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# WORKSHOP MANUAL

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RALLIART

SUPPLEMENT

## LANCER EVOLUTION-VI



Pub. No. S9806CNC9-A

**RALLIART**

**MITSUBISHI  
LANCER  
EVOLUTION-VI**

**WORKSHOP MANUAL  
SUPPLEMENT**

**FOREWORD**

This Workshop Manual contains procedures for service mechanics, including removal, disassembly, inspection, adjustment, reassembly and installation. Use the following manuals in combination with this manual as required.

**TECHNICAL INFORMATION MANUAL**

N9806CNCP9  
N9806CNCP9-A

**WORKSHOP MANUAL**

S9806CNCP9

All information, illustrations and product descriptions contained in this manual are current as at the time of publication. We, however, reserve the right to make changes at any time without prior notice or obligation.

The EVOLUTION-VI is sold exclusively through RALLIART Inc. Since the EVOLUTION-VI is a rally-based model, it will not be warranted and will not be homologated for general production. Therefore, any service matters on the EVOLUTION-VI should be inquired to RALLIART Inc. as usual.

 **MITSUBISHI MOTORS CORPORATION**  
**RALLIART INC.**

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**WARNING!**

- (1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).**
- (2) SRS components should not be subjected to heat over 93°C, so remove the SRS-ECU, air bag module and clock spring before drying or baking the vehicle after painting.**
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.**
- (4) MITSUBISHI dealer 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.**

**NOTE**

Section titles with asterisks (\*) in the table of contents in each group indicate operations requiring warnings.

# GENERAL

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**00-2**

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**NOTES**

## HOW TO USE THIS MANUAL

### SCOPE OF MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model. Note, however, that for engine and transmission-related component parts, this manual covers only on-vehicle inspections, adjustments, and the removal and installation procedures for major components.

For detailed information concerning the inspection, checking, adjustment, disassembly and reassembly of the engine, transmission and major components after they have been removed from the vehicle, please refer to separate manuals covering the engine and the transmission.

### ON-VEHICLE SERVICE

“On-vehicle Service” is procedures for performing inspections and adjustments of particularly important locations with regard to the construction and for maintenance and servicing, but other inspection (for looseness, play, cracking, damage, etc.) must also be performed.

### INSPECTION

Under this title are presented inspection and checking procedures to be performed by using special tools and measuring instruments and by feeling, but, for actual maintenance and servicing procedures, visual inspections should always be performed as well.

### DEFINITION OF TERMS

#### STANDARD VALUE

Indicates the value used as the standard for judging the quality of a part or assembly on inspection or the value to which the part or assembly is corrected and adjusted. It is given by tolerance.

#### LIMIT

Shows the standard for judging the quality of a part or assembly on inspection and means the maximum or minimum value within which the part or assembly must be kept functionally or in strength. It is a value established outside the range of standard value.

#### REFERENCE VALUE

Indicates the adjustment value prior to starting the work (presented in order to facilitate assembly and adjustment procedures, and so they can be completed in a shorter time).

#### CAUTION

Indicates the presentation of information particularly vital to the worker during the performance of maintenance and servicing procedures in order to avoid the possibility of injury to the worker, or damage to component parts, or a reduction of component or vehicle function or performance, etc.

#### INDICATION OF TIGHTENING TORQUE

The tightening torque shown in this manual is a basic value with a tolerance of  $\pm 10\%$  except the following cases when the upper and lower limits of tightening torque are given.

- (1) The tolerance of the basic value is within  $\pm 10\%$ .
- (2) Special bolts or the like are in use.
- (3) Special tightening methods are used.

EXPLANATION OF MANUAL CONTENTS

Indicates procedures to be performed before the work in that section is started, and procedures to be performed after the work in that section is finished.

**Component Diagram**  
A diagram of the component parts is provided near the front of each section in order to give a reader a better understanding of the installed condition of component parts.

Indicates (by symbols) where lubrication is necessary.






**Maintenance and Servicing Procedures**  
The numbers provided within the diagram indicate the sequence for maintenance and servicing procedures.

- Removal steps:  
The part designation number corresponds to the number in the illustration to indicate removal steps.
- Disassembly steps:  
The part designation number corresponds to the number in the illustration to indicate disassembly steps.
- Installation steps:  
Specified in case installation is impossible in reverse order of removal steps. Omitted if installation is possible in reverse order of removal steps.
- Reassembly steps:  
Specified in case reassembly is impossible in reverse order of disassembly steps. Omitted if reassembly is possible in reverse order of disassembly steps.

**Classifications of Major Maintenance/Service Points**  
When there are major points relative to maintenance and servicing procedures (such as essential maintenance and service points, maintenance and service standard values, information regarding the use of special tools, etc.), these are arranged together as major maintenance and service points and explained in detail.

◀A▶ : Indicates that there are essential points for removal or disassembly.  
▶A◀ : Indicates that there are essential points for installation or reassembly.

**Symbols for Lubrication, Sealants and Adhesives**  
Information concerning the locations for lubrication and for application of sealants and adhesives is provided, by using symbols, in the diagram of component parts or on the page following the component parts page, and explained.

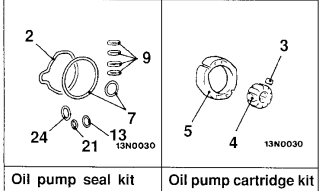
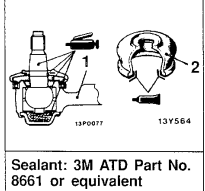
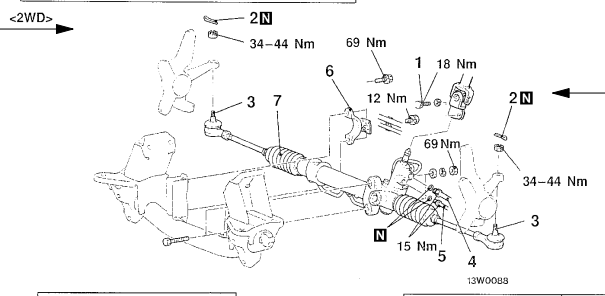
-  : Grease (multipurpose grease unless there is a brand or type specified)
-  : Sealant or adhesive
-  : Brake fluid or automatic transmission fluid
-  : Engine oil, gear oil or air conditioner compressor oil
-  : Adhesive tape or butyl rubber tape

Indicates the group title.      Indicates the section title.      Indicates the group number.      Indicates the page number.

STEERING – Power Steering Oil Pump 37A-29

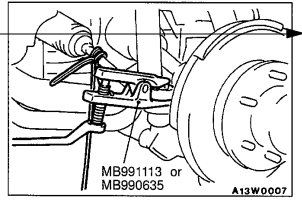
**POWER STEERING GEAR BOX**  
REMOVAL AND INSTALLATION

**Pre-removal Operation**  
(1) Power Steering Fluid Draining (Refer to P. 37A-10.)  
(2) Air Cleaner Assembly Removal  
(3) Under Cover Removal (Refer to GROUP 42 – Under Cover.)



- Removal steps**
1. Lower shaft assembly and gear box connecting bolt
  2. Split pin
  3. Connection for tie-rod end and knuckle
  4. Connection for return tube

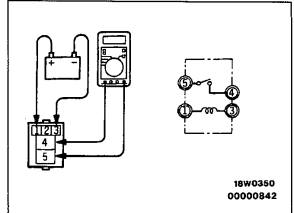
5. Connection for pressure tube
6. Clamp
7. Gear box assembly



**REMOVAL SERVICE POINTS**

◀A▶ TIE-ROD END DISCONNECTION

- 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.



**HEADLAMP RELAY CONTINUITY INSPECTION**

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

Denotes non-reusable part.

Denotes tightening torque. For bolts and nuts which do not have a tightening torque listed, refer to the "Tightening torque".

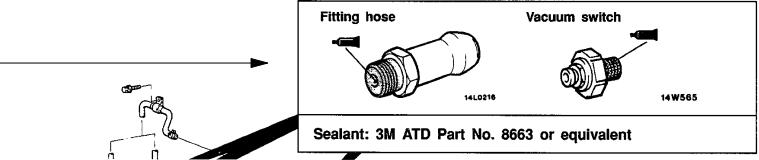
Repair kit or set parts are shown. (Only very frequently used parts are shown.)

Operating procedures, cautions, etc. on removal, installation, disassembly and reassembly are described.

○—○ indicates that there is a continuity between the terminals.  
⊕—⊖ indicates terminals to which battery voltage is applied.

**35A-26 BASIC BRAKE SYSTEM – Master Cylinder and Brake Booster**

Lubrication and sealing points



The title of the page (following the page on which the diagram of component parts is presented) indicating the locations of lubrication and sealing procedures.

# HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

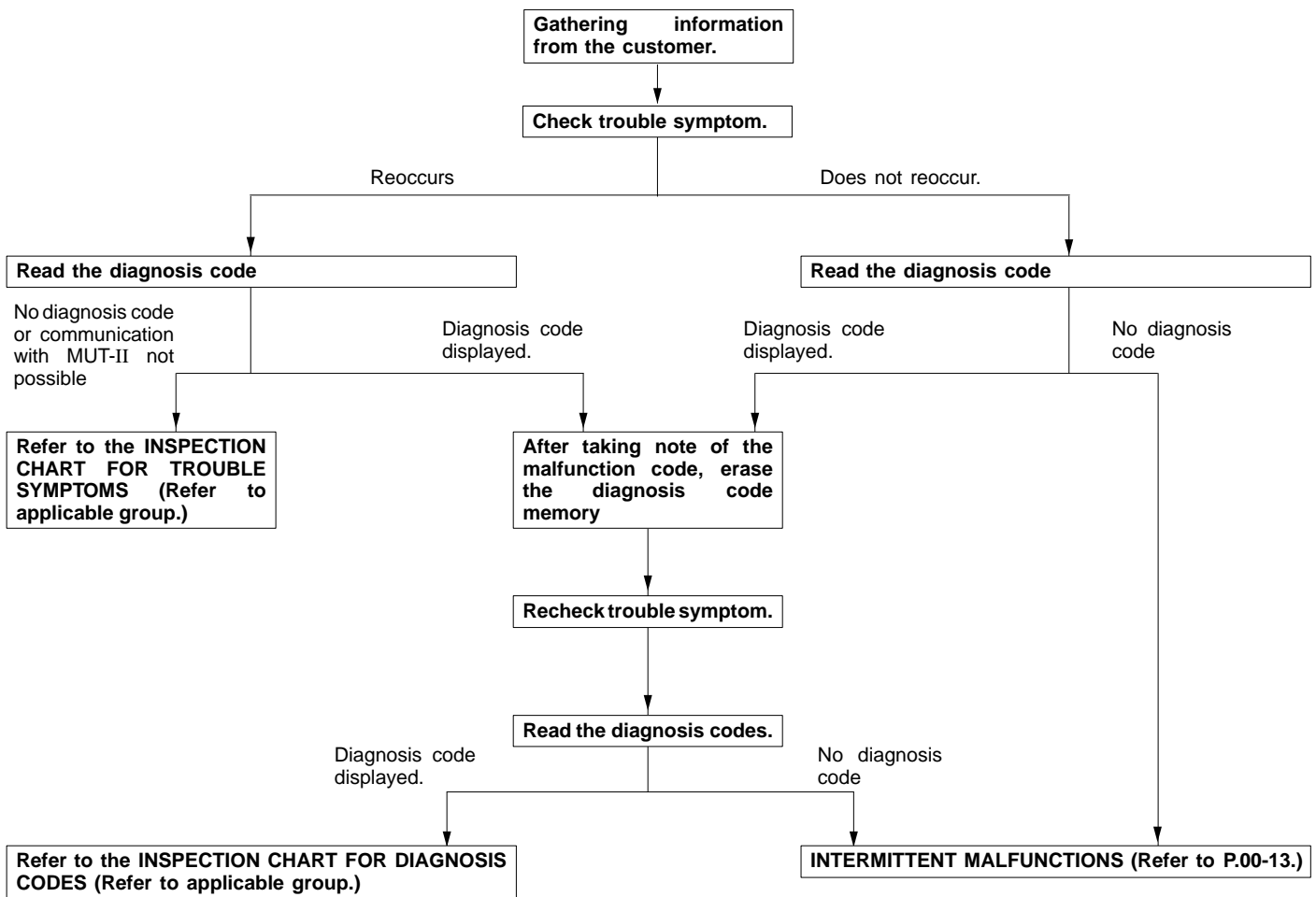
Troubleshooting of electronic control systems for which the MUT-II can be used follows the basic outline described below. Furthermore, even in systems for which the MUT-II cannot be used, part of these systems still follow this outline.

## TROUBLESHOOTING CONTENTS

### 1. STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

The troubleshooting sections follow the basic diagnosis flow which is given below. If the diagnosis flow is different from that given below, or if additional explanation is required, the details of such differences or additions will also be listed.

#### Diagnosis method



### 2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

If verification of the trouble symptoms is difficult, procedures for checking operation and verifying trouble symptoms are shown.

### 3. DIAGNOSIS FUNCTION

Details which are different from those in the “Diagnosis Function” section on the next page are listed.

**4. INSPECTION CHART FOR DIAGNOSIS CODES****5. INSPECTION PROCEDURE FOR DIAGNOSIS CODES**

Indicates the inspection procedures corresponding to each diagnosis code. (Refer to P.00-10 for how to read the inspection procedures.)

**6. INSPECTION CHART FOR TROUBLE SYMPTOMS**

If there are trouble symptoms even though the results of inspection using the MUT-II show that all diagnosis codes are normal, inspection procedures for each trouble symptom will be found by means of this chart.

**7. INSPECTION PROCEDURE FOR TROUBLE SYMPTOM**

Indicates the inspection procedures corresponding to each trouble symptoms classified in the Inspection Chart for Trouble Symptoms. (Refer to P.00-10 for how to read the inspection procedures.)

**8. SERVICE DATA REFERENCE TABLE**

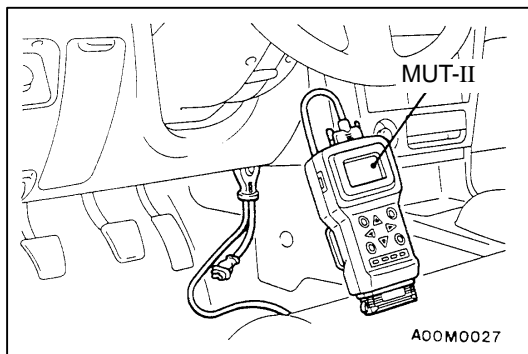
Inspection items and normal judgement values have been provided in this chart as reference information.

**9. CHECK AT ECU TERMINALS**

Terminal numbers for the ECU connectors, inspection items and standard values have been provided in this chart as reference information.

**10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE**

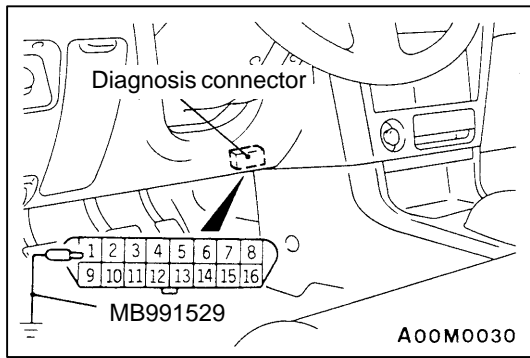
When there are inspection procedures using an oscilloscope, these are listed here.

**DIAGNOSIS FUNCTION****METHOD OF READING DIAGNOSIS CODES****WHEN USING THE MUT-II**

Connect the MUT-II to the diagnosis connector and take a reading of the diagnosis codes.

**Caution**

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



**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**

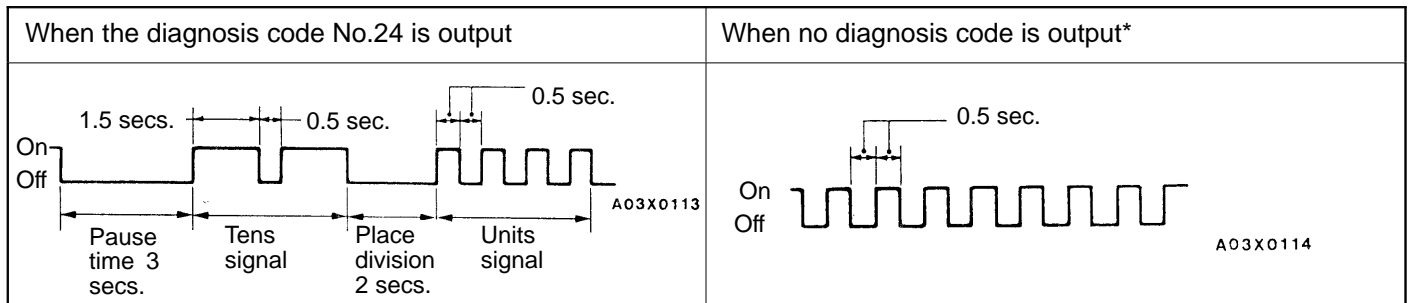
That is because the valve relay is off and the warning lamp remains illuminated if there is a fault in the ABS system.

3. Turn on the ignition switch.
4. Read out a diagnosis code by observing how the warning lamp flashes.

**Applicable systems**

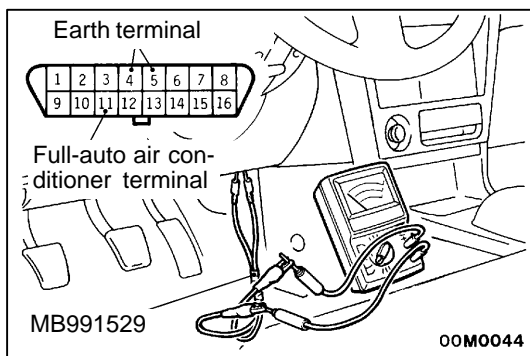
System name	Warning lamp name
MPI	Engine warning lamp
AYC	AYC warning lamp
ABS	ABS warning lamp

**Indication of diagnosis code by warning lamp**



**NOTE**

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



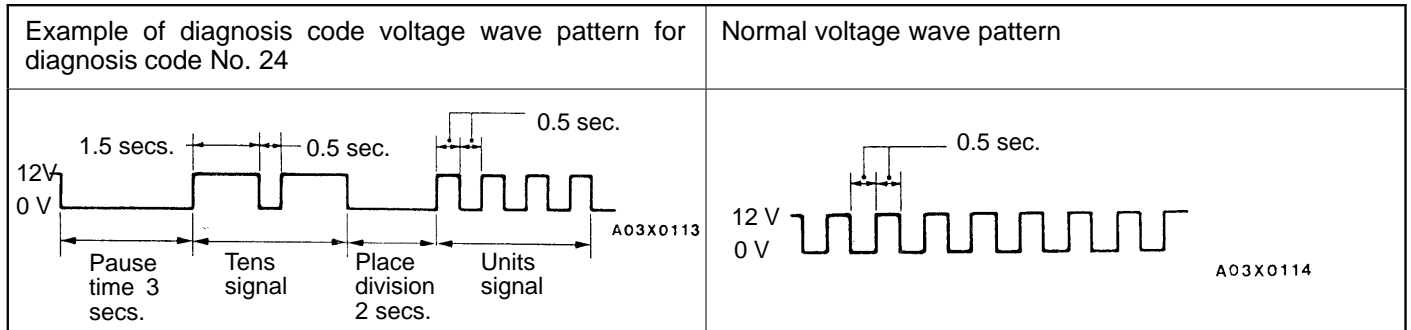
**WHEN USING THE VOLTMETER**

Use the special tool to connect the diagnosis output terminals and the earth terminal of the diagnosis connector to a voltmeter and take a reading of the diagnosis codes from the movement of the needle.

**Voltmeter connection terminals**

System name	Positive connection terminal	Negative connection terminal
Full-auto air conditioner	11	4 or 5

**Diagnosis result display method when using a voltmeter**



**METHOD OF ERASING DIAGNOSIS CODES**

**WHEN USING THE MUT-II**

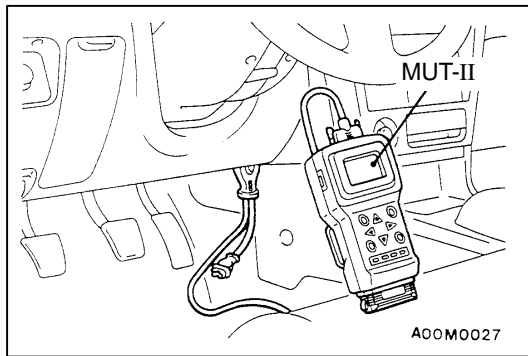
Connect the MUT-II to the diagnosis connector and erase the diagnosis code.

**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.



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

**WHEN USING THE MUT-II**

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

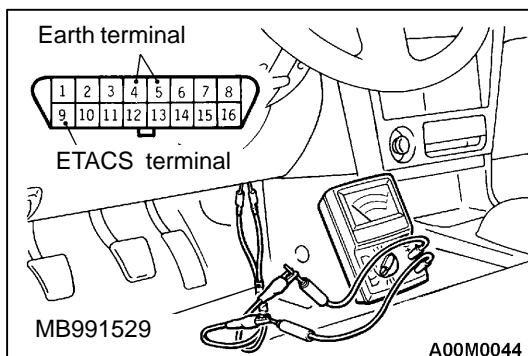
**Caution**

The MUT-II should be connected or disconnected after turning the ignition switch to the OFF position.

2. If buzzer of the MUT-II sounds once when the each switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

**WHEN USING VOLTMETER**

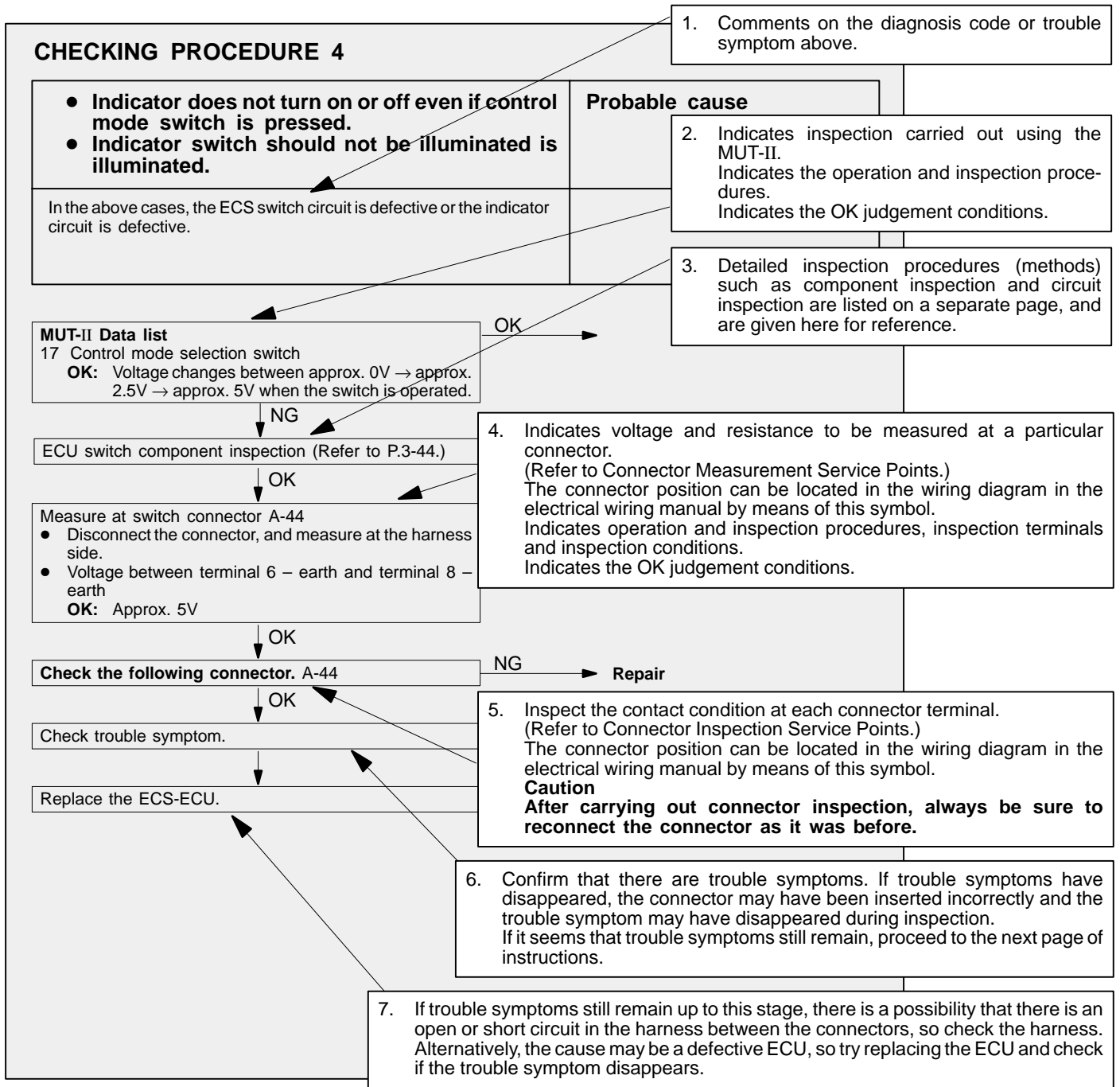
1. Use the special tool to connect a voltmeter between the earth terminal (No. 4 or 5) and the ETACS terminal (No. 9) of the diagnosis connector.
2. If the voltmeter indicator deflects once when the each switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.





**HOW TO USE THE INSPECTION PROCEDURES**

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



**HARNESS INSPECTION**

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

**MEASURES TO TAKE AFTER REPLACING THE ECU**

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

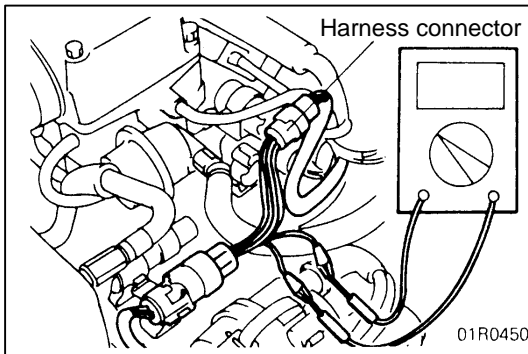
**CONNECTOR MEASUREMENT SERVICE POINTS**

Turn the ignition switch to OFF when connecting/disconnecting the connectors, and turn the ignition switch to ON when measuring if there are no instructions to be contrary.

**IF INSPECTING WITH THE CONNECTOR CONNECTED (WITH CIRCUIT IN A CONDITION OF CONTINUITY)**

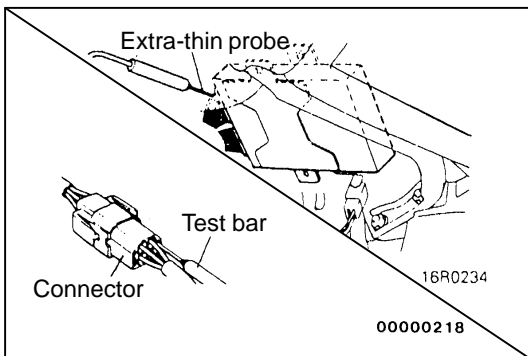
**Waterproof Connectors**

Be sure to use the special tool (harness connector). Never insert a test bar from the harness side, because to do so will reduce the waterproof performance and result in corrosion.



**Ordinary (non-waterproof) Connectors**

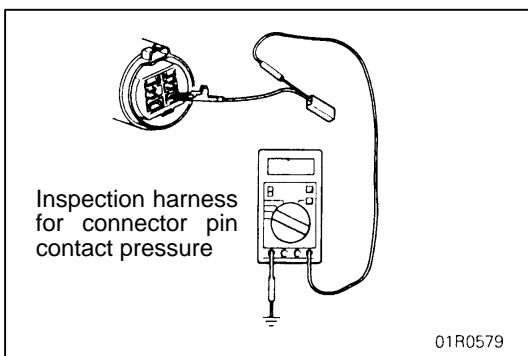
Check by inserting the test bar from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test bar, it should not be forced; use a special tool (the extra-thin probe in the harness set for checking for this purpose).



**IF INSPECTING WITH THE CONNECTOR DISCONNECTED**

**<When Inspecting a Female Pin>**

Use the special tool (inspection harness for connector pin contact pressure in the harness set for inspection). The inspection harness for connector pin contact pressure should be used. the test bar should never be forcibly inserted, as it may cause a defective contact.

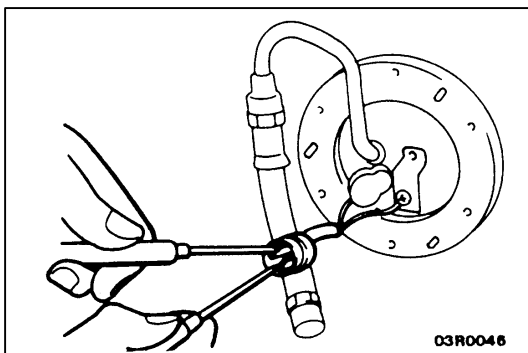


**<When Inspecting a Male Pin>**

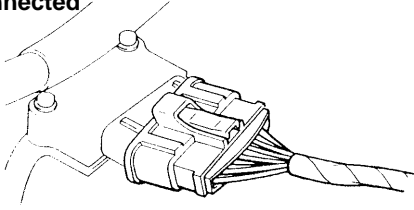
Touch the pin directly with the test bar.

**Caution**

At this time, be careful not to short the connector pins with the test bars. To do so may damage the circuits inside the ECU.

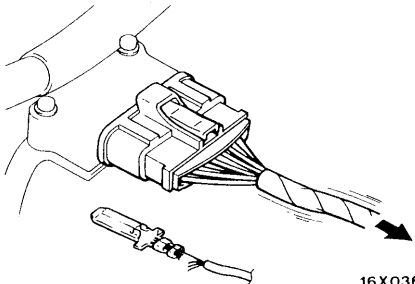


Connector disconnected or improperly connected



Defective connector contact

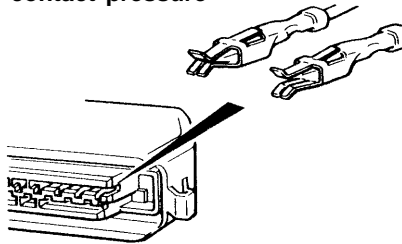
16S0256



Harness wire breakage at terminal section

16X0369

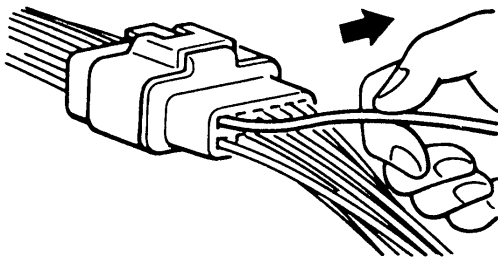
Low contact pressure



16S0254  
00000219

## CONNECTOR PIN INSPECTION

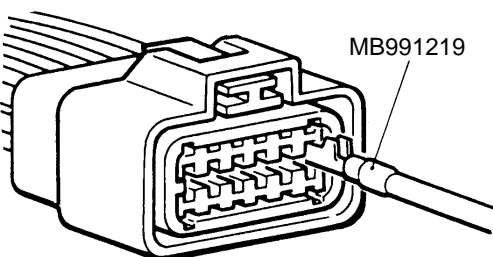
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even if the connector body is connected, and the pins may pull out of the reverse side of the connector. Therefore, gently pull the harnesses one by one to make sure that no pins pull out of the connector.



16R1317

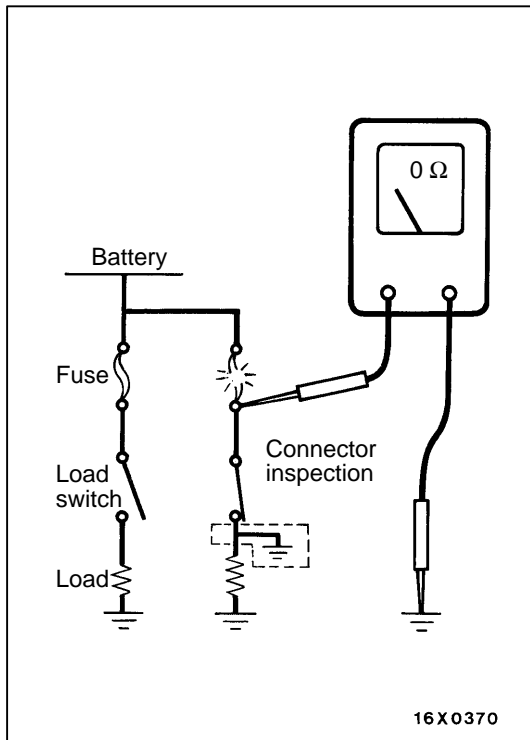
## CONNECTOR ENGAGEMENT INSPECTION

Use the special tool (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and females pins. (Pin drawing force : 1 N or more)



MB991219

16R1318

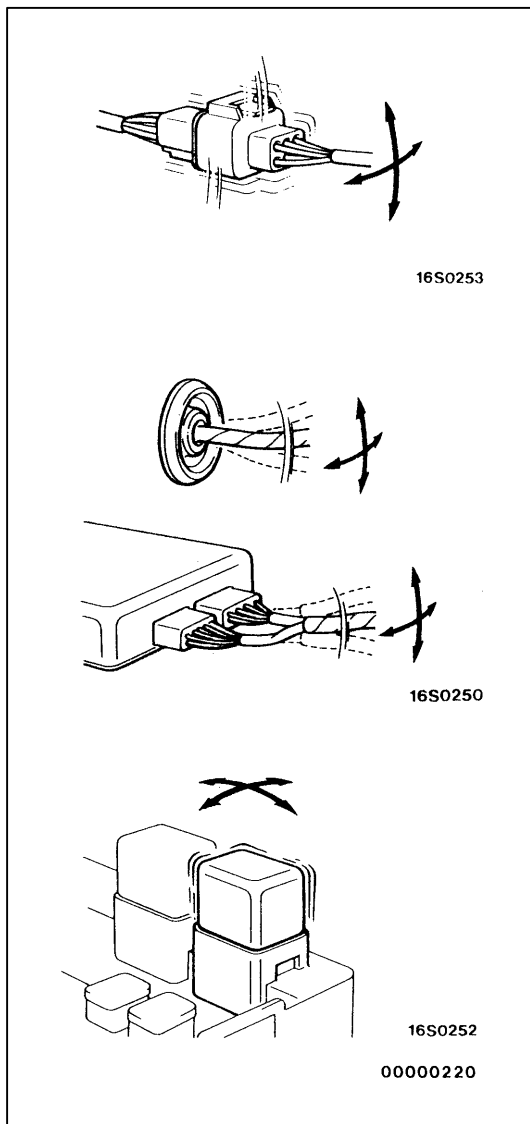


### INSPECTION SERVICE POINTS FOR A BLOWN FUSE

Remove the fuse and measure the resistance between the load side of the fuse and the earth. Set the switches of all circuits which are connected to this fuse to a condition of continuity. If the resistance is almost  $0 \Omega$  at this time, there is a short somewhere between these switches and the load. If the resistance is not  $0 \Omega$ , there is no short at the present time, but a momentary short has probably caused the fuse to blow.

The main causes of a short circuit are the following.

- Harness being clamped by the vehicle body
- Damage to the outer casing of the harness due to wear or heat
- Water getting into the connector or circuitry
- Human error (mistakenly shorting a circuit, etc.)



### POINTS TO NOTE FOR INTERMITTENT MALFUNCTIONS

Intermittent malfunctions often occur under certain conditions, and if these conditions can be ascertained, determining the cause becomes simple. In order to ascertain the conditions under which an intermittent malfunction occurs, first ask the customer for details about the driving conditions, weather conditions, frequency of occurrence and trouble symptoms, and then try to recreate the trouble symptoms. Next, ascertain whether the reason why the trouble symptom occurred under these conditions is due to vibration, temperature or some other factor. If vibration is thought to be the cause, carry out the following checks with the connectors and components to confirm whether the trouble symptom occurs.

The objects to be checked are connectors and components which are indicated by inspection procedures or given as probable causes (which generates diagnosis codes or trouble symptoms.)

- Gently shake the connector up, down and to the left and right.
- Gently shake the wiring harness up, down and to the left and right.
- Gently rock each sensor and relay, etc. by hand.
- Gently shake the wiring harness at suspensions and other moving parts.

#### NOTE

If determining the cause is difficult, the flight recorder function of the MUT-II can also be used.

**MODELS****<LANCER EVOLUTION-IV>**

Model code	Class code	Model year	Grade	Engine model	Transmission model	Fuel supply system
E-CN9A	SNDF	'97	RS	4G63 (2,000-DOHC – 16 valves-intercooler turbo)	W5M51 (4WD-5M/T)	Electronically controlled fuel injection (MPI)
	SRGF	'97	GSR			

**Applicable serial numbers**

E-CN9A: CN9A – 0000001 ~

**<LANCER EVOLUTION-V>**

Model code	Class code	Model year	Grade	Engine model	Transmission model	Fuel supply system
GF-CP9A	SNDF	'98	EVOLUTION-V RS	4G63 (2,000-DOHC – 16 valves-intercooler turbo)	W5M51 (4WD-5M/T)	MPI
	SNGF	'98	EVOLUTION-V GSR			

**Applicable serial numbers**

GF-CP9A: CP9A – 0000001 ~

**<LANCER EVOLUTION-VI>**

Model code	Class code	Model year	Grade	Engine model	Transmission model	Fuel supply system
GF-CP9A	SNDF	'99	EVOLUTION-VI RS	4G63 (2,000-DOHC – 16 valves-intercooler turbo)	W5M51 (4WD-5M/T)	MPI
	SNGF	'99	EVOLUTION-VI GSR			

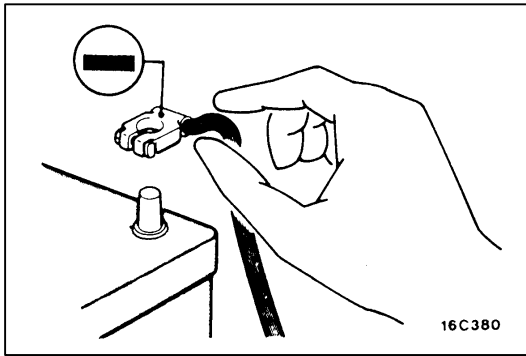
**Applicable serial numbers**

GF-CP9A: CP9A – 0100001 ~

## PRECAUTIONS BEFORE SERVICE

### SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

1. Items to follow when servicing SRS
  - (1) Be sure to read GROUP 52B – Supplemental Restraint System (SRS).  
For safe operations, please follow the directions and heed all warnings.
  - (2) Always use the designated special tools and test equipment.
  - (3) Wait at least 60 seconds after disconnecting the battery cable before doing any further work.  
The SRS system is designed to retain enough voltage to deploy the air bag even after the battery has been disconnected. Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.
  - (4) Never attempt to disassemble or repair the SRS components. (SRS air bag control unit, air bag module and clock spring.) If faulty, replace it.
  - (5) Warnings labels must be needed when servicing and handling SRS components. Warning labels are located in the following locations.
    - Sun visor
    - Glove box
    - SRS air bag control unit
    - Steering wheel
    - Steering gear and linkage
    - Air bag module
    - Clock spring
  - (6) Store components removed from the SRS in a clean and dry place.  
The air bag module should be stored on a flat surface and placed so that the pad surface is facing upwards.
  - (7) Be sure to deploy the air bag before disposing of air bag module or disposing of a vehicle equipped with an air bag. (Refer to GROUP 52B – Air Bag Module Disposal Procedures.)
  - (8) Whenever you finish servicing the SRS, check the SRS warning lamp operation to make sure that the system functions properly.
2. Observe the following when carrying out operations on place where SRS components are installed, including operations not directly related to the SRS air bag.
  - (1) When removing or installing parts do not allow any impact or shock to the SRS components.
  - (2) SRS components should not be subjected to heat over 93°C, so remove the SRS components before drying or baking the vehicle after painting.  
After re-installing them, check the SRS warning lamp operation to make sure that the system functions properly.



## 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

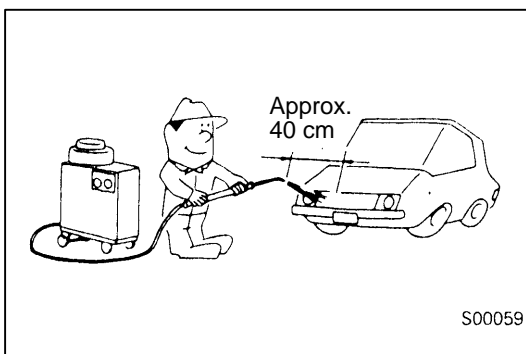
“Pre-inspection condition” refers to the condition that the vehicle must be in before proper engine inspection can be carried out. If you see the words “Set the vehicle to the pre-inspection condition.” in this manual, it means to set the vehicle to the following condition.

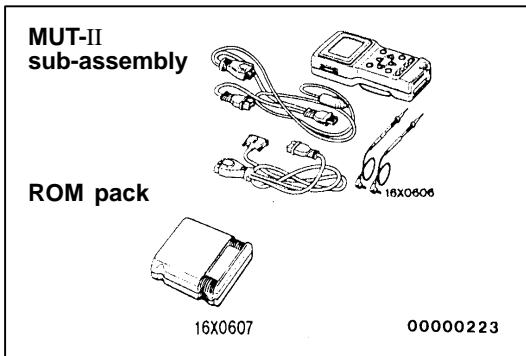
- Engine coolant temperature: 80–90°C
- Lamps, electric cooling fan and all accessories: OFF
- M/T: Neutral

## 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.

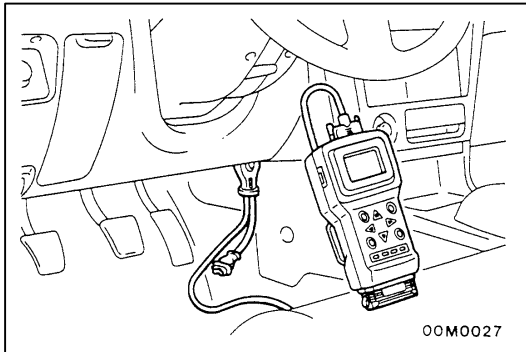
- Spray nozzle distance: Approx. 40 cm or more
- Spray pressure: 3,900 kPa or less
- Spray temperature: 82°C or less
- Time of concentrated spray to one point: within 30 sec.





## MUT-II

Refer to the MUT-II INSTRUCTION MANUAL for instructions on handling the MUT-II.



Connect the MUT-II to the diagnosis connector as shown in the illustration.

### Caution

Connection and disconnection of the MUT-II should always be made with the ignition switch in the OFF position.



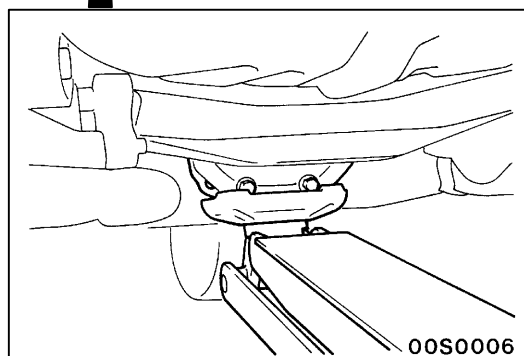
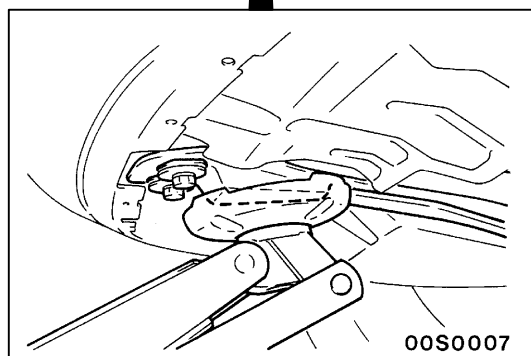
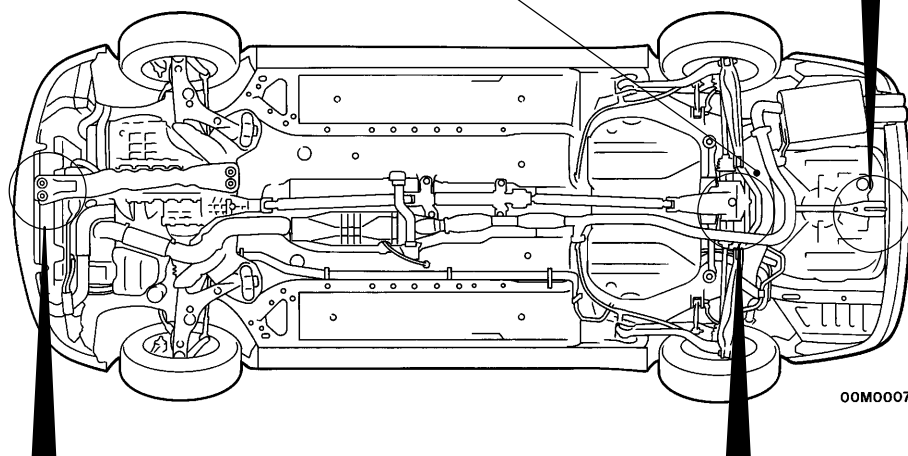
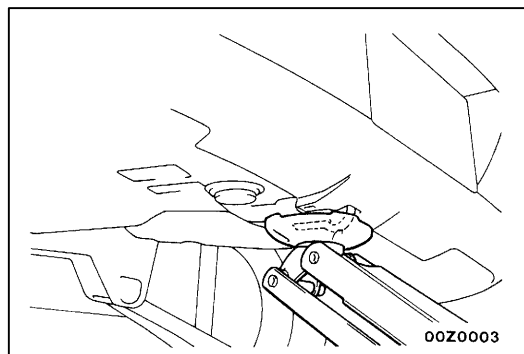
# SUPPORT LOCATIONS FOR LIFTING AND JACKING

## GARAGE JACK

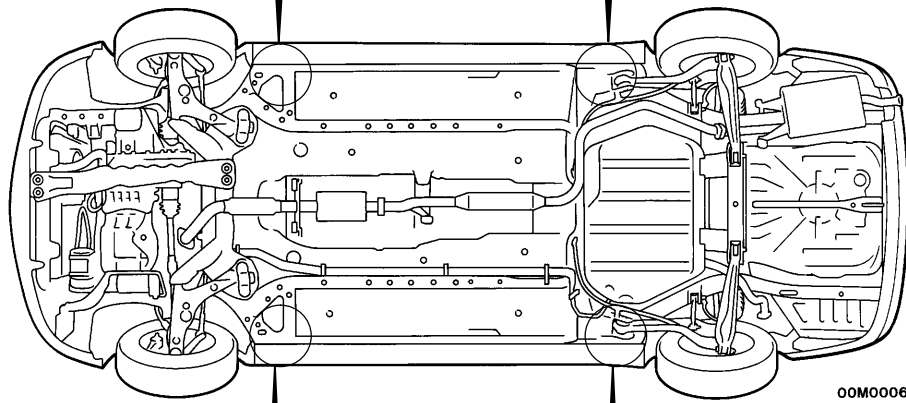
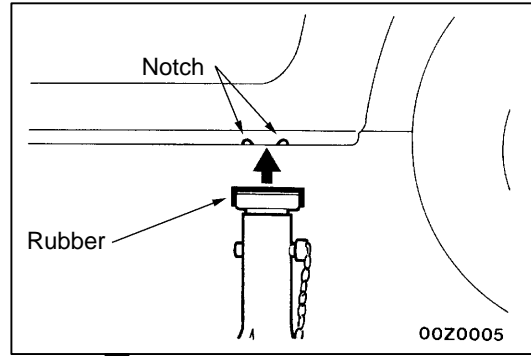
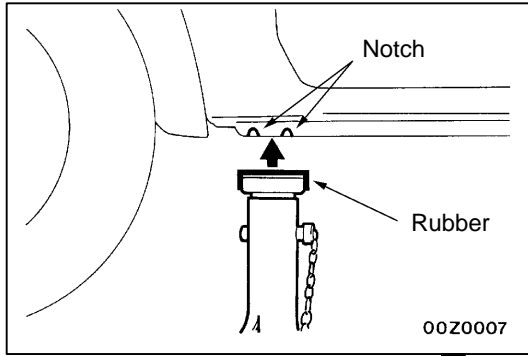
### Caution

Do not support the vehicles at locations other than specified supporting points. Neglecting this will cause damage, etc.

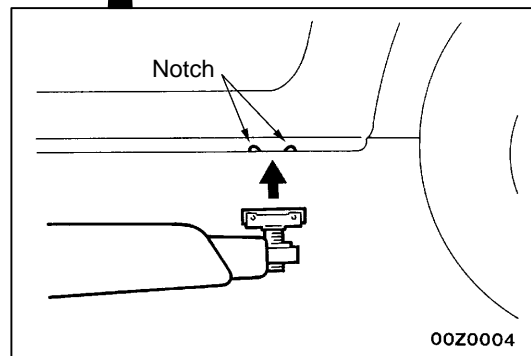
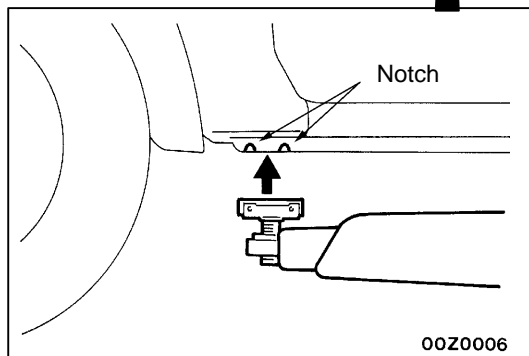
**Caution**  
Never support the rear floor crossmember.



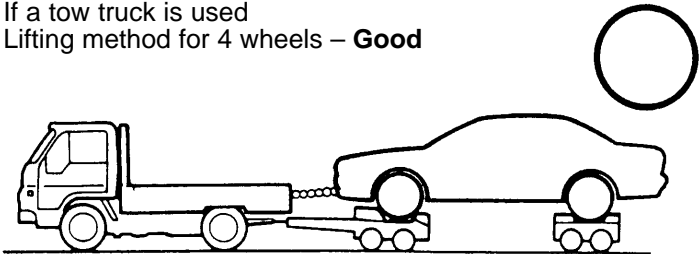
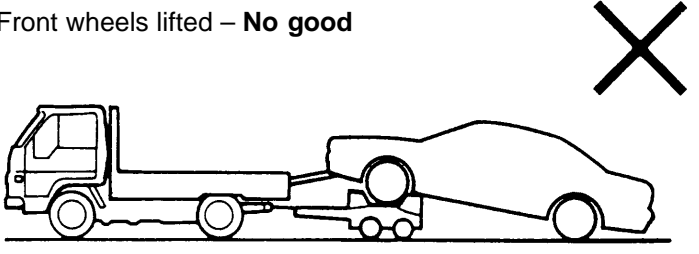
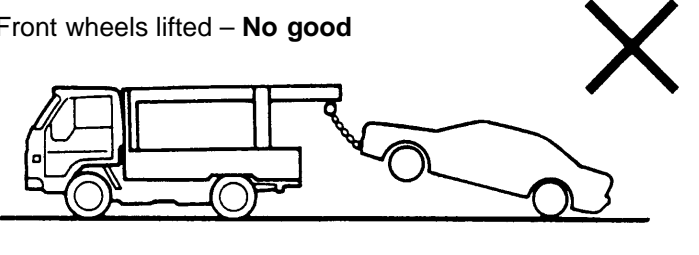
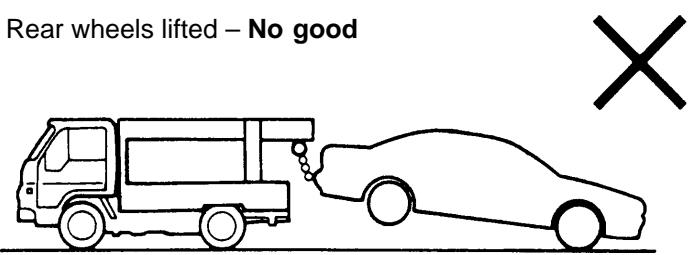
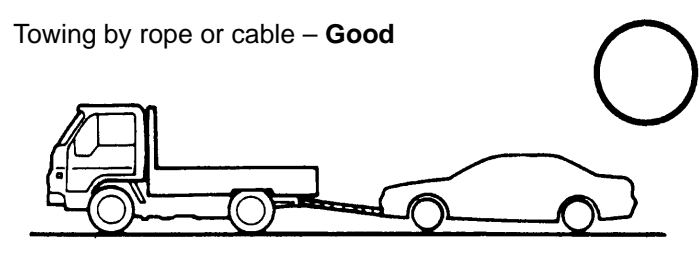
**AXLE STANDS**

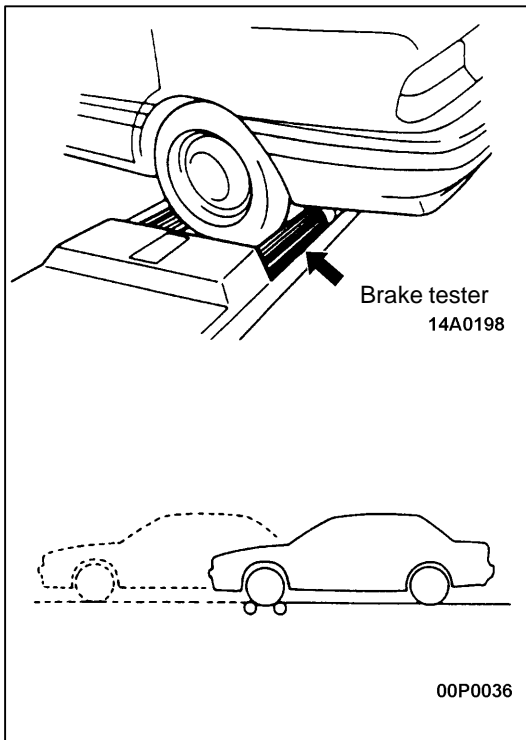


**SINGLE-POST AND DOUBLE-POST LIFT**



**SPECIAL HANDLING INSTRUMENTS FOR TOWING**

Towing methods	Remarks
<p>If a tow truck is used Lifting method for 4 wheels – <b>Good</b></p>  <p>00N0028</p>	<ul style="list-style-type: none"> <li>• For 4WD models, the basic principle is that all four wheels are to be raised before towing.</li> <li>• The shift lever should be set to 1st gear and the parking brake should be applied.</li> </ul>
<p>Front wheels lifted – <b>No good</b></p>  <p>00N0030</p>	<ul style="list-style-type: none"> <li>• The vehicle must not be towed by placing only its front wheels or only the rear wheels on a rolling dolly, because to do so will result in deterioration of the viscous coupling and result in the viscous coupling causing the vehicle to jump forward suddenly.</li> </ul>
<p>Front wheels lifted – <b>No good</b></p>  <p>00N0026</p>	<ul style="list-style-type: none"> <li>• If only the front wheels or only the rear wheels are lifted for towing, the bumper will be damaged. In addition, lifting of the rear wheels causes the oil to flow forward, and may result in heat damage to the rear bushing of the transfer, and so should never be done.</li> </ul>
<p>Rear wheels lifted – <b>No good</b></p>  <p>00N0029</p>	
<p>Towing by rope or cable – <b>Good</b></p>  <p>00N0027</p>	<ul style="list-style-type: none"> <li>• The front and rear wheels must rotate normally.</li> <li>• Both running and driving systems must function normally.</li> <li>• The shift lever must be set to the neutral position and the ignition key must be set to "ACC".</li> </ul>



## BRAKE TEST

In order to stabilize the viscous coupling's dragging force, the brake test should always be conducted after the speedometer test.

### FRONT WHEEL MEASUREMENTS

1. Place the front wheels on the brake tester.
2. Perform the brake test.

#### Caution

**The rear wheels should remain on the ground.**

3. If the brake dragging force exceeds the specified value, jack up the vehicle and manually rotate each wheel to check the rotation condition of each wheel.

#### NOTE

If the brake dragging force exceeds the specified value, the cause may be the effect of the viscous coupling's dragging force, so jack up the front wheels and check the rotation condition of the wheels in this state for no effect by the viscous coupling's dragging force.

### REAR WHEEL MEASUREMENTS

After placing the rear wheels on the brake tester, follow the same procedures as for the front wheel measurements.

## TIGHTENING TORQUE

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

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# ENGINE

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**GENERAL INFORMATION**

Descriptions		Specifications	
Type		In-line OHV, SOHC	
Number of cylinders		4	
Combustion chamber		Pentroof + curved top piston type	
Total displacement dm <sup>3</sup>		1,997	
Cylinder bore mm		85.0	
Piston stroke mm		88.0	
Compression ratio		8.8	
Valve timing	Intake valve	Opens (BTDC)	21°
		Closes (ABDC)	59°
	Exhaust valve	Opens (BBDC)	58°
		Closes (ATDC)	18°
Lubrication system		Pressure feed, full-flow filtration	
Oil pump type		Involute gear type	

**SPECIFICATIONS****SERVICE SPECIFICATIONS**

Items		Standard value	Limit
<b>Timing belt</b>			
Auto-tensioner rod projection length mm		12	–
Auto-tensioner rod pushed-in amount [when pushed with a force of 98 – 196 N] mm		1.0 or less	–
<b>Rocker arms and camshaft</b>			
Camshaft cam height mm	Intake	35.79	35.29
	Exhaust	35.49	34.99
Camshaft journal outer diameter mm		26	–
<b>Cylinder head and valves</b>			
Cylinder head flatness of gasket surface mm		Less than 0.05	0.2
Cylinder head grinding limit of gasket surface mm Total resurfacing depth of both cylinder head and cylinder block		–	0.2
Cylinder head overall height mm		131.9 – 132.1	–
Cylinder head bolt shank length mm		–	Maximum 99.4
Valve thickness of valve head (margin) mm	Intake	1.0	0.5
	Exhaust	1.5	1.0
Overall valve length mm	Intake	109.5	109.0
	Exhaust	109.7	109.2
Valve thickness to valve guide clearance mm	Intake	0.02 – 0.05	0.10
	Exhaust	0.05 – 0.09	0.15
Valve face angle		45° – 45.5°	–
Valve spring free length mm		48.3	47.3
Valve spring load/installed height N/mm		294/40.0	–
Valve spring out-of-squareness		1.5° or less	Maximum 4°
Valve seat contact width mm		0.9 – 1.3	–
Valve guide inner diameter mm		6.6	–
Valve guide projection from cylinder head upper surface mm		20.5	–
Valve stem projection mm	Intake	49.20	49.70
	Exhaust	48.40	48.90
Oversize rework dimensions of valve guide hole mm	0.05 O.S.	12.05 – 12.07	–
	0.25 O.S.	12.25 – 11.27	–
	0.50 O.S.	12.50 – 12.52	–



Items		Standard value	Limit
Intake oversize rework dimensions of valve guide hole mm	0.3 O.S.	35.30 – 35.33	–
	0.6 O.S.	35.60 – 35.63	–
Exhaust oversize rework dimensions of valve guide hole mm	0.3 O.S.	33.30 – 33.33	–
	0.6 O.S.	33.60 – 33.63	–
<b>Front case and oil pan</b>			
Oil pump side clearance mm	Drive gear	0.08 – 0.14	–
	Driven gear	0.06 – 0.12	–
Oil pressure at curb idle speed kPa [Oil temperature is 75 to 90°C]		78 or more	–
<b>Piston and connecting rod</b>			
Piston outer diameter mm		85.0	–
Piston ring side clearance mm	No. 1 ring	0.04 – 0.075	–
	No. 2 ring	0.02 – 0.06	–
Piston ring end gap mm	No. 1 ring	0.25 – 0.35	0.8
	No. 2 ring	0.40 – 0.55	0.8
	Oil ring	0.10 – 0.40	1.0
Piston pin outer diameter mm		21.0	–
Piston pin press-in load N (Room temperature)		7,350 – 17,200	–
Crankshaft pin oil clearance mm		0.02 – 0.05	0.1
Connecting rod big end side clearance mm		0.10 – 0.25	0.4
<b>Crankshaft and flywheel</b>			
Crankshaft end play mm		0.05 – 0.25	0.40
Crankshaft journal outer diameter mm		57.0	–
Crankshaft pin outer diameter mm		44.0	–
Crankshaft journal oil clearance mm		0.02 – 0.04	0.1
Bearing cap bolt shank length mm		–	Maximum 71.1
Piston to cylinder clearance mm		0.02 – 0.04	–
Cylinder block grinding limit of gasket surface mm Total resurfacing depth of both cylinder head and cylinder block		–	0.2
Cylinder block overall height mm		284	–
Cylinder block inner diameter mm		85.0	–
Cylinder block cylinder mm		0.01	–
<b>Turbocharger</b>			
Waste gate actuator operation check kPa		100	113.3

Items	Standard value	Limit
<b>Alternator</b>		
Rotor coil resistance $\Omega$	Approx. 3 – 5	–
Protrusion length of brush mm	–	2
<b>Starter motor</b>		
Commutator runout mm	0.05	0.1
Commutator outer diameter mm	32.0	31.4
Commutator undercut mm	0.5	–

## TORQUE SPECIFICATIONS

Items	Nm
<b>Alternator and ignition system</b>	
Oil level gauge guide	13
Water pump pulley	9
Alternator brace (Alternator side)	21
Alternator brace (Tightened with water pump)	23
Alternator pivot bolt	44
Crankshaft pulley	25
Center cover	3
Spark plug	25
Ignition coil	10
<b>Timing belt</b>	
Timing belt cover (Flange bolt)	11
Timing belt cover (Washer bolt)	9
Power steering pump bracket	49
Tensioner pulley	49
Tensioner arm	24
Auto tensioner	24
Idler pulley	48
Crank angle sensor	9
Oil pump sprocket	54
Camshaft bolt	118
Tensioner "B"	19
Counterbalance shaft sprocket	45

Items	Nm
Rocker cover	3.5
Engine support bracket	49
Camshaft sprocket bolt	88
Timing belt rear right cover	11
Timing belt rear left upper cover	11
<b>Fuel and emission control parts</b>	
Throttle body	18
Fuel pressure regulator	9
Delivery pipe	11
Vacuum tank bracket	9
Solenoid valve bracket	9
Solenoid valve	9
Vacuum hose and vacuum pipe	11
<b>Secondary air intake manifold</b>	
Heat protector	13
Vacuum hose and vacuum pipe	11
Air pipe (Heat protector side)	13
Air pipe (Cam position sensor side)	11
Air pipe (Eye bolt)	49
Air pipe (Control valve side)	24
Air control valve	21
Air control valve bracket	24
Intake manifold stay	30
Intake manifold (M8)	19
Intake manifold (M10)	35
<b>Exhaust manifold</b>	
Engine hanger	12
Heat protector (Turbocharger side)	14
Oxygen sensor	54
Exhaust fitting bolt	59
Exhaust fitting nut	59
Air outlet fitting	19

Items	Nm
Oil return pipe (Turbocharger side)	9
Oil return pipe (Oil pan side – Head mark 7)	9
Oil return pipe (Oil pan side – Head mark 10)	13
Oil pipe	11
Oil pipe eye bolt (Cylinder head side)	16
Oil pipe eye bolt (Turbocharger side)	30
Water pipe	11
Water pipe eye bolt	41
Exhaust manifold (M8)	29
Exhaust manifold (M10)	49
Exhaust manifold (Turbocharger side)	59
<b>Water pump and water hose</b>	
Water temperature sensor	29
Water temperature gauge unit	11
Water inlet fitting	24
Water outlet fitting (M6)	10
Water outlet fitting (M8)	13
Thermostat housing	24
Thermostat housing (Clamp)	11
Water inlet pipe (Cylinder block)	13
Water inlet pipe (Outlet fitting)	10
Water pump	14
Knock sensor	22
<b>Rocker arms and camshaft</b>	
Camshaft position sensor	9
Camshaft position sensor cover	10
Camshaft position sensing cylinder	21
Camshaft position sensing support	13
Camshaft bearing cap	20
Oil delivery body	11
<b>Cylinder head and valves</b>	
Cylinder head bolt [Tighten to 78 Nm and then completely before tightening to final torque specification]	20 → 90° + 90°

Items	Nm
<b>Front case and oil pan</b>	
Drain plug	39
Oil pan	7
Oil screen	19
Baffle plate	22
Oil pressure switch	10
Oil cooler by-pass valve	54
Relief plug	44
Plug	24
Front case	24
Oil pump cover (Screw)	10
Oil pump cover (Bolt)	16
<b>Piston and connecting rods</b>	
Connecting rod nut	20 + 90° to 94°
<b>Crankshaft and flywheel</b>	
Flywheel bolt	132
Rear plate	11
Bell housing cover	9
Oil seal case	11
Beam bearing cap bolt	25 + 90°
Check valve	32
<b>Throttle body</b>	
Throttle position sensor	3.5
Idle speed control body assembly	3.5
<b>Turbocharger</b>	
Waste gate actuator	11

## NEW TIGHTENING METHOD – BY USE OF BOLTS TO BE TIGHTENED IN PLASTIC AREA

A new type of bolts, to be tightened in plastic area, is currently used some parts of the engine. The tightening method for the bolts is different from the conventional one. Be sure to observe the method described in the text when tightening the bolts.

Service limits are provided for the bolts. Make sure that the service limits described in the text are strictly observed.

- Areas where the bolts are in use:
  - (1) Cylinder head bolts
  - (2) Main bearing cap bolts
  - (3) Connecting rod cap bolts
- Tightening method  
After tightening the bolts to the specified torque, tighten them another 90° or 180° (twice 90°). The tightening method varies on different areas. Observe the tightening method described in the text.

## SEALANTS

Item	Specified sealant	Quantity
Engine support bracket bolt	3M™ AAD Part No. 8672 or equivalent	As required
Semi-circular packing	3M™ AAD Part No. 8672 or equivalent	As required
Rocker cover	3M™ AAD Part No. 8672 or equivalent	As required
Oil return pipe gasket	3M™ AAD Part No. 8731 or equivalent	As required
Thermostat housing	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Water outlet fitting	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Engine coolant temperature gauge unit	3M™ AAD Part No. 8672 or equivalent	As required
Engine coolant temperature sensor	3M™ AAD Part No. 8731 or equivalent	As required
Cam position sensor support	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil pressure switch	3M™ AAD Part No. 8672 or equivalent	As required
Oil pan	Mitsubishi Genuine Part No. MD970389 or equivalent	As required
Oil seal case	Mitsubishi Genuine Part No. MD970389 or equivalent	As required

## FORM-IN-PLACE GASKET

The engine has several areas where the form-in-place gasket (FIPG) is in use. To ensure that the gasket fully serves its purpose, it is necessary to observe some precautions when applying the gasket. Bead size, continuity and location are of paramount importance. Too thin a bead could cause leaks. Too thick a bead, on the other hand, could be squeezed out of location, causing blocking or narrowing of the fluid feed line. To eliminate the possibility of leaks from a joint, therefore, it is absolutely necessary to apply the gasket evenly without a break, while observing the correct bead size.

The FIPG used in the engine is a room temperature vulcanisation (RTV) type and is supplied in a 100-gram tube (Part No. MD970389). Since the RTV hardens as it reacts with the moisture in the atmospheric air, it is normally used in the metallic flange areas. The FIPG, Part No. MD970389, can be used for sealing both engine oil and coolant, while Part No. MD997110 can only be used for engine oil sealing.

### Disassembly

The parts assembled with the FIPG can be easily disassembled without use of a special method. In some cases, however, the sealant between the joined surfaces may have to be broken by lightly striking with a mallet or similar tool. A flat and thin gasket scraper may be lightly hammered in between the joined surfaces. In this case, however, care must be taken to prevent damage to the joined surfaces. For removal of the oil pan, the special tool "Oil Pan Remover" (MD998727) is available. Be sure to use the special tool to remove the oil pan.

### Surface Preparation

Thoroughly remove all substances deposited on the gasket application surfaces, using a gasket scraper or wire brush. Check to ensure that the surfaces to which the FIPG is to be applied is flat. Make sure that there are no oils, greases and foreign substances deposited on the application surfaces. Do not forget to remove the old sealant remained in the bolt holes.

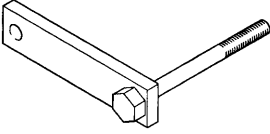
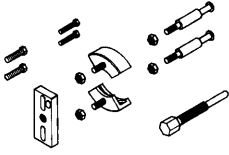
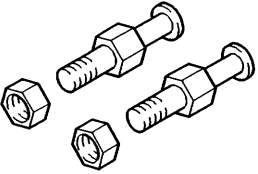
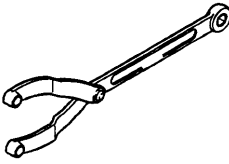
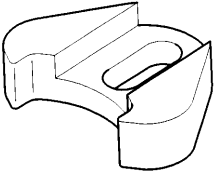
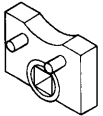
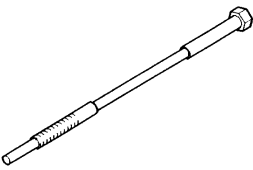
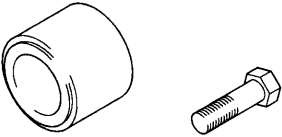
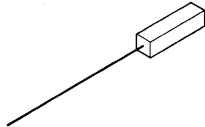
### Form-in-Place Gasket Application

When assembling parts with the FIPG, you must observe some precautions, but the procedures is very simple as in the case of a conventional precut gasket.

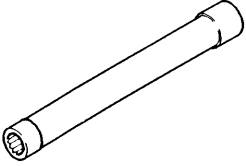
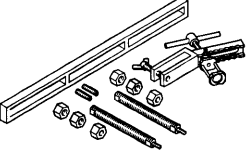
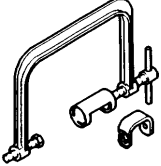
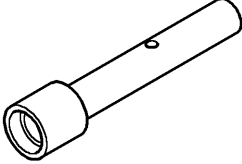
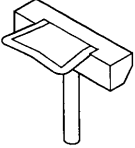
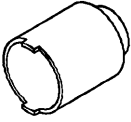
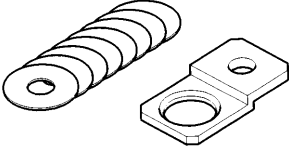
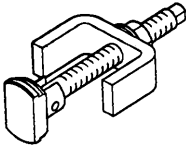
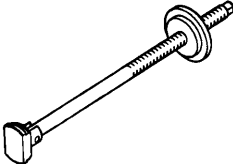
Applied FIPG bead should be of the specified size and without breaks. Also be sure to encircle the bolt hole circumference with a completely continuous bead. The FIPG can be wiped away unless it is hardened. While the FIPG is still moist (in less than 15 minutes), mount the parts in position. When the parts are mounted, make sure that the gasket is applied to the required area only. In addition, do not apply any oil or water to the sealing locations or start the engine until a sufficient amount of time (about one hour) has passed after installation is completed.

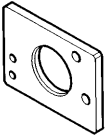
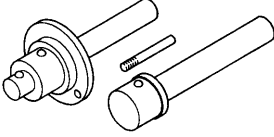
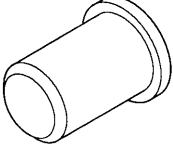
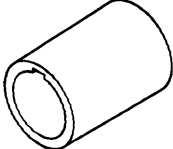
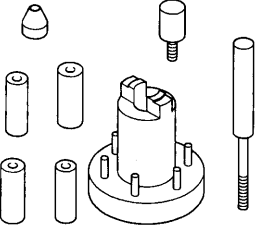
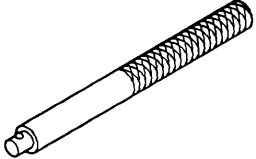
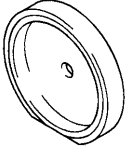
The FIPG application procedure may vary on different areas. Observe the procedure described in the text when applying the FIPG.

**SPECIAL TOOLS**

Tool	Number	Name	Use
	MD998781	Flywheel stopper	Holding of flywheel and drive plate
	MD998778	Crankshaft sprocket puller	Removal of crankshaft sprocket
	MD998719	Pulley holder pin	Holding camshaft sprocket
	MB990767	Crankshaft pulley holder	
	MD998785	Sprocket stopper	Holding silent shaft sprocket
	MD998767	Tensioner puller socket wrench	Adjustment of timing belt tension
	MD998738	Set screw	
	MD998713	Camshaft oil seal installer	Installation of camshaft oil seal
	MD998442	Lash adjuster wire	Air bleeding of lash adjuster

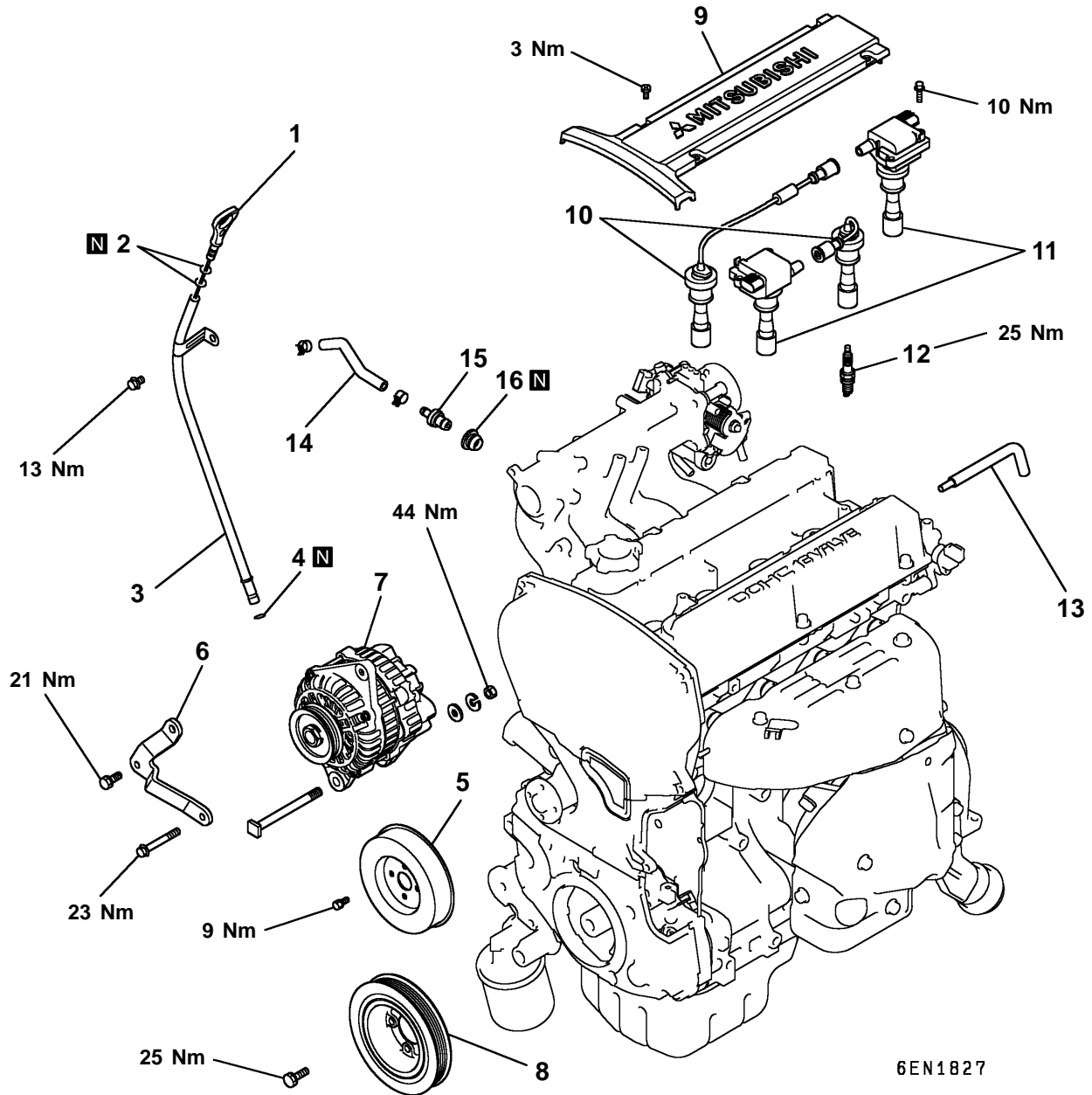


Tool	Number	Name	Use
	MB991654	Cylinder head bolt wrench (12)	Removal and installation of cylinder head bolt
	MD998772	Valve spring compressor	Removal and installation of valve and related parts
	MD998735	Valve spring compressor	
	MD998737	Valve stem seal installer	Installation of valve stem seal
	MD998727	Oil pan remover	Removal of oil pan
	MD998162	Plug wrench	Removal and installation of front case cap plug Use with MD998783.
	MD998783	Plug wrench retainer	Removal and installation of front case cap plug
	MD998371	Silent shaft bearing puller	Removal of counterbalance shaft front bearing
	MD998372	Silent shaft bearing puller	Removal of counterbalance shaft rear bearing

Tool	Number	Name	Use
	MB991603	Silent shaft bearing puller stopper	Guide stopper for removal and installation of counterbalance shaft rear bearing Use with MD998372.
	MD998705	Silent shaft bearing installer	Installation of counterbalance shaft front and rear bearing
	MD998375	Crankshaft front oil seal installer	Installation of crankshaft front oil seal
	MD998285	Crankshaft front oil seal guide	Guide for installation of crankshaft front oil seal Use with MD998375.
	MD998780	Piston setting tool	Removal and installation of piston pin
	MB990938	Handle	Installation of crankshaft rear oil seal
	MD998776	Crankshaft rear oil seal installer	

# ALTERNATOR AND IGNITION SYSTEM

## REMOVAL AND INSTALLATION



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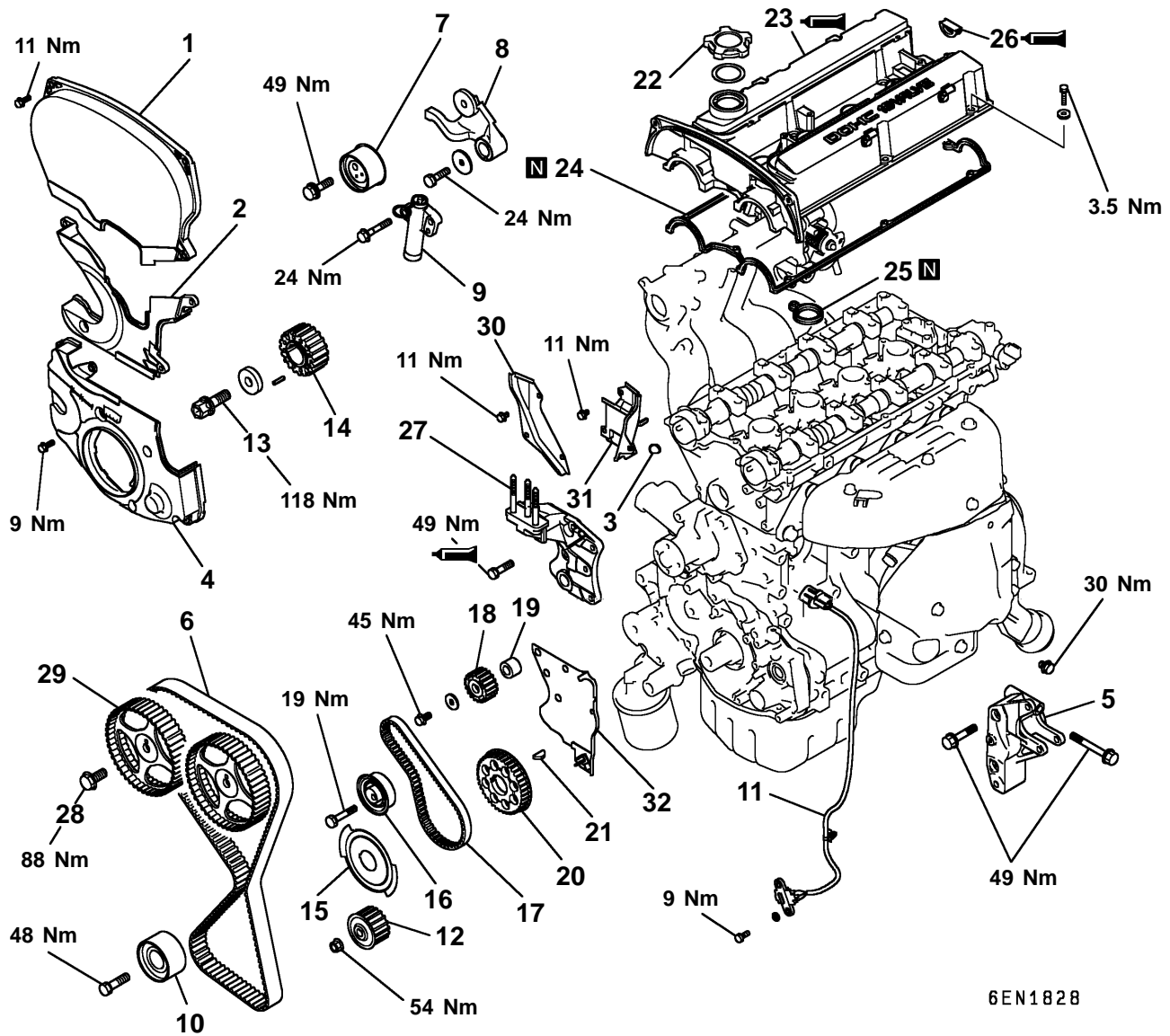
### Removal steps

1. Oil level gauge
2. O-ring
3. Oil level gauge guide
4. O-ring
5. Water pump pulley
6. Alternator brace
7. Alternator
8. Crankshaft pulley

9. Center cover
10. Spark plug cable
11. Ignition coil
12. Spark plug
13. Breather hose
14. PCV hose
15. PCV valve
16. PCV valve gasket

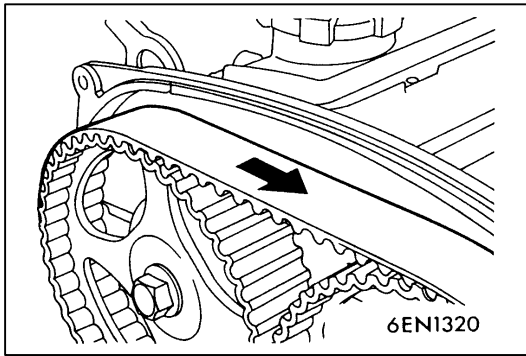
# TIMING BELT

## REMOVAL AND INSTALLATION



### Removal steps

- |                                   |     |     |                                       |
|-----------------------------------|-----|-----|---------------------------------------|
| 1. Timing belt front upper cover  | ▶E▶ | ▶G▶ | 17. Timing belt B                     |
| 2. Timing belt front center cover | ▶F▶ | ▶F▶ | 18. Counterbalance shaft sprocket     |
| 3. Rubber plug                    |     | ▶E▶ | 19. Crankshaft spacer                 |
| 4. Timing belt front lower cover  | ▶G▶ |     | 20. Crankshaft sprocket B             |
| 5. Power steering pump bracket    |     |     | 21. Crankshaft key                    |
| 6. Timing belt                    |     | ▶D▶ | 22. Oil filler cap                    |
| 7. Tensioner pulley               |     |     | 23. Rocker cover                      |
| 8. Tensioner arm                  |     |     | 24. Rocker cover gasket A             |
| 9. Auto tensioner                 |     |     | 25. Rocker cover gasket B             |
| 10. Idler pulley                  |     | ▶C▶ | 26. Semi-circular packing             |
| 11. Crank angle sensor            |     | ▶B▶ | 27. Engine support bracket            |
| 12. Oil pump sprocket             | ▶I▶ | ▶A▶ | 28. Camshaft sprocket bolt            |
| 13. Crankshaft sprocket bolt      | ▶H▶ |     | 29. Camshaft sprocket                 |
| 14. Crankshaft sprocket           |     |     | 30. Timing belt rear right cover      |
| 15. Crankshaft sensing blade      |     |     | 31. Timing belt rear left upper cover |
| 16. Tensioner B                   |     |     | 32. Timing belt rear left lower cover |

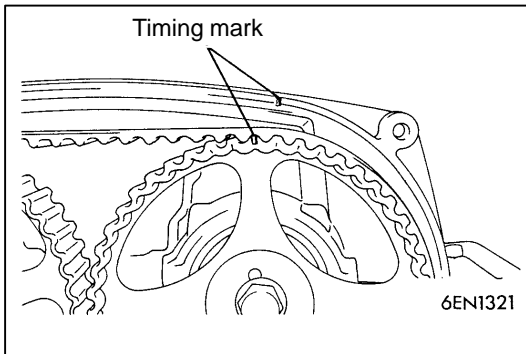
**REMOVAL SERVICE POINTS****◀A▶ TIMING BELT REMOVAL**

- (1) If the timing belt is to be reused, chalk an arrow mark on the back surface of the belt so that the belt can be reinstalled in the same direction.
- (2) Place the exhaust camshaft sprocket in a position where the timing mark for No. 1 cylinder is positioned about one tooth before the top dead center of the compression stroke.

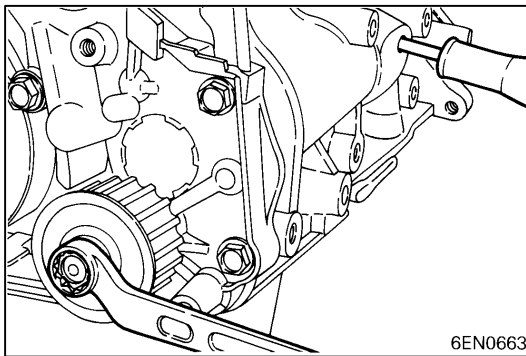
**Caution**

The camshaft sprocket on the exhaust side can turn very easily because of the valve spring tension. Use care not to allow your fingers to get caught by the sprocket.

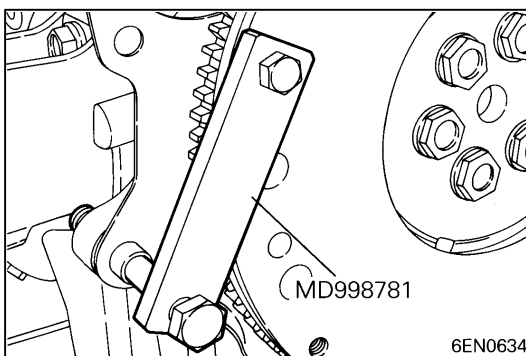
- (3) Loosen the lock nut of the tensioner pulley, then remove the timing belt.

**◀B▶ OIL PUMP SPROCKET REMOVAL**

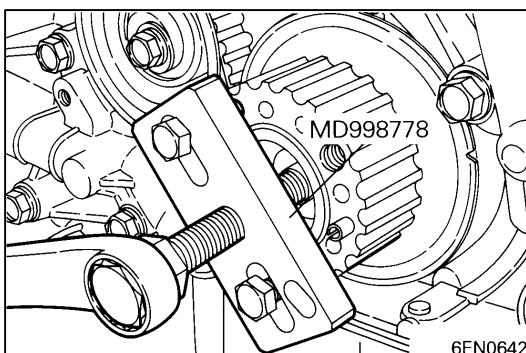
- (1) Remove the plug on the left side of cylinder block.
- (2) Insert a screwdriver (shank diameter 8 mm) to block the counterbalance shaft.
- (3) Remove the nut.
- (4) Remove the oil pump sprocket.

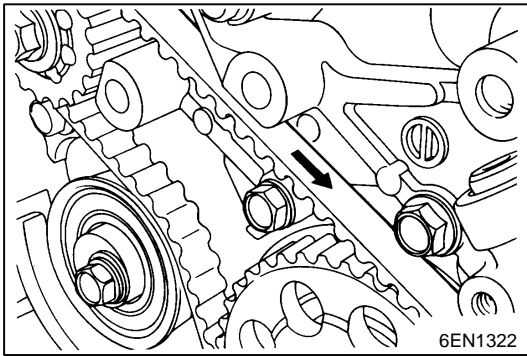
**◀C▶ CRANKSHAFT BOLT LOOSENING**

- (1) Hold the drive plate with the special tool as shown.
- (2) Remove the crankshaft bolt.

**◀D▶ CRANKSHAFT SPROCKET REMOVAL**

If it is difficult to remove the sprocket, use the special tool.



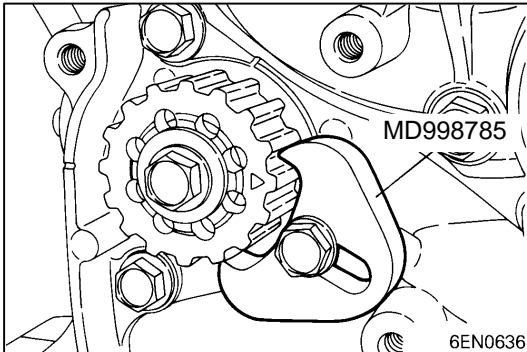


### ◀E▶ TIMING BELT “B” REMOVAL

Make a mark on the back of the timing belt indicating the direction of rotation so it may be reassembled in the same direction if it is to be reused.

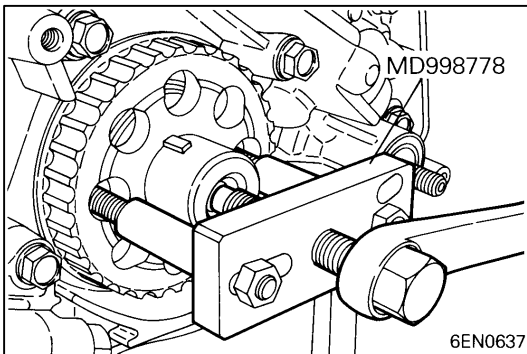
#### NOTE

- (1) Water or oil on the belt shortens its life drastically, so the removed timing belt, sprocket, and tensioner must be free from oil and water. These parts should not be washed. Replace parts if seriously contaminated.
- (2) If there is oil or water on each part check front case oil seals, camshaft oil seal and water pump for leaks.



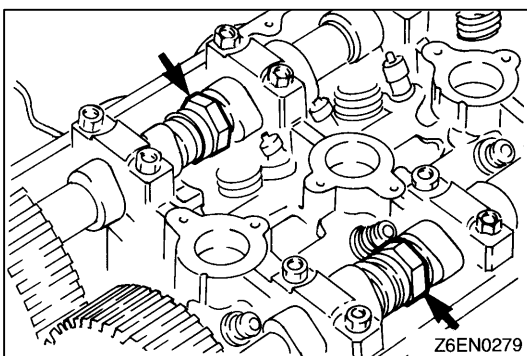
### ◀F▶ COUNTERBALANCE SHAFT SPROCKET REMOVAL

- (1) Set the special tool as shown to prevent the counterbalance shaft sprocket from turning together.
- (2) Loosen the bolt and remove the sprocket.



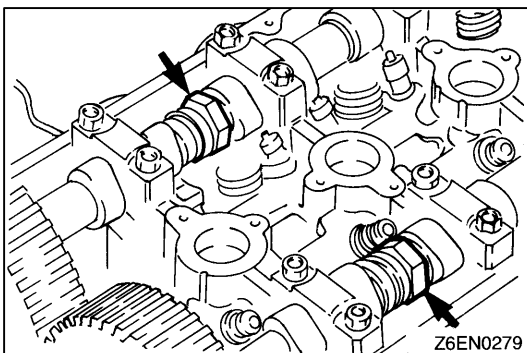
### ◀G▶ CRANKSHAFT SPROCKET “B” REMOVAL

If it is difficult to remove the sprocket, use the special tool.



### ◀H▶ CAMSHAFT SPROCKET BOLT LOOSENING

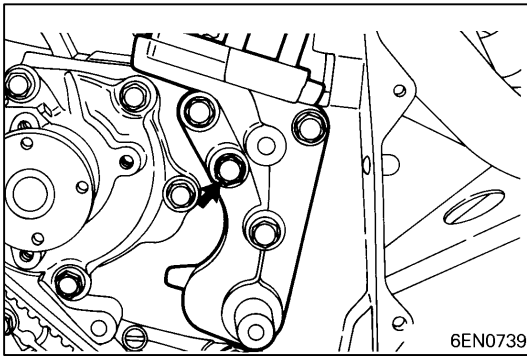
Use a wrench to hold the hexagonal part of the camshaft, and then remove the camshaft sprocket mounting bolt.



## INSTALLATION SERVICE POINTS

### ▶A◀ CAMSHAFT SPROCKET BOLT TIGHTENING

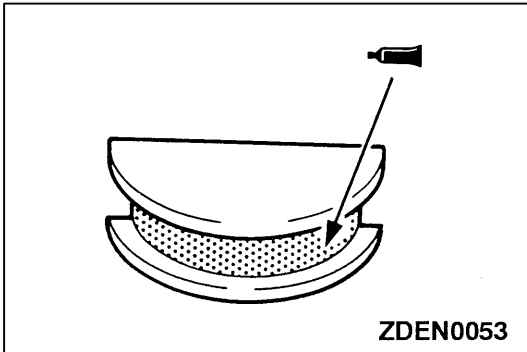
Using a wrench, hold the camshaft at its hexagon and tighten the bolt to the specification.



**►B◄ ENGINE SUPPORT BRACKET INSTALLATION**

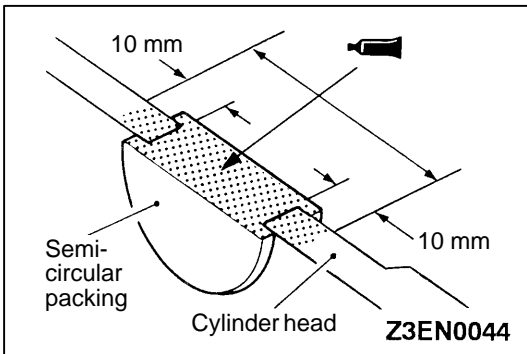
Coat the bolts illustrated with sealant before tightening.

**Specified sealant: 3M™ AAD Part No. 8672 or equivalent**



**►C◄ SEALANT APPLICATION TO SEMI-CIRCULAR PACKING**

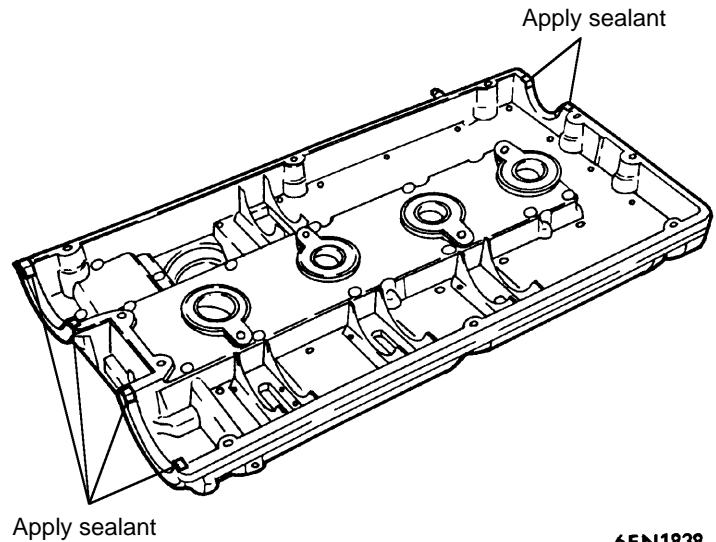
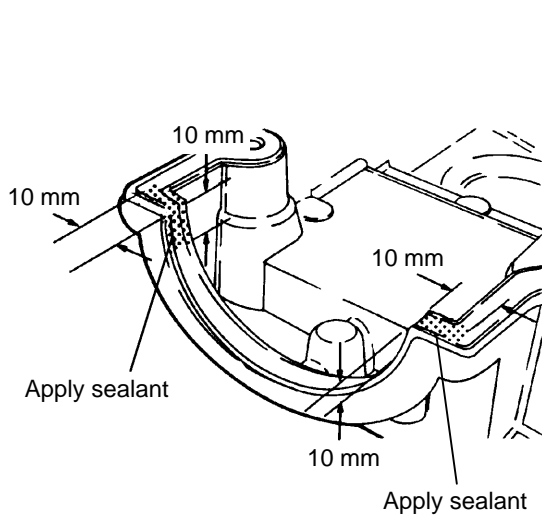
**Specified sealant: 3M™ AAD Part No. 8672 or equivalent**



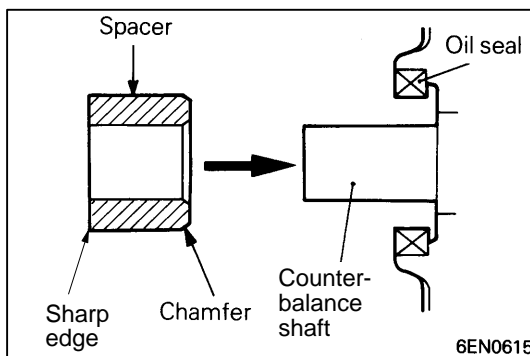
**►D◄ SEALANT APPLICATION TO ROCKER COVER**

Apply sealant to the areas indicated in the illustration.

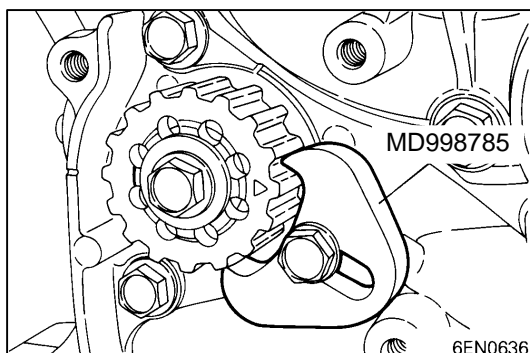
Specified sealant: 3M™ AAD Part No. 8672 or equivalent



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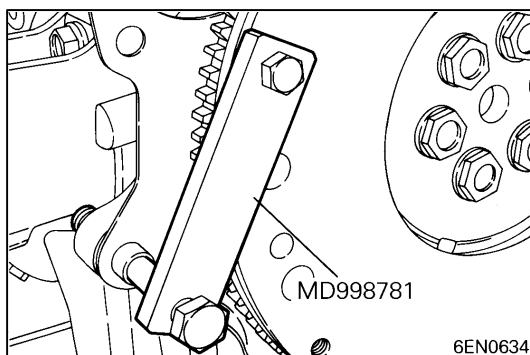
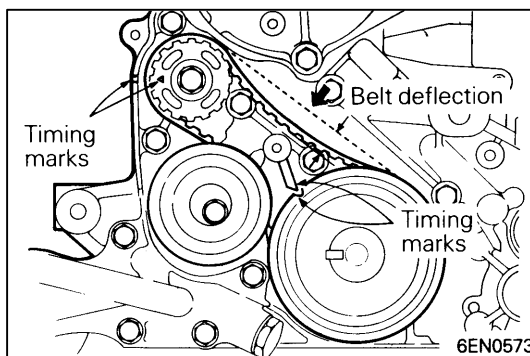
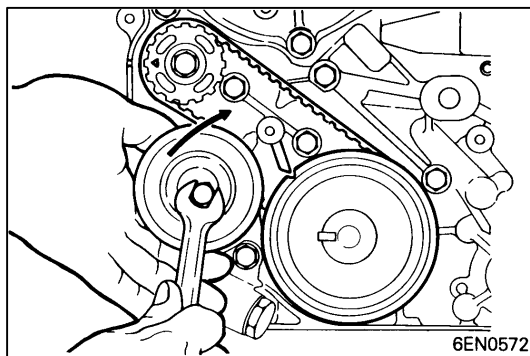
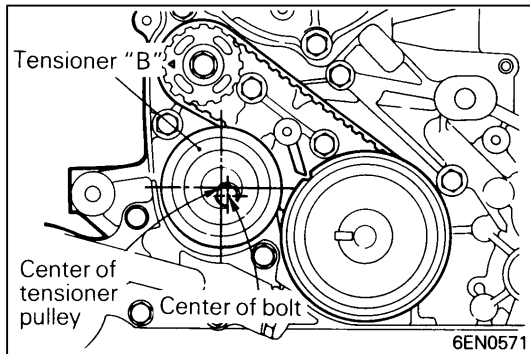
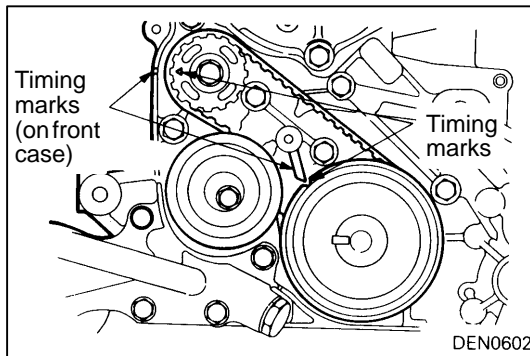
**►E◄ SPACER INSTALLATION**

Install the spacer with the chamfered end toward the oil seal.

**►F◄ COUNTERBALANCE SHAFT SPROCKET INSTALLATION**

- (1) Install the counterbalance shaft sprocket and screw the bolt.
- (2) Install special tool MD998785 as shown in the illustration to lock the counterbalance shaft.
- (3) Tighten the bolt, and then remove the special tool.





### ►G◄ TIMING BELT "B" INSTALLATION

- (1) Align timing marks on the crankshaft sprocket "B" and counterbalance shaft sprocket with the marks on the front case respectively.
- (2) Install the timing belt "B" on the crankshaft sprocket "B" and counterbalance shaft sprocket. There should be no slack on the tension side.

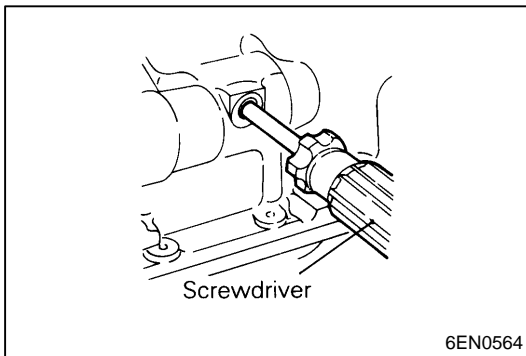
- (3) Make sure that the relationship between the tensioner pulley center and the bolt center is as shown in the illustration.

- (4) Move the tensioner "B" in the direction of arrow while lifting with a finger to give a sufficient tension to the tension side of timing belt. In this condition, tighten bolt to secure tensioner "B". When the bolt is tightened, use care to prevent shaft from turning together. If shaft is turned together, belt will be overtensioned.

- (5) Check to ensure that timing marks on sprockets and front case are in alignment.
- (6) Press with index finger the center of span on the tension side of timing belt "B". The bolt must deflect 5 – 7 mm.

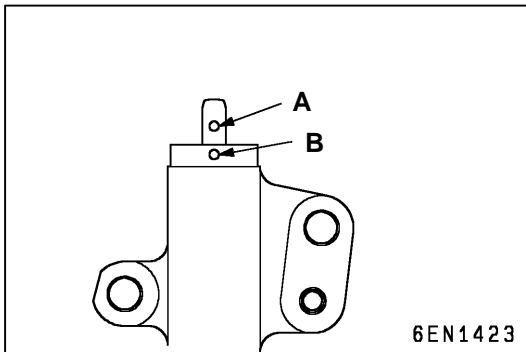
### ►H◄ CRANKSHAFT BOLT TIGHTENING

- (1) Using the special tool, hold the flywheel or drive plate.
- (2) Install the crankshaft pulley in position.



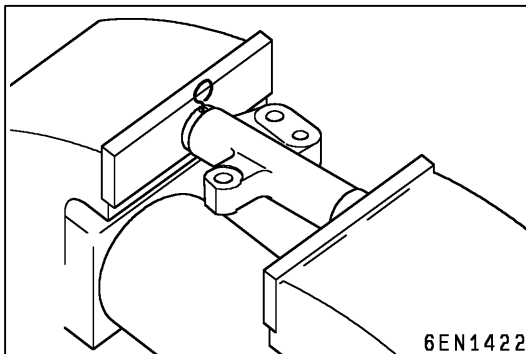
### ►I◄ OIL PUMP SPROCKET INSTALLATION

- (1) Insert a Phillips screwdriver (shank diameter 8 mm shaft) through the plug hole on the left side of the cylinder block to block the left counterbalance shaft.
- (2) Install the oil pump sprocket.
- (3) Apply a proper amount of engine oil to the bearing surfaces of the nuts.
- (4) Tighten the nuts to the specified torque.

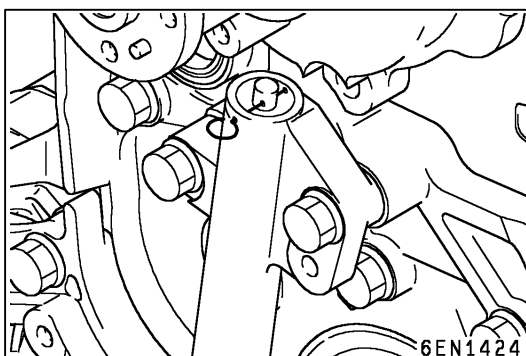


### ►J◄ AUTO TENSIONER INSTALLATION

- (1) If the auto tensioner rod is in its fully extended position, reset it as follows.
- (2) Clamp the auto-tensioner in the vise with soft jaws.
- (3) Push in the rod little by little with the vise until the set hole A in the rod is aligned with the hole B in the cylinder.



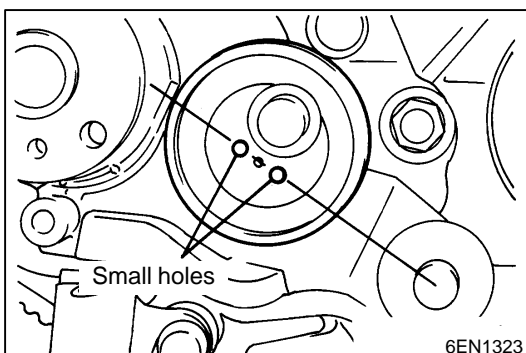
- (4) Insert a wire (1.4 mm in diameter) into the set holes.
- (5) Unclamp the auto tensioner from the vise.



- (6) Install the auto tensioner to front case and tighten to the specified torque.

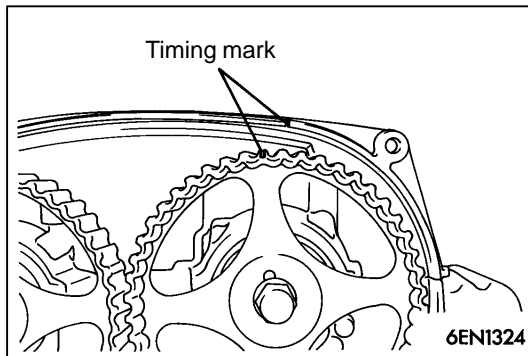
#### Caution

Leave the wire installed in the auto tensioner.



### ►K◄ TENSIONER PULLEY INSTALLATION

Install the tensioner pulley in such direction that its two small holes are arranged vertically.

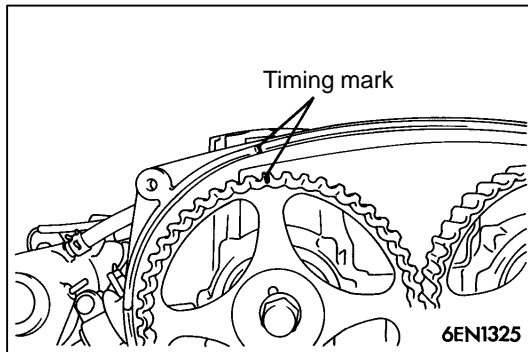


### ►◀ TIMING BELT INSTALLATION

- (1) Place the exhaust side camshaft sprocket in a position where its timing mark is one tooth offset from the timing mark on the rocker cover in the counterclockwise direction.

#### NOTE

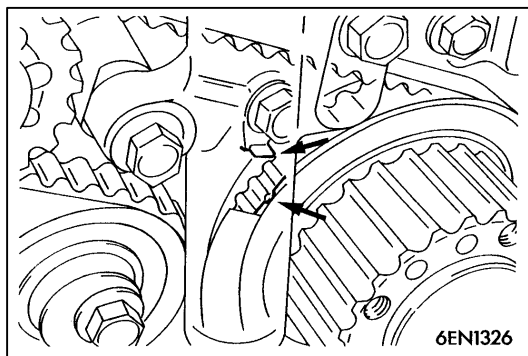
Even if the timing marks on the sprocket and the rocker cover are brought into alignment, the exhaust camshaft is forced back by the valve spring tension. It is stabilized at a position one tooth before the timing mark.



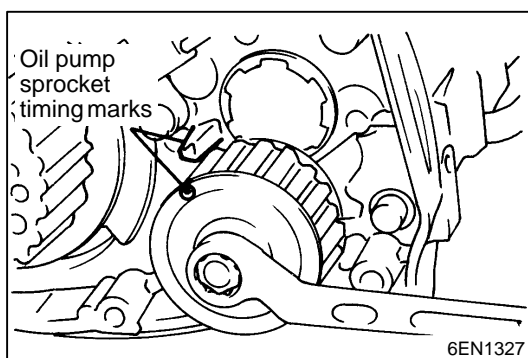
- (2) Align the timing mark on the intake side camshaft sprocket with that on the rocker cover.

#### NOTE

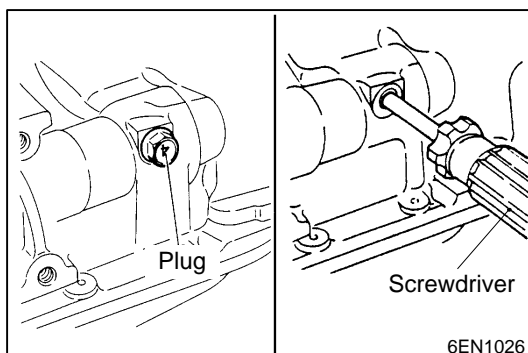
Even if the timing marks on the sprocket and the cover are brought into alignment, the intake camshaft is forced to turn one tooth in the clockwise direction by the valve spring tension and stabilized there.



- (3) Place the timing mark on the crankshaft sprocket one tooth this side from the mated timing mark as in the case of the camshaft sprocket.

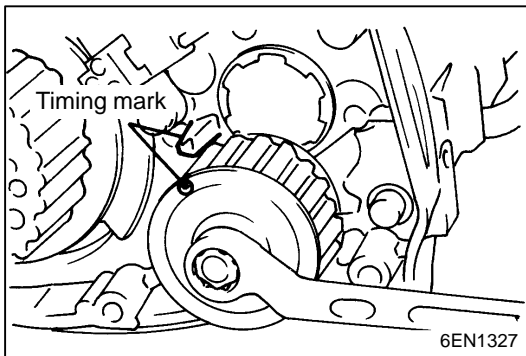


- (4) Align the timing mark on oil pump sprocket with its mating mark.

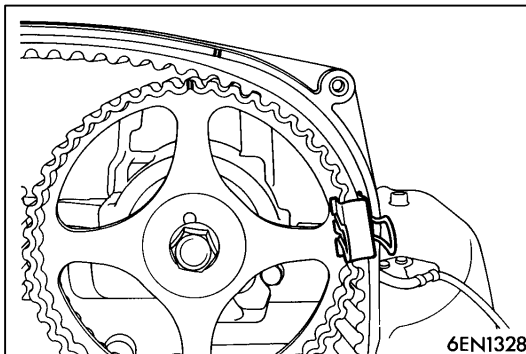


- (5) Remove the plug on cylinder block and insert a Phillips screwdriver (shank diameter 8 mm) through the hole (Engine with counterbalance shafts).

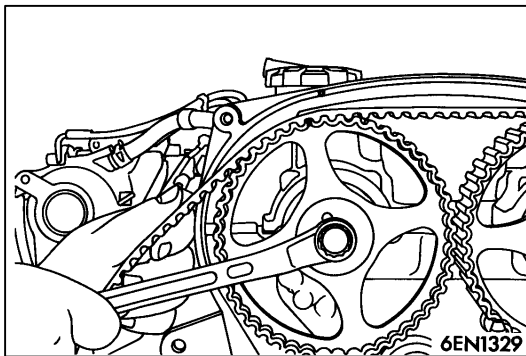
If it can be inserted as deep as 60 mm or more, the timing marks are correctly aligned. If the inserted depth is only 20 – 25 mm, turn the oil pump sprocket one turn and realign timing marks. Then check to ensure that the screwdriver can be inserted 60 mm or more. Keep the screwdriver inserted until installation of timing belt is finished.



- (6) Remove the Phillips screwdriver. Place the oil pump sprocket in a position where its timing mark is one tooth offset from the mated timing mark in the counterclockwise direction.



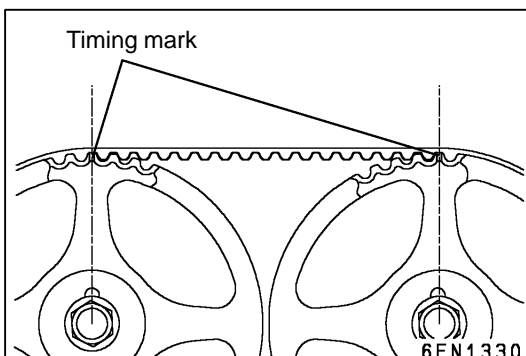
- (7) Fit the timing belt over the exhaust side camshaft sprocket, and secure it at the illustrated position using a paper clip.



- (8) Turn the intake side camshaft sprocket as shown to a position where its timing mark is one tooth offset from the mated timing mark in the counterclockwise direction. Then, fit the timing belt over the sprocket and secure it with a paper clip.

**NOTE**

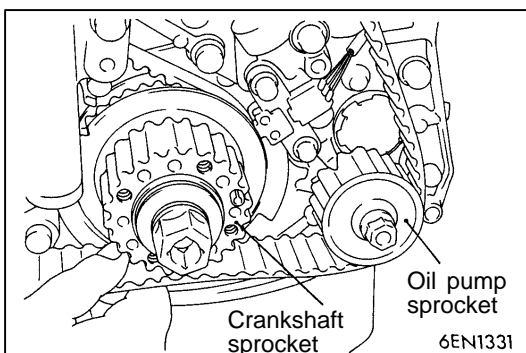
The intake camshaft will be turned a little clockwise by the valve spring tension and stabilized in position even if the belt is clipped at one tooth offset position.



- (9) Check to ensure that the timing marks on the intake camshaft sprocket side are in alignment when the exhaust camshaft sprocket is turned clockwise to align the timing marks.

**NOTE**

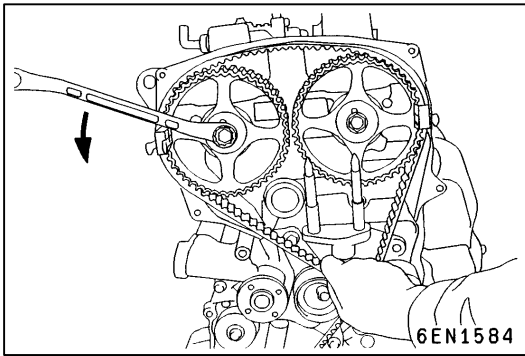
The timing belt span between the intake and exhaust sprockets will have 17 cogs.



- (10) Fit the timing belt over the idler pulley, oil pump sprocket and crankshaft sprocket in this order.

**NOTE**

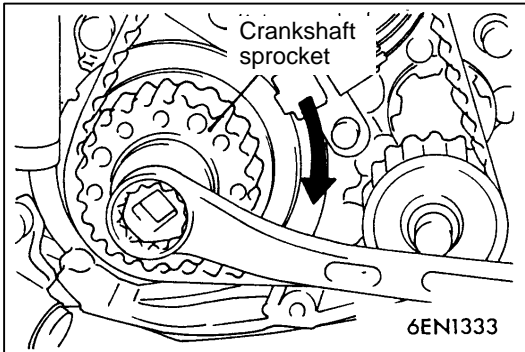
Be careful that the belt does not become slack.



(11) Fit the timing belt over the tensioner pulley.

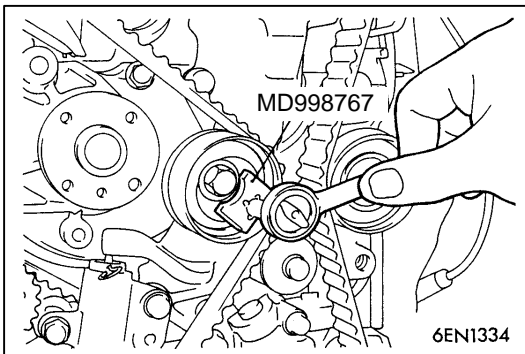
**NOTE**

When fitting the timing belt over the tensioner pulley, turn the intake side camshaft sprocket a little counterclockwise, as this will facilitate the work.



(12) Turn the crankshaft pulley a little in the illustrated direction to pull up the timing belt at the idler pulley side.

(13) Check to ensure that the timing marks on the crankshaft sprocket, oil pump sprocket and exhaust camshaft sprocket are all offset one tooth from the corresponding timing marks in the counterclockwise direction.

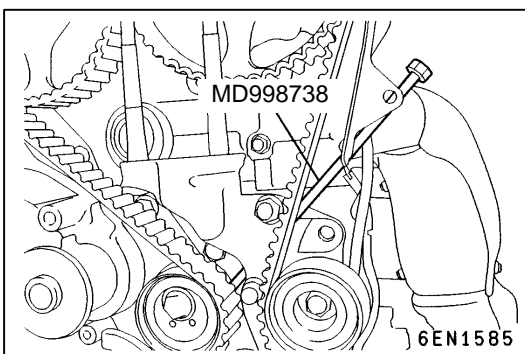


(14) Using the special tool, turn the tensioner pulley in the illustrated direction to strain the timing belt. Then, secure the tensioner temporarily by tightening the retaining bolt lightly.

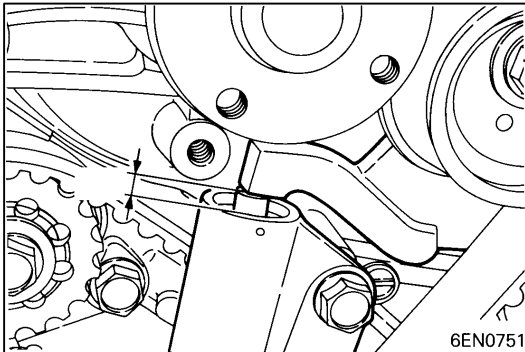
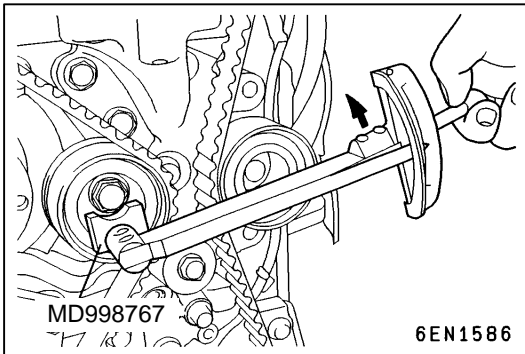
**NOTE**

There must be no slack in the timing belt between the intake and exhaust camshafts.

(15) Turn the crankshaft to align the timing mark with the mark for No. 1 cylinder top dead center in the compression stroke.



(16) Set the special tool as shown and screw it in up to the position where the wire inserted in the auto-tensioner when installing it can be moved lightly.



(17) Loosen the retaining bolt of the tensioner pulley.

#### Caution

Loosening the retaining bolt can cause the intake and exhaust camshafts to turn, resulting in slackened timing belt. Use care that the timing belt does not come off the sprockets at this time.

(18) Pull up the slack of the timing belt by turning the tensioner in illustrated direction using the special tool and a torque wrench (0 – 5 Nm).

(19) From this position, turn back the tensioner until the torque wrench reading becomes 3.5 Nm, then secure it by tightening the retaining bolt.

(20) Remove the special tool attached in step (16).

(21) Rotate the crankshaft clockwise 2 turns. Then, leave it intact 15 minutes.

(22) Check to see that the wire inserted when installing the auto-tensioner can be pulled out lightly. If it can be pulled out lightly, the timing belt is being tensioned properly. If so, remove the wire. In addition, check that the rod protrusion from the auto-tensioner meets the standard value, which is also an indication of properly tensioned timing belt.

**Standard value: 3.8 – 4.5 mm**

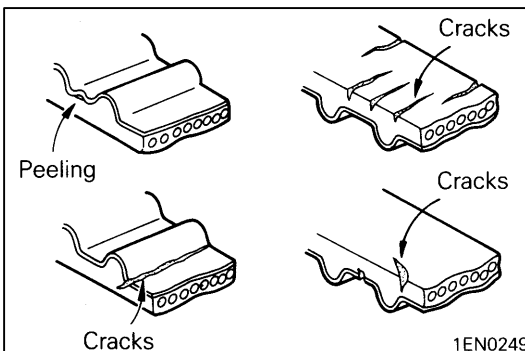
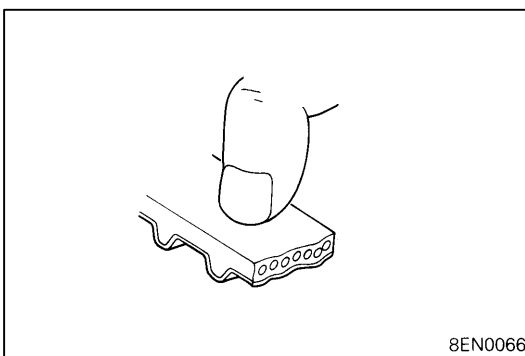
(23) If the wire cannot be removed with a light force, repeat steps (16) through (21) until the proper belt tensioner is obtained.

## INSPECTION

### TIMING BELT

Replace belt if any of the following conditions exist.

(1) Hardening of back rubber.  
Back side is glossy without resilience and leaves no indent when pressed with fingernail.

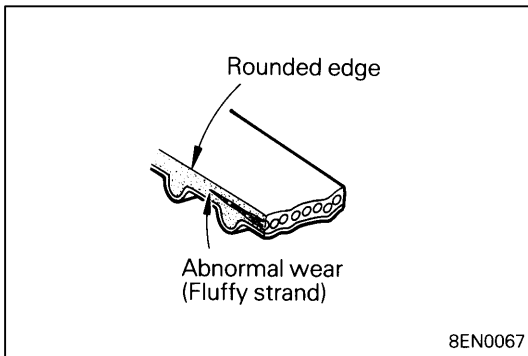


(2) Cracks on rubber back.

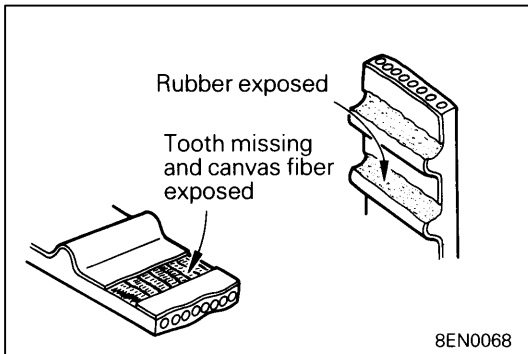
(3) Cracks or peeling of canvas.

(4) Cracks on rib root.

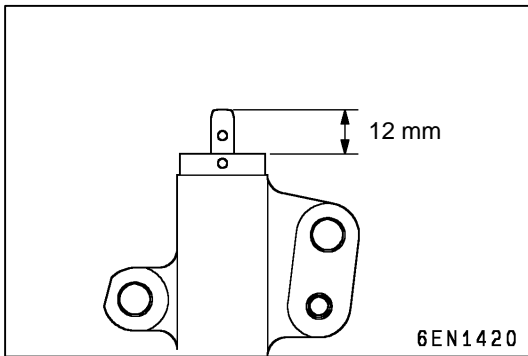
(5) Cracks on belt sides.



(6) Abnormal wear of belt sides. The sides are normal if they are sharp as if cut by a knife.



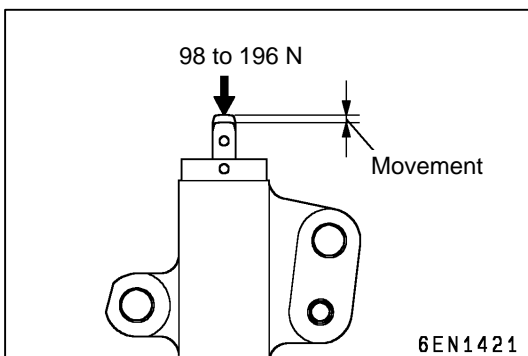
(7) Abnormal wear on teeth.  
 (8) Missing tooth.



**AUTO TENSIONER**

- (1) Check the auto tensioner for possible leaks and replace as necessary.
- (2) Check the rod end for wear or damage and replace as necessary.
- (3) Measure the rod protrusion. If it is out of specification, replace the auto tensioner.

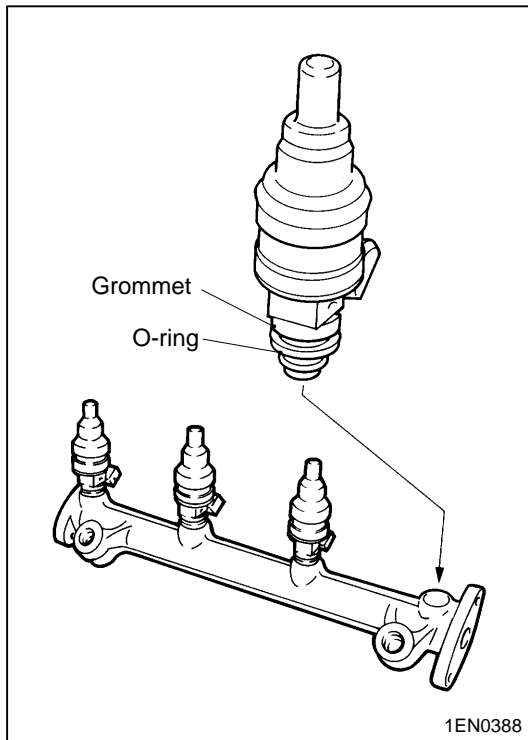
**Standard value: 12 mm**



- (4) Press the rod with a force of 98 to 196 N and measure its protrusion.
- (5) If the measured value is 1 mm or more shorter than the value obtained in step (3), replace the auto tensioner.







## INSTALLATION SERVICE POINTS

### ►A◄ INJECTORS INSTALLATION

- (1) Before installing an injector, the rubber O-ring must be lubricated with a drop of clean engine oil to aid in installation.
- (2) Install injector top end. Be careful not to damage O-ring during installation.

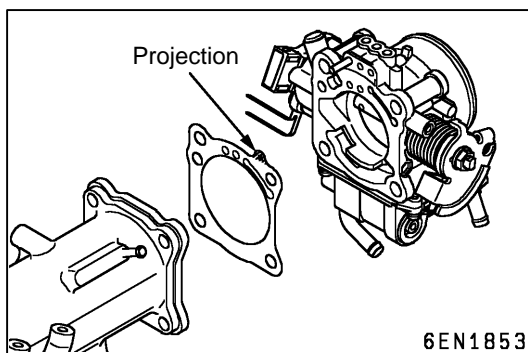
### ►B◄ FUEL PRESSURE REGULATOR INSTALLATION

- (1) Apply a small amount of new engine oil to the O-ring. Insert the fuel pressure regulator into the delivery pipe being careful not to damage the O-ring.

#### Caution

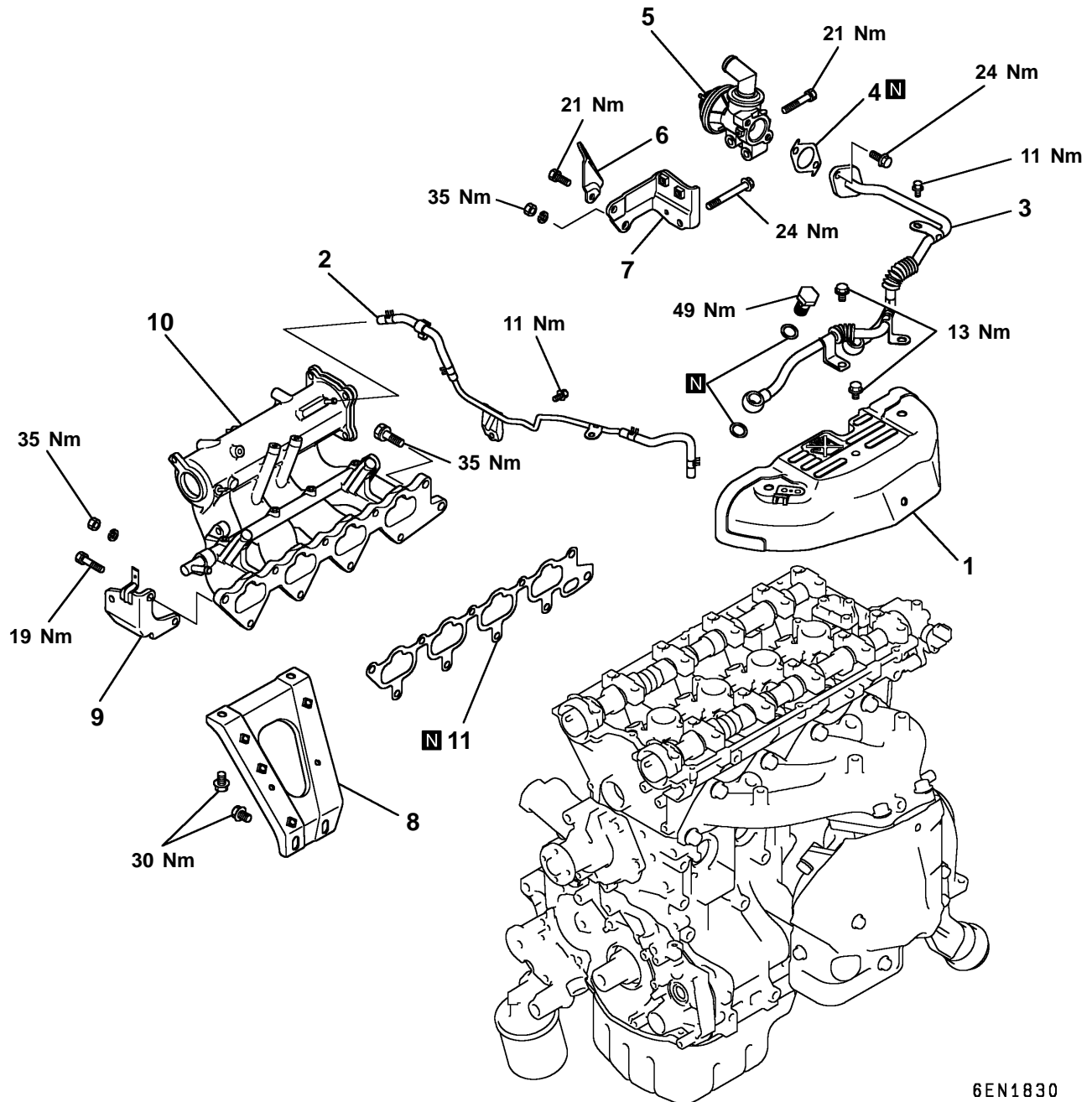
**Be sure not to let engine oil get into the delivery pipe.**

- (2) Check that the fuel pressure regulator turns smoothly. If it does not turn smoothly, the O-ring may be trapped. Remove the fuel pressure regulator and check the O-ring for damage, and then re-insert it into the delivery pipe and check once again.



### ►C◄ GASKET INSTALLATION

Position the projection as shown in the illustration.

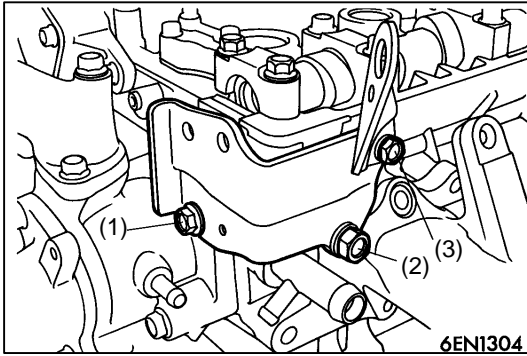
**SECONDARY AIR SYSTEM AND INTAKE MANIFOLD****REMOVAL AND INSTALLATION**

6EN1830

**Removal steps**

- B◄
1. Exhaust manifold heat protector
  2. Vacuum hose and vacuum pipe
  3. Air pipe assembly
  4. Air control valve gasket
  5. Air control valve assembly
  6. Engine hanger

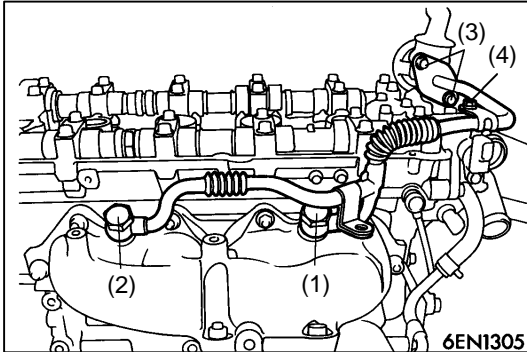
- A◄
7. Air control valve bracket
  8. Intake manifold stay
  9. Alternator brace stay
  10. Intake manifold
  11. Intake manifold gasket



## INSTALLATION SERVICE POINTS

### ►A◄ AIR CONTROL VALVE BRACKET INSTALLATION

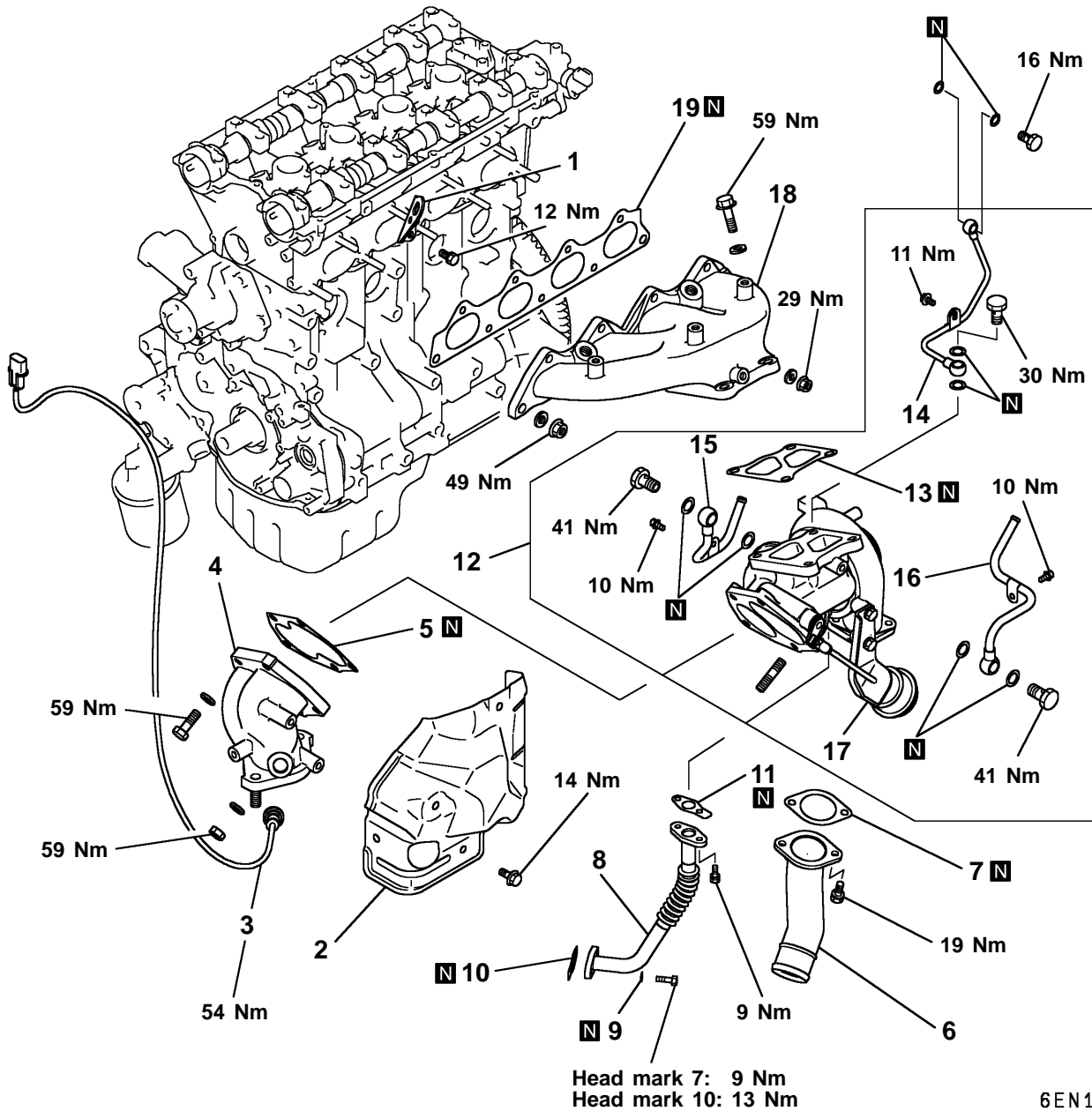
- (1) Attach the air control valve bracket and the engine hanger to the intake manifold using bolts and nuts with which the intake manifold is also installed to the engine.
- (2) Tighten the bolts and nuts to the specified torque in the sequence given in the illustration.



### ►B◄ AIR PIPE ASSEMBLY INSTALLATION

- (1) Install the air pipe assembly to the exhaust manifold and to the air control valve and secure it provisionally by tightening the fasteners handtight.
- (2) Tighten the fasteners to the specified torque in the sequence given in the illustration.

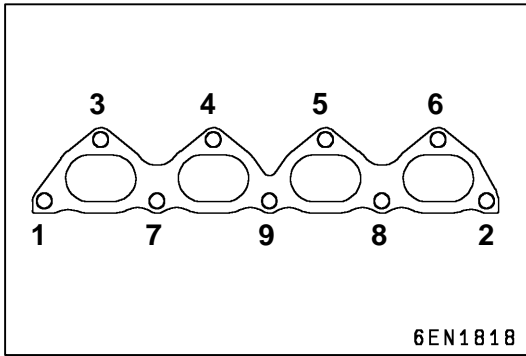
# EXHAUST MANIFOLD REMOVAL AND INSTALLATION



6EN1831

### Removal steps

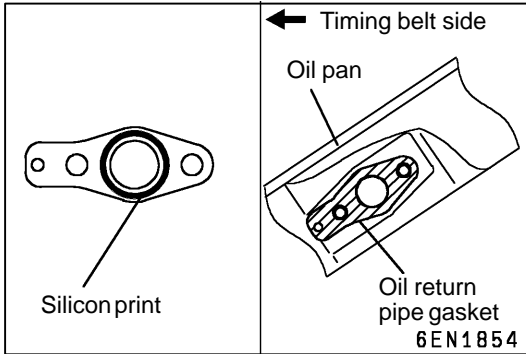
- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Engine hanger</li> <li>2. Turbocharger heat protector</li> <li>3. Oxygen sensor</li> <li>4. Exhaust fitting</li> <li>5. Exhaust fitting gasket</li> <li>6. Air outlet fitting</li> <li>▶C◀ 7. Air outlet fitting gasket</li> <li>▶B◀ 8. Oil return pipe</li> <li>▶B◀ 9. Gasket</li> <li>▶B◀ 10. Oil return pipe gasket (Oil pan side)</li> </ul> | <ul style="list-style-type: none"> <li>11. Oil return pipe gasket (Turbocharger side)</li> <li>12. Turbocharger assembly</li> <li>13. Turbocharger gasket</li> <li>14. Oil pipe</li> <li>15. Water pipe</li> <li>16. Water pipe</li> <li>17. Turbocharger</li> <li>▶A◀ 18. Exhaust manifold</li> <li>▶A◀ 19. Exhaust manifold gasket</li> </ul> |
|--|---|



**INSTALLATION SERVICE POINTS**

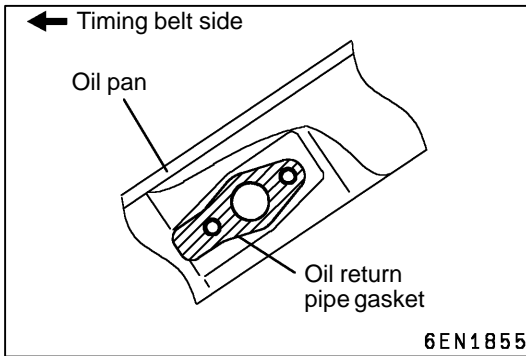
**►A◄ EXHAUST MANIFOLD INSTALLATION**

Tighten the exhaust manifold mounting nuts to the specified torque in the sequence given in the illustration.



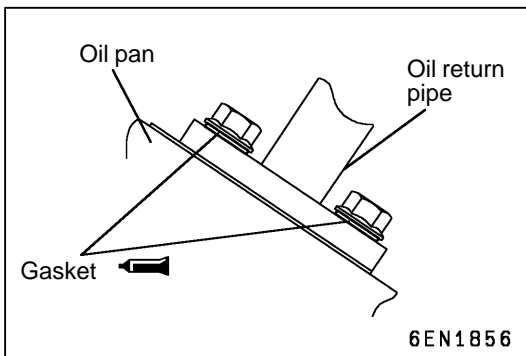
**►B◄ GASKET / OIL RETURN GASKET INSTALLATION EVOLUTION IV AND V**

Install the gasket with the silicon-printed side toward the oil pan and with the tabbed end directed as shown.



**EVOLUTION VI**

(1) Install the gasket with the tabbed end directed as shown.



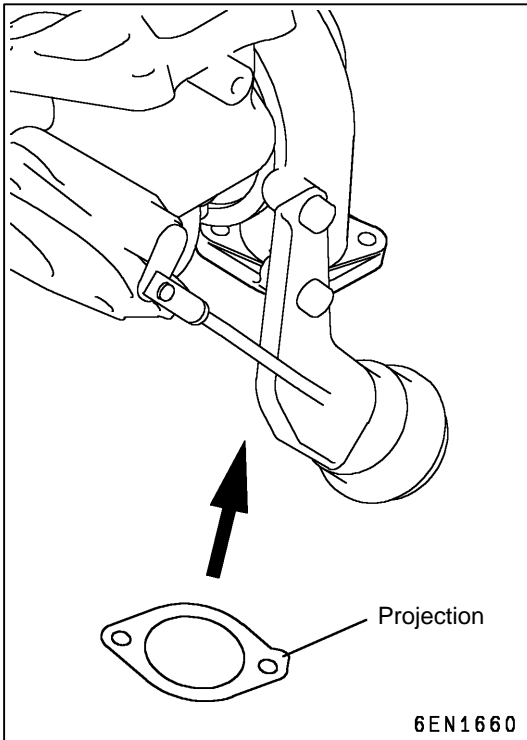
(2) Apply sealant to both sides of the oil return pipe gasket and leave it for 20 minutes to dry before installing. Tighten the mounting bolts to the specified torque.

**Specified sealant:**  
**3M™ AAD Part No. 8731 or equivalent**

**NOTE**  
 If mounting bolts with head mark 7 have been used, be sure to replace them with bolts having head mark 10.

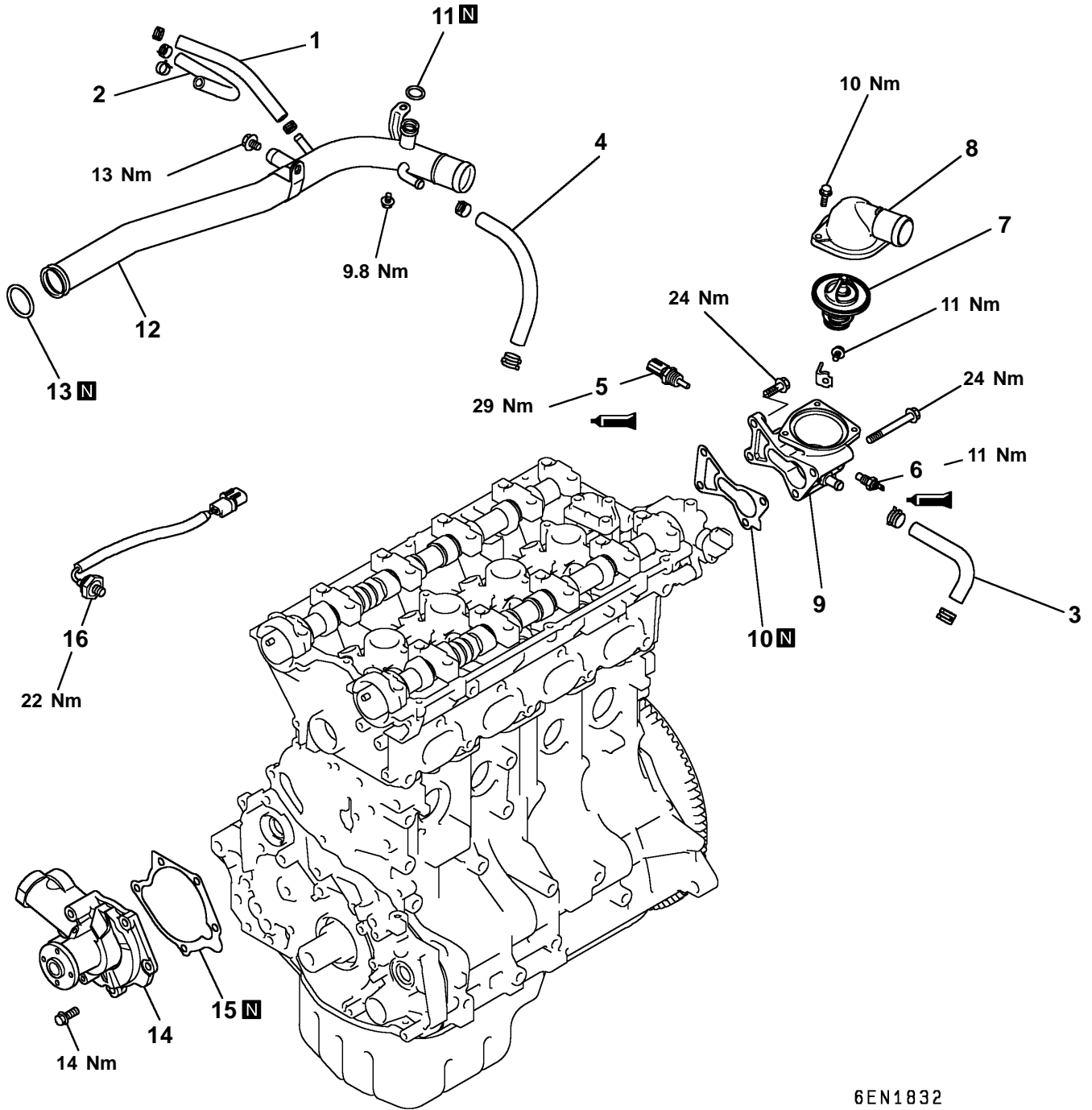
►C◄ GASKET INSTALLATION

Position the projection as shown in the illustration.



# WATER PUMP AND WATER HOSE

## REMOVAL AND INSTALLATION <EVOLUTION VI>

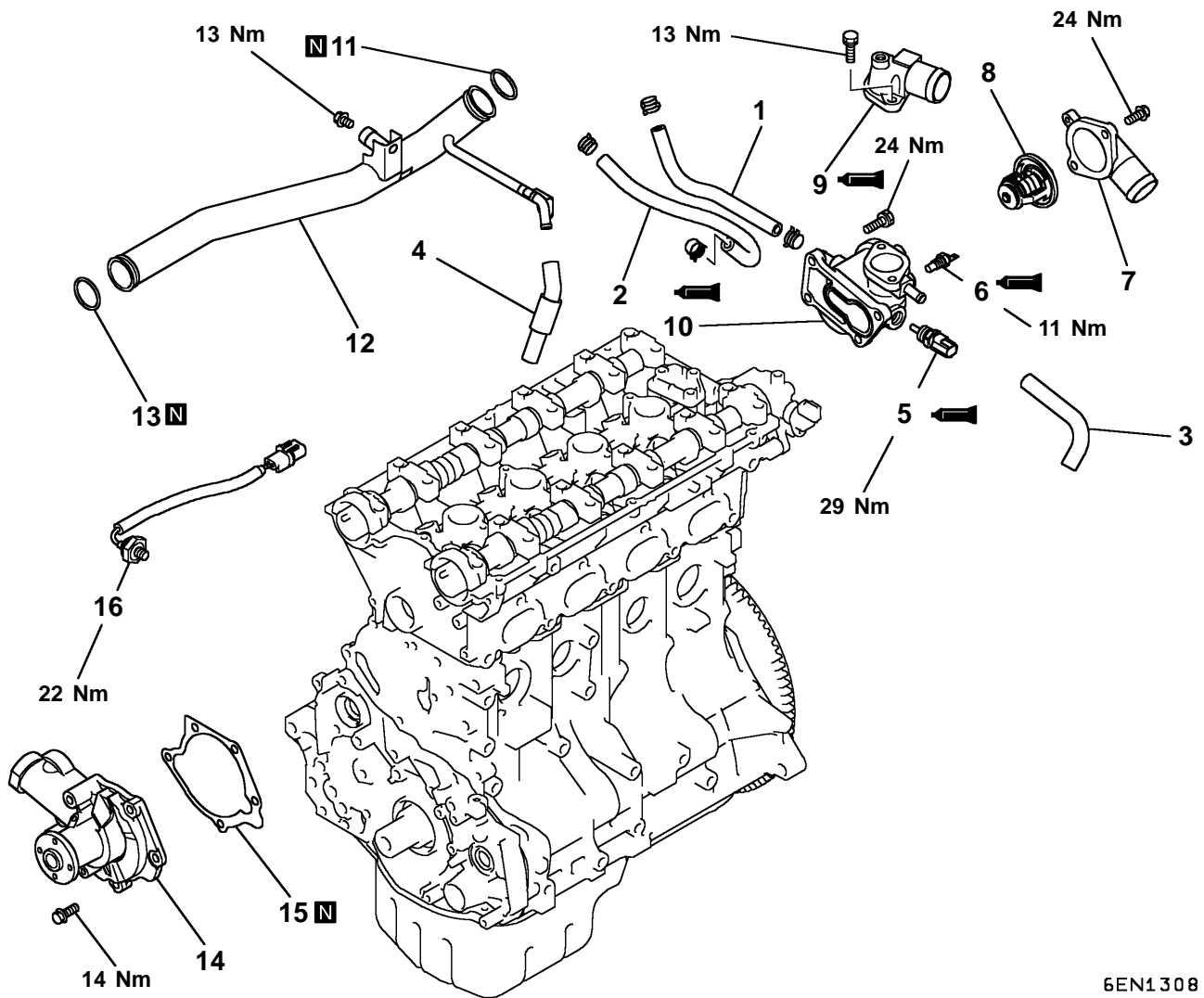


6EN1832

**Removal steps**

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. Water hose</li> <li>2. Water hose</li> <li>3. Water hose</li> <li>4. Water hose</li> <li>▶E▶ 5. Water temperature sensor</li> <li>▶D▶ 6. Water temperature gauge unit</li> <li>7. Thermostat</li> <li>8. Water outlet fitting</li> </ul> | <ul style="list-style-type: none"> <li>9. Thermostat housing</li> <li>10. Thermostat housing gasket</li> <li>▶A▶ 11. O-ring</li> <li>▶A▶ 12. Water inlet pipe</li> <li>▶A▶ 13. O-ring</li> <li>14. Water pump</li> <li>15. Water pump gasket</li> <li>16. Knock sensor</li> </ul> |
|--|---|

REMOVAL AND INSTALLATION <EVOLUTION IV or V>

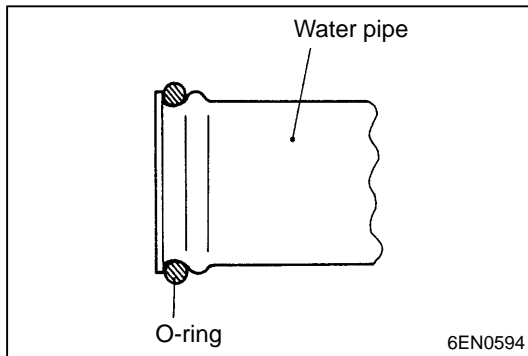


6EN1308

**Removal steps**

- |                                     |                             |
|-------------------------------------|-----------------------------|
| 1. Water hose                       | ▶C◀ 9. Water outlet fitting |
| 2. Water hose                       | ▶B◀ 10. Thermostat housing  |
| 3. Water hose                       | ▶A◀ 11. O-ring              |
| 4. Water hose                       | ▶A◀ 12. Water inlet pipe    |
| ▶E◀ 5. Water temperature sensor     | ▶A◀ 13. O-ring              |
| ▶D◀ 6. Water temperature gauge unit | 14. Water pump              |
| 7. Water inlet fitting              | 15. Water pump gasket       |
| 8. Thermostat                       | 16. Knock sensor            |





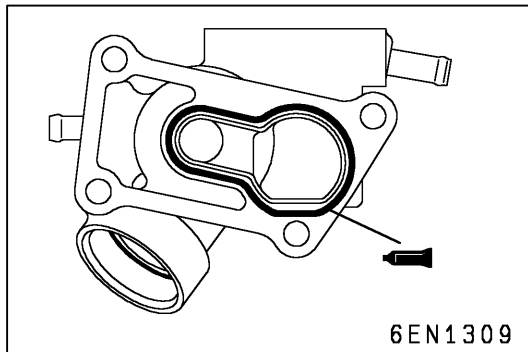
## INSTALLATION SERVICE POINTS

### ▶A◀ WATER PIPE / O-RING INSTALLATION

Wet the O-ring (with water) to facilitate assembly.

#### Caution

Keep the O-ring free of oil or grease.

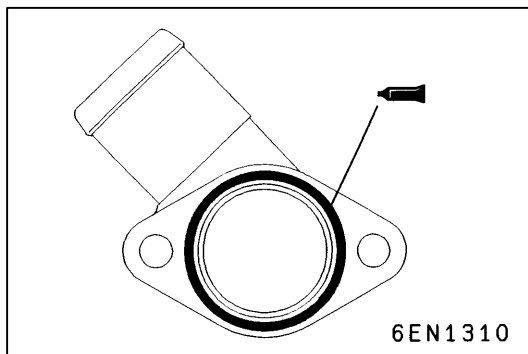


### ▶B◀ THERMOSTAT HOUSING INSTALLATION

Apply 3 mm diameter of form-in-place gasket (FIPG) to the location shown in the illustration.

#### Specified sealant:

Mitsubishi Genuine Part No. MD970389 or equivalent

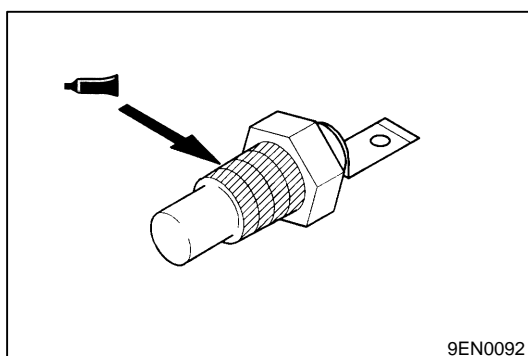


### ▶C◀ WATER OUTLET FITTING INSTALLATION

Apply 3 mm diameter of form-in-place gasket (FIPG) to the location shown in the illustration.

#### Specified sealant:

Mitsubishi Genuine Part No. MD970389 or equivalent

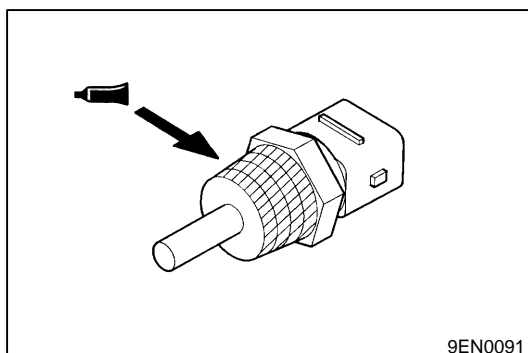


### ▶D◀ SEALANT APPLICATION TO ENGINE COOLANT TEMPERATURE GAUGE UNIT

- (1) When reusing the gauge unit, clean its thread.
- (2) Apply the specified sealant to the thread.

#### Specified sealant:

3M™ AAD Part No. 8672 or equivalent



### ▶E◀ SEALANT APPLICATION TO ENGINE COOLANT TEMPERATURE SENSOR

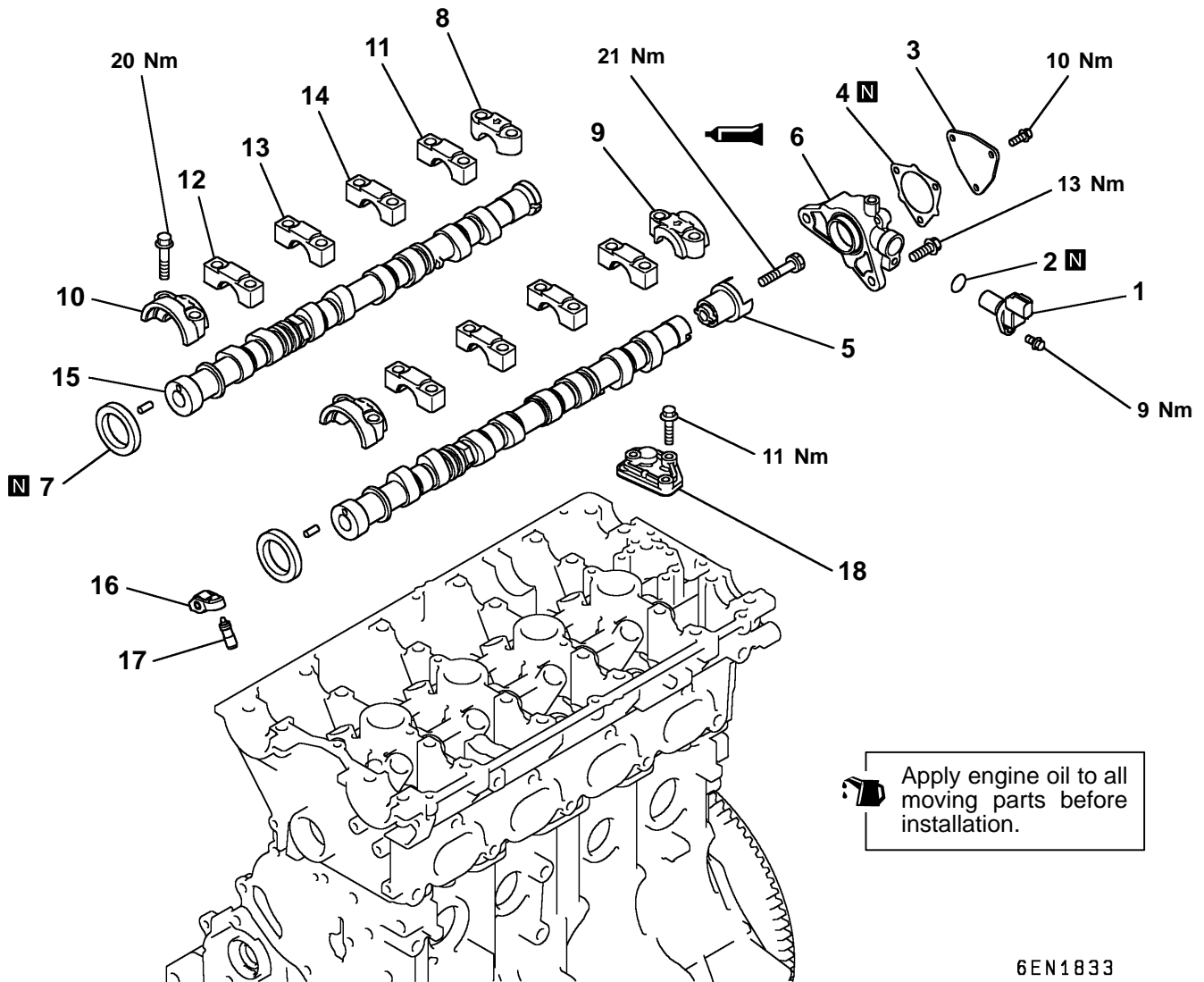
- (1) When reusing the sensor, clean its thread.
- (2) Apply the specified sealant to the thread.

#### Specified sealant:

3M™ AAD Part No. 8731 or equivalent

# ROCKER ARMS AND CAMSHAFT

## REMOVAL AND INSTALLATION



Apply engine oil to all moving parts before installation.

6EN1833

### Removal steps

- |  |                                    |
|--|------------------------------------|
| 1. Cam position sensor                 | ▶C◀ 10. Camshaft bearing cap front |
| 2. O-ring                              | ▶C◀ 11. Camshaft bearing cap No. 5 |
| 3. Cam position sensor support cover   | ▶C◀ 12. Camshaft bearing cap No. 2 |
| 4. Cam position sensor support gasket  | ▶C◀ 13. Camshaft bearing cap No. 3 |
| ▶F◀ 5. Cam position sensing cylinder   | ▶C◀ 14. Camshaft bearing cap No. 4 |
| ▶E◀ 6. Cam position sensor support     | ▶B◀ 15. Camshaft                   |
| ▶D◀ 7. Camshaft oil seal               | ▶A◀ 16. Rocker arm                 |
| ▶C◀ 8. Camshaft bearing cap rear right | ▶A◀ 17. Lash adjuster              |
| ▶C◀ 9. Camshaft bearing cap rear left  | ▶A◀ 18. Oil delivery body          |

**INSTALLATION SERVICE POINTS**

**▶A◀ LASH ADJUSTER INSTALLATION**

**Caution**

If the lash adjuster is re-used, clean the lash adjuster.

Fit the lash adjuster onto rocker arm without allowing diesel fuel to spill out.

**▶B◀ CAMSHAFT INSTALLATION**

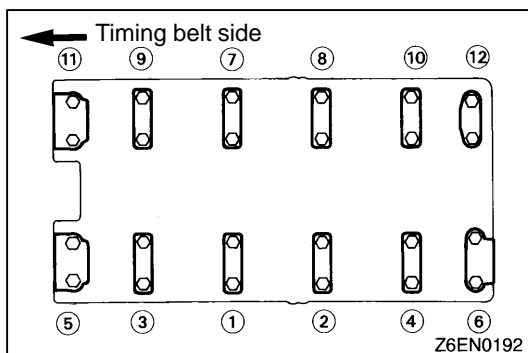
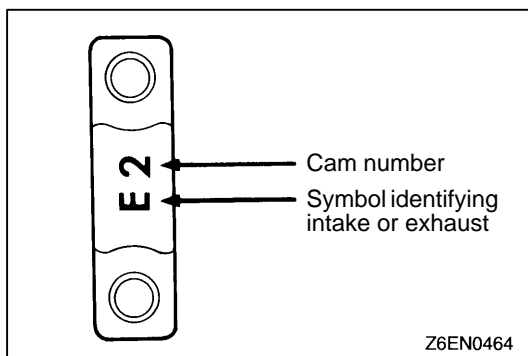
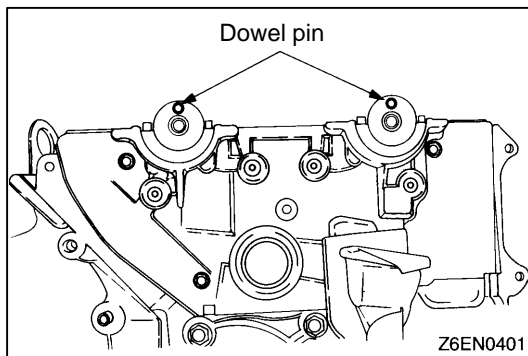
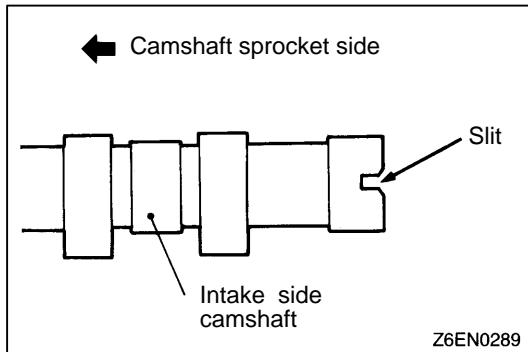
- (1) Apply engine oil to the journals and cams of the camshafts. Install the camshafts on the cylinder head. Use care not to confuse the intake camshaft with the exhaust one. The intake camshaft has a slit on its rear end for driving the crankshaft position sensor.

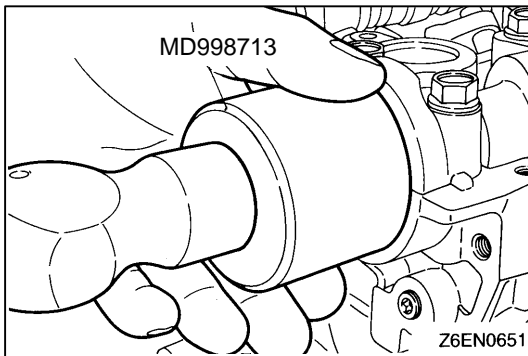
- (2) Install the crankshaft sprocket B or spacer and flange to one end of the crankshaft, and turn the crankshaft until the timing marks are lined up, setting No. 1 cylinder to the TDC.
- (3) Set the camshafts so that their dowel pins are positioned at top.

**▶C◀ BEARING CAP INSTALLATION**

- (1) According to the identification mark stamped on the top of each bearing cap, install the caps to the cylinder head. Only “L” or “R” is stamped on front bearing cap. Cap No. is stamped on No. 2 to No. 5 bearing caps. Rear bearing cap has no stamping.  
I: For intake camshaft side  
E: For exhaust camshaft side

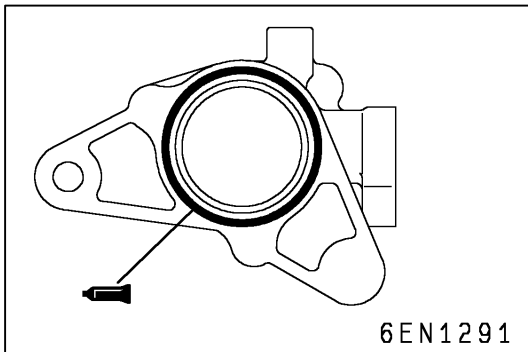
- (2) Tighten the bearing caps in the order shown two to three times by torquing progressively. Tighten to the specification in the final sequence.
- (3) Check to ensure that the rocker arm is positioned correctly on the lash adjuster and valve stem end.





**►D◄ CAMSHAFT OIL SEAL INSTALLATION**

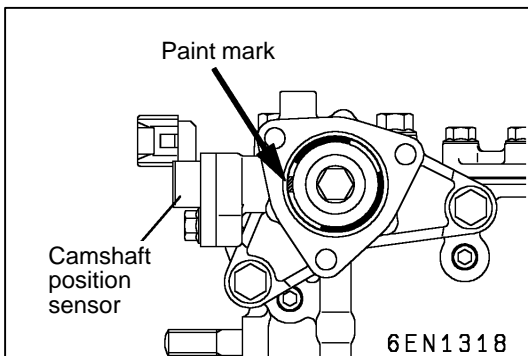
- (1) Apply engine oil to lib area of the oil seal and the front end outside diameter of the camshaft.
- (2) Using special tool install the camshaft oil seals.



**►E◄ CAMSHAFT POSITION SENSOR SUPPORT INSTALLATION**

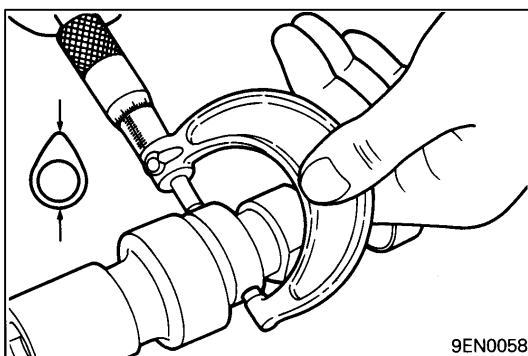
Apply 3 mm diameter of form-in-place gasket (FIPG) to the location shown in the illustration.

**Specified sealant:**  
**Mitsubishi Genuine Part No. MD970389 or equivalent**



**►F◄ CAMSHAFT POSITION SENSING CYLINDER INSTALLATION**

- (1) Set the No. 1 cylinder to the compression top dead center position (so that dowel pin of the exhaust camshaft is at the top).
- (2) Install the camshaft position sensing cylinder so that the white paint mark is facing in the direction shown in the illustration.

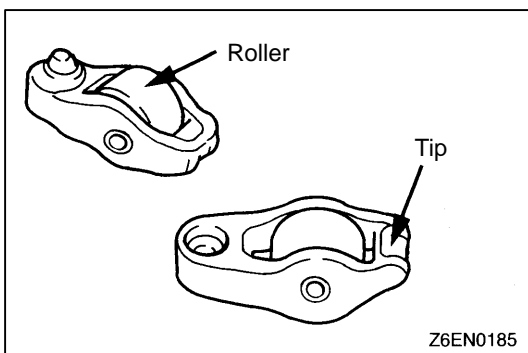


**INSPECTION**

**CAMSHAFT**

Measure the cam height.

Item	Standard value mm	Limit mm
Intake	35.79	35.29
Exhaust	35.49	34.99



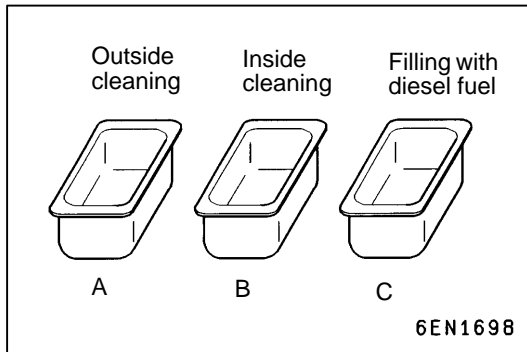
**ROCKER ARM**

- (1) Check the roller surface. If any dents, damage or seizure is evident, replace the rocker arm.
- (2) Check rotation of the roller. If it does not rotate smoothly or if looseness is evident, replace the rocker arm.
- (3) Check the inside diameter. If damage or seizure is evident, replace the rocker arm.

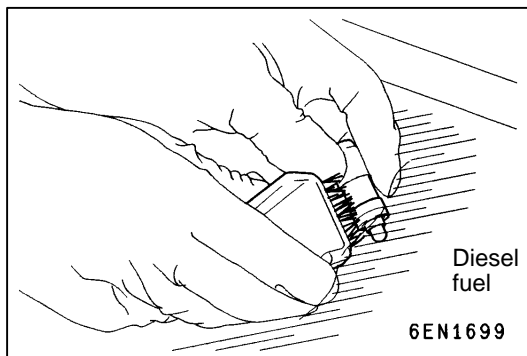
## LASH ADJUSTER

**Caution**

- (1) The lash adjusters are precision-engineered mechanisms. Do not allow them to become contaminated by dirt or other foreign substances.
- (2) Do not attempt to disassemble the lash adjusters.
- (3) Use only fresh diesel fuel to clean the lash adjusters.



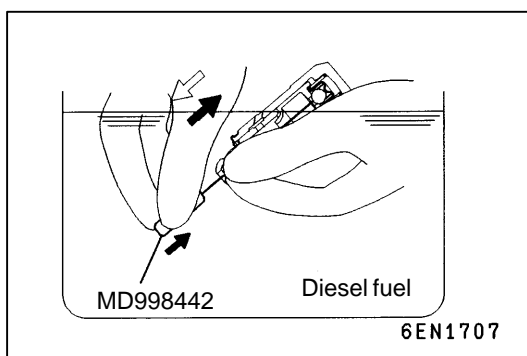
- (1) Prepare three containers and approximately five liters of diesel fuel. Into each container, pour enough diesel fuel to completely cover a lash adjuster when it is standing upright. Then, perform the following steps with each lash adjuster.



- (2) Place the lash adjuster in container A and clean its outside surface.

**NOTE**

Use a nylon brush if deposits are hard to remove.



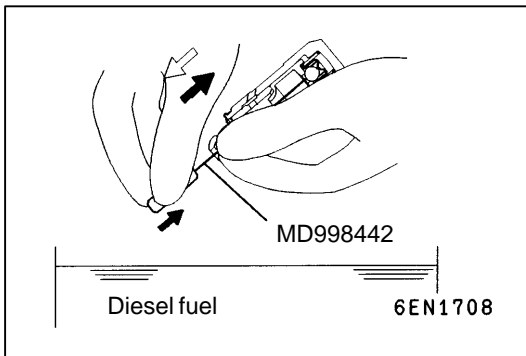
- (3) While gently pushing down the internal steel ball using wire (0.5 mm in diameter) or special tool MD998442, move the plunger through 5 to 10 strokes until it slides smoothly. In addition to eliminating stiffness in the plunger, this operation will remove dirty oil.

**Caution**

The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.

**NOTE**

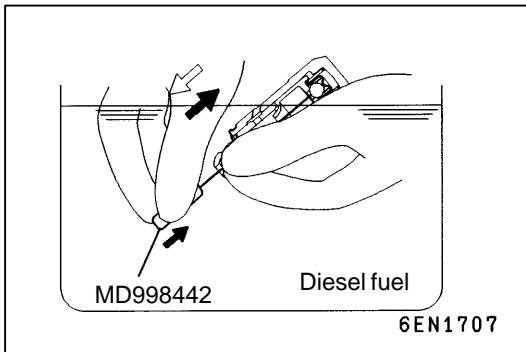
If the plunger remains stiff or the mechanism appears otherwise abnormal, replace the lash adjuster.



- (4) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

**Caution**

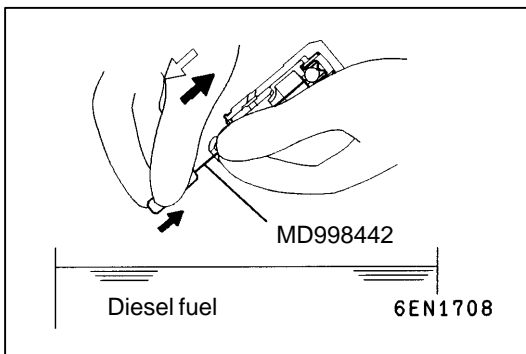
**Make sure the oil hole in the side of the body is pointing toward container A. Do not point the oil hole at yourself or other people.**



- (5) Place the lash adjuster in container B. Then, gently push down the internal steel ball using wire (0.5 mm in diameter) or special tool MD998442 and move the plunger through 5 to 10 strokes until it slides smoothly. This operation will clean the lash adjuster's pressure chamber.

**Caution**

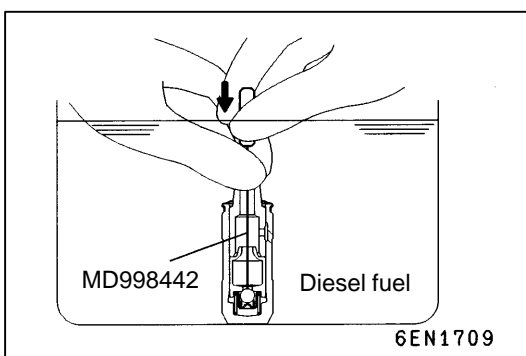
**The steel ball spring is extremely weak, so the lash adjuster's functionality may be lost if the air bleed wire is pushed in hard.**



- (6) Remove the lash adjuster from the container. Then, push down the steel ball gently and push the plunger to eliminate diesel fuel from the pressure chamber.

**Caution**

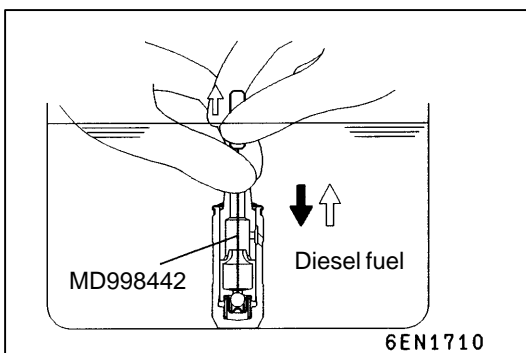
**Make sure the oil hole in the side of the body is pointing toward container A. Do not point the oil hole at yourself or other people.**



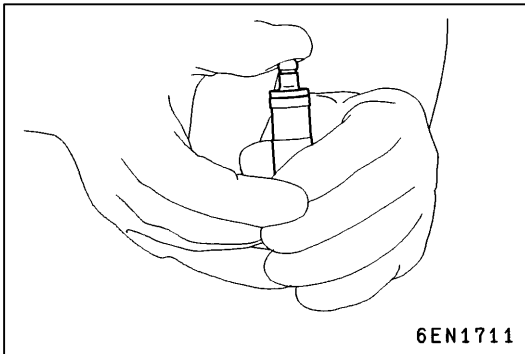
- (7) Place the lash adjuster in container C. Then, gently push down the internal steel ball using wire (0.5 mm in diameter) or special tool MD998442.

**Caution**

**Do not use container C for cleaning. If cleaning is performed in container C, foreign matter could enter the pressure chamber when chamber is filled with diesel fuel.**



- (8) Stand the lash adjuster with its plunger at the top, then push the plunger downward firmly until it moves through its greatest possible stroke. Return the plunger slowly, then release the steel ball and allow the pressure chamber to fill with diesel fuel.



- (9) Remove the lash adjuster from the container, then stand the lash adjuster with its plunger at the top. Push the plunger firmly and check that it does not move. Also, check that the lash adjuster's height matches that of a new lash adjuster.

**NOTE**

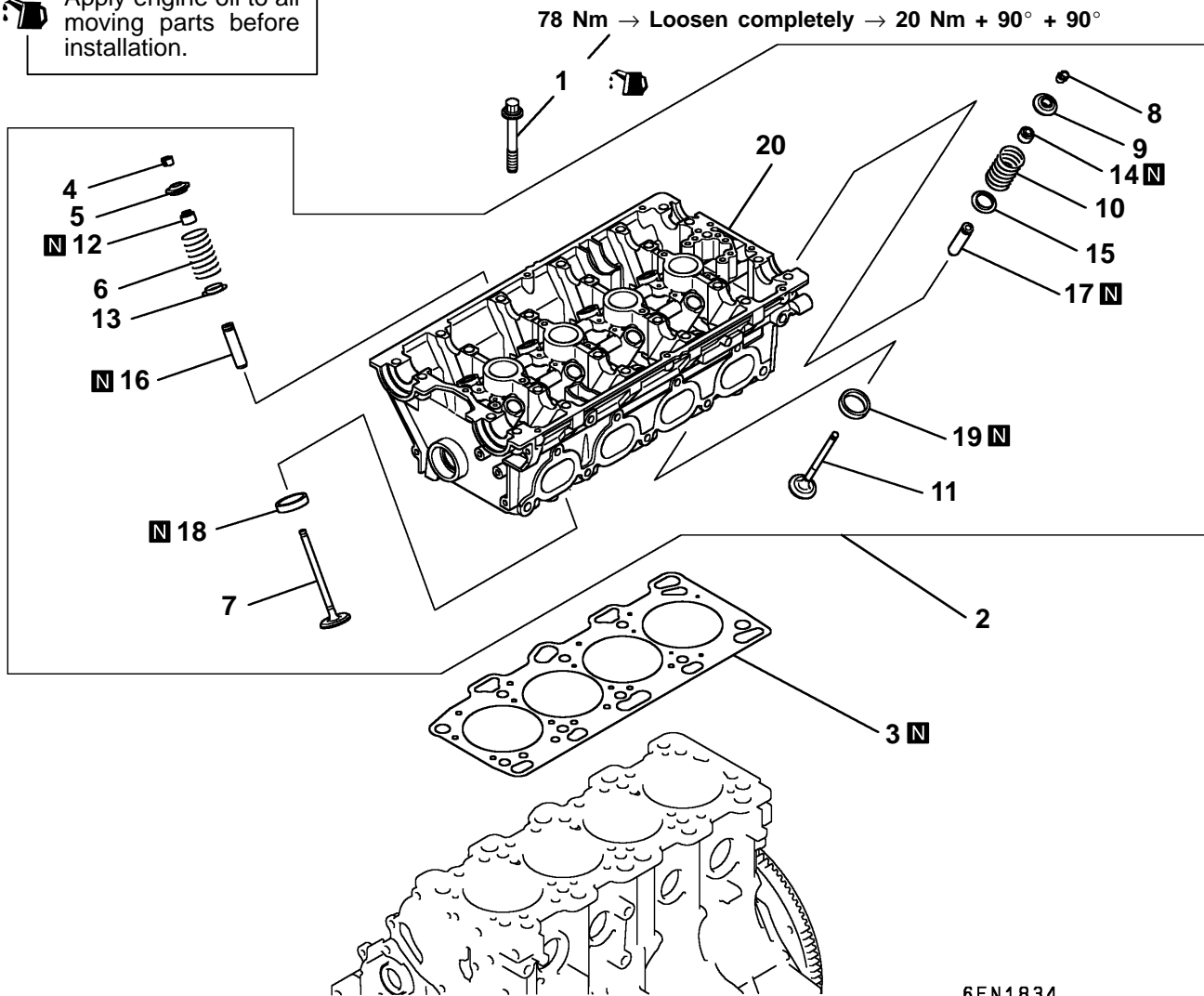
If lash adjuster contracts, perform the operations (7) through (9) again to fill it with diesel fuel completely. Replace the lash adjuster if it still contracts after performing these steps.

- (10) Stand the lash adjuster upright to prevent diesel fuel from spilling out. Do not allow the lash adjuster to become contaminated by dirt or other foreign matter. Fit the lash adjuster onto the engine as soon as possible.

# CYLINDER HEAD AND VALVES

## REMOVAL AND INSTALLATION

Apply engine oil to all moving parts before installation.



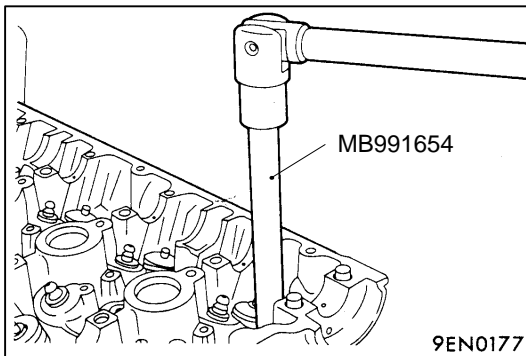
6EN1834

### Removal steps

- ◀A▶ ▶D▶ 1. Cylinder head bolt
- ◀B▶ ▶C▶ 2. Cylinder head assembly
- ◀B▶ ▶C▶ 3. Cylinder head gasket
- ◀B▶ ▶C▶ 4. Retainer lock
- ▶B▶▶ 5. Valve spring retainer
- ▶B▶▶ 6. Valve spring
- ◀B▶ ▶C▶ 7. Intake valve
- ▶B▶▶ 8. Retainer lock
- ▶B▶▶ 9. Valve spring retainer
- ▶B▶▶ 10. Valve spring

- ◀C▶ ▶A▶ 11. Exhaust valve
- ▶A▶▶ 12. Valve stem seal
- ▶A▶▶ 13. Valve spring seat
- ▶A▶▶ 14. Valve stem seal
- ▶A▶▶ 15. Valve spring seat
- ▶A▶▶ 16. Intake valve guide
- ▶A▶▶ 17. Exhaust valve guide
- ▶A▶▶ 18. Intake valve seat
- ▶A▶▶ 19. Exhaust valve seat
- ▶A▶▶ 20. Cylinder head

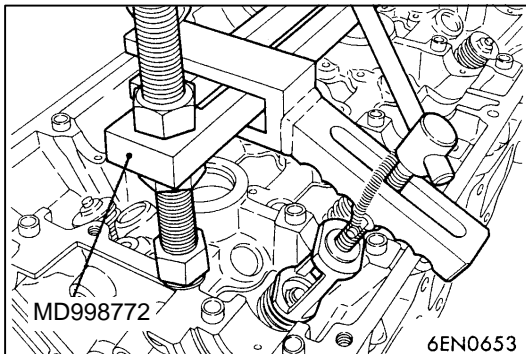


**REMOVAL SERVICE POINTS****PRECAUTION FOR REMOVED PARTS**

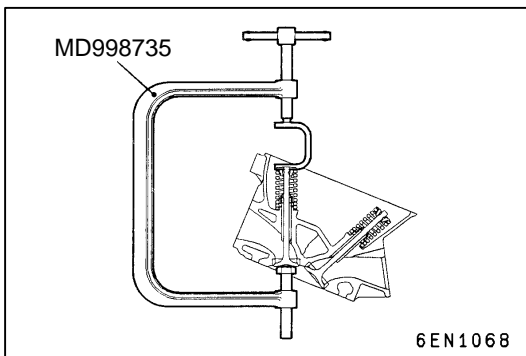
Keep removed parts in order according to the cylinder number and intake/exhaust.

**◀A▶ CYLINDER HEAD BOLTS REMOVAL**

Using the special tool, loosen the cylinder head bolts. Loosen evenly, little by little.

**◀B▶ RETAINER LOCK REMOVAL**

Store removed valves, springs and other parts, tagged to indicate their cylinder No. and location for reassembly.

**◀C▶ VALVE HANDLING PRECAUTIONS**

- (1) Sodium reacts violently with water or moisture generation heat and liberating hydrogen. It must be handled with utmost care because otherwise the following dangerous conditions may result:  
Loss of eyesight if sodium gets in eyes.  
Burns if sodium contact skin.  
Fire hazard.
- (2) Handling of Sodium-filled Exhaust Valves  
Sodium-filled exhaust valves are not dangerous and may be handled in the same way as ordinary valves unless they are broken.  
Never try to break the valves and expose sodium to the air. When worn exhaust valves are to be discarded, have them disposed of by a salvage company equipped with special disposal system, notifying them that the valves contain sodium.  
Should the exhaust valves be broken, neutralize sodium using the method described below, and discard the valves in the same way as ordinary valves.

## (3) How to Neutralize Sodium

Place a container filled with more than 10 liters of water in a well ventilated large space.

Wear rubber gloves and goggles, and carefully take out broken valves from the cylinder head.

Put a broken valve in the water-filled container and quickly get away from the container at least 2 or 3 m.

**Caution**

1. **Valves must be neutralized one at a time.**
2. **Put a valve in the container only after sodium in the preceding one has completely reacted with water.**

Keep fire away from the container during the neutralization. The resulting hydrogen gas is highly explosive.

When the reaction has finished (there is no more generation of hydrogen gas), take the valves out of the container with large tweezers or the like.

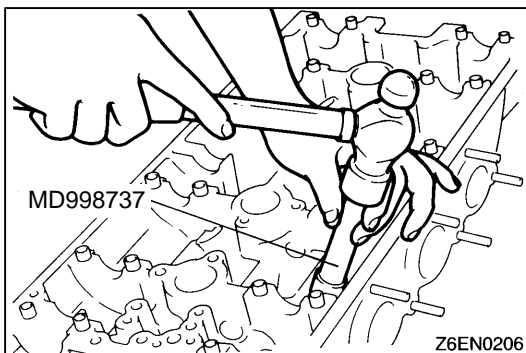
**NOTE**

The reaction occurs when water enters the cavity in the valve. Hydrogen gas may be trapped inside the valve, temporarily blocking the water passage. In such a case, wait until hydrogen gas is released and remaining sodium reacts with water.

After the neutralization of sodium, water in the container contains sodium hydroxide and is highly alkaline. The water solution should be disposed of according to local regulations.

**Caution**

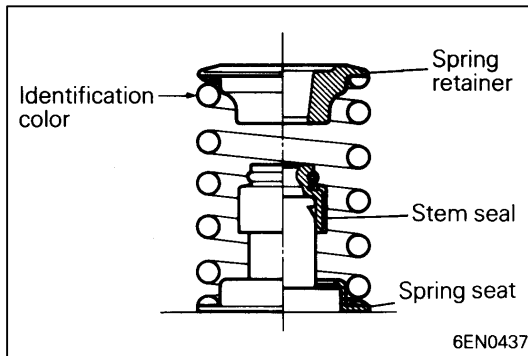
1. **Do not let the solution contact the eyes or the skin.**
2. **Should it get in the eyes, immediately flush them with clean water thoroughly, and receive medical attention. When it contacts the skin, wash with ample amounts of clean water.**

**INSTALLATION SERVICE POINTS****▶A◀ VALVE STEM SEAL INSTALLATION**

- (1) Install the valve spring seat.
- (2) The special tool must be used to install the valve stem seal. Improper installation could result in oil leaks past the valve guide.

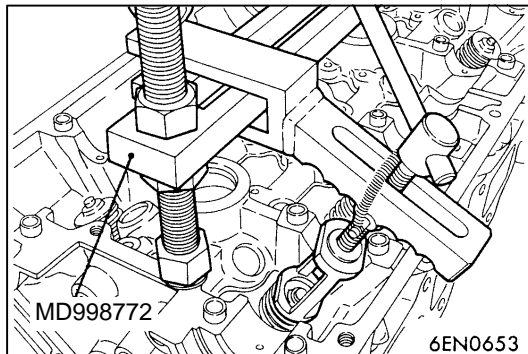
**Caution**

**Do not reuse removed valve stem seals.**



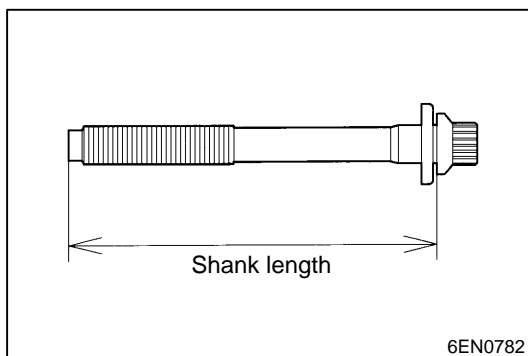
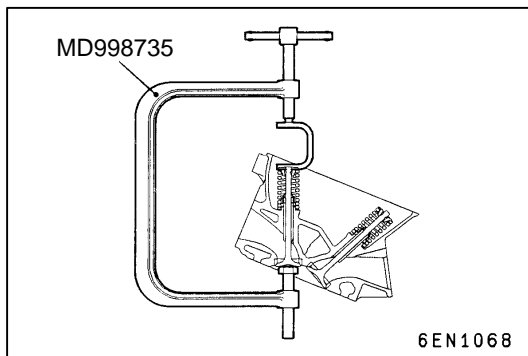
►B◄ VALVE SPRING INSTALLATION

Direct the valve spring end with identification color toward the spring retainer.



►C◄ RETAINER LOCK INSTALLATION

The valve spring, if excessively compressed, causes the bottom end of the retainer to be in contact with, and damage, the stem seal.

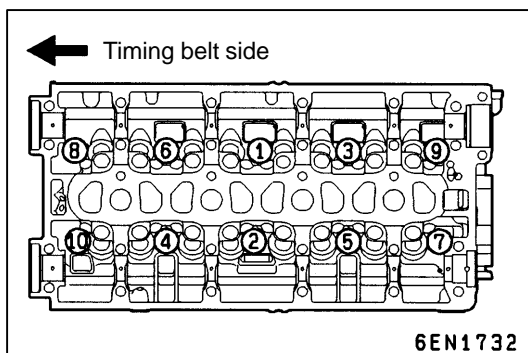


►D◄ CYLINDER HEAD BOLT INSTALLATION

(1) When installing the cylinder head bolts, check that the shank length of each bolt meets the limit. If the limit is exceeded, replace the bolt.

**Limit: Max. 99.4 mm**

(2) Apply engine oil to the bolt threads and to the washers.

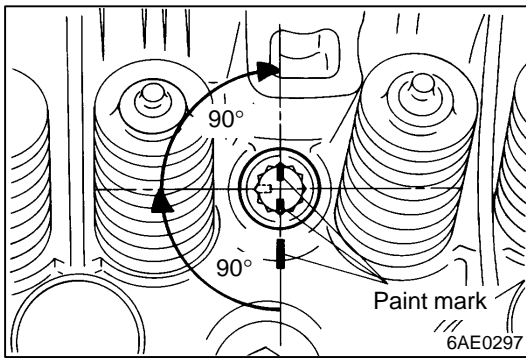


(3) Using the special tool (MB991654) and according to the tightening sequence, tighten the bolts to the specified torque.

**Tightening torque: 78 Nm**

(4) Loosen all bolts fully.

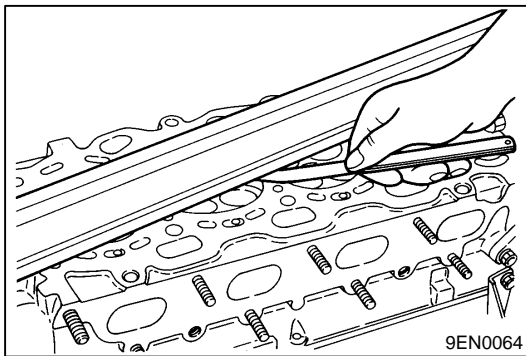
(5) Retighten the loosened bolts to a torque of 20 Nm in the specified tightening sequence.



- (6) Make paint marks on the cylinder head bolt heads and cylinder head.
- (7) Give a 90° turn to the cylinder head bolts in the specified tightening sequence.
- (8) Give another 90° turn to the cylinder head bolts and make sure that the paint mark on the head of each cylinder head bolt and that on the cylinder head are on the same straight line.

#### Caution

1. If the bolt is turned less than 90°, proper fastening performance may not be expected. When tightening the bolt, therefore, be careful to give a sufficient turn to it.
2. If the bolt is overtightened, loosen the bolt completely and then retighten it by repeating the tightening procedure from step (1).



## INSPECTION

### CYLINDER HEAD

- (1) Check the cylinder head gasket surface for flatness by using a straightedge and thickness gauge.

**Standard value: 0.05 mm**

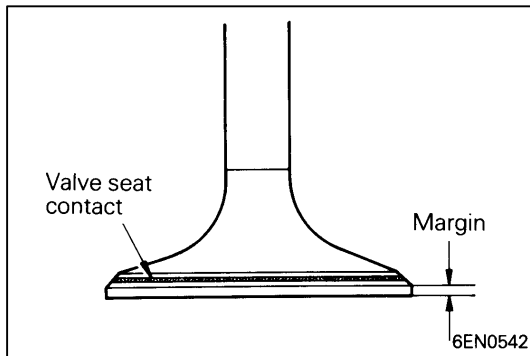
**Limit: 0.2 mm**

- (2) If the service limit is exceeded, correct to meet specification.

**Grinding limit: \*0.2 mm**

\* Includes combined with cylinder block grinding.

**Cylinder head height (Specification when new):  
131.9 – 132.1 mm**



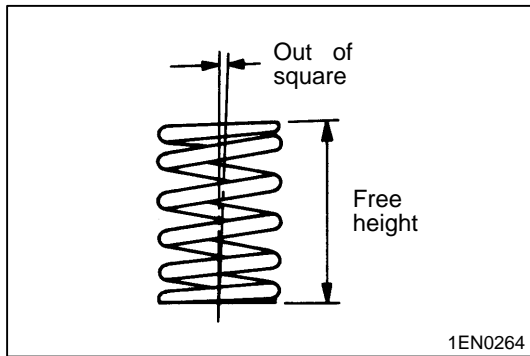
**VALVE**

- (1) Check the valve face for correct contact. If incorrect, reface using a valve refacer. Valve seat contact should be maintained uniform at the center of valve face.
- (2) If the margin exceeds the service limit, replace the valve.

Item	Standard value mm	Limit mm
Intake	1.0	0.5
Exhaust	1.5	1.0

- (3) Measure valve's total length. If measurement is less than specified, replace the valve.

Item	Standard value mm	Limit mm
Intake	109.5	109.0
Exhaust	109.7	109.2



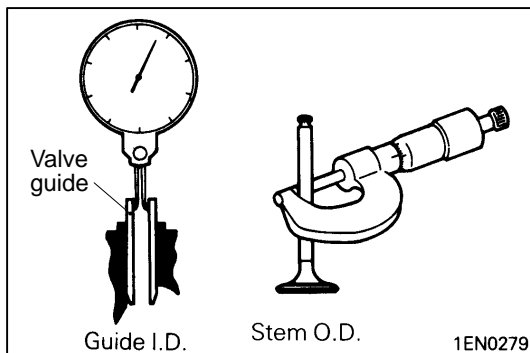
**VALVE SPRING**

- (1) Measure the free height of spring and, if it is smaller than the limit, replace.

Standard value mm	Limit mm
48.3	47.3

- (2) Measure the squareness of the spring and, if the limit is exceeded, replace.

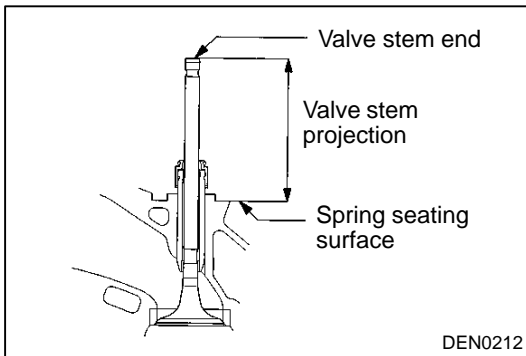
Standard value	Limit
1.5°	4°



**VALVE GUIDE**

Measure the clearance between the valve guide and valve stem. If the limit is exceeded, replace the valve guide or valve, or both.

Item	Standard value mm	Limit mm
Intake	0.02 – 0.05	0.10
Exhaust	0.05 – 0.09	0.15

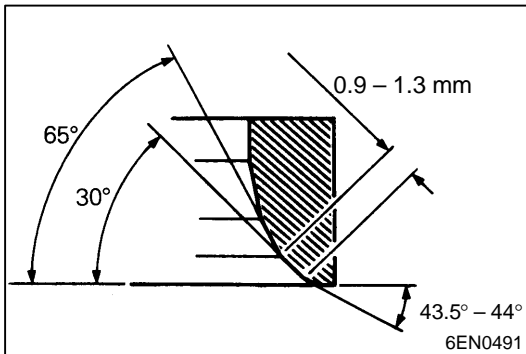


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**VALVE SEAT**

Assemble the valve, then measure the valve stem projection between the end of the valve stem and the spring seating surface. If the measurement exceeds the specified limit, replace the valve seat.

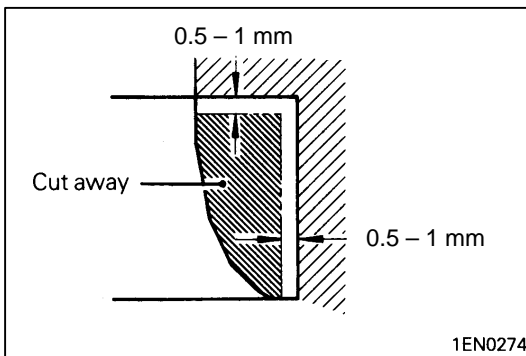
Item	Standard value mm	Limit mm
Intake	49.20	49.70
Exhaust	48.40	48.90



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**VALVE SEAT RECONDITIONING PROCEDURE**

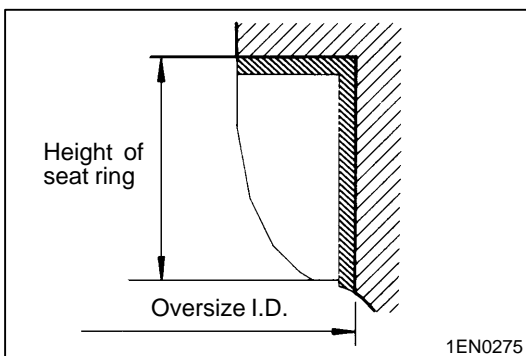
- (1) Before correcting the valve seat, check for clearance between the valve guide and valve and, if necessary, replace the valve guide.
- (2) Using the seat grinder, correct to obtain the specified seat width and angle.
- (3) After correcting the valve seat, lap the valve and valve seat using lapping compound. Then, check the valve stem projection (refer to VALVE SEAT in INSPECTION).



1EN0274

**VALVE SEAT REPLACEMENT PROCEDURE**

- (1) Cut the valve seat to be replaced from the inside to thin the wall thickness. Then, remove the valve seat.



1EN0275

- (2) Rebore the valve seat hole in the cylinder head to a selected oversize valve seat diameter.

**Valve seat ring hole diameter**

Item		Standard value mm
Intake	0.30 O.S.	35.30 - 35.33
	0.60 O.S.	35.60 - 35.63
Exhaust	0.30 O.S.	33.30 - 33.33
	0.60 O.S.	33.60 - 33.63

- (3) Before fitting the valve seat, either heat the cylinder head up to approximately 250°C or cool the valve seat in liquid nitrogen, to prevent the cylinder head bore from galling.
- (4) Using a valve seat cutter, correct the valve seat to the specified width and angle.  
See "VALVE SEAT RECONDITIONING PROCEDURE".

**VALVE GUIDE REPLACEMENT PROCEDURE**

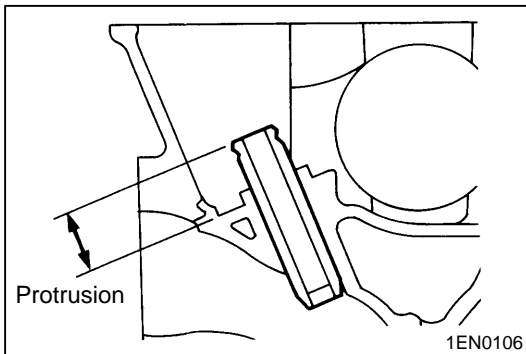
- (1) Force the valve guide out toward the cylinder block using a press.
- (2) Machine the valve guide hole in the cylinder head to the size of the oversize valve guide to be installed.

**Caution**

**Do not use the valve guide of the same size as the removed one.**

**Valve gauge hole diameters in cylinder head**

Item	Standard value mm
0.05 O.S.	12.05 – 12.07
0.25 O.S.	12.25 – 12.27
0.50 O.S.	12.50 – 12.52



- (3) Press-fit the valve guide until it protrude specified value 19.5 mm as shown in the illustration.


**Caution**

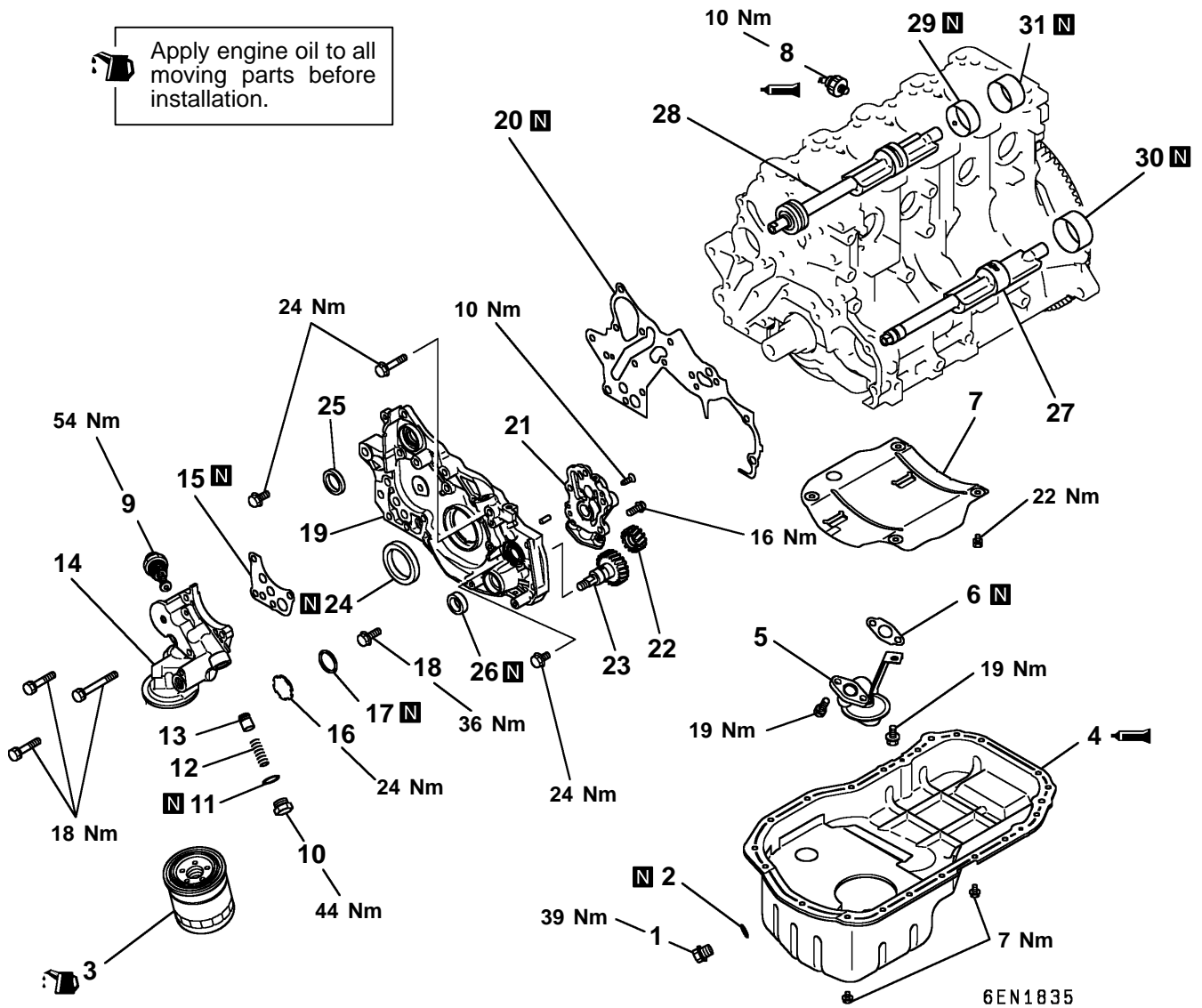
1. **Press the valve guide from the cylinder head top surface.**
2. **Valve guide for intake valve and that for exhaust valve are different in length. (45.5 mm for intake valve; 50.5 mm for exhaust valve)**

- (4) After the valve guide has been installed, insert a new valve to check for smooth sliding motion.

# FRONT CASE, COUNTERBALANCE SHAFT AND OIL PAN

## REMOVAL AND INSTALLATION

 Apply engine oil to all moving parts before installation.

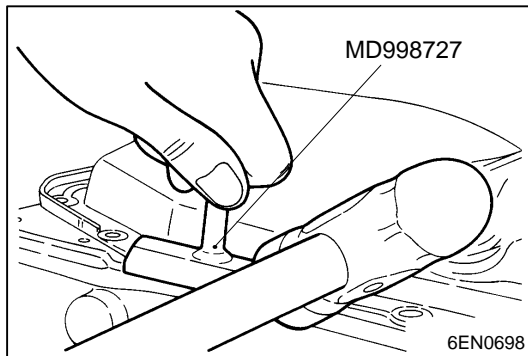


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### Removal steps

- |         |                               |         |   |  |  |
|---------|-------------------------------|---------|---|--|--|
|         | 1. Drain plug                 |         |   |  |  |
|         | 2. Drain plug gasket          |         |   |  |  |
|         | 3. Oil filter                 |         |   |  |  |
| ◀A▶     | 4. Oil pan                    |         |   |  |  |
|         | 5. Oil screen                 |         |   |  |  |
|         | 6. Oil screen gasket          |         |   |  |  |
|         | 7. Baffle plate               |         |   |  |  |
|         | 8. Oil pressure switch        |         |   |  |  |
|         | 9. Oil cooler by-pass valve   |         |   |  |  |
|         | 10. Relief plug               |         |   |  |  |
|         | 11. Relief plug gasket        |         |   |  |  |
|         | 12. Relief spring             |         |   |  |  |
|         | 13. Relief plunger            |         |   |  |  |
|         | 14. Oil filter bracket        |         |   |  |  |
|         | 15. Oil filter bracket gasket |         |   |  |  |
| ◀B▶ ▶K▶ | 16. Plug                      |         |   |  |  |
|         | 17. O-ring                    |         |   |  |  |
|         |                               | ◀C▶ ▶J▶ | 18. Flange bolt                             |  |  |
|         |                               | ▶H▶     | 19. Front case                              |  |  |
|         |                               |         | 20. Front case gasket                       |  |  |
|         |                               |         | 21. Oil pump cover                          |  |  |
|         |                               | ▶G▶     | 22. Oil pump driven gear                    |  |  |
|         |                               | ▶G▶     | 23. Oil pump drive gear                     |  |  |
|         |                               | ▶F▶     | 24. Crankshaft oil seal                     |  |  |
|         |                               | ▶E▶     | 25. Oil pump oil seal                       |  |  |
|         |                               | ▶D▶     | 26. Counterbalance shaft oil seal           |  |  |
|         |                               |         | 27. Counterbalance shaft left               |  |  |
|         |                               |         | 28. Counterbalance shaft right              |  |  |
|         |                               | ◀D▶ ▶C▶ | 29. Counterbalance shaft front bearing      |  |  |
|         |                               | ◀E▶ ▶B▶ | 30. Counterbalance shaft rear bearing left  |  |  |
|         |                               | ◀E▶ ▶A▶ | 31. Counterbalance shaft rear bearing right |  |  |





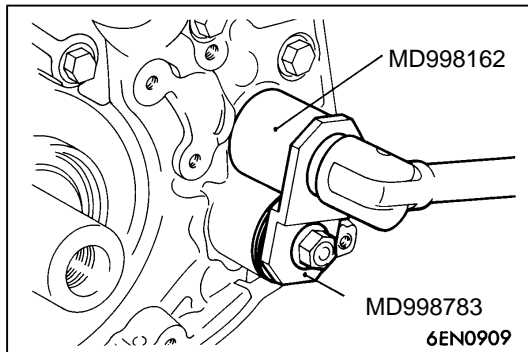
## REMOVAL SERVICE POINTS

### ◀A▶ OIL PAN REMOVAL

- (1) Remove all oil pan bolts.
- (2) Drive in the special tool between the cylinder block and oil pan.

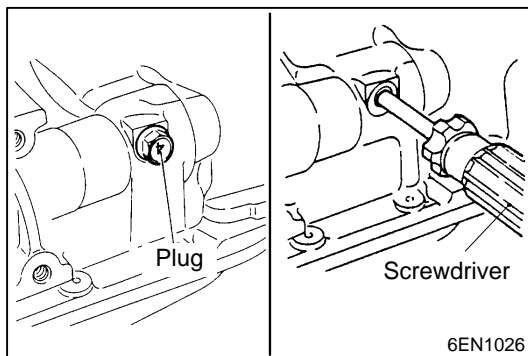
#### NOTE

Never use a screwdriver or chisel, instead of the service tool, as a deformed oil pan flange will result in oil leakage.



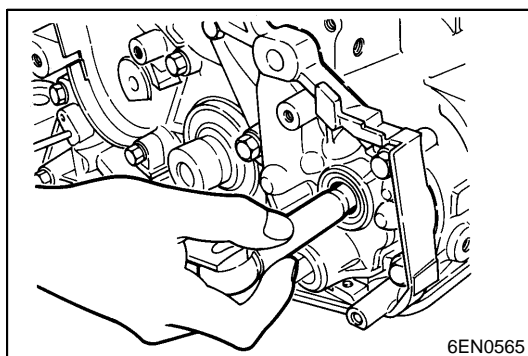
### ◀B▶ PLUG REMOVAL

- (1) Fit special tool MD998162 on the plug, and then hold it in position with special tool MD998783.
- (2) Loosen the plug.
- (3) Remove the special tools MD998783 and MD998162 and then the plug.

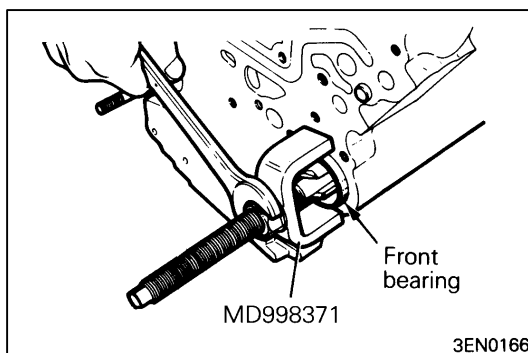


### ◀C▶ FLANGE BOLT REMOVAL

- (1) Remove the plug on the side of cylinder block.
- (2) Insert a Phillips screwdriver (shank diameter 8 mm) into the plug hole to lock the counterbalance shaft.



- (3) Loosen the flange bolt.

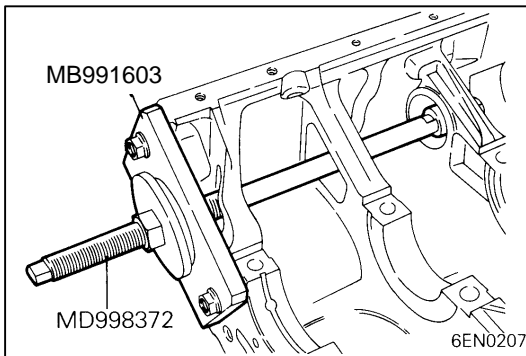


### ◀D▶ COUNTERBALANCE SHAFT FRONT BEARING REMOVAL

Using the special tool, remove the counterbalance shaft front bearing from the cylinder block.

#### NOTE

Be sure to remove the front bearing first. If it has not been removed, the Rear Bearing Puller cannot be used.

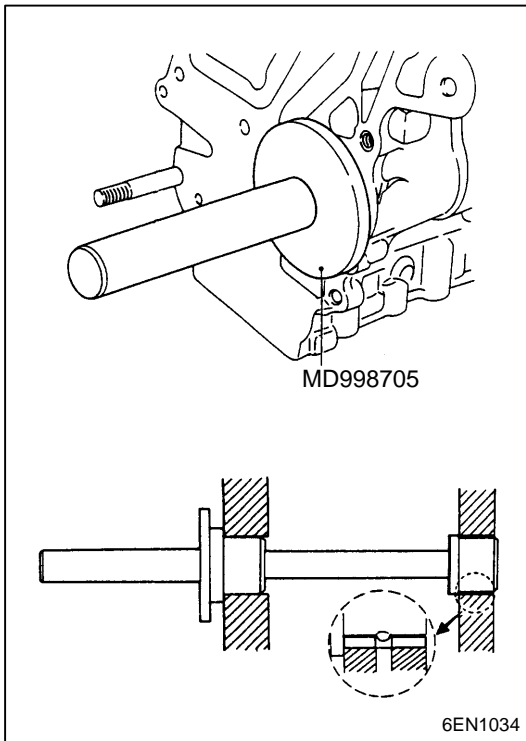


### ◀E▶ COUNTERBALANCE SHAFT REAR BEARING REMOVAL

Using the special tool, remove the left counterbalance shaft rear bearing from the cylinder block.

#### NOTE

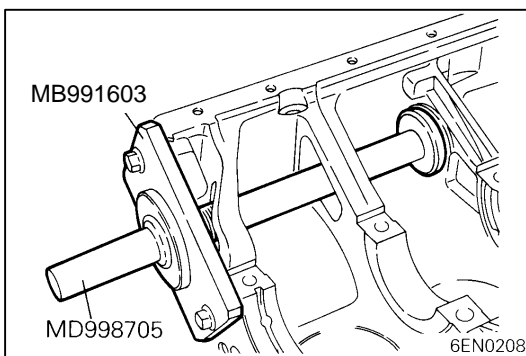
When removing the left counterbalance shaft rear bearing, install the special tool (MB991603) in front of the cylinder block.



### INSTALLATION SERVICE POINTS

#### ▶A▶ RIGHT COUNTERBALANCE SHAFT REAR BEARING INSTALLATION

- (1) Apply engine oil to the outer surface of bearing.
- (2) Using special tools, install right rear bearing. Make sure that oil hole of bearing is aligned with oil hole of cylinder block.

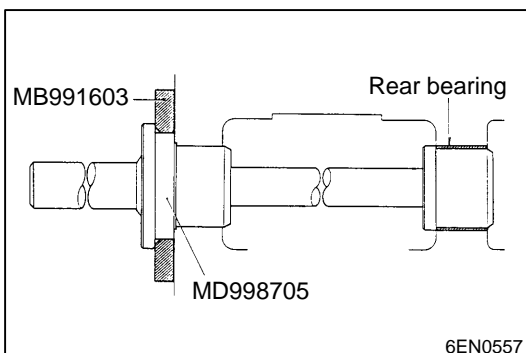


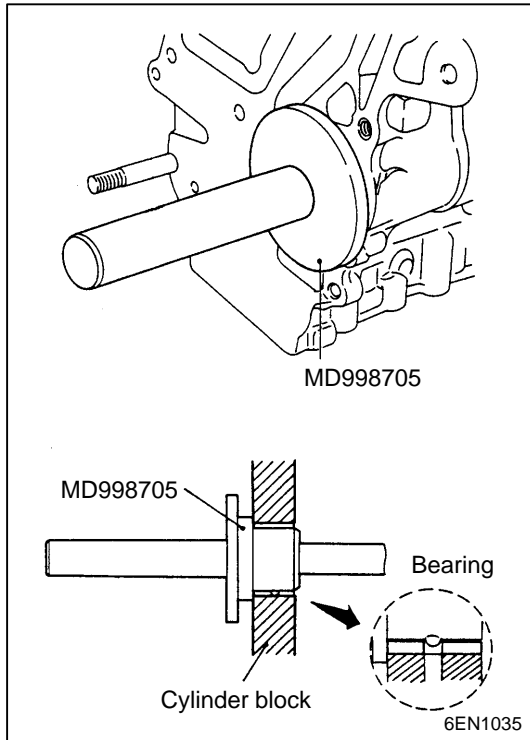
#### ▶B▶ LEFT COUNTERBALANCE SHAFT REAR BEARING INSTALLATION

- (1) Install the special tool (Guide Plate) to the cylinder block.
- (2) Apply engine oil to the rear bearing outer circumference and bearing hole in the cylinder block.
- (3) Using the special tool, install the rear bearing.

#### NOTE

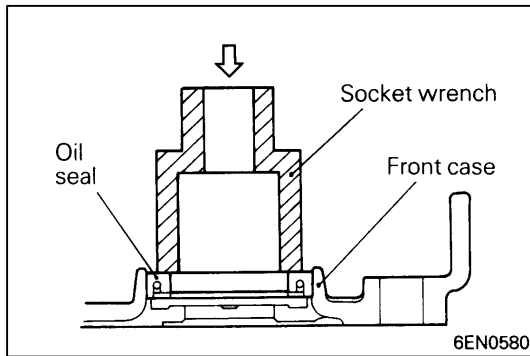
The left rear bearing has no oil holes.





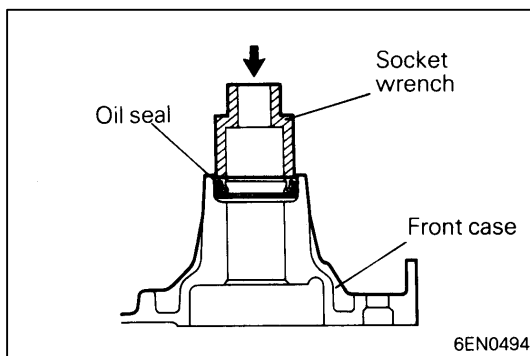
**►C◄ COUNTERBALANCE SHAFT FRONT BEARING INSTALLATION**

Using special tools, install front bearing.



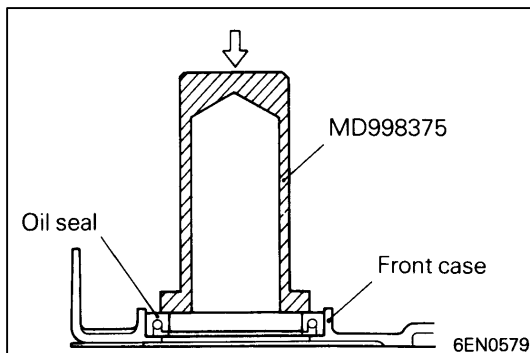
**►D◄ COUNTERBALANCE SHAFT OIL SEAL INSTALLATION**

Using a suitable socket wrench, install the counterbalance shaft oil seal into the front case.



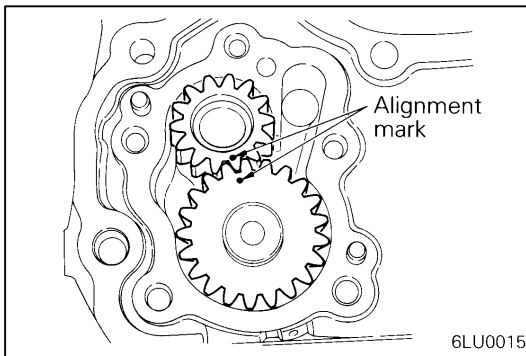
**►E◄ OIL PUMP OIL SEAL INSTALLATION**

Using a suitable socket wrench, install the oil pump oil seal into the front case.



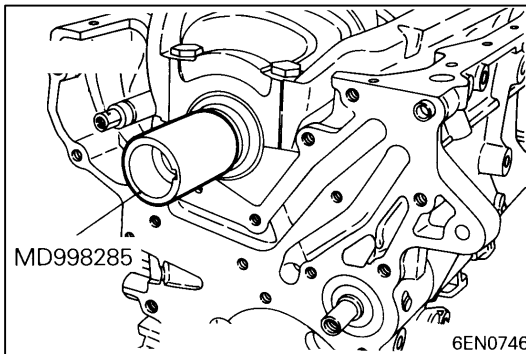
**►F◄ CRANKSHAFT FRONT OIL SEAL INSTALLATION**

Using the special tool, install the crankshaft front oil seal into the front case.



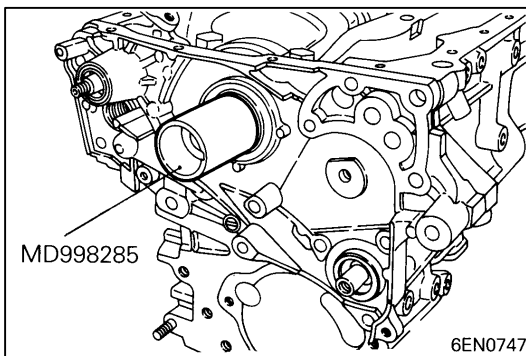
### ►G◄ OIL PUMP DRIVEN GEAR / OIL PUMP DRIVE GEAR INSTALLATION

Apply engine oil amply to the gears and line up the alignment marks.

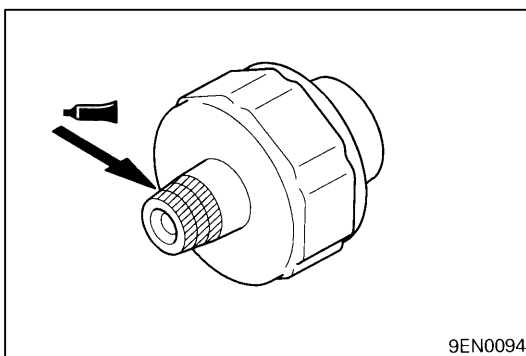


### ►H◄ FRONT CASE ASSEMBLY INSTALLATION

(1) Set the special tool on the front end of crankshaft and apply a thin coat of engine oil to the outer circumference of the special tool to install the front case.



(2) Install the front case assembly through a new front case gasket and temporarily tighten the flange bolts (other than those for tightening the filter bracket).



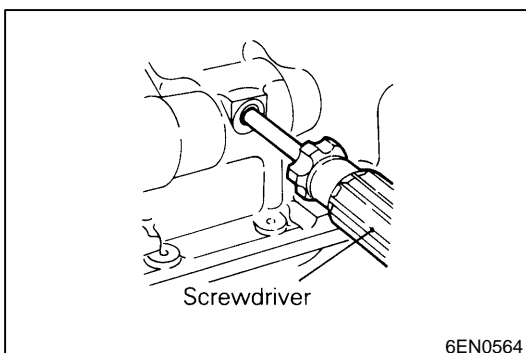
### ►I◄ SEALANT APPLICATION TO OIL PRESSURE SWITCH

Coat the threads of switch with sealant and install the switch using the special tool.

**Specified sealant: 3M™ AAD Part No. 8672 or equivalent**

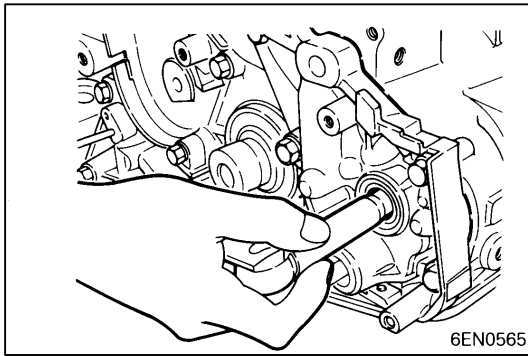
#### Caution

- (1) Keep the end of the thread portion clear or sealant.
- (2) Avoid an overtightening.

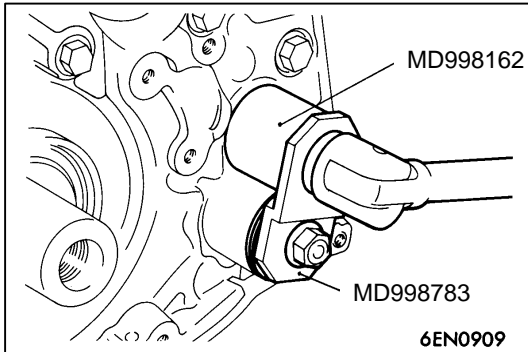


### ►J◄ FLANGE BOLT INSTALLATION

(1) Insert a Phillips screwdriver into a hole in the left side of the cylinder block to lock the silent shaft.

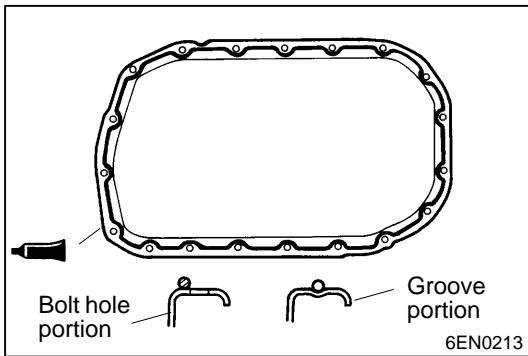


- (2) Secure the oil pump driven gear onto the left counterbalance shaft by tightening the flange bolt to specified torque.



**►K◄ PLUG INSTALLATION**

- (1) Install a new O-ring to the groove of the front case.
- (2) Install the plug to the front case.
- (3) Fit the special tool MD998162 on the plug, and then hold it in position with special tool MD998783.
- (4) Tighten the plug to the specified torque.
- (5) Remove the special tools MD998783 and MD998162.



**►L◄ OIL PAN INSTALLATION**

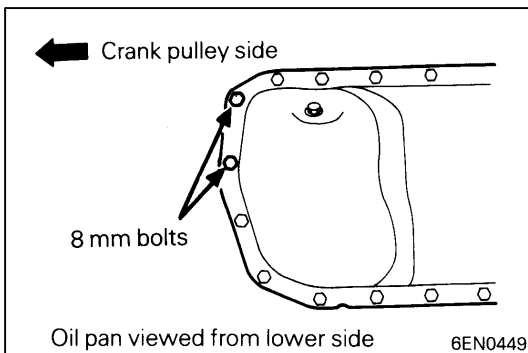
- (1) Clean both mating surfaces of oil pan and cylinder block.
- (2) Apply a 4 mm wide bead of sealant to the entire circumference of the oil pan flange.

**Specified sealant:**

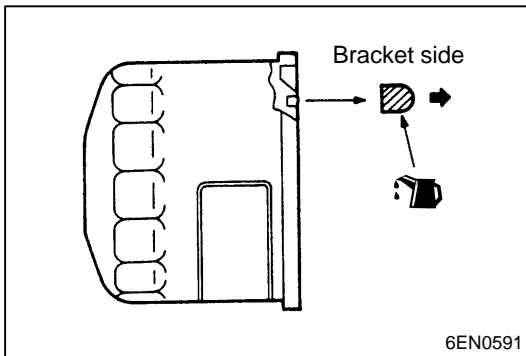
**Mitsubishi Genuine Part No. MD970389 or equivalent**

**NOTE**

1. Be sure to install the oil pan quickly while the sealant is wet (within 15 minutes).
2. After installation, keep the sealed area away from the oil and coolant for approx. one hour.

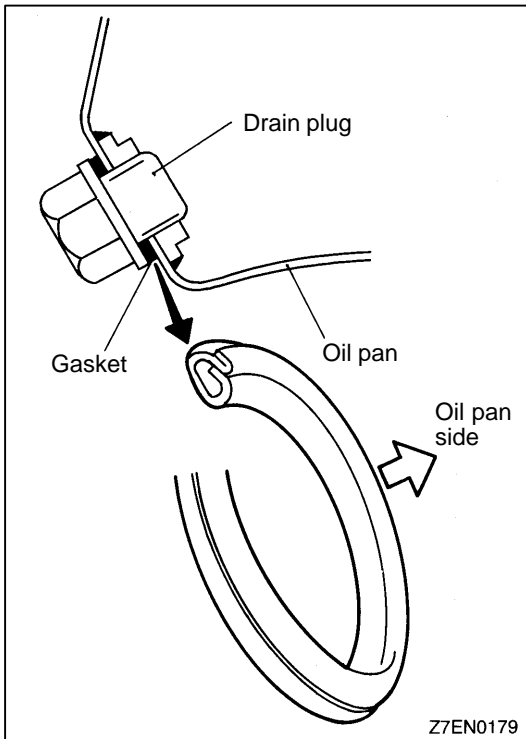


- (3) Note the difference in bolt lengths at the location shown.



### ►M◄ OIL FILTER INSTALLATION

- (1) Clean the installation surfaces of the filter bracket.
- (2) Apply engine oil to the O-ring of the oil filter.
- (3) Screw the oil filter in until the O-ring contacts the bracket. Then tighten 3/4 turn (tightening torque: 16 Nm).



### ►N◄ DRAIN PLUG GASKET INSTALLATION

#### Caution

**Fitting the gasket in a wrong way will result in oil leakage.**

Install the drain plug gasket in the direction shown.

