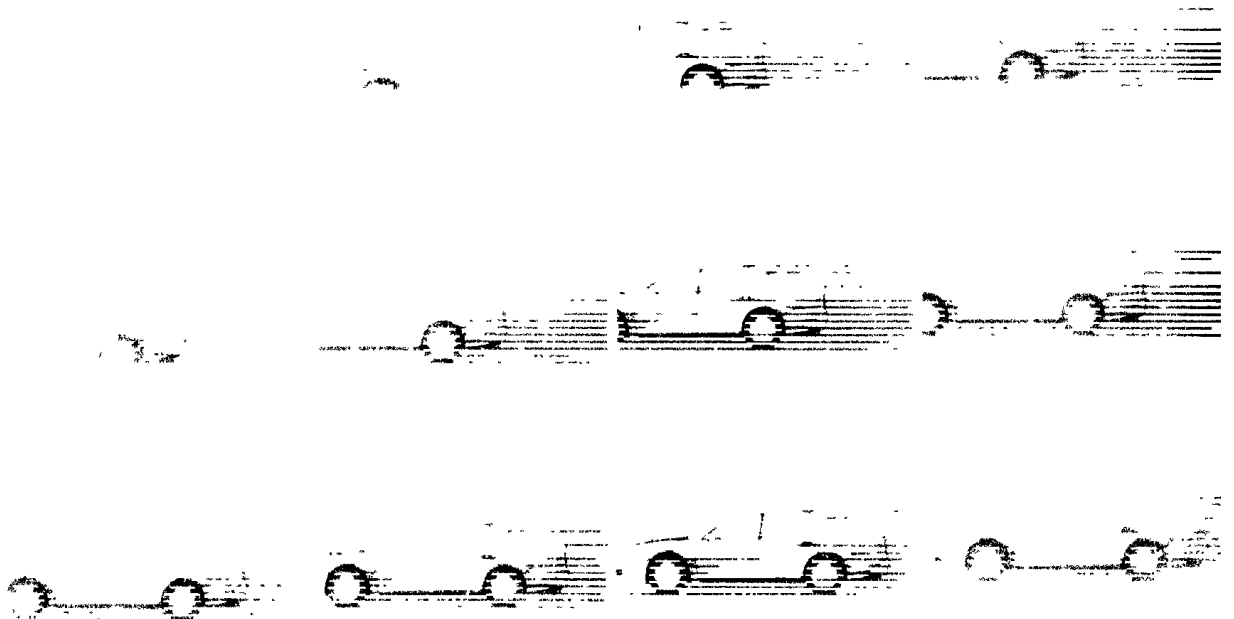
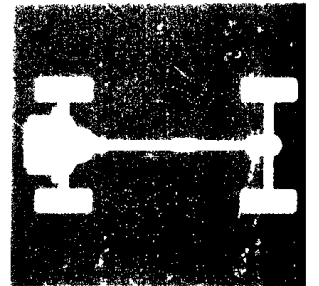




Workshop Manual

chassis

SIGMA '97



Pub. No. PWGE 9610

MITSUBISHI SIGMA

WORKSHOP MANUAL

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
PYGE9603

WORKSHOP MANUAL
BODY REPAIR MANUAL PBGE9608
ENGINE GROUP PWEE□□□□
(Looseleaf edition)
ELECTRICAL WIRING PHGE9701

PARTS CATALOGUE □□□□□□

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.



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GENERAL

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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) If it is possible that the SRS components are subjected to heat over 93°C in baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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 the asterisk (*) in the table of contents in each group indicate operations requiring warnings.

In Order to Prevent Vehicles From Fire	22	SUPPORT LOCATIONS FOR LIFTING AND JACKING	27
Engine Oils	22	TIGHTENING TORQUE	29
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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" are procedures for performing inspections and adjustments of particularly important locations with regard to the construction and for maintenance and servicing, but other inspections (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.

INDICATION OF DESTINATION

General Export and GCC are used for convenience to indicate destination.

NOTE

1. "General Export" means territories other than Europe, GCC, China, Australia, New Zealand, the U.S.A. and Canada.
2. "GCC" indicates countries that are members of the (Persian) Gulf Cooperation Council of nations.

3. In some instances, vehicles with other specifications may be shipped to some countries.

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.

MODEL INDICATIONS

The following abbreviations are used in this manual for classification of model types.

M/T: Indicates manual transmission or vehicle equipped with a manual transmission.

A/T: Indicates automatic transmission, or models equipped with an automatic transmission.

SOHC: Indicates an engine with the single overhead camshaft, or a model equipped with such an engine.

MPI: Indicates multipoint fuel injection.

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 the 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.

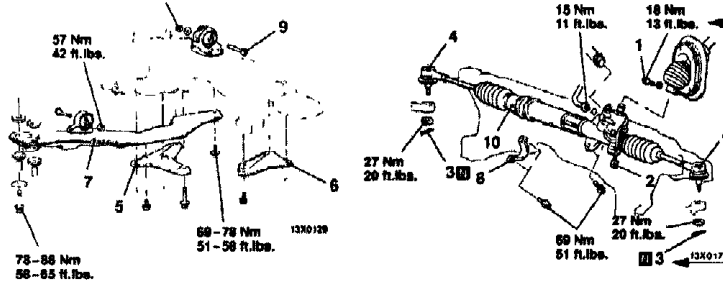
STEERING – Power Steering Gear Box

37A-23

POWER STEERING GEAR BOX
REMOVAL AND INSTALLATION

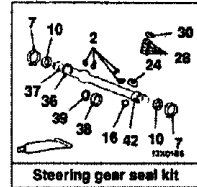
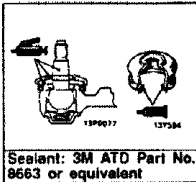
110000636

- Pre-removal Operation**
- Power Steering Fluid Draining (Refer to P37A-15)
 - Stabilizer Bar Removal (Refer to GROUP 33A – Stabilizer Bar)



Denotes tightening torque.

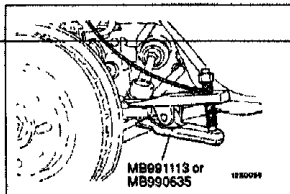
Denotes non-re-usable part.



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

Removal steps

1. Joint assembly and gear box connecting bolt
2. Solenoid valve connector <Vehicles with EPS>
3. Cotter pin
4. Connection for tie-rod end and knuckle
5. Stay (LH)
6. Stay (RH)
7. Center member assembly
8. Clamp
9. Bolt
10. Gear box assembly

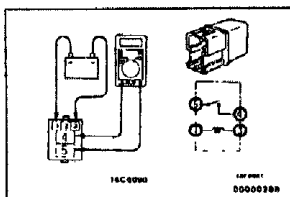


REMOVAL SERVICE POINTS

◀▶ TIE-ROD END DISCONNECTION

- Caution**
1. Be sure to tie the cord of the special tool to the nearby part.
 2. Loosen the nut but do not remove it.

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



FOG LIGHT RELAY CONTINUITY CHECK

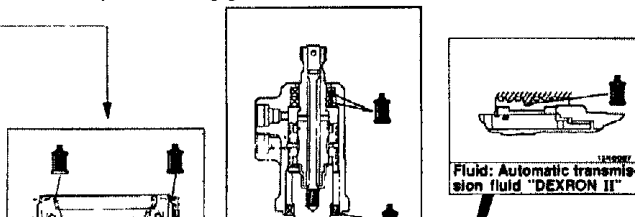
Battery voltage	Terminal			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○

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

37A-28

STEERING – Power Steering Gear Box

LUBRICATION AND SEALING POINTS
◀Conventional power steering gear box>



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

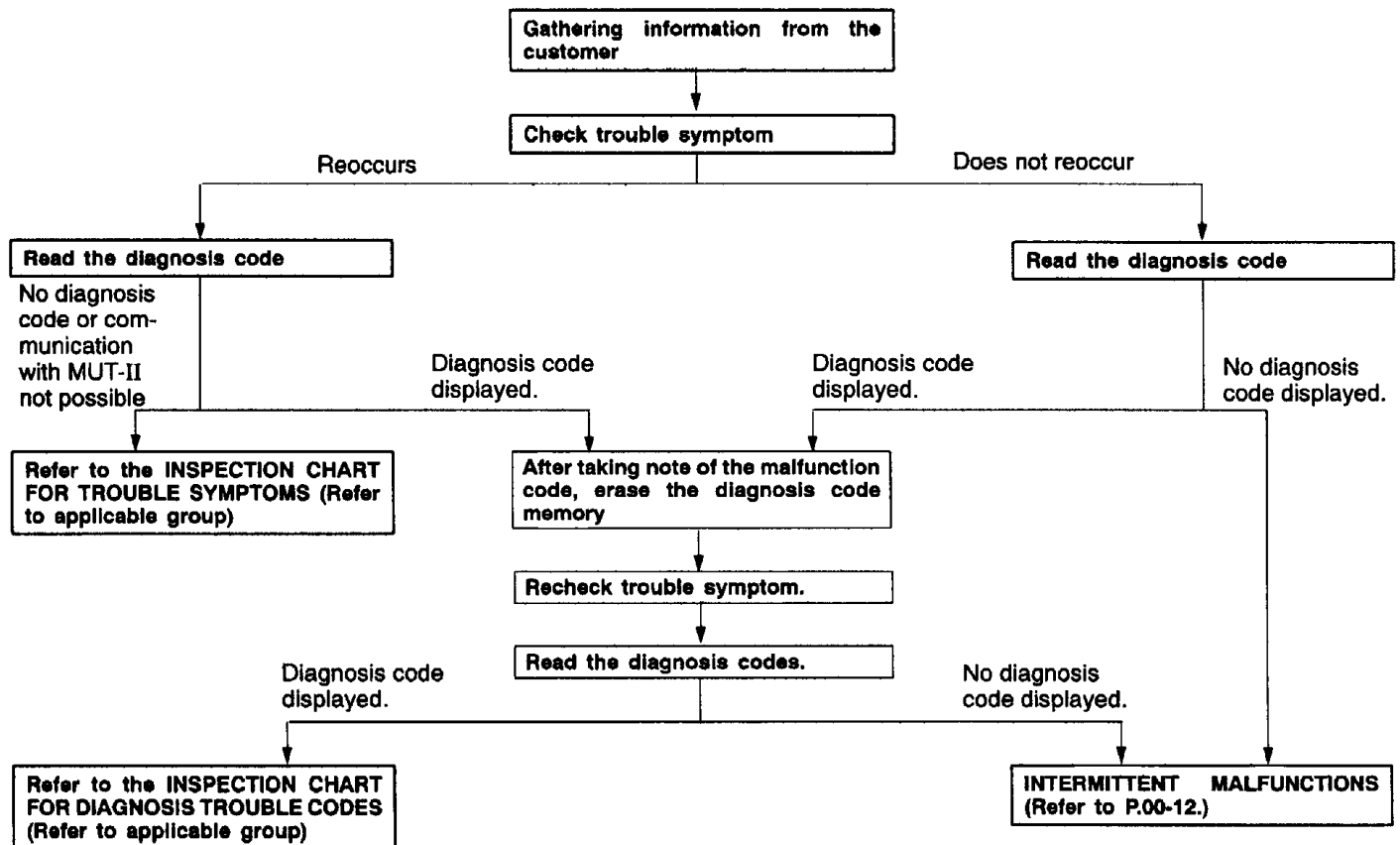
Troubleshooting of electronic control systems for which the MUT-II can be used follows the basic outline described below. Furthermore, even in systems for which the MUT-II cannot be used, part of these systems still follow this outline.

TROUBLESHOOTING CONTENTS

1. STANDARD FLOW OF DIAGNOSTIC 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.00-9 for How to Use 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.00-9 for How to Use the Inspection Procedures.)

8. SERVICE DATA REFERENCE TABLE

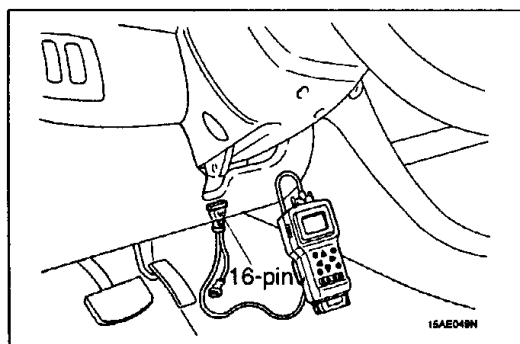
Inspection items and normal judgement values have been provided in this chart as reference information.

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

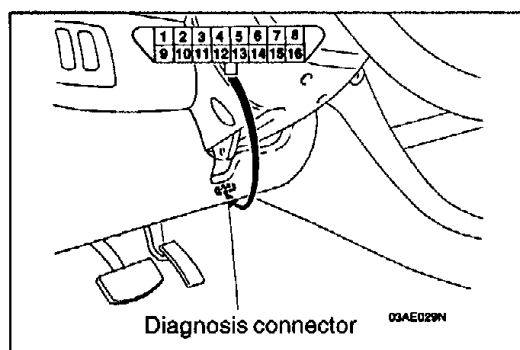
When there are inspection procedures using an oscilloscope, these are listed here.

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

Applicable system

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

Indications of diagnosis code by warning lamp

When the diagnosis code No.24 is output	When no diagnosis code is output
1.5 secs. 0.5 sec. 0.5 sec. On Off Pause time 3 secs. Tens signal Place division 2 secs. Units signal A03X0113	0.5 sec. On Off A03X0114

METHOD OF ERASING DIAGNOSIS CODES WHEN USING THE MUT-II

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

Caution

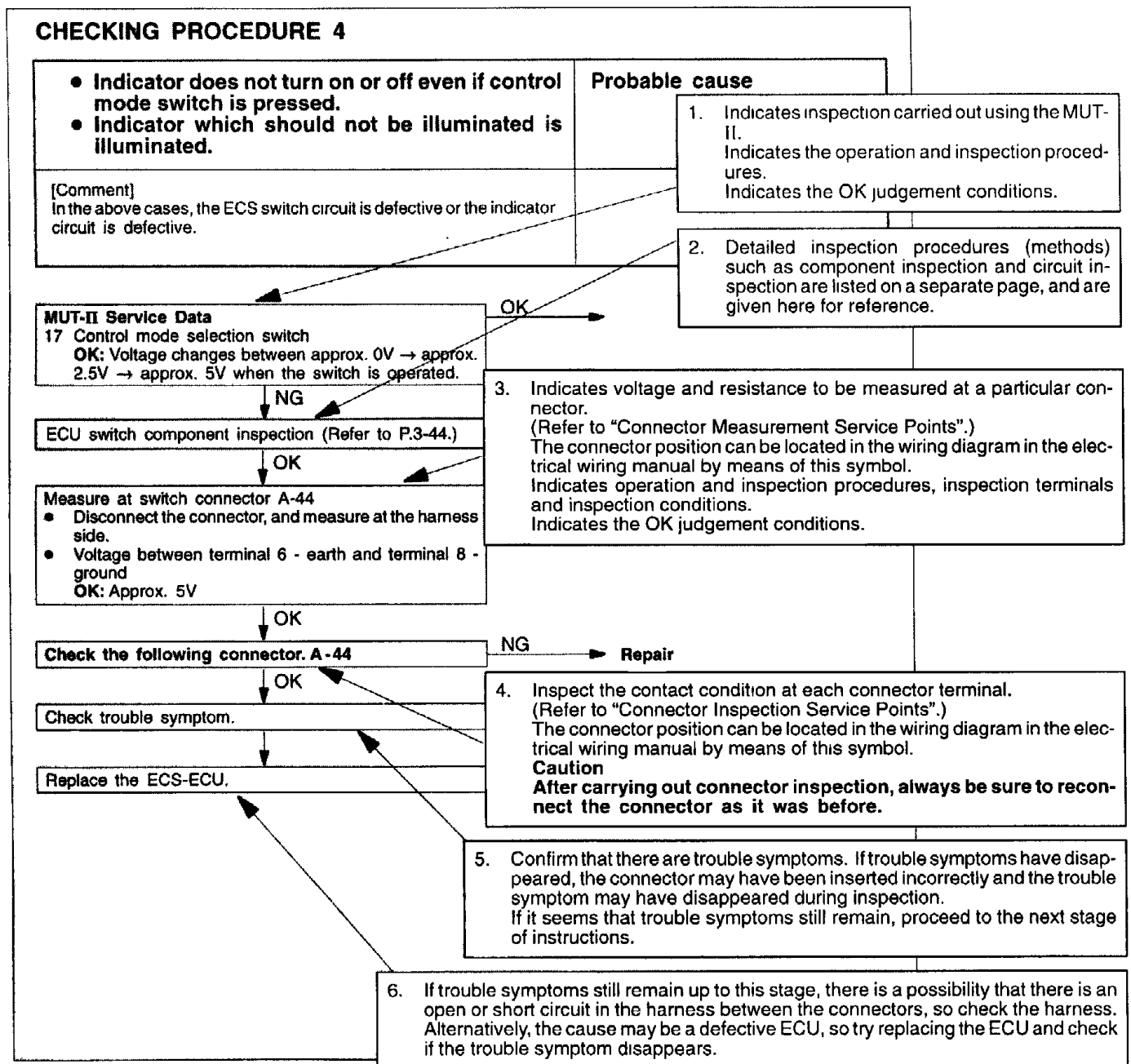
Turn off the ignition switch before connecting or disconnecting the MUT-II.

WHEN NOT USING THE MUT-II <MPI AND A/T>

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.

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

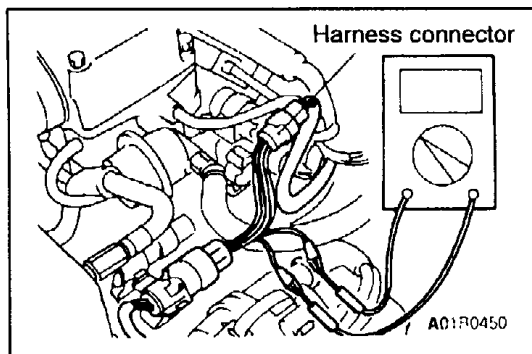
Check for an open or short circuit in the harness between the terminals which were defective according to the connector measurements. Carry out this inspection while referring to the electrical wiring manual. Here, "Check harness between power supply and terminal xx" also includes checking for blown 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

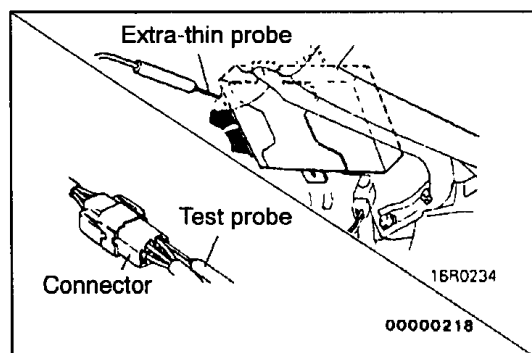
Turn the ignition switch to OFF when connecting and disconnecting the connectors, and turn the ignition switch to ON when measuring if there are no instructions to the contrary.



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

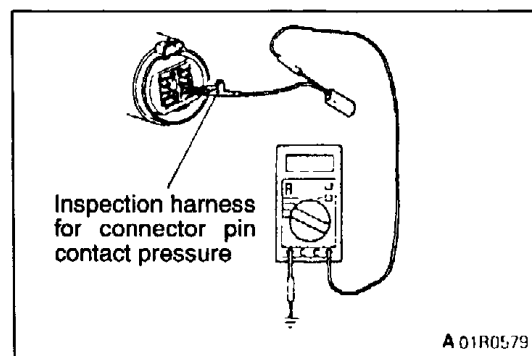
Waterproof Connectors

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



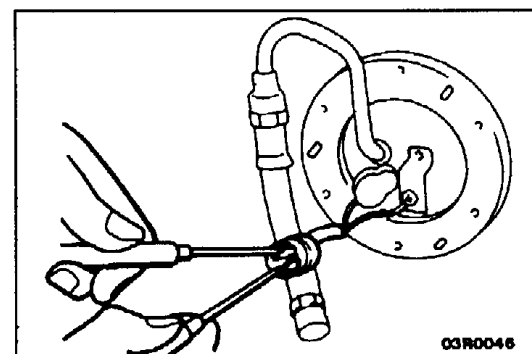
Ordinary (non-waterproof) Connectors

Check by inserting the test probe from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test probe, 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 probe should never be forcibly inserted, as it may cause a defective contact.



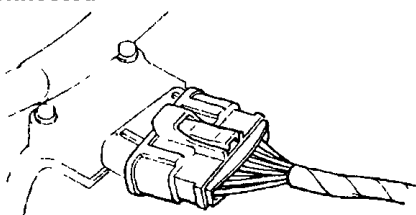
<When Inspecting a Male Pin>

Touch the pin directly with the test bar.

Caution

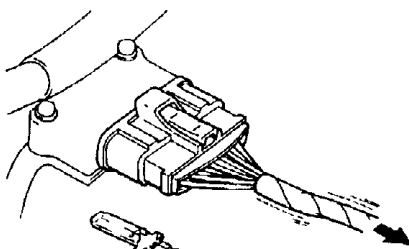
At this time, be careful not to short the connector pins with the test probes. To do so may damage the circuits inside the ECU.

Connector disconnected or improperly connected



16S0256

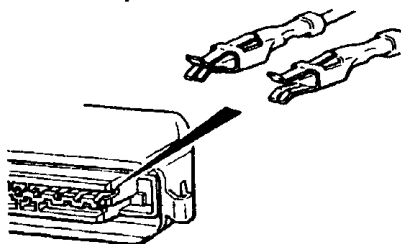
Defective connector contact



16X0369

Harness wire breakage at terminal section

Low contact pressure



16S0254
00000219

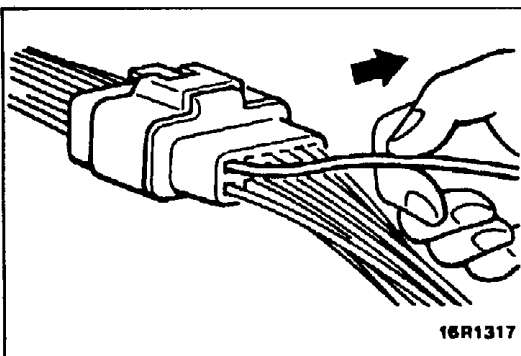
CONNECTOR INSPECTION

VISUAL INSPECTION

- Connector is disconnected or improperly connected.
- Connector pins are pulled out due to harness tension at terminal section.
- Low contact pressure between male and female terminals.
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals.

CONNECTOR PIN INSPECTION

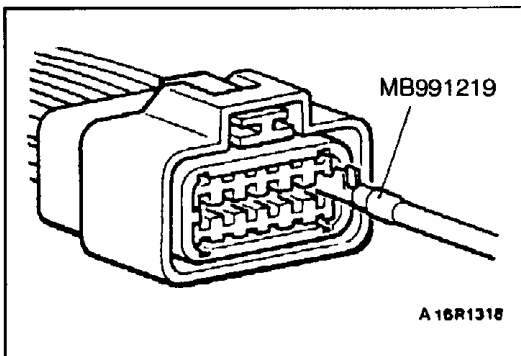
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even when the connector body is connected, because the pins may pull out of the back side of the connector. Therefore, gently pull the wires one by one to make sure that no pins pull out of the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



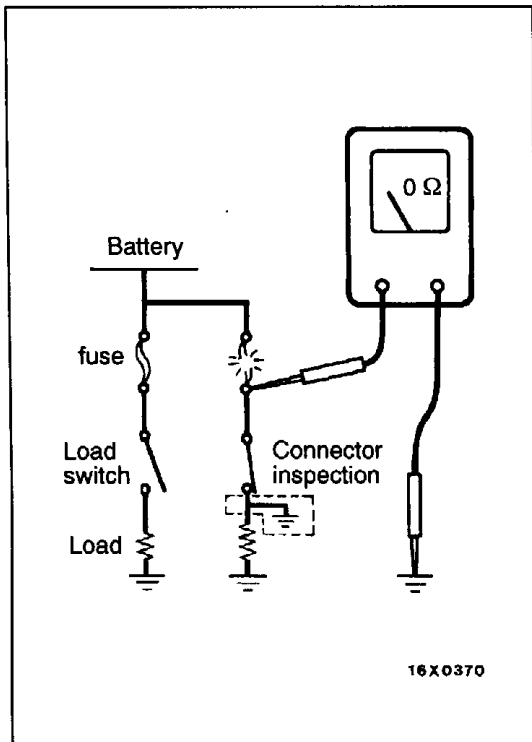
16R1317

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 female pins. [Pin drawing force : 1 N or more]



A 16R1318

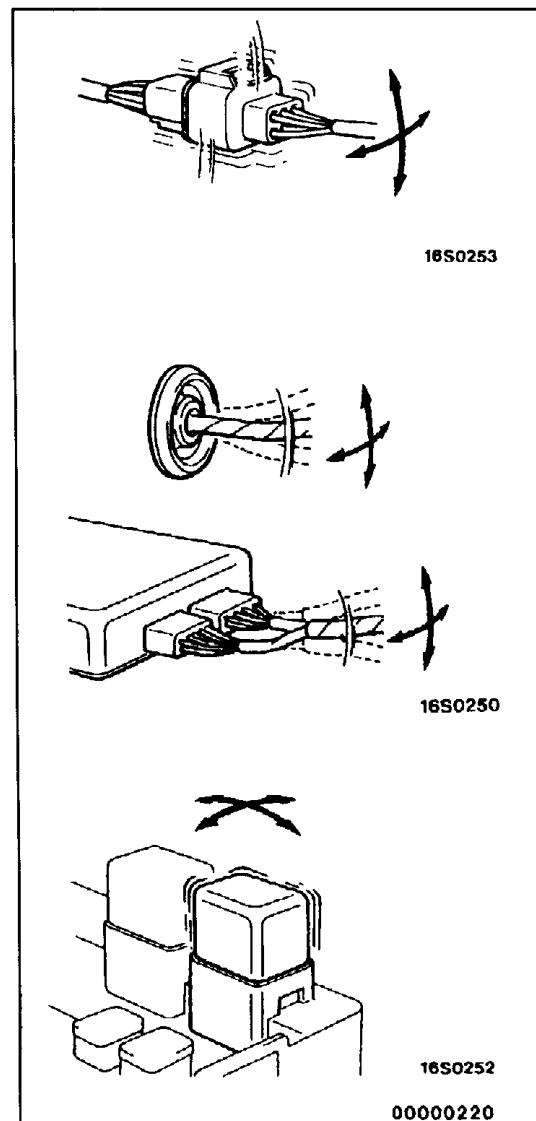


INSPECTION SERVICE POINTS FOR A BLOWN FUSE

Remove the fuse and measure the resistance between the load side of the fuse and ground. 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

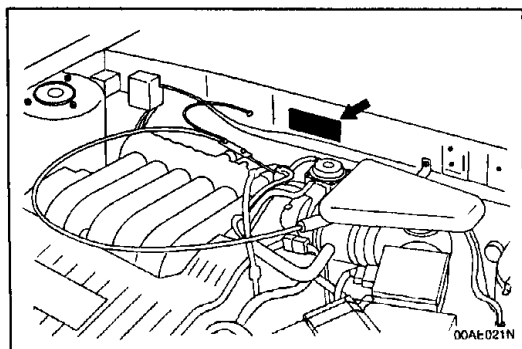
Intermittent malfunctions often occur under certain conditions, and if these conditions can be ascertained, determining the cause becomes simple. In order to ascertain the conditions under which an intermittent malfunction occurs, first ask the customer for details about the driving conditions, weather 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

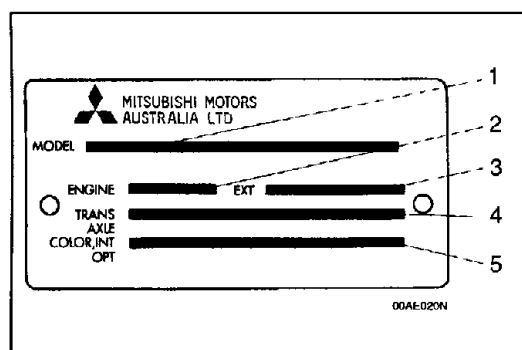
If determining the cause is difficult, the flight recorder function of the MUT-II can also be used.



VEHICLE IDENTIFICATION

VEHICLE INFORMATION CODE PLATE LOCATION

The vehicle information code plate is riveted onto the bulkhead in the engine compartment.



CODE PLATE DESCRIPTION

The plate shows model code, engine model, transmission model, and body colour code.

No.	Item	Contents	
1	MODEL	F38AT	F38AT: Vehicle model
		RPELJ2	RPELJ2: Model series
2	ENGINE	6G74	Engine model
3	EXT	CA6A	Exterior code
4	TRANS	F4A51	Transmission code
5	COLOUR, INT OPT	W4587V 03V	W45: Body colour code
			87V: Interior code
			03V: Equipment code

MODELS

VEHICLES FOR GCC

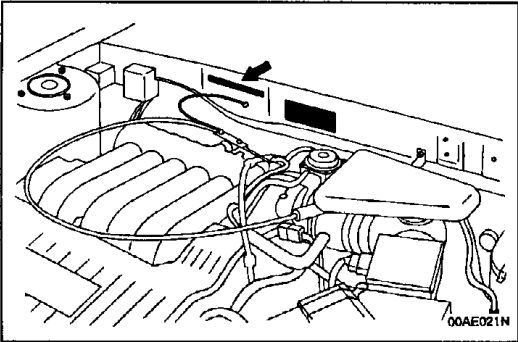
Model code		Engine model	Transmission model	Fuel supply system
F36A	TNHELJW	6G72-SOHC (2,972mℓ)	F5M51 (2WD-5M/T)	MPI
	TNXELJW			
	TRHELJW		F4A51 (2WD-4A/T)	
	TRXELJW			

VEHICLES FOR GENERAL EXPORT

Model	Model code		Engine model	Transmission model	Fuel supply system
Except vehicles for Hong Kong, Singapore etc.	F36A	TRHERJ1	6G72-SOHC (2,972mℓ)	F4A51 (2WD-4A/T)	MPI
		TRXERJ1			
Vehicles for Hong Kong, Singapore etc.		TRHERJD			
		TRXERJD			

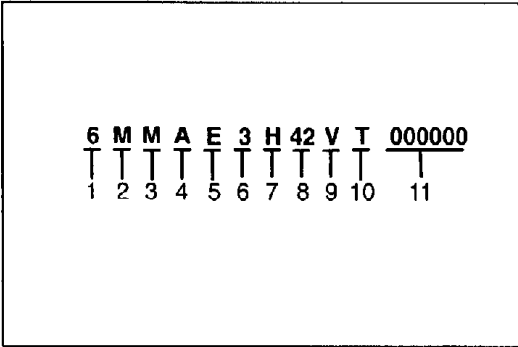
VEHICLES FOR CHINA

Model code		Engine model	Transmission model	Fuel supply system
F36A	TNXELJC	6G72-SOHC (2,972mℓ)	F5M51 (2WD-5M/T)	MPI
	TRXELJC		F4A51 (2WD-4A/T)	



CHASSIS NUMBER

The chassis number is stamped on the engine bulkhead next to the vehicle information code plate.

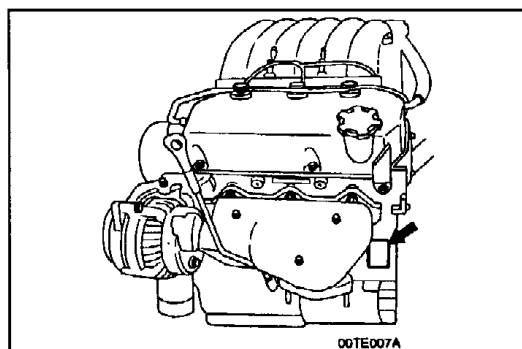


No.	Items		Contents
1-3	Fixed figure	6MM	Manufacturers identification
4	Car line	A	Sigma (LHD)
		K	Sigma (RHD)
5	Development order	E	E-Series
6	Engine/transmission combination	3	6G72: 2,972mℓ leaded petrol engine, M/T
		4	6G72: 2,972mℓ leaded petrol engine, A/T
		5	6G72: 2,972mℓ unleaded petrol engine, M/T
		6	6G72: 2,972mℓ unleaded petrol engine, A/T
7	Price line	C	LS (China specification)
		H	High (General export [Except vehicles for Hong Kong, Singapore etc.] and GCC)
		X	LS (General export [Except vehicles for Hong Kong, Singapore etc.] and GCC)
		G	High (Hong Kong, Singapore etc.)
		L	LS (Hong Kong, Singapore etc.)
8	Body type	42	4-door hardtop sedan
9	Model year	V	1997
10	Plant	T	Tonsley Park
11	Serial number	–	–

F	36	A	T	N	H	E	L	J	W
1	2	3	4	5	6	7	8	9	10

MODEL CODE

No.	Items	Contents
1	Development	F: MITSUBISHI SIGMA
2	Engine type	36: 2,972 mℓ petrol engine
3	Sort	A: Passenger car
4	Body style	T: 4-door hardtop
5	Transmission type	N: 5-speed manual transmission R: 4-speed automatic transmission
6	Trim level	H: – X: LS
7	Specified engine feature	E: SOHC-MPI
8	Steering wheel location	L: Left hand R: Right hand
9	Source	J: Mitsubishi Motors Australia Ltd.
10	Destination	1: For General Export (Except vehicles for Hong Kong, Singapore, etc.) W: For GCC C: For China D: Hong Kong, Singapore etc.

**ENGINE MODEL NUMBER**

1. The engine model number is stamped at the front side on the top edge of the cylinder block as shown in the following.

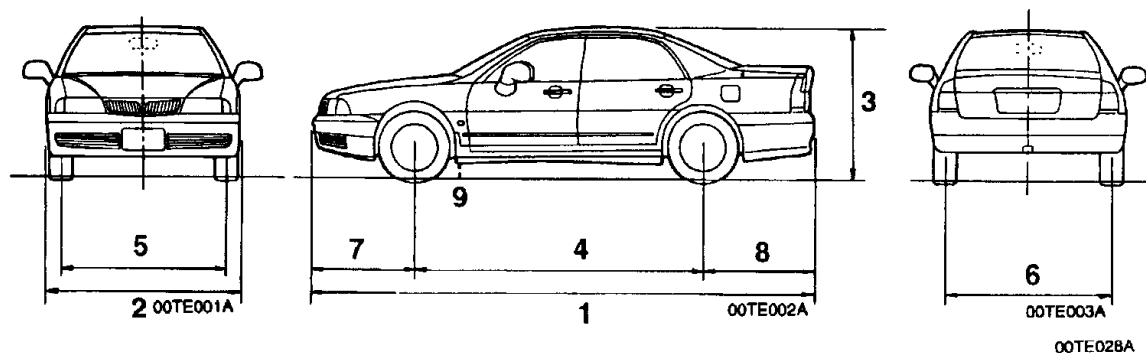
Engine model	Engine displacement mℓ
6G72	2,972

2. The engine serial number is stamped near the engine model number.

Engine serial number	6G72M: 000001–999999
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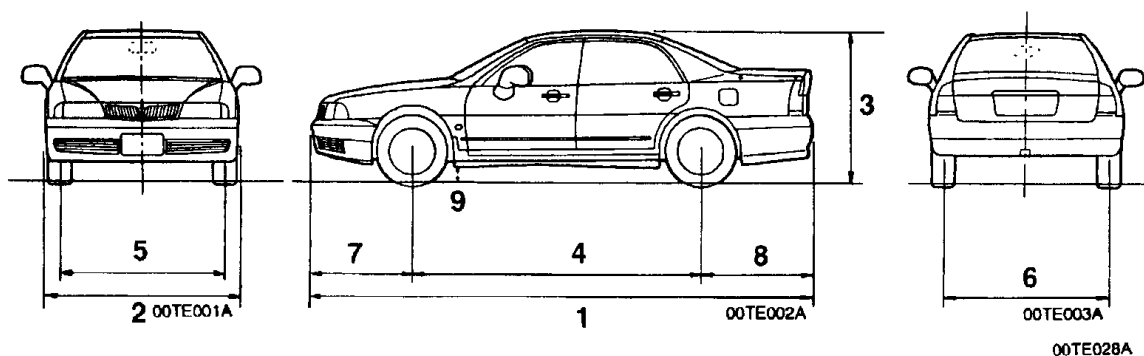
MAJOR SPECIFICATIONS

<VEHICLES FOR GENERAL EXPORT>



Items			F36AT RHERJ1	F36AT RXERJ1	F36AT RHERJD	F36AT RXERJD
Vehicle dimen- sions	Overall length mm	1	4,785			
	Overall width mm	2	1,785			
	Overall height (Unladen) mm	3	1,435			
	Wheelbase mm	4	2,720			
	Tread-front mm	5	1,545			
	Tread-rear mm	6	1,535			
	Overhang-front mm	7	970			
	Overhang-rear mm	8	1,103			
	Minimum running ground clearance mm	9	165			
Vehicle weight kg	Curb weight		1,510	1,520	1,505	1,515
	Gross vehicle weight rating		1,990	1,990	1,990	1,990
	Gross axle weight rating-front		955	970	950	965
	Gross axle weight rating-rear		555	550	555	550
Seating capacity			5			
Engine	Model No.		6G72 (SOHC)			
	Piston displacement cm ³		2,972			
Trans- mission	Model No.		F5M51	F4A51	F5M51	F4A51
	Type		5-speed man.	4-speed auto.	5-speed man.	4-speed auto.
Fuel system	Fuel supply system		Electronic control multipoint fuel injection			

MAJOR SPECIFICATIONS

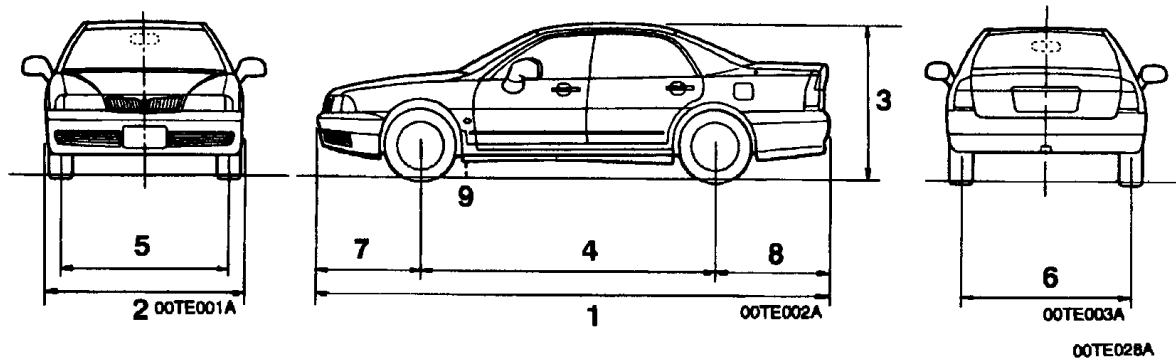


<VEHICLES FOR GCC>

Items			F36AT NHELJW	F36AT RHELJW	F36AT NXELJW	F36AT RXELJW
Vehicle dimen- sions	Overall length mm	1	4,785			
	Overall width mm	2	1,785			
	Overall height (Unladen) mm	3	1,435			
	Wheelbase mm	4	2,720			
	Tread-front mm	5	1,545			
	Tread-rear mm	6	1,535			
	Overhang-front mm	7	970			
	Overhang-rear mm	8	1,103			
	Minimum running ground clearance mm	9	165			
Vehicle weight kg	Curb weight		1,481	1,511	1,490	1,520
	Gross vehicle weight rating		1,990	1,990	1,990	1,990
	Gross axle weight rating-front		926	956	940	970
	Gross axle weight rating-rear		555	555	550	550
Seating capacity			5			
Engine	Model No.		6G72 (SOHC)			
	Piston displacement cm ³		2,972			
Trans- mission	Model No.		F5M51	F4A51	F5M51	F4A51
	Type		5-speed man.	4-speed auto.	5-speed man.	4-speed auto.
Fuel system	Fuel supply system		Electronic control multipoint fuel injection			

MAJOR SPECIFICATIONS

<VEHICLES FOR CHINA>

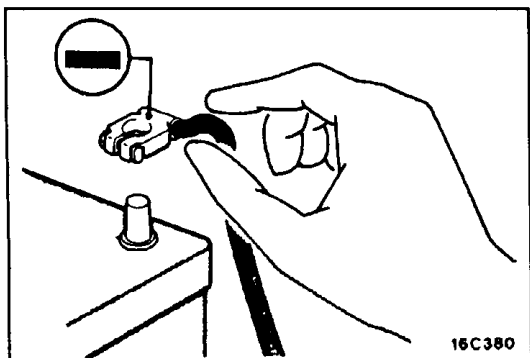


Items		F36AT NXELJC	F36AT RXELJC
Vehicle dimensions	Overall length mm	1 4,785	
	Overall width mm	2 1,785	
	Overall height (Unladen) mm	3 1,435	
	Wheelbase mm	4 2,720	
	Tread-front mm	5 1,545	
	Tread-rear mm	6 1,535	
	Overhang-front mm	7 970	
	Overhang-rear mm	8 1,103	
	Minimum running ground clearance mm	9 165	
Vehicle weight kg	Curb weight	1,490	1,520
	Gross vehicle weight rating	1,990	1,990
	Gross axle weight rating-front	940	970
	Gross axle weight rating-rear	550	550
Seating capacity		5	
Engine	Model No.	6G72 (SOHC)	
	Piston displacement cm ³	2,972	
Transmission	Model No.	F5M51	F4A51
	Type	5-speed manual	4-speed automatic
Fuel system	Fuel supply system	Electronic control multipoint fuel injection	

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 Airbag components (SRS-ECU, air bag module and clock spring). If faulty, replace them.
 - (5) Warning labels must be heeded when servicing or handling SRS components. Warning labels are located in the following locations.
 - Hood
 - Sun visor
 - Glove box
 - SRS-ECU
 - Steering wheel
 - Air bag module
 - Clock spring
 - Steering gear and linkage clamp
 - (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 upward.
Do not place anything on top.
 - (7) When discarding an airbag module or disposing of a vehicle with an SRS air bag, ensure that you first activate the airbag.
 - (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 places 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) If there is any possibility that the SRS airbag component parts will be subjected to heat over 93°C, remove the component parts.
After installing the component parts, test the SRS warning lamp operation to confirm that the airbag system is normal.



SERVICING THE ELECTRICAL SYSTEM

1. Note the following before proceeding with work on the electrical system.
Note that the following must never be done:
Unauthorised modifications of any electrical device or wiring, because such modifications might lead to a vehicle malfunction, over-capacity or short-circuit that could result in a fire in the vehicle.
2. When servicing the electrical system, disconnect the negative cable terminal from the battery.

Caution

1. **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 semi-conductor parts being damaged.)
2. **After completion of the work steps [when the battery's negative (-) terminal is connected], warm up the engine and allow it to idle for approximately ten minutes under the conditions described below, in order to stabilise the engine control conditions, and then check to be sure that idling is satisfactory.**
Engine coolant temperature: 80–95°C
Lights, electric fans, accessories: OFF
Transmission: "N" or "P"
Steering wheel: neutral (centre) position

APPLICATION OF ANTI-CORROSION AGENTS AND UNDERCOATS

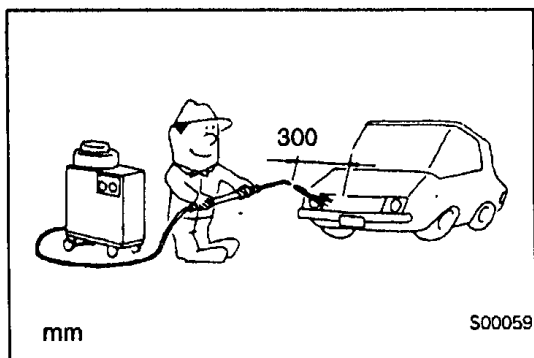
If oil or grease gets onto the oxygen sensor, it will cause a drop in the performance of the sensor.

Cover the oxygen sensor with a protective cover when applying anti-corrosion agents and undercoats.

PRE-INSPECTION CONDITION

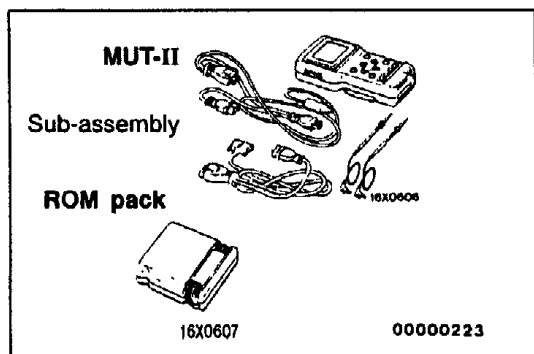
"Pre-inspection condition" refers to the condition that the vehicle must be in before proper engine inspection can be carried out. If you see the words "Set the vehicle to the pre-inspection condition" in this manual, it means to set the vehicle to the following condition.

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



VEHICLE WASHING

If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to maintain the spray nozzle at a distance of at least 300 mm from any plastic parts and all opening parts (doors, luggage compartment, etc.).

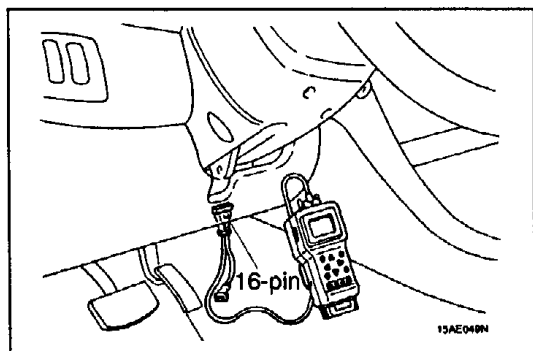


MUT-II

To operate the MUT-II, refer to the "MUT-II OPERATING INSTRUCTIONS".

Caution

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



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.

IN ORDER TO PREVENT VEHICLES FROM FIRE

"Improper installation of electrical or fuel related parts could cause a fire. In order to retain the high quality and safety of the vehicle, it is important that any accessories that may be fitted or modifications/repairs that may be carried out which involve the electrical or fuel systems, MUST be carried out in accordance with MMAL's information/instructions".

ENGINE OILS

Health Warning

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Recommended Precautions

The most effective precaution is to adapt working practices which prevent, as far as practicable, the risk of skin contact with mineral oils, for example by using enclosed systems for handling used engine oil and by degreasing components, where practicable, before handling them.

Other precautions:

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
- Wear protective clothing, including impervious gloves where practicable
- Avoid contaminating clothes, particularly underpants, with oil.
- Do not put oily rags in pockets, the use of overalls without pockets will avoid this.
- Do not wear heavily soiled clothing and oil-impregnated foot-wear. Overalls must be cleaned regularly and kept separately from personal clothing.
- Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be provided.
- Obtain First Aid treatment immediately for open cuts and wounds.
- Wash regularly with soap and water to ensure all oil is removed, especially before meals (skin cleansers and nail brushes will help). After cleaning, the application of preparations containing lanolin to replace the natural skin oils is advised.
- Do not use petrol, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
- Use barrier creams, applying them before each work period, to help the removal of oil from the skin after work.
- If skin disorders develop, obtain medical advice without delay.

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

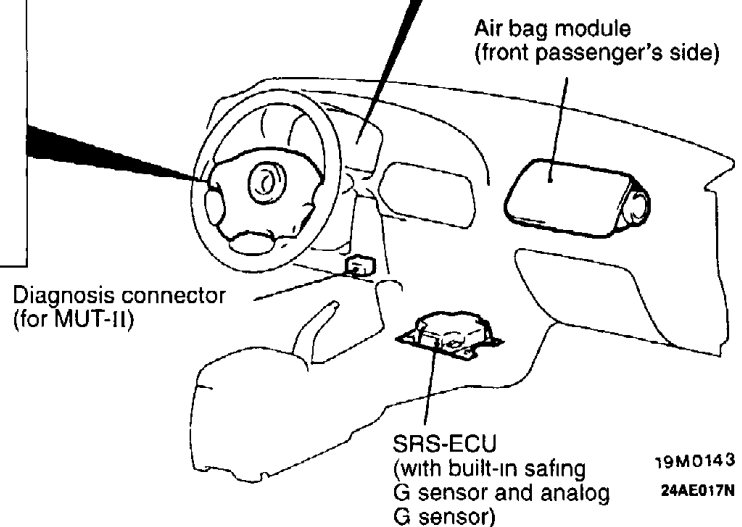
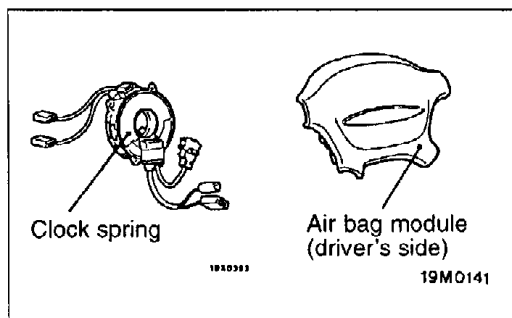
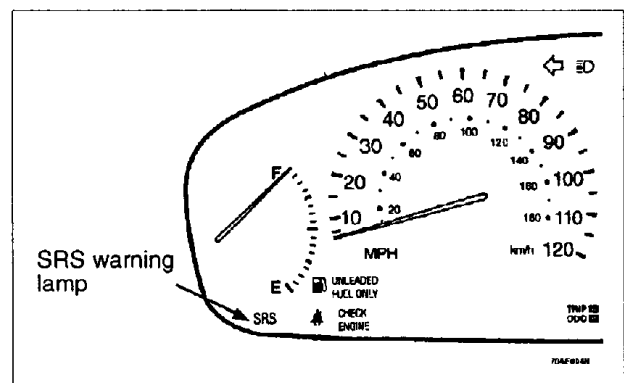
GENERAL INFORMATION

To improve safety, the SRS is available as optional parts.

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 the other 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 authorised 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 service personnel (by inadvertent deployment of the air bags) or the driver (by rendering the SRS inoperative).



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 body wiring harness.
21			

NOTE

*: Vehicles with front passenger's air bag

- 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.
- Whenever you finish servicing the SRS, check warning lamp operation to make sure that the system functions properly. (Refer to GROUP 52B – SRS Maintenance.)
- Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.
- If you have any questions about the SRS, please contact your local distributor.

NOTE

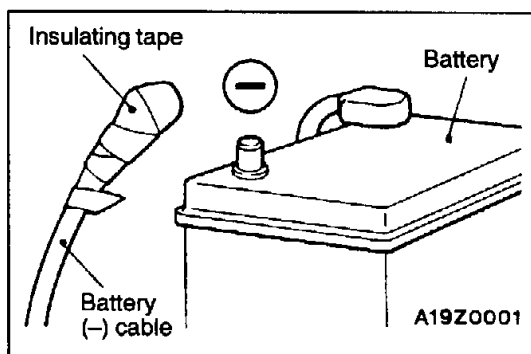
SERIOUS INJURY CAN RESULT FROM UNINTENDED AIR BAG DEPLOYMENT, SO USE ONLY THE PROCEDURES AND EQUIPMENT SPECIFIED IN THIS MANUAL.

SERVICE PRECAUTIONS

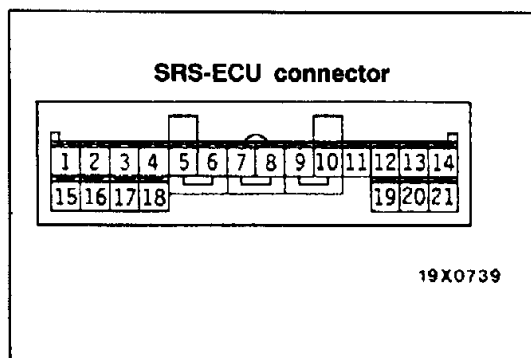
1. In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment on or near SRS components, except those specified on GROUP 52B.
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

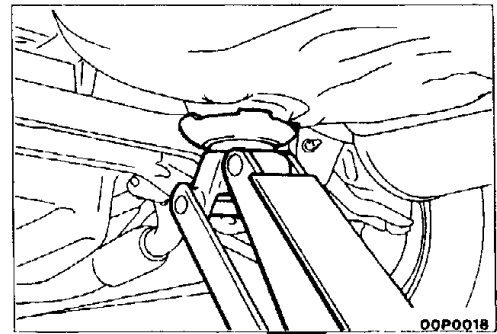
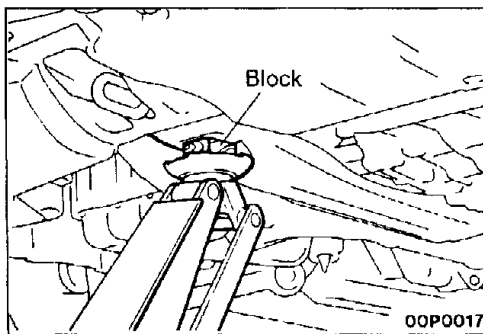
*: Vehicles with front passenger's air bag.
If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENTS SERVICE procedures in this manual. (Refer to GROUP 52B.)



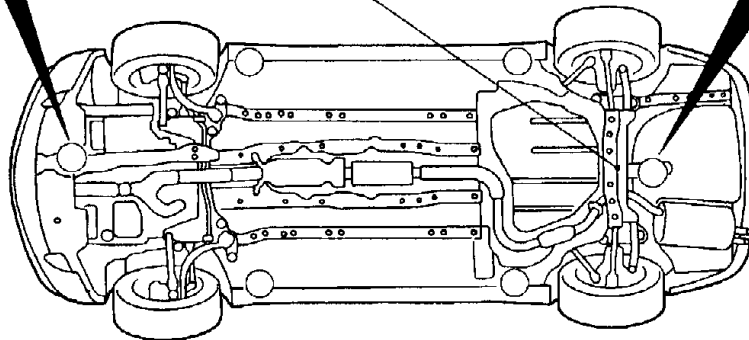
4. After disconnecting the battery cable, wait 60 seconds or more before proceeding with the following work. The SRS system is designed to retain enough voltage to deploy the air bag for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment 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.

SUPPORT LOCATIONS FOR LIFTING AND JACKING**GARAGE JACK**

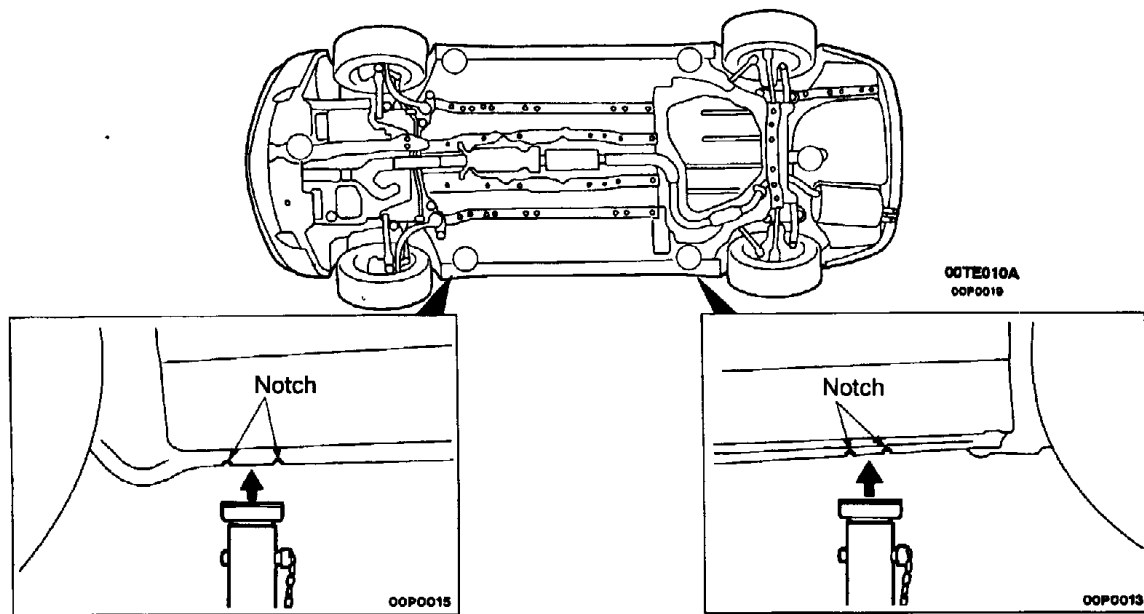
Caution
Never support the vehicle by
the rear floor cross member.



00P0018
00TE009A

Caution
Never support any point other than the specified one,
or it will be deformed.

RIGID RACK

**Caution**

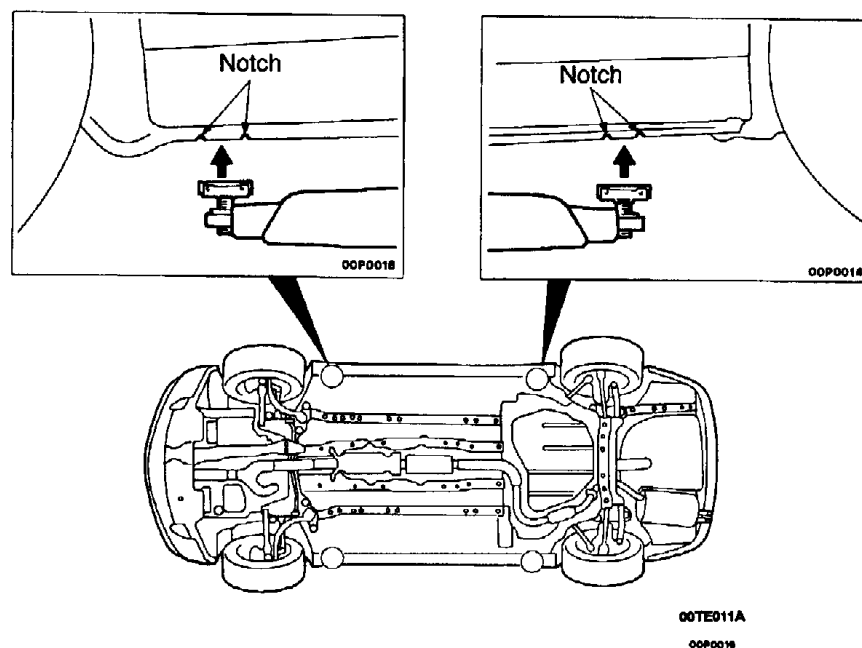
For lifting, put rubber or similar between the side sill and rigid rack, or the side sill area will be damaged.

POST TYPE

Special care should be taken when raising the vehicle on a frame contact type hoist. The hoist must be equipped with the proper adaptors in order to support the vehicle at the proper locations.

Caution

When service procedures require removing rear suspension, fuel tank and spare tyre, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping of centre of gravity changes.



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	5	6
M6	1.0	5	9	10
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	5	10	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

ENGINE <6G7>

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Compression Pressure Check	9	ENGINE ASSEMBLY	33
Manifold Vacuum Check	10		
Lash Adjuster Check	11		

GENERAL INFORMATION

Items		Specifications
Total displacement ml		2,972
Bore x Stroke mm		91.1 x 76.0
Compression ratio		9.0
Combustion chamber		Pentroof type
Camshaft arrangement		SOHC
Number of valves	Intake	12
	Exhaust	12
Valve timing	Intake	Opening BTDC 9°, Closing ABDC 59°
	Exhaust	Opening BBDC 47°, Closing ATDC 21°
Fuel system		Electronic control multipoint fuel injection
Rocker arm		Roller type
Auto-lash adjuster		Equipped

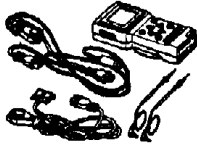
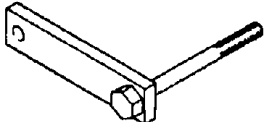
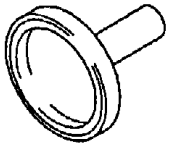
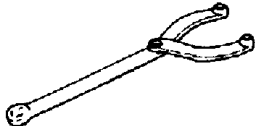
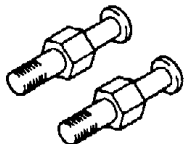
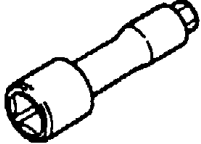
SERVICE SPECIFICATIONS

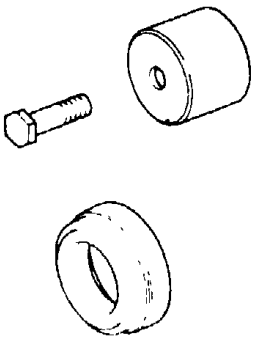
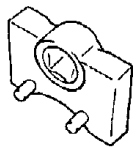
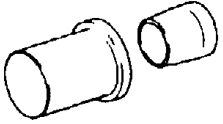
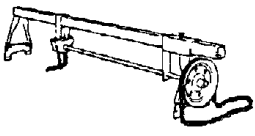
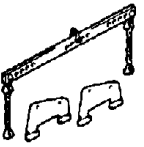
Items			Standard value	Limit
Alternator and A/C compressor drive belt tension	Tension N	When checked	392–588	—
		When a used belt is installed	441–539	—
		When a new belt is installed	637–833	—
	Deflection (Reference value) mm	When checked	5.0–7.0	—
		When a used belt is installed	5.5–6.5	—
		When a new belt is installed	4.0–5.0	—
Power steering oil pump drive belt tension	Tension N	When checked	294–490	—
		When a used belt is installed	343–441	—
		When a new belt is installed	490–686	—
	Deflection (Reference value) mm	When checked	13.0–17.0	—
		When a used belt is installed	14.0–16.0	—
		When a new belt is installed	11.0–13.0	—
Basic ignition timing at idle			5° BTDC ± 3°	—
Actual ignition timing at curb idle			Approx. 15° BTDC	—
Curb idle speed r/min			700±100	—
CO contents %			0.5 or less	—
Compression pressure (at engine speed of 250–400 r/min) kPa			1200	Min. 890
Compression pressure difference of all cylinder kPa			—	Max. 98
Intake manifold vacuum kPa			—	Min. 60
Timing belt tension torque Nm			4.4	—
Auto tensioner rod protrusion amount mm			3.8–5.0	—

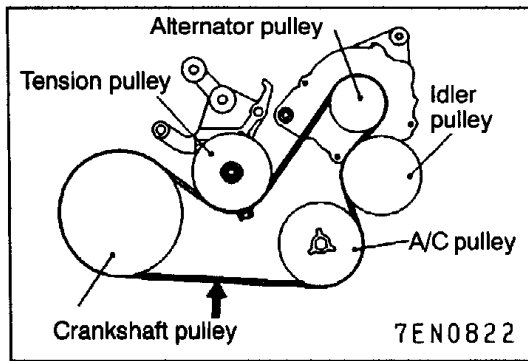
SEALANT

Items	Recommended sealant
Oil pan	MITSUBISHI GENUINE Part No. MD970389 or equivalent

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II sub-assembly	Checking ignition timing
	—	ROM pack	
	MD998781	Flywheel stopper	Securing the flywheel <M/T> or the drive plate <A/T>
	MD998718	Crankshaft rear oil seal installer	Installation of the crankshaft rear oil seal
	MB990767	End yoke holder	Supporting the sprocket and shaft pulley during removal and installation Use with MD998715
	MD998715	Pulley holding pins	Supporting the crankshaft pulley when crankshaft bolt and pulley are removed or reinstalled. Use together with MB990767 Camshaft pulley supporting
	MD998769	Crankshaft sprocket spacer	Used if the crankshaft needs to be rotated to attach the timing belt, etc.
	MD998051	Wrench, cylinder head bolt	Loosening and tightening of cylinder head bolt

Tool	Number	Name	Use
	MD998713	Camshaft oil seal installer	Camshaft oil seal installation
	MB991559	Camshaft oil seal installer	Press fitting the camshaft oil seal (For left bank)
	MD998767	Tension pulley socket wrench	Adjustment of the timing belt
	MD998717	Crankshaft front oil seal installer	Press-fitting of crankshaft front oil seal
 Z203827	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
 B991453	MB991453	Engine hanger	



ON-VEHICLE SERVICE

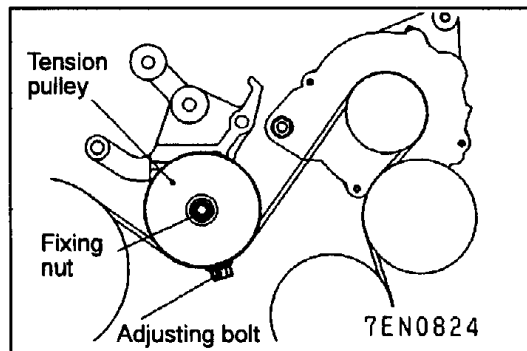
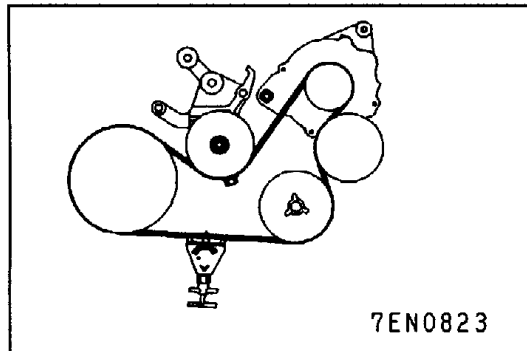
DRIVE BELT TENSION CHECK AND ADJUSTMENT

ALTERNATOR AND AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION CHECK

Use a belt tension gauge to check that the belt tension is at the standard value at a point as shown in the illustration. In addition, press this section with a force of 98N and check that the amount of belt deflection is at the standard value.

Standard value (for each belt):

Tension N	392–588
Deflection (Reference value) mm	5.0–7.0



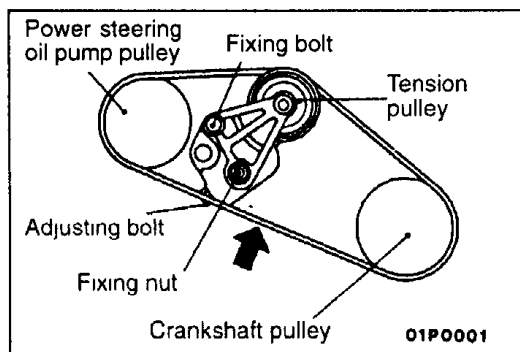
ALTERNATOR AND AIR-CONDITIONING COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

1. Loosen the tension pulley fixing nut.
2. Adjust the belt tension using the adjusting bolt.
3. Tighten the fixing nut.

Standard value:

Items	When a used belt is installed	When a new belt is installed
Tension N	441–539	637–833
Deflection (Reference value) mm	5.5–6.5	4.0–5.0

4. Crank the engine once or more.
5. Check the belt tension.



POWER STEERING OIL PUMP BELT TENSION CHECK AND ADJUSTMENT

1. Use a belt tension gauge to check that the belt tension is at the standard value at a point half-way between the two pulleys (indicated by an arrow in the illustration). In addition, press this section with a force of 98N and check that the amount of belt deflection is at the standard value.

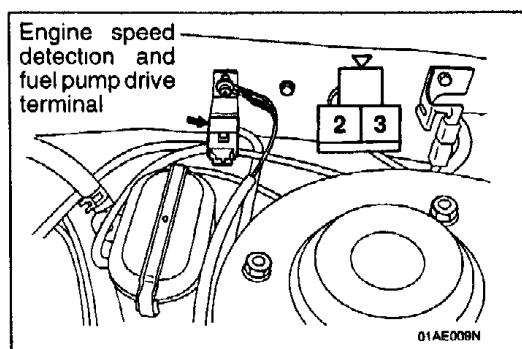
Standard value:

Items	When checked	When a used belt is installed	When a new belt is installed
Tension N	294–490	343–441	490–686
Deflection (Reference value) mm	13.0–17.0	14.0–16.0	11.0–13.0

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
 - (1) Loosen the tension pulley nut.
 - (2) Adjust the amount of belt deflection using adjusting bolt.
 - (3) Tighten the tension pulley nut.

Tightening torque: 48Nm

 - (4) Rotate the crankshaft once or more.
 - (5) Check the belt deflection amount and tension, and readjust if necessary.



IGNITION TIMING CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Insert a paper clip into the No. 3 terminal of the 3 pin connector shown.
3. Connect a primary voltage detection type tachometer to the paper clip.
4. Install the timing light.
5. Start the engine and run at idle.
6. Check that the idle speed is about 700 r/min.
7. Turn the ignition switch to OFF.
8. Connect the MUT-II to the diagnosis connector.
9. Start the engine and run it at idle.
10. Select the MPI system Actuator Test from the MUT-II menu and scroll to item 17 – Basic Ignition Timing.
11. Press the “Y” Key and check that the basic ignition timing is the standard value.

Standard value: 5° BTDC±3°

12. If the ignition timing value is not within the standard value range refer to GROUP 13A – On-vehicle Inspection of MPI Components.

13. Press the MUT-II clear key (Select forced driving cancel mode) to release the Actuator test.

Caution

If the test is not cancelled, forced driving will continue for 27 minutes. Driving under this condition may damage the engine.

14. Check that the idling ignition timing is at the correct value.

Standard value: Approx. 15° BTDC

NOTE

1. Ignition timing is variable within about $\pm 8^\circ$, even under normal operating conditions.
2. And it is automatically further advanced by about 5° from 15° BTDC at higher altitudes.

IDLE SPEED CHECK

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

Standard value: 5° BTDC $\pm 3^\circ$

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

Curb idle speed: 700 $\pm$ 100 r/min

NOTE

The idle speed is controlled automatically by the idle speed control (ISC) system.

6. If the idle speed is outside the standard value, inspect the MPI components by referring to GROUP 13A – Troubleshooting.

IDLE MIXTURE CHECK

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Check to be sure that the basic ignition timing is at the standard value.

Standard value: 5° BTDC $\pm 3^{\circ}$

3. After turning the ignition switch to OFF, connect a tachometer, or connect the MUT-II to the diagnosis connector.

NOTE

For the procedures for setting the tachometer, refer to P.11-6.

4. Start the engine and race it at an engine speed of 2,500 r/min for two minutes.
5. Connect a CO and HC tester.
6. Check the CO contents and the HC contents while the engine is idling.

Standard value:

CO contents:

0.5% or less <Vehicles with catalytic converter>

$1.5 \pm 0.5\%$ <Vehicles without catalytic converter>

7. If the concentrations are outside the standard values, check the following items.

<Vehicles with catalytic converter>

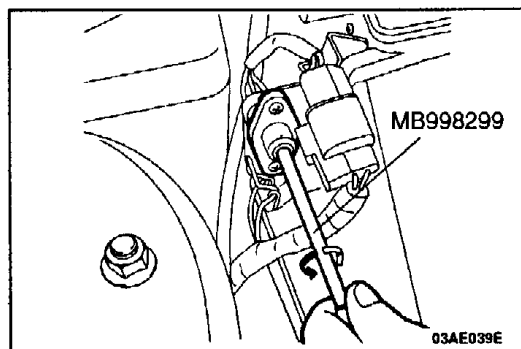
- Diagnosis output
- Closed loop control
(If closed loop control is being carried out normally, the oxygen sensor output signal will vary between 0–400 mV and 600–1,000 mV while the engine is idling.)
- Fuel pressure
- Injectors
- Ignition coil, spark plug cables, spark plugs
- Evaporative emission control system
- Compression pressure

NOTE

If the results of the checks for all items are normal but the CO concentration still exceeds the standard value, replace the three-way catalyst.

<Vehicles without catalytic converter>

Adjust CO concentration to specifications by using the variable resistor adjusting screw.



COMPRESSION PRESSURE CHECK

1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the pre-inspection condition.
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the crankshaft angle sensor connector.

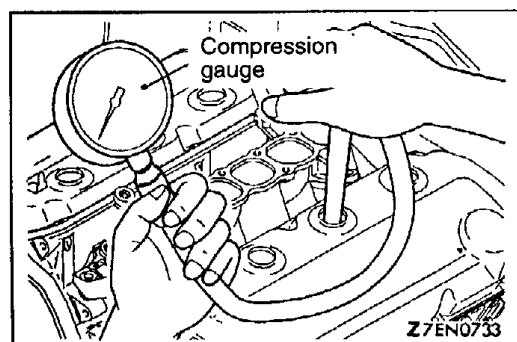
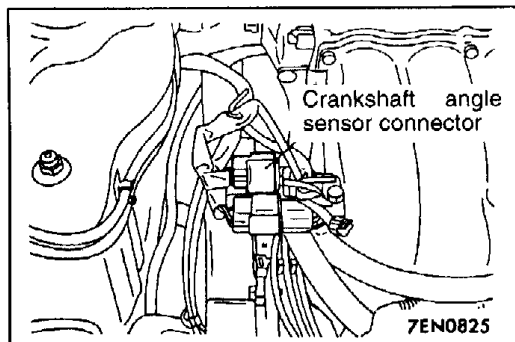
NOTE

Doing this will prevent the Engine-ECU from carrying out ignition and fuel injection.

5. Cover the spark plug hole with a shop towel or similar, and after the engine has been cranked, check that no foreign material is adhering to the shop towel.

Caution

1. **Keep away from the spark plug hole when cranking.**
2. **Do not let water, oil, fuel, etc. enter the cylinder through cracks, or these heated materials will gush out from the spark plug hole, which is dangerous.**



6. Set the compression gauge to a spark plug mounting hole.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

Standard value: 1200 kPa /250–400 r/min

Limit: min. 890 kPa /250–400 r/min

8. Measure the compression of all the cylinders, and check that the pressure differences of the cylinders are below the limit.

Limit: max. 100 kPa

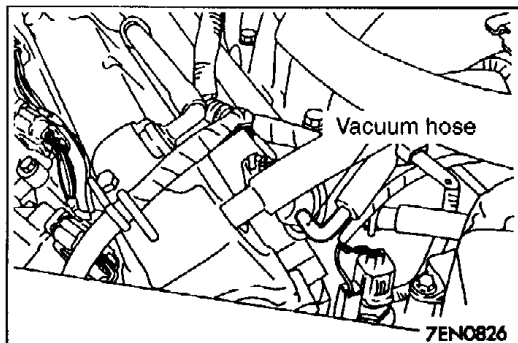
9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (6) to (8).
 - (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
 - (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure leaking from the gasket.
10. Reconnect the crankshaft angle sensor connector.
11. Reinstall the spark plugs and spark plug cables.
12. Use the MUT-II to erase the diagnosis codes, or disconnect the negative battery cable for 10 seconds or more and then re-connect it.

NOTE

This will erase the diagnosis code resulting from the crankshaft angle sensor connector being disconnected.

MANIFOLD VACUUM CHECK

1. Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C
 - Lights and all accessories: OFF
 - Transmission: Neutral P range



2. Connect a tachometer or connect the MUT-II to the diagnosis connector.

NOTE

For the procedures for setting the tachometer, refer to P.11-6.

3. Connect a three-way joint to the vacuum hose between the air intake manifold and the fuel pressure regulator, and then connect a vacuum gauge.
4. Start the engine and check that the idle speed is within the standard value range.
Check the vacuum gauge reading.

Limit: min. 60 kPa

LASH ADJUSTER CHECK

If an abnormal noise (chattering noise) suspected to be caused by malfunction of the lash adjuster is produced immediately after starting the engine and does not disappear, perform the following check.

NOTE

- (1) An abnormal noise due to malfunction of the lash adjuster is produced immediately after starting the engine and changes with the engine speed, irrespective of the engine load.
If, therefore, the abnormal noise is not produced immediately after starting the engine or does not change with the engine speed, or it changes with the engine load, malfunction of the lash adjuster is not the cause for the abnormal noise.
 - (2) When the lash adjuster is malfunctioning, the abnormal noise is rarely eliminated by continuing the warming-up of the engine at idle speed.
However, the abnormal noise may disappear only when seizure is caused by oil sludge in the engine whose oil is not maintained properly.
1. Start the engine.
 2. Check if abnormal noise produced immediately after starting the engine changes with the change in the engine speed.
If the abnormal noise is not produced immediately after starting the engine or it does not change with the engine speed, malfunction of the lash adjuster is not the cause for the noise. Therefore, investigate other causes. For your information, the abnormal noise is probably caused by some other parts than the engine proper if it does not change with the engine speed. (In this case, the lash adjuster is in good condition.)
 3. With the engine idling, change the engine load (shift from N to D range, for example) to make sure that there is no change in the level of abnormal noise.
If there is a change in the level of abnormal noise, suspect a tapping noise due to worn crankshaft bearing or connecting rod bearing. (In this case, the lash adjuster is in good condition.)
 4. After completion of warming-up, run the engine at idle to check for abnormal noise.
If the noise is reduced or disappears, make the following check as it is suspected that the noise is due to seizure of the lash adjuster. If there is no change in the level of the abnormal noise, proceed to step 5.
 - (1) Cool the engine sufficiently.
 - (2) Give two turns to the crankshaft.

- (3) Perform simple check of the lash adjuster.

(Refer to P.11-13)

- Replace the lash adjuster which allows the rocker arm to be pushed down easily.
- If the lash adjuster is found normal as a result of simple lash adjuster check (the rocker arm is not pushed down easily), investigate other causes for the abnormal noise.

NOTE

The lash adjuster can be judged correctly by the leak down test whether it is good or bad.

(Refer to ENGINE WORKSHOP MANUAL)

Caution

Before installation of a new lash adjuster, be sure to bleed air from the adjuster.

(Refer to ENGINE WORKSHOP MANUAL.)

5. Run the engine to bleed the lash adjuster system.
(Refer to P.11-14)
6. If the abnormal noise does not disappear after air bleeding operation, perform the following check.

- (1) Perform simple lash adjuster check. (Refer to P.11-13)

- If only one of the lash adjusters is found abnormal in the simple lash adjuster check (the rocker arm is pushed down easily), replace the lash adjuster.
- If two or more lash adjusters are found abnormal (the rocker arm is pushed down easily), clogged oil passage in the cylinder head is suspected. Check for clogged oil passage and repair the passage if it is clogged.
If the passage is not clogged, replace the lash adjusters.
- If all the lash adjusters are found normal (the rocker arms are hard to push down) as a result of simple lash adjuster check, investigate other causes for the abnormal noise.

NOTE

The lash adjuster can be judged correctly by the leak down test whether it is good or bad.

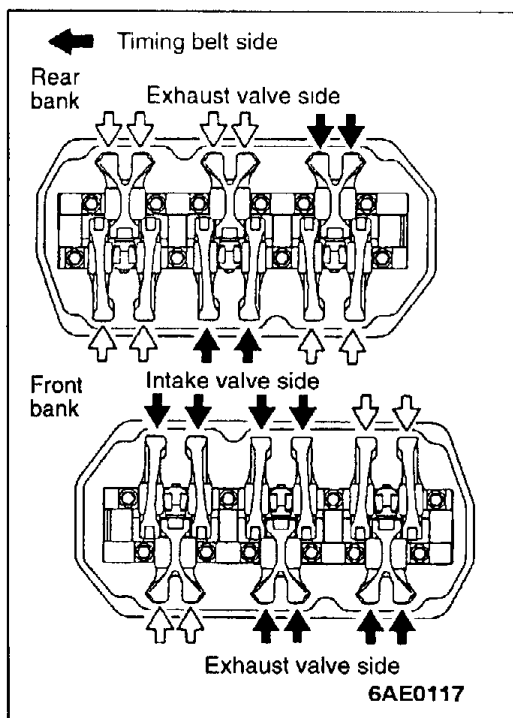
(Refer to ENGINE WORKSHOP MANUAL)

Caution

Before installation of a new lash adjuster, be sure to bleed air from the adjuster.

(Refer to ENGINE WORKSHOP MANUAL.)

7. Start the engine and make sure that the abnormal noise has disappeared. Perform air bleeding operation if required. (Refer to P.11-14)



<Simple Lash Adjuster Check>

1. Stop the engine.
2. Remove the rocker cover.
3. Set the piston in No. 1 cylinder at top dead center of the compression stroke.
4. Check the rocker arms indicated by a white arrow in left figure by the following procedure.

<Except checking of Y-shaped rocker arm>

- (1) Check if the rocker arm can be pushed down when pushing it at the portion right above the lash adjuster.
 - If the rocker arm can be pushed down easily, record the corresponding lash adjuster as a defective.
 - If the rocker arm cannot be pushed down (it feels very stiff), the lash adjuster is in good condition. Therefore, investigate other causes of the abnormal noise.

<Checking of Y-shaped rocker arm>

NOTE

The Y-shaped rocker arm on exhaust valve side cannot be pushed down if either of the lash adjusters is in good condition.

Therefore, use a feeler gauge to make a check by the following procedure.

- (1) Check if a 0.1 – 0.2 mm leaf of the feeler gauge can be inserted between the valve and the lash adjuster.
 - (2) Record the corresponding lash adjuster as a defective if the leaf of the feeler gauge can be inserted easily.
 - (3) If the feeler gauge leaf cannot be inserted easily, the lash adjuster is in good condition. Therefore, investigate other cause of the abnormal noise.
5. Slowly turn the crankshaft 360° clockwise.
 6. Follow the same procedure as step 4 to check the rocker arms indicated by a black arrow in left figure.

<Bleeding lash adjuster system>

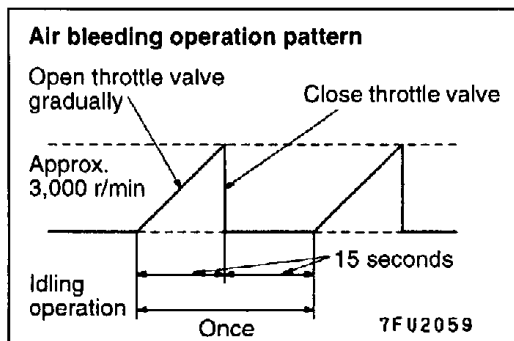
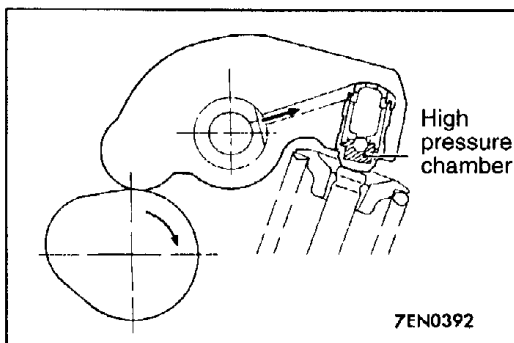
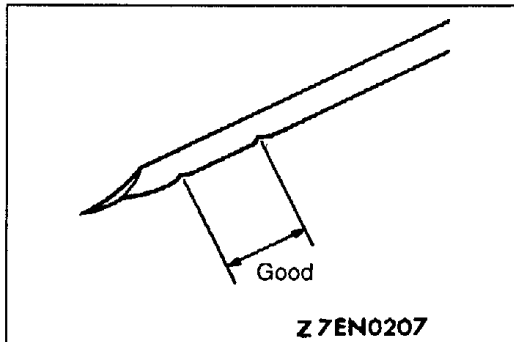
NOTE

- (1) Parking the vehicle on a grade for a long time may decrease oil in the lash adjuster, causing air to enter the high pressure chamber when starting the engine.
- (2) After parking for many hours, oil may run out from the oil passage and take time before oil is supplied to the lash adjuster, causing air to enter the high pressure chamber.
- (3) In the above cases, abnormal noise can be eliminated by bleeding the lash adjuster system.

1. Check engine oil and add or change oil if required.

NOTE

- (1) If the engine oil level is low, air is sucked from the oil screen, causing air to enter the oil passage.
- (2) If the engine oil level is higher than specification, oil may be stirred by the crankshaft, causing oil to be mixed with a large quantity of air.
- (3) If oil is deteriorated, air is not easily separated from oil, increasing the quantity of air contained in oil.
- (4) If air mixed with oil enters the high pressure chamber inside the lash adjuster from the above causes, air in the high pressure chamber is compressed excessively while the valve is opened, resulting in production of abnormal noise at closing of the valve. This is the same phenomenon as that observed when the valve clearance has become excessive. The lash adjuster can resume normal function when air entered the lash adjuster is removed.



2. Idle the engine for one to three minutes to warm it up.
3. Repeat the operation pattern, shown in left figure, at no load to check for abnormal noise. (Normally the abnormal noise is eliminated after repetition of the operation 10 to 30 times. If, however, no change is observed in the level of abnormal noise after repeating the operation more than 30 times, suspect that the abnormal noise is due to some other factors.)
4. After elimination of abnormal noise, repeat the operation shown in left figure five more times.
5. Run the engine at idle for one to three minutes so as to make sure that the abnormal noise has been eliminated.

CRANKSHAFT PULLEY

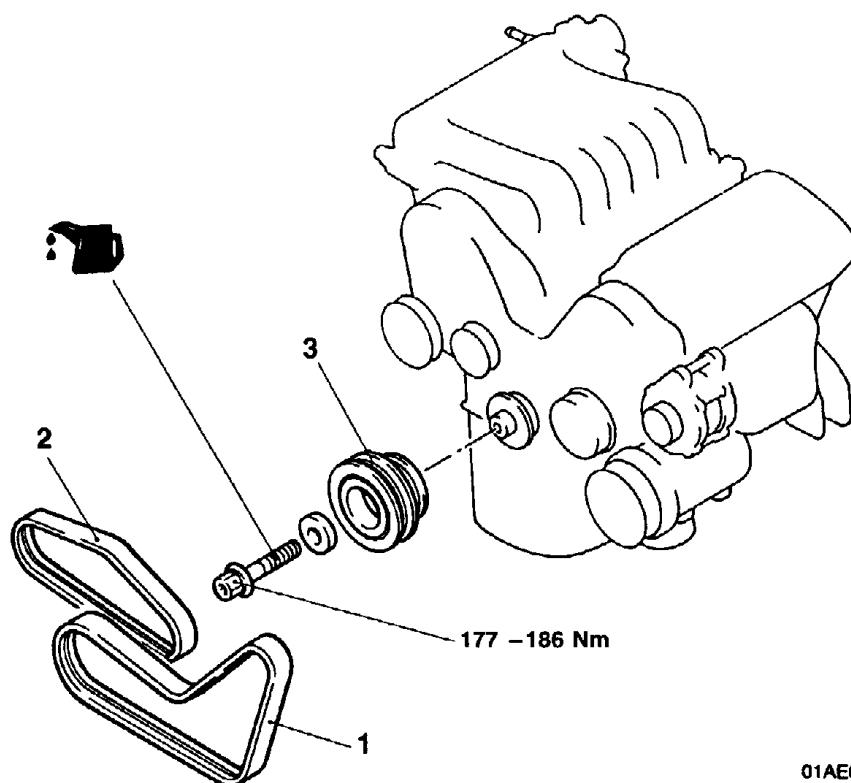
REMOVAL AND INSTALLATION

Pre-removal Operation

- Under Cover Removal

Post-installation Operation

- Drive Belt Tension Adjustment (Refer to P.11-5.)
- Under Cover Installation

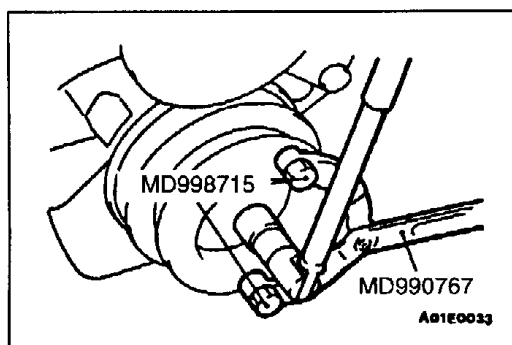


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Removal Steps

1. Drive belt (for alternator and A/C)
2. Drive belt (for power steering oil pump)
3. Crankshaft pulley

◀A▶ ▶A◀



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY REMOVAL

INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT PULLEY INSTALLATION

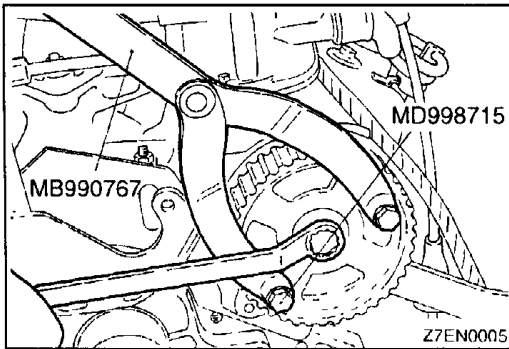
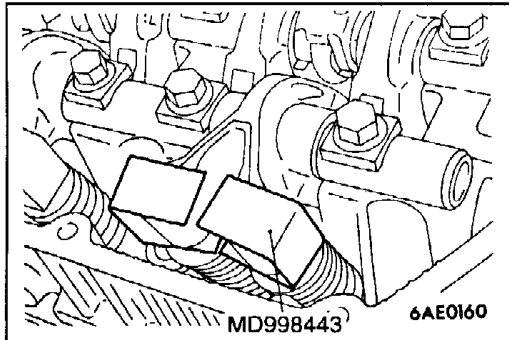
Use special tools and install the crankshaft pulley.

REMOVAL AND INSTALLATION

- **Cylinder Head Assembly Removal and Installation**
(Refer to P.11-24.)



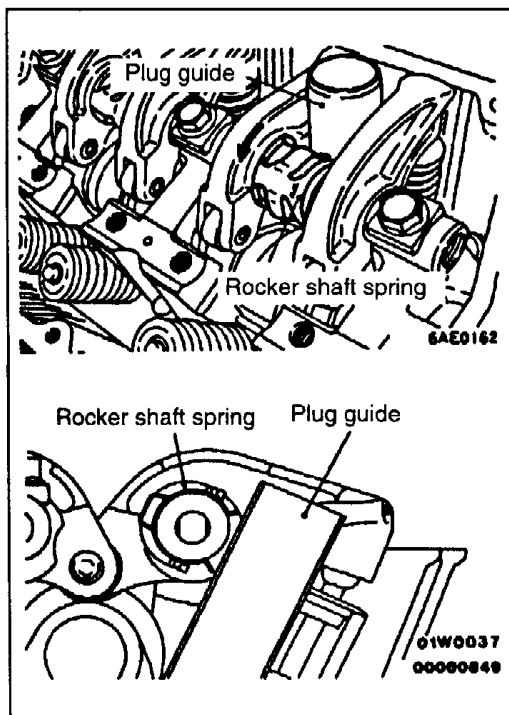
1. Camshaft sprocket
2. Rocker arm and shaft assembly (Intake side)
3. Rocker arm and shaft assembly (Exhaust side)
4. Thrust case
5. O-ring
6. Camshaft

**REMOVAL SERVICE POINTS****◀A▶ CAMSHAFT SPROCKET REMOVAL****◀B▶ ROCKER ARM AND SHAFT ASSEMBLY REMOVAL**

1. Install the special tools as shown in the illustration so that the lash adjusters will not fall out.
2. Loosen the rocker arm and shaft assembly mounting bolt, and then remove the rocker arm and shaft assembly with the bolt still attached.

Caution

Never disassemble the rocker arm and shaft assembly.

**INSTALLATION SERVICE POINTS****▶A▶ ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION**

1. Temporarily tighten the rocker shaft with the bolt so that all rocker arms on the inlet valve side do not push the valves.
2. Fit the rocker shaft spring from the above and position it so that it is at right angles to the plug guide.

NOTE

Install the rocker shaft spring before installing the rocker arm and rocker arm shaft on the exhaust side.

3. Tighten the rocker arm and shaft assembly mounting bolt to the specified torque

Tightening torque: 28 – 34 Nm

4. Remove the special tool for fixing the lash adjuster.

▶B▶ CAMSHAFT SPROCKET INSTALLATION

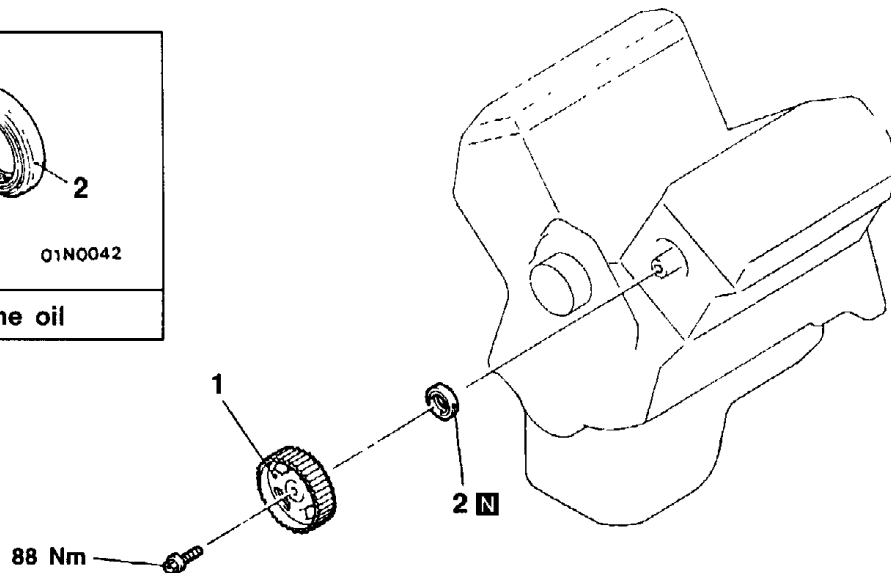
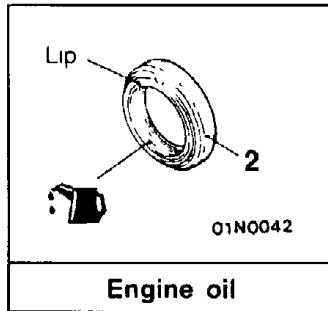
Use the special tool in the same way as during the removal to install the camshaft sprocket.

CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation operation

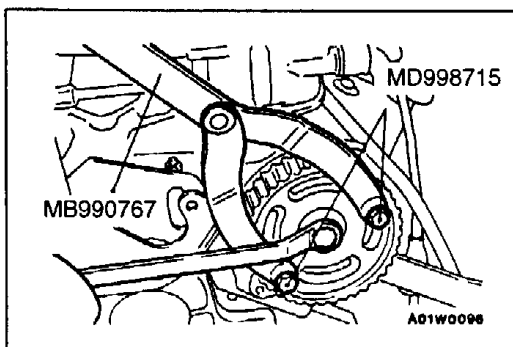
- Timing Belt Removal and Installation
(Refer to P.11-26.)



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Removal steps

- ◀A▶ ▶B▶ 1. Camshaft sprocket
◀B▶ ▶A▶ 2. Camshaft oil seals



REMOVAL SERVICE POINTS

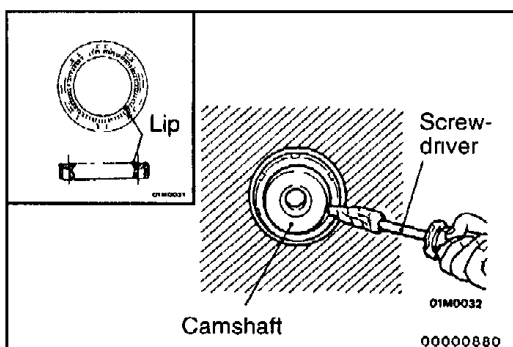
◀A▶ CAMSHAFT SPROCKET REMOVAL

◀B▶ CAMSHAFT OIL SEAL REMOVAL

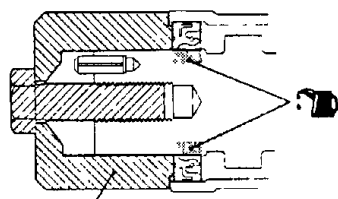
1. Cut out a portion in the camshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

Caution

Use care not to damage the camshaft and cylinder head.



<Rear bank side>



MD998713

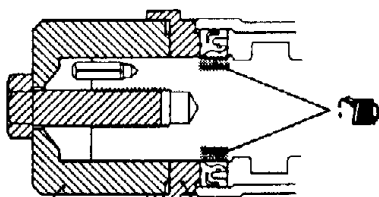
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INSTALLATION SERVICE POINTS**►A◄ CAMSHAFT OIL SEAL INSTALLATION**

Coat engine oil on the whole circumference of the oil seal lip section.

Using the special tool, press-fit the oil seal.

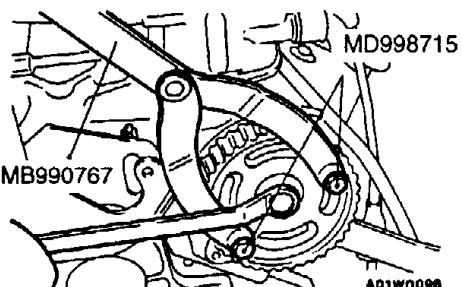
<Front bank side>



MD998713

MD991559

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►B◄ CAMSHAFT SPROCKET INSTALLATION

MD998715

MB990767

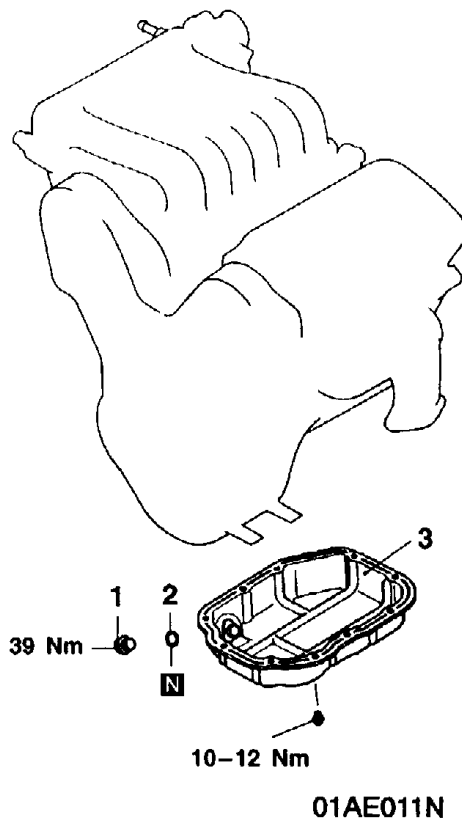
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OIL PAN, LOWER

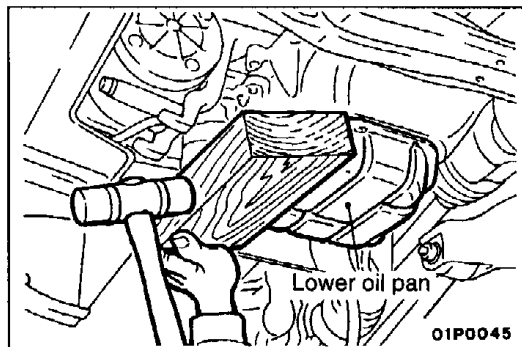
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15.)
- Draining and Filling with Engine Oil (Refer to GROUP 12 – On-vehicle Service.)



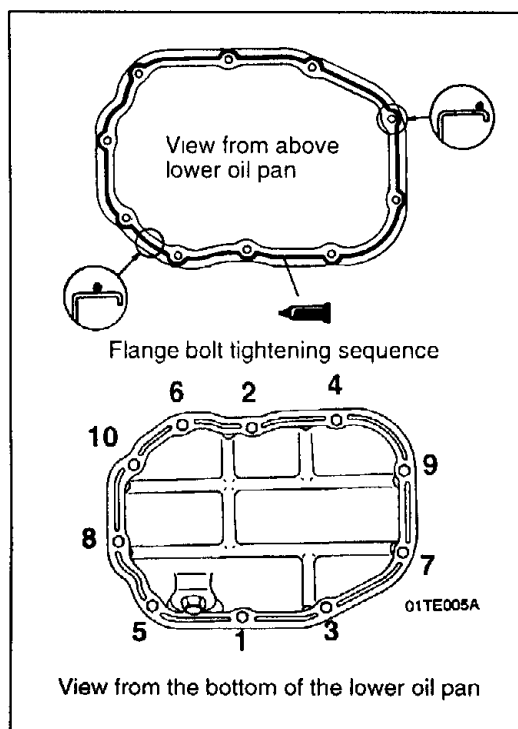
- ◀A▶ ▶A▶
1. Drain plug
 2. Drain plug gasket
 3. Oil pan, lower

**REMOVAL SERVICE POINT****◀A▶ OIL PAN, LOWER REMOVAL**

1. Remove the oil pan, lower installation bolt.
2. Place a wooden block against the oil pan, lower as shown in the figure and remove by tapping with a hammer.

Caution

The use of an oil pan remover (MD998727) can damage the aluminium upper oil pan.



INSTALLATION SERVICE POINT

►A◄ OIL PAN, LOWER INSTALLATION

1. Remove sealant from the upper and lower oil pan mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply the specified sealant around the gasket surface of oil pan as specified in illustration.

Specified sealant:

MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE

The sealant should be applied in a continuous bead approximately 4 mm in diameter.

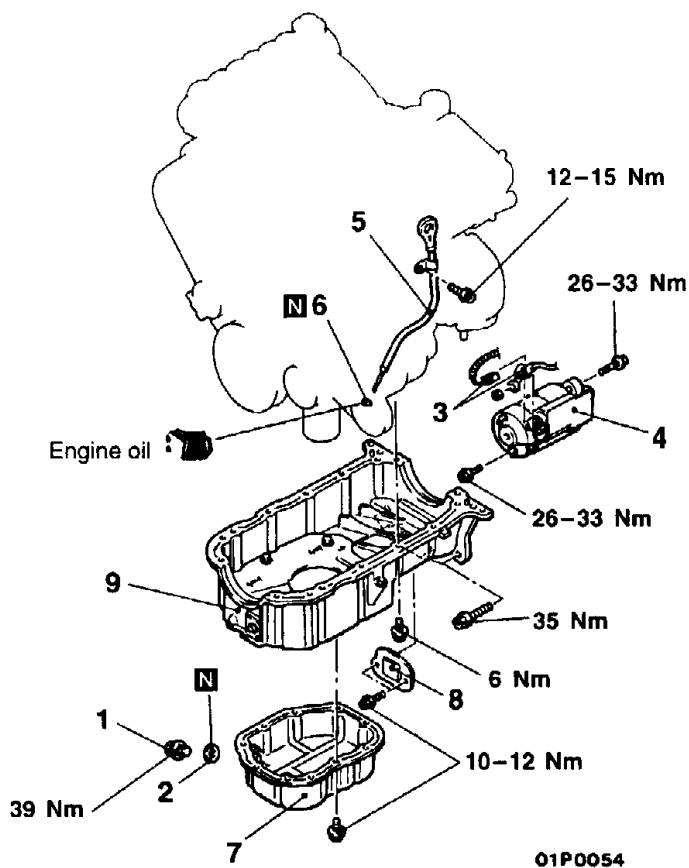
4. Assemble the lower oil pan to the upper oil pan within 30 minutes after applying the sealant.
5. Tighten the oil pan mounting bolt in the order illustrated (left).

OIL PAN, UPPER

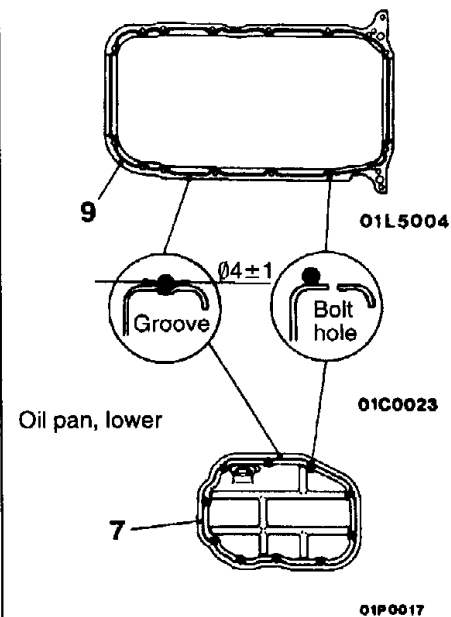
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Draining and Filling with Engine Oil (Refer to GROUP 12 – On-vehicle Service.)



Oil pan, upper



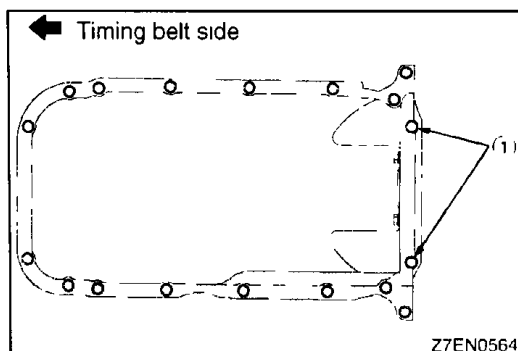
Sealant:
MITSUBISHI GENUINE PART NO.
MD970389 or equivalent

Removal steps

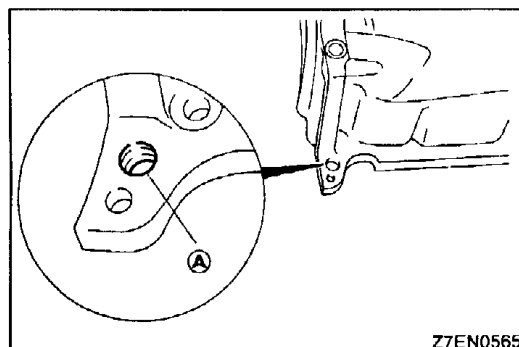
1. Drain plug
2. Drain plug gasket
3. Starter connector
4. Starter
5. Oil gauge and guide

6. O-ring
7. Oil pan, lower (Refer to P.11-20.)
8. Cover
9. Oil pan, upper



**REMOVAL SERVICE POINT****◀A▶ OIL PAN, UPPER REMOVAL**

1. Detach the bolt (1) shown at left.
2. Detach all other bolts.



3. Screw a bolt into bolt hole (A) shown (at both ends) to remove the oil pan.

Caution

The use of an oil pan remover (MD998727) can damage the aluminium upper oil pan.

INSTALLATION SERVICE POINT**▶A◀ OIL PAN, UPPER INSTALLATION**

1. Remove the sealant from the oil pan and cylinder block mating surfaces.
2. Degrease the sealant-coated surface and the engine mating surface.
3. Apply specified sealant around the gasket surface of the oil pan as shown in the illustration.

Specified sealant:

MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE

The sealant should be applied in a continuous bead approximately 4 mm in diameter.

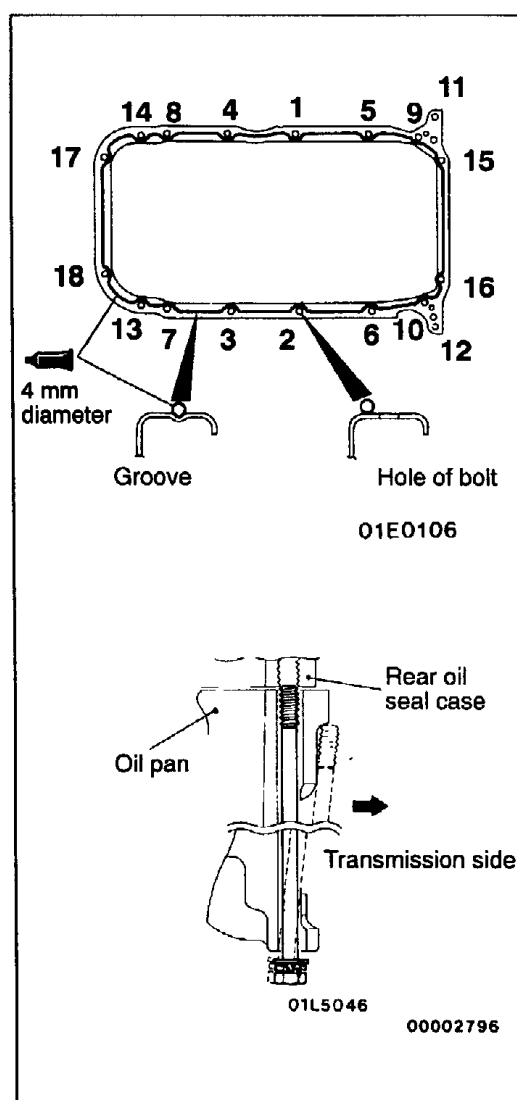
4. Install the oil pan to the cylinder block within 30 minutes after applying the sealant.
5. Tighten the oil pan mounting bolts in the order shown in the illustration at left.

Caution

The bolt holes for bolts 15 and 16 in the illustration are cut away on the transmission side, so be careful not to insert these bolts at an angle.

INSPECTION

- Check the oil pan for cracks.
- Check the sealant-coated surface of the oil pan for damage and deformation.

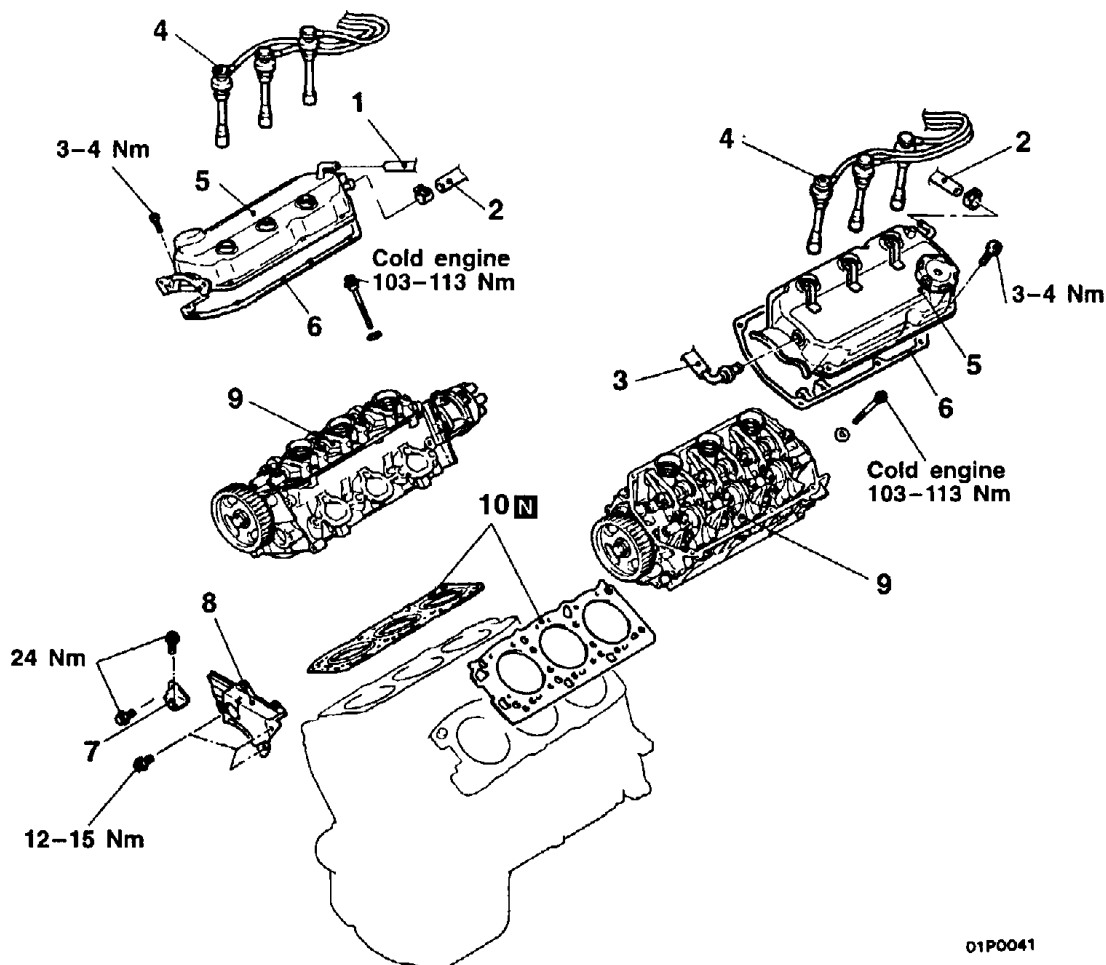


CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Intake Manifold Removal and Installation (Refer to GROUP 15 – Intake Manifold.)
- Water Hose Pipe Removal (Refer to GROUP 14)
- Timing Belt Removal and Installation (Refer to P.11-26.)
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Main Muffler)



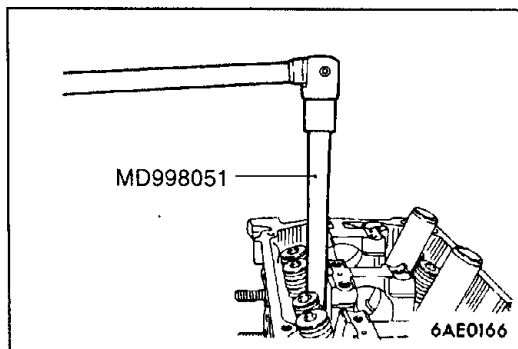
01P0041

Removal steps

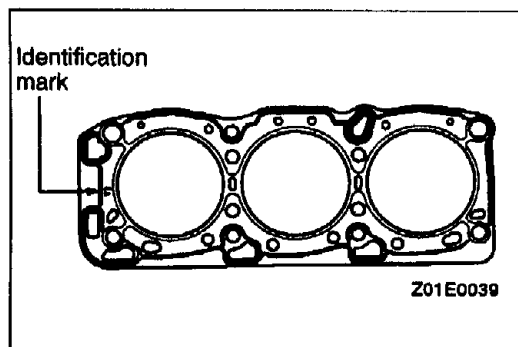
1. Breather hose
2. Blow-by hose
3. PVC hose
4. Spark plug cable
5. Rocker cover

6. Rocker cover gasket
7. Bracket
8. Timing belt cover (rear centre)
9. Cylinder head
10. Cylinder head gasket

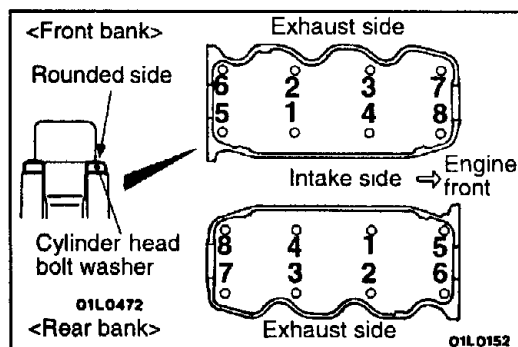


**REMOVAL SERVICE POINT****◀A▶ CYLINDER HEAD ASSEMBLY REMOVAL**

Using the special tool, after loosening the bolts (in 2 or 3 cycles), remove the cylinder head assembly.

**INSTALLATION SERVICE POINTS****▶A◀ CYLINDER HEAD GASKET INSTALLATION**

1. Degrease the mounting surface of the cylinder head gasket.
2. Lay the cylinder head gasket on cylinder block with the identification mark at front top.

**▶B◀ CYLINDER HEAD ASSEMBLY INSTALLATION**

Using the special tool, tighten the bolts in the order shown in two or three steps.

Caution

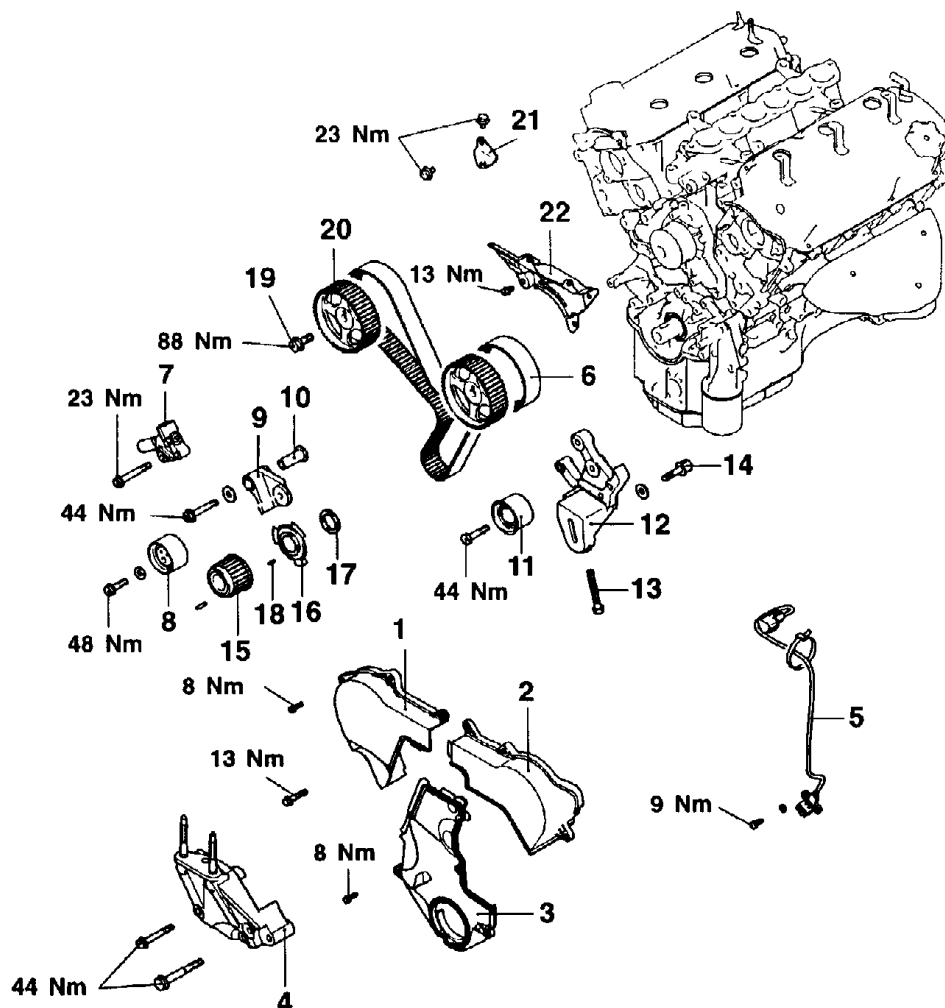
Attach the head bolt washer in the direction shown in the figure.

TIMING BELT

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Crankshaft Pulley Removal and installation (Refer to P.11-15.)



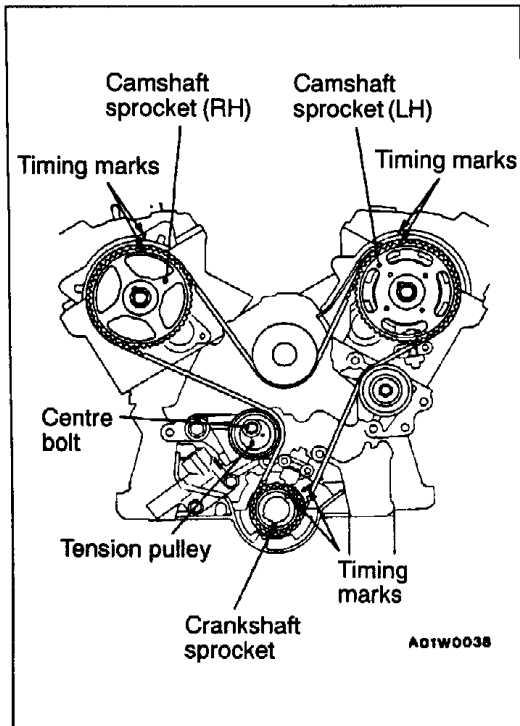
7EN0862

Removal steps

1. Timing belt front upper cover, rear
2. Timing belt front upper cover, front
3. Timing belt front lower cover
4. Engine support bracket
5. Crankshaft angle sensor
6. Timing belt
7. Auto tensioner
8. Tensioner pulley
9. Tensioner arm
10. Shaft
11. Idler pulley

12. Idler pulley adjusting bracket
13. Adjusting bolt
14. Adjusting stud
15. Crankshaft sprocket
16. Sensing blade
17. Crankshaft spacer
18. Crankshaft key
19. Camshaft sprocket bolt
20. Camshaft sprocket
21. Bracket
22. Timing belt rear cover





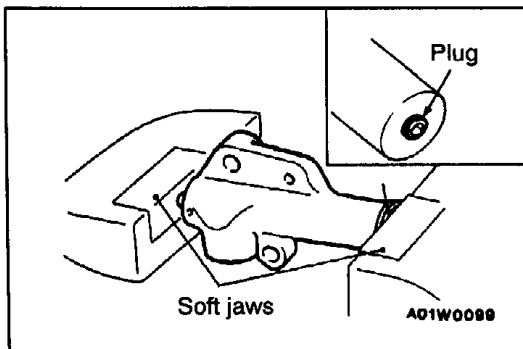
REMOVAL SERVICE POINT

◀▶ TIMING BELT REMOVAL

1. Align the timing marks.
2. Loosen the centre bolt on the tension pulley to remove the timing belt.

Caution

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.



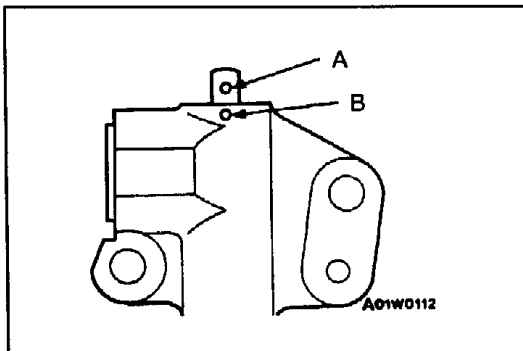
INSTALLATION SERVICE POINTS

▶◀ AUTO TENSIONER INSTALLATION

1. If the auto tensioner rod is in its fully extended position, reset it as follows.
 - (1) Keep the auto tensioner level and, in that position, clamp it in the vice with soft jaws.
 - (2) Push in the rod little by little with the vice until the set hole A in the rod is aligned with that B in the cylinder.

Caution

1. The auto tensioner must be placed at a right angle to the pressing surface of press or vice.
2. Push in the rod slowly to prevent the push rod from being damaged.



- (3) Insert a wire [1.4 mm in diameter] into the set holes.

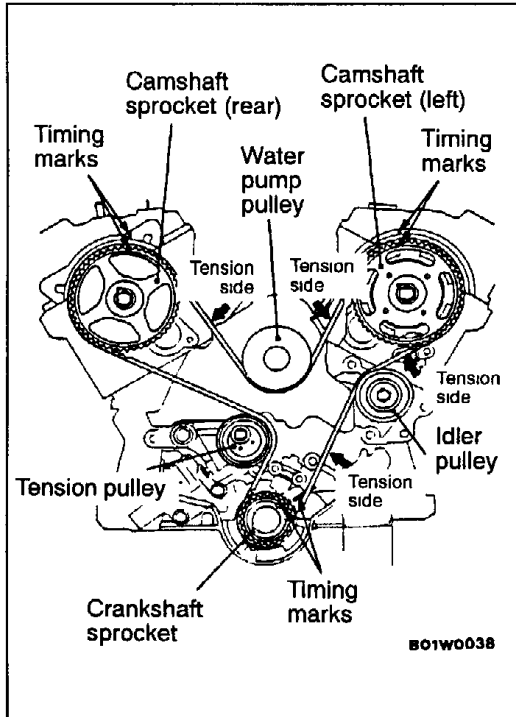
NOTE

The wire should be as stiff as possible (such as piano wire, etc.), and should be bent into the shape of an "L".

- (4) Unclamp the auto tensioner from the vice.
2. Install the auto tensioner.

Caution

Leave the wire installed in the auto tensioner.



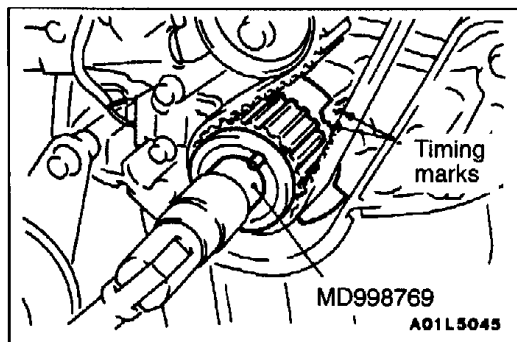
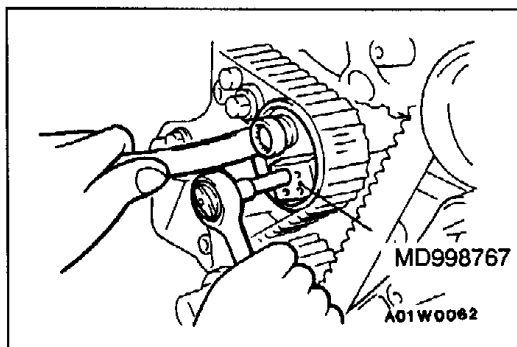
►B◀ TIMING BELT INSTALLATION

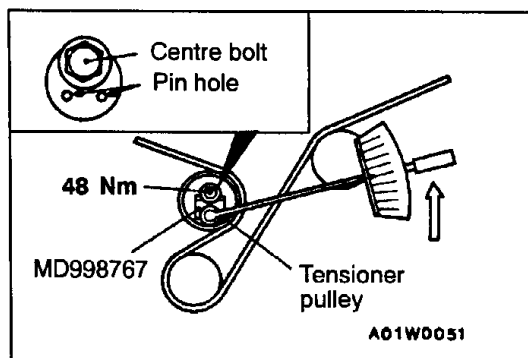
1. Align the timing marks of the camshaft sprockets and crankshaft sprocket.
2. Install the timing belt by the following procedure so that there is no deflection in the timing belt between each sprocket and pulley.
 - (1) Crankshaft sprocket
 - (2) Idler pulley
 - (3) Camshaft sprocket (front side)
 - (4) Water pump pulley
 - (5) Camshaft sprocket (rear side)
 - (6) Tension pulley

Caution

The camshaft sprocket (rear side) can turn easily due to the spring force applied, so be careful not to get your fingers caught.

3. Turn the camshaft sprocket (right side) anti-clockwise until the tension side of the timing belt is firmly stretched, and then check again that all timing marks are aligned.
4. Use the special tool to push the tension pulley into the timing belt, and then temporarily tighten the centre bolt.
5. Use the special tool to turn the crankshaft 1/4 of a turn anti-clockwise and then turn it again clockwise until the timing marks are aligned.





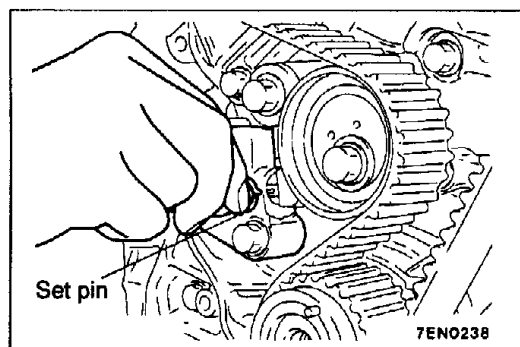
6. Loosen the centre bolt on the tensioner pulley. Using the special tool and torque wrench, apply tensioning torque to the timing belt and, at the same time, tighten the centre bolt to specification.

Reference value:

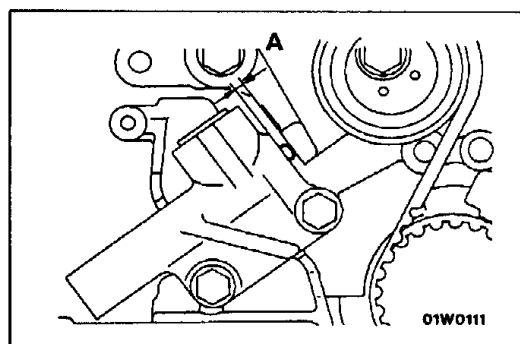
4.4 Nm (Timing belt tensioning torque)

Caution

When tightening the centre bolt, make sure that the tensioner pulley is not rotated together.



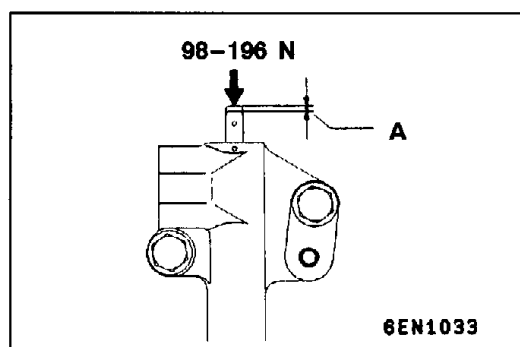
7. Remove the setting pin that has been inserted into the auto tensioner.
8. Turn the crankshaft two turns clockwise to align the timing marks.



9. Leave everything in this condition for five minutes or more, and then check that the protrusion of the auto tensioner push rod is within the range of the standard value.

Standard value (A): 3.8 – 5.0 mm

10. If the protrusion is out of specification, repeat steps (5) to (9).
11. Check again that timing marks on all sprockets are aligned properly.



INSPECTION

AUTO TENSIONER

1. Hold the auto tensioner by hand and measure contraction (A) when pressing the tip of the rod on a steel (cylinder block; etc.) with a force of 98-196 N.

Standard value (A): 1 mm

2. If not within the standard value, replace the auto tensioner.

CRANKSHAFT FRONT OIL SEAL

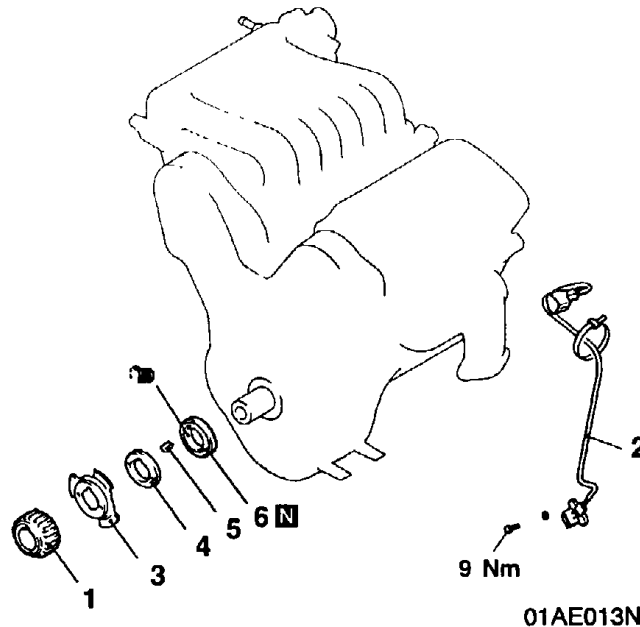
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation (Refer to P.11-26.)

Adjustment

- Engine Adjustment – Ignition Timing Check



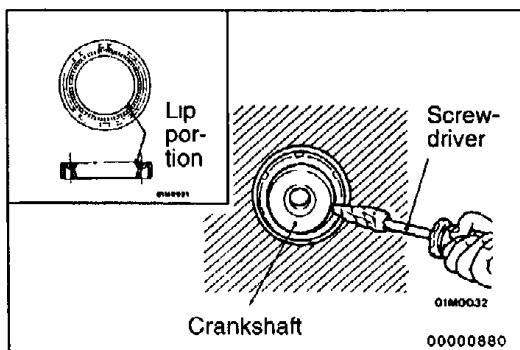
Removal Steps

1. Crankshaft sprocket
2. Crank angle sensor
3. Crankshaft sensing blade

4. Crankshaft spacer

5. Key

6. Crankshaft front oil seal



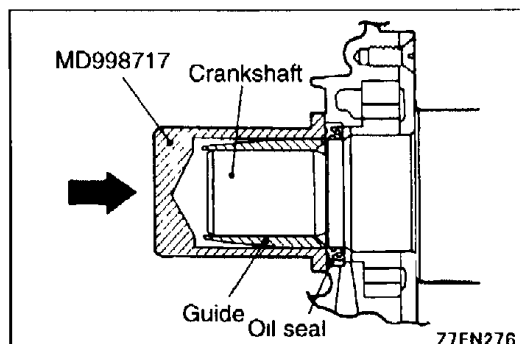
REMOVAL SERVICE POINT

◀A▶ OIL SEAL REMOVAL

1. Cut out a portion in the crankshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

Caution

Take care not to damage the crankshaft and oil pump case.



INSTALLATION SERVICE POINT

▶A◀ OIL SEAL INSTALLATION

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

NOTE

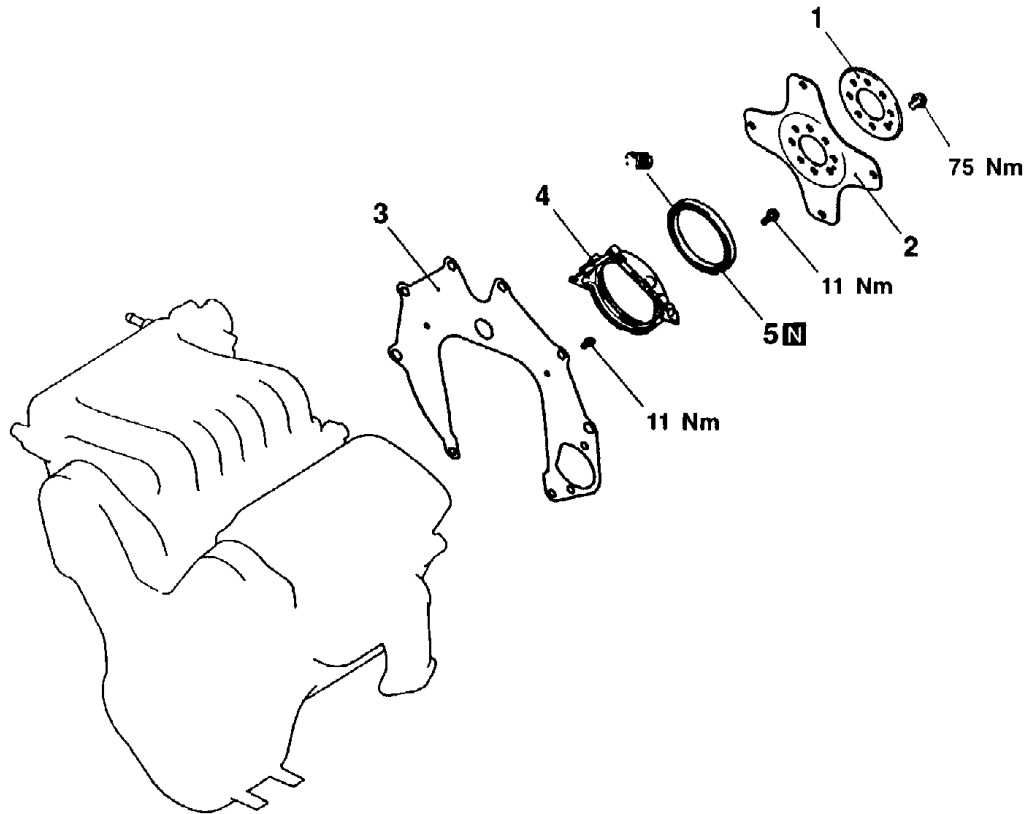
Knock it in until it is flush with the surface.

CRANKSHAFT REAR OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

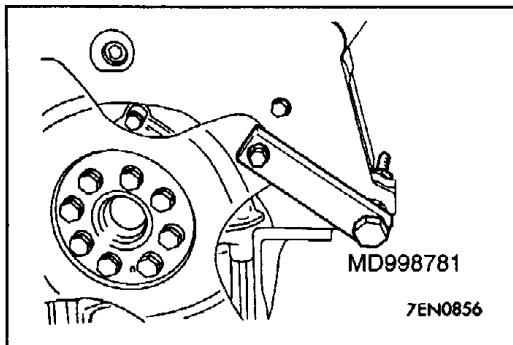
- Transmission Removal and Installation
(Refer to GROUP 22 – Manual Transmission or GROUP 23 – Automatic Transmission.)



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Removal Steps

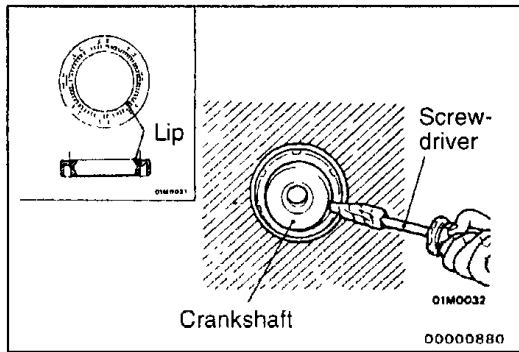
- | | |
|---------|------------------|
| ◀A▶ ▶B▶ | 1. Adaptor plate |
| ◀A▶ ▶B▶ | 2. Drive plate |
| | 3. Rear plate |
| | 4. Oil seal case |
| ◀B▶ ▶A▶ | 5. Oil seal |



REMOVAL SERVICE POINTS

◀A▶ ADAPTOR PLATE/DRIVE PLATE REMOVAL

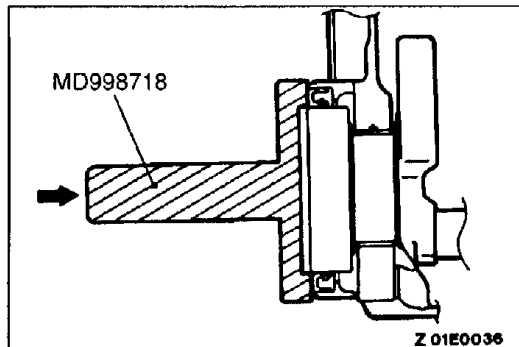
Use the special tool to secure the drive plate, and remove the bolt.

**◀B▶ OIL SEAL REMOVAL**

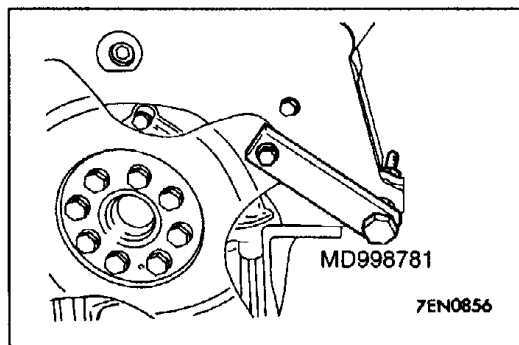
1. Cut out a portion in the crankshaft oil seal lip.
2. Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

Caution

Take care not to damage the crankshaft and oil seal case.

**INSTALLATION SERVICE POINTS****▶A◀ OIL SEAL INSTALLATION**

Using the special tool, press-fit a new crankshaft rear oil seal into the oil seal case.

**▶B◀ DRIVE PLATE/ADAPTOR PLATE INSTALLATION**

Use the special tool to secure the drive plate, and tighten the bolts.

ENGINE ASSEMBLY

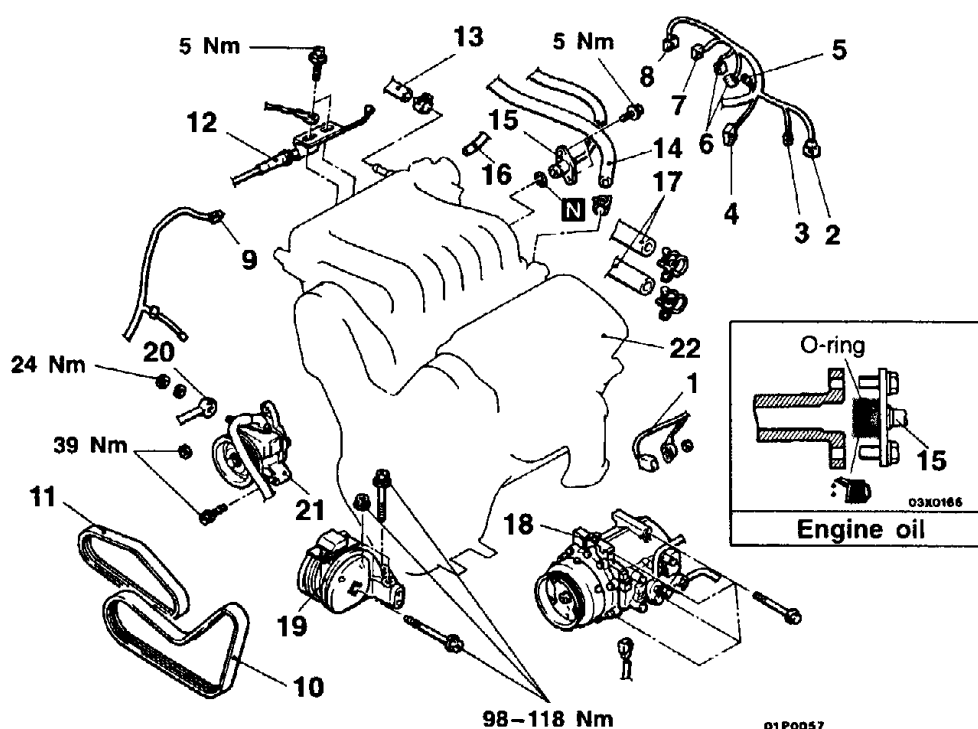
REMOVAL AND INSTALLATION

Pre-removal Operation

- Hood Removal (Refer to GROUP 42 Hood.)
- Air Cleaner Removal (Refer to GROUP 15)
- Drainage of Coolant (Refer to GROUP 14.)
- Radiator Removal (Refer to GROUP 14)
- Fuel Flow Prevention (Refer to GROUP 13A – On-vehicle Service.)
- Drainage of Power Steering Fluid (Refer to GROUP 37A – On-vehicle Service.)
- Front Exhaust Pipe (Refer to GROUP 15.)
- Washer Tank Removal (Refer to GROUP 51.)
- Transmission Assembly Removal (Refer to GROUP 22 or 23.)

Post-installation Operation

- Transmission Installation (Refer to GROUP 23.)
- Washer Tank Installation (Refer to GROUP 51.)
- Front Exhaust Pipe Installation (Refer to GROUP 15.)
- Filling with Power Steering Fluid (Refer to GROUP 37A – On-vehicle Service.)
- Radiator Installation (Refer to GROUP 14)
- Filling with Coolant (Refer to GROUP 14 – On-vehicle Service.)
- Air Cleaner Installation (Refer to GROUP 15.)
- Accelerator Cable Adjustment (Refer to GROUP 17.)
- Hood Installation (Refer to GROUP 42.)

**Removal Steps**

- | | |
|---|---|
| 1. Alternator connector | 13. Connection of brake booster vacuum hose |
| 2. Water temperature connector | 14. Connection of fuel return hose |
| 3. Water temperature gauge connector | 15. Connection of fuel high pressure hose |
| 4. Injector harness connector | 16. Connection of the purge hose |
| 5. Condenser connector | 17. Connection of heater hose |
| 6. Distributor connector | 18. A/C compressor |
| 7. ISC servo connector | 19. Engine mount |
| 8. TPS connector | 20. Pressure hose |
| 9. Crank angle sensor connector | 21. Power steering oil pump |
| 10. Drive belt (for alternator and A/C) | 22. Engine assembly |
| 11. Drive belt (for power steering) | |
| 12. Connection of the accelerator cable | |

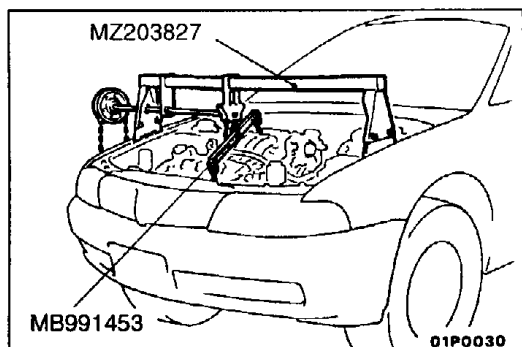


REMOVAL SERVICE POINTS**◀A▶ A/C COMPRESSOR/POWER STEERING OIL PUMP REMOVAL**

Remove the oil pump and air conditioning compressor (with the hose attached).

NOTE

Suspend the removed compressor and oil pump (by using wire or similar material) at a place where no damage will be caused during removal/installation of the engine assembly.

**◀B▶ ENGINE MOUNT REMOVAL**

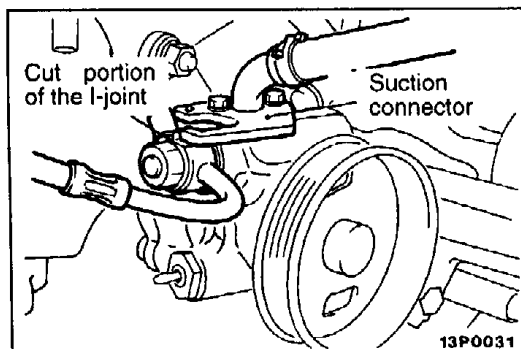
1. Place a garage jack against the engine oil pan through a square bar so that the weight of the engine is not placed on the engine mount.
2. Remove the Special Tool (used during removal of the transmission assembly).
3. Hold the engine assembly with a chain block.
4. Detach the engine mount.

◀C▶ ENGINE ASSEMBLY REMOVAL

1. Check that all cables, hoses, harness connectors, etc. are disconnected from the engine.
2. Lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS**▶A◀ ENGINE ASSEMBLY INSTALLATION**

Install the engine assembly. When doing so, check carefully that all pipes and hoses are connected, and that none are twisted, damaged, etc.

**▶B◀ PRESSURE HOSE INSTALLATION**

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

ENGINE LUBRICATION

CONTENTS

GENERAL INFORMATION	2	ON-VEHICLE SERVICE	3
LUBRICANTS	3	Engine Oil Inspection	3
SPECIAL TOOL	3	Engine Oil Replacement	3
		Oil Filter Replacement	4

GENERAL INFORMATION

The lubrication method is a fully force-fed, full flow filtration type. The oil pump is a trochoid type which is directly mounted to the crankshaft.

ENGINE OILS

Health Warning

Prolonged and repeated contact with mineral oil will result in the removal of natural fats from the skin, leading to dryness, irritation and dermatitis. In addition, used engine oil contains potentially

harmful contaminants which may cause skin cancer. Adequate means of skin protection and washing facilities must be provided.

Recommended Precautions

The most effective precaution is to adapt working practices which prevent, as far as practicable, the risk of skin contact with mineral oils, for example by using enclosed systems for handling used engine oil and by degreasing components, where practicable, before handling them.

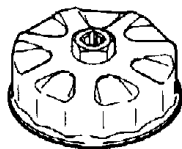
Other precautions:

- Avoid prolonged and repeated contact with oils, particularly used engine oils.
 - Wear protective clothing, including impervious gloves where practicable.
 - Avoid contaminating clothes, particularly underpants, with oil.
 - Do not put oily rags in pockets, the use of overalls without pockets will avoid this.
 - Do not wear heavily soiled clothing and oil-impregnated foot-wear. Overalls must be cleaned regularly and kept separate from personal clothing.
- Where there is a risk of eye contact, eye protection should be worn, for example, chemical goggles or face shields; in addition an eye wash facility should be improved.
 - Obtain First Aid treatment immediately for open cuts and wounds.
 - Wash regularly with soap and water to ensure all oil is removed, especially before meals (skin cleansers and nail brushes will help). After cleaning, the application of preparations containing lanolin to replace the natural skin oils is advised.
 - Do not use petrol, kerosene, diesel fuel, gas oil, thinners or solvents for cleaning skin.
 - Use barrier creams, applying them before each work period, to help the removal of oil from the skin after work.
 - If skin disorders develop, obtain medical advice without delay.

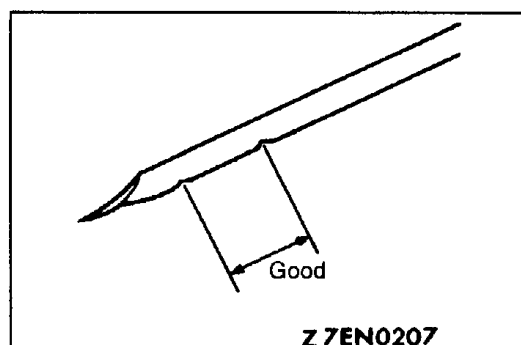
LUBRICANTS

Items	Engine oil (API classification)	Quantity (litres)
Oil filter	Except China: SE or higher China: SC or higher	0.3
Total quantity		4.3

SPECIAL TOOLS

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

ON-VEHICLE SERVICE



ENGINE OIL INSPECTION

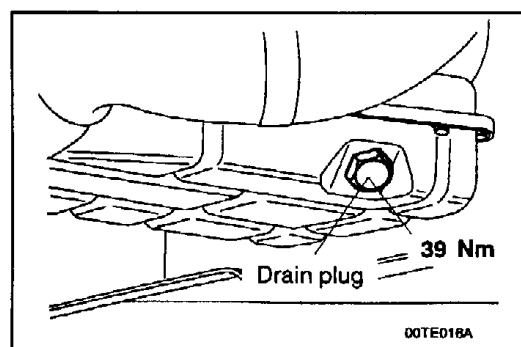
1. Pull out the level gauge slowly and check that the oil level is in the illustrated range.
2. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it has sufficient viscosity.

ENGINE OIL REPLACEMENT

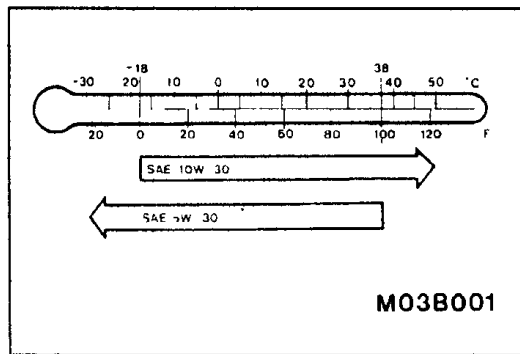
1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C to 90°C.
2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.

Caution

Use care as oil could be hot.



4. Install a new drain plug O-ring, and then tighten the drain plug to the specified torque.



5. Refill with specified quantity of oil.

Specified Engine Oil (API classification):

Except China: SE or higher

China: SC or higher

Total quantity (Includes volume inside oil filter): 4.3ℓ

6. Install the engine oil filler cap.
7. Check oil level.

OIL FILTER REPLACEMENT

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

Caution

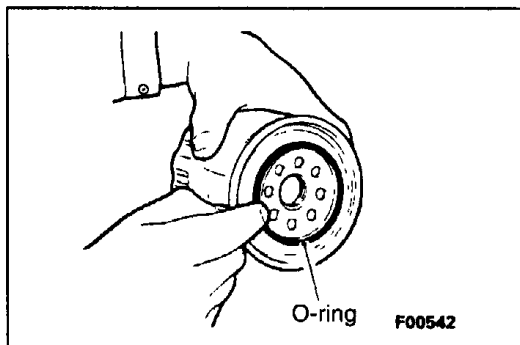
Use care as oil could be hot.

4. Use the Special Tool MB991396 (or equivalent) to remove the engine oil filter from the underside of the vehicle.
5. Clean the filter bracket side mounting surfaces.
6. Apply a small amount of engine oil to the O-ring of the new oil filter.
7. Install the engine oil filter.

NOTE

Tightening torque: 14Nm

8. Install the drain plug and refill engine oil. (Refer to Engine Oil Replacement P.12-3).
9. Race the engine 2-3 times, and check to be sure there are no engine oil leaks from the installation section of the filter.



FUEL

CONTENTS

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ELECTRONIC CONTROL TYPE CARBURETTOR	13B
CONVENTIONAL TYPE CARBURETTOR	13C
VARIABLE VENTURI TYPE CARBURETTOR	13D
DIESEL FUEL	13E
FUEL SUPPLY	13F
AUTO-CRUISE CONTROL SYSTEM	Refer to GROUP 17
TRACTION CONTROL SYSTEM (TCL)	13H

NOTE
THE GROUPS MARKED BY ARE NOT IN THIS MANUAL

MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

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SERVICE SPECIFICATIONS	6	Component Location	85
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Throttle Body (Throttle Valve Area) Cleaning ..	78	Idle Position Switch Check	87
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Fuel Pump Operation Check	84	INJECTOR	92
		THROTTLE BODY	95

MULTIPOINT FUEL INJECTION (MPI)

GENERAL INFORMATION

The Multipoint Fuel Injection System consists of sensors which detect the engine conditions, the Engine-ECU which controls the system based on signals from these sensors, and actuators which operate under the control of the Engine-ECU.

FUEL INJECTION CONTROL

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

A single injector is mounted at the intake port of each cylinder. Fuel is sent under pressure from the fuel tank by the fuel pump, with the pressure being regulated by the fuel pressure regulator. The fuel thus regulated is distributed to each of the injectors.

Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-2-3-4-5-6. The

The Engine-ECU carries out activities such as fuel injection control, idle speed control and ignition timing control.

In addition, the Engine-ECU is equipped with several diagnosis modes which simplify troubleshooting when a problem develops.

Engine-ECU provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance.

In addition, when the engine is warm or operating under normal conditions, the Engine-ECU controls the air/fuel mixture by using the oxygen sensor signal to carry out "closed-loop" control in order to obtain the theoretical air/fuel mixture ratio that provides the maximum cleaning performance from the three way catalyst <if equipped>.

IDLE AIR CONTROL

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling.

The Engine-ECU drives the idle air control (ISC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine

coolant temperature and air conditioner load. In addition, when the air conditioning switch is turned off and on while the engine is idling, the ISC motor operates to adjust the throttle valve bypass air amount in accordance with the engine load conditions in order to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

The ignition power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing in order to provide the optimum ignition timing with respect

to the engine operating conditions. The ignition timing is determined by the Engine-ECU from the engine speed, intake air volume, engine coolant temperature and atmospheric pressure.

SELF DIAGNOSIS FUNCTION

- When an abnormality is detected in one of the sensors or actuators related to emission control, the engine warning lamp (check engine lamp) illuminates as a warning to the driver.
- When an abnormality is detected in one of the sensors or actuators, a diagnosis code corresponding to the abnormality is output.
- The RAM data inside the Engine-ECU that is related to the sensors and actuators can be read by means of the MUT-II. In addition, the actuators can be controlled under certain circumstances.

OTHER CONTROL FUNCTIONS

1. Fuel Pump Control
Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Compressor Clutch Relay Control
Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control
The radiator fan and condenser fan speeds are controlled in response to the engine coolant temperature and vehicle speed.
4. Evaporative Emission Purge Control
(Refer to GROUP 17.)
5. EGR Control
(Refer to GROUP 17.)

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm	65
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor type [Stepper motor type bypass air control system with the air volume limiter]
	Closed throttle position switch	Rotary contact type, within throttle position sensor
Sensors	Air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor <vehicles with catalytic converter>	Zirconia type
	Vehicle speed sensor	Electromagnetic resistance element type
	Inhibitor switch	Contact switch type
	Camshaft position sensor	Hall element type
	Crankshaft angle sensor	Hall element type
	Power steering pressure switch	Contact switch type
Actuators	Multipoint fuel injection control relay	Contact switch type
	Fuel pump relay	Contact switch type
	Injector type and number	Electromagnetic type, 6
	Injector identification mark	CDH210
	EGR control solenoid valve	ON/OFF type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	329

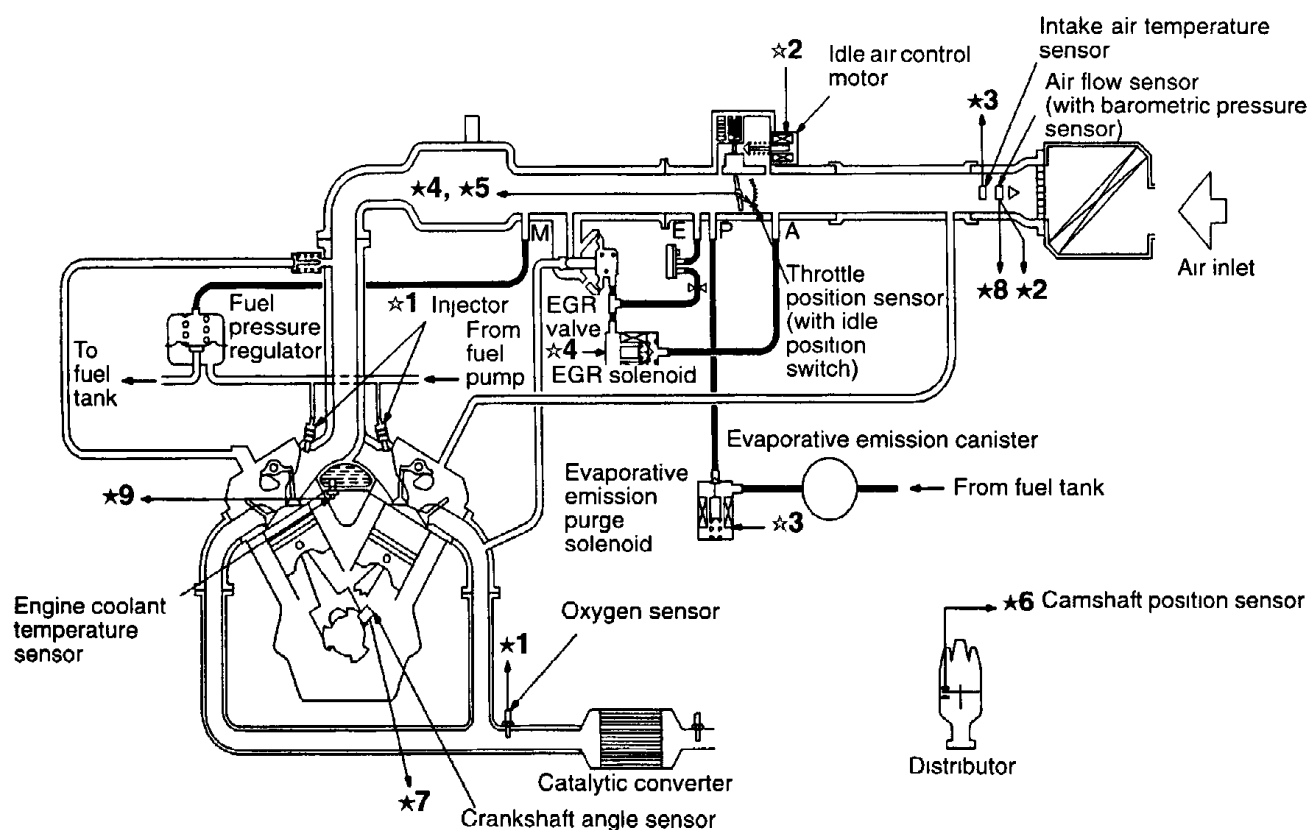
MULTIPOINT FUEL INJECTION (MPI) SYSTEM DIAGRAM

- ★1 Oxygen sensor <vehicles with catalytic converter>
- Variable resistor <vehicles without catalytic converter>
- ★2 Air flow sensor
- ★3 Intake air temperature sensor
- ★4 Throttle position sensor
- ★5 Idle position switch
- ★6 Camshaft position sensor
- ★7 Crankshaft angle sensor
- ★8 Barometric pressure sensor
- ★9 Engine coolant temperature sensor

- Power supply
- Vehicle speed sensor
- A/C switch
- Inhibitor switch
- Power steering pressure switch
- Ignition switch-ST
- Ignition switch-IG

⇒ Engine-ECU ⇒

- ★1 Injector
 - ★2 Idle air control motor
 - ★3 Evaporative emission purge solenoid
 - ★4 EGR solenoid
-
- Fuel pump relay
 - Multipoint fuel injection (MPI) relay
 - A/C compressor clutch relay
 - Engine warning lamp (check engine lamp)
 - Diagnosis output
 - Ignition coil, Ignition power transistor



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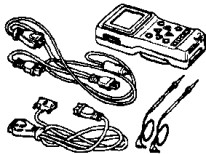
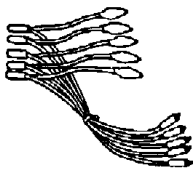
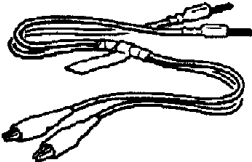
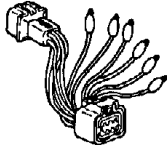
SERVICE SPECIFICATIONS

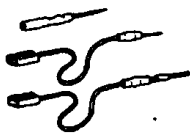
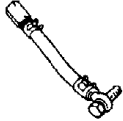
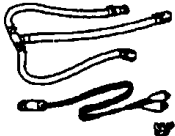
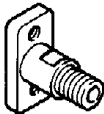
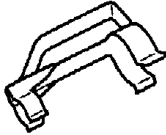
Items		Standard value
Basic ignition timing		5° BTDC ± 3° at curb idle
Curb idle speed r/min		700 ± 100
Idle speed when A/C is ON r/min		900 in Neutral
Basic idle speed r/min		700 ± 50
Throttle position sensor adjusting voltage mV		400–1000
Throttle position sensor resistance kΩ		3.5–6.5
Intake air temperature sensor resistance kΩ	20°C	2.3–3.0
	80°C	0.30–0.42
Engine coolant temperature sensor resistance kΩ	20°C	2.1–2.7
	80°C	0.26–0.36
Oxygen sensor output voltage V		0.6–1.0
Fuel pressure kPa	Vacuum hose disconnected	330–350 at curb idle
	Vacuum hose connected	Approx. 270 at curb idle
Injector coil resistance Ω		13–16 [at 20°C]

SEALANT

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

SPECIAL TOOLS

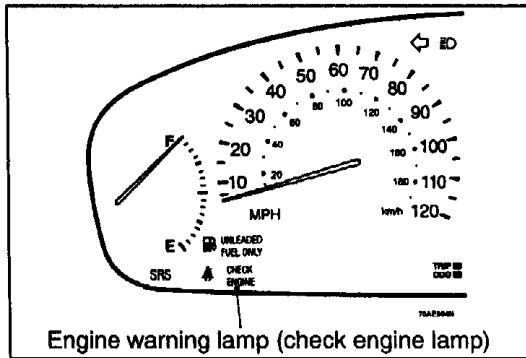
Tool	Number	Name	Use
A  MB991219 B  MB991220 C  MB991221 D  MB991222 MB991223	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adaptor D: Probe	- Fuel gauge simple inspection - Measurement of terminal voltage - A: Connector pin contact pressure inspection - B, C: Power circuit inspection - D: Commercial tester connection
	MB991502	MUT-II	- Reading diagnosis codes - MPI system inspection
		ROM pack	
	MB991348	Test harness set	- Adjustment of throttle position switch, throttle position sensor - Inspection using an analyser
	MB991529	Diagnosis code check harness	Checking the diagnosis codes.
	MD998463	Test harness (6 pin, square)	- Inspection of ISC servo motor - Inspection using an analyser

Tool	Number	Name	Use
	MD991223	Test harness	• Inspection of oxygen sensor • Inspection using an analyser
	MD998478	Test harness (3 pin, triangle)	Inspection using an analyser
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	
	MD998706	Injector test set	Checking the spray condition of injectors
	MD991607	Injector test harness	
	MD998741	Injector test adaptor	
	MB991608	Clip	

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 relating to the Multipoint Fuel Injection (MPI) system, the engine warning lamp will illuminate.

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

Engine warning lamp inspection items

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

Caution

Engine warning lamp will come on even when ignition timing check is performed. Therefore, it is not abnormal that the lamp comes on at the time of ignition timing check.

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

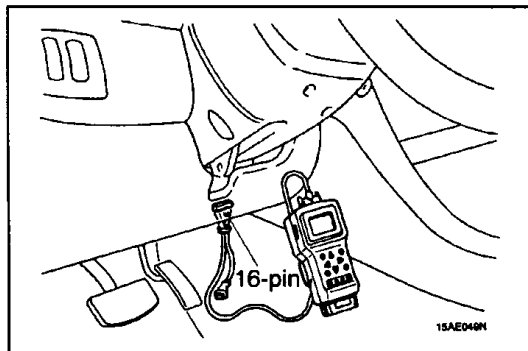
DIAGNOSIS USING DIAGNOSIS 2 MODE

1. Switch the diagnosis mode of the engine control unit to DIAGNOSIS 2 mode using the MUT-II.
2. Carry out a road test.
3. Take a reading of the diagnosis code and repair the problem location.
4. Turn the ignition switch to OFF and then back to ON again.

NOTE

By turning the ignition switch to OFF, the ENGINE-ECU will switch the diagnosis mode from DIAGNOSIS 2 mode to DIAGNOSIS 1 mode.

5. Erase the diagnosis codes.

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

1. Carry out inspection by means of the data list and the actuator test function.
If there is an abnormality, check and repair the chassis harnesses and components.
2. After repairing, re-check using the MUT-II and 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.
5. Start the engine again and carry out a road test to confirm that the problem has disappeared.

FAIL-SAFE FUNCTION REFERENCE TABLE

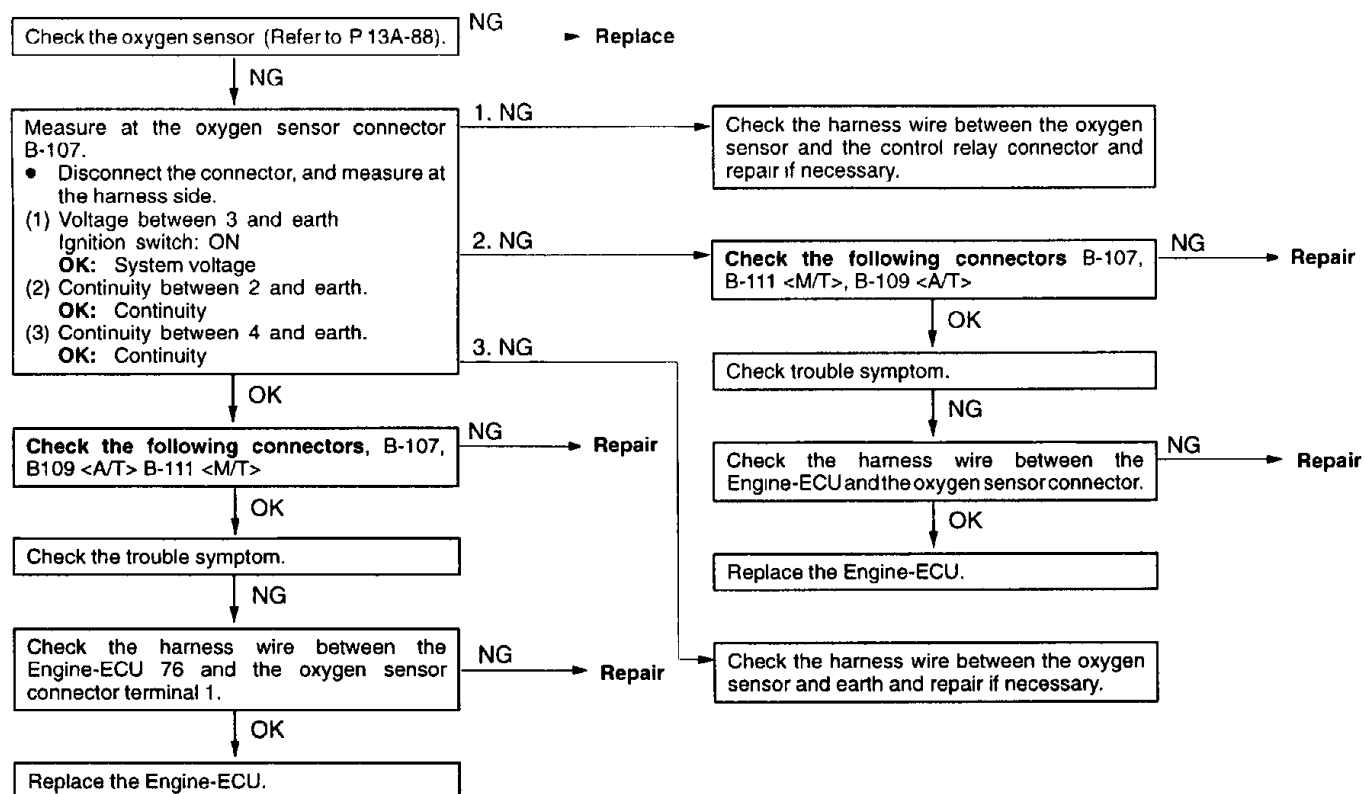
When the main sensor malfunctions are detected by the diagnosis function, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
Air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crankshaft angle sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the unreliable throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	Injects fuel simultaneously into all cylinders. (After the ignition switch is turned to ON, No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa (sea level).
Oxygen sensor	Air/fuel ratio closed loop control is not performed
Communication line with transmission control module	No ignition timing retard (overall engine-transmission control) achieved when transmission speeds are changed.

