

# CHASSIS ELECTRICAL

## CONTENTS

GENERAL .....	3	SPECIAL TOOL .....	13
BATTERY .....	3	TROUBLESHOOTING .....	13
SERVICE SPECIFICATION .....	3	IGNITION SWITCH AND IMMOBILIZER SYSTEM .....	19
ON-VEHICLE SERVICE .....	3	COMBINATION METERS .....	22
IGNITION SWITCH <EXCEPT EVOLUTION-VI WITH IMMOBILIZER SYSTEM> .....	6	SERVICE SPECIFICATIONS .....	22
SPECIAL TOOL .....	6	SEALANT .....	23
TROUBLESHOOTING .....	6	SPECIAL TOOLS .....	23
IGNITION SWITCH .....	11	TROUBLESHOOTING .....	24
IGNITION SWITCH AND IMMOBILIZER SYSTEM <EVOLUTION-VI WITH IMMOBILIZER SYSTEM> .....	13		

CONTINUED ON NEXT PAGE

### WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

#### WARNING!

- (1) The service personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.
- (2) When removing or installing the components indicated in the table of contents by an asterisk (\*), use utmost care so as not to apply any strong shock to SRS components.

#### NOTE

The SRS includes the following components: SRS-ECU, SRS warning lamp, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (\*).

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ON-VEHICLE SERVICE .....	27	SIDE TURN-SIGNAL LAMP .....	43
COMBINATION METERS .....	30	HAZARD WARNING LAMP SWITCH, CLOCK .....	44
HEADLAMP .....	32	SPECIAL TOOL .....	44
SERVICE SPECIFICATIONS .....	32	HAZARD WARNING LAMP SWITCH ....	44
SPECIAL TOOLS .....	32	RADIO AND TAPE PLAYER .....	45
TROUBLESHOOTING .....	33	TROUBLESHOOTING .....	45
ON-VEHICLE SERVICE .....	34	RADIO AND TAPE PLAYER .....	47
HEADLAMP AND FRONT TURN-SIGNAL LAMP* .....	36	SPEAKER .....	47
FRONT FOG LAMP .....	39	ANTENNA .....	48
SERVICE SPECIFICATIONS .....	39	POLE ANTENNA .....	48
ON-VEHICLE SERVICE .....	39	REAR WINDOW ANTENNA AND GLASS DIVERSITY ANTENNA .....	49
FOG LAMP .....	41	REAR WINDOW DEFOGGER .....	50
REAR COMBINATION LAMP* .....	42	TROUBLESHOOTING <VEHICLES WITH AUTOMATIC A/C> .....	50
TROUBLESHOOTING .....	42	ON-VEHICLE SERVICE .....	50
REAR COMBINATION LAMP* .....	42	REAR WINDOW DEFOGGER SWITCH <VEHICLES WITH AUTOMATIC A/C> ...	51
SIDE TURN-SIGNAL LAMP .....	43		
SPECIAL TOOL .....	43		

# GENERAL

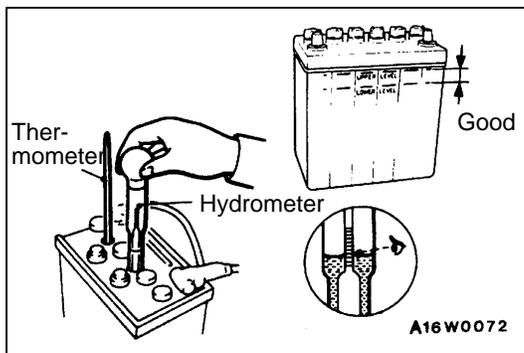
## Outline of Change

- The following service procedures have been incorporated.

# BATTERY

## SERVICE SPECIFICATION

Item	Specification
Specific gravity of the battery fluid	1.220–1.290 [20°C]



## ON-VEHICLE SERVICE

### FLUID LEVEL AND SPECIFIC GRAVITY CHECK

- Inspect whether or not the battery fluid is between the UPPER LEVEL and LOWER LEVEL marks.
- Use a hydrometer and thermometer to check the specific gravity of the battery fluid.

**Standard value: 1.220–1.290 [20°C]**

The specific gravity of the battery fluid varies with the temperature, so use the following formula to calculate the specific gravity for 20°C. Use the calculated value to determine whether or not the specific gravity is satisfactory.

$$D_{20} = Dt + 0.0007 (t - 20)$$

**$D_{20}$ :** Specific gravity of the battery fluid calculated for 20°C.

**Dt:** Actually measured specific gravity

**t:** Actually measured temperature

**CHARGING**

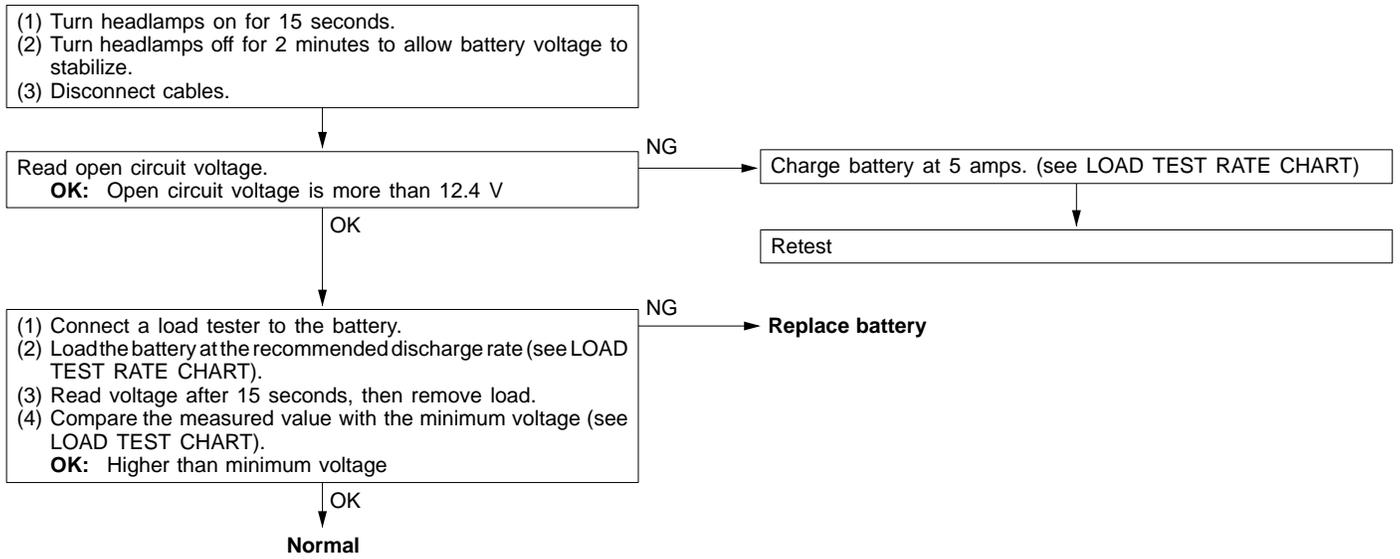
1. When charging a battery while still installed in the vehicle, disconnect the battery cables to prevent damage to electrical parts.
2. The current normally used for charging a battery should be approximately 1/10th of the battery capacity.
3. When performing a quick-charging due to lack of time, etc., the charging current should never exceed the battery capacity as indicated in amperes.
4. Determining if charging is completed.
  - (1) If the specific gravity of the battery fluid reaches 1.250–1.290 and remains constant for at least one hour.
  - (2) If the voltage of each cell reaches 2.5–2.8 V and remains constant for at least one hour.

**Caution**

1. **Be careful since the battery fluid level may rise during charging.**
2. **Keep all sources of fire away while charging because there is a danger of explosion.**
3. **Be careful not to do anything that could generate sparks while charging.**
4. **When charging is completed, replace the battery caps, pour clean water over the battery to remove any sulfuric acid and dry.**

**BATTERY TESTING PROCEDURE**

**TEST STEP**



**LOAD TEST RATE CHART**

Battery type	28B19L	34B19L	44B20L	95D31L	55D23L	55B24L
Charging time when fully discharged h [5-amp rated current charging]	5	6	7	13	10	8
Load test (Amps)	120	130	160	310	170	170

**LOAD TEST CHART**

Temperature °C	21 and above	16 to 20	10 to 15	4 to 9	-1 to 3	-7 to -2	-12 to -8	-18 to -13
Minimum voltage V	9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

# IGNITION SWITCH <EXCEPT EVOLUTION-VI WITH IMMOBILIZER SYSTEM>

## SPECIAL TOOL

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	ETACS-ECU input signal checking

## TROUBLESHOOTING

### DIAGNOSIS FUNCTION

#### INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

Refer to Group 00 – How to Use Troubleshooting / Inspection Service Points.

## INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptoms		Inspection procedure	Reference page
Communication with MUT-II is impossible.	Key hole illumination lamp remains illuminated.	1	54-7
	Even if driver's side door is opened, key hole illumination lamp does not illuminate.	2	54-7
	While key hole illumination lamp is illuminated, ignition key is turned to the ON position but key hole illumination lamp does not switch off. (However, it switch off after 10 seconds.)	3	54-8
Key reminder warning buzzer system	While the key reminder warning buzzer is sounding, the ignition key is turned to the ON position but the sound dose not stop. (However, it stops when the driver's side door is closed.)	3	54-8
	The key reminder warning buzzer dose not stop sounding even if the key is removed. (However, it stops when the driver's side door is closed.)	4	54-9
	The key reminder warning buzzer does 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.)	5	54-10

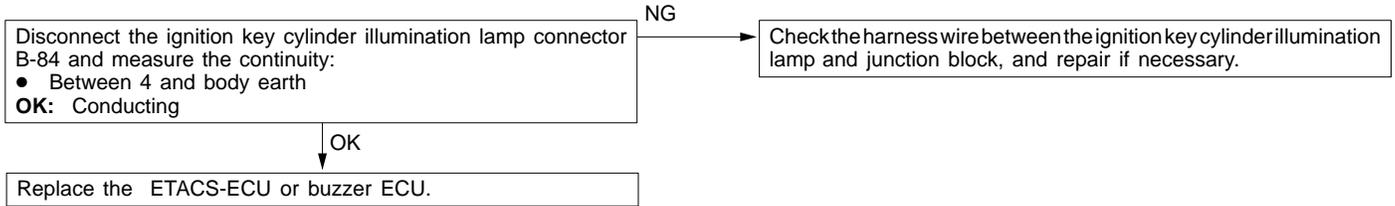
### NOTE

If every input signal can not be checked with the MUT-II, a diagnosis circuit system failure is probably the cause. <Vehicles with ETACS-ECU>

**INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**

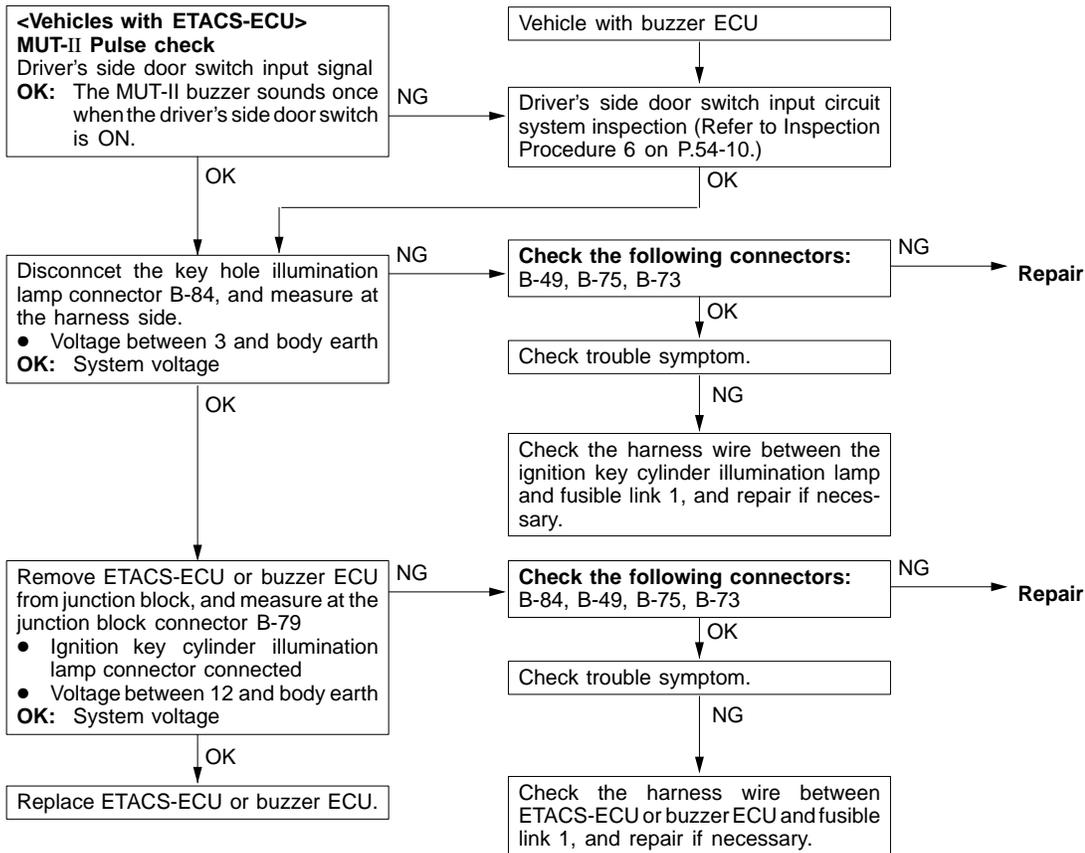
**Inspection Procedure 1**

Key hole illumination lamp remains illuminated.	Probable cause
The cause is probably a harness short or a defective ETACS-ECU or buzzer ECU.	<ul style="list-style-type: none"> <li>• Malfunction of harness wire</li> <li>• Malfunction of ETACS-ECU</li> <li>• Malfunction of buzzer ECU</li> </ul>



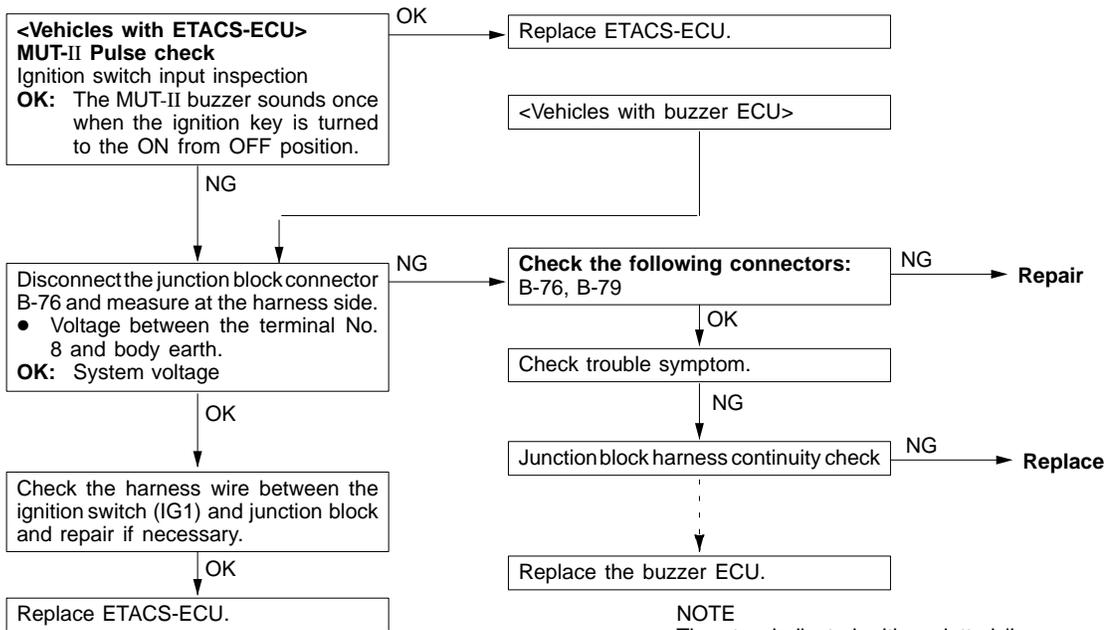
**Inspection Procedure 2**

Even if driver's side door is opened, key hole illumination lamp does not illuminate.	Probable cause
The cause is probably a defective key hole illumination lamp circuit system, or a defective driver's side door switch input circuit system if the ignition key reminder warning buzzer is also faulty.	<ul style="list-style-type: none"> <li>• Malfunction of driver's side door switch</li> <li>• Malfunction of bulb</li> <li>• Malfunction of connector</li> <li>• Malfunction of harness wire</li> <li>• Malfunction of ETACS-ECU</li> <li>• Malfunction of buzzer ECU</li> </ul>



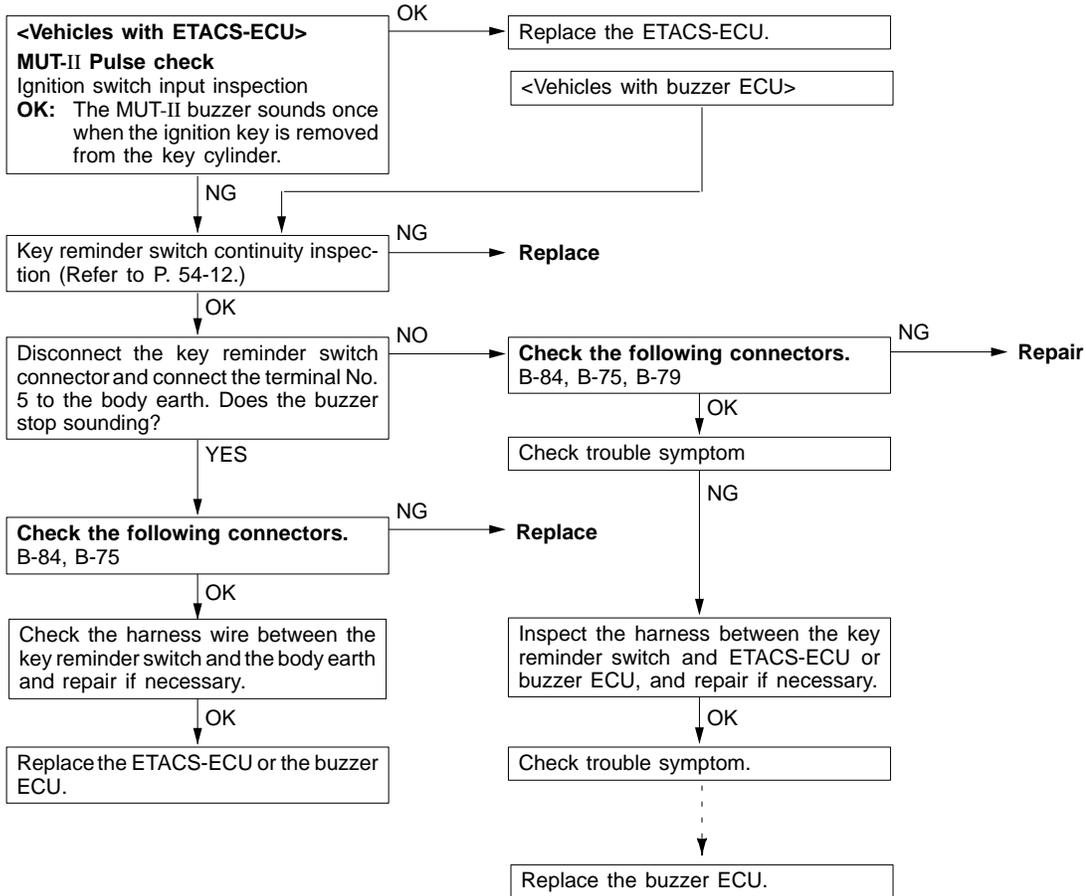
Inspection Procedure 3

<p><b>While key hole illumination lamp is illuminated, ignition key is turned to the ON position but key hole illumination lamp does not switch off. (However, it switch off after 15 seconds.)</b></p>	<p><b>Probable cause</b></p>
<p><b>While the key reminder warning buzzer is sounding, the ignition key is turned to the ON position but the sound dose not stop. (However, it stops when the driver’s side door is closed.)</b></p>	
<p>The cause is probably a malfunction of the ignition switch input circuit, ETACS-ECU or buzzer ECU. Furthermore, if there is a malfunction of a multipurpose fuse, the cause may also be a short circuit in a harness.</p>	<ul style="list-style-type: none"> <li>● Malfunction of fuse</li> <li>● Malfunction of connector</li> <li>● Malfunction of harness</li> <li>● Malfunction of ETACS-ECU</li> <li>● Malfunction of buzzer ECU</li> </ul>



