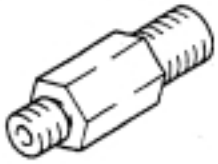
SERVICE SPECIFICATIONS

Items		Standard value
Input shaft speed sensor resistance (at 20°C) Ω		330 – 390
Output shaft speed sensor resistance (at 20°C) Ω		330 – 390
Oil temperature sensor kΩ	at 0°C	16.7 – 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
Resistance of reduction solenoid valve coil (at 20°C) Ω		2.7 – 3.4
Stall speed r/min		2,100 – 2,600

LUBRICANTS

Items	Specified lubricant	Quantity ℓ
Transmission fluid	DIA QUEEN ATF SP II, DIA QUEEN ATF SP II M or equivalent	7.8

SPECIAL TOOLS

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 MD998268	Adapter	
	MD998900	Adapter	

INSPECTION CHART FOR DIAGNOSIS CODE

Code	Diagnosis item		Reference page
11	Throttle position sensor system <Vehicles without TCL> Accelerator pedal position sensor system <Vehicles with TCL>	Short circuit	23-13
12		Open circuit	23-13
14		Sensor maladjustment	23-13
15	Oil temperature sensor system	Open circuit	23-13
21	Crank angle sensor system	Open circuit	23-14
22	Input shaft speed sensor system	Short circuit/open circuit	23-14
23	Output shaft speed sensor system	Short circuit/open circuit	23-15
26	Stop lamp switch system	Short circuit	23-15
31	Low and reverse solenoid valve system	Short circuit/open circuit	23-16
32	Underdrive solenoid valve system	Short circuit/open circuit	23-16
33	Second solenoid valve system	Short circuit/open circuit	23-16
34	Overdrive solenoid valve system	Short circuit/open circuit	23-16
35	Reduction solenoid valve system	Short circuit/open circuit	23-16
36	Damper control clutch solenoid valve system	Short circuit/open circuit	23-16
41	1st gear ratio does not meet the specification		23-17
42	2st gear ratio does not meet the specification		23-18
43	3rd gear ratio does not meet the specification		23-19
44	4th gear ratio does not meet the specification		23-20
45	5th gear ratio does not meet the specification		23-21
46	Reverse gear ratio does not meet the specification		23-22
51	Abnormal communication with engine-ECU <Vehicles without TCL> Abnormal communication with TCL-ECU <Vehicles with TCL>		23-23
52	Damper control clutch solenoid valve system	Defective system	23-16
54	A/T Control relay system	Short circuit to earth/ open circuit	23-23
56	N range lamp system	Short circuit to earth	23-24
71	Malfunction of A/T-ECU		23-24

Code No. 46 Reverse gear ratio does not meet the specification	Probable cause
If the output from the output shaft speed sensor multiplied by the reverse gear ratio is not the same as the output from the input shaft speed sensor after shifting to reverse gear has been completed, diagnosis code No. 46 is output. If diagnosis code No. 46 is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the low and reverse brake system • Malfunction of the reverse clutch system • Noise generated • Malfunction of the direct planetary carrier. • Malfunction of the reduction brake system

★: Refer to the Transmission Workshop Manual.

MUT-II Self-Diag code
Is the diagnosis code No. 22 output?
Yes → Code No. 22 Input shaft speed sensor system check (Refer to P.23-14.)
No ↓

MUT-II Self-Diag code
Is the diagnosis code No. 23 output?
Yes → Code No. 23 Output shaft speed sensor system check (Refer to P.23-15.)
No ↓

Measure output waveform from the input shaft speed sensor. (using an oscilloscope)
- Disconnect the connector A-73 and measure voltage between 1 and 2 at the input shaft speed sensor.
- Engine: 2,000 r/min (approx. 50 km/h)
- Selector lever position: D (3rd gear)

(Voltage)
OK: A waveform such as the one shown on P.23-43 (Inspection Procedure Using an Oscilloscope) is output (flashing is 1.0 V or more) and there is no noise appearing in the waveform.

NG → Replace the input shaft speed sensor.
→ Check the trouble symptoms.
NG → A/T overhaul ★
- Replace the underdrive clutch retainer.

→ Check the trouble symptoms.
NG → Eliminate the cause of the noise.

OK ↓

Measure output waveform from the output shaft speed sensor. (using an oscilloscope)
- Disconnect the connector A-72 and measure voltage between 1 and 2 at the output shaft speed sensor.
- Engine: 2,000 r/min (approx. 50 km/h)
- Selector lever position: D (3rd gear)

(Voltage)
OK: A waveform such as the one shown on P.23-43 (Inspection Procedure Using an Oscilloscope) is output (flashing is 1.0 V or more) there is no noise appearing in the waveform.

NG → Replace the output shaft speed sensor.
→ Check the trouble symptoms.
NG → A/T overhaul ★
- Replace the direct planetary carrier.

→ Check the trouble symptoms.
NG → Eliminate the cause of the noise.

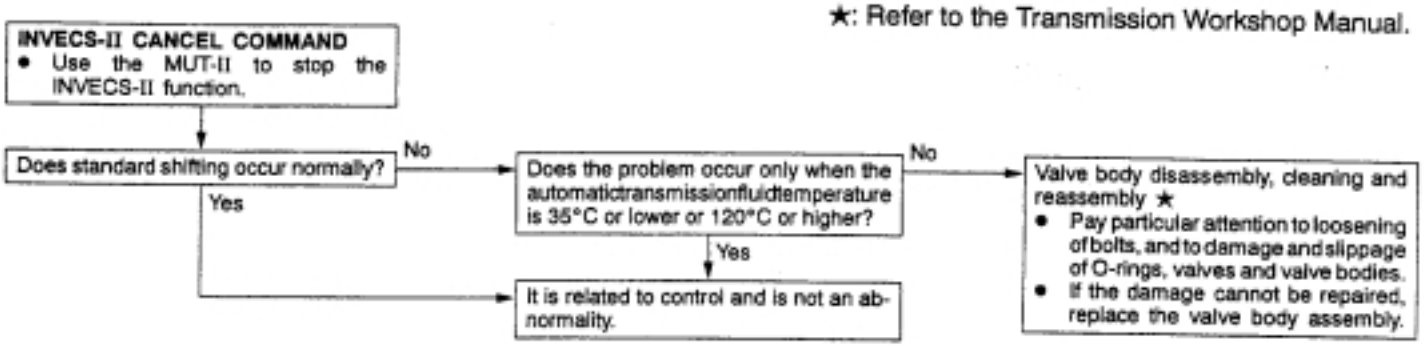
OK ↓

A/T overhaul ★
- Low and reverse brake system check
- Reverse clutch system check
- Direct clutch system check

INSPECTION PROCEDURE 12

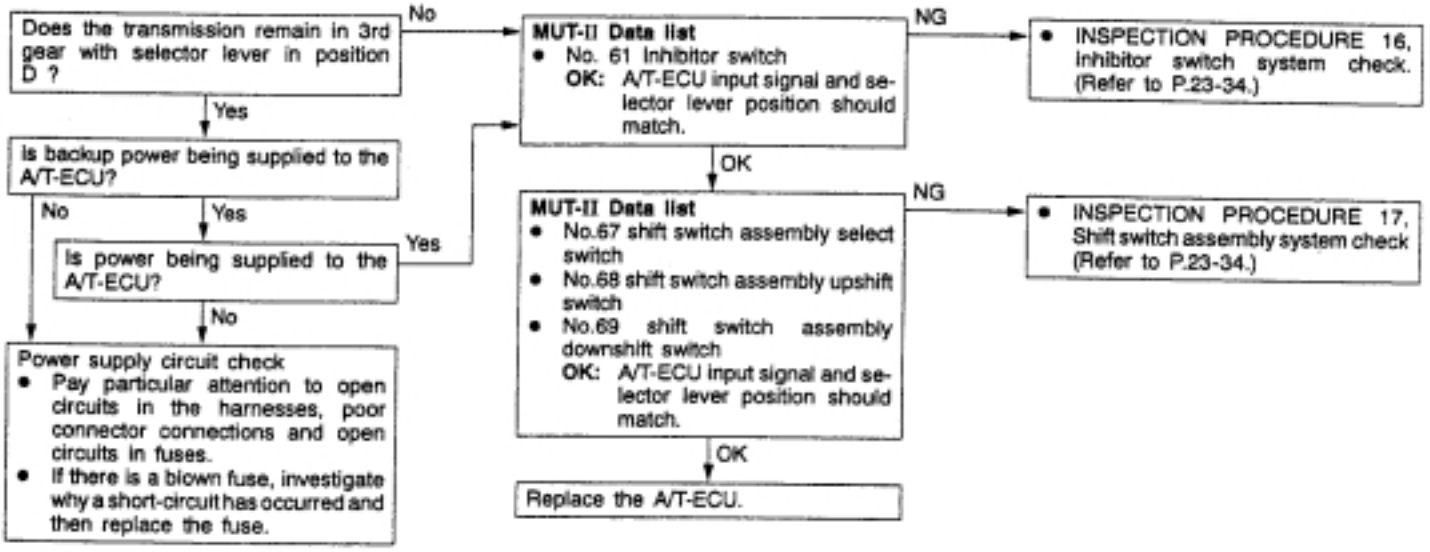
Some points (Displaced shifting points)	Probable cause
If some of the shift points are displaced while driving, the cause is probably a malfunction of the valve body, or it is related to control and is not an abnormality.	• Malfunction of the valve body

★: Refer to the Transmission Workshop Manual.