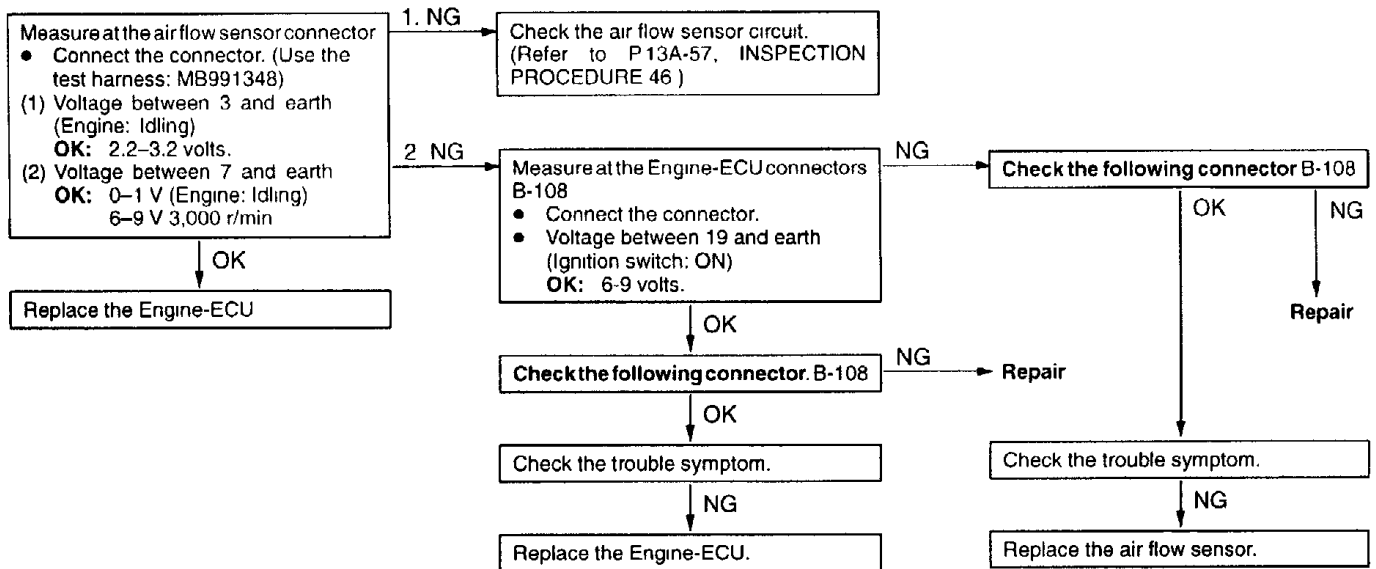
INSPECTION CHART FOR DIAGNOSIS

Code No.	Diagnosis Item	Reference Page
11	Oxygen sensor system <vehicles with catalytic converter>	13A-12
12	Air flow sensor system	13A-13
13	Intake air temperature sensor system	13A-14
14	Throttle position sensor system	13A-15
21	Engine coolant temperature sensor system	13A-16
22	Crankshaft angle sensor system	13A-17
23	Camshaft position sensor system	13A-18
24	Vehicle speed sensor system	13A-19
25	Barometric pressure sensor system	13A-20
41	Injector system	13A-21
44, 52, 53	Ignition coil and power transistor unit system	13A-22
61	Communication with A/T-ECU system <A/T>	13A-23

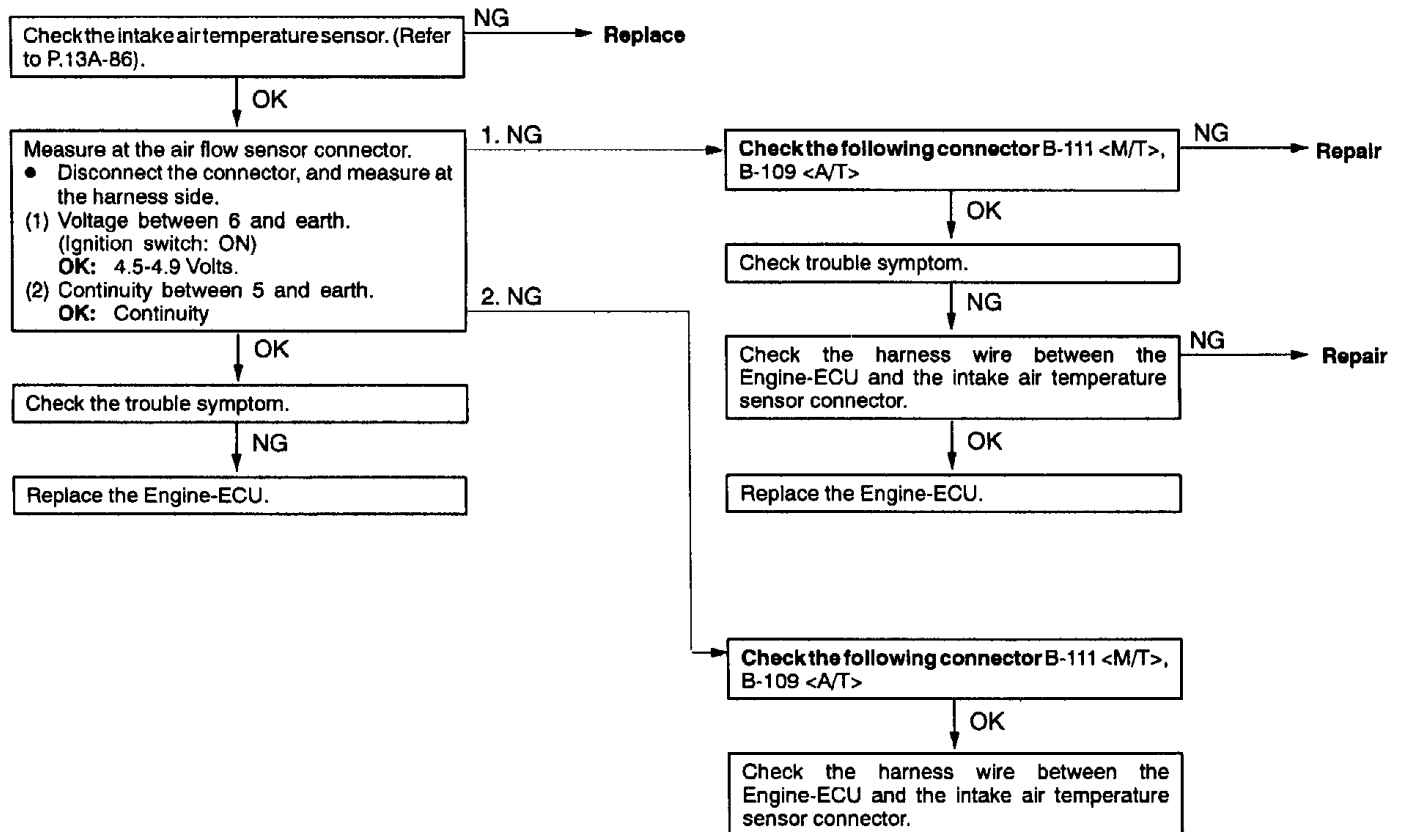
Code No. 11 Oxygen sensor system	Probable cause
Range of Check • 3 minutes have passed after engine was started. • Engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20-50°C. • Engine speed is approx. 2,000-3,000 r/min. • Vehicle is moving at constant speed on a flat, level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



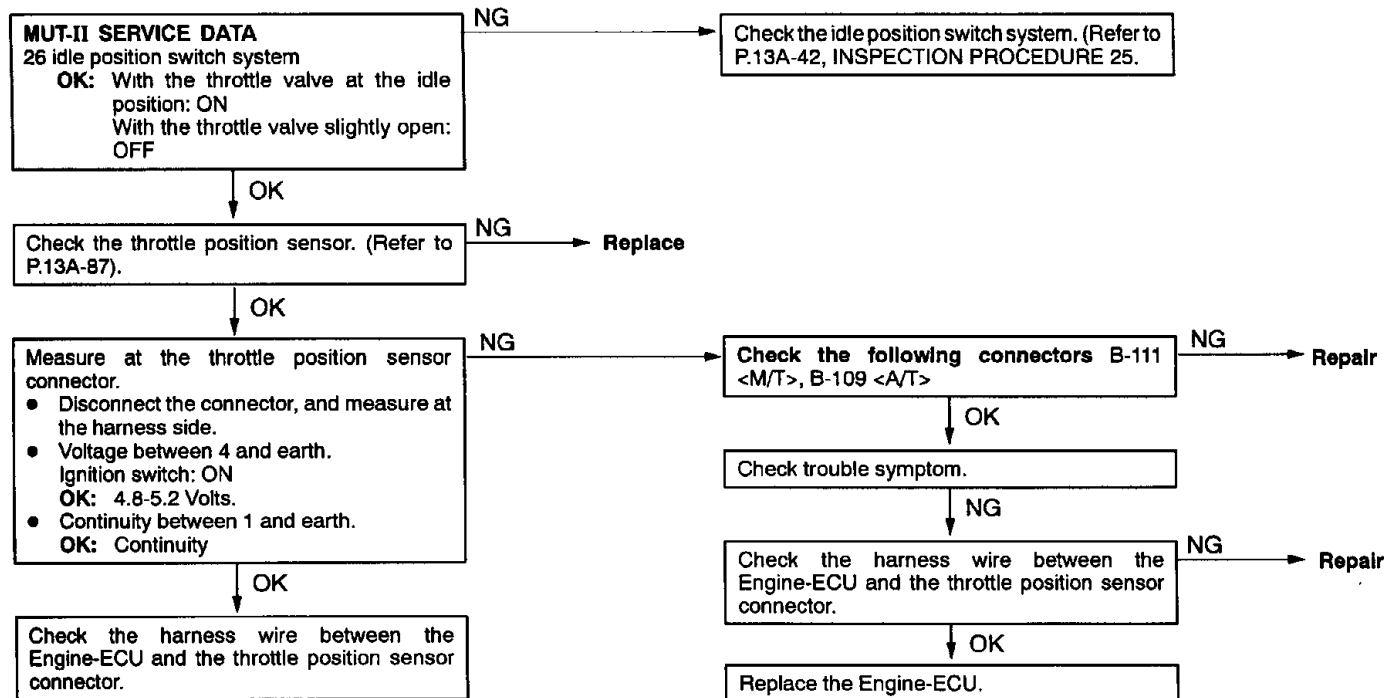
Code No. 12 Air flow sensor system	Probable cause
Range of Check • Engine speed is 500 r/min or more Set conditions • Sensor output frequency is 3 Hz or less for 4 seconds.	• Malfunction of the air flow sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU



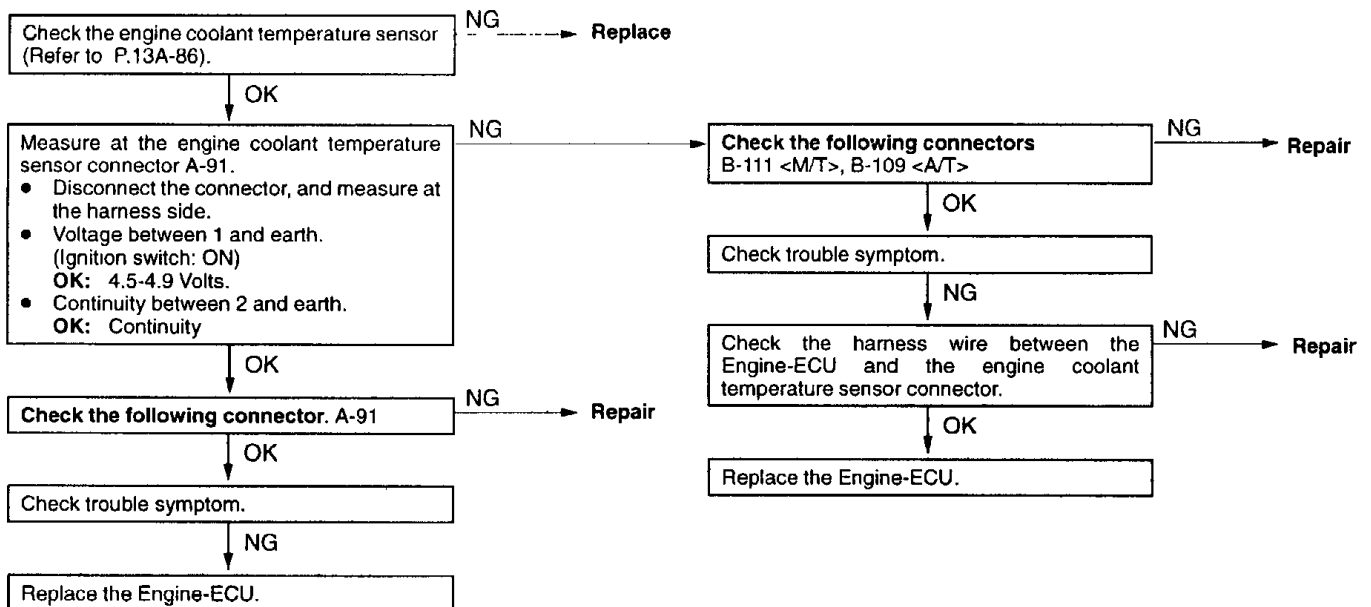
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check - Ignition switch: ON - Excluding 60 seconds after the ignition is turned to ON or immediately after the engine starts. Set conditions - Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature of -45°C or less) for 4 seconds. or - Sensor output voltage is 0.2 V or more (corresponding to an intake air temperature of -125°C or more) for 4 seconds.	- Malfunction of the intake air temperature sensor - Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor circuit - Malfunction of the Engine-ECU



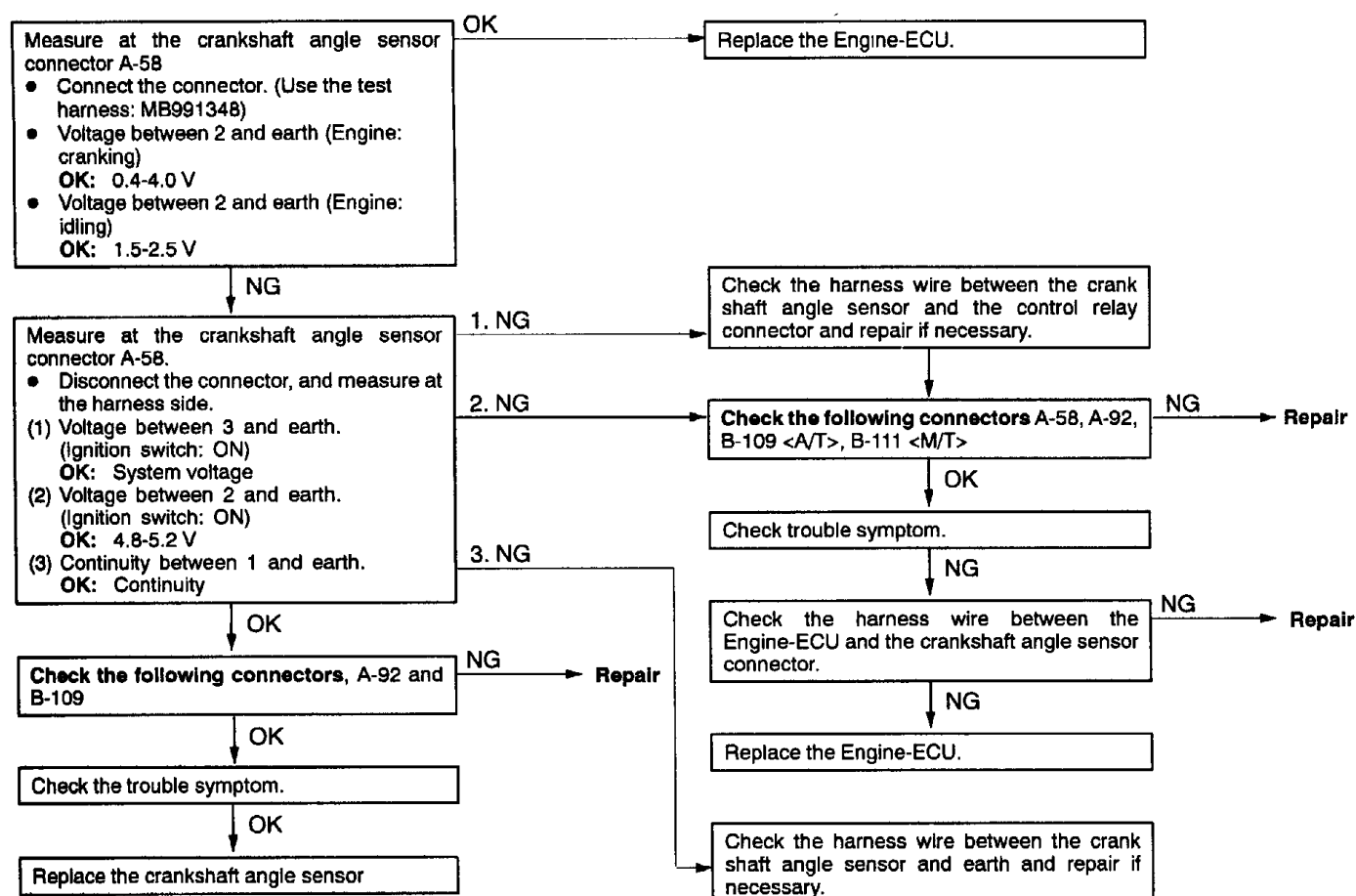
Code No. 14 Throttle position sensor system	Probable cause
Range of Check - Ignition switch: ON - Excluding 60 seconds after the ignition is turned to ON or immediately after the engine starts. Set conditions - When the idle position Switch is ON, the sensor output voltage is 2 Volts or more for 4 seconds or - Sensor output voltage is 0.2 V or less for 4 seconds.	- Malfunction of the throttle sensor or maladjustment - Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor circuit - Malfunction of the Engine-ECU



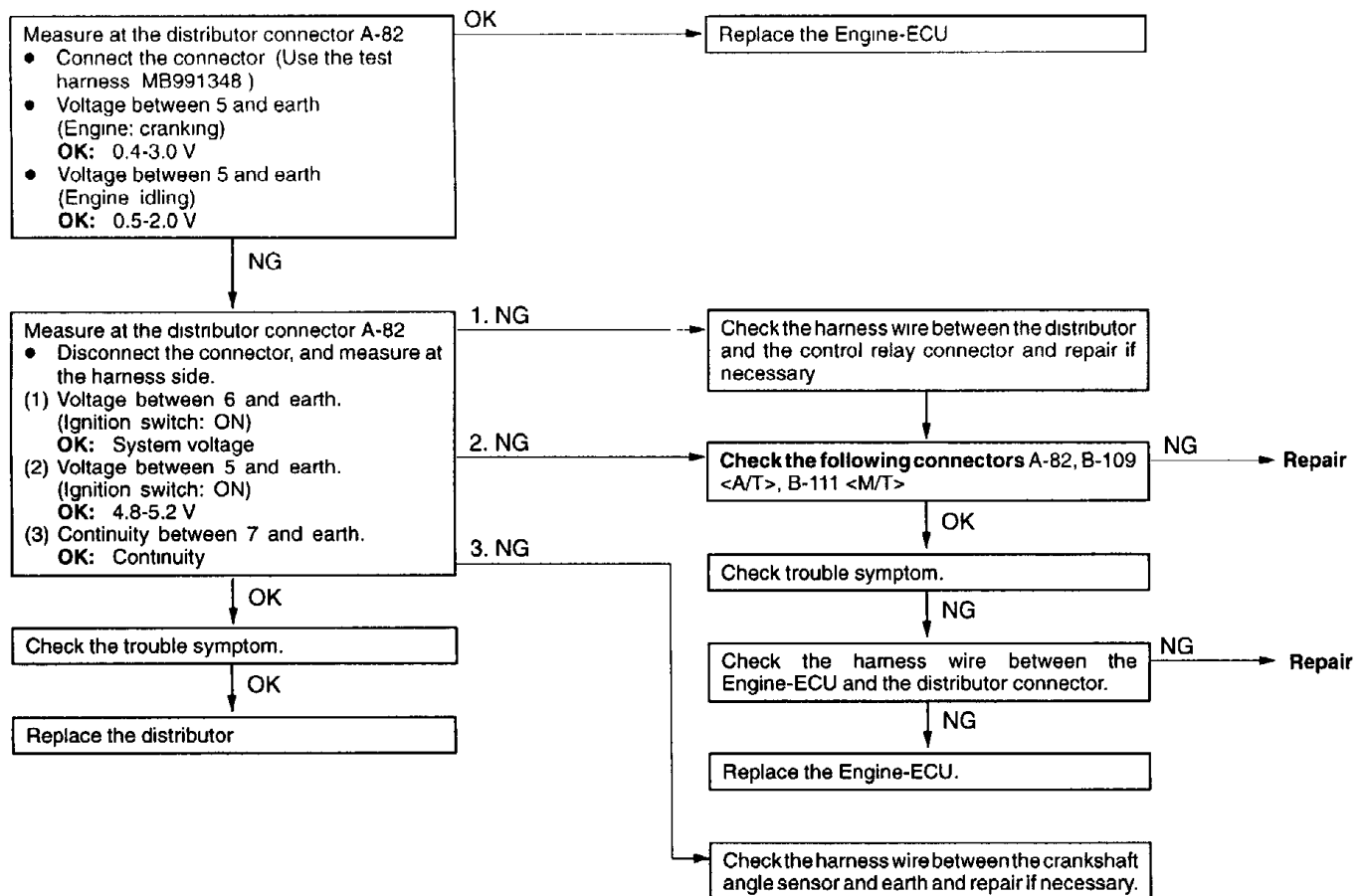
Code No. 21 Engine coolant temperature sensor system	Probable cause
Range of Check - Ignition switch: ON - Excluding 60 seconds after the ignition is turned to ON or immediately after the engine starts. Set conditions - Sensor output voltage is 4.6 V or more (corresponding to an engine coolant temperature of -45°C or less) for 4 seconds or - Sensor output voltage is 0.1 V or more (corresponding to an engine coolant temperature of 140°C or more) for 4 seconds Range of Check - Ignition switch: ON - Engine speed is approx. 50 r/min or more Set conditions - Sensor output voltage increases from 1.6 V or less (corresponding to an engine coolant temperature of -40°C or less) to 1.6 V or more (corresponding to an engine coolant temperature of -40°C or less) - After this, the sensor output voltage is 1.6 V or more for 5 minutes.	- Malfunction of the engine coolant temperature sensor - Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor circuit - Malfunction of the Engine-ECU sensor



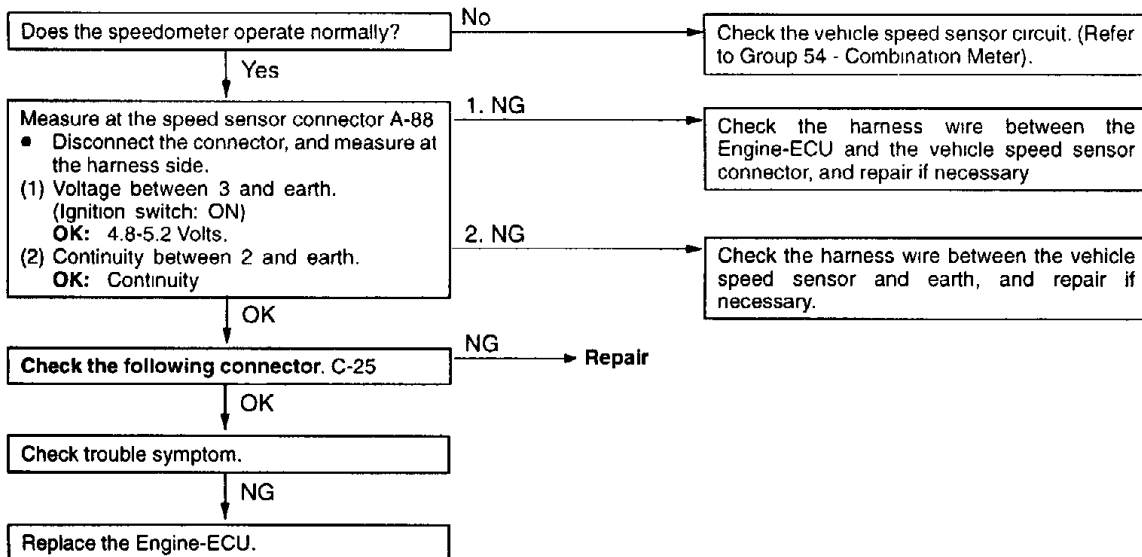
Code No. 22 Crankshaft angle sensor system	Probable cause
Range of Check • Engine is cranking. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input).	• Malfunction of the crankshaft angle sensor • Improper connector contact, open circuit or short-circuited harness wire of the crankshaft angle sensor circuit. • Malfunction of the Engine-ECU



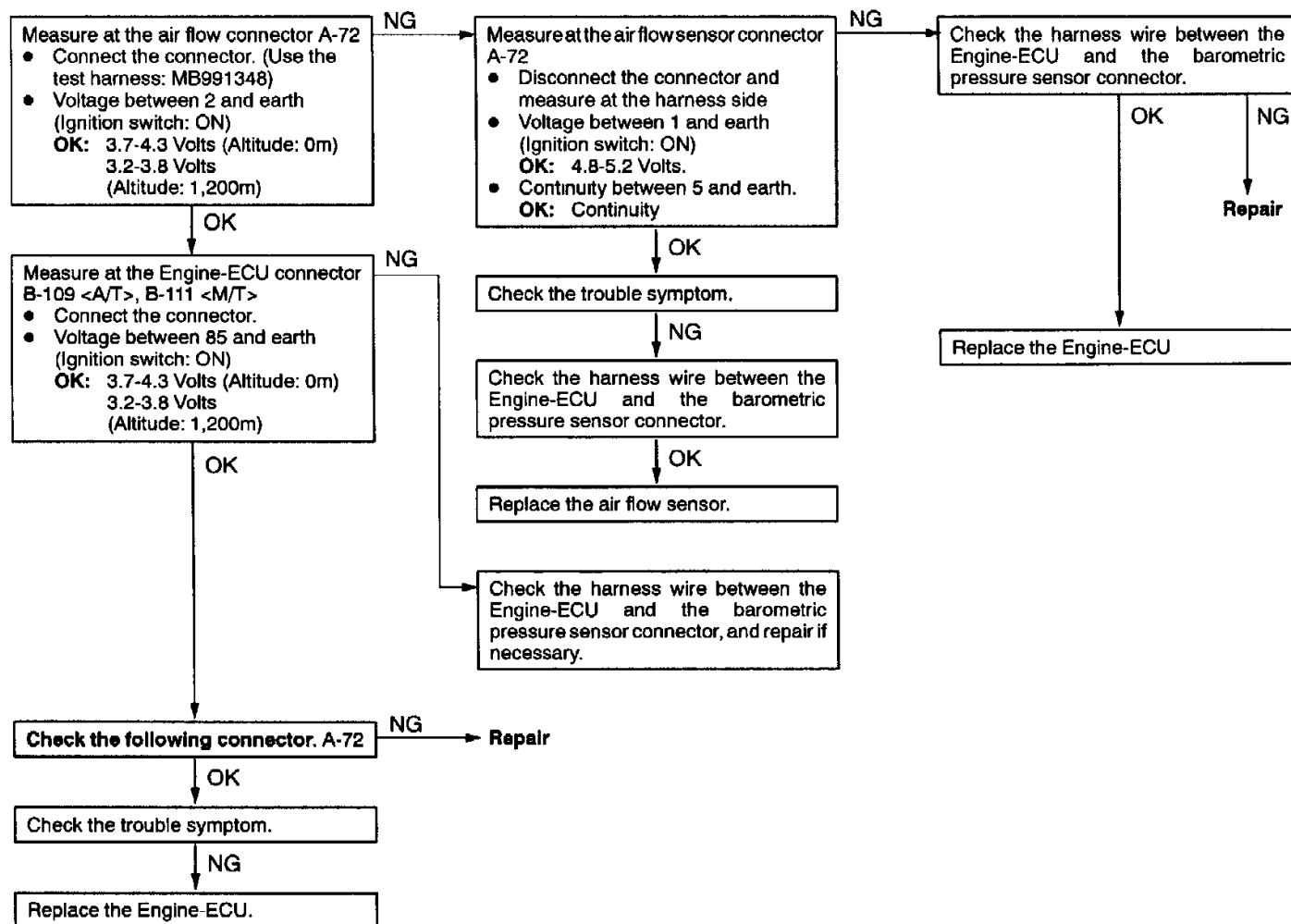
Code No. 23 Camshaft position sensor system	Probable cause
Range of Check - Ignition Switch: ON - Engine speed is approx. 50 r/min or more. Set conditions - Sensor output voltage does not change for 4 seconds (no pulse signal input).	- Malfunction of the crankshaft angle sensor - Improper connector contact,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



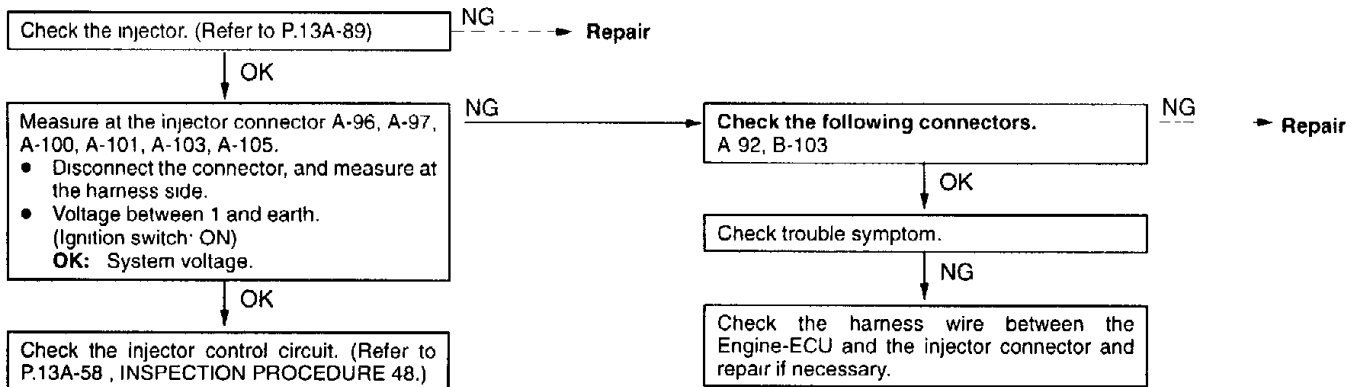
Code No. 24 Vehicle speed sensor system	Probable cause
Range of Check - Ignition Switch: ON - Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. - Idle position switch: OFF - Engine speed is approx. 50 r/min or more. - Driving under high engine load. Set conditions - Sensor output voltage does not change for 4 seconds (no pulse signal input).	- Malfunction of the vehicle speed sensor - Improper connector contact, open circuit or short-circuited harness wire of the vehicle speed sensor circuit. - Malfunction of the Engine-ECU



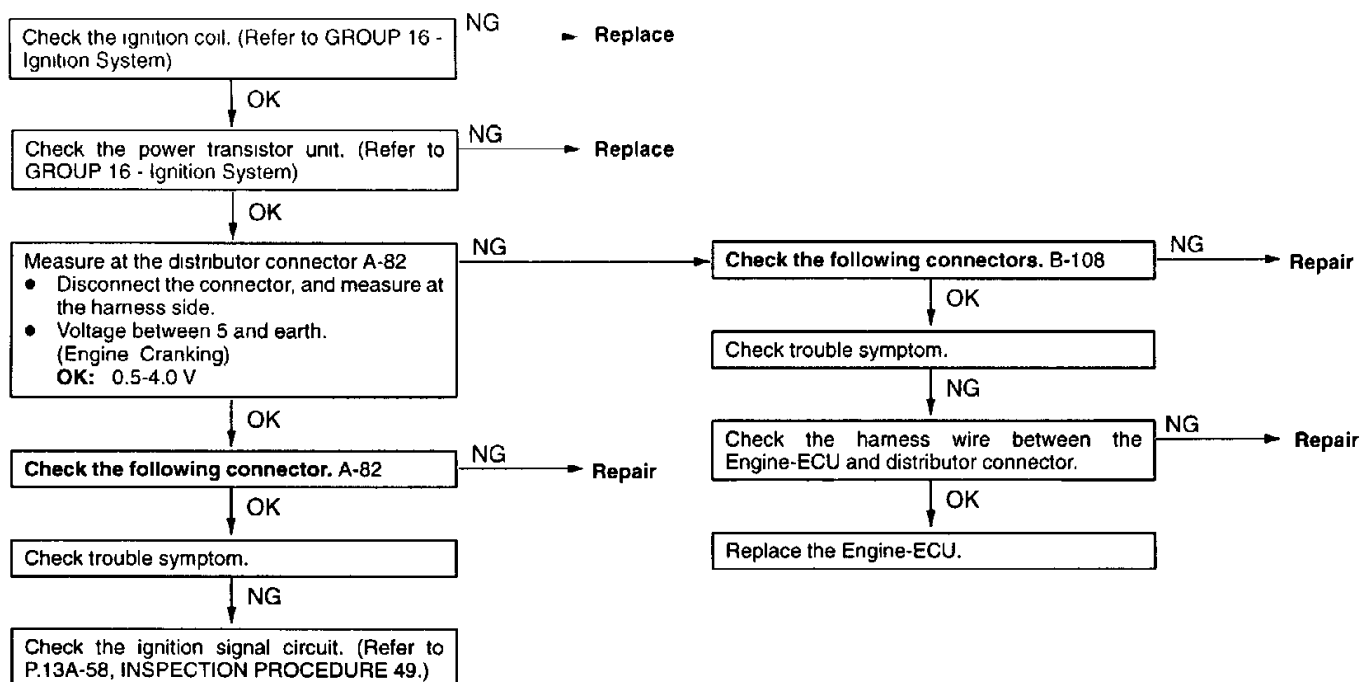
Code No. 25 Barometric pressure sensor system	Probable cause
Range of Check - Ignition Switch: ON - Excluding 60 seconds after the ignition switch is turned ON or immediately after the engine starts. - Battery voltage is 8 Volts or more Set conditions - Sensor output voltage is 4.5 Volts or more (corresponding to a barometric pressure of 114 kPa or more) for 4 seconds or - Sensor output voltage is 0.2 Volts or less (corresponding to a barometric pressure of 5.33 kPa or more) for 4 seconds.	- Malfunction of the vehicle speed sensor - Improper connector contact, open circuit or short-circuited harness wire of the barometric pressure sensor circuit - Malfunction of the Engine-ECU



Code No. 41 Injector system	Probable cause
Range of Check - Engine speed is approx. 50-1000 r/min - Throttle position sensor output voltage is 1.15 Volts or less. - Actuator test by MUT-II is not carried out. Set conditions - Surge voltage of injector coil is not detected for 4 seconds.	- Short circuit to earth of the diagnosis control line. - Improper connector contact, open circuit or short-circuited harness wire of the injector circuit - Malfunction of the Engine-ECU



Code No. 44, 52, 53 Ignition coil and power transistor unit system	Probable cause
Range of Check - Engine speed is approx. 50-4000 r/min - Engine is not cranking. Set conditions - The ignition signal from the same coil is not input for 4 seconds. However, this excludes cases where no ignition signal is input from any coils	- Malfunction of the ignition coil. - Improper connector contact, open circuit or short-circuited harness wire of the ignition primary circuit - Malfunction of the power transistor unit - Malfunction of the Engine-ECU



Code No. 61 Communication with A/T-ECU System <A/T>	Probable cause
Range of Check • For a period of 60 sec or longer immediately after completing startup • Engine revolutions approximately 50 r/min or faster Set Conditions • The signal from the A/T ECU requesting torque reduction has been continuously input for about 5 sec or longer	• Engine-A/T ECU fault

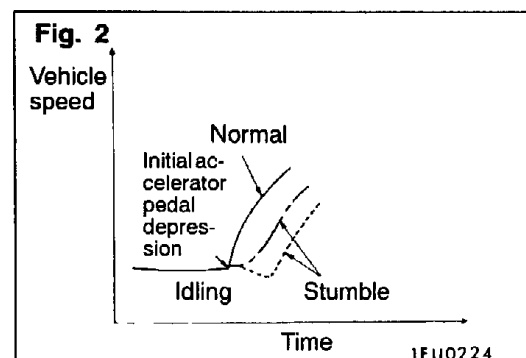
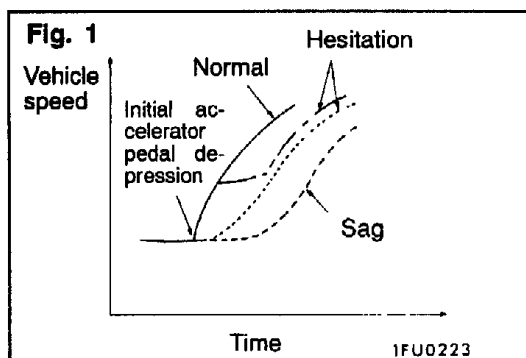
Replace the Engine-A/T ECU

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference Page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-26
	Communication with Engine-ECU only is not possible.	2	13A-26
Check engine/malfunction indicator lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-27
	The engine warning lamp remains illuminated and never goes out.	4	13A-28
Starting	Cranks, won't start	5	13A-28
	Fires up and dies	6	13A-29
	Hard starting	7	13A-30
Idling stability (Improper idling)	Unstable idle. (Rough idle, hunting)	8	13A-31
	Idle speed is high. (Improper idle speed)	9	13A-32
	Idle speed is low. (Improper idle speed)	10	13A-33
Idling stability (Engine stalls)	When the engine is cold, it stalls at idle (Die out)	11	13A-34
	When the engine becomes hot, it stalls at idle. (Die out)	12	13A-35
	The engine stalls when accelerating. (Pass out)	13	13A-36
	The engine stalls when decelerating.	14	13A-36
Driving	Hesitation, sag or stumble	15	13A-37
	Acceleration shock	16	13A-37
	Deceleration shock	17	13A-38
	Poor acceleration	18	13A-38
	Surge	19	13A-39
	Knocking	20	13A-39
Dieseling		21	13A-39
Too high CO and HC concentration when idling		22	13A-40

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

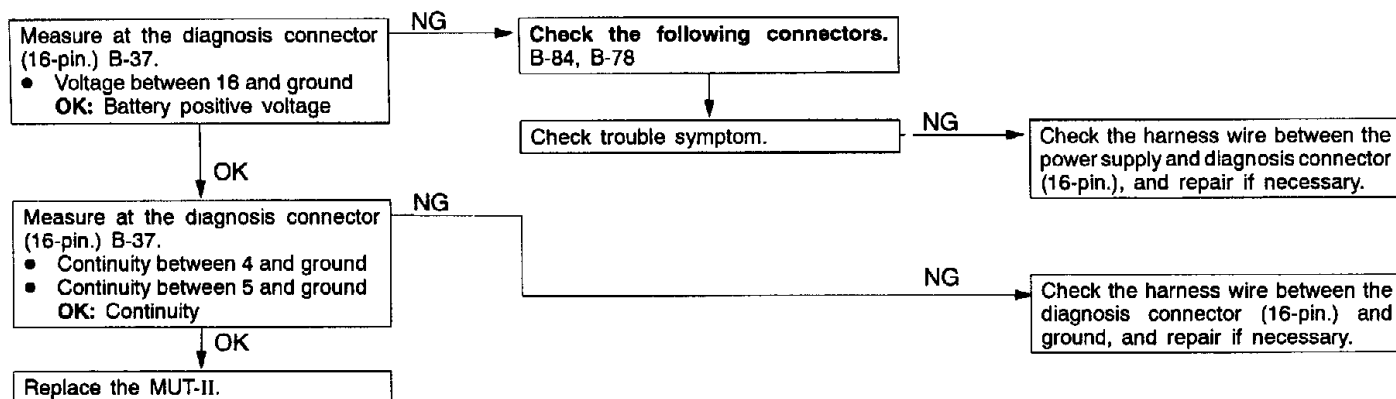
Items		Symptom
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Fires up and dies	There is combustion within the cylinders, but then the engine soon stalls.
	Hard starting	Engine starts after cranking a while.
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 vehicle 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 travelling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag". (Refer to Fig. 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 Fig. 2)
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually steady, light throttle cruise. Most notable under light loads.
	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

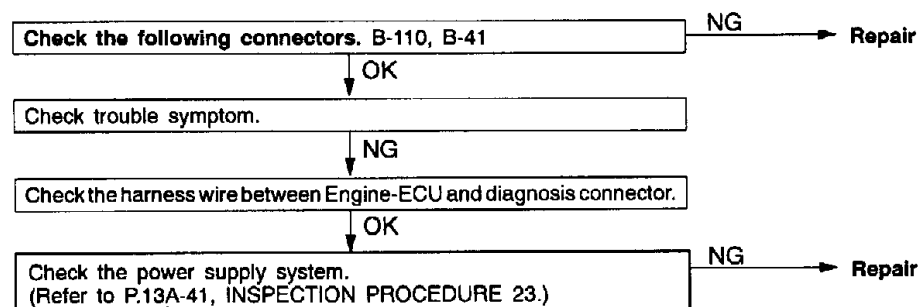
INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defect in the power supply system (including ground) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



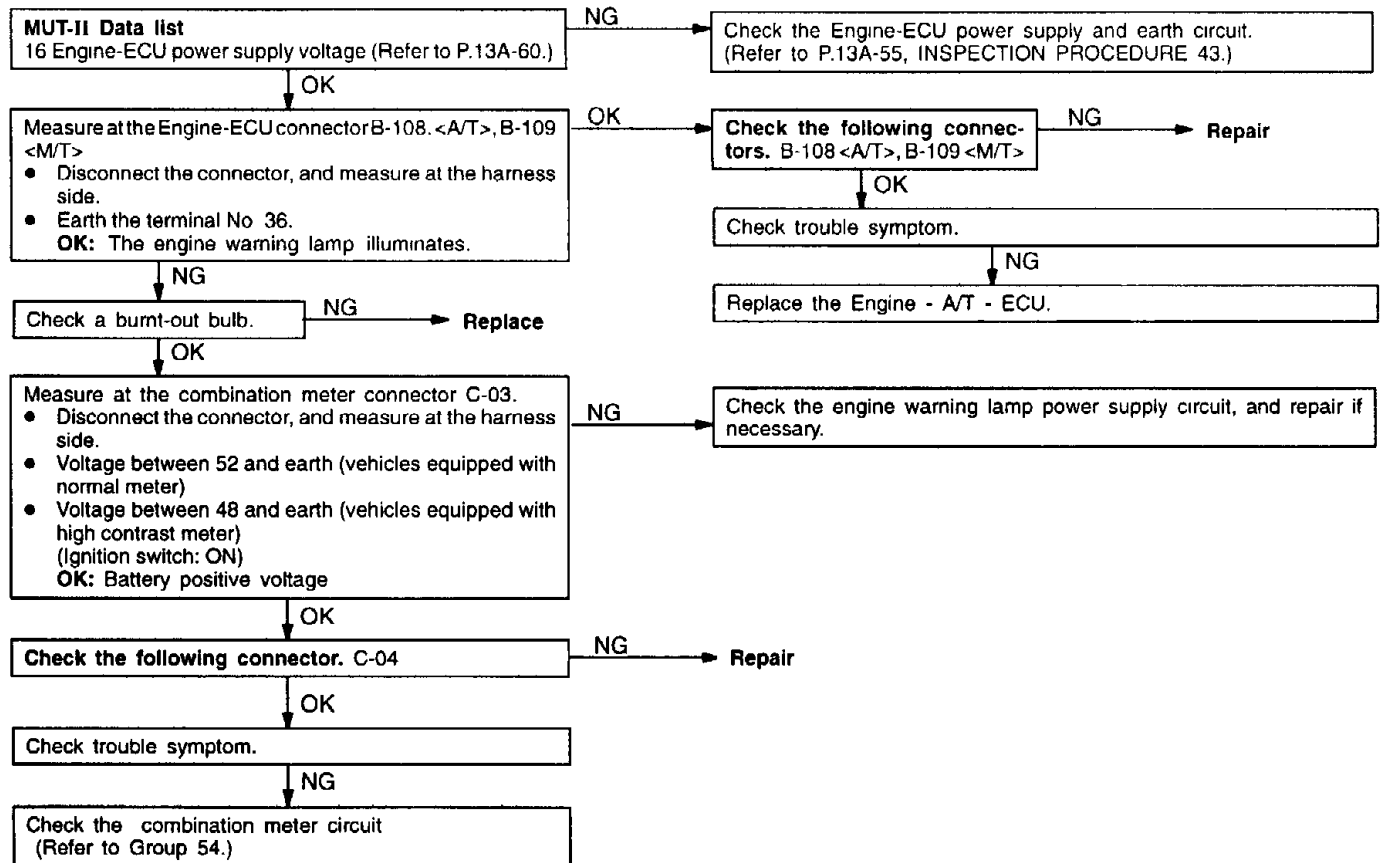
INSPECTION PROCEDURE 2

MUT-II communication with Engine-ECU is not possible.	Probable cause
One of the following causes may be suspected. • No power supply to Engine-ECU • Defective ground circuit of Engine-ECU • Defective Engine-ECU • Improper communication line between Engine-ECU and MUT-II	• Malfunction of Engine-ECU power supply circuit • Malfunction of the Engine-ECU • Open circuit between Engine-ECU and diagnosis connector



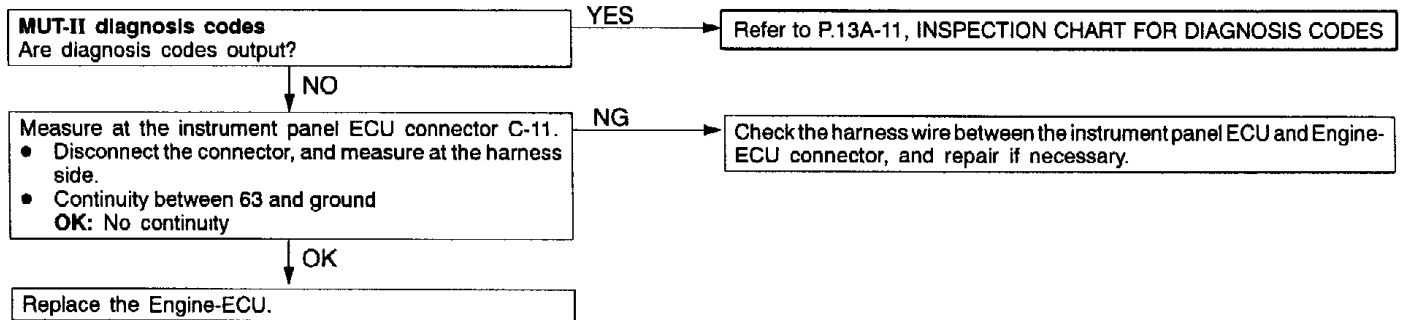
INSPECTION PROCEDURE 3

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



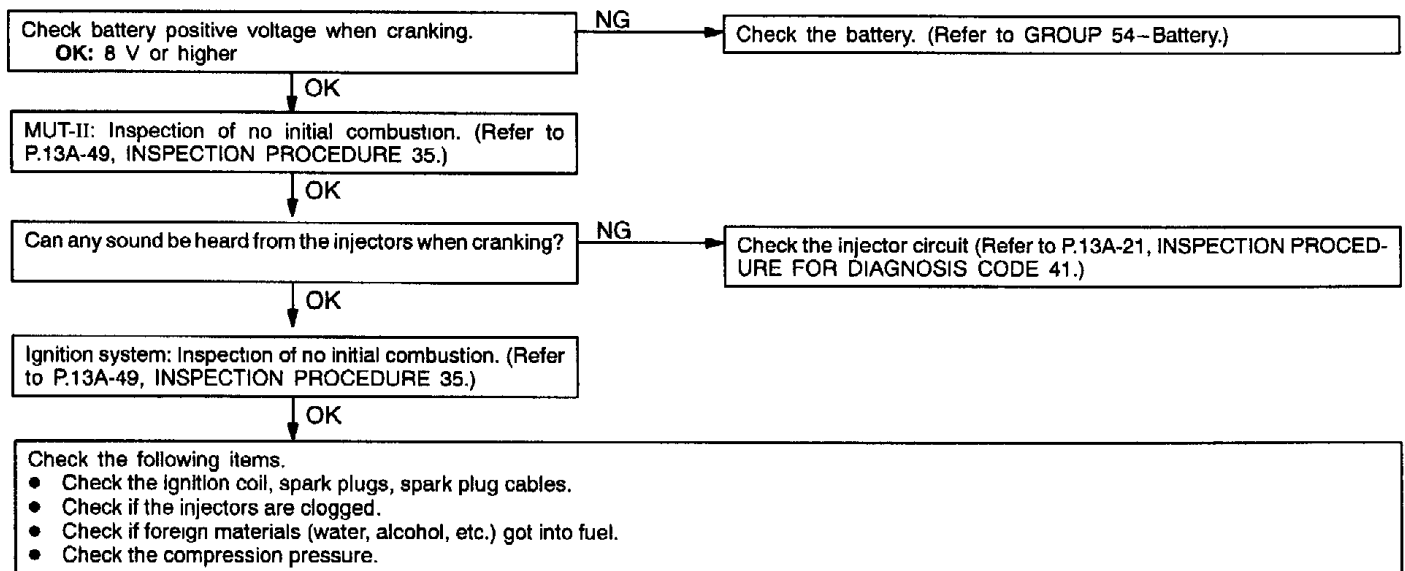
INSPECTION PROCEDURE 4

The engine warning lamp remains illuminated 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 these listed at right has occurred.	• Short-circuit between the check engine lamp and Engine-ECU • Malfunction of the Engine-ECU



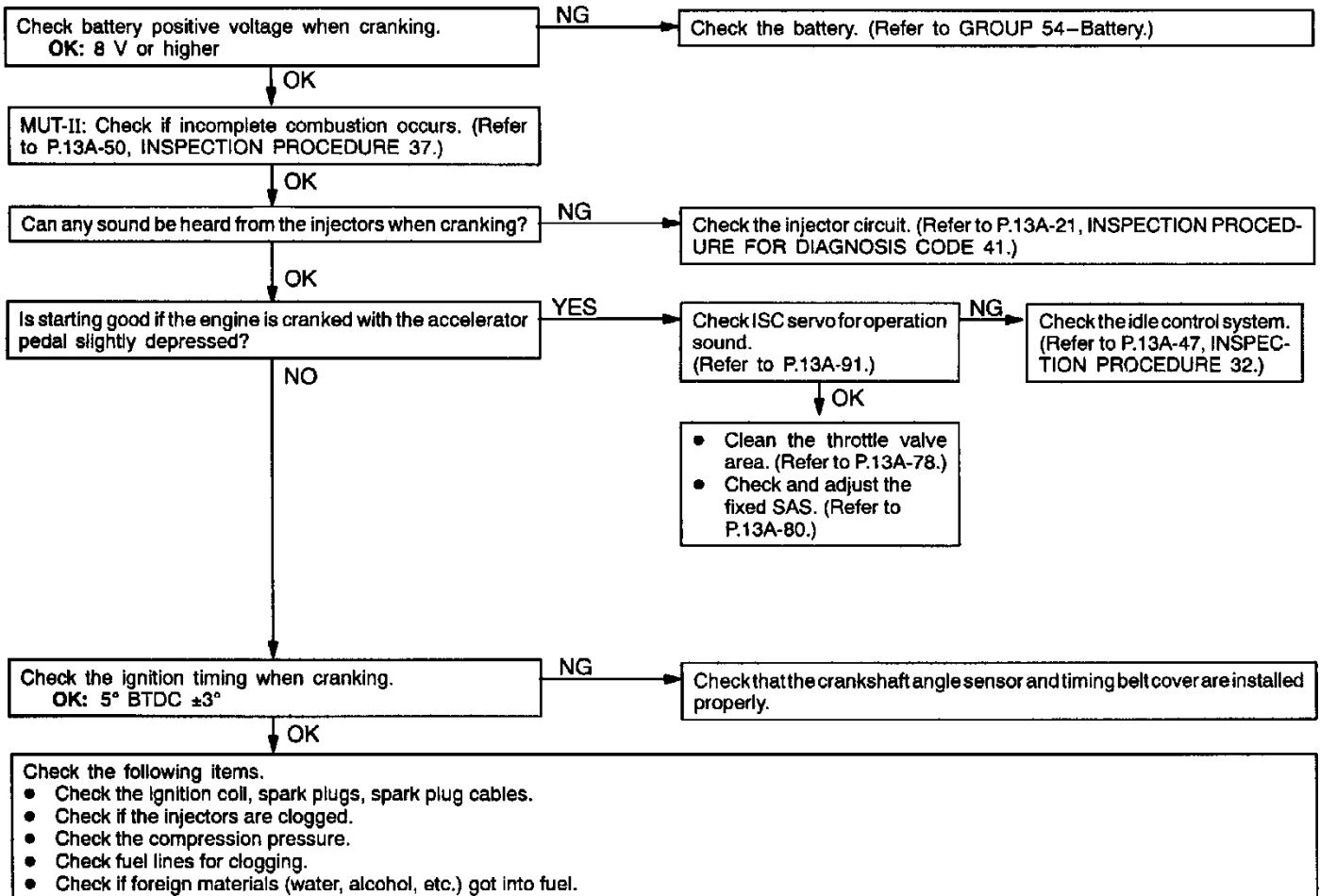
INSPECTION PROCEDURE 5

Cranks, won't start	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.	• Malfunction of the ignition system • Malfunction of the fuel pump system • Malfunction of the injectors • Malfunction of the Engine-ECU • Foreign materials in fuel



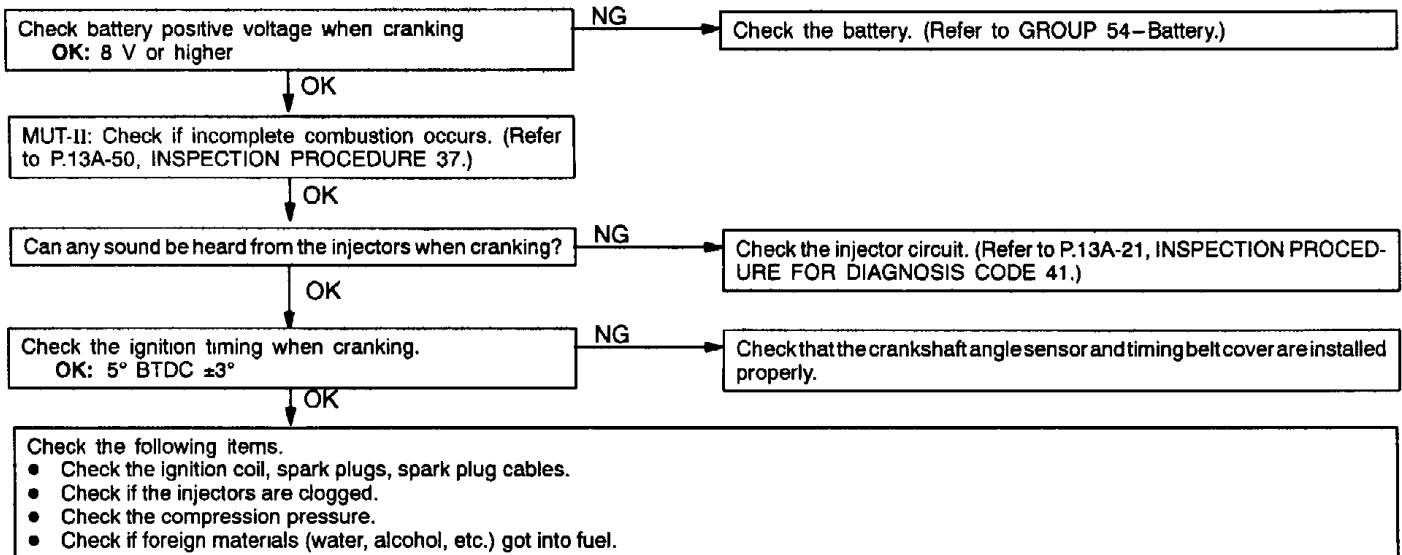
INSPECTION PROCEDURE 6

Fires up and dies.	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.	• Malfunction of the ignition system • Malfunction of the injector system • Foreign materials in fuel • Poor compression • Malfunction of the Engine-ECU



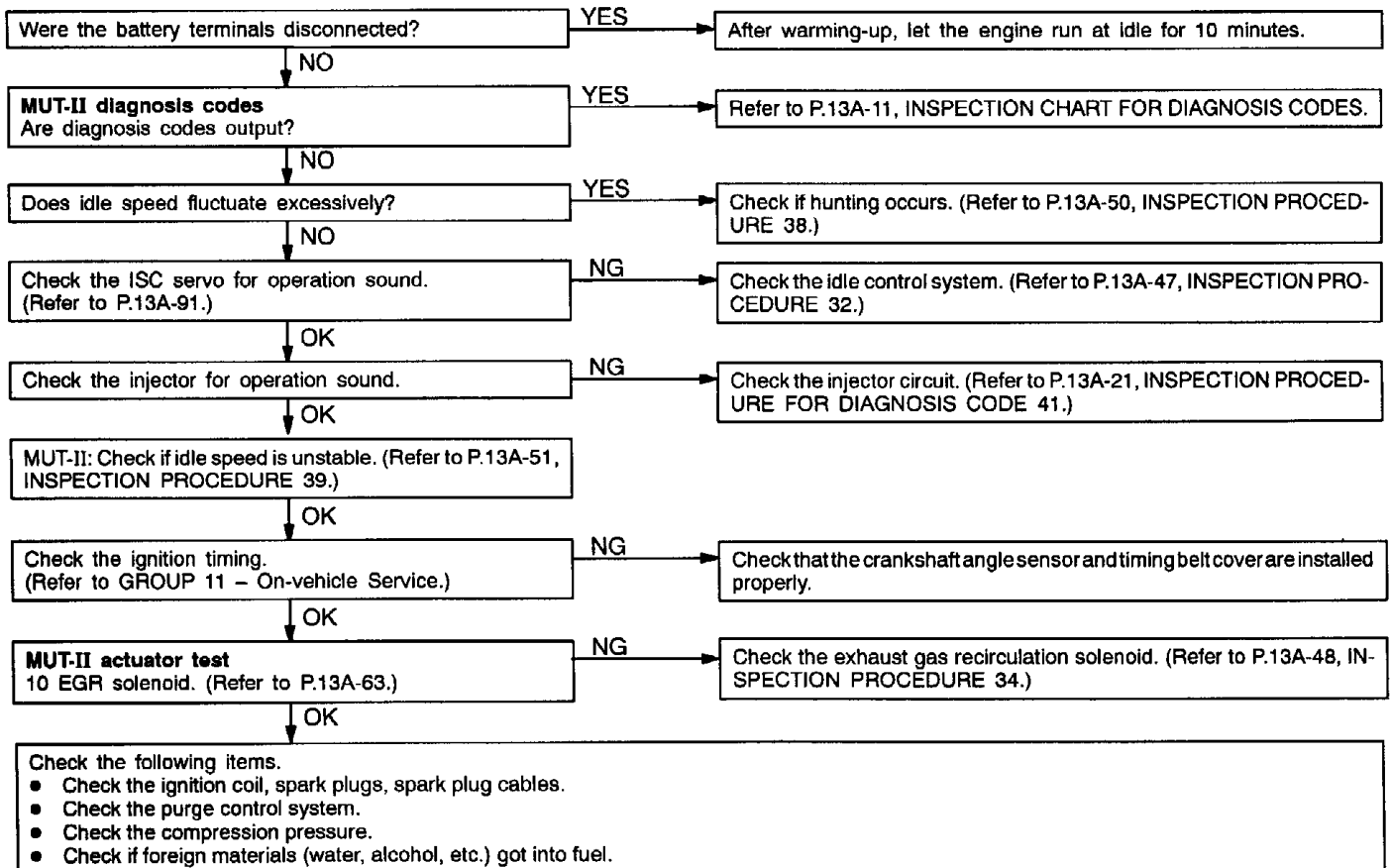
INSPECTION PROCEDURE 7

Hard starting.	Probable cause
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.	● Malfunction of the ignition system ● Malfunction of the injector system ● Inappropriate gasoline use ● Poor compression



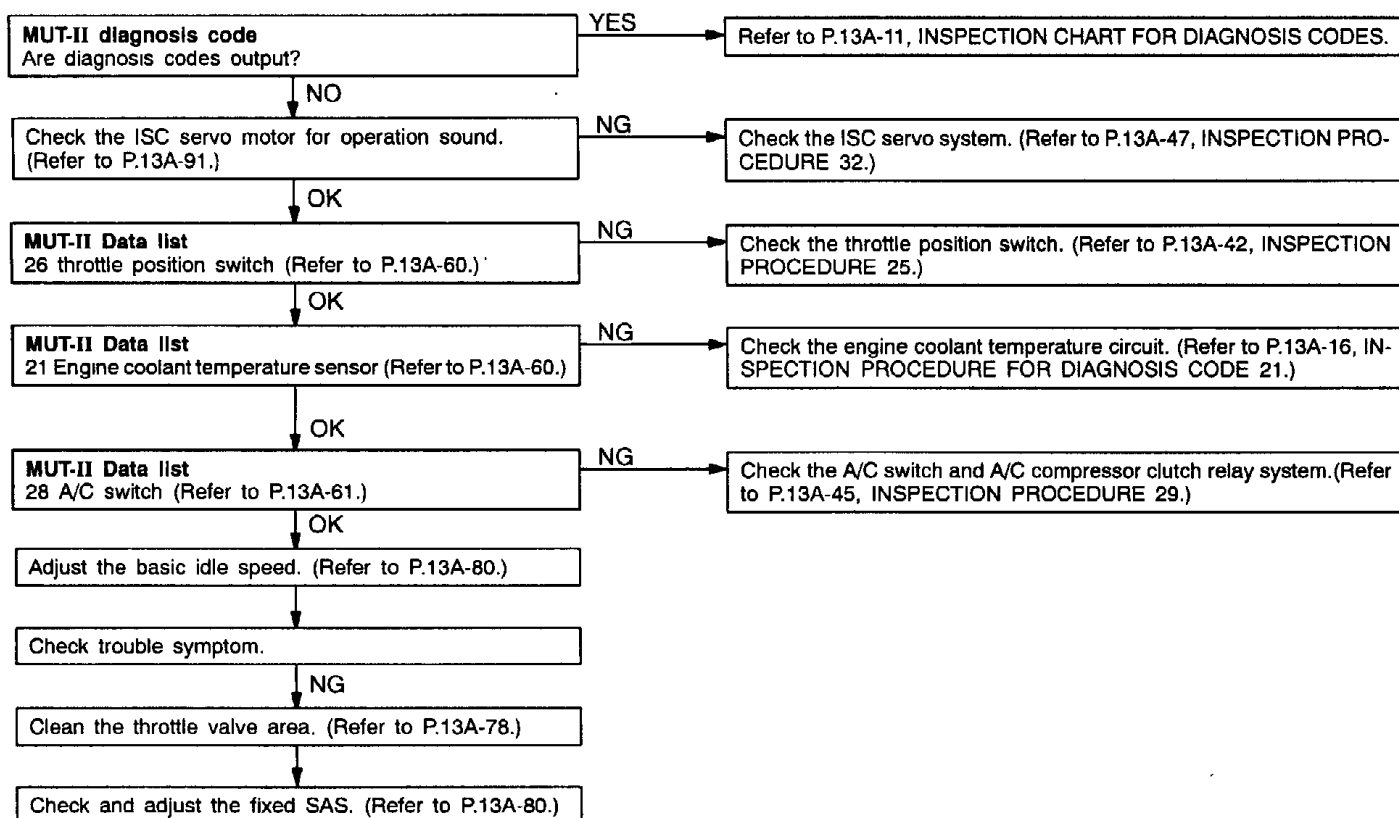
INSPECTION PROCEDURE 8

Unstable idle (Rough idle, hunting)	Probable cause
In cases such as the above, the cause is probably that the ignition system, air/fuel mixture, ISC servo or compression pressure is defective. Because the range of possible causes is broad, inspection is narrowed down to simple items.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the ISC system • Malfunction of the purge solenoid valve system • Poor compression • Drawing air into exhaust system • Malfunction of the EGR solenoid valve system



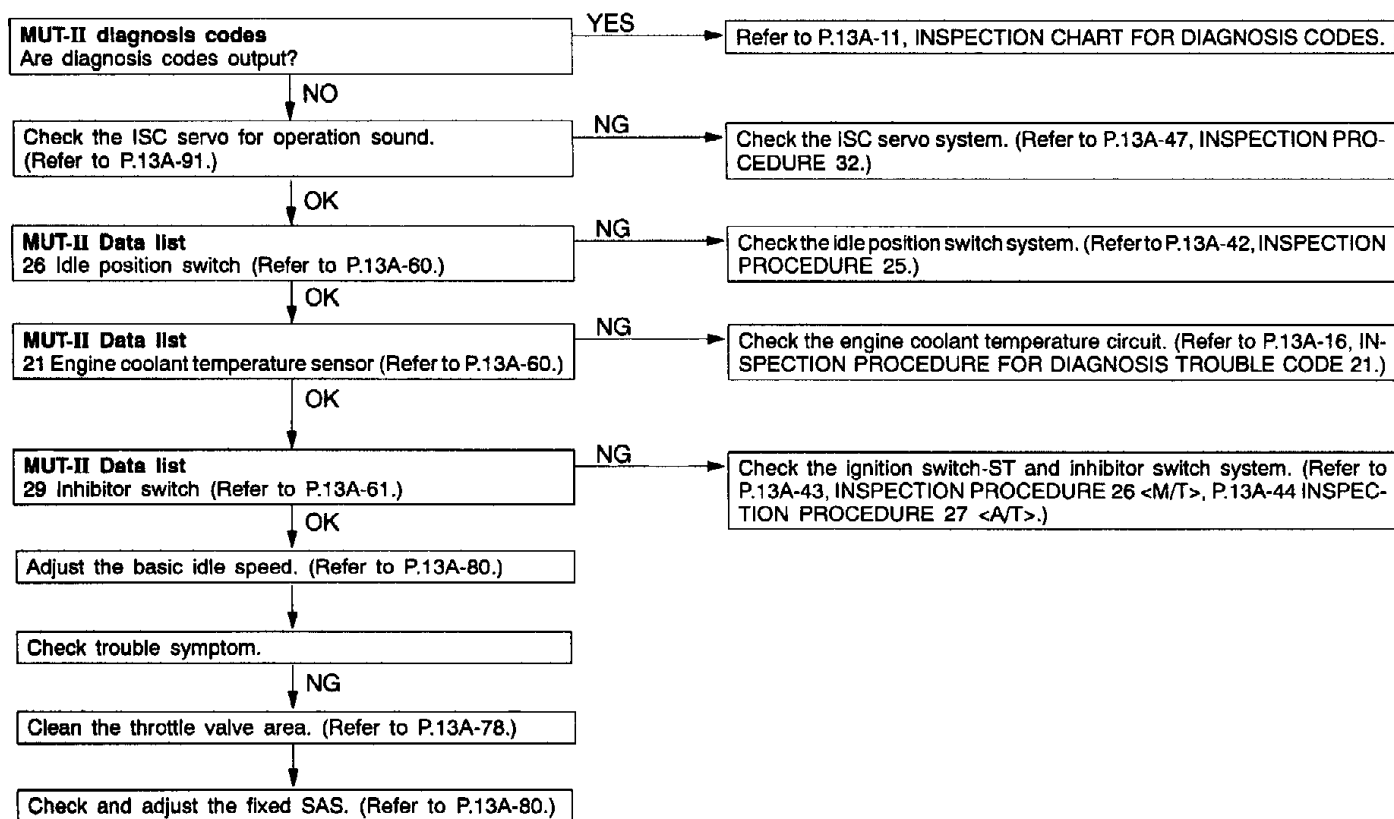
INSPECTION PROCEDURE 9

Idle speed is high. (Improper idle speed)	Probable cause
In such cases as the above, the cause is probably that the intake air volume during idle is too great.	• Malfunction of the ISC servo motor system • Malfunction of the throttle body



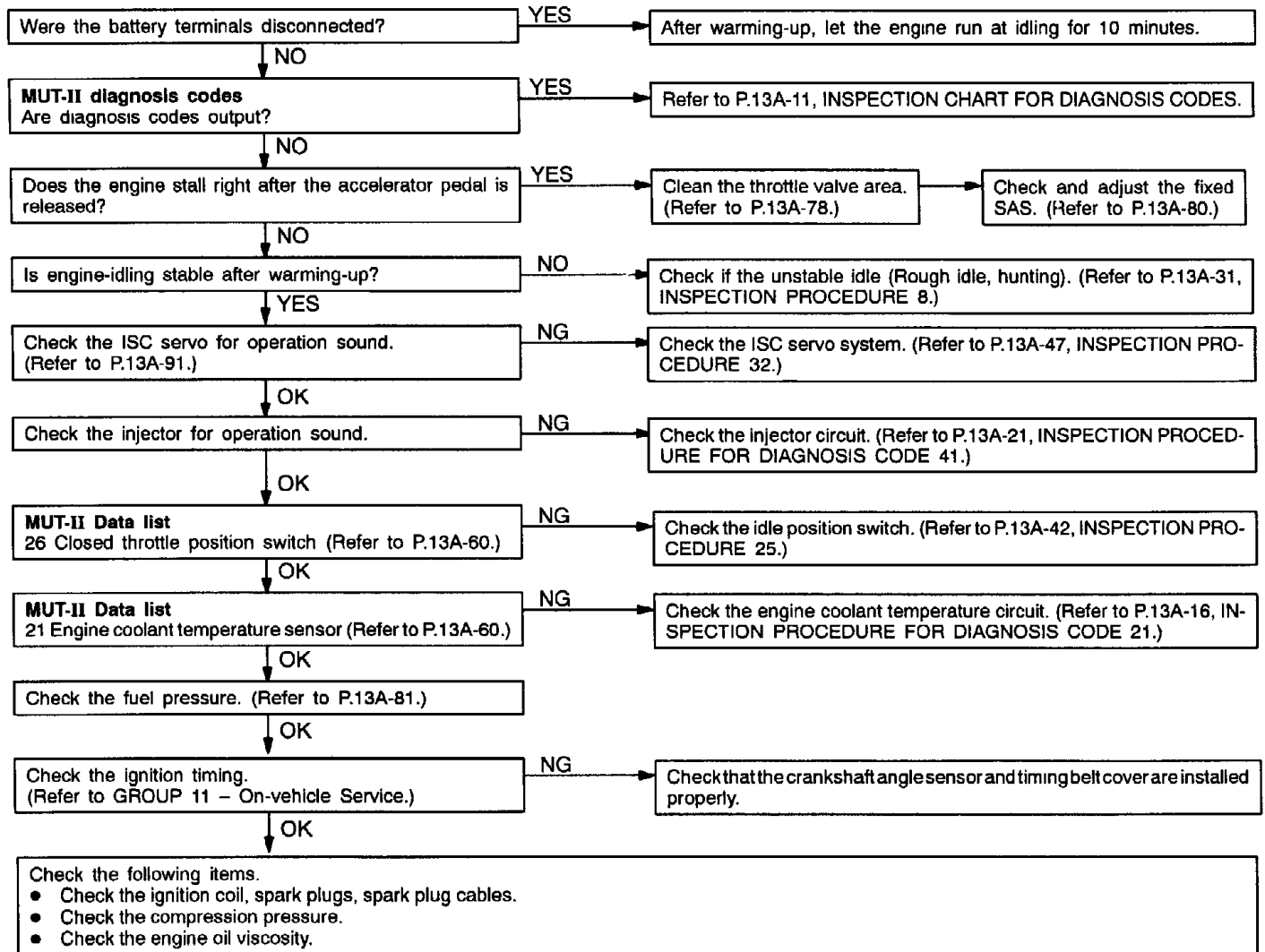
INSPECTION PROCEDURE 10

Idle speed is low. (Improper Idle speed)	Probable cause
In cases such as the above, the cause is probably that the intake air volume during idling is too small.	• Malfunction of the ISC servo system • Malfunction of the throttle body



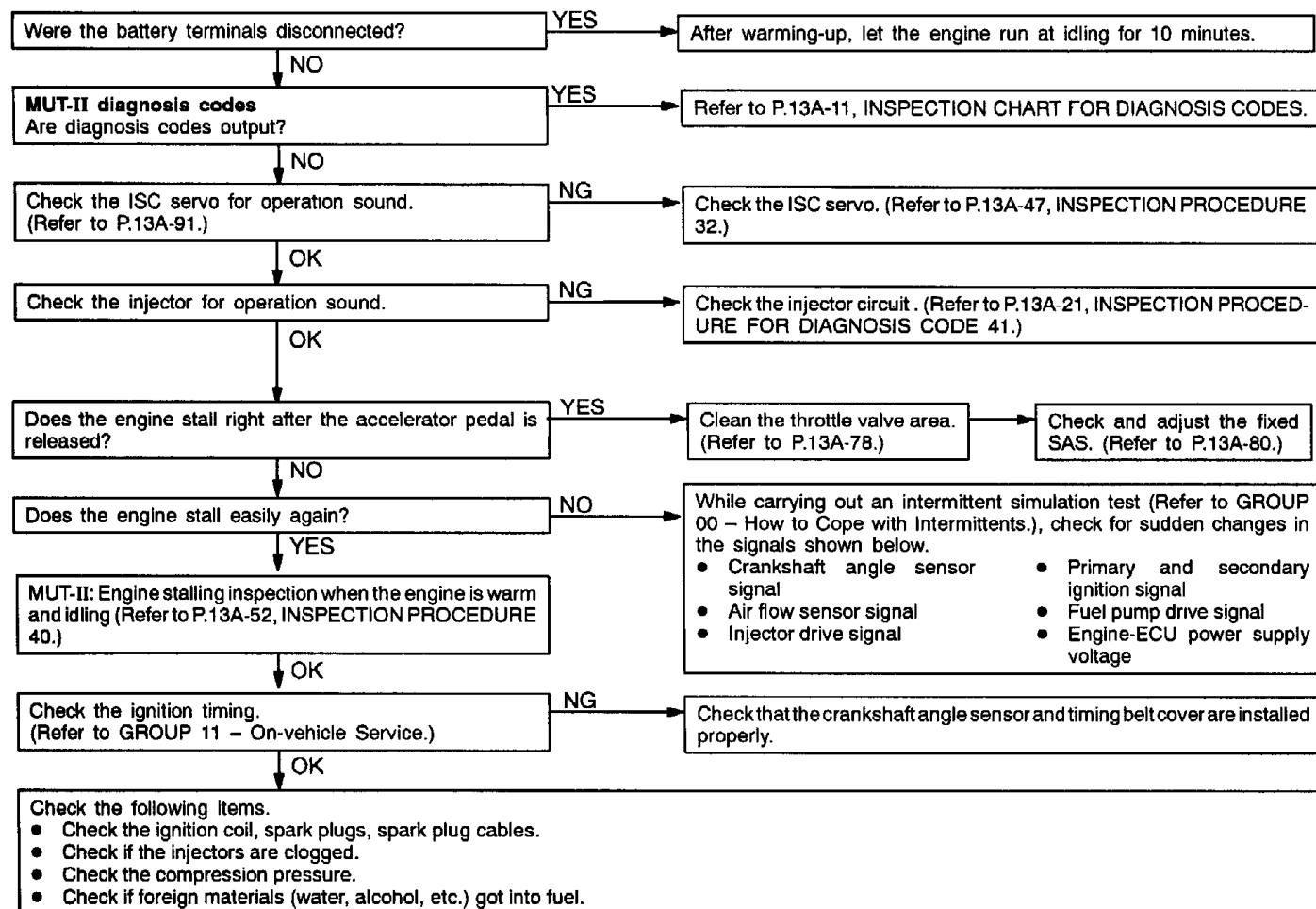
INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idle. (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.	• Malfunction of the ISC servo system • Malfunction of the throttle body • Malfunction of the injector system • Malfunction of the ignition system



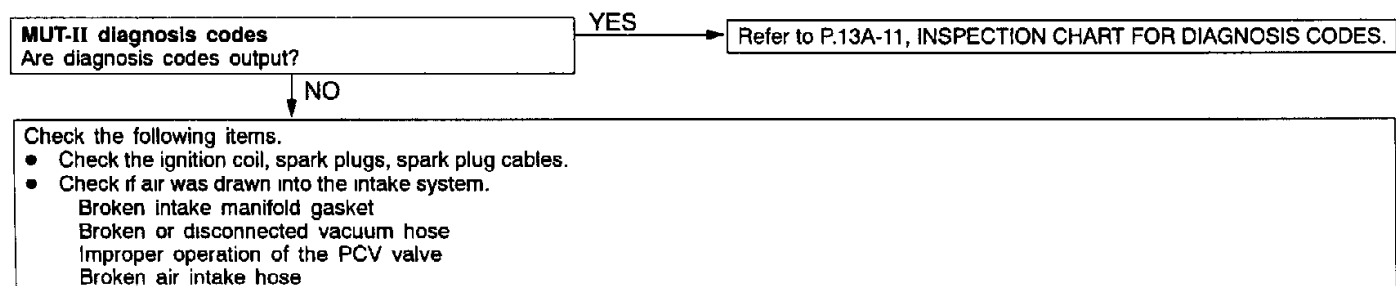
INSPECTION PROCEDURE 12

When the engine is hot, it stalls at idle. (Die out)	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture, ISC servo or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact.	● Malfunction of the Ignition system ● Malfunction of air-fuel ratio control system ● Malfunction of the ISC system ● Drawing air into intake system ● Improper connector contact



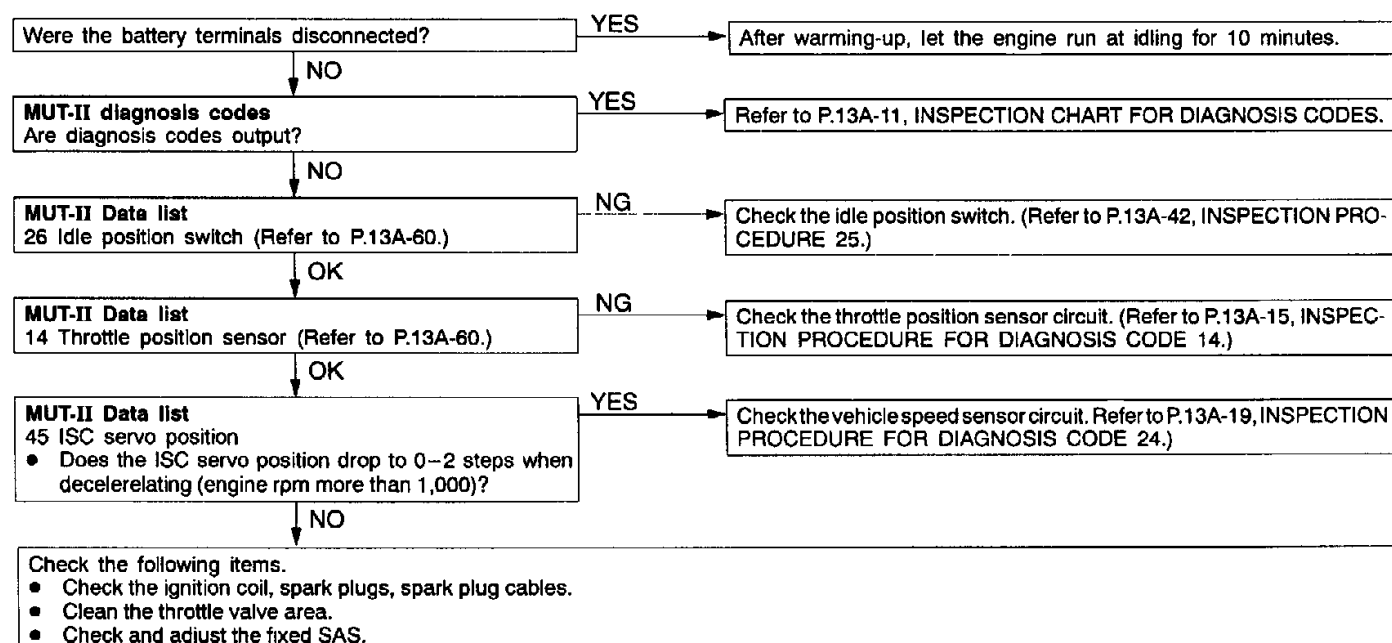
INSPECTION PROCEDURE 13

The engine stalls when accelerating. (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.	• Drawing air into intake system • Malfunction of the ignition system



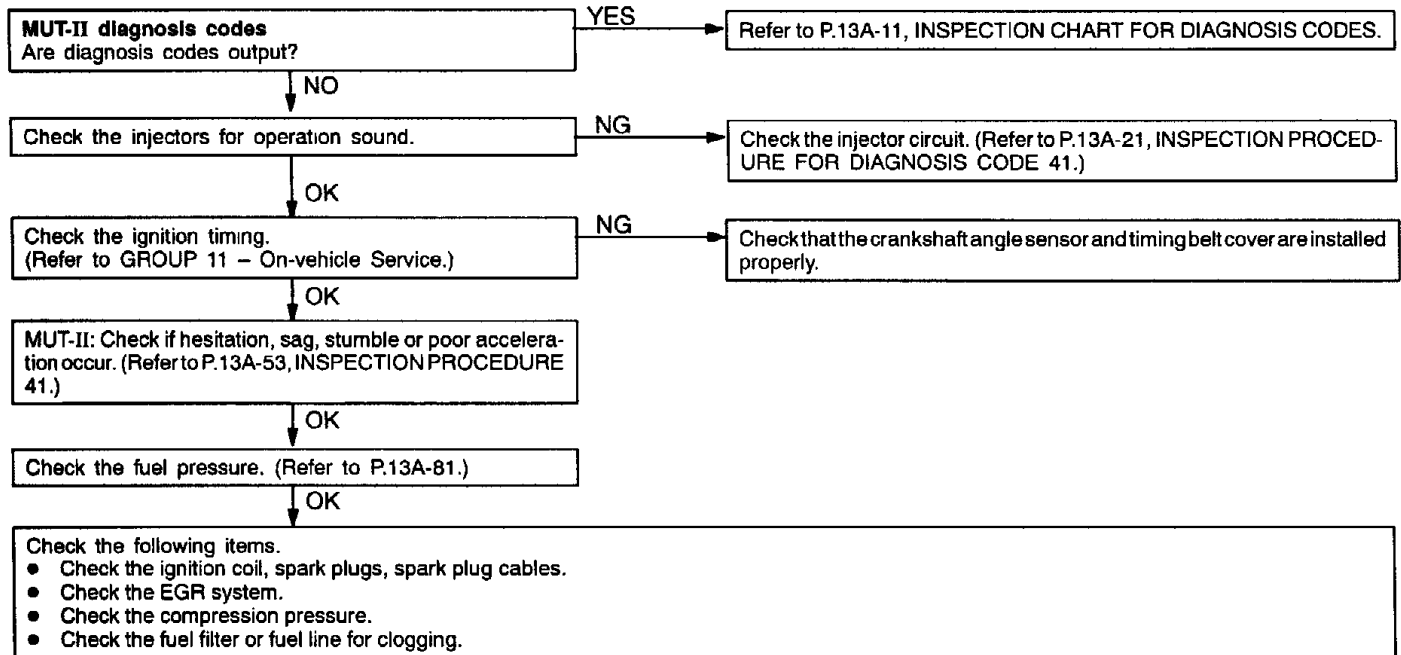
INSPECTION PROCEDURE 14

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 ISC servo system.	• Malfunction of the ISC servo system



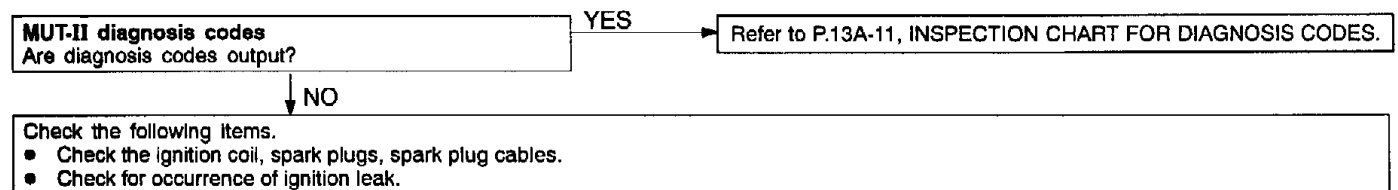
INSPECTION PROCEDURE 15

Hesitation, sag or stumble	Probable cause
In cases such as the above, the cause is probably that ignition system, air/fuel mixture or compression pressure is defective.	• Malfunction of the ignition system • Malfunction of air-fuel ratio control system • Malfunction of the fuel supply system • Malfunction of the EGR solenoid system • Poor compression



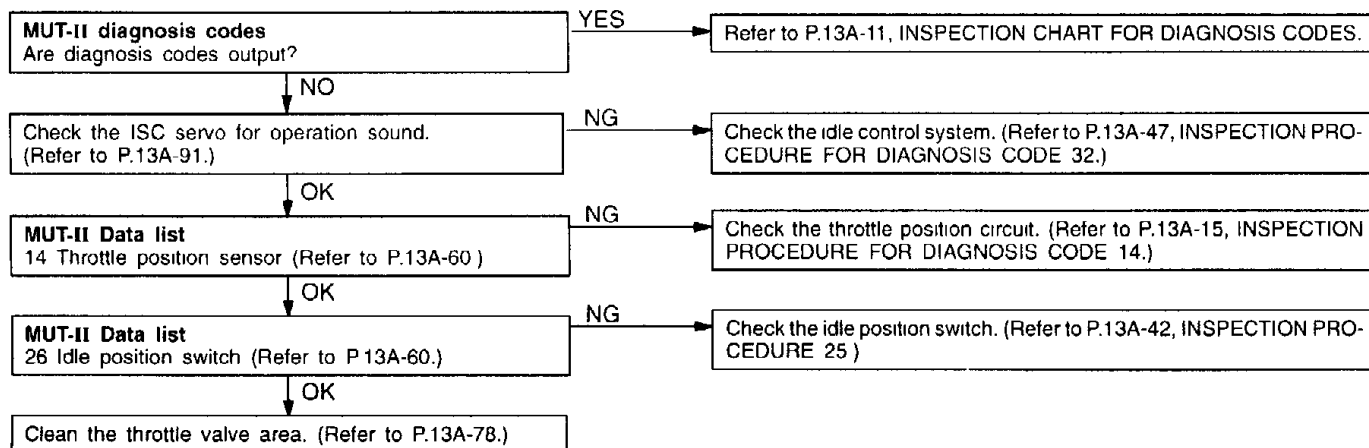
INSPECTION PROCEDURE 16

Acceleration shock	Probable cause
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.	• Malfunction of the ignition system



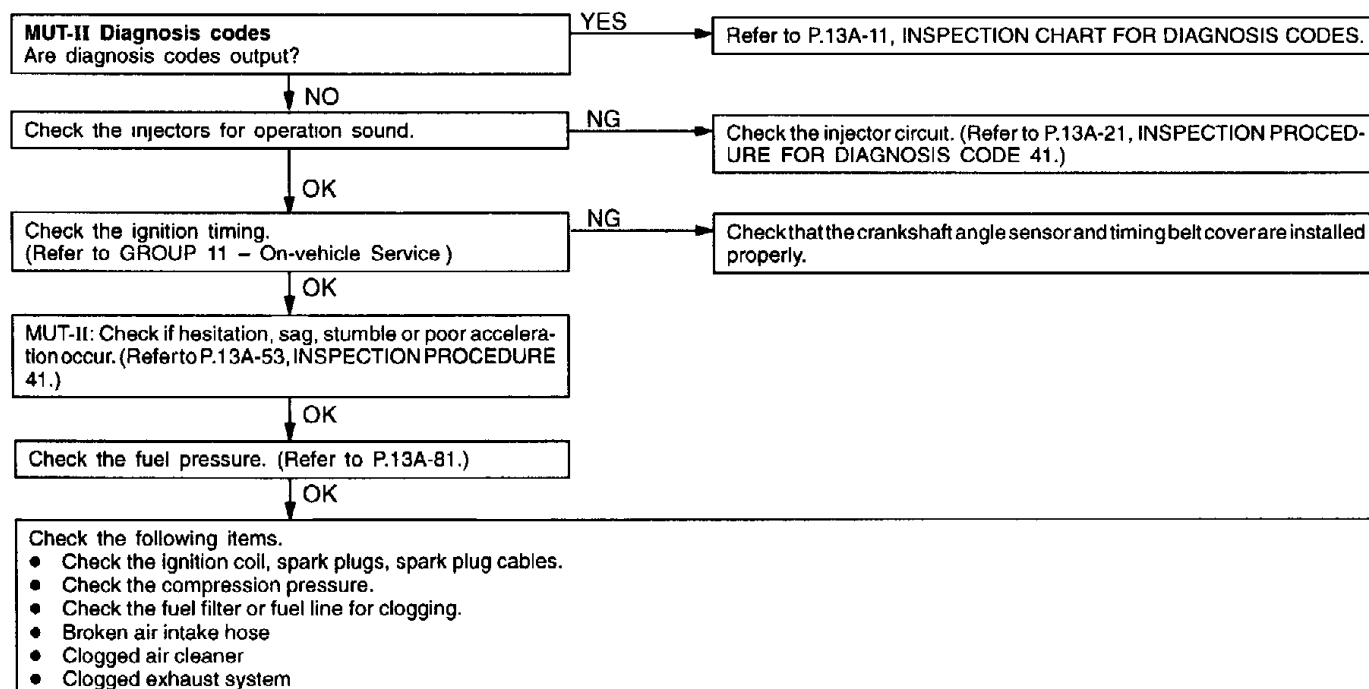
INSPECTION PROCEDURE 17

Deceleration shock	Probable cause
Malfunction of the ISC system is suspected.	Malfunction of the ISC system



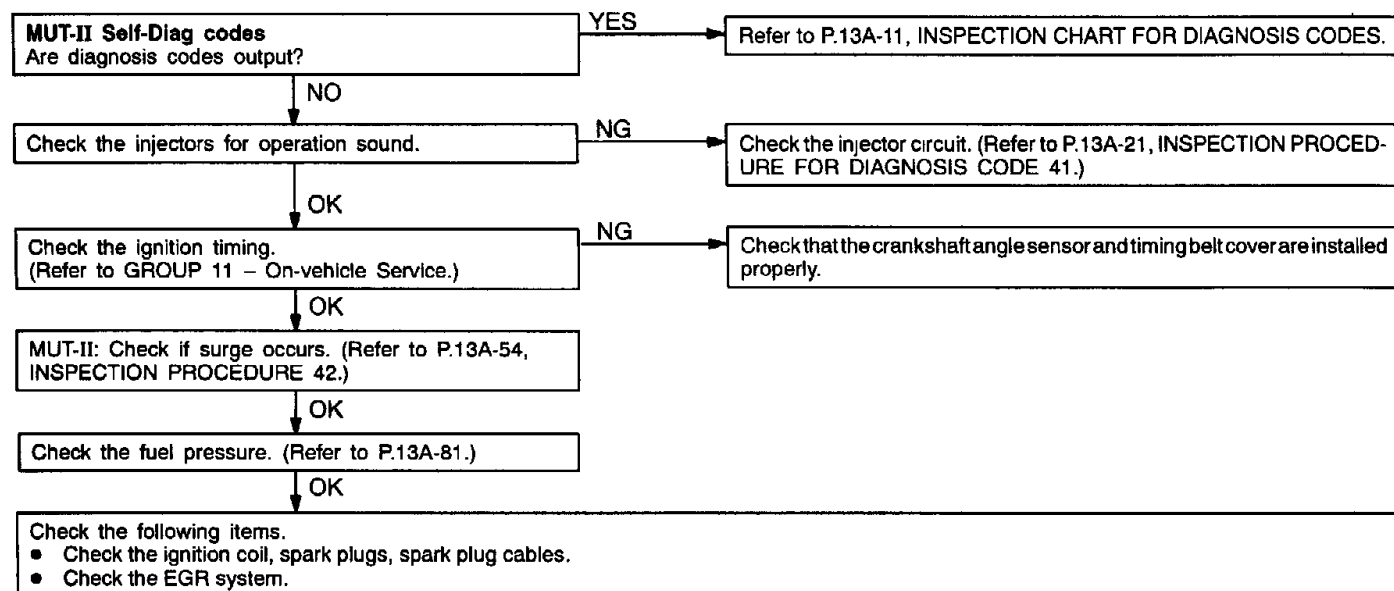
INSPECTION PROCEDURE 18

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



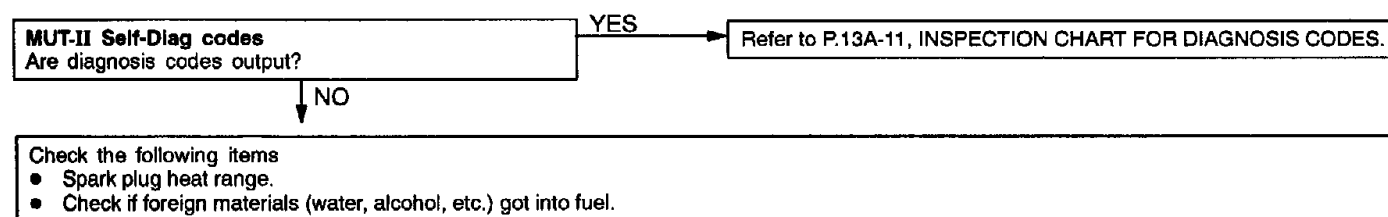
INSPECTION PROCEDURE 19

Surge	Probable cause
Defective ignition system, abnormal air-fuel ratio, etc. are suspected.	- Malfunction of the ignition system - Malfunction of air-fuel ratio control system - Malfunction of the EGR solenoid system



INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases such as the above, the cause is probably that the heat value of the spark plug is inappropriate.	- Defective knock sensor - Inappropriate heat value of the spark plug



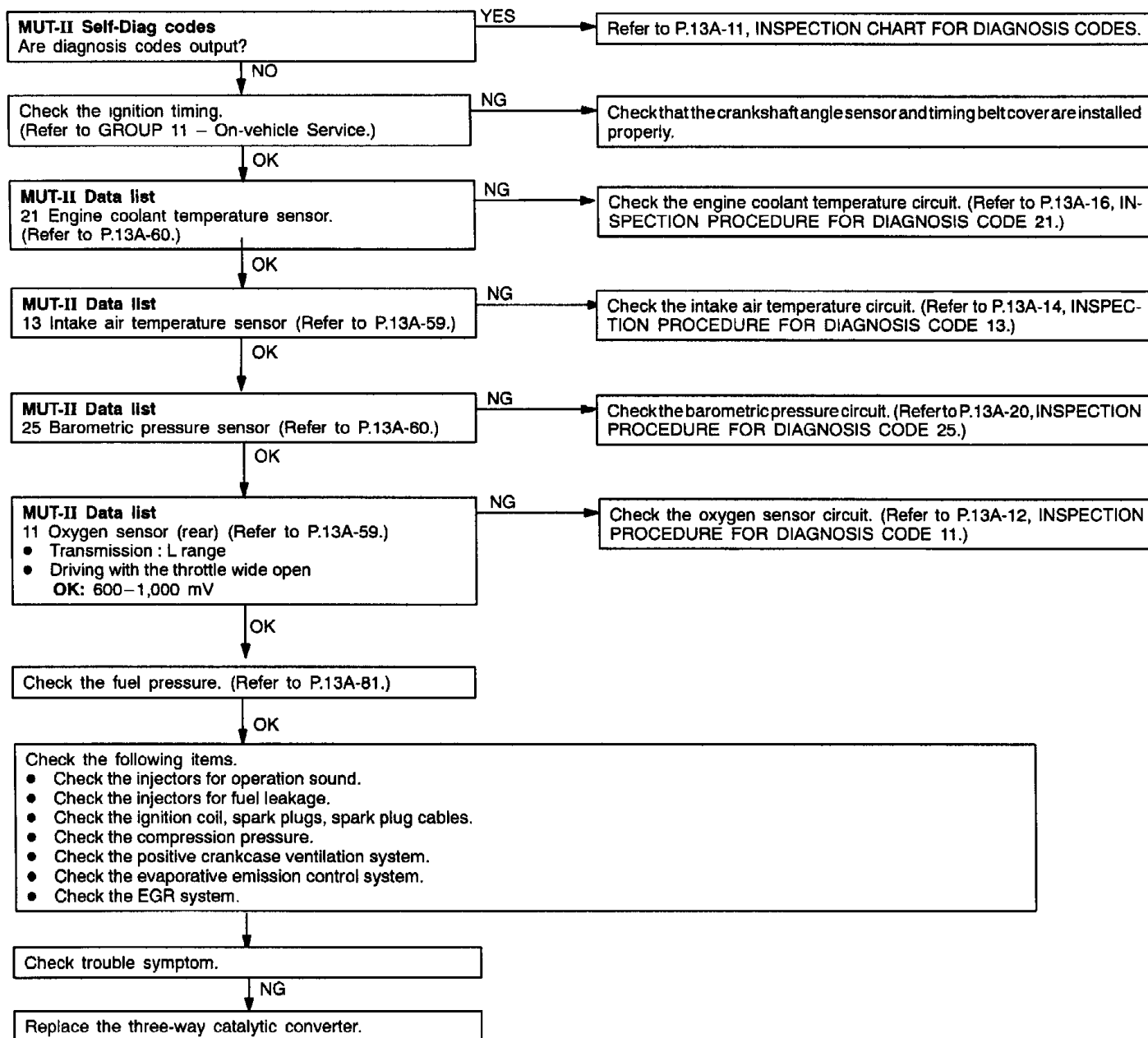
INSPECTION PROCEDURE 21

Dieseling	Probable cause
Fuel leakage from injectors is suspected.	Fuel leakage from injectors

Check the injectors for fuel leakage.

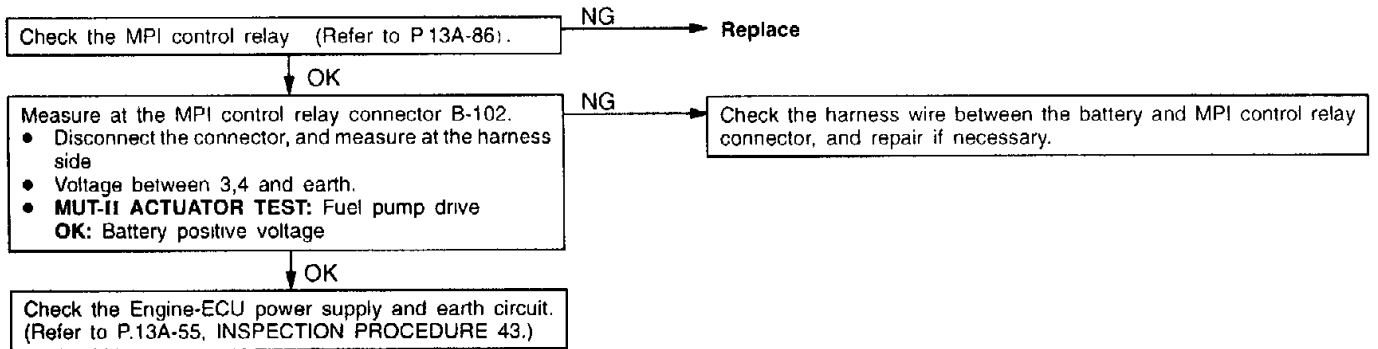
INSPECTION PROCEDURE 22

Too high CO and HC concentration when idling	Probable cause
Abnormal air-fuel ratio is suspected.	- Malfunction of the air-fuel ratio control system. - Deteriorated catalyst



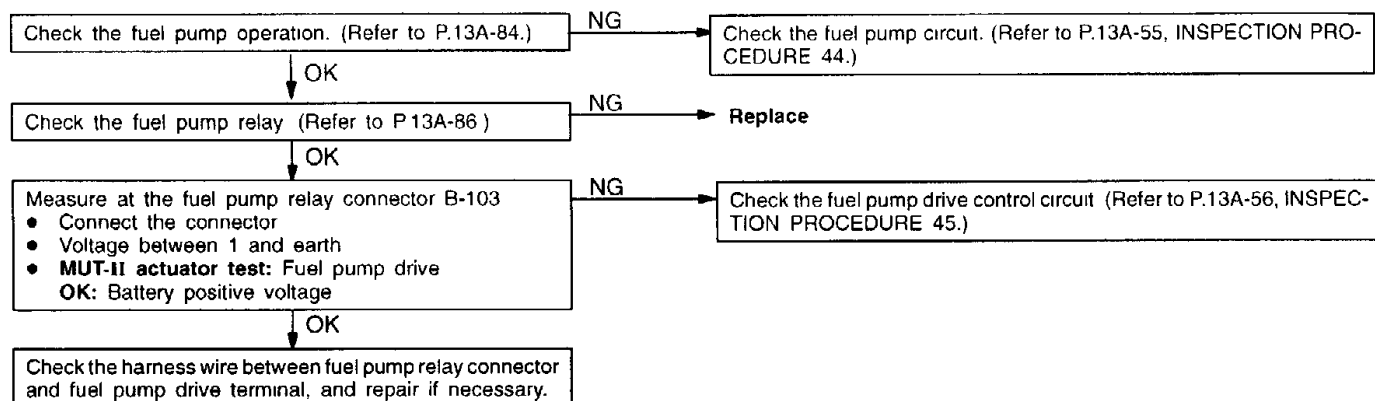
INSPECTION PROCEDURE 23

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 MPI control relay ON. This causes battery positive voltage to be supplied to the Engine-ECU, injectors and air flow sensor.	• Malfunction of the ignition switch • Malfunction of the MPI control relay • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU



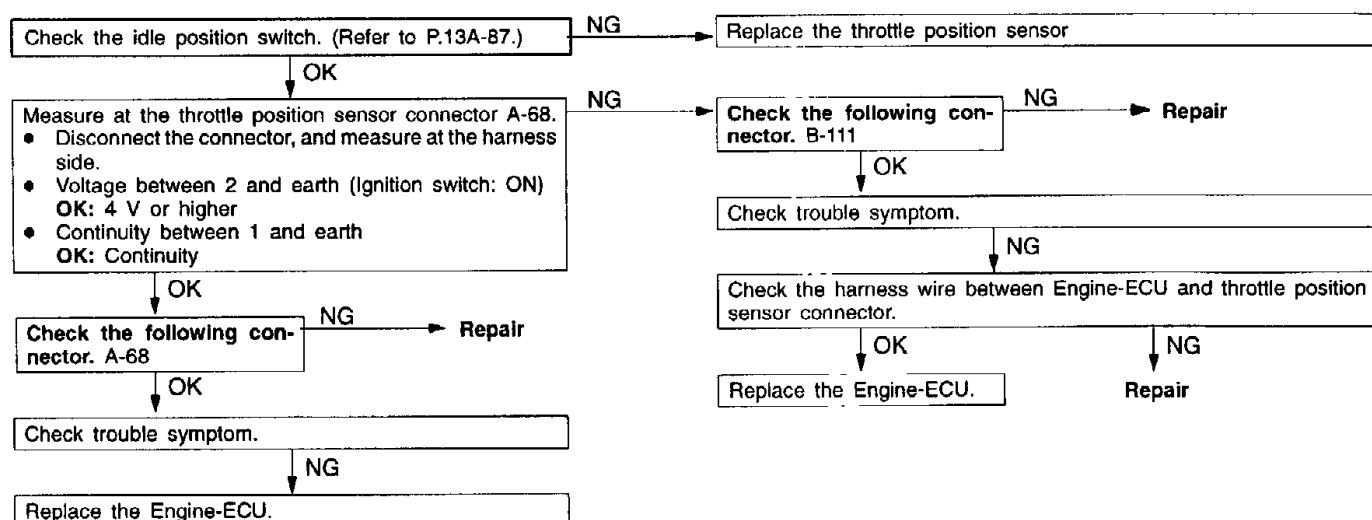
INSPECTION PROCEDURE 24

Fuel pump system	Probable cause
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	• Malfunction of the fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU



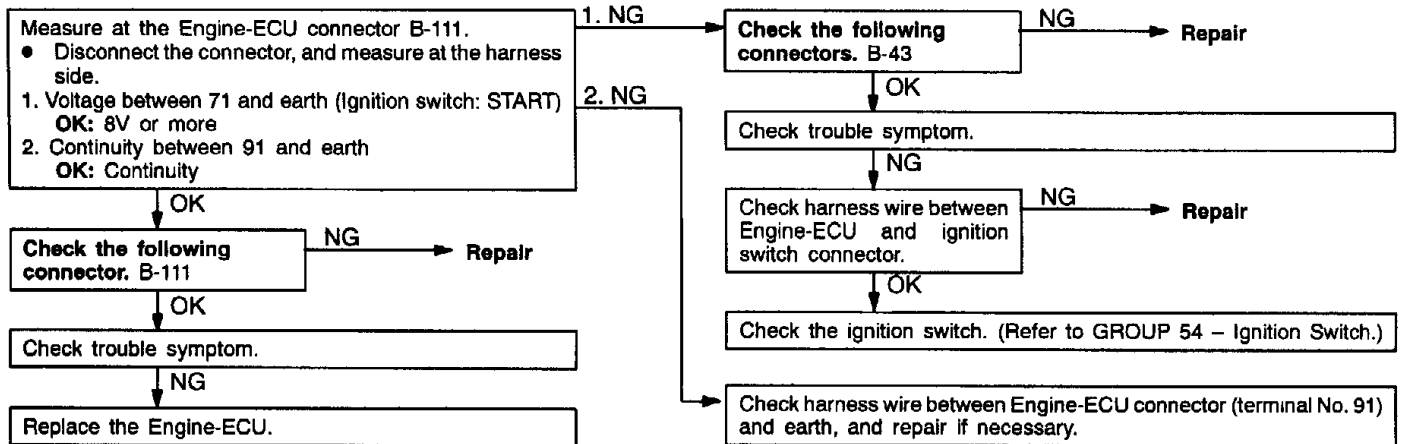
INSPECTION PROCEDURE 25

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 ISC servo based on this input.	• Maladjustment of the accelerator pedal • Maladjustment of the fixed SAS • Maladjustment of the idle position switch and throttle position sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU



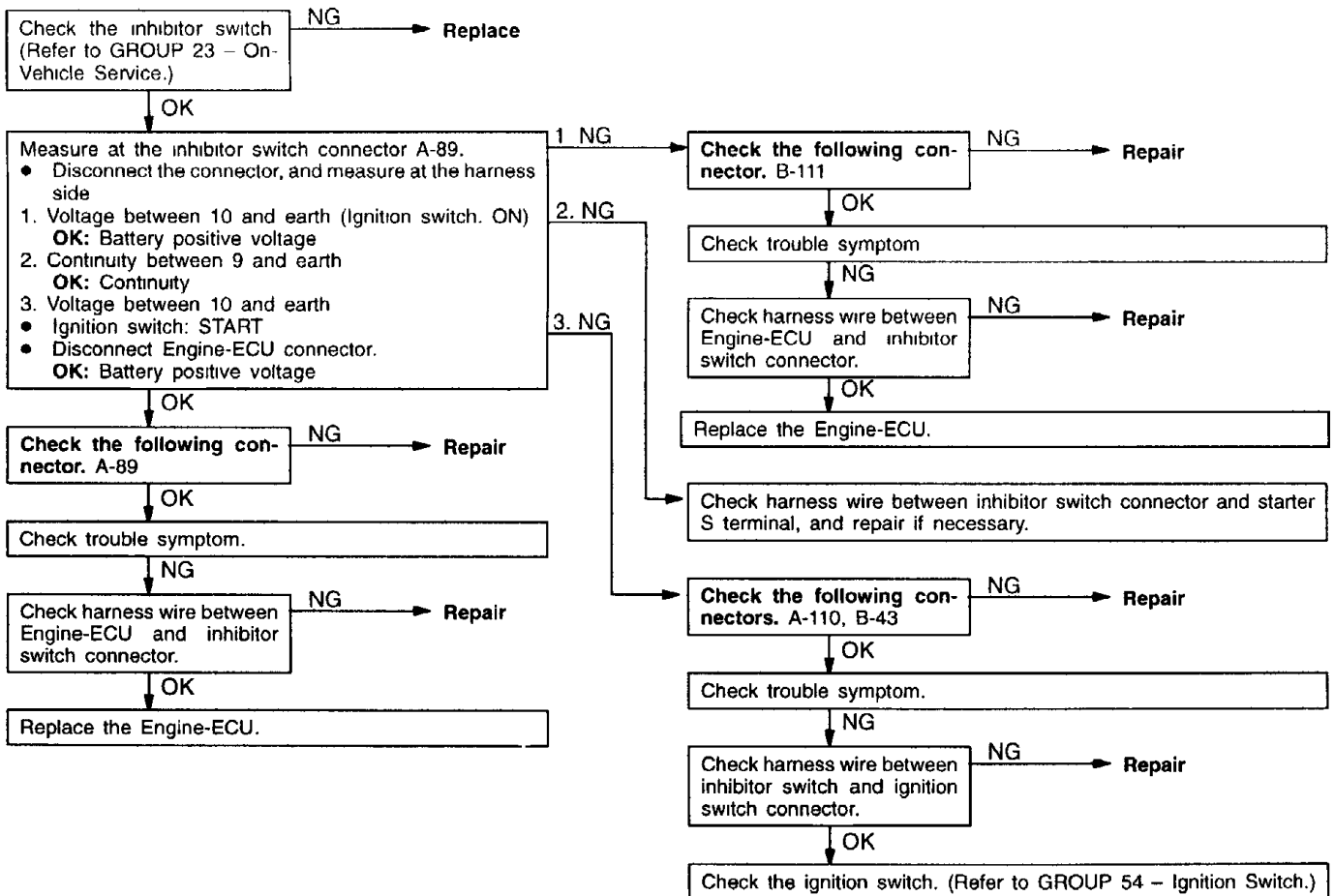
INSPECTION PROCEDURE 26

Ignition switch-ST system <M/T>	Probable cause
The ignition switch-ST inputs a HIGH signal to the engine-ECU while the engine is cranking. The Engine-ECU controls the fuel injection, etc. during starting based on this input.	• Malfunction of ignition switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU.



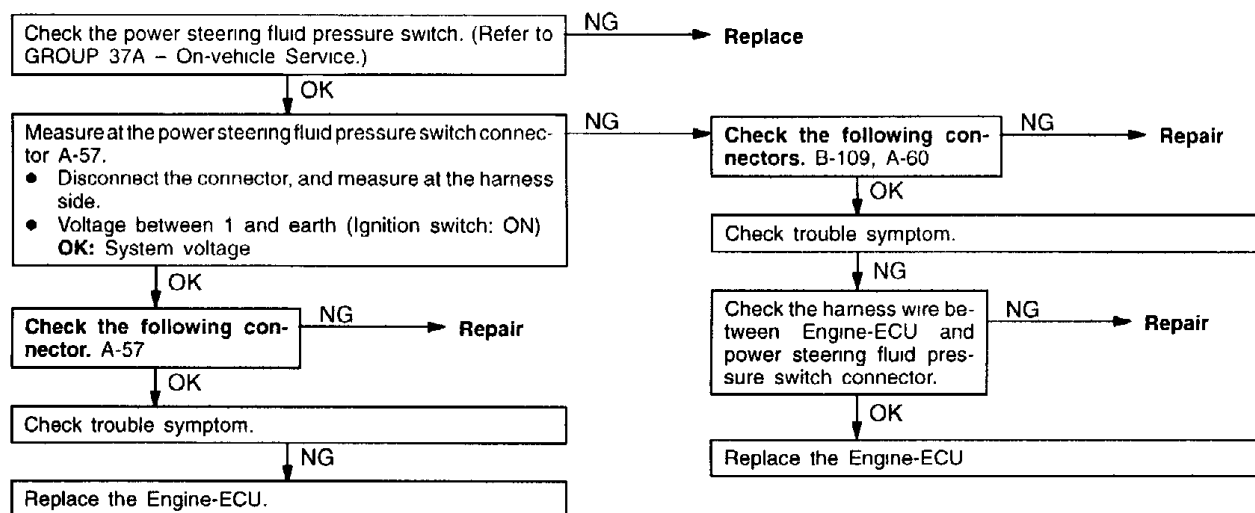
INSPECTION PROCEDURE 27

Ignition switch-ST and inhibitor switch system <A/T>	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. - The inhibitor switch inputs the condition of the select lever, i.e. whether it is in P or N range or in some other range, to the Engine-ECU. The Engine-ECU controls the ISC servo based on this input.	- Malfunction of ignition switch - Malfunction of inhibitor switch - Improper connector contact, open circuit or short circuited harness wire - Malfunction of the Engine-ECU



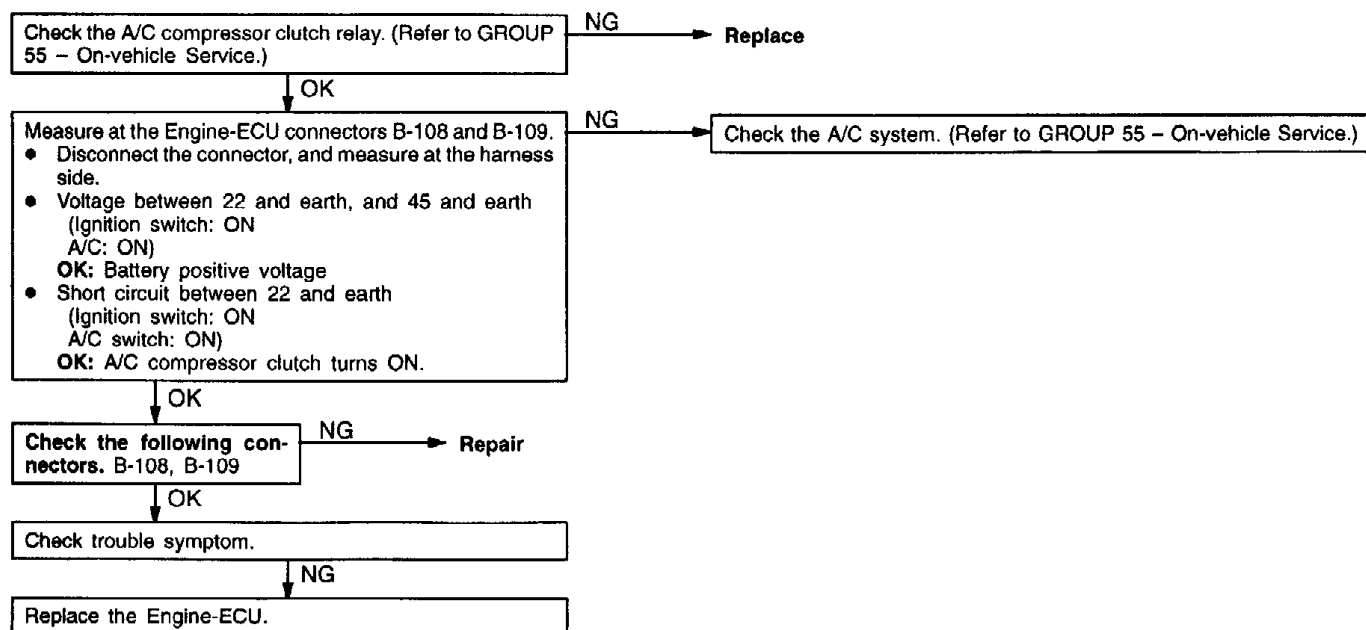
INSPECTION PROCEDURE 28

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.	• Malfunction of power steering fluid pressure switch • Improper connector contact, open circuit or short circuited harness wire • Malfunction of Engine-ECU



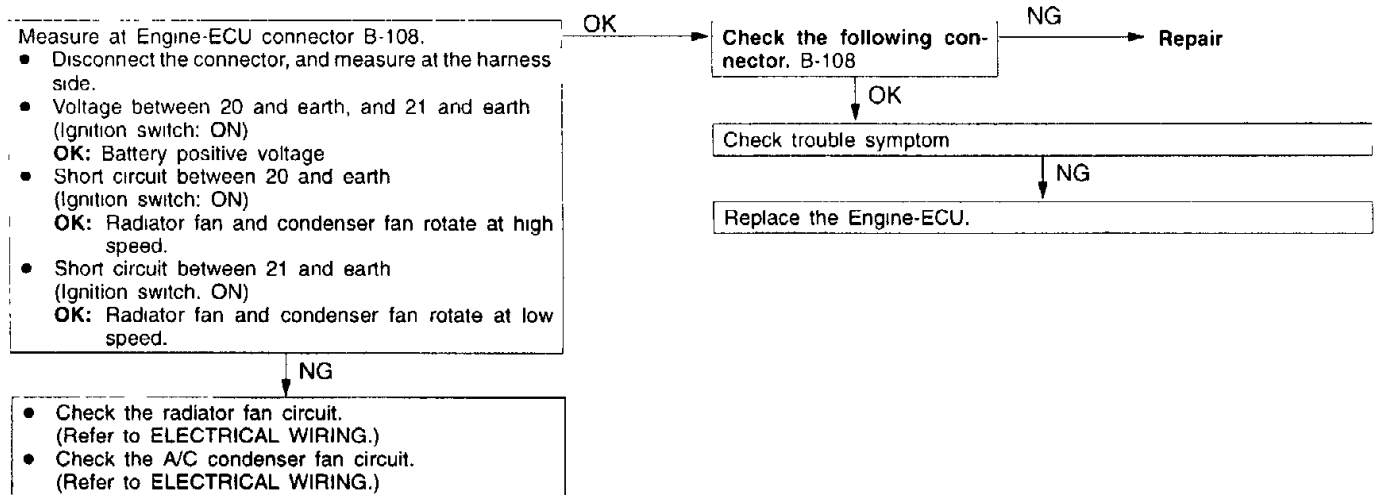
INSPECTION PROCEDURE 29

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 ISC servo, and also operates the A/C compressor magnetic clutch.	• Malfunction of A/C control system • Malfunction of A/C switch • Improper connector contact, open circuit or short circuited harness wire • Malfunction of Engine-ECU



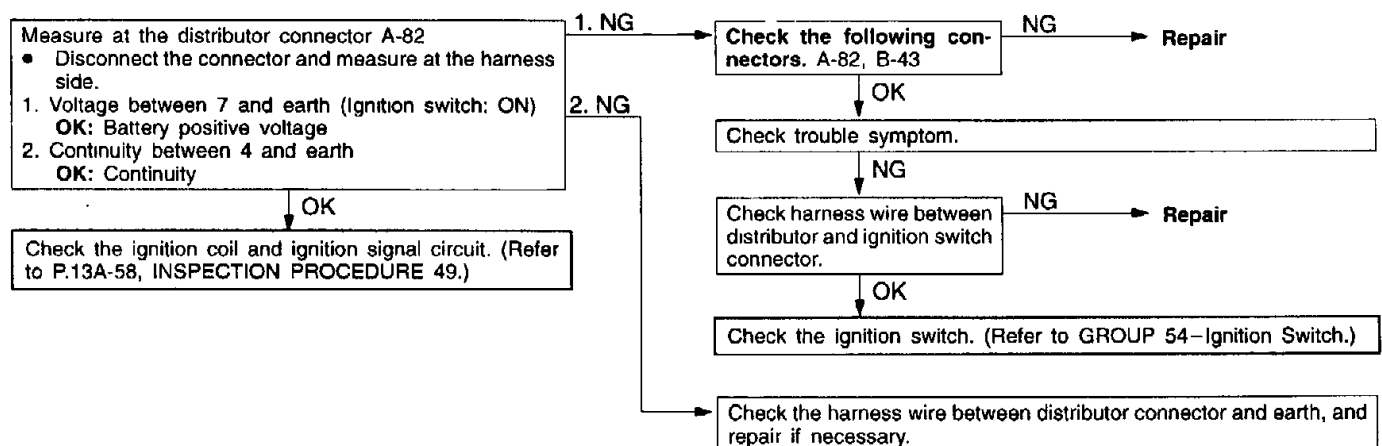
INSPECTION PROCEDURE 30

Fan motor relay system (Radiator fan, A/C condenser fan)	Probable cause
The fan motor relay is controlled by the power transistor inside the Engine-ECU turning ON and OFF.	• Malfunction of fan motor relay • Malfunction of fan motor • Improper connector contact, open circuit or short circuited harness wire • Malfunction of the Engine-ECU



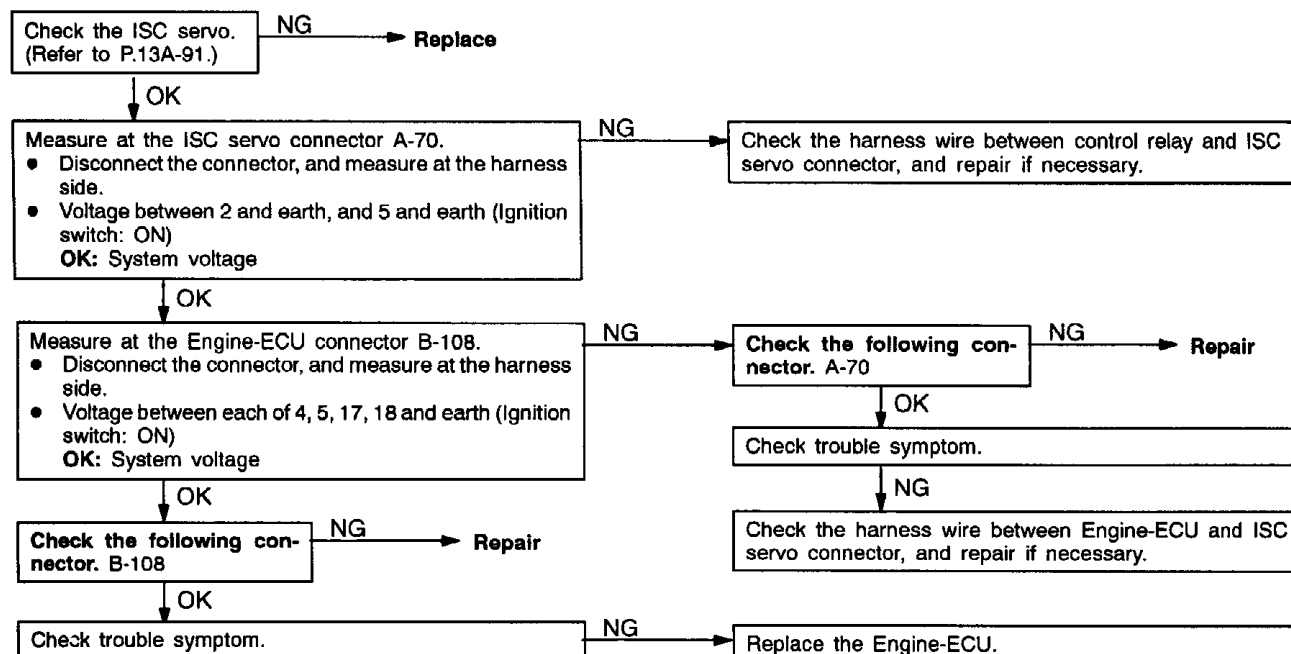
INSPECTION PROCEDURE 31

Ignition circuit system	Probable cause
The Engine-ECU interrupts the ignition coil primary current by turning the ignition power transistor inside the Engine-ECU ON and OFF.	• Malfunction of ignition coil • Malfunction of ignition power transistor unit • Improper connector contact, open circuit or short circuited harness wire • Malfunction of the Engine-ECU



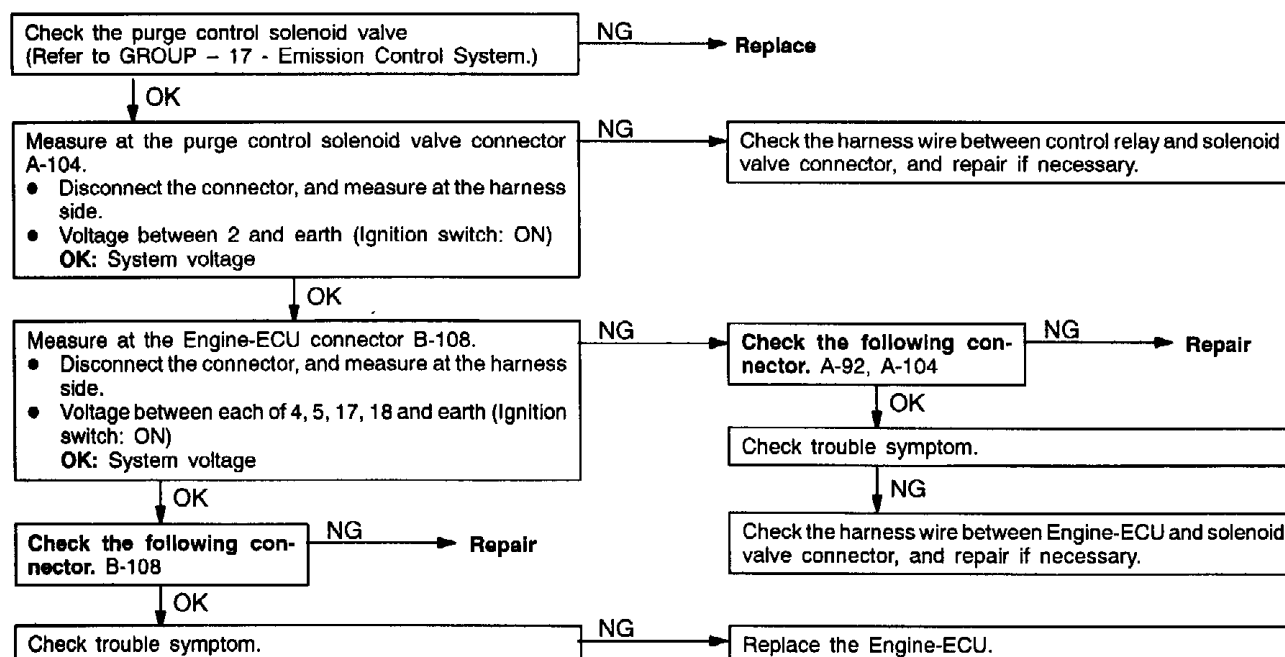
INSPECTION PROCEDURE 32

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.	• Malfunction of ISC servo • Improper connector contact, open circuit or short circuited harness wire • Malfunction of the Engine-ECU



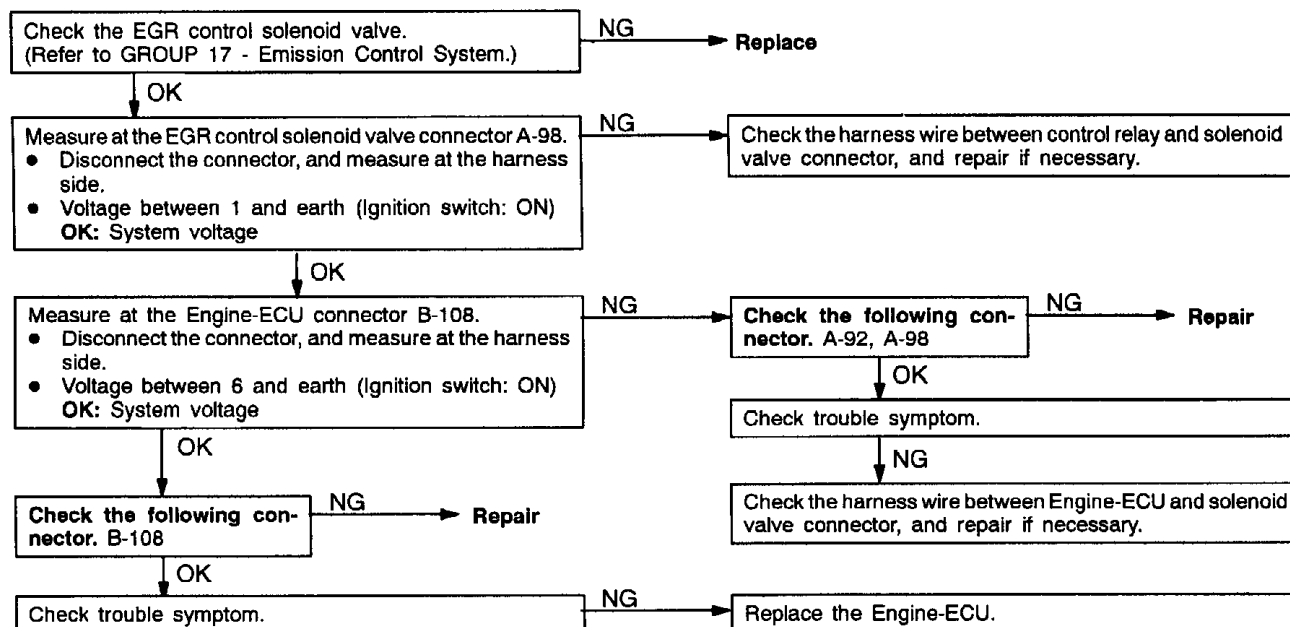
INSPECTION PROCEDURE 33

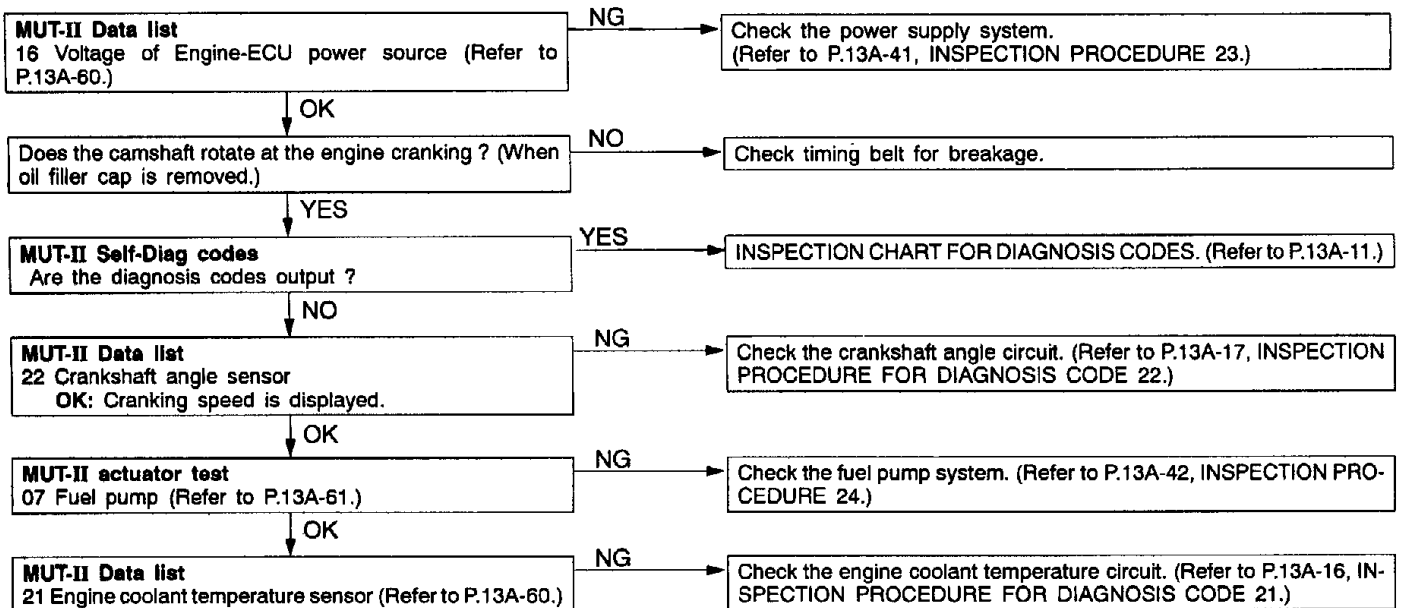
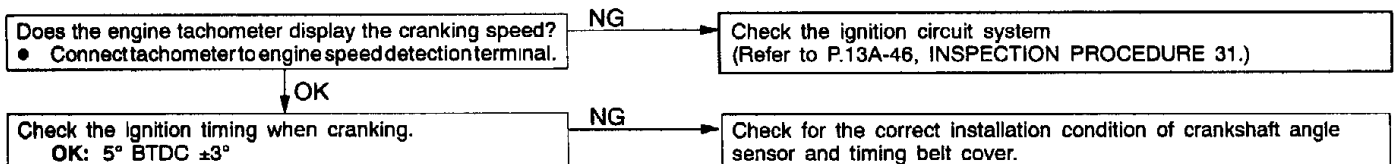
Purge control solenoid valve system	Probable cause
The purge control solenoid valve controls the purging of air from the canister located inside the intake manifold.	• Malfunction of solenoid valve • Improper connector contact, open circuit or short circuited harness wire • Malfunction of the Engine-ECU



INSPECTION PROCEDURE 34

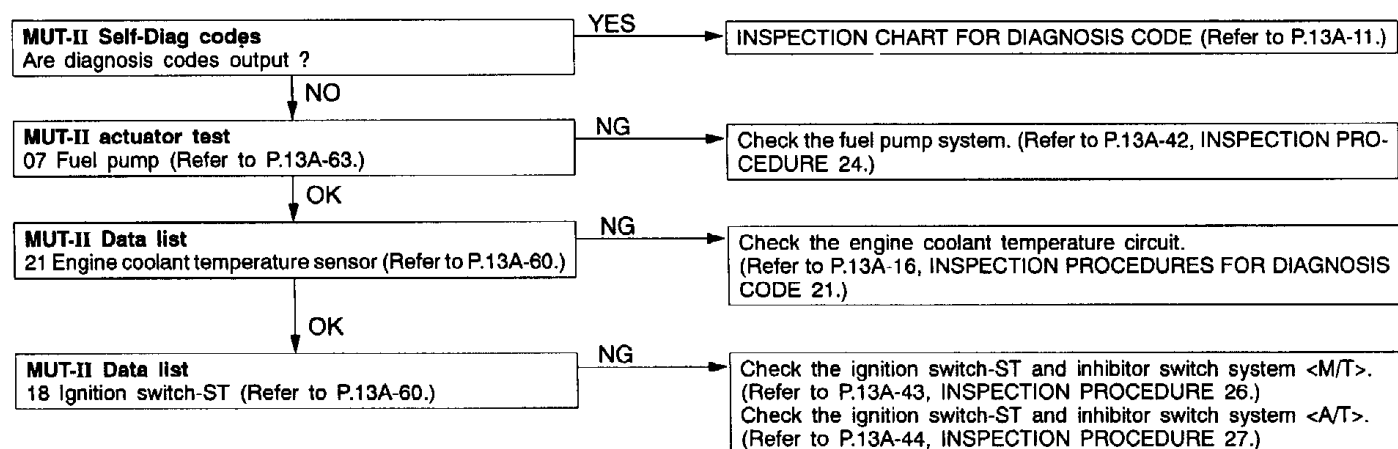
EGR control solenoid valve system	Probable cause
The EGR control solenoid valve is controlled by the negative pressure resulting from EGR operation leaking to port "A" of the throttle body.	• Malfunction of solenoid valve • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the Engine-ECU



INSPECTION PROCEDURE 35**MUT-II: Inspection of no initial combustion****INSPECTION PROCEDURE 36****Ignition system: Inspection of no initial combustion**

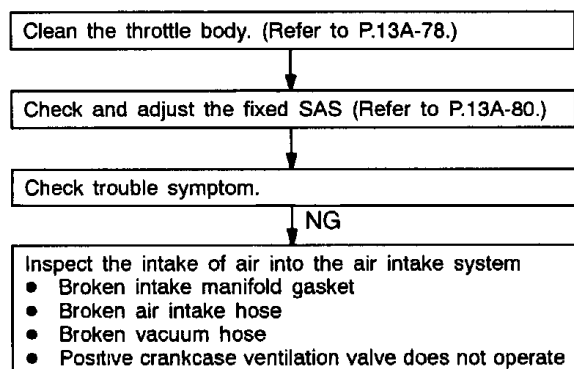
INSPECTION PROCEDURE 37

MUT-II: Check if incomplete combustion occurs.

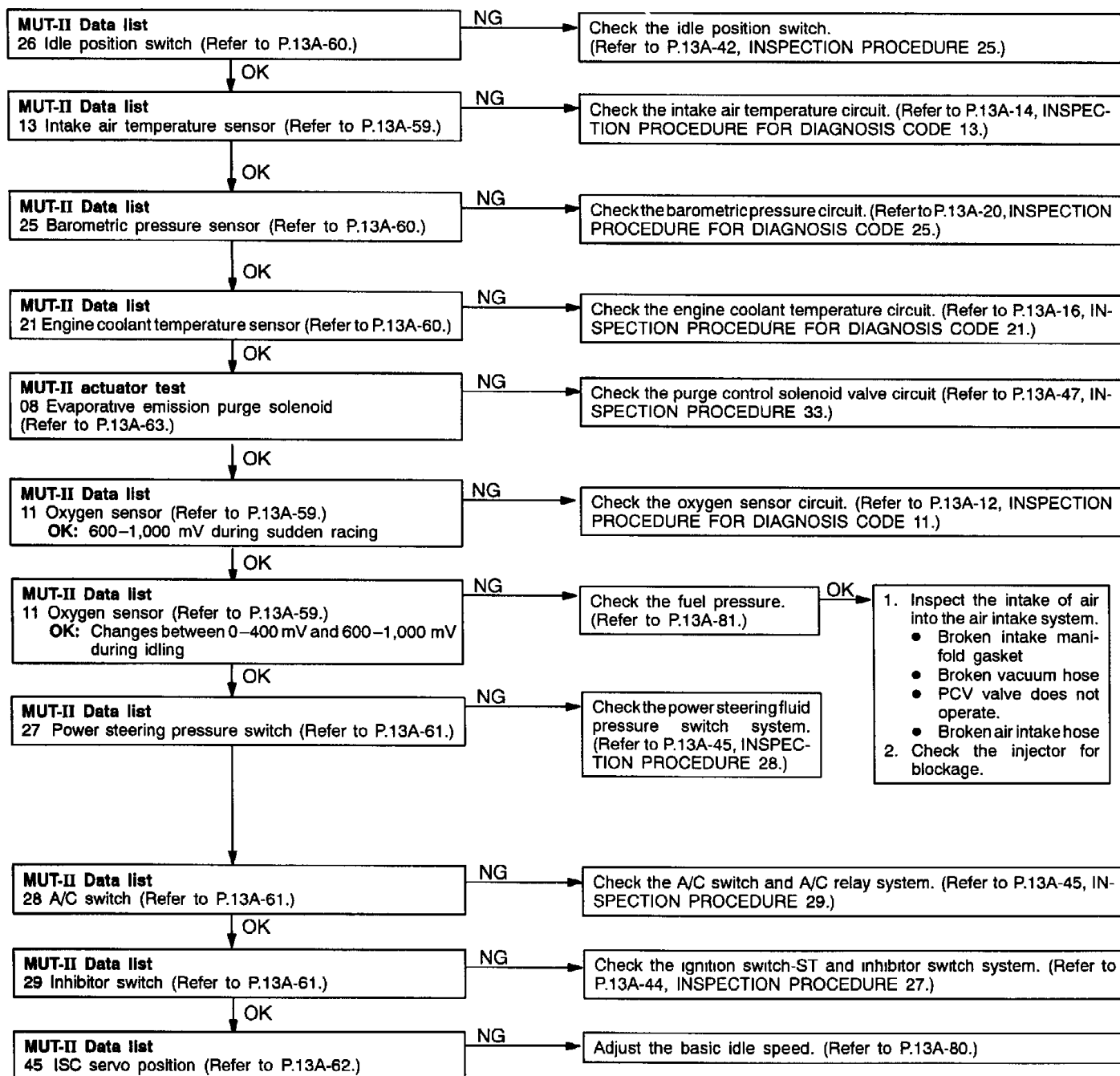


INSPECTION PROCEDURE 38

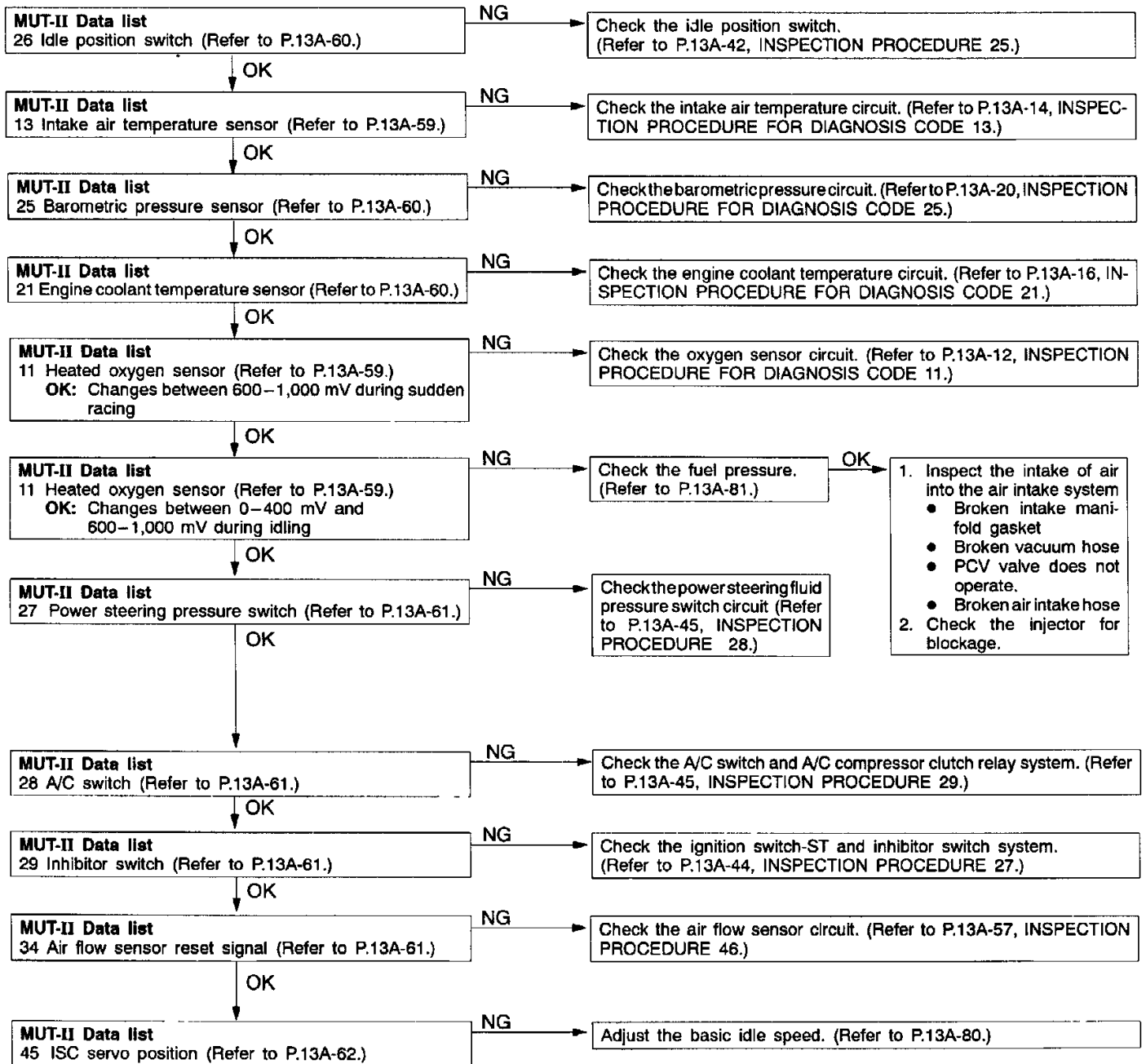
Check if hunting occurs.



INSPECTION PROCEDURE 39

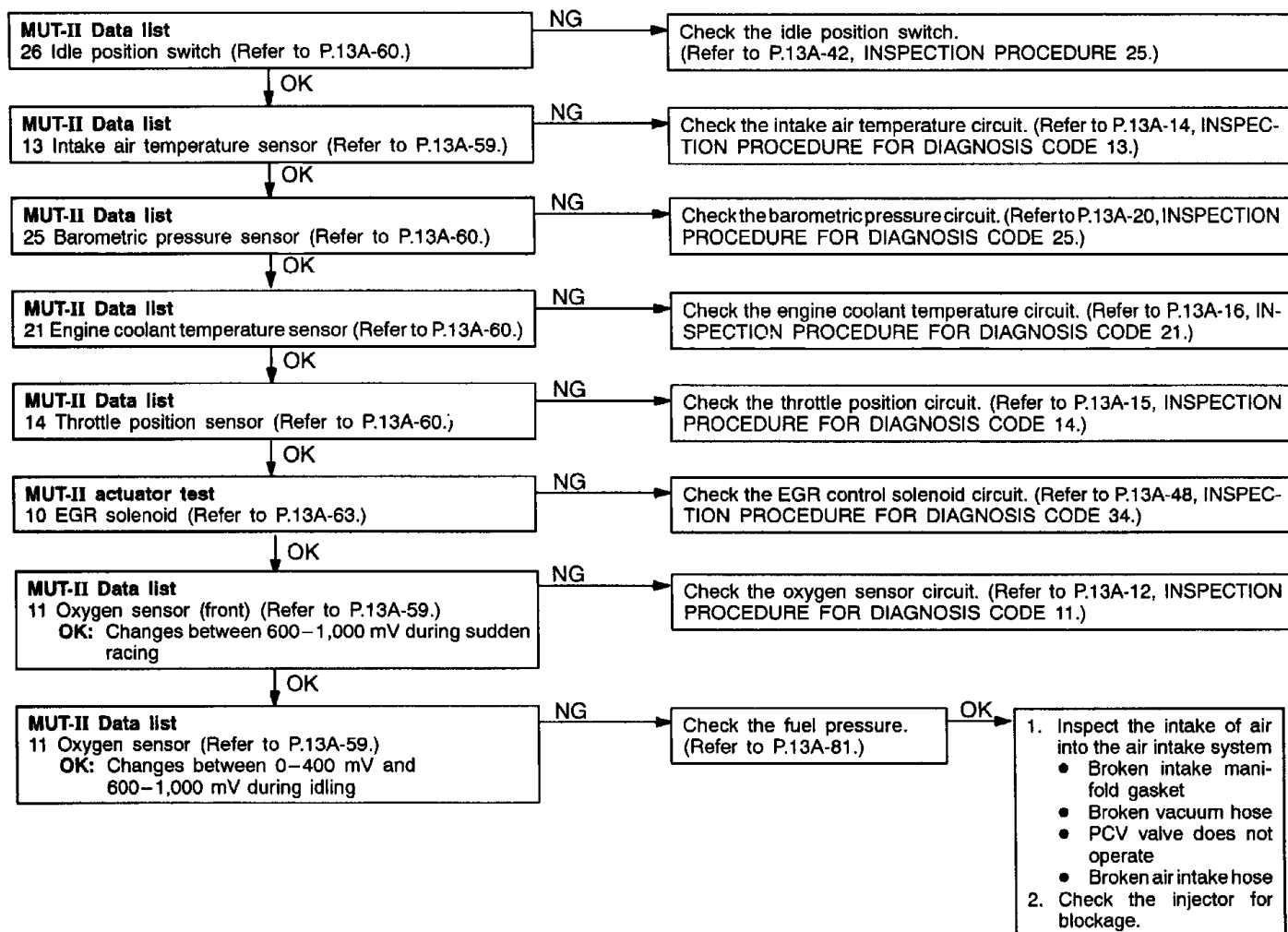
MUT-II: Check if idle speed is unstable.

INSPECTION PROCEDURE 40

MUT-II: Engine stalling inspection when the engine is warm and idling.

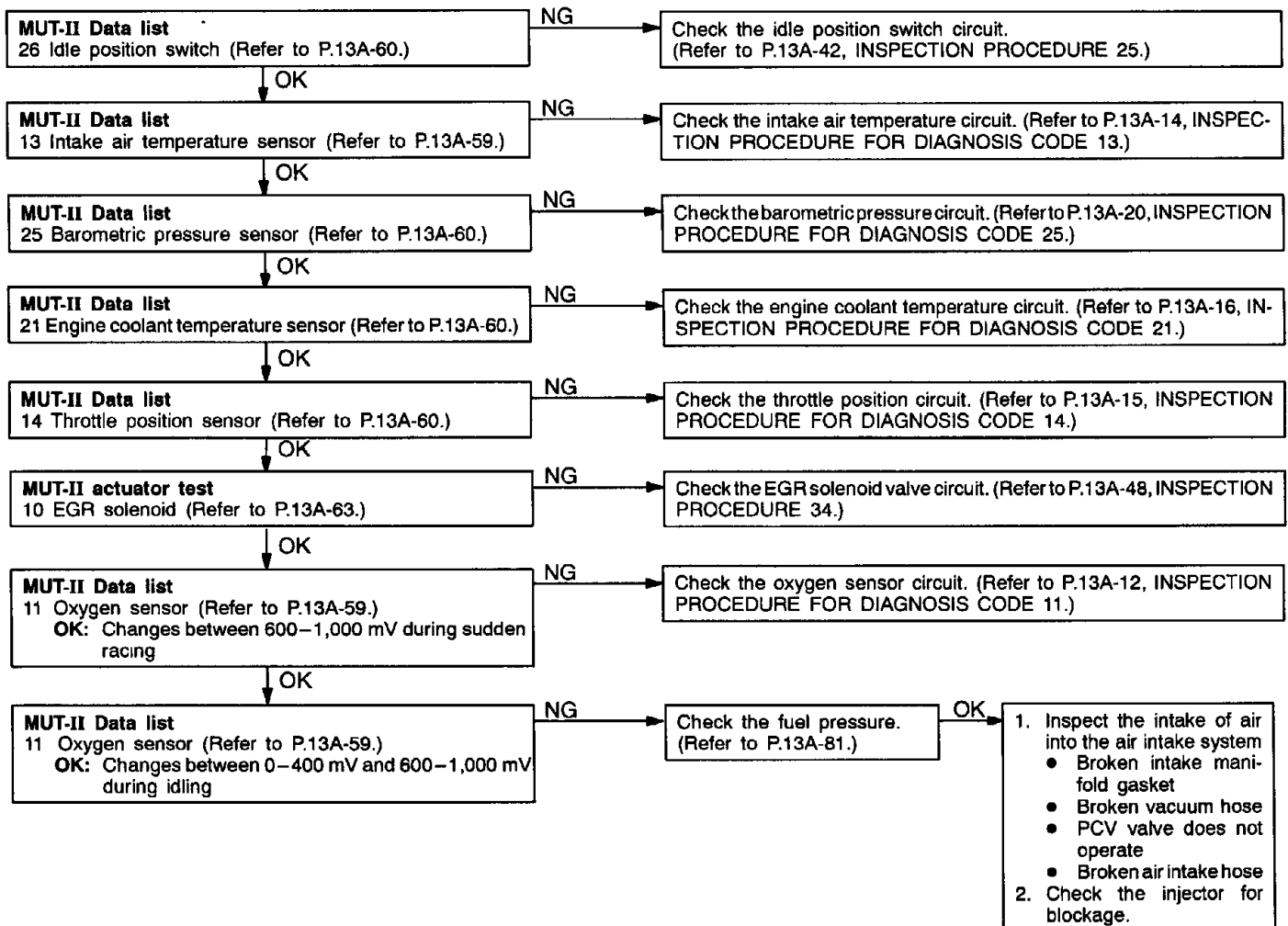
INSPECTION PROCEDURE 41

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



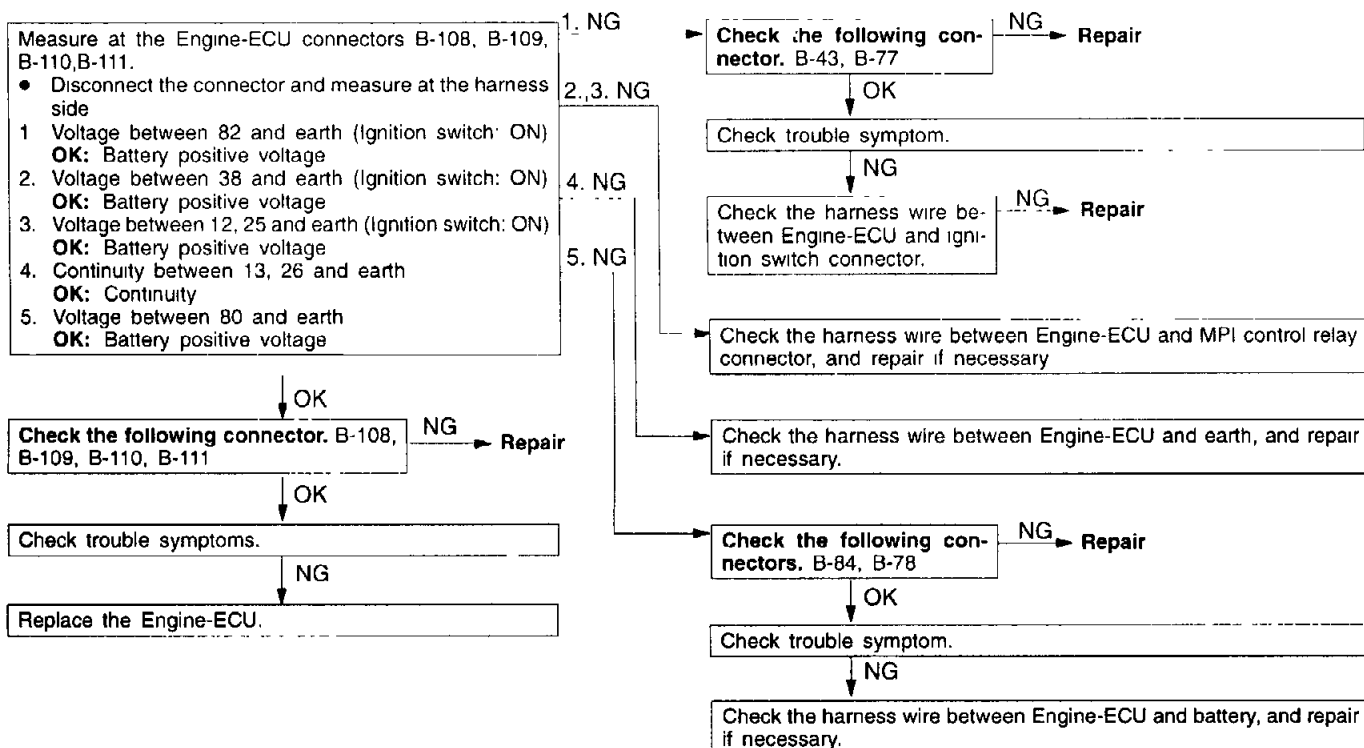
INSPECTION PROCEDURE 42

MUT-II: Check if surge occurs.



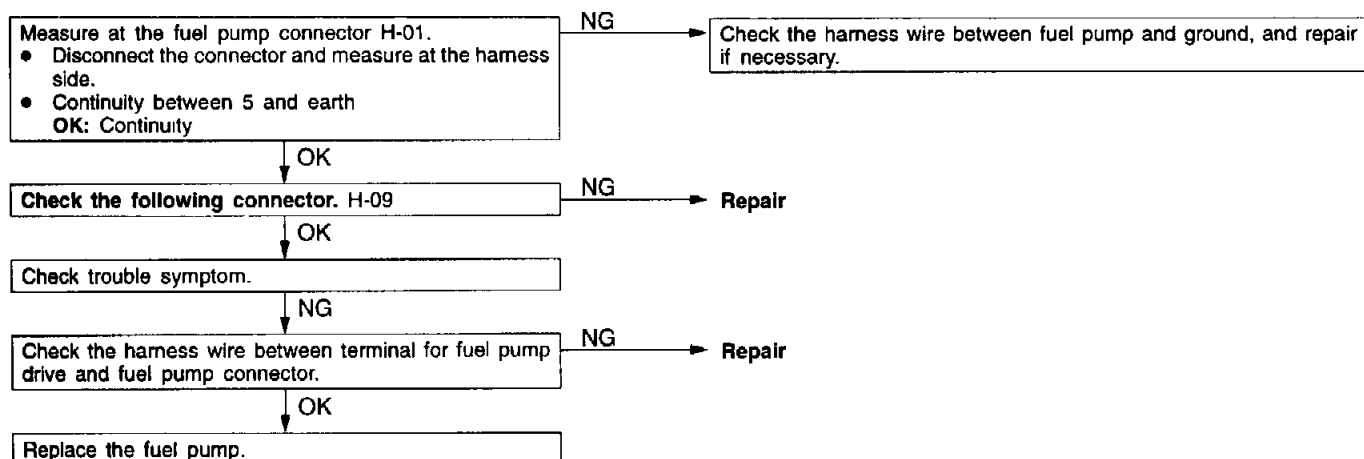
INSPECTION PROCEDURE 43

Check the Engine-ECU power supply and ground circuit.



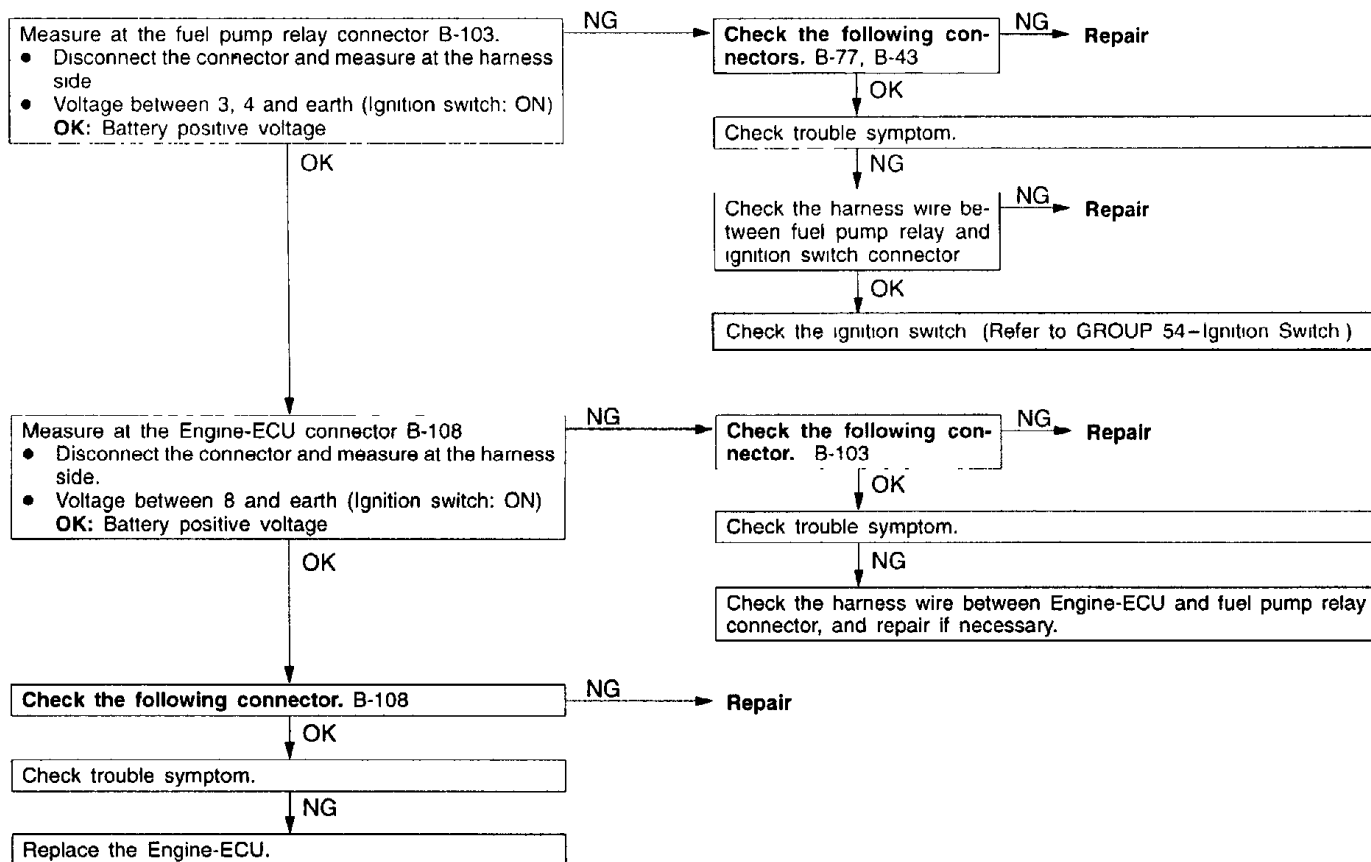
INSPECTION PROCEDURE 44

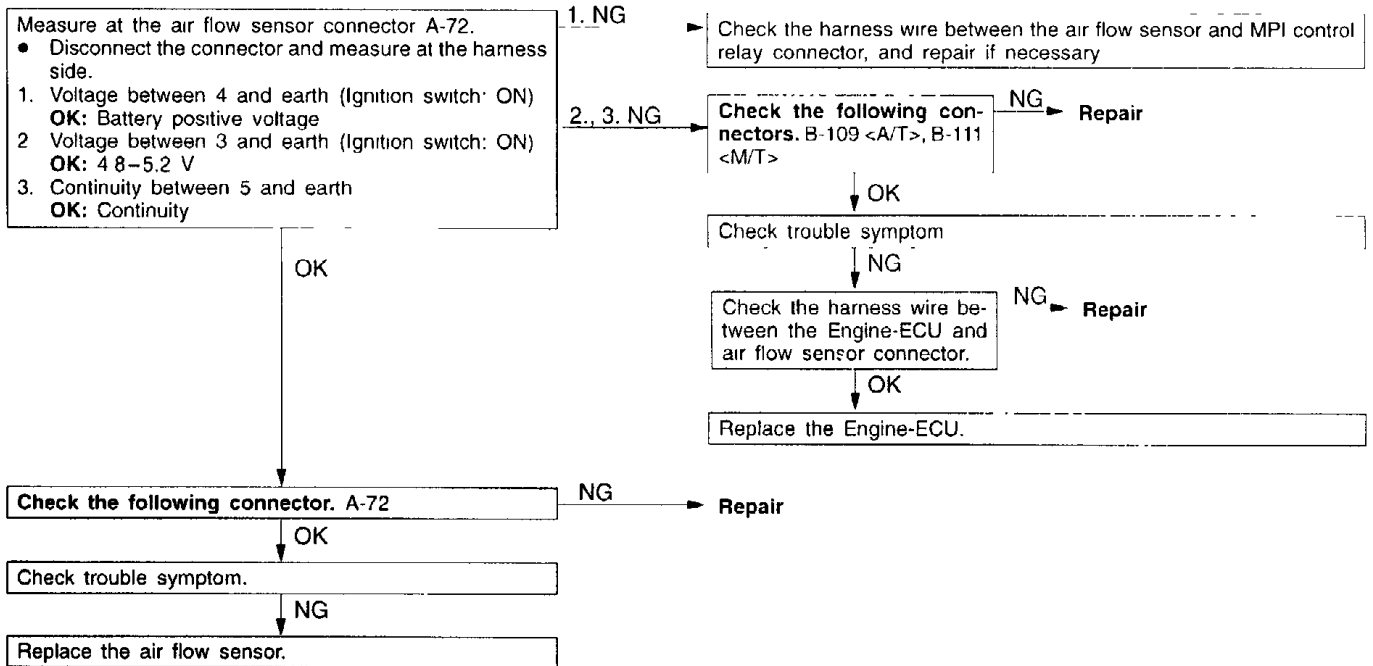
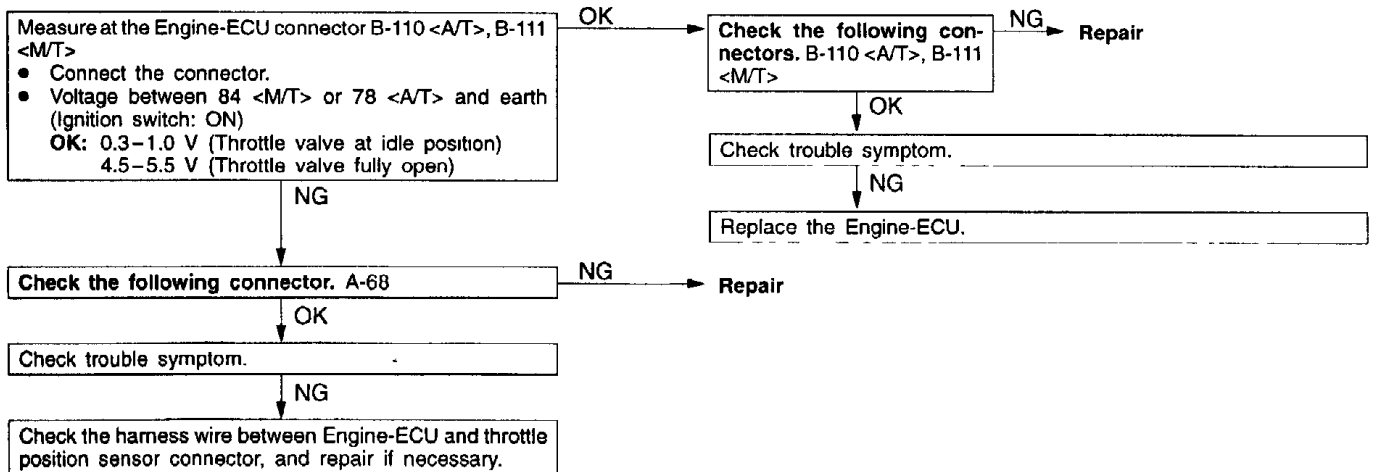
Check fuel pump circuit.



INSPECTION PROCEDURE 45

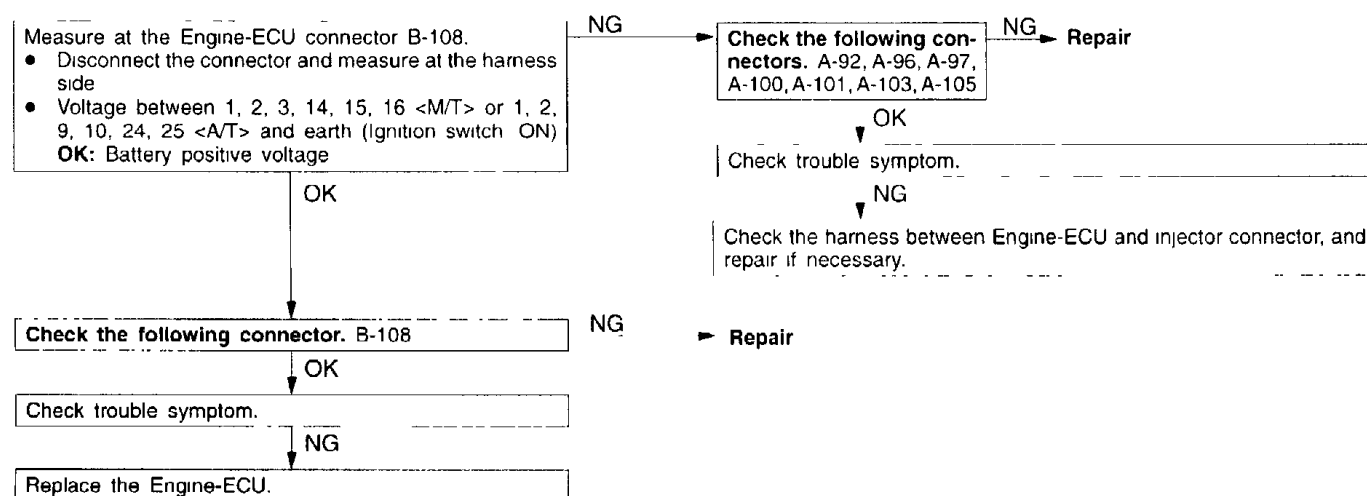
Check the fuel pump drive control circuit.



INSPECTION PROCEDURE 46**Check air flow sensor control circuit.****INSPECTION PROCEDURE 47****Check throttle position sensor (TPS) output circuit.**

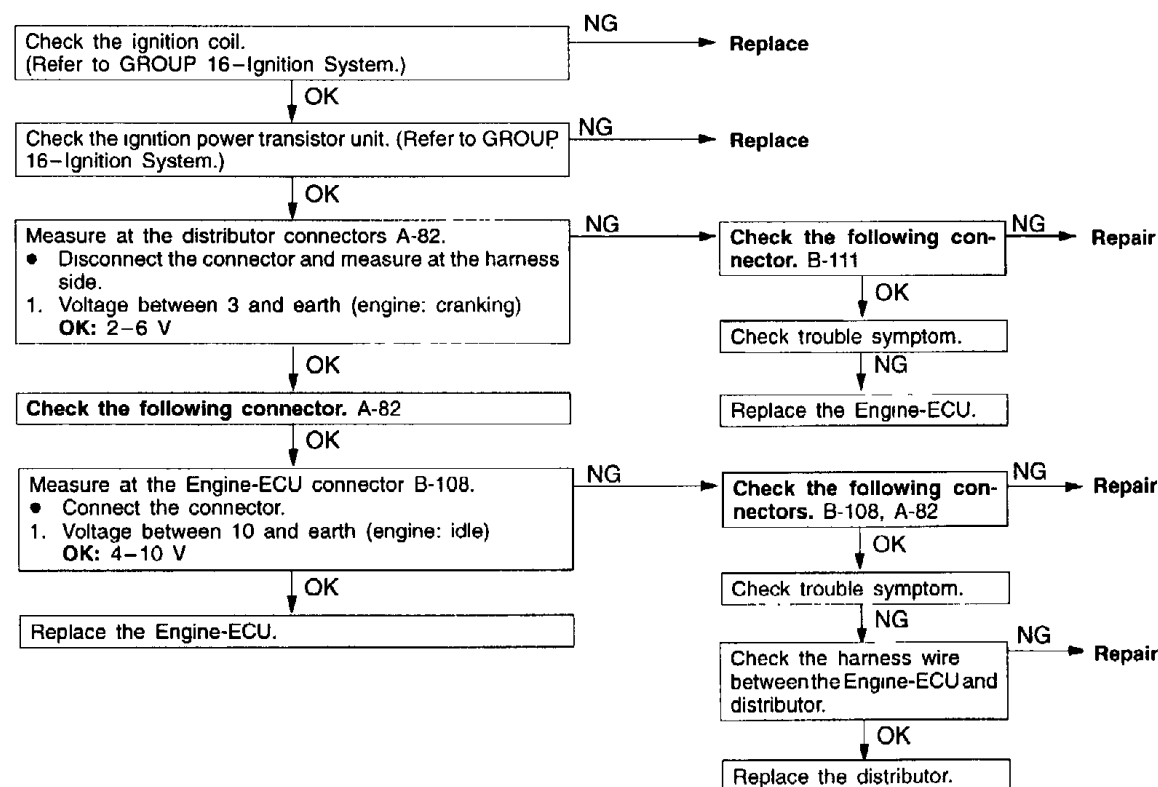
INSPECTION PROCEDURE 48

Check injector control circuit



INSPECTION PROCEDURE 49

Check ignition signal circuit.



DATA LIST REFERENCE TABLE

Caution

1. When shifting the select lever to D range, the brakes should be applied so that the vehicle does not move forward.
2. Driving tests always need another personnel.