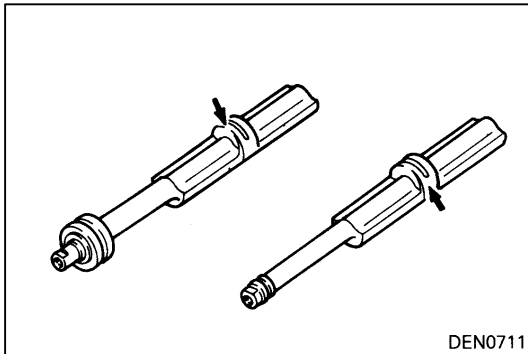
## INSPECTION

### FRONT CASE

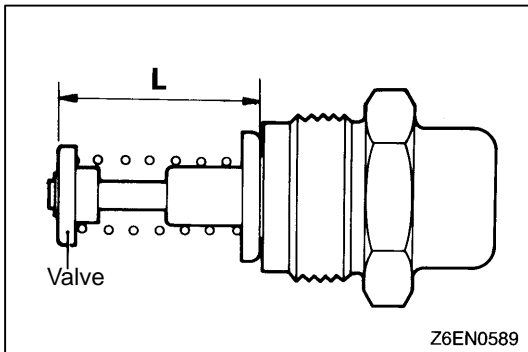
- (1) Check oil holes for clogging and clean if necessary.
- (2) Check the left counterbalance shaft front bearing section for wear, damage and seizure. If there is anything wrong with the section, replace the front case.
- (3) Check the front case for cracks and other damage. Replace cracked or damaged front case.

### OIL SEAL

- (1) Check the oil seal lip for wear and damage. Replace oil seal if necessary.
- (2) Check the oil seal lip for deterioration. Replace oil seal if necessary.

**COUNTERBALANCE SHAFT**

- (1) Check oil holes for clogging.
- (2) Check journals for seizure, damage and contact with bearing. If there is anything wrong with the journal, replace the counterbalance shaft, bearing or front case assembly.

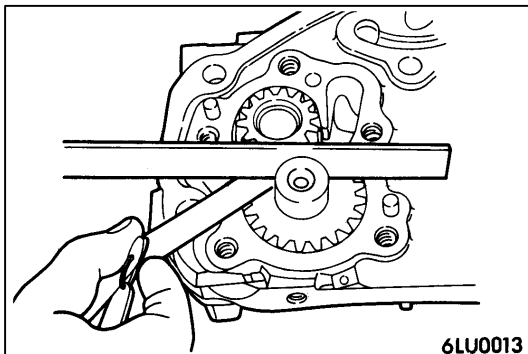
**OIL COOLER BY-PASS VALVE (ENGINE WITH AIR COOLING TYPE OIL COOLER)**

- (1) Make sure that the valve moves smoothly.
- (2) Ensure that the dimension (L) measures the standard valve under normal temperature and humidity.

**Standard value (L): 34.5 mm**

- (3) The dimension must be the standard value when measured after the valve has been dipped in 100°C oil.

**Standard value (L): 40 mm or more**

**OIL PUMP**

- (1) Assemble the oil pump gear to the front case and rotate it to ensure smooth rotation with no looseness.
- (2) Ensure that there is no ridge wear on the contact surface between the front case and the gear surface of the oil pump cover.
- (3) Check the side clearance.


**Standard value:**

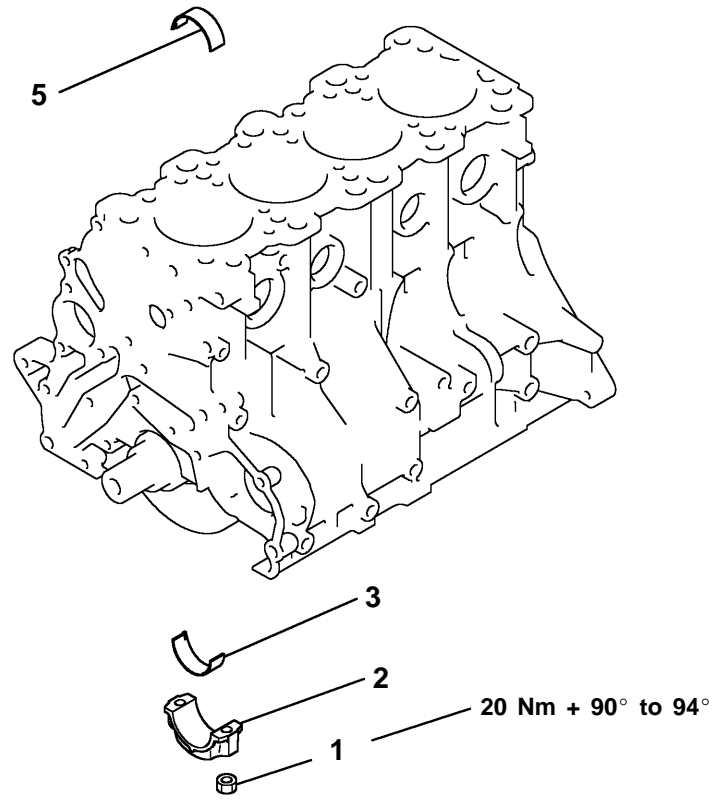
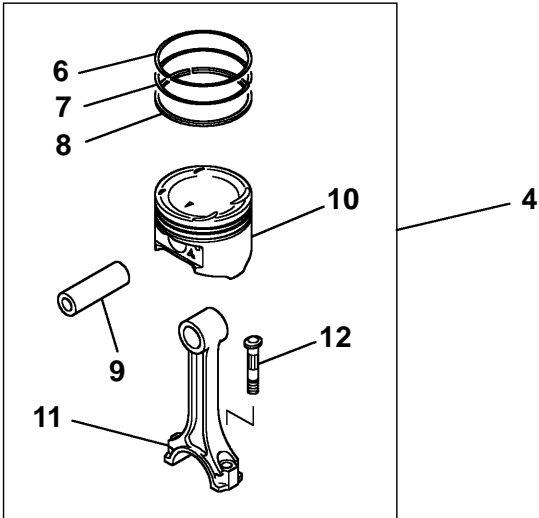
**Drive gear      0.08 – 0.14 mm**

**Driven gear     0.06 – 0.12 mm**

# PISTON AND CONNECTING ROD

## REMOVAL AND INSTALLATION

 Apply engine oil to all moving parts before installation.



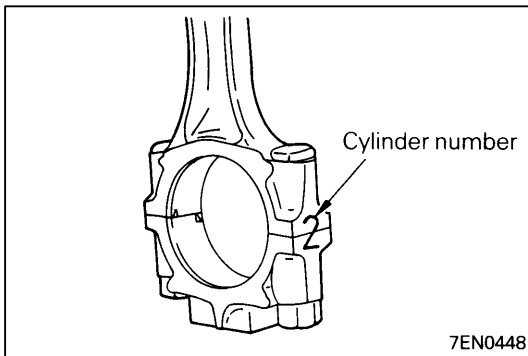
6EN1836

**Removal steps**

- ◀A▶ ▶G▶ 1. Connecting rod nut
- ▶F▶ 2. Connecting rod cap
- ▶E▶ 3. Connecting rod bearing
- ▶D▶ 4. Piston and connecting rod assembly
- ▶C▶ 5. Connecting rod bearing
- ▶C▶ 6. Piston ring No. 1

- ▶C▶ 7. Piston ring No. 2
- ▶B▶ 8. Oil ring
- ▶A▶ 9. Piston pin
- ▶B▶ 10. Piston
- ▶A▶ 11. Connecting rod
- ▶B▶ 12. Bolt

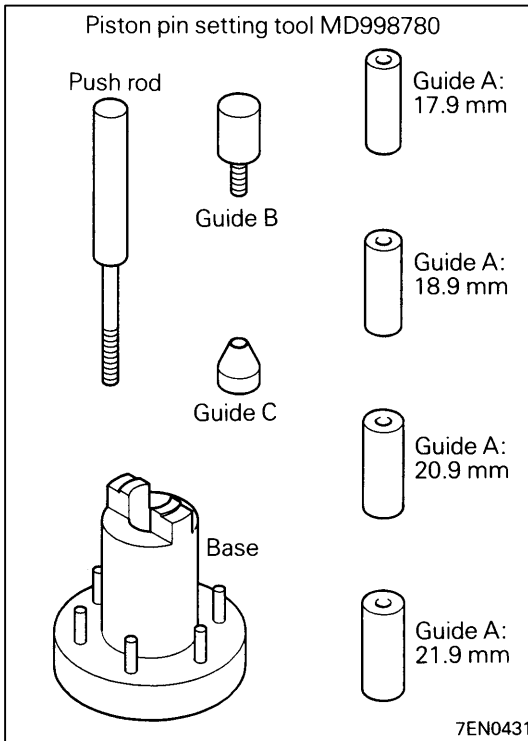




**REMOVAL SERVICE POINTS**

**◀A▶ CONNECTING ROD CAP REMOVAL**

- (1) Mark the cylinder number on the side of the connecting rod big end for correct reassembly.
- (2) Keep the removed connecting rods, caps, and bearings in order according to the cylinder number.

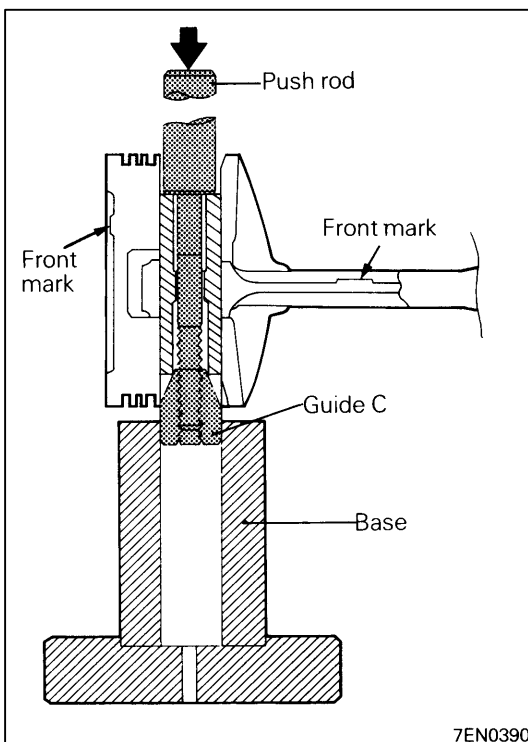


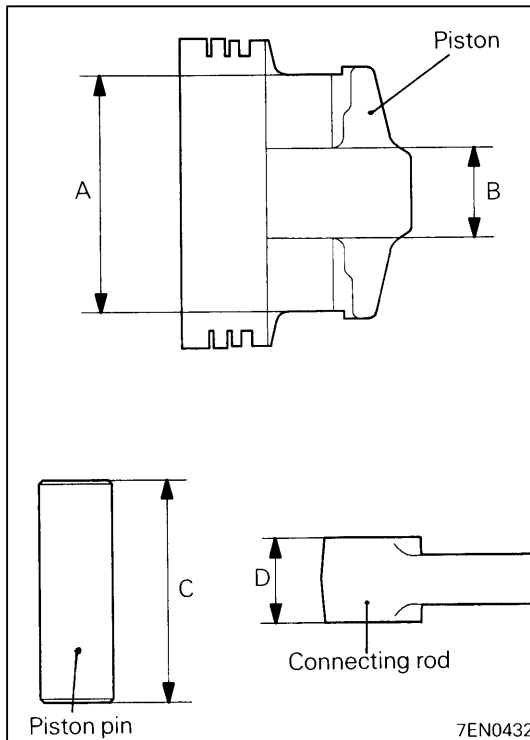
**◀B▶ PISTON PIN REMOVAL**

- (1) Insert the special tool, Push Rod, into the piston from the side on which the front mark is stamped in the piston head, and attach the guide C to the push rod end.
- (2) Place the piston and connecting rod assembly on the special tool, Piston Pin Setting Base, with the front mark facing upward.
- (3) Using a press, remove the piston pin.

**NOTE**

Keep the disassembled pistons, piston pins and connecting rods in order according to the cylinder number.





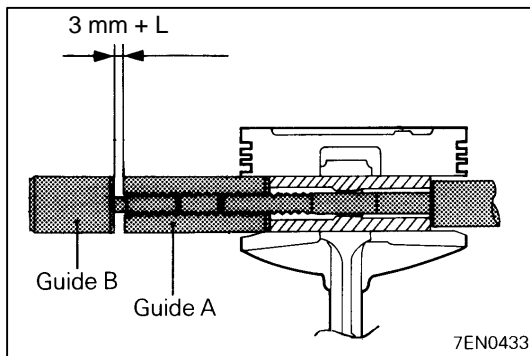
## INSTALLATION SERVICE POINTS

### ▶A◀ PISTON PIN INSTALLATION

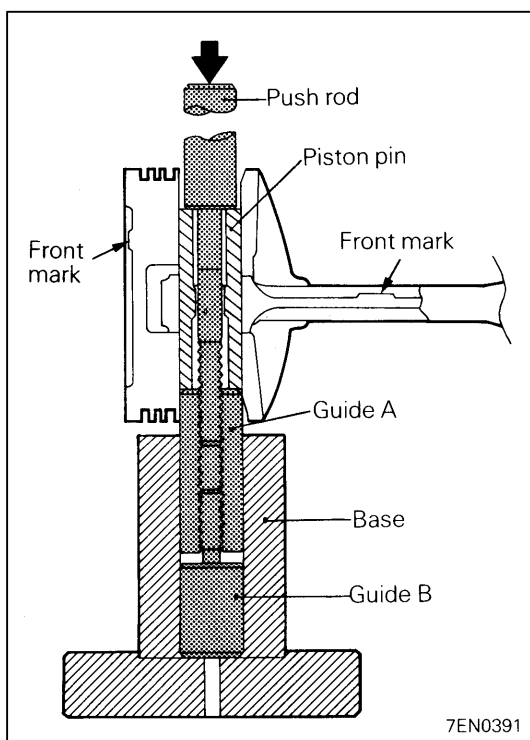
- Measure the following dimensions of the piston, piston pin and connecting rod.  
 A: Piston pin insertion hole length  
 B: Distance between piston bosses  
 C: Piston pin length  
 D: Connecting rod small end width
- Obtain dimension L (to be used later) from the above measurements by using the following formula.

$$L = \frac{(A - C) - (B - D)}{2}$$

- Insert the special tool, Push Rod, into the piston pin and attach the guide A to the push rod end.
- Assemble the connecting rod in the piston with their front marks facing the same direction.
- Apply engine oil to the entire periphery of the piston pin.
- Insert the piston pin, push rod and guide A assembly having assembled in step (3) from the guide A side into the piston pin hole on the front marked side.

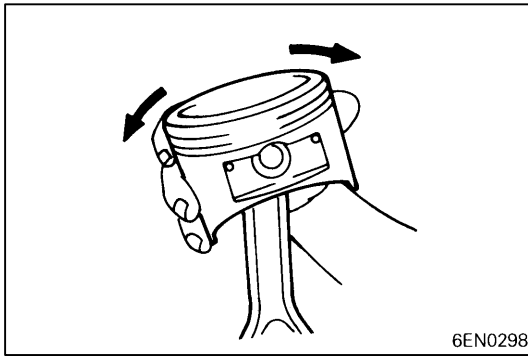


- Screw the guide B into the guide A until the gap between both guides amounts to the value L obtained in step (2) plus 3 mm.

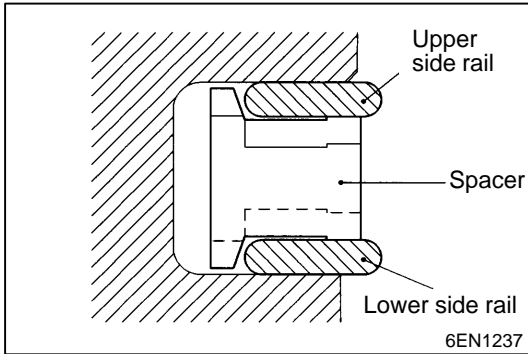


- Place the piston and connecting rod assembly onto the piston setting base with the front marks directed upward.
- Press-fit the piston pin using a press.  
 If the press-fitting force required is less than the standard value, replace the piston and piston pin set or/and the connecting rod.

**Standard value: 7,350 – 17,200 N**



(10) Check that the piston moves smoothly



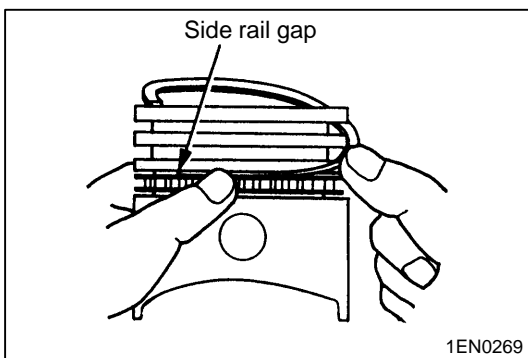
**►B◄ OIL RING INSTALLATION**

(1) Fit the oil ring spacer into the piston ring groove.

**NOTE**

1. The side rails and spacer may be installed in either direction.
2. New spacers and side rails are colored for identification of their sizes.

Size	Identification color
Standard	None
0.50 mm oversize	Red
1.00 mm oversize	Yellow

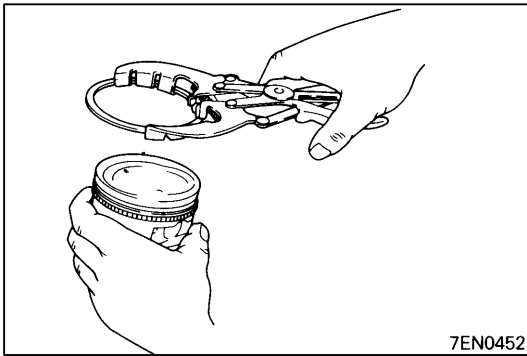


(2) Install the upper side rail.  
 To install the side rail, first fit one end of the rail into the piston groove, then press the remaining portion into position by finger. See illustration.  
 Use of ring expander to expand the side rail end gap can break the side rail, unlike other piston rings.

**Caution**

**Do not use piston ring expander when installing side rail.**

- (3) Install the lower side rail in the same procedure as described in step (2).
- (4) Make sure that the side rails move smoothly in either direction.



7EN0452

**►C◄ PISTON RING NO. 2 / PISTON RING NO. 1 INSTALLATION**

- (1) Using piston ring expander, fit No. 2 and then No. 1 piston ring into position.

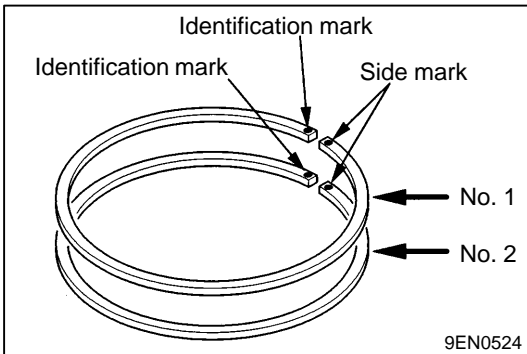
**NOTE**

1. The ring end is provided with identification mark.

Item	Identification mark
No. 1 ring	1R
No. 2 ring	2R

2. Install piston rings with identification mark facing up, to the piston crown side.
3. Size marks on position rings are as follows.

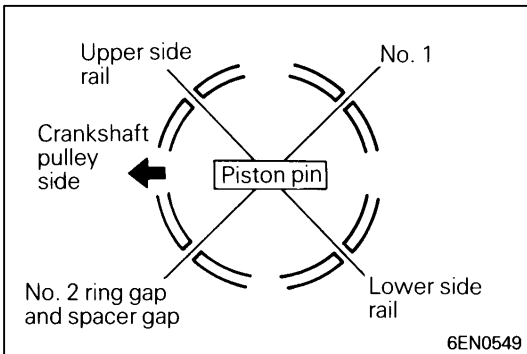
Size	Size mark
Standard	None
0.50 mm oversize	50
1.00 mm oversize	100



9EN0524

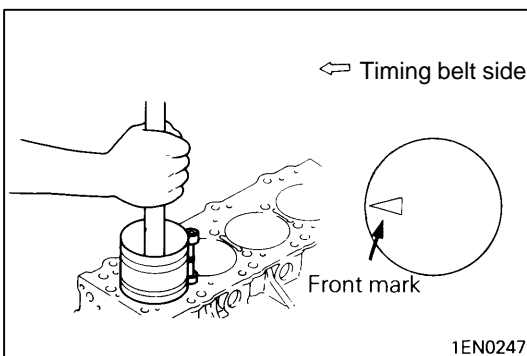
**►D◄ PISTON AND CONNECTING ROD ASSEMBLY INSTALLATION**

- (1) Liberally coat engine oil on the circumference of the piston, piston ring, and oil ring.
- (2) Arrange the piston ring and oil ring gaps (side rail and spacer) as shown in the figure.
- (3) Rotate the crankshaft so that crank pin is on the center of cylinder bore.



6EN0549

- (4) Use suitable thread protectors on the connecting rod bolts before inserting piston and connecting rod assembly into the cylinder block. Care must be taken not to nick the crank pin.
- (5) Using a suitable piston ring compressor tool, install the piston and connecting rod assembly into the cylinder block.

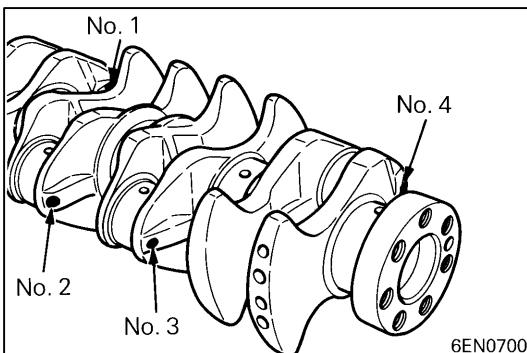


1EN0247

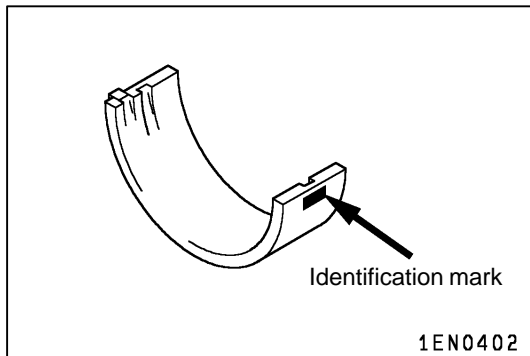
**►E◄ CONNECTING ROD BEARINGS INSTALLATION**

When the bearing needs replacing, select and install a proper bearing by the following procedure.

- (1) Measure the crankshaft pin diameter and confirm its classification from the following table. In the case of a crankshaft supplied as a service part, identification colors of its pins are painted at the positions shown in the illustration.



6EN0700



- (2) The connecting rod bearing identification mark is stamped at the position shown in the illustration.

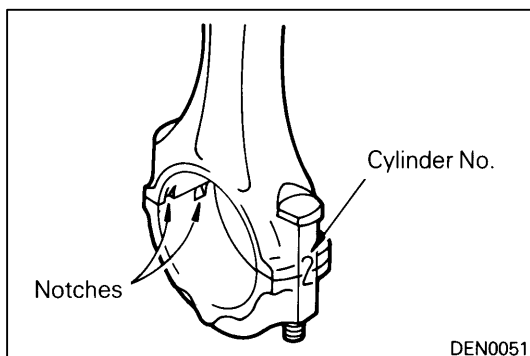
Crankshaft pin				Connecting rod bearing	
Classi- fication	Identifica- tion mark	Identifi- cation color	O. D. mm	Identi- fication mark	Thickness mm
	Produc- tion part	Service part			
1	None	Yellow	44.995–45.000	0	1.483–1.487
2	None	None	44.985–44.995	1	1.487–1.491
3	None	White	44.980–44.985	2	1.491–1.495

**Connecting rod I.D.: 48.000 – 48.015 mm**

- (3) Select a proper bearing from the above table on the basic of the identification data confirmed under items (1) and (2).

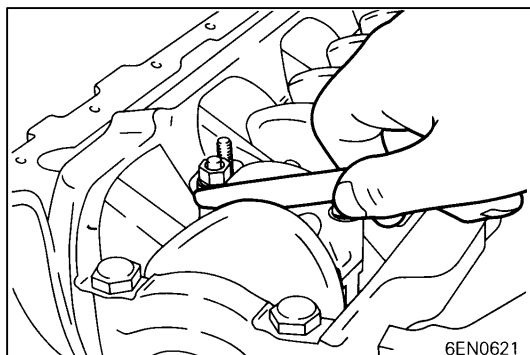
[Example]

If the measured value of a crankshaft pin outer diameter is 44.996 mm, the pin is classified as “1” in the table. In case the crankshaft is also replaced by a spare part, check the identification colors of the pins painted on the new crankshaft. If the color is yellow, for example, the pin is classified as “1”. In the above cases, select the connection rod bearing having identification mark “0”.



**▶F◀ CONNECTING ROD CAP INSTALLATION**

- (1) Verifying the mark made during disassembly, install the bearing cap to the connecting rod. If the connecting rod is new with no index mark, make sure that the bearing locking notches come on the same side as shown.



- (2) Make sure that the connecting rod big end side clearance meets the specification.

**Standard value: 0.10 – 0.25 mm**

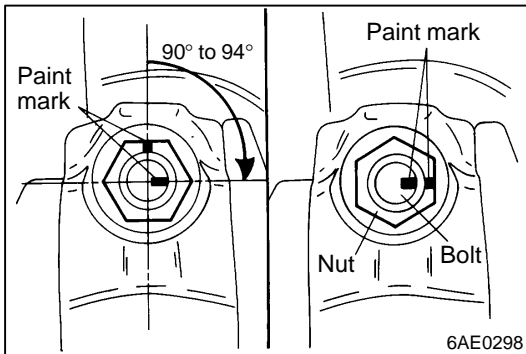
**Limit: 0.4 mm**

### ▶◀CONNECTING ROD CAP NUT INSTALLATION

#### Caution

If the cylinder head has been installed before installing the connecting rod cap nut, be sure to remove the spark plugs.

- (1) Since the connecting rod cap bolts and nuts are torqued using the plastic area tightening method, the bolts should be examined BEFORE reuse. If the bolt threads are “necked down”, the bolt should be replaced. Necking can be checked by running a nut with fingers to the full length of the bolt threads. If the nut does not run down smoothly, the bolt should be replaced.
- (2) Before installation of each nut, apply engine oil to the thread portion and bearing surface of the nut.
- (3) Install each nut to the bolt and tighten it with fingers. Then tighten the nuts alternately to install the cap properly.
- (4) Tighten the nuts to a torque of 20 Nm.
- (5) Make a paint mark on the head of each nut.
- (6) Make a paint mark on the bolt end at the position 90° to 94° from the paint mark made on the nut in the direction of tightening the nut.
- (7) Give a 90° to 94° turn to the nut and make sure that the paint mark on the nut and that on the bolt are in alignment.



#### Caution

1. If the nut is turned less than 90°, proper fastening performance may not be expected. When tightening the nut, therefore, be careful to give a sufficient turn to it.
2. If the nut is overtightened (exceeding 94°), loosen the nut completely and then retighten it by repeating the tightening procedure from step (1).

### INSPECTION

#### PISTON RING

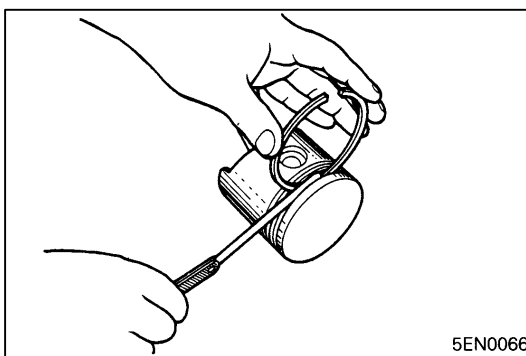
- (1) Check the piston ring for damage, excessive wear, and breakage and replace if defects are evident. If the piston has been replaced with a new one, the piston rings must also be replaced with new ones.
- (2) Check for the clearance between the piston ring and ring groove. If the limit is exceeded, replace the ring or piston, or both.

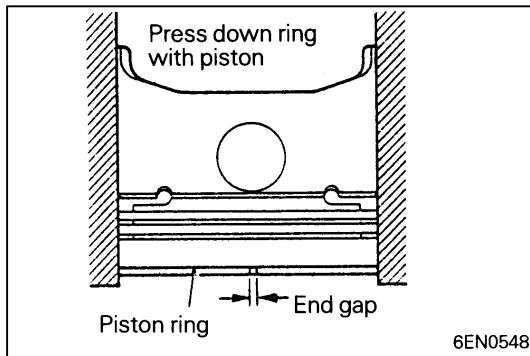
#### Standard value:

No. 1 ring 0.04 – 0.075 mm

No. 2 ring 0.02 – 0.06 mm

Limit: 0.1 mm





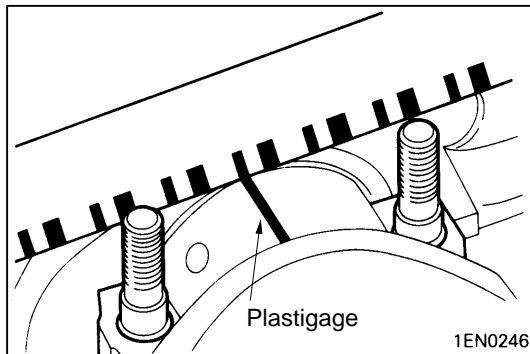
- (3) Install the piston ring into the cylinder bore. Force it down with a piston, its crown being in contact with the ring, to correctly position it at right angles to the cylinder wall. Then, measure the end gap with a feeler gauge. If the ring gap is excessive, replace the piston ring.

**Standard value:**

No. 1 ring	0.25 – 0.35 mm
No. 2 ring	0.40 – 0.55 mm
Oil ring	0.10 – 0.40 mm

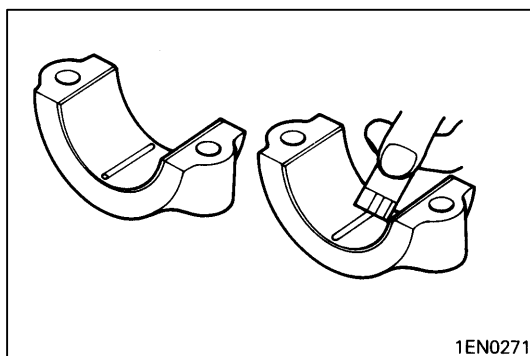
**Limit:**

No. 1, No. 2 ring	0.8 mm
Oil ring	1.0 mm



**CRANKSHAFT PIN OIL CLEARANCE  
(PLASTIGAGE METHOD)**

- (1) Remove oil from the crankshaft pin and connecting rod bearing.
- (2) Cut the Plastigage to the same length as the width of the bearing and place it on the crankshaft pin in parallel with its axis.



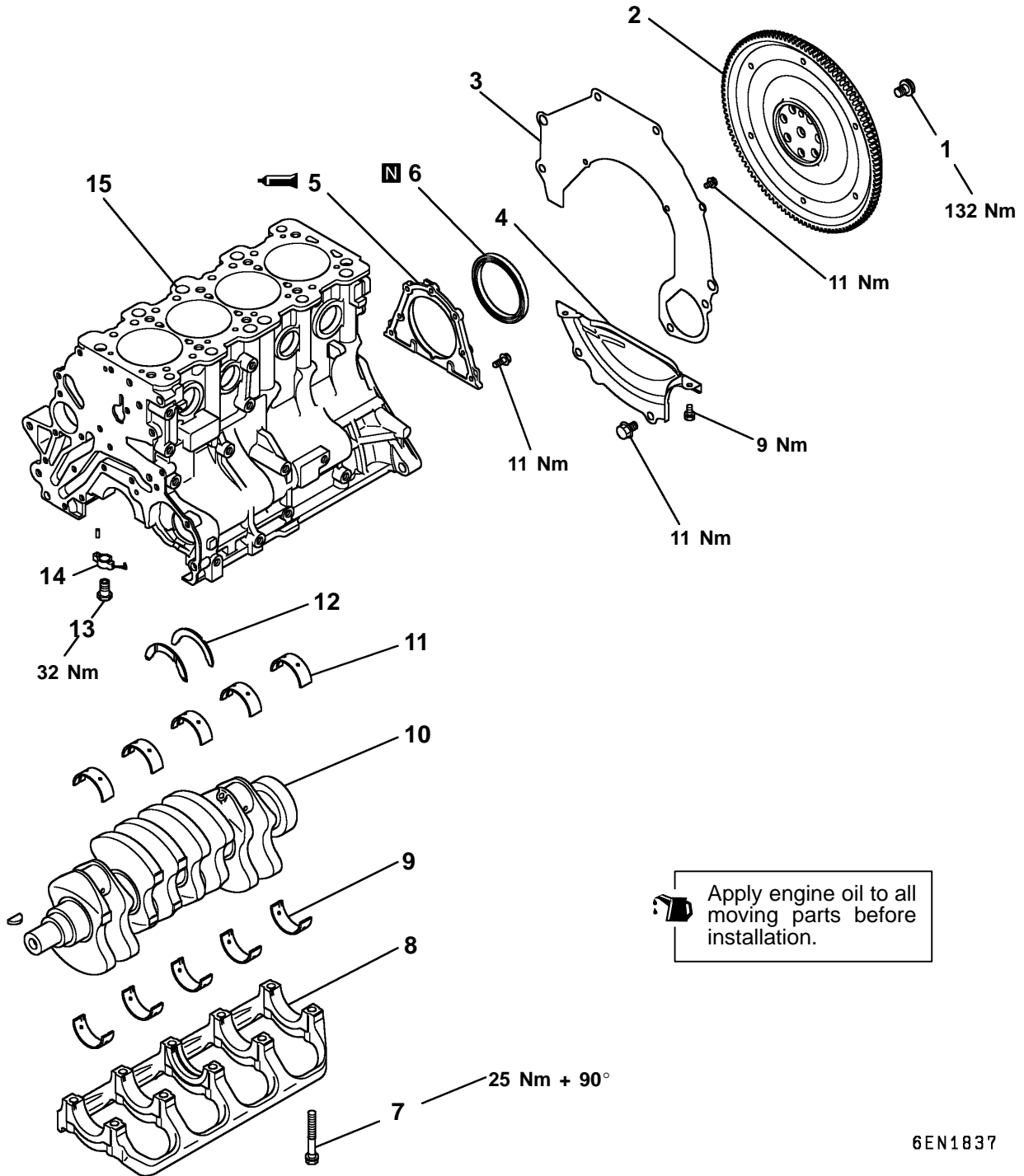
- (3) Install the connecting rod cap carefully and tighten the nuts to specified torque.
- (4) Carefully remove the connecting rod cap.
- (5) Measure the width of the Plastigage at its widest part by using a scale printed on the Plastigage package.

**Standard value: 0.03 – 0.05 mm**

**Limit: 0.1 mm**

# CRANKSHAFT AND FLYWHEEL

## REMOVAL AND INSTALLATION



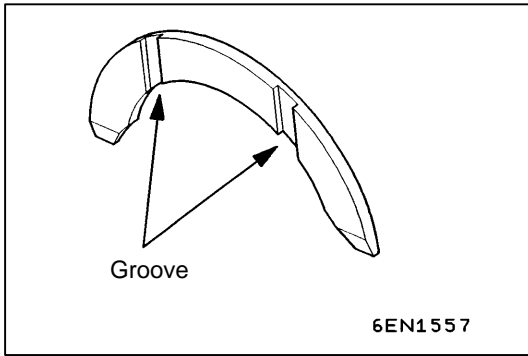
Apply engine oil to all moving parts before installation.

6EN1837

### Removal steps

- |                          |                                   |
|--------------------------|-----------------------------------|
| 1. Flywheel bolt         | ▶B◀ 9. Crankshaft bearing lower   |
| 2. Flywheel              | 10. Crankshaft                    |
| 3. Rear plate            | ▶B◀ 11. Crankshaft bearing upper  |
| 4. Bell housing cover    | ▶A◀ 12. Crankshaft thrust bearing |
| 5. Oil seal case         | 13. Check valve                   |
| 6. Oil seal              | 14. Oil jet                       |
| 7. Beam bearing cap bolt | 15. Cylinder block                |
| ▶E◀ 8. Beam bearing cap  |                                   |

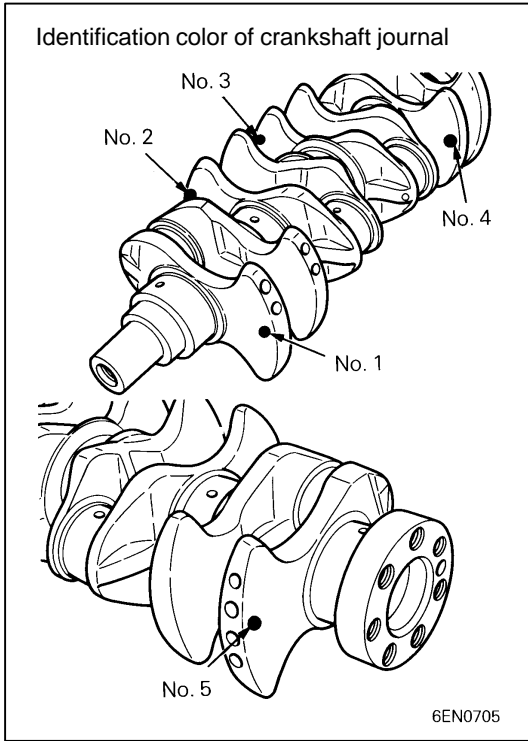




**INSTALLATION SERVICE POINTS**

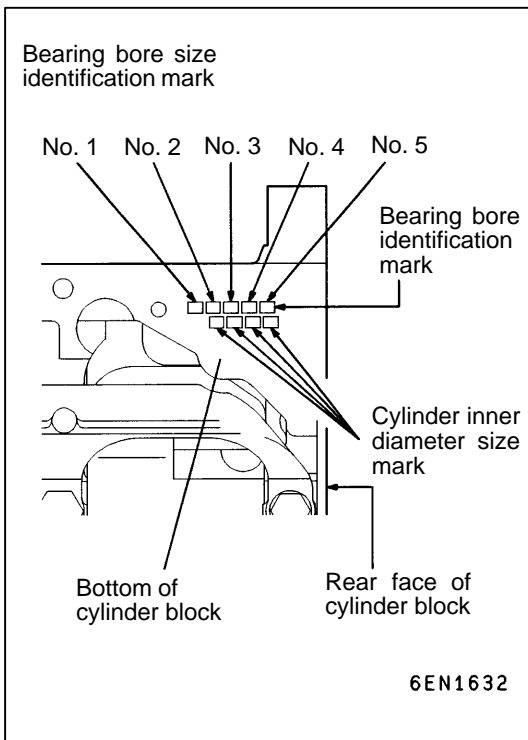
**▶A◀ CRANKSHAFT THRUST BEARING INSTALLATION**

- (1) Install the two thrust bearing in the number 3 bearing bore in the cylinder block. For easier installation, apply engine oil to the bearings; this will help hold them in position.
- (2) The thrust bearings must be installed with their groove side toward the crankshaft web.

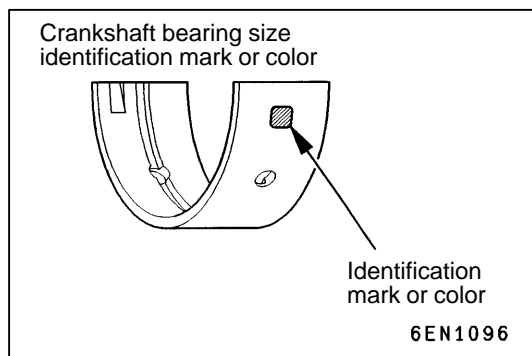


**▶B◀ CRANKSHAFT BEARING INSTALLATION**

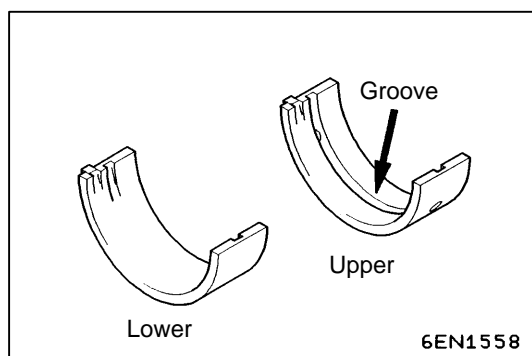
- (1) From the following table, select a bearing whose size is appropriate for the crankshaft journal outside diameter.



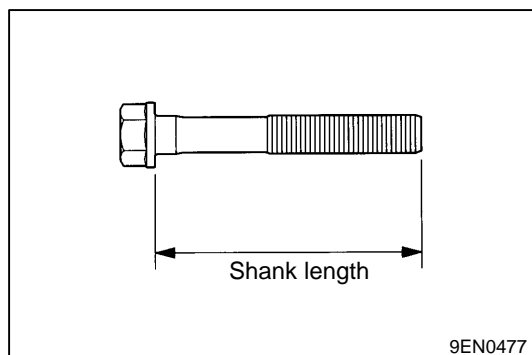
Crankshaft journal outside diameter		Cylinder block bearing bore	Crankshaft bearing
Identification color	Size mm	Identification mark	Identification mark or color
Yellow	56.994 – 57.000	0	0 or Black
		1	1 or Green
		2	2 or Yellow
None	56.988 – 56.994	0	1 or Green
		1	2 or Yellow
		2	3 or None
White	56.982 – 56.988	0	2 or Yellow
		1	3 or None
		2	4 or Blue



For example, if the crankshaft journal outside diameter ID color is “yellow” and cylinder block bearing bore ID mark is “1”, select a bearing whose ID mark is “1”. If there is no ID color paint on the crankshaft, measure the journal outside diameter and select a bearing appropriate for the measured value.



- (2) Install the bearings having an oil groove to the cylinder block.
- (3) Install the bearings having no oil groove to the bearing cap.

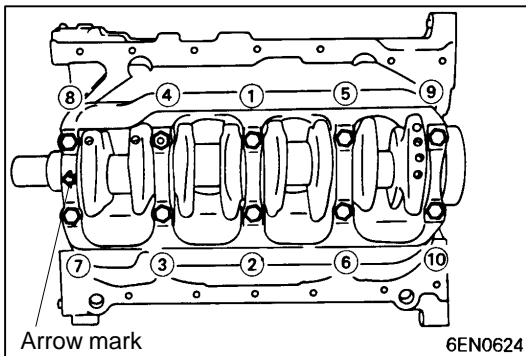


**▶◀ BEARING CAP / BEARING CAP BOLT INSTALLATION**

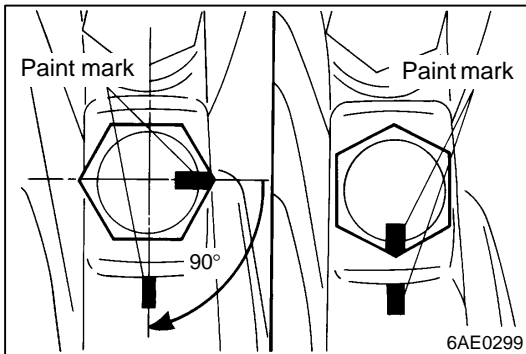
- (1) Install the bearing caps so the arrow points to the timing belt side.
- (2) Before installing the bearing cap bolts, check that the shank length of each bolt meets the limit. If the limit is exceeded, replace the bolt.

**Limit: Max. 71.1 mm**

- (3) Apply engine oil to the threaded portion and bearing surface of the bolt.



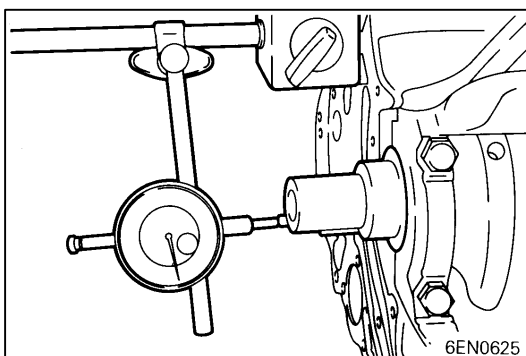
- (4) Tighten the bolts to 25 Nm in the specified tightening sequence.



- (5) Make a paint mark on the head of each bolt.
- (6) Make a paint mark on the bearing cap at the position 90° from the paint mark made on the bolt in the direction of tightening the bolt.
- (7) According to the specified tightening sequence, give a 90° turn to each bolt and make sure that the paint mark on the bolt and that on the cap are in alignment.

#### Caution

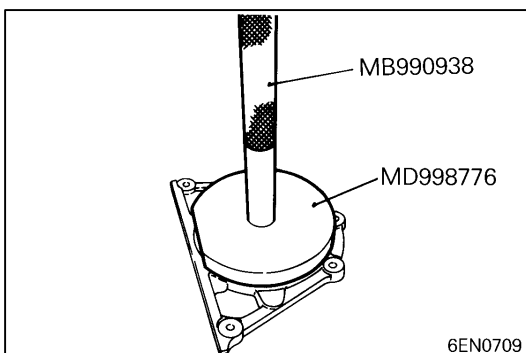
If the bolt is turned less than 90°, proper fastening performance may not be expected. When tightening the bolt, therefore, be careful to give a sufficient turn to it.



- (8) After installing the bearing caps, make sure that the crankshaft turns smoothly and the end play is correct. If the end play exceeds the limit, replace No. 3 crankshaft bearings.

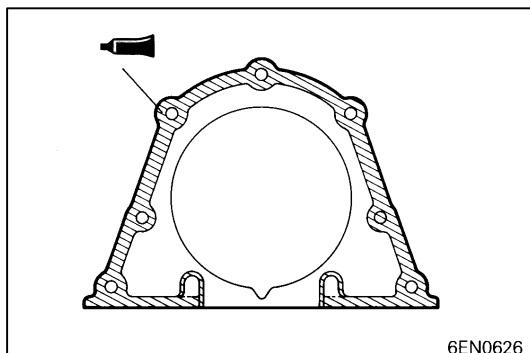
**Standard value: 0.05 – 0.25 mm**

**Limit: 0.4 mm**



#### ►D◄ OIL SEAL INSTALLATION

Using the special tool, knock the oil seal into the oil seal case.



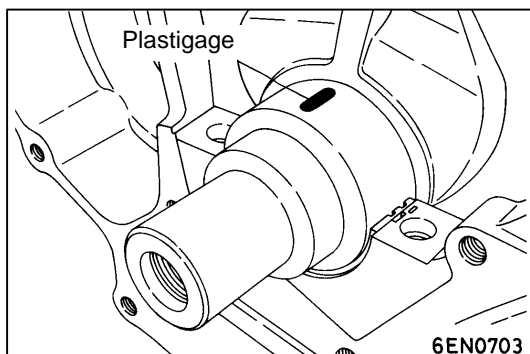
### ►E◀ SEALANT APPLICATION TO OIL SEAL CASE

#### Specified sealant:

Mitsubishi Genuine Part No. MD970389 or equivalent

#### NOTE

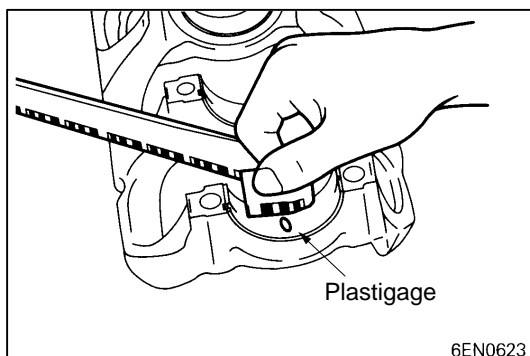
- (1) Be sure to install the case quickly while the sealant is wet (within 15 minutes).
- (2) After installation, keep the sealed area away from the oil and coolant for approx. one hour.



### INSPECTION

#### CRANKSHAFT OIL CLEARANCE (PLASTIGAGE METHOD)

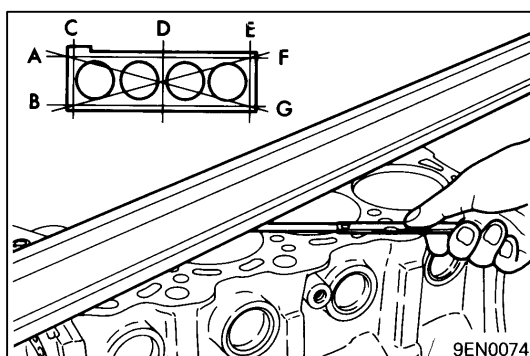
- (1) Remove oil from the crankshaft journal and the crankshaft bearing.
- (2) Install the crankshaft.
- (3) Cut the Plastigage to the same length as the width of the bearing and place it on the journal in parallel with its axis.



- (4) Install the crankshaft bearing cap carefully and tighten the bolts to the specified torque.
- (5) Carefully remove the crankshaft bearing cap.
- (6) Measure the width of the Plastigage at its widest part by using a scale printed on the Plastigage package.

**Standard value: 0.02 – 0.04 mm**

**Limit: 0.1 mm**



#### CYLINDER BLOCK

- (1) Visually check for scratches, rust, and corrosion. Use also a flaw detecting agent for the check. If defects are evident, correct, or replace.
- (2) Using a straightedge and feeler gauge, check the block top surface for warpage. Make sure that the surface is free from gasket chips and other foreign matter.

**Standard value: 0.05 mm**

**Limit: 0.1 mm**

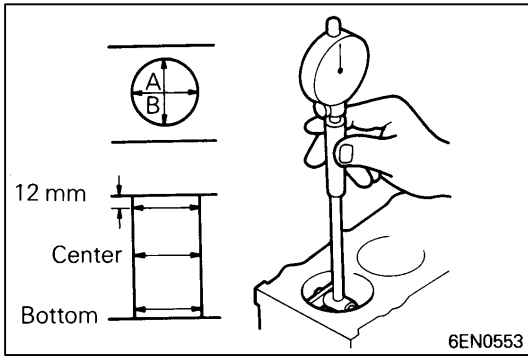
- (3) If the distortion is excessive, correct within the allowable limit or replace.

**Grinding limit: 0.2 mm**

**Includes/combined with cylinder head grinding**

**Cylinder block height (when new): 284 mm**

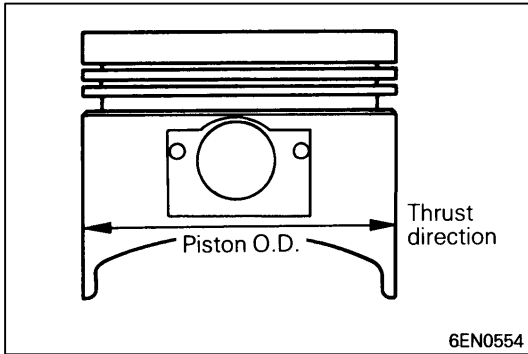
- (4) Check cylinder walls for scratches and seizure. If defects are evident, correct (bored to oversize) or replace.



- (5) Using cylinder gauge, measure the cylinder bore and cylindricity. If worn badly, correct cylinder to an oversize and replace piston and piston rings. Measure at the points shown in illustration.

**Standard value:**

**Cylinder I.D. 85.00 – 85.03 mm**  
**Cylindricity 0.01 mm or less**



**BORING CYLINDER**

- (1) Oversize pistons to be used should be determined on the basis of the largest bore cylinder.

**Piston size identification**

Size	Identification mark
0.50 O.S.	50
1.00 O.S.	100

**NOTE**

Size mark is stamped on the piston top.

- (2) Measure outside diameter of piston to be used. Measure it in thrust direction as shown.
- (3) Based on the measured piston O.D. calculate boring finish dimension.

**Boring finish dimension = Piston O.D. + (clearance between piston O.D. and cylinder) – 0.02 mm (honing margin)**

- (4) Bore all cylinders to the calculated boring finish dimension.

**Caution**

**To prevent distortion that may result from temperature rise during honing, bore cylinders, working from No. 2, No. 4, No. 1 to No. 3.**

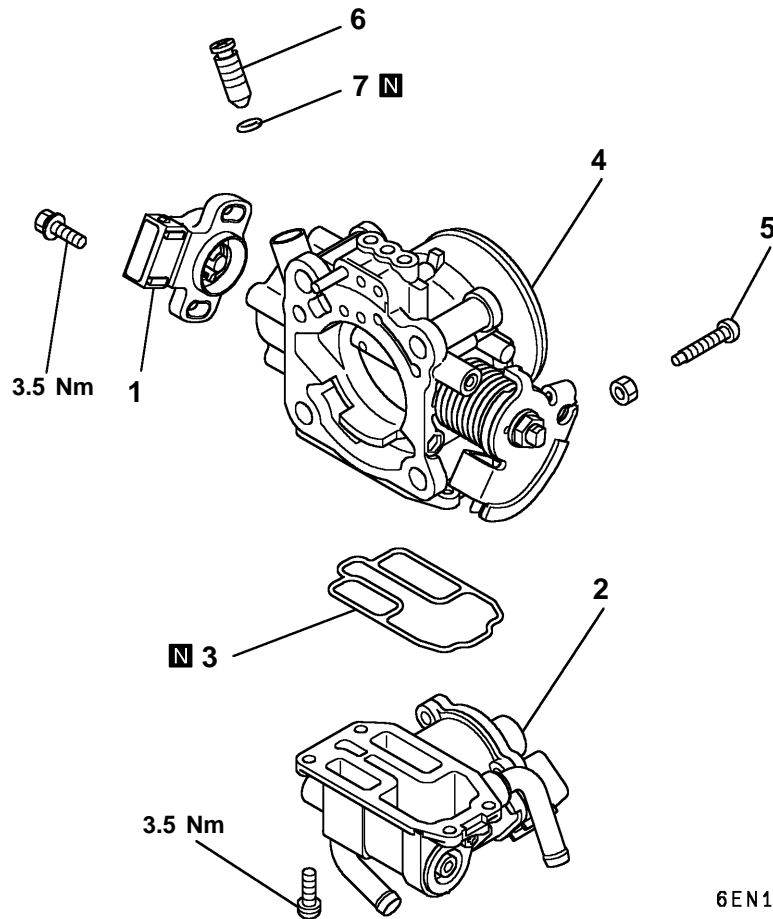
- (5)hone to final finish dimension (piston O.D. + clearance between piston O.D. and cylinder).
- (6) Check clearance between piston and cylinder.

**Clearance between piston and cylinder:**

**0.02 – 0.04 mm**

**NOTE**

When boring cylinders, finish all of four cylinders to same oversize. Do not bore only one cylinder to an oversize.

**THROTTLE BODY****DISASSEMBLY AND REASSEMBLY**

6EN1843

**Disassembly steps**

- ◀A▶ ▶A◀ 1. Throttle position sensor (with built-in closed throttle position switch)
2. Idle speed control body assembly
3. O-ring
- ◀B▶ 4. Throttle body
5. Fixed SAS
6. Speed adjusting screw
8. O-ring

**NOTE**

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

**DISASSEMBLY SERVICE POINTS**

**◀A▶ THROTTLE POSITION SENSOR AND IDLE AIR CONTROL MOTOR REMOVAL**

- (1) Do not disassemble the sensor and motor.
- (2) Do not immerse solvent to clean the sensor and motor. Clean then with shop towel.

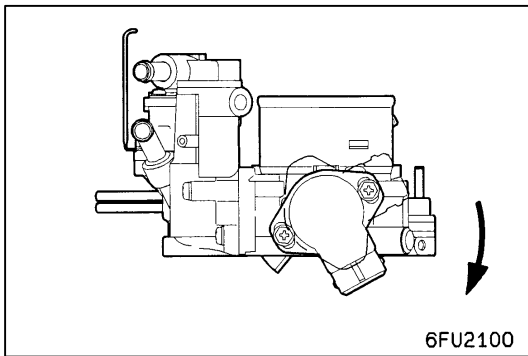
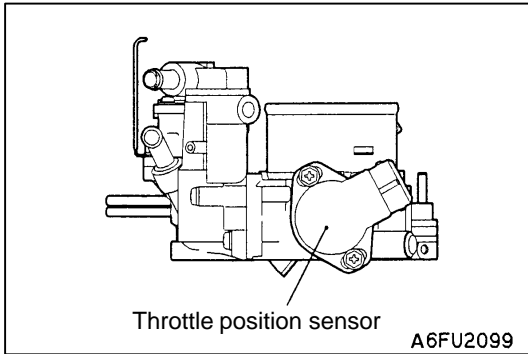
**◀B▶ THROTTLE BODY REMOVAL**

- (1) Do not remove the throttle body.
- (2) Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.

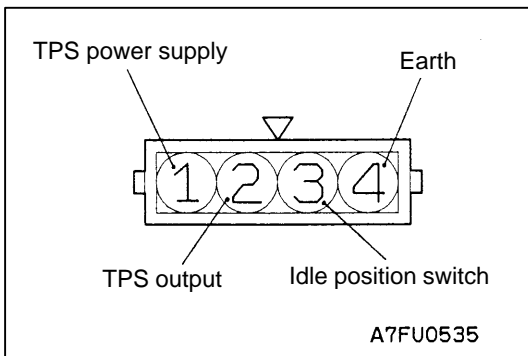
**REASSEMBLY SERVICE POINT**

**▶A◀ THROTTLE POSITION SENSOR INSTALLATION**

- (1) Install the throttle position sensor to the throttle body as shown in the diagram.



- (2) Turn throttle position sensor 90° clockwise to set it, and tighten screws.



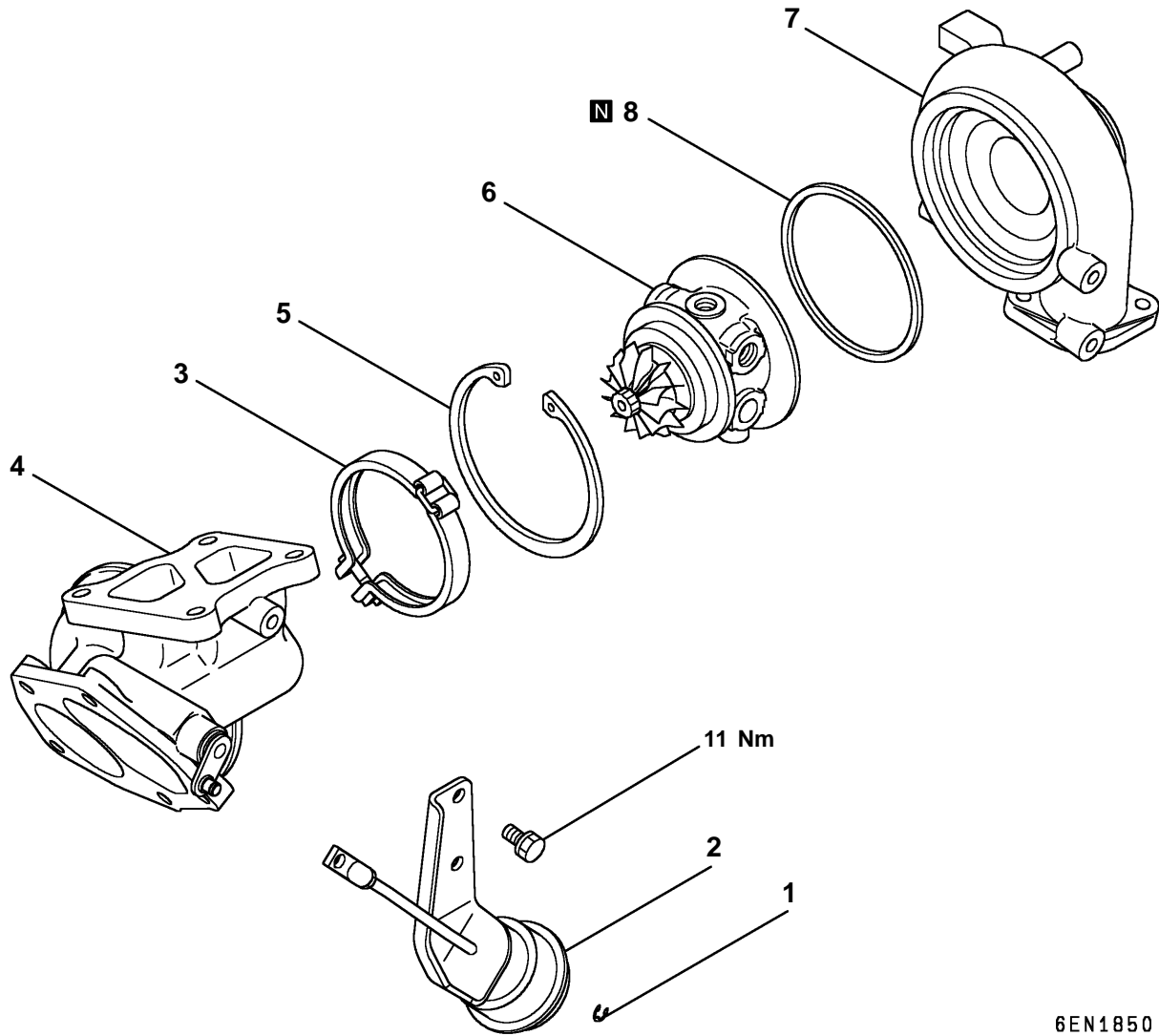
- (3) Check the continuity between terminal No. 3 (Idle throttle position switch) and No. 4 (Earth).

Throttle valve condition	Continuity
Fully closed	Conductive
Fully open	No conductive

If there is no continuity with the throttle valve fully closed, turn the throttle position sensor counterclockwise, and then check again.

# TURBOCHARGER

## DISASSEMBLY AND REASSEMBLY



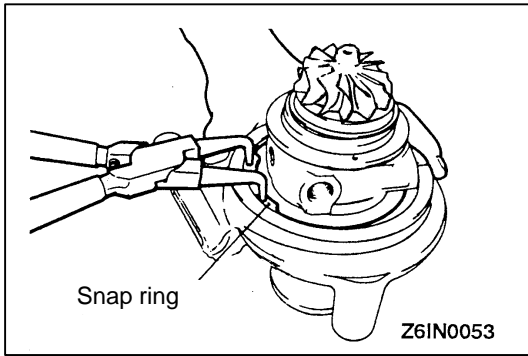
6EN1850

### Disassembly steps

- ▶F◀ • Inspection of turbocharger waste gate actuator operation
- ▶E◀ 1. Snap pin
- ▶E◀ 2. Waste gate actuator
- ▶E◀ 3. Coupling

- ▶D◀ 4. Turbine housing
- ▶C◀ 5. Snap ring
- ▶B◀ 6. Turbine wheel assembly
- ▶A◀ 7. Compressor cover
- ▶A◀ 8. O-ring





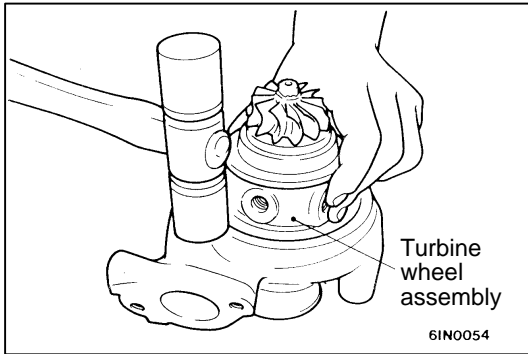
**DISASSEMBLY SERVICE POINTS**

**◀A▶ SNAP RING REMOVAL**

Lay the unit with the compressor cover side facing down and using snap ring pliers, remove the compressor cover attaching snap ring.

**Caution**

**When removing the snap ring, hold it with fingers to prevent it from springing away.**

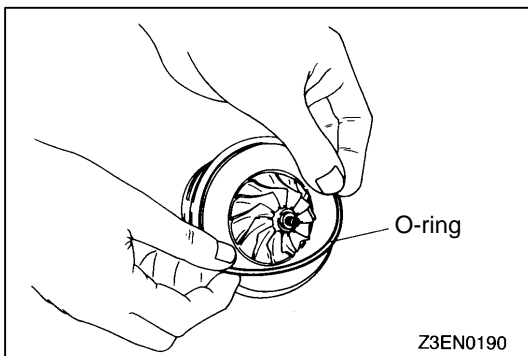


**◀B▶ TURBINE WHEEL ASSEMBLY REMOVAL**

Remove the turbine wheel assembly, striking the circumference of the compressor cover with a plastic hammer. The turbine wheel assembly may be a little hard to remove due to an O-ring put on the outer circumference.

**CLEANING**

- (1) Use a clean cleaning oil commercially available. Do not use corrosive cleaning oils as they could damage to some parts.
- (2) Use a plastic scraper or hard brush to clean aluminum parts.



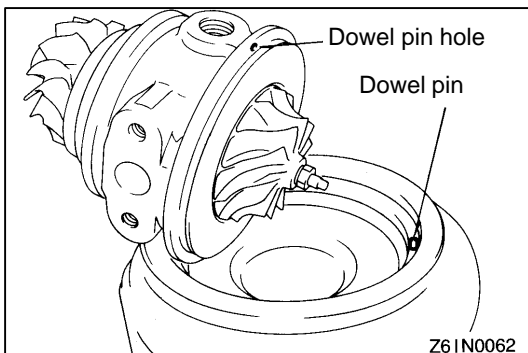
**REASSEMBLY SERVICE POINTS**

**▶A◀ O-RING INSTALLATION**

Apply a light coat of engine oil to a new O-ring and fit in the turbine wheel assembly groove.

**Caution**

**When installing the O-ring, use care not to damage it. A damaged O-ring causes oil leaks.**

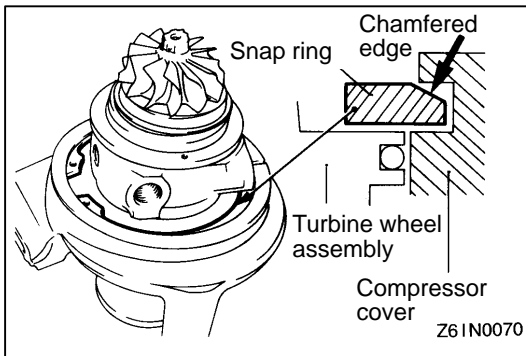


**▶B◀ TURBINE WHEEL ASSEMBLY**

- (1) Apply a light coat of engine oil to the periphery of the O-ring.
- (2) Install the turbine wheel assembly to the compressor cover in relation to the dowel pin.

**Caution**

**Use care not to damage the blades of turbine wheel and compressor wheel.**

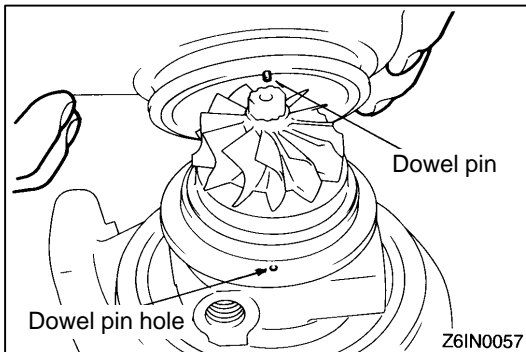


### ►C◄ SNAP RING INSTALLATION

Lay the assembly with the compressor cover facing down and fit the snap ring.

#### Caution

Fit the snap ring with its chamfered side facing up.

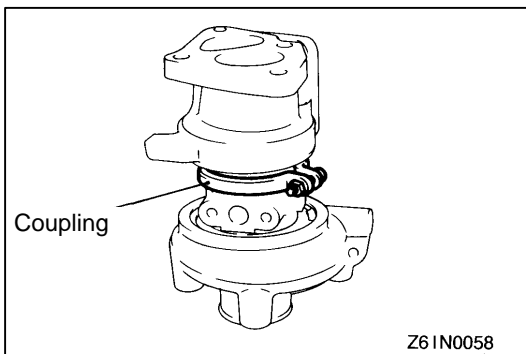


### ►D◄ TURBINE HOUSING INSTALLATION

Install the turbine housing in relation to the dowel pin.

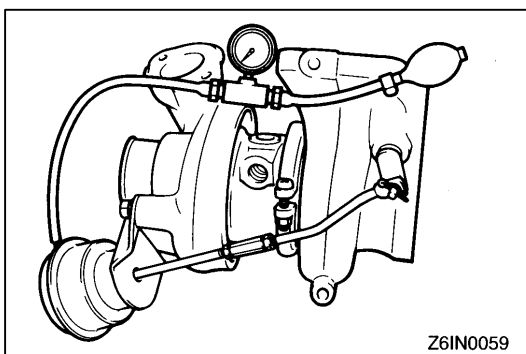
#### Caution

Use care not to damage the blades of turbine wheel.



### ►E◄ COUPLING INSTALLATION

Install the coupling and tighten to the specified torque.

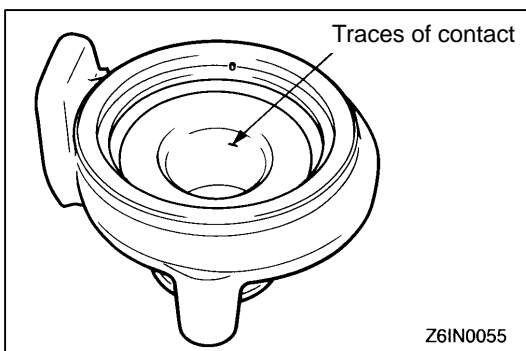


### ►F◄ WASTE GATE ACTUATOR OPERATION CHECK

Using a tester, apply a pressure of approx. 100.0 kPa to the actuator and make sure that the rod moves.

#### Caution

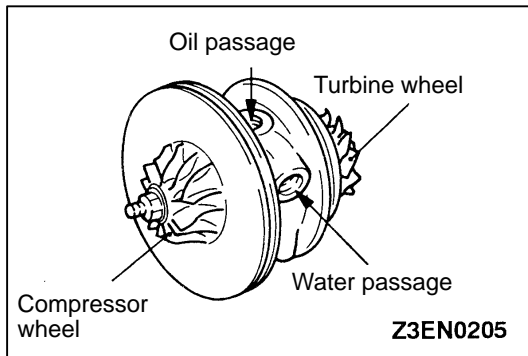
Do not apply a pressure of more than 113.3 kPa to the actuator. Otherwise, diaphragm may be damaged. Never attempt to adjust the waste gate valve.



## INSPECTION

### TURBINE HOUSING

- (1) Check the housing for traces of contact with the turbine wheel, cracks due to overheating, pitching, deformation and other damage. Replace with a new turbine housing if cracked.
- (2) Operate the waste gate valve lever manually to check that the gate can be operated and closed smoothly.



### COMPRESSOR COVER

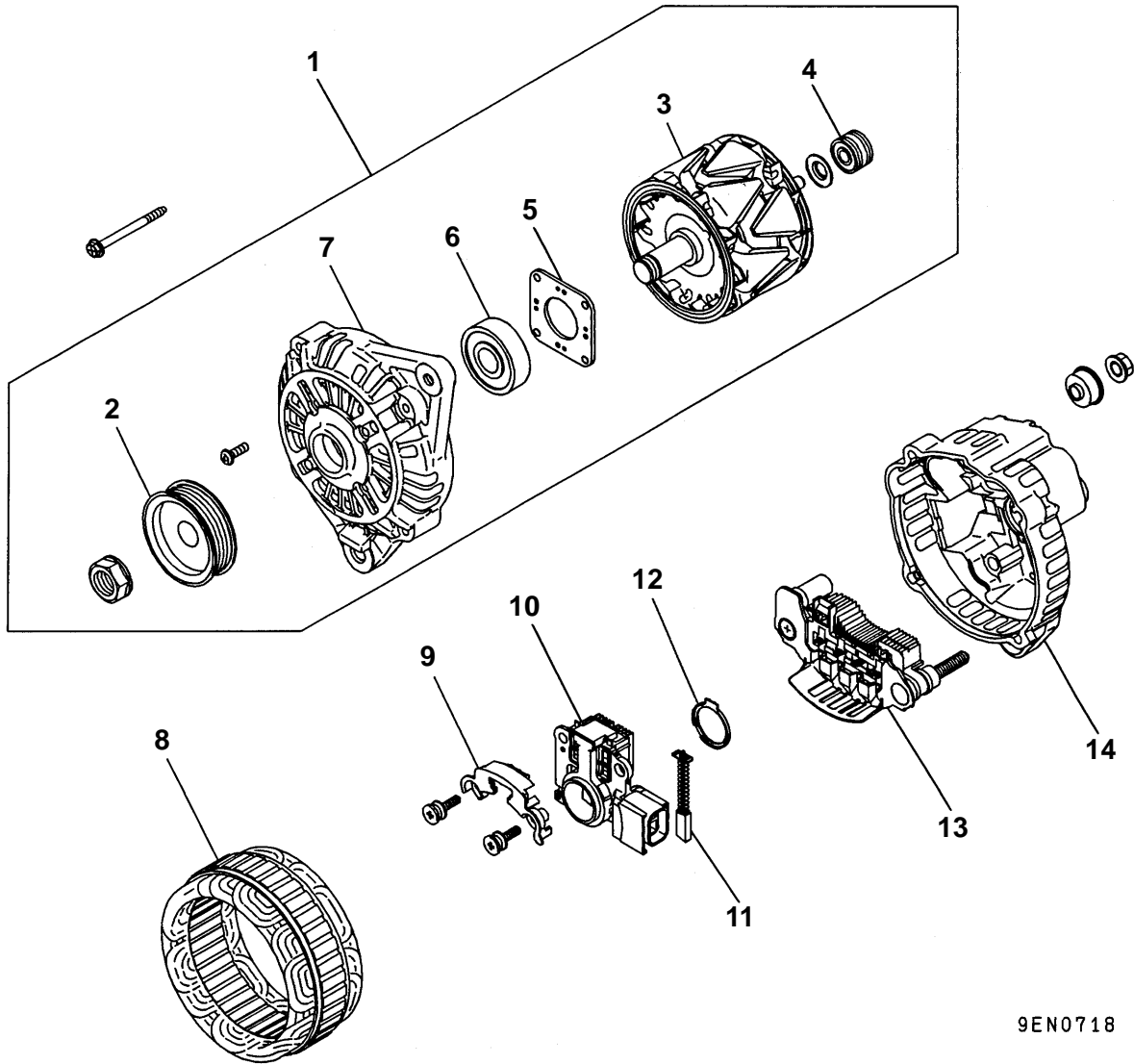
Check the compressor cover for traces of contact with the compressor wheel and other damage.

### TURBINE WHEEL ASSEMBLY

- (1) Check the turbine and compressor wheel blades for bend, burr, damage, corrosion and traces of contact on the back side and replace if defective.
- (2) Check the oil passage of the turbine wheel assembly for deposit and clogging.
- (3) In the case of water cooled type, check also the water passage for deposit and clogging.
- (4) Check the turbine wheel and compressor wheel for light and smooth turning.

# ALTERNATOR

## DISASSEMBLY AND REASSEMBLY



9EN0718

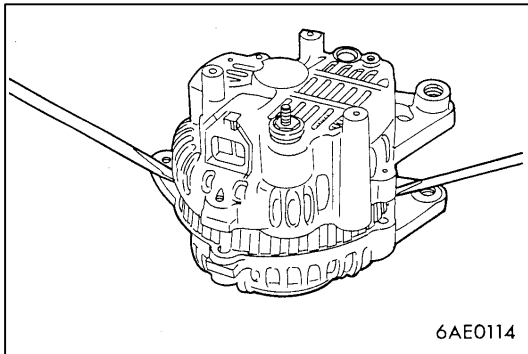
### Disassembly steps



1. Front bracket assembly
2. Alternator pulley
3. Rotor
4. Rear bearing
5. Bearing retainer
6. Front bearing
7. Front bracket



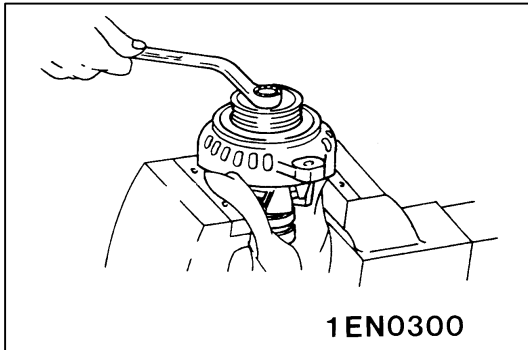
8. Stator
9. Plate
10. Regulator assembly
11. Brush
12. Slinger
13. Rectifier
14. Rear bracket

**DISASSEMBLY SERVICE POINTS****◀A▶ FRONT BRACKET ASSEMBLY REMOVAL**

Insert a flat tip screwdrivers or the like in the clearance between the front bracket assembly and stator core, to pry open and separate the stator and front bracket.

**Caution**

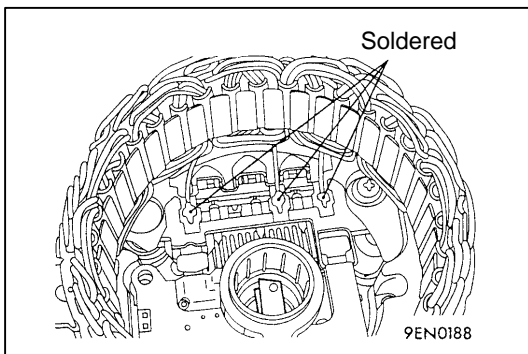
**Do not insert the screwdriver too far, or the stator coil gets damaged.**

**◀B▶ ALTERNATOR PULLEY REMOVAL**

Face pulley side upward, fix the rotor with a work bench and remove the pulley.

**Caution**

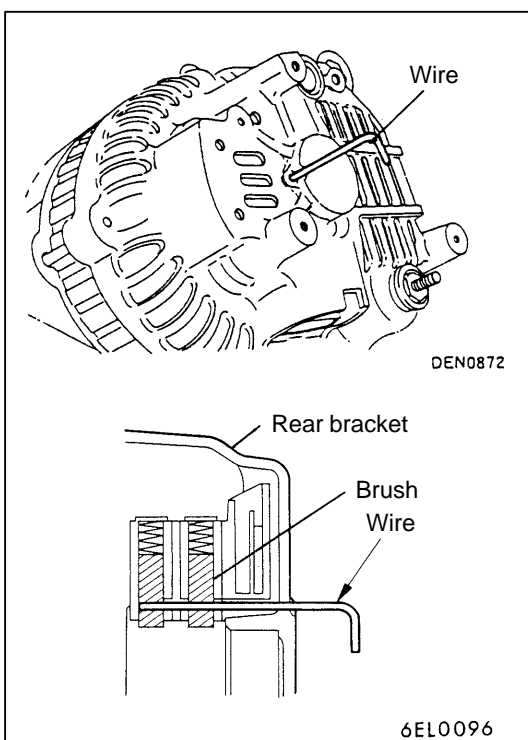
**Use care not to damage the rotor.**

**◀C▶ STATOR / REGULATOR ASSEMBLY REMOVAL**

- (1) Unsolder the stator with a soldering iron (180 to 250 W). Complete this work within four seconds not to transfer heat to the diode.
- (2) When removing rectifier from the regulator assembly, remove the soldered sections to rectifier.

**Caution**

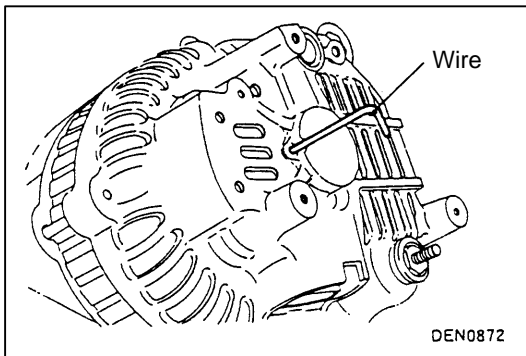
1. **Use care to make sure that the heat of the soldering iron is not transmitted to the diodes for a long period.**
2. **Use care that no undue force is exerted to the lead wires of the diodes.**

**REASSEMBLY SERVICE POINTS****▶A◀ REGULATOR ASSEMBLY INSTALLATION**

After installing the regulator assembly, insert a wire into the hole provided on the rear bracket while pressing in the brush to fix the brush.

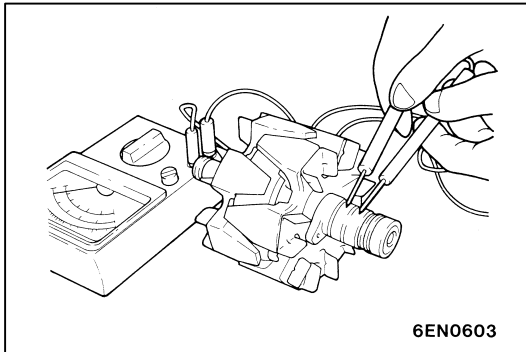
**NOTE**

The brush is fixed when a wire is inserted, making rotor installation easier.



### ▶B◀ ROTOR INSTALLATION

After installing the rotor, remove the wire used to fix the brush.

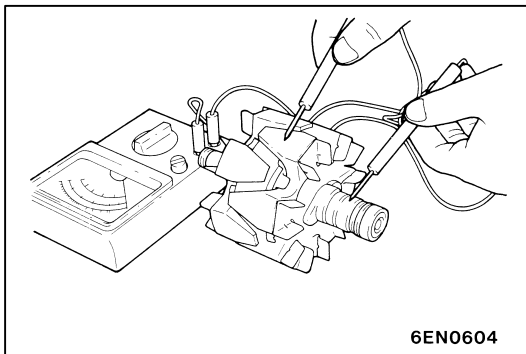


### INSPECTION

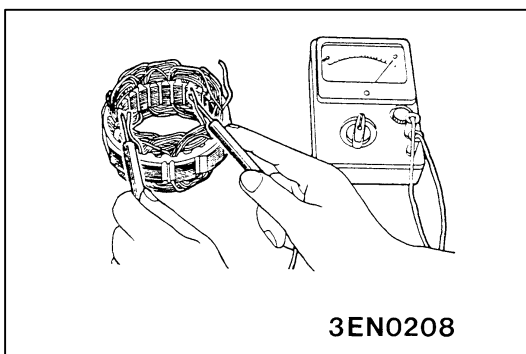
#### ROTOR CHECK

- (1) Check the continuity between the rotor coil slip rings, and replace the rotor if the resistance value is not at the standard value.

**Standard value: 3 – 5  $\Omega$**

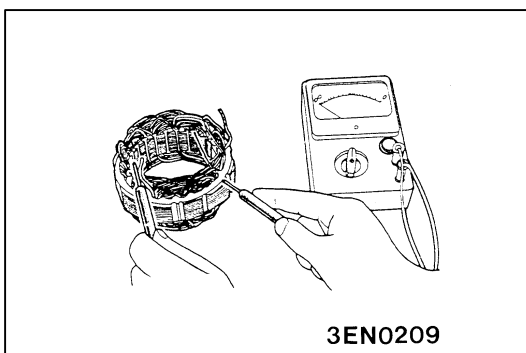


- (2) Check the continuity between the slip ring and core, and if there is continuity, replace the rotor.

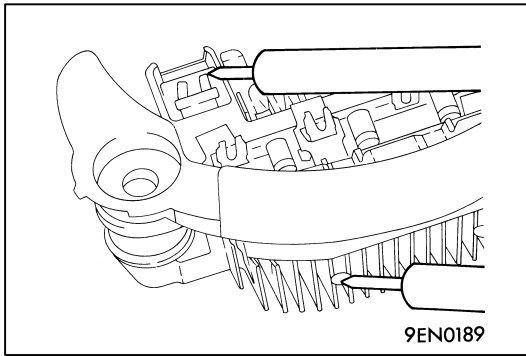


#### STATOR CHECK

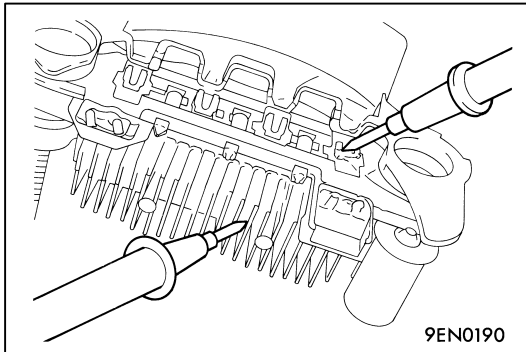
- (1) Check the continuity between the coil leads, and if there is continuity, replace the stator.



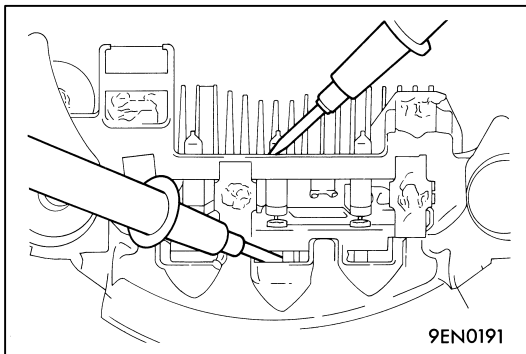
- (2) Check the continuity between the coil and core, and if there is continuity, replace the stator.

**RECTIFIERS CHECK**

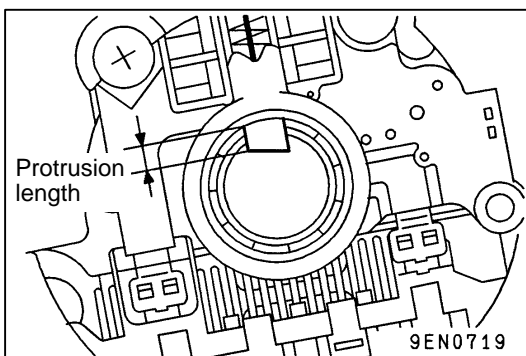
- (1) Inspect the (+) heat sink by checking the continuity between the (+) heat sink and stator coil lead wire connection terminal using a tester probe. If there is a continuity at both, the diode is short circuited, so replace the rectifier.



- (2) Inspect the (-) heat sink by checking the continuity between the (-) heat sink and stator coil lead wire connection terminal using a tester probe. If there is a continuity at both, the diode is short circuited, so replace the rectifier.

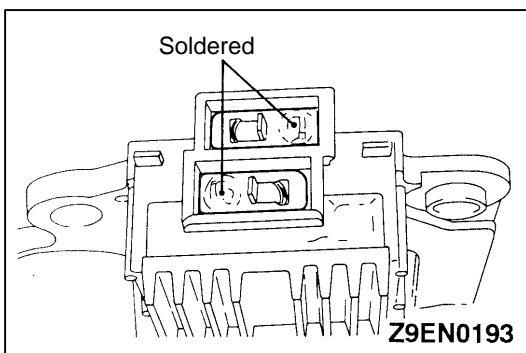


- (3) Check the diode trio by connecting an ohmmeter to both ends of each diode and check the continuity of the three diodes. If there is a continuity at both ends, or if there is no continuity, the diode is damaged so replace the rectifier.

**BRUSH CHECK**

- (1) Measure the length of the brush protrusion shown in the illustration, and replace the brush if the measured value is below the limit value.

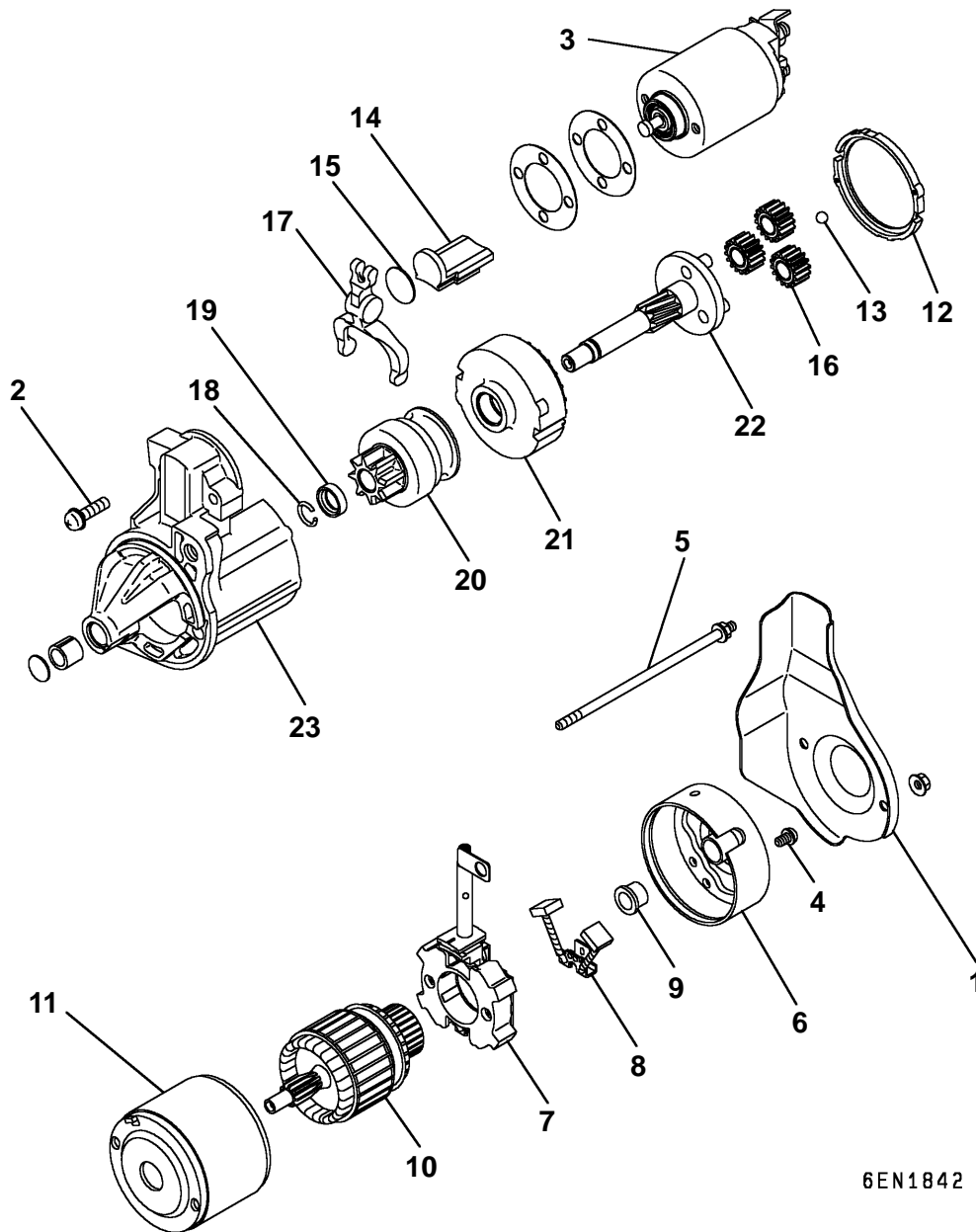
**Limit: 2 mm or less**



- (2) The brush can be removed if the solder of the brush lead wire is removed.
- (3) When installing a new brush, insert the brush into the holder as shown in the illustration, and then solder the lead wires.

# STARTER MOTOR

## DISASSEMBLY AND REASSEMBLY



6EN1842

### Disassembly steps

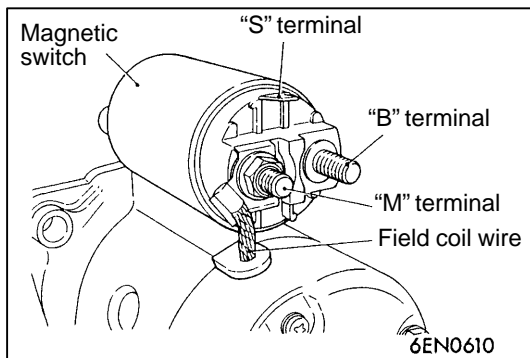


- 1. Cover
- 2. Screw
- 3. Magnetic switch
- 4. Screw
- 5. Through
- 6. Rear bracket
- 7. Brush holder
- 8. Brush
- 9. Rear bearing
- 10. Armature
- 11. Yoke assembly
- 12. Ball



- 13. Packing A
- 14. Packing B
- 15. Plate
- 16. Planetary gear
- 17. Lever
- 18. Snap ring
- 19. Stop ring
- 20. Overrunning clutch
- 21. Internal gear
- 22. Planetary gear holder
- 23. Front bracket





## DISASSEMBLY SERVICE POINTS

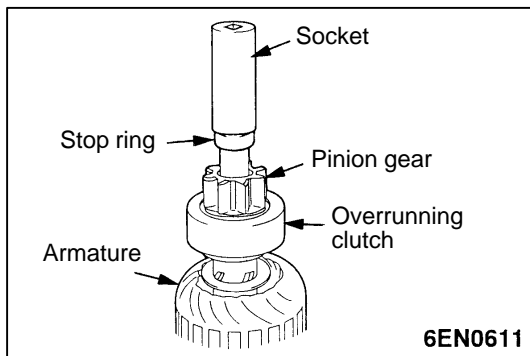
### ◀A▶ MAGNETIC SWITCH REMOVAL

Disconnect field coil wire from "M" terminal of magnetic switch.

### ◀B▶ ARMATURE / BALL REMOVAL

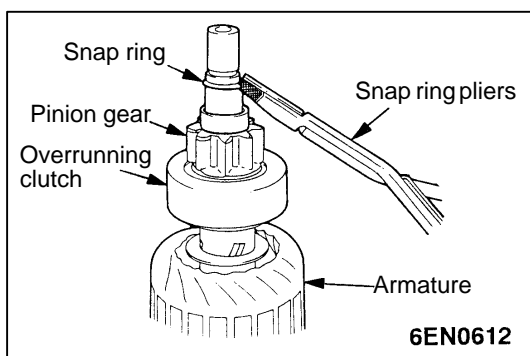
#### Caution

When removing the armature, take care not to lose the ball (which is used as a bearing) in the armature end.



### ◀C▶ SNAP RING / STOP RING REMOVAL

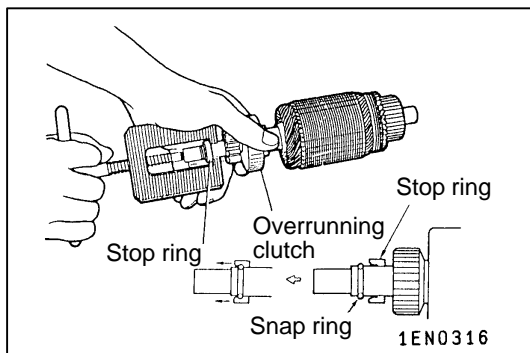
(1) Press stop ring off snap ring with a suitable socket.



(2) Remove snap ring with snap ring pliers and then remove stop ring and overrunning clutch.

## STARTER MOTOR PARTS CLEANING

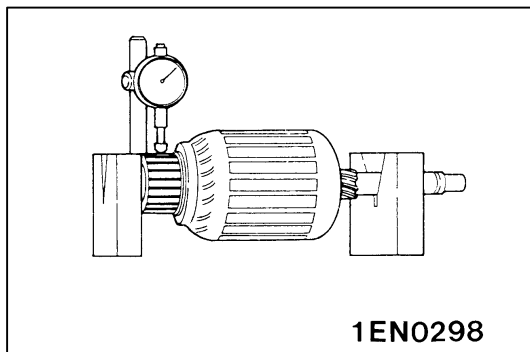
- (1) Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe motor assembly with a cloth only.
- (2) Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from clutch.
- (3) The drive unit may be cleaned with a brush moistened with cleaning solvent and wiped dry with a cloth.



## REASSEMBLY SERVICE POINTS

### ▶◀ STOP RING / SNAP RING INSTALLATION

Using a suitable pulling tool, pull overrunning clutch stop ring over snap ring.



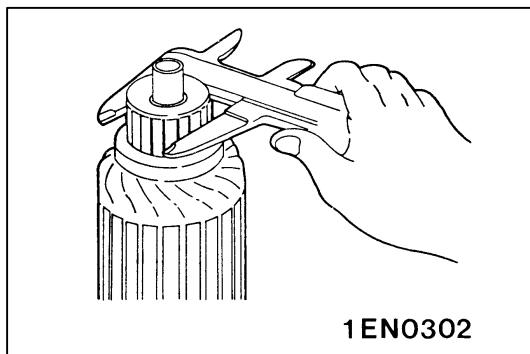
## INSPECTION

### COMMUTATOR CHECK

- (1) Place the armature in a pair of "V" blocks and check the runout with a dial indicator.

**Standard value: 0.05 mm**

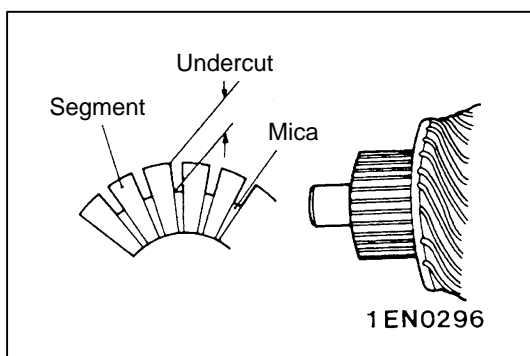
**Limit: 0.1 mm**



- (2) Measure the commutator outer diameter.

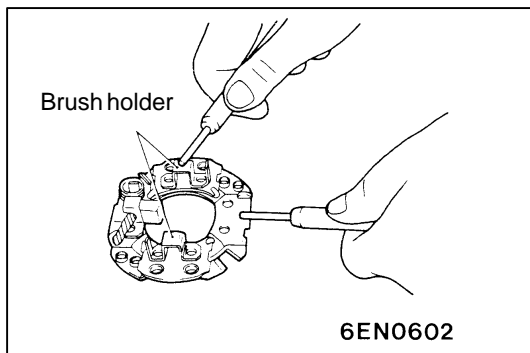
**Standard value: 32.0 mm**

**Limit: 31.4 mm**



- (3) Check the undercut depth between segments.

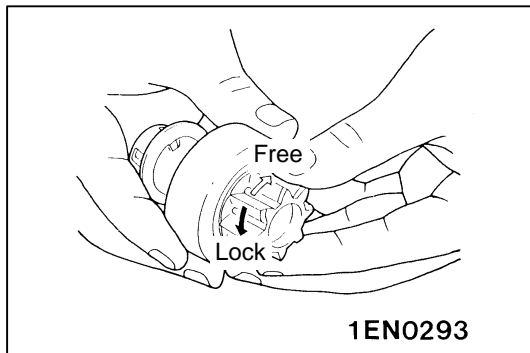
**Standard value: 0.5 mm**



### BRUSH HOLDER CHECK

Check the continuity between brush holder plate and brush holder.

If there is no continuity, the brush holder is in order.

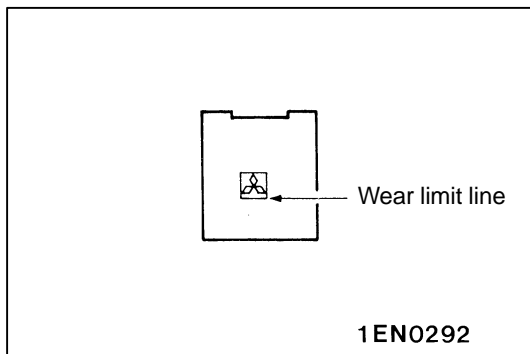


### OVERRUNNING CLUTCH CHECK

- (1) While holding clutch housing, rotate the pinion. Drive pinion should rotate smoothly in one direction, but should not rotate in opposite direction. If clutch does not function properly, replace overrunning clutch assembly.
- (2) Inspect pinion for wear or burrs. If pinion is worn or burred, replace overrunning clutch assembly. If pinion is damaged, also inspect ring gear for wear or burrs.

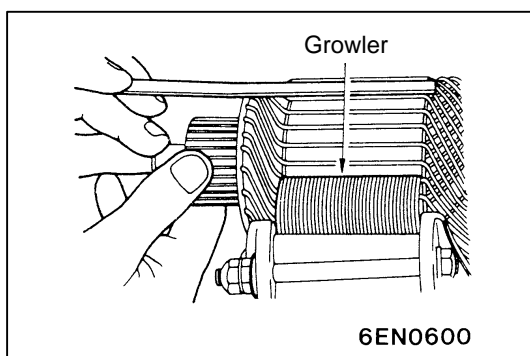
### FRONT AND REAR BRACKET BUSHING CHECK

Inspect bushing for wear or burrs. If bushing is worn or burred, replace front bracket assembly or rear bracket assembly.



### BRUSH AND SPRING REPLACEMENT

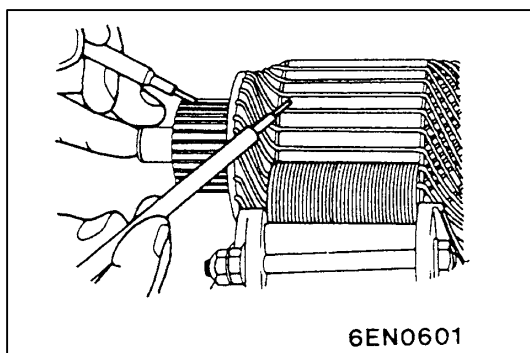
- (1) Brushes that are worn beyond wear limit line, or oil-soaked, should be replaced.
- (2) When replacing ground brush, slide the brush from brush holder by prying retaining spring back.



### ARMATURE TEST

#### ARMATURE COIL SHORT-CIRCUIT TEST

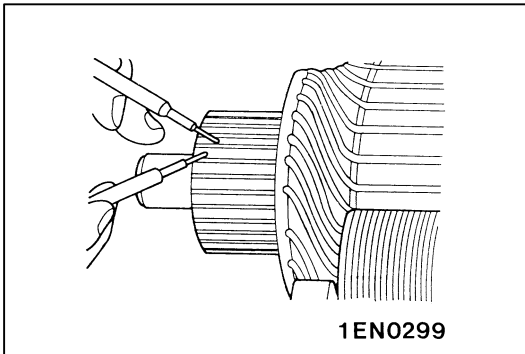
- (1) Place armature in a growler.
- (2) Hold a thin steel blade parallel and just above while rotating armature slowly in growler. A shorted armature will cause blade to vibrate and be attracted to the core. Replace shorted armature.



#### ARMATURE COIL EARTH TEST

Check the insulation between each commutator segment and armature coil core.

If there is no continuity, the insulation is in order.

**ARMATURE COIL OPEN-CIRCUIT INSPECTION**

Check the continuity between segments. If there is continuity, the coil is in order.

---

# FUEL

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		<b>FUEL TANK .....</b>	<b>69</b>

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# MULTIPOINT INJECTION (MPI)

## GENERAL

### OUTLINE OF CHANGE

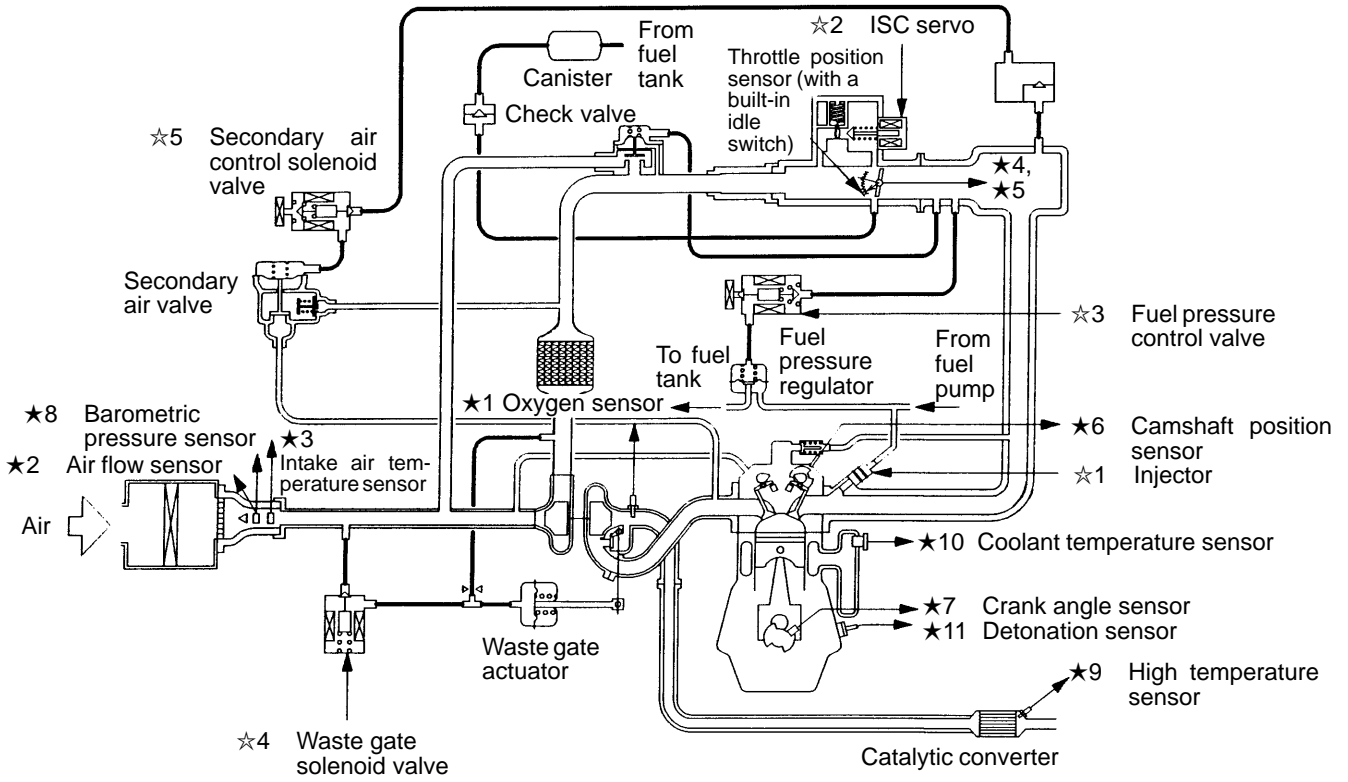
- The descriptions of the troubleshooting using an MUT-II tester have been added.
- The fuel system and its management of EVOLUTION-VI are different from those of EVOLUTION-V in the following items. Accordingly, the service procedures for these items are described herein. The service procedures for the remaining item are the same as those for EVOLUTION-V.
  - Fan motor control
  - Fuel pump drive control
  - Fuel pump relay No.2
  - Fuel pump resistor
  - Actuator test function of MUT-II (The test of the following items has been made possible.)
    - a) Item No.36: Secondary air control solenoid valve
    - b) Item No.37: Air conditioner condenser fan (High)
    - c) Item No.38: Air conditioner condenser fan (Low)

MPI System Diagram

- ★1 Oxygen sensor
  - ★2 Air flow sensor
  - ★3 Intake air temperature sensor
  - ★4 Throttle position sensor
  - ★5 Idle switch
  - ★6 Camshaft position sensor
  - ★7 Crank angle sensor
  - ★8 Barometric pressure sensor
  - ★9 High temperature sensor
  - ★10 Engine coolant temperature sensor
  - ★11 Detonation sensor
- 
- Power supply voltage
  - Ignition switch-IG
  - Ignition switch-ST
  - Vehicle speed sensor
  - A/C switch
  - Power steering fluid pressure switch
  - Alternator FR signal

⇒ Engine ECU ⇒

- ★1 Injector
  - ★2 ISC servo
  - ★3 Fuel pressure control valve
  - ★4 Waste gate solenoid valve
  - ★5 Secondary air control solenoid valve
- 
- Control relay
  - Fuel pump relay
  - A/C relay
  - Ignition coil
  - Exhaust temperature warning lamp
  - Engine warning lamp
  - Diagnosis output
  - Alternator G terminal
  - Fan motor relay
  - Tachometer
  - Fuel pump relay No.2



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**SERVICE SPECIFICATIONS**

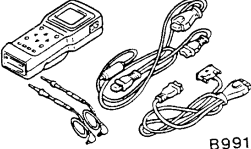
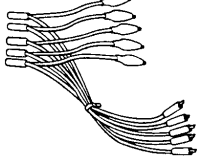

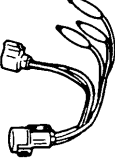
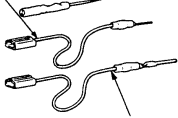
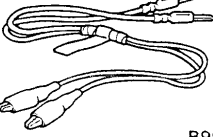
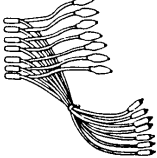
Items		Specifications
Basic ignition timing °BTDC		5 ± 3
Basic idle speed rpm		850 ± 50
Throttle position sensor adjusting voltage mV		400 – 1,000
Throttle position sensor resistance kΩ		3.5 – 6.5
ISC servo coil resistance (at 20°C) Ω		28 – 33
Intake air temperature sensor resistance kΩ	At 20°C	2.3 – 3.0
	At 80°C	0.30 – 0.42
Coolant temperature sensor resistance kΩ	At 20°C	2.1 – 2.7
	At 80°C	0.26 – 0.36
Fuel pressure kPa	When vacuum hose is connected	230
	When vacuum hose is disconnected	289 – 309
Injector coil resistance Ω		2 – 3
Amount of injector fuel leak drop/min		1 or less
Oxygen sensor output voltage V		0.6 – 1.0
Fuel pressure control valve coil resistance (at 20°C) Ω		28 – 36

**SEALANT**

Item	Specified sealant	Remark
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No.4171 or equivalent	Drying sealant



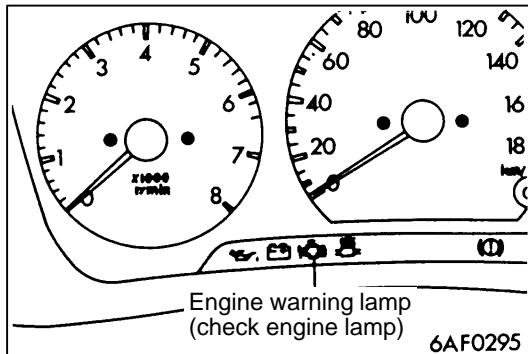
## SPECIAL TOOLS

Tool	Number	Name	Use
 <p>B991502</p>	MB991502	MUT-II sub assembly	MPI system inspection
	MB991348	Test harness set	<ul style="list-style-type: none"> <li>• Measurement of voltage during troubleshooting</li> <li>• Inspection using an oscilloscope</li> </ul>
	MB991519	Alternator harness connector	Measurement of voltage during troubleshooting
	MD998478	Test harness (3-pin, triangle)	<ul style="list-style-type: none"> <li>• Measurement of voltage during troubleshooting</li> <li>• Inspection using an oscilloscope</li> </ul>
 <p>Red harness</p> <p>White harness</p>	MB991223	Inspection test harness set <ul style="list-style-type: none"> <li>• Pin contact pressure inspection harness</li> <li>• Market tester contact probe (for general connectors)</li> </ul>	Measurement of terminal voltage
 <p>B991529</p>	MB991529	Diagnostic trouble code check harness	Reading of diagnosis codes
	MB991709	Test harness	<ul style="list-style-type: none"> <li>• Measurement of voltage during troubleshooting</li> <li>• Inspection using an oscilloscope</li> </ul>

## TROUBLESHOOTING

### DIAGNOSIS TROUBLESHOOTING FLOW

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



### DIAGNOSIS FUNCTION

#### ENGINE WARNING LAMP (CHECK ENGINE LAMP)

If an abnormality occurs in any of the following items related to the Multipoint Fuel Injection (MPI) system, the engine warning lamp will illuminate.

If the lamp remains illuminated or if the lamp illuminates while the engine is running, check the diagnosis code output.

#### Engine warning lamp inspection items

Engine-ECU
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Camshaft position sensor
Barometric pressure sensor
Detonation sensor
Injector
Ignition coil, power transistor unit

#### METHOD OF READING AND ERASING DIAGNOSIS CODES

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

#### INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

1. Carry out inspection by connecting the MUT-II.  
If there is an abnormality, check and repair the chassis harnesses and components.
2. After repairing, check that the abnormal input and output have returned to normal as a result of the repairs.
3. Erase the diagnosis code memory.
4. Remove the MUT-II and carry out a road test to confirm that the problem has disappeared.

**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.

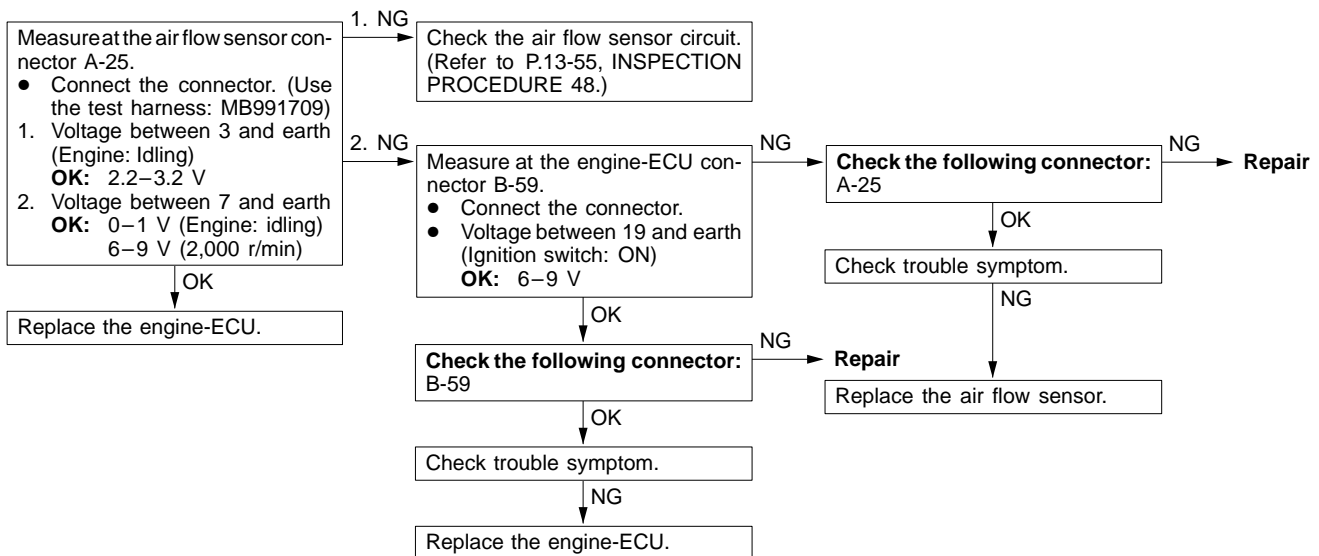
Malfunctioning item	Control contents during malfunction
Air flow sensor	<ol style="list-style-type: none"> <li>1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping.</li> <li>2. Fixes the ISC servo in the appointed position so idle control is not performed.</li> </ol>
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	<ol style="list-style-type: none"> <li>1. Controls as if the engine coolant temperature is 80°C. (This condition is maintained until the ignition switch is turned off even when the sensor signal returns normal.)</li> <li>2. Lets the fan motor (radiator and condenser) run at high speed.</li> </ol>
Camshaft position sensor	Injects fuel to all cylinders simultaneously for 4 seconds. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Ignition coil, power transistor unit	Cuts off the fuel supply to cylinders with an abnormal ignition.
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)

3. INSPECTION CHART FOR DIAGNOSIS CODES

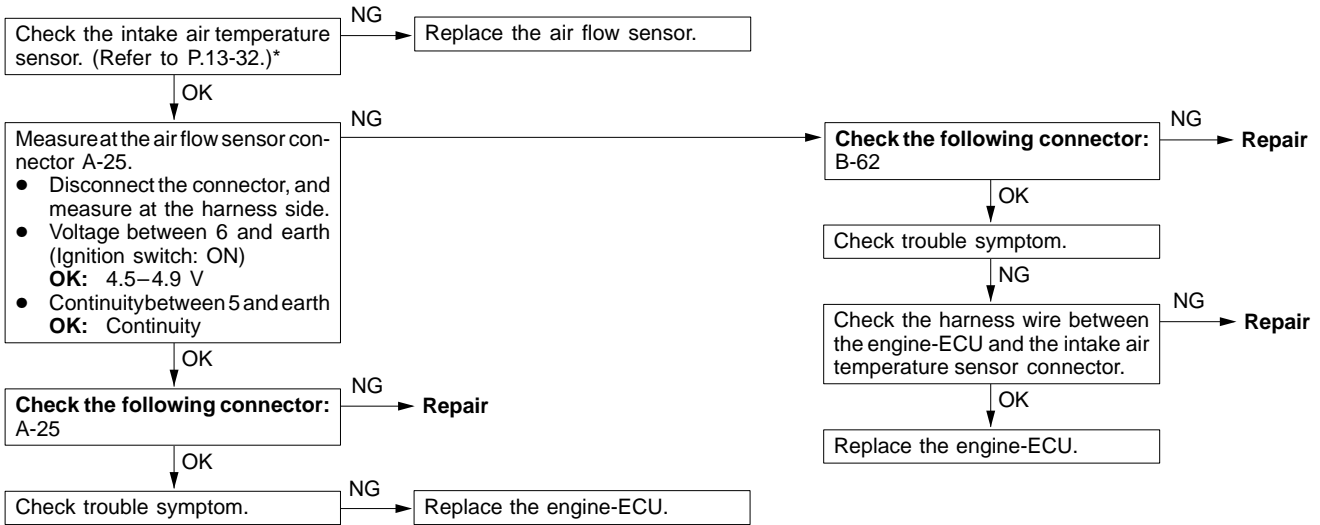
Code No.	Diagnosis item	Reference page
12	Air flow sensor system	13-8
13	Intake air temperature sensor system	13-9
14	Throttle position sensor system	13-9
21	Engine coolant temperature sensor system	13-10
22	Crank angle sensor system	13-11
23	Camshaft position sensor system	13-12
24	Vehicle speed sensor system	13-13
25	Barometric pressure sensor system	13-14
31	Detonation sensor system	13-15
41	Injector system	13-15
44	Ignition coil and power transistor unit system	13-16
64	Alternator FR terminal system	13-17

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 12 Air flow sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine speed is 500 r/min or more.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output frequency is 3 Hz or less for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the air flow sensor</li> <li>Improper connector contact, open or short-circuited harness wire of the air flow sensor</li> <li>Malfunction of the engine-ECU</li> </ul>



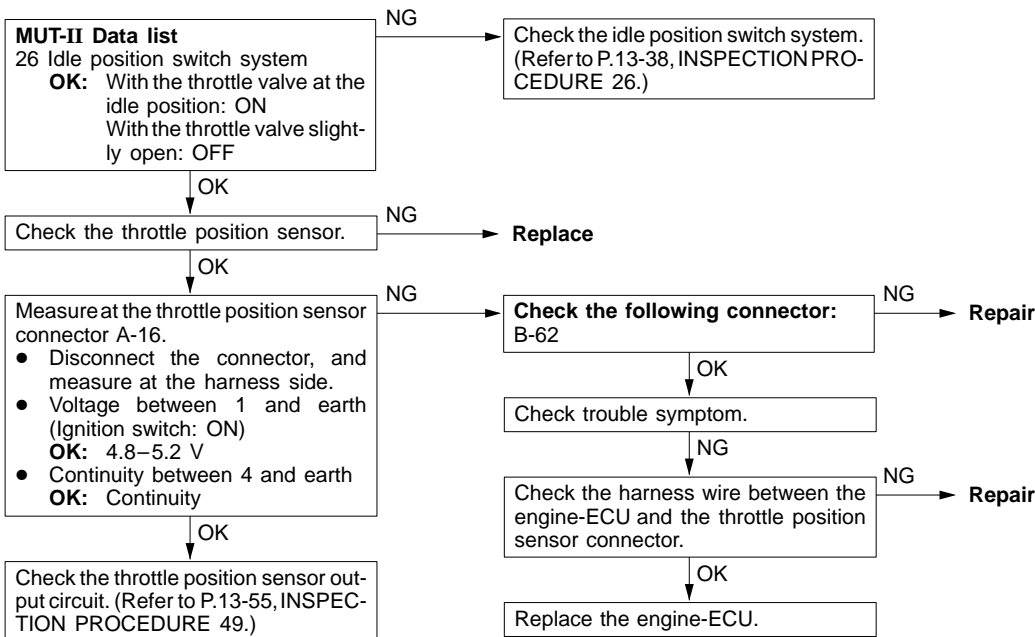
Code No. 13 Intake air temperature sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature of -45°C or less) for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.2V or less (corresponding to an intake air temperature of 125°C or more) for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the intake air temperature sensor</li> <li>Improper connector contact, open or short-circuited harness wire of the intake air temperature sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



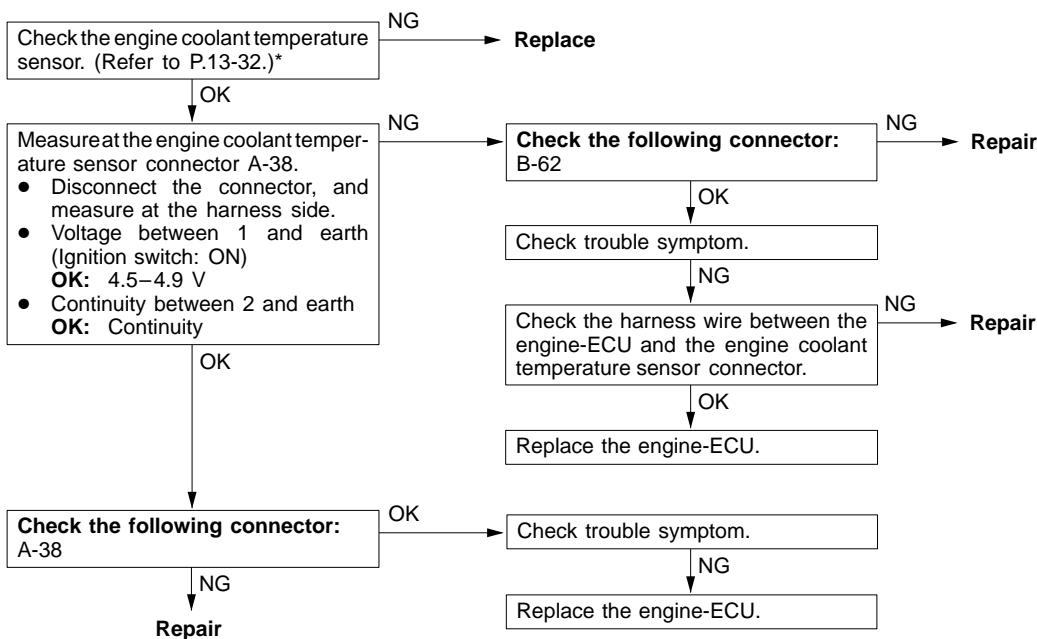
NOTE

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

Code No. 14 Throttle position sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The sensor output voltage is 0.2 V or less for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the throttle position sensor</li> <li>Improper connector contact, open or short-circuited harness wire of the throttle position sensor circuit</li> <li>Improper "ON" state of idle position switch</li> <li>Short circuit of the idle position switch signal line</li> <li>Malfunction of the engine-ECU</li> </ul>



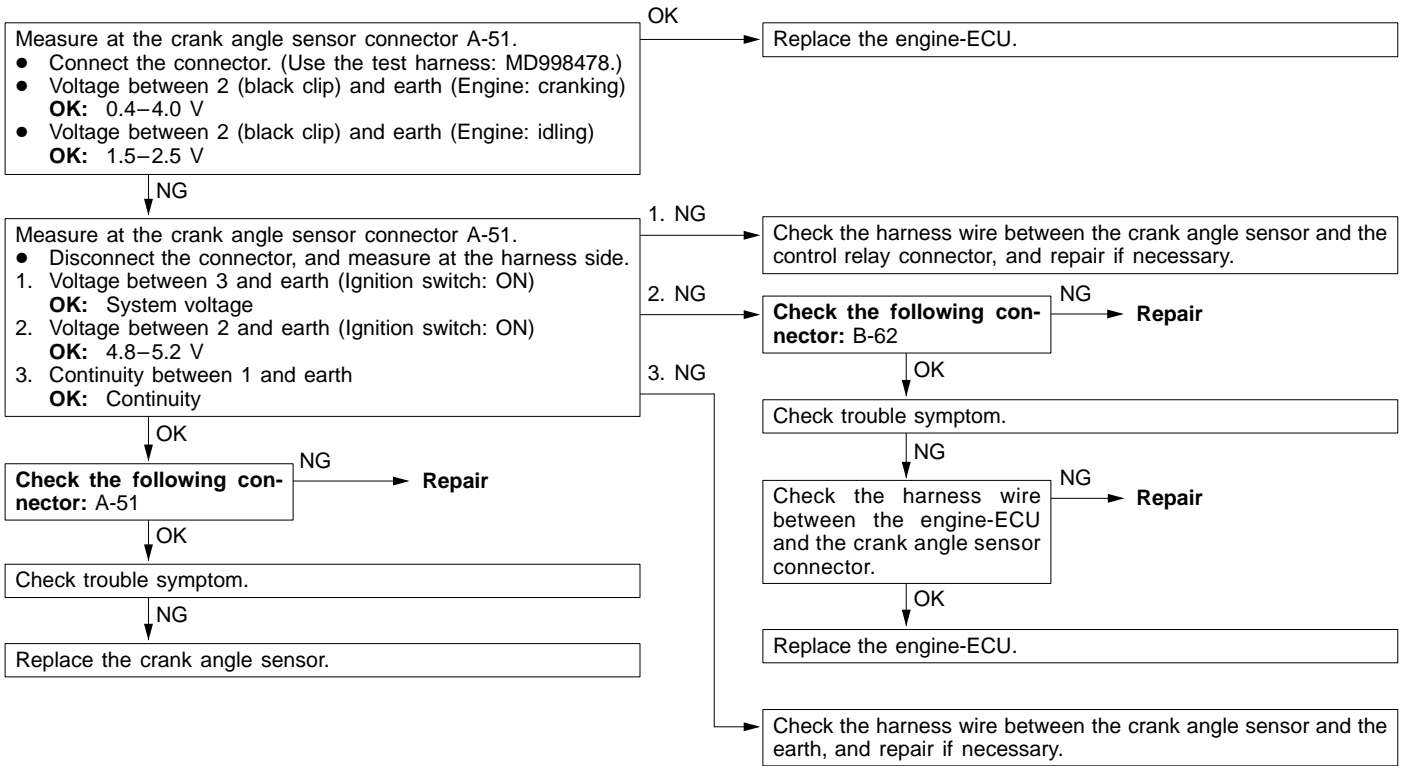
Code No. 21 Engine coolant temperature sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 4.6 V or more (corresponding to an engine coolant temperature of -45°C or less) for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.1 V or less (corresponding to an engine coolant temperature of 140°C or more) for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the engine coolant temperature sensor</li> <li>Improper connector contact, open or short-circuited harness wire of the engine coolant temperature sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Engine speed is approx. 50 r/min or more</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>The sensor output voltage increases from 1.6 V or less (corresponding to an engine coolant temperature of 40°C or more) to 1.6 V or more (corresponding to an engine coolant temperature of 40°C or less).</li> <li>After this, the sensor output voltage is 1.6 V or more for 5 minutes.</li> </ul>	



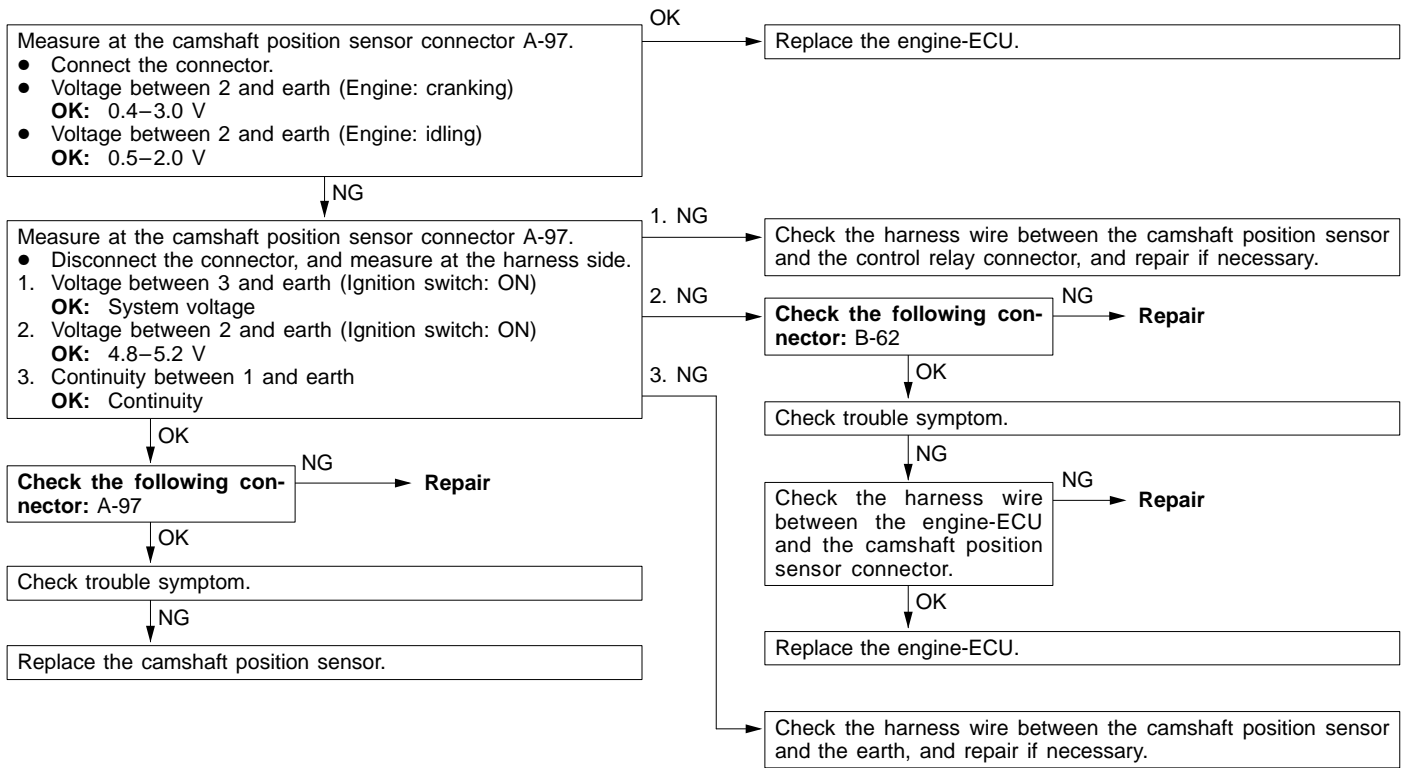
NOTE

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

Code No. 22 Crank angle sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Engine is cranking.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input.)</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the crank angle sensor</li> <li>Improper connector contact, open or short-circuited harness wire of the crank angle sensor</li> <li>Malfunction of the engine-ECU</li> </ul>

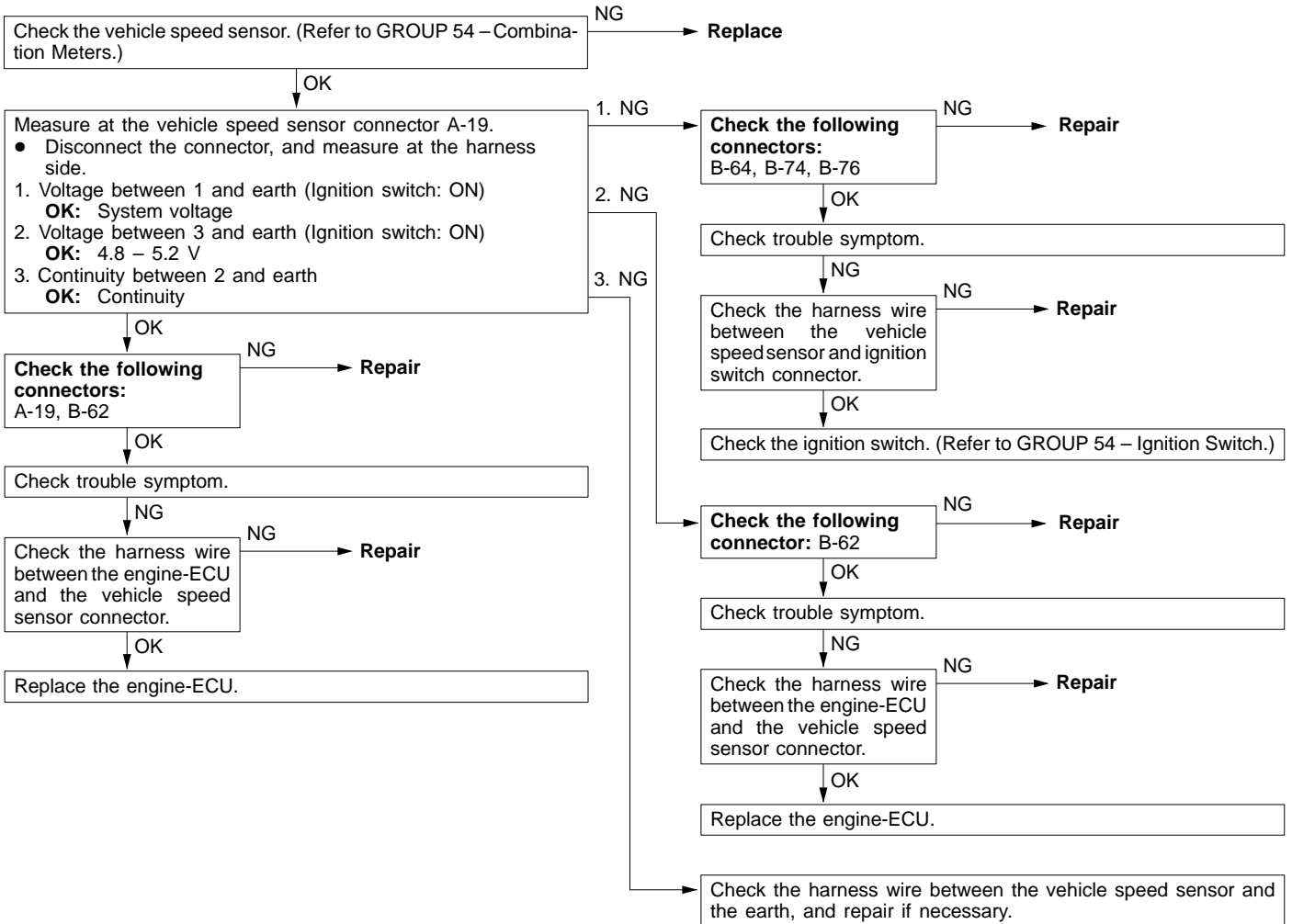


Code No. 23 Camshaft position sensor system	Probable cause
Range of Check ● Ignition switch: ON ● Engine speed is approx. 50 r/min or more. Set conditions ● Sensor output voltage does not change for 4 seconds (no pulse signal input.)	● Malfunction of the camshaft position sensor ● Improper connector contact, open or short-circuited harness wire of the camshaft position sensor circuit ● Malfunction of the engine-ECU

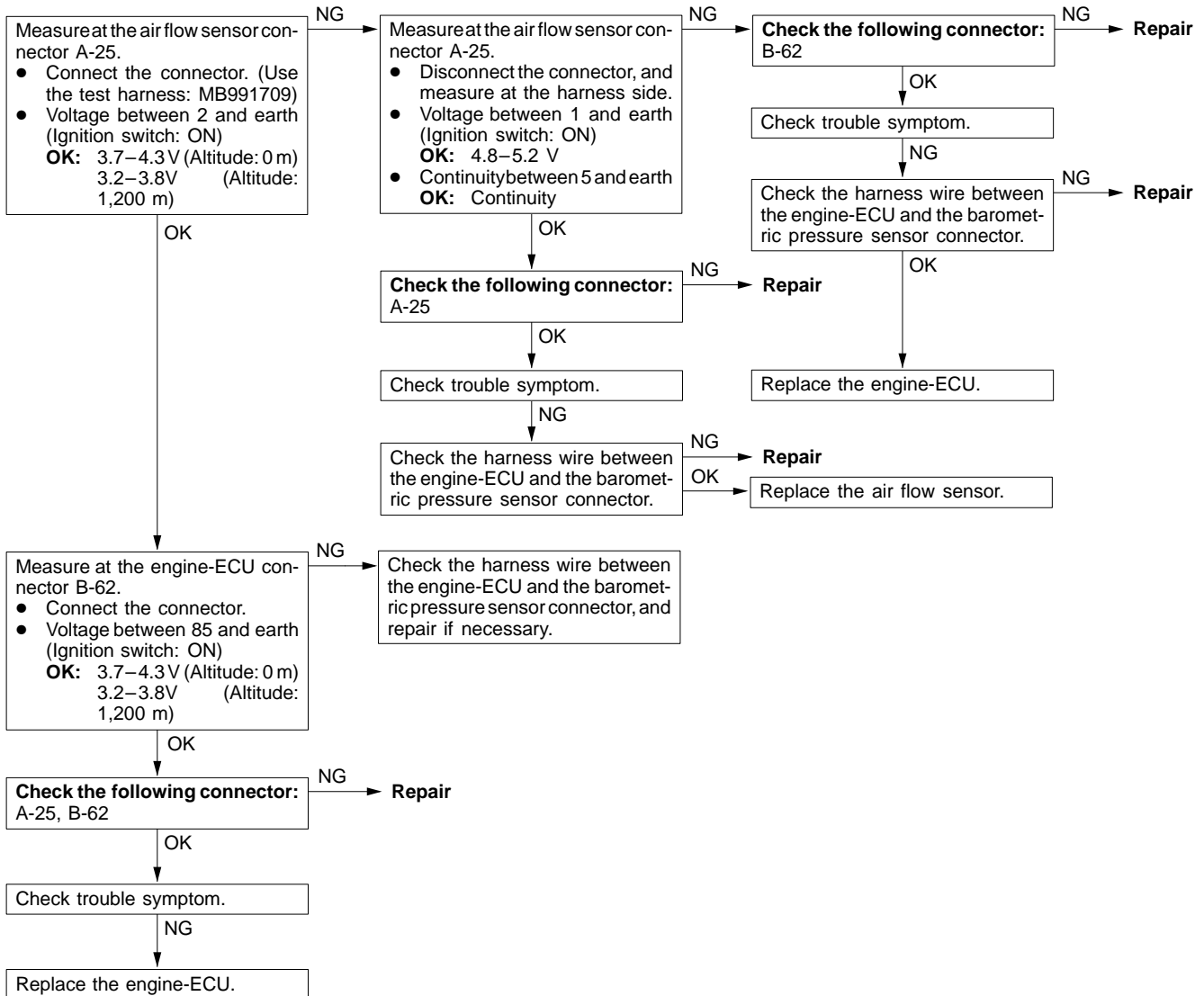




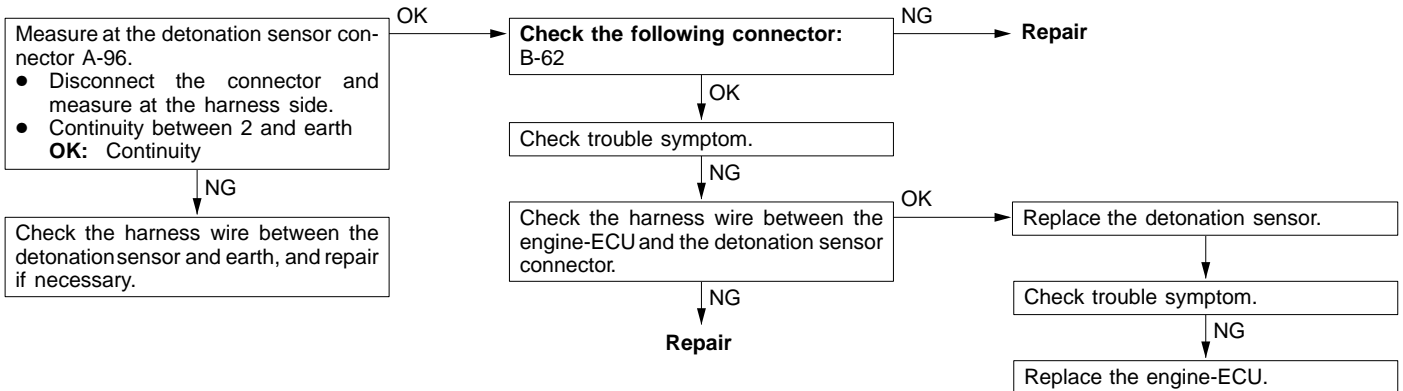
Code No. 24 Vehicles speed sensor system	Probable cause
<p>Range of check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>Idle position switch: OFF</li> <li>Engine speed is 3,000 r/min or more.</li> <li>Driving under high engine load conditions.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage does not change for 4 seconds (no pulse signal input).</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the vehicle speed sensor</li> <li>Improper connector contact, open or short-circuited harness wire of the vehicle speed sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



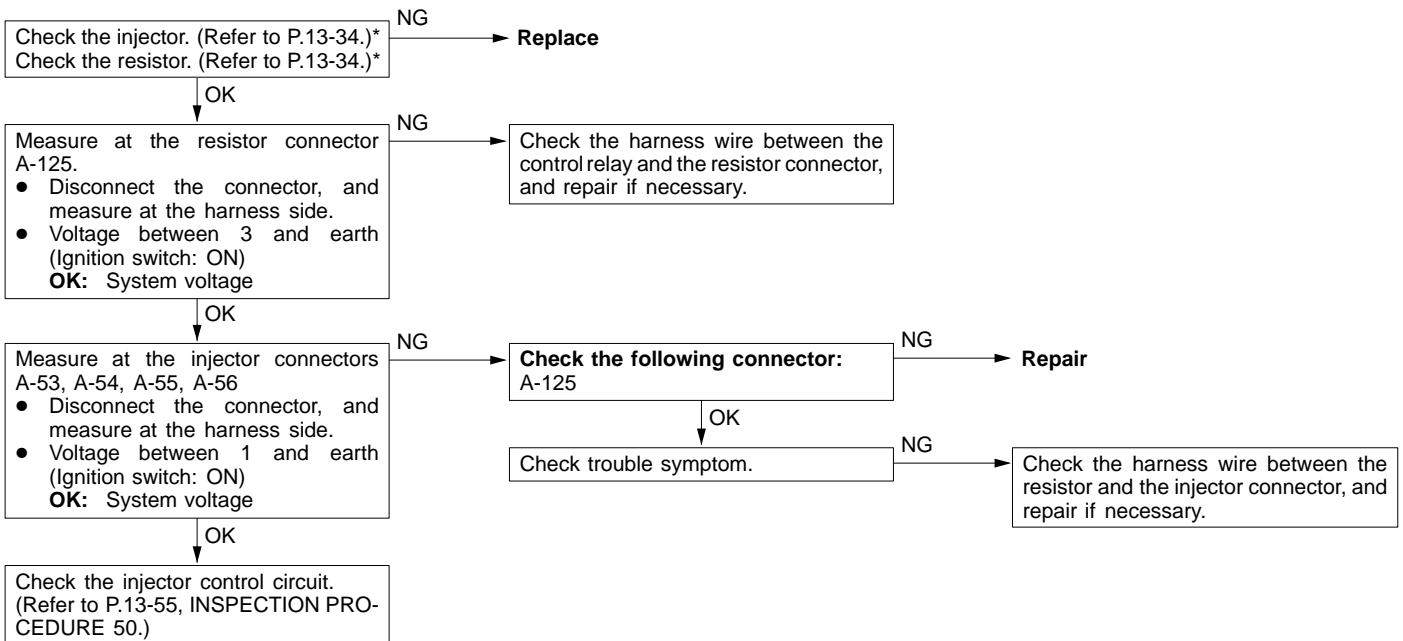
Code No. 25 Barometric pressure sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>Ignition switch: ON</li> <li>Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 4.5 V or more (corresponding to a barometric pressure of 114 kPa or more) for 4 seconds.</li> </ul> <p>or</p> <ul style="list-style-type: none"> <li>Sensor output voltage is 0.2 V or less (corresponding to a barometric pressure of 5.33 kPa or less) for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>Malfunction of the barometric pressure sensor</li> <li>Improper connector contact, open or short-circuited harness wire of the barometric pressure sensor circuit</li> <li>Malfunction of the engine-ECU</li> </ul>



Code No. 31 Detonation sensor system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• Ignition switch: ON</li> <li>• Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts.</li> <li>• Engine speed is approx. 5,000 r/min or more</li> <li>• Set conditions</li> <li>• The change in the detonation sensor output voltage (detonation sensor peak voltage at each 1/2 revolution of the crankshaft) is less than 0.06 V for 200 times in succession.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the detonation sensor</li> <li>• Improper connector contact, open or short-circuited harness wire of the detonation sensor circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



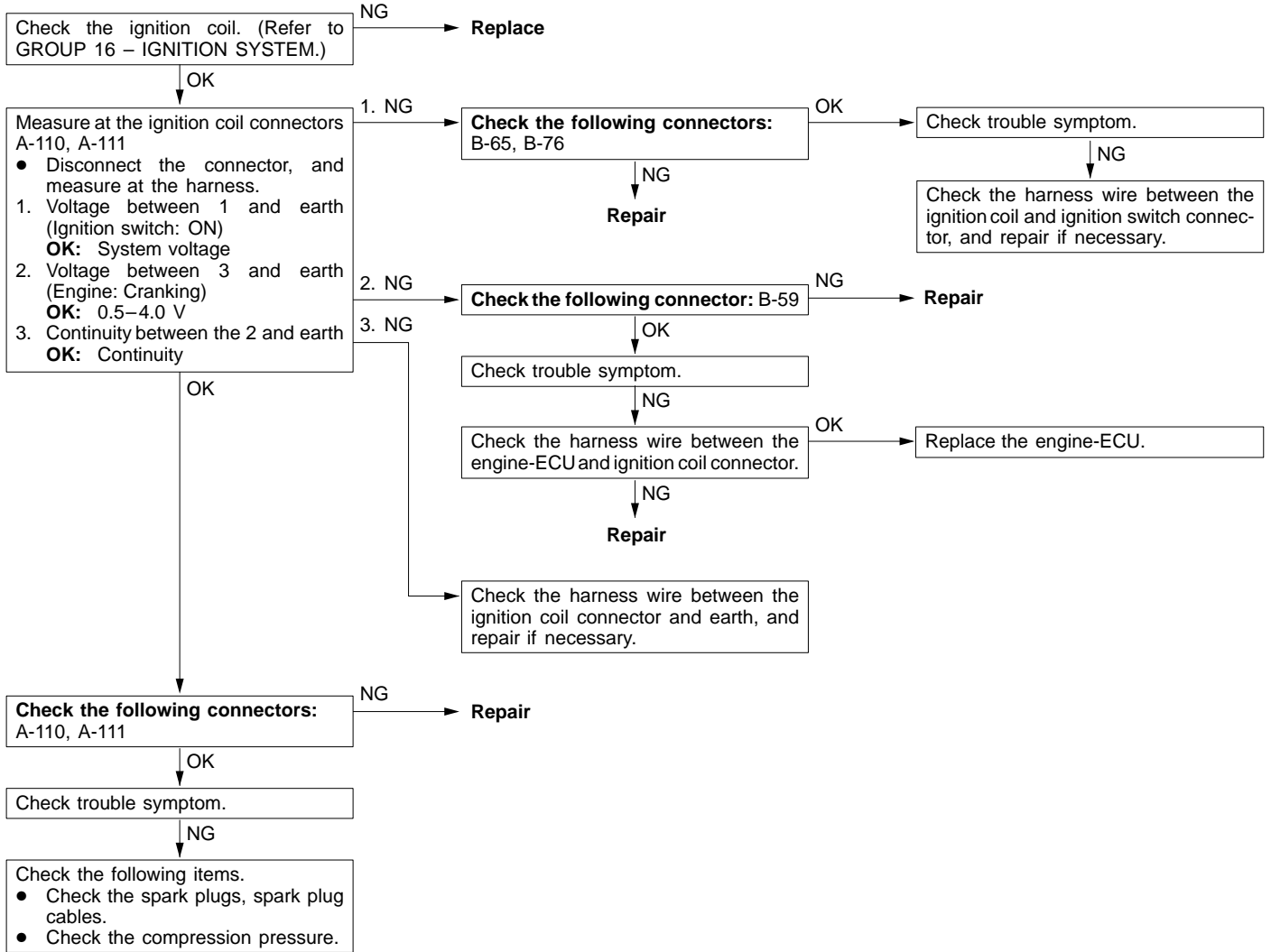
Code No. 41 Injector system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• Engine speed is approx. 50–1,000 r/min</li> <li>• The throttle position sensor output voltage is 1.15 V or less.</li> <li>• Actuator test by MUT-II is not carried out.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Surge voltage of injector coil is not detected for 4 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the injector</li> <li>• Improper connector contact, open or short-circuited harness wire of the injector circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



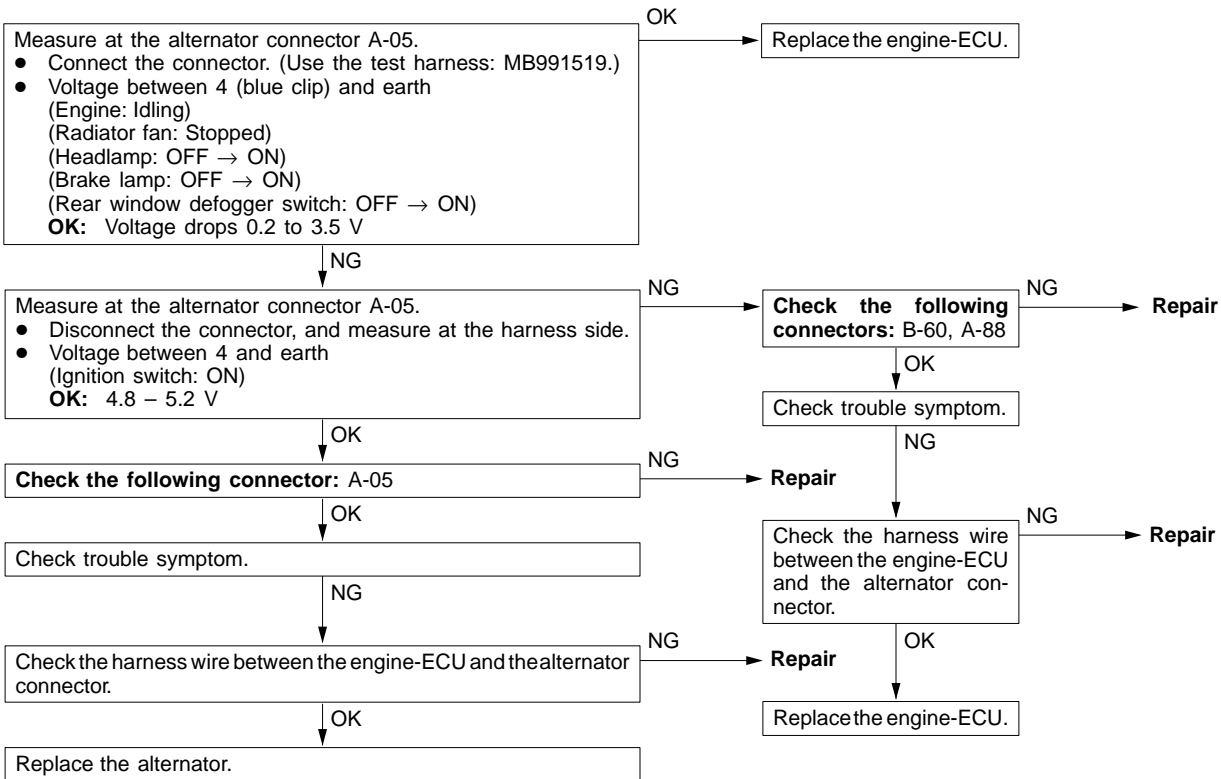
NOTE

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

Code No. 44 Ignition coil and power transistor unit system	Probable cause
<p>Range of Check</p> <ul style="list-style-type: none"> <li>• Engine speed is approx. 50–4,000 r/min</li> <li>• Engine is not cranking.</li> </ul> <p>Set conditions</p> <ul style="list-style-type: none"> <li>• Abnormal rotation due to misfire is detected by crank angle sensor (Either one of coils fails).</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the ignition coil</li> <li>• Improper connector contact, open or short-circuited harness wire of the ignition primary circuit</li> <li>• Malfunction of the engine-ECU</li> </ul>



Code No. 64 Alternator FR terminal system	Probable cause
Range of Check ● Engine speed is approx. 50 r/min or more Set Conditions ● The input voltage from the alternator FR terminal is higher than 4.5 V for 20 seconds.	● Open circuit in alternator FR terminal circuit ● Malfunction of the engine-ECU

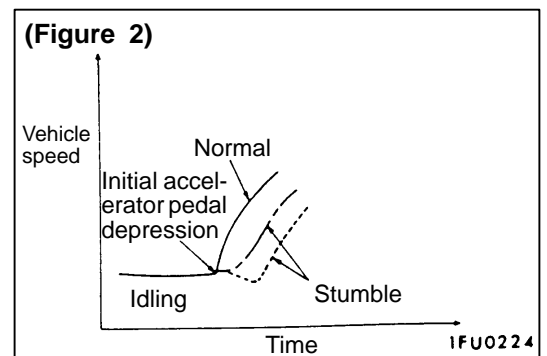
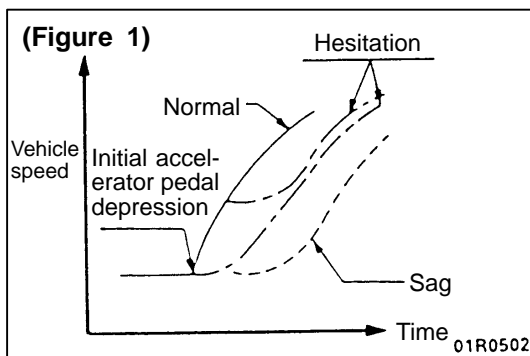


## INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is impossible.	1	13-20
	Communication with engine-ECU only is impossible.	2	13-20
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13-21
	The engine warning lamp remains illuminating and never goes out.	4	13-21
Starting	No initial combustion (starting impossible)	5	13-22
	Initial combustion but no complete combustion (starting impossible)	6	13-23
	Long time to start (improper starting)	7	13-24
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13-25
	Idling speed is high. (Improper idling speed)	9	13-26
	Idling speed is low. (Improper idling speed)	10	13-27
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13-28
	When the engine is hot, it stalls at idling. (Die out)	12	13-29
	The engine stalls when starting the car. (Pass out)	13	13-30
	The engine stalls when decelerating.	14	13-30
Driving	Hesitation, sag or stumble	15	13-31
	The feeling of impact or vibration when accelerating	16	13-31
	The feeling of impact or vibration when decelerating	17	13-32
	Poor acceleration	18	13-32
	Surge	19	13-33
	Knocking	20	13-33
Dieseling		21	13-33
Too high CO and HC concentration when idling		22	13-34
Low alternator output voltage (approx. 12.3 V)		23	13-35

**PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)**

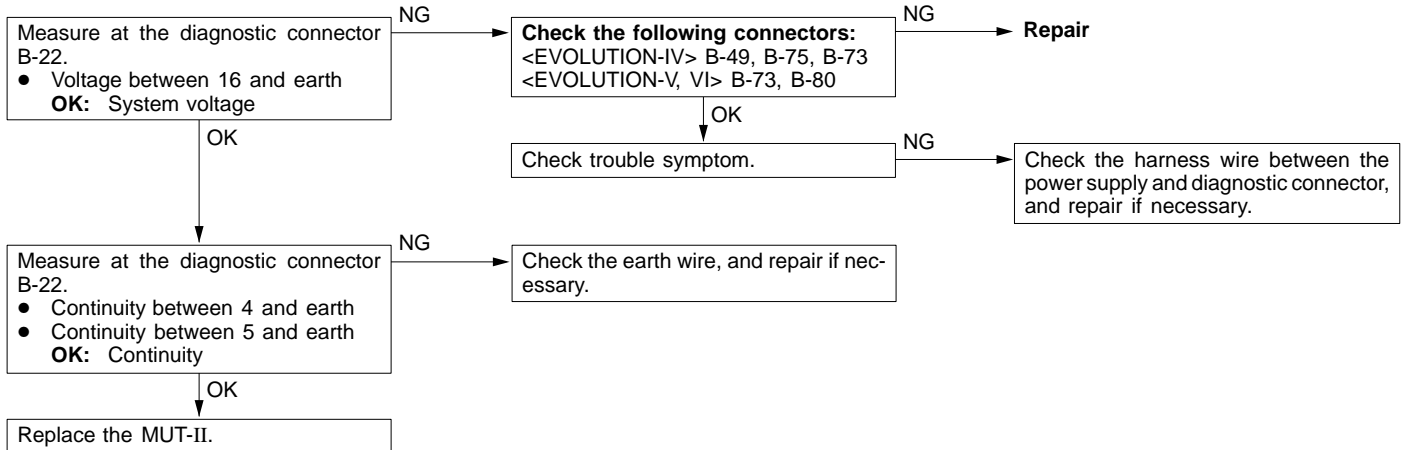
Items		Symptom
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idle.
	Rough idle	Usually, a judgement can be based upon the movement of the tachometer pointer, and the vibration transmitted to the steering wheel, shift lever, body, etc. This is called rough idle.
	Incorrect idle speed	The engine doesn't idle at the usual correct speed.
	Engine stall (Die out)	The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicles is moving or not.
	Engine stall (Pass out)	The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation, Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag". (Refer to Figure 1.)
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine speed increase is delayed when the accelerator pedal is initially depressed for acceleration. (Refer to Figure 2.)
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".



**INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**

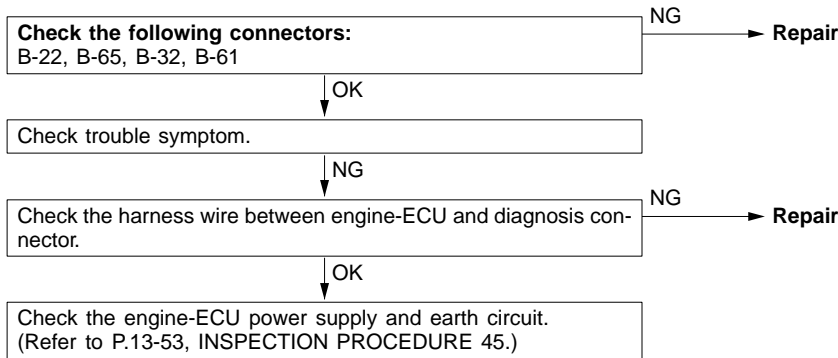
**INSPECTION PROCEDURE 1**

<b>Communication with MUT-II is impossible. (Communication with all systems is impossible.)</b>	<b>Probable cause</b>
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	<ul style="list-style-type: none"> <li>● Malfunction of the diagnosis connector</li> <li>● Malfunction of the harness wire</li> </ul>



**INSPECTION PROCEDURE 2**

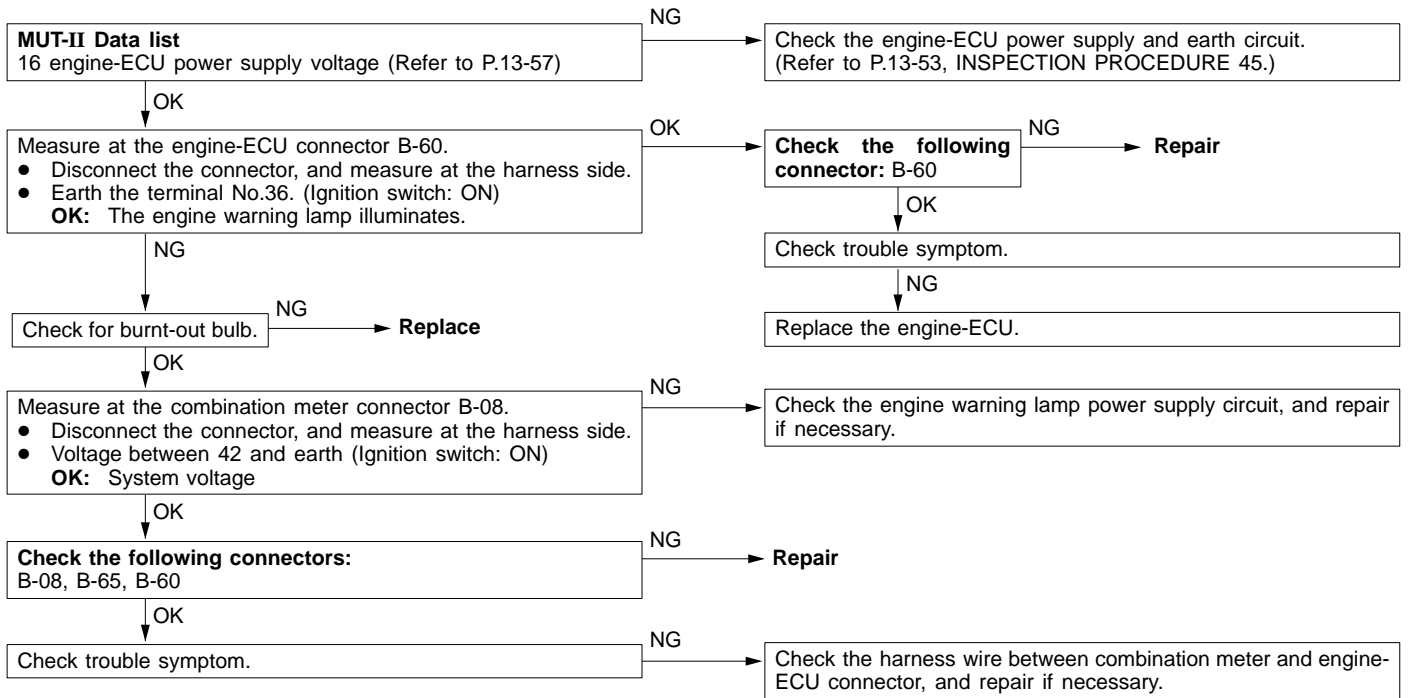
<b>MUT-II communication with engine-ECU is impossible.</b>	<b>Probable cause</b>
One of the following causes may be suspected. <ul style="list-style-type: none"> <li>● No power supply to engine-ECU.</li> <li>● Defective earth circuit of engine-ECU.</li> <li>● Defective engine-ECU.</li> <li>● Improper communication line between engine-ECU and MUT-II</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of engine-ECU power supply circuit</li> <li>● Malfunction of engine-ECU</li> <li>● Open circuit between immobilizer-ECU and diagnosis connector</li> </ul>





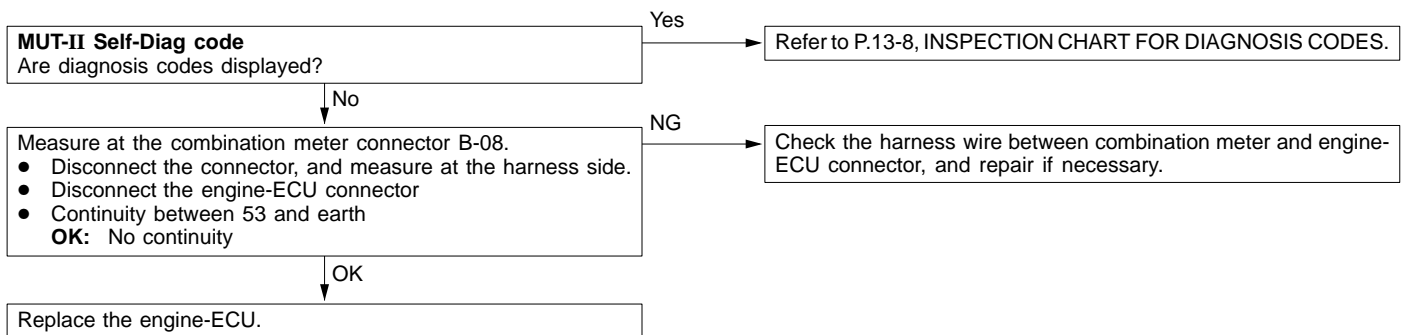
**INSPECTION PROCEDURE 3**

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
For checking for 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.	<ul style="list-style-type: none"> <li>● Burnt-out bulb of the engine warning lamp</li> <li>● Defective engine warning lamp circuit</li> <li>● Malfunction of the engine-ECU</li> </ul>



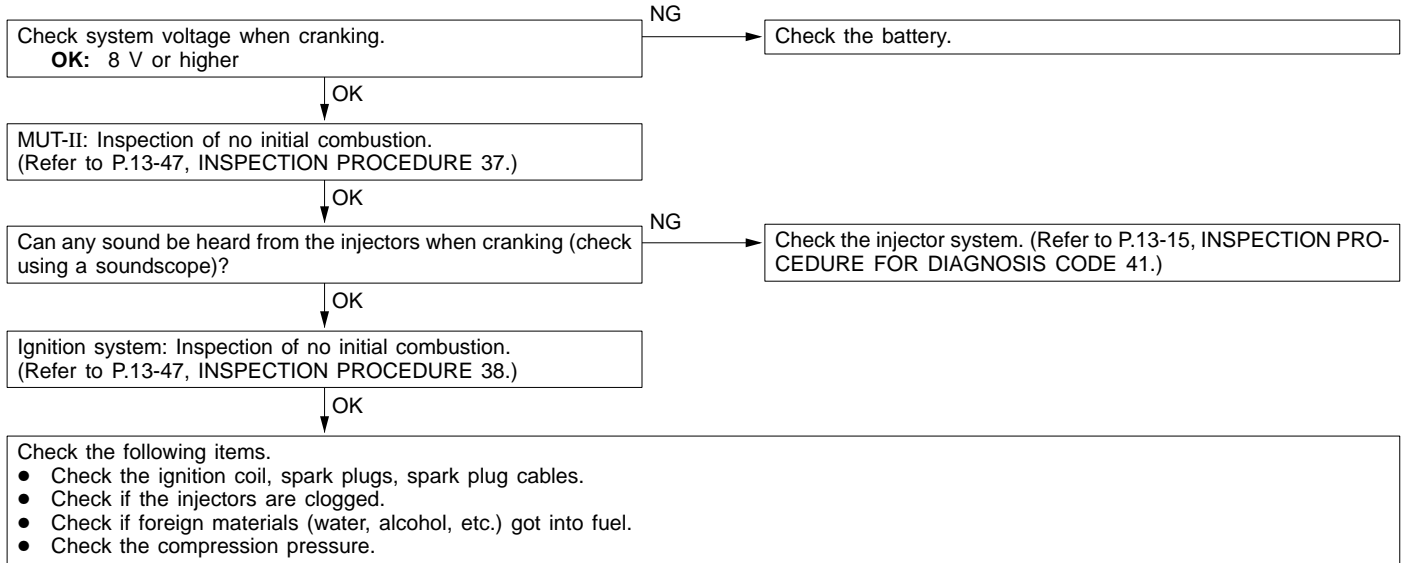
**INSPECTION PROCEDURE 4**

The engine warning lamp remains illuminating and never goes out.	Probable cause
In cases such as the above, the cause is probably that the engine-ECU is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.	<ul style="list-style-type: none"> <li>● Short-circuit between the engine warning lamp and engine-ECU</li> <li>● Malfunction of the engine-ECU</li> </ul>



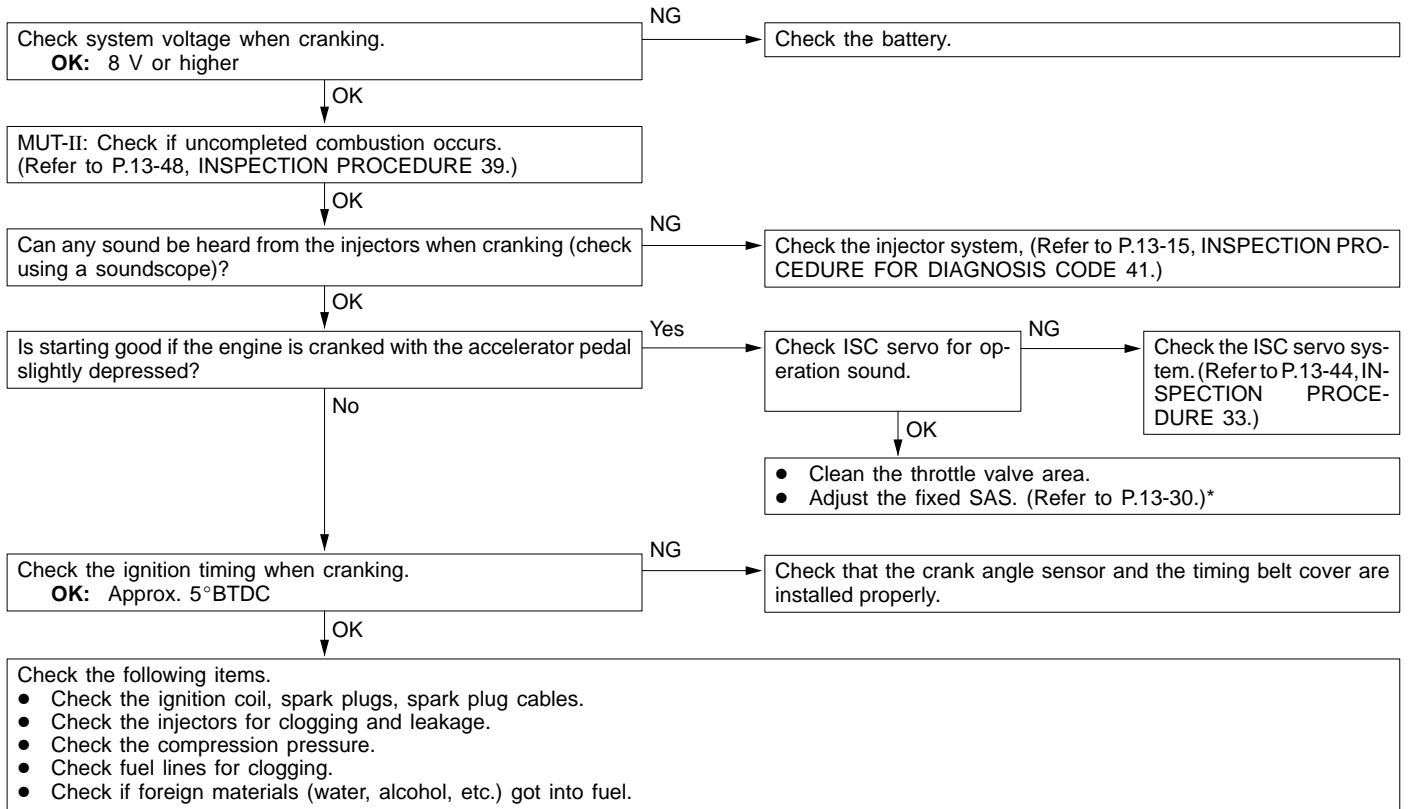
**INSPECTION PROCEDURE 5**

No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of the fuel pump system</li> <li>● Malfunction of the injectors</li> <li>● Malfunction of the engine-ECU</li> <li>● Foreign materials in fuel</li> </ul>



**INSPECTION PROCEDURE 6**

Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of the injector system</li> <li>● Foreign materials in fuel</li> <li>● Poor compression</li> <li>● Malfunction of the engine-ECU</li> </ul>

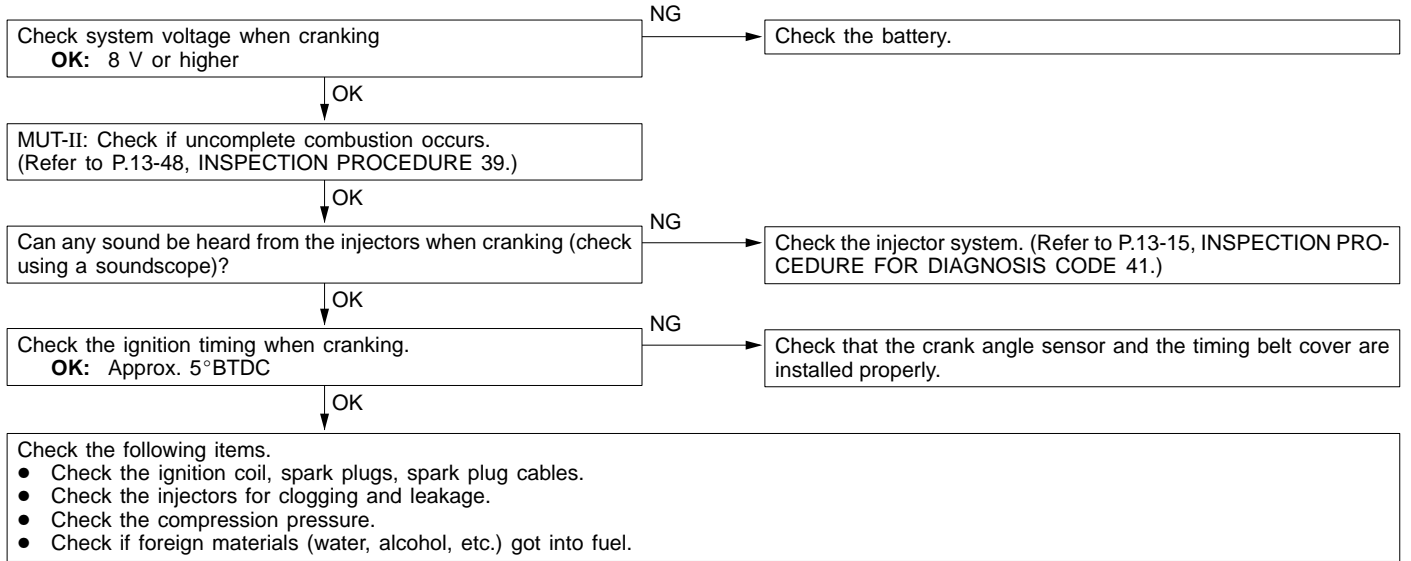


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

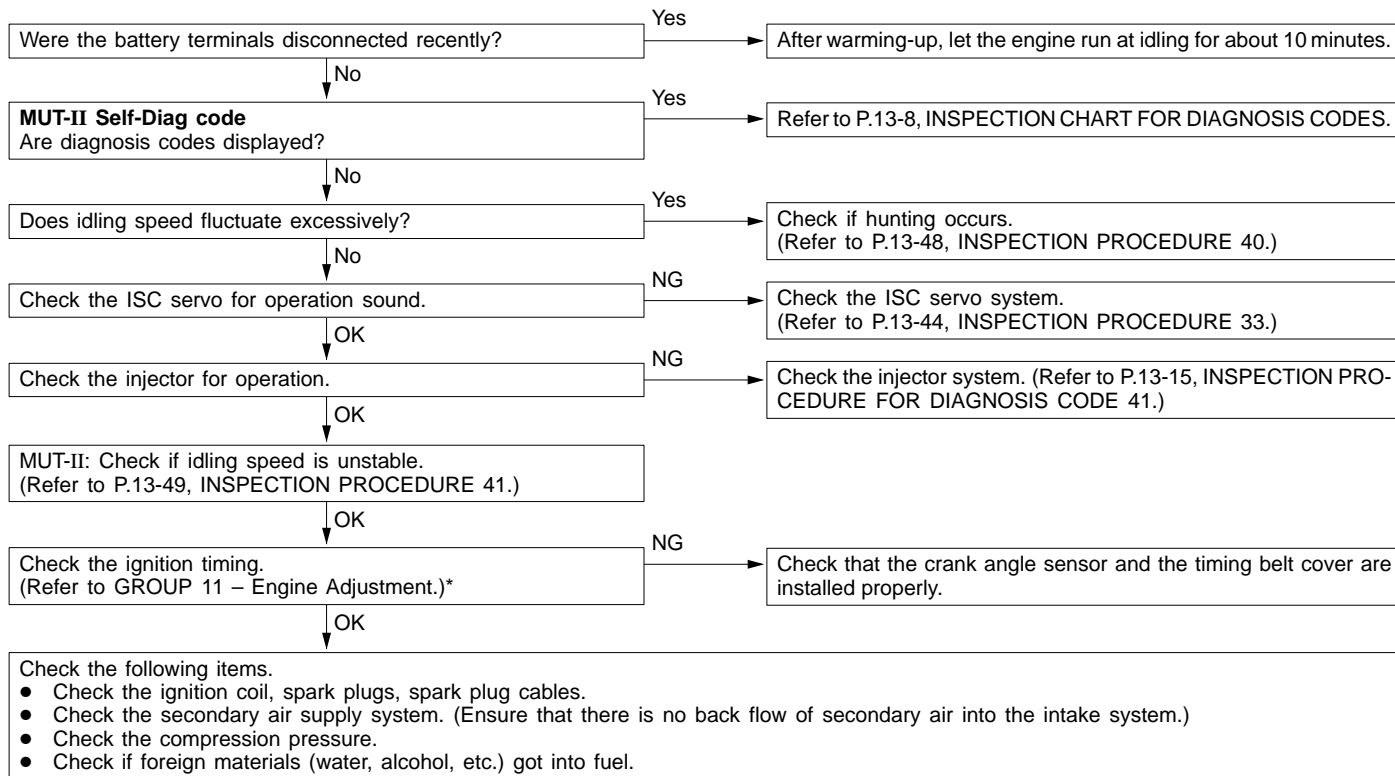
**INSPECTION PROCEDURE 7**

Long time to start (Improper starting)	Probable cause
<p>In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.</p>	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of the injector system</li> <li>● Inappropriate gasoline use</li> <li>● Poor compression</li> </ul>



**INSPECTION PROCEDURE 8**

<b>Unstable idling (Rough idling, hunting)</b>	<b>Probable cause</b>
<p>In cases as the above, the cause is probably that the ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.</p>	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of air-fuel ratio control system</li> <li>● Malfunction of the ISC servo system</li> <li>● Poor compression</li> <li>● Drawing air into exhaust system</li> <li>● Secondary air backflow to the intake system</li> </ul>

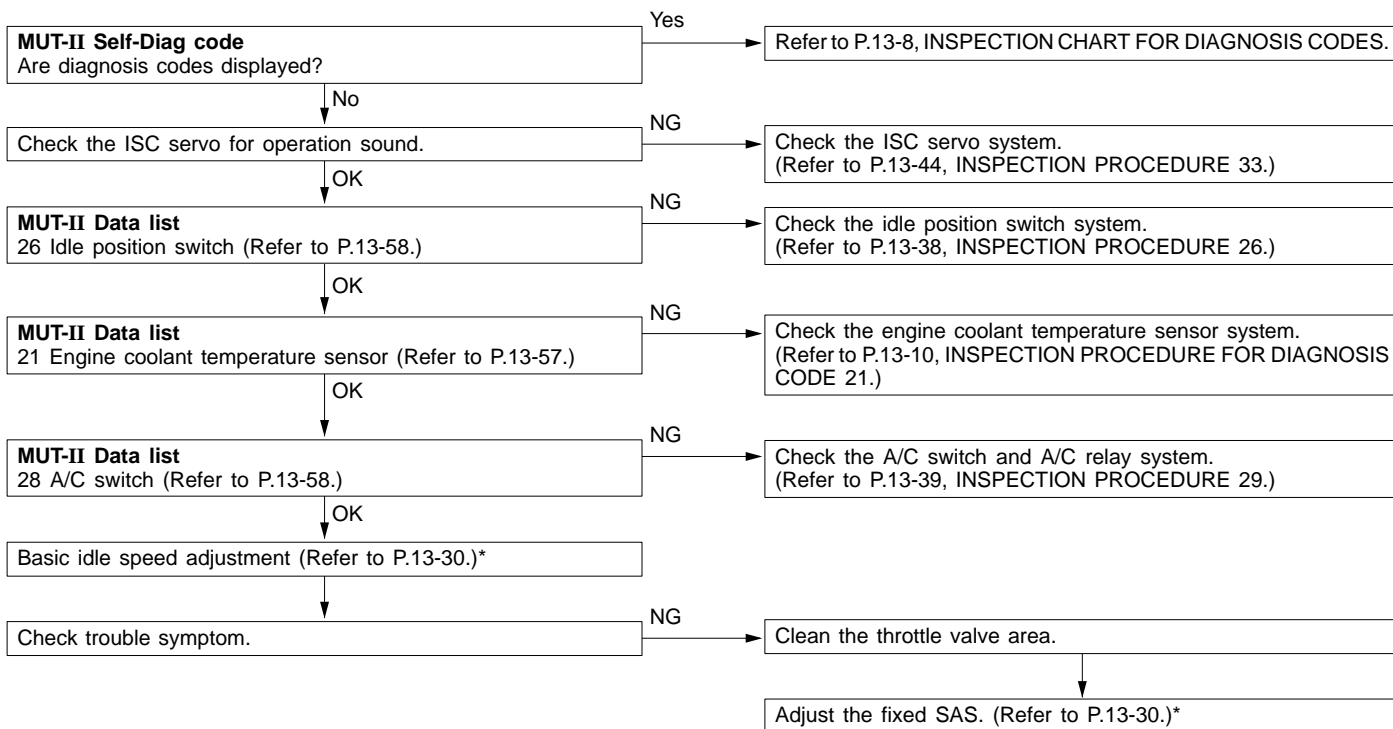


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 9**

Idling speed is high. (Improper idling speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idling is too great.	<ul style="list-style-type: none"> <li>● Malfunction of the ISC servo system</li> <li>● Malfunction of the throttle body</li> </ul>

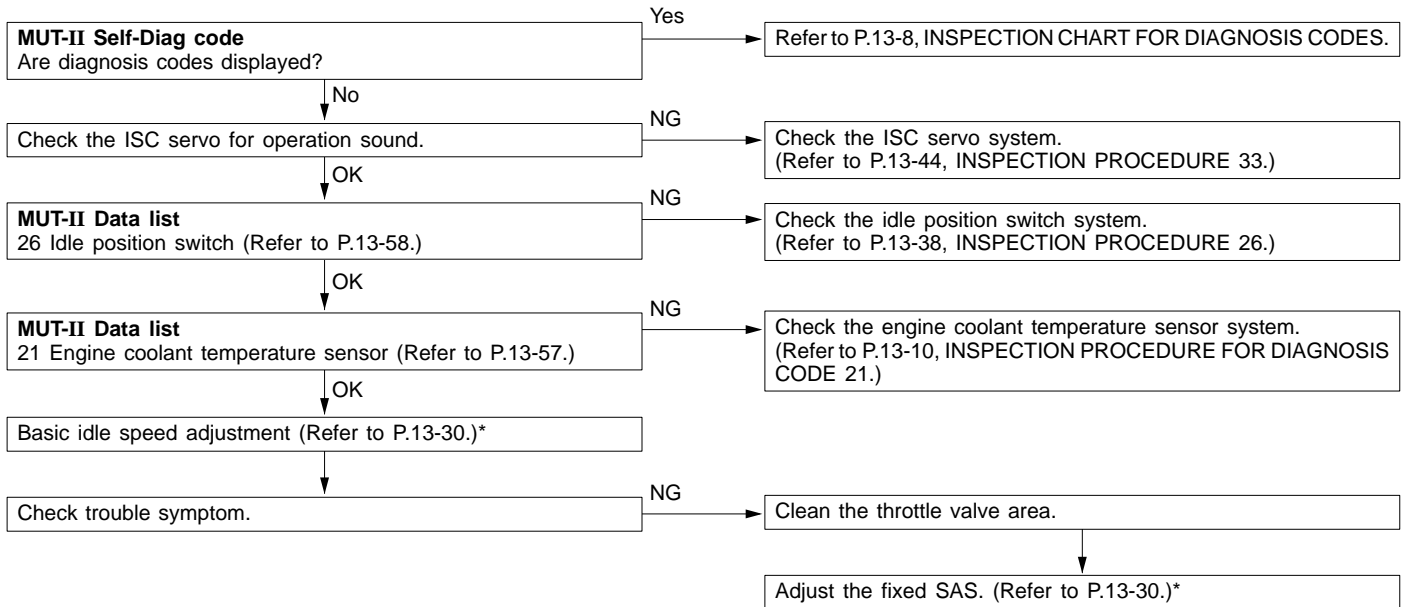


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 10**

Idling speed is low. (Improper idling speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	<ul style="list-style-type: none"> <li>● Malfunction of the ISC servo system</li> <li>● Malfunction of the throttle body</li> </ul>

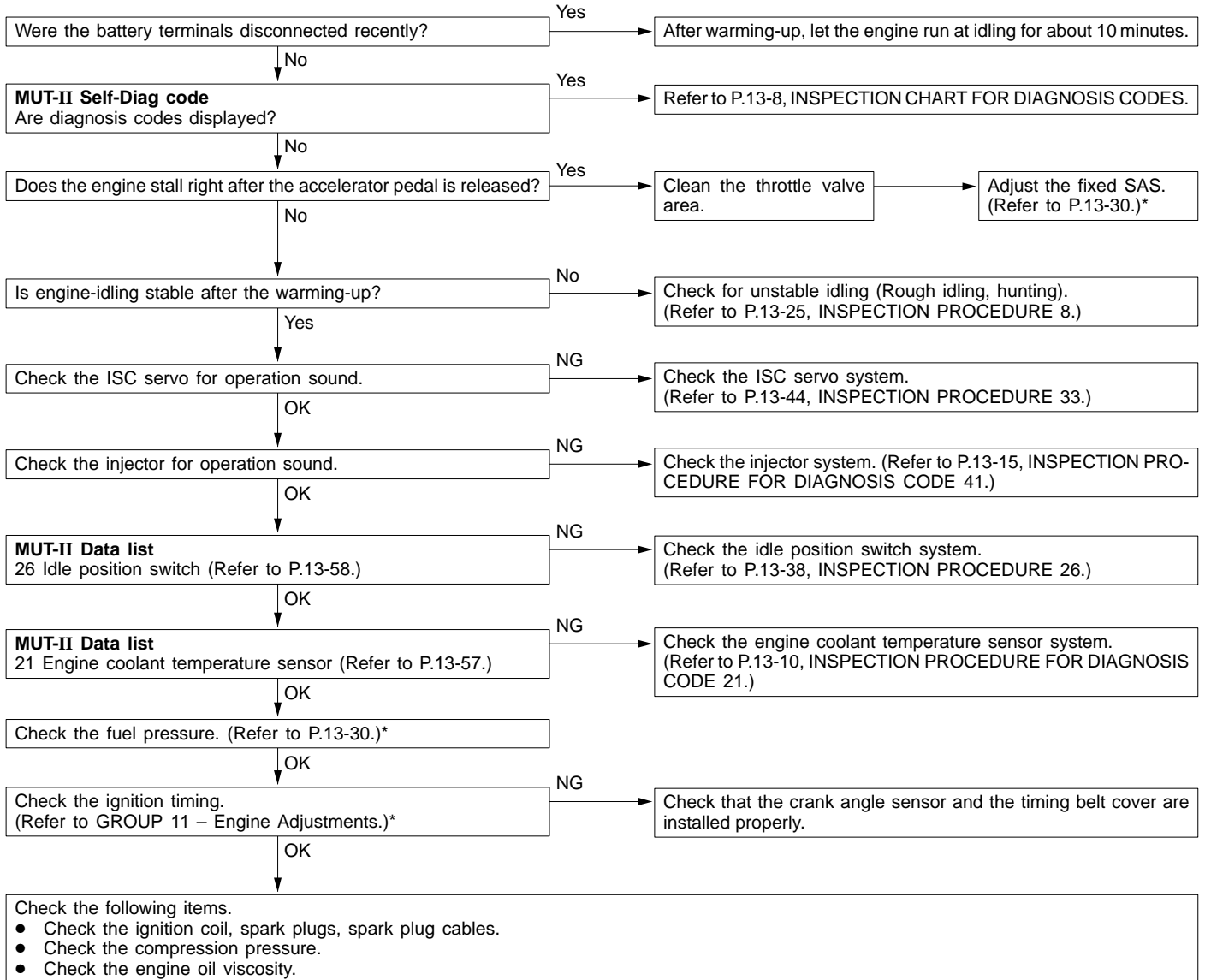


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 11**

When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	<ul style="list-style-type: none"> <li>● Malfunction of the ISC servo system</li> <li>● Malfunction of the throttle body</li> <li>● Malfunction of the injector system</li> <li>● Malfunction of the ignition system</li> </ul>



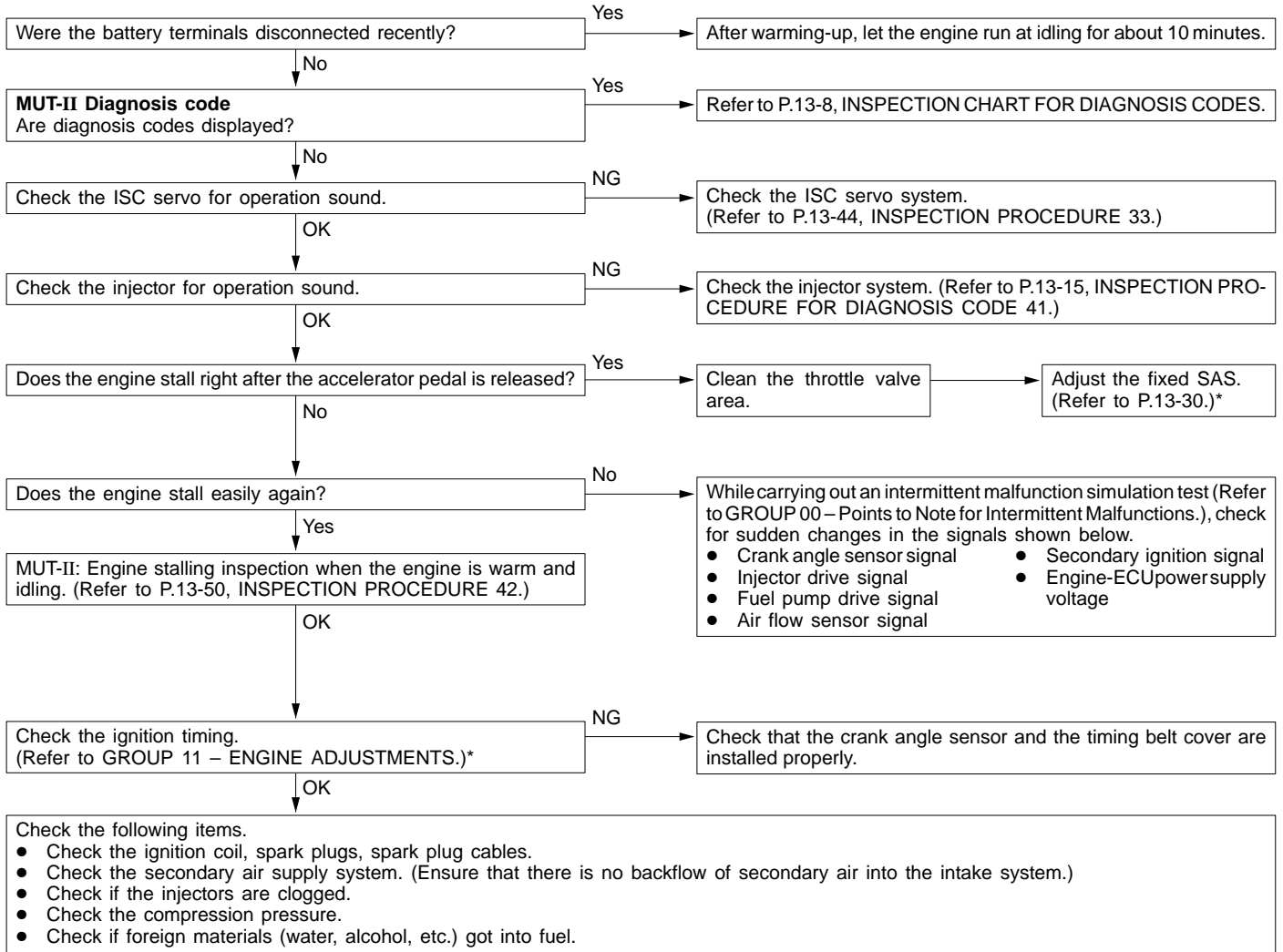
**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).



**INSPECTION PROCEDURE 12**

When the engine is hot, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of air-fuel ratio control system</li> <li>● Malfunction of the ISC servo system</li> <li>● Drawing air into intake system</li> <li>● Improper connector contact</li> <li>● Backflow of secondary air to the intake system</li> </ul>

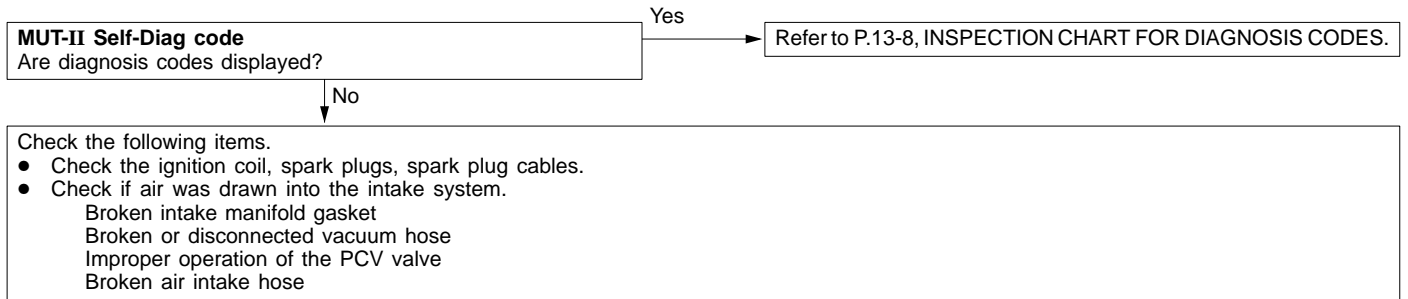


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

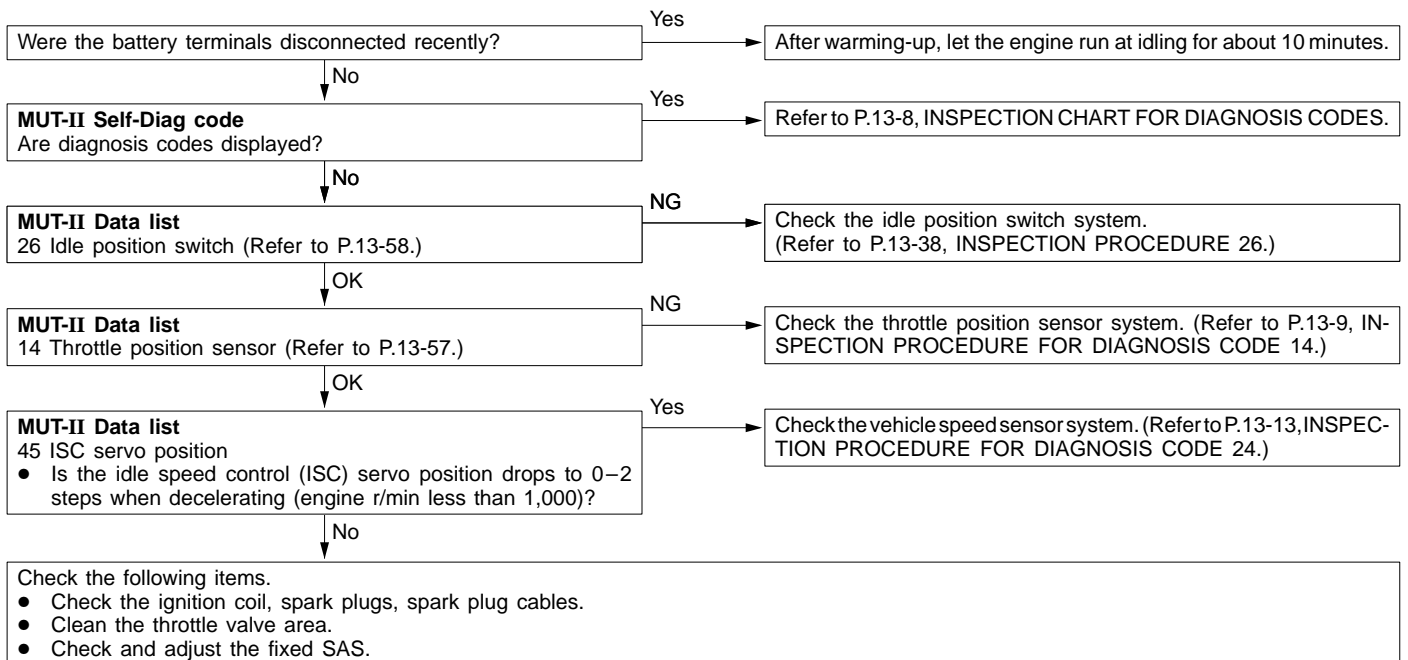
**INSPECTION PROCEDURE 13**

The engine stalls when starting the car. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.	<ul style="list-style-type: none"> <li>● Drawing air into intake system</li> <li>● Malfunction of the ignition system</li> </ul>



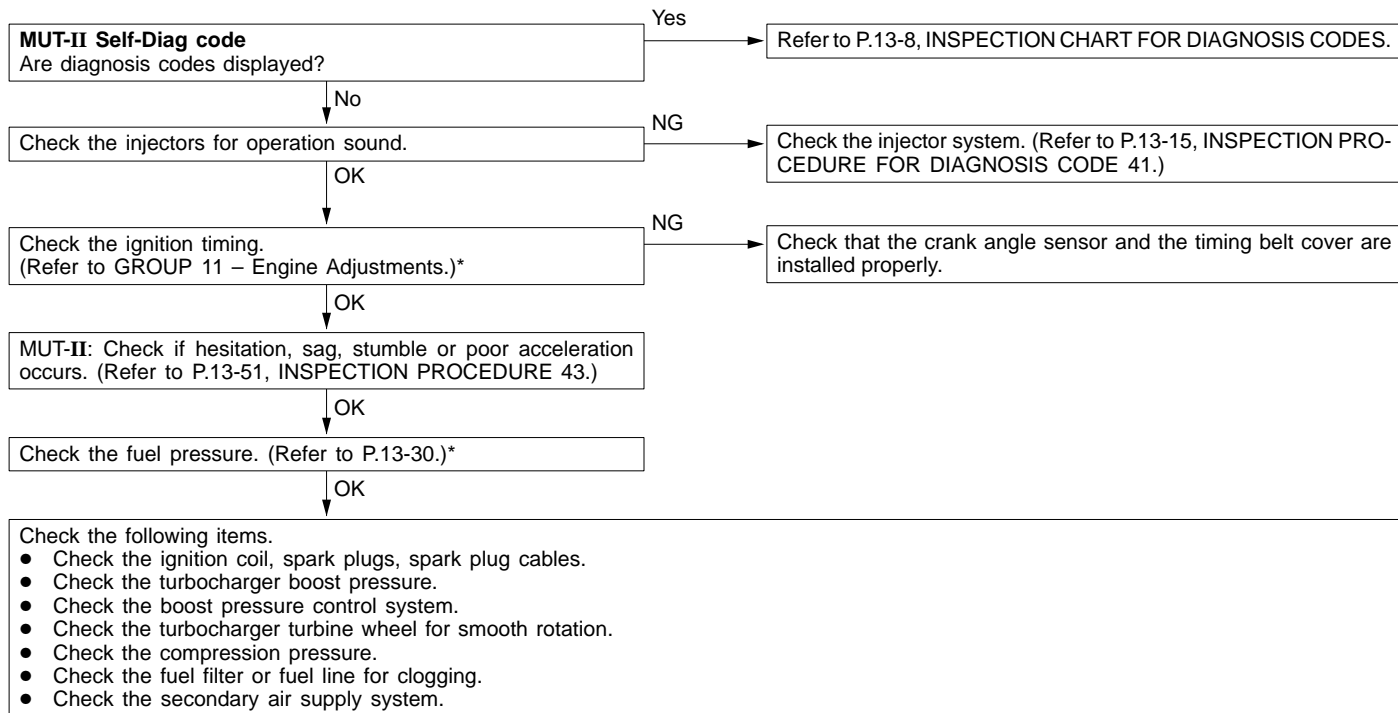
**INSPECTION PROCEDURE 14**

The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.	<ul style="list-style-type: none"> <li>● Malfunction of the ISC servo system</li> </ul>



**INSPECTION PROCEDURE 15**

<b>Hesitation, sag or stumble</b>	<b>Probable cause</b>
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> <li>● Malfunction of air-fuel ratio control system</li> <li>● Malfunction of the fuel supply system</li> <li>● Poor compression</li> <li>● Malfunction of the turbocharger system</li> <li>● Malfunction of the secondary air supply system</li> </ul>

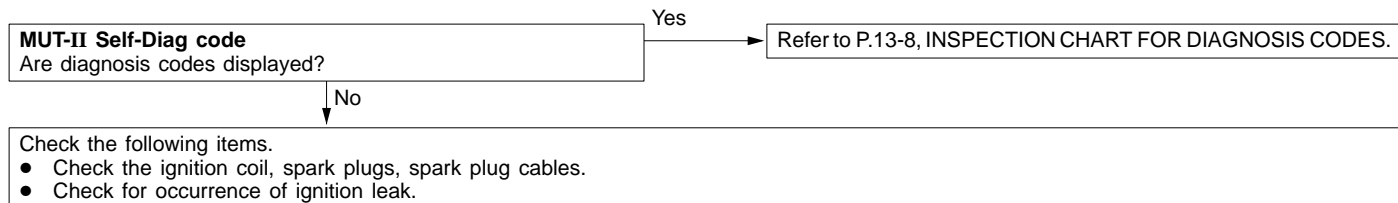


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

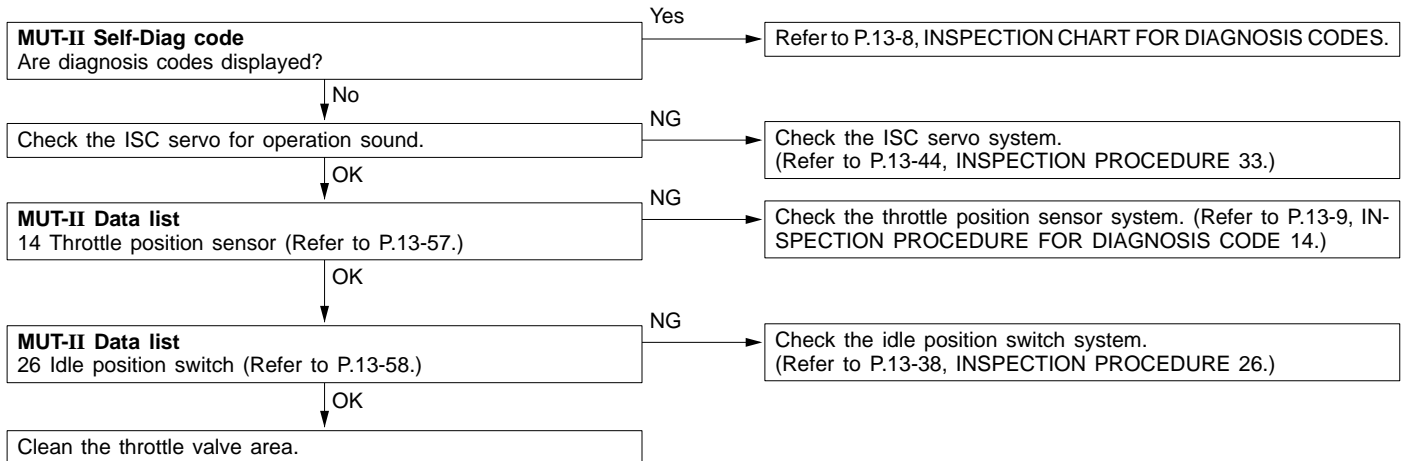
**INSPECTION PROCEDURE 16**

<b>The feeling of impact or vibration when accelerating</b>	<b>Probable cause</b>
In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition system</li> </ul>



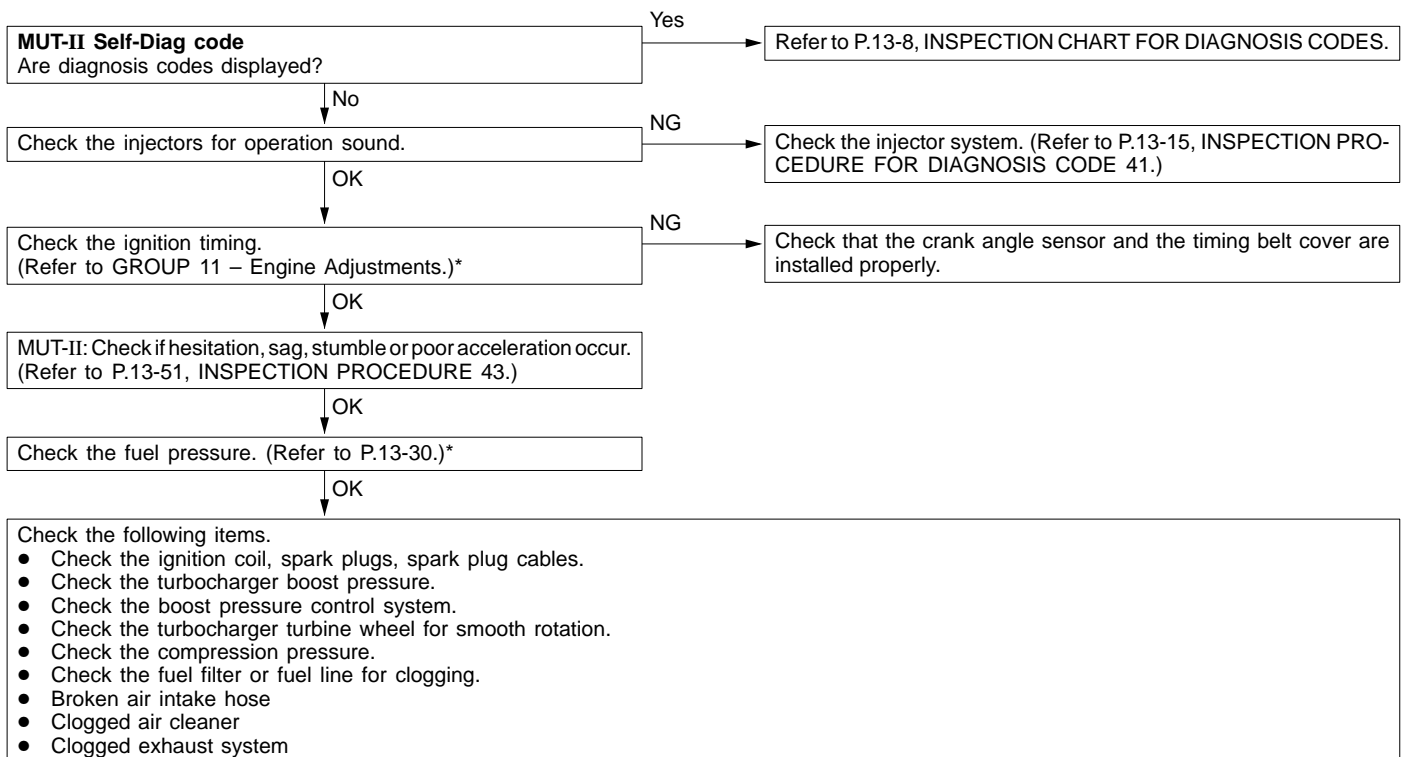
**INSPECTION PROCEDURE 17**

The feeling of impact or vibration when decelerating	Probable cause
Malfunction of the ISC servo system is suspected.	<ul style="list-style-type: none"> <li>Malfunction of the ISC servo system</li> </ul>



**INSPECTION PROCEDURE 18**

Poor acceleration	Probable cause
Defective ignition system, abnormal air-fuel ratio, poor compression pressure, etc. are suspected.	<ul style="list-style-type: none"> <li>Malfunction of the ignition system</li> <li>Malfunction of air-fuel ratio control system</li> <li>Malfunction of the fuel supply system</li> <li>Poor compression pressure</li> <li>Clogged exhaust system</li> <li>Malfunction of the turbocharger system</li> </ul>

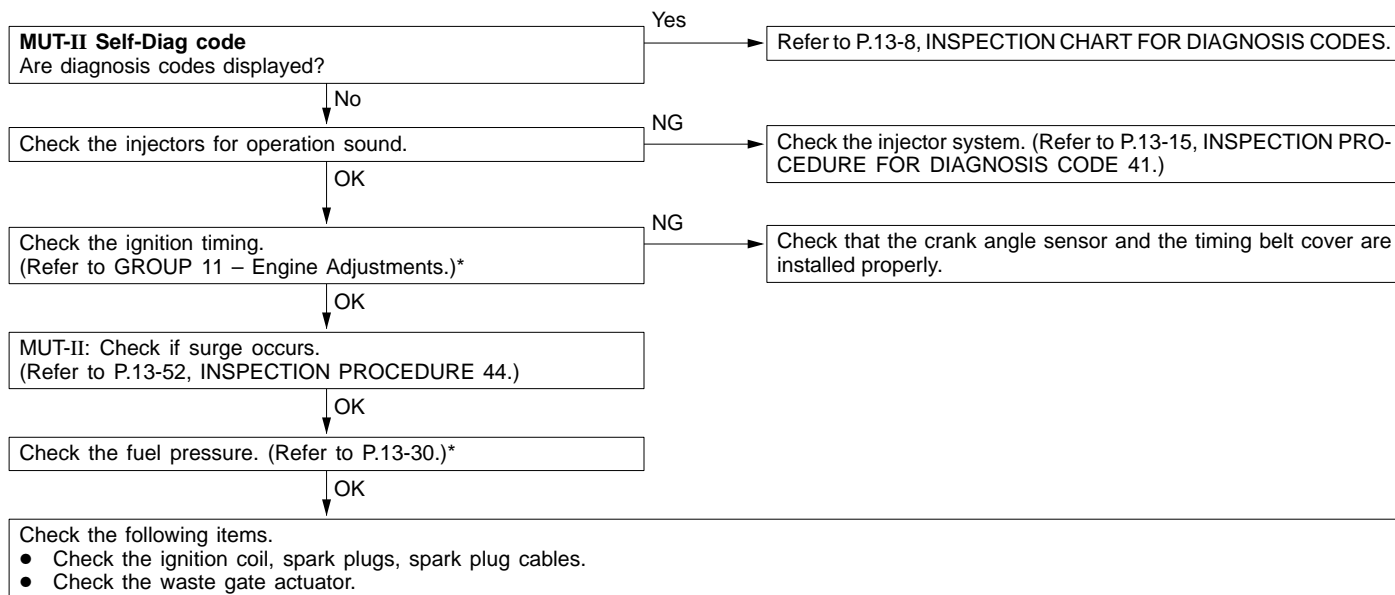


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 19**

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are suspected.	<ul style="list-style-type: none"> <li>• Malfunction of the ignition system</li> <li>• Malfunction of air-fuel ratio control system</li> </ul>

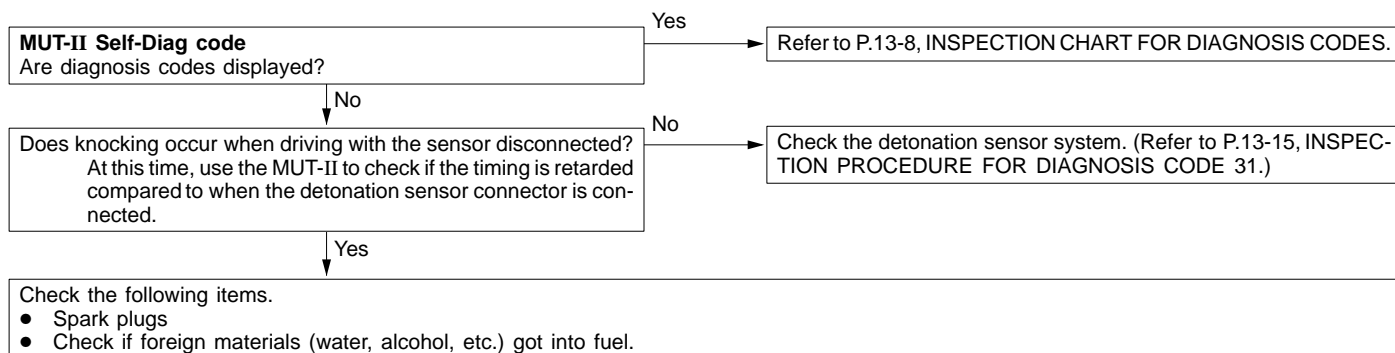


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 20**

Knocking	Probable cause
In cases as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.	<ul style="list-style-type: none"> <li>• Defective detonation sensor</li> <li>• Inappropriate heat value of the spark plug</li> </ul>



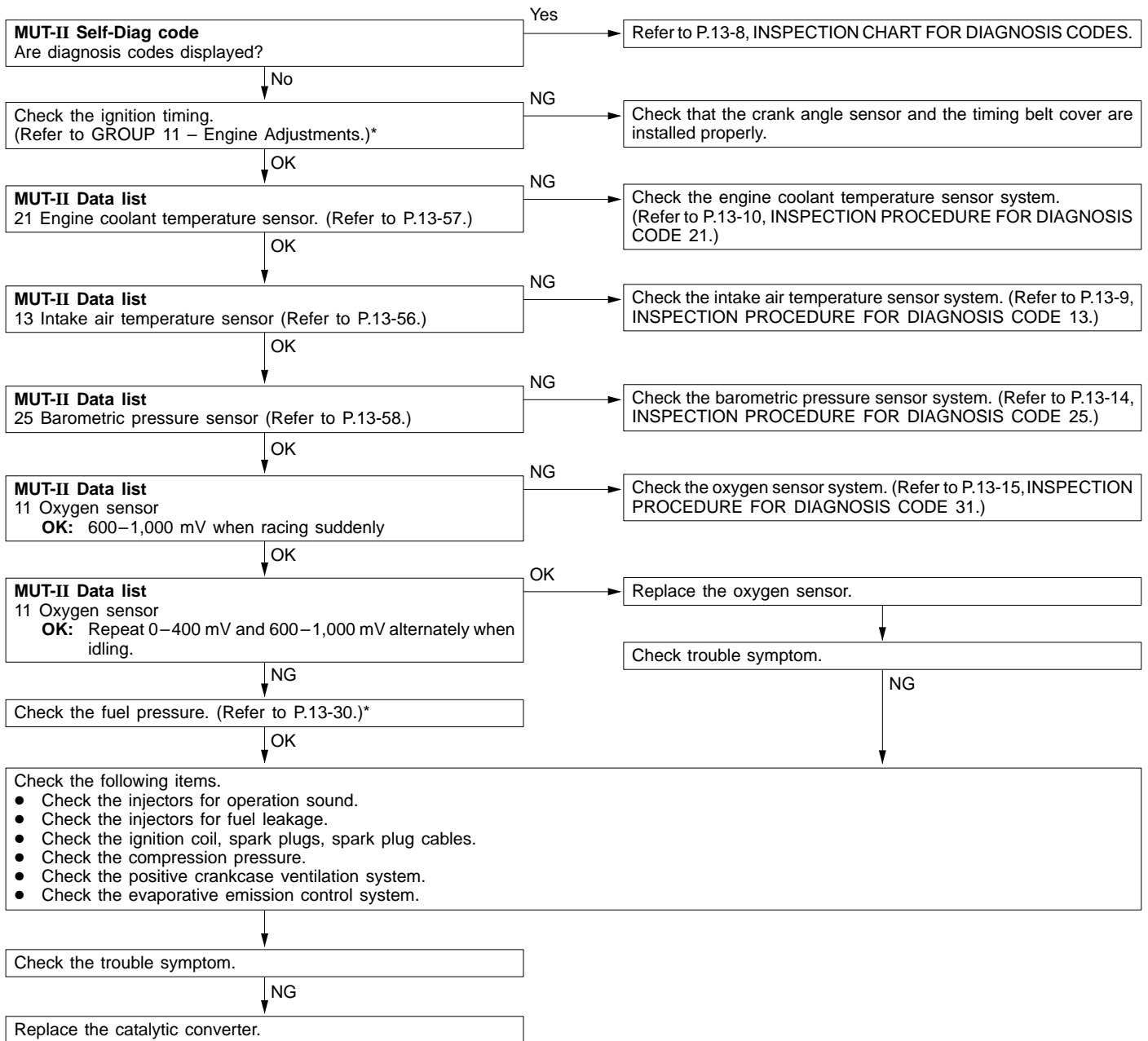
**INSPECTION PROCEDURE 21**

Dieseling	Probable cause
Fuel leakage from injectors is suspected.	<ul style="list-style-type: none"> <li>• Fuel leakage from injectors</li> </ul>

Check the injectors for fuel leakage.

INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	<ul style="list-style-type: none"> <li>● Malfunction of the air-fuel ratio control system</li> <li>● Deteriorated catalyst</li> </ul>

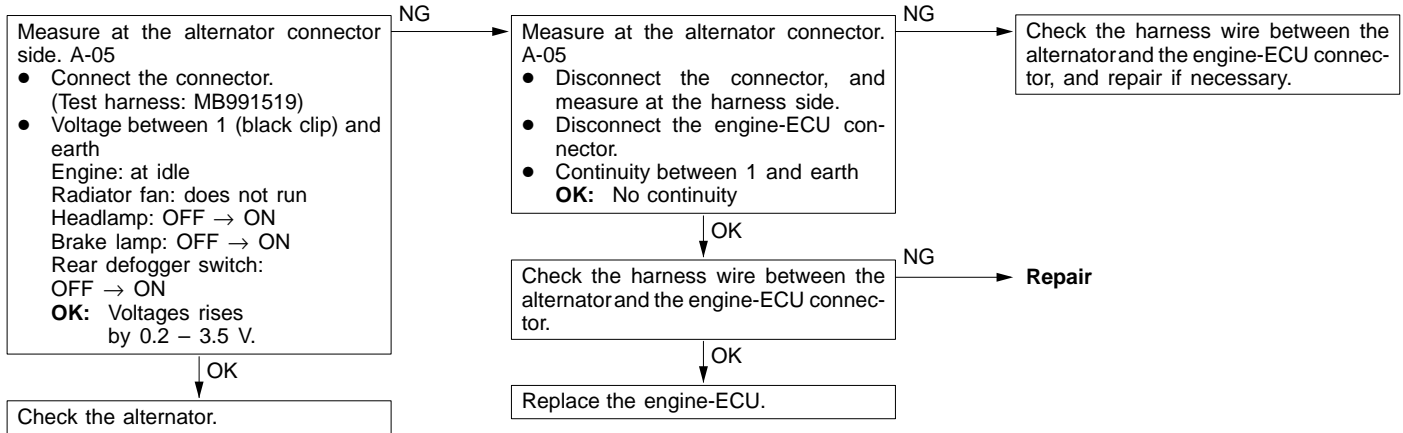


NOTE

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

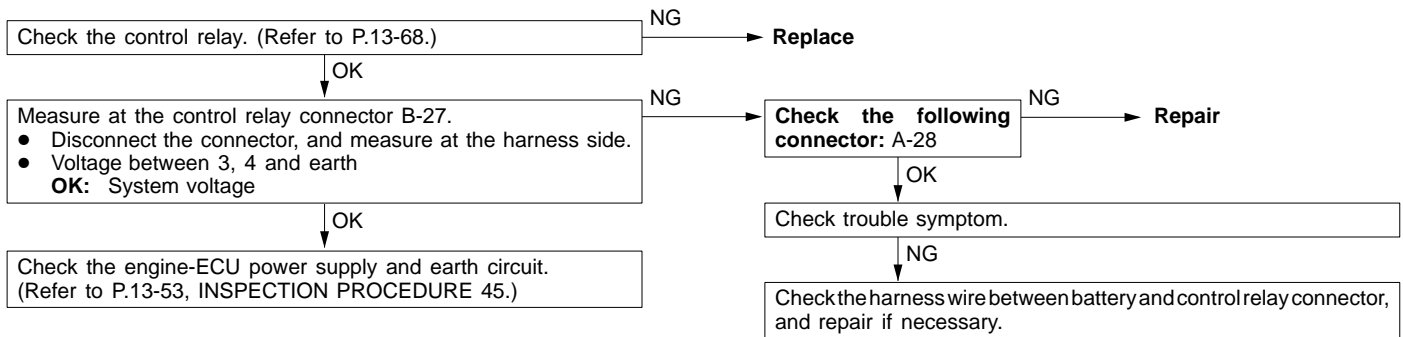
**INSPECTION PROCEDURE 23**

Low alternator output voltage (approx. 12.3 V)	Probable cause
The alternator may be defective, or malfunctions, which are listed in the right column, may be suspected.	<ul style="list-style-type: none"> <li>● Malfunction of charging system</li> <li>● Short circuit in harness between alternator G terminal and engine-ECU</li> <li>● Malfunction of engine-ECU</li> </ul>



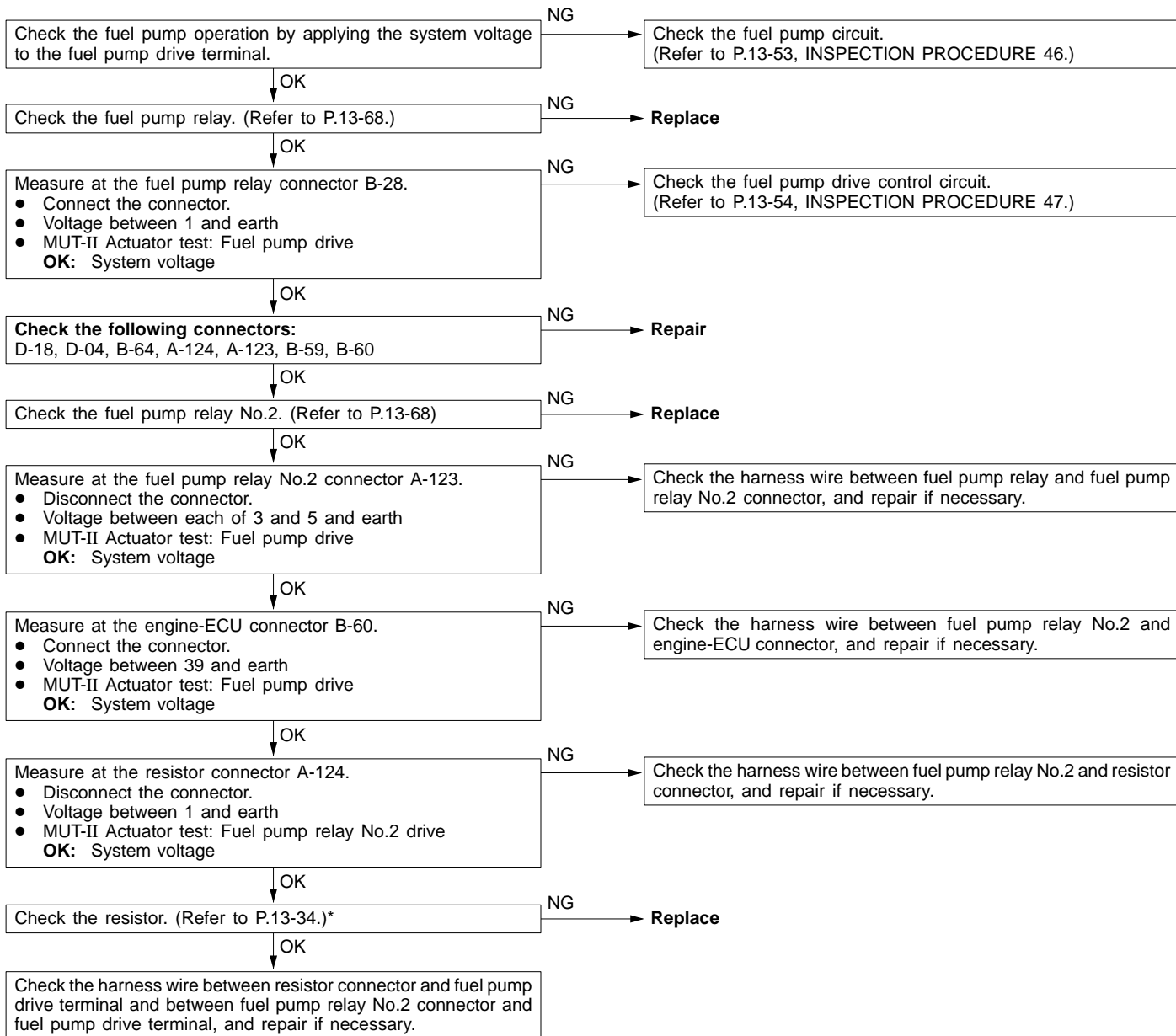
**INSPECTION PROCEDURE 24**

Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes system voltage to be supplied to the engine-ECU, injectors and air flow sensor.	<ul style="list-style-type: none"> <li>● Malfunction of the ignition switch</li> <li>● Malfunction of the control relay</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Disconnected engine-ECU earth wire</li> <li>● Malfunction of the engine-ECU</li> </ul>



**INSPECTION PROCEDURE 25 <EVOLUTION-IV, EVOLUTION-V>**

Fuel pump system	Probable cause
The engine-ECU turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	<ul style="list-style-type: none"> <li>● Malfunction of the fuel pump relay</li> <li>● Malfunction of the fuel pump</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of the engine-ECU</li> </ul>



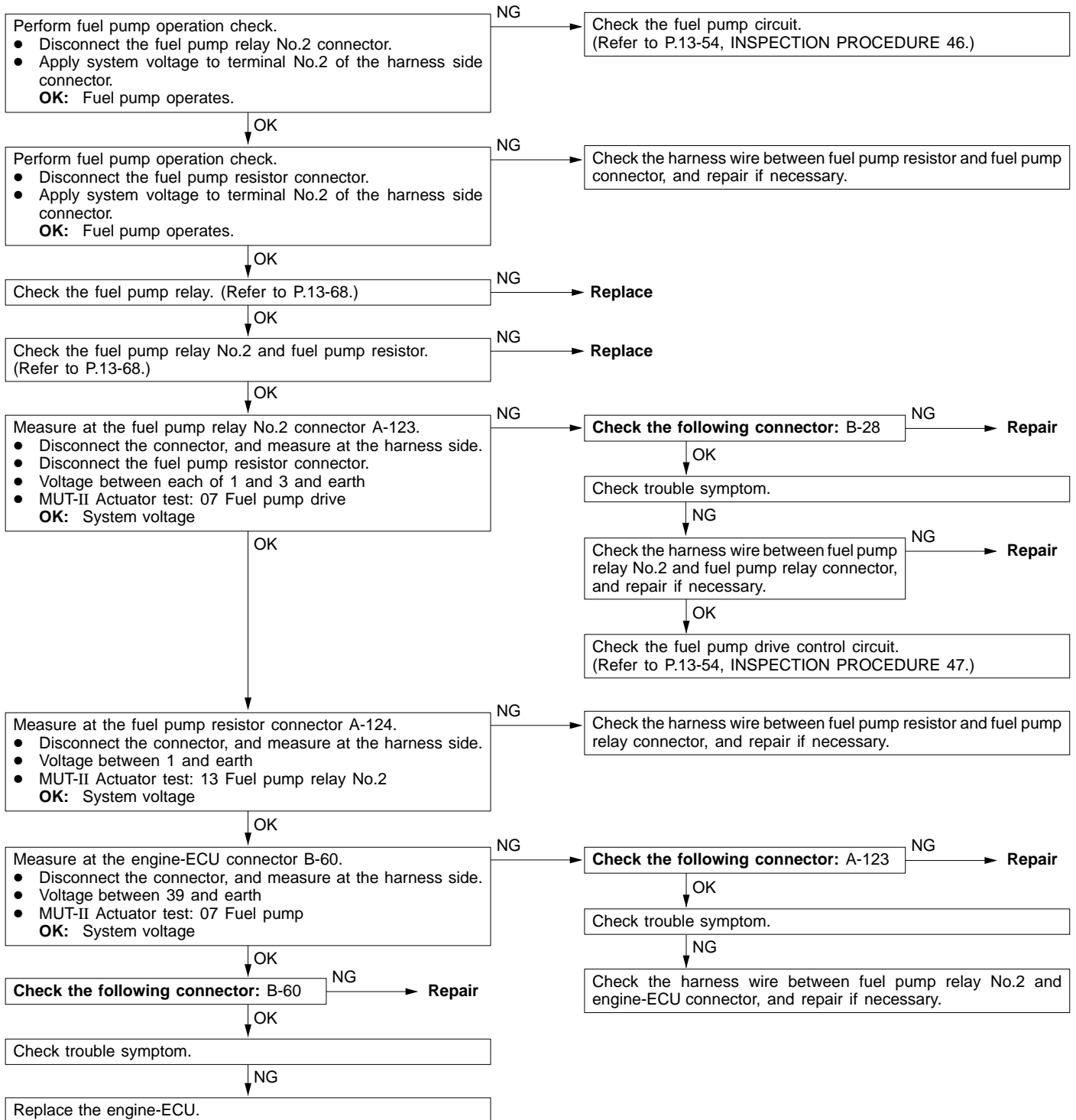
**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).