Inspection Procedure 4

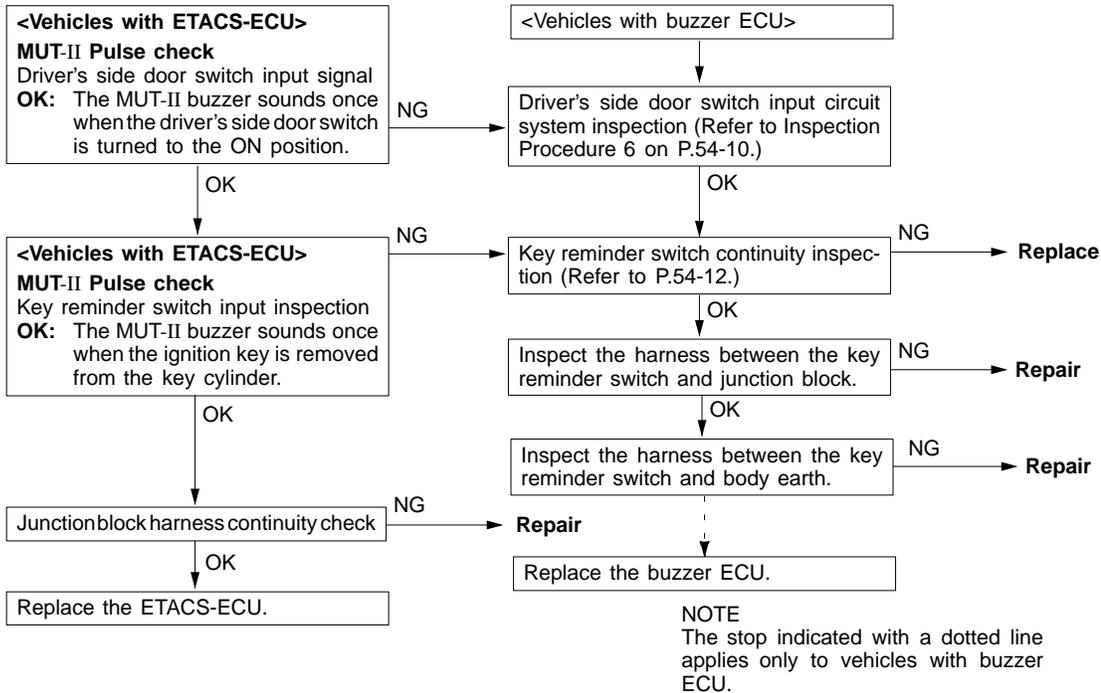
The key reminder warning buzzer dose not stop sounding even if the key is removed. (However, it stops when the driver’s side door is closed.)	Probable cause
The cause is probably a malfunction of the key reminder switch input circuit system, or a malfunction of ETACS-ECU, or a malfunction of buzzer ECU.	<ul style="list-style-type: none"> <li>● Malfunction of key reminder switch</li> <li>● Malfunction of connector</li> <li>● Malfunction of harness</li> <li>● Malfunction of ETACS-ECU</li> <li>● Malfunction of buzzer ECU</li> </ul>



NOTE  
The stop indicated with a dotted line applies only to vehicles with buzzer ECU.

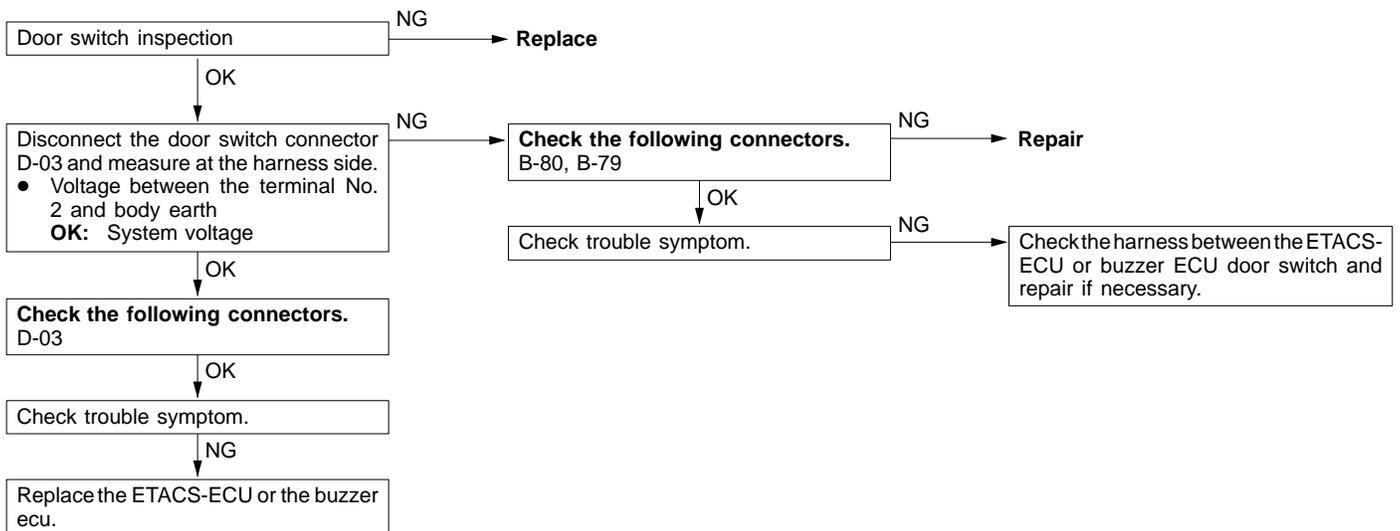
Inspection Procedure 5

The key reminder warning buzzer dose not sound even 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, if the key hole illumination lamp is also faulty. A malfunction of the key reminder switch input circuit system is also suspected.	<ul style="list-style-type: none"> <li>● Malfunction of door switch</li> <li>● Malfunction of key reminder switch</li> <li>● Malfunction of connector</li> <li>● Malfunction of harness</li> <li>● Malfunction of ETACS-ECU</li> <li>● Malfunction of buzzer ECU</li> </ul>



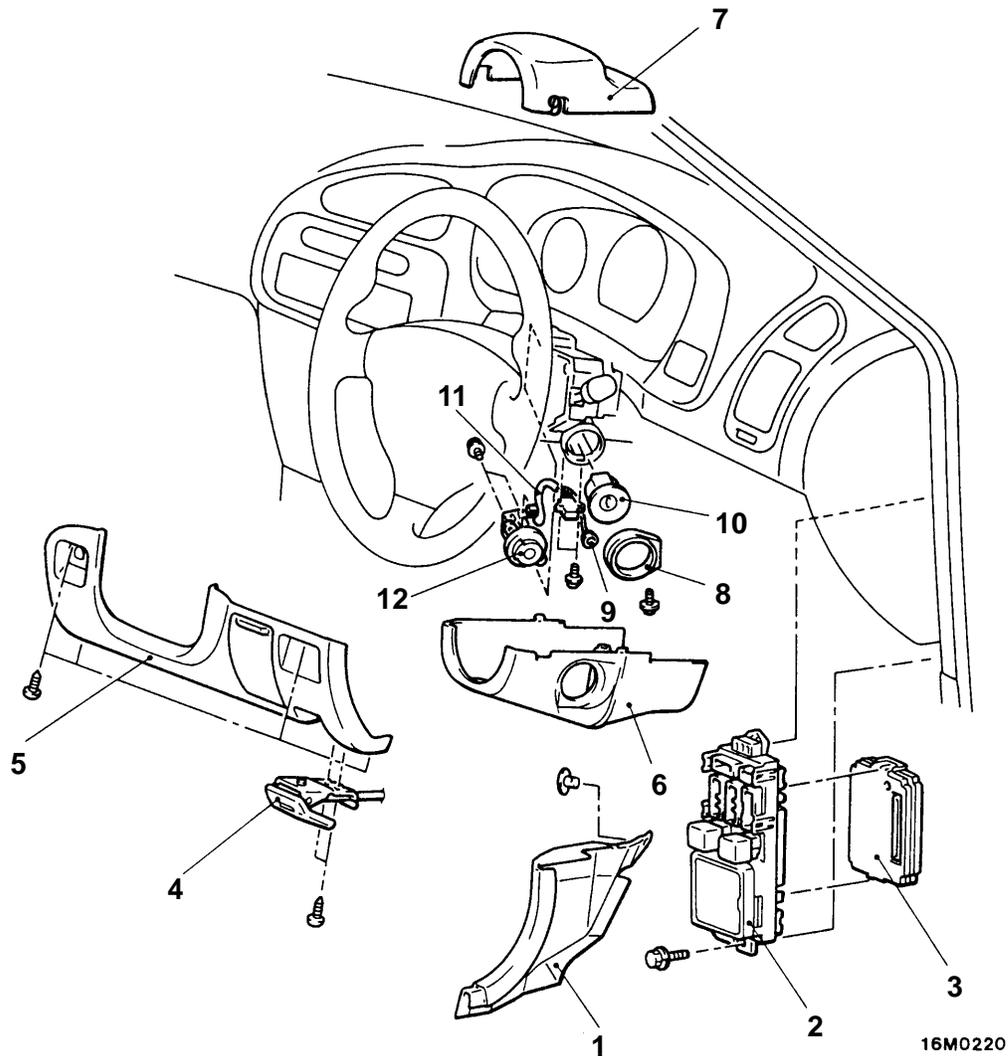
Inspection Procedure 6

Driver’s side door switch input circuit system inspection



# IGNITION SWITCH

## REMOVAL AND INSTALLATION



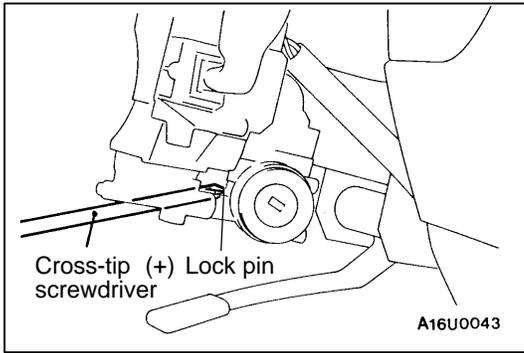
### ETACS-ECU or buzzer ECU removal steps

1. Cowl side trim (R.H.)
2. Junction block
3. Buzzer control unit ETACS-ECU

### Ignition switch removal steps

4. Hood lock release handle
5. Driver side lower panel
6. Column cover, lower
7. Column cover, upper
8. Illumination ring or ring cover
9. Key hole illumination lamp bulb
10. Steering lock cylinder
11. Key reminder switch
12. Ignition switch

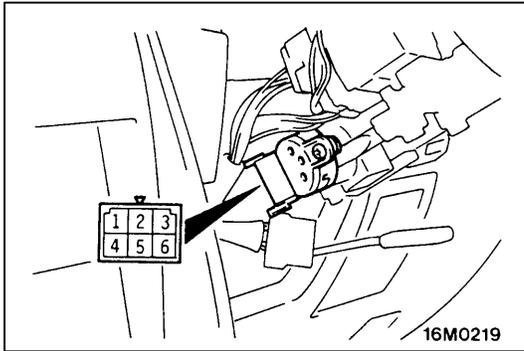




**REMOVAL SERVICE POINT**

**◀A▶ STEERING LOCK CYLINDER REMOVAL**

1. Insert the key in the steering lock cylinder and turn it to the “ACC” position.
2. Using a cross-tip (+) screwdriver (small) or a similar tool, push the lock pin of the steering lock cylinder inward and then remove the steering lock cylinder.

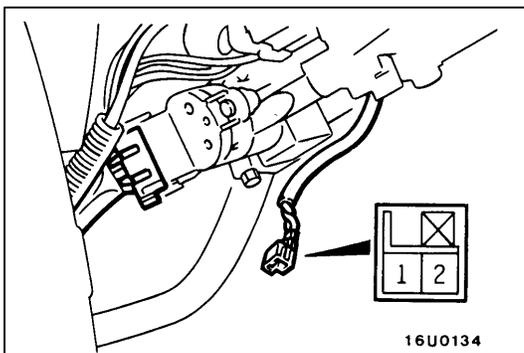


**INSPECTION**

**IGNITION SWITCH CONTINUITY CHECK**

Disconnect the ignition switch connector without removing the ignition switch from the vehicle. Then, check the continuity between the following terminals.

Ignition key position	Terminal No.					
	1	2	3	4	5	6
LOCK						
ACC	○					○
ON	○	○		○		○
START	○	○	○		○	



**KEY REMINDER SWITCH CONTINUITY CHECK**

Disconnect the key reminder switch connector with the switch installed on the vehicle, and then check continuity.

Ignition key	Terminal No.	
	1	2
Removed	○	○
Inserted		

# IGNITION SWITCH AND IMMOBILIZER SYSTEM <EVOLUTION-VI WITH IMMOBILIZER SYSTEM>

## SPECIAL TOOL

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	<ul style="list-style-type: none"> <li>• Immobilizer system check (Diagnosis display using the MUT-II)</li> <li>• Registration of the ID code</li> </ul>

## TROUBLESHOOTING

### Caution

The ID code should always be re-registered when replacing the immobilizer-ECU.

### STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

Refer to GROUP 00 – How To Use Troubleshooting/Inspection Service Points.

### DIAGNOSIS FUNCTION

#### DIAGNOSIS CODES CHECK

Refer to GROUP 00 – How To Use Troubleshooting/Inspection Service Points.

#### ERASING DIAGNOSIS CODES

Refer to GROUP 00 – How To Use Troubleshooting/Inspection Service Points.

### Caution

The diagnosis codes which result from disconnecting the battery cables cannot be erased.

## INSPECTION CHART FOR DIAGNOSIS CODES

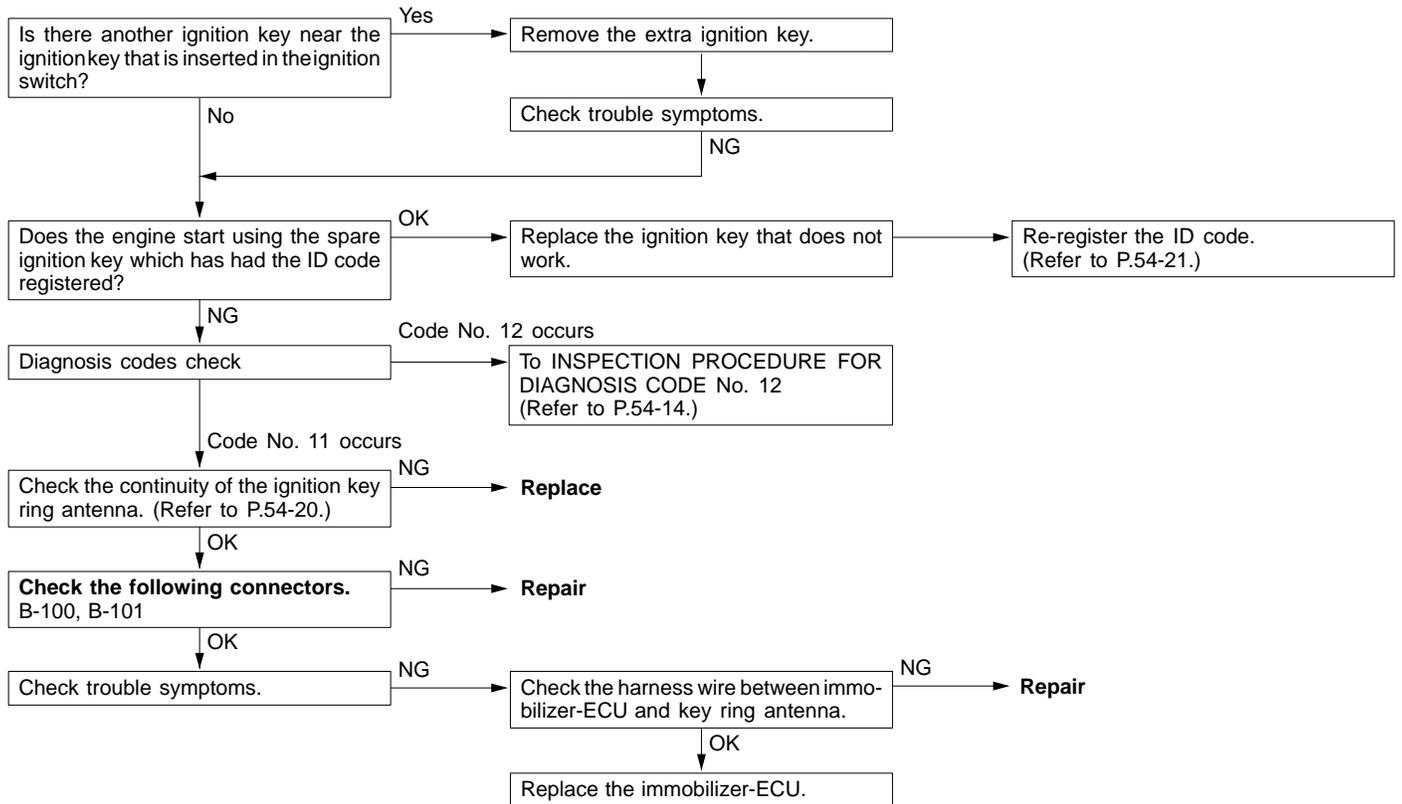
Diagnosis code No.	Inspection items	Reference page
11	Transponder communication system	54-14
12*	ID code are not the same or are not registered	54-14
21	Communication system between MUT-II and engine-ECU	54-15
31	EEPROM abnormality inside immobilizer-ECU	54-15

### NOTE

\*: Diagnosis code No. 12 is not recorded.