- *1: In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10% higher than the standard frequency.
- *2: After performing a warm up idle from an initial engine temperature of -20°C , if the idle speed is lower than the standard value then it is assumed that the air volume limiter in the throttle body is defective (even if the ISC motor is fully open).
- *3: 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.
- *4: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
- *5: The idle position switch normally turns off when the voltage of the throttle position sensor is 50 – 100mV higher than the voltage at the idle position. If the closed throttle position switch turns back on after the throttle position sensor voltage has risen by 100mV and the throttle valve has opened, the closed throttle position switch and the throttle position sensor need to be adjusted.
- *6: In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 3 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine: Warm (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	Code No. 11	13A-12
			When engine is suddenly raced	600–1,000 mV		
		Engine: Warm (The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the Engine-ECU.)	Engine is idling	400 mV or less ↔ 600–1,000 mV (Changes)		
			2,500 r/min			
12	Air flow sensor	- Engine coolant temperature: 80–95°C - Lights, electric cooling fan and all accessories: OFF - Transmission: Neutral (A/T: P range)	Engine is idling	18–44 Hz	Code No. 12	13A-13
			2,500 r/min	43–83 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	13A-14
			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		

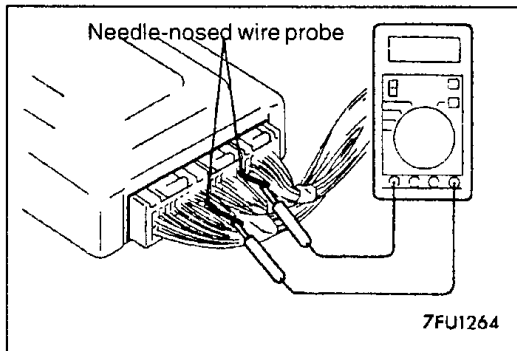
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300–1,000 mV (6–20%)	Code No. 14	13A-15
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV (80–100%)		
16	Power supply voltage	Ignition switch: ON		Battery positive voltage	Procedure No. 23	13A-41
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 26 <M/T> Procedure No. 27 <A/T>	13A-43 <M/T> 13A-44 <A/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13A-16
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		
22	Crankshaft angle sensor *2	- Engine: Cranking - Tachometer: Connected	Compare the rpm of the tachometer with the one of the MUT-II.	Identical	Code No. 22	13A-17
		- Engine: Idling - Idle position switch: ON	When engine coolant temperature is –20°C	1,300–1,500 r/min		
			When engine coolant temperature is 0°C	1,300–1,500 r/min		
			When engine coolant temperature is 20°C	1,300–1,500 r/min		
			When engine coolant temperature is 40°C	1,050–1,250 r/min		
			When engine coolant temperature is 80°C	600–800 r/min		
24	Vehicle speed sensor	Drive at 40 km/h		Approx. 40 km/h	Code No. 24	13A-19
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-20
			At altitude of 600m	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. 25	13A-42
			Throttle valve: Slightly open	OFF*5		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
27	Power steering pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 28	13A-45
			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	13A-45
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 27	13A-44
			D, 3, 2, L or R	D, 3, 2, L or R		
34	Air flow sensor reset signal	Engine: Warm	Engine is idling	ON	-	-
			2,500 r/min	OFF		
37	Volumetric efficiency	- Engine coolant temperature: 80–95°C - Lights, electric cooling fan and all accessories: OFF - Transmission: P range	Engine is idling	15–35 %	-	-
			2,500 r/min	15–35 %		
			When engine is suddenly raced	Volumetric efficiency increases in response to racing		
38	Crankshaft angle sensor	- Engine cranking (reading is possible at 2,000 r/min or less) - Tachometer: connected		Engine speeds displayed on the MUT-II and tachometer are identical.	-	-
41, 47	Injectors *3	Engine: Cranking	When engine coolant temperature is 20°C	12–18 ms	-	-
			When engine coolant temperature is 20°C	30–44 ms		
			When engine coolant temperature is 80°C	8–12 ms		
	Injectors *4	- Engine coolant temperature: 80–95°C - Lights, electric cooling fan and all accessories: OFF - Transmission: P range	Engine is idling	2.2–3.4 ms		
			2,500 r/min	2.0–3.2 ms		
			When engine is suddenly raced	Increases		
44	Ignition coils and ignition power transistors	- Engine: After having warmed up - Timing light is set. (The timing light is set in order to check actual ignition timing.)	Engine is idling	2–18 °BTDC	-	-
			2,500 r/min	25–45 °BTDC		

Item No.	Inspection item	Inspection contents	Normal condition	Inspection procedure No.	Reference page
45	ISC servo (stepper motor) position *6	- Engine coolant temperature: 80 – 95°C - Lights, electric cooling fan and all accessories: OFF - Transmission: P range) - Idle position switch: ON - Engine: Idling (When A/C switch is ON, A/C compressor should be operating)	A/C switch: OFF	Increases by 2–25 steps	–
			A/C switch: OFF → ON	Increases by 10–70 steps	
			- A/C switch: OFF - Select lever: N range → D range	Increases by 5–50 steps	
49	A/C compressor clutch relay	Engine: After having warmed up /Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 29
			A/C switch: ON	ON (Compressor clutch is operating)	
					13A-45

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: Warm, idle (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idle speed drops equally for each injector	Code No. 41	13A-21
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
05		Cut fuel to No. 5 injector					
06		Cut fuel to No. 6 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	- Engine: Cranking - Fuel pump: Activated 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. 24	13A-42
				Listen near the fuel tank for the sound of fuel pump operation.	Typical electric fuel pump whine.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Procedure No. 33	13A-47
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Clicks when solenoid valve is driven.	Procedure No. 34	13A-48
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idle Timing light is set		5° BTDC	—	—
20	Radiator fan (Hi) Condenser fan (Hi)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON		Fan motor operates at high speed.	Procedure No. 30	13A-46
21	Radiator fan (Hi) Condenser fan (Low)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON		Fan motor operates at low speed.	Procedure No. 30	13A-46



CHECK AT THE ENGINE-ECU TERMINALS TERMINAL VOLTAGE CHECK CHART

1. Connect a needle-nosed wire probe (paper clip etc.) to a voltmeter probe.
2. Insert the needle-nosed wire probe into each of the Engine-ECU connector terminals from the wire side, and measure the voltage while referring to the check chart.

NOTE

1. Measure voltage with the Engine-ECU connectors connected.
2. You may find it convenient to pull out the Engine-ECU to make it easier to reach the connector terminals.
3. Checks don't have to be carried out in the order given in the chart.

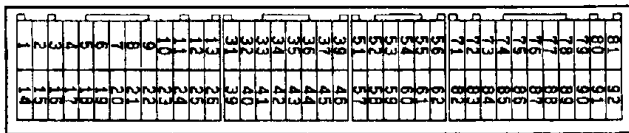
Caution

Short-circuiting the positive (+) probe between a connector terminal and ground could damage the vehicle wiring, the sensor, Engine-ECU, or all three. Use care to prevent this!

3. If voltmeter shows any deviation from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

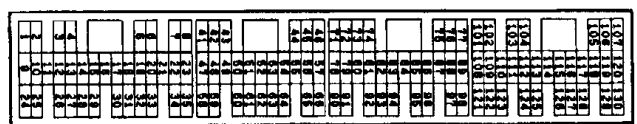
Engine-ECU Connector Terminal Arrangement

<M/T>



9FU0393

<A/T>



7FU1763

Terminal No.		Check item	Check condition (Engine condition)	Normal condition
M/T	A/T			
1	1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal slightly	From 11–14 V momentarily drops
14	9	No. 2 injector		
2	24	No. 3 injector		
15	2	No. 4 injector		
3	10	No. 5 injector		
16	25	No. 6 injector	Engine: Soon after the warmed up engine is started	SV ↔ 0–3V (Changes repeatedly)
4	14	Stepper motor coil<A1>		
17	28	Stepper motor coil<A2>		
5	15	Stepper motor coil<B1>		
18	29	Stepper motor coil<B2>	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)	SV or momentarily 6V or more → 0.3 V
8	20	A/C relay		

Terminal No.		Check item	Check condition (Engine condition)		Normal condition
M/T	A/T				
10	11	Power transistor unit	Engine: 3,000 r/min		0.3–3.0 V
12	41	Power supply	Ignition switch: ON		SV
25	47				
19	19	Volume air flow sensor reset signal	Engine: idle speed		0–1V
			Engine: 3,000 r/min		6–9V
20	17	Fan motor relay (High)	Radiator fan is not operating (Engine coolant temperature is 90°C or less)		SV
			Radiator fan is operating at high speed (Engine coolant temperature is 105°C or more)		0–3V
21	18	Fan motor relay (Low)	Radiator fan is not operating (Engine coolant temperature is 90°C or less)		SV
			Radiator fan is operating at low speed (Engine coolant temperature is 90–105°C)		0–3V
22	21	Fuel Pump relay	Ignition switch: ON		SV
			Engine: idle speed		0–3V
36	22	Engine warning lamp	Ignition switch: OFF → ON		0–3V → 9–13 (after several seconds have elapsed)
37	52	Power steering pressure switch	Engine: Idling after warmed up	When steering wheel is stationary	SV
				When steering wheel is turned	0–3V
38	49	Control relay (Power supply)	Ignition switch: OFF		SV
			Ignition switch: ON		0–3V
45	83	A/C switch	Engine: idle speed	Turn the A/C switch OFF	0–3V
				Turn the A/C switch ON (A/C compressor is operating)	SV
71	58	Ignition switch – ST	Engine: Cranking		8V or more
72	64	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2–3.8V
				When intake air temperature is 20°C	2.3–2.9V
				When engine coolant temperature is 40°C	1.5–2.1V
				When engine coolant temperature is 80°C	0.4–1.0V
76	71	Oxygen sensor <if equipped>	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ← → 0.8V (Changes repeatedly)
		Variable resistor	Ignition switch: ON		1–4V
80	66	Backup power supply	Ignition switch: OFF		SV
81	48	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
82	98	Ignition switch – IG	Ignition switch: ON		SV

Terminal No.		Check item	Check condition (Engine condition)		Normal condition
M/T	A/T				
83	44	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2–3.8V
				When engine coolant temperature is 20°C	2.3–2.9V
				When engine coolant temperature is 40°C	1.3–1.9V
				When engine coolant temperature is 80°C	0.3–0.9V
84	78	Throttle Position sensor	Ignition switch: ON (Check for smooth voltage increase as throttle valve is moved from idle position to wide open throttle)	Idle	0.3–1.0V
				Wide open throttle valve	4.5–5.5V
—	—	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7–4.3 V
				When altitude is 1,200m	3.2–3.8V
86	80	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ← → 5V (Changes repeatedly)
87	79	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
				Slightly open throttle valve	4V or more
88	56	Top dead centre sensor	Engine: Cranking		0.4–3.0V
			Engine: idle speed		0.5–2.0V
89	45	Crankshaft angle sensor	Engine: Cranking		0.4–4.0V
			Engine: idle speed		1.5–2.5V
90	65	Volume air flow sensor	Engine: idle speed		2.2–3.2V
			Engine: 2500 rpm		
	59	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0–3V
				Set selector lever to D, 3, 2, L or R	8–14V

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

1. Turn the ignition switch to OFF.
2. Disconnect the Engine-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the Engine-ECU harness-side connector while referring to the check chart.

NOTE

1. When measuring resistance and checking continuity, a harness for checking contact pin pressure should be used instead of inserting a test probe.
2. Checks do not have to be carried out in the order given in this chart.

Caution

If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, Engine-ECU, and/or ohmmeter may occur. Use care to prevent this!

4. If the ohmmeter shows any deviation from the normal condition, check the corresponding sensor, actuator and related electrical wiring, and then repair or replace.
5. After repair or replacement, recheck with the ohmmeter to confirm that the repair or replacement has corrected the problem.

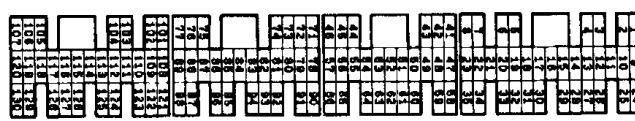
Engine-ECU Harness Side Connector Terminal Arrangement

<M/T>



9FU0392

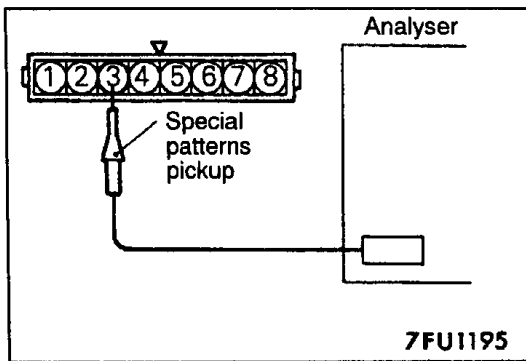
<A/T>



7FU1764

Terminal No.		Inspection item	Normal condition (Check condition)
<M/T>	<A/T>		
1-12	1-41	No. 1 injector	13-16 kΩ (At 20°C)
14-12	9-41	No. 2 injector	
2-12	24-41	No. 3 injector	
15-12	2-41	No. 4 injector	
3-12	10-41	No. 5 injector	
16-12	25-41	No. 6 injector	
4-12	14-41	Stepper motor coil<A1>	28-33 Ω (At 20°C)
17-12	28-41	Stepper motor coil<A2>	
5-12	15-41	Stepper motor coil<B1>	
18-12	29-41	Stepper motor coil<B2>	
6-12		EGR control solenoid valve	34-44 Ω (At 20°C)
9-12		Purge control solenoid valve	34-44 Ω (At 20°C)
13-Body earth	42-Body earth	Engine-ECU earth	Continuity (0Ω)
26-Body earth	48-Body earth	Engine-ECU earth	

Terminal No.		Inspection item	Normal condition (Check condition)
<M/T>	<A/T>		
72-92	64-57	Intake air temperature sensor	5.3-6.7 kΩ (When intake air temperature is 0°C)
			2.3-3.0 kΩ (When intake air temperature is 20°C)
			1.0-1.5 kΩ (When intake air temperature is 40°C)
			0.80-0.42 kΩ (When intake air temperature is 80°C)
83-92	44-57	Engine coolant temperature sensor	5.1-6.5 kΩ (When engine coolant temperature is 0°C)
			2.1-2.7 kΩ (When engine coolant temperature is 20°C)
			0.9-1.3 kΩ (When engine coolant temperature is 40°C)
			0.26-0.36 kΩ (When engine coolant temperature is 80°C)
87-92	79-57	Idle position switch	Continuity (When throttle valve is idle position)
			No Continuity (When throttle valve is slightly open)
	59-Body earth	Inhibitor switch <A/T>	No Continuity (When select lever is at P or N)
			Continuity (When select lever is at D, 2, 1 or R)



INSPECTION PROCEDURE USING AN ANALYSER

AIR FLOW SENSOR

Measurement Method

1. Disconnect the air flow sensor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyser special patterns pickup to volume air flow sensor connector terminal 3.

Alternate method (Test harness not available)

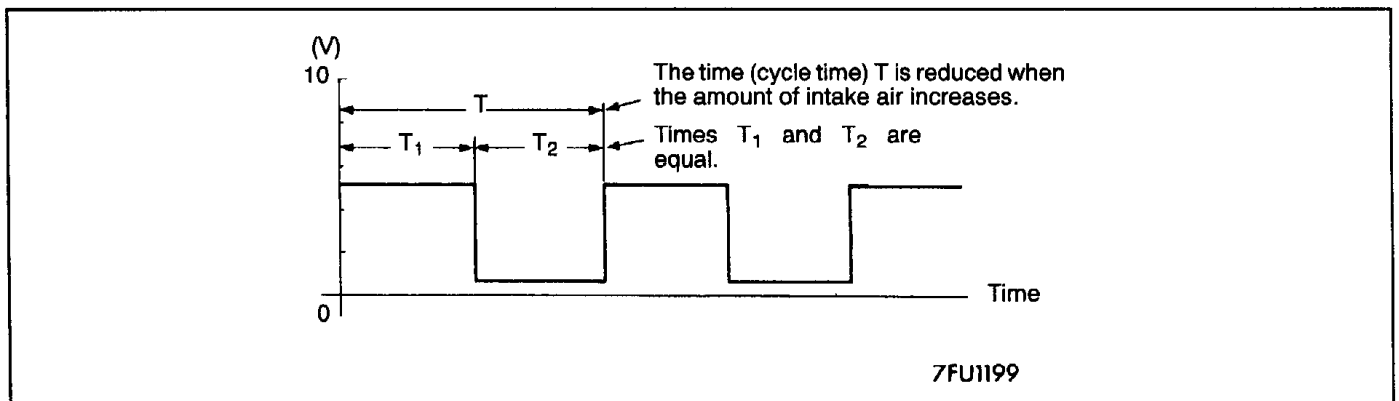
1. Connect the analyser special patterns pickup to Engine-ECU terminal 90.

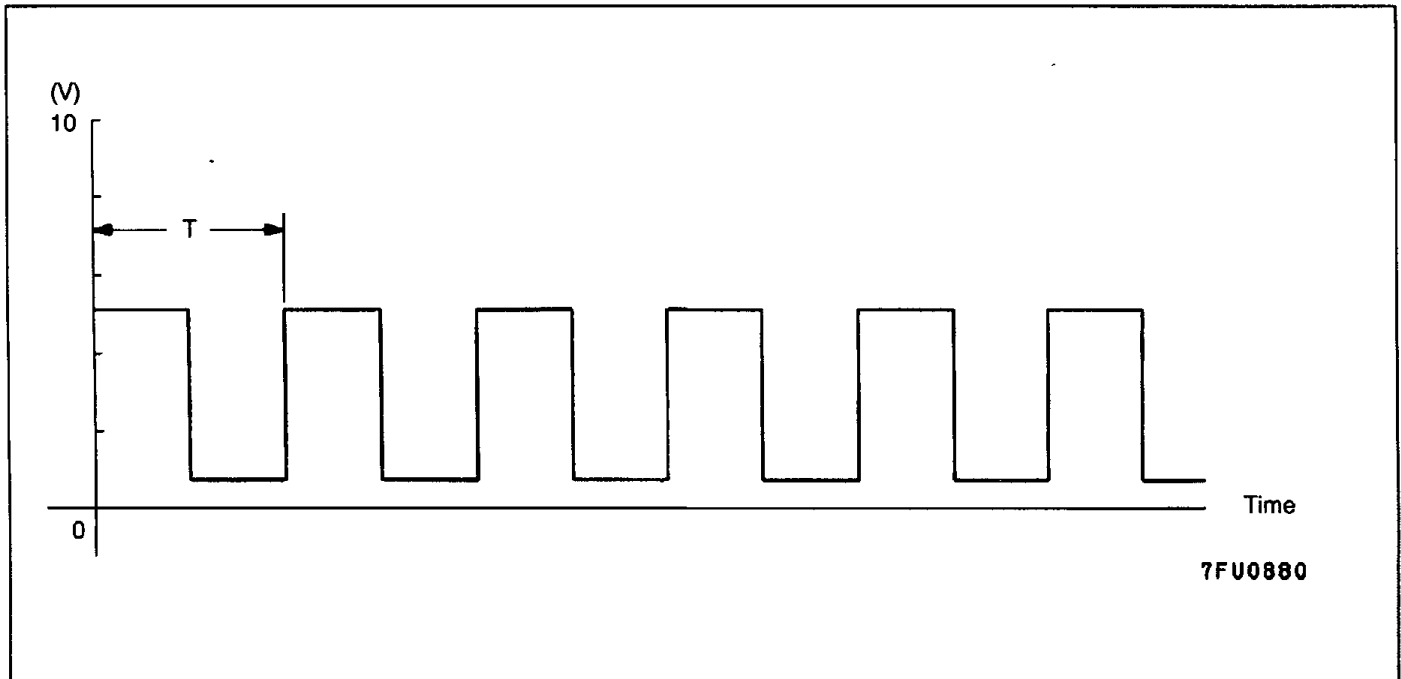
Standard Wave Pattern

Observation conditions

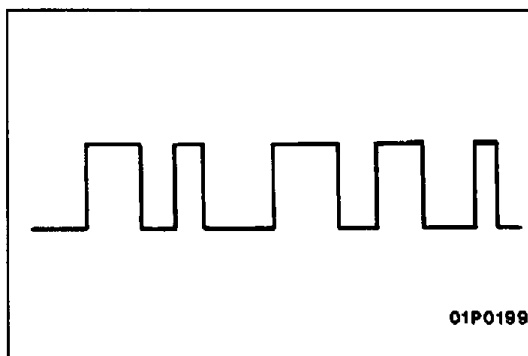
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern



Observation Conditions (pattern changes with engine speed changes.)**Wave Pattern Observation Points**

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

**Examples of Abnormal Wave Patterns**

- Example 1

CAUSE OF PROBLEM

Sensor interface malfunction

WAVE PATTERN CHARACTERISTICS

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

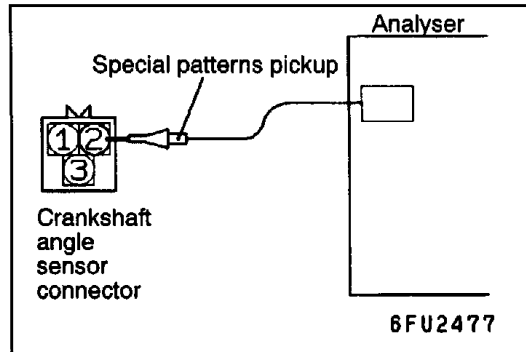
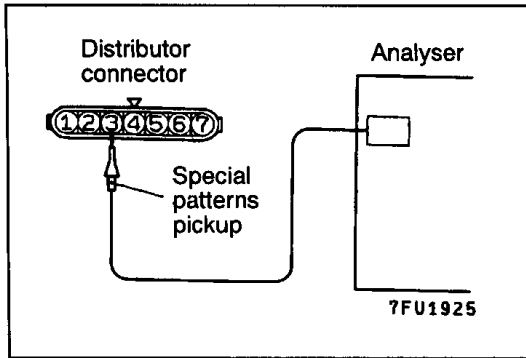
- Example 2

CAUSE OF PROBLEM

Damaged rectifier or vortex generation column

WAVE PATTERN CHARACTERISTICS

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



CAMSHAFT POSITION SENSOR AND CRANKSHAFT ANGLE SENSOR

Measurement Method

1. Disconnect the distributor (camshaft position sensor) connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyser special patterns pickup to distributor connector terminal 5.
3. Disconnect the crankshaft angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyser special patterns pickup to crankshaft angle sensor connector terminal 2.

Alternate method (Test harness not available)

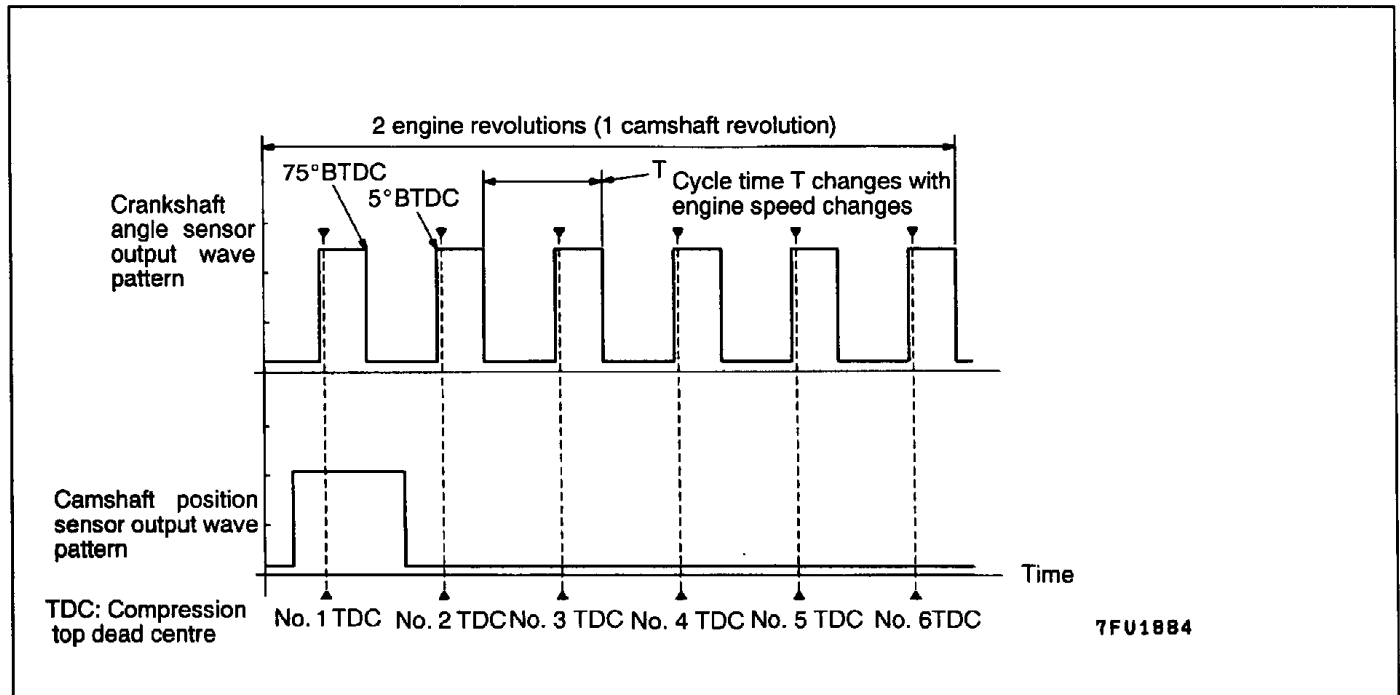
1. Connect the analyser special patterns pickup to Engine-ECU terminal 88. (When checking the camshaft position sensor signal wave pattern)
2. Connect the analyser special patterns pickup to Engine-ECU terminal 89. (When checking the crankshaft angle sensor signal wave pattern)

Standard Wave Pattern

Observation conditions

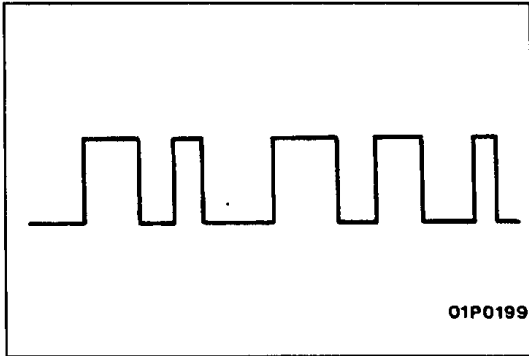
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

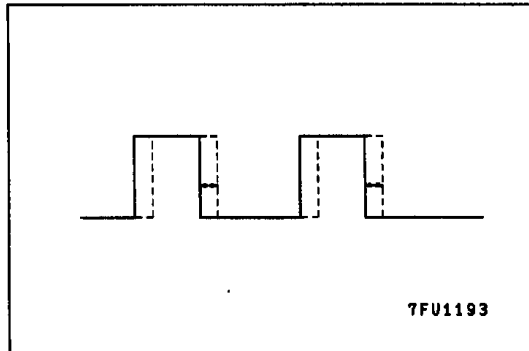
● Example 1

CAUSE OF PROBLEM

Sensor interface malfunction

WAVE PATTERN CHARACTERISTICS

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



● Example 2

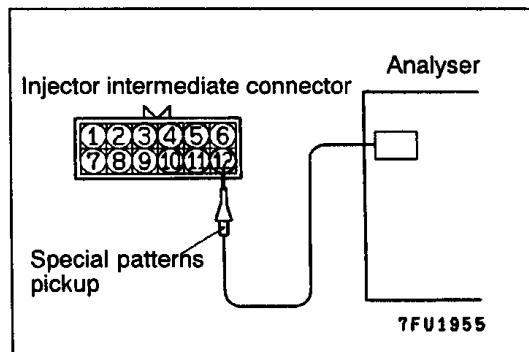
CAUSE OF PROBLEM

Loose timing belt

Abnormality in sensor disk

WAVE PATTERN CHARACTERISTICS

Wave pattern jumps to the left or right.



INJECTOR

Measurement Method

1. Disconnect the injector intermediate connector and connect the special tool (test harness: MB991348) in between.
2. Connect the analyser special patterns pickup to injector intermediate connector terminal 12 to analyse the No.1 cylinder, connection terminal 5 for No.2 cylinder, connection terminal 11 for No.3 cylinder, connection terminal 4 for No.4 cylinder, connection terminal 10 for No.5 cylinder, connection terminal 3 for No.6 cylinder respectively.

Alternate method (Test harness not available)

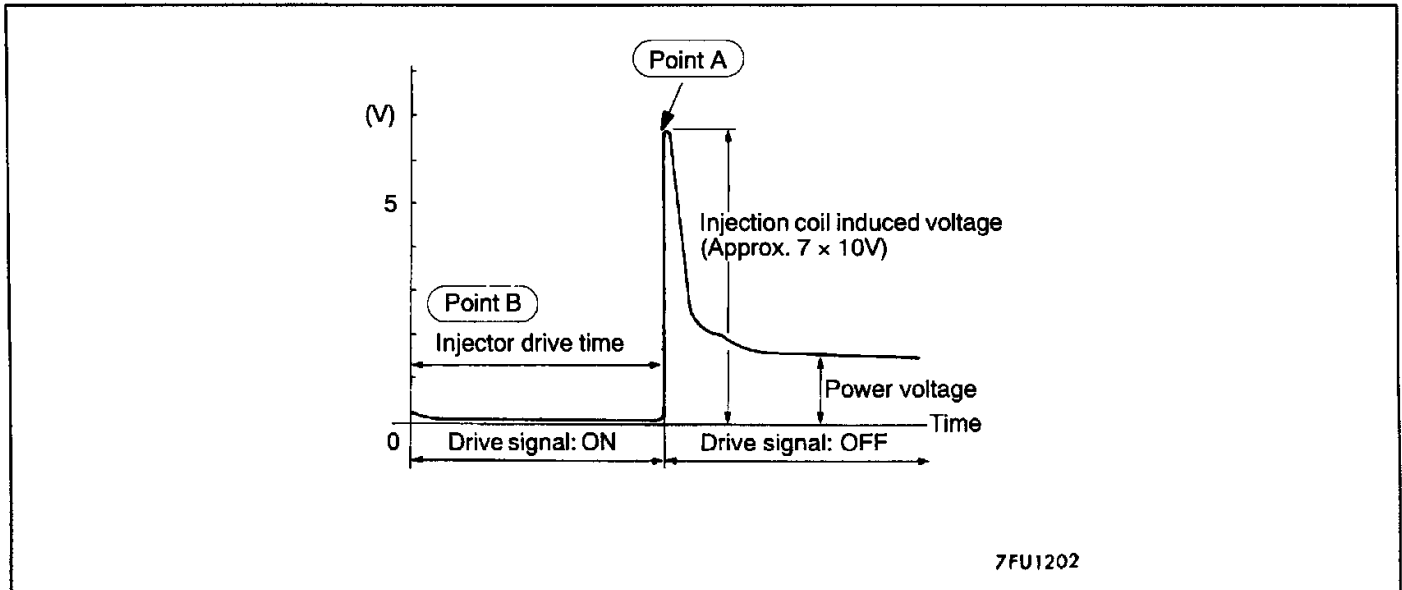
1. Connect the analyser special patterns pickup to Engine-ECU terminal 1 to analyse the No.1 cylinder, connection terminal 2 to analyse the No.3 cylinder, connection terminal 3 to analyse the No.5 cylinder, connection terminal 14 to analyse the No.2 cylinder, connection terminal 15 to analyse the No.4 cylinder, and connection terminal 16 to analyse No.6 respectively.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min	Idle

Standard wave pattern

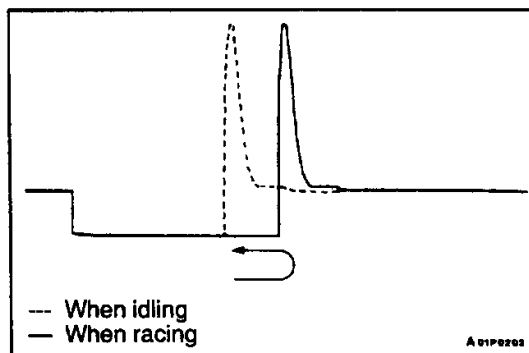


Wave Pattern Observation Points

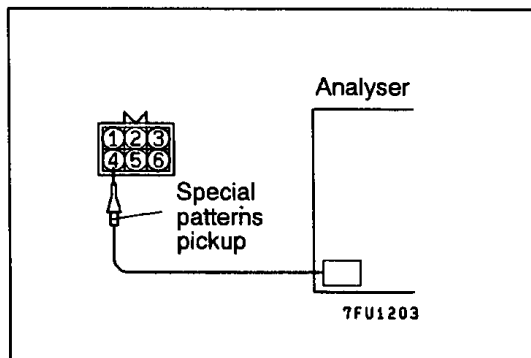
Point A: Height of injector coil induced voltage

Contrast with standard wave pattern	Probable cause
Injector coil induced voltage is low or doesn't appear at all.	Short in the injector solenoid

Point B: Injector drive time



- The injector drive time will be synchronised with the MUT-II tester display.
- When the engine is suddenly raced, the drive time will be greatly extended at first, but the drive time will soon match the engine speed.



ISC STEPPER MOTOR

Measurement Method

1. Disconnect the ISC stepper motor connector, and connect the special tool (test harness: MB998463) in between.
2. Connect the analyser special patterns pickup to the ISC stepper motor connector terminal 1 (red clip of the special tool), terminal 3 (green clip), terminal 4 (black clip) and terminal 6 (yellow clip) respectively.

Alternate method (Test harness not available)

1. Connect the analyser special patterns pickup to Engine-ECU terminals 4, 5, 17, and 18.(signal wave pattern.)

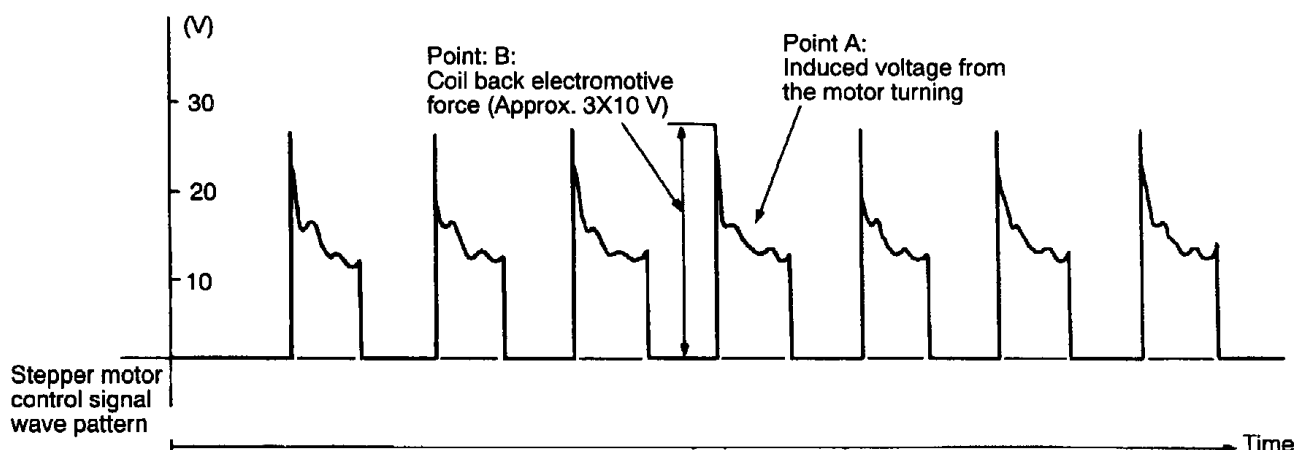
Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	Turn the ignition switch from OFF to ON (without starting the engine).
	While the engine is idling, turn the A/C switch to ON.
	Immediately after starting the warm engine (approx. 1 minute).

Standard wave pattern

The wave pattern appears for an instant, but soon disappears.



7FU1204

Wave Pattern Observation Points

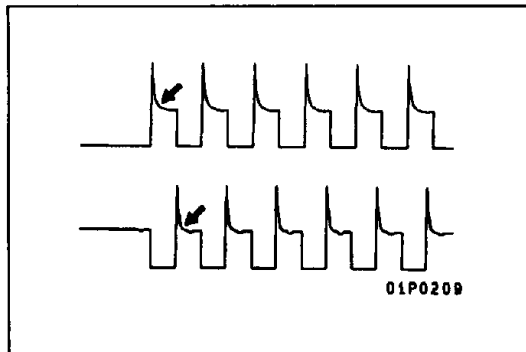
Check that the standard wave pattern appears when the idle air control motor is operating.

Point A: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern.)

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Malfunction of motor

Point B: Height of coil back electromotive force.

Contrast with standard wave pattern	Probable cause
Coil reverse electromotive force does not appear or is extremely small.	Short in coil

**Examples of Abnormal Wave Patterns**

- Example 1

CAUSE OF PROBLEM

Malfunction of motor (Motor is not operating.)

WAVE PATTERN CHARACTERISTICS

Induced electromotive force from the motor turning does not appear.

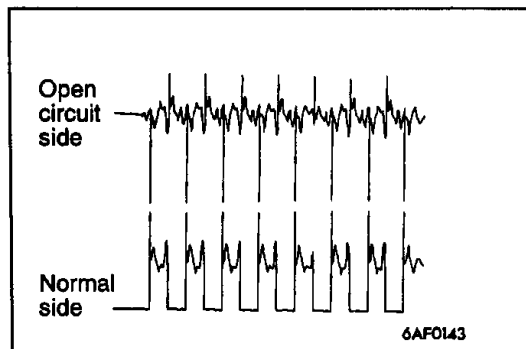
- Example 2

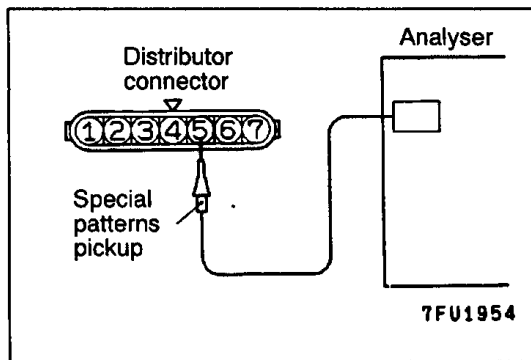
CAUSE OF PROBLEM

Open circuit in the line between the ISC stepper motor and Engine-ECU.

WAVE PATTERN CHARACTERISTICS

Current is not supplied to the motor coil on the open circuit side. (Voltage does not drop to 0 V.) Furthermore, the induced electromotive force wave pattern at the normal side is slightly different from the normal wave pattern.





IGNITION COIL AND IGNITION POWER TRANSISTOR

- Ignition coil primary signal
Refer to GROUP 16 – Ignition System
- Ignition power transistor control signal

Measurement Method

1. Disconnect the distributor (ignition power transistor) connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyser special patterns pickup to distributor connector terminal 5.

Alternate method (Test harness not available)

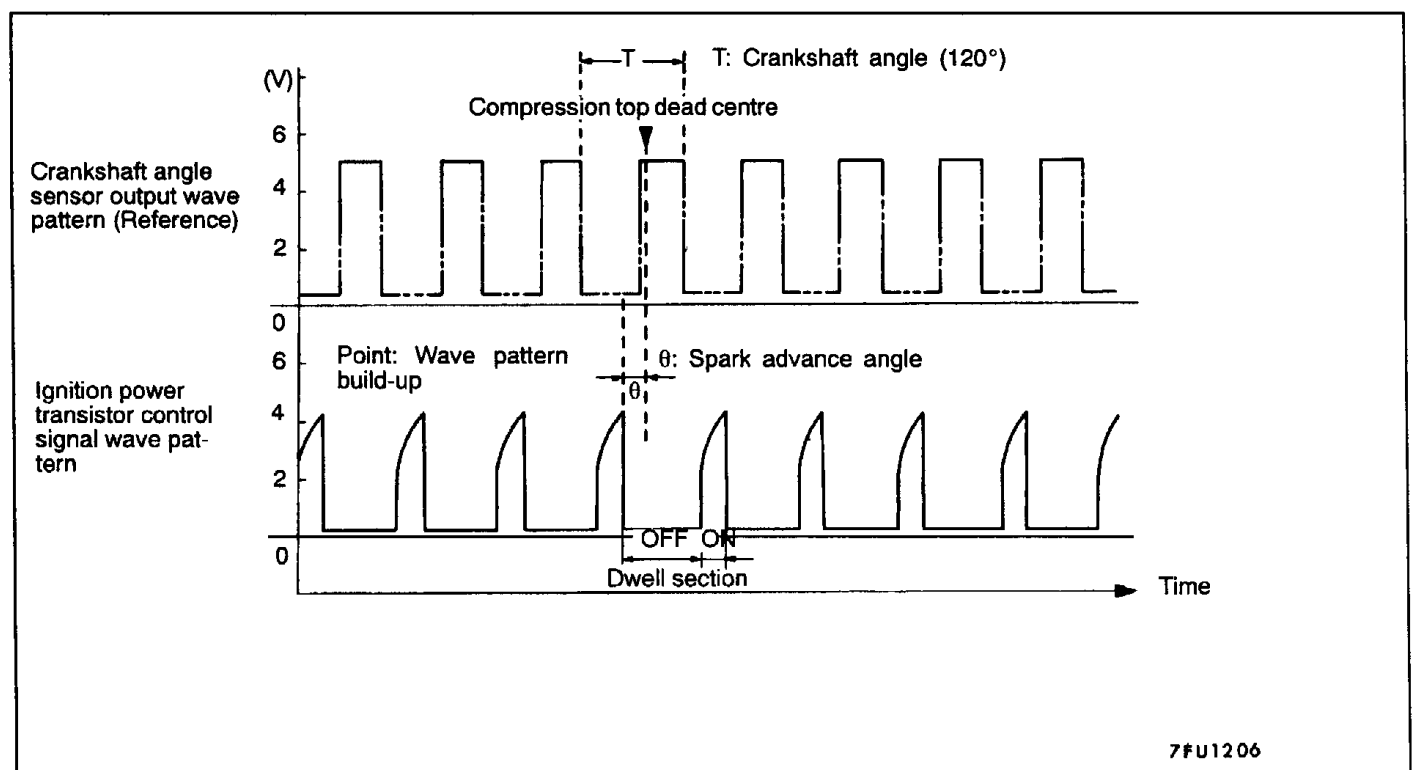
1. Connect the analyser special patterns pickup to Engine-ECU terminal 10.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Approx. 1,200 r/min

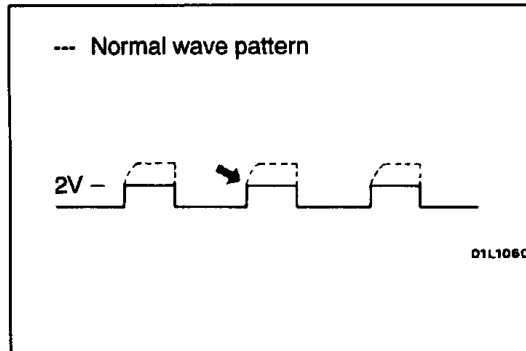
Standard wave pattern



Wave Pattern Observation Points

Point: Condition of wave pattern build-up section and maximum voltage (Refer to abnormal wave pattern examples 1 and 2.)

Condition of wave pattern build-up section and maximum voltage	Probable cause
Rises from approx. 2V to approx. 4.5V at the top-right	Normal
2V rectangular wave	Open-circuit in ignition primary circuit
Rectangular wave at power voltage	Ignition power transistor malfunction

**Examples of Abnormal Wave Patterns**

- Example 1

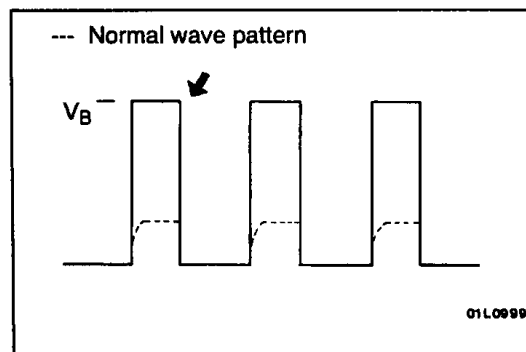
Wave pattern during engine cranking

CAUSE OF PROBLEM

Open-circuit in ignition primary circuit

WAVE PATTERN CHARACTERISTICS

Top-right part of the build-up section cannot be seen, and voltage value is approximately 2V too low.



- Example 2

Wave pattern during engine cranking

CAUSE OF PROBLEM

Malfunction in ignition power transistor

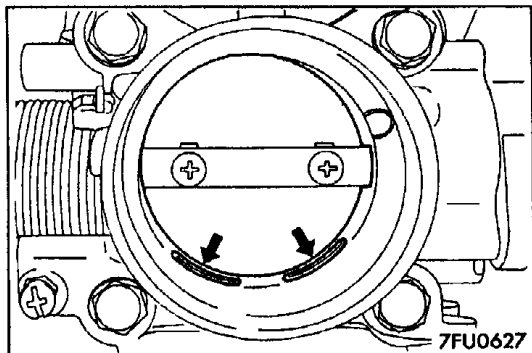
WAVE PATTERN CHARACTERISTICS

Power voltage results when the ignition power transistor is ON.

ON-VEHICLE SERVICE

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

1. Start the engine and warm it up until the coolant is heated to 80°C or higher and then stop the engine.
2. Remove the air intake hose from the throttle body.



3. Plug the bypass passage inlet (arrow) of the throttle body.

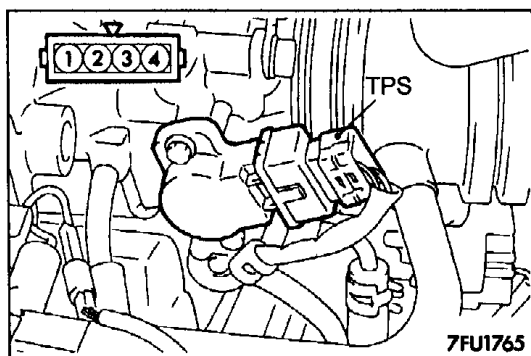
Caution

Do not allow cleaning solvent to enter the bypass passage.

4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the air intake hose.
9. Use the MUT-II to erase the diagnostic trouble code.
10. Adjust the basic idle speed. (Refer to P.13A-80.)

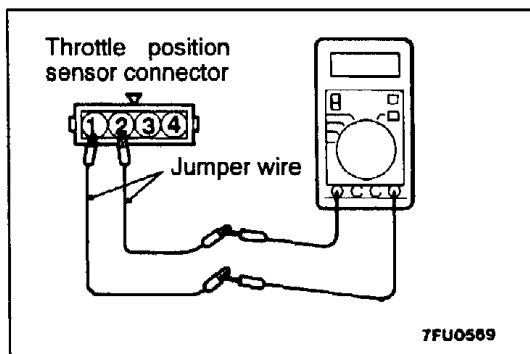
NOTE

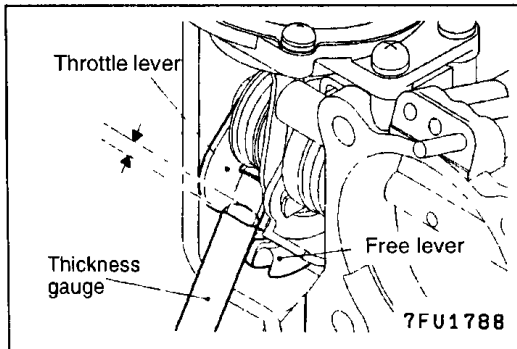
If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (-) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 10 minutes.



IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

1. Connect the MUT-II to the diagnosis connector. When not using the MUT-II, proceed as follows.
 - (1) Disconnect the connector of the throttle position sensor.
 - (2) Connect an ohmmeter between terminal 2 (closed throttle position switch) and 1 (sensor ground) by using jumper wires.



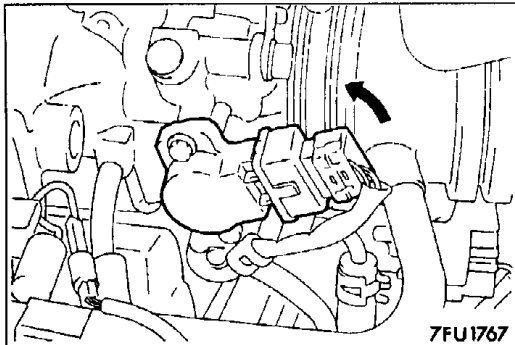


2. Insert a feeler gauge with a thickness of 1.4 mm between the levers shown in the illustration to a depth of no more than 3 mm.

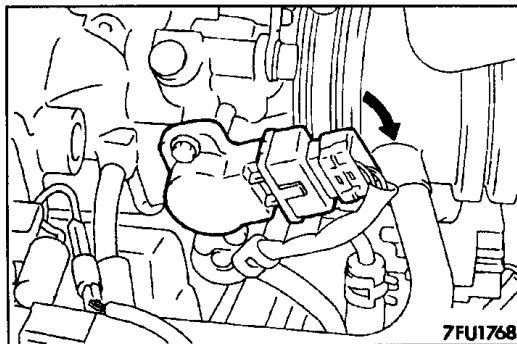
NOTE

Inserting the feeler gauge more than 3mm will result in incorrect adjustment.

3. When using the MUT-II, turn the ignition switch ON. (Engine does not start.)

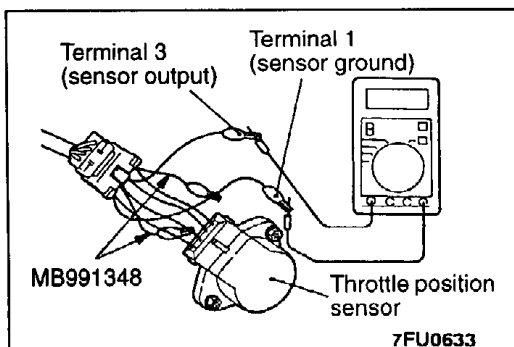


4. Loosen the throttle position sensor mounting bolt; then turn the throttle position sensor body fully anti-clockwise.
5. In this condition, make sure that the idle position switch is ON. (There is continuity between terminals 1 and 2.)



6. Slowly turn the throttle position sensor clockwise until the point at which the idle switch is turned off (continuity between terminals 1 and 2 changes to non-continuity) is found.

Tighten the throttle position sensor installation bolt at that position.

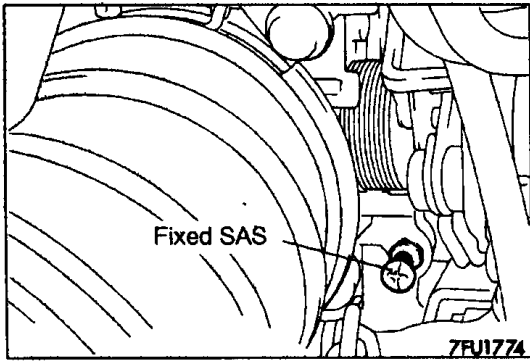


7. When not using the MUT-II, proceed as follows:
 - (1) Connect the special tool (test harness set) between the throttle position sensor connectors which have been disconnected. (Connect all terminals taking care not to mistake the terminal No.)
 - (2) Connect a digital voltmeter between the throttle position sensor terminal 1 (sensor ground) and terminal 3 (sensor output.)
 - (3) Turn the ignition switch ON (but do not start the engine).

8. Check the throttle position sensor output voltage.

Standard value: 400–1,000 mV

9. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
10. Remove the feeler gauge.
11. Switch OFF the ignition switch.



FIXED SAS ADJUSTMENT

NOTE

1. The fixed SAS should not be moved unnecessarily; it has been precisely adjusted by the manufacturer.
2. If the adjustment is disturbed for any reason, readjust as follows.

1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the fixed SAS lock nut.
3. Turn the fixed SAS anti-clockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Turn the fixed SAS clockwise until the throttle lever is touched (i.e., the point at which the throttle valve begins to open).
From that point, turn the fixed SAS clockwise another 1-1/4 turn.
5. While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
6. Adjust the tension of the accelerator cable.
7. Adjust the basic idle speed.
8. Adjust the idle position switch and the throttle position sensor. (Refer to P.13A-78.)

BASIC IDLE SPEED ADJUSTMENT

NOTE

1. The standard idle speed has been adjusted, by the engine speed adjusting screw, by the manufacturer, and there should usually be no need for readjustment.
 2. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the ISC servo, the compression pressure, etc., are all normal.
1. The vehicle should be set in the pre-adjustment condition before inspection and adjustment.
 2. Connect the MUT-II to the diagnosis connector (16-pin)

NOTE

When the MUT-II is connected, the diagnosis control terminal should be grounded.

3. Start the engine and run at idle.
4. Select item No. 30 of the MUT-II ACTUATOR TEST.

NOTE

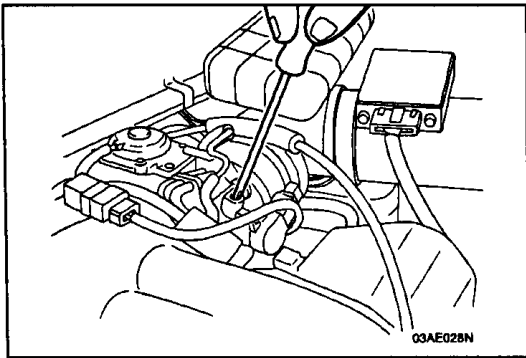
This holds the ISC servo at the basic step to adjust the basic idle speed.

5. Check the idle speed.

Standard value: 700 ± 100 r/min

NOTE

1. The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
2. If the engine stalls or the rpm is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-78.)



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

NOTE

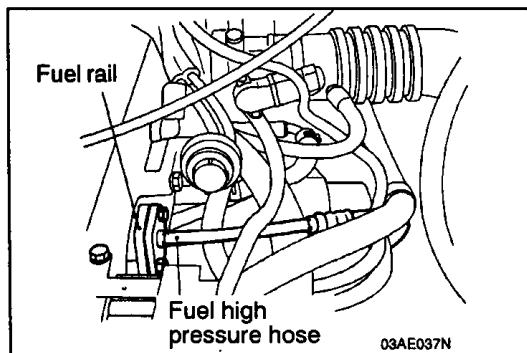
If the idling speed is higher than the standard value range even when the engine speed adjusting screw is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS.

7. Press the clear key and release the ISC servo from the ACTUATOR TEST mode.

NOTE

Unless the ISC servo is released, the ACTUATOR TEST mode will continue 27 minutes.

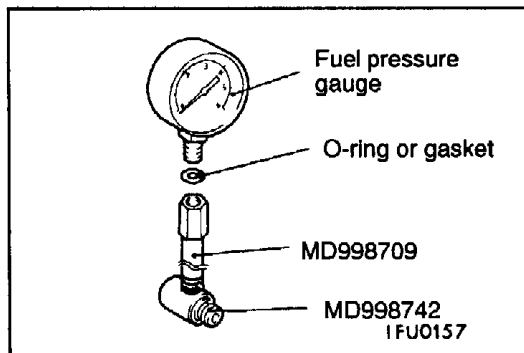
8. Switch OFF the ignition switch.
9. Disconnect the MUT-II.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

**FUEL PRESSURE TEST**

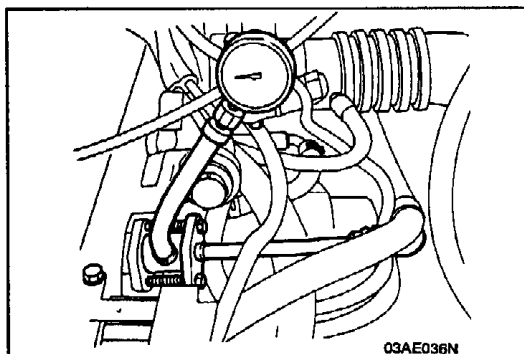
1. Release residual pressure from the fuel line to prevent fuel spray. (Refer to P.13A-83.)
2. Disconnect the fuel high pressure hose at the fuel rail side.

Caution

Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

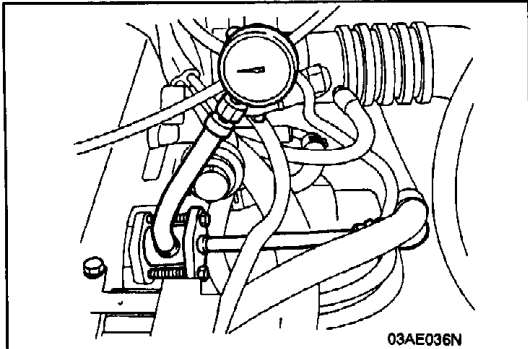


3. Remove the union joint and bolt from the special tool (adaptor hose MD998709) and instead attach the special tool (hose adaptor MD998742) to the adaptor hose.
4. Install a fuel pressure gauge on the adaptor hose that was set up in step 3. Use a suitable O-ring or gasket between the fuel pressure gauge and the special tool so as to seal in order to prevent fuel leakage at this time.



5. Install the special tool, which was assembled in steps 3 and 4 between the fuel rail and the high pressure hose.

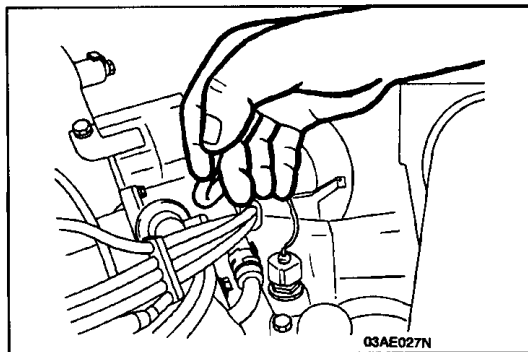
6. Use the MUT-II to operate the fuel pump. Check the connections between the fuel pressure gauge and the special tool for leaks.
7. Start the engine and run at idle.



8. Measure fuel pressure while the engine is running at idle.

Standard value:

Approx. 270 kPa at curb idle



9. Disconnect and plug the vacuum hose from the fuel pressure regulator and measure fuel pressure with the hose end closed by a finger.

Standard value:

330–350 kPa at curb idle

10. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
11. Racing the engine repeatedly, hold the fuel return hose lightly with fingers to feel that fuel pressure is present in the return hose.

NOTE

If the fuel flow rate is low, there will be no fuel pressure in the return hose.

12. If any of fuel pressure measured in steps 8 to 11 is out of specification, troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
• Fuel pressure too low • Fuel pressure drops after racing • No fuel pressure in fuel return hose	Clogged fuel filter	Replace fuel filter
	Fuel leaking to return side due to poor fuel regulator valve seating or settled spring	Replace fuel pressure regulator
	Low fuel pump delivery pressure	Replace fuel pump
Fuel pressure too high	Binding valve in fuel pressure regulator	Replace fuel pressure regulator
	Clogged fuel return hose or pipe	Clean or replace hose or pipe
Same fuel pressure when vacuum hose is connected and when disconnected	Damaged vacuum hose or clogged nipple	Replace vacuum hose or clean nipple

13. Stop the engine and observe fuel pressure gauge reading. Normal if the reading does not drop within 2 minutes. If it does, observe the rate of drop and troubleshoot and repair according to the table below.

Symptom	Probable cause	Remedy
Fuel pressure drops gradually after engine is stopped	Leaky injector	Replace injector
	Leaky fuel regulator valve seat	Replace fuel pressure regulator
Fuel pressure drops sharply immediately after engine is stopped	Check valve in fuel pump is held open	Replace fuel pump

14. Release residual pressure from the fuel pipe line. (Refer to P.13A-83.)
 15. Remove the fuel pressure gauge and special tool from the fuel rail.

Caution

Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

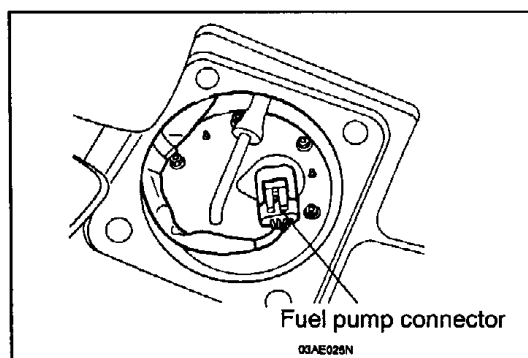
16. Replace the O-ring at the end of the fuel high pressure hose with a new one.
 17. Fit the fuel high pressure hose into the fuel rail and tighten the bolts to specified torque.

Tightening torque: 5 Nm

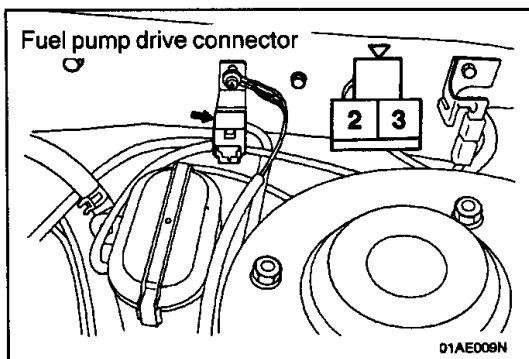
18. Check for fuel leaks.
 (1) Use the MUT-II to operate the fuel pump.
 (2) Check the fuel line for leaks, repair as needed.

FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE PRESSURISED FUEL LINES)

When removing the fuel pipe, hose, etc., since fuel pressure in the fuel pipe line is high, do the following operation so as to release fuel pressure in the line and prevent fuel from running out.



1. Remove the rear seat cushion. (Refer to GROUP 52A – Rear Seat.)
2. Remove the fuel pump/fuel gauge floor cover plate and disconnect the wiring connector at the fuel pump/gauge assembly.
3. Start the engine and let it run until it stops naturally, turn the ignition switch to OFF.
4. Re-connect the fuel pump/gauge wiring harness connector.
5. Install the rear seat cushion.



FUEL PUMP OPERATION CHECK

1. Check the operation of the fuel pump by using the MUT-II to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure. If normal, check the fuel pump drive circuit.

- (1) Turn the ignition switch to OFF.
- (2) When the fuel pump drive checking terminal (terminal 2) is attached directly to the battery, check if the sound of the fuel pump operation can be heard.

NOTE

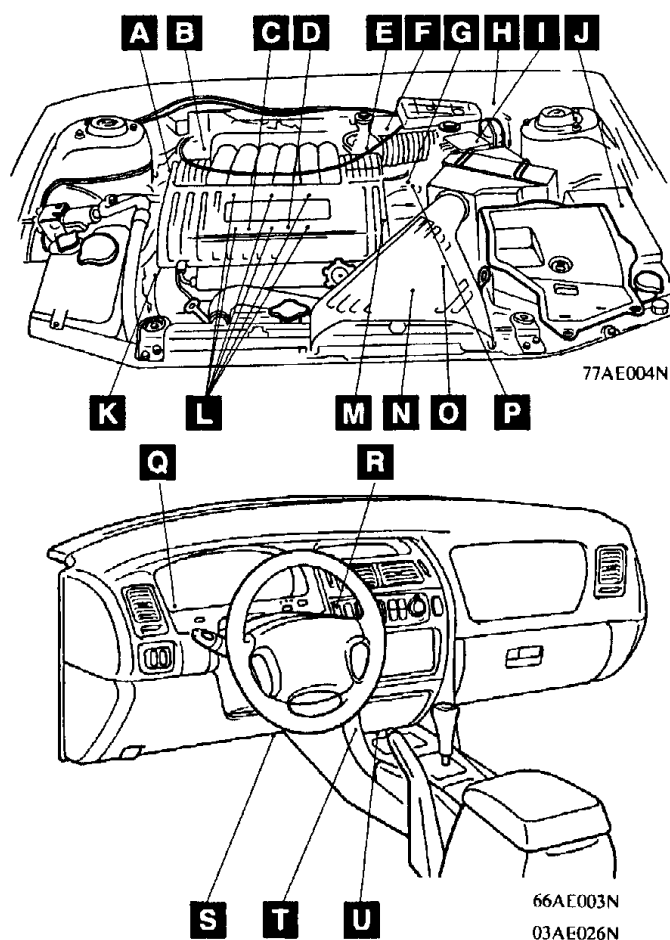
As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel tank filler tube cap and check from the tank inlet.

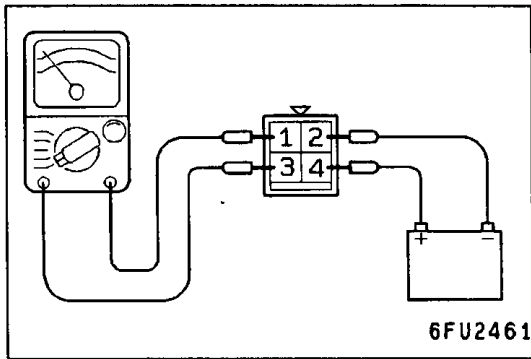
- (3) Check the fuel pressure by pinching the fuel hose with the fingertips.

ON-VEHICLE INSPECTION OF MPI COMPONENTS

COMPONENT LOCATION

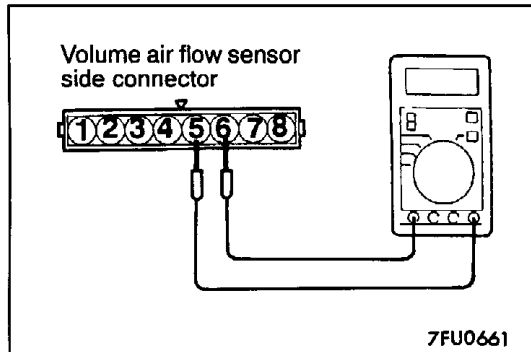
Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	J	Oxygen sensor	B
Air conditioner switch	R	Idle speed control servo	F
Camshaft position sensor <in distributor>	G	Ignition coil and ignition power transistor <in distributor>	P
Engine warning lamp (check engine lamp)	Q	Injector	L
Crankshaft angle sensor	K	Multipoint fuel injection (MPI) relay/Fuel pump relay	T
Diagnosis connector	S	Inhibitor switch	O
EGR control solenoid valve	D	Power steering pressure switch	A
Engine-ECU	U	Throttle position sensor (with built-in idle position switch)	E
Engine coolant temperature sensor	M	Vehicle speed sensor	N
Purge control solenoid valve	C	Air flow sensor (with built-in intake air temperature sensor and barometric pressure sensor)	I
Fuel pump check terminal	H		





MPI CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

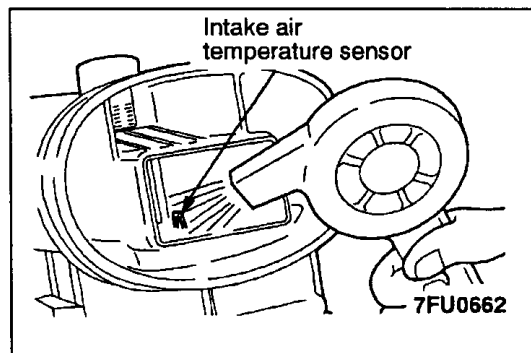
Battery voltage	Terminal No.			
	1	2	3	4
Not supplied		○	—	○
Supplied	○	⊖	○	⊕



INTAKE AIR TEMPERATURE SENSOR CHECK

1. Disconnect the air flow sensor connectors.
2. Measure resistance between terminals 5 and 6.

Temperature [°C]	Resistance (kΩ)
0	5.3–6.7
20	2.3–3.0
80	0.30–0.42



3. Measure resistance while heating the sensor using a hair drier.

Temperature	Resistance
Higher	Smaller

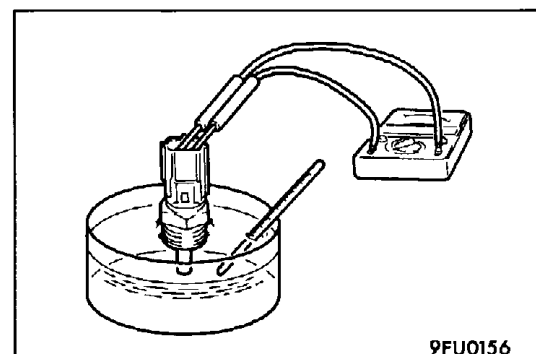
4. If resistance does not decrease as heat increases, replace the volume air flow sensor assembly.

ENGINE COOLANT TEMPERATURE SENSOR CHECK

Caution

Be careful not to touch the tool against the connector (resin section) when removing and installing.

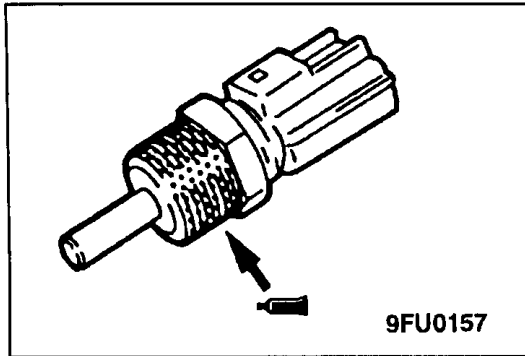
1. Remove engine coolant temperature sensor from the intake manifold.



2. With temperature sensing portion of engine coolant temperature sensor immersed in hot water, check resistance.

Temperature [°C]	Resistance (kΩ)
0	5.1–6.5
20	2.1–2.7
40	0.9–1.3
80	0.26–0.36

3. If the resistance deviates from the standard value greatly, replace the sensor.



4. Apply sealant threaded portion.

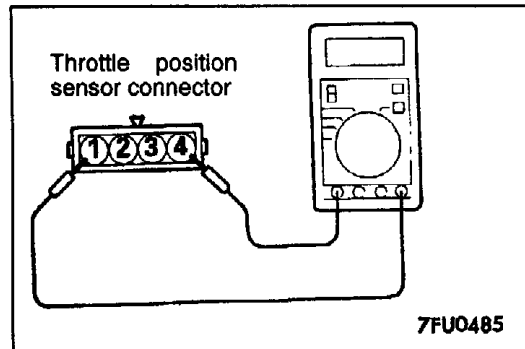
Specified sealant:

3M NUT locking Part No. 4171 or equivalent

5. Install engine coolant temperature sensor and tighten it to specified torque.

Sensor tightening torque: 30 Nm

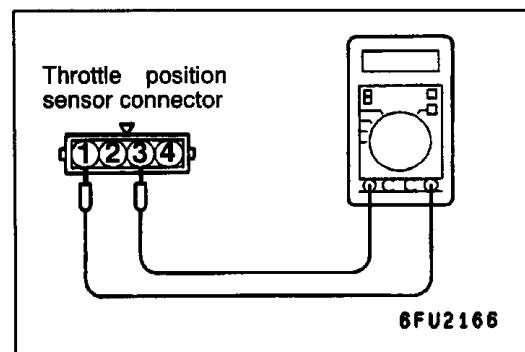
6. Fasten harness connectors securely.



THROTTLE POSITION SENSOR CHECK

1. Disconnect the throttle position sensor connector.
2. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 4.

Standard value: 3.5–6.5 k Ω



3. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 3.

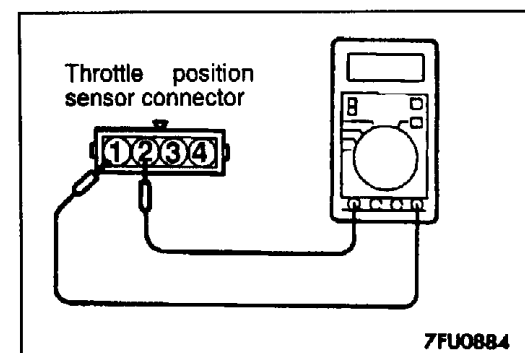
Throttle valve slowly open until fully open from the idle position

Changes smoothly in proportion to the opening angle of the throttle valve

4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.

NOTE

After replacement, the throttle position sensor adjustment procedure, should be adjusted.



IDLE POSITION SWITCH CHECK

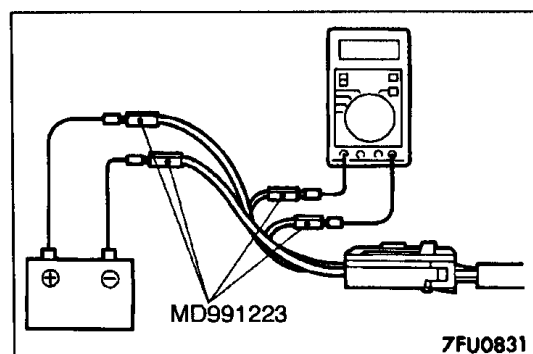
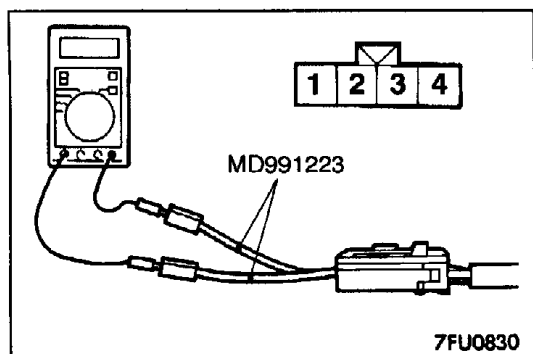
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 1 and terminal 2.

Accelerator pedal	Continuity
Depressed	Non-conductive
Released	Conductive (0 Ω)

3. If out of specification, replace the throttle position sensor.

NOTE

After replacement, the closed throttle position switch and throttle position sensor should be adjusted. (Refer to P.13A-78.)

**OXYGEN SENSOR CHECK****<Vehicles with catalytic converter>**

1. Disconnect the oxygen sensor connector and connect the special tool (test harness) to the connector on the oxygen sensor side.
2. Make sure that there is continuity [7–40 Ω at 20°C] between terminal 3 and terminal 4 on the heated oxygen sensor connector.
3. If there is no continuity, replace the heated oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.
5. Use the jumper wires to connect terminal 3 of the heated oxygen sensor connector to the battery (+) terminal and terminal 4 to the battery (–) terminal.

Caution

Be very careful when connecting the jumper wires; incorrect connection can damage the heated oxygen sensor.

6. Connect a digital voltage meter between terminal 1 and terminal 2.
7. While repeatedly racing the engine, measure the heated oxygen sensor output voltage.

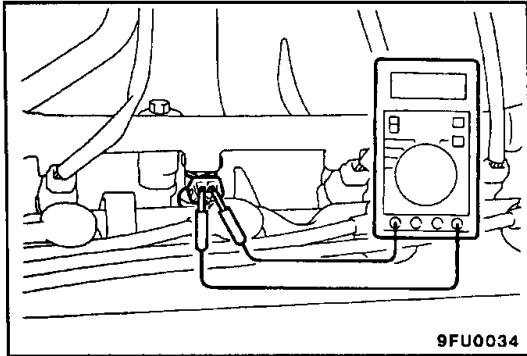
Standard value:

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

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

NOTE

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



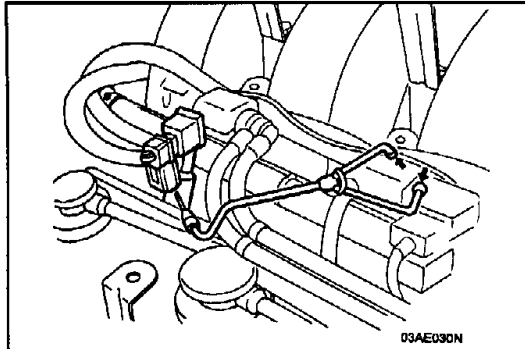
INJECTOR CHECK

Measurement of Resistance between Terminals

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

Standard value: 13–16 Ω [at 20°C]

3. Install the injector connector



Checking operation sound

Using a stethoscope or long blade screwdriver, check the operation sound ("chi-chi-chi") of injectors during idling or during cranking

Check that as the engine speed increases, the frequency of the operating sound also increases.

Caution

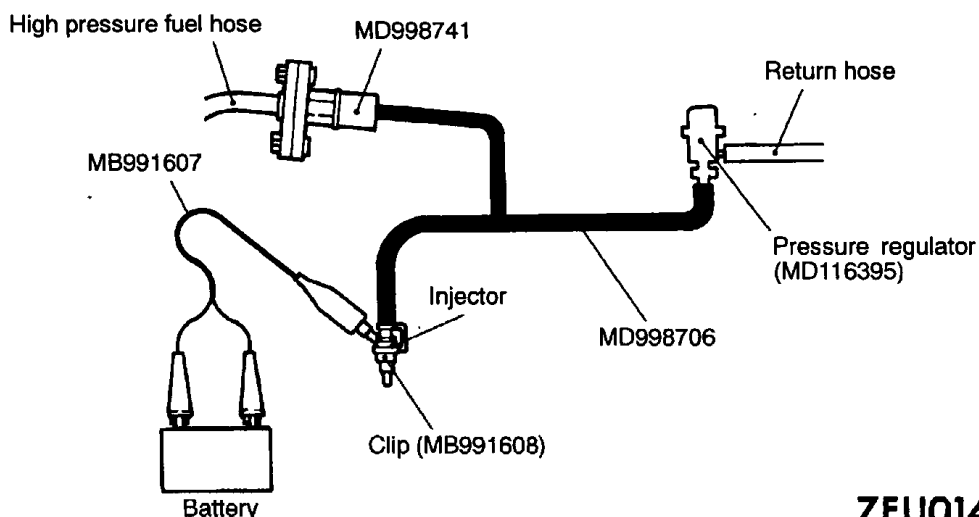
Note that even if the injector you are checking is not operating, you will hear the operating sound of the other injectors.

NOTE

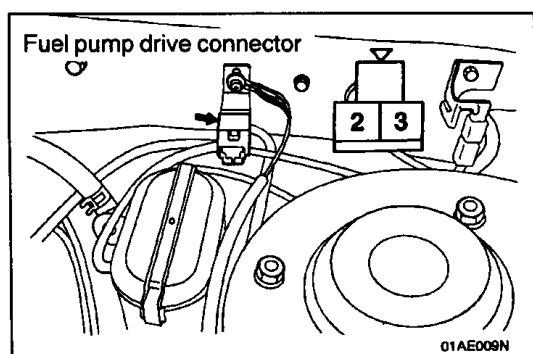
If no operating sound is heard from the injector that is being checked, check the injector drive circuit. If there is nothing wrong with the circuit, a defective injector or Engine-ECU is suspected

Checking the Injector Condition

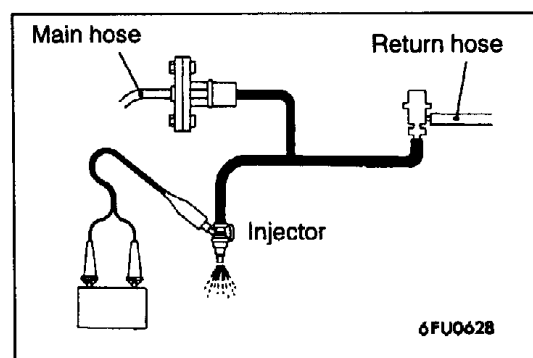
1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13-83.)
2. Remove the injector.
3. Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clips as shown in the following illustration.



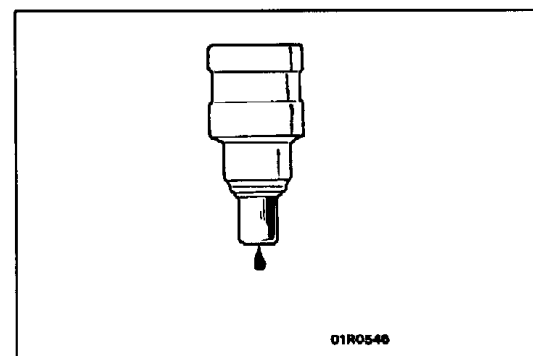
7FU0145



4. Apply battery voltage to the fuel pump drive terminal (black) and activate the fuel pump.



5. Activate the injector and check the atomised spray condition of the fuel. The condition can be considered satisfactory unless it is extremely poor.



6. Stop the actuation of the injector, and check for leakage from the injector's nozzle.

Standard value: 1 drop or less per minute

7. Activate the injector without activating the fuel pump; then, when the spray emission of fuel from the injector stops, disconnect the special tool and restore it to its original condition.

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

Use a stethoscope or long blade screwdriver to check if the sound of the idle air control motor operating can be heard immediately after the ignition switch is turned to "ON".

NOTE

If the motor operation cannot be heard, check the motor drive circuit and the idle air control motor.

PURGE CONTROL SOLENOID VALVE CHECK

<Evaporative emission purge solenoid>

Refer to GROUP 17 – Emission Control System.

EGR CONTROL SOLENOID VALVE CHECK

Refer to GROUP 17 – Emission Control System.

INJECTOR

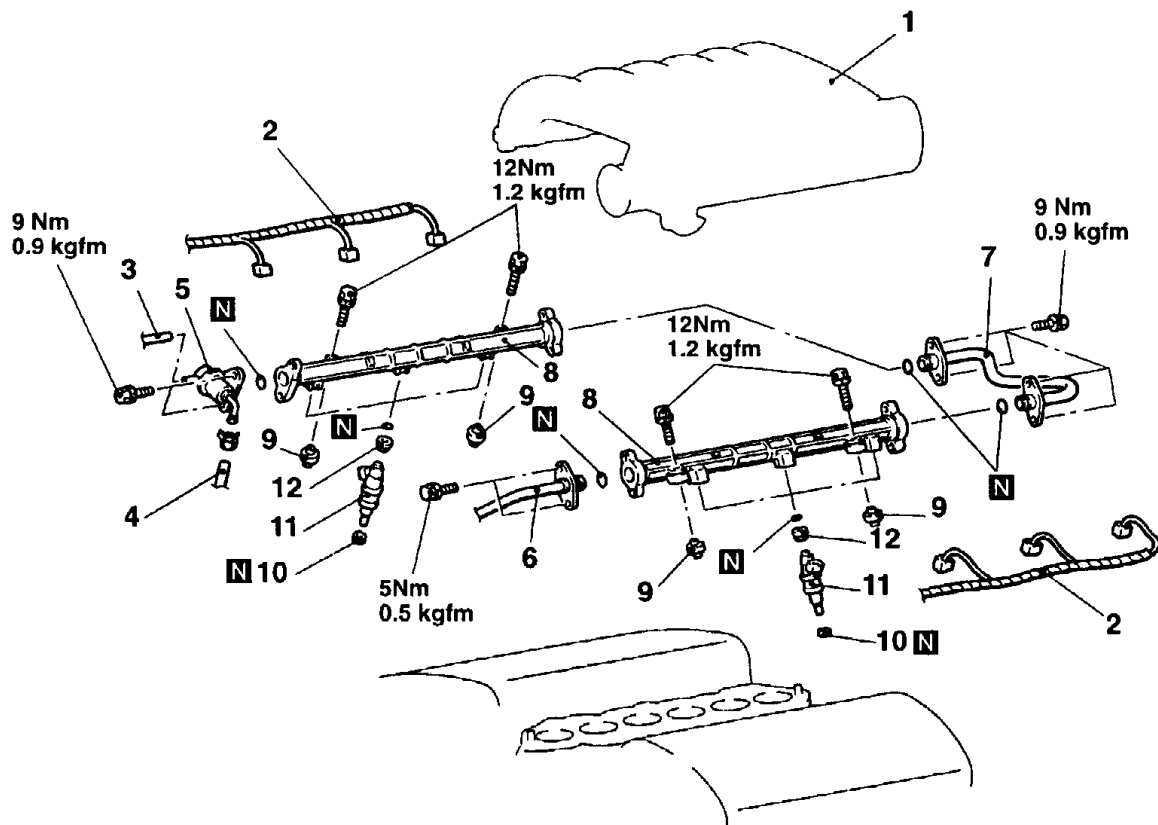
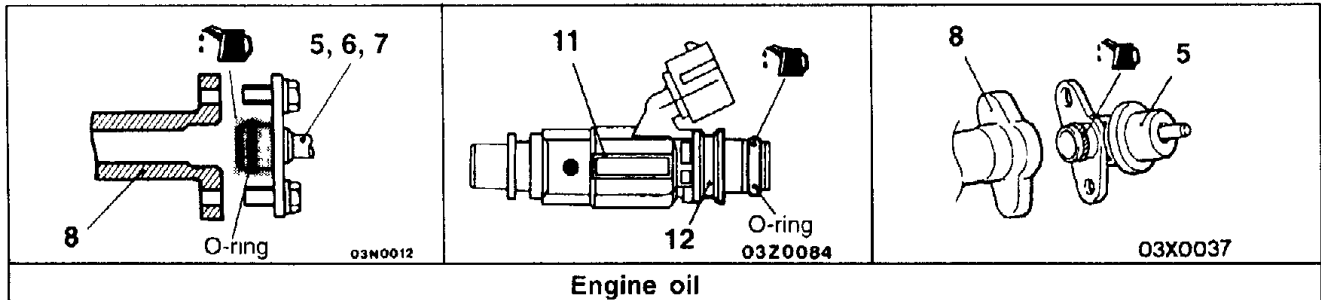
REMOVAL AND INSTALLATION

Pre-removal Operation

- Fuel Discharge Prevention (Refer to P.13A-83.)

Post-installation Operation

- Accelerator Cable Adjustment
(Refer to GROUP 17 – On-vehicle Service.)
- Fuel Leakage Inspection



03AE038N

Removal steps

- Intake manifold plenum
(Refer GROUP 15)
- Injector connectors
- Vacuum hose connection
- Fuel return hose connection
- Fuel pressure regulator
- High-pressure fuel hose connection



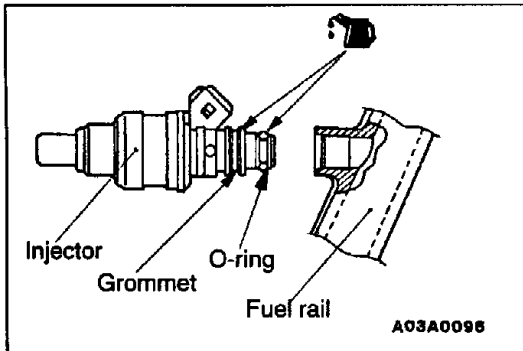
- Fuel pipe
- Fuel rail
- Insulators
- Insulators
- Injectors
- Grommet

REMOVAL SERVICE POINT**◀A▶ FUEL RAIL/INJECTOR REMOVAL**

Remove the fuel rail (with the injectors attached to it.)

Caution

Care must be taken, when removing the fuel rail, not to drop the injector.

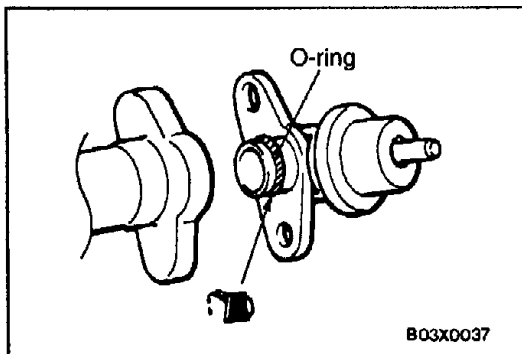
**INSTALLATION SERVICE POINTS****▶A◀ INJECTOR INSTALLATION**

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

Caution

Be sure not to let engine oil in the fuel rail.

2. While turning the injector to the left and right, install it to the fuel rail.
3. Check to be sure that the injector turns smoothly. If it does not turn smoothly, the O-ring may be trapped, remove the injector and then re-insert it into the fuel rail and check once again.

**▶B◀ FUEL PRESSURE REGULATOR INSTALLATION**

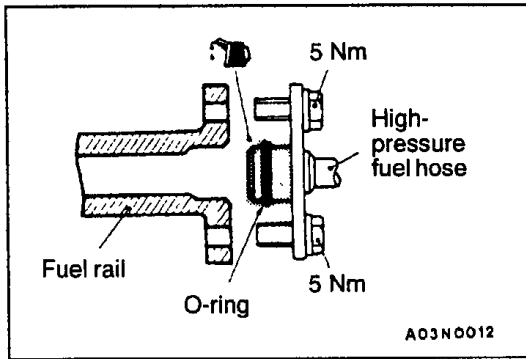
1. When connecting the fuel-pressure regulator to the fuel rail, apply a drop of new engine oil to the O-ring, and then insert, being careful not to damage the O-ring.

Caution

Be sure not to let engine oil in the fuel rail.

2. Check to be sure 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 then re-insert it into the fuel rail and check once again.
3. Tighten the bolts to the specified torque.

Specified tightening torque : 9 Nm

**►C◄ HIGH-PRESSURE FUEL HOSE INSTALLATION**

1. When connecting the high-pressure fuel hose to the fuel rail, apply a drop of new engine oil to the O-ring, and then insert, being careful not to damage the O-ring.

Caution

Be sure not to let engine oil in the fuel rail.

2. Check to be sure that the high-pressure fuel hose turns smoothly.
If it does not turn smoothly, the O-ring may be trapped. Remove the high-pressure fuel hose and then re-insert it into the fuel rail and check once again.
3. Tighten the bolts to the specified torque.

Specified tightening torque : 5Nm

THROTTLE BODY

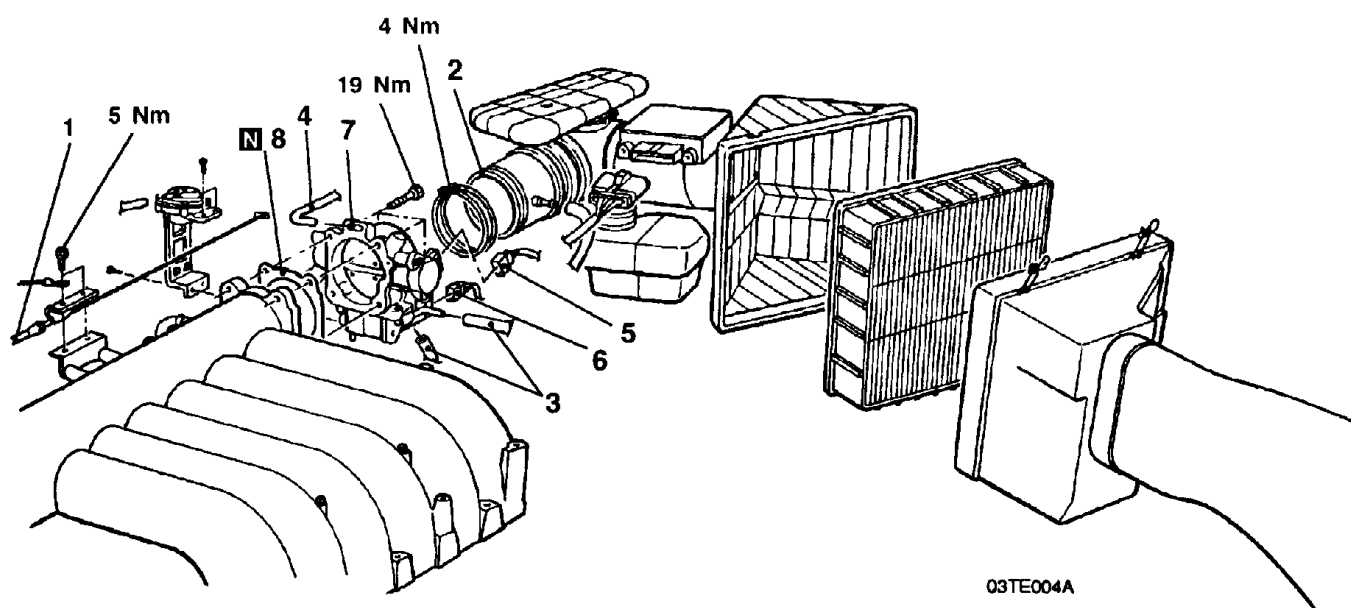
REMOVAL AND INSTALLATION

Pre-removal Operation

- Coolant Draining
(Refer to GROUP 14 – On-vehicle Service.)

Post-installation Operation

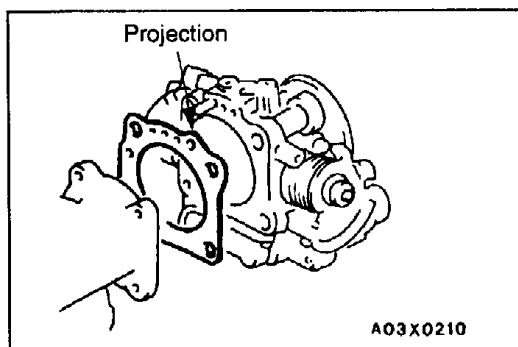
- Coolant Supplying
(Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)



Removal steps

1. Accelerator cable connection
2. Air intake hose
3. Heater hose connection
4. Vacuum hose connection

5. Throttle position sensor connector
6. Idle speed control servo connector
7. Throttle body
8. Gasket



INSTALLATION SERVICE POINT

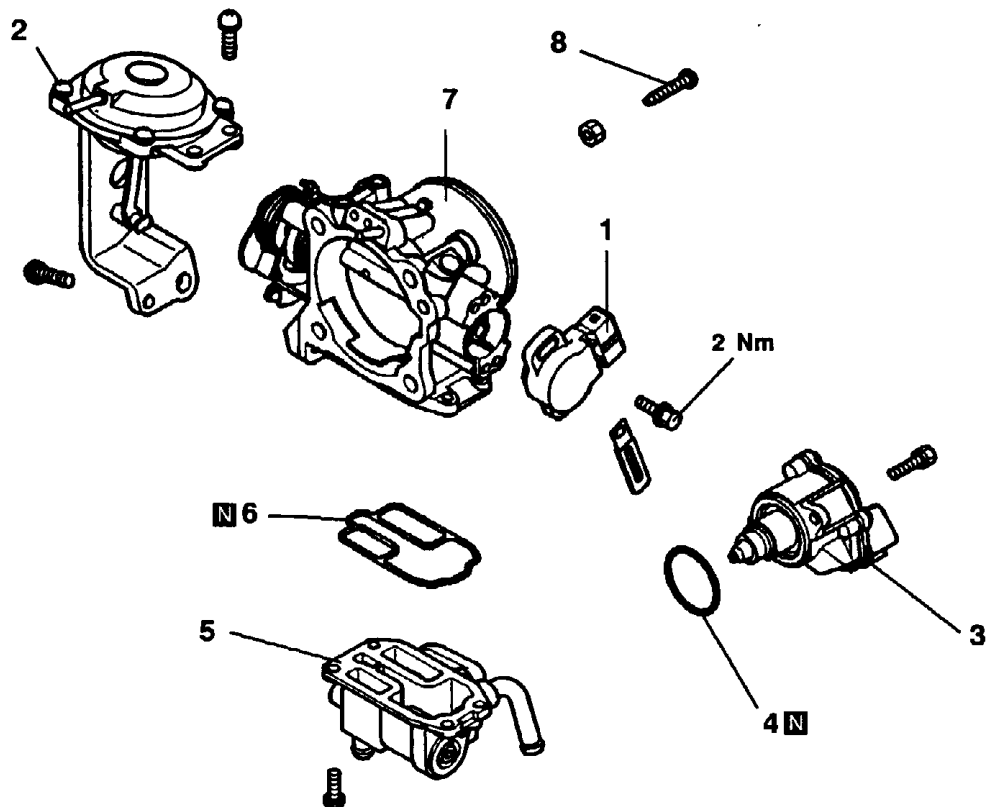
►A◄ GASKET INSTALLATION

Install the gasket so that the projection is where shown in the illustration.

Caution

Poor idling etc. may result if the gasket is installed incorrectly.

DISASSEMBLY AND REASSEMBLY



7EN0900

Disassembly steps

◀A▶ ▶A▶

1. Throttle position sensor (with idle position switch)

◀A▶

2. Vacuum actuator
 3. Idle speed control servo
 4. O-ring

◀B▶

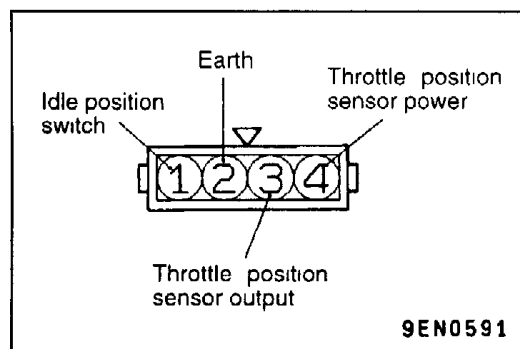
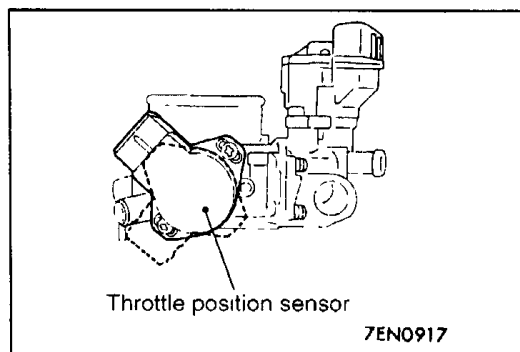
5. Idle speed control body assembly
 6. Gasket
 7. Throttle body
 8. Fixed SAS

DISASSEMBLY SERVICE POINT**◀A▶ THROTTLE POSITION SENSOR AND IDLE SPEED CONTROL SERVO REMOVAL**

1. Do not immerse in solvent to clean the sensor and servo. Clean them with shop towel.

◀B▶ THROTTLE BODY REMOVAL

1. Do not remove the throttle valve.
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. Set the throttle position sensor to the throttle body as shown in the diagram.
2. Turn throttle position sensor 90° in the clockwise direction to set it, and tighten screws.
3. Check for continuity across terminals 1 (idle position switch) and 2 (earth) with the throttle valve both fully closed and fully open.

Throttle valve position	Continuity
Fully closed	Conductive
Fully open	Non-conductive

If there is not continuity with the throttle valve fully closed, turn the throttle position sensor anti-clockwise, and then check again.

FUEL SUPPLY

CONTENTS

FUEL TANK	2	FUEL TANK	3
GENERAL INFORMATION	2	FUEL FILTER	5

FUEL TANK

GENERAL INFORMATION

1.

The fuel tank is located under the floor of the rear seats to provide increased safety and a wider luggage space.
2.

A fuel cut-off valve has been adopted to prevent fuel from leaking out in the event of a collision.

Items	Specifications
Fuel tank capacity (litres)	71
Fuel pump type	Electrical, in-tank type

FUEL TANK

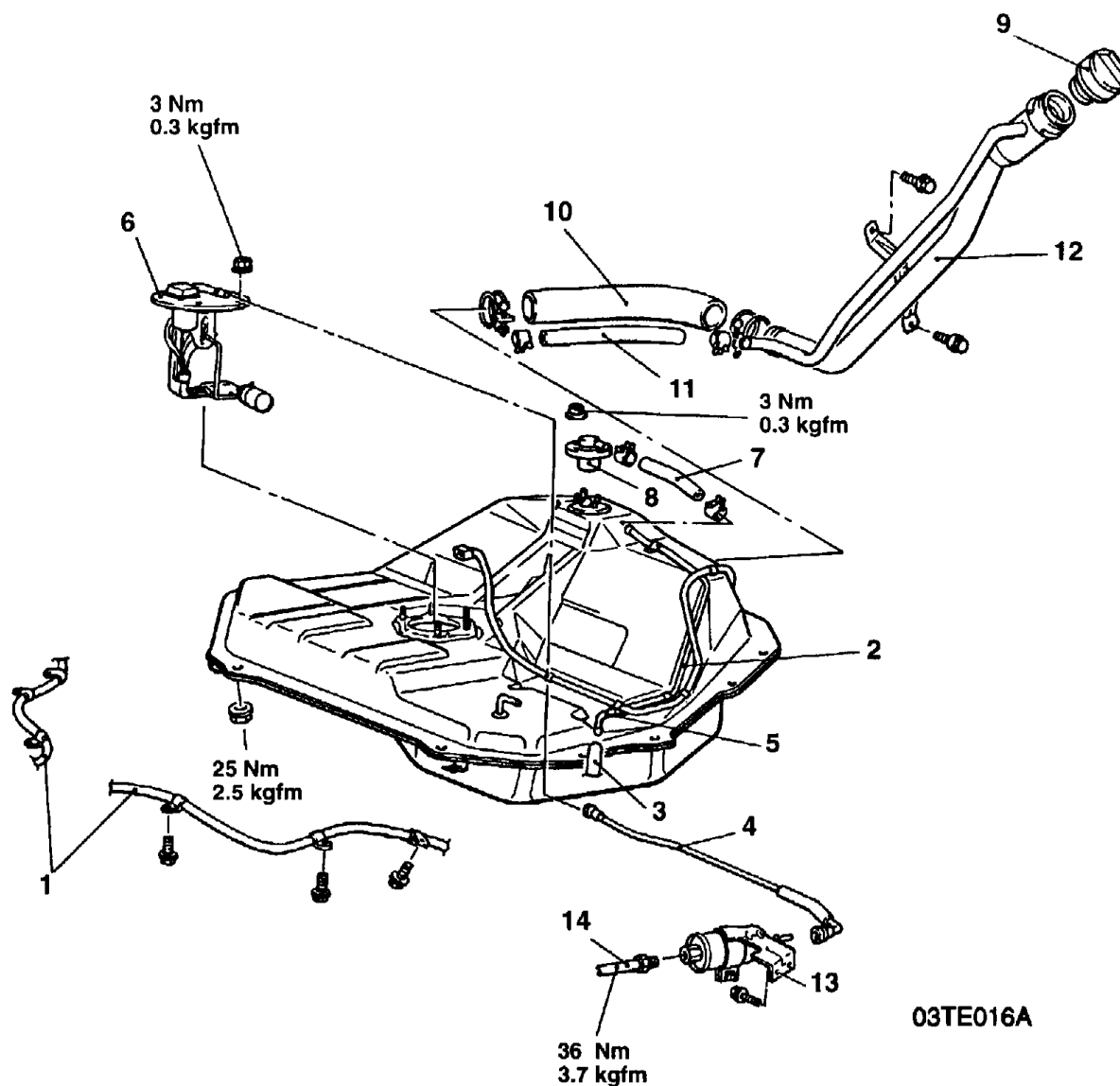
REMOVAL AND INSTALLATION

Pre-removal Operation

Reduce the Inner Pressure of Fuel Line and Hose.
(Refer to GROUP 13A – On-vehicle Service.)

Post-installation Operation

Checking for Fuel Leaks

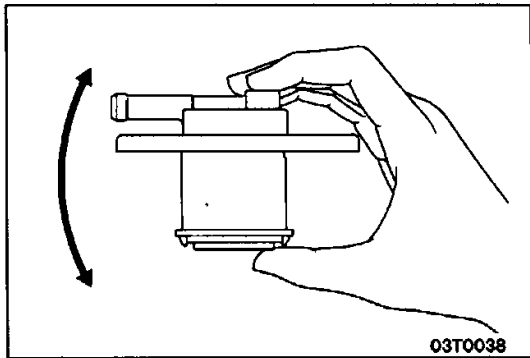
**Removal steps**

1. Parking brake cable connection
2. Fuel tank
3. Vapour hose
4. Pressure hose
5. Vapour hose connection
6. Fuel pump and gauge assembly
7. Vapour hose
8. Valve assembly
9. Fuel filler cap
10. Filler hose

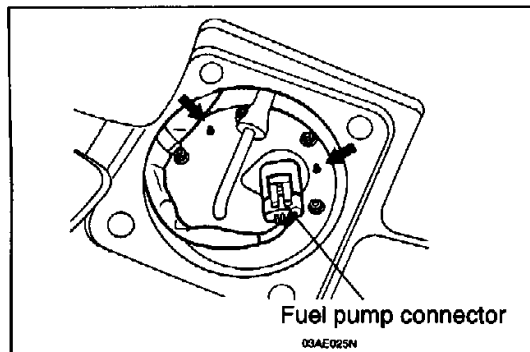
11. Vapour hose
12. Fuel filler neck
13. Fuel filter assembly
14. Fuel pipe

NOTE

When replacing the fuel gauge unit assembly only, it is possible to work from the service holes underneath the rear seat cushion without having to remove the fuel tank. (Refer to P.13F-4.)

**FUEL CUT OFF VALVE CHECK**

If the sound of the float valve moving (knocking sound) can be heard when the valve assembly is gently shaken up and down, then the valve is okay.

**FUEL GAUGE UNIT AND PUMP ASSEMBLY REPLACEMENT**

1. Remove the rear seat cushion.
(Refer to GROUP 52A – Rear Seat.)
2. Remove the cover plate.
3. Disconnect the connector from the fuel gauge unit and pump assembly, and then remove the fuel gauge unit.
4. When installing the fuel gauge unit and pump assembly, tilt the float at the end to the left and insert into the fuel tank.

NOTE

As there is a reservoir inside the fuel tank, if the fuel gauge unit and pump assembly is tilted to the right and inserted, the fuel gauge unit and pump assembly will touch the reservoir.

5. Align the packing positioning projections (locations indicated by arrows) with the holes in the fuel gauge unit and pump assembly.

FUEL GAUGE UNIT CHECK

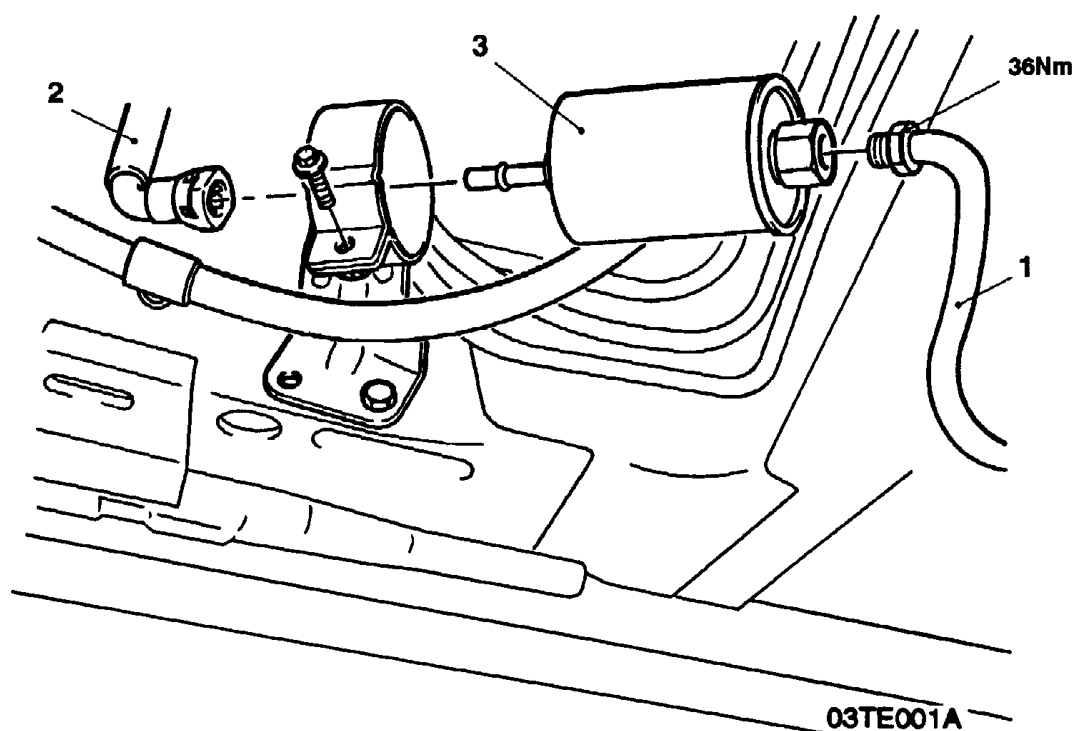
Refer to GROUP 54 – Combination Meter.

FUEL FILTER**REMOVAL AND INSTALLATION****Pre-removal Operation**

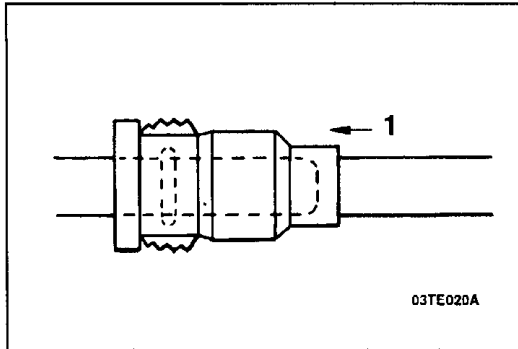
Reduce the Inner Pressure of Fuel Line and Hose.
(Refer to GROUP 13A – On-vehicle Service.)

Post-installation Operation

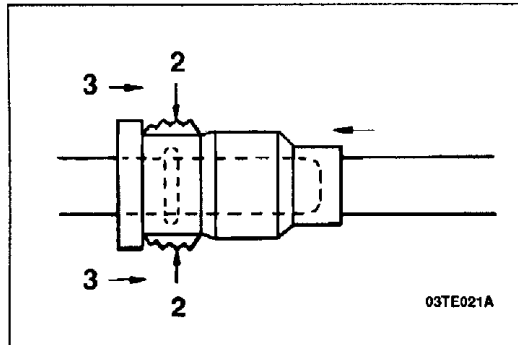
Checking for Fuel Leaks

**Removal steps**

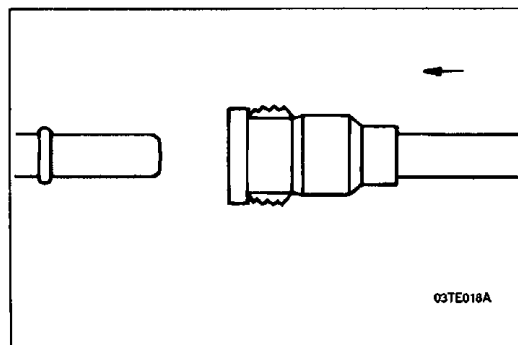
1. Fuel pipe
2. Pressure hose
3. Fuel filter

**REMOVAL SERVICE POINTS****◀A▶ PRESSURE HOSE REMOVAL**

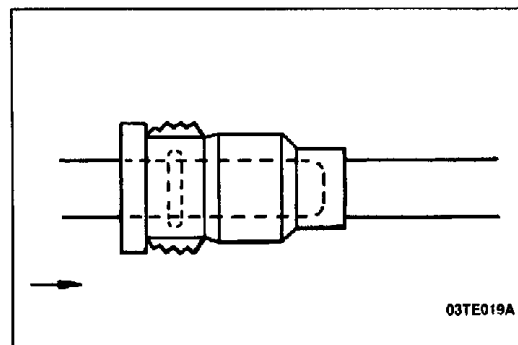
1. Push the connector body gently in the direction shown in the illustration.



2. Grip the removal tabs at each side
3. Push in the direction of removal.

**INSTALLATION SERVICE POINTS****▶A◀ PRESSURE HOSE INSTALLATION**

1. Push the connector over the pipe until the connector stops with a click.



2. Push the connector gently in the direction of removal to ensure that the connector is installed correctly.

ENGINE COOLING

CONTENTS

GENERAL INFORMATION	2	Engine Coolant Replacement	3
SERVICE SPECIFICATIONS	2	Concentration Measurement	4
LUBRICANT	2	THERMOSTAT	5
SEALANT	2	WATER PUMP	8
ON-VEHICLE SERVICE	3	WATER HOSE AND WATER PIPE	9
Engine Coolant Leak Check	3	RADIATOR	11
Radiator Cap Valve Opening Pressure Check	3		

GENERAL INFORMATION

The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated.

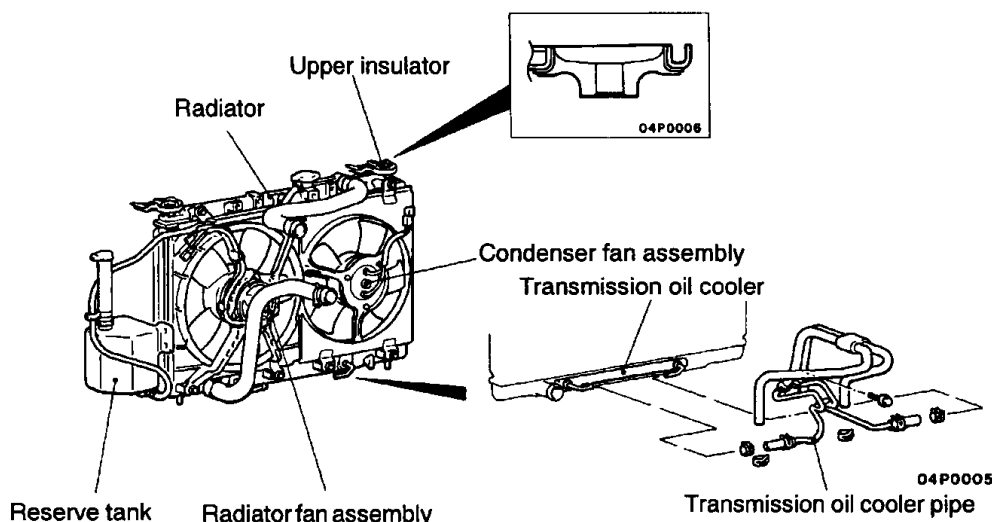
The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurises coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circu-

late the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air.

The water pump is of the centrifugal type and is driven by the camshaft drive belt.

The radiator is the corrugated fin, down flow type and is cooled by the electrical radiator fan.

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

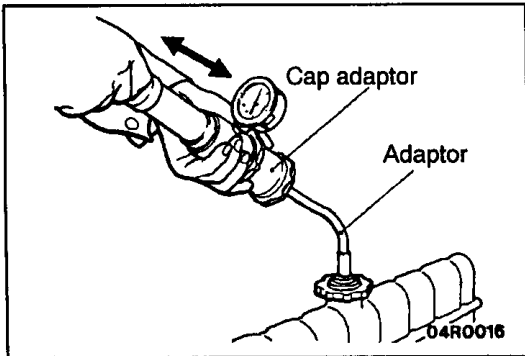
Items		Standard value	Limit
Thermostat	Valve opening temperature of thermostat °C	82	—
	Full-opening temperature of thermostat °C	95	—
Radiator	Range of coolant antifreeze concentration %	30–60	—
Radiator cap	High pressure valve opening pressure kPa	75–105	65

LUBRICANT

Items	Specified lubricant	Quantity (litres)
Engine coolant	High quality ethylene glycol antifreeze coolant	9.5

SEALANT

Items	Specified sealant	Remarks
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent	Drying sealant



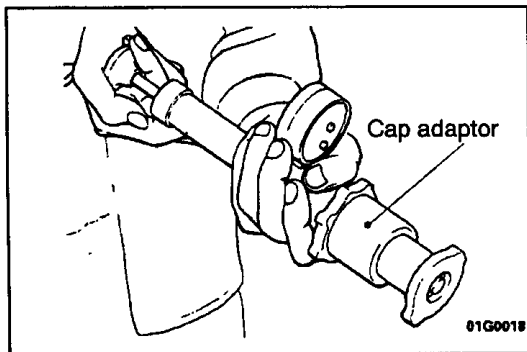
ON-VEHICLE SERVICE

ENGINE COOLANT LEAK CHECK

1. Confirm that the coolant level is up to the filler neck. Install a radiator cap tester and apply 160 kPa pressure, and then check for leakage from the radiator hose or connections.

Caution

1. Be sure to completely clean away any moisture from the places checked.
 2. When the tester is taken out, be careful not to spill any coolant from it.
 3. Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.
2. If there is leakage, repair or replace the appropriate part.



RADIATOR CAP VALVE OPENING PRESSURE CHECK

1. Use a cap adaptor to attach the cap to the tester.
2. Increase the pressure until the indicator of the gauge stops moving.

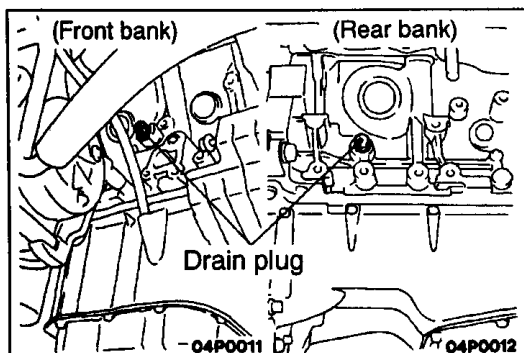
Limit: 65 kPa

Standard value: 75–105 kPa

3. Replace the radiator cap if the reading does not remain at or above the limit.

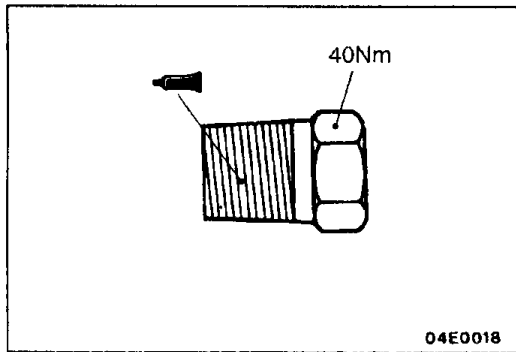
NOTE

Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.



ENGINE COOLANT REPLACEMENT

1. Remove the heat protectors (front and rear) from the exhaust manifold.
2. Loosen the radiator drain plug, remove two drain plugs from the engine block (one for each bank) and remove the radiator cap to discharge the coolant.
3. Remove the reserve tank and discharge the coolant.
4. When the coolant has been discharged, pour water through the filler port to flush the coolant passage.



5. Coat the threads of the engine drain plugs with the specified sealant and tighten the plugs to specification.

Specified Sealant: 3M Nut Locking Part No.4171 or equivalent.

Tightening torque: 40 Nm

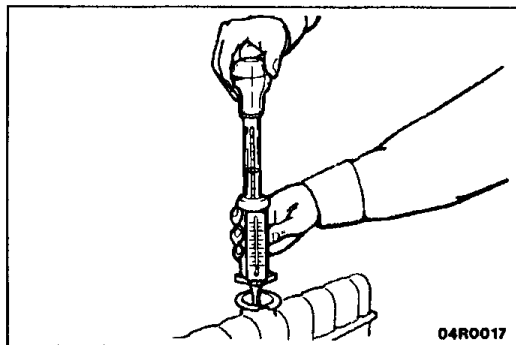
6. Fit the radiator drain plug securely.
7. Mount the reserve tank.
8. Slowly pour coolant into the radiator to the brim and also into the reserve tank to the full line.

Recommended antifreeze:

DIA-QUEEN LONG-LIFE COOLANT (Part No.0103044) or High quality ethylene-glycol anti-freeze coolant.

Quantity: 9.5 ℓ

9. Install the radiator cap securely.
10. Start the engine and warm up until the thermostat opens.
11. Race the engine up to around 3,000 r/min several times, then stop the engine.
12. When the engine has cooled down, remove the radiator cap and add coolant up to the brim. Add coolant to the reserve tank up to the FULL line.



CONCENTRATION MEASUREMENT

Measure the temperature and specific gravity of the engine coolant to check the antifreeze concentration.

Standard value: 30–60% (allowable concentration range)

RECOMMENDED ANTIFREEZE

Antifreeze	Allowable concentration
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	30–60%

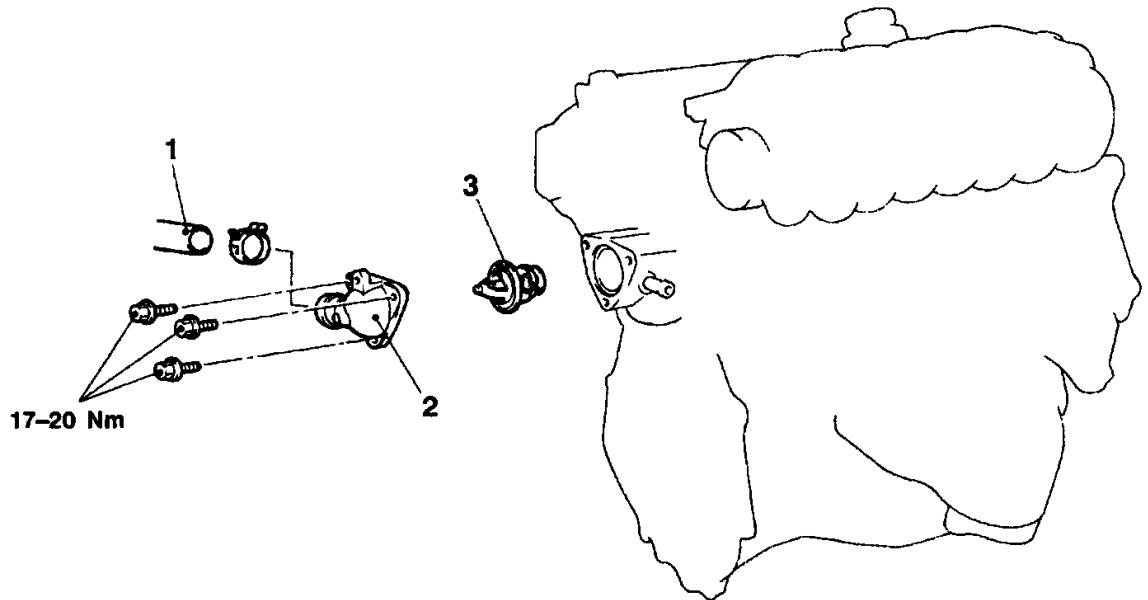
Caution

If the concentration of the anti-freeze is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freezing and the engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.

THERMOSTAT

REMOVAL AND INSTALLATION

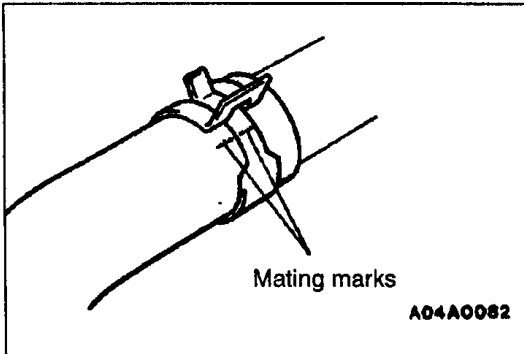
Pre-removal and Post-installation Operation
Engine Coolant, Draining and Supplying (Refer to P.14-3)



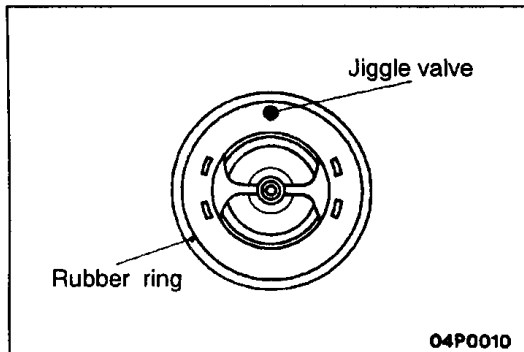
04P0013

Removal steps

- ◀A▶ ▶B▶ 1. Radiator lower hose connection
▶A▶ 2. Water outlet fitting
3. Thermostat

**REMOVAL SERVICE POINT****◀A▶ RADIATOR LOWER HOSE DISCONNECTION**

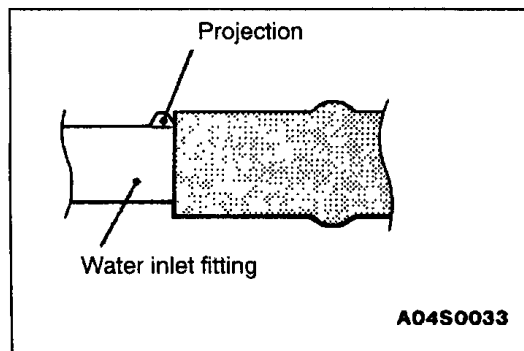
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

**INSTALLATION SERVICE POINTS****▶A◀ THERMOSTAT INSTALLATION**

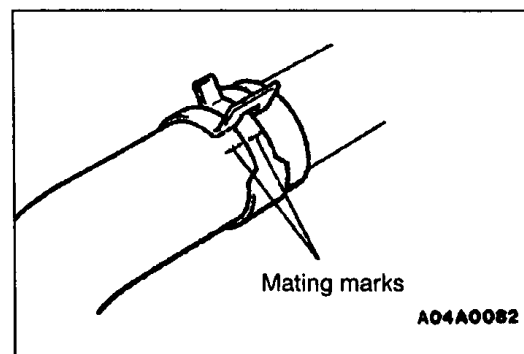
Install the thermostat so that the jiggle valve is facing straight up and is aligned with the mark on the thermostat case as shown in the illustration.

Caution

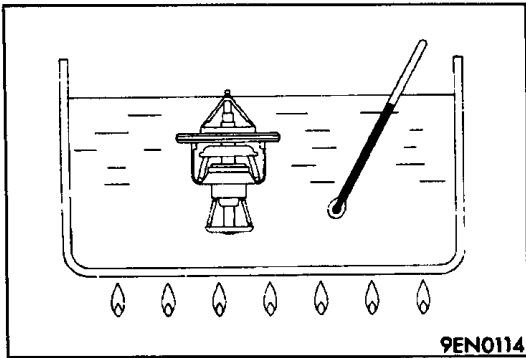
Make absolutely sure that no oil is adhering to the rubber ring of the thermostat. In addition, be careful not to fold over or scratch the rubber ring when inserting.

**▶B◀ RADIATOR LOWER HOSE CONNECTION**

1. Insert each hose as far as the projection of the water outlet fitting or water inlet fitting.



2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

**INSPECTION****THERMOSTAT CHECK**

1. Immerse the thermostat in water, and heat the water while stirring. Check the thermostat valve opening temperature.

Standard value: $82 \pm 1.5^{\circ}\text{C}$

2. Check that the amount of valve lift is at the standard value when the water is at the full-opening temperature.

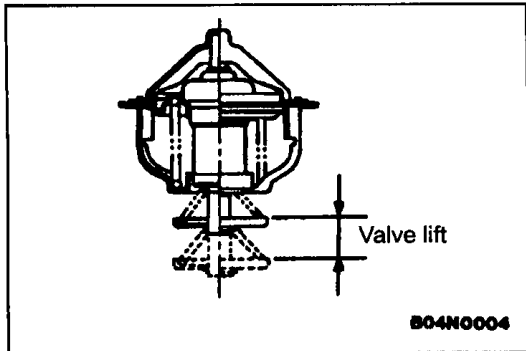
Standard value:

Full-opening temperature: 95°C

Amount of valve lift: 8.5mm or more

NOTE

Measure the valve height when the thermostat is fully closed, and use this measurement to calculate the valve height when the thermostat is fully open.

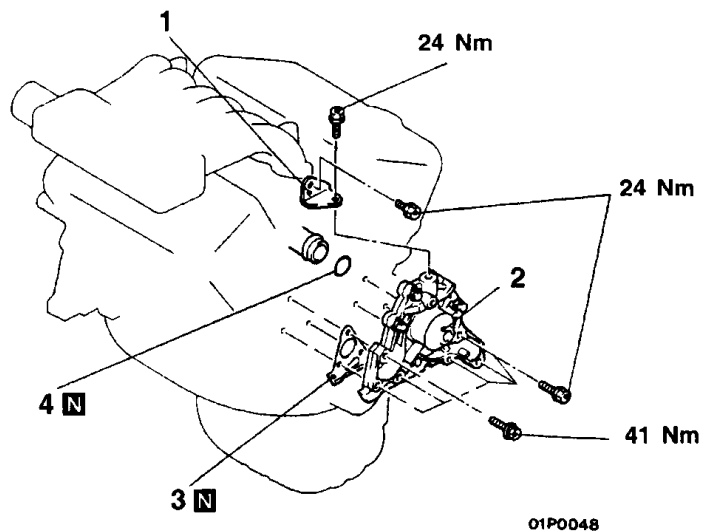
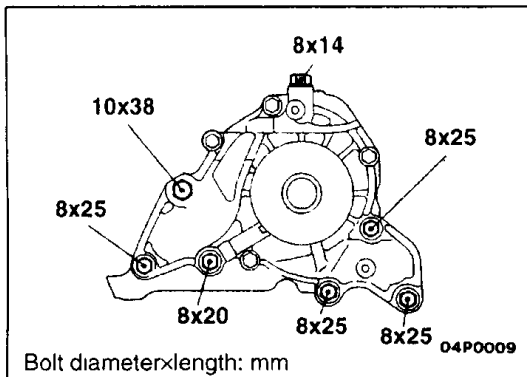


WATER PUMP

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

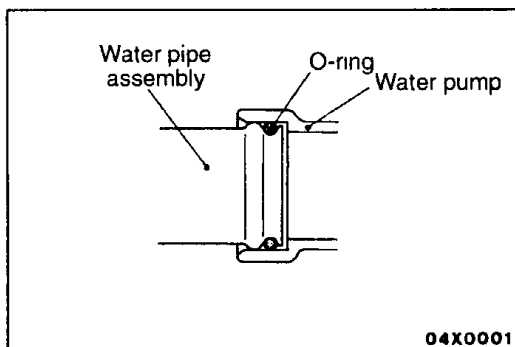
- Engine Coolant Draining and Supplying (Refer to P.14-3)
- Timing Belt Removal and Installation (Refer to GROUP 11.)



04TE003A

Removal steps

1. Alternator brace
2. Water pump
3. Water pump gasket
4. O-ring



INSTALLATION SERVICE POINT

▶A◀ O-RING INSTALLATION

Insert the O-ring to the water inlet pipe, and coat the outlet circumference of the O-ring with water. By coating with water, the insertion to the water pump will become easier.

Caution

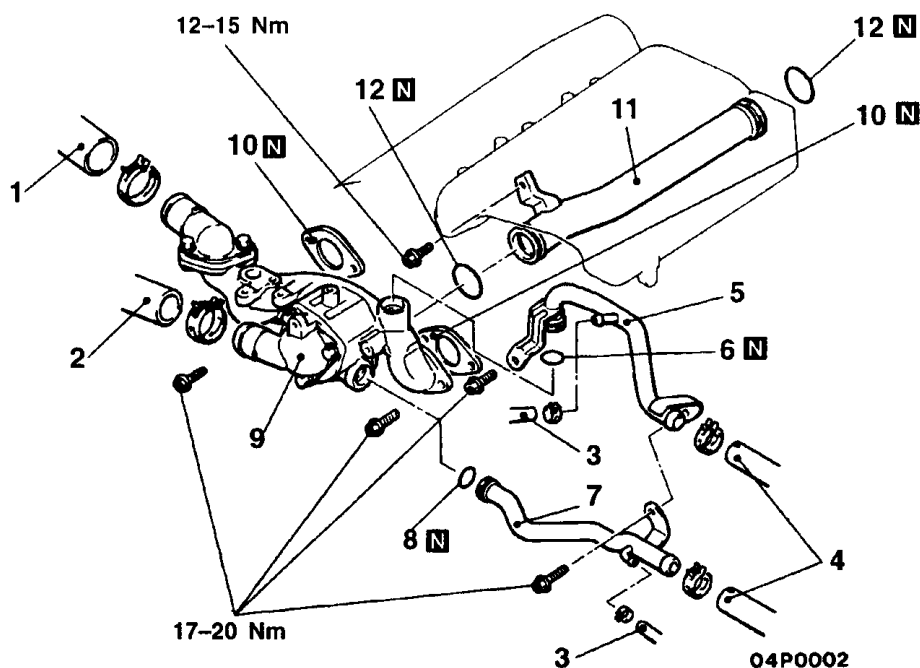
1. Care must be taken not to permit engine oil or other greases to adhere to the O-ring.
2. When inserting the pipe, check to be sure that there is no sand, dirt, etc. on its inner surface.

WATER HOSE AND WATER PIPE

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

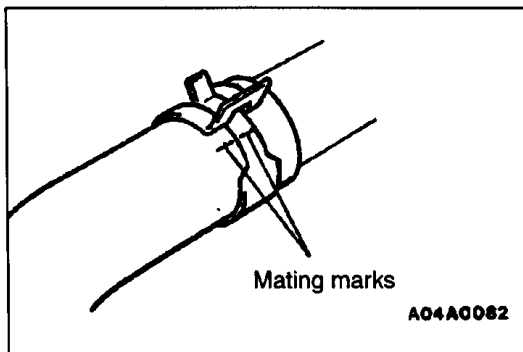
- Engine Coolant Draining and Supplying (Refer to P.14-3)
- Air Cleaner Removal and Installation
- Distributor Removal and Installation (Refer to GROUP 16 – Engine Electrical.)



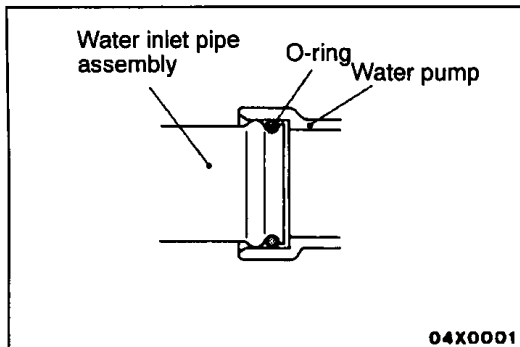
Removal steps

- ◀A▶ ▶B◀ 1. Radiator upper hose connection
- ◀A▶ ▶B◀ 2. Radiator lower hose connection
- 3. Water hose
- 4. Heater hose connection
- 5. Heater inlet pipe A
- ◀A▶ 6. O-ring

- ▶A◀ 7. Heater inlet pipe B
- ▶A◀ 8. O-ring
- 9. Thermostat housing assembly
- 10. Gasket
- 11. Water inlet pipe assembly
- ▶A◀ 12. O-ring

**REMOVAL SERVICE POINT****◀A▶ RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION**

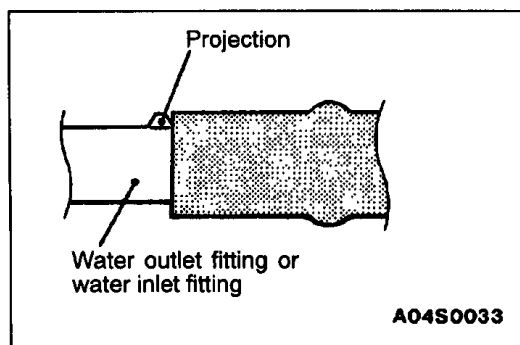
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

**INSTALLATION SERVICE POINTS****▶A◀ O-RING INSTALLATION**

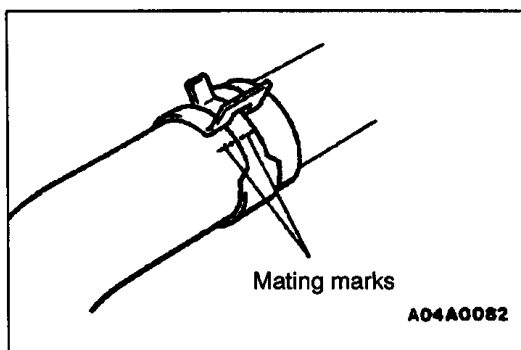
Insert the O-ring to the water inlet pipe, and coat the outer circumference of the O-ring with water.

Caution

Care must be taken not to permit engine oil or other greases to adhere to the O-ring.

**▶B◀ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION**

1. Insert each hose as far as the projection of the water outlet fitting or water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

**INSPECTION****WATER PIPE AND HOSE CHECK**

Check the water pipe and hose for cracks, damage, blockage and replace them if necessary.

RADIATOR

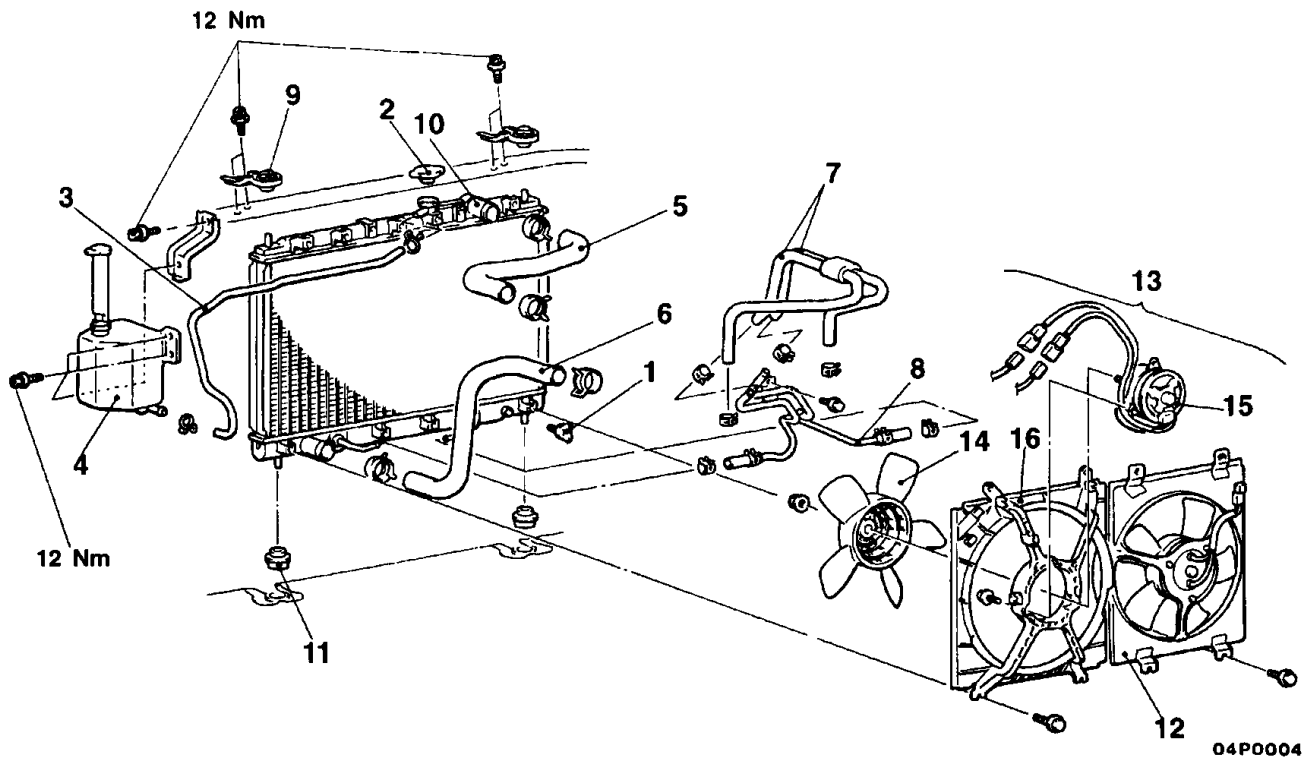
REMOVAL AND INSTALLATION

Pre-removal Operation

Engine Coolant Draining (Refer to P.14-3)

Post-installation Operation

- Engine Coolant Supplying and Checking (Refer to P.14-3)
- A/T Fluid Checking and Refilling If Necessary (Refer to GROUP 23 – On-vehicle Service.)



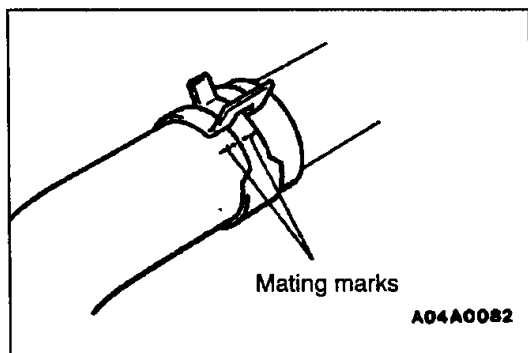
Radiator removal steps

1. Drain plug
2. Radiator cap
3. Overflow tube
4. Reserve tank
5. Radiator upper hose
6. Radiator lower hose
7. Transmission fluid cooler hose connection
8. Transmission fluid cooler hose connection
9. Upper insulator
10. Radiator assembly
11. Lower insulator
12. Condenser fan motor assembly
13. Radiator fan motor assembly
14. Fan
15. Radiator fan motor
16. Shroud

Radiator fan motor removal steps

1. Drain plug
2. Radiator cap
5. Radiator upper hose
12. Condenser fan motor assembly
13. Radiator fan motor assembly
14. Fan
15. Radiator fan motor
16. Shroud

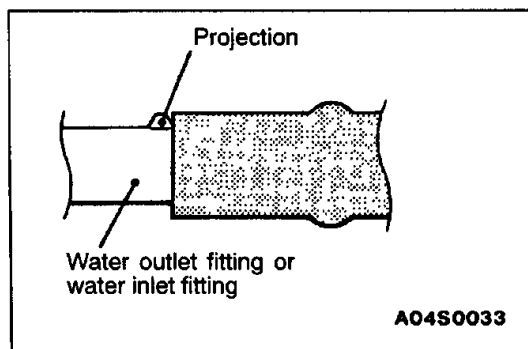


**REMOVAL SERVICE POINTS****◀A▶ RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION**

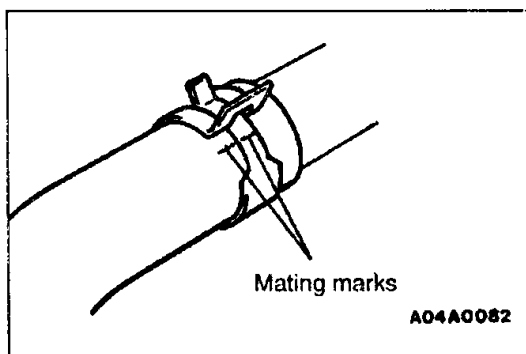
After making mating marks on the radiator hose and the hose clamp, disconnect the radiator hose.

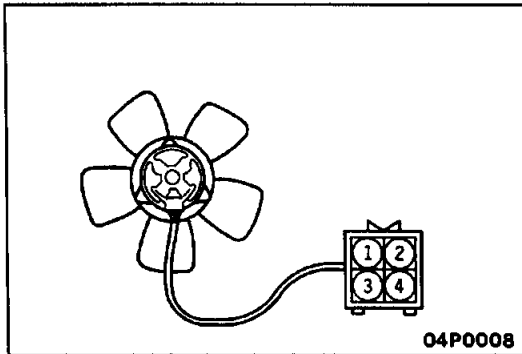
◀B▶ TRANSMISSION FLUID COOLER HOSE REMOVAL

After removing the hose from the radiator, plug the hose and the radiator nipple to prevent dust or foreign particles from getting in.

**INSTALLATION SERVICE POINT****▶A◀ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION**

1. Insert each hose as far as the projection of the water outlet fitting or water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

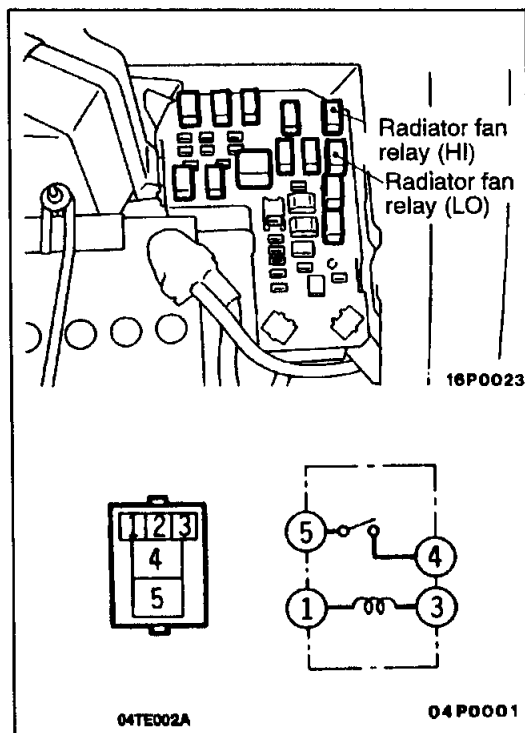


**INSPECTION****RADIATOR FAN MOTOR CHECK**

1. Check to be sure that the radiator fan rotates when battery voltage is applied between terminals.

Terminals connected to the battery				Radiator fan motor rotation
1	2	3	4	
		⊕ - - - - ⊖		Low
⊕ - - - - ⊖		⊕ - - - - ⊖		High

2. Check to see that abnormal noises are not produced, while motor is turning.

**RADIATOR RELAY CONTINUITY CHECK**

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

INTAKE AND EXHAUST

CONTENTS

GENERAL INFORMATION	2	INTAKE MANIFOLD PLENUM	4
SERVICE SPECIFICATIONS	2	INTAKE MANIFOLD	6
SPECIAL TOOL	2	EXHAUST MANIFOLD	8
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GENERAL INFORMATION

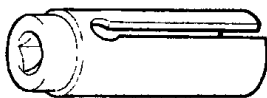
The intake manifold is made of an aluminium alloy, and the shape provides an increased intake inertia effect and has a good volumetric efficiency.

The exhaust pipe is divided into four parts.

SERVICE SPECIFICATIONS

Items		Standard value	Limit
Intake manifold	Distortion of the installation surface mm	0.15 or less	0.2

SPECIAL TOOL

Tool	Number	Name	Application
	MD998770	Oxygen sensor wrench	Removal/Installation of oxygen sensor <Vehicles with catalytic converter>

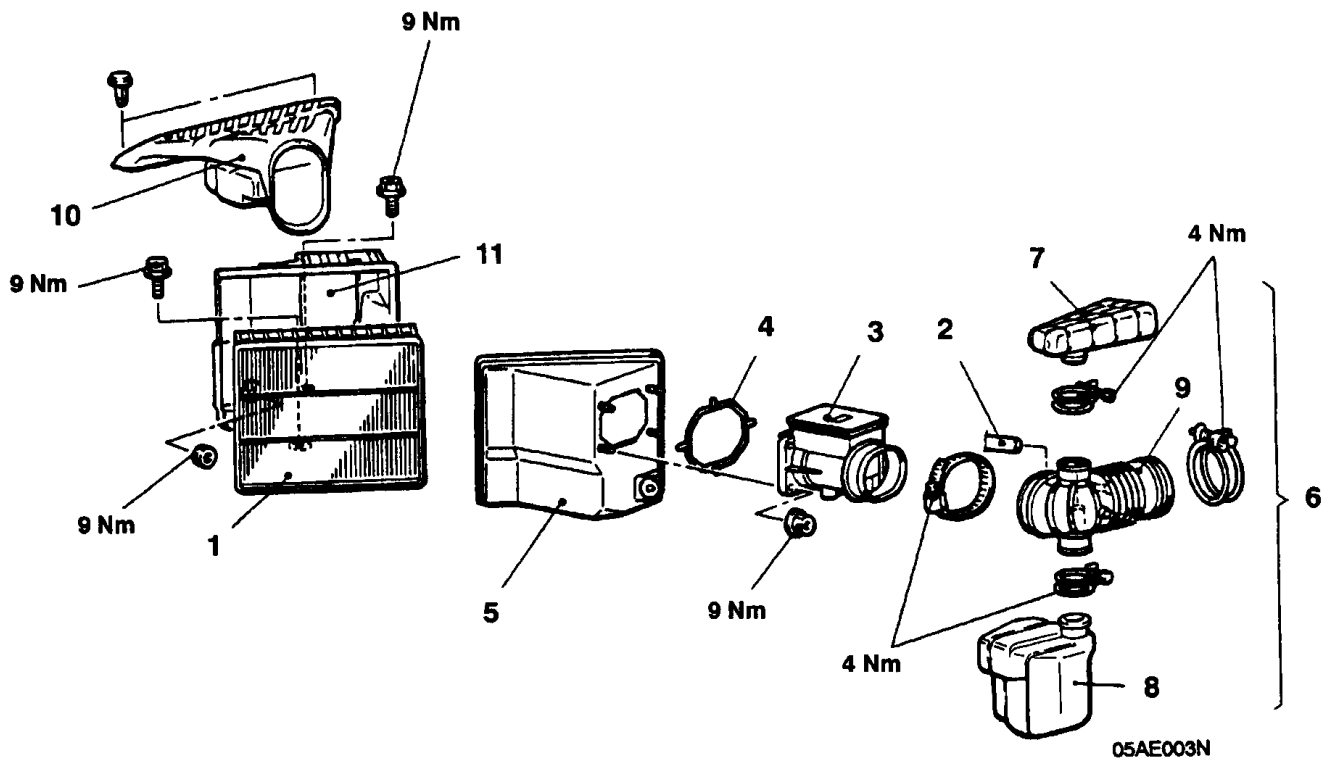
ON-VEHICLE SERVICE

INTAKE MANIFOLD VACUUM CHECK

Refer to Group 11 – On-vehicle Service

AIR CLEANER

REMOVAL AND INSTALLATION



Removal steps

1. Air cleaner element
2. Breather hose
3. Air flow sensor
4. Gasket
5. Air cleaner cover
6. Air intake hose assembly
7. Resonator A
8. Resonator B
9. Air intake hose
10. Air duct
11. Air cleaner body

INTAKE MANIFOLD PLENUM

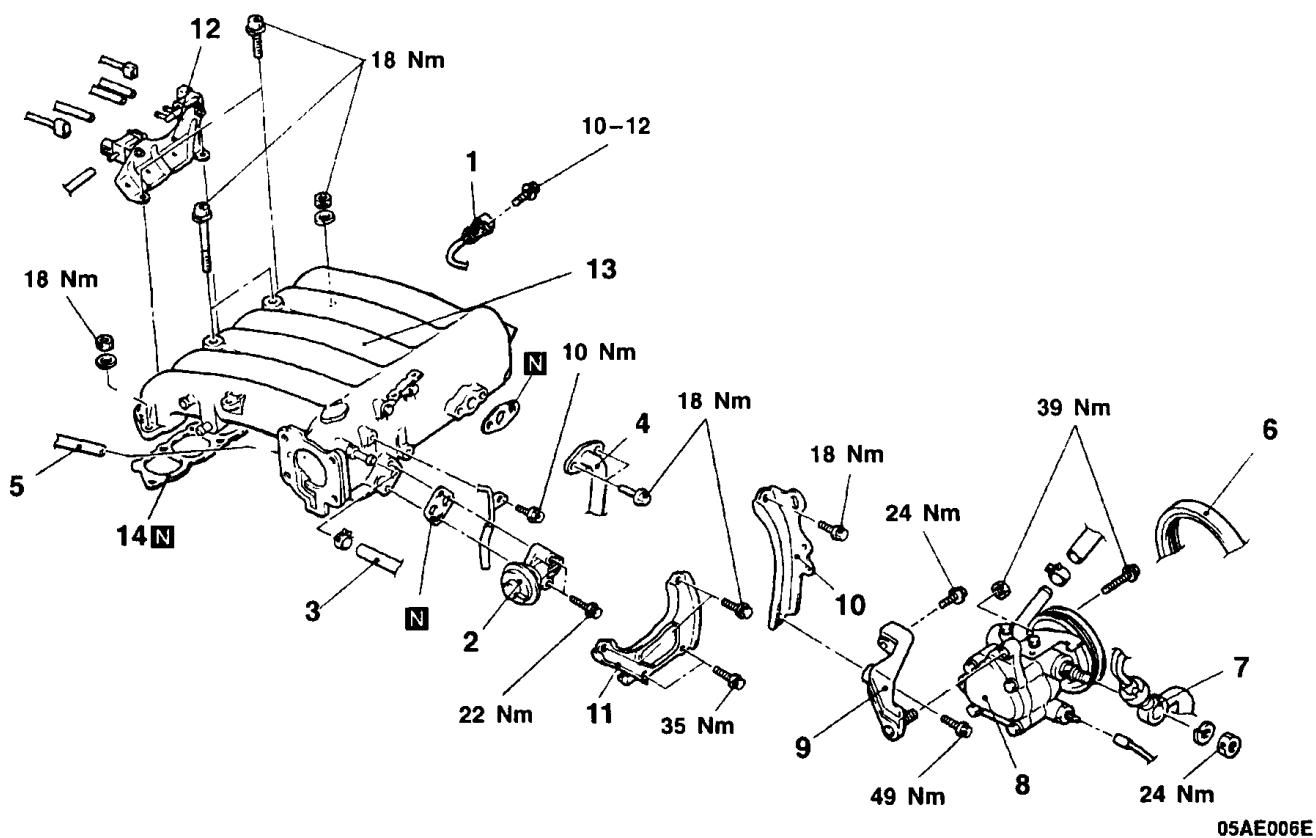
REMOVAL AND INSTALLATION

Pre-removal Operation

- Remove the engine cover (Refer to GROUP 11 – Intake manifold plenum and throttle body.)
- Remove the throttle body (Refer to GROUP 13A – Fuel)
- Drain the power steering fluid (Refer to GROUP 37A – On-vehicle service)

Post-installation Operation

- Install the throttle body (Refer to GROUP 13A – Fuel)
- Install the engine cover (Refer to GROUP 11 – Intake manifold plenum and throttle body.)
- Add power steering fluid and bleed (Refer to GROUP 37A – On-vehicle service.)
- Adjust the tension of the oil pump belt (Refer to GROUP 11 – On-vehicle service.)

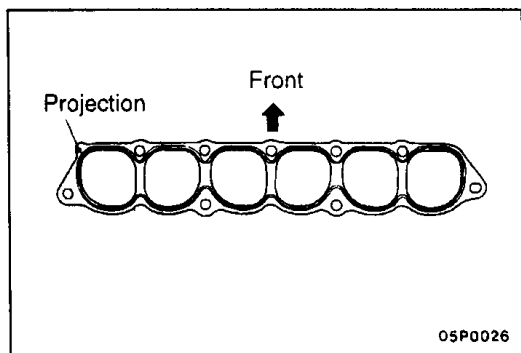


05AE006E

Removal steps

1. Crankshaft angle sensor connector
2. EGR valve assembly
3. Brake booster vacuum hose connection
4. EGR pipe assembly connection
5. Fuel pressure regulator vacuum hose connection
6. Oil pump belt

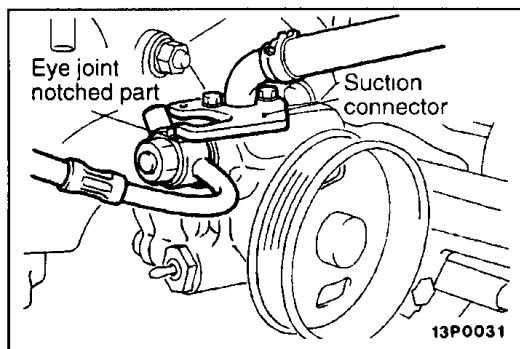
- B◄ 7. Pressure hose
8. Power steering oil pump
9. Pump bracket
10. Intake manifold plenum stay, front
11. Intake manifold plenum stay, rear
12. Solenoid valve assembly
13. Intake manifold plenum
►A◄ 14. Intake manifold plenum gasket



INSTALLATION SERVICE POINT

►A◄ INTAKE MANIFOLD PLENUM GASKET INSTALLATION

Install so that the projection on the gasket is as shown in the diagram.



►B◄ PRESSURE HOSE INSTALLATION

Secure the notched part of the pressure hose eye joint at the position where it contacts the oil pump suction connector.

INSPECTION

INTAKE MANIFOLD PLENUM

1. Check that the intake manifold plenum is not damaged or cracked.
2. Check that the vacuum extraction port is not clogged. If faulty, clean.
3. Using a straight edge and thickness gauge, check the mounting surface for distortion.

Standard value: 0.15 mm or less

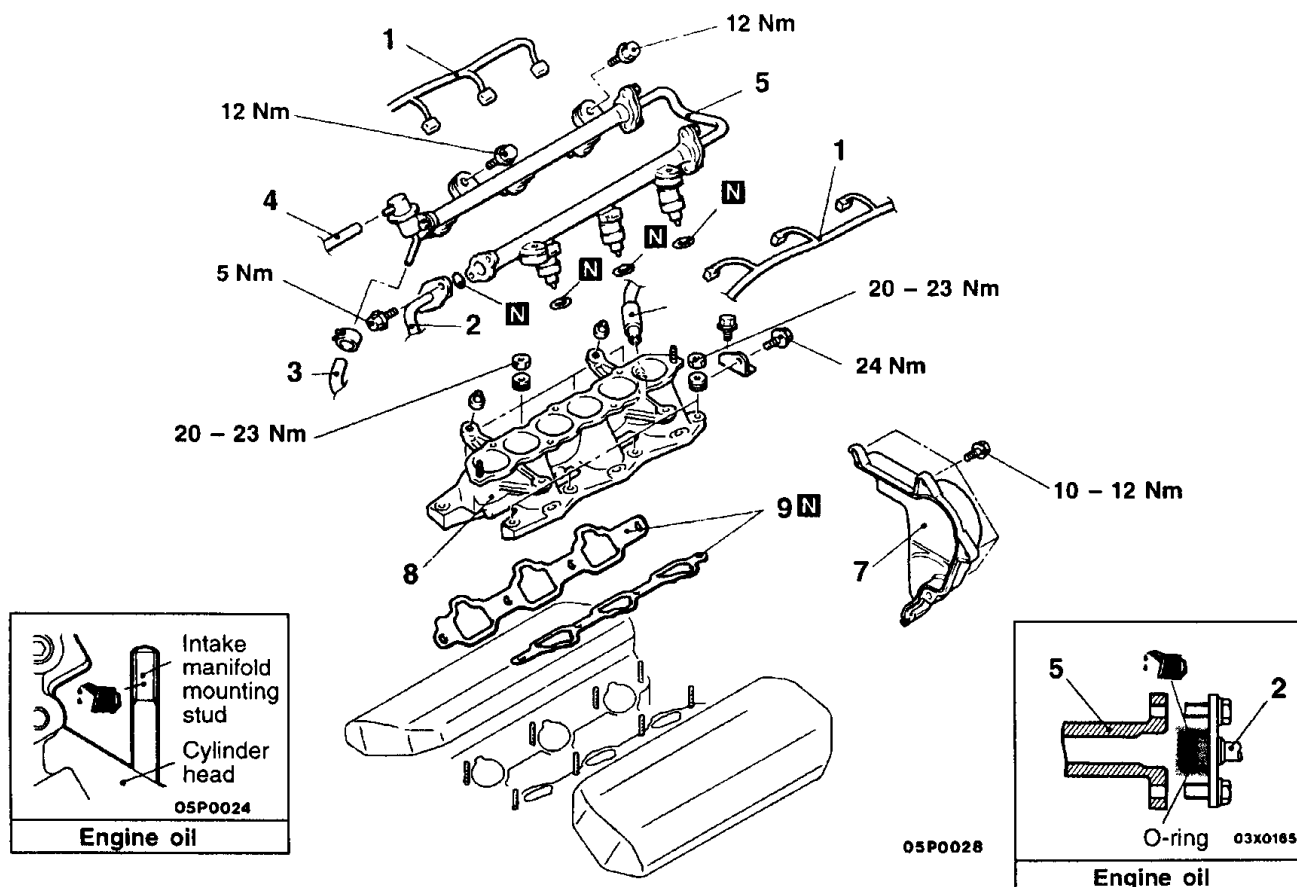
Limit: 0.2 mm

INTAKE MANIFOLD

REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operations

- Remove or install the intake manifold plenum (Refer to P.15-4.)
- Fuel discharge prevention (Refer to GROUP 13A – On-vehicle service)



Removal steps

1. Injector connector
2. High-pressure fuel hose connection
3. Return hose connection
4. Vacuum hose connection
5. Injector and delivery pipe assembly

6. PCV hose connection
7. Timing belt cover(Front upper)
8. Intake manifold
9. Intake manifold gasket

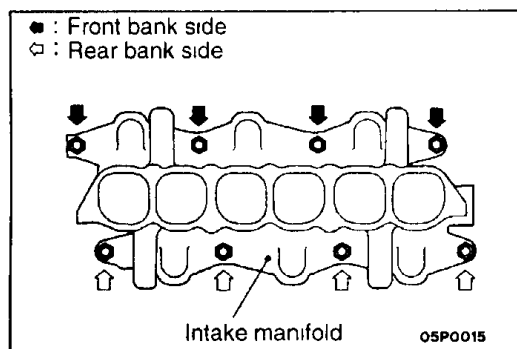
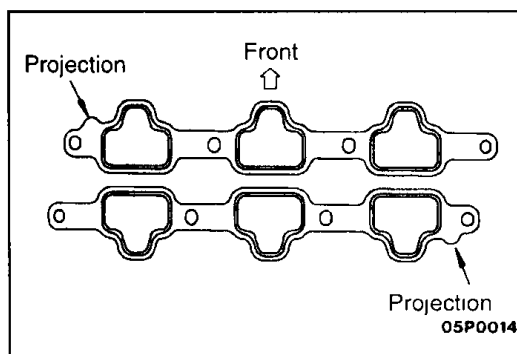
REMOVAL SERVICE POINT

◀A▶ INJECTOR AND DELIVERY PIPE ASSEMBLY REMOVAL

Remove the delivery pipe with the injectors fitted to the delivery pipe.

Caution

Do not drop the injectors when removing the delivery pipe.



INSTALLATION SERVICE POINT

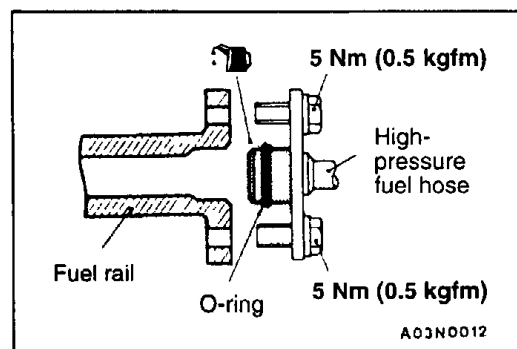
►A◄ INTAKE MANIFOLD GASKET INSTALLATION

Install so that the projection on the gaskets is as shown in the diagram.

►B◄ INTAKE MANIFOLD INSTALLATION

1. Coat the intake manifold mounting studs with engine oil.
2. Tighten the intake manifold mounting nuts in the following sequence.

Sequence	Tightening nuts	Tightening Torque Nm (kgfm)
1	Front bank side nuts	7 (0.7)
2	Rear bank side nuts	20 – 23 (2.0 – 2.3)
3	Front bank side nuts	20 – 23 (2.0 – 2.3)
4	Rear bank side nuts	20 – 23 (2.0 – 2.3)
5	Front bank side nuts	20 – 23 (2.0 – 2.3)



►C◄ HIGH-PRESSURE FUEL HOSE CONNECTION

1. When connecting the high-pressure fuel hose to the fuel rail, apply a drop of new engine oil to the O-ring, and then insert, being careful not to damage the O-ring.

Caution

Do not let engine oil in the fuel rail.

2. Check that the high-pressure fuel hose turns smoothly. If not, remove the hose and then re-insert it into the fuel rail and check again.
3. Tighten the bolts to the specified torque.

INSPECTION

INTAKE MANIFOLD

1. Check that the intake manifold is not damaged or cracked. If faulty, replace.
2. Check that the vacuum extraction port is not clogged. If faulty, clean.
3. Using a straight edge and thickness gauge, check the mounting surface for distortion.

Standard value: 0.15 mm or less

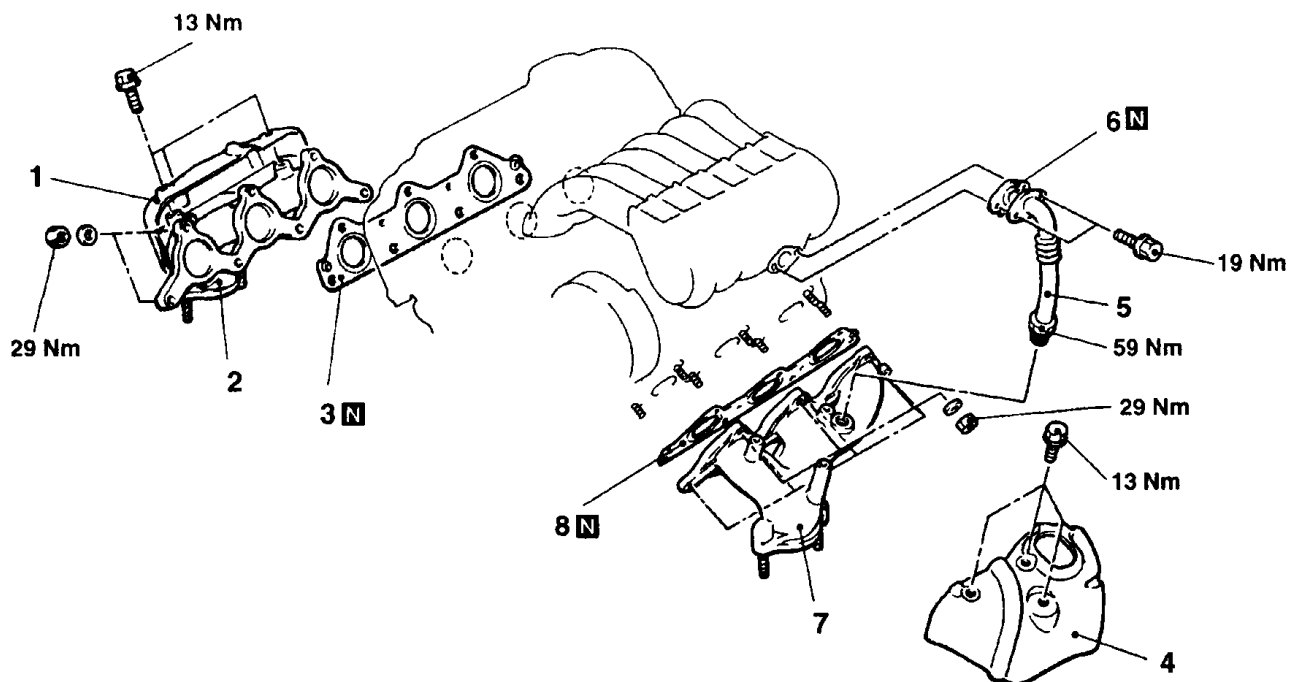
Limit: 0.2 mm

EXHAUST MANIFOLD

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations

- Remove or install the front exhaust pipe (Refer to P.15-9.)
- Remove or install the radiator (Front bank only) (Refer to GROUP 14)
- Remove or install the alternator (Front bank only) (Refer to GROUP 16)



05P0021

Removal steps**<Front Bank>**

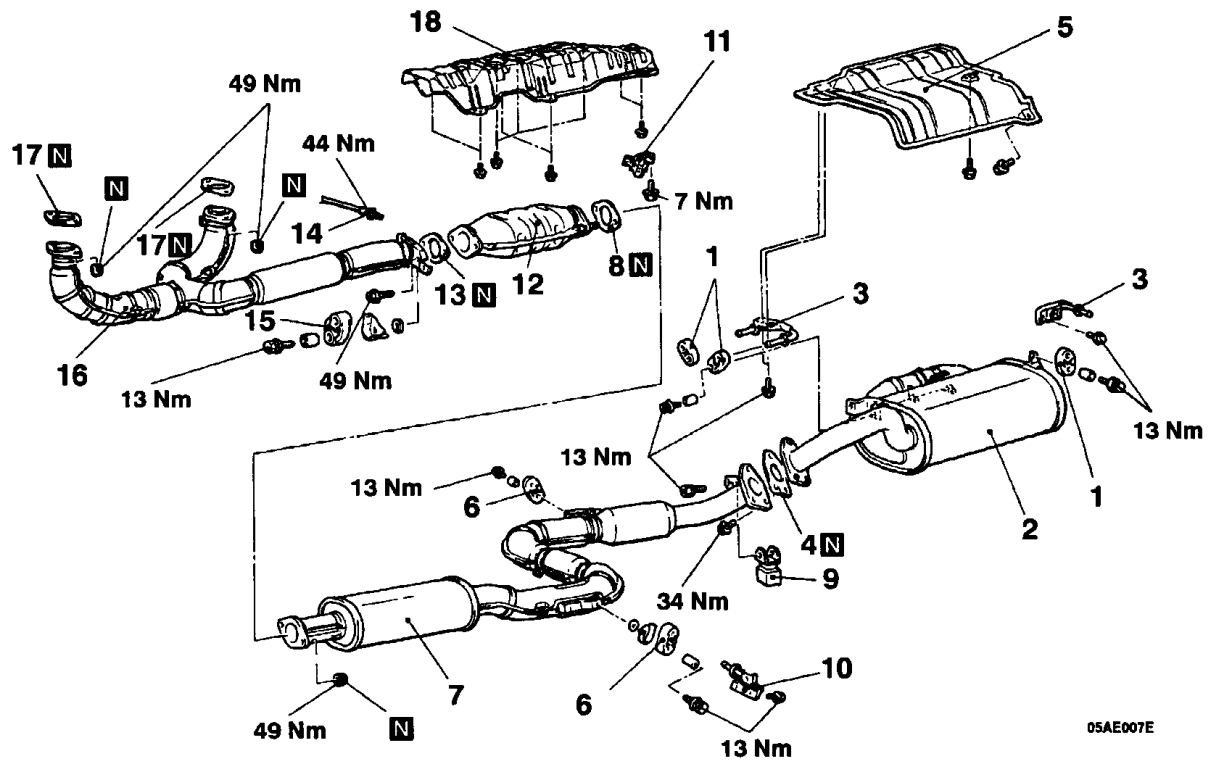
1. Heat protector
2. Exhaust manifold
3. Exhaust manifold gasket

Removal steps**<Rear Bank>**

4. Heat protector
5. EGR pipe
6. EGR pipe gasket
7. Exhaust manifold
8. Exhaust manifold gasket

EXHAUST PIPE AND MAIN MUFFLER

REMOVAL AND INSTALLATION



05AE007E

Main muffler removal steps

1. Hanger
2. Main muffler assembly
3. Hanger bracket
4. Gasket
5. Rear floor heat protector panel

Centre exhaust pipe removal steps

6. Hanger
7. Centre exhaust pipe
8. Gasket
9. Damper

10. Hanger bracket
11. Harness protector
12. Catalytic converter or pre-muffler
13. Gasket

Front exhaust pipe removal steps

14. Oxygen sensor
15. Hanger
16. Front exhaust pipe
17. Gasket
18. Front floor heat protector

ENGINE ELECTRICAL

CONTENTS

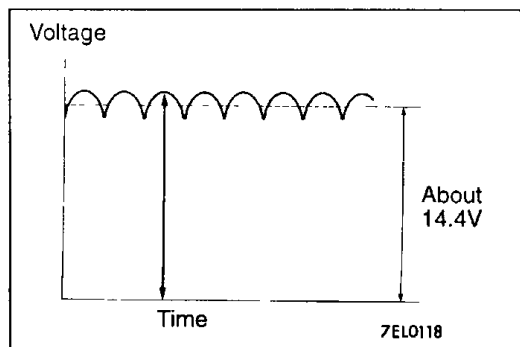
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CHARGING SYSTEM

GENERAL INFORMATION

The charging system is a system which charges the battery with the alternator output to keep the

battery charged at a constant level during varying electrical load.