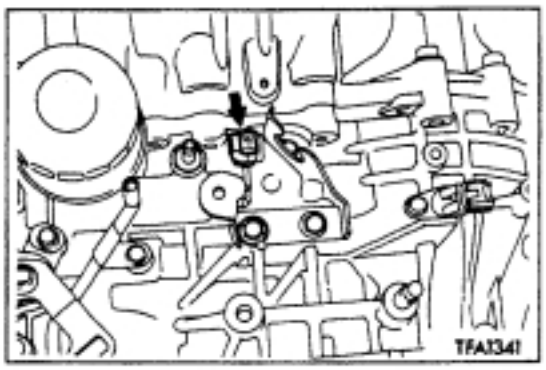


INSPECTION PROCEDURE 13

No diagnosis codes (Does not shift)	Probable cause
If shifting does not occur while driving and no diagnosis codes are output, the cause is probably a malfunction of the inhibitor switch, sport mode switch, or A/T-ECU.	• Malfunction of the inhibitor switch • Malfunction of the sport mode switch • Malfunction of the A/T-ECU



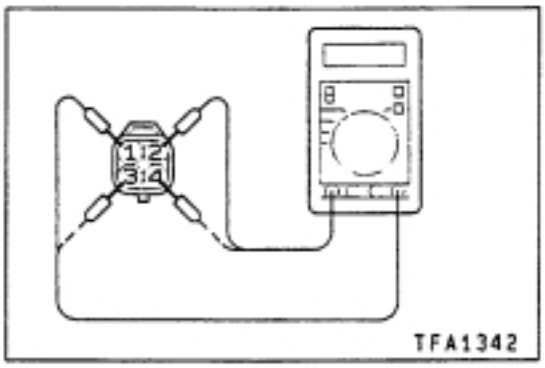
Terminal No.	Check item	Check requirement	Standard value
53	Communication with engine-ECU <Vehicles without TCL>	Engine: Idling Selector lever position: D	Other than 0 V
	Communication with TCL-ECU <Vehicles with TCL>		
54	Communication with engine-ECU <Vehicles without TCL>	Engine: Idling Selector lever position: D	Other than 0 V
	Communication with TCL-ECU <Vehicles with TCL>		
55	Inhibitor switch P	Selector lever position: P	Battery voltage
		Selector lever position: Other than above	0 V
56	Inhibitor switch N	Selector lever position: N	Battery voltage
		Selector lever position: Other than above	0 V
57	Select switch	Selector lever position: Sport mode	Battery voltage
		Selector lever position: Other than above	0 V
58	Downshift switch	Selector lever: Downshift in sport mode, and hold the selector lever	Battery voltage
		Selector lever: Other than above	0 V
59	Stop lamp switch	Brake pedal: Depressed	Battery voltage
		Brake pedal: Released	0 V
62	Low and reverse solenoid valve	Selector lever position: Sport mode (1st gear)	Battery voltage
		Selector lever position: Sport mode (2nd gear)	Approx. 7 – 9 V
63	Diagnosis output	Normal (No diagnosis code output)	0 → 5 V flashing
66	Inhibitor switch R	Selector lever position: R	Battery voltage
		Selector lever position: Other than above	0 V
67	Inhibitor switch D	Selector lever position: D	Battery voltage
		Selector lever position: Other than above	0 V
68	Upshift switch	Selector lever: Upshift in sport mode, and hold the selector lever	Battery voltage
		Selector lever: Other than above	0 V
69	Vehicle speed sensor	When stopped	0 V
		Move forward slowly	0 → 5 V flashing
71	A/T control relay	Ignition switch: OFF	0 V
		Ignition switch: ON	Battery voltage
72	Earth	Ignition switch: ON	0 V



A/T CONTROL COMPONENT CHECK

INPUT SHAFT SPEED SENSOR CHECK

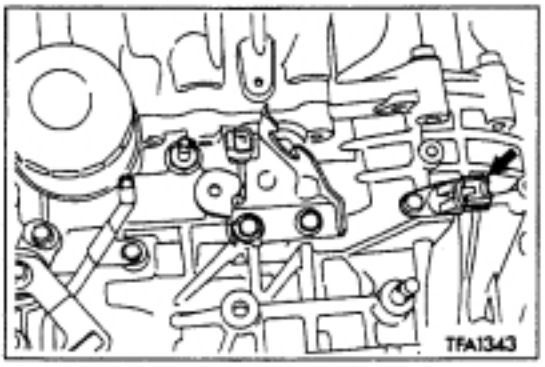
1. Disconnect the input shaft speed sensor connector.



2. Measure the resistance between the terminals No.1 and No.2 of the input shaft speed sensor-side connector.

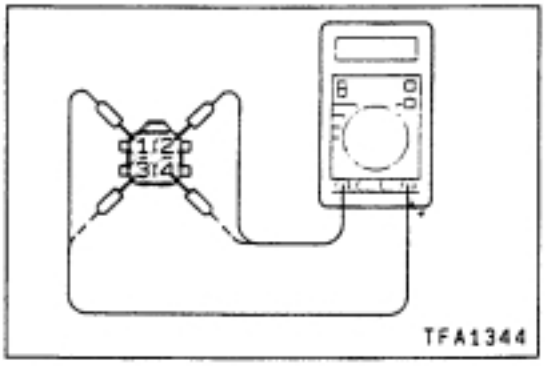
   Standard value: 330 – 390 Ω (at 20°C)

3. Check that there is continuity between the terminals No.1 and No.3, and between the terminals No.2 and No.4 of the input shaft speed sensor-side connector.
4. If the input shaft speed sensor is faulty, replace it.



OUTPUT SHAFT SPEED SENSOR CHECK

1. Disconnect the output shaft speed sensor connector.



2. Measure the resistance between the terminals No.1 and No.2 of the output shaft speed sensor-side connector.

   Standard value: 330 – 390 Ω (at 20°C)

3. Check that there is continuity between the terminals No.1 and No.3, and between the terminals No.2 and No.4 of the output shaft speed sensor-side connector.
4. If the output shaft speed sensor is faulty, replace it.

CRANK ANGLE SENSOR CHECK

Refer to GROUP 13A – Troubleshooting.

THROTTLE POSITION SENSOR CHECK <Vehicles without TCL>

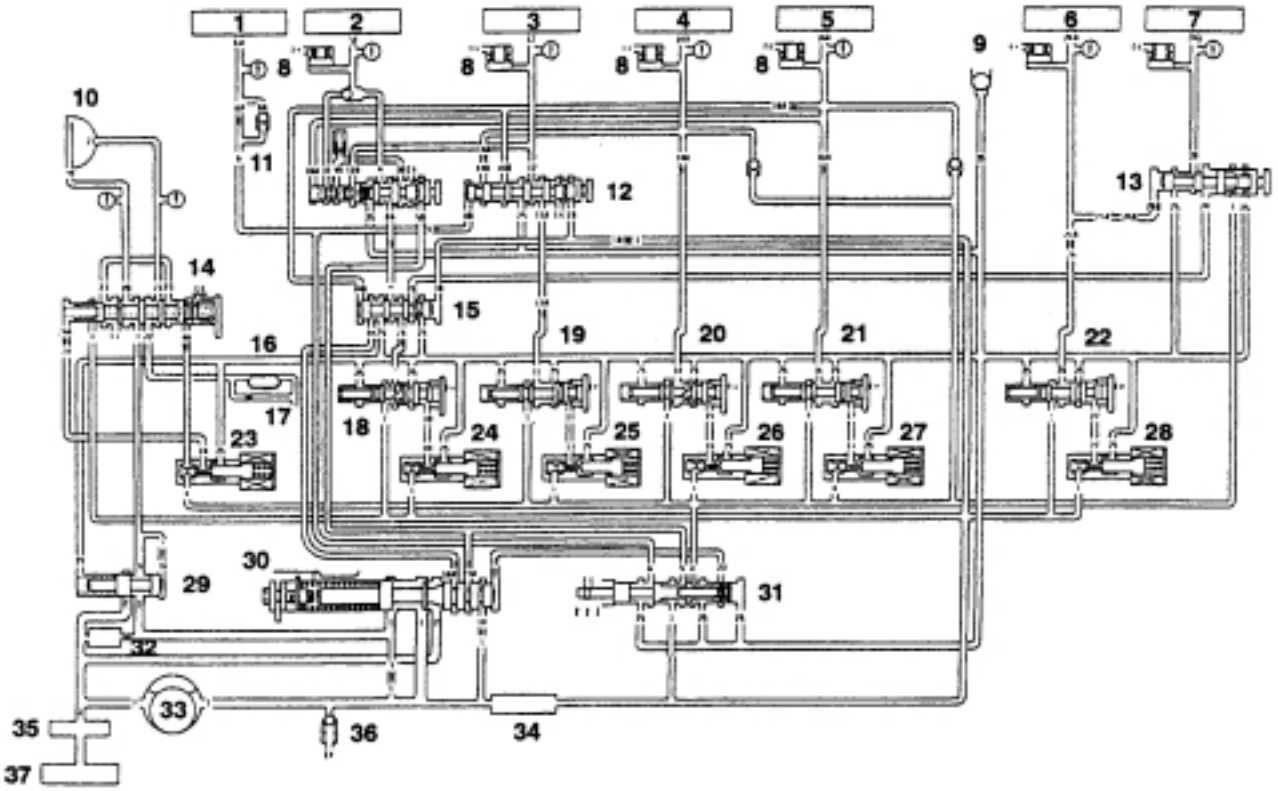
Refer to GROUP 13A – On-vehicle Service.

ACCELERATOR PEDAL POSITION SENSOR CHECK <Vehicles with TCL>

Refer to GROUP 13A – On-vehicle Service.

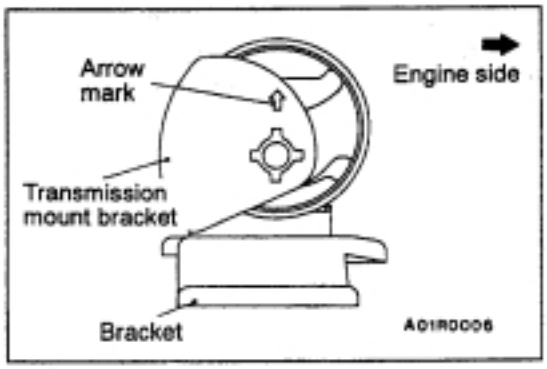
HYDRAULIC CIRCUIT

PARKING AND NEUTRAL



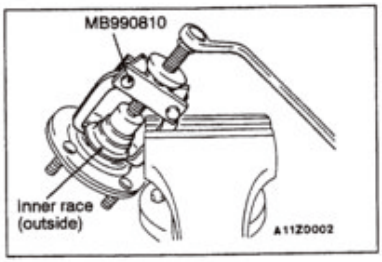
TFAJ741

1. Reverse clutch
2. Low-reverse brake
3. Second brake
4. Underdrive clutch
5. Overdrive clutch
6. Reduction brake clutch
7. Direct clutch
8. Accumulator
9. Check ball
10. Damper clutch
11. Fail safe valve A
12. Fail safe valve B
13. Fail safe valve C
14. Damper clutch control valve
15. Switch valve
16. Automatic transmission fluid cooler
17. Lubrication
18. Low-reverse pressure control valve
19. Second pressure control valve
20. Underdrive pressure control valve
21. Overdrive pressure control valve
22. Reduction pressure control valve
23. Damper clutch control solenoid valve
24. Low-reverse solenoid valve
25. Second solenoid valve
26. Underdrive solenoid valve
27. Overdrive solenoid valve
28. Reduction solenoid valve
29. Torque converter pressure control valve
30. Regulator valve
31. Manual valve
32. Oil filter
33. Oil pump
34. Oil strainer
35. Oil filter (Built in type)
36. Relief valve
37. Oil pan



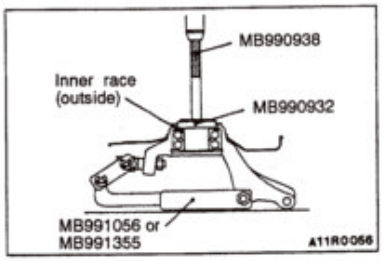
▶C◀ TRANSMISSION MOUNT STOPPER INSTALLATION

Install the transmission mount stopper so that the arrow points as shown in the illustration.



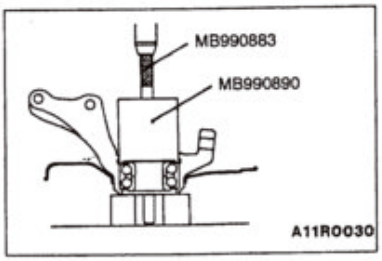
(2) Remove the wheel bearing inner race (outside) from the hub by using the special tool.