## INSPECTION PROCEDURE FOR DIAGNOSIS CODES

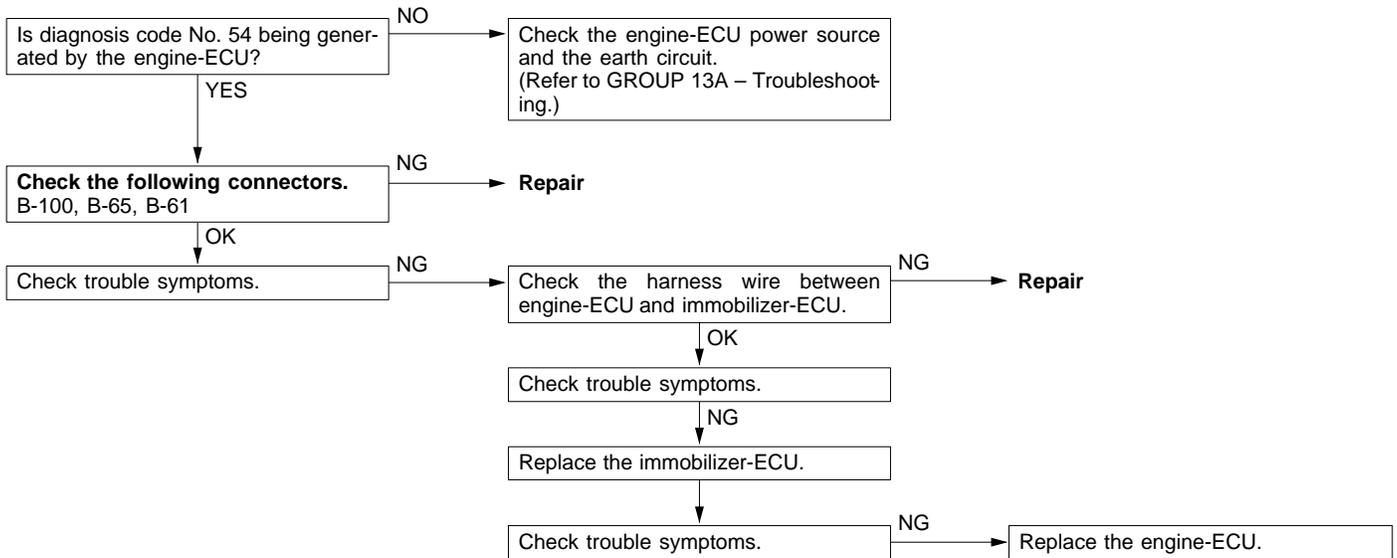
Code No. 11 Transponder communication system	Probable cause
<ul style="list-style-type: none"> <li>The ID code of the transponder is not sent to the immobilizer-ECU immediately after the ignition switch is turned to the ON position.</li> <li>When starting the engine, one ignition key's ID code interferes with another ignition key's code.</li> </ul>	<ul style="list-style-type: none"> <li>Radio interference of ID codes</li> <li>Malfunction of the transponder</li> <li>Malfunction of the ignition key ring antenna</li> <li>Malfunction of harness or connector</li> <li>Malfunction of the immobilizer-ECU</li> </ul>



Code No. 12 ID code are not the same or are not registered	Probable cause
The ID code which is sent from the transponder is not the same as the ID code which is registered in the immobilizer-ECU.	<ul style="list-style-type: none"> <li>The ID code in the ignition key being used has not been properly registered.</li> <li>Malfunction of the immobilizer-ECU</li> </ul>



Code No. 21 Communication system between MUT-II and engine-ECU	Probable cause
After the ignition switch is turned to the ON position, the confirmation code is not received from the engine-ECU within the allowable time, or an abnormal code is received.	<ul style="list-style-type: none"> <li>• Malfunction of harness or connector</li> <li>• Malfunction of the engine-ECU</li> <li>• Malfunction of the immobilizer-ECU</li> </ul>



Code No. 31 EEPROM abnormality inside immobilizer-ECU	Probable cause
No data has been written to the EEPROM inside the immobilizer-ECU.	<ul style="list-style-type: none"> <li>• Malfunction of the immobilizer-ECU</li> </ul>



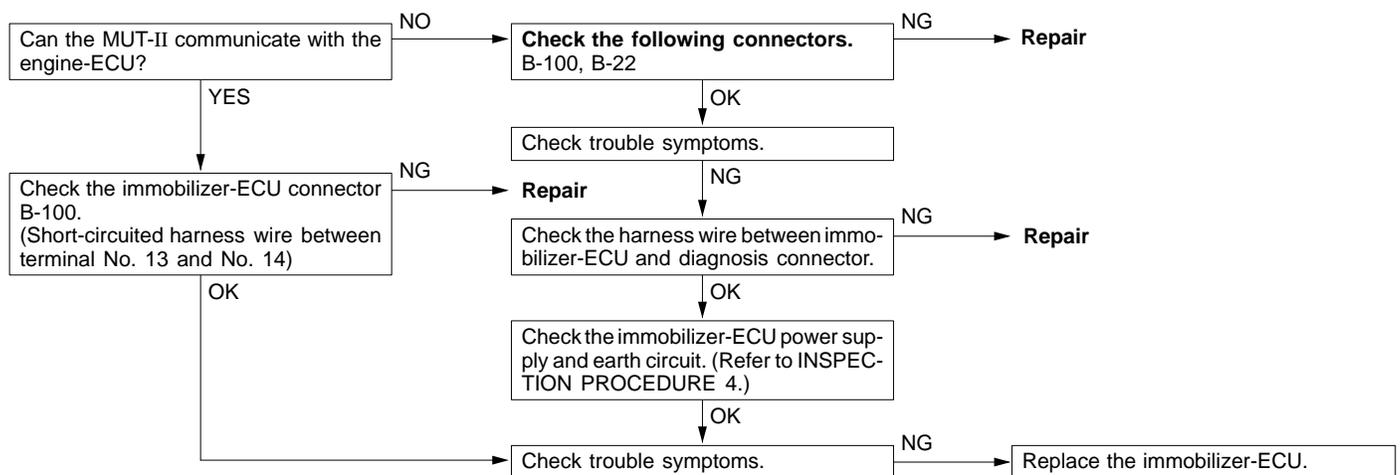
## INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	1	54-16
ID code cannot be registered using the MUT-II.	2	54-17
Engine does not start (Cranking but no initial combustion).	3	54-17
Malfunction of the immobilizer-ECU power source and earth circuit	4	54-18

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

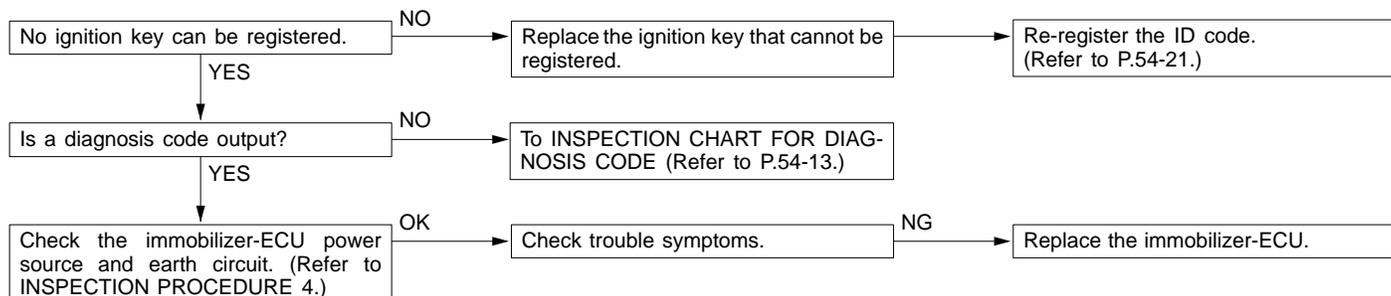
### Inspection Procedure 1

Communication with MUT-II is impossible.	Probable cause
The cause is probably that a malfunction of the diagnosis line or the immobilizer-ECU is not functioning.	<ul style="list-style-type: none"> <li>• Malfunction of the diagnosis line</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of the immobilizer-ECU</li> </ul>



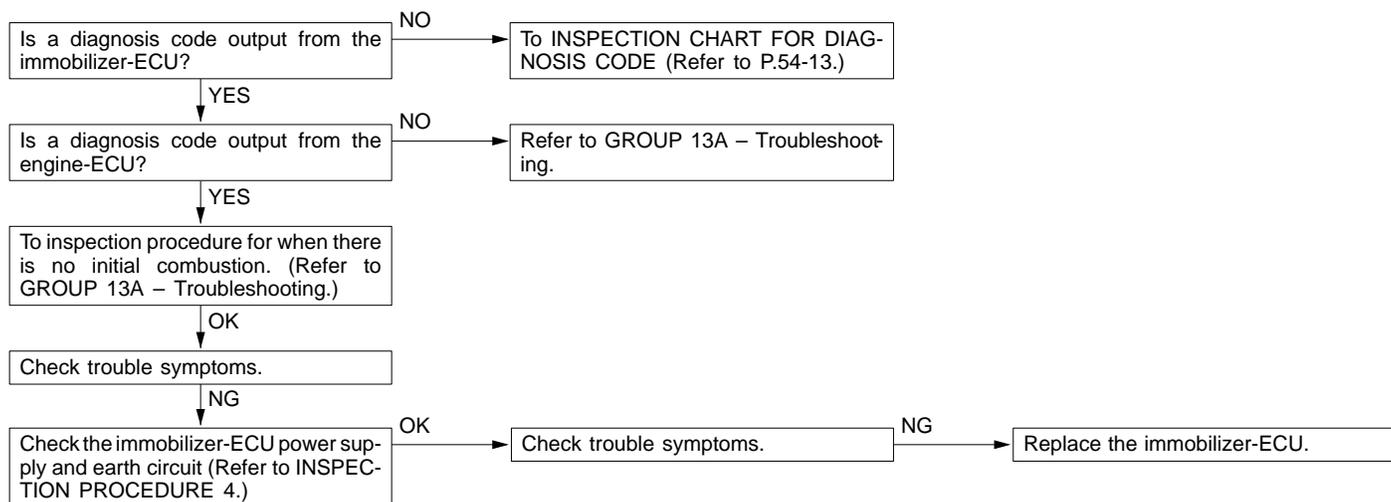
**Inspection Procedure 2**

ID code cannot be registered using the MUT-II.	Probable cause
The cause is probably that there is no ID code registered in the immobilizer-ECU, or there is a malfunction of the immobilizer-ECU.	<ul style="list-style-type: none"> <li>● Malfunction of the transponder</li> <li>● Malfunction of the ignition key ring antenna</li> <li>● Malfunction of harness or connector</li> <li>● Malfunction of the immobilizer-ECU</li> </ul>



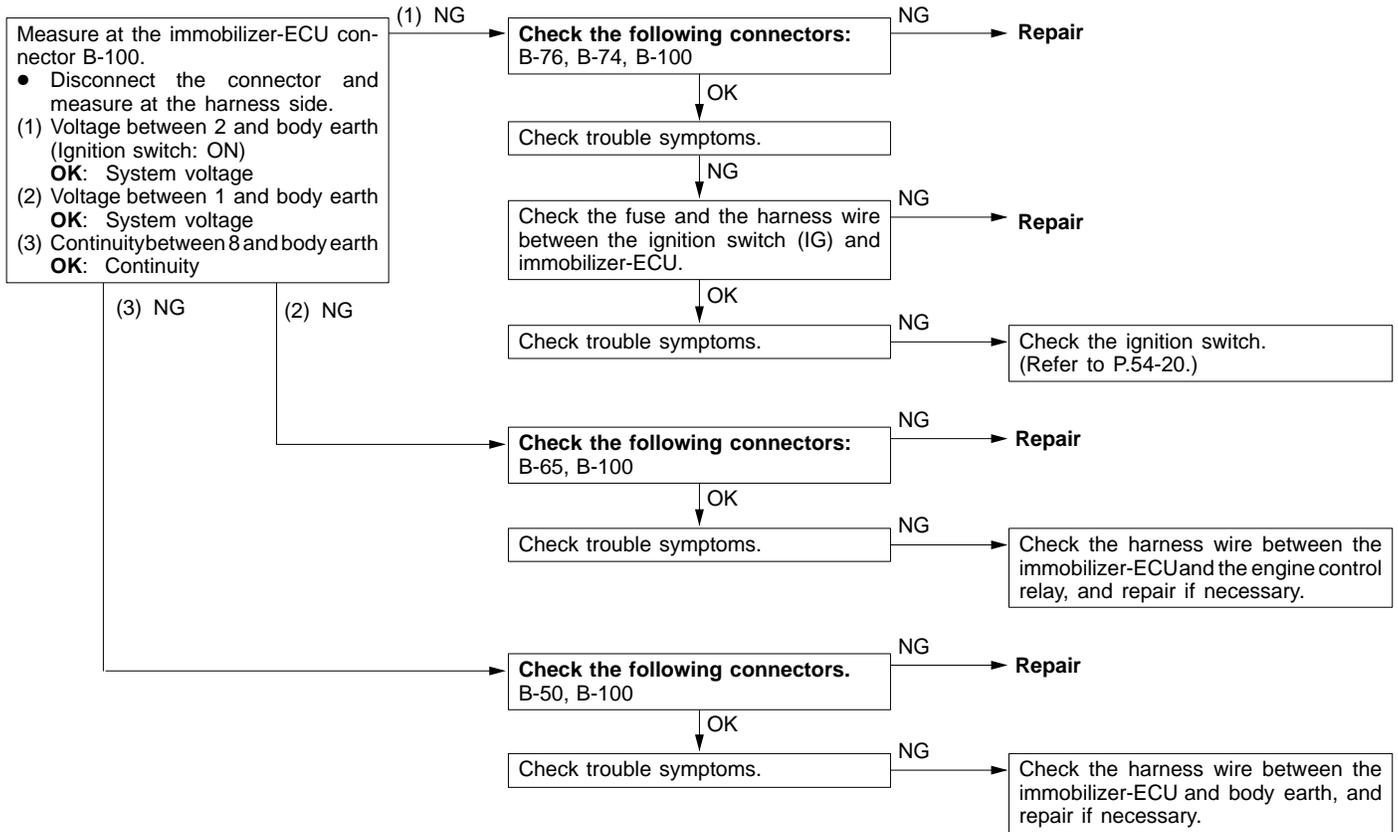
**Inspection Procedure 3**

Engine does not start (cranking but no initial combustion).	Probable cause
If the fuel injectors are not operating, there might be a problem with the MPI system in addition to a malfunction of the immobilizer system. It is normal for this to occur if an attempt is made to start the engine using a key that has not been properly registered.	<ul style="list-style-type: none"> <li>● Malfunction of the MPI system</li> <li>● Malfunction of the immobilizer-ECU</li> </ul>

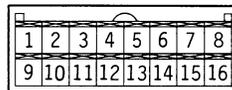


## Inspection Procedure 4

### Malfunction of the immobilizer-ECU power supply and earth circuit



### CHECK AT IMMOBILIZER-ECU TERMINAL VOLTAGE CHECK CHART



16W0390

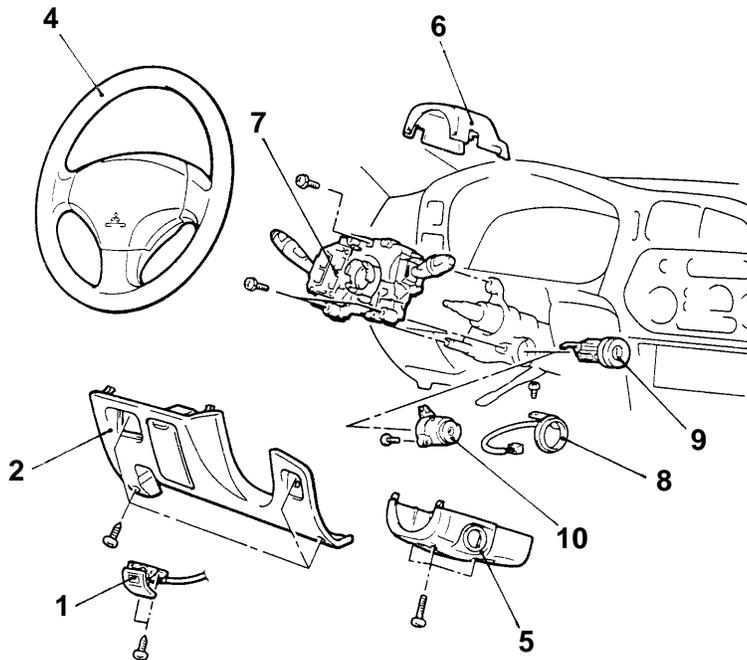
Terminal No.	Signal	Checking requirements	Terminal voltage
1	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
2	Ignition switch-IG	Ignition switch: OFF	0V
		Ignition switch: ON	System voltage
8	Immobilizer-ECU earth	Always	0V

## IGNITION SWITCH AND IMMOBILIZER SYSTEM

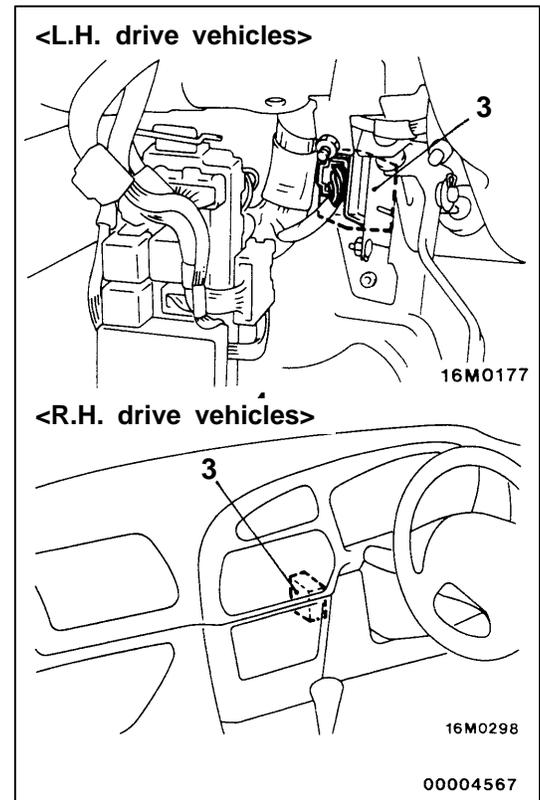
### Caution: SRS

Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

### REMOVAL AND INSTALLATION



16M0283



00004567

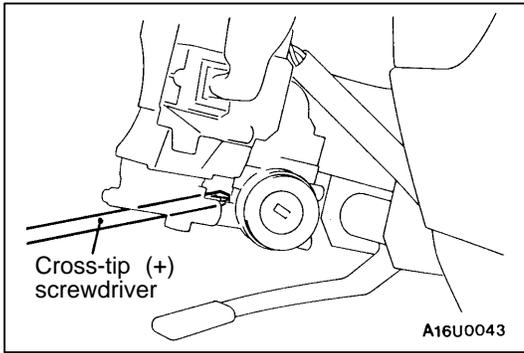
#### Immobilizer-ECU removal steps

1. Hood lock release handle
2. Driver's side lower cover
  - Radio and tape player <R.H. drive vehicles>
  - Heater control assembly <R.H. drive vehicles>
3. Immobilizer-ECU



#### Ignition switch and ignition key ring antenna removal steps

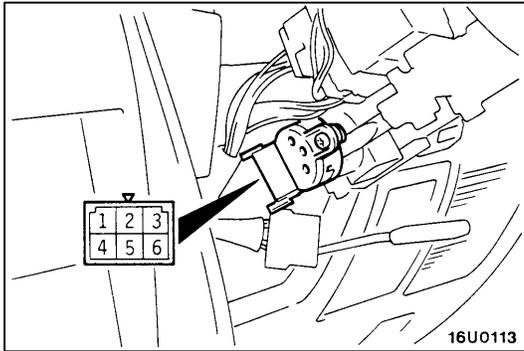
1. Hood lock release handle
2. Driver's side lower cover
4. Steering wheel
5. Column cover, lower
6. Column cover, upper
7. Column switch
8. Ignition key ring antenna
9. Steering lock cylinder
10. Ignition switch



**REMOVAL SERVICE POINTS**

**◀A▶ STEERING LOCK CYLINDER REMOVAL**

1. Insert the key in the steering lock cylinder and turn it to the “ACC” position.
2. Using a cross-tip (+) screwdriver (small) or a similar tool, push the lock pin of the steering lock cylinder inward and then pull the steering lock cylinder toward you.