Operation

Rotation of the excited field coil generates AC voltage in the stator.

This alternating current is rectified through diodes to DC voltage having a waveform shown in the illustration at left.

The average output voltage fluctuates slightly with the alternator load condition.

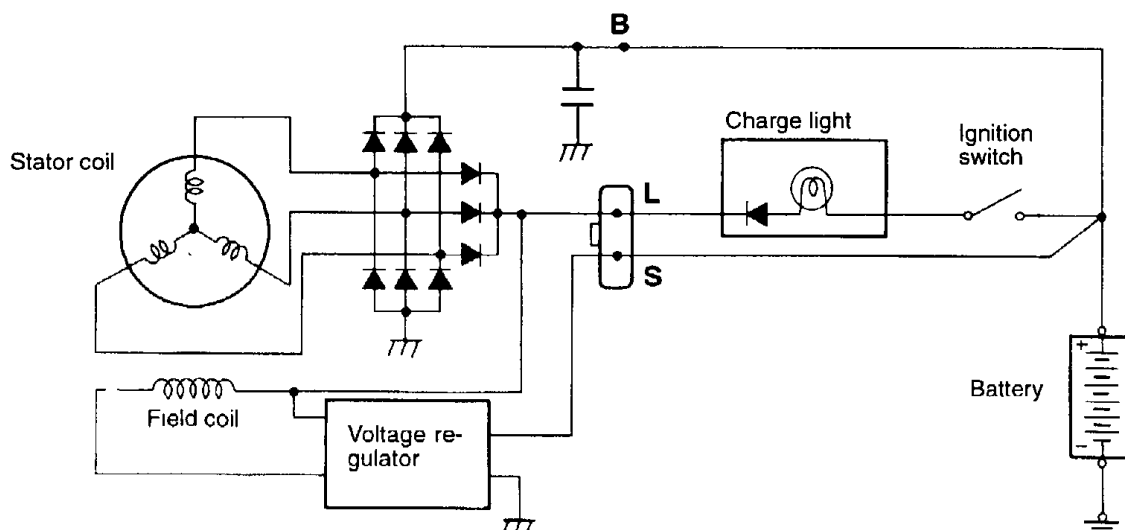
When the ignition switch is turned on, current flows in the field coil and initial excitation of the field coil occurs.

When the stator coil begins to generate power after the engine is started, the field coil is excited by the output current of the stator coil.

The alternator output voltage rises as the field current increases and it falls as the field current decreases. When the battery voltage (alternator S

terminal voltage) reaches a regulated voltage of approx. 14.4V, the field current is cut off. When the battery voltage drops below the regulated voltage, the voltage regulator regulates the output voltage to a constant level by controlling the field current.

In addition, when the field current is constant, the alternator output voltage rises as the engine speed increases.



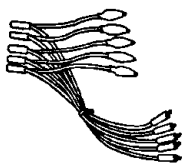
ALTERNATOR SPECIFICATIONS

Items	Specifications
Type	Battery voltage sensing
Rated output V/A	12/110
Voltage regulator	Electronic built-in type

SERVICE SPECIFICATIONS

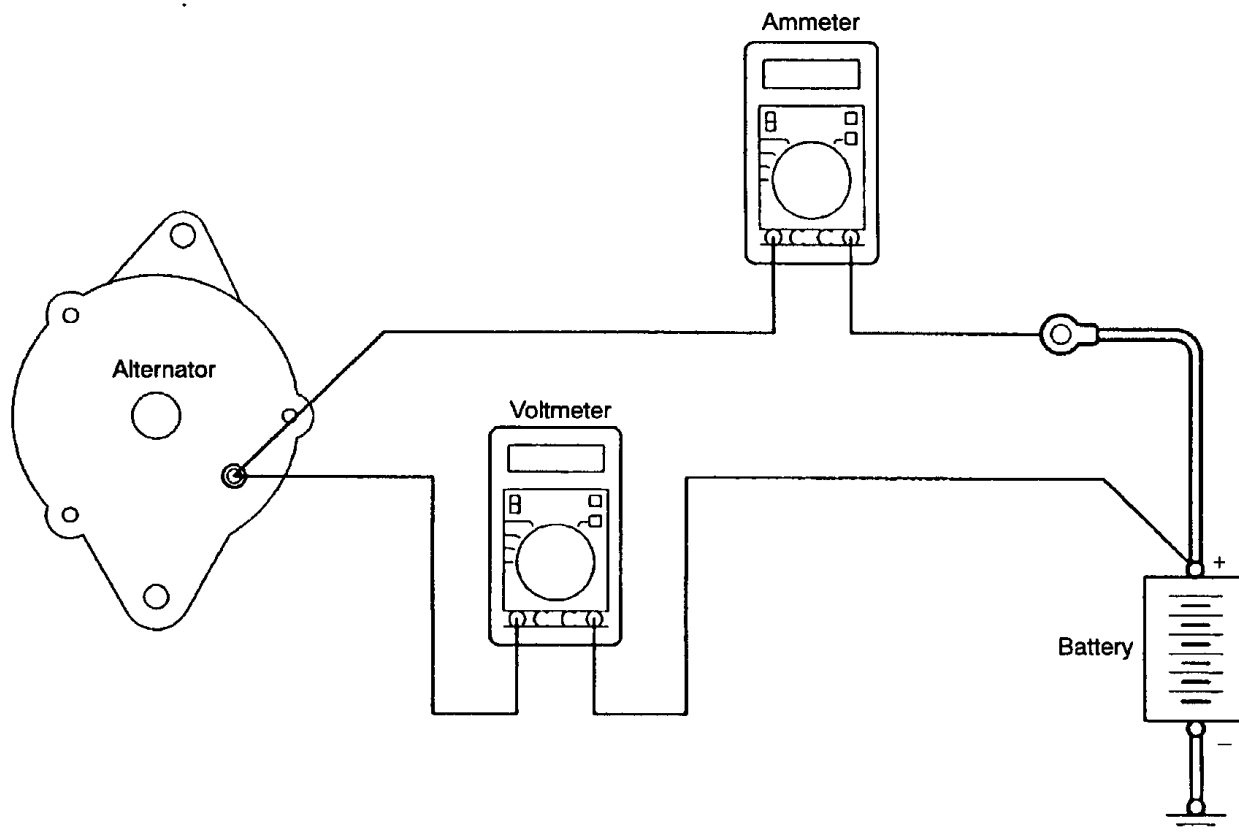
Items	Standard value	Limit
Regulated voltage V (Ambient temp. at voltage regulator)	-20°C	14.2–15.4
	20°C	13.9–14.9
	60°C	13.4–14.6
	80°C	13.1–14.5
Rotor coil resistance Ω	Approx. 3–5	–
Output current	–	70% of nominal output current

SPECIAL TOOL

Tool	Number	Name	Application
	MB991348	Test harness set	Inspection of ignition primary voltage (power transistor connection)

ON-VEHICLE SERVICE

ALTERNATOR OUTPUT LINE VOLTAGE DROP TEST



6EN0962

This test determines whether the wiring from the alternator "B" terminal to the battery (+) terminal (including the fusible link) is in a good condition or not.

1. Always be sure to check the following before the test.
 - Alternator installation
 - Alternator drive belt tension (Refer to GROUP 11 – On-vehicle Service.)
 - Fusible link
 - Abnormal noise from the alternator while the engine is running
2. Turn the ignition switch to the OFF position.
3. Disconnect the negative battery cable.
4. Disconnect the alternator output wire from the alternator "B" terminal and connect a DC test ammeter with a range of 0 – 130 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal, and then connect

the (–) lead of the ammeter to the disconnected output wire.)

NOTE

An inductive-type ammeter which enables measurements to be taken without disconnecting the alternator output wire is recommended. The reason for this is if a vehicle in which the voltage may have dropped due to a poor connection at the alternator "B" terminal is being inspected, and the alternator "B" terminal is loosened when the test ammeter is connected, the connection will be completed at this time and the possibility of finding problems will be reduced.

5. Connect a digital-type voltmeter between the alternator "B" terminal and the battery (+) terminal. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (–) lead of the voltmeter to the battery (+) cable.)

6. Connect a tachometer.
(Refer to GROUP 11 – On-vehicle Service.)
7. Reconnect the negative battery cable.
8. Leave the hood open.
9. Start the engine.
10. With the engine running at 2500 rpm, turn the headlights and other lights on and off to adjust the alternator load so that the value displayed on the ammeter is slightly above 30 A.

Limit value: Max. 0.3 V

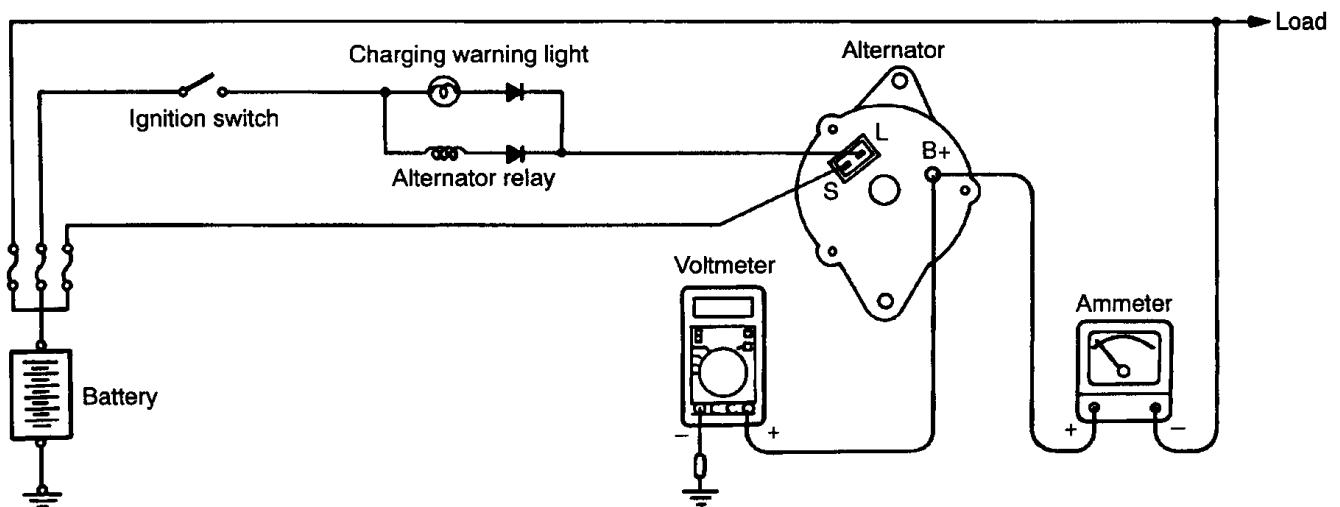
NOTE

When the alternator output is high and the value displayed on the ammeter does not decrease to 30A, set the value to 40A. Read the value displayed on the voltmeter at this time.
In this case the limit value becomes max. 0.4V.
Adjust the engine speed by gradually decreasing it until the value displayed on the ammeter

is 30 A. Take a reading of the value displayed on the voltmeter at this time.

11. If the value displayed on the voltmeter is above the limit value, there is probably a malfunction in the alternator output wire, so check the wiring between the alternator "B" terminal and the battery (+) terminal (including fusible link). If a terminal is not sufficiently tight or if the harness has become discoloured due to overheating, repair and then test again.
12. After the test, run the engine at idle.
13. Turn off all lights and turn the ignition switch to the OFF position.
14. Disconnect the negative battery cable.
15. Disconnect the ammeter, voltmeter and tachometer.
16. Connect the alternator output wire to the alternator "B" terminal.
17. Connect the negative battery cable.

OUTPUT CURRENT TEST



06AE014E

This test determines whether alternator output current is normal.

1. Before the test, always be sure to check the following.

- Alternator installation
- Battery (Refer to GROUP 54 – Battery.)

NOTE

The battery to be used should be slightly discharged. The load in a fully-charged battery will be insufficient and the test may not be able to be carried out correctly.

- Alternator drive belt tension (Refer to GROUP 11 – On-vehicle Service.)
- Fusible link
- Abnormal noise from the alternator while the engine is running

2. Turn the ignition switch to the OFF position.
3. Disconnect the negative battery cable.
4. Disconnect the alternator output wire from the alternator "B" terminal and connect a DC test ammeter with a range of 0–130 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal, and then connect the (–) lead of the ammeter to the disconnected output wire.)

Caution

Never use clips but tighten bolts and nuts to connect the line. Otherwise loose connections (e.g. using clips) will lead to a serious accident because of high current.

NOTE

An inductive-type ammeter which enables measurements to be taken without disconnecting the alternator output wire is recommended.

5. Connect a voltmeter with a range of 0–20 V between the alternator "B" terminal and the ground. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (–) lead of the voltmeter to the ground.)
6. Connect a tachometer.
Refer to GROUP 11 – On-vehicle Service.)
7. Connect the negative battery cable.
8. Leave the hood open.
9. Check to be sure that the reading on the voltmeter is equal to the battery voltage.

NOTE

If the voltage is 0 V, the cause is probably

an open circuit in the wire or fusible link between the alternator "B" terminal and the battery (+) terminal.

10. After turning the light switch on and turning on the headlights, start the engine.
11. Immediately after setting the headlights to high beam and turning the heater blower switch to the high speed position, increase the engine speed to 2,500 rpm and read the maximum current output value displayed on the ammeter.

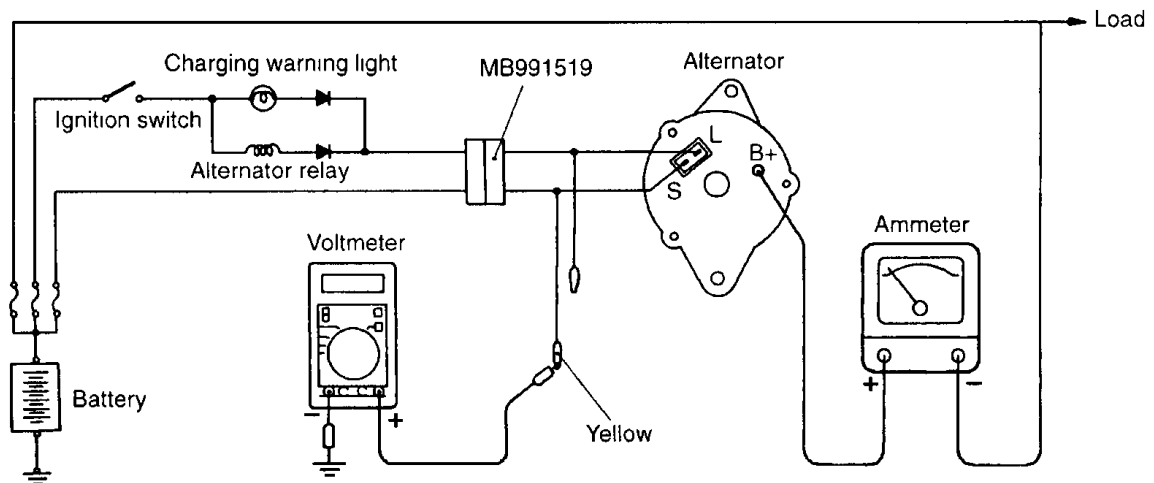
Limit value: 70% of nominal current output

NOTE

- For the nominal current output, refer to the Alternator Specifications.
- Because the current from the battery will soon drop after the engine is started, the above step should be carried out as quickly as possible in order to obtain the maximum current output value.
- The current output value will depend on the electrical load and the temperature of the alternator body.
- If the electrical load is small while testing, the specified level of current may not be output even though the alternator is normal. In such cases, increase the electrical load by leaving the headlights turned on for some time to discharge the battery or by using the lighting system in another vehicle, and then test again.
- The specified level of current also may not be output if the temperature of the alternator body or the ambient temperature is too high. In such cases, cool the alternator and then test again.

12. The reading on the ammeter should be above the limit value. If the reading is below the limit value and the alternator output wire is normal, remove the alternator from the engine and check the alternator.
13. Run the engine at idle speed after the test.
14. Turn the ignition switch to the OFF position.
15. Disconnect the negative battery cable.
16. Disconnect the ammeter, voltmeter and tachometer.
17. Connect the alternator output wire to the alternator "B" terminal.
18. Connect the negative battery cable.

REGULATED VOLTAGE TEST



06AE015E

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

1. Always be sure to check the following before the test.
 - Alternator installation
 - Check to be sure that the battery installed in the vehicle is fully charged. (Refer to GROUP 54 – Battery.)
 - Alternator drive belt tension (Refer to GROUP 11 – On-vehicle Service.)
 - Fusible link
 - Abnormal noise from the alternator while the engine is running
2. Turn the ignition switch to the OFF position.
3. Disconnect the negative battery cable.
4. Connect a digital-type voltmeter between the alternator “S” terminal and the ground. (Connect the (+) lead of the voltmeter to the “S” terminal, and then connect the (–) lead of the voltmeter to a secure ground or to the battery (–) terminal.)
5. Disconnect the alternator output wire from the alternator “B” terminal.
6. Connect a DC test ammeter with a range of 0–130 A in series between the “B” terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the “B” terminal, and then connect the (–) lead of the ammeter to the disconnected output wire.)
7. Connect a tachometer or the MUT II. Refer to GROUP 11 – On-vehicle Service.)
8. Reconnect the negative battery cable.
9. Turn the ignition switch to the ON position and check that the reading on the voltmeter is equal to the battery voltage.

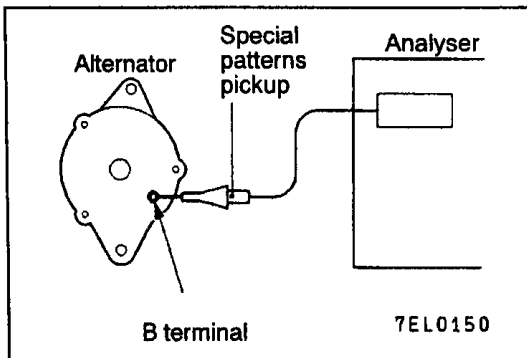
NOTE

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

10. Check to be sure that all lights and accessories are off.
11. Start the engine.
12. Increase the engine speed to 2,500 r/min
13. Read the value displayed on the voltmeter when the current output by the alternator becomes 10 A or less.
14. If the voltage reading conforms to the value in the voltage regulation table, then the voltage regulator is operating normally. If the voltage is outside the standard value, there is a malfunction of the voltage regulator or of the alternator.
15. After the test, lower the engine speed to the idle speed.
16. Turn the ignition switch to the “OFF” position.
17. Disconnect the negative battery cable.
18. Disconnect the ammeter, voltmeter and tachometer or the MUT II.
19. Connect the alternator output wire to the alternator “B” terminal.
20. Connect the negative battery cable.

VOLTAGE REGULATION TABLE

Inspection terminal	Voltage regulator ambient temperature (°C)	Standard value (V)
Terminal "S"	-20	14.2–15.4
	20	13.9–14.9
	60	13.4–14.6
	80	13.1–14.5



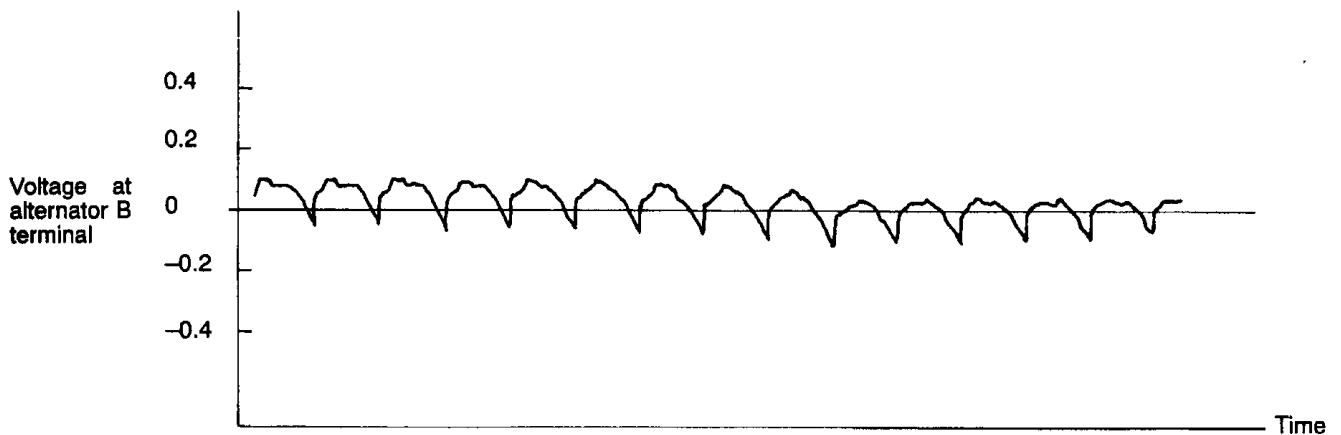
WAVE PATTERN CHECK USING AN ANALYSER

MEASUREMENT METHOD

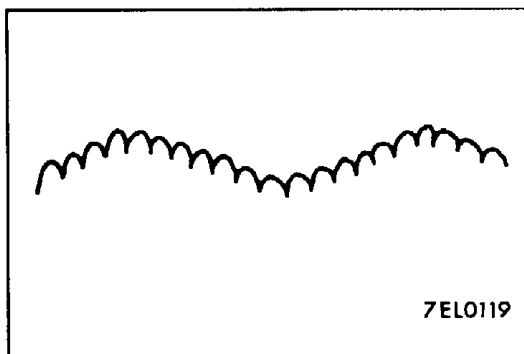
Connect the analyser special patterns pick-up to the alternator B terminal.

STANDARD WAVEFORM Observation Conditions

FUNCTION	SPECIAL PATTERNS
PATTERN HEIGHT	VARIABLE
VARIABLE knob	Adjust while viewing the wave pattern
PATTERN SELECTOR	RASTER
Engine speed	Curb idle speed



7EL0115



NOTE

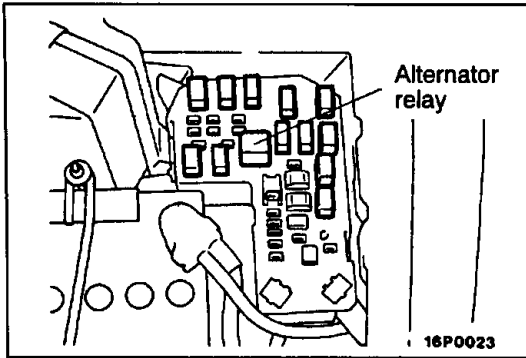
The voltage waveform of the alternator B terminal can undulate as shown at left. This waveform is produced when the regulator operates according to fluctuations in the alternator load (current), and is normal for the alternator.

ABNORMAL WAVEFORM EXAMPLES

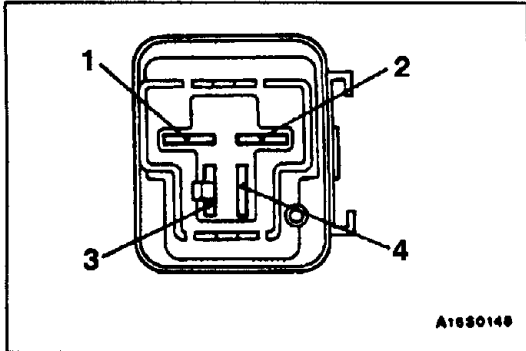
NOTE

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

Abnormal waveforms	Problem cause
Example 1  7EL0120	• Open diode
Example 2  7EL0121	• Short in diode
Example 3  7EL0122	• Broken wire in stator coil
Example 4  7EL0123	• Short in stator coil
Example 5  NOTE: At this time, the charge light is illuminated. 7EL0124	• Open diode supplementary

**ALTERNATOR RELAY CONTINUITY CHECK**

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

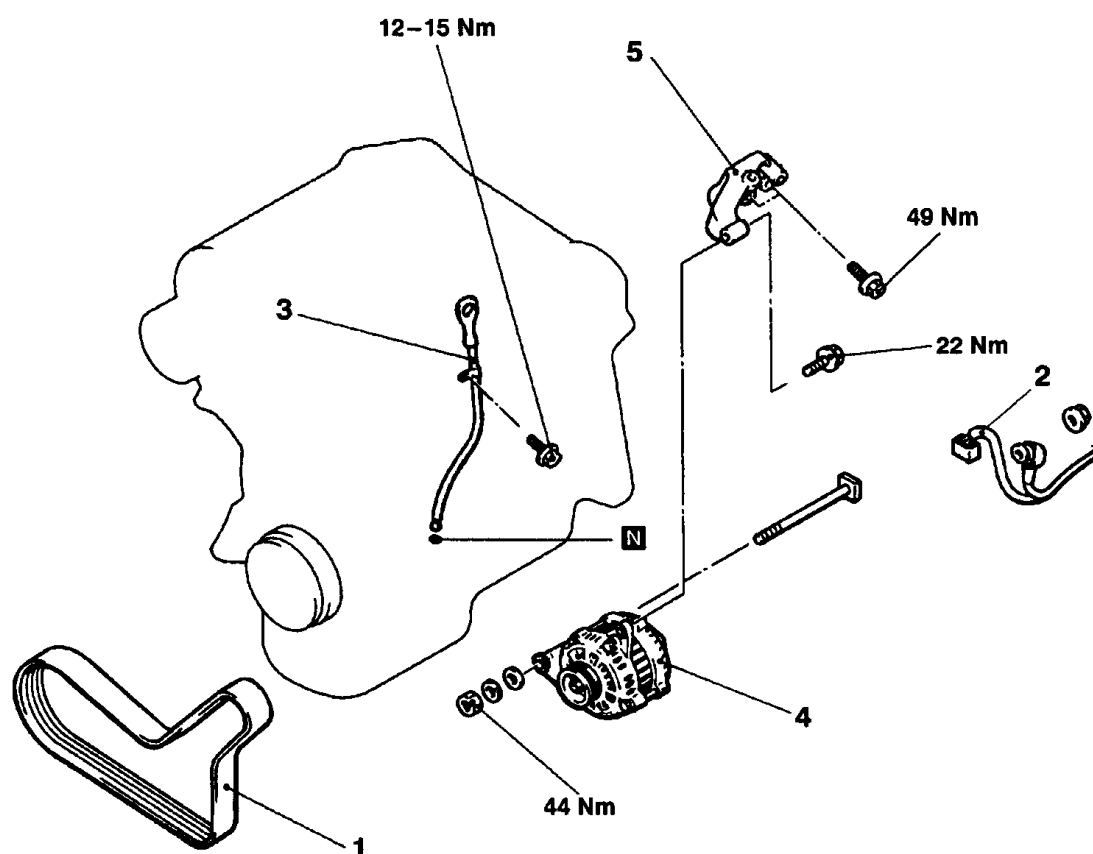


ALTERNATOR

REMOVAL AND INSTALLATION

Post-Installation Operation

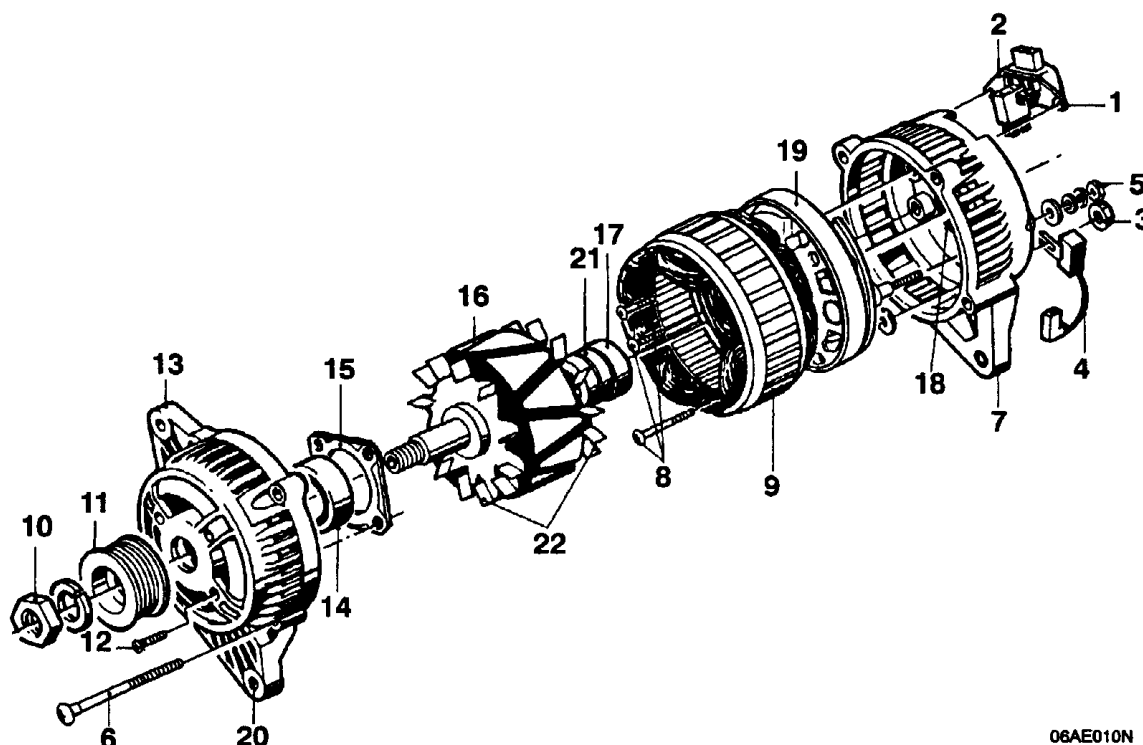
- Drive belt tension adjustment (Refer to Group 11 – On-vehicle Service)



16 P0246

Removal steps

1. Drive belt (Alternator)
2. Alternator harness connector connection
3. Engine oil level dipstick
4. Alternator
5. Alternator bracket

ALTERNATOR**DISASSEMBLY AND REASSEMBLY**

06AE010N

Disassembly steps

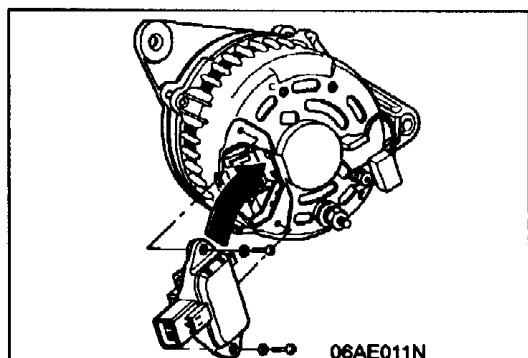
◀A▶

1. Voltage regulator retaining screws
2. Voltage regulator
3. Suppressor retaining nut
4. Suppressor
5. B+ terminal nut and washers
6. Through bolts

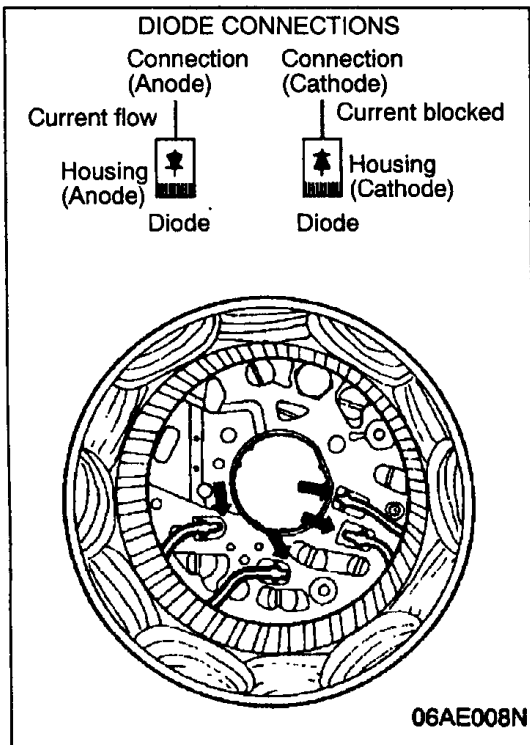
◀B▶

7. Slip ring end housing and stator assembly
8. Rectifier assembly retaining nuts
9. Stator assembly
10. Pulley retaining nut
11. Pulley

12. Drive end bearing retaining plate screws
13. Drive end plate
14. Drive end bearing
15. Bearing retaining plate
16. Rotor
17. Slip ring end housing bearing
18. Slip ring end housing bearing cap
19. Rectifier assembly
20. Bush
21. Slip ring assembly
22. Cooling fans

**DISASSEMBLY SERVICE POINTS****◀A▶ VOLTAGE REGULATOR REMOVAL**

Tilt the regulator slightly from the plug connection until the regulator clears the housing then lift clear.

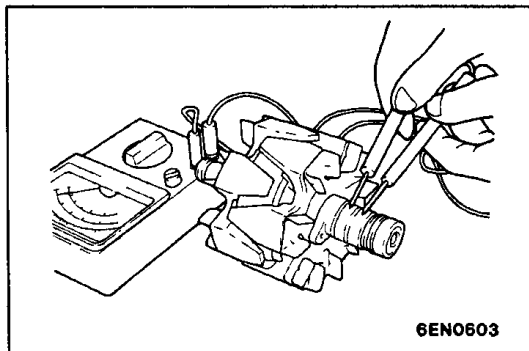


◀B▶ STATOR REMOVAL

When removing stator, unsolder the stator leads soldered to main diodes on rectifier.

Caution

1. When soldering or unsoldering, use care to make sure that heat of soldering iron is not transmitted to diodes for a long period. Finish soldering or unsoldering in as short a time as possible.
2. Use care that no undue force is exerted to leads of diodes.



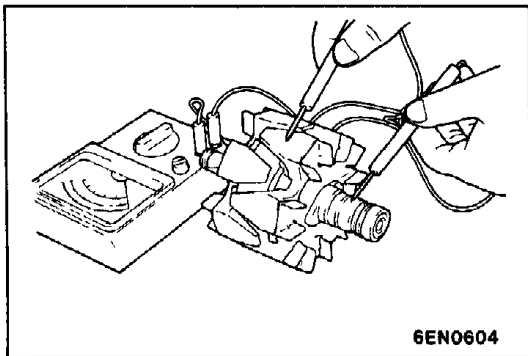
INSPECTION

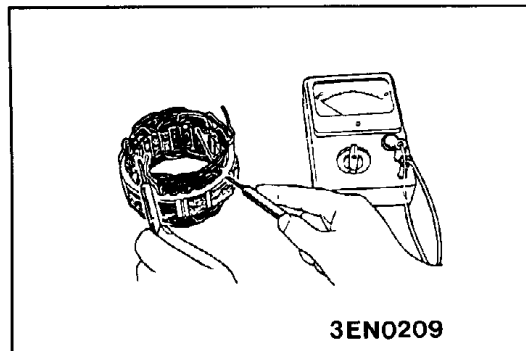
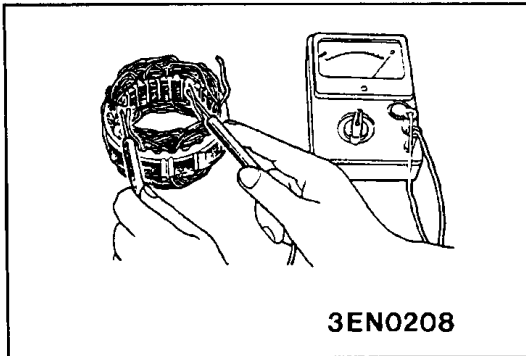
ROTOR

1. Check rotor coil for continuity. Check to ensure that there is no continuity between slip rings. If resistance is too small, it means that there is a short circuit. If there is no continuity or if there is a short circuit, replace rotor assembly.

Resistance value: Approx. 3–5 Ω

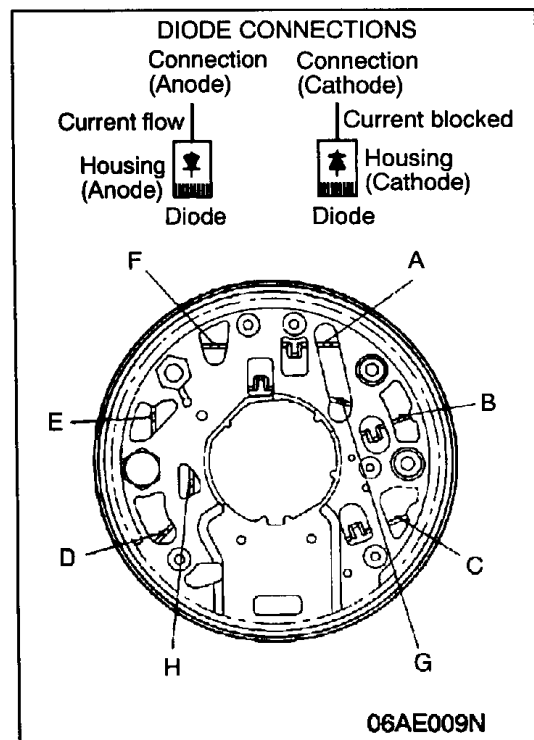
2. Check rotor coil for grounding. Check to ensure that there is no continuity between slip ring and core. If there is continuity, replace rotor assembly.





STATOR

1. Make continuity test on stator coil. Check to ensure that there is continuity between coil leads. If there is no continuity, replace stator assembly.
2. Check coil for grounding. Check to ensure that there is no continuity between coil and core. If there is continuity, replace stator assembly.



POWER DIODES

1. Apply the negative test probe of the diode tester or a multimeter with a diode test feature to the positive heatsink and the positive probe alternatively to A, B and C, a low resistance reading, or the forward voltage drop across the diode should be obtained. Reverse the test probes, a high resistance reading or a higher reverse voltage should be obtained.
2. Connect the positive test probe to the negative heatsink and the negative test probe alternatively to D, E and F, a low resistance or forward voltage drop across the diode should be obtained. Reverse the test probes, a high resistance reading or higher reverse voltage reading should be obtained.

BRUSHES

1. Ensure the brushes have not been worn to or beyond their wear limit,

Brush wear limit: 3.8mm

2. Check the brush springs for burning and loss of tension due to excessive heat.

SLIP RINGS

1. Check the slip rings for excessive wear and damage.

Minimum slip ring diameter: 26.7mm

STARTING SYSTEM

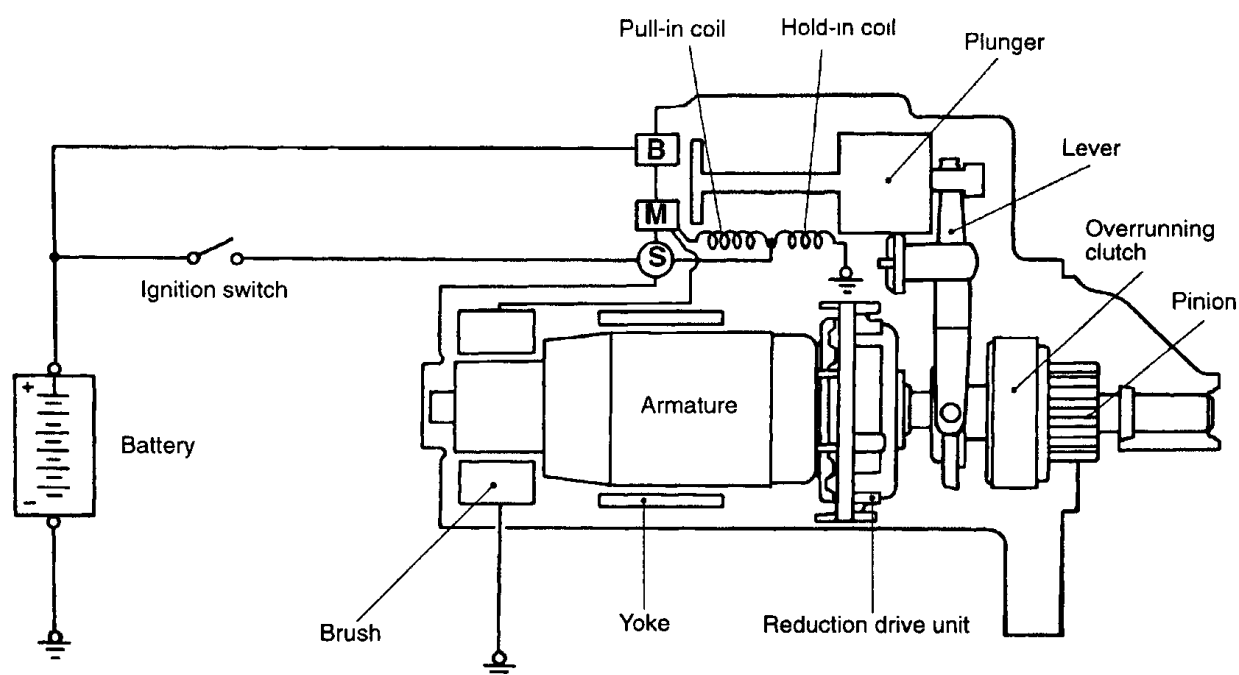
GENERAL INFORMATION

If the ignition switch is turned to the "START" position, current flows in the coil provided inside magnetic switch, attracting the plunger. When the plunger is attracted, the lever connected to the plunger is actuated to engage the starter clutch.

Attracting the plunger will turn on the magnetic switch, allowing the B terminal and M terminal to conduct. Thus, current flows to engage the starter motor.

When the ignition switch is returned to the "ON" position after starting the engine, the starter clutch is disengaged from the ring gear.

An overrunning clutch is provided between the pinion and the armature shaft, to prevent damage to the starter.



06AE001N

STARTER MOTOR SPECIFICATIONS

Items	Specifications
Type	Reduction drive with planetary gear
Rated output kW/V	1.2/12
No. of pinion teeth	8

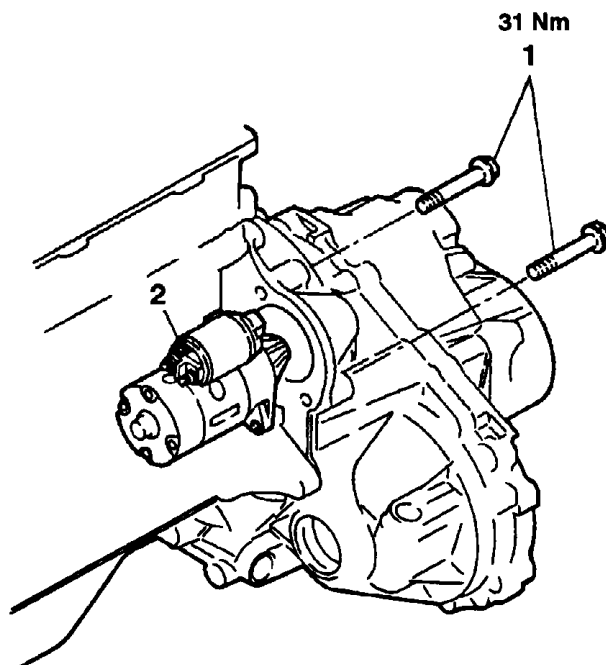
SERVICE SPECIFICATIONS

Items		Standard value	Limit
Free running characteristics	Terminal voltage V	12	–
	Current A	110	–
	Speed r/min	5,000 or more	–
Pinion gap mm		0.5–2.0	–
Commutator run out mm		0.10	–
Commutator diameter mm		32.3	31.2
Undercut depth mm		0.5–0.8	–

STARTER MOTOR

REMOVAL AND INSTALLATION

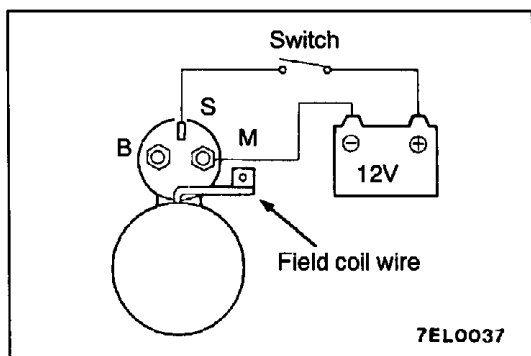
Pre-removal and Post-installation Operation
Air Cleaner Removal and Installation



1EL097

Removal steps

1. Bolt
2. Starter motor



INSPECTION

PINION GAP ADJUSTMENT

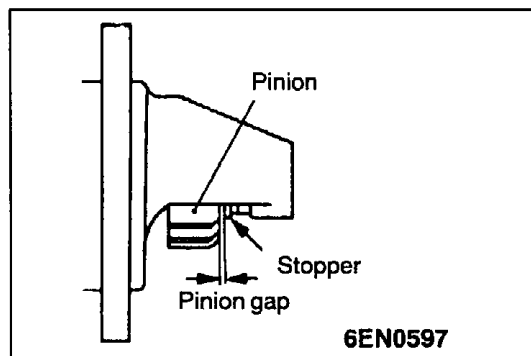
1. Disconnect field coil wire from M-terminal of magnetic switch.
2. Connect a 12V battery between S-terminal and M-terminal.
3. Set the switch to "ON", and pinion will move out.

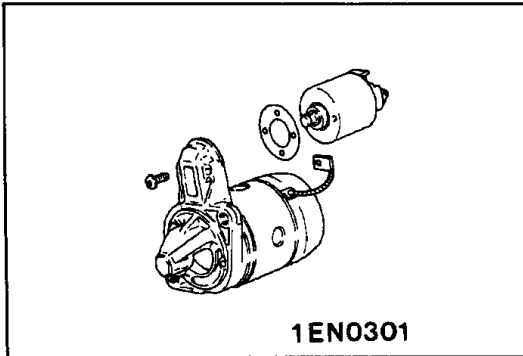
Caution

This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

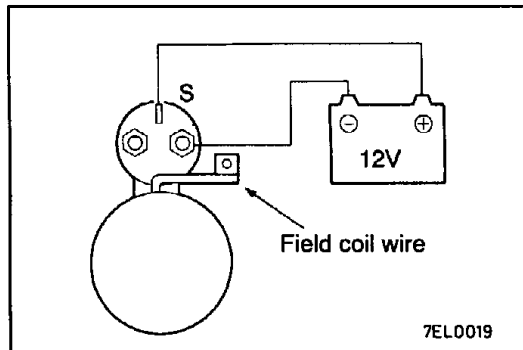
4. Check pinion to stopper clearance (pinion gap) with a feeler gauge.

Pinion gap: 0.5–2.0 mm





5. If pinion gap is out of specification, adjust by adding or removing gaskets between magnetic switch and front bracket.



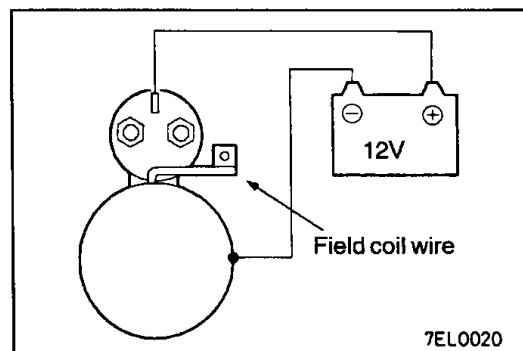
MAGNETIC SWITCH PULL-IN TEST

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

Caution

This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

3. If pinion moves out, then pull-in coil is good. If it doesn't, replace magnetic switch.



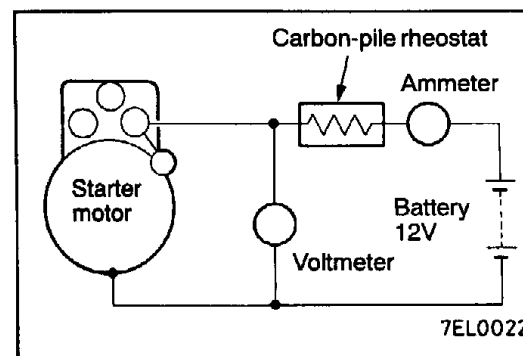
MAGNETIC SWITCH HOLD-IN TEST

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

Caution

This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

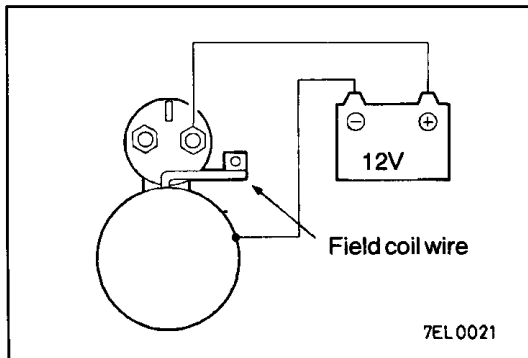
3. If pinion remains out, everything is in order. If pinion moves in, hold-in circuit is open. Replace magnetic switch.



FREE RUNNING TEST

1. Place starter motor in a vice equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows:
2. Connect a test ammeter (130-ampere scale) and carbon pile rheostat in series between battery positive post and starter motor terminal.
3. Connect a voltmeter (15-volt scale) across starter motor.
4. Rotate carbon pile to full-resistance position.
5. Connect battery cable from battery negative post to starter motor body.
6. Adjust the rheostat until the battery voltage shown by the voltmeter is 11V.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

Current: Max. 110 Amps

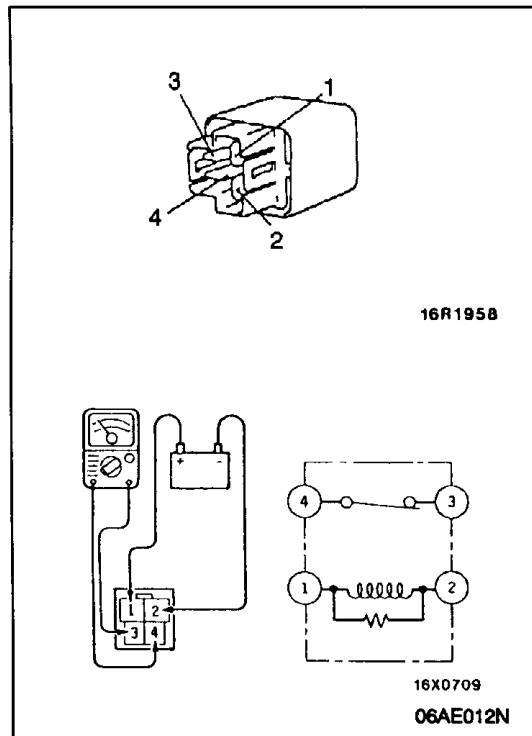
**MAGNETIC SWITCH RETURN TEST**

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

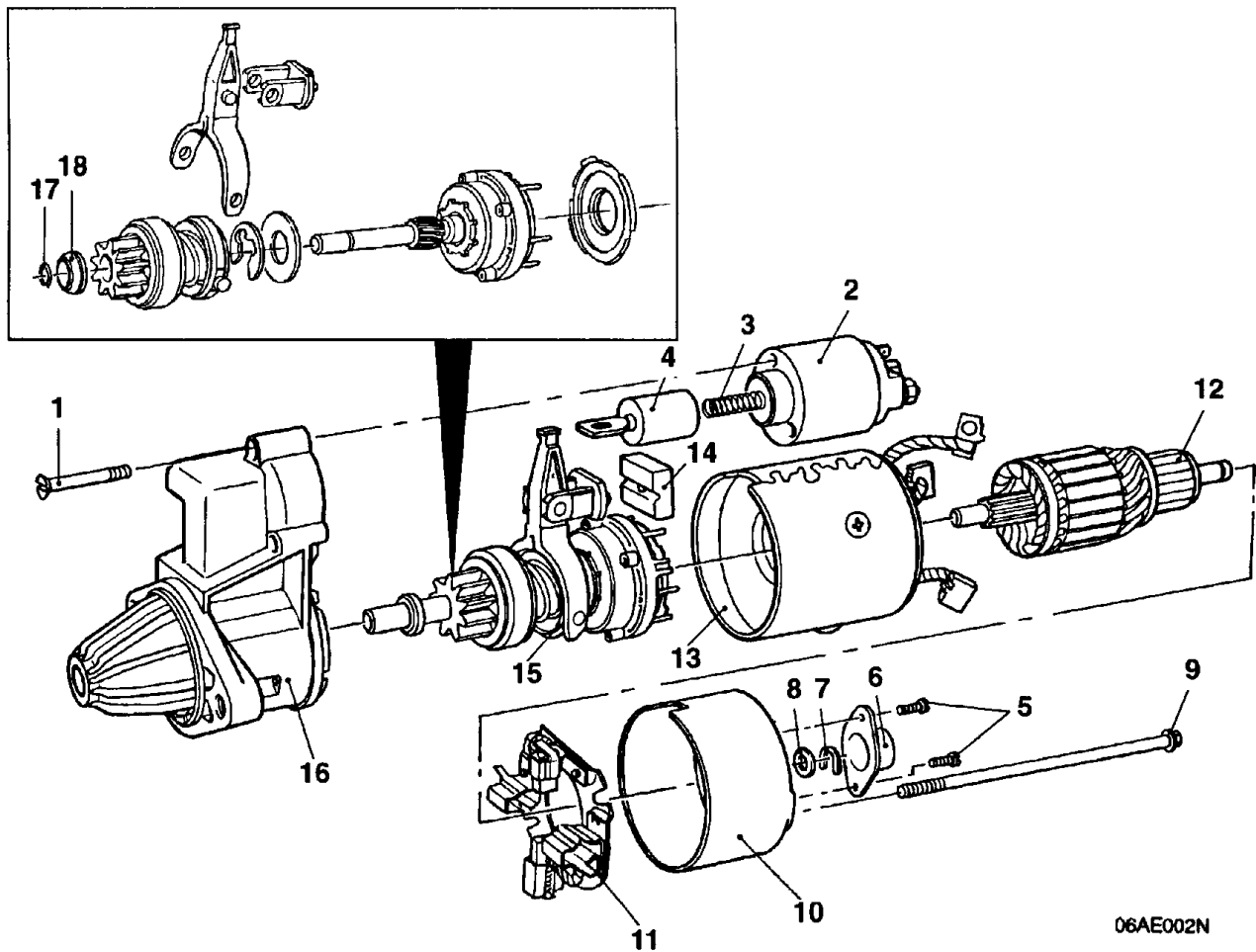
Caution

This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

3. Pull pinion out and release. If pinion quickly returns to its original position, everything is in order. If it doesn't, replace magnetic switch.

**STARTER RELAY CONTINUITY CHECK**

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

STARTER MOTOR**DISASSEMBLY AND REASSEMBLY**

06AE002N

Disassembly steps

◀A▶

1. Screw
2. Magnetic switch
3. Spring
4. Solenoid barrel
5. End cover screws
6. End cover
7. C clip
8. Flat washer
9. Through bolts
10. Rear housing

◀B▶

11. Brush holder
12. Armature assembly
13. Yoke assembly
14. Rubber seal
15. Overrunning clutch, drive pinion assembly and gear set

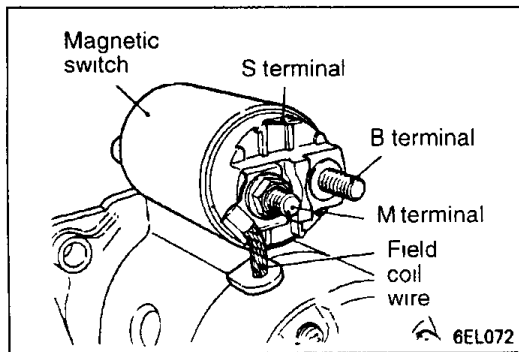
◀C▶

▶B▶

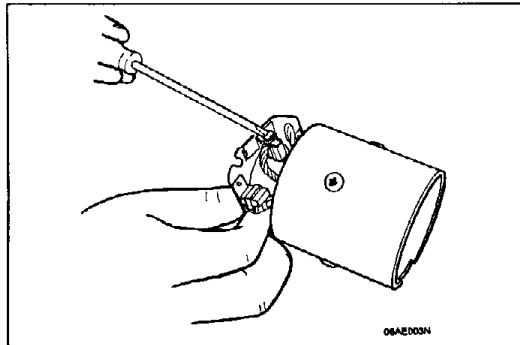
▶A▶

▶A▶

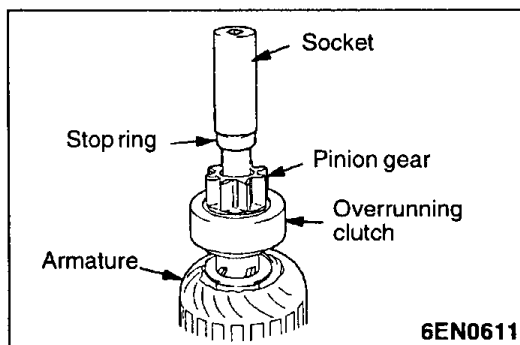
16. Front housing
17. Snap ring
18. Stop ring

**DISASSEMBLY SERVICE POINTS****◀A▶ MAGNETIC SWITCH REMOVAL**

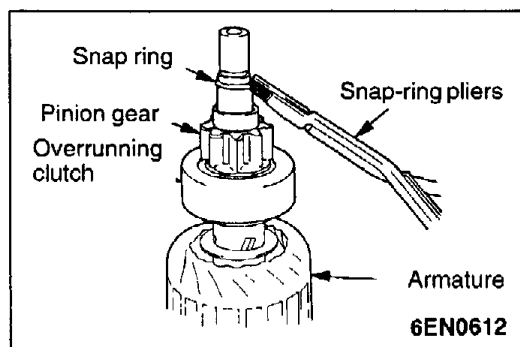
1. Disconnect the field coil wire from terminal M of the magnetic switch.

**◀B▶ BRUSH HOLDER REMOVAL**

1. Mark the position of the brush holder in relation to the yoke assembly.
2. Prise back the brush retaining lugs of the brushes which are connected to the yoke assembly and remove the brush plate.

**◀C▶ SNAP RING/STOP RING REMOVAL**

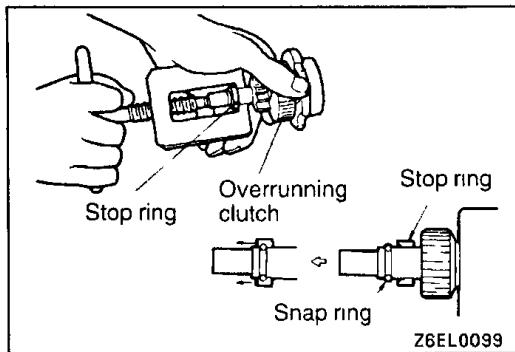
1. Press the stop ring, by using an appropriate socket wrench.



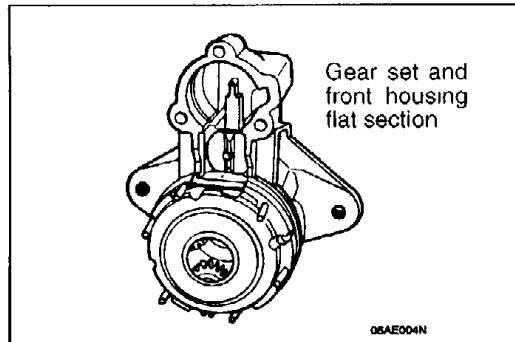
2. After removing the snap ring (by using snap-ring pliers), remove the stop ring and the overrunning clutch.

STARTER MOTOR PART CLEANING

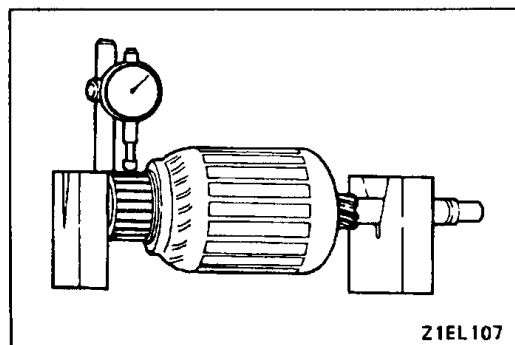
1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from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

**REASSEMBLY SERVICE POINT****►A◄ STOP RING/SNAP RING INSTALLATION**

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

**►B◄ GEAR SET HOUSING INSTALLATION**

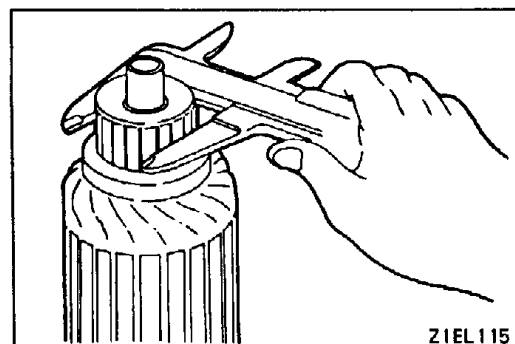
Ensure the flat of the gear set housing and the flat of the front housing are aligned together.

**INSPECTION****COMMUTATOR**

1. Place the armature on a pair of V-blocks, and check the deflection by using a dial gauge.

Standard value: 0.05 mm

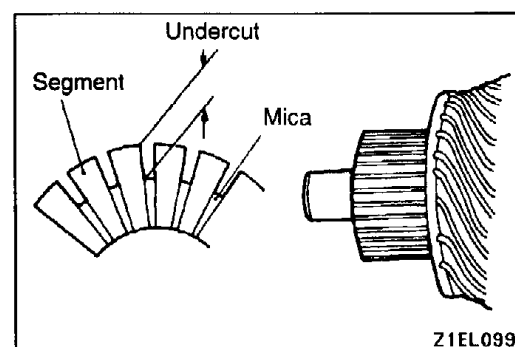
Limit: 0.1 mm



2. Check the outer diameter of the commutator.

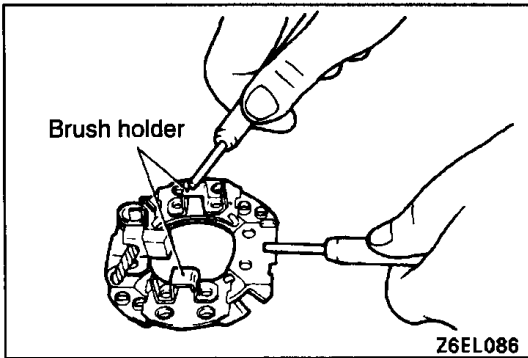
Standard value: 32.3 mm

Limit: 31.2 mm



3. Check the depth of the undercut between segments.

Standard value: 0.5 mm

**BRUSH HOLDER**

Check for continuity between the brush holder plate and the brush holder.

The normal condition is non-continuity.

**OVERRUNNING CLUTCH**

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

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.

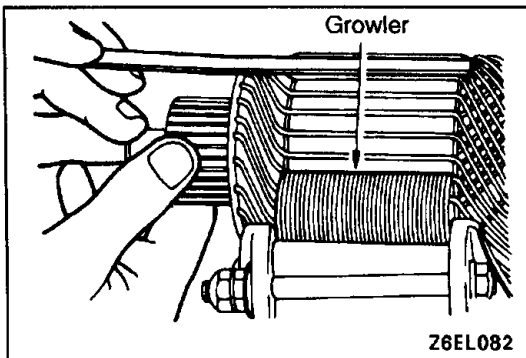
Standard value: Brush minimum length 7mm

POSITIVE BRUSHES

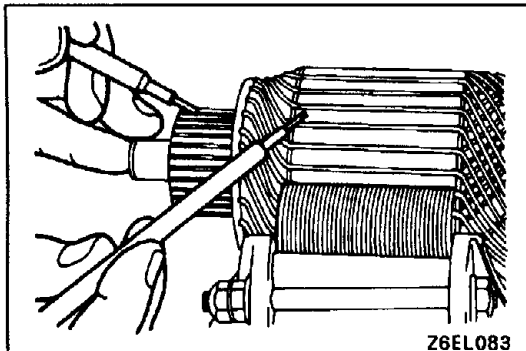
1. Cut the old brush about 1mm away from the field coil connecting strap.
2. Tin the lead with solder, take the new brush and position it on the pre-tinned lead and solder the new brush to the lead.

NEGATIVE BRUSHES

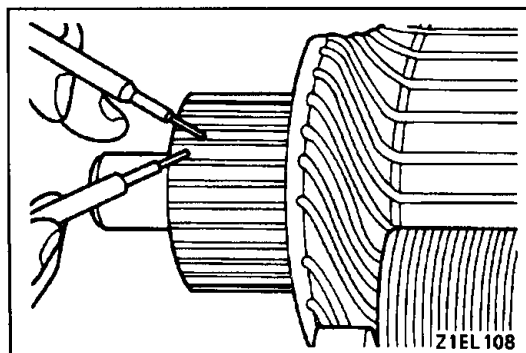
1. Cut the old brush lead flush with the brush plate.
2. Pre-tin the remaining copper lead on the brush plate with solder.
3. Using a pair of pointed nose pliers position and solder new brushes to the brush plate.

**ARMATURE TEST****ARMATURE SHORT-CIRCUIT TEST**

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

**ARMATURE COIL GROUND TEST**

Check the insulation between the armature coil cores and the commutator segments. They are normal if there is no continuity.

**ARMATURE COIL OPEN-CIRCUIT TEST**

Check for continuity between segments. The condition is normal if there is continuity.

IGNITION SYSTEM

GENERAL INFORMATION

Interruption of the primary current flowing in the primary side of the ignition coil generates high voltage in the secondary side of the ignition coil. The high voltage thus generated is directed by the distributor to the applicable spark plug. The engine firing order is 1-2-3-4-5-6 cylinders.

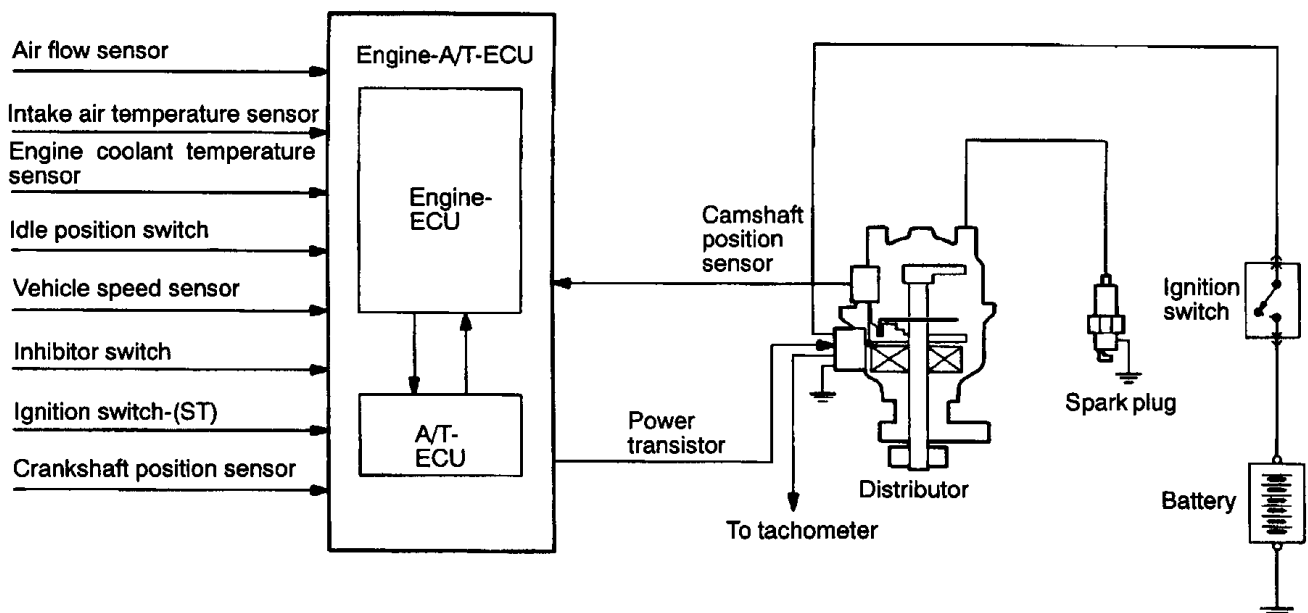
On application of high voltage, the spark plug generates a spark to ignite the compressed air fuel mixture in the combustion chamber.

The Engine-ECU makes and breaks the primary current of the ignition coil to regulate the ignition timing.

The Engine-ECU detects the crankshaft position by the crankshaft position sensor mounted on the engine to provide ignition at the most appropriate timing for the engine operating condition.

When the engine is cold or operated at a high altitude, the ignition timing is slightly advanced to provide optimum performance to the operating condition.

When the automatic transmission shifts gears, ignition timing is retarded to reduce output torque and alleviate shock during shifting.



DISTRIBUTOR SPECIFICATIONS

Items	Specifications
Type	Contact pointless with built-in ignition coil and power transistor
Advance mechanism	Electronic
Firing order	1-2-3-4-5-6

IGNITION COIL SPECIFICATION

Items	Specification
Type	Moulded single-coil incorporated in distributor

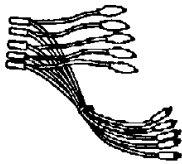
SPARK PLUG SPECIFICATION

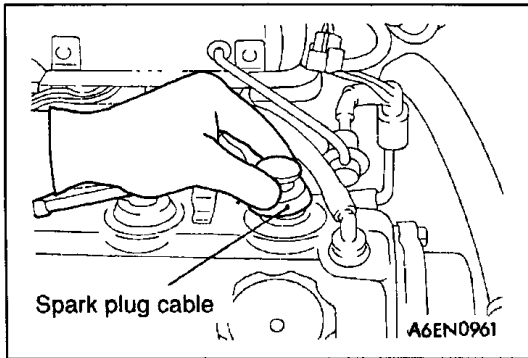
Items	Specifications
Champion	RC8YCC
NGK	BKR6E

SERVICE SPECIFICATIONS

Items	Standard value	Limit
Primary coil resistance Ω	0.5 – 0.7	–
Secondary coil resistance $k\Omega$	9 – 13	–
Spark plug cable resistance $k\Omega$	Max.22	–
Spark plug gap mm	1.0–1.1	–

SPECIAL TOOL

Tool	Number	Name	Use
	MB991348	Test harness set	Inspection of ignition primary voltage (power transistor connection)



ON-VEHICLE SERVICE

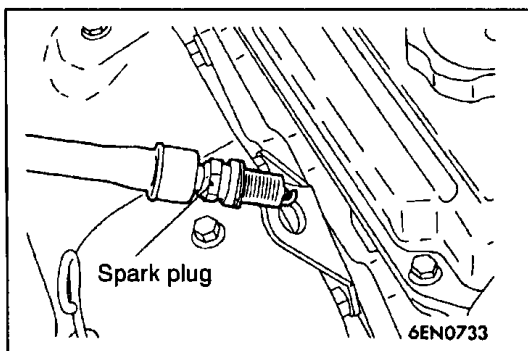
SPARK PLUG CABLE TEST

1. Disconnect, one at a time, each of the spark plug cables while the engine is idling to check whether the engine's running performance changes or not.

Caution

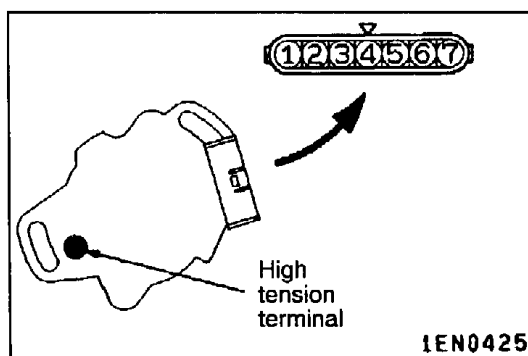
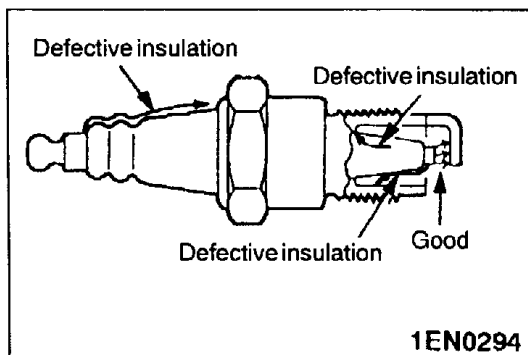
Wear rubber gloves while doing so.

2. If the engine performance does not change, check the resistance of the spark plug cable, and check the spark plug itself.



SPARK PLUG TEST

1. Remove the spark plug and connect to the spark plug cable.
2. Ground the spark plug outer electrode (body), and crank the engine. Check to be sure that there is an electrical discharge between the electrodes at this time.



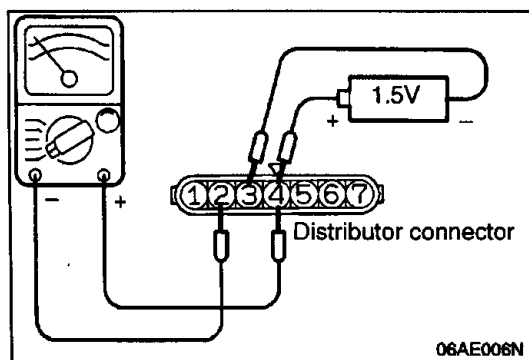
IGNITION COIL CHECK

1. Measurement of the primary coil resistance
Measure the resistance between connector terminal 1 and 2 of the distributor.

Standard value: 0.5–0.7Ω

2. Measurement of secondary coil resistance
Measure the resistance between the high-voltage terminals and connector terminals 1 or 2.

Standard value: 9–13 kΩ



POWER TRANSISTOR CHECK

NOTE

An analog-type ohmmeter should be used.

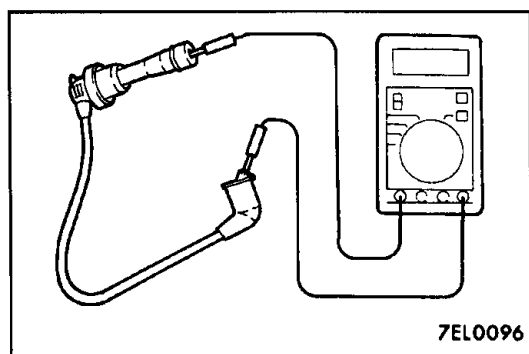
1. Connect the negative (–) terminal of the 1.5V power supply to terminal 4 of the power transistor; then check whether there is continuity between terminal 4 and terminal 2 when terminal 3 and the positive (+) terminal are connected and disconnected.

NOTE

Connect the negative (–) probe of the circuit tester to terminal 12.

Terminal 6 and (+) terminal	Terminal 5 and terminal 12
Connected	Continuity
Unconnected	No continuity

2. Replace the power transistor if there is a malfunction.



SPARK PLUG CABLE RESISTANCE CHECK

Measure the resistance of all spark plug leads.

1. Check cap and coating for cracks.
2. Measure resistance

Limit: Max. 22 k Ω

SPARK PLUG CHECK AND CLEANING

1. Remove the engine cover and intake manifold plenum, refer to GROUP 15.
2. Remove the spark plug cables.

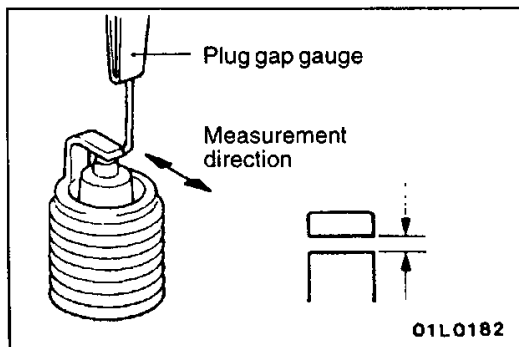
Caution

When pulling off the spark plug cable from the plug always hold the cable cap, not the cable.

3. Remove the spark plugs.
4. Check for burned out electrode or damaged insulator. Check for even burning.
5. Remove carbon deposits with a plug cleaner. Remove sand from plug screw with compressed air.

Caution

When cleaning platinum tip spark plugs the tip may be damaged. If carbon deposits must be removed use a plug cleaner and complete cleaning within 20 seconds. Do not use a wire brush.



6. Use a plug gap gauge to check that the plug gap is within the standard value range. Replace the spark plug if the limit is exceeded.

Standard value: 1.0–1.1 mm

NOTE

On conventional type plugs, if plug is outside the specified value range, adjust by bending the earth electrode. If the plug gap is outside the specified value range on platinum tip plugs, the plug must be replaced.

7. Clean the engine plug holes.

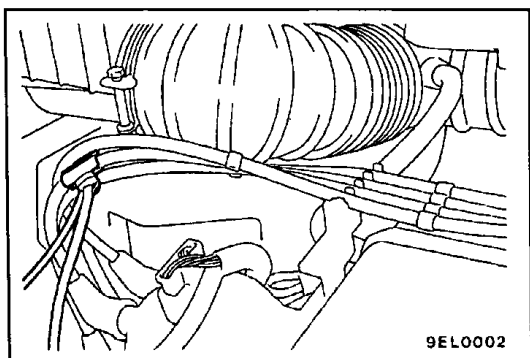
Caution

Use care not to allow foreign matter in cylinders.

8. Install the spark plugs.

CAMSHAFT POSITION SENSOR CHECK

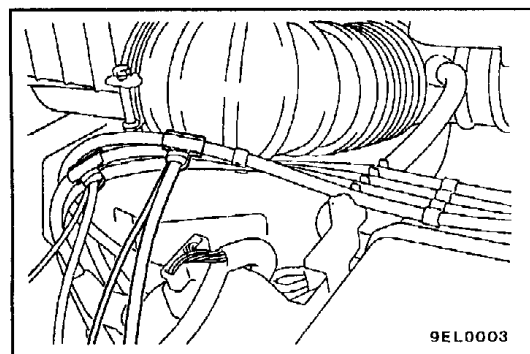
Refer to GROUP 13A – Troubleshooting.



IGNITION SECONDARY VOLTAGE WAVE PATTERN CHECK

MEASUREMENT METHOD

1. Clamp the spark plug cable (No. 1, No. 2, No. 3, No.4, No. 5 or No. 6) with the secondary pickup.

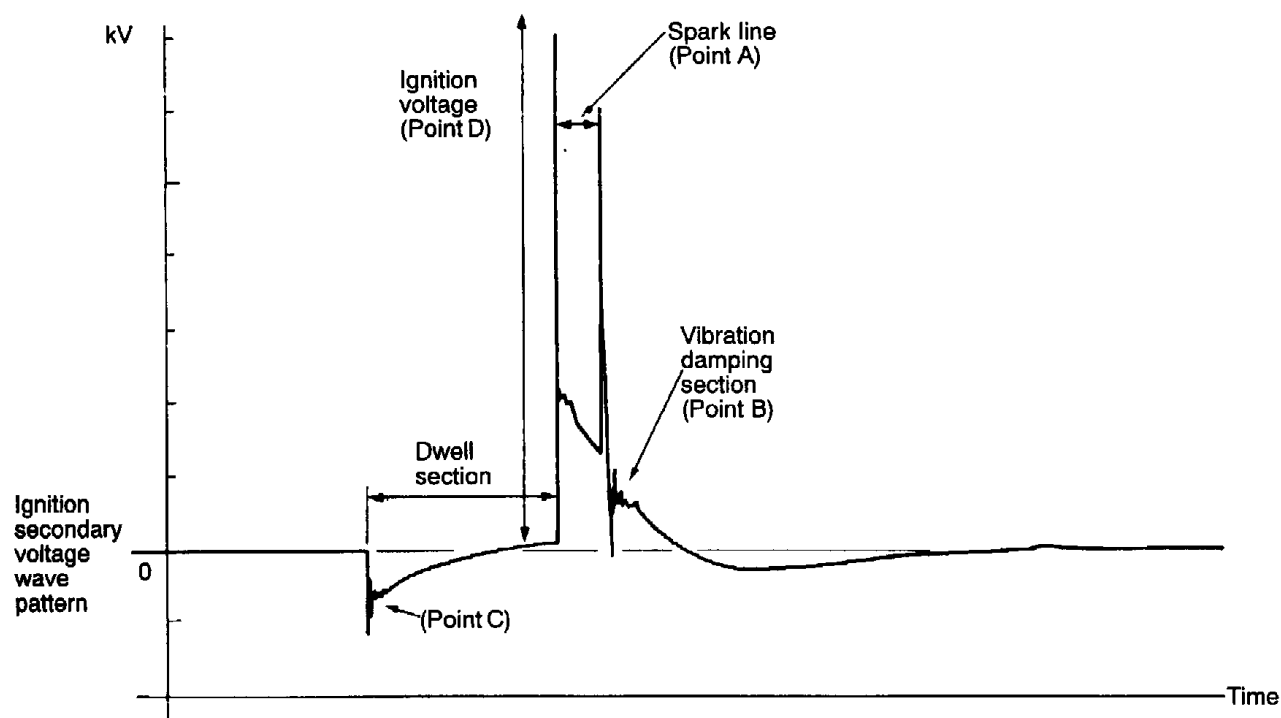


2. Clamp the No. 1 cylinder spark plug cable with the trigger pickup.

STANDARD WAVE PATTERN

Observation conditions

FUNCTION	SECONDARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine Speed	Curb idle speed



WAVEFORM OBSERVATION POINTS

Point A: The height, length and slope of the spark line (refer to abnormal waveform examples 1, 2, 3 and 4) show the following trends.

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
Length	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High Resistance
Height	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	—	—	—	—

Point B: Number of vibration in reduction vibration section
(Refer to abnormal waveform example 5)

Number of vibrations	Coil and condenser
Three or more	Normal
Except above	Abnormal

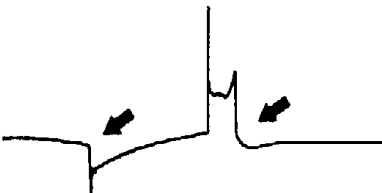
Point C: Number of vibrations at beginning of dwell section
(Refer to abnormal waveform example 5)

Number of vibrations	Coil
5–6 or higher	Normal
Except above	Abnormal

Point D: Ignition voltage height (distribution per each cylinder) shows the following trends.

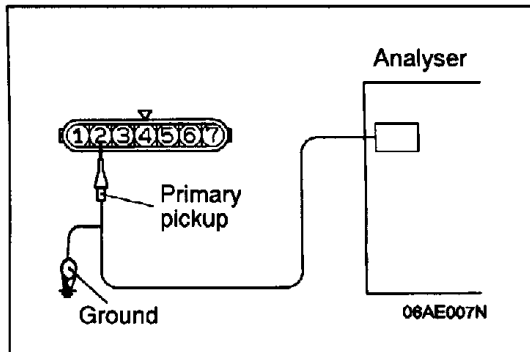
Ignition voltage	Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
High	Large	Large wear	High	Lean	Retarded	High resistance
Low	Small	Normal	Low	Rich	Advanced	Leak

ABNORMAL WAVEFORMS EXAMPLES

Abnormal waveform	Wave characteristics	Cause of problem
Example 1  01P021	Spark line is high and short.	Spark plug gap is too large.
Example 2  01P0216	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.	Spark plug gap is too small.
Example 3  01P0217	Spark line is low and long, and is sloping. However, there is almost no spark line distortion.	Spark plug gap is fouled.
Example 4  01P0218	Spark line is high and short. Difficult to distinguish between this and abnormal wave pattern example 1.	Spark plug cable is nearly falling off. (Causing a dual ignition)
Example 5  01P0219	No waves in wave damping section	Rare short in ignition coil.

IGNITION PRIMARY VOLTAGE WAVE PATTERN CHECK**MEASUREMENT METHOD**

1. Disconnect the distributor connector and connect the special tool (test harness: MB991348) in between. (All of the terminals should be connected.)



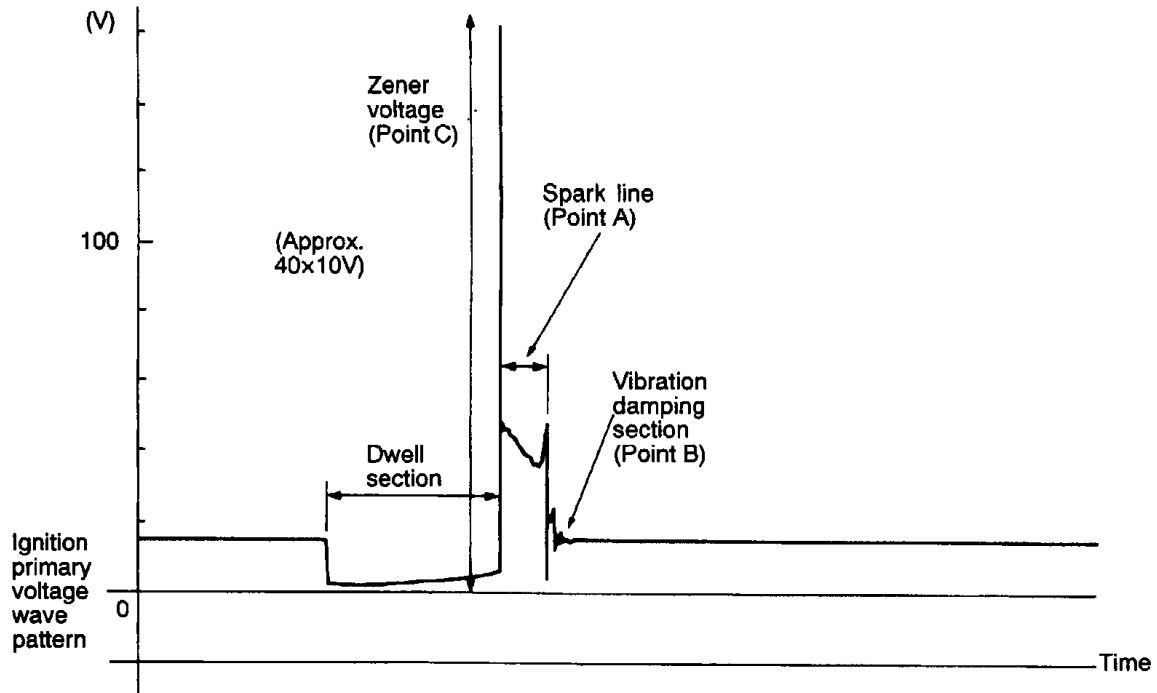
2. Connect the analyser primary pickup to the distributor connector terminal 2.
3. Connect the primary pickup earth terminal.
4. Clamp the spark plug cable with the trigger pickup.

NOTE

The wave pattern of the cylinder clamped to the trigger pickup will appear at the left edge of the screen.

STANDARD WAVE PATTERN**Observation conditions**

FUNCTION	SECONDARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine Speed	Curb idle speed

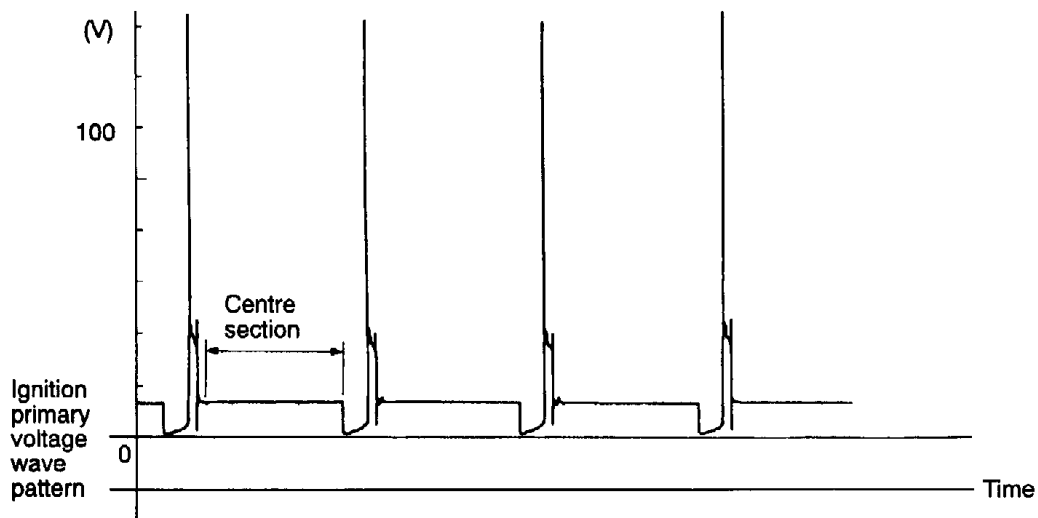


7EL0132

Observation conditions

(Only the pattern selector shown below changes from the previous conditions)

PATTERN SELECTOR	DISPLAY
------------------	---------



9EL0006

WAVEFORM OBSERVATION POINTS

Point A: The height, length and slope of the spark line (refer to abnormal waveform examples 1, 2, 3 and 4) show the following trends.

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
Length	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High Resistance
Height	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	—	—	—	—

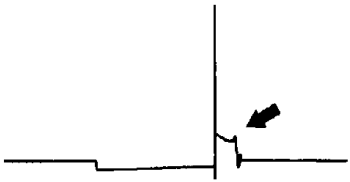
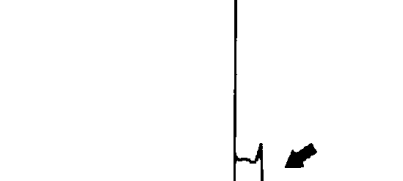
Point B: Number of vibration in reduction vibration section
(Refer to abnormal waveform example 5)

Number of vibrations	Coil, condenser
3 or higher	Normal
Except above	Abnormal

Point C: Height of Zener voltage

Height of Zener voltage	Probable cause
High	Problem in Zener diode
Low	Abnormal resistance in primary coil circuit

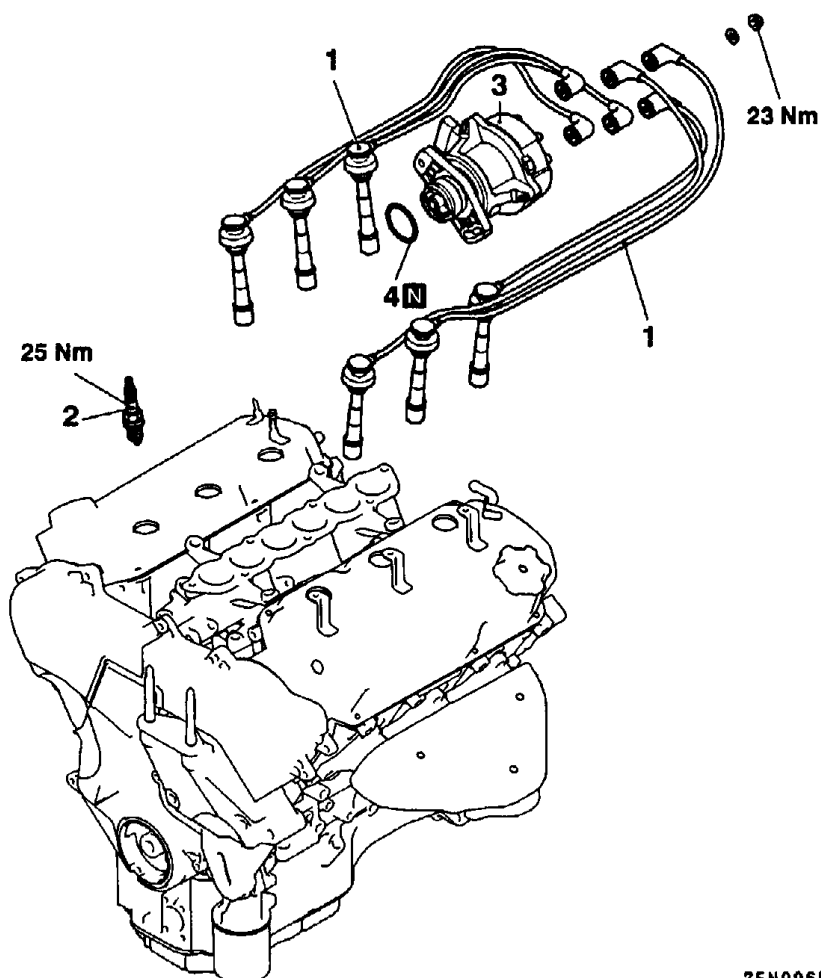
ABNORMAL WAVEFORMS EXAMPLES

Abnormal waveform	Wave characteristics	Cause of problem
Example 1  01P0210	Spark line is high and short.	Spark plug gap is too large.
Example 2  01P0211	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.	Spark plug gap is too small.
Example 3  01P0212	Spark line is low and long, and is sloping. However, there is almost no spark line distortion.	Spark plug gap is fouled.
Example 4  01P0213	Spark line is high and short.	Spark plug cable is nearly falling off. (Causing a dual ignition)
Example 5  01P0214	No waves in wave damping section	Rare short in ignition coil.

IGNITION SYSTEM

REMOVAL AND INSTALLATION

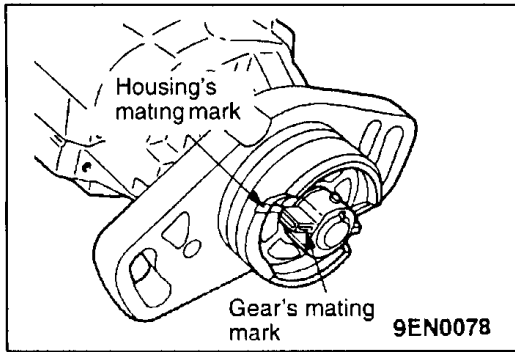
Pre-removal and Post-Installation Operation
Engine cover removal and installation (Refer to GROUP
11 – Intake Manifold Plenum and Throttle Body.)



7EN0965

Removal steps

- B◄ 1. Spark plug cable
- 2. Spark plug
- A◄ 3. Distributor
- 4. O-ring



INSTALLATION SERVICE POINTS

►A◄ DISTRIBUTOR INSTALLATION

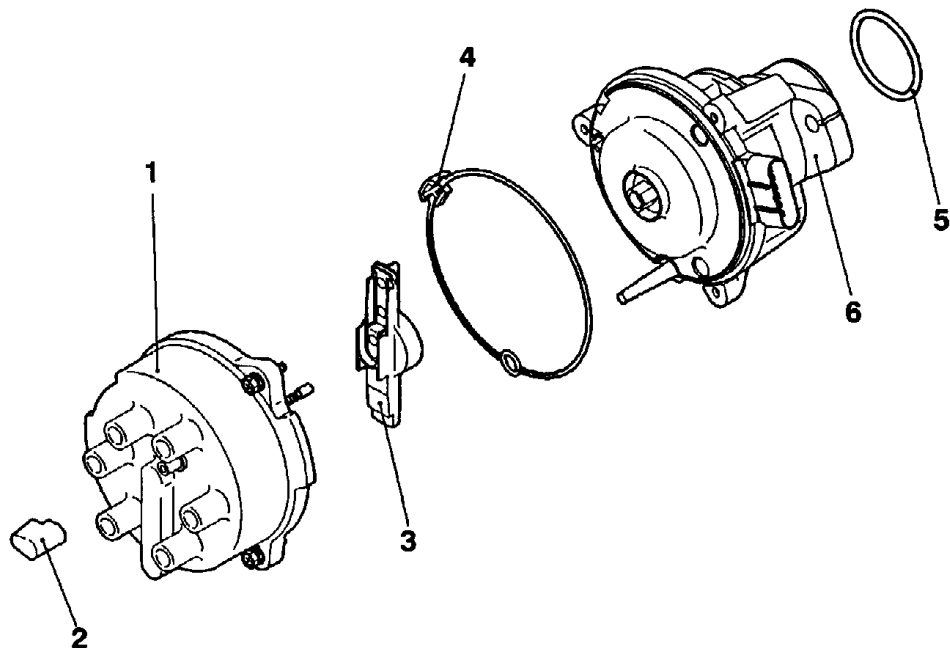
1. Turn the crankshaft so that the No. 1 cylinder is at top dead centre.
2. Align the distributor housing and gear mating marks and install the distributor.

►B◄ SPARK PLUG CABLE INSTALLATION

Improper arrangement of spark plug cables will induce voltage between the cables, causing misfiring and developing a surge at acceleration in high-speed operation.

Therefore, be careful to arrange the spark plug cables properly paying attention to the following items.

1. Install the cables securely to avoid possible contact with metal parts.
2. Install the cables neatly, ensuring they are not too tight, loose, twisted or kinked.

DISTRIBUTOR**DISASSEMBLY AND REASSEMBLY**

7EN0964

Disassembly steps

1. Distributor cap
2. Breather
3. Rotor
4. Seal
5. O-ring
6. Distributor housing

INSPECTION

Check the following points; repair or replace if a problem is found.

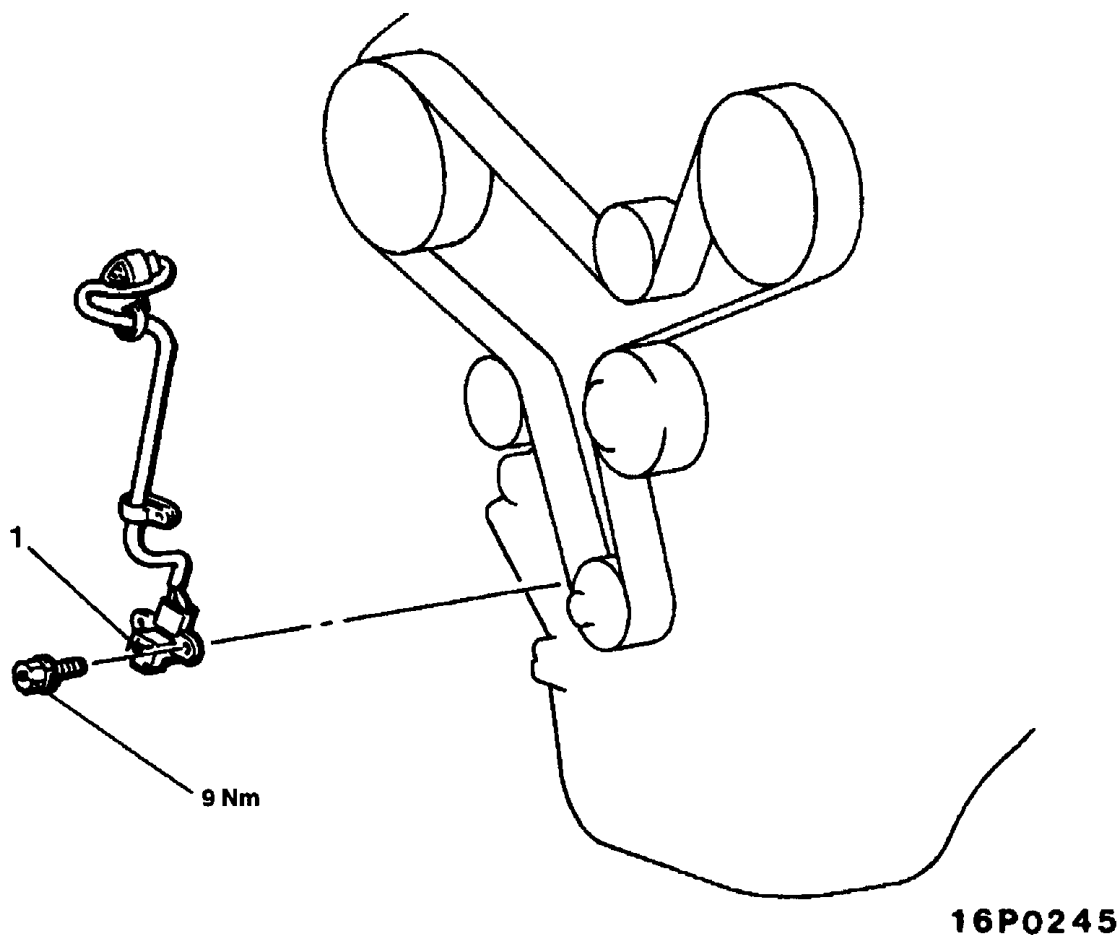
CAP ROTOR

1. There must be no cracking in the cap.
2. There must be no damage to the cap's electrode or the rotor's electrode.
3. Clean away any dirt from the cap and rotor.

CRANKSHAFT POSITION SENSOR

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Timing Belt Cover Removal and Installation
(Refer to GROUP 11 – Timing Belt.)



Removal steps

1. Crankshaft position sensor

INSPECTION

CRANKSHAFT POSITION SENSOR CHECK

Refer to GROUP 13A – Troubleshooting.

ENGINE AND EMISSION CONTROL

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		Check	39

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 EGR Valve Check 44

 EGR Port Vacuum Check 45

 EGR Solenoid Check 45

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ENGINE CONTROL SYSTEM

GENERAL INFORMATION

A cable-type accelerator mechanism and a suspended-type pedal have been adopted.

SERVICE SPECIFICATIONS

Items	Standard value
Accelerator cable play mm	3–5
Engine idle speed r/min	700 ± 50

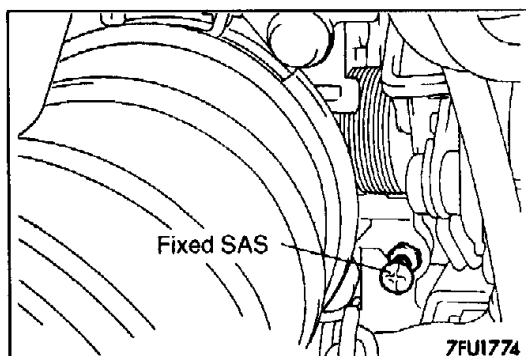
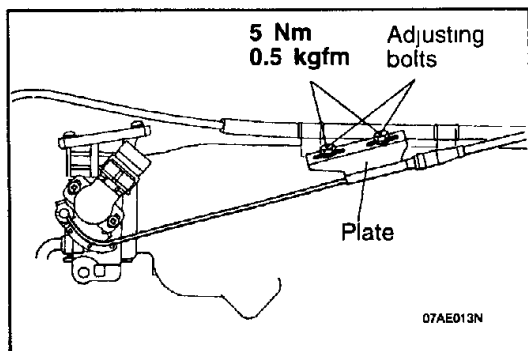
ON-VEHICLE SERVICE

ACCELERATOR CABLE CHECK AND ADJUSTMENT

1. Turn A/C and lights OFF.
Inspect and adjust at no load.
 2. Warm engine until stabilised at idle.
 3. Confirm idle speed is at prescribed r/min.
 4. Stop engine (ignition switch OFF).
 5. Confirm there are no sharp bends in accelerator cable.
 6. Check inner cable for correct slack.
 7. If there is too much slack or no slack, adjust play by the following procedures.
 - (1) Loosen the adjusting bolt to release the cable.
 - (2) After moving the plate to the position immediately before the throttle lever starts to move, move the plate back towards the throttle body by the standard value amount only to bring the accelerator cable play to the standard value.

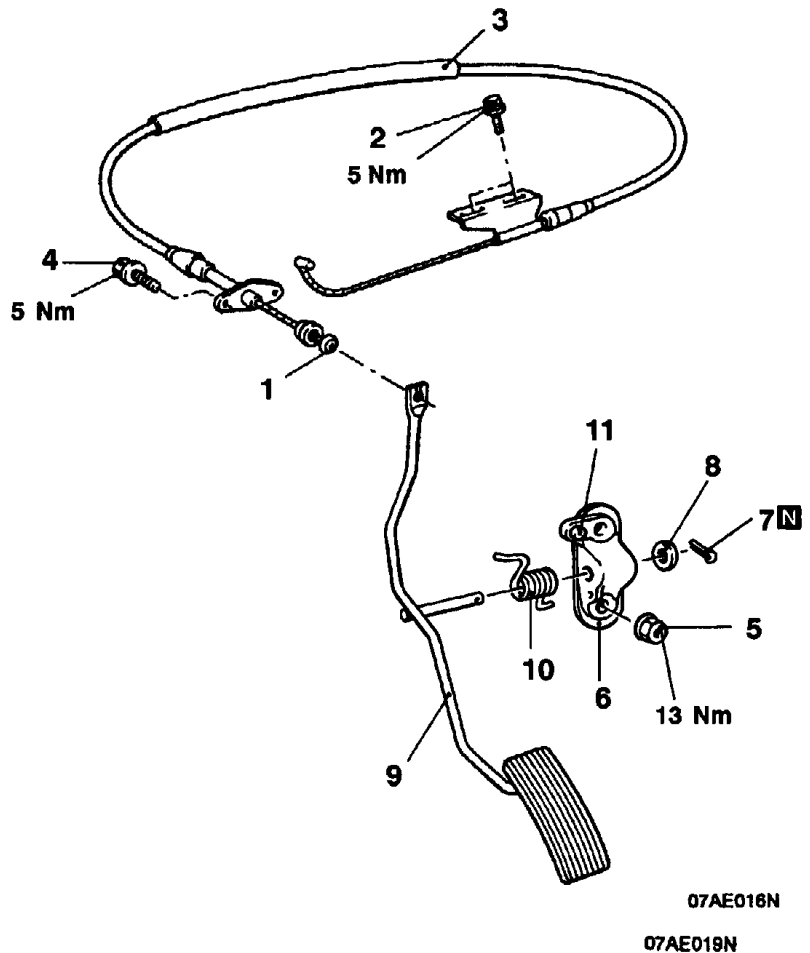
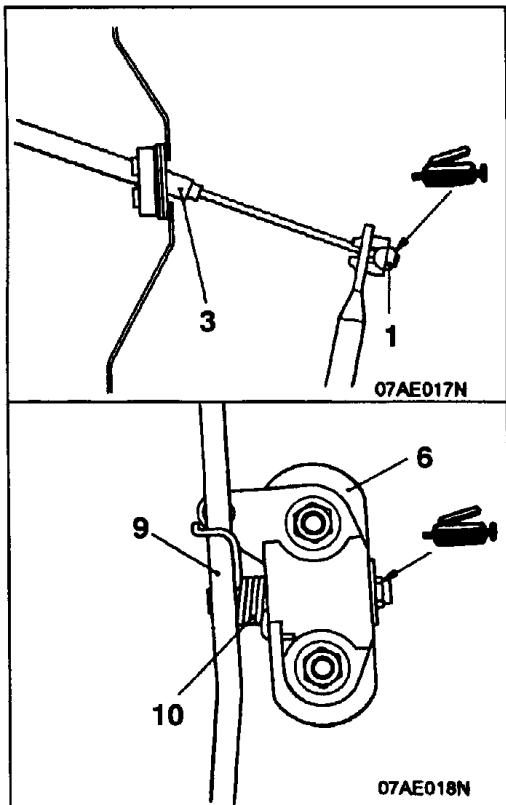
Standard value: 3–5 mm

 - (3) Tighten the adjusting bolts to the specified torque.
8. Adjust accelerator cable play and confirm throttle lever stopper touches the fixed SAS.



ACCELERATOR CABLE AND PEDAL REMOVAL AND INSTALLATION

Post-Installation Operation
Adjusting the Accelerator Cable (Refer to P.17-3.)

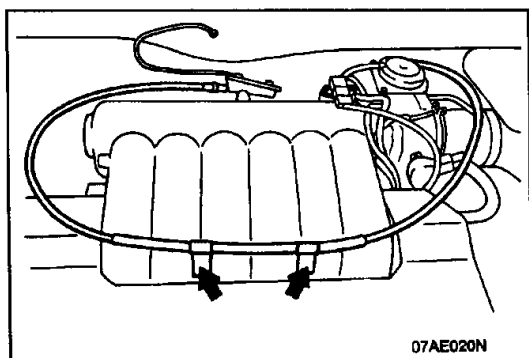


Removal steps of accelerator cable

- A◄
1. Accelerator cable connection
 2. Adjusting bolts
 3. Accelerator cable
 4. Bolt

Removal steps of accelerator pedal

5. Nut
6. Accelerator pedal bracket
7. Cotter pin
8. Washer
9. Accelerator pedal
10. Spring
11. Accelerator pedal stopper

**INSTALLATION SERVICE POINT****►A◄ ACCELERATOR CABLE INSTALLATION**

Install the accelerator cable, ensuring that the cable is securely clamped in the support clips as shown by the arrows.

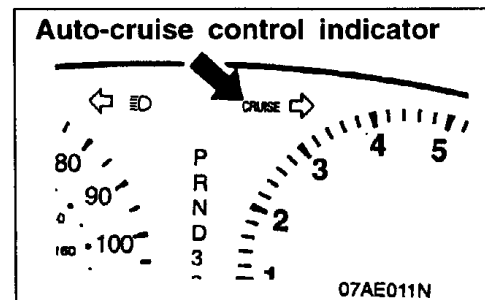
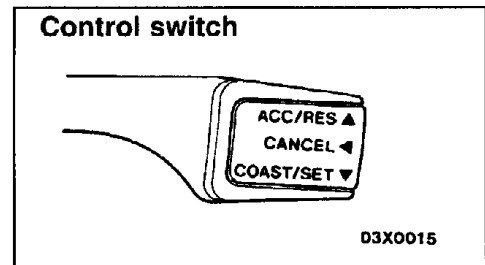
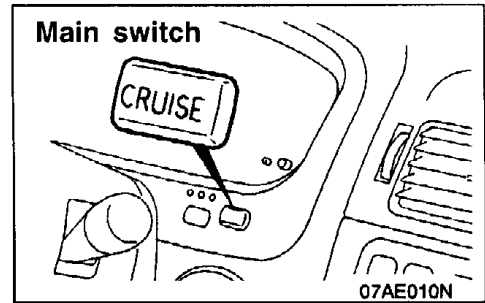
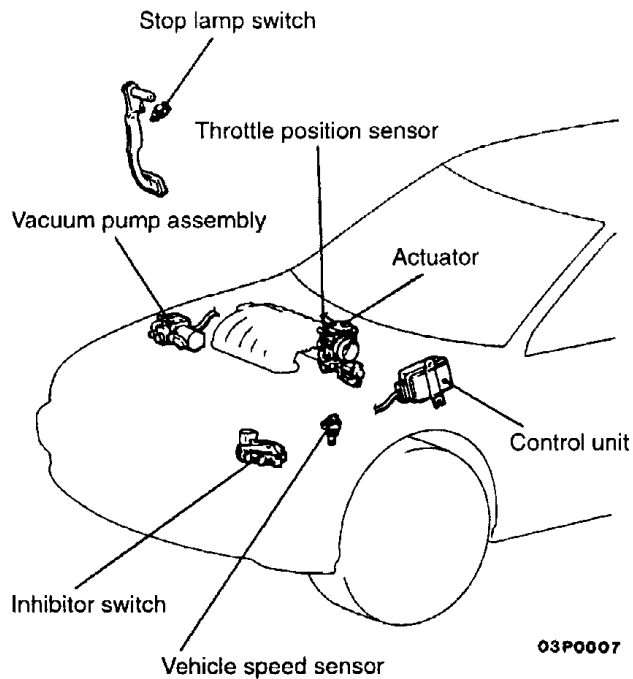
AUTO-CRUISE CONTROL SYSTEM

GENERAL INFORMATION

By using the auto-cruise control, the driver can drive at the speed he/she likes [in a range of approxi-

mately 40–200 km/h] without depressing the accelerator pedal.

CONSTRUCTION DIAGRAM

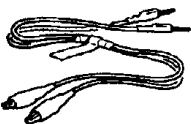


07AE014N

SERVICE SPECIFICATIONS

Items	Standard value
Accelerator cable play mm	3–5

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	• Reading diagnosis codes • Auto-cruise control system inspection
	—	ROM Pack	
	MB991529	Diagnosis code check harness	Checking the diagnosis codes

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or voltmeter. (Refer to GROUP 00 – How to use Troubleshooting/Inspection Service Points.)

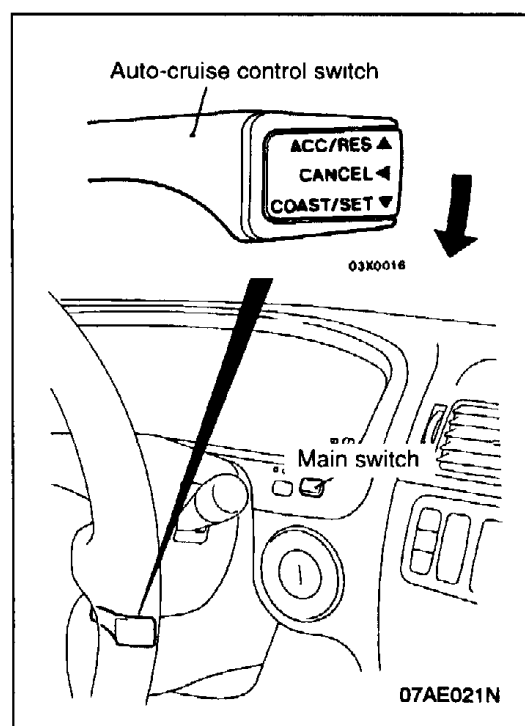
ERASING DIAGNOSIS CODES

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

METHOD OF ERASING DIAGNOSIS CODES

The diagnosis codes can be erased by disconnecting the (–) cable from the battery for 10 seconds or more and then re-connecting it, or by the following procedure.

1. Turn the ignition switch to ON.
2. With the SET switch at the ON position, press the main switch to ON, and within 1 second after this, turn the RESUME switch to ON.
3. With the SET switch once more at the ON position, hold the stop lamp switch ON for a continuous period of 5 seconds or more.



INPUT SWITCH CODE INSPECTION METHOD

1. Connect the MUT-II to the diagnosis connector (16-pin) underneath the instrument under cover.
2. With the ignition switch in the ON position, press the cruise control SET switch to the ON position.
3. Within 1 second after pressing the cruise control main switch to ON, turn the cruise control RESUME switch to ON.
4. Operate each switch listed in the input inspection table and take a reading of the input switch codes with the MUT-II.

Input Inspection Table

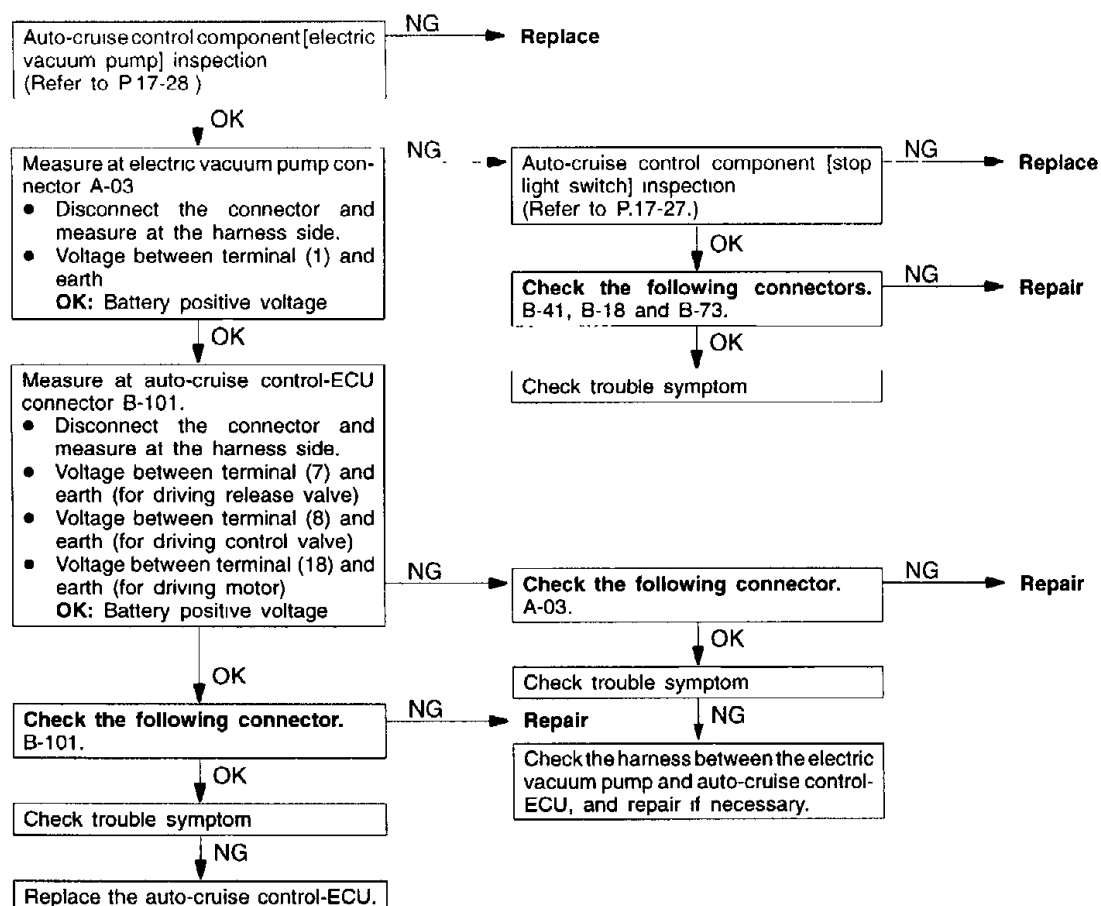
Code No.	Input operation	Operation judgement
21	SET switch ON	Auto-cruise control-ECU judges that SET switch is ON
22	RESUME switch ON	Auto-cruise control-ECU judges that RESUME switch is ON
23	Stop lamp switch (ON when brake pedal is depressed)	Auto-cruise control-ECU judges that stop lamp switch is ON
24	Vehicle speed signal	Auto-cruise control-ECU judges that vehicle speed is 40 km/h or higher
25		Auto-cruise control-ECU judges that vehicle speed is lower than 40 km/h
26	Inhibitor switch (ON when select lever in N range) <A/T> Clutch pedal switch (ON when clutch pedal is depressed) <M/T>	Auto-cruise control-ECU judges that the inhibitor switch or clutch pedal switch is ON
27	CANCEL switch ON	Auto-cruise control-ECU judges that CANCEL switch is ON
28	Throttle position sensor signal	Auto-cruise control-ECU judges that throttle position sensor voltage is 1.5 V or more
29	Idle position switch	Auto-cruise control-ECU judges that idle position switch is OFF

INSPECTION CHART FOR DIAGNOSIS CODES

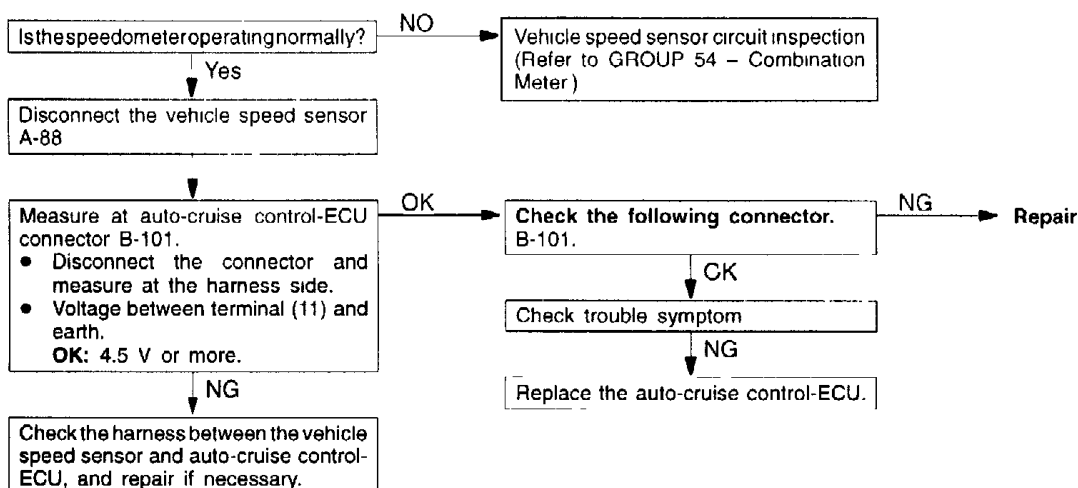
Code No.	Diagnosis items	Reference page
11	Electric vacuum pump drive system	17-10
12	Vehicle speed sensor system	17-11
14	Electric vacuum pump power supply system	17-11
15	Auto-cruise control switch	17-11
16	Auto-cruise control-ECU	17-12
17	Throttle position sensor system	17-12

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

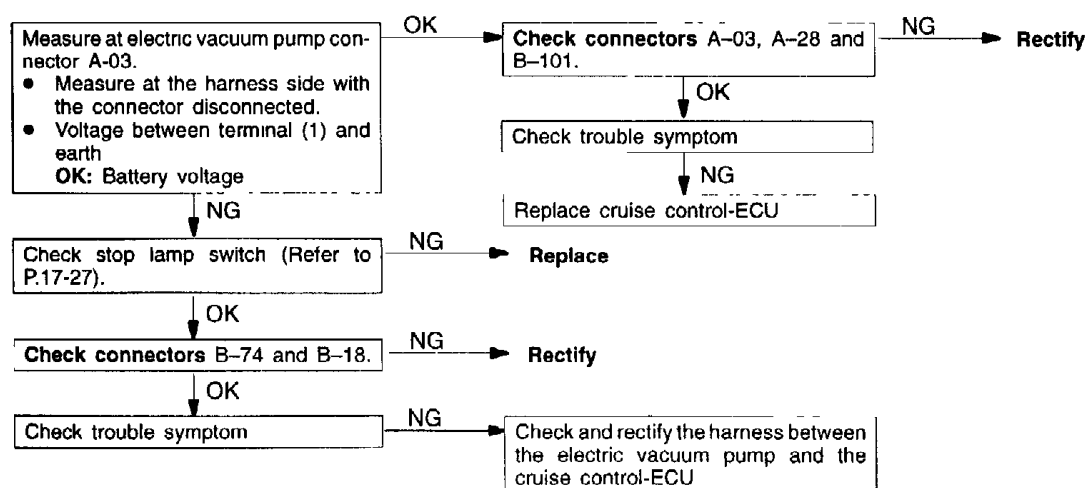
Code No.11 Electric vacuum pump drive system	Probable cause
This diagnosis code is output if the release valve, control valve and motor drive signals from the electric vacuum pump are not input to the auto-cruise control-ECU.	• Malfunction of the electric vacuum pump • Malfunction of the stop lamp switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



Code No.12 Vehicle speed signal system	Probable cause
This diagnosis code is output if the vehicle speed signals from the vehicle speed sensor are not input to the auto-cruise control-ECU when the vehicle speed is 40 km/h or more.	• Malfunction of the vehicle speed sensor • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



Code No.14 Electric vacuum pump power supply system	Probable cause
This diagnosis code is output if the electric vacuum pump release valve, control valve and motor driving signals are not input into the cruise control-ECU.	• Stop lamp switch fault • Connector fault • Harness fault • Cruise control-ECU fault



Code No.15 Auto-cruise control switch	Probable cause
This diagnosis code is output if the cruise control RESUME switch, SET switch or CANCEL switch remains ON.	• Malfunction of the auto-cruise control switch

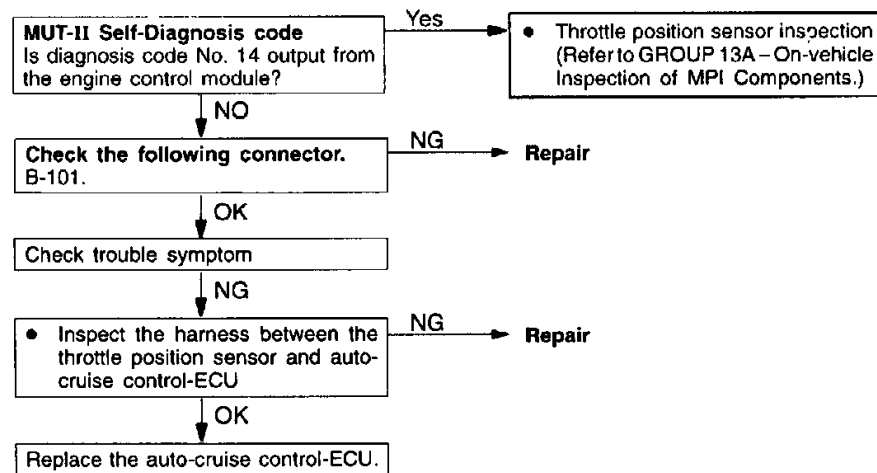
Replace the auto-cruise control switch.

17-12 ENGINE AND EMISSION CONTROL – Auto-cruise Control System

Code No.16 Auto-cruise control-ECU	Probable cause
This diagnosis code is output if there is an abnormality in the CANCEL hold circuit or the microprocessor monitor circuit in the auto-cruise control-ECU.	• Malfunction of the auto-cruise control-ECU

Replace the auto-cruise control-ECU.

Code No.17 Throttle position sensor system	Probable cause
This diagnosis code is output if a voltage of 1.5 V or more when the idle position switch is ON or 0.2 V or less when the idle position switch is OFF is output for a continuous period of 4 seconds or more.	• Malfunction of the throttle position sensor • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	17-13
	Communication with auto-cruise control-ECU only is not possible.	2	17-14
Input switch inspection using the MUT-II is not possible. (However, diagnosis inspection is possible.)		3	17-15
Auto-cruise control is not cancelled.	Even if brake pedal is depressed	4	17-16
	Even if the clutch pedal is depressed <M/T>	5	17-17
	Even if the select lever is set to N range <A/T>	6	17-18
	Even if CANCEL switch is set to ON	7	17-18
The diagnosis result displayed on the MUT-II is normal even though auto-cruise control cannot be set.		8	17-19
Auto-cruise control cannot be set.		9	17-20
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		10	17-21
Even though auto-cruise control main switch is ON, switch indicator does not illuminate. (However, auto-cruise control is normal.)		11	17-21
Auto-cruise control main switch illumination lamp does not illuminate.		12	17-22
Auto-cruise control indicator lamp inside combination meter does not illuminate. (However, auto-cruise control is normal.)		13	17-22

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**INSPECTION PROCEDURE 1**

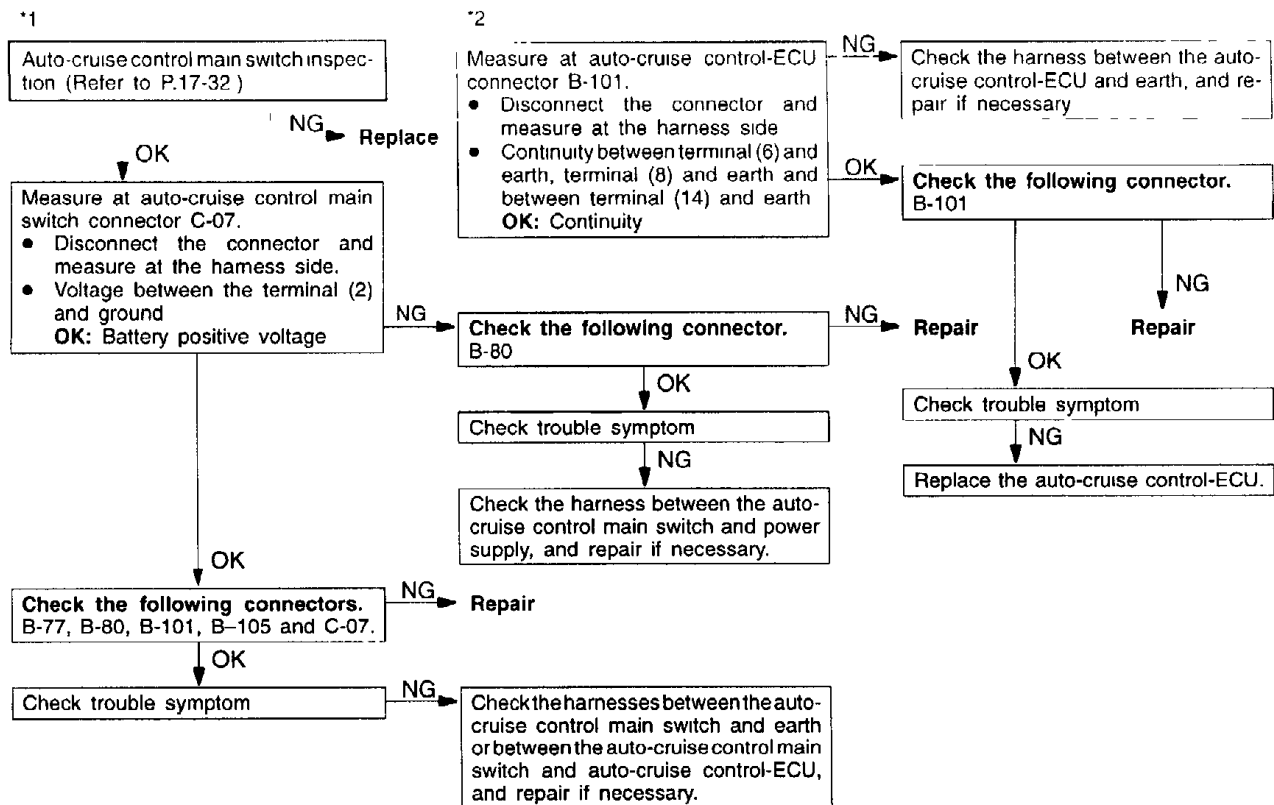
Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The reason is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness

Refer to GROUP 13A – Troubleshooting

17-14 ENGINE AND EMISSION CONTROL – Auto-cruise Control System

INSPECTION PROCEDURE 2

Communication with MUT-II is not possible. (Communication with auto-cruise control-ECU only is not possible.)	Probable cause
The cause is probably a malfunction of auto-cruise control main switch circuit or a malfunction of auto-cruise control-ECU earth circuit	• Malfunction of the auto-cruise control main switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



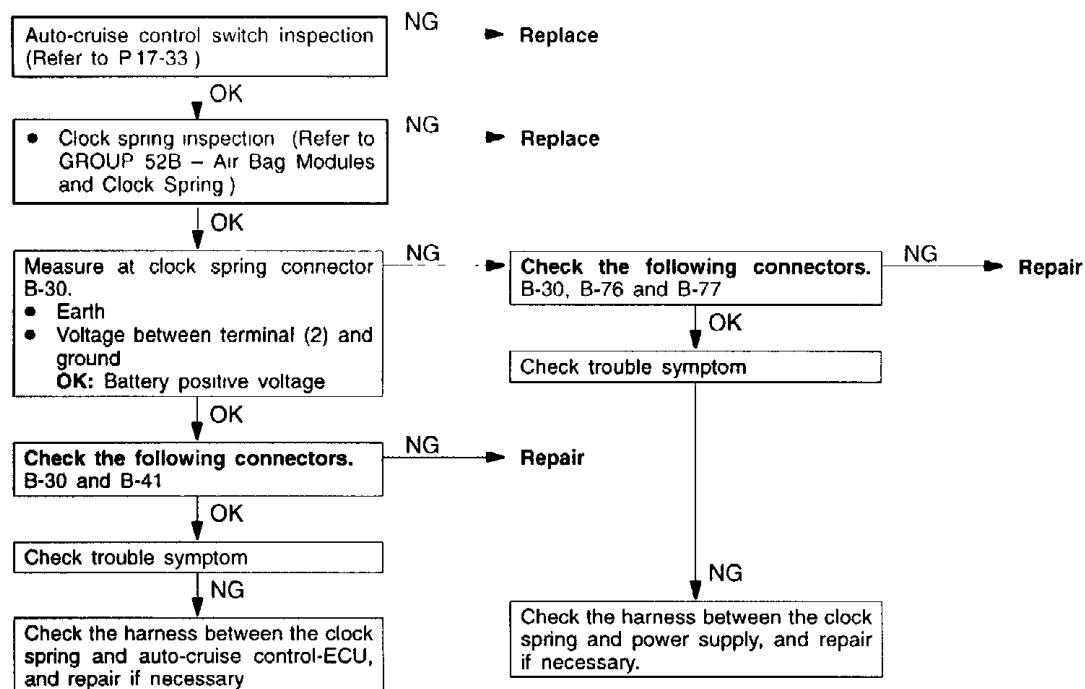
NOTE

*1 indicates malfunction of the auto-cruise control main switch circuit.

*2 indicates malfunction of the auto-cruise control-ECU earth circuit.

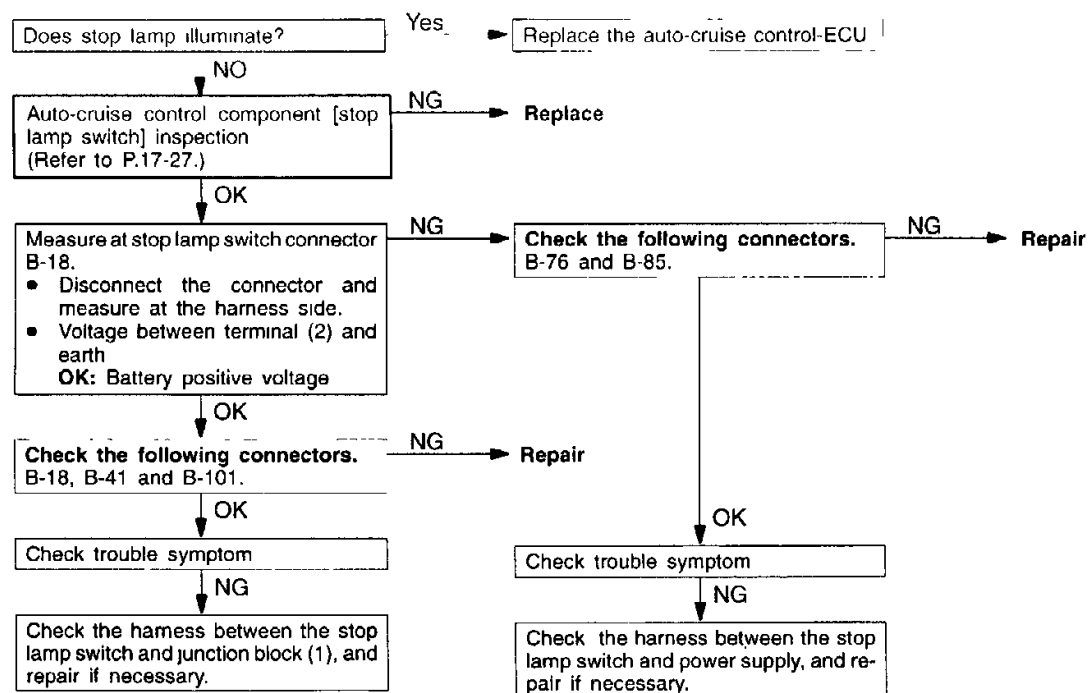
INSPECTION PROCEDURE 3

Input switch inspection using the MUT-II is not possible. (However, diagnosis inspection is possible.)	Probable cause
The cause is probably a malfunction of auto-cruise control switch circuit system	• Malfunction of the auto-cruise control switch • Malfunction of the clock spring • Malfunction of the connector • Malfunction of the harness



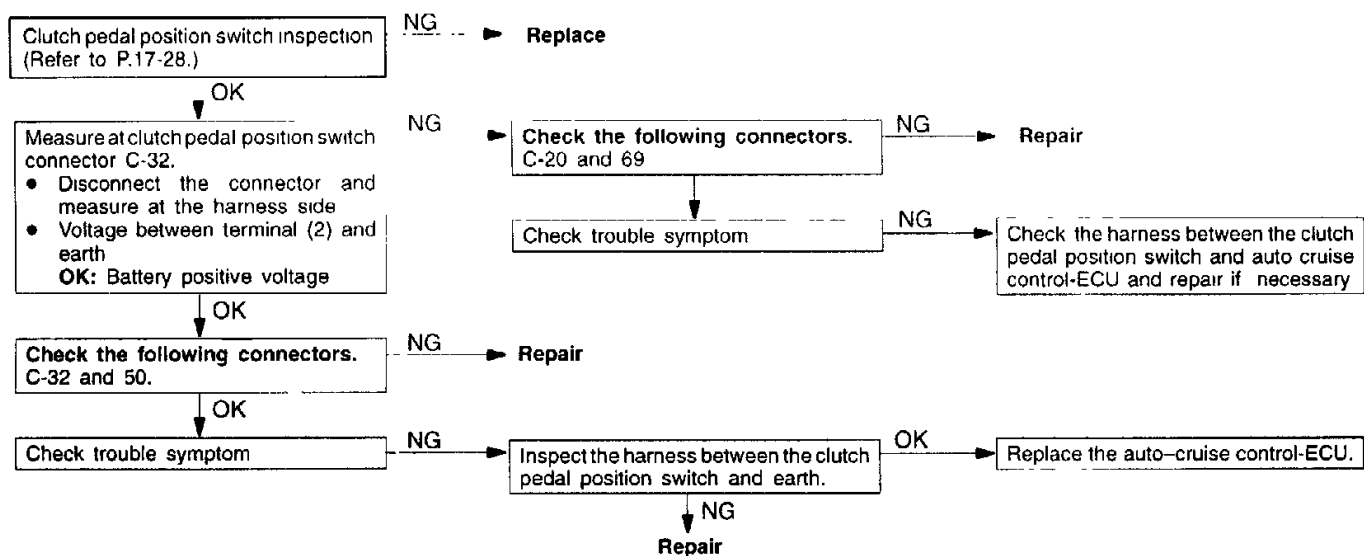
INSPECTION PROCEDURE 4

Even if brake pedal is depressed, auto-cruise control is not cancelled.	Probable cause
The cause is probably a malfunction of stop lamp switch or a malfunction of stop lamp circuit.	• Malfunction of the stop lamp switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



INSPECTION PROCEDURE 5

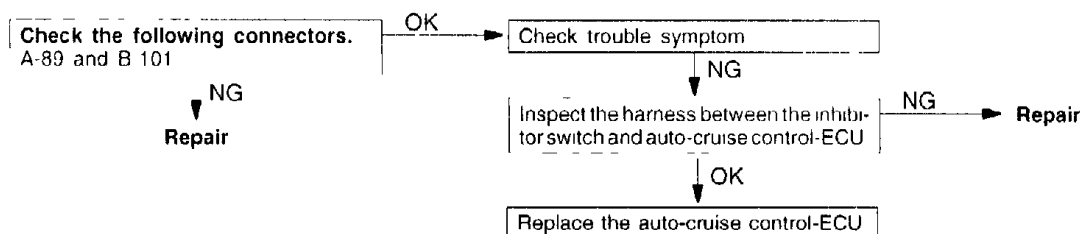
Even if clutch pedal is depressed, auto-cruise control is not cancelled. <M/T>	Probable cause
The cause is probably a malfunction of clutch pedal position switch or clutch circuit	• Malfunction of the clutch pedal position switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



17-18 ENGINE AND EMISSION CONTROL – Auto-cruise Control System

INSPECTION PROCEDURE 6

Even if select lever is set to N range, auto-cruise control is not cancelled. <A/T>	Probable cause
The cause is probably an open-circuit in the output signal circuit in N range	• Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



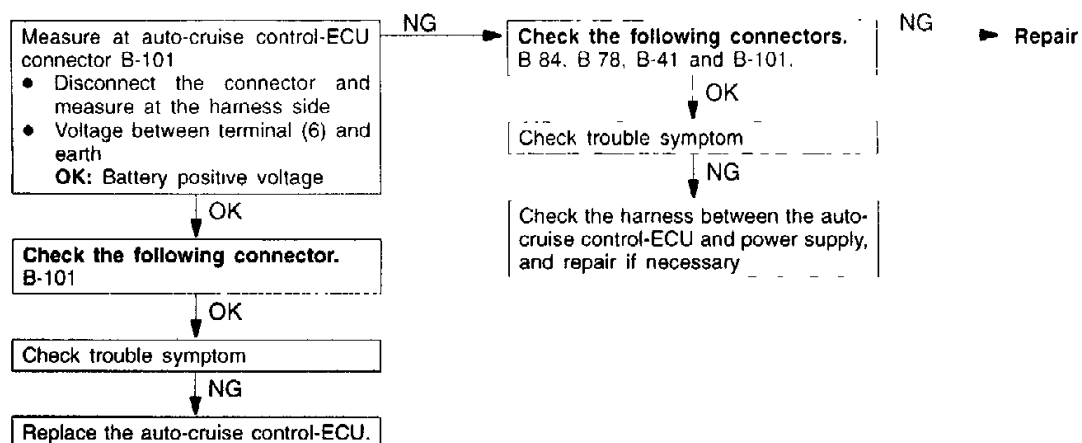
INSPECTION PROCEDURE 7

Even if auto-cruise control CANCEL switch is set to ON, auto-cruise control is not cancelled.	Probable cause
The cause is probably an open-circuit in the circuit inside the CANCEL switch.	• Malfunction of the auto-cruise control-ECU

Replace the auto-cruise control switch.

INSPECTION PROCEDURE 8

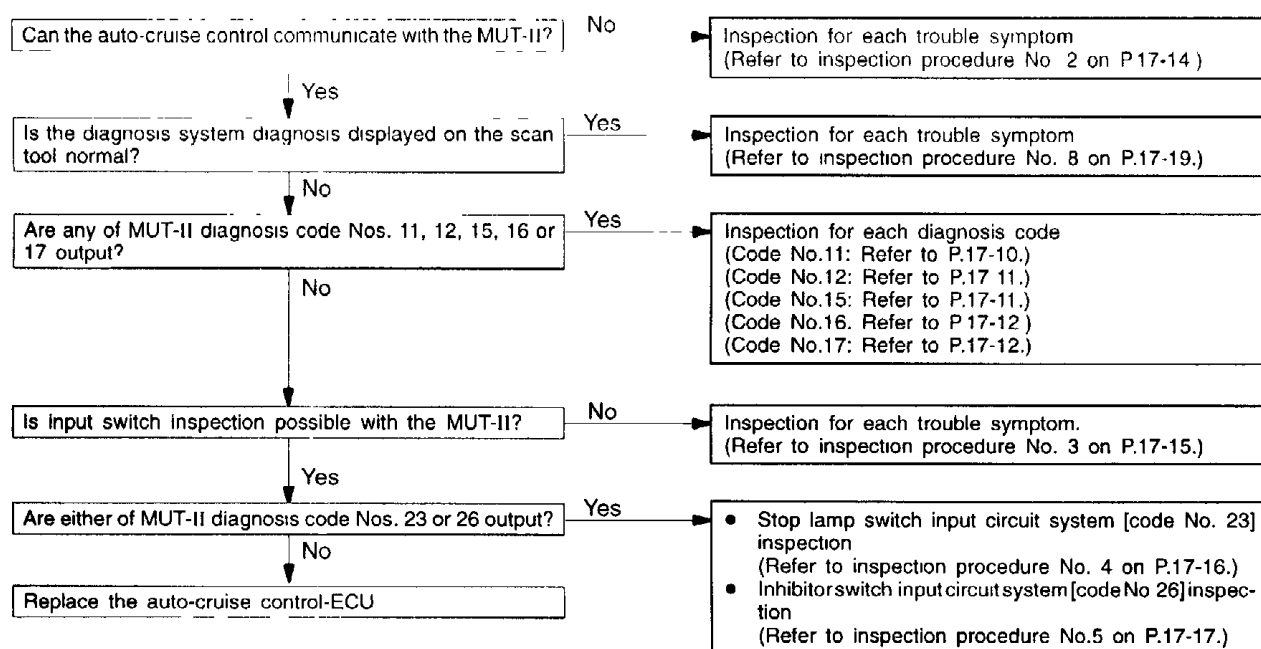
The diagnostic result displayed on the MUT-II is normal even though auto-cruise control cannot be set.	Probable cause
Because of an open-circuit in the battery backup circuit system, the fail-safe function prevents diagnosis codes from being memorised and displayed even though auto-cruise control is cancelled.	• Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



17-20 ENGINE AND EMISSION CONTROL – Auto-cruise Control System

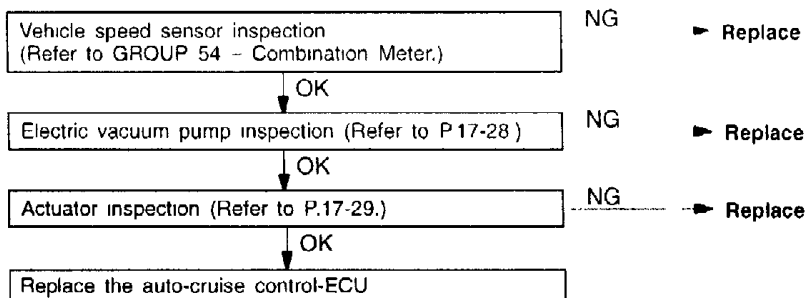
INSPECTION PROCEDURE 9

Auto-cruise control cannot be set.	Probable cause
The cause is probably that the fail-safe function is cancelling auto-cruise control. In this case, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes. The MUT-II can also be used to check if the circuits of each input switch are normal or not by inspecting the input switch codes.	• Malfunction of the auto-cruise control main switch • Malfunction of the auto-cruise control switch • Malfunction of the clock spring • Malfunction of the harnesses or connectors • Malfunction of the auto-cruise control-ECU



INSPECTION PROCEDURE 10

Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.	Probable cause
The cause is probably a malfunction of vehicle speed sensor or incorrect vacuum in the electric vacuum pump or actuator	• Malfunction of the vehicle speed sensor • Malfunction of the electric vacuum pump • Malfunction of the actuator • Malfunction of the auto-cruise control-ECU



INSPECTION PROCEDURE 11

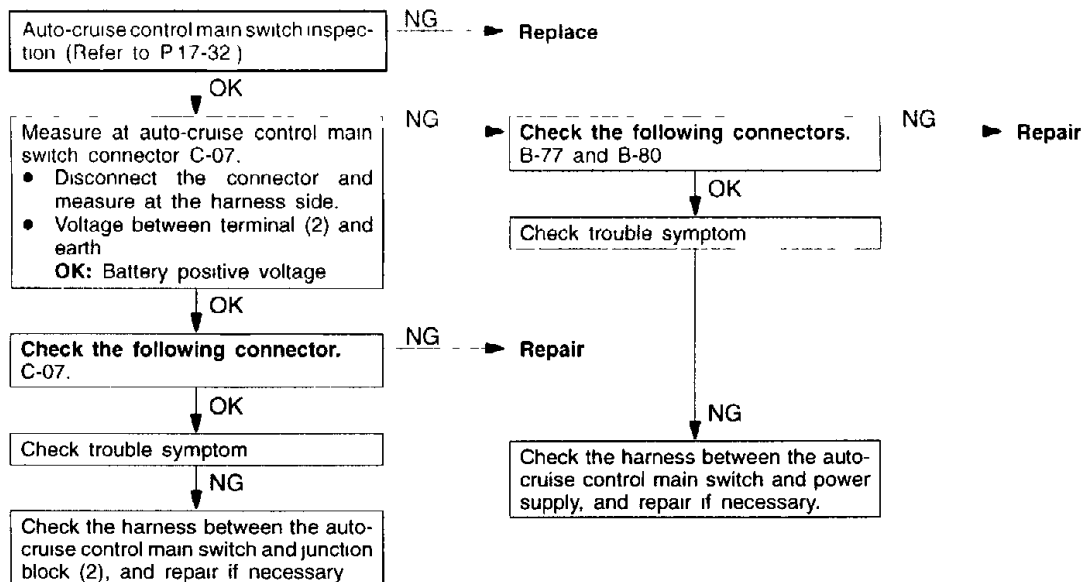
Even though auto-cruise control main switch is ON, switch indicator does not illuminate. (However, auto-cruise control is normal.)	Probable cause
Blown bulb in auto-cruise control main switch	• Malfunction of the auto-cruise control main switch

Replace the auto-cruise control main switch.

17-22 ENGINE AND EMISSION CONTROL – Auto-cruise Control System

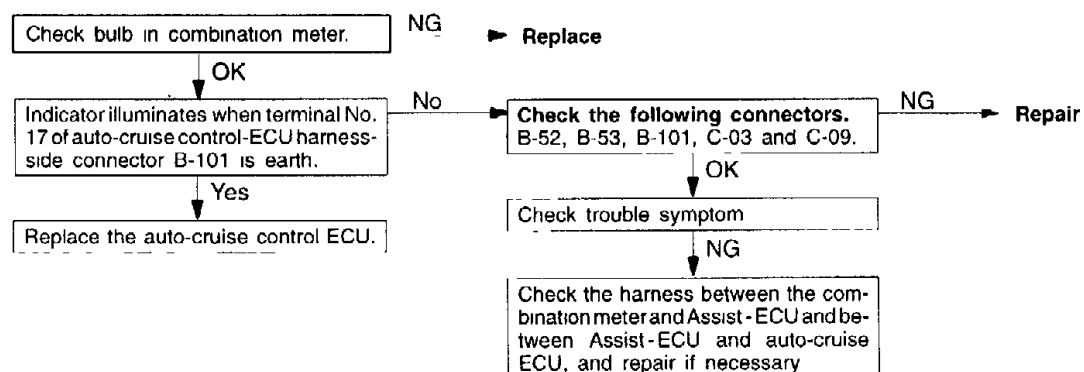
INSPECTION PROCEDURE 12

Auto-cruise control main switch illumination lamp does not illuminate.	Probable cause
The cause is probably a malfunction of auto-cruise control main switch or a malfunction of harness or connector.	• Malfunction of the auto-cruise control main switch • Malfunction of the connector • Malfunction of the harness



INSPECTION PROCEDURE 13

Auto-cruise control indicator lamp inside combination meter does not illuminate. (However, auto-cruise control is normal.)	Probable cause
The cause is probably a malfunction of bulb or a malfunction of connector or harness.	• Malfunction of the bulb • Malfunction of the harness • Malfunction of the connector • Malfunction of the auto-cruise control-ECU



INSPECTION PROCEDURE 14

Stop lamp switch input circuit system inspection (Code No. 23)

Check the following connectors.

B-18, B-41, B-74 B-76, B-85 and B-101.

NG

► Repair

OK

Check trouble symptom

NG

► Check the harness between junction block (2) and auto-cruise control-ECU and repair if necessary

INSPECTION PROCEDURE 15

Inhibitor switch input circuit system inspection (Code No. 26)

Check the harness between auto-cruise control-ECU and power supply.

17-24 ENGINE AND EMISSION CONTROL – Auto-cruise Control System

CHECK AT ECU TERMINALS

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16

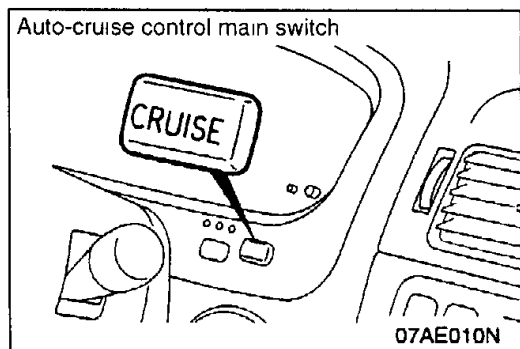
07AE012N

Terminal No.	Check item	Check conditions		Normal condition
1	Throttle position sensor input	When the accelerator pedal is depressed fully		4.0–5.5V
		When the accelerator pedal is returned		0.5–0.7V
2	Idle switch output	When the accelerator pedal is depressed (Idle switch ON)		4.5–5.5V
		When the accelerator switch is not depressed (Idle switch OFF)		0V
3	ACC power supply	When the ignition switch is on ACC		Battery voltage
4	Stop lamp switch input	When the brake pedal is depressed (Stop lamp switch ON)		Battery voltage
		When the brake pedal is not depressed (Stop lamp switch OFF)		0V
5	Diagnosis control input	Ignition switch ON		4.0V or greater
6	ECU backup power supply	At all times		Battery voltage
7	Electric vacuum pump release valve, control valve input	When decelerating with the set switch during travel at a constant speed	Release valve closed	0V
8			Control valve open	Battery voltage
7		When constant speed travel is cancelled with the cancel switch	Release valve open	Battery voltage
8			Control valve closed	Battery voltage
9	Ground	—		—
10	A/T control output	No OD-OFF request		Battery voltage
		OD-OFF request		0V
11	Vehicle speed sensor input	The sensor repeatedly turns ON/OFF when the vehicle moves forwards or backwards	Sensor ON	0V
			Sensor OFF	4.5V
12	Cruise control switch input	When not operated (All switches OFF)		0V
		When Flicked down (Set switch ON)		3V
		When flicked up (Resume switch ON)		6V
		When flicked toward the driver (Cancel switch ON)		Battery voltage
13	—	—		—
14	Inhibitor switch input <A/T>	When the shift lever is other than in the N position (Inhibitor switch OFF)		Battery voltage
		When the shift lever is in the N position (Inhibitor switch ON)		0V
	Clutch pedal switch input <M/T>	When the clutch pedal is released (switch OFF)		Battery voltage
		When the clutch pedal is pressed (switch ON)		0V

Terminal No.	Check item	Check conditions	Normal condition
15	Pump power supply	Ignition switch ON	Battery voltage
		Main switch ON	
		Stop lamp switch OFF	
16	ECU power supply	Ignition switch ON	Battery voltage
		Main switch ON	
17	Indicator lamp input (In combination meter)	When travelling at constant-speed (Indicator lamp illuminated)	0V
		When constant-speed travel cancelled (Indicator lamp extinguished)	Battery voltage
18	Electric vacuum pump motor input	During constant-speed travel with Set switch (Motor stopped/running)	Battery voltage /0V
		Accelerating with Resume switch during constant-speed travel (Motor stopped/running)	Battery voltage /0V
		Decelerating with Set switch during constant-speed travel (Motor stopped)	Battery voltage
		Constant-speed travel cancelled with Cancel switch (Motor stopped)	Battery voltage

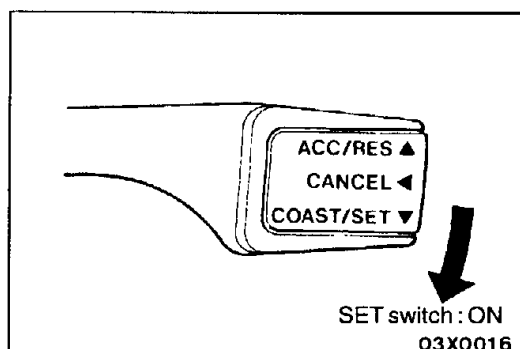
ON-VEHICLE SERVICE

AUTO-CRUISE CONTROL SYSTEM OPERATION CHECK



AUTO-CRUISE CONTROL MAIN SWITCH INDICATOR LAMP

1. Turn the ignition key to ON
2. Check to be sure that the indicator within the switch illuminates when the main switch is switched ON.

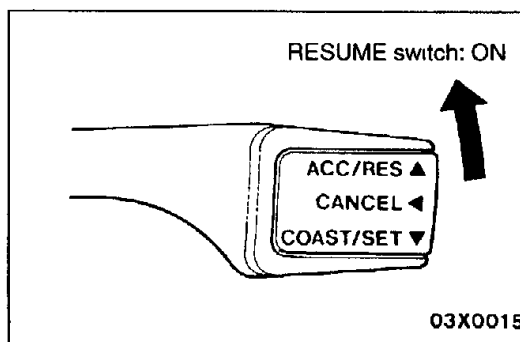


AUTO-CRUISE CONTROL SETTING

1. Switch ON the main switch.
2. Drive at the desired speed within the range of approximately 40–200 km/h.
3. Switch ON the SET switch.
4. Check to be sure that when the switch is released the speed is the desired constant speed.

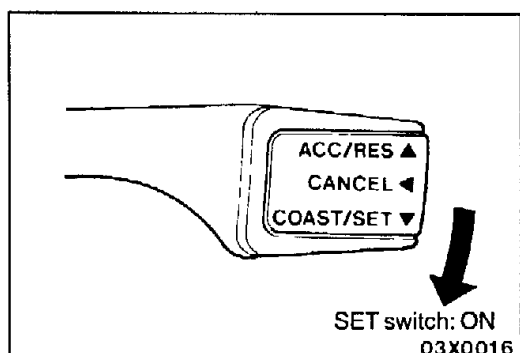
NOTE

If the vehicle's speed decreases to approximately 15 km/h below the set speed because of climbing a hill for example, the auto-cruise control will be cancelled.



SPEED-INCREASE SETTING

1. Set to the desired speed.
2. Switch ON the RESUME switch.
3. Check to be sure that acceleration continues while the switch is held, and that when it is released the constant speed at the time when it was released becomes the driving speed.

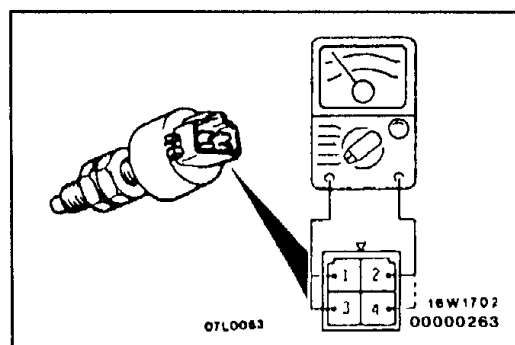
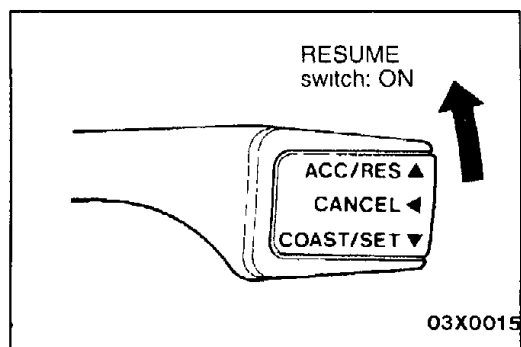
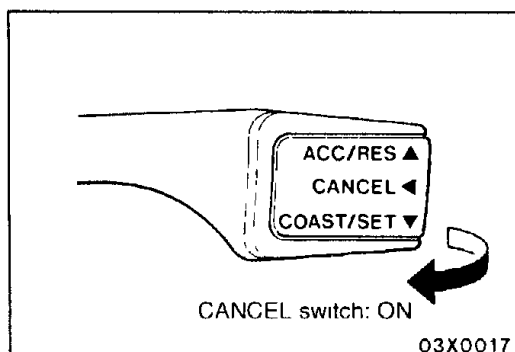


SPEED REDUCTION SETTING

1. Set to the desired speed.
2. Switch ON the SET switch.
3. Check to be sure that deceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE

When the vehicle speed reaches the low limit [approximately 40 km/h during deceleration], the auto-cruise control will be cancelled.



RETURN TO THE SET SPEED BEFORE CANCELLATION AND AUTO-CRUISE CONTROL CANCELLATION

1. Set the auto-cruise speed control.
2. When any of the following operations are performed while at constant speed during auto-cruise control, check if normal driving is resumed and deceleration occurs.
 - (1) Switch ON the CANCEL switch.
 - (2) The brake pedal is depressed.
 - (3) The selector lever is moved to the "N" range <A/T>.
 - (4) The clutch pedal is depressed <M/T>.
3. At a vehicle speed of 40 km/h or higher, check if when the RESUME switch is switched ON, vehicle speed returns to the speed before auto-cruise control driving was cancelled, and constant speed driving occurs.
4. When the main switch is turned to OFF while driving at constant speed, check if normal driving is resumed and deceleration occurs.

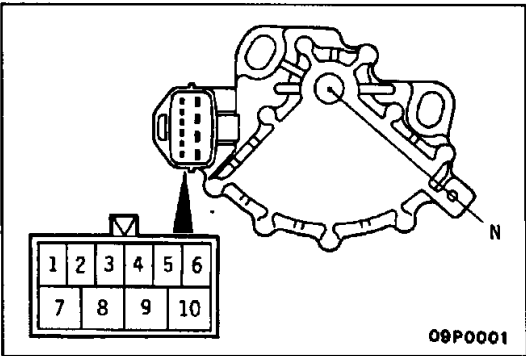
AUTO-CRUISE CONTROL COMPONENT CHECK

STOP LAMP SWITCH

Measurement conditions	For stop lamp circuit Terminal No.		For auto-cruise control circuit Terminal No.	
	2	3	1	4
When brake pedal depressed.	○	○		
When brake pedal not depressed.			○	○

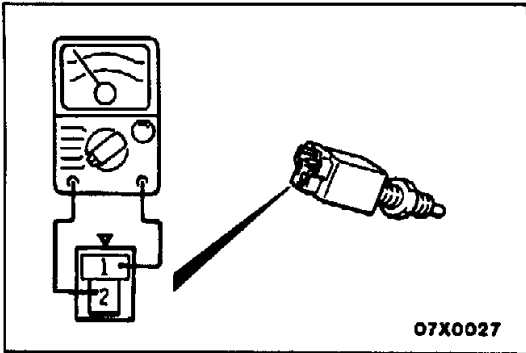
THROTTLE POSITION SENSOR

Refer to GROUP 13A – On-vehicle Inspection of MPI Components.



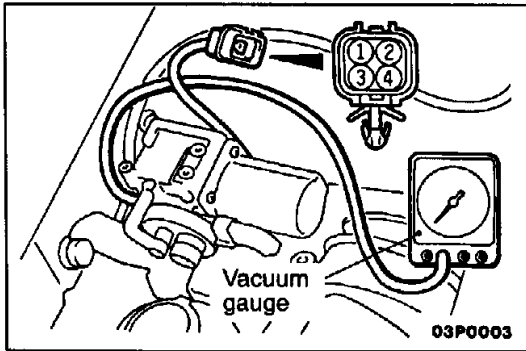
INHIBITOR SWITCH ("N" POSITION)

Measurement conditions	Terminal No.			
	4	8	9	10
Selector lever is at "N" position	○	○	○	○
Selector lever is not at "N" position				



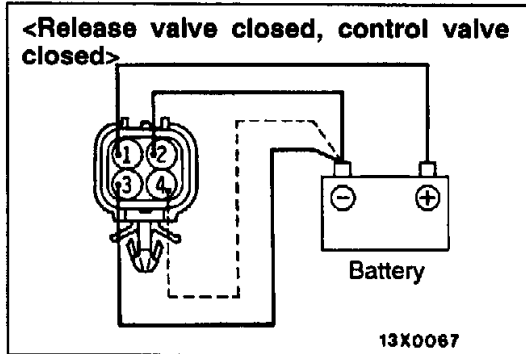
CLUTCH PEDAL SWITCH

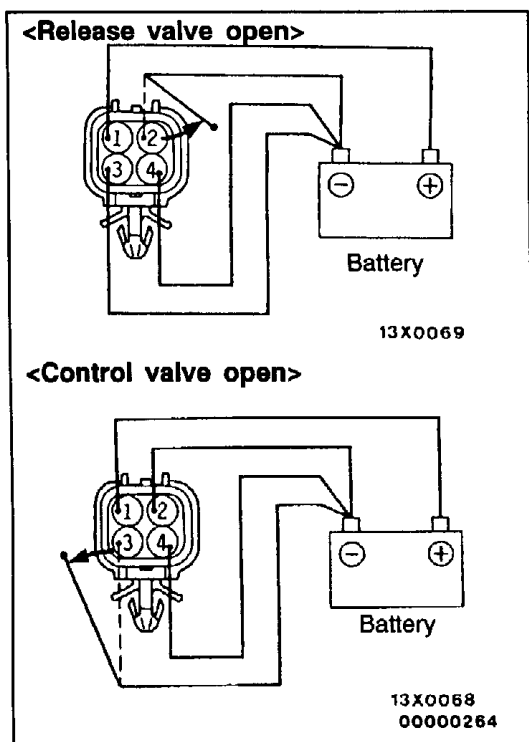
Measurement conditions	Terminal No.	
	1	2
When clutch pedal is depressed	○	○
When clutch pedal is not depressed		



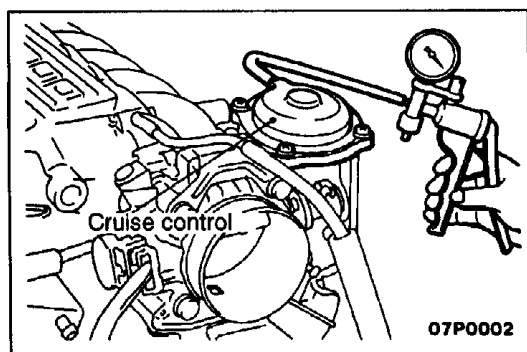
AUTO-CRUISE VACUUM PUMP

1. Disconnect the vacuum hose from the electric vacuum pump and connect a vacuum gauge to the vacuum pump.
2. Disconnect the electric vacuum pump connector.
3. Connect terminal (1) to the battery (+) terminal, and connect terminals (2) and (3) to the battery (-) terminal.
4. Check to be sure that the vacuum gauge shows a reading of 53 kPa (398 mm Hg) or more when terminal (4) is connected to the battery (-) terminal.





5. In this condition, check to be sure that the vacuum gauge shows a 20 kPa (150 mm Hg) or less when terminals (2) and (3) are disconnected from the battery.

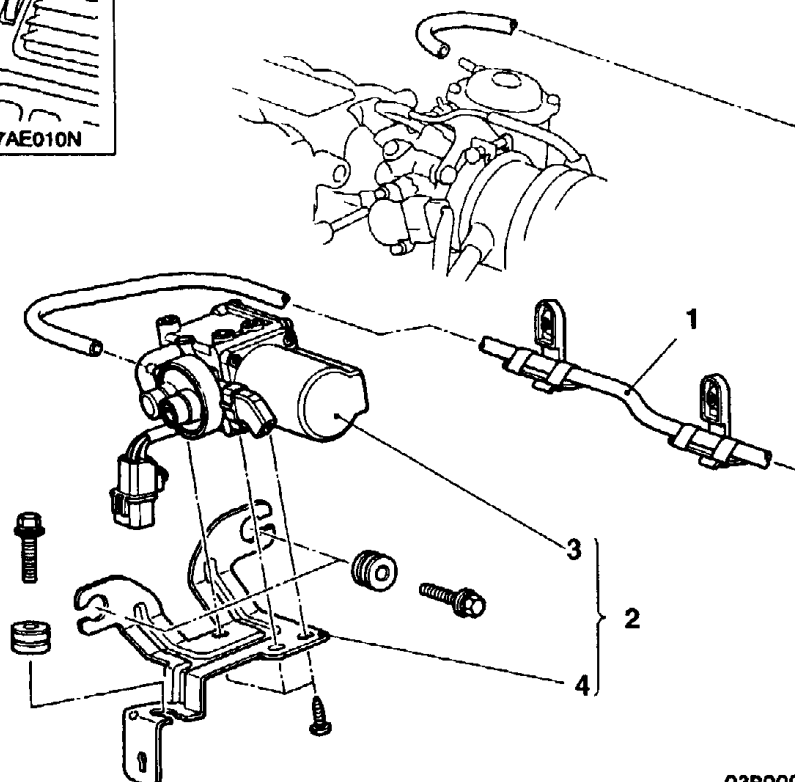
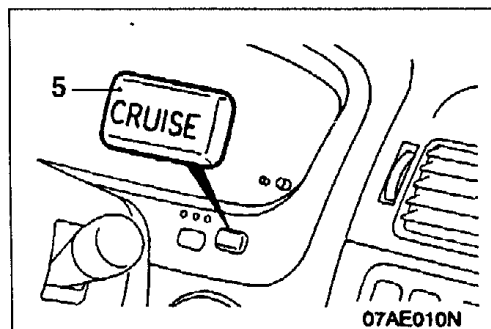


ACTUATOR

1. Disconnect the vacuum hose from the vacuum actuator and connect a hand vacuum pump to the vacuum actuator.
2. Confirm that the throttle lever operates and the vacuum is also maintained when a vacuum is present.

AUTO-CRUISE CONTROL

REMOVAL AND INSTALLATION



Vacuum pump removal steps

1. Vacuum hose
2. Electric vacuum pump and bracket assembly
3. Electric vacuum pump

Main switch removal steps

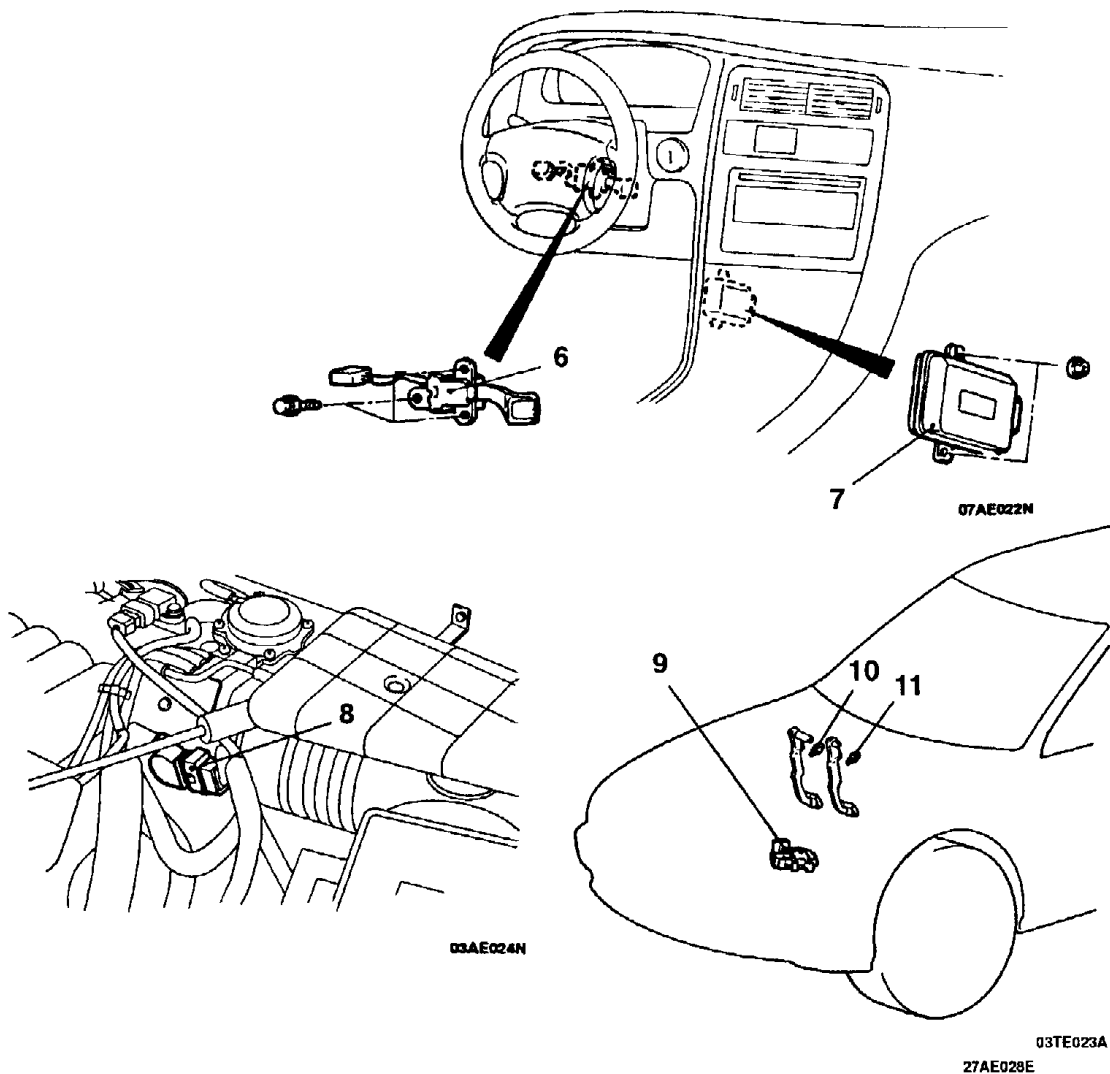
4. Bracket
5. Main switch
(Refer to GROUP 54-Combination meter)

CAUTION: SRS

Before removal of air bag module and clock spring, refer to the followings:

GROUP 52B – SRS Service Precautions.