Caution
When removing the inner race (outside) from the hub, be careful not to let the hub drop.



(3) Install the inner race (outside) that was removed from the hub to the wheel bearing, and then use the special tool to remove the wheel bearing.

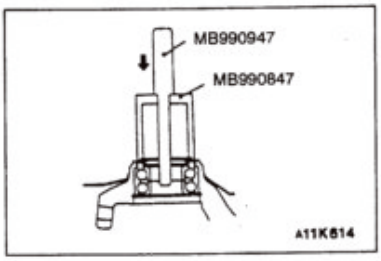
REASSEMBLY SERVICE POINTS



▶A◀ WHEEL BEARING INSTALLATION

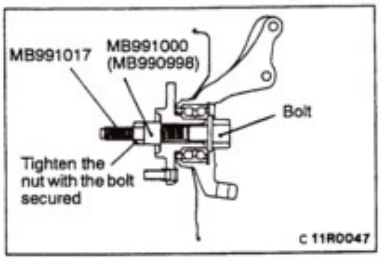
(1) Fill the wheel bearing with multipurpose grease.
(2) Apply a thin coating of multipurpose grease to the knuckle and bearing contact surfaces.
(3) Press-in the bearing by using the special tools.

Caution
Always press the outer race when pressing-in the wheel bearing, otherwise wheel bearing may be damaged.



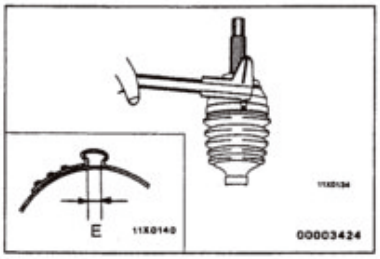
▶B◀ OUTER OIL SEAL INSTALLATION

(1) Fill the oil seal rear part with multipurpose grease. Drive the oil seal (hub side) into the knuckle by using the special tools until it is flush with the knuckle end surface.
(2) Apply multipurpose grease to the lip of the oil seal and to the surfaces of the oil seal which contact the front hub.



▶C◀ WHEEL BEARING STARTING TORQUE CHECK

(1) Use the special tools to mount the hub onto the knuckle.
(2) Tighten the nut of the special tool to 196–255 Nm.
(3) Rotate the hub in order to seat the bearing.



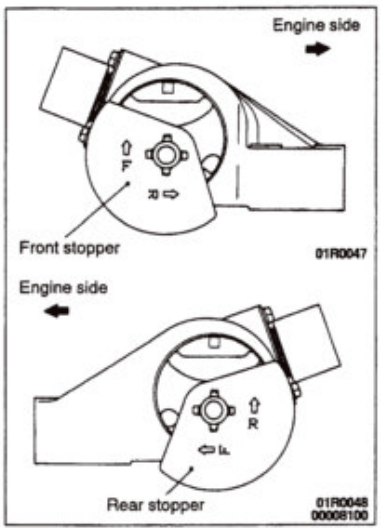
(14) Check that the crimping amount (E) of the B.J. boot band is at the standard value.

Standard value (E): 2.4 – 2.8 mm

<If the crimping amount is larger than 2.8 mm>
Readjust the value of (W) in step (11) according to the following formula, and then repeat the operation in step (13).
W = 5.8 mm – E
Example: If E = 2.9 mm, then W = 2.9 mm.

<If the crimping amount is smaller than 2.4 mm>
Remove the B.J. boot band, readjust the value of (W) in step (11) according to the following formula, and then repeat the operations in steps (12) and (13) using a new B.J. boot band.
W = 5.8 mm – E
Example: If E = 2.3 mm, then W = 3.5 mm.

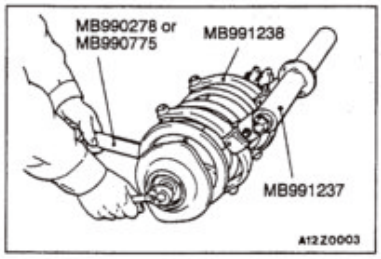
(15) Check that the B.J. boot band is not sticking out past the place where it has been installed.
If the B.J. boot band is sticking out, remove it and then repeat the operations in steps (12) to (14) using a new B.J. boot band.



INSTALLATION SERVICE POINT

▶A◀ ENGINE MOUNT STOPPER INSTALLATION

Install the engine mount stopper so that the arrow points in the direction as shown in the figure.



DISASSEMBLY SERVICE POINT

◀A▶ SELF-LOCKIING NUT REMOVAL

(1) Use the special tools to compress the coil spring.

Caution
1. **To hold the coil spring securely, install the special tools evenly, and so that the space between both arms of the special tool will be maximum within the installation range.**
2. **Do not use an impact wrench to tighten the bolt of the special tool, otherwise the special tool will break.**

(2) Use the special tool to hold the spring upper seat and loosen the self-locking nut.

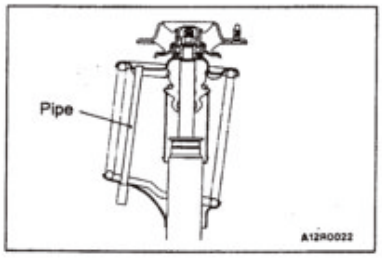
Caution
Do not use an impact wrench to loosen the self-locking nut. Vibration of the impact wrench will cause the special tool to slip. This is dangerous.

REASSEMBLY SERVICE POINT

▶A◀ SELF-LOCKING NUT INSTALLATION

(1) With the coil spring held compressed by the special tools, provisionally tighten the self-locking nut.

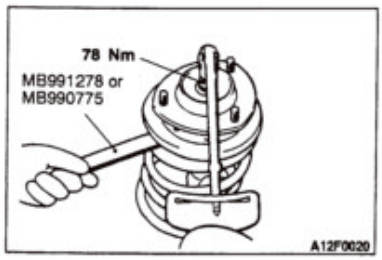
Caution
Do not use an impact wrench to tighten the bolt of the special tool, otherwise the special tool will break.



(2) Line up the holes in the strut assembly spring lower seat with the hole in the spring upper seat.

NOTE
The job is easily accomplished with a pipe.

(3) Correctly align both ends of the coil spring with the grooves in the spring seat, and then loosen the special tools.

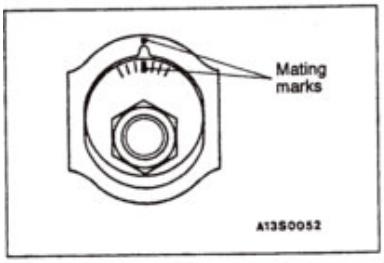


(4) Using the same special tool, tighten the self-locking nut to the specified torque.

Caution
Do not use an impact wrench to tighten the self-locking nut. Vibration of the impact wrench will cause the special tool to slip. This is dangerous.

(5) Fill the strut insulator bearing with multi-purpose grease.

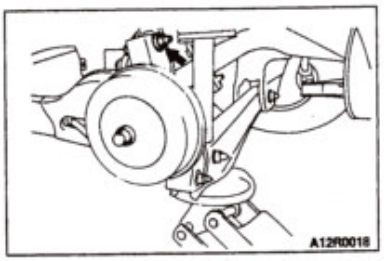
Caution
Do not apply the grease to the insulator rubber part.



REMOVAL SERVICE POINTS

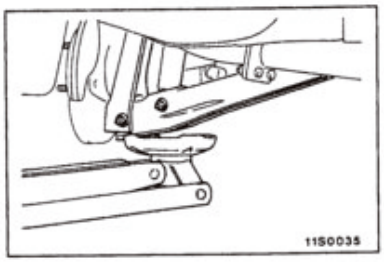
◀A▶ CONTROL LINK/LOWER ARM REMOVAL

After making a mating marks on the toe-in or camber adjusting bolt, remove the control link and lower arm.



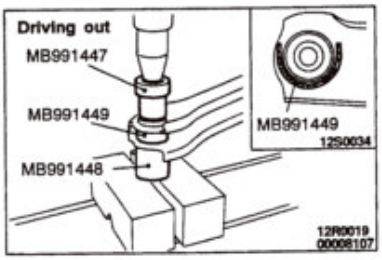
◀B▶ UPPER LINK REMOVAL

Support the lower arm with a jack and disconnect the upper link and trailing arm.



◀C▶ LOWER ARM AND TRAILING ARM DISCONNECTION

After supporting the lower arm with a jack, separate the connection.

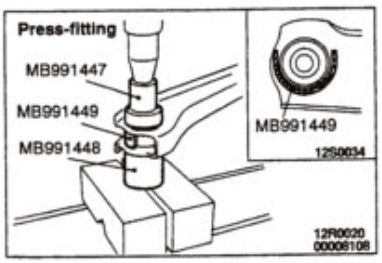


LOWER ARM BUSHING REPLACEMENT

Use the special tools to drive out and press-fit the lower arm bushing.

NOTE
If the special tool (MB991449) is hard to install, tap it with a plastic hammer.

Caution
Because the outside diameter of both edges of the bushing are different, be careful not to mistake the direction when driving out and press-fitting.