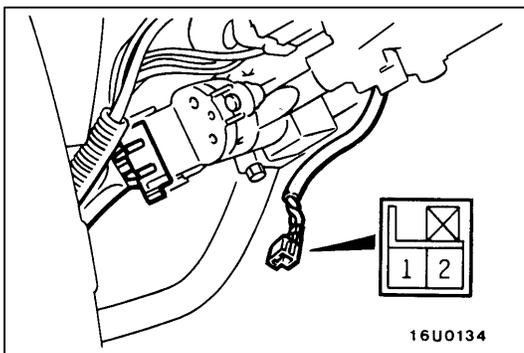


**INSPECTION**

**IGNITION SWITCH CONTINUITY CHECK**

1. Remove the column cover lower and upper.
2. Disconnect the wiring connector from the ignition switch.
3. Operate the switch, and check the continuity between the terminals.

Ignition key position	Terminal No.				
	1	2	3	5	6
LOCK					
ACC		○	—	○	
ON	○	○	○	○	
START		○	○	—	○



**IGNITION KEY RING ANTENNA CONTINUITY CHECK**

Use a circuit tester to check the continuity between the terminals.

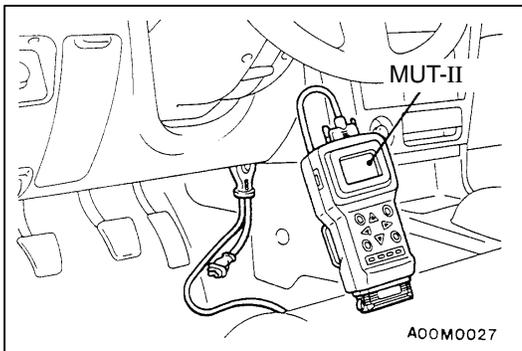
## ID CODE REGISTRATION METHOD

If using an ignition key that has just been newly purchased, or if the immobilizer-ECU has been replaced, you will need to register the ID codes for each ignition key being used into the immobilizer-ECU. (A maximum of eight different ID codes can be registered.)

Moreover, when the immobilizer-ECU has been replaced, you will need to use the MUT-II to register the password that the user specifies into the immobilizer-ECU. (Refer to the MUT-II instruction manual for instructions on using the MUT-II.)

### Caution

**If registering of the ID codes is carried out all previously-registered codes will be erased. Accordingly, you should have ready all of the ignition keys that have already been registered.**



1. Connect the MUT-II to the diagnosis connector.

### Caution

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

2. Check that the diagnosis code No.54 is not displayed for MPI system. If the code is displayed, carry out troubleshooting before proceeding to the next step. (Refer to GROUP 13A – Troubleshooting).
3. Use the ignition key that is to be registered to turn the ignition switch to the ON position.
4. Use the MUT-II to register the ID code. If you are registering two or more codes, use the next key to be registered to turn the ignition switch to the ON position without disconnecting the MUT-II.
5. Disconnect the MUT-II. This completes the registration operation.
6. Check that the engine can be started by each one of the ignition keys.
7. Check that the diagnosis code No.54 is not displayed for MPI system. If the code is displayed, erase it. (Refer to GROUP 13A – Troubleshooting).

# COMBINATION METERS

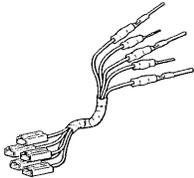
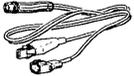
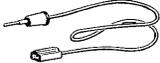
## SERVICE SPECIFICATIONS

Items			Standard value	Limit
Speedometer	Allowable indication range km/h (Speedometer indication error to be with -6% to +10%)	40	37 – 45	–
		80	75 – 88	–
		120	113 – 132	–
		160	150 – 176	–
	Pointer fluctuation km/h (at vehicle speeds of higher than 35 km/h)		–	±3
Tachometer indication error r/min	700	All types of tachometer	± 100	–
	3,000	Meters measurable up to 6,000 rpm and meters measurable up to 8,000 rpm	+ 150	–
		Meters measurable up to 9,000 rpm and meters measurable up to 10,000 rpm	+ 225 – 100	–
	4,750	Meters measurable up to 6,000 rpm	± 160	–
	5,000	Meters measurable up to 8,000 rpm	± 250	–
		Meters measurable up to 9,000 rpm and meters measurable up to 10,000 rpm	+ 325 – 125	–
	6,000	Meters measurable up to 8,000 rpm	± 300	–
	7,000	Meters measurable up to 9,000 rpm and meters measurable up to 10,000 rpm	+ 400 – 100	–
	8,000	Meters measurable up to 10,000 rpm	+ 400 – 0	–
Fuel gauge unit resistance $\Omega$	Main tank	Float point F	$1.8 \pm 1.2$	–
		Float point E	$65.2 \pm 4$	–
	Sub tank	Float point F	$1.2 \pm 0.8$	–
		Float point E	$44.8 \pm 3$	–
Fuel gauge unit float height mm	Main tank	Float point F	16.4	–
		Float point E	122.6	–
	Sub tank	Float point F	17.5	–
		Float point E	134.6	–
Engine coolant temperature gauge unit resistance (at 70 °C) $\Omega$			$104 \pm 13.5$	–
Fuel gauge resistance $\Omega$	Power supply and earth		$192 \pm 19.2$	–
	Power supply and fuel gauge		$89 \pm 8.9$	–
	Fuel gauge and earth		$103 \pm 10.3$	–
Engine coolant temperature gauge resistance $\Omega$	Power supply and earth		$187 \pm 18.7$	–
	Power supply and engine coolant temperature gauge		$90 \pm 4.5$	–
	Engine coolant temperature gauge and earth		$247 \pm 24.7$	–

## SEALANT

Items	Specified sealant	Remark
Engine coolant temperature gauge unit threaded portion	3M Adhesive nut locking No. 4171 or equivalent	Drying sealant

## SPECIAL TOOLS

Tool	Number	Name	Use
<p><b>A</b></p>  <p><b>B</b></p>  <p><b>C</b></p>  <p><b>D</b></p> 	<p>MB991223</p> <p>A: MB991219</p> <p>B: MB991220</p> <p>C: MB991221</p> <p>D: MB991222</p>	<p>Harness set</p> <p>A: Test harness</p> <p>B: LED harness</p> <p>C: LED harness adapter</p> <p>D: Probe</p>	<p>Fuel gauge simple check</p> <p>A: Connector pin contact pressure check</p> <p>B, C: Power circuit check</p> <p>D: Commercial tester connection</p>

# TROUBLESHOOTING

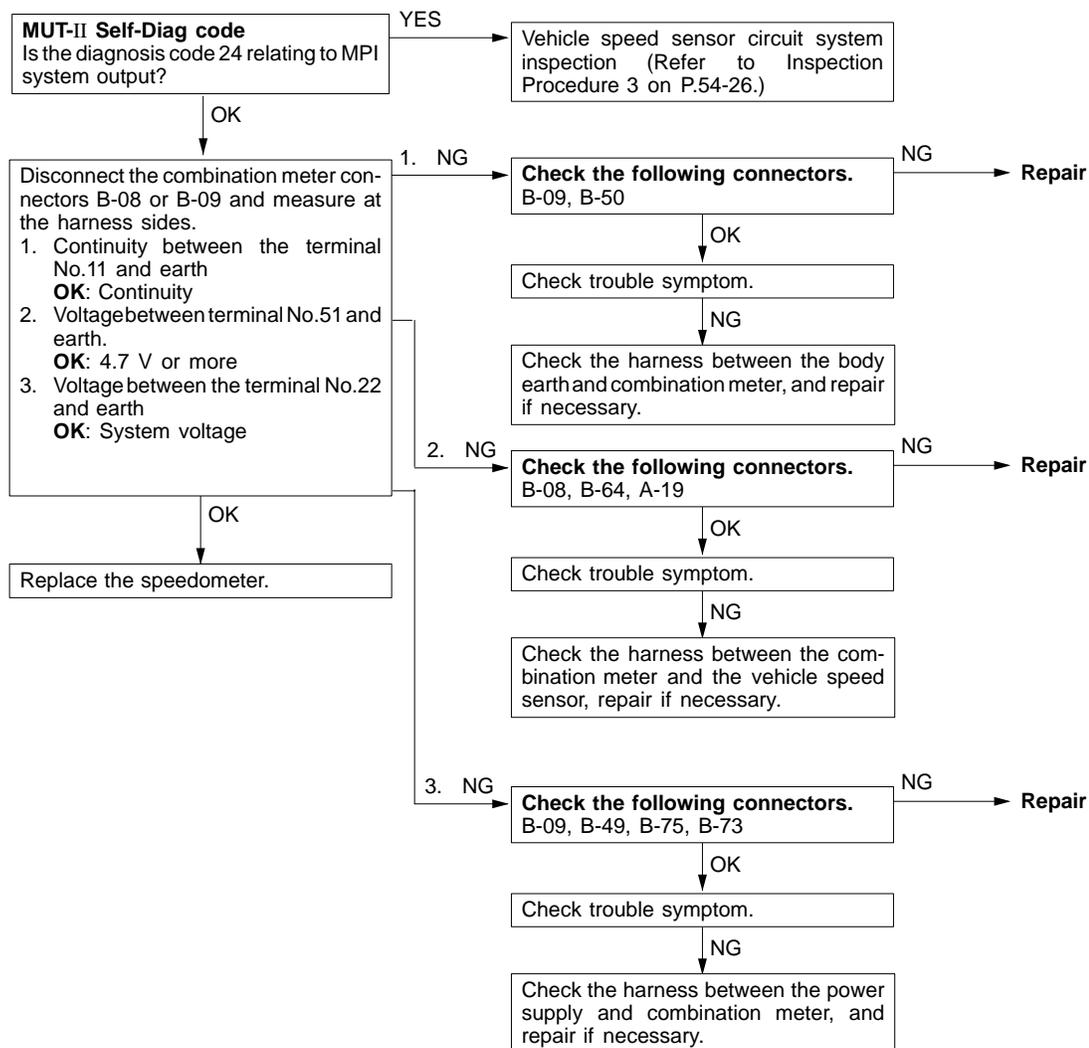
## INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Speedometer does not work.	1	54-24
Tachometer does not work.	2	54-25

## INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

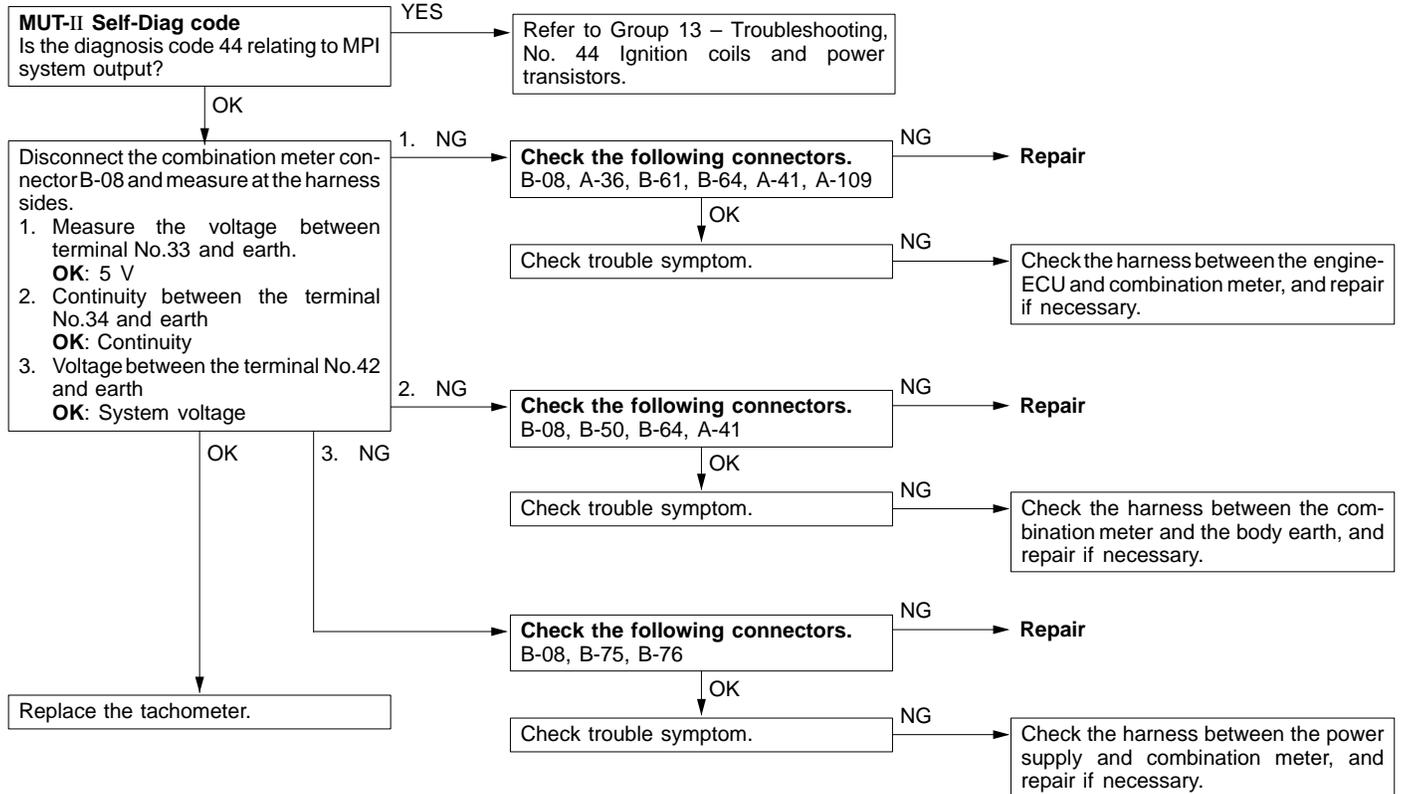
### Inspection Procedure 1

Speedometer does not work.	Probable cause
Examine the diagnosis codes registered in the engine-ECU. If no wheel speed sensor-relating diagnosis code has been output, the wheel speed sensors are in order.	<ul style="list-style-type: none"> <li>• Malfunction of vehicle speed sensor</li> <li>• Malfunction of speedometer</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction of relevant ECU</li> </ul>



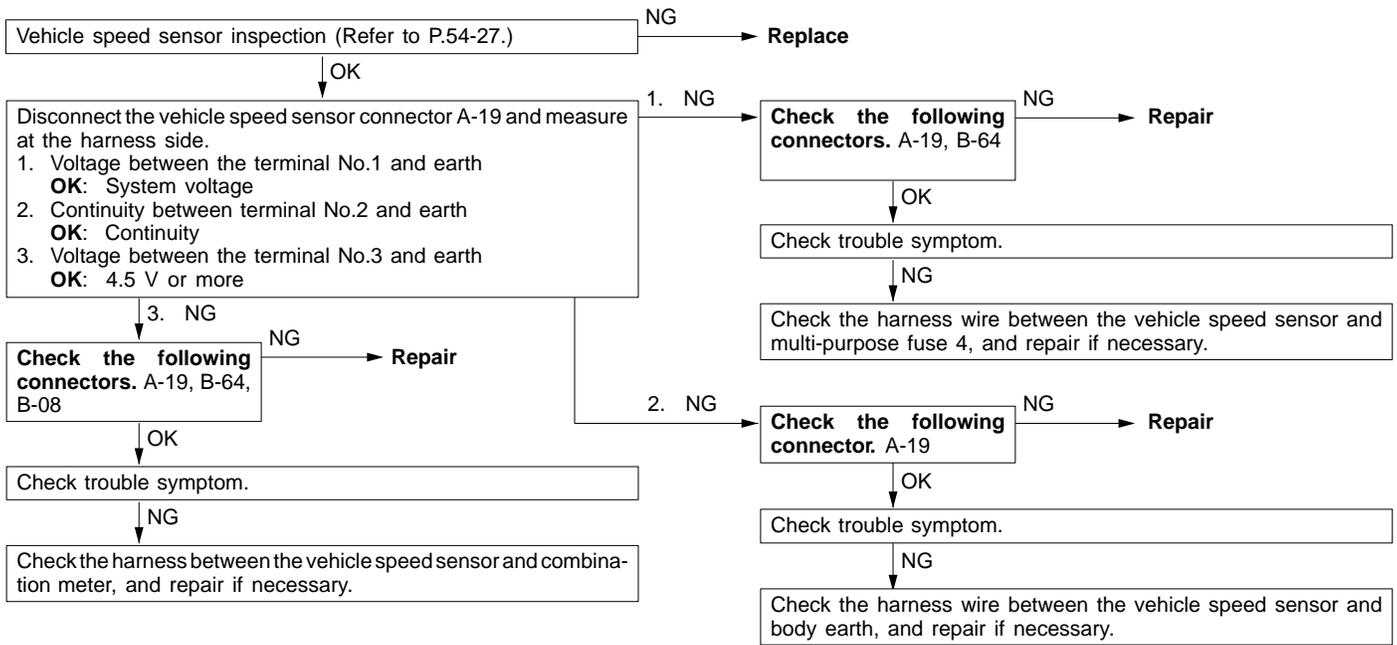
Inspection Procedure 2

Tachometer does not work.	Probable cause
The ignition signal may not be input from the engine, or there may be a malfunction in the power supply or earth circuit.	<ul style="list-style-type: none"> <li>• Malfunction of tachometer</li> <li>• Malfunction of harness or connector</li> </ul>



Inspection Procedure 3

**Vehicle speed sensor circuit system inspection**  
 Signals from the vehicle speed sensor are utilized both in the speedometer and the engine-ECU.