GROUP 52B – Air Bag Modules and Clock Spring.

**Control switch removal steps**

- Air bag module (Refer to group 52B)
- 6. Control switch

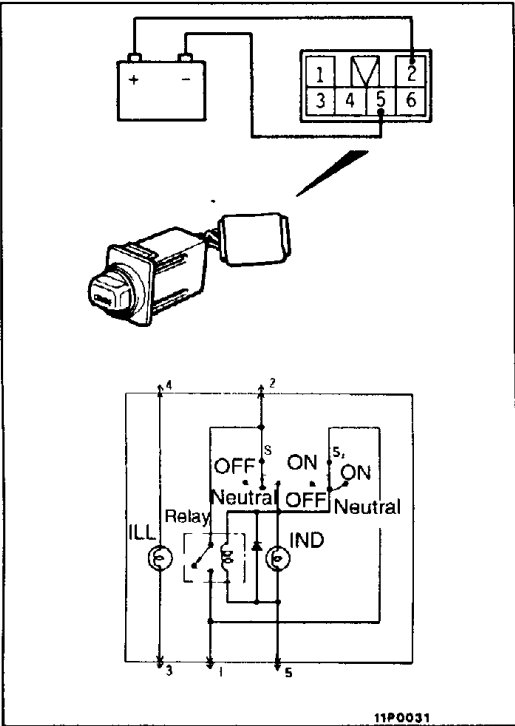
Control unit removal steps

- Floor console box assembly (Refer to group 52A)
- Centre air outlet assembly (Refer to group 52A-Instrument Panel)
- Ash tray (Refer to group 52A-Instrument Panel)

- Air conditioner control unit and radio/tape player
- 7. Auto-cruise control-ECU

Sensor removal steps

- 8. Throttle position sensor
- 9. Inhibitor switch
- 10. Stop lamp switch
- 11. Clutch pedal switch



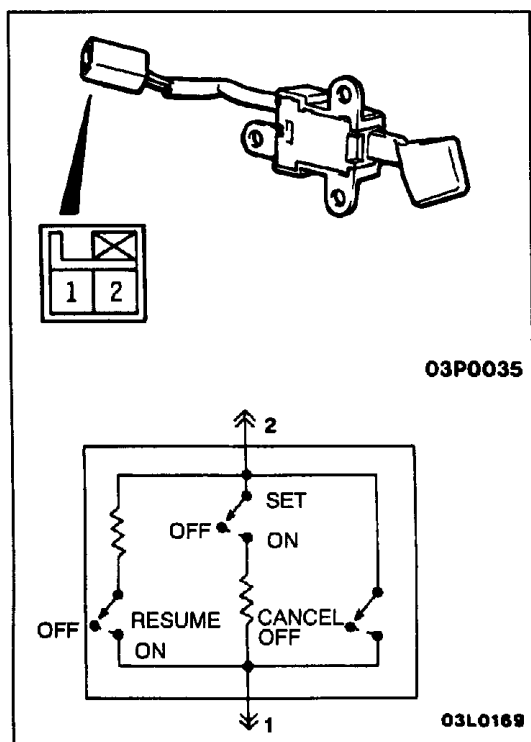
INSPECTION

AUTO-CRUISE CONTROL MAIN SWITCH CHECK

1. Operate the switch and check for continuity between the terminals

Switch position	Terminal No.					
	3	ILL	4	2	5	1
OFF	○	○	○			
Neutral	○	○	○		○	○
ON	○	○	○	○		○

2. When the battery (+) side is connected to terminal 2 and the (–) side is connected to terminal 5, and the main switch is turned to ON, check if battery voltage is output between terminal 1 and the earth until the main switch is turned to OFF.
- Next, when the main switch is turned to OFF, check if the battery voltage that was output between terminal 1 and the earth becomes 0V.



AUTO-CRUISE CONTROL SWITCH CHECK

Measure the resistance between the terminals when each of the SET, RESUME and CANCEL switches is pressed. If the values measured at this time correspond to those in the table below, then there is no problem.

Switch position	Resistance between terminals
Switch OFF	No continuity
CANCEL switch ON	Approx. 0 Ω
RESUME switch ON	Approx. 820 Ω
SET switch ON	Approx. 2,700 Ω

EMISSION CONTROL SYSTEM

GENERAL INFORMATION

The emission control system consists of the following subsystems:

- Positive crankcase ventilation system
- Evaporative emission control system
- Exhaust emission control system

Items	Name	Specification
Crankcase emission control system	Positive crankcase ventilation (PCV) valve	Variable flow type (Purpose: HC reduction)
Evaporative emission control system	Canister Purge control valve	Equipped Manifold vacuum purge (Purpose: HC reduction)
Exhaust emission control system	Air-fuel ratio control device—MPI system (vehicles with catalytic converter)	Oxygen sensor feedback type (Purpose: CO, HC, NOx reduction)
	Exhaust gas recirculation system • EGR valve • EGR control solenoid valve	Equipped Single type Duty cycle type solenoid valve (Purpose: NOx reduction)
	Catalytic converter	Monolith type (Purpose: CO, HC, NOx reduction)

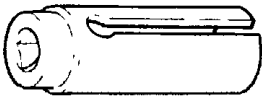
EMISSION CONTROL DEVICE REFERENCE TABLE

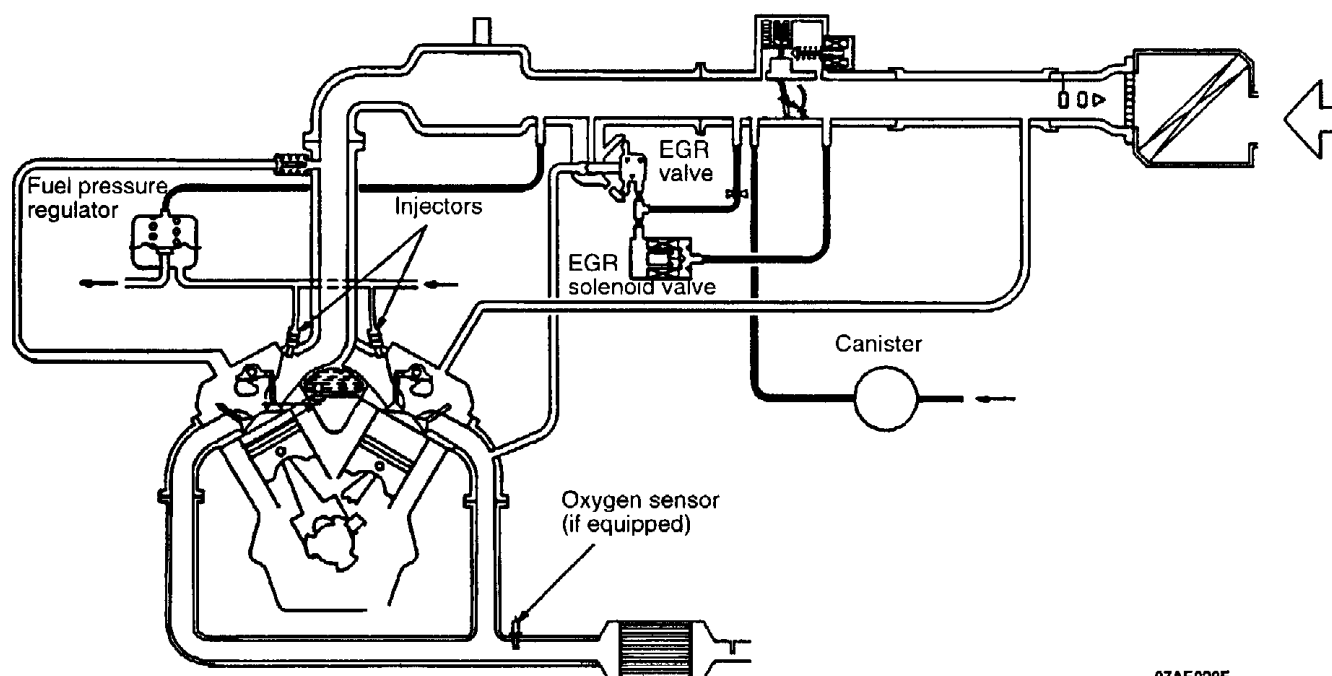
Related parts	Crankcase emission control system	Evaporative emission control system	Air/fuel ratio control system	Catalytic converter	Exhaust gas recirculation system	Reference page
PCV valve	X					17-39
MPI system component		X	X			Group 13A
EGR valve					X	17-44
EGR control solenoid valve					X	17-45
Catalytic converter				X		17-46

SERVICE SPECIFICATIONS

Items	Specification
EGR control solenoid valve coil resistance [at 20°C] Ω	36–44

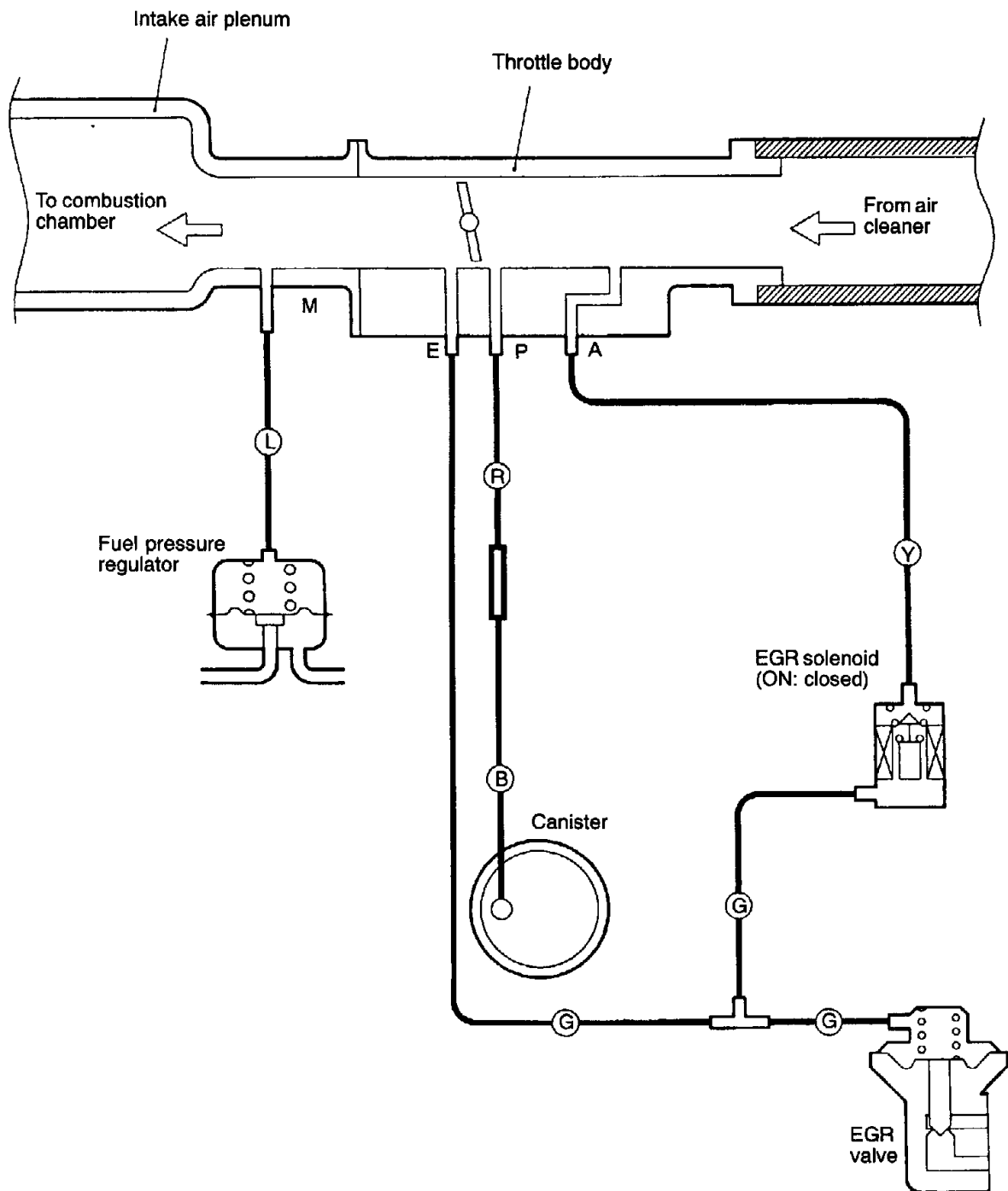
SPECIAL TOOL

Tool	Number	Name	Use
	MD998770	Oxygen sensor wrench	Removal/Installation of oxygen sensor <vehicles with catalytic converter>

VACUUM HOSE**VACUUM HOSE PIPING DIAGRAM**

07AE029E

VACUUM CIRCUIT DIAGRAM



07AE030E

VACUUM HOSE INSTALLATION

1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the VACUUM HOSE PIPING DIAGRAM as a guide.

VACUUM HOSE INSPECTION

1. Using the VACUUM HOSE PIPING DIAGRAM as a guide, check to be sure that the vacuum hoses are correctly connected.
2. Check the connection condition of the vacuum hoses, (removed, loose, etc.) and check to be sure that there are no bends or damage.

CRANKCASE EMISSION CONTROL SYSTEM

GENERAL INFORMATION

The crankcase emission control system is a system for preventing the escape of blow-by gases from inside the crankcase into the atmosphere.

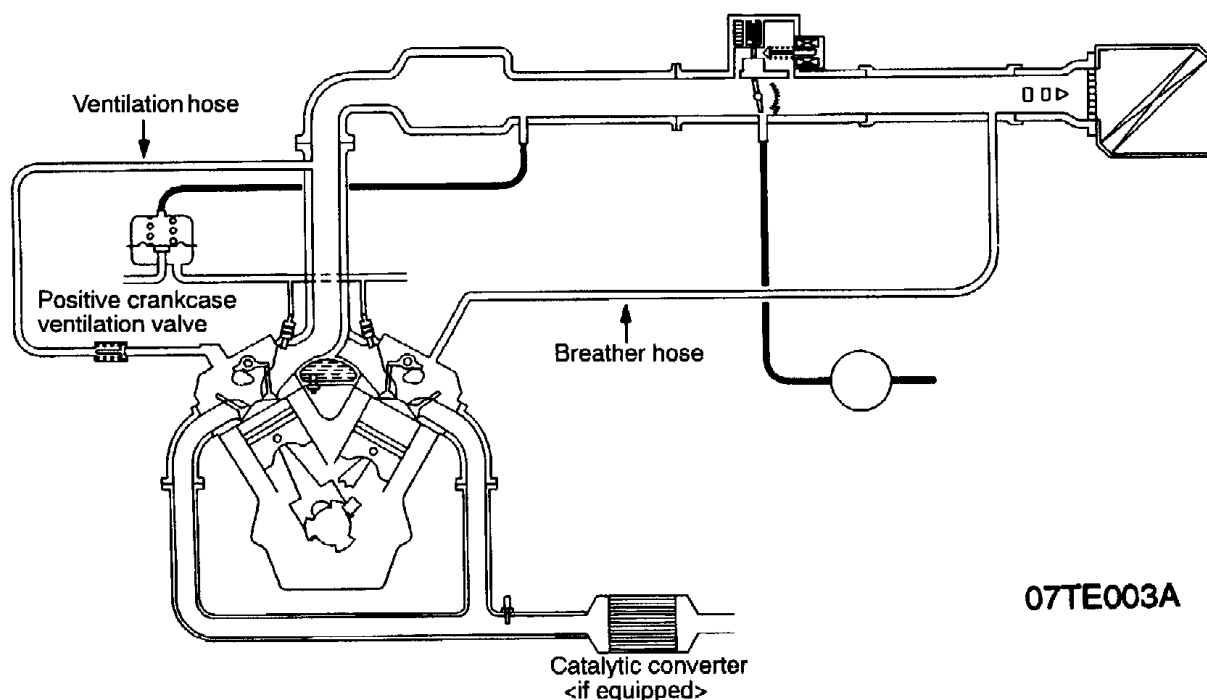
Fresh air is sent from the air cleaner into the crankcase through the breather hose to be mixed with the blow-by gases inside the crankcase.

The blow-by gas inside the crankcase is drawn into the intake manifold through the positive crankcase ventilation valve.

The positive crankcase ventilation valve is designed to lift the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly.

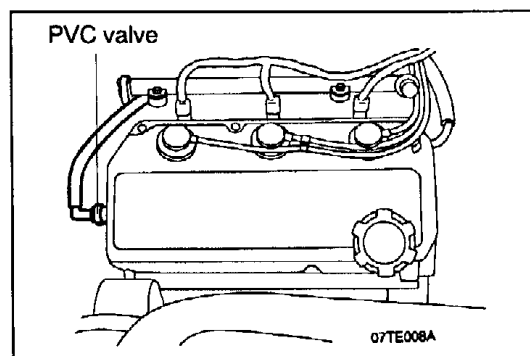
In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

SYSTEM DIAGRAM



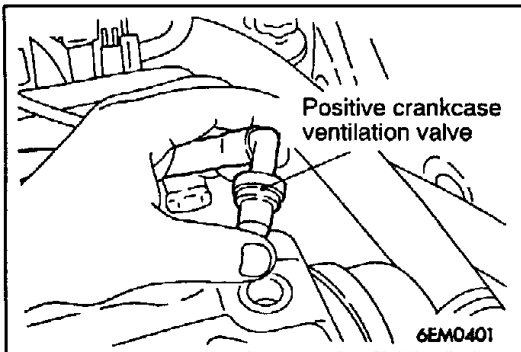
COMPONENT LOCATION

Positive crankcase ventilation valve



POSITIVE CRANKCASE VENTILATION SYSTEM CHECK

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

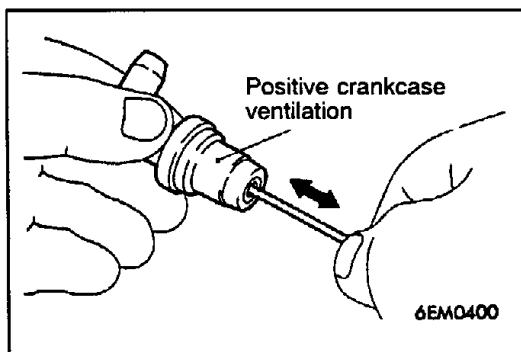


5. Place a finger at the opening of the positive crankcase ventilation valve and confirm that vacuum of the intake manifold is felt.

NOTE

At this moment, the plunger in the positive crankcase ventilation valve moves forward and backward.

6. If vacuum is not felt, clean the positive crankcase ventilation valve or replace it.
7. Install the positive crankcase ventilation valve.

**POSITIVE CRANKCASE VENTILATION (PCV) VALVE CHECK**

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

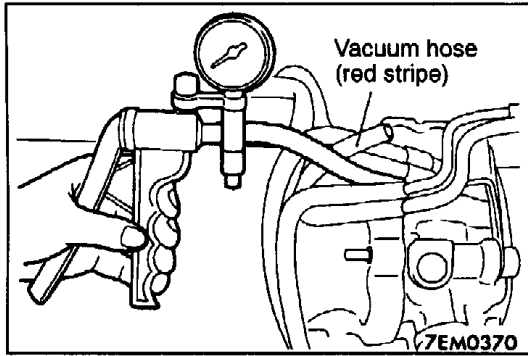
EVAPORATIVE EMISSION CONTROL SYSTEM

GENERAL INFORMATION

The evaporative emission control system prevents fuel vapours generated in the fuel tank from escaping into the atmosphere.

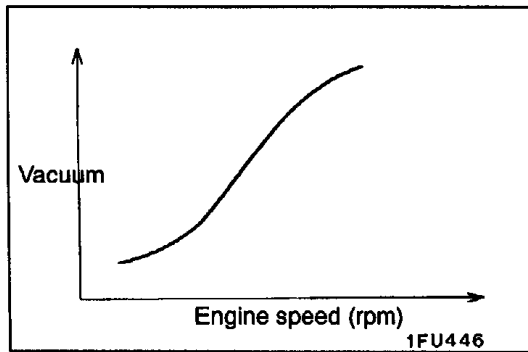
Fuel vapours from the fuel tank flow through the fuel tank pressure control valve and vapour pipe/hose to be stored temporarily in the canister.

When driving the vehicle, the fuel vapours which are stored in the canister are drawn into the intake manifold and are then sent to the combustion chamber.



PURGE PORT VACUUM CHECK

1. Disconnect the vacuum hose (red stripe) from the throttle body purge vacuum nipple and connect a hand vacuum pump to the nipple.

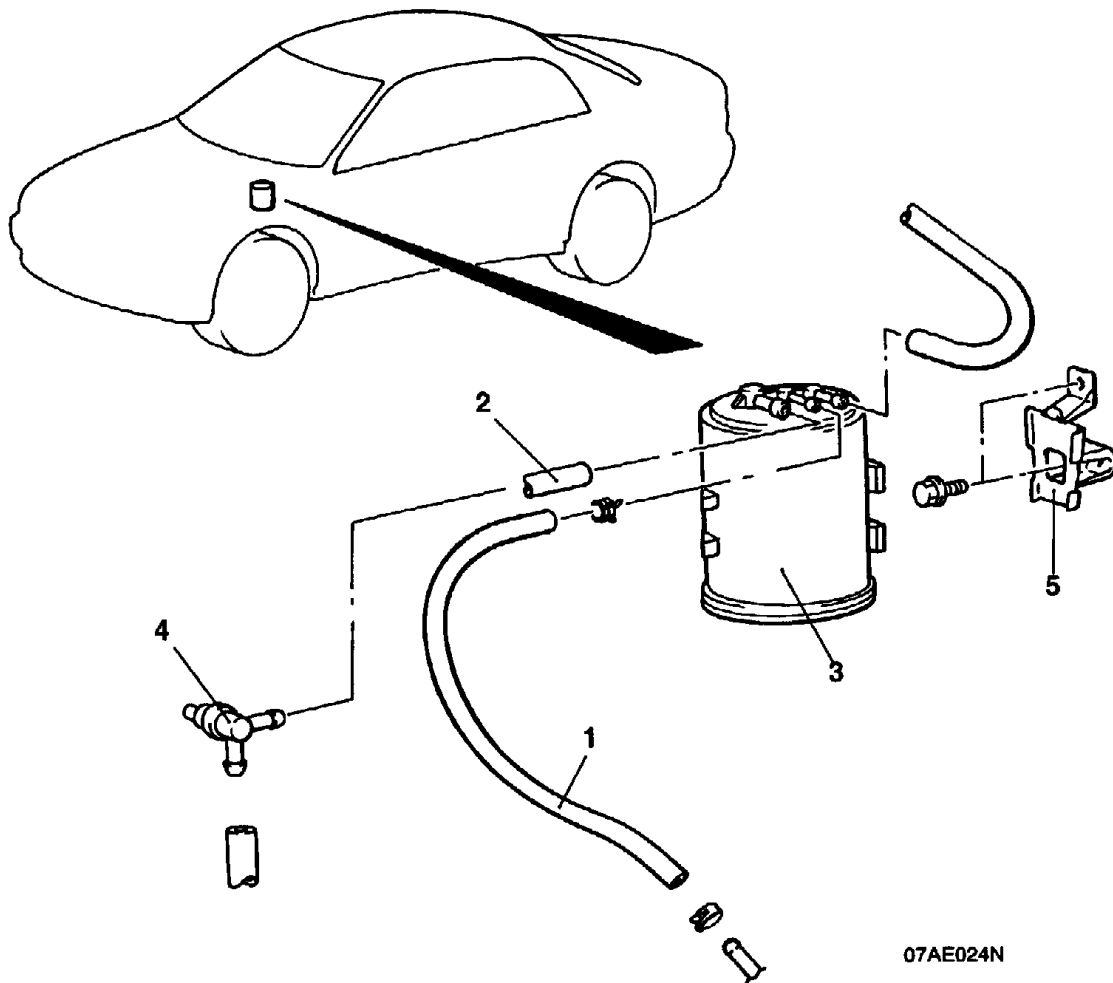


2. Start the engine and check to see that, after raising the engine speed by racing the engine, purge vacuum raises proportionately with the rise in engine speed.

NOTE

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

CANISTER REMOVAL AND INSTALLATION



Removal steps

1. vapour hose
2. Purge hose connection
3. Canister
4. Breather valve
5. Canister bracket

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

GENERAL INFORMATION

The exhaust gas recirculation (EGR) system lowers the nitrogen oxide (NO_x) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of nitrogen oxides (NO_x) is generated in the combustion chamber. Therefore, this system recirculates part of emission gas from the exhaust port of the cylinder head to the combustion

chamber through the intake manifold to decrease the air/fuel mixture combustion temperature, resulting in reduction of NO_x.

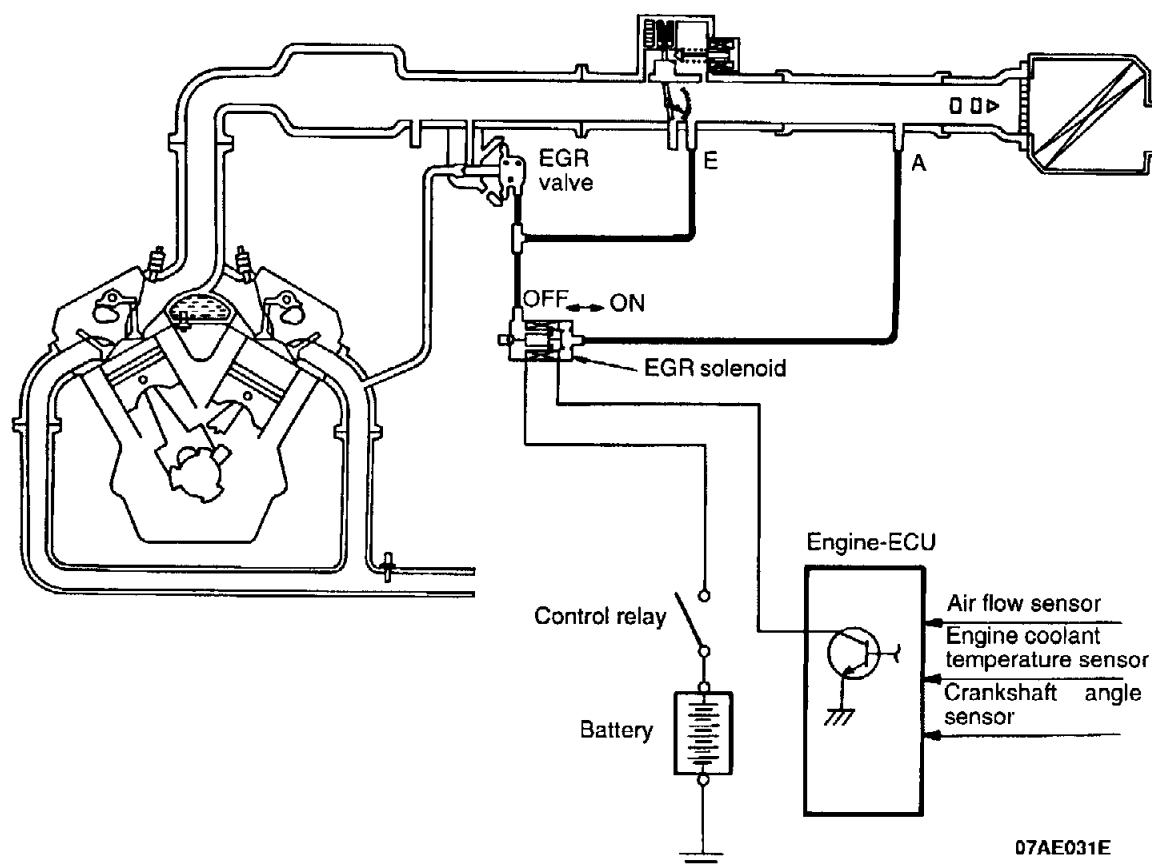
The EGR flow rate is controlled by the EGR valve so as not to decrease the driveability.

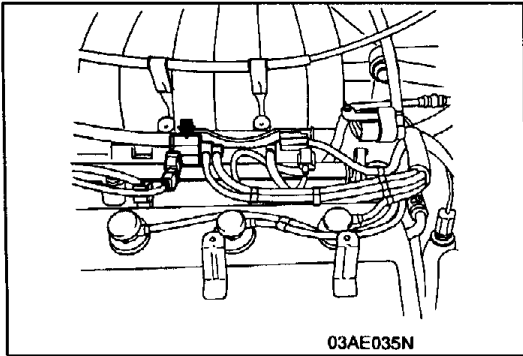
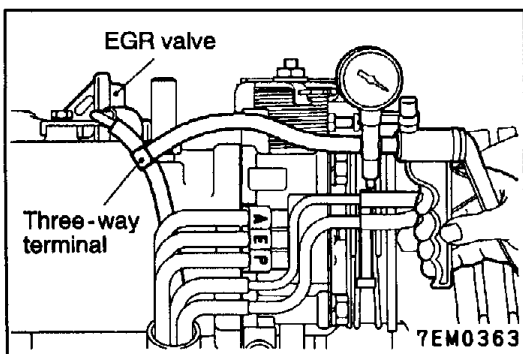
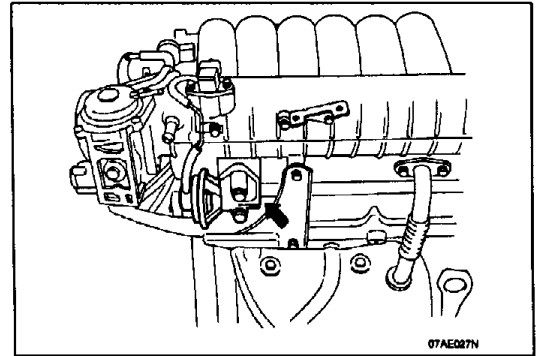
OPERATION

When the engine coolant temperature is low, when the engine is at idle or when a wide open throttle operation is performed, the EGR valve is kept closed, achieving no EGR.

In normal vehicle operation performed after warming up of the engine, the EGR valve is opened to carry out EGR.

SYSTEM DIAGRAM



COMPONENT LOCATION**EGR solenoid****EGR valve****EGR SYSTEM CHECK**

1. Disconnect the vacuum hose (green stripe) that connects to the EGR valve, and then connect a hand vacuum pump via a three-way terminal.
2. With the engine in cold and hot conditions, check the condition of vacuum when rapid racing has been performed by opening the throttle valve quickly.

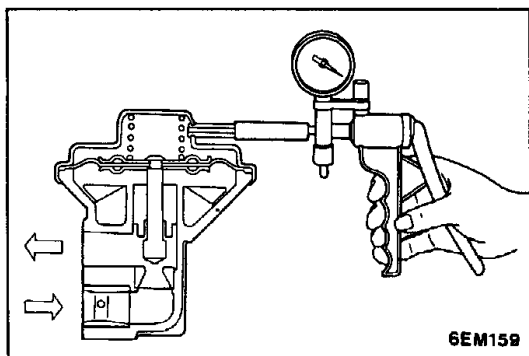
When engine is cold**[Engine coolant temperature: 20°C or less]**

Throttle valve	Normal vacuum condition
Open quickly	No vacuum will generate (remained as barometric pressure).

When engine is hot**[Engine coolant temperature: 80°C or higher]**

Throttle valve	Normal vacuum condition
Open quickly	It will momentarily rise over 100 mm Hg

3. Disconnect the three-way terminal.
4. Connect the hand vacuum pump directly to the EGR valve.
5. Check whether the engine stalls or the idling is unstable when a vacuum of 220 mm Hg or higher is applied during idling.



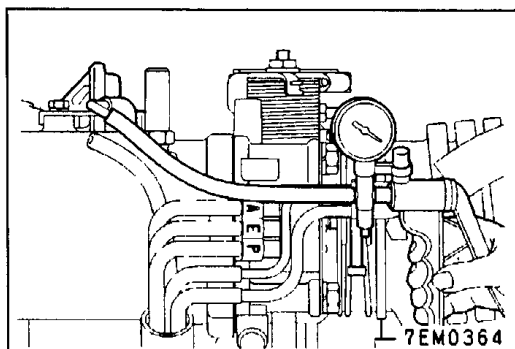
EGR VALVE CHECK

1. Remove the EGR valve and inspect for sticking, carbon deposits, etc. If necessary, clean with a suitable solvent so that the valve seats correctly.
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 500 mm Hg of vacuum, and check to be sure that the vacuum is maintained.
4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

Vacuum	Passage of air
40 mm Hg or less	Air is not blown out
220 mm Hg or more	Air is blown out

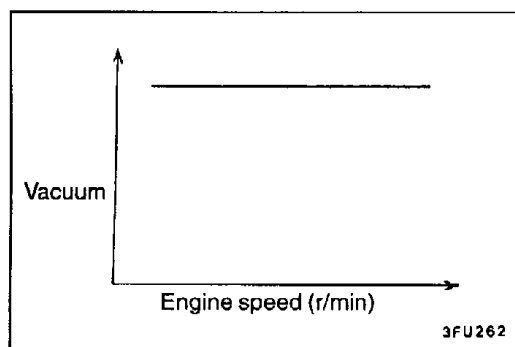
5. Use a new gasket, and tighten to the specified torque.

Specified torque: 22 Nm



EGR PORT VACUUM CHECK

1. Disconnect the vacuum hose (green stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.
2. Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum remains fairly constant.

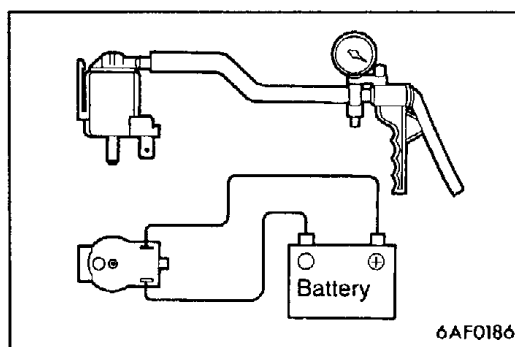


EGR SOLENOID CHECK

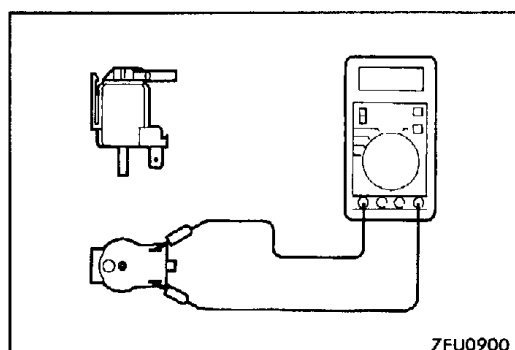
NOTE

When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

1. Disconnect the vacuum hose (yellow stripe, green stripe) from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.



Battery voltage	Normal condition
Not applied	Vacuum leaks
Applied	Vacuum maintained



5. Measure the resistance between the terminals of the solenoid valve.

Standard value: 36–44Ω [at 20°C]

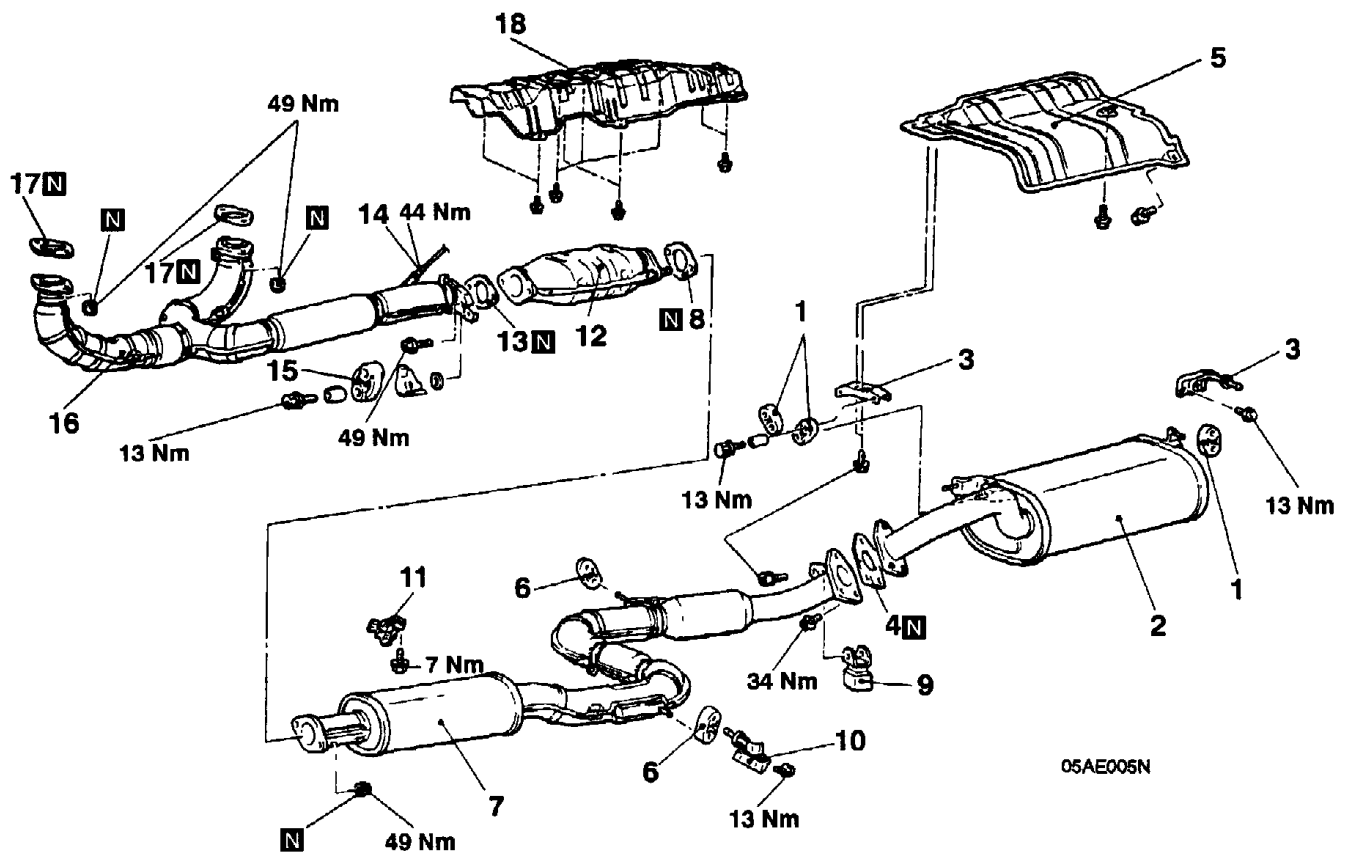
CATALYTIC CONVERTER <IF EQUIPPED>

GENERAL INFORMATION

The three-way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidises carbon monoxides (CO) and hydrocarbons (HC) and reduces nitrogen oxides (NOx).

When the mixture is controlled at stoichiometric air-fuel ratio, the three-way catalytic converter provides the highest purification against the three constituents, namely, CO, HC and NOx.

REMOVAL AND INSTALLATION



Removal steps

1. Hanger
2. Main muffler assembly
3. Hanger bracket
4. Gasket
5. Rear floor heat protector panel
6. Hanger
7. Centre exhaust pipe
8. Gasket
9. Damper



10. Hanger bracket
11. Harness protector
12. Catalytic converter
13. Gasket
14. Oxygen sensor
15. Hanger
16. Front exhaust pipe
17. Gasket
18. Front floor heat protector

REMOVAL SERVICE POINT**◀A▶ OXYGEN SENSOR REMOVAL**

Remove the oxygen sensor with the special tool (MD998770).

INSPECTION

Inspect for damage, cracking or deterioration. Replace if faulty.

Caution

1. Stop the engine immediately if engine misfiring occurs, otherwise an abnormally hot exhaust system will damage the catalytic converter or other underbody parts.
2. Correct and repair the ignition or fuel system if there are malfunctions, otherwise engine misfiring may occur which will damage the catalytic converter.
3. Observe manufacturer's specifications when doing service work.

CLUTCH

CONTENTS

GENERAL INFORMATION	2	CLUTCH PEDAL	5
SERVICE SPECIFICATIONS	2	CLUTCH CONTROL	6
LUBRICANTS	2	CLUTCH MASTER CYLINDER	8
ON-VEHICLE SERVICE	3	CLUTCH RELEASE CYLINDER	9
Clutch Pedal Check and Adjustment	3		
Bleeding	4		

GENERAL INFORMATION

A dry single-disc, diaphragm pull type clutch is used.
Hydraulic pressure is used for the clutch control.

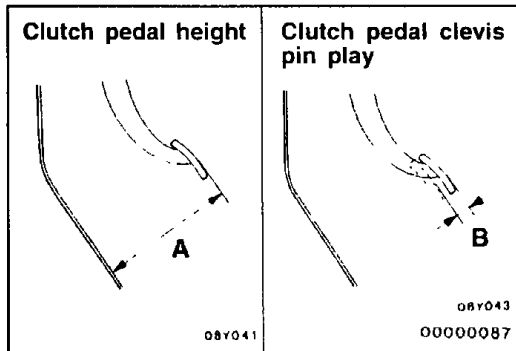
Items	Specifications
Clutch operating method	Hydraulic type
Clutch disc type	Single dry disc type
Clutch disc facing diameter O.D.×I.D. mm	225×150
Clutch cover type	Diaphragm spring pull type
Clutch cover setting load N	6,300
Clutch release cylinder I.D. mm	20.5

SERVICE SPECIFICATIONS

Items	Standard value
Clutch pedal height mm	168–173
Clutch pedal clevis pin play mm	1–3
Clutch pedal free play mm	6–13
Distance between the clutch pedal and the firewall when the clutch is disengaged mm	60 or more

LUBRICANTS

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



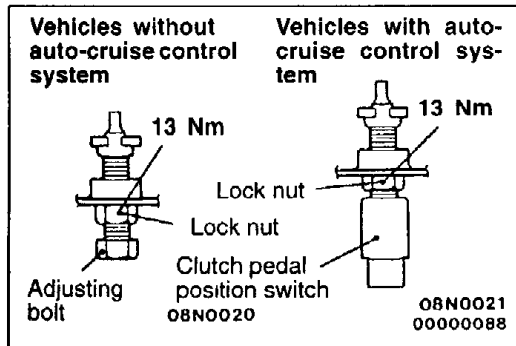
ON-VEHICLE SERVICE

CLUTCH PEDAL CHECK AND ADJUSTMENT

1. Turn up the carpet, etc. under the clutch pedal.
2. Measure the clutch pedal height and the clutch pedal clevis pin play.

Standard value (A): 168–173 mm

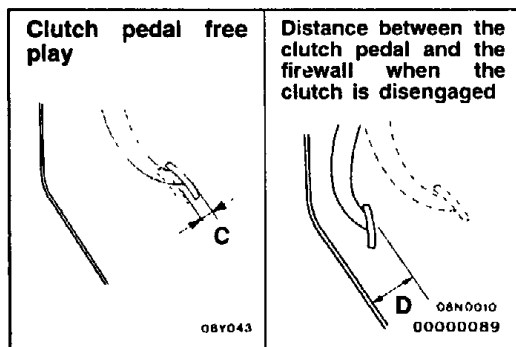
Standard value (B): 1–3 mm



3. If the height of the clutch pedal is outside the standard value, loosen the lock nut and adjust the pedal height to the standard value using the adjusting bolt (Vehicles without auto-cruise control system) or clutch pedal position switch (Vehicles with auto-cruise control system).
4. If the clutch pedal play is outside the standard value, adjust with the push rod.

Caution

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

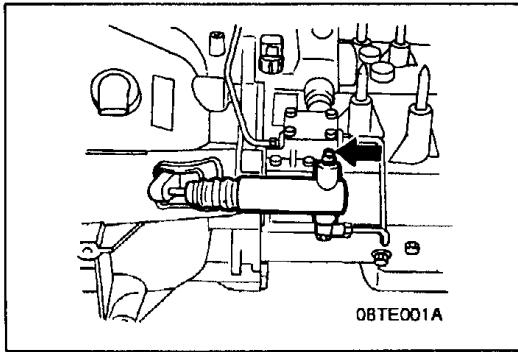


5. After completing the adjustments, confirm that the clutch pedal free play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the firewall when the clutch is disengaged are within the standard value ranges.

Standard value (C): 6–13 mm

Standard value (D): 60 mm or more

6. If the clutch pedal free play and the distance between the clutch pedal and the firewall 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 disassemble and inspect the master cylinder or clutch.
7. Turn back the carpet, etc.

**BLEEDING**

1. Top up the fluid reservoir.

Specified brake fluid: DOT 3 or DOT 4

NOTE

Always use the specified fluid that is clean and uncontaminated and has been stored in a sealed container.

2. Attach a length of transparent tubing to the bleed valve and insert the other end into a jar, partially filled with hydraulic fluid.
3. With an assistant to operate the clutch, open the bleed valve approximately half a turn, and depress the pedal. Just before the pedal reaches the end of its travel, close the bleed valve and allow the pedal to return to the rest position.
4. Repeat step 4 until the fluid hose is free of air bubbles.

NOTE

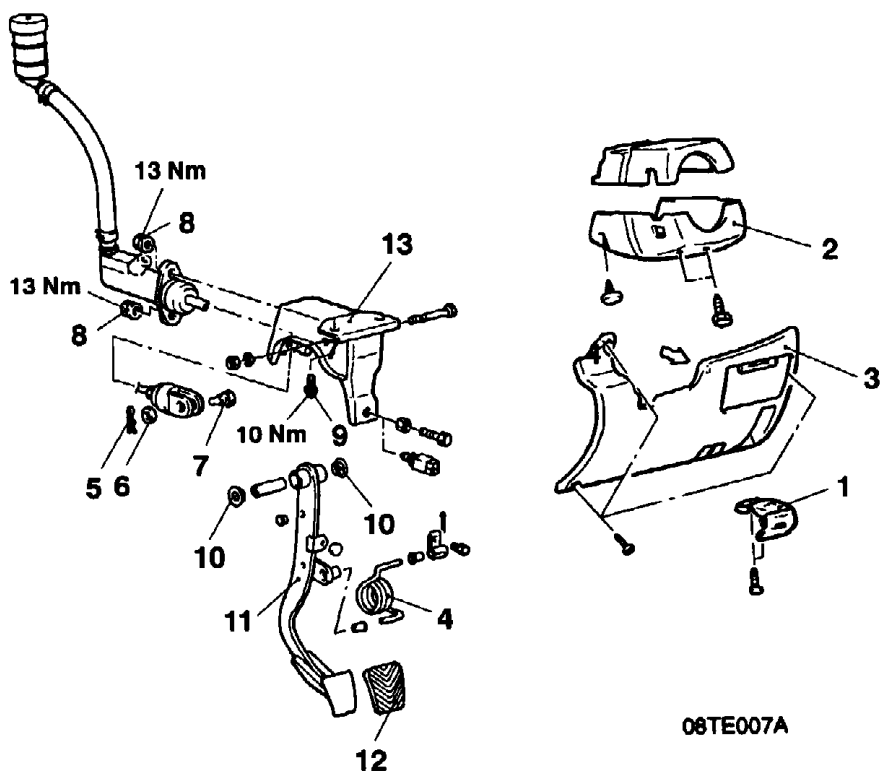
Ensure the reservoir fluid is replenished throughout the bleeding procedure.

5. Fill the master cylinder to the correct level.

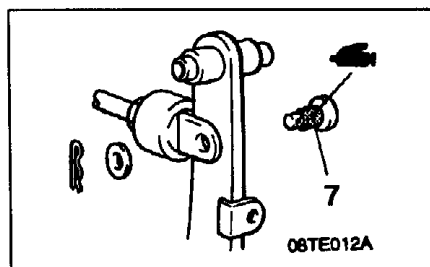
CLUTCH PEDAL

REMOVAL AND INSTALLATION

Post-Installation Operation
Clutch Pedal Adjustment (Refer to P.21-3.)



08TE007A



08TE012A

08AE015E

Removal steps

1. Hood release lever
2. Lower column cover
3. Instrument under cover
4. Return spring
5. R-clip
6. Washer
7. Clevis pin

8. Nut
9. Bolt
10. Bushing
11. Clutch pedal
12. Pedal pad
13. Pedal support member

INSPECTION

- Check the pedal shaft and bushing for wear.
- Check the clutch pedal for bend or torsion.
- Check the return spring for damage or deterioration.
- Check the pedal pad for damage or wear.

CLUTCH CONTROL

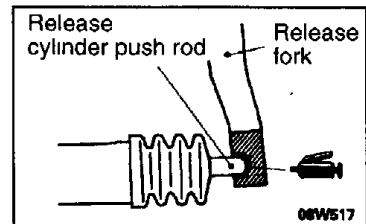
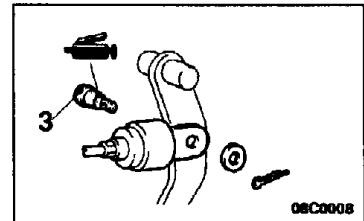
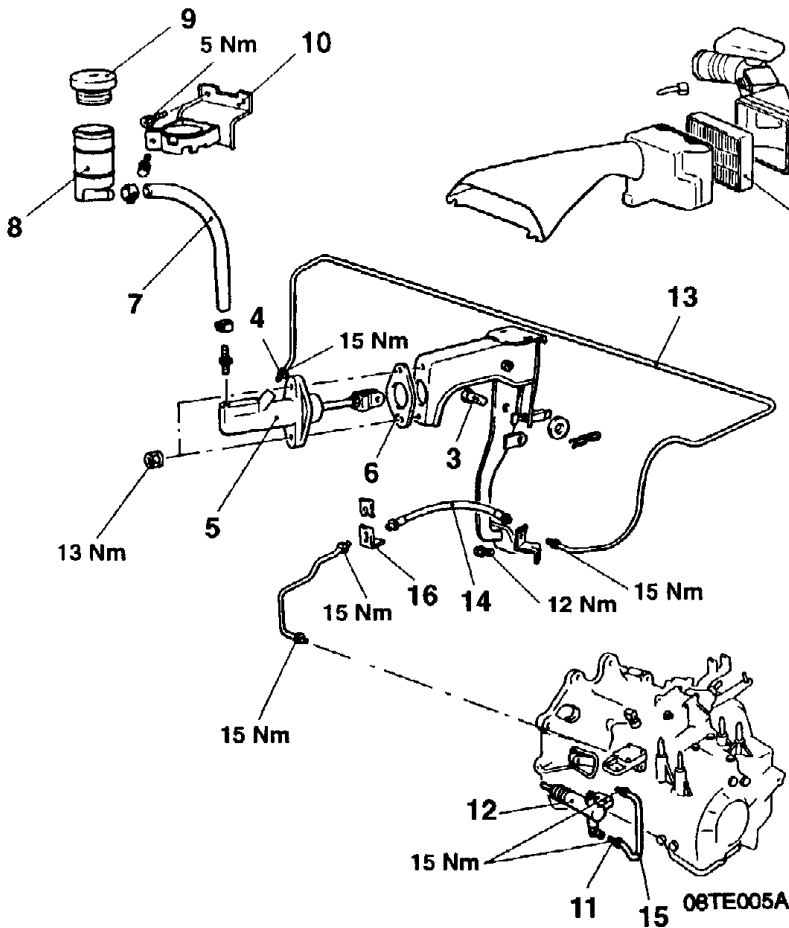
REMOVAL AND INSTALLATION

Pre-removal Operation

Clutch Fluid Draining

Post-installation Operation

- Clutch Fluid Supplying
- Clutch Line Bleeding (Refer to P.21-4.)
- Clutch Pedal Adjustment (Refer to P.21-3.)



Specified grease:
MITSUBISHI genuine
 grease Part No. 0101011

08AE017E

Clutch master cylinder removal steps

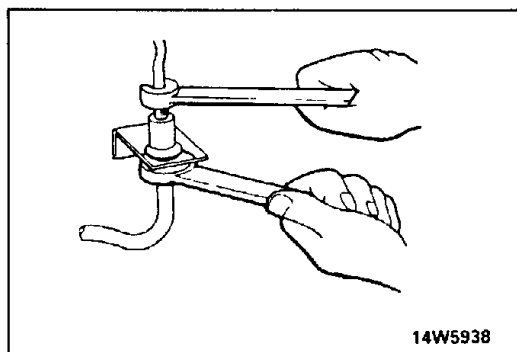
1. Air cleaner element
2. Air cleaner cover
3. Clevis pin
4. Clutch pipe connection
5. Clutch master cylinder
6. Sealer
7. Reservoir hose
8. Reservoir tank
9. Reservoir cap
10. Reservoir bracket

Clutch release cylinder removal steps

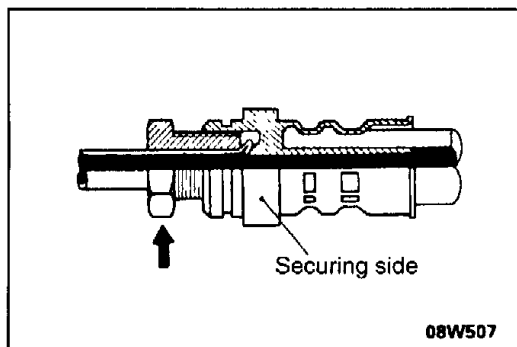
11. Clutch pipe connection
12. Clutch release cylinder

Clutch line removal steps

- | | | |
|-----|-----|-------------------------|
| ◀A▶ | ▶A◀ | 13. Clutch pipe |
| ◀A▶ | ▶A◀ | 14. Clutch hose |
| ◀A▶ | ▶A◀ | 15. Clutch pipe |
| | | 16. Clutch hose bracket |

**REMOVAL SERVICE POINT****◀A▶ CLUTCH PIPE/CLUTCH HOSE REMOVAL**

Holding the nut at the clutch hose side, loosen the flare nut of the clutch pipe.

**INSTALLATION SERVICE POINT****▶A◀ CLUTCH HOSE/CLUTCH PIPE INSTALLATION**

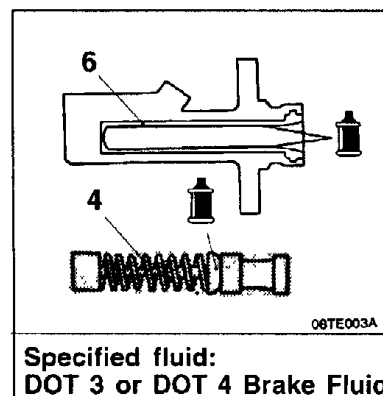
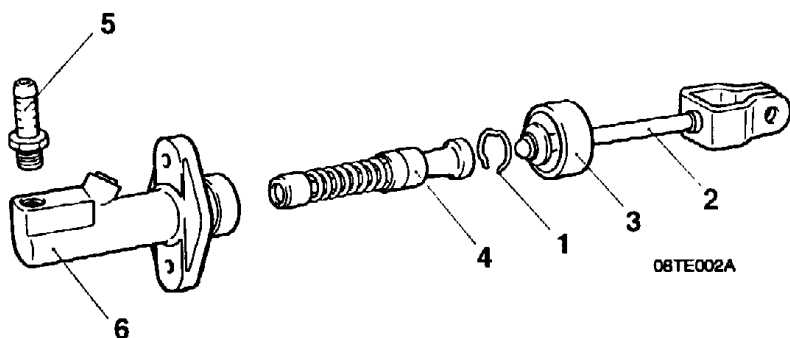
1. Temporarily tighten the clutch pipe flare nut by hand, and then tighten it to the specified torque, being careful that the clutch hose does not become twisted.
2. After tightening the clutch pipe flare nut and eye bolt, check to be sure there is no clutch fluid leakage.

INSPECTION

- Check the pedal shaft bushing for wear.
- Check the pedal arm for bend or torsion.
- Check the fluid reservoir tank, master cylinder or clutch hose for fluid leakage.
- Check the clutch hose or pipe for cracks or clogging.

CLUTCH MASTER CYLINDER

DISASSEMBLY AND REASSEMBLY



08AE016E

Disassembly steps

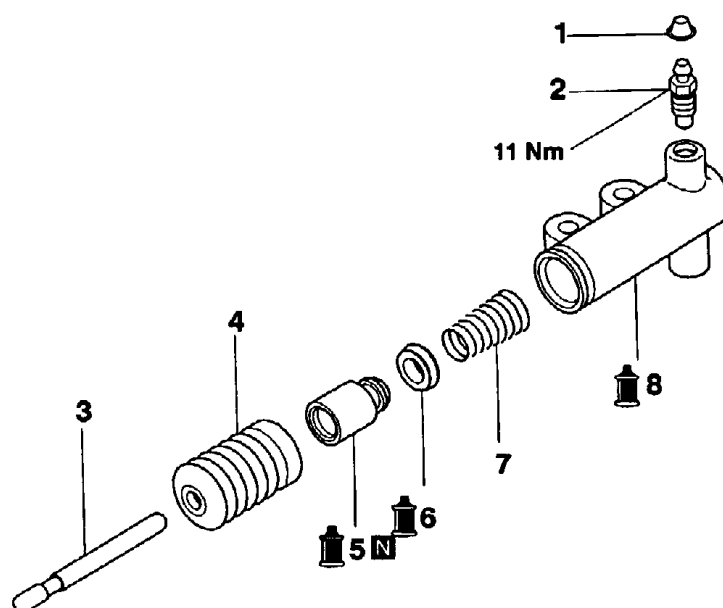
1. Piston stopper ring
2. Damper push rod
3. Boot
4. Piston assembly
5. Nipple
6. Clutch master cylinder

Caution

1. Do not damage the master cylinder bore or piston assembly.
2. Do not disassemble the piston assembly.

INSPECTION

- Check the inside cylinder body for rust or scars.
- Check the piston cup for wear or deformation.
- Check the piston for rust or scars.
- Check the clutch pipe connection for clogging.

CLUTCH RELEASE CYLINDER**DISASSEMBLY AND REASSEMBLY**

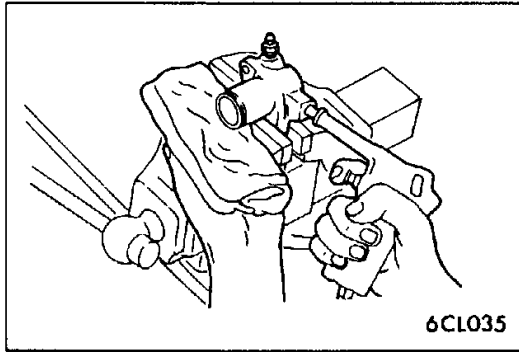
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Disassembly steps

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



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

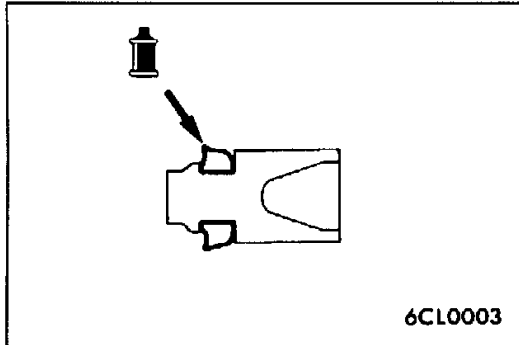
**REMOVAL SERVICE POINT****◀A▶ PISTON CUP / PISTON REMOVAL**

1. Remove the piston from the release cylinder using compressed air.

Caution

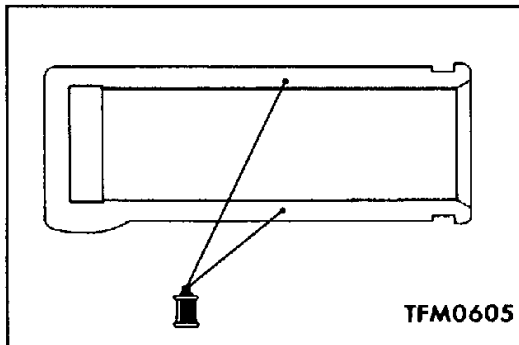
Cover with shop towel to prevent the piston from popping out.

Apply compressed air slowly to prevent brake fluid from splashing.

**INSTALLATION SERVICE POINT****▶A◀ PISTON / PISTON CUP INSTALLATION**

1. 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:
DOT 3 or DOT 4

**INSPECTION****CLUTCH RELEASE CYLINDER**

1. Check the inner surface of the release cylinder for rust, scratches or irregular wear.
2. 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 assembly as an assembly.

Limit: 0.15mm

MANUAL TRANSMISSION

CONTENTS

LUBRICANT	2	Transmission Oil Replacement	3
SPECIAL TOOLS	2	TRANSMISSION CONTROL	4
ON-VEHICLE SERVICE	3	Shift Lever Assembly	6
Transmission Oil Level Check	3	TRANSMISSION ASSEMBLY*	7

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) If it is possible that the SRS components are subjected to heat over 93°C in baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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.

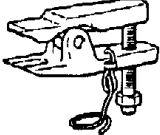
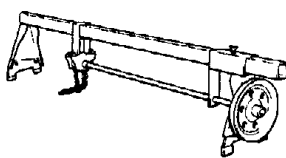
NOTE

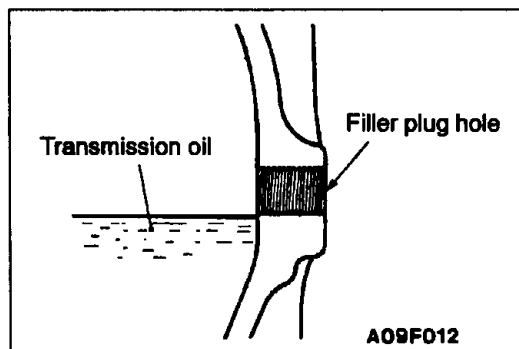
Section titles with the astensik (*) in the table of contents in each group indicate operations requiring warnings.

LUBRICANT

Items	Specified lubricant	Quantity (litres)
Transmission oil	Hypoid gear oil SAE 75W-85W conforming to API classification GL-4	2.8

SPECIAL TOOLS

Tool	Number	Name	Application
	MB991113	Steering linkage puller	• Tie rod end ball joint and knuckle removal • Lateral lower arm ball joint and knuckle removal • Compression lower arm ball joint and knuckle removal
	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
	MB991460	Plug	Preventing foreign substances from entering transmission case

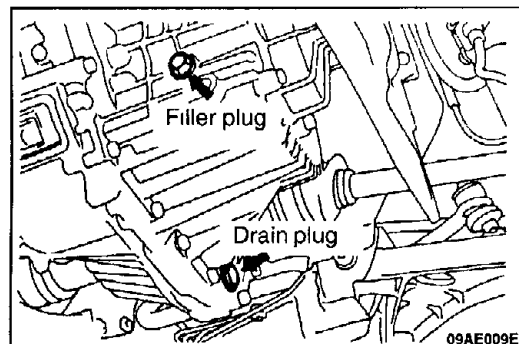


ON-VEHICLE SERVICE

TRANSMISSION OIL LEVEL CHECK

1. Remove the oil filler plug.
2. The oil level should be at the lower portion of the filler plug hole.
3. Check that the transmission oil is not noticeably dirty and that it has a suitable viscosity.
4. Tighten the filler plug to the specified torque.

Torque: 32 Nm



TRANSMISSION OIL REPLACEMENT

1. Remove transmission drain plug.
2. Drain oil.
3. Tighten drain plug to specified torque.

Specified torque: 32 Nm (3.3 kgfm)

4. Remove filler plug and fill with specified oil until the level reaches the lower portion of filler plug hole.

Specified oil:

Hypoid gear oil SAE 75W-85W or 80W conforming to API classification GL-4

Quantity: 2.8 dm³ (2.8ℓ)

5. Tighten filler plug to specified torque.

Specified torque: 32 Nm (3.3 kgfm)

TRANSMISSION CONTROL

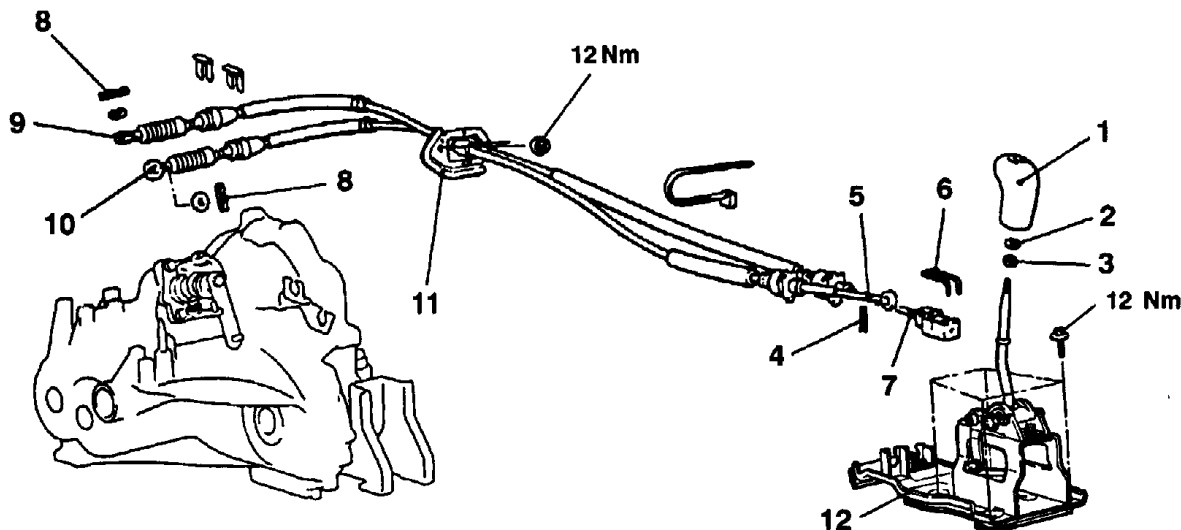
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Air Cleaner – Removal and Installation (Refer to Group 15).

Caution: SRS

Be careful not to subject the SRS-ECU to any shocks during removal and installation of the transmission control cable and shift lever assembly.



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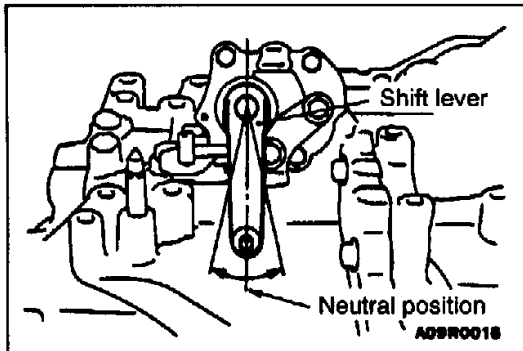
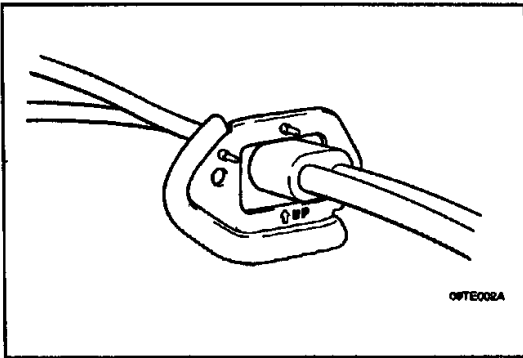
Transmission control cable assembly removal steps

- ▶B◀ 1. Shift knob
- ▶B◀ 2. Spring washer
- ▶B◀ 3. Nut
- Front floor console (Refer to Group 52A)
- 4. R-clip
- 5. Select cable connection (Shift lever side)
- 6. Clip
- 7. Shift cable connection (Shift lever side)
- 8. R-clip
- ▶A◀ 9. Select cable connection (Transmission side)
- ▶A◀ 10. Shift cable connection (Transmission side)

- ▶A◀ 11. Shift cable and select cable assembly

Shift lever assembly removal steps

- ▶B◀ 1. Shift knob
- ▶B◀ 2. Spring washer
- ▶B◀ 3. Nut
- Front floor console (Refer to Group 52A)
- 4. R-clip
- 5. Select cable connection (Shift lever side)
- 6. Clip
- 7. Shift cable connection (Shift lever side)
- 12. Shift lever assembly



INSTALLATION SERVICE POINT

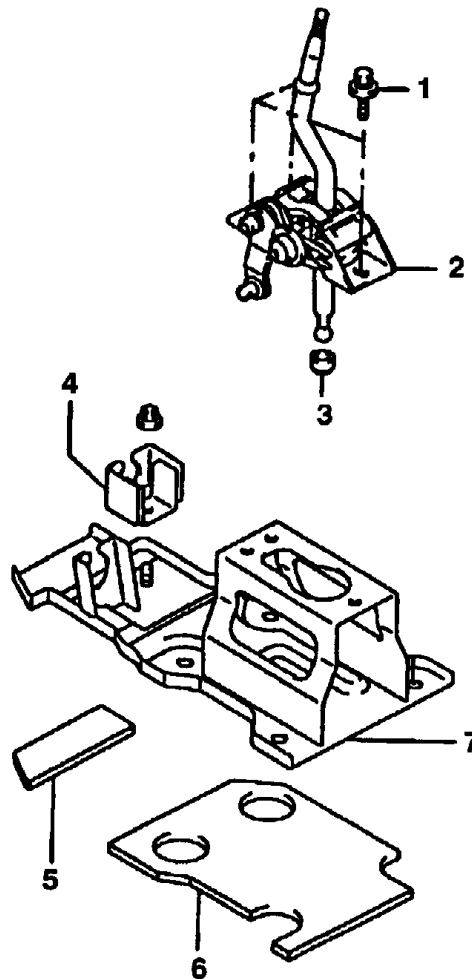
►A◄ SHIFT CABLE AND SELECT CABLE ASSEMBLY/SHIFT CABLE CONNECTION/SELECT CABLE CONNECTION

1. Ensure the shift cable and select lever assembly is mounted in the vehicle with the "UP" symbol and arrow on the mounting plate pointing upward as shown in the illustration.
2. Set the transmission side shift lever and the passenger compartment side shift lever to the neutral position.
3. For the transmission side, the white and the yellow paint marks on the shift and select cable ends should face the snap rings.
4. Move the shift lever to all positions and check that the operation is smooth.

►B◄ NUT/SPRING WASHER/SHIFT KNOB

1. Screw in the nut all the way by hand, turn back half a turn and then insert the spring washer.
2. Screw in the shift knob until it touches the spring washer and make one more turn. Then turn more to adjust the shift pattern on the shift knob.
3. If the above steps are impossible you can turn back the shift knob by one turn at most after screwing in all the way to the adjust the shift pattern.

SHIFT LEVER ASSEMBLY DISASSEMBLY AND REASSEMBLY



09AE004E

Disassembly steps

1. Gearshift lever assembly retaining bolts
2. Gearshift lever assembly
3. Gearshift linkage bushing
4. Gearshift cable bracket
5. Gearshift lever bracket insulator
6. Gearshift lever bracket insulator
7. Gearshift lever bracket

TRANSMISSION ASSEMBLY

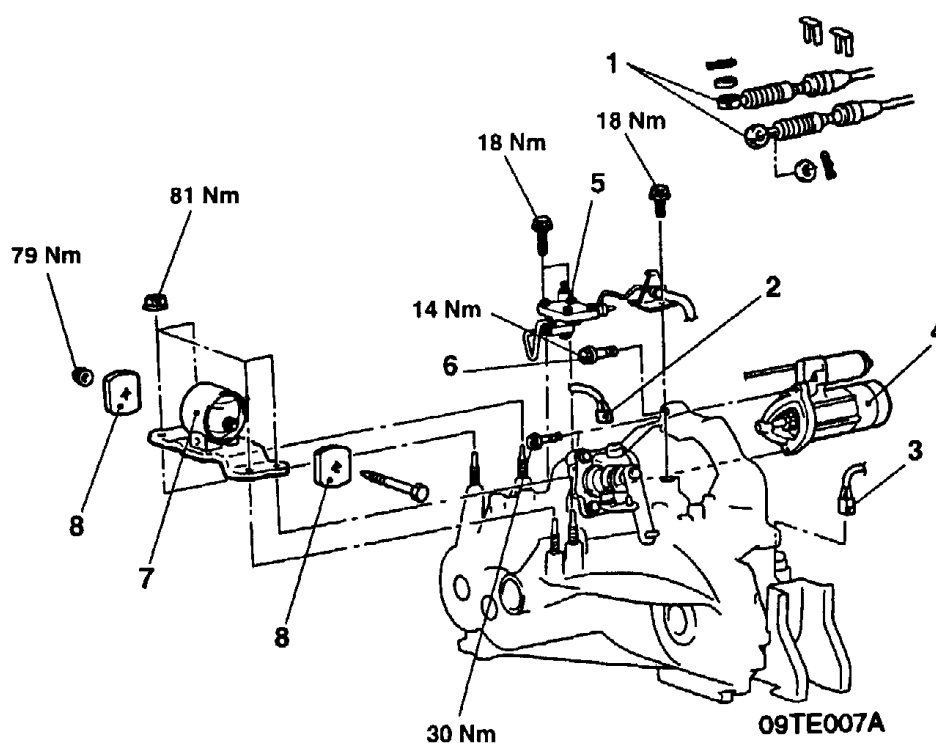
REMOVAL AND INSTALLATION

Pre-removal Operation

- Transmission Oil Draining (Refer to P.22-3.)
- Under Cover Removal
- Battery and Battery Tray Removal
- Air Cleaner Assembly Removal

Post-installation Operation

- Air Cleaner Assembly Installation
- Battery and Battery Tray Installation
- Under Cover Installation
- Supplying Transmission Oil (Refer to P.22-3.)
- Shift Lever Operation Check
- Speedometer Operation Check

**Removal steps**

1. Shift cable and select cable connection (Refer to P.22-4)
2. Reverse lamp switch connector
3. Vehicle speed sensor connector
4. Starter motor
5. Clutch release cylinder connection

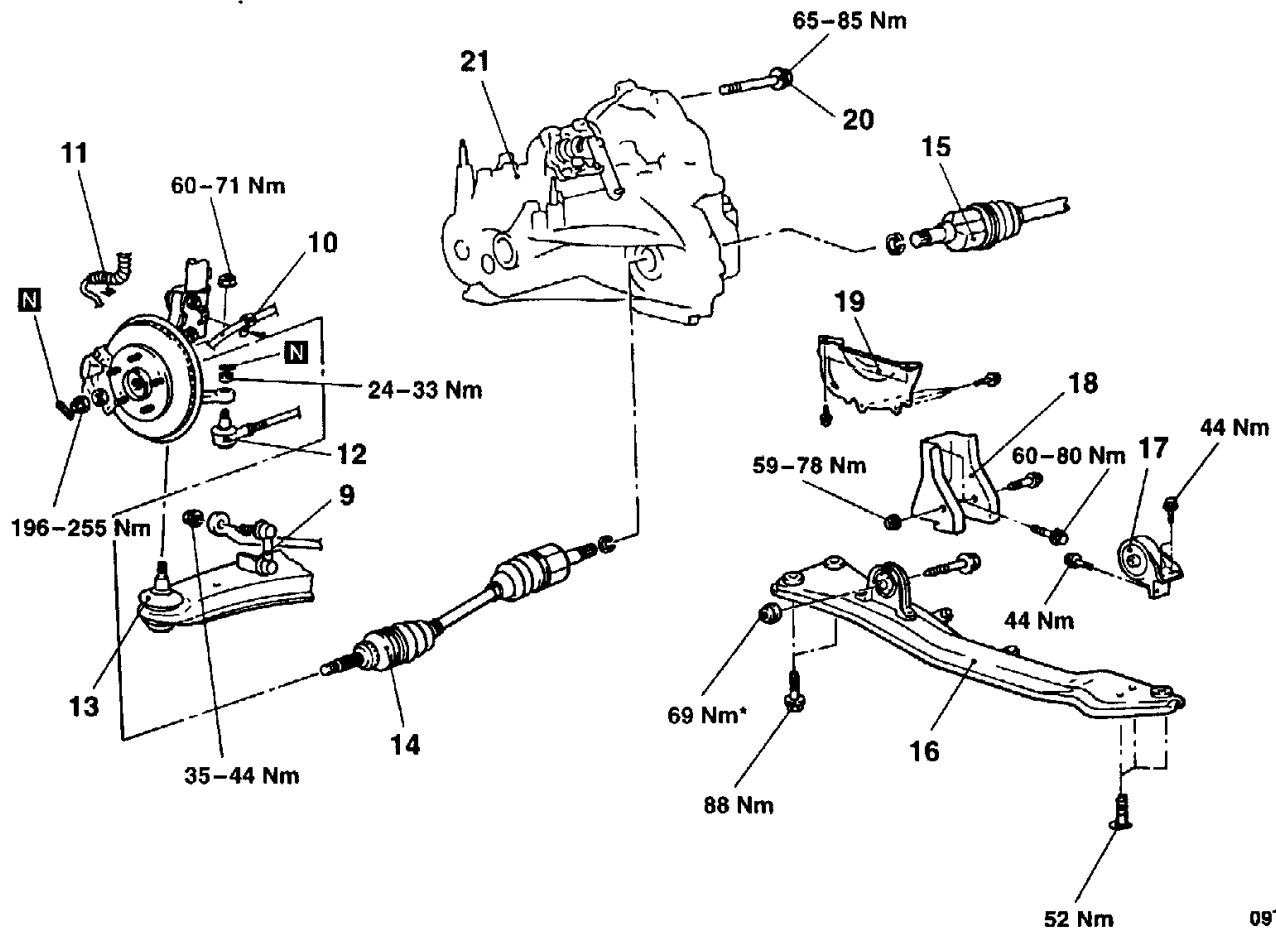
6. Transmission assembly upper part coupling bolts
7. Transmission mount bracket
8. Transmission mount stopper
- Supporting engine assembly



◀C▶

▶A◀

◀D▶



09TE005A

9. Stabiliser bar connection
 10. Wheel speed sensor cable connection (Vehicles with ABS)
 11. Brake hose clamp
 12. Tie rod end connection
 13. Lower arm ball joint connection
 14. Drive shaft <LH> connection
 15. Drive shaft <RH> connection
 16. Centre member assembly
 17. Rear roll stopper

18. Rear roll stopper bracket
 19. Bell housing cover
 20. Transmission assembly lower part coupling bolts
 21. Transmission assembly

Caution

*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.



REMOVAL SERVICE POINTS**◀A▶ STARTER MOTOR REMOVAL**

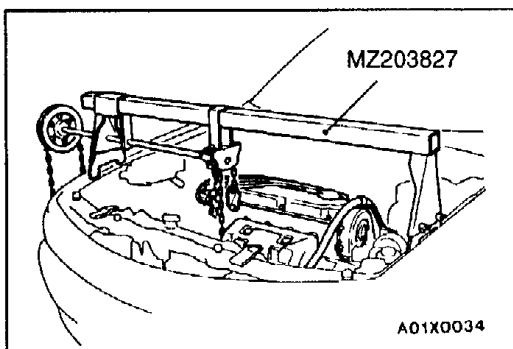
Remove the starter motor with the starter harness still connected and secure it to the inside of the engine compartment.

◀B▶ CLUTCH RELEASE CYLINDER REMOVAL

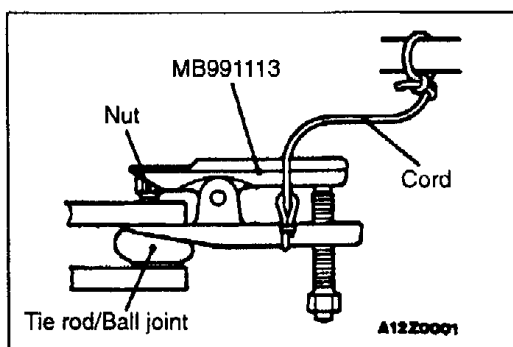
Remove the clutch release cylinder without disconnecting the oil line connection, and fix it to the vehicle chassis.

◀C▶ TRANSMISSION MOUNT BRACKET REMOVAL

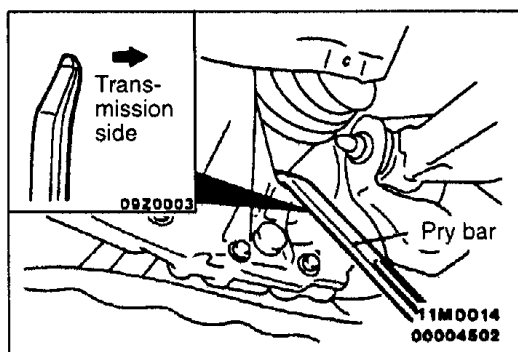
Jack up the transmission assembly gently with a garage jack and then remove the transmission mount bracket.

**◀D▶ ENGINE ASSEMBLY SUPPORTING**

Set the special tool to the vehicle to support the engine assembly.

**◀E▶ TIE ROD END/LOWER ARM BALL JOINT REMOVAL****Caution**

1. Loosen the nut without removing it from the ball joint and use the special tool MB991113 to disconnect the tie rod or ball joint.
2. Support the special tool with a cord in order to prevent it from falling off.

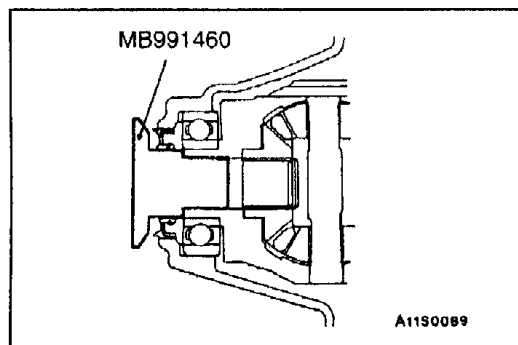


◀F▶ DRIVE SHAFT REMOVAL

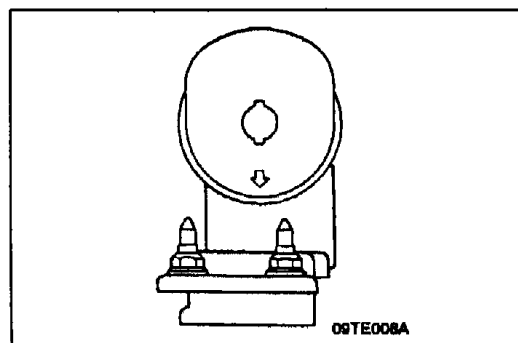
1. Insert a pry bar between the transmission case and the drive shaft to remove the drive shaft.

Caution

Always use a pry bar or the drive shaft joints will be damaged.



2. To prevent foreign matter from entering the transmission case, insert a suitable plug into the drive shaft openings.
3. Suspend the RH drive shaft with wire so that there are no sharp bends in any of the joints.



INSTALLATION SERVICE POINT

▶A◀ TRANSMISSION MOUNT STOPPER INSTALLATION

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

AUTOMATIC TRANSMISSION

CONTENTS

SERVICE SPECIFICATIONS	2	Inhibitor Switch Control Cable Adjustment	46
LUBRICANTS	2	A/T Control Component Location	48
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TROUBLESHOOTING	4	Torque Converter Stall Test	51
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Automatic Transmission Fluid Check	44	Hydraulic Circuit	57
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Throttle Position Sensor Adjustment	46	TRANSMISSION CONTROL*	59
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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) If it is possible that the SRS components are subjected to heat over 93°C in baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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 the asterisk (*) in the table of contents in each group indicate operations requiring warnings.

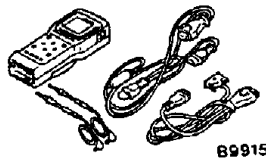
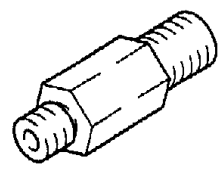
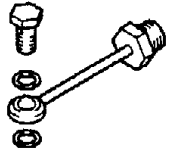
SERVICE SPECIFICATIONS

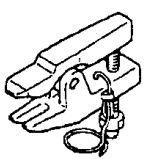
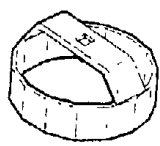
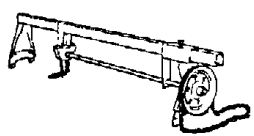
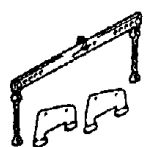
Items		Standard value
Oil temperature sensor k Ω	at 0°C	16.7 – 20.5
	at 100°C	0.57 – 0.69
Resistance of damper clutch control solenoid coil [at 20°C] Ω		2.7 – 3.4
Resistance of Low-Reverse solenoid valve coil [at 20°C] Ω		2.7 – 3.4
Resistance of second solenoid valve coil [at 20°C] Ω		2.7 – 3.4
Resistance of underdrive solenoid valve coil [at 20°C] Ω		2.7 – 3.4
Resistance of overdrive solenoid valve coil [at 20°C] Ω		2.7 – 3.4
Stall speed r/min.		2,100 – 2,600

LUBRICANT

Items	Specified lubricant	Quantity (litres)
Transmission fluid	DIAQUEEN ATF SPII or equivalent	8.5

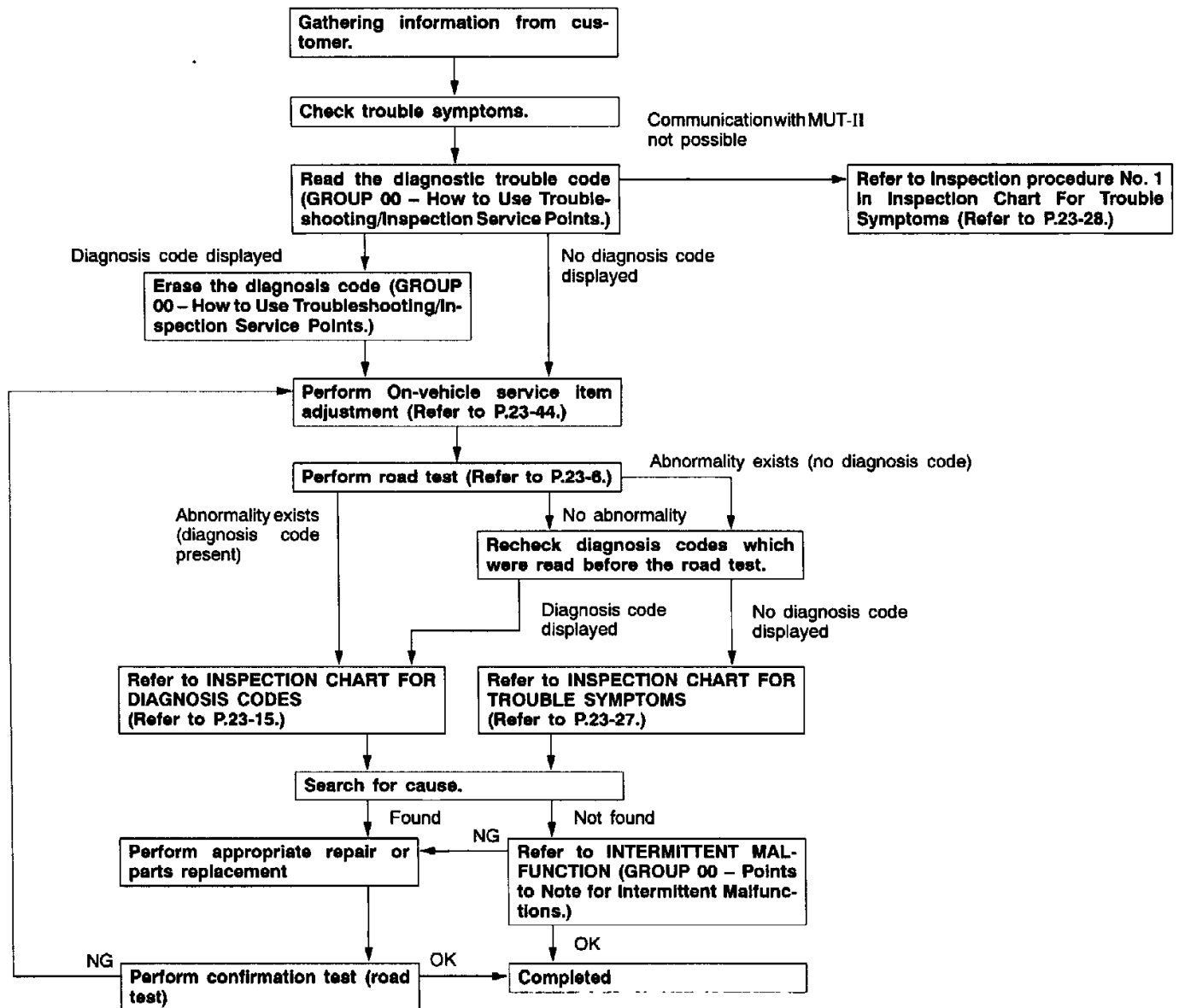
SPECIAL TOOLS

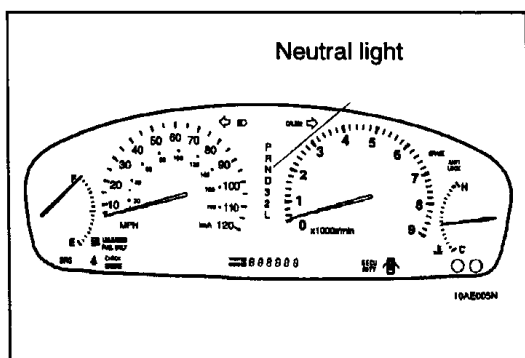
Tool	Number	Name	Application
 6991502	MB991502	MUT-II	Checking for diagnosis trouble codes
	MD998330	Oil pressure gauge 2,942 kPa	Measurement of oil pressure
	MD998332	Adaptor	
	MD998900	Adaptor	

Tool	Number	Name	Application
 B991113	MB991113	Steering linkage puller	Removal of the tie rod end and the lower arm
	MB991610	Oil filter wrench	Removal and installation of automatic transmission oil filter
 Z203827	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
 B991453	MB991453	Engine hanger assembly	Supporting the engine assembly during removal and installation of the transmission

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING





DIAGNOSIS FUNCTION

1. N (Neutral) range light

The N range light flashes at a frequency of approximately 1 Hz (once per second) if there is an abnormality in any of the items in the table below which are related to the A/T system. Check for diagnostic trouble codes if the N range light is flashing at a frequency of approximately 1 Hz.

N range light flashing items

Input shaft speed sensor
Output shaft speed sensor
Each solenoid valve
Gear incorrect ratio

Caution

- If the N range light is flashing at a frequency of approximately 2 Hz (two flashes per second), it means that the automatic transmission fluid temperature is too high. Stop the vehicle in a safe place and wait until the N range light switches off.

2. Method of reading the diagnosis code

Use the MUT-II or the N range lamp to take a reading of the diagnosis codes. (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)

ROAD TEST

Check by the following procedures

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
1	Ignition switch: OFF	Ignition switch (1) ON	Data list No. 54 Control Relay Voltage	A/T Control relay	54	A/T Control relay system (23-26)
2	Ignition switch: ON Engine: Stopped Selector lever position: P	Selector lever position (1) P, (2) R, (3) N, (4) D, (5) 3, (6) 2, (7) L	Data list No. 61 (1) P, (2) R, (3) N, (4) D, (5) 3, (6) 2, (7) L	Inhibitor switch	27 28	Inhibitor switch system (23-19)
		Accelerator pedal (1) Fully closed (2) Depressed (3) Fully open	Data list No. 11 (1) 400 – 1,000 mV (2) Gradually rises from (1) (3) 4,500 – 5,000 mV	TPS	11 12 14	TPS system (23-16)
		Brake pedal (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stop light switch	26	Stop light switch system (23-19)
3	Ignition switch: ST Engine: Stopped	Starting test with lever P or N range	Starting should be possible	Starting	–	Starting impossible (23-28)
4	Warming up	Drive for 15 minutes or more so that the automatic transmission fluid temperature becomes 70 – 90°C.	Data list No. 15 Gradually rises to 70 – 90°C	Oil temperature sensor	15 16	Oil temperature sensor system (23-16)

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
5	Engine: Idling Selector lever position: N	Brake pedal (Retest) (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stop light switch	26	Stop light switch system (23-19)
		A/C switch (1) ON (2) OFF	Data list No. 65 (1) ON (2) OFF	Dual pressure switch	–	Dual pressure switch system (23-36)
5	Engine: Idling Selector lever position: N	Accelerator pedal (1) Fully closed (2) Depressed	Data list No. 64 (1) ON (2) OFF	Idle position switch	–	Idle position switch system (23-36)
			Data list No. 21 (1) 600 – 900 r/min (2) Gradually rises from (1)	Crankshaft position sensor	21	Crankshaft position sensor system (23-16)
			Data list No. 57 (2) Data changes	Communication with Engine-ECU	51	Abnormal communication with Engine-ECU (23-26)
5	Engine: Idling Selector lever position: N	Selector lever position (1) N → D (2) N → R	Should be no abnormal shifting shocks Time lag when shifting should be within 2 seconds	Malfunction when starting	–	Engine stalling when shifting (23-30)
					--	Shocks when changing from N to D and large time lag (23-31)
					–	Shocks when changing from N to R and large time lag (23-32)
					–	Shocks when changing from N to D, N to R and long time lag (23-32)
				Driving impossible	–	Does not move forward (23-29)
					–	Does not reverse (23-29)
					–	Does not move (forward or reverse) (23-30)

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
6	Selector lever position: N (on a flat and straight road.)	Selector lever position and vehicle speed (1) Idling in L range (Vehicle stopped) (2) Driving at constant speed of 10 km/h in L position (3) Driving at constant speed of 30 km/h in 2 position (4) Accelerate to 50 km/h in 3 position, then release accelerator pedal. (5) Driving at constant speed of 50 km/h in D position (Each condition should be maintained for 10 seconds or more.)	Data list No. 63 (2) 1st, (3) 2nd, (4) 3rd, (5) 4th	Shift condition	—	—
			Data list No. 31 (2) 0 %, (3) 100 %, (4) 100 %, (5) 100 %	Low and reverse solenoid valve	31	Low and reverse solenoid valve system (23-20)
			Data list No. 32 (2) 0 %, (3) 0 %, (4) 0 %, (5) 100 %	Underdrive solenoid valve	32	Underdrive solenoid valve system (23-20)
			Data list No. 33 (2) 100 %, (3) 0 %, (4) 100 %, (5) 0 %	Second solenoid valve	33	Second solenoid valve system (23-20)

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
6	Selector lever position: N (on a flat and straight road.)	Selector lever position and vehicle speed (1) Idling in L range (Vehicle stopped)	Data list No. 34 (2) 100 %, (3) 100 %, (4) 0 %, (5) 0 %	Overdrive solenoid valve	34	Overdrive solenoid valve system (23-20)
		(2) Driving at constant speed of 10 km/h in L position	Data list No. 29 (1) 0 km/h (4) 50 km/h	Vehicle speed sensor	—	Vehicle speed sensor system (23-37)
		(3) Driving at constant speed of 30 km/h in 2 position				
		(4) Accelerate to 50 km/h mph in 3 position, then release accelerator pedal.	Data list No. 22 (4) 1,800 – 2,100 r/min	Input shaft speed sensor	22	Input shaft speed sensor system (23-17)
		(5) Driving at constant speed of 50 km/h in D position (Each condition should be maintained for 10 seconds or more.)	Data list No. 23 (4) 1,800 – 2,100 r/min	Output shaft speed sensor	23	Output shaft speed sensor system (23-18)
7	Selector lever position: 3 (on a flat and straight road.)	Selector lever position and vehicle speed (1) Accelerate to 50 km/h in 3 position, then release accelerator pedal.	Data list No. 36 (1) 0% (2) Approx.70 – 90%	Damper clutch solenoid	36 52 53	Damper clutch solenoid system (23-20)
		(2) Driving at constant speed of 50 km/h	Data list No. 52 (1) Approx. 100 – 300 r/min (2) Approx. 0 – 10 r/min			

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
8	Use the MUT-II to stop the INVECS-II function. Selector lever position: D (on a flat and straight road.)	Monitor data list No. 11, 23, and 63 with the MUT-II. (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%). (4) While driving at 60 km/h in 4th gear, shift down to 3 range. (5) While driving at 40 km/h in 3rd gear, shift down to 2 range. (6) While driving at 20 km/h in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed, and no abnormal shift shocks should occur. For (4), (5) and (6), downshifting should occur immediately after shifting.	Malfunction when shifting	–	Shift shocks and running up (23-33)
				Displaced shifting points	–	All points (23-33)
					–	Some points (23-34)
				Does not shift	–	No diagnosis code (23-34)
					22	Input shaft speed sensor system (23-17)
					23	Output shaft speed sensor system (23-18)

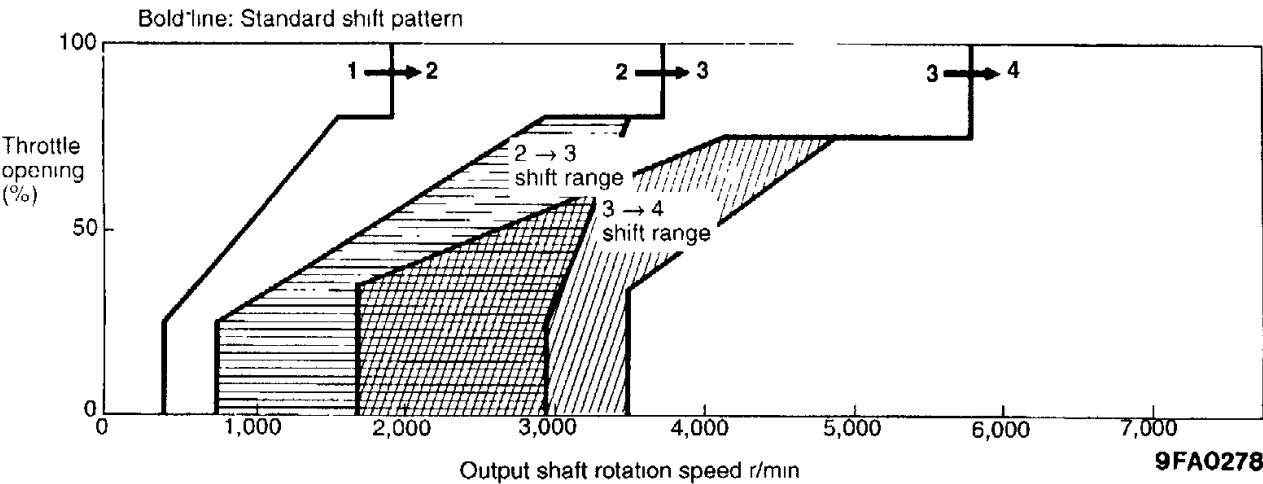
No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
8	Use the MUT-II to stop the INVECS-II function. Selector lever position: D (on a flat and straight road.)	Monitor data list No. 11, 23, and 63 with the MUT-II. (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%). (4) While driving at 60 km/h in 4th gear, shift down to 3 range. (5) While driving at 40 km/h in 3rd gear, shift down to 2 range. (6) While driving at 20 km/h in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed, and no abnormal shift shocks should occur. For (4), (5) and (6), downshifting should occur immediately after shifting.	Does not shift from 1 to 2 or 2 to 1	31	Low and reverse solenoid valve system (23-20)
					33	Second solenoid valve system (23-20)
					41	1st gear incorrect ratio (23-21)
					42	2nd gear incorrect ratio (23-22)

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
8	Use the MUT-II to stop the INVECS-II function. Selector lever position: D (on a flat and straight road.)	Monitor data list No. 11, 23, and 63 with the MUT-II. (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%). (4) While driving at 60 km/h in 4th gear, shift down to 3 range. (5) While driving at 40 km/h in 3rd gear, shift down to 2 range. (6) While driving at 20 km/h in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed, and no abnormal shift shocks should occur. For (4), (5) and (6), downshifting should occur immediately after shifting.	Does not shift from 2 to 3 or 3 to 2	33	Second solenoid valve system (23-20)
					34	Overdrive solenoid valve system (23-20)
					42	2nd gear incorrect ratio (23-22)
					43	3rd gear incorrect ratio (23-23)

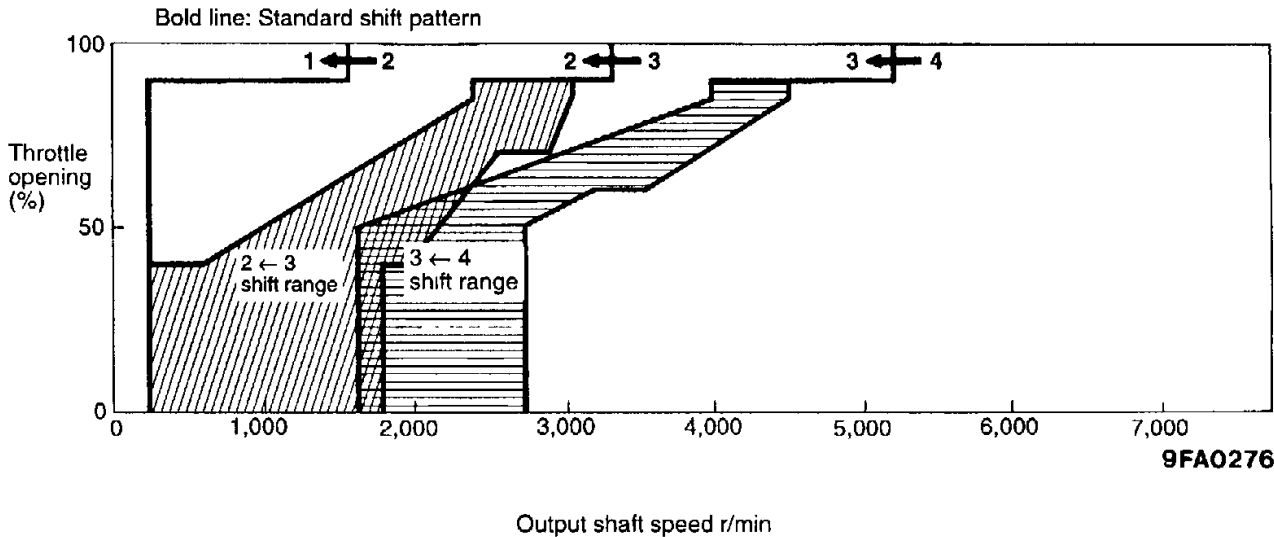
No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
8	Use the MUT-II to stop the INVECS-II function. Selector lever position: D (on a flat and straight road.)	Monitor data list No. 11, 23, and 63 with the MUT-II. (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%). (4) While driving at 60 km/h in 4th gear, shift down to 3 range. (5) While driving at 40 km/h in 3rd gear, shift down to 2 range. (6) While driving at 20 km/h in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft speed, and no abnormal shift shocks should occur. For (4), (5) and (6), downshifting should occur immediately after shifting.	Does not shift from 3 to 4 or 4 to 3	32	Underdrive solenoid valve system (23-20)
					33	Second solenoid valve system (23-20)
					43	3rd gear incorrect ratio (23-23)
					44	4th gear incorrect ratio (23-24)
9	Selector lever position: N (on a flat and straight road.)	Monitor data list No. 22 and No. 23 with the MUT-II. (1) Move selector lever to R range, drive at constant speed of 10 km/h.	The ratio between data list No. 22 and No. 23 should be the same as the gear ratio when reversing.	Does not shift	22	Input shaft speed sensor system (23-17)
					23	Output shaft speed sensor system (23-18)
					46	Reverse gear incorrect ratio (23-25)

SHIFT PATTERN

UPSHIFT PATTERN



DOWNSHIFT PATTERN

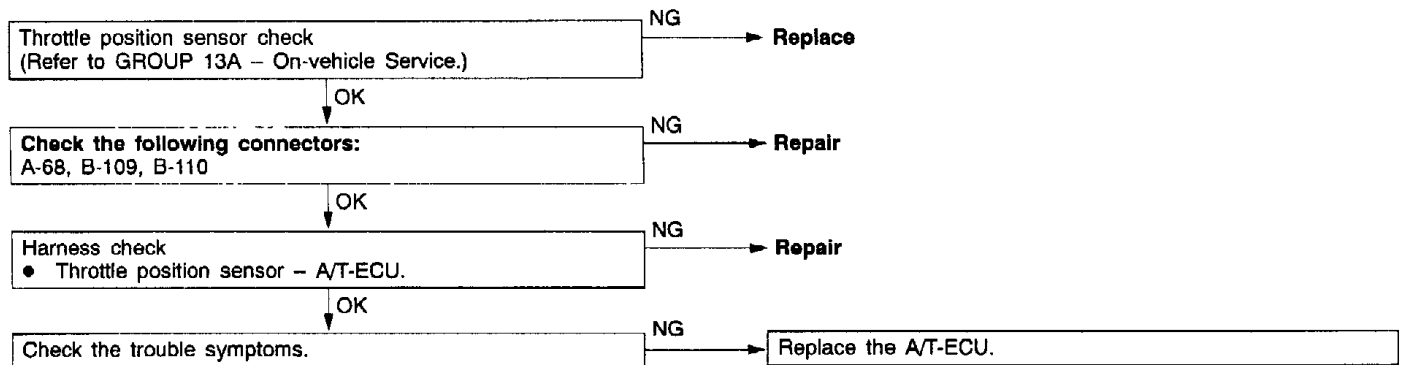


INSPECTION CHART FOR DIAGNOSIS CODES

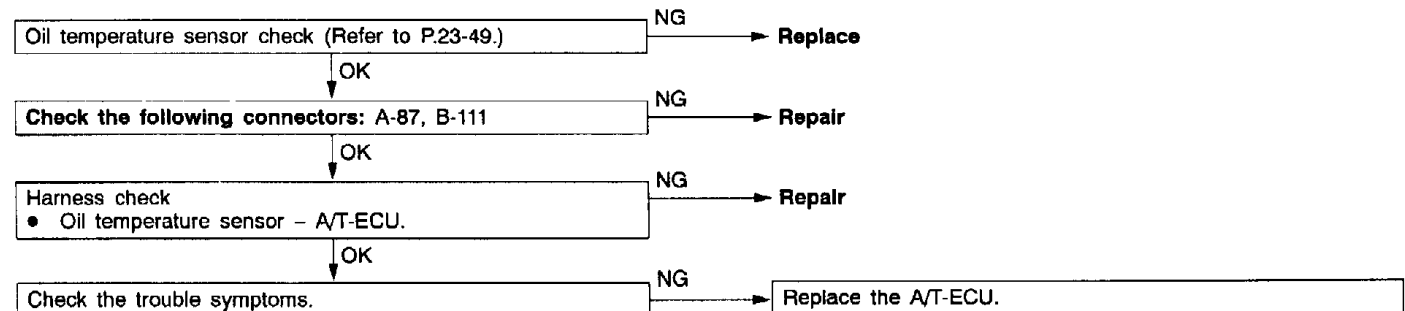
Code	Diagnosis item		Reference page
11	Throttle position sensor system	Short circuit	23-16
12		Open circuit	23-16
14		Sensor maladjustment	23-16
15	Oil temperature sensor system	Open circuit	23-16
16		Short circuit	23-16
21	Crankshaft position sensor system	Open circuit	23-16
22	Input shaft speed sensor system	Short circuit/open circuit	23-17
23	Output shaft speed sensor system	Short circuit/open circuit	23-18
26	Stop light switch system	Short circuit/open circuit	23-19
27	Inhibitor switch system	Open circuit	23-19
28		Short circuit	23-19
31	Low and reverse solenoid valve system	Short circuit/open circuit	23-20
32	Underdrive solenoid valve system	Short circuit/open circuit	23-20
33	Second solenoid valve system	Short circuit/open circuit	23-20
34	Overdrive solenoid valve system	Short circuit/open circuit	23-20
36	Damper clutch solenoid system	Short circuit/open circuit	23-20
41	1st gear incorrect ratio		23-21
42	2nd gear incorrect ratio		23-22
43	3rd gear incorrect ratio		23-23
44	4th gear incorrect ratio		23-24
46	Reverse gear incorrect ratio		23-25
51	Abnormal communication with Engine-ECU		23-26
52	Damper clutch solenoid system	Defective system	23-20
53		Lock-up stuck on	23-20
54	A/T Control relay system	Short circuit to ground/open circuit	23-26
56	N range light system	Short circuit to ground	23-26
71	Malfunction of A/T-ECU		23-26

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

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



Code No. 15, 16 Oil temperature sensor system	Probable cause
If the oil temperature sensor output voltage is 2.6 V or more even after driving for 10 minutes or more (if the oil temperature does not increase), it is judged that there is an open circuit in the oil temperature sensor and diagnosis code No. 15 is output. If the oil temperature sensor output detects the voltage which corresponds to 200°C or more for more than one second, it is judged that there is an open circuit in oil temperature sensor and diagnosis code No.16 is output.	• Malfunction of the oil temperature sensor • Malfunction of connector • Malfunction of the A/T-ECU

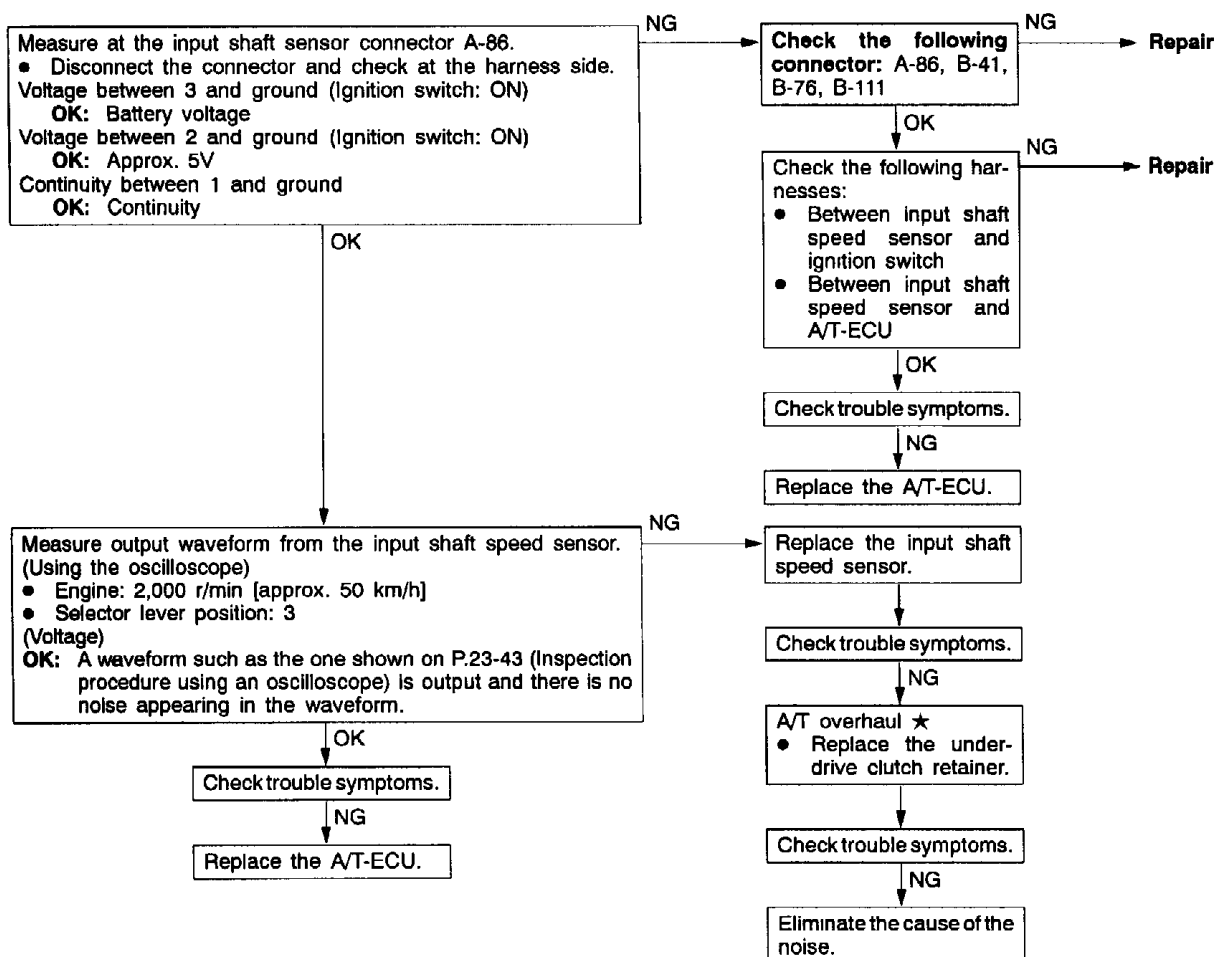


Code No. 21 Crankshaft position sensor system	Probable cause
If no output pulse is detected from the crankshaft position sensor for 5 seconds or more while driving at 25 km/h or more, it is judged that there is an open circuit in the crankshaft position sensor and diagnosis code No. 21 is output.	• Malfunction of the crankshaft position sensor • Malfunction of connector • Malfunction of the A/T-ECU

Refer to GROUP 13A – MPI

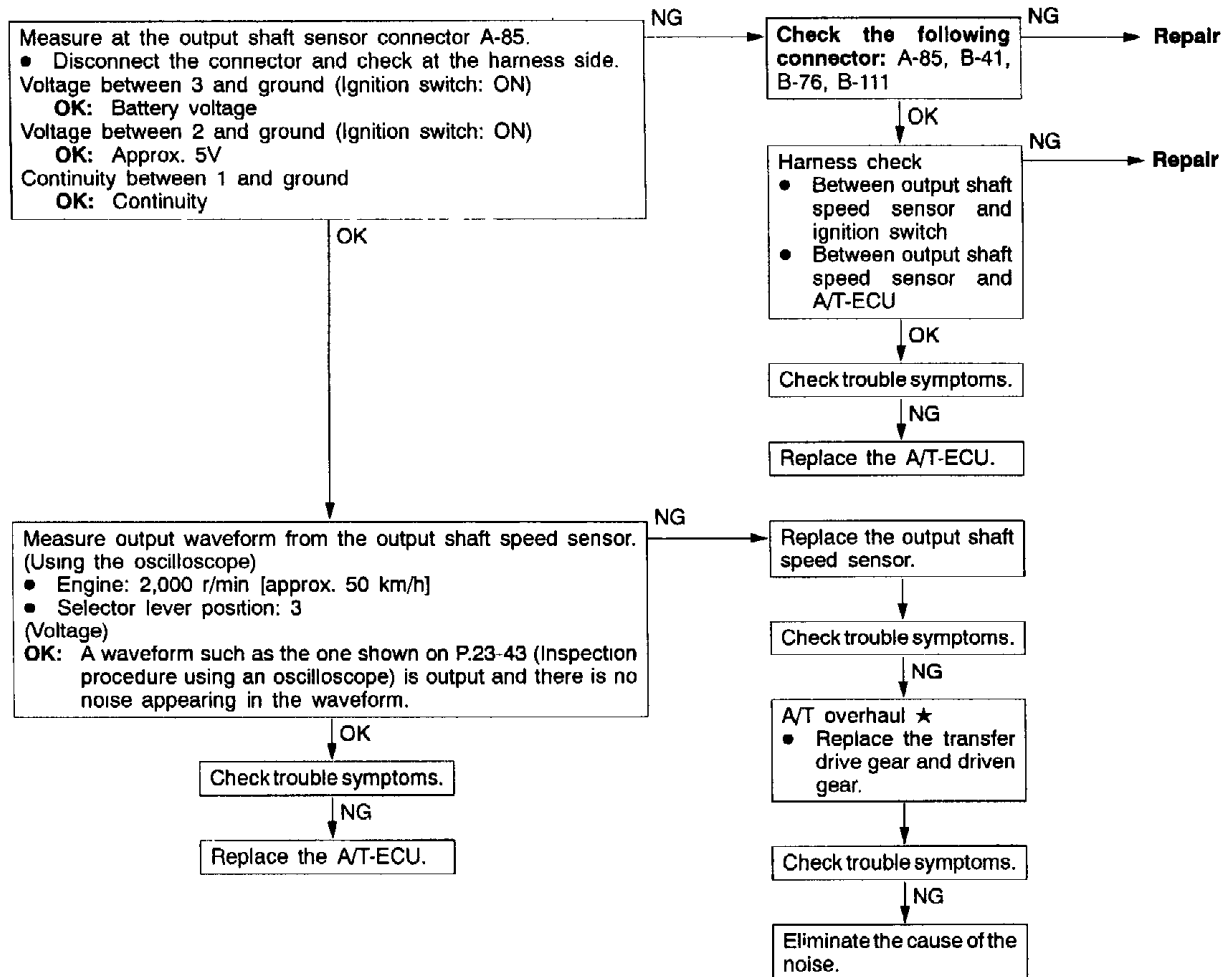
Code No. 22 Input shaft speed sensor system	Probable cause
If no output pulse is detected from the input shaft speed sensor for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more, it is judged to be an open circuit or short-circuit in the input shaft speed sensor and diagnosis code No. 22 is output. If diagnosis code No. 22 is output four times, the transmission is locked into 3rd gear or 2nd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of connector • Malfunction of the A/T-ECU

★: Refer to the Transmission Workshop Manual.

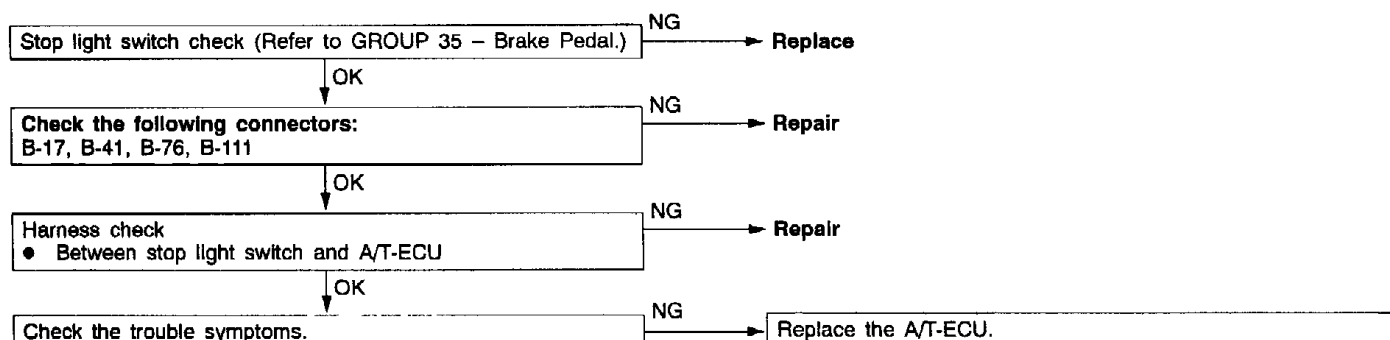


Code No. 23 Output shaft speed sensor system	Probable cause
If the output from the output shaft speed sensor is continuously 50% lower than the vehicle speed for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more, it is judged to be an open circuit or short-circuit in the output shaft speed sensor and diagnosis code No. 23 is output. If diagnosis code No. 23 is output four times, the transmission is locked into 3rd gear or 2nd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz.	• Malfunction of the output shaft speed sensor • Malfunction of the transfer drive gear or driven gear • Malfunction of connector • Malfunction of the A/T-ECU

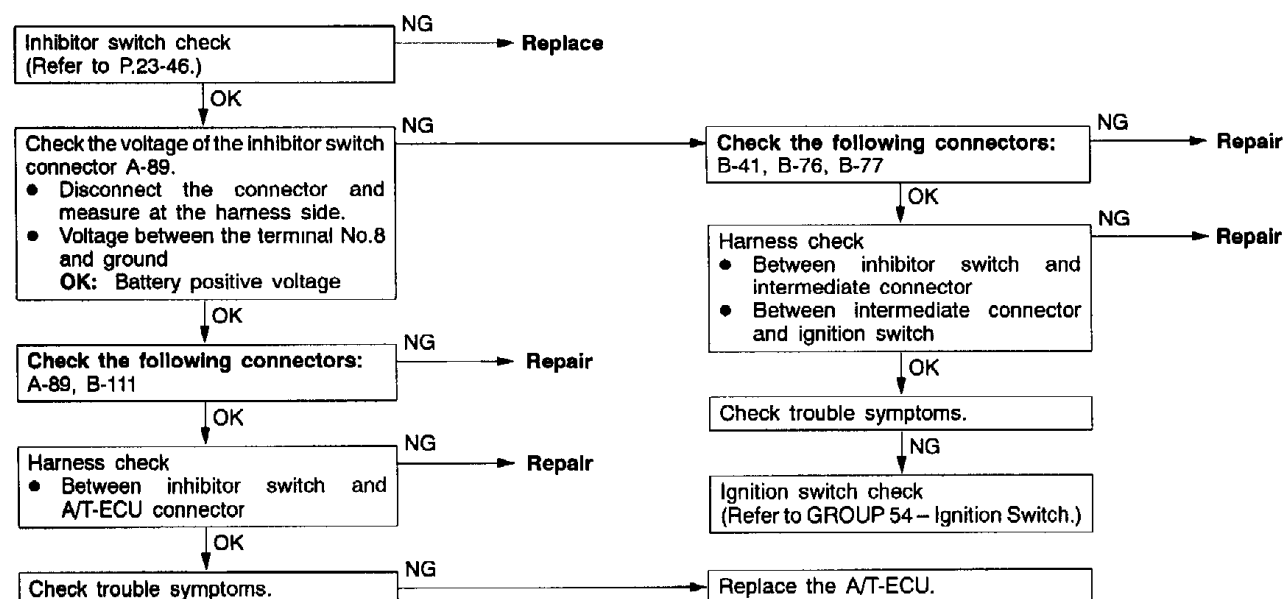
★: Refer to the Transmission Workshop Manual.



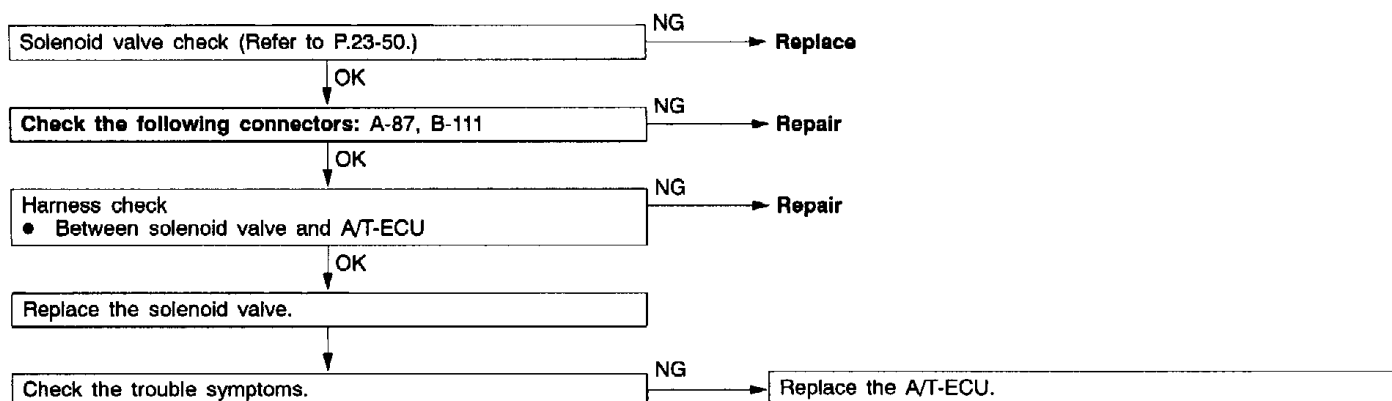
Code No. 26 Stop light switch system	Probable cause
If the stop light switch is on for 5 minutes or more while driving, it is judged that there is a short circuit in the stop light switch and diagnosis code No. 26 is output.	• Malfunction of the stop light switch • Malfunction of connector • Malfunction of the A/T-ECU



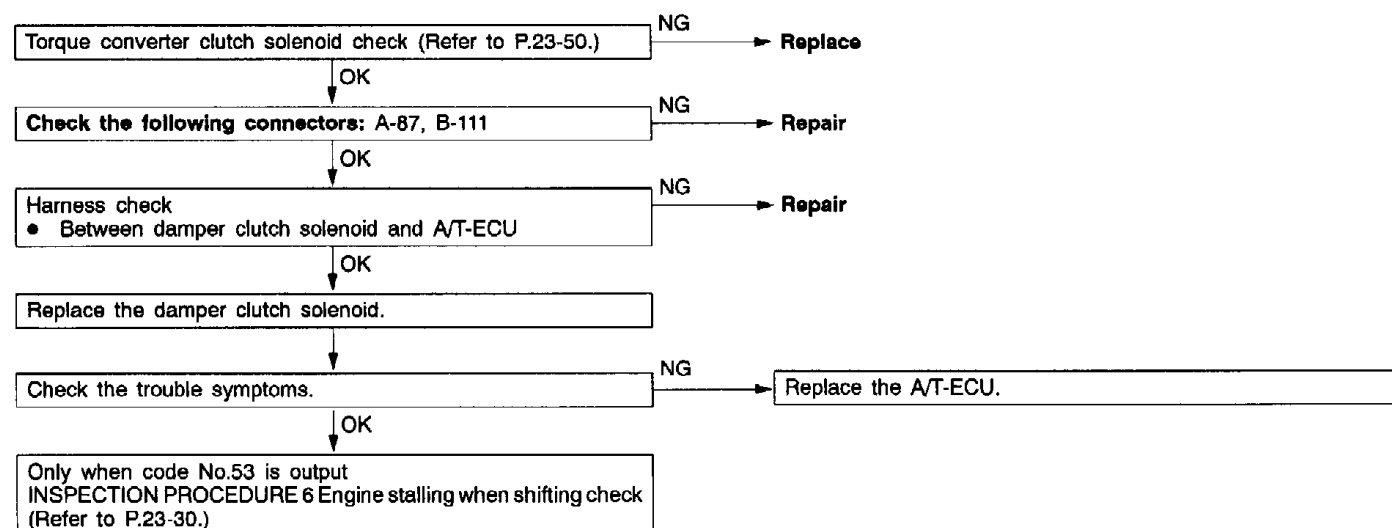
Code No.27, 28 Inhibitor switch system	Probable cause
If the A/T-ECU detects no inhibitor switch input signal for a continuous period of 30 seconds, it is judged that there is an open circuit in the inhibitor switch and diagnosis code No.27 is output. If the A/T-ECU detects more than two kinds of inhibitor switch input signals for a continuous period of 30 seconds, it is judged that there is an open circuit in the inhibitor switch and diagnosis code No.28 is output.	• Malfunction of the inhibitor switch • Malfunction of the ignition switch • Malfunction of connector • Malfunction of the A/T-ECU



Code No. 31 Low and reverse solenoid valve system	Probable cause
Code No. 32 Underdrive solenoid valve system	
Code No. 33 Second solenoid valve system	
Code No. 34 Overdrive solenoid valve system	
If the resistance value for a solenoid valve is too large or too small, it is judged that there is a short-circuit or an open circuit in the solenoid valve and the respective diagnosis code is output. The transmission is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz.	● Malfunction of solenoid valve ● Malfunction of connector ● Malfunction of the A/T-ECU

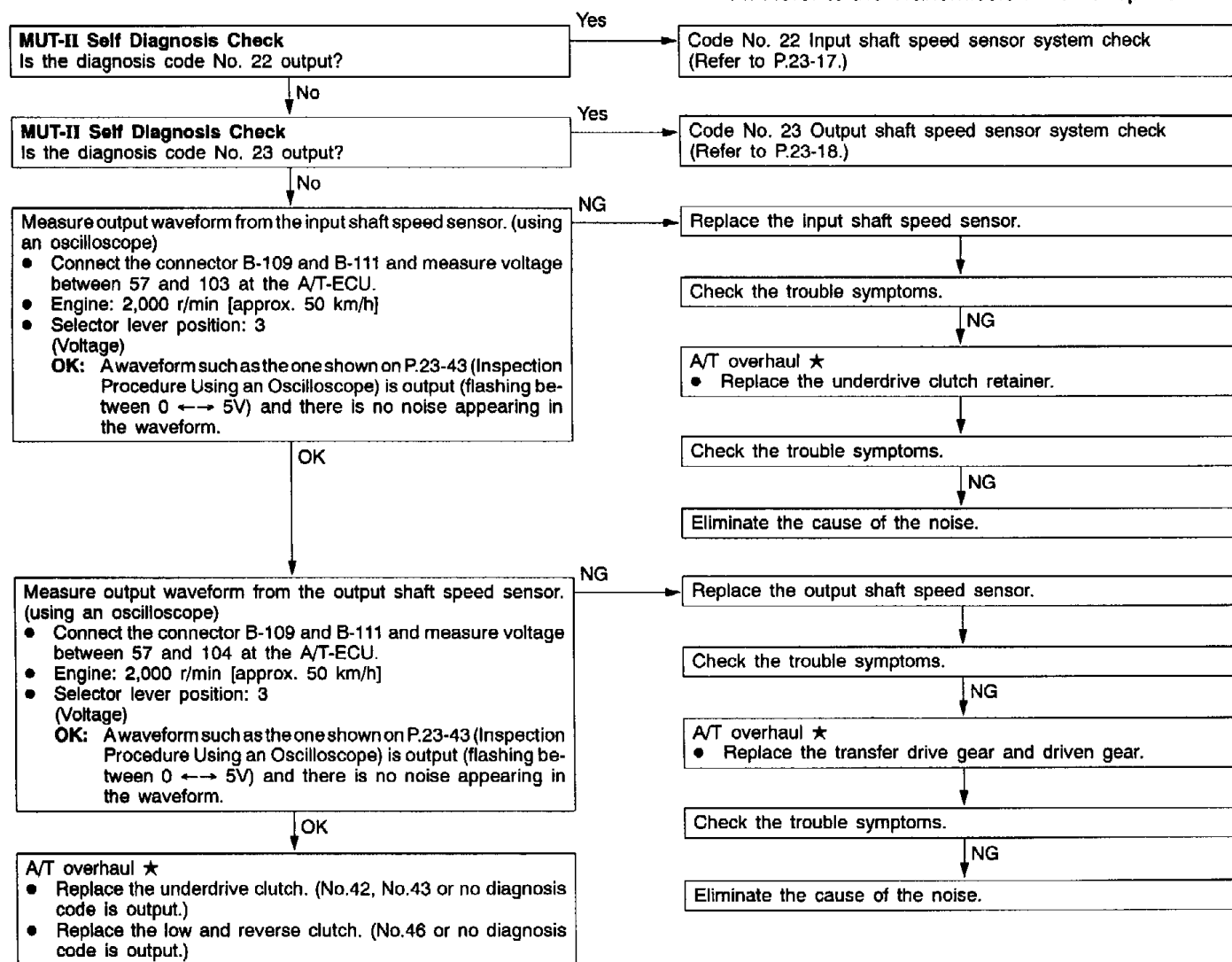


Code No. 36, 52, 53 Damper clutch solenoid system	Probable cause
If the resistance value for the damper clutch solenoid is too large or too small, it is judged that there is a short-circuit or an open circuit in the damper clutch solenoid and diagnosis code No. 36 is output. If the drive duty rate for the damper clutch solenoid is 100 % for a continuous period of 4 seconds or more, it is judged that there is an abnormality in the damper clutch system and diagnosis code No. 52 is output. When diagnosis code No. 36 is output, the transmission is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz. If the lock-up clutch remains engaged for a continuous period of 10 seconds when the A/T-ECU is attempting to disengage the lock-up clutch, it is judged that the damper clutch is stuck on and diagnosis code No.53 is output.	
• Malfunction of the damper clutch solenoid • Malfunction of connector • Malfunction of the A/T-ECU	



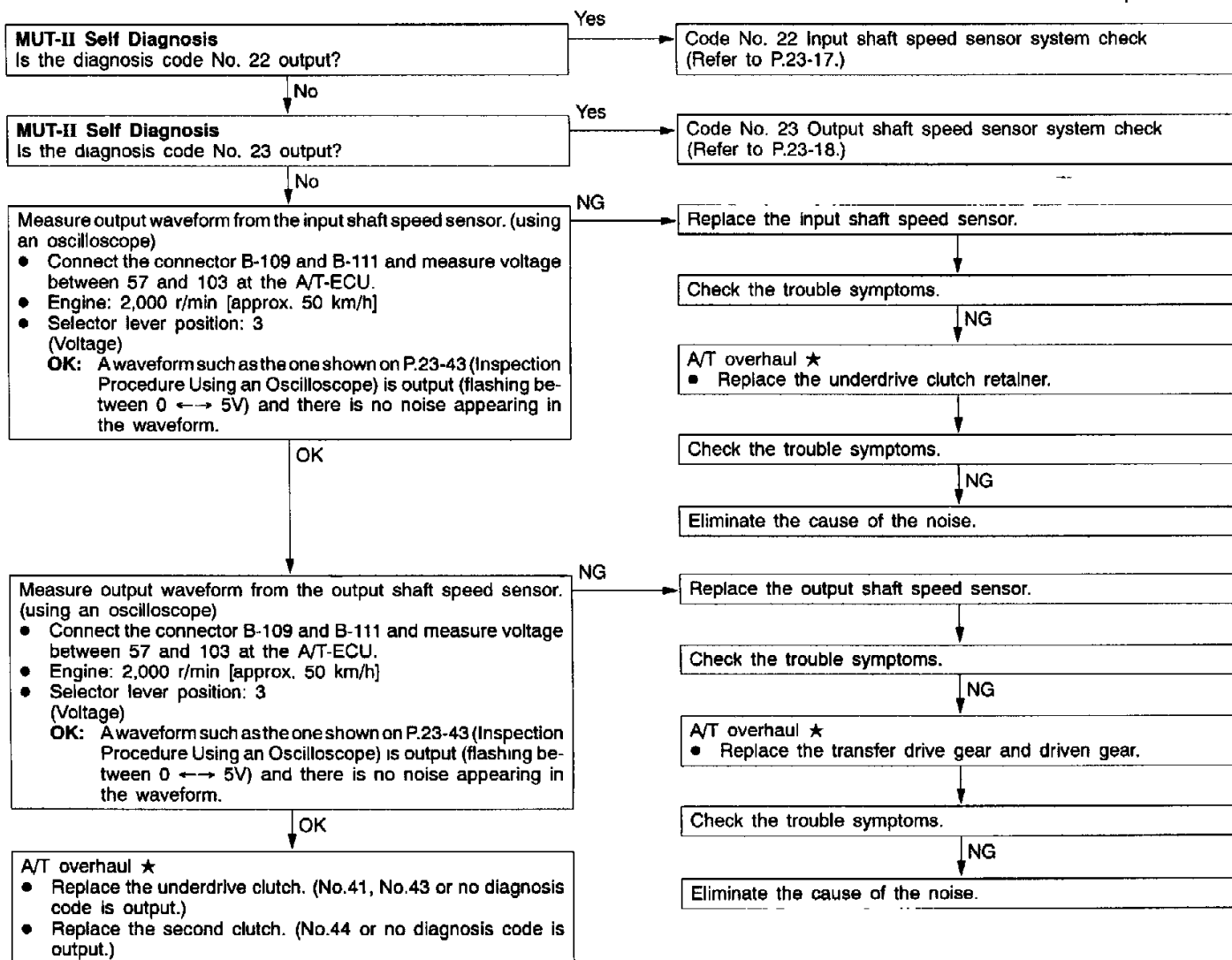
Code No. 41 1st gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the 1st gear ratio is not the same as the output from the input shaft speed sensor after shifting to 1st gear has been completed, diagnosis code No. 41 is output. If diagnosis code No. 41 is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the transfer drive gear or driven gear • Malfunction of the low and reverse brake system • Malfunction of the underdrive clutch system • Noise generated

★: Refer to the Transmission Workshop Manual.



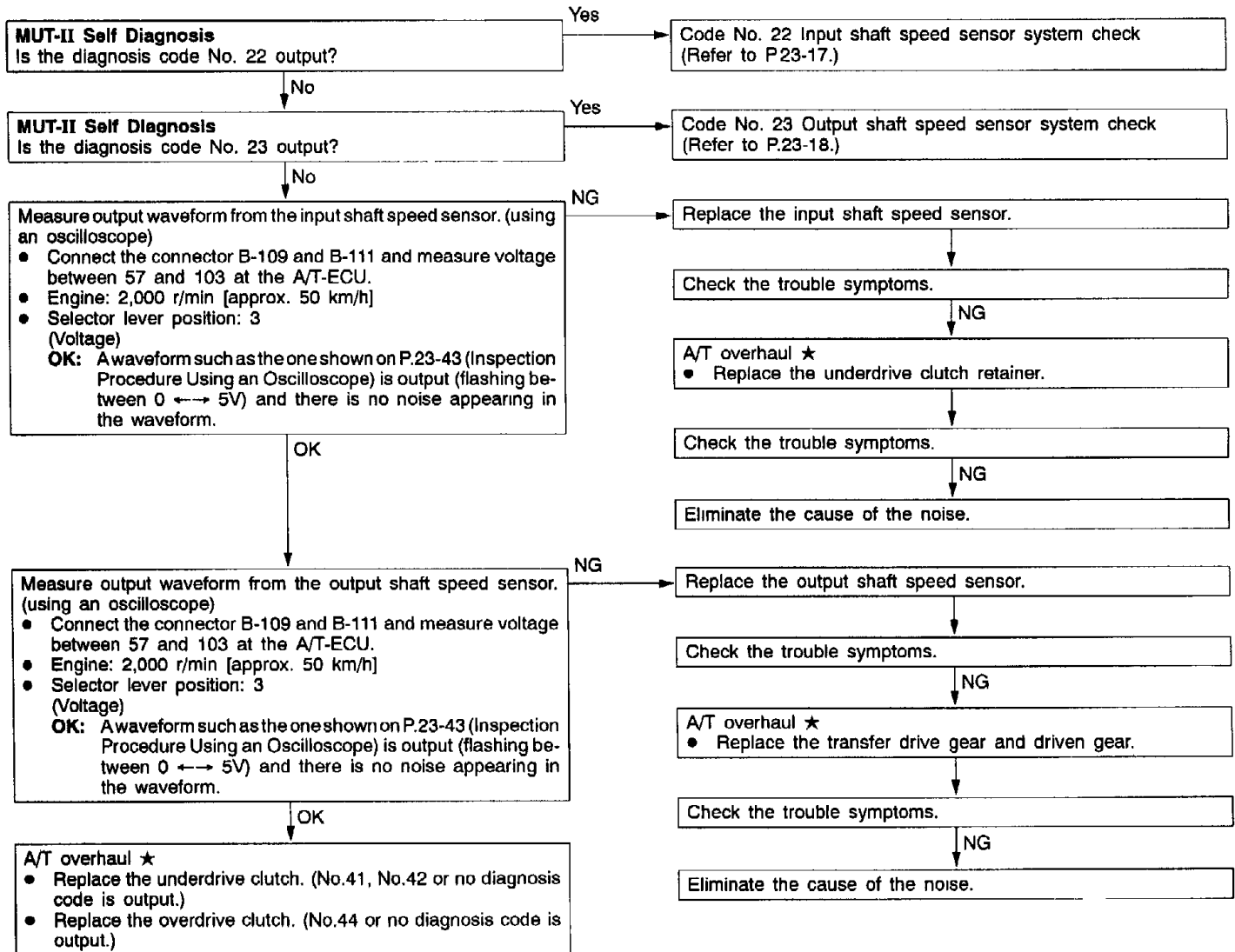
Code No. 42 2nd gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the 2nd gear ratio is not the same as the output from the input shaft speed sensor after shifting to 2nd gear has been completed, diagnosis code No. 42 is output. If diagnosis code No. 42 is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the transfer drive gear or driven gear • Malfunction of the second brake system • Malfunction of the underdrive clutch system • Noise generated

★: Refer to the Transmission Workshop Manual.



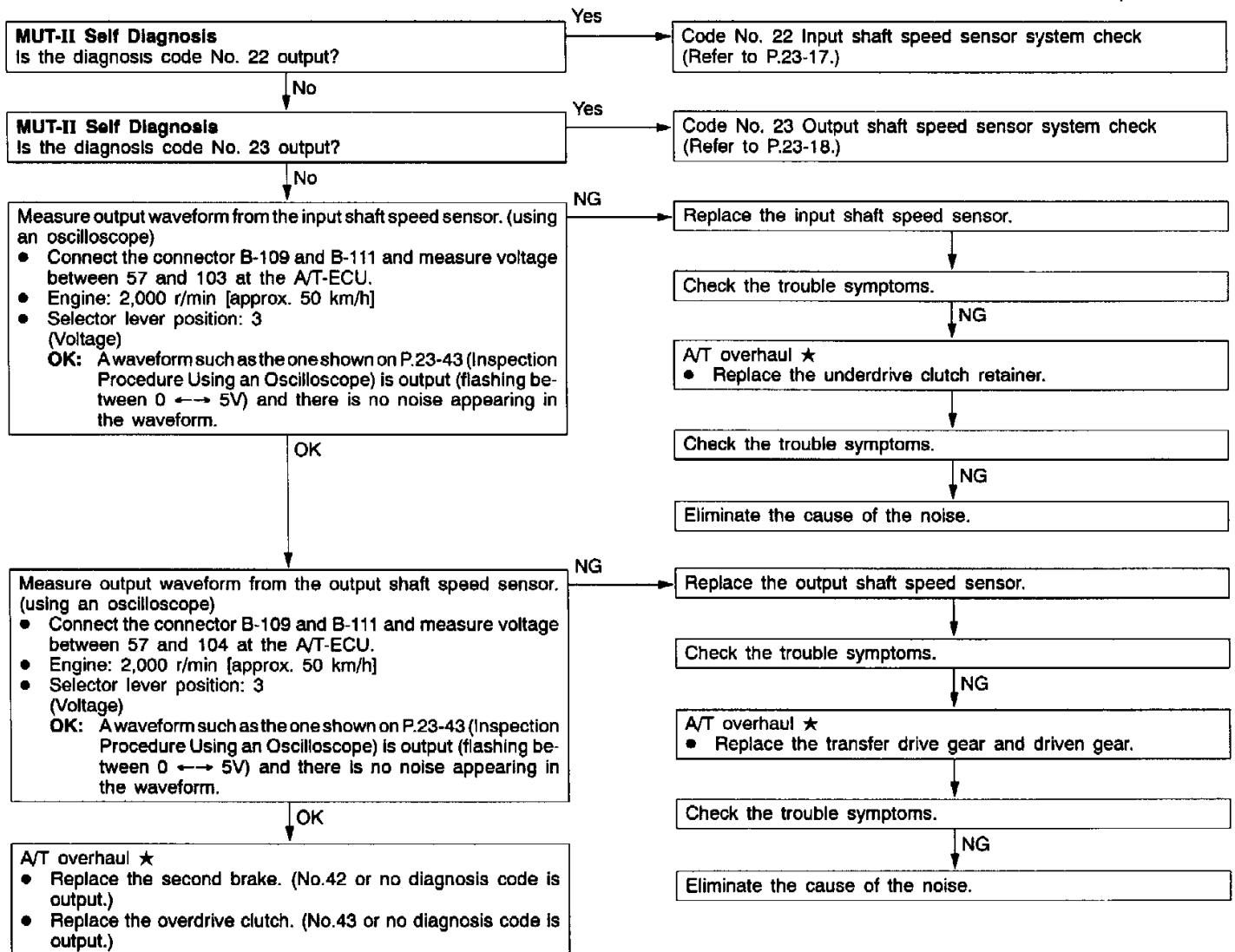
Code No. 43 3rd gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the 3rd gear ratio is not the same as the output from the input shaft speed sensor after shifting to 3rd gear has been completed, diagnosis code No. 43 is output. If diagnosis code No. 43 is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the transfer drive gear or driven gear • Malfunction of the underdrive clutch system • Malfunction of the overdrive clutch system • Noise generated

★: Refer to the Transmission Workshop Manual.



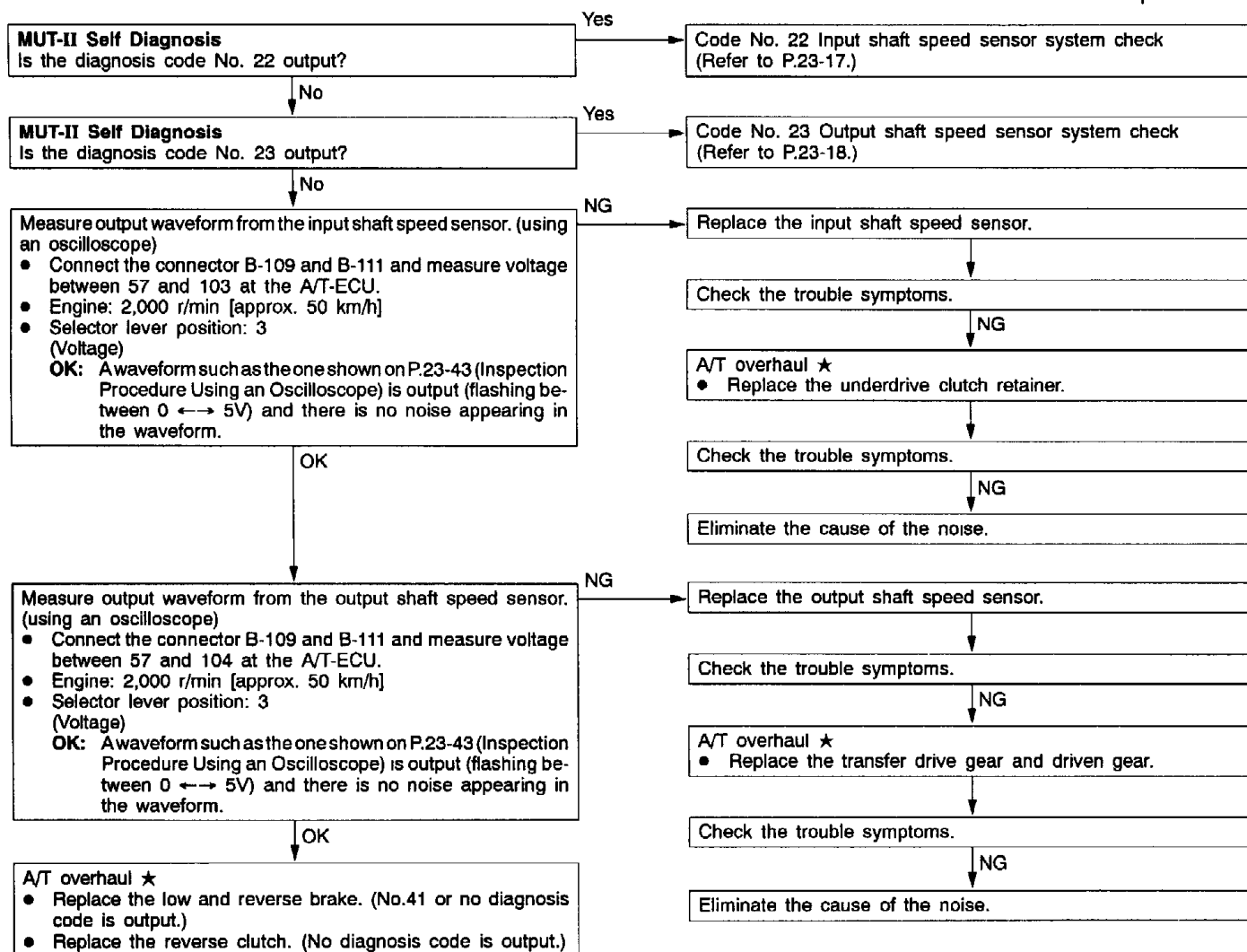
Code No. 44 4th gear incorrect ratio	Probable cause
If the output from the output shaft speed sensor multiplied by the 4th gear ratio is not the same as the output from the input shaft speed sensor after shifting to 4th gear has been completed, diagnosis code No. 44 is output. If diagnosis code No. 44 is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the transfer drive gear or driven gear • Malfunction of the second brake system • Malfunction of the overdrive clutch system • Noise generated

★: Refer to the Transmission Workshop Manual.



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

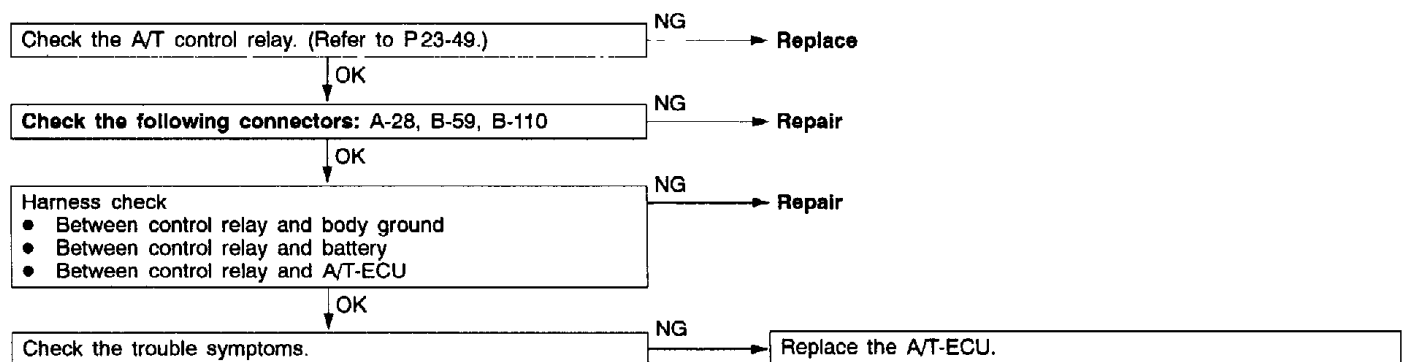
★: Refer to the Transmission Workshop Manual.



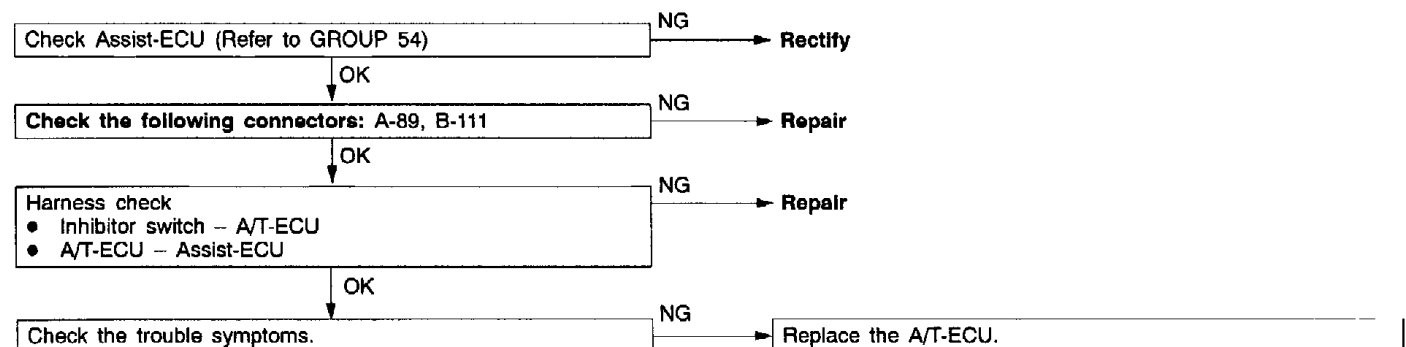
Code No. 51 Abnormal communication with Engine-ECU	Probable cause
If normal communication is not possible for a continuous period of 1 second or more when the battery voltage is 10 V or more and the engine speed is 450 r/min or more, diagnosis code No. 51 is output. Diagnosis code No. 51 is also output if the data being received is abnormal for a continuous period of 4 seconds under the same conditions.	• Malfunction of the Engine-ECU • Malfunction of the A/T-ECU

Replace the Engine-A/T-ECU.

Code No. 54 A/T Control relay system	Probable cause
If the control relay voltage is less than 7 V after the ignition switch has been turned to ON, it is judged that there is an open circuit or a short-circuit in the A/T control relay earth and diagnosis code No. 54 is output. The transmission is locked into 3rd gear as a fail-safe measure, and the N range light flashes at a frequency of 1 Hz.	• Malfunction of the A/T control relay • Malfunction of connector • Malfunction of the A/T-ECU



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



Code No. 71 Malfunction of A/T-ECU	Probable cause
There is an abnormality in the A/T-ECU. The transmission is locked into 3rd gear as a fail-safe measure.	• Malfunction of the A/T-ECU

Replace the Engine-A/T-ECU.

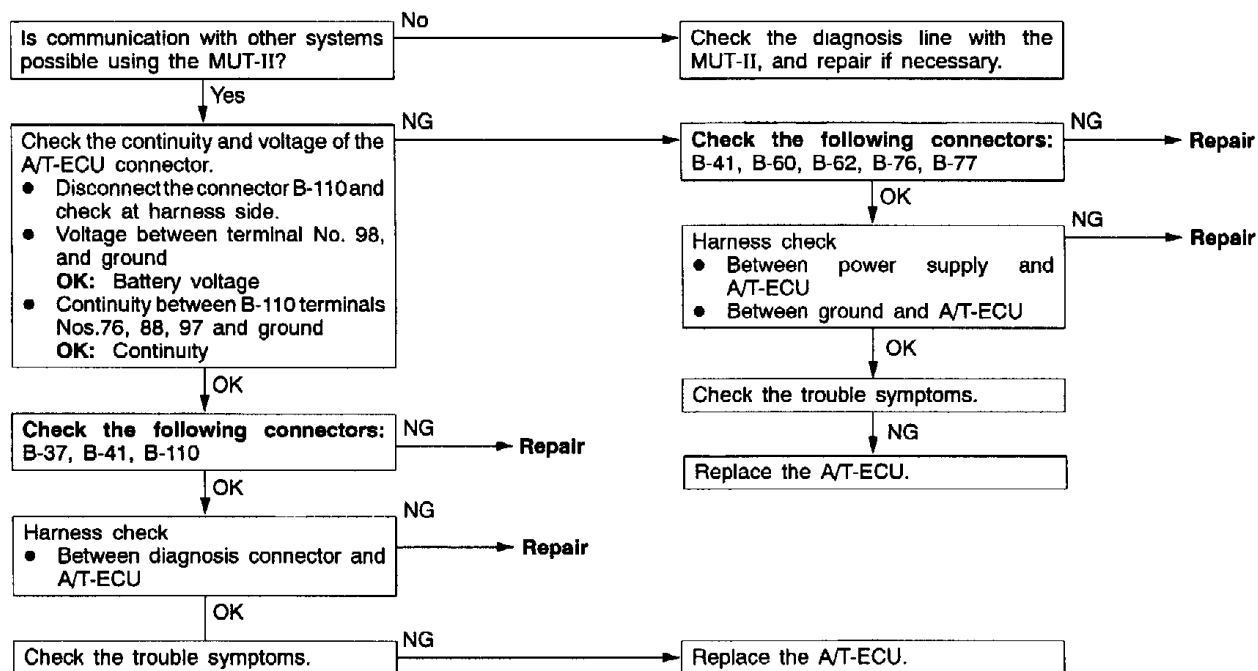
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with the MUT-II is not possible		1	23-28
Driving impossible	Starting impossible	2	23-28
	Does not move forward	3	23-29
	Does not reverse	4	23-29
	Does not move (forward or reverse)	5	23-30
Malfunction when starting	Engine stalling when shifting	6	23-30
	Shocks when changing from N to D and long time lag	7	23-31
	Shocks when changing from N to R and long time lag	8	23-32
	Shocks when changing from N to D, N to R and long time lag	9	23-32
Malfunction when shifting	Shocks and running up	10	23-33
Displaced shifting points	All points	11	23-33
	Some points	12	23-34
Does not shift	No diagnosis codes	13	23-34
Malfunction while driving	Poor acceleration	14	23-35
	Vibration	15	23-35
Idle position switch system		16	23-36
Dual pressure switch system		17	23-36
Vehicle speed sensor system		18	23-37
Auto-cruise-ECU signal system		19	23-37

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

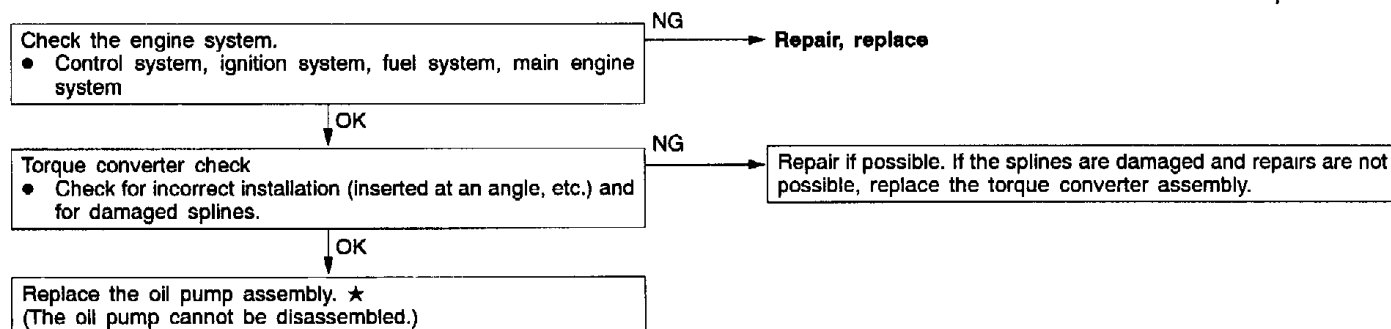
Communication with the MUT-II is not possible	Probable cause
If communication with the MUT-II is not possible, the cause is probably a defective diagnosis line or the A/T-ECU is not functioning.	• Malfunction of diagnosis line • Malfunction of connector • Malfunction of the A/T-ECU



INSPECTION PROCEDURE 2

Starting impossible	Probable cause
Starting is not possible when the selector lever is in P or N range. In such cases, the cause is probably a defective engine system, torque converter or oil pump or seized oil pump.	• Malfunction of the engine system • Malfunction of the torque converter • Malfunction of the oil pump

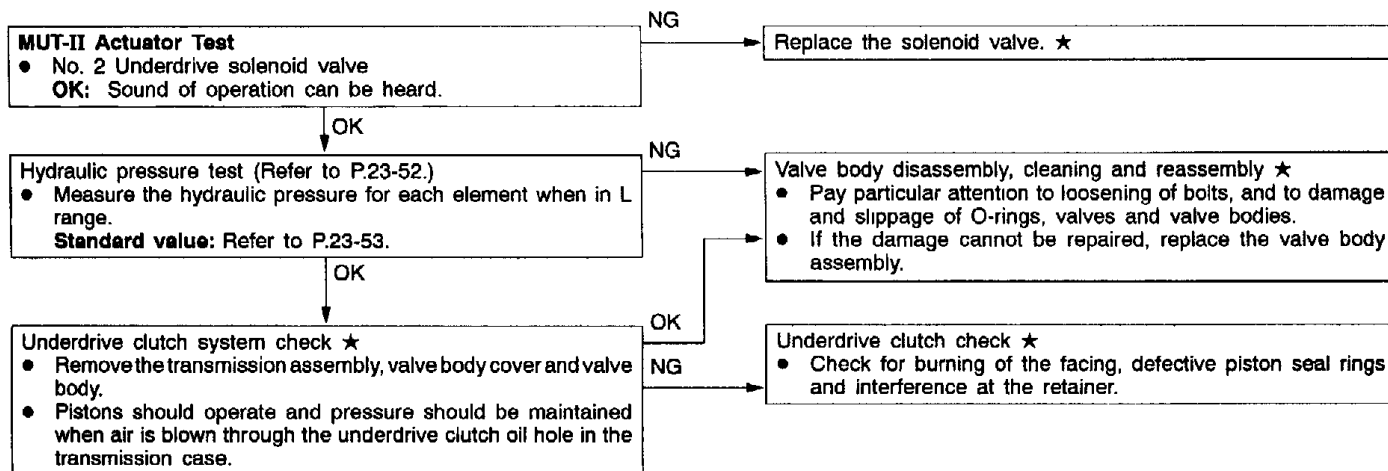
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 3

Does not move (forward)	Probable cause
If the vehicle does not move forward when the selector lever is shifted from N to D, 3, 2 or L range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the underdrive clutch or valve body.	- Abnormal line pressure - Malfunction of the underdrive solenoid valve - Malfunction of the underdrive clutch - Malfunction of the valve body

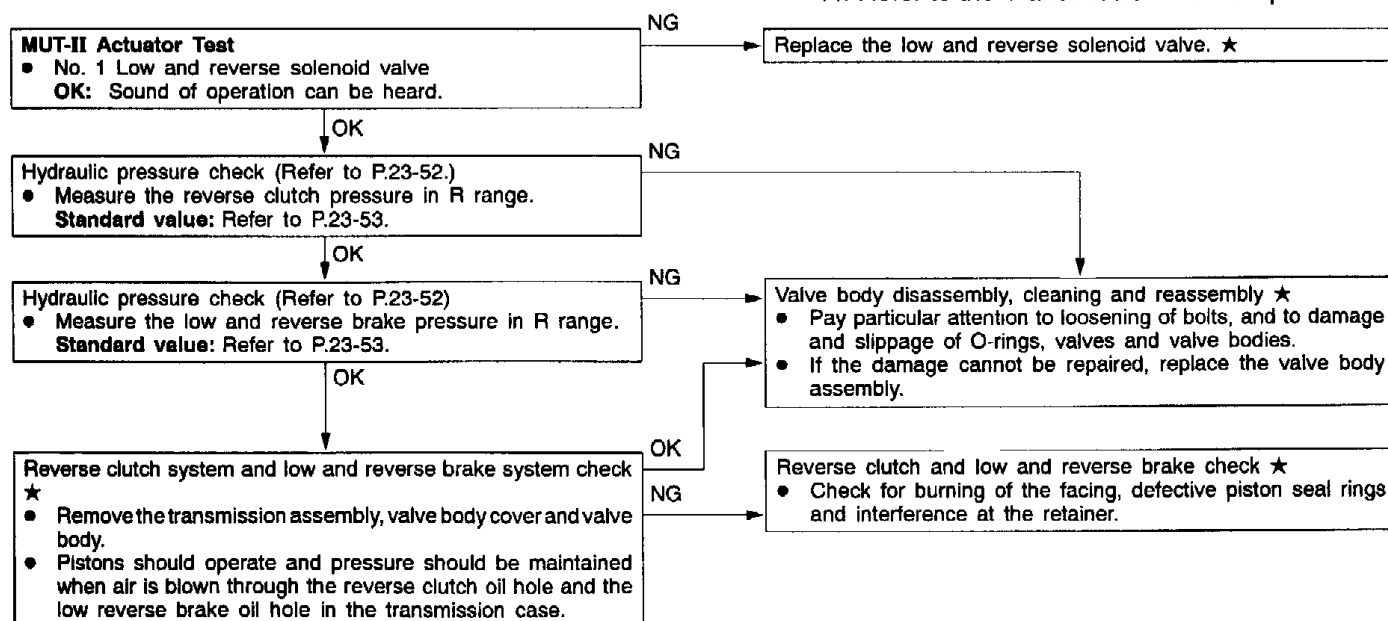
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 4

Does not reverse	Probable cause
If the vehicle does not reverse when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal pressure in the reverse clutch or low and reverse brake or a malfunction of the reverse clutch, low and reverse brake or valve body.	- Abnormal reverse clutch pressure - Abnormal low and reverse brake pressure - Malfunction of the low and reverse solenoid valve - Malfunction of the reverse clutch - Malfunction of the low and reverse brake - Malfunction of the valve body

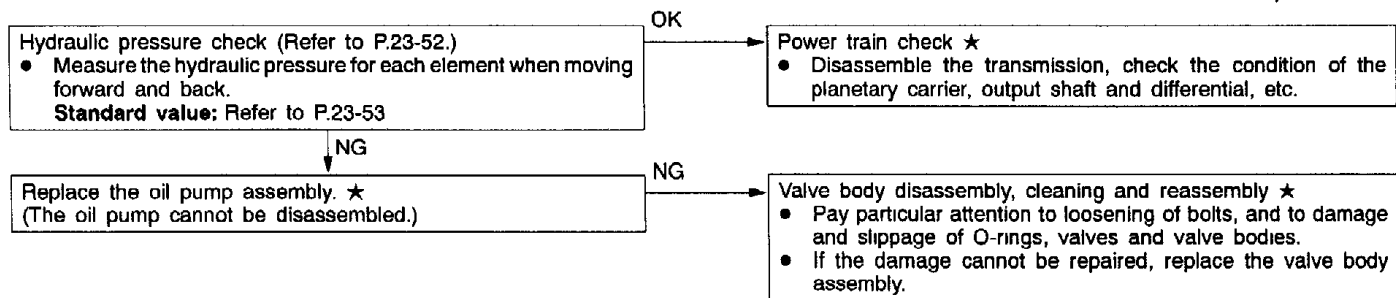
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 5

Does not move (forward or reverse)	Probable cause
If the vehicle does not move forward or reverse when the selector lever is shifted to any position while the engine is idling, the cause is probably abnormal line pressure, or a malfunction of the power train, oil pump or valve body.	- Abnormal line pressure - Malfunction of power train - Malfunction of the oil pump - Malfunction of the valve body

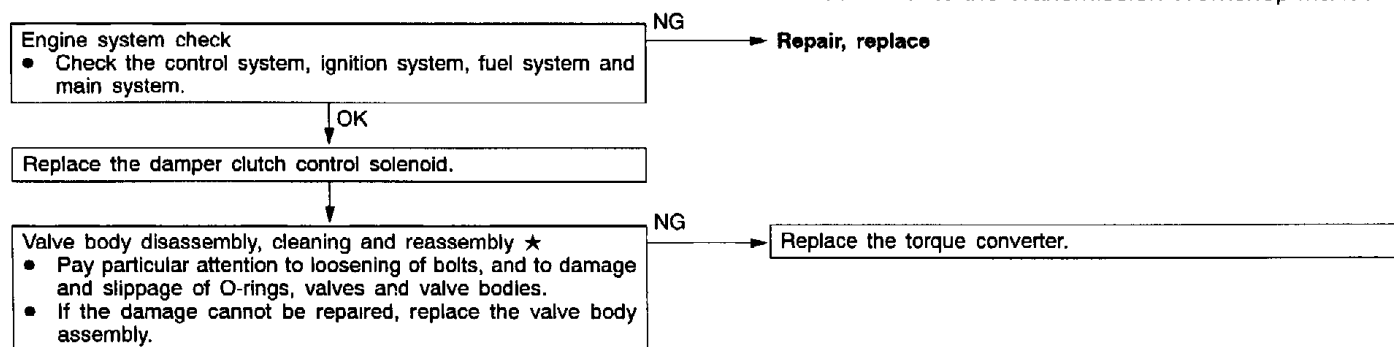
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 6

Engine stalling when shifting	Probable cause
If the engine stalls when the selector lever is shifted from N to D or R range while the engine is idling, the cause is probably a malfunction of the engine system, damper clutch control solenoid, valve body or torque converter (damper clutch malfunction).	- Malfunction of the engine system - Malfunction of the damper clutch control solenoid - Malfunction of the valve body - Malfunction of the torque converter (Malfunction of the damper clutch)

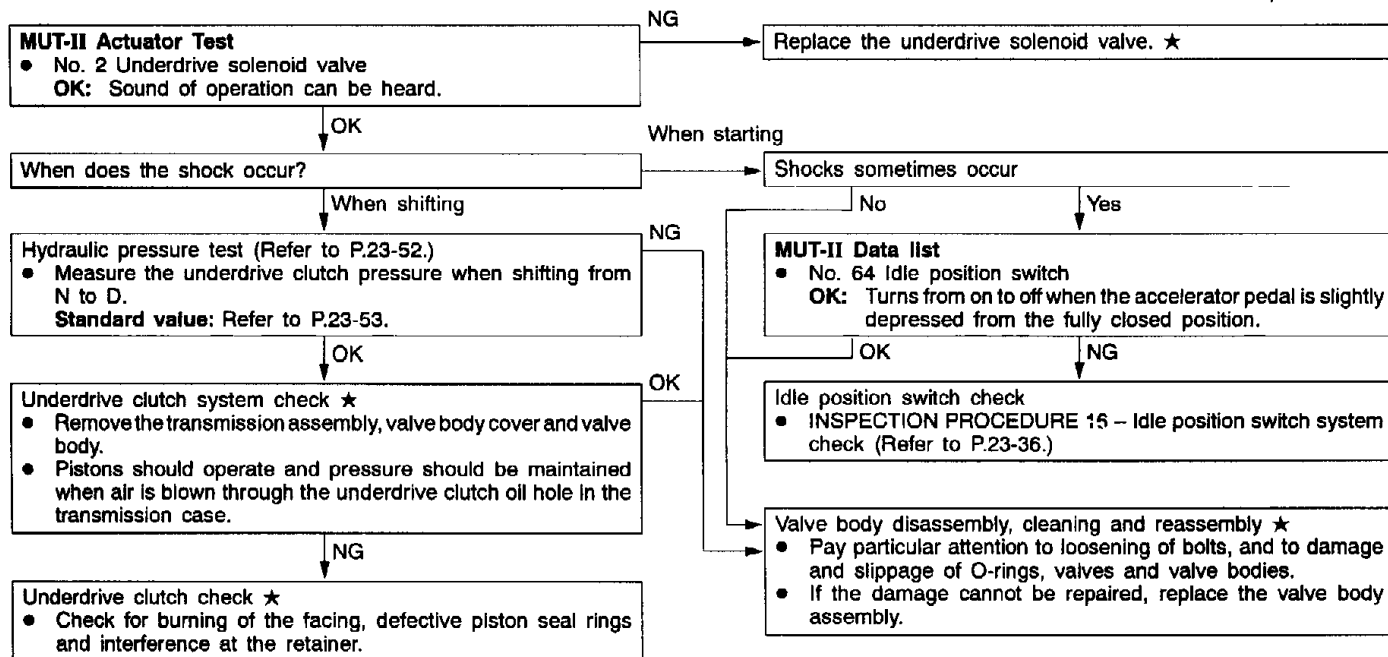
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 7

Shocks when changing from N to D and large time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range while the engine is idling, the cause is probably abnormal underdrive clutch pressure or a malfunction of the underdrive clutch, valve body or idle position switch.	- Abnormal underdrive clutch pressure - Malfunction of the underdrive solenoid valve - Malfunction of the underdrive clutch - Malfunction of the valve body - Malfunction of the idle position switch

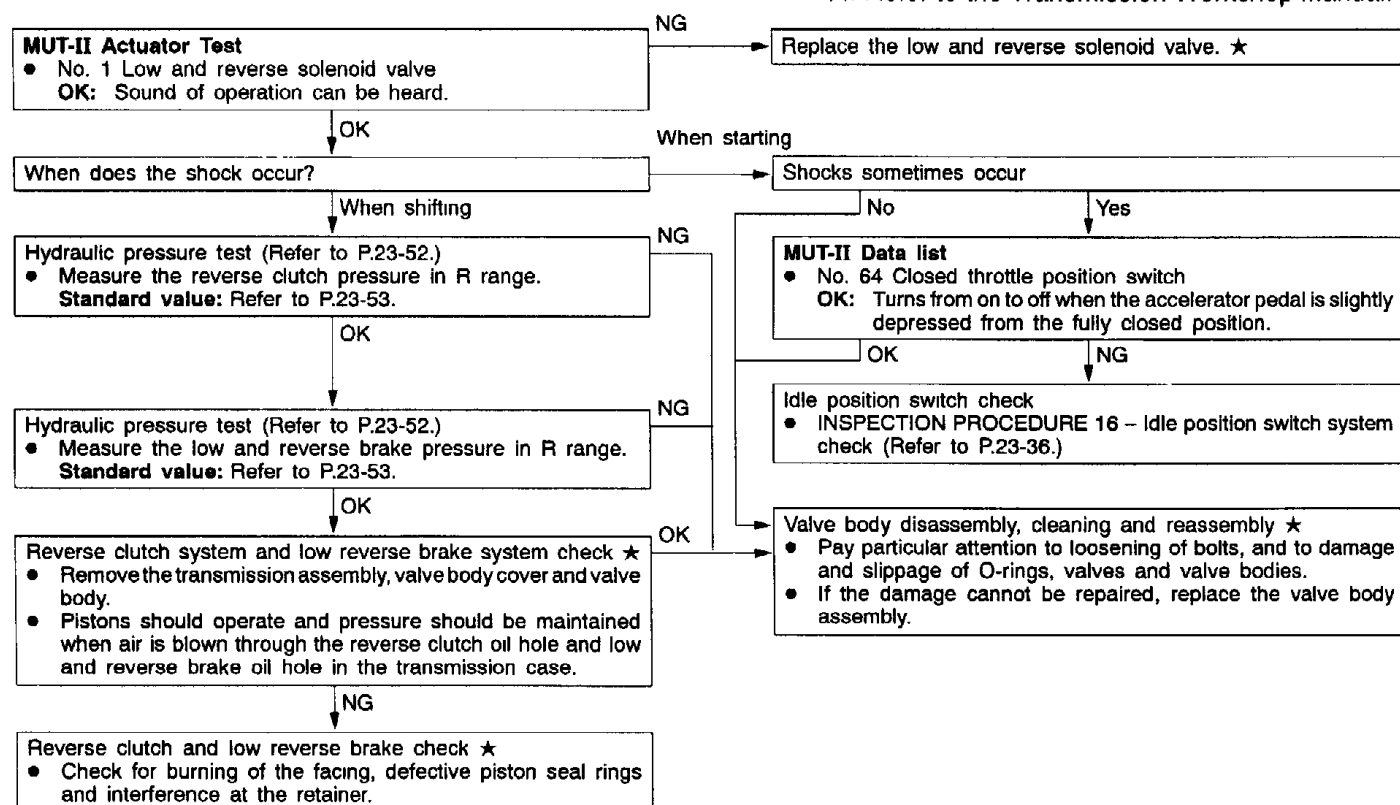
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 8

Shocks when changing from N to R and large time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occurs when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal reverse clutch pressure or low and reverse brake pressure, or a malfunction of the reverse clutch, low and reverse brake, valve body or idle position switch.	• Abnormal reverse clutch pressure • Abnormal low and reverse brake pressure • Malfunction of the low and reverse solenoid valve • Malfunction of the reverse clutch • Malfunction of the low and reverse brake • Malfunction of the valve body • Malfunction of the idle position switch

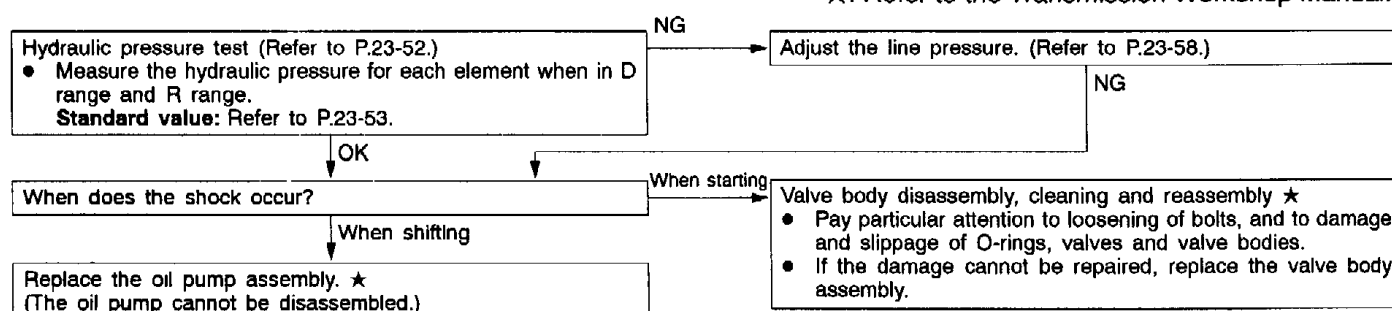
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 9

Shocks when changing from N to D, N to R and large time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range and from N to R range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the oil pump or valve body.	• Abnormal line pressure • Malfunction of the oil pump • Malfunction of the valve body

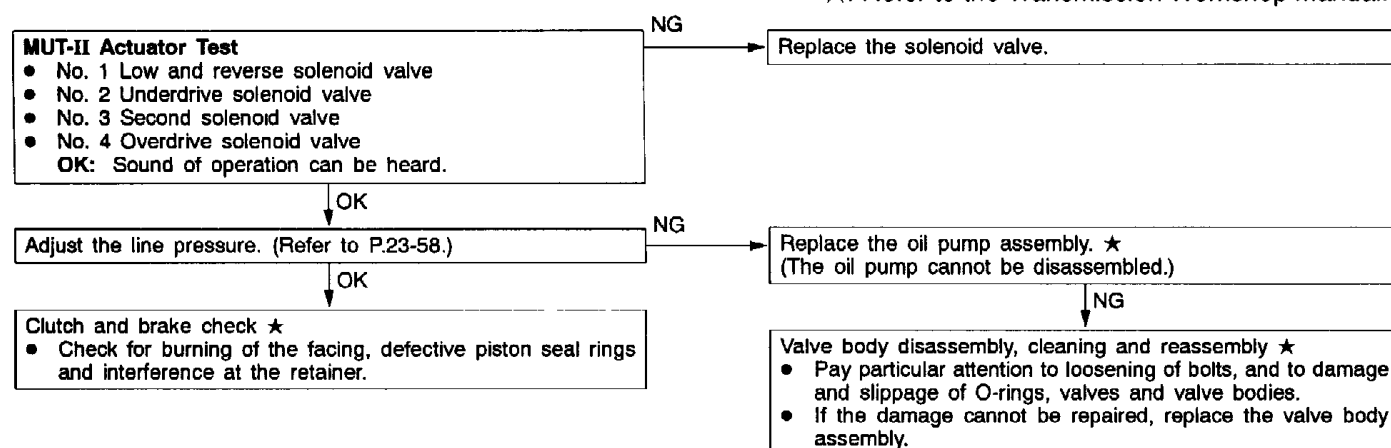
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 10

Shocks and running up	Probable cause
If shocks occur when driving due to upshifting or downshifting and the transmission speed becomes higher than the engine speed, the cause is probably abnormal line pressure or a malfunction of a solenoid valve, oil pump, valve body or of a brake or clutch.	- Abnormal line pressure - Malfunction of each solenoid valve - Malfunction of the oil pump - Malfunction of the valve body - Malfunction of each brake or each clutch

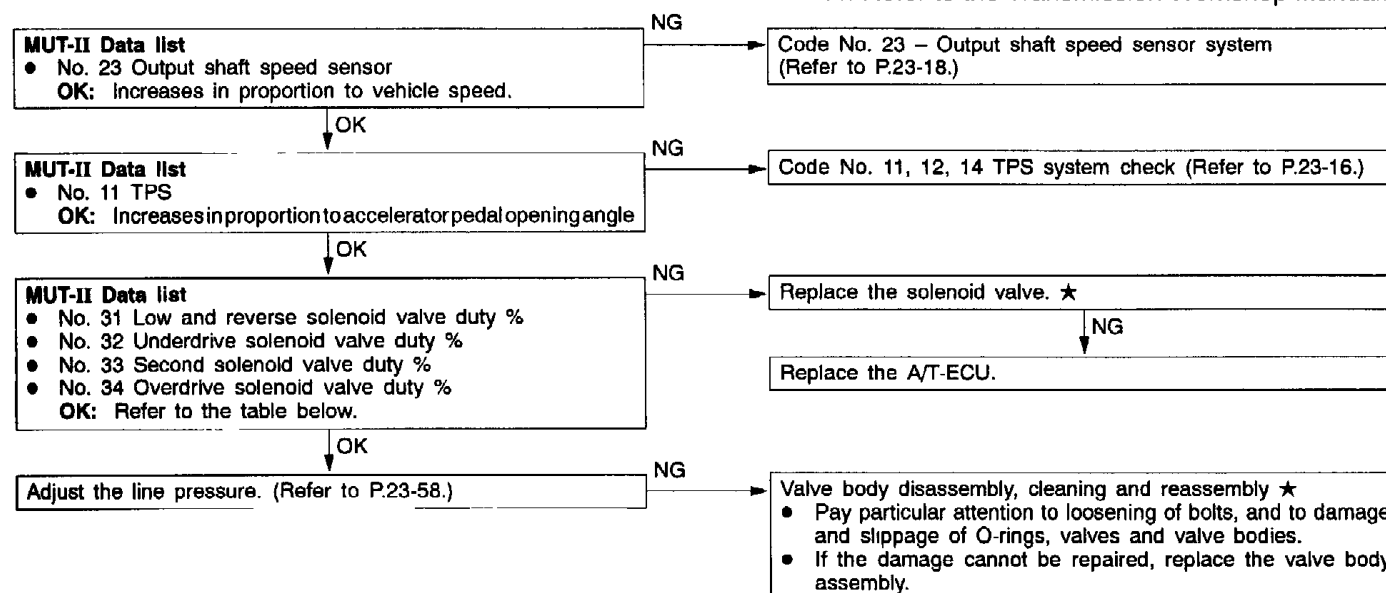
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 11

All points (Displaced shifting points)	Probable cause
If all shift points are displaced while driving, the cause is probably a malfunction of the output shaft speed sensor, TPS or of a solenoid valve.	- Malfunction of the output shaft speed sensor - Malfunction of the throttle position sensor - Malfunction of each solenoid valve - Abnormal line pressure - Malfunction of the valve body - Malfunction of the A/T-ECU

★: Refer to the Transmission Workshop Manual.