BASIC BRAKE SYSTEM

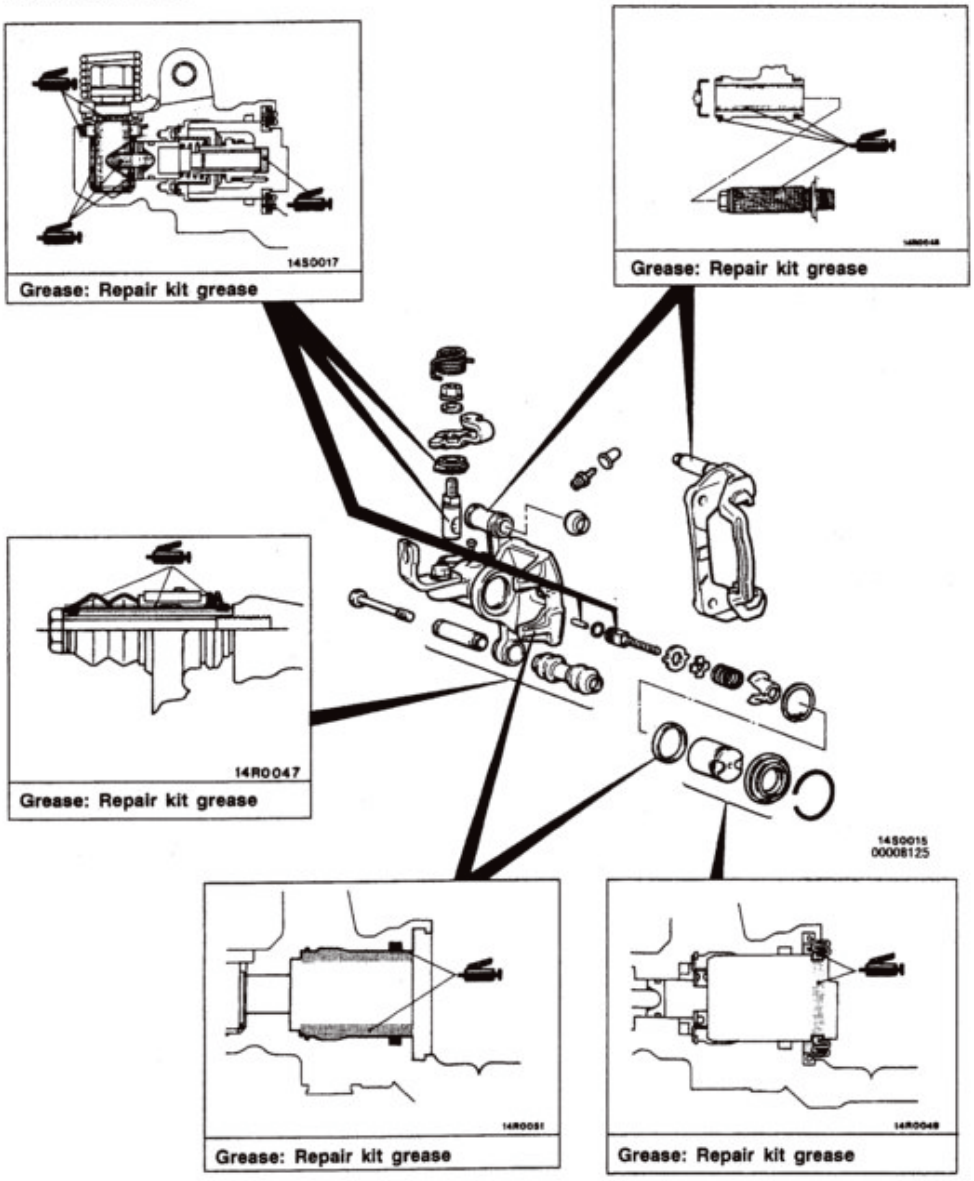
CONTENTS

(3) If the play does not exceed the limit specification, install the brake disc at a position 180° away from the chalk mark, and then check the run-out of the brake disc once again.

2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the disc.
3. Tighten the brake assembly to the specified torque.

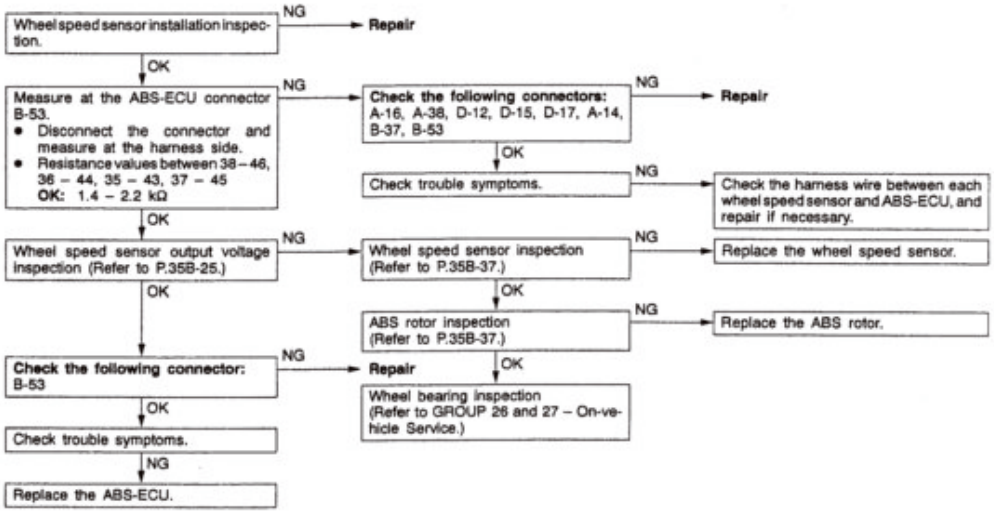
Tightening torque: 88 Nm <Front>, 49 – 59 Nm <Rear>

<Rear disc brake>



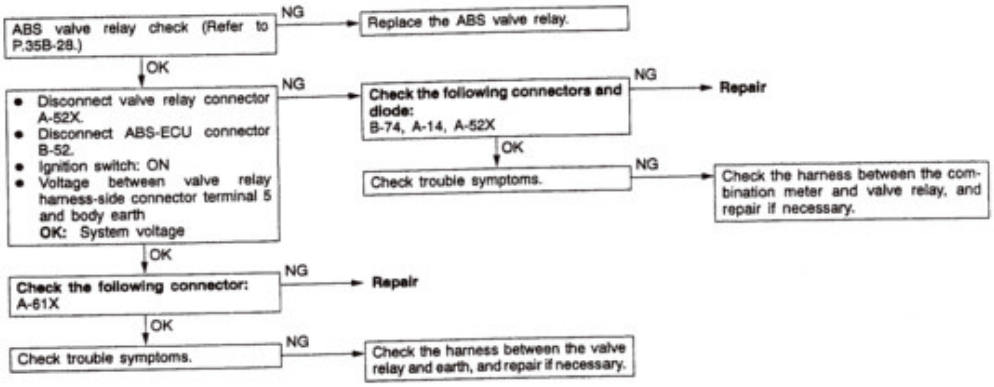
INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code Nos. 11, 12, 13, 14 Wheel speed sensor open circuit **Code Nos.21, 22, 23, 24 Wheel speed sensor short circuit**	**Probable cause**
Code Nos.11, 12, 13, 14 are output when the ABS-ECU detects an open circuit in at least one of the four wheel-speed sensors.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU
Code Nos.21, 22, 23, 24 are output under the following case: • When an open circuit cannot be found, but more than one wheel speed sensor does not output any signal during driving at 10 km/h or higher.	• Malfunction of wheel speed sensor • Malfunction of ABS rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU • Excessive gap between ABS rotor and wheel speed sensor



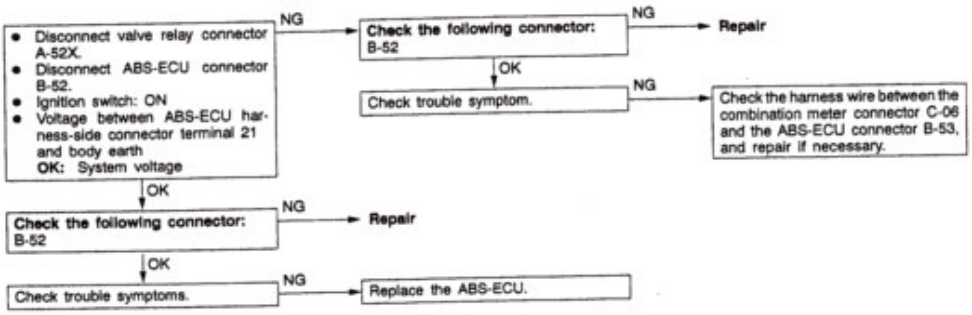
Inspection Procedure 5

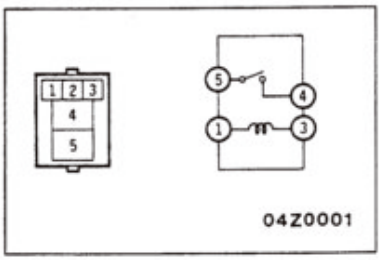
When the ignition key is turned to "START", the ABS warning lamp does not illuminate.	Probable cause
Current does not flow in the ABS-ECU when the ignition switch is turned to "START". Current flows in the ABS warning lamp even when the ignition switch is turned to "START". Therefore, the valve relay, which current is supplied through the ABS-ECU, turns off when the ignition switch is at "START". However, the warning lamp circuit of the valve relay must turn on in turn. So the cause must be a defective circuit on valve relay side.	• Malfunction of wiring harness or connector • Malfunction of valve relay



Inspection Procedure 6

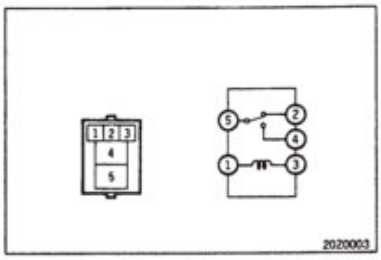
After the ignition key is turned to "ON", the ABS warning lamp blinks twice, and when turned to "START", it illuminates. When returned to "ON", the lamp flashes once, and then switches off.	Probable cause
The ABS-ECU causes the ABS warning lamp to illuminate during the initial check (approx. 3 seconds). During the initial check, the valve relay turns from off to on, off and back to on again. If there is an open circuit in the harness between the ABS-ECU and the ABS warning lamp, the lamp will illuminate only when the valve relay is OFF during valve relay test, etc.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU





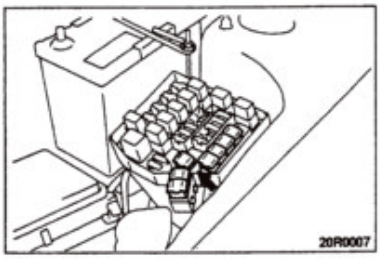
MOTOR RELAY CONTINUITY CHECK

Battery voltage	Terminal No.			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊖	⊕	○	○



VALVE RELAY CONTINUITY CHECK

Battery voltage	Terminal No.				
	1	2	3	4	5
Power is not supplied	○	○	○		○
Power is supplied	⊖		⊕	○	○



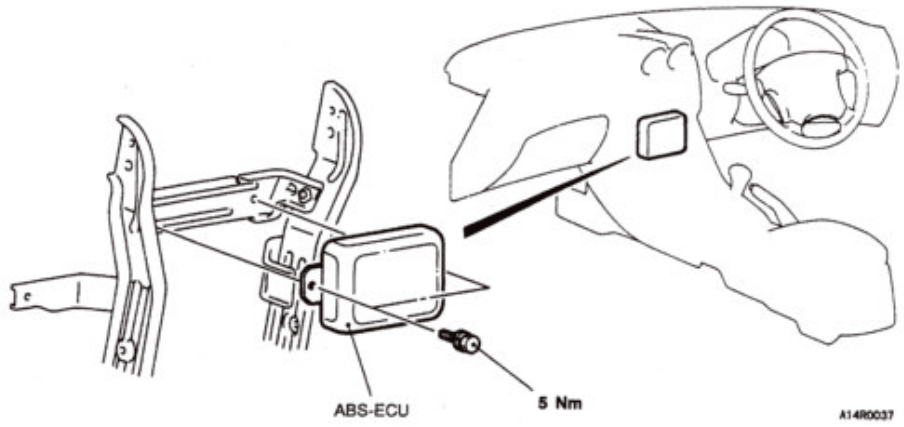
REMEDY FOR A FLAT BATTERY

When booster cables are used to start the engine when the battery is completely flat and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire, and driving might not be possible.
This happens because ABS consumes a great amount of current for its self-check function; the remedy is to either allow the battery to recharge sufficiently, or to remove the fuse for ABS circuit, thus disabling the anti-skid brake system. The ABS warning lamp will illuminate when the fuse (for ABS) is removed.
After the battery has sufficiently recharged, install the fuse (for ABS) and restart the engine; then check to be sure the ABS warning lamp is not illuminated.

ABS-ECU

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Center Panel Removal and Installation (Refer to GROUP 52A – Instrument Panel.)