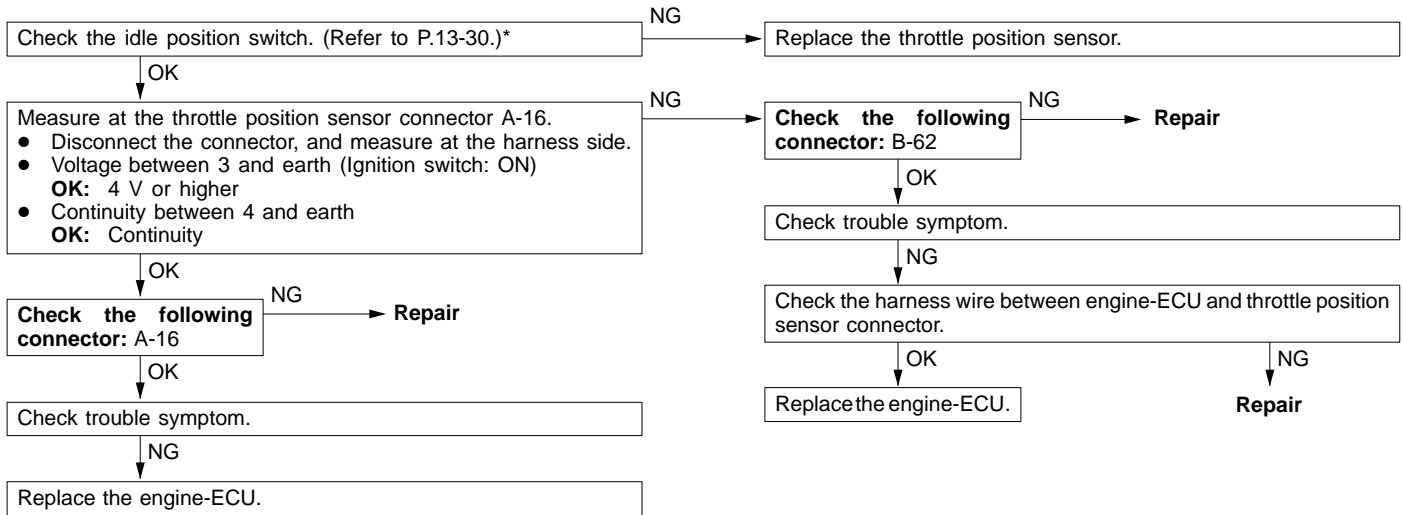
**INSPECTION PROCEDURE 25 <EVOLUTION-VI>**

Fuel pump system	Probable cause
<ul style="list-style-type: none"> <li>• The engine-ECU turns the fuel pump relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.</li> <li>• The engine-ECU supplies power to the fuel pump through the resistor at low load operations. It supplies power directly to the fuel pump at high load operations to increase the pump output.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of the fuel pump relay</li> <li>• Malfunction of the fuel pump relay No.2</li> <li>• Malfunction of the fuel pump</li> <li>• Malfunction of fuel pump resistor</li> <li>• Improper connector contact, open or short-circuited harness wire</li> <li>• Malfunction of engine-ECU</li> </ul>



**INSPECTION PROCEDURE 26**

Idle position switch system	Probable cause
The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based on this input.	<ul style="list-style-type: none"> <li>● Maladjustment of the accelerator cable</li> <li>● Maladjustment of the fixed SAS</li> <li>● Maladjustment of the idle position switch and throttle position sensor</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of the engine-ECU</li> </ul>

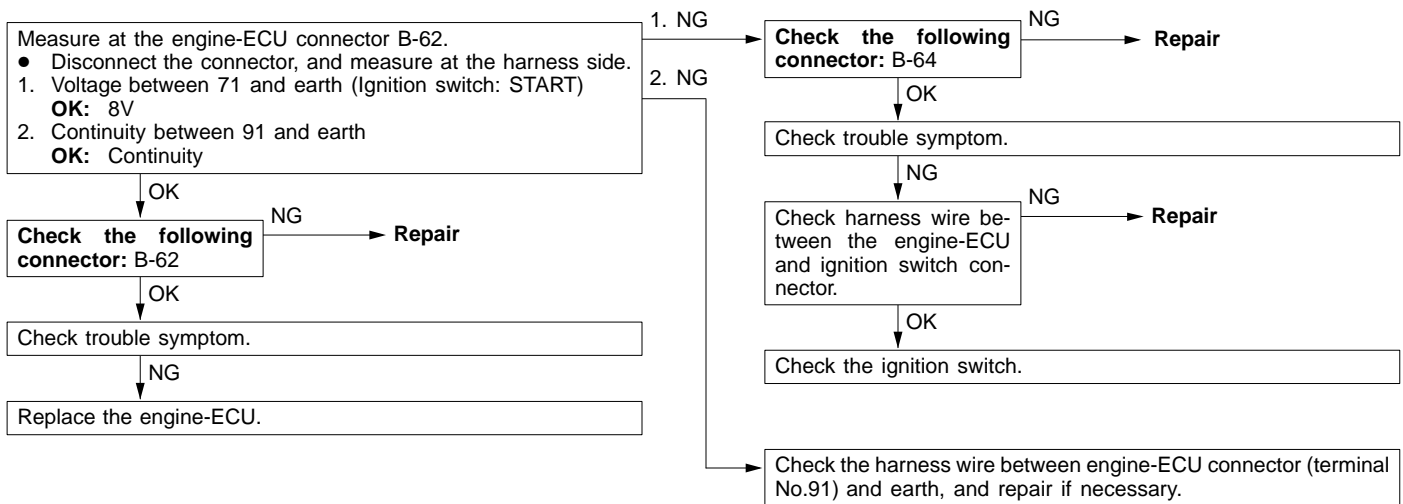


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

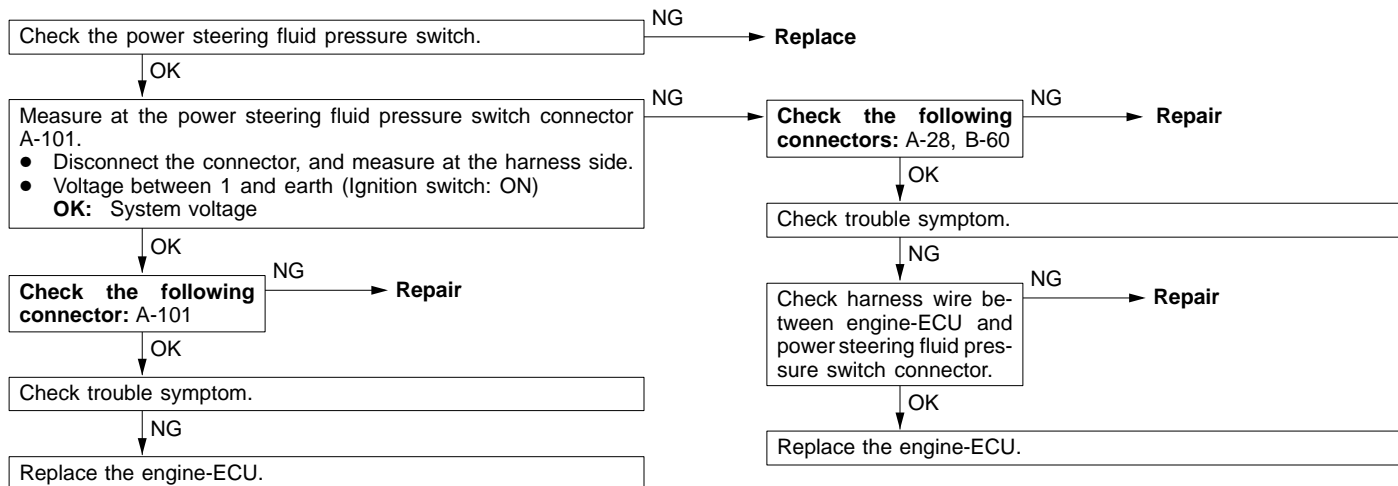
**INSPECTION PROCEDURE 27**

Ignition switch-ST system	Probable cause
The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking. The engine-ECU controls fuel injection, etc. during starting based on this input.	<ul style="list-style-type: none"> <li>● Malfunction of ignition switch</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of the engine-ECU</li> </ul>



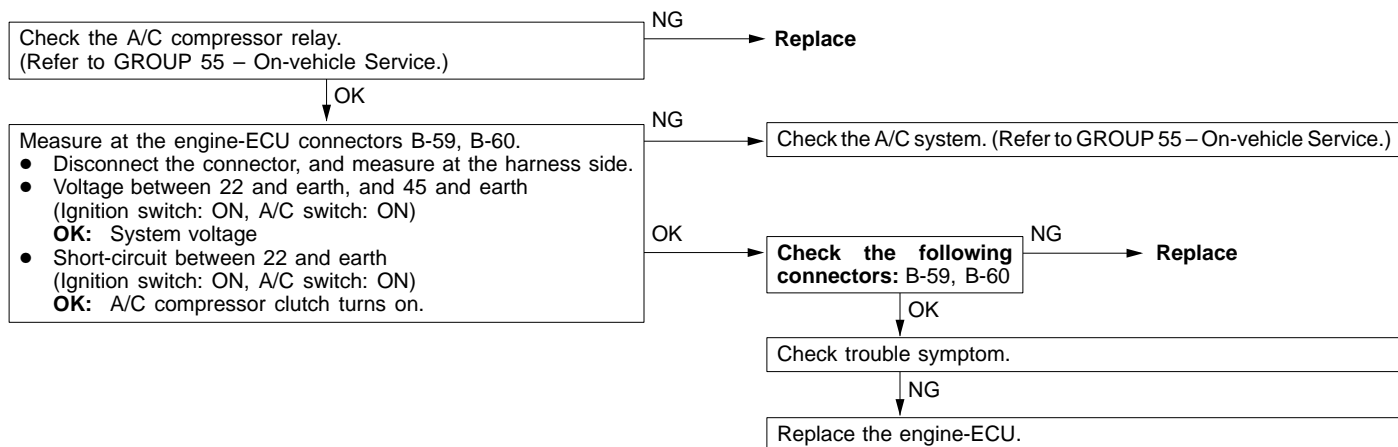
**INSPECTION PROCEDURE 28**

Power steering fluid pressure switch system	Probable cause
The presence or absence of power steering load is input to the engine-ECU. The engine-ECU controls the idle speed control (ISC) servo based on this input.	<ul style="list-style-type: none"> <li>• Malfunction of power steering fluid pressure switch</li> <li>• Improper connector contact, open or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



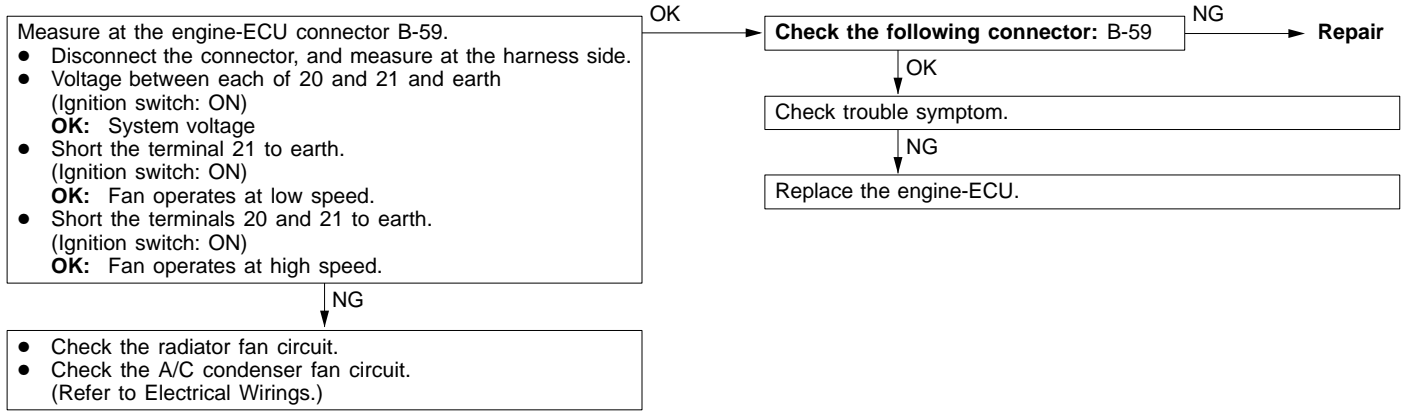
**INSPECTION PROCEDURE 29**

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine-ECU, the engine-ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	<ul style="list-style-type: none"> <li>• Malfunction of A/C control system</li> <li>• Malfunction of A/C switch</li> <li>• Improper connector contact, open or short-circuited harness wire</li> <li>• Malfunction of the engine-ECU</li> </ul>



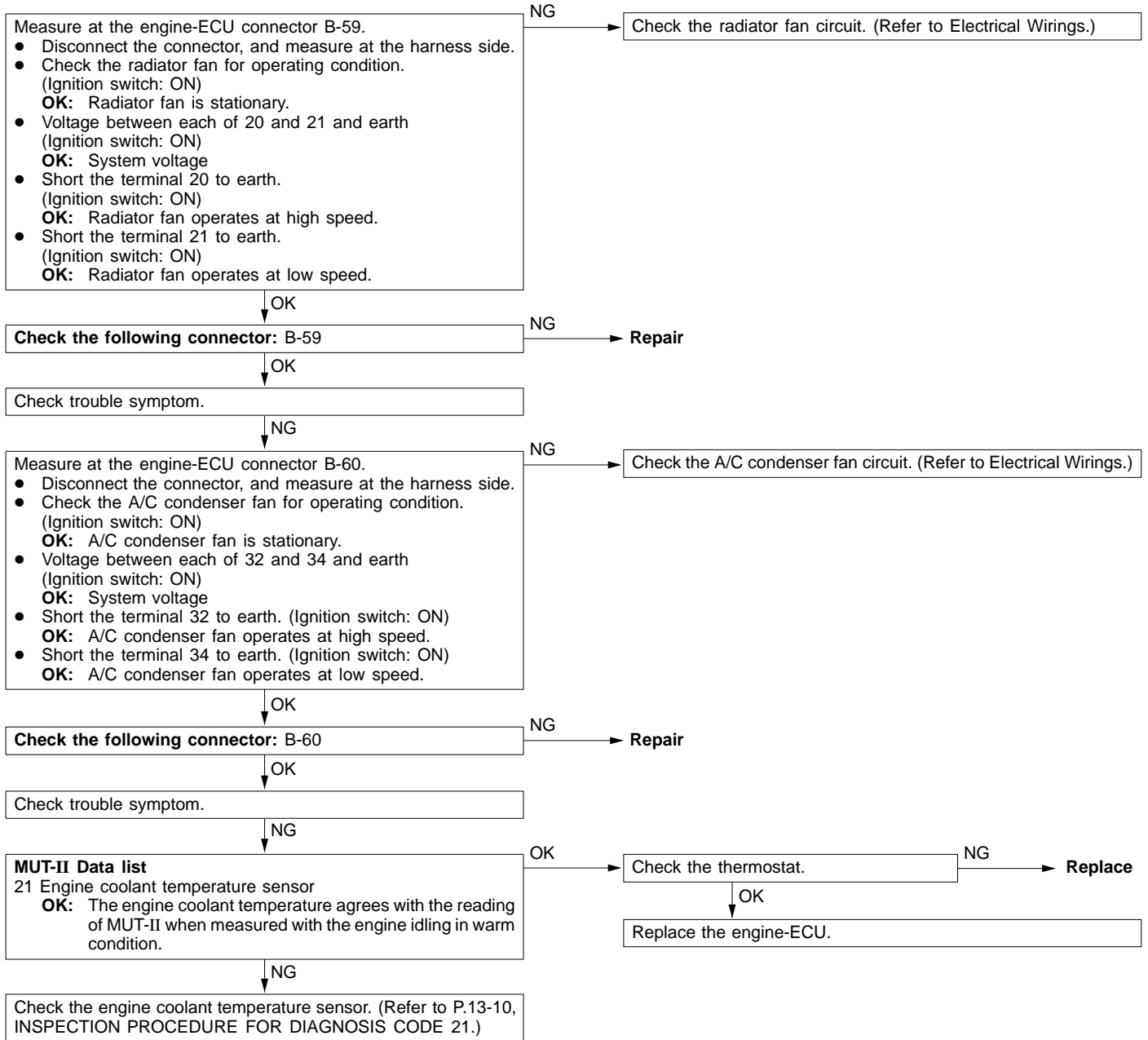
**INSPECTION PROCEDURE 30 <EVOLUTION-IV, EVOLUTION-V>**

Fan motor relay system (Radiator fan, A/C condenser fan)	Probable cause
The engine-ECU turns on/off the built-in power transistor to control the fan motor relay.	<ul style="list-style-type: none"> <li>● Malfunction of the fan motor relay</li> <li>● Malfunction of the fan motor</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of engine-ECU</li> </ul>



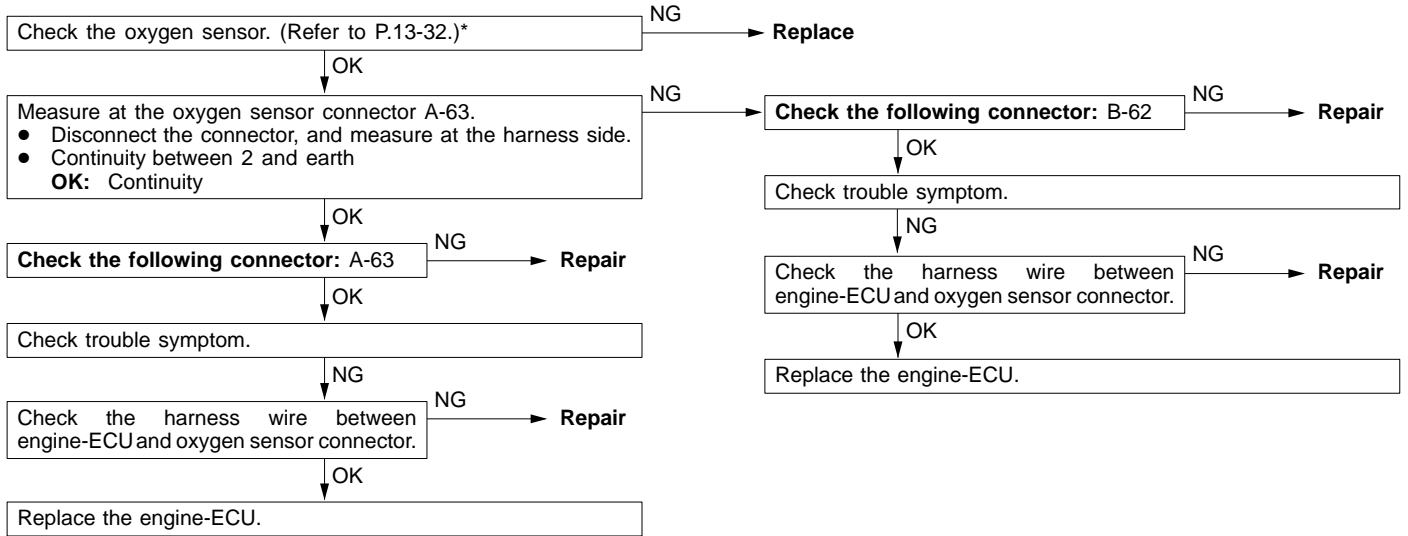
**INSPECTION PROCEDURE 30 <EVOLUTION-VI>**

Fan motor relay system (Radiator fan, A/C condenser fan)	Probable cause
The engine-ECU turns on/off the built-in power transistor to control the fan motor relay.	<ul style="list-style-type: none"> <li>● Malfunction of the fan motor relay</li> <li>● Malfunction of the fan motor</li> <li>● Malfunction of thermostat</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of engine-ECU</li> </ul>



**INSPECTION PROCEDURE 31 <EVOLUTION-IV>**

Oxygen sensor system	Probable cause
When CO or HC concentration is too high, the malfunction of the parts shown at right may be the cause. <ul style="list-style-type: none"> <li>• The oxygen sensor detects the density of oxygen in exhaust gas and inputs it to the engine-ECU after converting into a voltage signal.</li> <li>• The engine-ECU controls the fuel injection amount based on this signal such that the stoichiometric air/fuel mixture ratio can be obtained.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of oxygen sensor</li> <li>• Improper connector contact, open or short-circuited harness wire</li> <li>• Malfunction of engine-ECU</li> </ul>

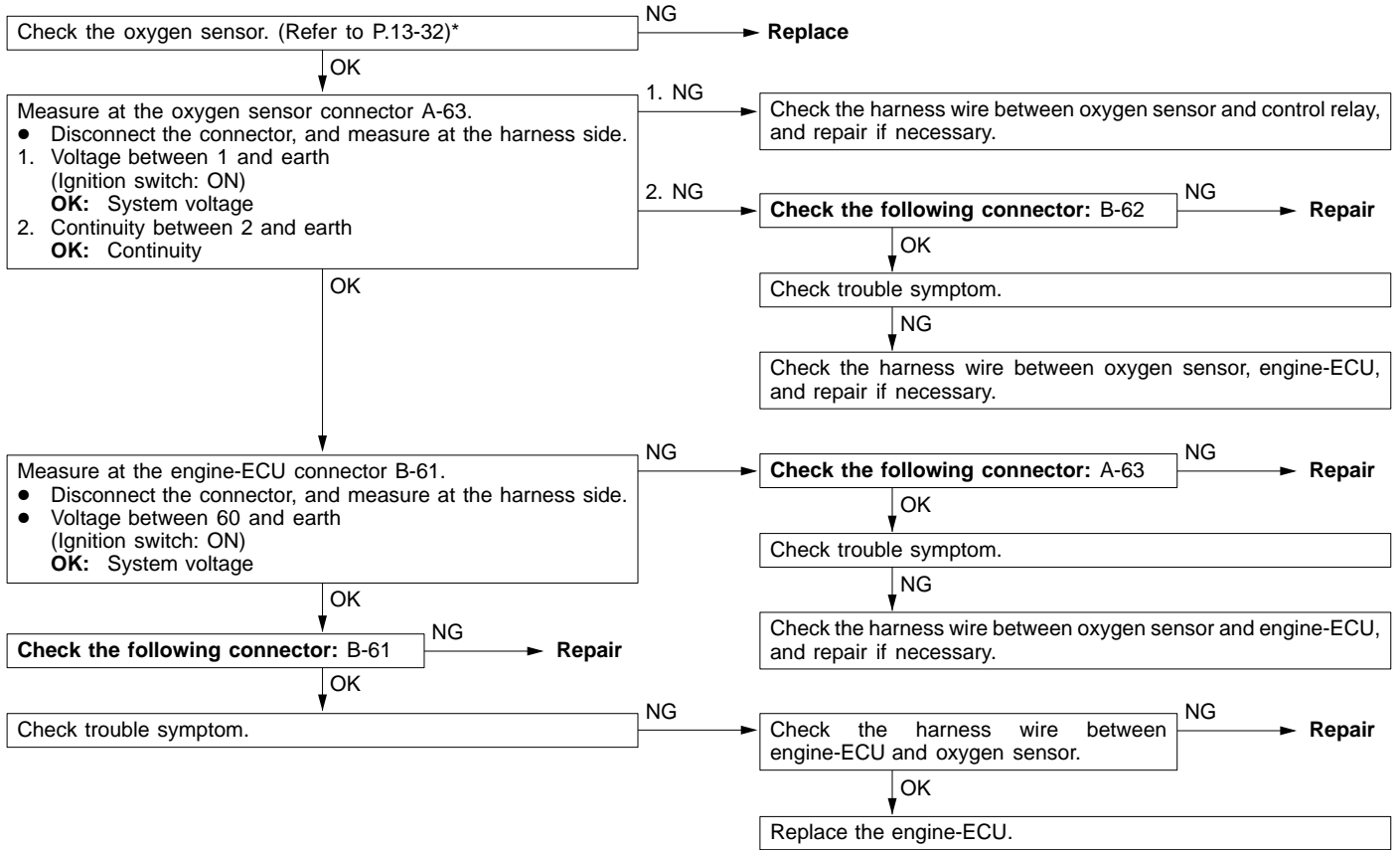


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 31 <EVOLUTION-V, EVOLUTION-VI>**

Oxygen sensor system	Probable cause
When CO or HC concentration is too high, the malfunction of the parts shown at right may be the cause. <ul style="list-style-type: none"> <li>• The oxygen sensor detects the density of oxygen in exhaust gas and inputs it to the engine-ECU after converting into a voltage signal.</li> <li>• The engine-ECU controls the fuel injection amount based on this signal such that the stoichiometric air/fuel mixture ratio can be obtained.</li> </ul>	<ul style="list-style-type: none"> <li>• Malfunction of oxygen sensor</li> <li>• Improper connector contact, open or short-circuited harness wire</li> <li>• Malfunction of engine-ECU</li> </ul>

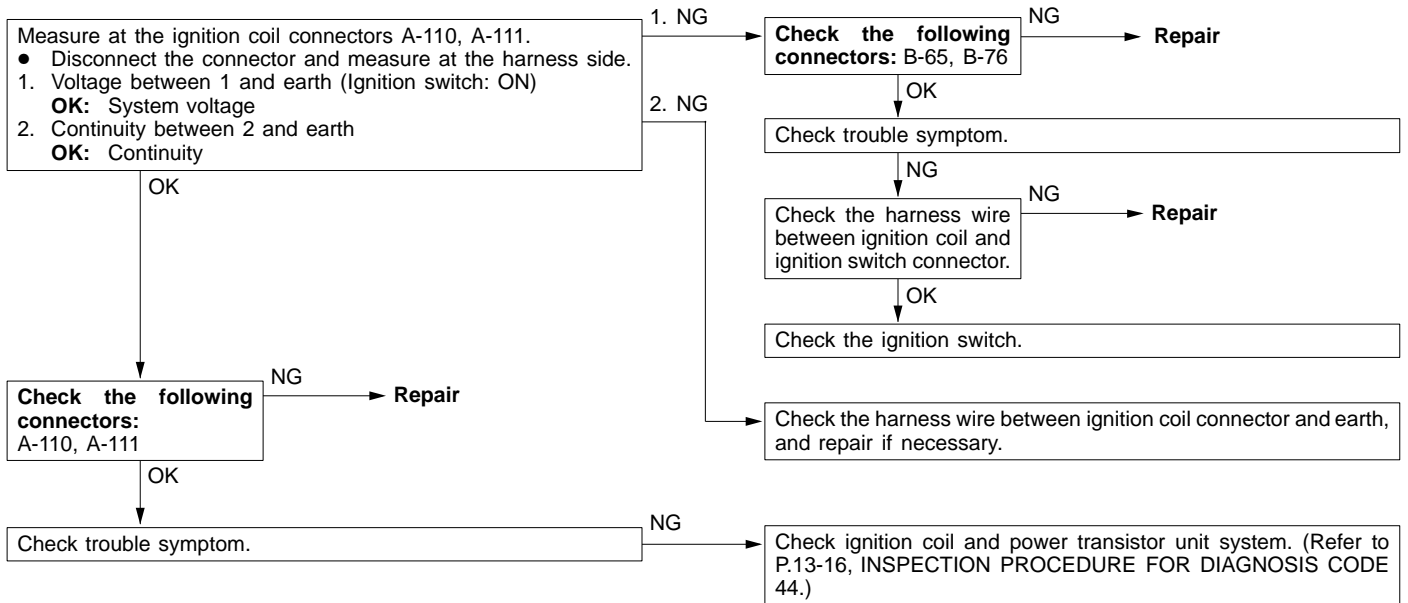


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

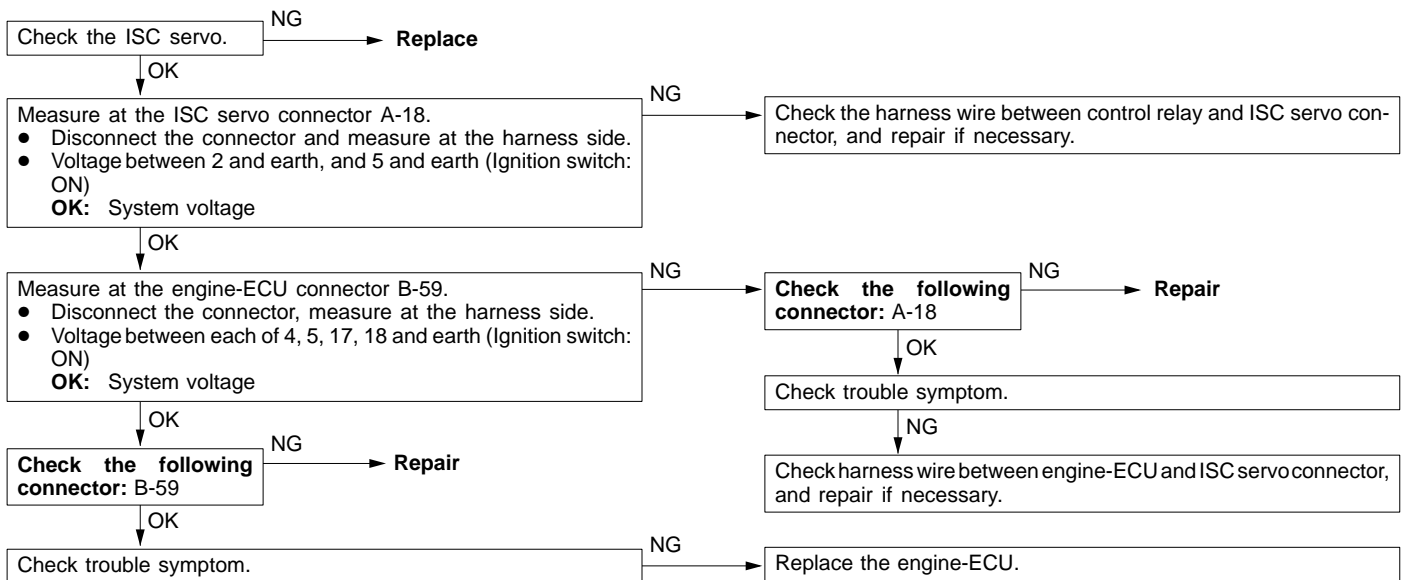
**INSPECTION PROCEDURE 32**

Ignition circuit system	Probable cause
The engine-ECU interrupts the ignition coil primary current by turning the power transistor inside the engine-ECU ON and OFF.	<ul style="list-style-type: none"> <li>● Malfunction of ignition switch.</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of the engine-ECU</li> </ul>



**INSPECTION PROCEDURE 33**

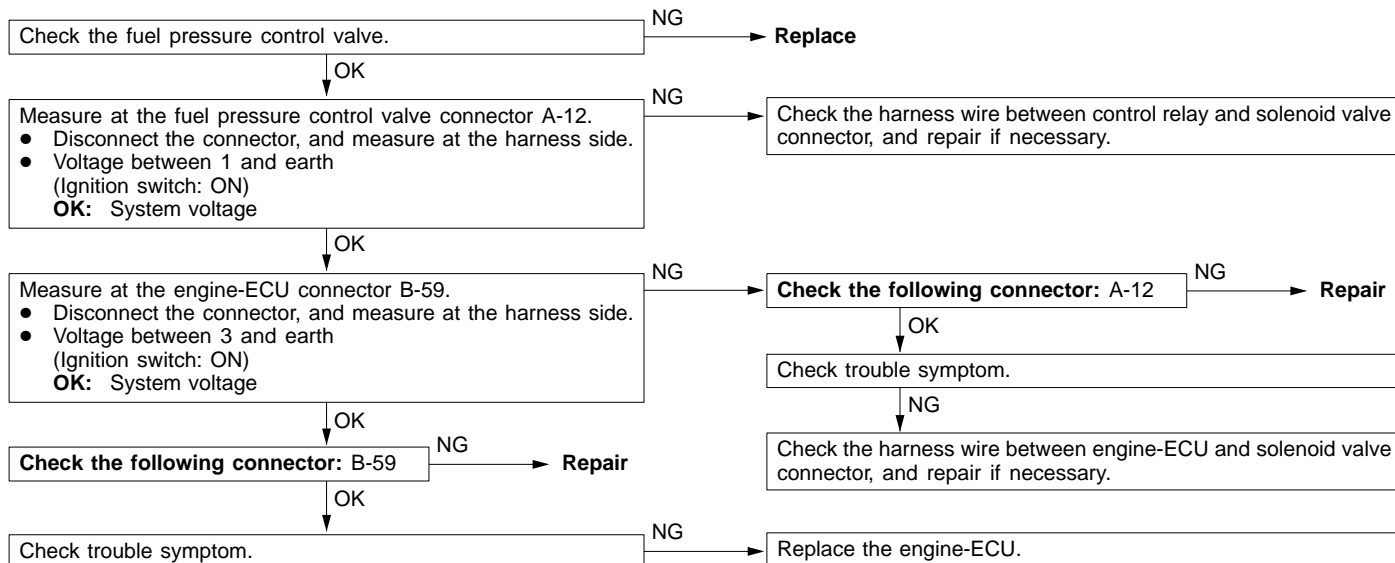
Idle speed control (ISC) servo (Stepper motor) system	Probable cause
The engine-ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	<ul style="list-style-type: none"> <li>● Malfunction of ISC servo</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of the engine-ECU</li> </ul>





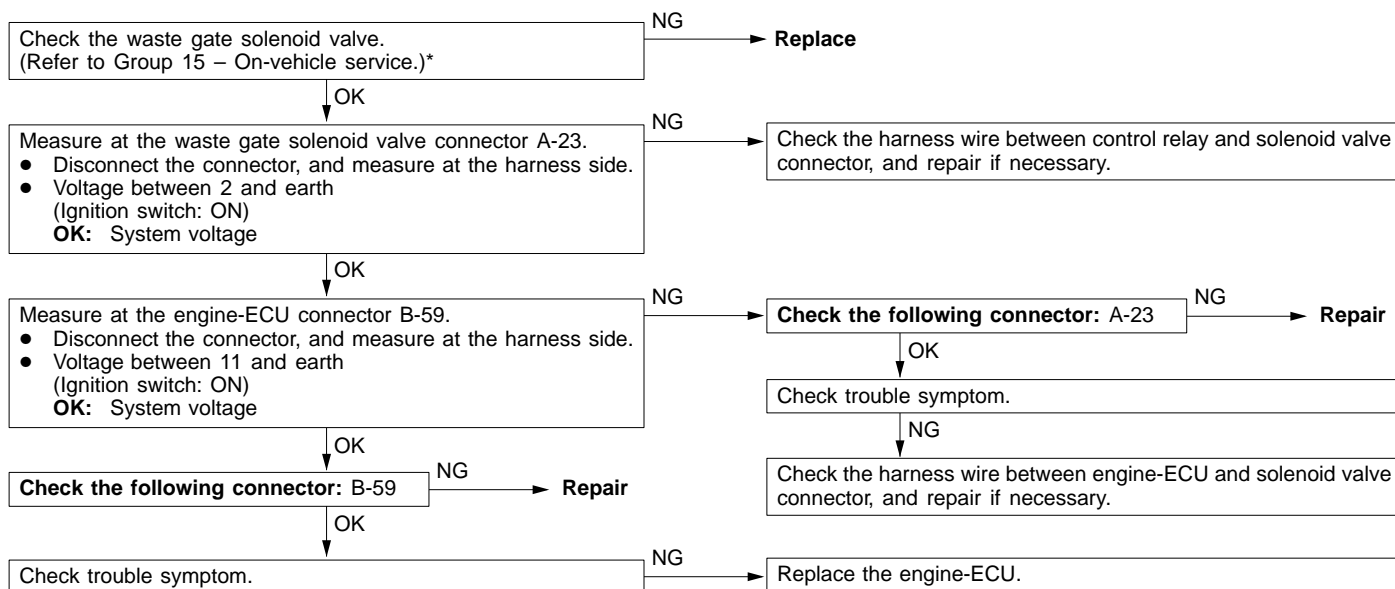
**INSPECTION PROCEDURE 34**

Fuel pressure control valve system	Probable cause
The fuel pressure control valve switches the pressure introduction into the fuel pressure regulator between the intake manifold and atmosphere.	<ul style="list-style-type: none"> <li>● Malfunction of solenoid valve</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of engine-ECU</li> </ul>



**INSPECTION PROCEDURE 35**

Waste gate solenoid valve	Probable cause
The waste gate solenoid valve controls the boost pressure introduced into the waste gate actuator in the turbocharger.	<ul style="list-style-type: none"> <li>● Malfunction of solenoid valve</li> <li>● Improper connector contact, open or short-circuited harness wire</li> <li>● Malfunction of engine-ECU</li> </ul>

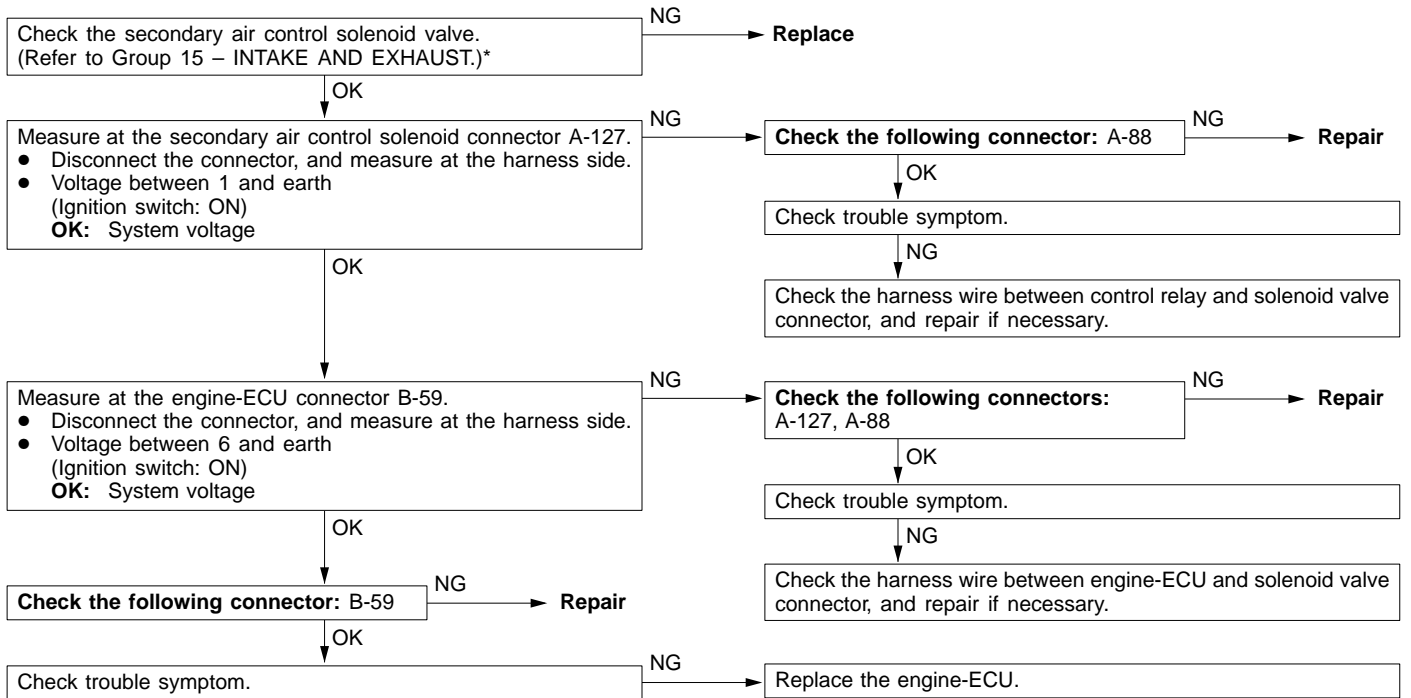


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

INSPECTION PROCEDURE 36

Secondary air control solenoid valve system	Probable cause
The secondary air control solenoid valve switches the pressure introduction into the secondary air valve between the intake manifold and atmosphere.	<ul style="list-style-type: none"> <li>• Malfunction of solenoid valve</li> <li>• Improper connector contact, open or short-circuited harness wire</li> <li>• Malfunction of engine-ECU</li> </ul>

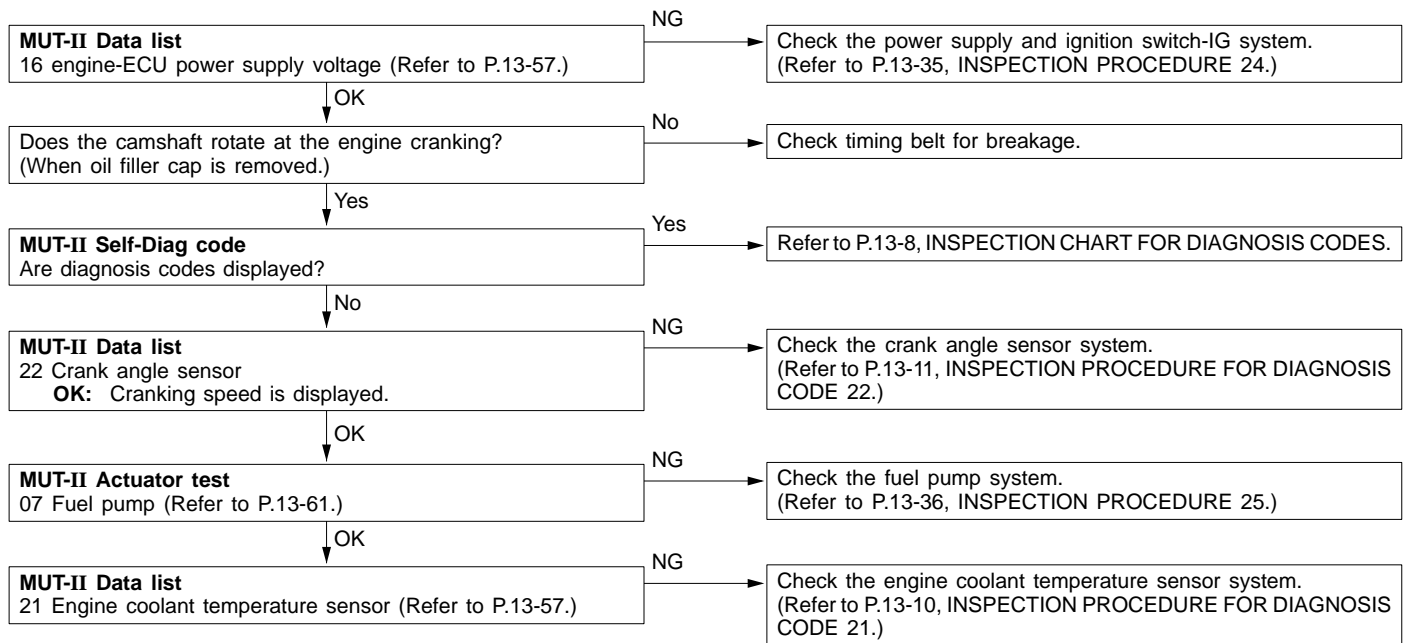


NOTE

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

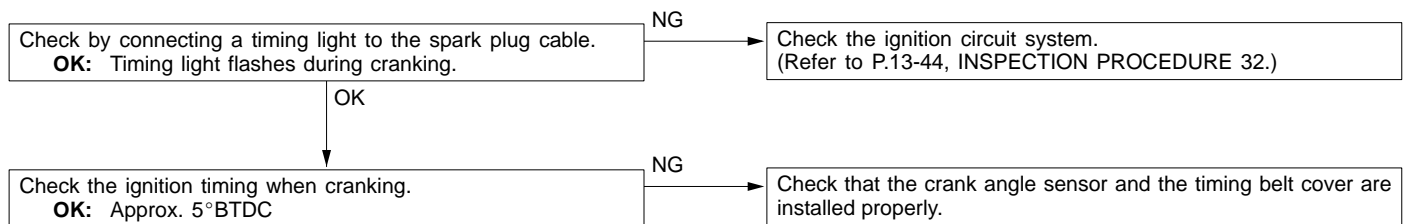
**INSPECTION PROCEDURE 37**

**MUT-II: Inspection of no initial combustion**



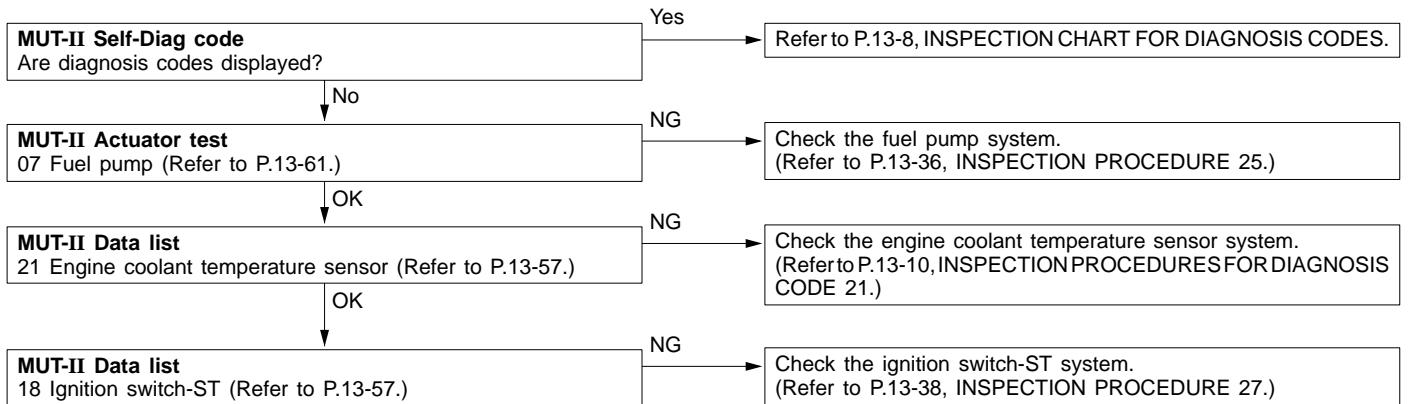
**INSPECTION PROCEDURE 38**

**Ignition system: Inspection of no initial combustion.**



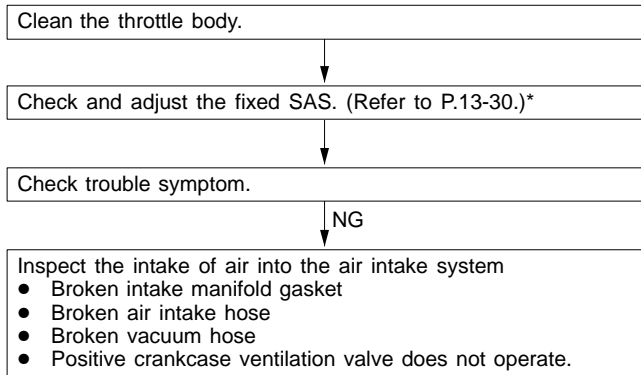
**INSPECTION PROCEDURE 39**

**MUT-II: Check if incomplete combustion occurs.**



**INSPECTION PROCEDURE 40**

**Check if hunting occurs.**

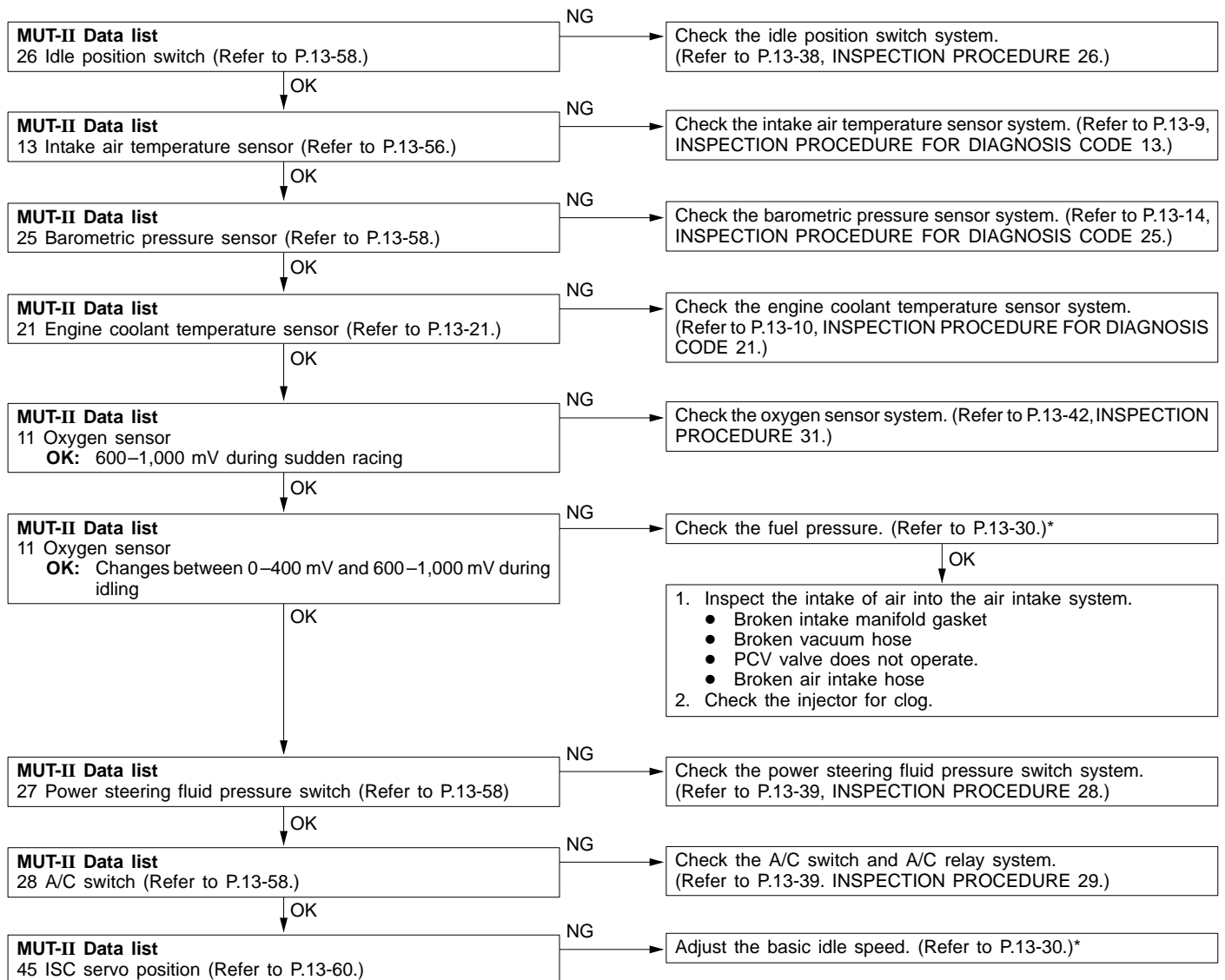


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 41**

**MUT-II: Check if idling speed is unstable.**

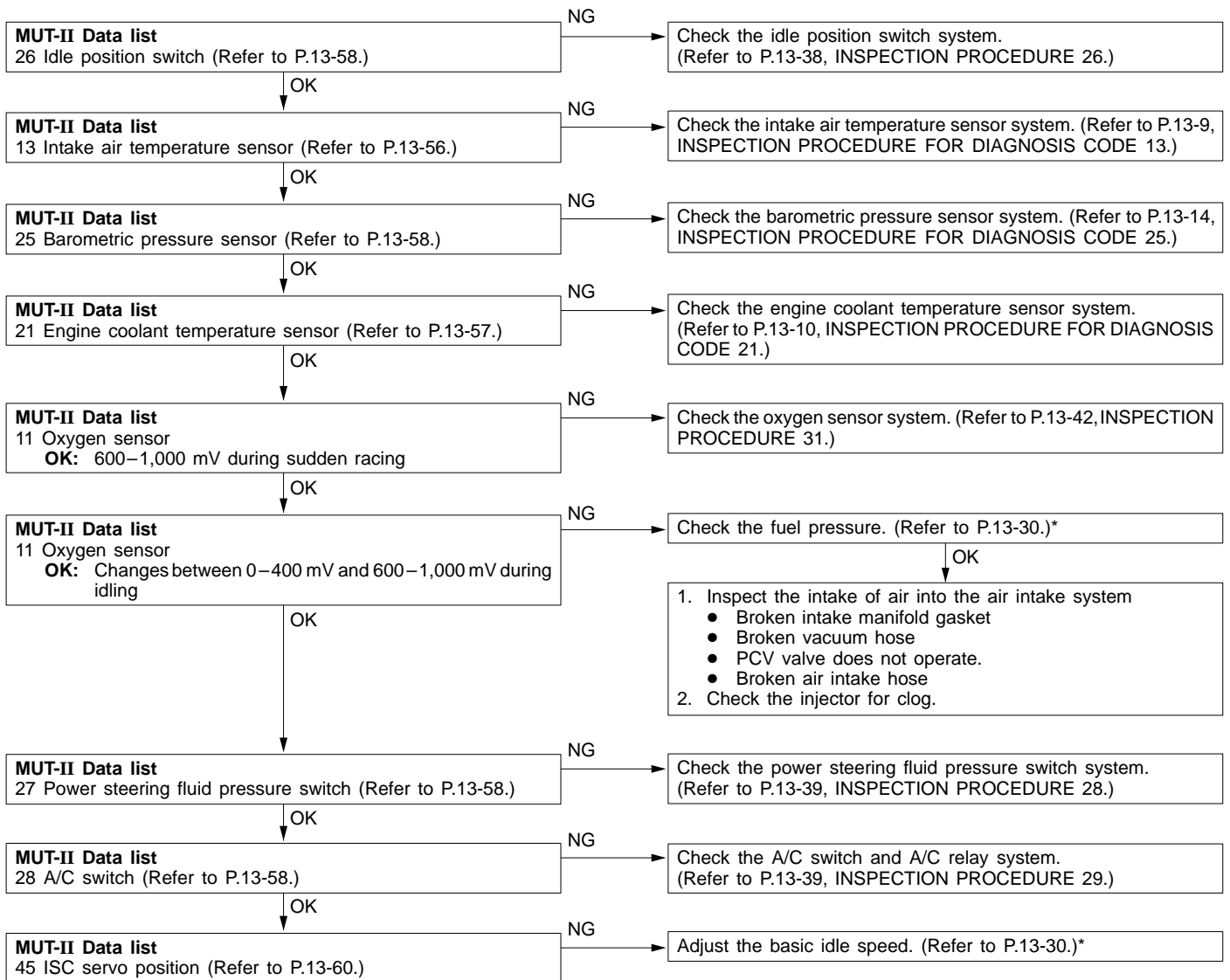


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

INSPECTION PROCEDURE 42

**MUT-II: Engine stalling inspection when the engine is warmed up and idling.**

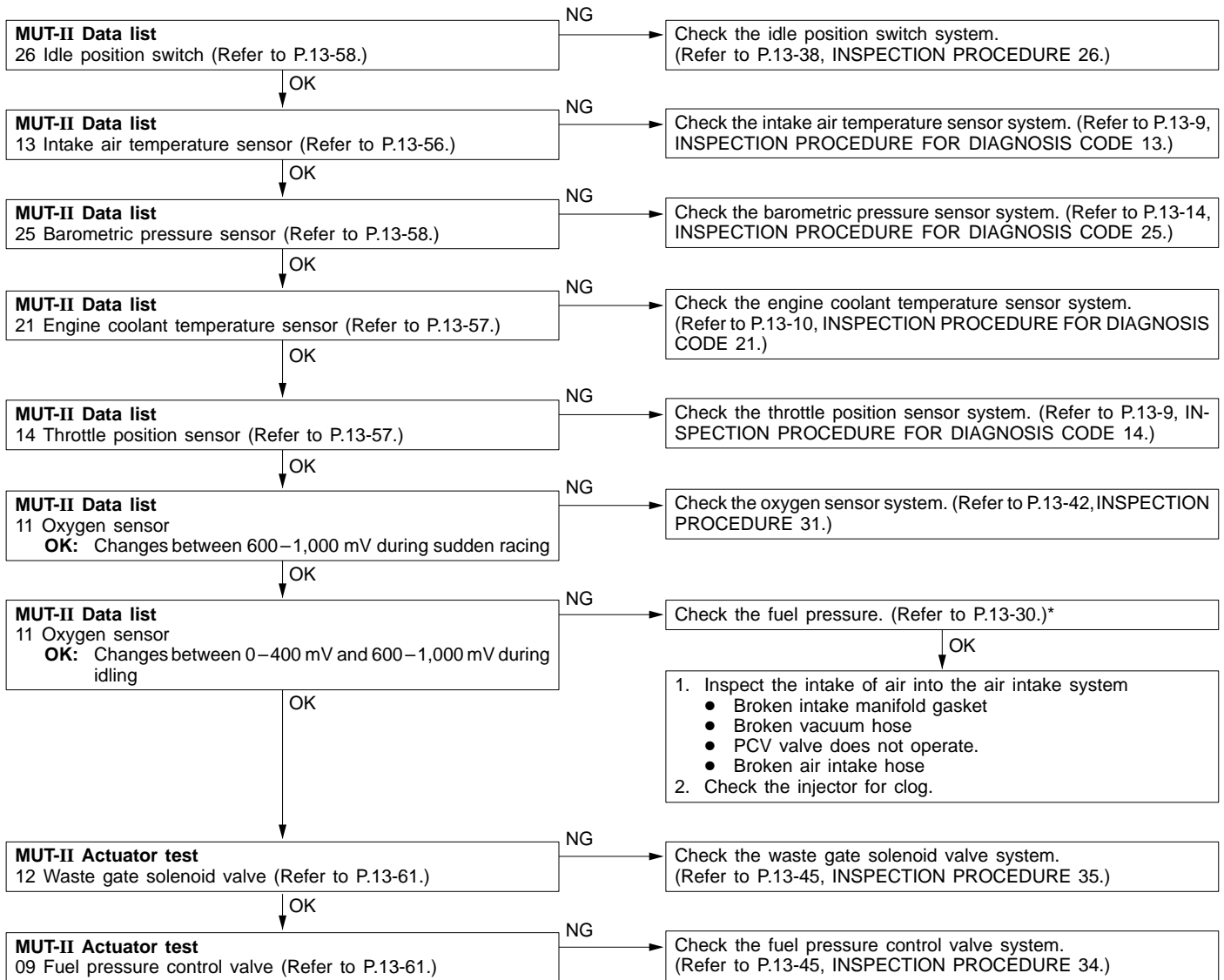


NOTE

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 43**

**MUT-II: Check if hesitation, sag, stumble or poor acceleration occurs.**

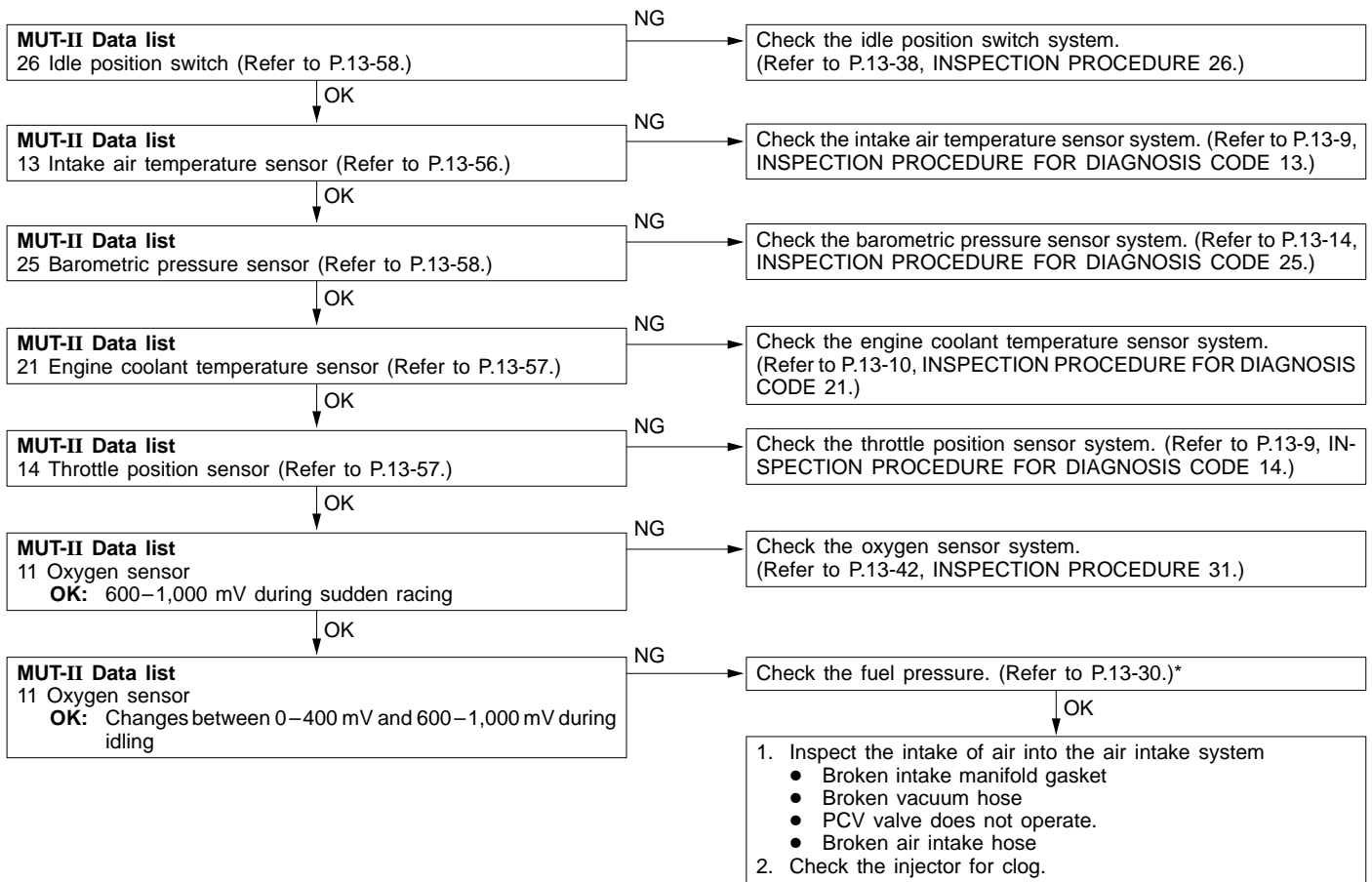


**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).

**INSPECTION PROCEDURE 44**

**MUT-II: Check if surge occurs.**



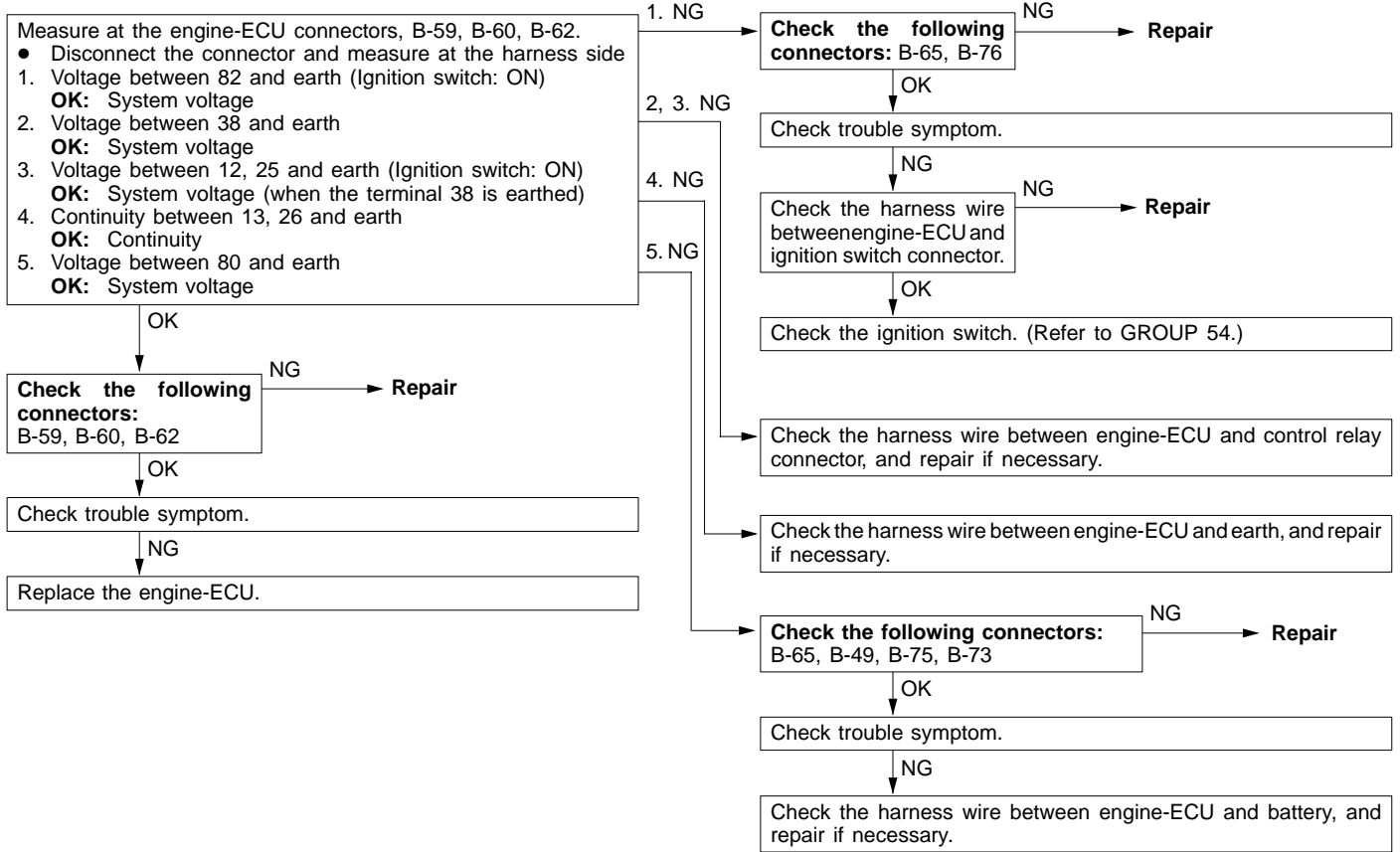
**NOTE**

\*: Refer to Workshop Manual for LANCER EVOLUTION-IV and EVOLUTION-V (Pub. No. S9806CNCP9).



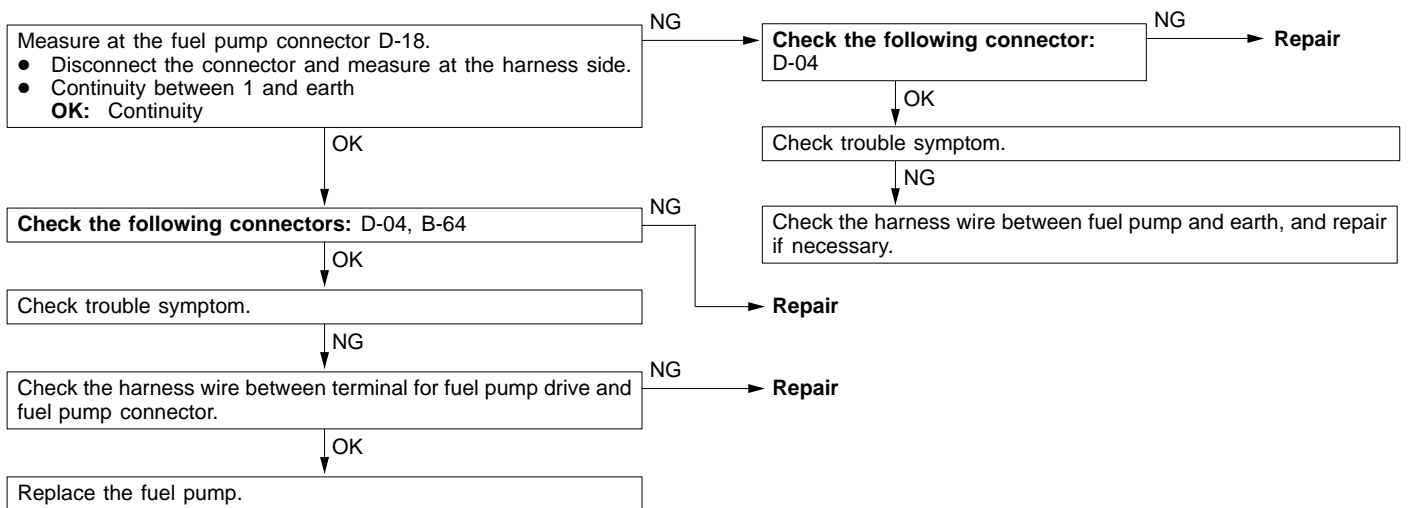
**INSPECTION PROCEDURE 45**

**Check the engine-ECU power supply and earth circuit.**



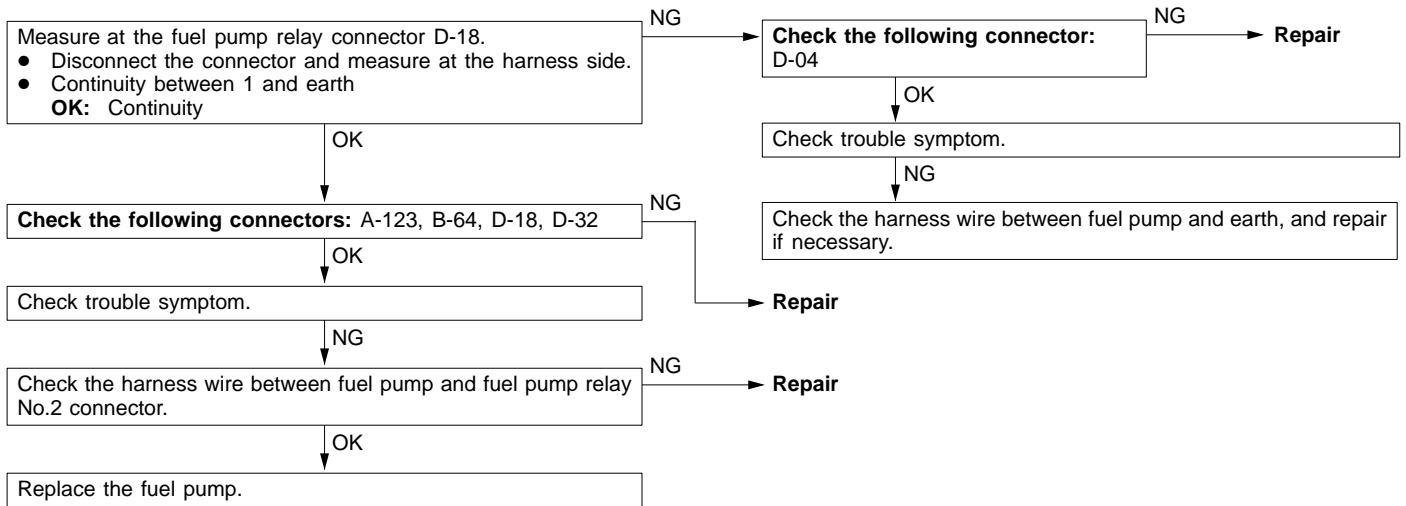
**INSPECTION PROCEDURE 46 <EVOLUTION-IV, EVOLUTION-V>**

**Check fuel pump circuit.**



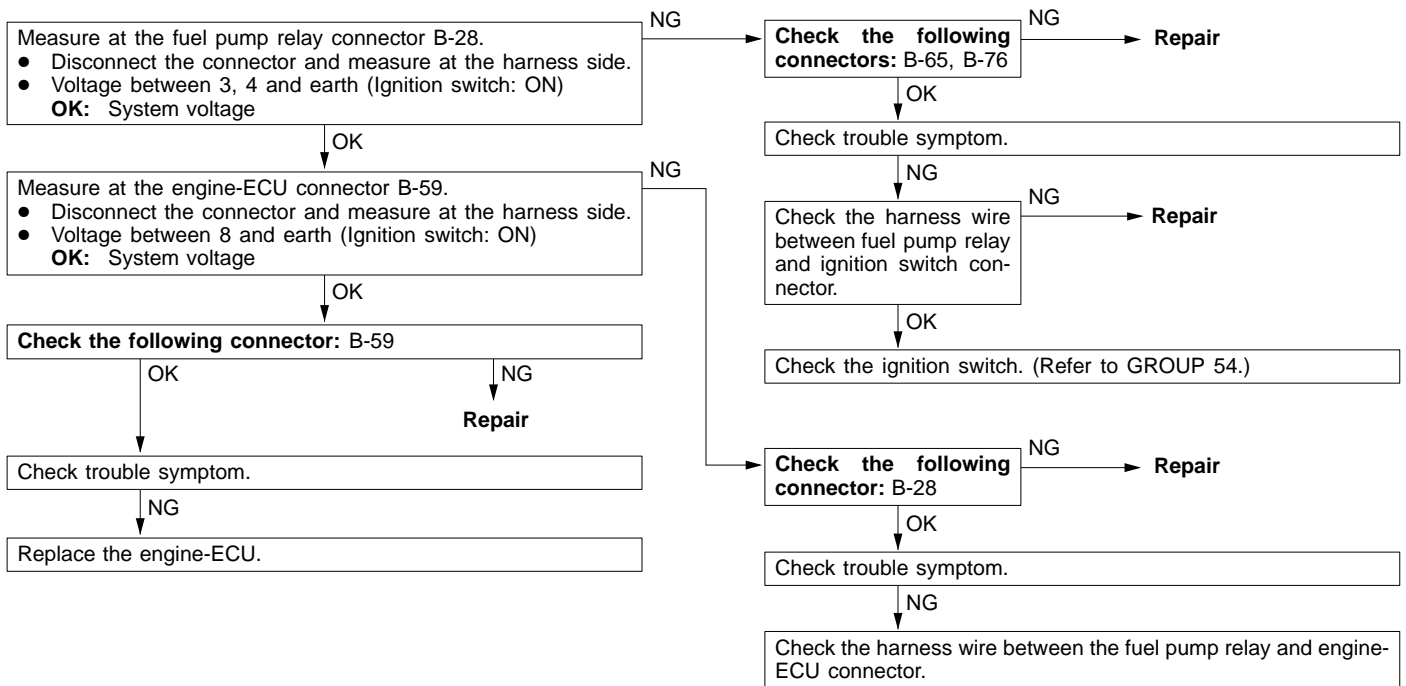
**INSPECTION PROCEDURE 46 <EVOLUTION-VI>**

**Check fuel pump circuit.**



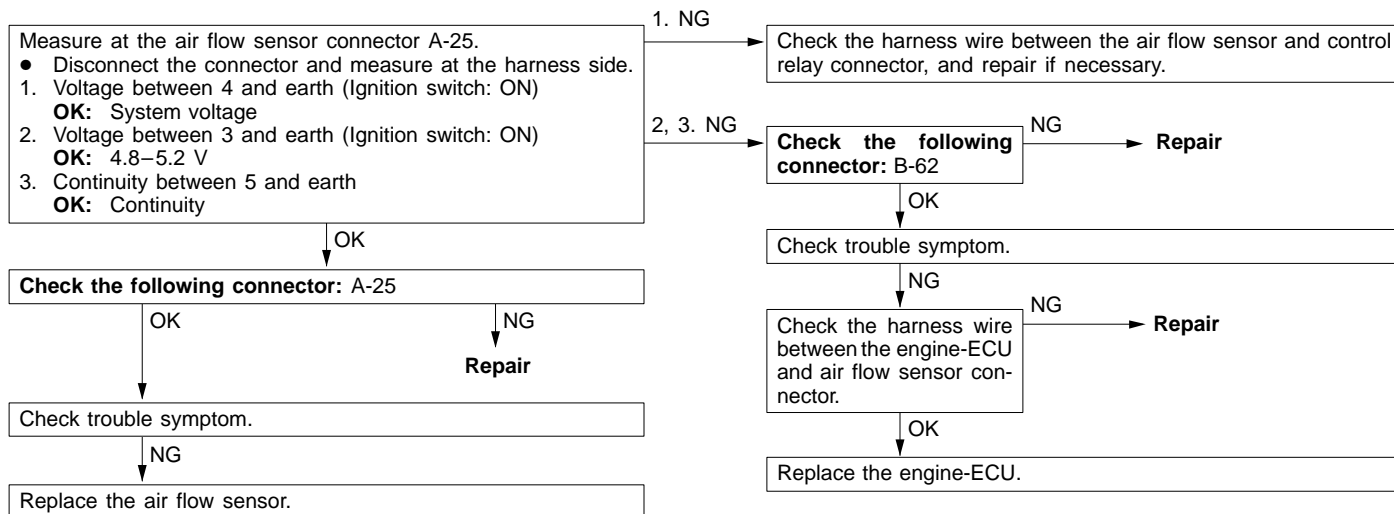
**INSPECTION PROCEDURE 47**

**Check the fuel pump drive control circuit.**



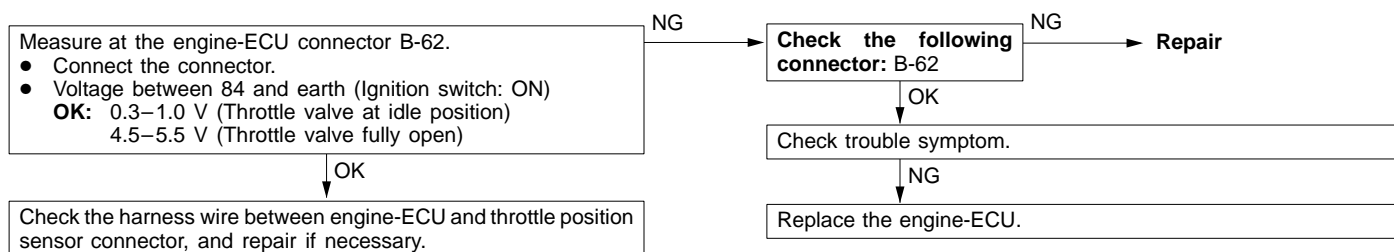
**INSPECTION PROCEDURE 48**

**Check air flow sensor control circuit.**



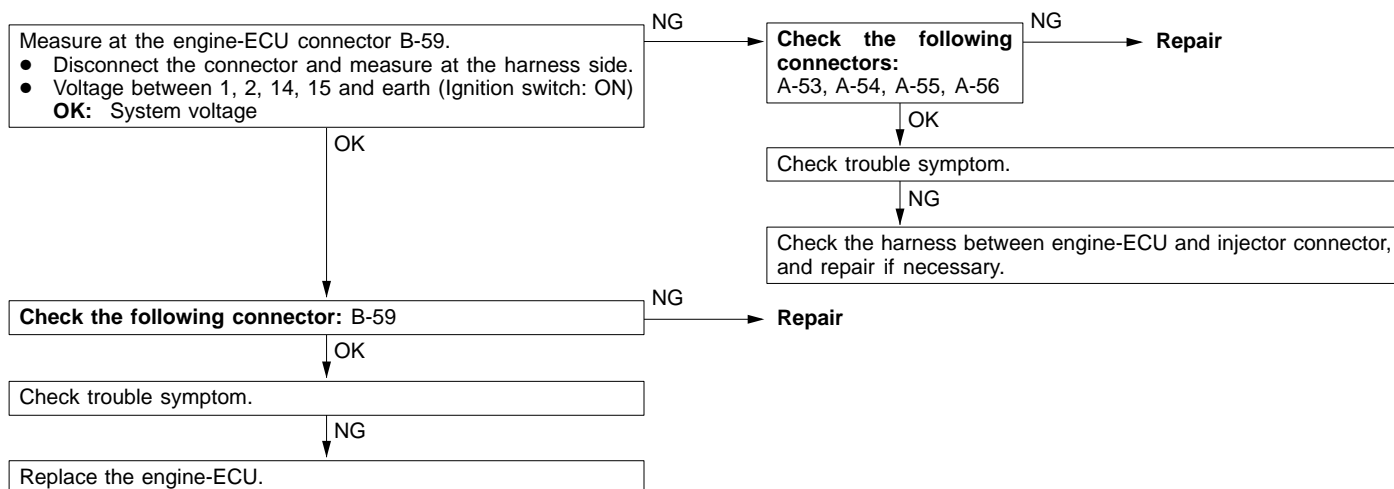
**INSPECTION PROCEDURE 49**

**Check throttle position sensor output circuit.**



**INSPECTION PROCEDURE 50**

**Check injector control circuit.**



## DATA LIST REFERENCE TABLE

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine:After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Procedure No. 31	13-42
			When engine is suddenly raced	600 – 1,000 mV		
		Engine:After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes)		
			2,500 r/min	600 – 1,000 mV		
12	Air flow sensor* <EVOLUTION-IV>	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95°C</li> <li>• Lamps, electric cooling fan and all accessories: OFF</li> <li>• Transmission: Neutral (A/T: P range)</li> </ul>	Engine is idling	17 – 43 Hz	–	–
			2,500 r/min	46 – 86 Hz		
			Engine is raced	Frequency increases in response to racing		
12	Air flow sensor* <EVOLUTION-V, VI>	<ul style="list-style-type: none"> <li>• Engine coolant temperature: 80 – 95°C</li> <li>• Lamps, electric cooling fan and all accessories: OFF</li> <li>• Transmission: Neutral (A/T: P range)</li> </ul>	Engine is idling	12 – 38 Hz	–	–
			2,500 r/min	36 – 76 Hz		
			Engine is raced	Frequency increases in response to racing		
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is –20°C	–20°C	Code No. 13	13-9
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		

## NOTE

\*: In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10% higher than the standard frequency.

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	13-9
			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	13-35	
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27	13-38
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is $-20^{\circ}\text{C}$	$-20^{\circ}\text{C}$	Code No. 21	13-10
			When engine coolant temperature is $0^{\circ}\text{C}$	$0^{\circ}\text{C}$		
			When engine coolant temperature is $20^{\circ}\text{C}$	$20^{\circ}\text{C}$		
			When engine coolant temperature is $40^{\circ}\text{C}$	$40^{\circ}\text{C}$		
			When engine coolant temperature is $80^{\circ}\text{C}$	$80^{\circ}\text{C}$		

Item No.	Inspection item	Inspection contents	Normal condition	Inspection procedure No.	Reference page	
22	Crank angle sensor	<ul style="list-style-type: none"> <li>● Engine: Cranking</li> <li>● Tachometer: Connected</li> </ul>	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	–	–
		<ul style="list-style-type: none"> <li>● Engine: Idling</li> <li>● Idle position switch: ON</li> </ul>	When engine coolant temperature is –20°C	1,300 – 1,500 rpm		
			When engine coolant temperature is 0°C	1,300 – 1,500 rpm		
			When engine coolant temperature is 20°C	1,300 – 1,500 rpm		
			When engine coolant temperature is 40°C	1,150 – 1,350 rpm		
When engine coolant temperature is 80°C	750 – 950 rpm					
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13-14
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON (Check by operating accelerator pedal repeatedly.)	Throttle valve: Set to idle position	ON	Procedure No. 26	13-38
			Throttle valve: Slightly open	OFF*		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 28	13-39
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13-39
			A/C switch: ON	ON		

## NOTE

\*: The idle position switch normally turns off when the voltage of the throttle position sensor is 50 – 100 mV higher than the voltage at the idle position. If the throttle position switch turns back on after the throttle valve has opened, the idle position switch and the throttle position sensor need to be adjusted.

Item No.	Inspection item	Inspection contents	Normal condition	Inspection procedure No.	Reference page	
41	Injectors* <sup>1</sup> <EVOLUTION-IV>	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	27 – 41 ms	–	–
			When engine coolant temperature is 20°C	14 – 22 ms		
			When engine coolant temperature is 80°C	3.9 – 5.9 ms		
	Injectors* <sup>2</sup> <EVOLUTION-IV>	<ul style="list-style-type: none"> <li>● Engine coolant temperature: 80–95°C</li> <li>● Lamps, electric cooling fan and all accessories: OFF</li> <li>● Transmission: Neutral (A/T : P range)</li> </ul>	Engine is idling	1.2 – 2.4 ms		
			2,500 r/min	1.0 – 2.2 ms		
			When engine is suddenly raced	Increases		
41	Injectors* <sup>1</sup> <EVOLUTION-V, VI>	Engine: Cranking	When engine coolant temperature is 0°C	27 – 40 ms	–	–
			When engine coolant temperature is 20°C	14.5 – 21.7 ms		
			When engine coolant temperature is 80°C	3.8 – 5.6 ms		
	Injectors* <sup>2</sup> <EVOLUTION-V, VI>	<ul style="list-style-type: none"> <li>● Engine coolant temperature: 80–95°C</li> <li>● Lamps, electric cooling fan and all accessories: OFF</li> <li>● Transmission: Neutral (A/T : P range)</li> </ul>	Engine is idling	0.9 – 2.1 ms		
			2,500 r/min	0.7 – 1.9 ms		
			When engine is suddenly raced	Increases		

## NOTE

\*1: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.

\*2: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.

Item No.	Inspection item	Inspection contents	Normal condition	Inspection procedure No.	Reference page	
44	Ignition coils and power transistors <EVOLUTION-IV>	<ul style="list-style-type: none"> <li>Engine: After having warmed up</li> <li>Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)</li> </ul>	Engine is idling	3°ATDC – 13°BTDC	–	–
			2,500 r/min	24 – 44°BTDC		
44	Ignition coils and power transistors <EVOLUTION-V, VI>	<ul style="list-style-type: none"> <li>Engine: After having warmed up</li> <li>Timing lamp is set.</li> </ul>	Engine is idling	0 – 13°BTDC	–	–
			2,500 r/min	24 – 44°BTDC		
45	ISC (stepper) motor position *	<ul style="list-style-type: none"> <li>Engine coolant temperature: 80 – 90°C</li> <li>Lamps, electric cooling fan and all accessories: OFF</li> <li>Transmission: Neutral (A/T : P range)</li> <li>Idle position switch: ON</li> <li>Engine: Idling</li> <li>When A/C switch is ON, A/C compressor should be operating</li> </ul>	A/C switch: OFF	2 – 25 steps	–	–
			A/C switch: OFF → ON	Increases by 10 – 70 steps		
			<ul style="list-style-type: none"> <li>A/C switch: OFF</li> <li>Select lever: N range → D range</li> </ul>	Increases by 5 – 50 steps		
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29	13-39
			A/C switch: ON	ON (Compressor clutch is operating)		

## NOTE

\*: In a new vehicle [driven approximately 500 km or less], the stepper motor has sometimes 30 steps greater than the standard value.

**Caution**

**When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.**



## 8. ACTUATOR TEST REFERENCE TABLE

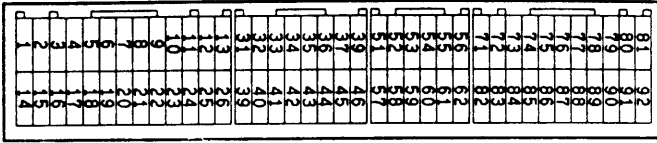
Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page	
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)	Idling condition becomes different (becomes unstable, resulting in engine stall).	Code No. 41	13-15	
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	<ul style="list-style-type: none"> <li>● Engine: Cranking</li> <li>● Fuel pump: Forced driving</li> </ul> Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 25	13-36
				Listen near the fuel tank for the sound of fuel pump operation.			
09	Fuel pressure control valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Procedure No. 34	13-45	
12	Waste gate solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Procedure No. 35	13-45	
13	Fuel pump relay No.2	Turn fuel pump relay No.2 from OFF to ON.	<ul style="list-style-type: none"> <li>● Ignition switch: ON</li> <li>● Listen to pump operation sound near fuel tank.</li> </ul>	Sound of operation can be heard.	Procedure No. 25	13-36	
17	Basic ignition timing	Set to ignition timing adjustment mode	<ul style="list-style-type: none"> <li>● Engine: Idling</li> <li>● Timing light is set</li> </ul>	5° BTDC	—	—	

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
20	Radiator fan (HIGH), condenser fan (HIGH)*1	Drive the fan motors (for radiator and condenser*1)	<ul style="list-style-type: none"> <li>● Ignition switch: ON</li> <li>● A/C switch: ON*1</li> </ul>	Fan motors operate at high speed.	Procedure No. 30	13-40
21	Radiator fan (LOW), condenser fan (LOW)*1	Drive the fan motors (for radiator and condenser*1)	<ul style="list-style-type: none"> <li>● Ignition switch: ON</li> <li>● A/C switch: ON*1</li> </ul>	Fan motors operate at low speed.		
36*2	Secondary air control solenoid valve	Turn solenoid valve from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Procedure No. 36	13-46
37*2	A/C condenser fan (HIGH)	Drive A/C condenser fan motor	Ignition switch: ON	A/C condenser fan motor operates at high speed.	Procedure No. 30	13-41
38*2	A/C condenser fan (LOW)	Drive A/C condenser fan motor	Ignition switch: ON	A/C condenser fan motor operates at low speed.		

## NOTE

\*1: EVOLUTION-IV and EVOLUTION-V

\*2: EVOLUTION-VI

**ENGINE-ECU INSPECTION****TERMINAL VOLTAGES****Engine ECU connector**

9FU0393

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No.1 injector	While engine is idling after having been warmed up, suddenly depress the accelerator pedal.	Momentarily drops slightly from 11 – 14 V.
14	No.2 injector		
2	No.3 injector		
15	No.4 injector		
3	Fuel pressure control valve	Ignition switch: ON	System voltage
		Engine: Cranking to idling (within about two minutes)	0 – 3 V to system voltage
4	Stepper motor coil (A1)	Engine: Immediately after engine has been started for warming up	Changes repeatedly from system voltage to 0 – 6 V and from 0 – 6 V to system voltage.
17	Stepper motor coil (A2)		
5	Stepper motor coil (B1)		
18	Stepper motor coil (B2)		
6	Secondary air control solenoid valve	Ignition switch: ON	System voltage
8	Fuel pump relay	Ignition switch: ON	System voltage
		Engine: Idling	0 – 3 V
10	Power transistor unit (A)	Engine speed: 3,000 r/min	0.3 – 3.0 V
23	Power transistor unit (B)		
11	Wastegate solenoid valve	Ignition switch: ON	System voltage
		Engine: At idle after having been warmed up (when premium gasoline is used)	0 – 3 V
12	Power supply	Ignition switch: ON	System voltage
25			
19	Air flow sensor reset signal	Engine: Idling	0 – 1 V
		Engine speed: 3,000 r/min	6 – 9 V
20	Fan motor relay (HI) <EVOLUTION-IV, V>	Fan not operating (coolant temperature: 90°C or below)	System voltage
		Fan at high speed (coolant temperature: 105°C or above)	0 – 3 V

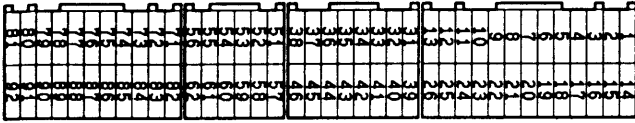
Terminal No.	Check item	Check condition (Engine condition)	Normal condition	
20	Radiator fan motor relay (HI) <EVOLUTION-VI>	Radiator fan not operating (coolant temperature: 95°C or below)	System voltage	
		Radiator fan at high speed (coolant temperature: 105°C or above)	0 – 3 V	
21	Fan motor relay (LOW) <EVOLUTION-IV, V>	Fan not operating (coolant temperature: 95°C or below)	System voltage	
		Fan at low speed (coolant temperature: 95 – 100°C)	0 – 3 V	
21	Radiator fan motor relay (LOW) <EVOLUTION-VI>	Radiator fan not operating (coolant temperature: 95°C or below)	System voltage	
		Radiator fan at low speed (coolant temperature: 95 – 105°C)	0 – 3 V	
22	A/C relay	<ul style="list-style-type: none"> <li>● Engine: Idling</li> <li>● A/C switch: OFF to ON (Compressor is being driven.)</li> </ul>	System voltage, or 6 V or more instantaneously to 0 – 3 V	
32	A/C condenser fan motor relay (HI) <EVOLUTION-VI>	A/C condenser fan not operating (A/C switch: ON, coolant temperature: 105°C or below)	System voltage	
		A/C condenser fan at high speed (A/C switch: ON, coolant temperature: 105°C or above)	0 – 3 V	
33	Alternator G terminal	<ul style="list-style-type: none"> <li>● Engine: Warm, idle (radiator fan: OFF)</li> <li>● Headlamp: OFF to ON</li> <li>● Brake lamp: OFF to ON</li> <li>● Rear defogger switch: OFF to ON</li> </ul>	Voltage rises by 0.2 – 3.5 V.	
34	A/C condenser fan motor relay (LOW) <EVOLUTION-VI>	A/C condenser fan not operating (A/C switch: OFF, coolant temperature: 105°C or below)	System voltage	
		A/C condenser fan at low speed (A/C switch: OFF, coolant temperature: 105°C or above)	0 – 3 V	
36	Engine warning lamp	Ignition switch: OFF → ON	0 – 3 V → System voltage (After several seconds have elapsed)	
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0 – 3 V
38	Control relay	Ignition switch: OFF	System voltage	
		Ignition switch: ON	0 – 3 V	
39	Fuel pump relay No.2	While engine is idling, suddenly depress the accelerator pedal.	Momentarily rises slightly from 0 to 3 V.	
40	Exhaust temperature warning lamp	Ignition switch: OFF to ON	0 – 3 V to system voltage (After several seconds have elapsed)	

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
41	Alternator FR terminal	<ul style="list-style-type: none"> <li>● Engine: Warm, idle (radiator fan: OFF)</li> <li>● Headlamp: OFF to ON</li> <li>● Brake lamp: OFF to ON</li> <li>● Rear defogger switch: OFF to ON</li> </ul>		Voltage drops by 0.2 – 3.5 V.
45	A/C switch	Engine: Idle speed	Turn the A/C switch OFF	0 – 3 V
			Turn the A/C switch ON (A/C compressor is operating)	System voltage
60	Oxygen sensor heater <EVOLUTION-V, VI>	Engine: Idling		0 – 3 V
		Engine speed: 5,000 r/min		System voltage
71	Ignition switch-ST	Engine: Cranking		8 V or more
72	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2 – 3.8 V
			When intake air temperature is 20°C	2.3 – 2.9 V
			When intake air temperature is 40°C	1.5 – 2.1 V
			When intake air temperature is 80°C	0.4 – 1.0 V
76	Oxygen sensor	Engine: Running at 2,000 r/min after having been warmed up (Check using a digital type voltmeter)		0 ↔ 0.8 V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF		System voltage
81	Sensor impressed voltage	Ignition switch: ON		4.5 – 5.5 V
82	Ignition switch-IG	Ignition switch: ON		System voltage
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2 – 3.8 V
			When engine coolant temperature is 20°C	2.3 – 2.9 V
			When engine coolant temperature is 40°C	1.3 – 1.9 V
			When engine coolant temperature is 80°C	0.3 – 0.9 V
84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3 – 1.0 V
			Fully open throttle valve	4.5 – 5.5 V
85	Barometric pressure sensor	Ignition switch: ON	When altitude is 0 m	3.7 – 4.3 V
			When altitude is 1,200 m	3.2 – 3.8 V
86	Vehicle speed sensor	<ul style="list-style-type: none"> <li>● Ignition switch: ON</li> <li>● Move the vehicle slowly forward</li> </ul>		0 ↔ 5 V (Changes repeatedly)

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0 – 1 V
			Slightly open throttle valve	4 V or more
88	Camshaft position sensor	Engine: Cranking		0.4 – 3.0 V
		Engine: Idle speed		0.5 – 2.0 V
89	Crank angle sensor	Engine: Cranking		0.4 – 4.0 V
		Engine: Idle speed		1.5 – 2.5 V
90	Air flow sensor	Engine: Idle speed		2.2 – 3.2 V
		Engine speed: 2,000 r/min		

## RESISTANCE AND CONTINUITY BETWEEN HARNESS SIDE CONNECTORS AND TERMINALS

## Engine-ECU Harness Side Connector Terminal Arrangement



9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1 – 12	No.1 injector	2 – 3 $\Omega$ (At 20°C)
14 – 12	No.2 injector	
2 – 12	No.3 injector	
15 – 12	No.4 injector	
3 – 12	Fuel pressure control valve	28 – 36 $\Omega$ (At 20°C)
4 – 12	Stepper motor coil (A1)	28 – 33 $\Omega$ (At 20°C)
17 – 12	Stepper motor coil (A2)	
5 – 12	Stepper motor coil (B1)	
18 – 12	Stepper motor coil (B2)	
6 – 12	Secondary air control solenoid valve	28 – 36 $\Omega$ (At 20°C)
11 – 12	Wastegate solenoid valve	62 – 74 $\Omega$ (At 20°C)
60 – 12	Oxygen sensor heater <EVOLUTION-V, VI>	11 – 18 $\Omega$ (at 20°C)
13 – Body earth	Engine-ECU earth	Continuity established (0 $\Omega$ )
26 – Body earth		
72 – 92	Intake air temperature sensor	5.3 – 6.7 k $\Omega$ (When intake air temperature is 0°C)
		2.3 – 3.0 k $\Omega$ (When intake air temperature is 20°C)
		1.0 – 1.5 k $\Omega$ (When intake air temperature is 40°C)
		0.30 – 0.42 k $\Omega$ (When intake air temperature is 80°C)
74 – 77	High temperature sensor	3 $\Omega$ or less
83 – 92	Engine coolant temperature sensor	5.1 – 6.5 k $\Omega$ (When coolant temperature is 0°C)
		2.1 – 2.7 k $\Omega$ (When coolant temperature is 20°C)
		0.9 – 1.3 k $\Omega$ (When coolant temperature is 40°C)
		0.26 – 0.36 k $\Omega$ (When coolant temperature is 80°C)
87 – 92	Idle position switch	Continuity established (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91 – Body earth	–	Continuity established

## ON-VEHICLE SERVICE

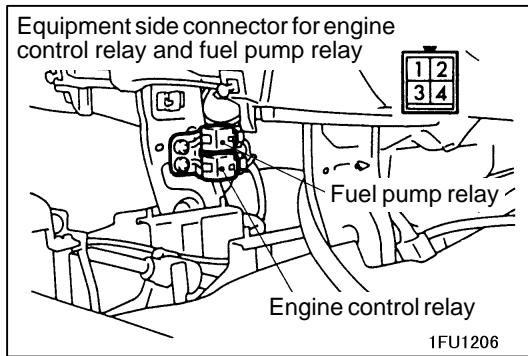
### FUEL PUMP RESISTOR CHECK <EVOLUTION-VI>

Standard value: 0.45 – 0.65 Ω

The inspection procedures are the same as for the preceding year-models.

### FUEL PUMP RELAY No.2 CONTINUITY CHECK <EVOLUTION-VI>

Battery voltage	Terminal No.			
	1	2	3	4
Not supplied			○ — ○	○ — ○
Supplied	○ — ○		⊕ — ⊖	



### ENGINE CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

Battery voltage	Terminal No.			
	1	2	3	4
Not supplied		○ — ○	○ — ○	○ — ○
Supplied	○ — ○	⊖ — ⊖	○ — ○	⊕ — ⊕



# FUEL SUPPLY

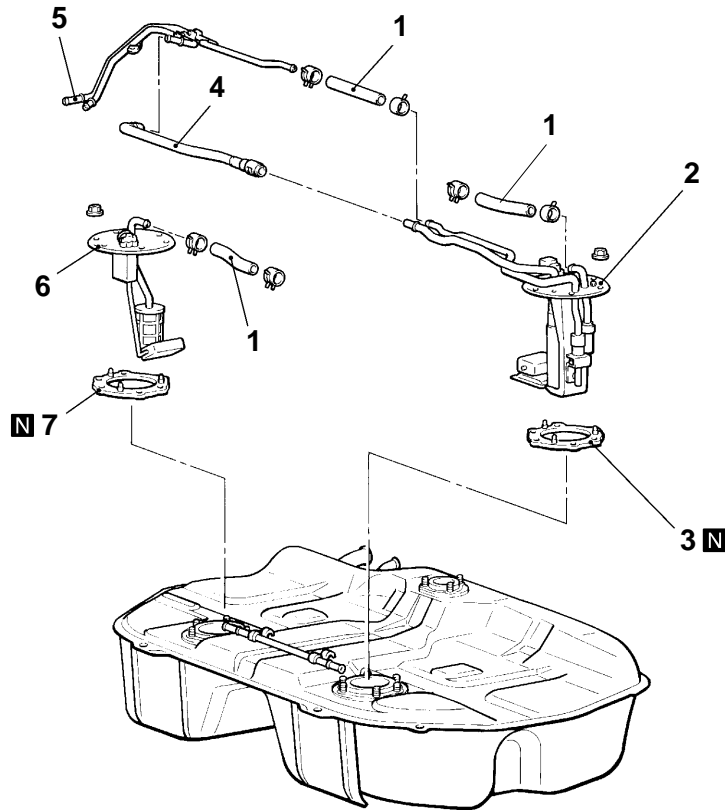
## GENERAL

### OUTLINE OF CHANGE

The service procedures have been revised as shown below because of change in the fuel pump & gauge assembly and the fuel gauge unit. <EVOLUTION-VI>

## FUEL TANK <EVOLUTION-VI>

### REMOVAL AND INSTALLATION



03M0080

#### Removal steps

- 1. Fuel hose
- 2. Fuel pump & gauge assembly
- 3. Packing
- ▶A◀ 4. High-pressure fuel hose

- 5. Fuel pipe assembly
- 6. Fuel gauge unit
- 7. Packing

#### NOTE

The service procedures other than those mentioned above remain unchanged.

### INSTALLATION SERVICE POINT

#### ▶A◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

#### Caution

After connecting the quick-release joint of the high-pressure fuel hose, pull it gently in the direction of removal to check that the hose is firmly connected with a play of about 3 mm.

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## NOTES

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# CLUTCH OVERHAUL



## CONTENTS

<b>GENERAL</b> .....	<b>2</b>	<b>CLUTCH</b> .....	<b>3</b>
Outline of Change .....	2	<b>CLUTCH RELEASE CYLINDER</b> .....	<b>9</b>



## GENERAL

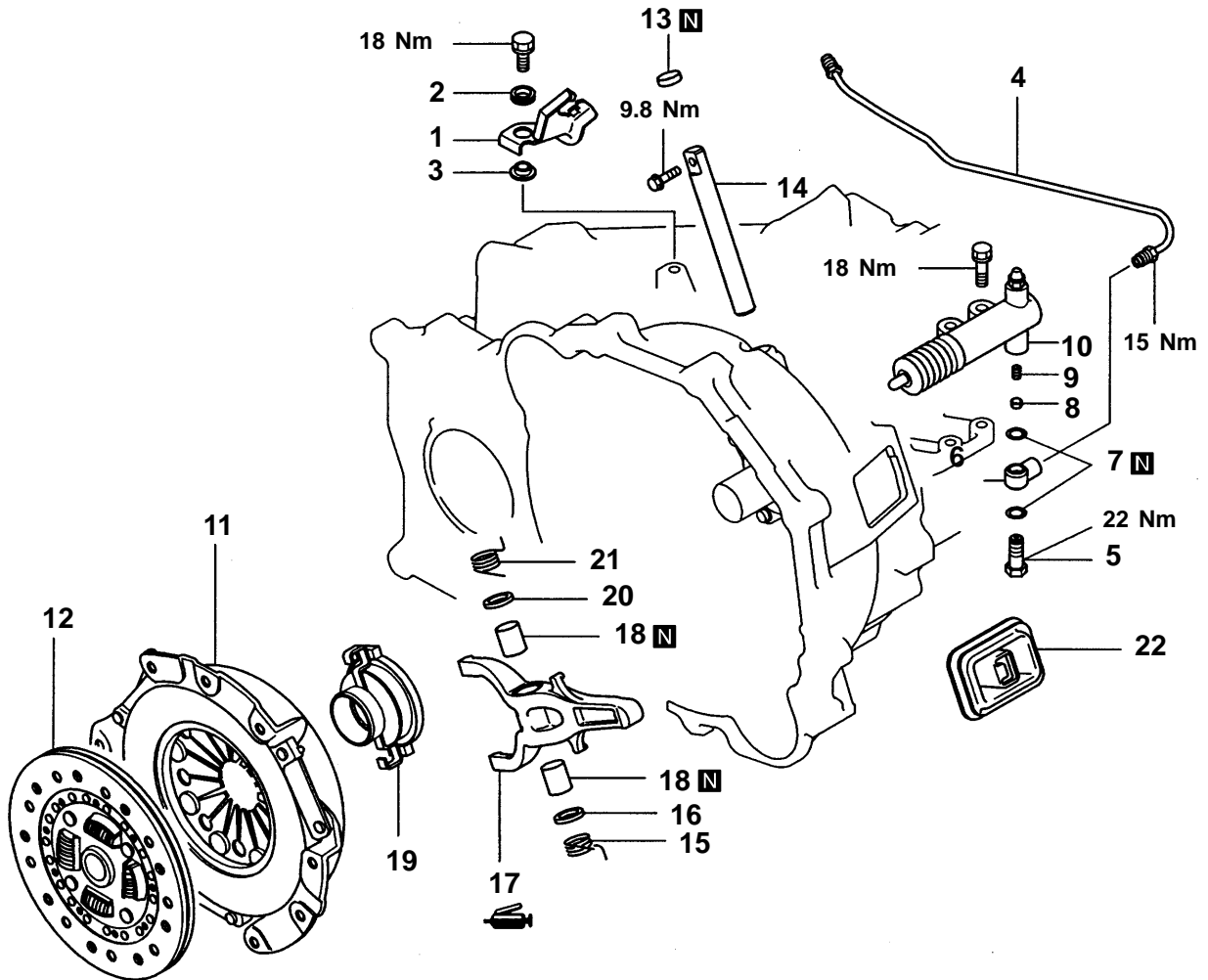
### OUTLINE OF CHANGE

The following service procedures have been established.

- Clutch overhaul
- Clutch release cylinder overhaul

# CLUTCH

## REMOVAL AND INSTALLATION (Not applicable to twin plate type clutch)

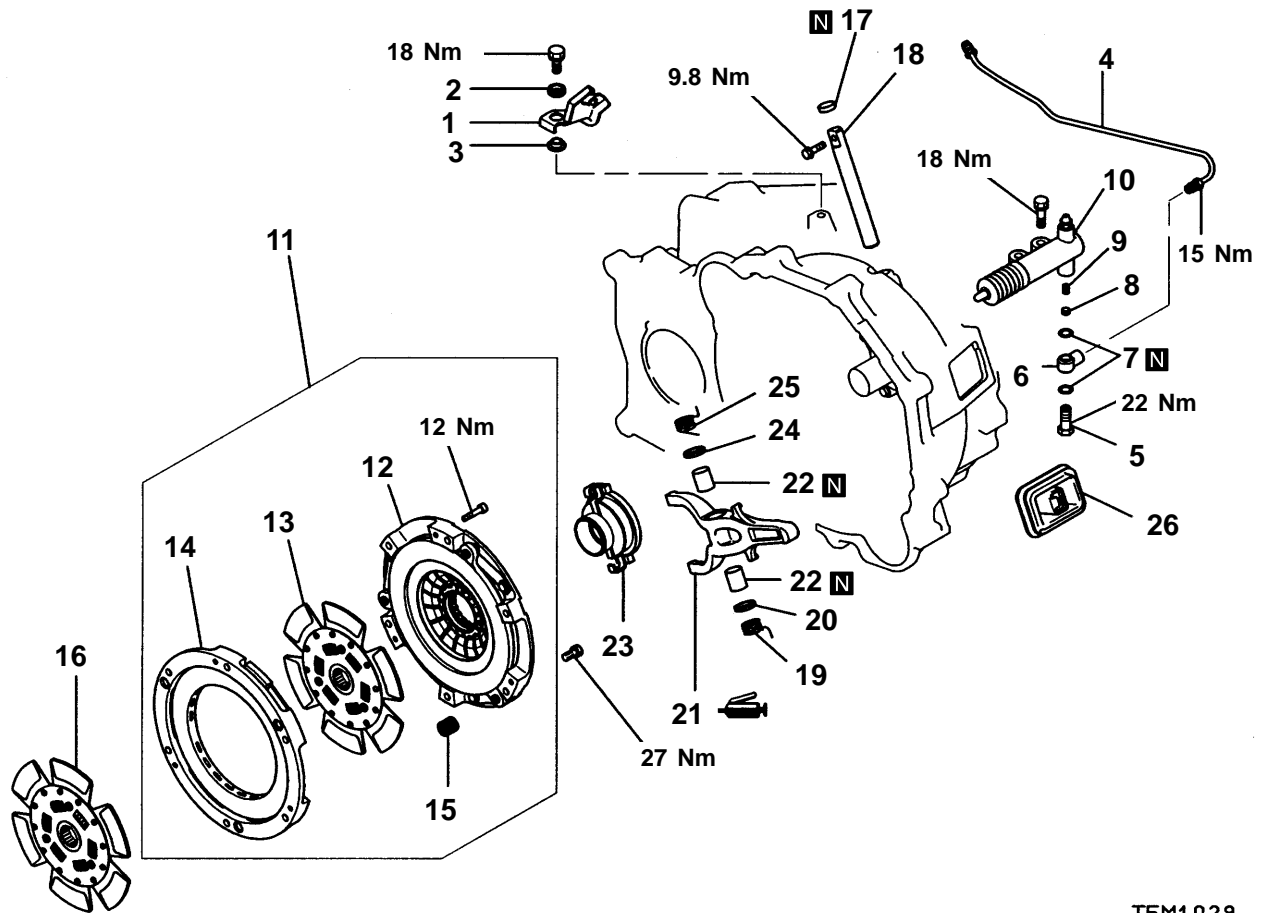


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### Removal steps

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>▶▶E◀◀ 1. Clutch fluid line bracket</li> <li>▶▶E◀◀ 2. Insulator</li> <li>▶▶D◀◀ 3. Washer</li> <li>▶▶E◀◀ 4. Clutch tube</li> <li>▶▶E◀◀ 5. Union bolt</li> <li>▶▶E◀◀ 6. Union</li> <li>▶▶E◀◀ 7. Gasket</li> <li>▶▶E◀◀ 8. Valve plate</li> <li>▶▶E◀◀ 9. Valve plate spring</li> <li>▶▶E◀◀ 10. Clutch release cylinder</li> <li>▶▶E◀◀ 11. Clutch cover</li> </ul> | <ul style="list-style-type: none"> <li>▶C◀ 12. Clutch disc</li> <li>▶C◀ 13. Sealing cap</li> <li>▶C◀ 14. Release fork shaft</li> <li>▶C◀ 15. Support spring (L)</li> <li>▶C◀ 16. Packing</li> <li>▶B◀ 17. Release fork</li> <li>▶A◀ 18. Bushing</li> <li>▶A◀ 19. Clutch release bearing</li> <li>▶A◀ 20. Packing</li> <li>▶A◀ 21. Support spring (R)</li> <li>▶A◀ 22. Release fork boot</li> </ul> |
|---|--|

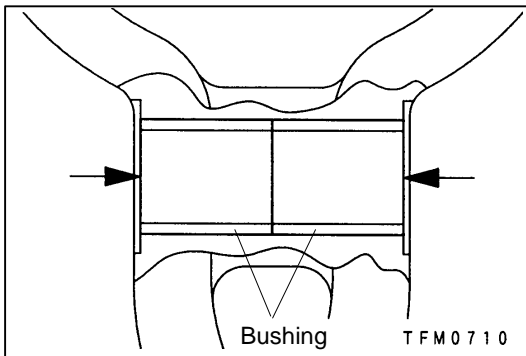
REMOVAL AND INSTALLATION (Twin plate type clutch)



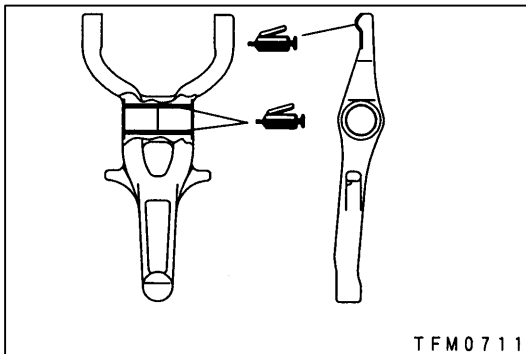
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Removal steps

- |                                 |                                |
|---------------------------------|--------------------------------|
| 1. Clutch fluid line bracket    | ▶F◀ 14. Intermediate plate     |
| 2. Insulator                    | ▶F◀ 15. Spring                 |
| 3. Washer                       | ▶F◀ 16. Clutch disc            |
| 4. Clutch tube                  | ▶C◀ 17. Sealing cap            |
| 5. Union bolt                   | ▶F◀ 18. Release fork shaft     |
| 6. Union                        | ▶F◀ 19. Support spring (L)     |
| 7. Gasket                       | ▶F◀ 20. Packing                |
| ▶E◀ 8. Valve plate              | ▶B◀ 21. Release fork           |
| ▶E◀ 9. Valve plate spring       | ▶A◀ 22. Bushing                |
| ▶D◀ 10. Clutch release cylinder | ▶A◀ 23. Clutch release bearing |
| ▶F◀ 11. Clutch cover assembly   | ▶A◀ 24. Packing                |
| ▶F◀ 12. Clutch cover            | ▶A◀ 25. Support spring (R)     |
| ▶F◀ 13. Clutch disc             | ▶A◀ 26. Release fork boot      |

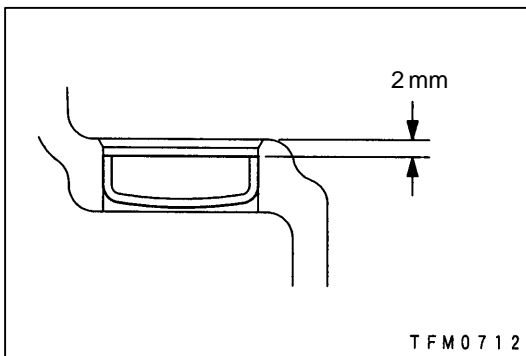
**INSTALLATION SERVICE POINTS****▶A◀ BUSHING INSTALLATION**

Press-fit the bushing in the release fork up to the illustrated positions.

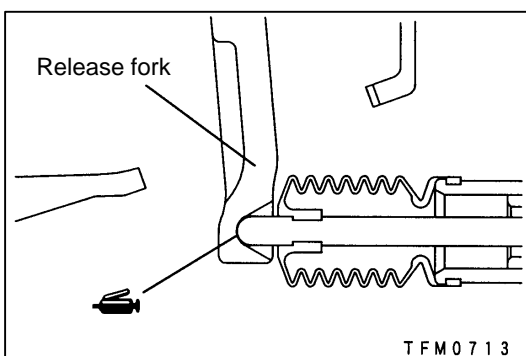
**▶B◀ RELEASE FORK INSTALLATION**

Apply grease to the illustrated positions of the release fork.

**Specified grease: Molywhite TA No. 2**

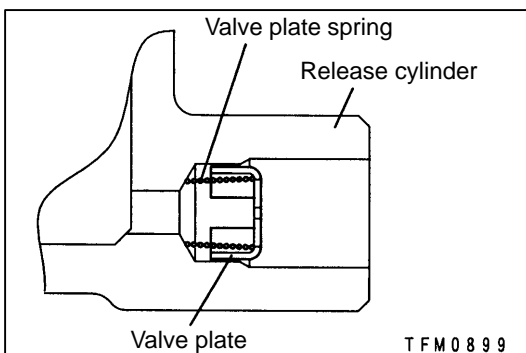
**▶C◀ SEALING CAP INSTALLATION**

Press-fit the sealing cap up to the illustrated position while using care not to tilt it.

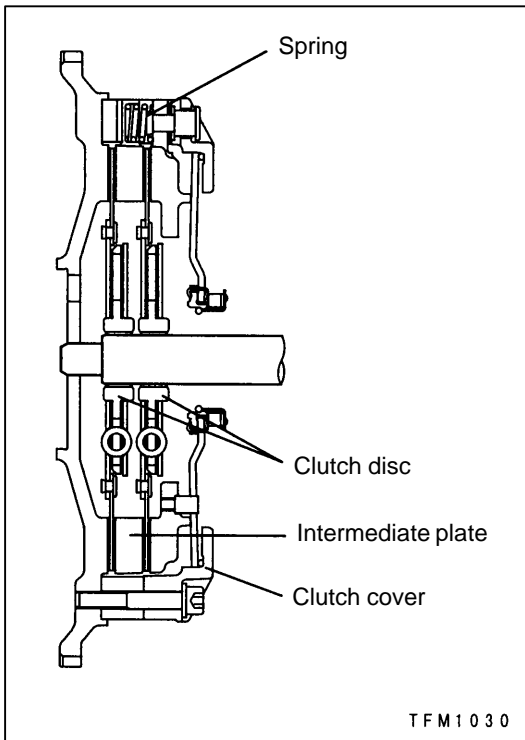
**▶D◀ CLUTCH RELEASE CYLINDER INSTALLATION**

Pack the pit in the release fork with grease (see illustration).

**Specified grease: Molywhite TA No. 2**

**▶E◀ VALVE PLATE SPRING / VALVE PLATE INSTALLATION**

Install the valve plate and its spring in the release cylinder as shown; direct the larger diameter side of the spring toward the valve plate.



### ►F◄ CLUTCH COVER/CLUTCH DISC/INTERMEDIATE PLATE/SPRING INSTALLATION

- (1) Temporarily assemble the clutch cover, spring, clutch discs (two) and intermediate plate to each other using three M6 bolts.
- (2) Bring the splines of two clutch discs in alignment using the input shaft or a similar tool, then install the assembly on the flywheel so that the centers of the splined holes in the clutch discs may be coaxial with the center of the flywheel hole. Tighten the three M6 bolts and then six M8 bolts to the specified torques.

#### Caution

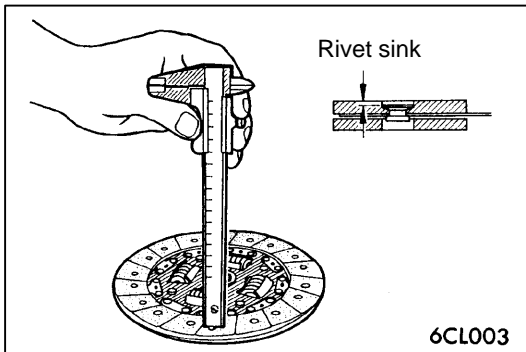
**Be sure to align the paint marks on the clutch cover, intermediate plate and flywheel with each other.**



**INSPECTION****CLUTCH COVER**

Check the pressure plate surface for wear, cracks and discoloration.

Check the rivets of the strap plate for looseness. If loose, replace the clutch cover.

**CLUTCH DISC****Caution**

**Don't clean the clutch disc in a cleaning fluid.**

Check the facing for loose rivets, uneven contact, evidence of seizure, or deposited oils and greases. If defective, replace the clutch disc.

Measure the rivet sink and replace the clutch disc if it is out of specification. (Not applicable to twin plate type clutch)

**Limit: 0.3 mm**

Measure the clutch disc thickness. Replace the clutch disc if the limit is exceeded. (Twin plate type clutch)

**Limit: 2.6 mm**

Check the torsion spring for looseness and damage. If defective, replace the clutch disc.

Combine the clutch disc with the input shaft and check for sliding condition and play in the rotating direction. If poor sliding condition is evident, clean, reassemble, and recheck. If excessive looseness is evident, replace the clutch disc and/or input shaft.

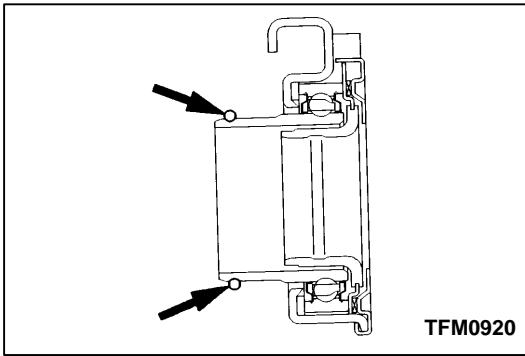
**CLUTCH RELEASE BEARING****Caution**

**Release bearing is packed with grease. Therefore, do not wash it in a cleaning fluid and the like.**

Check for seizure, damage, noise or improper rotation.

Check the pull ring for wear.

Check for wear on the surface which contacts with release fork. If abnormally worn, replace.



Check the pull ring for wear and replace the clutch release bearing if necessary.

### RELEASE FORK

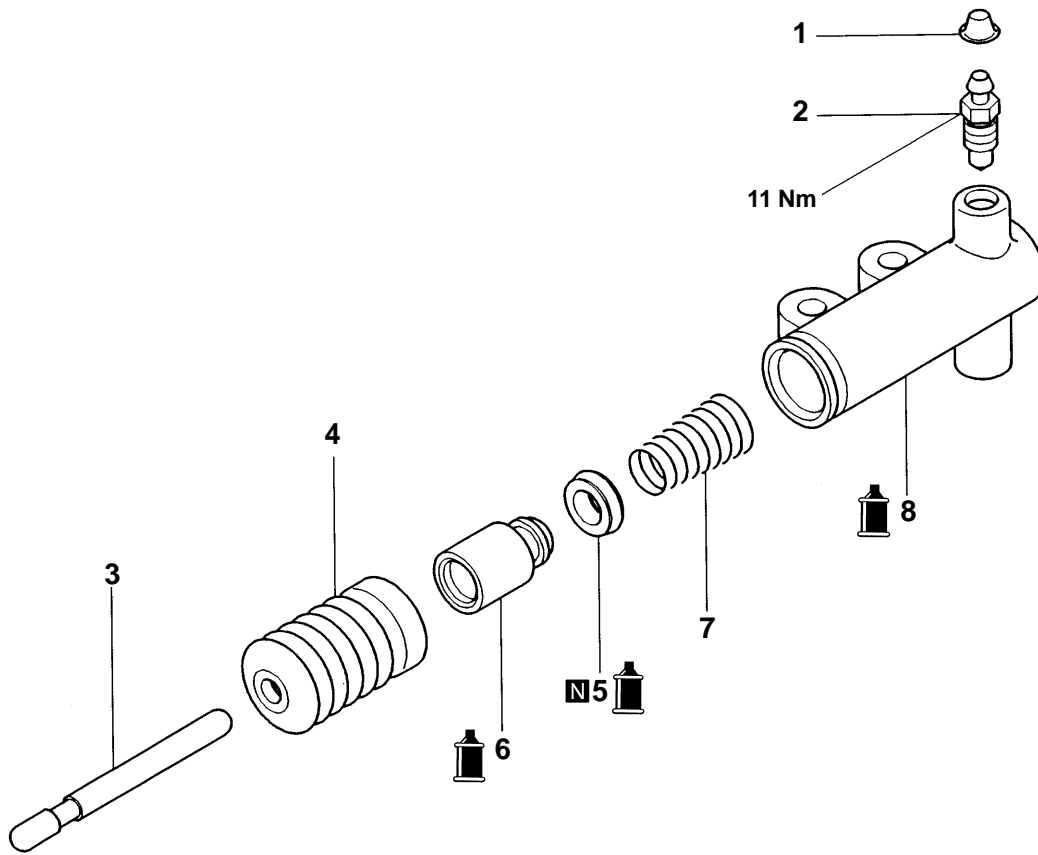
If the surface which contacts with the bearing is abnormally worn, replace.

### RELEASE FORK SHAFT

Check the release fork shaft for bend and wear, and replace if necessary.

# CLUTCH RELEASE CYLINDER

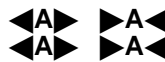
## DISASSEMBLY AND REASSEMBLY



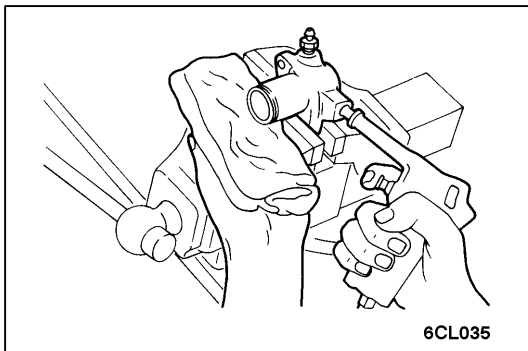
TFM0709

### Disassembly steps

1. Cap
2. Air bleeder
3. Push rod
4. Boot



5. Piston cup
6. Piston
7. Conical spring
8. Release cylinder



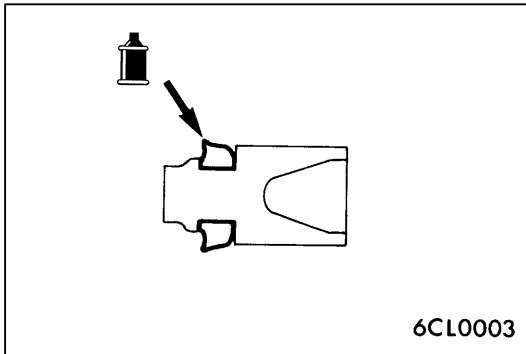
### DISASSEMBLY SERVICE POINT

#### ◀A▶ PISTON CUP / PISTON REMOVAL

Remove the piston from the release cylinder using compressed air.

#### Caution

1. Cover with shop towel to prevent the piston from popping out.
2. Apply compressed air slowly to prevent brake fluid from splashing.



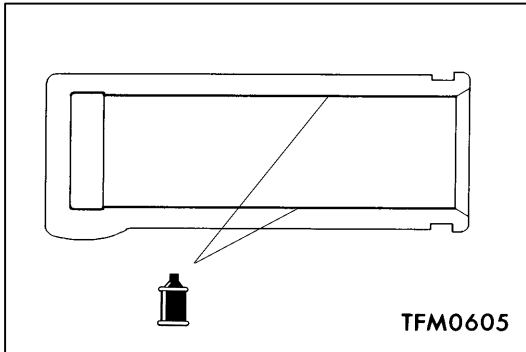
## REASSEMBLY SERVICE POINT

### ►A◄ PISTON / PISTON CUP INSTALLATION

After applying brake fluid to the inside wall surface of the release cylinder and all the circumferential surfaces of the piston and piston cup, insert the piston and piston cup into the cylinder.

**Specified brake fluid:**

**Brake fluid SAE J1703 (DOT3)**



## INSPECTION

### RELEASE CYLINDER

Check the inside wall surface of the release cylinder for rust and damage.

Using a cylinder gauge, measure the inside diameter of the release cylinder at about three positions (the deepest, middle and brim positions). If the clearance from the outside diameter of the piston exceeds the limit, replace the release cylinder as an assembly.

**Limit: 0.15 mm**

---

# CLUTCH



## CONTENTS

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<b>LUBRICANTS</b> .....	<b>2</b>	<b>CLUTCH PEDAL</b> .....	<b>4</b>
		<b>CLUTCH CONTROL</b> .....	<b>5</b>
		Clutch Master Cylinder .....	6

---

**GENERAL****OUTLINE OF CHANGE**

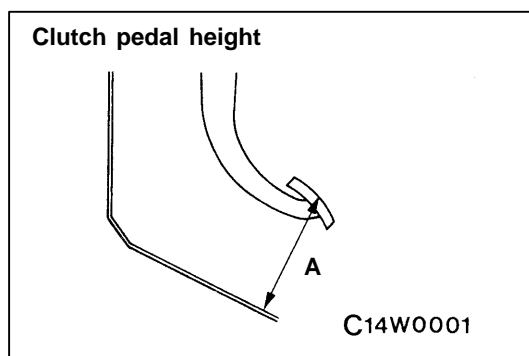
- The service procedures for left-hand drive vehicles have been established as described below.

**SERVICE SPECIFICATIONS <L.H. DRIVE VEHICLES>**

Items	Standard value
Clutch pedal height mm	163.5–166.5
Clutch pedal clevis pin play mm	1–3
Clutch pedal free play mm	6–13
Distance between the clutch pedal and the toeboard when the clutch is disengaged mm	85 or more

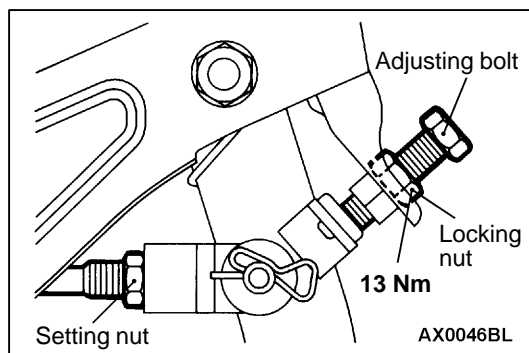
**LUBRICANTS <L.H. DRIVE VEHICLES>**

Items	Specified lubricants	Quantity
Clutch fluid	Brake fluid DOT 3 or DOT 4	As required
Push rod assembly	Rubber grease	
Boot		
Release cylinder push rod	MITSUBISHI genuine grease Part No. 0101011	

**ON-VEHICLE SERVICE  
<L.H. DRIVE VEHICLES>****CLUTCH PEDAL INSPECTION AND  
ADJUSTMENT**

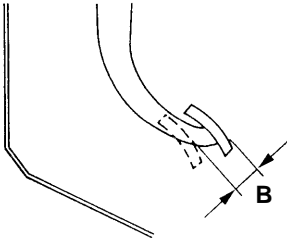
1. Turn up the carpet, etc. under the clutch pedal.
2. Measure the clutch pedal height.

**Standard value (A): 163.5 – 166.5 mm**



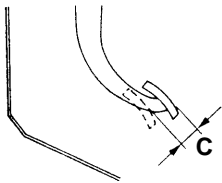
3. If the height of the clutch pedal is outside the standard value, loosen the locking nut and adjust the pedal height to the standard value using the adjusting bolt or push rod.

## Clutch pedal clevis pin play



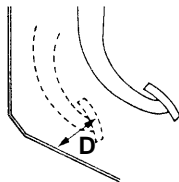
A14W0002

## Clutch pedal free play



14W0002

Distance between the clutch pedal and the toeboard when the clutch is disengaged

14W0003  
00003373

4. Measure the clutch pedal play.  
**Standard value (B): 1 – 3 mm**
5. If the clutch pedal play is not within the standard value, loosen the setting nut and move the push rod to adjust.

**Caution**

**Do not push in the master cylinder push rod at this time.**

6. After completing the adjustments, confirm that the clutch pedal free play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the toeboard when the clutch is disengaged are within the standard value ranges.

**Standard value (C): 6–13 mm**

**Standard value (D): 85 mm or more**

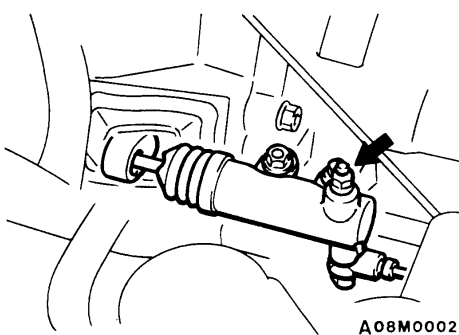
7. If the clutch pedal free play and the distance between the clutch pedal and the toeboard when the clutch is disengaged do not agree with the standard values, it is probably the result of either air in the hydraulic system or a faulty master cylinder or clutch. Bleed the air, or disassembly and inspect the master cylinder or clutch.
8. Turn back the carpet, etc.

**BLEEDING**

**Specified fluid: Brake fluid DOT 3 or DOT 4**

**Caution**

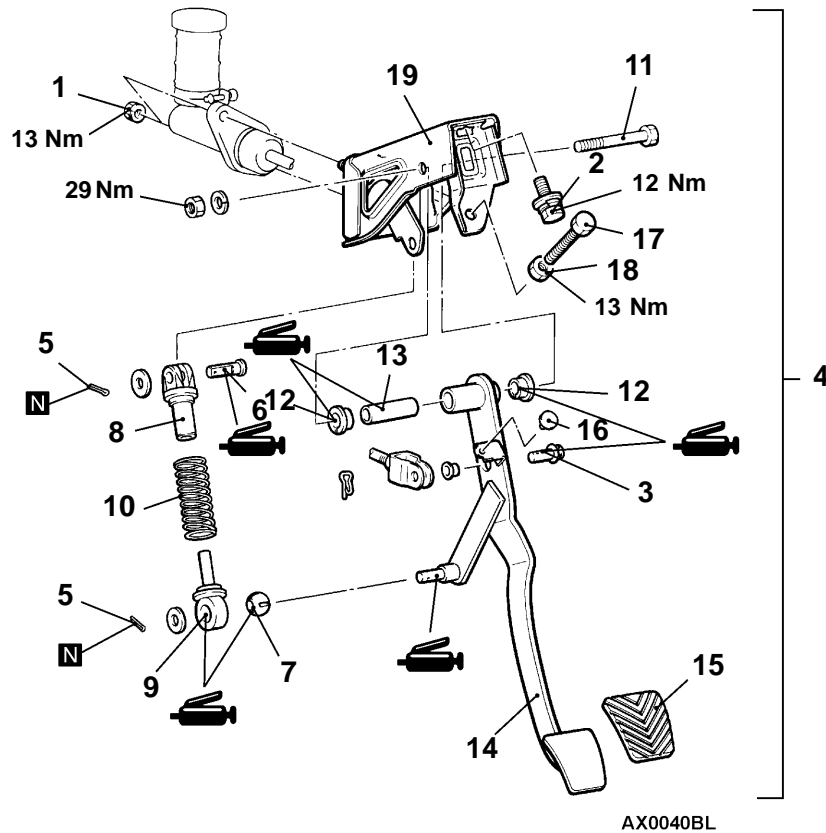
**Use the specified brake fluid. Avoid using a mixture of the specified fluid and other fluid.**



A08M0002

**CLUTCH PEDAL <L.H. DRIVE VEHICLES>****REMOVAL AND INSTALLATION**

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

**Removal steps**

1. Clutch master cylinder installation nut
2. Master cylinder member bracket installation bolt
3. Clevis pin
4. Pedal support member and clutch pedal assembly
5. Split pin
6. Clevis pin
7. Bushing
8. Rod A
9. Rod B
10. Turn over spring
11. Bolt
12. Bushing
13. Pipe
14. Clutch pedal
15. Pedal pad
16. Stopper
17. Adjusting bolt
18. Locking nut
19. Pedal support member

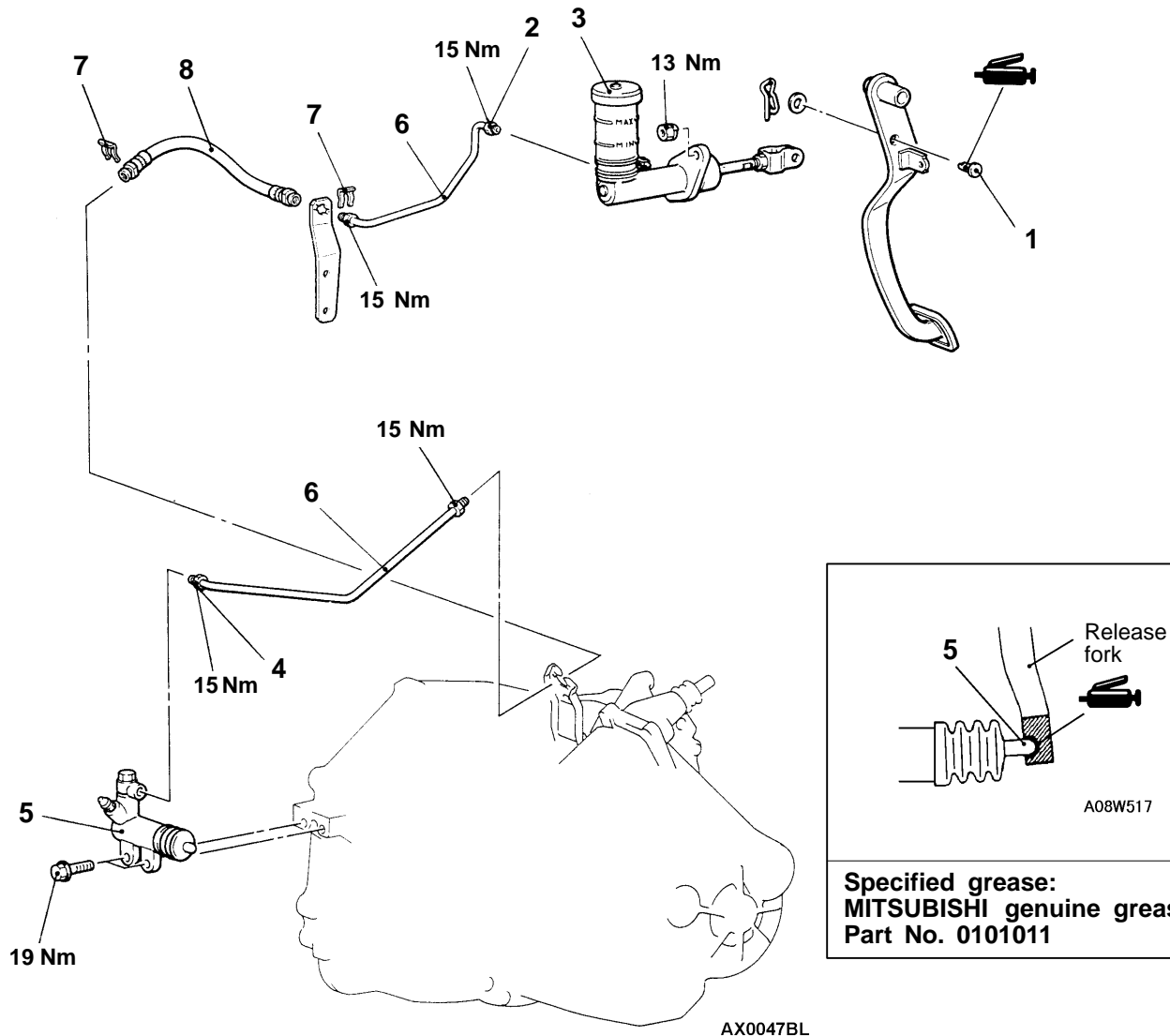


**CLUTCH CONTROL <L.H. DRIVE VEHICLES>****REMOVAL AND INSTALLATION****Pre-removal Operation**

- Clutch Fluid Draining
- Air Cleaner Removal

**Post-installation Operation**

- Air Cleaner Installation
- Clutch Fluid Supplying
- Clutch Line Bleeding (Refer to P.21A-3.)
- Clutch Pedal Adjustment (Refer to P. 21A-2.)



**Specified grease:**  
**MITSUBISHI** genuine grease  
 Part No. 0101011

**Clutch master cylinder removal steps**

1. Clevis pin
2. Clutch pipe connection
3. Clutch master cylinder

**Clutch release cylinder removal steps**

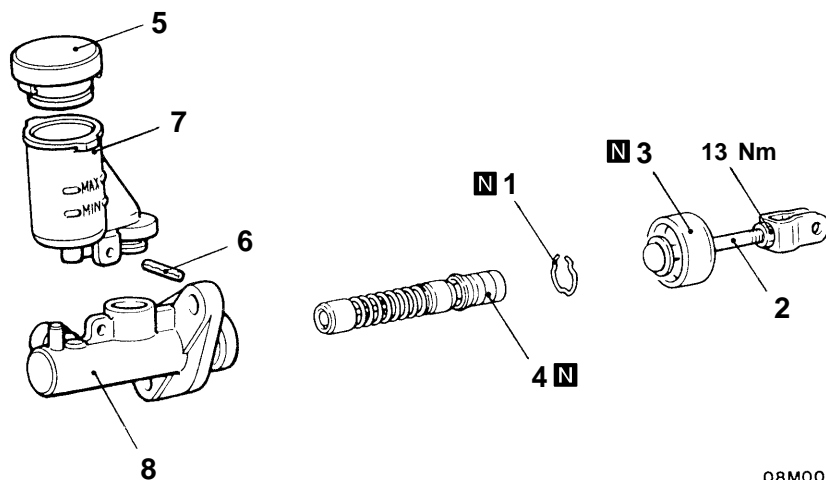
4. Clutch pipe connection
5. Clutch release cylinder

**Clutch line removal steps**

6. Clutch pipe
7. Hose clip
8. Clutch hose

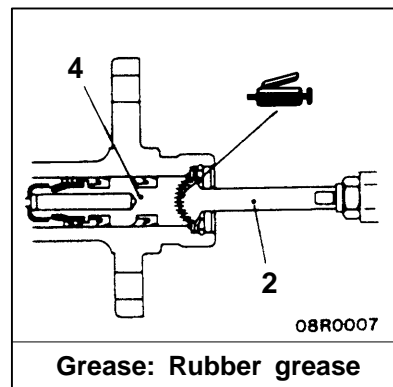
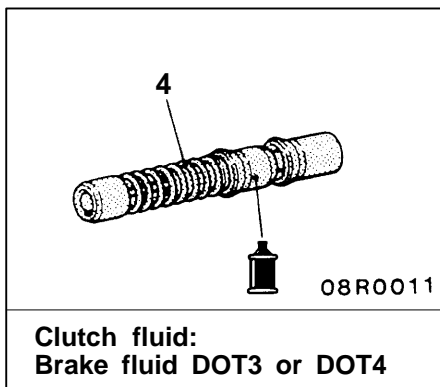
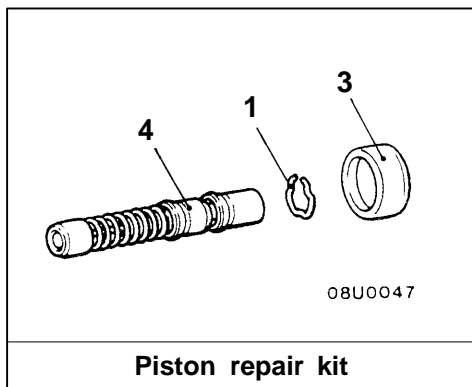
**DISASSEMBLY AND REASSEMBLY**

**CLUTCH MASTER CYLINDER**



08M0003

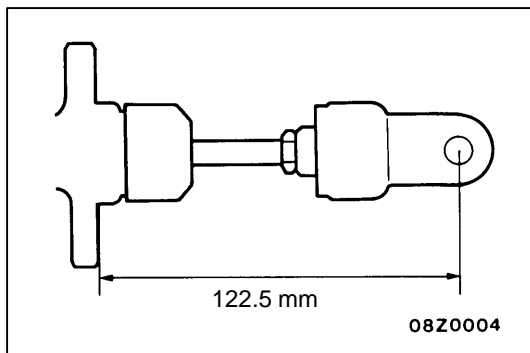
00004610



**Disassembly steps**

- ▶◀
1. Piston stopper ring
  2. Push rod assembly
  3. Boot
  4. Piston assembly
  5. Reservoir cap
  6. Spring pin
  7. Reservoir tank
  8. Clutch master cylinder body

**Caution**  
Do not disassemble piston assembly.



**INSTALLATION SERVICE POINT**

◀▶ **PUSH ROD ASSEMBLY INSTALLATION**

Set the length of the push rod assembly to the shown dimension to make the adjustment of the clutch pedal easier.

---

# MANUAL TRANSMISSION OVERHAUL



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## GENERAL

### OUTLINE OF CHANGE

Of the newly introduced transmission model, the service procedures for the following unit sections are described.

- Transmission
- Clutch housing
- Reverse idler gear

## SPECIFICATIONS

### TRANSMISSION MODEL TABLE

#### <EVOLUTION-IV>

Transmission model	Gear ratio	Speedometer gear ratio	Final gear ratio	Front LSD
W5M51-1-X6A	A	29/36	4.529	Not available
W5M51-1-X6A1	A	29/36	4.529	Available
W5M51-1-X7A	A	30/36	4.529	Not available
W5M51-1-X7A1	A	30/36	4.529	Available
W5M51-1-Z6A	B	29/36	4.875	Not available
W5M51-1-Z6A1	B	29/36	4.875	Available
W5M51-1-Z7A	B	30/36	4.875	Not available
W5M51-1-Z7A1	B	30/36	4.875	Available
W5M51-1-X6A2	B	29/36	4.529	Not available
W5M51-1-X6A3	B	29/36	4.529	Available
W5M51-1-X7A2	B	30/36	4.529	Not available
W5M51-1-X7A3	B	30/36	4.529	Available

#### <EVOLUTION-V>

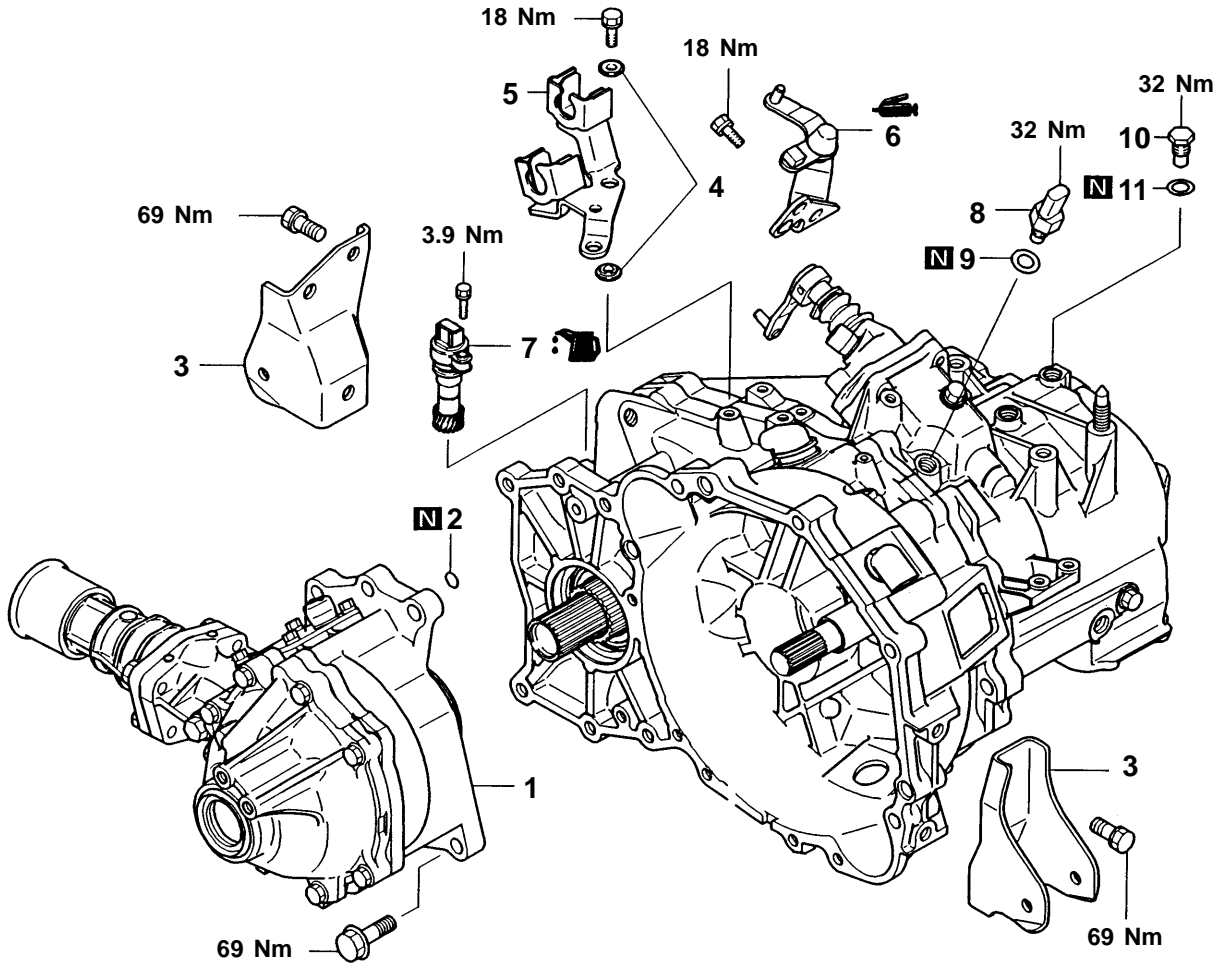
Transmission model	Gear ratio	Speedometer gear ratio	Final gear ratio	Front LSD
W5M51-2-X6A	A	29/36	4.529	Not available
W5M51-2-X6A1	A	29/36	4.529	Available
W5M51-2-Z6A	B	29/36	4.875	Not available
W5M51-2-X6A2	B	29/36	4.529	Not available
W5M51-2-Z6A1	B	29/36	4.875	Available
W5M51-2-X6A3	B	29/36	4.529	Available

#### <EVOLUTION-VI>

Transmission model	Gear ratio	Speedometer gear ratio	Final gear ratio	Front LSD
W5M51-2-X6A4	A	29/36	4.529	Not available
W5M51-2-X6A6	B	29/36	4.529	Not available
W5M51-2-Z6A	B	29/36	4.875	Not available
W5M51-2-X6A8	A	29/36	4.529	Available
W5M51-2-Z6A7	B	29/36	4.529	Available
W5M51-2-X6A1	B	29/36	4.875	Available

**TRANSMISSION**

**DISASSEMBLY AND REASSEMBLY**



TFM0881

**Disassembly steps**

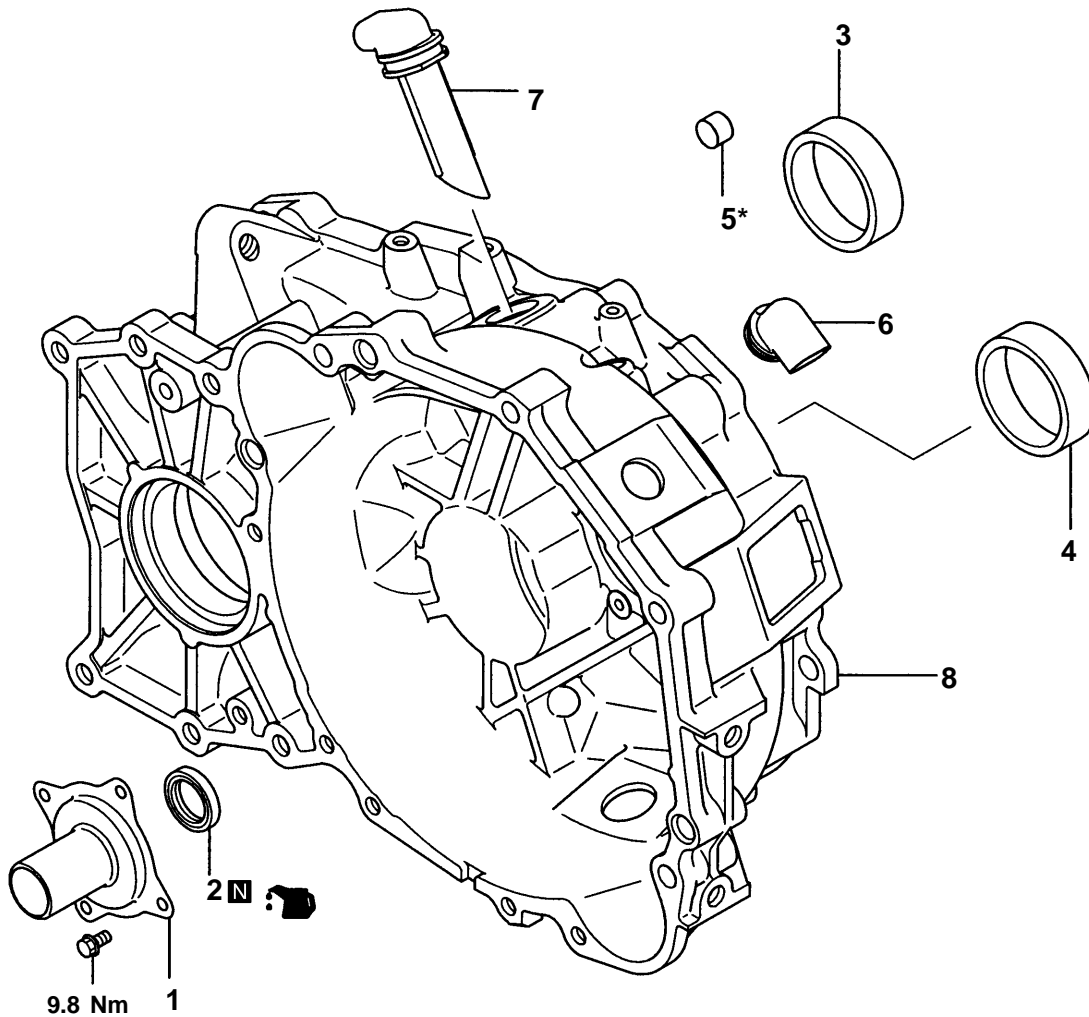
- |   |  |
|---|--|
| <p>▶◀ <b>J</b></p> <ol style="list-style-type: none"> <li>1. Transfer</li> <li>2. O-ring</li> <li>3. Roll stopper bracket</li> <li>4. Insulator washer (EVOLUTION-IV only)</li> <li>5. Shift cable bracket</li> </ol> | <p>◀▶ <b>I</b><br/>▶◀ <b>H</b></p> <ol style="list-style-type: none"> <li>6. Select lever</li> <li>7. Speedometer gear</li> <li>8. Back-up lamp switch</li> <li>9. Gasket</li> <li>10. Plug</li> <li>11. Gasket</li> </ol> |
|---|--|

**NOTE:**

For each service point, refer to Basic Manual. (Pub. No. S9806CNCP9)

# CLUTCH HOUSING

## DISASSEMBLY AND REASSEMBLY



TFM1032

### Disassembly steps

- |   |  |  |  |   |
|---|--|--|--|---|
| <p>                 ◀A▶<br/>                 ▶B▶             </p> | <p>                 ▶E▶<br/>                 ▶D▶<br/>                 ▶C▶             </p> | <p>                 1. Clutch release bearing retainer<br/>                 2. Oil seal<br/>                 3. Outer race<br/>                 4. Outer race             </p> | <p>                 ▶B▶<br/>                 ▶A▶<br/>                 ▶A▶             </p> | <p>                 5. Bushing*<br/>                 6. Cover-A<br/>                 7. Cover-B<br/>                 8. Clutch housing             </p> |
|---|--|--|--|---|

### NOTE:

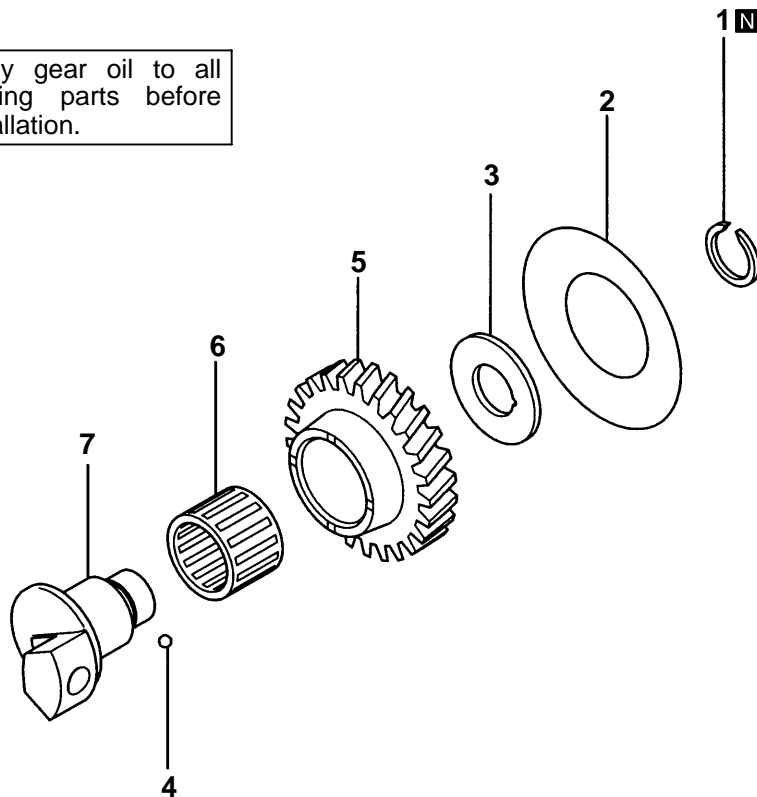
- (1)\*: Never remove the bushings from the clutch housing. Only the case when installing new bushings into a new clutch housing, refer to ▶B▶.
- (2) For each service point, refer to Basic Manual. (Pub. No. S9806CNCP9)

## REVERSE IDLER GEAR

### DISASSEMBLY AND REASSEMBLY



Apply gear oil to all moving parts before installation.



TFM1033

#### Disassembly steps

1. Snap ring
2. Cone spring  
(except EVOLUTION-IV)
3. Thrust washer
4. Steel ball  
(except EVOLUTION-IV)
5. Reverse idler gear
6. Needle roller bearing
7. Reverse idler gear shaft

## INSPECTION

### NEEDLE ROLLER BEARING

- (1) Check to ensure that when the shaft and gear are combined and made to rotate, they rotate smoothly without looseness and noise.
- (2) Check to ensure that the cage is not deformed.



## GROUP 26 FRONT AXLE

### GENERAL OUTLINE OF CHANGE

- The installation method of the ball joint between the knuckle and the lower arm has been changed, and accordingly the removal and installation procedures of the axle hub and the knuckle have been revised. <EVOLUTION-VI>

### AXLE HUB AND KNUCKLE <EVOLUTION-VI>

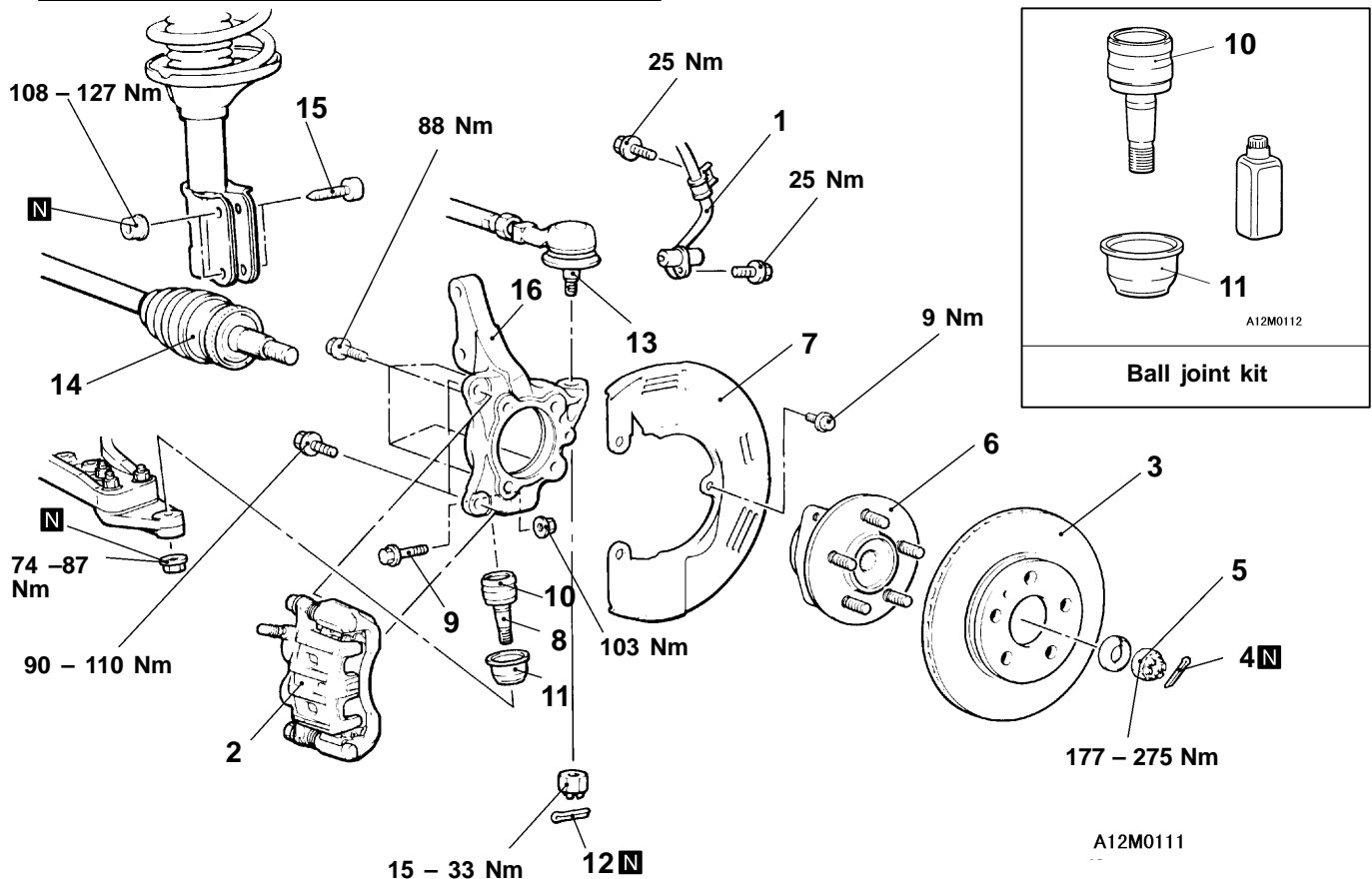
#### REMOVAL AND INSTALLATION

##### Caution

- (1) For vehicles with AYC, be careful when handling the pole piece at the tip of the speed sensor so as not to damage it by striking against other parts.
- (2) For vehicles with AYC, be careful not to damage the rotors installed to B.J. outer race during removal and installation of the drive shaft.

##### Post-installation Operation

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



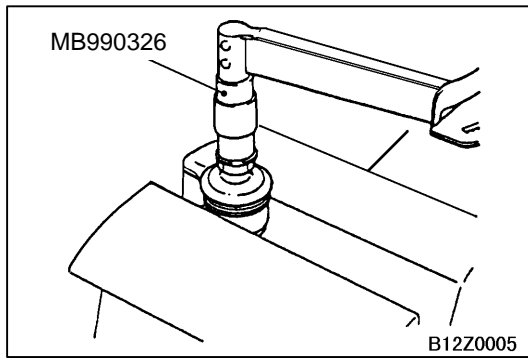
##### Removal steps

1. Front speed sensor<Vehicles with AYC>
2. Caliper assembly
3. Brake disc
4. Split pin
5. Drive shaft nut
6. Front hub assembly
7. Dust shield
8. Connection for lower arm ball joint
9. Connection bolt for lower arm joint

10. Lower arm ball joint
11. Dust cover
12. Split pin
13. Connection for tie rod end
14. Front drive shaft
15. Front strut mounting bolt
16. Knuckle

##### NOTE

Follow the conventional procedures for removal and installation service points.



## INSPECTION

### LOWER ARM BALL JOINT ROTATION STARTING TORQUE CHECK

- (1) After shaking the ball joint stud several times, install the nut to the stud and use the special tool to measure the rotation starting torque of the ball joint.

**Standard value: 1.0 – 3.4 Nm**

- (2) When the measured value exceeds the standard value, replace the ball joint assembly.
- (3) When the measured value is lower than the standard value, check that the ball joint turns smoothly without excessive play. If so, it is possible to use that ball joint.

### LOWER ARM BALL JOINT DUST COVER REPLACEMENT

When the dust cover is damaged during service work or grease leaks out from the dust cover, replace the dust cover in the conventional procedure. After replacement, check the dust cover for cracks or damage by pushing it with finger.

# REAR AXLE

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## GENERAL

### OUTLINE OF CHANGE

- The descriptions of the service procedures for the AYC system including the troubleshooting using an MUT-II tester has been incorporated.

## SERVICE SPECIFICATIONS

### <Vehicles with AYC>


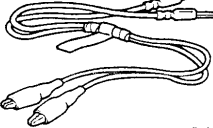
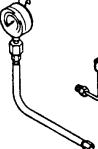

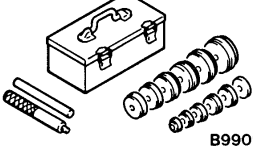
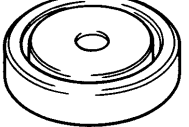
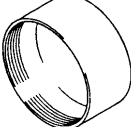
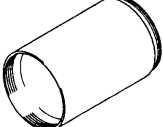
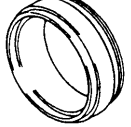
Items	Standard value	Limit
Rear axle total backlash mm	–	5
Pressure generated by hydraulic unit MPa	0 – 1.6	–
Wheel bearing axial play mm	–	0.05
Wheel bearing rotation starting torque Nm	–	1.0 or less

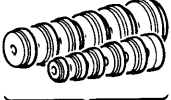
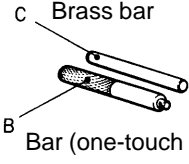
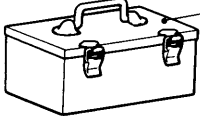
## LUBRICANT

### <Vehicles with AYC>

Items			Specified lubricant	Capacity
Gear oil	Torque transfer differential	Differential	Hypoid gear oil API classification GL-5 or higher SAE viscosity No. 90, 80W	0.41 ± 0.02 ℓ
		Torque transfer mechanism	MITSUBISHI GENUINE DIA QUEEN AYC FLUID	0.70 <sup>+0</sup> / <sub>-0.05</sub> ℓ
Hydraulic piping fluid			Dia Queen ATF SPII or equivalent	1 ℓ
Torque transfer mechanism oil seal lips			Vaseline	As required

**SPECIAL TOOLS**

Tool	Number	Name	Use
 <p>B991502</p>	MB991502	MUT-II sub-assembly	Inspection of AYC (diagnosis display by MUT-II)
 <p>B991529</p>	MB991529	Diagnosis code check harness	Inspection of AYC (diagnosis display by AYC warning lamp)
	MD998330 (MD998331)	Oil pressure gauge (2,942 kPa)	Hydraulic pressure measurement <vehicles with AYC>
 <p>B991705</p>	MB991705	Hose adapter	
 <p>B990925</p>	MB990925	Bearing & oil seal installer set	Pressfitting of oil seal <differential>
 <p>B991115</p>	MB991115	Oil seal installer	Pressfitting of oil seal <differential> (used in combination with MB990938)
	MD998812	Installer cap	Pressfitting of oil seal <torque transfer mechanism of vehicles with AYC>
	MD998813	Installer 100	
	MD998829	Installer adapter (60)	

MB990925 <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;">    </div> <div style="display: flex; justify-content: space-between; margin-top: 10px;"> <span>Installer adapter</span> <span>Bar (one-touch type)</span> <span>11W0113</span> </div>					
	Tool number (MB990925)	O.D. mm		Tool number (MB990925)	O.D. mm
A	MB990926	39.0	A	MB990933	63.5
	MB990927	45.0		MB990934	67.5
	MB990928	49.5		MB990935	71.5
	MB990929	51.0		MB990936	75.5
	MB990930	54.0		MB990937	79.0
	MB990931	57.0	B	MB990938	–
	MB990932	61.0	C	MB990939	–

## TROUBLESHOOTING <AYC>

### BASIC TROUBLESHOOTING CONDITIONS

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

#### NOTE

Before starting the troubleshooting procedure, make sure that the following items have been checked okay.

- The correct steering wheel has been properly installed in the neutral position of the steering column shaft.
- Tire and wheel sizes are correct with correct specifications. Inflation pressure, balance, and wear conditions are okay.
- Wheel alignment is correct.
- The engine, suspension, and other parts have not been remodeled so as to affect the AYC system.

### DIAGNOSIS FUNCTION

#### READING THE DIAGNOSIS CODE

Read the diagnosis code using an MUT-II tester or the AYC warning lamp.  
(Refer to Group 00 – How to Use Troubleshooting / Inspection Service Points.)

#### ERASING THE DIAGNOSIS CODE

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

**3. INSPECTION CHART FOR DIAGNOSIS CODE**

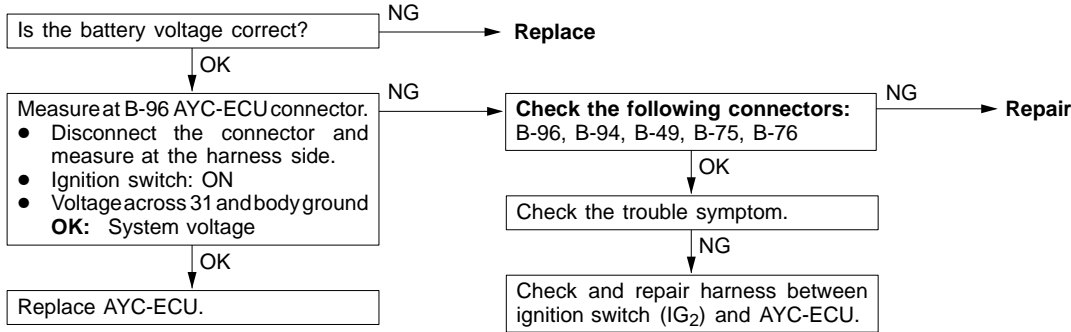
Diagnosis code No.	Diagnosis items	Ref. page
12	Power supply voltage (valve power supply) system (open- or short-circuit)	27-6
21	FR wheel speed sensor system (open- or short-circuit)	27-6
22	FL wheel speed sensor system (open- or short-circuit)	27-6
23	RR wheel speed sensor system (open- or short-circuit)	27-6
24	RL wheel speed sensor system (open- or short-circuit)	27-6
25	Wrong-diameter tire	27-8
26	Faulty wheel speed sensor	27-9
31	Steer sensor (ST-1, ST-2, ST-N) system (open-circuit)	27-10
32	Steer sensor (ST-N) system (short-circuit)	27-10
33	Steer sensor (ST-N) system	27-11
34	Steer sensor (ST-1, ST-2) system (short-circuit)	27-11
41	TPS system (open- or short-circuit)	27-12
51	Longitudinal acceleration sensor system (open- or short-circuit)	27-12
52	Longitudinal acceleration sensor	27-13
56	Lateral acceleration sensor system (open- or short-circuit)	27-12
61	Stop lamp switch system (open-circuit)	27-13
65	ABS monitor system (open-circuit or defective ABS)	27-14
71	Proportioning valve system (open- or short-circuit)	27-14
72	Directional control valve (right) system (open- or short-circuit)	27-15
73	Directional control valve (left) system (open- or short-circuit)	27-16
81	AYC relay system (open- or short-circuit)	27-17
82	Electric pump system	27-18
83	Electric pump system	27-19

4. INSPECTION PROCEDURES FOR DIAGNOSIS CODES

Code No. 12: Power supply voltage (valve power supply) system	Probable cause
This code is output when the AYC-ECU power supply voltage drops below, goes beyond, a specified level.	<ul style="list-style-type: none"> <li>● Defective harness or connector</li> <li>● Defective battery</li> <li>● Defective AYC-ECU</li> </ul>

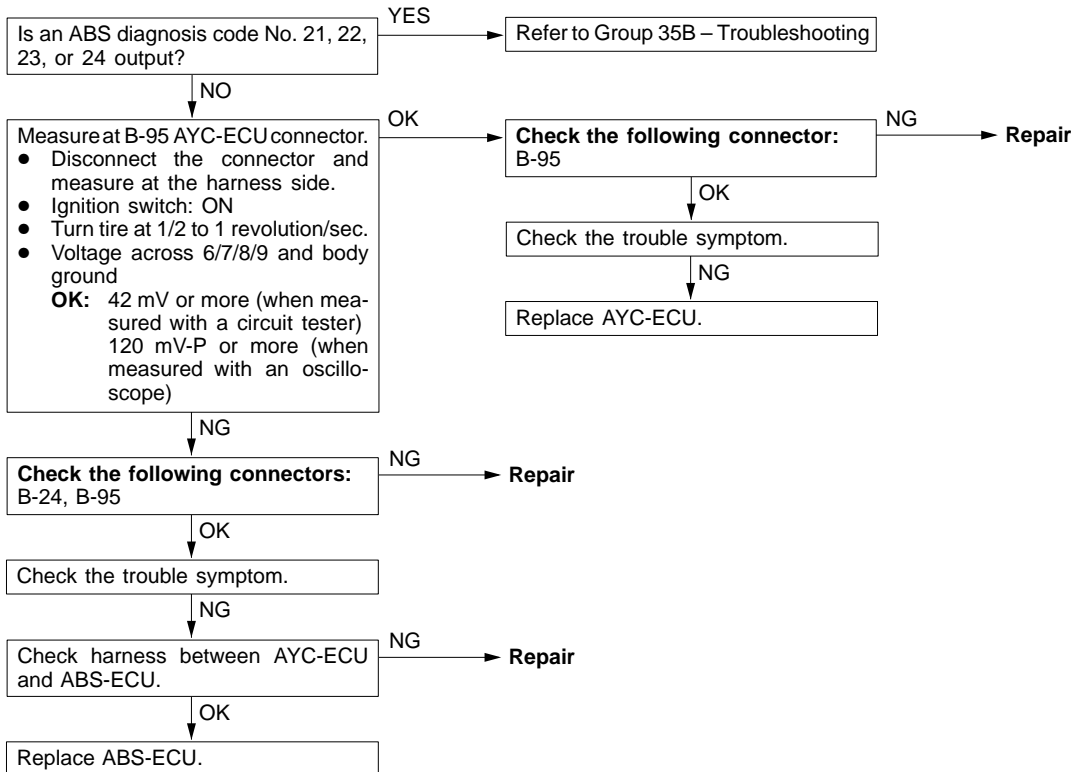
NOTE

Refer to the corresponding item if any other diagnosis code is being output.



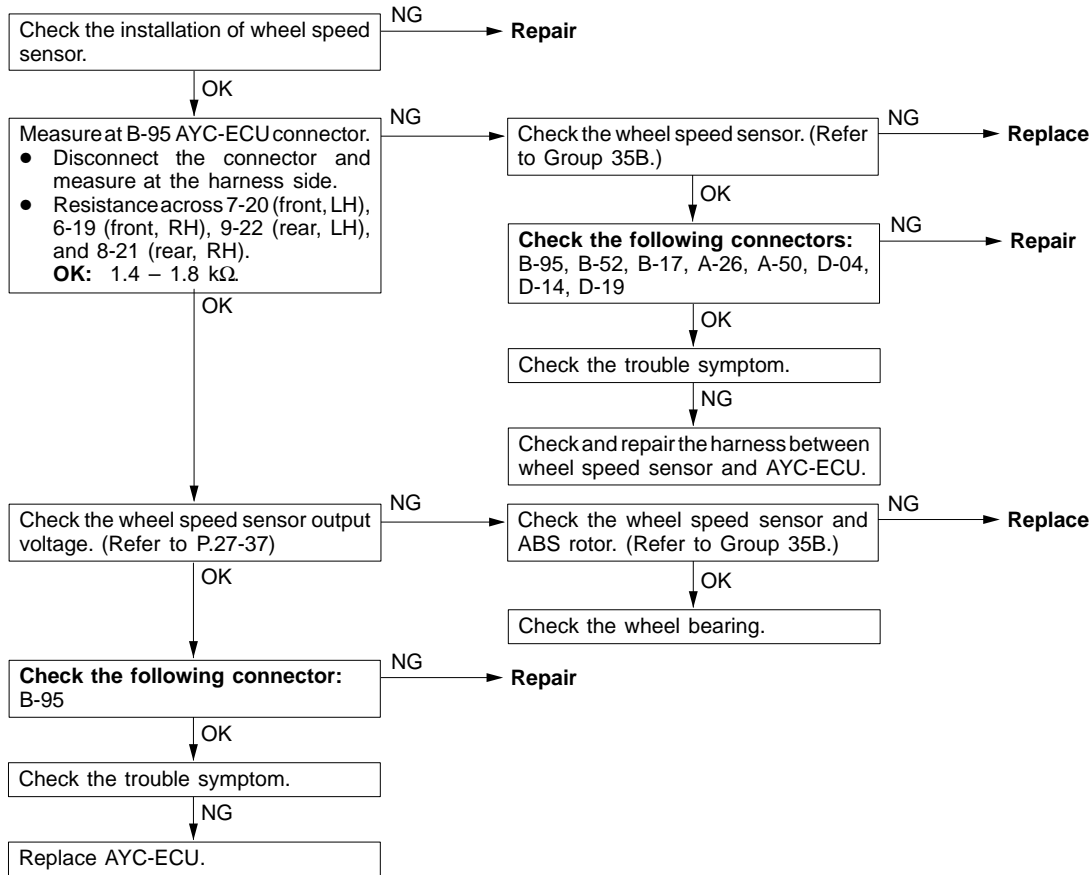
Code Nos. 21, 22, 23, 24: Wheel speed sensor system	Probable cause
This code is output if any one of three wheel speed sensors fails to provide an input even after the other wheel exceeded 8 km/h.	<ul style="list-style-type: none"> <li>● Defective harness or connector</li> <li>● Defective ABS-ECU</li> <li>● Defective AYC-ECU</li> </ul>

<Vehicles with ABS>



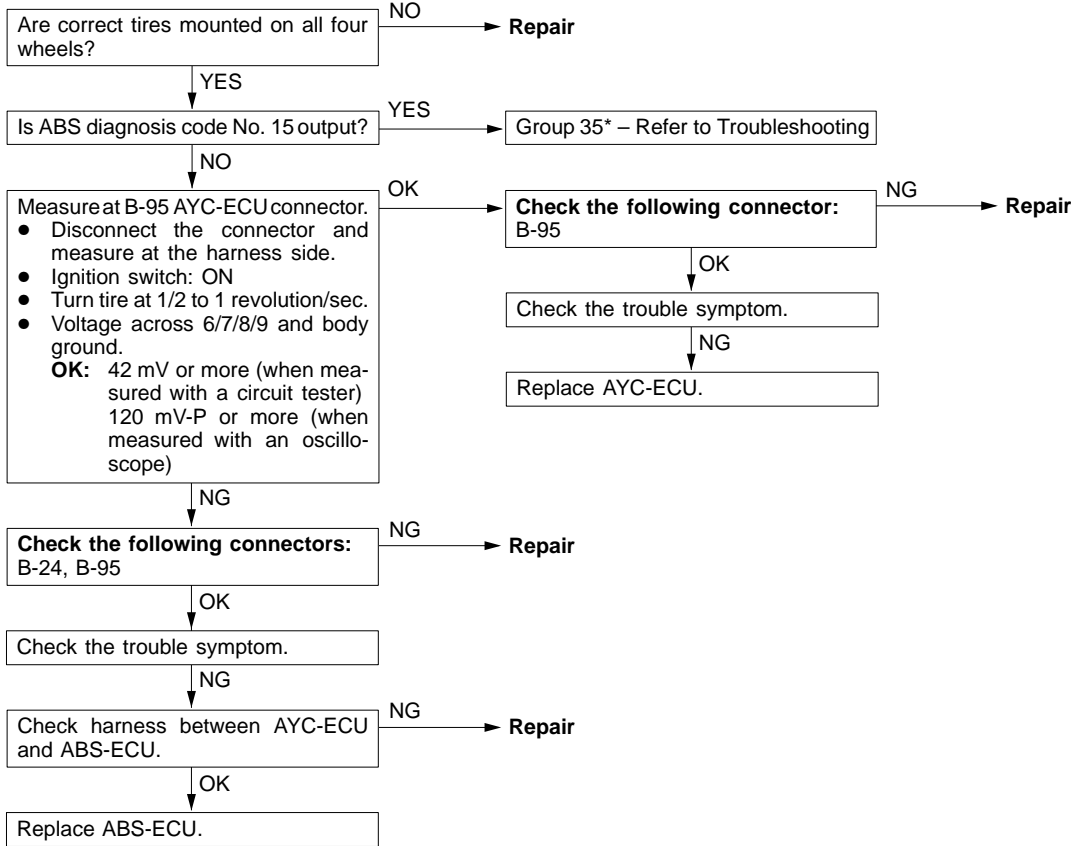


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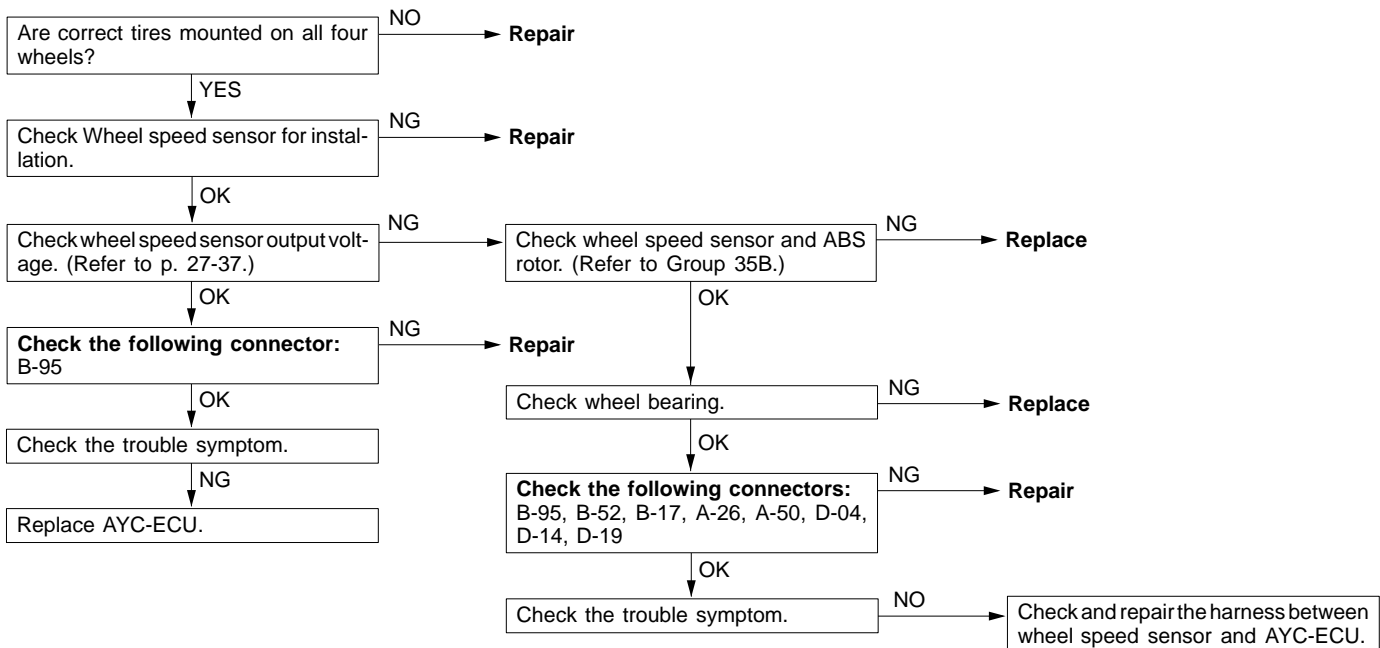


Code No. 25: Wrong-diameter tire	Probable cause
This code is output if the speed of any one of the four wheels exceeds a specified level with respect to the average of the four wheel speed sensor outputs when the steering wheel is in the straight-ahead position and the vehicle speed exceeds 20 km/h. At this time, the warning lamp does not light up.	<ul style="list-style-type: none"> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> <li>● Defective ABS-ECU</li> </ul>

<Vehicles with ABS>

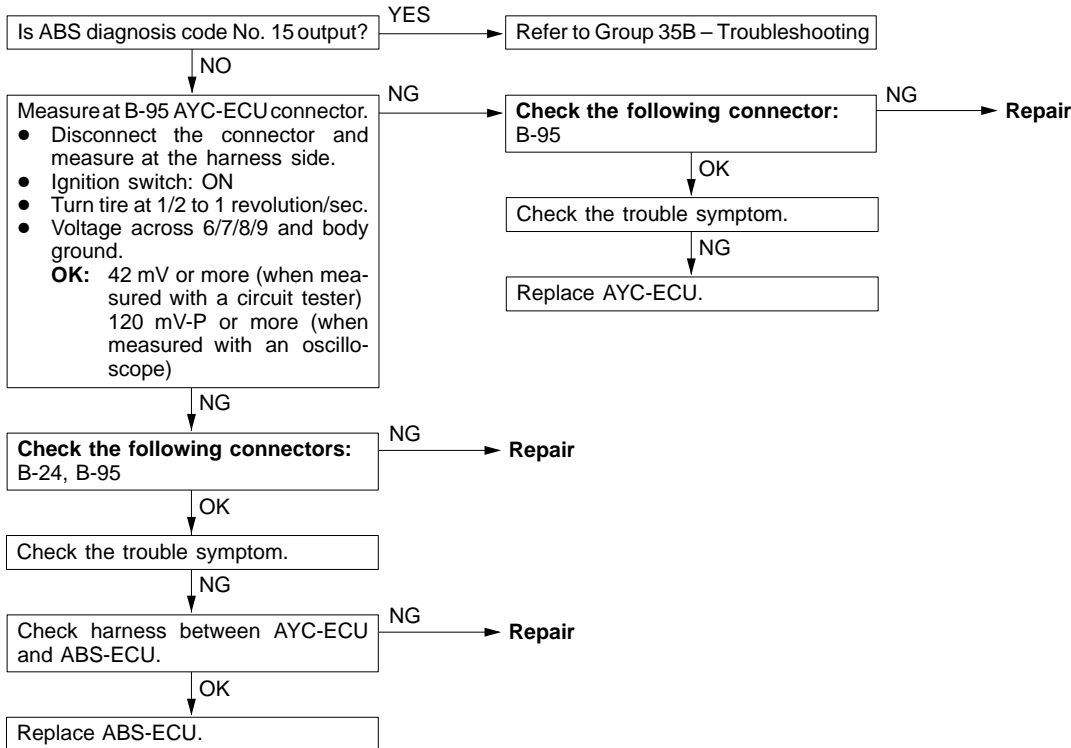


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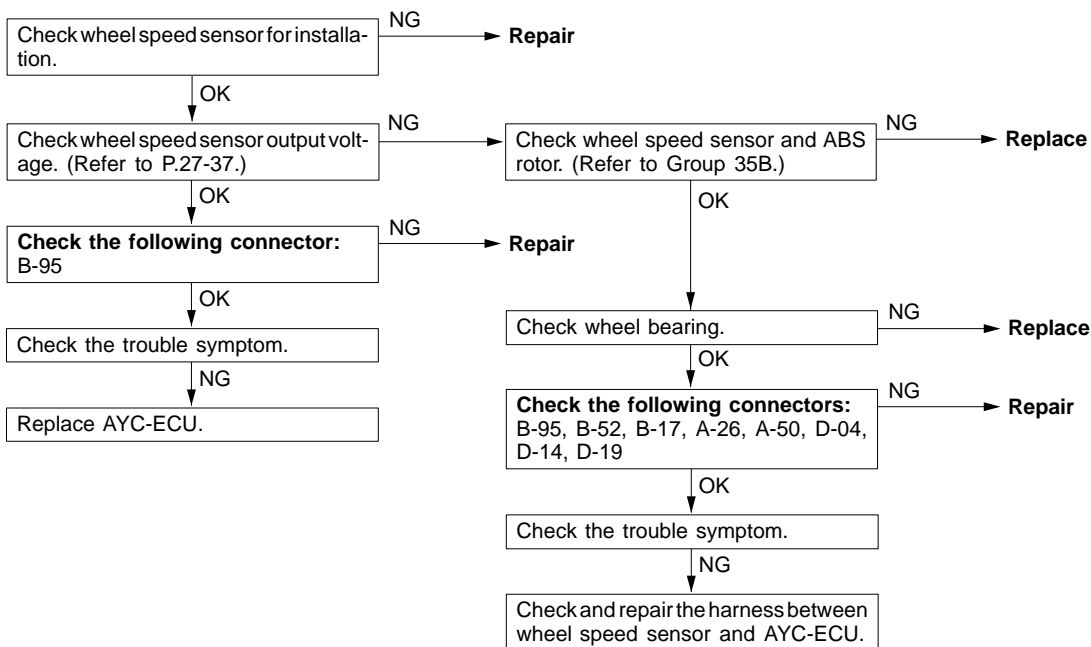


Code No. 26: Wheel speed sensor system (faulty output signal)	Probable cause
This code is output if the speed of one of the four wheels exceeds a specified level when the vehicle speed is 20 km/h or more. At this time, the warning lamp is turned on.	<ul style="list-style-type: none"> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> <li>● Defective ABS-ECU</li> </ul>

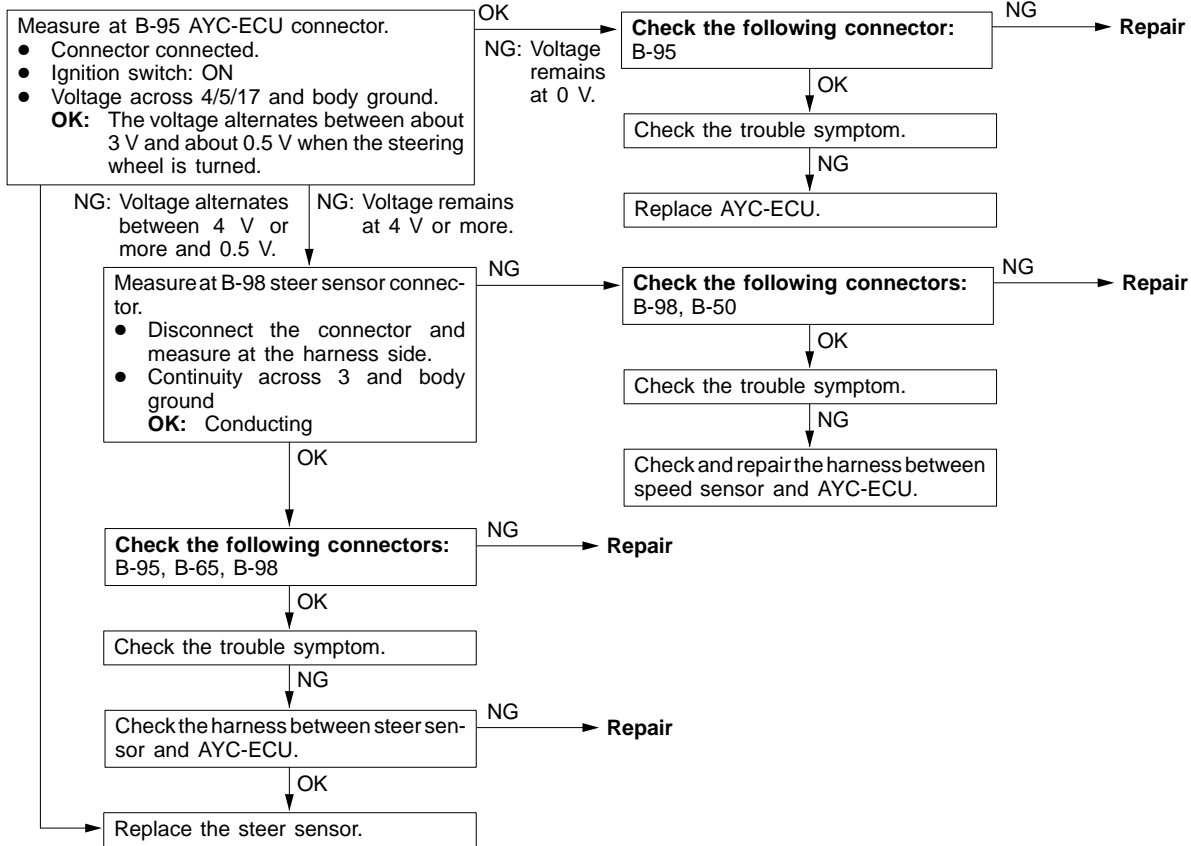
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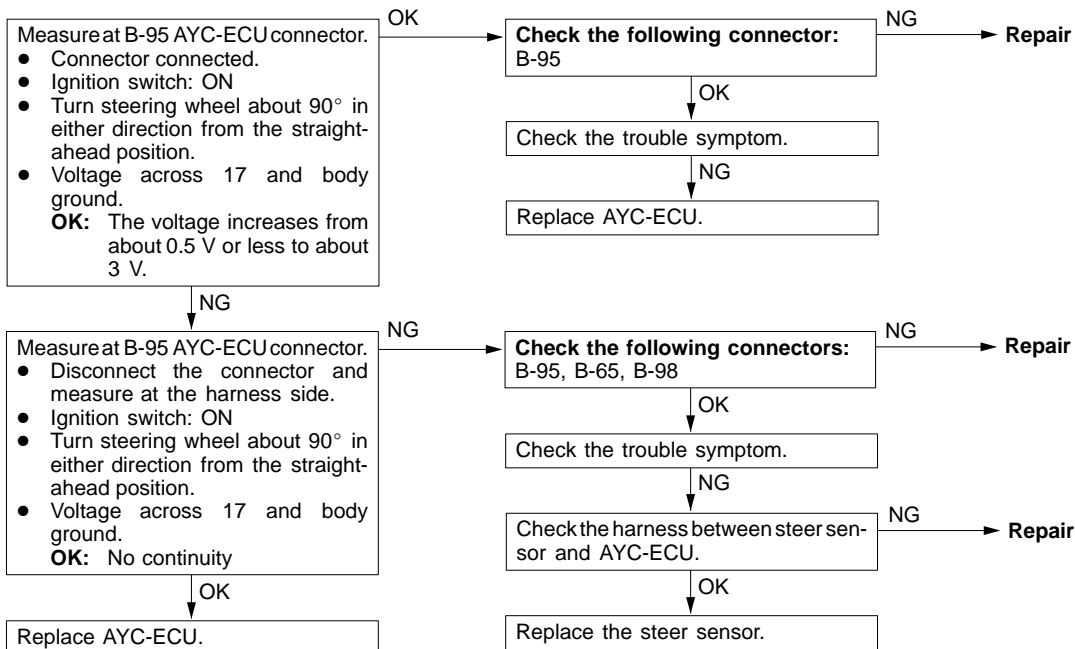
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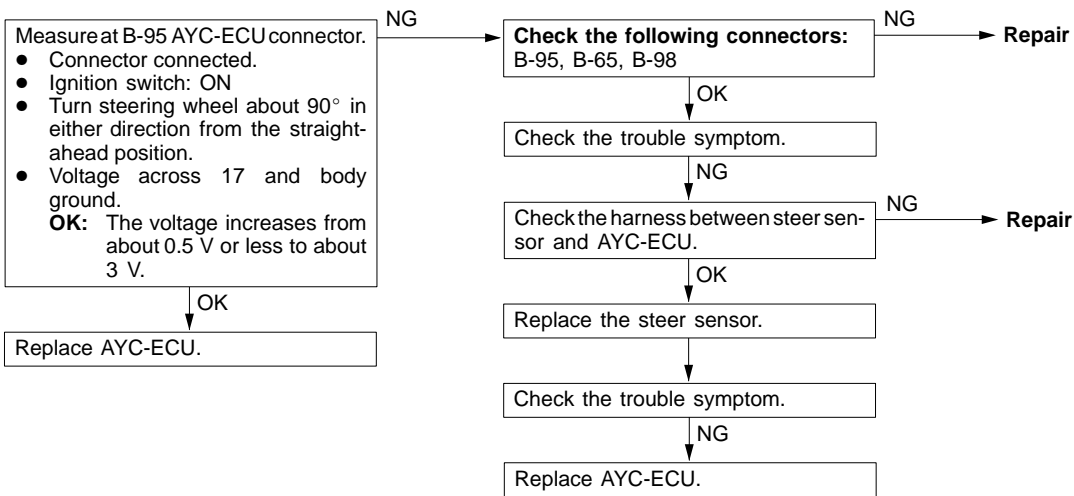
Code No. 31: Steer sensor (ST-1, ST-2, ST-N) system	Probable cause
This code is output when any of the steer sensors ST-1, ST-2, and ST-N is open-circuited or the steer sensor ground wire is open-circuited.	<ul style="list-style-type: none"> <li>● Defective steer sensor</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



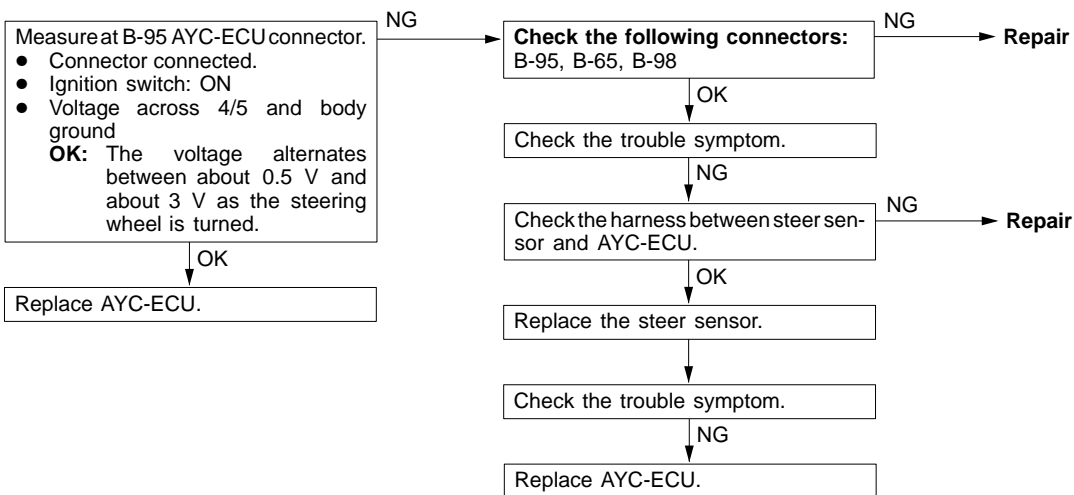
Code No. 32: Steer sensor (ST-N) system	Probable cause
This code is output when the steering wheel is considered to be turned 40° or more as determined with ST-1 and ST-2 with ST-N ON (LOW voltage).	<ul style="list-style-type: none"> <li>● Defective steer sensor</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



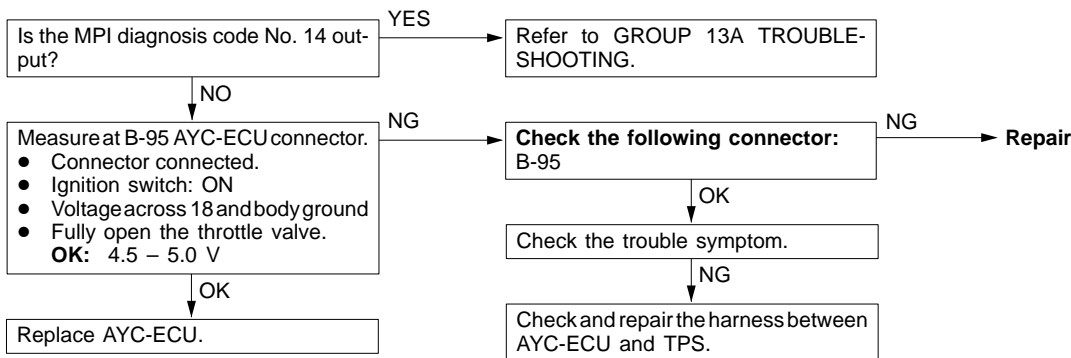
Code No. 33: Steer sensor (ST-N) system	Probable cause
This code is output when the steering wheel is turned 400° or more in the same direction with ST-N OFF (HIGH voltage).	<ul style="list-style-type: none"> <li>● Defective steer sensor</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



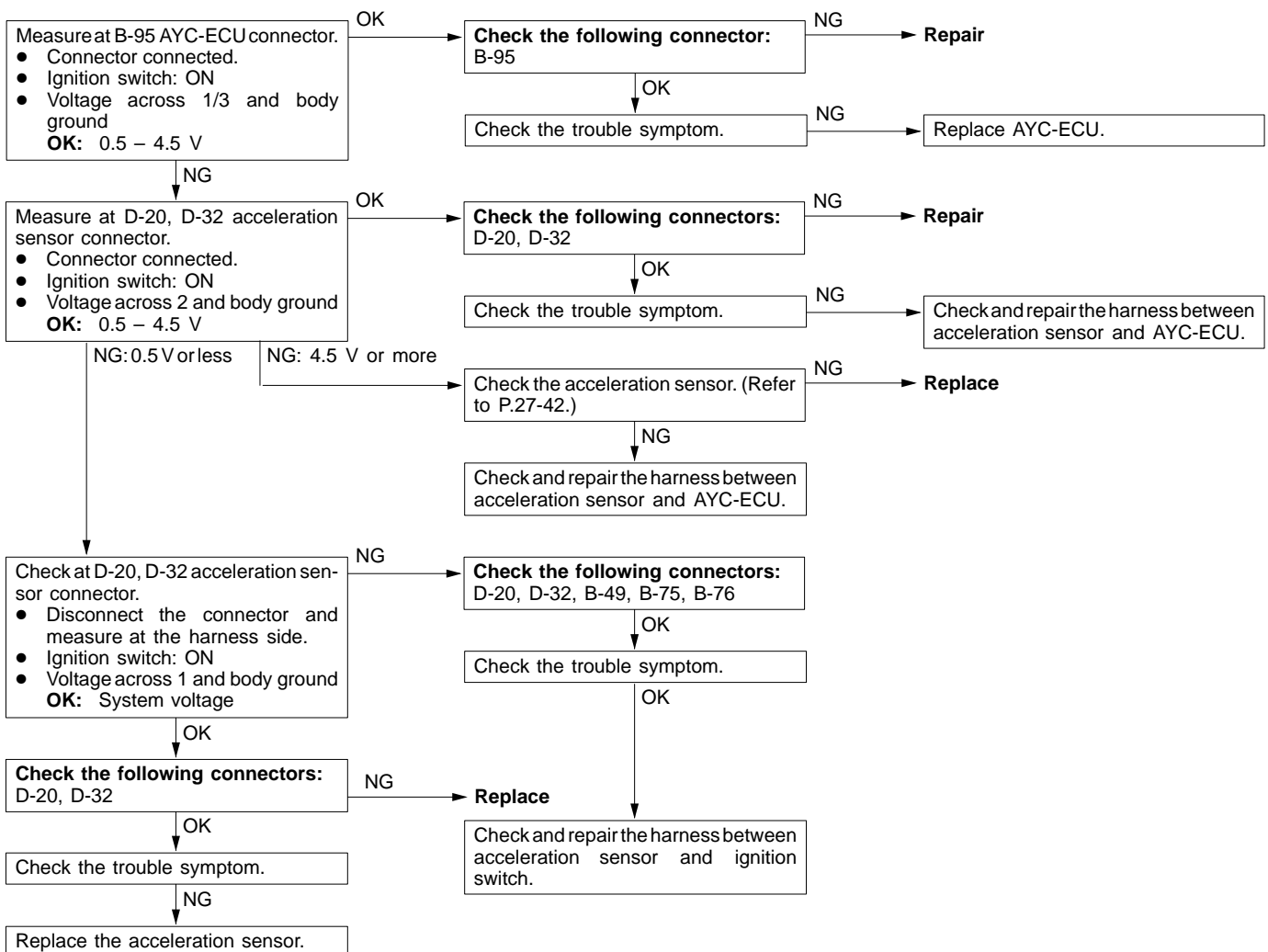
Code No. 34: Steer sensor (ST-1, ST-2) system	Probable cause
This code is output if a turning condition is detected for a cumulative period of time of 15 min. or more, during which there is no change in the steer sensor (ST-1, ST-2) signals with the wheel speed 15 km/h or more.	<ul style="list-style-type: none"> <li>● Defective steer sensor</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



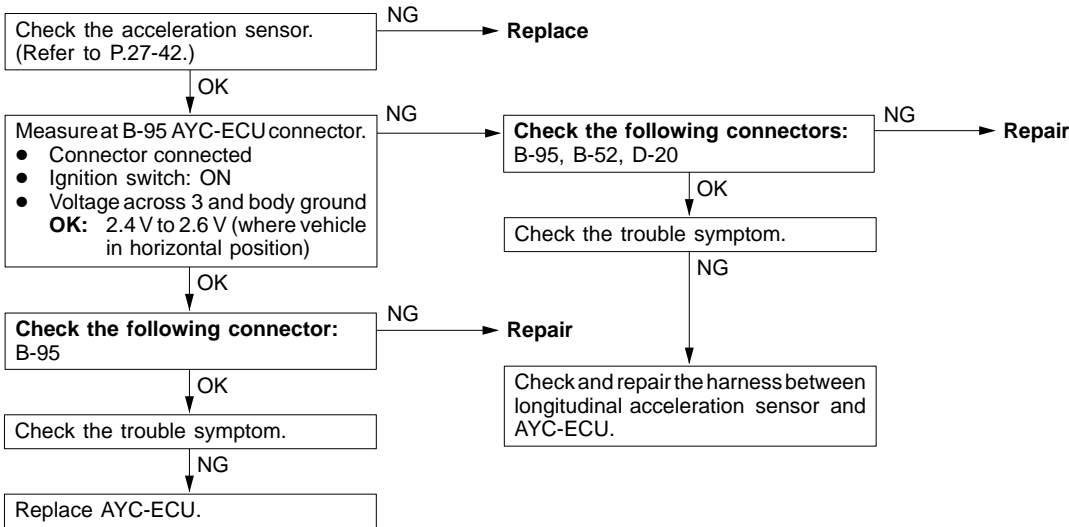
Code No. 41: TPS system	Probable cause
This code is output when the input from the throttle position sensor falls short of 0.2 V.	<ul style="list-style-type: none"> <li>● Defective TPS</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



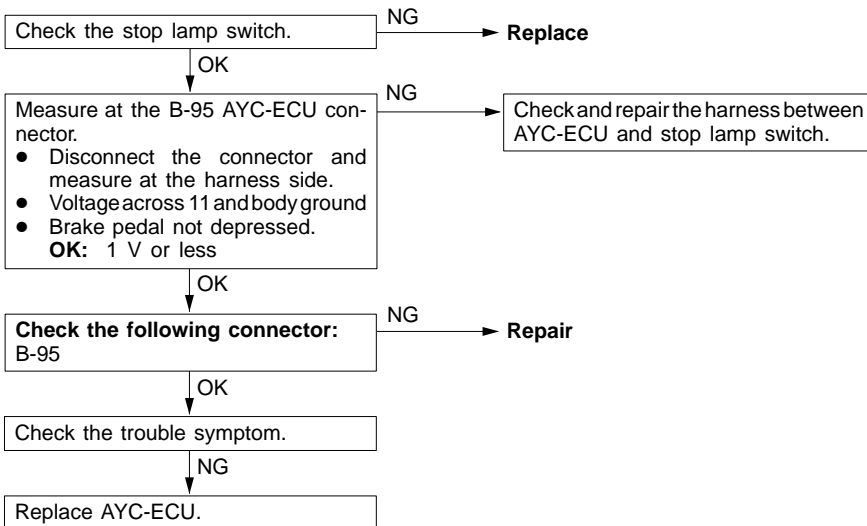
Code No. 51: Longitudinal acceleration sensor system	Probable cause
<b>Code No. 56: Lateral acceleration sensor system</b> This code is output when the output from the acceleration sensor becomes 0.5 V or less or 4.5 V or more.	<ul style="list-style-type: none"> <li>● Defective longitudinal acceleration sensor</li> <li>● Defective lateral acceleration sensor</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



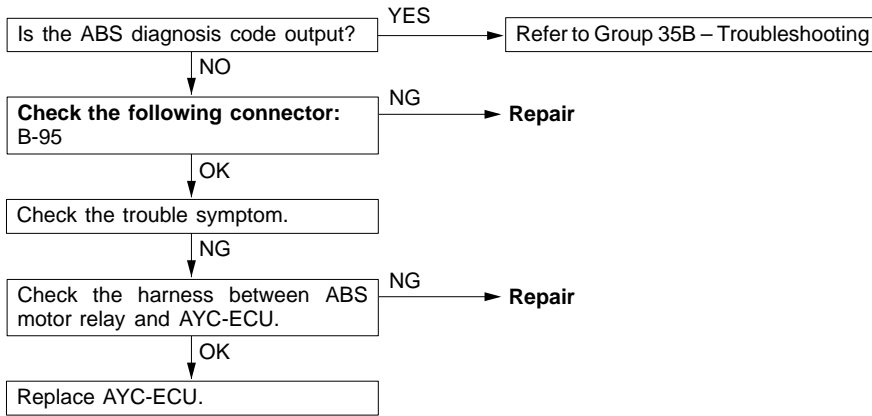
Code No. 52: Longitudinal acceleration sensor system	Probable cause
This code is output when the longitudinal acceleration exceeds a predetermined value while the vehicle is running with both ABS and brakes being inactive.	<ul style="list-style-type: none"> <li>● Defective longitudinal acceleration sensor</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



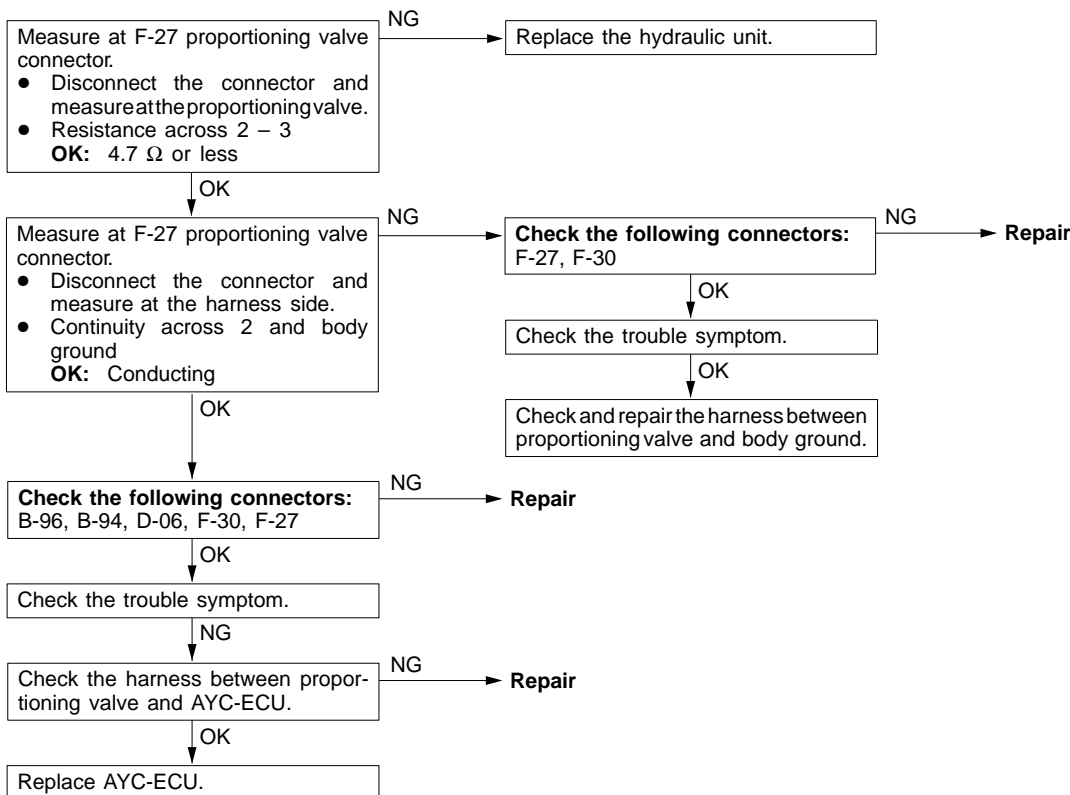
Code No. 61: Stop lamp switch system	Probable cause
This code is output under either of the following conditions: <ul style="list-style-type: none"> <li>● Stop lamp switch remains ON for 15 min. or more.</li> <li>● There is an open-circuit in the harness between AYC-ECU and stop lamp switch.</li> </ul>	<ul style="list-style-type: none"> <li>● Defective stop lamp switch</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



Code No. 65: ABS monitor system	Probable cause
This code is output when ABS is considered to remain activated (motor relay remains ON) for a continuous 1-min.-or-more period. It is output also when there is an open-circuit in the harness between ABS motor relay and AYC-ECU.	<ul style="list-style-type: none"> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>

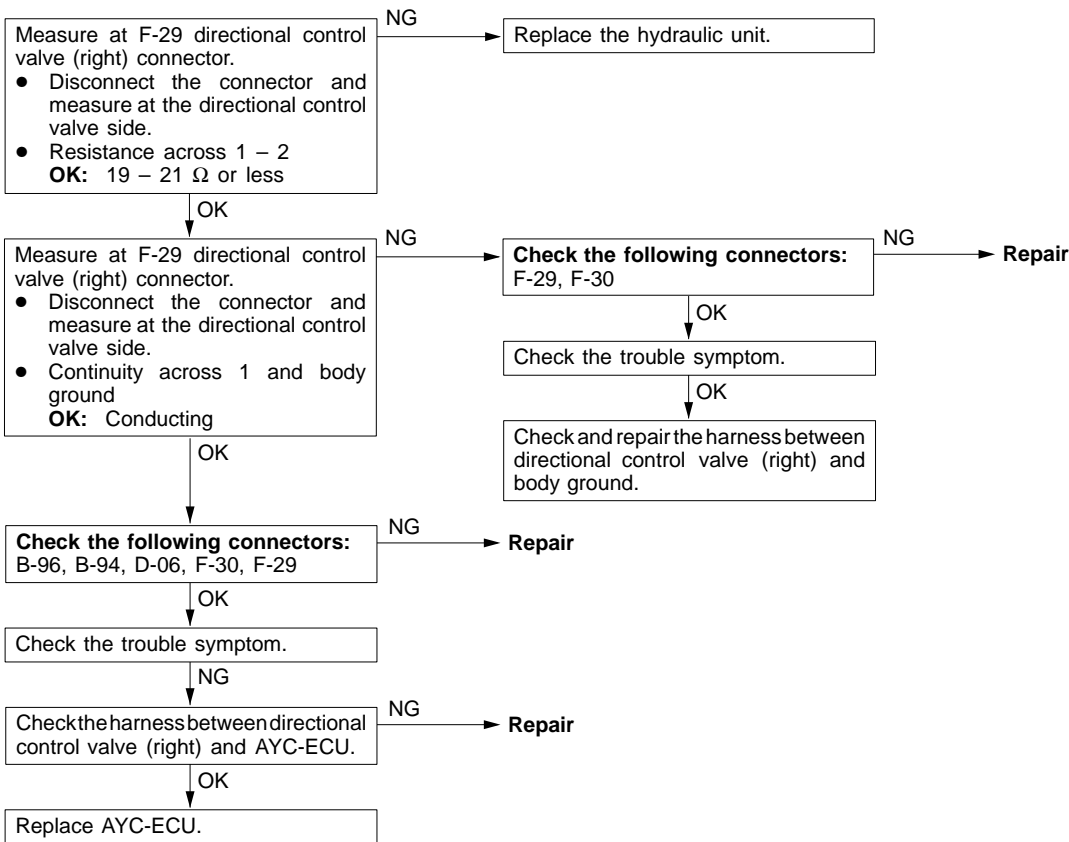


Code No. 71: Proportioning valve system	Probable cause
This code is output when the proportioning valve control circuit is open- or short-circuited.	<ul style="list-style-type: none"> <li>● Defective proportioning valve</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>

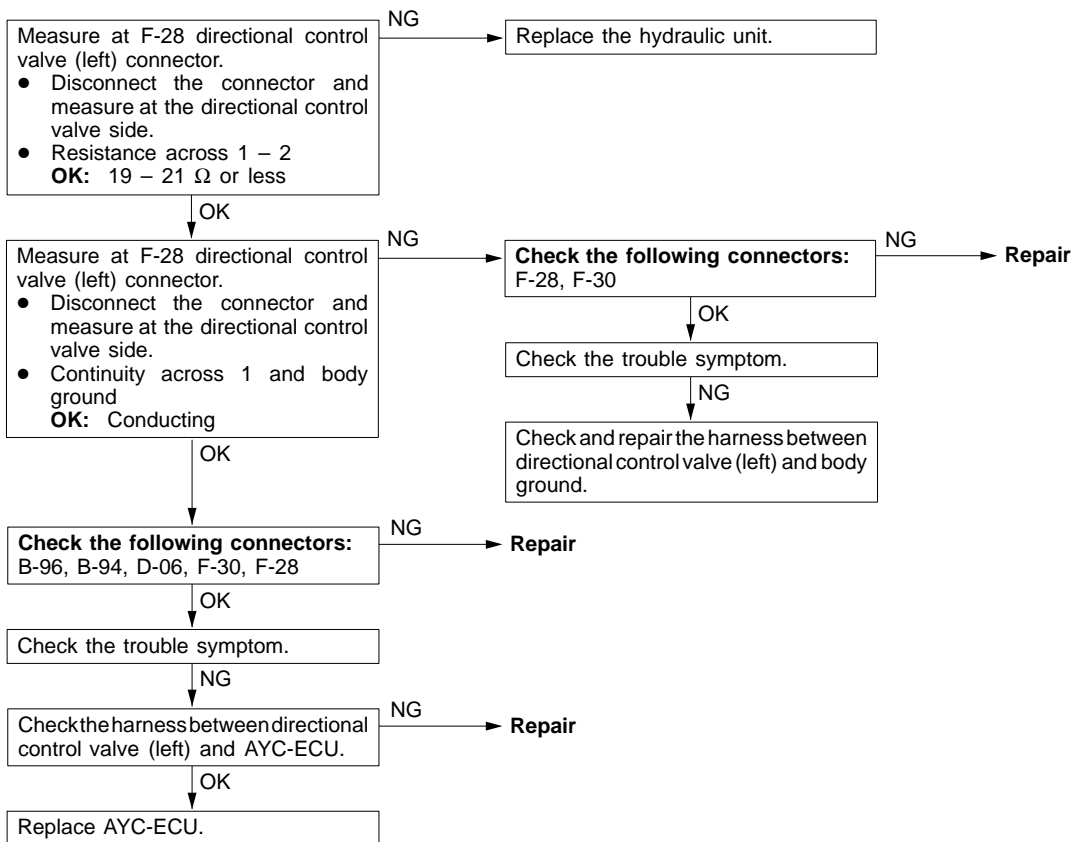




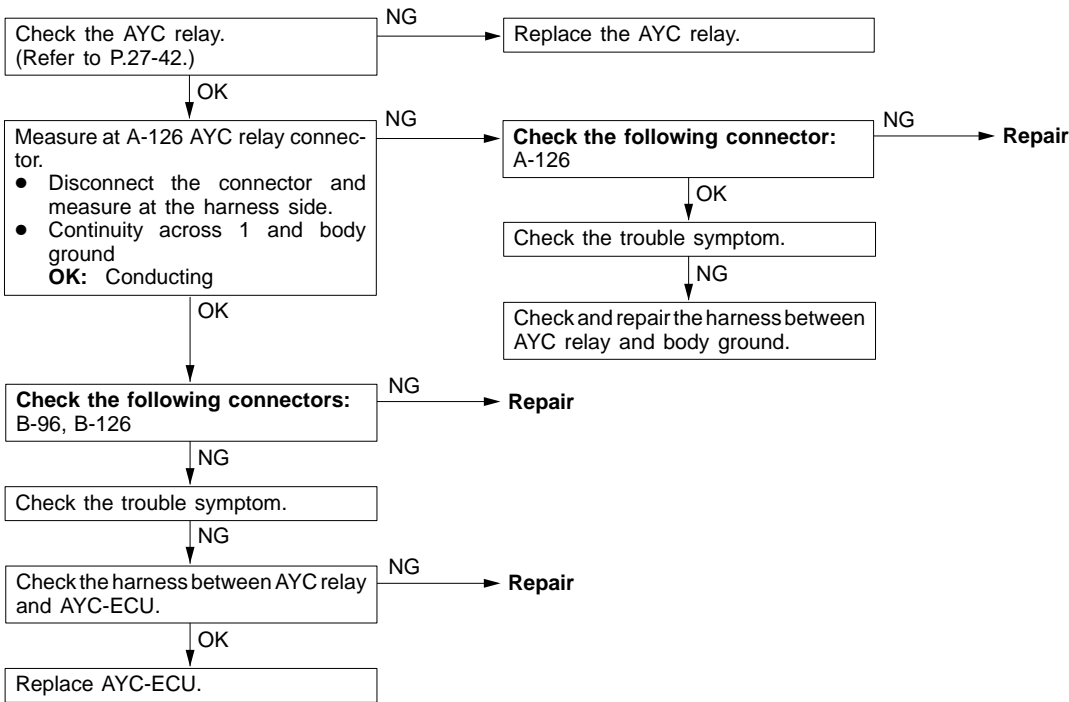
Code No. 72: Directional control valve (right) system	Probable cause
This code is output when the directional control valve (right) control circuit is open- or short-circuited.	<ul style="list-style-type: none"> <li>● Defective directional control valve (right)</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



Code No. 73: Directional control valve (left) system	Probable cause
This code is output when the directional control valve (left) control circuit is open- or short-circuited.	<ul style="list-style-type: none"> <li>● Defective directional control valve (left)</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>

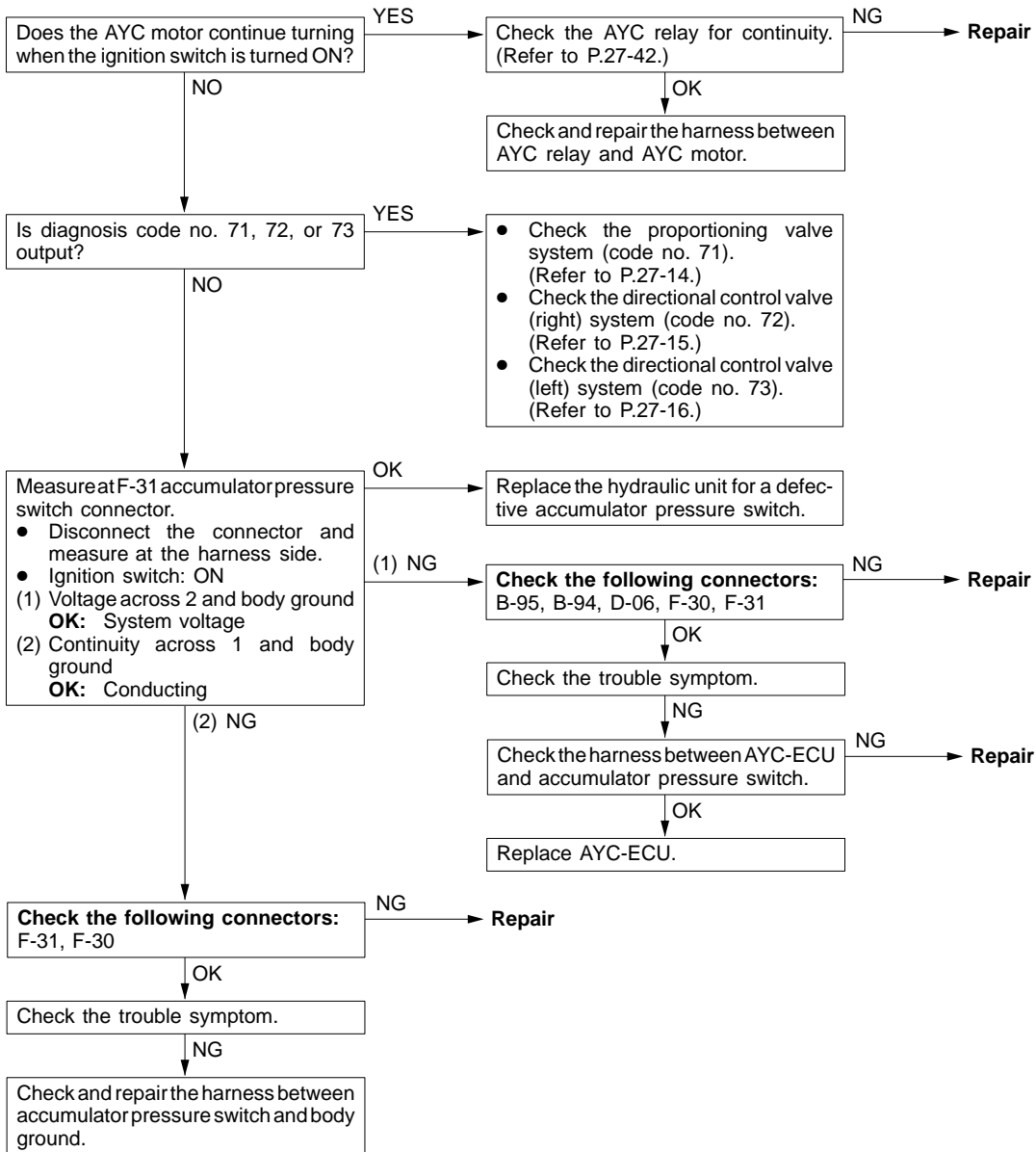


Code No. 81: AYC relay system	Probable cause
This code is output when the coil circuit of the AYC relay is open- or short-circuited.	<ul style="list-style-type: none"> <li>● Defective AYC relay</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>





Code No. 83: Electric pump system	Probable cause
This code is output if the pressure switch is not set to low-pressure position despite the AYC-ECU's command to change the driving force.	<ul style="list-style-type: none"> <li>• Defective accumulator pressure switch</li> <li>• Defective harness or connector</li> </ul>



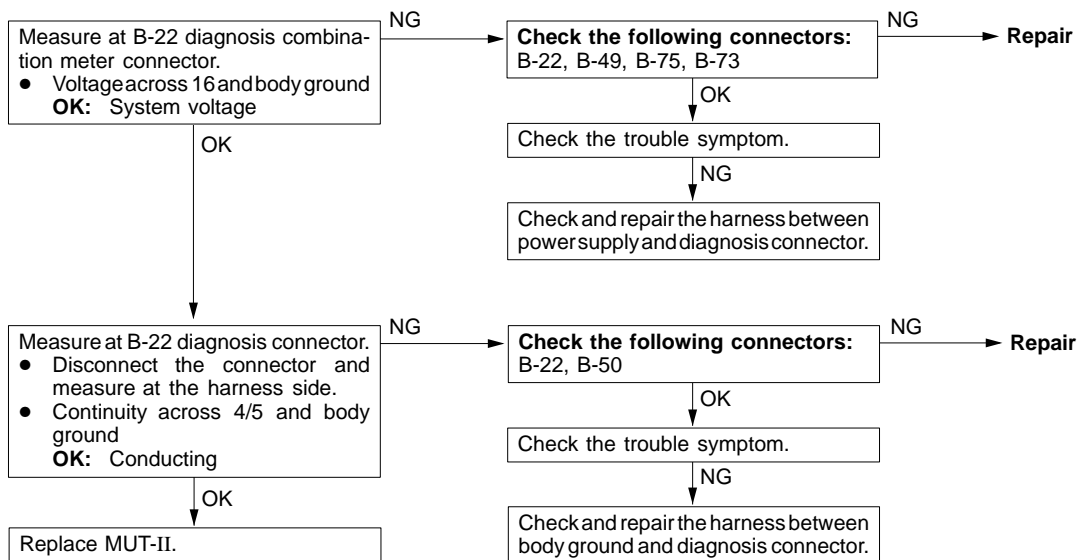
5. INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Ref. page
Communication between MUT-II and the whole system is not possible.	1	27-20
Communication between MUT-II and AYC-ECU is not possible.	2	27-21
AYC warning lamp does not light up when the ignition key is turned to "ON" (engine stationary).	3	27-22
AYC warning lamp remains lit up after the engine has started.	4	27-23
AYC is inoperative. Unable to start or accelerate on slippery road surfaces.	5	27-23
Rear tires are noisy during low-speed cornering. Vehicle skews.	6	27-24

6. INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

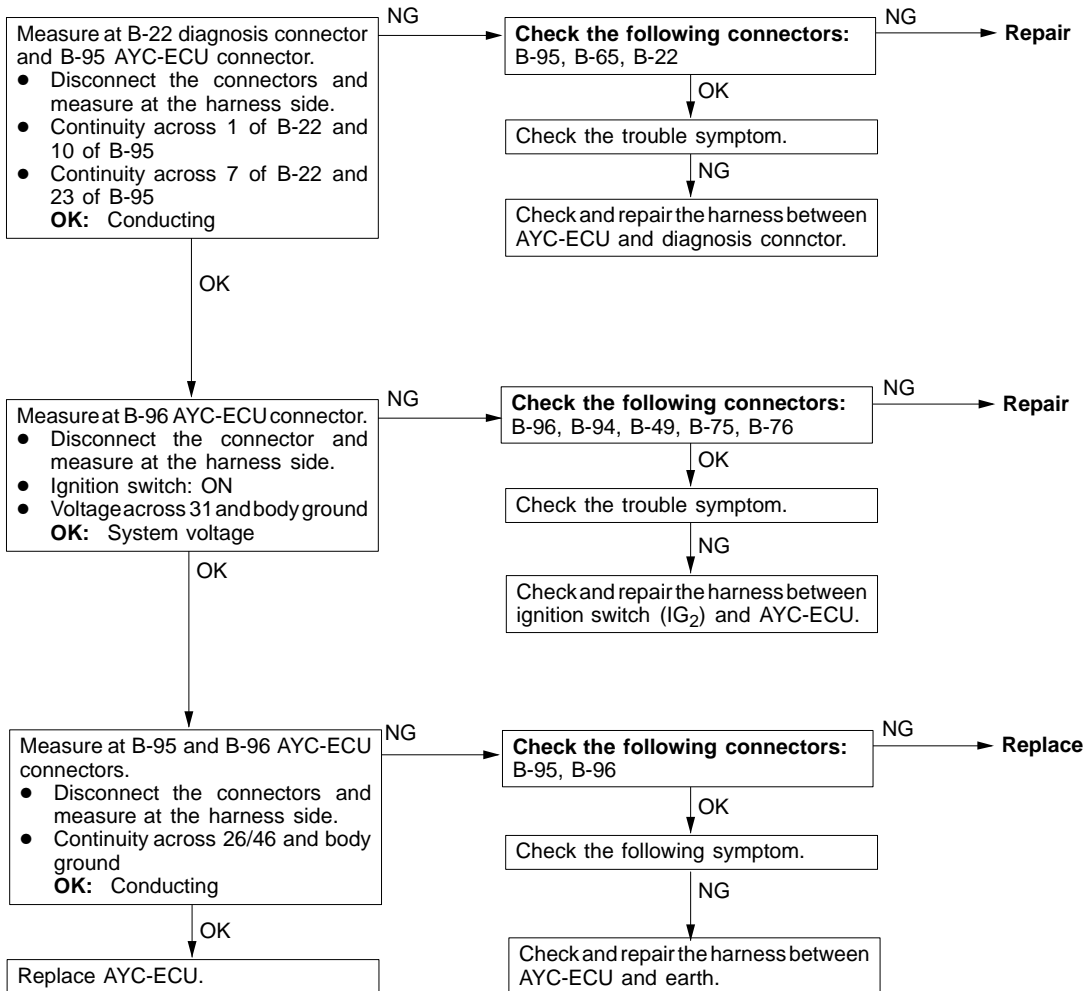
INSPECTION PROCEDURE 1

Communication between MUT-II and the whole system is not possible.	Probable cause
The cause may be a malfunction of the power supply circuit or the ground circuit of the diagnosis connector.	<ul style="list-style-type: none"> <li>Defective diagnosis connector</li> <li>Defective harness or connector</li> </ul>



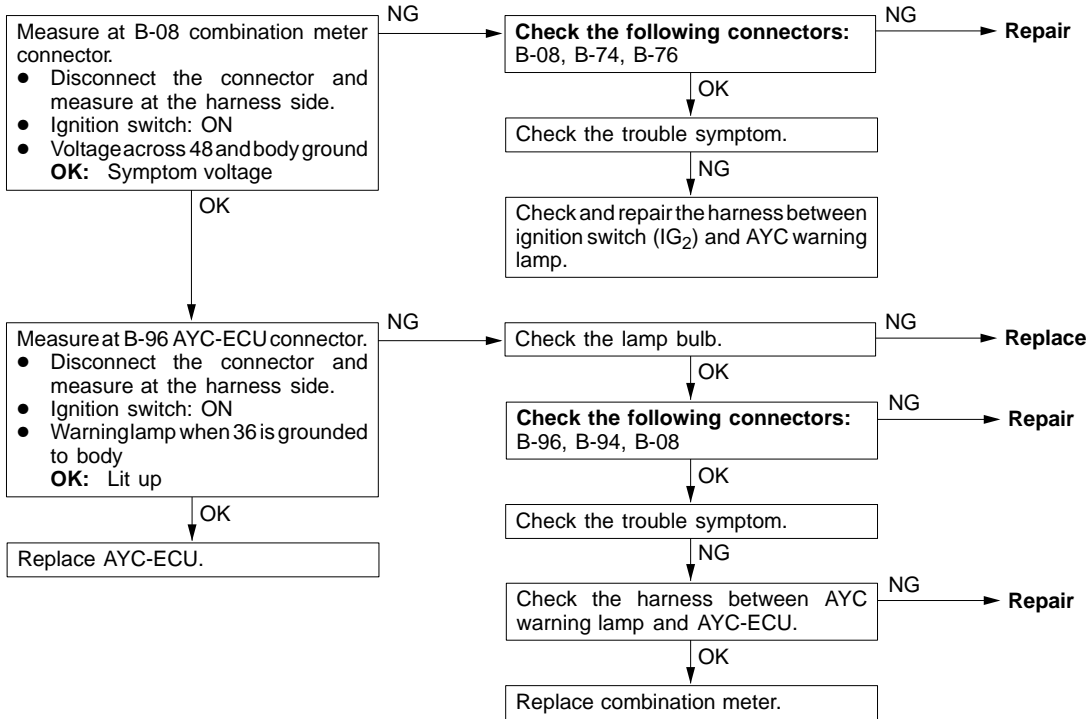
INSPECTION PROCEDURE 2

Communication between MUT-II and the AYC-ECU is not possible.	Probable cause
The cause may be a malfunction of the AYC-ECU power supply circuit or an open circuit in the diagnosis output circuit.	<ul style="list-style-type: none"> <li>● Blown fuse</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



INSPECTION PROCEDURE 3

AYC warning lamp does not light up when the ignition key is turned to "ON" (engine stationary).	Probable cause
The lamp power supply circuit is probably open-circuited, lamp bulb is out, or the circuit between AYC warning lamp and AYC-ECU or AYC-ECU itself is defective.	<ul style="list-style-type: none"> <li>● Blown fuse</li> <li>● AYC warning lamp out</li> <li>● Defective harness or connector</li> <li>● Defective AYC-ECU</li> </ul>



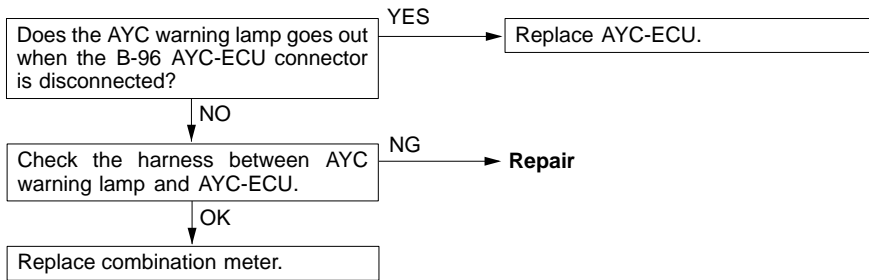


**INSPECTION PROCEDURE 4**

<b>AYC warning lamp remains lit up after the engine has started.</b>	<b>Probable cause</b>
The AYC warning lamp ON circuit is probably short-circuited.	<ul style="list-style-type: none"> <li>● Defective combination meter</li> <li>● Defective harness (short-circuit)</li> <li>● Defective AYC-ECU</li> </ul>

**NOTE**

This symptom is limited only when the communication with MUT-II is possible with AYC-ECU power supply in normal condition and the diagnosis code is correct.