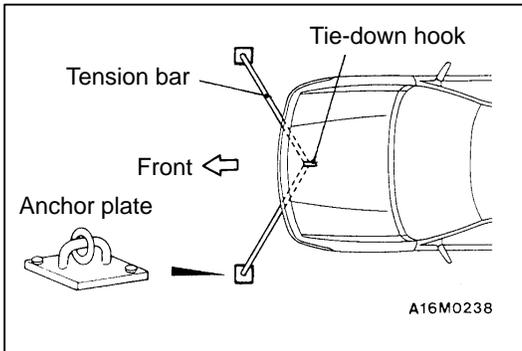
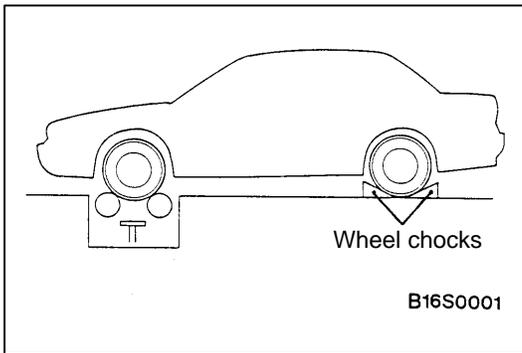
NOTE

If the trouble symptom still persists even after the above procedures are performed, check the vehicle speed sensor output signal side circuit (harness, speedometer and engine ECU) for short-circuit.

## ON-VEHICLE SERVICE

### SPEEDOMETER CHECK

1. Adjust the pressure of the tyres to the specified level.
2. Set the vehicle onto a speedometer tester and use wheel chocks to hold the rear wheels.
3. Pull the parking brake lever firmly.



4. To prevent the front wheel from moving from side to side, attach tension bars to the tie-down hook, and secure both ends to anchor plates.
5. To prevent the vehicles from starting, attach a chain or wire to the rear towing hook, and secure the other end of the chain or wire firmly to an unmovable body.
6. Check if the speedometer indication range is within the standard values and if the pointer fluctuation is within the limits.

#### Caution

Do not operate the clutch suddenly. Do not increase/decrease speed rapidly while testing.

#### Standard values:

Vehicle speed km/h	Speedometer indication allowable errors km/h
40	37 – 45
80	75 – 88
120	113 – 132
160	150 – 176

#### Limit: Pointer fluctuation

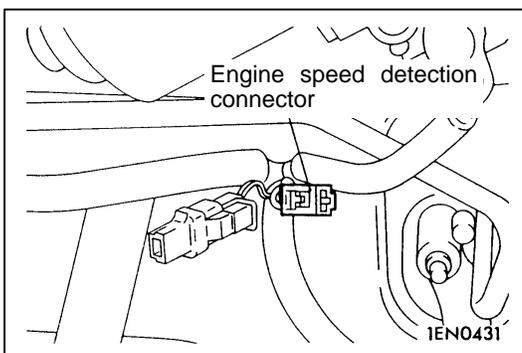
(at vehicle speeds of higher than 35 km/h)  $\pm 3$  km/h

### TACHOMETER CHECK

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach the engine speedometer.
2. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variations are within the standard values.

#### Standard values:

- 700 r/min :  $\pm 100$  r/min
- 3,000<sup>\*1</sup> r/min :  $\pm 150$  r/min
- 3,000<sup>\*2</sup> r/min : +225 to -100 r/min
- 5,000<sup>\*1</sup> r/min :  $\pm 250$  r/min
- 5,000<sup>\*2</sup> r/min : +325 to -125 r/min
- 6,000<sup>\*1</sup> r/min :  $\pm 300$  r/min
- 7,000<sup>\*2</sup> r/min : +400 to -100 r/min
- 8,000<sup>\*3</sup> r/min : +400 to 0 r/min



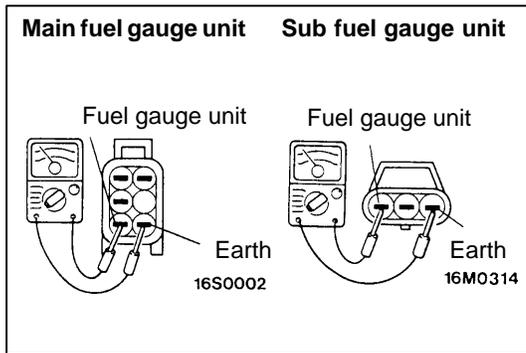
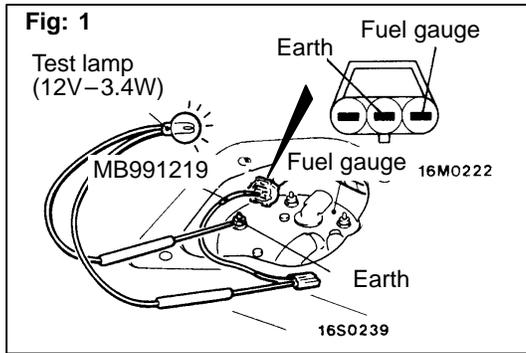
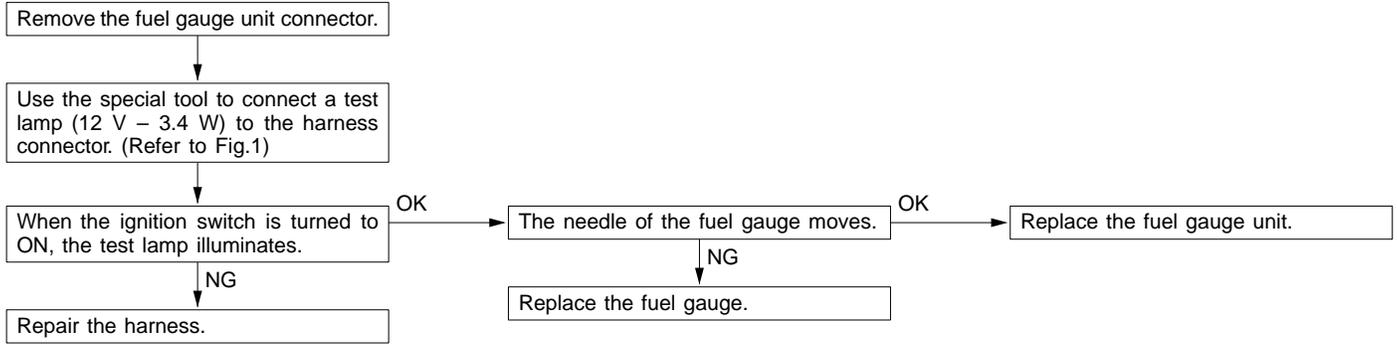
#### NOTE

\*1: Tachometer measurable up to 8,000 r/min

\*2: Tachometer measurable up to 9,000 r/min and one measurable up to 10,000 r/min

\*3: Tachometer measurable up to 10,000 r/min

**FUEL GAUGE SIMPLE CHECK**



**FUEL GAUGE UNIT CHECK**

Remove the fuel gauge unit from the fuel tank.

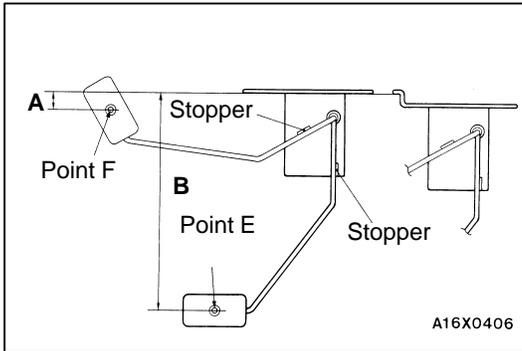
**FUEL GAUGE UNIT RESISTANCE**

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

**Standard value:**

Float position	Main	Sub
Point F	1.8 ± 1.2 Ω	1.2 ± 0.8 Ω
Point E	65.2 ± 4 Ω	44.8 ± 8 Ω

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

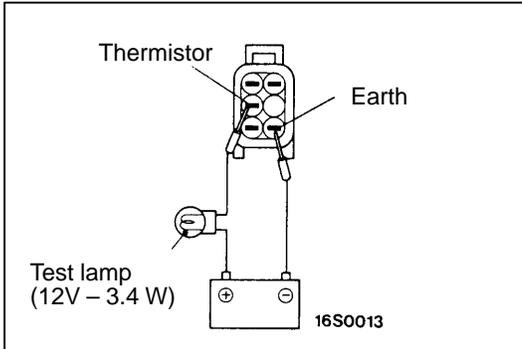


**FUEL GAUGE UNIT FLOAT HEIGHT**

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

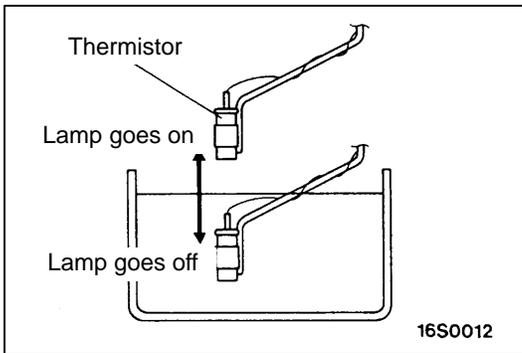
Standard value:

Float position	Main	Sub
Point F	16.4	17.5
Point E	122.6	134.6



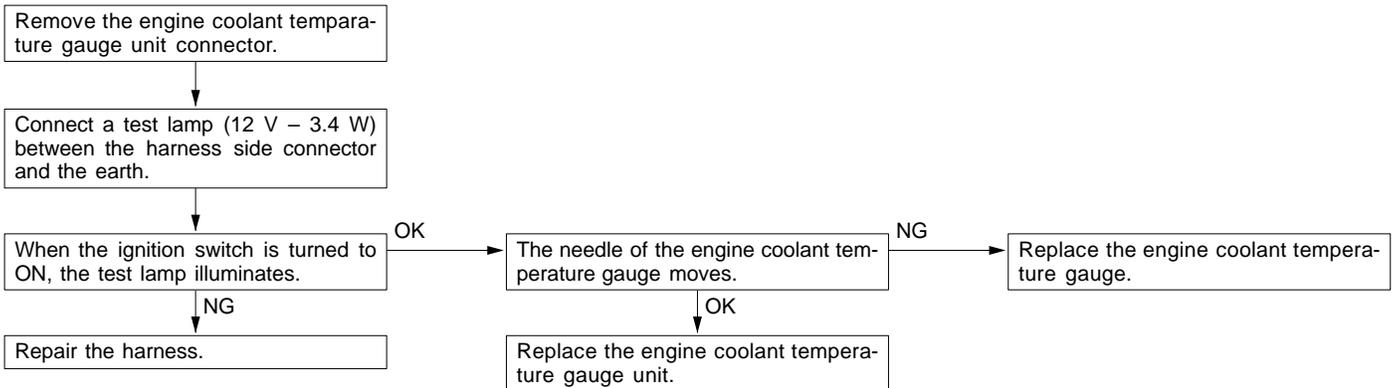
**FUEL LEVEL SENSOR (THERMISTOR)**

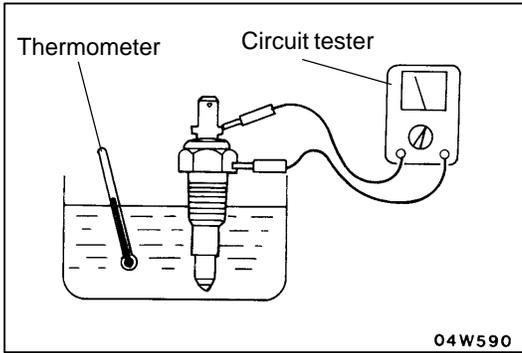
1. Connect a test lamp (12V – 3.4W) to the fuel gauge unit connector terminal and apply the battery voltage.



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.

**ENGINE COOLANT TEMPERATURE GAUGE SIMPLE CHECK**

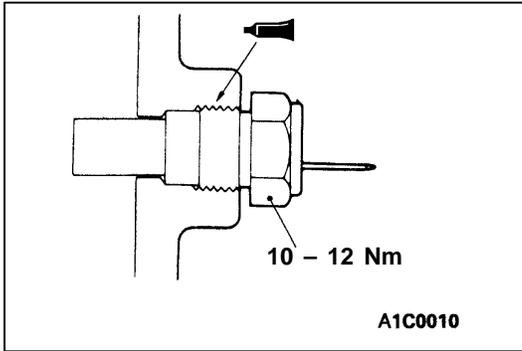




**ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK**

1. Bleed the engine coolant.
2. Remove the engine coolant temperature gauge unit.
3. Immerse the unit in 70°C water to measure the resistance.

**Standard value: 104 ± 13.5 Ω**



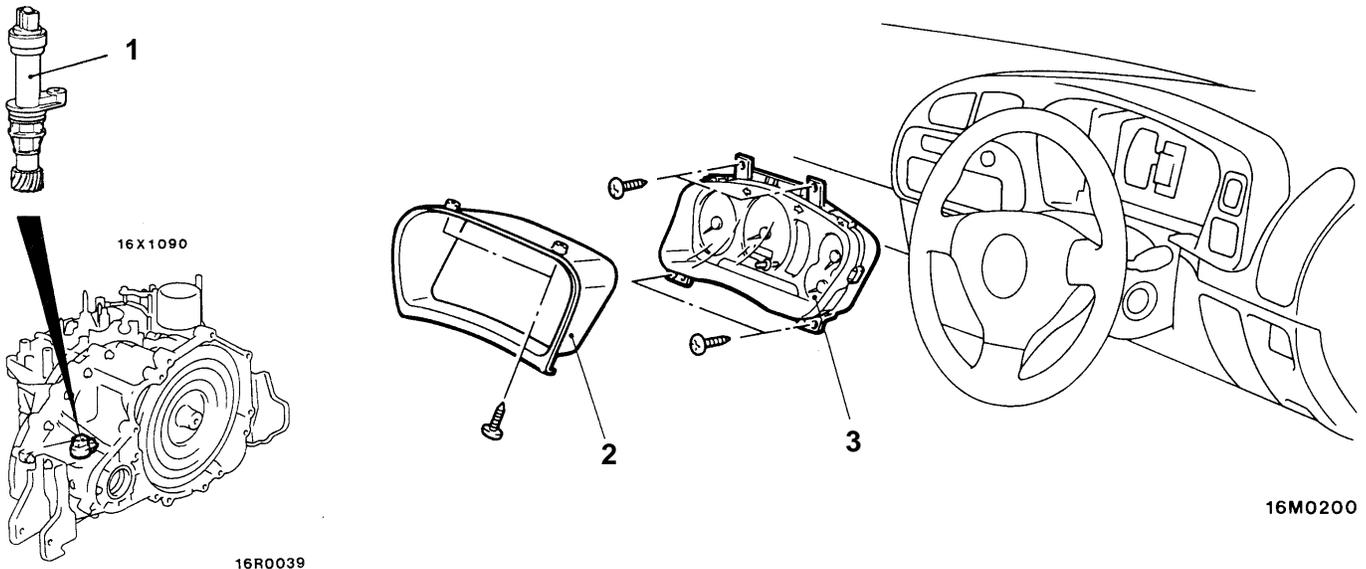
4. After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit. Then, tighten the unit to the specified torque.

**Specified sealant:**

**3M Adhesive Nut Locking No. 4171 or equivalent**

5. Add engine coolant.

**COMBINATION METERS  
REMOVAL AND INSTALLATION**

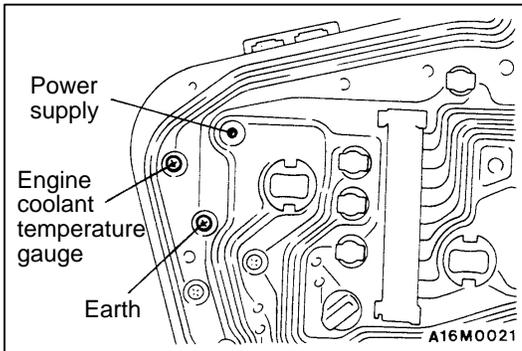
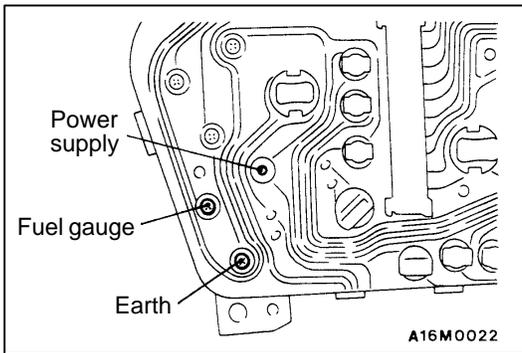


**Vehicle speed sensor removal steps**

- Battery and battery tray
- Air cleaner assembly
- 1. Vehicle speed sensor

**Combination meter removal steps**

2. Meter bezel
3. Combination meter



**INSPECTION**

**FUEL GAUGE RESISTANCE CHECK**

1. Remove the power supply tightening screw.
2. Use a circuit tester to measure the resistance value between the terminals.

**Standard value:**

**Unit:** Ω

Measurement terminal	Resistance value
Power supply – Earth	192±19.2
Power supply – Fuel gauge	89±8.9
Fuel gauge – Earth	103±10.3

**Caution**

When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.

**ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE CHECK**

1. Remove the power supply tightening screw.
2. Use a circuit tester to measure the resistance value between the terminals.

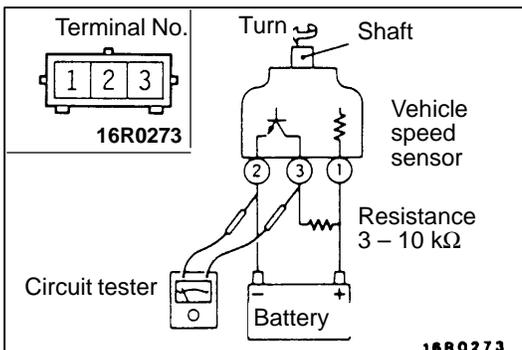
**Standard value:**

**Unit:** Ω

Measurement terminal	Resistance value
Power supply – Earth	187±18.7
Power supply – Engine coolant temperature gauge	90±4.5
Engine coolant temperature gauge – Earth	247±24.7

**Caution**

When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.