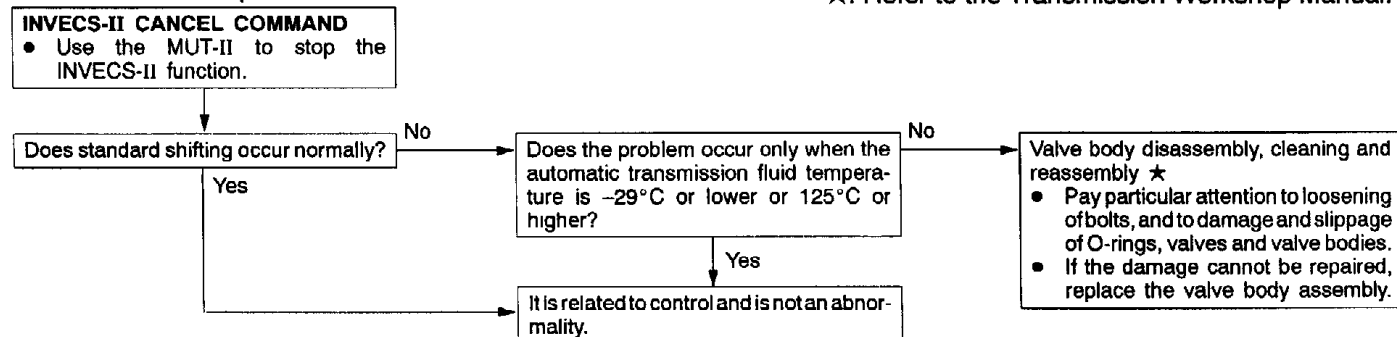


	No. 31	No. 32	No. 33	No. 34
Driving at constant speed in 1st gear	0 %	0 %	100 %	100 %
Driving at constant speed in 2nd gear	100 %	0 %	0 %	100 %
Driving at constant speed in 3rd gear	100 %	0 %	100 %	0 %
Driving at constant speed in 4th gear	100 %	100 %	0 %	0 %

INSPECTION PROCEDURE 12

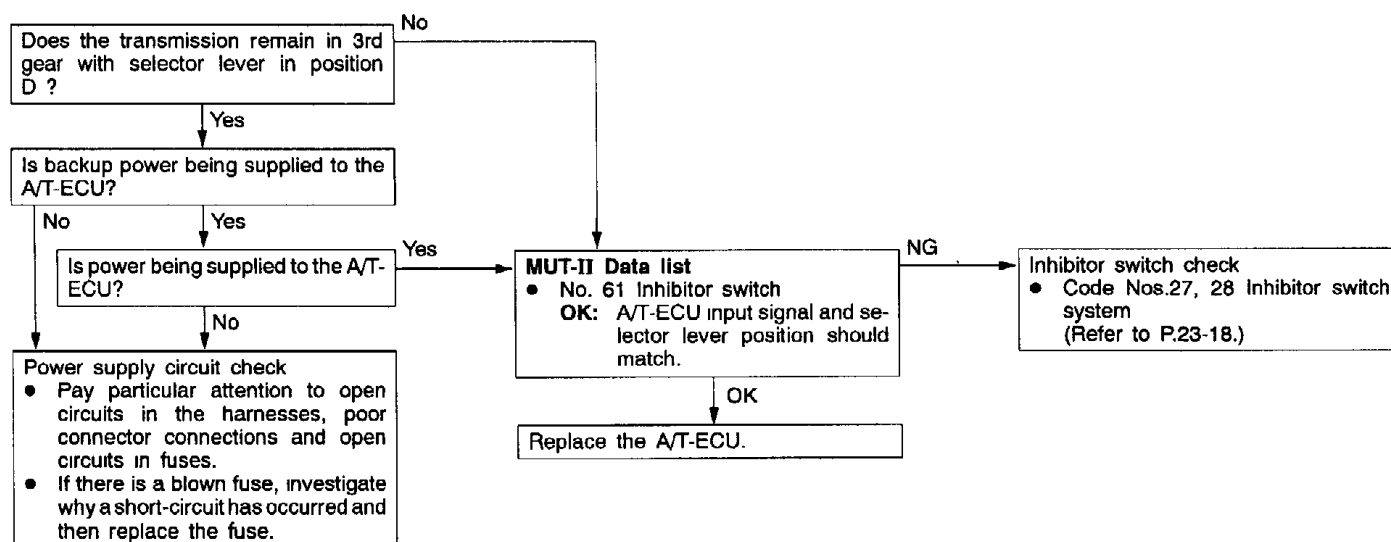
Some points (Displaced shifting points)	Probable cause
If some of the shift points are displaced while driving, the cause is probably a malfunction of the valve body, or it is related to control and is not an abnormality.	Malfunction of the valve body

★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 13

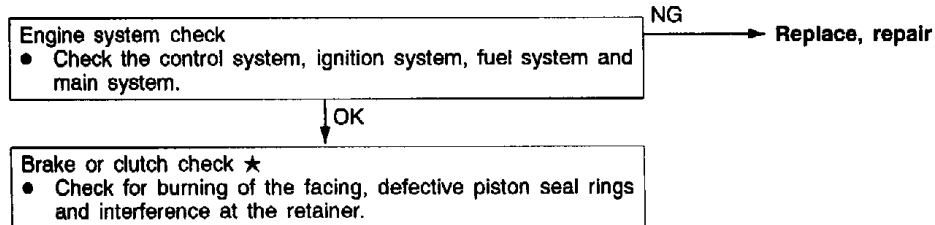
No diagnosis codes (Does not shift)	Probable cause
If shifting does not occur while driving and no diagnosis codes are output, the cause is probably a malfunction of the Inhibitor switch, or A/T-ECU.	- Malfunction of the Inhibitor switch - Malfunction of the A/T-ECU



INSPECTION PROCEDURE 14

Poor acceleration	Probable cause
If acceleration is poor even if downshifting occurs while driving, the cause is probably a malfunction of the engine system or of a brake or clutch.	- Malfunction of the engine system - Malfunction of the brake or clutch

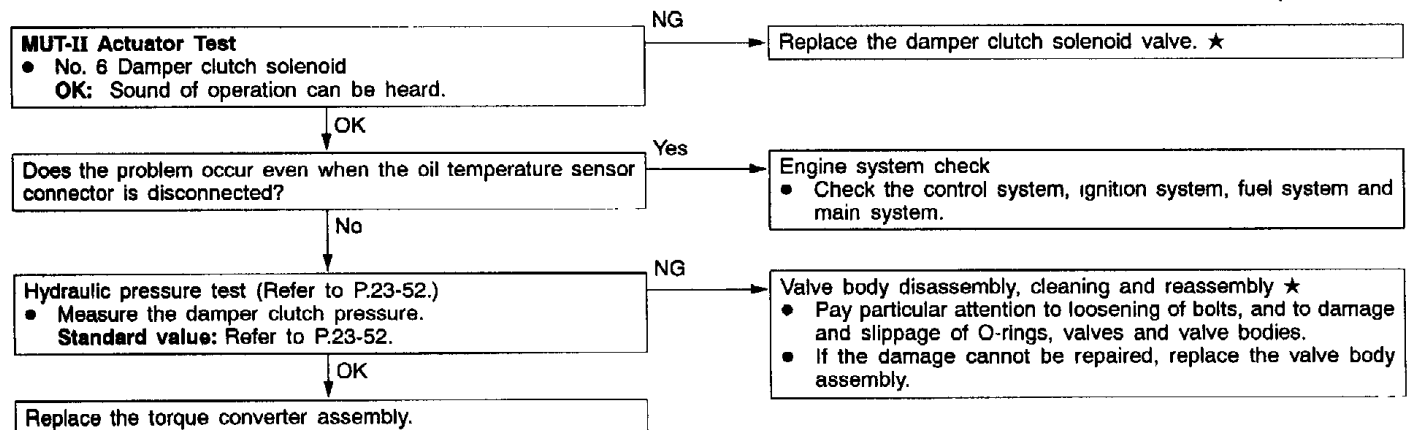
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 15

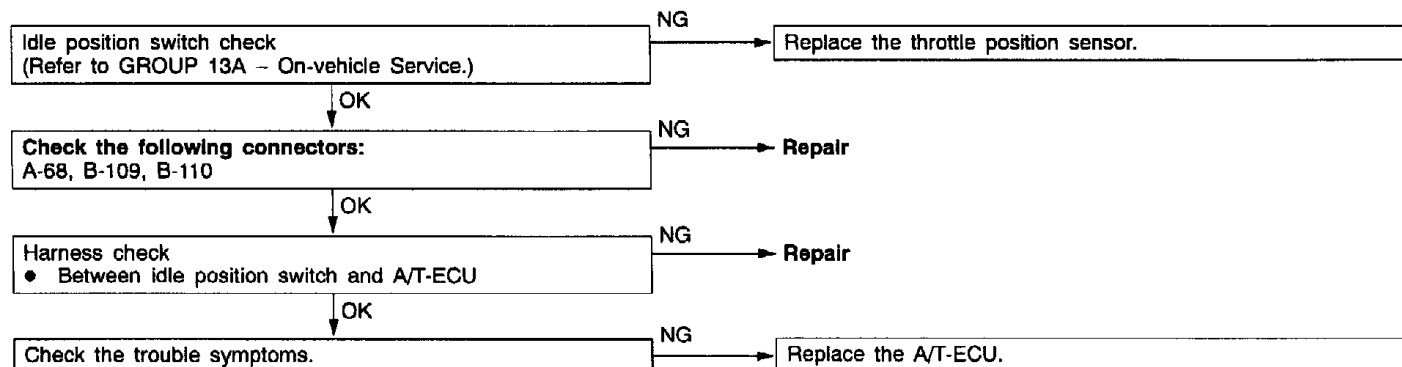
Vibration	Probable cause
If vibration occurs when driving at constant speed or when accelerating in top range, the cause is probably abnormal damper clutch pressure or a malfunction of the engine system, damper clutch solenoid, torque converter or valve body.	- Abnormal damper clutch pressure - Malfunction of the engine system - Malfunction of the damper clutch solenoid - Malfunction of the torque converter - Malfunction of the valve body

★: Refer to the Transmission Workshop Manual.



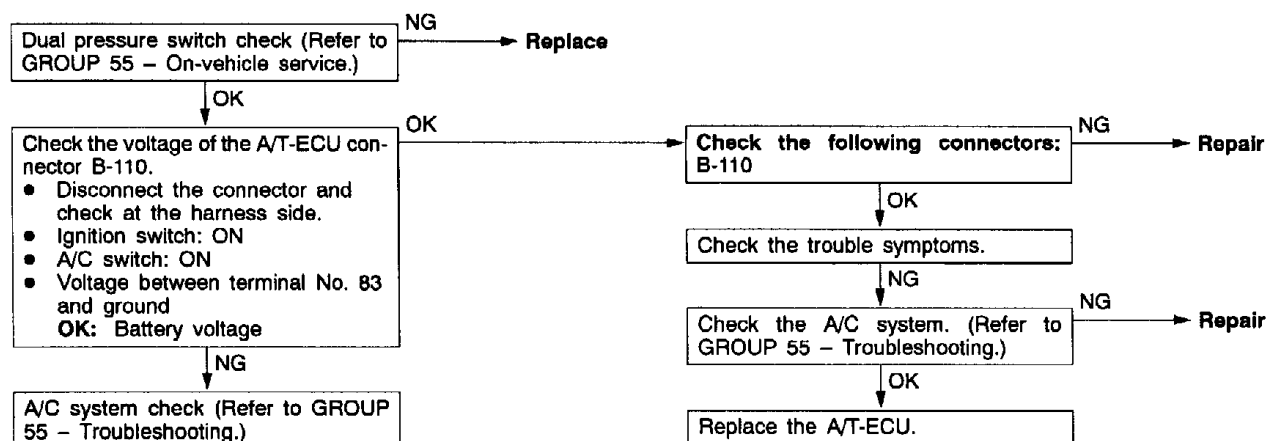
INSPECTION PROCEDURE 16

Idle position switch system	Probable cause
The cause is probably a defective idle position switch circuit or a defective A/T-ECU circuit.	• Malfunction of the idle position switch • Malfunction of connector • Malfunction of the A/T-ECU



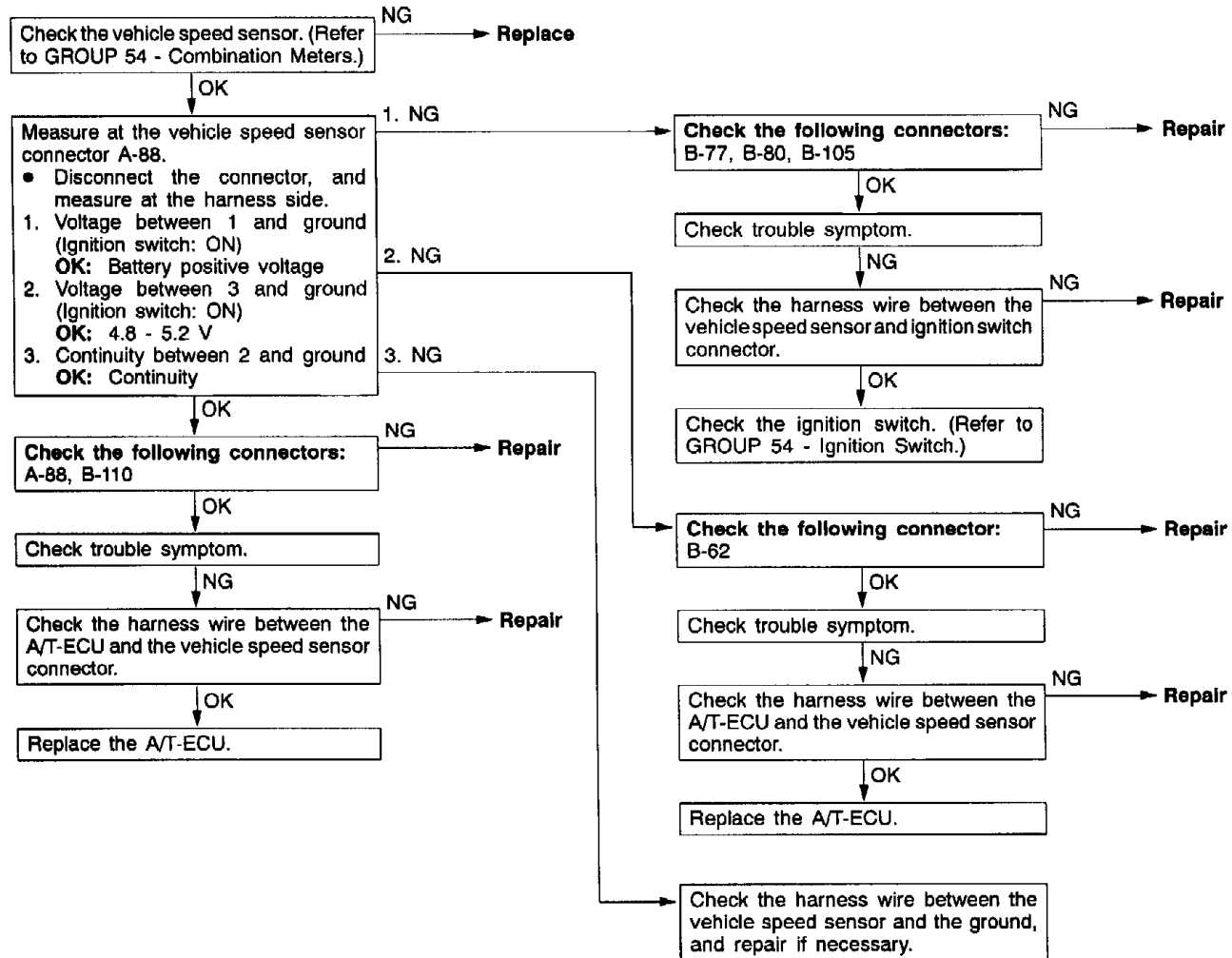
INSPECTION PROCEDURE 17

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



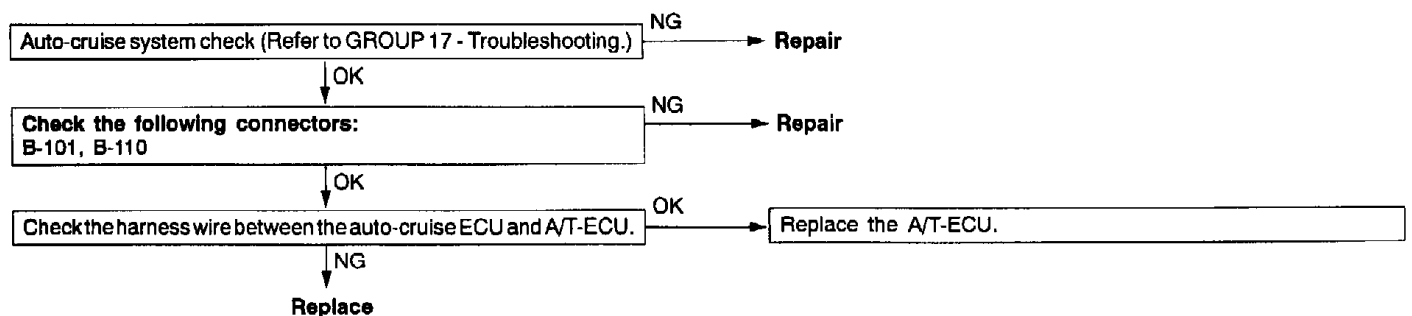
INSPECTION PROCEDURE 18

Vehicle speed sensor system	Probable cause
A malfunction may exist in the speed sensor circuit or the A/T-ECU.	• Malfunction of the vehicle speed sensor • Malfunction of the connector • Malfunction of the A/T-ECU



INSPECTION PROCEDURE 19

Auto-cruise-ECU signal system	Probable cause
A malfunction may exist in the auto-cruise signal line circuit or the A/T-ECU.	• Malfunction of connector • Malfunction of the A/T-ECU • Malfunction of the auto-cruise ECU



SERVICE DATA REFERENCE TABLE

Item No.	Check item	Check requirement		Normal value
11	Throttle position sensor	Engine: Stopped Selector lever position: P	Accelerator pedal: Fully closed	400 – 1,000 mV
			Accelerator pedal: Depressed	Gradually rises from the above value
			Accelerator pedal: Fully open	4,500 – 5,000 mV
15	Oil temperature sensor	Warming up	Drive for 15 minutes or more so that the automatic transmission fluid temperature becomes 70 – 90 °C.	Gradually rises to 70 – 90 °C
21	Crankshaft position sensor	Engine: Idling Selector lever position: P	Accelerator pedal: Fully closed	600 – 900 r/min
			Accelerator pedal: Depressed	Gradually rises from the above value
22	Input shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h gear	1,800 – 2,100 r/min
23	Output shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear	1,800 – 2,100 r/min
26	Stop light switch	Ignition switch: ON Engine: Stopped	Brake pedal: Depressed	ON
			Brake pedal: Released	OFF
29	Vehicle speed sensor	Selector lever position: 3	Idling with 1st gear (Vehicle stopped)	0 km/h
			Driving at constant speed of 50 km/h in 3rd gear	50 km/h
31	Low and reverse solenoid valve duty %	Selector lever position: L, 2, 3, D	Driving at constant speed of 10 km/h in 1st gear	No. 31: 0 %, No. 32: 0 %, No. 33: 100 %, No. 34: 100%
32	Underdrive solenoid valve duty %		Driving at constant speed of 30 km/h in 2nd gear	No. 31: 100 %, No. 32: 0 %, No. 33: 0 %, No. 34: 100%
33	Second solenoid valve duty %		Driving at constant speed of 50 km/h in 3rd gear	No. 31: 100 %, No. 32: 0 %, No. 33: 100 %, No. 34: 0%
34	Overdrive solenoid valve duty %		Driving at constant speed of 50 km/h in 4th gear	No. 31: 100 %, No. 32: 100 %, No. 33: 0 %, No. 34: 0%
36	Damper clutch solenoid duty %	Selector lever position: 3	Accelerate to 50 km/h in 3 position, then release accelerator pedal*	0 %
			Driving at constant speed of 50 km/h in 3rd gear	Approx. 70 – 90 %

Item No.	Check item	Check requirement		Normal value
52	Amount of damper clutch slippage	Selector lever position: 3	Accelerate to 50 km/h in 3 position, then release accelerator pedal*	Approx. 100 – 300 r/min*
			Driving at constant speed of 50 km/h in 3rd gear	Approx. 0 – 10 r/min
54	A/T control relay output voltage		Ignition switch: OFF → ON	0 mV → Battery voltage (mV)
57	Engine volumetric efficiency	Selector lever position: N	Accelerator pedal fully closed → depressed	Data changes
61	Inhibitor switch	Ignition switch: ON Engine: Stopped	Selector lever position: P	P
			Selector lever position: R	R
			Selector lever position: N	N
			Selector lever position: D	D
			Selector lever position: 3	3
			Selector lever position: 2	2
			Selector lever position: L	L
63	Shift position	Selector lever position: L, 2, 3, D	Driving at constant speed of 10 km/h in 1st gear	1st
			Driving at constant speed of 30 km/h in 2nd gear	2nd
			Driving at constant speed of 50 km/h in 3rd gear	3rd
			Driving at constant speed of 50 km/h in 4th gear	4th
64	Idle position switch	Engine: Idling Selector lever position: N	Accelerator pedal: Fully closed	ON
			Accelerator pedal: Depressed	OFF
65	Dual pressure switch	Engine: Idling Selector lever position: N	A/C switch: ON	ON
			A/C switch: OFF	OFF
66	Auto-cruise ECU signal	While auto-cruise operating	Plain road	OFF
			Sloping road	ON

NOTE

*: The damper clutch is released when the accelerator is fully closed (Idle position switch: ON).

ACTUATOR TEST JUDGEMENT VALUE

Item No.	Check item	Test content	Check requirement	Normal value
1	Low reverse solenoid valve	Drive the solenoid valve specified by the MUT-II at 50 % duty for 5 seconds. No other solenoid valve should be energised.	Ignition switch: ON Selector lever position: P Engine: 0 r/min Vehicle speed: 0 km/h (Vehicle stopped) Throttle opening voltage: Less than 1 V Idle position switch: ON While fail-safe function is not in operation.	The operation sound should be audible when the solenoid valve is driven.
2	Underdrive solenoid valve			
3	Second solenoid valve			
4	Overdrive solenoid valve			
6	Damper clutch solenoid			
12	A/T control relay	Control relay is OFF for 3 seconds.		Data list No. 54 (1) During test: 0 mV (2) Normal: Battery voltage [mV]

INVECS-II CANCEL COMMAND

Item No.	Item	Content	Remarks
14	INVECS-II	Stop the INVECS-II control and change gears according to the standard shift pattern.	Use this function when carrying out procedure 8 in the road tests. (Refer to P.23-10.)

CHECK AT A/T-ECU TERMINALS

1	2	3	4		5	6	7	8	41	42	43		44	45	46	71	72	73	74		75	76	77	101	102	103	104		105	106	107	
9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		47	48	49	50	51	52	53	54	55	56	57	78	79	80	81	82	83
24	25	26	27	28	29	30	31	32	33	34	35		58	59	60	61	62	63	64	65	66	90	91	92	93	94	95	96	97	98		

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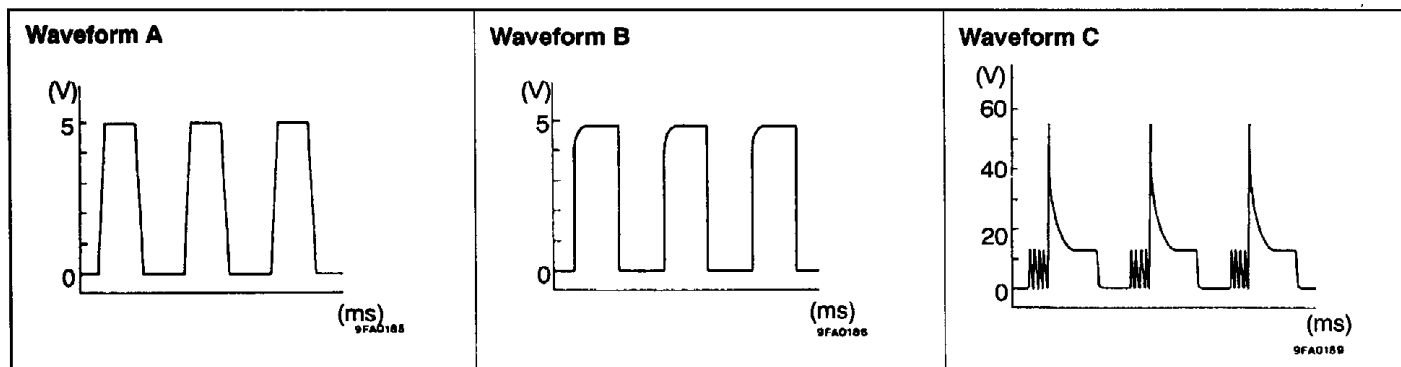
Terminal No.	Check item	Check requirement	Standard value
50	A/T control relay	Ignition switch: Off	0 V
		Ignition switch: On	Battery voltage
57	Sensor ground	Always	0 V
75	Cruise control unit	OD-OFF command not executed	Battery voltage
		OD-OFF command executed	0 V
76	Ground	Always	0 V
77	Power supply	Ignition switch: OFF	0 V
		Ignition switch: ON	Battery voltage
88	Ground	Always	0 V
89	Power supply	Ignition switch: OFF	0 V
		Ignition switch: ON	Battery voltage
97	Ground	Always	0 V
101	Inhibitor switch: P	Selector lever position: P	Battery voltage
		Selector lever position: Other than above	0 V
102	Inhibitor switch: D	Selector lever position: D	Battery voltage
		Selector lever position: Other than above	0 V
103	Input shaft speed sensor	Measure from terminal No. 104 to 57 with an oscilloscope. Engine: 2,000 r/min Selector lever position: D (3rd)	See procedures for checking with an oscilloscope (Page 23–40).
104	Output shaft speed sensor	Measure from terminal No. 104 to 57 with an oscilloscope. Engine: 2,000 r/min Selector lever position: D (3rd)	
106	2nd solenoid valve	Selector lever position: D (2nd)	Battery voltage
		Selector lever position: D (1st)	Approx. 7 – 9 V
107	DCC solenoid valve	Selector lever position: D (1st)	Battery voltage
		Selector lever position: D (3rd-60km/h)	Approx. 7 – 9 V
108	Inhibitor switch: R	Selector lever position: R	Battery voltage
		Selector lever position: Other than above	0 V

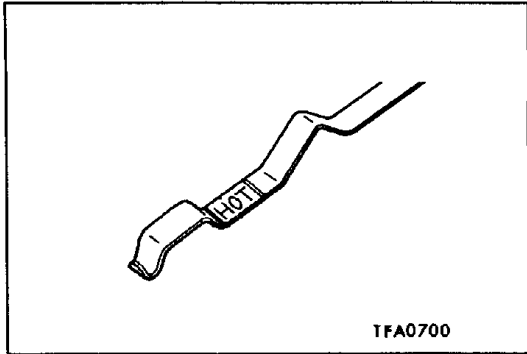
Terminal No.	Check item	Check requirement	Standard value
120	UD solenoid valve	Selector lever position: (1st)	Battery voltage
		Selector lever position: R	Approx. 7 – 9 V
121	Inhibitor switch: N	Selector lever position: N	Battery voltage
		Selector lever position: Other than above	0 V
123	Stop lamp switch	Brake pedal: Depressed	Battery voltage
		Brake pedal: Released	0 V
124	Oil temperature sensor	ATF temperature: 25°C	3.8 – 4.0 V
		ATF temperature: 80°C	2.3 – 2.5 V
129	LR solenoid valve	Selector lever position: D (1st)	Battery voltage
		Selector lever position: D (2nd)	Approx. 7 – 9 V
130	OD solenoid valve	Selector lever position: D (3rd)	Battery voltage
		Selector lever position: D (1st)	Approx. 7 – 9 V

OSCILLOSCOPE INSPECTION PROCEDURE

Check item	Check requirement		Normal condition (Waveform sample)
Crankshaft position sensor	Selector lever position: N	Idling (Vehicle stopped)	Waveform A
Input shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear (Engine: 1,800 – 2,100 r/min)	Waveform B
Output shaft speed sensor			
Vehicle speed sensor			
Low reverse solenoid valve	Ignition switch: ON Selector lever position: P Engine: 0 r/min Vehicle speed: 0 km/h (Vehicle stopped) Throttle (Accelerator) opening angle: Less than 1 V Closed throttle position switch: ON	Force drive each solenoid valve (Actuator test)	Waveform C
Underdrive solenoid valve			
Second solenoid valve			
Overdrive solenoid valve			
Damper clutch control solenoid			

Waveform sample





ON-VEHICLE SERVICE

AUTOMATIC TRANSMISSION FLUID CHECK

1. Drive until the fluid temperature reaches the operating temperature 70–80°C.
2. Place vehicle on level floor.
3. Move selector lever sequentially to every position to fill torque converter and hydraulic circuit with fluid, then place lever in "N" Neutral position. This operation is necessary to be sure that fluid level check is accurate.
4. Before removing the oil level gauge, wipe all dirt from area around the oil level gauge. Then take out the oil level gauge and check the condition of the fluid. Further investigation of the transmission is necessary if,
 - the fluid smells burnt.
 - the fluid colour is brown or black.
 - metal particles can be seen or felt on the dipstick.
5. Check to see if fluid level is in "HOT" range on oil level gauge. If fluid level is low, add ATF until level reaches "HOT" range.

NOTE

Low fluid level can cause a variety of conditions because it allows the pump to take in air along with fluid. Air trapped in the hydraulic circuit forms bubbles which make the fluid spongy.

Therefore, pressures will be erratic.

Improper filling can also raise fluid level too high. When the transmission has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of ATF. In either case, air bubbles can cause overheating, fluid oxidation, which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a leak.

6. Be sure to examine the fluid on the oil level gauge closely.

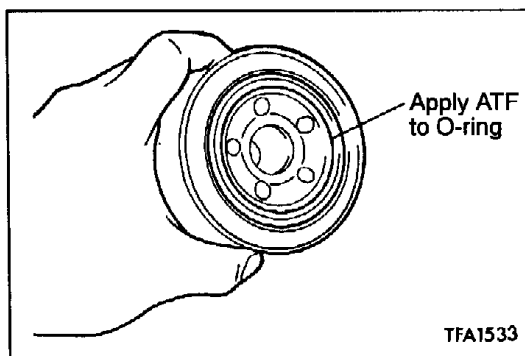
OIL FILTER REPLACEMENT

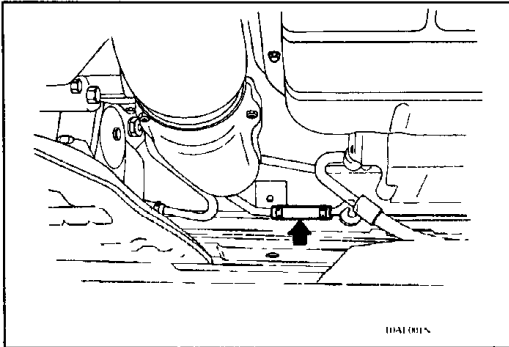
1. Use the special tool (MB991610) to remove the automatic transmission oil filter.
2. Clean the transmission case side mounting surface.
3. Apply a small amount of automatic transmission fluid to the O-ring of the new oil filter.
4. Use the special tool (MB991610) to install the automatic transmission oil filter.

NOTE

Tightening torque: 12 Nm.

5. Check the quantity of the automatic transmission fluid.





AUTOMATIC TRANSMISSION FLUID REPLACEMENT

Drain the fluid and check if there is any evidence of contamination.

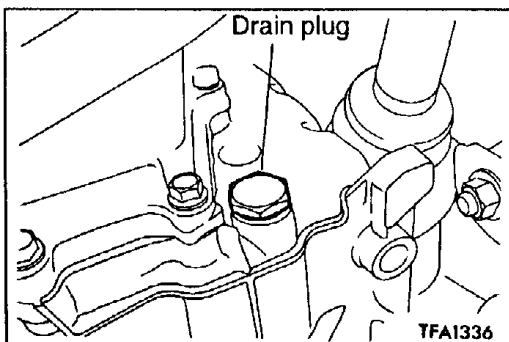
Replenish with new fluid after the cause of any contamination has been corrected.

1. Remove the right hand hose connecting the transmission oil cooler pipe to the oil cooler (built in to the bottom of the radiator).
2. Connect a suitable length of hose from the radiator cooler pipe to an oil drain receptacle, large enough to hold the quantity of discharged fluid.
3. Start the engine and discharge the ATF.
Operating conditions: "N" Neutral gear and idling.

Caution

Start the engine and then stop it within one minute. If the ATF is discharged before the one minute elapses, stop the engine at that time.

Amount of oil discharged: Approximately 6.5 litres



4. Remove the drain plug at the bottom of the transmission case and discharge the ATF.

Amount of ATF discharged: Approximately 2.0 litres

5. Check for deterioration of the oil filter. Change the oil filter if necessary.
6. Install the drain plug and gasket, applying the specified amount of torque.

Tightening torque: 32 Nm

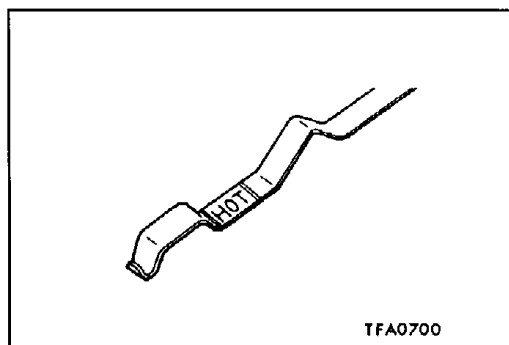
7. Fill with new ATF through the oil filler tube.

Amount of ATF added: Approximately 8.5 litres

NOTE

If the entire amount of new ATF cannot be added, follow procedure (8) to add fluid.

8. Repeat step (3) to discharge ATF from the hose.
9. Add the new ATF through the oil filler tube.
10. Attach and secure the hose that was disconnected in step (1) and securely insert the oil level gauge.
11. Start the engine and let it idle for one or two minutes.
12. Move the selector lever through all gear positions, ending in Neutral position.



13. Make sure the ATF reaches the "COLD" mark on the oil level gauge. If there is not enough ATF, add more.
14. Drive the car until the ATF temperature reaches normal 70–80°C and recheck the ATF level. The ATF must be within the "HOT" range.

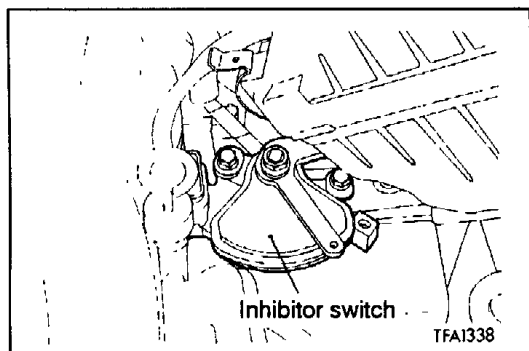
NOTE

The "COLD" level is for reference and the "HOT" level serves as the standard.

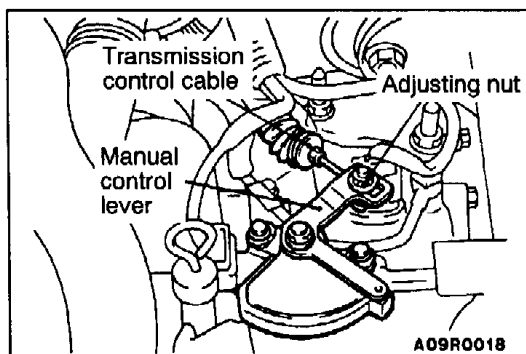
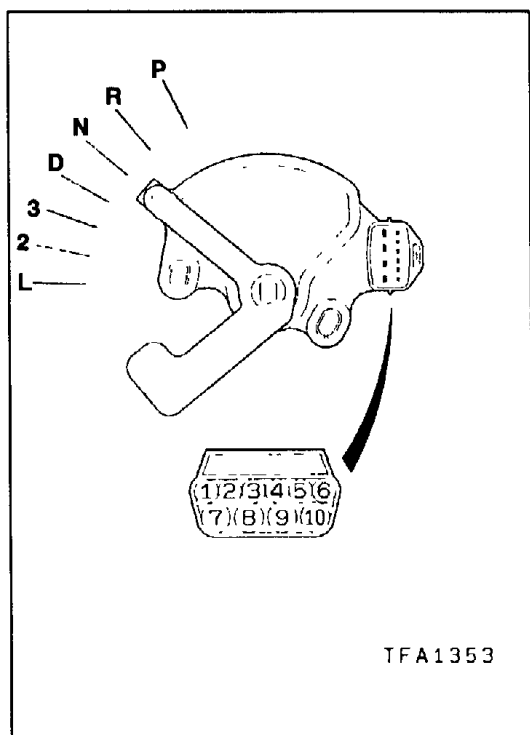
15. Securely insert the oil level gauge into the filler tube.

THROTTLE POSITION SENSOR ADJUSTMENT

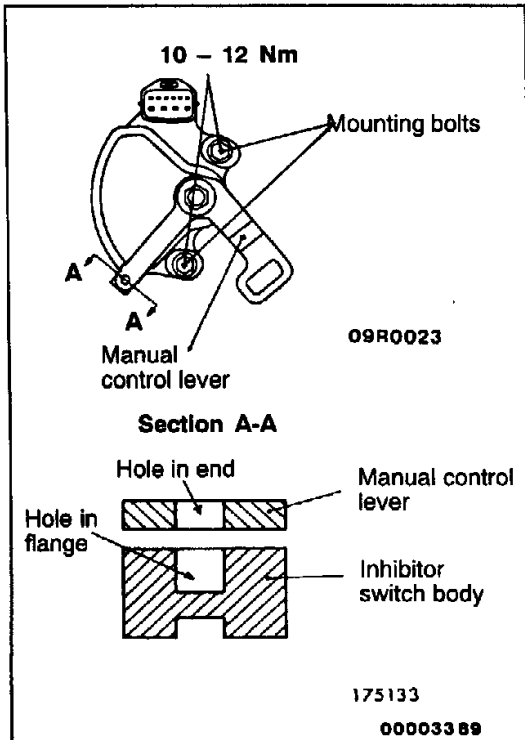
Refer to GROUP 13A – On-vehicle Service.

**INHIBITOR SWITCH CONTINUITY CHECK**

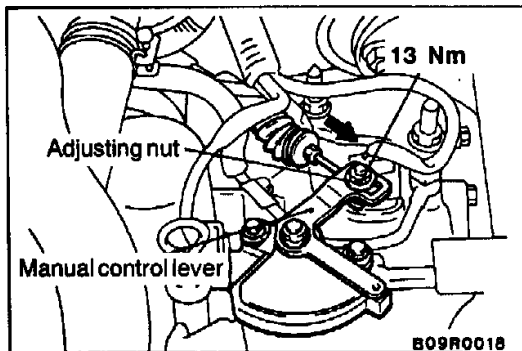
Items	Terminal No.									
	1	2	3	4	5	6	7	8	9	10
P			○	—				○	○	○
R							○	○		
N				○	—			○	○	○
D	○	—						○		
3					○	—		○		
2		○	—					○		
L						○	—	○		

**INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT**

1. Set the selector lever to the "N" position.
2. Loosen the control cable to manual control lever coupling nut to free the cable and lever.
3. Set the manual control lever to the neutral position.



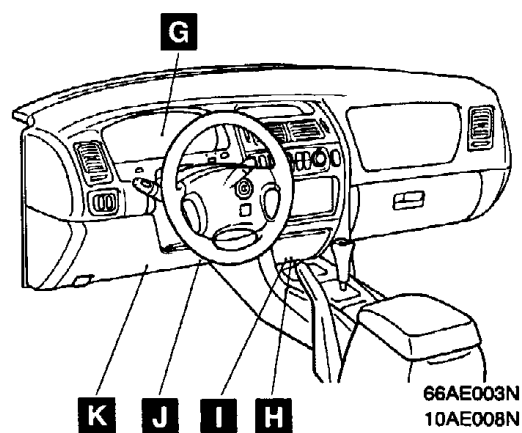
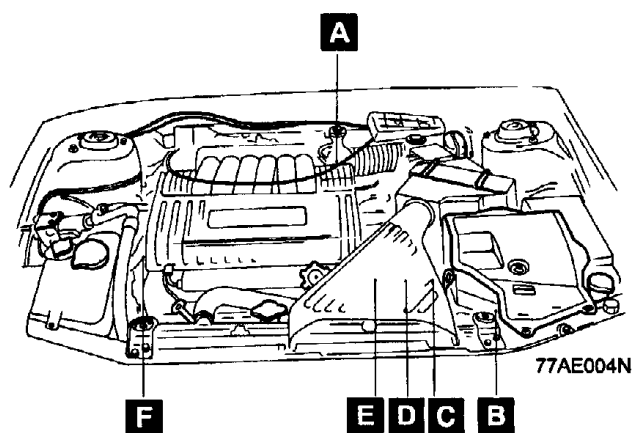
4. Loosen the inhibitor switch body mounting bolts and turn the inhibitor switch body so the hole in the end of the manual control lever and the hole (cross section A-A in the figure on the left) in the flange of the inhibitor switch body flange are aligned.
5. Tighten the inhibitor switch body mounting bolts to the specified torque. Be careful at this time that the position of the switch body is not changed.



6. Gently pull the transmission control cable in the direction of the arrow, and then tighten the adjusting nut.
7. Check that the selector lever is in the "N" position.
8. Check that each range on the transmission side operates and functions correctly for each position of the selector lever.

A/T CONTROL COMPONENT LOCATION

Name	Symbol	Name	Symbol
A/T control relay	I	Oil temperature sensor	D
Crankshaft position sensor	F	Output shaft speed sensor	C
Diagnosis connector	J	Shift indicator light	G
Dual pressure switch	B	Solenoid valve	D
Engine-A/T-ECU	H	Stop light switch	K
Inhibitor switch	E	Throttle position sensor (with built-in idle position switch)	A
Input shaft speed sensor	C	Vehicle speed sensor	C

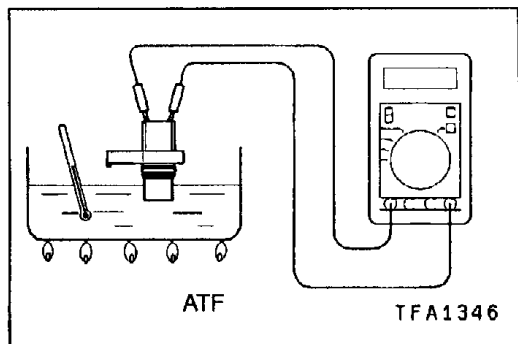


A/T CONTROL COMPONENT CHECK**1. CRANKSHAFT POSITION SENSOR CHECK**

Refer to GROUP 13A – Troubleshooting.

2. THROTTLE POSITION SENSOR CHECK

Refer to GROUP 13A – On-vehicle Service.

**3. OIL TEMPERATURE SENSOR CHECK**

1. Remove the oil temperature sensor.
2. Measure the resistance between terminals No.1 and No.2 of the oil temperature sensor connector.

Standard value:

Oil temperature [°C]	Resistance (kΩ)
0	1.67 – 20.5
100	0.57 – 0.69

3. Replace the sensor if not within the standard value.

4. INHIBITOR SWITCH CHECK

Refer to P.23-46.

5. STOP LAMP SWITCH CHECK

Refer to GROUP 35 – Brake Pedal.

6. VEHICLE SPEED SENSOR CHECK

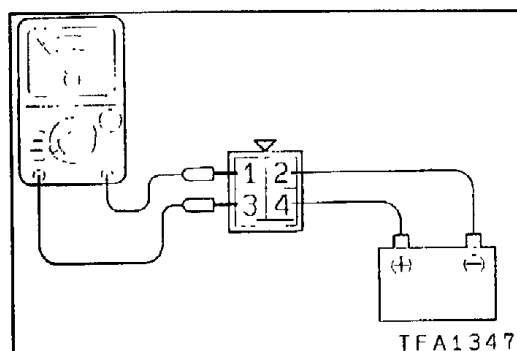
Refer to GROUP 54 – On-vehicle Service.

7. DUAL PRESSURE SWITCH CHECK

Refer to GROUP 55 – On-vehicle Service.

8. IDLE POSITION SWITCH CHECK

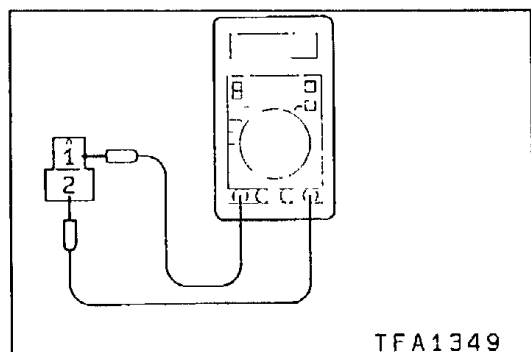
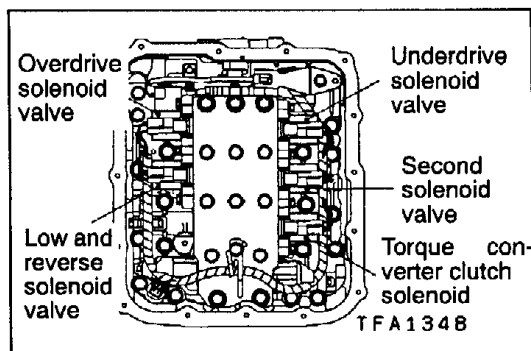
Refer to GROUP 13A – On-vehicle Service.

**9. A/T CONTROL RELAY CHECK**

1. Remove the A/T control relay.
2. Use jumper wires to connect the A/T control relay terminal (2) to the battery (–) terminal and terminal (4) to the battery (+) terminal.
3. Check the continuity between the terminal (1) and the terminal (3) of the A/T control relay when the jumper wires are connected to and disconnected from the battery.

Jumper wire	Continuity between terminals No.1 and No.3
Connected	Continuity
Disconnected	No continuity

4. If there is a problem, replace the A/T control relay.



10. SOLENOID VALVE CHECK

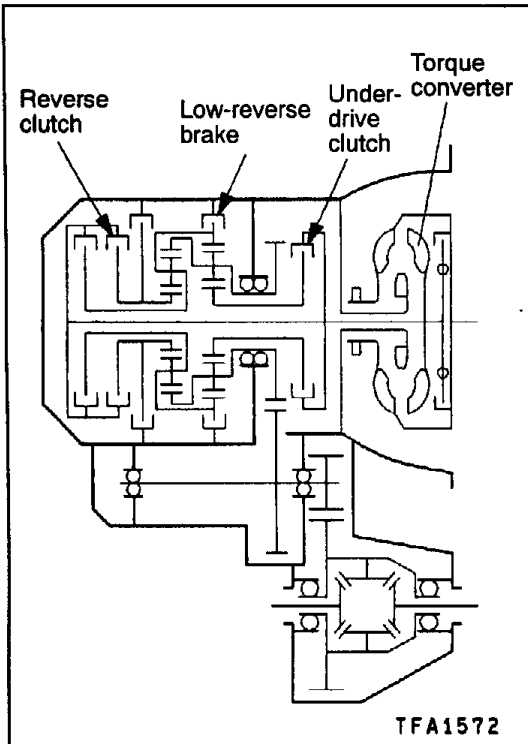
1. Remove the valve body cover.
2. Disconnect the connectors of each solenoid valve.

3. Measure the resistance between terminals 1 and 2 of each solenoid valve.

Standard value:

Name	Resistance
Damper clutch solenoid	2.7 – 3.4 Ω (at 20°C)
Low and reverse solenoid valve	
Second solenoid valve	
Underdrive solenoid valve	
Overdrive solenoid valve	

4. If the resistance is not within the standard value, replace the solenoid valve.



TORQUE CONVERTER STALL TEST

This test measures the maximum engine speed when the selector lever is at the D or R position and the torque converter stalls to test the operation of the torque converter, starter motor and one-way clutch operation and the holding performance of the clutches and brakes in the transmission.

Caution

Do not let anybody stand in front of or behind the vehicle while this test is being carried out.

1. Check the automatic transmission fluid level and temperature and the engine coolant temperature.
 - Fluid level: At the HOT mark on the oil level gauge
 - Fluid temperature: 80 – 100°C
 - Engine coolant temperature: 80 – 100°C
2. Chock both rear wheels.
3. Pull the parking brake lever on, with the brake pedal fully depressed.
4. Start the engine.
5. Move the selector lever to the D position, fully depress the accelerator pedal and take a reading of the maximum engine speed at this time.

Caution

1. The throttle should not be left fully open for any more than eight seconds.
2. If carrying out the stall test two or more times, move the selector lever to the N position and run the engine at 1,000 r/min to let the automatic transmission fluid cool down before carrying out subsequent tests.

Standard value:

Stall speed: 2,100 – 2,600 r/min

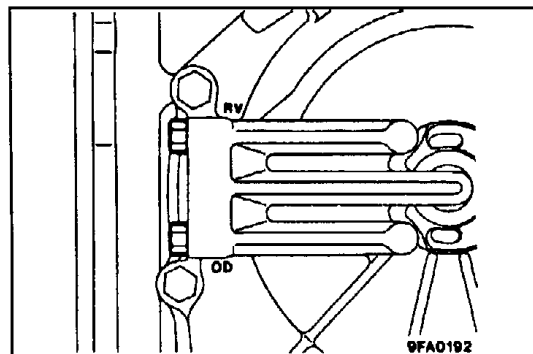
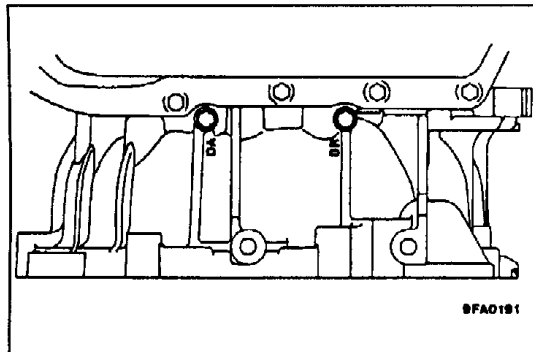
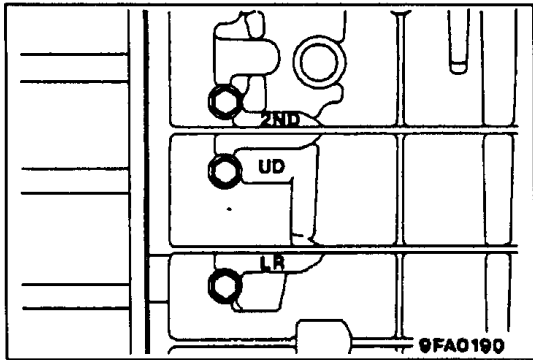
6. Move the selector lever to the R position and carry out the same test again.

Standard value:

Stall speed: 2,100 – 2,600 r/min

TORQUE CONVERTER STALL TEST JUDGEMENT RESULTS

- a. Stall speed is too high in both D and R ranges
 - Low line pressure
 - Low & reverse brake slippage
- b. Stall speed is too high in D range only
 - Underdrive clutch slippage
- c. Stall speed is too high in R range only
 - Reverse clutch slippage
- d. Stall speed too low in both D and R ranges
 - Malfunction of torque converter
 - Insufficient engine output



HYDRAULIC PRESSURE TEST

1. Warm up the engine until the automatic transmission fluid temperature is 80–100°C.
2. Jack up the vehicle so that the wheels are free to turn.
3. Connect the special tools (2,942 kPa) oil pressure gauge [MD998330] and joints [MD998332, MD998900]) to each pressure discharge port.
4. Measure the hydraulic pressure at each port under the conditions given in the standard hydraulic pressure table, and check that the measured values are within the standard value ranges.
5. If a value is outside the standard range, correct the problem while referring to the hydraulic pressure test diagnosis table.

STANDARD HYDRAULIC PRESSURE TEST

Measurement condition			Standard hydraulic pressure kPa					
Selector lever position	Shift position	Engine speed (r/min)	Underdrive clutch pressure	Reverse clutch pressure	Overdrive clutch pressure	Low and reverse brake pressure	Second brake pressure	Torque converter pressure
P	–	2,500	–	–	–	260 – 340	–	260 – 340
R	Reverse	2,500	–	1,270 – 1,770	–	1,270 – 1,770	–	500 – 700
N	2,500	–	–	–	–	260 – 340	–	260 – 340
D	1st gear	2,500	1,010 – 1,050	–	–	1,010 – 1,050	–	500 – 700
	2nd gear	2,500	1,010 – 1,050	–	–	–	1,010 – 1,050	500 – 700
	3rd gear	2,500	780 – 880	–	780 – 880	–	–	450 – 650
	4th gear	2,500	–	–	780 – 880	–	780 – 880	450 – 650

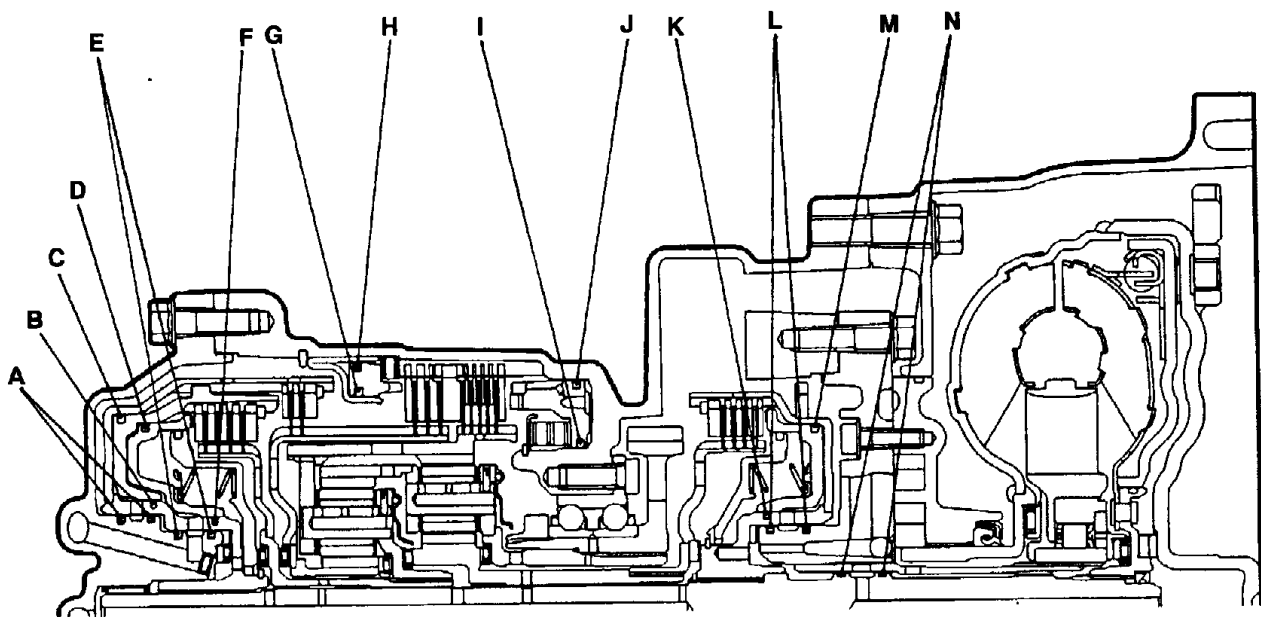
HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

Trouble symptom	Probable cause
All hydraulic pressures are high.	Incorrectly adjusted line pressure
	Malfunction of the regulator valve
All hydraulic pressures are low.	Incorrectly adjusted line pressure
	Malfunction of the oil pump
	Clogged internal oil filter
	Clogged oil cooler
	Malfunction of the regulator valve
	Malfunction of the relief valve
	Incorrect valve body installation
Hydraulic pressure is abnormal in "R" range only.	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
Hydraulic pressure is abnormal in "3" or "4" range only.	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the regulator valve
	Malfunction of the switch valve
	Clogged orifice
	Incorrect valve body installation

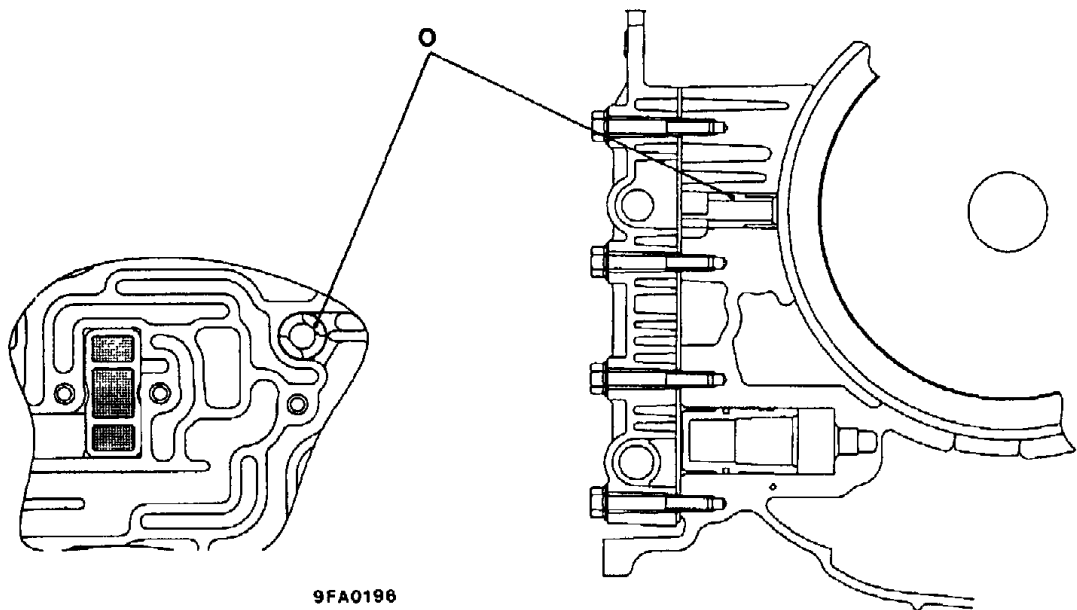
Trouble symptom	Probable cause
Only underdrive hydraulic pressure is abnormal.	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal.	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation
Only overdrive hydraulic pressure is abnormal.	Malfunction of the oil seal D
	Malfunction of the oil seal E
	Malfunction of the oil seal F
	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only low and reverse hydraulic pressure is abnormal.	Malfunction of the oil seal I
	Malfunction of the oil seal J
	Malfunction of the low and reverse solenoid valve
	Malfunction of the low and reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve A
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation

Trouble symptom	Probable cause
Only second hydraulic pressure is abnormal.	Malfunction of the oil seal G
	Malfunction of the oil seal H
	Malfunction of the oil seal O
	Malfunction of the second solenoid valve
	Malfunction of the second pressure control valve
	Malfunction of the fail safe valve B
	Clogged orifice
	Incorrect valve body installation
Only torque converter pressure is abnormal.	Clogged oil cooler
	Malfunction of the oil seal N
	Malfunction of the damper clutch solenoid
	Malfunction of the damper clutch control valve
	Malfunction of the torque converter pressure control valve
	Clogged orifice
	Incorrect valve body installation
Pressure applied to element which should not receive pressure.	Incorrect transmission control cable adjustment
	Malfunction of the manual valve
	Malfunction of check ball
	Incorrect valve body installation

OIL SEAL LAYOUT



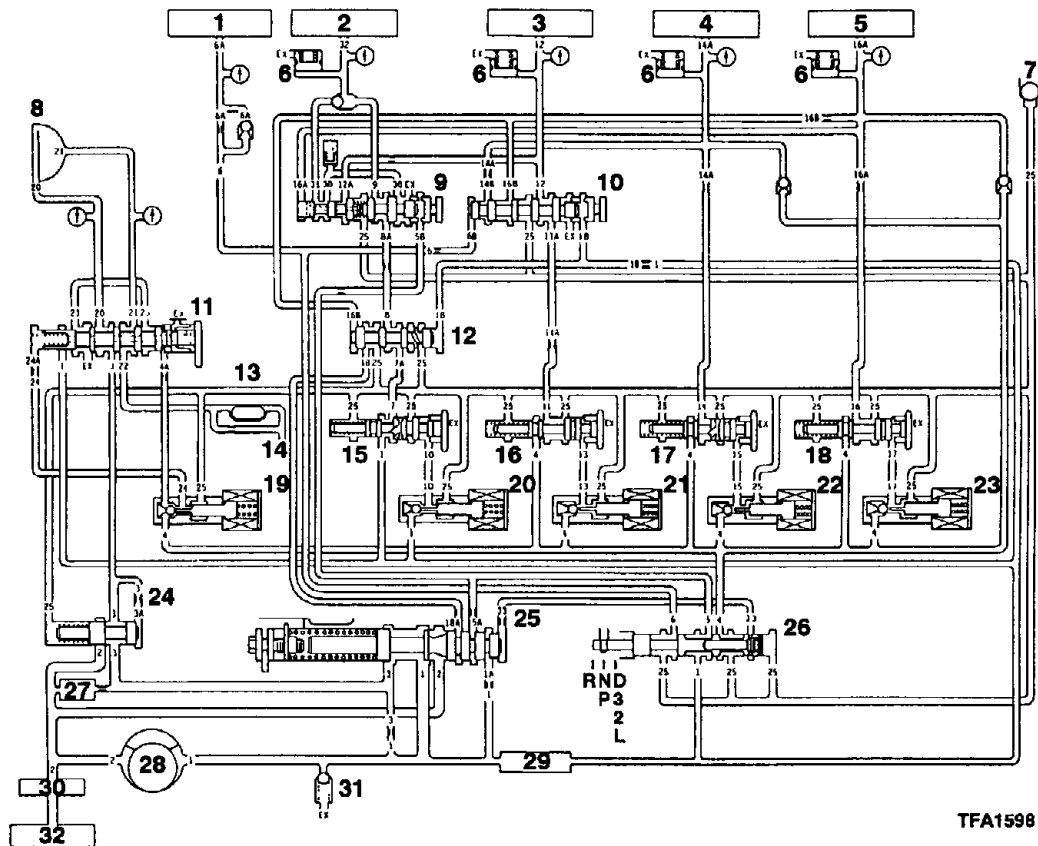
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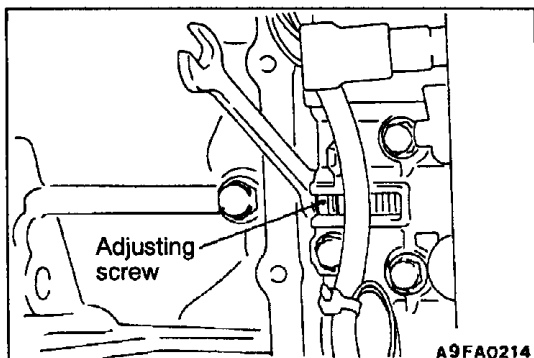
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HYDRAULIC CIRCUIT PARKING AND NEUTRAL



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



LINE PRESSURE ADJUSTMENT

1. Discharge the automatic transmission fluid, and then remove the valve body cover.
2. Turn the adjusting screw shown in the illustration to adjust the underdrive pressure in "D" range 1st or 2nd gear to the standard value. The pressure increases when the screw is turned to the left.

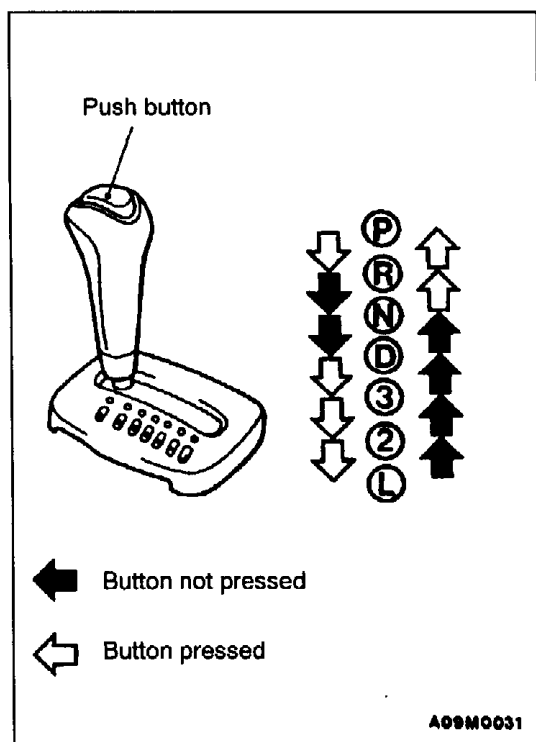
NOTE

When adjusting the underdrive pressure, adjust to the middle of the standard value range.

Standard value: 1,010 – 1,050 kPa

Change in pressure for each turn of the adjusting screw:
35 kPa

3. Install the valve body cover, and pour in the standard volume of automatic transmission fluid.
4. Carry out a hydraulic pressure test. (Refer to P.23-52.) Readjust the line pressure if necessary.



SELECTOR LEVER OPERATION CHECK

1. Shift selector lever to each range and check that lever moves smoothly and clicks into position. Check that position indicator is correct.
2. Check to be sure the selector lever can be shifted to each position (by button operation as shown in the illustration).
3. Start the engine and check if the vehicle moves forward when the selector lever is shifted from N to D, and moves backward when shifted to R.
4. When the shift lever malfunctions, adjust control cable and selector lever sleeve. Check for worn shift lever assembly sliding parts.

TRANSMISSION CONTROL

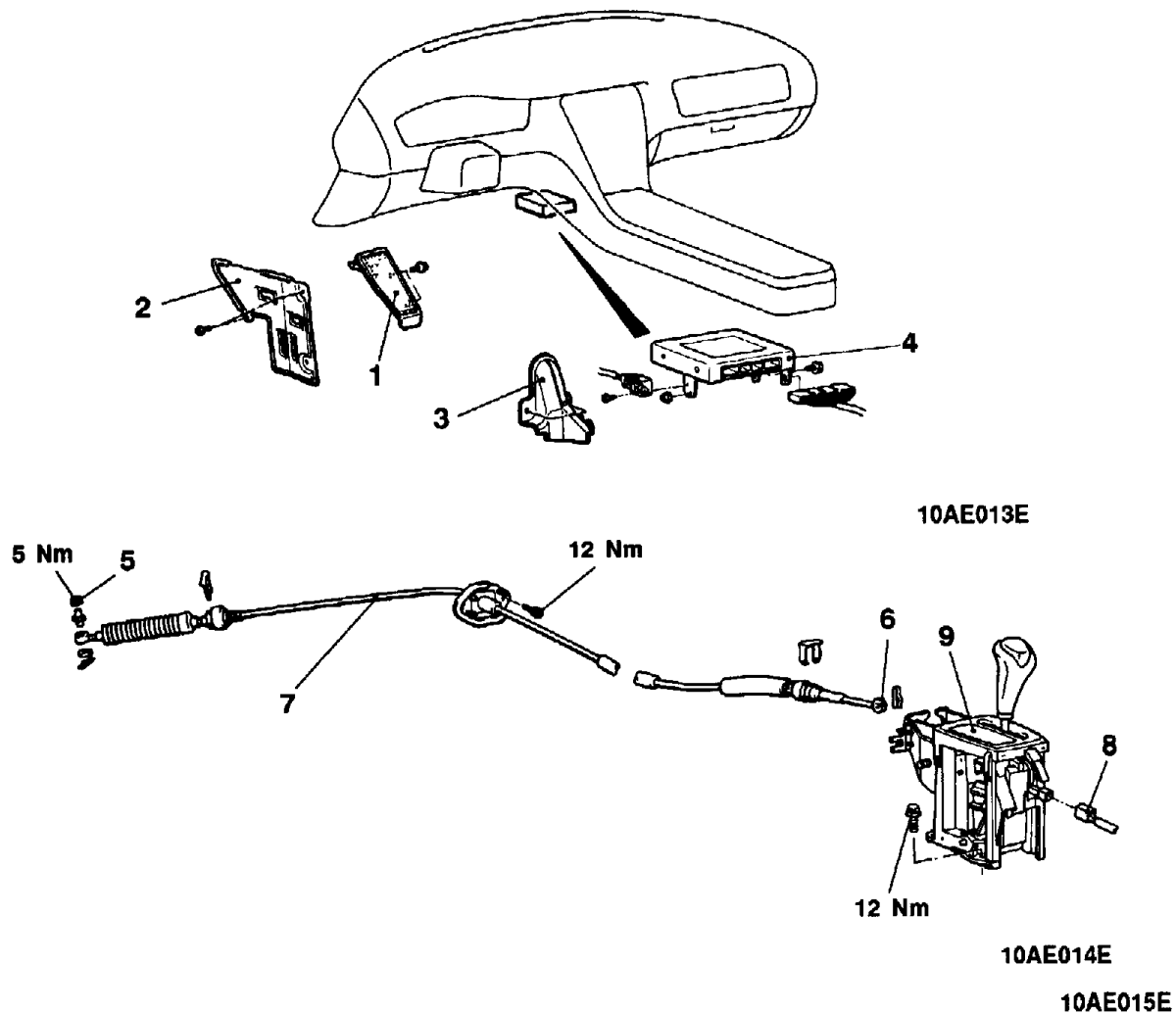
REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operation

- (1) Air Cleaner Assembly Removal and Installation
- (2) Front Floor Console Removal and Installation
(Refer to GROUP 52A)

Caution: SRS

Be careful not to subject the SRS-ECU to any shocks during removal and installation of the transmission control cable and selector lever assembly.



Transmission control cable assembly removal steps

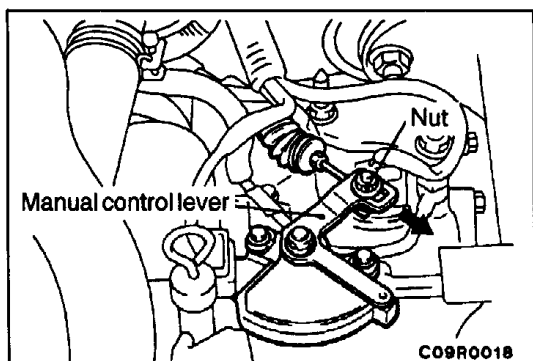
1. Foot rest
2. Floor carpet front reinforcements (LH and RH)
3. Harness protector
4. Engine-A/T-ECU and A/T control relay
5. Nut
6. Connection of the transmission control cable



7. Transmission control cable assembly

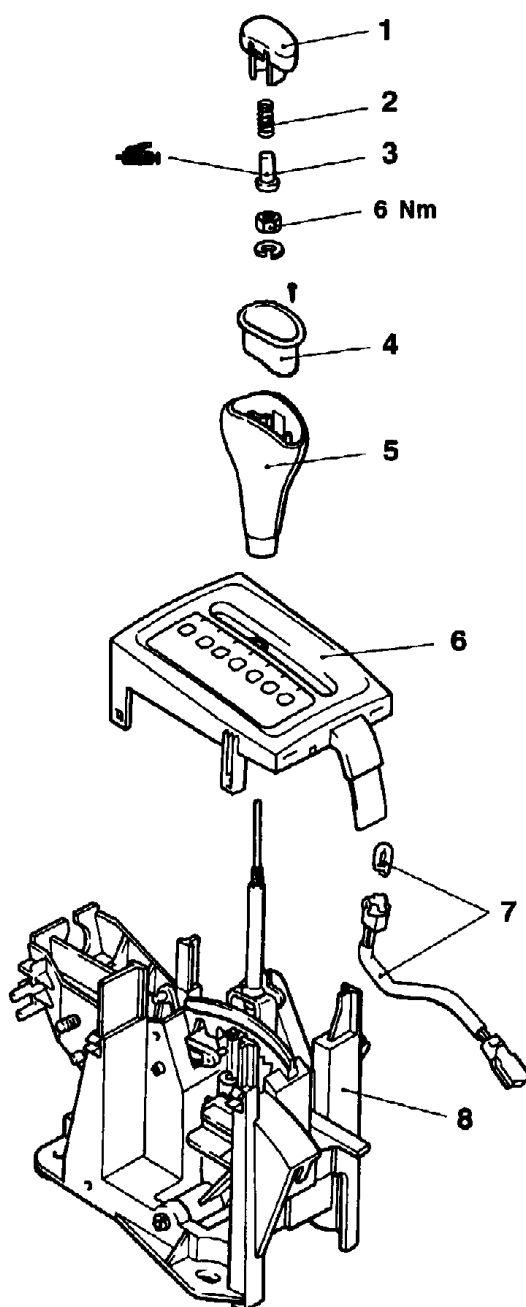
Selector lever assembly removal steps

7. Transmission control cable assembly
8. Harness connector
9. Selector lever assembly

**INSTALLATION SERVICE POINT****►A◄ NUT INSTALLATION**

1. Put the selector lever in the "N" position.
2. Loosen the adjusting nut, gently pull the transmission control cable in the direction of the arrow and tighten the nut.

SELECTOR LEVER ASSEMBLY DISASSEMBLY AND REASSEMBLY



10AE012N

Disassembly steps

1. Push button
2. Spring
3. Adjuster
4. Bezel

5. Shift knob
6. Indicator panel assembly
7. Position indicator light assembly
8. Shift lever assembly

TRANSMISSION ASSEMBLY

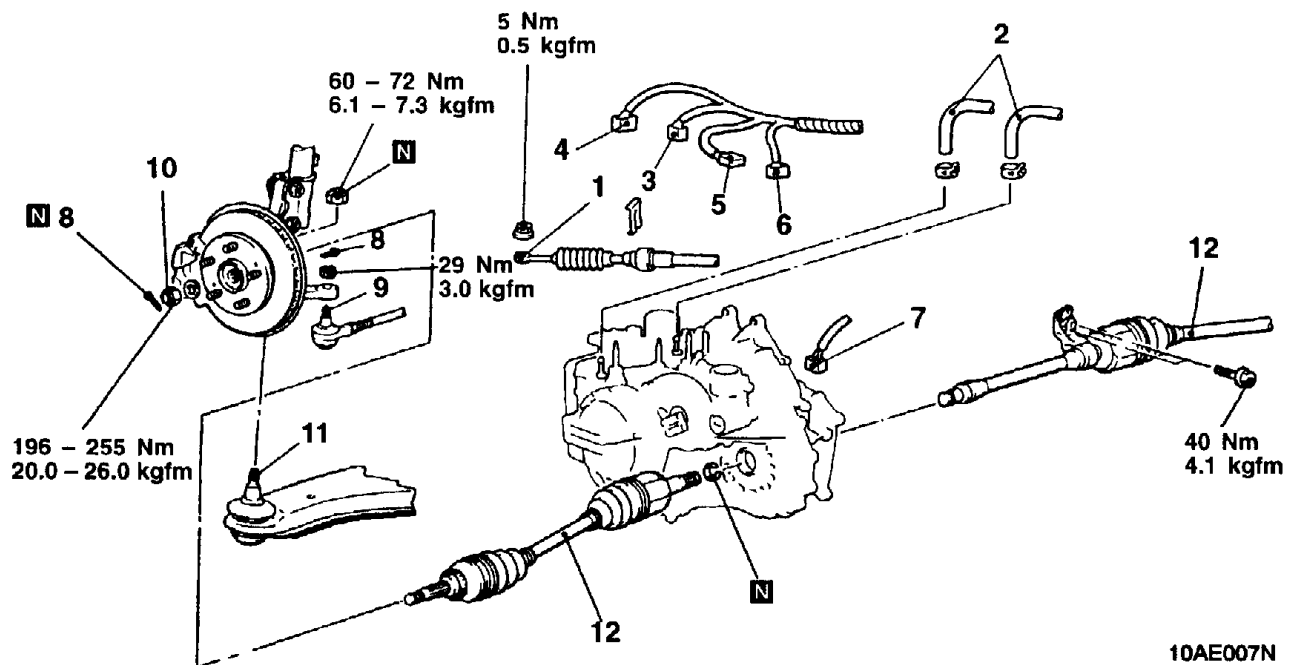
REMOVAL AND INSTALLATION

Pre-removal Operation

- (1) Transmission Fluid Draining
(Refer to P.23-45)
- (2) Under Cover Removal
- (3) Battery and Battery Tray Removal
- (4) Air Cleaner Assembly Removal
(Refer to GROUP 15)

Post-installation Operation

- (1) Air Cleaner Assembly Installation
(Refer to GROUP 15)
- (2) Battery and Battery Tray Installation
- (3) Under Cover Installation
- (4) Transmission Fluid Supplying
(Refer to P.23-45)
- (5) Selector Lever Operation Check
- (6) Speedometer Operation Check



10AE007N

Removal steps

1. Transmission control cable connection
2. Transmission oil cooler hoses connection
3. Inhibitor switch connector
4. A/T control solenoid valve connector
5. Input shaft speed sensor connector
6. Output shaft speed sensor connector
7. Vehicle speed sensor connector
8. Split pin

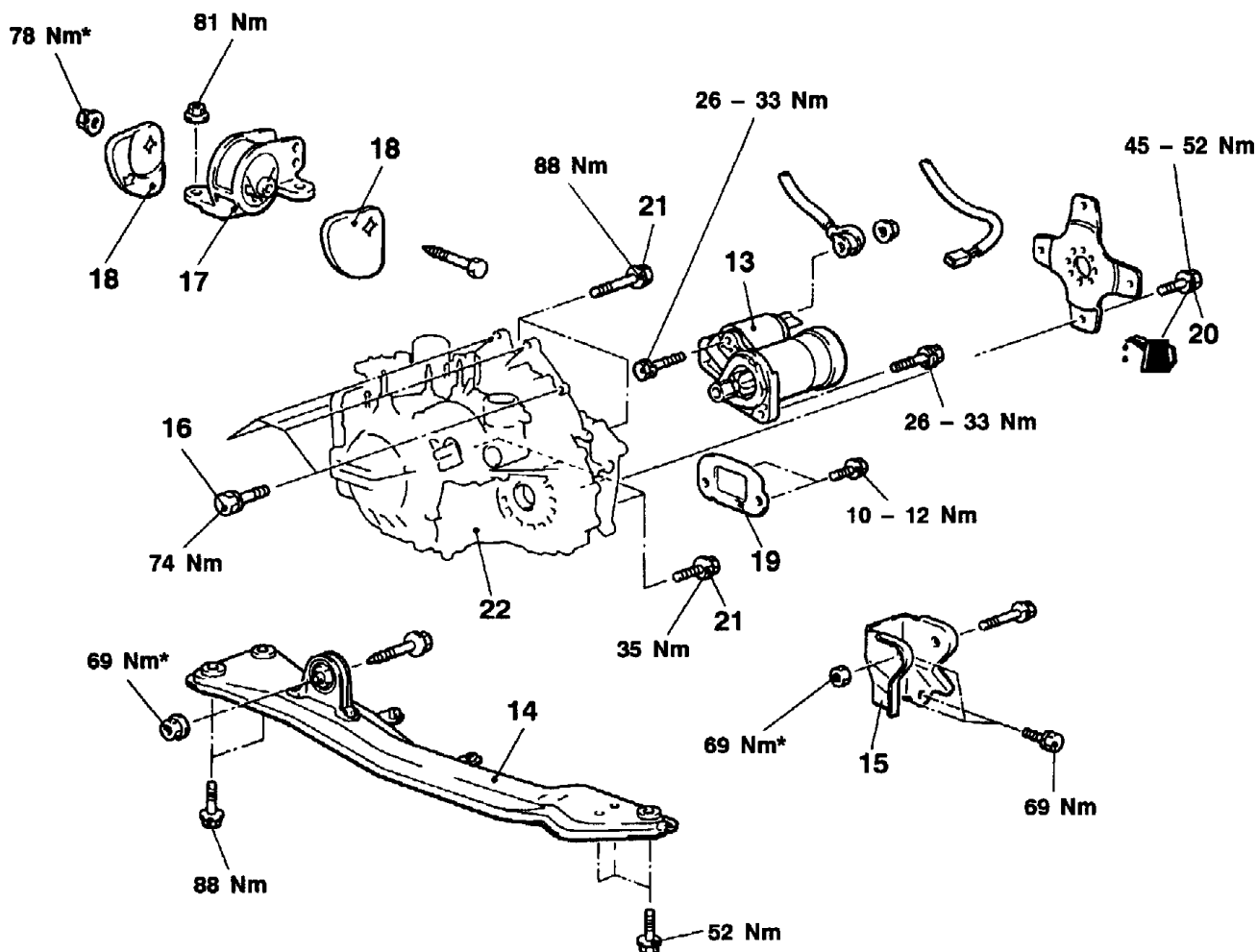
◀A▶

◀B▶

9. Connection of the tie rod end
10. Drive shaft nut
11. Connection for the lower arm ball joint
12. Drive shaft and inner shaft assembly (RH) and the drive shaft (LH)

Caution

Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.



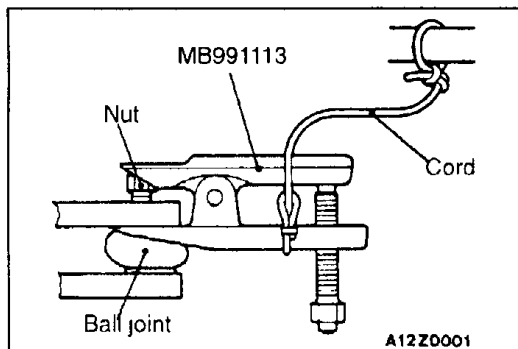
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Lifting up of the vehicle

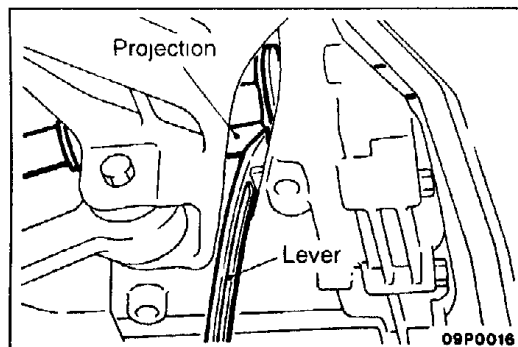
- 13. Starter motor
- 14. Centre member assembly
- 15. Rear roll stopper bracket
- 16. Transmission upper portion fixing bolt
- 17. Transmission mounting bracket
- 18. Transmission mount stopper
 - Support the engine and transmission assembly
- 19. Bell housing cover

- 20. Drive plate attaching bolt
- 21. Transmission lower portion fixing bolt
- 22. Transmission assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

**REMOVAL SERVICE POINTS****◀A▶ TIE ROD END/LOWER ARM BALL JOINT DISCONNECTION****Caution**

1. Before 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.

**◀B▶ DRIVE SHAFT <L.H.>/DRIVE SHAFT <R.H.> DISCONNECTION**

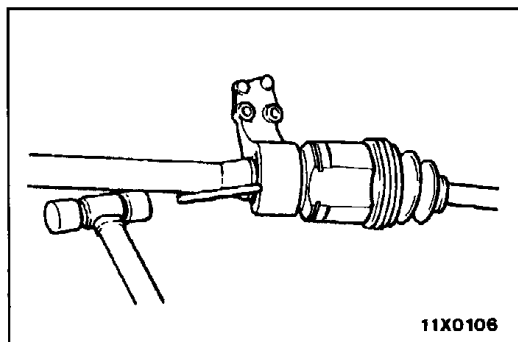
1. Insert a pry bar between the transmission case and the drive shaft as shown to remove the drive shaft.

NOTE

Do not remove the hub and knuckle from the drive shaft.

Caution

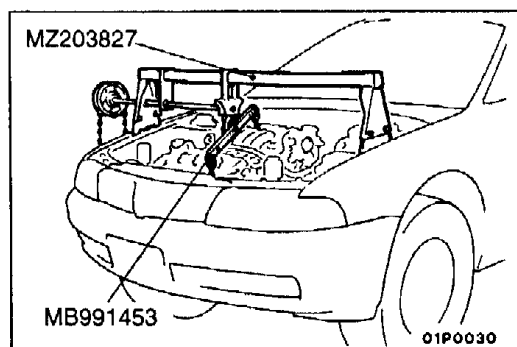
Always use a pry bar, or the ball joint will be damaged.



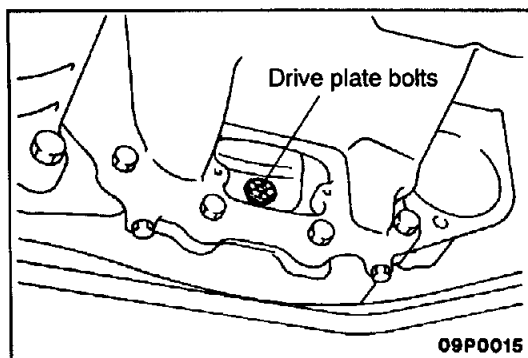
2. Lightly strike the centre bearing with a plastic hammer or similar object and pull out the inner shaft (RH) from the transmission.
3. Suspend the removed drive shaft with a wire so that there are no sharp bends in any of the joints.
4. Use a shop towel to cover the transmission case to prevent foreign material from entering it.

◀C▶ TRANSMISSION MOUNT BRACKET REMOVAL

Jack up the transmission assembly gently with a garage jack, and then remove the transmission mounting.

**◀D▶ ENGINE ASSEMBLY SUPPORTING**

Set the special tool to the vehicle to support the engine assembly.



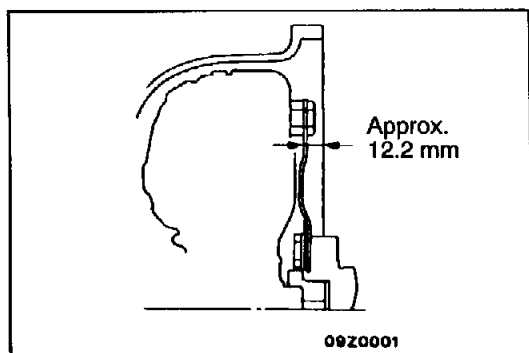
◀E▶ DRIVE PLATE BOLTS/TRANSMISSION ASSEMBLY LOWER PART COUPLING BOLTS/TRANSMISSION ASSEMBLY REMOVAL

1. Support the transmission assembly by using a transmission jack.
2. Remove the drive plate bolts while turning the crank shaft.
3. Press in the torque converter to the transmission side so that the torque converter does not remain on the engine side.
4. Remove the transmission assembly lower bolts and lower the transmission assembly.

INSTALLATION SERVICE POINTS

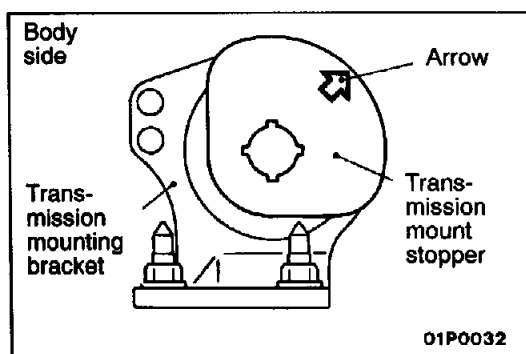
▶A◀ TRANSMISSION ASSEMBLY INSTALLATION

After securely inserting the torque converter into the transmission side so that the shown dimension is approx. 12.2 mm, install the transmission assembly to the engine.



▶B◀ TRANSMISSION MOUNT STOPPER INSTALLATION

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



FRONT AXLE

CONTENTS

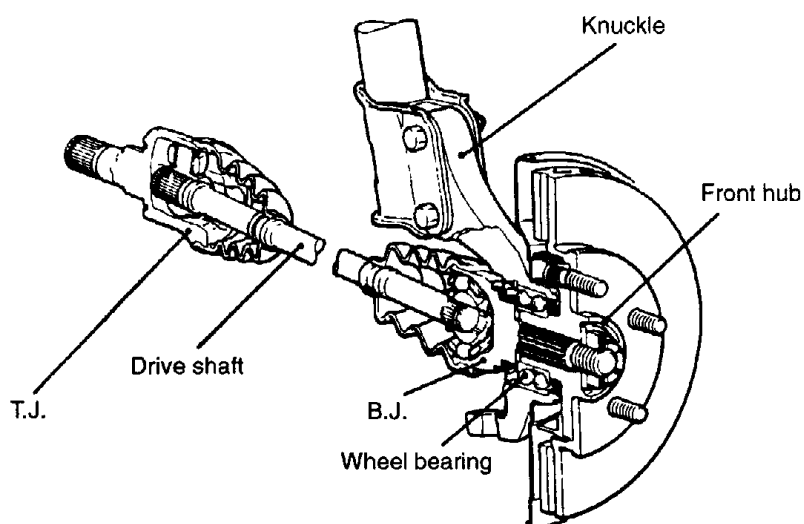
GENERAL INFORMATION	2	ON-VEHICLE SERVICE	5
SERVICE SPECIFICATIONS	2	Hub Axial Play Check	5
LUBRICANTS	2	Hub Bolt Replacement	5
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		ASSEMBLY	6
		DRIVE SHAFT	11

GENERAL INFORMATION

The front axle consists of a knuckle, front hub, double-row angular contact ball bearing and drive shaft. The bearing is press-fitted to the hub and the hub and bearing assembly is press fitted in

the knuckle to support the drive shaft. The drive shaft has a tripod joint (T.J.) on the transmission side and a birfield joint (B.J.) on the wheel side.

CONSTRUCTION DIAGRAM



22AE003N

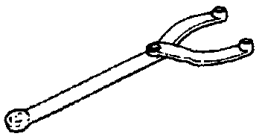
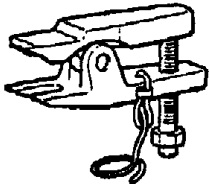
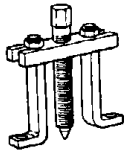
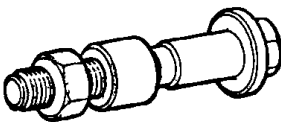
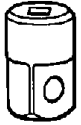
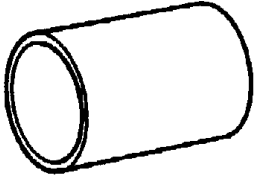
SERVICE SPECIFICATIONS

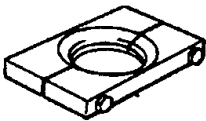
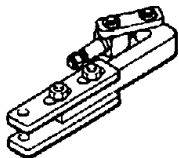
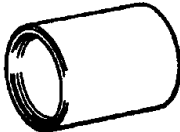
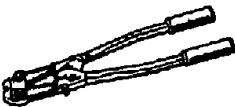
Items		Standard value	Limit
Setting of the T.J. boot length mm		75±3	
Hub axial play mm		–	0.05
Wheel bearing starting torque Nm		–	1.8 or less
Opening dimension of the special tool (MB991561) mm	When the B.J. boot band (small) is crimped	2.9	–
	When the B.J. boot band (big) is crimped	3.2	–
Crimped width of the B.J. boot band mm		2.4 – 2.8	–
Clearance between the B.J. boot (larger diameter side) and the stepped phase of the B.J. housing mm		0.1 – 1.55	–

LUBRICANTS

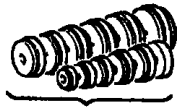
Items	Quantity g	Specified lubricant
T.J. boot grease	145	Repair kit grease
B.J. boot grease	160	Repair kit grease

SPECIAL TOOLS

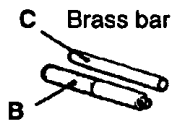
Tool	Number	Name	Use
	MB990767	End yoke holder	Hub fixing
	MB991113	Steering linkage puller	Tie rod end and lower arm ball joint removal
	MB990241	Axle shaft puller	Drive shaft removal
	MB990998	Front hub remover and installer	• Wheel bearing provisional holding • Hub axial play measurement • Rotational starting torque measurement
	MB990685	Torque wrench	Wheel bearing starting torque measurement
	MB990326	Preload wrench	Wheel bearing starting torque measurement
	MB990810	Bearing puller	Removal of the wheel bearing inner race
	MB991172	Adaptor	Press-fitting

Tool	Number	Name	Use
	MB991248	Inner shaft remover	Pressing-out
	MB991056 or MB991355	Knuckle arm bridge	Removal of the hub
	MB990955	Oil seal installer	Press-fitting the oil seal
	MB990947	Lower arm bushing arbor	Press-fitting the oil seal
	MB990890	Rear suspension bush- ing base	Press-fitting the wheel bearing
	MB990883	Rear suspension arbor	Press-fitting the wheel bearing
	MB991561	Boot band clipping tool	Resin boot band installation
 11H0072	MB991618	Hub bolt remover	Removing hub bolt

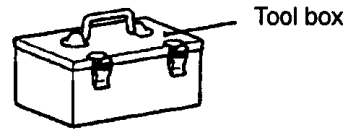
MB990925



A
Installer adaptor

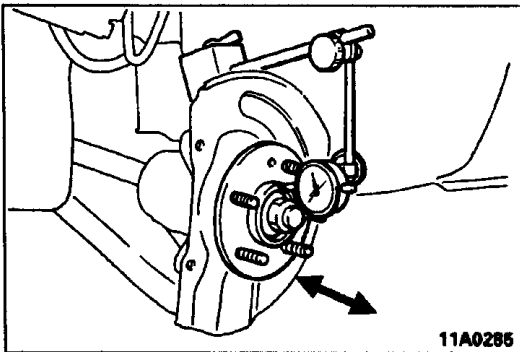


Bar (snap-in type)



A11W0113

Type	Tool number	O.D. mm	Type	Tool number	O.D. mm
A	MB990926	39	A	MB990933	63.5
	MB990927	45		MB990934	67.5
	MB990928	49.5		MB990935	71.5
	MB990929	51		MB990936	75.5
	MB990930	54		MB990937	79
	MB990931	57	B	MB990938	—
	MB990932	61	C	MB990939	—



11A0285

ON-VEHICLE SERVICE

HUB AXIAL PLAY CHECK

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

Limit: 0.05 mm

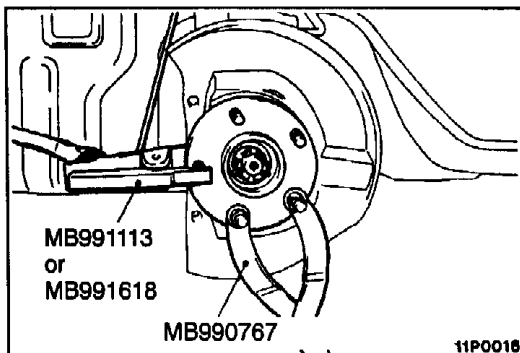
4. If end play exceeds the limit, replace the front hub assembly.

HUB BOLT REPLACEMENT

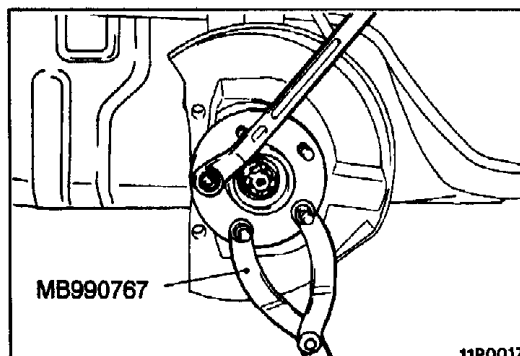
1. Remove the calliper assembly and secure it with wire so that it does not fall.
2. Remove the brake disc.
3. Use the special tools to remove the hub bolts.

Caution

The special tool should be suspended by a cord to prevent it from coming off.



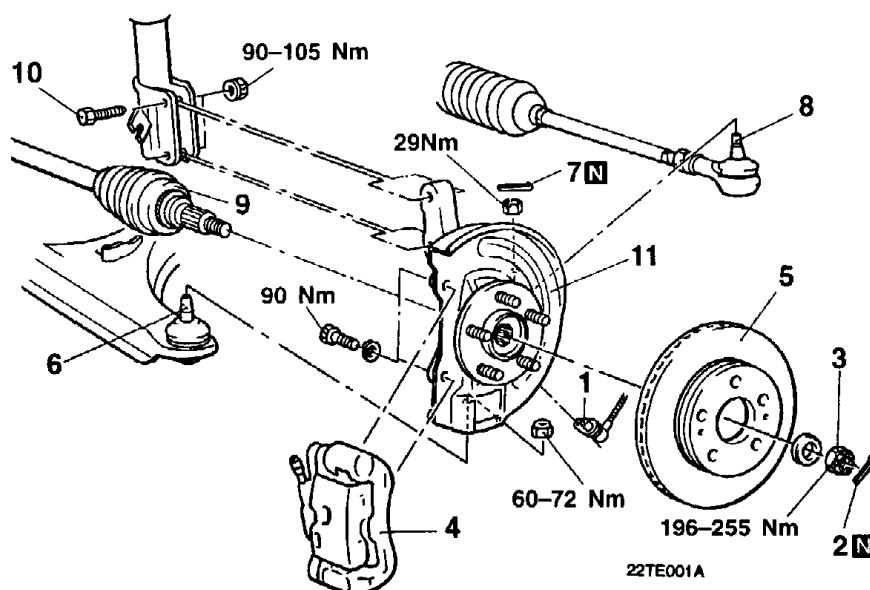
11P0016



11P0017

4. Align the splines on the hub bolt with the splines in the hub and use the wheel nuts to securely install the new hub bolts.

FRONT HUB AND KNUCKLE ASSEMBLY REMOVAL AND INSTALLATION

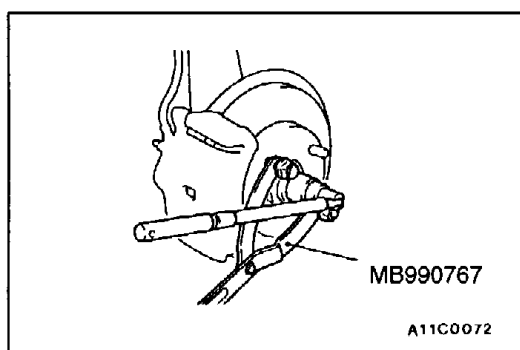


Removal steps

1. Front speed sensor <Vehicles with ABS>
2. Cotter pin
3. Drive shaft nut
4. Calliper assembly
5. Brake disc



6. Connection for lower arm ball joint
7. Split pin
8. Connection for tie rod end
9. Drive shaft
10. Front strut mounting bolt
11. Hub and knuckle

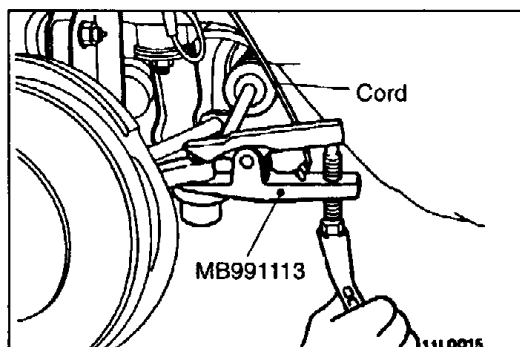


REMOVAL SERVICE POINTS

◀A▶ DRIVE SHAFT NUT REMOVAL

◀B▶ CALLIPER ASSEMBLY REMOVAL

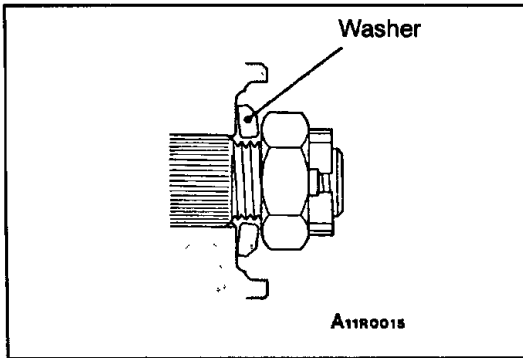
Secure the calliper assembly with wire to avoid placing load on the brake hose.



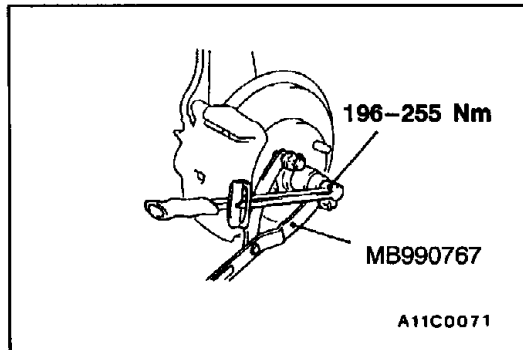
◀C▶ DISCONNECTION OF LOWER ARM BALL JOINT/ TIE ROD END

Caution

1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.

**INSTALLATION SERVICE POINT****►A◄ DRIVE SHAFT NUT INSTALLATION**

1. Be sure to install the drive shaft washer in the specified direction.



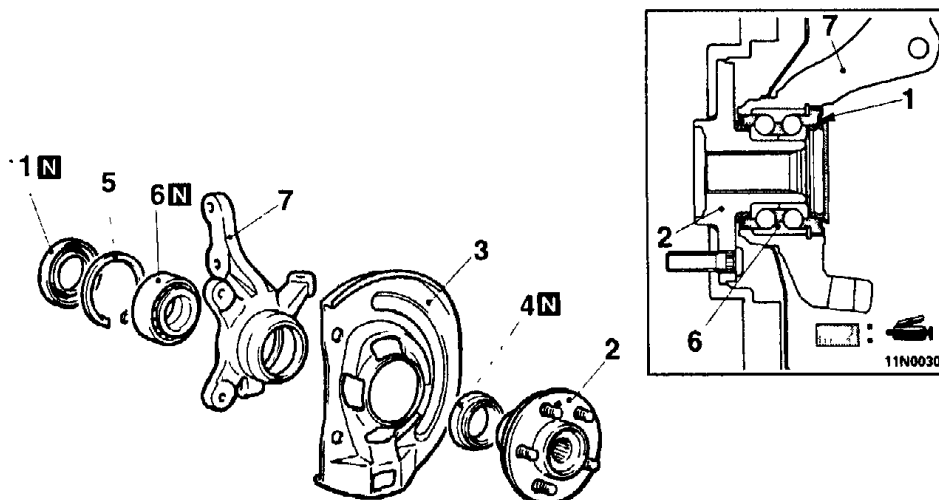
2. Using the special tool, tighten the drive shaft nut to the lower end of the specified torque range.

Caution

There should be no load on the wheel bearings when the drive shaft nut is tightened.

3. If the position of the cotter pin holes does not match, tighten the nut up to a maximum of 255 Nm.
4. Install the cotter pin in the first matching holes and bend it securely.

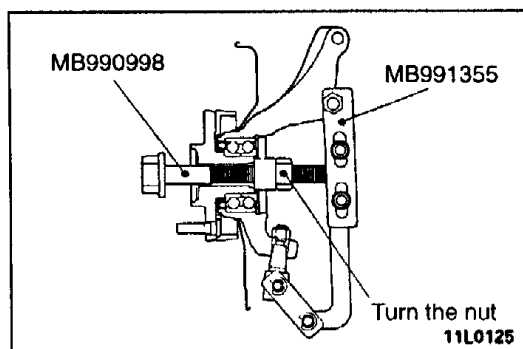
DISASSEMBLY AND REASSEMBLY



22TE004A

Disassembly Procedure

- | | |
|--|--|
| <p>▶D▶ 1. Oil seal (Drive shaft side)</p> <p>▶C▶ • Adjustment of the wheel bearing starting torque</p> <p>▶C▶ • Adjustment of the hub end play</p> <p>◀A▶ ▶C▶ 2. Hub</p> | <p>▶B▶ 3. Dust shield</p> <p>▶B▶ 4. Oil seal</p> <p>▶A▶ 5. Snap ring</p> <p>▶A▶ 6. Wheel bearing</p> <p>▶A▶ 7. Knuckle</p> |
|--|--|

**DISASSEMBLY SERVICE POINTS****◀A▶ REMOVAL OF HUB FROM KNUCKLE**

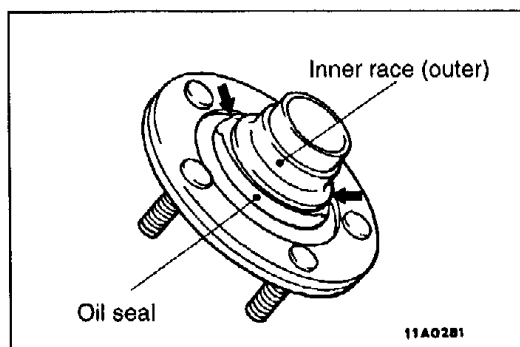
1. Attach the special tools to the knuckle and hub.
2. Secure the knuckle in a vice.
3. Tighten the nut of the special tool to remove the hub from the knuckle.

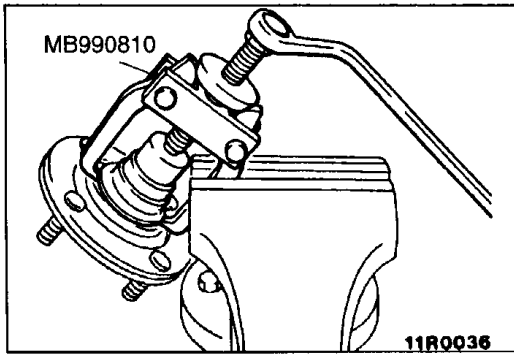
Caution

1. Always use the special tool to remove the hub.
2. Never strike the hub or knuckle with a hammer to separate them as the bearing will be damaged.

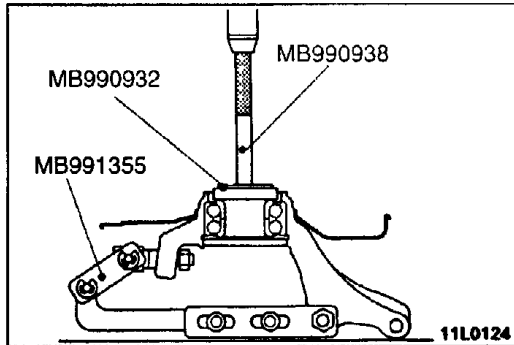
◀B▶ WHEEL BEARING REMOVAL

1. Crush the oil seal in two places so that the tabs of the special tool can be engaged on the wheel bearing inner race.

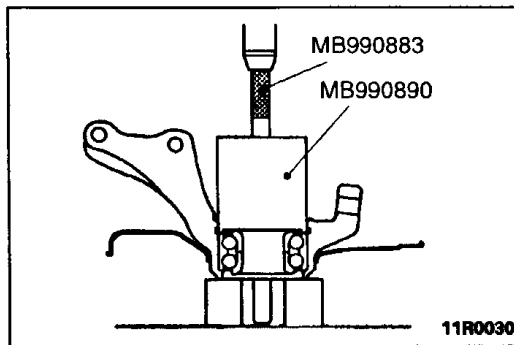




2. Remove the wheel bearing inner race from the front hub by using the special tool, as shown in the illustration.



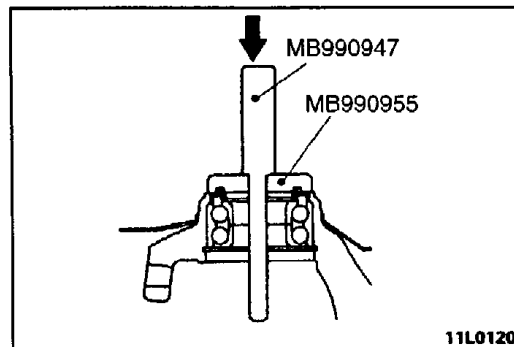
3. Drive the wheel bearing out with a press, using a 61 mm installer adaptor.



REASSEMBLY SERVICE POINTS

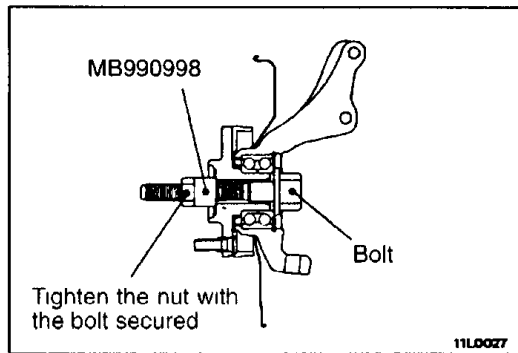
►A◄ WHEEL BEARING INSTALLATION

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



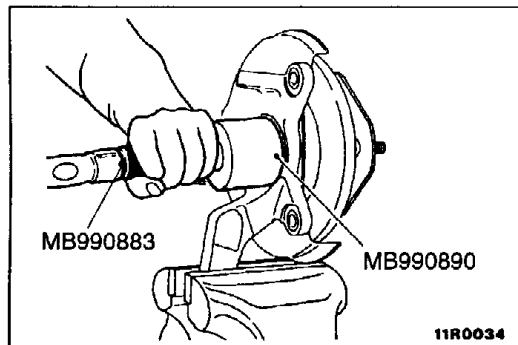
►B◄ OIL SEAL (HUB SIDE) INSTALLATION

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



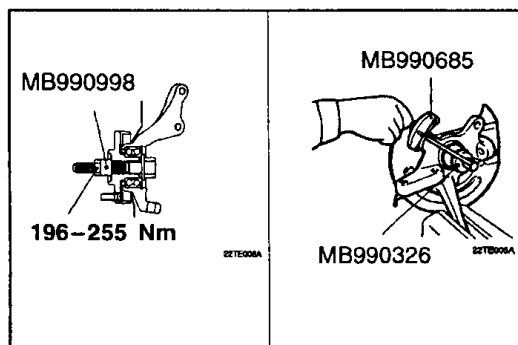
►C◄ INSTALLING HUB (ON TO KNUCKLE)

1. Use the special tool to mount the hub on to the knuckle.
2. Torque the nut of the special tool to 196–255 Nm (20.0 – 26.0 kgfm).
3. Rotate the hub in order to seat the bearing.
4. Leave the special tool in place and take the measurements described under "Inspection".



►D◄ OIL SEAL (DRIVE SHAFT SIDE) INSTALLATION

1. Drive the oil seal (drive shaft side) into the knuckle until it contacts the snap ring.
2. Apply multipurpose grease to the lip of the oil seal.



INSPECTION

- Check the front hub and brake disc mounting surfaces for fretting and contamination.
- Check the knuckle inner surface for galling or cracks.
- Check for a defective bearing.

WHEEL BEARING STARTING TORQUE CHECK

1. Tighten the special tool to the front hub assembly to the specified torque 196–255 Nm.
2. Use the special tool to measure the hub rotation starting torque.

Limit: 1.8 Nm (18.0 kgfcm) or less

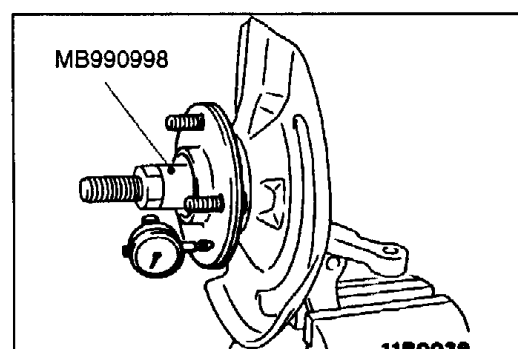
3. The hub starting torque should be within the limit value range, and there should be no engagement or feeling of roughness.

WHEEL BEARING AXIAL PLAY CHECK

1. Tighten the special tool to the front hub assembly to the specified torque 196–255 Nm (20.0 – 26.0 kgfm).
2. Measure the play in the wheel bearing axial direction.

Limit: 0.05 mm

3. If the limit value of wheel bearing axial play cannot be obtained, replace the front hub assembly.

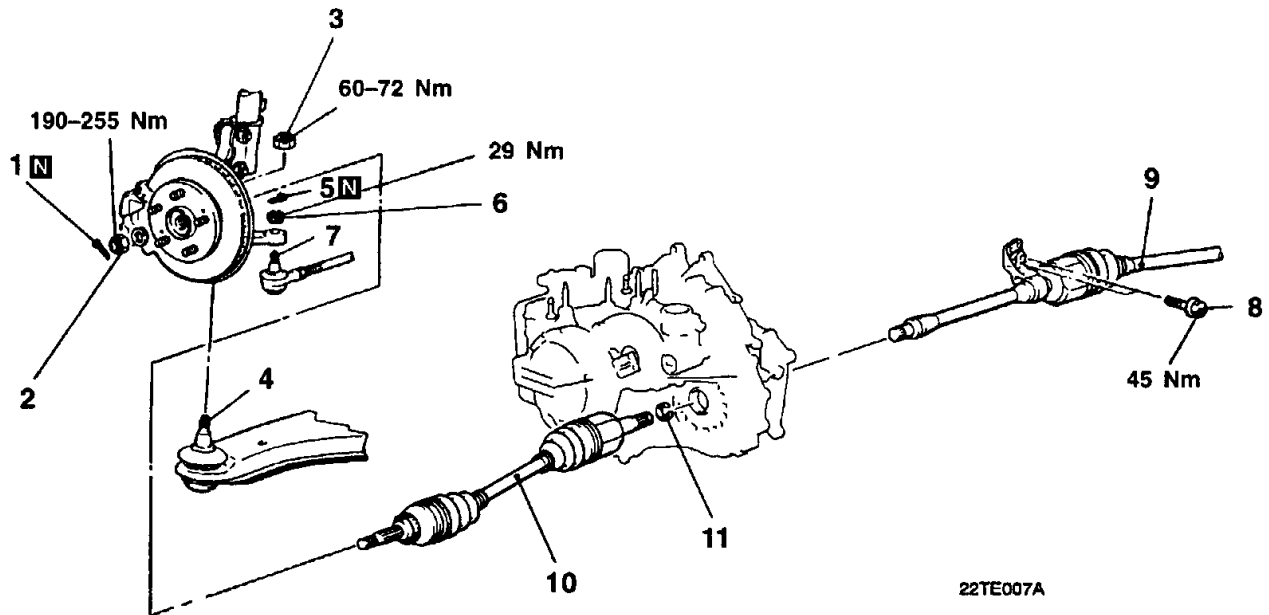


DRIVE SHAFT

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Remove the transmission under cover.
- Drain and replenish the transmission fluid.



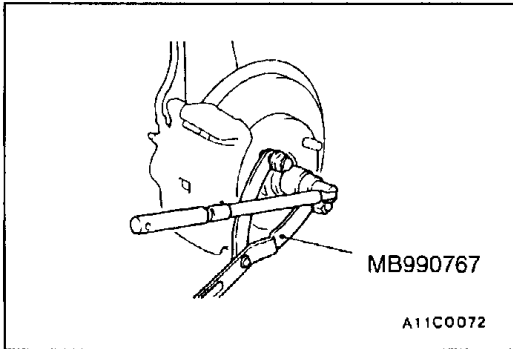
Removal steps

- ◀A▶ ▶A▶ 1. Drive shaft cotter pin
 ▶B▶ 2. Drive shaft nut
 ▶B▶ 3. Lower arm ball joint retaining nut
 ▶B▶ 4. Connection for lower arm ball joint
 ▶C▶ 5. Tie rod end cotter pin
 ▶C▶ 6. Tie rod end retaining nut
 ▶C▶ 7. Connection for tie rod end
 ▶C▶ 8. Centre bearing bracket bolts

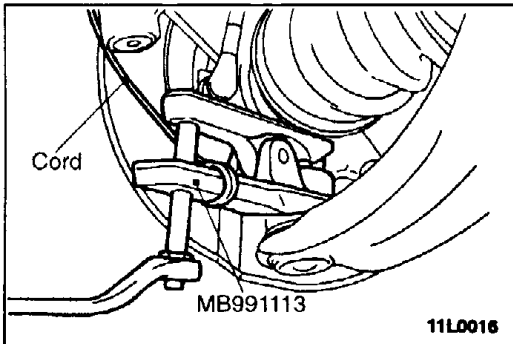
- ◀D▶ 9. Drive shaft and inner shaft assembly (R.H.)
 ▶D▶ 10. Drive shaft (L.H.)
 ▶D▶ 11. Circlip

Caution

*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.

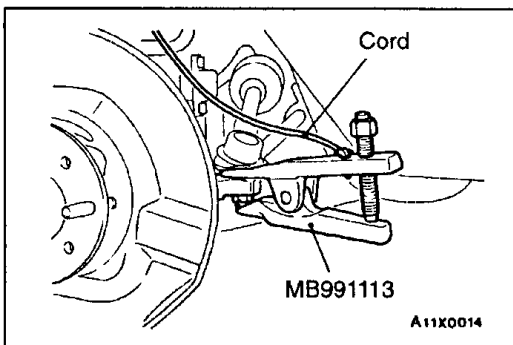
**REMOVAL SERVICE POINTS****◀A▶ DRIVE SHAFT NUT REMOVAL****Caution**

Do not apply the vehicle weight to the wheel bearing while loosening the drive shaft nut.

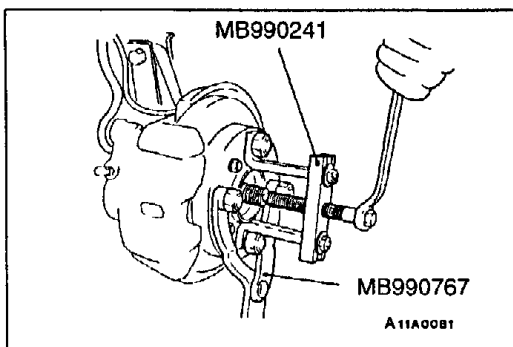
**◀B▶ DISCONNECTION OF LOWER ARM BALL JOINT****Caution**

1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.

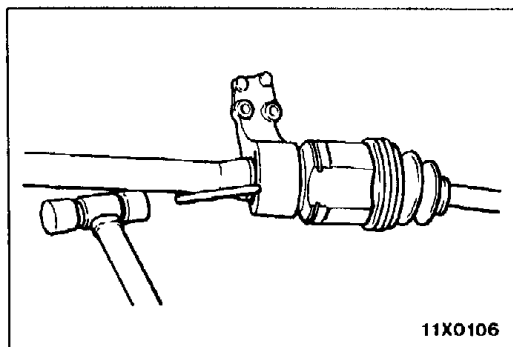
Disconnect the ball joint by using the special tool.

**◀C▶ TIE ROD END REMOVAL****Caution**

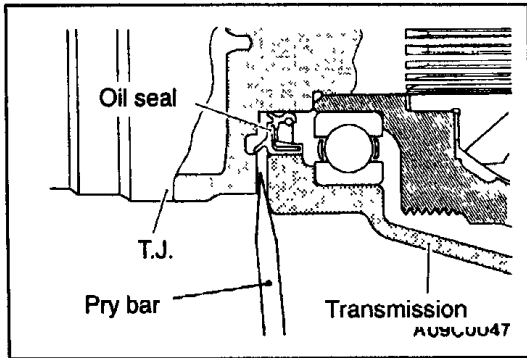
1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.

**◀D▶ DRIVE SHAFT AND INNER SHAFT (R.H.) AND DRIVESHAFT (L.H.) REMOVAL**

1. Use the special tools to push out the drive shaft from the hub.



2. Tap the centre bearing bracket with a hammer, to remove the drive shaft and inner shaft (R.H.) from the transmission.



3. Insert a pry bar between the transmission case and the drive shaft, and then pry the drive shaft from the transmission.

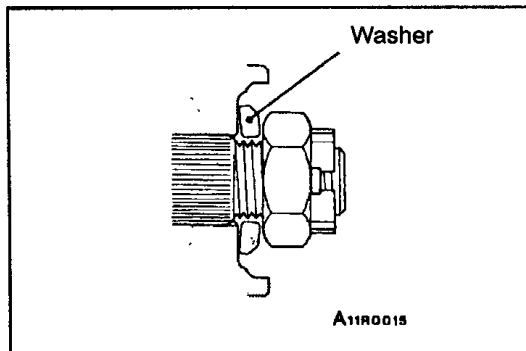
Caution

1. Do not pull on the drive shaft; doing so will damage the T.J.; be sure to use the pry bar.
2. Do not insert the pry bar so deep as to damage the oil seal.

4. Use a shop towel to cover the transmission case and to prevent the entry of foreign objects.

Caution

Do not apply the full load of the vehicle onto the wheel bearings when the drive shaft has been removed. If you need to apply a load to the bearings in order to move the vehicle, for instance, use the special tool to provisional secure the bearings.



INSTALLATION SERVICE POINT

►A◄ **DRIVE SHAFT NUT INSTALLATION**

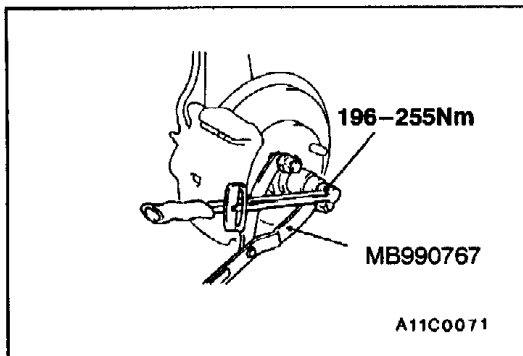
1. Be sure to install the drive shaft washer in the specified direction.

2. Using the special tool, tighten the drive shaft nut to the lower end of the specified torque range.

Caution

There should be no load on the wheel bearings when the drive shaft nut is tightened.

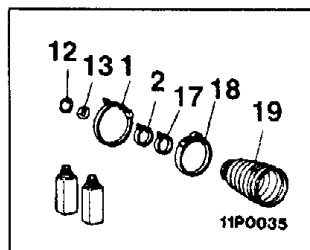
3. If the position of the cotter pin holes does not match, tighten the nut to a maximum of 255 Nm.
4. Install the cotter pin in the first matching holes and bend it securely.



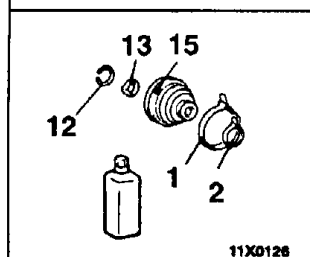
INSPECTION

- Check the drive shaft boot for damage or deterioration.
- Check the ball joints for wear or operating condition.
- Check the spline part for wear or damage.

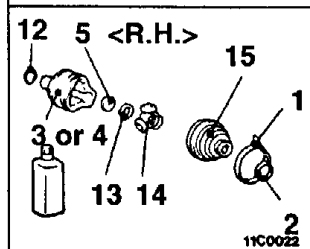
DISASSEMBLY AND REASSEMBLY



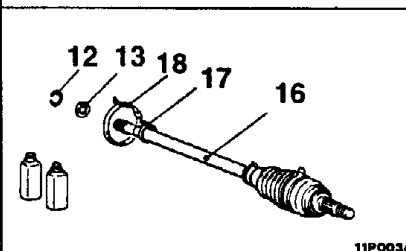
B.J. boot repair kit



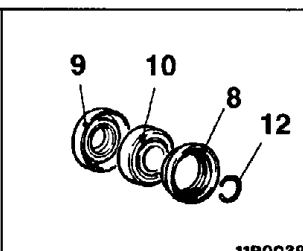
T.J. boot repair kit



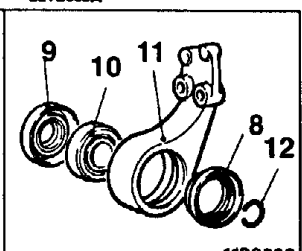
T.J. repair kit



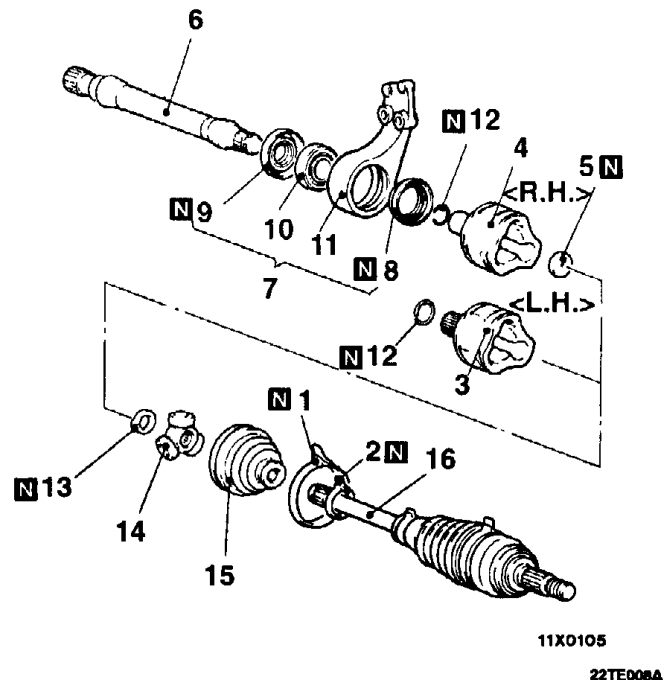
B.J. repair kit



Bearing dust seal repair kit



Bracket assembly repair kit



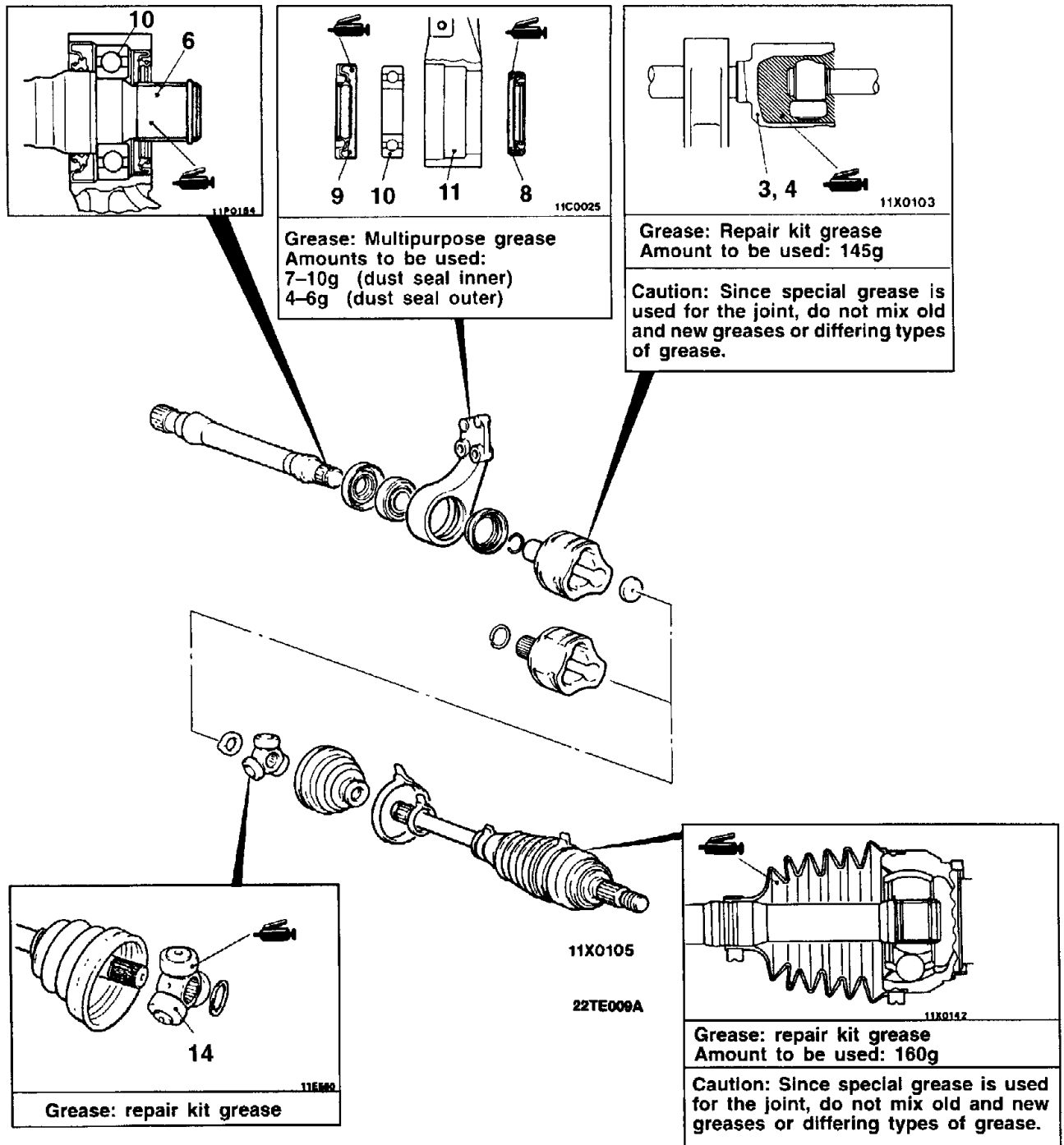
- Disassembly steps**
- | | |
|-----|----------------------------|
| ▶G◀ | 1. Boot band (large) |
| ▶G◀ | 2. Boot band (small) |
| ▶B◀ | 3. T.J. case (L.H.) |
| ▶B◀ | 4. T.J. case (R.H.) |
| ▶B◀ | 5. Seal plate |
| ▶B◀ | 6. Inner shaft |
| ▶B◀ | 7. Bracket assembly |
| ▶D◀ | 8. Dust seal outer |
| ▶D◀ | 9. Dust seal inner |
| ▶C◀ | 10. Centre bearing |
| ▶C◀ | 11. Centre bearing bracket |
| ▶C◀ | 12. Circlip |

- | | | |
|-----|-----|----------------------------|
| ▶D◀ | ▶B◀ | 13. Snap ring |
| ▶D◀ | ▶B◀ | 14. Spider assembly |
| ▶E◀ | ▶A◀ | 15. T.J. boot |
| | | 16. B.J. assembly |
| | | 17. B.J. boot band (small) |
| | | 18. B.J. boot band |
| | | 19. B.J. boot |

Caution

Do not disassemble the B.J. assembly or remove the boot bands unless boot replacement is required.

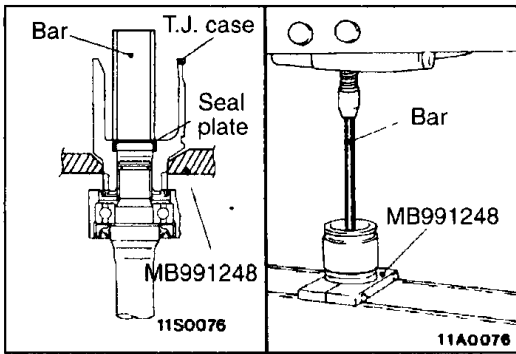
LUBRICANT POINTS



DISASSEMBLY SERVICE POINTS

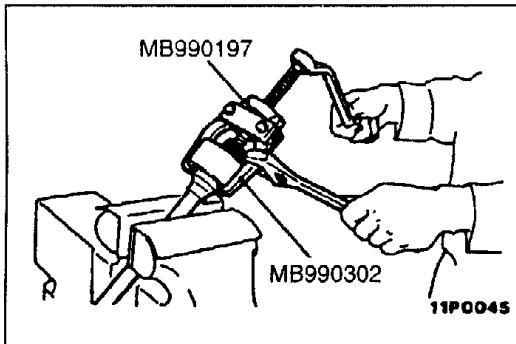
◀A▶ T.J. CASE (L.H.) REMOVAL

Remove the T.J. case from the B.J. assembly, and wipe off the grease inside the T.J. case.

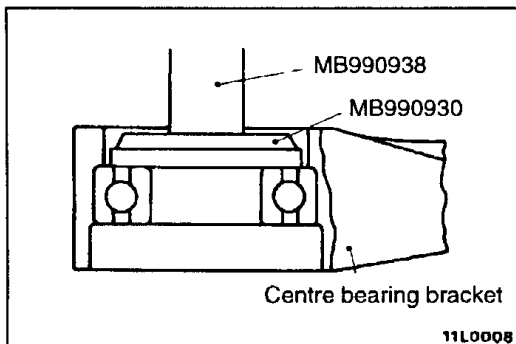


◀B▶ T.J. CASE (R.H.)/SEAL PLATE/INNER SHAFT/BRACKET ASSEMBLY REMOVAL

1. Remove the T.J. case from the B.J. assembly, and wipe off the grease inside the T.J. case.
2. Using the special tool, secure the T.J. case.
3. Push the seal plate with a bar (Diam 20mm), and press out the inner shaft assembly together with the seal plate.
4. Using the special tool, remove the inner shaft from the centre bearing bracket.



◀C▶ CENTRE BEARING REMOVAL

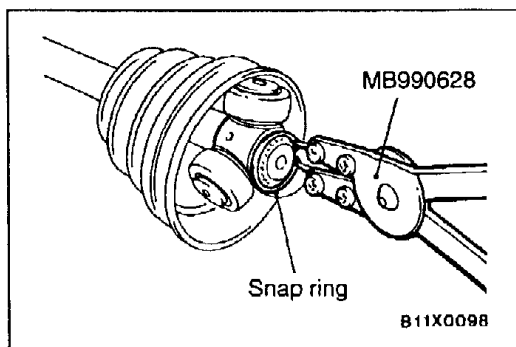


◀D▶ SNAP RING/SPIDER ASSEMBLY REMOVAL

1. Remove the snap ring from the drive shaft with the special tool.
2. Take out the spider assembly from the drive shaft.
3. Clean the spider assembly.

Caution

1. Do not disassemble the spider assembly.
2. Use care in handling so as not to damage the drive shaft.

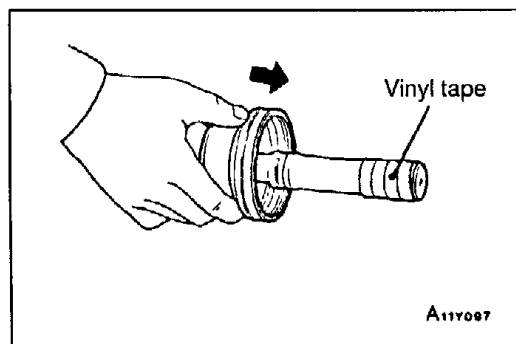


◀E▶ T.J. BOOT REMOVAL

1. Wipe the grease off of the spline portion.
2. Remove the T.J. boot.

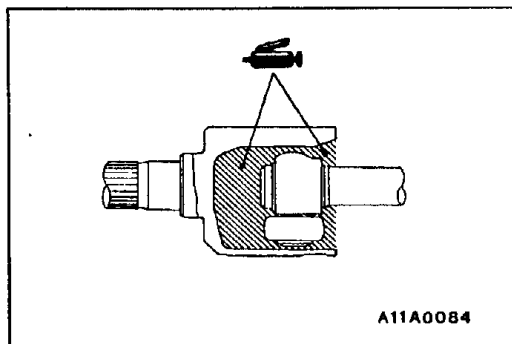
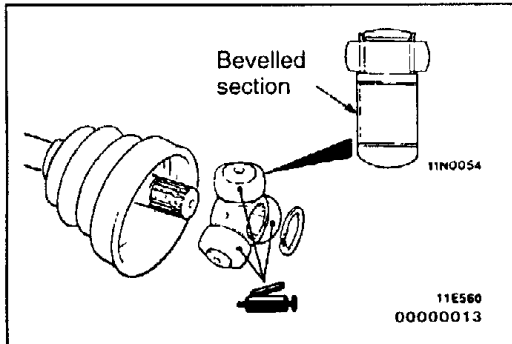
NOTE

If the boot is to be reused, wrap vinyl tape around the drive shaft spline so that the boot is not damaged when it is removed.



REASSEMBLY SERVICE POINTS**►A◄ T.J. BOOT INSTALLATION**

Wrap vinyl tape around the spline part on the drive shaft, and then install the T.J. boot band (small) and T.J. boot.

**►B◄ SPIDER ASSEMBLY/T.J. CASE (L.H.) INSTALLATION**

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

Specified grease: Repair kit grease

Caution

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

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

Specified grease:

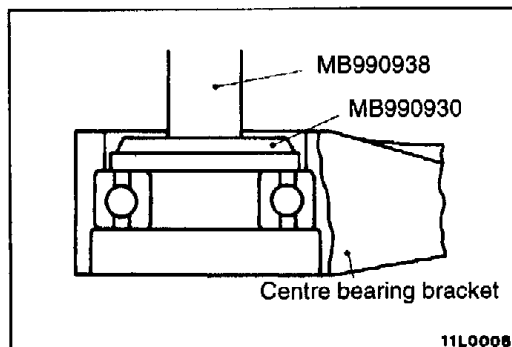
Repair kit grease 145g

NOTE

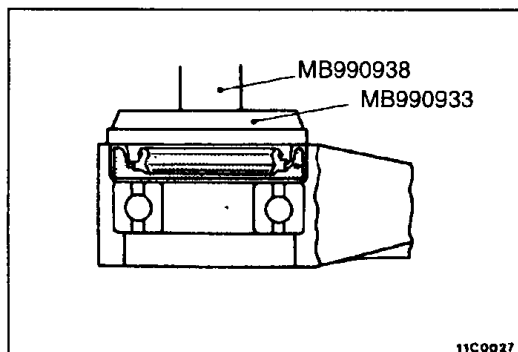
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution

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

**►C◄ CENTRE BEARING INSTALLATION**

1. Using a 61mm installer, press in the centre bearing.



►D◄ DUST SEAL INNER/DUST SEAL OUTER INSTALLATION

1. Fill the back surfaces of each dust seal with multipurpose grease.

Amount to be used:

7–10g (dust seal inner)

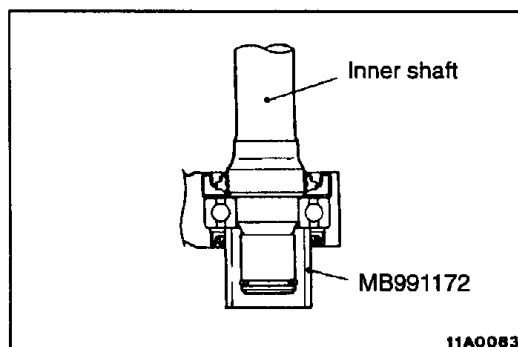
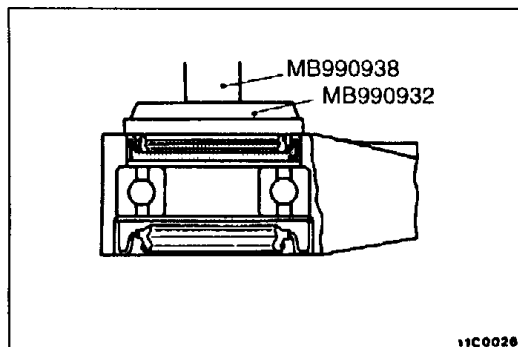
4–6g (dust seal outer)

2. Using a 61mm installer, drive in the oil seal until it is flat against the end face of the centre bearing bracket.

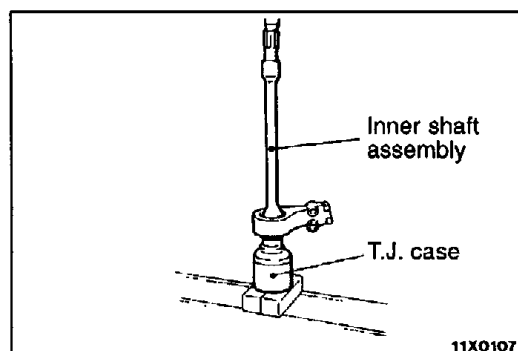
3. Coat the lip parts of each dust seal with multipurpose grease.

NOTE

Coat so that grease does not adhere to the outside of the lip.

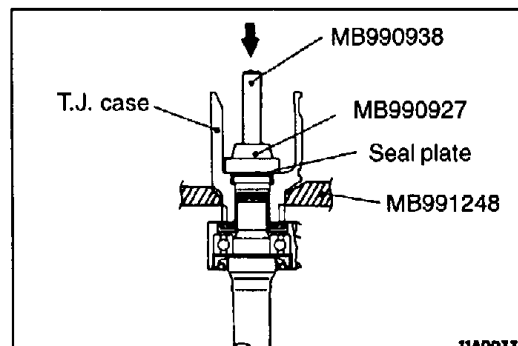


►E◄ BRACKET ASSEMBLY INSTALLATION



►F◄ INNER SHAFT/T.J. CASE (R.H.) INSTALLATION

1. Coat the spline part of the inner shaft with multipurpose grease and force the inner shaft assembly into the T.J. case.
2. Using the special tool, force the seal plate into the T.J. case.



3. Fill the T.J. case with the specified grease, then insert the drive shaft, and once again fill with the specified grease.

Specified grease: Repair kit grease

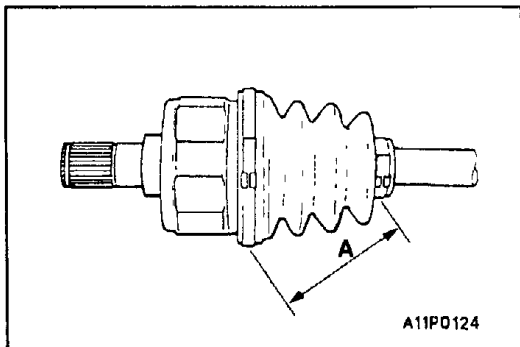
Amount to be used: 145g

NOTE

When using the repair kit grease, use the whole amount, aiming at filling the inside of the joint and the inside of the boot with about half each.

Caution

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



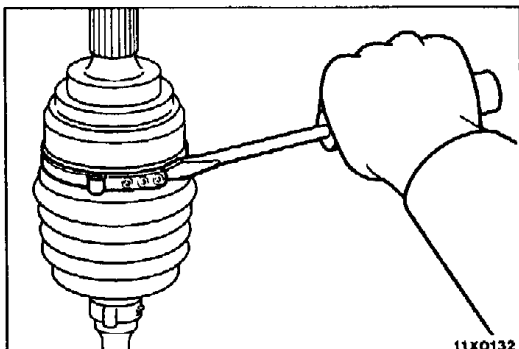
►G◄ T.J. BOOT BAND (SMALL)/T.J. BOOT BAND (LARGE) INSTALLATION

Set the T.J. boot bands at the specified distance in order to adjust the amount of air inside the T.J. boot, and then tighten the T.J. boot bands securely.

Standard value (A): 75 ± 3 mm

INSPECTION

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft spline part for wear or damage.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear or corrosion.
- Check the boots for deterioration, damage or cracking.



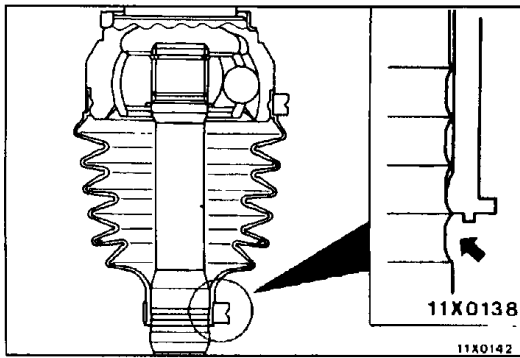
B.J. BOOT (RESIN BOOT) REPLACEMENT

1. Remove the B.J. boot bands (large and small).

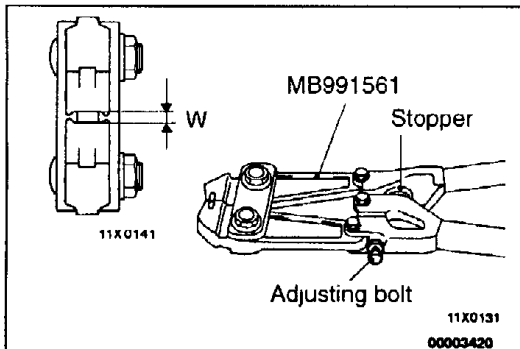
NOTE

The B.J. boot bands cannot be re-used.

2. Remove the B.J. boot.



3. Install the B.J. boot with the part with the smallest diameter in a position such that the shaft groove can be seen.



4. Turn the adjusting bolt on the special tool so that the size of the opening (W) is at the standard value.

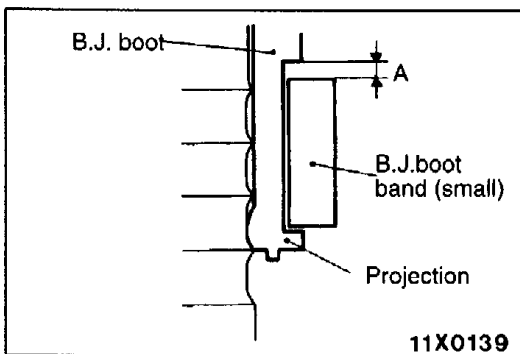
Standard value (W): 2.9 mm

**<If it is larger than 2.9 mm>
Tighten the adjusting bolt.**

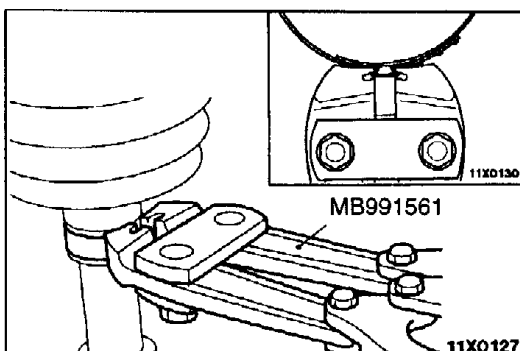
**<If it is smaller than 2.9 mm>
Loosen the adjusting bolt.**

NOTE

1. The value of W will change by approximately 0.7 mm for each turn of the adjusting bolt.
2. The adjusting bolt should not be turned more than once.



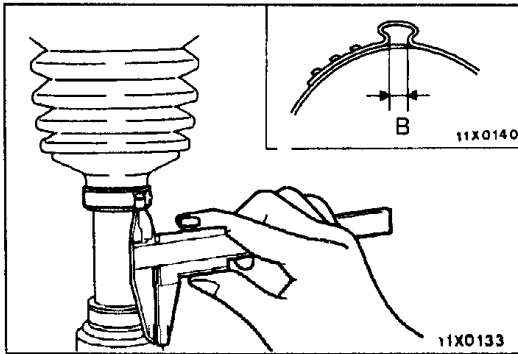
5. Place the B.J. boot band (small) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (A) in the illustration.



6. Use the special tool to crimp the B.J. boot band (small).

Caution

1. **Secure the drive shaft in an upright position and clamp the part of the B.J. boot band to be crimped securely in the jaws of the special tool.**
2. **Crimp the B.J. boot band until the special tool touches the stopper.**



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

Standard value (B): 2.4 – 2.8mm

<If the crimping amount is larger than 2.8 mm>
Readjust the value of (W) in step (4) according to the following formula, and then repeat the operation in step (6).

$$W = 5.5 \text{ mm} - B$$

EXAMPLE: If $B = 2.9 \text{ mm}$, then $W = 2.6 \text{ mm}$

<If the crimping amount is smaller than 2.4 mm>
Remove the B.J. boot band, readjust the value of (W) in step (4) according to the following formula, and then repeat the operations in steps (5) and (6) using a new B.J. boot band.

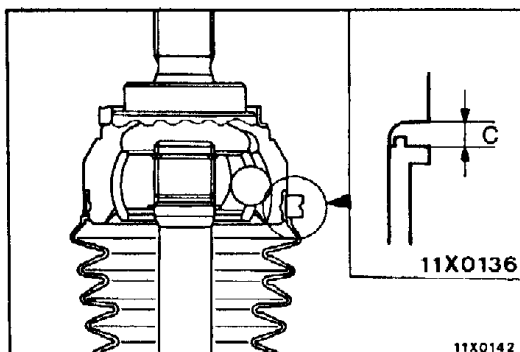
$$W = 5.5 \text{ mm} - B$$

Example: If $B = 2.3 \text{ mm}$, then $W = 3.2 \text{ mm}$.

8. Check that the B.J. boot band is not sticking out past the place where it had been installed.
If the B.J. boot band is sticking out, remove it and then repeat the operations in step (5) to (7) using a new boot band.
9. Fill the inside of the B.J. boot with the specified grease.

Specified grease: Repair kit grease

Amount to be used: 160g

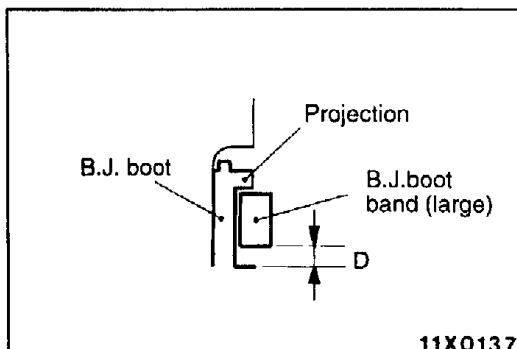


10. Install the B.J. boot band (large) so that there is the clearance (C) between it and the B.J. housing is at the standard value.

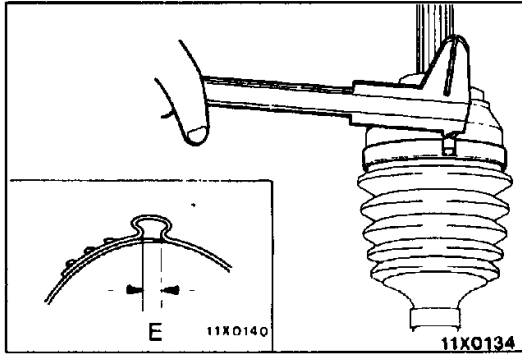
Standard value (C): 0.1 – 1.55 mm

11. Follow the same procedure as in step (4) to adjust the size of the opening (W) on the special tool so that it is at the standard value.

Standard value (W): 3.2 mm



12. Place the B.J. boot band (large) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (D) in the illustration.
13. Use the special tool to crimp the B.J. boot band (large) in the same way as in step (6).



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

Standard value (E): 2.4 – 2.8 mm

<If the crimping amount is larger than 2.8 mm>
Readjust the value of (W) in step (4) according to the following formula, and then repeat the operation in step (13).

$$W = 5.8 \text{ mm} - E$$

Example: If $E = 2.9 \text{ mm}$, then $W = 2.9 \text{ mm}$

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

$$W = 5.8 \text{ mm} - E$$

Example: If $E = 2.3 \text{ mm}$, then $W = 3.5 \text{ mm}$

15. Check that the B.J. boot is not sticking out past the place where it has been installed.

If the B.J. boot band is sticking out, remove it and then repeat operations in steps (12) to (14) using a new B.J. boot band.

REAR AXLE

CONTENTS

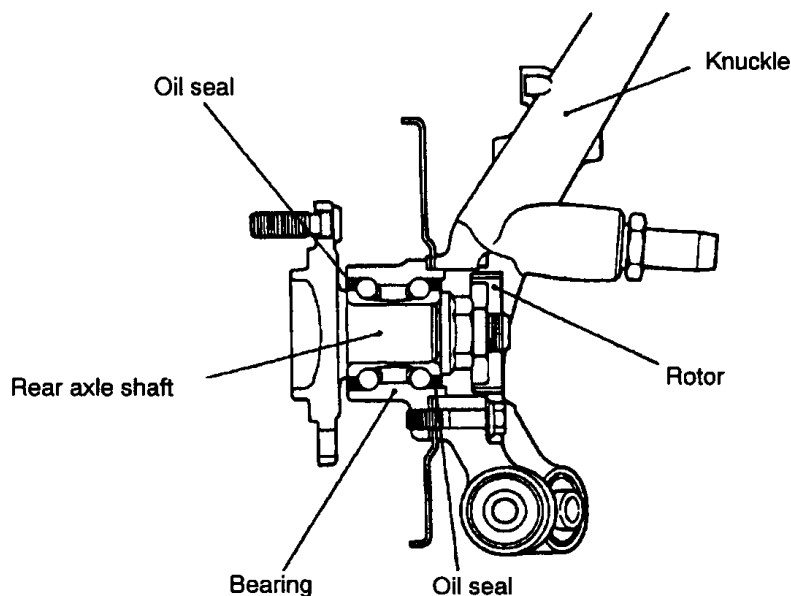
GENERAL INFORMATION	2	Hub Axial Play Check	3
SERVICE SPECIFICATIONS	2	Rear Hub Rotary-Sliding Resistance Check	3
SPECIAL TOOLS	2	Hub Bolt Replacement	4
ON-VEHICLE SERVICE	3	REAR HUB ASSEMBLY	5
		KNUCKLE	7

GENERAL INFORMATION

The rear axle consists of a knuckle, rear hub, unit bearing and axle shaft. The unit bearing is press-fitted to the rear axle shaft and bolted to the knuckle. The unit bearing utilises the double row angular con-

tact ball bearing type. For ABS operation, a rotor is located on the rear axle shaft, and a speed sensor is located on the knuckle to detect vehicle speed.

SECTIONAL VIEW

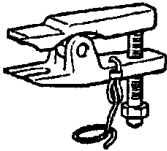
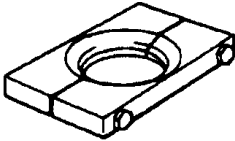


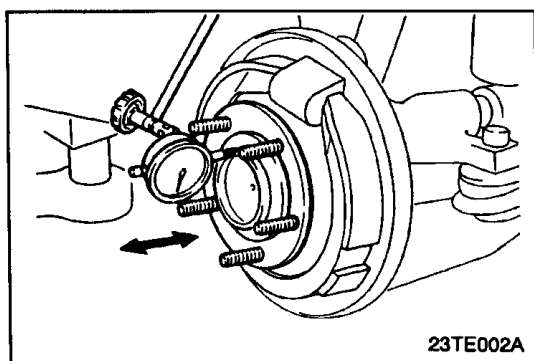
23TE001A

SERVICE SPECIFICATIONS

Items	Limit
Wheel bearing axial play mm	0.05
Wheel bearing rotary-sliding resistance N	18 or less

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991113	Steering linkage puller	Toe control arm ball joint and knuckle removal
	MB991248	Inner shaft remover	ABS rotor removal



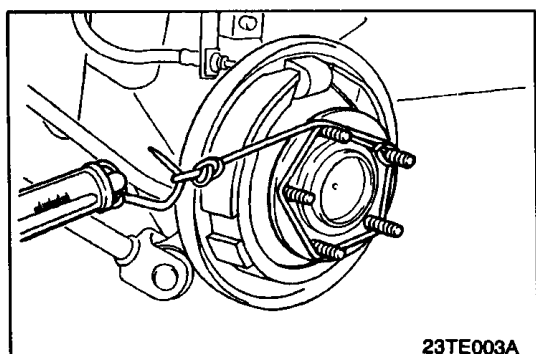
ON-VEHICLE SERVICE

HUB AXIAL PLAY CHECK

1. Remove the calliper assembly and the brake disc.
2. Check the hub axial play
Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is axial play.

Limit: 0.05 mm

3. If the play exceeds the limit value, replace the rear hub assembly.



REAR HUB ROTARY-SLIDING RESISTANCE CHECK

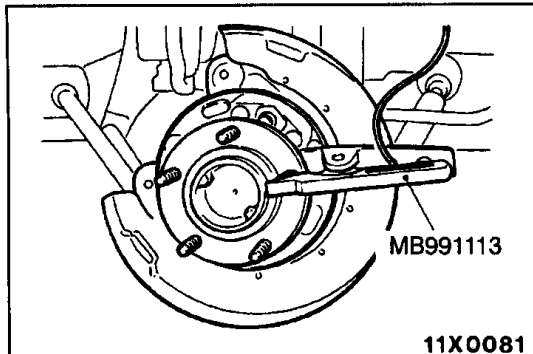
1. Remove the calliper assembly and the brake disc.
2. After turning the hub a few times to seat the bearing, wind a cord around the hub bolt and turn the hub by pulling at a 90° angle with a spring balance. Measure to determine whether or not the rotary-sliding resistance of the rear hub is at the limit value.

Limit: 18 N or less

3. If the rotary-sliding resistance exceeds the limit value, replace the rear hub assembly.

HUB BOLT REPLACEMENT

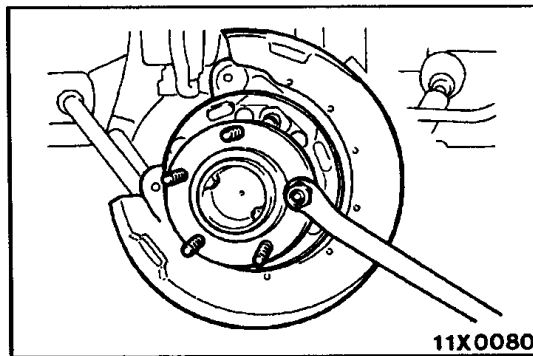
1. Remove the calliper assembly and support it with wire so that it does not fall.
2. Remove the brake disc.
3. Remove the parking brake shoe and lining assembly.