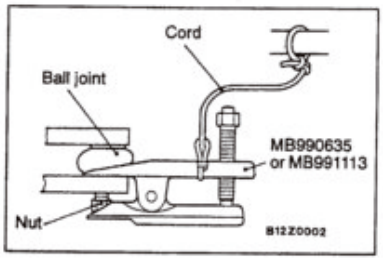


STEERING ANGLE CHECK

1. Locate front wheels on turning radius gauge and measure steering angle.

   Standard value:
   Inner wheel 37°00' ± 1°30'
   Outer wheel 30°00' <Reference value>

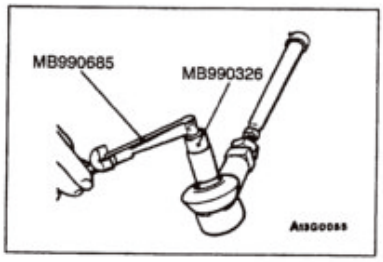
2. When the angle is not within the standard value, the toe is probably incorrect. Adjust toe (Refer to GROUP 33A – On-vehicle Service) and recheck steering angle.



TIE ROD END BALL JOINT STARTING TORQUE CHECK

1. Disconnect tie rod and knuckle with special tool.

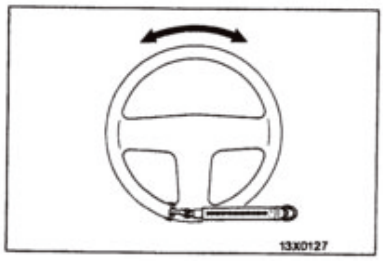
   Caution
   (1) Using the special tool, loosen the tie rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.
   (2) Support the special tool with a cord, etc. to prevent it from coming off.



2. Move ball joint stud several times and install nut on stud. Measure ball joint starting torque with special tools.

   Standard value: 0.5 – 2.5 Nm

3. When the starting torque exceeds the standard value, replace tie rod end.
4. When the starting torque is under the standard value, check ball joint for end play or ratcheting. If none of these, the joint is still serviceable.



STATIONARY STEERING EFFORT CHECK

1. With the vehicle stopped on a flat, paved surface, turn the steering wheel to the straight ahead position.
2. Start the engine and set it to 1,000±100 r/min.

   Caution
   After checking, the engine r/min must return to the standard idling r/min.

3. Attach a spring balance to the outer circumference of the steering wheel and measure the steering force required to turn the steering wheel from the straight ahead position to the left and right (within a range of 1.5 turns). Also check to be sure that there is no significant fluctuation of the required steering force.

   Standard value:
   Steering effort: 34 N or less
   Fluctuation allowance: 5.9 N or less

4. If the measured value is not within the standard value, check and adjust each parts.

4. Even if the measured value is below the standard value, the tie rod which swings smoothly without excessive play may be used.

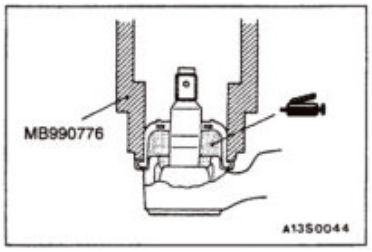
TIE ROD END BALL JOINT DUST COVER CHECK

1. Check the dust cover for cracks or damage by pushing it with finger.
2. If the dust cover is cracked or damaged, replace the tie rod end. (Refer to P.37A-17.)

NOTE
Cracks or damage of the dust cover may cause damage of the ball joint. When it is damaged during service work, replace the dust cover.

OTHER CHECK

- Check the cylinder inner surface of the rack housing for damage.
- Check the boots for damage, cracking or deterioration.
- Check the rack support for uneven wear or dents.
- Check the rack bushing for uneven wear or damage.



TIE ROD END BALL JOINT DUST COVER REPLACEMENT

Only when the dust cover is damaged accidentally during service work, replace the dust cover as follows:

1. Apply grease to the inside of the dust cover.
2. Apply the specified sealant to the mounting surface of the dust cover.

   Specified sealant: 3M ATD Part No.8663 or equivalent
3. Drive in the dust cover with special tool until it is fully seated.
4. Check the dust cover for cracks or damage by pushing it with finger.

REMOVAL SERVICE POINT

◀A▶ TRUNK LID GAS SPRING REMOVAL

Caution

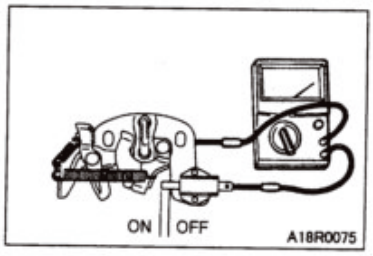
(1) Never disassemble the trunk lid gas spring and do not throw it into fire.

(2) Drill a hole in the trunk lid gas spring cylinder to drain the gas when it is disposed of.

INSTALLATION SERVICE POINT

▶A◀ TRUNK LID WEATHER STRIP INSTALLATION

Install the trunk lid weatherstrip so that the marking is aligned with the body centre line.



INSPECTION

TRUNK ROOM LAMP SWITCH CONTINUITY CHECK

Switch position	Terminal No.1	Body earth
ON (Released)	○	○
OFF (Pushed)		

FENDER

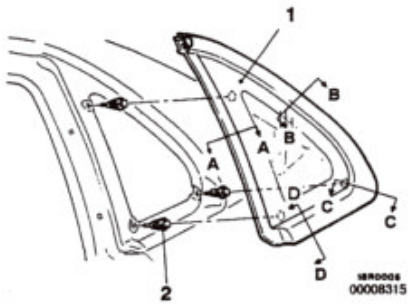
SEALANT

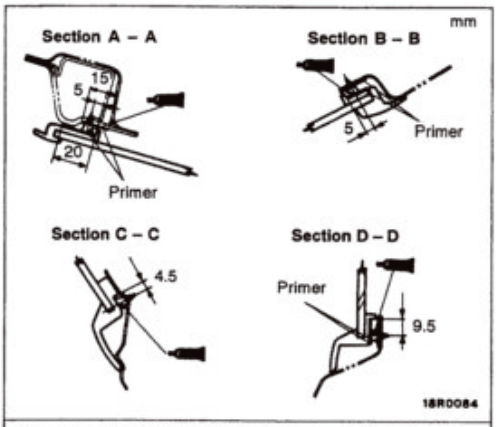
Item	Specified sealant	Remark
Splash shield	3M ATD Part No. 8625 or equivalent	Ribbon sealer

QUARTER WINDOW GLASS

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Quarter Trim, Rear Pillar Trim Removal and Installation (Refer to GROUP 52A.)





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

Removal steps

◀A▶ ▶A◀ 1. Quarter window glass
2. Clip

REMOVAL SERVICE POINT

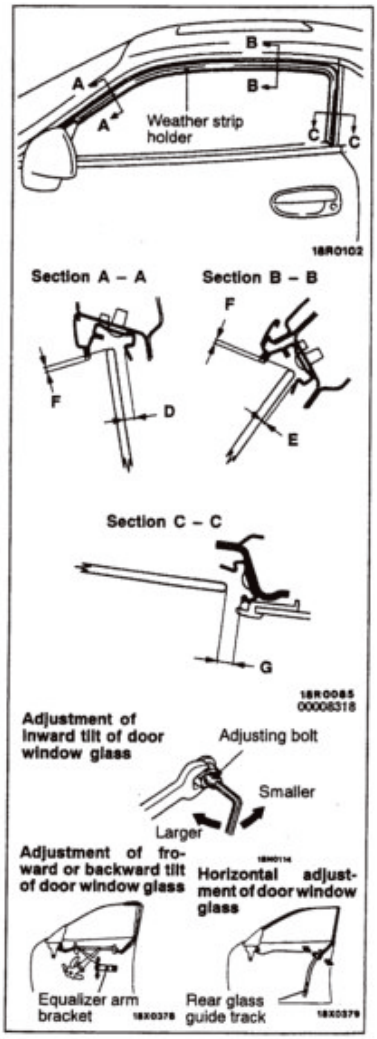
◀A▶ QUARTER WINDOW GLASS REMOVAL

1. Remove the quarter window glass in the same manner as for the windshield, except the clips. (Refer to P.42-11.)
2. Push the quarter window glass from the compartment side to remove the quarter window glass disengaging clips.

INSTALLATION SERVICE POINT

▶A◀ QUARTER WINDOW GLASS INSTALLATION

Install the quarter window glass in the same manner as for the windshield. (Refer to P.42-11.)



4. Adjust the inward tilt of the door glass by turning the adjusting bolts on the front and rear glass guide tracks so that the clearances (D) and (E) between the door window glass and weatherstrip holder satisfy the standard values.

   Standard value:
   (D) 7.4 ± 1.0 mm
   (E) 3.3 ± 1.0 mm

   Caution
   Turn each two bolts on the front and rear glass guide tracks by the same amount.

5. Carry out the following adjustments so that the overlapping dimension (F) of the door window glass end and glass catch, and clearance (G) between the door window glass end and weatherstrip holder satisfy the standard values. Horizontal adjustment of the door window glass; move the rear glass guide track forward and backward. Forward and backward tilt adjustment; move the equalizer arm bracket up and down.

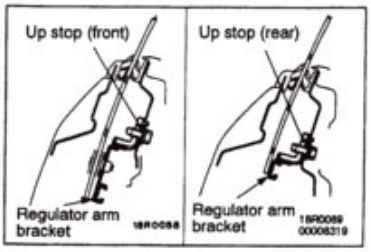
   Standard value:
   (F) 3.0 ± 1.0 mm
   (G) 10.7 ± 1.0 mm

   Caution
   Do not let to turn the inner stabilizer adjusting bolt.

6. Tighten the front and rear glass guide tracks mounting bolts.

   Caution
   Do not let to turn the bolts of each guide track.

7. Tighten the equalizer arm bracket mounting bolt.



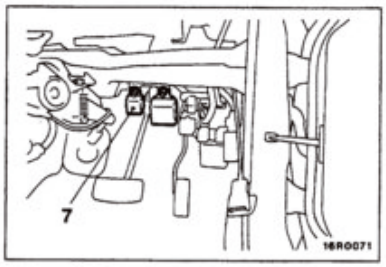
8. Tighten each up stop while pushing it toward the regulator arm bracket.

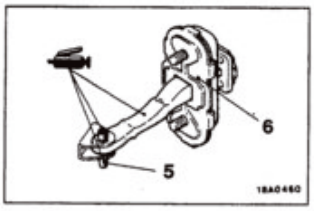
DOOR HANDLE AND LATCH

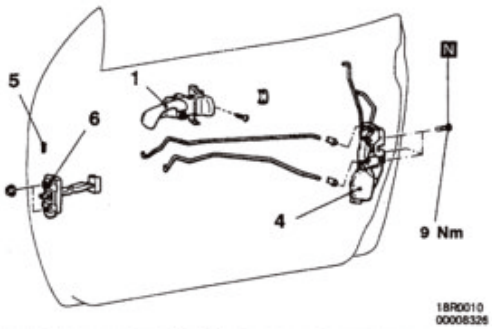
REMOVAL AND INSTALLATION

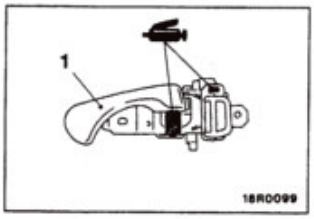
Pre-removal Operation
- Door Trim Removal (Refer to P.42-30.)