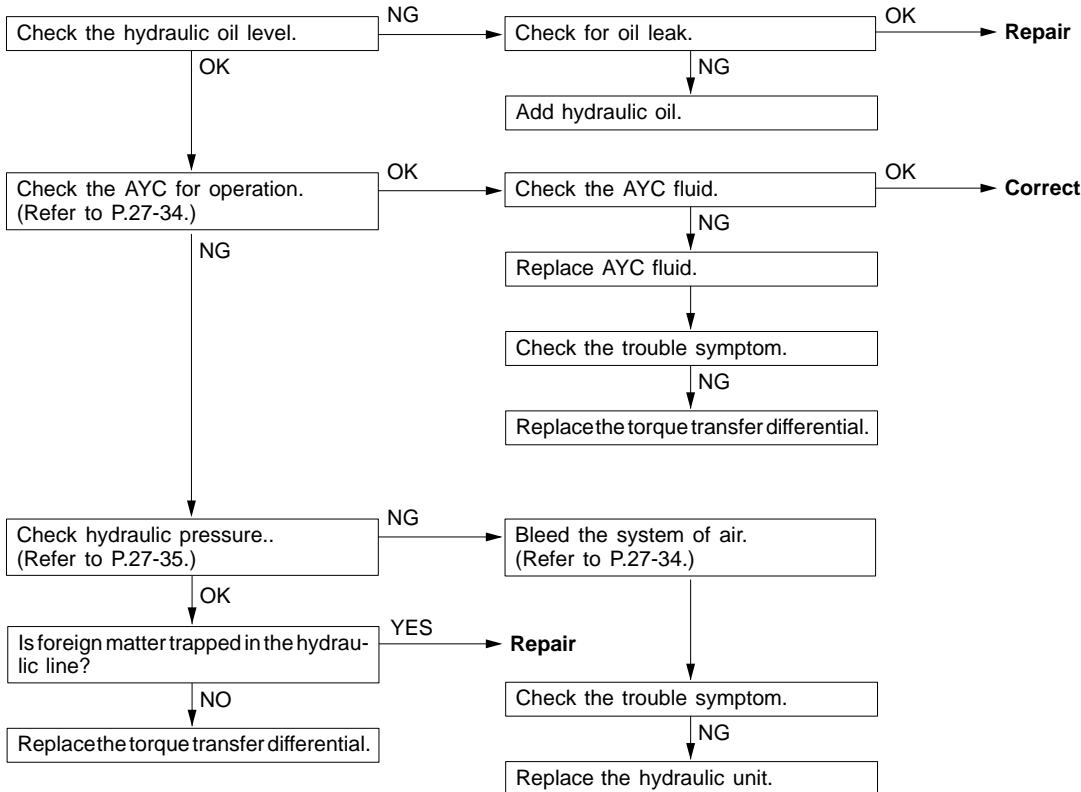


**INSPECTION PROCEDURE 5**

<b>AYC is inoperative. Unable to start or accelerate on slippery road surfaces.</b>	<b>Probable cause</b>
The hydraulic oil level is probably low, there is an oil leak, the hydraulic unit is defective, or the torque transfer differential is defective.	<ul style="list-style-type: none"> <li>● Low hydraulic oil level</li> <li>● Oil leak</li> <li>● Defective hydraulic unit</li> <li>● Defective torque transfer differential</li> </ul>

**NOTE**

This symptom is limited only when the diagnosis code is correct.

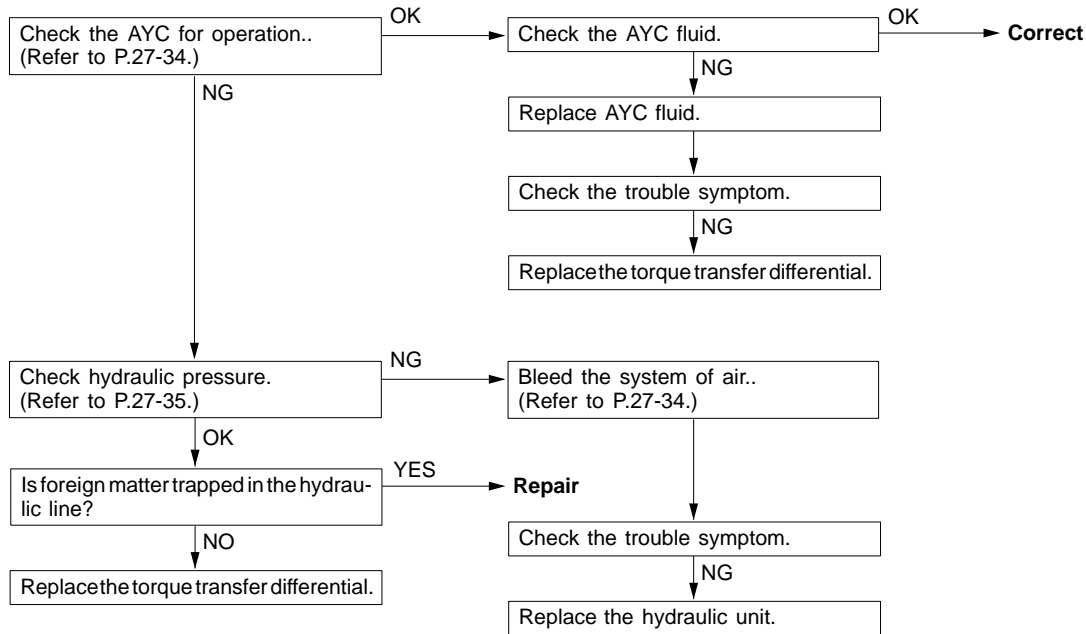


INSPECTION PROCEDURE 6

Rear tires are noisy during low-speed cornering. Vehicle skews.	Probable cause
The hydraulic unit or torque transfer differential is probably defective.	<ul style="list-style-type: none"> <li>● Defective hydraulic unit</li> <li>● Defective torque transfer differential</li> </ul>

NOTE

This symptom is limited only when the diagnosis code is correct.



**DATA LIST REFERENCE TABLE**

The following items can be read by t01he MUT-II from the ECU input data.

Item No.	Check item	Checking requirements		Normal value
01	Front-right wheel speed	Perform a test run.		Vehicle speeds displayed on the speedometer and MUT-II are identical.
02	Front-left wheel speed			
03	Rear-right wheel speed			
04	Rear-left wheel speed			
05	Front-right wheel speed (0.2 km/h)			
06	Front-left wheel speed (0.2 km/h)			
07	Rear-right wheel speed (0.2 km/h)			
08	Rear-left wheel speed (0.2 km/h)			
10	Vehicle speed			
11	System voltage	Ignition switch: ON		Battery voltage
15	TPS opening	Accelerator pedal position/Ignition switch: ON	Fully closed	300 – 1000mV
			Partially open	Gradually increases from the above value.
			Fully open	4500 – 5000mV
19	Longitudinal acceleration sensor	Vehicle stands on level ground		2.4 – 2.6V
		Perform a test run.		Reading fluctuates up or down with 2.5V as its center.
20	Lateral acceleration sensor	Vehicle stands on level ground		2.4 – 2.6V
		Perform a test run.		Reading fluctuates up or down with 2.5V as its center.
22	Steering wheel operation	Steering wheel turning direction Ignition switch: ON	90 deg. clockwise	R90 deg
			90 deg counter-clockwise	L90 deg
23	Steering wheel turning angular velocity	Steering wheel position Ignition switch: ON	Not turned	0 deg/s
			Turned	Reading varies according to turning speeds.
45	Idle position switch	Accelerator pedal position Ignition position: ON	Not depressed	ON
			Depressed	OFF

Item No.	Check item	Checking requirements		Normal value
46	Steer sensor (ST-N)	Steering wheel position Ignition switch: ON	Neutral position	ON
			90 deg. turned from neutral position	OFF
47	Steer sensor (ST-1)	Steering wheel position: Turn slowly counterclockwise. Ignition switch: ON		ON and OFF are indicated alternately.
48	Steer sensor (ST-2)	Steering wheel position: Turn slowly clockwise. Ignition switch: ON		ON and OFF are indicated alternately.
50	Stop lamp switch	Accelerator pedal position Ignition switch: ON	Depressed	ON
			Released	OFF
56	Pressure switch	Forced activation No.13 or No.14 is being executed.	Electric pump in operation	Low
			Electric pump not in operation	High
59	ABS monitor	ABS monitor		ON
		ABS not in operation		OFF

**ACTUATOR TEST REFERENCE TABLE**

The following items can be tested by driving the corresponding actuator forcibly using the MUT-II.

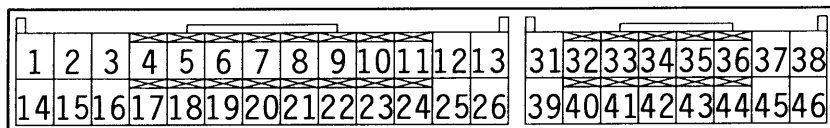
Item No.	Check item	Checking requirements	Normal value
10	Air bleeding	Supply current to proportioning valve in accordance with steering angle to operate directional valve.	No air is to be bled from the bleeder plug on the torque transfer differential.
11	Oil level check	Let the directional valve operate to left and right 20 times.	To be checked by oil level in reservoir tank.
12	Electric pump operation	Let the electric pump operate for 5 seconds.	Operation sounds of the electric pump are to be heard.
13	Clutch operation (left)	Let the directional valve operate to supply the maximum pressure to the left clutch.	The operation conditions are to be checked by the speed difference between left and right rear wheels with the wheels raised. For details, refer to AYC Operation Check on P.27-34.
14	Clutch operation (right)	Let the directional valve operate to supply the maximum pressure to the right clutch.	The operation conditions are to be checked by the speed difference between left and right rear wheels with the wheels raised. For details, refer to AYC Operation Check on P.27-34.
15	Control OFF	Turn off the electric pump relay to deactivate AYC control.	During the test run, some differences are to be recognized in running behaviors between when the system is ON and when it is OFF.

**NOTE**

- (1) The actuator test is feasible only when the following requirements are all satisfied.
  - All of inputs from four wheel speed sensors show 20 km/h or lower.
  - No system failure is registered.
  - The steering angle is within  $\pm 30$  deg. from the neutral position.
- (2) The actuator test comes to an end when either of the following conditions is met since the forced actuation is canceled.
  - Either of inputs from four wheel sensors shows higher than 20 km/h (with exception of Item No.15 "Control OFF").
  - Some trouble with the system is registered.
  - Forced activation time expires.
  - MUT-II is removed.
  - The clear key of MUT-II is operated.

**CHECK AT AYC-ECU TERMINALS****TERMINAL VOLTAGE LISTING**

- The voltage is to be measured across each terminal and ground terminal.
- Fig. below shows the arrangement of the terminals.



1110060

Terminal No.	Check item	Check requirement	Normally
1	Lateral acceleration sensor	Ignition switch: ON	2.4 – 2.6 V (horizontal position)
2	Longitudinal acceleration sensor ground Lateral acceleration sensor ground	At all times	0 V
3	Longitudinal acceleration sensor	Ignition switch: ON	2.4 – 2.6 V (horizontal position)
4	Steer sensor (ST-2)	Engine: Idle speed Turn steering wheel slowly.	0 V ↔ approx. 3 V flashing
5	Steer sensor (ST-1)	Engine: Idle speed Turn steering wheel slowly.	0 V ↔ approx. 3 V flashing
6*1	FR wheel speed	Vehicle stationary	1 V or less
		Forward vehicle slowly.	0 – 5 V
7*1	FL wheel speed	Vehicle stationary	1 V or less
		Forward vehicle slowly.	0 – 5 V
8*1	RR wheel speed	Vehicle stationary	1 V or less
		Forward vehicle slowly.	0 – 5 V
9*1	FL wheel speed	Vehicle stationary	1 V or less
		Forward vehicle slowly.	0 – 5 V
10	Diagnosis selection input	When MUT-II is connected	1 V or less
		When MUT-II is disconnected	System voltage
11	Stop lamp switch	Ignition switch: ON Stop lamp switch: ON	System voltage
		Stop lamp switch: OFF	1 V or less
12*1	ABS monitor	When ABS monitor is activated	System voltage
		When ABS monitor is deactivated	1 V or less

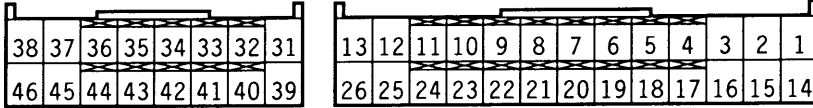
Terminal No.	Check item	Check requirement		Normally
17	Steer sensor (ST-N)	Engine: Idle speed	Steering wheel: Neutral position	0.5 V or less
			Steering wheel: Turned 90° from neutral position	2.5 – 3.5 V
18	TPS	Ignition switch: ON	Accelerator pedal: Fully closed	0.3 – 1.0 V
			Accelerator pedal: Fully open	4.5 – 5.0 V
23	Diagnosis data input/output	When MUT-II is connected		Serial communication with MUT-II
		When MUT-II is disconnected		1 V or less
24	Idle position switch	Ignition switch: ON	Accelerator pedal: Fully closed	2 V or less
			Accelerator pedal: Fully open	4.5 – 5.0 V
25	Accumulator pressure switch	Ignition switch: ON	Accumulator internal pressure: Low	2 V or less
			Accumulator internal pressure: High	System voltage
26	ECU ground	At all times		0 V
31	AYC-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: OFF		0 V
35	AYC motor relay	Ignition switch: ON	When motor is energized	System voltage
			When motor is deenergized	2 V or less
36	AYC warning lamp	Ignition switch: ON	When lamp is OFF	System voltage
			When lamp is ON	2 V or less
37	Directional control valve (right)	Ignition switch: ON	Right clutch: ON	System voltage
			Right clutch: OFF	0 V
38	Proportioning valve	Ignition switch: ON	AYC-ON	0 V to system voltage
			AYC-OFF	0 V
39	ECU backup power supply	At all times		System voltage
45	Directional control valve (left)	Ignition switch: ON	Left clutch: ON	System voltage
			Left clutch: OFF	0 V
46	ECU ground	At all times		0 V

NOTE

\*1: Indicates the vehicles with ABS.

**LISTING OF RESISTANCE AND CONTINUITY ACROSS CONNECTOR TERMINALS ON HARNESS SIDE**

- Measure the resistance and check for continuity with the ignition switch in the “OFF” position and AYC-ECU connector disconnected.
- Measure the resistance and check for continuity across terminals listed below.
- Fig. below shows the arrangement of terminals.



1110061

Terminal No.	Signal name	Normally
2 – body ground	Longitudinal acceleration sensor ground, lateral acceleration sensor ground	Conducting
26 – body ground	ECU ground	Conducting
35 – body ground	AYC motor relay	Conducting
37 – body ground	Directional control valve (right)	15.4 – 16.4 Ω
38 – body ground	Proportioning valve	3.4 – 4.0 Ω
45 – body ground	Directional control valve (left)	15.4 – 16.4 Ω
46 – body ground	ECU ground	Conducting
6 – 19*2	Speed sensor (front, RH)	1.4 – 1.8 kΩ
7 – 20*2	Speed sensor (front, LH)	1.4 – 1.8 kΩ
8 – 21*2	Speed sensor (rear, RH)	1.4 – 1.8 kΩ
9 – 22*2	Speed sensor (rear, LH)	1.4 – 1.8 kΩ

**NOTE**

\*2: Indicates the vehicles without ABS.



## ON-VEHICLE SERVICE <VEHICLES WITH AYC>

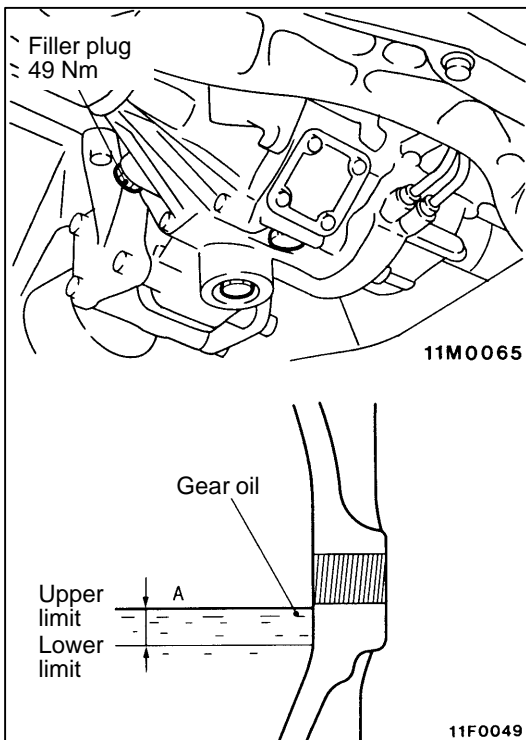
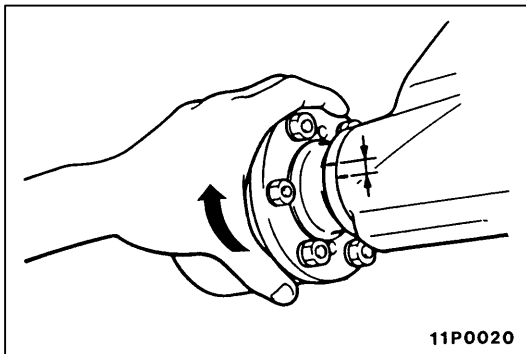
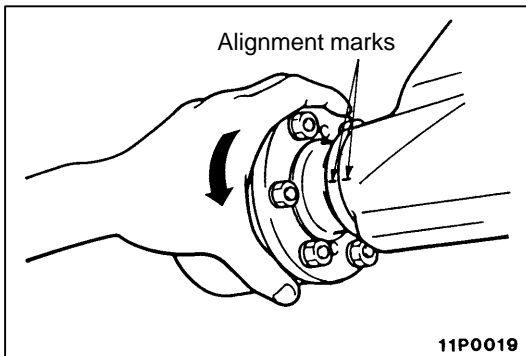
### REAR AXLE TOTAL BACKLASH CHECK

If the drive system roars or the vehicle vibrates, use the following procedure to measure total backlash in the rear axle. Based on the measurement taken, determine whether the differential carrier assembly needs to be removed or not.

1. Place the shift lever in the neutral position and operate the parking brake.
2. Turn the propeller shaft fully clockwise and make an alignment mark on the companion flange dust cover and gear carrier.
3. Turn the propeller shaft fully counterclockwise and measure the deviation between the alignment marks.

**Limit: 5 mm**

4. If the backlash exceeds the limit, replace the differential carrier assembly.



### GEAR OIL LEVEL CHECK

#### DIFFERENTIAL

1. Remove the filler plug.
2. Check that the gear oil level is within the specified range from the bottom end of the filler plug hole.

**Standard value (A): 6 mm**

3. If the gear oil level exceeds the standard value, add the specified gear oil up to the bottom end of the filler plug hole.

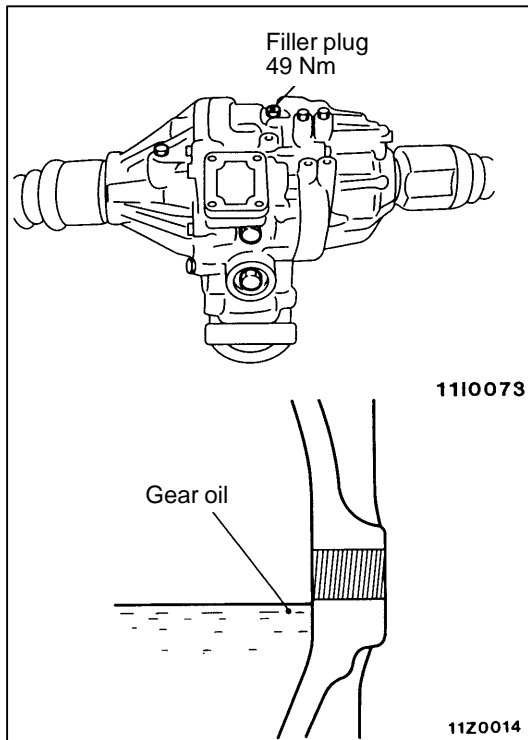
#### Specified gear oil:

**Hypoid gear oil API classification GL-5 or higher  
SAE viscosity Number 90, 80W.**

#### NOTE

10°C or more: #90, less than 10°C: #80

4. Fit the filler plug and tighten it to the specified torque.

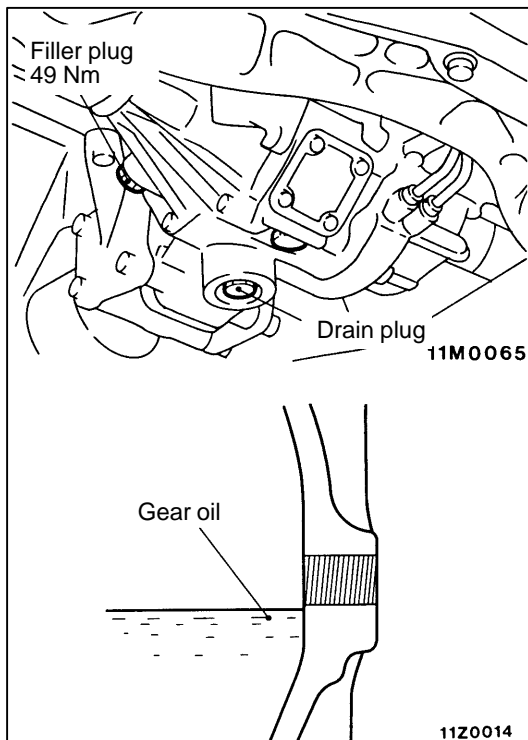
**TORQUE TRANSFER MECHANISM**

1. Remove the filler plug.
2. Check that the gear oil level is up to the bottom end of the filler plug hole.
3. If the gear oil level is lower than the bottom end of the filler plug hole, add the specified gear oil up to the bottom end of the filler plug hole.

**Specified gear oil:**

**MITSUBISHI GENUINE DIA QUEEN SUPER AYC FLUID**

4. Fit the filler plug and tighten it to the specified torque.

**GEAR OIL CHANGE****DIFFERENTIAL**

1. Remove the drain plug to discharge the gear oil.
2. Fit the drain plug and tighten it to the specified torque.

**Tightening torque: 49 Nm**

3. Remove the filler plug and add the specified gear oil up to the bottom end of the filler plug hole.

**Specified gear oil:**

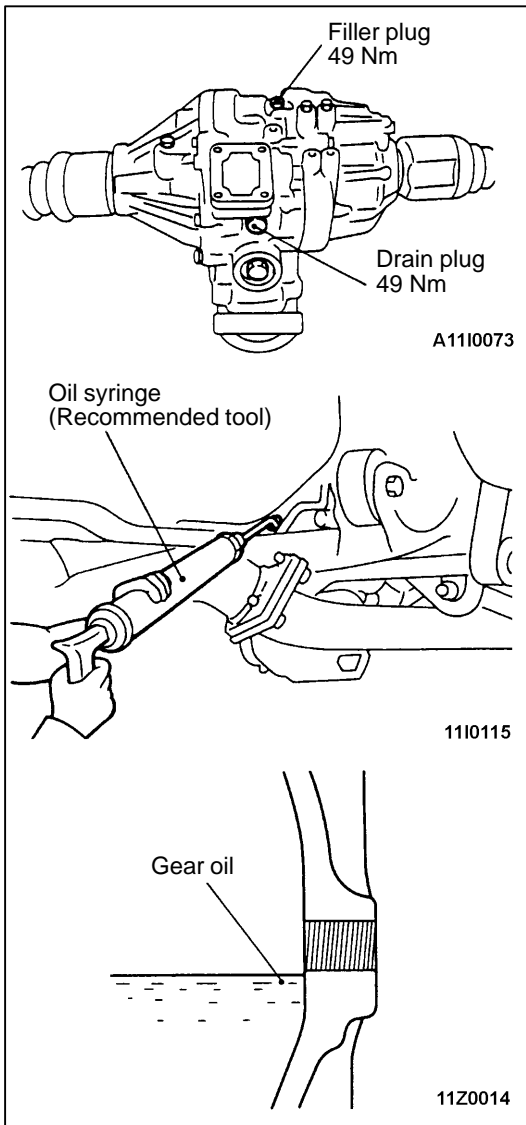
**Hypoid gear oil API classification GL-5 or higher  
SAE viscosity Number 90, 80W.**

**Quantity used: 0.41 ± 0.02 ℓ**

**NOTE**

10°C or more: #90, less than 10°C: #80

4. Fit the filler plug and tighten it to the specified torque.



**TORQUE TRANSFER MECHANISM**

1. Remove the drain plug to discharge the gear oil.
2. Fit the drain plug and tighten it to the specified torque.
3. Remove the filler plug.
4. Pour the specified gear oil up to the bottom end of the filler plug hole using an oil syringe (recommended tool) through the gap between the body and the differential support arm.

**Specified gear oil:**

**mitsubishi GENUINE DIA QUEEN SUPER AYC FLUID**

**Quantity used: 0.70 <sup>+0</sup>/<sub>-0.05</sub> ℓ**

5. Fit the filler plug and tighten it to the specified torque.

**FLUID LEVEL CHECK**

1. Remove the maintenance lid located in the luggage compartment.
2. **<When MUT-II is not used>**  
If the vehicle has been run, leave it for 5 min. or more in an ordinary temperature (10°C to 30°C) to allow the accumulator internal pressure to drop.

**NOTE**

If the ambient temperature is less than 10°C or less, allow more time to leave the vehicle to stand idle.

**<When MUT-II is used>**

Connect the MUT-II to the 16-pin diagnosis connector. Turn on the ignition switch. Operate the MUT-II (Item No.11) to activate the hydraulic unit forcibly for removing the pressure from inside the accumulator.

**Caution**

**Before connecting or disconnecting the MUT-II, always turn off the ignition switch.**

**NOTE**

- (1) The forced activation (oil level check mode) will be automatically canceled as soon as the directional valve in the hydraulic unit is activated to the left and right 20 times.  
It can also be canceled forcibly by operating the clear key on the MUT-II.
- (2) While this function is being disabled by the fail-safe function, the forced activation of the hydraulic unit can not be executed.

3. Check that the fluid level in the oil reservoir is in the range between MAX and MIN.
4. If the fluid level is lower than MIN, add the specified fluid.

**Specified fluid: Dia Queen ATF SP II or equivalent**

5. Reinstall the maintenance lid.

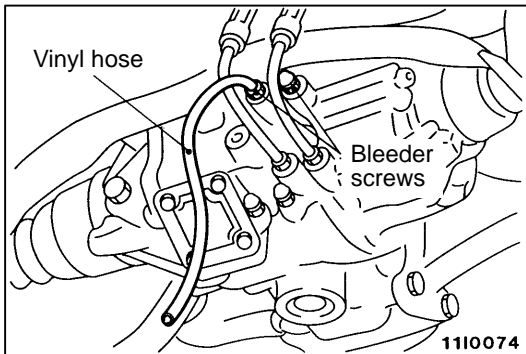
**BLEEDING**

1. Lift up the vehicle.
2. Connect the MUT-II to the 16-pin diagnosis connector.

**Caution**

**Before connecting or disconnecting the MUT-II, always turn off the ignition switch.**

3. Turn on the ignition switch.
4. Operate the MUT-II (Item No.10) to activate the hydraulic unit forcibly.

**NOTE**

- (1) The forced activation (air bleeding mode) will be automatically canceled after 5 minutes operation. It can also be canceled forcibly by operating the clear key on the MUT-II.
  - (2) While this function is being disabled by the fail-safe function, the forced activation of the hydraulic unit can not be executed.
5. Remove the cap of the left bleeder screw on the torque transfer differential and connect a vinyl hose.
  6. Gradually turn the steering wheel clockwise from the straight-ahead position. At this time, loosen the left bleeder screw and check that fluid is discharged with air.
  7. After air has been completely discharged, tighten the bleeder screw.

**Caution**

**While the system is being bled of air, add fluid as necessary to ensure that it is left in the oil reservoir during the entire procedure.**

8. Repeat steps (6) and (7) two to three times until no air bubbles are recognized in the fluid that comes out. Then, tighten the bleeder screw to the specified torque.

**Tightening torque: 9 Nm**

9. Perform steps (5) through (8) for the right bleeder screw. Note, however, that the steering wheel should be turned counterclockwise.
10. After the system has been completely bled of air, check for the fluid level. (Refer to P.27-33.)

**Caution**

**If the system is not completely bled of air, the hydraulic unit could generate noise, degrading pump durability.**

**AYC OPERATION CHECK**

1. Lift up the vehicle.
2. Connect the MUT-II to the 16-pin diagnosis connector.

**Caution**

**Before connecting or disconnecting the MUT-II, always turn off the ignition switch.**

3. Start the engine.
4. Operate the MUT-II with the transmission in 2nd or a higher gear and check to ensure that the vehicle speed is higher than 10 km/h using the Data List (Item 10).

## NOTE

- (1) Hold the steering wheel in the neutral position.
- (2) If the steering wheel is turned, it may happen that the AYC system continues to operate (operation sounds are heard from the torque transfer differential). However, it does not mean a system failure. If such a case is encountered, perform the following operations with the steering wheel in the neutral position to cancel the AYC function.

- Disengage the clutch.
- Set the transmission to neutral.
- Stop the engine.

5. Operate the MUT-II (Item Nos.13 and 14) to activate the torque transfer differential.

## NOTE

- (1) The forced activation (clutch operation mode) will be automatically canceled after 1 minute operation. It can also be canceled forcibly by operating the clear key on the MUT-II.
- (2) While this function is being disabled by the fail-safe function, the forced activation of the torque transfer differential can not be executed.

6. Operate the MUT-II to confirm that the several speeds of the wheels are as shown below, using the Data List (Item Nos.07 and 08).

<Forced activation Item No.13 is being executed>

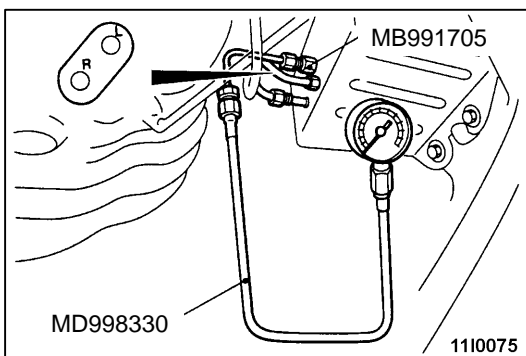
The speed of left rear wheel is more than 2 km/h higher than that of right rear wheel.

<Forced activation Item No.14 is being executed>

The speed of right rear wheel is more than 2 km/h higher than that of left rear wheel.

## NOTE

If the above requirements are not satisfied, the system is probably failed. Check the hydraulic pressure.

**HYDRAULIC PRESSURE CHECK**

1. Lift up the vehicle.
2. Connect the MUT-II to the 16-pin diagnosis connector.

**Caution**

**Before connecting or disconnecting the MUT-II, always turn off the ignition switch.**

3. Turn on the ignition switch.
4. Disconnect the joint between the hydraulic unit and the hydraulic unit hose assembly. Connect the special tool to the L port. To the R port, attach a blind plug or connect the L port of the removed hydraulic unit hose assembly.
5. Operate the MUT-II (Item No.13) to activate the hydraulic unit.

## NOTE

- (1) The forced activation (clutch left side operation check mode) will be automatically canceled after 1 minute operation.

It can also be canceled forcibly by operating the clear key on the MUT-II.

(2) While this function is being disabled by the fail-safe function, the forced activation of the hydraulic unit can not be executed.

6. Check to ensure that the hydraulic pressure generated by the hydraulic unit conforms to the standard value.

**Standard value: 1.0 – 1.6 MPa**

**NOTE**

During checking the hydraulic pressure, occasionally replenish the oil reservoir with fluid so that it does not become empty.

7. Check the hydraulic pressure of the clutch right side by repeating the steps (4) through (6). At this time, however, the special tool must be connected to the R port and the blind plug or the R port of the removed hydraulic unit hose assembly must be attached to the L port. Further, the MUT-II must be operated in the forced activation mode Item No. 14 (clutch right side operation check mode).
8. If the measured value exceeds the standard value, replace the hydraulic unit.
9. Connect the hydraulic unit hose assembly to the hydraulic unit and to the torque transfer differential and tighten the flare nuts to the specified torque.

**Specified torque: 34 Nm**

10. Pour the specified fluid in the oil reservoir up to the MAX mark. Then, bleed the system.

**Specified fluid: Dia Queen ATF SP II or equivalent**

**Fluid amount used: Approx. 1 ℓ**

**DIFFERENTIAL CARRIER OIL SEAL REPLACEMENT**

**DIFFERENTIAL**

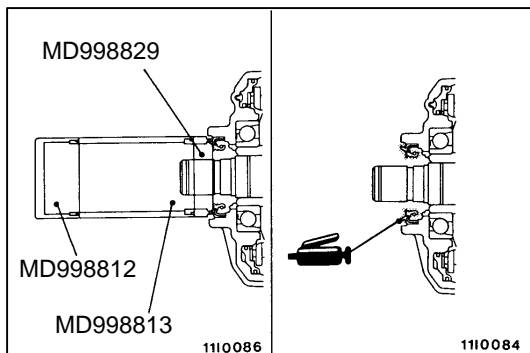
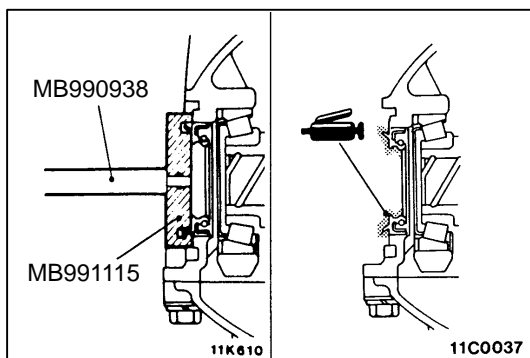
1. Remove the drive shaft.
2. Remove the oil seal from the differential carrier.
3. Using the special tool, drive a new oil seal all the way into position.
4. Coat the oil seal lips and the drive shaft surface in contact with the oil seal with multi-purpose grease.
5. Replace the drive shaft circlip with a new one and mount the drive shaft to the differential carrier.
6. Check for correct wheel alignment.

**TORQUE TRANSFER MECHANISM**

1. Remove the drive shaft.
2. Remove the oil seal from the differential carrier.
3. Using the special tool, drive a new oil seal all the way into position.
4. Coat the oil seal lips and the drive shaft surface in contact with the oil seal with the specified grease.

**Specified grease: Vaseline**

5. Replace the drive shaft circlip with a new one and mount the drive shaft to the differential carrier.
6. Check for correct wheel alignment.



**WHEEL SPEED SENSOR OUTPUT VOLTAGE MEASUREMENT <VEHICLES WITHOUT ABS>**

1. Lift up the vehicle and release the parking brake.
2. Disconnect the AYC-ECU harness connector and take measurements on the harness side connector.

**Caution**

**Insert the probe from the harness side with the double lock of the connector unlocked. Inserting it to the terminal side could result in poor contact.**

3. Turn the wheel to be tested at about 1/2 to one revolution/sec. and check for the output voltage using a circuit tester (AC mV range) or oscilloscope.

**Terminal nos.**

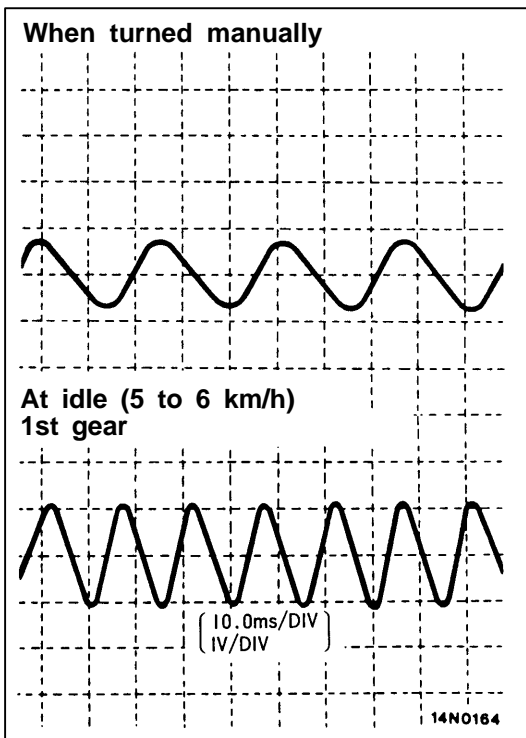
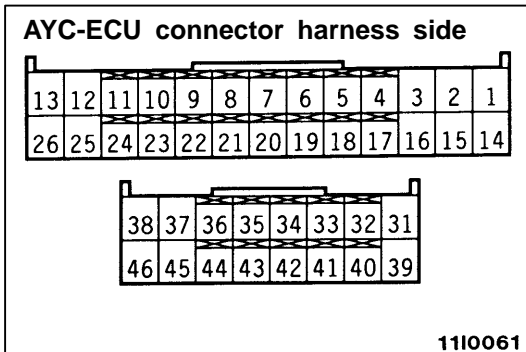
Front LH	Front RH	Rear LH	Rear RH
7	6	9	8
20	19	22	21

**Output voltage:**

**When circuit tester is used: 70 mV or more**

**When oscilloscope is used: 200 mVp-p or more**

- (4) If the output voltage is lower than the above value, it is probably attributable to the following faults. Check or replace the wheel speed sensor as necessary.
  - Excessive clearance between the pole piece and rotor of the wheel speed sensor
  - Defective wheel speed sensor



**Waveform Check Using Oscilloscope**

Check the harness and connector of the wheel speed sensor for connection. Then, use an oscilloscope to check for output voltage waveform of each sensor as follows.

Start the engine and monitor the sensor by turning the wheel; for a driving wheel, let it turn by shifting into the 1st gear and for a driven wheel turn it manually at a constant speed.

**NOTE**

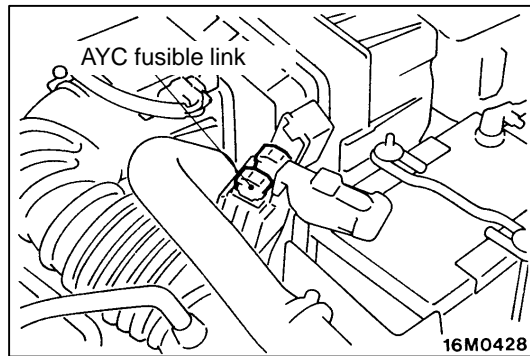
- (1) Waveform may be observed by actually running the vehicle.
- (2) The output voltage is low when the wheel speed remains low and builds up as the wheel speed increases.

## Waveform Observation Points

Symptom	Probable cause	Action
Waveform amplitude is too small, or no waveform.	Defective wheel speed sensor	Replace sensor.
Waveform amplitude varies greatly. (No problem if the smallest amplitude is 100 mV or more)	Excessive axle hub lateral and radial runout	Replace hub.
	Poor AYC-ECU grounding	Repair.
Noise on waveform or disturbed waveform	Open-circuited sensor	Replace sensor.
	Open-circuited harness	Repair harness.
	Improperly mounted wheel speed sensor	Correct sensor installation.
	Missing or collapsed ABS rotor tooth	Replace ABS rotor.

**Caution**

Since the wheel speed sensor cable follows the movement of the front or rear suspension, it may be open-circuited only when the vehicle is run on rough roads and not on ordinary road. The wheel speed sensor output voltage waveform should therefore be checked also by rocking the sensor harness so that driving on rough roads may be simulated.

**ACTION WHEN BATTERY RUNS OUT**

When the engine is started using a booster cable where the battery has completely run down and you attempt to start the vehicle without waiting for the battery to recover a certain charge, the engine can misfire and you just cannot start to move it. In such cases, charge the battery sufficiently; or, remove the AYC fusible link from the engine compartment relay box to make AYC inactive before attempting to start the vehicle. When the fusible link is removed, the AYC warning lamp lights up. After the battery has been recharged, fit the fusible link back again and start the engine to ensure that the AYC warning lamp is off.



# HYDRAULIC UNIT <VEHICLES WITH AYC>

## REMOVAL AND INSTALLATION

**Caution**

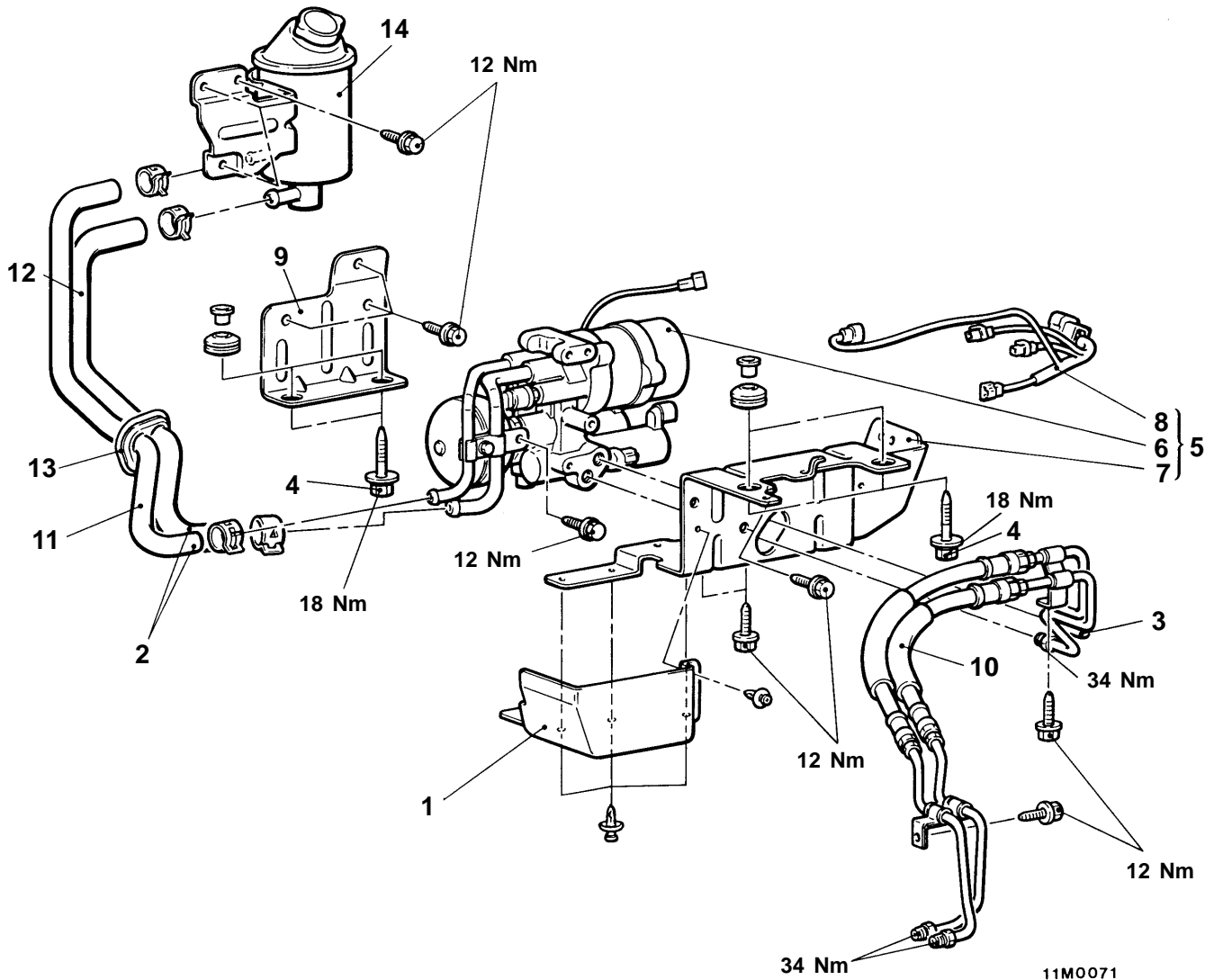
- (1) When connecting the return hose and suction hose, do not apply lubricant.
- (2) No foreign matter should be allowed in the hydraulic piping and joints.

**Pre-removal Operation**

- Trunk Side Trim Removal
- Hydraulic Piping Fluid Draining

**Post-installation Operation**

- Hydraulic Piping Fluid Filling and Bleeding (Refer to P.27-32, 34.)
- Trunk Side Trim Installation



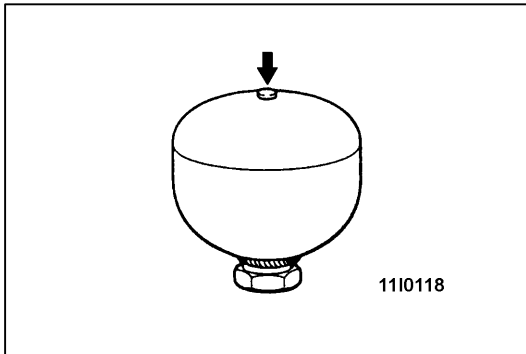
**Removal steps**

1. Dust guard
2. Suction hose and return hose connection
3. Hydraulic unit hose assembly connection
4. Hydraulic unit and bracket assembly mounting bolt
5. Hydraulic unit and bracket assembly
6. Hydraulic unit

7. Hydraulic unit bracket
8. AYC harness
9. Hydraulic unit bracket
10. Hydraulic unit hose assembly
11. Return hose
12. Suction hose
13. Grommet
14. Oil reservoir



11M0071



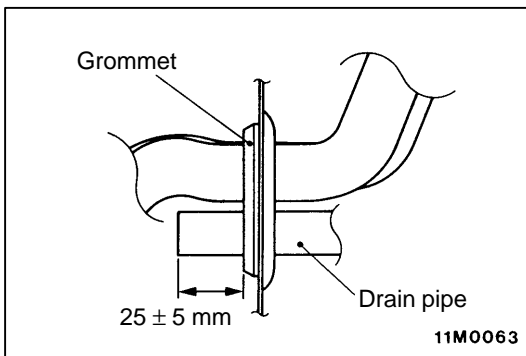
## REMOVAL SERVICE POINTS

### ◀A▶ HYDRAULIC UNIT REMOVAL

Should the hydraulic unit be discarded, drill a hole in the accumulator at the illustrated position beforehand in order to release the inside gas.

#### Caution

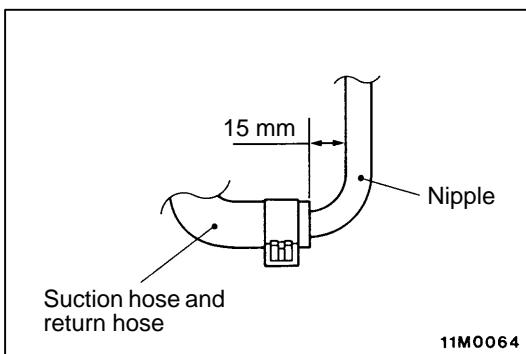
- (1) The hydraulic unit has its accumulator filled with a high pressure gas. Never throw it into a fire. Also, never attempt to disassemble, press, weld or melt it.
- (2) When drilling a hole in the accumulator, be sure to wear safety goggles since drill chips may blow out together with the gas.



## INSTALLATION SERVICE POINTS

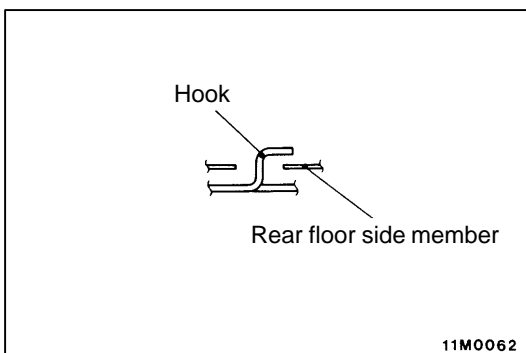
### ▶A▶ GROMMET INSTALLATION

On the vehicle mounted with a sunroof, mount the drain pipe to the grommet as illustrated.



### ▶B▶ SUCTION HOSE / RETURN HOSE INSTALLATION

Fit the suction hose and return hose to the nipple of hydraulic unit as illustrated.



### ▶C▶ HYDRAULIC UNIT AND BRACKET ASSEMBLY INSTALLATION

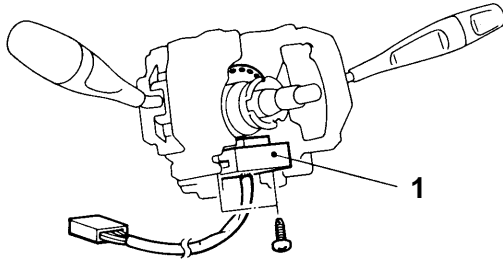
Hook the hydraulic unit bracket hook to the rear floor side member and install the hydraulic unit and bracket assembly mounting bolt.

# SENSOR RELAY <VEHICLES WITH AYC>

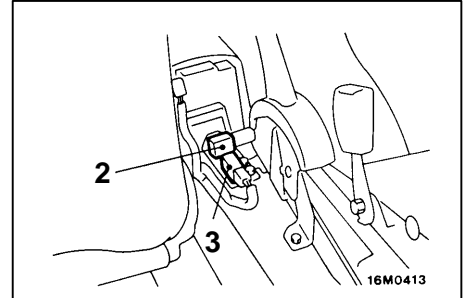
## REMOVAL AND INSTALLATION

**Caution: SRS**

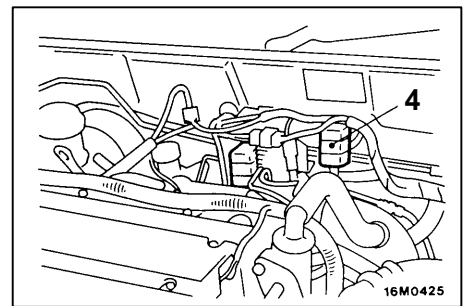
For vehicles with SRS, before removal of air bag module and clock spring, refer to GROUP 52B – Service Precautions and Air Bag Module and Clock Spring.



14W0057



16M0413



16M0425

### Steer sensor removal steps

- Steering wheel and column cover
- 1. Steer sensor

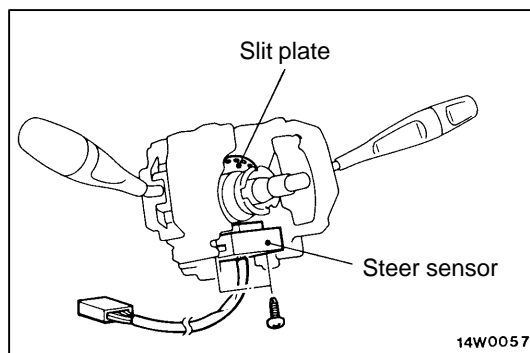


### Acceleration sensor and AYC relay removal

2. Longitudinal acceleration sensor
3. Lateral acceleration sensor
4. AYC relay

**NOTE**

For the wheel speed sensor, refer to GROUP 35B.



14W0057

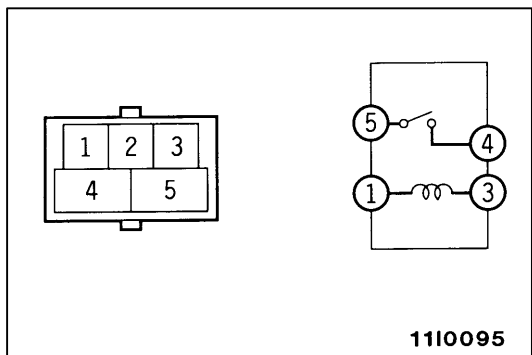
## REMOVAL SERVICE POINT

### ◀▶ STEER SENSOR REMOVAL

Remove the steer sensor from the column switch.

**Caution**

- (1) A photocoupler is used as the steer sensor. Use care not to allow dust or grease to be on the sensor.
- (2) Do not bend or dirty with grease the slit plate on the column switch side.



**INSPECTION**

**1. LONGITUDINAL AND LATERAL ACCELERATION SENSOR CHECK**

Refer to GROUP 35B – Acceleration Sensor.

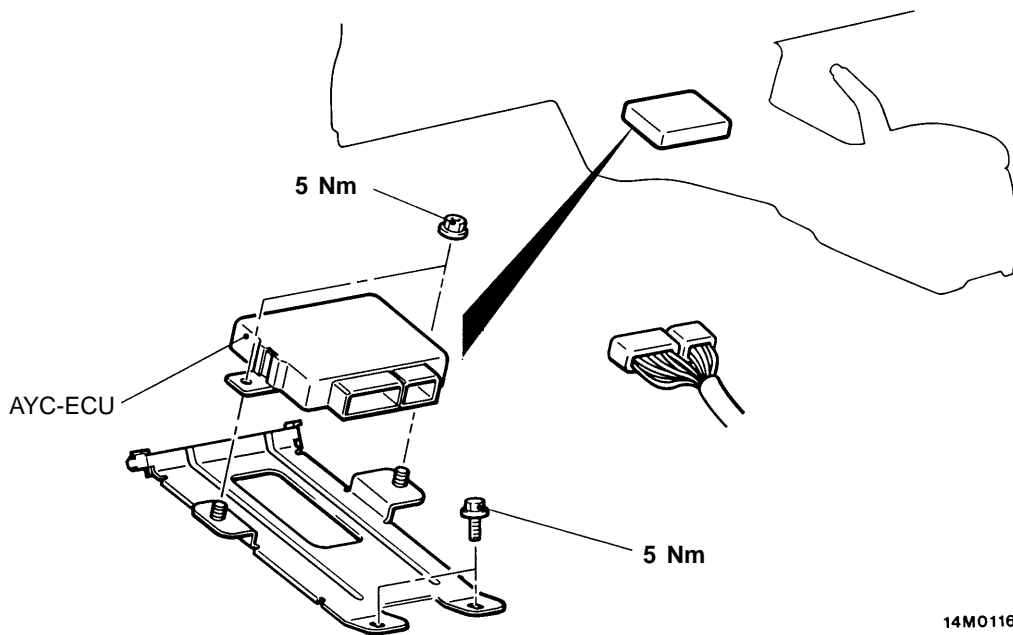
**2. AYC RELAY CONTINUITY CHECK**

Battery voltage	Terminal No.			
	1	3	4	5
When not energized	○	○		
When energized	⊖	⊕	○	○

**AYC-ECU**

**REMOVAL AND INSTALLATION**

- Pre-removal and Post-installation Operation**
- Front Floor Console Removal and Installation



14M0116

## GROUP 33A

# FRONT SUSPENSION

### GENERAL OUTLINE OF CHANGE

- The installation method of the ball joint between the knuckle and the lower arm has been changed, and accordingly the removal and installation procedures of the lower arm have been revised. <EVOLUTION-VI>

### LOWER ARM <EVOLUTION-VI>

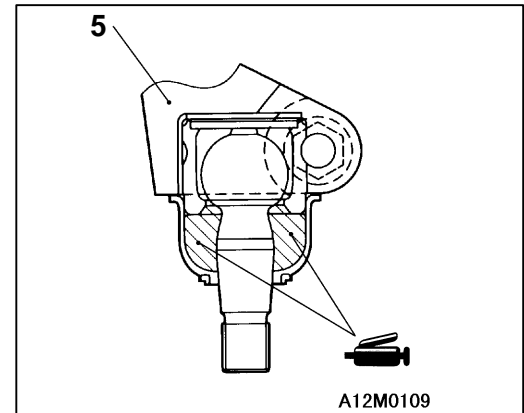
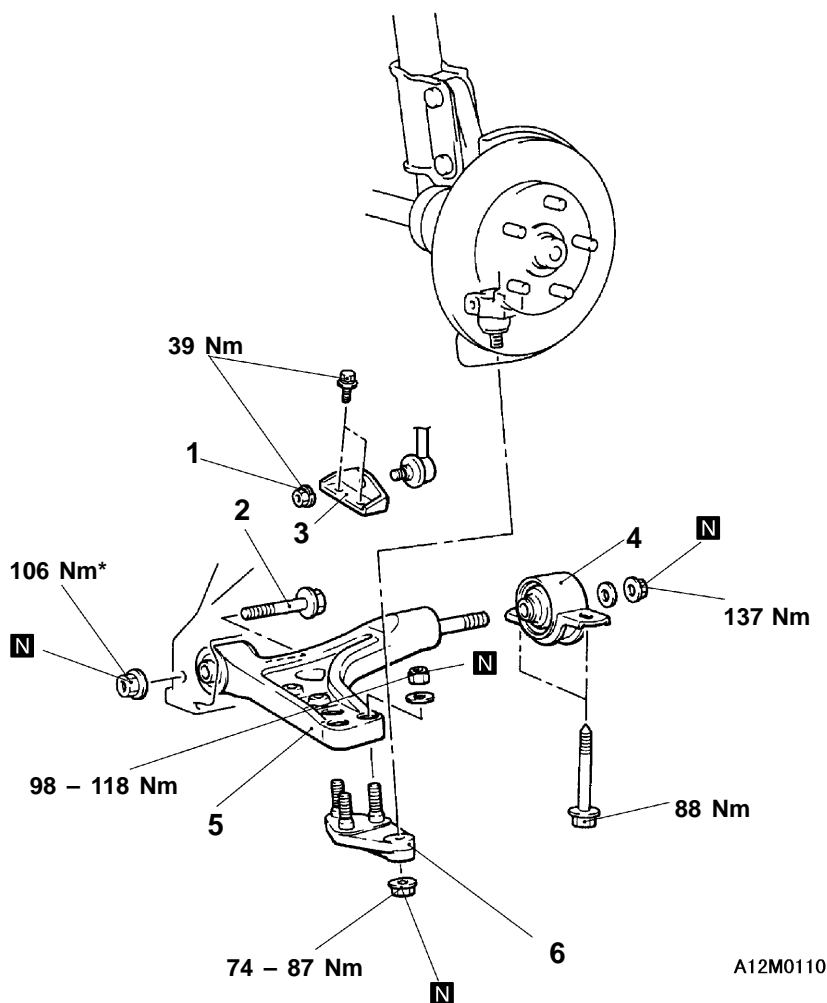
### REMOVAL AND INSTALLATION

#### Caution

The part marked with \* should be first temporarily tightened, then torqued to specification with the vehicle on the ground in unloaded condition.

#### Post-installation Operation

- Push the Dust Cover of the Lower Arm and Stabilizer Link Ball Joint with a Finger to Check for Possible Cracks or Damage.
- Wheel Alignment Check and Adjustment



#### Removal steps

1. Stabilizer link mounting nut
2. Bolt
3. Stabilizer bracket
4. Bushing assembly
5. Lower arm assembly

6. Lower arm bracket assembly

#### NOTE

Follow the conventional procedures for installation service points.



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## NOTES

# ANTI-SKID BRAKING SYSTEM (ABS)

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

#### WARNING!

- (1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).
- (2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.
- (3) MITSUBISHI dealer 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.

#### 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 (\*).

## GENERAL


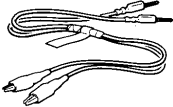
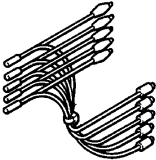
### OUTLINE OF CHANGE

- The description of the service procedures including the troubleshooting using an MUT-II tester has been incorporated.

### SERVICE SPECIFICATIONS

Items		Standard value
Resistance between hydraulic unit solenoid valve terminals $\Omega$	IN	8.04 – 9.04
	OUT	4.04 – 4.54
Wheel speed sensor-to-rotor clearance	mm	0.3 – 0.9
Wheel speed sensor's internal resistance	k $\Omega$	1.4 – 1.8
Wheel speed sensor insulation resistance	k $\Omega$	100
Acceleration sensor output voltage	V	
	On stationary vehicle	2.4 – 2.6
	With front mark downward	3.4 – 3.6

### SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	For checking of ABS (Diagnosis code display when using the MUT-II)
	MB991529	Diagnosis code check harness	For checking of ABS (Diagnosis code display when using the ABS warning lamp)
 B991348	MB991348	Test harness set	For checking of acceleration sensor



# TROUBLESHOOTING

## STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

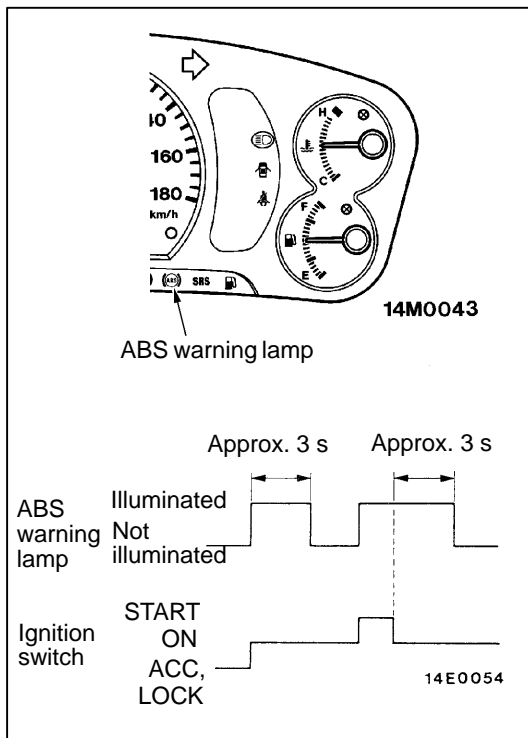
Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

### NOTES WITH REGARD TO DIAGNOSIS

- The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation of phenomenon
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this is because the system operation check is being performed, and is not an abnormality.
ABS operation sound	<ol style="list-style-type: none"> <li>1. Sound of the motor inside the ABS hydraulic unit operation. (whine)</li> <li>2. Sound is the generated along with vibration of the brake pedal. (scraping)</li> <li>3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)</li> </ol>

- For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.
- Diagnosis detection condition can vary depending on the diagnosis code. Make sure that checking requirements listed in the “Comment” are satisfied when checking the trouble symptom again.



### ABS WARNING LAMP INSPECTION

Check that the ABS warning lamp illuminates as follows.

1. When the ignition key is turned to “ON”, the ABS warning lamp illuminates for approximately 3 seconds and then switches off.
2. When the ignition key is turned to “START”, the ABS warning lamp remains illuminated.
3. When the ignition key is turned from “START” back to “ON”, the ABS warning lamp illuminates for approximately 3 seconds and then switches off.
4. If the illumination is other than the above, check the diagnosis codes.

**DIAGNOSIS FUNCTION****DIAGNOSIS CODES CHECK**

Read a diagnosis code by the MUT-II or ABS warning lamp.  
(Refer to GROUP 00 – How to Use Troubleshooting/Inspection  
Service Points.)

**NOTE**

Connect the MUT-II to the 16-pin diagnosis connector.

**ERASING DIAGNOSIS CODES**

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

**INSPECTION CHART FOR DIAGNOSIS CODES**

&lt;EVOLUTION-IV&gt;

Diagnosis code No.	Diagnosis items	Reference Page
11	Wheel speed sensor (FR) system (open- or short-circuit)	35B-7
12	Wheel speed sensor (FL) system (open- or short-circuit)	35B-7
13	Wheel speed sensor (RR) system (open- or short-circuit)	35B-7
14	Wheel speed sensor (RL) system (open- or short-circuit)	35B-7
15	Wheel speed sensor system (abnormal output signal)	35B-9
16	ABS-ECU power supply system (abnormal voltage drop or rise)	35B-10
21	Wheel speed sensor (FR) system	35B-7
22	Wheel speed sensor (FL) system	35B-7
23	Wheel speed sensor (RR) system	35B-7
24	Wheel speed sensor (RL) system	35B-7
27	AYC monitor system (defective AYC)	35B-12
32	Acceleration sensor circuit system	35B-12
33	Stop lamp switch system (open circuit or stop lamp stays ON)	35B-14
41	Solenoid valve (FR) system	35B-15
42	Solenoid valve (FL) system	35B-15
43	Solenoid valve (RR) system	35B-15
44	Solenoid valve (RL) system	35B-15
51	Valve relay system	35B-16
53	Motor relay system	35B-18
63	ABS-ECU failure	Replace ABS-ECU.

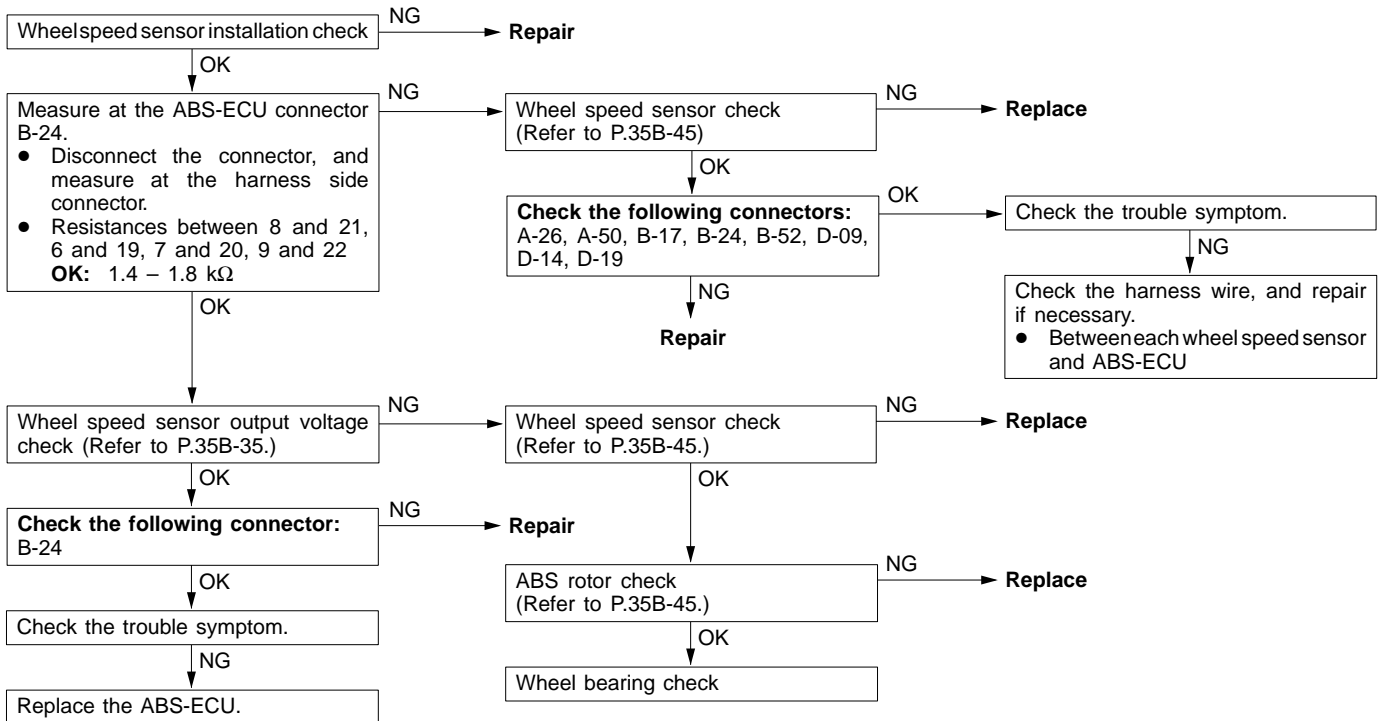
## &lt;EVOLUTION-V, VI&gt;

Diagnosis code No.	Diagnosis items	Reference Page
11	Wheel speed sensor (FR) system (open- or short-circuit)	35B-8
12	Wheel speed sensor (FL) system (open- or short-circuit)	35B-8
13	Wheel speed sensor (RR) system (open- or short-circuit)	35B-8
14	Wheel speed sensor (RL) system (open- or short-circuit)	35B-8
15	Wheel speed sensor system (abnormal output signal)	35B-9
16	ABS-ECU power supply system (abnormal voltage drop or rise)	35B-11
21	Wheel speed sensor (FR) system	35B-8
22	Wheel speed sensor (FL) system	35B-8
23	Wheel speed sensor (RR) system	35B-8
24	Wheel speed sensor (RL) system	35B-8
32	Acceleration sensor (longitudinal acceleration) circuit system	35B-13
33	Stop lamp switch system (open circuit or stop lamp stays ON)	35B-15
41	Solenoid valve (FR) system	35B-15
42	Solenoid valve (FL) system	35B-15
43	Solenoid valve (RR) system	35B-15
44	Solenoid valve (RL) system	35B-15
51	Valve relay system	35B-17
53	Motor relay system	35B-19
63	ABS-ECU failure	Replace ABS-ECU.
71	Acceleration sensor (lateral acceleration) system	35B-20

**INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES**

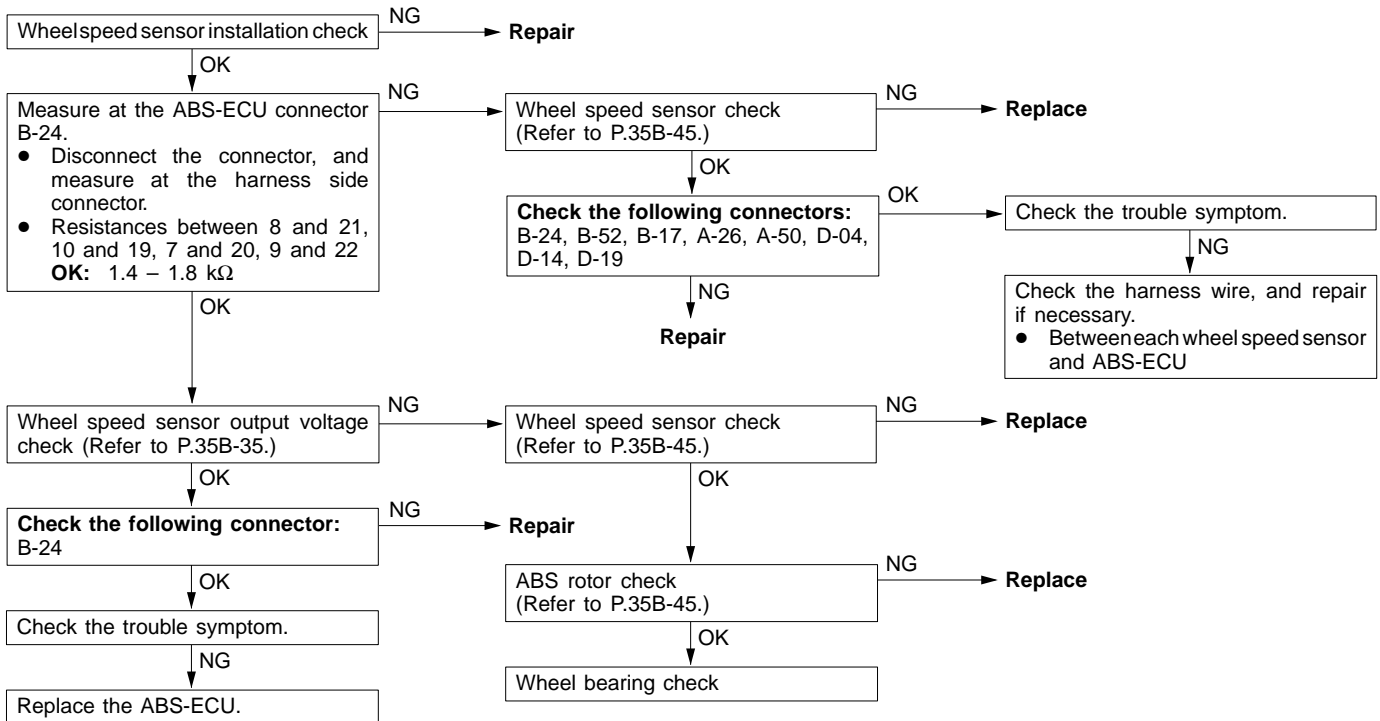
<EVOLUTION-IV>

Code Nos.11, 12, 13 and 14 Wheel speed sensor system (open- or short-circuit)	Probable cause
Code Nos.21, 22, 23 and 24 Wheel speed sensor system	
Code Nos 11, 12, 13 and 14 are output if the ABS-ECU detects an open circuit or short-circuit in the (+) wire or (-) wire in any one of the four wheel speed sensors.	<ul style="list-style-type: none"> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS-ECU</li> </ul>
Code Nos.21, 22, 23 and 24 are output in the following cases. <ul style="list-style-type: none"> <li>● When there is no input from any one of the four wheel speed sensors when travelling at 8 km/h or more, even though open circuit can not be verified.</li> <li>● When a chipped or blocked-up ABS rotor is detected and if the anti-lock system operates continuously because a malfunctioning sensor or a warped ABS rotor is causing sensor output to drop.</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS rotor</li> <li>● Too much gap between the sensor and the ABS rotor</li> <li>● Malfunction of ABS-ECU</li> <li>● Malfunction of wheel bearing</li> </ul>

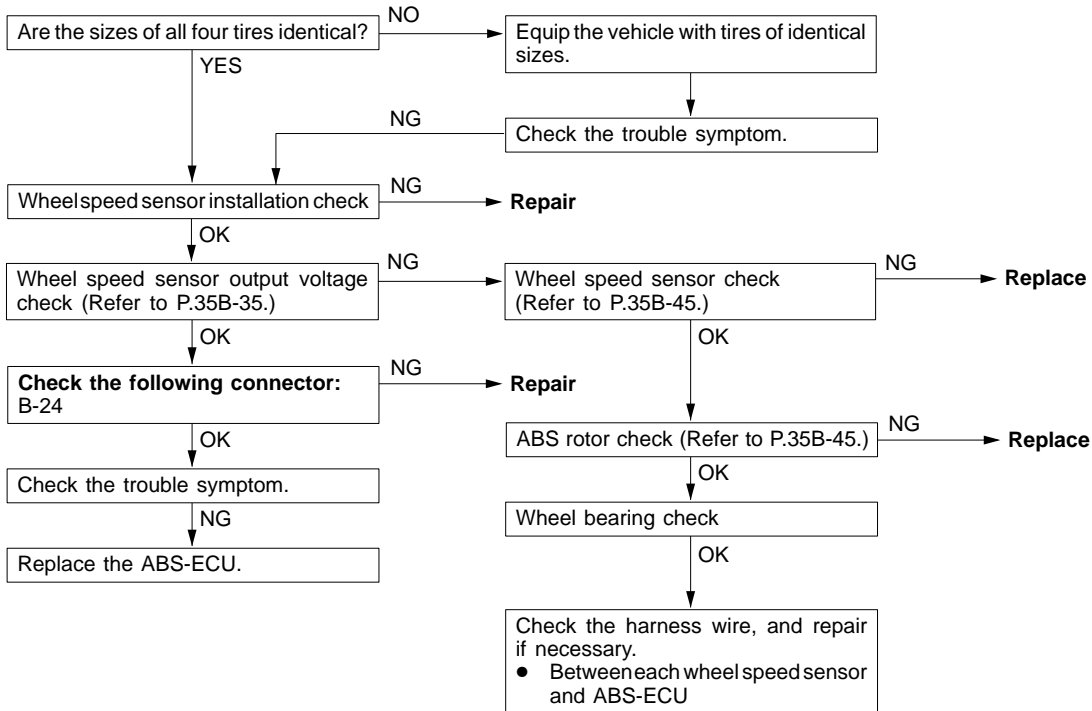


<EVOLUTION-V, VI>

Code Nos.11, 12, 13 and 14 Wheel speed sensor system (open- or short-circuit)	Probable cause
Code Nos.21, 22, 23 and 24 Wheel speed sensor system	
Code Nos 11, 12, 13 and 14 are output if the ABS-ECU detects an open circuit or short-circuit in the (+) wire or (-) wire in any one of the four wheel speed sensors.	<ul style="list-style-type: none"> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS-ECU</li> </ul>
Code Nos.21, 22, 23 and 24 are output in the following cases. <ul style="list-style-type: none"> <li>● When there is no input from any one of the four wheel speed sensors when travelling at 8 km/h or more, even though open circuit can not be verified.</li> <li>● When a chipped or blocked-up ABS rotor is detected and if the sensor output is lowered due to faulty wheel speed sensor.</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Too much gap between the sensor and the ABS rotor</li> <li>● Malfunction of ABS-ECU</li> <li>● Malfunction of wheel bearing</li> </ul>



Code No.15 Wheel speed sensor system (abnormal output signal)	Probable cause
<p>This code is output when there is an abnormality in the output signal from any one of the four wheel speed sensors while driving (except for an open circuit or short circuit).</p>	<ul style="list-style-type: none"> <li>● The four vehicle tires are of different sizes</li> <li>● Improperly installed wheel speed sensor</li> <li>● Malfunction of wheel speed sensor</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS rotor</li> <li>● Malfunction of wheel bearing</li> <li>● Malfunction of ABS-ECU</li> </ul>



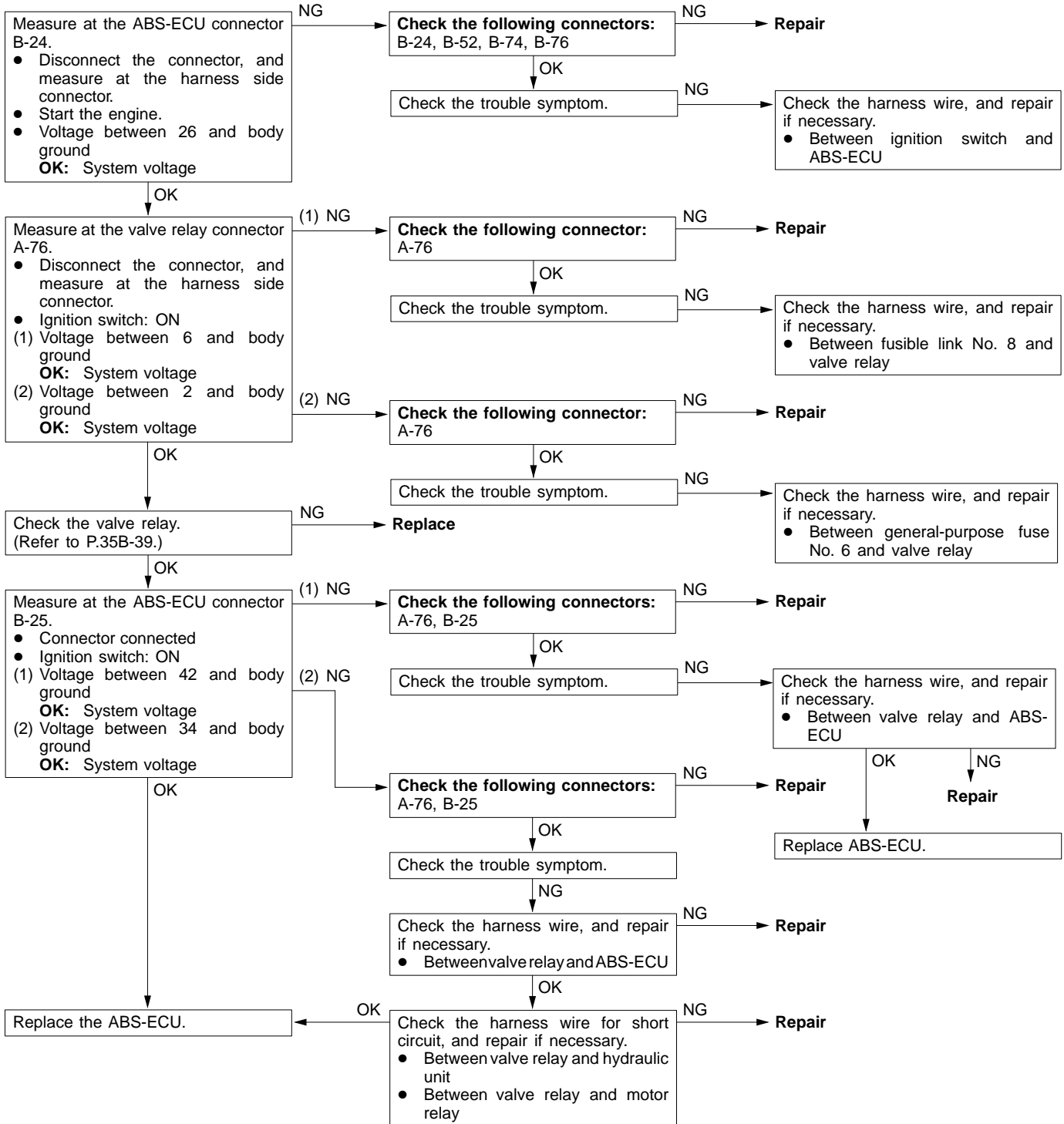
<EVOLUTION-IV>

Code No.16 ABS-ECU power supply system (abnormal voltage drop or rise)	Probable cause
This code is output if the ABS-ECU or valve relay power supply voltage drops below or rises above the rated values. The valve relay power supply voltage is detected based on the voltage in the valve relay monitor line.	<ul style="list-style-type: none"> <li>● Malfunction of battery</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of valve relay</li> <li>● Malfunction of ABS-ECU</li> </ul>

**Caution**

If system voltage drops or rises during inspection, this code will be output as well, making it impossible to obtain correct diagnostic results.

Before carrying out the following inspection, check the battery level, and refill it if necessary.





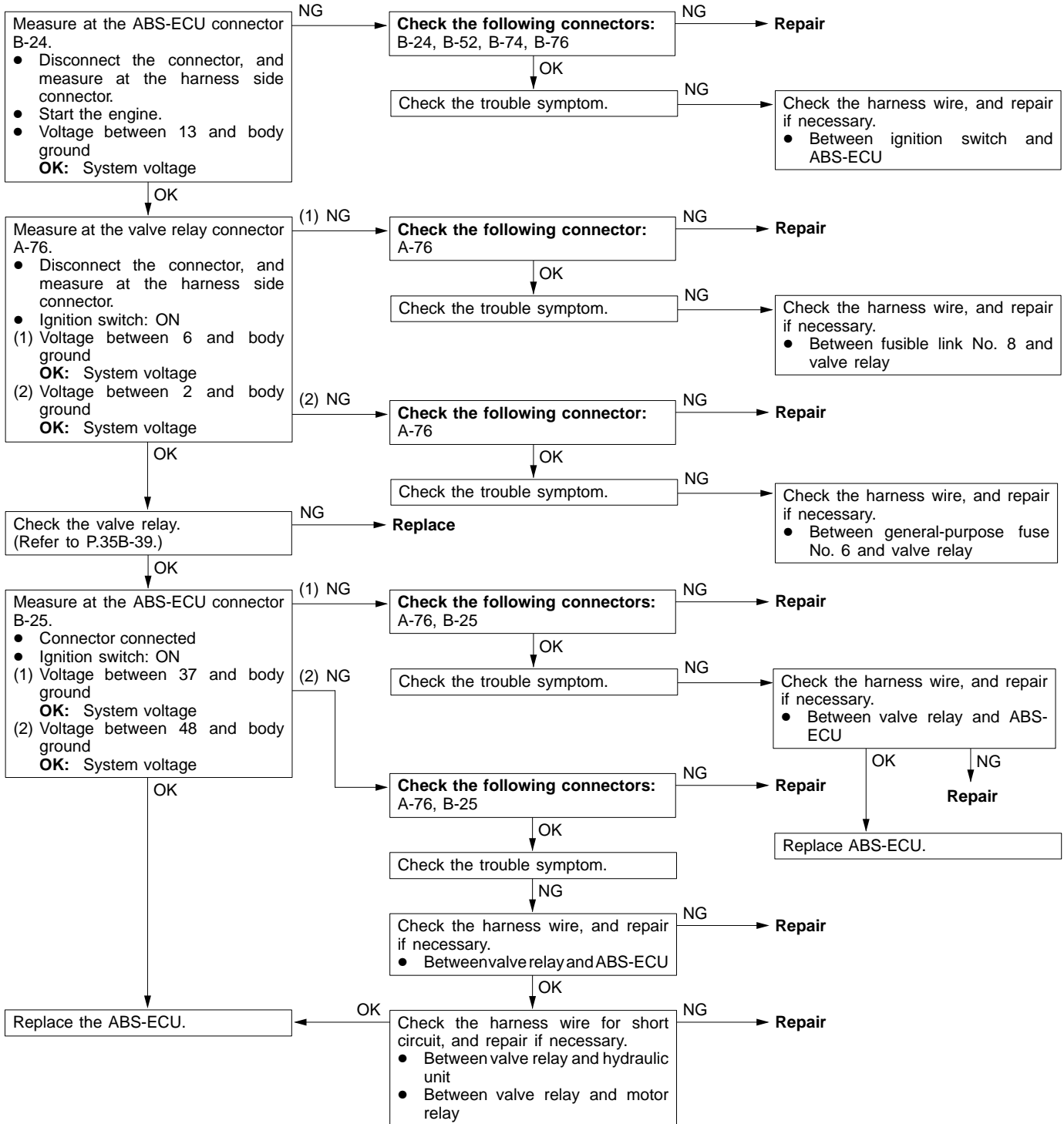
<EVOLUTION-V, VI>

Code No.16 ABS-ECU power supply system (abnormal voltage drop or rise)	Probable cause
This code is output if the ABS-ECU or valve relay power supply voltage drops below or rises above the rated values. The valve relay power supply voltage is detected based on the voltage in the valve relay monitor line.	<ul style="list-style-type: none"> <li>● Malfunction of battery</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of valve relay</li> <li>● Malfunction of ABS-ECU</li> </ul>

**Caution**

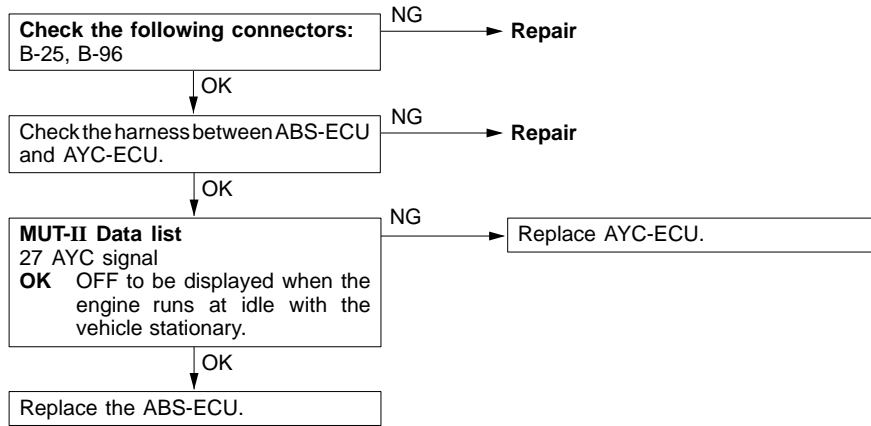
If system voltage drops or rises during inspection, this code will be output as well, making it impossible to obtain correct diagnostic results.

Before carrying out the following inspection, check the battery level, and refill it if necessary.



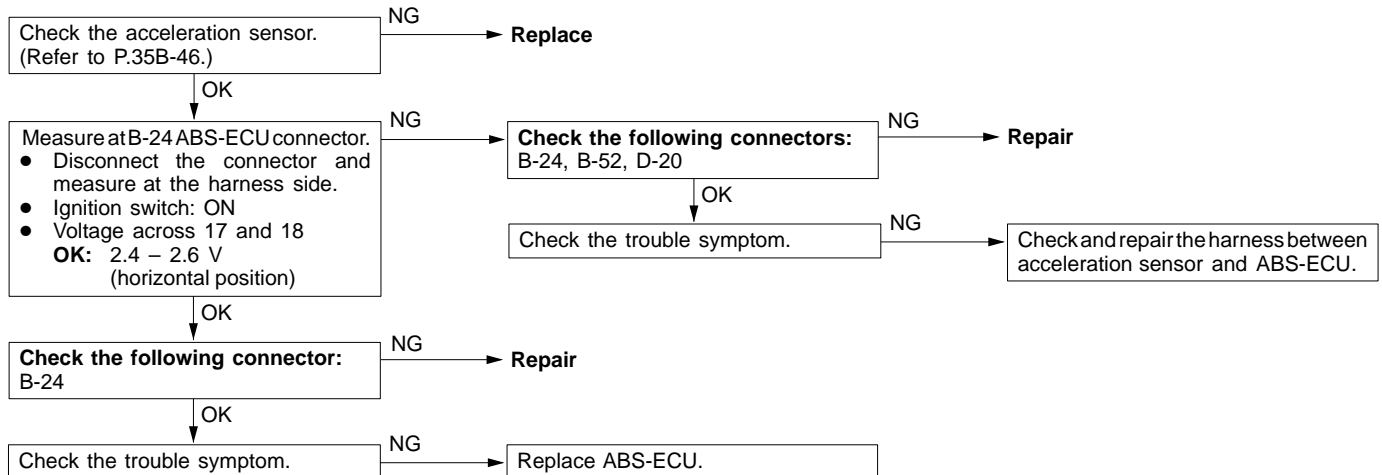
<EVOLUTION-IV>

Code No.27 AYC monitor system (defective AYC)	Probable cause
This code is output when the AYC monitor signal becomes faulty.	<ul style="list-style-type: none"> <li>• Defective AYC-ECU</li> <li>• Defective ABS-ECU</li> <li>• Defective harness or connector</li> </ul>



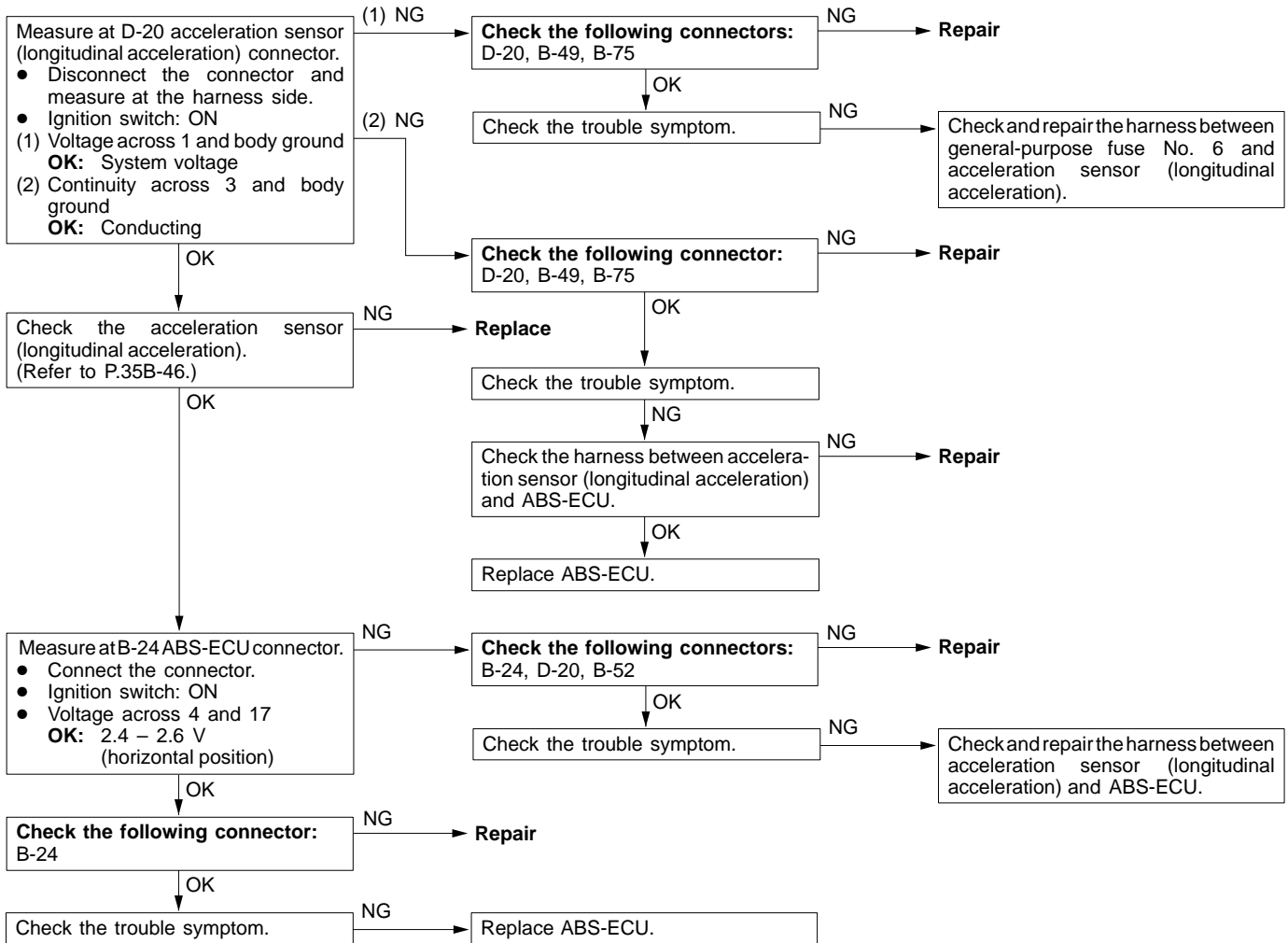
<EVOLUTION-IV>

Code No.32 Acceleration sensor circuit system	Probable cause
This code is output under either of the following conditions: <ul style="list-style-type: none"> <li>• The output from the acceleration sensor becomes 0.5 V or less, or 4.5 V or more.</li> <li>• The acceleration sensor harness is open- or short-circuited.</li> </ul>	<ul style="list-style-type: none"> <li>• Defective acceleration sensor</li> <li>• Defective harness or connector</li> <li>• Defective ABS-ECU</li> </ul>



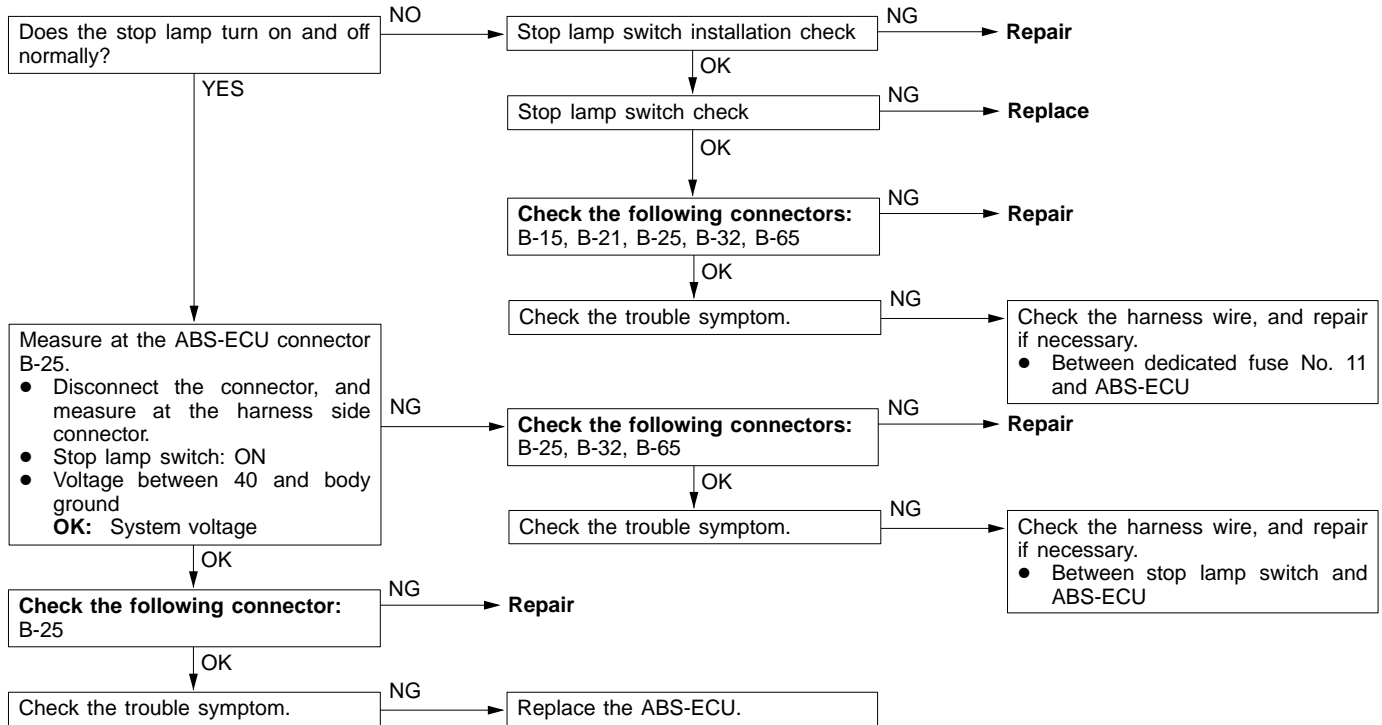
<EVOLUTION-V, VI>

Code No.32 Acceleration sensor (longitudinal acceleration) circuit system	Probable cause
This code is output under either of the following conditions: <ul style="list-style-type: none"> <li>• The output from the acceleration sensor (longitudinal acceleration) becomes 0.5 V or less, or 4.5 V or more.</li> <li>• The acceleration sensor (longitudinal acceleration) harness is open- or short-circuited.</li> </ul>	<ul style="list-style-type: none"> <li>• Defective acceleration sensor (longitudinal acceleration)</li> <li>• Defective harness or connector</li> <li>• Defective ABS-ECU</li> </ul>



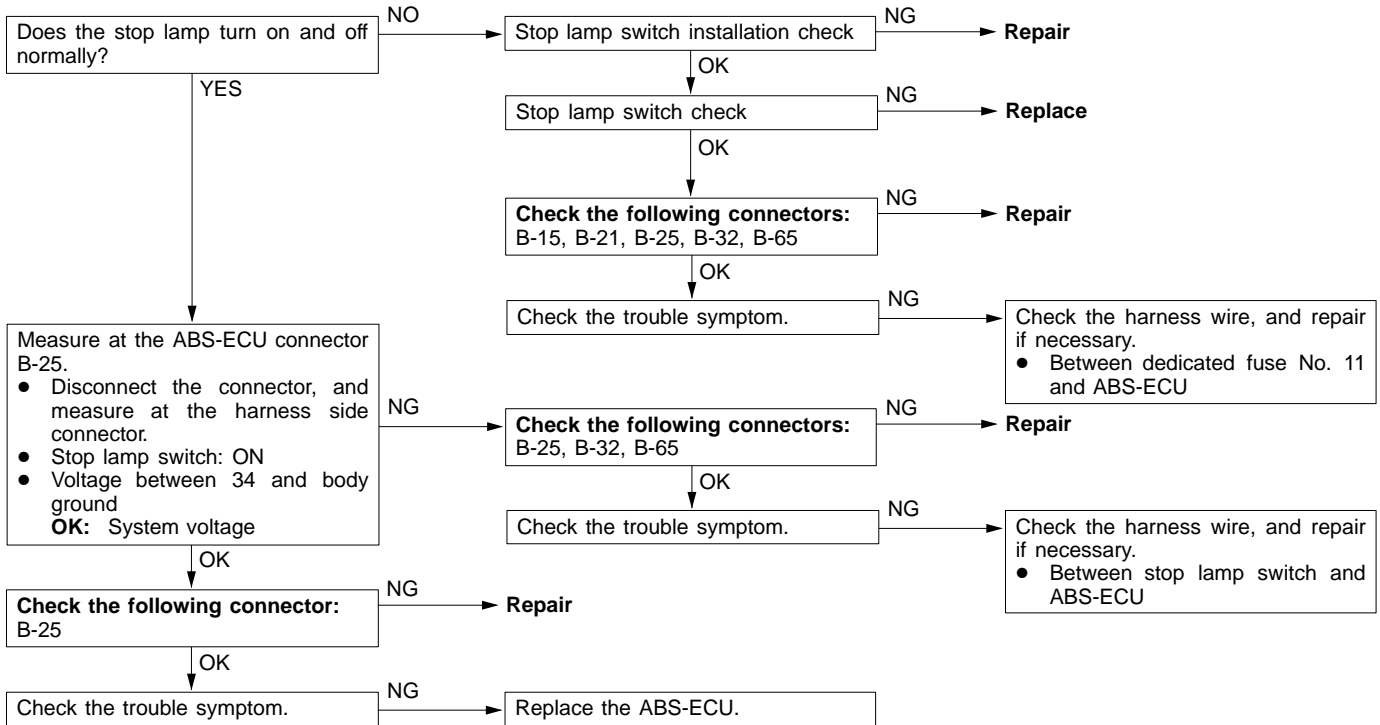
<EVOLUTION-IV>

Code No.33 Stop lamp switch system (open circuit or stop lamp stays ON)	Probable cause
This code is output, if the stop lamp switch is continuously on for 15 minutes or more.	<ul style="list-style-type: none"> <li>● Malfunction of stop lamp switch</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS-ECU</li> </ul>

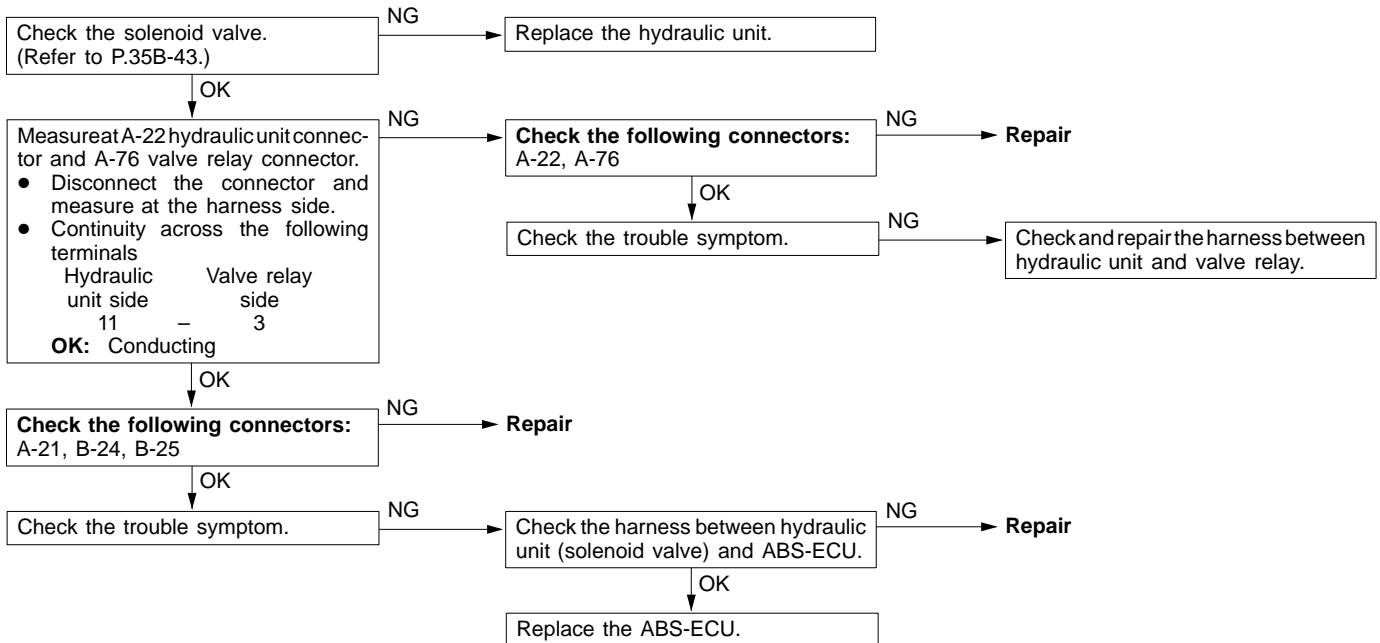


<EVOLUTION-V, VI>

Code No.33 Stop lamp switch system (open circuit or stop lamp stays ON)	Probable cause
This code is output, if the stop lamp switch is continuously on for 15 minutes or more.	<ul style="list-style-type: none"> <li>• Malfunction of stop lamp switch</li> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of ABS-ECU</li> </ul>



Code No. 41, 42, 43, 44: Solenoid valve system	Probable cause
ABS-ECU monitors the solenoid valve energization circuit at all times. This code is output when no current flows through the solenoid even when ABS-ECU energizes it or when current continues flowing through the solenoid even when ABS-ECU deenergizes it, which is considered to be attributable to an open- or short-circuited solenoid coil or open- or short-circuited harness.	<ul style="list-style-type: none"> <li>• Defective hydraulic unit</li> <li>• Defective harness or connector</li> <li>• Defective ABS-ECU</li> </ul>



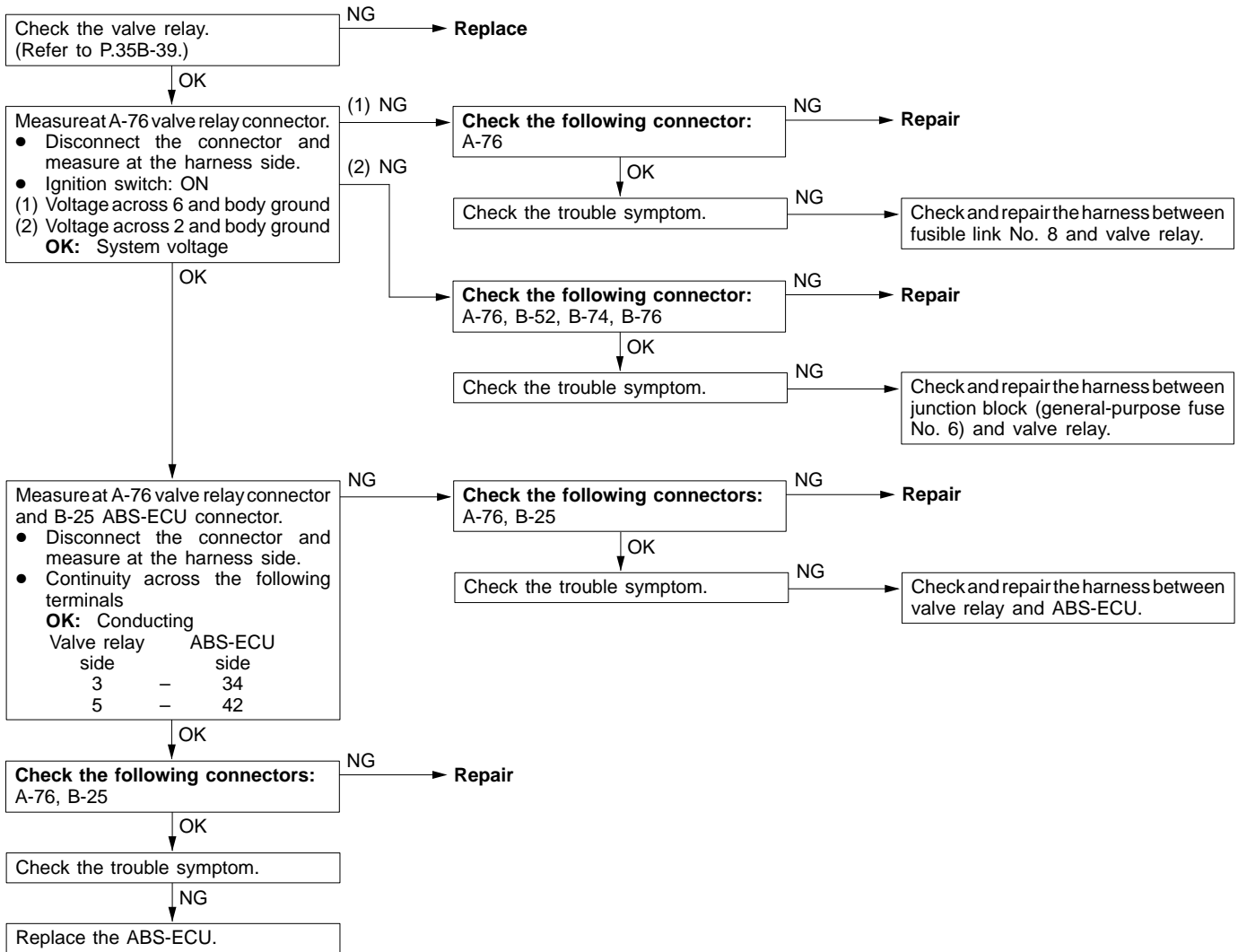
<EVOLUTION-IV>

Code No.51 Valve relay system	Probable cause
This code is output under any of the following conditions: <ul style="list-style-type: none"> <li>• The solenoid valve power is not supplied when ABS-ECU attempts to turn ON the valve relay as part of the initial check when the ignition switch is turned ON.</li> <li>• The solenoid valve power remains supplied when ABS-ECU attempts to turn OFF the valve relay as part of the initial check when the ignition switch is turned ON.</li> <li>• The solenoid valve power is not supplied while the valve relay remains ON under normal conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• Defective ABS valve relay</li> <li>• Defective harness or connector</li> <li>• Defective ABS-ECU</li> </ul>

NOTE

In the diagnosis code reading by means of the ABS warning lamp (refer to P.35B-4), this code is output in addition to the actual diagnosis code since the valve relay connector is disconnected.

If the ABS warning lamp turns ON even when the spot represented by the diagnosis code output in addition to this code has been repaired, and if no diagnosis code other than No. 51 is output, then the valve relay system is probably defective. Make the following checks.



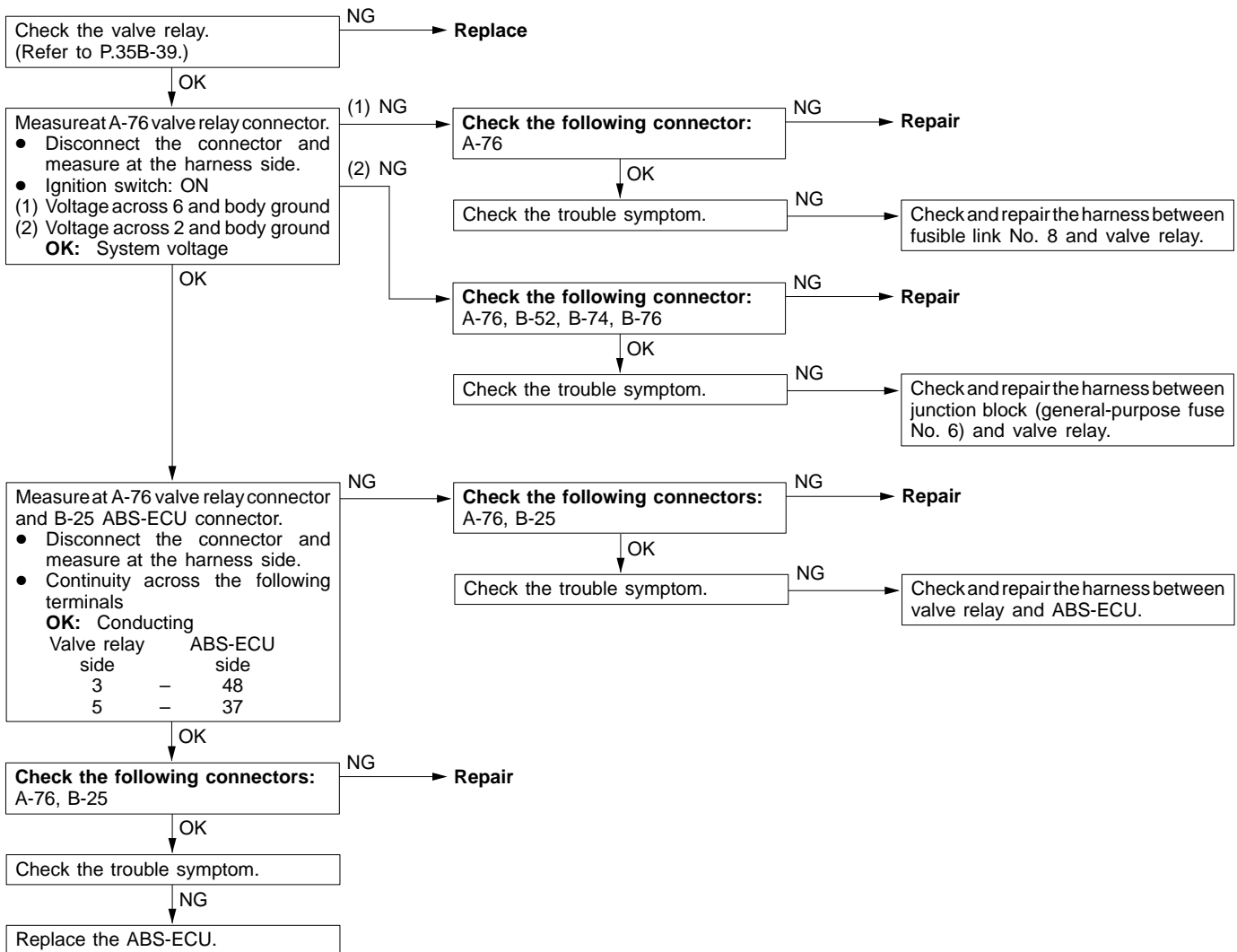
<EVOLUTION-V, VI>

Code No.51 Valve relay system	Probable cause
This code is output under any of the following conditions: <ul style="list-style-type: none"> <li>• The solenoid valve power is not supplied when ABS-ECU attempts to turn ON the valve relay as part of the initial check when the ignition switch is turned ON.</li> <li>• The solenoid valve power remains supplied when ABS-ECU attempts to turn OFF the valve relay as part of the initial check when the ignition switch is turned ON.</li> <li>• The solenoid valve power is not supplied while the valve relay remains ON under normal conditions.</li> </ul>	<ul style="list-style-type: none"> <li>• Defective ABS valve relay</li> <li>• Defective harness or connector</li> <li>• Defective ABS-ECU</li> </ul>

NOTE

In the diagnosis code reading by means of the ABS warning lamp (refer to P.35B-4), this code is output in addition to the actual diagnosis code since the valve relay connector is disconnected.

If the ABS warning lamp turns ON even when the spot represented by the diagnosis code output in addition to this code has been repaired, and if no diagnosis code other than No. 51 is output, then the valve relay system is probably defective. Make the following checks.

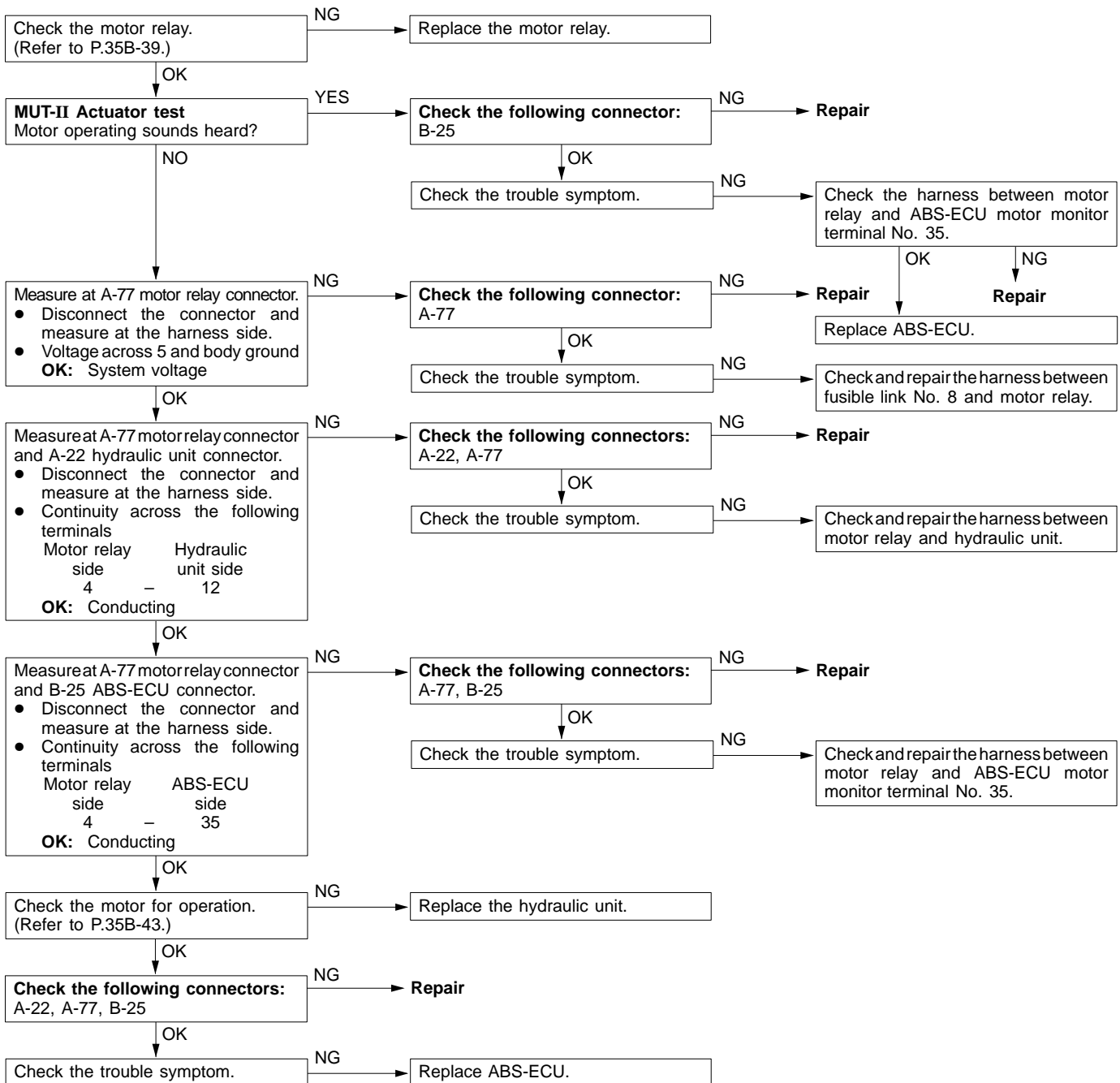


<EVOLUTION-IV>

Code No.53 Motor relay system	Probable cause
This code is output under any of the following conditions: <ul style="list-style-type: none"> <li>• No signals are input to the motor monitor when the motor relay is ON (motor does not run, etc.).</li> <li>• A signal is being input to the motor monitor for 3 sec. or more when the motor relay is OFF (motor continues running, etc.).</li> <li>• The motor relay is inoperative.</li> </ul>	<ul style="list-style-type: none"> <li>• Defective motor relay</li> <li>• Defective harness or connector</li> <li>• Defective hydraulic unit</li> <li>• Defective ABS-ECU</li> </ul>

**Caution**

- (1) If the motor relay contacts fuse, the motor continues running even when the ignition switch is turned OFF. In this case, immediately remove fusible link No. 8 (60 A) or disconnect the A-22 hydraulic unit connector or A-77 motor relay connector. Overloading the motor results in a rundown battery.
- (2) Driving the motor through actuator test runs down the battery. After the test, run the engine for some while.



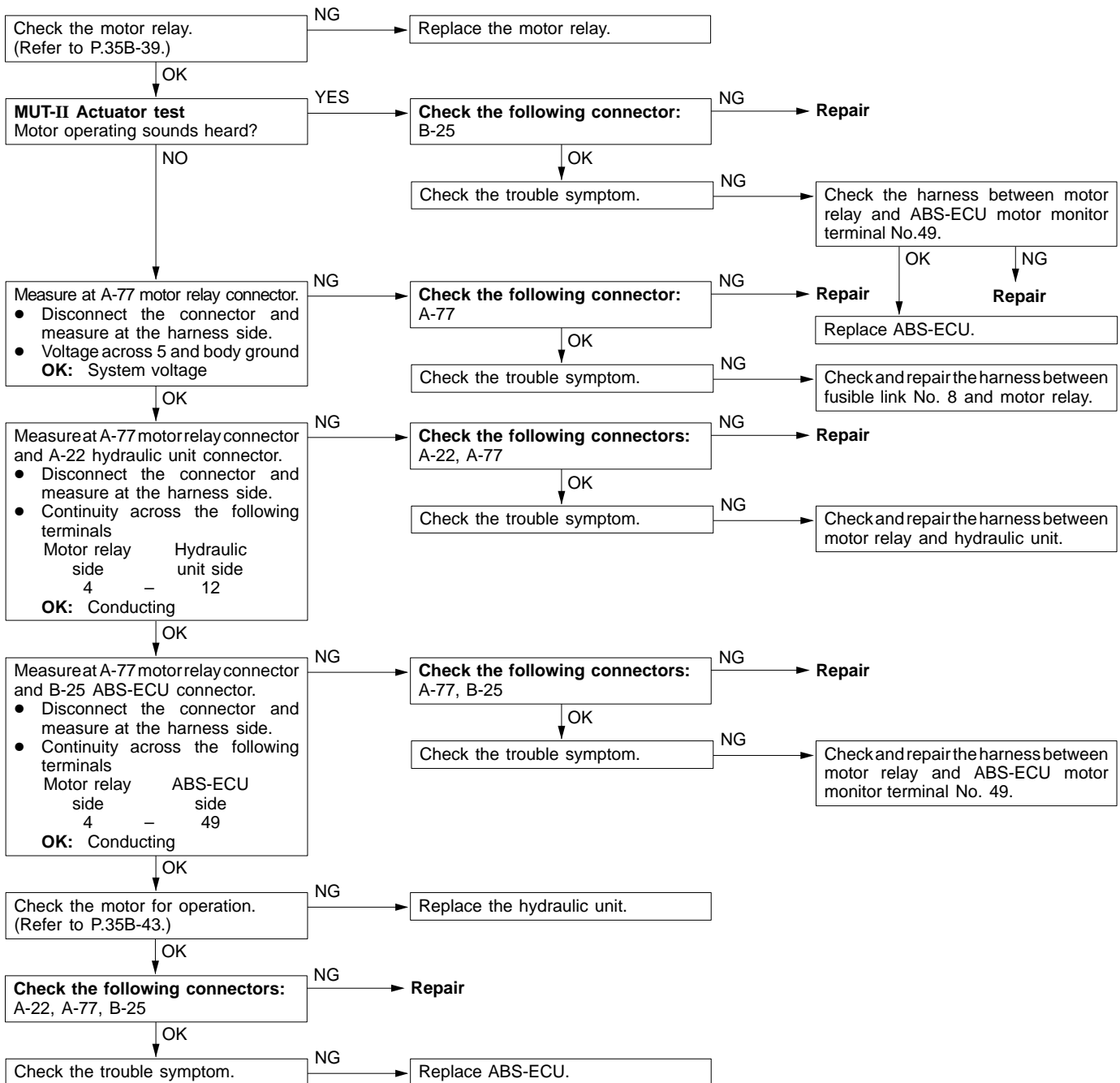


<EVOLUTION-V, VI>

Code No.53 Motor relay system	Probable cause
This code is output under any of the following conditions: <ul style="list-style-type: none"> <li>• No signals are input to the motor monitor when the motor relay is ON (motor does not run, etc.).</li> <li>• A signal is being input to the motor monitor for 3 sec. or more when the motor relay is OFF (motor continues running, etc.).</li> <li>• The motor relay is inoperative.</li> </ul>	<ul style="list-style-type: none"> <li>• Defective motor relay</li> <li>• Defective harness or connector</li> <li>• Defective hydraulic unit</li> <li>• Defective ABS-ECU</li> </ul>

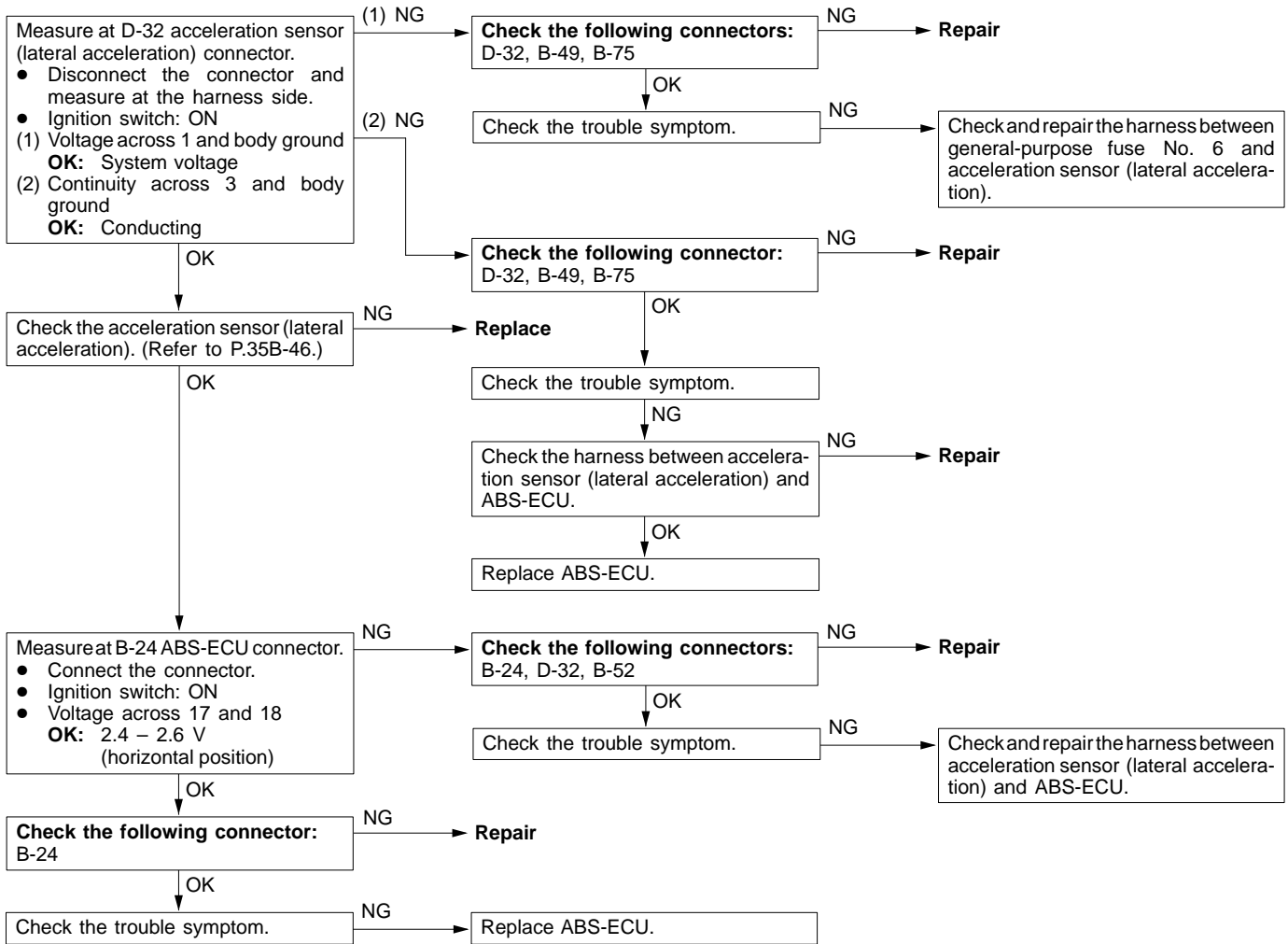
**Caution**

- (1) If the motor relay contacts fuse, the motor continues running even when the ignition switch is turned OFF. In this case, immediately remove fusible link No. 8 (60 A) or disconnect the A-22 hydraulic unit connector or A-77 motor relay connector. Overloading the motor results in a rundown battery.
- (2) Driving the motor through actuator test runs down the battery. After the test, run the engine for some while.



<EVOLUTION-V, VI>

Code No.71 Acceleration sensor (lateral acceleration) system	Probable cause
This code is output under either of the following conditions: <ul style="list-style-type: none"> <li>• The output from the acceleration sensor (lateral acceleration) becomes 0.5 V or less, or 4.5 V or more.</li> <li>• The acceleration sensor (lateral acceleration) harness is open- or short-circuited.</li> </ul>	<ul style="list-style-type: none"> <li>• Defective acceleration sensor (lateral acceleration)</li> <li>• Defective harness or connector</li> <li>• Defective ABS-ECU</li> </ul>



**INSPECTION CHART FOR TROUBLE SYMPTOMS**

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptoms	Inspection procedure No.	Reference page
Communication between the MUT-II and the whole system is not possible.	1	35B-22
Communication between the MUT-II and the ABS-ECU is not possible.	2	35B-23, 24
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate.	3	35B-25
Even after the engine is started, the ABS warning lamp remains illuminated.	4	35B-26
After the ignition key is turned to "ON", the ABS warning lamp blinks once, and when turned to "START", it illuminates. When returned to "ON", the lamp flashes once, and then switches off.	5	35B-27
When the ignition key is turned to "START", the ABS warning lamp does not illuminate.	6	35B-28
Brake operation is abnormal.	7	35B-28

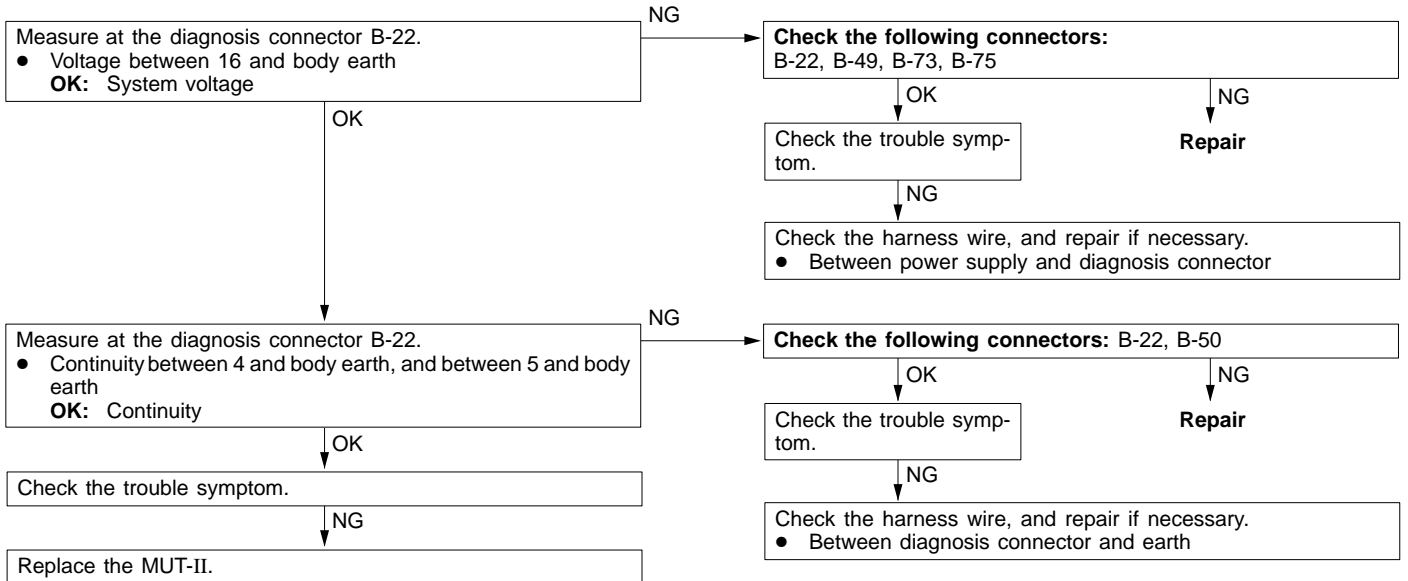
**Caution**

- (1) If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate even though sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.
- (2) During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.

**INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**

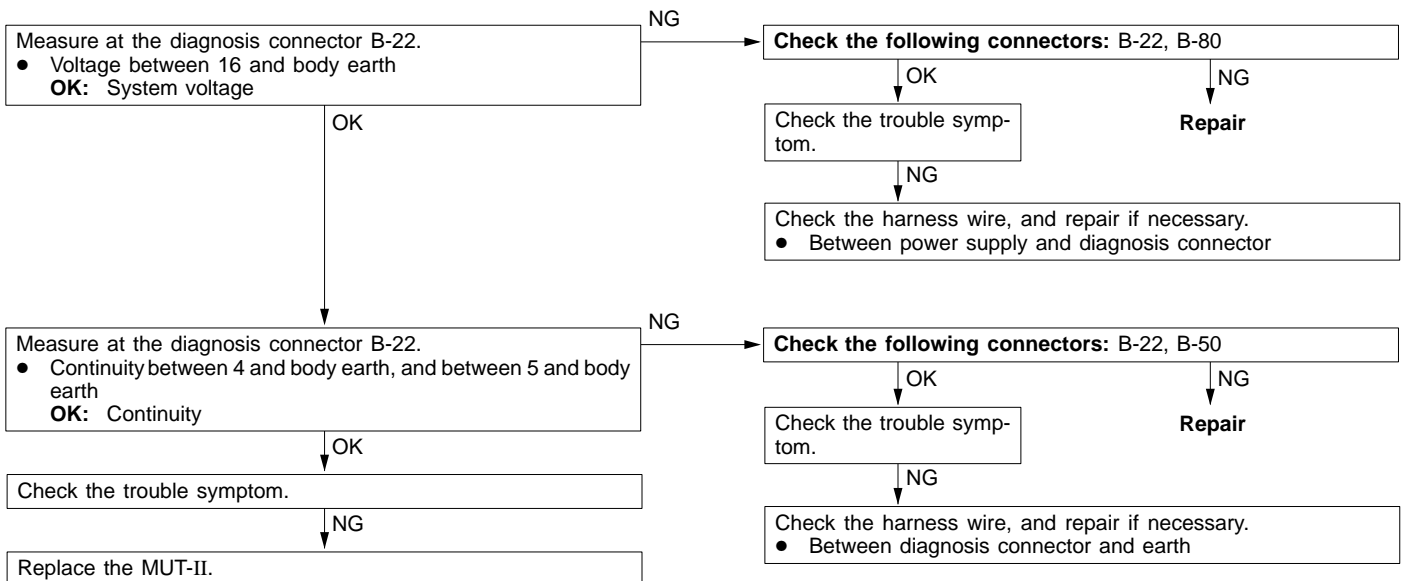
**Inspection Procedure 1 <EVOLUTION-IV>**

Communication between the MUT-II and the whole system is not possible.	Probable cause
The cause may be a malfunction of the power supply circuit or the earth circuit of the diagnosis connector.	<ul style="list-style-type: none"> <li>● Malfunction of diagnosis connector</li> <li>● Malfunction of wiring harness or connector</li> </ul>



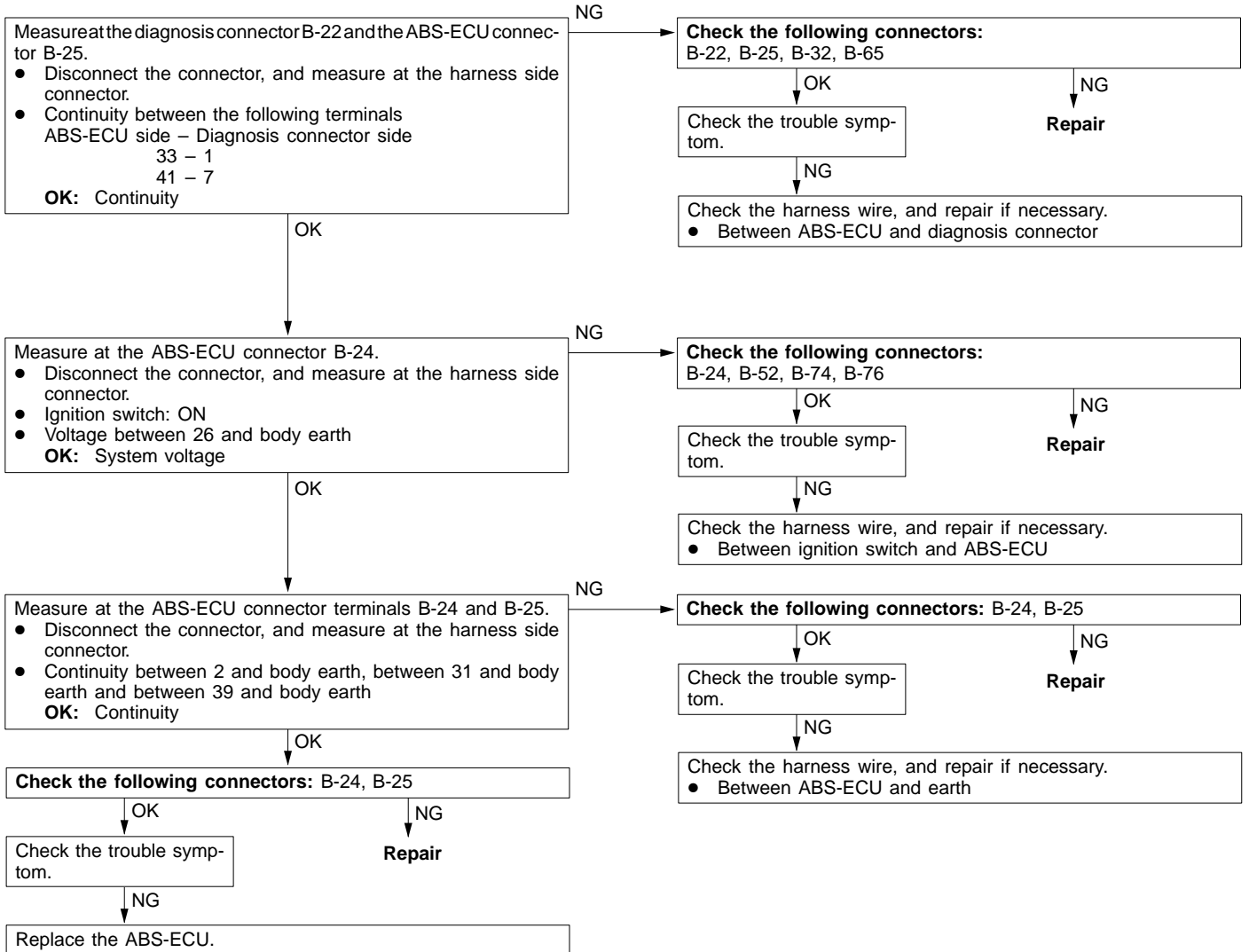
**Inspection Procedure 1 <EVOLUTION-V, VI>**

Communication between the MUT-II and the whole system is not possible.	Probable cause
The cause may be a malfunction of the power supply circuit or the earth circuit of the diagnosis connector.	<ul style="list-style-type: none"> <li>● Malfunction of diagnosis connector</li> <li>● Malfunction of wiring harness or connector</li> </ul>



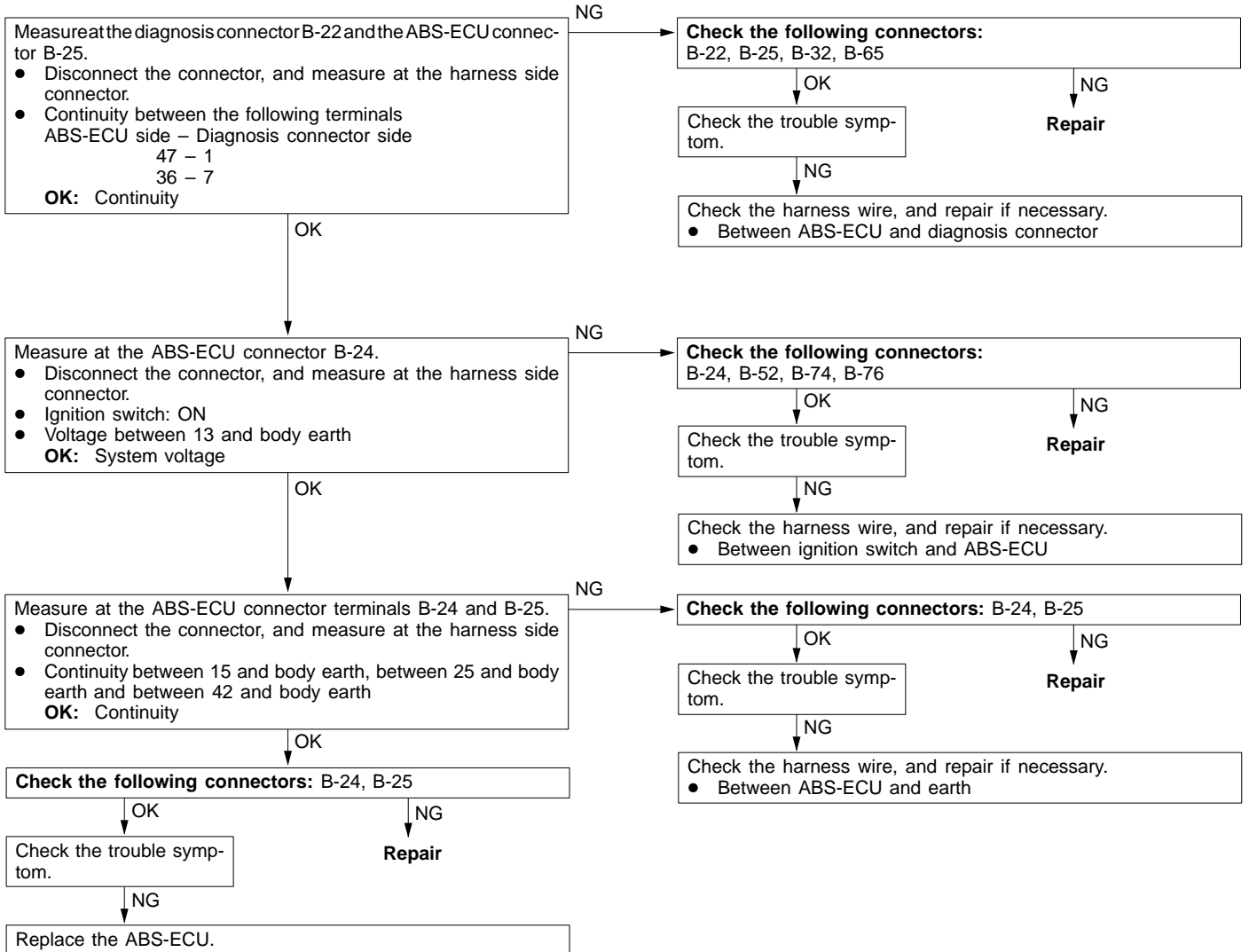
Inspection Procedure 2 <EVOLUTION-IV>

Communication between MUT-II and the ABS-ECU is not possible.	Probable cause
The cause may be an open circuit in the ABS-ECU power supply circuit or an open circuit in the diagnosis output circuit.	<ul style="list-style-type: none"> <li>● Blown fuse</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS-ECU</li> </ul>



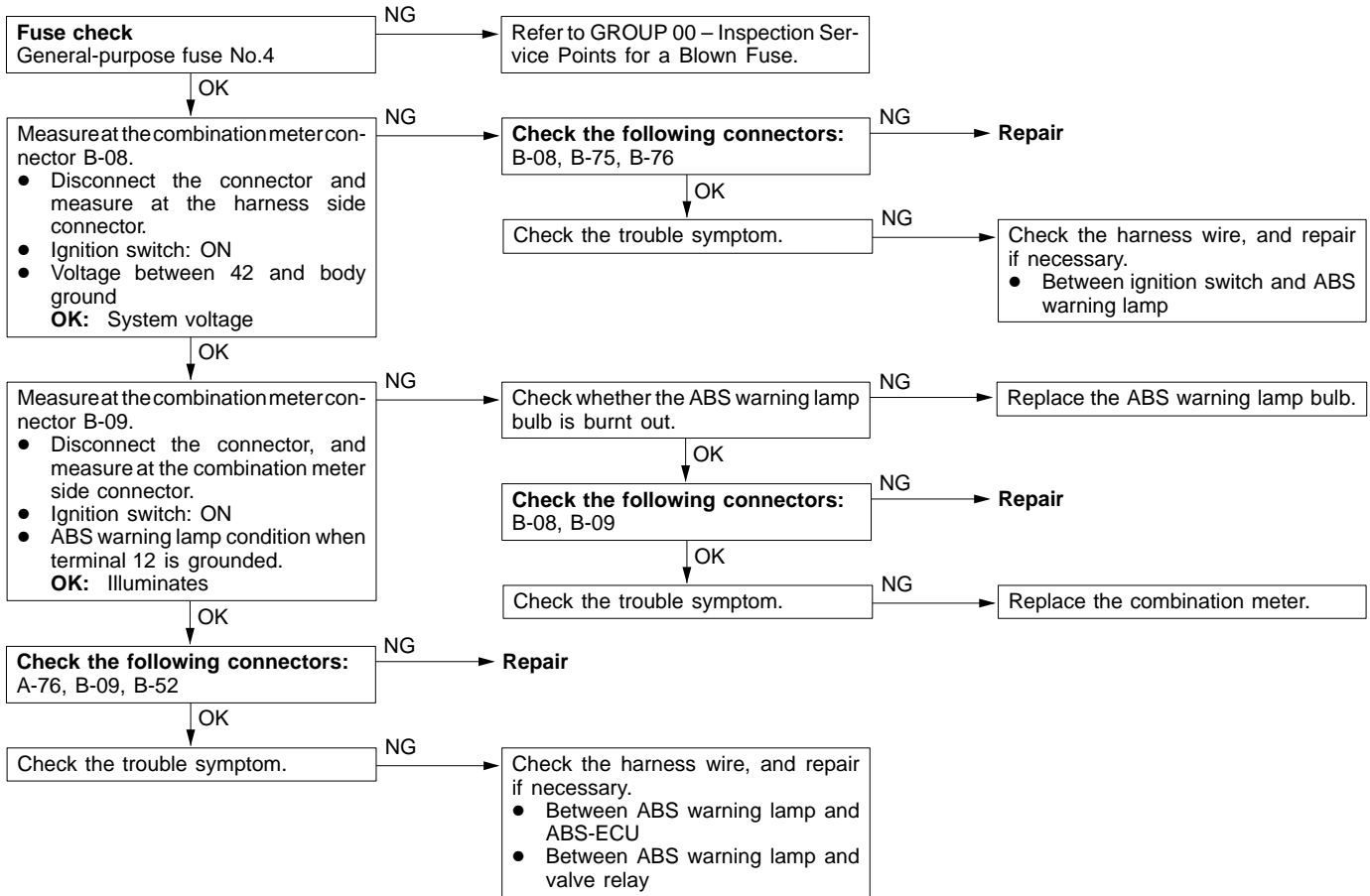
Inspection Procedure 2 <EVOLUTION-V, VI>

Communication between MUT-II and the ABS-ECU is not possible.	Probable cause
The cause may be an open circuit in the ABS-ECU power supply circuit or an open circuit in the diagnosis output circuit.	<ul style="list-style-type: none"> <li>● Blown fuse</li> <li>● Malfunction of wiring harness or connector</li> <li>● Malfunction of ABS-ECU</li> </ul>



Inspection Procedure 3

When the ignition key is turned to “ON” (engine stopped), the ABS warning lamp does not illuminate.	Probable cause
<p>The ABS-ECU turns the valve relay ON → OFF → ON for initial checking when it is powered ON. Accordingly, the ABS warning lamp illuminates twice even if the circuit between the ABS warning lamp and ABS-ECU is faulty.                      The cause may be an open circuit in the lamp power supply circuit, a blown lamp, an open circuit between the ABS warning lamp and ABS-ECU or between the ABS warning lamp and the valve relay.</p>	<ul style="list-style-type: none"> <li>● Blown fuse</li> <li>● Burn out ABS warning lamp bulb</li> <li>● Malfunction of wiring harness or connector</li> </ul>

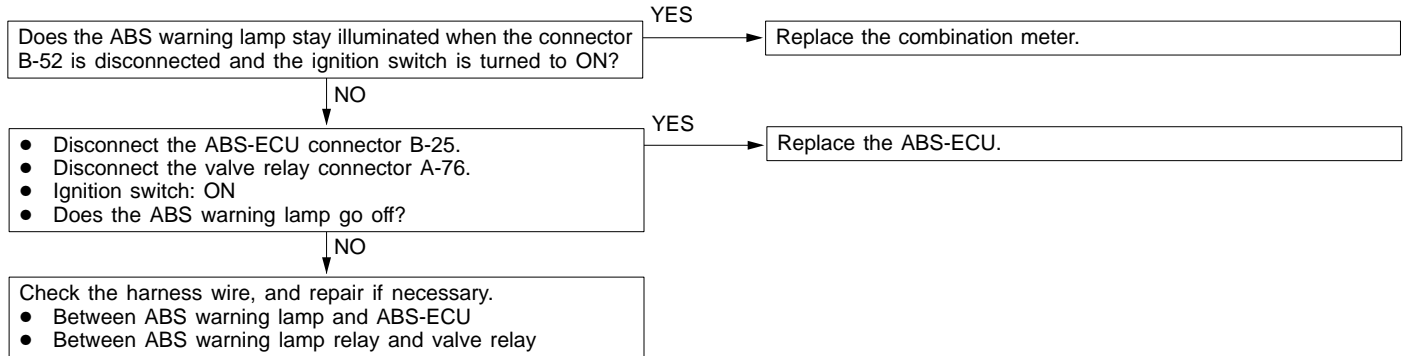


Inspection Procedure 4

Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
The cause is probably a short-circuit in the ABS warning lamp illumination circuit.	<ul style="list-style-type: none"> <li>● Malfunction of combination meter</li> <li>● Malfunction of ABS-ECU</li> <li>● Malfunction of wiring harness (short circuit)</li> </ul>

NOTE

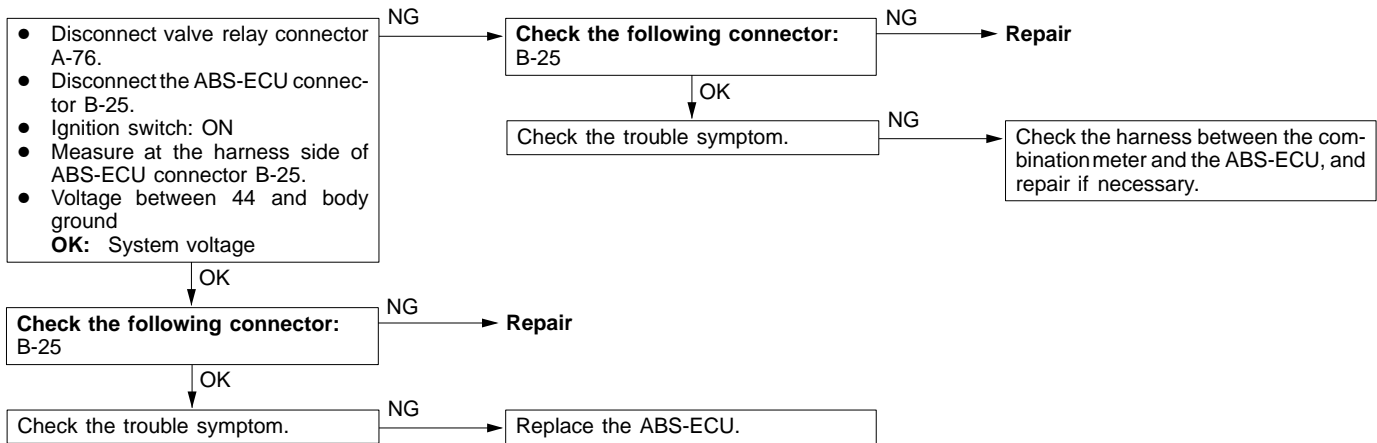
This trouble symptom is limited to cases communication with MUT-II is possible (where ABS-ECU power supply is normal) and the diagnosis code is a normal diagnosis code.





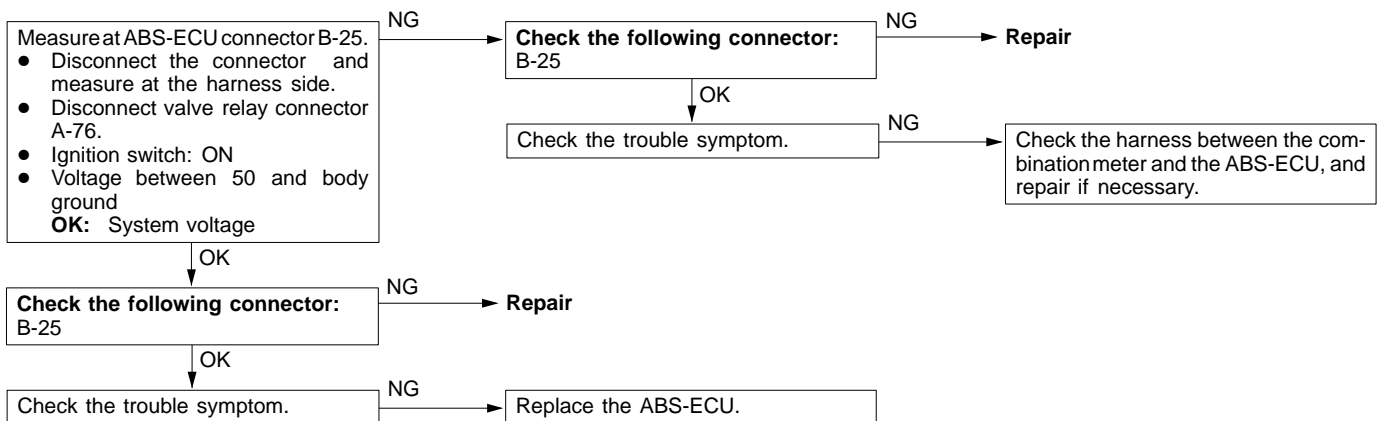
Inspection Procedure 5 <EVOLUTION-IV>

<p><b>After the ignition key is turned to “ON”, the ABS warning lamp blinks once, and when turned to “START”, it illuminates. When returned to “ON”, the lamp flashes once, and then switches off.</b></p>	<p><b>Probable cause</b></p>
<p>The ABS-ECU causes the ABS warning lamp to illuminate during the initial check. 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.</p>	<ul style="list-style-type: none"> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of ABS-ECU</li> </ul>



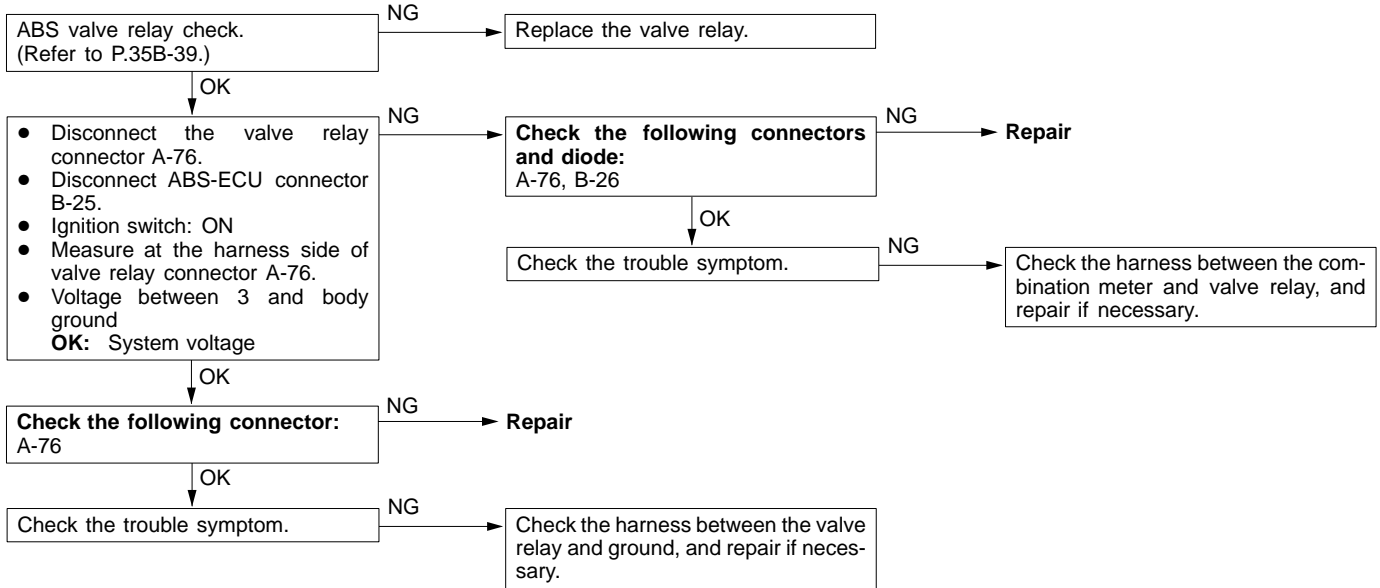
Inspection Procedure 5 <EVOLUTION-V, VI>

<p><b>After the ignition key is turned to “ON”, the ABS warning lamp blinks once, and when turned to “START”, it illuminates. When returned to “ON”, the lamp flashes once, and then switches off.</b></p>	<p><b>Probable cause</b></p>
<p>The ABS-ECU causes the ABS warning lamp to illuminate during the initial check. 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.</p>	<ul style="list-style-type: none"> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of ABS-ECU</li> </ul>



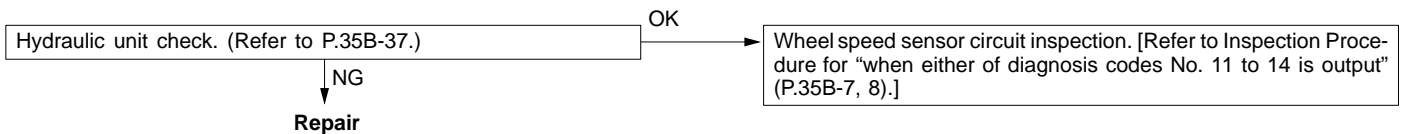
Inspection Procedure 6

When the ignition key is turned to “START”, the ABS warning lamp does not illuminate.	Probable cause
<p>The ABS-ECU is powered through IG2 which is turned off when the ignition key is in START position. The ABS warning lamp is powered through IG1 which is not turned off even when the ignition key is in START position. So the cause must be a defective circuit on valve relay side.</p>	<ul style="list-style-type: none"> <li>• Malfunction of valve relay</li> <li>• Malfunction of wiring harness or connector</li> </ul>



Inspection Procedure 7

Brake operation is abnormal.	Probable cause
<p>This symptom varies depending on the driving conditions and the road surface conditions, so problem diagnosis is difficult. However, if no diagnosis code is displayed, carry out the following inspection.</p>	<ul style="list-style-type: none"> <li>• Improper installation of wheel speed sensor</li> <li>• Malfunction of wiring harness or connector</li> <li>• Malfunction of wheel speed sensor</li> <li>• Malfunction of ABS rotor</li> <li>• Foreign material adhering to wheel speed sensor</li> <li>• Malfunction of wheel bearing</li> <li>• Malfunction of hydraulic unit</li> <li>• Malfunction of ABS-ECU</li> </ul>



**DATA LIST REFERENCE TABLE**

The following items can be read by the MUT-II from the ABS-ECU input data.

**1. When the system is normal****<EVOLUTION-IV>**

Item No.	Check item	Checking requirements	Normal value
11	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and MUT-II are identical.
12	Front-left wheel speed sensor		
13	Rear-right wheel speed sensor		
14	Rear-left wheel speed sensor		
16	System voltage	Ignition switch: ON	9 – 16 V
27	AYC monitor signal	Perform a test run.	Turns on and off alternately.
32	Acceleration sensor	Keep the vehicle stationary.	2.4 – 2.6 V
		Drive the vehicle.	0.5 – 4.5 V
33	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF

**<EVOLUTION-V, VI>**

Item No.	Check item	Checking requirements	Normal value
11	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and MUT-II are identical.
12	Front-left wheel speed sensor		
13	Rear-right wheel speed sensor		
14	Rear-left wheel speed sensor		
16	System voltage	Ignition switch: ON	9 – 16 V
32	Acceleration sensor (longitudinal)	Keep the vehicle stationary on level ground.	2.4 – 2.6 V
		Drive the vehicle.	0.5 – 4.5 V
33	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF
71	Acceleration sensor (lateral)	Keep the vehicle stationary on level ground.	2.4 – 2.6 V
		Drive the vehicle.	0.5 – 4.5 V

**2. When the ABS-ECU shut off ABS operation.**

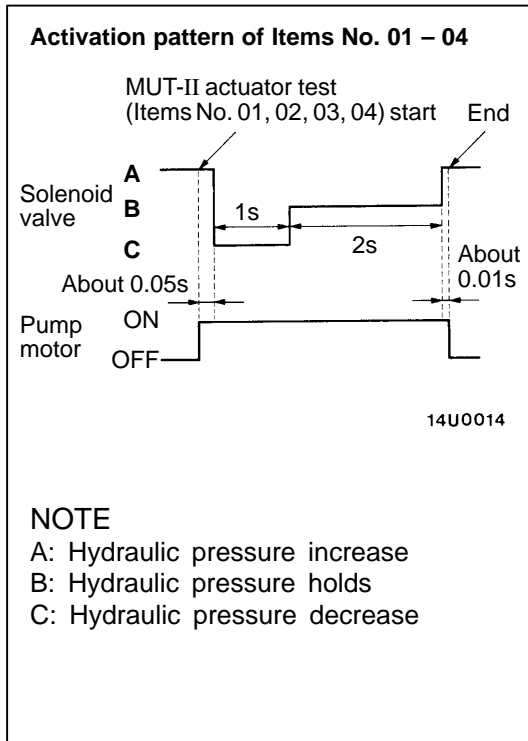
When the diagnosis system stops the ABS-ECU, the MUT-II display data will be unreliable.

**ACTUATOR TEST REFERENCE TABLE**

The MUT-II activates the following actuators for testing.

**NOTE**

- (1) If the ABS-ECU runs down, actuator testing cannot be carried out.
- (2) Actuator testing is only possible when the vehicle is stationary.



**ACTUATOR TEST SPECIFICATIONS**

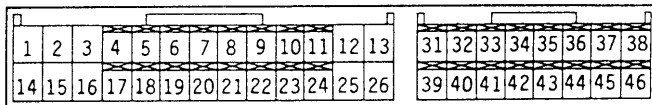
Item No.	Checking item	Activation
01	Solenoid valve for front-right wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-left wheel	
03	Solenoid valve for rear-right wheel	
04	Solenoid valve for rear-left wheel	

**CHECK AT ABS-ECU TERMINALS**

**TERMINAL VOLTAGE LISTING**

- 1. The voltage is to be measured across each terminal and ground terminal.
- 2. Fig. below shows the arrangement of the terminals.

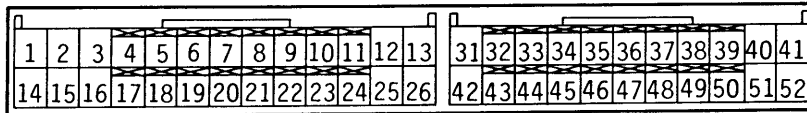
<EVOLUTION-IV>



Terminal No.	Check item	Check requirement	Normally
1	Solenoid valve IN (RR) output	Ignition switch: ON (after initial check)	System voltage
2	Ground	At all times	0 V
14	Solenoid valve OUT (FL) output	Ignition switch: ON (after initial check)	System voltage
15	Solenoid valve OUT (RR) output	Ignition switch: ON (after initial check)	System voltage
16	Solenoid valve IN (FL) output	Ignition switch: ON (after initial check)	System voltage

Terminal No.	Check item	Check requirement		Normally
17	Acceleration sensor input	Ignition switch: ON		2.4 – 2.6 V (horizontal position)
18	Acceleration sensor ground	At all times		0 V
25	ABS-ECU backup power supply	At all times		System voltage
26	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
31	Ground	At all times		0 V
33	Diagnosis changeover input	When the MUT-II is connected		0 V
		When the MUT-II is not connected		System voltage
34	Valve relay monitor input	Ignition switch: ON (after initial check)		System voltage
35	Motor monitor input	Ignition switch: ON (after initial check)	When motor is ON	System voltage
			When motor is OFF	0 V
37	Solenoid valve OUT (RL) output	Ignition switch: ON (after initial check)		System voltage
38	Solenoid valve IN (FR) output	Ignition switch: ON (after initial check)		System voltage
39	Ground	At all times		0 V
40	Stop lamp switch input	Ignition switch: ON	Stop lamp switch: ON	System voltage
			Stop lamp switch: OFF	0 V
41	Diagnosis data input/output	When the MUT-II is connected		Serial communica- tion with MUT-II possible
		When the MUT-II is not connected		–
42	Valve relay output	Ignition switch: ON	When relay is ON (after initial check)	0 V
			When relay is OFF	System voltage
43	Motor relay output	Ignition switch: ON	When motor is energized	0 V
			When motor is deenergized	System voltage
44	ABS warning lamp output	Ignition switch: ON	When lamp is off	System voltage
			When lamp is on	0 V
45	Solenoid valve IN (RL) output	Ignition switch: ON		System voltage
46	Solenoid valve OUT (FR) output	Ignition switch: ON		System voltage

## &lt;EVOLUTION-V, VI&gt;



14M0128

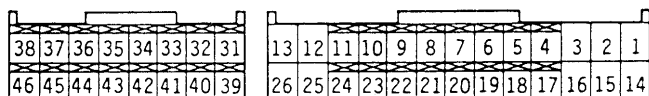
Terminal No.	Check item	Check requirement	Normally	
1	Solenoid valve OUT (FL) output	Ignition switch: ON (after initial check)	System voltage	
2	Solenoid valve OUT (RR) output	Ignition switch: ON (after initial check)	System voltage	
3	Solenoid valve IN (RR) output	Ignition switch: ON (after initial check)	System voltage	
4	Acceleration sensor (longitudinal acceleration) input	Ignition switch: ON	2.4 – 2.6 V (horizontal position)	
11	Wheel speed (FL) output	Vehicle stationary	1 V or less	
		Moving forward slowly	0 – 5 V	
13	ABS-ECU power supply	Ignition switch: ON	System voltage	
14	Solenoid valve IN (FL) output	Ignition switch: ON (after initial check)	System voltage	
15	Ground	At all times	0 V	
17	Acceleration sensor ground	At all times	0 V	
18	Acceleration sensor (lateral acceleration) input	Ignition switch: ON	2.4 – 2.6 V (horizontal position)	
24	Wheel speed (RL) output	Vehicle stationary	1 V or less	
		Moving forward slowly	0 – 5 V	
25	Ground	At all times	0 V	
32	ABS-ECU backup power supply	At all times	System voltage	
33	Wheel speed (FR) output	Vehicle stationary	1 V or less	
		Moving forward slowly	0 – 5 V	
34	Stop lamp switch input	Stop lamp switch: ON	System voltage	
		Stop lamp switch: OFF	0 V	
36	Diagnosis data input/output	When the MUT-II is connected	Serial communication with MUT-II possible	
		When the MUT-II is not connected	–	
37	Valve relay output	Ignition switch: ON	When relay is ON	0 V
			When relay is OFF	System voltage
38	Motor relay output	Ignition switch: ON	When motor is energized	0 V
			When motor is deenergized	System voltage
40	Solenoid valve OUT (RL) output	Ignition switch: ON (after initial check)	System voltage	
41	Solenoid valve OUT (FR) output	Ignition switch: ON (after initial check)	System voltage	
42	Ground	At all times	0 V	

Terminal No.	Check item	Check requirement	Normally	
44	Wheel speed (RR) output	Vehicle stationary	1 V or less	
		Moving forward slowly	0 – 5 V	
47	Diagnosis changeover input	When the MUT-II is connected	0 V	
		When the MUT-II is not connected	System voltage	
48	Valve relay monitor input	Ignition switch: ON (after initial check)	System voltage	
49	Motor relay monitor input	Ignition switch: ON	When motor is energized	0 V
			When motor is deenergized	System voltage
50	ABS warning lamp output	Ignition switch: ON	When lamp is off	System voltage
			When lamp is on	0 V
51	Solenoid valve IN (RL) output	Ignition switch: ON (after initial check)	System voltage	
52	Solenoid valve IN (FR) output	Ignition switch: ON (after initial check)	System voltage	

**LISTING OF RESISTANCE AND CONTINUITY ACROSS CONNECTOR TERMINALS ON HARNESS SIDE**

1. Measure the resistance and check for continuity with the ignition switch in the “OFF” position and ABS-ECU connector disconnected.
2. Measure the resistance and check for continuity across terminals listed below.
3. Fig. below shows the arrangement of terminals.

**<EVOLUTION-IV>**

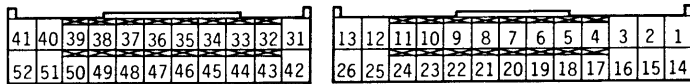


14Y0077

Terminal No.	Signal name	Normally
1 – body ground	Solenoid valve IN (RR)	8.04 – 9.04 Ω
2 – body ground	ECU ground	Conducting
6 – 19	Wheel speed sensor (FL)	1.4 – 1.8 kΩ
7 – 20	Wheel speed sensor (RR)	1.4 – 1.8 kΩ
8 – 21	Wheel speed sensor (FR)	1.4 – 1.8 kΩ
9 – 22	Wheel speed sensor (RL)	1.4 – 1.8 kΩ
14 – body ground	Solenoid valve OUT (FL)	4.04 – 4.54 Ω
15 – body ground	Solenoid valve OUT (RR)	4.04 – 4.54 Ω
16 – body ground	Solenoid valve IN (FL)	8.04 – 9.04 Ω
18 – body ground	Acceleration sensor ground	Conducting
31 – body ground	ECU ground	Conducting
34 – body ground	Valve relay monitor	Conducting
35 – body ground	Motor monitor	Conducting
37 – body ground	Solenoid valve OUT (RL)	4.04 – 4.54 Ω

Terminal No.	Signal name	Normally
38 – body ground	Solenoid valve IN (FR)	8.04 – 9.04 Ω
39 – body ground	ECU ground	Conducting
45 – body ground	Solenoid valve IN (RL)	8.04 – 9.04 Ω
46 – body ground	Solenoid valve OUT (FR)	4.04 – 4.54 Ω

## &lt;EVOLUTION-V, VI&gt;



14M0127

Terminal No.	Signal name	Normally
1 – body ground	Solenoid valve OUT (FL) output	4.04 – 4.54 Ω
2 – body ground	Solenoid valve OUT (RR) output	4.04 – 4.54 Ω
3 – body ground	Solenoid valve IN (RR) output	8.04 – 9.04 Ω
7 – 20	Wheel speed sensor (FL) input	1.4 – 1.8 kΩ
8 – 21	Wheel speed sensor (RR) input	1.4 – 1.8 kΩ
9 – 22	Wheel speed sensor (RL) input	1.4 – 1.8 kΩ
10 – 23	Wheel speed sensor (FR) input	1.4 – 1.8 kΩ
14 – body ground	Solenoid valve IN (FL) output	8.04 – 9.04 Ω
15 – body ground	Ground	Conducting
25 – body ground	Ground	Conducting
40 – body ground	Solenoid valve OUT (RL) output	4.04 – 4.54 Ω
41 – body ground	Solenoid valve OUT (FR) output	4.04 – 4.54 Ω
42 – body ground	Ground	Conducting
48 – body ground	Valve relay monitor input	Conducting
49 – body ground	Motor relay monitor input	Conducting
51 – body ground	Solenoid valve IN (RL) output	8.04 – 9.04 Ω
52 – body ground	Solenoid valve IN (FR) output	8.04 – 9.04 Ω



## ON-VEHICLE SERVICE

### WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ABS-ECU connector, and then measure the output voltage at the harness-side connector.

**Caution**

Insert the probe in the connector from the harness side after releasing the double lock. Inserting it from the terminal side could cause poor contacts.

3. Rotate the wheel to be measured at approximately 1/2–1 rotation per second, and check the output voltage using a circuit tester (ACmV range) or an oscilloscope.

**Terminal numbers**

<EVOLUTION-IV>

Front left	Front right	Rear left	Rear right
6	8	9	7
19	21	22	20

<EVOLUTION-V, VI>

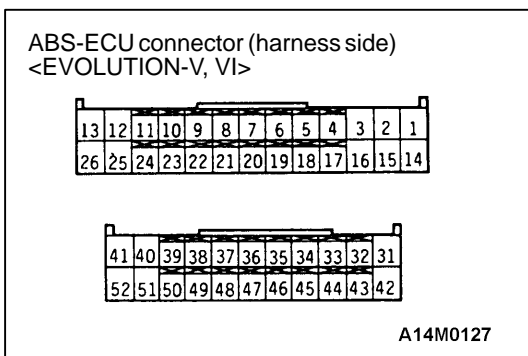
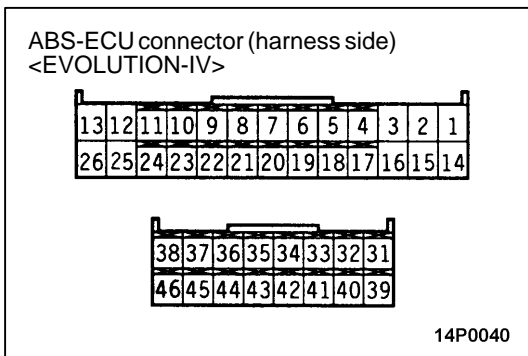
Front left	Front right	Rear left	Rear right
7	10	9	8
20	23	22	21

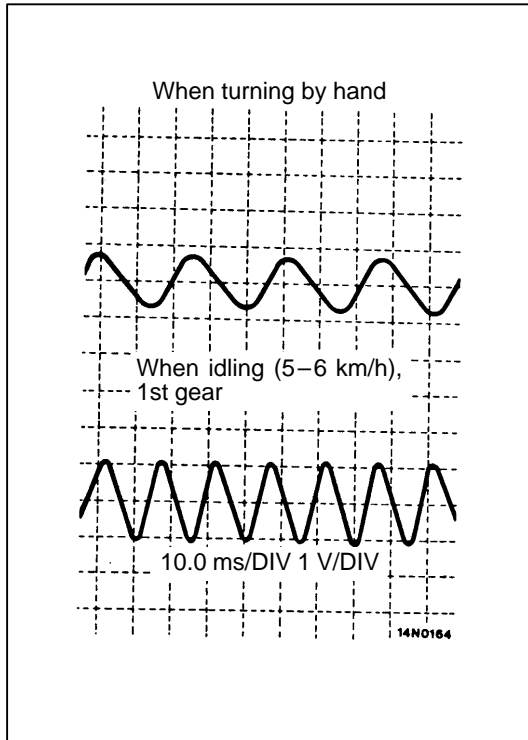
**Output voltage**

**When measuring with a circuit tester:  
70 mV or more**

**When measuring with an oscilloscope:  
200 mV p-p or more**

4. If the output voltage is lower than the above values, the following causes are suspected. Check the wheel speed sensors and replace if necessary.
  - Too large gap between wheel speed sensor pole piece and ABS rotor
  - Faulty wheel speed sensor





**Inspecting Waveforms with an Oscilloscope**

Use the following method to observe the output voltage waveform from each wheel sensor with an oscilloscope. Check the connection of the sensor harness and connector before using the oscilloscope.

Start the engine, and rotate the wheels by engaging 1st gear.

**NOTE**

- (1) The waveform measurements can also be taken while the vehicle is actually moving.
- (2) The output voltage will be small when the wheel speed is low, and similarly it will be large when the wheel speed is high.

**Points in Waveform Measurement**

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
Waveform amplitude fluctuates excessively (this is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
	Faulty ABS-ECU ground	Repair
Noisy or disturbed waveform	Open circuit in sensor	Replace sensor
	Open circuit in harness	Correct harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	ABS rotor with missing or damaged teeth	Replace rotor

**Caution**

The wheel speed sensor cable moves following motion of the front or rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads and it functions normally on ordinary roads. It is, therefore, recommended to observe sensor output voltage waveform also under special conditions, such as rough road driving.

## HYDRAULIC UNIT CHECK

### Caution

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

1. Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

### Caution

- (1) The roller of the braking force tester and the tyre should be dry during testing.
- (2) When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.

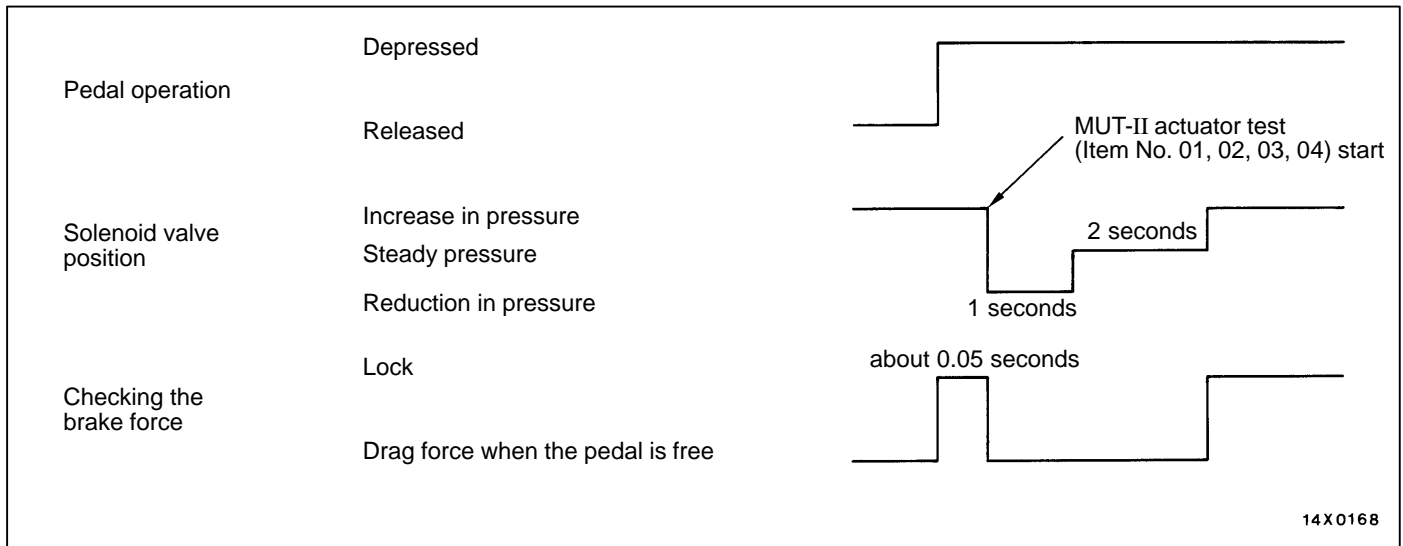
2. Turn the ignition key to the OFF position and set the MUT-II.
3. After checking that the shift lever is in neutral, start the engine.

### NOTE

- (1) During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.
  - (2) When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.
4. Use the MUT-II to force-drive the actuator.
  5. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed. When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check that the braking force decreases when the actuator is force-driven.

Front wheel	785 – 981 N
Rear wheel	294 – 490 N

The result should be as shown in the following diagram.

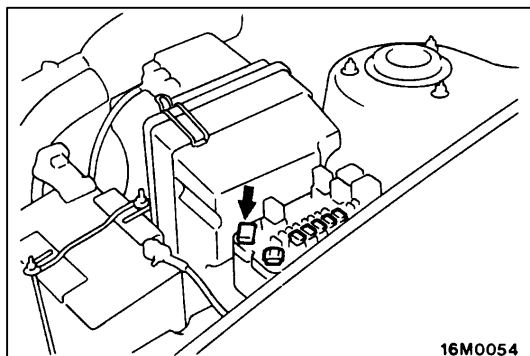


6. If the result of inspection is abnormal, correct according to the “Diagnosis Table”.

**Diagnosis Table**

No.	MUT-II display	Operation	Judgement – Normal	Judgement – Abnormal	Probable cause	Remedy
01	FR valve	(1) Depress brake pedal to lock wheel. (2) Using the MUT-II, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel using brake force tester or manually to check the change of brake force.	Brake force released for 3 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than hydraulic unit	Check and clean brake line
02	FL valve				Clogged hydraulic circuit in hydraulic unit	Replace hydraulic unit assembly
03	RR valve			Brake force is not released	Incorrect hydraulic unit brake tube connection	Connect correctly
04	RL valve			Hydraulic unit solenoid valve not functioning correctly	Replace hydraulic unit assembly	

7. After inspection, turn the ignition switch off and remove the MUT-II.

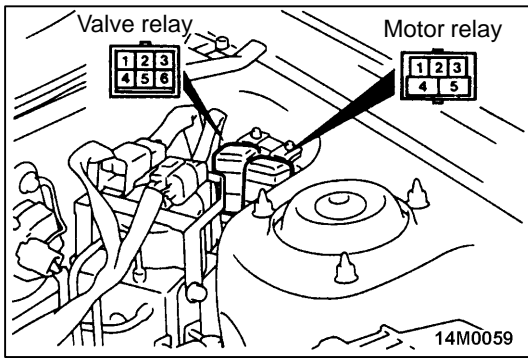


**REMEDY FOR A FLAT BATTERY**

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 fusible link for ABS circuit, thus disabling the anti-skid brake system. The ABS warning lamp will illuminate when the fusible link (for ABS) is removed.

After the battery has sufficiently recharged, install the fusible link (for ABS) and restart the engine; then check to be sure the ABS warning lamp is not illuminated.



**ABS MOTOR RELAY CONTINUITY CHECK**

Checking condition	Terminal No.				
	1	2	3	4	5
Power is not supplied	○	—	○		
Power is supplied	⊕	—	⊖	○	○

**ABS VALVE RELAY CONTINUITY CHECK**

Checking condition	Terminal No.					
	1	2	3	4	5	6
Power is not supplied	○	○	○		○	
Power is supplied		⊕	○	—	⊖	○

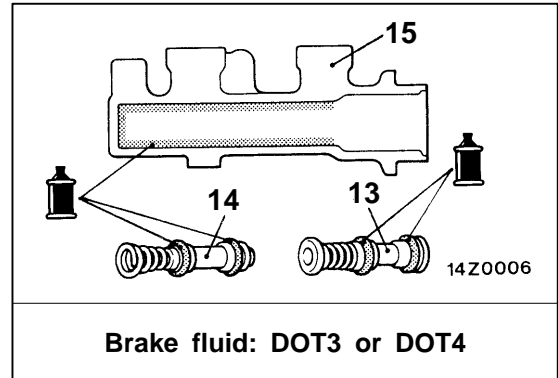
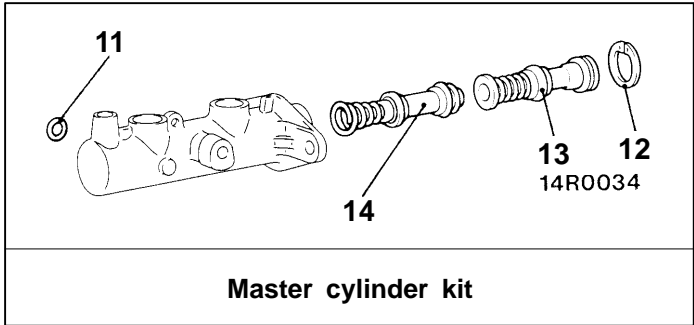
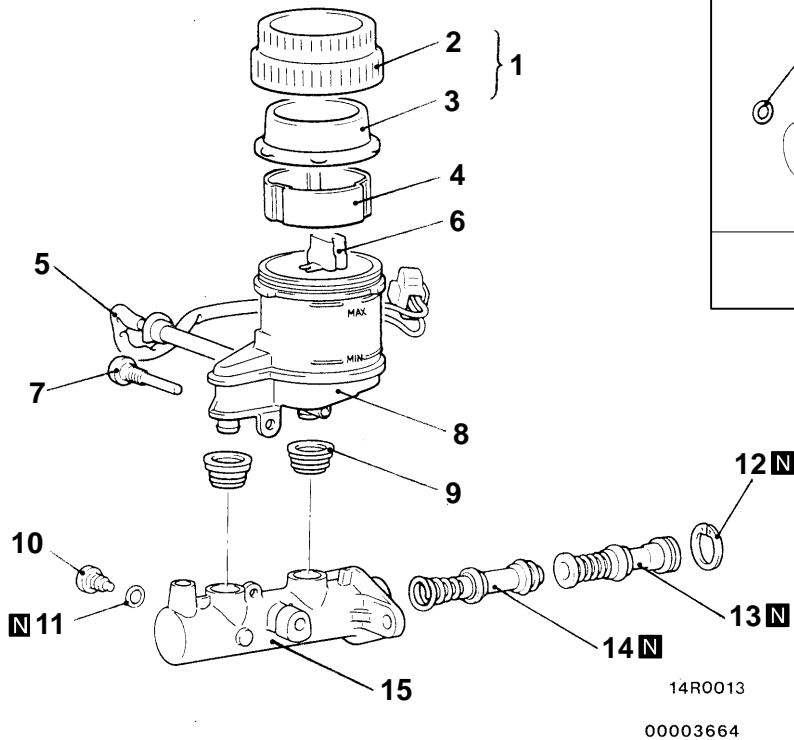
# MASTER CYLINDER AND BRAKE BOOSTER

## REMOVAL AND INSTALLATION

Refer to GROUP 35A.

### MASTER CYLINDER

### DISASSEMBLY AND REASSEMBLY

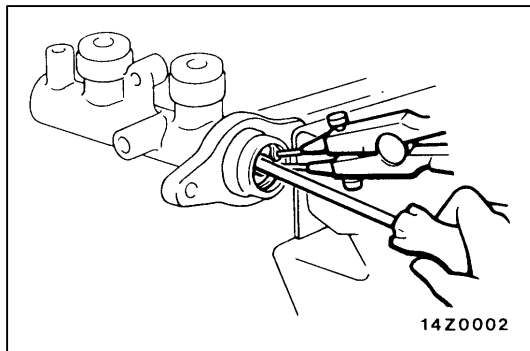


#### Disassembly steps

1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Filter
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt



8. Reservoir tank
9. Reservoir seal
10. Piston stopper bolt
11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body



#### DISASSEMBLY SERVICE POINTS

##### ◀A▶ PISTON STOPPER BOLT / STOPPER RING REMOVAL

Remove the piston stopper bolt and stopper ring, while depressing the primary piston assembly.

#### NOTE

Shown at left is the stopper ring removal manner.

# HYDRAULIC UNIT

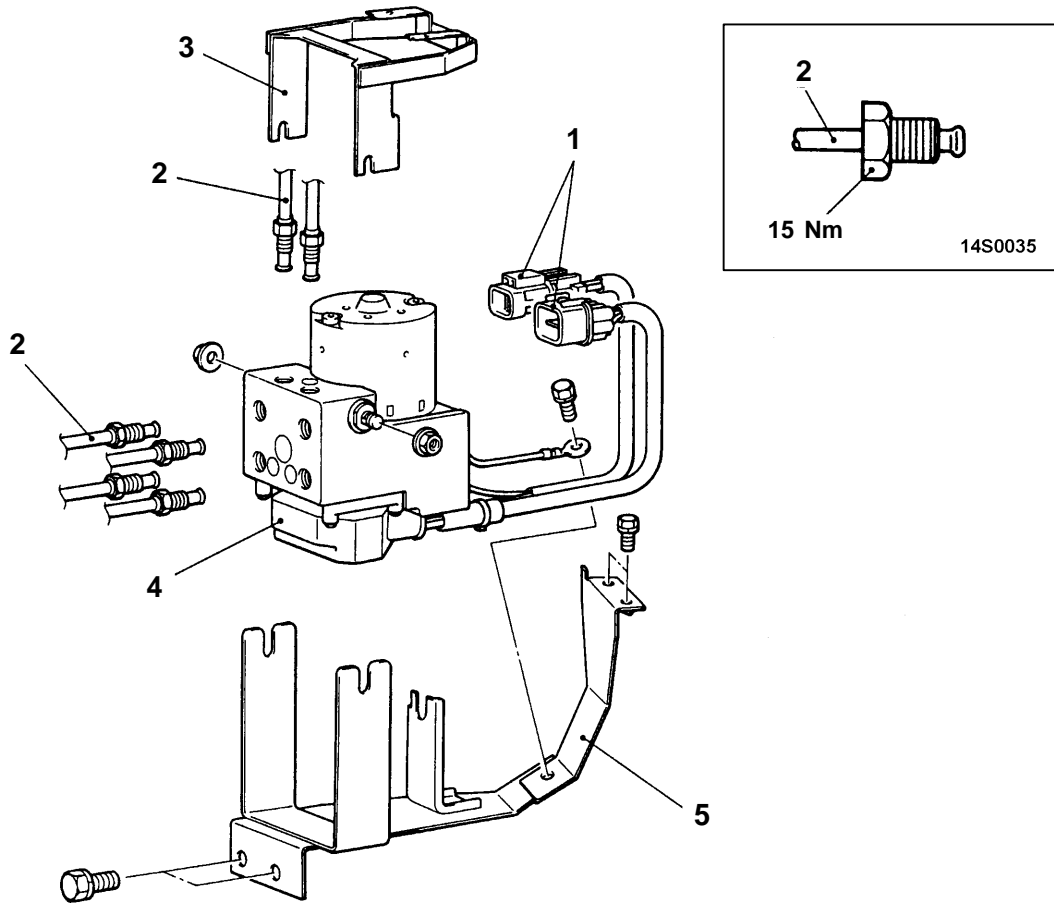
## REMOVAL AND INSTALLATION

**Pre-removal Operation**

- Brake Fluid Draining

**Post-installation Operation**

- Brake Fluid Supplying and Air Bleeding
- Hydraulic Unit Checking (Refer to P.35B-37.)



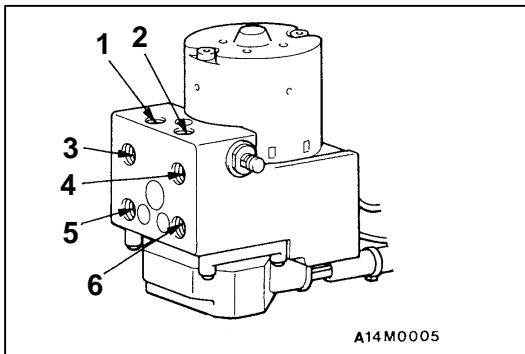
14M0003

**Removal steps**

- ▶A◀ 1. Harness connector
- ▶A◀ 2. Brake pipe connection
- ▶A◀ 3. Connector bracket
- ◀A▶ 4. Hydraulic unit assembly
- ◀A▶ 5. Hydraulic unit bracket

**REMOVAL SERVICE POINT****◀A▶ HYDRAULIC UNIT ASSEMBLY REMOVAL****Caution**

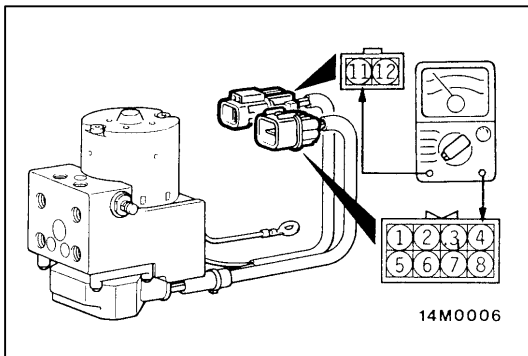
- (1) The hydraulic unit assembly is heavy, and so care should be taken when removing it.
- (2) The hydraulic unit assembly is not to be disassembled; its nuts and bolts should absolutely not be loosened.
- (3) The hydraulic unit assembly must not be dropped or otherwise subjected to impact shocks.
- (4) The hydraulic unit assembly must not be turned upside down or laid on its side.

**INSTALLATION SERVICE POINT****▶A◀ BRAKE PIPE CONNECTION**

Connect the pipes to the hydraulic unit assembly as shown in the illustration.

1. To the proportioning valve (Rear brake LH)
2. To the proportioning valve (Rear brake RH)
3. From the master cylinder (Primary)
4. From the master cylinder (Secondary)
5. To the front brake (RH)
6. To the front brake (LH)





**INSPECTION**

**SOLENOID VALVE CHECK**

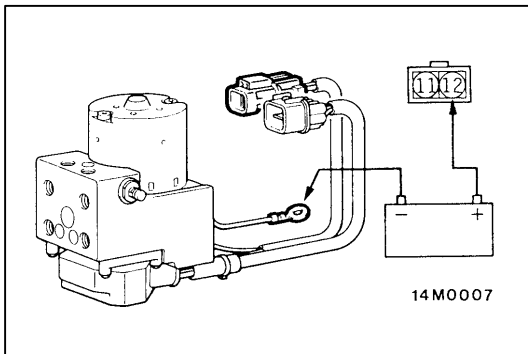
Measure the resistance between the terminals of the following solenoid valves.

**Standard value:**

**Solenoid valve IN 8.04 – 9.04 Ω**

**Solenoid valve OUT 4.04 – 4.54 Ω**

Solenoid valve IN	Measurement terminal	Solenoid valve OUT	Measurement terminal
Front (right)	1 – 11	Front (right)	5 – 11
Front (left)	4 – 11	Front (left)	8 – 11
Rear (right)	3 – 11	Rear (right)	7 – 11
Rear (left)	2 – 11	Rear (left)	6 – 11



**MOTOR OPERATION CHECK**

Connect the battery to the motor and check if the operating sound is heard.

**Caution**

**Never apply the battery power for more than 1 second.**

# WHEEL SPEED SENSOR

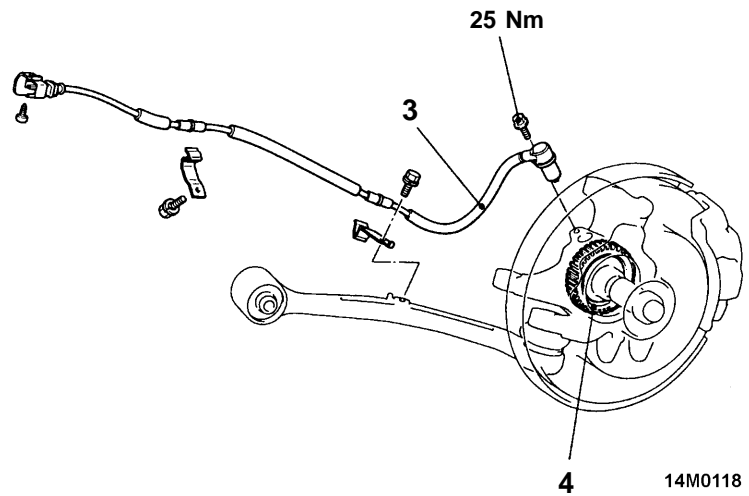
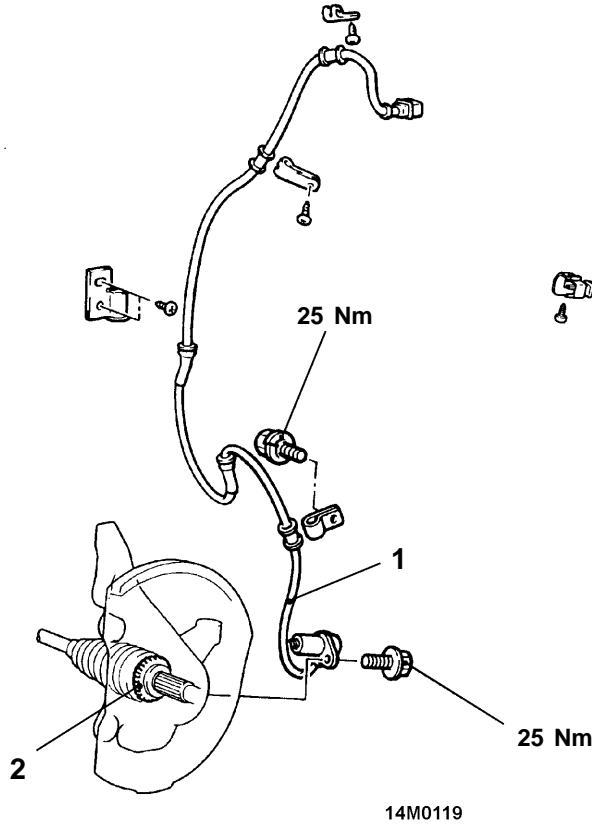
## REMOVAL AND INSTALLATION

### Post-installation Operation

- Wheel Speed Sensor Output Voltage Check (Refer to P.35B-35.)

<Front>

<Rear>



### Front speed sensor removal steps



- Splash shield
- 1. Front speed sensor
- 2. Front ABS rotor

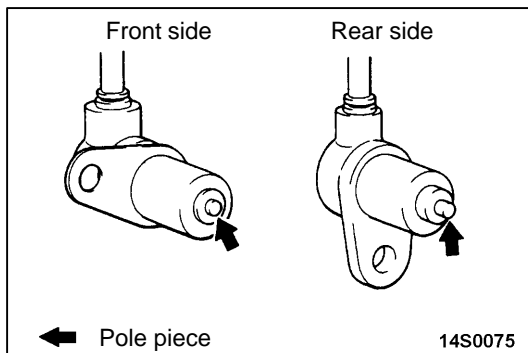
### NOTE

The front rotor is integrated with the drive shaft and is not disassembled.

### Rear speed sensor removal steps



- 3. Rear speed sensor
- 4. Rear ABS rotor



### REMOVAL SERVICE POINT

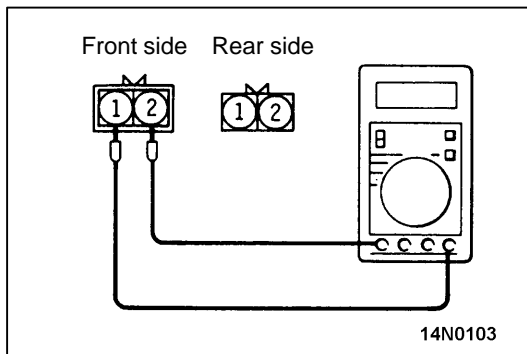
#### FRONT SPEED SENSOR / REAR SPEED SENSOR REMOVAL

### Caution

Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.

**INSPECTION****RESISTANCE CHECK BETWEEN SPEED SENSOR TERMINALS****NOTE**

The pole piece can become magnetized because of the magnet built in the speed sensor, with the result that metallic foreign material easily adheres to it. Moreover, the pole piece may not be able to correctly sense the wheel rotation speed if it is damaged.



1. Measure the resistance between the speed sensor terminals.

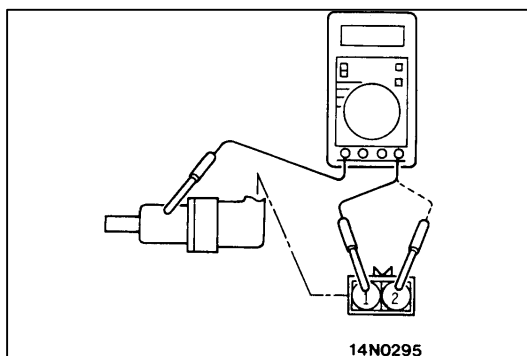
**Standard value: 1.4 – 1.8 k $\Omega$**

If the internal resistance of the speed sensor is not within the standard value, replace with a new speed sensor.

2. Check the speed sensor cable for breakage, damage or disconnection; replace with a new one if a problem is found.

**NOTE**

When checking for cable damage, remove the cable clamp part from the body and then bend and pull the cable near the clamp to check whether or not temporary disconnection occurs. Check also that the connector is free from poor contact, loose terminal, etc.

**SPEED SENSOR INSULATION CHECK**

1. Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

**Standard value: 100 k $\Omega$**

2. If the speed sensor insulation resistance is outside the standard value range, replace with a new speed sensor.

**ABS ROTOR CHECK**

Check whether rotor teeth are broken or deformed, and, if so, replace the rotor.

# ACCELERATION SENSOR

## REMOVAL AND INSTALLATION

### CAUTION: SRS

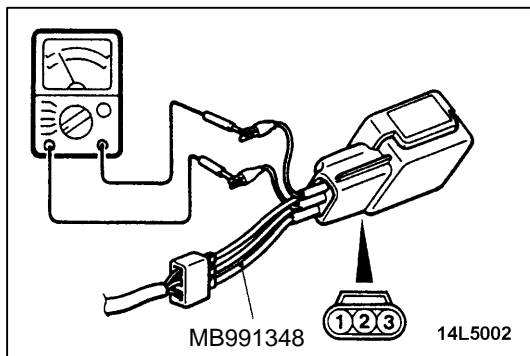
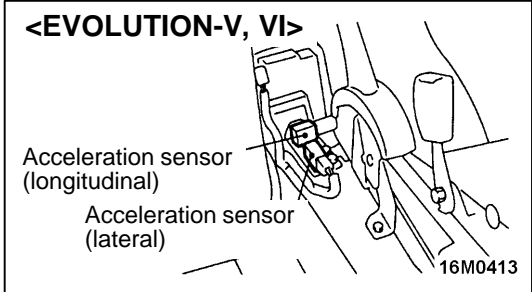
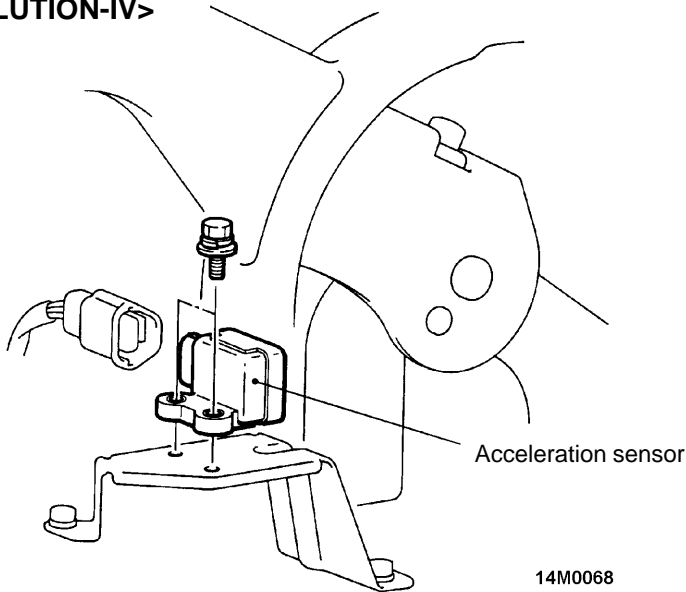
When removing and installing the ABS-ECU from vehicles equipped with SRS, do not let it bump against the SRS-ECU or other components.

### Caution

Use utmost care not to drop the sensors nor expose them to any other type of shock.

**Pre-removal and Post-installation Operation**  
 • Floor Console Removal and Installation

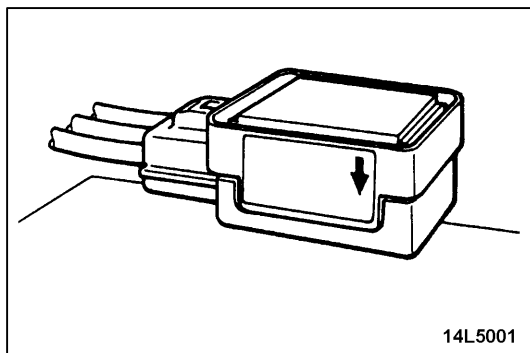
### <EVOLUTION-IV>



## INSPECTION

1. Disconnect the acceleration sensor connector and connect the special tool to the terminals of the disconnected connector.
2. Turn on the ignition switch. Measure the output voltage across the terminals No. 2 and No. 3.

**Standard value: 2.4 – 2.6 V**



3. With the special tool connected, hold the sensor in such a way that the front mark on the mounting surface is directed downward. Then, read the output voltage between the terminals No. 2 and No. 3.

**Standard value: 3.4 – 3.6 V**

4. If the reading does not conform to the standard value, check the power supply and grounding lines for abnormality. If they are in order, replace the acceleration sensor.

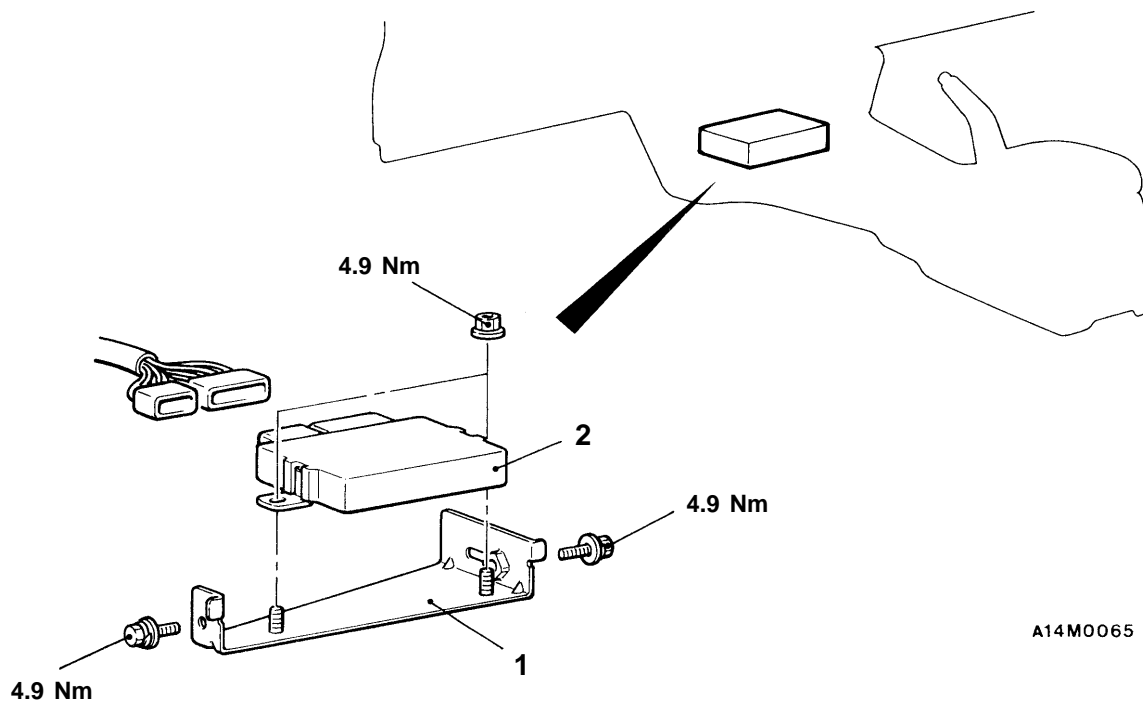
## ABS-ECU

### REMOVAL AND INSTALLATION

#### CAUTION: SRS

When removing and installing the ABS-ECU from vehicles equipped with SRS, do not let it bump against the SRS-ECU or other components.

- Pre-removal and Post-installation Operation**
- Floor Console Removal and Installation



#### Removal steps

1. ABS-ECU bracket
2. ABS-ECU

#### INSPECTION

Refer to P.35B-30.

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## NOTES

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# BASIC BRAKE SYSTEM

## CONTENTS

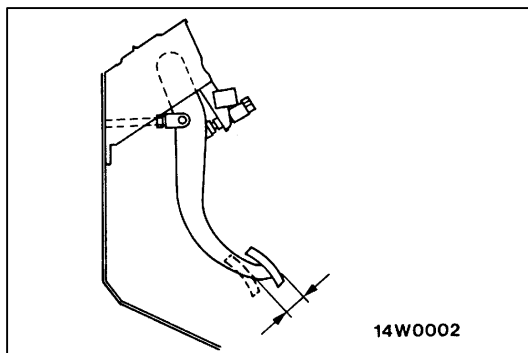
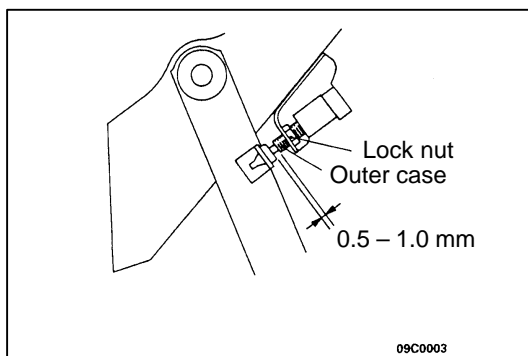
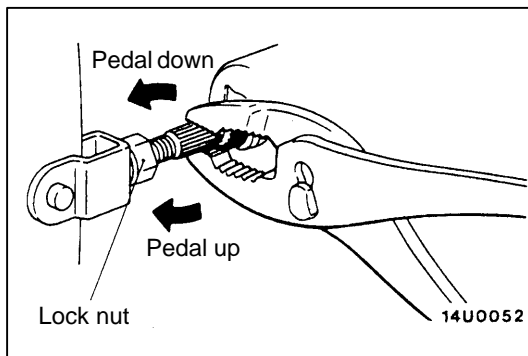
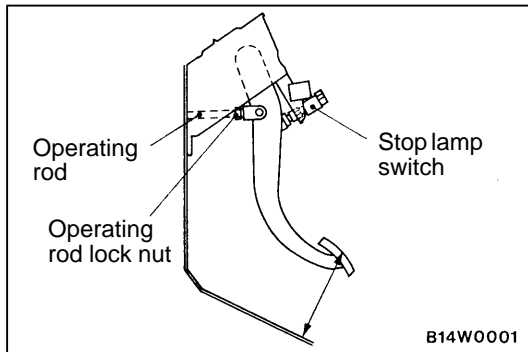
<b>GENERAL</b> .....	<b>2</b>	<b>MASTER CYLINDER AND BRAKE BOOSTER</b> .....	<b>5</b>
Outline of Change .....	2	Master Cylinder .....	7
<b>ON-VEHICLE SERVICE</b> .....	<b>2</b>	<b>DISC BRAKE</b> .....	<b>9</b>
Brake Pedal Check and Adjustment .....	2		
<b>BRAKE PEDAL</b> .....	<b>4</b>		



## GENERAL

### OUTLINE OF CHANGE

- The service procedures for left-hand drive vehicles have been established as described below.
- The service procedures for the front and rear disc brakes have been changed since they had been replaced by a different type. <EVOLUTION-VI with BREMBO braking system>



## ON-VEHICLE SERVICE

### BRAKE PEDAL CHECK AND ADJUSTMENT

#### <L.H. DRIVE VEHICLES>

1. Turn up the carpet, etc under the brake pedal.
2. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, follow the procedure below.

**Standard value: 163.5–166.5 mm**

- (1) Disconnect the stop lamp switch connector.
- (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.
- (3) Secure by tightening the lock nut of the operating rod.

- (4) Push the stop lamp switch in the direction of the pedal stroke until it stops. (The switch will slide if it is pushed firmly.)
- (5) Lift up the pedal until the operating rod is fully extended, and then slide the stop lamp switch back to the required position. Adjust the position of the switch by turning it until the distance shown in the illustration is correct.
- (6) Connect the connector of the stop lamp switch.
- (7) Check that the stop lamp is not illuminated with the brake pedal unpressed.

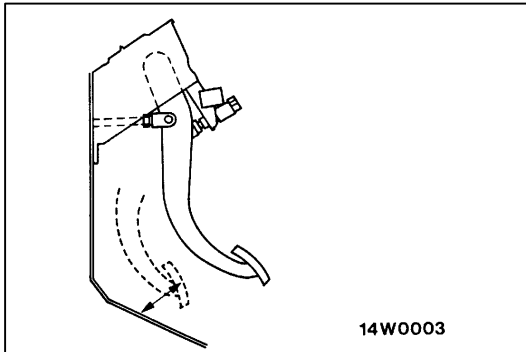
3. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.

**Standard value: 3–8 mm**



If the free play exceeds the standard value, it is probably due to excessive play between the retaining ring bolt and brake pedal arm.

Check for excessive clearance and replace faulty parts as required.



4. Start the engine, depress the brake pedal with approximately 490 N of force, and measure the clearance between the brake pedal and the floorboard.

**Standard value: 80 mm or more**

If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake.

Adjust and replace defective parts as required.

5. Turn back the carpet, etc.

**BRAKE PEDAL <L.H. DRIVE VEHICLES>**

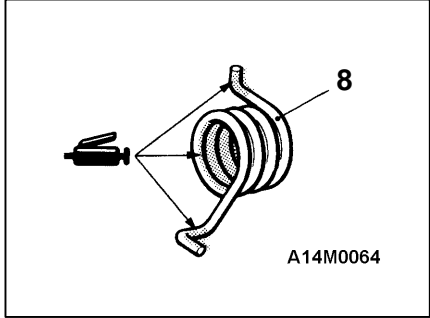
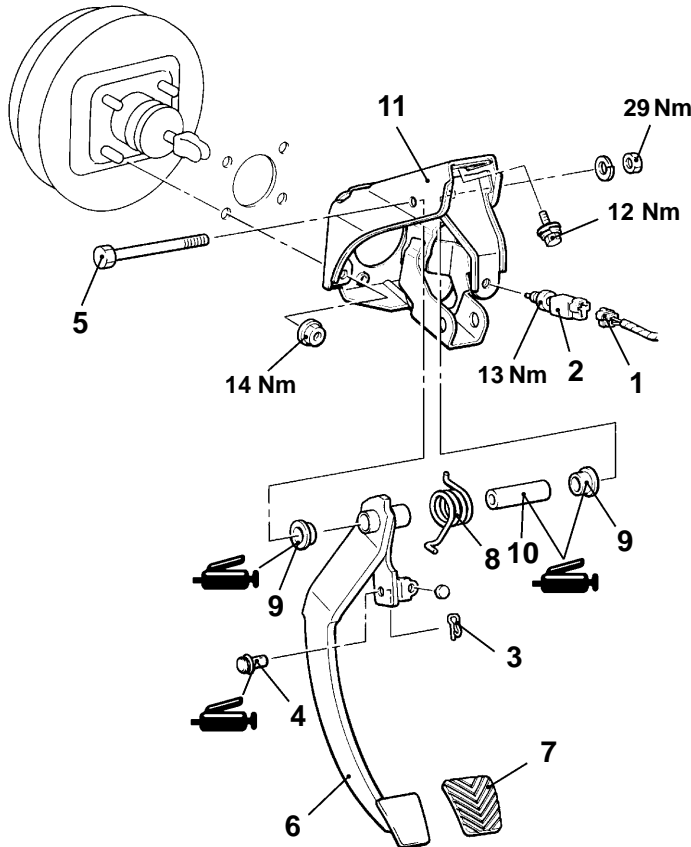
**REMOVAL AND INSTALLATION**

**Pre-removal Operation**

- Instrument Under Cover Removal
- Steering Column Assembly Removal  
(Refer to GROUP 37A – Steering Wheel and Shaft.)
- Accelerator Pedal Removal

**Post-installation Operation**

- Accelerator Pedal Installation
- Steering Column Assembly Installation  
(Refer to GROUP 37A – Steering Wheel and Shaft.)
- Instrument Under Cover Installation
- Brake Pedal Adjustment (Refer to P.35A-2.)



AX0039BL

**Removal steps**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Stop lamp switch connector</li> <li>2. Stop lamp switch</li> <li>3. Snap pin</li> <li>4. Clevis pin</li> <li>5. Brake pedal shaft bolt</li> <li>6. Brake pedal</li> </ol> | <ol style="list-style-type: none"> <li>7. Brake pedal pad</li> <li>8. Brake pedal return spring</li> <li>9. Bushing</li> <li>10. Pipe</li> <li>11. Pedal support member</li> </ol> |
|---|--|

# MASTER CYLINDER AND BRAKE BOOSTER <L.H. DRIVE VEHICLES>

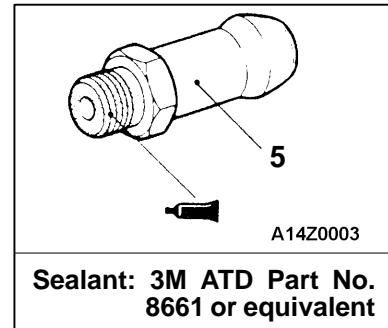
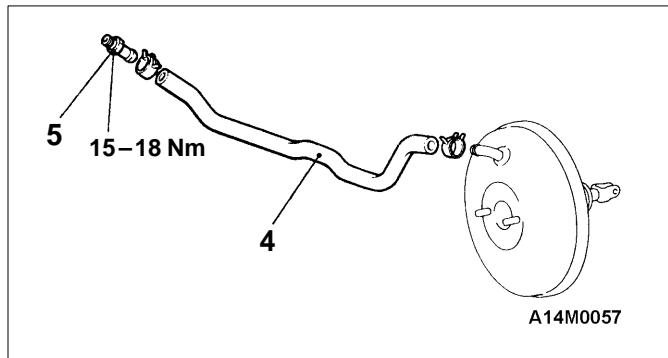
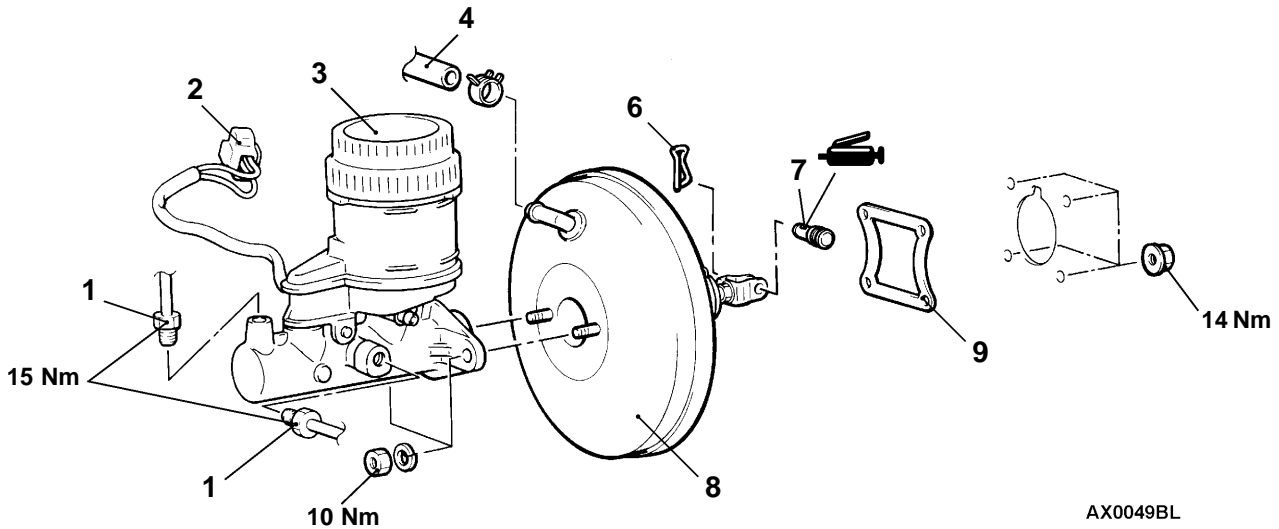
## REMOVAL AND INSTALLATION

### Pre-removal Operation

- Brake Fluid Draining
- Air Intake Hose Removal

### Post-installation Operation

- Brake Fluid Supplying
- Brake Line Bleeding
- Brake Pedal Adjustment (Refer to P.35A-2.)
- Air Intake Hose Installation



### Removal steps

1. Brake pipe connection
2. Brake fluid level sensor connector
3. Master cylinder assembly
- ▶B◀ • Clearance adjustment between brake booster push rod and primary piston
- ▶A◀ 4. Vacuum hose (With built-in check valve)

5. Fitting
6. Snap pin
7. Clevis pin assembly
8. Brake booster
9. Sealer

## INSTALLATION SERVICE POINTS

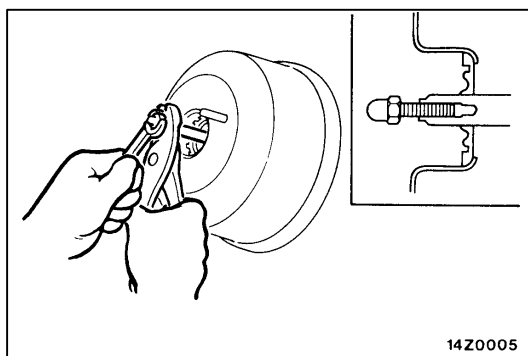
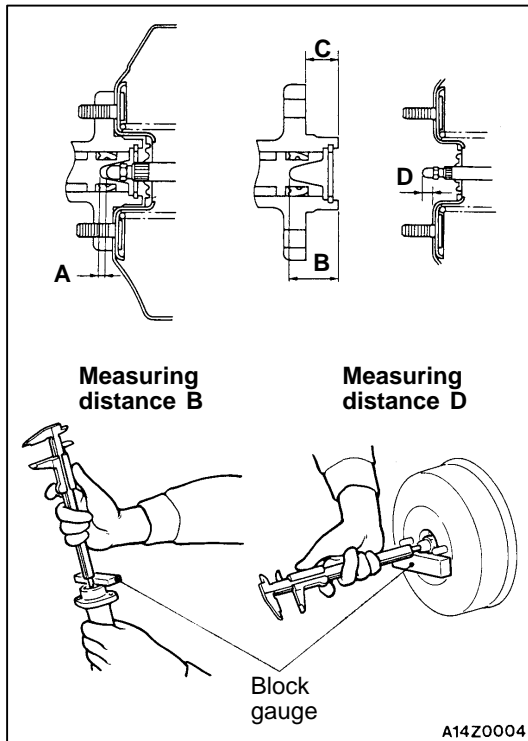
### ►A◄ VACUUM HOSE CONNECTION

Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.

### ►B◄ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

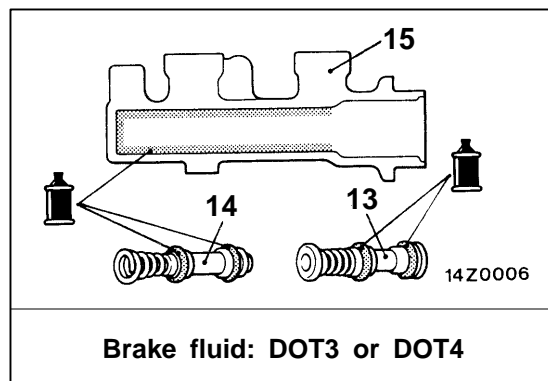
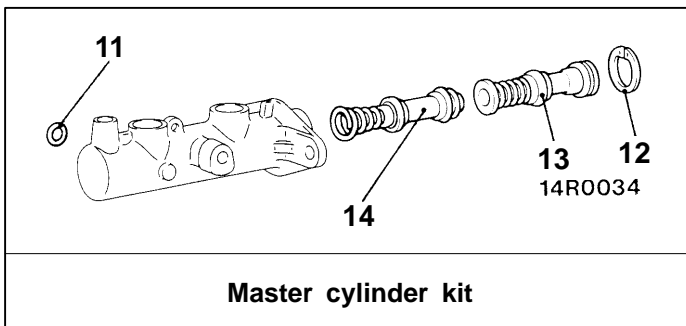
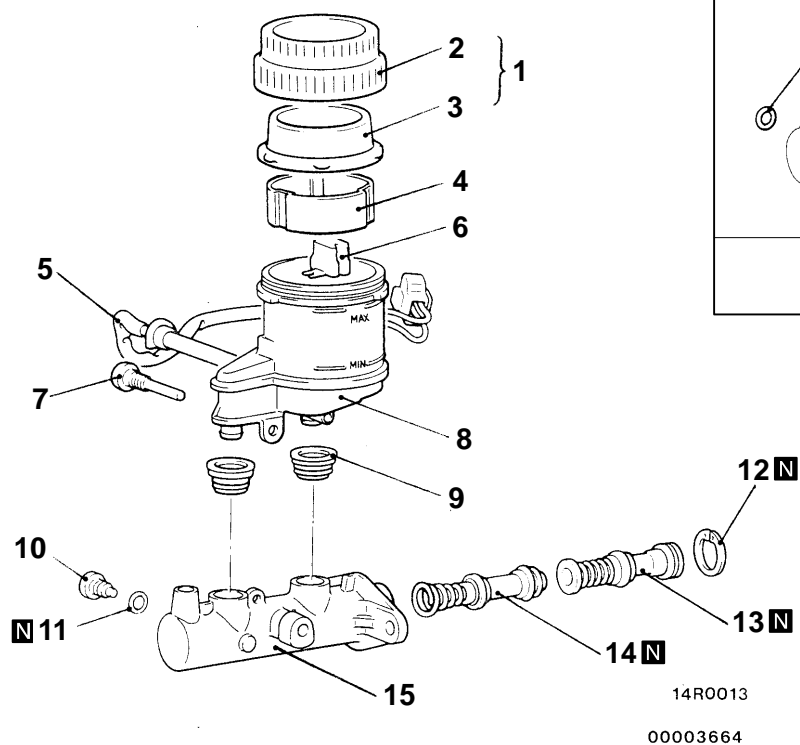
Calculate clearance A from the B, C and D measurements.  
 $A = B - C - D$

**Standard value: 0.65–0.85 mm**



If the clearance is not within the standard value range, adjust by changing the push rod length by turning the screw of the push rod.

**MASTER CYLINDER  
DISASSEMBLY AND REASSEMBLY**

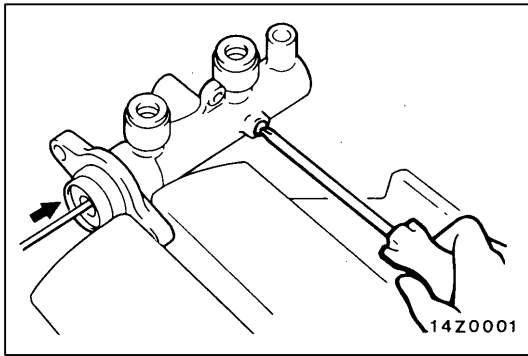


**Disassembly steps**

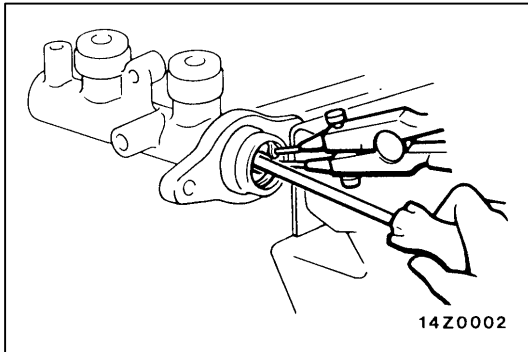
1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Filter
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt



8. Reservoir tank
9. Reservoir seal
10. Piston stopper bolt
11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body

**DISASSEMBLY SERVICE POINTS****◀A▶ PISTON STOPPER BOLT DISASSEMBLY**

Remove the piston stopper bolt, while depressing the piston.

**◀B▶ PISTON STOPPER RING DISASSEMBLY**

Remove the piston stopper ring, while depressing the piston.

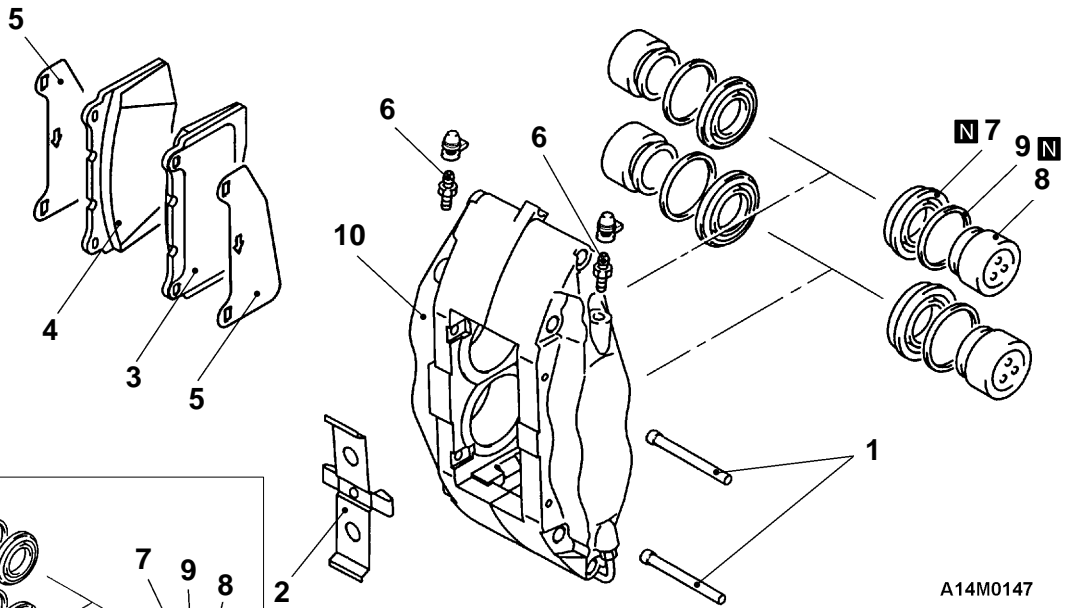
**INSPECTION**

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear, damage or wear.
- Check the diaphragm for cracks and wear.