**VEHICLE SPEED SENSOR CHECK**

1. Connect a 3 – 10 kΩ resistance as shown in the illustration.
2. Turn the shaft of the vehicle speed sensor one turn and check that voltage changes are caused when measured between terminals 2 and 3 using a circuit tester. (1 turn = 4 pulses)

# HEADLAMP

## SERVICE SPECIFICATIONS

Items			Standard value	Limit	
Headlamp aiming [Parenthesized are allowable beam axis deviations 3 m ahead of headlamp.]	High beam	Vertical direction	25' (22 mm) below horizontal line	–	
		Horizontal direction	Left head-lamp	Parallel to direction of vehicle travel	–
			Right head-lamp	15' (13 mm) leftward from vertical line (V)	–
	Low beam	Vertical direction	25' (22 mm) below horizontal line	–	
		Horizontal direction	Position where 15* rising section intersects vertical line (V)	–	
Headlamp intensity cd (Center of high-beam high intensity zone)			–	15,000 or more per light	

### Cautions in Handling Headlamp Assembly

Each headlamp assembly has a plastic outer lens on. Observe the do's and don'ts below when handling the headlamps.

- Do not leave the headlamps lit for longer than 3 minutes with a protective cover on.
- Do not mask the outer lens surface by taping or in any other way.
- Do not scrub the outer lens surface with a pointed tool.
- Use the designated wax remover for cleaning the outer lens surface. Rinse it thoroughly.
- Use the designated genuine bulbs.

### SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	ETACS-ECU input signal checking

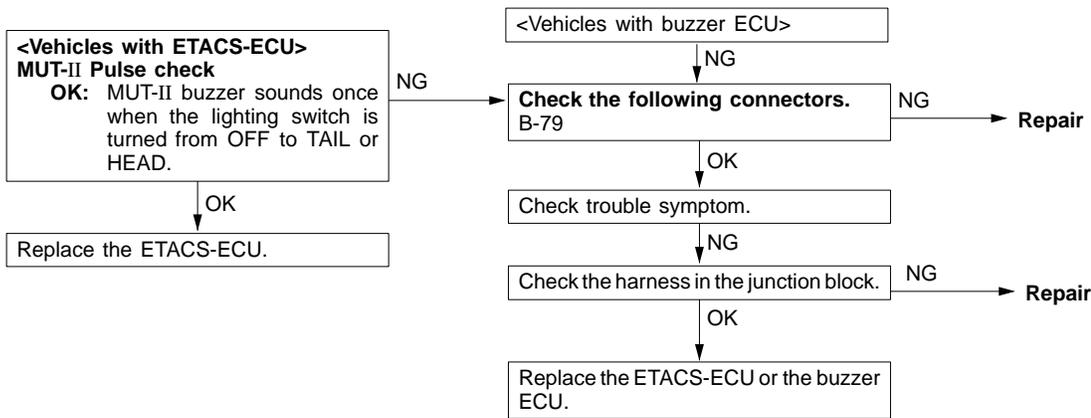
# TROUBLESHOOTING

## DIAGNOSIS FUNCTION

### INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

Refer to Group 00 – How to Use Troubleshooting / Inspection Service Points.

<p><b>The lighting monitor buzzer does not sound even when the ignition key is removed with the tail lamps or headlamps ON and the driver’s side door open. [However, the key reminder warning buzzer sounds when inserting the key into the ignition key cylinder.</b></p>	<p><b>Probable cause</b></p>
<p>The cause is probably a malfunction of the lighting switch input circuit system or a malfunction of ETACS-ECU or buzzer ECU. When the key reminder warning buzzer is sounding, the lighting monitor warning buzzer does not sound even if the tail lamps or headlamps are lit.</p>	<ul style="list-style-type: none"> <li>● Malfunction of harness or connector</li> <li>● Malfunction of ETACS-ECU</li> <li>● Malfunction of buzzer ECU</li> </ul>



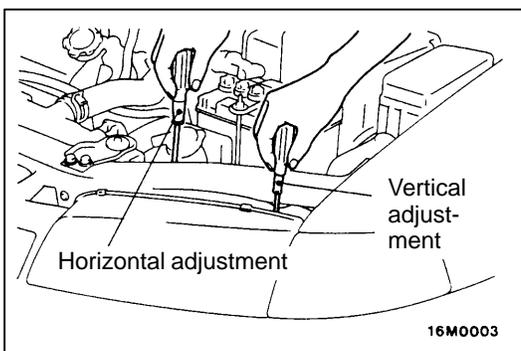
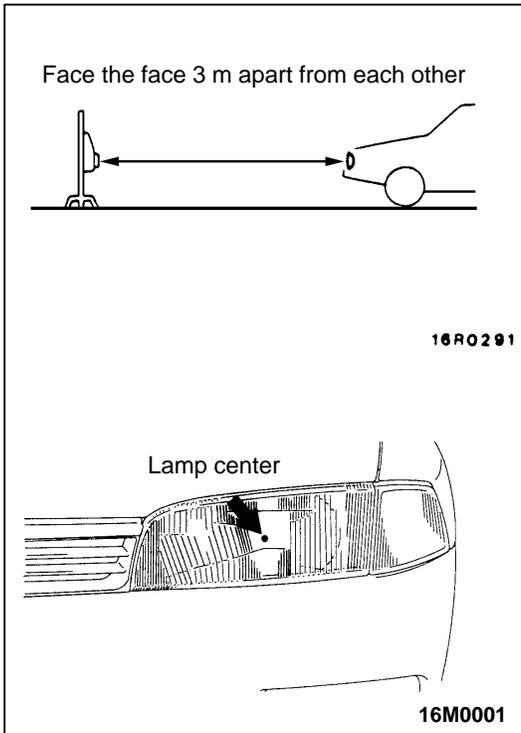
## ON-VEHICLE SERVICE

### HEADLAMP AIMING

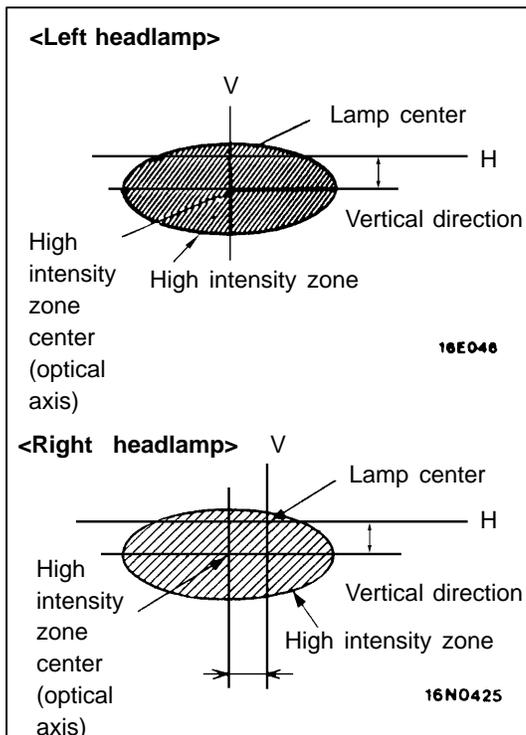
Bring the vehicle in the following conditions before aiming the headlamp.

- Check the tires for inflation pressure. Pump them up if necessary to the labeled pressure level.
- Set the vehicle unladen on a level floor.
- Place one person (approximately 55 kg) on the driver's seat.

1. Position the tester so that its converging lens faces the high-beam lamp (○ marked) center to center at a distance of 3 m from each other.



2. Aim the headlamps to appropriate standard values using the aiming adjustment screw.

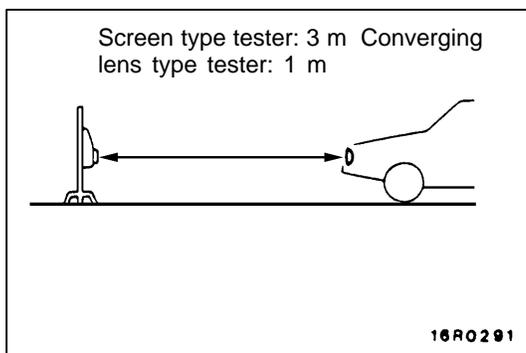


**Standard values:**

Vertical direction		25' (22 mm) below horizontal line (H)
Horizontal direction	Left headlamp	Parallel to direction of vehicle travel
	Right headlamp	15' (13 mm) leftward from vertical line (V)

**Caution:**

- (1) Perform aiming adjustments, one light at a time, with the other headlamp disconnected so as not to be lit unless circumstances compel otherwise. When reconnecting the headlamps, be careful not to upset their aim. Do not leave the headlamps on for any longer than 3 minutes if their outer lenses are covered with a surface covering impervious to light.
- (2) Do not mask the outer lenses by taping or in any other way.
- (3) Aiming adjustment must be completed with the aiming adjustment screws turned in the tightening direction.



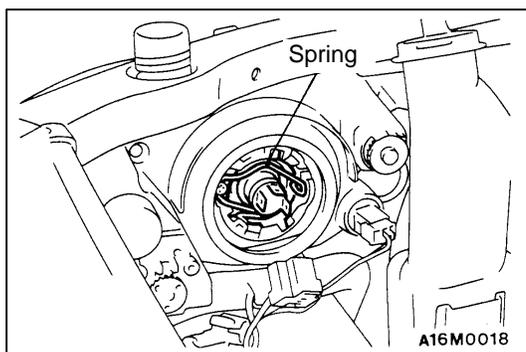
**INTENSITY MEASUREMENT**

1. Position the tester so that its light sensor faces each headlamp center to center at the appropriate distance shown.
2. Maintain an engine speed of 2,000 r/m into keep the battery in the charged condition.
3. Check that the high-beam headlamp intensity at the center of the high intensity zone satisfies the limit value.

**Limit: 15,000 cd or more per headlamp**

**Caution**

- (1) Perform intensity measurement, one headlamp at a time, with the low-beam lamp and the other headlamp disconnected from the battery unless circumstances compel otherwise. Do not leave the headlamps on for any longer than 3 minutes if their outer lenses are covered with a surface covering impervious to light.
- (2) Do not mask the outer lens surfaces by taping or in any other way.

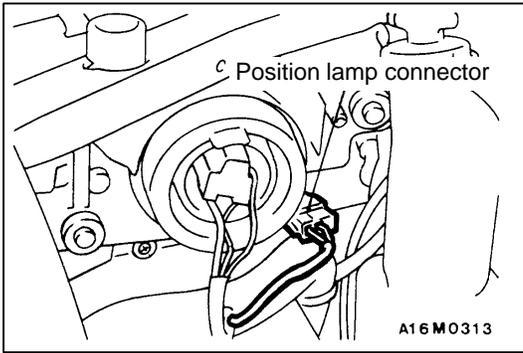


**HEADLAMP BULB REPLACEMENT**

1. Disconnect the connector.
2. Remove the socket cover.
3. Unhook the spring which secures the bulb, and then remove the bulb.

**Caution**

Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.



- After the bulb is replaced, reinstall the socket cover with the TOP mark facing upward.

**NOTE**

To prevent the clouding of lens and ingress of water into the lamp unit, install the socket cover correctly.

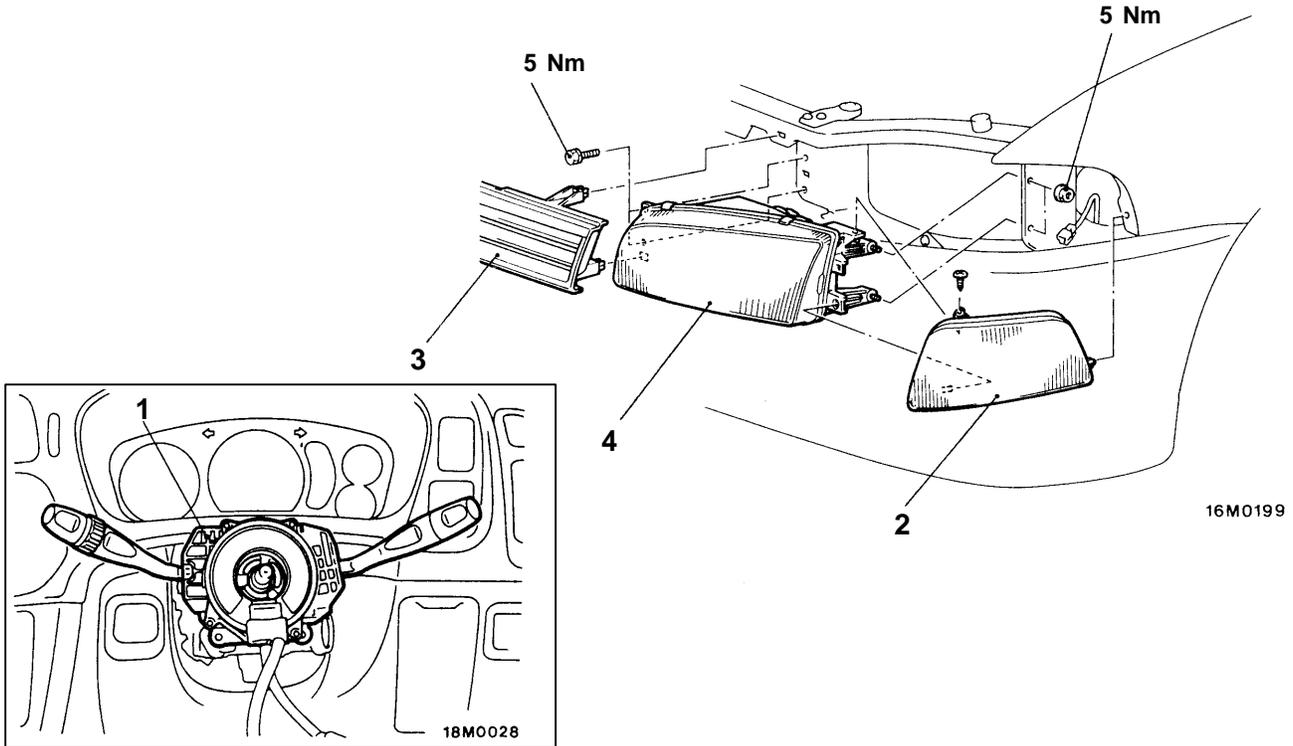
**POSITION LAMP BULB REPLACEMENT**

Remove the position lamp by turning it together with the lamp socket, then replace its bulb.

**HEADLAMP AND FRONT TURN-SIGNAL LAMP**

**REMOVAL AND INSTALLATION**

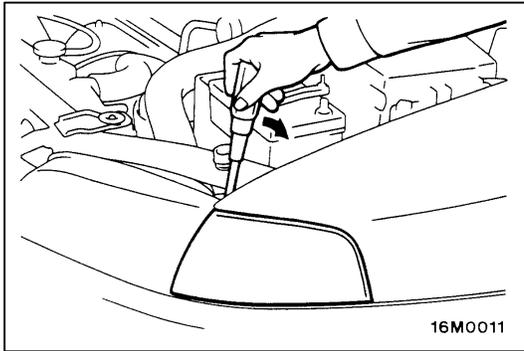
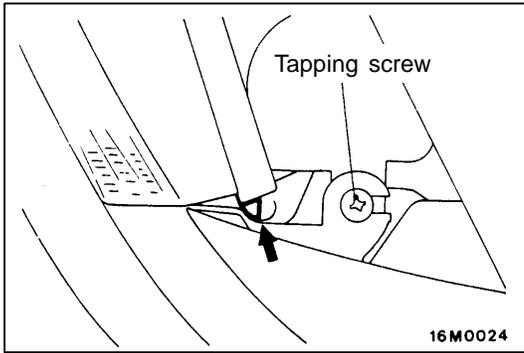
**CAUTION: SRS**  
 Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



1. Column switch

**Removal steps**

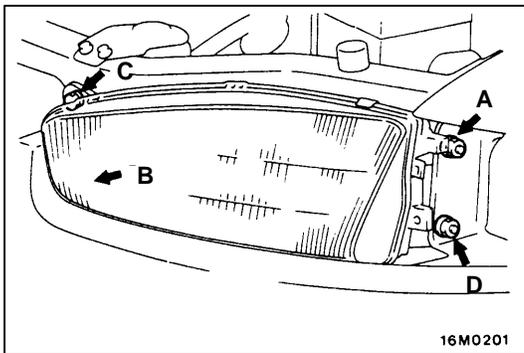
- ◀A▶ 2. Front turn-signal lamp
- ▶A◀ 3. Radiator grille
- ▶A◀ 4. Headlamp



**REMOVAL SERVICE POINT**

**◀A▶ FRONT TURN-SIGNAL LAMP REMOVAL**

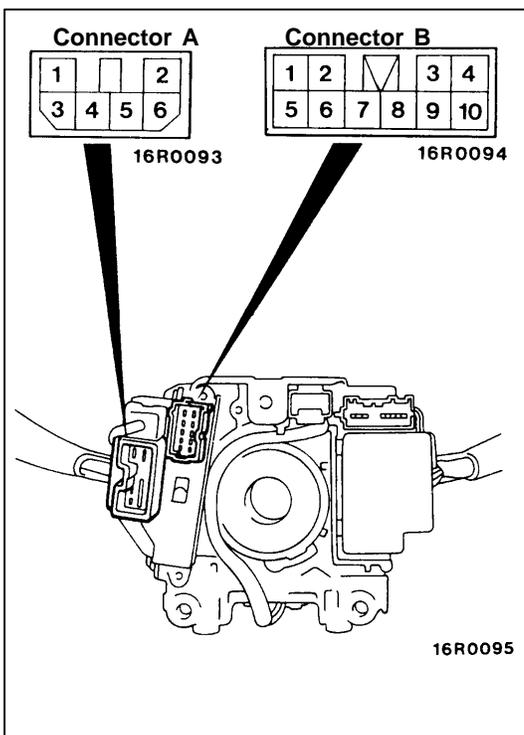
1. Loosen the tapping screw connecting the headlamp to the front turn-signal lamp. Put a screwdriver in the space produced between the headmap and the front turn-signal lamp.
2. Prying the screwdriver in the direction shown, thrust the front turn-signal lamp in the direction of the vehicle.
3. Unplug the connector and remove the front turn-signal lamp.



**INSTALLATION SERVICE POINT**

**▶A◀ HEADLAMP INSTALLATION**

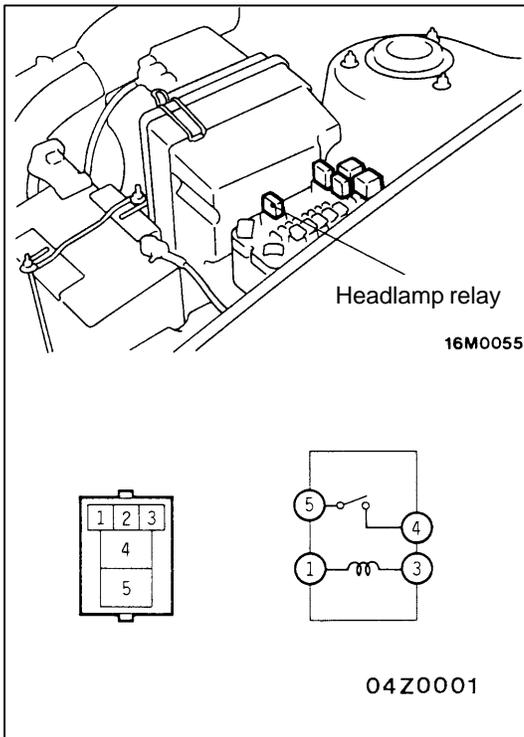
Tighten attaching bolts and nuts in the order of A, B, C and D.