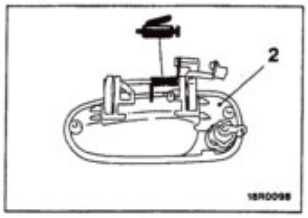
Post-installation Operation
- Door Inside Handle Play Check (Refer to P.42-27.)
- Door Adjustment (Refer to P.42-23.)
- Door Trim Installation (Refer to P.42-31.)

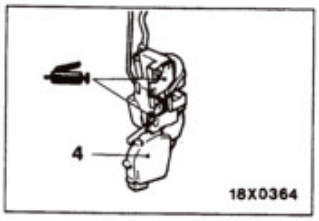












Door handle and door latch assembly removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-31.)
2. Door outside handle
3. Door lock key cylinder
4. Door latch assembly

Door check removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-31.)
5. Spring pin
▶A◀ 6. Door check

Door-lock ECU removal
7. Door-lock ECU

SUNROOF

ADHESIVES

Items	Specified sealant	Remarks
Roof lid glass seal	3M 8155 Quick Fix Adhesive	As required
Roof lid glass mounting screw	3M Stud Locking 4170	As required

TROUBLESHOOTING

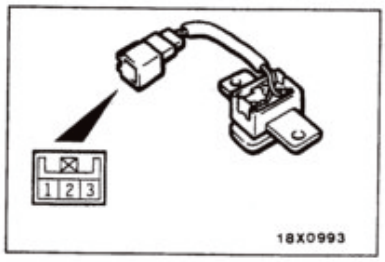
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
The sunroof does not operate when the ignition switch is turned to ON.	1	42-44
The motor does not reverse its direction when a load of 140 N or more is applied while the sunroof is closing.	2	42-45
The timer does not operate for 30 seconds after the ignition switch is turned to OFF.	3	42-46
Opening or closing of the sunroof is possible for 30 seconds immediately after turning the ignition switch to OFF, but the timer function does not operate continuously for another 30 seconds if the driver's side door is opened within 30 seconds.	4	42-46

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1

The sunroof does not operate when the ignition switch is turned to ON.	**Probable cause**
One of the following items may be defective. • Sunroof switch • Sunroof motor • Sunroof-ECU • Power supply circuit • Earth circuit	• Malfunction of sunroof switch • Malfunction of sunroof motor • Malfunction of sunroof-ECU • Malfunction of wiring harness or connector

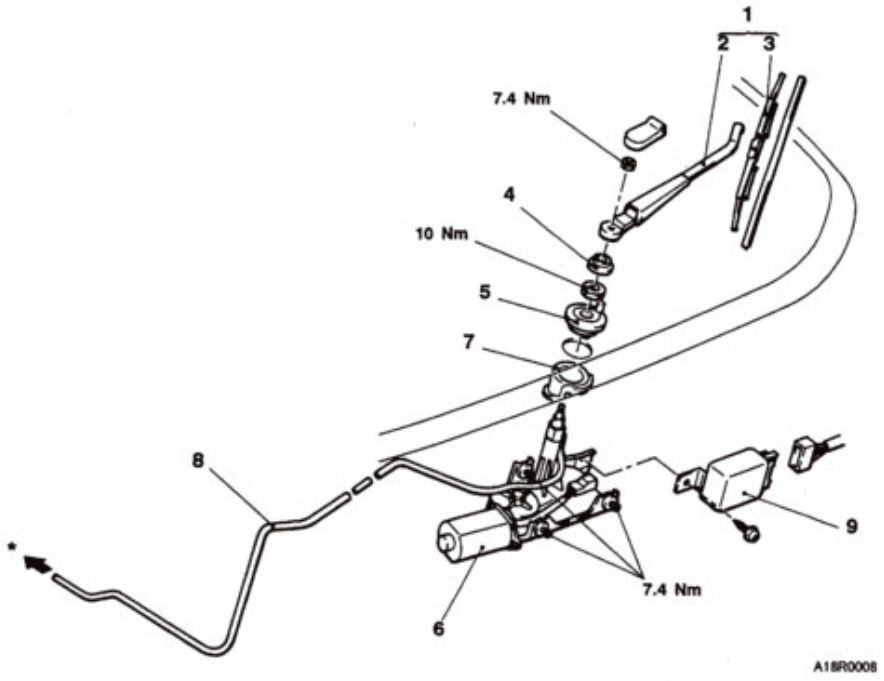


SUNROOF SWITCH CONTINUITY CHECK

Switch position	Terminal No.		
	1	2	3
Slide open	○	○	
Off			
Slide close		○	○

REAR WIPER AND WASHER

REMOVAL AND INSTALLATION



Wiper motor assembly removal steps

▶A◀ 1. Wiper arm and blade assembly
2. Wiper arm
3. Wiper blade
4. Shield cap
5. Nozzle collar assembly
6. Wiper motor assembly
7. Packing and washer

Rear washer hose removal steps

- Scuff plate, quarter trim (LH), rear seat (Refer to GROUP 52A.)

8. Washer hose

Rear intermittent wiper relay removal

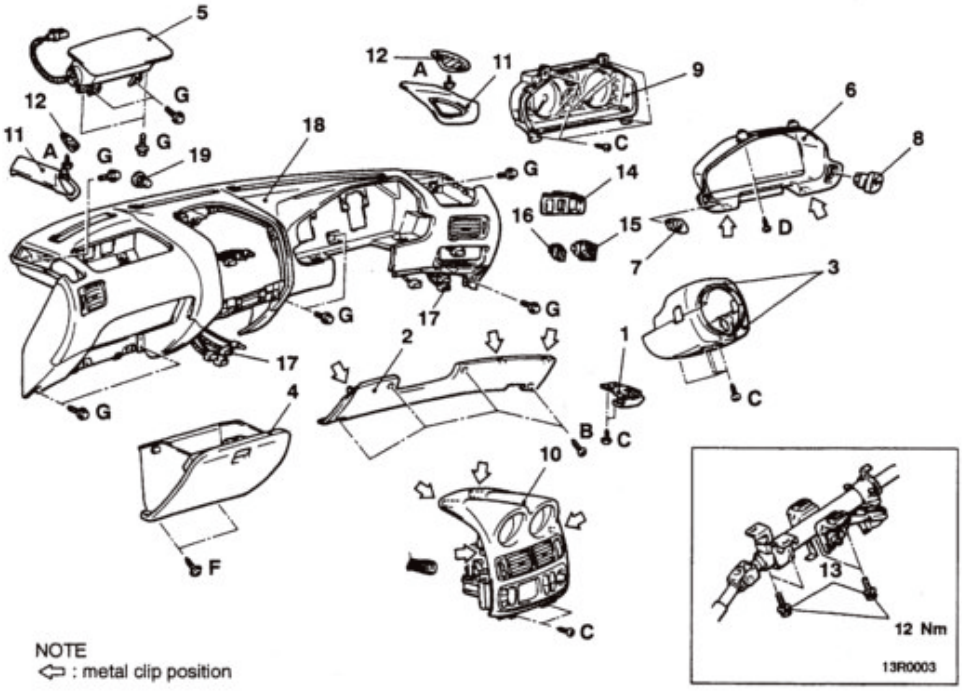
9. Rear intermittent wiper relay

NOTE
1. *: To washer tank assembly (Refer to P.51-7.)
2. For removal and installation of the column switch assembly (windshield wiper and washer switch), refer to GROUP 37A – Steering Wheel and Shaft.)

CAUTION: SRS

- **When removing and installing the instrument panel, do not let it bump against the SRS-ECU.**
- **For the passenger side air bag module removal/installation, always observe the service procedures of GROUP 52B – Air Bag Module and Clock Spring.**

Pre-removal and Post-installation Operation
- Floor Console Assembly Removal and Installation (Refer to P.52A-6.)



NOTE
⇦ : metal clip position

19R0022
00008336

Removal steps

1. Hood lock release handle
2. Driver side lower cover
3. Column cover
4. Glove box
5. Front passenger's air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
6. Meter bezel
7. Antenna switch or plug
8. Fog lamp switch or plug
9. Combination meter
10. Center panel
11. Tweeter garnish
12. Side defroster grill
13. Steering column assembly installation bolt
14. Switch panel
15. Remote control switch or plug
16. TCL switch <Vehicles with TCL>
17. Harness connector
18. Instrument panel assembly
19. Grommet

NOTES

Code No.35 SRS-ECU (deployed air bag) system	Probable cause
This diagnosis code is output after the air bag deploys. If this code is output before the air bag has deployed, the cause is probably a malfunction inside the SRS-ECU.	• Malfunction of SRS-ECU

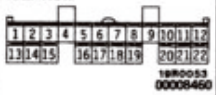
Replace the SRS-ECU.

Code No.41 IG_1 (A) power circuit system	Probable cause
This diagnosis code is output if the voltage between the IG_1 (A) terminal (SRS-ECU terminal No.5) and the earth is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnosis code No.41 will be automatically erased, and the SRS warning lamp will switch off. If diagnosis code No.42 is displayed simultaneously, battery voltage is low. First check the battery.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU

SRS-ECU harness connector

MB991222

Rear view



Measure at the SRS-ECU harness connector.
- Remove the driver's side air bag module.
- Disconnect the passenger's side air bag module connector B-02.
- Disconnect the SRS-ECU connector B-27.
- Continuity between SRS-ECU harness connector B-27 terminals No.2, No.14 and body earth

OK: Continuity

NG → **Check the following connector:** B-27 NG → **Repair**

OK → Check trouble symptoms.

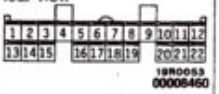
NG → Check the harness wire between the SRS-ECU and earth, and repair if necessary.

OK

SRS-ECU harness connector

MB991222

Rear view



Measure at SRS check harness connector.
- Connect the battery negative (–) terminal.
- Ignition switch: ON
- Voltage between SRS-ECU connector B-27 terminal No.5 and body earth

OK: 9 V or more

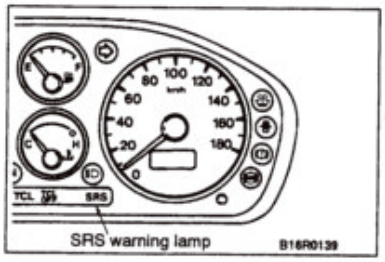
NG → **Check the following connectors:** B-44, B-45 NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ignition switch IG_1 (A), and repair if necessary.

OK

Replace the SRS-ECU.



▶B◀ POST-INSTALLATION INSPECTION

1. Reconnect the negative battery terminal.
2. Turn the ignition key to the "ON" position.
3. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 45 seconds?
4. If yes, SRS system is functioning properly.
   If no, consult page 52B-6.

INSPECTION

- Check the SRS-ECU and brackets for dents, cracks or deformation.
- Check connector for damage, and terminals for deformation.