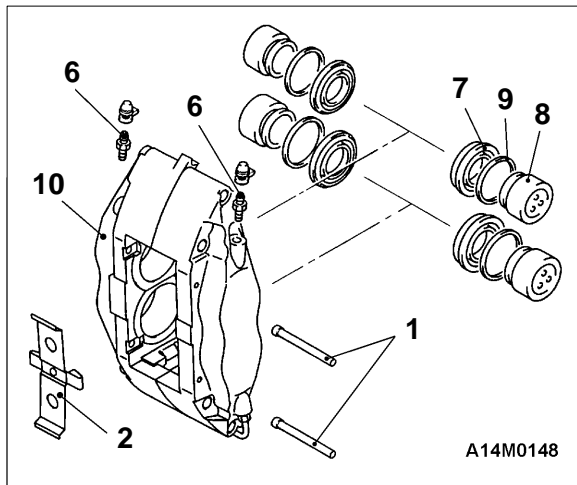
# DISC BRAKE <EVOLUTION-VI WITH BREMBO BRAKING SYSTEM>

## DISASSEMBLY AND REASSEMBLY

### Front Brake

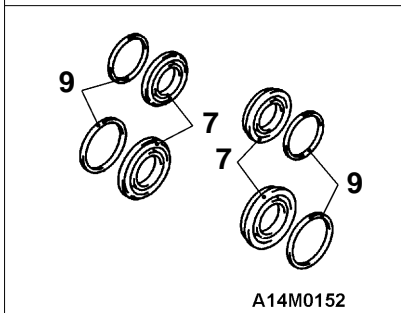


A14M0147



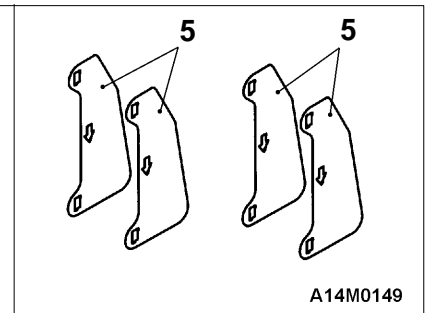
A14M0148

**Brake caliper kit**



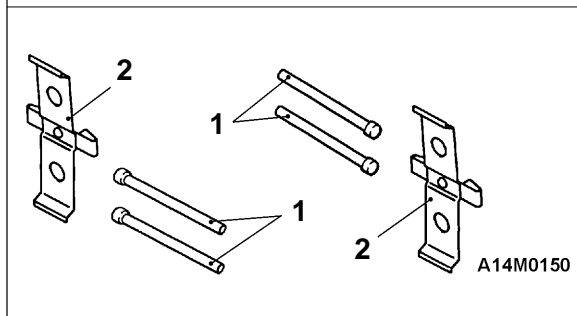
A14M0152

**Seal & boot kit**



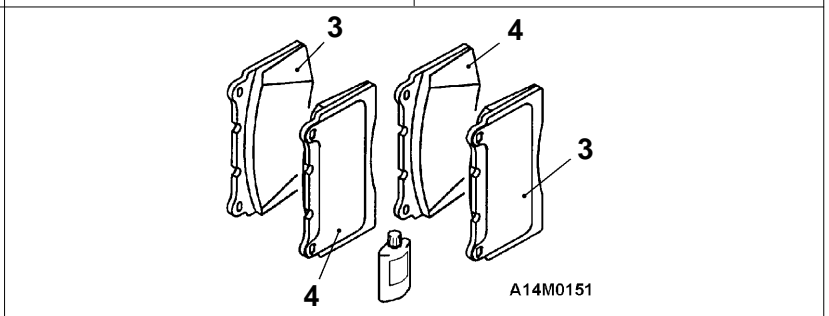
A14M0149

**Shim set**



A14M0150

**Clip set**



A14M0151

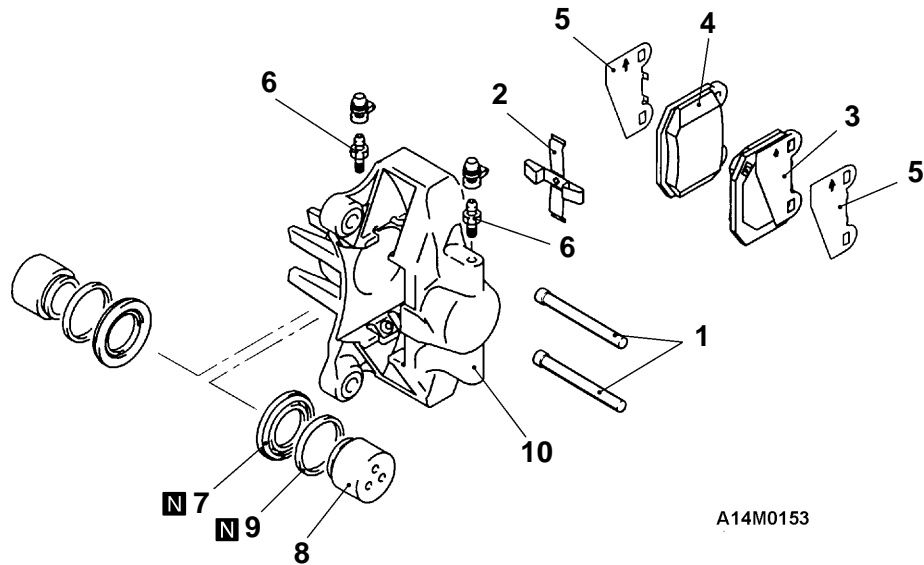
**Pad set**

### Disassembly steps

1. Pin
2. Cross spring
3. Pad & wear indicator assembly
4. Pad assembly
5. Shim

6. Air bleeder screw
7. Piston boot
8. Piston
9. Piston seal
10. Caliper body

Rear Brake



A14M0153

<p>A14M0154</p>	<p>A14M0155</p>	<p>A14M0158</p>
<p><b>Brake caliper kit</b></p>	<p><b>Seal &amp; boot kit</b></p>	<p><b>Shim set</b></p>
<p>A14M0156</p>	<p>A14M0157</p>	
<p><b>Clip set</b></p>	<p><b>Pad set</b></p>	

**Disassembly steps**

1. Pin
2. Cross spring
3. Pad & wear indicator assembly
4. Pad assembly
5. Shim

6. Air bleeder screw
7. Piston boot
8. Piston
9. Piston seal
10. Caliper body



# STEERING

## CONTENTS

<b>GENERAL</b> .....	<b>2</b>	<b>STEERING WHEEL AND SHAFT*</b> .....	<b>2</b>
Outline of Change .....	2	<b>POWER STEERING GEAR BOX*</b> .....	<b>5</b>

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

#### WARNING!

- (1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).
- (2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.
- (3) MITSUBISHI dealer 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.

#### 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 (\*).

**GENERAL**

**OUTLINE OF CHANGE**

- The service procedures for left-hand drive vehicles have been established as described below. The service procedures for components not mentioned below are the same as for the preceding models.

**STEERING WHEEL AND SHAFT <L.H. DRIVE VEHICLES>**

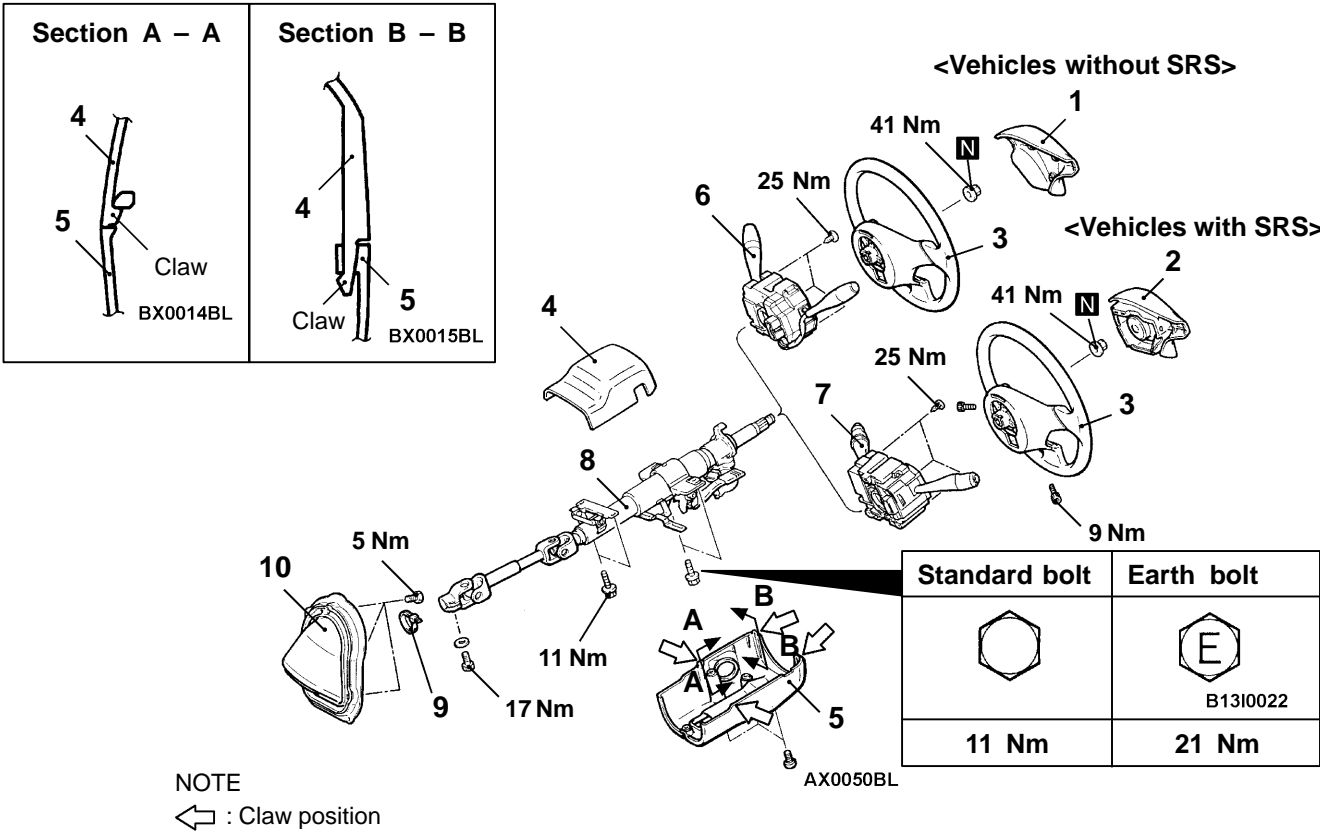
**REMOVAL AND INSTALLATION**

**CAUTION: SRS**  
 For vehicles with SRS, before removal of air bag module, refer to GROUP 52B – Service Precautions and Air Bag Module and Clock Spring.

**Pre-removal Operation**  
 Instrument Under Cover Removal

**Post-installation Operation**

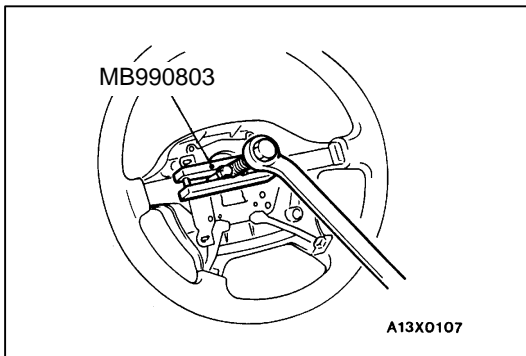
- Instrument Under Cover Installation
- Checking Steering Wheel Position with Wheels Straight Ahead



**Removal steps**

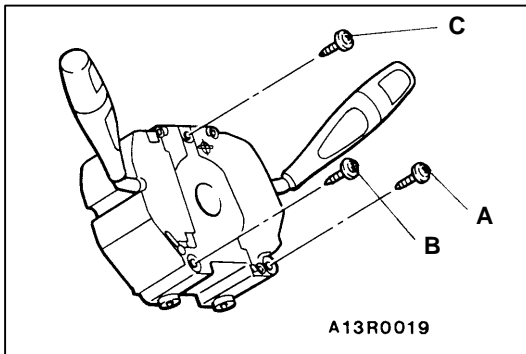
1. Horn pad <Vehicles without SRS>
2. Air bag module  
 (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
3. Steering wheel
4. Upper column cover
5. Lower column cover
6. Column switch  
 <Vehicles without SRS>
7. Clock spring and column switch  
 (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
8. Steering shaft assembly
9. Band
10. Steering cover assembly





**REMOVAL SERVICE POINT**

◀A▶ STEERING WHEEL REMOVAL

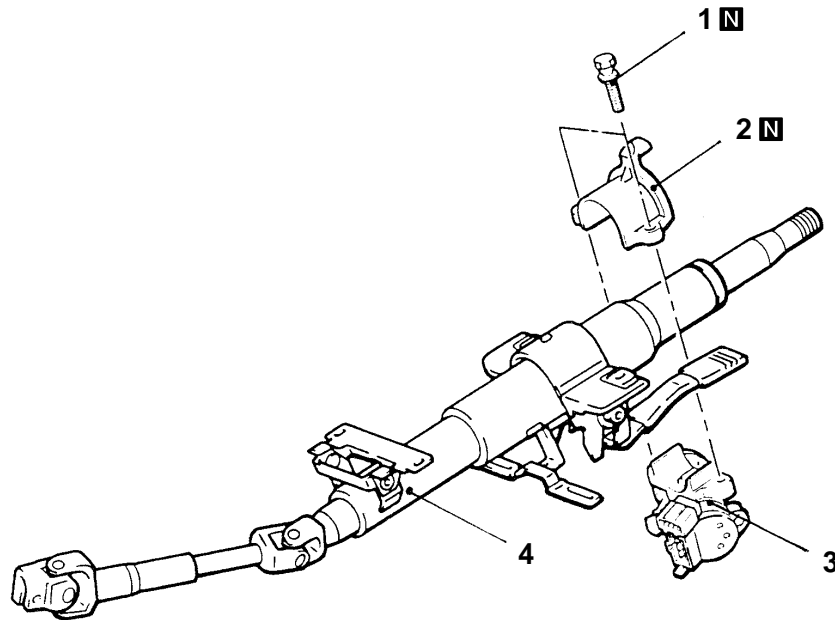


**INSTALLATION SERVICE POINT**

▶A◀ CLOCK SPRING AND COLUMN SWITCH / COLUMN SWITCH INSTALLATION

Tighten the screws in an alphabetical order.

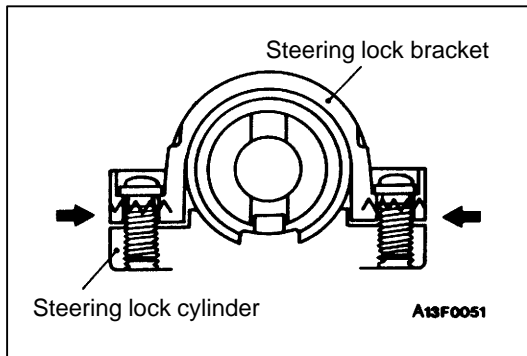
**DISASSEMBLY AND REASSEMBLY**



A13M0029

**Disassembly steps**

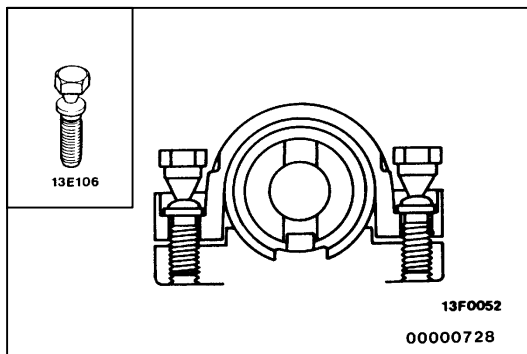
- ▶A◀ 1. Special bolt
- ▶A◀ 2. Steering lock bracket
- ▶A◀ 3. Steering lock cylinder
- ▶A◀ 4. Steering shaft

**DISASSEMBLY SERVICE POINT****◀A▶ STEERING LOCK BRACKET / STEERING LOCK CYLINDER REMOVAL**

If it is necessary to remove the steering lock cylinder, use a hacksaw to cut the special bolts at the steering lock bracket side.

**REASSEMBLY SERVICE POINT****▶A◀ STEERING LOCK CYLINDER/STEERING LOCK BRACKET / SPECIAL BOLT INSTALLATION**

1. When installing the steering lock cylinder and steering lock bracket to the column tube, temporarily install the steering lock in alignment with the column boss.



2. After checking that the lock works properly, tighten the special bolts until the head twists off.

**Caution**

**The steering lock bracket and bolts must be replaced with new ones when the steering lock is installed.**

# POWER STEERING GEAR BOX <L.H. DRIVE VEHICLES>

## REMOVAL AND INSTALLATION

**CAUTION: SRS**

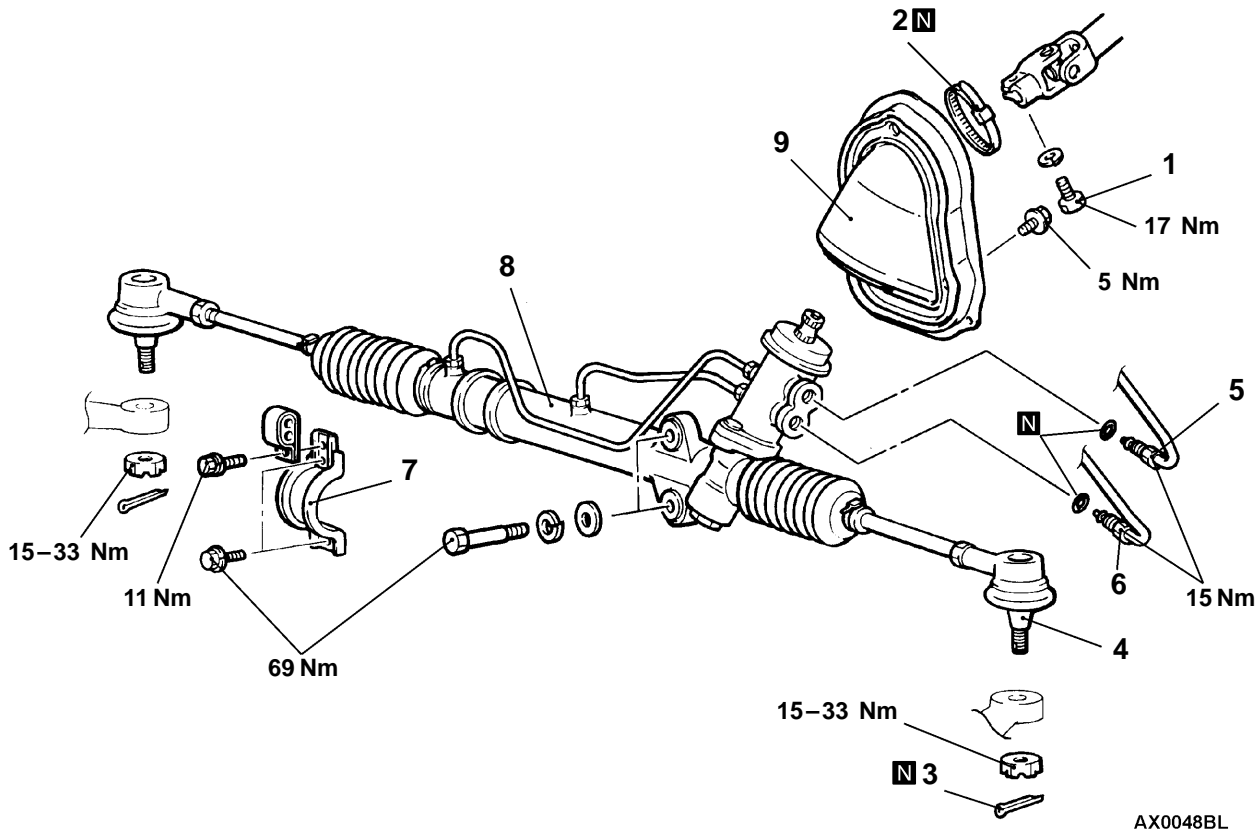
For vehicles with SRS, before removal of steering gear box, refer to GROUP 52B, centre front wheels and remove ignition key. Failure to do so may damage SRS clock spring and render SRS system inoperative, risking serious driver injury.

**Pre-removal Operation**

- Power Steering Fluid Draining
- Center Member Removal
- Front Exhaust Pipe Removal

**Post-installation Operation**

- Front Exhaust Pipe Installation
- Center Member Installation
- Power Steering Fluid Supplying
- Power Steering Fluid Line Bleeding
- Steering Wheel Position Check with Wheels Straight Ahead
- Front Wheel Alignment Adjustment
- Dust Cover Check for Cracks or Damage by Pushing it with Finger.



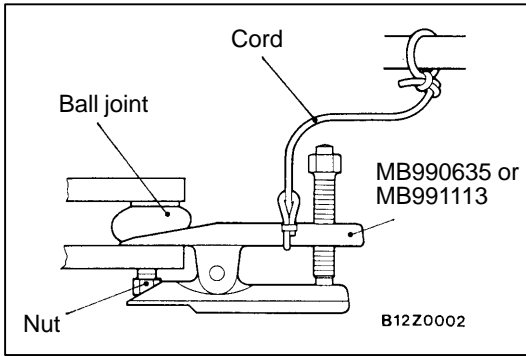
AX0048BL

**Removal steps**

1. Steering shaft assembly and gear box connecting bolt
2. Band
3. Split pin
4. Tie-rod end and knuckle connection



5. Return tube connection
6. Pressure tube connection
7. Cylinder clamp
8. Gear box assembly
9. Steering cover assembly



**REMOVAL SERVICE POINTS**

**◀A▶ TIE-ROD END AND KNUCKLE DISCONNECTION**

**Caution**

1. In order not to damage the ball joint thread, the tie rod end mounting nut must be only loosened but not removed from the ball joint. Be sure to use the special tool.
2. Tie the special tool with a cord so as not to fall off.

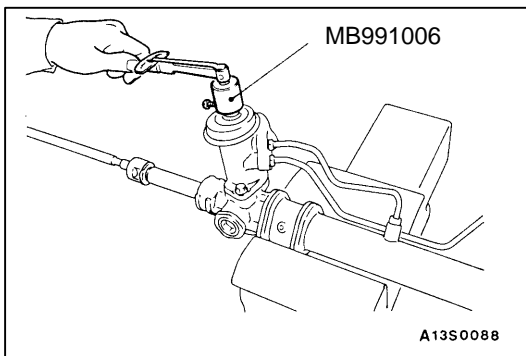
**◀B▶ GEAR BOX ASSEMBLY REMOVAL**

**Caution**

Do not damage the bellows and the tie-rod end dust cover when removing the gear box assembly.

**INSPECTION**

- Check the rubber parts for cracks and breakage.



**GEAR BOX TOTAL PINION TORQUE**

Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

**Standard value: 0.9 – 1.7 Nm**  
**[Change in torque: 0.4 Nm]**

**Caution**

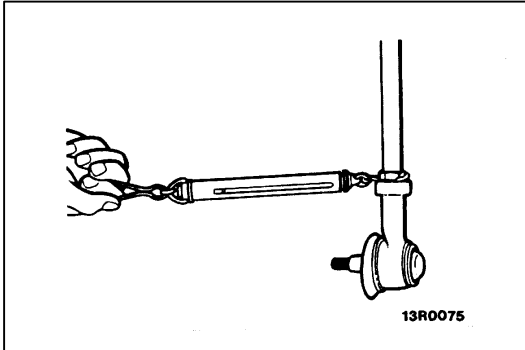
When holding the steering gear box assembly in a vice, secure its mounting positions. If it is secured in any other places, the gear housing may become deformed or damaged.

**NOTE**

When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.

If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion starting torque again.

If the total pinion starting torque cannot be adjusted to within the standard range by adjusting the rack support cover, check the rack support cover, rack support spring, rack support and replace any parts if necessary.



#### CHECK THE TIE ROD FOR SWING RESISTANCE

1. Give 10 hard swings to the tie rod.
2. Measure the tie rod swing resistance with a spring balance.

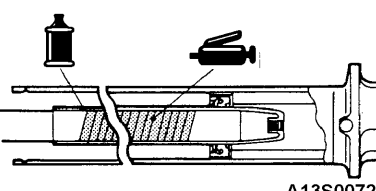
**Standard value: 5–18 N [1.5–4.9 Nm]**

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





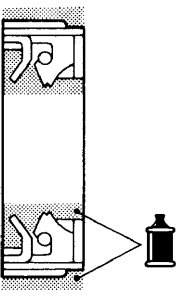
Lubrication and Sealing Points



A13S0072

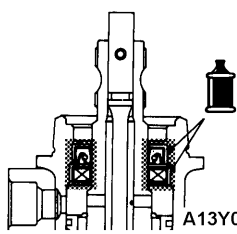
**Grease:** Repair kit grease

**Fluid:**  
Automatic transmission fluid  
DEXRON or DEXRON II



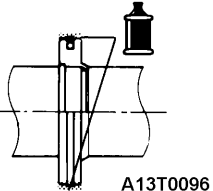
B13S0075

**Fluid:**  
Automatic transmission fluid  
DEXRON or DEXRON II



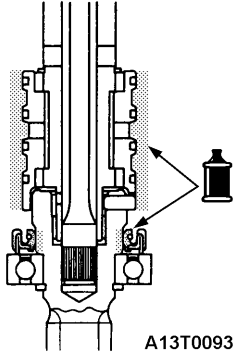
A13Y0047

**Fluid:**  
Automatic transmission fluid  
DEXRON or DEXRON II



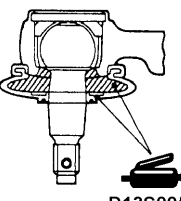
A13T0096

**Fluid:**  
Automatic transmission fluid  
DEXRON or DEXRON II

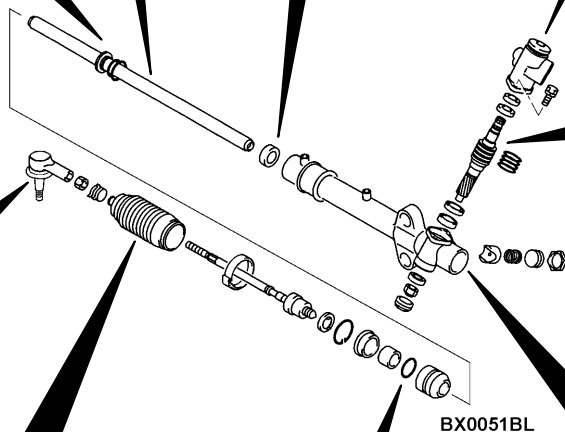
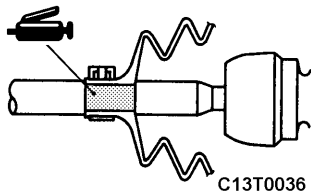


A13T0093

**Fluid:**  
Automatic transmission fluid  
DEXRON or DEXRON II

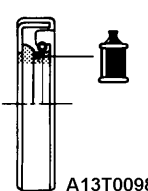


D13S0056

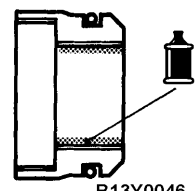



C13T0036

**Grease:** Silicone grease

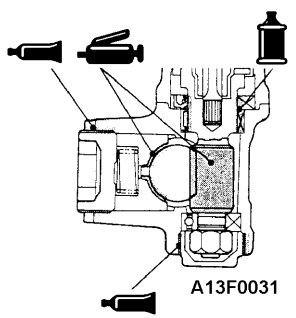


A13T0098



B13Y0046

**Fluid:**  
Automatic transmission fluid  
DEXRON or DEXRON II



A13F0031

**Grease:** Repair kit grease

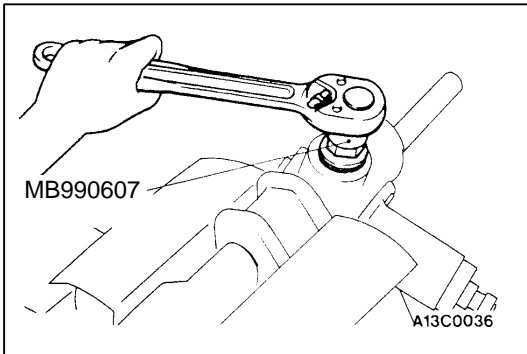
**Sealant:**  
3M ATD Part No. 8661 or equivalent

**Fluid:**  
Automatic transmission fluid  
DEXRON or DEXRON II

**DISASSEMBLY SERVICE POINTS**

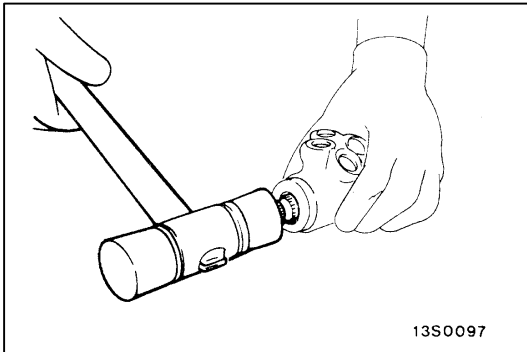
**◀A▶ RACK SUPPORT COVER REMOVAL**

Use the special tool to remove the rack support cover from the gear box.



**◀B▶ OIL SEAL / PINION AND VALVE ASSEMBLY REMOVAL**

Using a plastic hammer, gently tap the pinion to remove it.

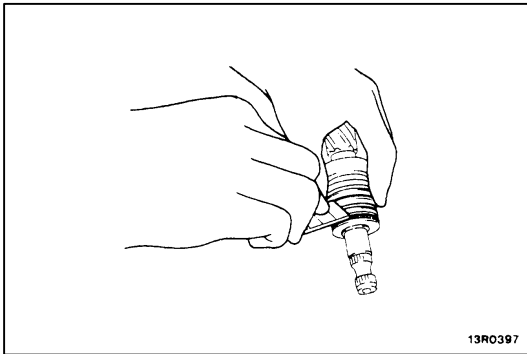


**◀C▶ SEAL RING REMOVAL**

Cut the seal ring and remove it from the pinion and valve assembly and the rack.

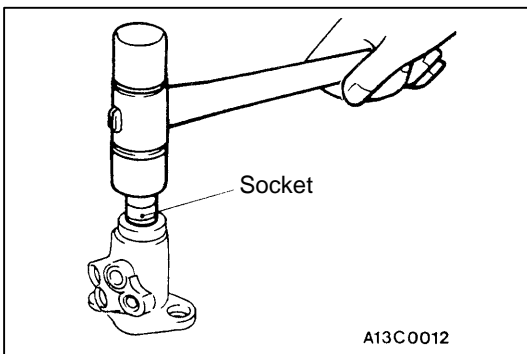
**Caution**

**When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.**



**◀D▶ BALL BEARING / OIL SEAL REMOVAL**

Use a socket, remove the oil seal and the ball bearing from the valve housing assembly simultaneously.

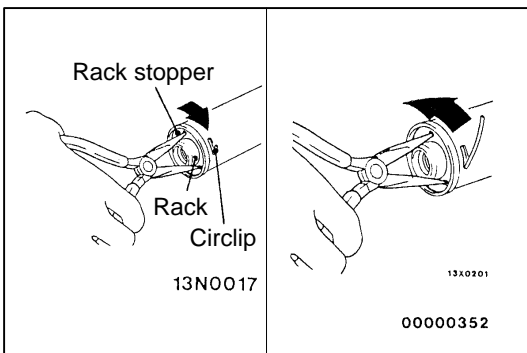


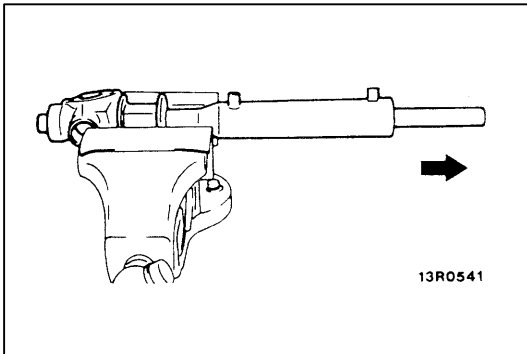
**◀E▶ CIRCLIP REMOVAL**

1. Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the rack housing.
2. Turn the rack stopper anticlockwise to remove the circlip.

**Caution**

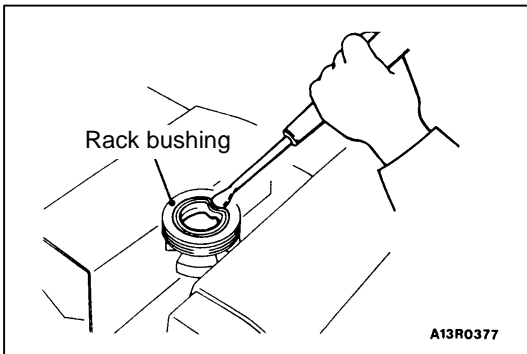
**Note that if the rack stopper is first turned anticlockwise, the circlip will get caught in the slot in the housing and the rack stopper will not turn.**





◀F▶ RACK STOPPER / RACK BUSHING / RACK REMOVAL

Pull out the rack assembly gently, and remove the rack stopper and rack bushing together.

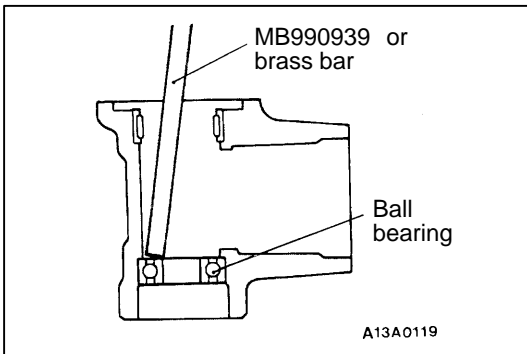


◀G▶ OIL SEAL REMOVAL

Partially bend the oil seal to remove from the rack bushing.

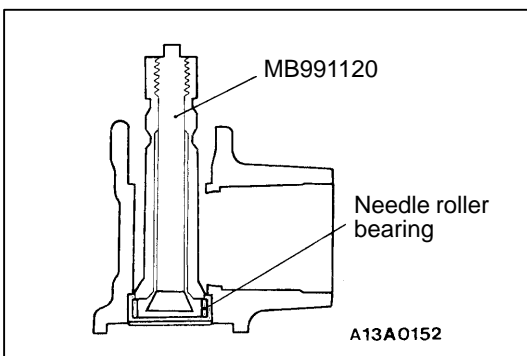
**Caution**

**Do not damage the oil seal press fitting surface of the rack bushing.**



◀H▶ BALL BEARING REMOVAL

Use a brass bar or the special tool to remove the ball bearing from the gear housing.

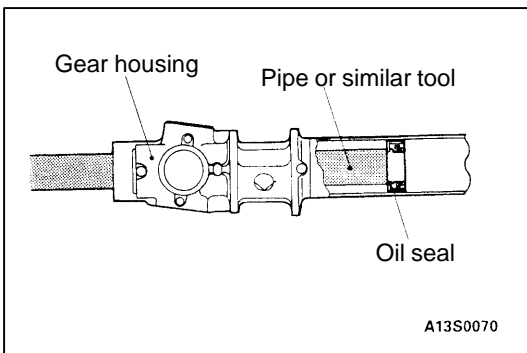


◀I▶ NEEDLE ROLLER BEARING REMOVAL

Use the special tool to remove the needle roller bearing from the rack housing.

**Caution**

**Do not open the special tool excessively to prevent damaging housing interior.**

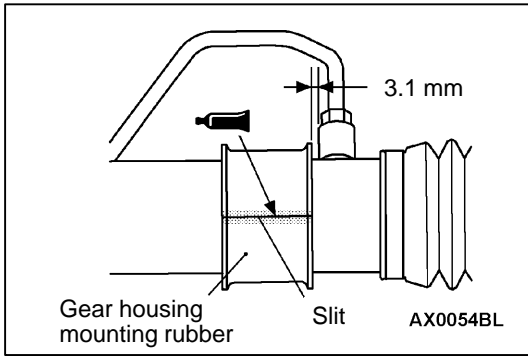


◀J▶ OIL SEAL REMOVAL

Use a piece of pipe or similar tool to remove the oil seal from the gear housing.

**Caution**

**Be careful not to damage the inner surface of the rack cylinder of the gear housing.**



**REASSEMBLY SERVICE POINTS**

**►A◄ GEAR HOUSING MOUNTING RUBBER INSTALLATION**

1. Install the gear housing mounting rubber on the rack housing so that the dimension shown is achieved.

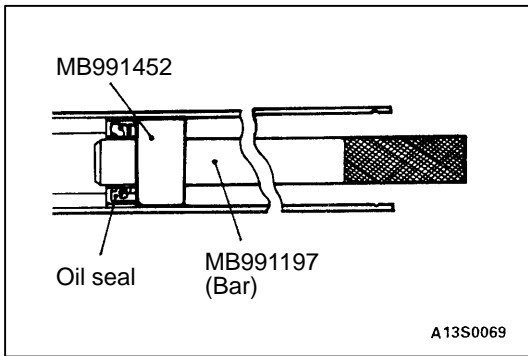
**NOTE**

The gear housing mounting rubber can be installed regardless of the installation direction of the slit.

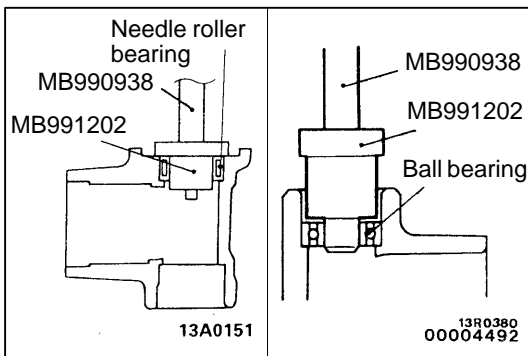
2. Apply specified adhesive to the slit of the gear housing mounting rubber.

**Specified adhesive:**

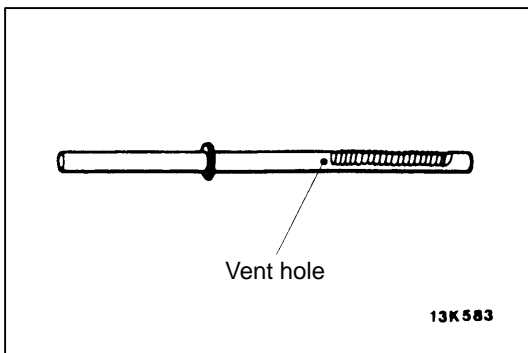
**3M ATD Part No. 8155 or equivalent**



**►B◄ OIL SEAL INSTALLATION**



**►C◄ NEEDLE ROLLER BEARING / BALL BEARING INSTALLATION**

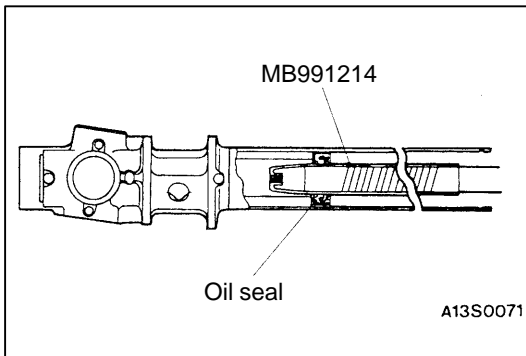


**►D◄ RACK INSTALLATION**

1. Apply a coating of repair kit grease to the rack tooth face.

**Caution**

**Do not close the vent hole in the rack with grease.**

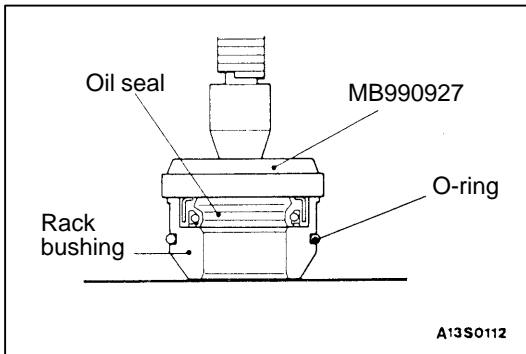


2. Cover rack serrations with special tool.
3. Apply the specified fluid on the special tool.

**Specified fluid:**  
**Automatic transmission fluid**  
**DEXRON or DEXRON II**

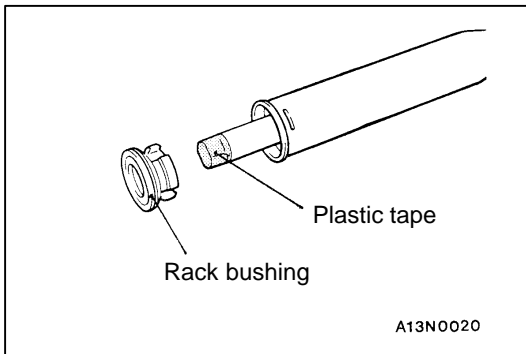
4. Match the oil seal centre with rack to prevent retainer spring from slipping and slowly insert rack from power cylinder side.

**►E◄ OIL SEAL / RACK BUSHING INSTALLATION**



1. Apply the specified fluid to the outer surface of the oil seal. Press-fit the oil seal using the special tool until it is flush with the bushing end face.

**Specified fluid:**  
**Automatic transmission fluid**  
**DEXRON or DEXRON II**

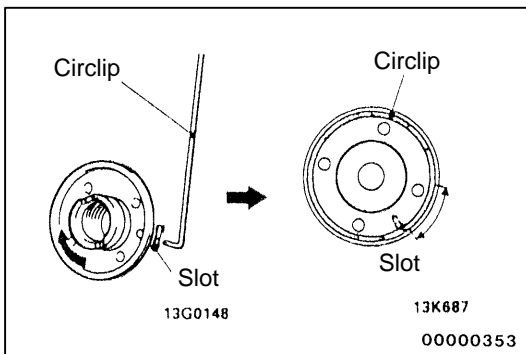


2. Apply the specified fluid to the oil seal inner surface and the O-ring.

**Specified fluid:**  
**Automatic transmission fluid**  
**DEXRON or DEXRON II**

3. Wrap the rack end with plastic tape, and push the rack bushing onto the rack.

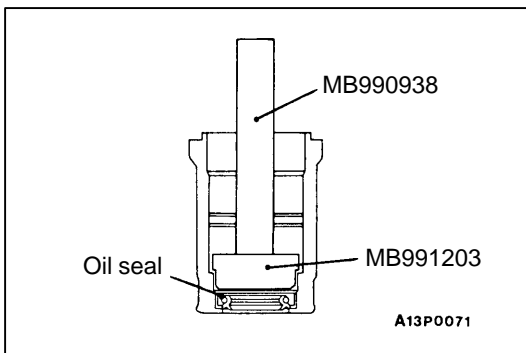
**►F◄ CIRCLIP INSTALLATION**



Insert the circlip to the rack stopper hole through the cylinder hole. Turn the rack stopper clockwise and insert the circlip firmly.

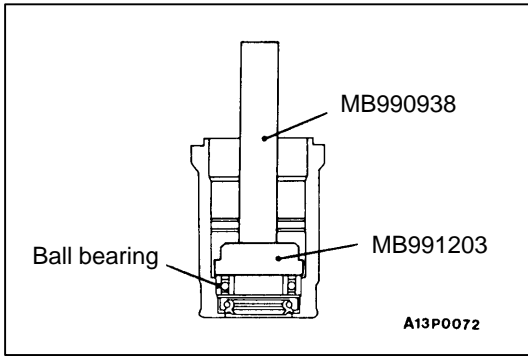
**Caution**  
**Insert the circlip to the rack stopper hole while turning the rack stopper clockwise.**

**►G◄ OIL SEAL / BALL BEARING INSTALLATION**



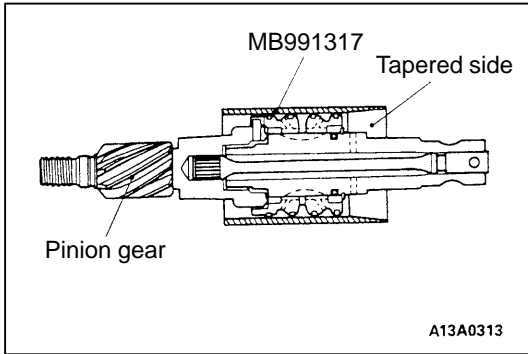
1. Apply a coating of the specified fluid to the outside of the oil seal. Using the special tools, press the oil seal into the valve housing.

**Specified fluid:**  
**Automatic transmission fluid**  
**DEXRON or DEXRON II**



2. Apply a coating of the specified fluid to the outside of the ball bearing. Using the special tools, press the ball bearing into the valve housing.

**Specified fluid:**  
**Automatic transmission fluid**  
**DEXRON or DEXRON II**

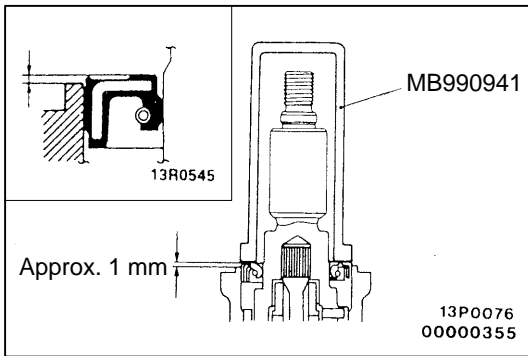


**►H◄ SEAL RING INSTALLATION**

1. Knead the seal ring to soften it.
2. Apply the specified fluid to the seal ring, and install to the rack groove.

**Specified fluid:**  
**Automatic transmission fluid**  
**DEXRON or DEXRON II**

3. Insert the tapered side of the special tool from the pinion gear side, and compress the seal ring.

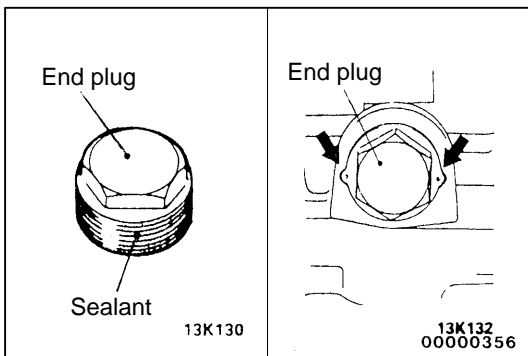


**►I◄ OIL SEAL INSTALLATION**

Use the special tool to press the oil seal into the valve housing. The upper surface of the oil seal should project outwards approx. 1 mm from the housing edge surface.

**Caution**

**If the oil seal is flush with or lower than the housing edge, it will cause oil leaks and require reassembly.**

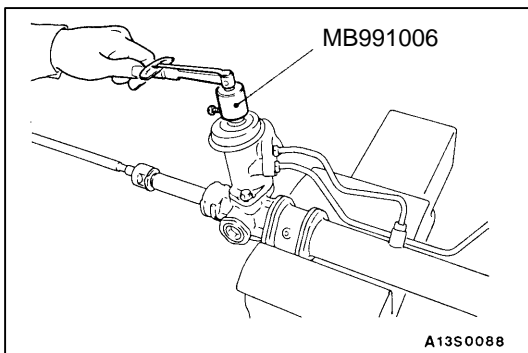


**►J◄ END PLUG INSTALLATION**

1. Apply the specified sealant to the threaded part of the end plug.

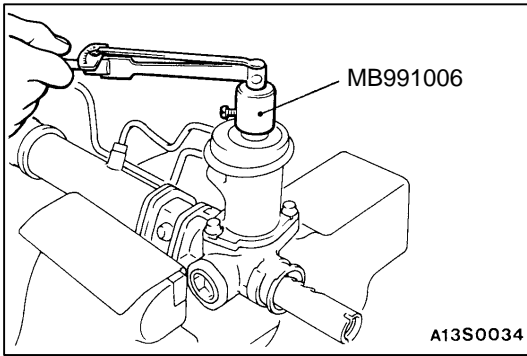
**Specified sealant:**  
**3M ATD Part No.8661 or equivalent**

2. Secure the threaded portion of the end plug at two places by using a punch.



**►K◄ TOTAL PINION TORQUE ADJUSTMENT**

1. Position the rack at its centre. Tighten the rack support cover to 15 Nm.
2. In neutral position, rotate the pinion shaft clockwise one turn/4 – 6 seconds with the special tool. Return the rack support cover 30° – 60° and adjust torque to the standard value.



- Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

**Standard value: 0.9 – 1.7 Nm**  
**[Change in torque: 0.4 Nm]**

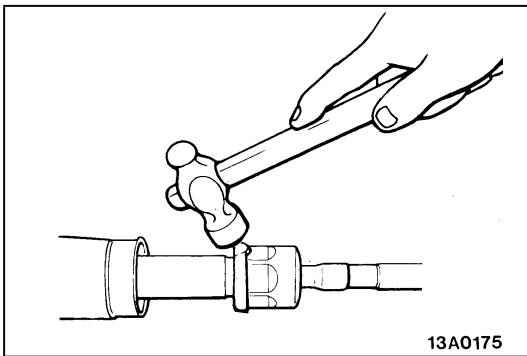
**Caution**

- When adjusting, set the standard value at its highest value.
- Assure no ratcheting or catching when operating the rack towards the shaft direction.

**NOTE**

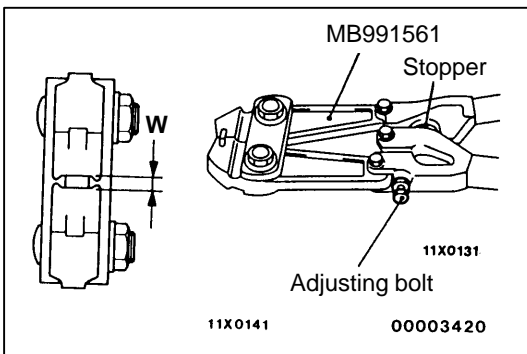
When it cannot be adjusted within the specified return angle, check or replace the rack support cover components.

- After adjusting, lock the rack support cover with lock nut.



**►L◀ TAB WASHER / TIE-ROD INSTALLATION**

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



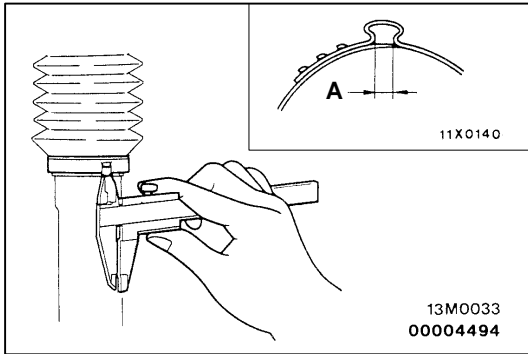
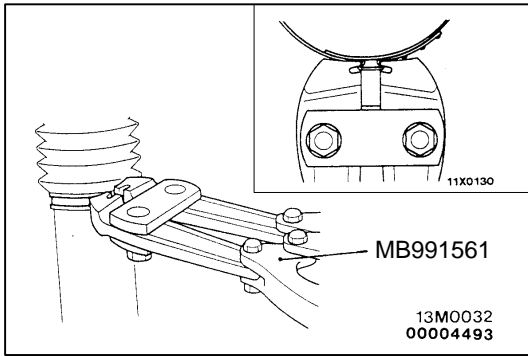
**►M◀ BELLOWS BAND INSTALLATION**

- Turn the adjusting bolt of the special tool to adjust the opening dimension (W) to the standard value.

**Standard value (W): 2.9 mm**  
**<When more than 2.9 mm>**  
**Screw in the adjusting bolt.**  
**<When less than 2.9 mm>**  
**Loosen the adjusting bolt.**

**NOTE**

- The dimension (W) is adjusted by approx. 0.7 mm per one turn.
- Do not turn the adjusting bolt more than one turn.



2. Use the special tool to crimp the bellows band.

**Caution**

- (1) Hold the rack housing, and use the special tool to crimp the bellows band securely.
- (2) Crimp the bellows band until the special tool touches the stopper.

3. Check that the crimped width (A) is within the standard value.

**Standard value (A): 2.4 – 2.8 mm**

**<When more than 2.8 mm>**

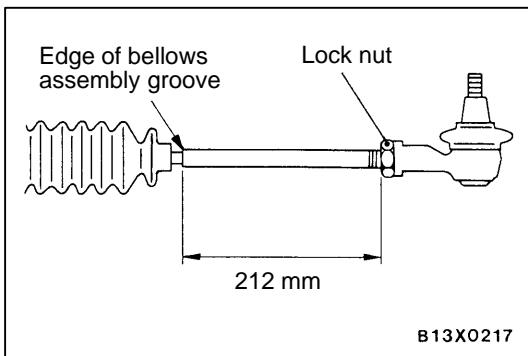
Readjust the dimension (W) of step (1) to the value calculated by the following equation, and repeat step (2).

$W = 5.5 \text{ mm} - A$  [Example: If (A) is 2.9 mm, (W) is 2.6 mm.]

**<When less than 2.4 mm>**

Remove the bellows band, readjust the dimension (W) of step (1) to the value calculated by the following equation, and use a new bellows band to repeat steps (2) to (3).

$W = 5.5 \text{ mm} - A$  [Example: If (A) is 2.3 mm, (W) is 3.2 mm.]

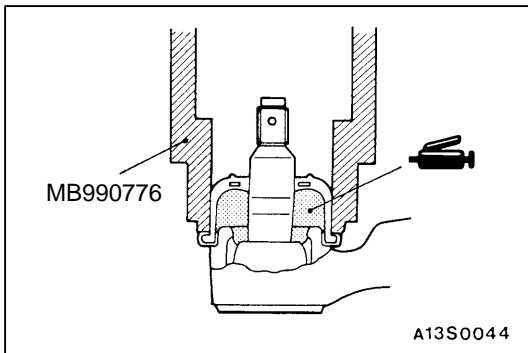


**►◄ TIE-ROD END / TIE-ROD END LOCKING NUT INSTALLATION**

Screw in the tie-rod end until the dimension shown is achieved. Then, temporarily tighten with the locking nut.

**NOTE**

The locking nut must be tightened securely only after the power steering gear box and linkage are installed to the vehicle and toe-in is adjusted.



**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 inside a new dust cover.
- 2. Using the special tool, press in the dust cover to the tie rod end.
- 3. Check the dust cover for cracks or damage by pushing it with finger.



**INSPECTION****RACK CHECK**

- Check the rack tooth surfaces for damage or wear.
- Check the oil seal contact surfaces for uneven wear.
- Check the rack for bends.

**PINION AND VALVE ASSEMBLY CHECK**

- Check the pinion gear tooth surfaces for damage or wear.
- Check for worn or defective seal ring.

**BEARING CHECK**

- Check for roughness or abnormal noise during bearing operation.
- Check the bearing for play.
- Check the needle roller bearing for roller slip-off.

**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.

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
## NOTES

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# BODY

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<b>GENERAL</b> .....	<b>2</b>	<b>SUNROOF</b> .....	<b>9</b>
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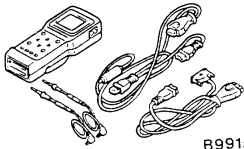


# GENERAL OUTLINE OF CHANGE

- The descriptions of the troubleshooting using on MUT-II tester have been incorporated.

## KEYLESS ENTRY SYSTEM

### SPECIAL TOOL

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	Recording secret codes

### TROUBLESHOOTING

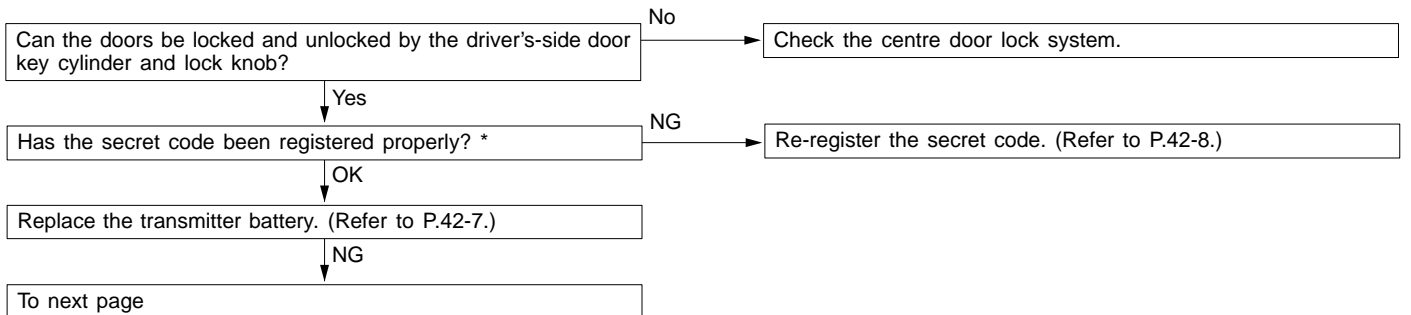
#### INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
None of the doors can be locked or unlocked using the transmitter.	1	42-2
All of the doors can be locked and unlocked using the transmitter, but the room lamp does not flash or illuminate. (However, the room lamp operates normally when the doors are opened and closed.)	2	42-4
Secret codes cannot be registered.	3	42-4

#### INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

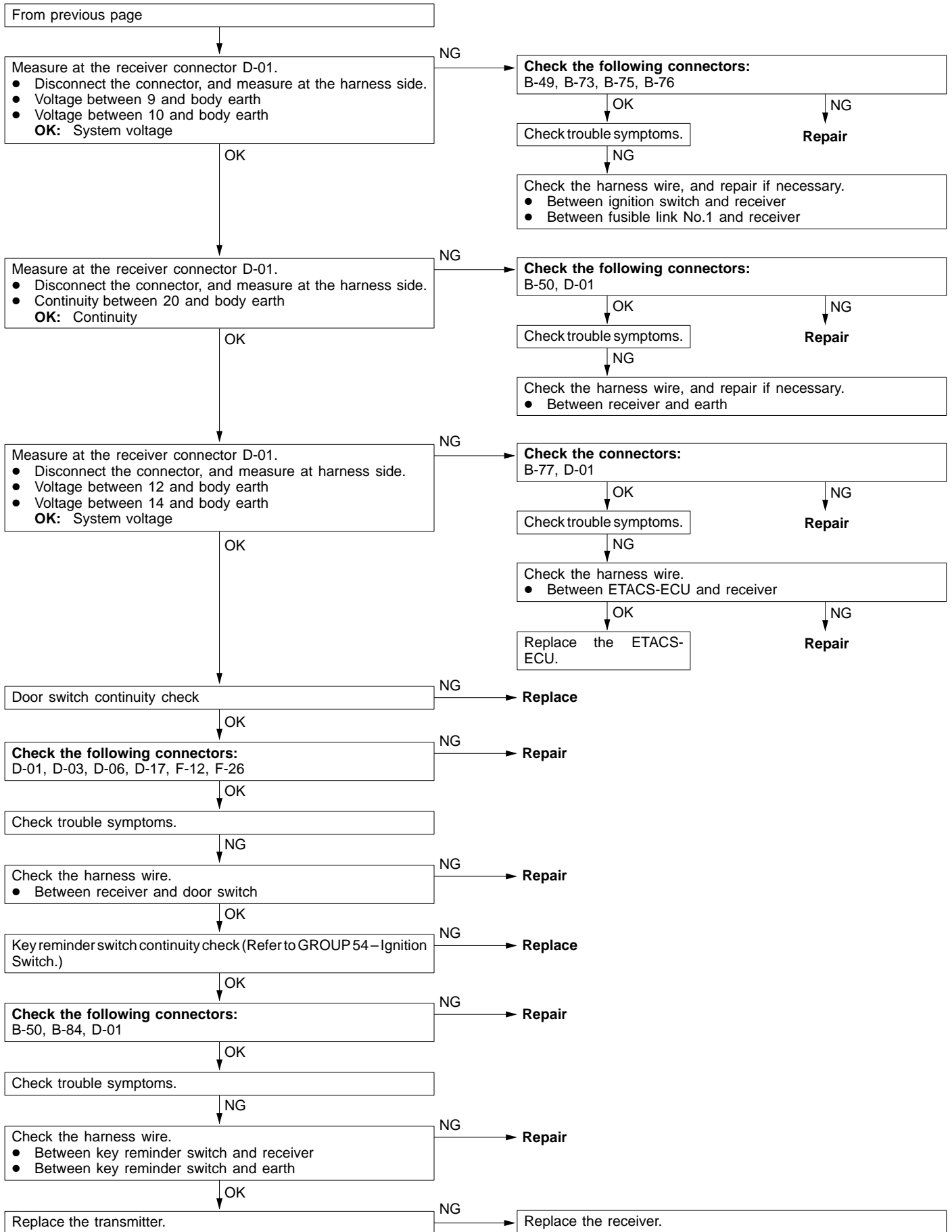
##### INSPECTION PROCEDURE 1

None of the doors can be locked or unlocked using the transmitter.	Probable cause
The cause may be a malfunction of the transmitter, a malfunction of the receiver or the lock and unlock signals are not being input to the ETACS-ECU.	<ul style="list-style-type: none"> <li>Malfunction of transmitter</li> <li>Malfunction of receiver</li> <li>Malfunction of ETACS-ECU</li> <li>Malfunction of wiring harness or connector</li> <li>Malfunction of key reminder switch</li> <li>Malfunction of door switch</li> </ul>



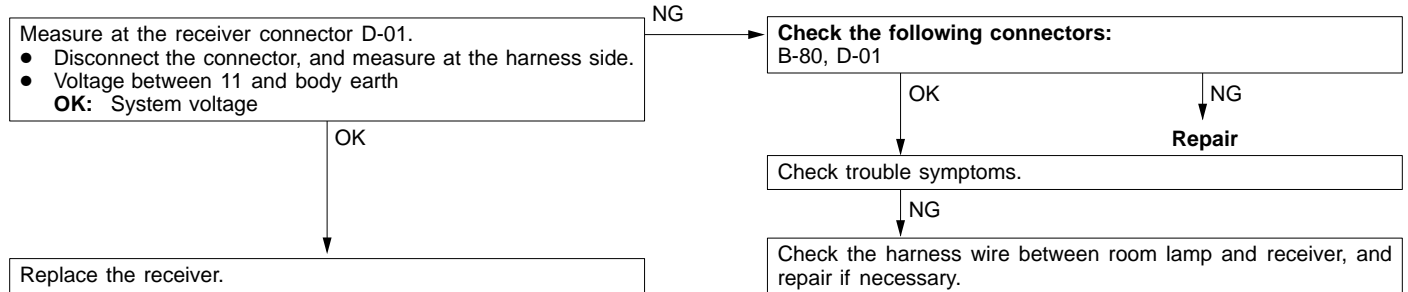
**NOTE**

\*: This should be done if a transmitter or receiver has been replaced, and if a secret code has not been registered properly.



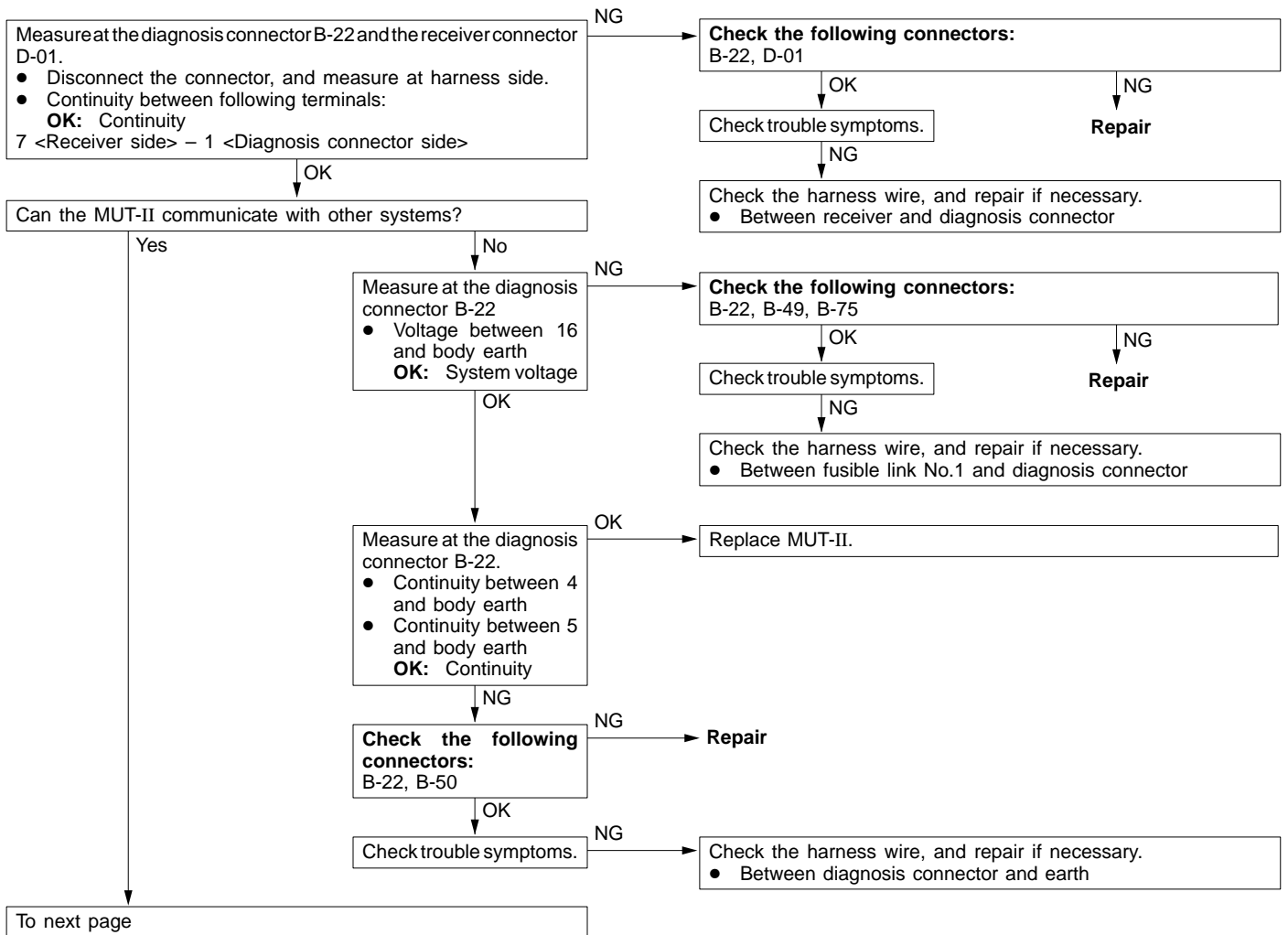
**INSPECTION PROCEDURE 2**

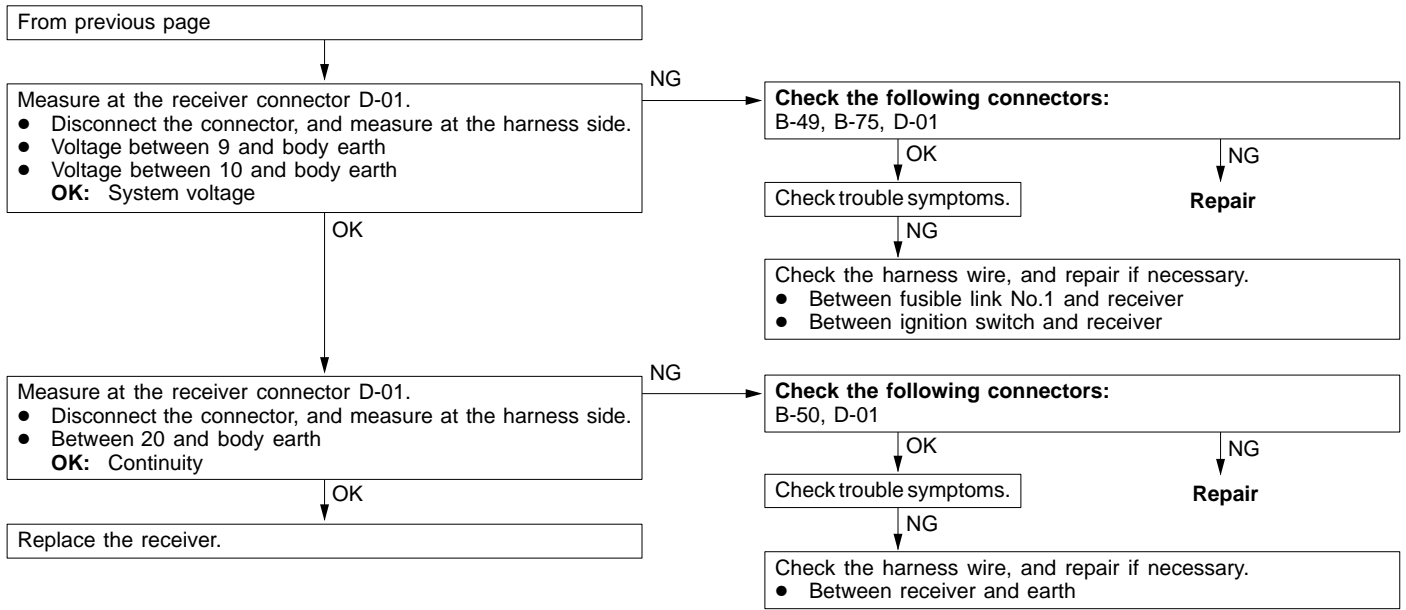
<p><b>All of the doors can be locked and unlocked using the transmitter, but the room lamp does not flash or illuminate. (However, the room lamp operates normally when the doors are opened and closed.)</b></p>	<p><b>Probable cause</b></p>
<p>If the room lamp operates normally when the doors are opened and closed, the cause of the problem may be a malfunction of the receiver or a malfunction of the harness between the room lamp the receiver.</p>	<ul style="list-style-type: none"> <li>• Malfunction of receiver</li> <li>• Malfunction of connector or wiring harness</li> </ul>



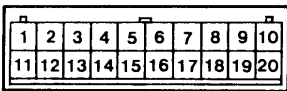
**INSPECTION PROCEDURE 3**

<p><b>Secret codes cannot be registered.</b></p> <p>The cause may be a malfunction of the diagnosis connector, a malfunction of the power supply or earth circuit of the receiver, a malfunction of the earth circuit or a malfunction of the diagnosis output circuit.</p>	<p><b>Probable cause</b></p> <ul style="list-style-type: none"> <li>• Malfunction of receiver</li> <li>• Malfunction of MUT-II</li> <li>• Malfunction of connector or wiring harness</li> </ul>
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**INSPECTION OF RECEIVER TERMINAL VOLTAGE**



18W0311

Terminal	Signal name	Conditions	Terminal voltage
2	Door switch	One or more doors are open (Door switch: ON)	0 V
		All doors are closed (Door switch: OFF)	System voltage
6	Door lock actuator switch (driver's side)	LOCK	5 V and pulse output*
		UNLOCK	0 V
7	Diagnosis changeover input	When MUT-II is connected	0 V
		When MUT-II is disconnected	System voltage
8	Key reminder switch	OFF (When ignition key is inserted)	5 V and pulse output*
		ON (When ignition key is removed)	0 V
9	Ignition switch	Ignition switch: ACC or ON	System voltage
		Ignition switch: OFF	0 V
10	Receiver power supply	At all times	System voltage
11	Room lamp output	One or more door are open (Door switch: ON)	0 V
		All doors are closed (Door switch: OFF)	System voltage

Terminal	Signal name	Conditions	Terminal voltage
12	Door lock output	When activated	0 V
		When not activated	System voltage
14	Door unlock output	When activated	0 V
		When not activated	System voltage
20	Earth	At all times	0 V

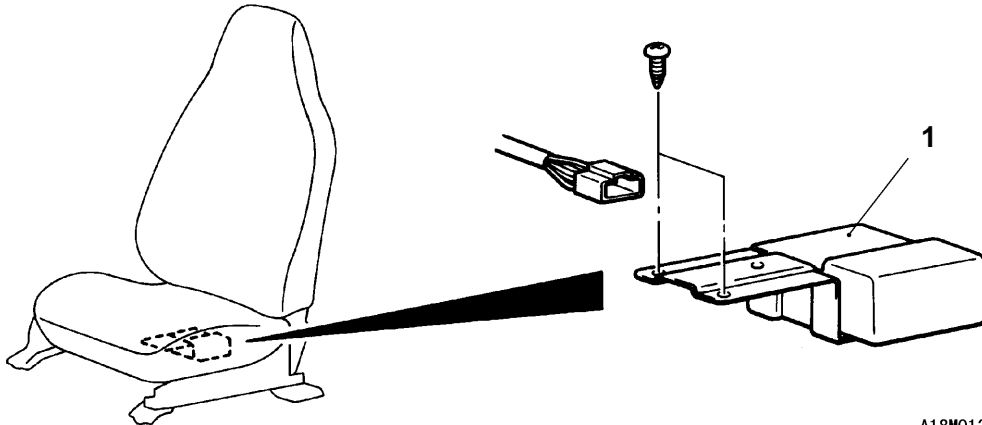
**NOTE**

Values marked with \* should be measured using an oscilloscope. (The value will alternate between 0 V and 0.03 V if a circuit tester is used.)

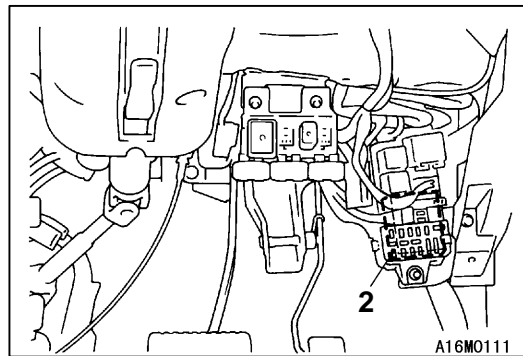


# KEYLESS ENTRY SYSTEM

## REMOVAL AND INSTALLATION



A18M0135



A16M0111

### Keyless entry receiver removal steps

- Front seat assembly (driver's side)
- 1. Keyless entry receiver

### ETACS-ECU removal

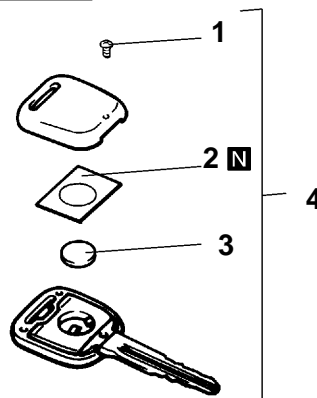
- 2. ETACS-ECU

# TRANSMITTER

## DISASSEMBLY AND REASSEMBLY

### Post-assembly Operation

- Transmitter operation check



A18M0134

### Disassembly steps

- 1. Screw
- 2. Tape



- 3. Battery
- 4. Master key assembly

**ASSEMBLY SERVICE POINTS****▶A◀ BATTERY INSTALLATION**

Install a new battery with (+) side upward.

**Battery required for replacement:  
Lithium battery CR1216**

**SECRET CODE REGISTRATION METHOD**

Each individual secret code is registered inside the transmitter, and so it is necessary to register these codes with the EEPROM inside the receiver in the following cases.

- When either the transmitter or receiver is replaced;
- If it appears that a problem is occurring because of faulty registration of a code.

A maximum of two different codes can be stored in the memory area of the EEPROM (two different transmitters can be used). When the code for the first transmitter is registered, the previously-registered codes for two transmitters are cleared. Therefore, if you are using two transmitters or are adding a second transmitter, the codes for both transmitters must be registered at the same time. Before beginning with the registration, check that the doors lock normally when the key is used.

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

**NOTE**

This will connect terminal (1) of the diagnosis connector to earth, and the system will be in secret code registration standby mode.

**Caution**

**Always turn the ignition switch to OFF before connecting and disconnecting the MUT-II.**

2. Close all the doors.
3. Turn the ignition switch to ACC and then back to OFF.

**NOTE**

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

4. Press the transmitter switch, and then press it two times within 10 seconds of the first press. This will register the code.
5. After registration is completed, the doors will be automatically locked and unlocked once.
6. If you are using two transmitters or have added a second transmitter, the same registration procedure should be carried out for the second transmitter, and it should be carried out within one minute after registration of the code for the first transmitter has been completed. After the second registration is completed, the doors will be automatically locked and unlocked once.
7. Registration mode will be cancelled if one of the following conditions is met.
  - When the secret codes for two transmitters have been registered;
  - When 1 minute has passed after registration mode started;
  - If the MUT-II is disconnected (the earth connection is broken);
  - If the ignition switch is turned to ON;
  - If any of the doors are opened;
8. After registration is completed, carry out the following to check if the keyless entry system is operable properly.
  - Remove the ignition key.
  - Close all the doors.

# SUNROOF

## SERVICE SPECIFICATIONS

Items	Standard value
Roof lid glass operating current A (at 20°C)	7 or less
Sunroof motor clutch slippage torque Nm	4.7 – 6.2

## SEALANT

Item	Specified sealant
Rail cover assembly	3M ATD Part No.8531 or 3M Part No.8646 or equivalent

## TROUBLESHOOTING

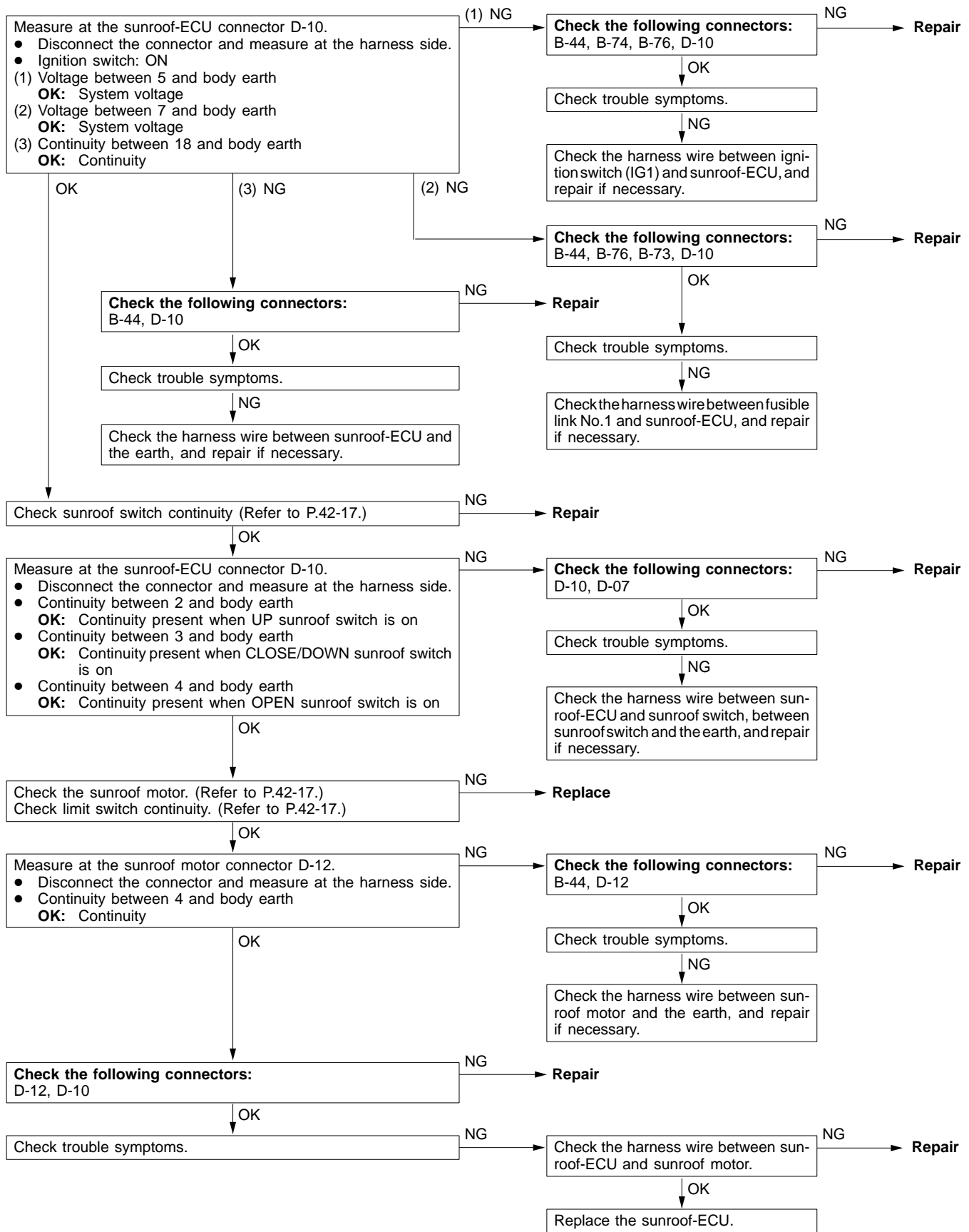
### INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
The sunroof can not be operated when the ignition switch is in ON position.	1	42-9
The motor does not reverse its direction when a load of 140 N or more is applied while the sunroof is closing.	2	42-11
The timer does not operate for 30 seconds after the ignition switch is turned to OFF.	3	42-11
Opening or closing of the sunroof is possible for 30 seconds after turning the ignition switch to OFF, but the timer function is not extended when the driver's side door is opened within this period.	4	42-11

### INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

#### Inspection Procedure 1

The sunroof can not be operated when the ignition switch is in ON position.	Probable cause
One of the following items may be defective. <ul style="list-style-type: none"> <li>● Sunroof switch</li> <li>● Sunroof motor</li> <li>● Sunroof-ECU power supply circuit</li> <li>● Earth circuit</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of sunroof switch</li> <li>● Malfunction of sunroof motor</li> <li>● Malfunction of sunroof-ECU</li> <li>● Malfunction of wiring harness or connector</li> </ul>



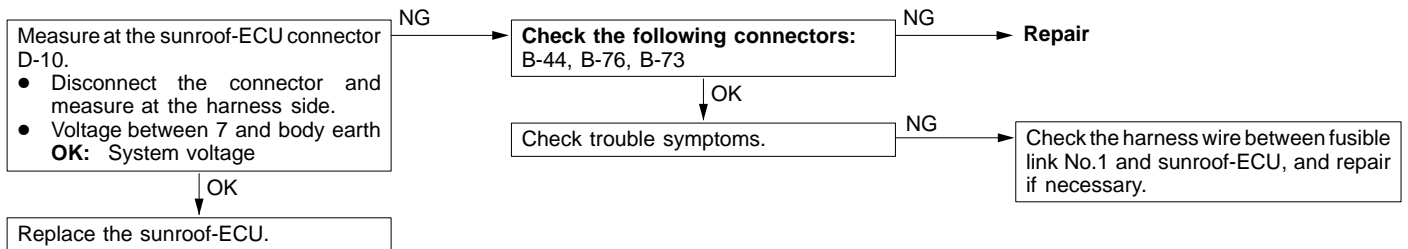
**Inspection Procedure 2**

<p><b>The motor does not reverse its direction when a load of 140 N or more is applied while the sunroof is closing.</b></p>	<p><b>Probable cause</b></p>
<p>The sunroof-ECU monitors the load conditions from the amount of current flowing to the motor. If more than the constant amount of current is flowing, the direction of motor operation is reversed to prevent jamming. If the motor does not reverse direction even when an excessive load is being applied, the cause may be a malfunction of the sunroof-ECU.</p>	<ul style="list-style-type: none"> <li>• Malfunction of sunroof-ECU</li> </ul>

Replace the sunroof-ECU.

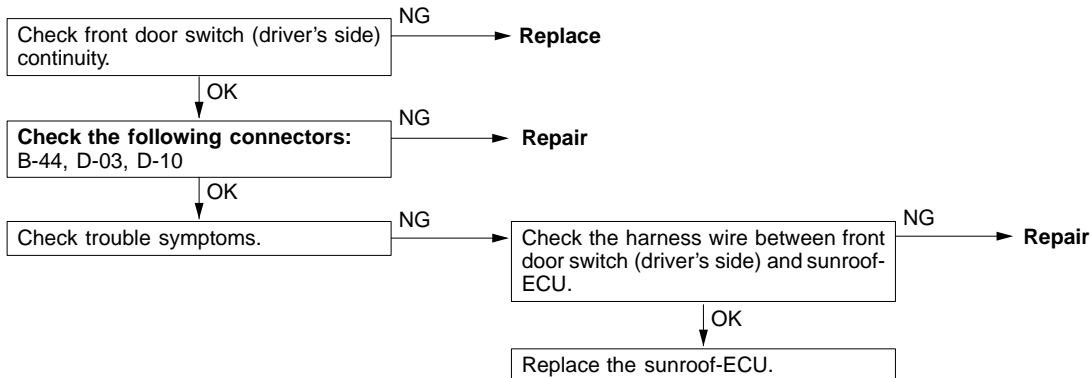
**Inspection Procedure 3**

<p><b>The timer does not operate for 30 seconds after the ignition switch is turned to OFF.</b></p>	<p><b>Probable cause</b></p>
<p>The sunroof-ECU has a timer function which operates for 30 seconds after the ignition switch is turned to OFF. If the timer does not operate, the cause may be a malfunction of the sunroof-ECU or of the wiring harness or connector.</p>	<ul style="list-style-type: none"> <li>• Malfunction of sunroof-ECU</li> <li>• Malfunction of wiring harness or connector</li> </ul>



**Inspection Procedure 4**

<p><b>Opening or closing of the sunroof is possible for 30 seconds after turning the ignition switch to OFF, but the timer function is not extended when the driver's side door is opened within this period.</b></p>	<p><b>Probable cause</b></p>
<p>The sunroof timer operation period is extended when an on signal is output from the driver's-side door switch. Because of this, if the timer operation period is not extended, the cause may be a malfunction of the door switch input circuit.</p>	<ul style="list-style-type: none"> <li>• Malfunction of the front door switch (driver's side)</li> <li>• Malfunction of sunroof-ECU</li> <li>• Malfunction of wiring harness or connector</li> </ul>



## TERMINAL VOLTAGE CHART

1	2	3	4	A	5	6	7	8	
9	10	11	12	13	14	15	16	17	18

18P0142

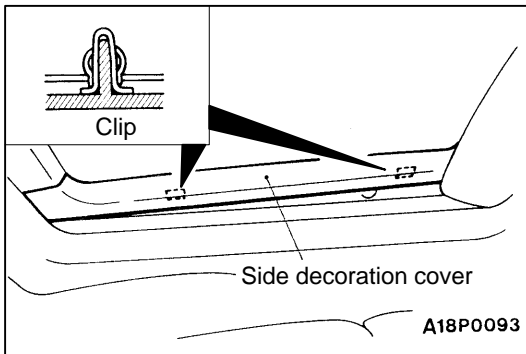
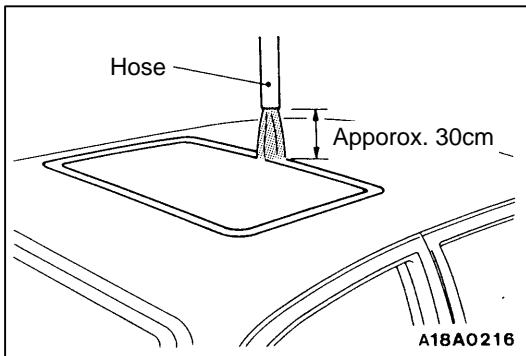
Terminal No.	Check Item	Check Condition	Normal Condition	
1	Door switch input	Driver's door switch	ON	0 V
			OFF	System voltage
2	Sunroof switch (up) input	Sunroof switch (up position)	ON	0 V
			OFF	System voltage
3	Sunroof switch (close or down) input	Sunroof switch (close position or down position)	ON	0 V
			OFF	System voltage
4	Sunroof switch (open input)	Sunroof switch (open position)	ON	0 V
			OFF	System voltage
5	ECU power supply	Ignition switch: ON	System voltage	
6	Motor output (When sunroof is opening)	While sunroof is opening or moving down	System voltage	
		Other than the above	0 V	
7	Timer operation power supply	Always	System voltage	
8	Motor output (When sunroof is closing)	While sunroof is closing or moving up	System voltage	
		Other than the above	0 V	
9	Limit switch 3 input	In tilt up condition and fully-open condition	0 V	
		Other than the above	System voltage	
10	Limit switch 1 input	In tilt up condition	System voltage	
		In fully-closed and fully-open conditions	0 V	
		In slide-closing condition	0 V → System voltage → 0V.	
12	Limit switch 2 input	In tilt up condition and fully-closed condition	System voltage	
		Other than the above	0 V	
18	Earth	Always	0 V	

## ON-VEHICLE SERVICE

### WATER TEST

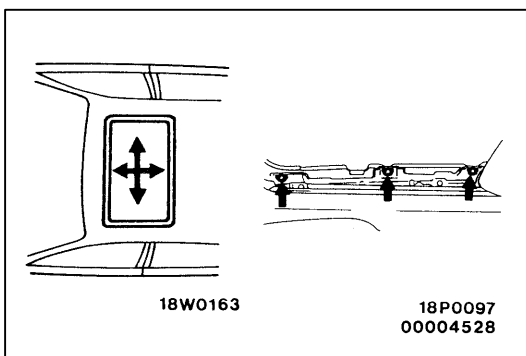
Check if there are any leaks in the sunroof by the following procedure.

1. Fully close the roof lid glass.
2. Adjust the water pressure so that water comes out of the hose to a height of approximately 50 cm when the hose is held vertically facing upwards.
3. Hold the end of the hose approximately 30 cm above the roof and let the water run onto the weatherstrip for 5 minutes or more.
4. While doing this, check if any water leaks through into the passenger compartment from around the roof lid glass.



### SUNROOF FIT ADJUSTMENT

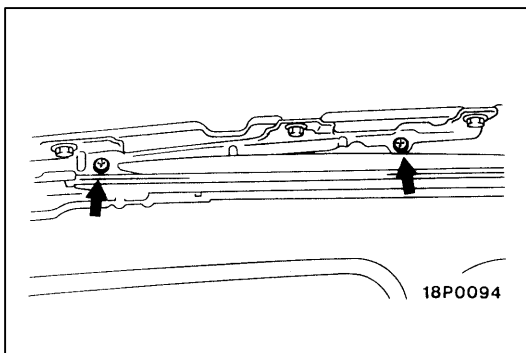
1. Fully close the roof lid glass.
2. Fully open the sunshade.
3. Remove the side decoration cover.



4. To adjust the forward, backward and sideways position of the roof lid glass, loosen the six roof lid glass assembly mounting nuts and then adjust the glass forward, backward or sideways.

#### NOTE

If the adjustment cannot be made by loosening the adjustment nuts, the fully closed position of the roof lid glass may not match that of the motor. If so, adjust them to match their fully closed positions.



5. To adjust the height of the roof lid glass, loosen the four guide (A) assembly mounting screws and then move the roof lid glass assembly along the slot in the guide (A) assembly.
6. After adjustment, check to be sure that the sunroof operates smoothly.

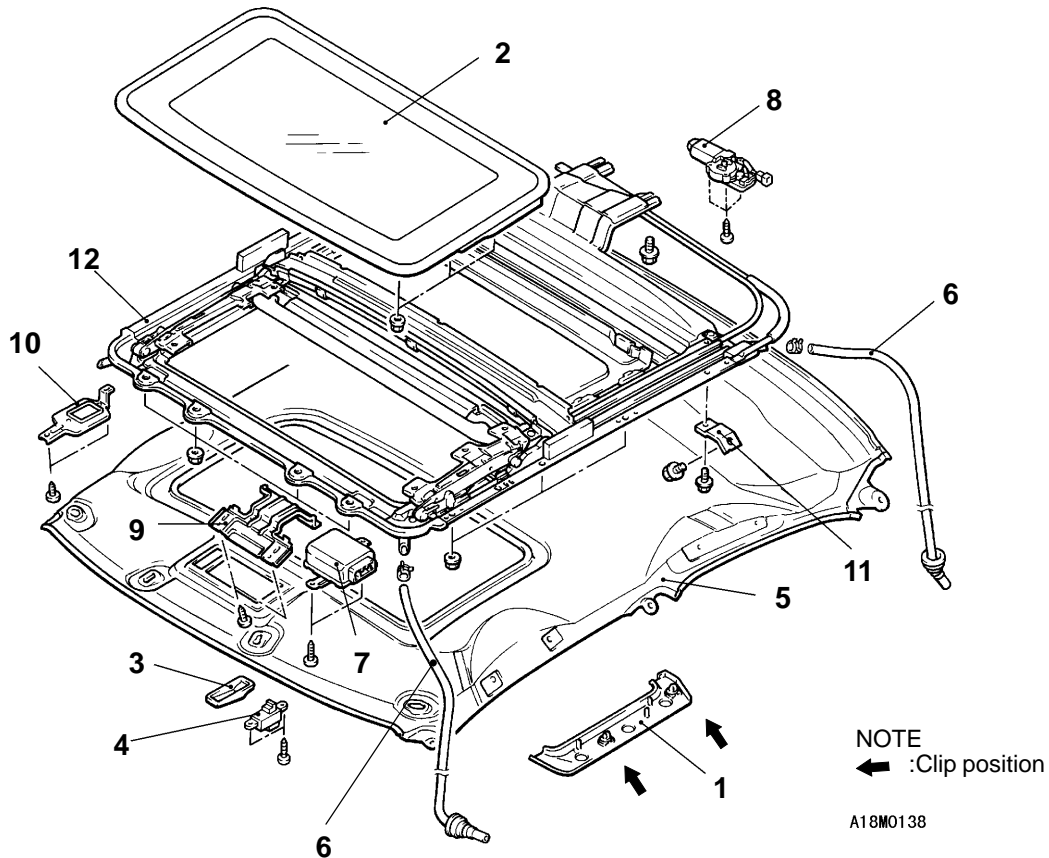
# SUNROOF

## REMOVAL AND INSTALLATION

### Post-installation Operation

#### <Roof lid glass assembly, Sunroof assembly>

- Sunroof Water Test (Refer to P.42-13.)
- Sunroof Fit Adjustment (Refer to P.42-13.)



### NOTE

← :Clip position

A18M0138

### Roof lid glass assembly removal steps



1. Side decoration cover
2. Roof lid glass assembly

### Sunroof switch removal steps

3. Sunroof switch cover
4. Sunroof switch

### Drain hose removal steps



- Splash shield (Front drain hose)
5. Headlining
  6. Drain hose

### Sunroof-ECU removal steps

5. Headlining
7. Sunroof-ECU

### Sunroof motor removal steps

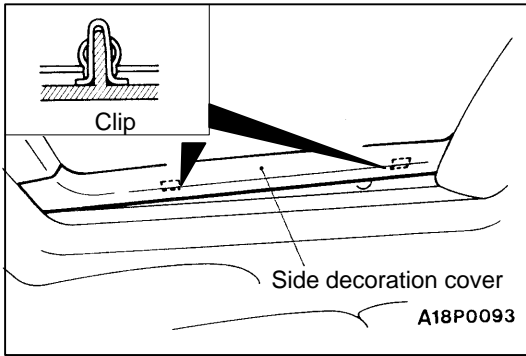


5. Headlining
8. Sunroof motor

### Sunroof assembly removal steps

5. Headlining
6. Drain hose connection
9. Room lamp bracket
10. Sunroof switch bracket
11. Set bracket
12. Sunroof assembly

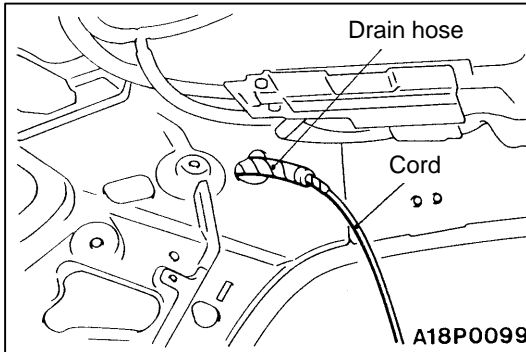




**REMOVAL SERVICE POINTS**

**◀A▶ SIDE DECORATION COVER REMOVAL**

Remove the clips, and then remove the side decoration cover.



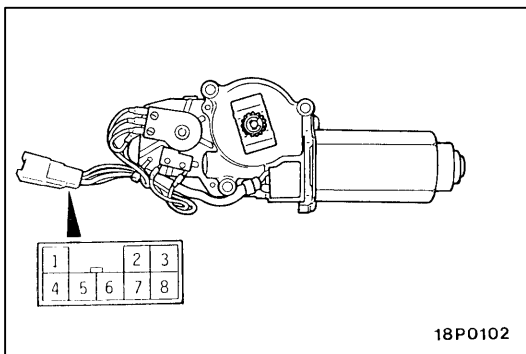
**◀B▶ DRAIN HOSE REMOVAL**

Tie a cord to the end of the drain hose, and wind tape around the tie until it is smooth. Then pull the drain hose out from the passenger compartment.

**◀C▶ SUNROOF MOTOR REMOVAL**

**Caution**

Always close the roof lid glass fully before removing the sunroof motor. If the fully-closed positions of the roof lid glass and the sunroof motor are not the same, the sunroof will not operate properly.

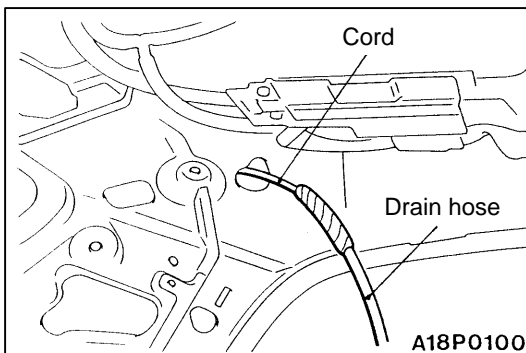


**INSTALLATION SERVICE POINTS**

**▶A◀ SUNROOF MOTOR INSTALLATION**

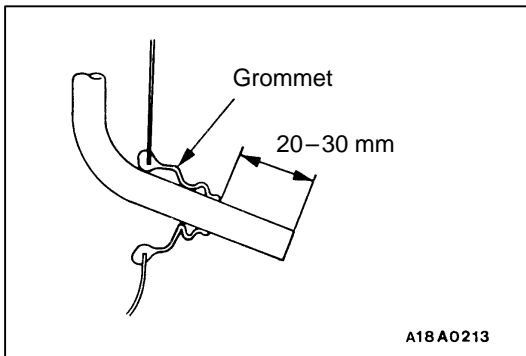
If the fully-closed position of the sunroof motor is incorrect, set the motor to the fully-closed position by the procedure given below before installing the motor.

1. Connect a circuit analyser between terminals (4) and (6) of the motor connector.
2. Operate the motor until the position is reached at which continuity switches from on to off or from off to on, and then install the motor.

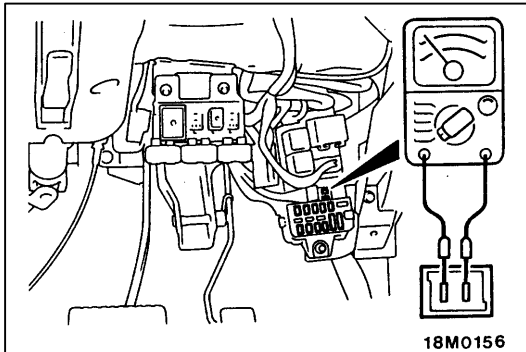


**▶B◀ DRAIN HOSE INSTALLATION**

1. Tie the cord that was used during removal to the end of the drain hose, and wind tape around it so that there is no unevenness.
2. Pull the cord to pass through the drain hose



3. Make the drain hose protrusion from the grommet as shown in the illustration.



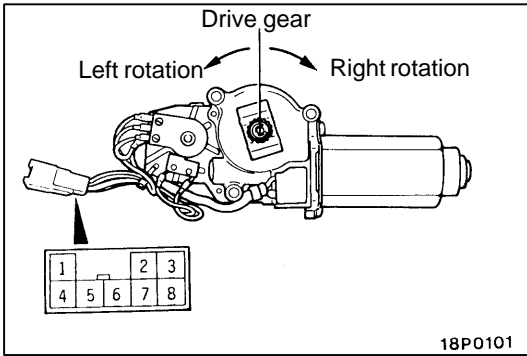
## INSPECTION

### ROOF LID GLASS OPERATION CURRENT CHECK

1. Remove the sunroof fuse and connect a circuit analyser as shown in the illustration.
2. Press the sunroof switch to the ON position, and then measure the operation current in the intervals between the points when the sunroof starts to operate, when it is fully open, when it is fully closed and when it is fully tilted up.

**Standard value: 7 A or less (at 20°C)**

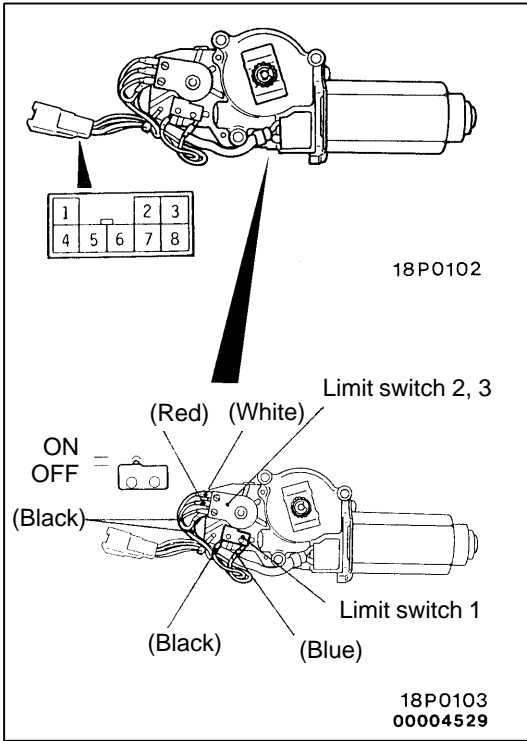
3. If the operation current is outside the standard value, check the following points.
  - Installation condition, warping or jamming of sunroof assembly
  - Sticking of drive cable
  - Tilt of roof lid glass



**SUNROOF MOTOR CHECK**

Check the direction of rotation of the drive gear when the battery is connected to the connector.

Battery connection terminal		Drive gear rotation direction
1	2	
⊕	⊖	Left
⊖	⊕	Right

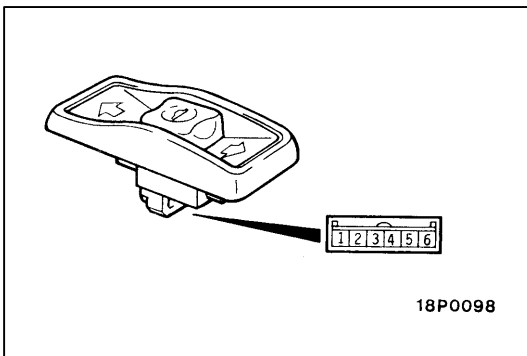


**LIMIT SWITCH CONTINUITY CHECK**

1. Remove the limit switches from the sunroof motor, and then check the operation of the limit switches.

Switch position		Terminal No.			
		4	5	6	7
Limit switch 1	ON	○	○		
	OFF				
Limit switch 2	ON	○		○	
	OFF				
Limit switch 3	ON	○			○
	OFF				

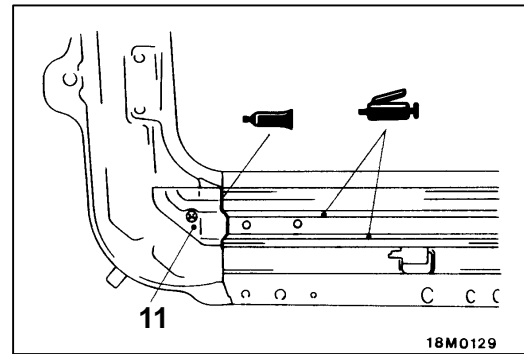
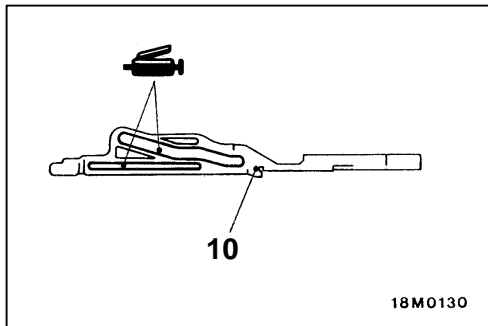
2. Check the identification colours. Then install the limit switches as shown in the illustration.



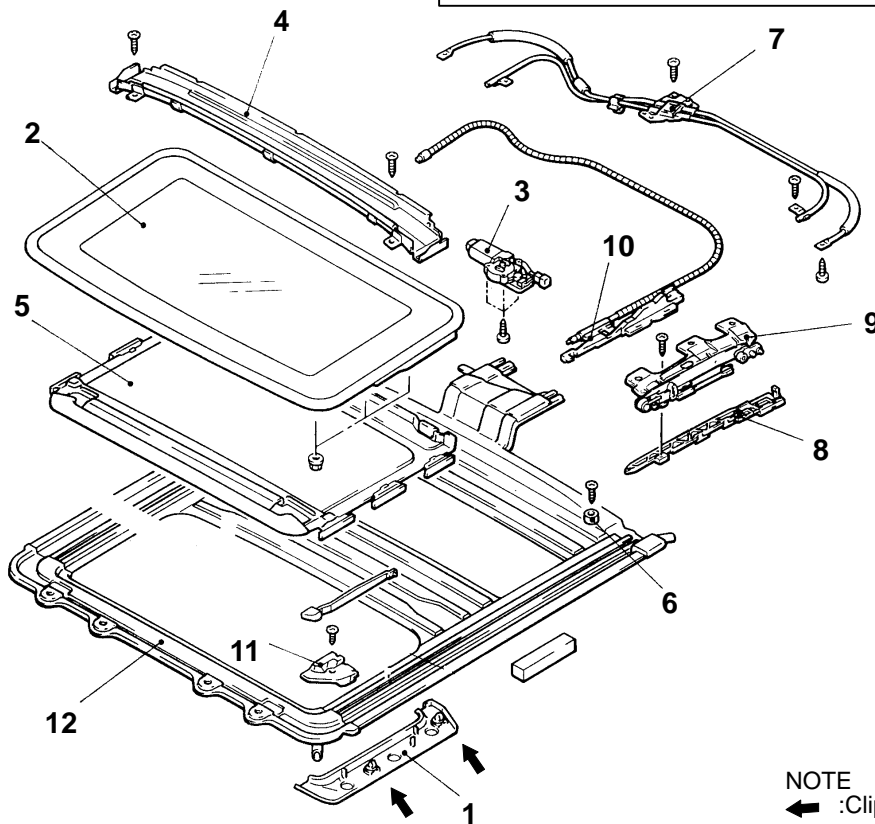
**SUNROOF SWITCH CONTINUITY CHECK**

Switch position	Terminal No.			
	3	4	5	6
Slide open		○	○	
Off				
Tilt up	○	○		
Slide close, Tilt down		○		○

DISASSEMBLY AND REASSEMBLY



Sealant:  
3M ATD Part No.8531 or 3M Part  
No.8646, or equivalent



NOTE  
← :Clip position

18M0139  
00004534

**Disassembly steps**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Side decoration cover<br/>(Refer to P.42-15.)</li> <li>2. Roof lid glass assembly</li> <li>3. Sunroof motor</li> <li>4. Drip rail assembly</li> <li>5. Sunshade assembly</li> <li>6. Cushion (B) assembly</li> </ol> | <ol style="list-style-type: none"> <li>7. Drive unit assembly</li> <li>8. Decoration link</li> <li>9. Guide (A) assembly</li> <li>10. Slider assembly</li> <li>11. Rail cover assembly</li> <li>12. Frame sub assembly</li> </ol> |
|--|---|

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# EXTERIOR

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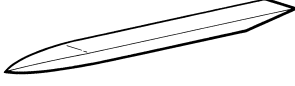
## GENERAL

### OUTLINE OF CHANGE

As the following changes had been made, the service procedures for the relating components have been newly established.

- Front bumper and aero parts changed
- Front and rear window washer tank relocated to the luggage compartment
- Intercooler & radiator water spray system changed
- Marks changed

### SPECIAL TOOL

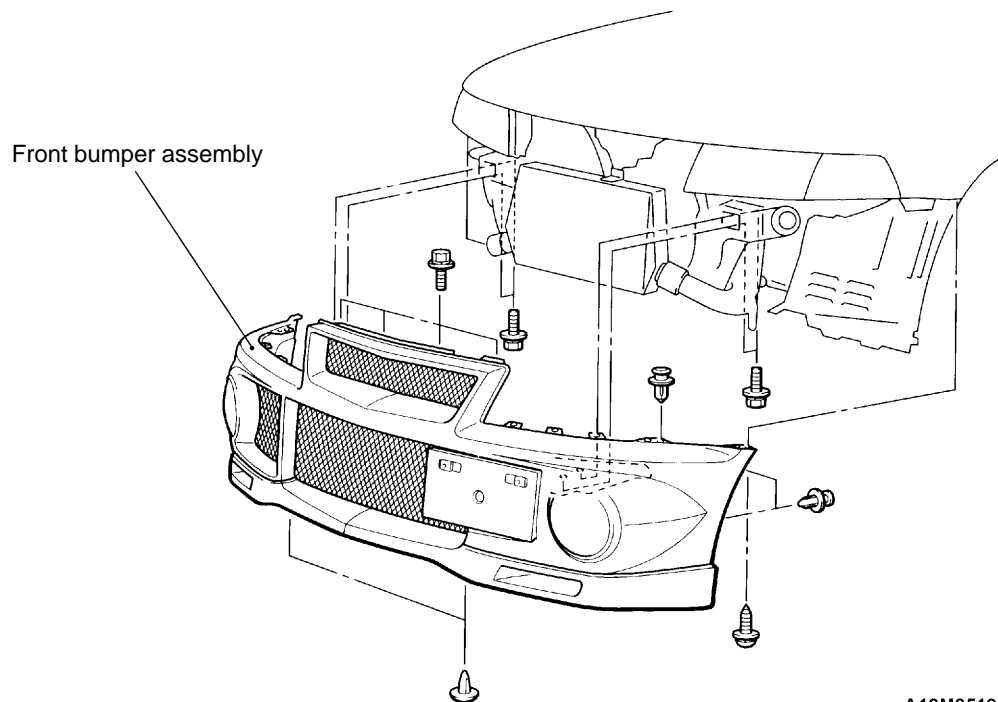
Tool	Number	Name	Use
 B990784	MB990784	Ornament remover	Removal of front bumper

## FRONT BUMPER

### REMOVAL AND INSTALLATION

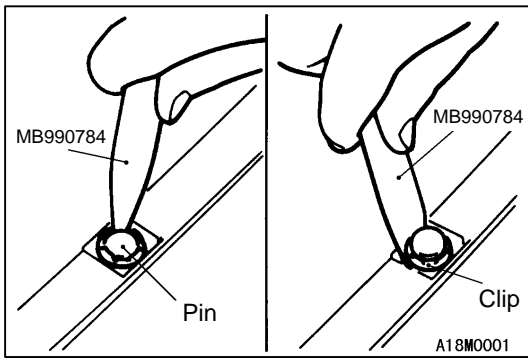
#### Pre-removal and Post-installation Operations

- Front Turn Signal Lamp Removal and Installation



A18M0519





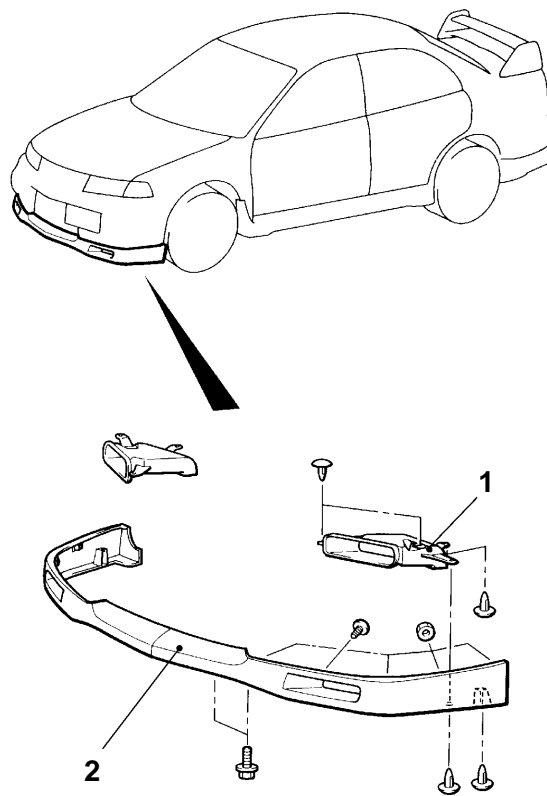
**DISASSEMBLY SERVICE POINT**

**◀A▶ CLIP REMOVAL**

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

**AERO PARTS**

**REMOVAL AND INSTALLATION**



A18M0522

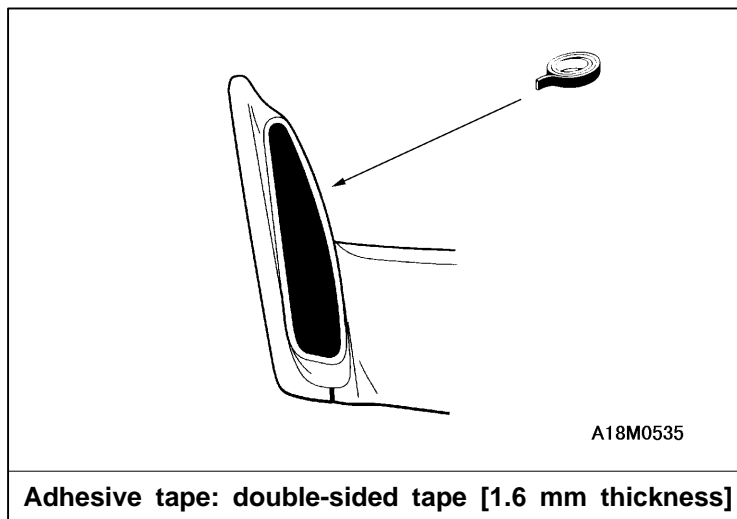
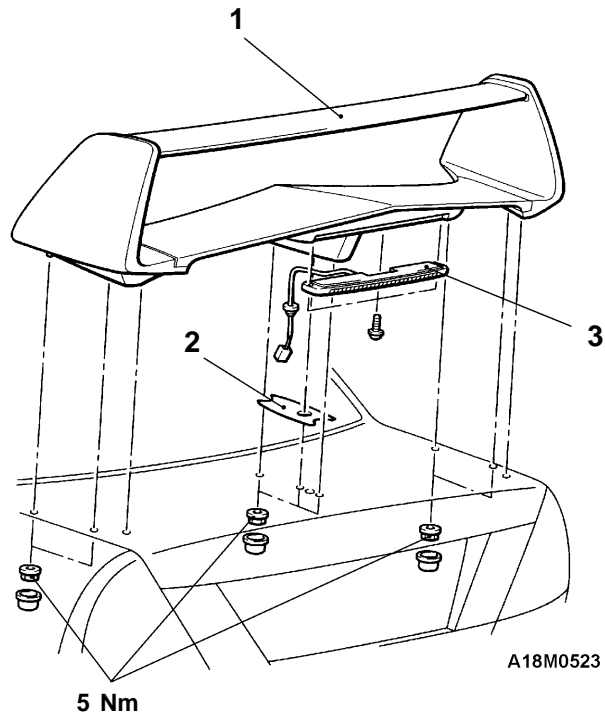
**Front airdam removal steps**

- ◀A▶ ▶A▶
1. Air blow duct
  2. Front airdam

**NOTE**

The removal and installation service points for the new model are the same as those for the preceding models.





**Rear spoiler removal steps**

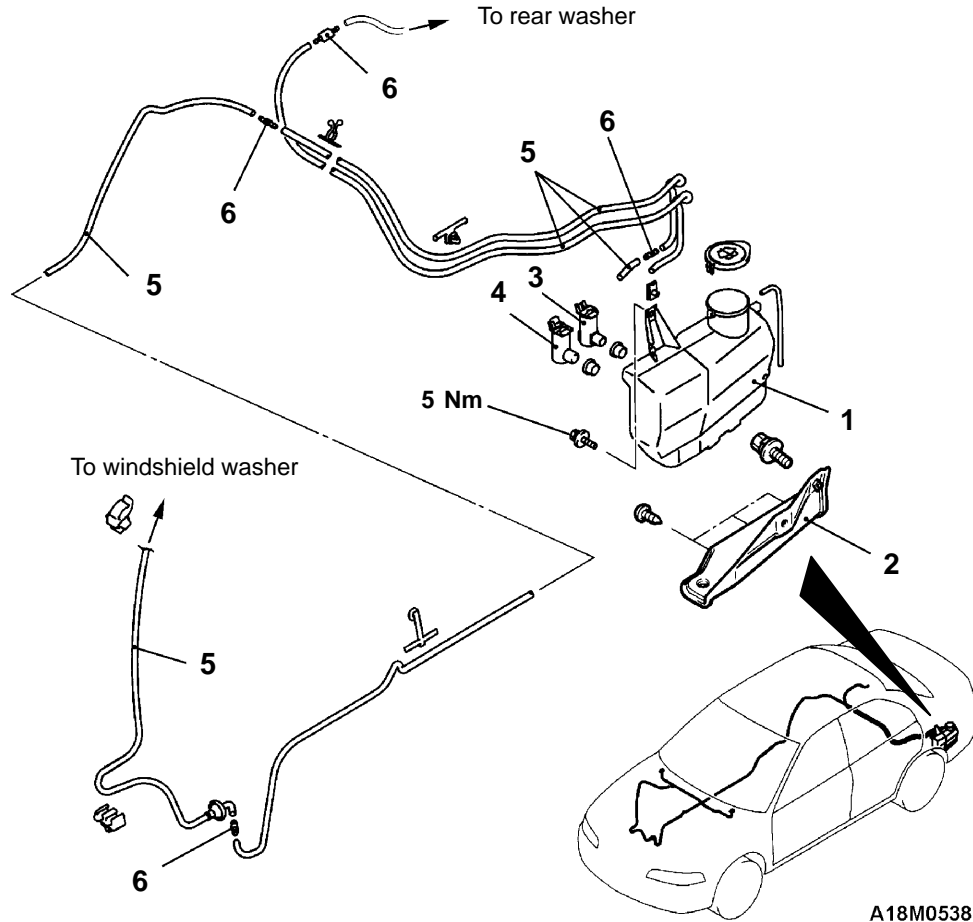
1. Rear spoiler
2. Packing
3. High-mount stop lamp

# WASHER TANK AND HOSES

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operations**

- Washer Fluid Draining and Pouring
- Trunk Side Trim (L.H.) Removal and Installation <GSR>



A18M0538

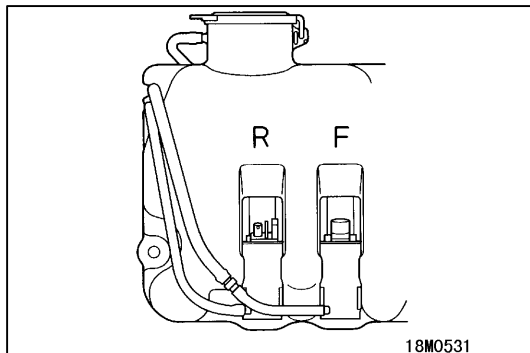
**Washer tank removal steps**



1. Washer tank assembly
2. Washer tank bracket
3. Washer motor (rear)
4. Washer motor (front)

**Washer hose removal steps**

- Front seat and rear seat
- Floor carpet
- 5. Washer hose
- 6. Joint



18M0531

**INSTALLATION SERVICE POINT**

**►A◄ WASHER MOTOR (FRONT) / WASHER MOTOR (REAR) INSTALLATION**

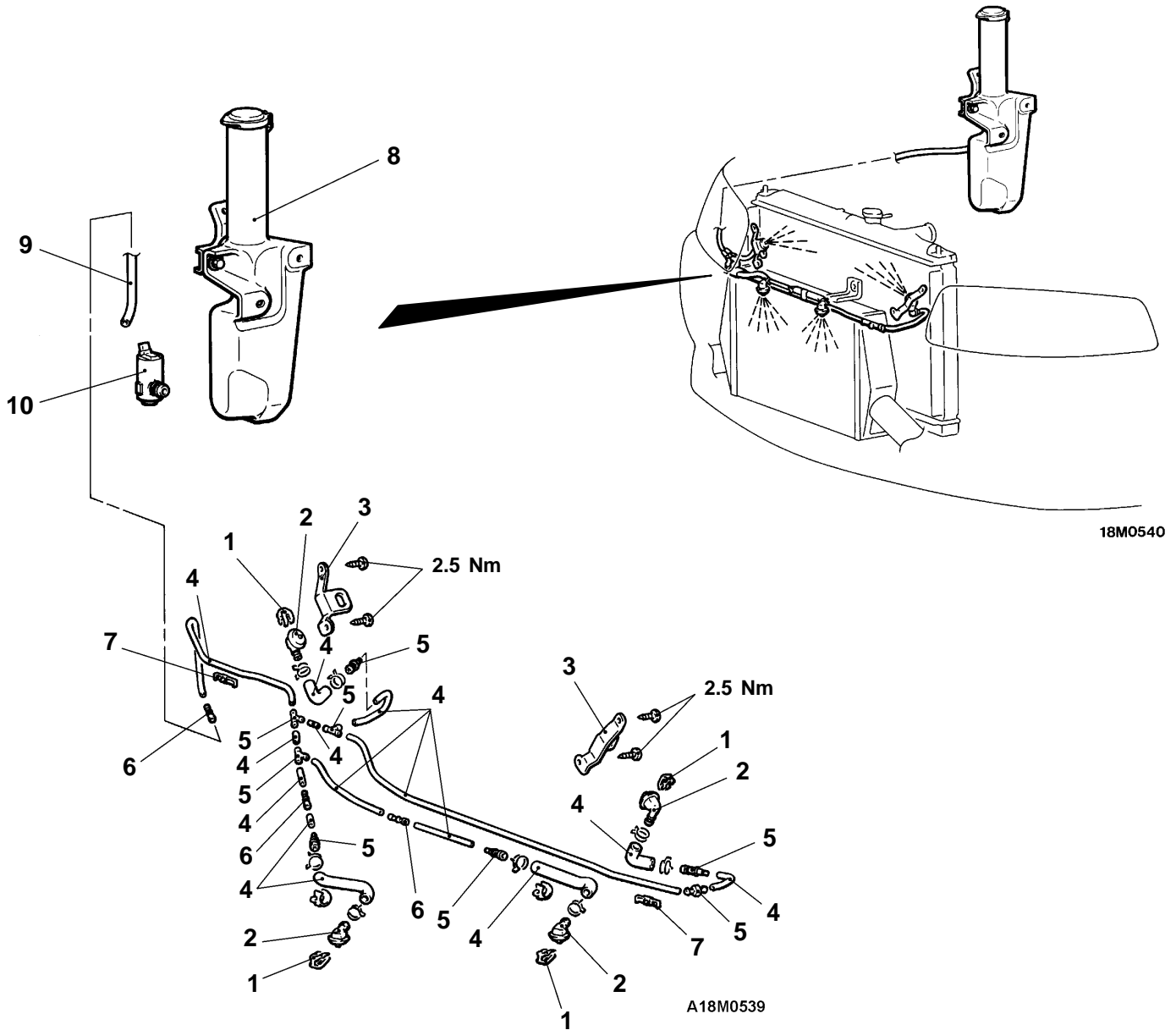
When installing the washer motors, pay special attention to the following:

1. Connector shape (front: 2-pole round connector, rear: 2-pole square connector)
2. Connection of washer tubes

# INTERCOOLER & RADIATOR WATER SPRAY SYSTEM

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operations**  
 Front Bumper Removal and Installation (Refer to P.51-2)

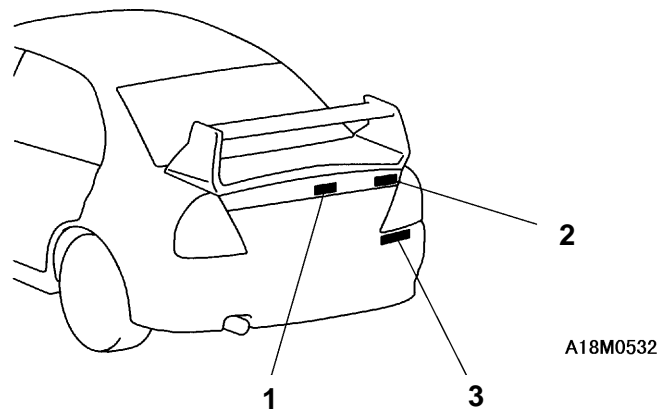


- 1. Clamp
- 2. Water spray nozzle
- 3. Water spray nozzle bracket
- ▶A◀ 4. Water spray hose
- 5. Joint
- 6. Stop valve
- ▶A◀ 7. Clip

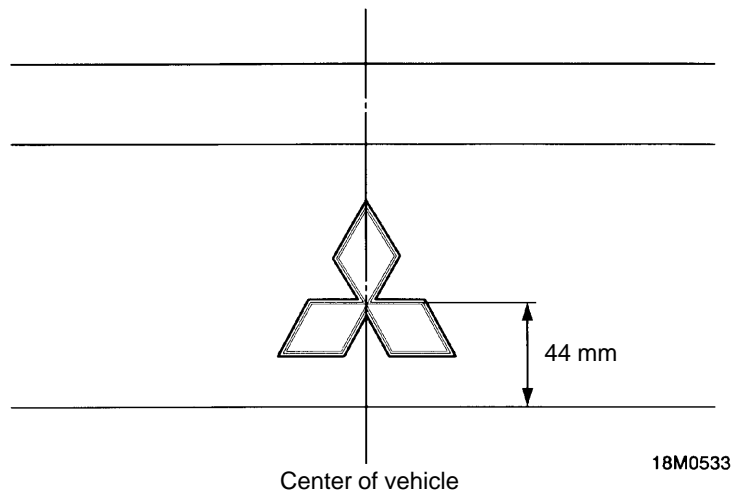
- Water spray motor removal steps**
- 8. Water spray tank
  - 9. Water spray hose
  - 10. Water spray tank

**NOTE**

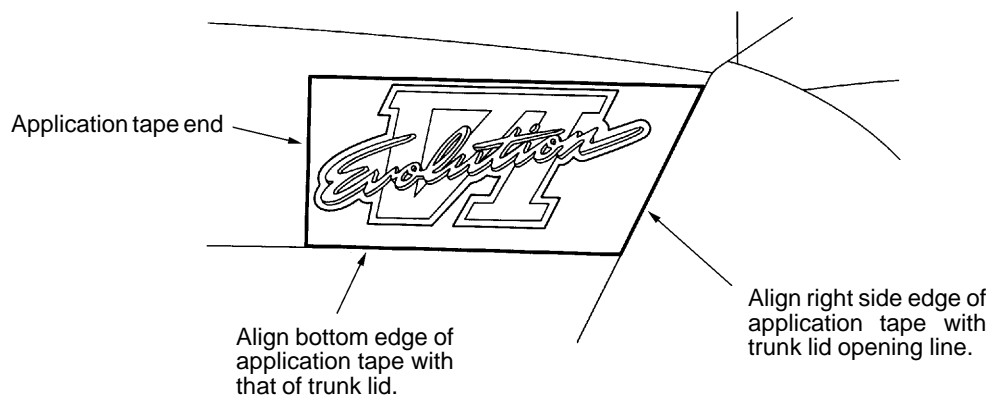
- (1) The installation service points for the new model are the same as those for preceding models.
- (2) The water spray switch can be serviced in the same procedure as for the preceding models.

**MARKS****REMOVAL AND INSTALLATION**

- ▶◀A▶ 1. Three-diamond mark
- ▶◀A▶ 2. EVOLUTION-VI mark
- ▶◀A▶ 3. LANCER mark

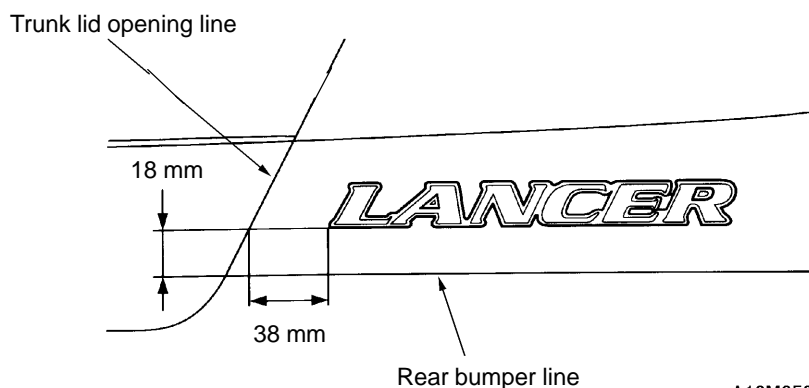
**INSTALLATION SERVICE POINT****▶◀A▶ MARK INSTALLATION****Mounting Positions****1. Three-diamond mark**

## 2. EVOLUTION-VI mark



B18M0530

## 3. LANCER mark



A18M0534

**INSTALLATION**

1. Clean the mark installation surfaces on the body with unleaded petrol.
2. Peel off the backing paper from the reverse side of the marks, and then attach the marks to the vehicle body so that they fit properly into position.

**Caution**

- (1) When attaching the marks, the surrounding temperature should be 20 – 38°C and the air should be completely free from dust.
- (2) If the surrounding temperature is lower than 20°C, the marks and the places on the body where the marks are to be attached should be heated to 20 – 30°C.
- (3) After sticking, press the marks strongly against the body panels. Neglecting this could cause peeled off marks.

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## NOTES

# SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

## CONTENTS

GENERAL INFORMATION .....	2	WARNING/CAUTION LABELS .....	23
SRS SERVICE PRECAUTIONS .....	3	SRS AIR BAG CONTROL UNIT (SRS-ECU) .....	24
SPECIAL TOOLS .....	5	AIR BAG MODULES AND CLOCK SPRING .....	25
TEST EQUIPMENT .....	5	AIR BAG MODULE DISPOSAL PROCEDURES .....	32
TROUBLESHOOTING .....	6	Undeployed Air Bag Module Disposal Procedures .....	32
SRS MAINTENANCE .....	15	Deployed Air Bag Module Disposal Procedures .....	40
POST-COLLISION DIAGNOSIS .....	19		
INDIVIDUAL COMPONENT SERVICE ...	22		

### CAUTION

- Carefully read and observe the information in the **SERVICE PRECAUTIONS (P.52B-3.)** prior to any service.
- For information concerning troubleshooting or maintenance, always observe the procedures in the **Troubleshooting (P.52B-6.)** section.
- If any SRS components are removed or replaced in connection with any service procedures, be sure to follow the procedures in the **INDIVIDUAL COMPONENT SERVICE** section (P.52B-22.) for the components involved.
- If you have any questions about the SRS, please contact your local distributor.

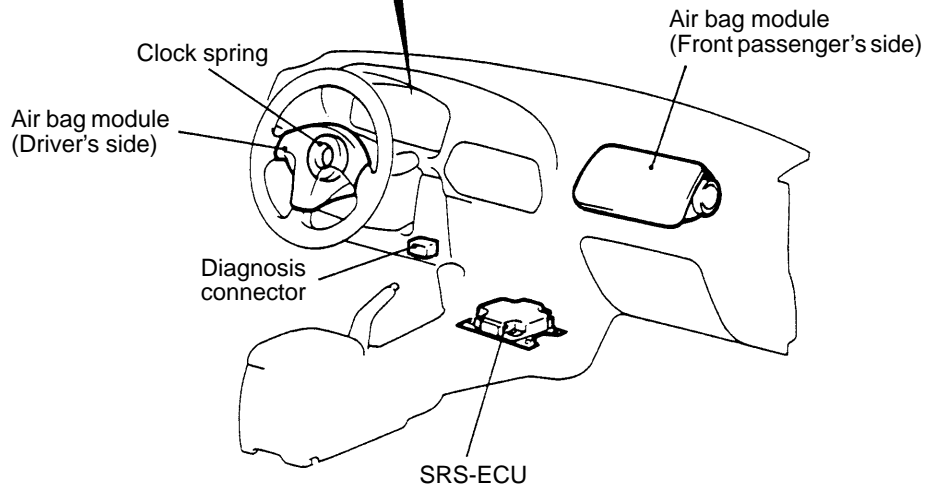
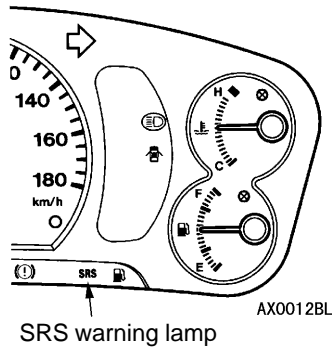
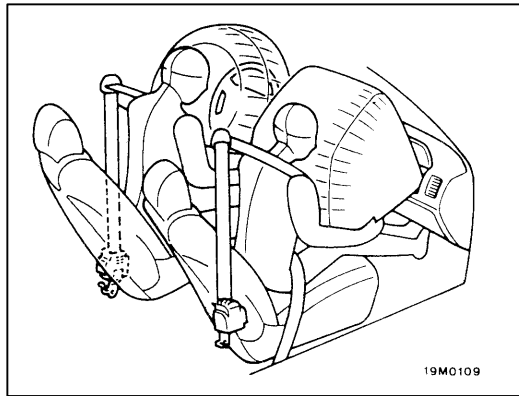
### GENERAL INFORMATION

To improve safety, the SRS is available as optional part.

The SRS consists of two air bag modules, SRS air bag control unit (SRS-ECU), SRS warning lamp and clock spring. One air bag is located in the centre of the steering wheel and another above the glove box. Each air bag has a folded air bag and an inflator unit. The control unit under the floor console monitors the system and has a safing G sensor and an analog G sensor. The warning lamp on the instrument panel indicates the operational

status of the SRS. The clock spring is installed in the steering column.

Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work. Extreme care must be used when servicing the SRS to avoid injury to the service personnel (by inadvertent deployment of the air bags) or the driver (by rendering the SRS inoperative).



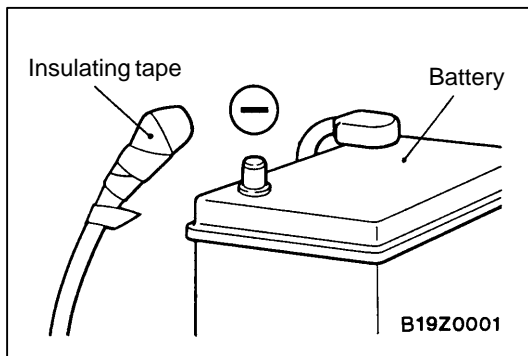


## SRS SERVICE PRECAUTIONS

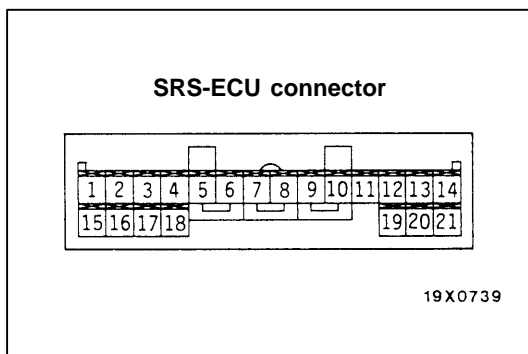
1. In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment on or near SRS components, except those specified on P.52B-5.
3. **Never Attempt to Repair the Following Components:**
  - SRS air bag control unit (SRS-ECU)
  - Clock Spring
  - Air Bag Module  
(Driver's side or front passenger's side\*)

### NOTE

\*: Vehicles with front passenger's air bag  
If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENT SERVICE procedures in this manual, starting at page 52B-22.



4. After disconnecting the battery cable, wait 60 seconds or more before proceeding with the following work. The SRS system is designed to retain enough voltage to deploy the air bag for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cables are disconnected.



5. Do not attempt to repair the wiring harness connectors of the SRS. If any of the connectors are diagnosed as faulty, replace the wiring harness. If the wires are diagnosed as faulty, replace or repair the wiring harness according to the following table.

SRS-ECU terminal No.	Harness connector (No. of terminals, colour)	Destination of harness	Corrective action
1 to 4	21 pins, yellow	–	–
5		Body wiring harness → Clock spring → Air bag module (Driver's side)	Correct or replace each wiring harness. Replace clock spring.
6			
7*		Body wiring harness → Air bag module (Front passenger's side)	Correct or replace each wiring harness.
8*			
9,10		–	–
11		Body wiring harness → Diagnosis connector	Correct or replace each wiring harness.
12		–	–
13		Body wiring harness → Junction block (fuse No.2)	Correct or replace each wiring harness.
14		Body wiring harness → Junction block (fuse No.4)	
15		Body wiring harness → SRS warning lamp	
16 to 19		–	–
20		Body wiring harness → Earth	Correct or replace each wiring harness.
21		–	–

## NOTE

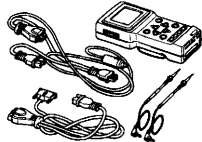
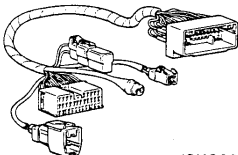
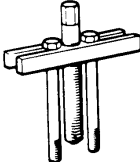
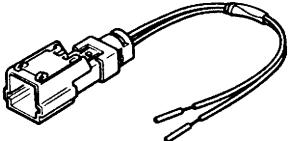
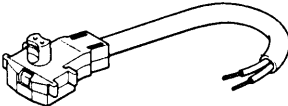
\*: Vehicles with front passenger's air bag

6. SRS components should not be subjected to heat over 93°C, so remove the SRS-ECU, air bag module and clock spring before drying or baking the vehicle after painting.
7. Whenever you finish servicing the SRS, check warning lamp operation to make sure that the system functions properly. (Refer to P.52B-14.)
8. Make certain that the ignition switch is LOCK (OFF) position when the MUT-II is connected or disconnected.
9. If you have any questions about the SRS, please contact your local distributor.


## NOTE

SERIOUS INJURY CAN RESULT FROM UNINTENDED AIR BAG DEPLOYMENT, SO USE ONLY THE PROCEDURES AND EQUIPMENT SPECIFIED IN THIS MANUAL.

**SPECIAL TOOLS**

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	<ul style="list-style-type: none"> <li>• Reading diagnosis codes</li> <li>• Erasing diagnosis code</li> <li>• Reading trouble period</li> <li>• Reading erase times</li> </ul>
 19U0039	MB991613	SRS check harness	Checking the SRS electrical circuitry
	MB990803	Steering wheel puller	Steering wheel removal
	MB686560	SRS air bag adapter harness A	<ul style="list-style-type: none"> <li>• Deployment of air bag modules and seat belt with pre-tensioner inside the vehicle</li> <li>• Deployment of air bag module (front passenger's side) outside the vehicle</li> </ul>
	MR203491 MB628919	or SRS air bag adapter harness B	Deployment of air bag module (driver's side) outside the vehicle

**TEST EQUIPMENT**

Tool	Name	Use
 13R0746	Digital multi-meter	Checking the SRS electrical circuitry Use a multi-meter for which the maximum test current is 2 mA or less at the minimum range of resistance measurement

## TROUBLESHOOTING

### STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

### DIAGNOSIS FUNCTION

#### DIAGNOSIS CODES CHECK

Connect the MUT-II to the diagnosis connector (16-pin) under the instrument under cover, then check diagnosis codes.

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

#### ERASING DIAGNOSIS CODES

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.**

### INSPECTION CHART FOR DIAGNOSIS CODES

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

Code No.	Diagnosis item	Reference page
14	Analog G-sensor system in the SRS-ECU	52B-7
15,16	Safing G-sensor system in the SRS-ECU	52B-7
21, 22, 61, 62	Driver's side air bag module (squib) system	52B-8
24, 25, 64, 65	Front passenger's side air bag module (squib) system	52B-9
31, 32	SRS-ECU capacitor system	52B-9
34*	Connector lock system	52B-10
35	SRS-ECU (deployed air bag) system	52B-10
41*	IG <sub>1</sub> (A) power circuit system	52B-10
42*	IG <sub>1</sub> (B) power circuit system	52B-11
43	SRS warning lamp drive circuit system	Lamp does not illuminate.*
		Lamp does not switch off.
44	SRS warning lamp drive circuit system	52B-12
45	SRS-ECU non-volatile memory (EEPROM) and A/D converter system	52B-13
51, 52	Driver's side air bag module (squib ignition drive circuit) system	52B-13
54, 55	Front passenger's side air bag module (squib ignition drive circuit) system	52B-13

#### NOTE

- (1) \*: If the vehicle condition returns to normal, the diagnosis code will be automatically erased, and the SRS warning lamp will return to normal.
- (2) If the vehicle has a discharged battery it will store the fault codes 41 or 42. When these diagnosis codes are displayed, check the battery.

**INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE**

<b>Code No.14 Analog G-sensor system in the SRS-ECU</b>	<b>Probable cause</b>
<p>The SRS-ECU monitors the output of the analog G-sensor inside the SRS-ECU. It outputs this code when any of the following are detected.</p> <ul style="list-style-type: none"> <li>● When the analog G-sensor is not operating</li> <li>● When the characteristics of the analog G-sensor are abnormal</li> <li>● When the output from the analog G-sensor is abnormal</li> </ul>	<ul style="list-style-type: none"> <li>● Malfunction of SRS-ECU</li> </ul>

Replace the SRS-ECU.

<b>Code No.15, 16 Safing G-sensor system in the SRS-ECU</b>	<b>Probable cause</b>
<p>This code is output if there is a short or open circuit between the terminals of the safing G-sensor inside the SRS-ECU. The trouble causes for each diagnosis code No. are as follows.</p>	<ul style="list-style-type: none"> <li>● Malfunction of SRS-ECU</li> </ul>

Code No.	Trouble symptom
15	Short circuit in the safing G-sensor
16	Open circuit in the safing G-sensor

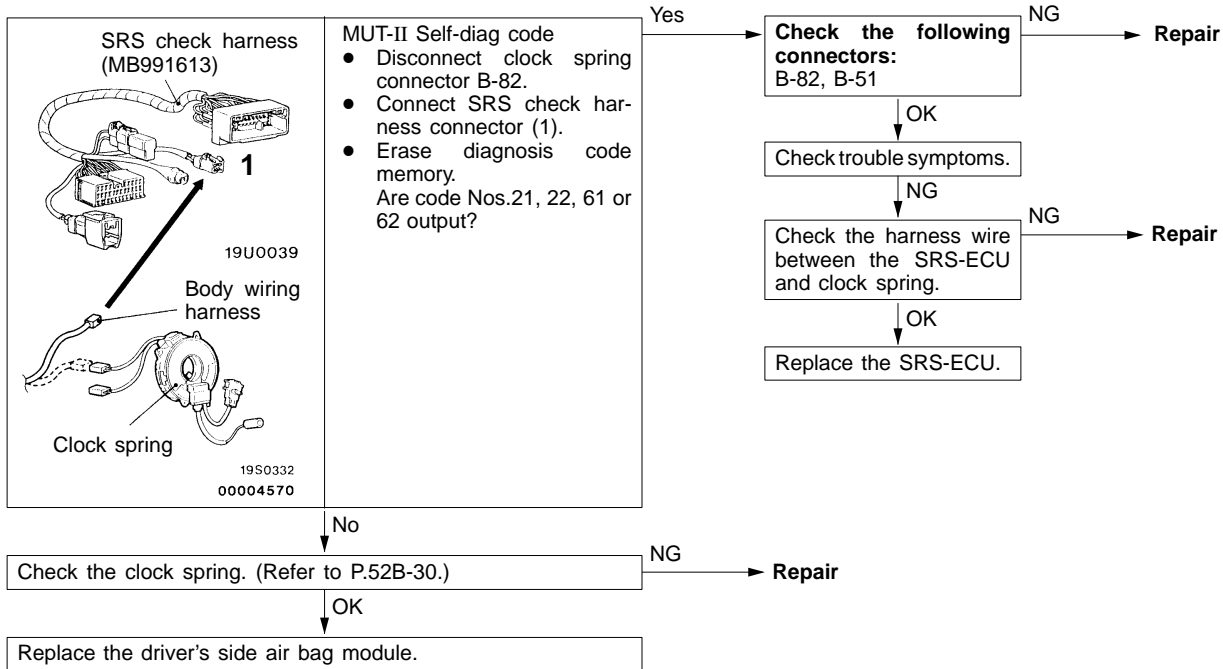
Replace the SRS-ECU.

Code No.21, 22, 61 or 62 Driver's side air bag module (squib) system	Probable cause
These diagnosis codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The trouble causes for each diagnosis code No. are as follows.	<ul style="list-style-type: none"> <li>● Malfunction of clock spring</li> <li>● Partial disconnection due to incorrect clock spring neutral position</li> <li>● Malfunction of wiring harnesses or connectors</li> <li>● Malfunction of driver's side air bag module (squib)</li> <li>● Malfunction of SRS-ECU</li> </ul>

Code No.	Trouble symptom
21	<ul style="list-style-type: none"> <li>● Short in driver's side air bag module (squib) or harness short</li> <li>● Short in clock spring</li> <li>● Malfunction of connector*</li> </ul>
22	<ul style="list-style-type: none"> <li>● Open circuit in driver's side air bag module (squib) or open harness</li> <li>● Open circuit in clock spring</li> <li>● Malfunction of connector contact</li> </ul>
61	<ul style="list-style-type: none"> <li>● Short in driver's side air bag module (squib) harness leading to the power supply</li> </ul>
62	<ul style="list-style-type: none"> <li>● Short in driver's side air bag module (squib) harness leading to the earth</li> </ul>

NOTE

\*: The connector in the squib circuit has a built-in short bar which short-circuits between plus (+) lead and minus (-) lead of the squib circuit when the connector is not being connected to prevent an accidental air bag deployment possibly caused by static electricity, etc. Therefore, malfunction of the connector can also be caused by this short bar which fails to be released even when the connector is reconnected if it is damaged.

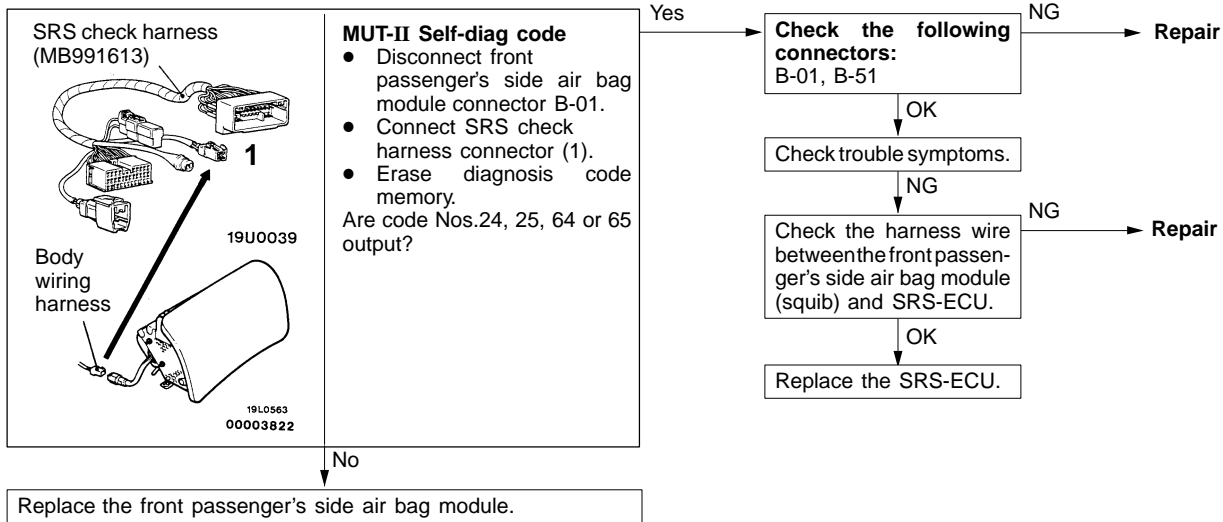


Code No.24, 25, 64 or 65 Front passenger's side air bag module (squib) system	Probable cause
These diagnosis codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The trouble causes for each diagnosis code No. are as follows.	<ul style="list-style-type: none"> <li>Malfunction of wiring harnesses or connectors</li> <li>Malfunction of front passenger's side air bag module (squib)</li> <li>Malfunction of SRS-ECU</li> </ul>

Code No.	Trouble symptom
24	<ul style="list-style-type: none"> <li>Short in front passenger's side air bag module (squib) or harness short</li> <li>Malfunction of connector*</li> </ul>
25	<ul style="list-style-type: none"> <li>Open circuit in front passenger's side air bag module (squib) or open harness</li> <li>Malfunction of connector contact</li> </ul>
64	<ul style="list-style-type: none"> <li>Short in front passenger's side air bag module (squib) harness leading to the power supply</li> </ul>
65	<ul style="list-style-type: none"> <li>Short in front passenger's side air bag module (squib) harness leading to the earth</li> </ul>

**NOTE**

\*: The connector in the squib circuit has a built-in short bar which short-circuits between plus (+) lead and minus (-) lead of the squib circuit when the connector is not being connected to prevent an accidental air bag deployment possibly caused by static electricity, etc. Therefore, malfunction of the connector can also be caused by this short bar which fails to be released even when the connector is reconnected if it is damaged.

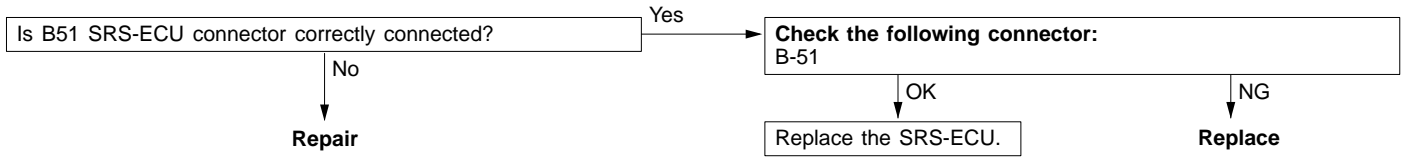


Code No.31 or 32 SRS-ECU capacitor system	Probable cause
Probable cause These diagnosis codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib).	<ul style="list-style-type: none"> <li>Malfunction of SRS-ECU</li> </ul>

Code No.	Trouble symptom
31	<ul style="list-style-type: none"> <li>Voltage at the capacitor terminal is higher than the specified value for five seconds or more</li> </ul>
32	<ul style="list-style-type: none"> <li>Voltage at the capacitor terminal is lower than the specified value for five seconds or more (this is not detected if diagnosis code No.41 or 42 indicating system voltage drop has been output.)</li> </ul>

Replace the SRS-ECU.

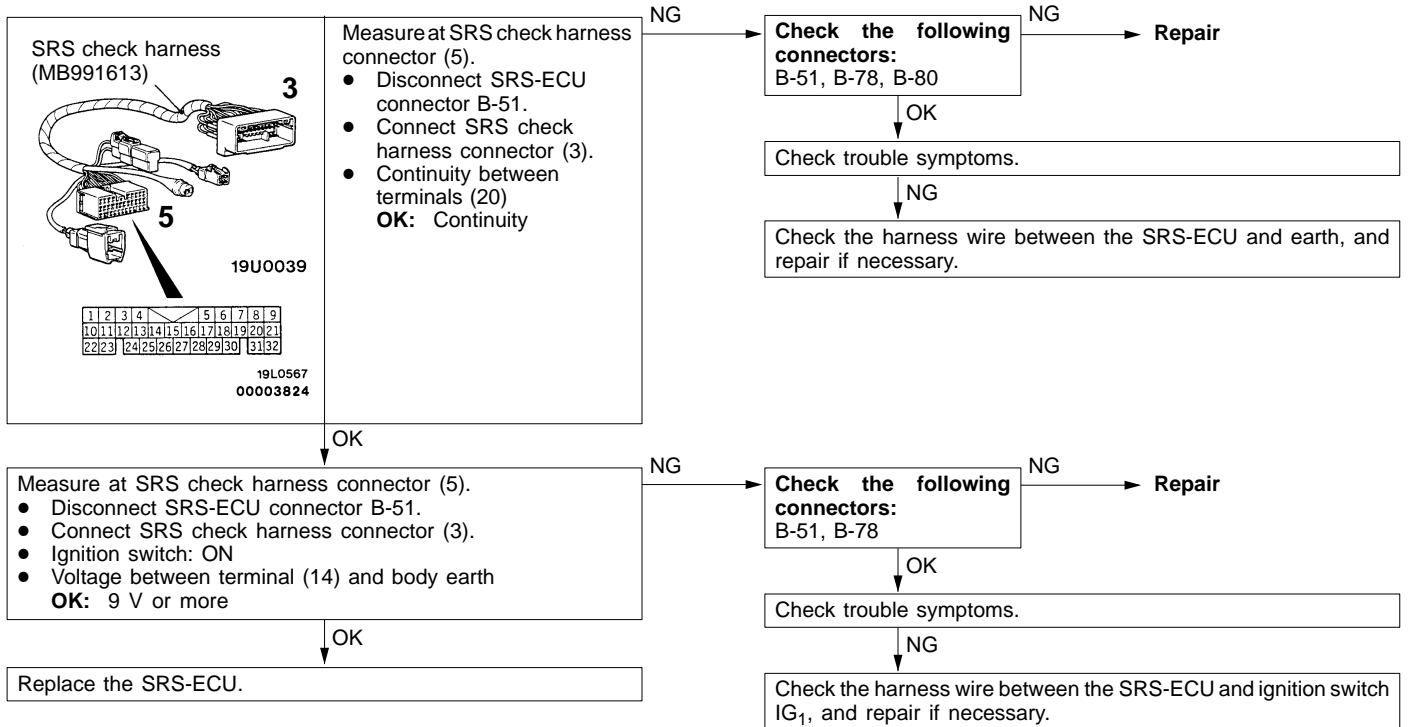
Code No.34 Connector lock system	Probable cause
This diagnosis code is output if a poor connection of the SRS-ECU is detected. However, if the vehicle condition returns to normal, diagnosis code No.34 will be automatically erased, and the SRS warning lamp will switch off.	<ul style="list-style-type: none"> <li>• Malfunction of connectors</li> <li>• Malfunction of SRS-ECU</li> </ul>



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.	<ul style="list-style-type: none"> <li>• Malfunction of SRS-ECU</li> </ul>

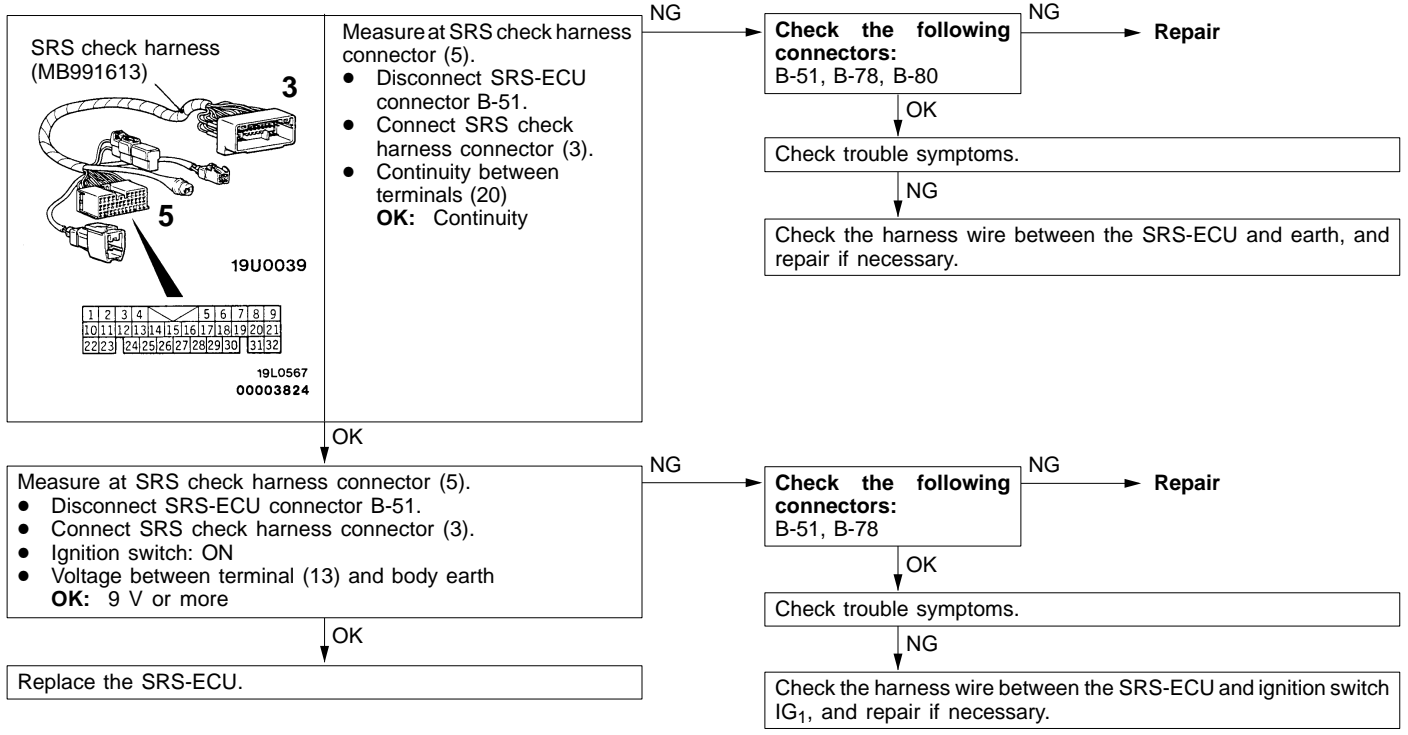
Replace the SRS-ECU.

Code No.41 IG <sub>1</sub> (A) power circuit system	Probable cause
This diagnosis code is output if the voltage between the IG <sub>1</sub> (A) terminal 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.	<ul style="list-style-type: none"> <li>• Malfunction of wiring harnesses or connectors</li> <li>• Malfunction of SRS-ECU</li> </ul>

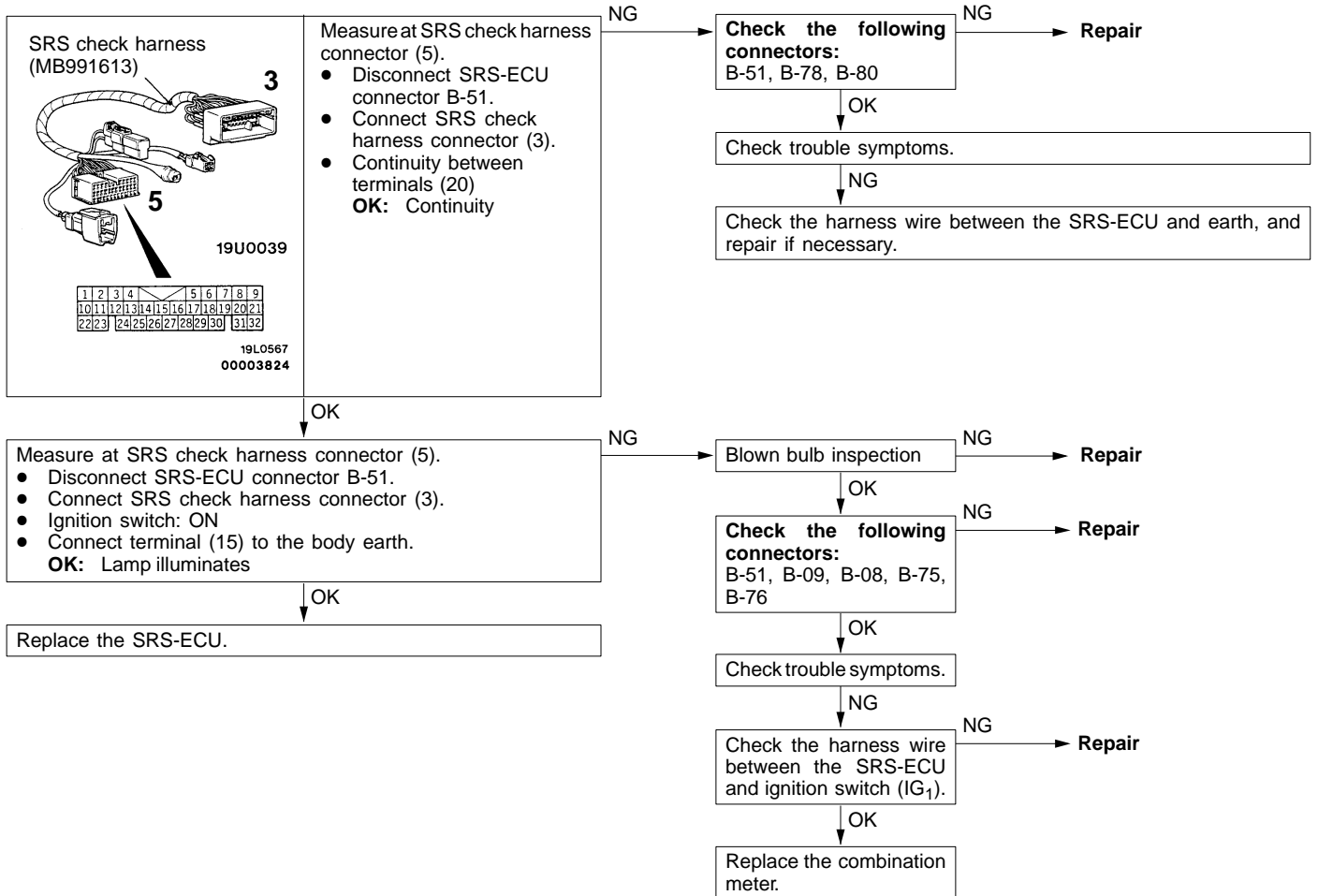




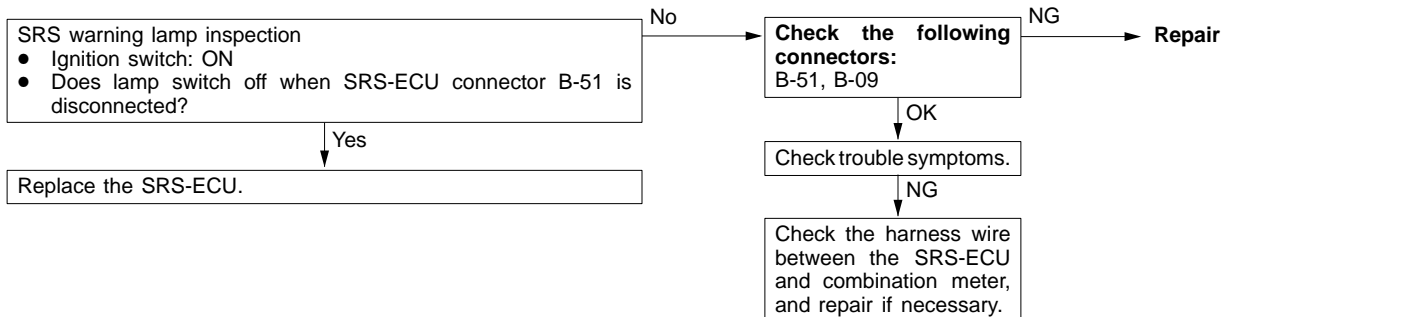
Code No.42 IG <sub>1</sub> (B) power circuit system	Probable cause
<p>This diagnosis code is output if the voltage between the IG<sub>1</sub> (B) terminal and the earth is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnosis code No.42 will be automatically erased, and the SRS warning lamp will switch off.</p>	<ul style="list-style-type: none"> <li>Malfunction of wiring harnesses or connectors</li> </ul>



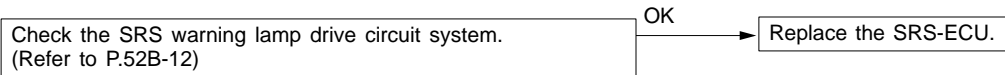
Code No.43 SRS warning lamp drive circuit system (Lamp does not illuminate.)	Probable cause
<p>This diagnosis code is output when an open circuit occurs for a continuous period of 5 seconds while the SRS-ECU in monitoring the SRS warning lamp and the lamp is OFF (transistor OFF). However, if this code is output due to an open circuit, if the vehicle condition returns to normal, this diagnosis code No.43 will be automatically erased, and the SRS warning lamp will return to normal.</p>	<ul style="list-style-type: none"> <li>• Malfunction of wiring harnesses or connectors</li> <li>• Blown bulb</li> <li>• Malfunction of SRS-ECU</li> <li>• Malfunction of combination meter</li> </ul>



Code No.43 SRS warning lamp drive circuit system (Lamp does not switch off.)	Probable cause
<p>This diagnosis code is output when a short to earth occurs in the harness between the lamp and the SRS-ECU while SRS-ECU is monitoring the SRS warning lamp and the lamp is ON.</p>	<ul style="list-style-type: none"> <li>• Malfunction of wiring harnesses or connectors</li> <li>• Malfunction of SRS-ECU</li> <li>• Malfunction of combination meter</li> </ul>



Code No.44 SRS warning lamp drive circuit system	Probable cause
This diagnosis code is output when a short occurs in the lamp drive circuit or a malfunction of the output transistor inside the SRS-ECU is detected while the SRS-ECU is monitoring the SRS warning lamp drive circuit.	<ul style="list-style-type: none"> <li>• Malfunction of wiring harnesses or connectors</li> <li>• Malfunction of SRS-ECU</li> </ul>



Code No.45 SRS-ECU non-volatile memory (EEPROM) and A/D converter system	Probable cause
This diagnosis code is output if there is a malfunction in the SRS-ECU non-volatile memory (EEPROM) and A/D converter.	<ul style="list-style-type: none"> <li>• Malfunction of SRS-ECU</li> </ul>

Code No.	Trouble symptom	
45	Non-volatile memory (EEPROM)	<ul style="list-style-type: none"> <li>• Non-volatile memory (EEPROM) is abnormal.</li> </ul>

Replace the SRS-ECU.

Code No.51 or 52 Driver's side air bag module (squib ignition drive circuit) system	Probable cause
This diagnosis code is output if a short (No.51) or an open circuit (No.52) is detected in the circuit for the driver's seat.	<ul style="list-style-type: none"> <li>• Malfunction of SRS-ECU</li> </ul>

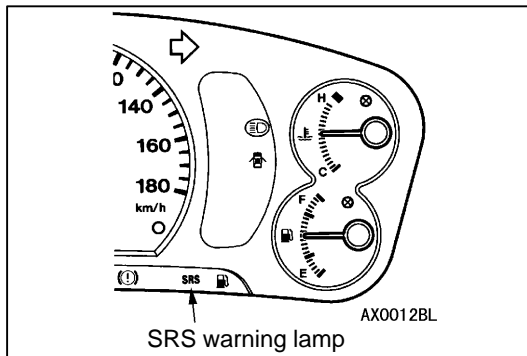
Code No.	Trouble symptom	
51	Driver's side air bag module (squib ignition drive circuit)	<ul style="list-style-type: none"> <li>• Short circuit in the squib ignition drive circuit</li> </ul>
52		<ul style="list-style-type: none"> <li>• Open circuit in the squib ignition drive circuit</li> </ul>

Replace the SRS-ECU.

Code No.54 or 55 Front passenger's side air bag module (squib ignition drive circuit) system	Probable cause
This diagnosis code is output if a short (No.54) or an open circuit (No.55) is detected in the circuit for the passenger's seat.	<ul style="list-style-type: none"> <li>• Malfunction of SRS-ECU</li> </ul>

Code No.	Trouble symptom	
54	Front passenger's side air bag module (squib ignition drive circuit)	<ul style="list-style-type: none"> <li>• Short circuit in the squib ignition drive circuit</li> </ul>
55		<ul style="list-style-type: none"> <li>• Open circuit in the squib ignition drive circuit</li> </ul>

Replace the SRS-ECU.



### SRS WARNING LAMP INSPECTION

1. Check to be sure that the SRS warning lamp illuminates when the ignition switch is in the ON position.
2. Check to be sure that it illuminates for approximately 7 seconds and then switches off.
3. If the above is not the cause, inspect the diagnosis codes.

### INSPECTION CHART FOR TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	52B-14
	Communication is not possible with SRS only.	2	52B-15
When the ignition key is turned to "ON" (engine stopped), the SRS warning lamp does not illuminate.		Refer to diagnosis code No.43.	52B-12
After the ignition switch is turned to ON, the SRS warning lamp is still on after approximately 7 seconds have passed.		Refer to diagnosis code No.43.	52B-12

### INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

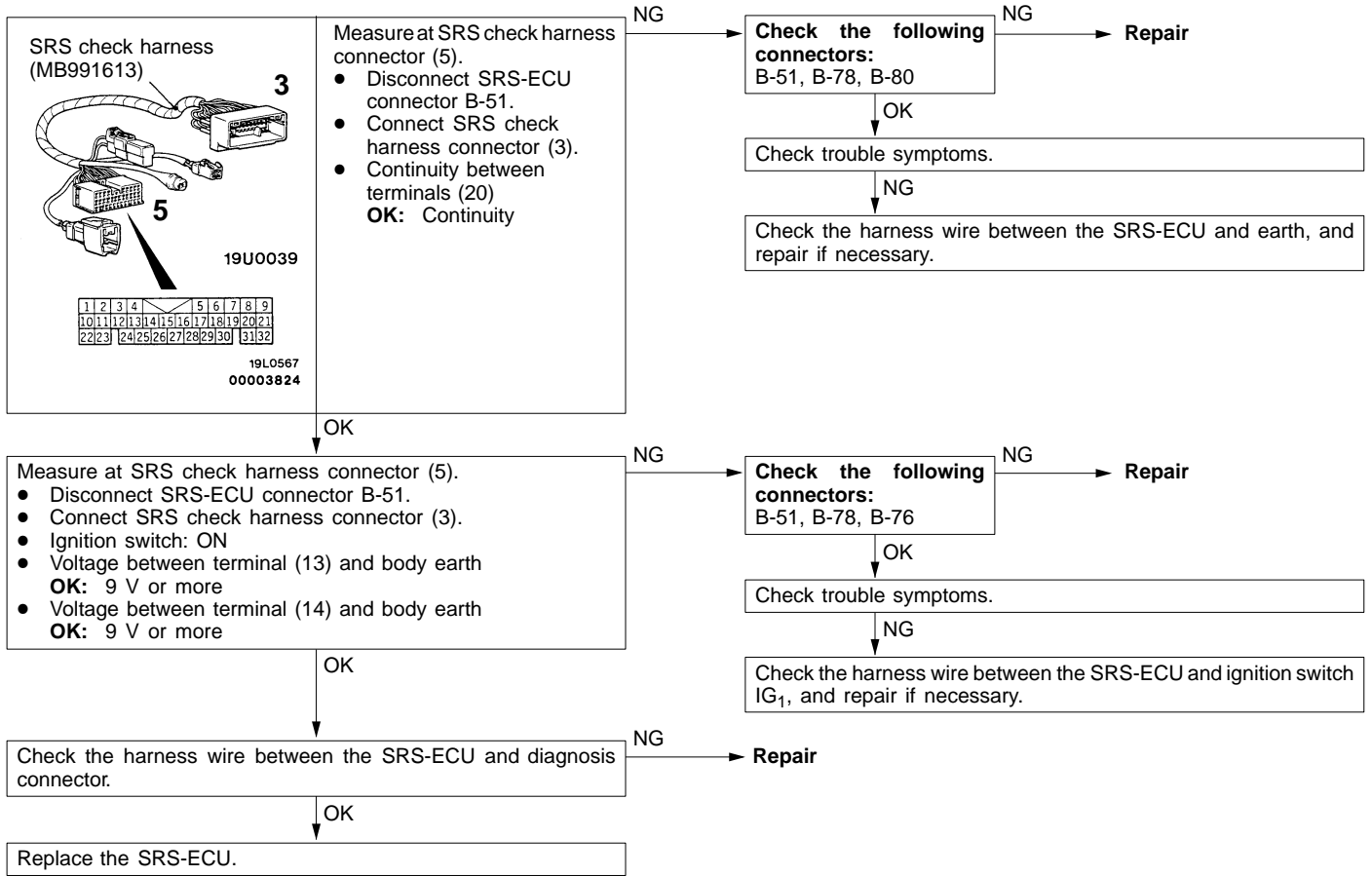
#### Inspection Procedure 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a power supply system (including earth circuit) of the diagnosis line.	<ul style="list-style-type: none"> <li>• Malfunction of connectors</li> <li>• Malfunction of wiring harness</li> </ul>

Refer to GROUP 13A – Troubleshooting.

Inspection Procedure 2

Communication with MUT-II is not possible. (Communication is not possible with SRS only.)	Probable cause
If communication is not possible with the SRS only, the cause is probably an open circuit in the diagnosis output circuit of the SRS or in the power circuit (including earth circuit).	<ul style="list-style-type: none"> <li>• Malfunction of wiring harnesses or connectors</li> <li>• Malfunction of SRS-ECU</li> </ul>

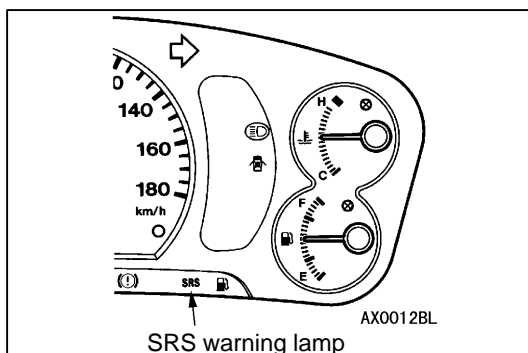


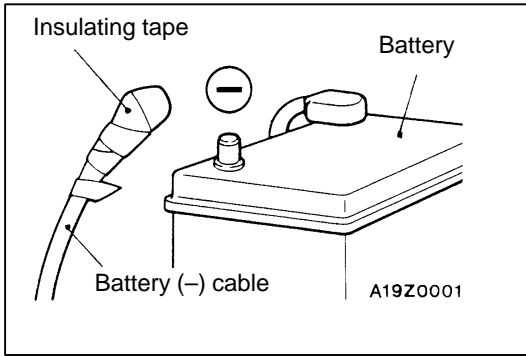
## SRS MAINTENANCE

The SRS must be inspected by an authorized dealer 10 years after the date of vehicle registration.

## SRS WARNING LAMP CHECK

Turn the ignition key to the “ON” position. Does the SRS warning lamp illuminate for about 7 seconds, turn off and then remain extinguished for at least 5 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-6.



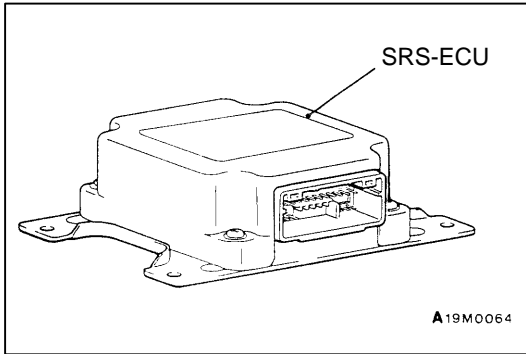


### SRS COMPONENT VISUAL CHECK

Turn the ignition key to the LOCK (OFF) position, disconnect the negative battery cable and tape the terminal.

#### Caution

**Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3.)**



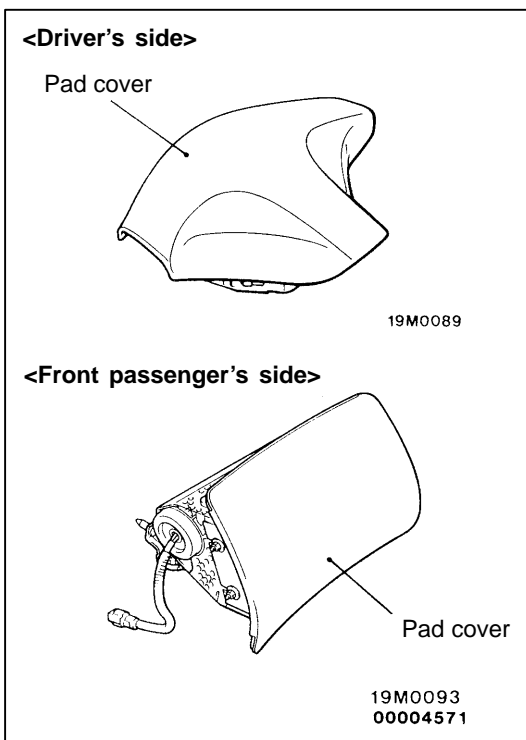
### SRS CONTROL UNIT (SRS-ECU)

1. Check SRS-ECU case and brackets for dents, cracks, deformation or rust.

#### Caution

**The SRS may not activate if the SRS-ECU is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.**

2. Check connector for damage, and terminals for deformation or rust. Replace SRS-ECU if it fails visual check. (Refer to P.52B-24.)



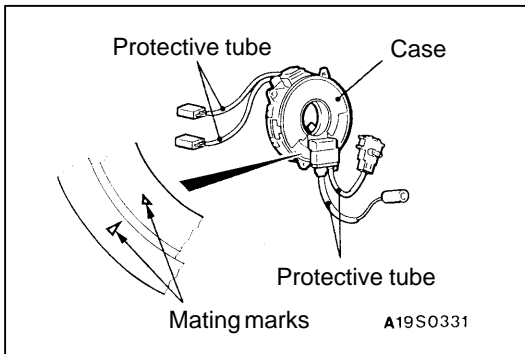
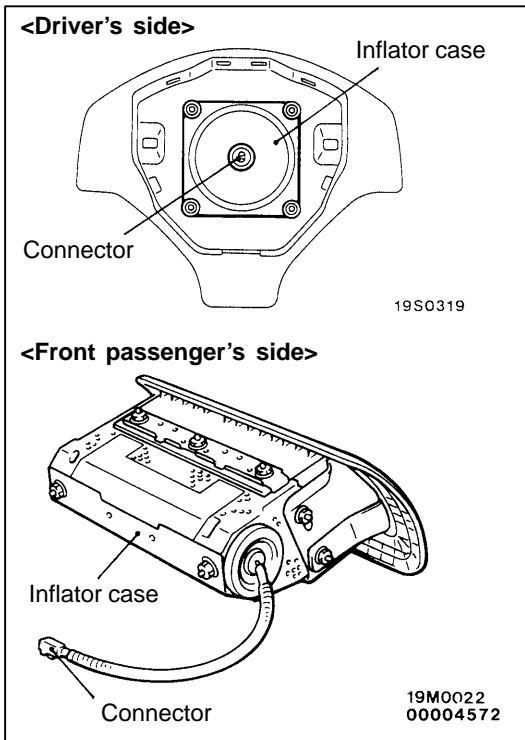
### AIR BAG MODULES, STEERING WHEEL AND CLOCK SPRING

1. Remove the air bag modules, steering wheel and clock spring. (Refer to P.52B-25.)

#### Caution

**The removed air bag modules should be stored in a clean, dry place with the pad cover face up.**

2. Check pad cover for dents, cracks or deformation.



3. Check connector for damage, terminals deformities, and harness for binds.
4. Check air bag inflator case for dents, cracks or deformities.
5. Check harness and connectors for damage, and terminals for deformation.

6. Check clock spring connectors and protective tube for damage, and terminals for deformation.
7. Visually check the clock spring case for damage.
8. Align the mating marks of the clock spring and, after turning the vehicle's front wheels to straight-ahead position, install the clock spring to the column switch.

#### Mating Mark Alignment

Turn the clock spring clockwise fully, and then turn back it approx. 3 4/5 turns counterclockwise to align the mating marks.

#### Caution

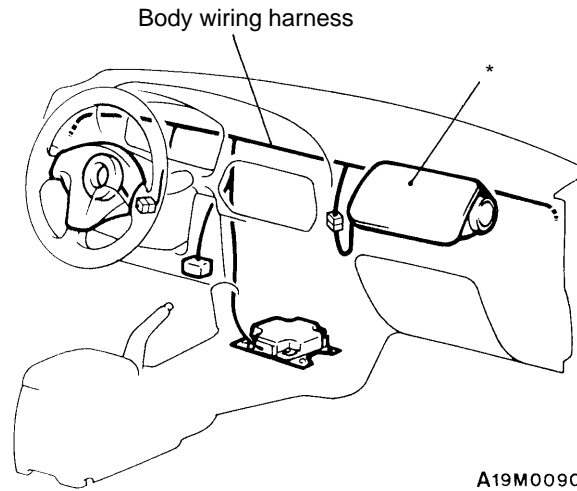
**If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver or front passenger.**

9. Install the steering column covers, steering wheel and the air bag module.
10. Check steering wheel for noise, binds or difficult operation.
11. Check steering wheel for excessive free play.  
REPLACE ANY VISUALLY INSPECTED PART IF IT FAILS THAT INSPECTION. (Refer to P.52B-25.)

#### Caution

**The SRS may not activate if any of the above components is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.**

## BODY WIRING HARNESS



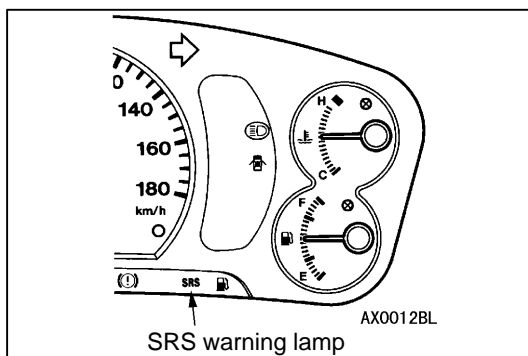
## NOTE

\*: Vehicles with front passenger's air bag

1. Check connector for poor connection.
  2. Check harnesses for binds, connectors for damage, and terminals for deformation.
- REPLACE ANY CONNECTORS OR HARNESS THAT FAIL THE VISUAL INSPECTION. (Refer to P.52B-3.)

**Caution**

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

**POST-INSTALLATION INSPECTION**

Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the SRS warning lamp illuminate for about 7 seconds, turn off and then remain extinguished for at least 5 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-6.



## POST-COLLISION DIAGNOSIS

To inspect and service the SRS after a collision (whether or not the air bags have deployed), perform the following steps.

### SRS-ECU MEMORY CHECK

1. Connect the MUT-II to the diagnosis connector (16-pin).

#### Caution

**Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.**

2. Read (and write down) all displayed diagnosis codes. (Refer to P.52B-6.)

#### NOTE

If the battery power supply has been disconnected or disrupted by the collision, the MUT-II cannot communicate with the SRS-ECU. Inspect and, if necessary, repair the body wiring harness before proceeding further.

3. Read the data list (fault duration and how many times memories are erased) using the MUT-II.

#### Data list

No	Service Data Item	Applicability
92	Number indicating how often the memory is cleared	Maximum time to be stored: 250
93	How long a problem has lasted (How long it takes from the occurrence of the problem till the first igniting signal)	Maximum time to be stored: 9,999 minutes (approximately 7 days)
94	How long a problem has lasted (How long it takes from the first igniting signal till now)	

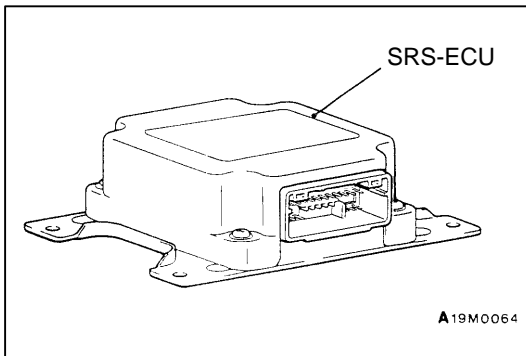
4. Erase the diagnosis codes and after waiting 5 seconds or more read (and write down) all displayed diagnosis codes. (Refer to P.52B-6.)

**REPAIR PROCEDURE****WHEN AIR BAG DEPLOYS IN A COLLISION.**

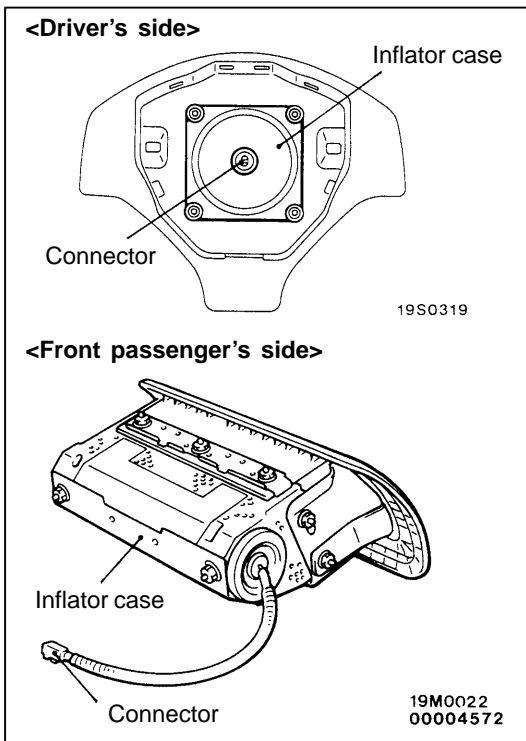
1. Replace the following parts with new ones.
  - SRS-ECU (Refer to P.52B-24.)
  - Air bag module (Refer to P.52B-25.)
  
2. Check the following parts and replace if there are any malfunctions.
  - Clock spring (Refer to P.52B-25.)
  - Steering wheel, steering column and intermediate joint
    - (1) Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
    - (2) Install air bag module to check fit or alignment with steering wheel.
    - (3) Check steering wheel for noise, binds or difficult operation and excessive free play.
  
3. Check harnesses for binding, connectors for damage, poor connections, and terminals for deformation. (Refer to P.52B-18.)

**WHEN AIR BAG DOES NOT DEPLOY IN LOW-SPEED COLLISION.**

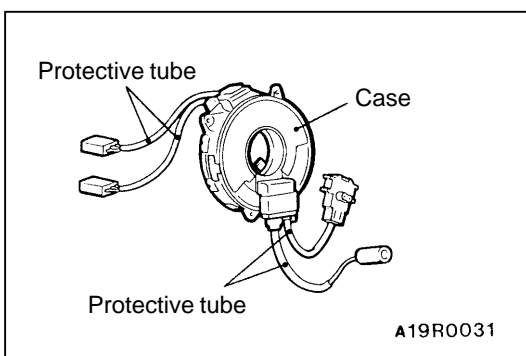
Check the SRS components. If the SRS components are showing any visible damage such as dents, cracks, or deformation, replace them with new ones. Concerning parts removed for inspection, replacement with new parts and cautionary points for working, refer to appropriate INDIVIDUAL COMPONENT SERVICE, P.52B-22.

**SRS-ECU**

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

**Air bag modules**

1. Check pad cover for dents, cracks or deformation.
2. Check connector for damage, terminals deformities, and harness for binds.
3. Check air bag inflator case for dents, cracks or deformities.
4. Install air bag module to steering wheel to check fit or alignment with the wheel.

**Clock spring**

1. Check clock spring connectors and protective tube for damage, and terminals for deformation.
2. Visually check the case for damage.

### **Steering wheel, steering column and intermediate joint**

1. Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
2. Install air bag module to check fit or alignment with steering wheel.
3. Check steering wheel for noise, binds or difficult operation and excessive free play.

### **Harness connector (body wiring harness)**

Check harnesses for binding, connectors for damage, poor connection, and terminals for deformation. (Refer to P.52B-18.)

## **INDIVIDUAL COMPONENT SERVICE**

If the SRS components are to be removed or replaced as a result of maintenance, troubleshooting, etc., follow each procedure (P.52B-24 – P.52B-31)

### **Caution**

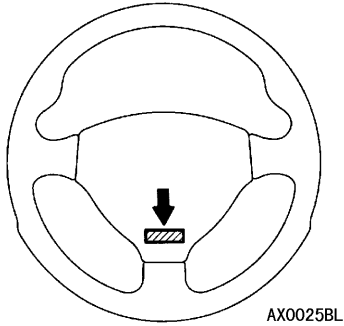
1. **SRS components should not be subjected to heat over 93°C, so remove the SRS-ECU, air bag module and clock spring before drying or baking the vehicle after painting. Recheck SRS system operability after re-installing them.**
2. **If the SRS components are removed for the purpose of check, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.**

# WARNING/CAUTION LABELS

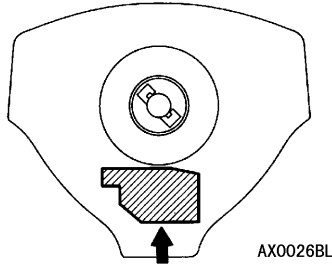
A number of caution labels related to the SRS are found in the vehicle, as shown in the following

illustration. Follow label instructions when servicing SRS. If labels are dirty or damaged, replace them.

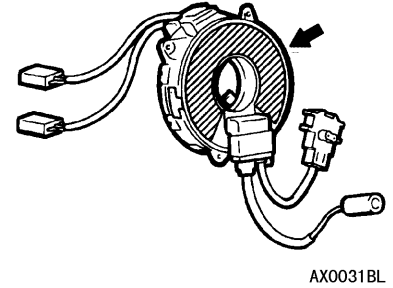
**Steering wheel**



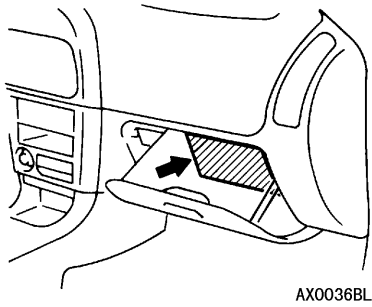
**Air bag module (driver's side)**



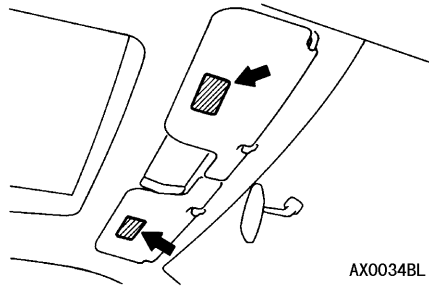
**Clock spring**



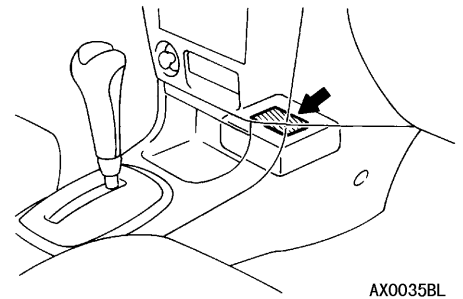
**Glove box**



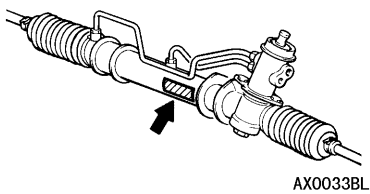
**Sun visor**



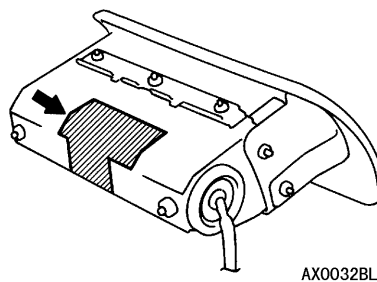
**SRS-ECU**



**Steering gear and linkage**



**Air bag module (front passenger's side)**



## SRS AIR BAG CONTROL UNIT (SRS-ECU)

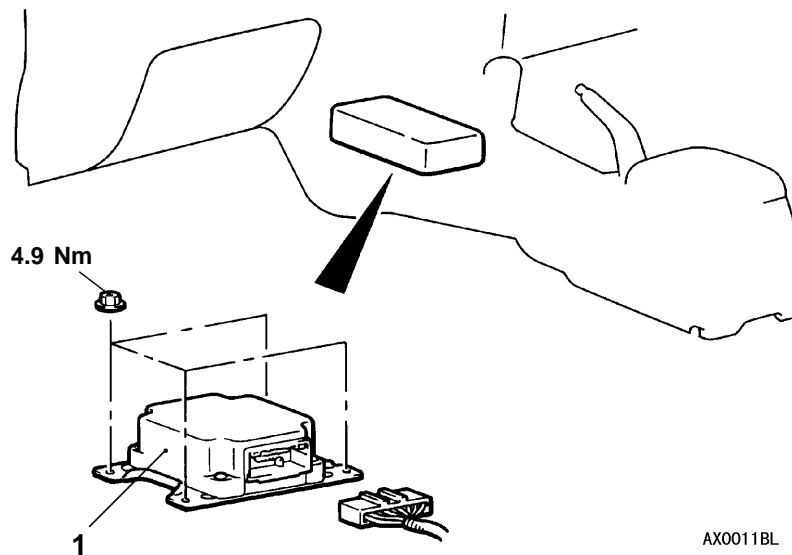
### Caution

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 SRS-ECU. If faulty, replace it.
3. Do not drop or subject the SRS-ECU to impact or vibration. If denting, cracking, deformation, or rust are discovered in the SRS-ECU, replace it with a new SRS-ECU. Discard the old one.
4. After deployment of an air bag, replace the SRS-ECU with a new one.

### REMOVAL AND INSTALLATION

#### Pre-removal Operation

- Turn the ignition key to the LOCK (OFF) position.
- Negative (–) battery cable connection



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#### Removal steps

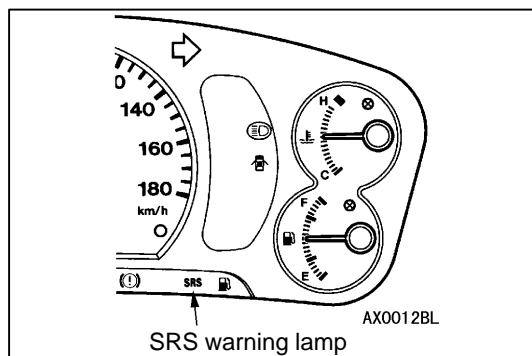
- Floor console
1. SRS-ECU

#### Installation steps

- ▶B◀ • Post-installation inspection
  - Negative (–) battery cable connection
1. SRS-ECU
- Floor console

**INSTALLATION SERVICE POINTS****►A◄ SRS-ECU INSTALLATION****Caution**

The SRS may not activate if SRS-ECU is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.

**►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 5 seconds after turning OFF?
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**

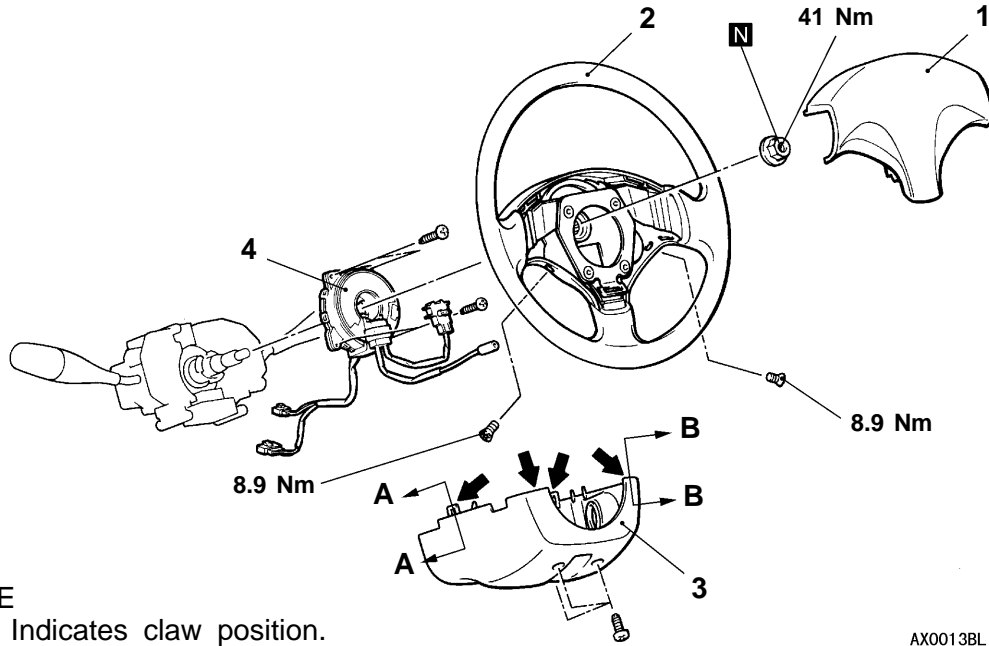
1. Disconnect the battery (–) terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it. (Refer to P.52B-3.)
2. Never attempt to disassemble or repair the air bag modules or clock spring. If faulty, replace 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. Both driver's side and front passenger's side air bag modules should be replaced with new ones once the respective air bags were deployed. The clock springs should also be checked and replaced with new ones if considered abnormal.
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-32.)

**REMOVAL AND INSTALLATION**

**<Air bag module (driver’s side), clock spring>**

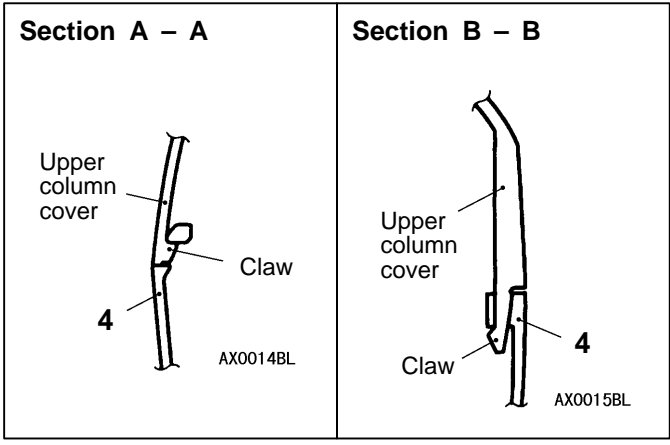
**Pre-removal Operation**

- After setting the steering wheel and the front wheels to the straight ahead position, remove the ignition key.
- Battery negative (-) terminal disconnection



**NOTE**  
 ← : Indicates claw position.

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**Driver’s side air bag module removal steps**



1. Driver’s side air bag module

**Clock spring removal steps**



1. Driver’s side air bag module



2. Steering wheel
3. Lower column cover



4. Clock spring

**Driver’s side air bag module installation steps**



- Pre-installation inspection
- 1. Driver’s side air bag module
- Negative (-) battery cable connection
- Post-installation inspection



**Clock spring installation steps**



- Pre-installation inspection
- 4. Clock spring



- 3. Lower column cover
- 2. Steering wheel

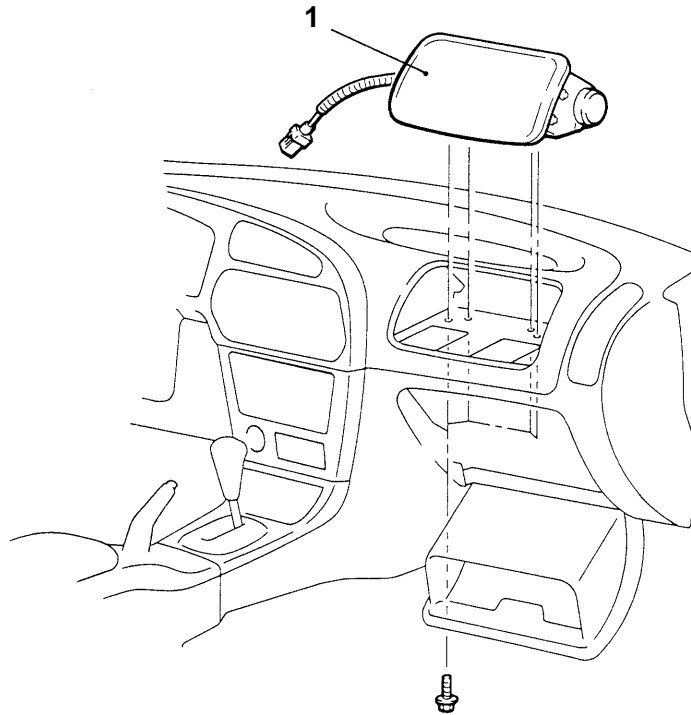


- 1. Driver’s side air bag module
- Negative (-) battery cable connection
- Post-installation inspection





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



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**Front passenger’s side air bag module removal steps**

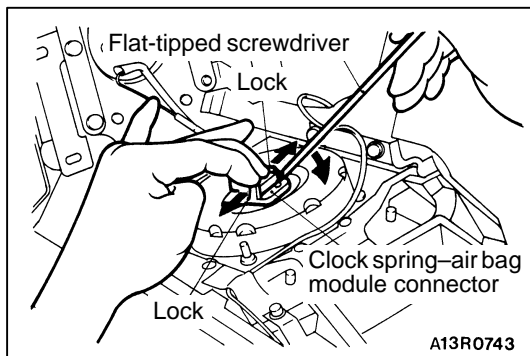


1. Front passenger’s side air bag module

**Front passenger’s side air bag module installation steps**



- Pre-installation inspection
  - 1. Front passenger’s side air bag module
  - Negative (-) battery cable connection
- ▶D◀
- Post-installation inspection



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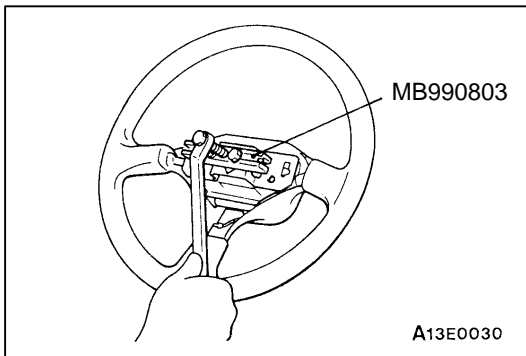
**REMOVAL SERVICE POINTS**

◀A▶ **AIR BAG MODULE REMOVAL (DRIVER’S SIDE)**

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

**Caution**

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



### ◀B▶ STEERING WHEEL REMOVAL

### ◀C▶ CLOCK SPRING REMOVAL

#### Caution

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

### ◀D▶ AIR BAG MODULE REMOVAL (FRONT PASSENGER'S SIDE)

#### Caution

The removed air bag module should be stored in a clean, dry place with the pad cover face up.

## INSTALLATION SERVICE POINTS

### ▶A◀ PRE-INSTALLATION INSPECTION

1. When installing the new air bag modules and clock spring, refer to "INSPECTION".

#### Caution

**Dispose of air bag modules only according to the specified procedure. (Refer to P.52B-32.)**

2. Connect the battery (-) terminal.
3. Connect the MUT-II to the diagnosis connector.

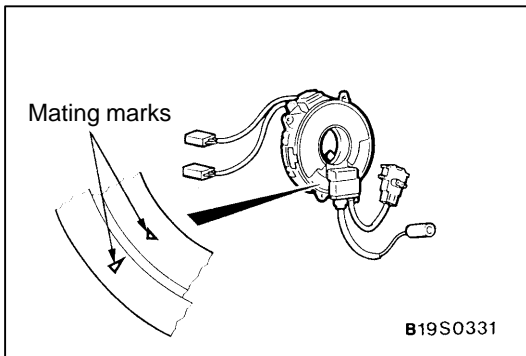
#### Caution

**Make certain that the ignition switch is LOCK (OFF) when the MUT-II is connected or disconnected.**

4. Turn the ignition key to the "ON" position.
5. Conduct self-diagnosis using the MUT-II to ensure entire SRS operates properly, except open circuit of air bag modules.
6. Turn the ignition key to the LOCK (OFF) position, disconnect the negative battery cable and tape the terminal.

#### Caution

**Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3.)**



### ►B◄ CLOCK SPRING INSTALLATION

Align the mating marks of the clock spring and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch.

#### Mating Mark Alignment

Turn the clock spring clockwise fully, and then turn back it approx. 3 4/5 turns counterclockwise to align the mating marks.

#### Caution

**If the clock spring's mating marks are not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver.**

### ►C◄ STEERING WHEEL INSTALLATION

1. Before installation the steering wheel, be sure to first turn the vehicle's front wheels to the straight-ahead position and align the mating marks of the clock spring.

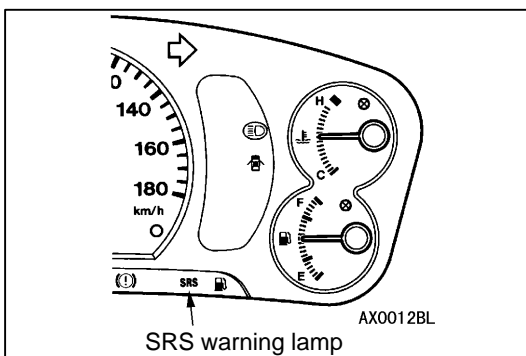
#### Caution

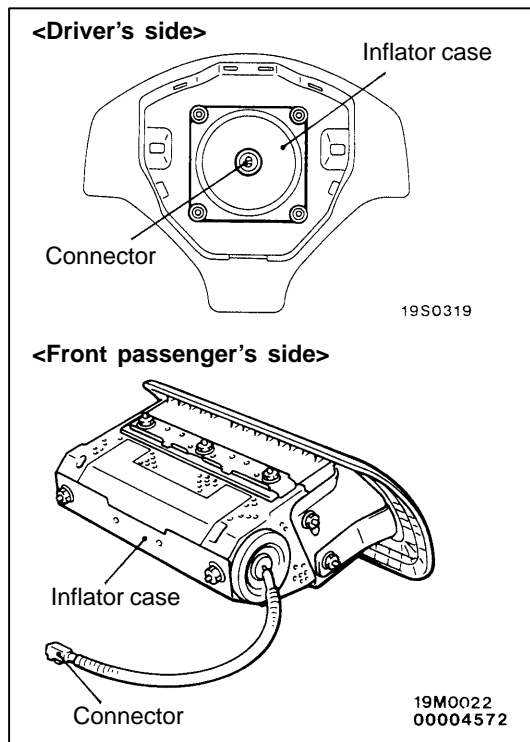
**Be sure when installing the steering wheel, that the harness of the clock spring does not become caught or tangled.**

2. After clamping, turn the steering wheel all the way in both directions to confirm that steering is normal.

### ►D◄ POST-INSTALLATION INSPECTION

1. Turn the steering wheel lightly to the left and right to check if it can be operated properly without any abnormality.
2. Reconnect the negative battery terminal.
3. Turn the ignition key to the "ON" position.
4. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 5 seconds after turning OFF?
5. If yes, SRS system is functioning properly.  
If no, consult page 52B-6.





## INSPECTION

### AIR BAG MODULE CHECK

If any improper part is found during the following inspection, replace the air bag modules with a new one. Dispose the old one according to the specified procedure. (Refer to P.52B-32.)

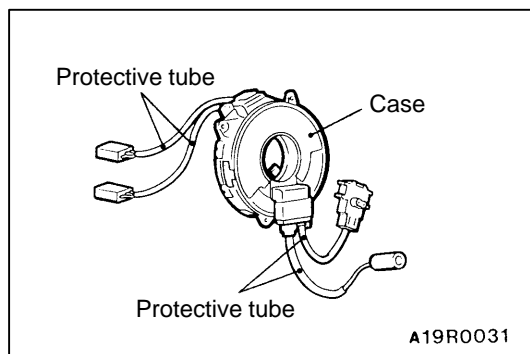
#### Caution

**Never attempt to measure the circuit resistance of the air bag modules (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bags deployment will result in serious personal injury.**

1. Check pad cover for dents, cracks or deformation.
2. Check connectors for damage, terminals for deformation, and harness for binds.
3. Check air bag inflator case for dents, cracks or deformation.
4. Install the air bag module to steering wheel to check fit or alignment with the wheel.

#### Caution

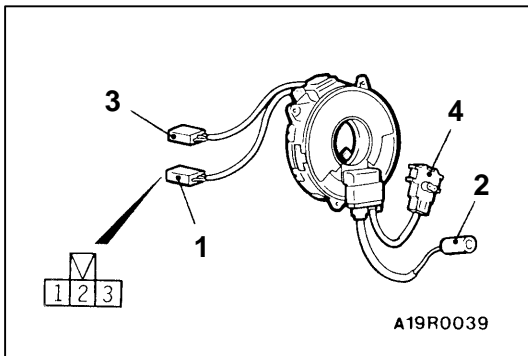
**If dents, cracks, deformation, or rust are discovered in the air bag module, replace it with a new one. Dispose of the old one according to the specified procedure. (Refer to P.52B-32.)**



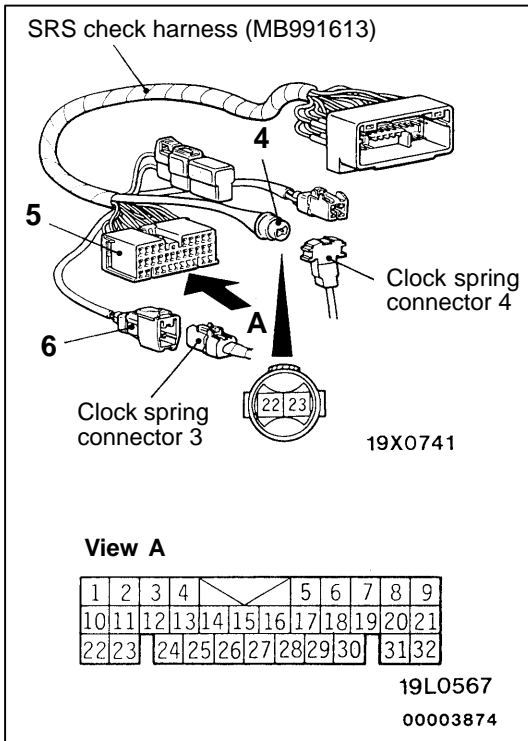
### CLOCK SPRING CHECK

If, as result of following checks, even one abnormal point is discovered, replace the clock spring with a new one.

1. Check connectors and protective tube for damage, and terminals for deformation.
2. Visually check the case for damage.



3. Check that there is continuity between terminal (3) of the clock spring No.1 connector and the No. 2 connector.



4. Joint the No.3 connector and No.4 connector of the clock spring to connector No.6 and connector No.4 respectively, of the SRS check harness.

**NOTE**

When joining SRS check harness connector No.4 align its white paint with the hollow portion of the No.4 connector of the clock spring.

5. Check for continuity between terminal 22 and terminal 25, and terminal 23 and terminal 24, of SRS Check Harness connector No. 5 using a digital multi-meter.

## AIR BAG MODULE DISPOSAL PROCEDURES

Before disposing of an air bag or a vehicle which is equipped with it, the procedures below are to be followed to deploy them.

### UNDEPLOYED AIR BAG MODULE DISPOSAL PROCEDURES

#### Caution

1. If the vehicle is to be scrapped or otherwise disposed of, deploy the air bags inside the vehicle. If the vehicle will continue to be used and only the air bag modules are to be disposed of, deploy the air bags outside the vehicle.
2. Since a large amount of smoke is produced when the air bag is deployed, avoid residential areas whenever possible.
3. Since there is loud noise when the air bags are deployed, avoid residential areas whenever possible. If anyone is nearby, give warning of the impending noise.
4. Suitable ear protection should be worn by personnel performing these procedures or by people in the immediate area.

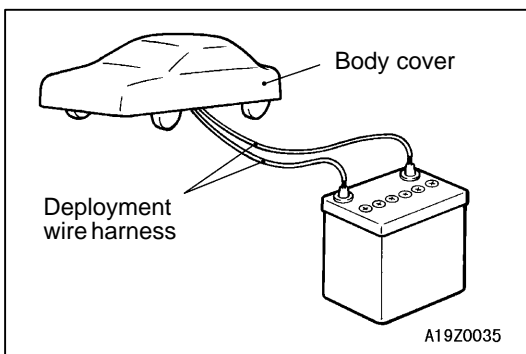
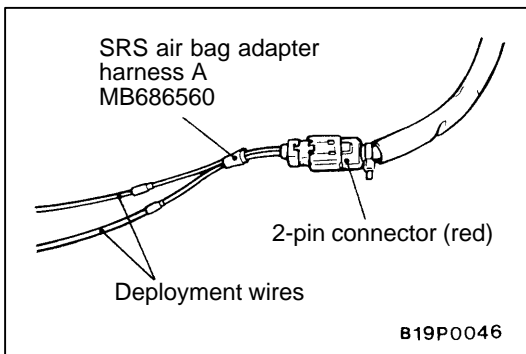
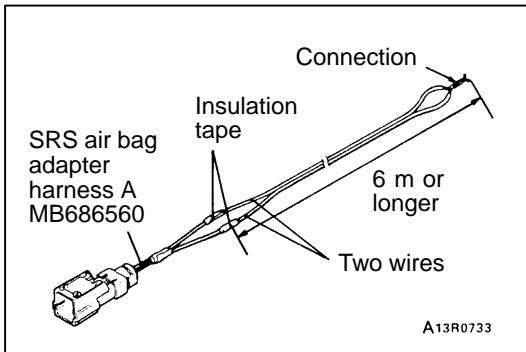
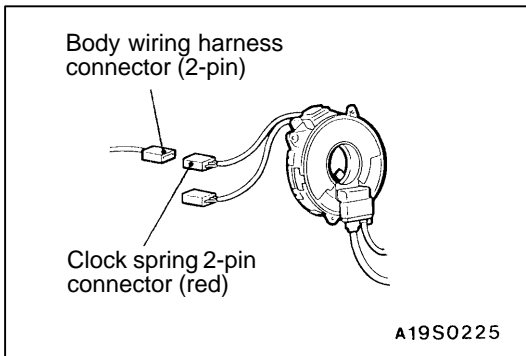
### DEPLOYMENT INSIDE THE VEHICLE

(when disposing of a vehicle)

1. Move the vehicle to an isolated spot.
2. Disconnect the negative (-) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

#### Caution

Wait at least 60 seconds after disconnecting the battery cables before doing any further work.  
(Refer to P.52B-3.)



3. Perform the following procedure to deploy each air bag module.

#### <Air bag module (driver's side)>

- (1) Remove the steering column cover lower.
- (2) Remove the connection between the clock spring 2-pin connector (red) and the body wiring harness connector.

#### NOTE

If the clock spring connector is disconnected from the body wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.

- (3) Connect two wires, each six meters or longer, to the two leads of SRS air bag adapter harness A and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.

- (4) Connect the clock spring or air bag module (front passenger's side) 2-pin connector (red) to SRS air bag adapter harness A and pass the deployment wires out of the vehicle.

- (5) Shut all the doors with their window glasses closed and cover the vehicle with a body cover to suppress explosion noise leaks as much as possible.

#### Caution

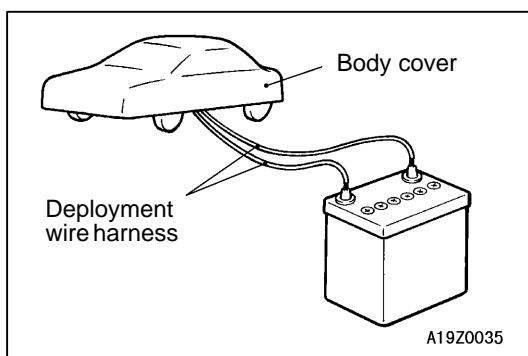
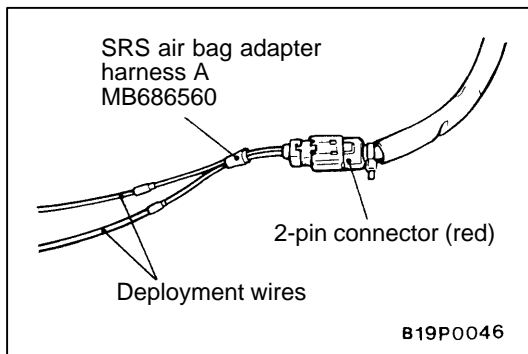
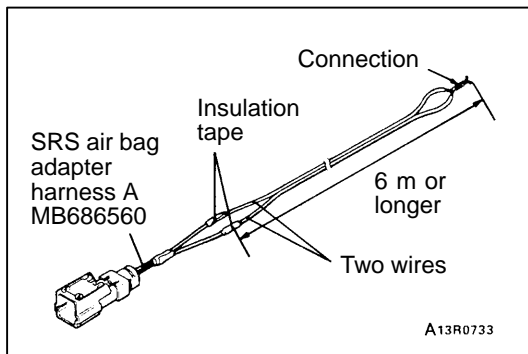
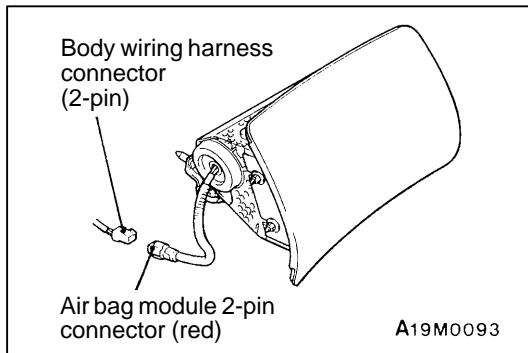
**Be sure to wrap the vehicle entirely in a body cover, otherwise damaged glass panes could break into fragments, bringing about a very dangerous situation.**

- (6) At a location as far away from the vehicle as possible, disconnect the two connected 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 deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle.
  - 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. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (P.52B-40) for post-deployment handling instructions.
  - 3) If the air bag module fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.
- (7) After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-40.)





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

- (1) Remove the glove box. (Refer to P.52B-27.)
  - (2) Remove the connection between the air bag module (front passenger's side) connector (red 2-pin) and the body wiring harness connector.
  - (3) Connect two wires, each six meters or longer, to the two leads of SRS air bag adapter harness A and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.
  - (4) Connect the clock spring or air bag module (front passenger's side) 2-pin connector (red) to SRS air bag adapter harness A and pass the deployment wires out of the vehicle.
  - (5) Shut all the doors with their window glasses closed and cover the vehicle with a body cover to suppress explosion noise leaks as much as possible.
- Caution**  
**Be sure to wrap the vehicle entirely in a body cover, otherwise damaged glass panes could break into fragments, bringing about a very dangerous situation.**
- (6) At a location as far away from the vehicle as possible, disconnect the two connected 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 deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle.
  - 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. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (P.52B-40) for post-deployment handling instructions.
  - 3) If the air bag module fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.
- (7) After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-40.)

**DEPLOYMENT OUTSIDE THE VEHICLE****Caution**

1. This should be carried out in a wide, flat area at least 6 m away from obstacles and other people.
  2. Do not perform deployment outside, if a strong wind is blowing, and if there is even a slight breeze, the air bag module should be placed and deployed downwind from the battery.
1. Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

**Caution**

**Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-4.)**

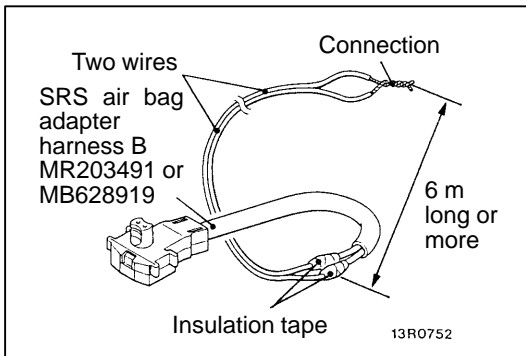
2. Perform the following procedure to deploy each air bag module.

**<Air bag module (driver's side)>**

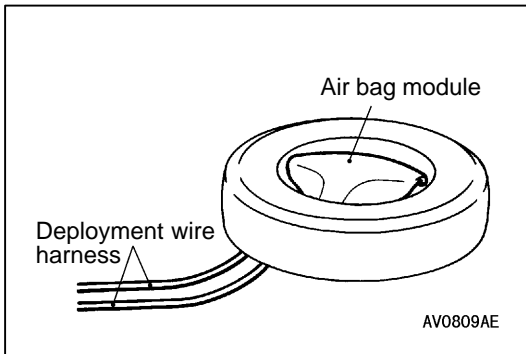
- (1) Remove the air bag module from the vehicle. (Refer to P.52B-26.)

**Caution**

**The connector of the driver's side air bag module is so constructed that the positive and negative terminals are automatically short-circuited when it is disconnected to prevent an accidental deployment of the air bag resulting from static electricity generation. Nevertheless, to eliminate the slightest possibility of an accidental deployment, always bear the following in mind; the air bag module should be stored on a flat surface and placed so that the pad cover face up. Anything should not be placed on top of it.**



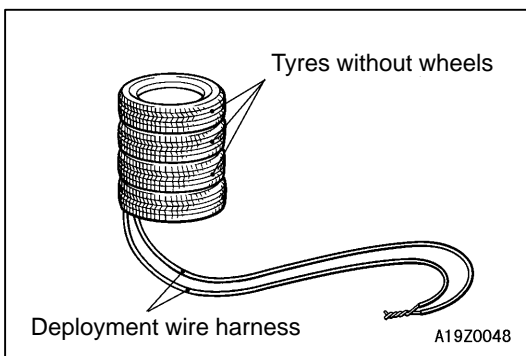
- (2) Connect two wires, each six meters or longer, to the two leads of SRS air bag adapter harness B <driver's side>, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.



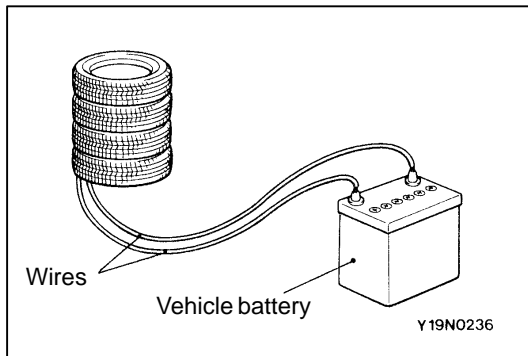
- (3) Take the SRS air bag adapter harness B that is connected to the wires, pass it beneath the old tyre wheel assembly, and connect it to the air bag module.
- (4) Pass the thick wire through the air bag module mounting hole, and then secure the air bag module to an old tyre with a wheel in it so that the pad on the module is facing upwards.

#### Caution

Leave some space below the wheel for the adaptor harness. If there is no space, the reaction when the air bag deploys could damage the adaptor harness.



- (5) Place three old tyres with no wheels on top of the tyre secured to the air bag module.



- (6) At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected 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

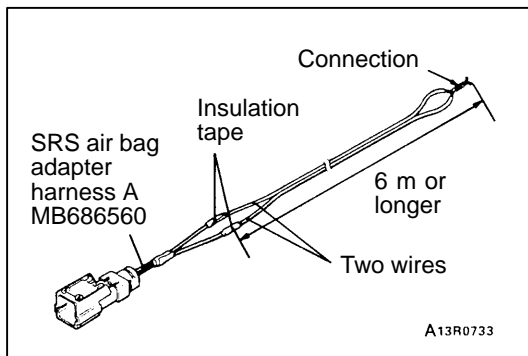
- 1) **Before deployment, check carefully to be sure that no one is nearby.**
  - 2) **The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (P.52B-40) for post-deployment handling instructions.**
  - 3) **If the air bag fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.**
- (7) After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-40.)

## &lt;Air bag module (front passenger's side)&gt;

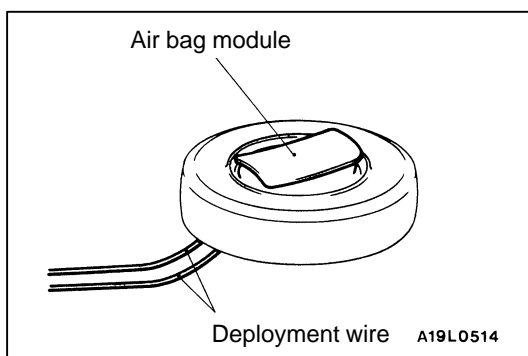
- (1) Remove the air bag module from the vehicle.  
(Refer to P.52B-27.)

**Caution**

The connector of the front passenger's side air bag module is so constructed that the positive and negative terminals are automatically short-circuited when it is disconnected to prevent an accidental deployment of the air bag resulting from static electricity generation. Nevertheless, to eliminate the slightest possibility of an accidental deployment, always bear the following in mind; the air bag module should be stored on a flat surface and placed so that the pad cover face up. Anything should not be placed on top of it.



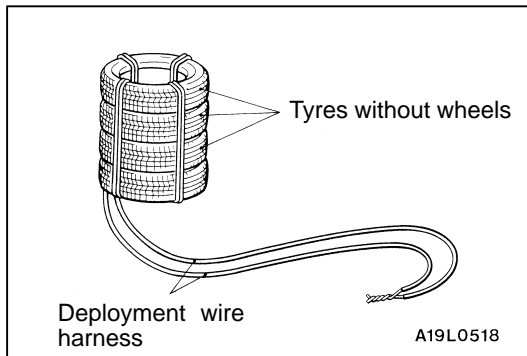
- (2) Connect two wires, each six meters or longer, to the two leads of SRS air bag adapter harness A and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.



- (3) Connect the deployment wires to the SRS air bag adaptor harness A, pass it beneath the tyre, and wheel assembly, and connect it to the air bag module.
- (4) 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**

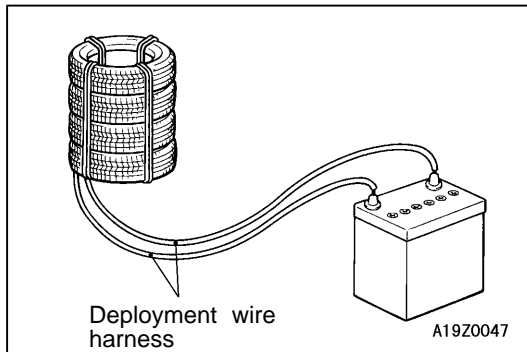
- 1) Leave some space below the wheel for the deployment wires.  
If there is no space, the reaction of the air bag deployment could result in damage of the adaptor harness.
- 2) While deployment takes place, do not have the connector of the SRS air bag adaptor harness A inserted between the tyres.



- (5) 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).

**NOTE**

The front passenger's side air bag is larger in capacity than the driver's side air bag when deployed. For this reason, it is necessary to tie up all tyres together with rope.



- (6) At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected 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**

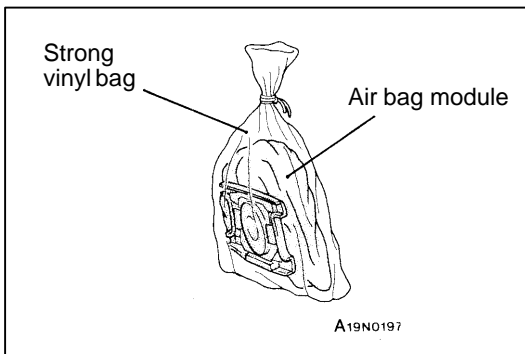
- 1) Before deployment, check carefully to be sure that no one is nearby.
  - 2) The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (P.52B-40) for post-deployment handling instructions.
  - 3) If the air bag fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.
- (7) After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures.

## DEPLOYED AIR BAG MODULE DISPOSAL PROCEDURES

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

1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it cool before attempting to handle it.
2. Do not put water or oil on the air bag after deployment.

3. There may be, adhered to the deployed air bag module, material that could irritate the eye and/or skin, so wear gloves and safety glasses when handling a deployed air bag module. IF AFTER FOLLOWING THESE PRECAUTIONS, ANY MATERIAL DOES GET INTO THE EYES OR ON THE SKIN, IMMEDIATELY RINSE THE AFFECTED AREA WITH A LARGE AMOUNT OF CLEAN WATER. IF ANY IRRITATION DEVELOPS, SEEK MEDICAL ATTENTION.