**INSPECTION**

**LIGHTING SWITCH, DIMMER/PASSING SWITCH CONTINUITY CHECK**

Switch position		Terminal No.											
		Connector A			Connector B								
		5	6	7	1	2	3	4	6				
LIGHTING SWITCH	OFF												
	TAIL	○	—	○									
	HEAD	○		○									
DIMMER/PASSING SWITCH	LOWER							○	—	○			
	UPPER										○	—	○
	PASSING				○	—	○						○



**HEADLAMP RELAY CONTINUITYCHECK**

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

# FRONT FOG LAMP

## SERVICE SPECIFICATIONS

Items		Standard value
Headlamp aiming [Parenthesized are allowable beam axis deviations 10 m ahead of headlamp.]	Vertical direction	2° (349 mm) below horizontal line (H)
	Horizontal direction	3° (524 mm) leftward from vertical line (V)

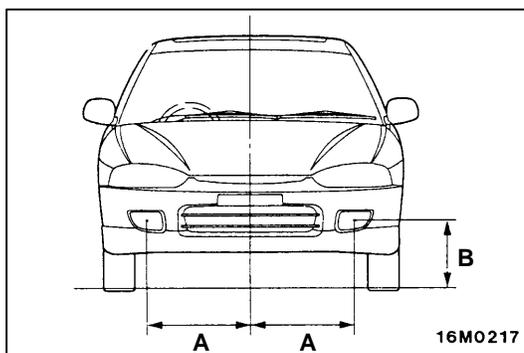
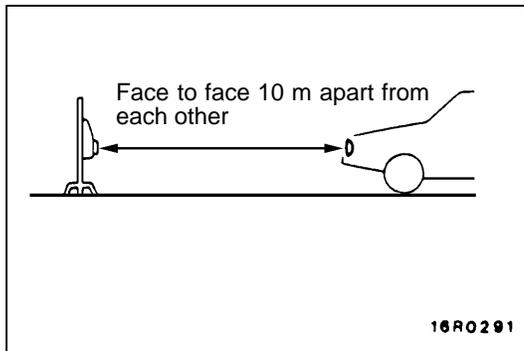
## ON-VEHICLE SERVICE

### HEADLAMP AIMING

Bring the vehicle in the following conditions before aiming the headlamp.

- Check the tires for inflation pressure. Pump them up if necessary to the labeled pressure level.
- Set the vehicle unladen on a level floor.
- Place one person (approximately 55 kg) on the driver's seat.
- Maintain an engine speed of 2,000 r/min to keep the battery in the charged condition.

1. Position the tester so that its converging lens faces the fog lamp center to center at a distance of 10 m.

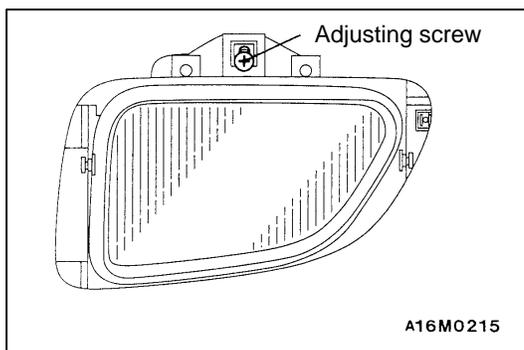


#### NOTE

Measure the center of the fog lamp as shown.

A: 572.5 mm (from the center of the vehicle body)

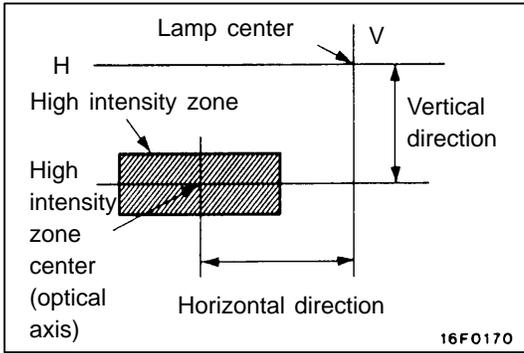
B: 360 mm



2. Remove the fog lamp bezel, and using the aiming adjustment screw, aim the fog lamp to the standard value.

#### NOTE

The horizontal direction is non-adjustable. If the beam axis deviation exceeds the standard value, check the fog lamp to determine if it is installed out of position and correct if necessary.

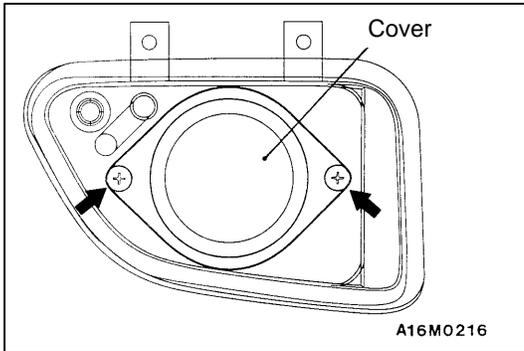


**Standard values:**

Vertical direction	2° (349 mm) below horizontal line (H)
Horizontal direction	3° (524 mm) leftward from vertical line (V)

**Caution:**

- (1) Perform aiming adjustments, one light at a time, with the other headlamp disconnected so as not to be lit unless circumstances compel otherwise. When reconnecting the headlamps, be careful not to upset their aim. Do not leave the headlamps on for any longer than 3 minutes if their outer lenses are covered with a surface covering impervious to light.
- (2) Do not mask the outer lenses by taping or in any other way.
- (3) Aiming adjustment must be completed with the aiming adjustment screws turned in the tightening direction.



**FOG LAMP BULB REPLACEMENT**

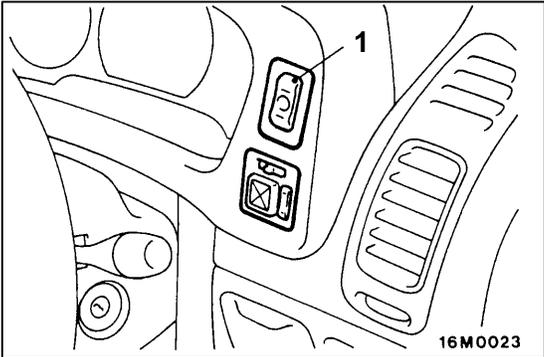
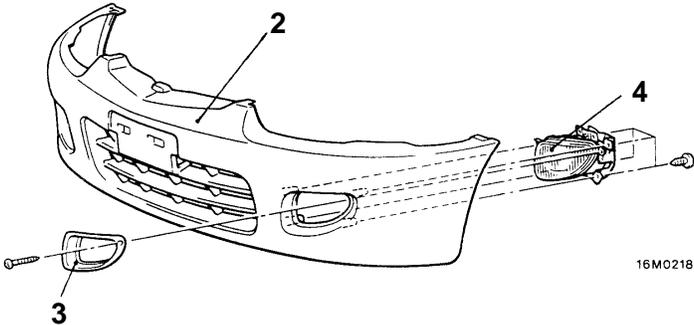
1. Remove the fog lamp.
2. Remove the cover.
3. Unhook the spring which secures the bulb and then replace the bulb.

**Caution**

- (1) Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.
- (2) To prevent the clouding of lens and ingress of water into the lamp unit, install the socket cover correctly.

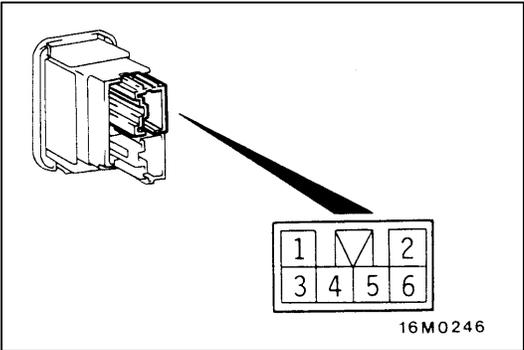
# FOG LAMP

## REMOVAL AND INSTALLATION



1. Front fog lamp switch

- Fog lamp removal steps**
- 2. Front bumper
  - 3. Fog lamp bezel
  - 4. Fog lamp assembly



### INSPECTION

#### FOG LAMP SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	2	3	4	-	5	6
OFF				○	ILL ↑	○	
ON	○	○		○	ILL ↓	○	○

# REAR COMBINATION LAMP

## TROUBLESHOOTING

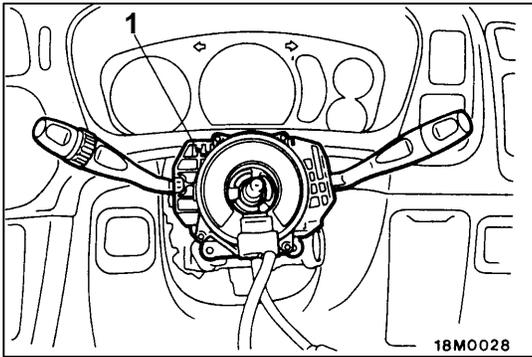
For the troubleshooting of the lighting monitor warning buzzer, refer to P.54-33.

## REAR COMBINATION LAMP

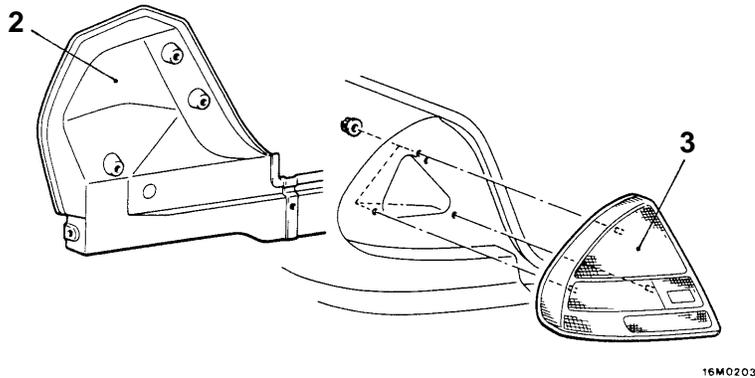
### REMOVAL AND INSTALLATION

**Caution: SRS**

Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

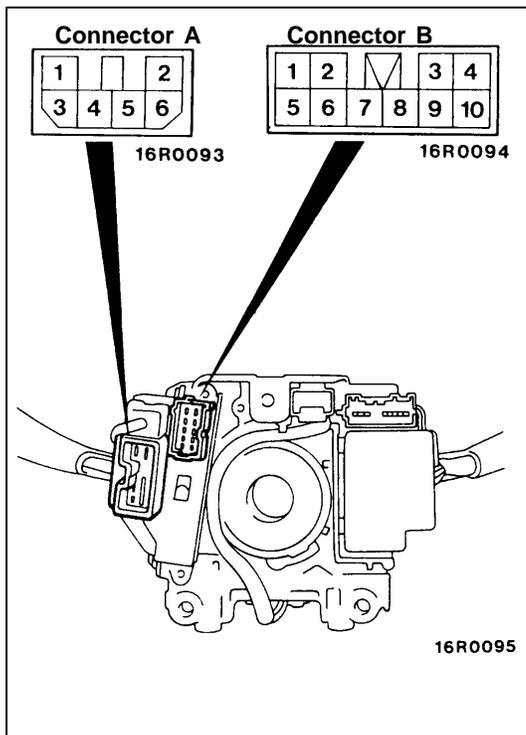


1. Column switch



**Rear combination lamp removal steps**

- 2. Rear end trim
- 3. Rear combination lamp



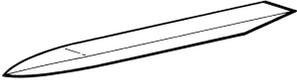
## INSPECTION

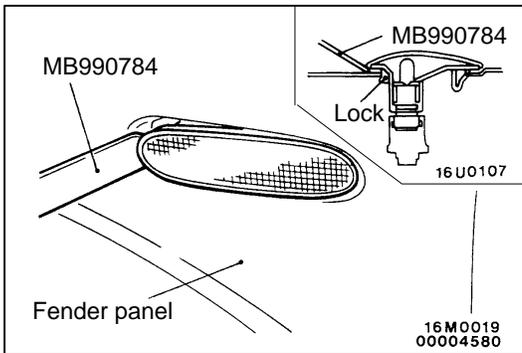
### LIGHTING SWITCH CONTINUITY CHECK

Switch position		Terminal No.			
		Connector B			Connector A
		5	6	7	1
LIGHTING SWITCH	OFF				
	TAIL	○	—	○	
	HEAD	○	○	○	○

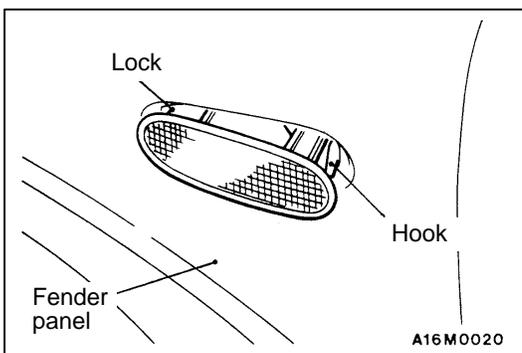
# SIDE TURN-SIGNAL LAMP

## SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of side turn-signal lamp



## SIDE TURN-SIGNAL LAMP REMOVAL

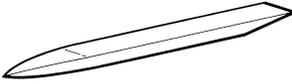


## INSTALLATION

Fit the hook side rearward.

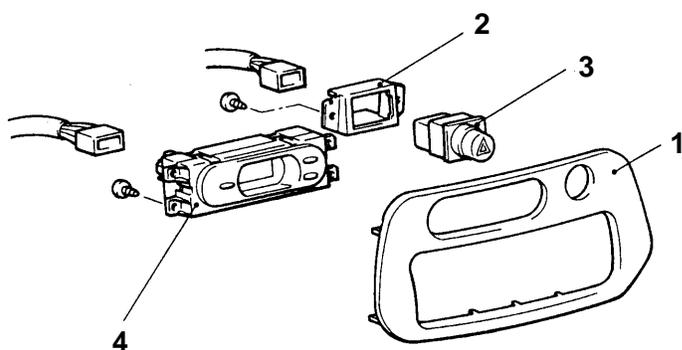
# HAZARD WARNING LAMP SWITCH, CLOCK

## SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Air conditioner panel removal

## HAZARD WARNING LAMP SWITCH

### REMOVAL AND INSTALLATION



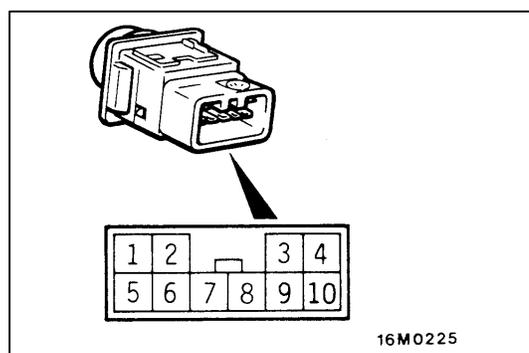
#### Hazard warning lamp switch removal steps

1. Air conditioner panel
2. Switch holder
3. Hazard warning lamp switch

16M0210

#### Clock removal steps

1. Air conditioner panel
4. Clock



## INSPECTION

### HAZARD WARNING LAMP SWITCH CONTINUITY CHECK

Switch position	Terminal No.									
	1	2	4	5	6	7	9	-	10	
OFF				○	—	○	○	ILL	○	
ON	○	○	○	○	○		○	ILL	○	

# RADIO AND TAPE PLAYER

## TROUBLESHOOTING

There is noise when the engine is running.

Kind of Noise (Parenthesized is how noise sounds.)	Symptom	Cause	Remedy
AM, FM: Ignition noise (Popping, snapping, crackling, buzzing)	<ul style="list-style-type: none"> <li>• Popping sound becomes faster with the increase of engine speed.</li> <li>• The noise is lost with ignition switch turned to ACC.</li> </ul>	<ul style="list-style-type: none"> <li>• Mainly due to the spark plugs.</li> <li>• Due to noise circulation from elsewhere</li> <li>• Noise from the engine</li> </ul>	Check the noise capacitor and earth cable and replace if necessary. (See Fig. 1 and Fig. 2.)
AM, FM: Defogger noise (1) (Murmuring)	Occurs when the defogger switch is turned to ON and OFF.	Noise produced by sparking when the defogger switch is turned to ON/OFF enters the glass antenna.	Check the noise capacitor and replace if necessary. (See Fig. 1.)
AM, FM: Defogger noise (2) (Snapping noise)	Occurs when the defogger switch is turned to ON.	Noise produced by current flowing in the defogger enters the glass antenna.	Check the choke coil and replace if necessary. (See Fig. 3.)
AM, FM: Defogger noise (3) (Scratching, gagging)	Occurs when the defogger switch is turned to ON with print heater wire broken.	Noise produced by sparking where print heater is broken enters the glass antenna.	Repair the print heater.
AM, FM: Wiper motor noise (Humming, wheezing)	Sound becomes faster with the increase of wiper speed and is lost when the wiper is stopped.	Caused by sparking in wiper motor brush.	Replace the wiper motor.
FM: Mirror motor noise (Humming, wheezing)	Occurs when electric mirror operates.	Caused by sparking in mirror motor brush.	Replace the electric motor.
Other electrical components	–	Noise is emitted by some electrical components in long use.	Repair or replace electrical components.
Static electricity (Crackling, crinkling)	<ul style="list-style-type: none"> <li>• Noise is stopped when the vehicle comes to a complete stop.</li> <li>• Noise becomes louder when the clutch is released.</li> </ul>	Occurs when parts or wiring move for some reason and contact metal parts of the body.	Put parts or wiring into position.
	Various noises are produced by body parts.	Due to electrical detachment of the hood, exhaust pipe and muffler, suspension, etc. from the body.	Tighten mounting bolts securely. In many cases, remedy of one part does not eliminate the problem due to incomplete earthing elsewhere.

### Caution

- (1) Never let the noise filter contact a high tension cable. The noise filter could break down.
- (2) Check that there is no external noise. This check is necessary to prevent misidentification of noise sources.
- (3) Noise prevention should be performed by eliminating noise sources in the descending order of loudness.

## NOTE

## 1. Noise Suppressing Capacitor

The capacitor does not allow the passage of DC current but AC current. It decreases in impedance (resistance to AC) as the number of waves increases, making the AC flow easier. A noise suppressing capacitor relying on this property to function is inserted between a noise generating power line and earthing line to suppress noise by earthing noise components (in AC or pulse signal) to the vehicle body.