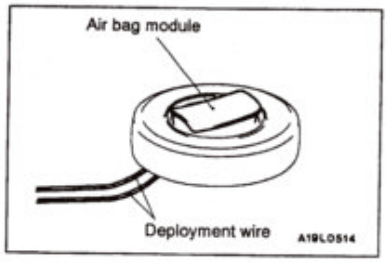
Caution
If a dent, crack, deformation or rust is discovered, replace the SRS-ECU with a new one.

NOTE
For checking of the SRS-ECU other than described above, refer to the section concerning troubleshooting. (Refer to P.52B-6.)

AIR BAG MODULES AND CLOCK SPRING

Caution

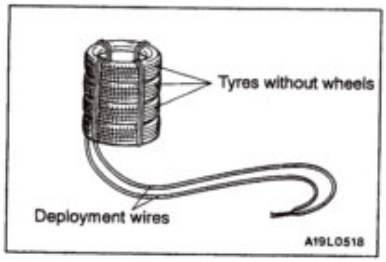
1. **Disconnect the battery (–) terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it. (Refer to P.52B-3.)**
2. **Never attempt to disassemble or repair the air bag modules or clock spring. If faulty, replace it.**
3. **Do not drop the air bag modules or clock spring or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust is detected.**
4. **The air bag modules 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.**
5. **Do not expose the air bag modules to temperatures over 93°C.**
6. **After deployment of an air bag, replace the air bag modules. Check the clock spring, and if faulty, replace it with a new part.**
7. **Wear gloves and safety glasses when handling air bags that have already deployed.**
8. **An undeployed air bag module should only be disposed of in accordance with the procedures (Refer to P.52B-26.)**



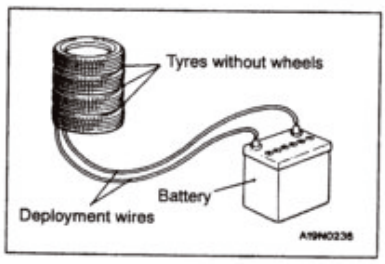
<Air bag module (front passenger's side)>

(1) Connect the deployment wires to the SRS air bag adapter harness A, pass it beneath the old tyre wheel assembly, and connect it to the air bag module.
(2) Pass the thick wires into the hole of the air bag module bracket, and secure it to the wheel of the old tyre with wheel (4 locations), with the air bag facing upwards.

Caution
1. **Leave some space below the wheel for the deployment wires.**
   If there is no space, the reaction of the air bag deployment could result in damage of the adapter harness.
2. **Do not have the connector of the SRS air bag adapter harness A inserted between the tyres.**



(3) Place three old tyres, without wheels, on top of the tyre secured to the air bag module, and secure all tyres with ropes (4 locations).



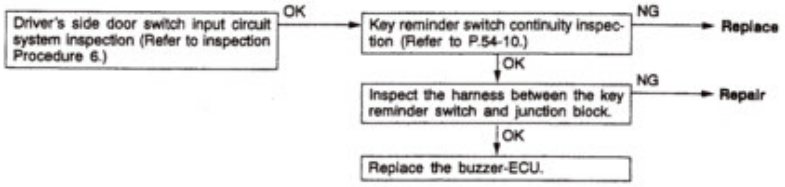
5. At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected deployment wires from each other, and connect them to the two terminals of the battery (which has been removed from the vehicle) to deploy the air bag.

Caution
1. **Before deployment, check carefully to be sure that no one is nearby.**
2. **The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.**
3. **If the air bag module fails to deploy, contact your local distributor.**

6. **After deployment, dispose the air bag module according to the Deployment Air Bag Module Disposal Procedures.**

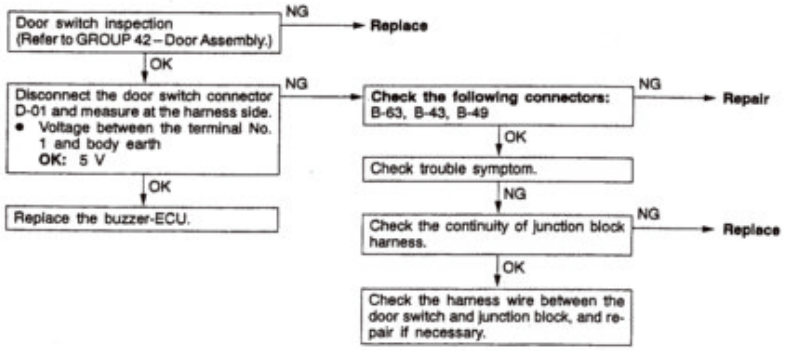
Inspection Procedure 5

Then Key reminder warning buzzer dose not sound ever if the driver's side door is opened while the key is still inserted. (However, the ignition key should be in the OFF position.)	Probable cause
The cause is probably a malfunction of the door switch input circuit system, or a malfunction of the key reminder switch input circuit system.	• Malfunction of door switch • Malfunction of key reminder switch • Malfunction of harness or connector • Malfunction of buzzer-ECU



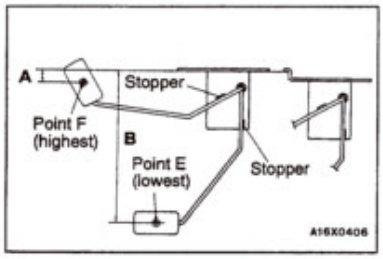
Inspection Procedure 6

Driver's side door switch input circuit system inspection



Standard value:
Point F: 11.7 ± 1.5 Ω
Point E: 100 ± 2.0 Ω

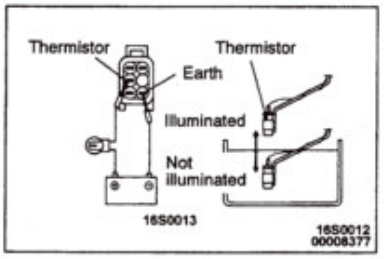
2. Check that resistance value changes smoothly when float moves slowly between point F (highest) and point E (lowest).



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.

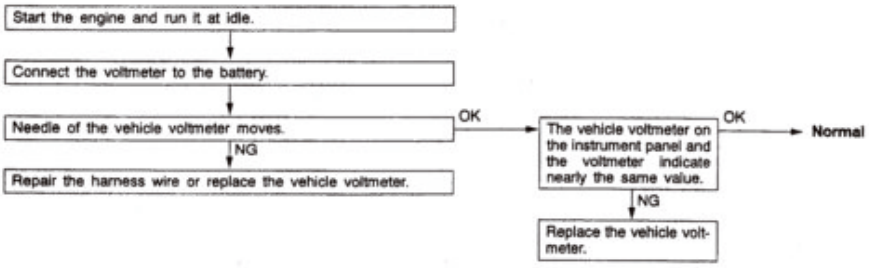
Standard value:
A: 12.8 mm
B: 135.8 mm

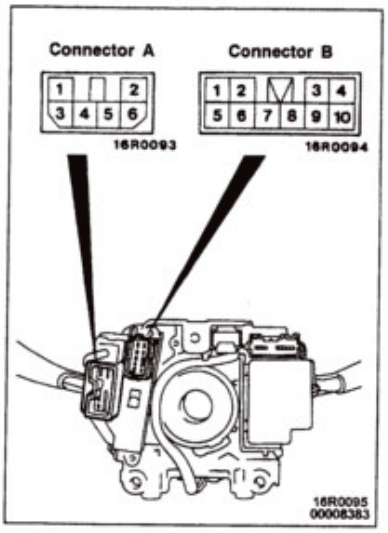


THERMISTOR

1. Connect fuel gauge unit (thermistor) to battery via test lamp (12 V – 3.4 W). Immerse in water.
2. Condition is good if lamp goes off when the thermistor is immersed in water and goes on when it is taken out of water.

VEHICLE VOLTMETER SIMPLE CHECK

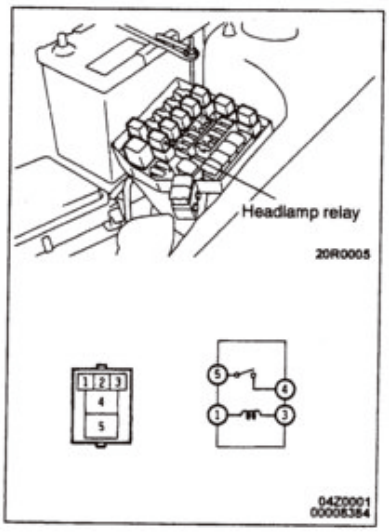




INSPECTION

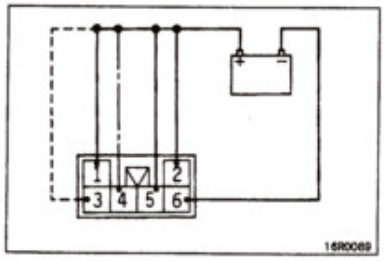
LIGHTING SWITCH, DIMMER/PASSING SWITCH AND TURN-SIGNAL LAMP SWITCH CHECK

Switch position		Connector A–terminal No.			Connector B–terminal No.			
		5	6	7	1	2	4	6
LIGHTING SWITCH	OFF							
	TAIL	○		○				
	HEAD	○		○				
			○		○			
DIMMER/ PASSING SWITCH	UPPER						○	○
	PASSING				○	○		○



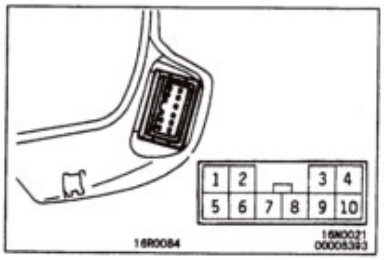
HEADLAMP RELAY CHECK

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



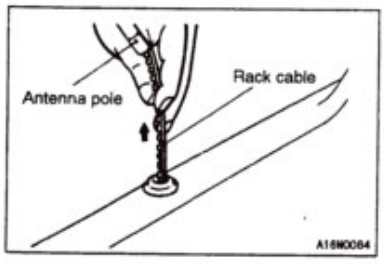
MOTOR ANTENNA ASSEMBLY CHECK

1. Connect the circuit as indicated by the solid lines in the illustration.
2. Check that the motor antenna extends when the connection indicated by the one dot line is made.
3. Check that the motor antenna retracts halfway when the connection indicated by the broken line is made, and the motor antenna extends up to the original position when the connection indicated by the broken line is released.
4. Check that the motor antenna retracts fully when the connection indicated by the one dot line is removed.