4. Pull the hub bolt out using the special tool.

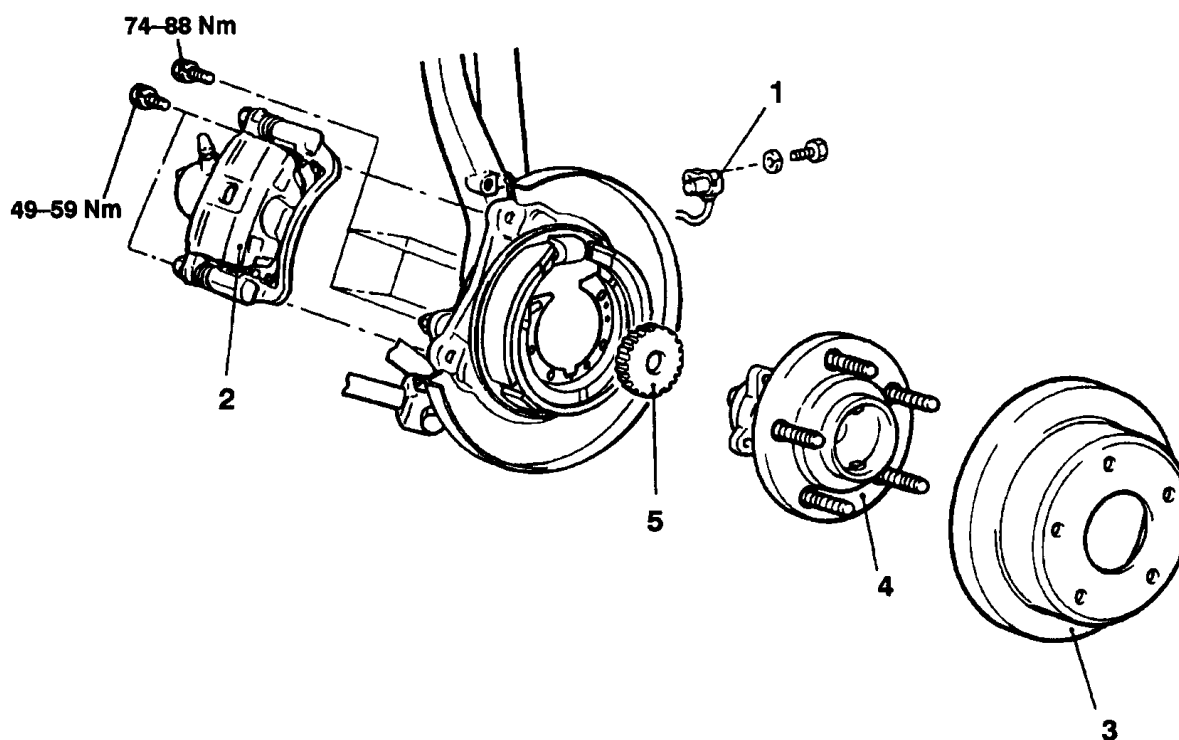
Caution

The special tool should be suspended by a cord to prevent it from coming off.



5. Use the wheel nuts to securely install the new hub bolts, ensuring they are seated correctly.

REAR HUB ASSEMBLY REMOVAL AND INSTALLATION



23TE004A

Removal steps

1. Rear speed sensor (Refer to GROUP 35B – Wheel Speed Sensor.)
2. Calliper assembly
3. Brake disc

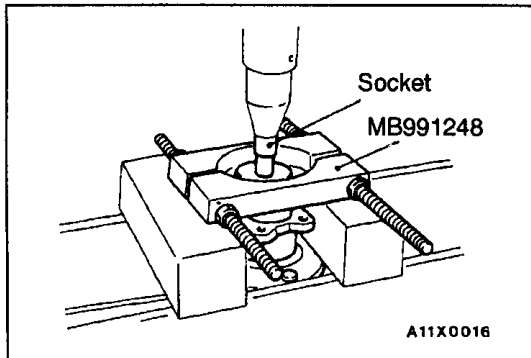
◀B▶ ▶A◀

4. Rear hub assembly
5. Rotor

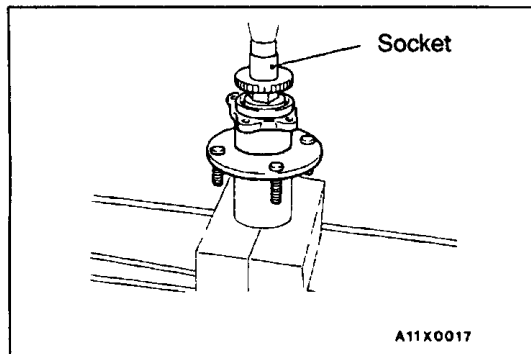
Caution

The rear hub assembly should not be disassembled.

◀A▶

**REMOVAL SERVICE POINTS****◀A▶ CALLIPER ASSEMBLY REMOVAL**

Remove the calliper assembly and suspend it with wire to an adjacent part to ensure no load is placed on the brake hose.

◀B▶ ROTOR REMOVAL**INSTALLATION SERVICE POINT****▶A◀ ROTOR INSTALLATION****INSPECTION**

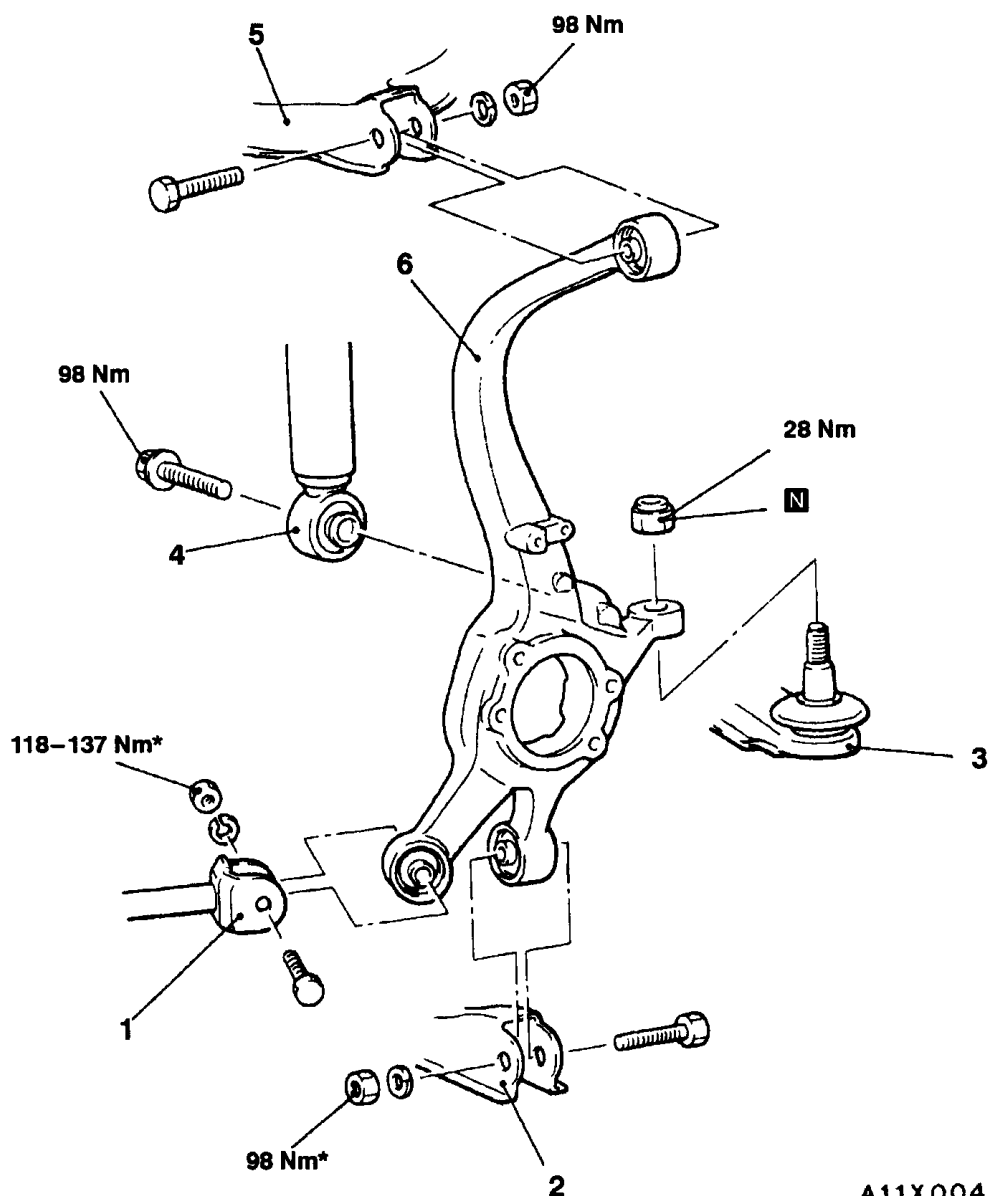
- Check the oil seal for crack or damage.
- Check the rear rotor for chipped teeth.

KNUCKLE

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- (1) Rear Speed sensor Removal and Installation
(Refer to GROUP 35B – Wheel Speed Sensor.)
- (2) Rear Hub Assembly Removal and Installation
<Refer to P. 27-5.>



A11X0042

Removal steps

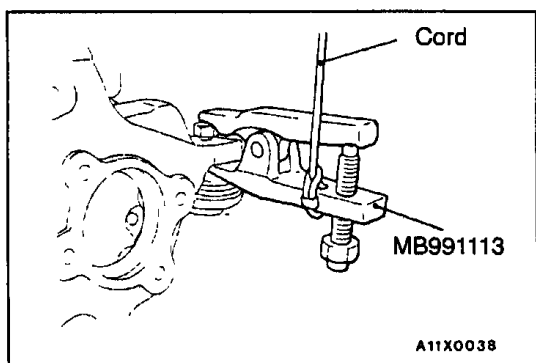
1. Connection for trailing arm
2. Connection for lower arm
3. Connection for toe control arm
4. Connection for shock absorber
5. Connection for upper arm

6. Knuckle

Caution

*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.



**REMOVAL SERVICE POINT****◀A▶ TOE CONTROL ARM REMOVAL****Caution**

1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.

WHEEL AND TYRE

CONTENTS

GENERAL INFORMATION	2	Tyre Inflation Pressure Check	4
SERVICE SPECIFICATIONS	2	Tyre Wear Check	4
TROUBLESHOOTING	3	Wheel Runout Check	4
ON-VEHICLE SERVICE	4	WHEEL AND TYRE	4

GENERAL INFORMATION

Both steel type and aluminium type wheels have been adopted. The type of wheel used depends on the vehicle model.

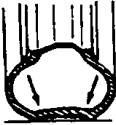
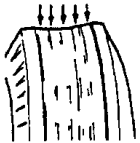
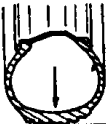
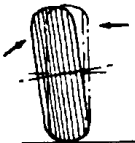
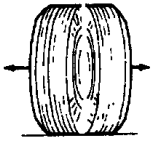
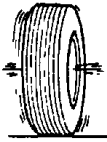
A full size spare tyre with steel wheel has been adopted for all models.

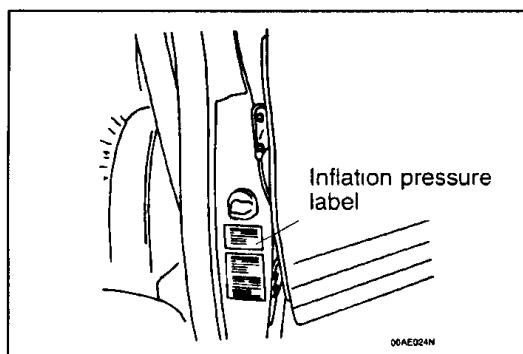
Wheel (except spare wheel)	Type	Steel	Aluminium
	Size	15×6JJ, 15×6J(ISO)	16×6JJ, 16×6J(ISO)
	Amount of wheel offset mm	46	46
	Pitch circle diameter (P.C.D) mm	114.3	114.3
Tyre (except spare tyre)	Size	P205/65R 15	215/60R 16
Spare wheel	Type	Steel type	Steel type
	Size	15×6J(ISO)	16×6JJ
	Amount of wheel offset mm	46	46
	Pitch circle diameter (P.C.D) mm	114.3	114.3
Spare tyre	Size	P205/65R 15	215/60R 16

SERVICE SPECIFICATIONS

Items			Limit
Tread depth of tyre mm			1.6
Wheel runout mm	Radial runout	Steel wheel	1.2 or less
		Aluminium wheel	1.0 or less
	Lateral runout	Steel wheel	1.2 or less
		Aluminium wheel	1.0 or less

TROUBLESHOOTING

Symptom		Probable cause		Remedy
Rapid wear at shoulders	 11X0109	Under-inflation or lack of rotation	 11X0116	Adjust the tyre pressure.
Rapid wear at centre	 11X0110	Over-inflation or lack of rotation	 11X0117	Adjust the tyre pressure.
Cracked treads	 11X0111	Under-inflation		Adjust the tyre pressure.
Wear on one side	 11X0112	Excessive camber	 11X0118	Inspect the camber.
Feathered edge	 11X0113	Incorrect toe-in	 11X0119	Adjust the toe-in.
Bald spots	 11X0114	Unbalanced wheel	 11X0120	Adjust the imbalanced wheels.
Scalloped wear	 11X0115	Lack of rotation of tyres or worn or out-of-alignment suspension		Rotate the tyres, inspect the front suspension alignment.

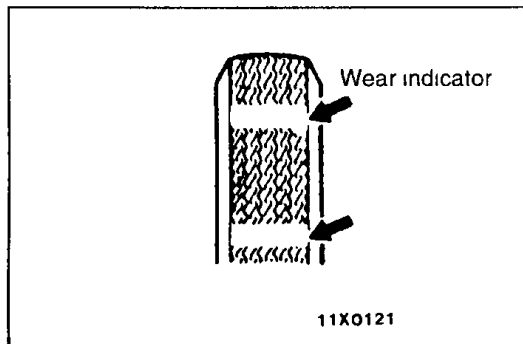


ON-VEHICLE SERVICE

TYRE INFLATION PRESSURE CHECK

NOTE

Refer to the inflation pressure label on the driver's side door.



TYRE WEAR CHECK

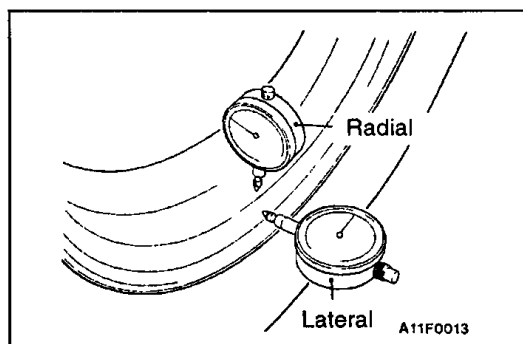
Measure the tread depth of tyres.

Limit: 1.6 mm

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

NOTE

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



WHEEL RUNOUT CHECK

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

Limit:

Radial runout.

Steel wheel; 1.2 mm

Aluminium wheel; 1.0 mm

Lateral runout.

Steel wheel; 1.2 mm

Aluminium wheel; 1.0 mm

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TYRE

WHEEL AND TYRE REMOVAL AND INSTALLATION

Tighten the wheel nut to the specified torque.

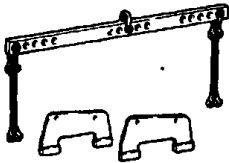
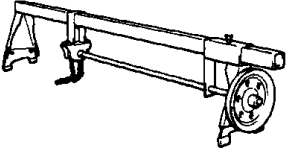
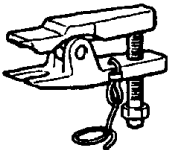
Tightening torque: 90–110 Nm

POWER PLANT MOUNT

CONTENTS

SPECIAL TOOLS	2	ENGINE ROLL STOPPER, CENTRE MEMBER	6
ENGINE MOUNTING	3	CROSSMEMBER	7
TRANSMISSION MOUNTING	5		

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991453	Engine Hanger	To support the engine assembly during removal and installation of the centre member
	GENERAL SERVICE TOOL MZ203827	Engine lifter	To support the engine assembly during removal and installation of the centre member
	MB991113 MB990635 or MB991406	Steering linkage puller	Disconnecting the tie rod end from the knuckle

ENGINE MOUNTING

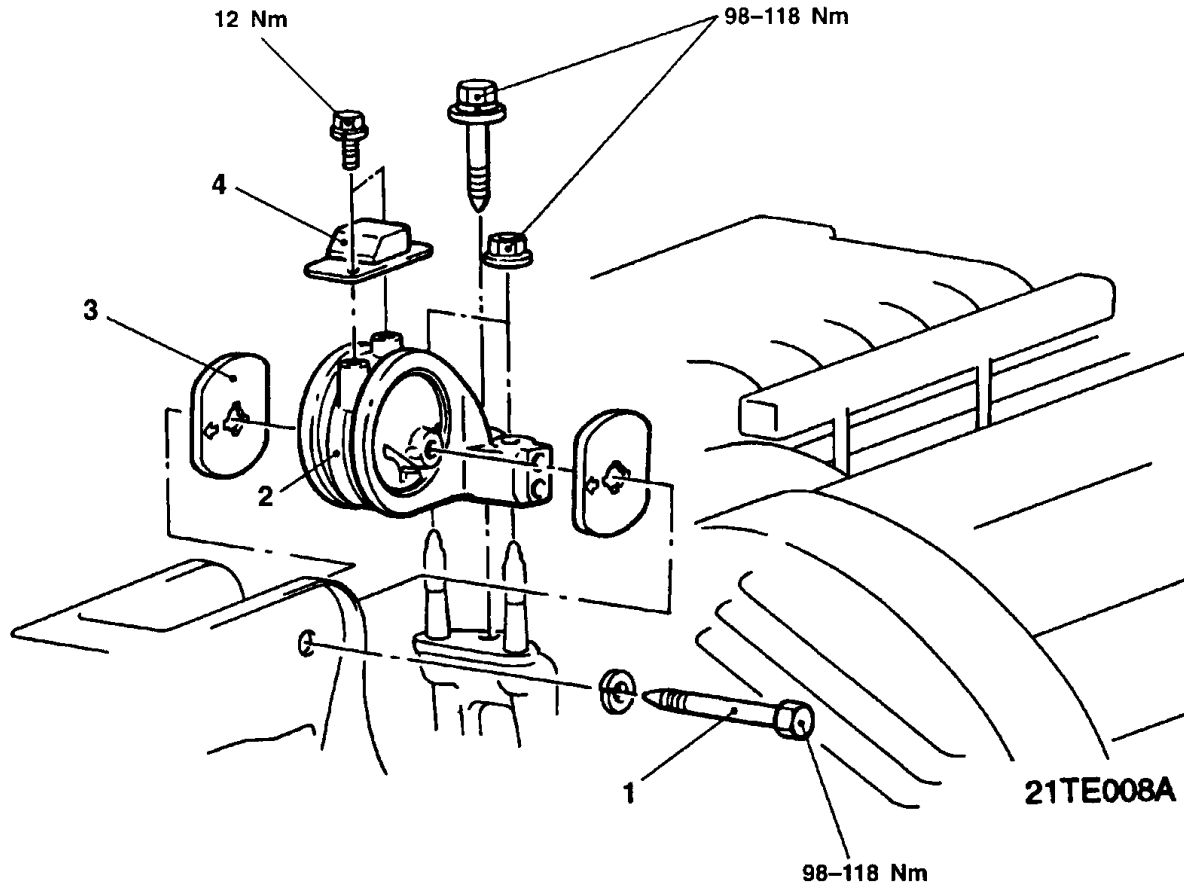
REMOVAL AND INSTALLATION

Pre-removal Operation

- Raise the engine and transmission assembly to a position where the weight is removed from the insulator
- Remove the washer fluid tank

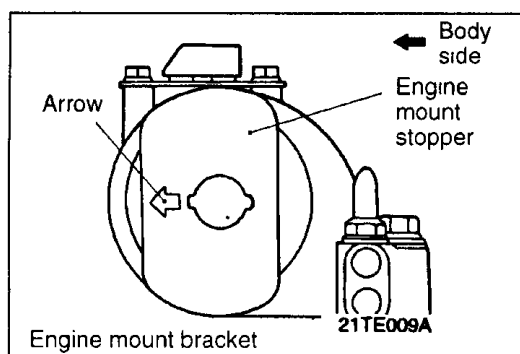
Post-installation Operation

- Lower the engine and transmission assembly to their original position
- Replace the washer fluid tank

**Removal steps**

1. Mounting bolt for engine mount insulator
2. Engine mount bracket
3. Engine mount stopper
4. Dynamic damper



**INSTALLATION SERVICE POINT****►A◄ ENGINE MOUNT STOPPER INSTALLATION**

Fit the engine mount stopper so that the arrow points in the direction shown in the diagram.

INSPECTION

- Check each insulator for cracks or damage.
- Check each bracket for deformations or damage.

TRANSMISSION MOUNTING

REMOVAL AND INSTALLATION

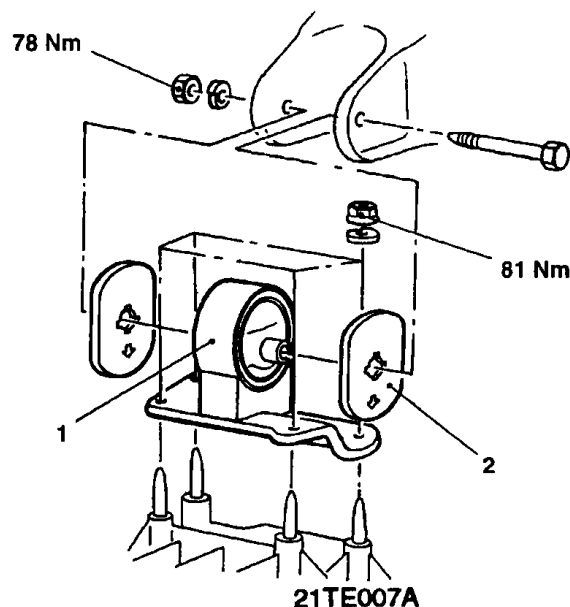
Pre-removal Operation

- Remove the air cleaner assembly (Refer to GROUP 15)
- Remove the battery and battery tray
- Remove the front roll stopper (Refer to P.32-7)
- Remove the washer, transmission and rear roll stopper coupling bolt (Refer to P.32-7)
- Remove the rear roll stopper bracket (Refer to P.32-7)

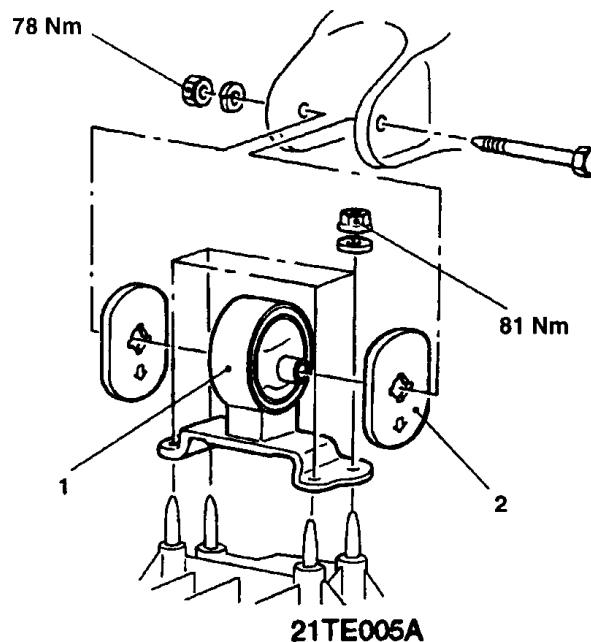
Post-installation Operation

- Replace the rear roll stopper bracket (Refer to P.32-7)
- Replace the transmission and rear roll stopper coupling bolt (Refer to P.32-7)
- Replace the front roll stopper (Refer to P.32-7)
- Replace the battery and battery tray
- Replace the air cleaner assembly (Refer to GROUP 15)

<Automatic Transmission>

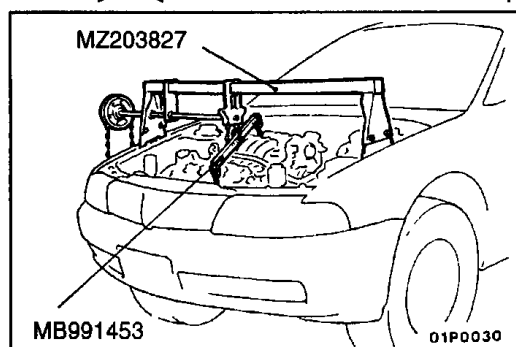


<Manual Transmission>



Removal steps

- ◀A▶ ▶A▶
1. Transmission mount bracket
 2. Transmission mount stopper



REMOVAL SERVICE POINT

◀A▶ TRANSMISSION MOUNT BRACKET REMOVAL

1. Fit the special tool to the vehicle and support the engine and transmission assembly.
2. Remove the bolts and nuts from the transmission mount bracket.
3. Slightly lower the engine and transmission (while still supporting) and remove the transmission mount bracket.

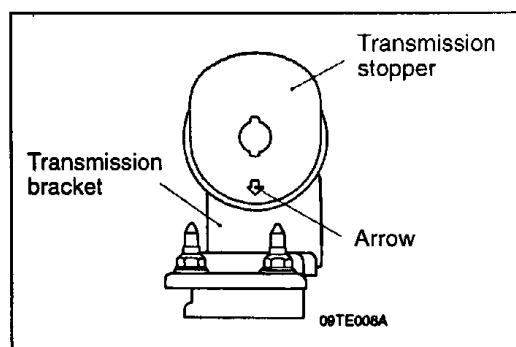
INSTALLATION SERVICE POINT

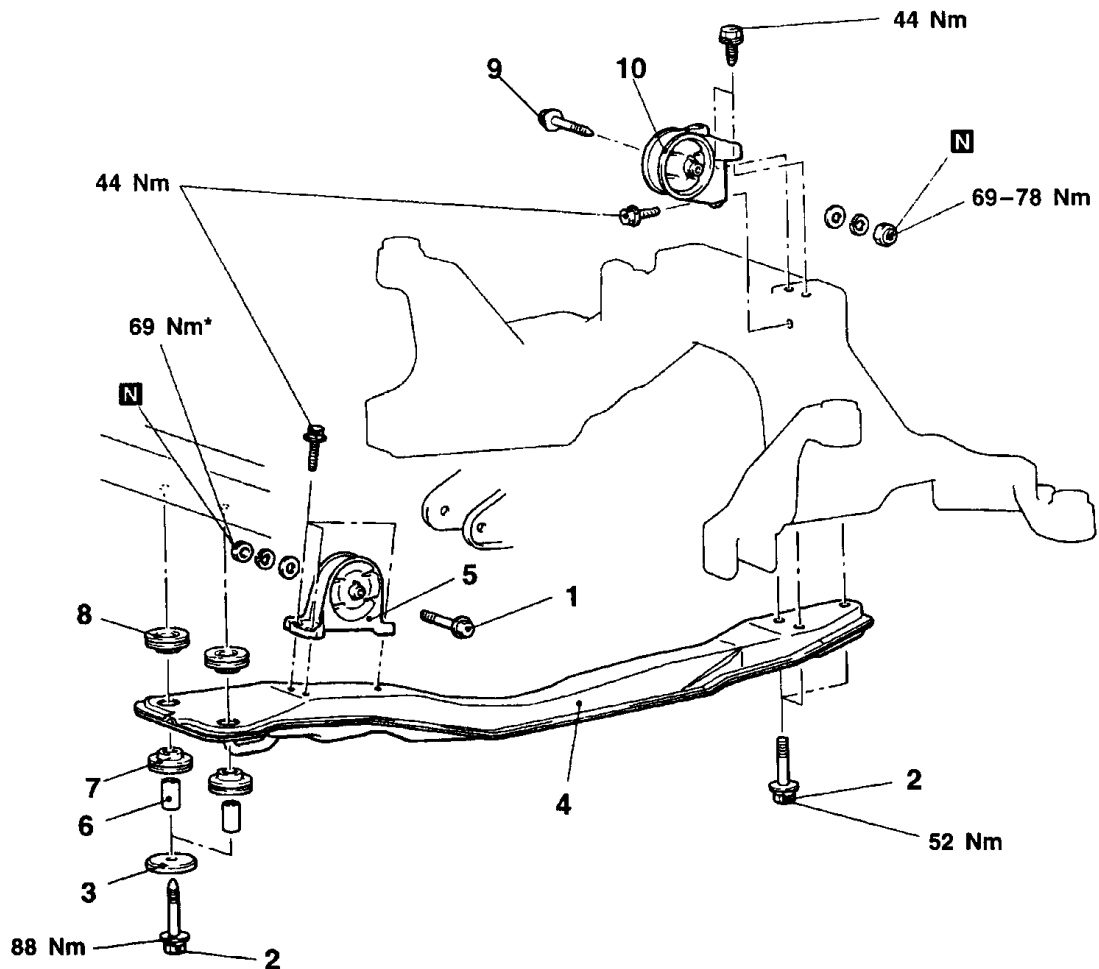
▶A◀ TRANSMISSION MOUNT STOPPER INSTALLATION

Fit the transmission mount stopper so that the arrow points in the direction shown in the diagram.

INSPECTION

- Check each insulator for cracks or damage.
- Check each bracket for deformations or damage.



ENGINE ROLL STOPPER, CENTRE MEMBER**REMOVAL AND INSTALLATION**

01P0056

**Front roll stopper & Centre Member
Removal steps**

1. Coupling bolt for transmission and front roll stopper
2. Mounting bolt for centre member
3. Stopper
4. Centre member
5. Front roll stopper
6. Collar
7. Bush (lower)
8. Bush (upper)

**Rear roll stopper
Removal steps**

9. Coupling bolt between transmission and rear roll stopper
10. Rear roll stopper

Caution

*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.

CROSSMEMBER

REMOVAL AND INSTALLATION

Pre-removal Operation

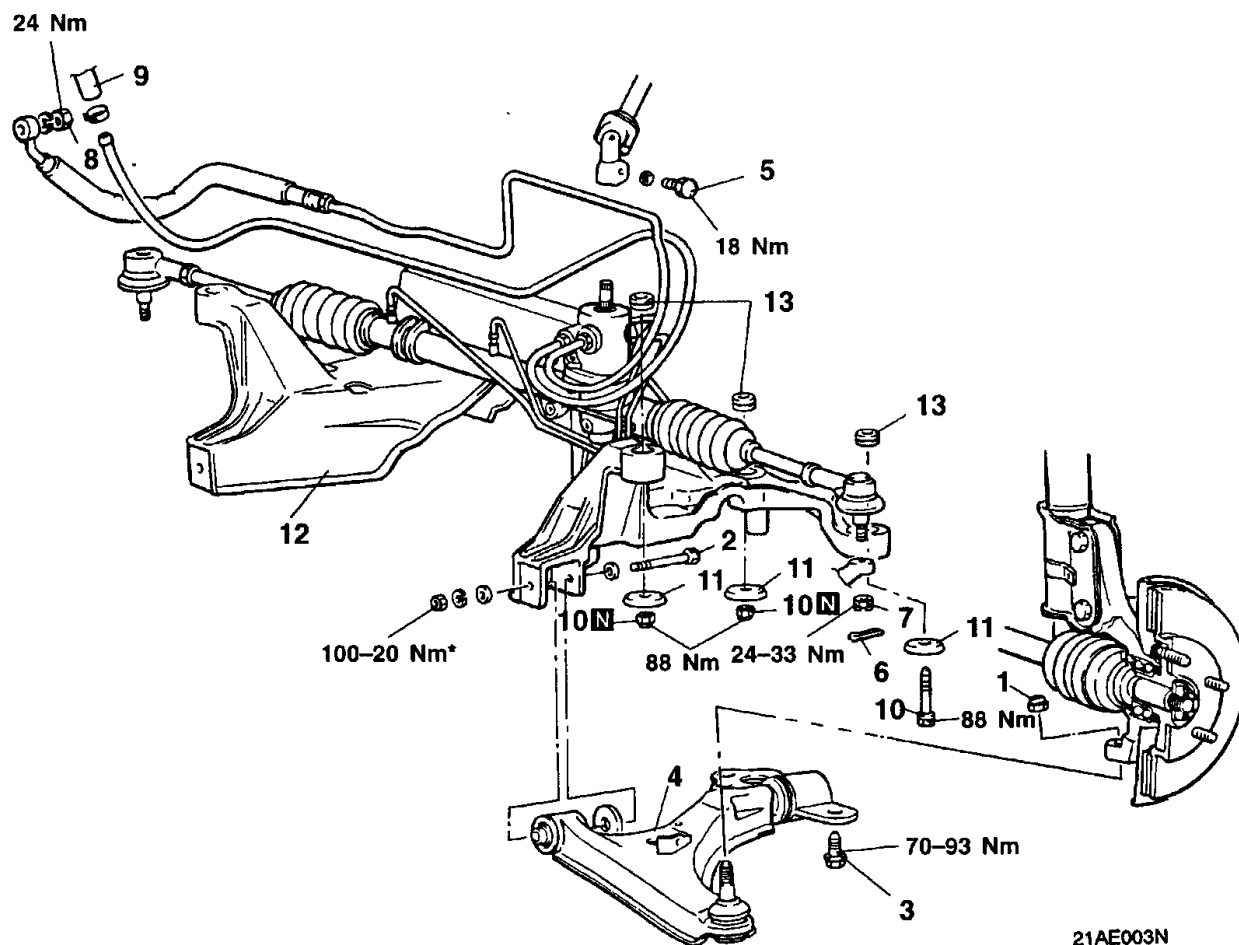
- Drain the power steering fluid (Refer to GROUP 37A)
- Remove the centre member (Refer to P.32-7)
- Disconnect the front exhaust pipe (Refer to GROUP 15)
- Remove the front stabiliser bar (Refer to GROUP 33A)
- Remove the rear roll stopper (Refer to P.32-7)

Post-installation Operation

- Install the rear roll stopper (Refer to P.32-7)
- Install the front stabiliser bar (Refer to GROUP 33A)
- Reconnect the front exhaust pipe (Refer to GROUP 15)
- Install the centre member (Refer to P.32-7)
- Replenish the power steering fluid (Refer to GROUP 37A)

CAUTION: SRS

For vehicles with SRS, before removal of steering rack, ensure you refer to GROUP 52B – SRS Air bag. In addition, place the front wheels in a straight ahead position and remove the ignition key. If you fail to observe this caution, the SRS clockspring may be damaged and could render the SRS system inoperative and could result in serious injury to the driver in the event of an accident.

**Removal steps for crossmember**

1. Self locking nut
2. Lower control arm mounting bolt and nut
3. Lower control arm mounting bolts
4. Lower control arm
5. Coupling bolt for steering gear and joint
6. Split pin
7. Tie rod end coupling bolt
8. Coupling nut for pressure hose and oil pump
9. Return hose coupling

◀B▶

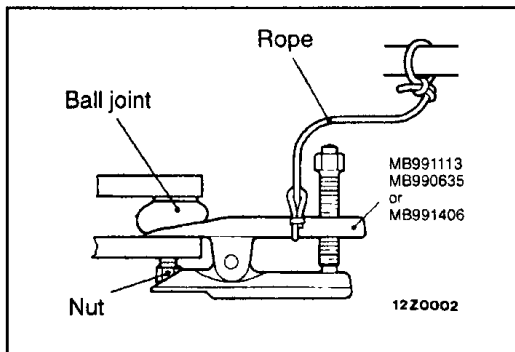
10. Crossmember mounting bolt and nut
11. Lower stopper
 - Steering gear and linkage (Refer to Group 37A)
12. Crossmember
13. Stopper B

Caution

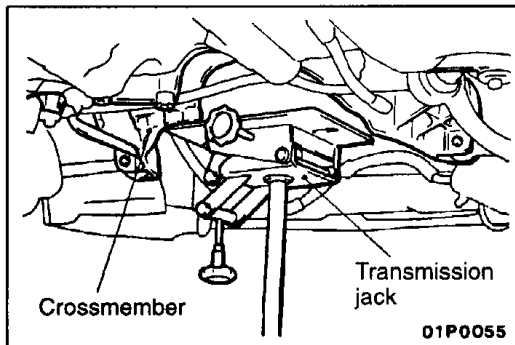
*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.

Caution

Under no circumstances is the front crossmember on this vehicle to be repaired. If it is found to be faulty it must be replaced with a new part.

**REMOVAL SERVICE POINTS****◀A▶ DISCONNECTING THE TIE ROD END AND KNUCKLE****Caution**

1. Using the special tool, loosen the tie rod end mounting nut but do not remove it until the ball joint has been dislodged.
2. Be sure to tie the cord attached to the special tool to a nearby part to prevent the tool from falling.

**◀B▶ DISCONNECTING THE CROSSMEMBER MOUNTING BOLT AND NUT**

1. Support the crossmember with a transmission jack and remove the bolt and nut.

FRONT SUSPENSION

CONTENTS

GENERAL INFORMATION	2	Front Wheel Alignment Check and Adjustment	4
SERVICE SPECIFICATIONS	3	STRUT ASSEMBLY	5
SPECIAL TOOLS	3	LOWER ARM	8
ON-VEHICLE SERVICE	4	STABILISER BAR	10

GENERAL INFORMATION

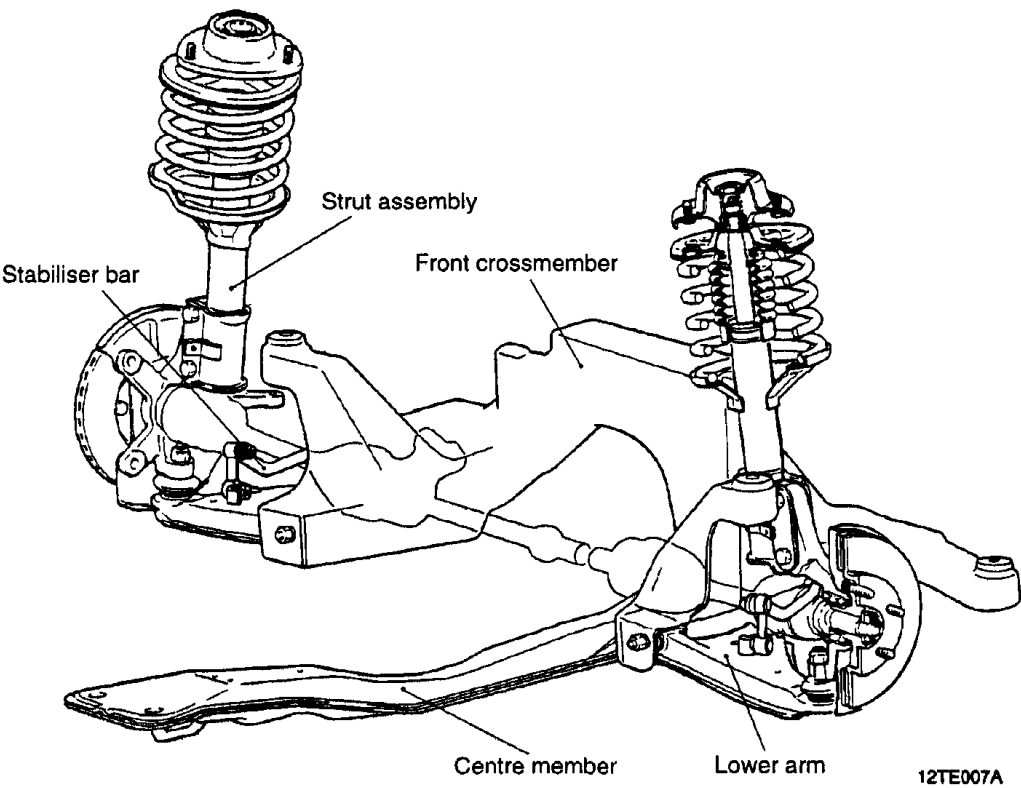
The front suspension is McPherson strut type with coil springs and compression rod. Anti-dive geometry ensures excellent driving stability whilst

negative offset geometry provides good braking stability. The offset coil spring ensures optimum riding comfort.

COIL SPRING

Items		M/T	A/T
Wire diameter x average diameter x free length mm	15" wheels	15.0 x 185 x 389.6	←
	16" wheels	14.5 x 184.5 x 364.6 (LH)	14.9 x 184.9 x 381.3 (LH)
		14.7 x 184.7 x 373.3 (RH)	15.0 x 185 x 389.6 (RH)

CONSTRUCTION DIAGRAM

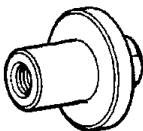
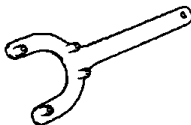
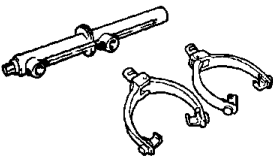
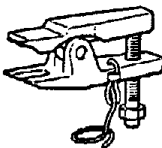


12TE007A

SERVICE SPECIFICATIONS

Items		Specifications
Toe-in mm		0±3
Steering angle	Inner wheel	39°00'±2°
	Outer wheel	30°30'
Camber		0°00'±30' <Left/right deviation within 30'>
Caster		3°00'±30' <Left/right deviation within 30'>
Lower arm ball joint starting torque Nm		10.0–22.0
Stabiliser link ball joint starting torque Nm		1.7–3.2

SPECIAL TOOLS

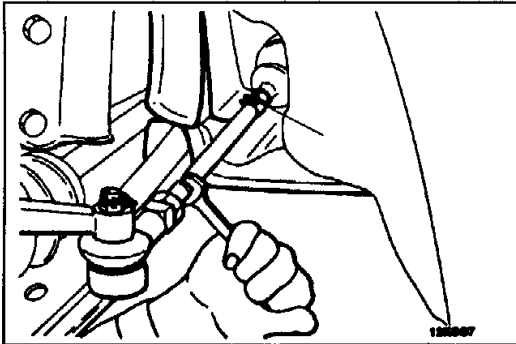
Tool	Number	Name	Use
	MB991004	Wheel alignment gauge attachment	Wheel alignment measurement
	MB991176	Spring seat holder	Strut disassembly and assembly
	MB991237	Spring compressor body	Front coil spring compression
	MB991238	Arm set	
	MB991113	Steering linkage puller	Lower arm ball joint removal
	MB990326	Preload socket	Lower arm ball joint rotation starting torque measurement
	MB990800	Ball joint remover and installer	Dust cover installation

ON-VEHICLE SERVICE

FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT

Measure wheel alignment with alignment equipment on a level surface.

The front suspension, steering system, and wheels should be serviced to normal condition prior to measurement of wheel alignment.



TOE-IN

Standard value: $0 \pm 3 \text{ mm}$

NOTE

1. If the toe-in is not within the standard value, adjust the toe-in by undoing the clips and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).
2. The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

STEERING ANGLE

Standard value:

Inner wheel $39^{\circ}00' \pm 2^{\circ}$

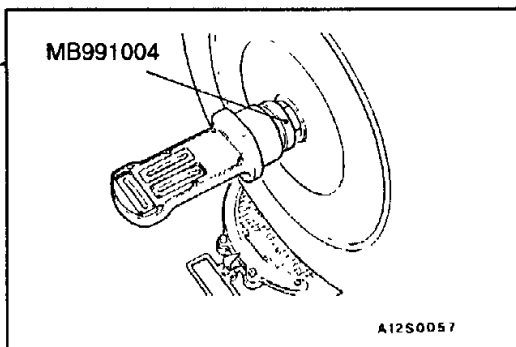
Outer wheel $30^{\circ}30'$

CAMBER AND CASTER

Standard value:

Camber $0^{\circ}00' \pm 30'$ (Left/right deviation within $30'$)

Caster $3^{\circ}00' \pm 30'$ (Left/right deviation within $30'$)



NOTE

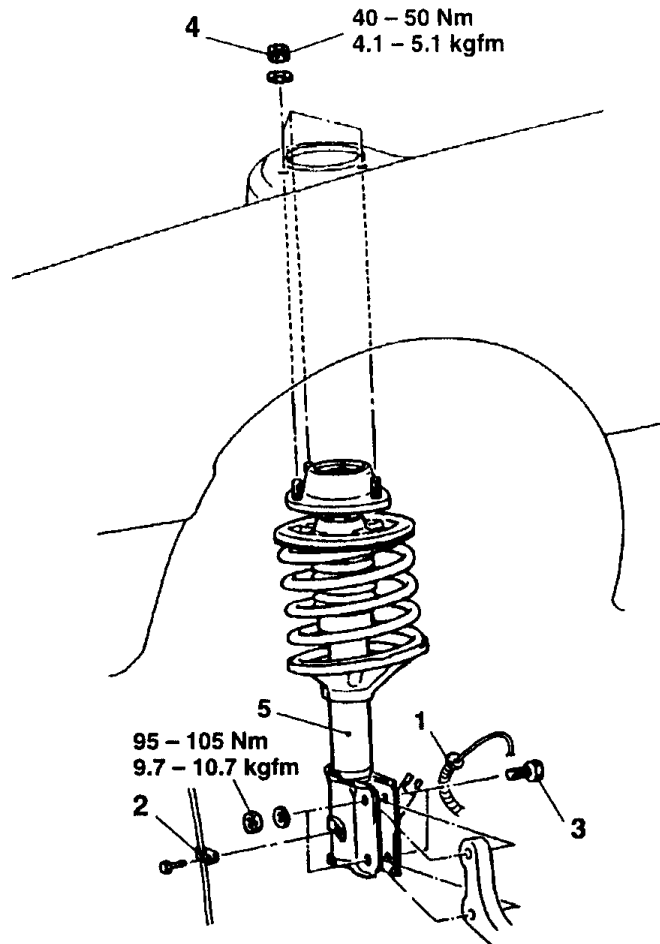
1. Camber and caster are preset at the factory and cannot be adjusted.
2. If camber is not within the standard value, check and replace bent or damaged parts.
3. For vehicles with aluminium type wheels, attach the camber/caster/kingpin gauge to the drive shaft by using the special tool. Tighten the special tool to the same torque [196–255 Nm] as the drive shaft nut.

Caution

Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

STRUT ASSEMBLY**REMOVAL AND INSTALLATION****Post-installation Operation**

- Front Wheel Alignment Adjustment (Refer to P. 33A-4.)



12TE006A

Removal steps

1. Brake hose
2. Front speed sensor wiring clamp
<Vehicles with ABS>

- ◀A▶
3. Strut lower mounting bolt
 4. Strut upper mounting nuts
 5. Strut assembly

REMOVAL SERVICE POINT**◀A▶ BOLT REMOVAL**

1. Suspend the lower arm from the vehicle with wire.
2. Remove the strut and knuckle connection.

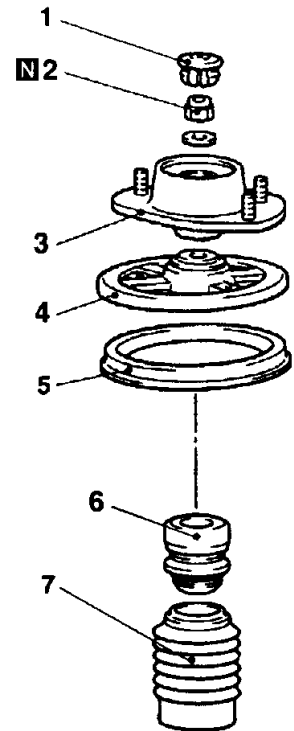
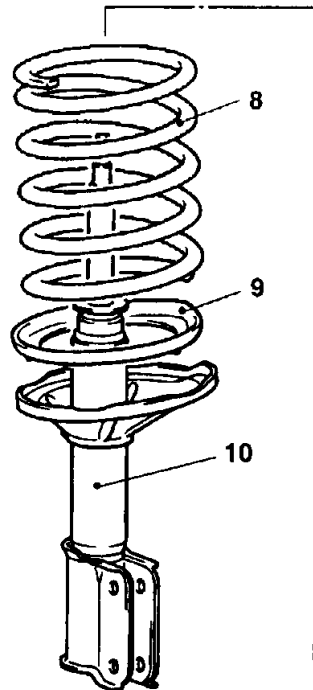
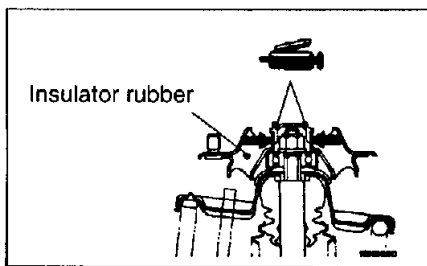
INSPECTION

- Check for oil leaks from the strut assembly.
- Check the strut assembly shock absorber for damage or deformation.

DISASSEMBLY AND REASSEMBLY

Post-installation Operation

- Front Wheel Alignment Adjustment (Refer to P. 33A-4.)

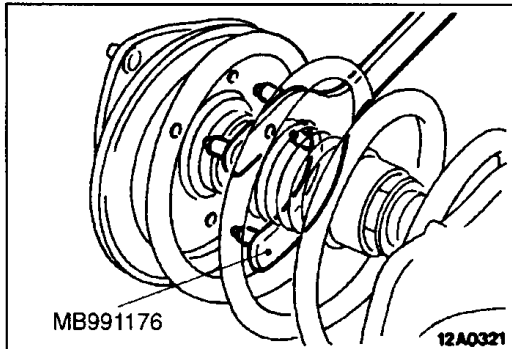


12TE005A
12TE008A

Disassembly steps

1. Dust cover
2. Self locking nut
3. Strut insulator
4. Upper spring seat
5. Upper spring pad

6. Bump rubber
7. Dust cover
8. Coil spring
9. Lower spring pad
10. Strut assembly



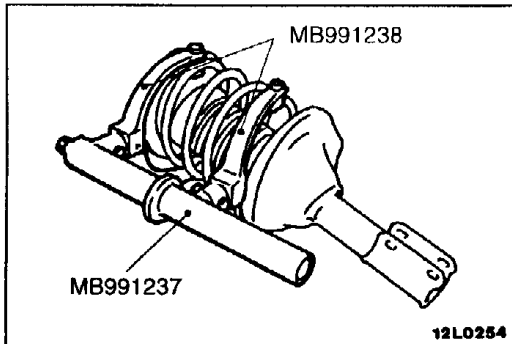
DISASSEMBLY SERVICE POINTS

◀A▶ SELF-LOCKING NUT REMOVAL

1. Whilst holding the spring upper seat with the special tool loosen the self-locking nut.

Caution

The self-locking nut should be loosened only, not removed, and should never be loosened using an air tool.



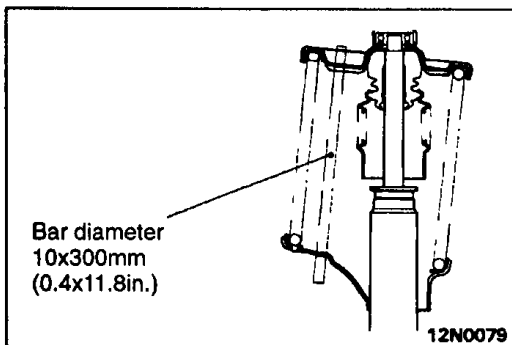
2. Using the special tools, compress the coil spring, and then remove the self-locking nut.

NOTE

1. Extend the special tool to the maximum length to which it is able to be fitted to the spring.
2. Ensure that the special tool is installed evenly.

Caution

Never use an air tool to tighten the special tool.



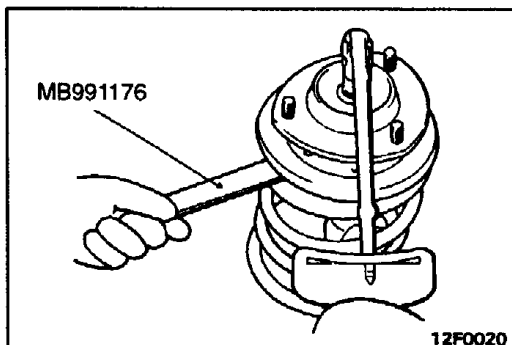
REASSEMBLY SERVICE POINTS

▶A◀ SELF-LOCKING NUT INSTALLATION

1. Line up the holes in the strut assembly spring lower seat with the holes in the spring upper seat.

NOTE

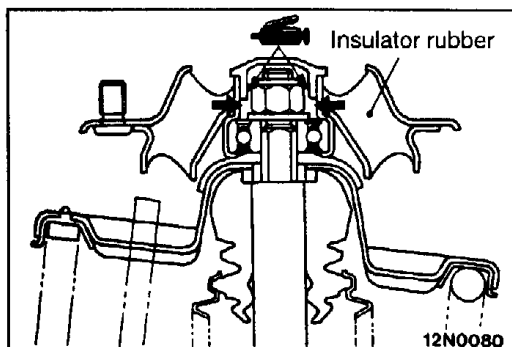
Aligning of the holes in the strut assembly can be easily achieved by using a steel bar 10mm x 300mm.



2. With the coil spring held compressed by the special tools (MB991237 and MB991238), temporarily tighten the self-locking nut.
3. Correctly align both ends of the coil spring with grooves in the spring seat, and then loosen the special tools MB991237 and MB991238.
4. Using the special tool, tighten the strut insulator to the specified torque.

NOTE

Do not use an air tool to tighten the strut insulator.



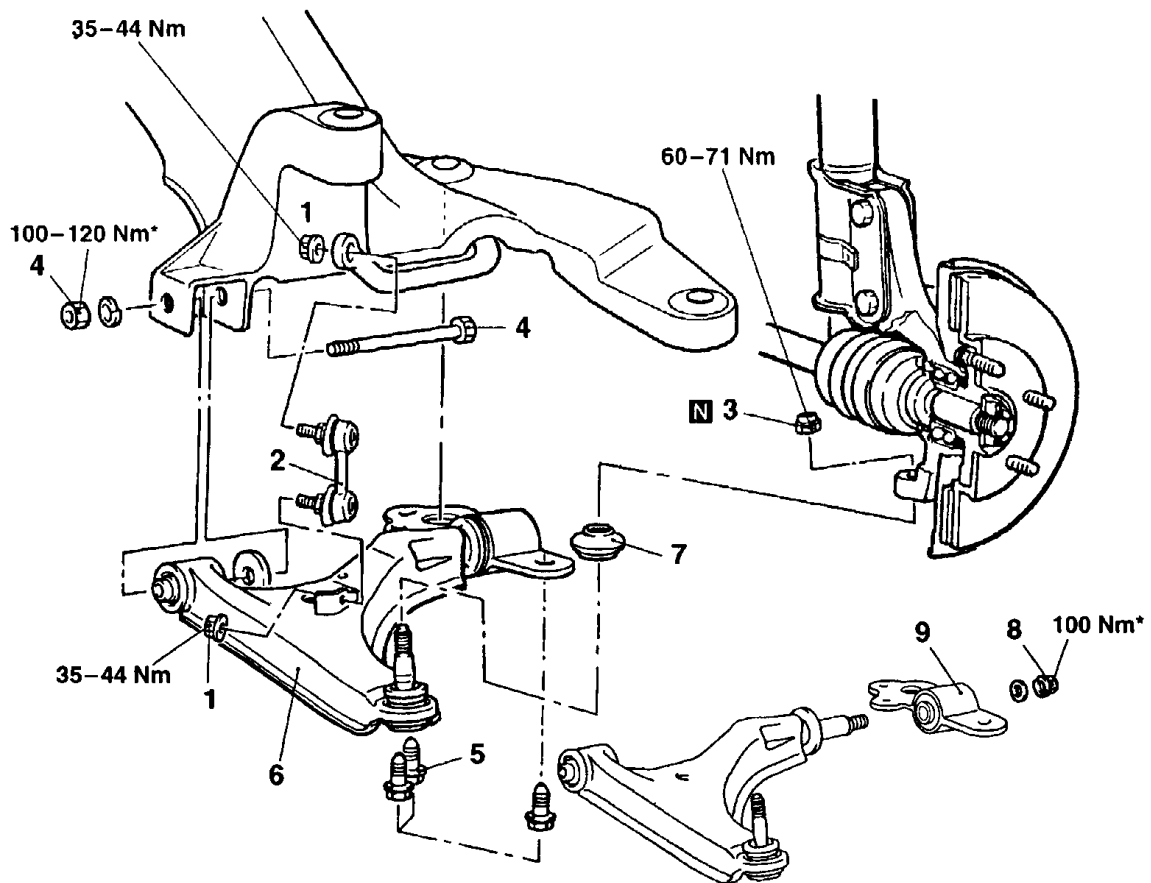
5. Apply multipurpose grease to the bearing part of the strut insulator, and install the insulator cap.

Caution

When applying the grease, take care that grease does not come into contact with the insulator's rubber components as this will cause the rubber to deteriorate.

LOWER ARM

REMOVAL AND INSTALLATION



12TE004A

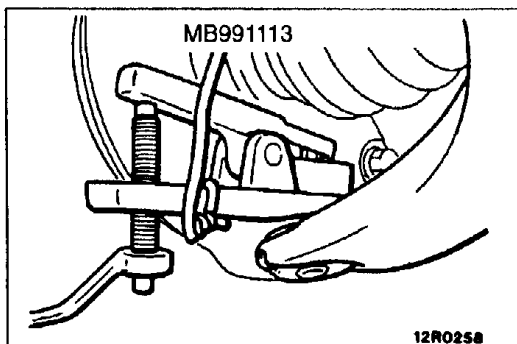
Removal steps

1. Stabiliser link mounting nuts
2. Stabiliser link
3. Self-locking nut
4. Lower arm mounting nut and bolt
5. Bolts
6. Lower arm assembly

- ▶ A ◀
7. Ball joint dust cover
 8. Self-locking nut
 9. Clamp

Caution

*: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.



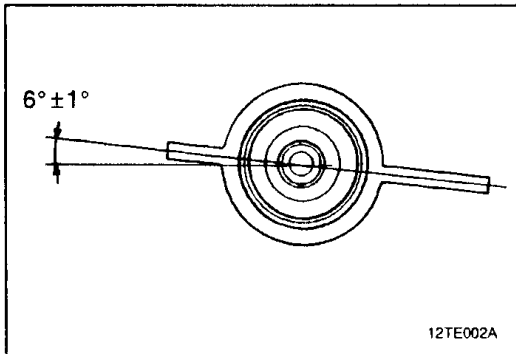
12R0258

REMOVAL SERVICE POINTS

◀ A ▶ DISCONNECTION OF LOWER ARM BALL JOINT AND KNUCKLE

Caution

1. Be sure to tie the cord of the special tool to a nearby part.
2. Loosen the nut but do not remove it.



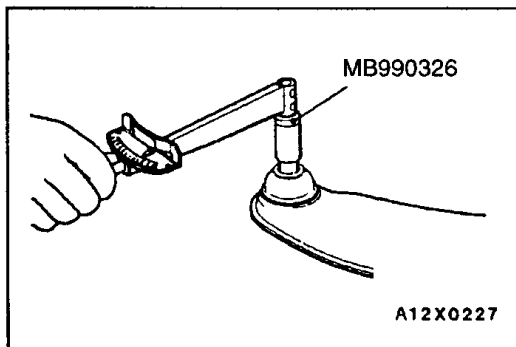
INSTALLATION SERVICE POINTS

►A◄ SELF-LOCKING NUT INSTALLATION

1. After positioning the clamp at the angle indicated, install the self-locking nut.

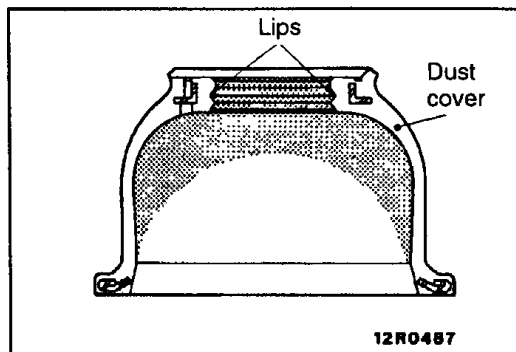
INSPECTION

- Check the bushings for wear and deterioration.
- Check the lower arm for bends or damage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.
- Check clamp for deterioration or damage.



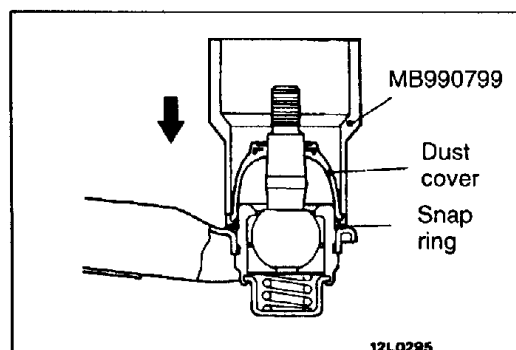
BALL JOINT STARTING TORQUE CHECK

Standard value: 10.0–22.0 Nm



BALL JOINT DUST COVER REPLACEMENT

1. Remove the dust cover.
2. Apply multipurpose grease to the lip and inside of the dust cover.



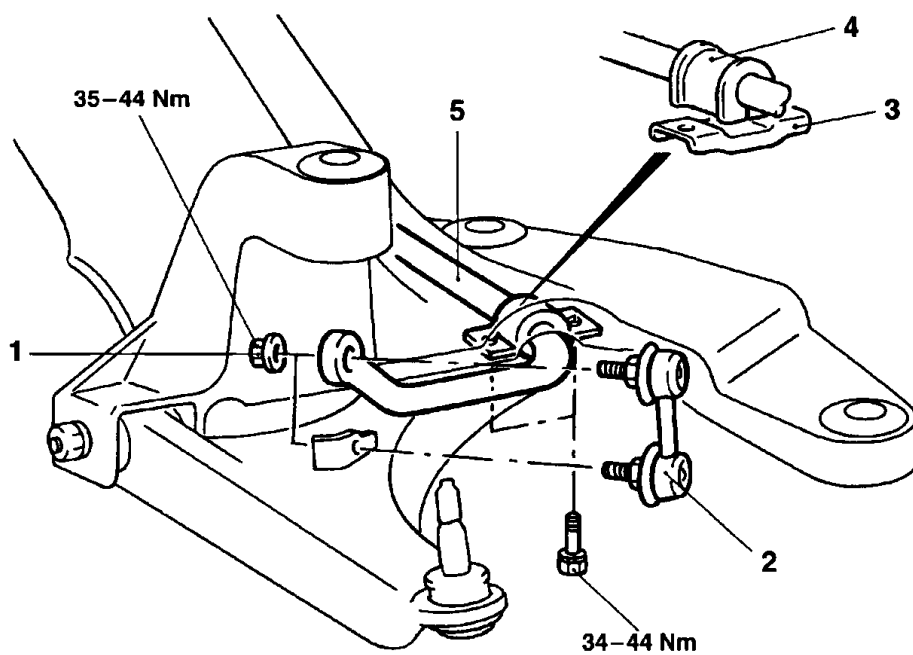
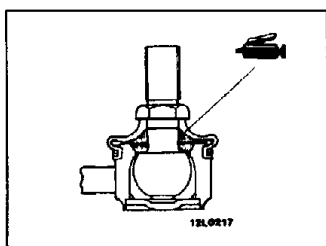
3. Using the special tool, drive in the dust cover to the position shown in the illustration.

STABILISER BAR

REMOVAL AND INSTALLATION

Pre-removal Operations

- Removal of front exhaust pipe (Refer to Group 15 – Exhaust Pipe.)
- Removal of lower arm (Refer to P.33A-8)



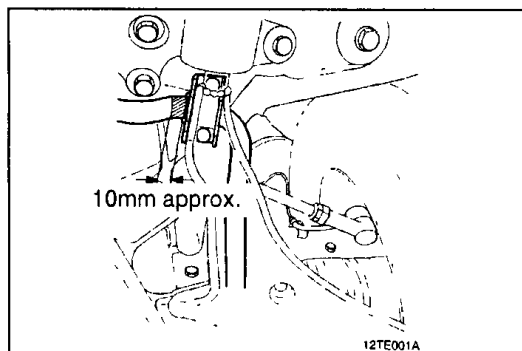
12TE003A
12TE009A

Removal steps

1. Stabiliser link mounting nut
2. Stabiliser link
3. Stabiliser bar bracket

4. Bushing
5. Stabiliser bar





INSTALLATION SERVICE POINT

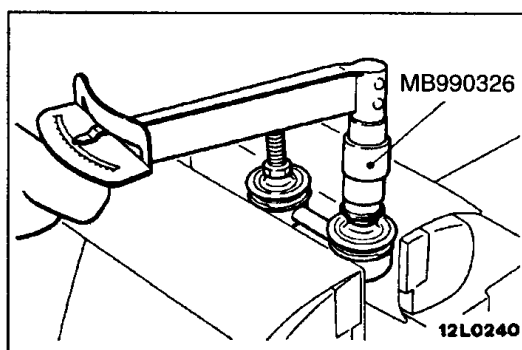
►A◄ STABILISER BAR BRACKET INSTALLATION

Position the stabiliser bar so that the marking on the stabiliser bar and the edge of the bracket becomes the reference value, and then tighten the stabiliser bar bracket mounting bolt.

Reference value: Approx. 10 mm

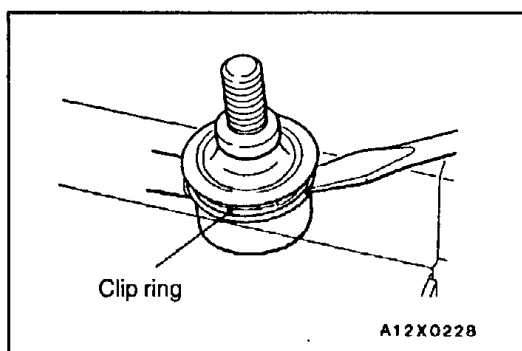
INSPECTION

- Check the bushings for wear and deterioration.
- Check the stabiliser bar for deterioration or damage.
- Check the stabiliser link ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



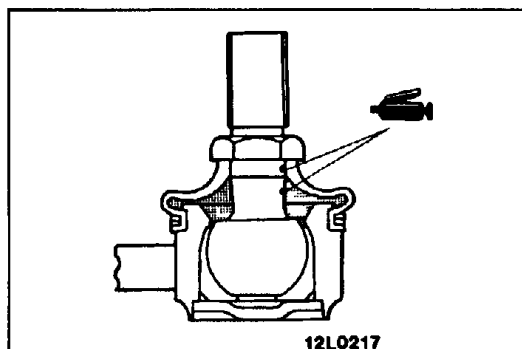
STABILISER LINK BALL JOINT STARTING TORQUE CHECK

Standard value: 1.7–3.2 Nm

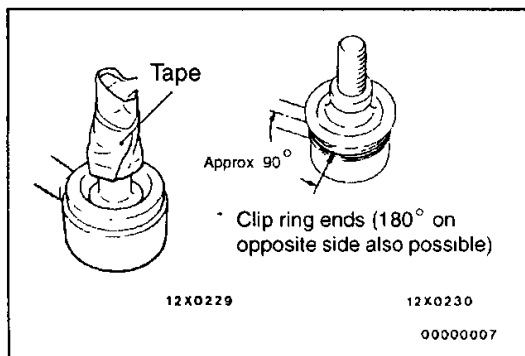


BALL JOINT DUST COVER REPLACEMENT

1. Remove the clip ring and the dust cover.



2. Apply multipurpose grease to the lip and inside of the dust cover.



3. Use vinyl tape on the stabiliser link threads as shown in the illustration, and then install the dust cover to the stabiliser link.
4. Secure the dust cover by the clip ring.

NOTE

When installing the clip ring, align the ends at a 90° angle from the axis of the stabiliser link.

REAR SUSPENSION

CONTENTS

GENERAL INFORMATION	2	REAR SUSPENSION ASSEMBLY	5
SERVICE SPECIFICATIONS	3	UPPER ARM ASSEMBLY	7
SPECIAL TOOLS	3	TRAILING ARM ASSEMBLY	9
ON-VEHICLE SERVICE	4	LOWER ARM AND TOE CONTROL ARM ASSEMBLIES	10
Rear Wheel Alignment Check and Adjustment	4	SHOCK ABSORBER ASSEMBLY	12

GENERAL INFORMATION

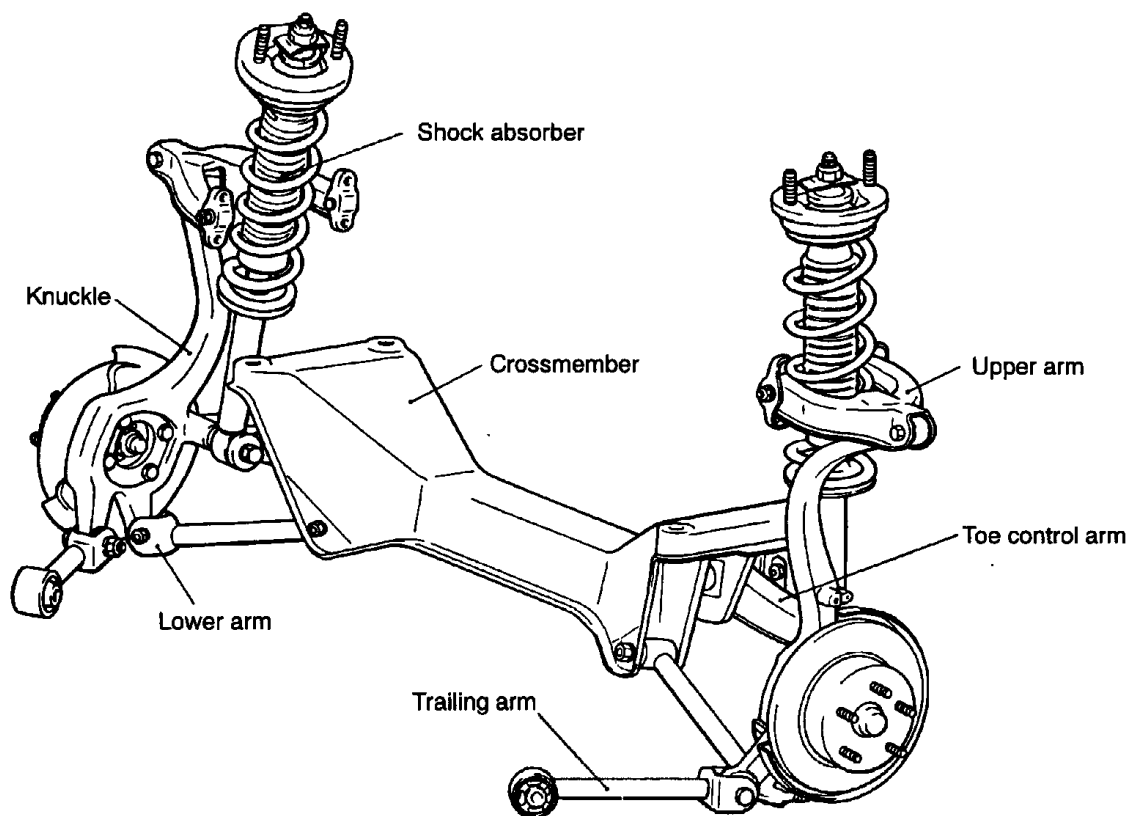
A newly-developed multi-link type of suspension has been adopted for the rear suspension. The layout of each arm and the rigidity balance of each

bushing have been rationalised to provide both excellent steering stability and riding comfort.

COIL SPRING

Wire dia.xO.D.xfree length mm	with 15 in. wheel	11.2x117.4-125.4x428.5
	with 16 in. wheel	11.5x118.0-126.0x400.7

CONSTRUCTION DIAGRAM

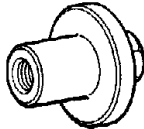
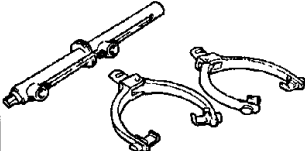
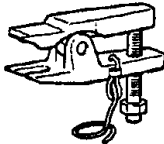


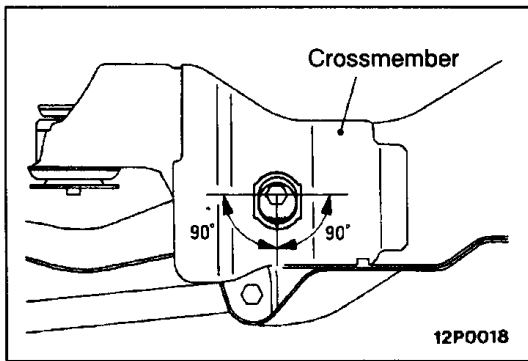
177E001A

SERVICE SPECIFICATIONS

Items	Standard value
Toe-in mm	3 ± 3
Camber – 205/65R15 Tyre – 215/60R16 Tyre	– $40' \pm 30'$ <Left/right deviation within 30'> – $50' \pm 30'$ <Left/right deviation within 30'>
Toe control arm ball joint starting torque Nm	0.1 – 2.65

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991004	Wheel alignment gauge attachment	Wheel alignment measurement
	MB991237 MB991239	Spring compressor body Arm set	Coil spring removal and installation
	MB991113	Steering linkage puller	Ball joint disconnection
	MB990326	Preload socket	Ball joint rotating torque check
	MB990800	Ball joint remover and installer	Dust cover installation



ON-VEHICLE SERVICE

REAR WHEEL ALIGNMENT CHECK AND ADJUSTMENT

Measure the wheel alignment with the vehicle parked on level ground.

The rear suspension and wheels should be serviced to the normal condition prior to measurement of wheel alignment.

TOE-IN

Standard value: 3 ± 3 mm

Adjustment is carried out by turning the toe control arm mounting bolt to the left or right by equal amounts.

L.H.: Turning clockwise toe-out direction

R.H.: Turning clockwise toe-in direction

One Scale mark is equivalent to a change of about 1.7mm.

Caution:

- Adjustments are to be made within the range of $\pm 90^\circ$ from the position indicated in the diagram.

CAMBER

Standard value:

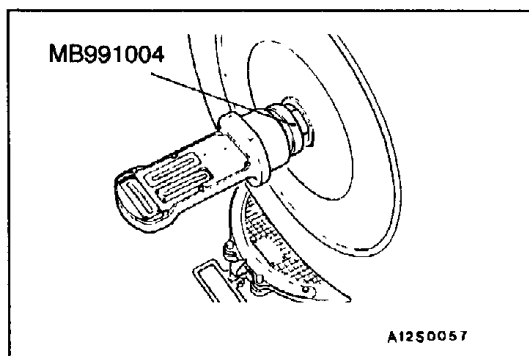
With 205/65R15 Tyres – $40' \pm 30'$

With 215/60R16 Tyres – $50' \pm 30'$

(Left/right deviation within $30'$)

NOTE

1. Camber is preset at the factory and cannot be adjusted.
2. If camber is not within the standard value, check and replace bent or damaged parts.



3. For vehicles with aluminium type wheels, attach the camber/caster/kingpin gauge by using the special tool. Tighten the special tool to the same torque [196–255 Nm] as the drive shaft nut.

Caution

Never subject the wheel bearings to the full vehicle load when the flange nuts are loosened.

REAR SUSPENSION ASSEMBLY

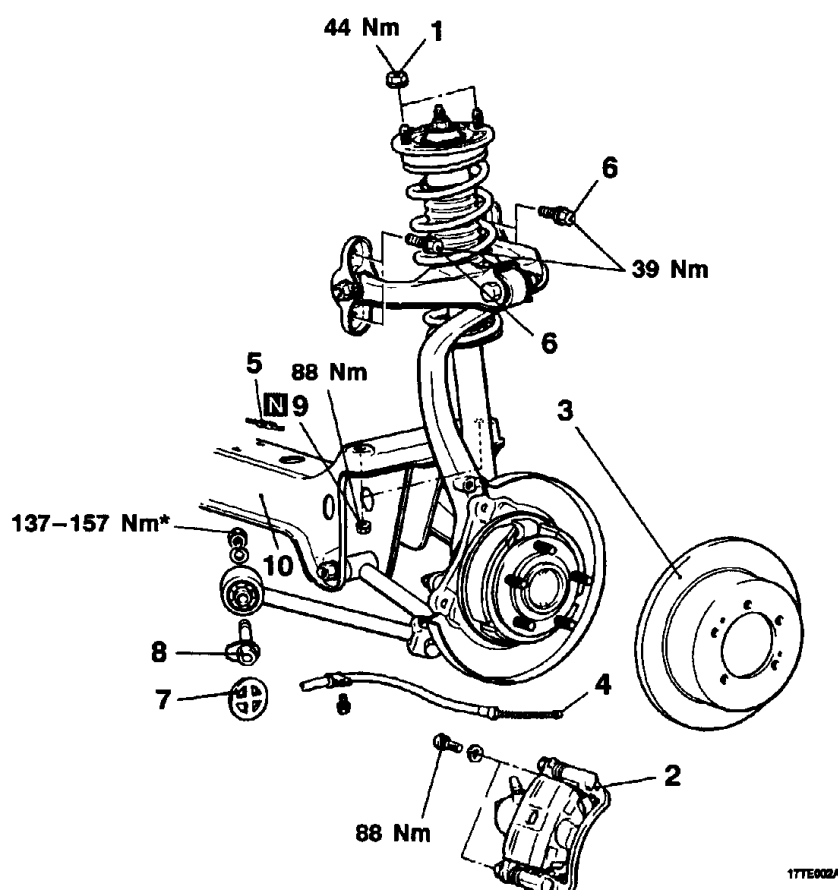
REMOVAL AND INSTALLATION

Pre-removal Operation

- Rear Seat Removal
(Refer to GROUP 52A – Rear Seat.)
- Centre Exhaust Pipe Removal
(Refer to GROUP 15 – Exhaust Pipe.)

Post-installation Operation

- Centre Exhaust Pipe Installation
(Refer to GROUP 15 – Exhaust Pipe.)
- Rear Seat Installation
(Refer to GROUP 52A – Rear Seat.)
- Parking Brake Lever Stroke Check
(Refer to GROUP 36 – On-vehicle Service.)
- Wheel Alignment Check and Adjustment (Refer to P.34-4.)



Removal steps

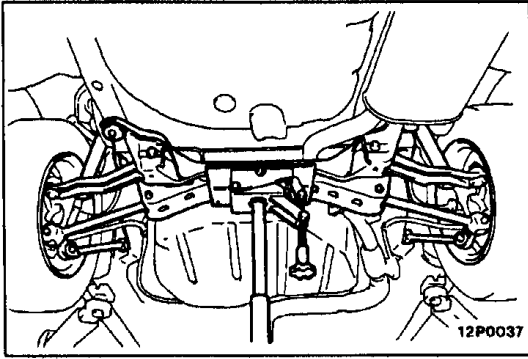
1. Shock absorber mounting nuts
2. Brake calliper assembly
3. Brake disc
4. Parking brake cable end
(Refer to GROUP 36 – Parking brake drum)
5. Rear speed sensor connector
6. Upper arm bracket mounting bolt
7. Grommet



8. Trailing arm mounting bolt
9. Crossmember mounting self-locking nuts
10. Rear suspension assembly

Caution

* Indicates parts which should be temporarily tightened, and then full tightened with the vehicles on the ground in the unladen condition.

**REMOVAL SERVICE POINT****◀A▶ CROSSMEMBER MOUNTING SELF-LOCKING NUT REMOVAL**

After supporting the crossmember with a garage jack or transmission jack respectively, remove the crossmember mounting nuts.

INSPECTION

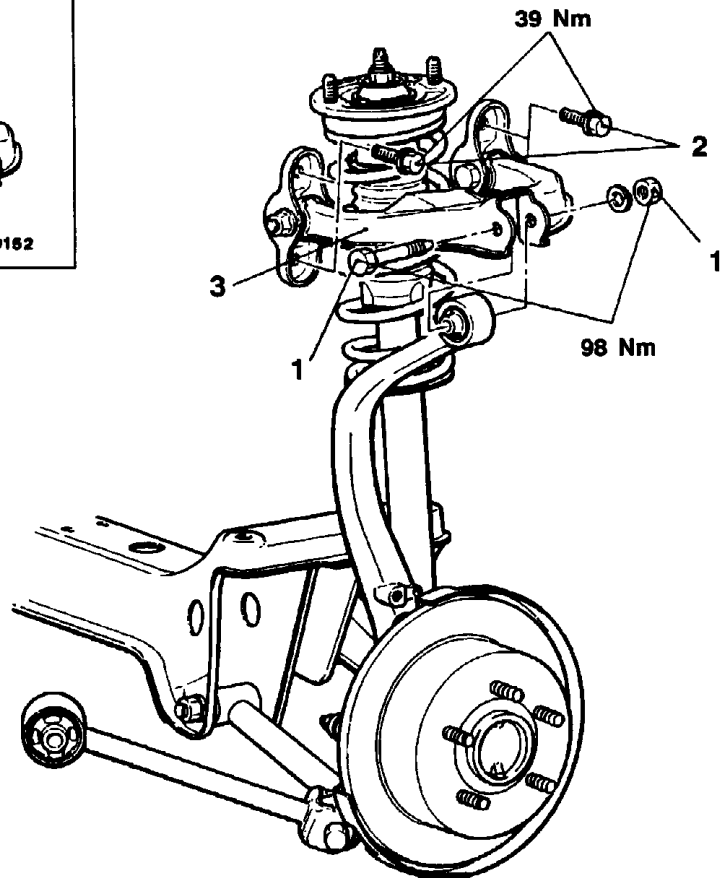
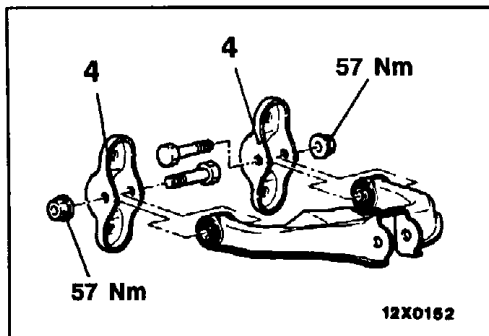
- Check crossmember for cracks or other damage.

UPPER ARM ASSEMBLY

REMOVAL AND INSTALLATION

Post-Installation Operation

- Wheel Alignment Check and Adjustment (Refer to P.34-4.)



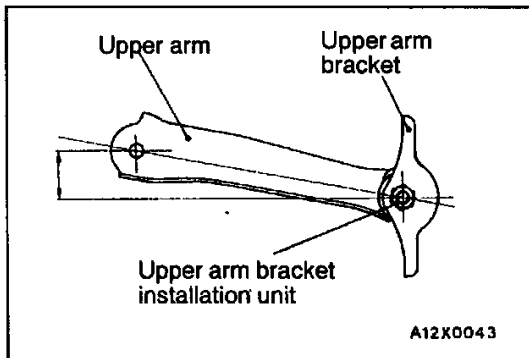
17TE002A

17TE007A

Removal steps

1. Upper arm and knuckle connecting bolt and nut
2. Upper arm assembly mounting bolts

3. Upper arm assembly
4. Upper arm bracket

**INSTALLATION SERVICE POINT****►A◄ UPPER ARM BRACKET INSTALLATION**

Tighten the upper arm bracket installation nut and bolt so that the dimension shown in the illustration is at the standard value.

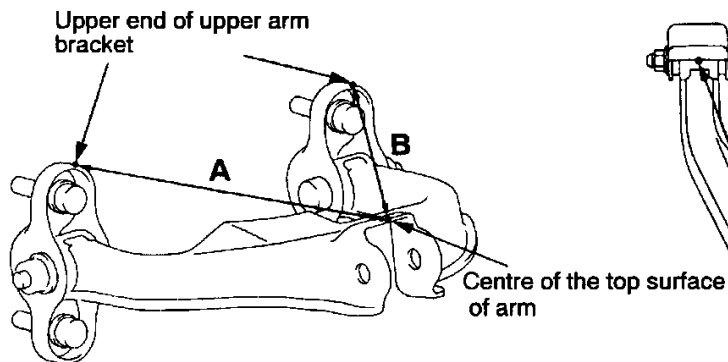
Standard value: 37.2 ± 2 mm

NOTE

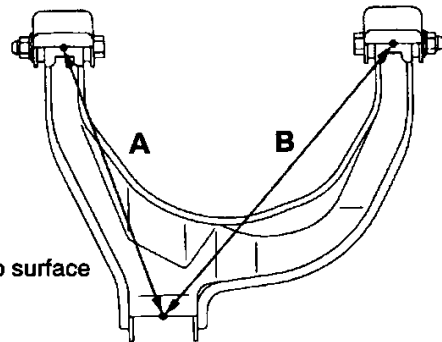
If the upper arm bracket is installed with the former-mentioned standard value, the reference dimension is determined as follows;

A: 213.5 mm

B: 269.2 mm



12X0204



12X0201

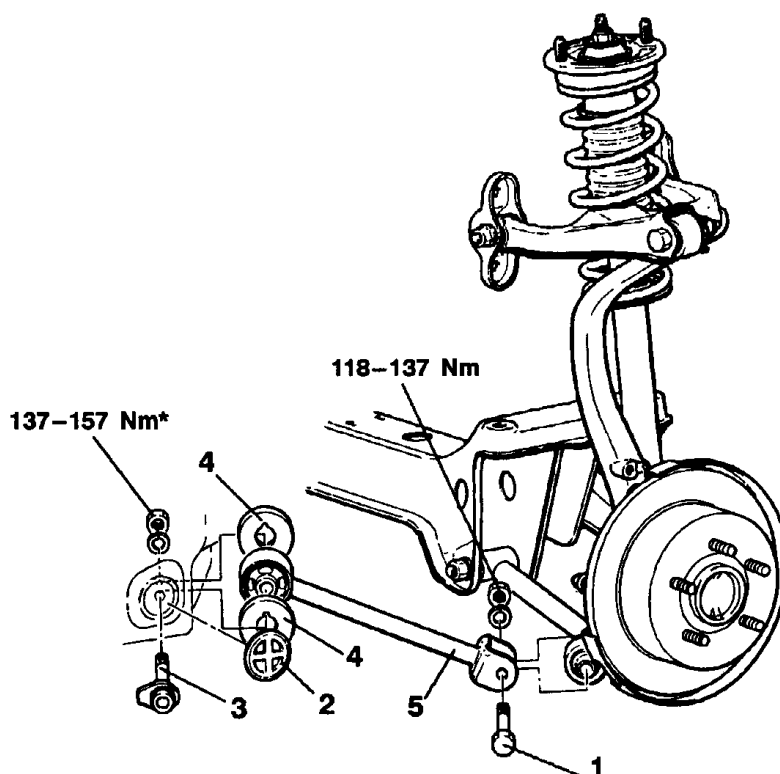
00000004

INSPECTION

- Check the bushings for wear and deterioration.
- Check the upper arm for bends or damage.
- Check all bolts for condition and straightness.

REMOVAL AND INSTALLATION

- **Wheel Alignment Check and Adjustment**
(Refer to P.34-4.)



17TE004A

1. Connection for knuckle and trailing arm assembly
2. Grommet
3. Trailing arm assembly mounting bolt
4. Stopper
5. Trailing arm assembly

* Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.

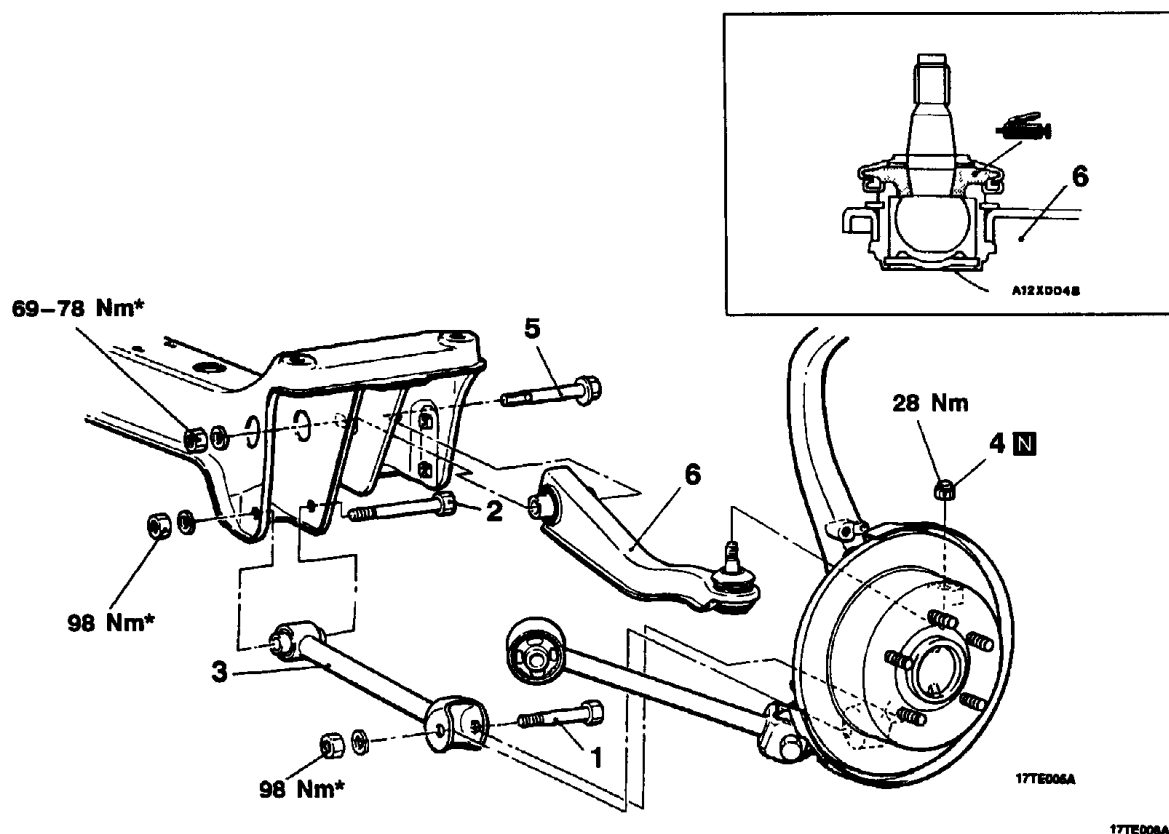
- Check the bushings for wear and deterioration.
- Check the trailing arm for bends or damage.

LOWER ARM AND TOE CONTROL ARM ASSEMBLIES

REMOVAL AND INSTALLATION

Post-Installation Operation

- Wheel Alignment Check and Adjustment
(Refer to P.34-4.)



Lower arm assembly removal steps

1. Lower arm assembly and knuckle connection
2. Lower arm assembly mounting bolt
3. Lower arm assembly

◀A▶

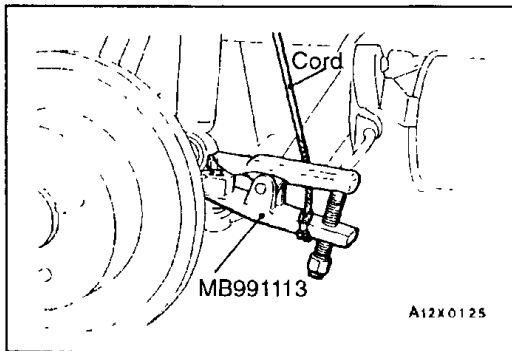
◀B▶

Toe control arm assembly removal steps

4. Connection for toe control arm ball joint joint and knuckle
5. Toe control arm assembly mounting bolt
6. Toe control arm assembly

Caution

* Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.

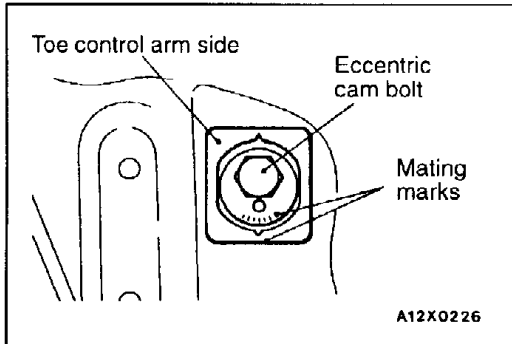


REMOVAL SERVICE POINTS

◀A▶ DISCONNECTION OF TOE CONTROL ARM BALL JOINT AND KNUCKLE

Caution

1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it.

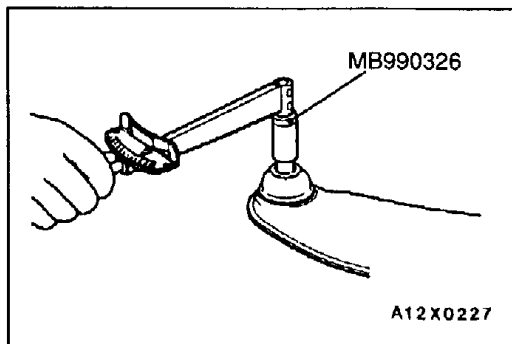


◀B▶ TOE CONTROL ARM ASSEMBLY MOUNTING BOLT REMOVAL

Make mating marks on the toe control arm and eccentric cam bolt before removing the bolt.

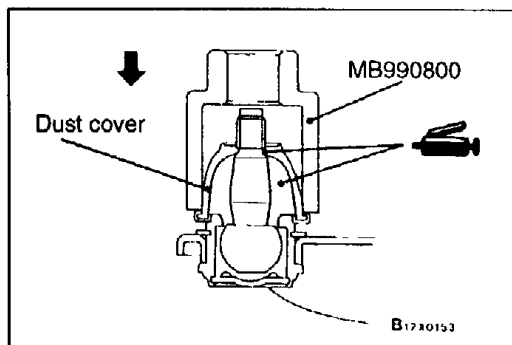
INSPECTION

- Check the bushings for wear and deterioration.
- Check the lower arm or toe control arm for bends or damage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



BALL JOINT STARTING TORQUE CHECK

Standard value: 0.1–2.65 Nm



BALL JOINT DUST COVER REPLACEMENT

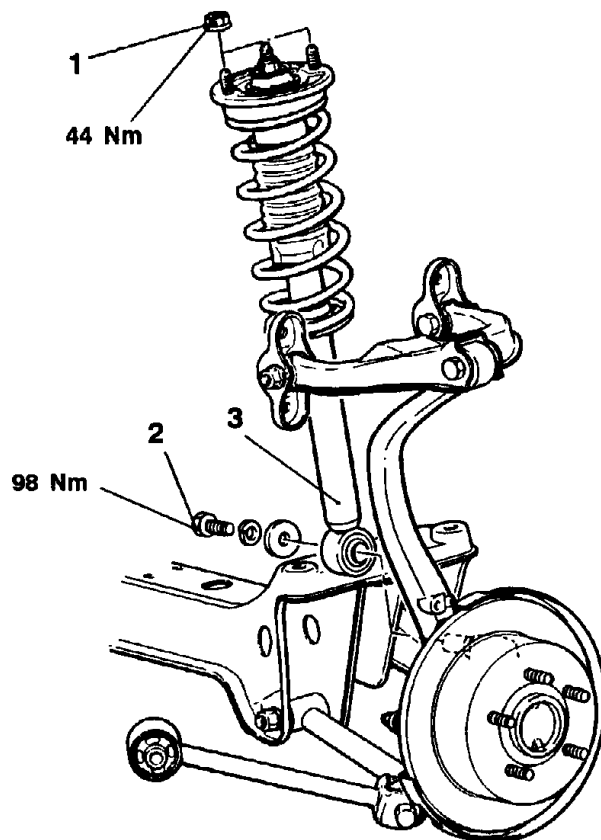
1. Remove the dust cover.
2. Apply multipurpose grease to the lip and inside of the dust cover.
3. Drive in the dust cover with special tool until it is fully seated.

SHOCK ABSORBER ASSEMBLY

REMOVAL AND INSTALLATION

**Pre-removal and Post-installation
Operation**

- Rear Seat Removal and Installation (Refer to GROUP 52A – Rear Seat.)



17TE006A

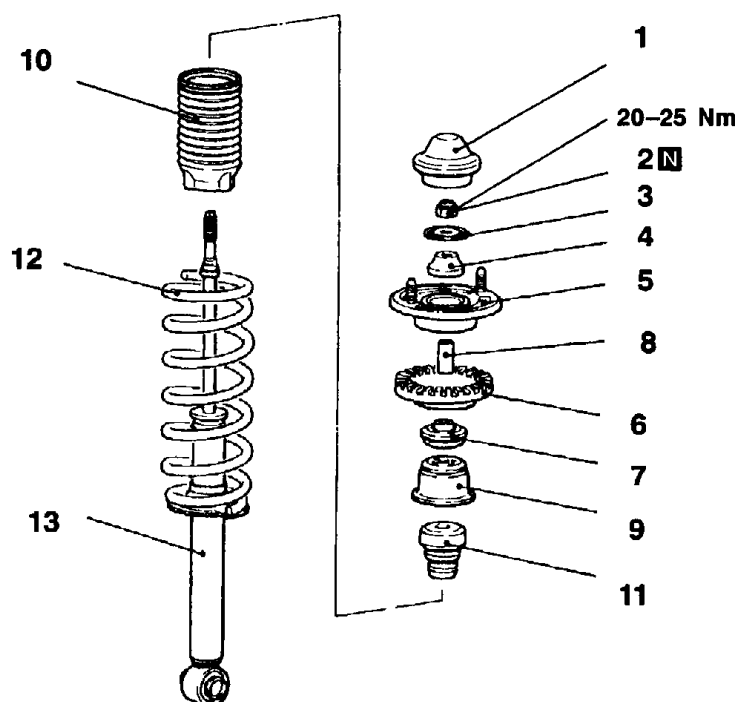
Removal steps

1. Flange nut
2. Bolt
3. Shock absorber

INSPECTION

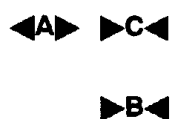
- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage or abnormal noise.

DISASSEMBLY AND REASSEMBLY



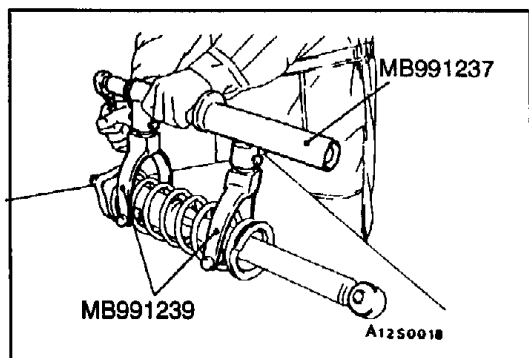
A12x0083

Disassembly steps



1. Cap
2. Self-locking nut
3. Washer
4. Upper bushing A
5. Bracket
6. Spring pad
7. Upper bushing B

8. Collar
9. Cup
10. Dust cover
11. Bump rubber
12. Coil spring
13. Shock absorber assembly



DISASSEMBLY SERVICE POINT

SELF LOCKING NUT REMOVAL

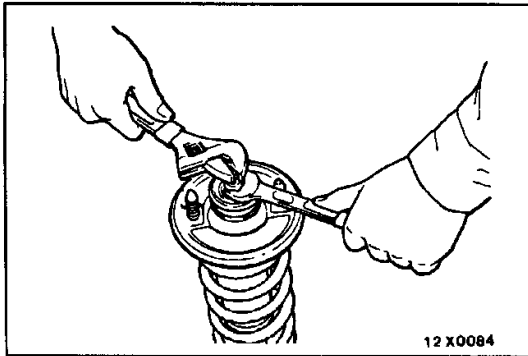
1. Compress the coil spring using the special tools.

NOTE

Install the special tools evenly, and so that the maximum length will be attained within the installation range.

Caution

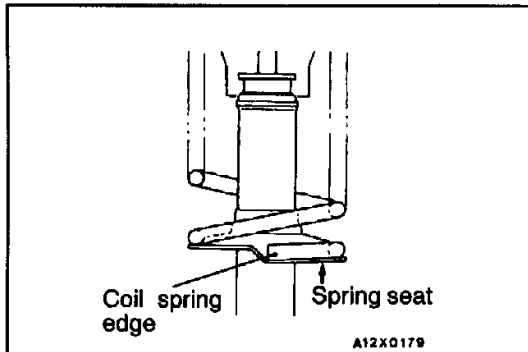
An air tool should not be used for the tightening of the special tool bolt.



2. While holding the piston rod, remove the self-locking nut.

Caution

An air tool should not be used for the removal of the special tool bolt.



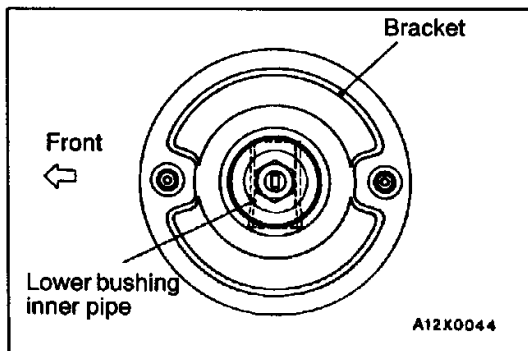
REASSEMBLY SERVICE POINTS

►A◄ COIL SPRING INSTALLATION

1. Use the special tools (MB991237 and MB991239) to compress the coil spring and install it to the shock absorber seat.
2. Align the edge of the coil spring to the stepped part of the shock absorber spring seat.

Caution

An air tool should not be used for the tightening of the special tool bolt.



►B◄ BRACKET INSTALLATION

Install the bracket as shown in the illustration.

►C◄ SELF-LOCKING NUT INSTALLATION

1. Temporarily tighten the self-locking nut.
2. Remove the special tools (MB991237, MB991239), and tighten the self-locking nut to the specified torque.

Caution

Do not use an air tool.

SERVICE BRAKES

CONTENTS

BASIC BRAKE SYSTEM	35A
ANTI-SKID BRAKING SYSTEM (ABS)	35B

BASIC BRAKE SYSTEM

CONTENTS

GENERAL INFORMATION	2	Front Disc Brake Rotor Check	11
SERVICE SPECIFICATIONS	3	Front Brake Disc Run-out Check	11
LUBRICANTS	3	Front Brake Disc Run-out Correction	12
SEALANT	4	Front Brake Disc Thickness Check	12
SPECIAL TOOLS	4	Rear Disc Brake Pad Check and Replacement	13
ON-VEHICLE SERVICE	5	Rear Brake Disc Thickness Check	14
Brake Pedal Check and Adjustment	5	Rear Brake Disc Run-out Check	14
Stop Lamp Switch Check	6	Rear Brake Disc Run-out Correction	15
Brake Booster Operating Test	6	BRAKE PEDAL	16
Check Valve Operation Check	7	MASTER CYLINDER AND BRAKE BOOSTER	17
Proportioning Valve Function Test	7	FRONT DISC BRAKE	22
Brake Fluid Level Sensor Check	8	REAR DISC BRAKE	27
Bleeding	8	PROPORTIONING VALVE	31
Front Disc Brake Pad Check and Replacement	9		

GENERAL INFORMATION

The brake system has high reliability and durability which maintains excellent braking performance.

The main features are as follows.

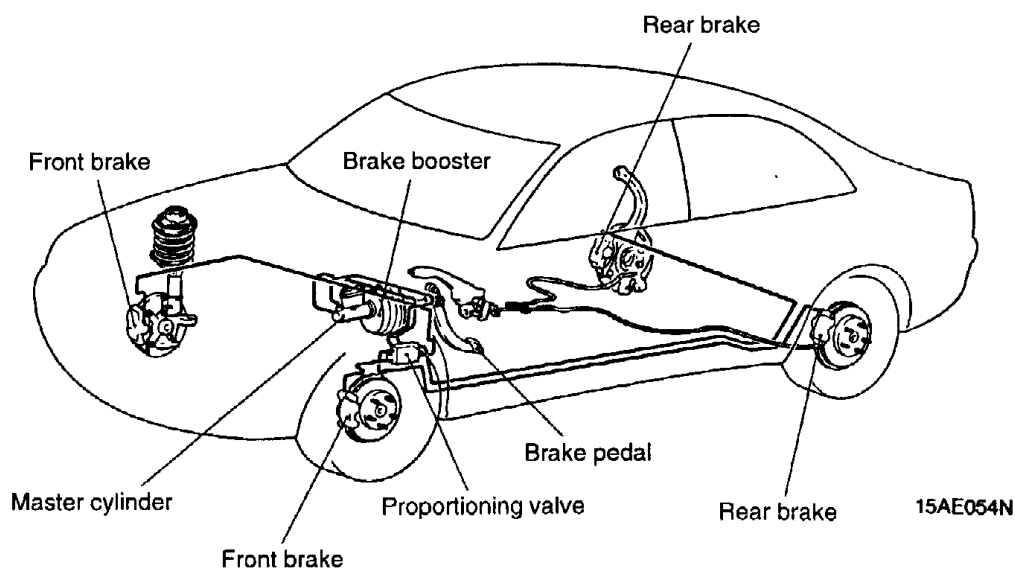
- A dual type master cylinder is equipped on all models.
- A tandem type brake booster has been

adopted.

- Floating calliper, single piston, ventilated disc brakes have been adopted as the front brakes.
- Each rear disc brake is equipped with floating calliper, single piston and solid disc.

Items		Specifications
Master cylinder	I.D. mm (in.)	25.4
Brake booster	Effective dia. of power cylinder mm	205 + 230
	Boosting ratio	6.5
Proportioning valve	Decompression ratio	0.25
Front brakes	Disc effective dia. mm	276
	Wheel cylinder I.D. mm	60.52
Rear disc brakes	Disc effective dia. mm	258
	Wheel cylinder I.D. mm	38.2

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

Items		Standard value	Limit
Brake pedal height mm		175–180	–
Brake pedal free play mm		3–8	–
Brake pedal to floorboard clearance mm		85 or more	–
Output pressure of proportioning valve MPa	Split point	2.2–2.7	–
	Output fluid pressure	3.4–3.9	–
Left/right proportioning valve output pressure difference MPa (psi)		–	0.4
Front disc brake pad thickness mm		10	2.0
Front disc brake drag force (tangential force of wheel mounting bolts) N		69 or less	–
Front brake disc thickness mm		24	22.4
Front brake disc run-out mm		–	0.06
Front hub end play mm		–	0.05
Rear disc brake pad thickness mm		8.8	1.0
Rear disc brake drag force (tangential force of wheel mounting bolts) N		69 or less	–
Rear brake disc thickness mm		10.4	8.4
Rear brake disc run-out mm		–	0.05
Booster push rod to master cylinder piston clearance mm		0.40–0.60	–

LUBRICANTS

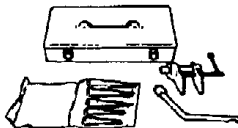
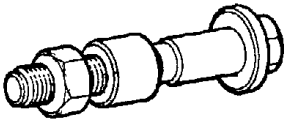
Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease (orange)
Slide pin boot and slide pin bush inner surfaces	
Brake piston boot inner surfaces	
Lock pin boot inner surfaces	
Guide pin boot inner surfaces	
Pad assembly and shim contact surface	
Piston boot mounting grooves	
Piston cup surface	

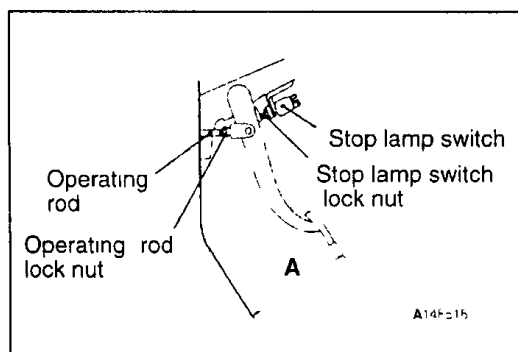
35A-4 BASIC BRAKE SYSTEM – Sealant/Special Tools

SEALANT

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Vacuum switch		

SPECIAL TOOLS

Tool	Number	Name	Use
	MB990964 MB990520 MB990619	Brake tool set	Compressing front disc brake piston Installation of drum brake wheel cylinder piston cup
	MB990998	Front hub remover and installer	Removal and installation of front hub



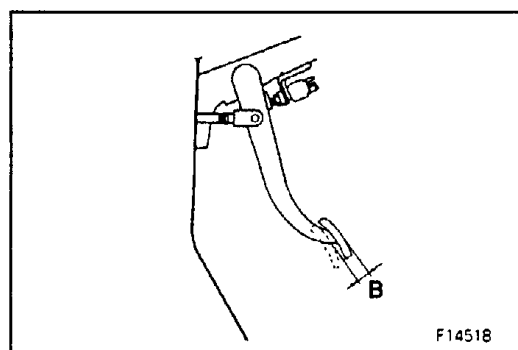
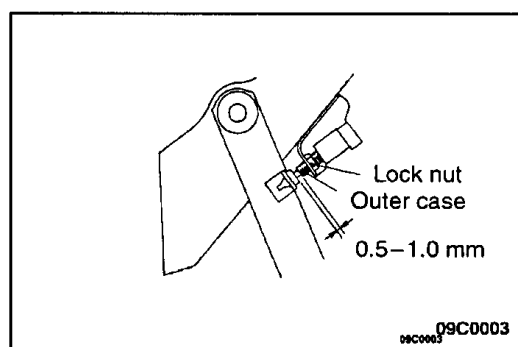
ON-VEHICLE SERVICE

BRAKE PEDAL CHECK AND ADJUSTMENT

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, adjust as follows.

Standard value (A): 175–180 mm

- (1) Disconnect the stop lamp switch connector, loosen the lock nut, and move the stop lamp switch to a position where it does not contact the brake pedal arm.
- (2) Screw in the stop lamp switch until it contacts the brake pedal stopper (just before the brake pedal is caused to move). Back off the stop lamp switch 1/2 to 1 turn and secure by tightening the lock nut.
- (3) Connect the connector of the stop lamp switch.
- (4) Check to be sure that the stop lamp is not illuminated with the brake pedal released.



3. With the engine stopped, press 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 feeling resistance (the free play) is within the standard value range.

Standard value (B): 3–8 mm

If the free play exceeds the standard value, it is probably due to excessive play between the clevis pin and brake pedal arm.

Check for excessive clearance and replace faulty parts as required.

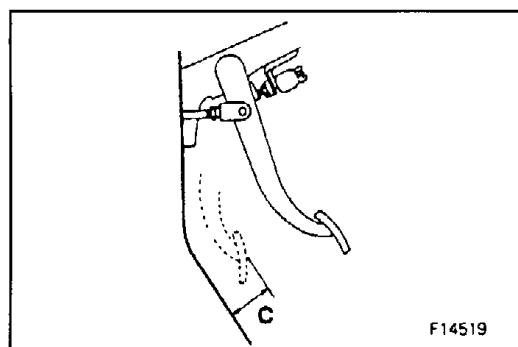
4. Start the engine, depress the brake pedal with approximately 490 N of force, and measure the clearance between the brake pedal and the floorboard.

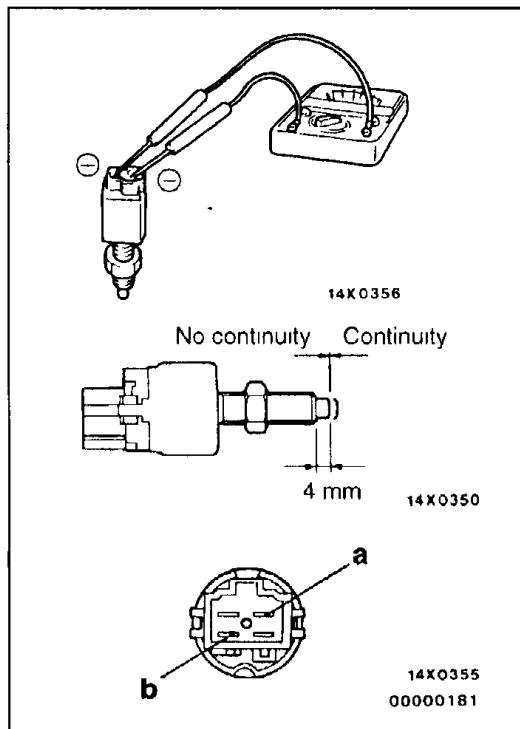
Standard value (C): 85 mm or more

If the clearance is less than the standard value, check for air trapped in the brake line.

Adjust and replace defective parts as required.

5. Turn back the carpet, etc.

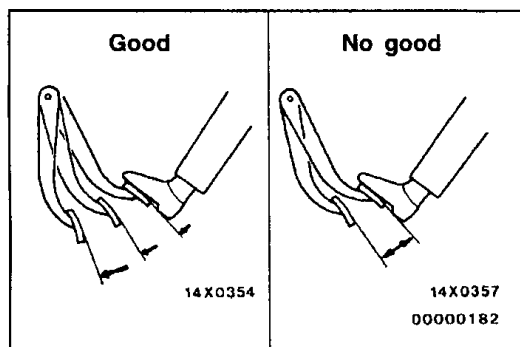




STOP LAMP SWITCH CHECK

Connect a circuit tester to stop lamp switch terminals "a" and "b" and check whether or not there is continuity when the plunger of the stop lamp switch is pushed in and when it is released.

The stop lamp switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm from the outer case edge surface, and if there is continuity when it is released.

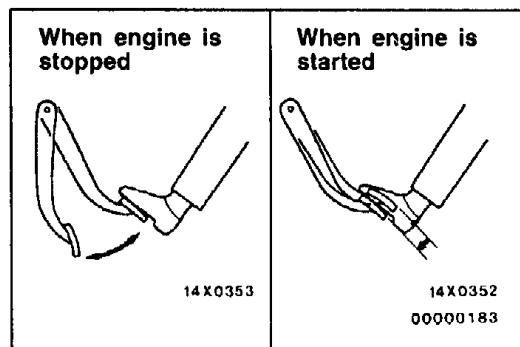


BRAKE BOOSTER OPERATING TEST

For simple checking of the brake booster operation, carry out the following tests:

1. Run the engine for one or two minutes, and then turn the engine off.

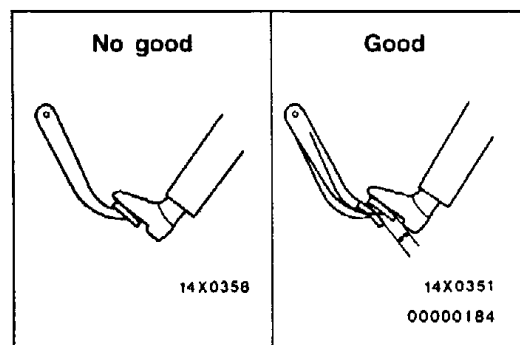
If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly. If the pedal height remains unchanged, the booster is defective.



2. With the engine stopped, step on the brake pedal several times.

Then step on the brake pedal and start the engine.

If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.

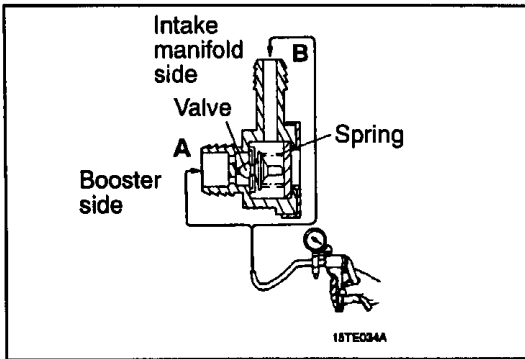


3. With the engine running, step on the brake pedal and then stop the engine.

Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition. If the pedal rises, the booster is defective.

Brake booster performance is satisfactory if it passes all three operating tests.

If the brake booster does not pass all three tests, there may be a fault in the check valve, vacuum hose or in the booster itself.



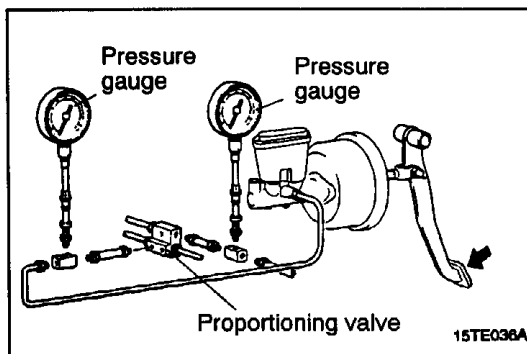
CHECK VALVE OPERATION CHECK

1. Remove the vacuum hose.
2. Remove the check valve.
3. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created.

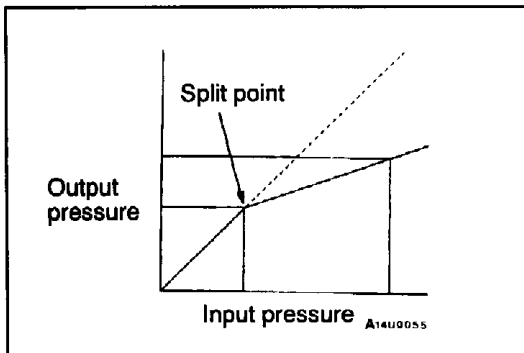
Caution

If the check valve is defective, replace it as an assembly, never attempt to disassemble it.



PROPORTIONING VALVE FUNCTION TEST

1. Connect two pressure gauges, one each to the input side and output side of the proportioning valve, as shown.
2. Air bleed the brake line and the pressure gauge.
3. While gradually depressing the brake pedal, make the following measurements and check to be sure that the measured values are within the allowable range.



- (1) Output pressure begins to drop relative to input pressure (split point).

Standard value: 2.2–2.7 MPa

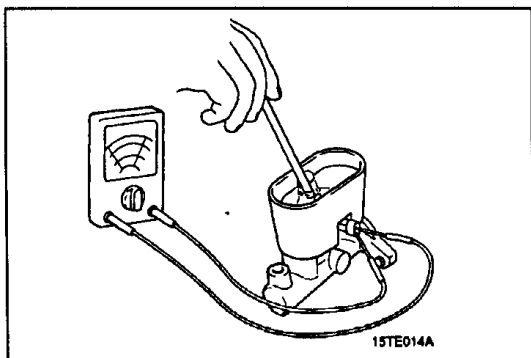
- (2) Output fluid pressure when input fluid pressure is 6.1–6.6 MPa.

Standard value: 3.4–3.9 MPa

- (3) Output pressure difference between left and right brake lines

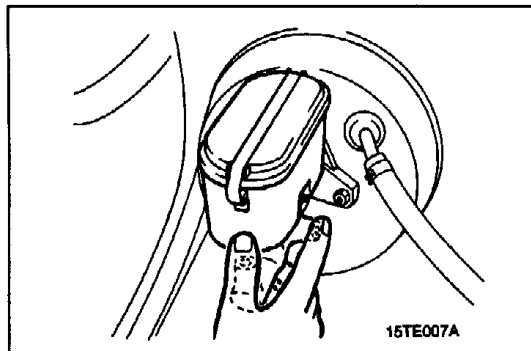
Limit: 0.4 MPa

4. If the measured pressures are not within allowable ranges, replace the proportioning valve.



BRAKE FLUID LEVEL SENSOR CHECK

The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "MIN" or "A" and if there is continuity when the float surface is below "MIN" or "A".



BLEEDING

Caution

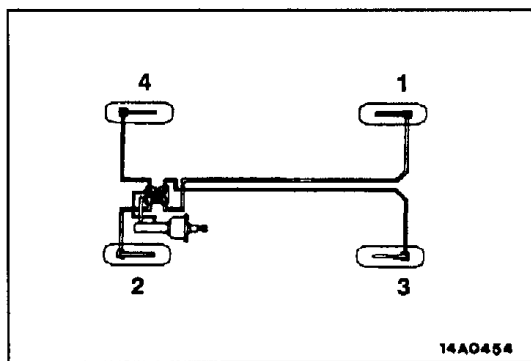
Use the specified brake fluid. Don't use a mixture of the specified brake fluid and another non-specified fluid.

Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING

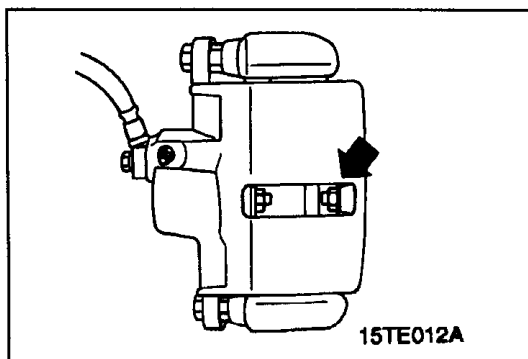
The master cylinder has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake line will become easier.

- (1) Fill the reserve tank with brake fluid.
- (2) Keep the brake pedal depressed.
- (3) Have another person cover the master cylinder outlet with a finger.
- (4) With the outlet still closed, release the brake pedal.
- (5) Repeat steps 2.–4. three or four times to fill the inside of the master cylinder with brake fluid.



BRAKE LINE BLEEDING

Start the engine and bleed the air in the sequence shown in the figure.



FRONT DISC BRAKE PAD CHECK AND REPLACEMENT

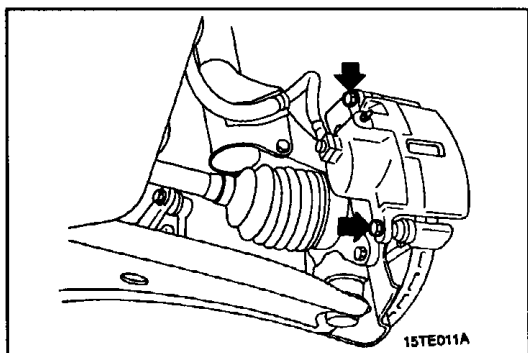
1. Check brake pad thickness through calliper body check port.

Standard value: 10 mm

Limit: 2.0 mm

Caution

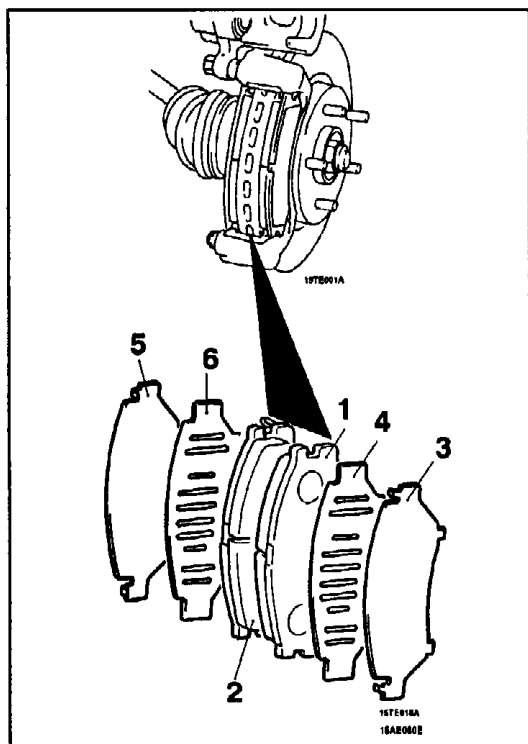
1. When the limit is exceeded, the brake pads on both the left and right wheels must be replaced as a set.
2. If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.



2. Remove guide pin. Lift calliper assembly upwards and support it with wires.

Caution

Do not wipe off the special grease that is on the guide pin or allow it to contaminate the lock pin.

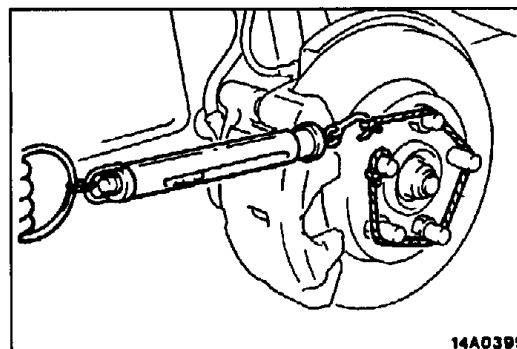
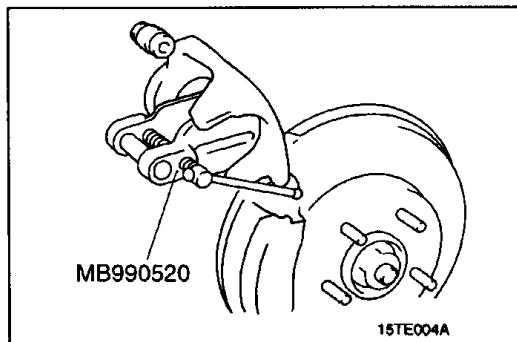
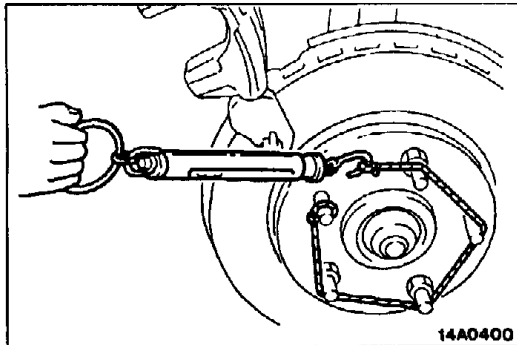
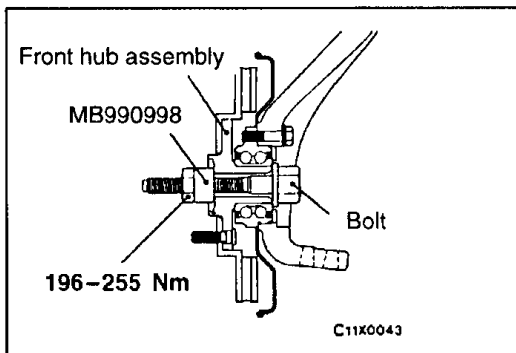


3. Remove the following parts from calliper support.

1. Pad assembly
2. Pad assembly
3. Outer shim (stainless)
4. Inner shim (coated with rubber)
5. Outer shim (stainless)
6. Inner shim (coated with rubber)

NOTE

Shims must be cleaned and inspected for serviceability, if found to be unserviceable new shims must be fitted.



4. Take out the drive shaft.
(Refer to GROUP 26 – Drive Shaft.)
5. Set the special tool to the front hub assembly as shown in the illustration.

6. Measure hub torque (A) with pads removed to measure brake drag torque. Torque value will be used later to calculate brake drag force with the pads installed.

NOTE

Tighten the nuts in order to secure the disc to the hub.

7. Fit the pad clip and pads to the calliper support.
8. Clean piston and push into cylinder (calliper) with special tool.
9. Be careful that the piston boot does not catch and tear as the calliper assembly and lock pin are installed.
10. Check brake drag torque as follows.
 - (1) Start engine and hold brake pedal down for 5 seconds.
[Pedal depression force: approx. 196 N]
 - (2) Stop engine.
 - (3) Turn brake disc forward 10 times.

- (4) Check hub torque (B) with spring balance.
- (5) Calculate the drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

Standard value:

69 N [4 Nm] or less

11. If the difference between brake drag torque and hub torque exceeds the standard value, disassemble piston and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.
12. Reinstall the drive shaft.
(Refer to GROUP 26 – Drive Shaft.)

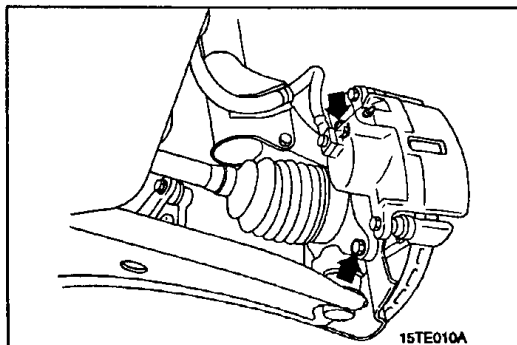
FRONT DISC BRAKE ROTOR CHECK

Caution

To maintain safe braking performance, the disc brake rotors must be kept within allowable service specifications.

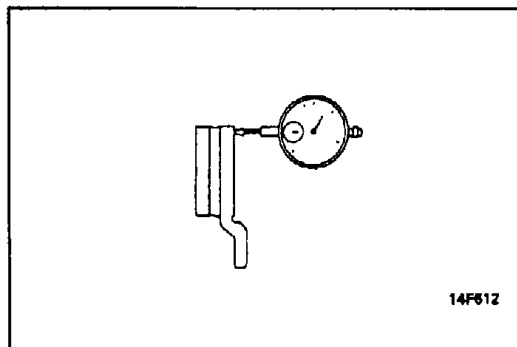
Before re-finishing or re-processing the brake disc surface, the following conditions should be checked.

Inspection items	Remarks
Scratches, rust, saturated lining materials and wear	- If the vehicle is not driven for a certain period, the sections of the discs that are not in contact with lining will become rusty, causing noise and shuddering. - If grooves resulting from excessive disc wear and scratches are not removed prior to installing a new pad assembly, there will momentarily be inappropriate contact between the disc and the lining (pad).
Run-out or drift	Excessive run-out or drift of the discs will increase the pedal depression resistance due to piston knock-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause inset or warping.



FRONT BRAKE DISC RUN-OUT CHECK

1. Remove the calliper support bolts, then raise the calliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks, and rust. Clean the disc thoroughly and remove all rust.

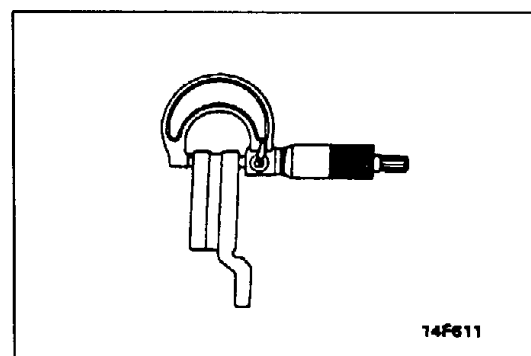
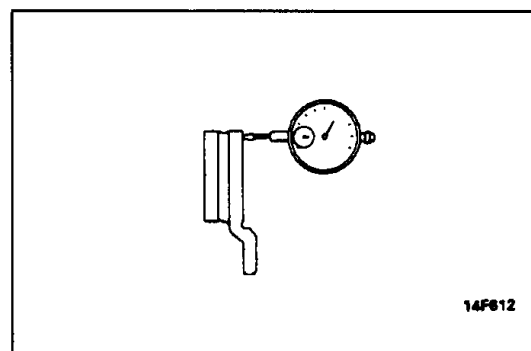
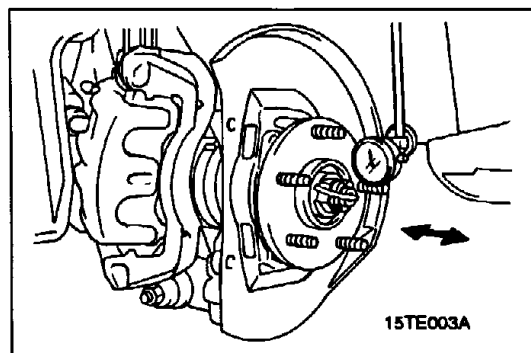
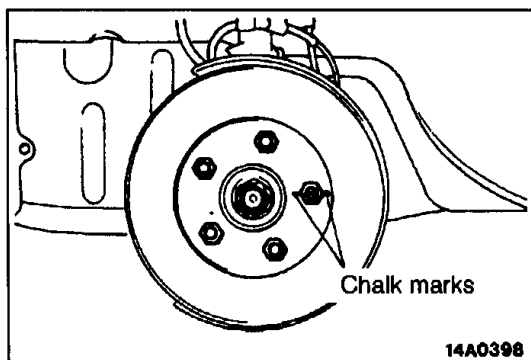


3. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the runout of the disc.

Limit: 0.06 mm

NOTE

Tighten the nuts in order to secure the disc to the hub.



FRONT BRAKE DISC RUN-OUT CORRECTION

1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.

(1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.

- (2) Remove the brake disc, and then place a dial gauge as shown in the illustration; then move the hub in the axial direction and measure the play.

Limit: 0.05 mm

If the play is equivalent to or exceeds the limit, disassemble the hub knuckle and check each part.

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

2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the brake disc or turn rotor with an on the car type brake lathe ("MAD, DL-8700PF" or equivalent). Be sure to follow the exact brake lathe manufacturer instructions. Rotors turned on the vehicle will often have a lower run-out than a new brake disc.

FRONT BRAKE DISC THICKNESS CHECK

1. Using a micrometer, measure disc thickness at eight positions, approximately 45° apart and 10 mm in from the outer edge of the disc.

Brake disc thickness

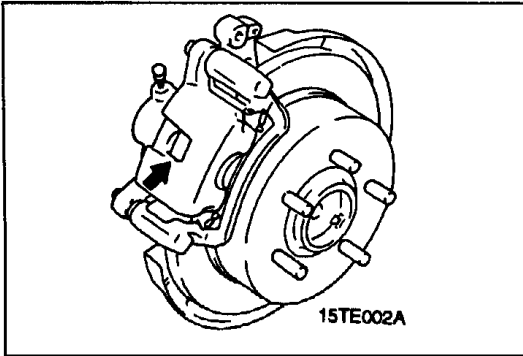
Standard value: 24 mm

Limit: 22.4 mm

Thickness variation (at least 8 positions)

The difference between any thickness measurements should not be more than 0.015 mm.

2. If the disc is beyond the limits for thickness, remove it and install a new one. If thickness variation exceeds the specification, replace the brake disc or turn rotor with an on the car type brake lathe ("MAD, DL-8700PF" or equivalent). Be sure to follow the exact brake lathe manufacturer instructions.



REAR DISC BRAKE PAD CHECK AND REPLACEMENT

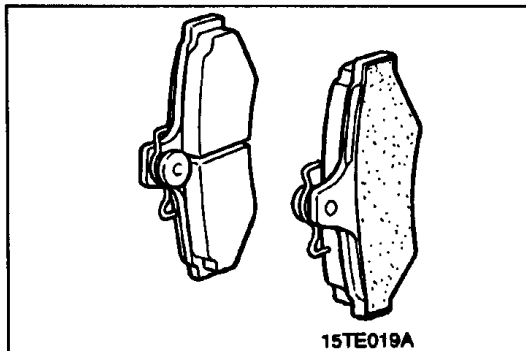
1. Check brake pad thickness through calliper body check port.

Standard value: 10 mm

Limit: 2.0 mm

Caution

1. When the limit is exceeded, the brake pads on both the left and right wheels must be replaced as a set.
2. If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin sleeve and guide pin sleeve.

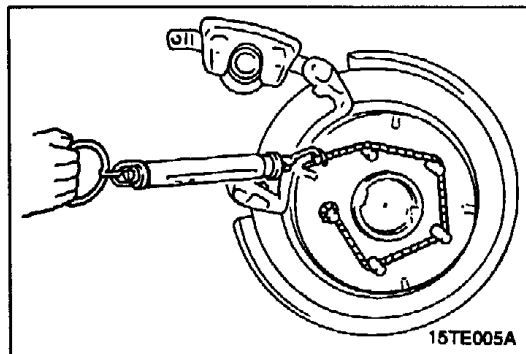


2. Remove the lower guide pin calliper bolt. Lift calliper assembly and retain with wire.

Caution

Do not wipe off the special grease that is on the guide pin or allow it to contaminate the guide pin.

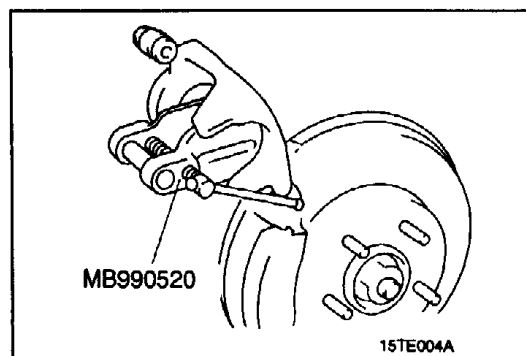
3. Remove the brake pads parts from the calliper support.



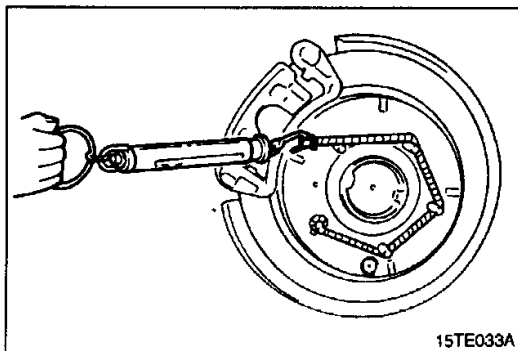
4. Measure hub torque (A) with pads removed to measure brake drag torque. Torque value (A) will be used later to calculate brake drag force with the pads installed.

NOTE

To secure the disc to the hub, tighten the nuts.



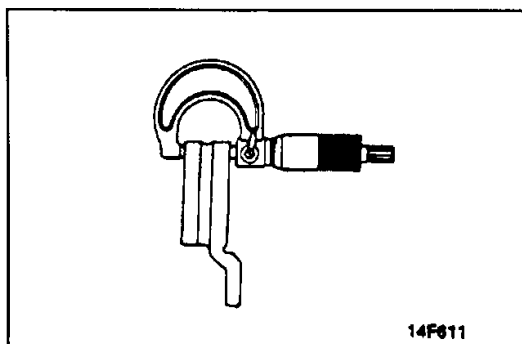
5. Clean the piston; then use the special tool to thread the piston into the cylinder (calliper).
6. Be careful that the piston boot does not catch and tear as the calliper assembly and guide pin locking bolts are installed.



7. Check brake drag torque as follows.
 - (1) Start engine and hold brake pedal down for 5 seconds. [Pedal depression force: approx. 196 N]
 - (2) Stop engine.
 - (3) Turn brake disc forward 10 times.
 - (4) Check brake hub torque (B) with spring balance.
 - (5) Calculate the drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

Standard value: 69 N [4 Nm] or less

8. If the difference between brake drag torque and hub torque exceeds the standard value, disassemble piston and clean piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.



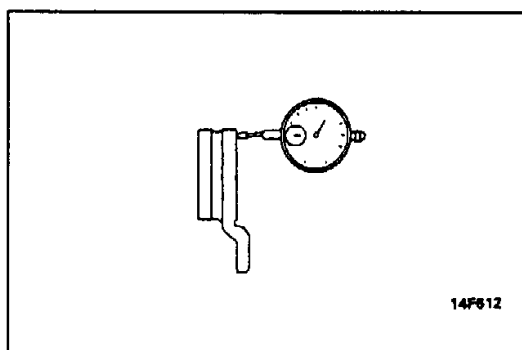
REAR BRAKE DISC THICKNESS CHECK

1. Remove dirt and rust from brake disc surface.
2. Measure disc thickness at 4 locations or more.

Standard value: 10.4 mm

Limit: 8.4 mm

Replace the discs and pad assembly for both sides left and right of the vehicle if they are worn beyond the specified limit.



REAR BRAKE DISC RUN-OUT CHECK

1. Remove the calliper support, raise the calliper assembly, and secure it by using a wire, etc.
2. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the run-out of the disc.

Limit: 0.05 mm

NOTE

To secure the disc to the hub, tighten the nuts.

REAR BRAKE DISC RUN-OUT CORRECTION

1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.

NOTE

The procedures for checking and changing the rear disc phase are the same as those for the front brake discs.

2. If the problem cannot be corrected by changing the phase of the brake disc, replace the disc or turn rotor using an on the car type brake lathe. Be sure to follow the exact brake lathe manufacturer instructions. Rotors turned on the vehicle will often have a lower run-out than a new brake disc.

MASTER CYLINDER AND BRAKE BOOSTER

REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

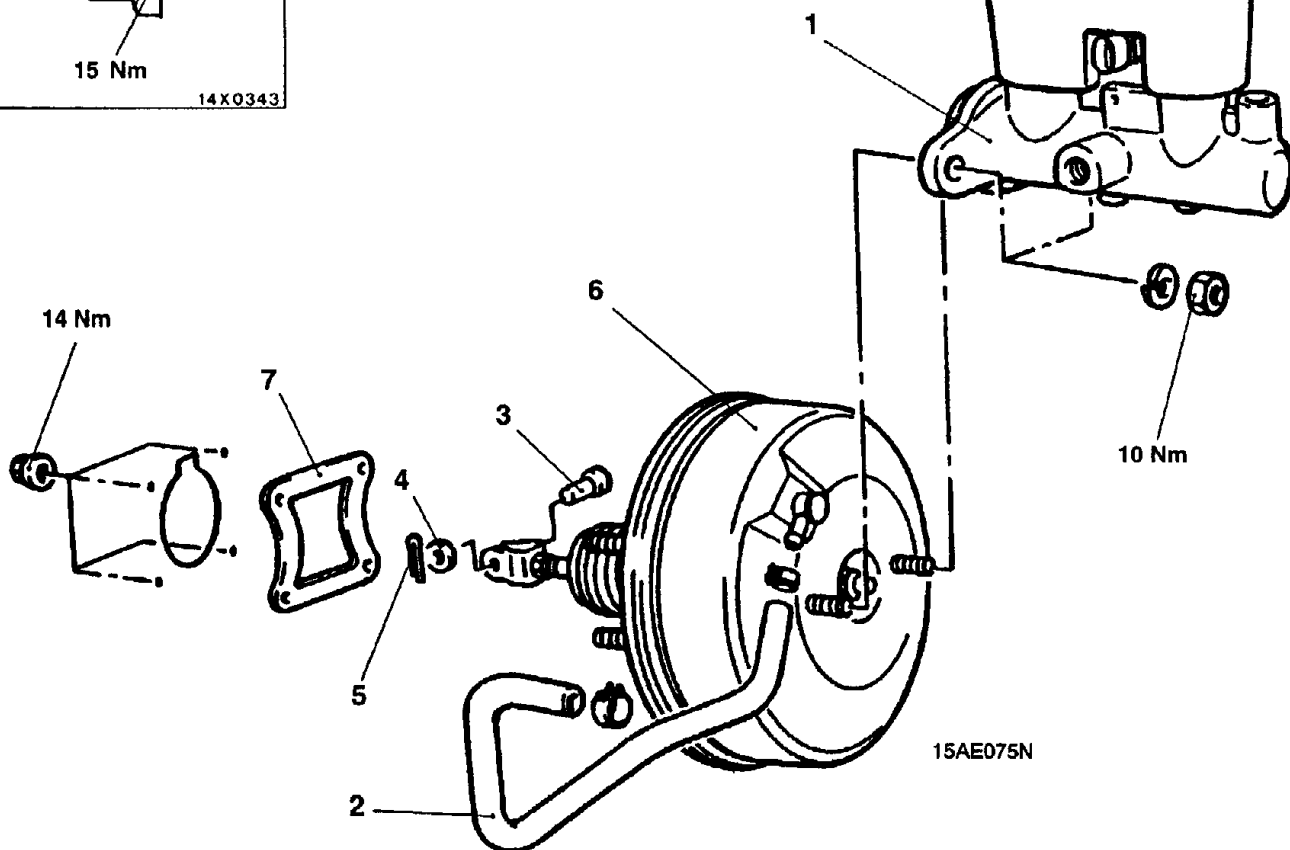
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-8.)
- Brake Pedal Adjustment (Refer to P.35A-5.)

Flared brake line nuts



15 Nm

14X0343



Master cylinder removal steps

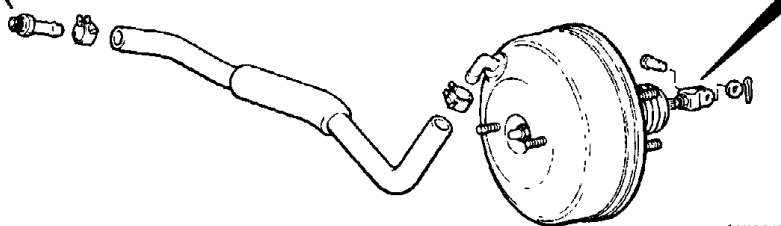
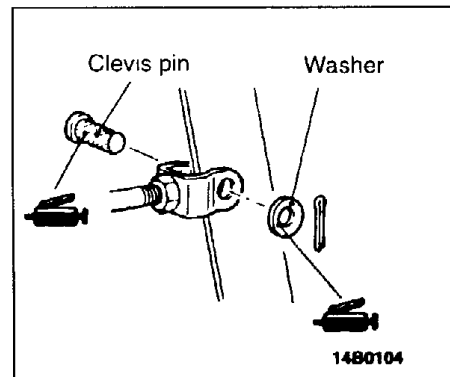
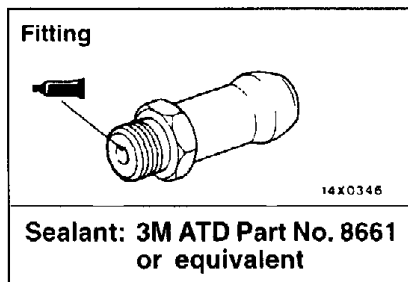
- A◄
1. Master cylinder
 - Adjustment of clearance between brake booster push rod and primary piston

Brake booster removal steps

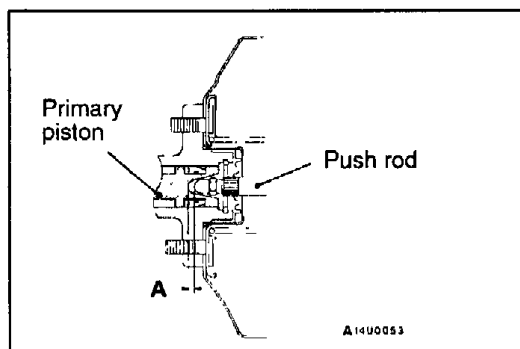
- A◄
1. Master cylinder
 - Adjustment of clearance between brake booster push rod and primary piston
 2. Vacuum hose (With built-in check valve)
 3. Cotter pin
 4. Washer
 5. R-clip
 6. Brake booster
 7. Sealer

35A-18 BASIC BRAKE SYSTEM – Master Cylinder and Brake Booster

Grease points



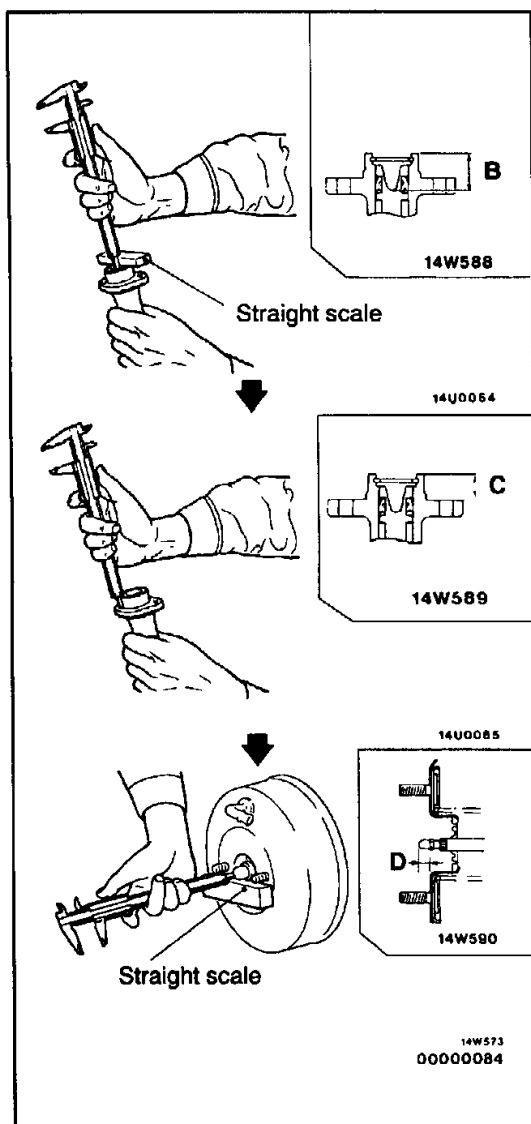
00000339



INSTALLATION SERVICE POINT

►A◄ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

Adjust the clearance (A) between the brake booster push rod and primary piston as follows:



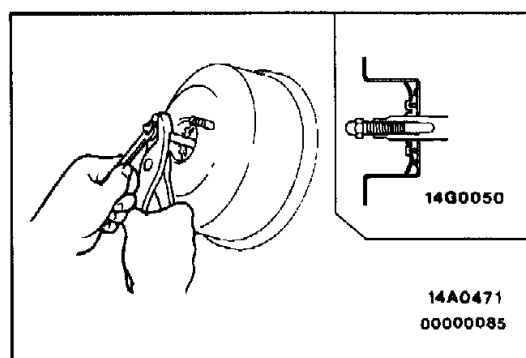
Calculate clearance A from the B, C and D measurements.

$$A = B - C - D$$

Standard value: 0.40–0.60mm

NOTE

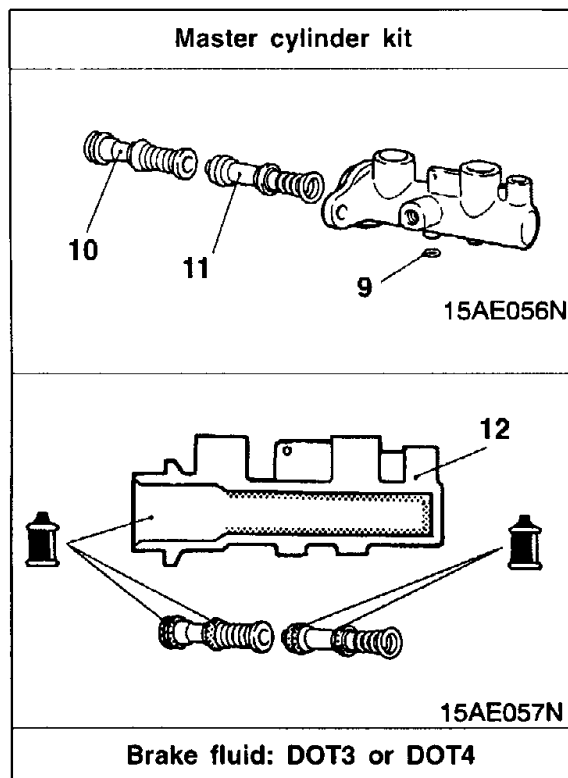
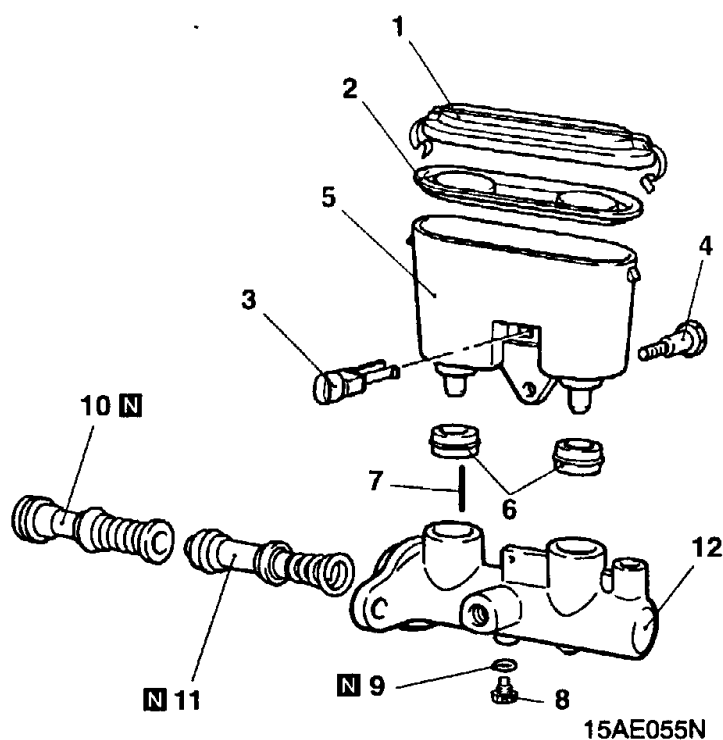
When brake booster negative pressure –93.3 kPa is applied, clearance value will become 0.05–0.30 mm.



NOTE

If the clearance is not within the standard value range, turn the push rod screw to achieve desired length.

MASTER CYLINDER DISASSEMBLY AND REASSEMBLY



15AE058N

Disassembly steps

1. Reservoir cap assembly
2. Diaphragm
3. Brake fluid level sensor
4. Reservoir bolt
5. Reservoir
6. Reservoir seals
7. Piston stopper pin (Vehicles with ABS)

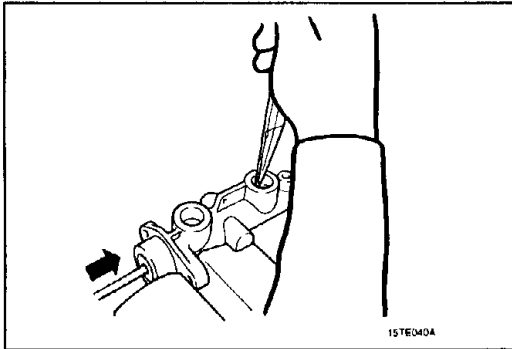
◀B▶

8. Piston stopper bolt (Vehicles without ABS)
9. Gasket (Vehicles without ABS)
10. Primary piston assembly
11. Secondary piston assembly
12. Master cylinder body

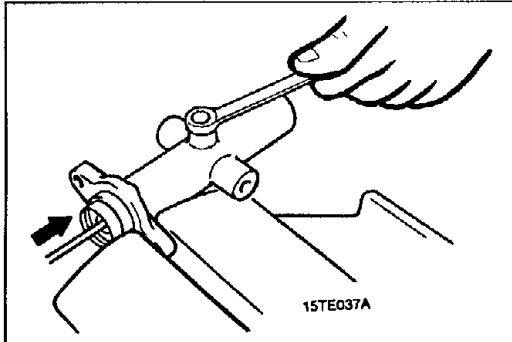
◀A▶ ▶A▶

Caution

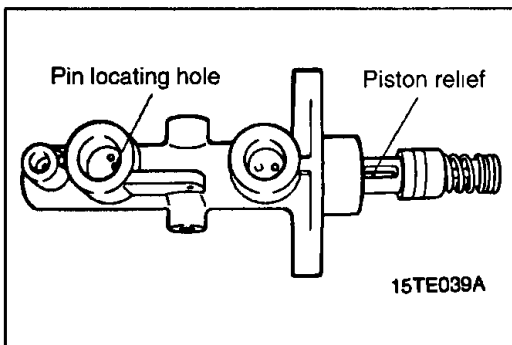
Do not disassemble the primary and secondary piston assemblies.

**DISASSEMBLY SERVICE POINTS****◀A▶ PISTON STOPPER PIN REMOVAL <VEHICLES WITH ABS>**

Remove the piston stopper pin, while depressing the piston.

**◀B▶ PISTON STOPPER BOLT REMOVAL <VEHICLES WITHOUT ABS>**

Remove the piston stopper bolt while depressing the piston.

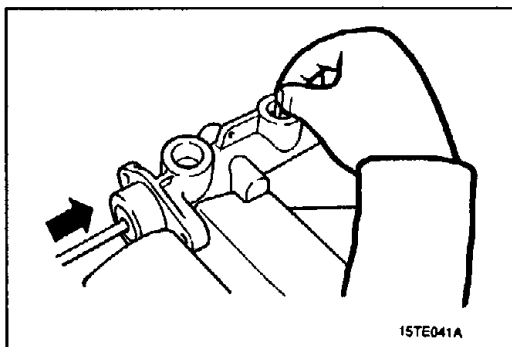
**REASSEMBLY SERVICE POINT****▶A◀ PISTON STOPPER PIN <VEHICLES WITH ABS>**

1. Align the relief in the secondary piston with the piston stopper pin locating hole and push the piston into the bore.

2. Push the primary piston into the bore and then while depressing the primary piston drop the piston stopper pin through the locating hole into the secondary piston relief.

NOTE

Ensure the pin goes all the way through the secondary piston and locates in the bottom of the master cylinder bore.

**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.

FRONT DISC BRAKE

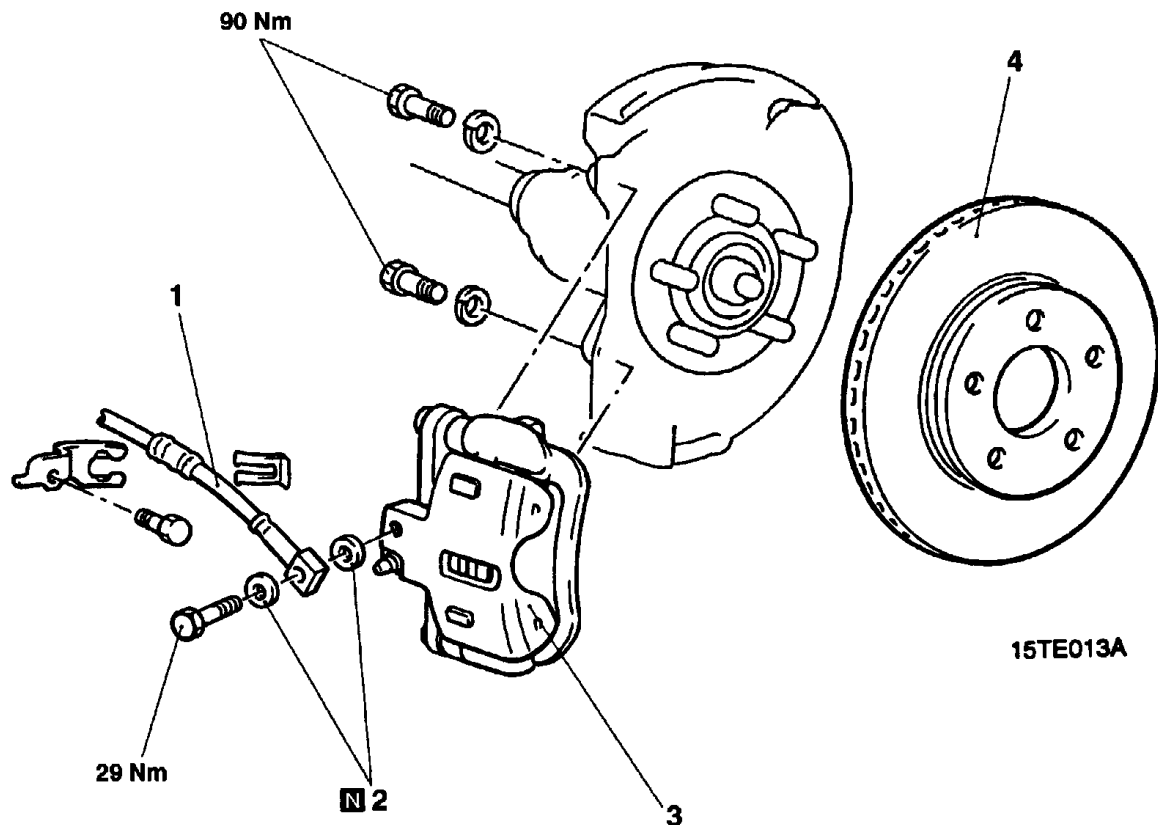
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-8.)


Removal steps

1. Connection for the brake hose
2. Gasket
3. Front brake assembly
4. Brake disc



INSTALLATION SERVICE POINTS

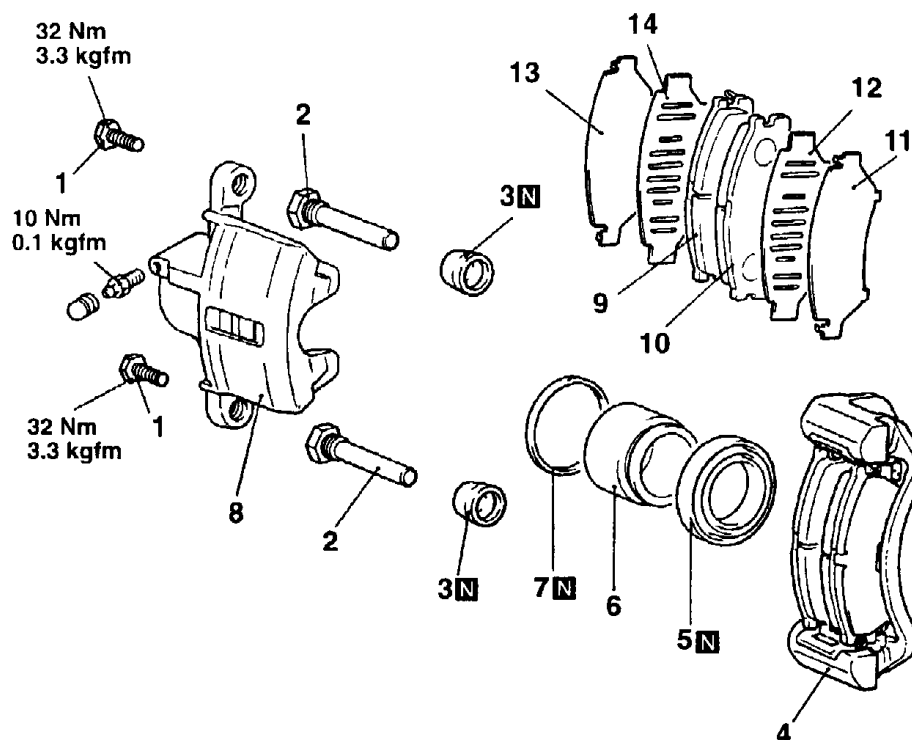
►A◄ FRONT BRAKE ASSEMBLY INSTALLATION

Install the front brake assembly and measure the disc brake drag torque. (Refer to P.35A-10.)

INSPECTION

Check the brake disc for damage.

DISASSEMBLY AND REASSEMBLY



15TE026E

15AE082E

15AE081E	15TE026A	15TE026A
Brake calliper kit	Pad kit	Seal and boot kit

Calliper Disassembly steps

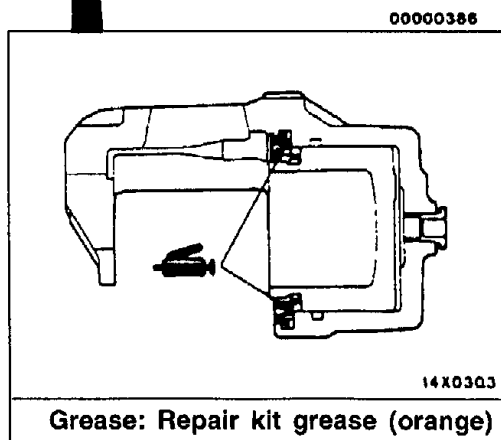
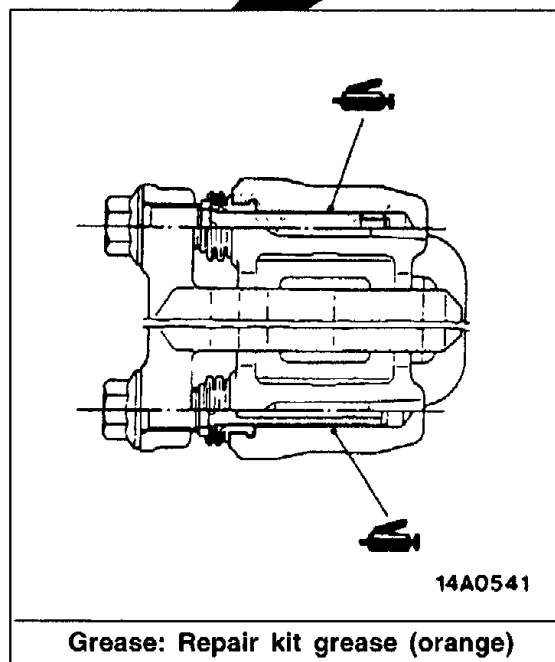
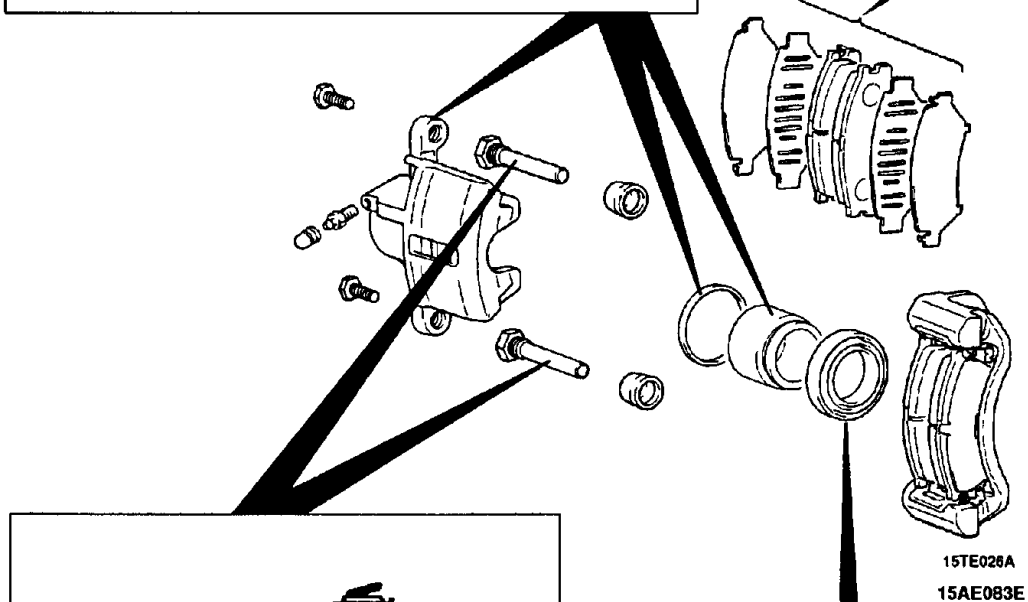
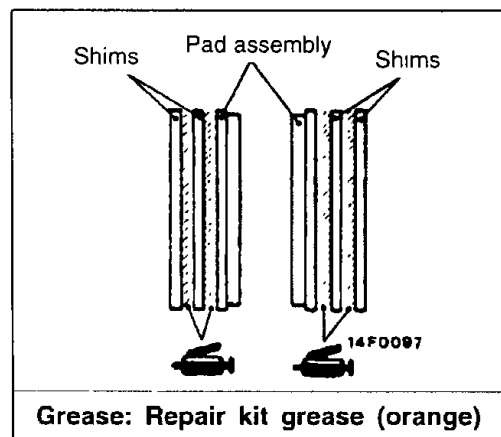
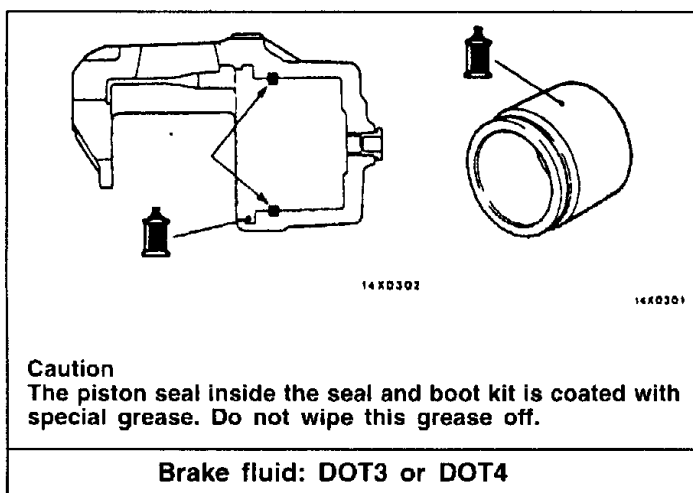
1. Guide pin locking bolts
2. Guide pins
3. Boot
4. Calliper support (pad, shims)
5. Piston boot
6. Piston
7. Piston seal
8. Calliper body

Pad Disassembly steps

1. Guide pin locking bolts
2. Guide pins
3. Boot
4. Calliper support (pad, shims)
9. Pad assembly
10. Pad assembly
11. Outer shim (stainless)
12. Inner shim (coated with rubber)
13. Outer shim (stainless)
14. Inner shim (coated with rubber)

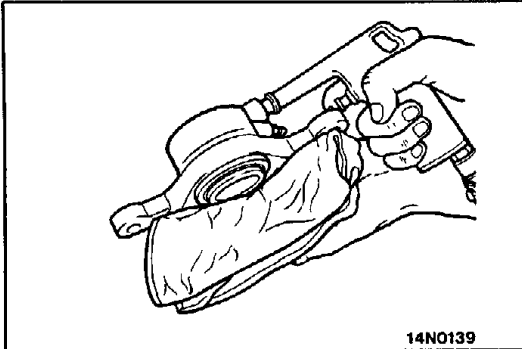


Lubrication Points



DISASSEMBLY SERVICE POINTS

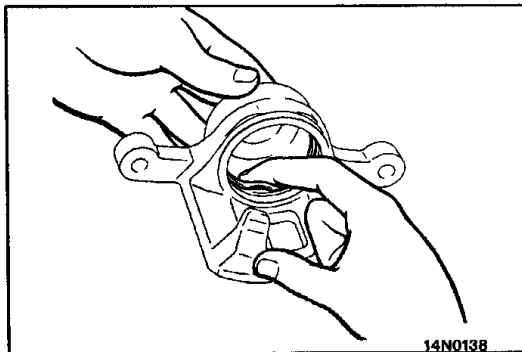
When disassembling the disc brakes, disassemble both sides (left and right) as a set.

**◀A▶ PISTON BOOT/PISTON REMOVAL**

Protect calliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution

Blow compressed air gently.

**◀B▶ PISTON SEAL REMOVAL**

1. Remove piston seal with finger tip.

Caution

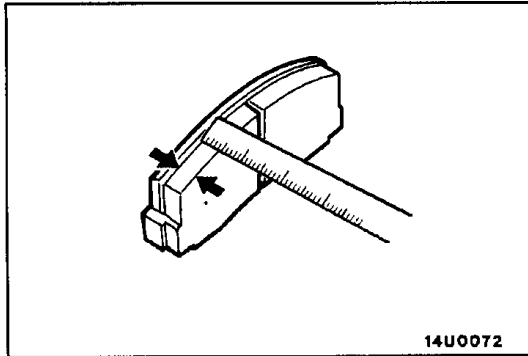
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

2. Clean piston surface and inner cylinder with trichloro-ethylene, alcohol, or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check calliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.

**PAD WEAR CHECK**

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

Standard value: 10 mm

Limit value: 2.0 mm

Caution

1. When the limit is exceeded, the brake pads on both the left and right wheels must be replaced as a set.
2. If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.