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

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## NOTES



# CHASSIS ELECTRICAL

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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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# GENERAL

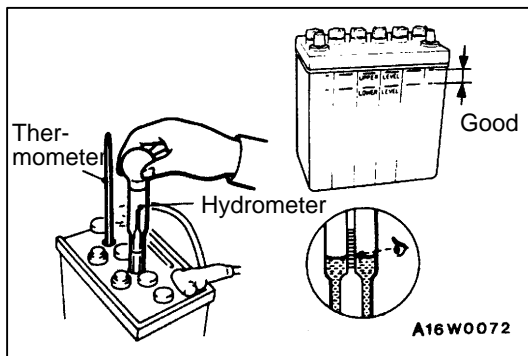
## Outline of Change

- 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**

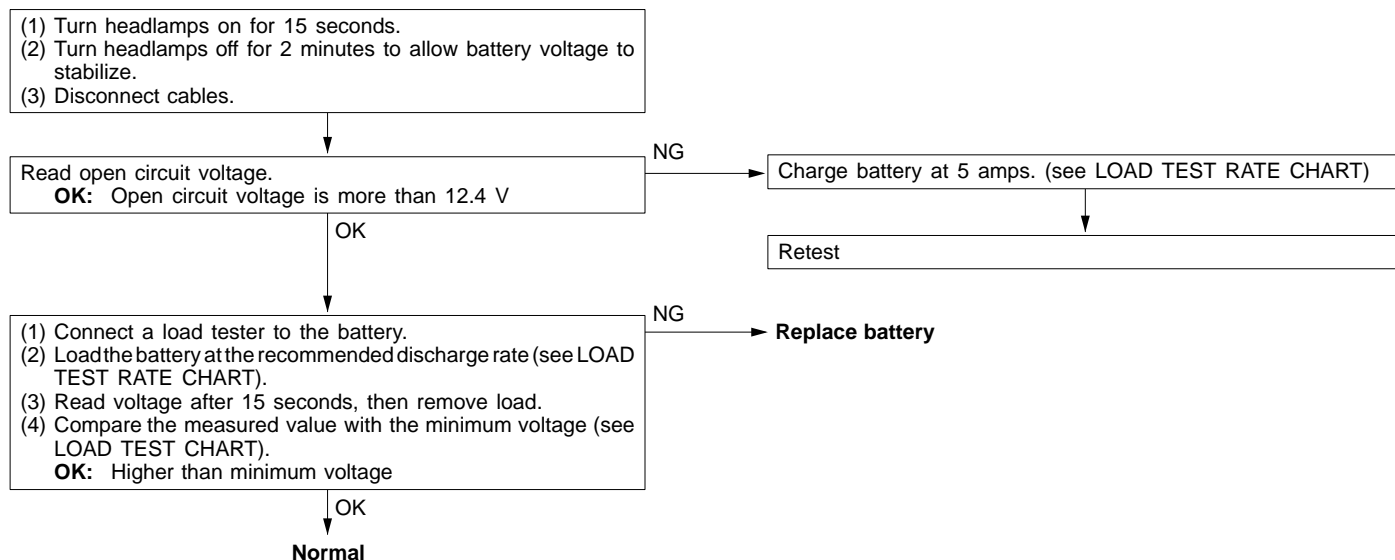
1. When charging a battery while still installed in the vehicle, disconnect the battery cables to prevent damage to electrical parts.
2. The current normally used for charging a battery should be approximately 1/10th of the battery capacity.
3. When performing a quick-charging due to lack of time, etc., 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**

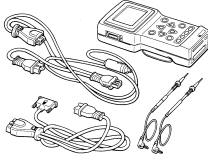
Battery type	28B19L	34B19L	44B20L	95D31L	55D23L	55B24L
Charging time when fully discharged h [5-amp rated current charging]	5	6	7	13	10	8
Load test (Amps)	120	130	160	310	170	170

**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

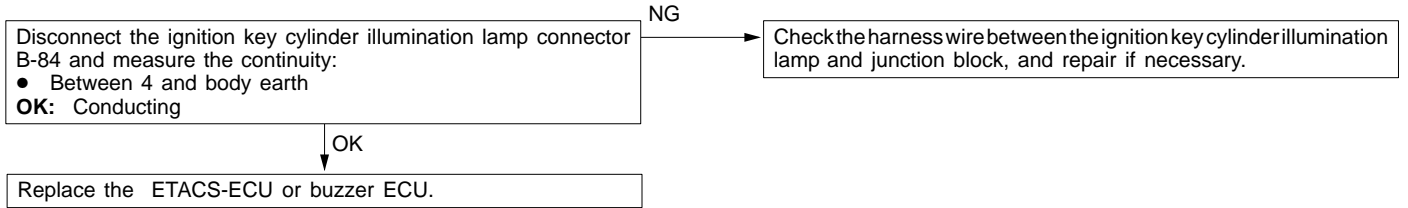
### NOTE

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**

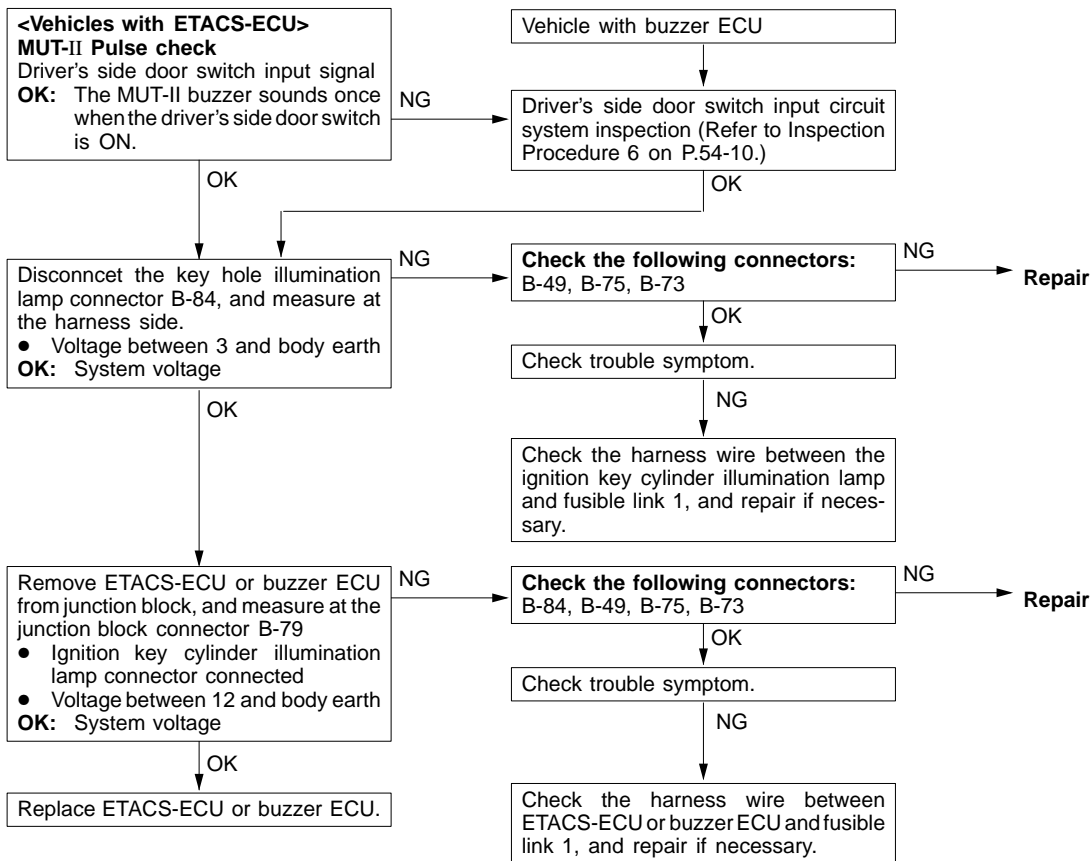
**Inspection Procedure 1**

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>



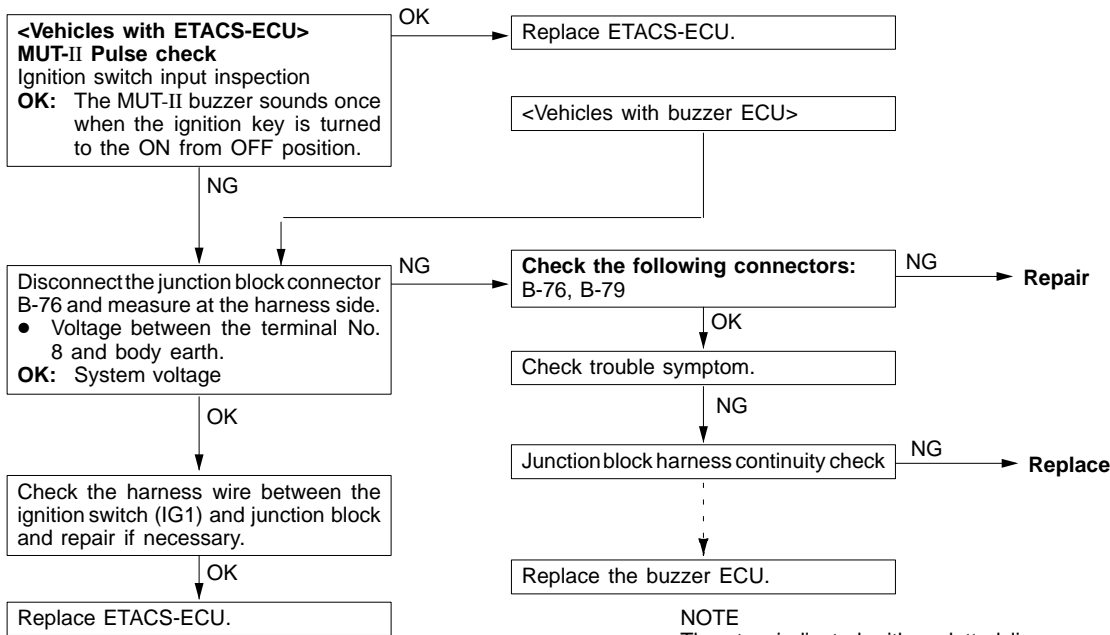
**Inspection Procedure 2**

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>

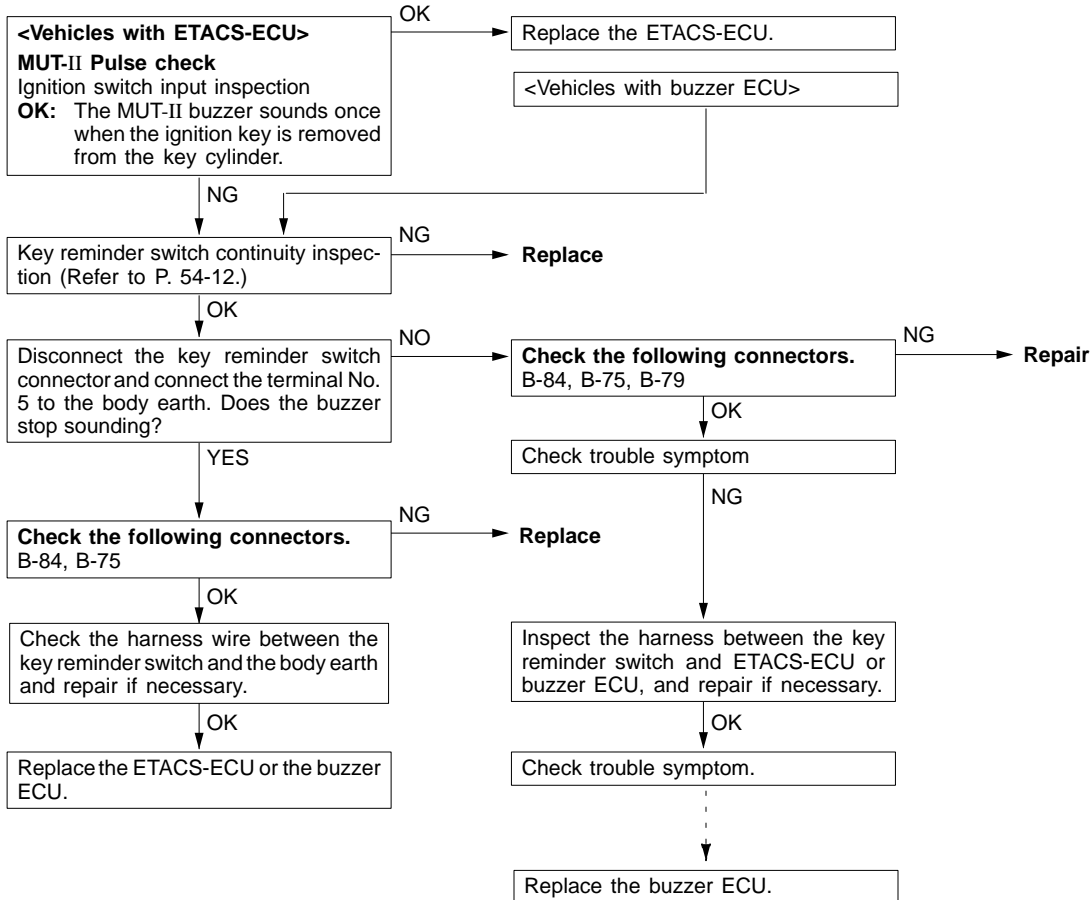


NOTE  
The stop indicated with a dotted line applies only to vehicles with buzzer ECU.



Inspection Procedure 4

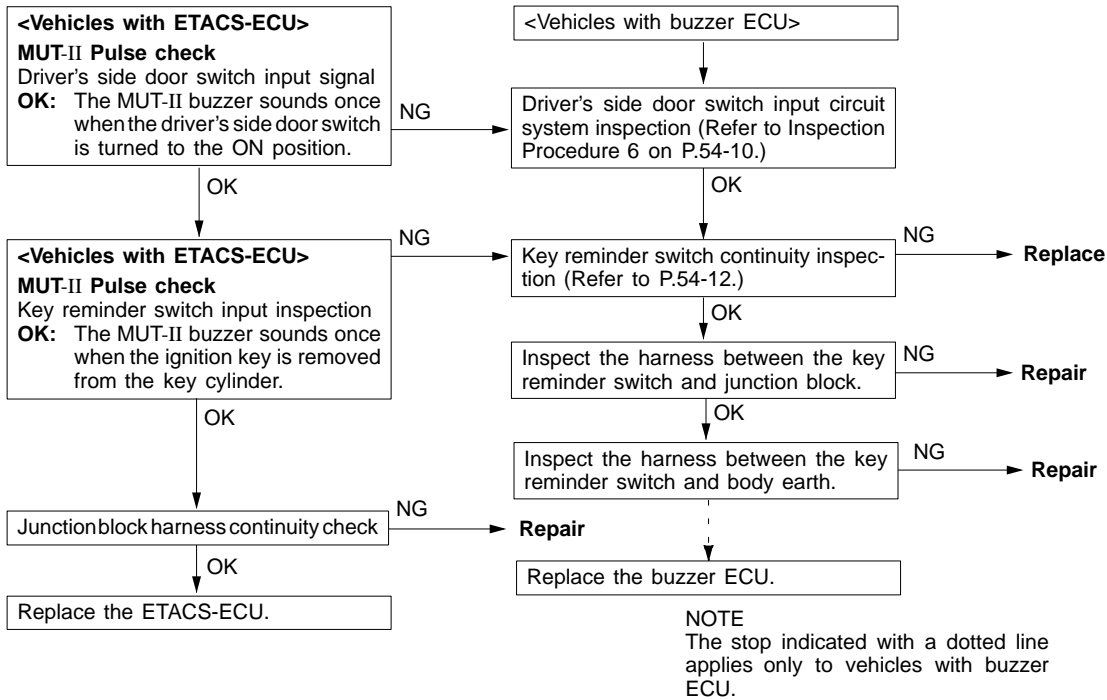
The key reminder warning buzzer dose not stop sounding even if the key is removed. (However, it stops when the driver’s side door is closed.)	Probable cause
The cause is probably a malfunction of the key reminder switch input circuit system, or a malfunction of ETACS-ECU, or a malfunction of buzzer ECU.	<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.

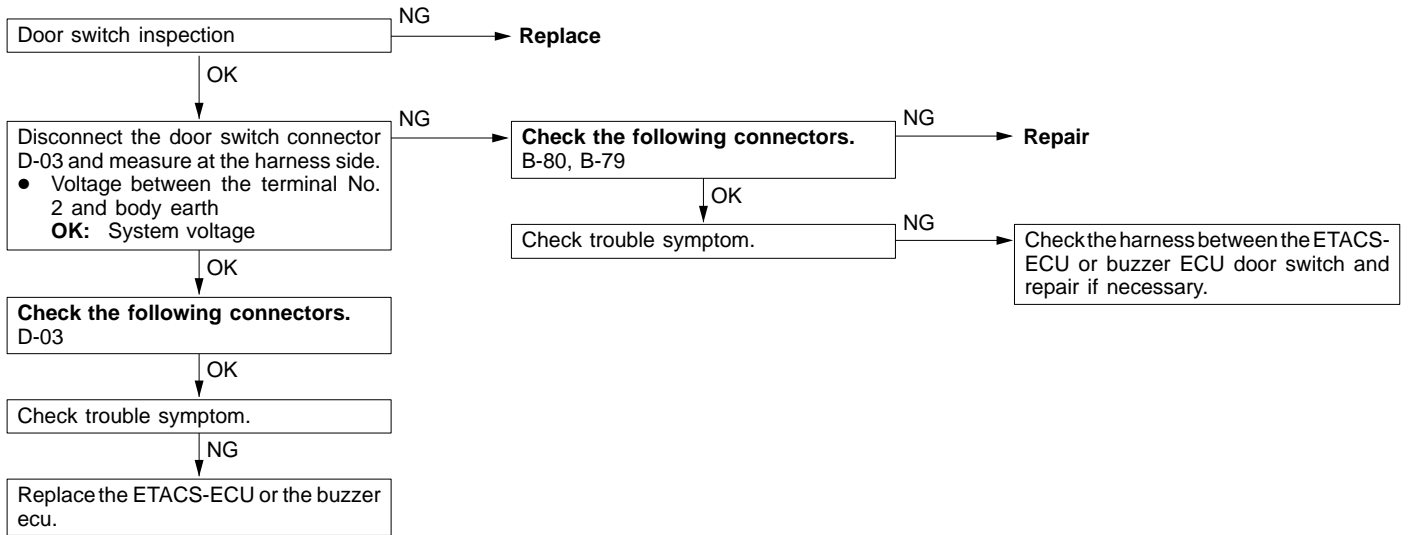
Inspection Procedure 5

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>



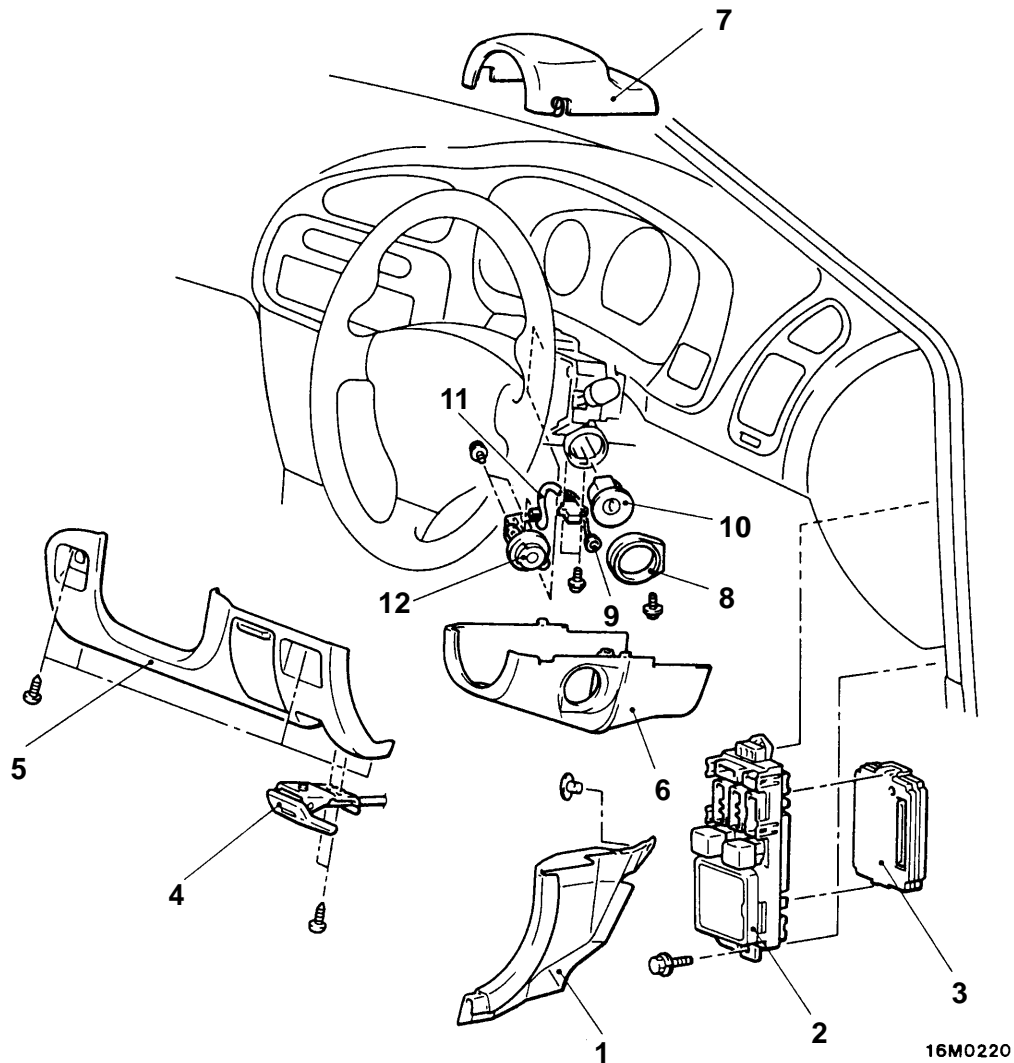
Inspection Procedure 6

Driver’s side door switch input circuit system inspection



# IGNITION SWITCH

## REMOVAL AND INSTALLATION



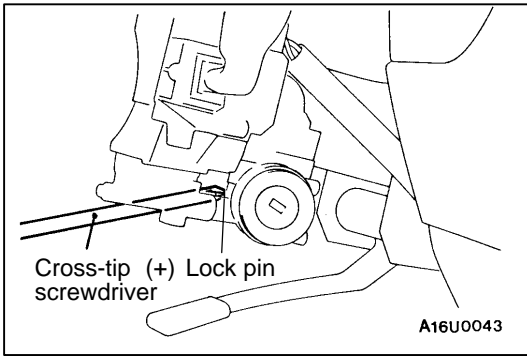
### ETACS-ECU or buzzer ECU removal steps

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

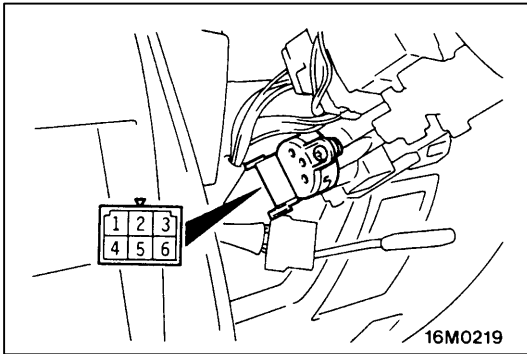




**REMOVAL SERVICE POINT**

**◀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.

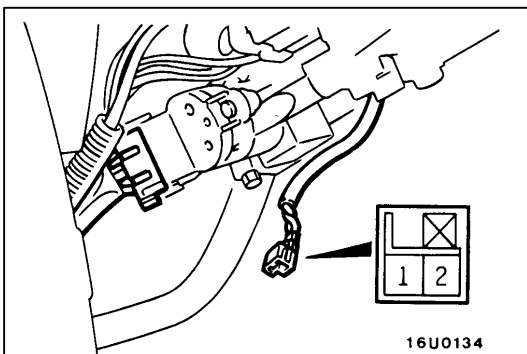


**INSPECTION**

**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

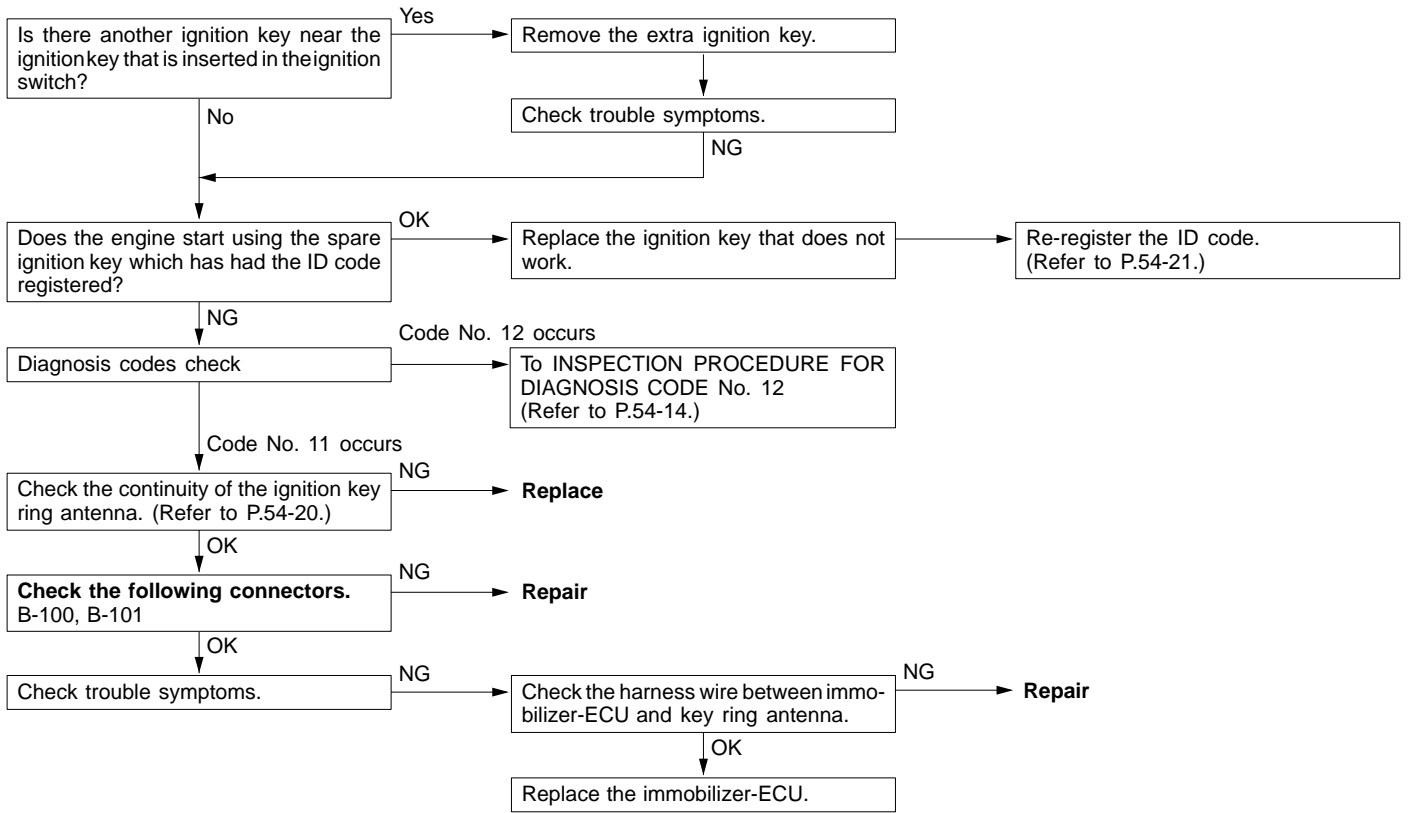
Diagnosis code No.	Inspection items	Reference page
11	Transponder communication system	54-14
12*	ID code are not the same or are not registered	54-14
21	Communication system between MUT-II and engine-ECU	54-15
31	EEPROM abnormality inside immobilizer-ECU	54-15

### NOTE

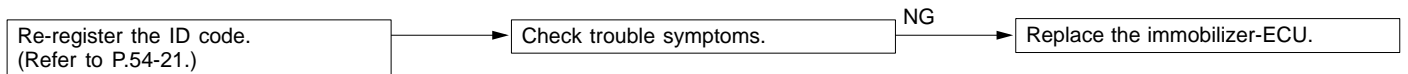
\*: Diagnosis code No. 12 is not recorded.

**INSPECTION PROCEDURE FOR DIAGNOSIS CODES**

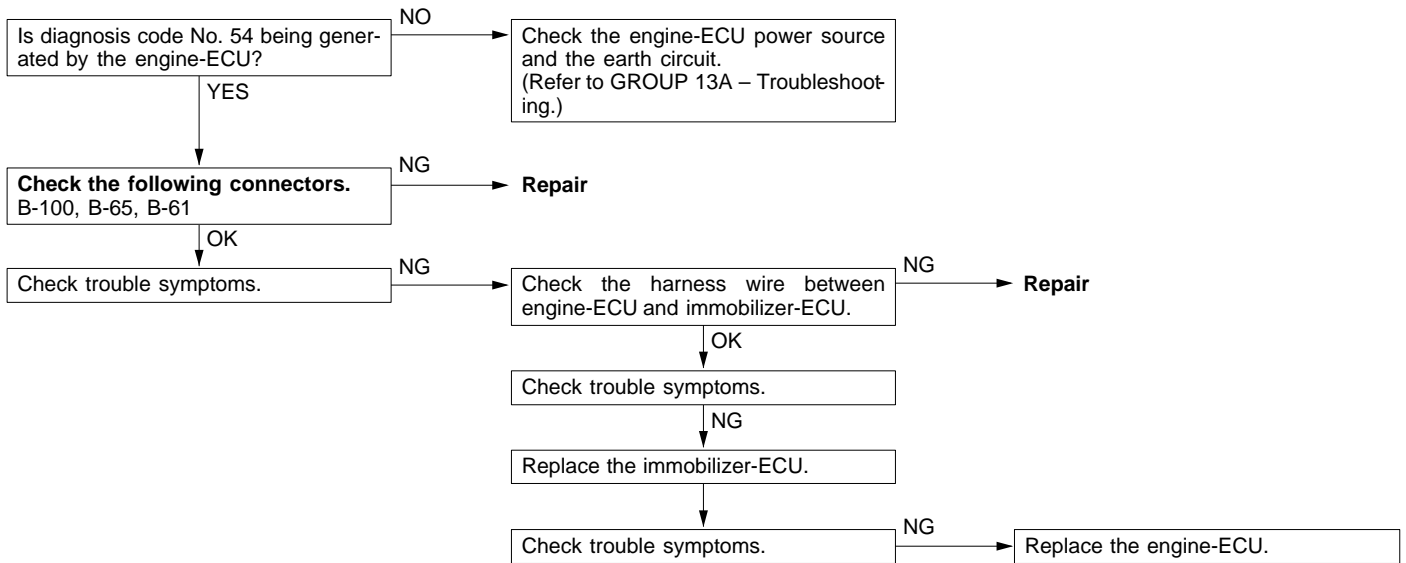
<b>Code No. 11 Transponder communication system</b>	<b>Probable cause</b>
<ul style="list-style-type: none"> <li>• The ID code of the transponder is not sent to the immobilizer-ECU immediately after the ignition switch is turned to the ON position.</li> <li>• When starting the engine, one ignition key's 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>



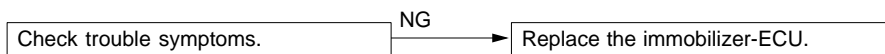
<b>Code No. 12 ID code are not the same or are not registered</b>	<b>Probable cause</b>
<p>The ID code which is sent from the transponder is not the same as the ID code which is registered in the immobilizer-ECU.</p>	<ul style="list-style-type: none"> <li>• The ID code in the ignition key being used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



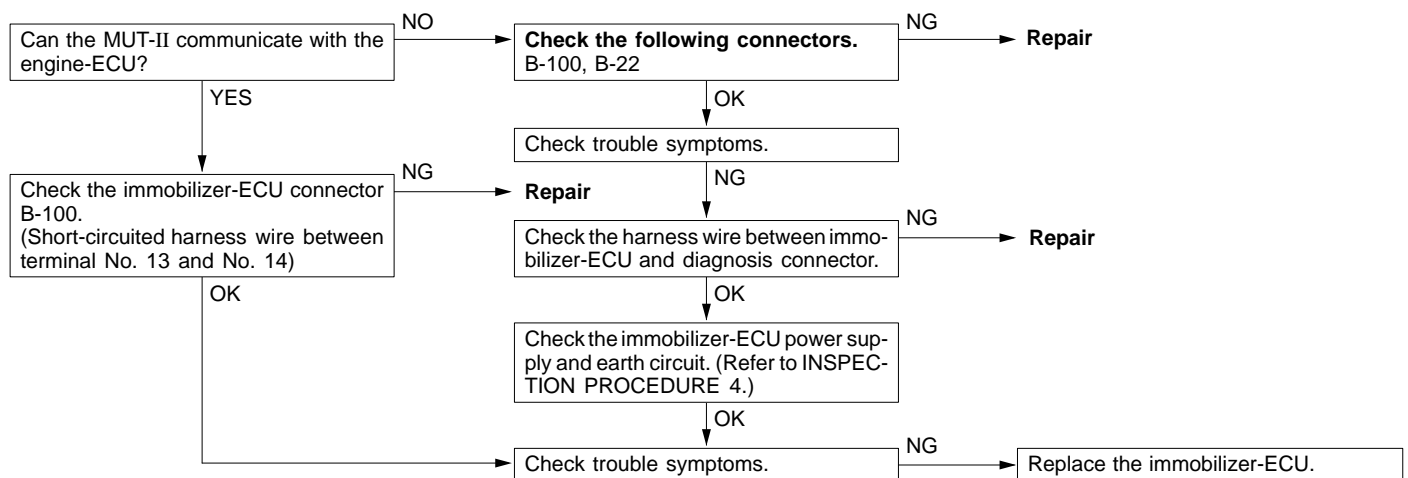
## INSPECTION CHART FOR TROUBLE SYMPTOMS

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

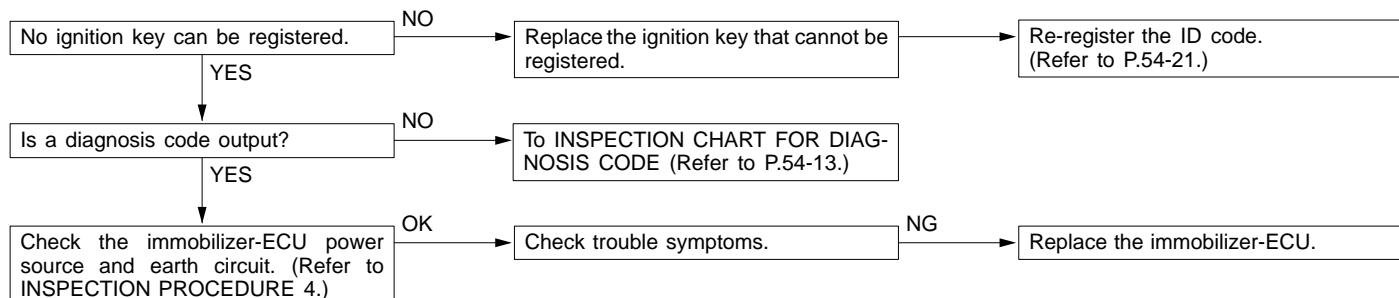
Communication with MUT-II is impossible.	Probable cause
The cause is probably that a malfunction of the diagnosis line or the immobilizer-ECU is not functioning.	<ul style="list-style-type: none"> <li>• Malfunction of the diagnosis line</li> <li>• Malfunction of harness or connector</li> <li>• Malfunction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





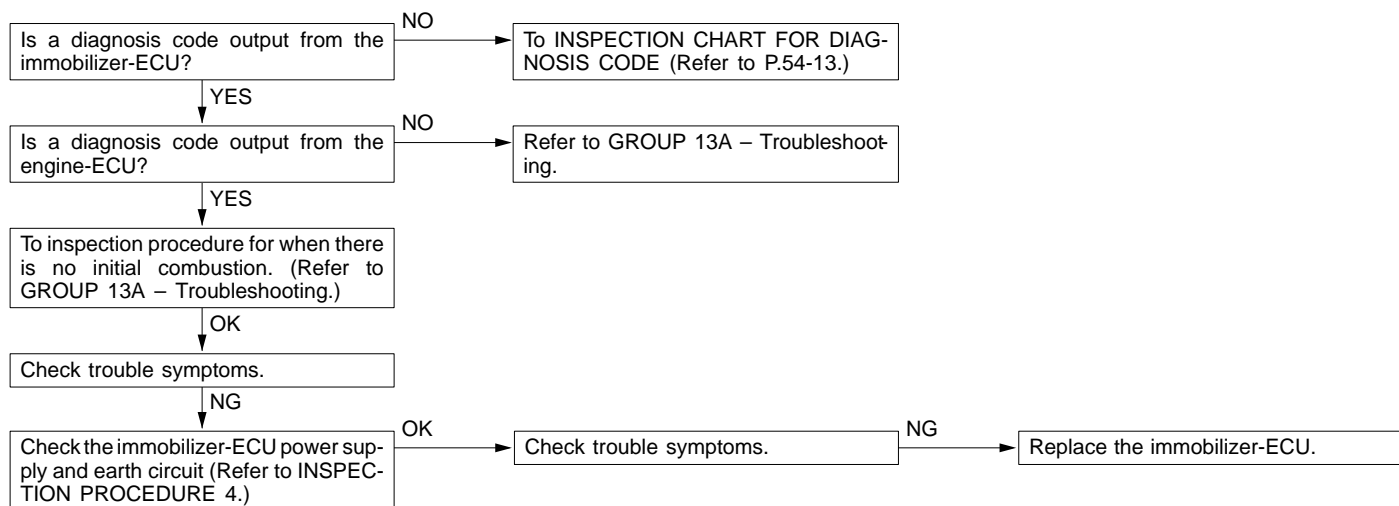
**Inspection Procedure 2**

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>



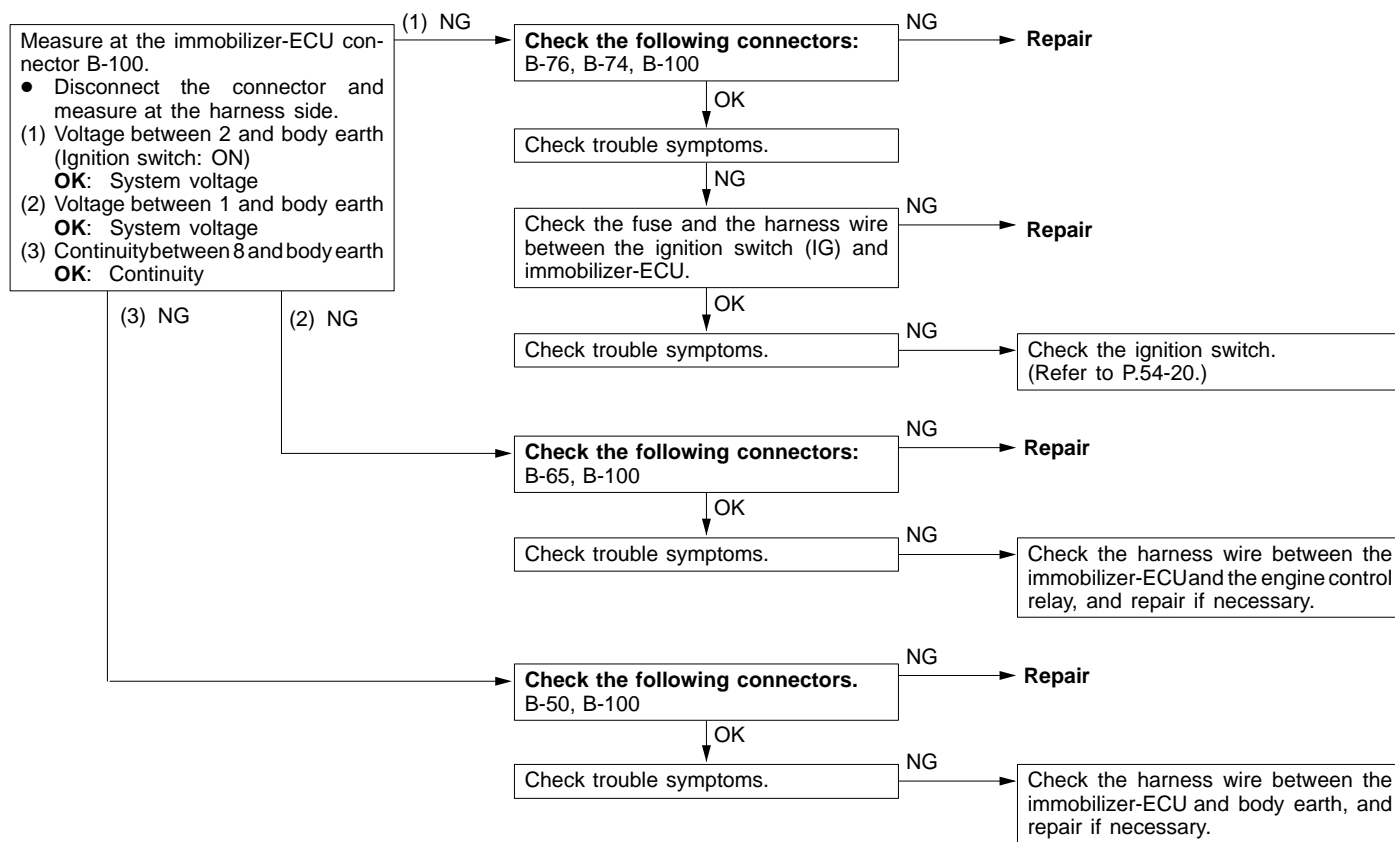
**Inspection Procedure 3**

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>

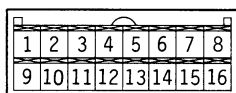


## Inspection Procedure 4

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



## CHECK AT IMMOBILIZER-ECU TERMINAL VOLTAGE CHECK CHART



16W0390

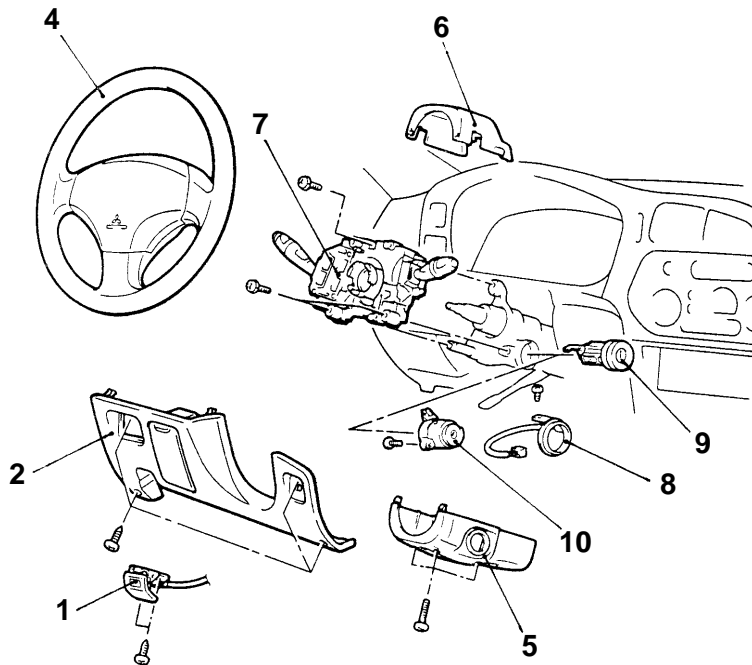
Terminal No.	Signal	Checking requirements	Terminal voltage
1	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
2	Ignition switch-IG	Ignition switch: OFF	0V
		Ignition switch: ON	System voltage
8	Immobilizer-ECU earth	Always	0V

## IGNITION SWITCH AND IMMOBILIZER SYSTEM

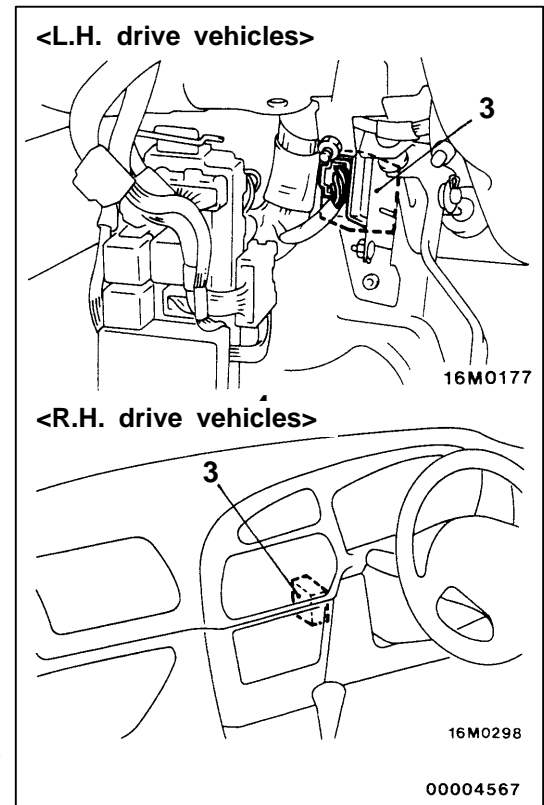
### Caution: SRS

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

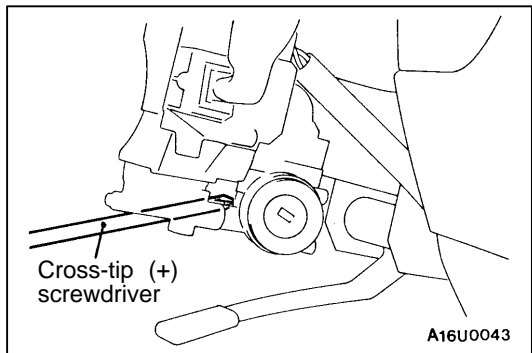
#### Immobilizer-ECU removal steps

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

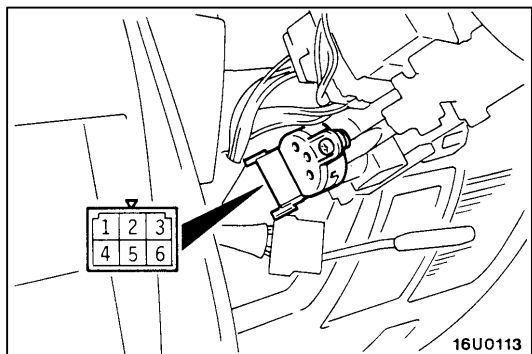
1. Hood lock release handle
2. Driver's side lower cover
4. Steering wheel
5. Column cover, lower
6. Column cover, upper
7. Column switch
8. Ignition key ring antenna
9. Steering lock cylinder
10. Ignition switch



## 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.

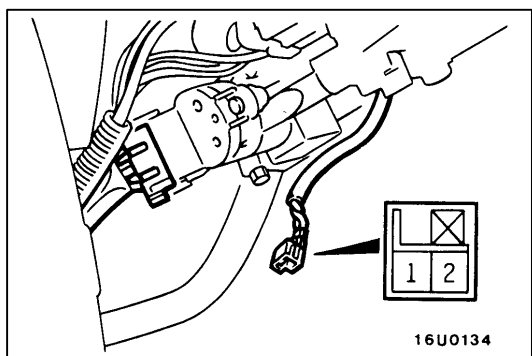


## INSPECTION

### 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.

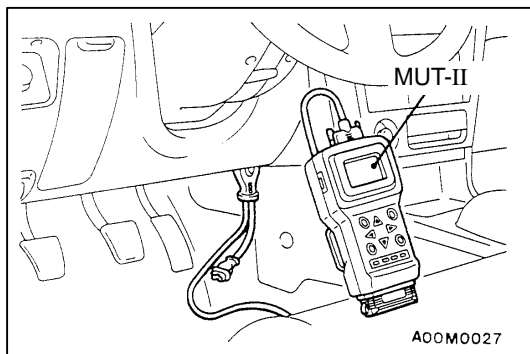
## ID CODE REGISTRATION METHOD

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

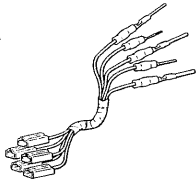
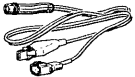


## SERVICE SPECIFICATIONS

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

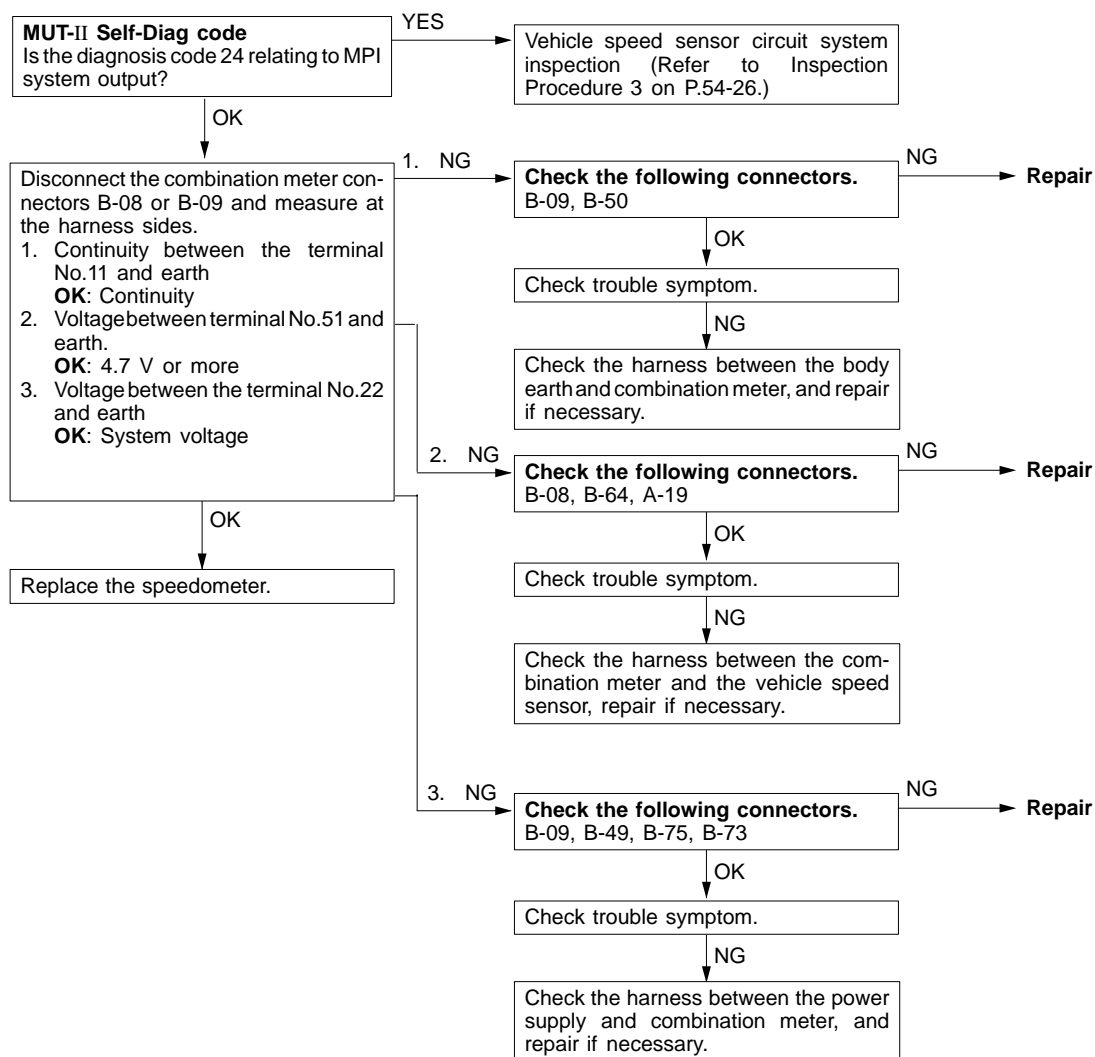
## INSPECTION CHART FOR TROUBLE SYMPTOMS

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

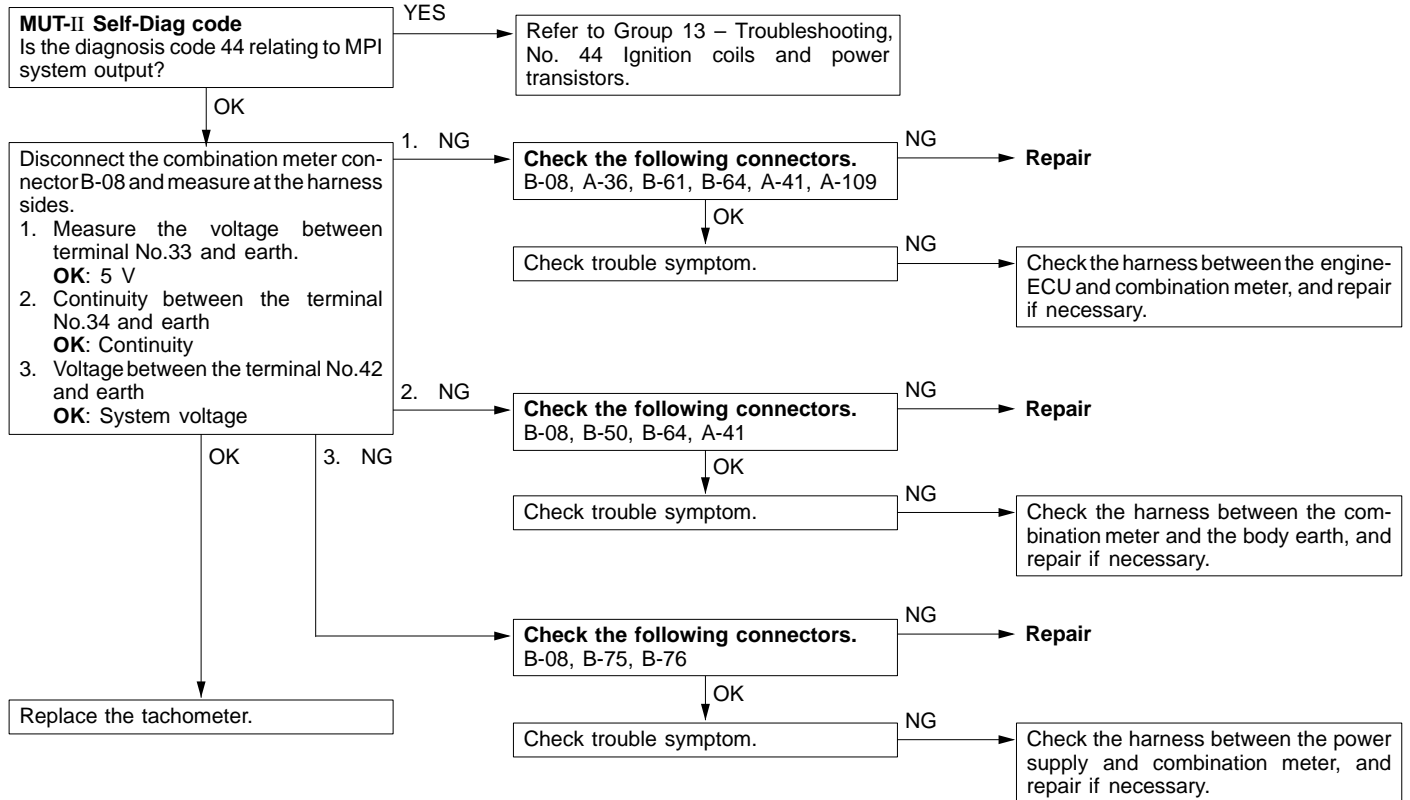
Speedometer does not work.	Probable cause
Examine the diagnosis codes registered in the engine-ECU. If no wheel speed sensor-relating diagnosis code has been output, the wheel speed sensors are in order.	<ul style="list-style-type: none"> <li>• Malfunction of vehicle speed sensor</li> <li>• Malfunction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





Inspection Procedure 2

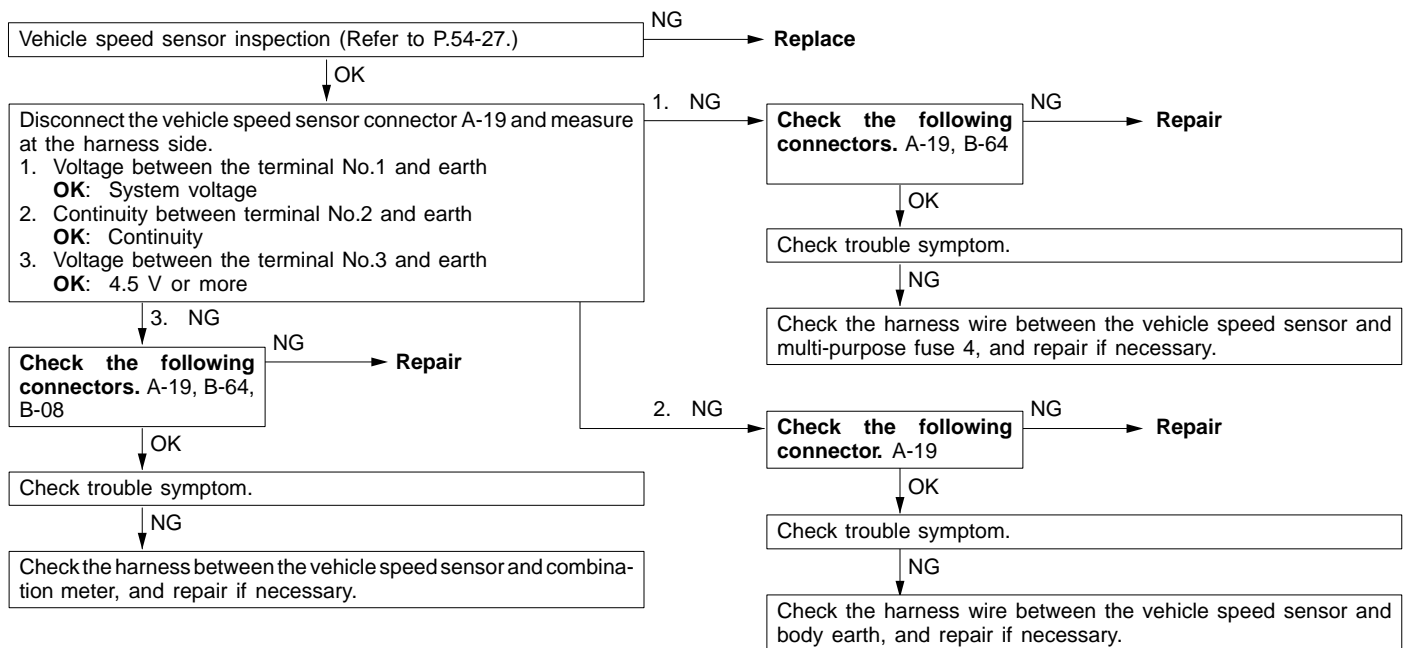
Tachometer does not work.	Probable cause
The ignition signal may not be input from the engine, or there may be a malfunction in the power supply or earth circuit.	<ul style="list-style-type: none"> <li>● Malfunction of tachometer</li> <li>● Malfunction of harness or connector</li> </ul>



## 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.

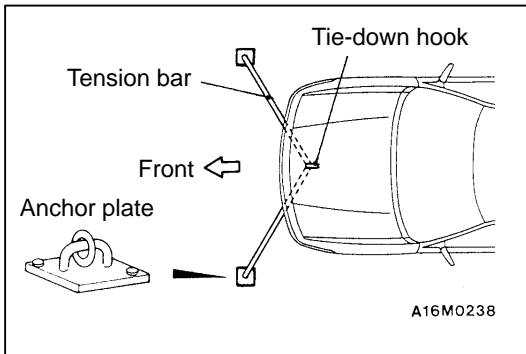
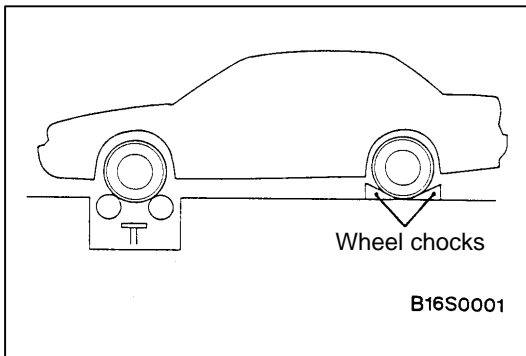
**NOTE**

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

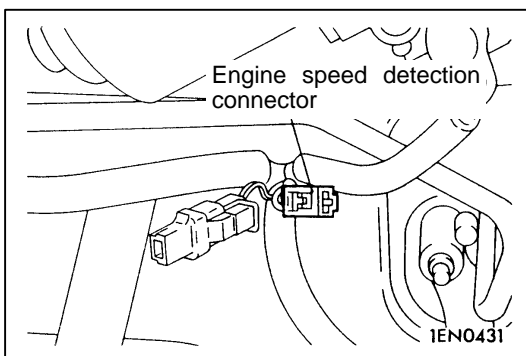
(at vehicle speeds of higher than 35 km/h)  $\pm 3$  km/h

### 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



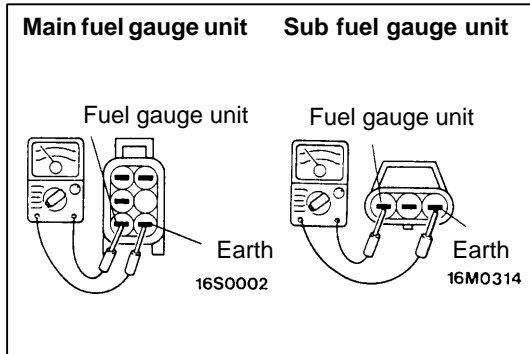
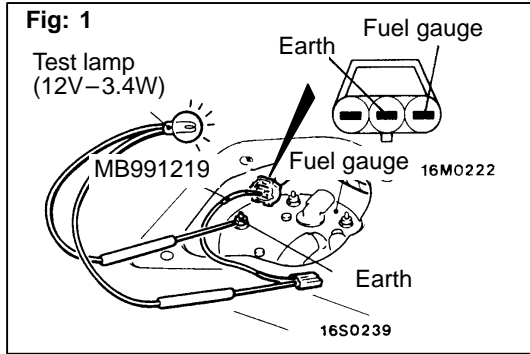
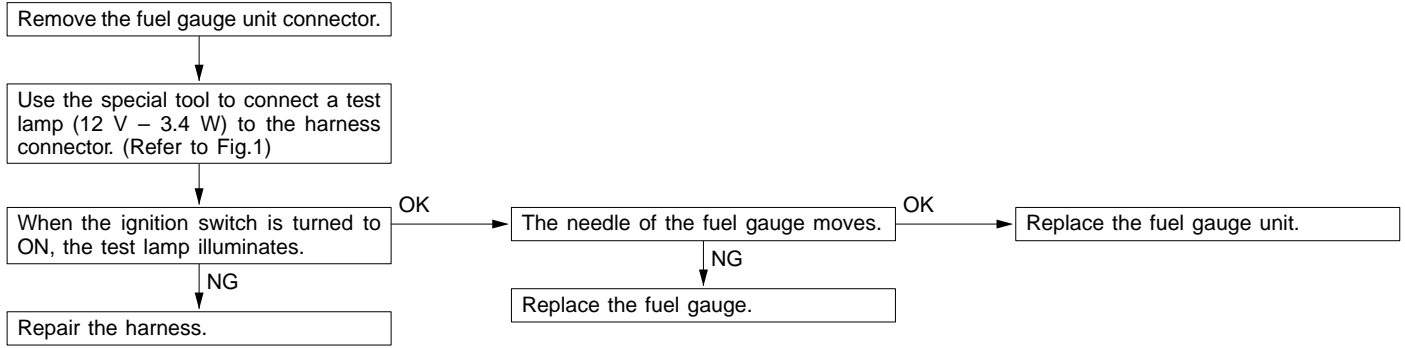
#### NOTE

\*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.

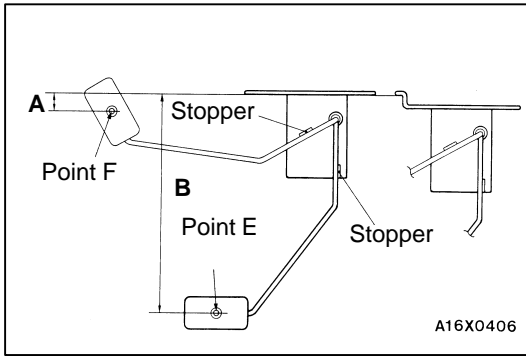
**FUEL GAUGE UNIT RESISTANCE**

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.

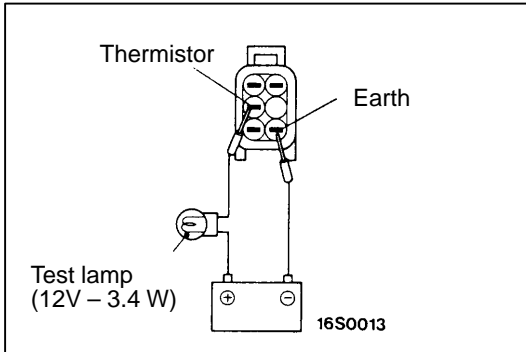


**FUEL GAUGE UNIT FLOAT HEIGHT**

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

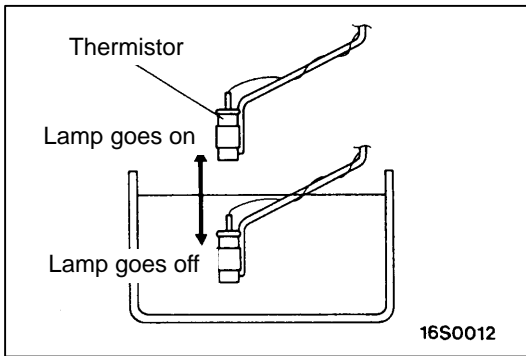
Standard value:

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



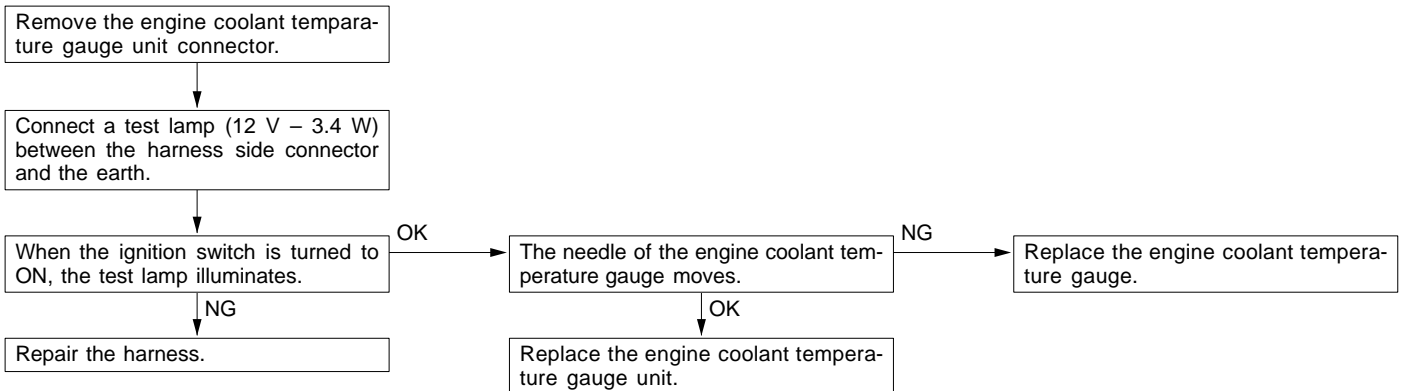
**FUEL LEVEL SENSOR (THERMISTOR)**

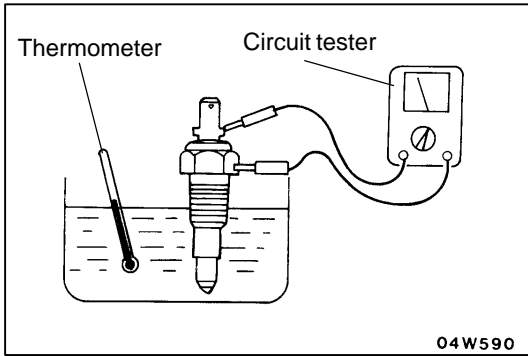
1. Connect a test lamp (12V – 3.4W) to the fuel gauge unit connector terminal and apply the battery voltage.



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**

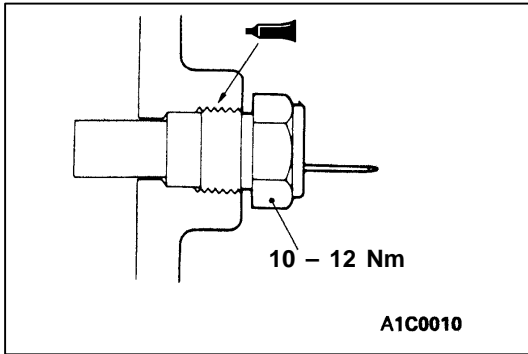




**ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK**

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**



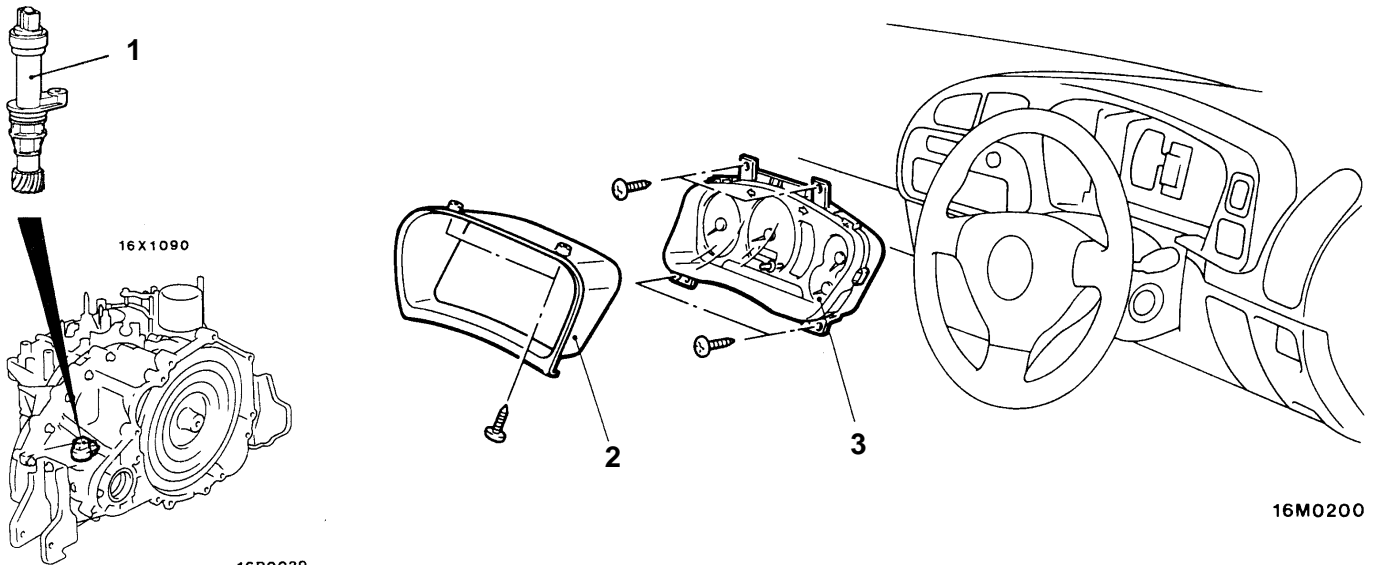
4. After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit. Then, tighten the unit to the specified torque.

**Specified sealant:**

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

5. Add engine coolant.

**COMBINATION METERS  
REMOVAL AND INSTALLATION**

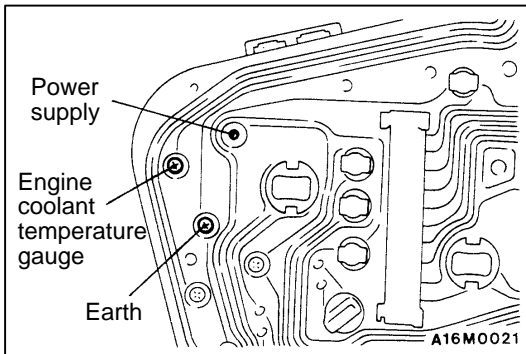
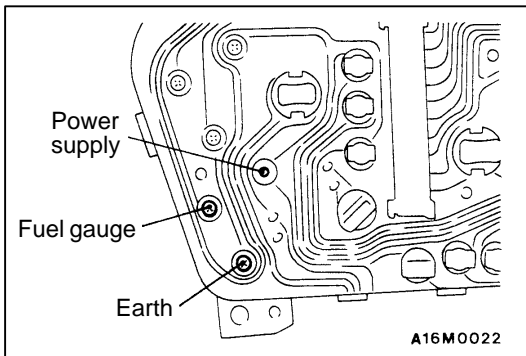


**Vehicle speed sensor removal steps**

- 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.

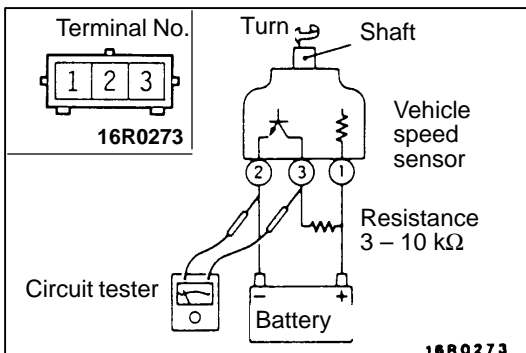
**Standard value:**

**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



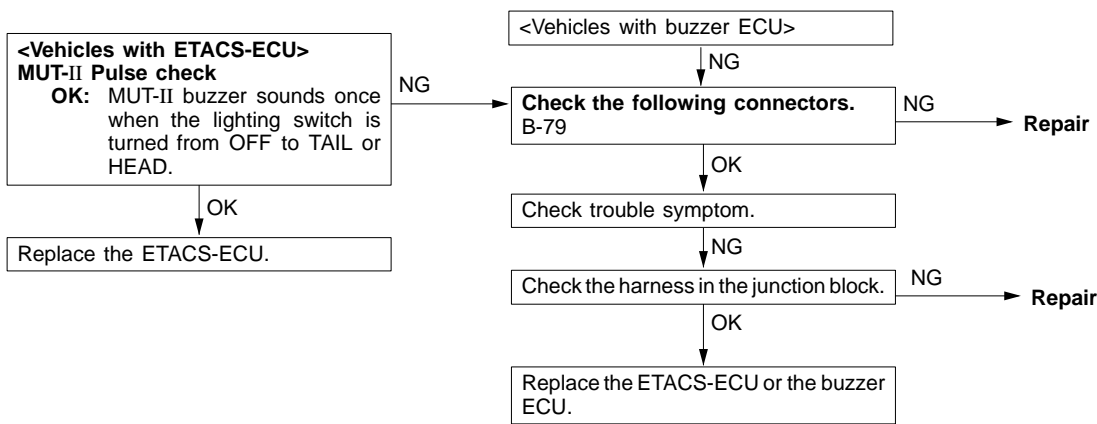
# TROUBLESHOOTING

## 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>



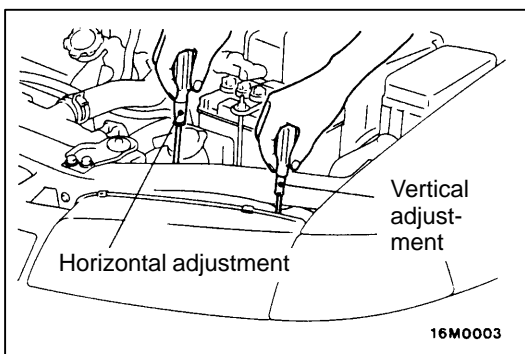
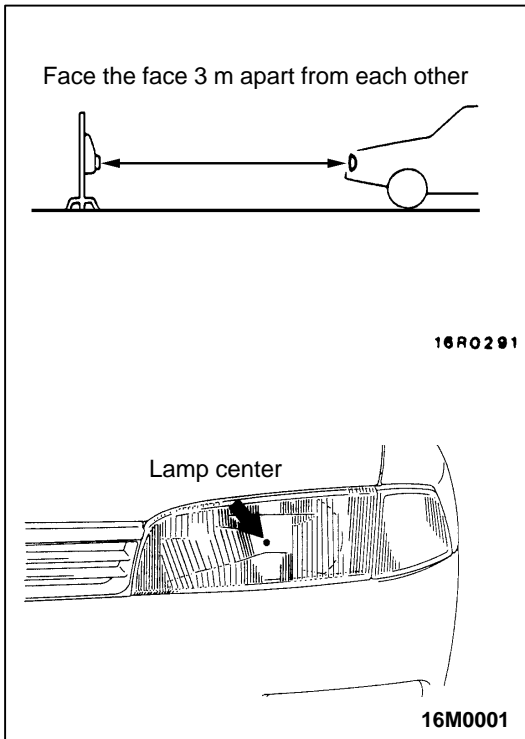
## ON-VEHICLE SERVICE

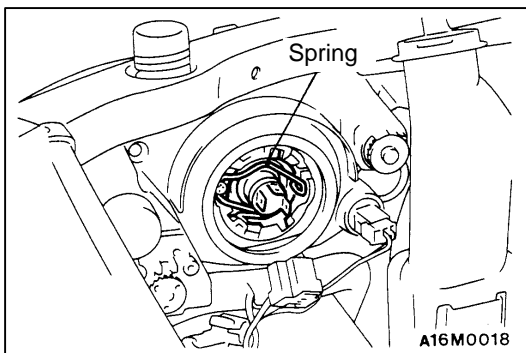
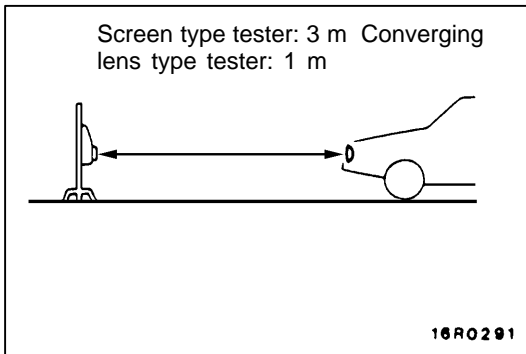
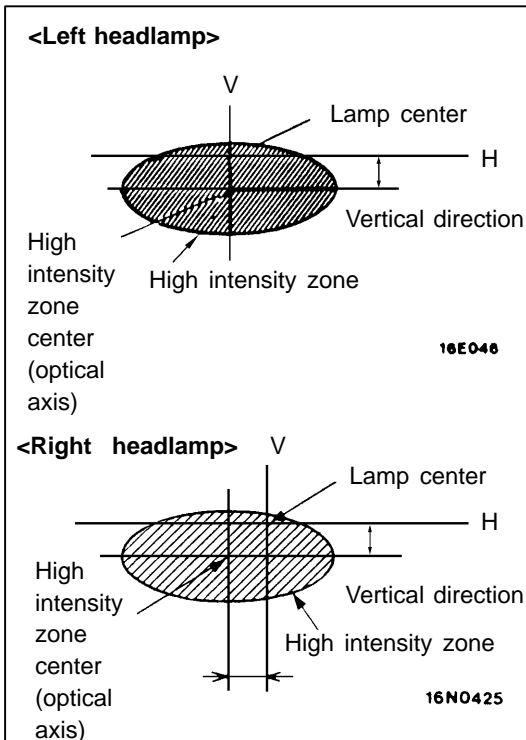
### HEADLAMP AIMING

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.





**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**

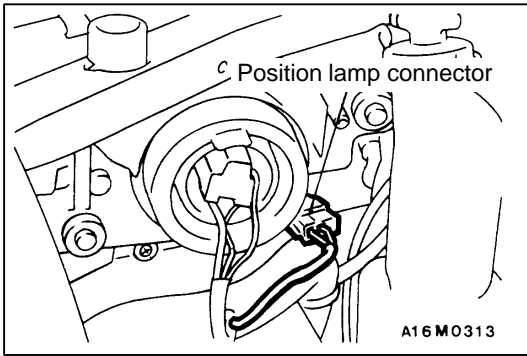
- (1) Perform intensity measurement, one headlamp at a time, with the low-beam lamp and the other headlamp disconnected from the battery unless circumstances compel otherwise. Do not leave the headlamps on for any longer than 3 minutes if their outer lenses are covered with a surface covering impervious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

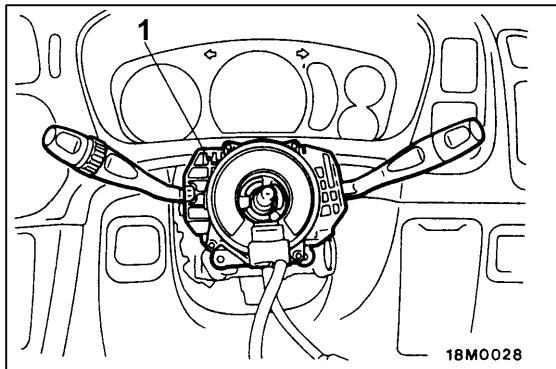
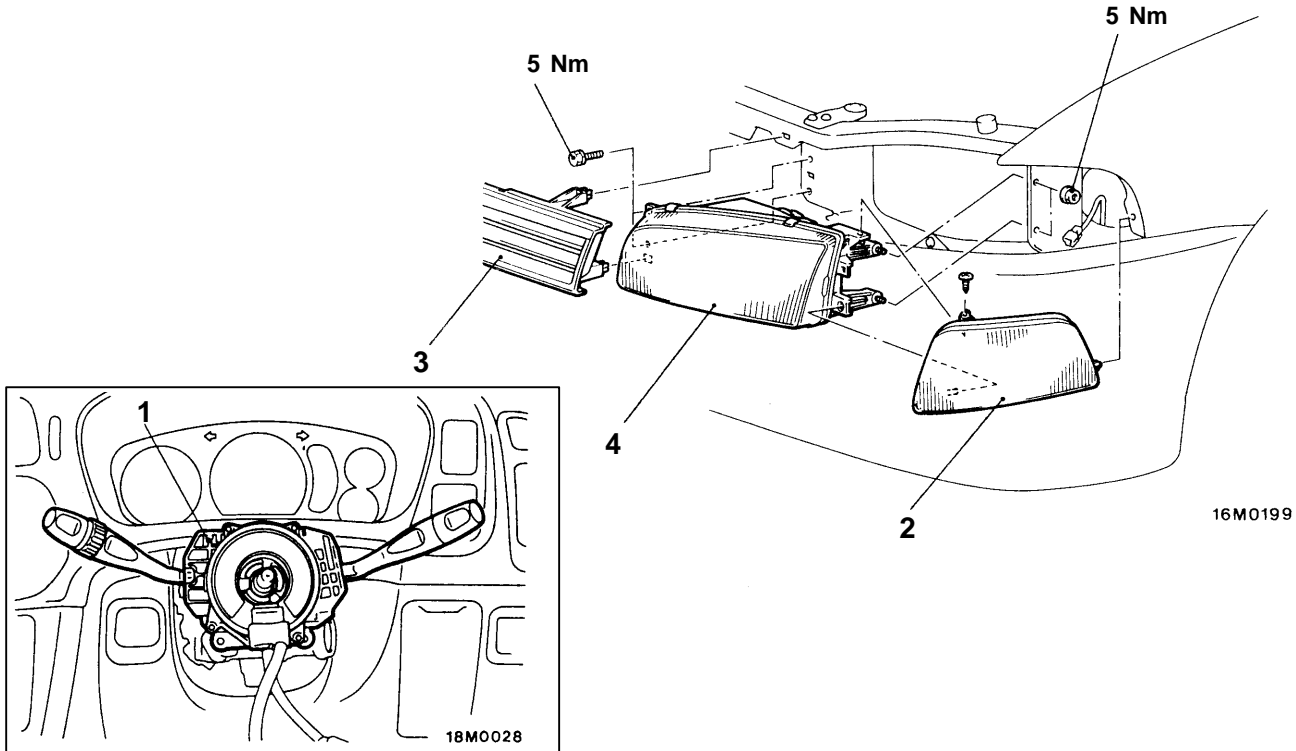
Remove the position lamp by turning it together with the lamp socket, then replace its bulb.

**HEADLAMP AND FRONT TURN-SIGNAL LAMP**

**REMOVAL AND INSTALLATION**

**CAUTION: SRS**

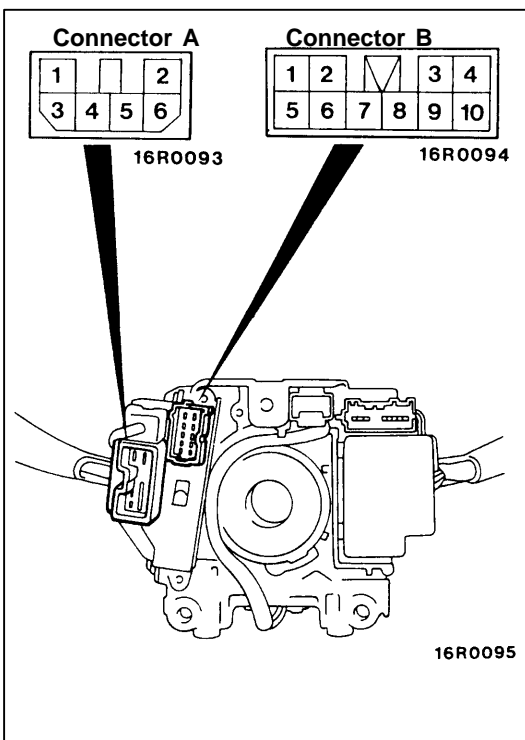
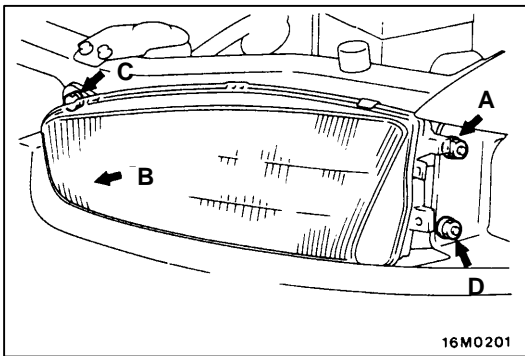
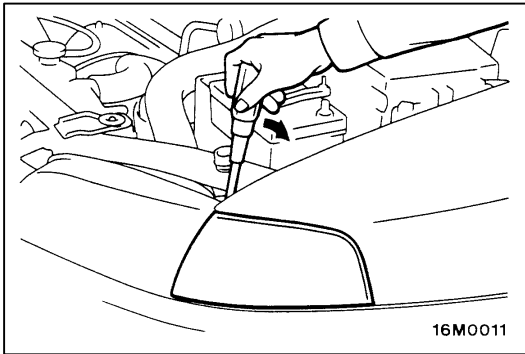
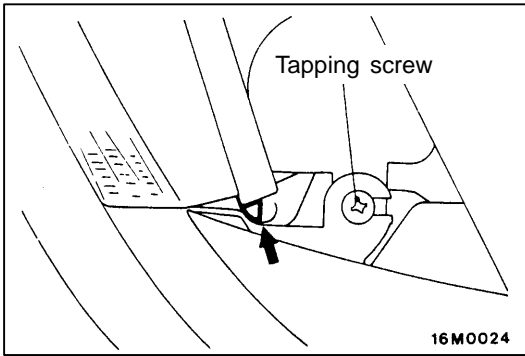
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



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**

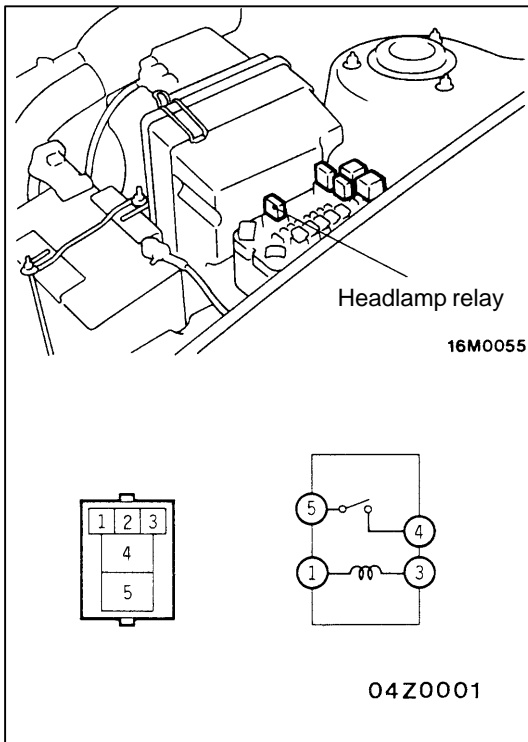
**▶A◀ HEADLAMP INSTALLATION**

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)

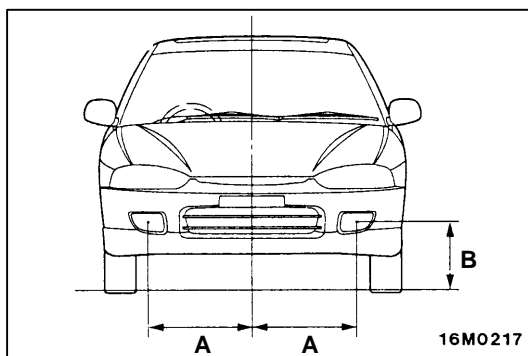
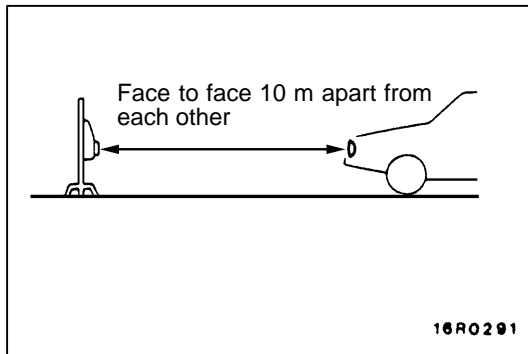
## ON-VEHICLE SERVICE

### 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.

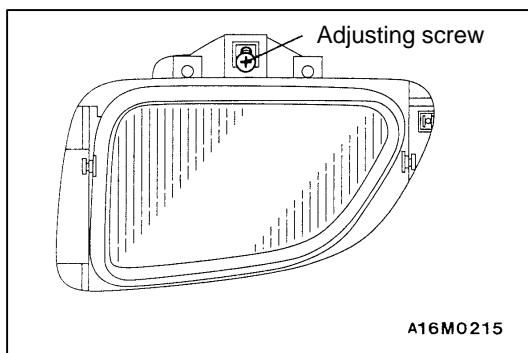


#### NOTE

Measure the center of the fog lamp as shown.

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

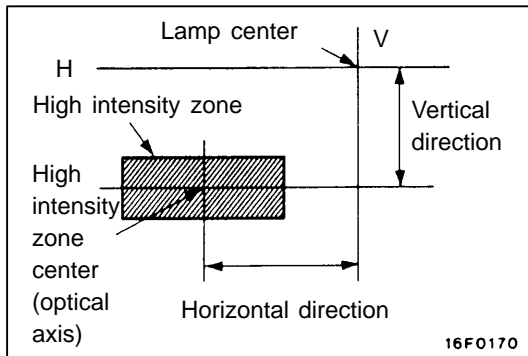
B: 360 mm



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

#### NOTE

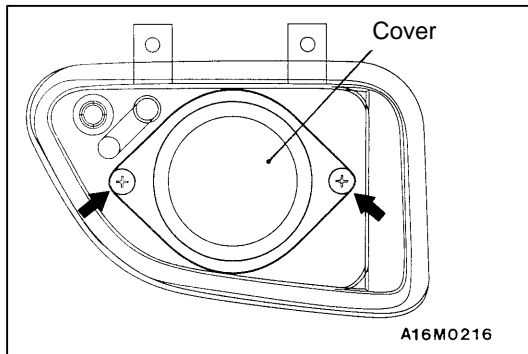
The horizontal direction is non-adjustable. If the beam axis deviation exceeds the standard value, check the fog lamp to determine if it is installed out of position and correct if necessary.

**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.

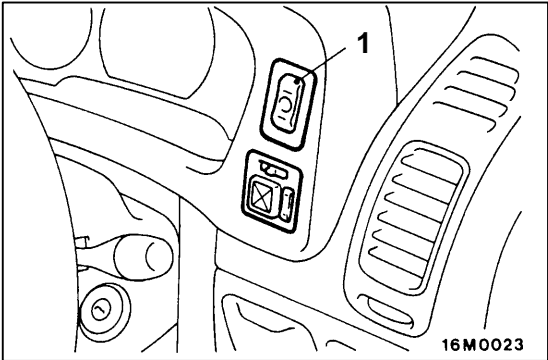
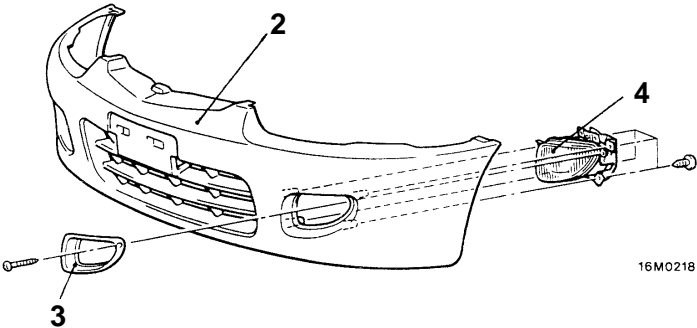
**Caution**

- (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.



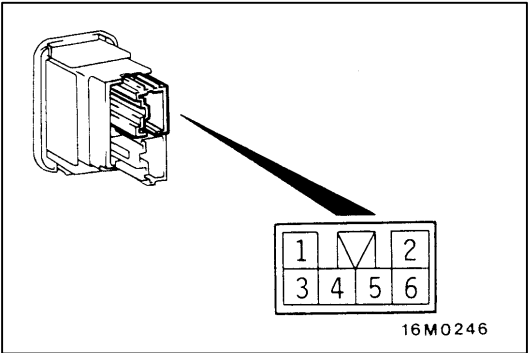
# FOG LAMP

## 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

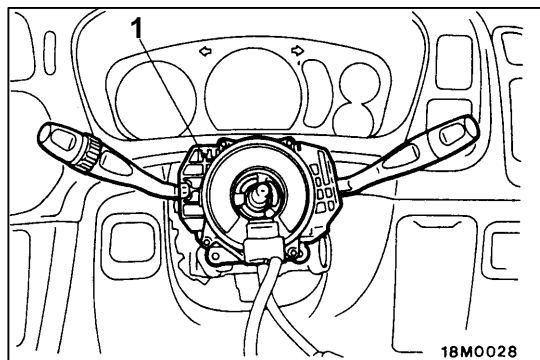
For the troubleshooting of the lighting monitor warning buzzer, refer to P.54-33.

## REAR COMBINATION LAMP

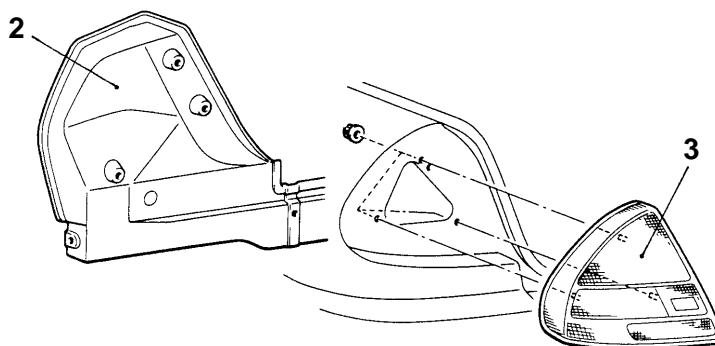
### REMOVAL AND INSTALLATION

**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.

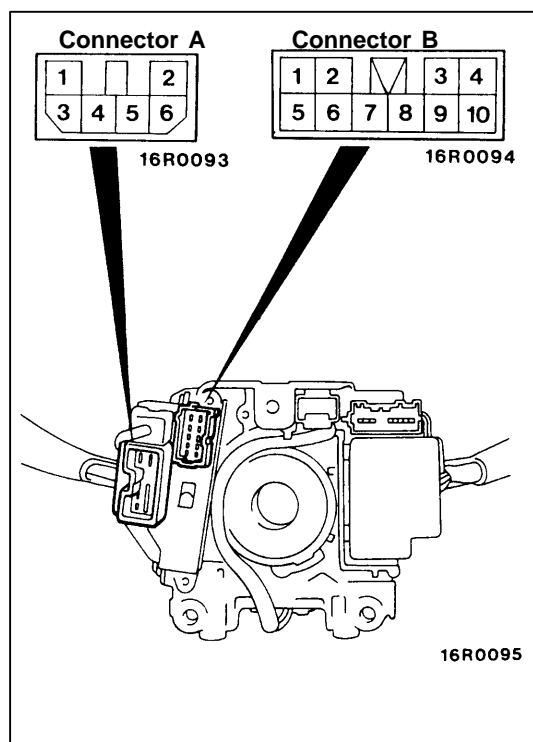


1. Column switch



**Rear combination lamp removal steps**

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




## INSPECTION

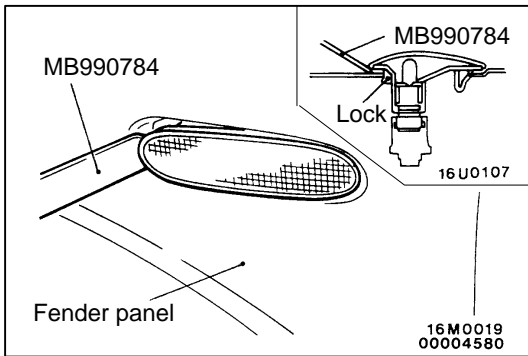
### LIGHTING SWITCH CONTINUITY CHECK

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

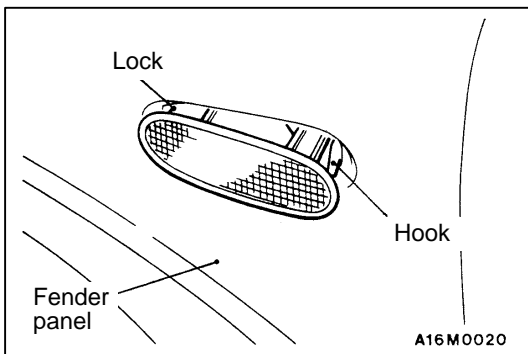
# SIDE TURN-SIGNAL LAMP

## SPECIAL TOOL

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



## SIDE TURN-SIGNAL LAMP REMOVAL

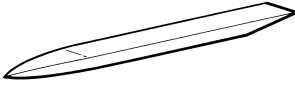


## INSTALLATION

Fit the hook side rearward.

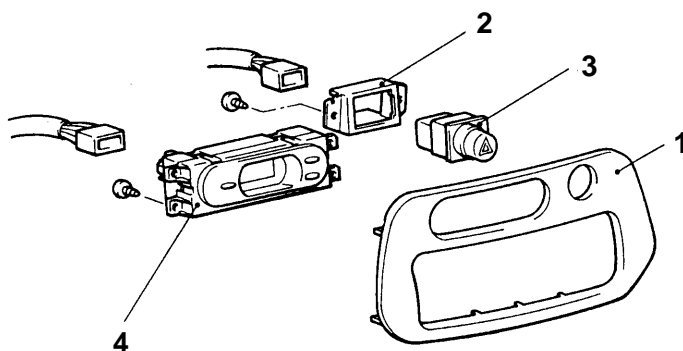
# HAZARD WARNING LAMP SWITCH, CLOCK

## SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Air conditioner panel removal

## HAZARD WARNING LAMP SWITCH

### REMOVAL AND INSTALLATION



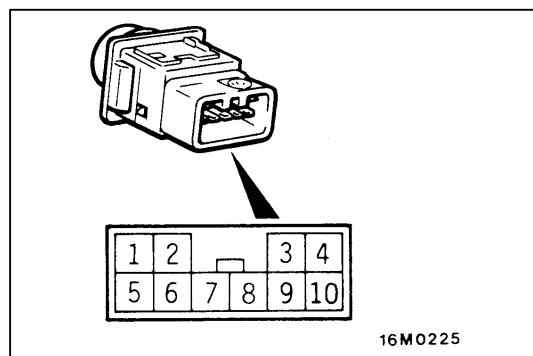
#### Hazard warning lamp switch removal steps

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

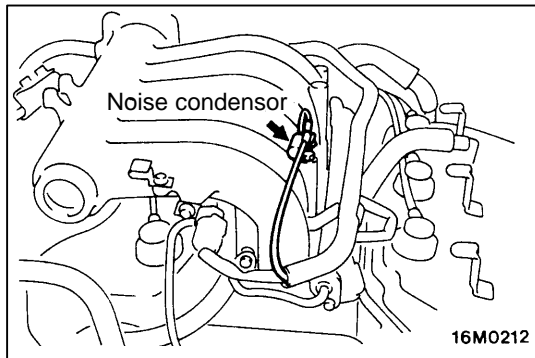


Fig: 3

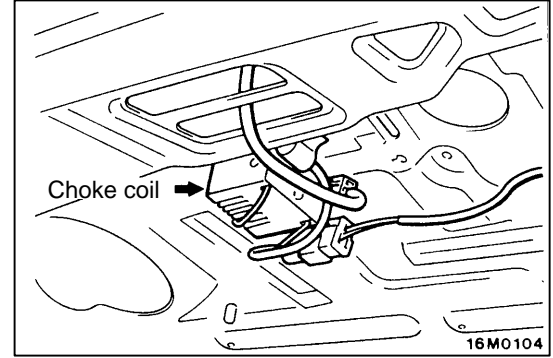
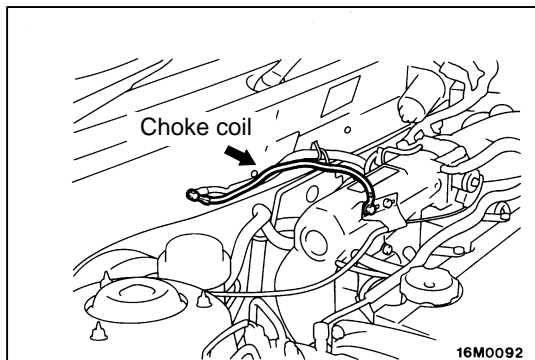
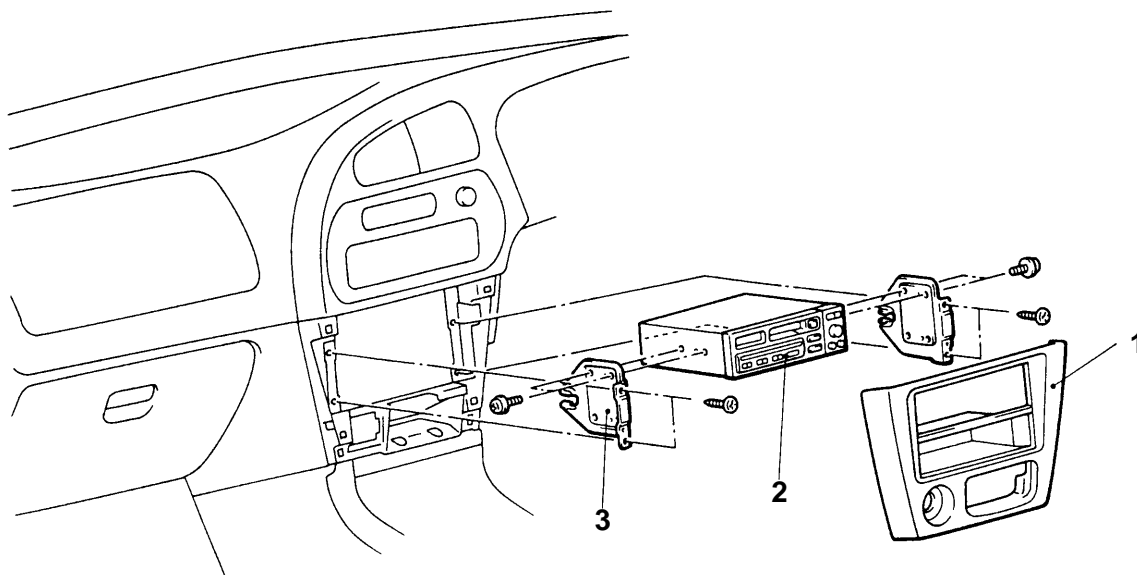


Fig: 2



## RADIO AND TAPE PLAYER

### REMOVAL AND INSTALLATION



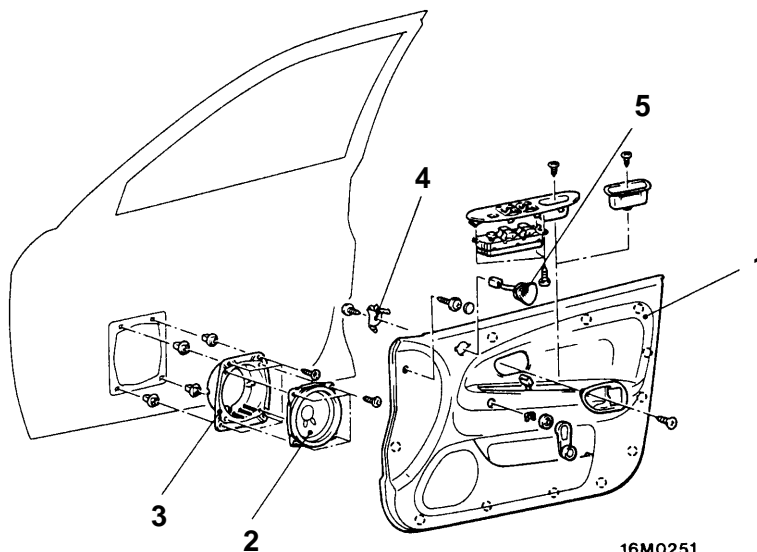
16M0254

#### Removal steps

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

## SPEAKER

### REMOVAL AND INSTALLATION



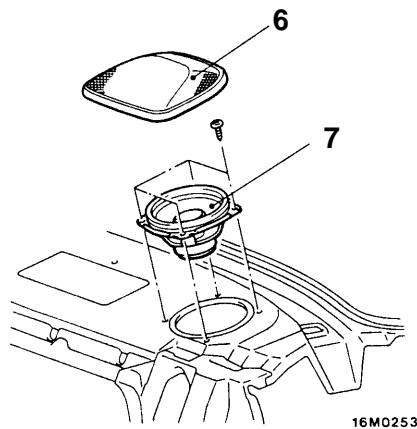
16M0251

#### Removal steps

1. Door trim
2. Speaker
3. Speaker cover

4. Speaker brakcet
5. Tweeter speaker

<REAR SPEAKER>



16M0253

Rear shelf speaker removal steps

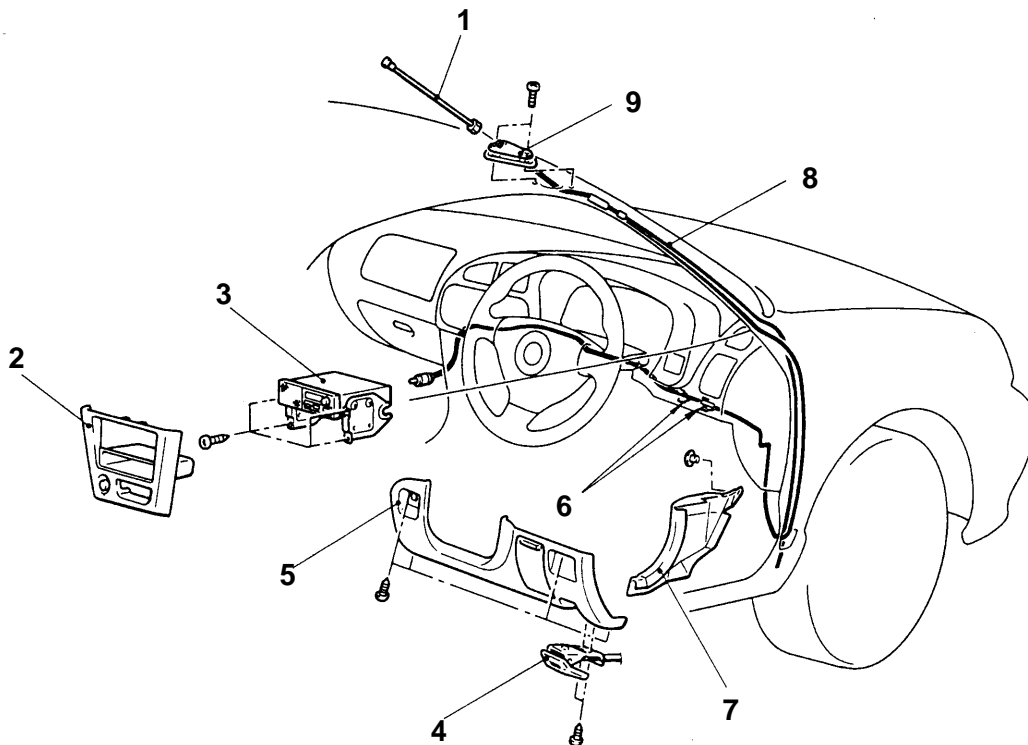
6. Speaker garnish

7. Speaker

# ANTENNA

## POLE ANTENNA

### REMOVAL AND INSTALLATION



16M0221

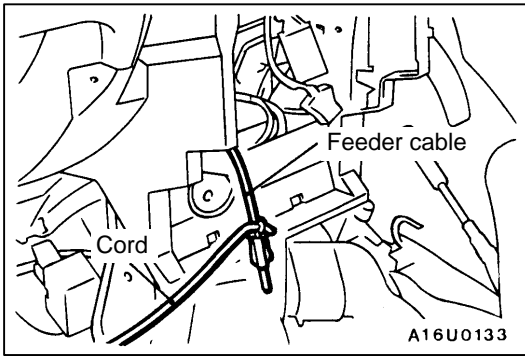
Removal steps

- 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**

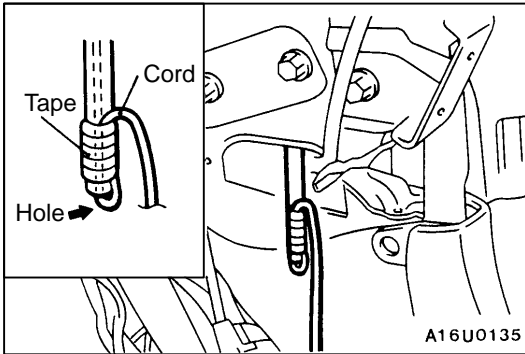
To facilitate the installation work of the antenna assembly, perform the following before removing the feeder cable:

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.

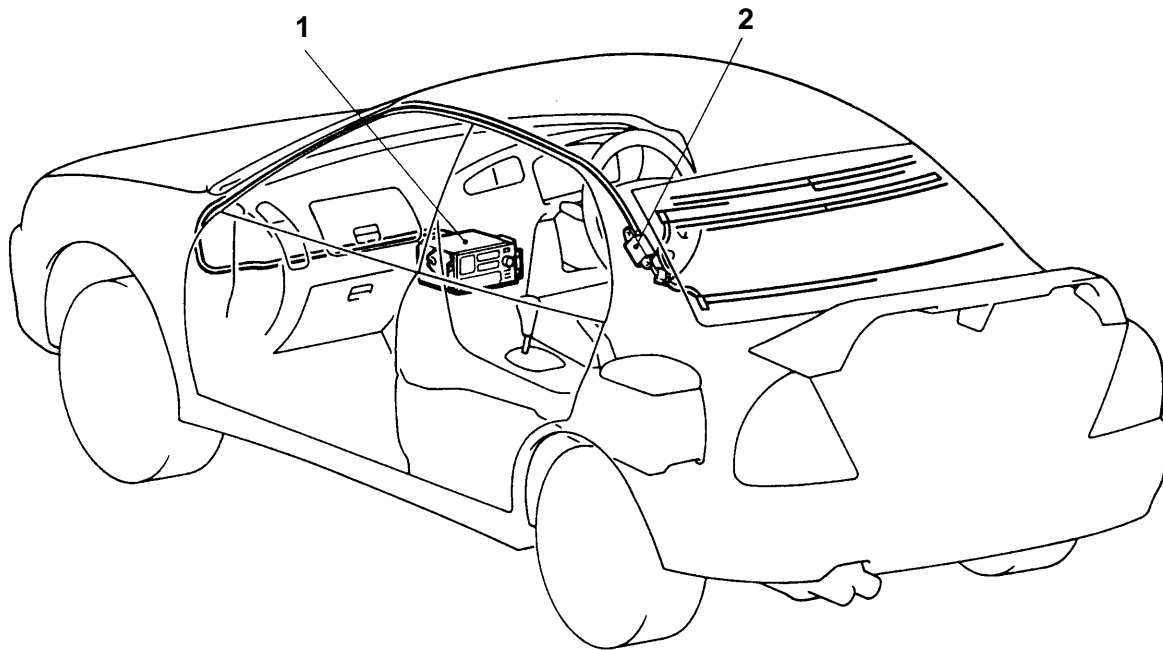
**Caution**

**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.

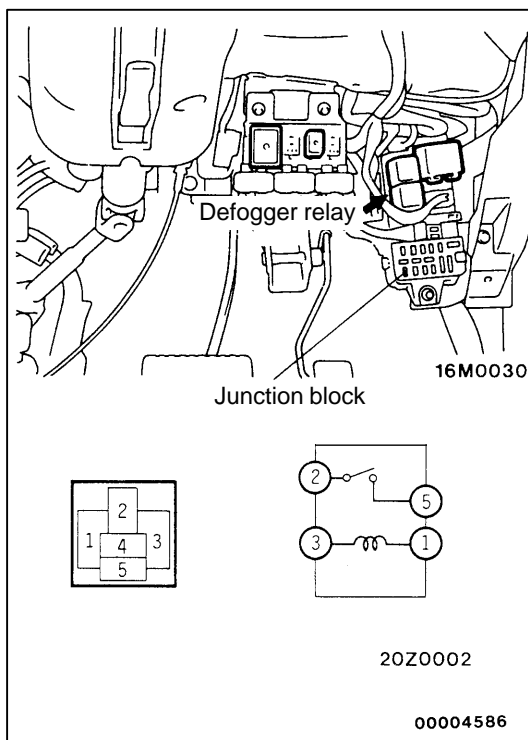
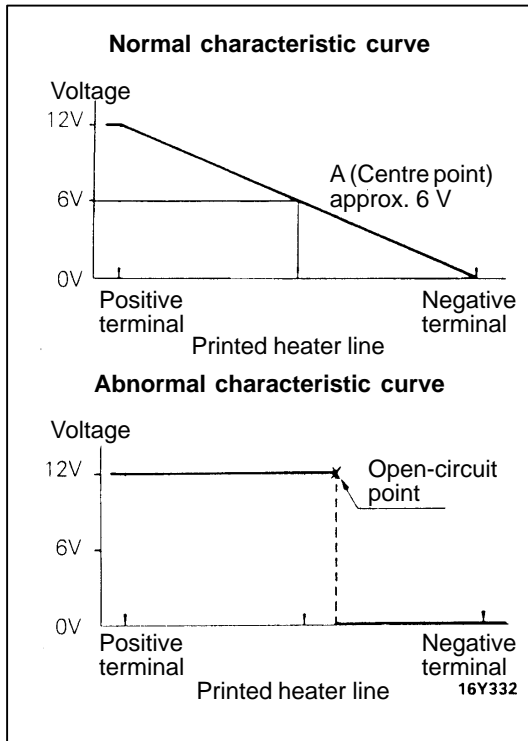
**ON-VEHICLE SERVICE**

**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**

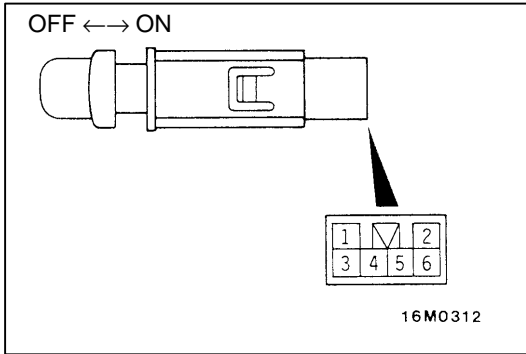
Battery voltage	Terminal No.			
	1	3	2	5
Power is not supplied	○ — ○			
Power is supplied	⊖ — ⊕		○ — ○	



# 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 ⊕	○

---

## NOTES

# HEATER, AIR CONDITIONER AND VENTILATION

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# HEATER AND MANUAL AIR CONDITIONER

## GENERAL

### OUTLINE OF CHANGE

- The following service procedures have been established.

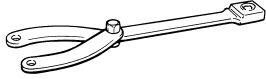
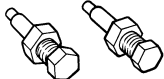
## SERVICE SPECIFICATIONS

Items	Standard value	
Idle speed r/min	700 ± 50	
Idle up speed r/min	850 ± 50	
Resistor (for blower motor) Ω	HI – LO (between terminals 3 and 2)	2.81 ± 10%
	HI – ML (between terminals 3 and 4)	1.28 ± 10%
	HI – MH (between terminals 3 and 1)	0.33 ± 10%
Air gap (Compressor) mm	0.4 – 0.6	

## LUBRICANTS

Items	Specified lubricants	Quantity
Compressor oil ml	SUN PAG 56	120 – 140
Pipe joint	SUN PAG 56	As required
Refrigerant g	R134a (HFC-134a)	555 – 595

## SPECIAL TOOLS

Tool	Number	Name	Use
	MB991367	Special spanner	Removal and installation of armature mounting nut of compressor
	MB991386	Pin	

## TROUBLESHOOTING

### TROUBLESHOOTING PROCEDURES

1. Check air ducts, control rods, etc. for improper connection.
2. Check that the electrical connectors of the relevant components are connected securely and the fuse is not blown.
3. Perform the troubleshooting as follows; first understand the items to be inspected and the the procedures comprehensively using Trouble Symptom/Failed Component Cross-Reference Table and then inspect the appropriate items sequentially.
4. Be sure to perform each component check after disconnecting the relevant connector.

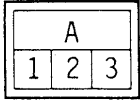
#### Trouble Symptom/Failed Component Cross-Reference Table

Items to be checked	1. When the ignition switch is "ON", the A/C does not operate.	2. When the A/C is operating, temperature inside the passenger compartment does not decrease (cool air is not emitted).	3. Blower fan motor does not turn.	4. Blower fan motor does not stop turning.	5. When A/C is operating, radiator fan and condenser fan do not run.
Fuse	1		1		1
Harness, connector	2		2	1	2
Amount of refrigerant	3	1			
A/C compressor relay	4				
A/C compressor magnet clutch	5				
Dual pressure switch	6	2			3
A/C switch	7				
Blower switch	8		3	2	
Blower relay			4		
Resistor			5	3	
Blower motor			6		
Air thermo-sensor	9	3			
Condenser fan relay		4			4
Condenser fan motor		5			5
Radiator fan relay (HI, LO)		6			6
Radiator fan motor		7			7
Refrigerant temperature switch	10	8			
Auto compressor control unit	11	9			
Engine-ECU	12	10			8



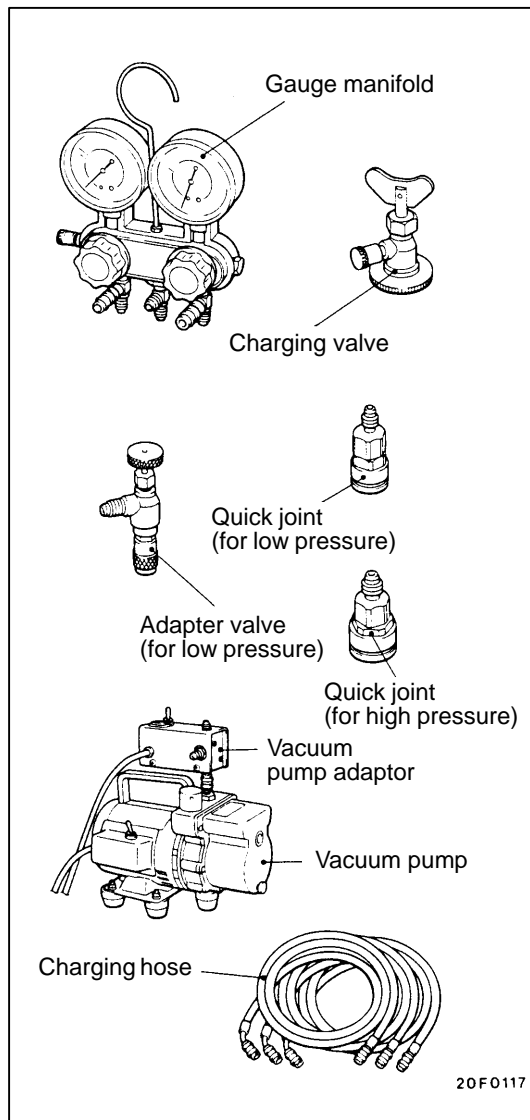
No.	Trouble symptom	Problem cause	Remedy	Reference page
1	When the ignition switch is "ON", the A/C does not operate.	Refrigerant leak or overfilling of refrigerant	Replenish the refrigerant, repair the leak or take out some of the refrigerant	55-6
		A/C compressor relay is defective	Replace the A/C compressor relay	55-14
		A/C compressor magnetic clutch is defective	Replace the A/C compressor magnet clutch	55-26
		Dual pressure switch is defective	Replace the dual pressure switch	55-13
		A/C switch is defective	Replace the A/C switch	55-17
		Blower switch is defective	Replace the blower switch	55-17
		Air thermo-sensor is defective	Replace the air thermo-sensor	55-22
		Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-25
		Automatic compressor-ECU is defective	Replace the automatic compressor-ECU	–
2	When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	Refrigerant leak	Replenish the refrigerant and repair the leak	55-6
		Dual pressure switch is defective	Replace the dual pressure switch	55-13
		Air thermo-sensor is defective	Replace the air thermo-sensor	–
		Condenser fan relay is defective	Replace the condenser fan relay	55-14
		Condenser fan motor is defective	Replace the condenser fan motor	55-29
		Radiator fan relay (HI, LO) is defective	Replace the radiator fan relay (HI, LO)	55-14
		Radiator fan motor is defective	Replace the radiator fan motor	–
		Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-25
		Automatic compressor-ECU is defective	Replace the automatic compressor-ECU	–
3	Blower fan motor doesn't turn.	Blower switch is defective	Replace the blower switch	55-17
		Blower relay is defective	Replace the blower relay	55-13
		Resistor is defective	Replace the resistor	55-21
		Blower fan motor is defective	Replace the blower fan motor	55-21
4	Blower fan motor doesn't stop turning.	Defective harness between the blower fan motor and the blower switch	Repair the harness	–
		Blower switch is defective	Replace the blower switch	55-17
		Resistor is defective	Replace the resistor	55-21
5	When the A/C is operating condenser fan or radiator fan does not run.	Condenser fan relay is defective	Replace the condenser fan relay	55-14
		Condenser fan motor is defective	Replace the condenser fan motor	55-29
		Radiator fan relay (HI, LO) is defective	Replace the radiator fan relay (HI, LO)	55-14
		Radiator fan motor is defective	Replace the radiator fan motor	–
		Dual pressure switch is defective	Replace the dual pressure switch	55-13
		Engine-ECU is defective	Replace the engine-ECU	–

## INSPECTION AT THE AUTOMATIC COMPRESSOR-ECU TERMINAL



20M0065

Terminal No.	Check item	Checking requirements	Normal condition
1	Output from ECU to A/C compressor relay	A/C compressor relay: OFF	System voltage
		A/C compressor relay: ON	0 V
2	Input from A/C switch to ECU	A/C switch: OFF	0 V
		A/C switch: ON	System voltage
3	Earth	Always	0 V



## ON-VEHICLE SERVICE

## REFRIGERANT CHARGING

**Caution**

The refrigerant generates toxic gases when it is exposed to a heat source such as fire. Keep flames away from the refrigerant. Perform refrigerant charging at a well-ventilated place.

**1. Recommended charging tools**

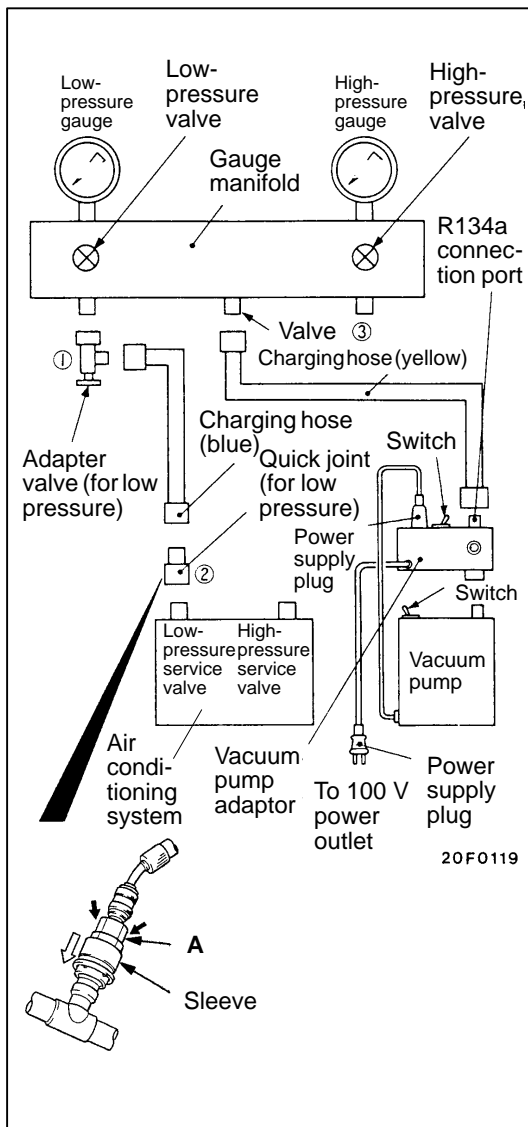
The following commercially available tools are recommended for discharging and charging refrigerant.

- Gas charging set [No. EA95 (R134a)]
- Gas charging set case [No. EA101CS-2]
- Gauge manifold [No. EA101N-1]
- Charging valve [No. EA108N]
- Adapter valve [No. EA104AD-3]

**NOTE**

The adapter valve opens when the handle is turned clockwise and closes when it is turned counter-clockwise.

- Quick joint (for low pressure) [No. EA413L]
- Quick joint (for high pressure) [No. EA413H]
- Charging hose (red) [No. EA104N-1]
- Charging hose (blue) [No. EA104N-2]
- Charging hose (yellow) [No. EA104N-3]
- Vacuum pump [No. EA112A]
- Vacuum pump adaptor [No. EA112X]



## 2. Charging

1. Open the low-pressure valve of the gauge manifold. Keep the high-pressure valve closed.
2. With the handles turned back all the way (valve closed), install the adaptor valve to the low-pressure side of the gauge manifold.
3. Connect the charging hose (blue) to the adaptor valve 1.
4. Connect the quick joint 2 to the charging hose (blue).
5. Connect the quick joint 2 to the low pressure service valve.

### NOTE

The low-pressure service valve is provided on the suction pipe.

### Caution

- (1) To install the quick joint, press section "A" firmly against the service valve until a click is heard.
- (2) When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.

6. Connect the charging hose (yellow) to the valve 3 of the gauge manifold.
7. Install the vacuum pump adaptor to the vacuum pump.

### Caution

To supply the power, connect the power supply plug of the vacuum pump to the vacuum pump adaptor and then the power supply plug of the vacuum pump adaptor to a 100 V power outlet.

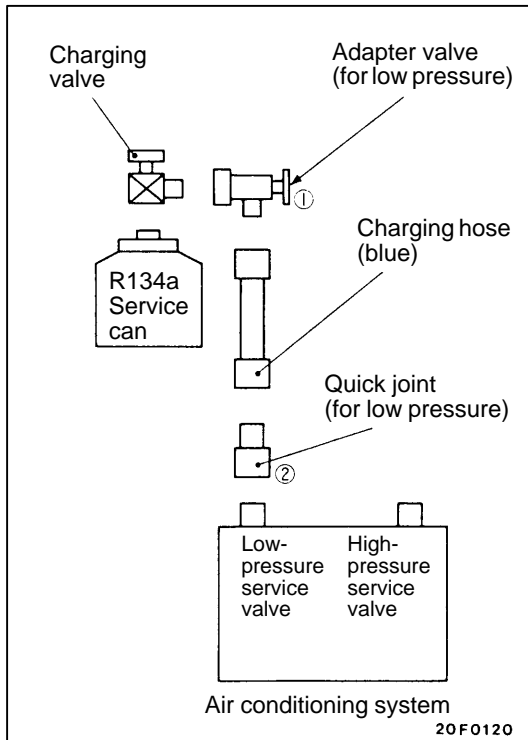
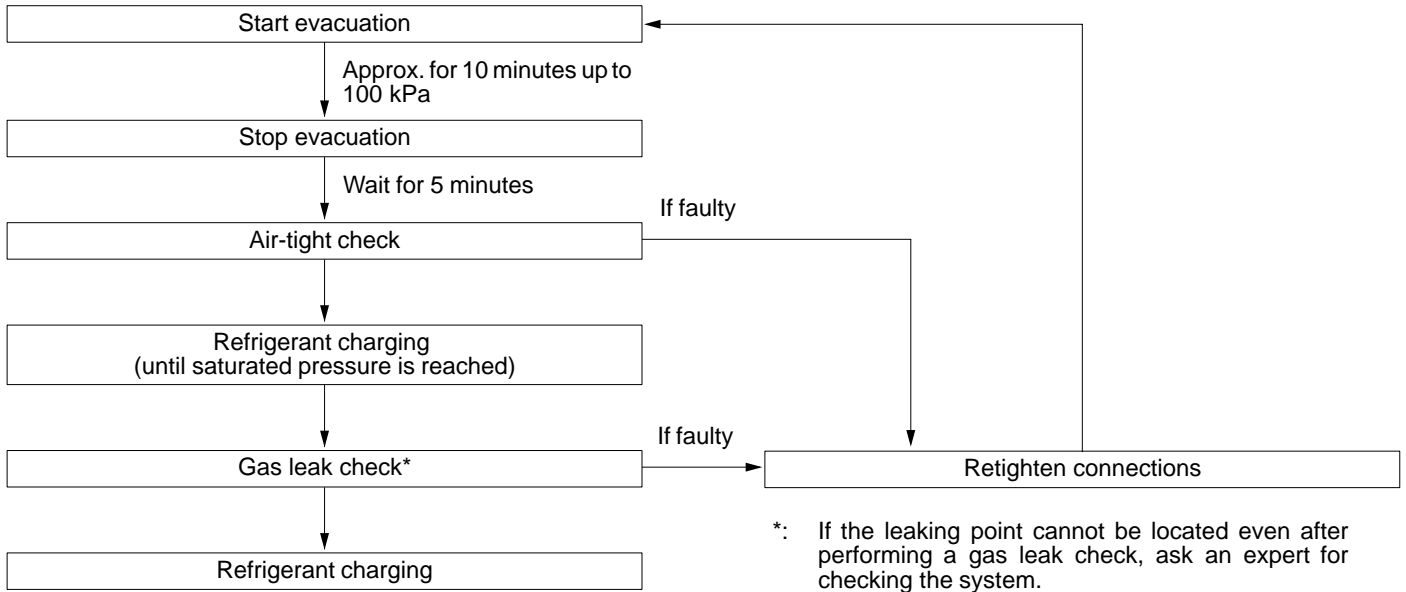
8. Connect the charging hose (yellow) to the R134a connection port of the vacuum pump adaptor.
9. Tighten the adaptor valve 1 handle (valve closed).
10. Turn the power switch of the vacuum pump to the ON position.

### NOTE

Even if the vacuum pump power switch is turned ON, the vacuum pump will not operate because of the power supply connection in step (7).

11. Turn the vacuum pump adaptor switch to the R134a side to start the vacuum pump.

12. Evacuate to a vacuum reading of 100 kPa or higher (takes approx. 10 minutes).



13. Return the handle of the adapter valve 1 to the original position (valve closed), turn off the vacuum pump adapter switch and leave as it is for 5 minutes.
14. Carry out a leak test. (Good if the negative pressure does not drop.)
15. With the handle turned back all the way (valve open), install the charging valve to the service can.
16. Remove the adaptor valve 1 from the gauge manifold and install the service can.
17. Tighten the handle of the charging valve (valve closed) and puncture the service can.
18. Turn the handle of the charging valve back (valve open) and tighten the handle of the adaptor valve 1 (valve open) to charge the system with refrigerant.
19. If the refrigerant is not drawn in, turn the handle of the adaptor valve 1 back all the way (valve closed).
20. Check for gas leaks using a leak detector.

**Caution**

**The leak detector for R134a should be used.**

21. Start the engine.
22. Operate the A/C and set to the lowest temperature (MAX. COOL).
23. Fix the engine speed at 1,500 r/min.
24. Tighten the handle of the adaptor valve 1 (valve open) to charge the required volume of refrigerant.

**Caution**

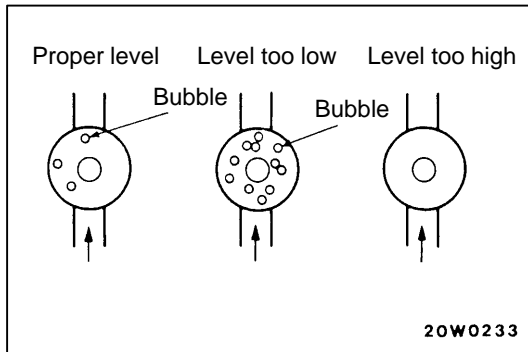
**If the service can is inverted, liquid refrigerant may be drawn into the compressor damaging it by liquid compression. Keep the service can upright to ensure that refrigerant is charged in gas state.**

25. After charging with refrigerant, turn the handle of the adaptor valve 1 back all the way (valve closed).
26. Tighten the charging valve handle (valve closed).

27. Remove the quick joint 2 from the low-pressure service valve.
28. Remove the service can.

**NOTE**

If the service can is not emptied completely, keep the handles of the charging valve and adaptor valve 1 closed for the next charging.



**REFRIGERANT CHARGING AMOUNT CHECK**

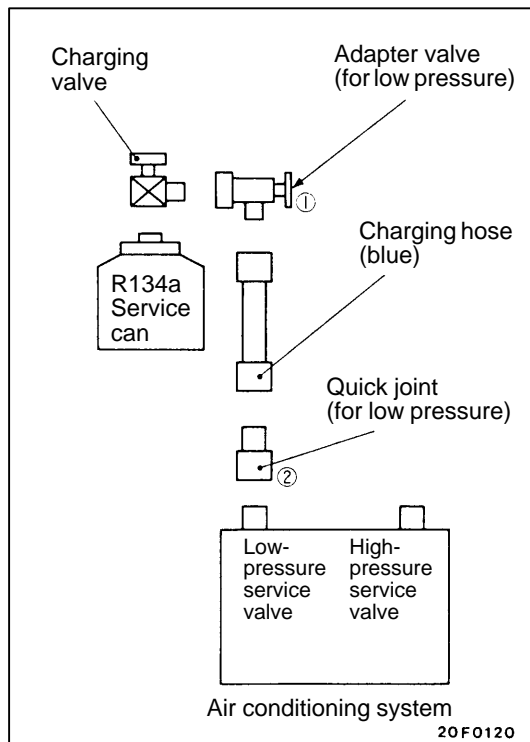
1. Start the engine.
2. Operate A/C and set the temperature control to MAX COOL.
3. Fix the engine speed at 1,500 r/min.
4. Check the refrigerant level (bubble generation) through the sight glass of the receiver.

Item	Condition
Proper level	Bubbles are generated some times. No bubbles appear when the engine speed is slightly increased.
Level too low	A large amount of air bubbles are generated. If it looks milky white, the level is excessively lowered.
Level too high	No air bubbles appear.

5. If the level is too low, add the refrigerant, and if the level is too high, drain the refrigerant as necessary.

**Caution**

**Be sure to work at the low-pressure side service valve.**



## REPLENISHING SYSTEM

1. Connect the charging hose (blue) to the adapter valve 1 with the handle fully turned back (valve closed).
2. Connect the charging hose (blue) to the quick joint 2 and to the low pressure service valve.

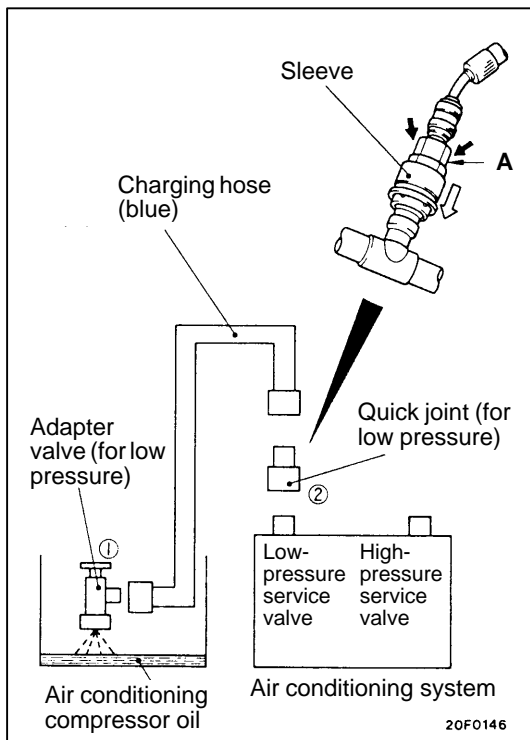
### Caution

**Never connect to the high-pressure side since otherwise the refrigerant could flow back.**

3. Open and close the valve by operating the handle of the adapter valve 1 to bleed air from inside the charging hose.
4. With the handle turned back all the way (valve open), install the charging valve to the service van.
5. Tighten the handle of the charging valve (valve closed) and puncture the service can.
6. Install the charging valve to the adapter valve 1 and turn back the handle all the way (valve open).
7. Start the engine.
8. Operate the A/C and set to the lowest temperature (MAX. COOL).
9. Fix the engine speed at 1,500 r/min.
10. Tighten the handle of the adapter valve 1 (valve open). Replenish the system with refrigerant while checking the level through the sight glass.  
After charging with refrigerant, turn the handles of the charging valve and the adapter valve 1 all the way back (valve closed), then remove the quick joint 2.

### NOTE

If the service can is not emptied completely, keep the handles of the charging valve and adaptor valve closed for the next charging.



### DISCHARGING SYSTEM

1. Run the engine at an engine speed of 1,200–1,500 r/min for approximately 5 minutes with the A/C operating to return to the oil.

**NOTE**

Returning the oil will be more effective if it is done while driving.

2. Stop the engine.
3. Connect the charging hose (blue) to the adaptor valve 1 with its handle turned back all the way (valve closed).
4. Connect the quick joint 2 to the charging hose (blue), and install the quick joint to the low-pressure service valve.

**NOTE**

The low-pressure service valve is provided on the suction pipe.

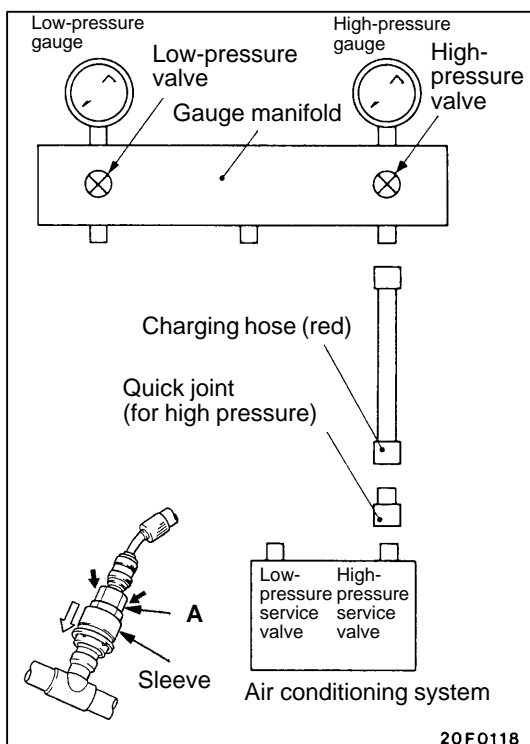
**Caution**

- (1) To connect the quick joint, press section “A” firmly against the service valve until a click is heard.
- (2) When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.

5. Place the adaptor valve 1 inside the container and discharge the refrigerant by opening the handle gradually so that oil does not gush out.

**NOTE**

Any oil remaining in the container should be returned to the A/C system.



### PERFORMANCE TEST

1. The vehicle to be tested should be placed in a place that is not exposed to direct sunlight.
2. The ambient condition should be 16 – 30 °C in temperature and 60 – 100 % in relative humidity.
3. Open all the doors so that the air condition inside the passenger compartment may be identical to that of the outside.
4. With the high-pressure side of the gauge manifold closed, connect the charging hose (red) to the gauge manifold high-pressure side. Attach the quick joint for high-pressure to the charging hose (red) and install it to the high-pressure service valve on the vehicle side.

**NOTE**

The high-pressure service valve is found on liquid pipe B.

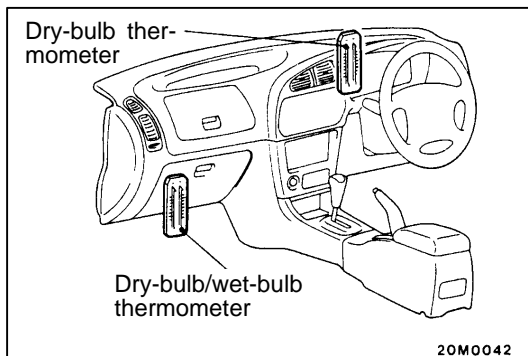
### Caution

- (1) To connect the quick joint, press section “A” firmly against the service valve until a click is heard.
- (2) When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.

5. Start the engine.
6. Set the blower switch to HI (Fast) position
7. Set the A/C switch to ON position
8. Set the temperature control to Max. cooling position
9. Set the mode selection to Face position
10. Set the air selection to Recirculation position
11. Fix engine speed to 1,500 r/min.
12. Check that the high-pressure side pressure is 1,667 – 1,765 kPa.

### NOTE

If the pressure is not within this range, adjust it as follows; cool down the condenser using a cooling fan if the pressure is higher, and cover the condenser to protect it from ventilation air if it is lower.

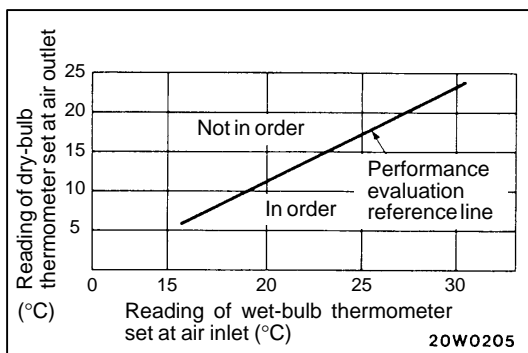


13. Set a dry-bulb/wet-bulb thermometer at the air inlet, and set a dry-bulb thermometer at the air outlet.

### Caution

- (1) Set the dry-bulb thermometer at a position where the temperature sensing section can be directly blown with cooled air.
- (2) Place the dry-bulb/wet-bulb thermometer at a position where it is not exposed to cooled air blown out.

14. After the temperature of the air blown out from the air outlet has been stabilized (10 – 15 minutes after starting), read the dry-bulb thermometer set at the air outlet and the wet-valve thermometer set at the air inlet.

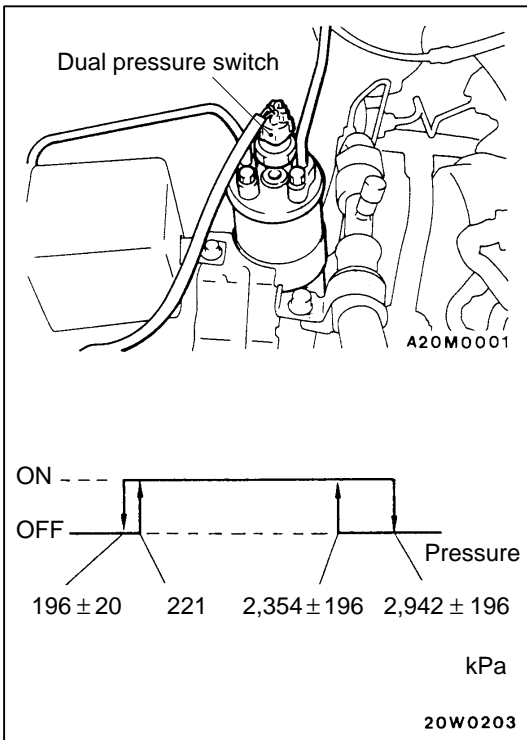


15. The air conditioning system is considered in good condition if the intersecting point of the measurements obtained in Step (14) is below the performance evaluation reference line on the graph.

### Caution

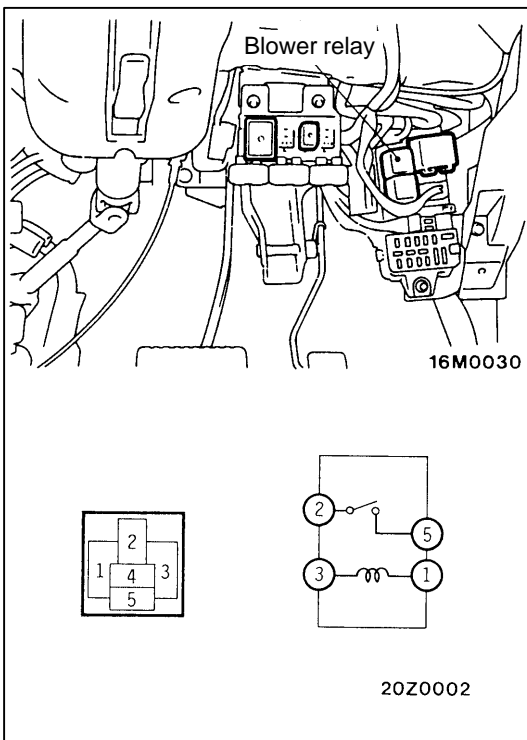
**Do not remove the quick joint immediately after the performance test has been completed. Stop the engine and wait until the high-pressure side pressure of the gauge manifold has been lowered sufficiently.**





### DUAL PRESSURE SWITCH SIMPLE CHECK

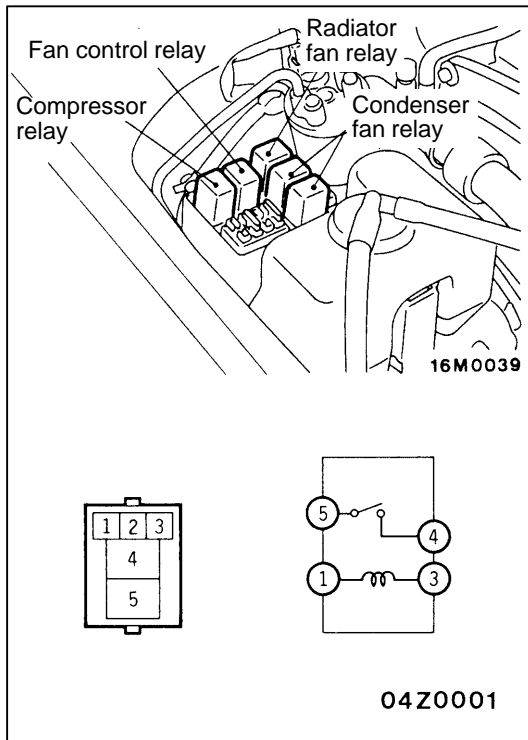
Measure the high-pressure side pressure. If there is a continuity between the dual pressure switch terminals with the dual pressure switch in ON condition as shown in the graph at left, the switch is in good condition. If not, it is faulty. Replace the switch.



### POWER RELAY CHECK

#### BLOWER RELAY

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



**A/C COMPRESSOR RELAY, CONDENSER FAN RELAY**

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

**IDLE-UP OPERATION CHECK**

1. Before inspection and adjustment, set vehicle in the pre-inspection condition:
2. Check whether or not the idle speed is the standard value.

**Standard value: 700 ± 50 r/min**

**NOTE**

There is no necessity to make an adjustment, because the idle speed is automatically adjusted by the ISC system. If, however, there occurs a deviation from the standard value for some reason, check the fuel control system.

3. When the A/C is running after turning the A/C switch to ON, check to be sure that the idle speed is at the standard value.

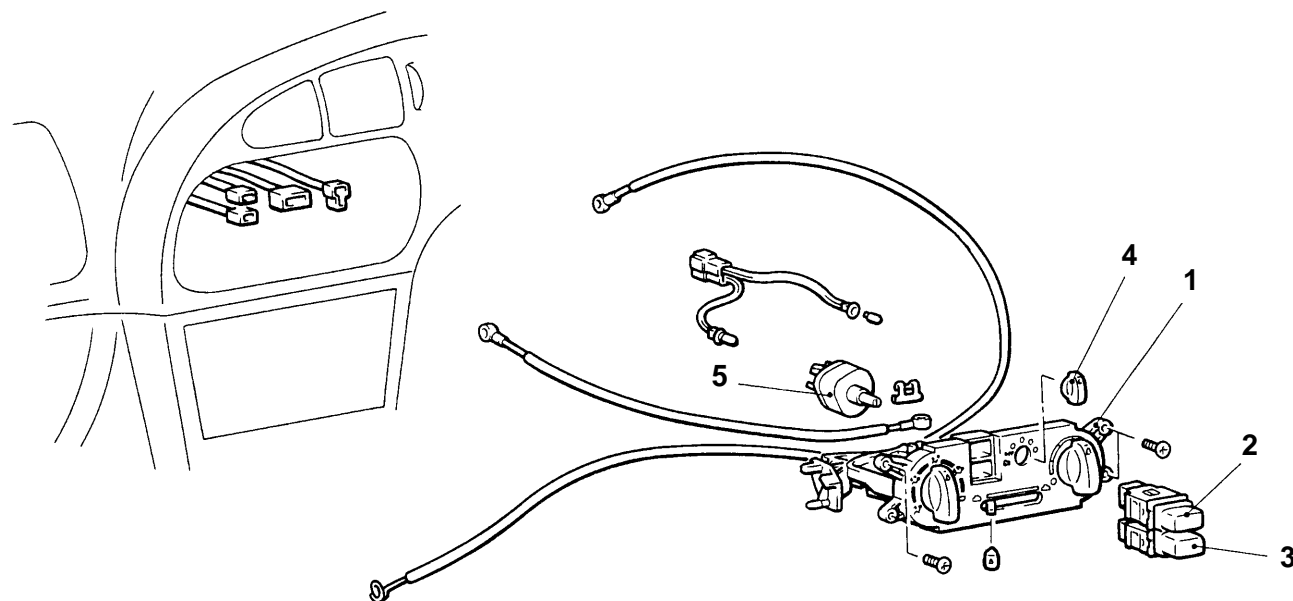
**Standard value: 850 ± 50 r/min**

## HEATER CONTROL ASSEMBLY AND A/C SWITCH

### REMOVAL AND INSTALLATION

#### Pre-removal and Post-installation Operation

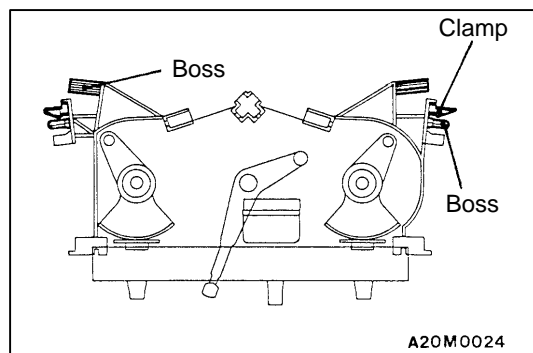
- Instrument Lower Panel and Heater Control Panel Removal and Installation
- Floor Console Assembly Removal and Installation
- Foot Duct Removal and Installation (Refer to P.55-31.)



20M0044

#### Removal steps

- ◀A▶ ▶A◀
1. Heater control assembly
  2. Rear window defogger switch
  3. A/C switch
  4. Knob
  5. Blower switch

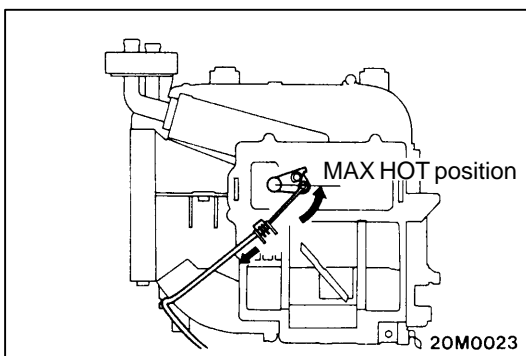
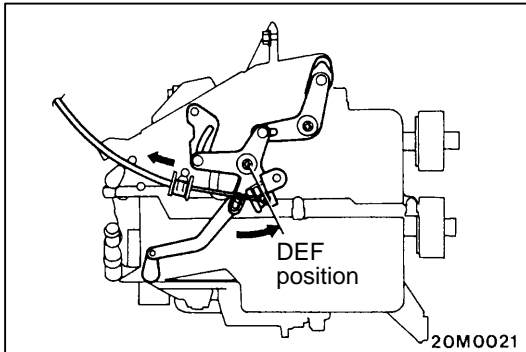
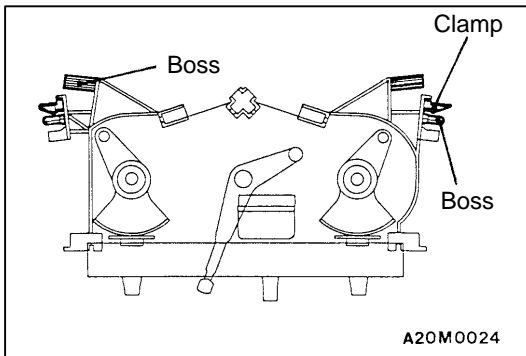


A20M0024

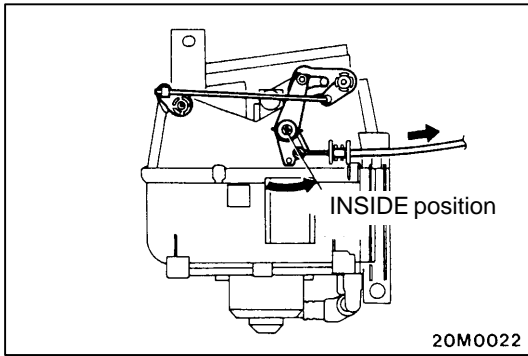
#### REMOVAL SERVICE POINT

##### ◀A▶ HEATER CONTROL ASSEMBLY REMOVAL

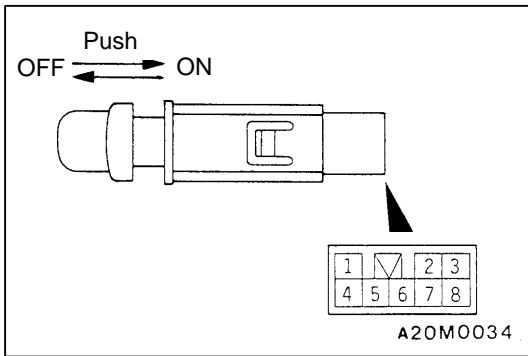
1. Remove the heater control assembly mounting screws.
2. Bend the clamp and the bosses (2 each side), which are inserted into the centre reinforcement.
3. Remove the heater control assembly.

**INSTALLATION SERVICE POINT****►A◄ HEATER CONTROL ASSEMBLY INSTALLATION**

1. Cut off the bosses and clamp shown before installing a new heater control assembly.
  2. Install the heater control assembly mounting screws.
3. Follow the steps below to install the air outlet changeover damper lever cable.
    - (1) Set the air outlet changeover link of the heater unit to the DEF position.
    - (2) Set the air outlet changeover control knob on the heater control assembly to the DEF position.
    - (3) After inserting the inner cable into the link, pull the outer cable to the heater control assembly side and then fasten the outer cable to the clip of the heater unit.
    - (4) After installation, operate the heater control knob to check if the mode changeover can be accomplished smoothly.
4. Follow the steps below to install the air mix damper lever cable.
    - (1) Set the air mix damper link on the heater unit to the MAX HOT position.
    - (2) Set the air mix damper knob of the heater control assembly to the MAX HOT position.
    - (3) After inserting the inner cable into the link, pull the outer cable to the heater control assembly side and then fasten the outer cable to the clip of the heater unit.
    - (4) After installation, operate the heater control knob to check if the air mix damper can be actuated smoothly.



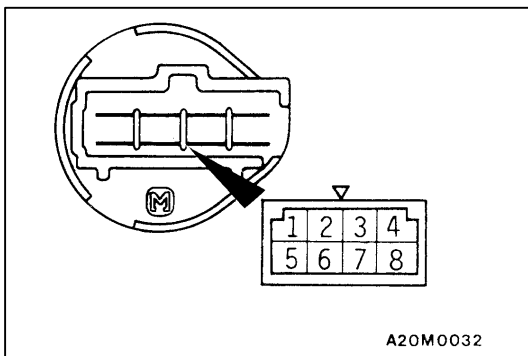
5. Follow the steps below to install the inside/outside air changeover damper lever cable.
  - (1) Set the inside/outside air changeover damper link on the blower unit to the INSIDE position.
  - (2) Set the inside/outside air changeover damper knob of the heater control assembly to the INSIDE position.
  - (3) After inserting the inner cable into the link, pull the outer cable to the heater control assembly side and then fasten the outer cable to the clip of the blower unit.
  - (4) After installation, ensure that inside/outside air changeover damper operates smoothly by operating the heater control assembly knob.



**INSPECTION**

**A/C SWITCH CONTINUITY CHECK**

Switch position	Terminal No.						
	1	ILL	2	IND	4	5	7
OFF	○	⊕			○		
ON	○	⊕			○		
			○	⊕		○	○



**BLOWER SWITCH CONTINUITY CHECK**

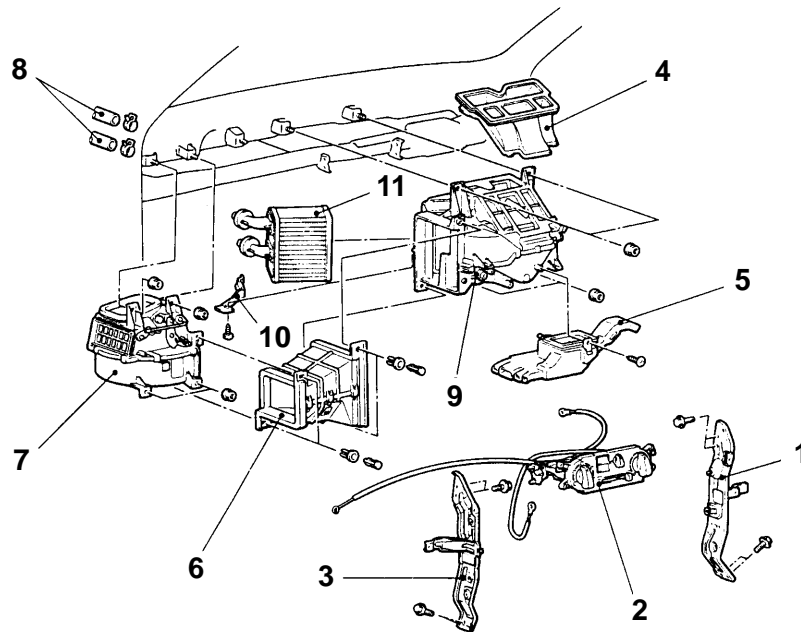
Switch position	Terminal No.							
	1	2	3	5	6	7	8	
OFF								
● (LO)	○		○	○			○	
● (ML)	○			○	○		○	
● (MH)	○	○		○			○	
● (HI)	○			○	○	○	○	

# HEATER UNIT AND BLOWER UNIT <VEHICLES WITHOUT AIR CONDITIONER>

## REMOVAL AND INSTALLATION

### Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling
- Air Cleaner Cover and Hose Removal and Installation
- Floor Console and Instrument Panel Removal and Installation
- Rear Seat Heater Duct Removal and Installation  
<Vehicles for cold regions> (Refer to P.55-31.)



20M0011

### Removal steps

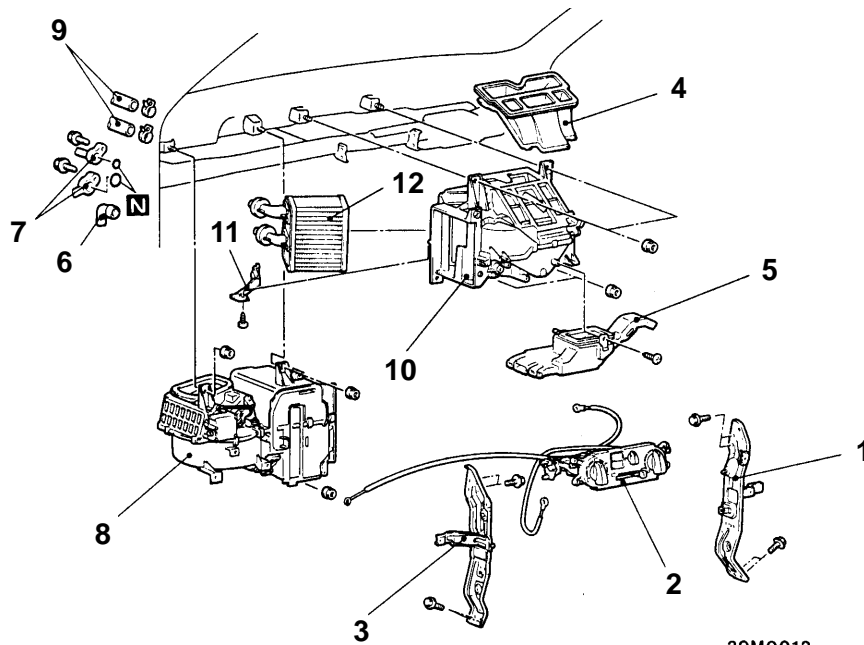
- |                            |                         |
|----------------------------|-------------------------|
| 1. Center reinforcement RH | 7. Blower unit          |
| 2. Heater control assembly | 8. Heater hose          |
| 3. Center reinforcement LH | 9. Heater unit          |
| 4. Center ventilation duct | 10. Heater core support |
| 5. Foot distribution duct  | 11. Heater core         |
| 6. Joint duct              |                         |

# HEATER UNIT, COOLING AND BLOWER UNIT <VEHICLES WITH AIR CONDITIONER>

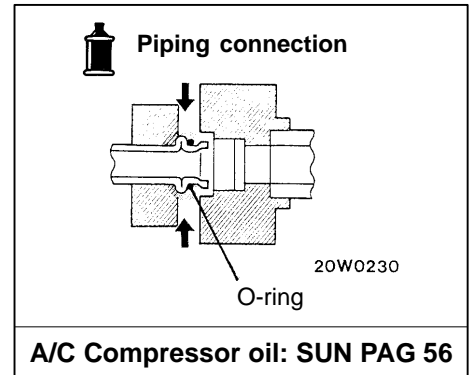
## REMOVAL AND INSTALLATION

### Pre-removal and Post-installation Operation

- Engine Coolant Draining and Refilling
- Discharging and Charging of Refrigerant (Refer to P.55-6.)
- Air Cleaner Cover and Hose Removal and Installation
- Floor Console and Instrument Panel Removal and Installation
- Rear Seat Heater Duct Removal and Installation <Vehicles for cold regions> (Refer to P.55-31.)



20M0012



### Removal steps

- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li>1. Center reinforcement RH</li> <li>2. Heater control assembly</li> <li>3. Center reinforcement LH</li> <li>4. Center ventilation duct</li> <li>5. Foot distribution duct</li> <li>6. Drain hose</li> <li>7. Connection between cooling unit and refrigerant line</li> </ol> | <ol style="list-style-type: none"> <li>8. Cooling and blower unit</li> <li>9. Heater hose</li> <li>10. Heater unit</li> <li>11. Heater core support</li> <li>12. Heater core</li> </ol> |
|---|---|



### REMOVAL SERVICE POINT

#### ◀A▶ REMOVAL OF REFRIGERANT LINE FROM COOLING UNIT

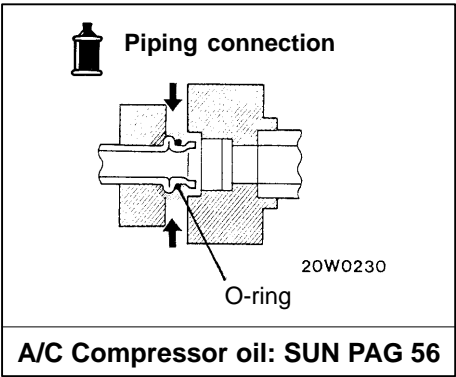
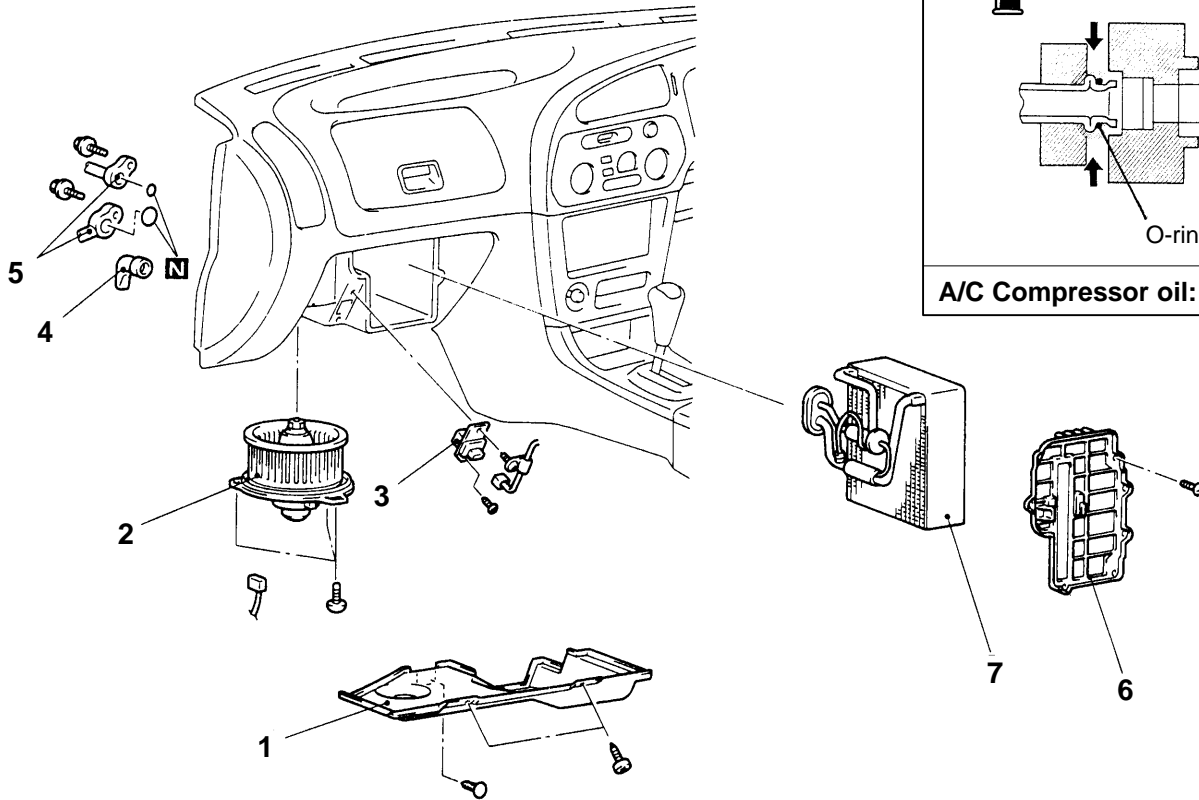
Plug the open end of the removed hose and the opening in the cooling unit to prevent entry of dust and foreign substances.

#### Caution

**Compressor oil and the receiver are highly moisture-absorptive.**

**Do not use plugs allowing ventilation.**

# BLOWER MOTOR ASSEMBLY, RESISTOR AND EVAPORATOR REMOVAL AND INSTALLATION



20M0013

### Blower motor assembly removal steps

1. Under cover  
<Vehicles for cold regions>
2. Blower motor assembly

### Resistor removal steps

1. Under cover  
<Vehicles for cold regions>
- Glove box, glove box frame
3. Resistor



### Evaporator removal steps <Vehicles with A/C>

- Discharging and Charging of refrigerant (Refer to P.55-6.)
- Glove box, glove box frame
- 4. Drain hose
- 5. Connection between evaporator and refrigerant line
- 6. Case cover
- 7. Evaporator

## REMOVAL SERVICE POINT

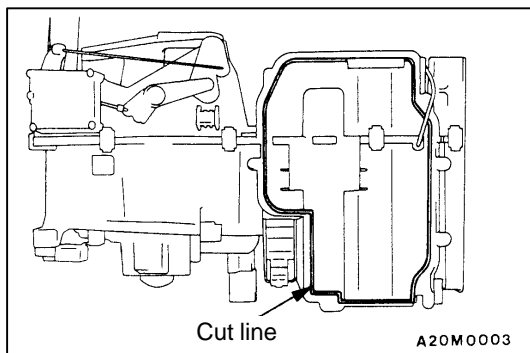
### ◀A▶ REMOVAL OF REFRIGERANT LINE FROM EVAPORATOR

Plug the open end of the removed hose and the opening in the evaporator to prevent entry of dust and foreign substances.

### Caution

Compressor oil and the receiver are highly moisture-absorptive.  
Do not use plugs allowing ventilation.

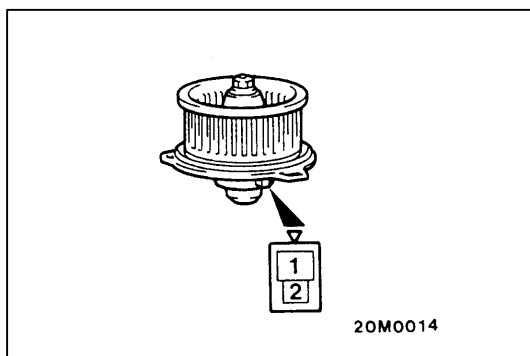
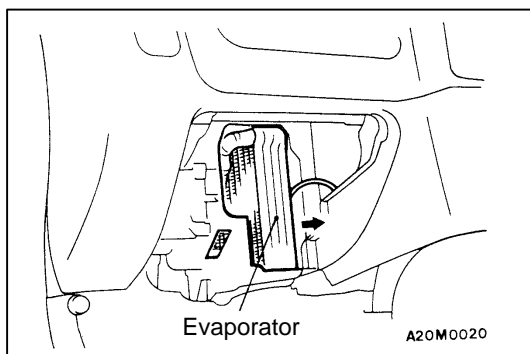




### ◀B▶ CASE COVER, EVAPORATOR REMOVAL

The evaporator, which has been installed in a factory, has no case cover. Follow the steps below to remove that evaporator.

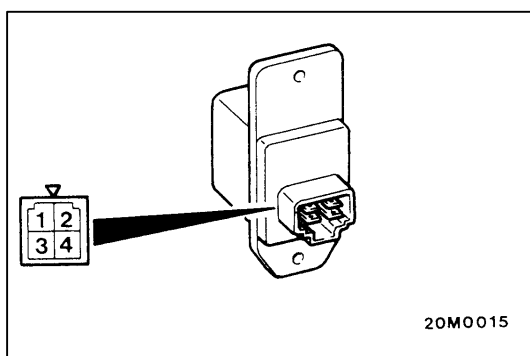
1. Cut the case along the shown line to remove the cooling and blower unit.
2. Remove the air thermo sensor from the evaporator, and then remove the evaporator towards you, being careful not to damage its core.



### INSPECTION

#### BLOWER MOTOR CHECK

When battery voltage is applied between the terminals, check that the motor operates. Also, check that there is no abnormal noise.

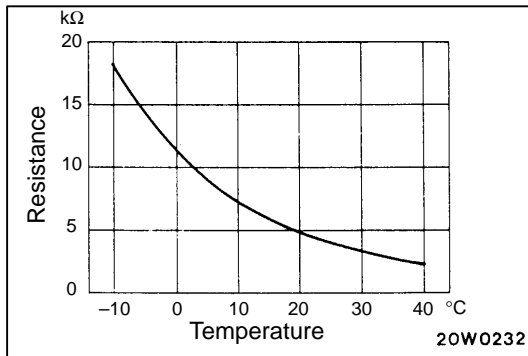


#### RESISTOR CHECK

Use a circuit tester to measure the resistance between the terminals as indicated below. Check that the measured value is at the standard value.

#### Standard value:

Measurement terminal	Standard value $\Omega$
Between terminals 3 and 2	$2.81 \pm 10\%$
Between terminals 3 and 4	$1.28 \pm 10\%$
Between terminals 3 and 1	$0.33 \pm 10\%$



### AIR THERMO-SENSOR CHECK

Measure the resistance between the sensor terminals in two or more different temperature conditions. The resistance values must conform to the values shown in the graph.

#### NOTE

The temperatures at checking must be within the range shown in the characteristic curve.

# COMPRESSOR AND TENSION PULLEY

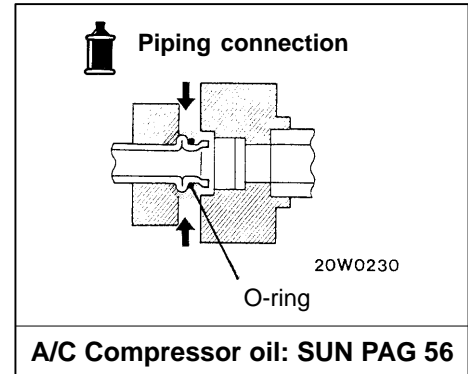
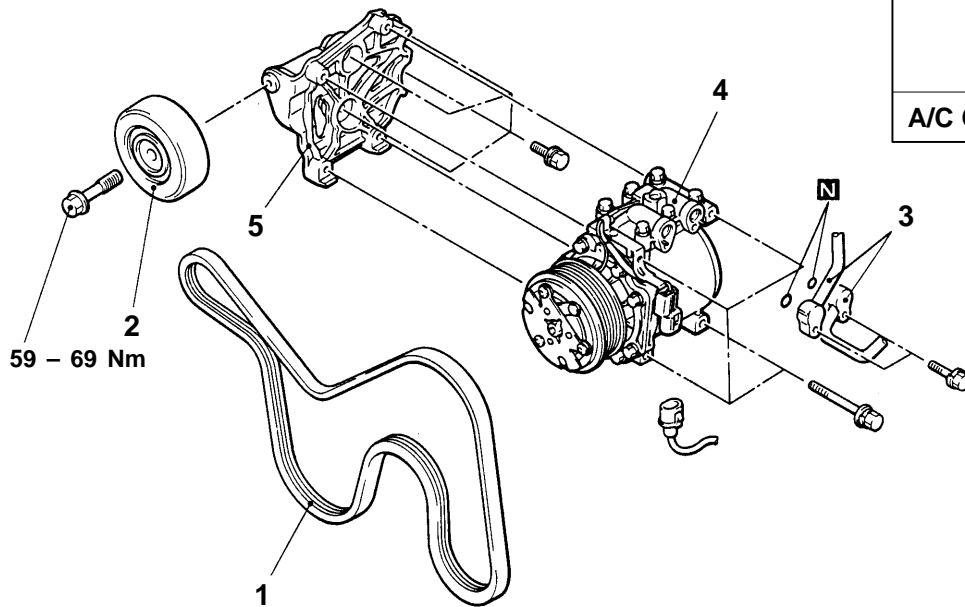
## REMOVAL AND INSTALLATION

### Pre-removal Operation

- Discharging of Refrigerant (Refer to P.55-6.)

### Post-installation Operation

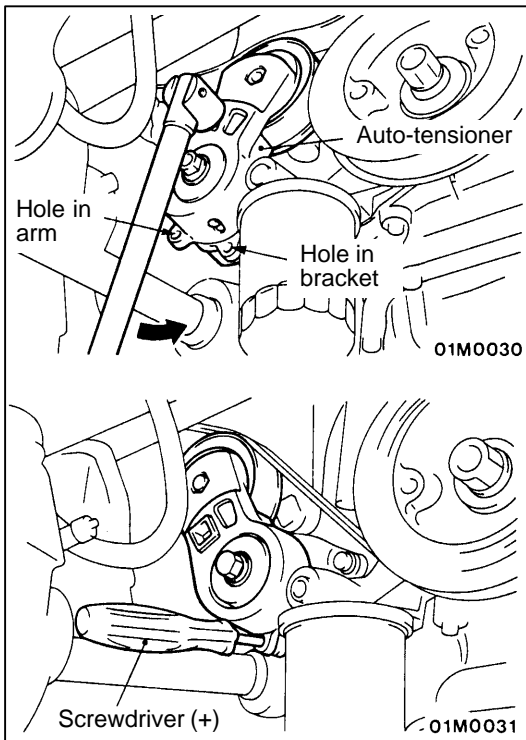
- Drive Belt Tension Adjustment
- Charging of Refrigerant (Refer to P.55-6.)



20M0017

### Removal steps

- ◀A▶ 1. Drive belt
- ◀B▶ 2. Idler pulley
- ◀C▶ ▶A▶ 3. Suction hose and discharge hose connection
- 4. Compressor
- 5. Compressor bracket

**REMOVAL SERVICE POINTS****◀A▶ DRIVE BELT REMOVAL**

1. Align the hole in the auto-tensioner bracket with that in the arm and insert a screwdriver into the holes.
2. Remove the drive belt.

**◀B▶ SUCTION HOSE, DISCHARGE HOSE DISCONNECTION**

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

**Caution**

**Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapour easily.**

**◀C▶ COMPRESSOR REMOVAL**

When doing this work, be careful not to spill the compressor oil.

## INSTALLATION SERVICE POINT

### ▶A◀ COMPRESSOR INSTALLATION

If a new compressor is installed, first adjust the amount of oil according to the procedures described below, and then install the compressor.

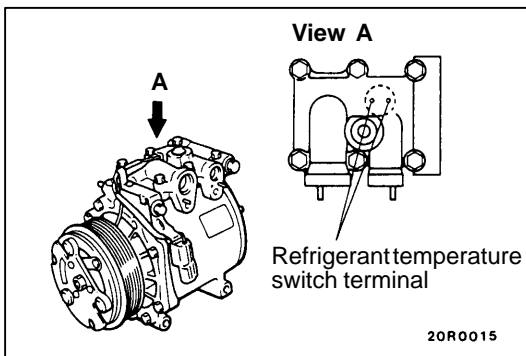
1. Measure the amount (X ml) of oil within the removed compressor.
2. Drain (from the new compressor) the amount of oil calculated according to the following formula, and then install the new compressor.

New compressor oil amount

$$120 \text{ to } 140 \text{ ml} - X \text{ ml} = Y \text{ ml}$$

#### NOTE

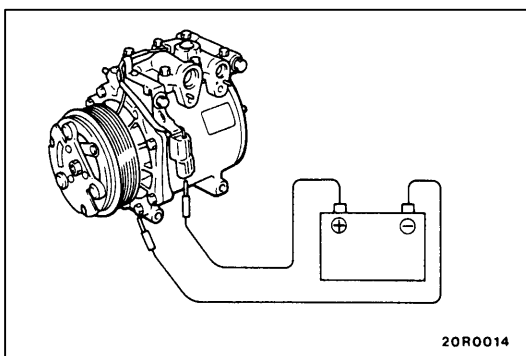
- (1) "120 to 140 ml" is the amount of oil filled in a new compressor.
- (2) Y ml indicates the amount of oil in the refrigerant line, the condenser, the cooling unit etc.



## INSPECTION

### REFRIGERANT-TEMPERATURE SWITCH SIMPLE CHECK

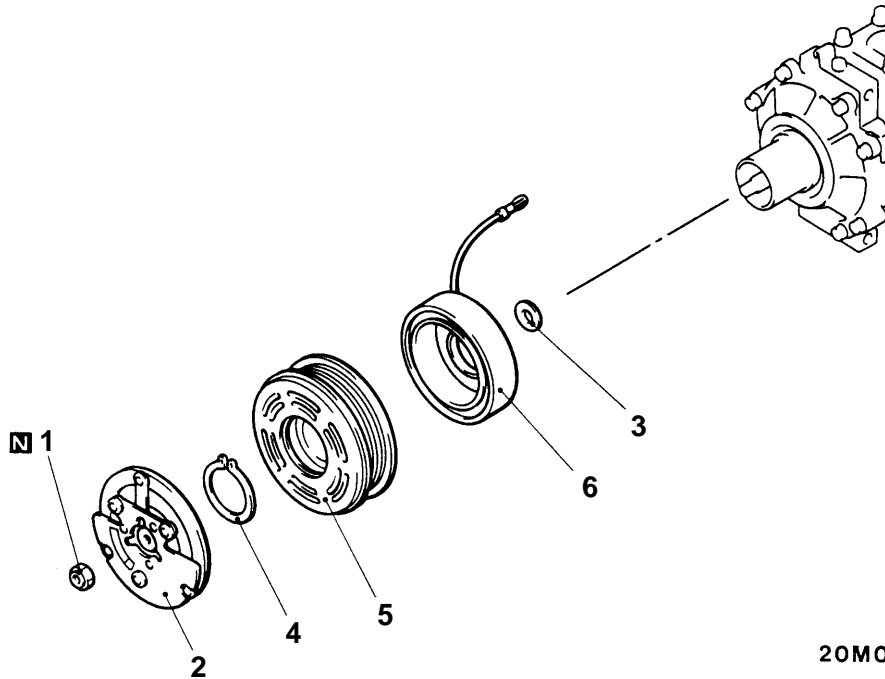
When the A/C is off, check that there is continuity between the refrigerant-temperature switch terminals. If no, replace the compressor assembly.



### COMPRESSOR MAGNETIC CLUTCH OPERATION INSPECTION

Connect the battery (+) terminal to the compressor side terminal, and earth the battery (-) terminal to the body of the compressor. The condition is normal if the sound of the magnetic clutch (click) can be heard.

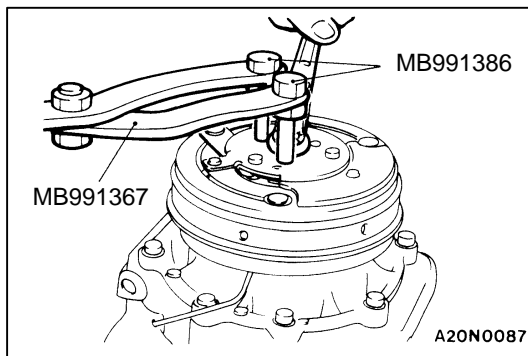
**MAGNETIC CLUTCH  
DISASSEMBLY AND REASSEMBLY**



**Disassembly steps**

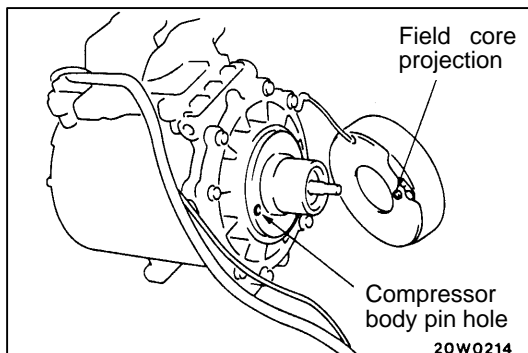
- ◀A▶ ▶E▶ ● Air gap adjustment
- ▶D▶ 1. Self-locking nut
- ▶C▶ 2. Armature
- 3. Shims

- ▶B▶ 4. Snap ring
- 5. Rotor
- ▶A▶ 6. Field core



**DISASSEMBLY SERVICE POINT**

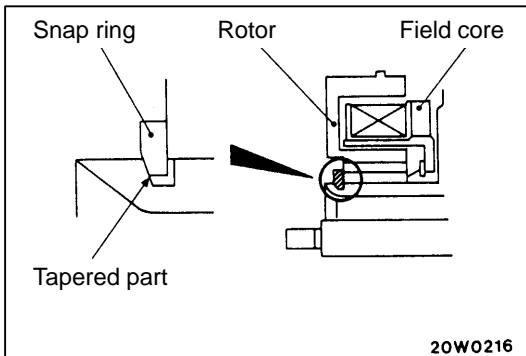
◀A▶ SELF-LOCKING NUT REMOVAL



**REASSEMBLY SERVICE POINTS**

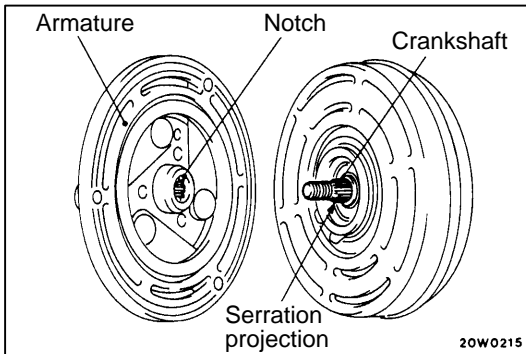
▶A▶ FIELD CORE INSTALLATION

When installing the field core to the compressor body, install so that the pin hole of the compressor body and the field core projection are aligned.



### ▶B◀ SNAP RING INSTALLATION

Install the snap ring using a pair of snap ring pliers so that the tapered surface is at the outer side.

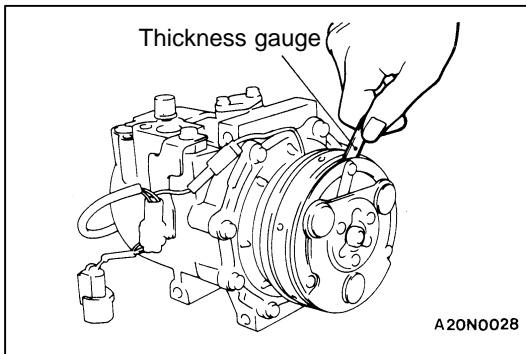


### ▶C◀ ARMATURE INSTALLATION

Align the serration projection of the crankshaft with the notch in the armature, and then fit them together.

### ▶D◀ SELF-LOCKING NUT INSTALLATION

Use the special tool to hold the magnet clutch, and tighten the self-locking nut in the same manner as removal.



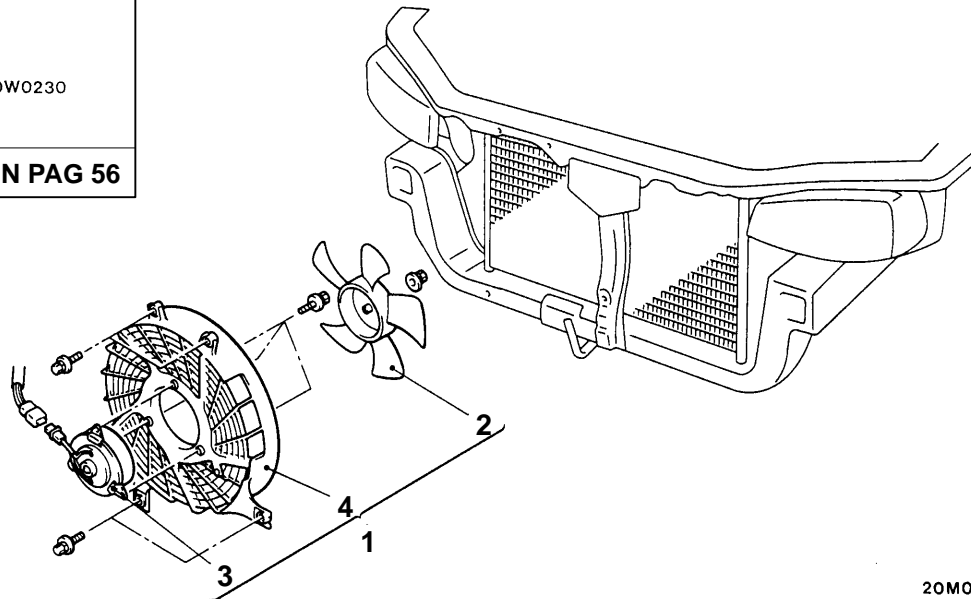
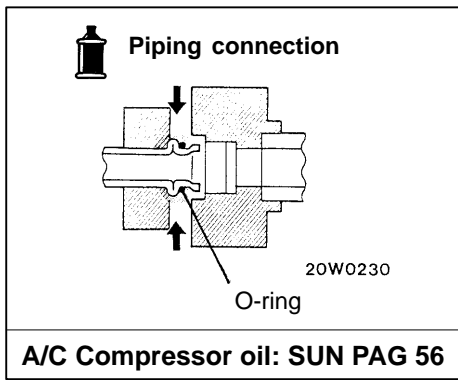
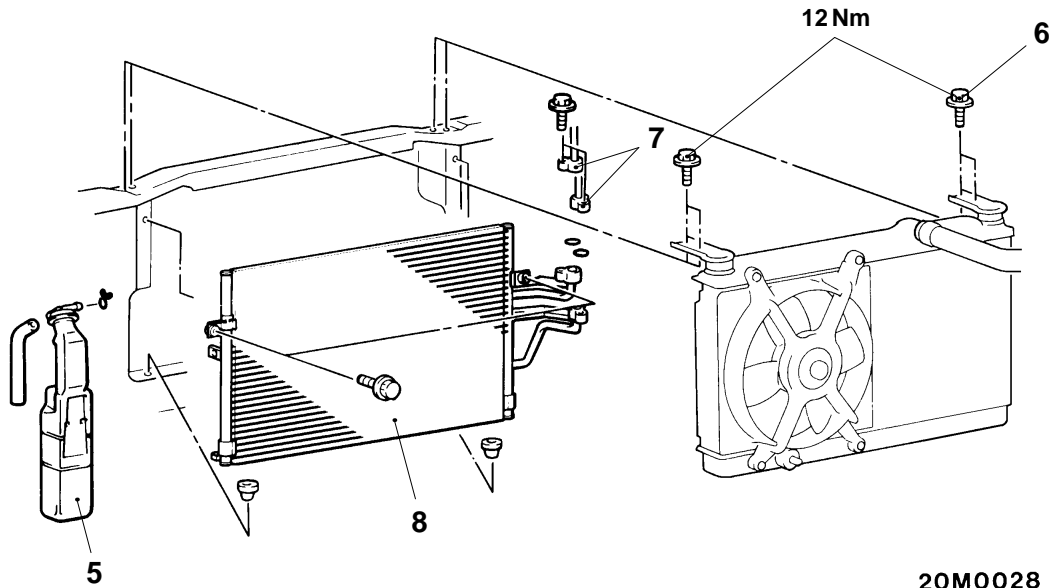
### ▶E◀ AIR GAP ADJUSTMENT

Check whether or not the air gap of the clutch is within the standard value. If there is a deviation of the air gap from the standard value, make the necessary adjustment by adjusting the number of shims.

**Standard value: 0.4 – 0.6 mm**

# CONDENSER AND CONDENSER FAN

## REMOVAL AND INSTALLATION



### Condenser fan removal steps

- Front bumper
- 1. Condenser fan motor and shroud assembly
- 2. Fan
- 3. Motor assembly
- 4. Shroud

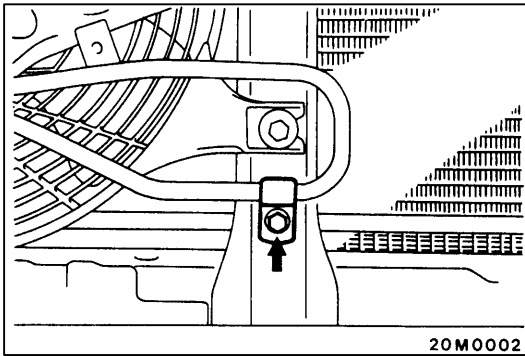


### Condenser removal steps

- Discharging and charging of refrigerant (Refer to P.55-6.)
- 5. Reserve tank
- 6. Radiator mounting bolt
- 7. Discharge hose, liquid pipe A connection
- 8. Condenser







## REMOVAL SERVICE POINTS

### ◀A▶ FAN MOTOR AND SHROUD ASSEMBLY REMOVAL

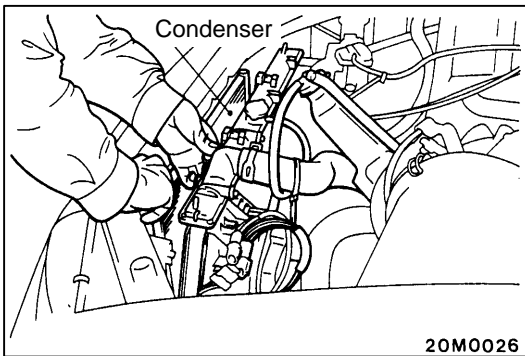
Remove the clamp bolt of the power steering oil cooler pipe. Remove the fan motor and shroud assembly while pulling the power steering oil cooler pipe toward you.

### ◀B▶ DISCHARGE HOSE / LIQUID PIPE A DISCONNECTION

Plug the open end of the disconnected hose and the opening in the cooling unit not to let foreign matter get into them.

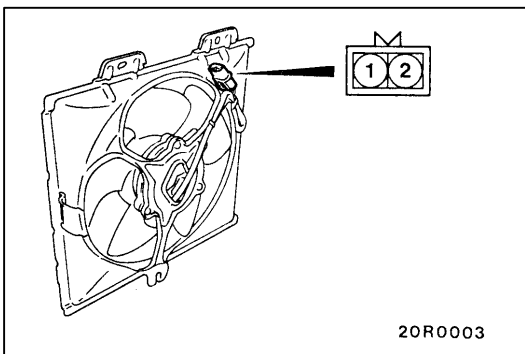
#### Caution

Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapour easily.



### ◀C▶ CONDENSER REMOVAL

Move the radiator to the engine side and then lift up the condenser to remove it.



## INSPECTION

### CONDENSER FAN MOTOR CHECK

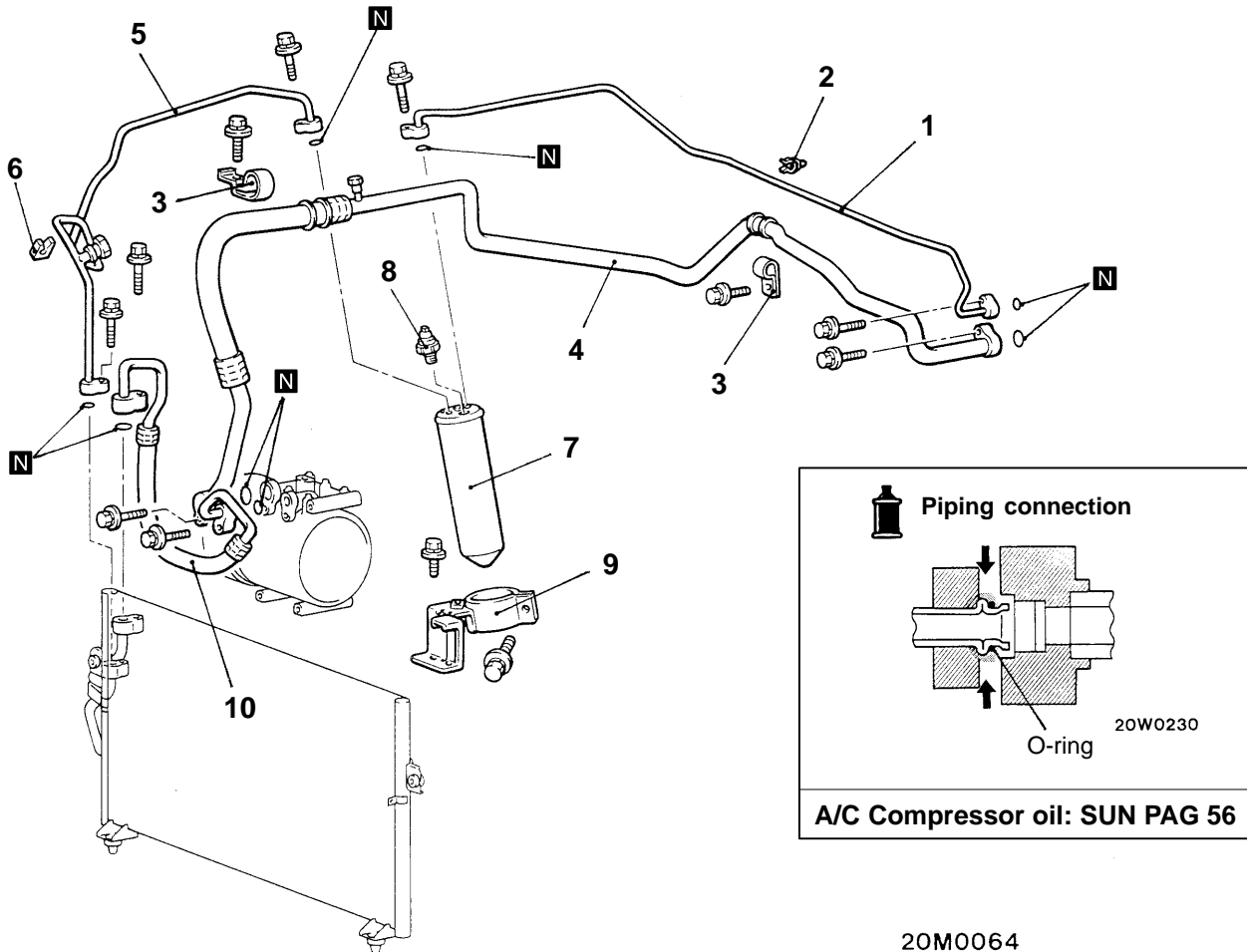
Battery connection terminal		Condenser fan operation
1	2	
⊕	⊖	Rotate

# REFRIGERANT LINE

## REMOVAL AND INSTALLATION

**Pre-removal and Post-installation Operation**

- Discharging and Charging of Refrigerant (Refer to P.55-6.)
- Air Cleaner Case and Hose Removal and Installation



1. Liquid pipe B



4. Suction hose assembly



6. Clip



7. Receiver  
8. Dual pressure switch  
9. Receiver bracket  
10. Discharge hose

**HOSE / PIPE DISCONNECTION**

Plug the open end of the disconnected hose and the opening in the cooling unit not to let foreign matter get into them.

**Caution**

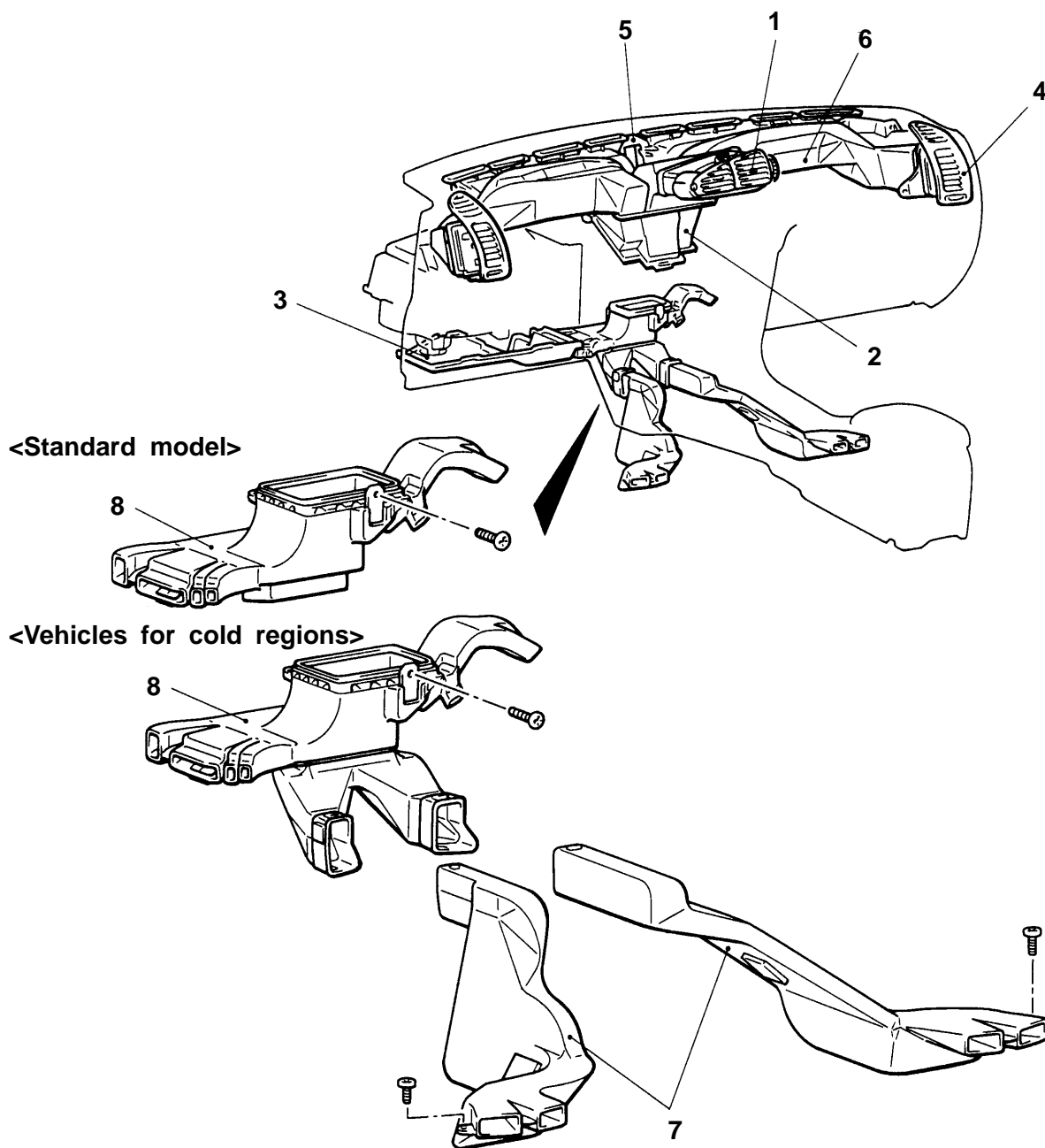
Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapour easily.

20M0064

00004595

## DUCTS

### REMOVAL AND INSTALLATION

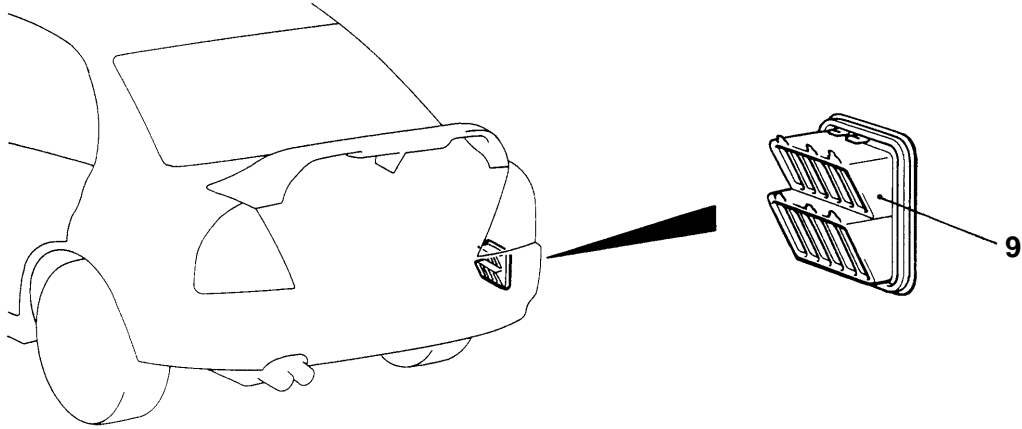


20M0043

1. Center air outlet assembly
2. Center ventilation duct  
(Refer to P.55-18, 19.)
3. Undercover  
<Vehicles for cold regions>  
(Refer to P.55-20.)
4. Side air outlet assembly
5. Defroster nozzle
6. Distribution duct

#### Rear heater duct removal steps

- Front seat assembly
- Floor console assembly
- 7. Rear heater duct <Vehicles for cold regions>
- Radio and tape player
- 8. Foot duct



20M0039

**Rear ventilation duct removal steps**

- Rear bumper assembly
  - Trunk side trim
9. Rear ventilation duct

# FULL-AUTOMATIC AIR CONDITIONER

## GENERAL

### OUTLINE OF CHANGE

- The following service procedures have been established.

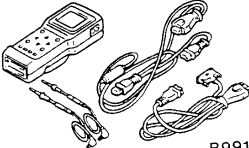
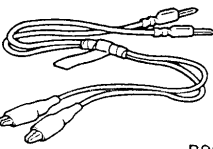
### SERVICE SPECIFICATIONS

Items	Standard value	
Idle speed r/min	750 ± 50	
Idle-up speed r/min	850 ± 50	
Air gap (Compressor) mm	0.4 – 0.6	
Air mix damper potentiometer resistance kΩ	MAX. HOT position	4.82
	MAX. COOL position	0.18
Outlet air changeover damper potentiometer resistance kΩ	DEF position	0.18
	FACE position	4.82

## LUBRICANTS

Items	Specified lubricants	Quantity
Compressor oil ml	SUN PAG 56	120 – 140
Each connection of refrigerant line	SUN PAG 56	As required
Refrigerant g	R134a (HFC-134a)	555 – 595

## SPECIAL TOOLS

Tool	Number	Name	Use
 <p>B991502</p>	MB991502	MUT-II sub-assembly	Inspection of full-automatic air conditioner
 <p>B991529</p>	MB991529	Diagnosis code check harness	Inspection of full-automatic air conditioner using a voltmeter

## TROUBLESHOOTING

### STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

### DIAGNOSIS FUNCTION

#### DIAGNOSIS CODES CHECK

Connect the MUT-II or a voltmeter to the diagnosis connector (16-pin), then check diagnosis codes. (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.

### INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
11	Inside air temperature sensor system (open circuit)	55-34
12	Inside air temperature sensor system (short circuit)	55-34
13	Outside air temperature sensor system (open circuit)	55-35
14	Outside air temperature sensor system (short circuit)	55-35
15	Heater water temperature sensor system (open circuit)	55-36
16	Heater water temperature sensor system (short circuit)	55-36
21	Air thermo sensor system (open circuit)	55-37
22	Air thermo sensor system (short circuit)	55-37
31	Potentiometer system of air mix damper assembly	55-38
32	Potentiometer system of air outlet changeover damper assembly	55-39
41	Drive system of air mix damper motor assembly	55-40
42	Drive system of air outlet changeover damper motor assembly	55-40

### INSPECTION PROCEDURES FOR DIAGNOSIS CODES

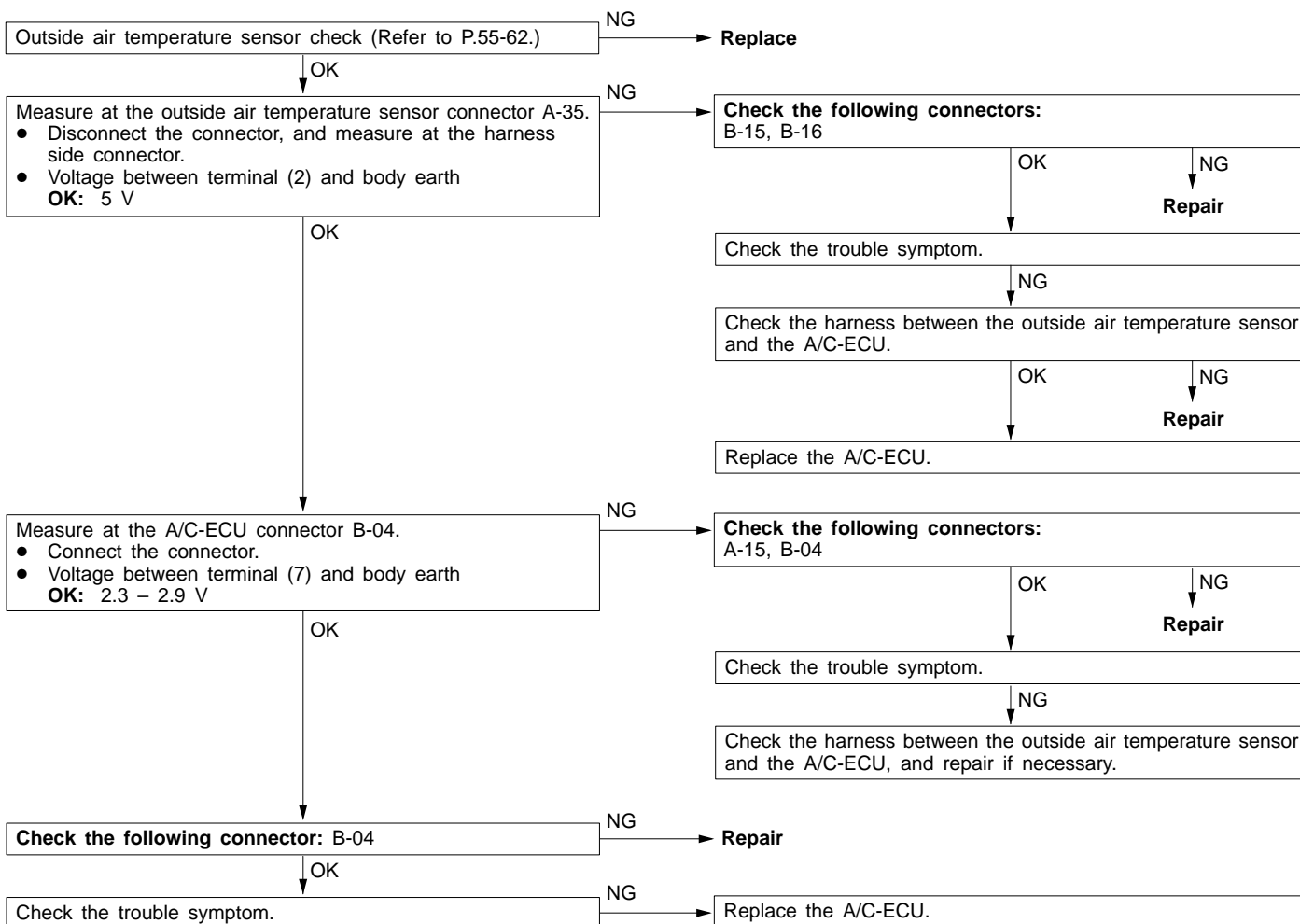
Code No.11 Inside air temperature sensor system (open circuit)	Probable cause
This diagnosis code is output if the power supply line or input line of the inside air temperature sensor inside A/C-ECU is open-circuited and no signal is input from the inside air temperature sensor to A/C-ECU.	<ul style="list-style-type: none"> <li>Malfunction of the A/C-ECU</li> </ul>

Replace the A/C-ECU.

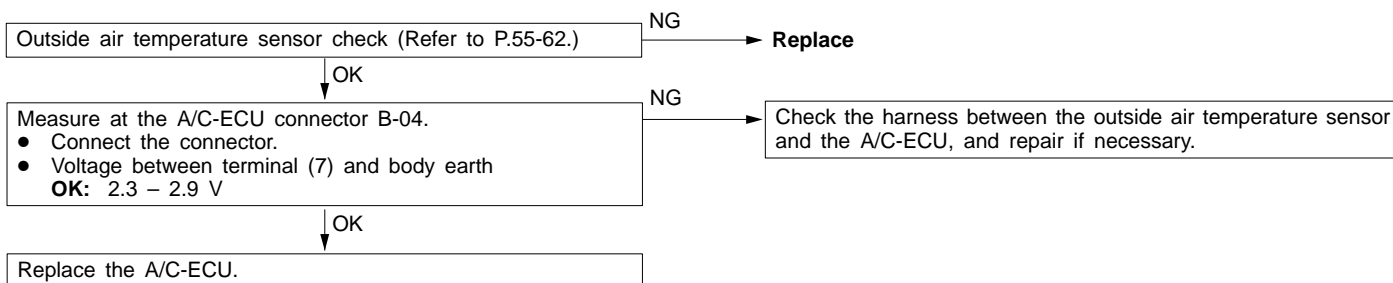
Code No.12 Inside air temperature sensor system (short circuit)	Probable cause
This diagnosis code is output if the power supply line or input line of the inside air temperature sensor inside A/C-ECU is short-circuited and inside air temperature sensor power supply voltage signals are input to A/C-ECU.	<ul style="list-style-type: none"> <li>Malfunction of the A/C-ECU</li> </ul>

Replace the A/C-ECU.

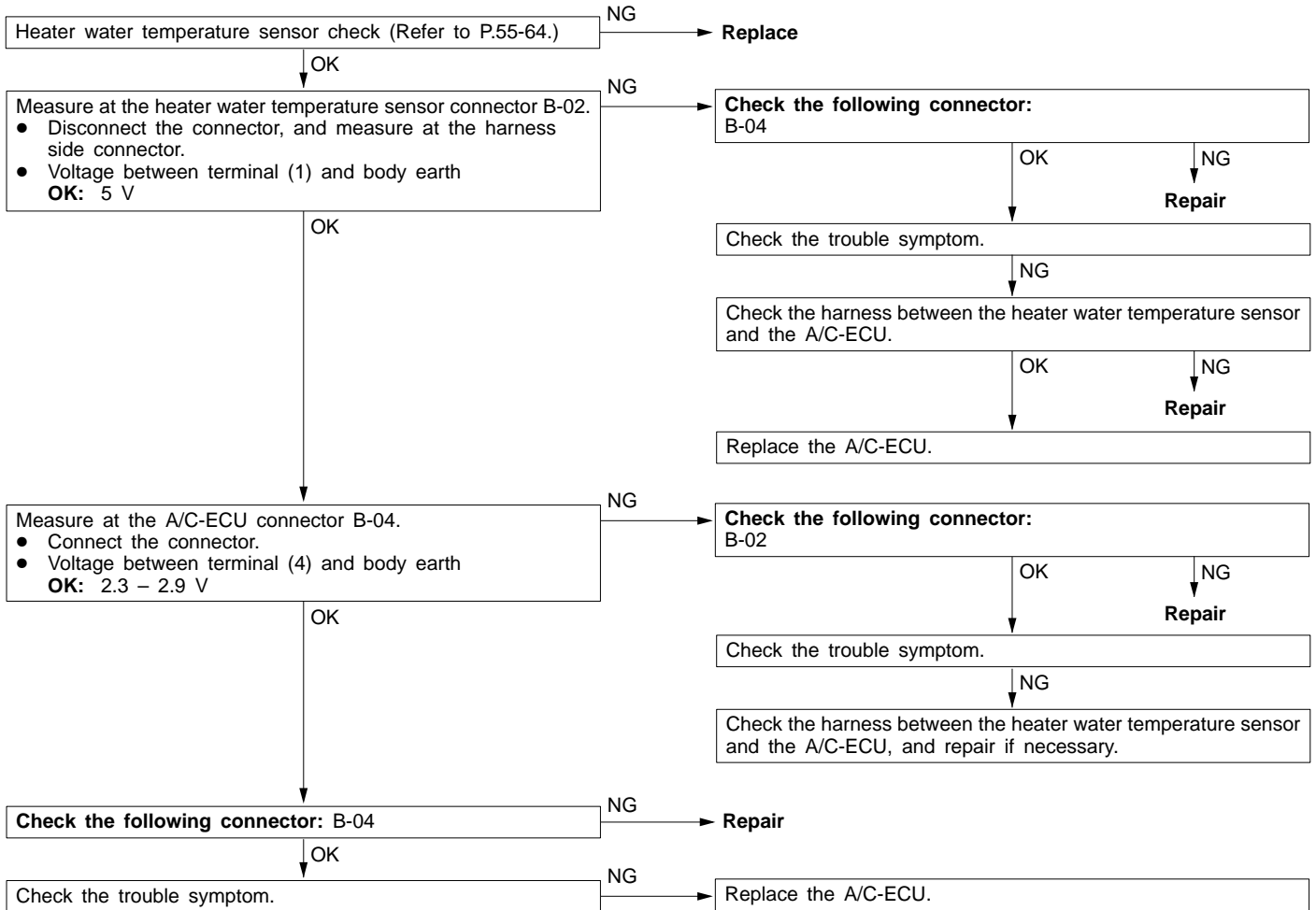
Code No.13 Outside air temperature sensor system (open circuit)	Probable cause
This diagnosis code is output if the power supply line or input line of the outside air temperature sensor is open-circuited and no signal is input from the outside air temperature sensor to A/C-ECU.	<ul style="list-style-type: none"> <li>● Malfunction of the outside air temperature sensor</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>



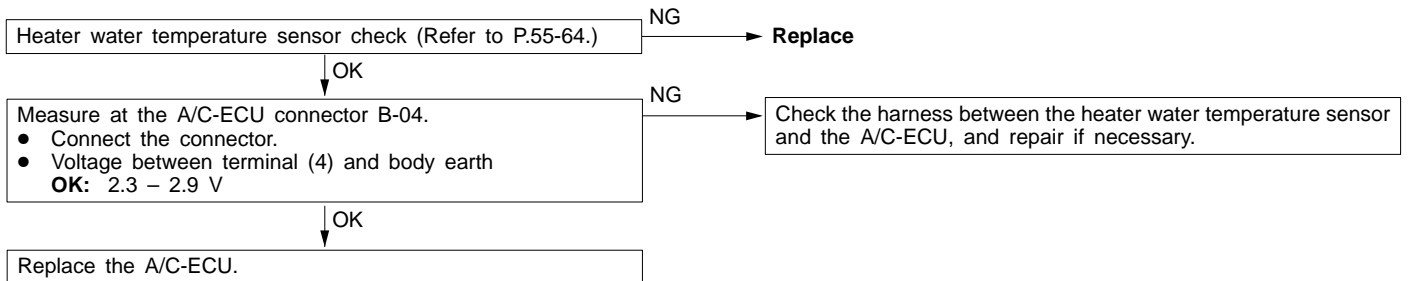
Code No.14 Outside air temperature sensor system (short circuit)	Probable cause
This diagnosis code is output if the power supply line or input line of the outside air temperature sensor is short-circuited and outside air temperature sensor power supply voltage signals are input to A/C-ECU.	<ul style="list-style-type: none"> <li>● Malfunction of the outside air temperature sensor</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>



Code No.15 Heater water temperature sensor system (open circuit)	Probable cause
This diagnosis code is output if the power supply line or input line of the heater water temperature sensor is open-circuited and no heater water temperature sensor signals are input to A/C-ECU.	<ul style="list-style-type: none"> <li>● Malfunction of the heater water temperature sensor</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>

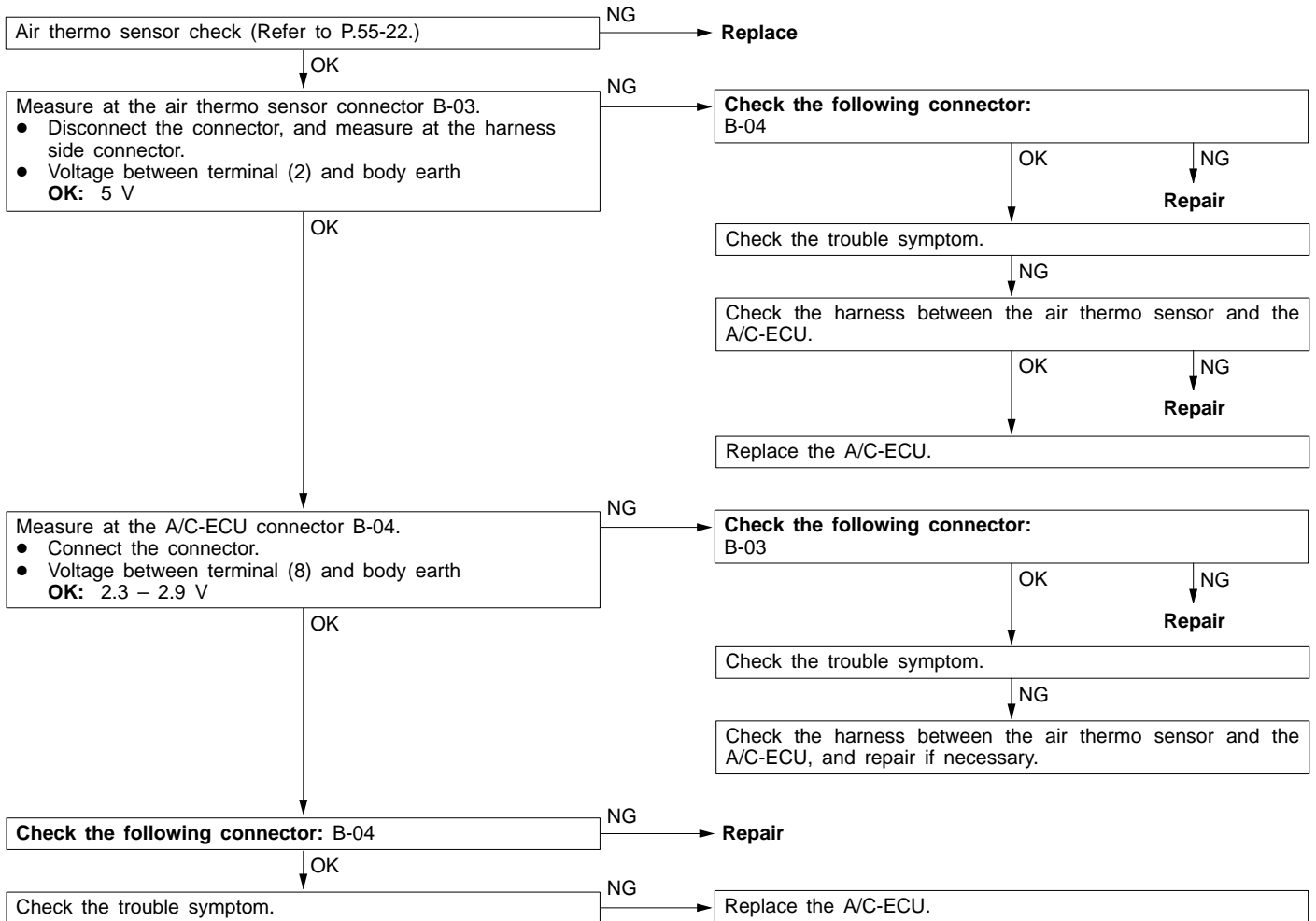


Code No.16 Heater water temperature sensor system (short circuit)	Probable cause
This diagnosis code is output if the power supply line or output line of the heater water temperature sensor is short-circuited and heater water temperature sensor power supply voltage signals are input to A/C-ECU.	<ul style="list-style-type: none"> <li>● Malfunction of the heater water temperature sensor</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>

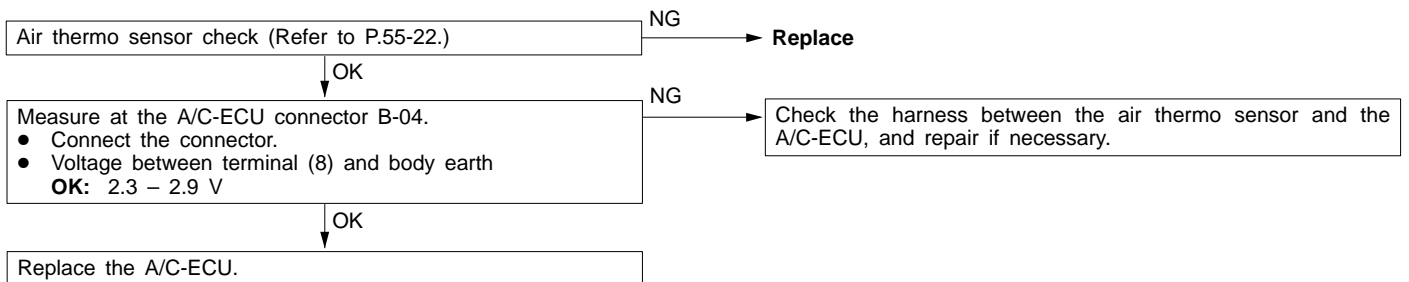




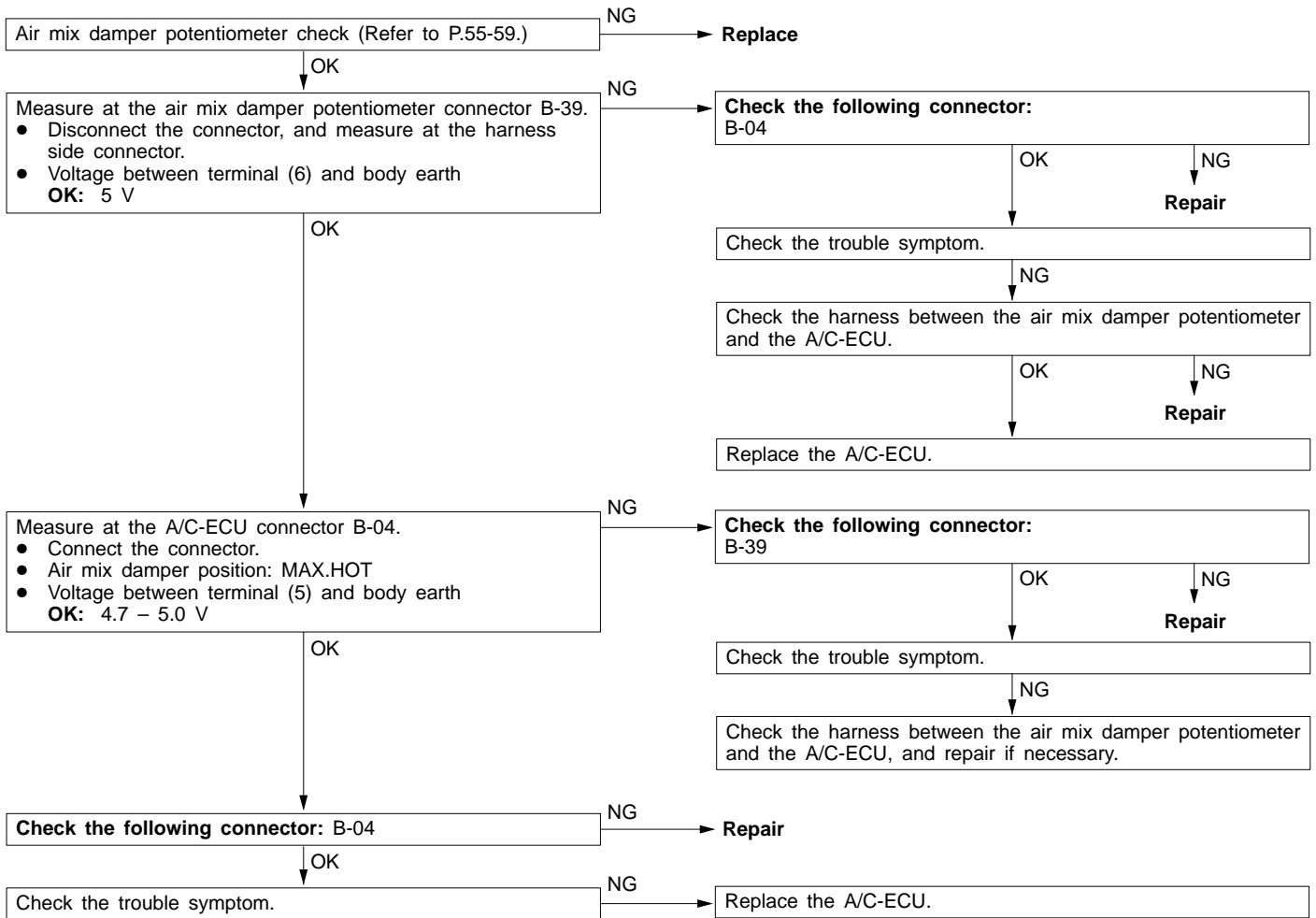
Code No.21 Air thermo sensor system (open circuit)	Probable cause
This diagnosis code is output if the power supply line or input line of the air thermo sensor is open-circuited and no air thermo sensor signals are input to A/C-ECU.	<ul style="list-style-type: none"> <li>● Malfunction of the air thermo sensor</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>



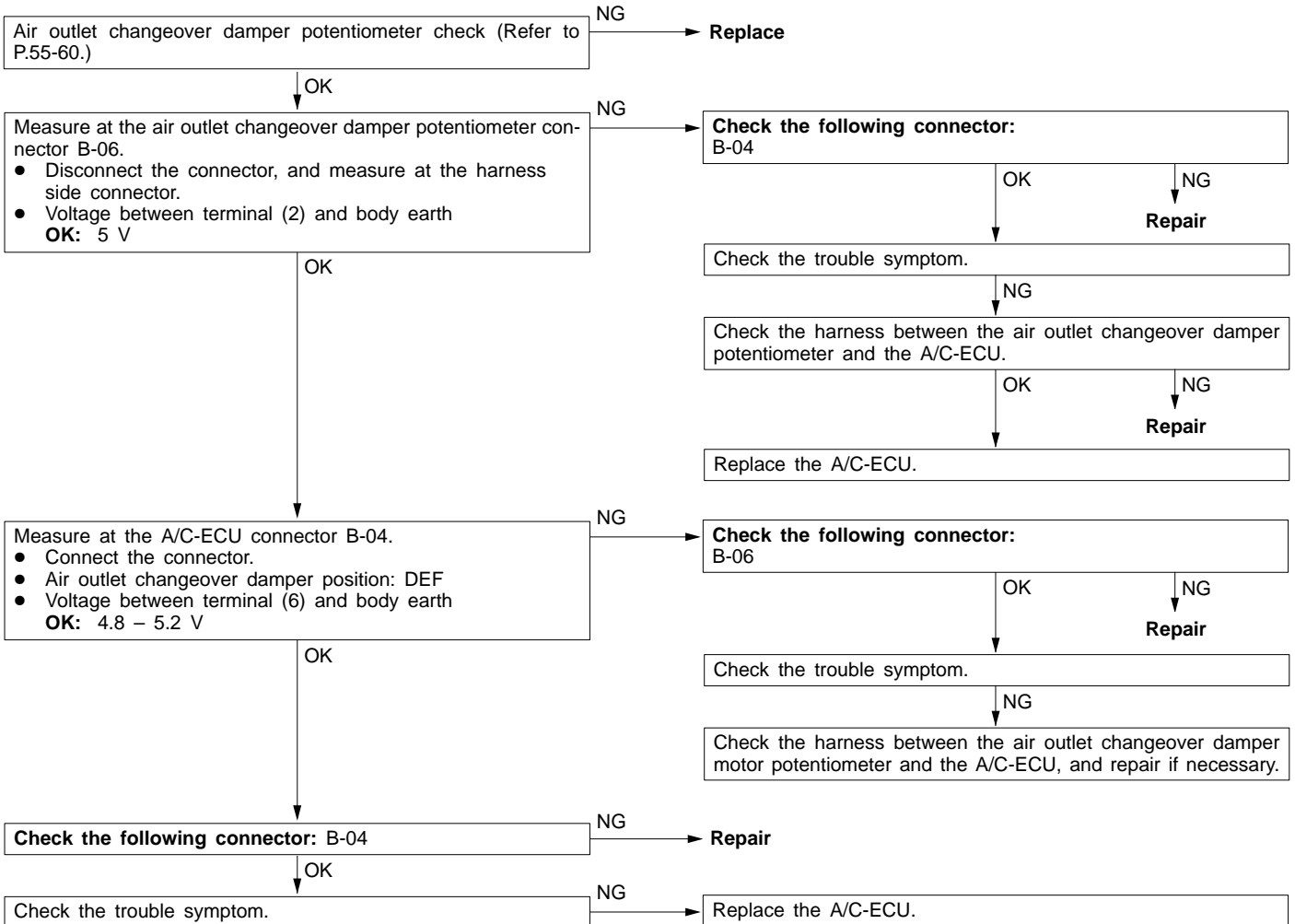
Code No.22 Air thermo sensor system (short circuit)	Probable cause
This diagnosis code is output if the power supply line or output line of the air thermo sensor is short-circuited and air thermo sensor power supply voltage signals are input to A/C-ECU.	<ul style="list-style-type: none"> <li>● Malfunction of the air thermo sensor</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>



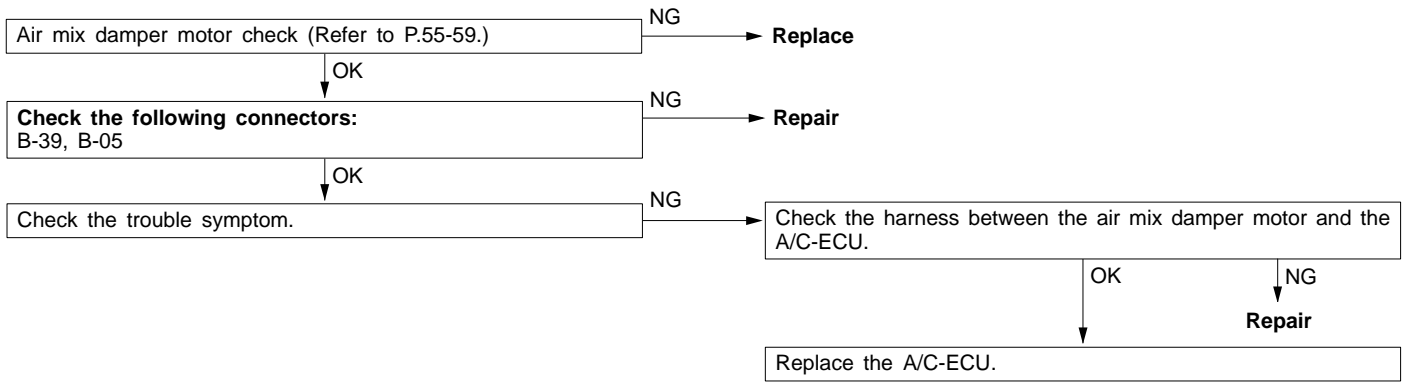
Code No.31 Potentiometer system of air mix damper motor assembly	Probable cause
This diagnosis code is output if no signals are input from air mix damper potentiometer to A/C-ECU because of short-circuit or open-circuit in the harness.	<ul style="list-style-type: none"> <li>● Malfunction of the air mix damper potentiometer</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>



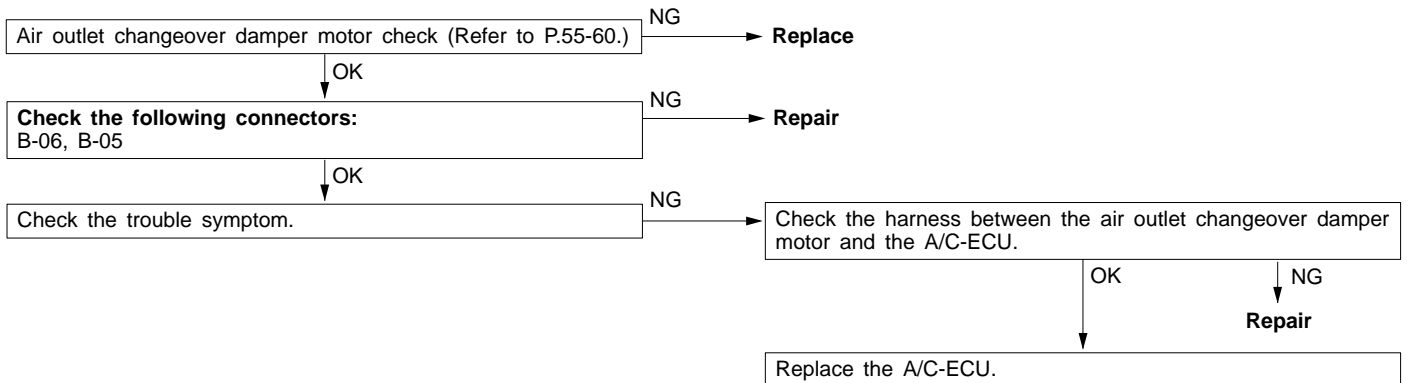
Code No.32 Potentiometer system of air outlet changeover damper motor assembly	Probable cause
This diagnosis code is output if no signals are input from air outlet changeover damper potentiometer to A/C-ECU because of short-circuit or open-circuit in the harness.	<ul style="list-style-type: none"> <li>● Malfunction of the air outlet changeover damper potentiometer</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>



Code No.41 Drive system of air mix damper motor assembly	Probable cause
This diagnosis code is output if the air mix damper fails to be turned to the preset opening.	<ul style="list-style-type: none"> <li>● Malfunction of the air mix damper motor assembly</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>



Code No.42 Drive system of air outlet changeover damper motor assembly	Probable cause
This diagnosis code is output if the air outlet changeover damper fails to be turned to the preset opening.	<ul style="list-style-type: none"> <li>● Malfunction of the air outlet changeover damper motor assembly</li> <li>● Malfunction of connector, harness</li> <li>● Malfunction of the A/C-ECU</li> </ul>



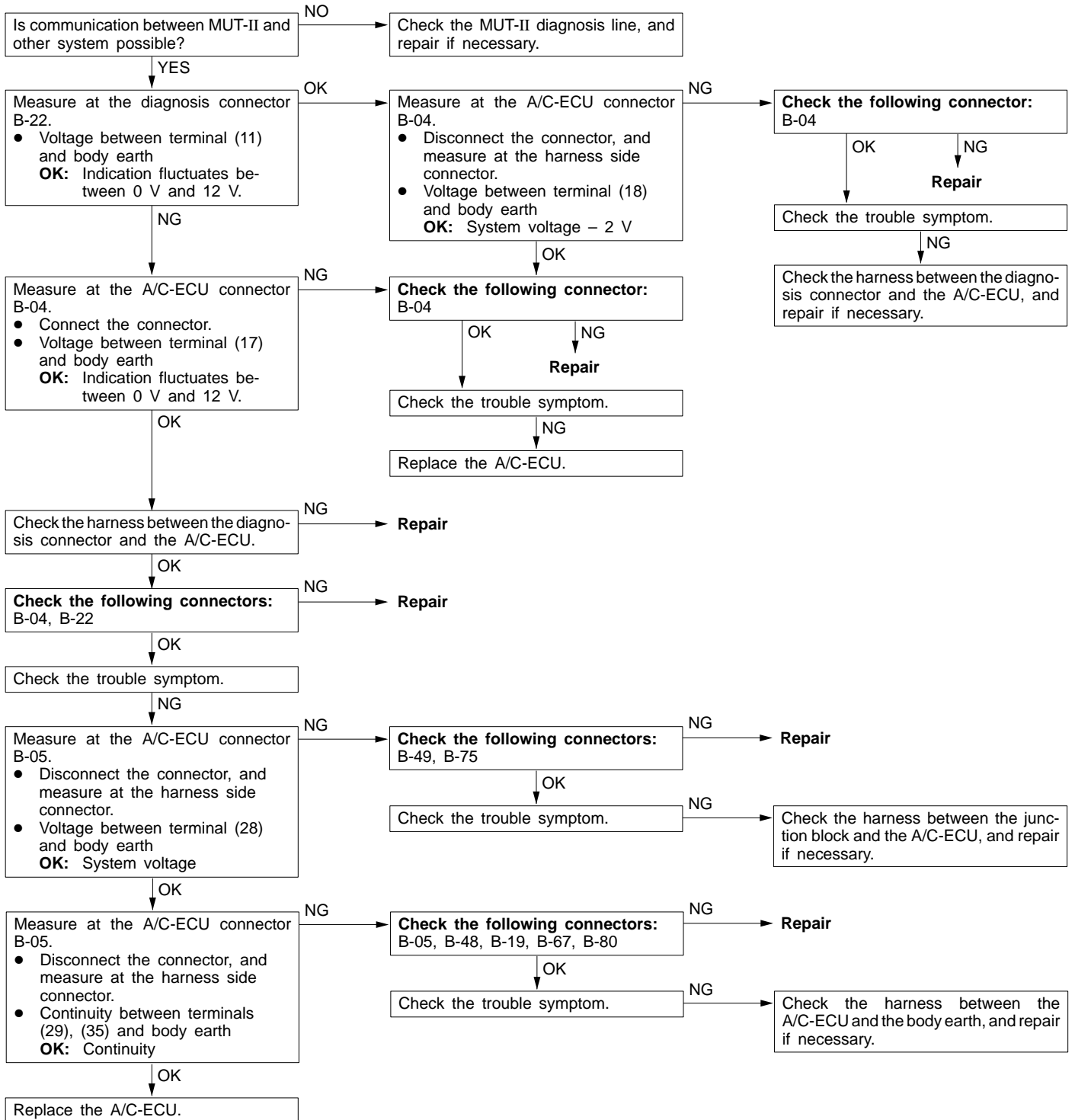
**INSPECTION CHART FOR TROUBLE SYMPTOMS**

Trouble symptom	Inspection procedure No.	Reference page
Communication with the MUT-II is not possible.	1	55-42
Air conditioner does not operate.	2	55-43
A/C graphic display on control panel is blank.	3	55-44
Temperature cannot be set.	4	55-44
A/C outlet air temperature does not increase.	5	55-44
A/C outlet air temperature does not decrease.	6	55-44
Blower does not operate.	7	55-45
Blower does not operate in HI mode.	8	55-46
Blower air amount cannot be changed.	9	55-47
Air outlet port cannot be changed.	10	55-47
Inside/outside air changeover is not possible.	11	55-48
Defroster function does not operate.	12	55-49
Condenser fan does not operate.	13	55-50
Rear defogger does not operate.	14	55-51
A/C-ECU power supply circuit check	15	55-52
A/C compressor control circuit check	16	55-53

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

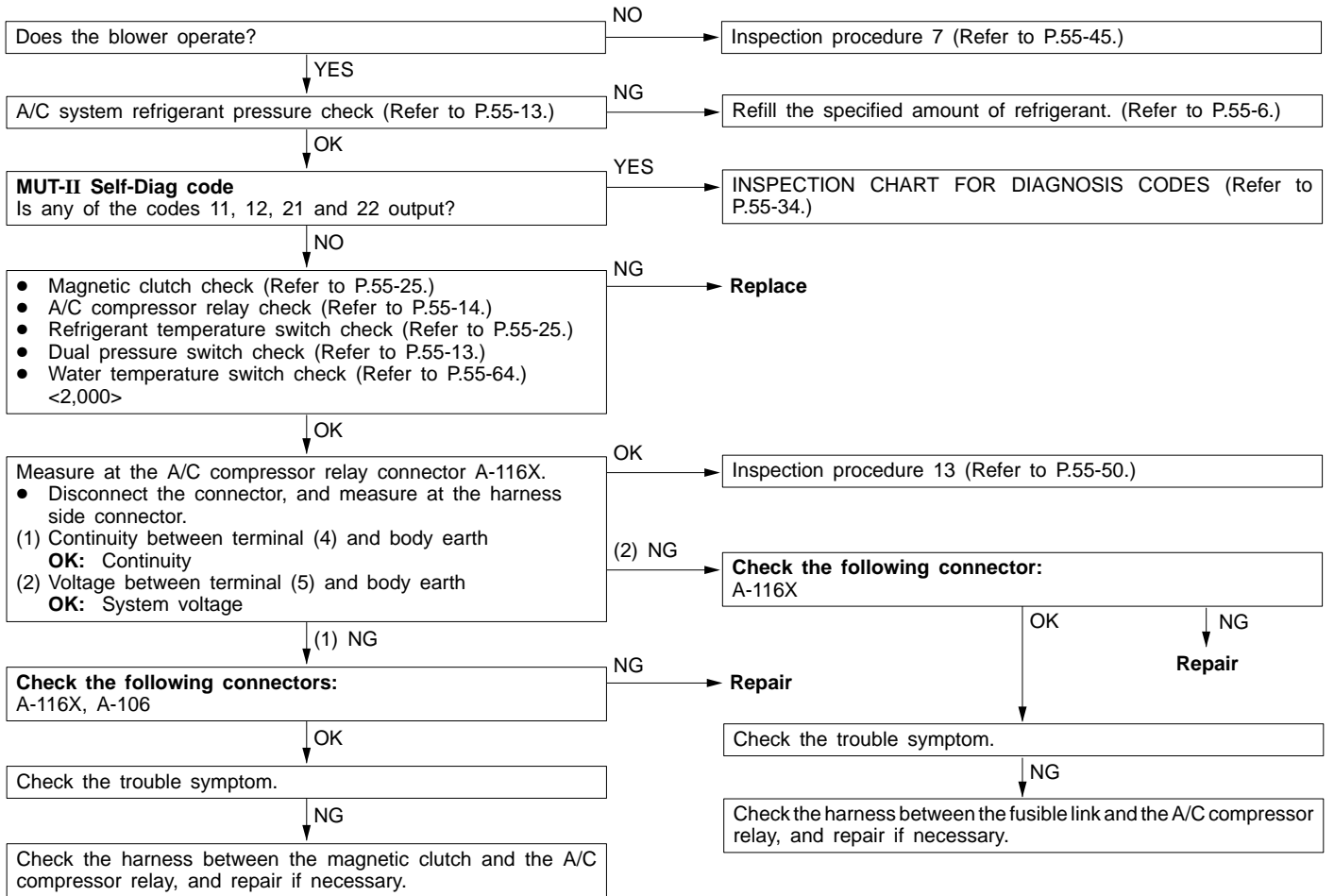
Inspection procedure 1

Communication with the MUT-II is not possible.	Probable cause
If communication with all other systems is not possible, there is a high possibility that there is a malfunction of the diagnosis line. If communication with only the A/C is not possible, the cause is probably a malfunction of the diagnosis line or of the A/C-ECU power supply system (earth).	<ul style="list-style-type: none"> <li>• Malfunction of connector or harness</li> <li>• Malfunction of A/C-ECU</li> </ul>



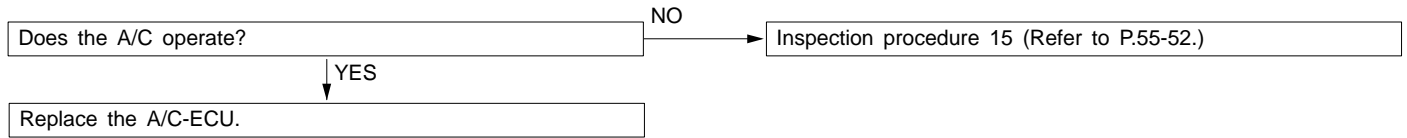
Inspection procedure 2

Air conditioner does not operate.	Probable cause
If the A/C does not operate when the A/C switch is on and the temperature setting is at 17°C, the cause is probably insufficient refrigerant, or a malfunction of the blower or of the magnet clutch power supply.	<ul style="list-style-type: none"> <li>● Malfunction of blower</li> <li>● Insufficient refrigerant</li> <li>● Malfunction of magnetic clutch</li> <li>● Malfunction of air thermo sensor</li> <li>● Malfunction of A/C compressor relay</li> <li>● Malfunction of refrigerant temperature switch</li> <li>● Malfunction of dual pressure switch</li> <li>● Malfunction of water temperature switch</li> <li>● Malfunction of connector or harness</li> <li>● Malfunction of engine-ECU</li> <li>● Malfunction of A/C-ECU</li> </ul>



## Inspection procedure 3

A/C graphic display on control panel is blank.	Probable cause
The cause is probably a malfunction of the A/C-ECU power supply system (earth).	<ul style="list-style-type: none"> <li>• Malfunction of connector or harness</li> <li>• Malfunction of A/C-ECU</li> </ul>



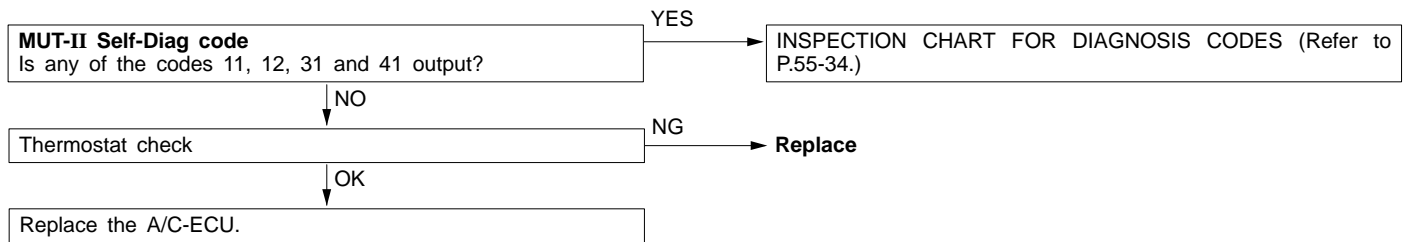
## Inspection procedure 4

Temperature cannot be set.	Probable cause
The cause is probably a malfunction of the temperature setting signal input system or output system.	<ul style="list-style-type: none"> <li>• Malfunction of connector or harness</li> <li>• Malfunction of A/C-ECU</li> </ul>

Inspection procedure 15 (Refer to P.55-52.)