## 2. Noise Filter

The coil allows the passage of DC current and increases in impedance (resistance to AC) as the number of waves increases. A noise suppressing coil relying on this property to function is inserted somewhere in a noise generating power line, preventing noise components from flowing or radiating from the line.

Fig: 1

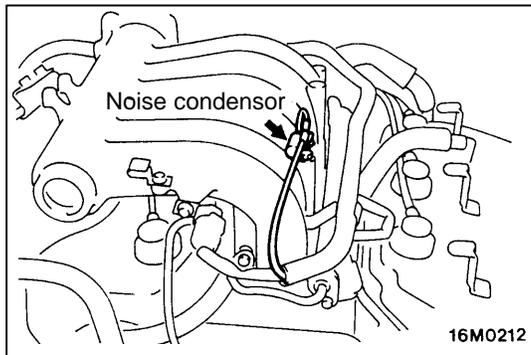


Fig: 3

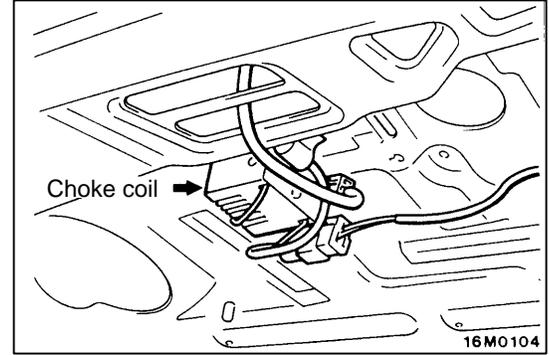
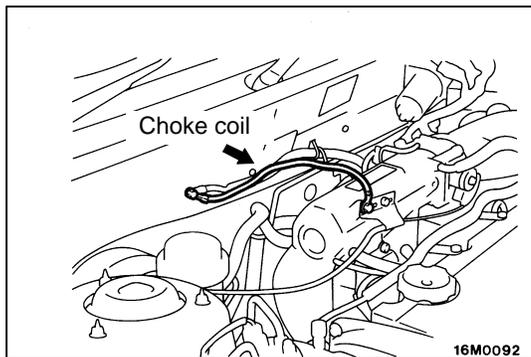
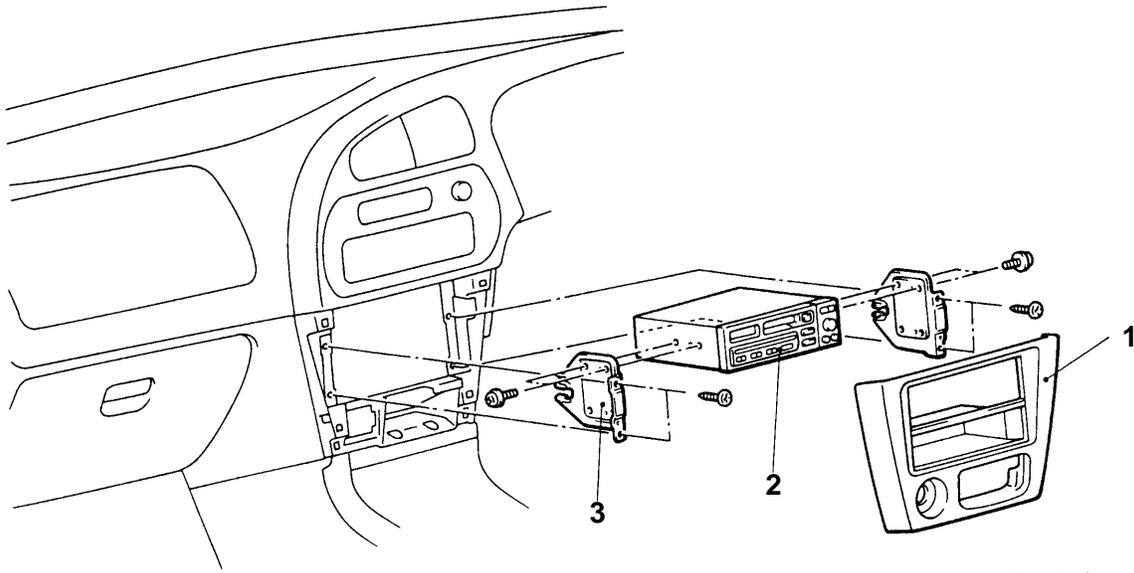


Fig: 2



## RADIO AND TAPE PLAYER

### REMOVAL AND INSTALLATION



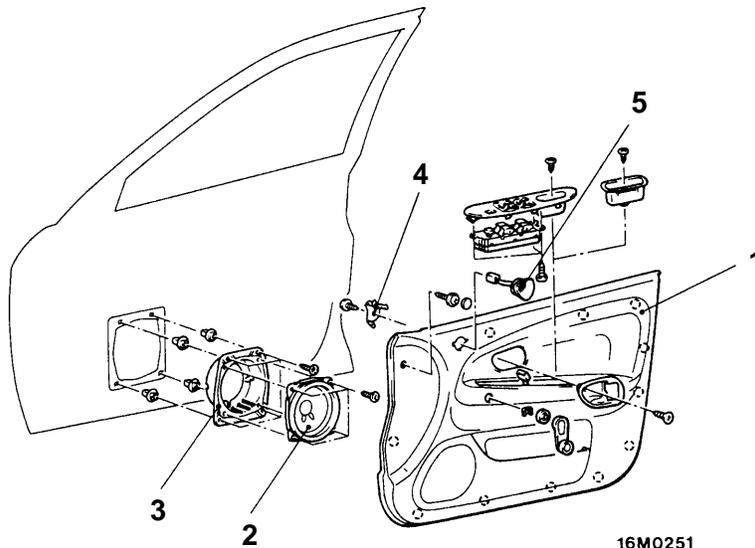
16M0254

#### Removal steps

1. Radio panel
2. Radio and tape player
3. Radio bracket

## SPEAKER

### REMOVAL AND INSTALLATION

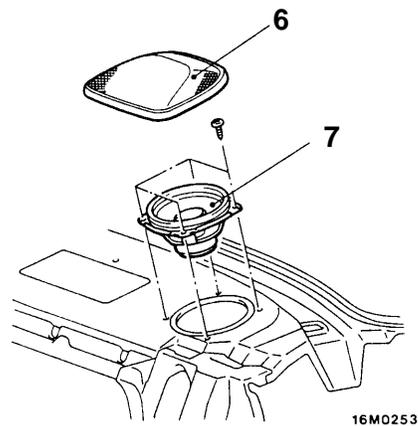


16M0251

#### Removal steps

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Door trim</li> <li>2. Speaker</li> <li>3. Speaker cover</li> </ol> | <ol style="list-style-type: none"> <li>4. Speaker brakcet</li> <li>5. Tweeter speaker</li> </ol> |
|--|--|

<REAR SPEAKER>



16M0253

Rear shelf speaker removal steps

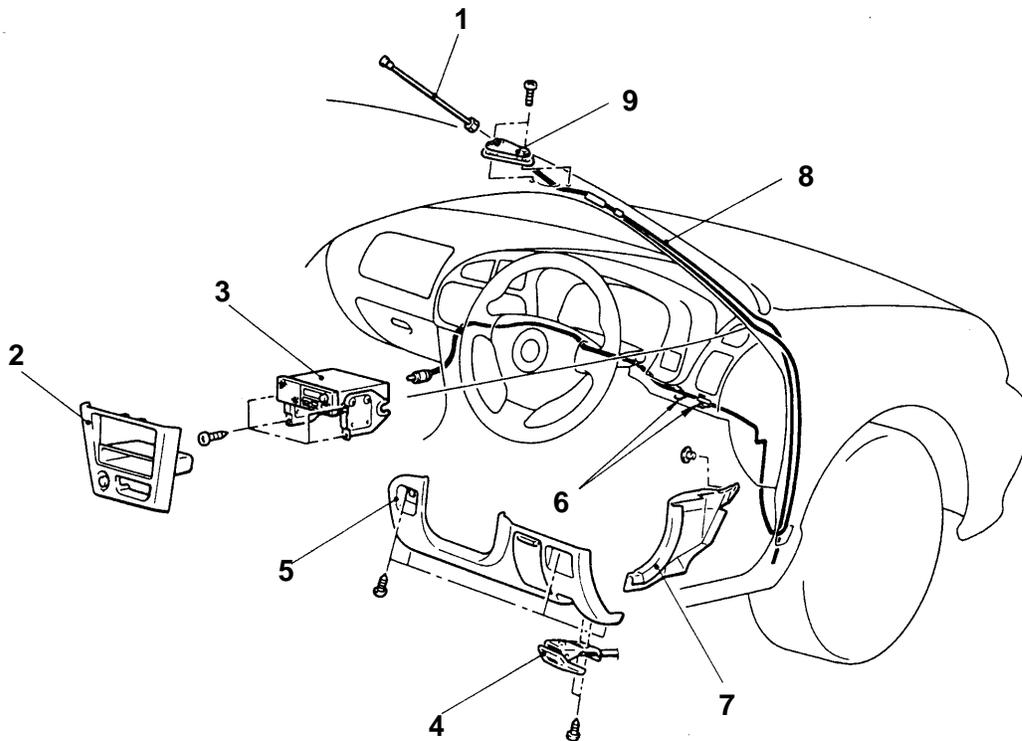
6. Speaker garnish

7. Speaker

# ANTENNA

## POLE ANTENNA

### REMOVAL AND INSTALLATION



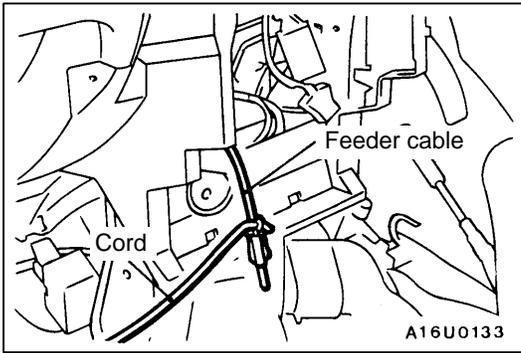
16M0221

Removal steps

- 1. Pole
- 2. Radio panel
- 3. Radio and tape player
- 4. Hood lock release handle



- 5. Driver side lower cover
- 6. Clip
- 7. Cowl side trim
- 8. Antenna assembly
- 9. Antenna base gasket



**REMOVAL SERVICE POINT**

**◀A▶ ANTENNA ASSEMBLY REMOVAL**

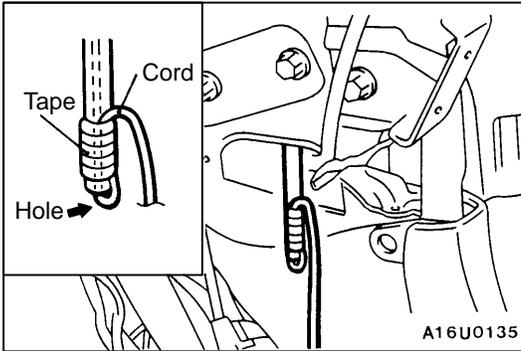
To facilitate the installation work of the antenna assembly, perform the following before removing the feeder cable:

1. Tie a cord to the end of the feeder cable.
2. Pull out the antenna assembly until the end of the drain pipe can be seen.
3. Pass the cord through the hole in the end of the drain pipe and wrap it with vinyl tape.

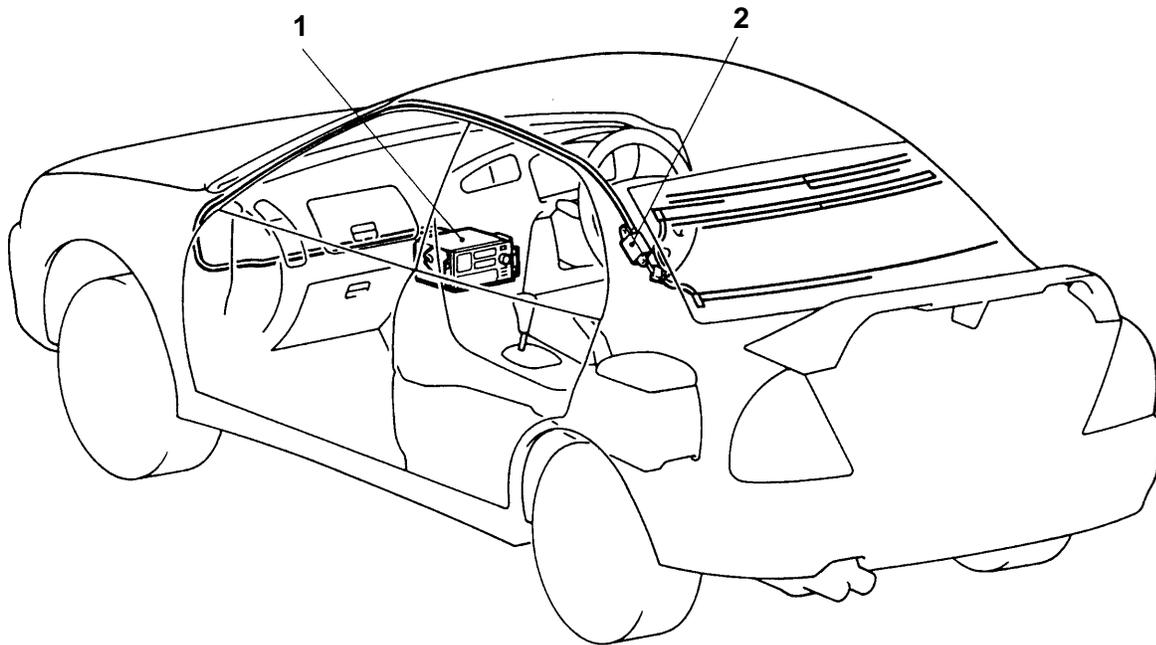
**Caution**

**Wrap it securely so that the cord will not come off.**

4. Pull out the antenna assembly little by little to remove it.



**REAR WINDOW ANTENNA AND GLASS DIVERSITY ANTENNA  
REMOVAL AND INSTALLATION**



16M0255

**Removal steps**

- Glove box
- Front pillar trim (LH), center pillar trim (LH), rear pillar trim (LH)



- Assist grip
- 1. Radio and tape player
- 2. Antenna assembly

**REMOVAL SERVICE POINT**

**◀A▶ ANTENNA AMPLIFIER ASSEMBLY REMOVAL**

Take off the left-hand edge of the hand lining and undo the clips of the antenna amplifier assembly.

**REAR WINDOW DEFOGGER**

**TROUBLESHOOTING <VEHICLES WITH AUTOMATIC A/C>**

Refer to GROUP 55.

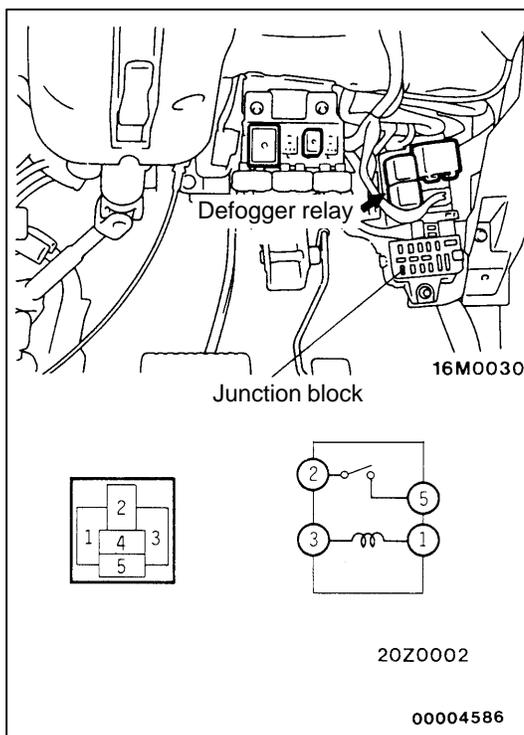
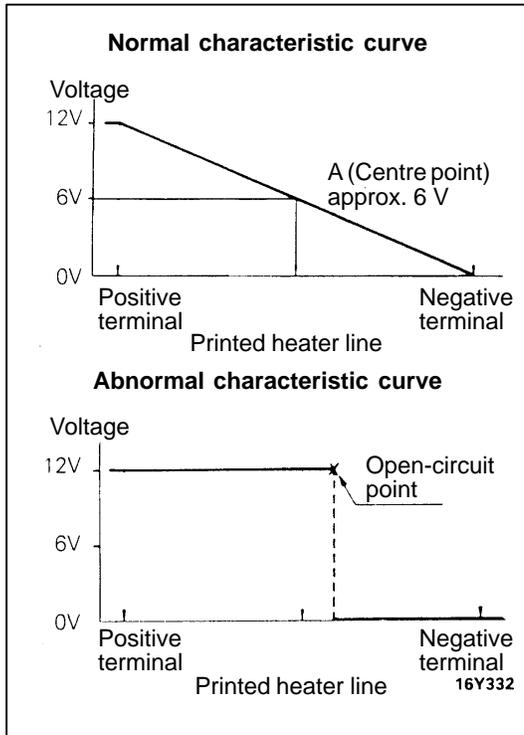
**ON-VEHICLE SERVICE**

**PRINTED-HEATER CHECK**

1. Run engine at 2,000 r/min. Check heater element with battery at full.
2. Turn ON rear window defogger switch. Measure heater element voltage with circuit tester at rear window glass centre A.
3. If 12 V is indicated at A, there is a break in the negative terminals from A. Move test bar slowly to negative terminal to detect where voltage changes suddenly (0V).
4. If 0 V is indicated at A, there is a break in the positive terminals from A. Defect where the voltage changes suddenly (12 V) in the same method described above.

**DEFOGGER RELAY CONTINUITY CHECK**

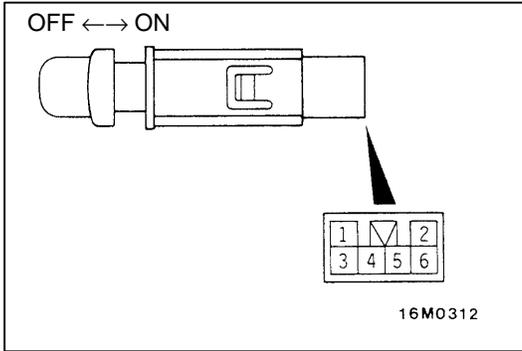
Battery voltage	Terminal No.			
	1	3	2	5
Power is not supplied	○—○			
Power is supplied	⊖—⊕		○—○	



# REAR WINDOW DEFOGGER SWITCH <VEHICLES WITH AUTOMATIC A/C>

## REMOVAL AND INSTALLATION

Refer to GROUP – Heater Control Assembly.



## INSPECTION

### DEFOGGER SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	2	-	3	4	-	6
OFF	○		ILL ⊕	○			
ON	○		ILL ⊕	○		IND ⊕	○

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## NOTES