ANTENNA SWITCH CONTINUITY CHECK

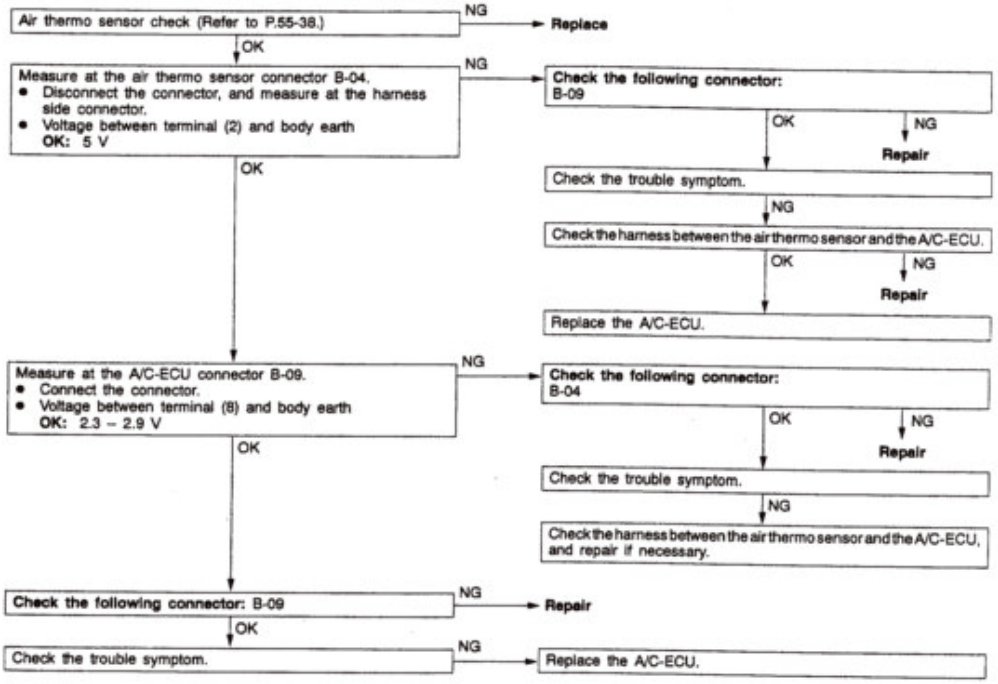
Switch position	Terminal No.				
	5	6	9		10
FULL				ILL	
HALF				ILL	



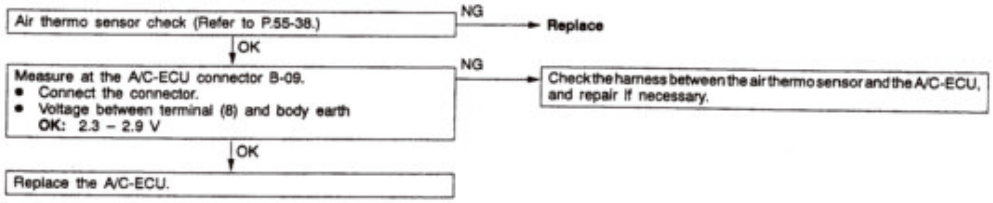
ANTENNA POLE REPLACEMENT

1. Set the antenna switch to OFF position.
2. Remove the ring nut.
3. After turning the ignition switch to ACC or ON, turn the radio switch to ON to raise the antenna pole, and remove it, together with the rack cable.

Code No.21 Air thermo sensor system (open circuit)	Probable cause
This diagnosis code is displayed when the air thermo sensor does not send any signals to the A/C-ECU due to open circuit in the power supply or input line of the air thermo sensor.	• Malfunction of connector • Malfunction of harness • Malfunction of the air thermo sensor • Malfunction of the A/C-ECU

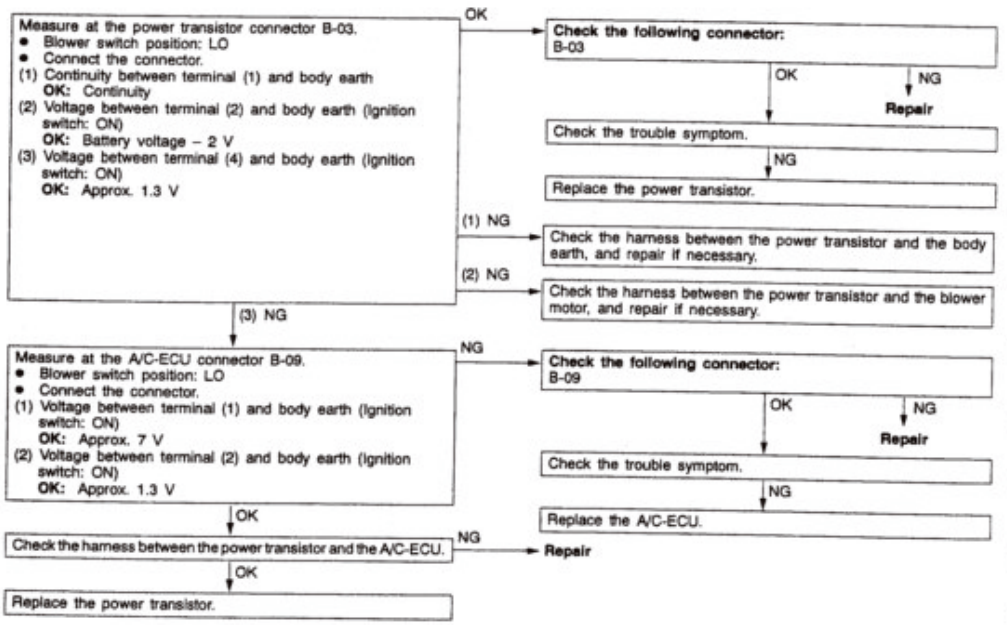


Code No.22 Air thermo sensor system (short circuit)	Probable cause
This diagnosis code is displayed when the air thermo sensor sends the power supply voltage to the A/C-ECU due to short circuit in the power supply and output lines of the air thermo sensor.	• Malfunction of harness • Malfunction of connector • Malfunction of the air thermo sensor • Malfunction of the A/C-ECU



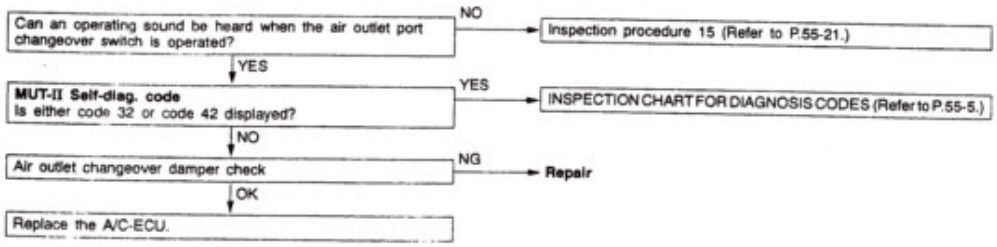
Inspection procedure 9

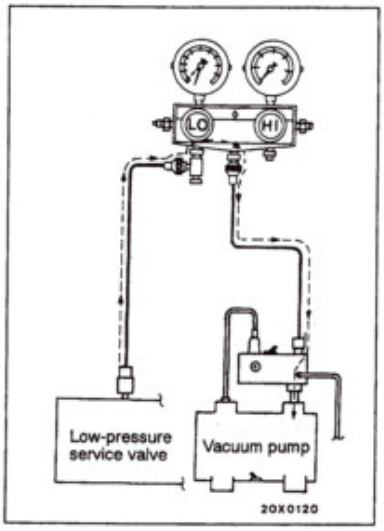
Blower air amount cannot be changed.	Probable cause
If the blower does not operate in any mode other than HI setting, the cause is probably a malfunction of the power transistor system.	• Malfunction of power transistor • Malfunction of connector or harness • Malfunction of A/C-ECU



Inspection procedure 10

Air outlet port cannot be changed.	Probable cause
The cause is probably a malfunction of the air outlet port changeover signal input system or output system. The MUT-II can be used to check the diagnosis codes in order to check the cause of the problem for each separate system.	• Malfunction of air outlet changeover damper motor potentiometer • Malfunction of air outlet changeover damper motor • Malfunction of air outlet changeover damper • Malfunction of connector or harness • Malfunction of A/C-ECU





12. Turn the vacuum pump adaptor switch to the R-134a side to start the vacuum pump.

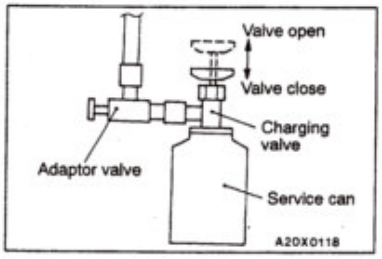
    Caution
    Do not operate the compressor for evacuation.

13. Evacuate to a vacuum reading of 100 kPa or higher (takes approx. 10 minutes).
14. Turn the vacuum pump adaptor switch OFF and allow to stand it for 5 minutes.

    Caution
    Do not operate the compressor in the vacuum condition; damage may occur.

15. Carry out a leak test. (Good if the negative pressure does not drop.)

    Caution
    If the negative pressure drops, increase the tightness of the connections, and then repeat the evacuation procedure from step (12).

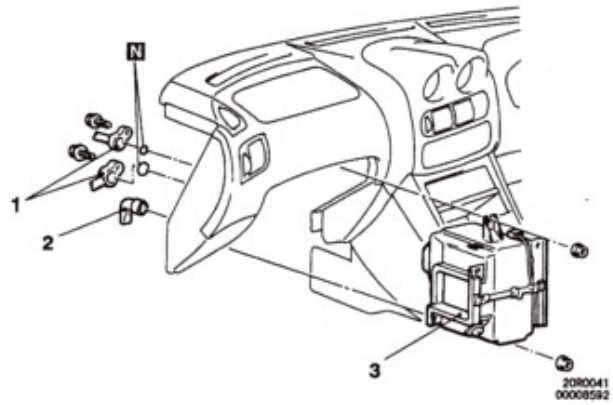


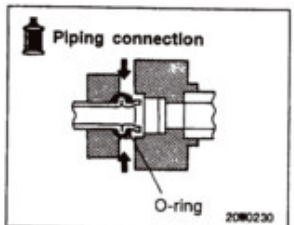
16. With the handle turned back all the way (valve open), install the charging valve to the service can.
17. Turn the handle of the adaptor valve back all the way (valve closed), remove it from the gauge manifold and install the service can.
18. Tighten the handle of the charging valve (valve closed) to puncture the service can.

EVAPORATOR

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Discharging and Charging of Refrigerant (Refer to P.55-27.)
- Glove Box and Glove Box Frame Removal and Installation (Refer to GROUP 52A – Instrument Panel.)
- Air Cleaner and Hose Removal and Installation (Refer to GROUP 15.)





Compressor oil: SUN PAG 56

Removal steps

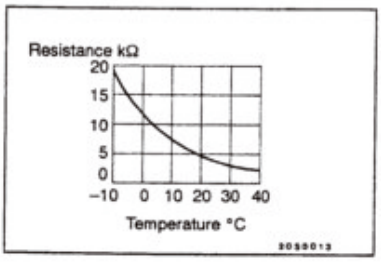
◀A▶ 1. Suction hose and liquid pipe connection
2. Drain hose
3. Evaporator

REMOVAL SERVICE POINT

◀A▶ SUCTION HOSE AND LIQUID PIPE DISCONNECTION

Plug the disconnected hose and the evaporator nipple not to let foreign matter get into them.

Caution
The compressor oil and receiver will absorb water vapour easily. Therefore, use a blank plug which isolates the air.



INSPECTION

AIR THERMO SENSOR

When the resistance value between the sensor terminals is measured under two or more temperature conditions, the resistance value should be close to the values shown in the graph.

NOTE
The temperature conditions when testing should not exceed the range of the characteristic curve in the graph.