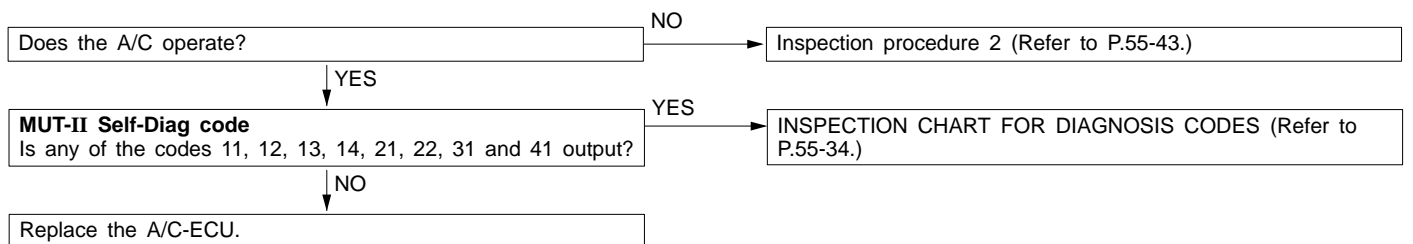
## Inspection procedure 5

A/C outlet air temperature does not increase.	Probable cause
If the outlet air temperature does not increase when the temperature setting is increased, the cause is probably a sensor malfunction or a problem with operation of the air mix damper. The MUT-II can be used to check the diagnosis codes in order to check the cause of the problem for each separate system.	<ul style="list-style-type: none"> <li>• Malfunction of air mix damper potentiometer</li> <li>• Malfunction of air mix damper motor</li> <li>• Malfunction of air mix damper</li> <li>• Malfunction of connector or harness</li> <li>• Malfunction of thermostat</li> <li>• Malfunction of A/C-ECU</li> </ul>



## Inspection procedure 6

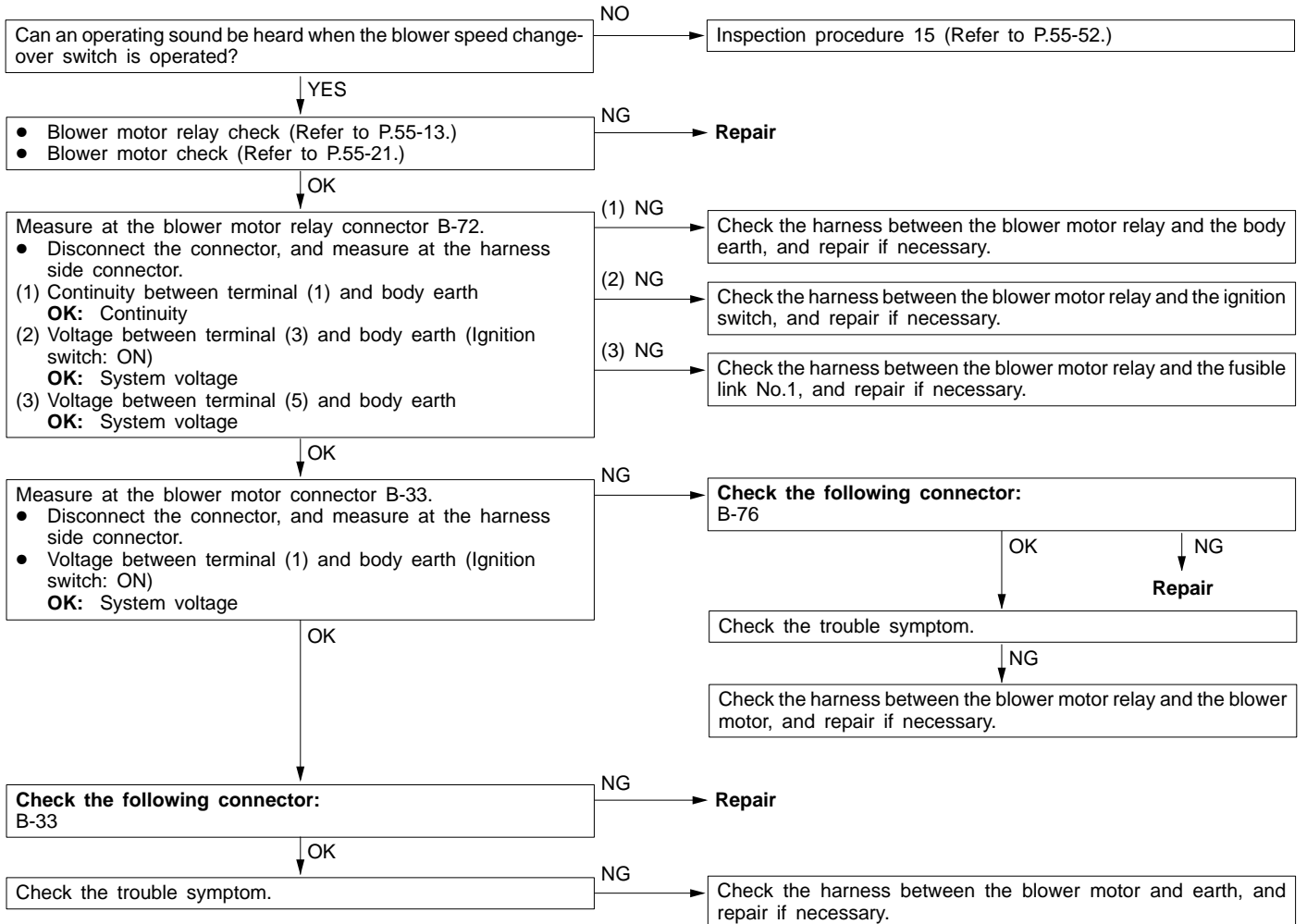
A/C outlet air temperature does not decrease.	Probable cause
If the outlet air temperature does not decrease when the temperature setting is decreased, the cause is probably a problem in A/C system operation due to a sensor error, or a problem with operation of the air mix damper. The MUT-II can be used to check the diagnosis codes in order to check the cause of the problem for each separate system.	<ul style="list-style-type: none"> <li>• Malfunction of outside air temperature sensor</li> <li>• Malfunction of air mix damper potentiometer</li> <li>• Malfunction of air mix damper motor</li> <li>• Malfunction of air thermo sensor</li> <li>• Malfunction of connector or harness</li> <li>• Malfunction of air mix damper</li> <li>• Malfunction of A/C-ECU</li> </ul>





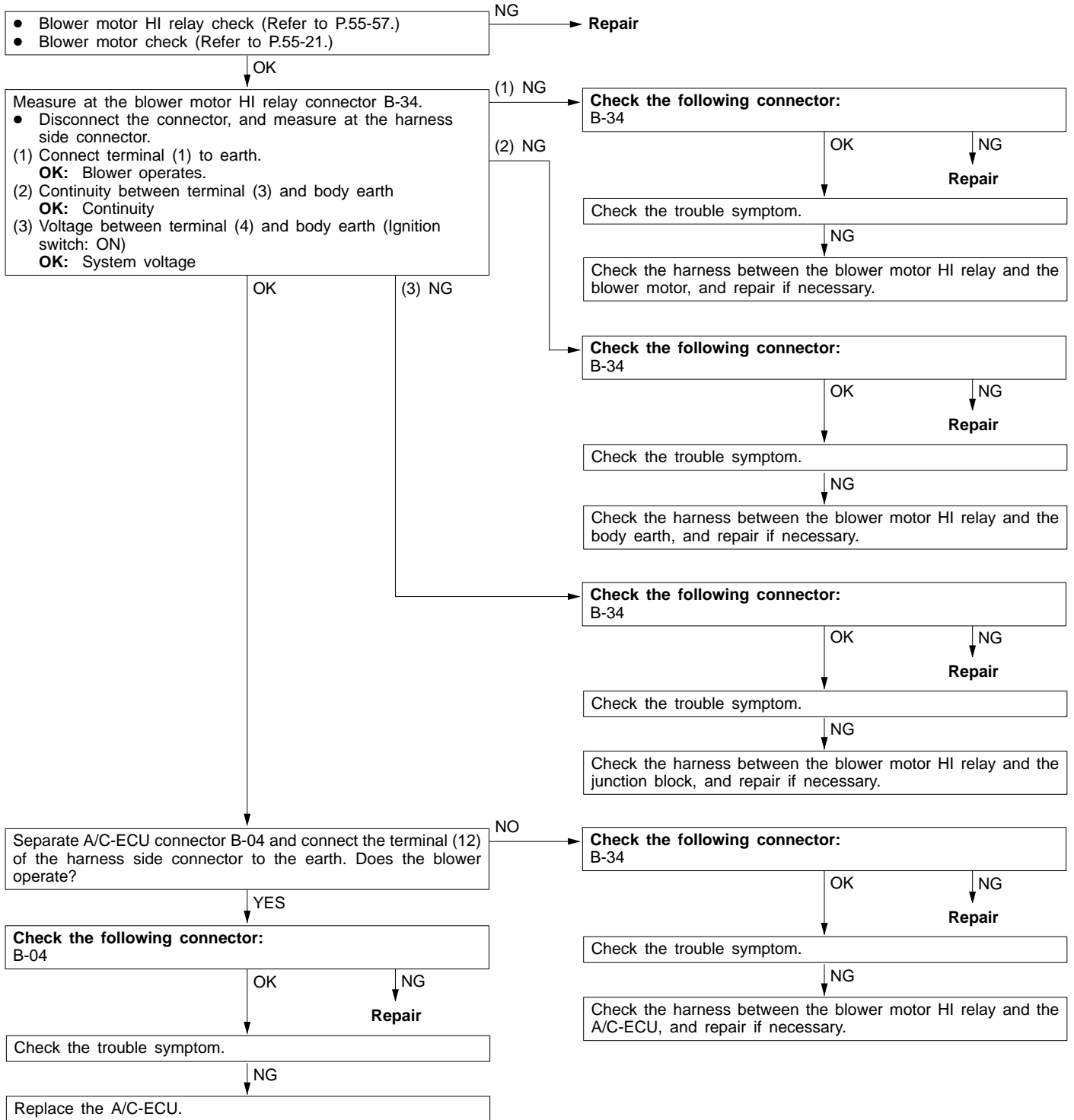
Inspection procedure 7

Blower does not operate.	Probable cause
If no air comes out of the blower even though the blower switch is on, the cause is probably a malfunction of the blower motor relay circuit.	<ul style="list-style-type: none"> <li>● Malfunction of blower motor relay</li> <li>● Malfunction of blower motor</li> <li>● Malfunction of connector or harness</li> <li>● Malfunction of A/C-ECU</li> </ul>



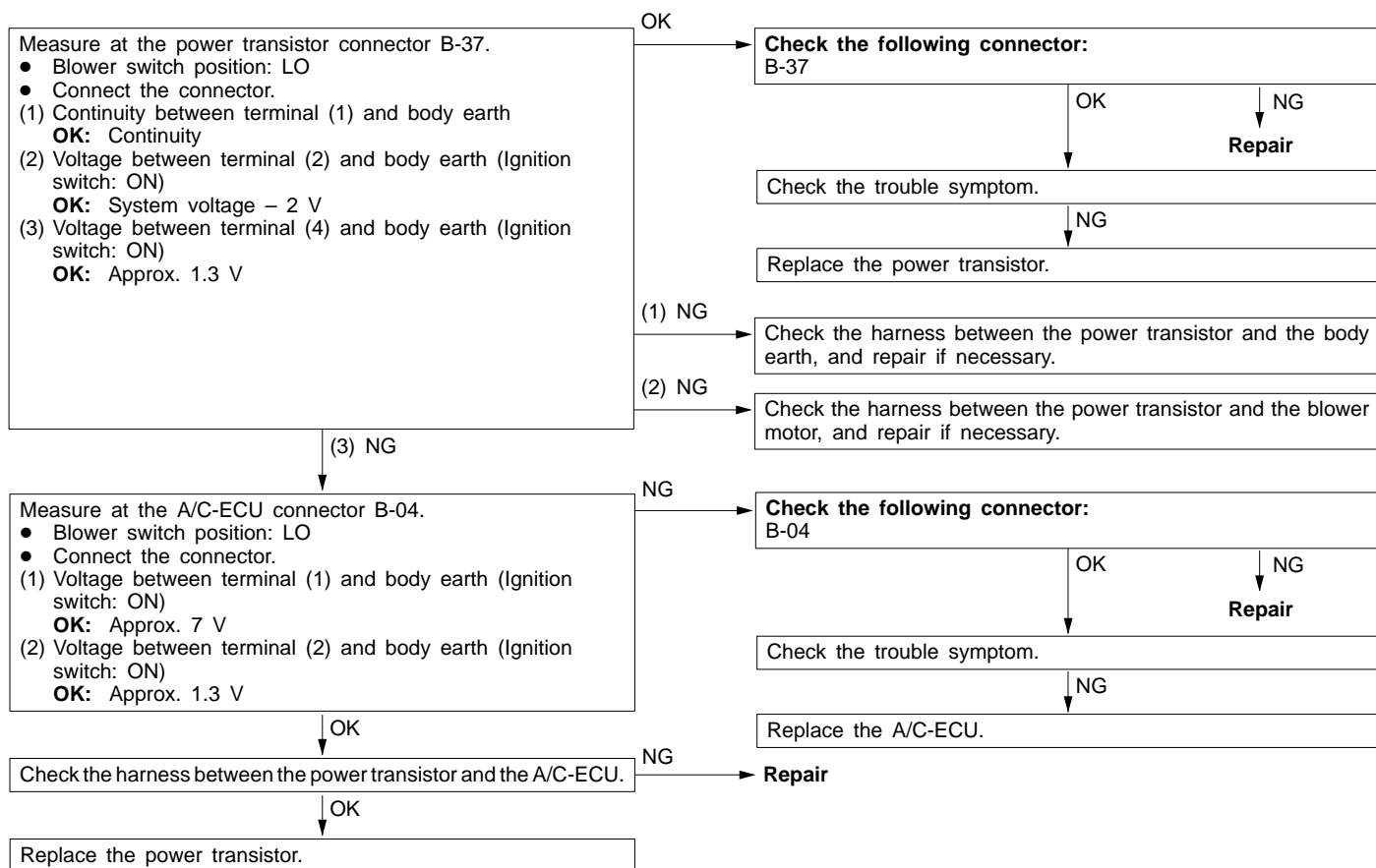
Inspection procedure 8

Blower does not operate in HI mode.	Probable cause
If the blower does not operate in HI mode when the temperature is set to 17 or 32, the cause is probably a malfunction of the blower motor HI relay circuit system.	<ul style="list-style-type: none"> <li>● Malfunction of blower motor HI relay</li> <li>● Malfunction of blower motor</li> <li>● Malfunction of connector or harness</li> <li>● Malfunction of A/C-ECU</li> </ul>



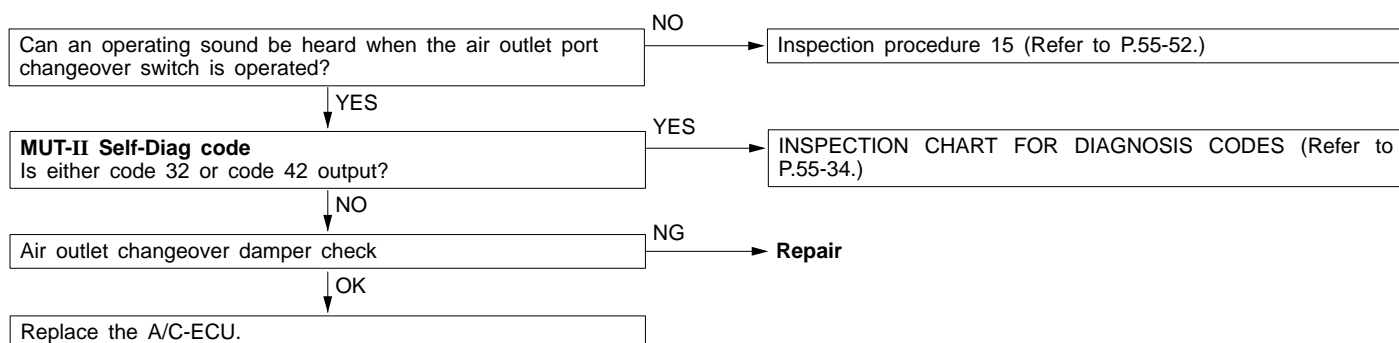
Inspection procedure 9

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.	<ul style="list-style-type: none"> <li>● Malfunction of power transistor</li> <li>● Malfunction of connector or harness</li> <li>● Malfunction of A/C-ECU</li> </ul>



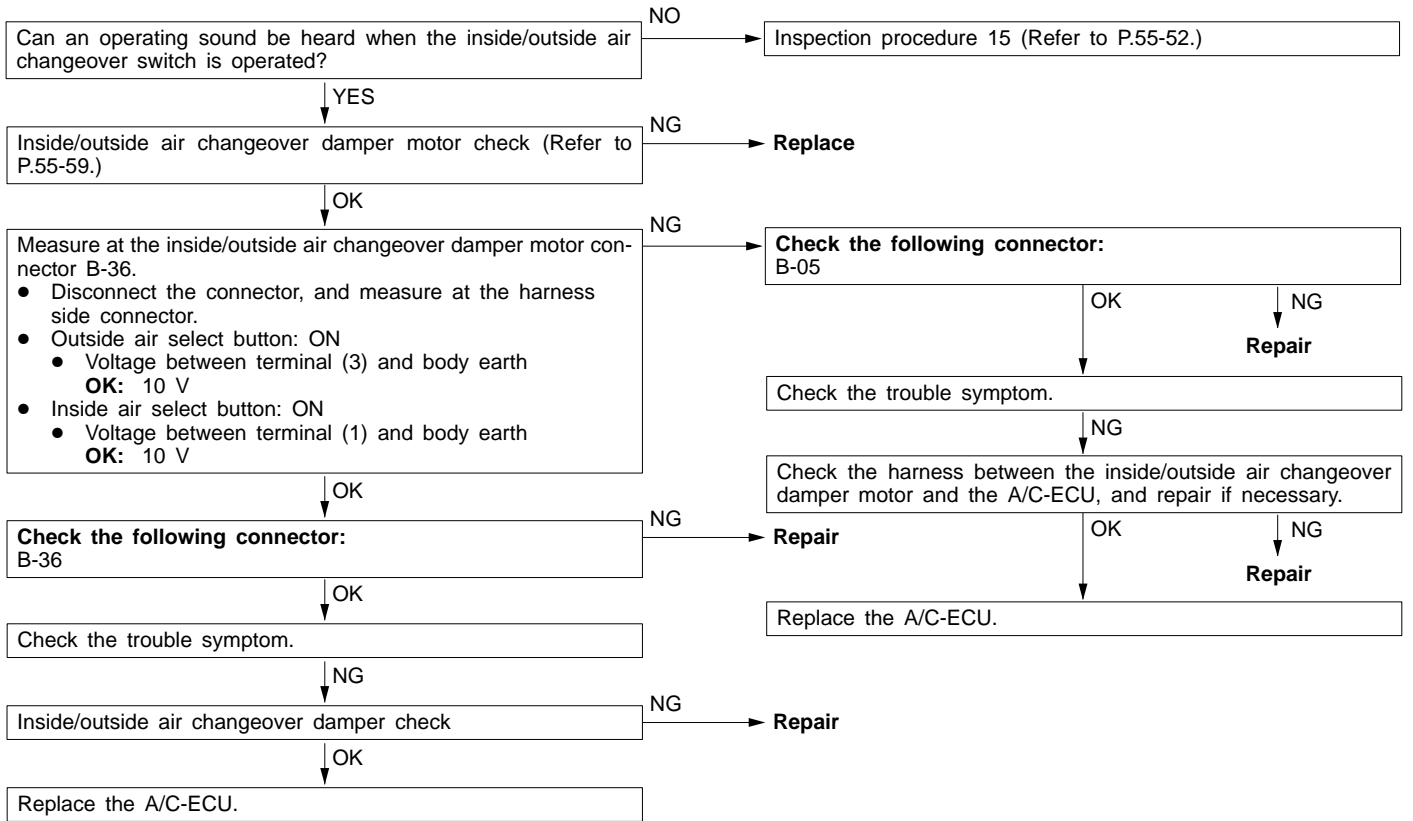
Inspection procedure 10

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.	<ul style="list-style-type: none"> <li>● Malfunction of air outlet changeover damper potentiometer</li> <li>● Malfunction of air outlet changeover damper motor</li> <li>● Malfunction of air outlet changeover damper</li> <li>● Malfunction of connector or harness</li> <li>● Malfunction of A/C-ECU</li> </ul>



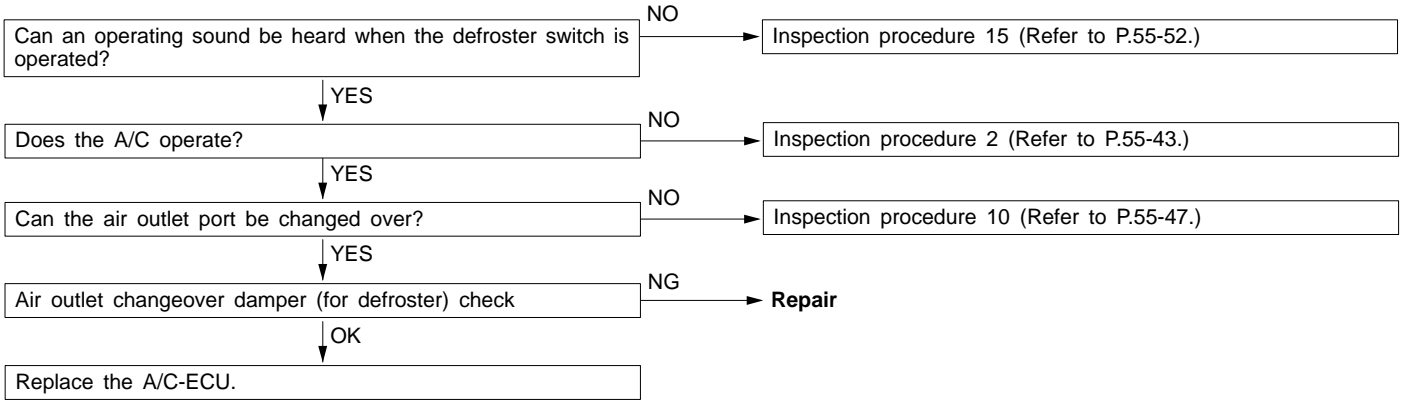
Inspection procedure 11

Inside/outside air changeover is not possible.	Probable cause
If inside/outside air changeover is not possible even when the inside/outside air changeover switch is on, the cause is probably a malfunction of the inside/outside air changeover damper motor.	<ul style="list-style-type: none"> <li>● Malfunction of inside/outside air changeover damper motor</li> <li>● Malfunction of inside/outside air changeover damper</li> <li>● Malfunction of connector or harness</li> <li>● Malfunction of A/C-ECU</li> </ul>



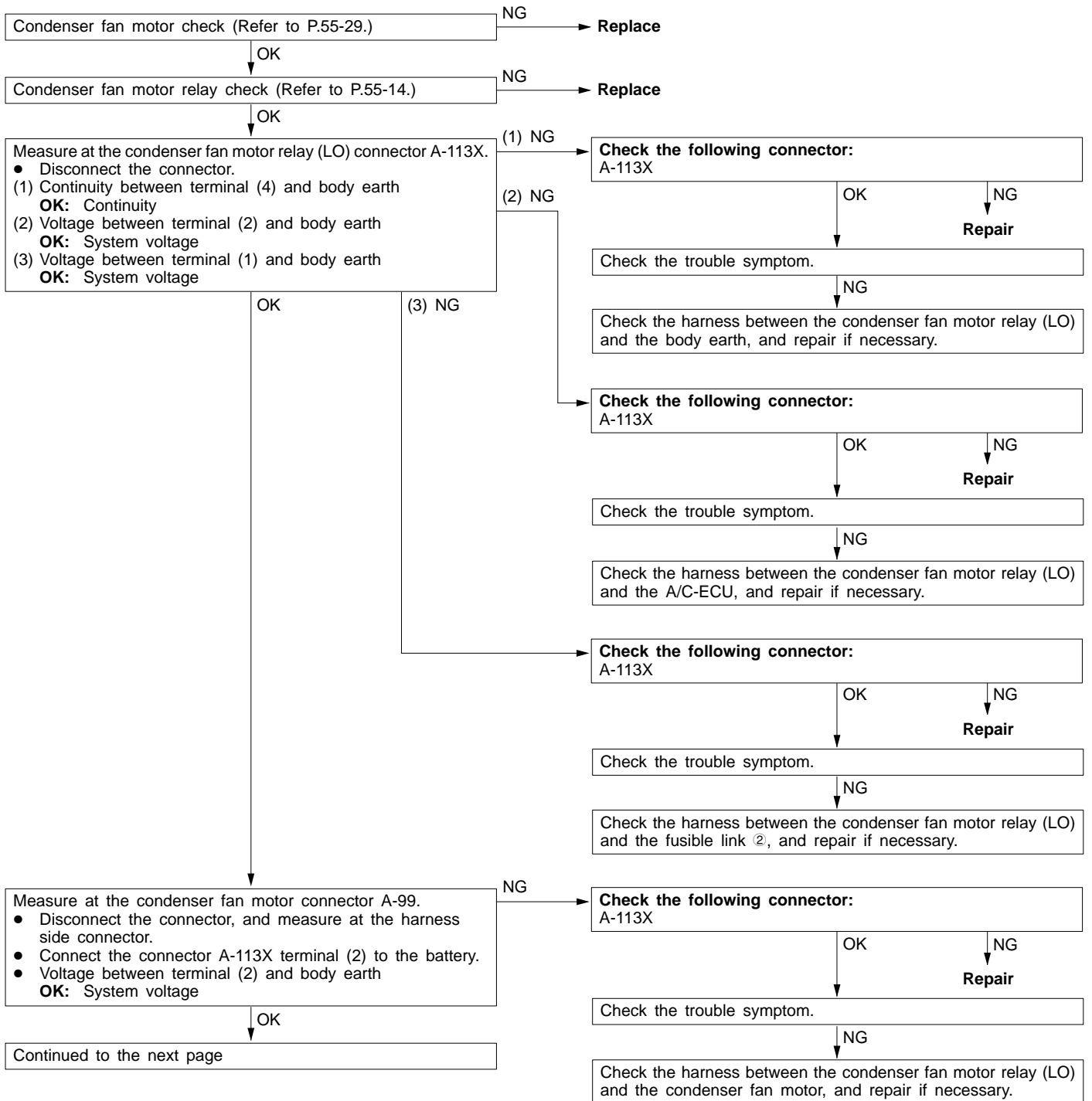
Inspection procedure 12

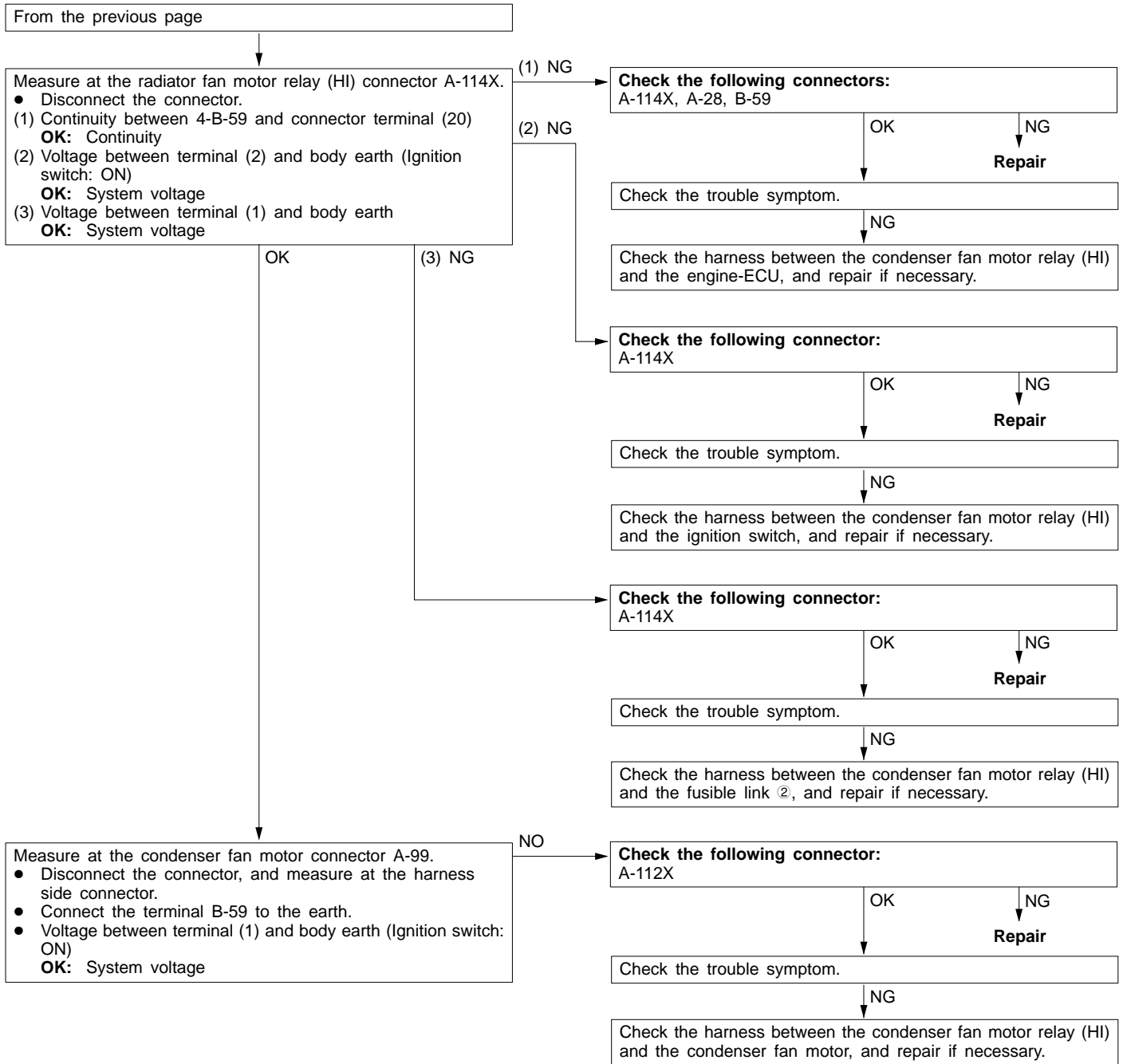
Defroster function does not operate.	Probable cause
If the defroster function does not operate when the defroster switch is turned on, the cause is probably a malfunction of the A/C or of the air outlet port changeover circuit.	<ul style="list-style-type: none"> <li>● Malfunction of air conditioner drive system</li> <li>● Malfunction of air outlet changeover damper drive system</li> <li>● Malfunction of connector or harness</li> <li>● Malfunction of A/C-ECU</li> </ul>



Inspection procedure 13

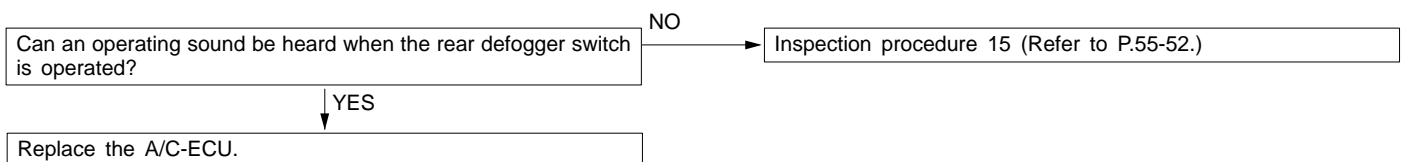
Condenser fan does not operate.	Probable cause
If the condenser fan does not turn when the A/C is ON, the cause is probably a malfunction of the condenser fan motor activation circuit. In this case, reduced cooling performance will be caused if the vehicle is not running.	<ul style="list-style-type: none"> <li>● Malfunction of condenser fan motor</li> <li>● Malfunction of condenser fan motor relay (HI, LO)</li> <li>● Malfunction of wiring harness or connector</li> </ul>





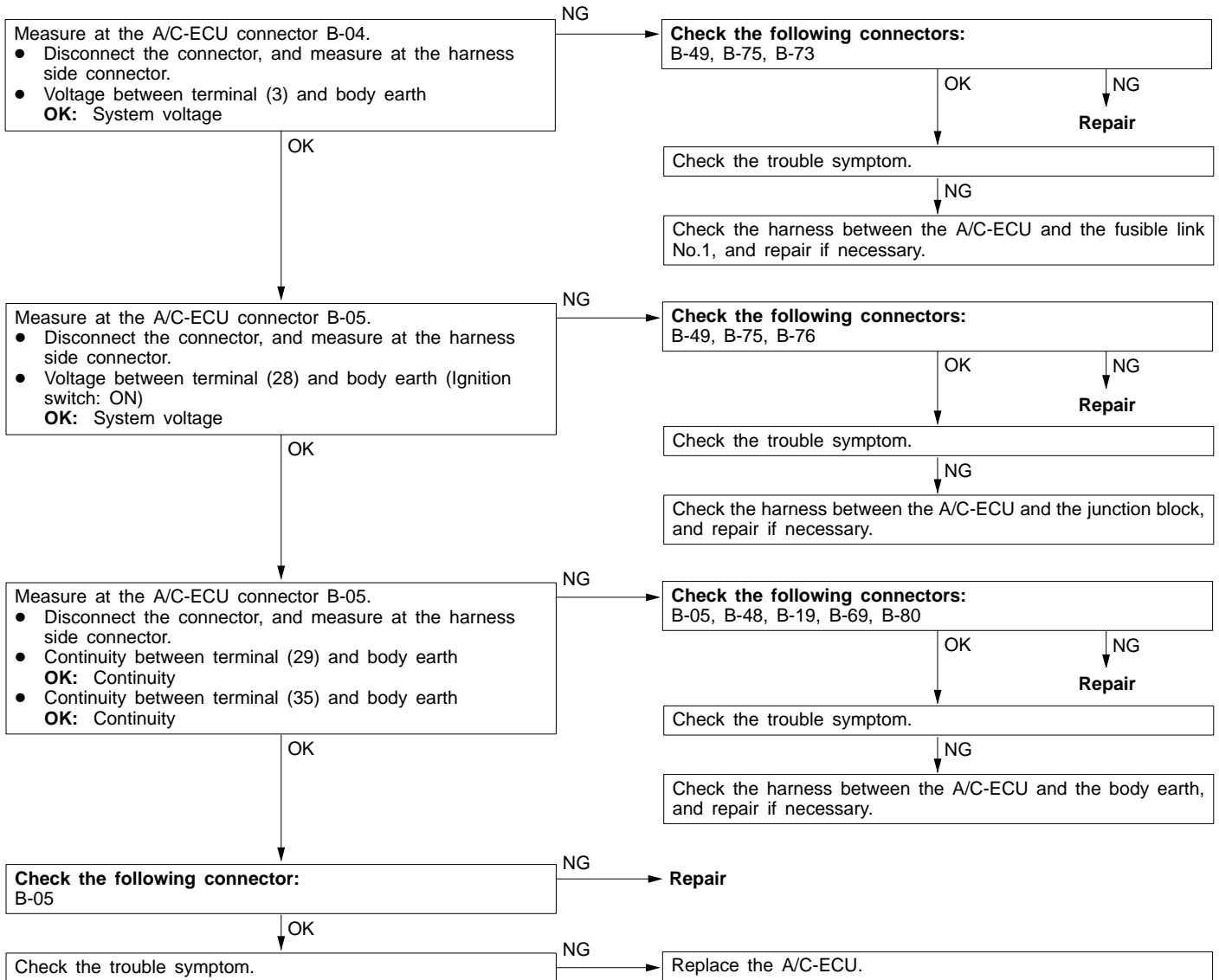
**Inspection procedure 14**

Rear defogger does not operate.	Probable cause
If the rear defogger does not operate when the rear defogger switch is turned on (timer operates for 20 minutes), the cause is probably a malfunction of the A/C-ECU power supply system (earth).	<ul style="list-style-type: none"> <li>Malfunction of connector or harness</li> <li>Malfunction of A/C-ECU</li> </ul>



Inspection procedure 15

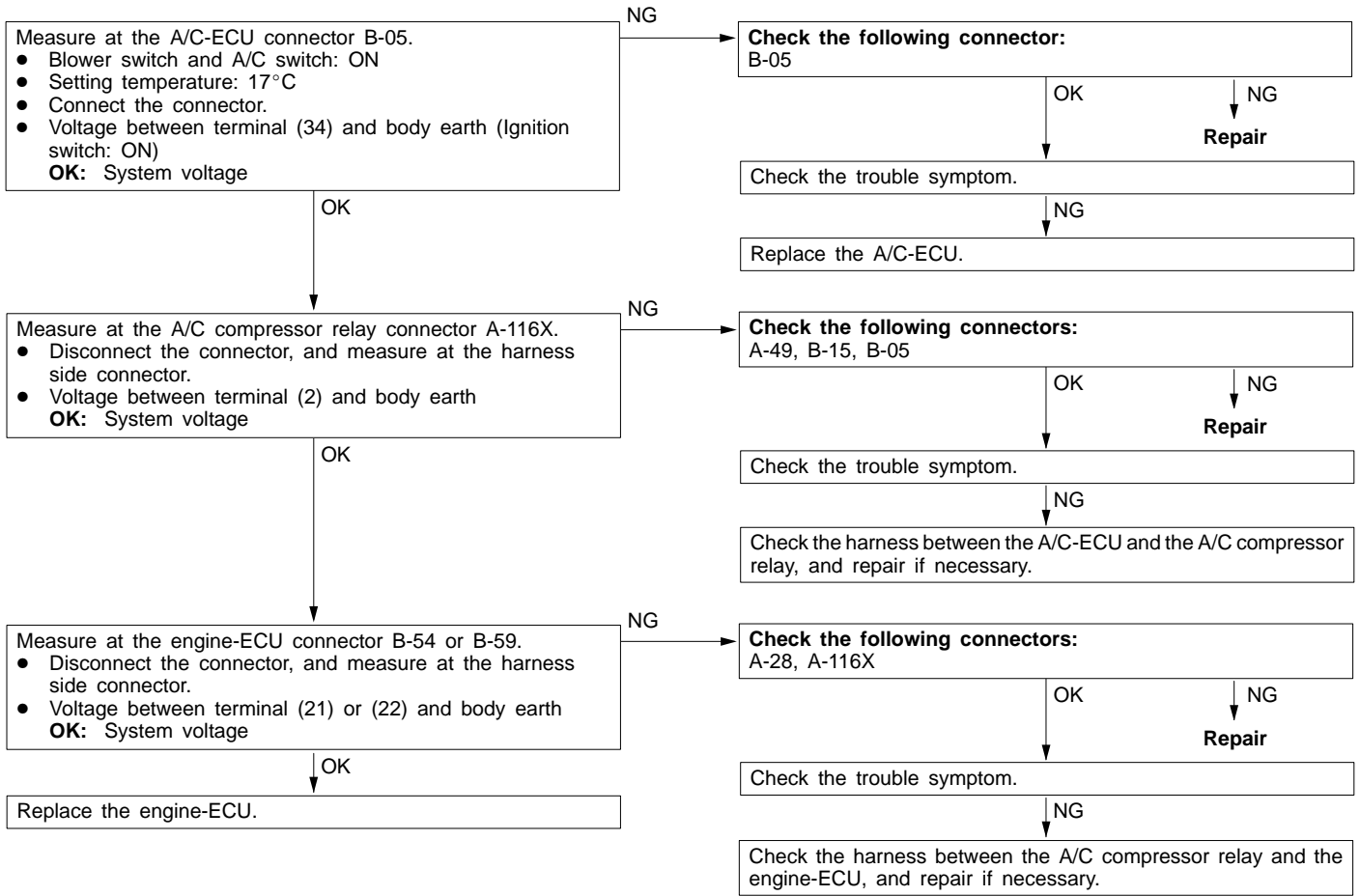
**A/C-ECU power supply circuit check**





Inspection procedure 16

**A/C compressor control circuit check**



## DATA LIST REFERENCE TABLE

Check item	Check condition	Normal condition	
Inside air temperature sensor ● MUT-II (11)	Ignition switch: ON	Inside air temperature and temperature displayed on the MUT-II are identical.	
Outside air temperature sensor ● MUT-II (13)	Ignition switch: ON	Outside air temperature and temperature displayed on the MUT-II are identical.	
Heater water temperature sensor ● MUT-II (15)	Ignition switch: ON	Heater core surface temperature and temperature displayed on the MUT-II are identical.	
Air thermo sensor ● MUT-II (21)	Ignition switch: ON	Evaporator surface temperature and temperature displayed on the MUT-II are identical.	
Photo sensor ● MUT-II (25)	Ignition switch: ON	Amount of incident light is proportional to voltage displayed on the MUT-II.	
Air mix damper potentiometer ● MUT-II (31)	Ignition switch: ON	Damper position	Opening degree (%)
		MAX. HOT	Approx. 100
		MAX. COOL	Approx. 0
Air outlet changeover damper potentiometer ● MUT-II (32)	Ignition switch: ON	Damper position	Opening degree (%)
		FACE	Approx. 0
		FOOT	Approx. 50
		FOOT/DEF.	Approx. 75
		DEF.	Approx. 100

## CHECK AT THE A/C-ECU TERMINALS

A/C-ECU

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36

The parenthesized values in “Normal condition” column are for your reference.

Terminal No.	Check item	Check condition	Normal condition
1	Front power transistor collector output	When blower switch is at OFF	System voltage
		When blower switch is at LO	Approx. 7 V
		When blower switch is at HI	Almost no voltage (0 V)
2	Front power transistor base output	When blower switch is at OFF	0 V
		When blower switch is at LO	Approx. 1.3 V
		When blower switch is at HI	Approx. 2.5 V
3	Backup	At all times	System voltage

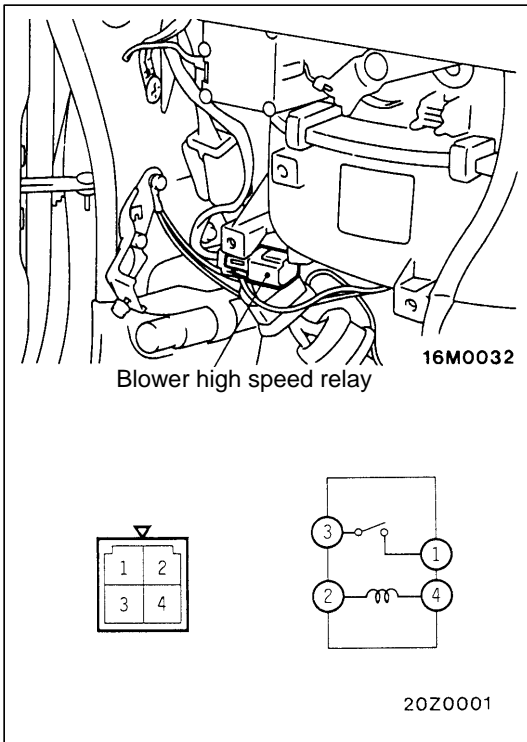
Terminal No.	Check item	Check condition	Normal condition
4	Heater water temperature sensor input	When sensor section temperature is 25°C (4 kΩ)	2.3 – 2.9 V
5	Air mix damper potentiometer input	When damper is moved to MAX. HOT position	4.7 – 5.0 V
6	Air outlet changeover damper potentiometer input	When damper is moved to DEF. position	4.8 – 5.2 V
7	Outside air temperature sensor input	When sensor section temperature is 25°C (4 kΩ)	2.3 – 2.9 V
8	Air thermo sensor input	When sensor section temperature is 25°C (4 kΩ)	2.3 – 2.9 V
9	Photo sensor (–)	At luminous intensity of 0 lux	0 V
		At luminous intensity of 100,000 lux or more	–0.1 – 0.2 V
10	Sensor power supply	At all times	4.8 – 5.2 V
12	Blower motor HI relay (Exciting circuit)	When blower switch is in HI	1.5 V or less
		When blower switch is in a position other than HI	System voltage
16	Rear defogger	When rear defogger switch is ON	1.5 V or less
		When rear defogger switch is OFF	System voltage
17	Diagnosis date output	When ignition switch is ON	0 V ↔ 12 V
18	Diagnosis control output	When ignition switch is ON	System voltage – 2 V
19	Photo sensor (+)	At all times	0 V
20	Sensor earth	At all times	0 V
21	Air outlet changeover damper motor (FACE)	When damper is moved to FACE position	10 V
		When damper is moved to DEF. position	Almost no voltage (0.5 V)
22	Air mix damper motor (MAX. COOL)	When damper is moved to MAX. COOL position	10 V
		When damper is moved to MAX. HOT position	Almost no voltage (0.5 V)
23	Inside/outside air changeover damper motor (Inside)	When switch is set to inside air position	Almost no voltage (0.5 V)
		When switch is set to outside air position	10 V
24	Air outlet changeover damper motor (DEF.)	When damper is moved to FACE position	Almost no voltage (0.5 V)
		When damper is moved to DEF. position	10 V

Terminal No.	Check item	Check condition	Normal condition
25	Air mix damper motor (MAX. HOT)	When damper is moved to MAX. COOL position	Almost no voltage (0.5 V)
		When damper is moved to MAX. HOT position	10 V
26	Inside/outside air changeover damper motor (Outside)	When switch is set to inside air position	10 V
		When switch is set to outside air position	Almost no voltage (0.5 V)
28	IG <sub>2</sub> power supply	When ignition switch is ON	System voltage
29	Earth	At all times	Continuity
30	ILL power supply	When lighting switch is at ON	System voltage
34	A/C output	When A/C is OFF	0 V
		When A/C is ON	System voltage
35	Earth	At all times	Continuity

## ON-VEHICLE SERVICE

### REFRIGERANT CHARGING, LEVEL CHECK, ADDITION AND REMOVAL, PERFORMANCE TEST, DUAL PRESSURE SWITCH SIMPLE CHECK

Follow the same procedures as for the heater and manual air conditioner. (Refer to P.55-6.)



**POWER RELAY CHECK**

Follow the same procedures as for the heater and manual air conditioner except for the following. (Refer to P.55-13.)

**BLOWER HIGH SPEED RELAY**

Battery voltage	Terminal No.			
	1	2	3	4
Power is not supplied		○	—	○
Power is supplied	○	+	○	-

**IDLE-UP OPERATION CHECK**

The idle-up inspection procedures are the same as for the heater and manual air conditioner. (Refer to P.55-14.)

**<Idle speed>**

**Standard value: 750 ± 50 r/min**

**<Idle-up speed>**

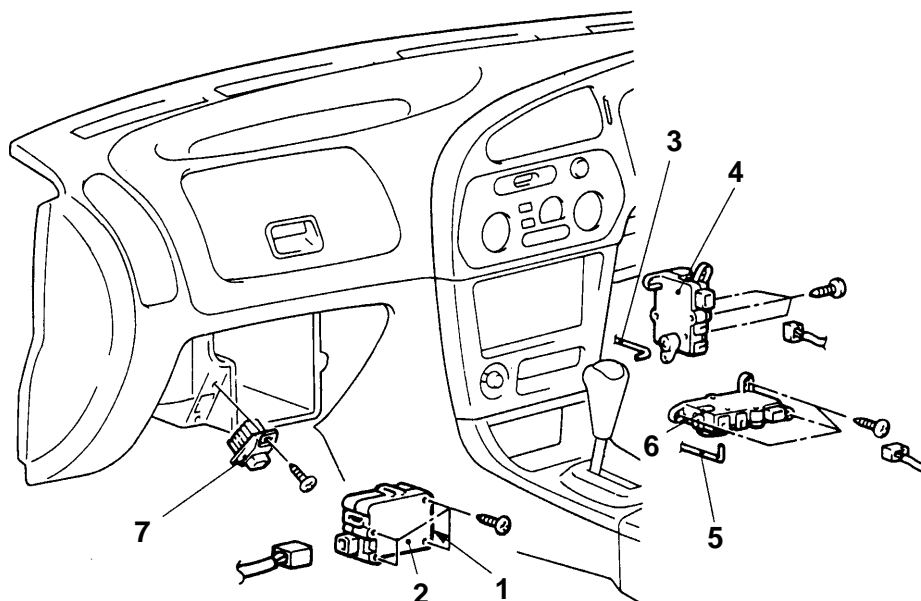
**Standard value: 850 ± 50 r/min**

**NOTE**

If the idling speed is not within the standard value range, adjust it.

## DAMPER CONTROL MOTOR ASSEMBLY AND POWER TRANSISTOR

### REMOVAL AND INSTALLATION



20M0047

#### Inside/outside air changeover damper motor removal steps

- Glove box, glove box frame
1. Linkage connection
  2. Inside/outside air changeover damper motor

#### Air outlet port changeover damper motor removal steps

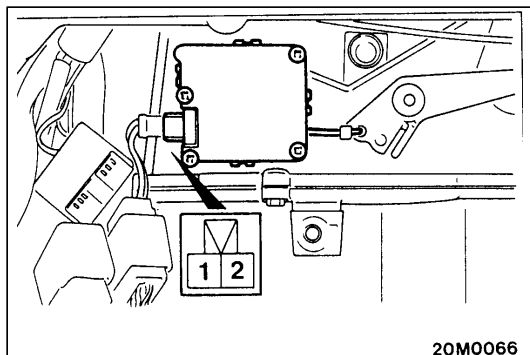
- Instrument lower panel
3. Linkage connection
  4. Air outlet port changeover damper motor

#### Air mix damper motor removal steps

- Front floor console, console side cover
5. Linkage connection
  6. Air mix damper motor

#### Power transistor removal steps

- Glove box, glove box frame
7. Power transistor



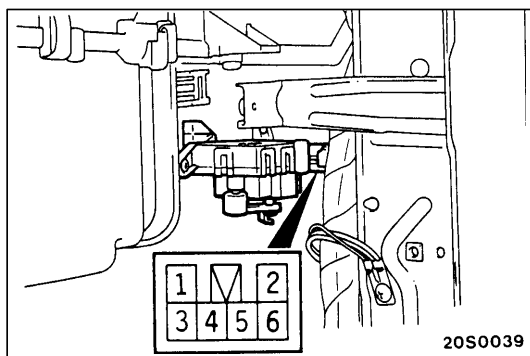
### INSPECTION

#### INSIDE/OUTSIDE CHANGEOVER DAMPER MOTOR CHECK

Battery connection terminal		Lever operation
1	2	
⊖	⊕	Moves to the outside air position
⊕	⊖	Moves to the inside air position

#### Caution

Cut off the battery voltage when the lever is in the stop position.



#### AIR MIX DAMPER MOTOR CHECK

##### Motor

Battery connection terminal		Lever operation
1	3	
⊕	⊖	Moves to COOL position
⊖	⊕	Moves to HOT position

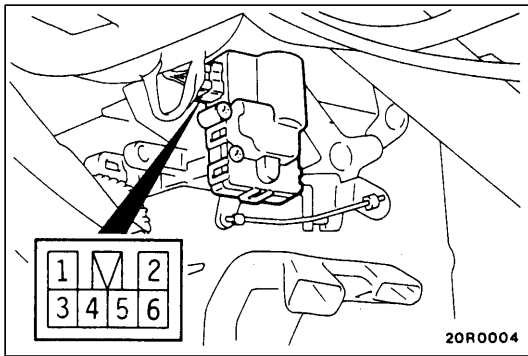
#### Caution

Cut off the battery voltage when the lever is in the stop position.

#### Potentiometer

Check to ensure that the resistance value changes gradually within the standard value range when the resistance value is measured between connector terminals 2 and 5 or between 5 and 6 with the above inspection condition unchanged.

**Standard value: Approx. 0.18 – 4.82 kΩ**



**AIR OUTLET CHANGEOVER DAMPER MOTOR CHECK  
Motor**

Battery connection terminal		Lever operation
1	3	
⊕	⊖	Moves to DEF. position
⊖	⊕	Moves to FACE position

**Caution**  
Cut off the battery voltage when the lever is in the stop position.

**Potentiometer**

Check to ensure that the resistance value changes within the standard value range when the resistance value is measured between connector terminals 2 and 5 or between 5 and 6 with the above inspection condition unchanged.

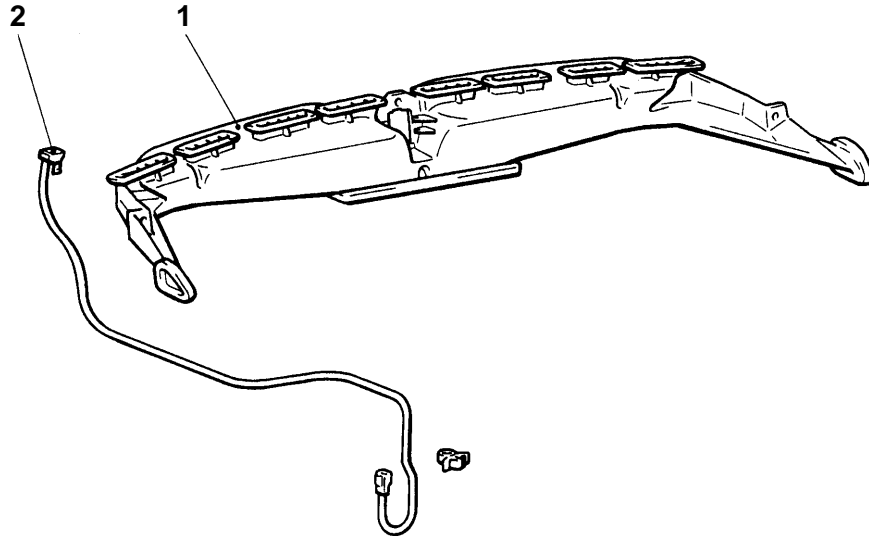
**Standard value: Approx. 0.18 – 4.82 kΩ**



## PHOTO SENSOR

### REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operation**
- Instrument Panel Removal and Installation



20M0045

#### Removal step

1. Defroster nozzle
2. Photo sensor

### INSPECTION

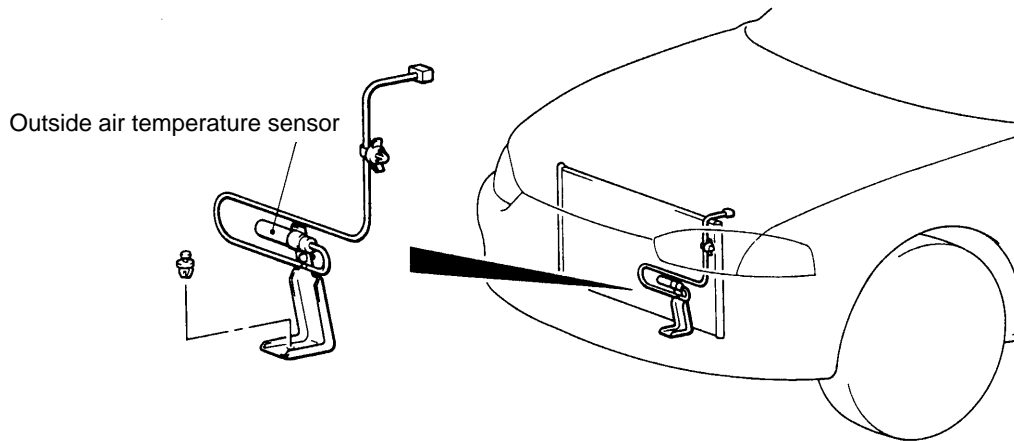
If the blower speed drops when the receiver section of the photo sensor is covered with your hand, then the photo sensor is normal. If the speed does not drop, replace the photo sensor.

## OUTSIDE AIR TEMPERATURE SENSOR

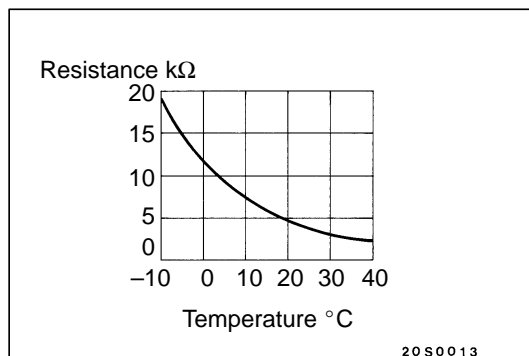
### REMOVAL AND INSTALLATION

#### Pre-removal and Post-installation Operation

- Radiator Grille Removal and Installation



20M0041



20S0013

### INSPECTION

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

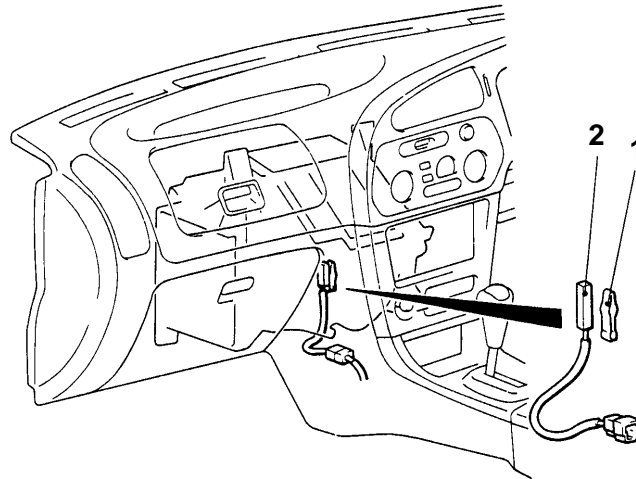
The temperature conditions when testing should not exceed the range of the characteristic curve in the graph.

# HEATER WATER TEMPERATURE SENSOR

## REMOVAL AND INSTALLATION





### Pre-removal and Post-installation Operation

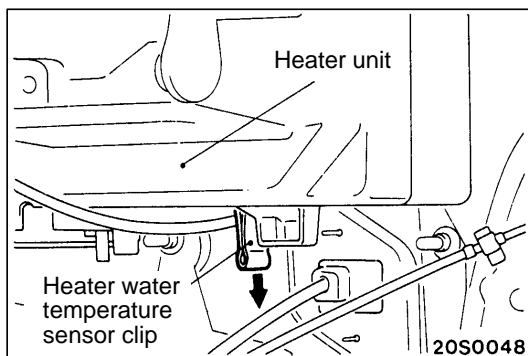
- Floor Console Removal and Installation
- Glove Box Removal and Installation
- Foot Duct Removal and Installation  
(Refer to P55-31.)



20M0046

### Removal steps

- 

 1. Heater water temperature sensor clip  


 2. Heater water temperature sensor



### REMOVAL SERVICE POINT

#### ◀A▶ HEATER WATER TEMPERATURE SENSOR CLIP AND HEATER WATER TEMPERATURE SENSOR REMOVAL

Pull out the heater water temperature sensor clip which is at the bottom of the heater unit, and then remove the heater water temperature sensor from the heater unit.

### INSTALLATION SERVICE POINT

#### ▶A◀ HEATER WATER TEMPERATURE SENSOR AND HEATER WATER TEMPERATURE SENSOR CLIP INSTALLATION

Insert the heater water temperature sensor into its mounting hole at the bottom of the heater unit, and then fix it by inserting the heater water temperature sensor clip.

### **INSPECTION**

Follow the same procedure as for the inspection of the outside temperature sensor. (Refer to P55-62.)

### **OTHER MAINTENANCE SERVICE POINTS**

The following maintenance service points are the same as for the manual A/C.

Items	Reference page
Dual Pressure Switch	55-13
Blower Relay, A/C Compressor Relay, Condenser Fan Relay, Radiator Fan Relay	55-13, 14
Idle-up System	55-14
Heater Unit, Cooling and Blower Unit	55-15
Blower Motor Assembly, Evaporator	55-19
Compressor, Tension Pulley	55-23
Condenser, Condenser Fan	55-28
Ducts	55-31

# ELECTRICAL WIRING (R.H. DRIVE VEHICLES)

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EARTH .....	21		

CONTINUED ON NEXT PAGE

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<b>BACK-UP LAMP</b> .....	<b>52</b>	<b>DEFOGGER AND DOOR MIRROR</b>	
<b>METER AND GAUGE</b> .....	<b>54</b>	<b>HEATER</b> .....	<b>80</b>
<b>FUEL WARNING LAMP</b> .....	<b>56</b>	Without Full-Auto Air Conditioner .....	80
<b>BRAKE WARNING LAMP</b> .....	<b>56</b>	With Full-Auto Air Conditioner .....	82
<b>OIL PRESSURE WARNING LAMP</b> .....	<b>57</b>	<b>RADIO</b> .....	<b>84</b>
<b>SEAT BELT WARNING LAMP</b> .....	<b>57</b>	Radio Spare Circuit .....	84
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With Keyless Entry System .....	60	<b>ANTI-SKID BRAKING SYSTEM (ABS)</b> ..	<b>90</b>
<b>HEATER AND AIR CONDITIONER</b> .....	<b>64</b>	<b>SUPPLEMENTAL RESTRAINT SYSTEM</b>	
<b>FULL-AUTO AIR CONDITIONER</b> .....	<b>70</b>	<b>(SRS)</b> .....	<b>96</b>
<b>WINDSHIELD WIPER AND WASHER</b> ..	<b>78</b>	<b>ACTIVE YAW CONTROL SYSTEM (AYC)</b>	<b>98</b>
With Intermittent Wiper .....	78	<b>INTERCOOLER AND RADIATOR WATER</b>	
		<b>SPRAY SYSTEM</b> .....	<b>104</b>

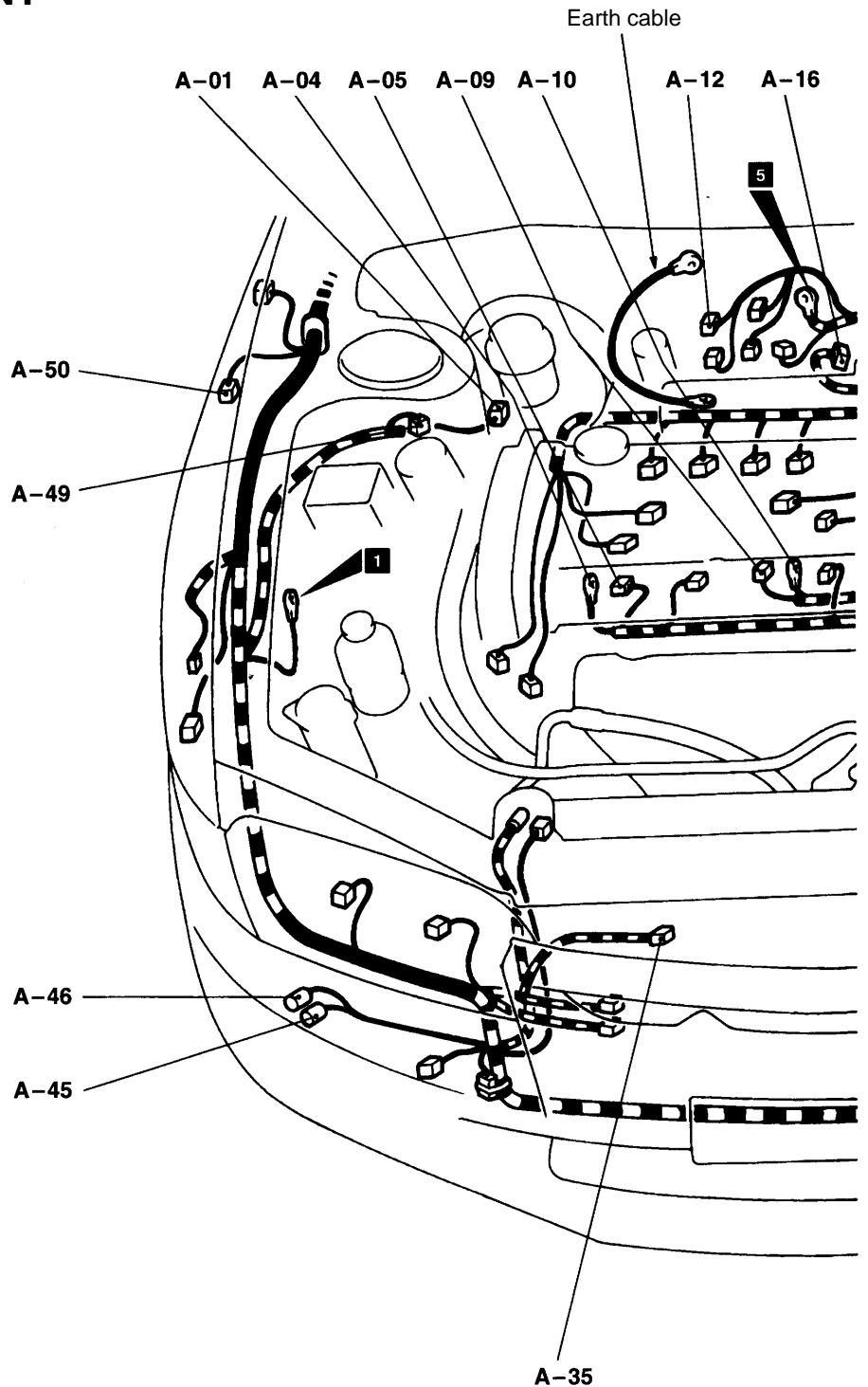
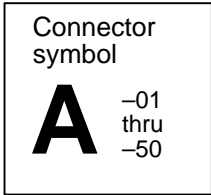
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# GENERAL

Only sections which have been changed in contents of R.H. drive vehicles are carried.

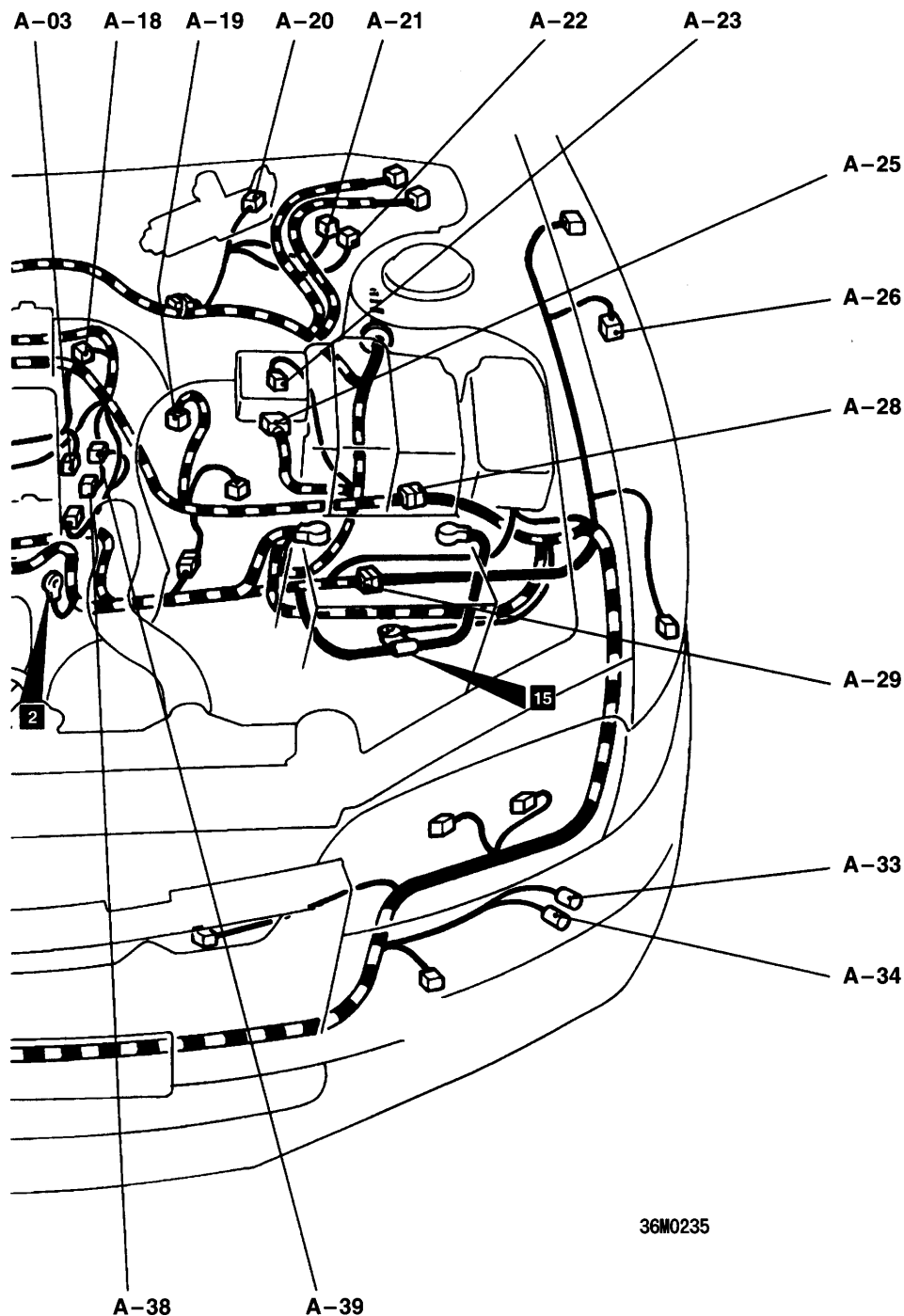
# WIRING HARNESS CONFIGURATION DIAGRAMS

## ENGINE COMPARTMENT



- |             |                              |             |   |
|-------------|------------------------------|-------------|---|
| A-01 (2-B)  | Brake fluid level switch     | A-20 (4-B)  | Windshield wiper motor                        |
| A-03 (1-B)  | Noise condenser              | A-21 (8-B)  | Hydraulic unit <vehicles with ABS>            |
| A-04 (1)    | Alternator                   | A-22 (2-B)  | Hydraulic unit <vehicles with ABS>            |
| A-05 (4-GR) | Alternator                   | A-23 (2-B)  | Waste gate solenoid valve                     |
| A-09 (1-B)  | Starter                      | A-25 (7-B)  | Air flow sensor                               |
| A-10 (1)    | Starter                      | A-26 (2-B)  | Front speed sensor (LH) <vehicles with ABS>   |
| A-12 (2-B)  | Fuel pressure solenoid valve | A-28 (10-B) | Control harness and front harness combination |
| A-16 (4-B)  | Throttle position sensor     |             |   |
| A-18 (6-B)  | Idle speed control servo     |             |   |
| A-19 (3-B)  | Vehicle speed sensor         |             |   |

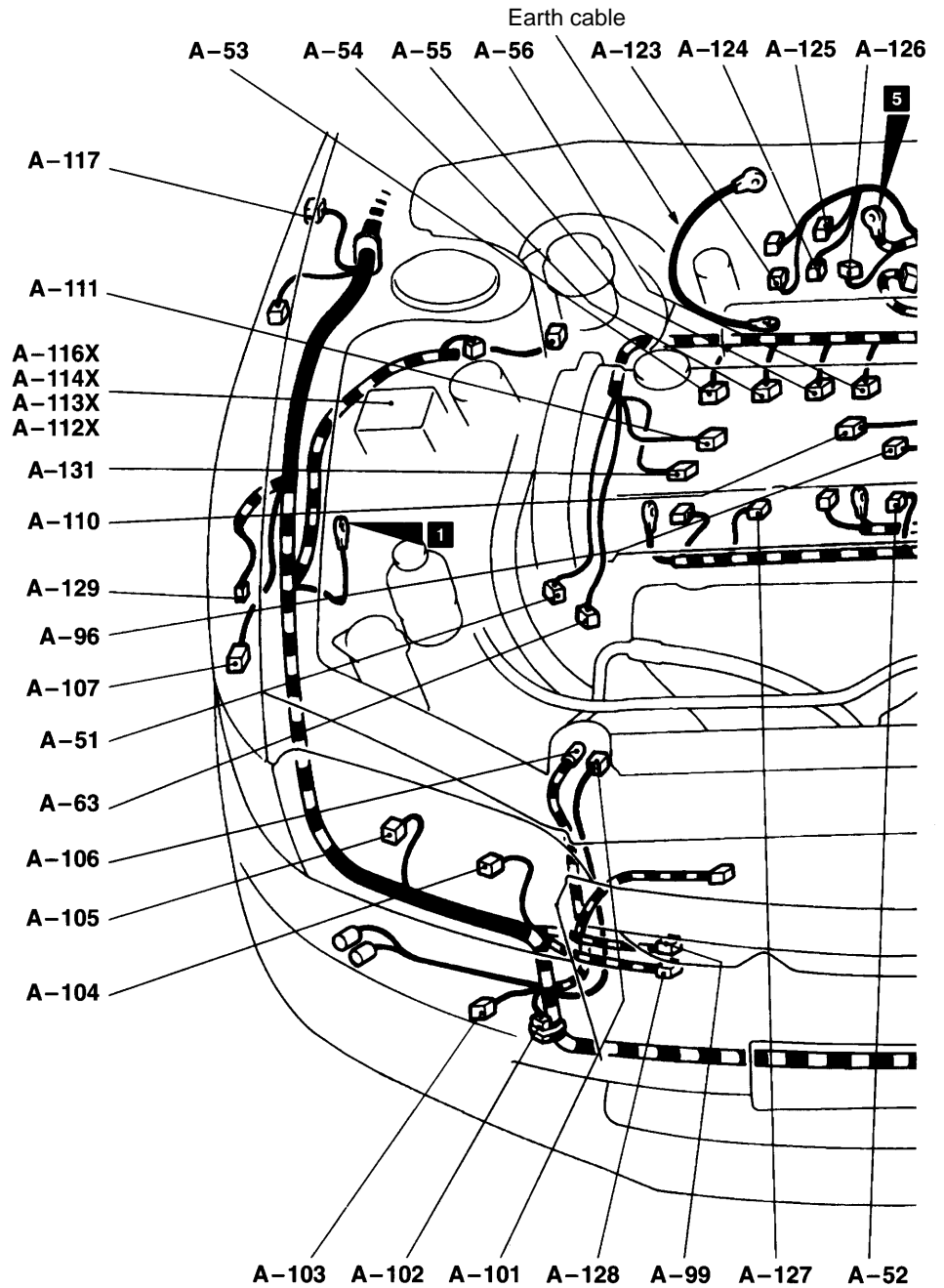
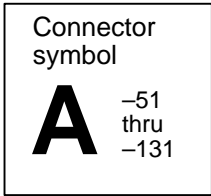




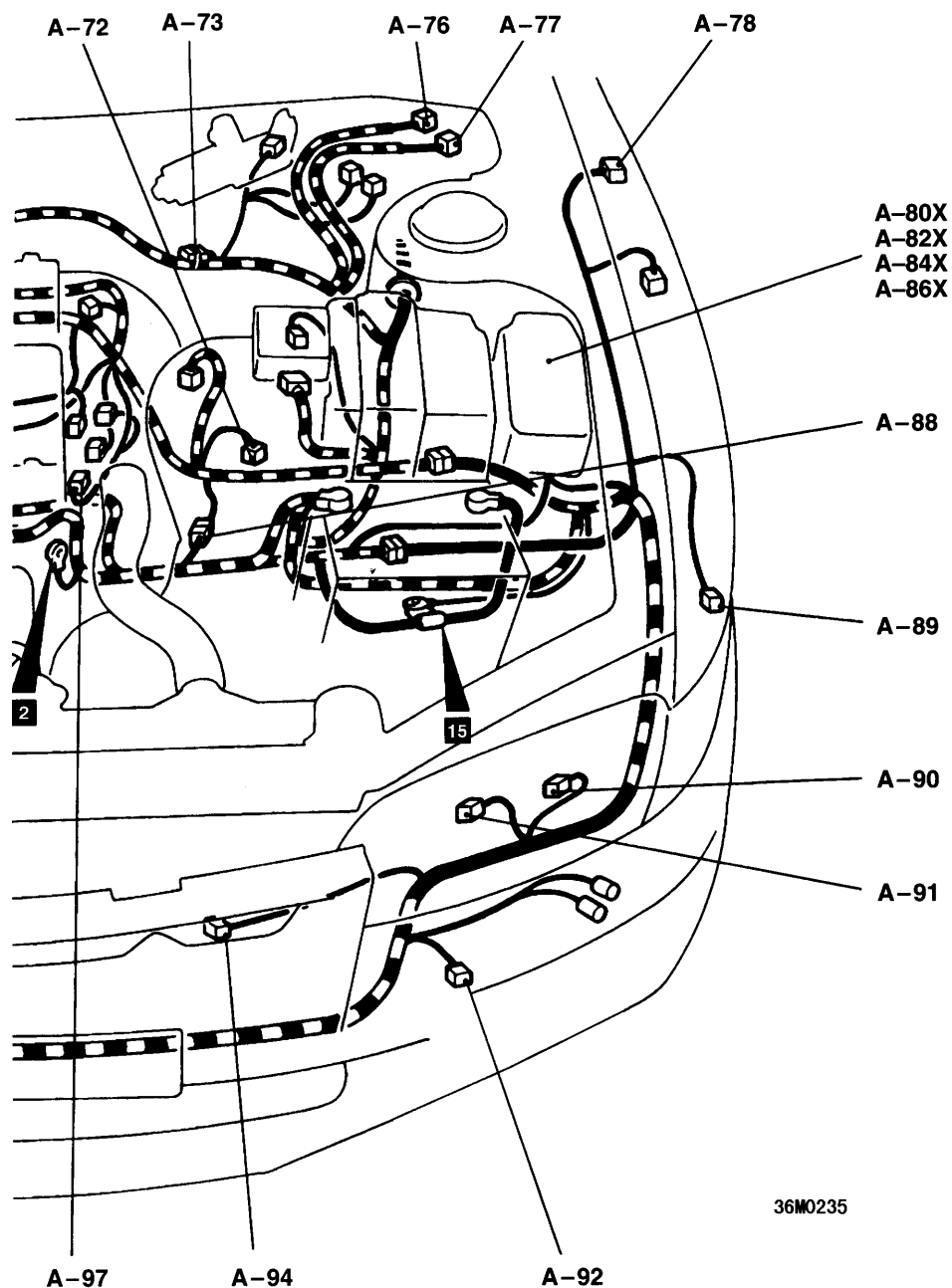
36M0235

A-29 (2-B)	Front harness and battery harness combination	A-39 (1-B)	Engine coolant temperature gauge unit
A-33 (1)	Horn (LH)	A-45 (1)	Horn (RH)
A-34 (1)	Horn (LH)	A-46 (1)	Horn (RH)
A-35 (2-BR)	Outside air temperature sensor <vehicles with fully automatic air conditioner>	A-49 (2-BR)	Dual pressure switch
A-38 (2-B)	Engine coolant temperature sensor	A-50 (2-B)	Front speed sensor (RH) <vehicles with ABS>

ENGINE COMPARTMENT



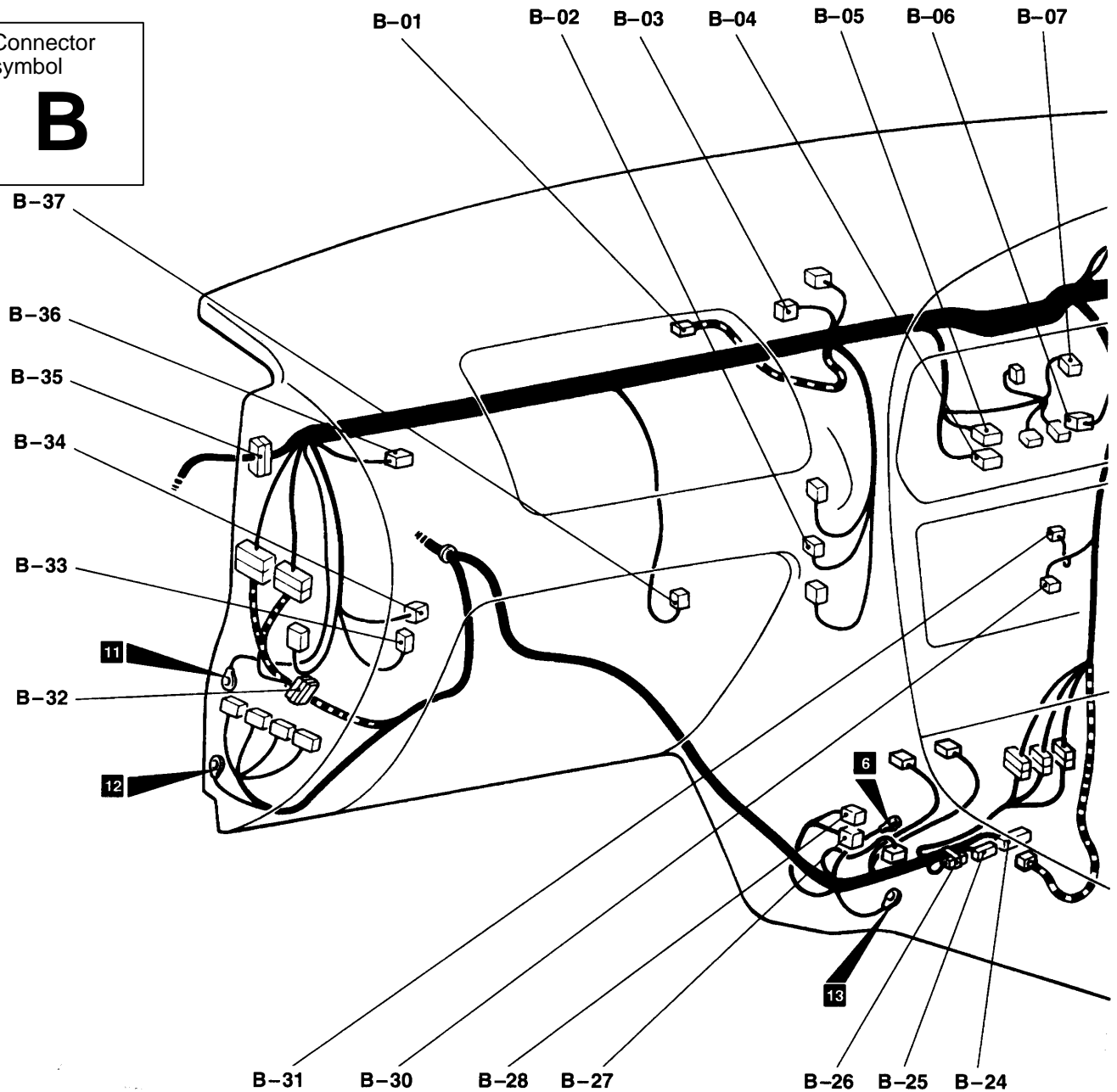
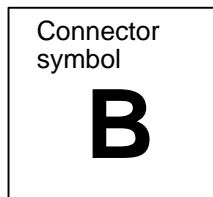
- |            |                                  |             |   |
|------------|----------------------------------|-------------|---|
| A-51 (3-B) | Crank angle sensor               | A-78 (2-GR) | Side turn signal lamp (LH)                      |
| A-52 (1-B) | Oil pressure switch              | A-80X (5)   | Horn relay <vehicles with SRS air bag>          |
| A-53 (2-B) | Injector (No.1)                  | A-82X (5)   | Radiator fan relay (LO)                         |
| A-54 (2-B) | Injector (No.2)                  | A-84X (5)   | Headlamp relay                                  |
| A-55 (2-B) | Injector (No.3)                  | A-86X (4)   | Alternator relay                                |
| A-56 (2-B) | Injector (No.4)                  | A-88 (6-B)  | Control harness and battery harness combination |
| A-63 (4-B) | O <sub>2</sub> sensor            | A-89 (2-BR) | Front turn signal lamp (LH)                     |
| A-72 (2-B) | Back-up lamp switch              | A-90 (3-B)  | Headlamp (LH)                                   |
| A-73 (1-L) | Engine speed detection connector | A-91 (2)    | Position lamp (LH)                              |
| A-76 (6)   | Valve relay <vehicles with ABS>  | A-92 (2-B)  | Fog lamp (LH)                                   |
| A-77 (5)   | Motor relay <vehicles with ABS>  |             |   |



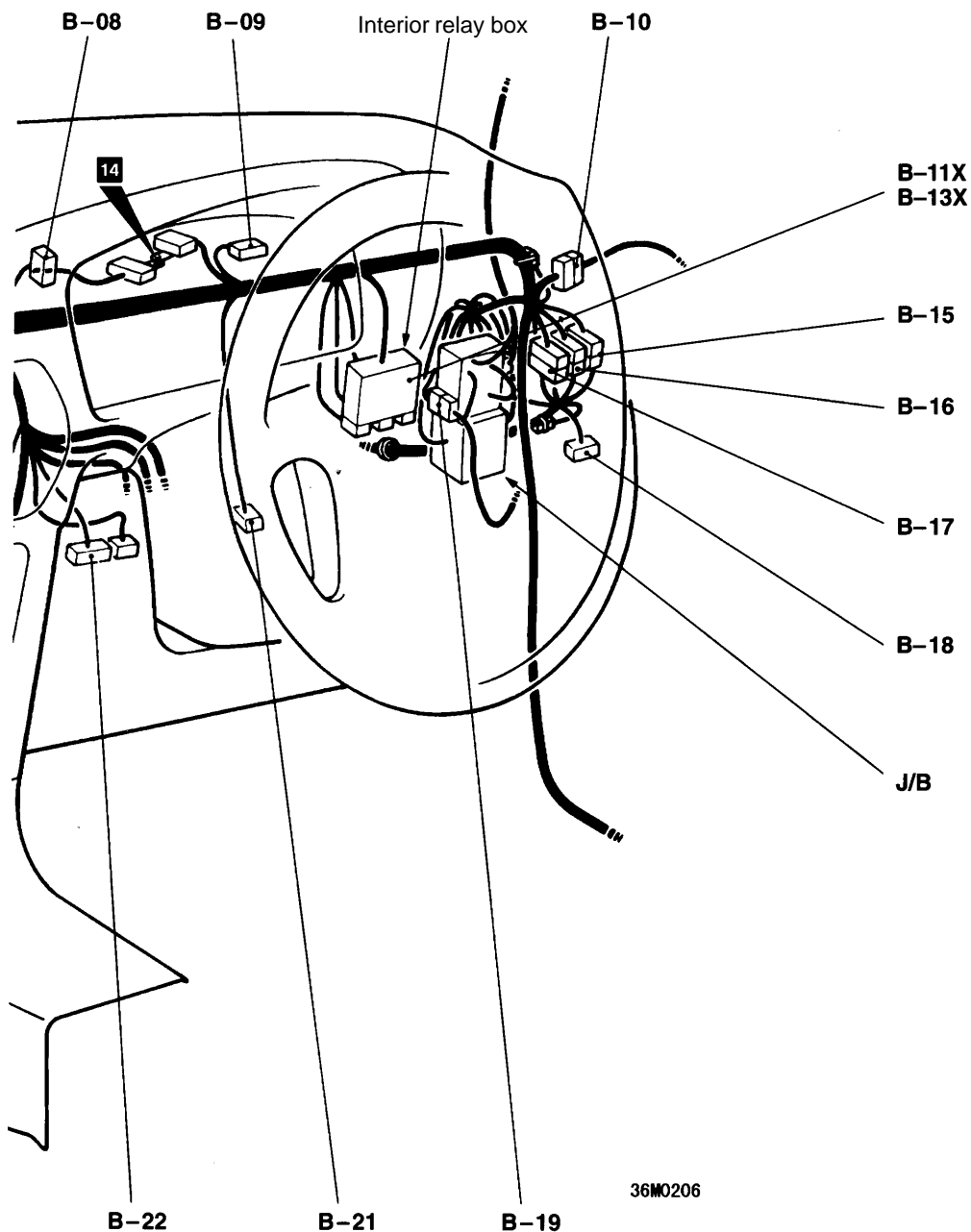
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- |              |                                    |              |                                      |
|--------------|------------------------------------|--------------|--------------------------------------|
| A-94 (4-GR)  | Radiator fan motor                 | A-112X (4)   | Radiator fan relay (HI)              |
| A-96 (2-GR)  | Knock sensor                       | A-113X (4)   | Condenser fan relay (LO)             |
| A-97 (3-B)   | Camshaft position sensor           | A-114X (4)   | Condenser fan relay (HI)             |
| A-99 (2-B)   | Condenser fan motor                | A-116X (4)   | A/C compressor relay                 |
| A-101 (1)    | Power steering oil pressure switch | A-117 (2-GR) | Side turn signal lamp (RH)           |
| A-102 (1)    | Spare connector for fog lamp       | A-123 (5-B)  | Fuel pump relay No.2                 |
| A-103 (2-B)  | Fog lamp (RH)                      | A-124 (2-B)  | Fuel pump resistor                   |
| A-104 (2)    | Position lamp (RH)                 | A-125 (6-B)  | Resistor (for injector)              |
| A-105 (3-B)  | Headlamp (RH)                      | A-126 (5-B)  | AYC relay                            |
| A-106 (1-B)  | A/C compressor assembly            | A-127 (2-B)  | Secondary air control solenoid valve |
| A-107 (2-BR) | Front turn signal lamp (RH)        | A-128 (2-GR) | Condenser fan motor                  |
| A-110 (3-GR) | Ignition coil 1                    | A-129 (2-B)  | Water spray motor                    |
| A-111 (3-GR) | Ignition coil 2                    | A-131 (1-B)  | Noise condenser                      |

DASH PANEL



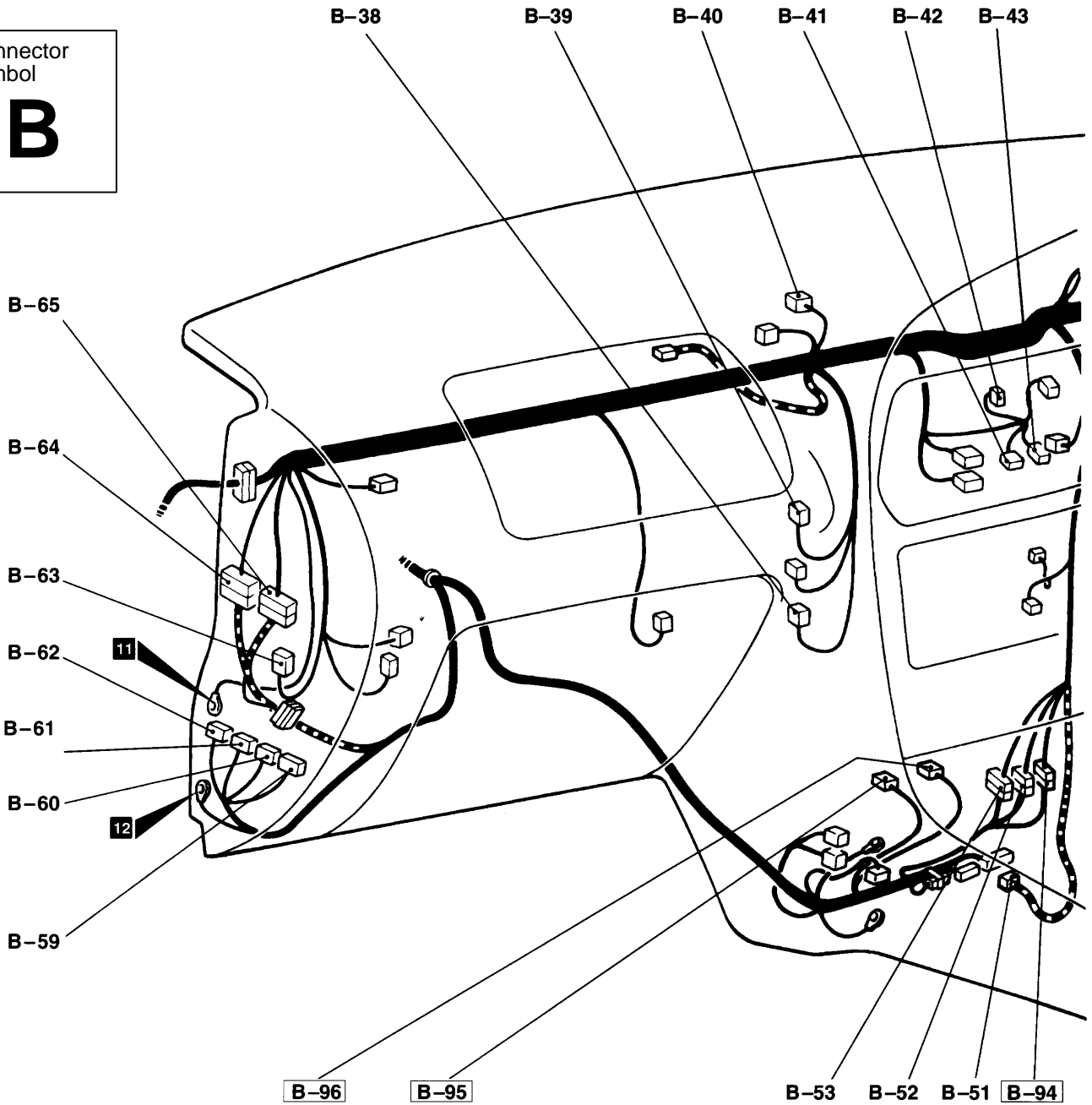
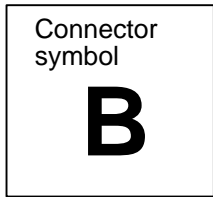
- |             |   |           |   |
|-------------|---|-----------|---|
| B-01 (2-R)  | Passenger seat air bag module (squib)   | B-09 (25) | Meter and gauge   |
| B-02 (2)    | Heater water temperature sensor <vehicles with fully automatic air conditioner>                       | B-10 (22) | Body harness and front door harness (driver's side) combination |
| B-03 (2-B)  | Air thermo sensor <vehicles with fully automatic air conditioner>                                     | B-11X (8) | Rear intermittent wiper relay                                   |
| B-04 (20-B) | A/C-ECU <vehicles with fully automatic air conditioner>   | B-13X (5) | Power window relay  |
| B-05 (16-B) | A/C-ECU <vehicles with fully automatic air conditioner>   | B-15 (20) | Front harness and body harness combination                      |
| B-06 (6)    | Air outlet change-over damper motor and potentiometer <vehicles with fully automatic air conditioner> | B-16 (6)  | Front harness and body harness combination                      |
| B-07 (8)    | Blower switch <vehicles with manual air conditioner>  | B-17 (14) | Front harness and body harness combination <ABS>                |
| B-08 (25)   | Meter and gauge   | B-18 (19) | J/C (1)   |
|             |   | B-19 (22) | Body harness and instrument panel harness combination           |



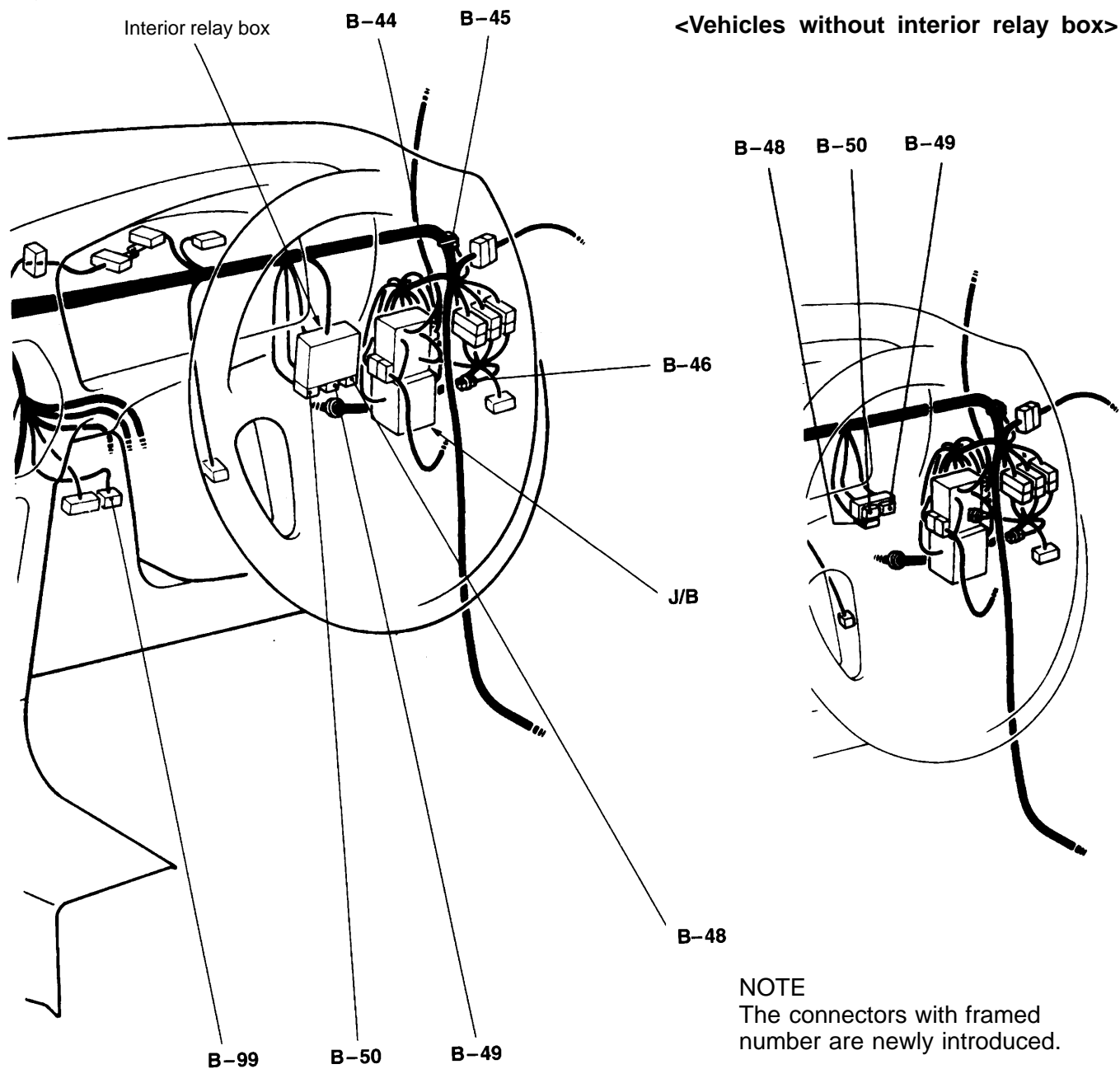
36M0206

B-21 (2)	Stop lamp switch	B-34 (4)	Blower high speed relay <vehicles with fully automatic air conditioner>
B-22 (16-B)	Diagnosis connector	B-35 (22)	Body harness and front door harness (passenger's side) combination
B-24 (26-Y)	ABS-ECU	B-36 (2)	Inside and outside air change-over damper motor <vehicles with fully automatic air conditioner>
B-25 (22-Y)	ABS-ECU	B-37 (4)	Power transistor <vehicles with fully automatic air conditioner> or resistor <vehicles with heater or manual air conditioner>
B-26 (2-B)	Diode (for ABS circuit)		
B-27 (4)	Engine control relay		
B-28 (4)	Fuel pump relay		
B-30 (14)	Radio or spare connector for radio		
B-31 (1)	Glass antenna amplifier		
B-32 (19-B)	J/C (5)		
B-33 (2)	Blower motor <vehicles with fully automatic air conditioner>		

DASH PANEL



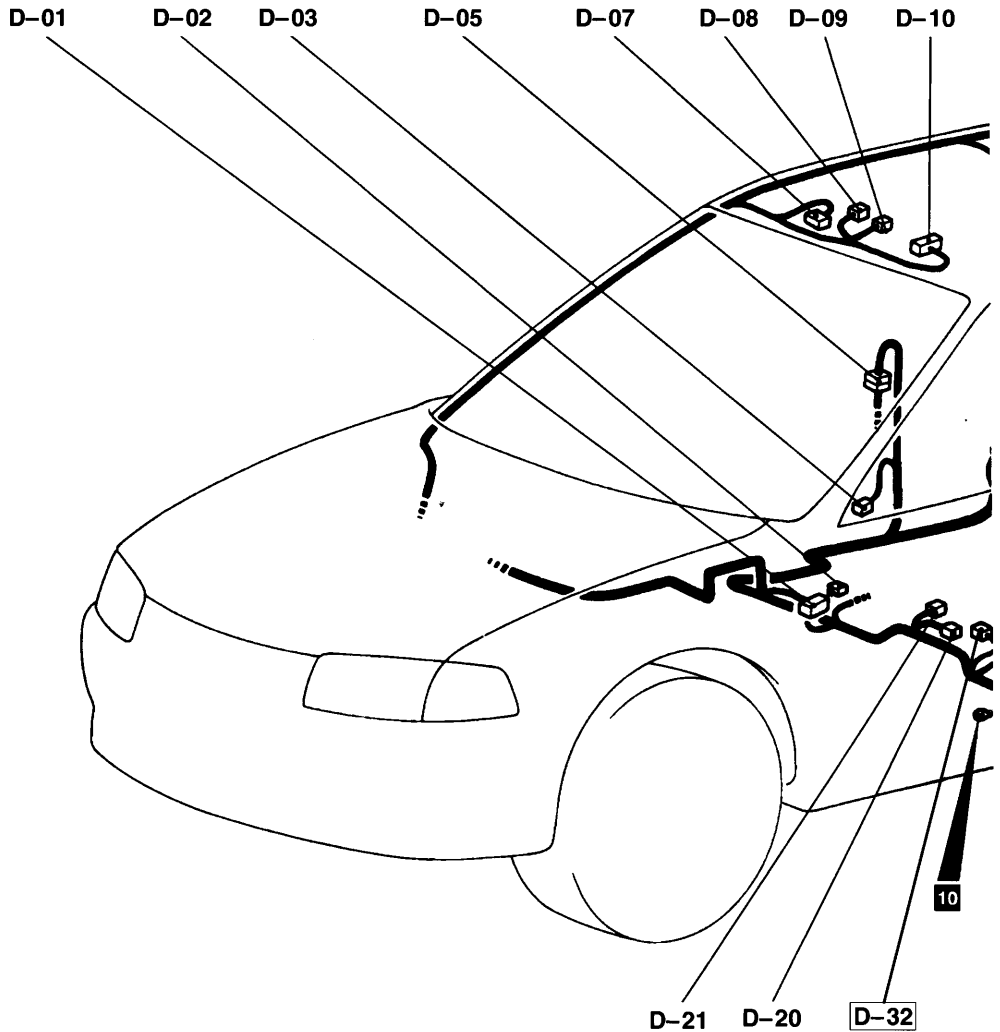
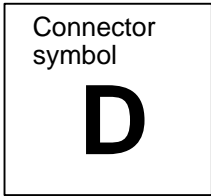
- |            |  |             |   |
|------------|--|-------------|---|
| B-38 (2)   | Sunlight sensor <vehicles with fully automatic air conditioner>                        | B-44 (6)    | Body harness and roof harness combination <vehicles with sunroof> |
| B-39 (6)   | Air mix damper motor and potentiometer <vehicles with fully automatic air conditioner> | B-45 (2-B)  | Diode (for keyless entry system circuit)                          |
| B-40 (3)   | Automatic compressor ECU <vehicles with manual air conditioner>                        | B-46 (2)    | Spare connector for fog lamp switch <vehicles without fog lamp>   |
| B-41 (8)   | A/C switch <vehicles with manual air conditioner>                                      | B-48 (14)   | J/C (2)   |
| B-42 (2)   | Blower switch illumination lamp <vehicles with heater or manual air conditioner>       | B-49 (14)   | J/C (3)   |
| B-43 (6-B) | Defogger switch <vehicles with heater or manual air conditioner>                       | B-50 (14-L) | J/C (4)   |
|            |  | B-51 (21-Y) | SRS-ECU   |
|            |  | B-52 (16-B) | Control harness and body harness combination <vehicles with ABS>  |



- B-59 (26-Y) Engine-ECU
- B-60 (16-Y) Engine-ECU
- B-61 (12-Y) Engine-ECU
- B-62 (22-Y) Engine-ECU
- B-63 (2) Blower motor <vehicles with heater or manual air conditioner>
- B-64 (13) Control harness and body harness combination

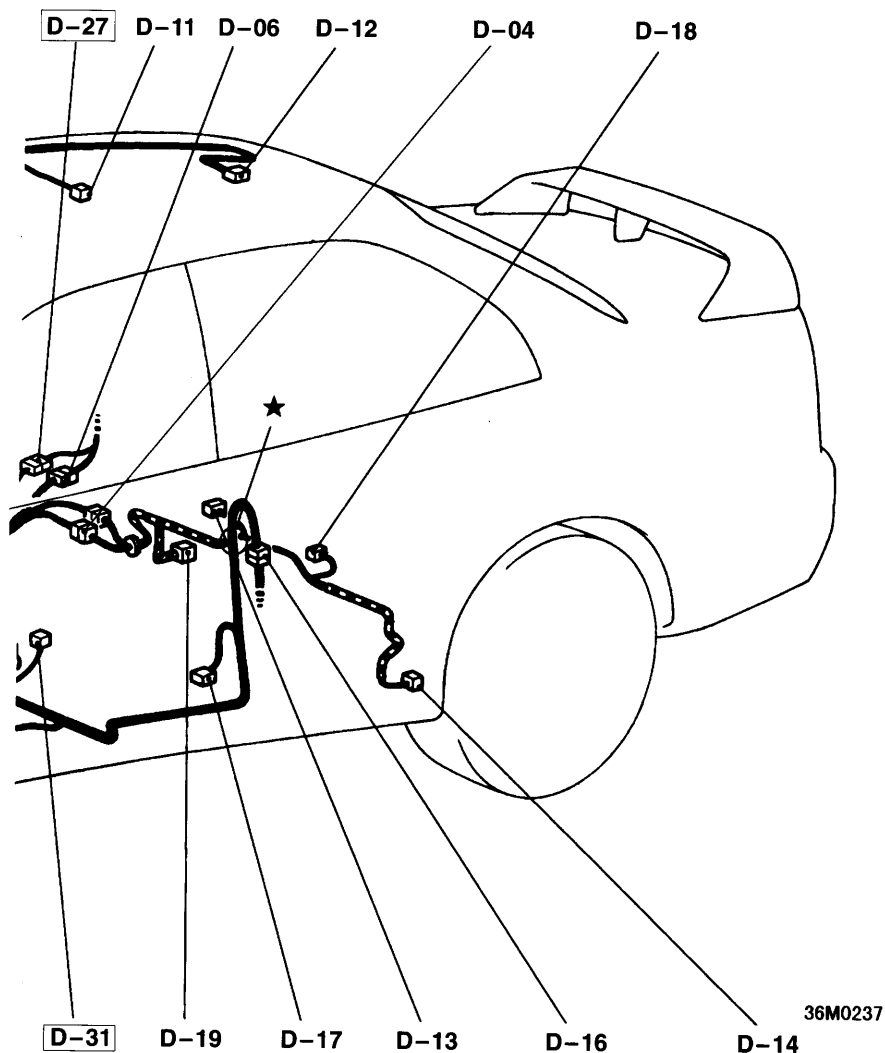
- B-65 (16-B) Control harness and body harness combination
- B-94 (13) Control harness and body harness combination <vehicles with AYC-ECU>
- B-95 (26) AYC-ECU
- B-96 (16) AYC-ECU
- B-99 (12) Diagnosis connector

FLOOR AND ROOF



- |           |   |             |   |
|-----------|---|-------------|---|
| D-01 (20) | Receiver<br><vehicles with keyless entry system>    | D-09 (1)    | Map lamp  |
| D-02 (2)  | Seat belt switch                                    | D-10 (18)   | Sunroof ECU   |
| D-03 (2)  | Front door switch (driver's side)                   | D-11 (2-GR) | Room lamp <vehicles without sunroof>                |
| D-04 (10) | Body harness and fuel harness combination           | D-12 (8)    | Sunroof motor                                       |
| D-05 (6)  | Body harness and rear door harness (RH) combination | D-13 (3-B)  | Fuel gauge unit (sub)                               |
| D-06 (18) | Body harness and rear harness combination           | D-14 (2-B)  | Rear speed sensor (LH)<br><vehicles with ABS>       |
| D-07 (6)  | Sunroof switch                                      | D-16 (6)    | Body harness and rear door harness (LH) combination |
| D-08 (2)  | Room lamp <vehicles with sunroof>                   | D-17 (2)    | Front door switch (passenger's side)                |
|           |   | D-18 (6)    | Fuel gauge unit (main)                              |



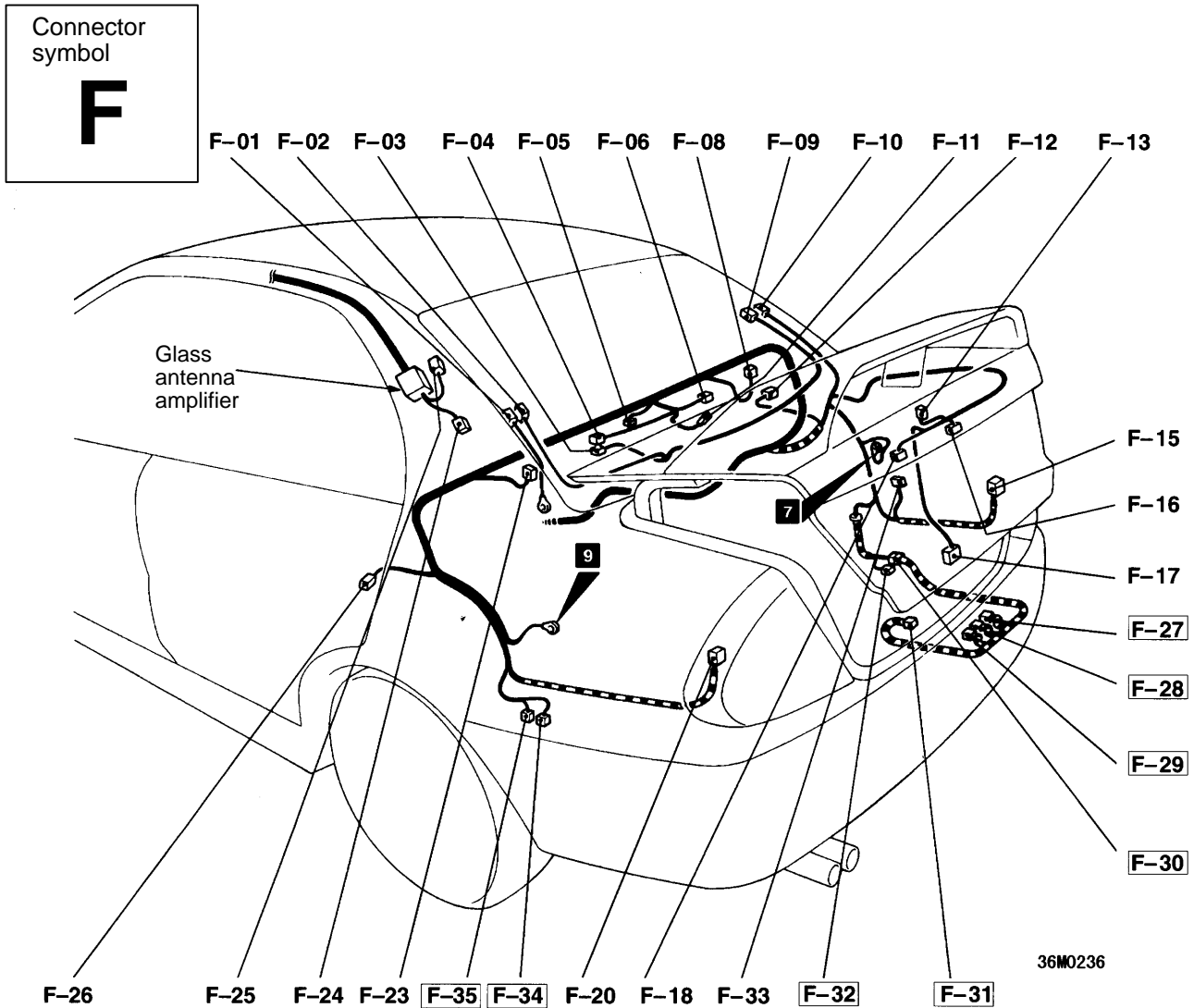


NOTE  
The connectors with framed number are newly introduced.

- D-19 (2-B) Rear speed sensor (RH)  
<vehicles with ABS>
- D-20 (3-B) Acceleration sensor <vehicles with ABS>
- D-21 (1-B) Parking brake switch
- D-27** (2) Body harness and rear harness combination <vehicles with AYC>

- D-31** (2) Water spray switch
- D-32** (3-B) Acceleration sensor (lateral)  
<vehicles with AYC>

LUGGAGE COMPARTMENT



NOTE

The connectors with framed number are newly introduced.

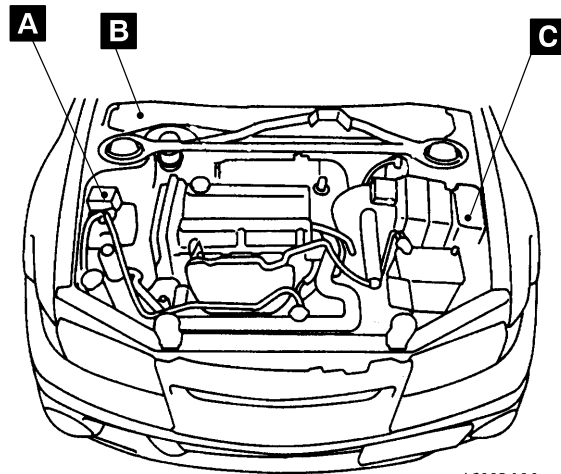
F-01 (1-B)	Defogger (-) <vehicles without choke coil>	F-20 (6)	Rear combination lamp (LH)
F-02 (1-B)	Defogger (-) <vehicles with choke coil>	F-23 (2-B)	Rear speaker (LH)
F-03 (2)	Choke coil	F-24 (1)	Glass antenna
F-04 (3)	Choke coil		<vehicles with diversity glass antenna>
F-05 (2)	Trunk room lamp	F-25 (1)	Glass antenna
F-06 (2)	Vacant connector or high mounted stop lamp (installed on rear shelf)	F-26 (1-B)	Rear door switch (LH)
		<b>F-27</b> (3-B)	Proportioning valve <vehicles with AYC>
F-08 (2-B)	Rear speaker (RH)	<b>F-28</b> (2-B)	Direction valve (LH) <vehicles with AYC>
F-09 (1-B)	Defogger (+) <vehicles with choke coil>	<b>F-29</b> (2-B)	Direction valve (RH) <vehicles with AYC>
F-10 (1-B)	Defogger (+) <vehicles without choke coil>	<b>F-30</b> (8-B)	Rear harness and AYC harness combination
F-11 (3)	Rear wiper motor		
F-12 (1-B)	Rear door switch (RH)	<b>F-31</b> (2-B)	Accumulator pressure switch
F-13 (2)	High mounted stop lamp (installed on rear spoiler)		<vehicles with AYC>
		<b>F-32</b> (2-B)	AYC motor
F-15 (6)	Rear combination lamp (RH)	F-33 (6)	CD changer
F-16 (2-GR)	Licence plate lamp (RH)	<b>F-34</b> (2)	Rear window washer
F-17 (1-B)	Trunk room lamp switch	<b>F-35</b> (2)	Windshield washer motor
F-18 (2-GR)	Licence plate lamp (LH)		

NOTES

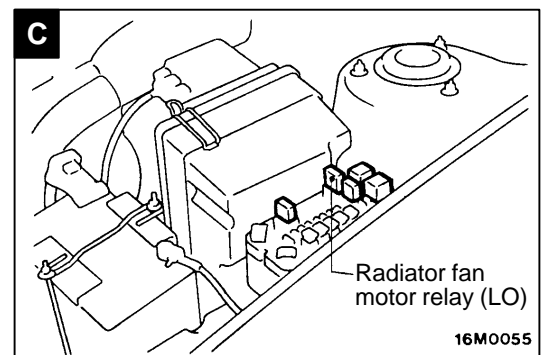
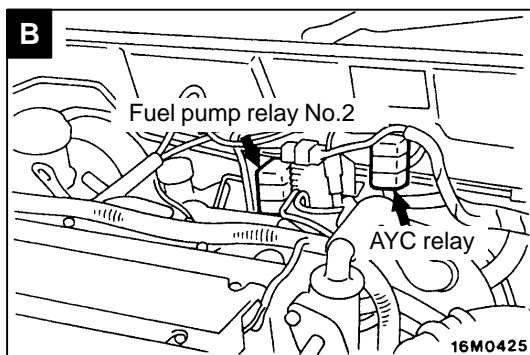
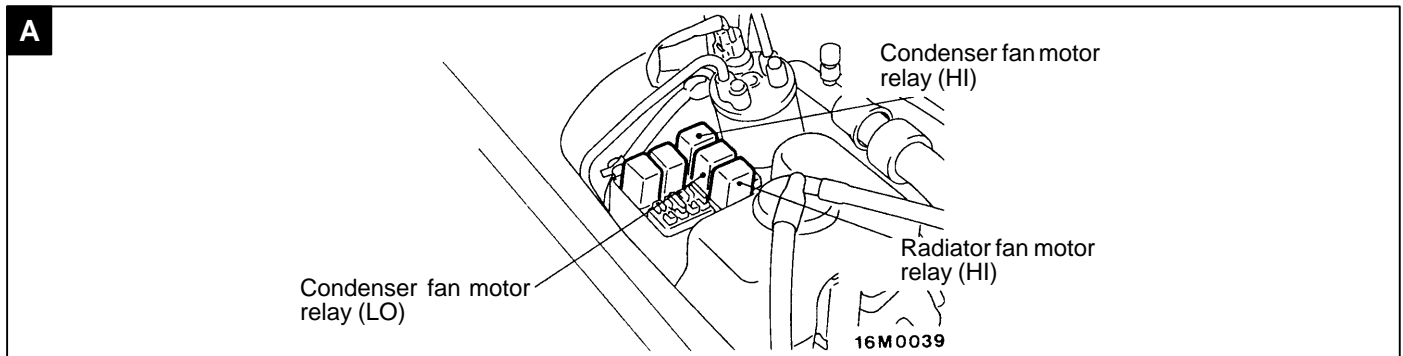
# SINGLE PART INSTALLATION POSITION

## RELAY

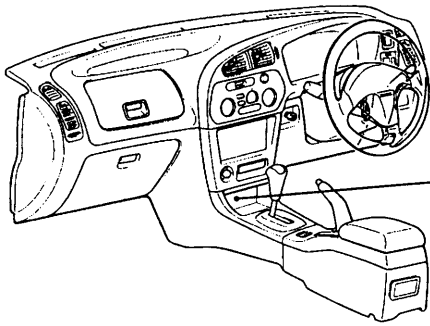
Name	Symbol	Name	Symbol
AYC relay	B	Fuel pump relay No.2	B
Condenser fan motor relay (HI)	A	Radiator fan motor relay (HI)	A
Condenser fan motor relay (LO)	A	Radiator fan motor relay (LO)	C



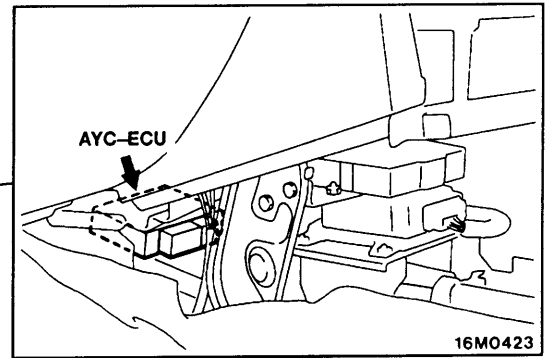
16M0466



**ECU**



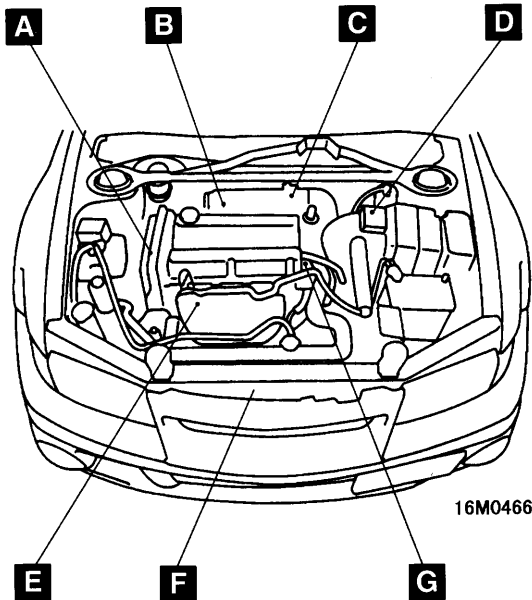
B21A066



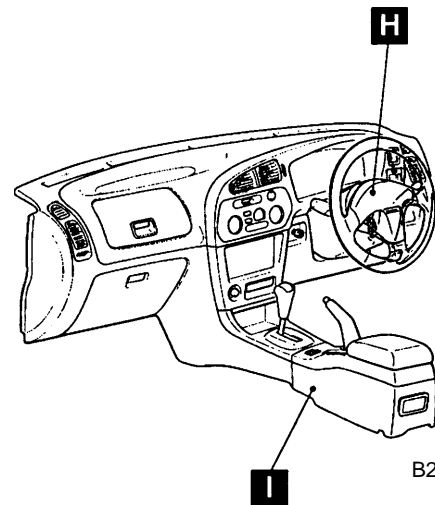
16M0423

**SENSOR**

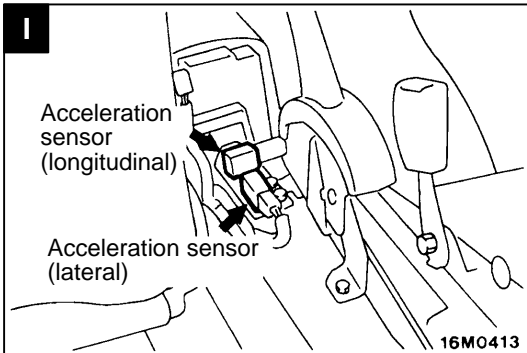
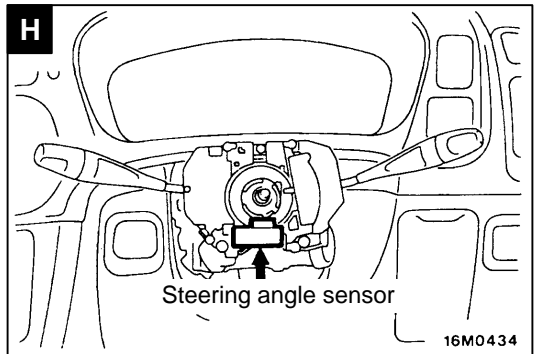
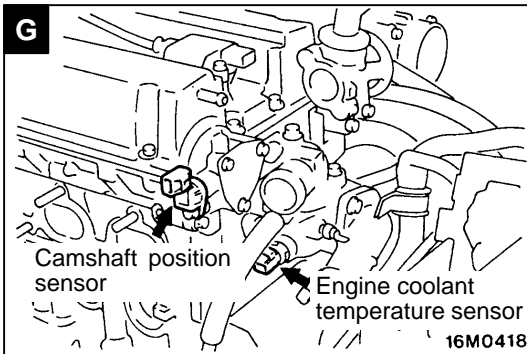
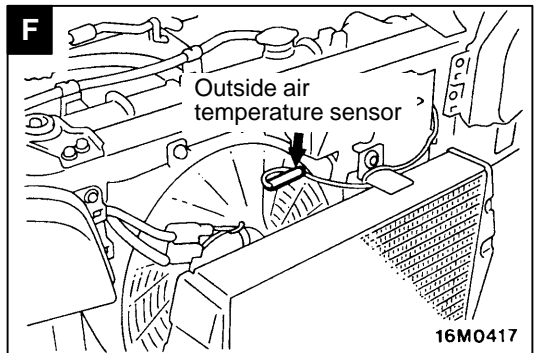
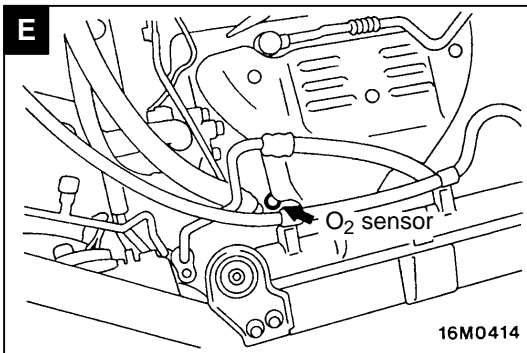
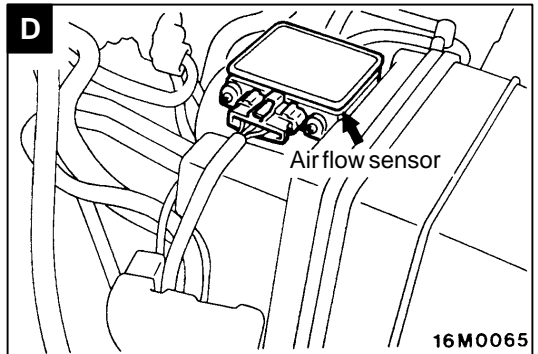
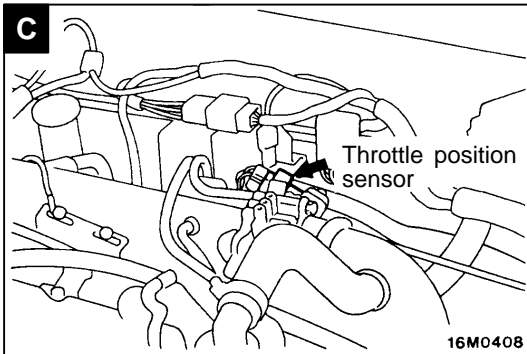
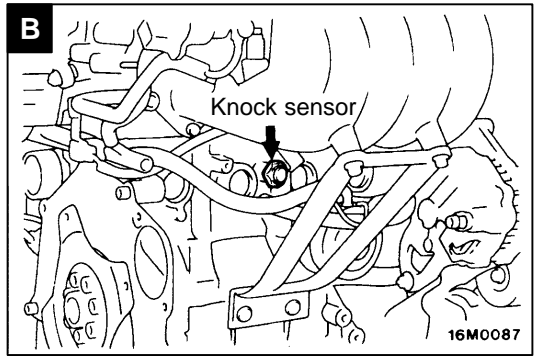
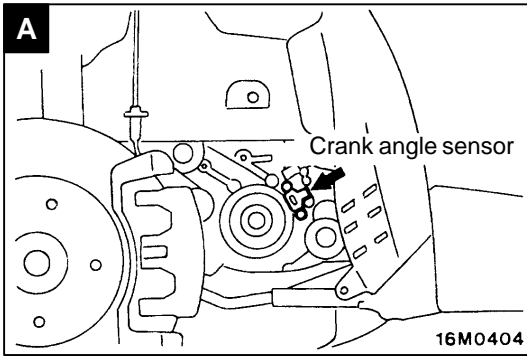
Name	Symbol	Name	Symbol
Acceleration sensor (lateral) <vehicles with AYC>	I	Knock sensor	B
Acceleration sensor (longitudinal) <vehicles with ABS and AYC>	I	Outside air temperature sensor <vehicles with fully automatic air conditioner>	F
Air flow sensor	D	O <sub>2</sub> sensor	E
Camshaft position sensor	G	Steering angle sensor (lateral) <vehicles with AYC>	H
Crank angle sensor	A	Throttle position sensor	C
Engine coolant temperature sensor	G		



16M0466

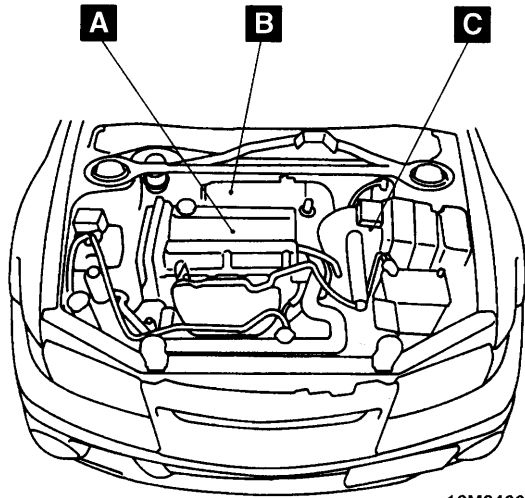


B21A066

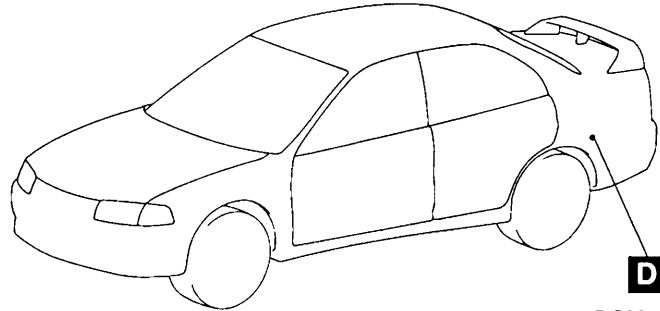


# SOLENOID AND SOLENOID VALVE

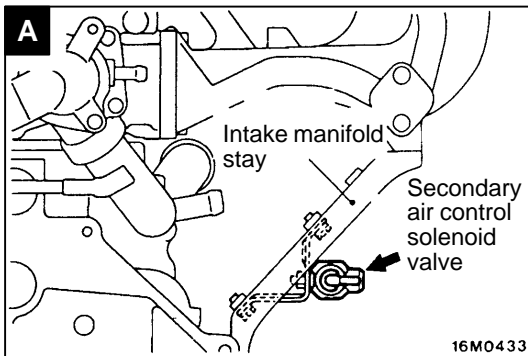
Name	Symbol	Name	Symbol
Direction valve <vehicles with AYC>	D	Secondary air control solenoid valve	A
Fuel pressure solenoid valve	B	Waste gate solenoid valve	C
Proportioning valve <vehicles with AYC>	D		



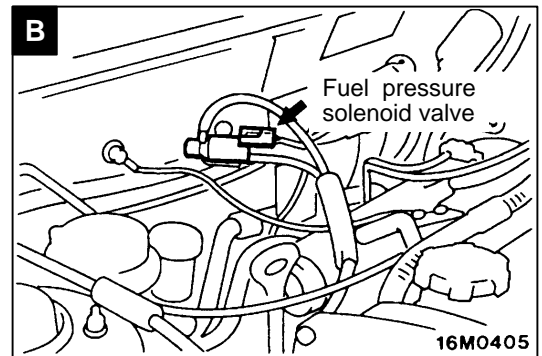
16M0466



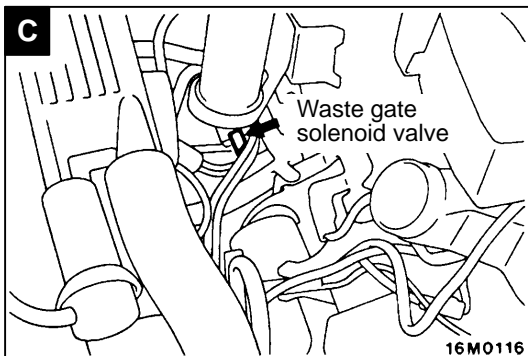
DOM0011



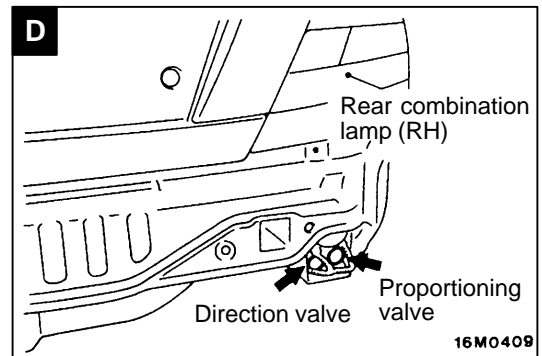
16M0433



16M0405

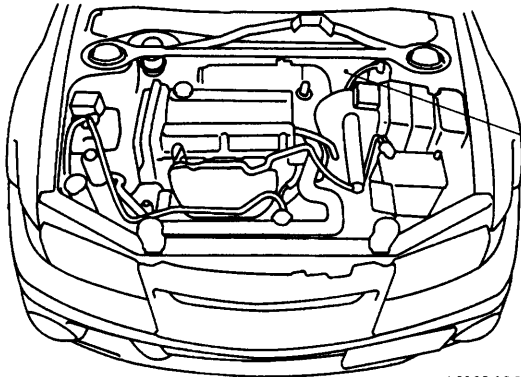


16M0116

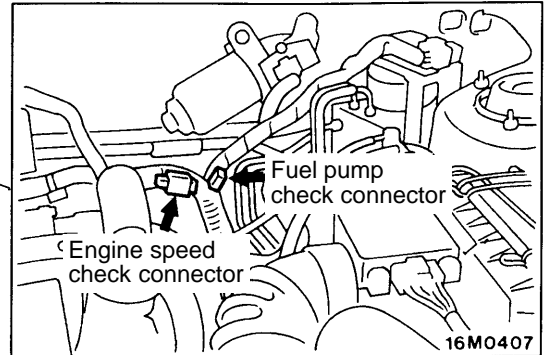


16M0409

# INSPECTION CONNECTOR

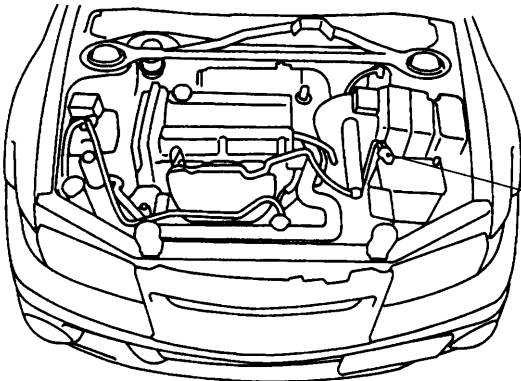


16M0466

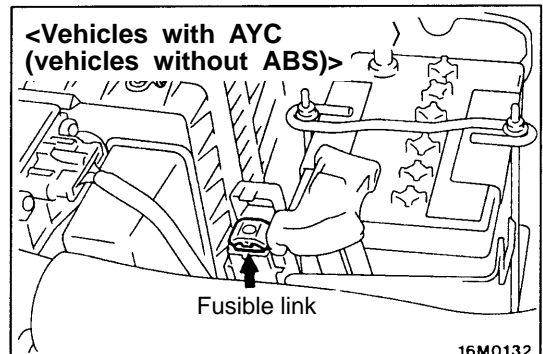


16M0407

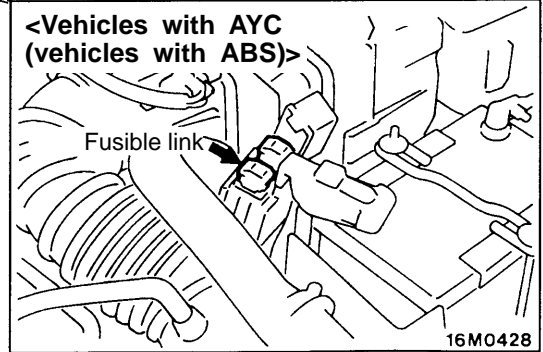
# FUSIBLE LINK AND FUSE



16M0466



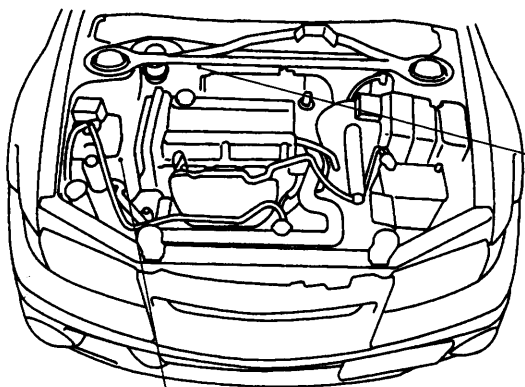
16M0132



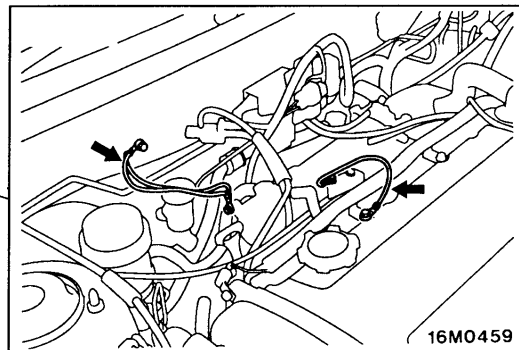
16M0428



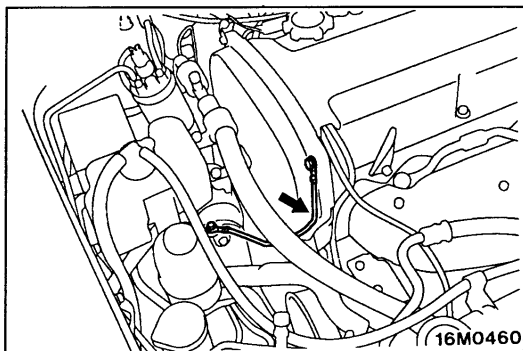
# EARTH CABLE



16M0466

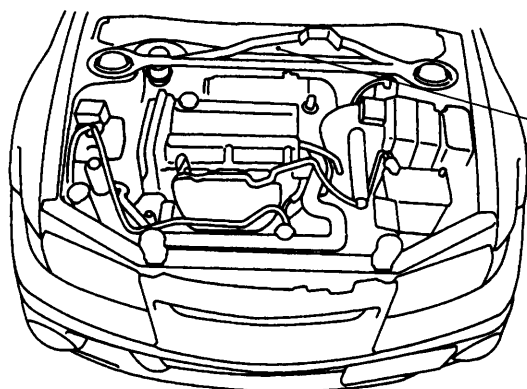


16M0459

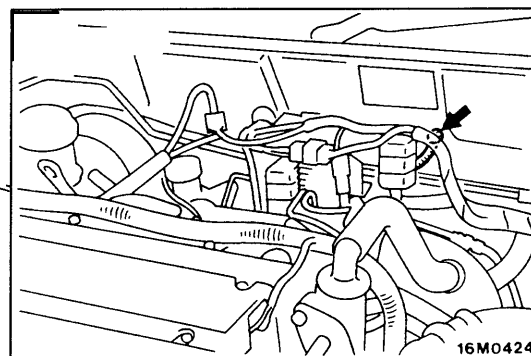


16M0460

# EARTH



16M0466



16M0424



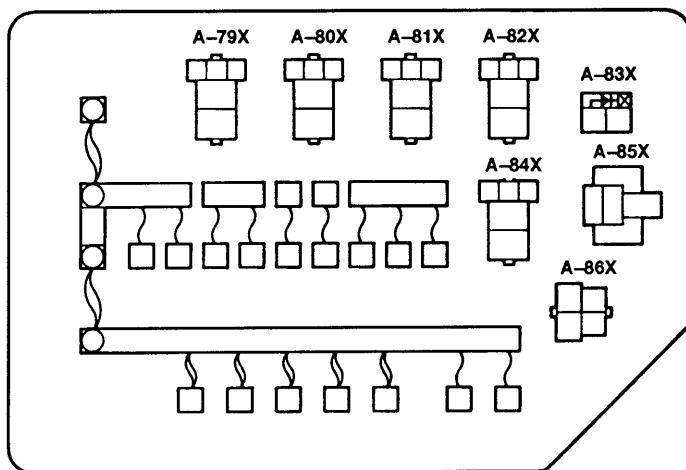
# CIRCUIT DIAGRAM

## CENTRALIZED JUNCTION

### CENTRALIZED RELAY

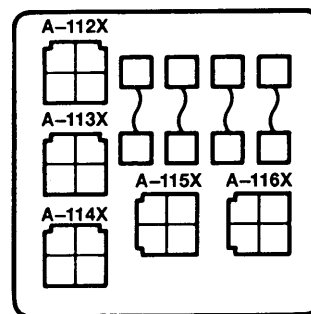
Connector No.	Name	Connector No.	Name
A-82X	Radiator fan motor relay (LO)	A-113X	Condenser fan motor relay (LO)
A-112X	Radiator fan motor relay (HI)	A-114X	Condenser fan motor relay (HI)

Relay box in engine compartment



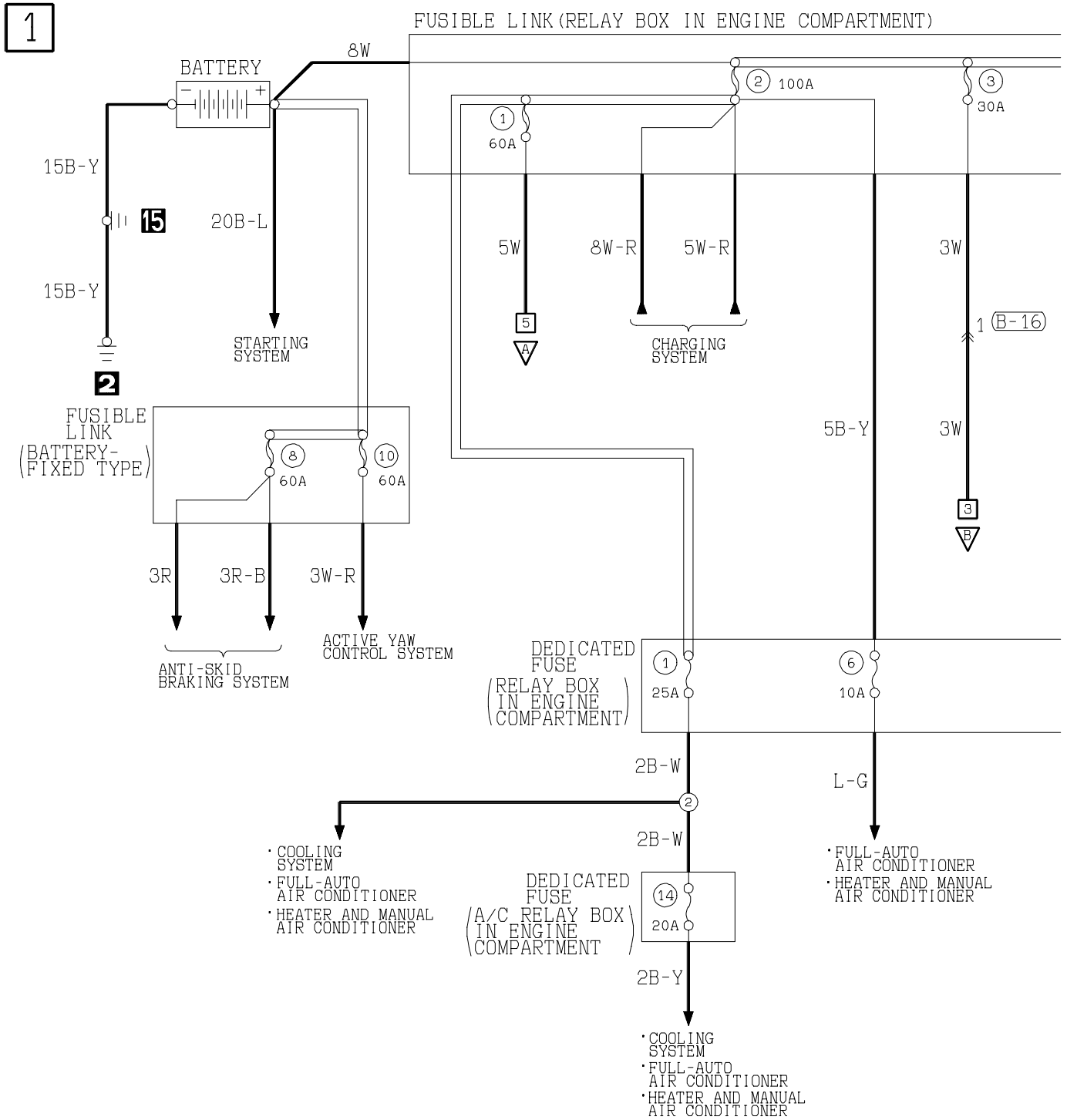
16M0141

(A/C relay box)



16M0142

POWER DISTRIBUTION SYSTEM

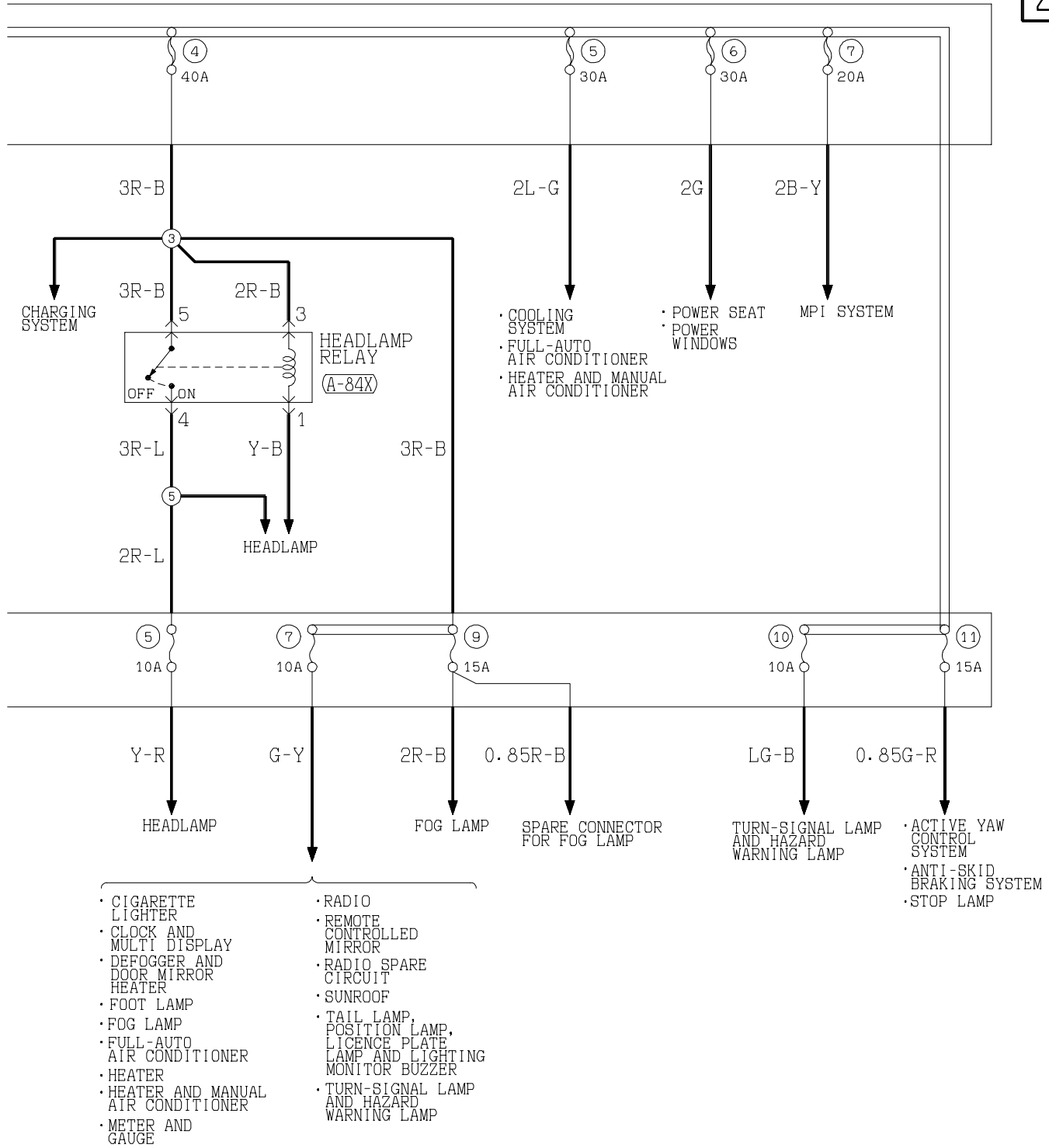


(A-84X)

(B-16)



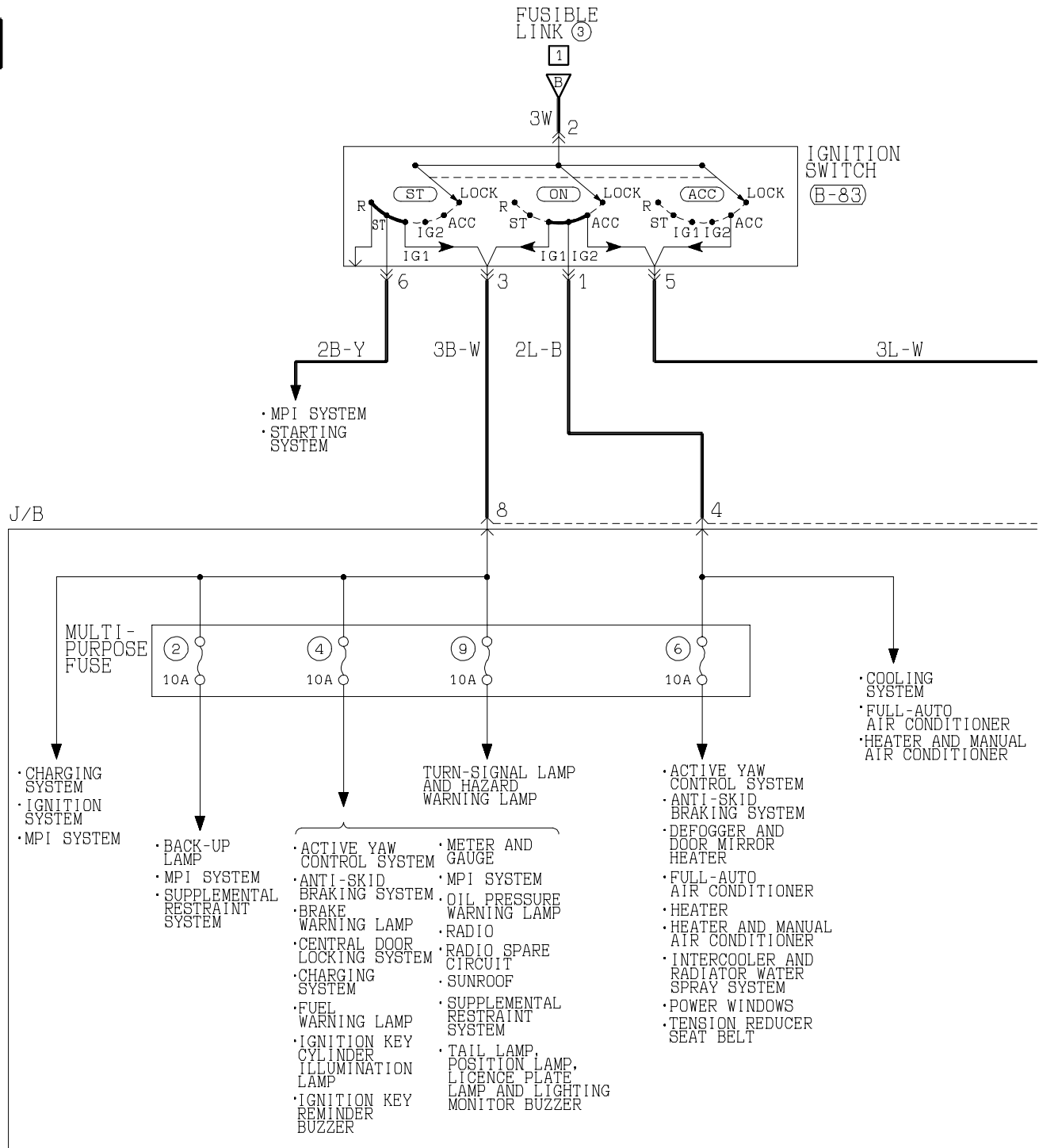
2



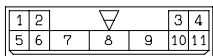
Wire colour code  
 B:Black LG:Light green G:Green L:Blue W:White Y:Yellow SB:Sky blue  
 BR:Brown O:Orange GR:Gray R:Red P:Pink V:Violet

POWER DISTRIBUTION SYSTEM (CONTINUED)

3



(B-67)



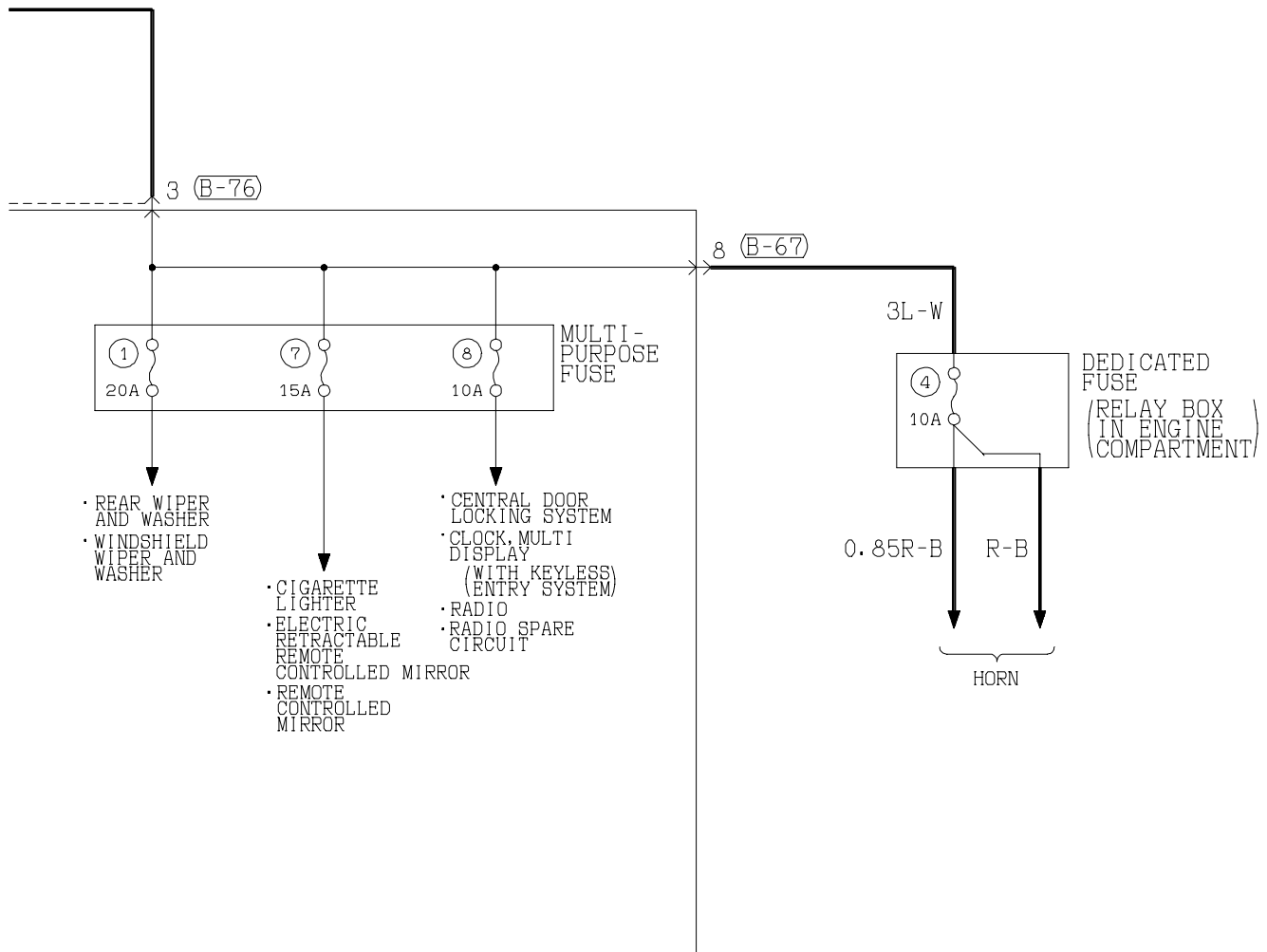
(B-76)



(B-83)

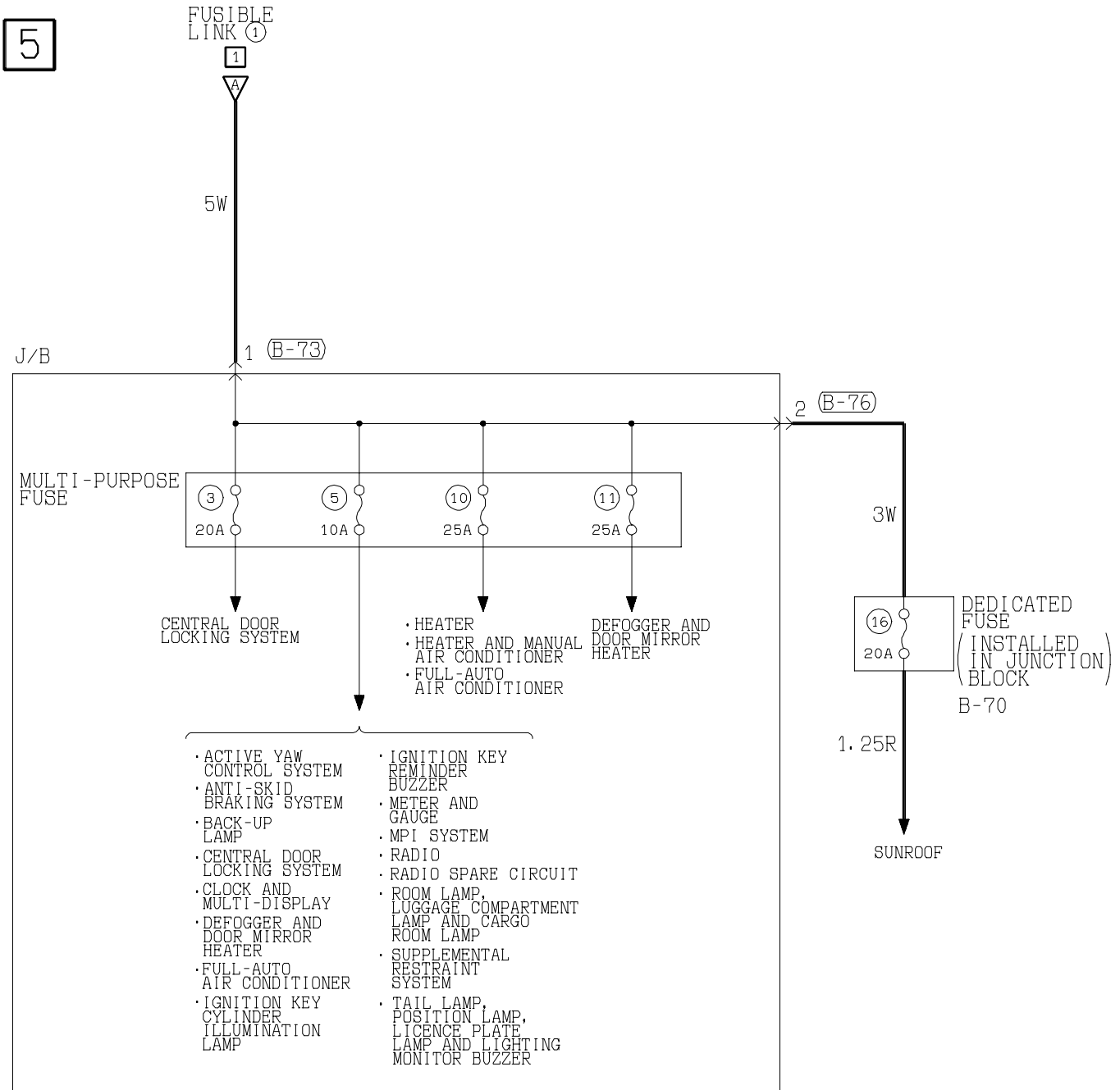


4



Wire colour code  
 B :Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet

POWER DISTRIBUTION SYSTEM (CONTINUED)



(B-73) (B-76)



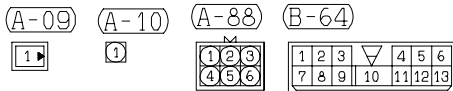
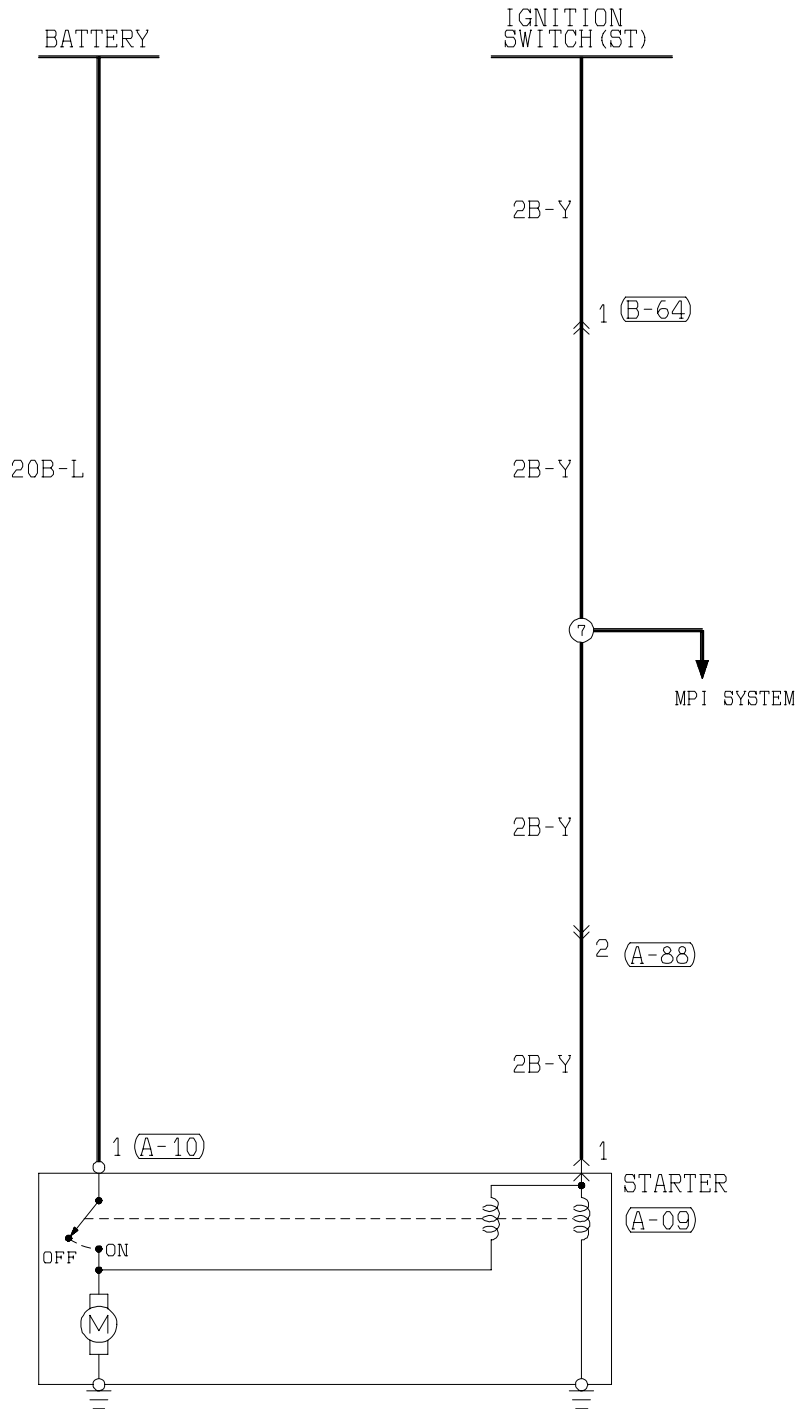
Wire colour code

B :Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet



STARTING SYSTEM

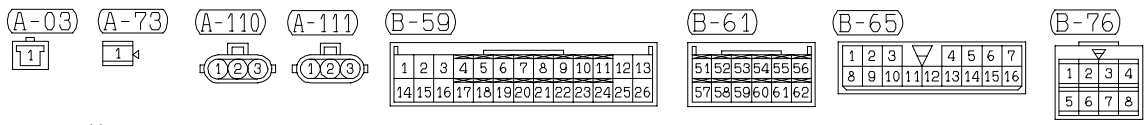
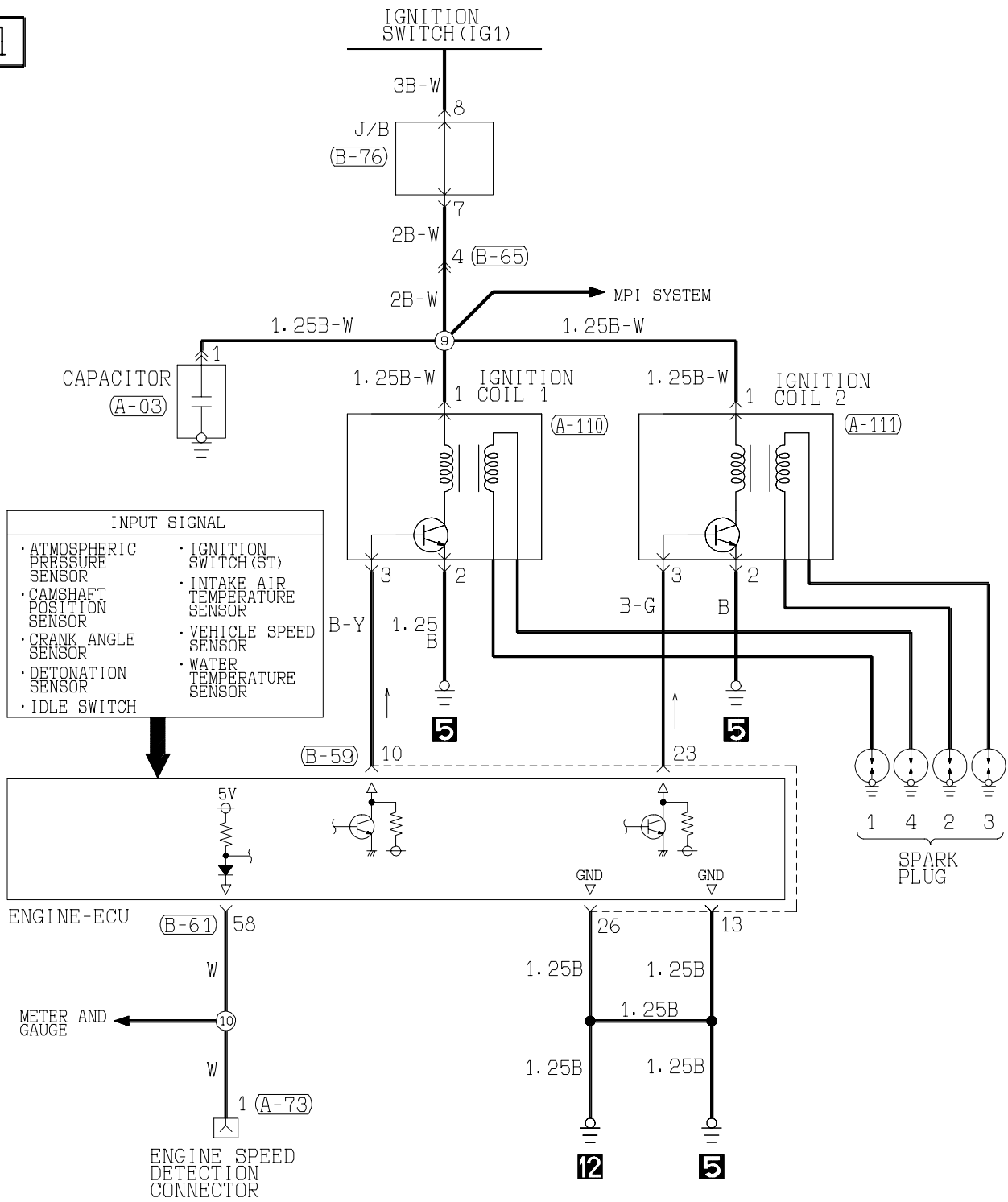
1



Wire colour code  
 B :Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet

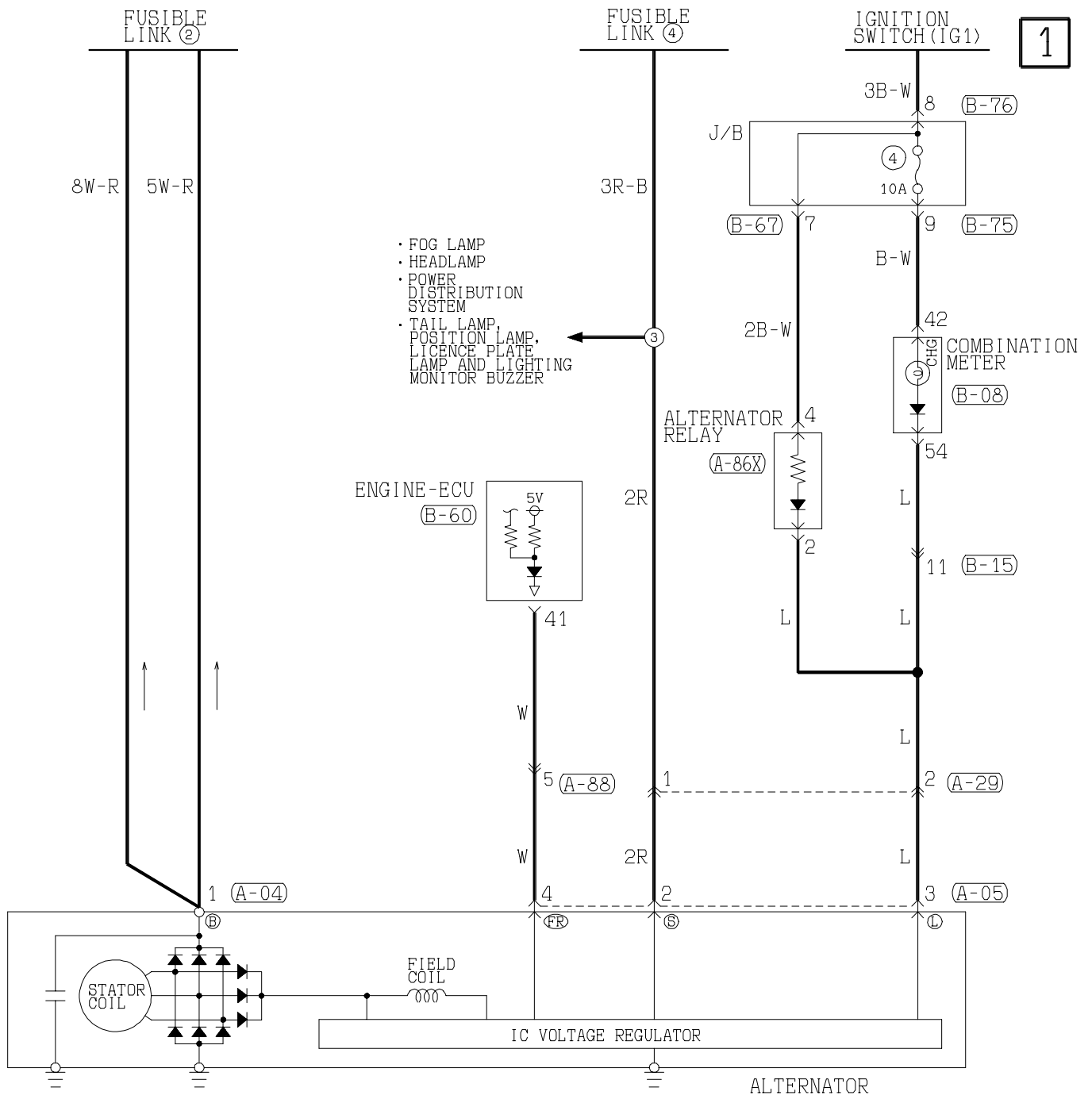
IGNITION SYSTEM

1



Wire colour code  
 B : Black    LG : Light green    G : Green    L : Blue    W : White    Y : Yellow    SB : Sky blue  
 BR : Brown    O : Orange    GR : Gray    R : Red    P : Pink    V : Violet

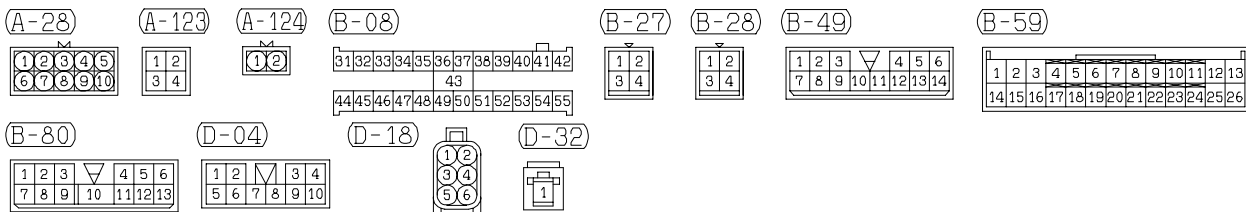
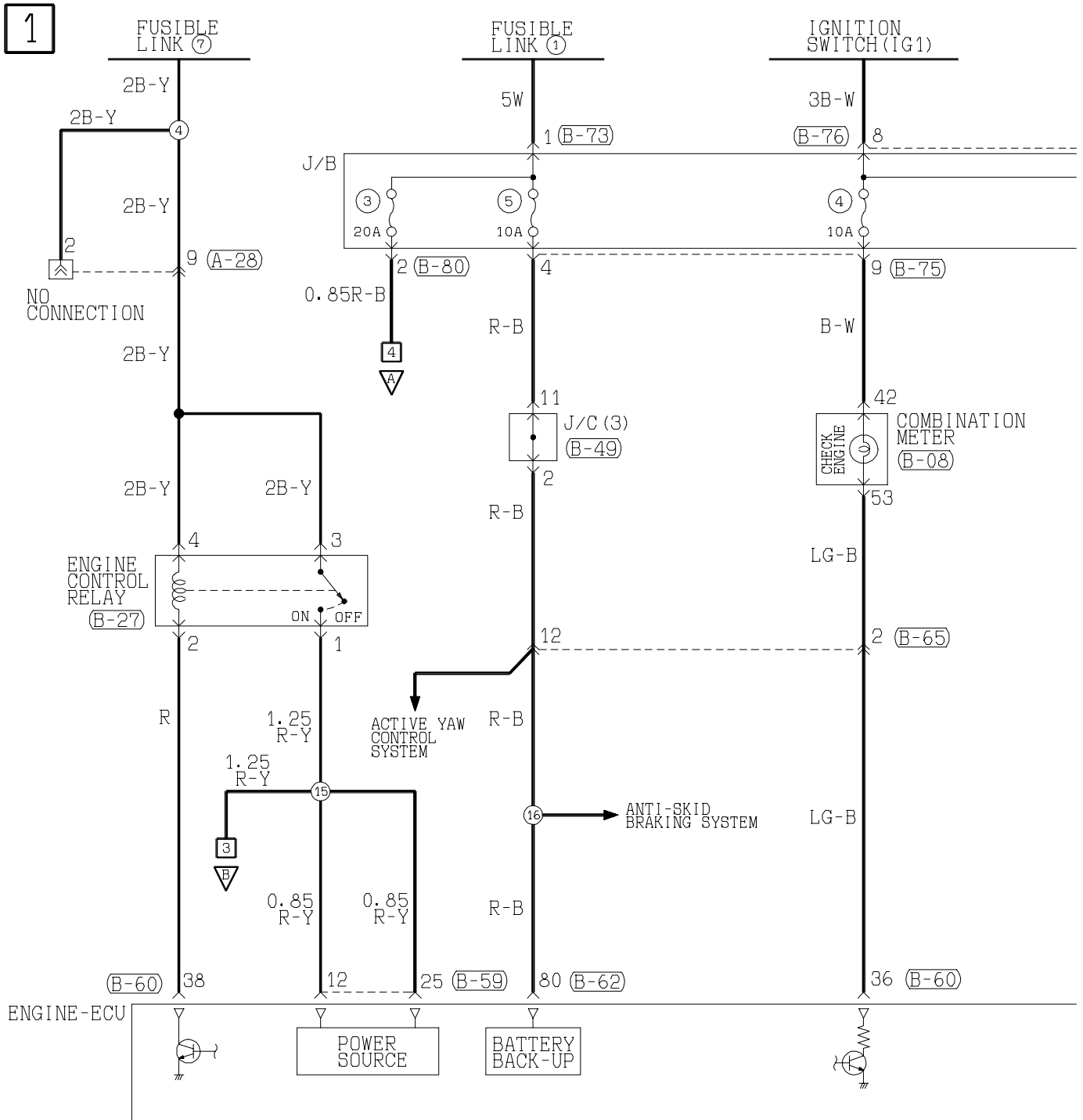
CHARGING SYSTEM



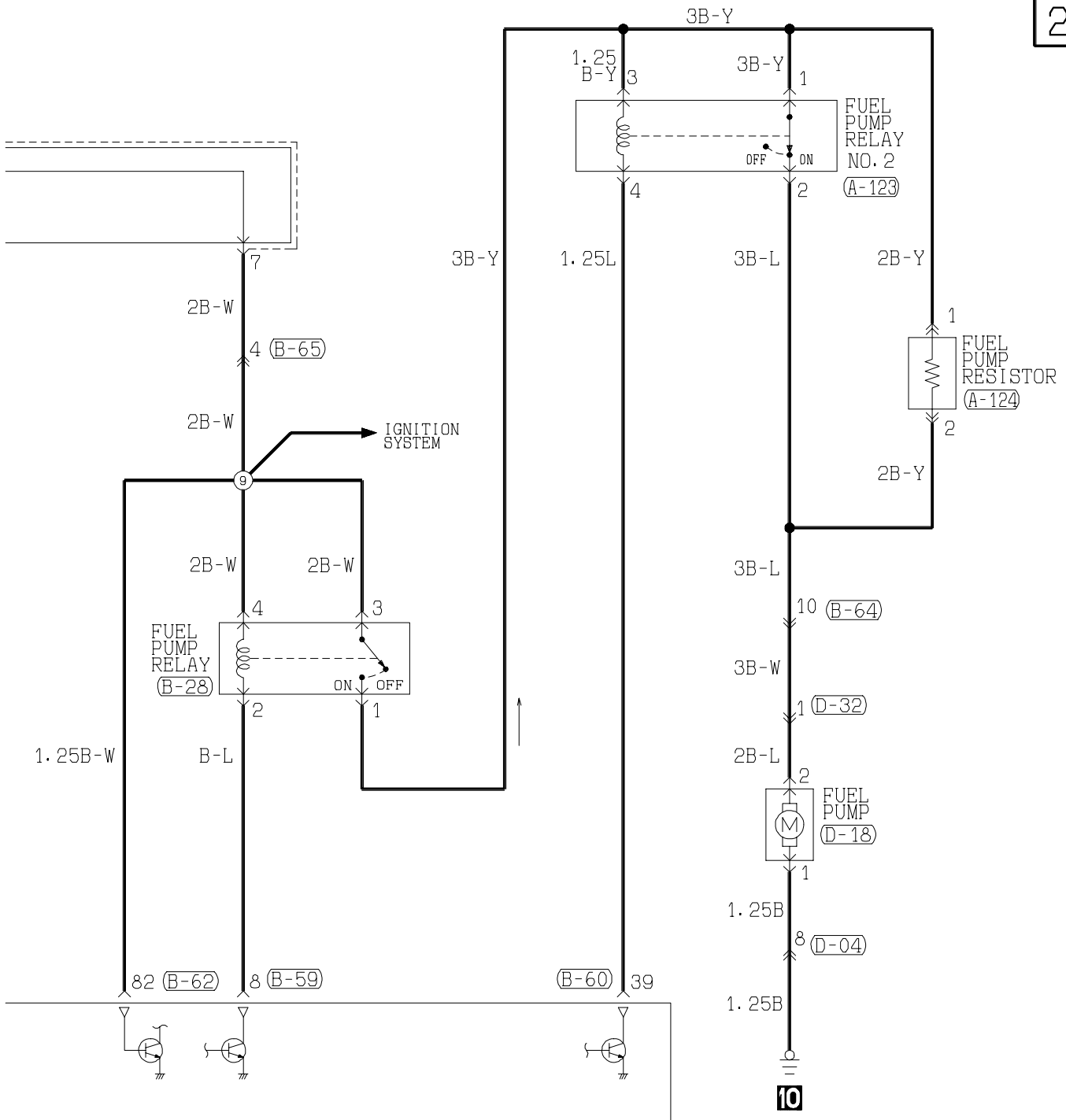
- FOG LAMP
- HEADLAMP
- POWER DISTRIBUTION SYSTEM
- TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER

(A-04)	(A-05)	(A-29)	(A-86X)	(A-88)	(B-08)	(B-15)	(B-60)
(B-67)	(B-75)	(B-76)	Wire colour code		G : Green		L : Blue
			B : Black		LG : Light green		R : Red
			BR : Brown		O : Orange		Y : Yellow
			W : White		SB : Sky blue		
			V : Violet				

MPI SYSTEM



2



(B-60)

31	32	33	34	35	36	37	38
39	40	41	42	43	44	45	46

(B-62)

71	72	73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90	91	92

(B-64)

1	2	3	▽	4	5	6
7	8	9	10	11	12	13

(B-65)

1	2	3	▽	4	5	6	7	
8	9	10	11	12	13	14	15	16

(B-73)

1
---

(B-75)

1	2	3	▽	4	5	6	7	
8	9	10	11	12	13	14	15	16

(B-76)

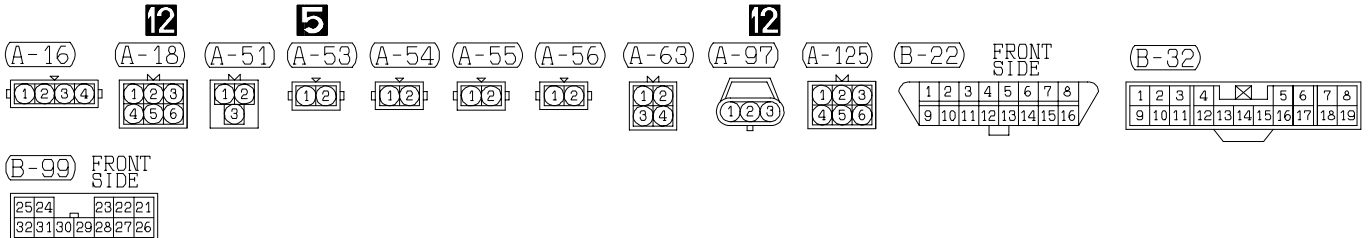
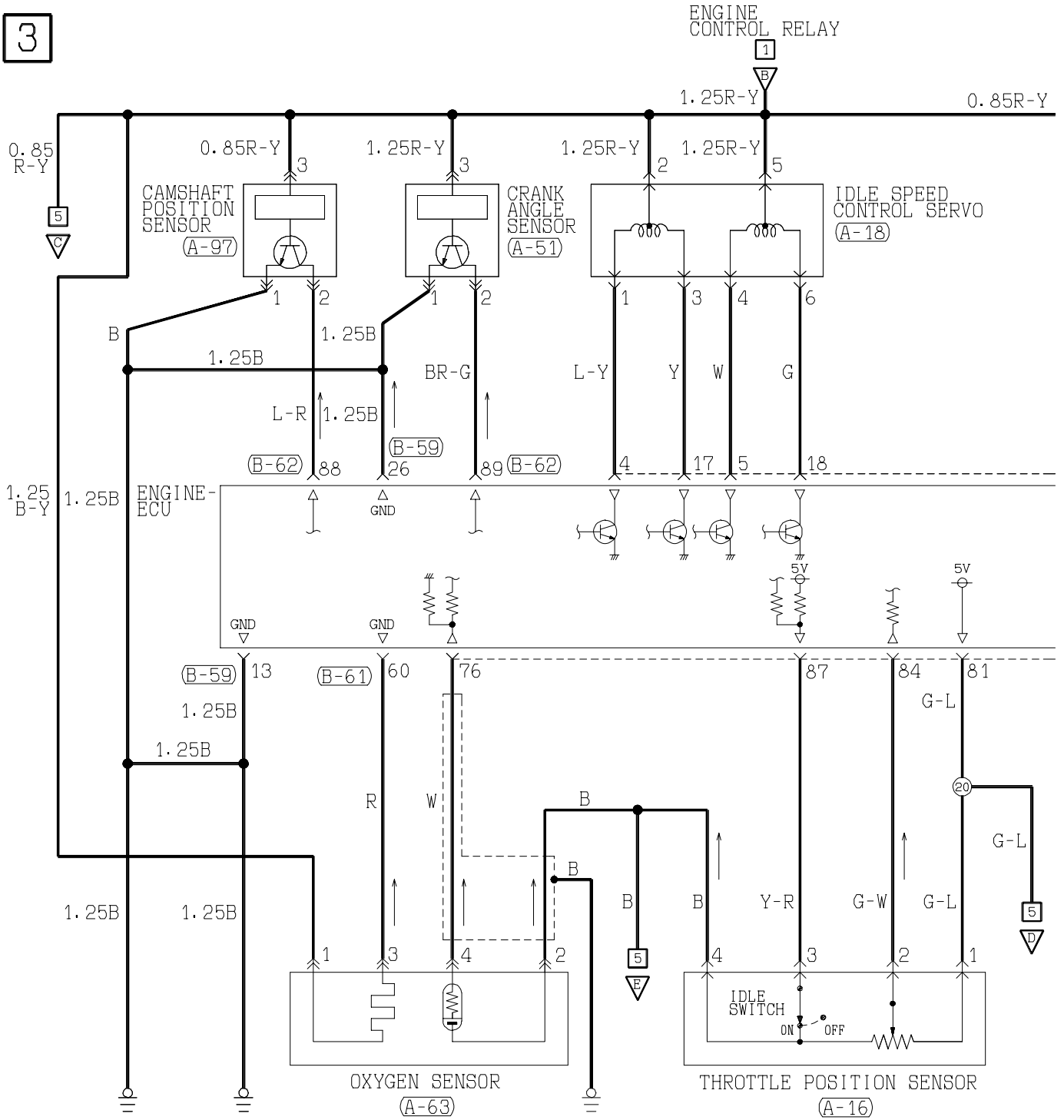
1	2	3	4
5	6	7	8

Wire colour code

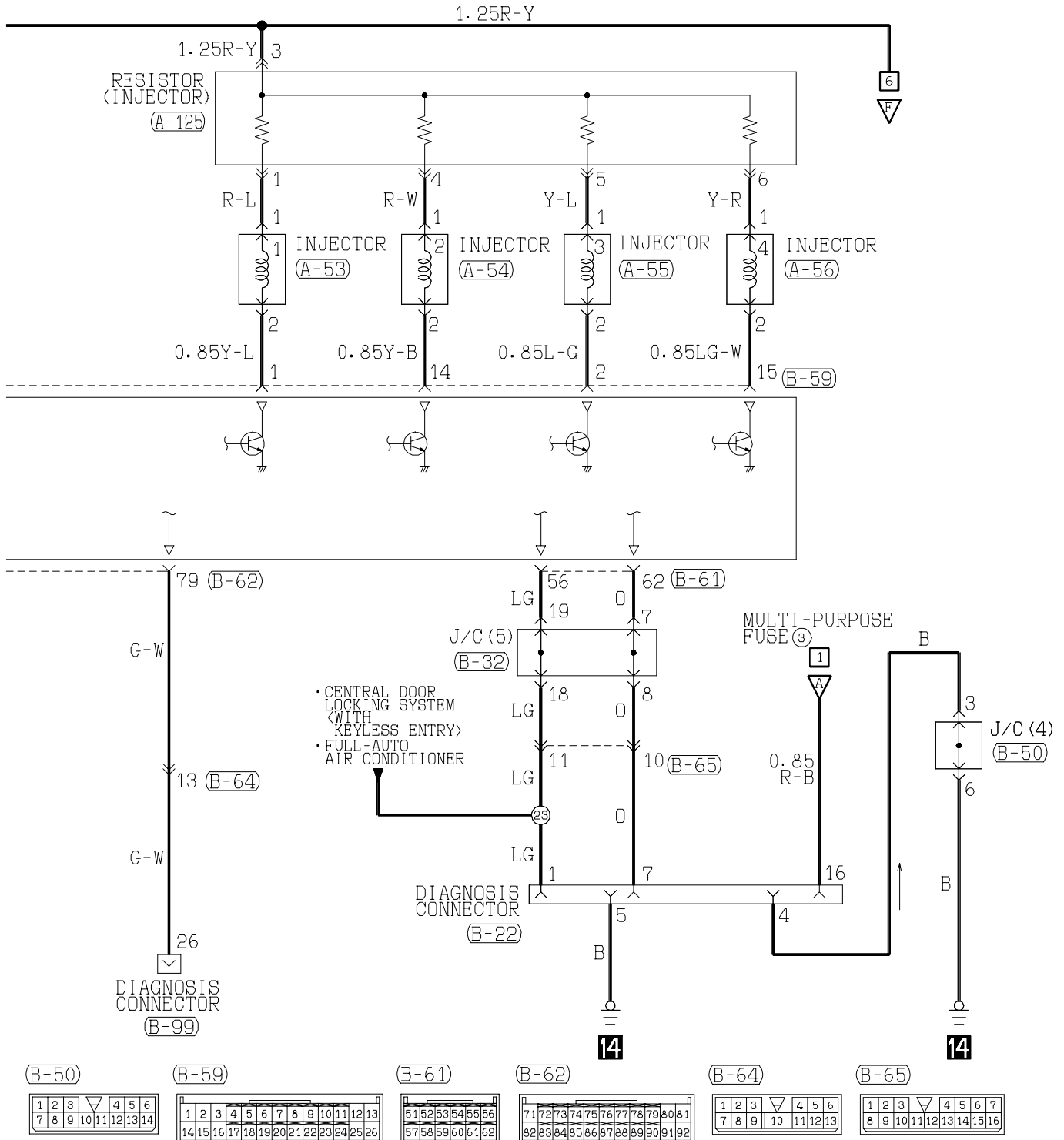
B :Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet

MPI SYSTEM (CONTINUED)

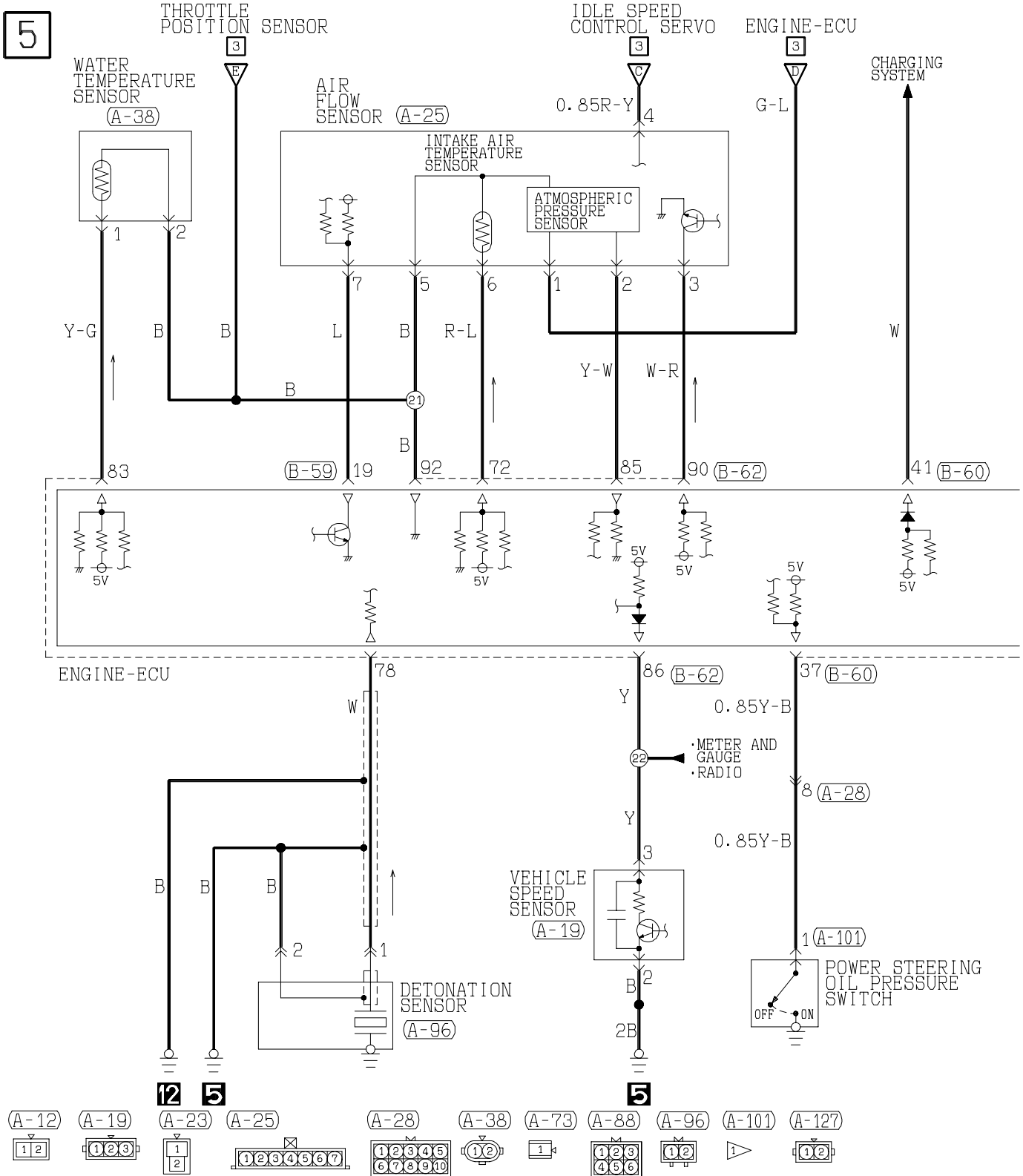
3



4

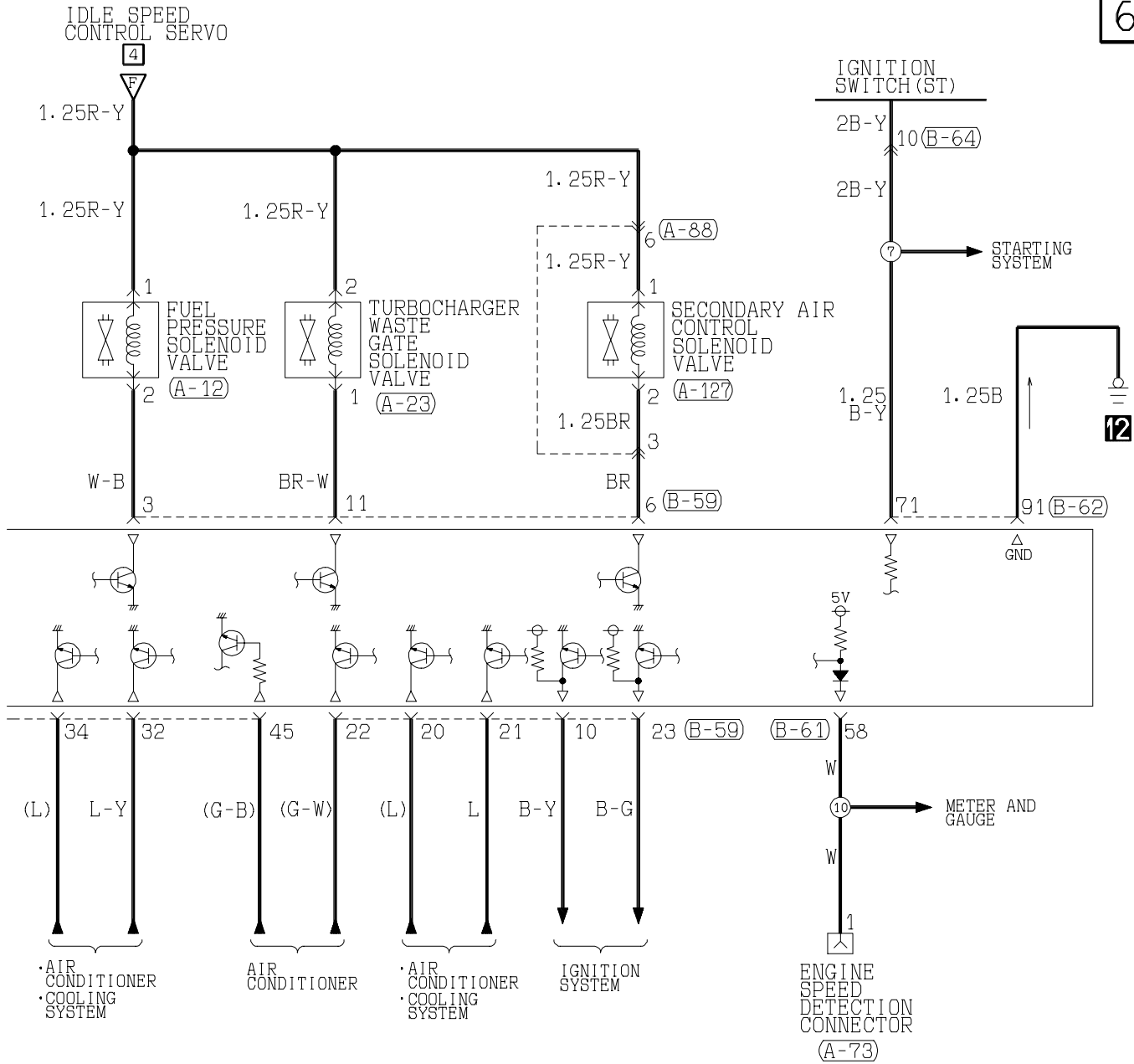


MPI SYSTEM (CONTINUED)





6



(B-59)

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

(B-60)

31	32	33	34	35	36	37	38
39	40	41	42	43	44	45	46

(B-61)

51	52	53	54	55	56
57	58	59	60	61	62

(B-62)

71	72	73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90	91	92

(B-64)

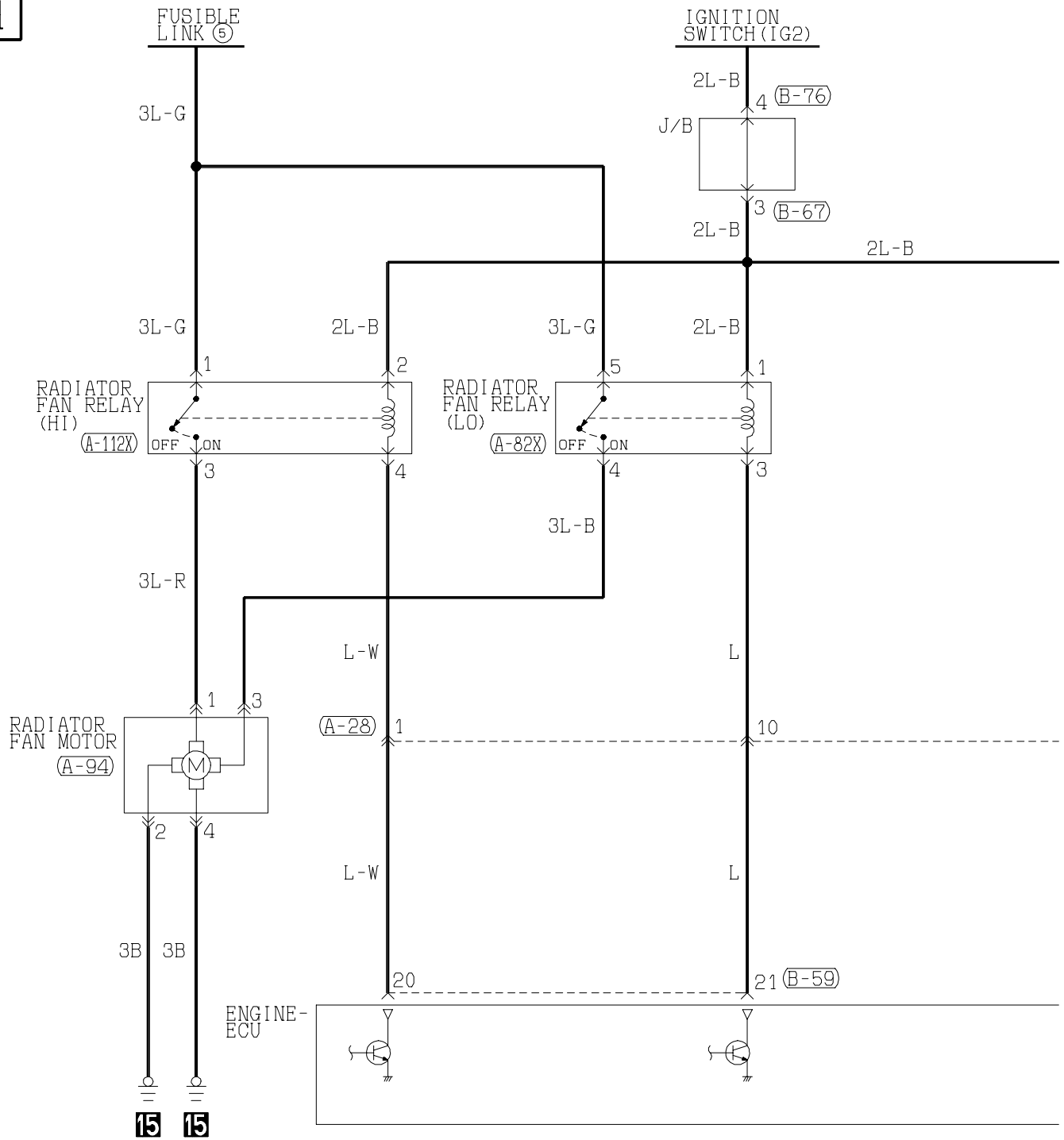
1	2	3	4	5	6	
7	8	9	10	11	12	13

Wire colour code

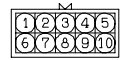
B : Black    LG : Light green    G : Green    L : Blue    W : White    Y : Yellow    SB : Sky blue  
 BR : Brown    O : Orange    GR : Gray    R : Red    P : Pink    V : Violet

COOLING SYSTEM

1



(A-28)



(A-82X)



(A-94)



(A-99)



(A-112X)



(A-113X)



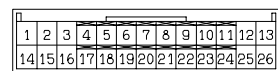
(A-114X)



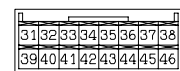
(A-128)



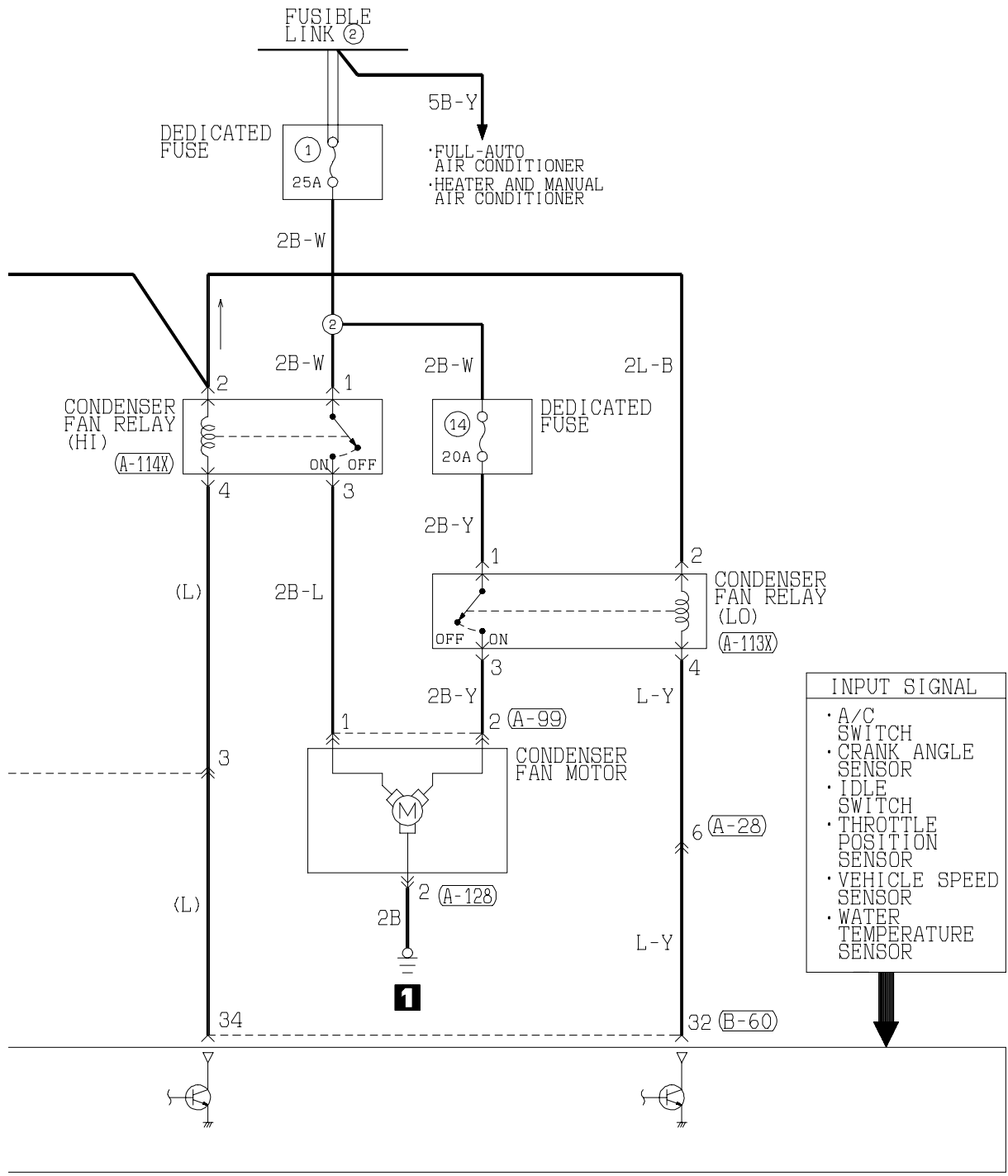
(B-59)



(B-60)



2



(B-67)

1	2	3	4
5	6	7	8

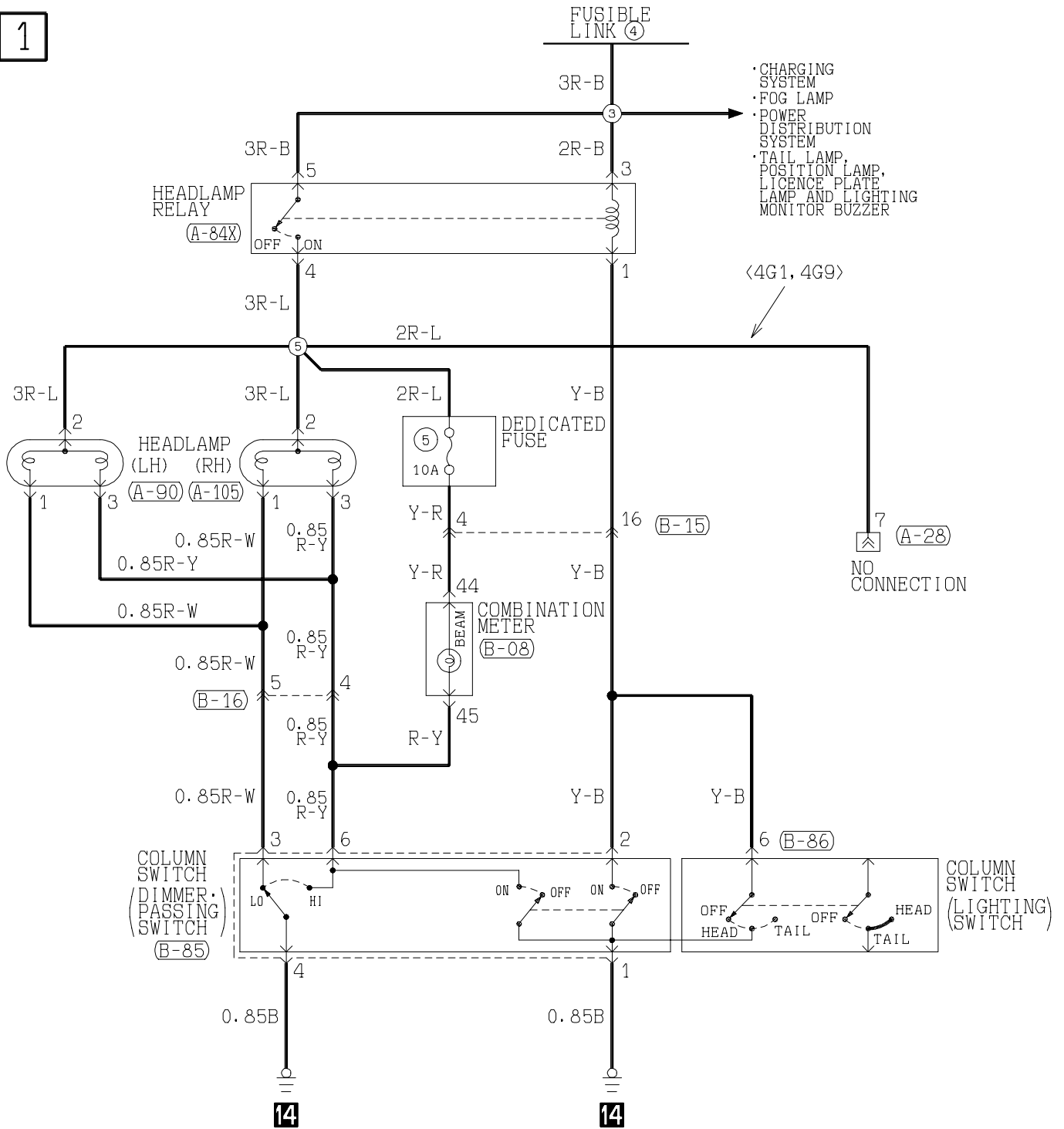
(B-76)

1	2	3	4
5	6	7	8

Wire colour code  
 B : Black    LG: Light green    G : Green    L : Blue    W : White    Y : Yellow    SB: Sky blue  
 BR: Brown    O : Orange    GR: Gray    R : Red    P : Pink    V : Violet

HEADLAMP

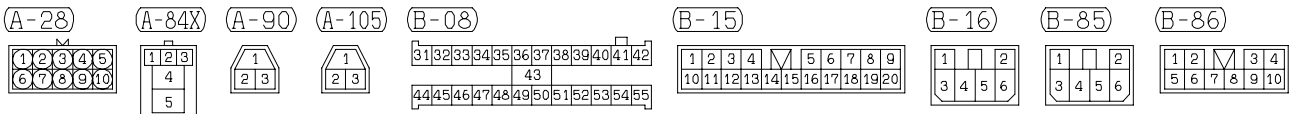
1



- CHARGING SYSTEM
- FOG LAMP
- POWER DISTRIBUTION SYSTEM
- TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER

<4G1, 4G9>

NO CONNECTION

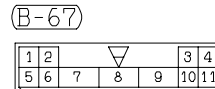
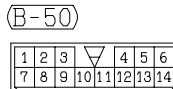
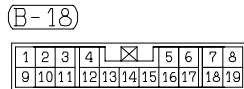
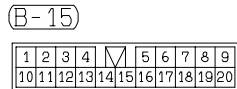
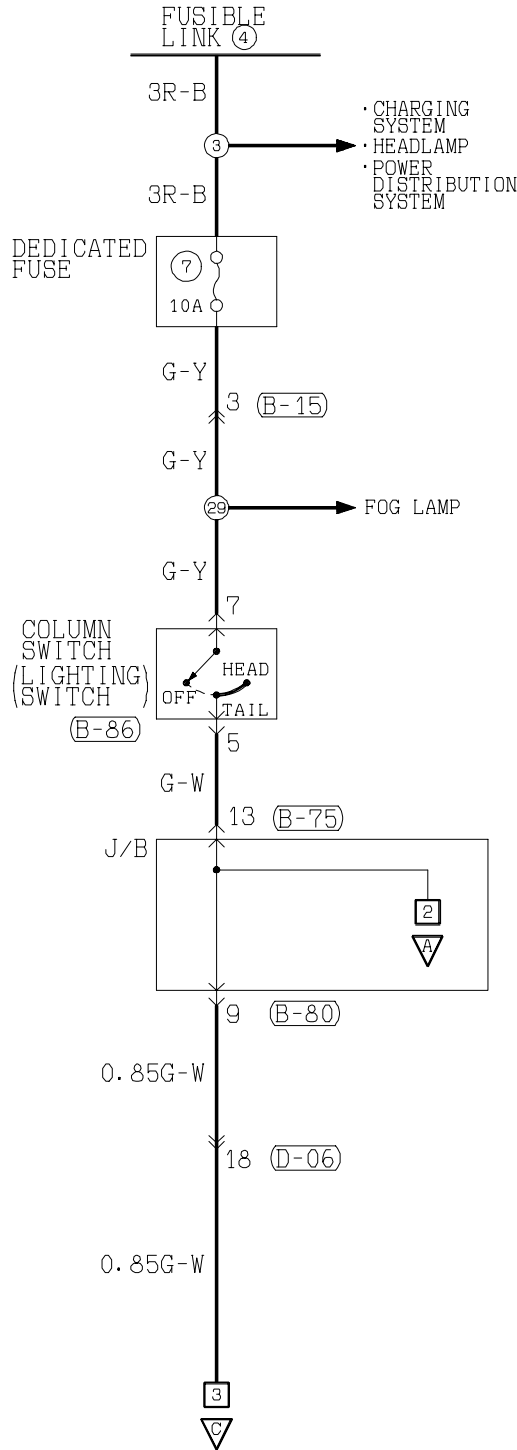


Wire colour code  
 B : Black    LG: Light green    G : Green    L : Blue    W : White    Y : Yellow    SB: Sky blue  
 BR: Brown    O : Orange    GR: Gray    R : Red    P : Pink    V : Violet

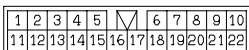
NOTES

**TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER**

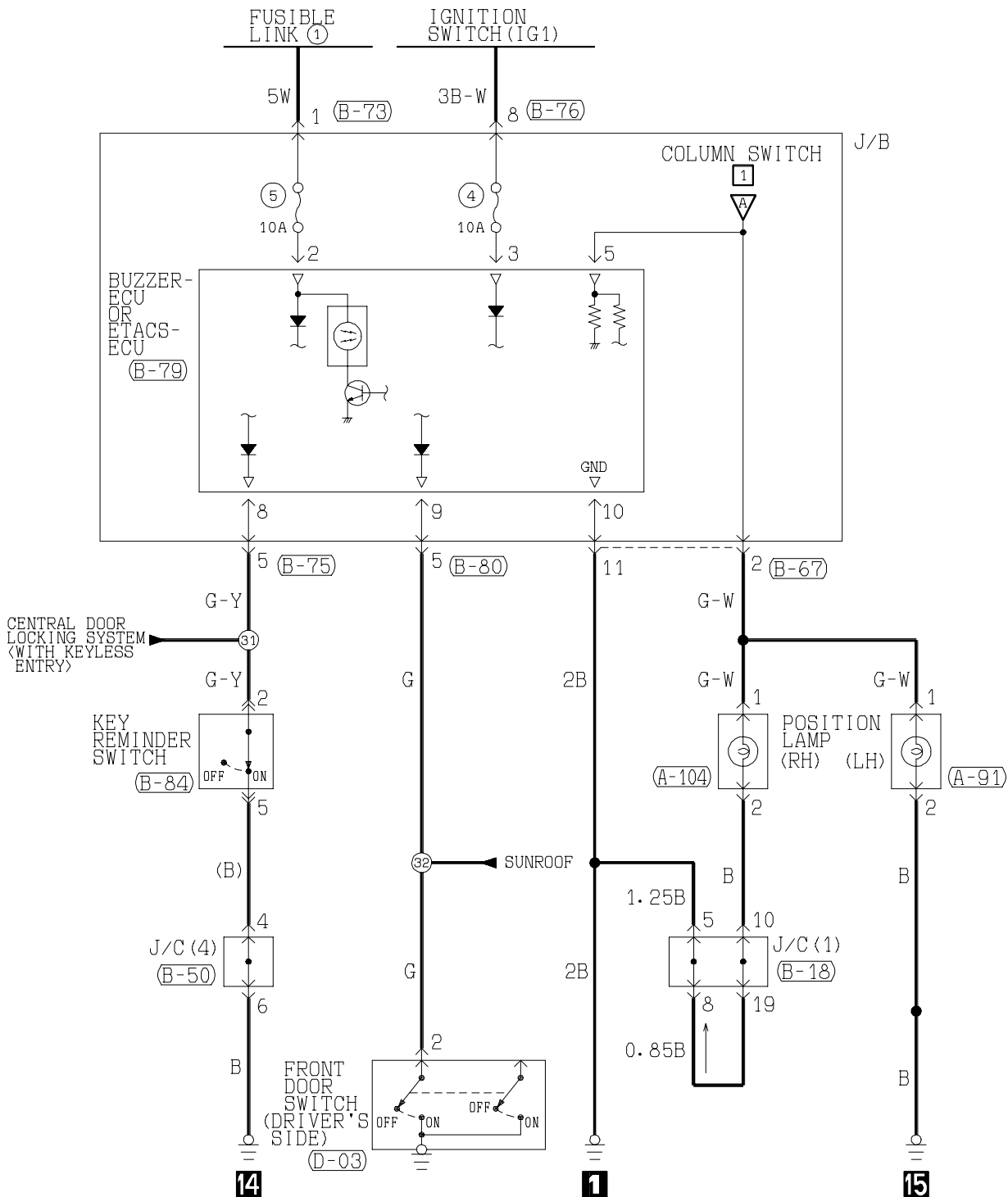
1



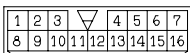
(D-06)



2



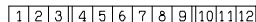
(B-75)



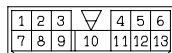
(B-76)



(B-79)



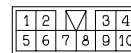
(B-80)



(B-84)



(B-86)



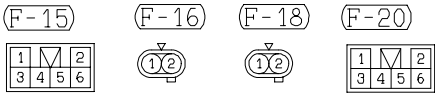
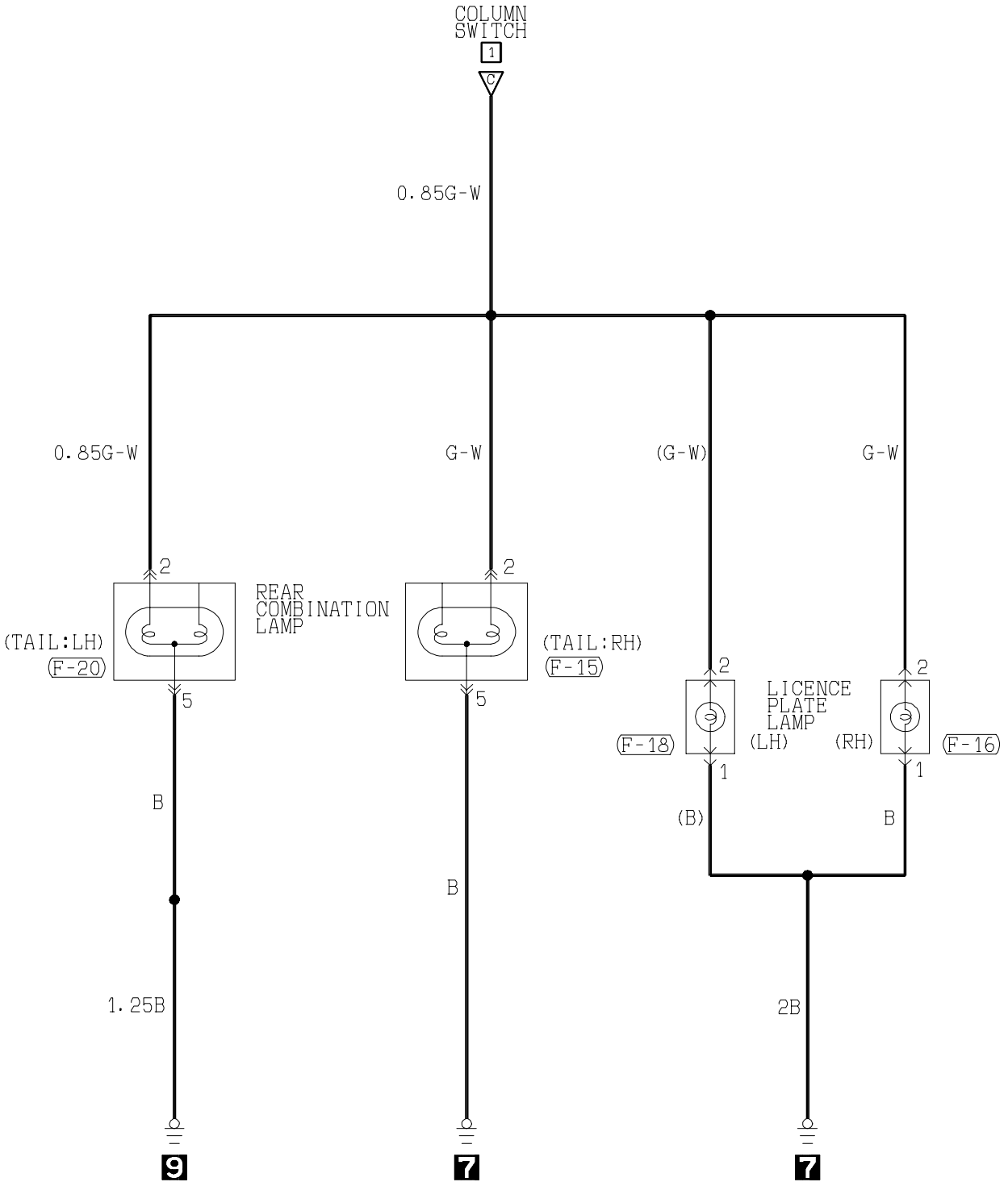
(D-03)



Wire colour code  
 B : Black    LG : Light green    G : Green    L : Blue    W : White    Y : Yellow    SB : Sky blue  
 BR : Brown    O : Orange    GR : Gray    R : Red    P : Pink    V : Violet

TAIL LAMP, POSITION LAMP, LICENCE PLATE LAMP AND LIGHTING MONITOR BUZZER (CONTINUED)

3

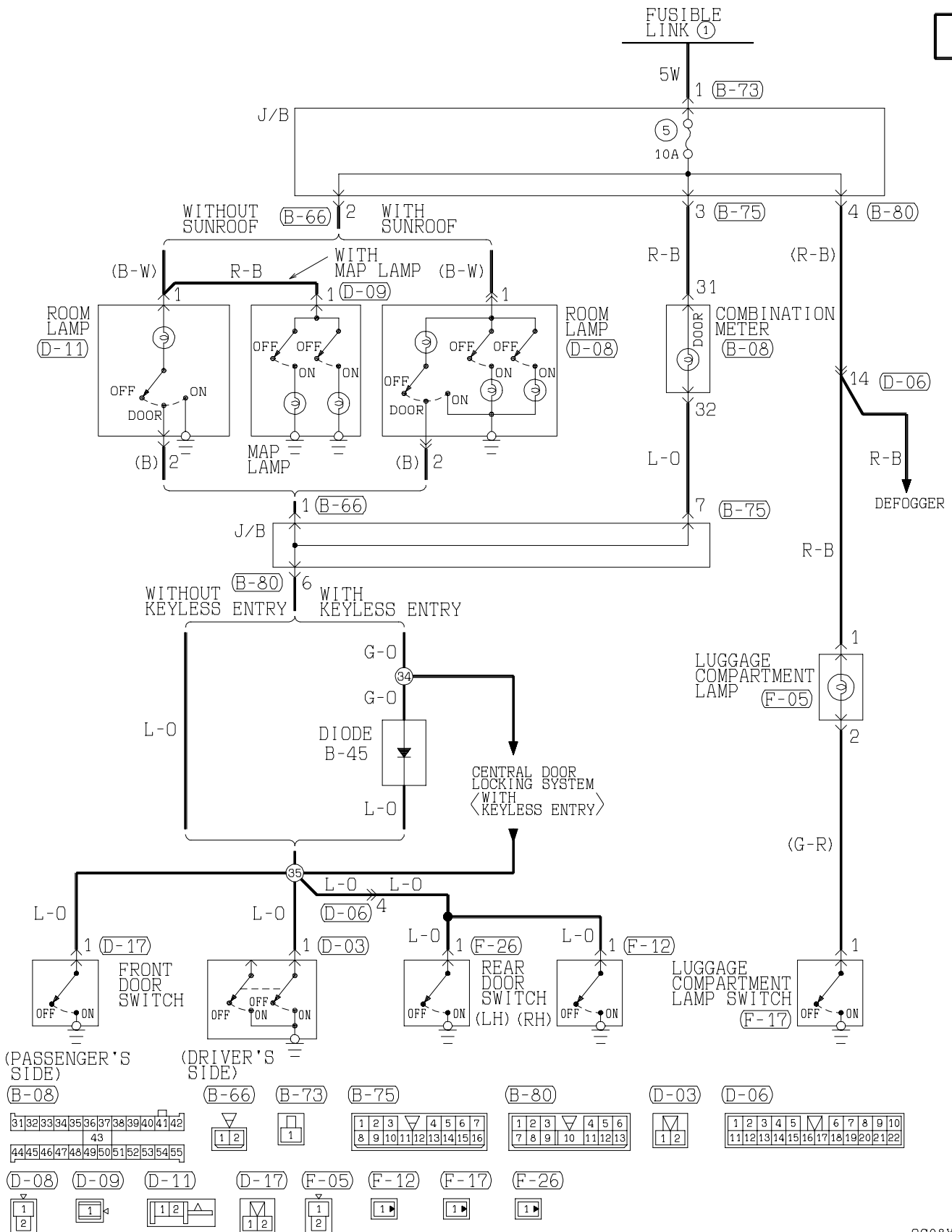


Wire colour code  
 B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue  
 BR:Brown O :Orange GR:Gray R :Red P :Pink V :Violet



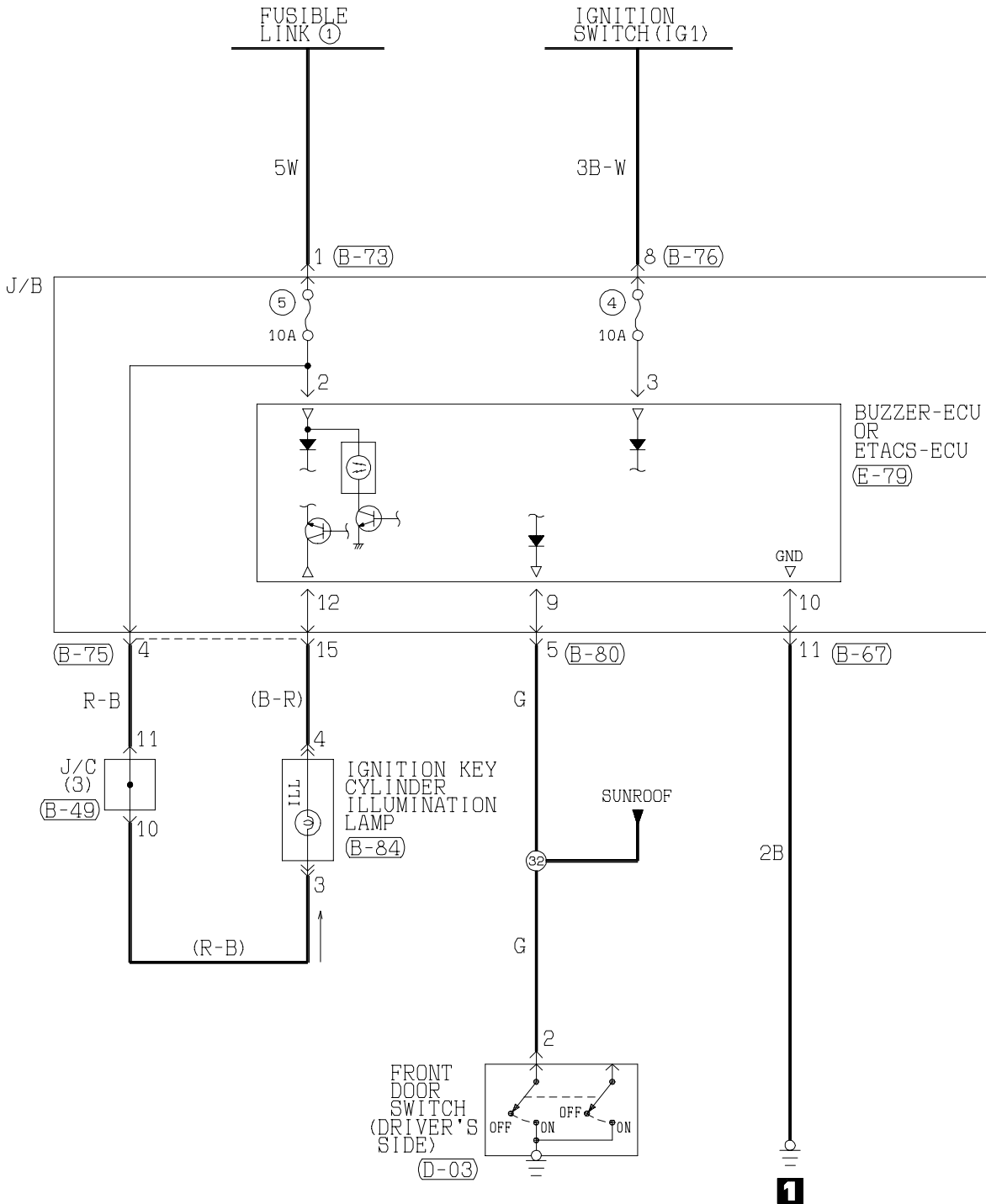
# ROOM LAMP AND LUGGAGE COMPARTMENT LAMP

1

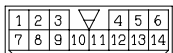


IGNITION KEY CYLINDER ILLUMINATION LAMP

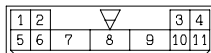
1



(B-49)



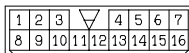
(B-67)



(B-73)



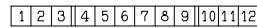
(B-75)



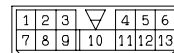
(B-76)



(B-79)



(B-80)



(B-84)



(D-03)



Wire colour code  
 B :Black  
 BR:Brown  
 W :White  
 V :Violet

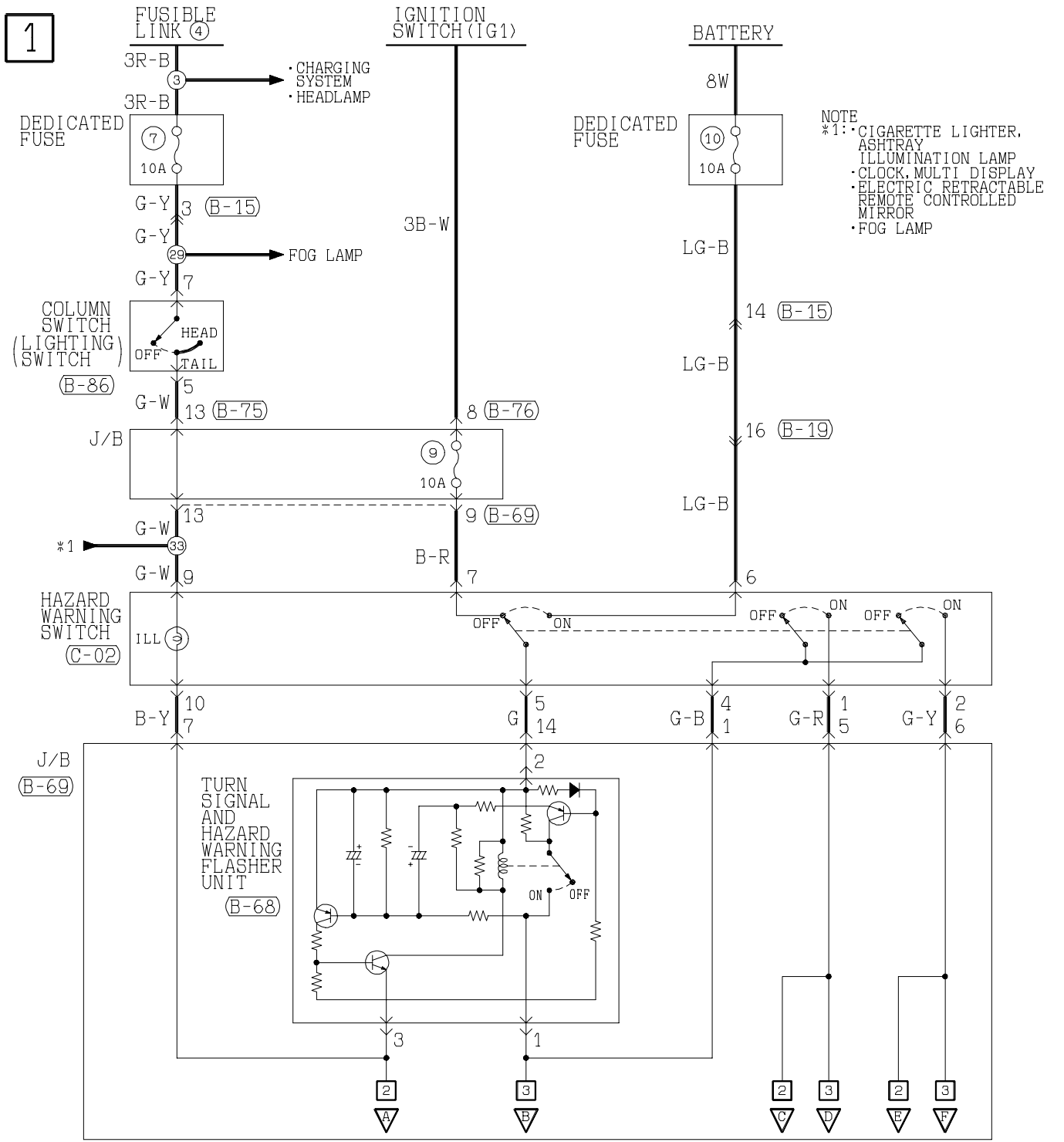
LG:Light green  
 O :Orange  
 SB:Sky blue

G :Green  
 GR:Gray  
 P :Pink

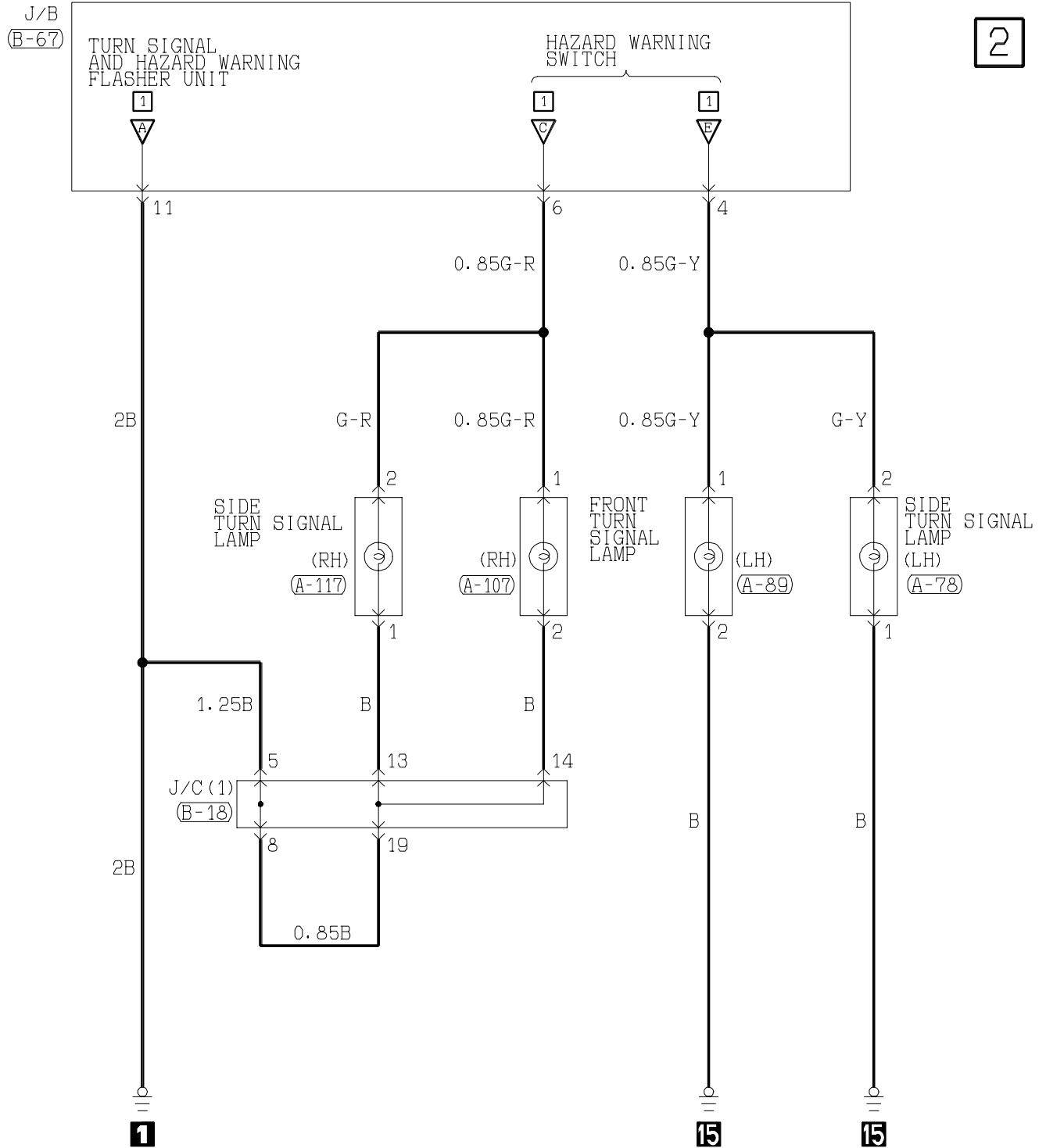
L :Blue  
 R :Red  
 Y :Yellow

NOTES

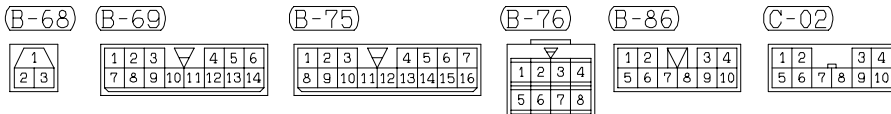
TURN-SIGNAL LAMP AND HAZARD WARNING LAMP



(A-78)	(A-89)	(A-107)	(A-117)	(B-15)	(B-18)	(B-19)	(B-67)																																																																								
				<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td></tr><tr><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr></table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td></tr><tr><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td></tr></table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr><tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td><td>21</td><td>22</td></tr></table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	<table border="1"><tr><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td></tr></table>	1	2	3	4	5	6	7	8	9	10	11
1	2	3	4	5	6	7	8	9																																																																							
10	11	12	13	14	15	16	17	18	19	20																																																																					
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9	10	11	12	13	14	15	16	17	18	19																																																																					
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5	6	7	8	9	10	11																																																																									

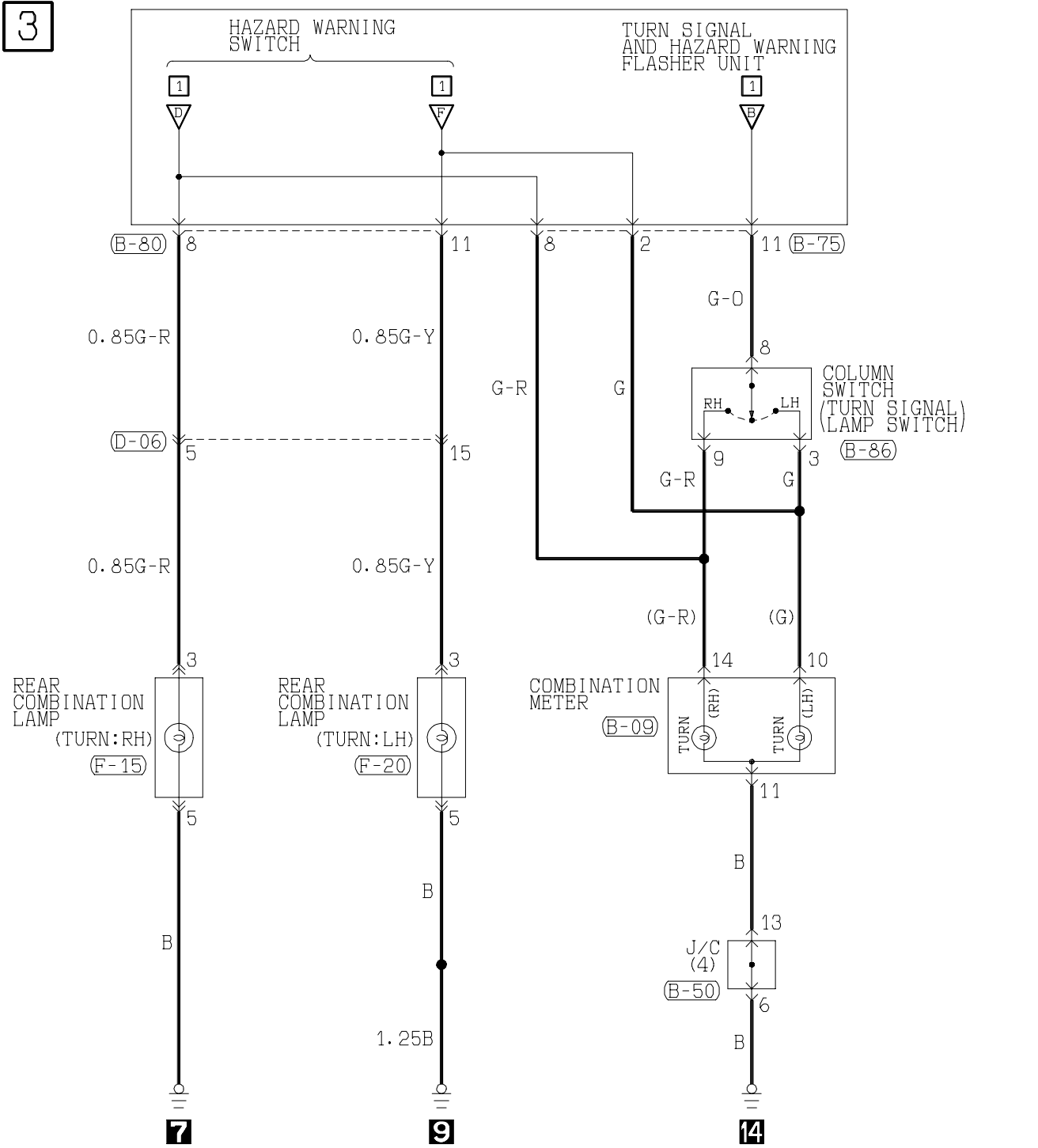


2



Wire colour code  
 B :Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet

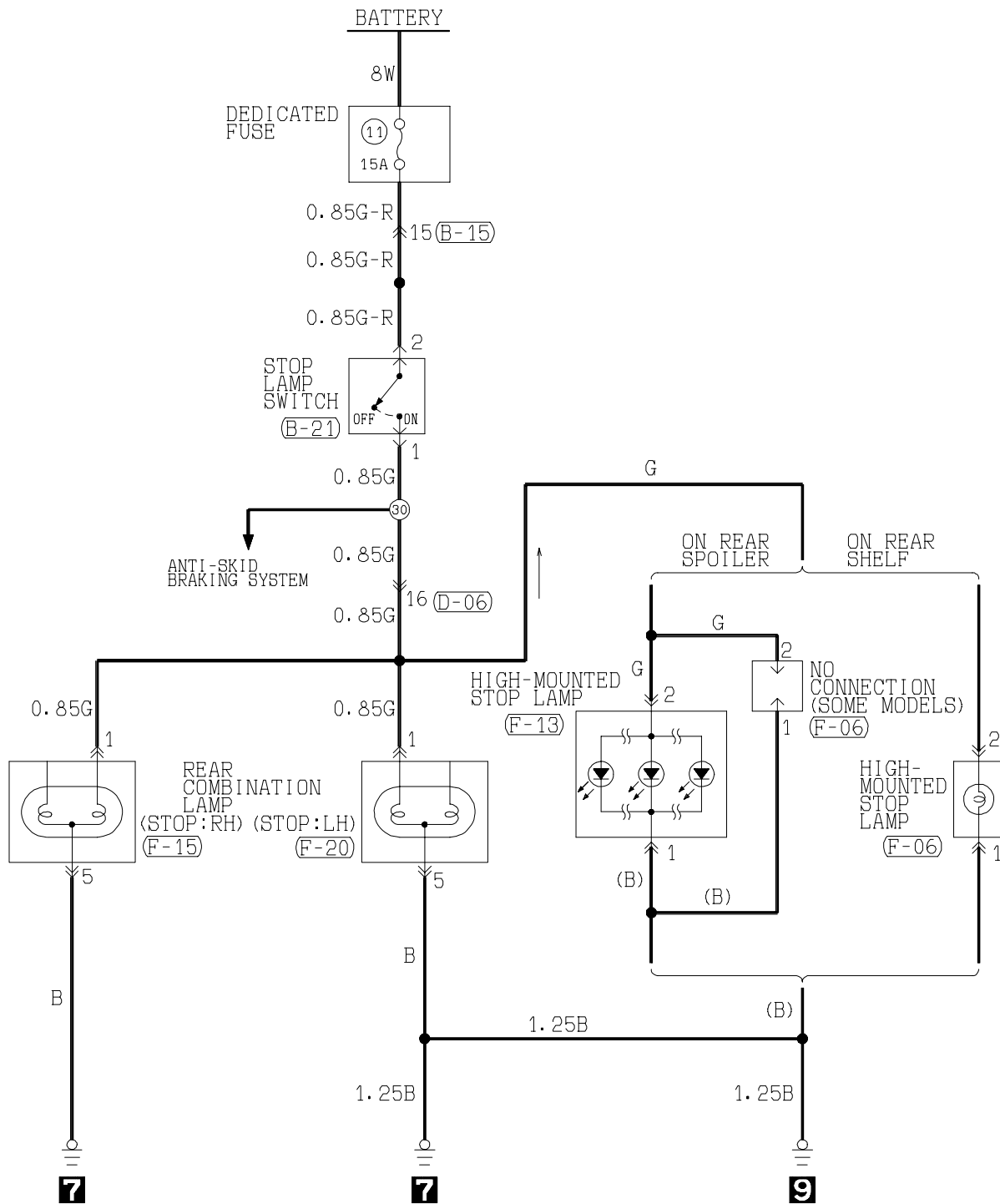
TURN-SIGNAL LAMP AND HAZARD WARNING LAMP (CONTINUED)



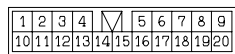
(B-09)	(B-50)	(B-75)	(B-80)	(B-86)	(D-06)
(F-15)	(F-20)	Wire colour code			
		B : Black	LG : Light green	G : Green	L : Blue
		BR : Brown	O : Orange	GR : Gray	R : Red
		W : White	SB : Sky blue	P : Pink	Y : Yellow
		V : Violet			

STOP LAMP

1



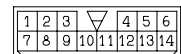
(B-15)



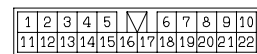
(B-21)



(B-50)



(D-06)



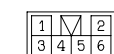
(F-06)



(F-13)



(F-15)



(F-20)

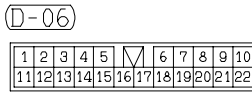
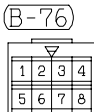
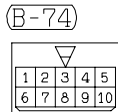
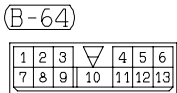
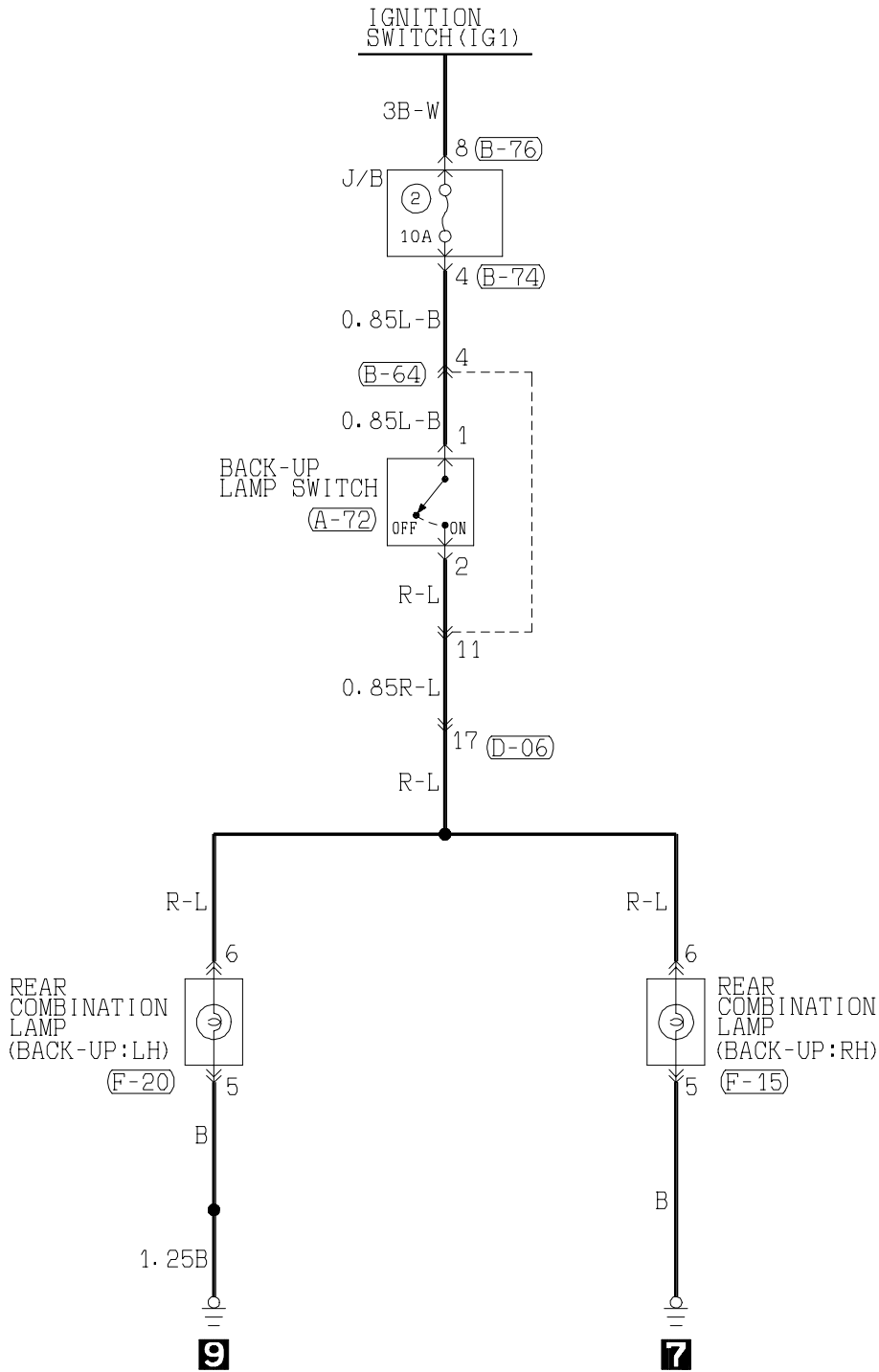


Wire colour code

B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue  
 BR:Brown O :Orange GR:Gray R :Red P :Pink V :Violet

BACK-UP LAMP

1

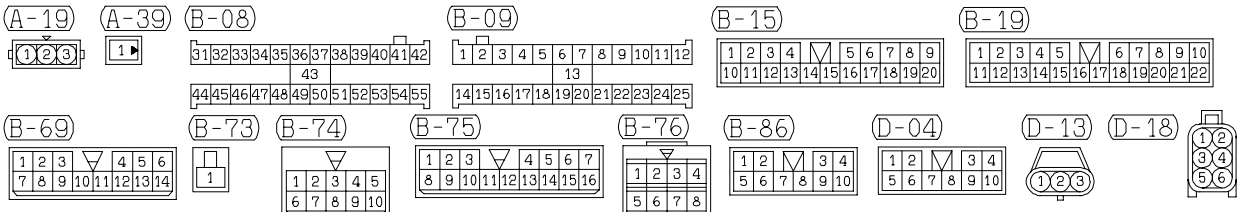
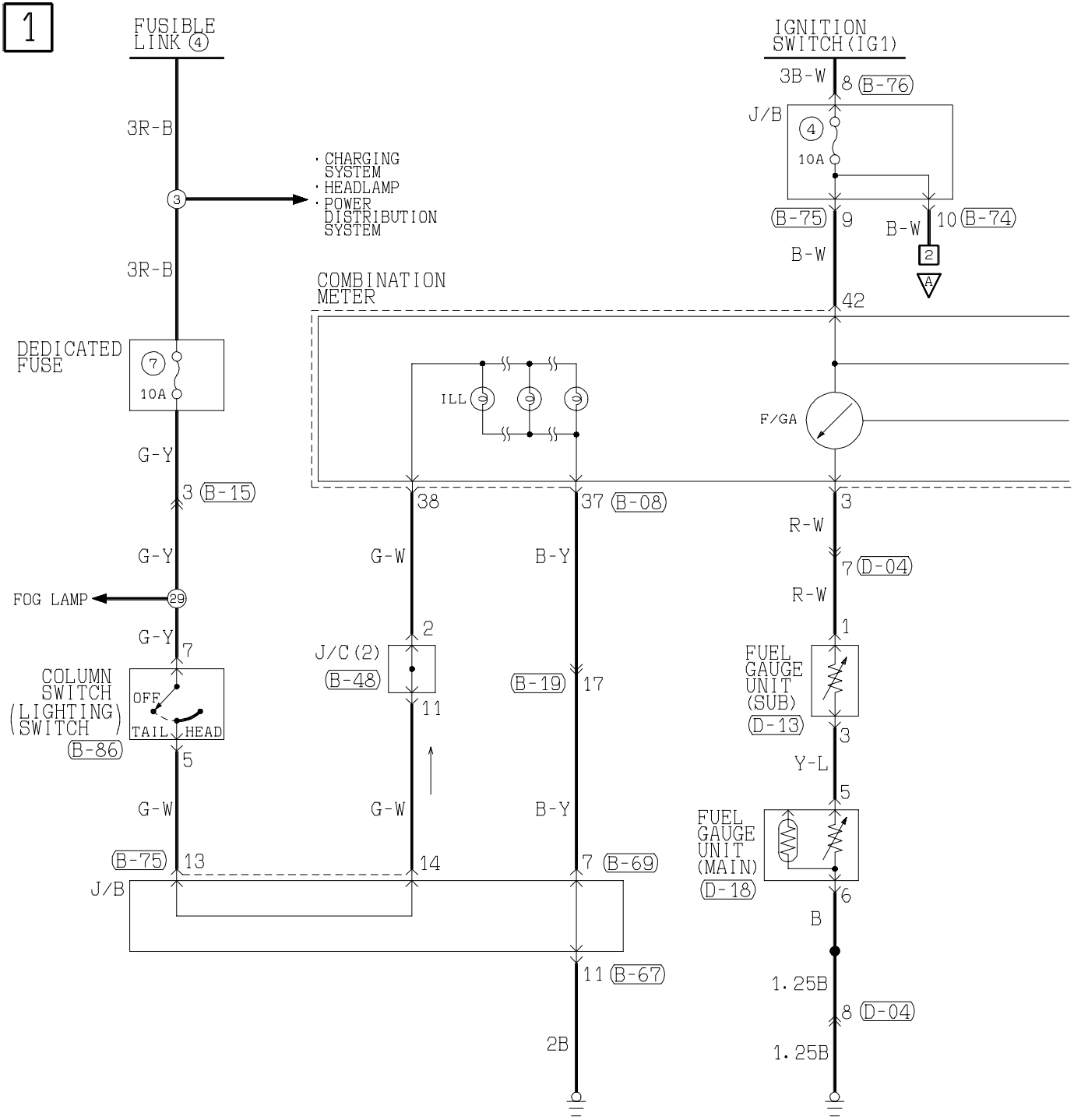


Wire colour code  
 B : Black    LG: Light green    G : Green    L : Blue    W : White    Y : Yellow    SB: Sky blue  
 BR: Brown    O : Orange    GR: Gray    R : Red    P : Pink    V : Violet



NOTES

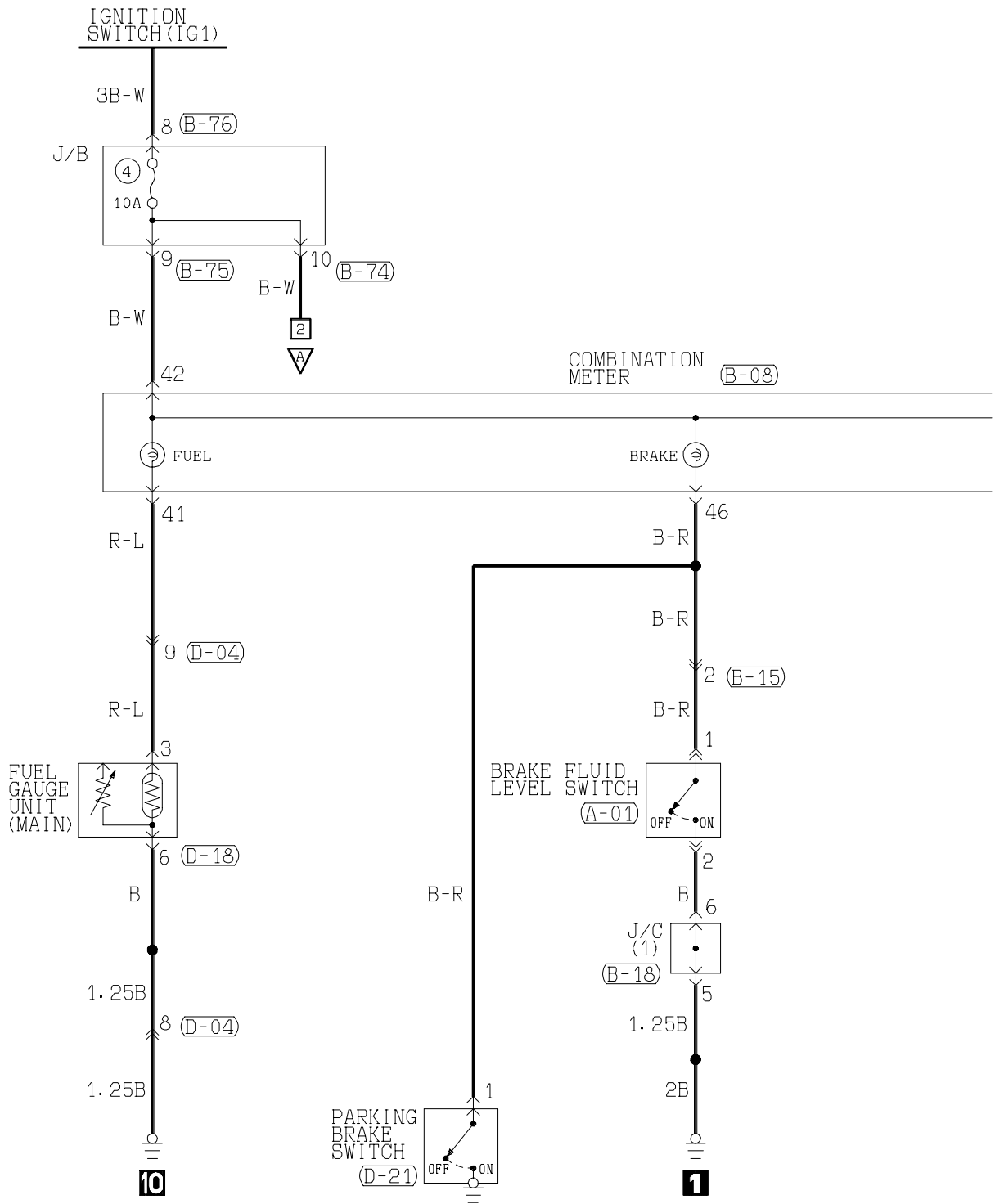
METER AND GAUGE





# FUEL WARNING LAMP AND BRAKE WARNING LAMP

1



(A-01)



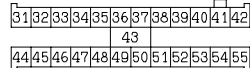
(A-52)



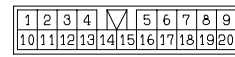
(A-88)



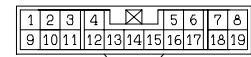
(B-08)



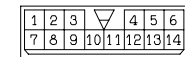
(A-88)



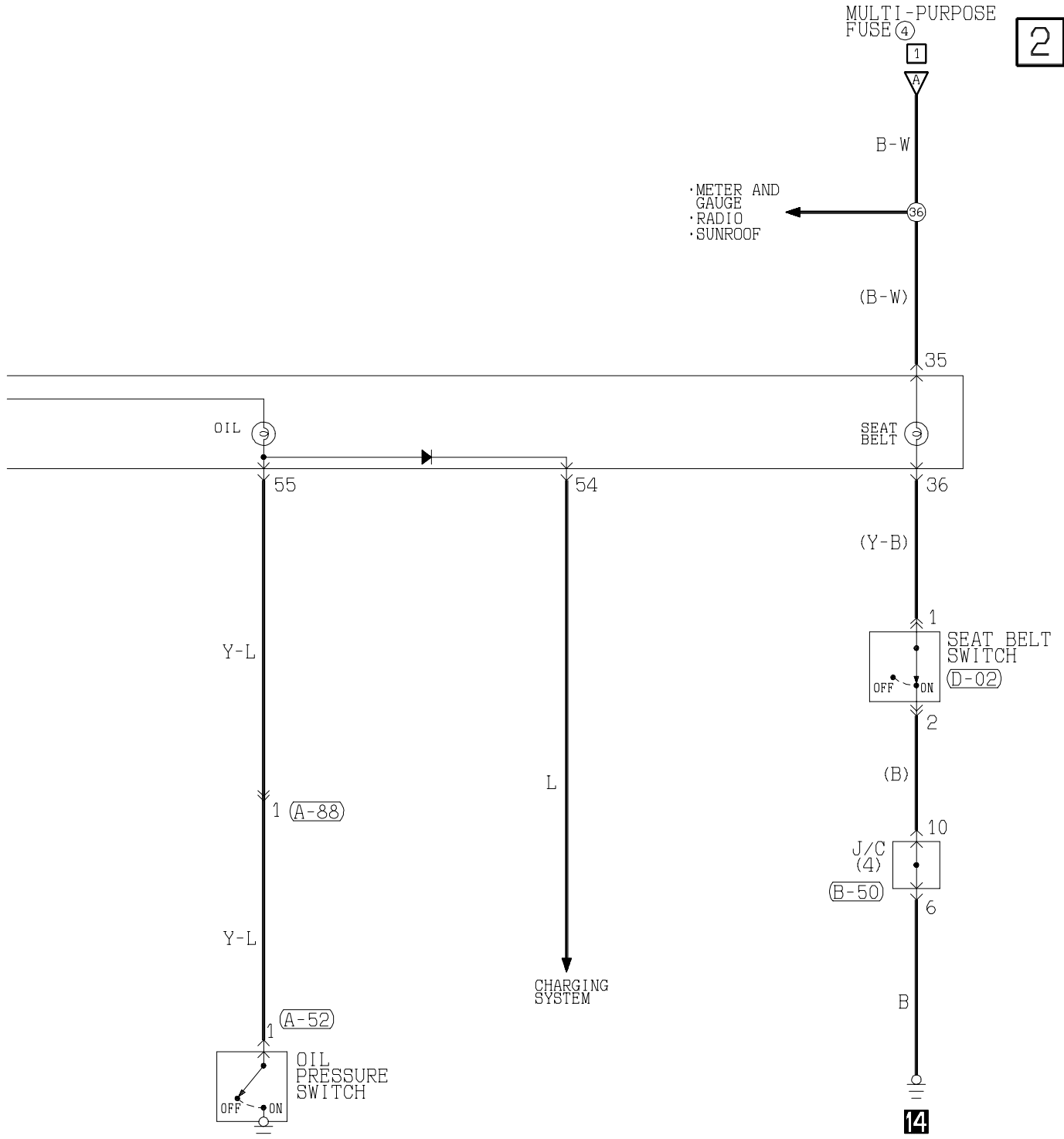
(B-08)



(B-15)

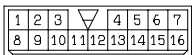


OIL PRESSURE WARNING LAMP AND SEAT BELT WARNING LAMP

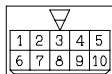


2

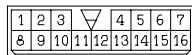
(B-65)



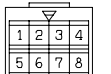
(B-74)



(B-75)



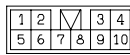
(B-76)



(D-02)



(D-04)



(D-18)



(D-21)



Wire colour code

B :Black LG:Light green  
BR:Brown O :Orange

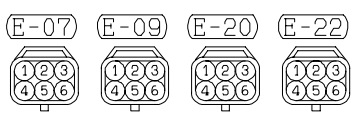
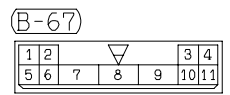
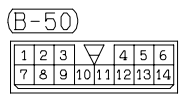
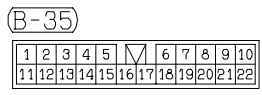
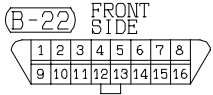
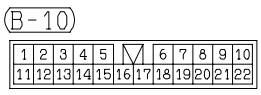
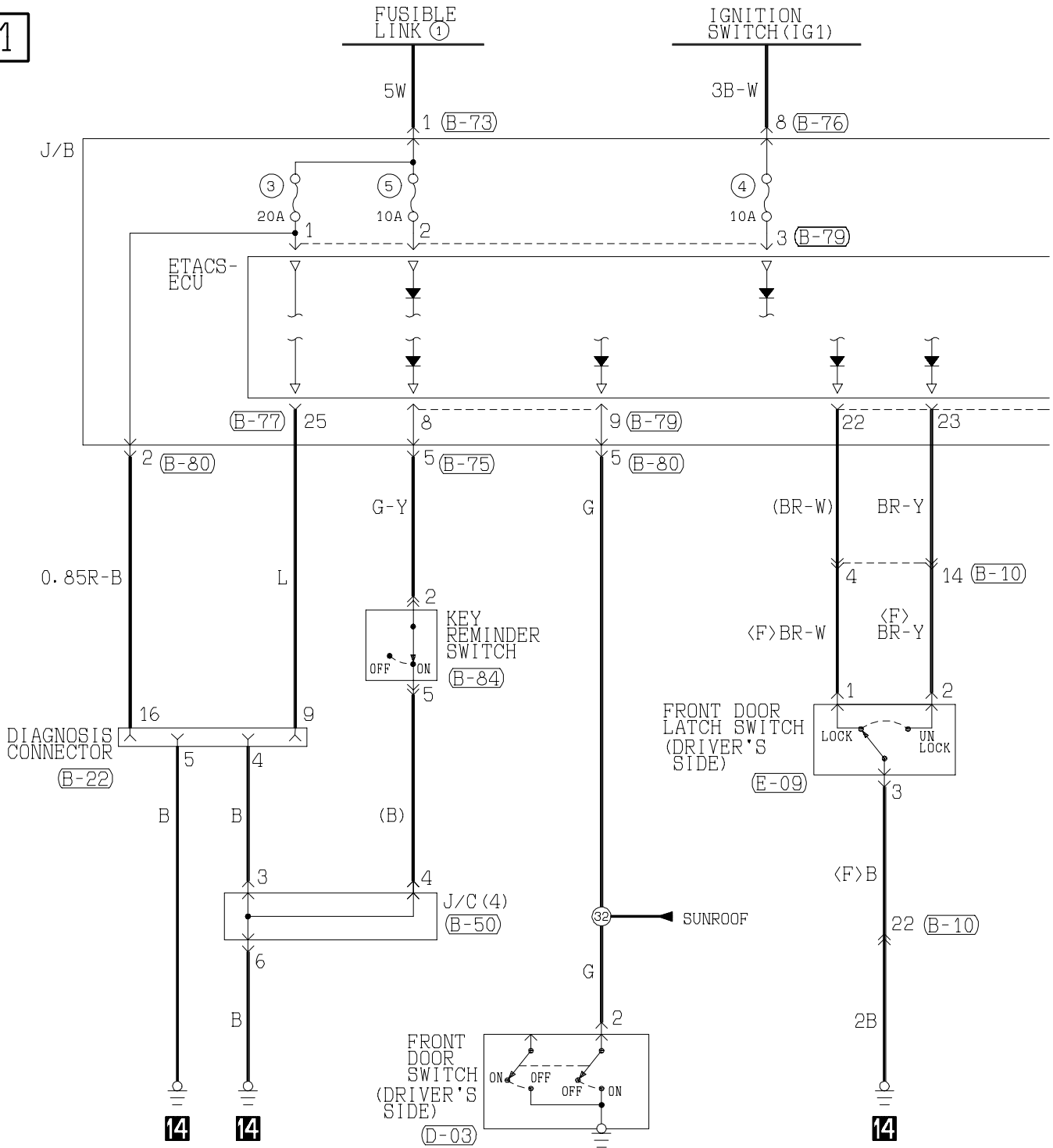
G :Green L :Blue  
GR:Gray R :Red

W :White Y :Yellow  
P :Pink V :Violet

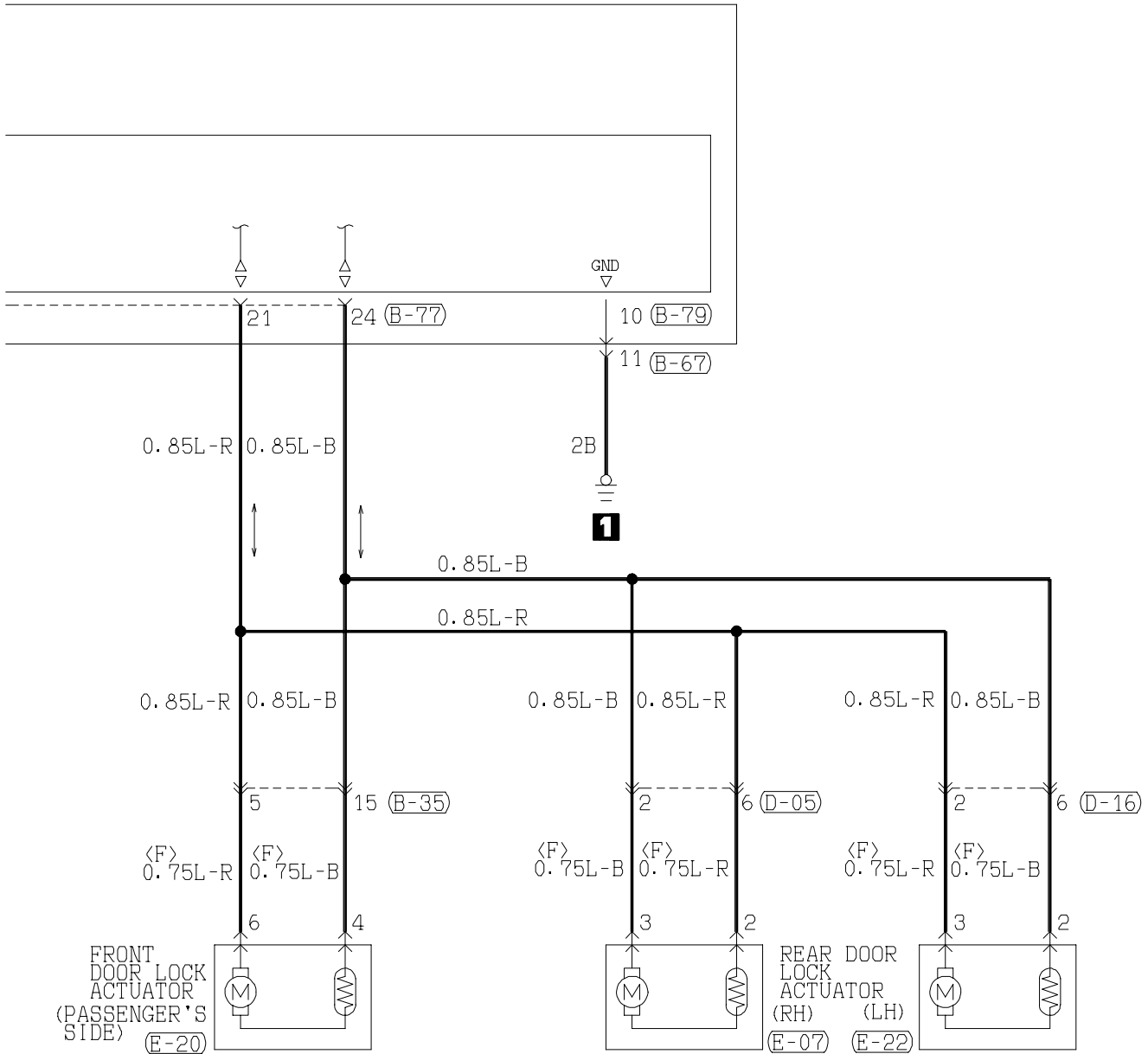
SB:Sky blue

# CENTRAL DOOR LOCKING SYSTEM <WITHOUT KEYLESS ENTRY SYSTEM>

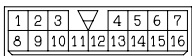
1



2



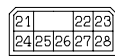
(B-75)



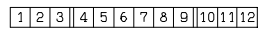
(B-76)



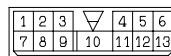
(B-77)



(B-79)



(B-80)



(B-84)



(D-03)



(D-05)



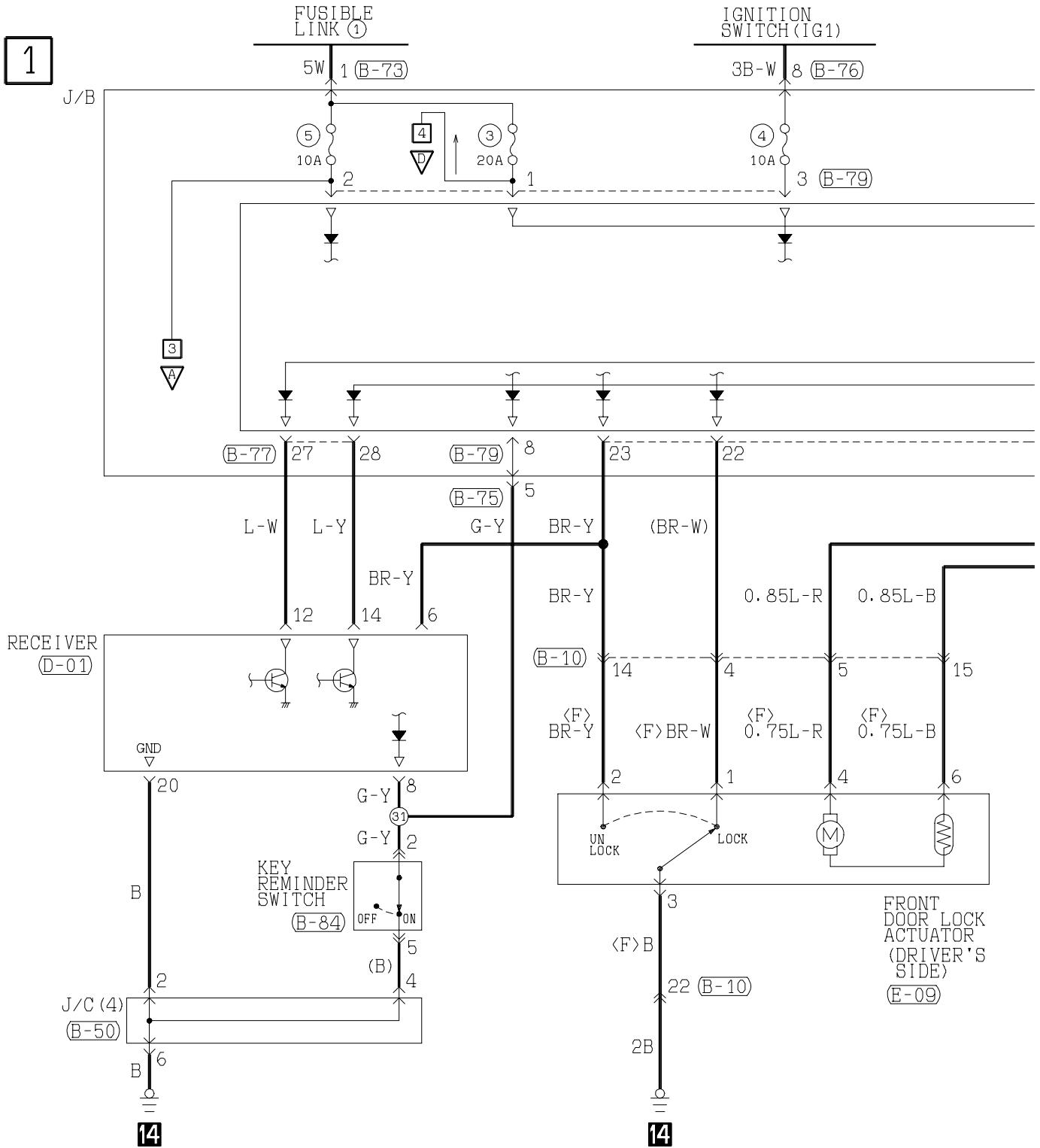
(D-16)



Wire colour code

B : Black    LG: Light green    G : Green    L : Blue    W : White    Y : Yellow    SB: Sky blue  
 BR: Brown    O : Orange    GR: Gray    R : Red    P : Pink    V : Violet

**CENTRAL DOOR LOCKING SYSTEM**  
**<WITH KEYLESS ENTRY SYSTEM>**



(B-10)

1	2	3	4	5	6	7	8	9	10		
11	12	13	14	15	16	17	18	19	20	21	22

(B-35)

1	2	3	4	5	6	7	8	9	10		
11	12	13	14	15	16	17	18	19	20	21	22

(B-50)

1	2	3	4	5	6		
7	8	9	10	11	12	13	14

(B-67)

1	2	3	4			
5	6	7	8	9	10	11

(B-73)

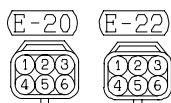
1
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(B-75)

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

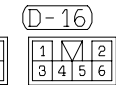
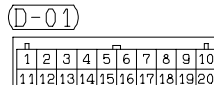
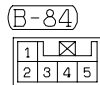
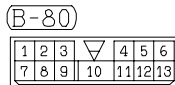
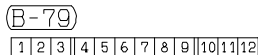
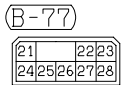
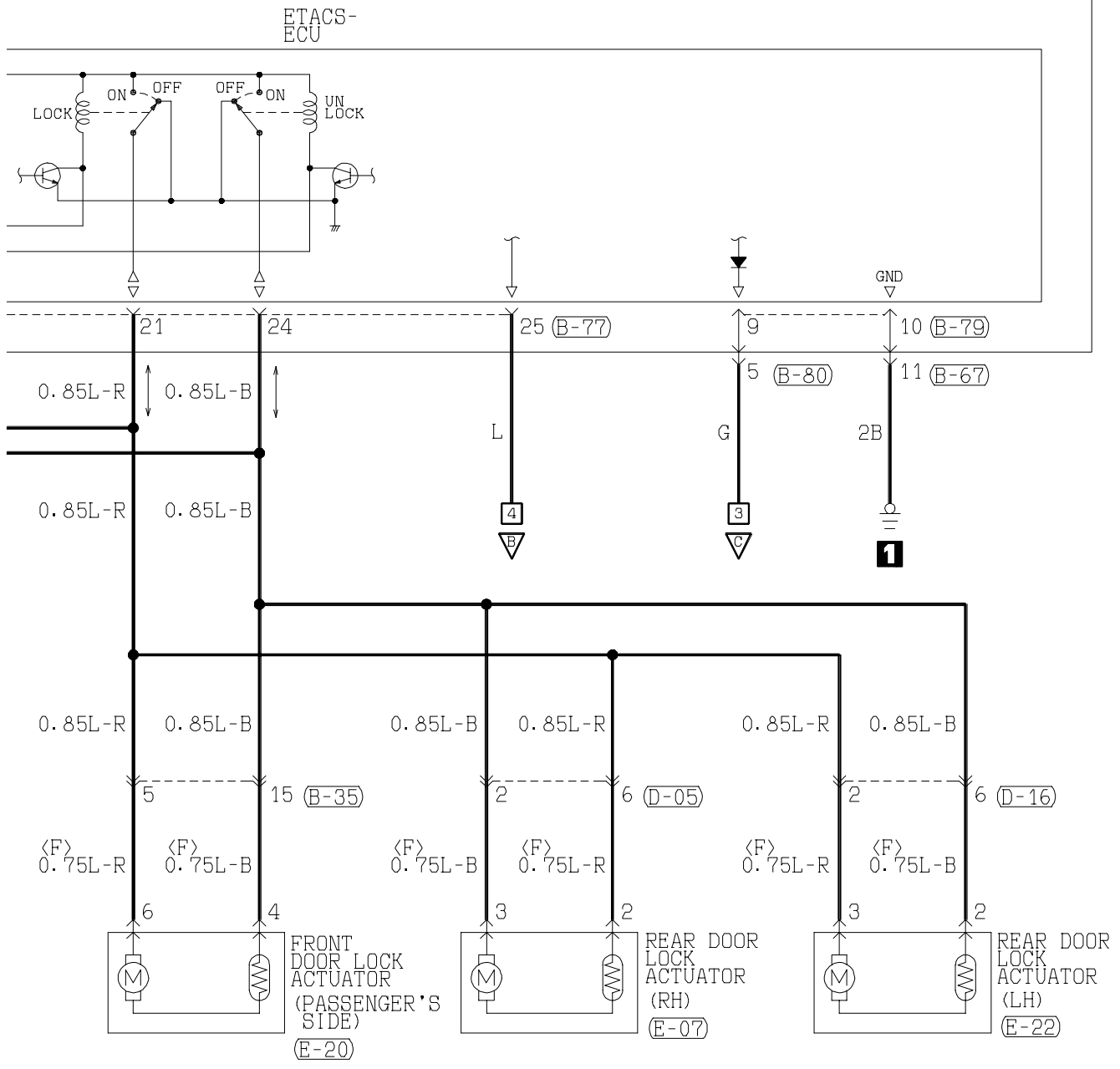
(B-76)

1	2	3	4
5	6	7	8





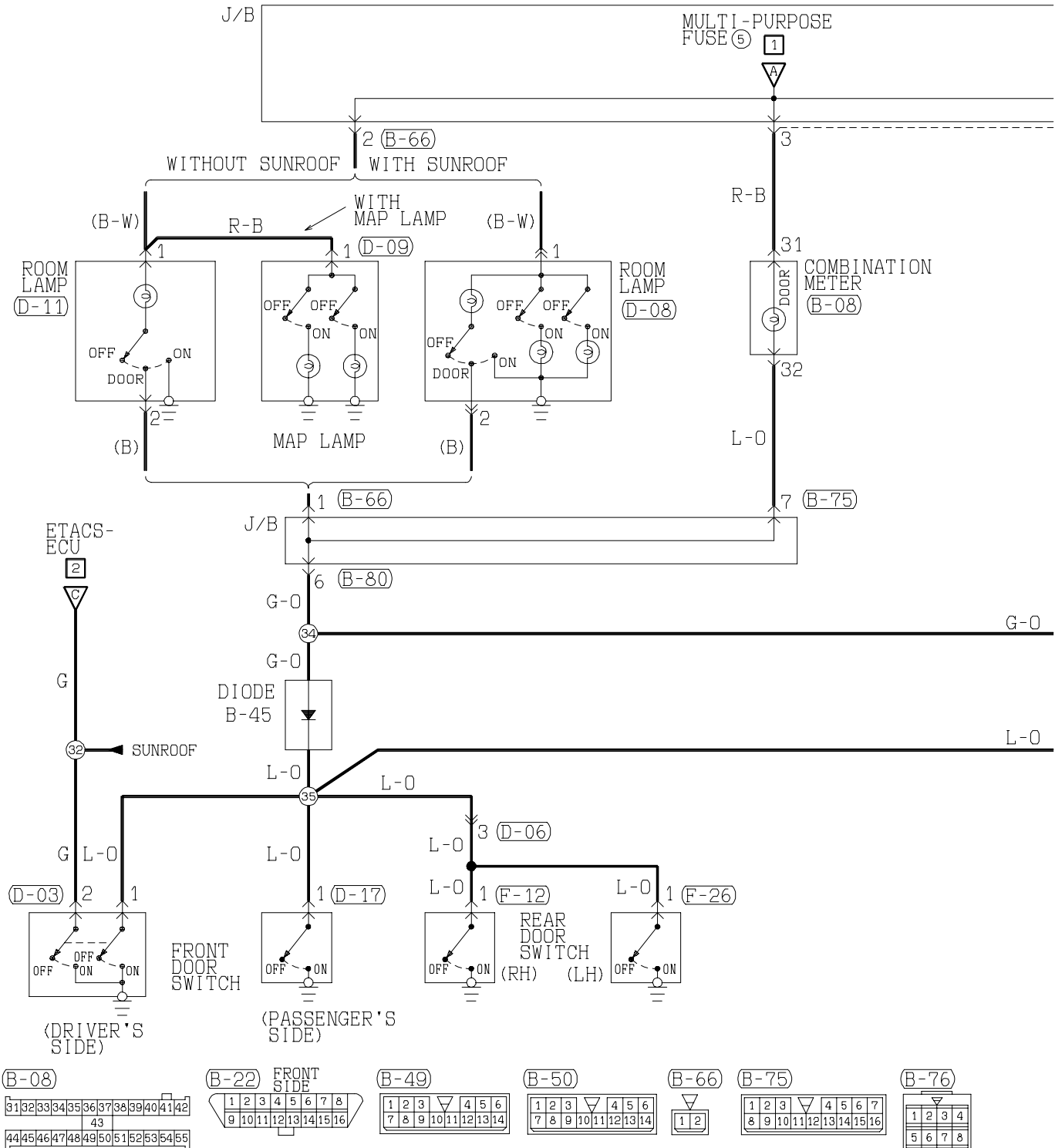
2

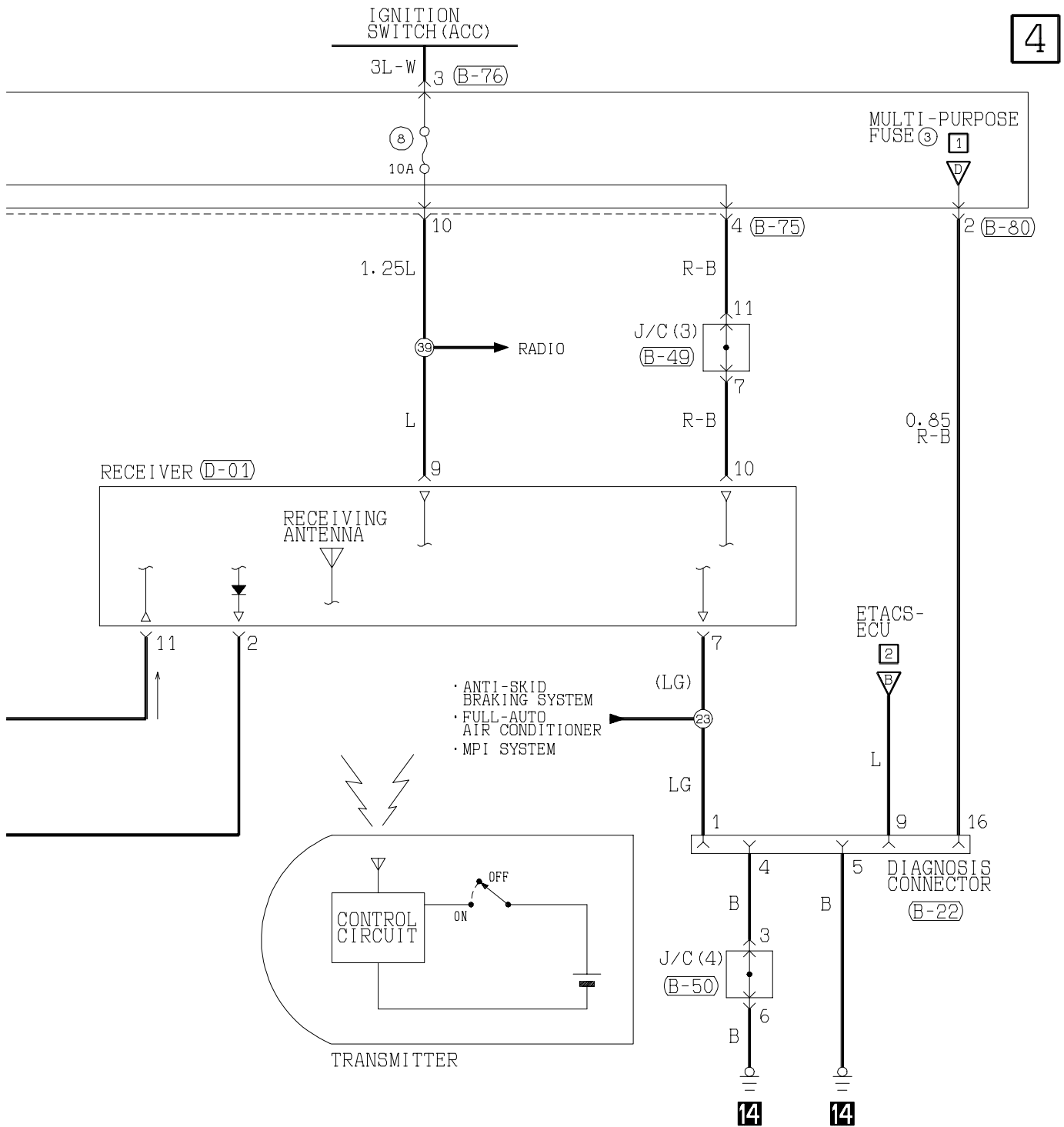


Wire colour code  
 B : Black    LG: Light green    G : Green    L : Blue    W : White    Y : Yellow    SB: Sky blue  
 BR: Brown    O : Orange    GR: Gray    R : Red    P : Pink    V : Violet

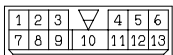
CENTRAL DOOR LOCKING SYSTEM <WITH KEYLESS ENTRY SYSTEM>  
(CONTINUED)

3

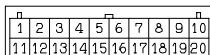




(B-80)



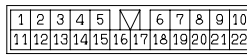
(D-01)



(D-03)



(D-06)



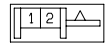
(D-08)



(D-09)



(D-11)



(D-17)



(F-12)

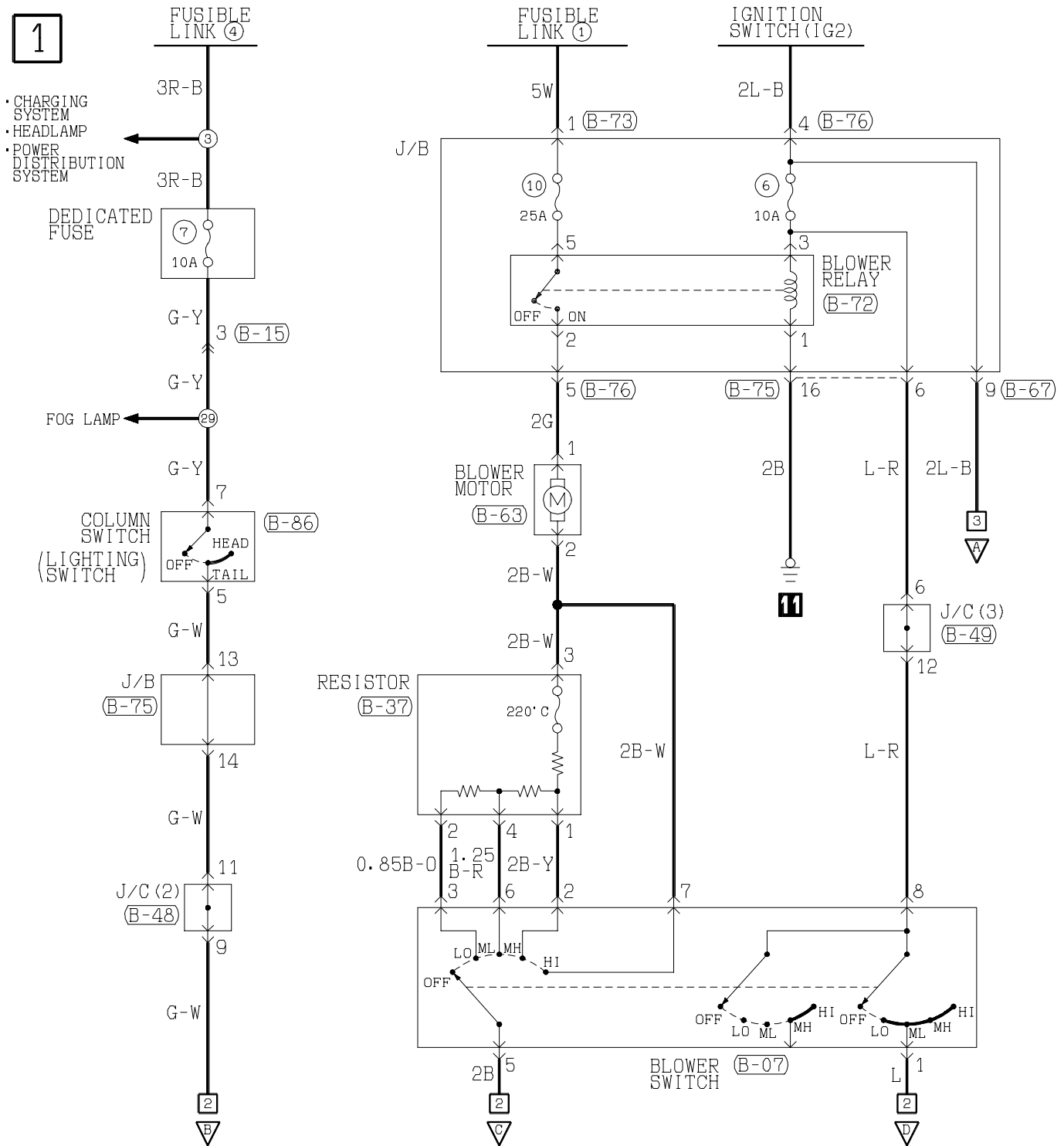


(F-26)



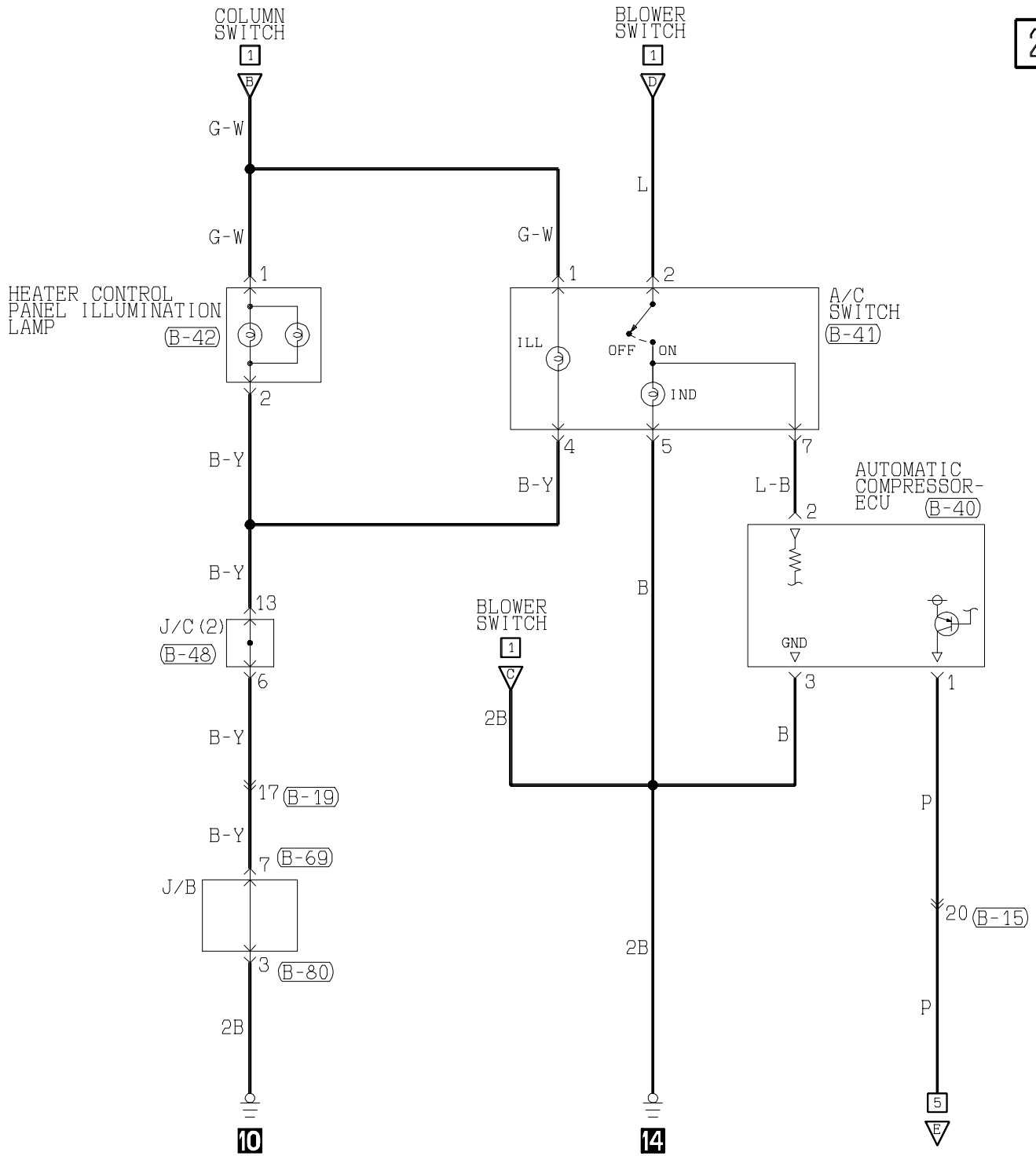
Wire colour code  
 B:Black LG:Light green G:Green L:Blue W:White Y:Yellow SB:Sky blue  
 BR:Brown O:Orange GR:Gray R:Red P:Pink V:Violet

HEATER AND AIR CONDITIONER

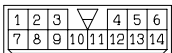


(B-07)	(B-15)	(B-19)	(B-37)	(B-40)	(B-41)	(B-42)	(B-48)
1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	1 2 3 4	1 2 3	1 2 3 4 5 6 7 8	1 2	1 2 3 4 5 6 7 8 9 10 11 12 13 14
(B-80)	(B-86)						
1 2 3 4 5 6 7 8 9 10 11 12 13	1 2 3 4 5 6 7 8 9 10						

2



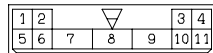
(B-49)



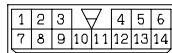
(B-63)



(B-67)



(B-69)



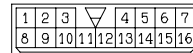
(B-72)



(B-73)



(B-75)



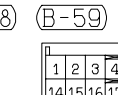
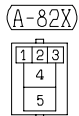
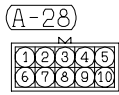
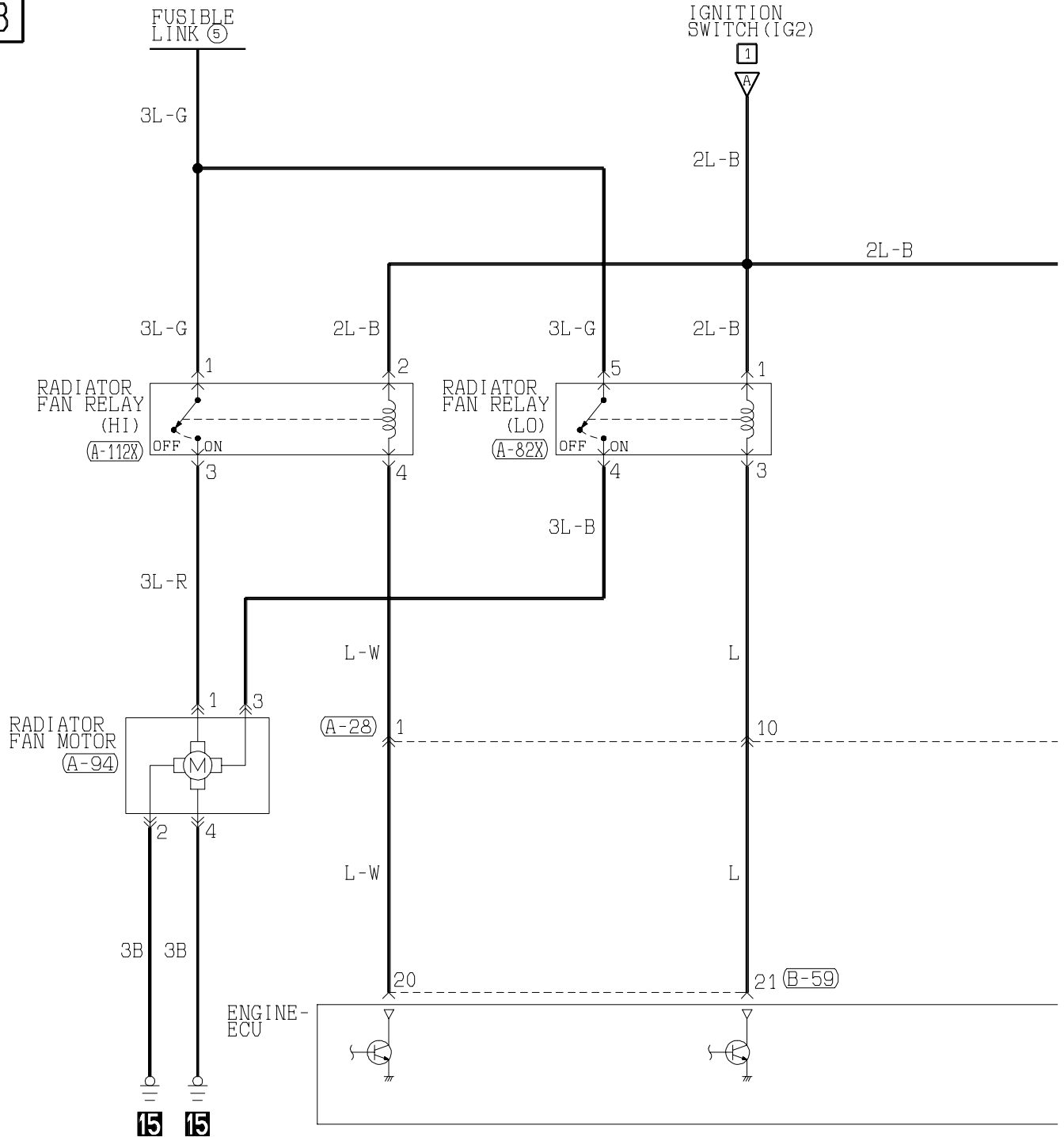
(B-76)



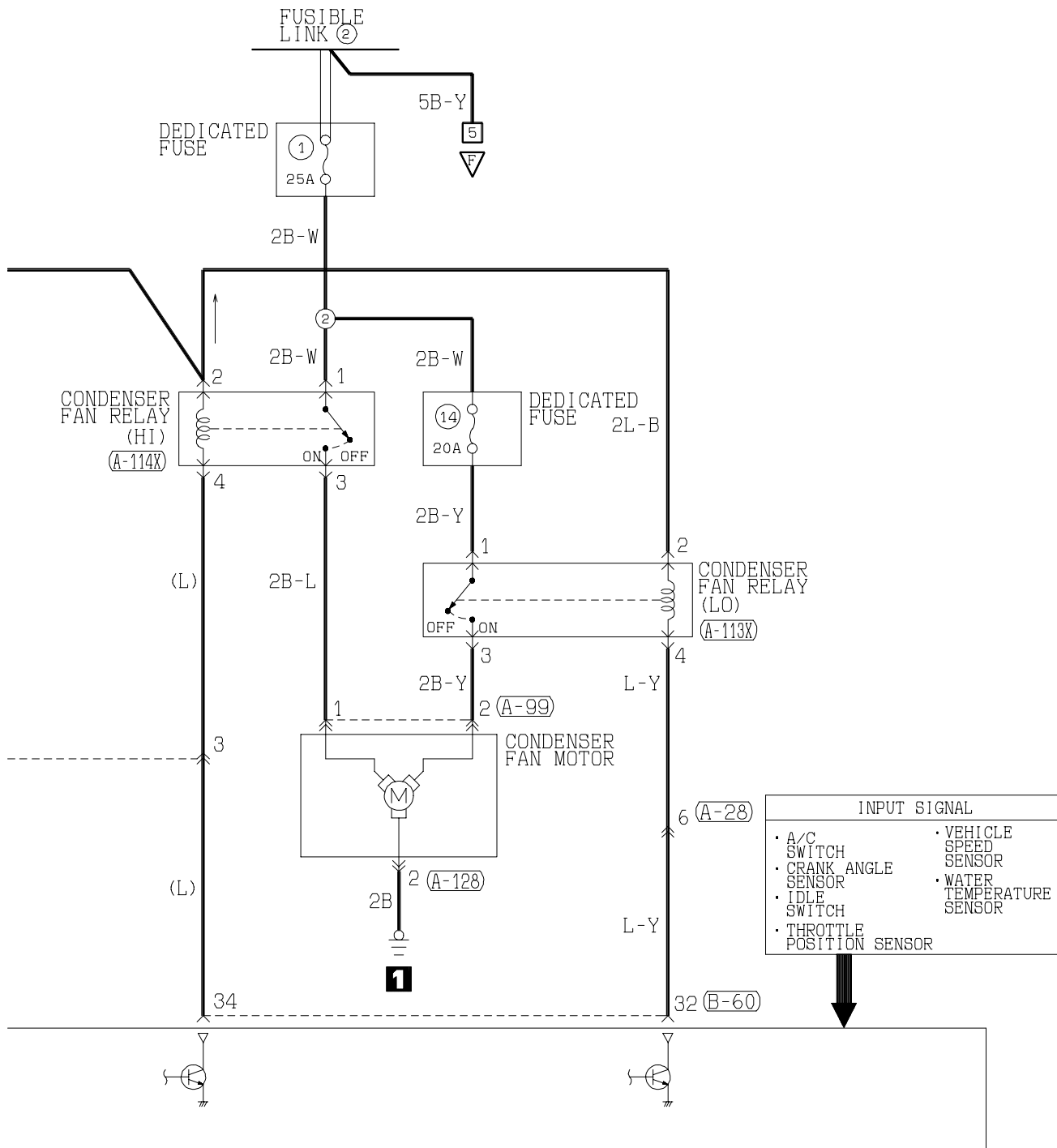
Wire colour code  
 B :Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet

HEATER AND AIR CONDITIONER (CONTINUED)

3



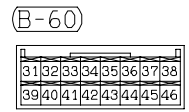
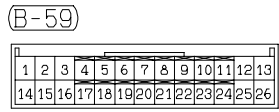
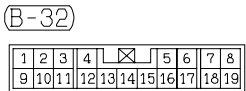
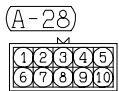
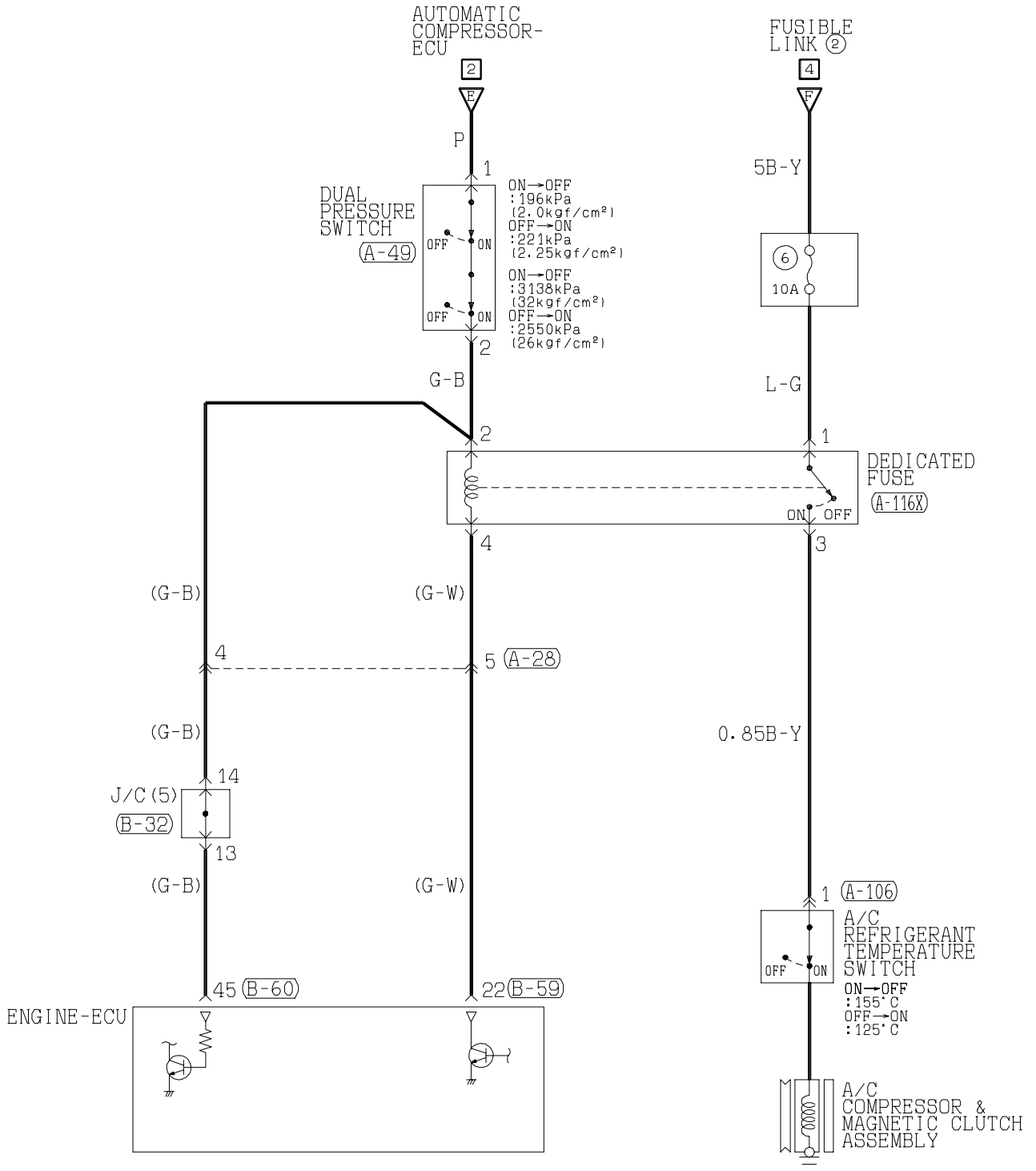
4



Wire colour code  
 B :Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet

HEATER AND AIR CONDITIONER (CONTINUED)

5



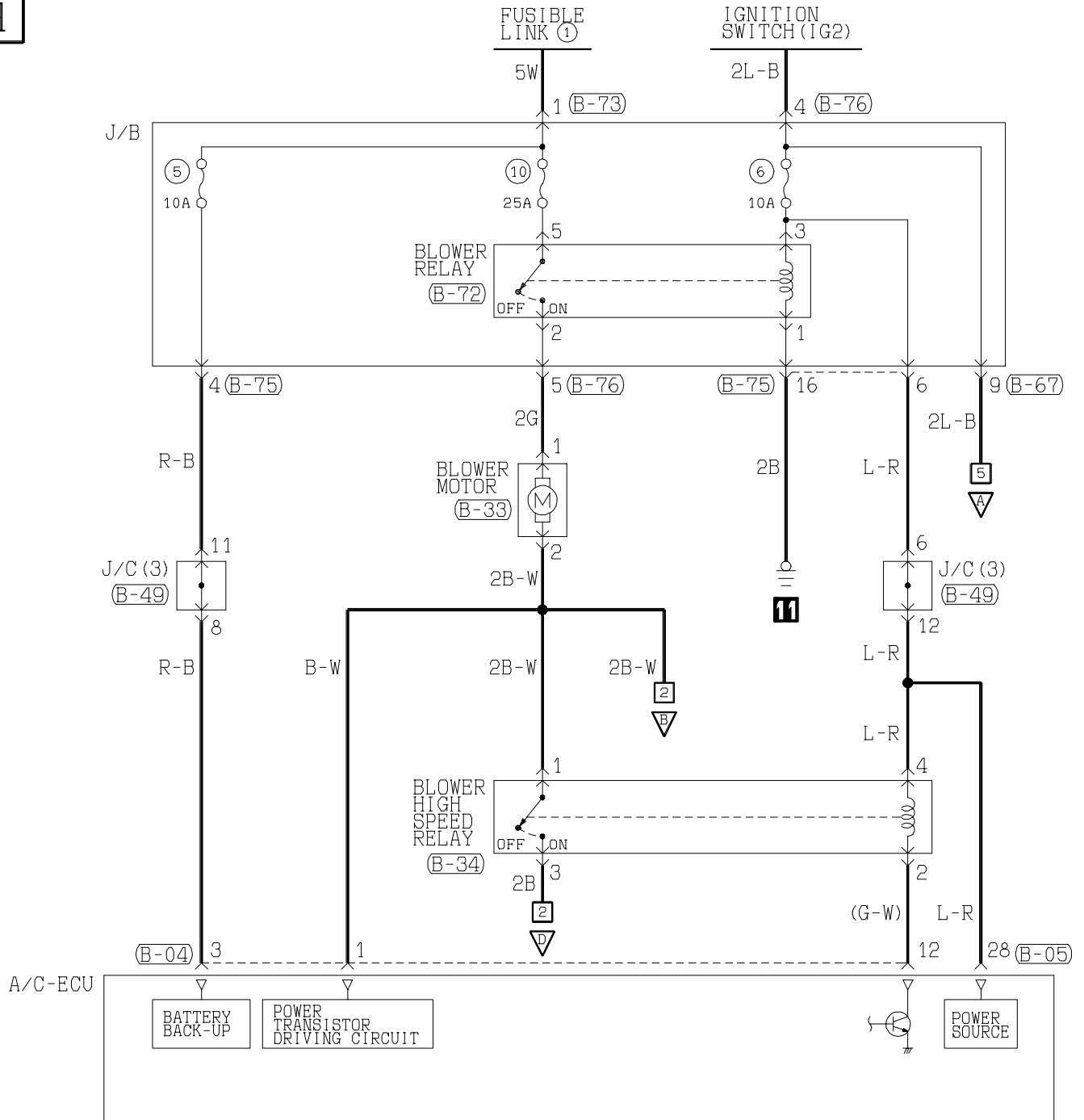
Wire colour code  
 B:Black LG:Light green G:Green L:Blue W:White Y:Yellow SB:Sky blue  
 BR:Brown O:Orange GR:Gray R:Red P:Pink V:Violet



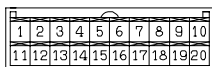
NOTES

FULL-AUTO AIR CONDITIONER

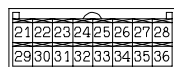
1



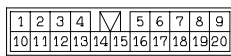
(B-04)



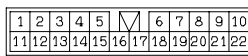
(B-05)



(B-15)



(B-19)



(B-33)



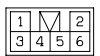
(B-34)



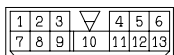
(B-37)



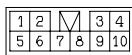
(B-39)

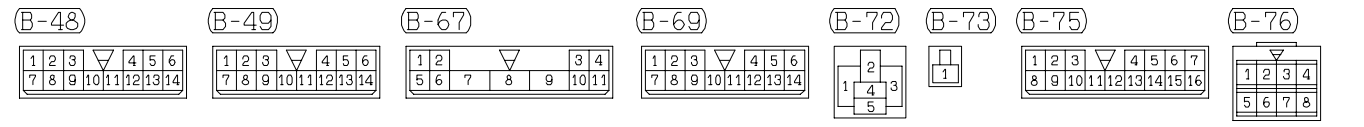
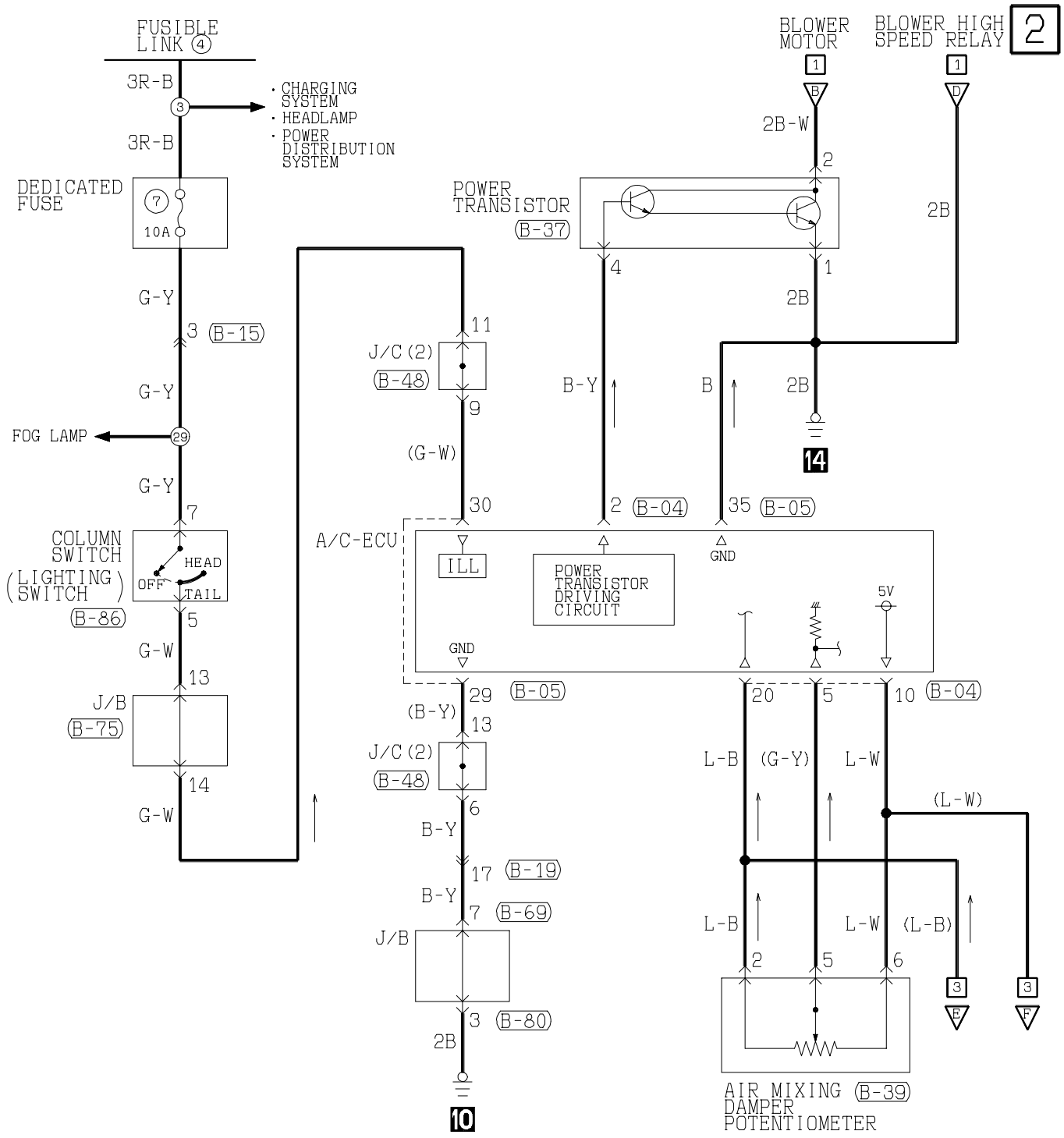


(B-80)



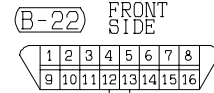
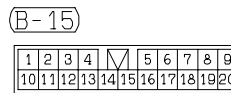
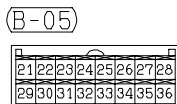
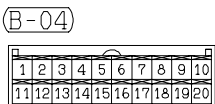
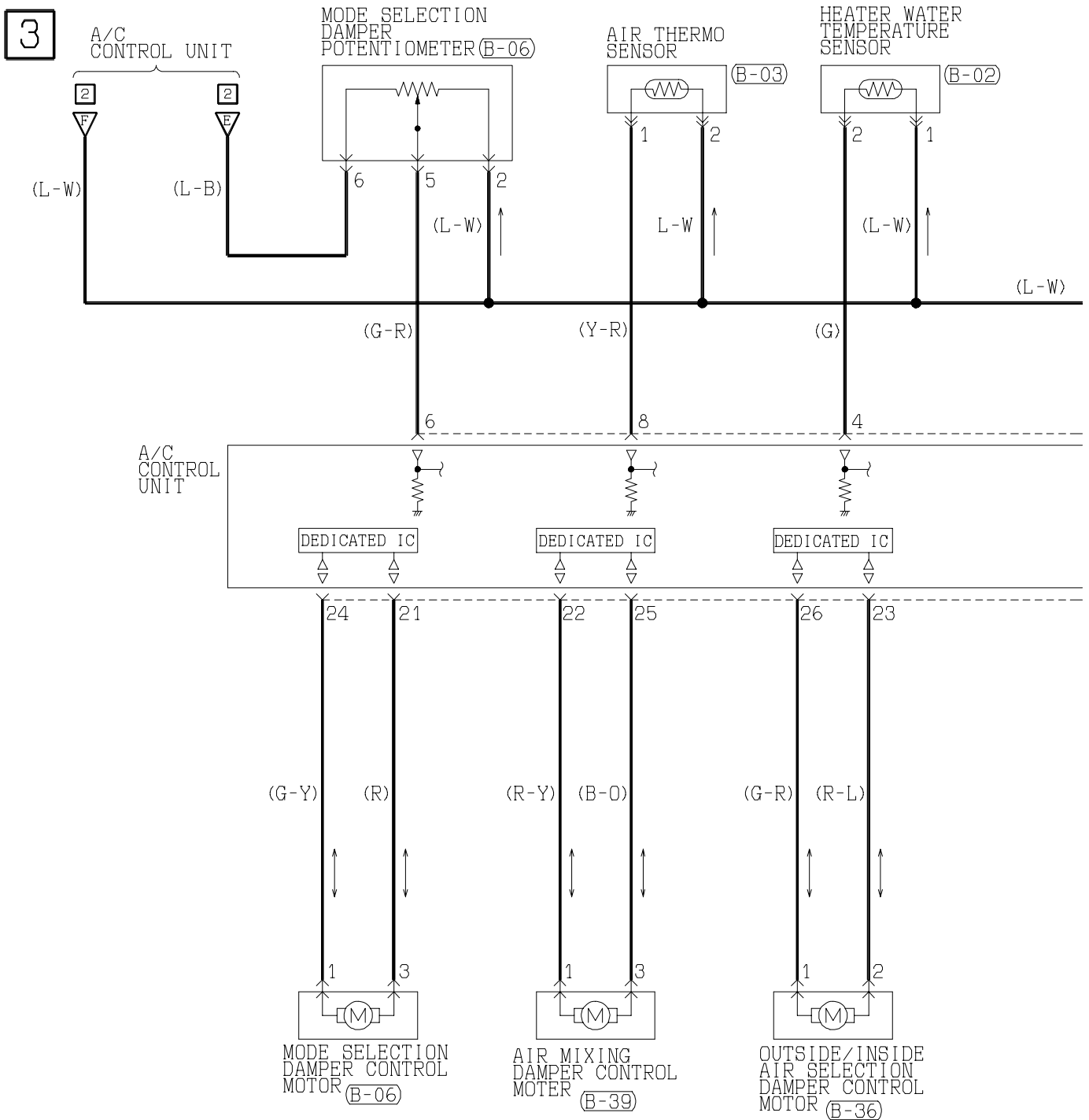
(B-86)



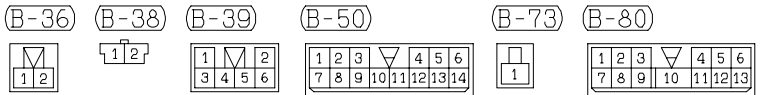
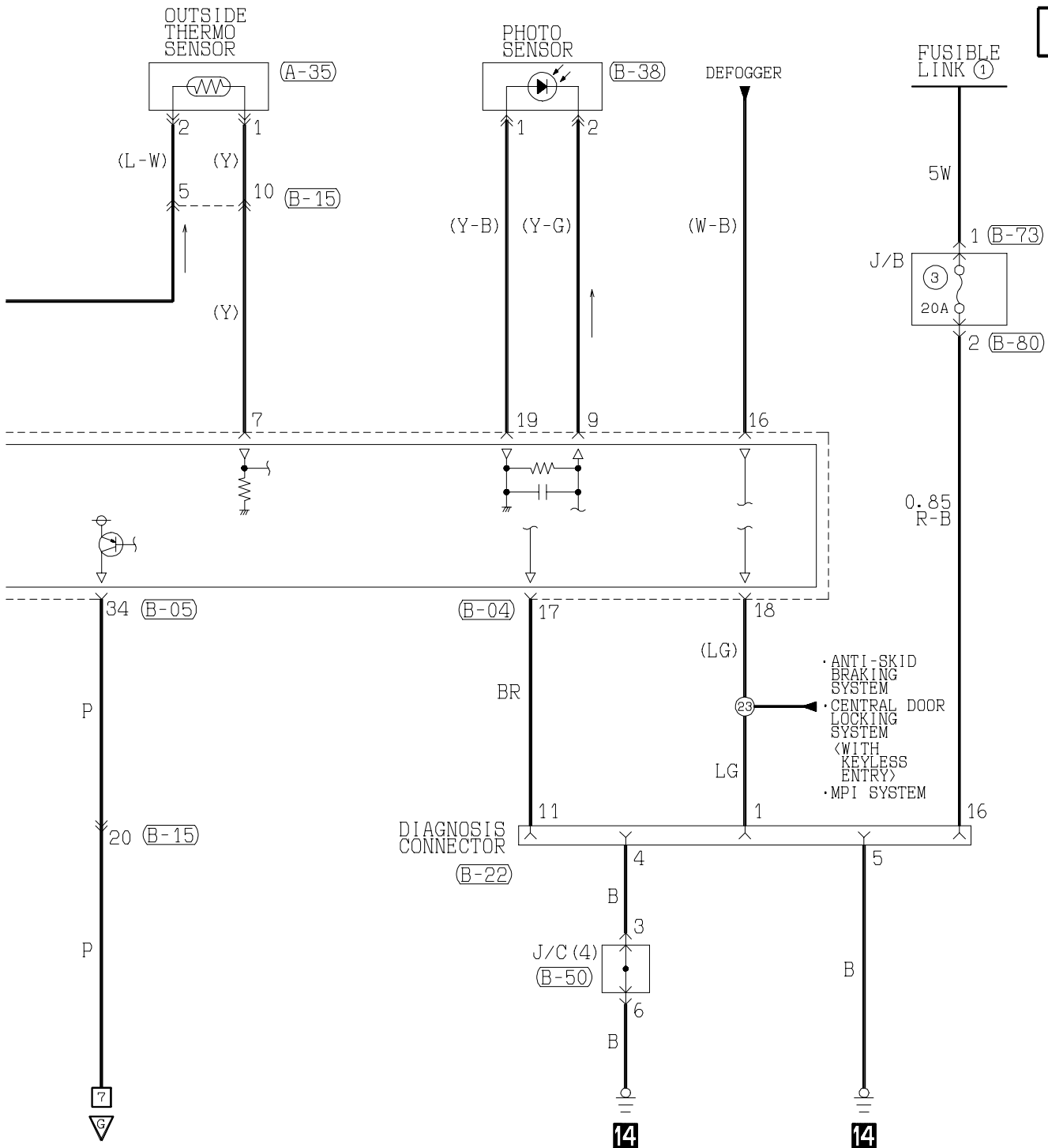


Wire colour code  
 B : Black    LG : Light green    G : Green    L : Blue    W : White    Y : Yellow    SB : Sky blue  
 BR : Brown    O : Orange    GR : Gray    R : Red    P : Pink    V : Violet

FULL-AUTO AIR CONDITIONER (CONTINUED)



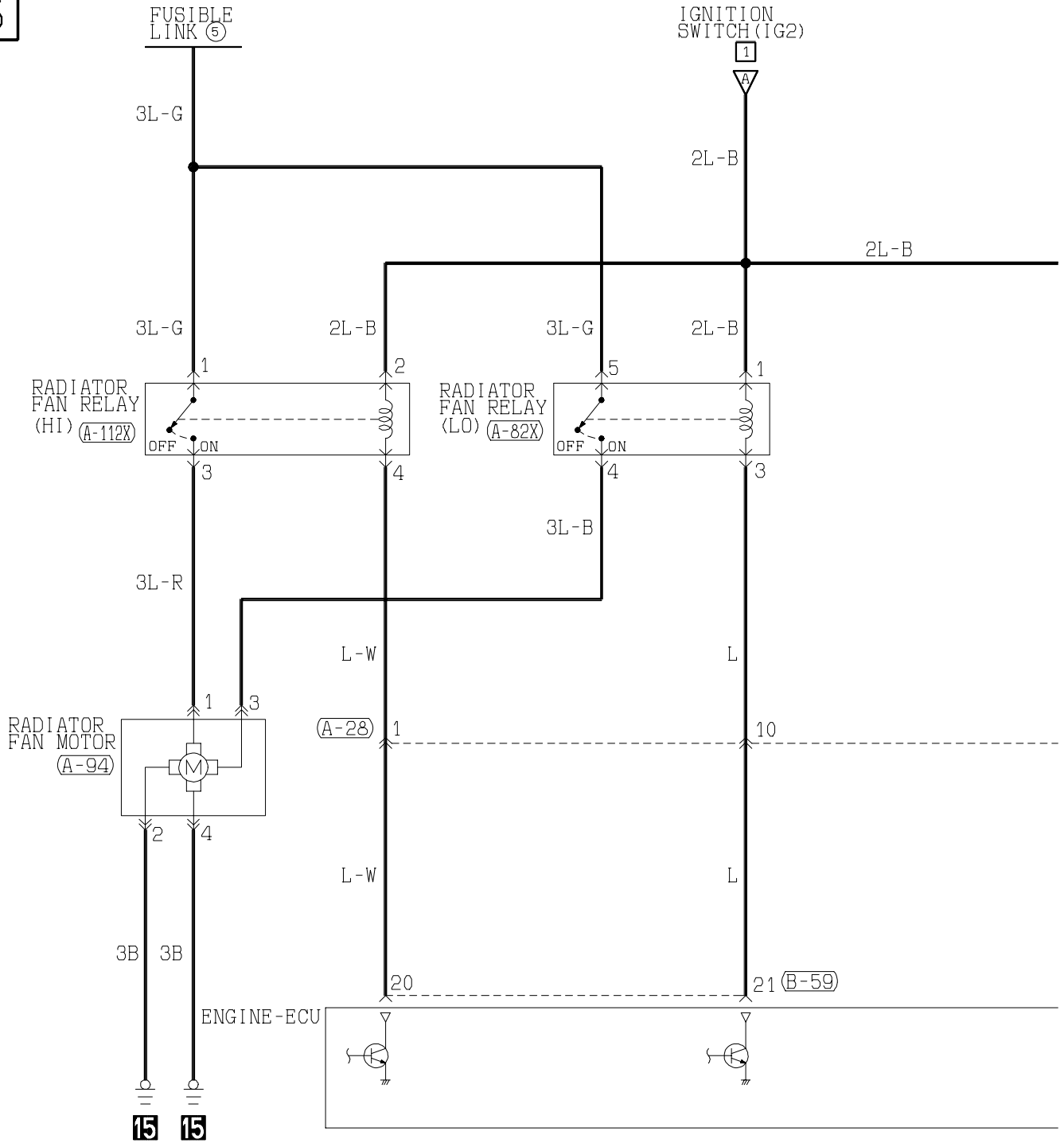
4



Wire colour code  
 B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue  
 BR:Brown O :Orange GR:Gray R :Red P :Pink V :Violet

FULL-AUTO AIR CONDITIONER (CONTINUED)

5



A-28

A-82X

A-94

A-99

A-112X

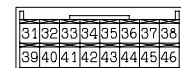
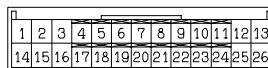
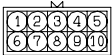
A-113X

A-114X

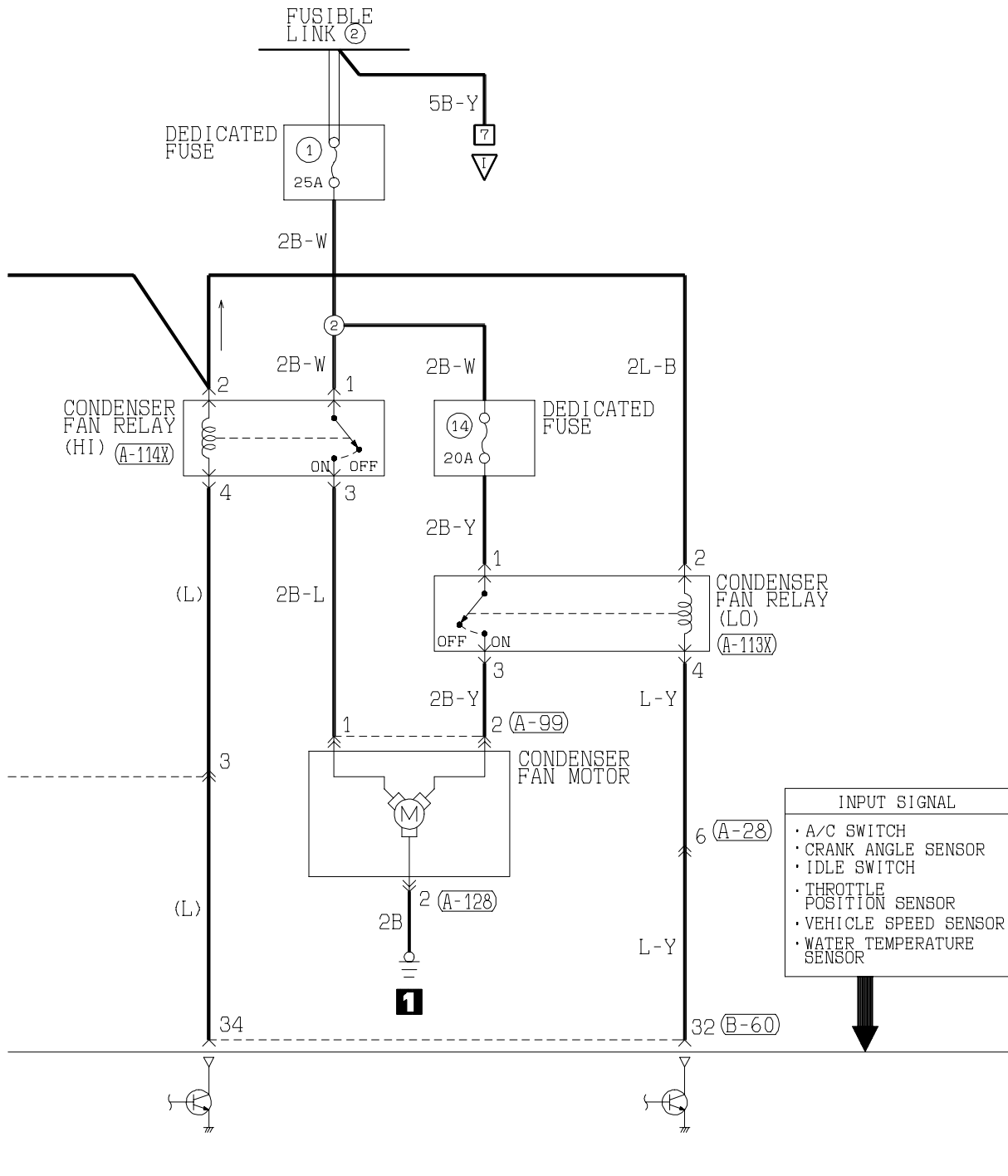
A-128

B-59

B-60



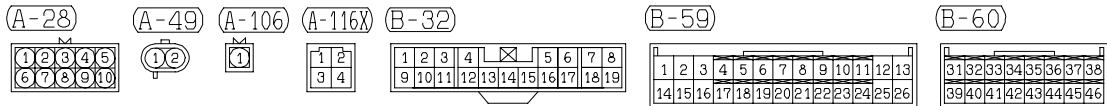
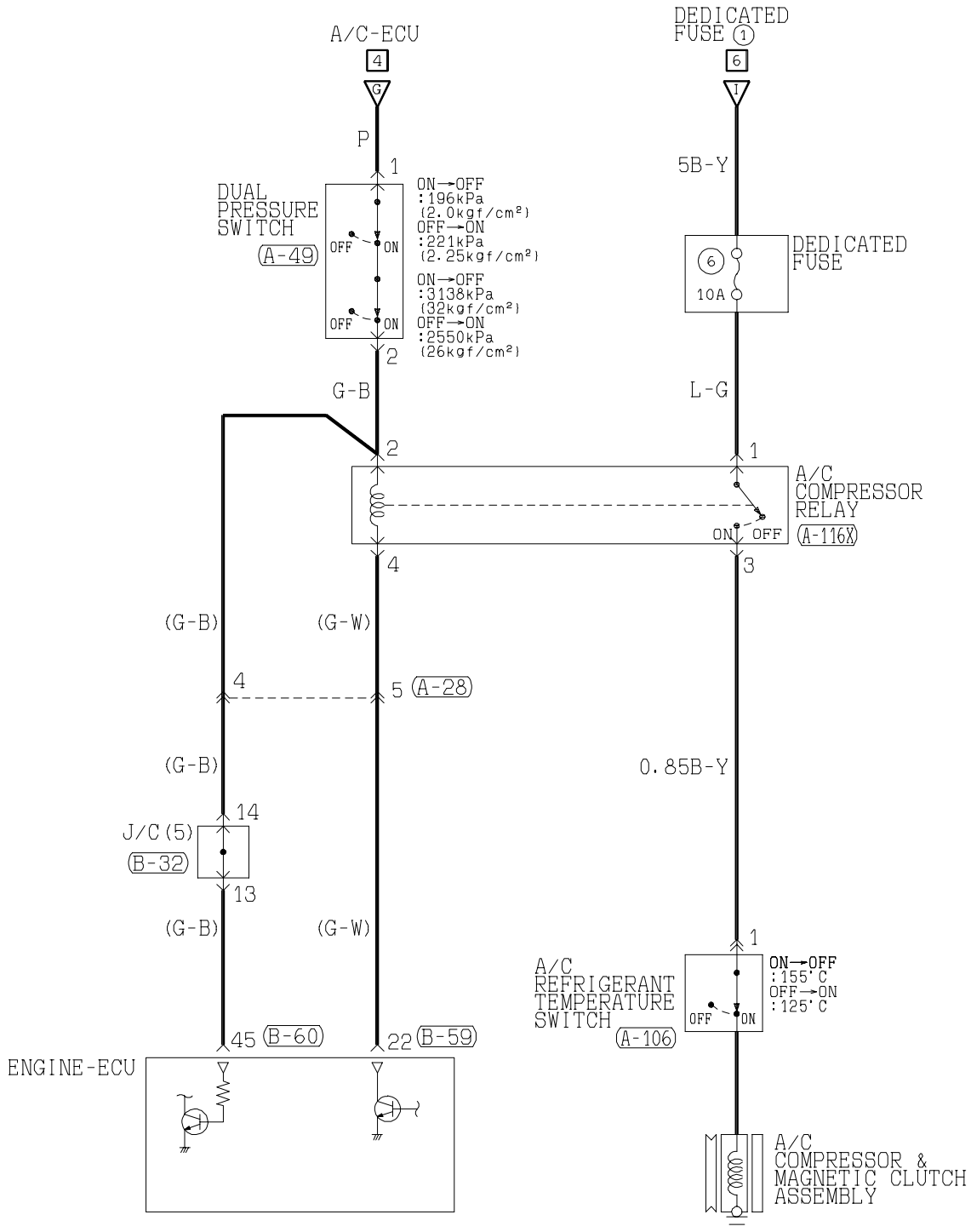
6



Wire colour code  
 B:Black LG:Light green G:Green L:Blue W:White Y:Yellow SB:Sky blue  
 BR:Brown O:Orange GR:Gray R:Red P:Pink V:Violet

FULL-AUTO AIR CONDITIONER (CONTINUED)

7



Wire colour code  
 B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue  
 BR:Brown O :Orange GR:Gray R :Red P :Pink V :Violet

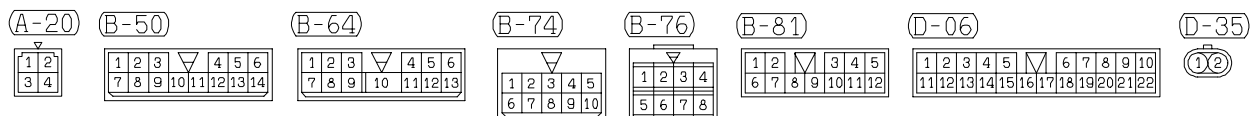
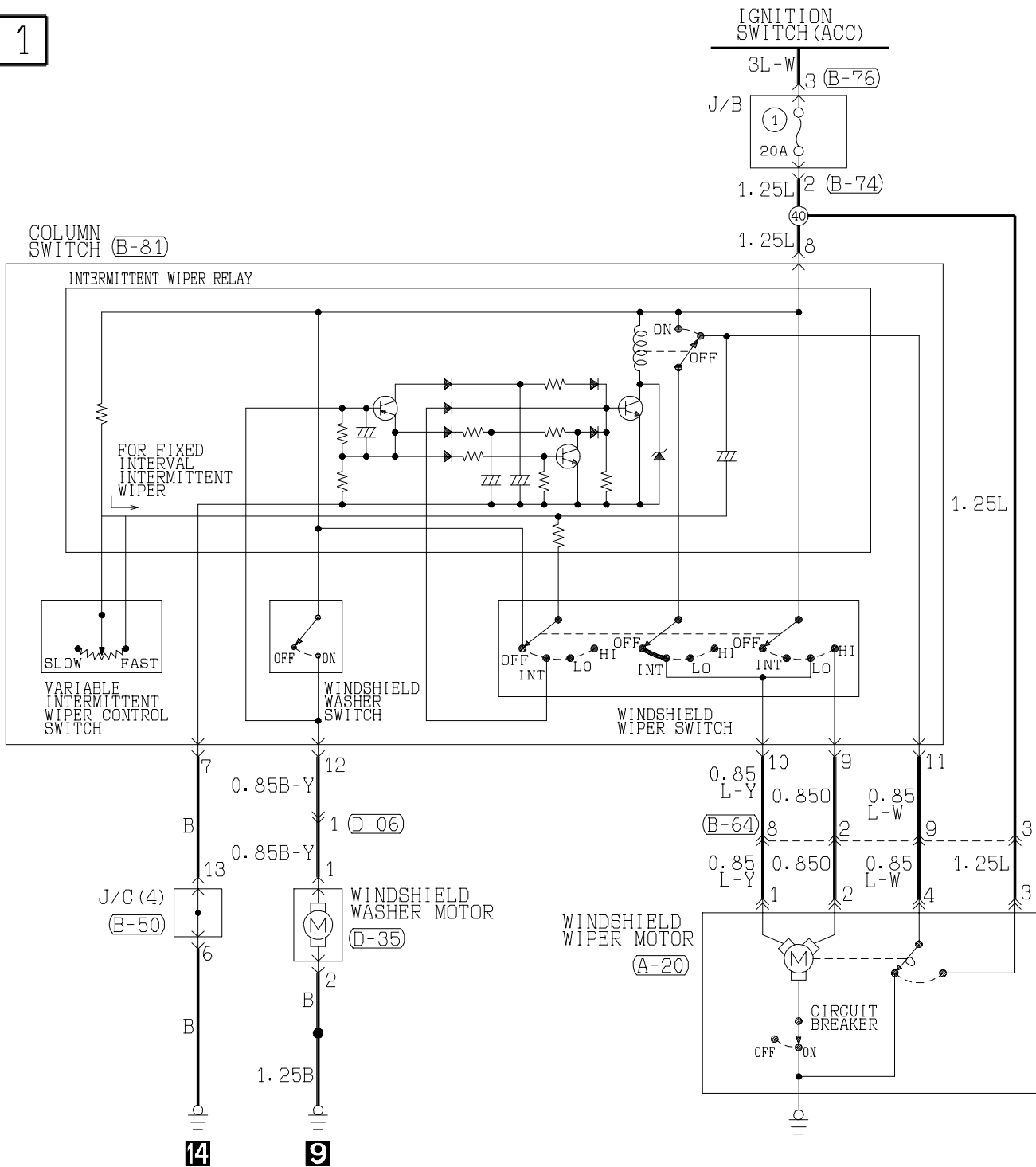


NOTES

# C-78 CIRCUIT DIAGRAM – Windshield Wiper and Washer <With Intermittent Wiper>

## WINDSHIELD WIPER AND WASHER <WITH INTERMITTENT WIPER>

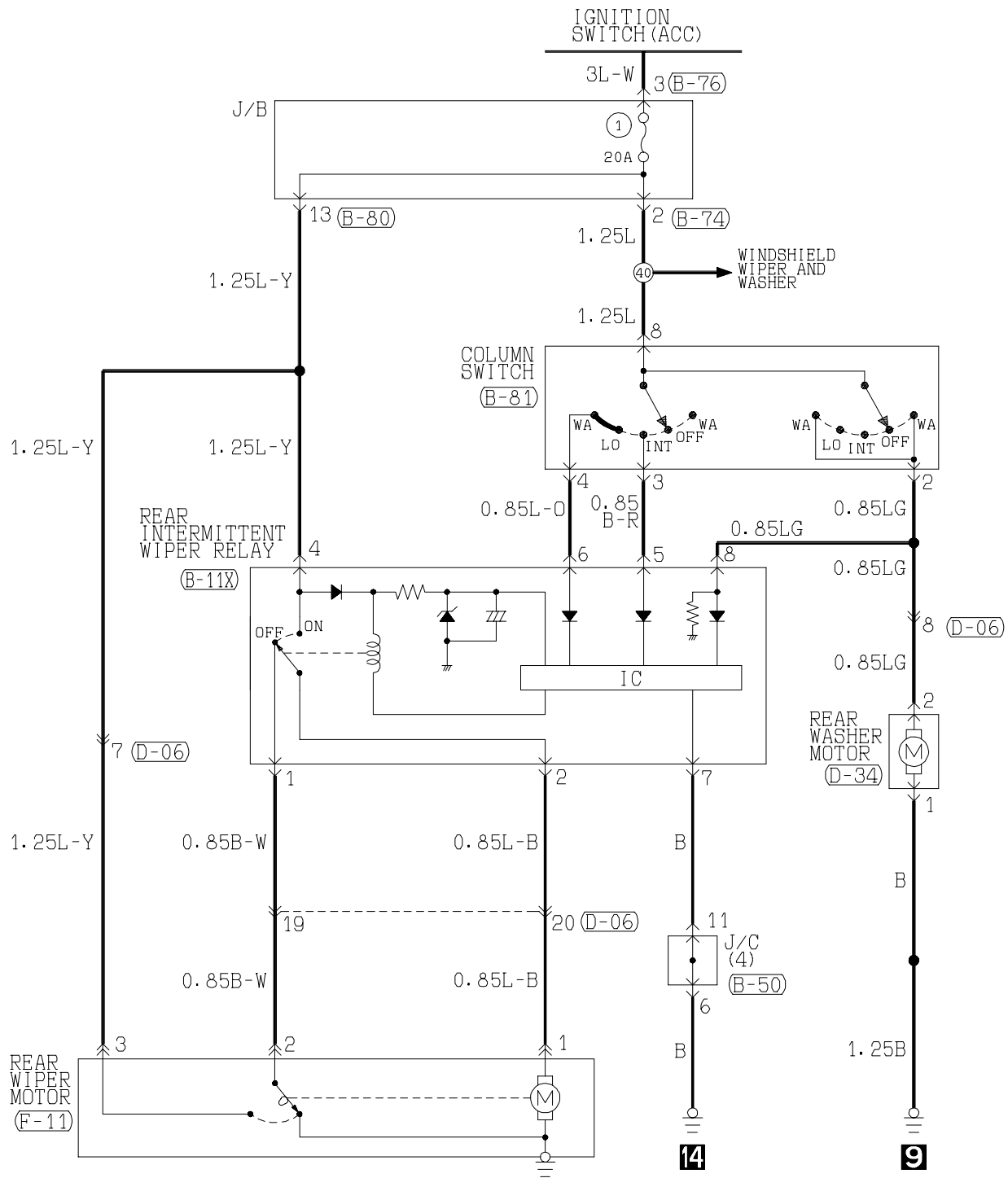
1



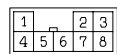
Wire colour code  
 B :Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet

REAR WIPER AND WASHER

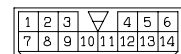
1



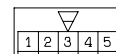
(B-11X)



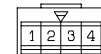
(B-50)



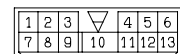
(B-74)



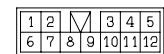
(B-76)



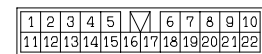
(B-80)



(B-81)



(D-06)



(D-34)

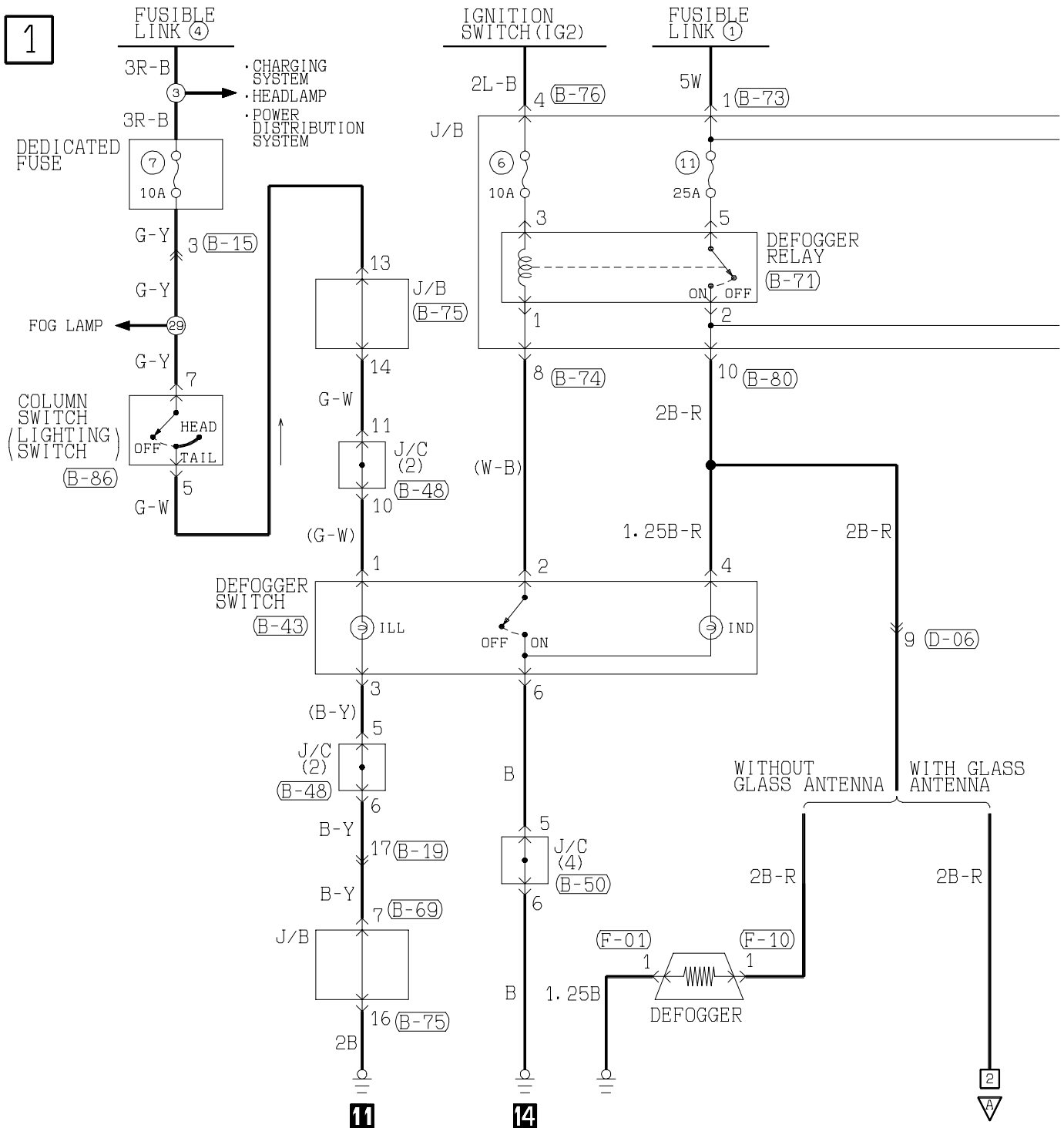


(F-11)



Wire colour code  
 B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue  
 BR:Brown O :Orange GR:Gray R :Red P :Pink V :Violet

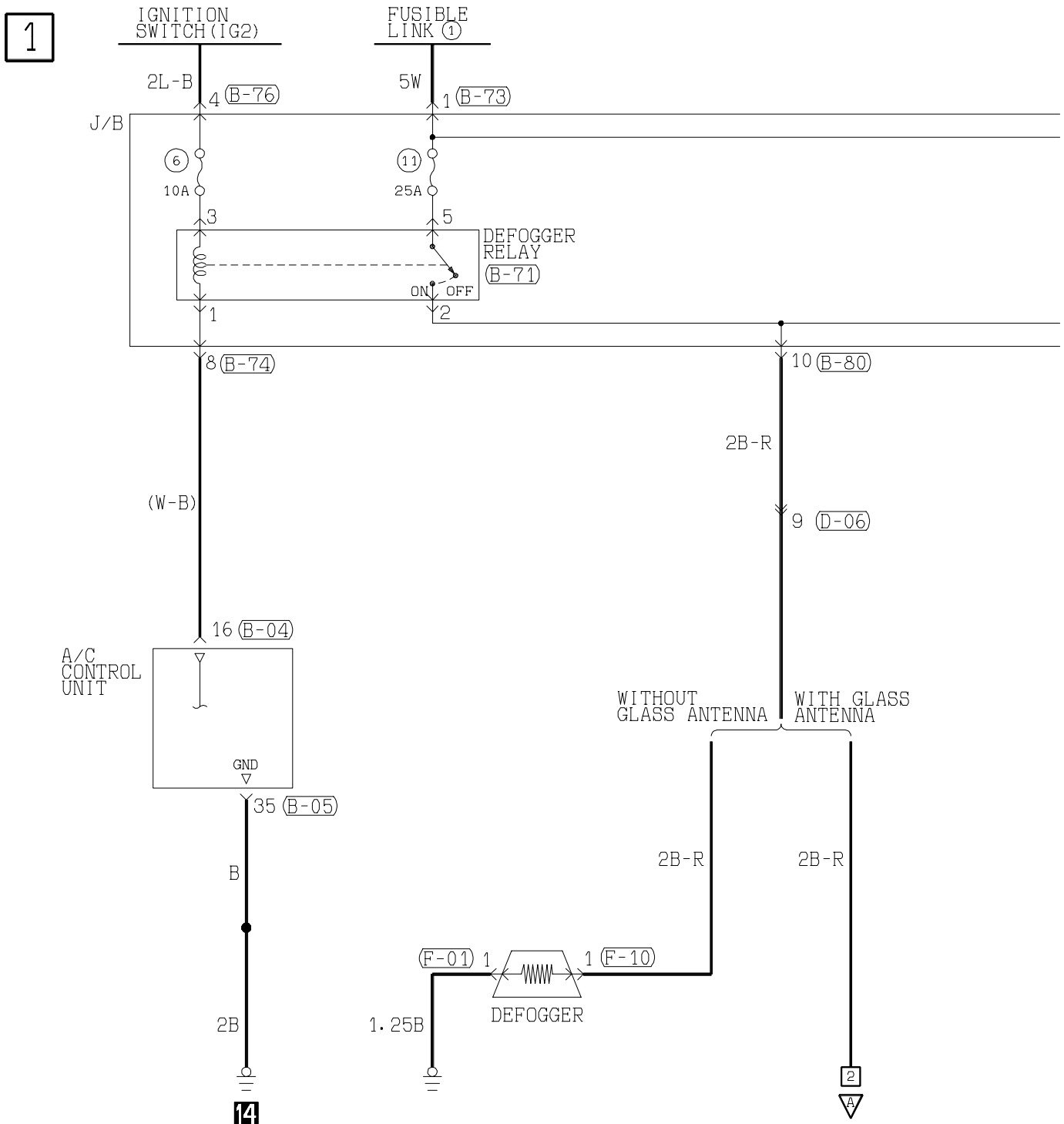
# DEFOGGER AND DOOR MIRROR HEATER <WITHOUT FULL-AUTO AIR CONDITIONER>



<b>(B-10)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	<b>(B-15)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	<b>(B-19)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	<b>(B-35)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	<b>(B-43)</b> 1 2 3 4 5 6	<b>(B-48)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14			
<b>(D-06)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	<b>(E-01)</b> 1 2 3 4 5 6 7	<b>(E-17)</b> 1 2 3 4 5 6 7	<b>(F-01)</b> 1	<b>(F-02)</b> 1	<b>(F-03)</b> 1 2	<b>(F-04)</b> 1 2 3	<b>(F-09)</b> 1	<b>(F-10)</b> 1



DEFOGGER AND DOOR MIRROR HEATER <WITH FULL-AUTO AIR CONDITIONER>



(B-04)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

(B-05)

21	22	23	24	25	26	27	28
29	30	31	32	33	34	35	36

(B-10)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22								

(B-35)

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22								

(B-71)

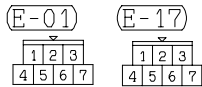
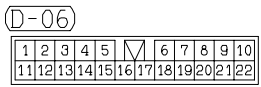
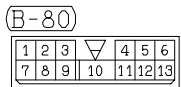
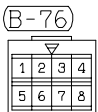
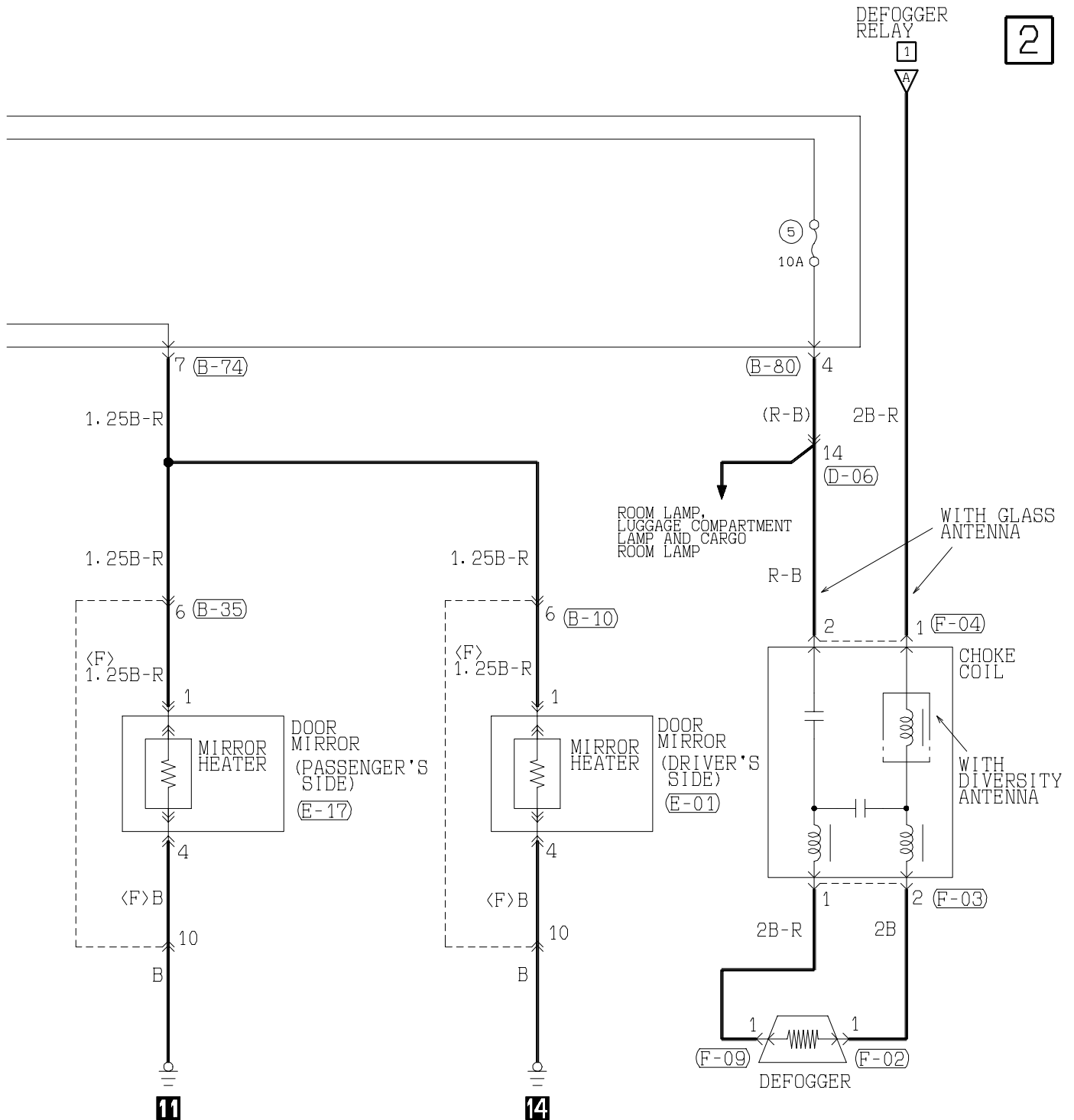
2		
4	3	
1		5

(B-73)

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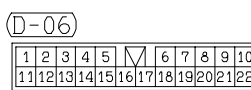
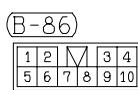
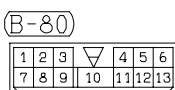
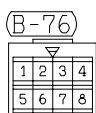
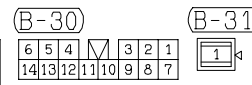
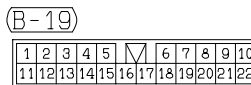
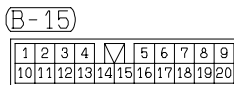
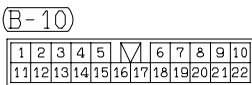
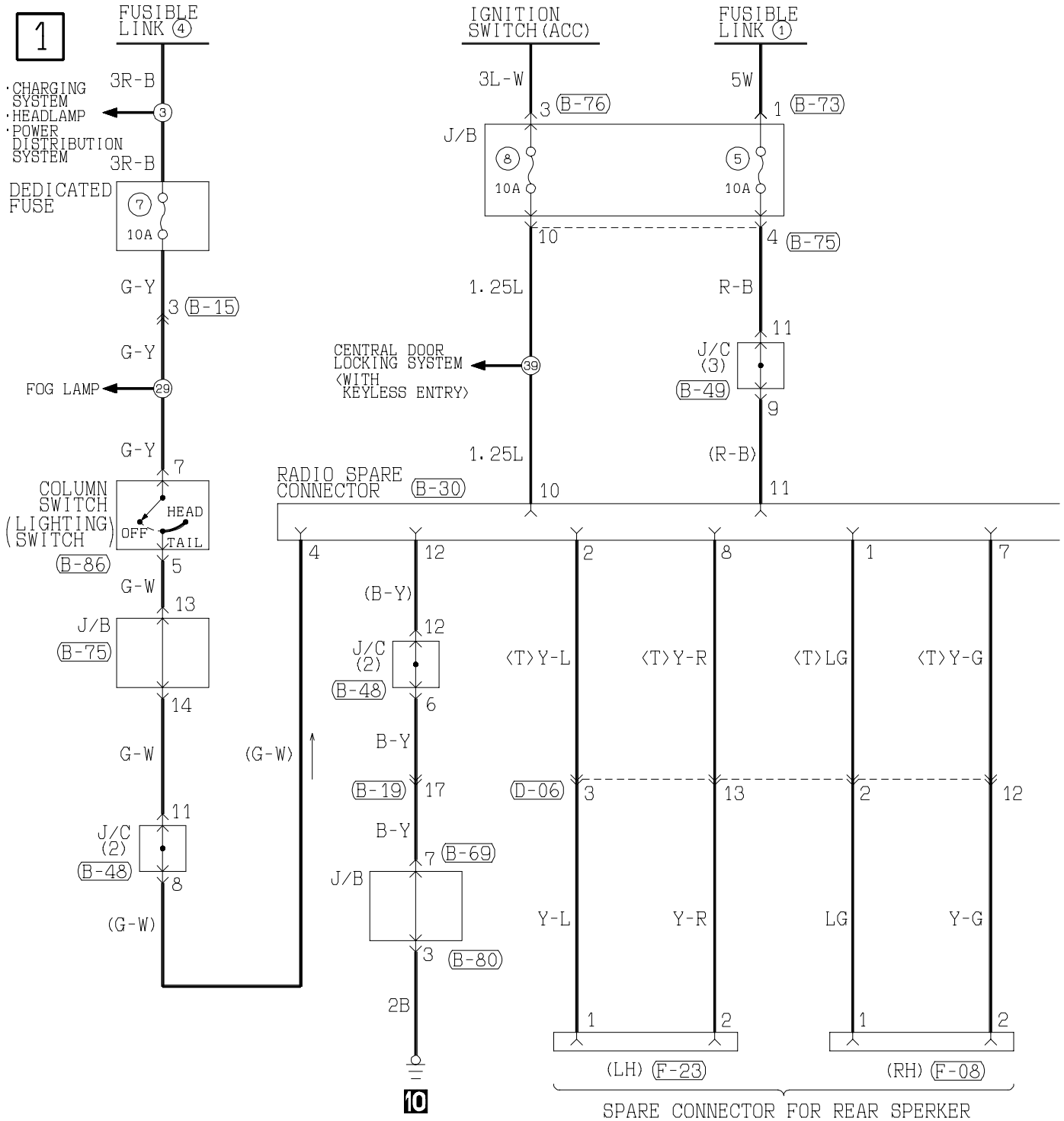
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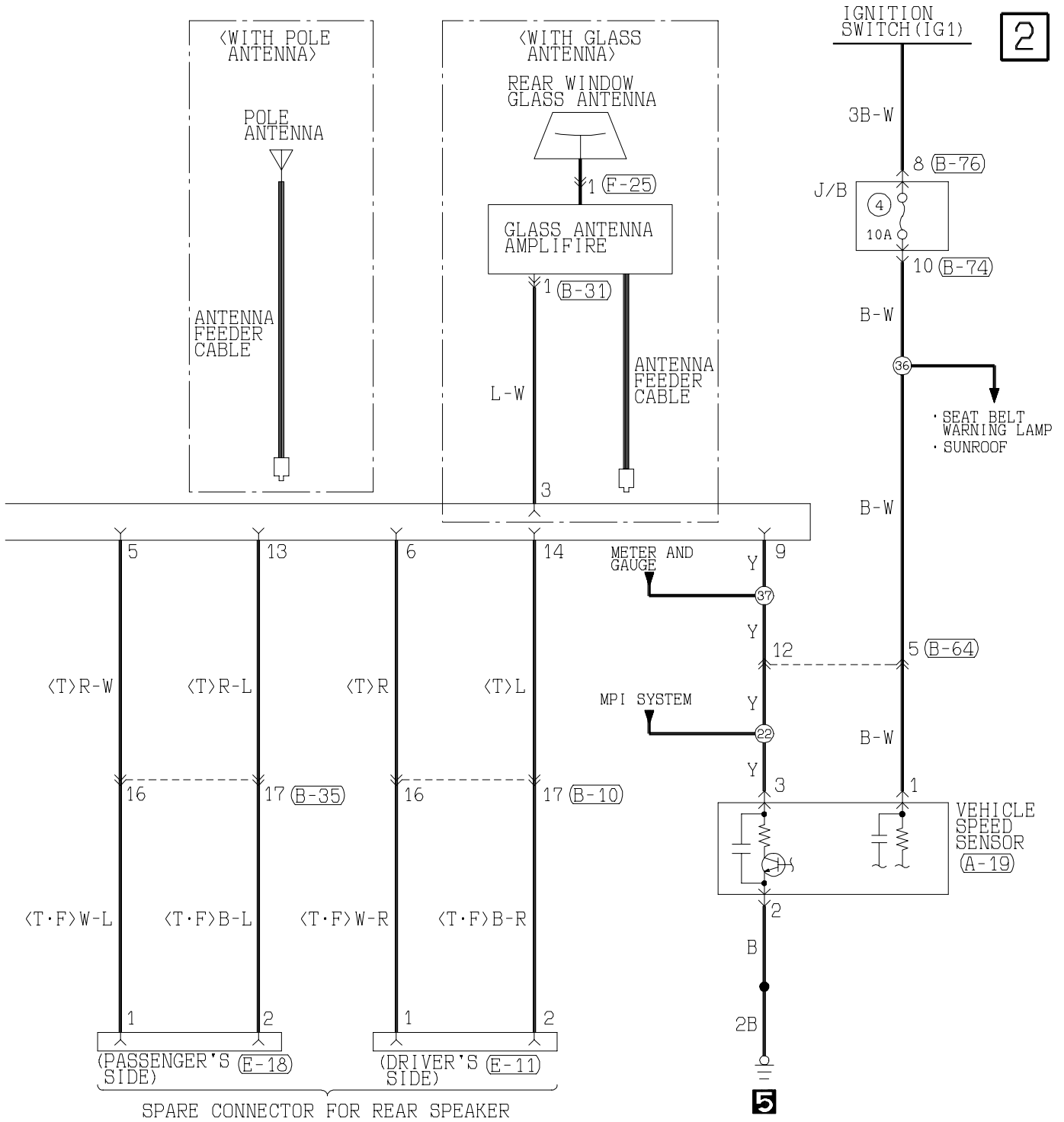


Wire colour code  
 B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue  
 BR:Brown O :Orange GR:Gray R :Red P :Pink V :Violet

RADIO <RADIO SPARE CIRCUIT>

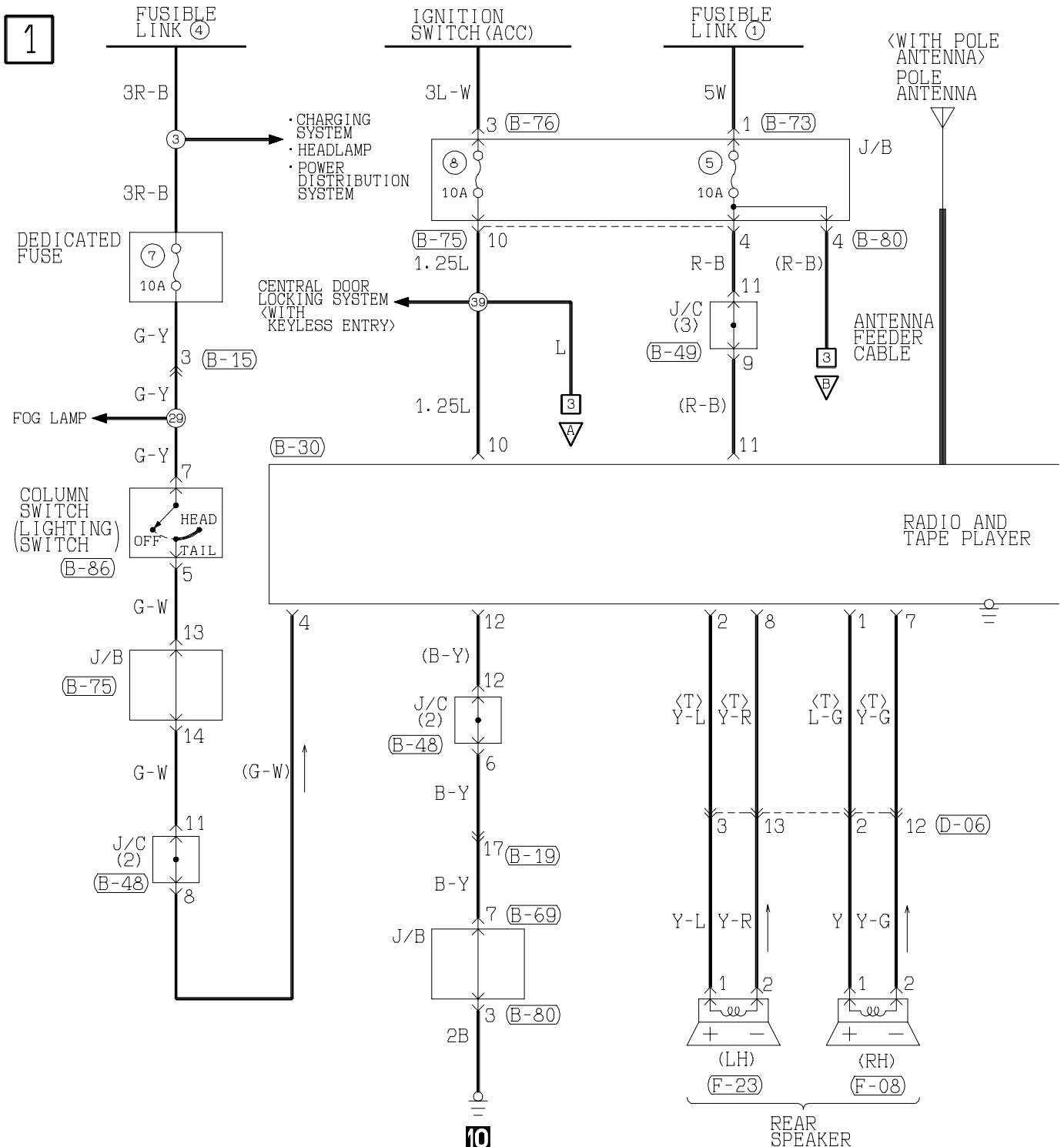






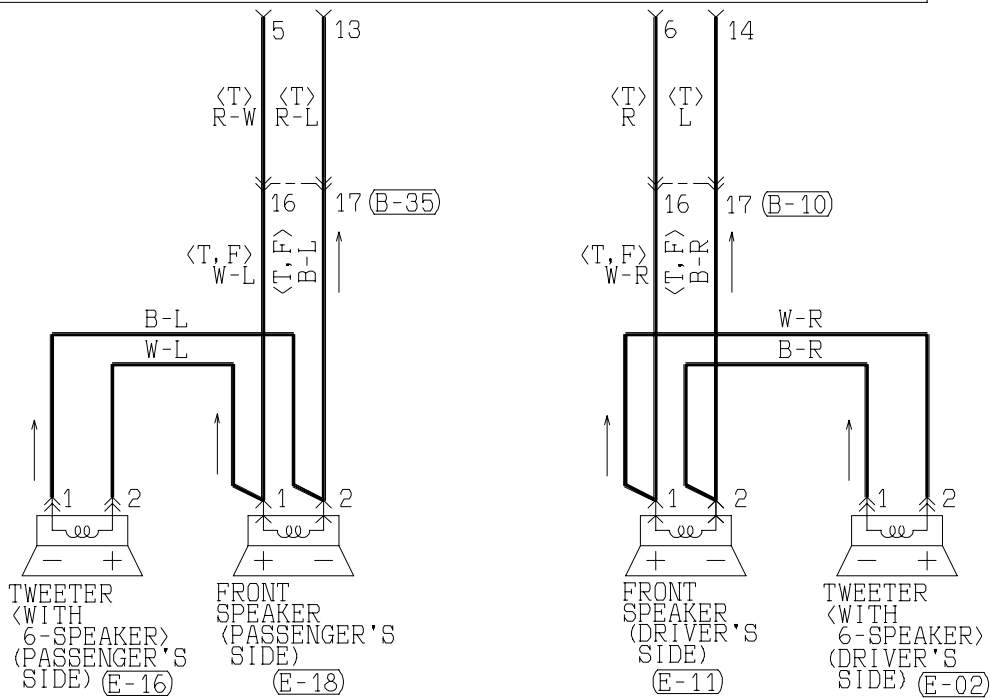
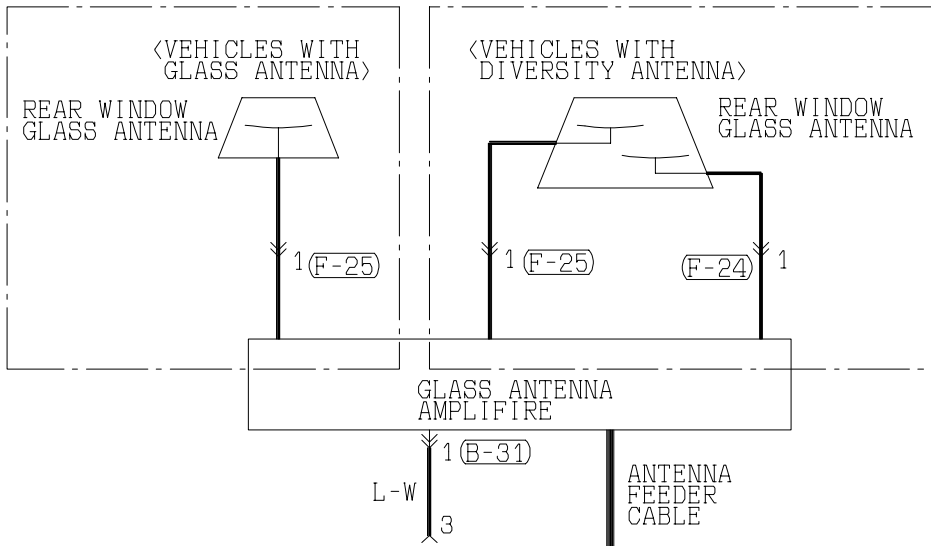
<b>(B-35)</b>	<b>(B-48)</b>	<b>(B-49)</b>	<b>(B-64)</b>	<b>(B-69)</b>	<b>(B-73)</b>	<b>(B-74)</b>																																																																																																																	
<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr> <tr><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td><td>17</td><td>18</td><td>19</td><td>20</td></tr> <tr><td>21</td><td>22</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22									<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14					<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14					<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14					<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td></tr> <tr><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td></tr> <tr><td>13</td><td>14</td><td></td><td></td><td></td><td></td></tr> </table>	1	2	3	4	5	6	7	8	9	10	11	12	13	14					<table border="1"> <tr><td>1</td></tr> </table>	1	<table border="1"> <tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td></tr> <tr><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td></tr> </table>	1	2	3	4	5	6	7	8	9	10
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6	7	8	9	10																																																																																																																			

RADIO <4 SPEAKER, 6 SPEAKER>

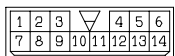


(B-10)	(B-15)	(B-19)	(B-30)	(B-31)	(B-35)			
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	1 2 3 4 5 6 7 8 9 10 11 12 13 14	1	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22			
(D-06)	(E-02)	(E-11)	(E-16)	(E-18)	(F-08)	(F-23)	(F-24)	(F-25)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	1 2	1 2	1 2	1 2	1 2	1 2	1 2	1 2

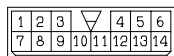
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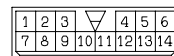
(B-48)



(B-49)



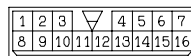
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(B-73)



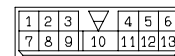
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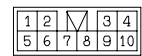
(B-76)



(B-80)



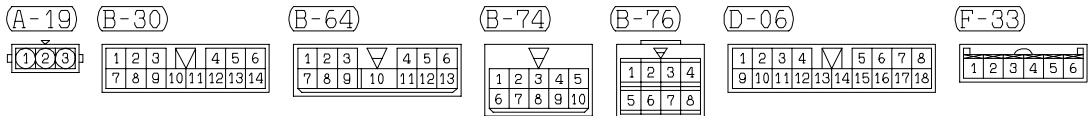
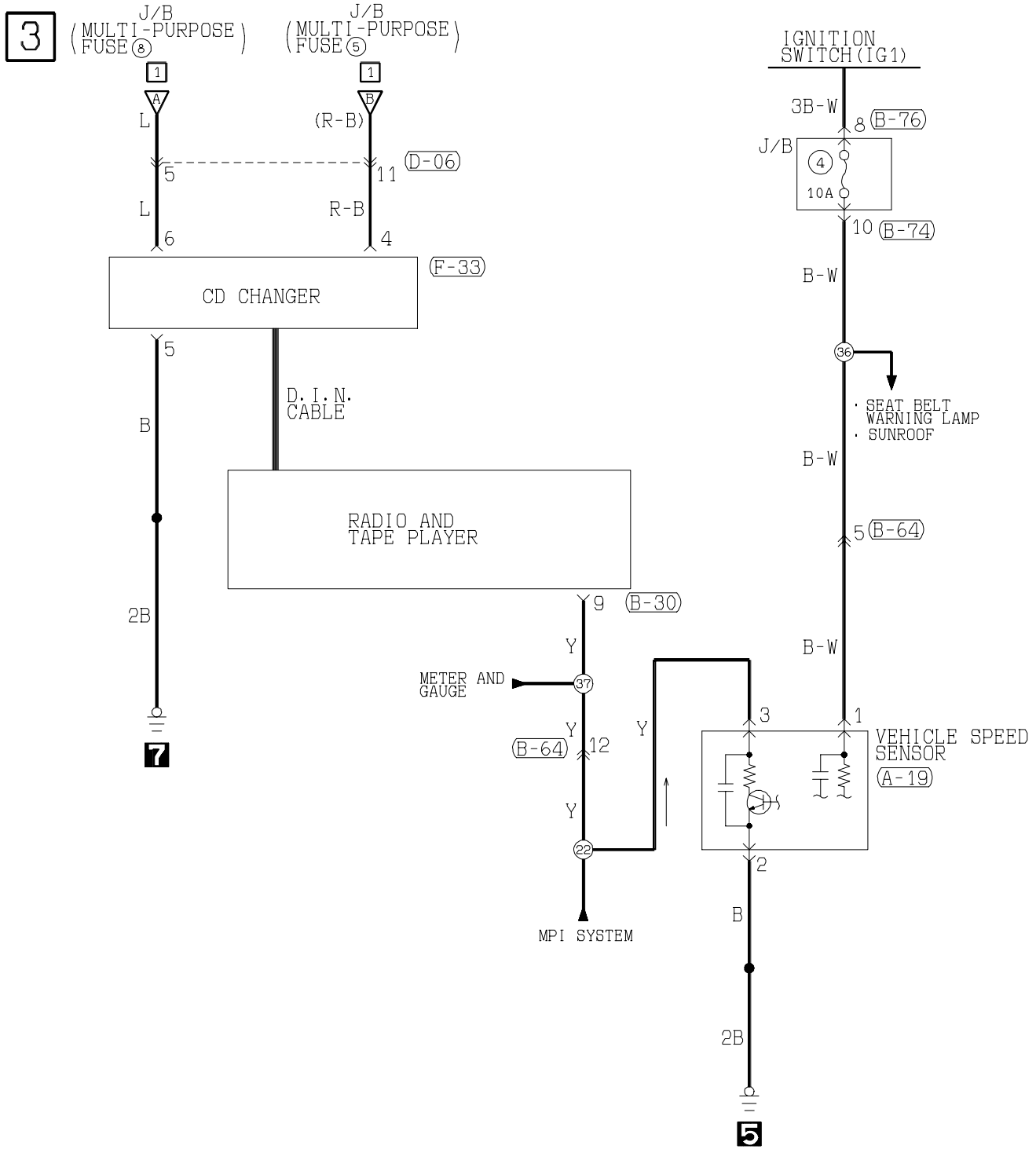
(B-86)



Wire colour code

B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue  
 BR:Brown O :Orange GR:Gray R :Red P :Pink V :Violet

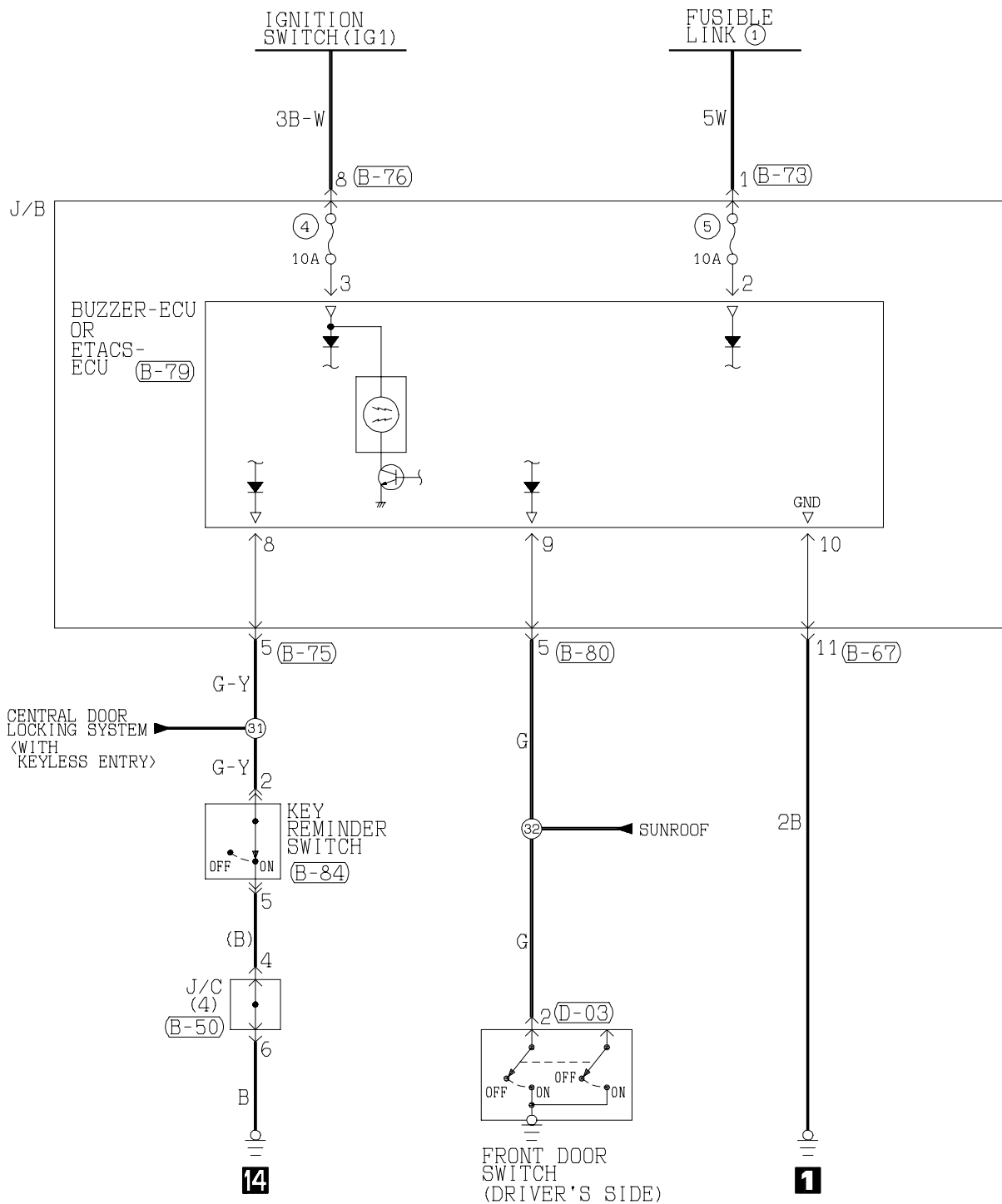
RADIO <4 SPEAKER, 6 SPEAKER> (CONTINUED)



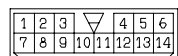
Wire colour code  
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 BR : Brown    O : Orange    GR : Gray    R : Red    P : Pink    V : Violet

KEY REMINDER BUZZER

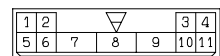
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(B-50)



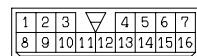
(B-67)



(B-73)



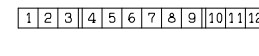
(B-75)



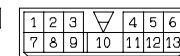
(B-76)



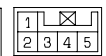
(B-79)



(B-80)



(B-84)



(D-03)



Wire colour code  
 B : Black LG:Light green  
 BR:Brown O :Orange

G :Green GR:Gray

L :Blue R :Red

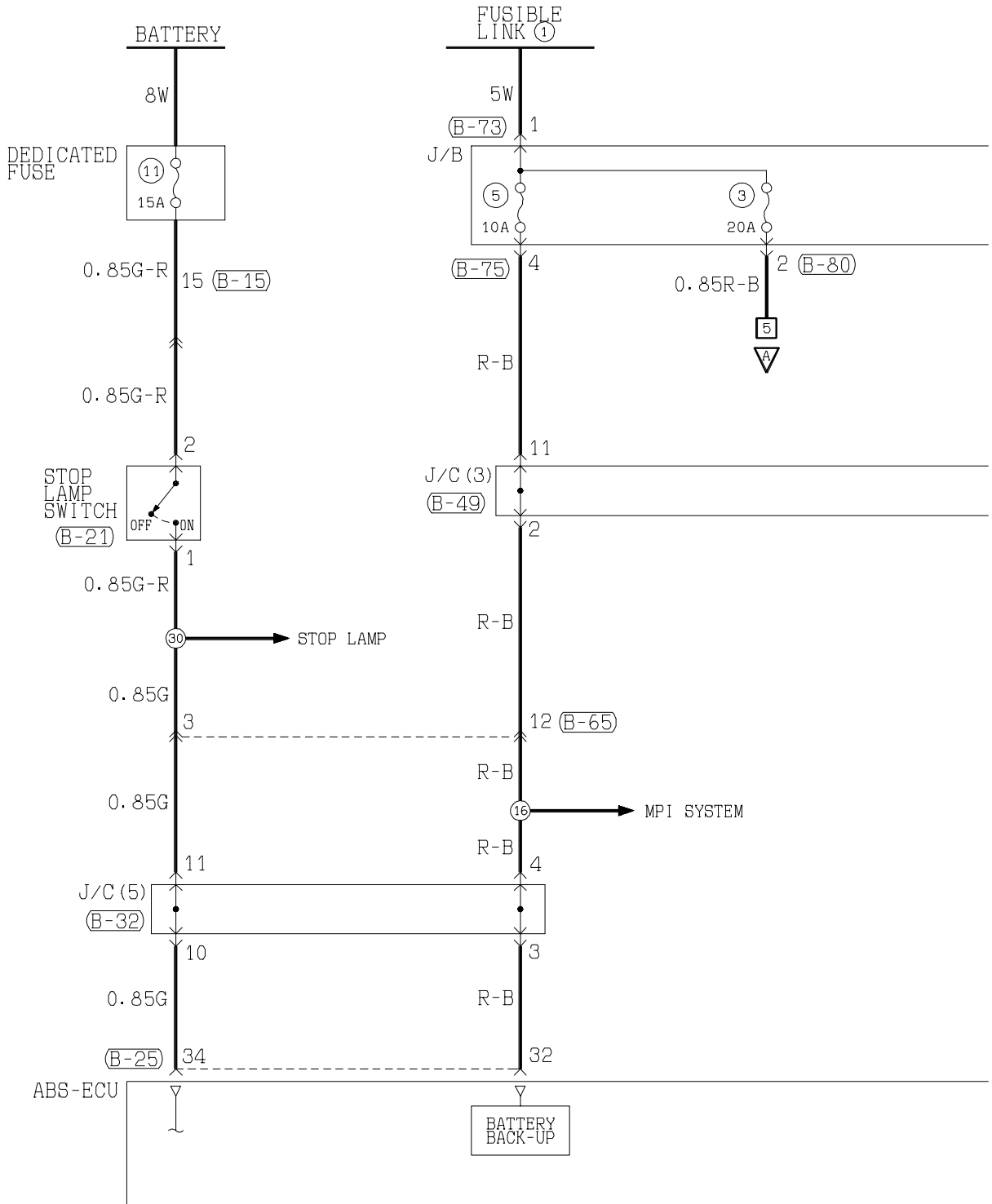
W :White P :Pink

Y :Yellow V :Violet

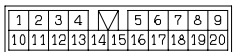
SB:Sky blue

ANTI-SKID BRAKING SYSTEM (ABS)

1



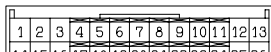
(B-15)



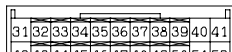
(B-21)



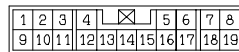
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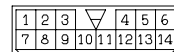
(B-25)



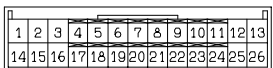
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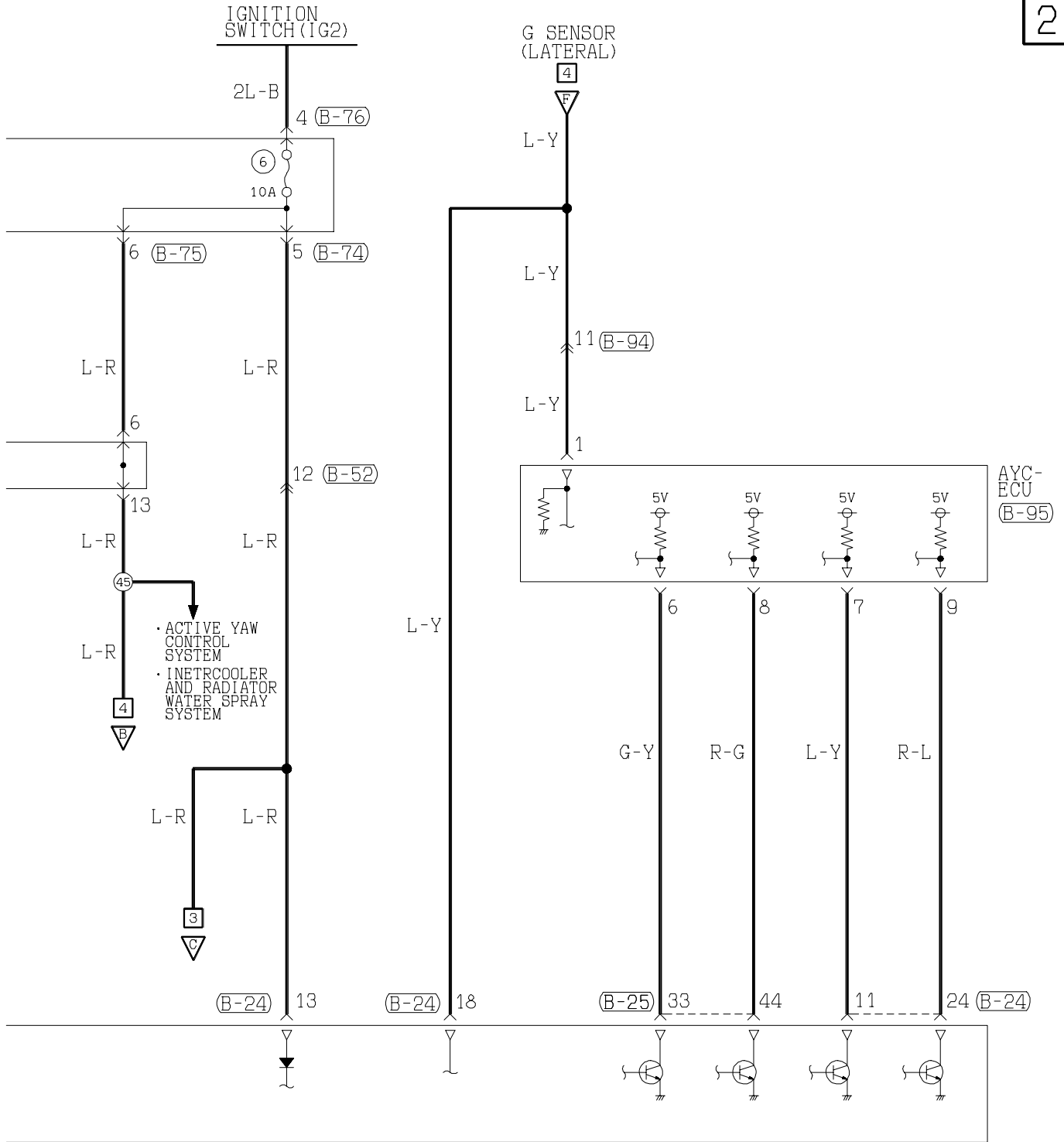
(B-49)



(B-95)



2



(B-52)

1	2	3	▽	4	5	6	7	
8	9	10	11	12	13	14	15	16

(B-65)

1	2	3	▽	4	5	6	7	
8	9	10	11	12	13	14	15	16

(B-73)

1
---

(B-74)

1	2	3	4	5
6	7	8	9	10

(B-75)

1	2	3	▽	4	5	6	7	
8	9	10	11	12	13	14	15	16

(B-76)

1	2	3	4
5	6	7	8

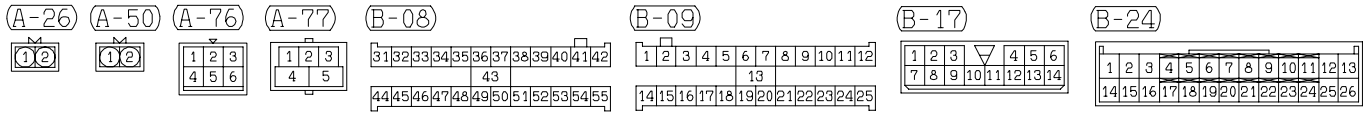
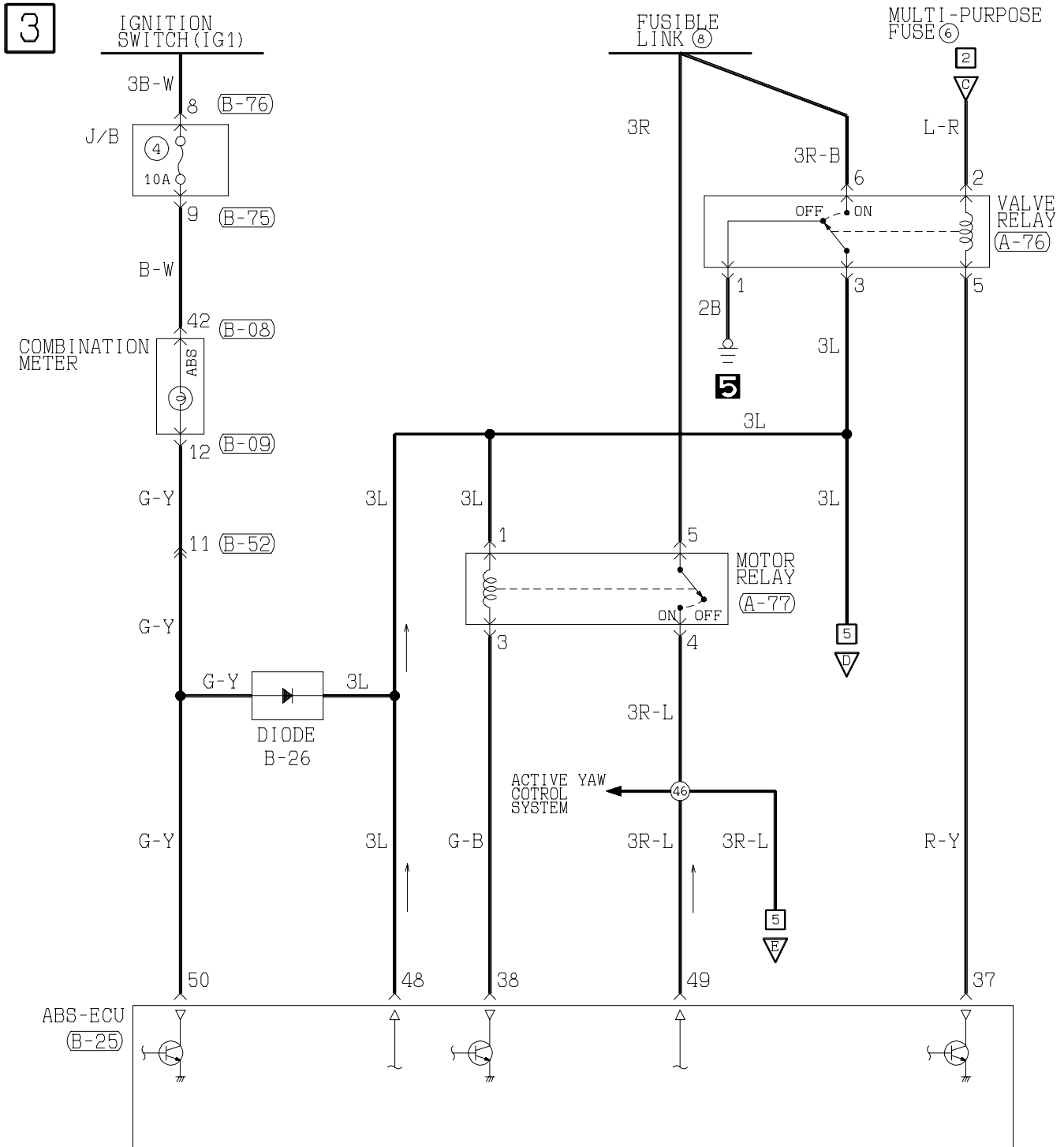
(B-80)

1	2	3	▽	4	5	6
7	8	9	10	11	12	13

(B-94)

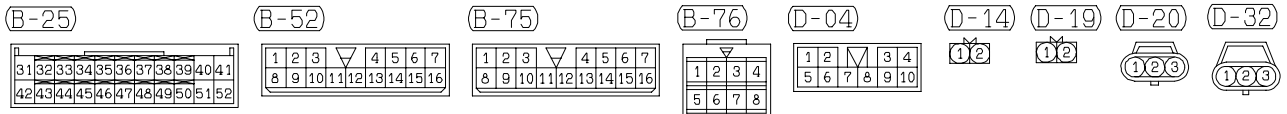
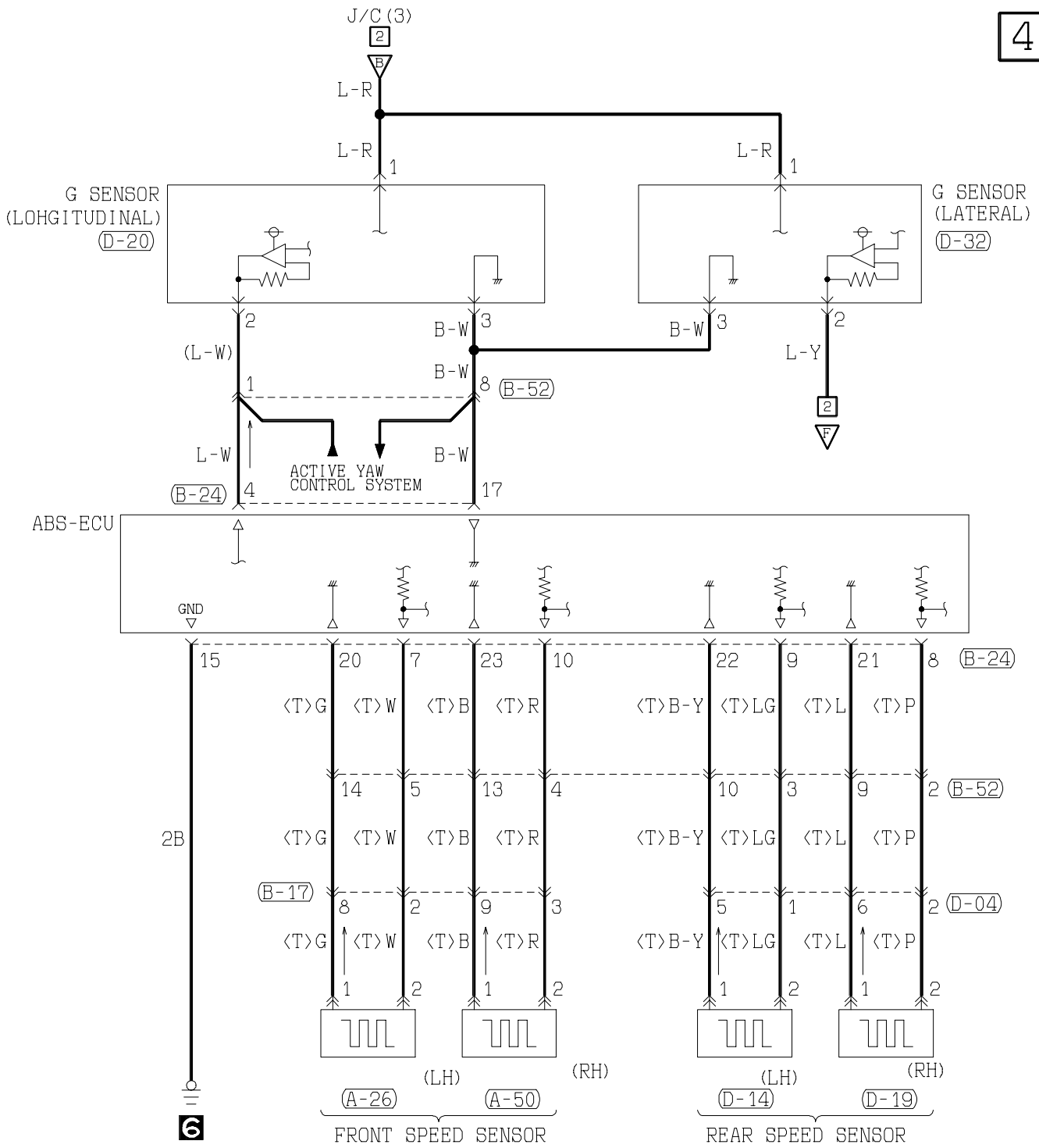
1	2	3	▽	4	5	6
7	8	9	10	11	12	13

ANTI-SKID BRAKING SYSTEM (ABS) (CONTINUED)



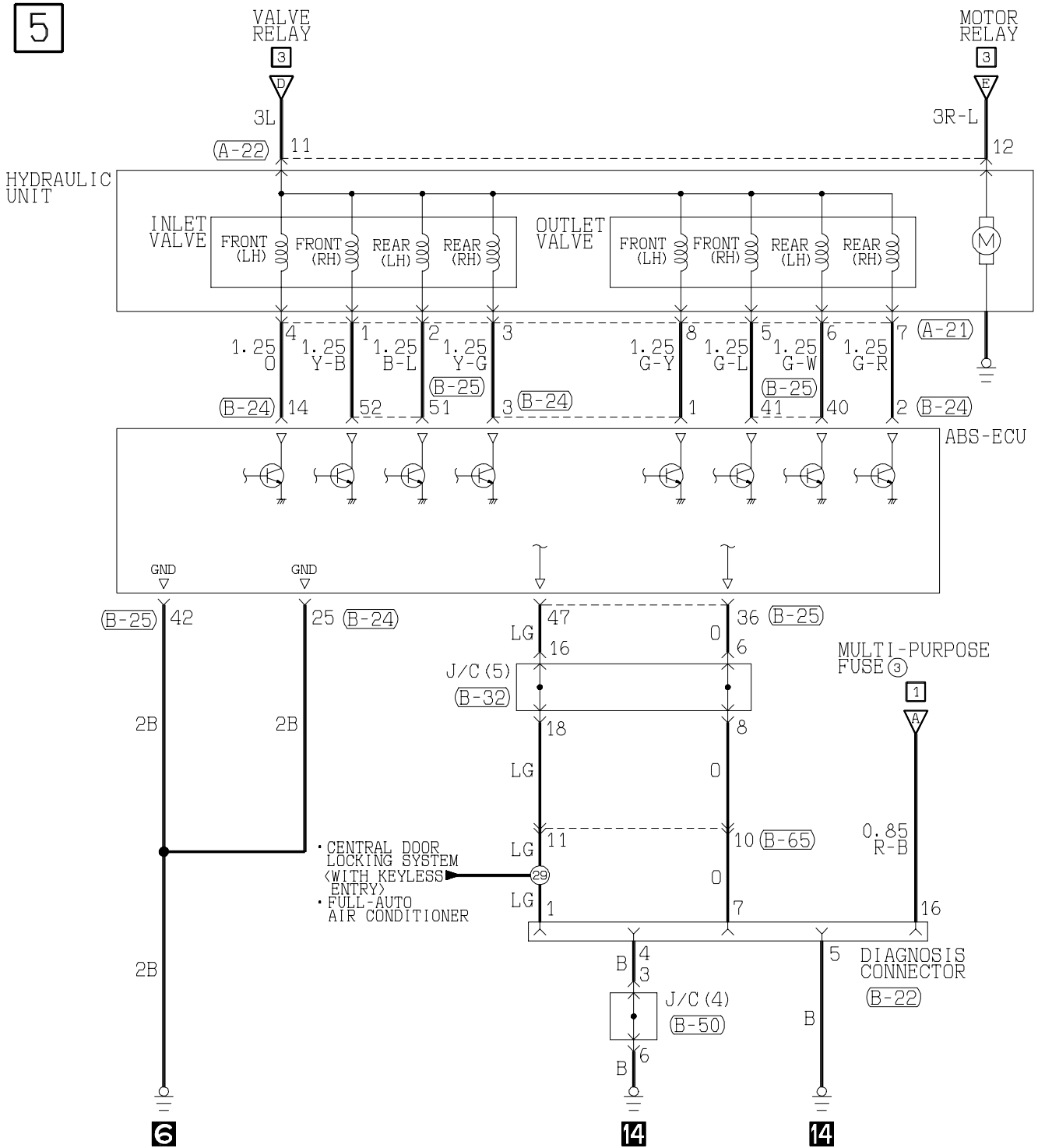


4



Wire colour code  
 B : Black    LG : Light green    G : Green    L : Blue    W : White    Y : Yellow    SB : Sky blue  
 BR : Brown    O : Orange    GR : Gray    R : Red    P : Pink    V : Violet

ANTI-SKID BRAKING SYSTEM (ABS) (CONTINUED)

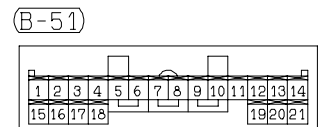
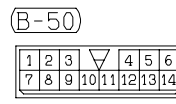
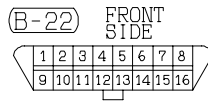
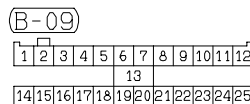
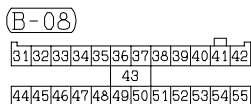
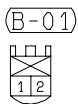
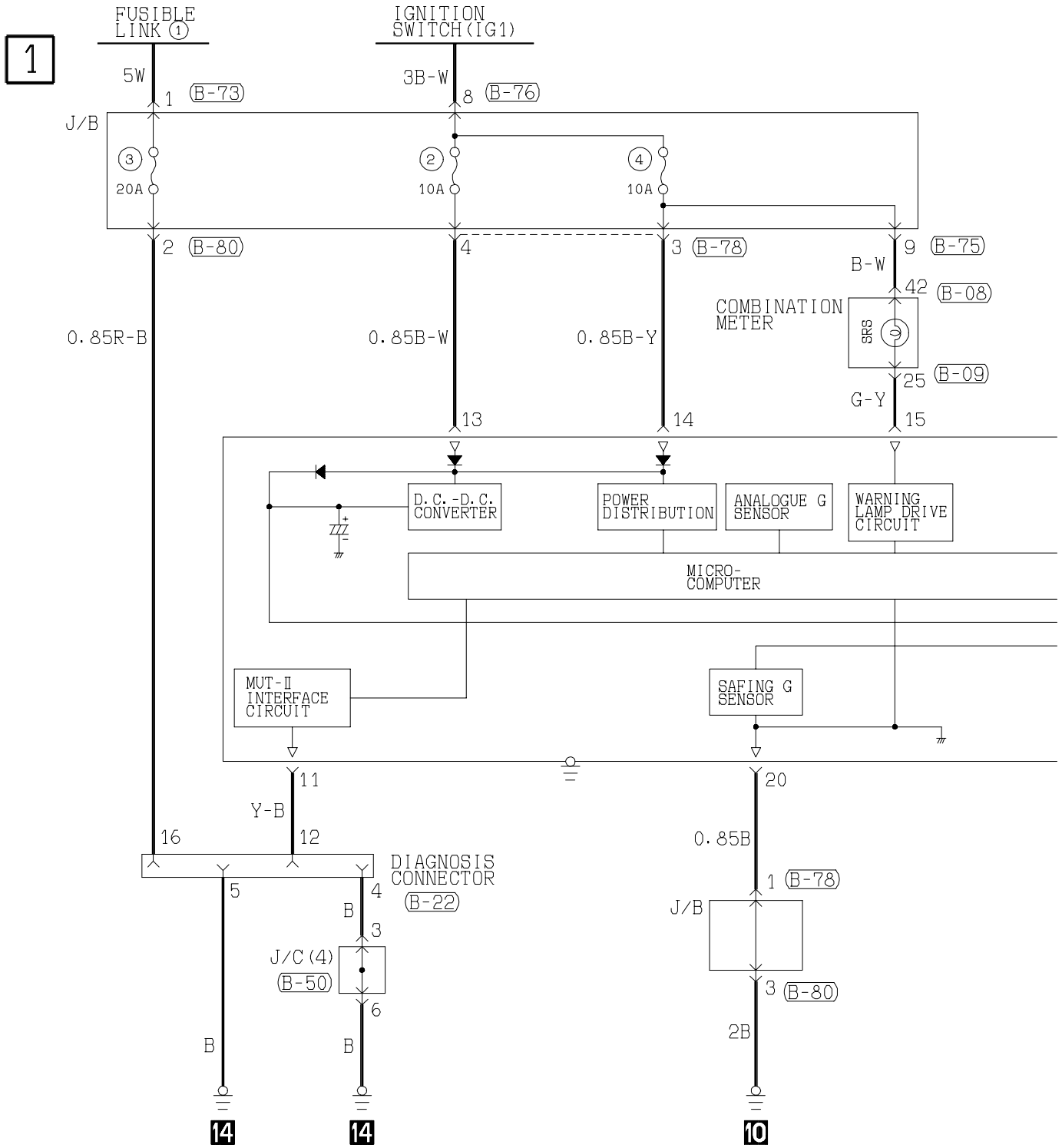


<b>(A-21)</b> 1 2 3 4 5 6 7 8	<b>(A-22)</b> 1 2	<b>(B-22) FRONT SIDE</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	<b>(B-24)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26	<b>(B-25)</b> 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52	<b>(B-32)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
<b>(B-50)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14	<b>(B-60)</b> 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	<p>Wire colour code</p> <p>B : Black    LG: Light green    G : Green    L : Blue</p> <p>BR: Brown    O : Orange    GR: Gray    R : Red</p> <p>W : White    SB: Sky blue    P : Pink    Y : Yellow</p> <p>V : Violet</p>			

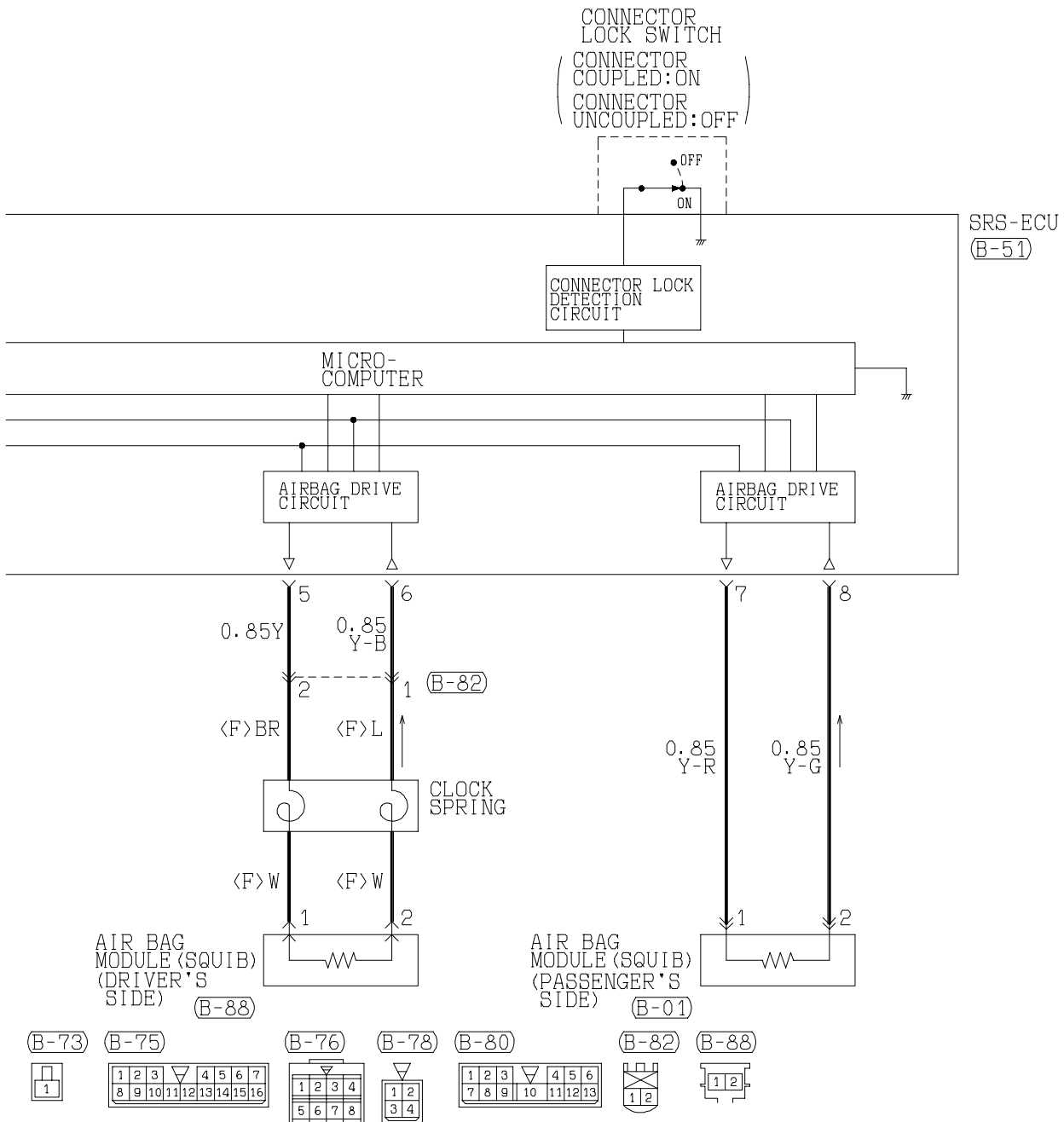
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NOTES

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

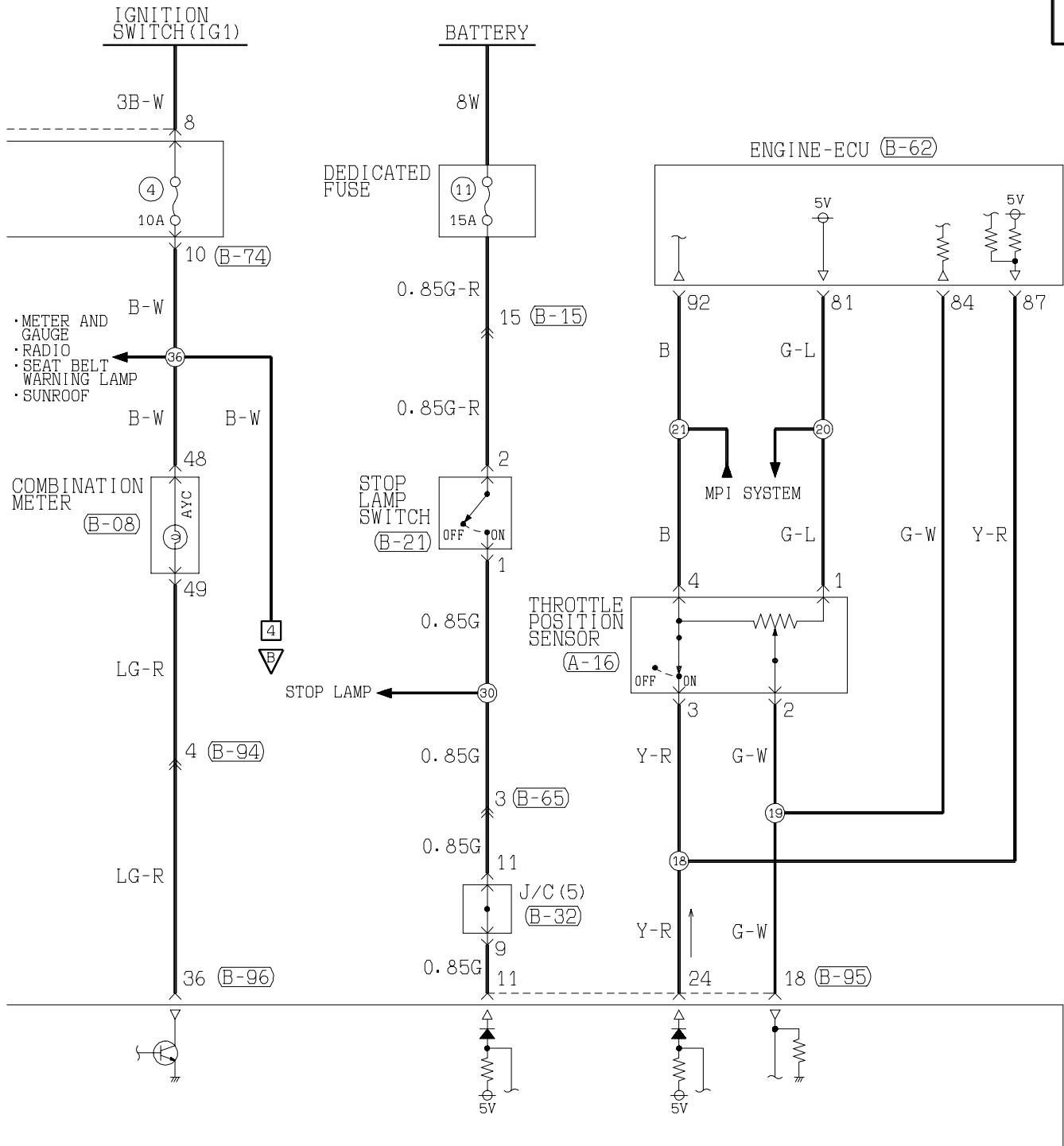


2





2



(B-62)

71	72	73	74	75	76	77	78	79	80	81
82	83	84	85	86	87	88	89	90	91	92

(B-65)

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

(B-73)

1
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(B-74)

1	2	3	4	5
6	7	8	9	10

(B-75)

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

(B-76)

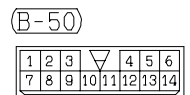
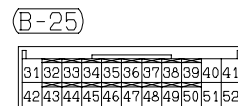
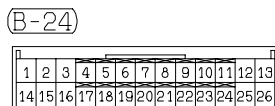
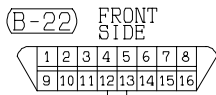
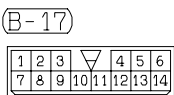
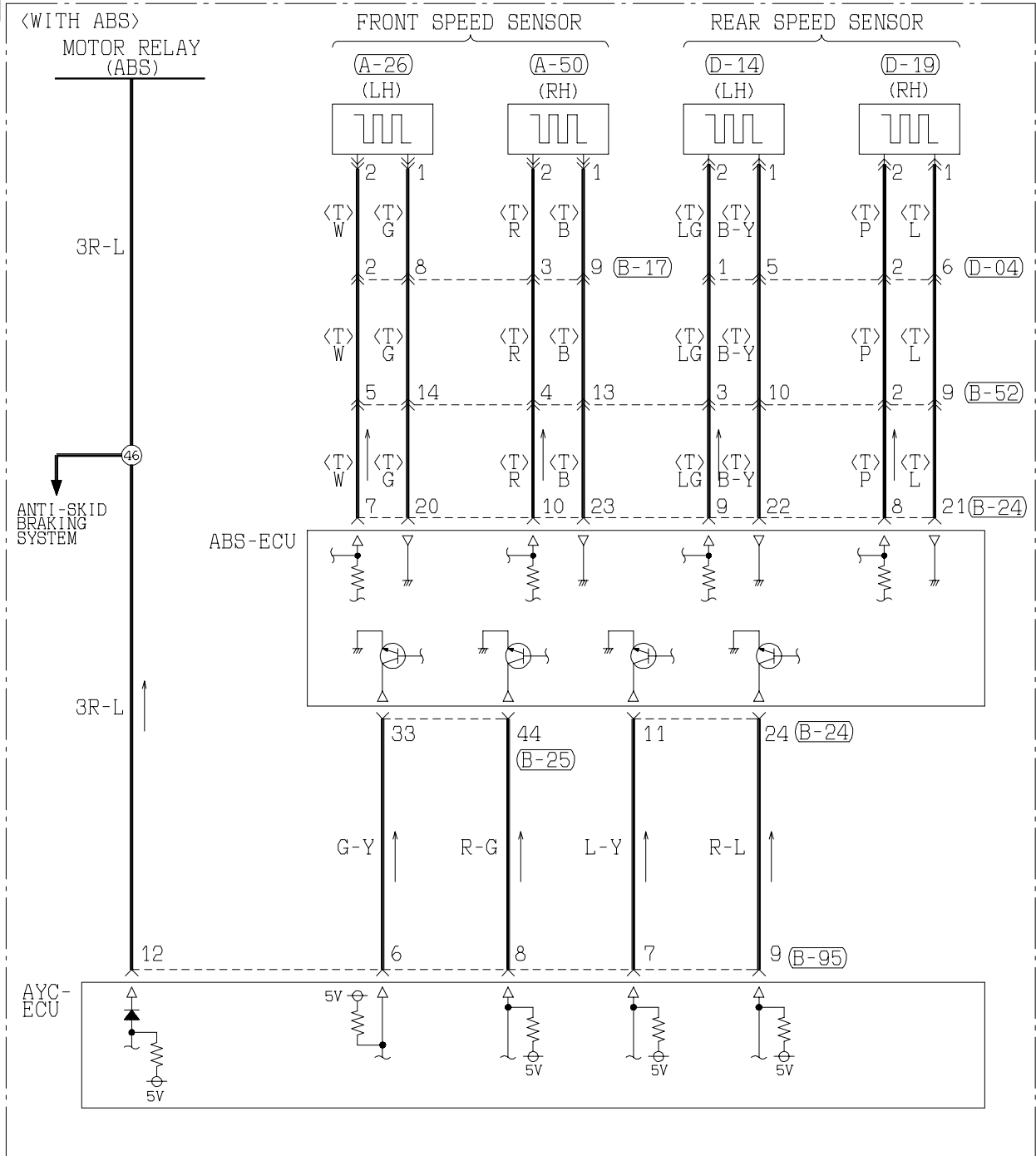
1	2	3	4
5	6	7	8

(B-80)

1	2	3	4	5	6	
7	8	9	10	11	12	13

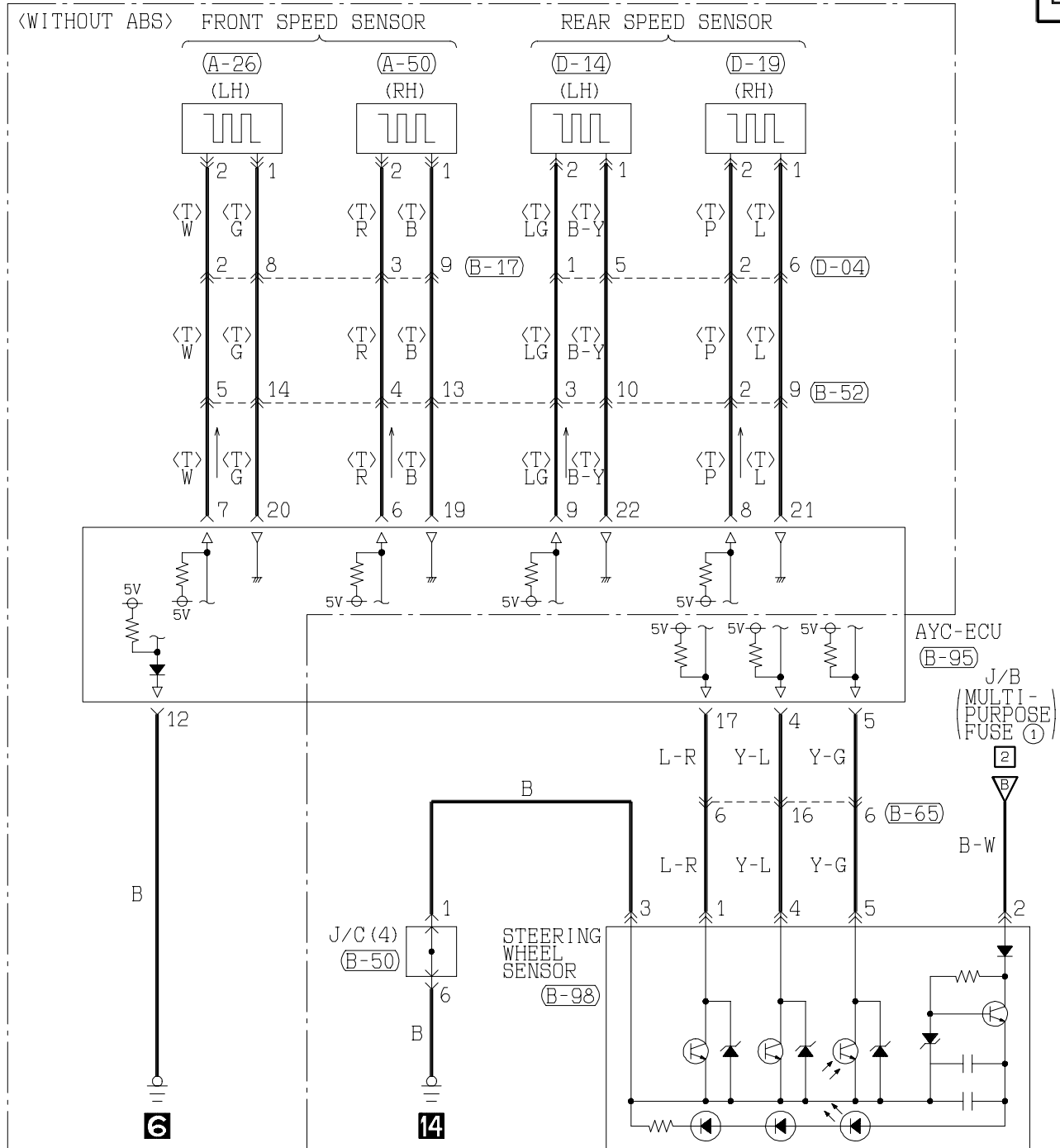
ACTIVE YAW CONTROL SYSTEM (AYC) (CONTINUED)

3





4



(B-52)

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

(B-65)

1	2	3	4	5	6	7		
8	9	10	11	12	13	14	15	16

(B-95)

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

(B-96)

31	32	33	34	35	36	37	38
39	40	41	42	43	44	45	46

(B-98)

1			
2	3	4	5

(D-04)

1	2	3	4		
5	6	7	8	9	10

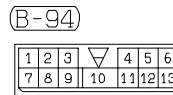
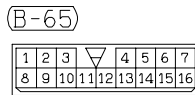
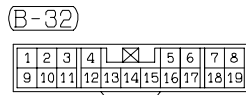
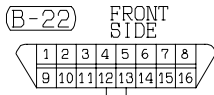
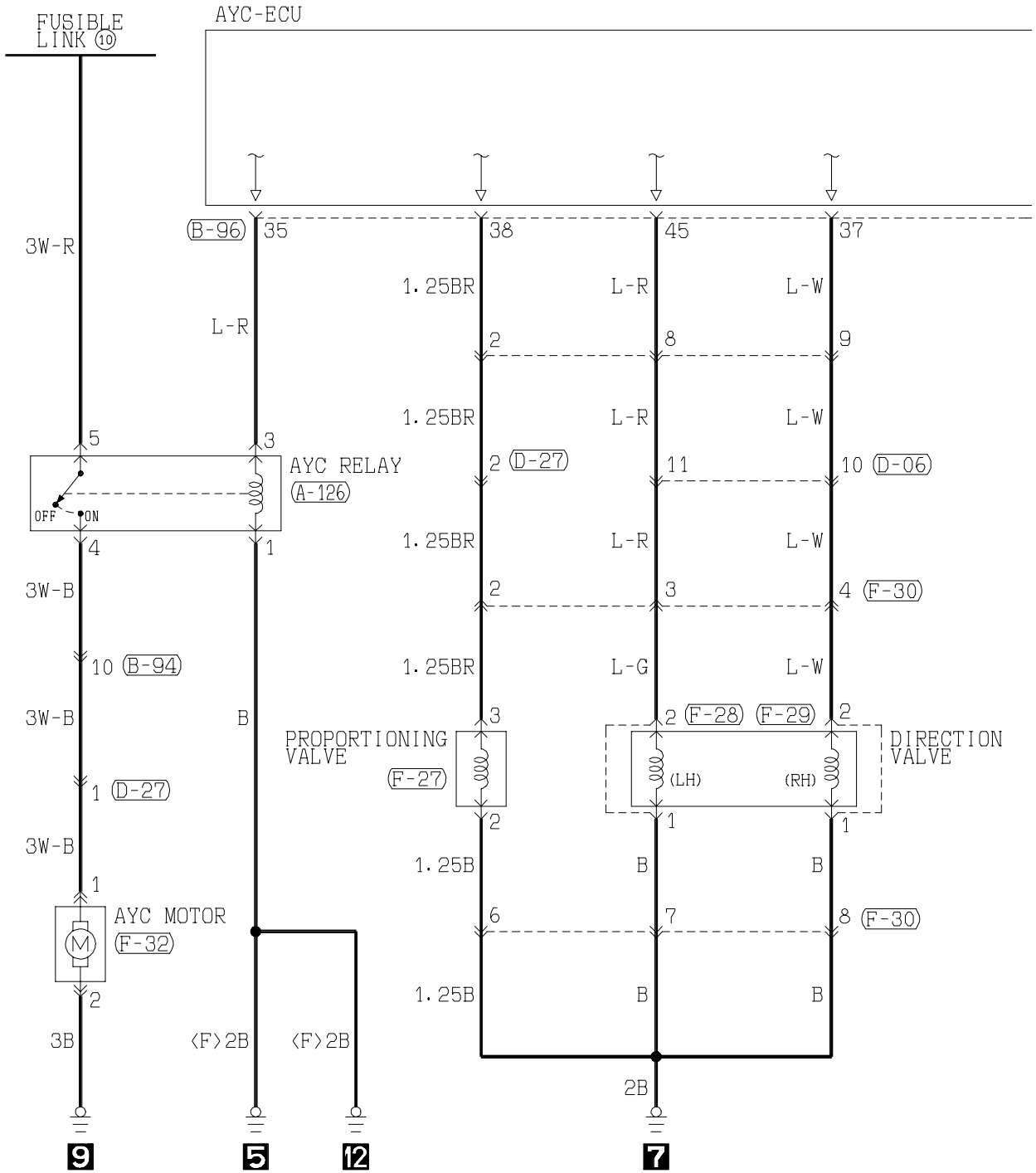
(D-14) (D-19)

1	2
1	2

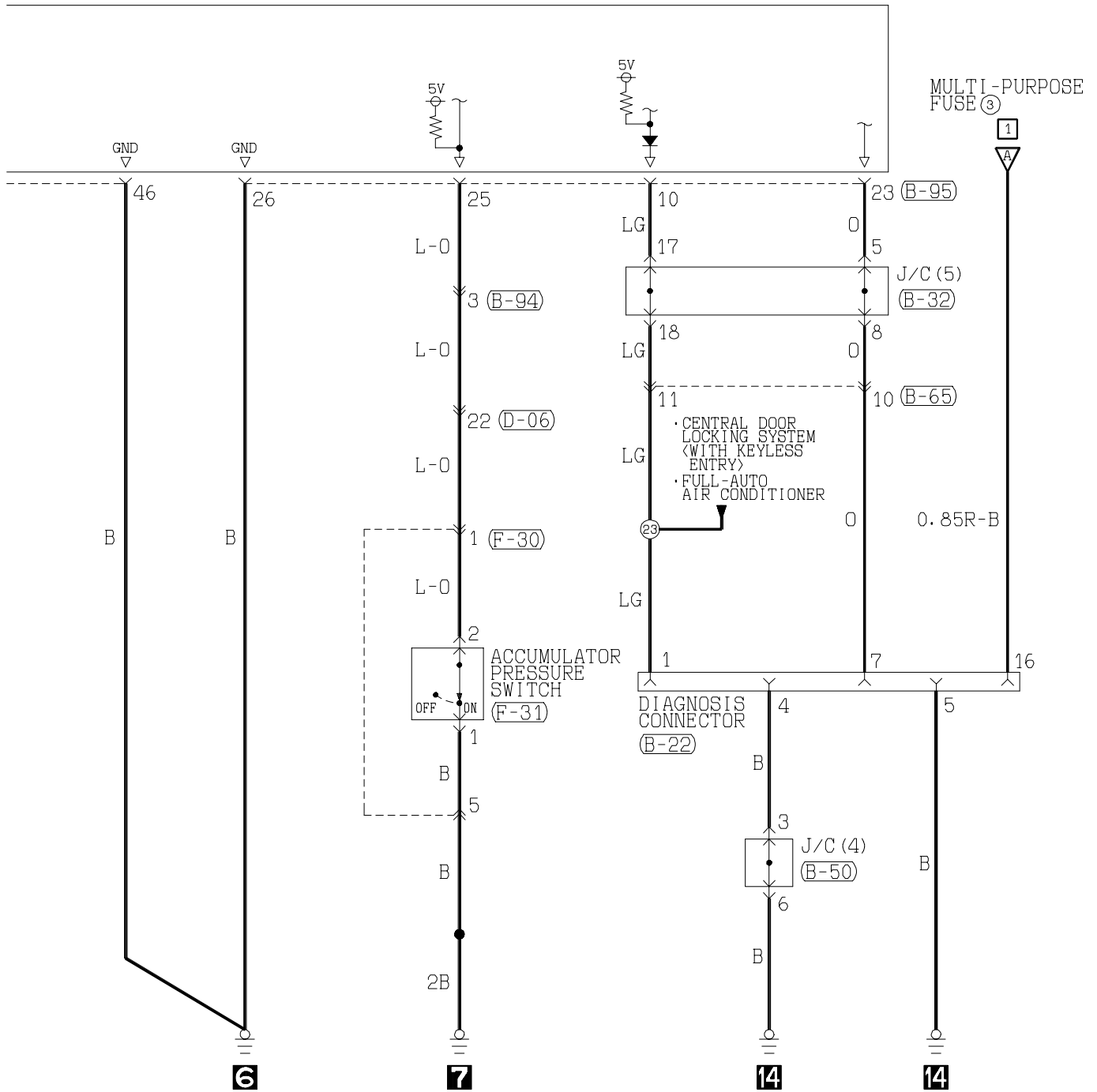
Wire colour code  
 B : Black    LG : Light green    G : Green    L : Blue    W : White    Y : Yellow    SB : Sky blue  
 BR : Brown    O : Orange    GR : Gray    R : Red    P : Pink    V : Violet

ACTIVE YAW CONTROL SYSTEM (AYC) (CONTINUED)

5



6



(B-96)

31	32	33	34	35	36	37	38
39	40	41	42	43	44	45	46

(D-06)

1	2	3	4	5	6	7	8	9	10		
11	12	13	14	15	16	17	18	19	20	21	22

(D-27)

1	2
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(F-27)



(F-28)



(F-29)



(F-30)



(F-31)



(F-32)

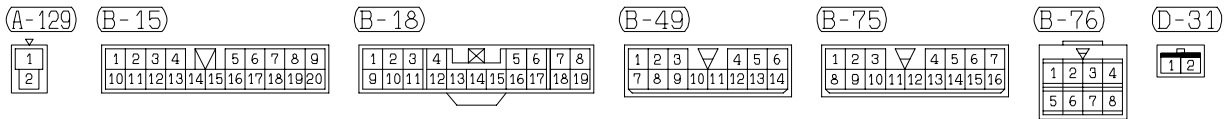
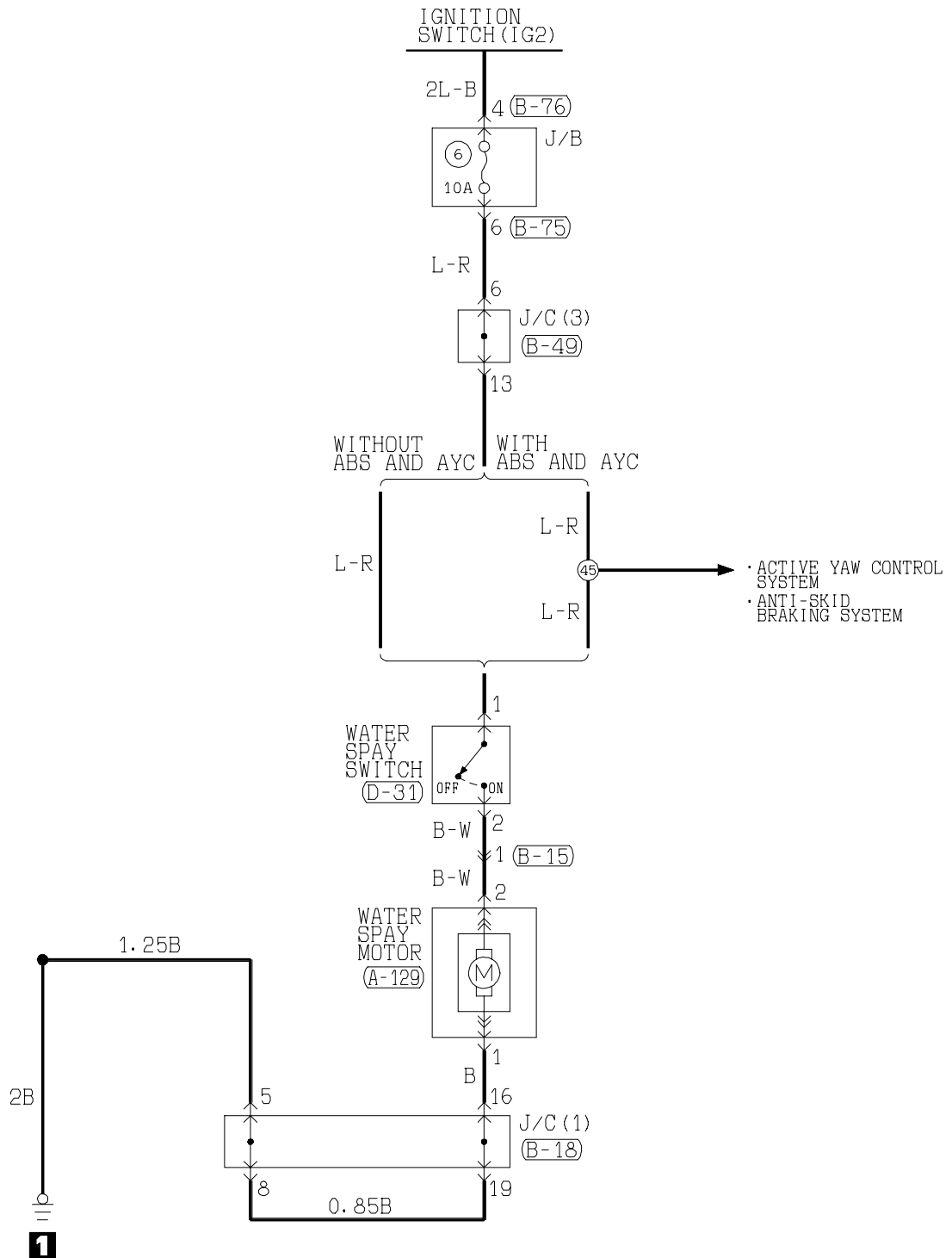


Wire colour code

B : Black    LG:Light green    G :Green    L :Blue    W :White    Y :Yellow    SB:Sky blue  
 BR:Brown    O :Orange    GR:Gray    R :Red    P :Pink    V :Violet

**INTERCOOLER AND RADIATOR WATER SPRAY SYSTEM**

**1**



Wire colour code  
 B :Black LG:Light green G :Green L :Blue W :White Y :Yellow SB:Sky blue  
 BR:Brown O :Orange GR:Gray R :Red P :Pink V :Violet

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# HOW TO READ THE WIRING DIAGRAMS

## CONTENTS

HOW TO READ CIRCUIT DIAGRAMS ..... 2



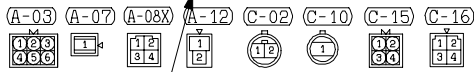
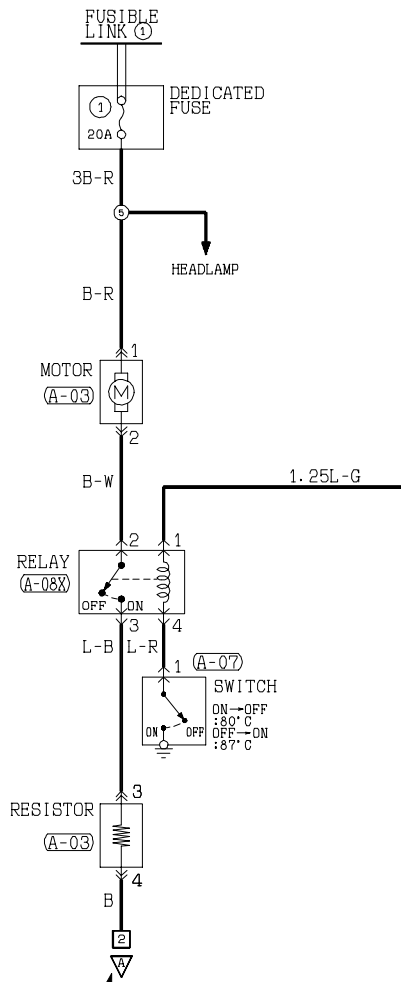
**HOW TO READ CIRCUIT DIAGRAMS**

The circuit of each system from fuse (or fusible link) to earth is shown. The power supply is shown at the top and the earth at the bottom to facilitate understanding of how the current flows.

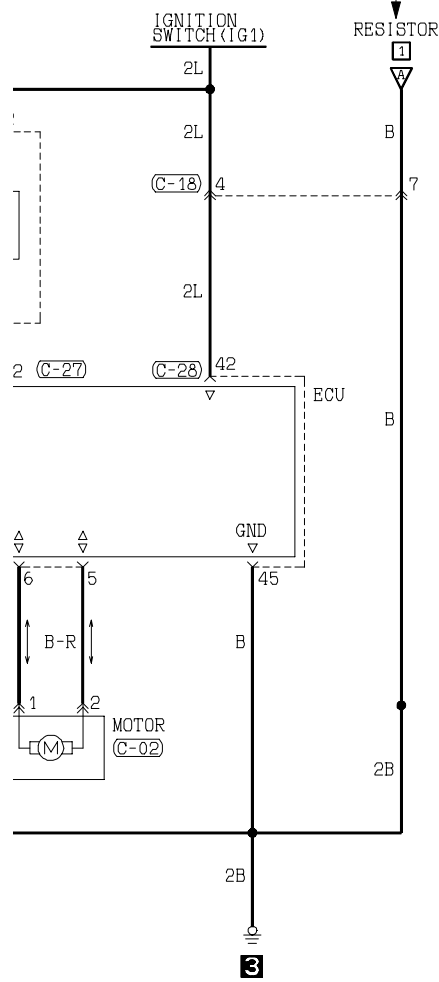
Each circuit diagram consists of block(s). The blocks are divided by page number.

Indicates that the diagram comes from **1** which belongs to the **1** block in the same circuit.

**1**



**2**



Indicates that the diagram continues at **2** which belongs to the **2** block in the same circuit.