REAR DISC BRAKE

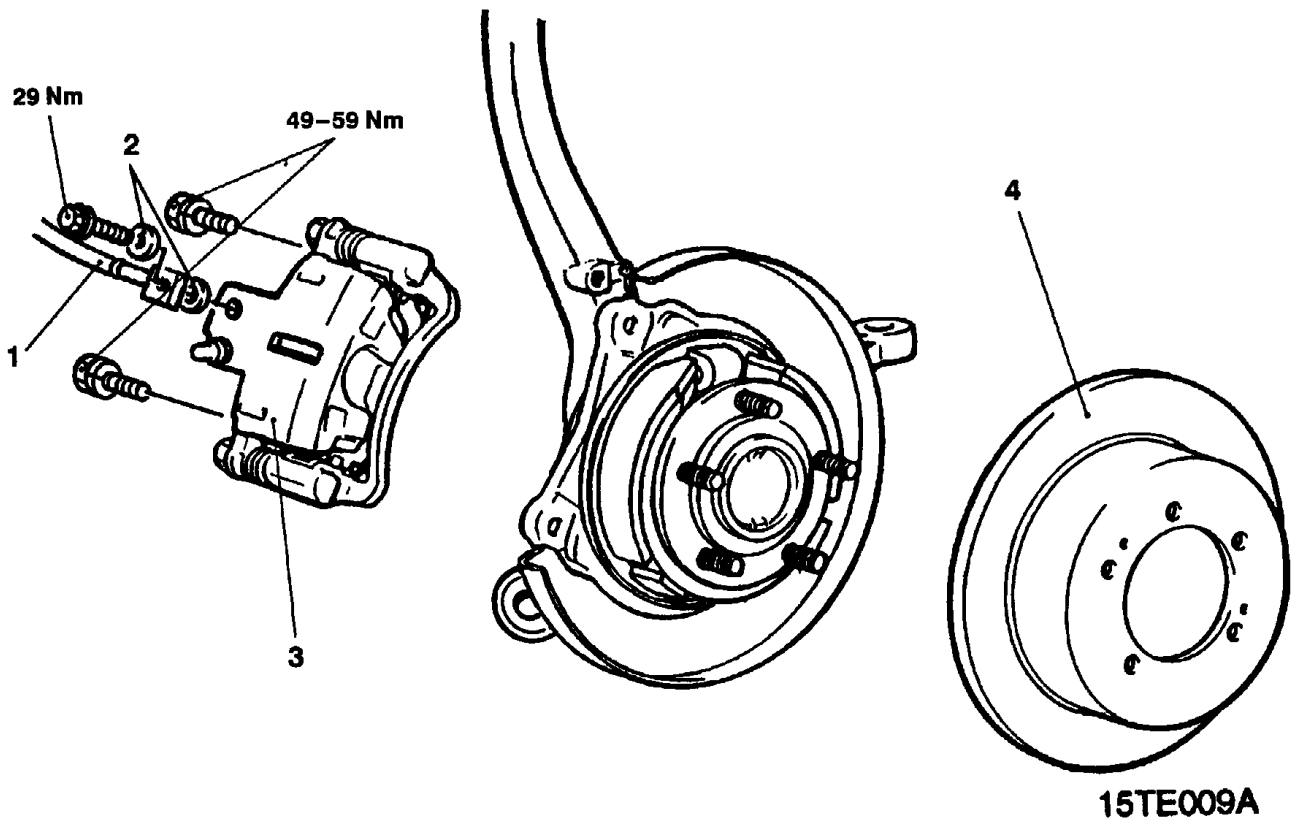
REMOVAL AND INSTALLATION

Pre-removal Operation

- Loosening Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-Installation Operation

- Brake Fluid Filling and Air Bleeding (Refer to P.35A-8.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – On-vehicle Service.)



Removal steps

1. Connection for the brake hose
2. Gasket
3. Rear brake assembly
4. Brake disc



INSTALLATION SERVICE POINT

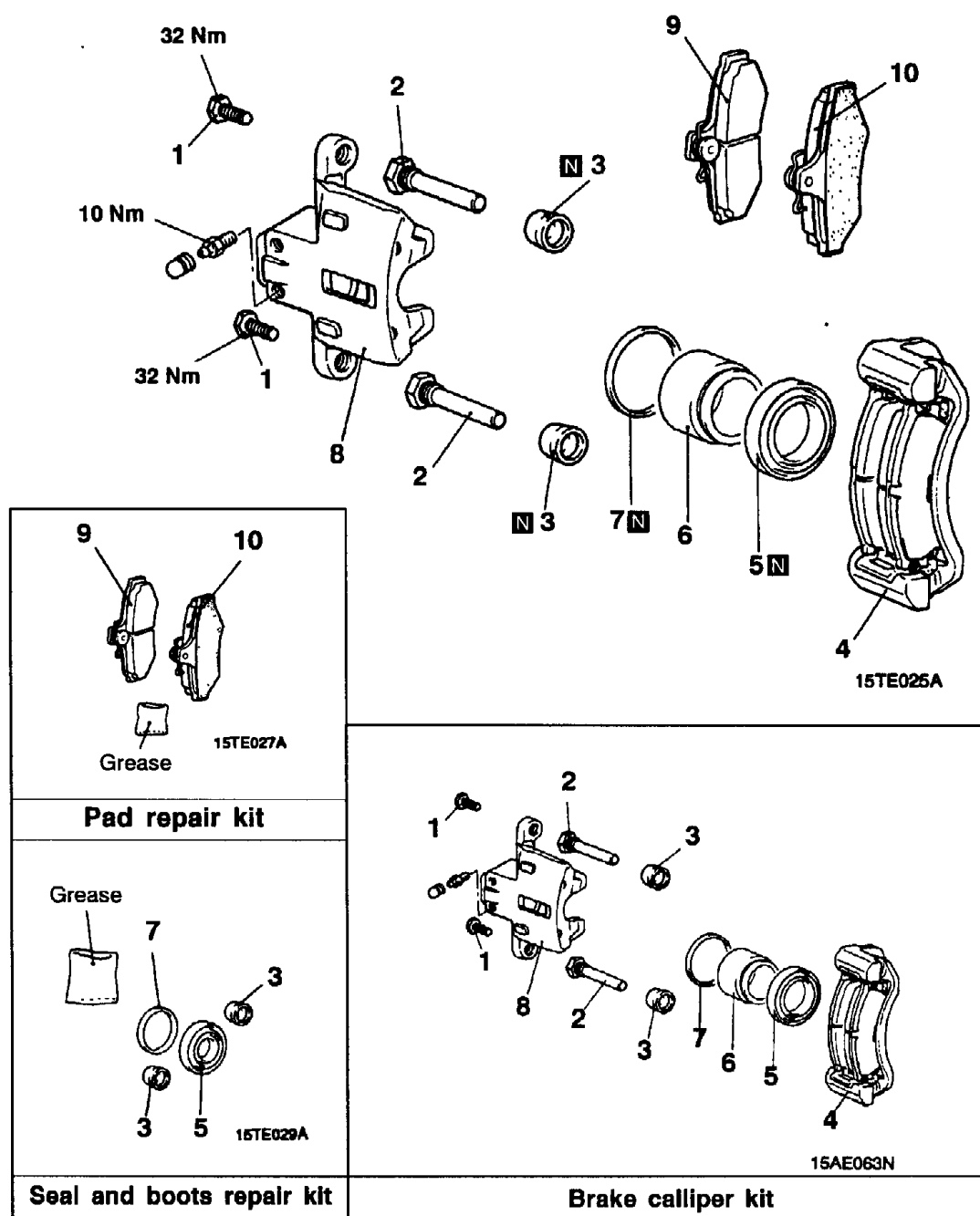
►◄ REAR BRAKE ASSEMBLY INSTALLATION

Install the rear brake assembly and measure the disc brake drag torque. (Refer P.35A-14.)

INSPECTION

- Check the brake disc for damage.
- Check the brake disc for thickness.
- Check the brake disc for run-out.

DISASSEMBLY AND REASSEMBLY



15AE062N

Calliper assembly disassembly steps

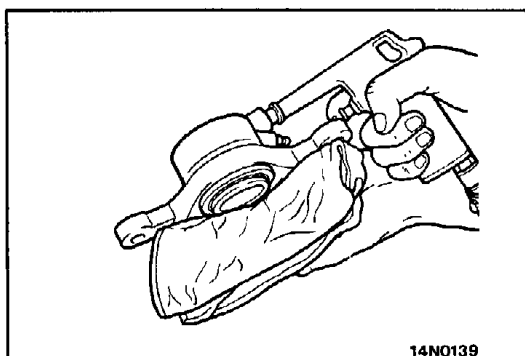
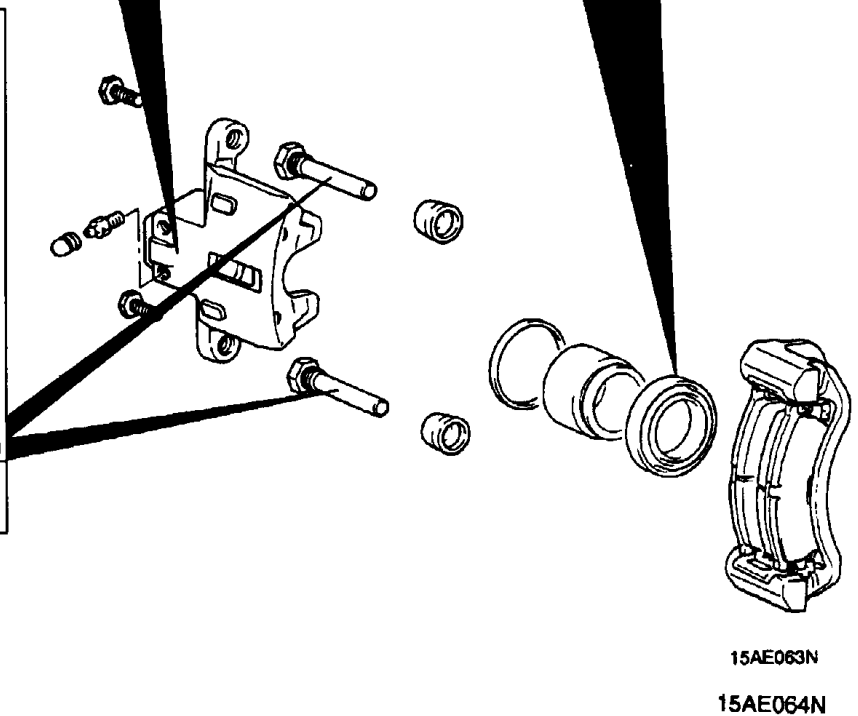
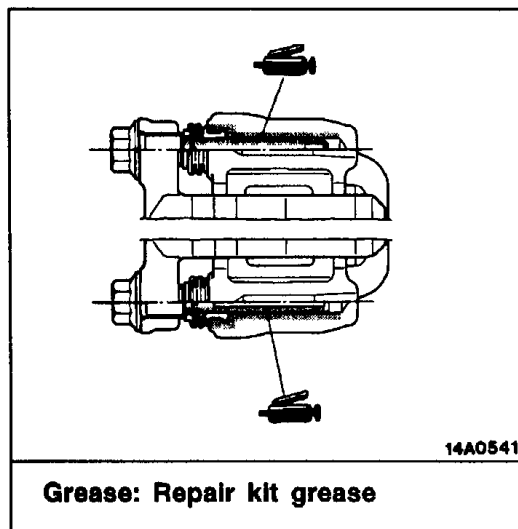
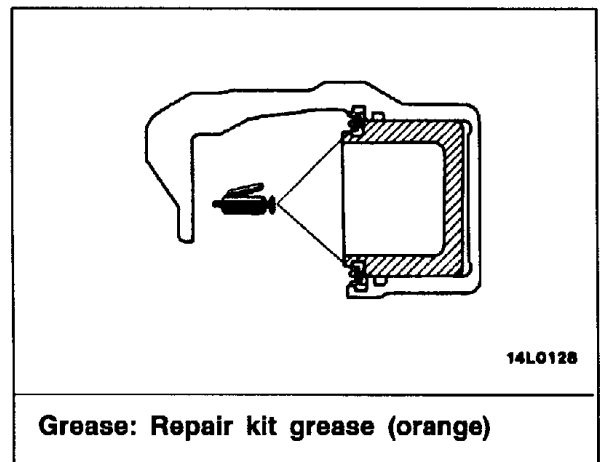
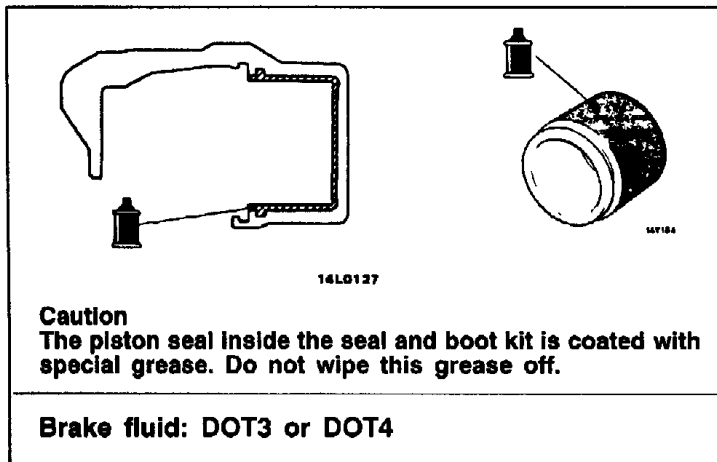
1. Guide pin locking bolts
2. Guide pin
3. Boot
4. Calliper support (pads)
5. Piston boot
6. Piston
7. Piston seal

8. Calliper body

- ### Pad assembly disassembly steps
1. Locking bolts
 2. Guide pin
 3. Boot
 4. Calliper support (pads)
 9. Pad and wear indicator assembly
 10. Pad assembly



Lubrication Points



DISASSEMBLY SERVICE POINTS

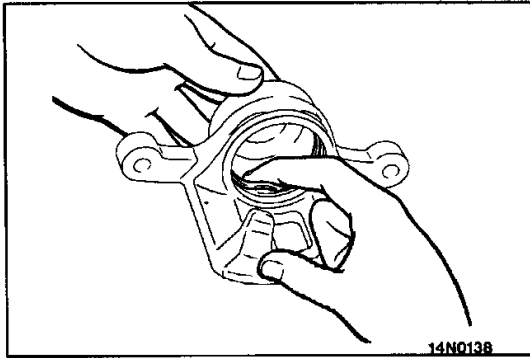
When disassembling the disc brakes, disassemble both sides (left and right) as a set.

◀▶ PISTON BOOT/PISTON REMOVAL

Protect calliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution

Blow compressed air gently.

**◀B▶ PISTON SEAL REMOVAL**

1. Remove piston seal with finger tip.

Caution

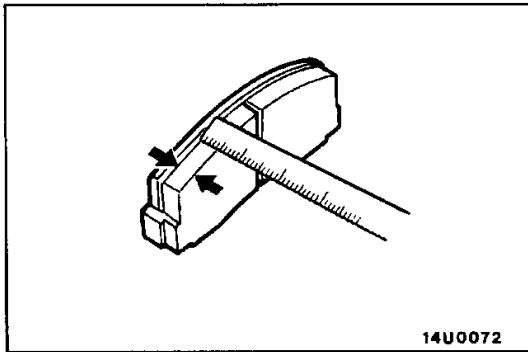
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

2. Clean piston surface and inner cylinder with trichloro-ethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check calliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.

**PAD WEAR CHECK**

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

Standard value: 8.8 mm

Limit value: 1.0 mm

Caution

1. When the limit is exceeded, the brake pads on both the left and right wheels must be replaced as a set.
2. If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.

PROPORTIONING VALVE

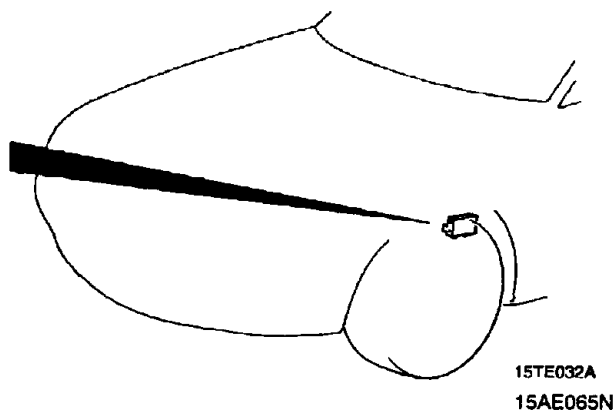
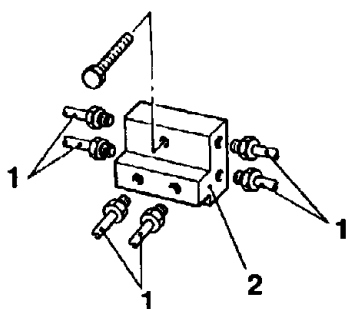
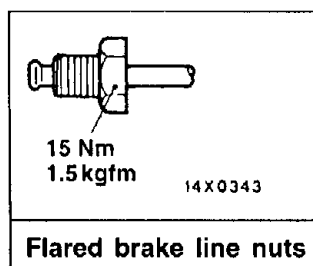
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining
- Air Intake Hose Removal

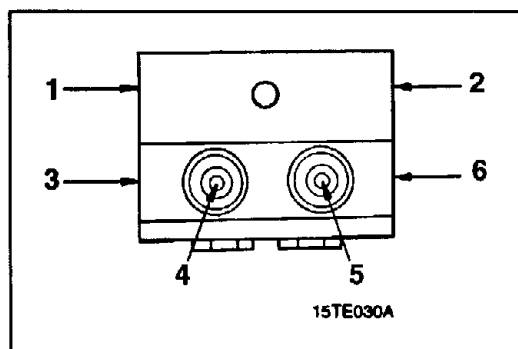
Post-installation Operation

- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-8.)
- Air Intake Hose Installation



Removal steps

- A◄ 1. Connection for the brake pipe
2. Proportioning valve



INSTALLATION SERVICE POINT

►A◄ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

Vehicles without ABS

1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – Front brake (R.H.)
4. Proportioning valve – Master cylinder
5. Proportioning valve – Master cylinder
6. Proportioning valve – Front brake (L.H.)

Refer to P.35B-32.

ANTI-SKID BRAKING SYSTEM (ABS)

CONTENTS

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Wheel Speed Sensor Output Voltage Check ..	23	WHEEL SPEED SENSOR	31
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Refer to GROUP 35A for the following items.

BRAKE PEDAL

FRONT DISC BRAKE

LUBRICANTS

ON-VEHICLE SERVICE

Brake Booster Operating Test

Brake Fluid Level Sensor Check

Check Valve Operation Check

Front Brake Disc Run-out Check

Front Brake Disc Run-out Correction

Front Brake Disc Thickness Check

Front Disc Brake Pad Check and Replacement

Front Disc Brake Rotor Inspection

Proportioning Valve Function Test

Rear Brake Disc Run-out Check

Rear Brake Disc Run-out Correction

Rear Brake Disc Thickness Check

Rear Disc Brake Pad Check and Replacement

MASTER CYLINDER AND BRAKE BOOSTER

REAR DISC BRAKE

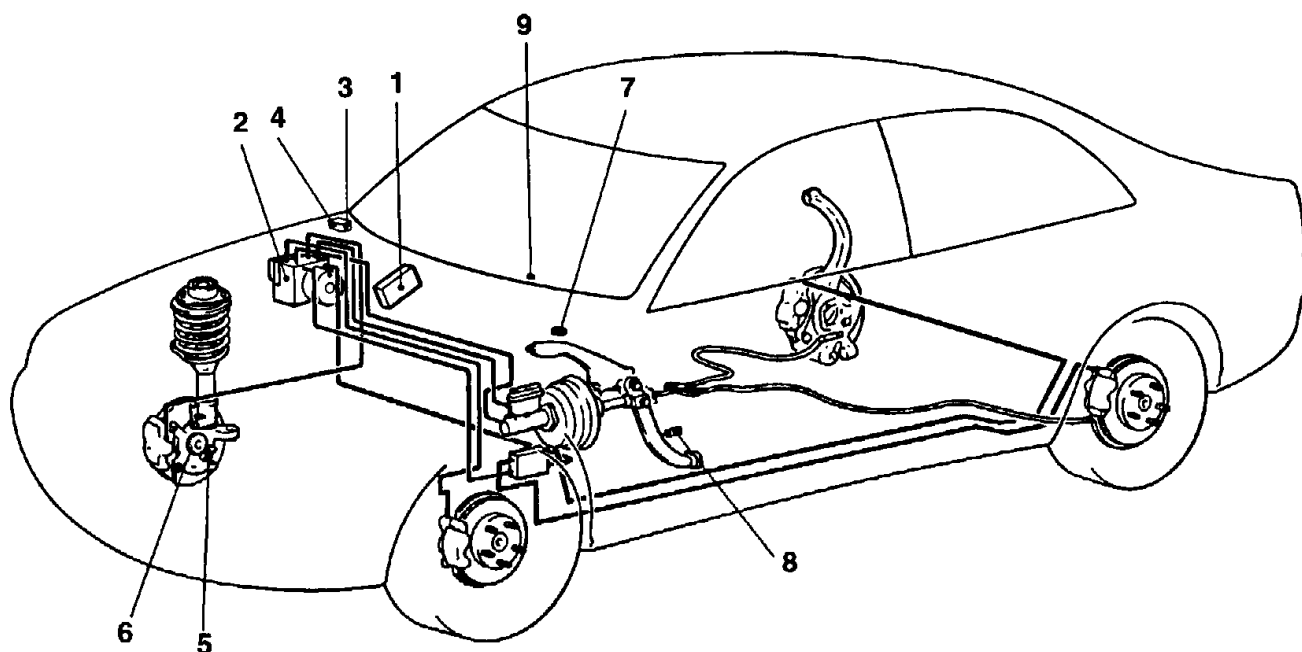
GENERAL INFORMATION

The ABS consists of wheel speed sensors, brake pedal switch, hydraulic unit and the ABS-ECU. If a problem occurs in the system, the malfunctioning system can be identified by means of the diagnostic function. The diagnosis code will not be erased even if the ignition switch is turned to OFF.

In addition, reading of diagnosis codes, service data and actuator testing are possible using the MUT-II.

Items	Specifications
Speed sensor	Magnet coil type
Front rotor teeth	48
Rear rotor teeth	48

CONSTRUCTION DIAGRAM



15AE047N

1. ABS-ECU
2. Hydraulic unit
3. ABS valve relay
4. ABS motor relay
5. Wheel speed sensor

6. Rotor
7. Diagnosis connector
8. Stop lamp switch
9. ABS warning lamp

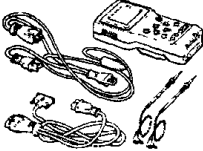
SERVICE SPECIFICATIONS

Items	Standard value
Hydraulic unit inlet solenoid valve internal resistance Ω	8.0–9.0
Hydraulic unit outlet solenoid valve internal resistance Ω	3.8–4.8
Speed sensor's internal resistance $k\Omega$	1.4–1.8
Clearance between the wheel speed sensor mounting surface and the toothed rotor mm	28.2–28.5

SEALANT

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Vacuum switch		

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	For checking ABS
		ROM pack	

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

NOTES WITH REGARD TO DIAGNOSIS

The conditions listed in the following table are considered normal.

Condition	Explanation of condition
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. This is considered normal.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operating (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)
ABS operation (Long braking distance)	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 overconfident.

Diagnosis detection condition depends on the diagnosis code.

When checking to see if the trouble symptom reoccurs after the diagnosis code has been erased, check the detection conditions column in the inspection chart for diagnosis codes (refer to P.35B-6) and the memorise conditions recorded in the "Comments" column of the inspection procedure chart for diagnosis codes in order to carry out testing under driving conditions which satisfy each of the given conditions.

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read the diagnosis codes by the MUT-II or ABS warning lamp. (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)

ERASING DIAGNOSIS CODES

WITH MUT-II

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

WITHOUT MUT-II

1. Press on the brake pedal so that the brake pedal switch is on.
2. Switch the ignition ON.
3. Wait until the ABS warning lamp goes out, then release the brake pedal.
4. "Toggle" the brake pedal so that the ABS-ECU receives a brake pedal switch on signal 9 times in 20 seconds.
5. The warning lamp will illuminate for 1 second to confirm code erasure.

INSPECTION CHART FOR DIAGNOSIS CODES

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

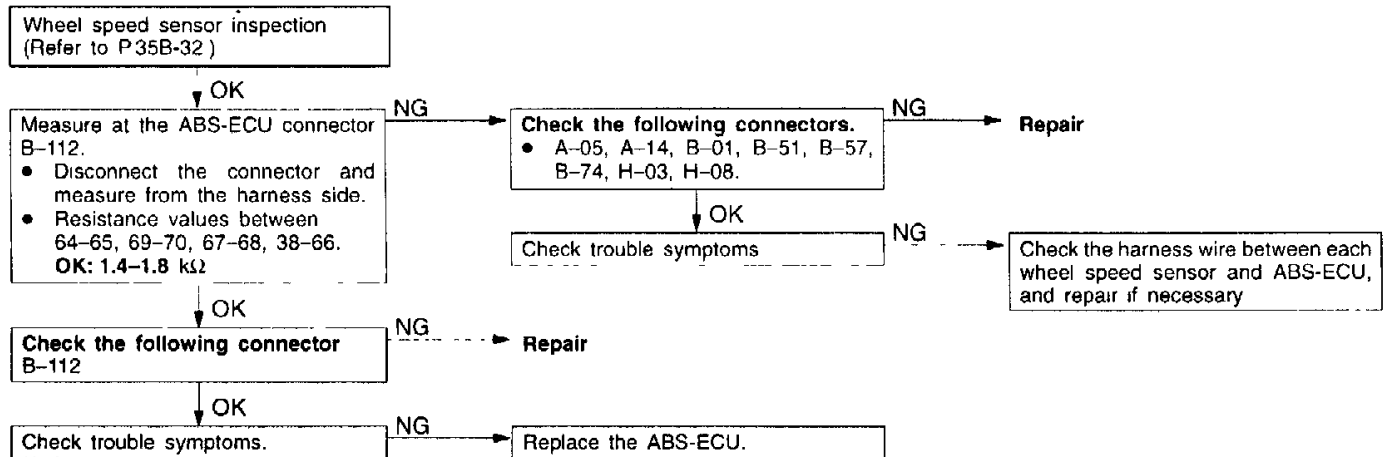
Diagnosis code no.	Inspection item		Detection conditions	Reference page
11	Front right wheel speed sensor	Open circuit	B, C	35B-6
12	Front left wheel speed sensor			
13	Rear right wheel speed sensor			
14	Rear left wheel speed sensor			
15	Wheel speed sensor output signal abnormal		A, B	35B-6
16	Power supply system	Short circuit	A, B, C	35B-7
21	Front right wheel speed sensor			
22	Front left wheel speed sensor			
23	Rear right wheel speed sensor			
24	Rear left wheel speed sensor			
38	Stop light switch system		B, C	35B-8
41	Front right solenoid valve (inlet)	B, C	35B-9	
42	Front left solenoid valve (inlet)			
43	Rear right solenoid valve (inlet)			
44	Rear left solenoid valve (inlet)			
45	Front right solenoid valve (outlet)	B, C	35B-10	
46	Front left solenoid valve (outlet)			
47	Rear right solenoid valve (outlet)			
48	Rear left solenoid valve (outlet)			
51	Valve relay		A, B, C	35B-11
53	Motor relay		B	35B-12
63	ABS-ECU		A, B, C	Replace ABS-ECU

Detection conditions

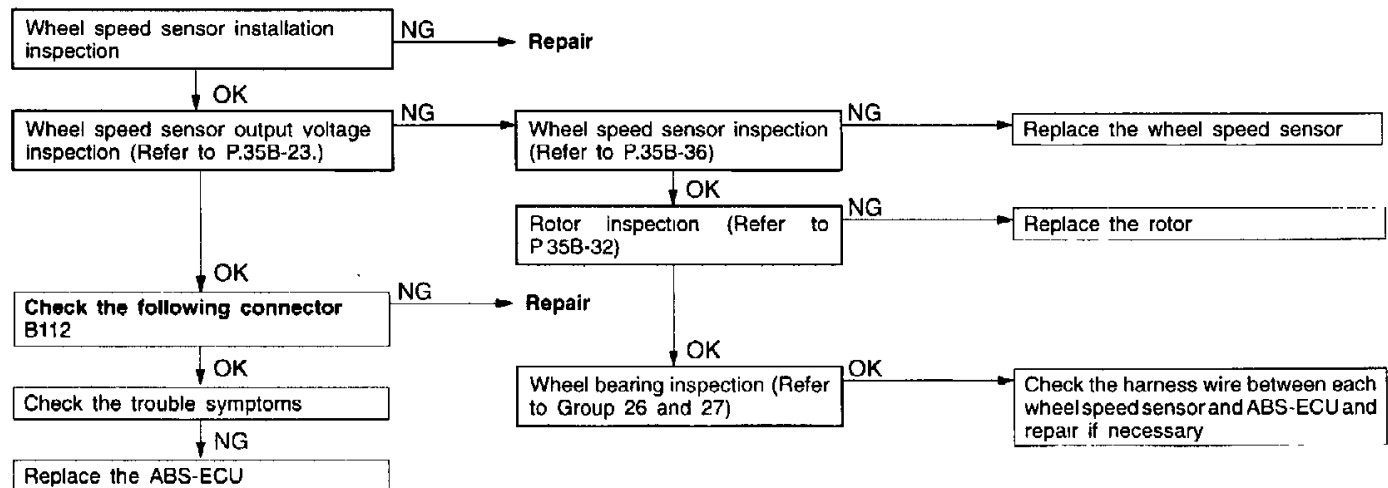
- A: During system check immediately after starting
 B: While ABS control is not operating while driving
 C: While ABS control is operating

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 11, 12, 13, 14 Wheel speed sensor open circuit	Probable cause
These codes are displayed when the sensor with the open circuit can be distinguished.	• Malfunction of wheel speed sensor (Open circuit) • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Code No. 15 Wheel speed sensor (Abnormal output signal)	Probable cause
A wheel speed sensor outputs an abnormal signal (other than an open or short circuit)	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Damaged rotor • Wheel bearing worn or loose • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

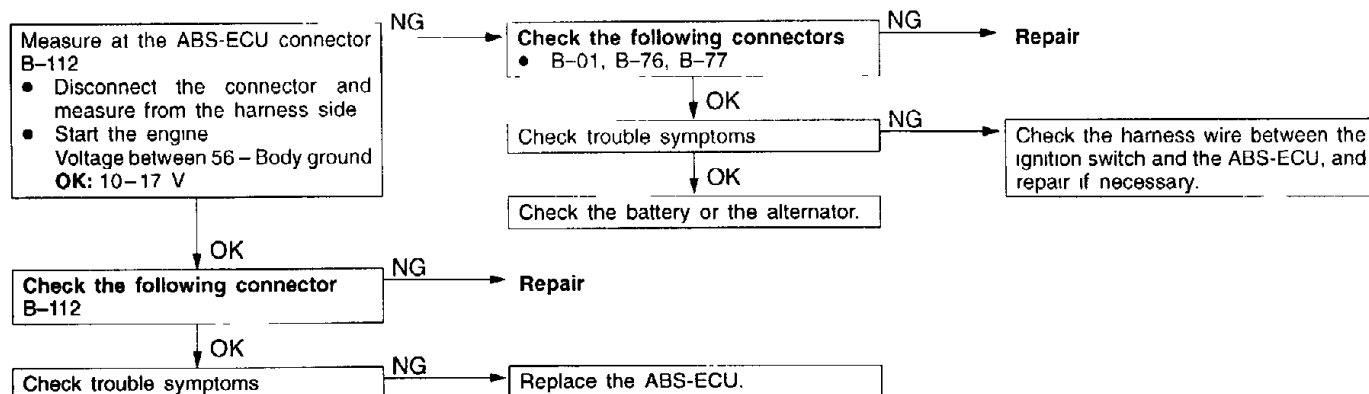


Code No. 16 Power supply system	Probable cause
This diagnosis code is output when the ABS-ECU power voltage is outside the standard value. Furthermore, if the voltage returns to normal, this diagnosis code will not be output.	• Malfunction of wiring harness or connector. • Malfunction of battery or alternator • Malfunction of ABS-ECU

Caution

If the battery voltage drops during inspection, this code will be output as a current problem, and correct diagnosis of the problem cannot be made.

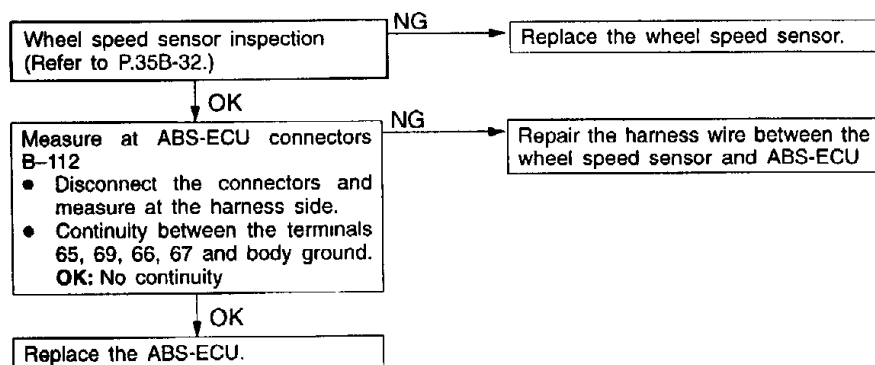
Before carrying out the following inspection, check the battery condition, and recharge it if necessary.



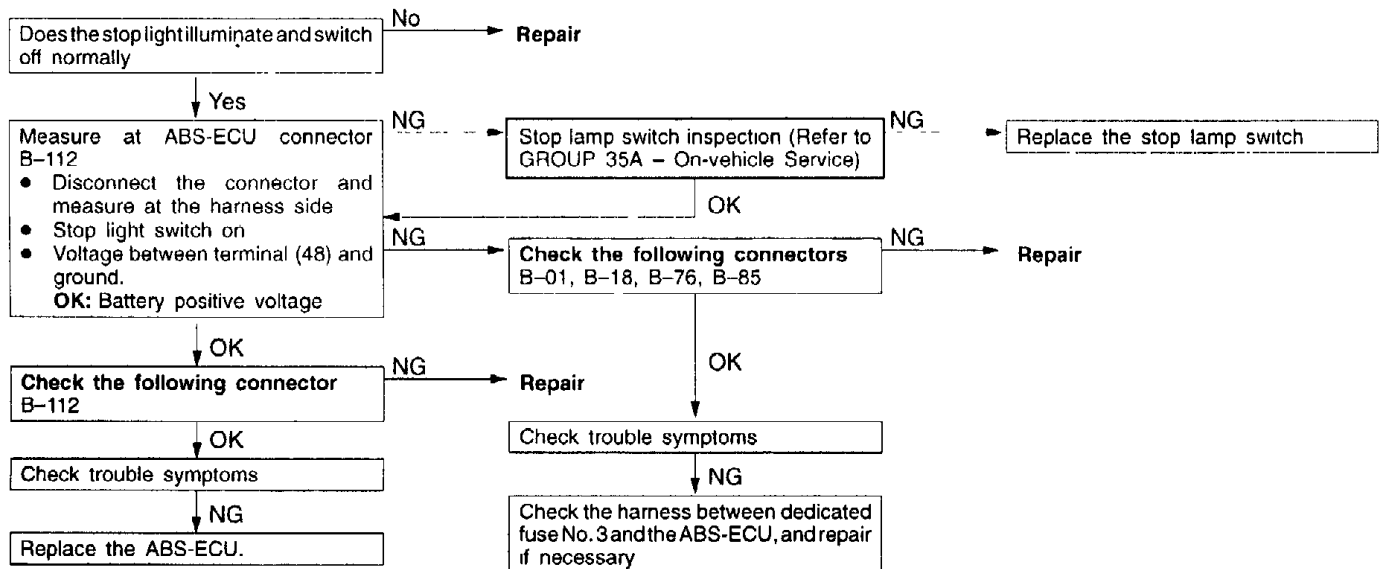
Code No. 21, 22, 23, 24 Wheel speed sensor short circuit	Probable cause
These codes are displayed when the sensor with the short circuited can be distinguished.	• Malfunction of wheel speed sensor • Malfunction of wiring harness • Malfunction of ABS-ECU

NOTE

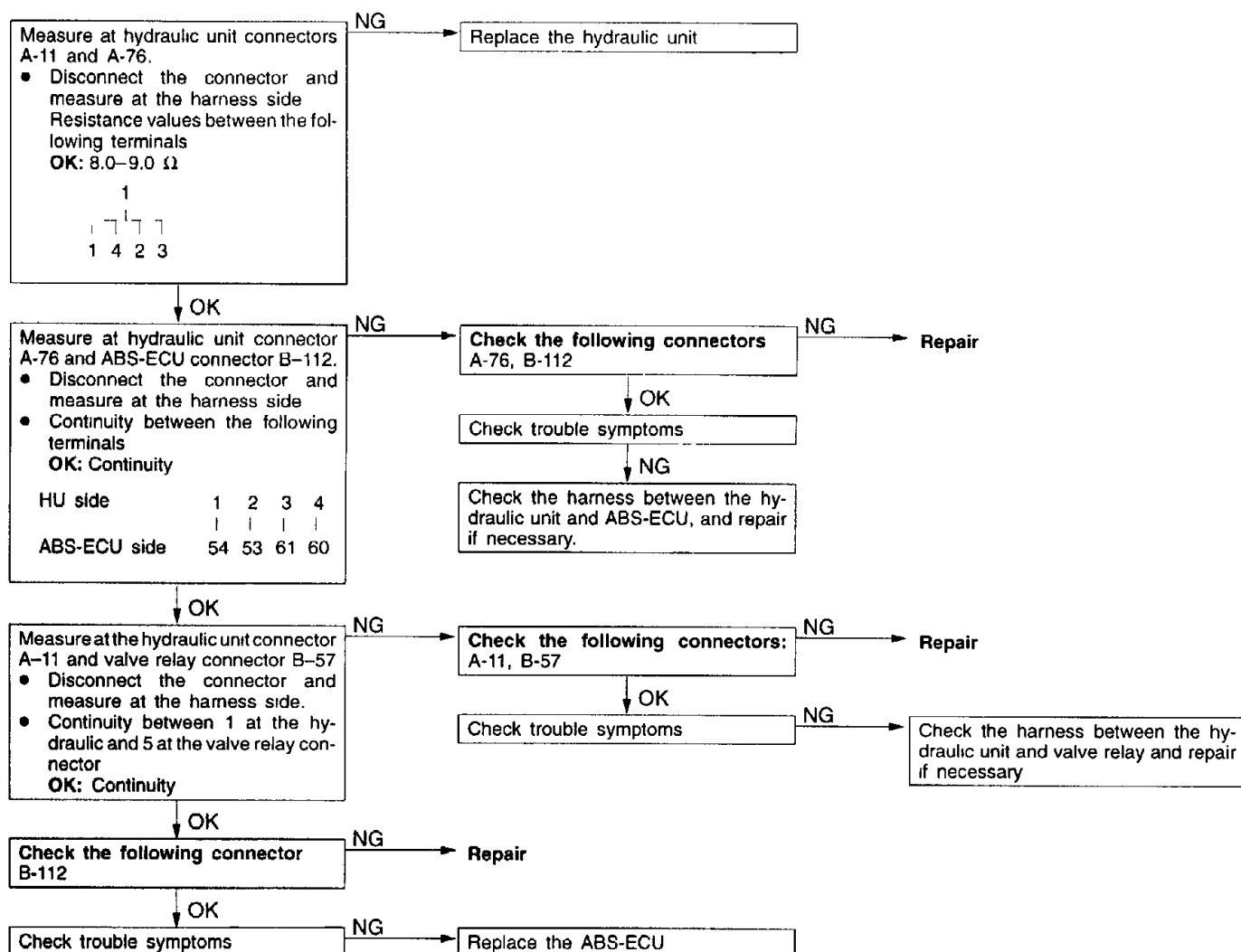
Short circuit is not detected when IG power voltage drops.



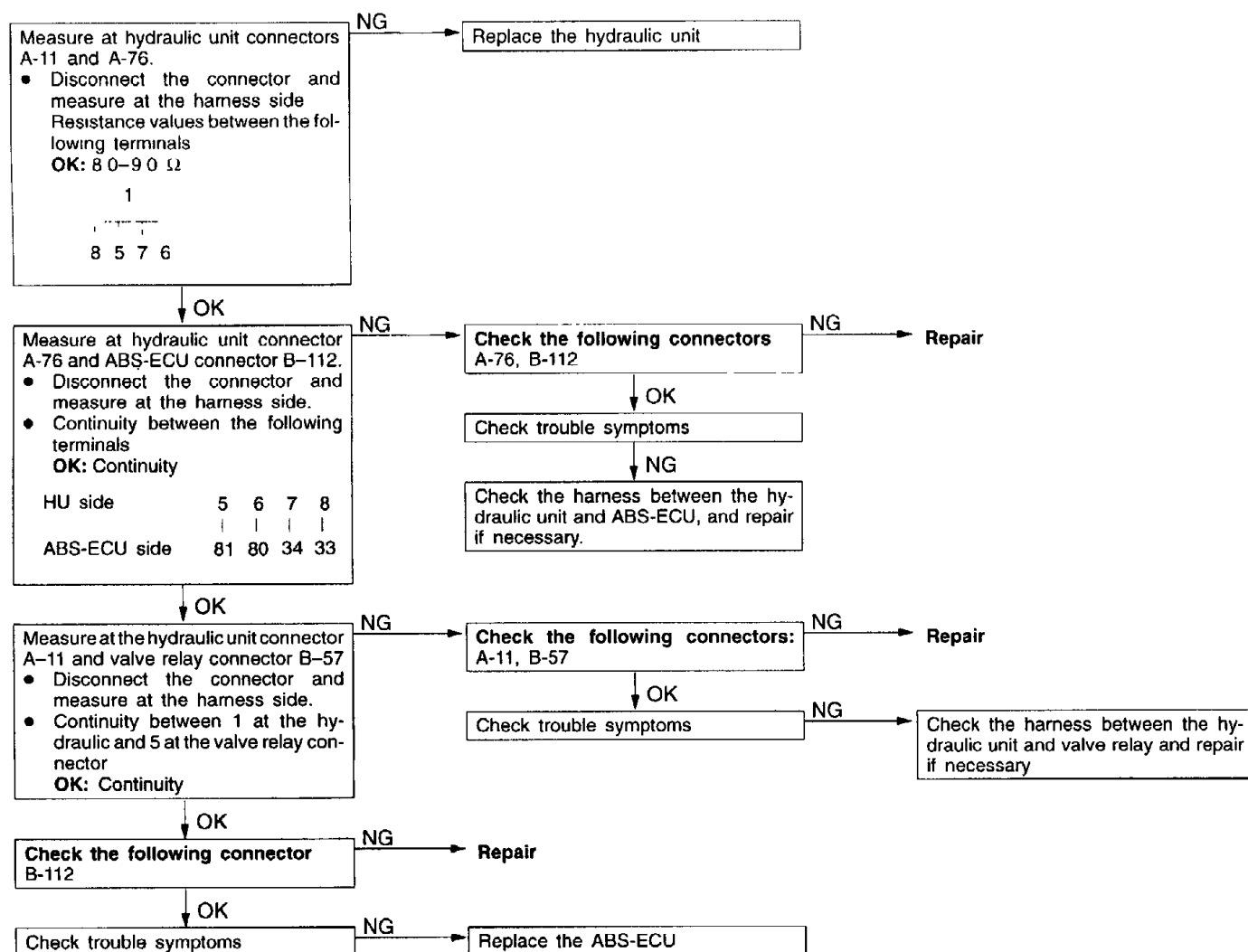
Code No. 38 Stop light switch system	Probable cause
This diagnosis code is output if it is judged to be a short circuit when the stop light switch is ON for a continuous period of 15 minutes or more.	• Malfunction of wiring harness or connector • Malfunction of stop light switch • Malfunction of ABS-ECU



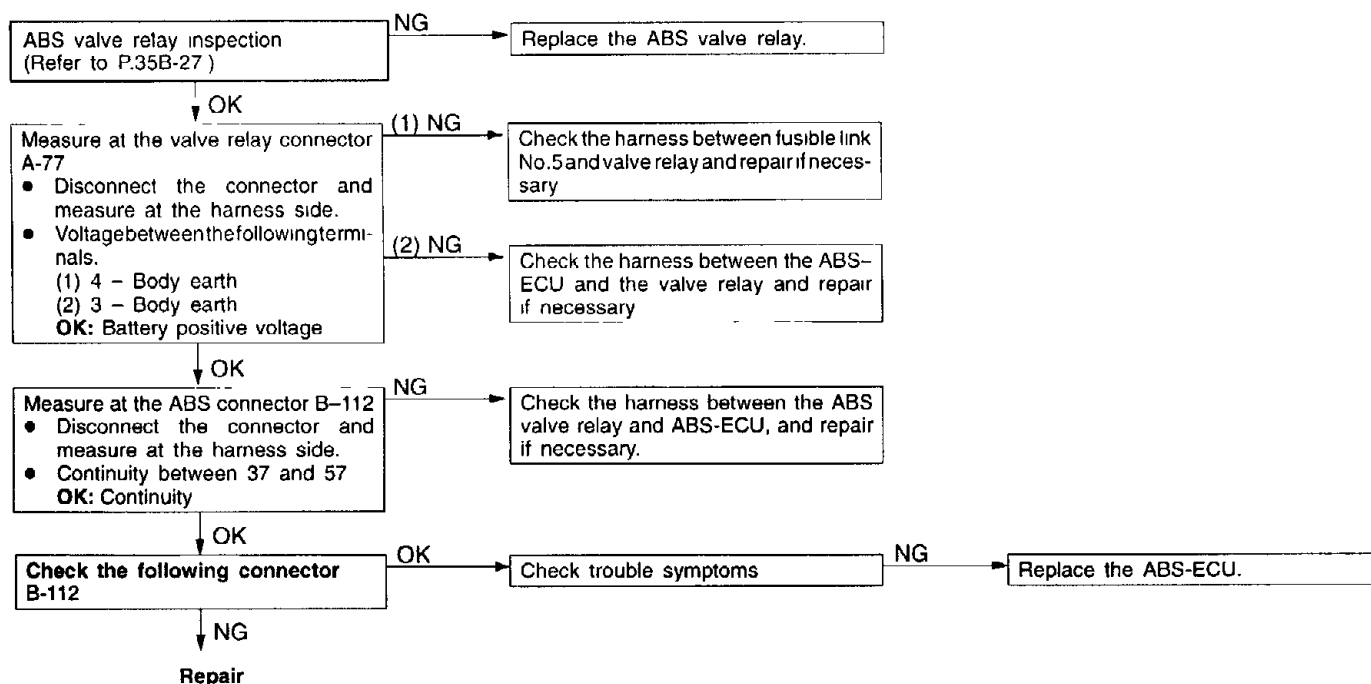
Code No. 41, 42, 43, 44 Solenoid valve (inlet)	Probable cause
The ABS-ECU normally monitors the solenoid valve drive circuit, and determines if there is an open circuit or short circuit in the solenoid coil or in the harness, i.e. no current flows in the solenoid even though the ABS-ECU turns it on, and vice versa.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU



Code No. 45, 46, 47, 48 Solenoid valve (outlet)	Probable cause
The ABS-ECU normally monitors the solenoid valve drive circuit, and determines if there is an open circuit or short circuit in the solenoid coil or in the harness, i.e. no current flows in the solenoid even though the ABS-ECU turns it on, and vice versa.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU



Code No. 51 Valve relay	Probable cause
When the ignition switch is turned to ON, the ABS-ECU switches the valve relay off and on during the initial check to check if the valve relay is operating normally.	• Malfunction of ABS valve relay • Malfunction of wiring harness or connector • Malfunction of ABS-ECU • Malfunction of hydraulic unit

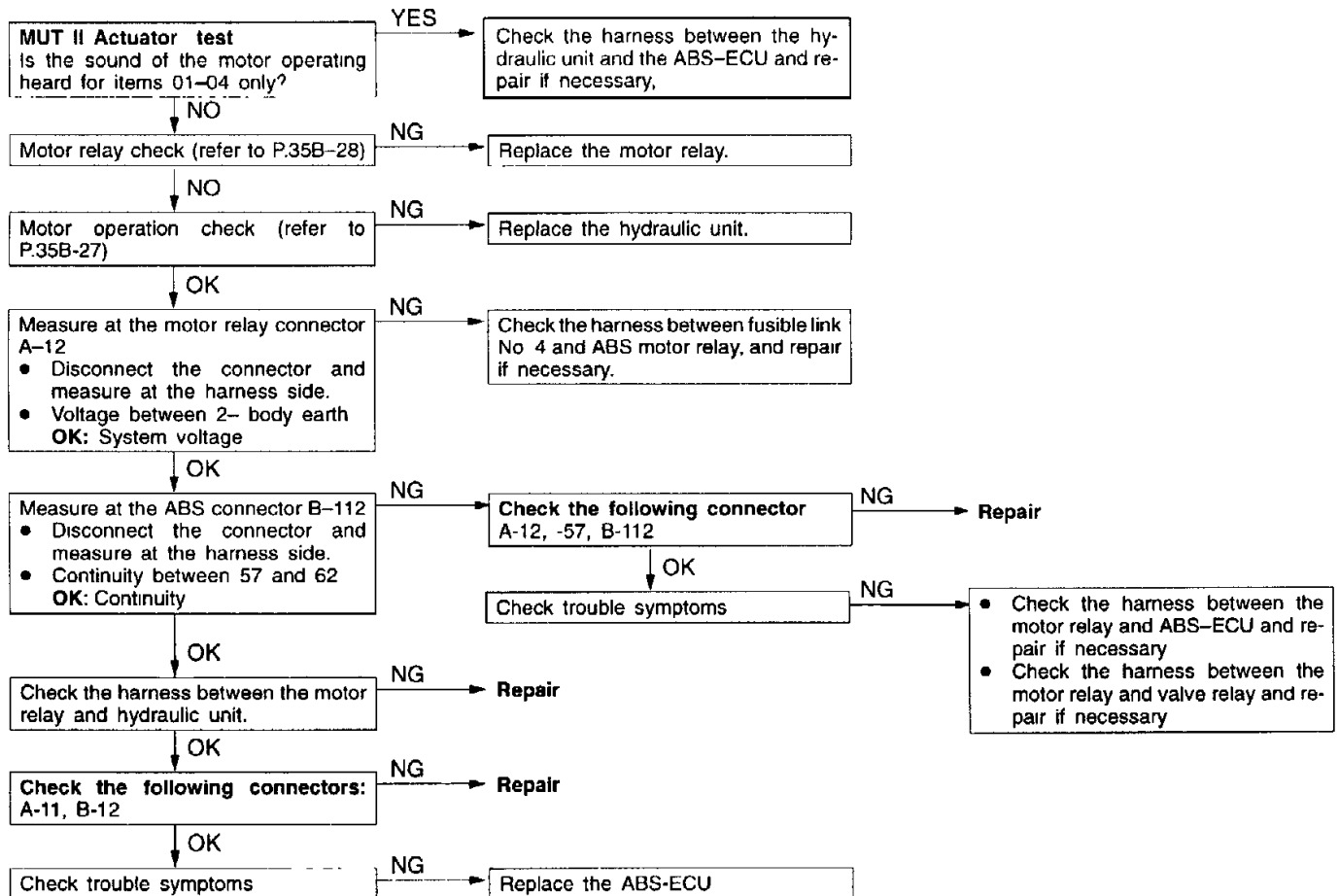


Code No. 53 Motor relay, motor	Probable cause
The code is output at the following times: - When the motor relay is on but no signal is input to the motor monitor line (motor is not operating etc.). - When the motor relay is off but a signal is input to the motor monitor line (motor continues operating etc.).	- Malfunction of ABS motor relay - Malfunction of wiring harness or connector - Malfunction of hydraulic unit - Malfunction of ABS-ECU

WHEN THE MOTOR DOES NOT RUN

Caution

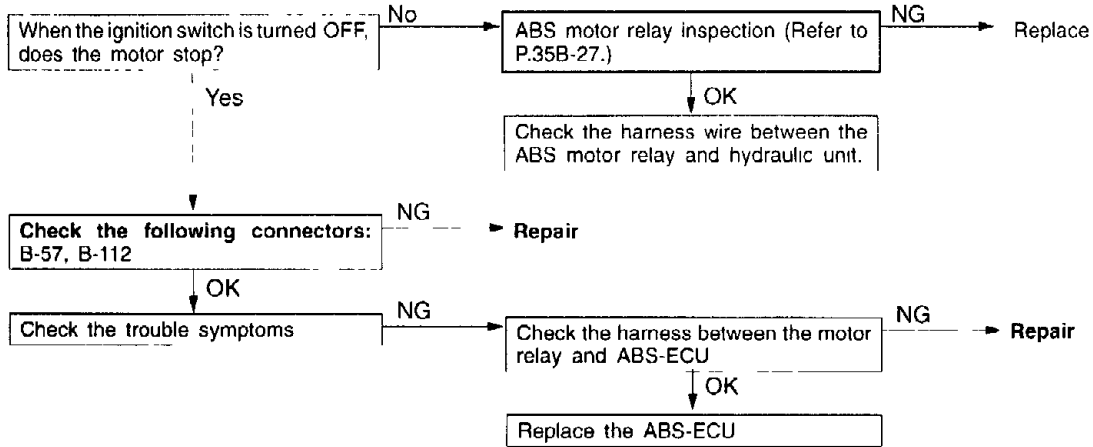
Because force-driving of the motor by means of the actuator test will drain the battery, the engine should be started and left to run for a while after testing is completed.

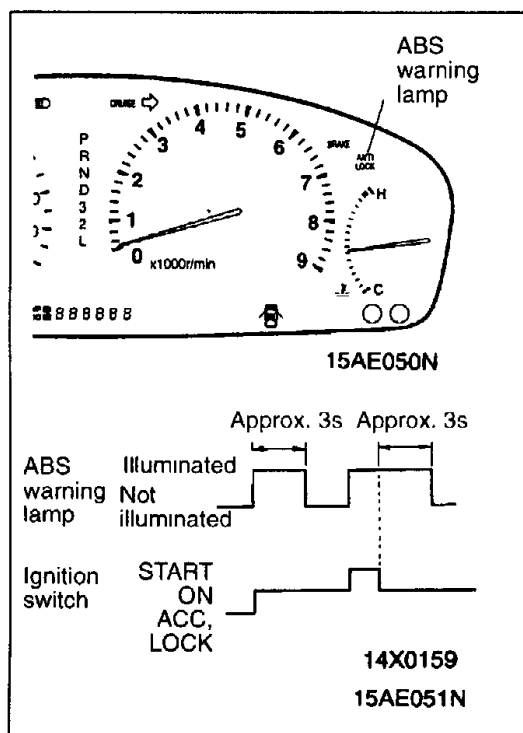


Continued next page

WHEN THE MOTOR KEEPS RUNNING**Caution**

If there is a melted contact in the motor relay, the motor will keep turning, even if the ignition switch is turned to OFF. In such a case, immediately remove the fusible link No. 5 or disconnect the hydraulic unit connector A-11 or motor relay connector A-12. Excessive running of the motor will drain the battery.





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 diagnostic trouble 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	35B-15
	Communication with ABS only is not possible.	2	35B-15
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate.		3	35B-16
After the engine starts, the lamp remains illuminated.		4	35B-17
Faulty ABS operation	Unequal braking power on both sides	5	35B-18
	Insufficient braking power		
	ABS operates under normal braking conditions		
	ABS operates before vehicle stops under normal braking conditions		
	Large brake pedal vibration when ABS operates		
	Large brake pedal vibration (Caution 2.)	-	-

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, changes in the feeling of the brake pedal (vibration may occur or pedal may not be able to be depressed). Such changes are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking, and is considered normal.

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

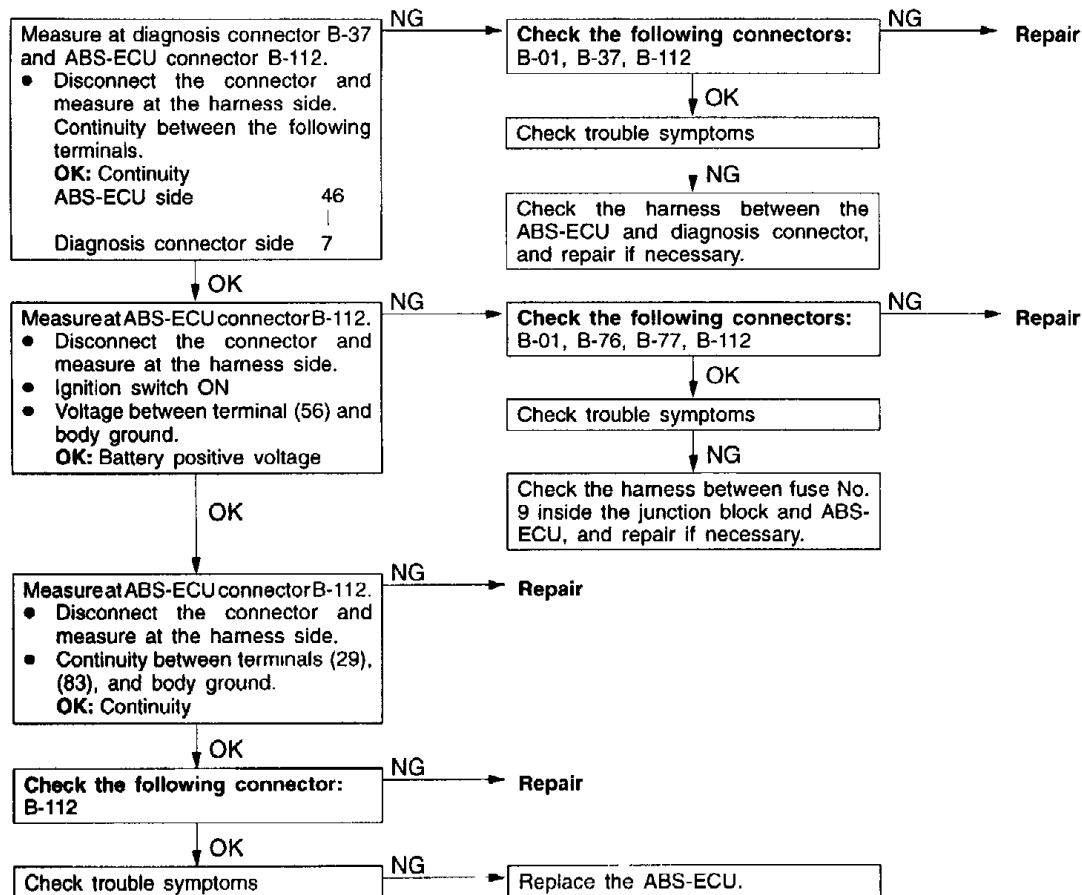
INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The reason is probably a defect in the power supply system (including ground) for the diagnostic line.	• Malfunction of connector • Malfunction of harness

Refer to GROUP 13A – Troubleshooting

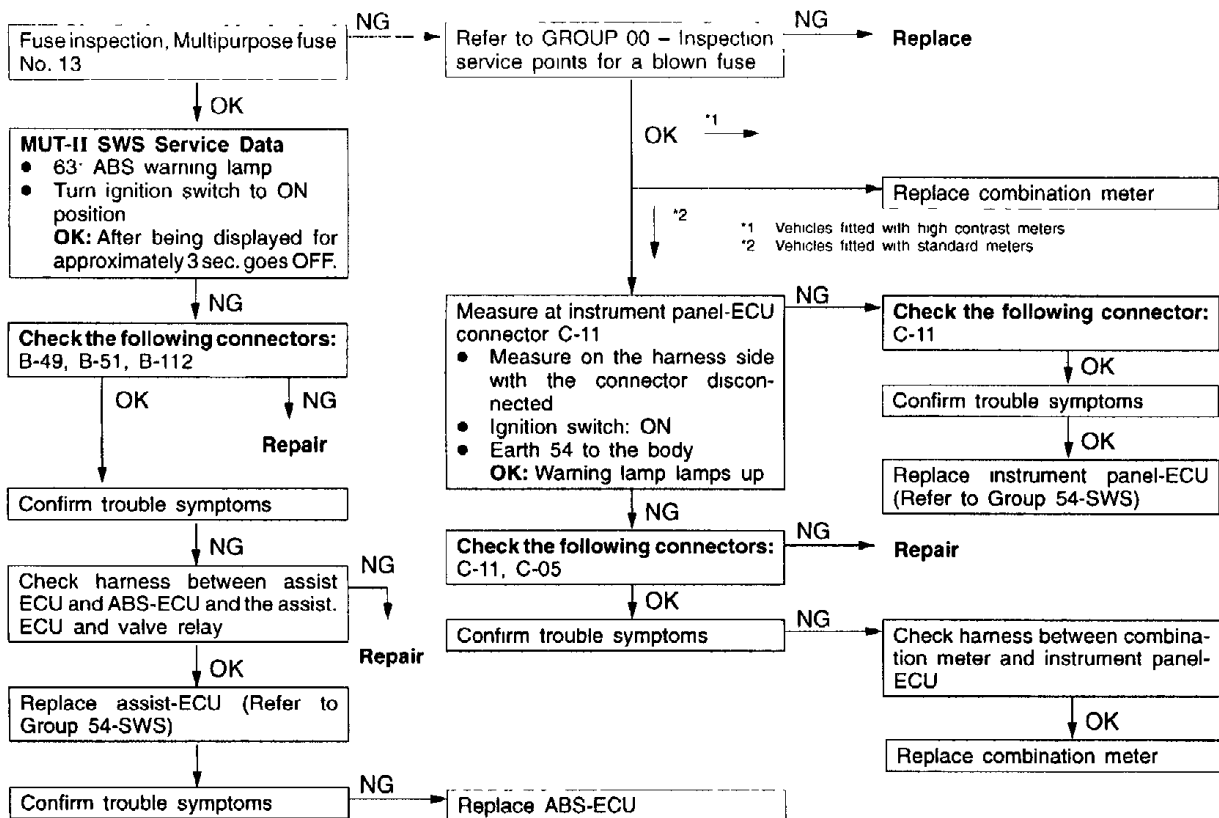
INSPECTION PROCEDURE 2

Communication with MUT-II is not possible. (Communication with ABS only is not possible.)	Probable cause
When communication with the MUT-II is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnostic output circuit	• Blown fuse • Malfunction of wiring harness or connector • Malfunction of ABS power relay • Malfunction of ABS-ECU



INSPECTION PROCEDURE 3

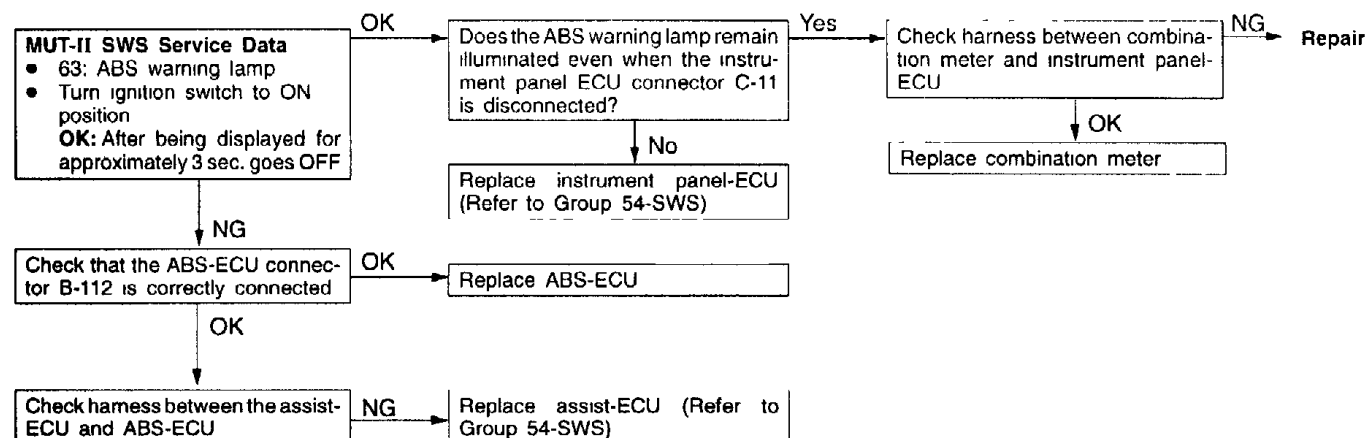
When ignition key is turned to “ON” (engine stopped), ABS warning lamp does not illuminate	Probable cause
The cause may be an open circuit in the lamp power supply circuit, a blown lamp bulb, an open circuit in both the circuit between the ABS warning lamp and the ABS-ECU	• Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector • Malfunction of ABS-ECU • Malfunction of Assist-ECU • Malfunction of Instrument Panel-ECU



INSPECTION PROCEDURE 4

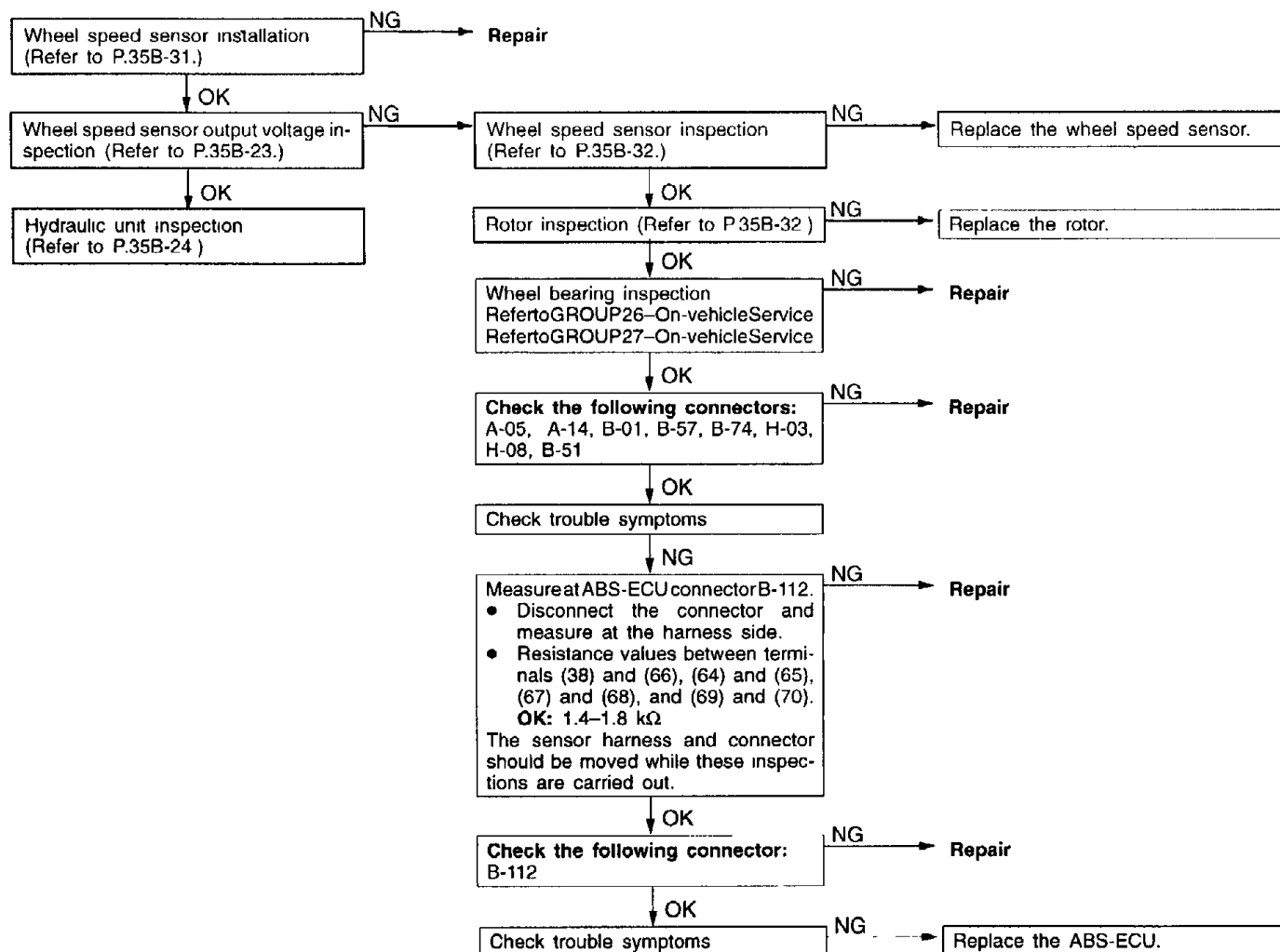
Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
The cause may be a short circuit in the ABS warning lamp illumination circuit or an incorrectly secured connector at the ABS-ECU.	• Combination meter fault • ABS-ECU fault • Harness fault (short) • Assist-ECU fault • Instrument panel-ECU fault

This breakdown phenomenon is restricted to circumstances where communication with the MUT-II is possible (ABS-ECU power supply normal), and when the diagnosis code is normal.



INSPECTION PROCEDURE 5

Brake operation is abnormal	Probable cause
This varies depending on the driving conditions and the road surface conditions, so problem diagnosis is difficult. However, if a normal diagnosis code is displayed, carry out the following inspection.	• Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU



DATA LIST REFERENCE TABLE

With the MUT-II, check the data list for the items listed.

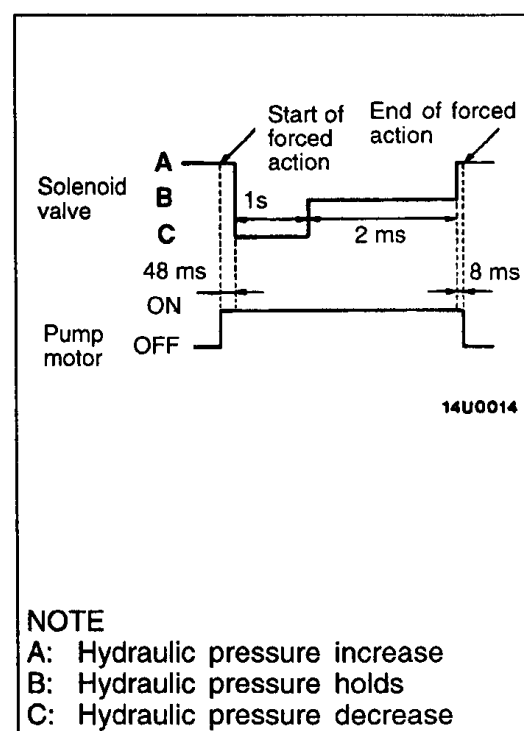
Item No.	Check point	Check condition	Normal condition
11	Front right wheel speed sensor	Check by actually operating vehicle.	Speedometer indication and MUT-II indication are the same.
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
16	Battery positive voltage	IG power voltage and valve monitor voltage	9–16 V
33	Stop lamp switch	Depress brake pedal.	ON
		Release brake pedal.	OFF

ACTUATOR TEST REFERENCE TABLE

The MUT-II activates the following actuators for testing.

NOTE

1. If the ABS-ECU is not functional, actuator testing cannot be carried out.
2. Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h, forced actuation will be cancelled.
3. During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.

**ACTUATOR TEST SPECIFICATIONS**

No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

CHECK AT THE ABS-ECU**TERMINAL VOLTAGE CHECK CHART**

1. Turn the ignition switch to OFF.
2. Disconnect the ABS-ECU connector.
3. Measure the voltage at the terminals of the ABS-ECU harness-side connector while referring to the check chart.

NOTE

1. When measuring voltage, a harness for checking contact pin pressure should be used instead of inserting a test probe.
2. Checks do not have to be carried out in the order given in this chart.

Caution

Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, ABS-ECU, or all three. Use care to prevent this!

4. If voltmeter shows any deviation from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
5. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

[illegible]

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Item No.	Check point	Check condition	Normal condition
81	F.R. solenoid valve <Outlet> (Output) of hydraulic unit	Ignition switch: ON (when solenoid valve turns OFF approximately 1 second after the engine is started)	Battery positive voltage
54	F.R. solenoid valve <Inlet> (Output) of hydraulic unit		
53	R.L. solenoid valve <Inlet> (Output) of hydraulic unit		
48	Stop lamp switch (Input)	Ignition switch: ON (Stop lamp switch ON)	Battery positive voltage
		Ignition switch: ON (Stop lamp switch OFF)	1.0 V or less
57	Memory power supply	At all times	Battery positive voltage
56	ECU power supply	Ignition switch: ON	Battery positive voltage
80	R.L. solenoid valve <Outside> (Output) of hydraulic unit	Ignition switch: ON (when solenoid valve turns OFF approximately 1 second after the engine is started)	Battery positive voltage
30	ABS warning lamp (Output)	Ignition switch: ON	When lamp is switched off Battery positive voltage
			When lamp is illuminated 0-2 V
33	F.L. solenoid valve <Outlet> (Output) of hydraulic unit	Ignition switch: ON (when solenoid valve turns OFF approximately 1 second after the engine is started)	Battery positive voltage
60	F.L. solenoid valve <Inlet> (Output) of hydraulic unit		
34	R.R. solenoid valve <Outlet> (Output) of hydraulic unit	Ignition switch: ON (when solenoid valve turns OFF approximately 1 second after the engine is started)	Battery positive voltage
61	R.R. solenoid valve <Inlet> (Output) of hydraulic unit		

1. Turn the ignition switch to OFF.
2. Disconnect the ABS-ECU connector.
3. Measure the resistance and check for continuity between the terminals of the ABS-ECU harness-side connector while referring to the check chart.

1. When measuring resistance and checking continuity, a harness for checking contact pin pressure should be used instead of inserting a test probe.
2. Checks do not have to be carried out in the order given in this chart.

If resistance or continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ABS-ECU, and/or ohmmeter may occur. Use care to prevent this!

- [illegible]

Terminal No.	Name of circuit	Check requirements	Terminal voltage
38–66	Rear right wheel speed sensor	Ignition switch: OFF	1.4–1.8 kΩ
62–57	Motor relay coil	Ignition switch: OFF	Continuity
64–65	Front left wheel speed sensor	Ignition switch: OFF	1.4–1.8 kΩ
83–earth	ABS-ECU earth	—	Continuity
29–earth	ABS-ECU earth	—	Continuity
37–57	Valve relay coil	Ignition switch: OFF	Continuity
67–68	Rear left wheel speed sensor	Ignition switch: OFF	1.4–1.8 kΩ
69–70	Front right wheel speed sensor	Ignition switch: OFF	1.4–1.8 kΩ

ON-VEHICLE SERVICE

BLEEDING

Caution

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

Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING

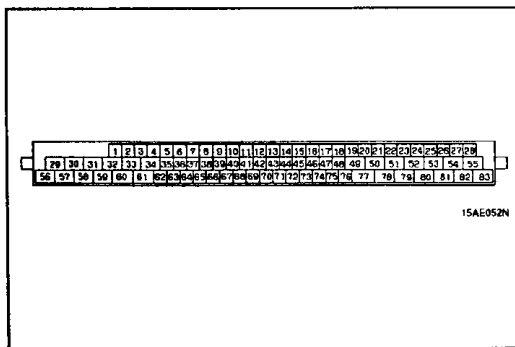
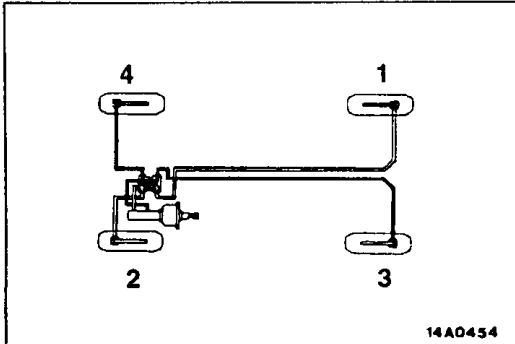
Refer to GROUP 35A – On-vehicle Service.

BRAKE LINE BLEEDING

Start the engine and bleed the air in the sequence shown in the figure.

Caution

For vehicles with ABS, be sure to filter/strain the brake fluid being added to the master cylinder reservoir tank. Debris may damage the HU.



ABS OPERATION CHECK

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ECU harness connector and measure from the harness side connector.

Caution

Use a special tool (inspection harness for connector pin contact pressure) to measure the output voltage at the harness side connector to prevent damaging the connector terminals.

3. Rotate the wheel to be measured at approximately 1/2–1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

Wheel speed sensor	Front left	Front right	Rear left	Rear right
Terminal No.	64	69	67	38
	65	70	68	66

Output voltage

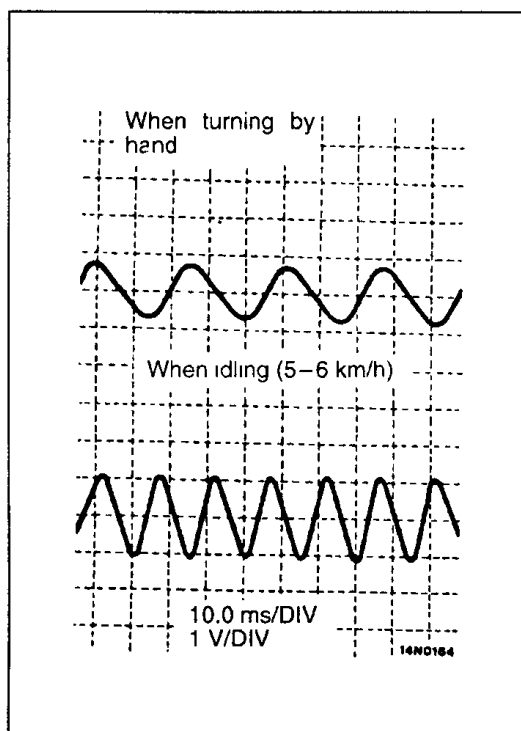
When measuring with a circuit tester:

50 mV or more

When measuring with an oscilloscope:

20 mV p-p or more

4. If the output voltage is lower than the above values, the reason could be as follow:
 - Faulty wheel speed sensor.
 So replace the wheel speed sensor.



Inspecting Wave Forms With An Oscilloscope

Use the following method to observe the output voltage wave form from each wheel sensor with an oscilloscope

- Start the engine, and rotate the front wheels by engaging D range. Turn the rear wheels manually so that they rotate at a constant speed.

NOTE

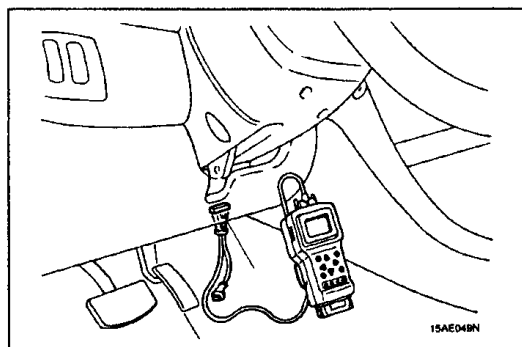
- Check the connection of the sensor harness and connector before using the oscilloscope.
- The wave form measurements can also be taken while the vehicle is actually moving.
- The output voltage will be low when the wheel speed is low, and similarly it will be higher as the wheel speed increases.

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
Noisy or disturbed waveform	Open circuit in sensor	Replace sensor
	Open circuit in harness	Correct harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	Rotor with missing or damaged teeth	Replace rotor

NOTE

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 INSPECTION

Caution

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

- 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.

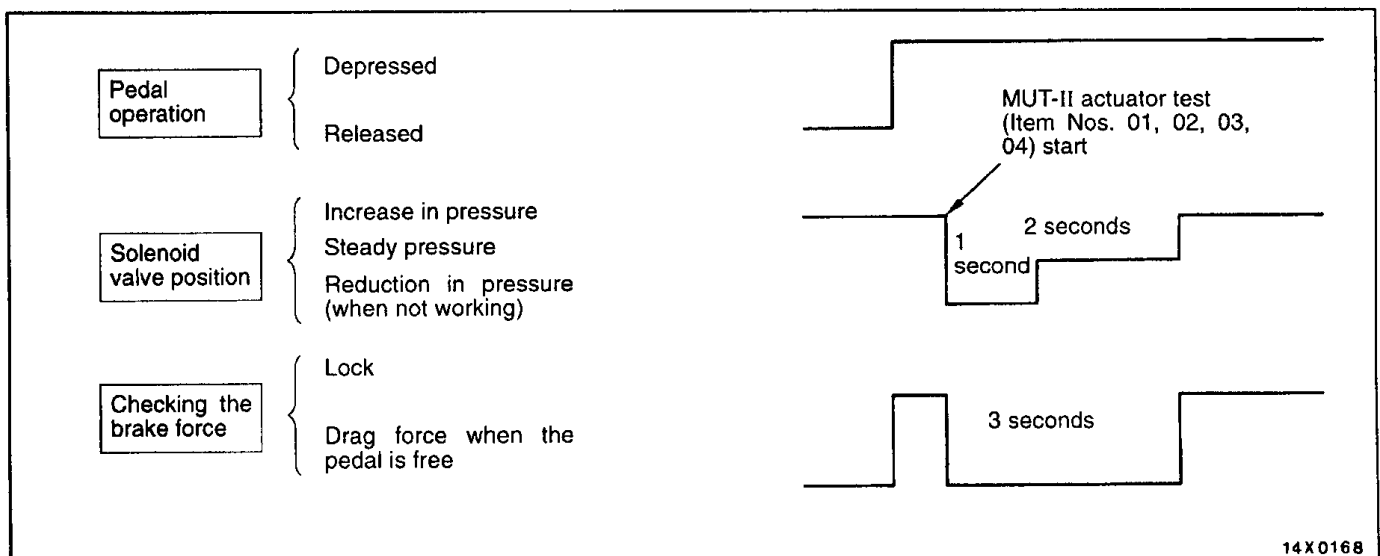
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel.
When using the braking force tester, take a reading of the brake drag force.
3. Turn the ignition key to the OFF position and set the MUT-II as shown in the diagram.
4. After checking that the selector lever is in neutral, start the engine.

NOTE

- (1) At this time, the ABS system will switch to the MUT-II mode and the ABS warning lamp will illuminate.
- (2) When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.
5. Use the MUT-II to force-drive the actuator.
6. 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 to be sure that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven.

Front wheel	785–981 N (80 – 100 kgf)
Rear wheel	294–490 N (30 – 50 kgf)

The result should be as shown in the following diagram.

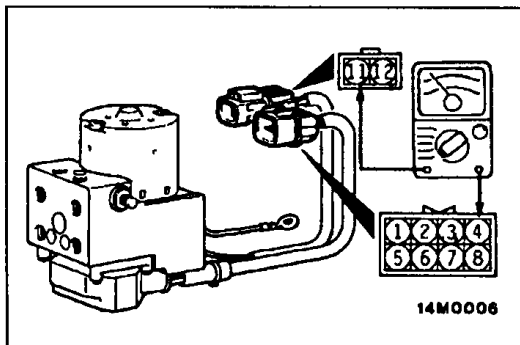


7. If the result of inspection is abnormal, correct according to the "Diagnosis Table."

Diagnosis Table

No.	Operation	Judgement-Normal	Judgement-Abnormal	Probable cause	Remedy
01	(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 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 HU	Check and clean brake line
02				Clogged hydraulic circuit in HU	Replace HU assembly
03			Brake force is not released	Incorrect HU brake tube connection	Connect correctly
04				HU solenoid valve not functioning correctly	Replace HU assembly

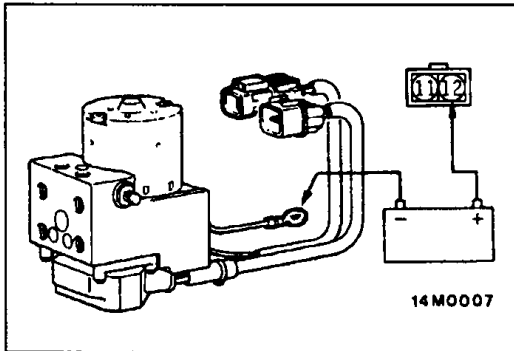
8. After inspection, disconnect the MUT-II immediately after turning the ignition switch to OFF.



SOLENOID VALVE CHECK

Measure the resistance between terminals.

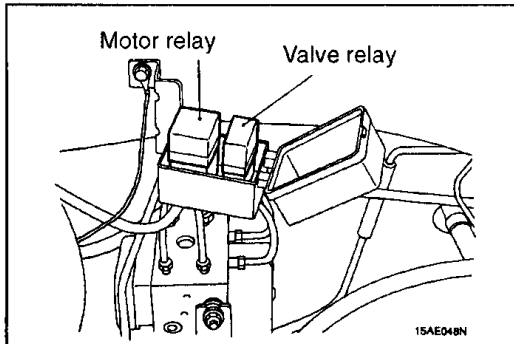
Solenoid valve	Measurement terminals	Resistance between terminals
Front IN (right side)	1 - 11	8.0-9.0Ω
Front IN (left side)	4 - 11	
Rear IN (right side)	3 - 11	
Rear IN (left side)	2 - 11	
Front OUT (right side)	5 - 11	3.8-4.8Ω
Front OUT (left side)	8 - 11	
Rear OUT (right side)	7 - 11	
Rear OUT (left side)	6 - 11	

**MOTOR OPERATION CHECK**

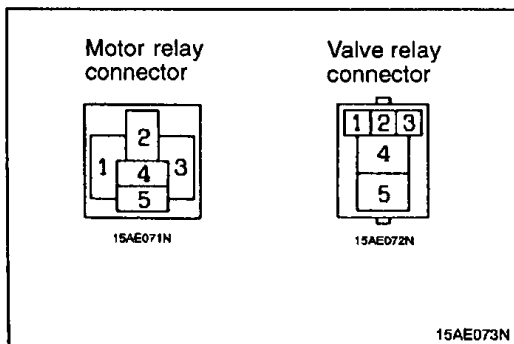
Connect the battery and check to be sure that the sound of the hydraulic unit motor operating can be heard.

Caution

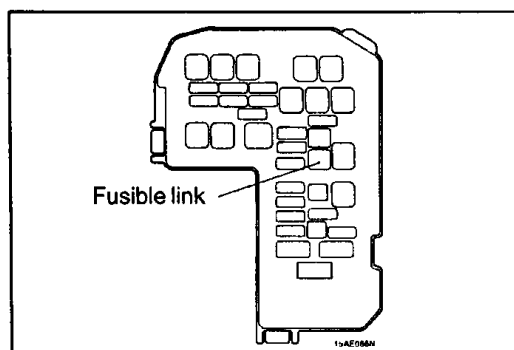
The battery power should not be applied for more than 1 second.

**MOTOR RELAY CHECK**

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

**VALVE RELAY CHECK**

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

**REMEDY FOR A FLAT BATTERY**

When booster cables are used to start the engine when the battery is completely discharged and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire or stall, making driving difficult.

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 charged, install the fusible link (for ABS) and restart the engine; then check to be sure the ABS warning lamp is not illuminated.

PROPORTIONING VALVE

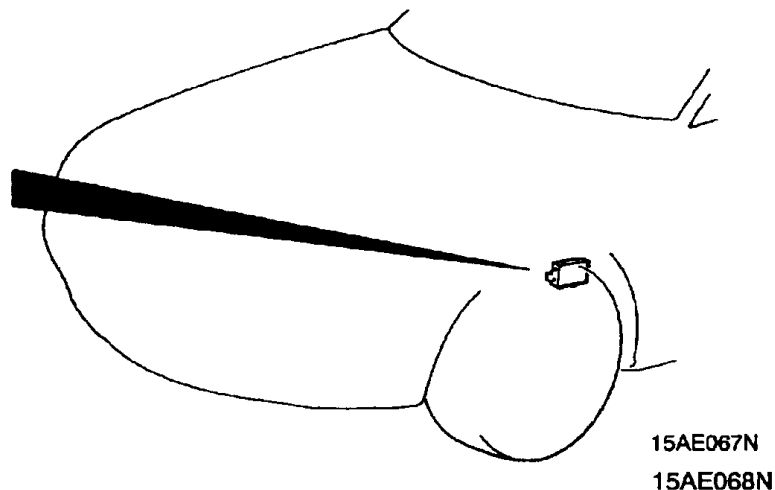
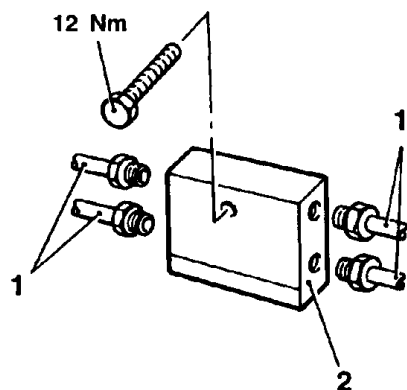
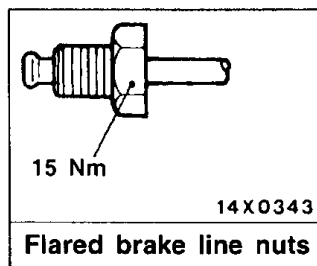
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

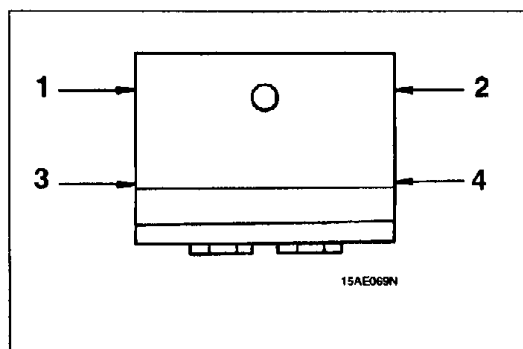
Post-installation Operation

- Brake Fluid Supplying
- Brake Lines Bleeding (Refer to P.35B-23.)



Removal steps

- A◄
1. Brake pipe
 2. Proportioning valve



INSTALLATION SERVICE POINT

►A◄ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – Hydraulic unit
4. Proportioning valve – Hydraulic unit

HYDRAULIC UNIT

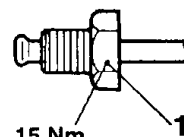
REMOVAL AND INSTALLATION

Pre-removal Operation

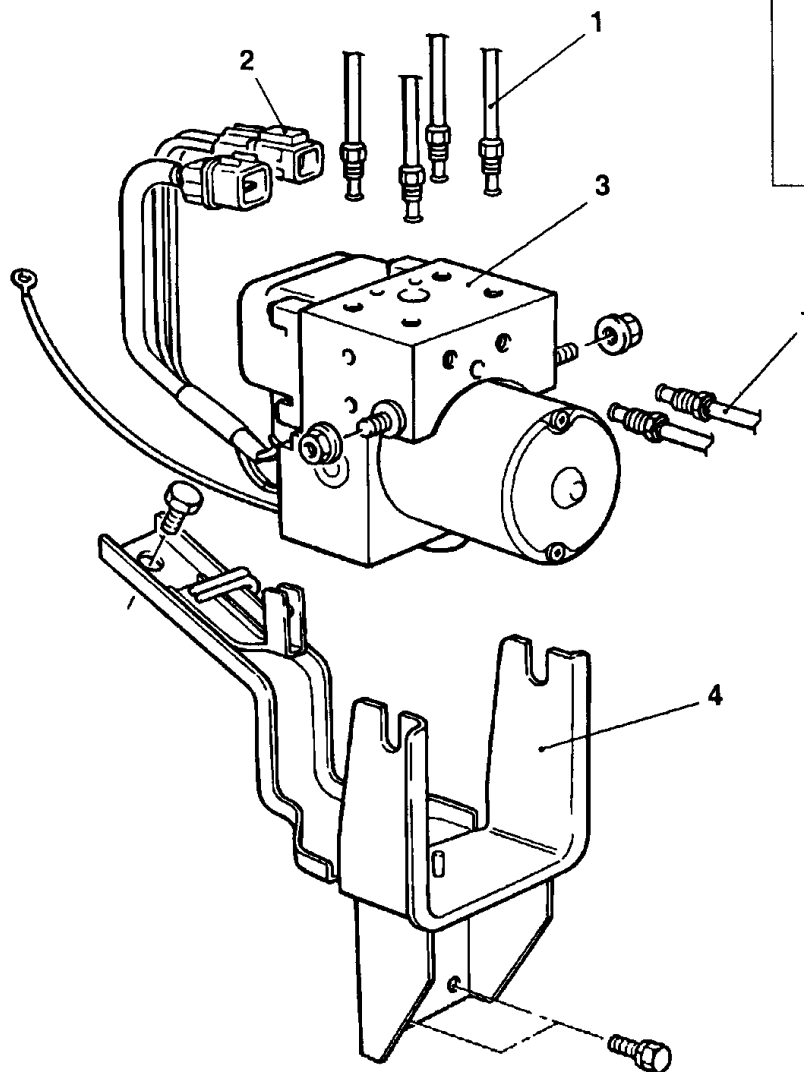
- Brake Fluid Draining
- Air Intake Hose Removal

Post-installation Operation

- Installation of the Air Intake Hose Removal
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35B-23.)
- Hydraulic Unit Checking (Refer to P.35B-24.)

Flared brake line nuts

14X0343



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Removal steps

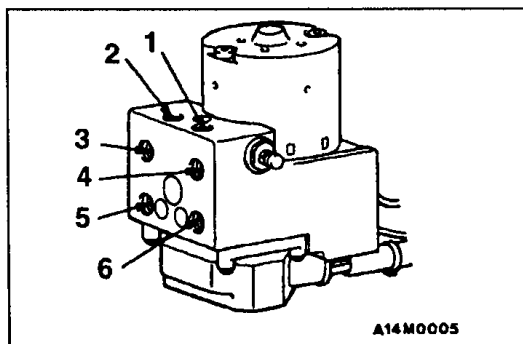
1. Connection for brake pipe
2. Connection for harness connector



3. Hydraulic unit
4. Hydraulic unit bracket

REMOVAL SERVICE POINT**◀A▶ HYDRAULIC UNIT REMOVAL****Caution**

1. The hydraulic unit is heavy, and so care should be taken when removing it.
2. The hydraulic unit is not to be disassembled; its nuts and bolts must not be loosened.
3. The hydraulic unit must not be dropped or otherwise subjected to impact shocks.
4. The hydraulic unit 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 as shown in the illustration.

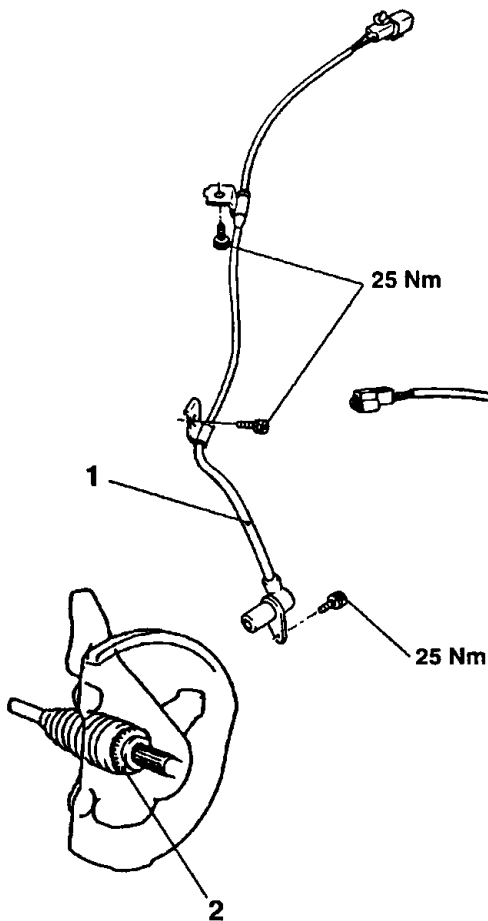
1. To the proportioning valve (R.H. Rear)
2. To the proportioning valve (L.H. Rear)
3. From the master cylinder (primary)
4. From the master cylinder (secondary)
5. To the front brake (R.H.)
6. To the front brake (L.H.)

WHEEL SPEED SENSOR REMOVAL AND INSTALLATION

Post-installation Operation

- Wheel Speed Sensor Output Voltage Checking
(Refer to P.35B-23.)

Front



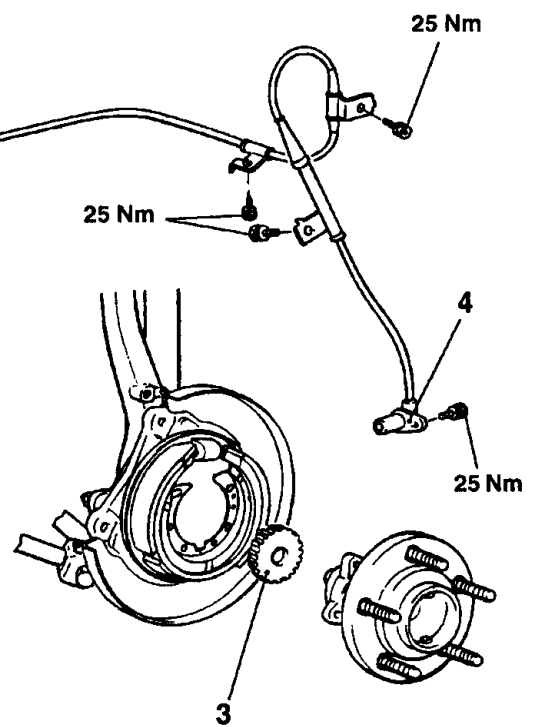
Front speed sensor removal steps

1. Front speed sensor
2. Front rotor (Refer to GROUP 26 – Drive Shaft)

NOTE

The front rotor is integrated with the drive shaft and is not disassembled.

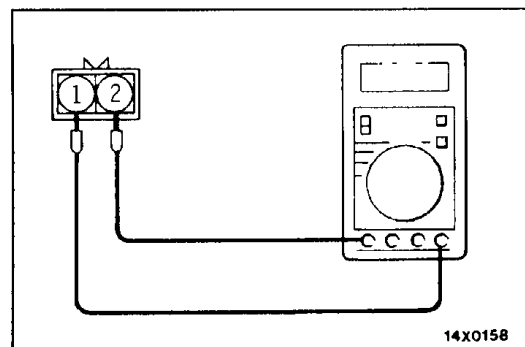
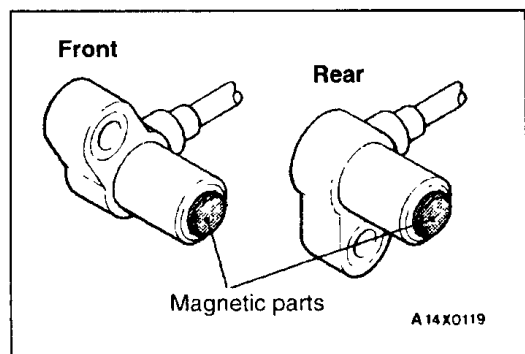
Rear



Rear speed sensor removal

3. Rear rotor (Refer to GROUP 27 – Rear Axle Hub)
4. Rear speed sensor

15TE045A



INSPECTION

SPEED SENSOR

1. Check whether any metallic foreign material has adhered to the parts shown in the illustration at the speed sensor tip, and if so, remove it.

NOTE

The section shown in the illustration can become magnetised because of the magnet built into the speed sensor, with the result that foreign metallic material is attached to it.

2. Measure the resistance between the speed sensor terminals.

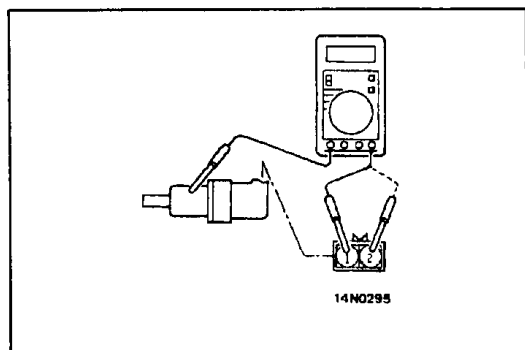
Standard value: 1.4–1.8 k Ω

If the internal resistance of the speed sensor is not within the standard value, replace with a new speed sensor.

3. 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 an intermittent contact results. Check the connector connection and the terminal insertion.



SPEED SENSOR INSULATION INSPECTION

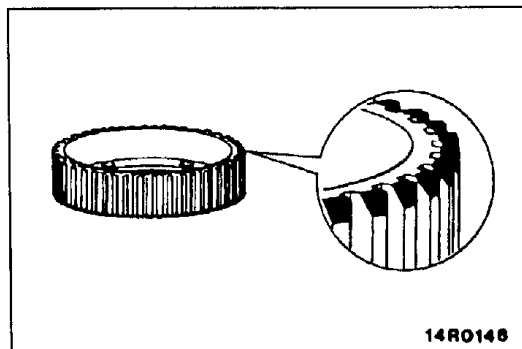
1. Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

Standard value: 100 k Ω or more

2. If the speed sensor insulation resistance is outside the standard value range, replace with a new speed sensor.

TOOTHED ROTOR

Check whether rotor teeth are broken or deformed, and, if so, replace the rotor.

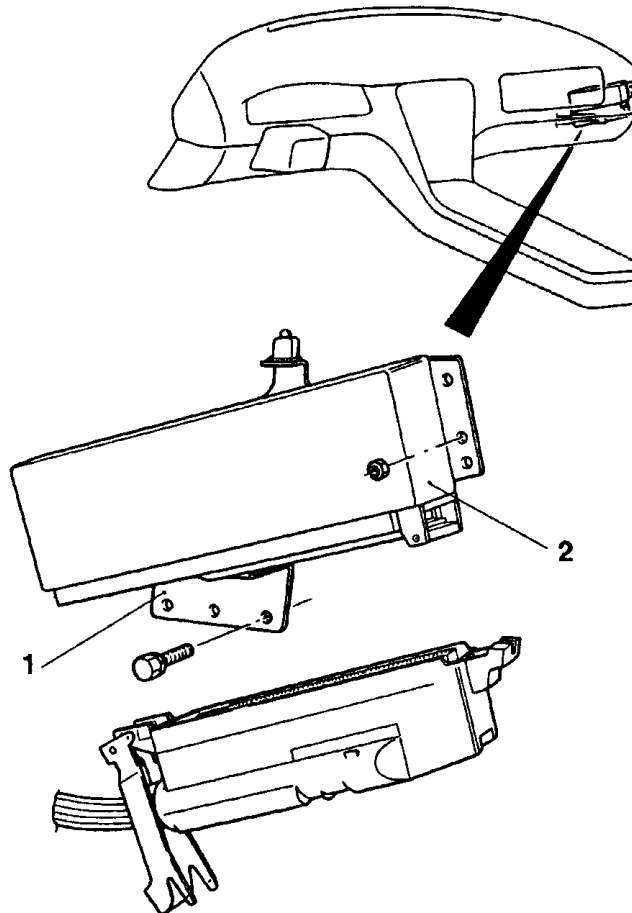


ELECTRONIC CONTROL UNIT

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Under Cover and Glovebox Removal and Installation
(Refer to GROUP 52A – Instrument Panel.)



15AE053N

Removal steps

1. ABS-ECU bracket
2. ABS-ECU

INSPECTION

Refer to P.35B-20.

PARKING BRAKES

CONTENTS

GENERAL INFORMATION	2	Lining Running-in	4
SERVICE SPECIFICATIONS	2	Replacing Dust Boot	5
LUBRICANTS	2	PARKING BRAKE LEVER *	6
ON-VEHICLE SERVICE	3	PARKING BRAKE CABLE *	7
Parking Brake Lever Stroke Check	3	PARKING BRAKE	9

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) If it is possible that the SRS components are subjected to heat over 93°C in baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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 the asterisk (*) in the table of contents in each group indicate operations requiring warnings.

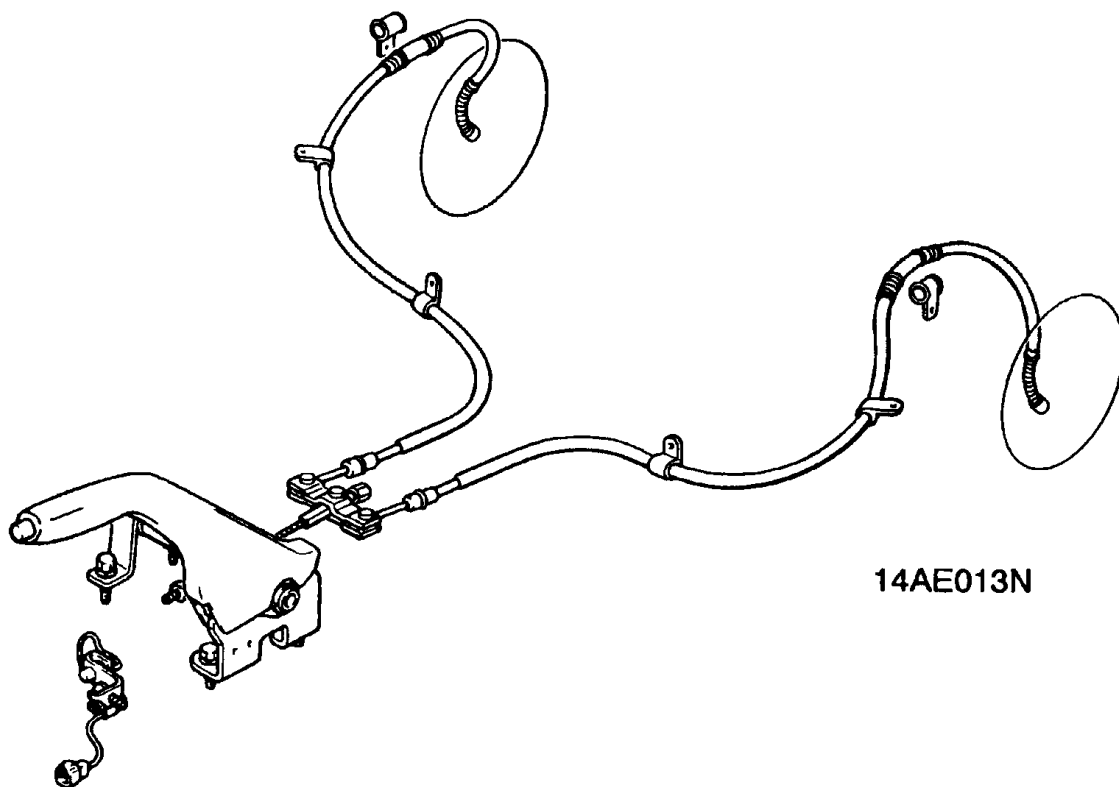
36-2 PARKING BRAKES – General Information/Service Specifications/Lubricants

GENERAL INFORMATION

The parking brake is of a mechanical rear-wheel brake construction employing a drum in disc-type parking brake mechanism.

The operation method utilises a parking brake lever which is in an offset position at the driver's side.

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

Item	Standard value	Limit
Parking brake lever stroke (Operator force: Approx. 196N)	3–5 notches	–
Brake lining thickness mm	2.8	1.0
Brake drum inside diameter mm	168	169

LUBRICANTS

Items	Specified lubricants
Shoe and lining assembly and adjuster contact surfaces	Brake grease SAE J310, NLGI No. 1
Adjuster	

ON-VEHICLE SERVICE

PARKING BRAKE LEVER STROKE CHECK

1. Pull the parking brake lever with a force of approx. 200 N and count the number of notches.

Caution

The 200 N force of the parking brake lever must be strictly observed.

Standard value: 3–5 notches

2. If the parking brake lever stroke is not the standard value, adjust as described below.

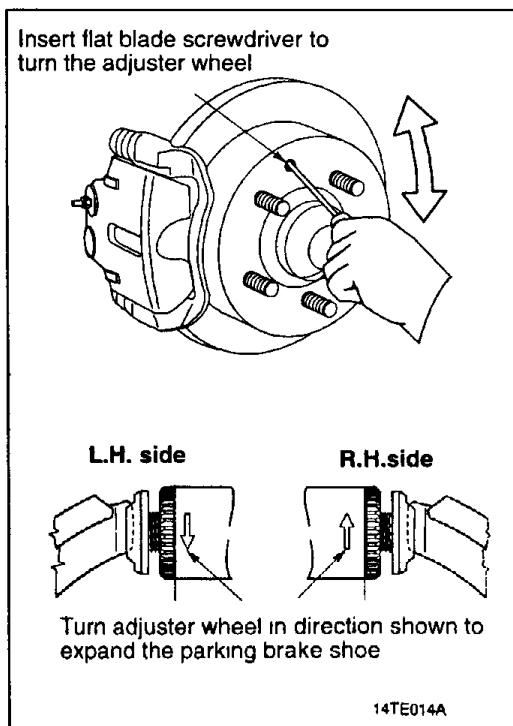
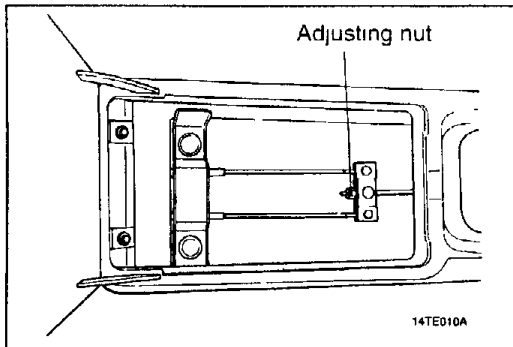
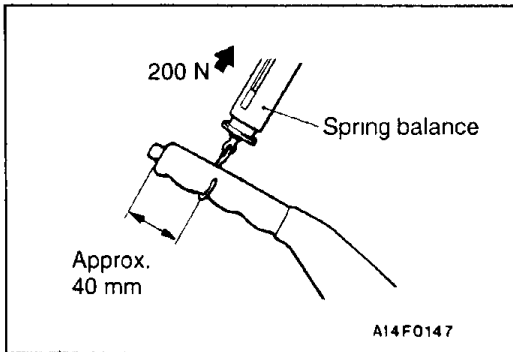
- (1) Remove the inner compartment of the floor console.
- (2) Loosen the parking brake cable adjusting nut to the end of the cable rod, to allow slack in the cables.

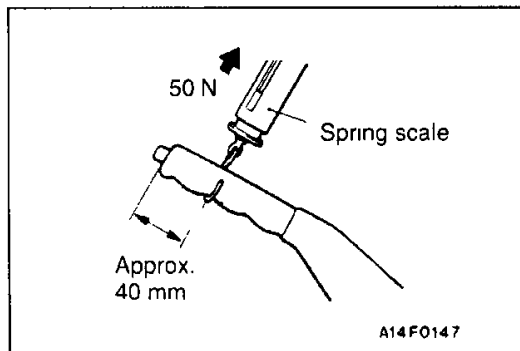
- (3) Jack up the rear of the vehicle and support on jack stands and remove the rear wheels.
- (4) Temporarily install the wheel nuts so that the back of the nuts contact the brake disc and hold the disc in position.
- (5) Remove the brake shoe adjustment hole plug, and insert a flat blade screwdriver to turn the adjuster wheel (to expand the shoe) sufficiently to prevent the disc rotating.
- (6) Rotate the adjuster wheel 5 notches in the reverse direction to allow the disc to rotate freely. Carry out this operation on both sides.
- (7) Remove the temporarily installed wheel nuts and install the rear wheels.
- (8) Tighten the parking brake cable adjusting nut inside the vehicle to achieve a 3–5 notch stroke of the parking brake lever at the specified lever force.

Caution

If the number of brake lever notches engaged is less than the standard value, the cable has been over adjusted. Be sure to adjust it to within the standard value.

- (9) After completing the adjustment, check to be sure that there is no play between the adjusting nut and the pin. Also check that the adjusting nut is securely held by the nut holder.
- (10) With the parking brake lever in the released position, turn the rear wheels to confirm that the rear brakes are not dragging.
- (11) Remove the jack stands and lower the vehicle to the floor. Retorque the wheel nuts to the specified torque.

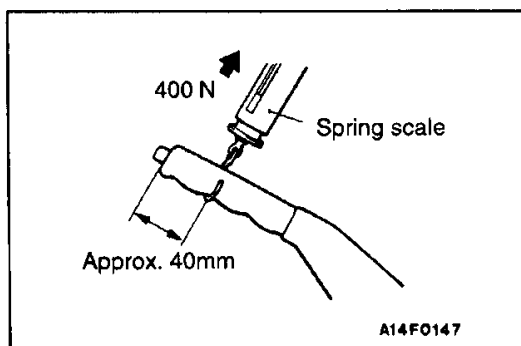




LINING RUNNING-IN

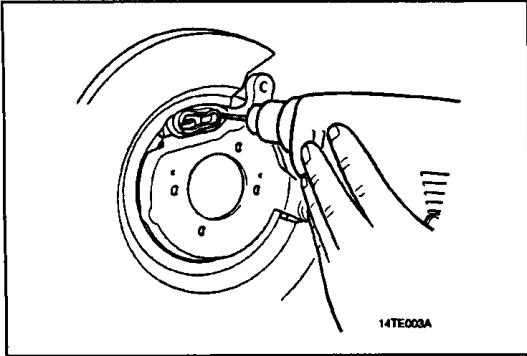
The parking brakes must always be run – in using the following procedure when the parking brake linings or brake disc rotors have been replaced; if the brake drum has been machined or when parking brake performance is insufficient.

1. Adjust the parking brake stroke to the specified value.
2. Hook a spring scale onto the centre of the parking brake lever grip and pull it with a force of 50 N in a direction perpendicular to the handle.
3. Drive the vehicle in a forward direction at a constant speed of 30 km/h for 50 m.
4. Release the parking brake and let the brakes cool for 5 to 10 minutes.
5. Repeat the procedure in steps (2) to (4) 4–5 times.
6. Repeat step (2) and drive the vehicle at 5 km/h in the reverse direction for 50 m.
7. Repeat this operation twice, allowing the brakes to cool for 5 to 10 minutes between each operation.
8. Confirm the parking brake is working correctly by parking the vehicle in a large open area (at least 10 m from any obstacles) and apply the parking brake lever with a force of 400 N. It should be possible to stall the engine in both the forward and reverse directions in low gear without the vehicle moving.

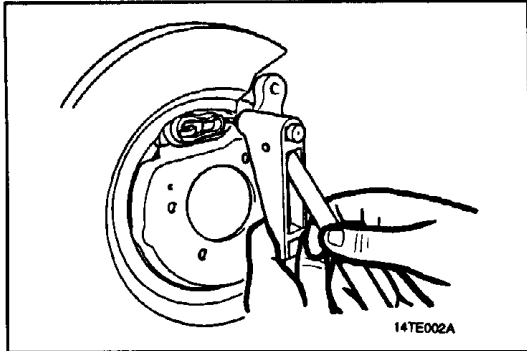


Caution

1. Care must be exercised when undertaking this test. The driver must be ready to apply the footbrake in case of emergency.
2. The above test should only be conducted once in the forward and once in the reverse direction.
3. The vehicle transmission should never be stalled for more than 3 seconds, as damage to the transmission may result.

**REPLACING DUST BOOT**

1. Remove the backing plate, refer page 36-9.
2. Drill out the rivet of the dust boot retaining bracket.
3. Remove the old dust boot.



4. Install the new dust boot onto the backing plate.
5. Place the dust boot retaining bracket onto the backing plate.
6. Re-rivet the dust boot retaining bracket onto the backing plate.

PARKING BRAKE LEVER

REMOVAL AND INSTALLATION

Pre-removal Operation

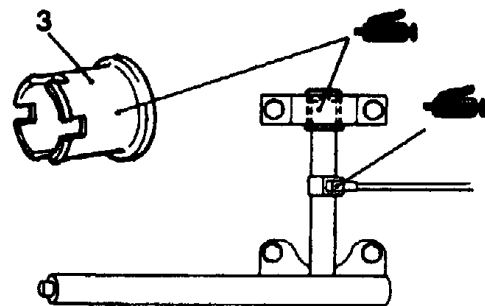
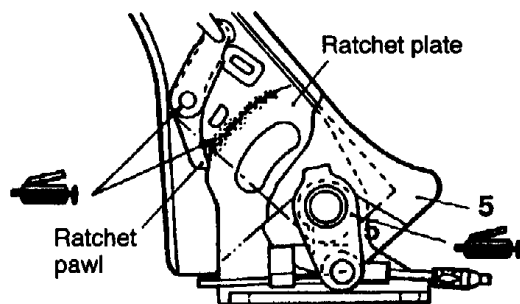
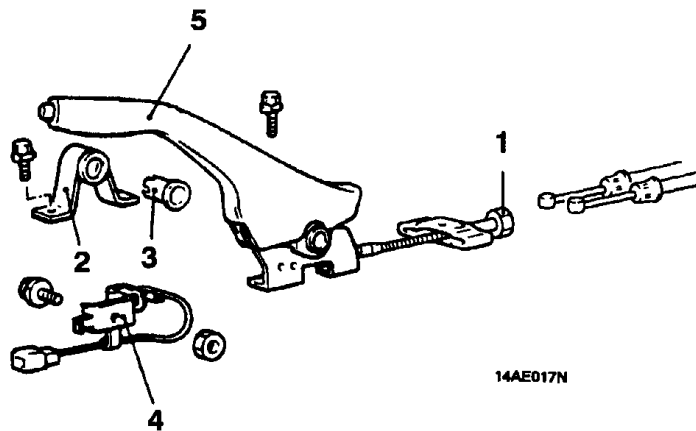
Floor Console Removal
(Refer to GROUP 52A – Floor Console.)

Post-Installation Operation

- Parking Brake Lever Stroke Adjustment
(Refer to P. 36-3.)
- Floor Console Installation
(Refer to GROUP 52A - Floor Console.)

CAUTION: SRS

1. When removing and installing the floor console, do not let it bump against the SRS-ECU or other components.
2. Before removal of SRS-ECU, refer to GROUP 52B – SRS-ECU.



Removal steps

1. Adjusting nut
2. Parking brake stay
3. Bushing
4. Parking brake switch
5. Parking brake lever

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PARKING BRAKE CABLE

REMOVAL AND INSTALLATION

Pre-removal Operation

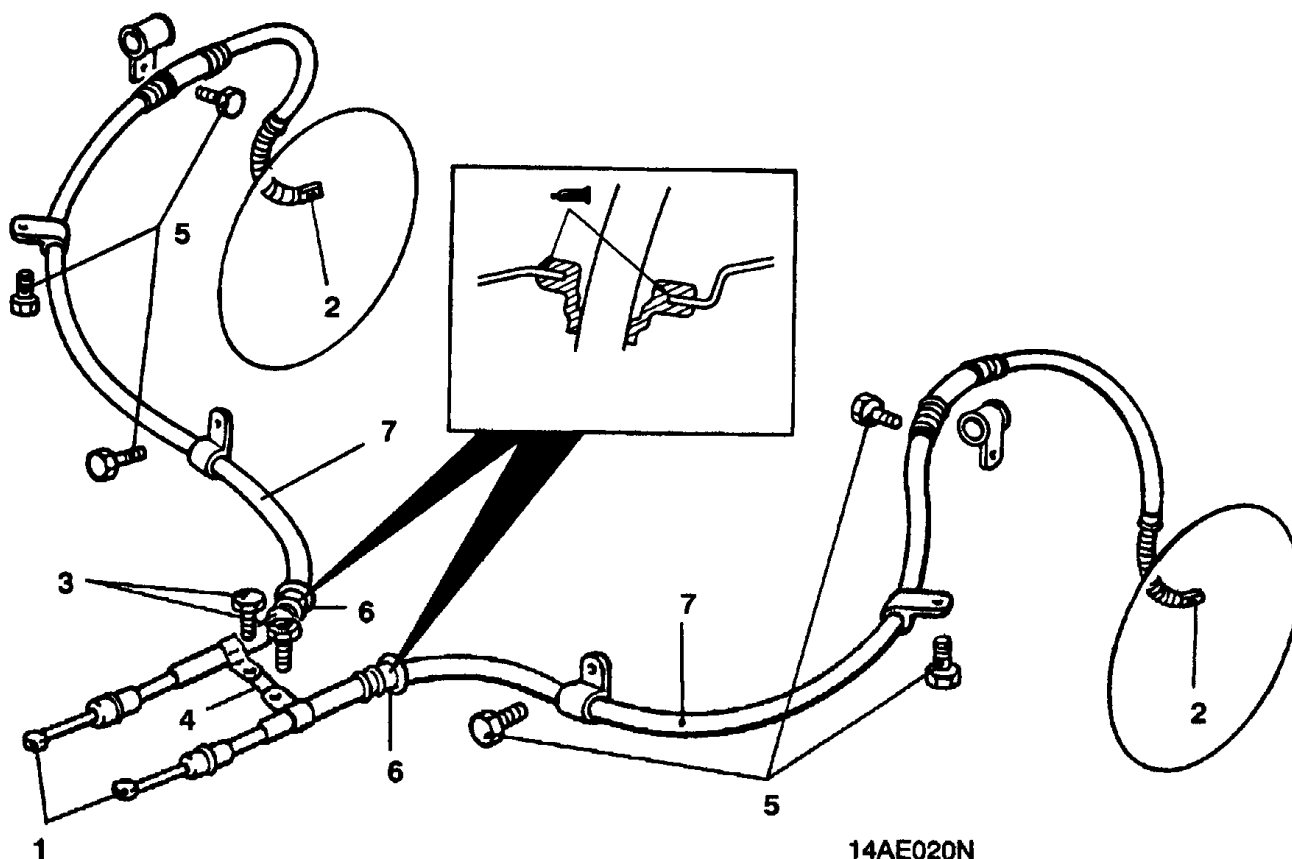
- Floor Console Removal (Refer to GROUP 52A – Floor Console.)

CAUTION: SRS

1. When removing and installing the floor console, do not let it bump against the SRS-ECU or other components.
2. Before removal of SRS-ECU, refer to GROUP 52B – SRS-ECU.

Post-installation Operation

- Parking Brake Lever Stroke Adjustment (Refer to P.36-3.)
- Floor Console Installation (Refer to GROUP 52A – Floor Console.)

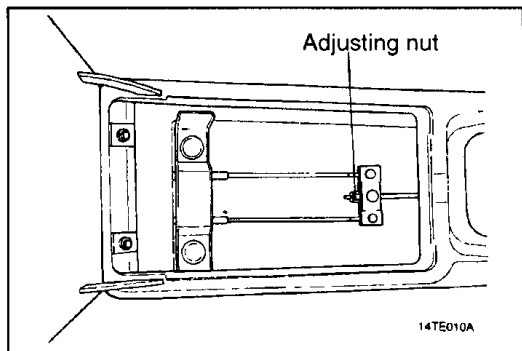


Removal steps

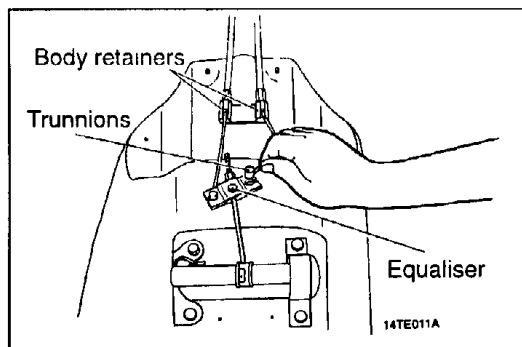
1. Park brake cable trunnion
2. Park brake cable actuator lever eyelet
3. Interior park brake cable retaining clamp bolts
4. Interior park brake cable retaining clamp

5. Exterior park brake cable clamp bolts
6. Grommets
7. Cables

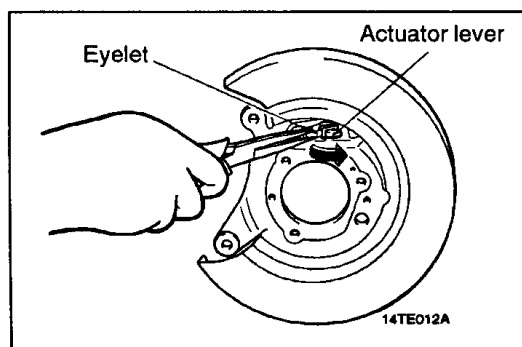


**REMOVAL SERVICE POINTS****◀A▶ PARK BRAKE CABLE TRUNNION REMOVAL**

1. Loosen the park brake cable adjusting nut to the end of the cable rod as shown in the illustration.



2. Unclip the park brake cable trunnions from the equaliser and remove the cable from the body retainers.

**◀B▶ PARK BRAKE CABLE ACTUATOR LEVER EYELET REMOVAL**

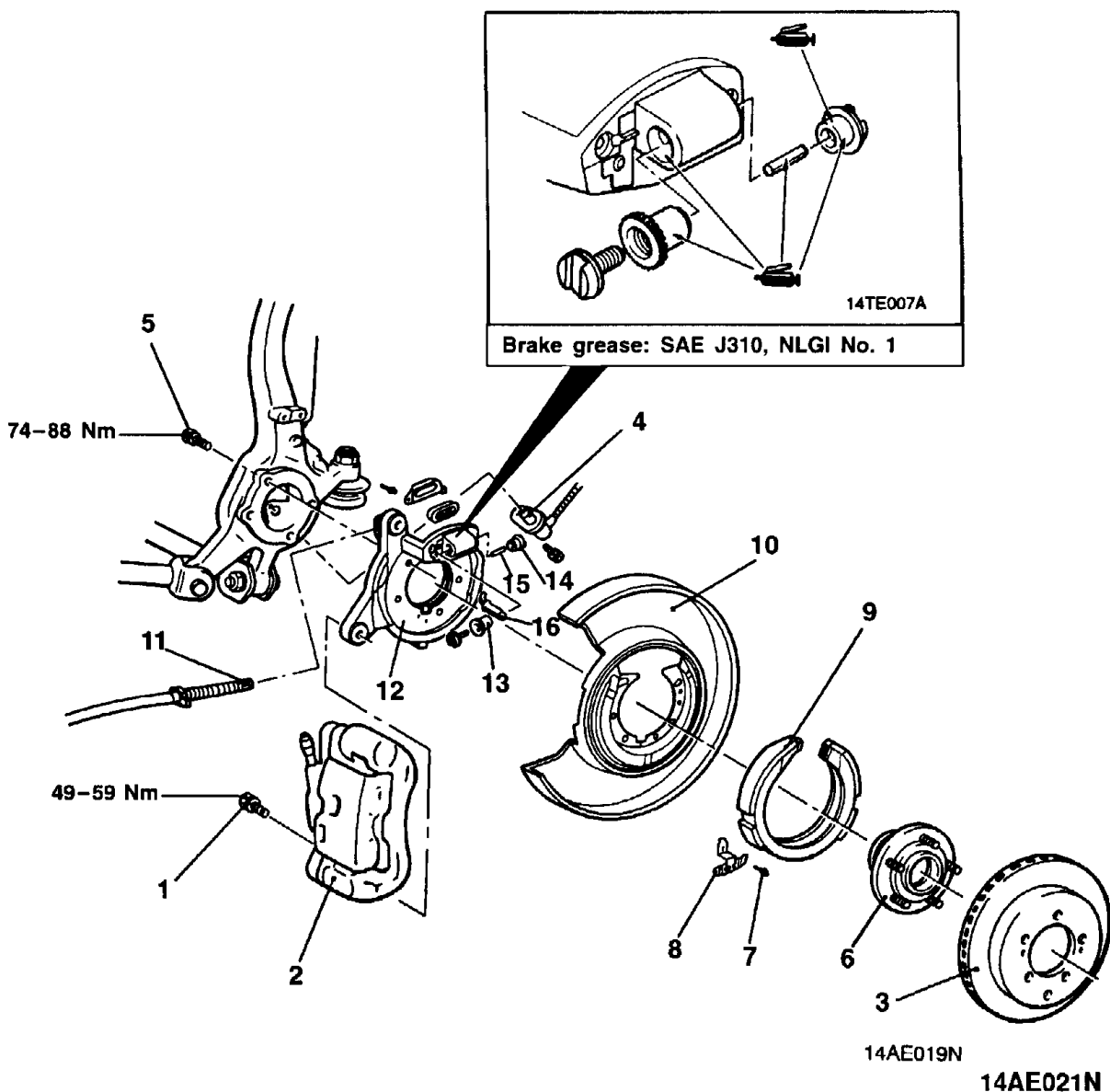
Push the cable towards the rear of the vehicle to release the park brake cable eyelet from the actuator lever.

PARKING BRAKE

REMOVAL AND INSTALLATION

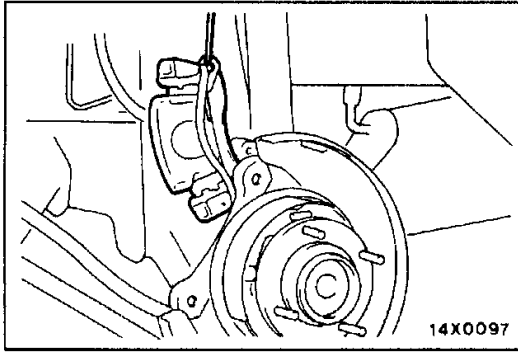
Post-installation Operation

- Parking Brake Lever Stroke Check
(Refer to P.36-3.)



Removal steps

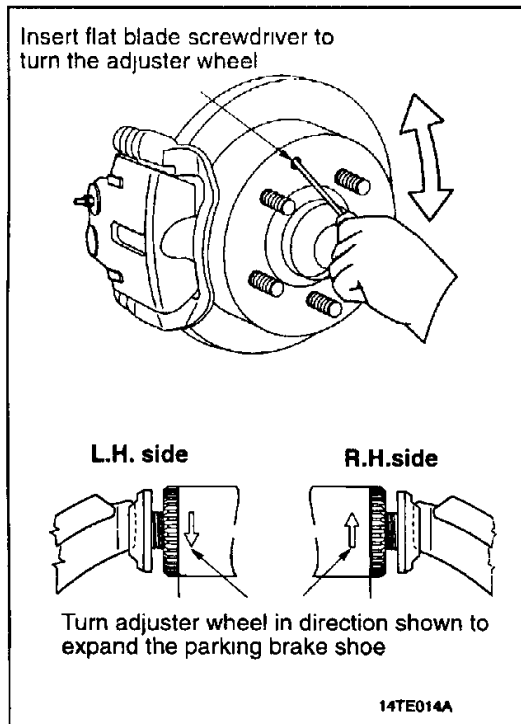
- | | | |
|---------|--------------------------------|---|
| ◀A▶ | 1. Calliper attaching bolts | 10. Splash shield |
| ◀B▶ | 2. Calliper | 11. Parking brake cable to lever connection |
| ◀C▶ ▶C▶ | 3. Disc | 12. Backing plate |
| ◀C▶ ▶C▶ | 4. Speed sensor | 13. Adjuster star wheel |
| | 5. Hub retaining bolts | ◀B▶ ▶B▶ ▶A▶ |
| | 6. Hub | 14. Tappet |
| | 7. Shoe hold down spring screw | 15. Pushrod |
| | 8. Shoe hold down spring | ◀D▶ ▶A▶ |
| ◀B▶ | 9. Shoe | 16. Lever |



REMOVAL SERVICE POINTS

◀A▶ CALLIPER REMOVAL

Support the removed calliper with wire to a nearby part to avoid placing stress on the flexible brake hose.



◀B▶ BRAKE DISC REMOVAL

If removal of the brake disc is difficult, release the shoe adjuster star wheel to a point where the brake disc is able to be removed by rotating the disc and pulling gently.

Caution

If excessive force is applied to the brake disc, the shoe hold down clip will be damaged.

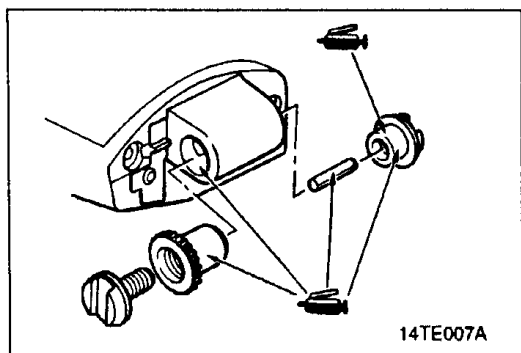
◀C▶ SPEED SENSOR/HUB REMOVAL

Ensure no damage is caused to the ABS rotor or speed sensor by striking them against each other or other components.

◀D▶ LEVER REMOVAL

NOTE

Care must be taken when pulling the lever through the boot as damage may result.



INSTALLATION SERVICE POINTS

►A◄ LEVER INSTALLATION

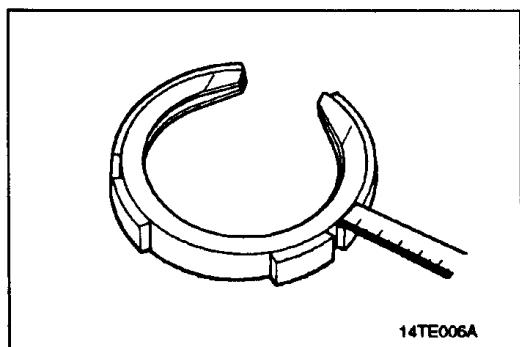
When inserting the lever through the boot, take care not to damage the boot.

►B◄ PUSHROD/TAPPET INSTALLATION

Pack the inside of the tappet with grease to hold the pushrod during assembly.

►C◄ HUB/SPEED SENSOR INSTALLATION

Ensure no damage is caused to the ABS rotor or speed sensor by striking them against each other or other components.



INSPECTION

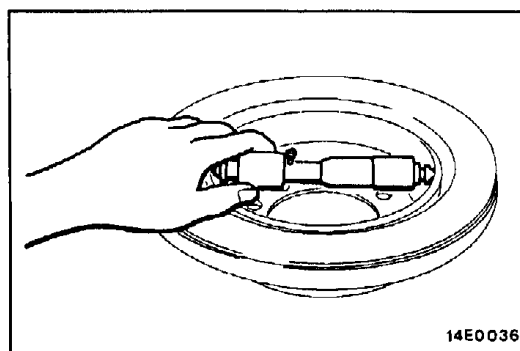
- Clean the backing plate, boot and actuation components.

Caution

1. Do not clean the shoe, only brush off the brake dust.
 2. Only use soap and water to wash the boot as solvents may damage the rubber.
- Measure the brake lining thickness in at least three locations on each side of the shoe. Replace the shoe if less than the limit value of lining exists or if the lining is worn unevenly.

Standard value: 2.8mm

Limit (maximum): 1.0mm



- Using an inside micrometer measure the brake disc inner diameter in two or more locations. Replace the rotor if the inside diameter exceeds the limit value.

Standard value: 168mm

Limit (maximum): 169mm

- Inspect the actuation components for wear or cracking.
- Check the shoe for cracks.

STEERING

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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) If it is possible that the SRS components are subjected to heat over 93°C in baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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 the asterisk (*) in the table of contents in each group indicate operations requiring warnings.

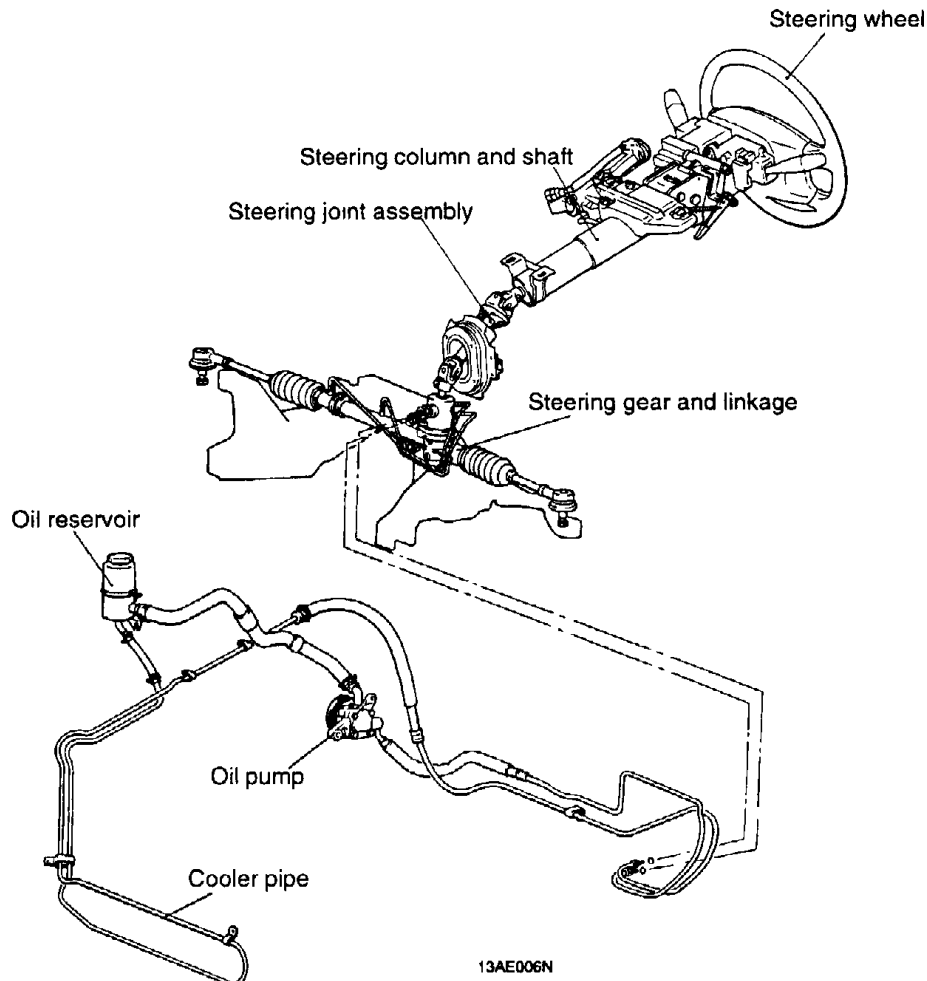
GENERAL INFORMATION

Power steering has been adopted in all models. The power steering is responsive to engine speed. The main features are as follows. Four-spoke steering wheel has been adopted. In addition, a driver SRS airbag is provided as a standard in all vehicles.

The steering column in all vehicles has a shock absorber mechanism and a tilt steering mechanism. A vane-type oil pump with a fluid flow control system included has been adopted. The steering gear and linkage is an integral rack and pinion type.

Items		Specifications
Gear box	Steering gear type	Rack and pinion
Oil pump	Oil pump type	Vane type
	Displacement cm ³ /rev.	9.6
	Relief set pressure MPa	11.8

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

Items		Standard value	Limit
Steering wheel free play mm	with engine stopped	0–10	–
	with engine running	–	30
Steering angle	Inner wheel	$36^{\circ}00' \pm 2^{\circ}$	–
	Outer wheel	$30^{\circ}30'$	–
Tie rod end ball joint starting torque Nm		0.5–2.5	–
Stationary steering effort N		27 or less (LHD)	–
		30 or less (RHD)	–
Fluctuation allowance N		5.9 or less	–
Oil pump pressure MPa	Oil pump relief pressure	11.8	–
	Pressure under no-load conditions	0.8–1.0	–
	Steering gear holding hydraulic pressure	11.8	–
Power steering pressure switch operating pressure MPa	ON → OFF	2.5–4.4	–
	OFF → ON	3.4–4.4	–
Total pinion preload Nm		0.8–1.6	–
Tie rod joint swing resistance N		6–20	–
Tie rod joint swing torque Nm		2–5	–
Oil pump pulley assembly backlash mm		–	0.1

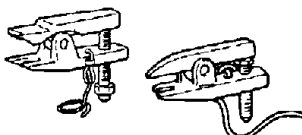
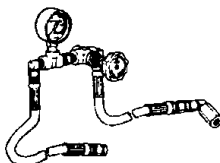
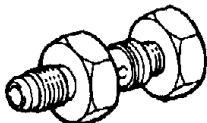
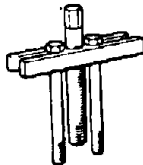
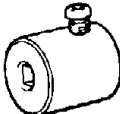
LUBRICANTS

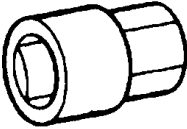
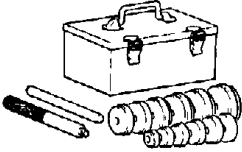
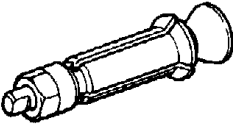
Items		Specified lubricants	Quantity
Power steering gearbox	Bearing	Automatic transmission fluid DEXRON or DEXRON II	As required
	O-ring		
	Oil seal		
	Special tool (MB991214)		
	Pinion and valve assembly seal ring part		
	Bellows	Silicone grease	As required
Oil pump	Power steering fluid	Automatic transmission fluid DEXRON or DEXRON II	0.9 ℓ
	Flow control valve	Automatic transmission fluid DEXRON or DEXRON II	As required
	Friction surface of rotor, vane, cam ring and pump cover		
	O-ring		

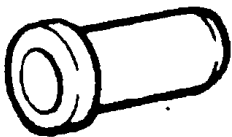
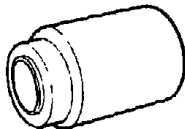
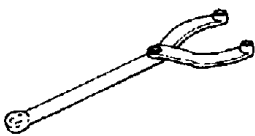
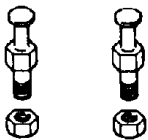
SEALANT

Items		Specified sealant	Remarks
Power steering gearbox	End plug screw	3M ATD Part No. 8663 or equivalent	Semi-drying sealants
	Power steering rack support cover screw		
	Dust cover lip for tie rod end ball joint		

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991113 or MB990635	Steering linkage puller	Tie-rod end disconnection
	MB990326	Preload socket	Tie rod end ball joint starting torque check
	MB990662	Oil pressure gauge assembly	Oil pump pressure test
	MB990993 or MB991217	Power steering oil pressure gauge adaptor (pump side)	Oil pump pressure test
	MB990994	Power steering oil pressure gauge adaptor (hose side)	
	MB990803	Steering wheel puller	Steering wheel removal
	MB991006	Preload socket	Pinion shaft preload measurement

Tool	Number	Name	Use
	MB991204	Torque wrench socket	Rack support adjustment Rack support cover removal
	MB990925	Bearing and oil seal installer set	Oil seal and bearing installation MB990926 MB990927 MB990938 MB990939
	MB991120	Needle bearing puller	Needle roller bearing removal
	MB991197	Bar (long type)	Oil seal installation
	MB991201	Oil seal installer	Oil seal installation
	MB991202	Oil seal & bearing installer	Needle roller bearing installation
	MB991214	Rack installer	Rack installation
	MB991203	Oil seal & bearing installer	Oil seal and bearing installation
	MB991317	Seal ring installer	Seal ring installation

Tool	Number	Name	Use
	MB990941	Dust cover installer	Oil seal installation
	MB990776	Front axle base	Dust cover installation
	MB990767	End yoke holder	Drive pulley removal and installation
	MD998719 or MD998754	Crankshaft pulley holder pin	Drive pulley removal and installation
	MB990956	Needle bearing installer	Drive shaft assembly installation
	MB991172	Adaptor	Drive shaft assembly installation

ON-VEHICLE SERVICE

STEERING WHEEL FREE PLAY CHECK

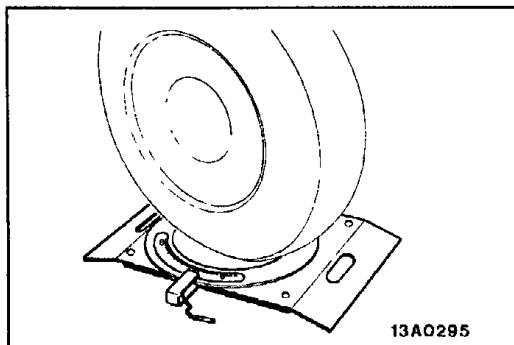
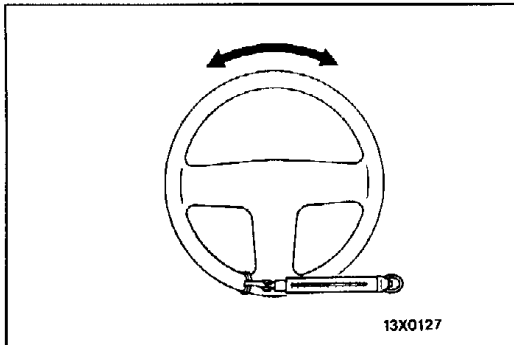
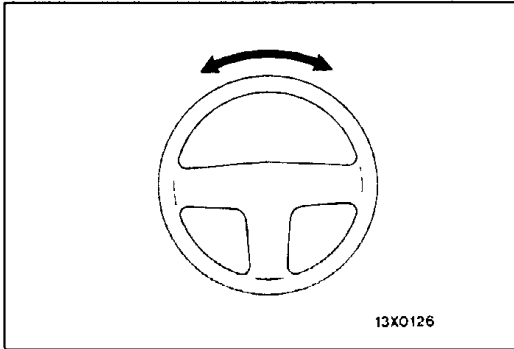
1. With engine running (hydraulic operation), set front wheels straight ahead.
2. Measure the play on steering wheel circumference before wheels start to move when slightly moving steering wheel in both directions.

Limit: 30 mm

3. When play exceeds the limit, check for play on steering shaft connection and steering linkage. Correct or replace.
4. If the free play still exceeds the limit value, set steering wheel straight ahead with engine stopped. Load 5 N towards steering wheel circumference and check play.

Standard value (steering wheel play with engine stopped): 0–10 mm or less

If the play exceeds the standard value, remove steering gear box and check total pinion torque.



STEERING ANGLE CHECK

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

Standard value:

Inside wheel: $36^{\circ}00' \pm 2^{\circ}$

Outside wheel: $30^{\circ}30'$

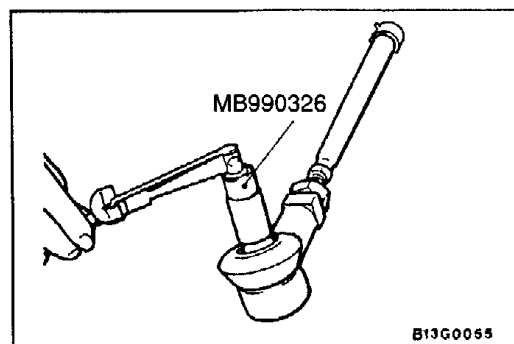
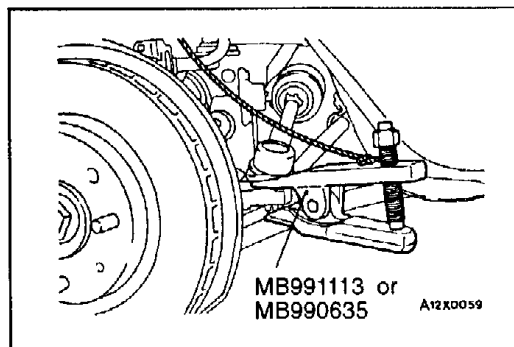
2. When the angle is not within the standard value, the toe is probably incorrect. Adjust toe (Refer to GROUP 33A – On-vehicle Service) and recheck steering angle.

TIE ROD END BALL JOINT STARTING TORQUE CHECK

1. Disconnect tie rod and knuckle with special tool.

Caution

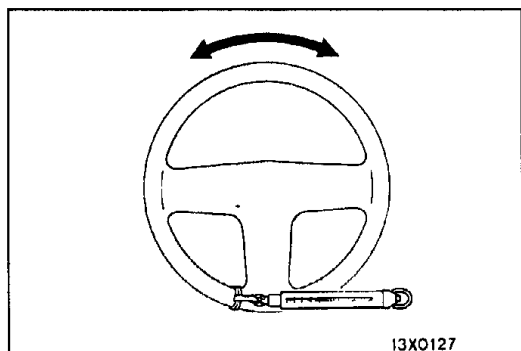
1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it until the tie rod end is separated from the knuckle.



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

Standard value: 0.5–2.5 Nm

3. When the starting torque exceeds the standard value, replace tie rod end.
4. When the starting torque is less than the standard value, check ball joint for excessive end play or binding. If these checks are satisfactory, the joint is still serviceable.



STATIONARY STEERING EFFORT CHECK

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

Caution

After checking, reset the idle speed to the specified idling rpm.

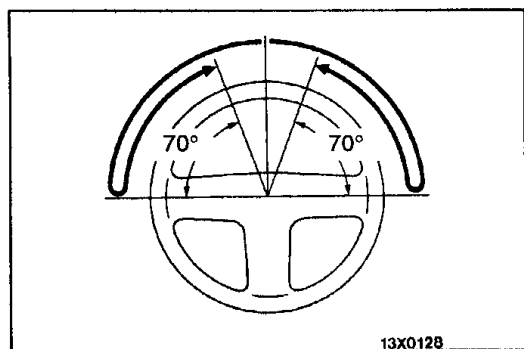
3. Attach a spring balance to the outer circumference of the steering wheel and measure the steering force required to turn the steering wheel from the straight ahead position to the left and right (within a range of 1.5 turns). Also check to be sure that there is no significant fluctuation of the required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

Standard value:

Steering effort: 27 N or less

Fluctuation allowance: 5.9 N or less

4. If the measured force exceeds the standard value, refer to the troubleshooting and make the checks and adjustments described there.



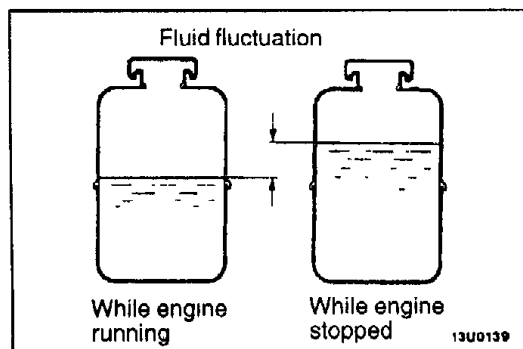
CHECKING STEERING WHEEL RETURN TO CENTRE

To perform this test, conduct a road test and check as follows.

1. Make both gradual and sudden turns and check the steering "feeling" to be sure that there is no difference in the steering force required and the wheel return between left and right turns.
2. At a speed of 20–30 km/h, turn the steering wheel 90° , and release the steering wheel after 1 or 2 seconds. If the steering wheel then returns 70° or more, the return can be judged to be satisfactory.

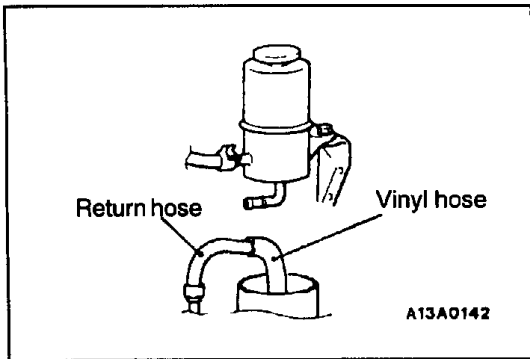
NOTE

There will be a momentary feeling or "heaviness" when the wheel is turned quickly, but this is not abnormal. (This is because the oil pump discharge amount is reduced during idling.)



FLUID LEVEL CHECK

1. Park the vehicle on a flat, level surface, start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately $50-60^\circ\text{C}$.
2. With the engine running, turn the wheel all the way to the left and right several times.
3. Check the fluid in the oil reservoir for foaming or milkiness.
4. Check the difference of the fluid level when the engine is stopped, and while it is running. If the fluid level changes considerably, air bleeding should be done.



FLUID REPLACEMENT

1. Raise the front wheels on a jack, and then support them with rigid racks.
2. Disconnect the return hose connection.
3. Connect a vinyl hose to the return hose, and drain the oil into a container.
4. Disconnect the connector from the crankshaft angle sensor and then while operating the starter motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.
5. Connect the return hoses securely, and then secure it with the clip.
6. Fill the oil reservoir with the specified fluid up to the lower position of the filter, and then bleed the air.

Specified fluid:

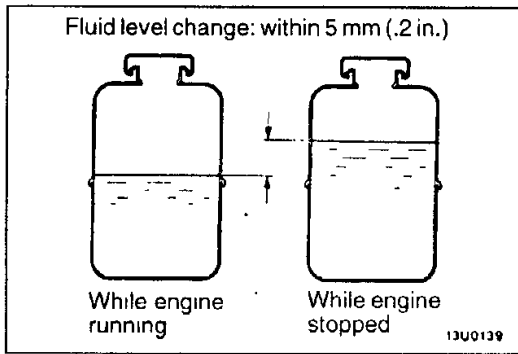
Automatic transmission fluid DEXRON or DEXRON II

BLEEDING

1. Jack up the front wheels and support them by using a rigid rack.
2. Manually turn the oil pump pulley a few times.
3. Turn the steering wheel all the way to the left and to the right five or six times.
4. Disconnect the connector from the crankshaft position sensor and then, while operating the starting motor intermittently, turn the steering wheel all the way to the left and right five or six times (for 15 to 20 seconds).

Caution

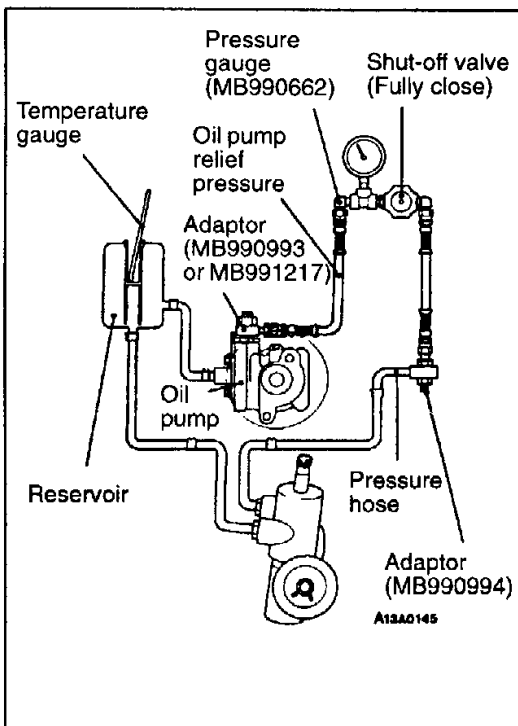
1. **During air bleeding, replenish the fluid supply so that the level never falls below the lower position of the filter.**
2. **If air bleeding is done while engine is running, the air will be broken up and absorbed into the fluid; be sure to do the bleeding only while cranking.**
5. Connect the crankshaft angle sensor connector and then start the engine (idling).
6. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
7. Confirm that the fluid is not milky, and that the level is up to the specified position on the level gauge.
8. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.



9. Check whether or not the change in the fluid level is within 5 mm when the engine is stopped and when it is running.

Caution

1. If the change of the fluid level is 5 mm or more, the air has not been completely bled from the system, and thus must be bled completely.
2. If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled.
3. If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could cause a lessening of the life of the pump, etc.



OIL PUMP PRESSURE TEST

CHECKING THE OIL PUMP RELIEF PRESSURE

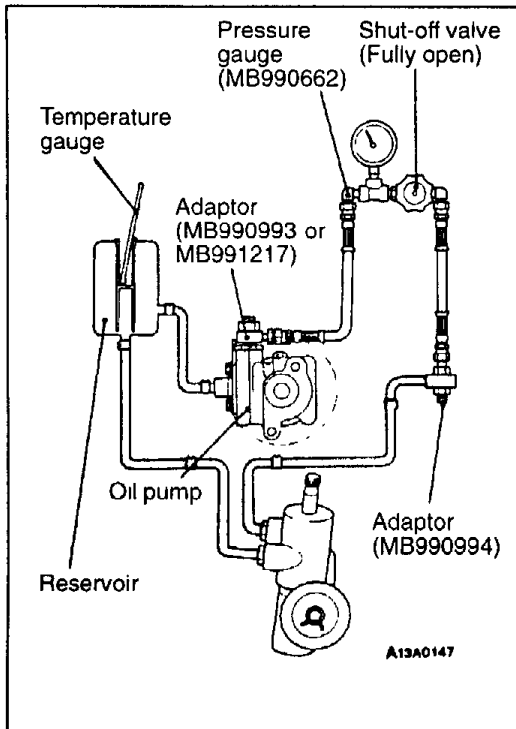
1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at $1,000 \pm 100$ r/min.
4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range.

Standard value: 11.8 MPa

Caution

Pressure gauge shut off valve must not remain closed for more than 10 seconds.

5. If it is not within the standard value, overhaul the oil pump.
6. Remove the special tools and then tighten the pressure hose to the specified torque.
7. Bleed the system.

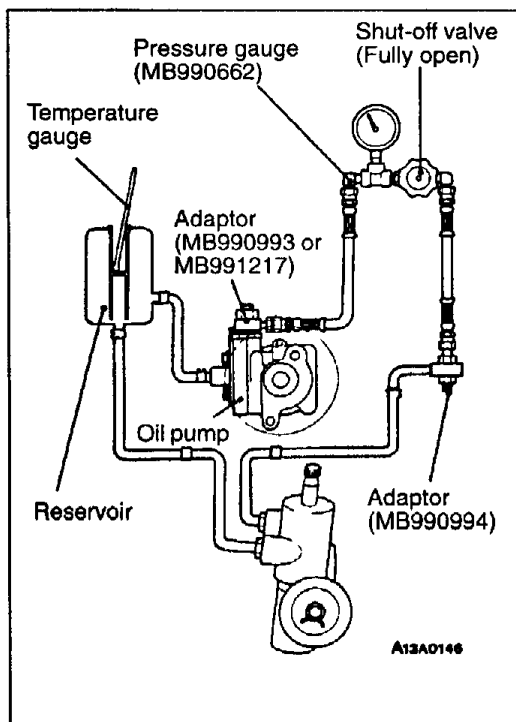


CHECKING THE PRESSURE UNDER NO-LOAD CONDITIONS

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at $1,000 \pm 100$ r/min.
4. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

Standard value: 0.8–1.0 MPa

5. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
6. Remove the special tools, and then tighten the pressure hose to the specified torque.
7. Bleed the system.

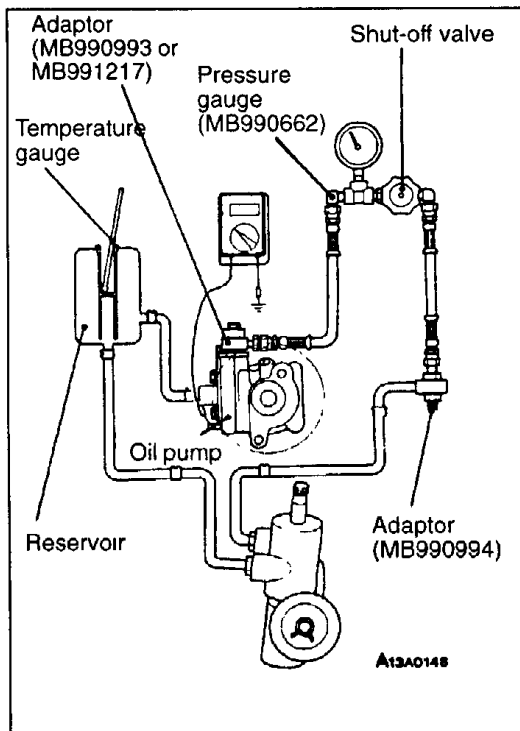


CHECKING THE STEERING GEAR HOLDING HYDRAULIC PRESSURE

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at $1,000 \pm 100$ r/min.
4. Fully close and fully open the shut-off valve of the pressure gauge.
5. Turn the steering wheel all the way to the left or right; then check whether or not the holding hydraulic pressure is the standard value.

Standard value: 11.8 MPa

6. When not within the standard value, overhaul the steering gear box.
Remeasure fluid pressure.
7. Remove the special tools, and then tighten the pressure hose to the specified torque.
8. Bleed the system.



POWER STEERING PRESSURE SWITCH CHECK

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. The engine should be idling.
4. Disconnect the connection of the connector for the pressure switch, and place an ohmmeter in position.
5. Gradually close the shut-off valve of the pressure gauge and increase the hydraulic pressure then check whether or not the hydraulic pressure that activates the switch is the standard value.

Standard value: 3.4–4.4 MPa

6. Gradually open the shut-off valve and reduce the hydraulic pressure; then check whether or not the hydraulic pressure that deactivates the switch is the standard value.

Standard value: 2.5–4.4 MPa

7. Remove the special tools, and then tighten the pressure hose to the specified torque.
8. Bleed the system.

STEERING WHEEL AND SHAFT

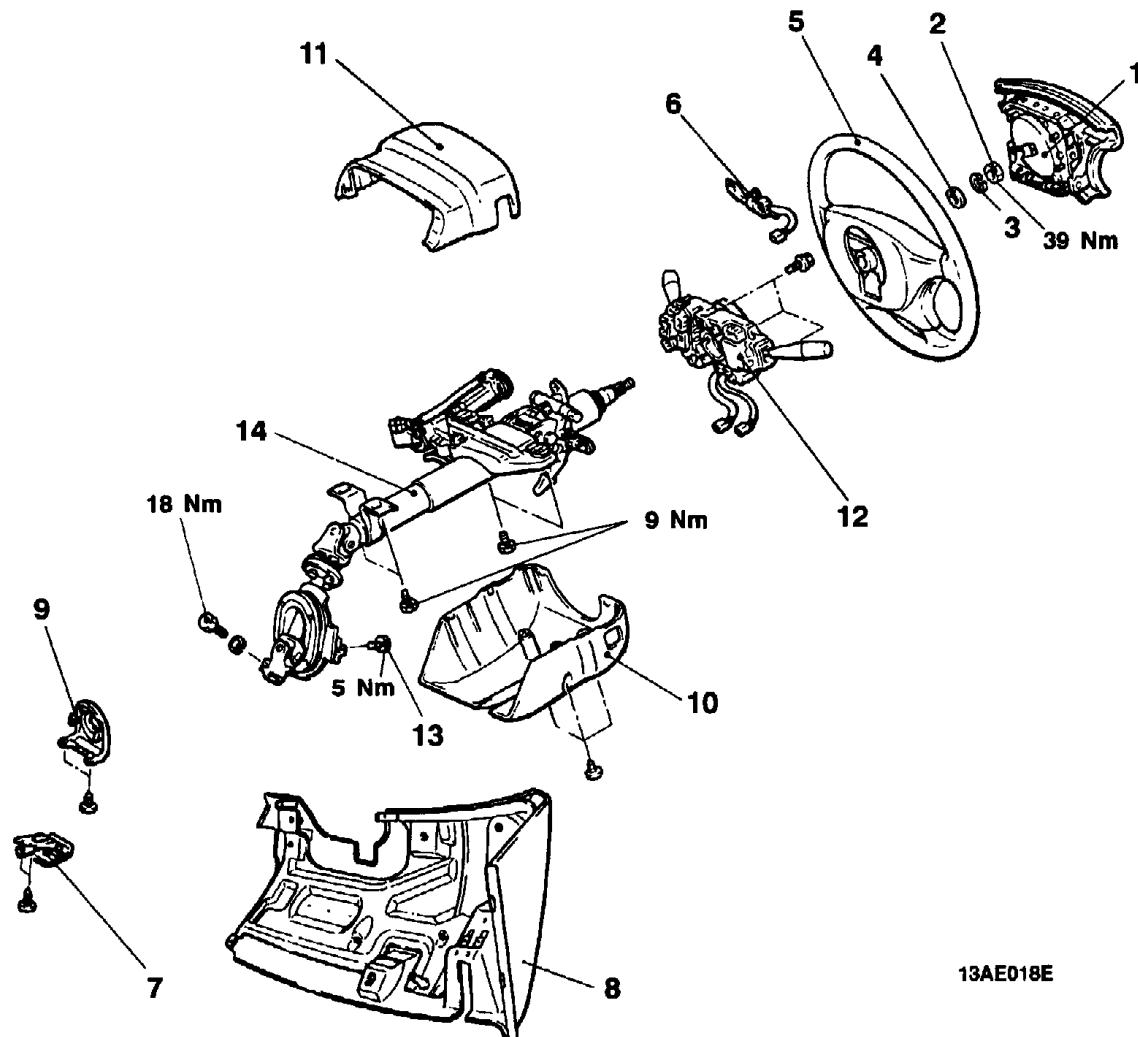
REMOVAL AND INSTALLATION

CAUTION: SRS

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

Post-Installation Operation

- Checking Steering Wheel Position with Wheels Straight Ahead



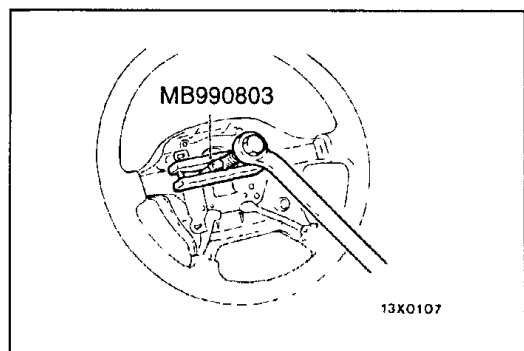
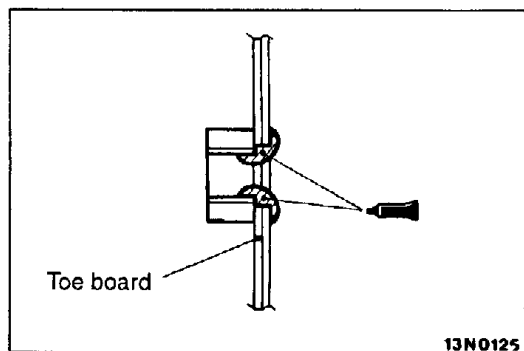
13AE018E

Removal steps

1. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
2. Steering wheel retaining nut
3. Spring washer
4. Flat washer
5. Steering wheel
6. Cruise control switch
7. Lock release handle

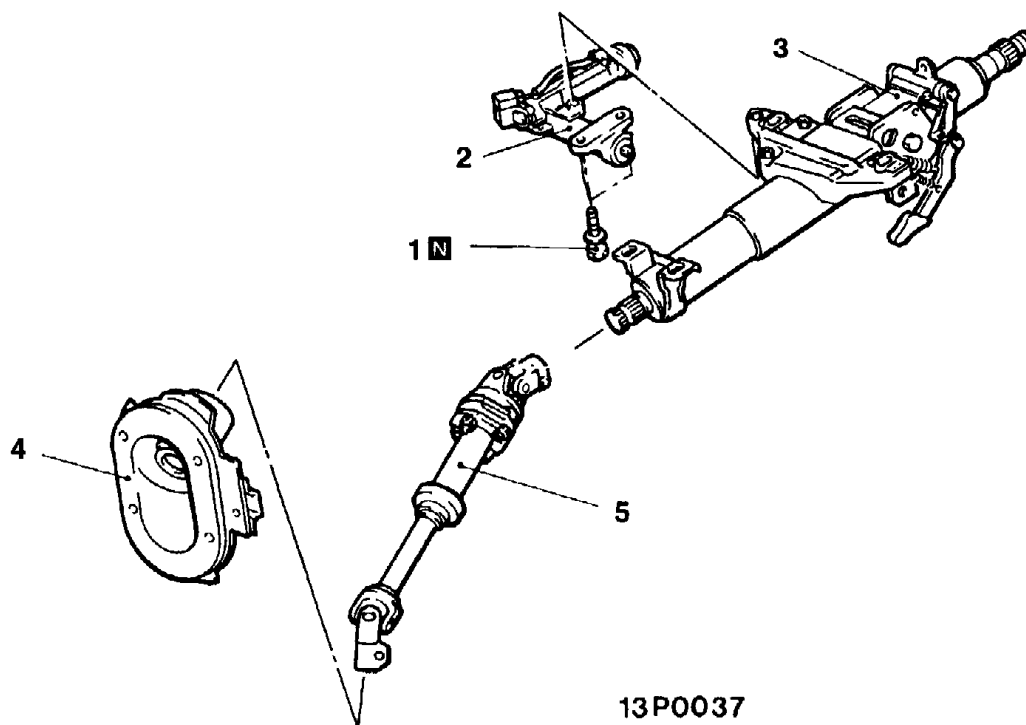
8. Instrument panel lower cover
9. Key cylinder panel
10. Lower column cover
11. Upper column cover
12. Clock spring and column switch assembly (Refer to GROUP 52B)
13. Retainer mounting bolt
14. Steering column assembly



**REMOVAL SERVICE POINT****◀A▶ STEERING WHEEL REMOVAL****INSTALLATION SERVICE POINT****▶A◀ RETAINER MOUNTING BOLT**

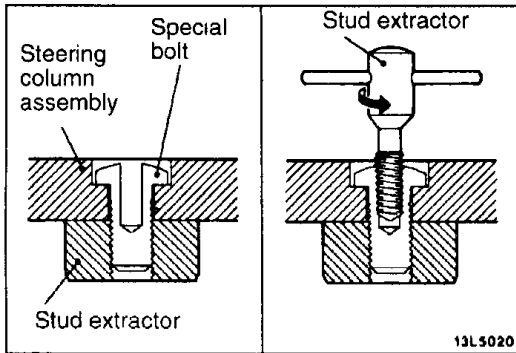
Before installing the bolt, coat the mounting hole on the toe board with the specified sealant.

Specified Sealant: Three-bond 1104 or equivalent product.

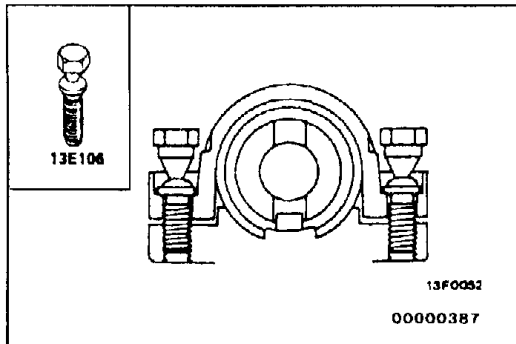
DISASSEMBLY AND REASSEMBLY**Disassembly steps**

- ◀A▶ ▶A◀ 1. Special bolt
▶A◀ 2. Steering lock cylinder and bracket assembly

3. Steering column assembly
4. Cover assembly
5. Steering joint assembly

**DISASSEMBLY SERVICE POINT****◀A▶ SPECIAL BOLT REMOVAL**

1. Drill a hole in the special bolt to a depth to enable a suitable size stud extractor to stand up.
2. Using the stud extractor, remove the special bolt.

**REASSEMBLY SERVICE POINT****▶A◀ STEERING LOCK CYLINDER AND BRACKET ASSEMBLY/SPECIAL BOLT INSTALLATION**

1. When installing the steering lock cylinder and bracket assembly 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.

INSPECTION

- Check the steering shaft for play and rough movement.
- Check the joints for play, damage, or rough movement.
- Check the joint bearing for wear and damage.
- Check the dust shield for damage.

POWER STEERING GEAR BOX

REMOVAL AND INSTALLATION

Pre-removal Operation

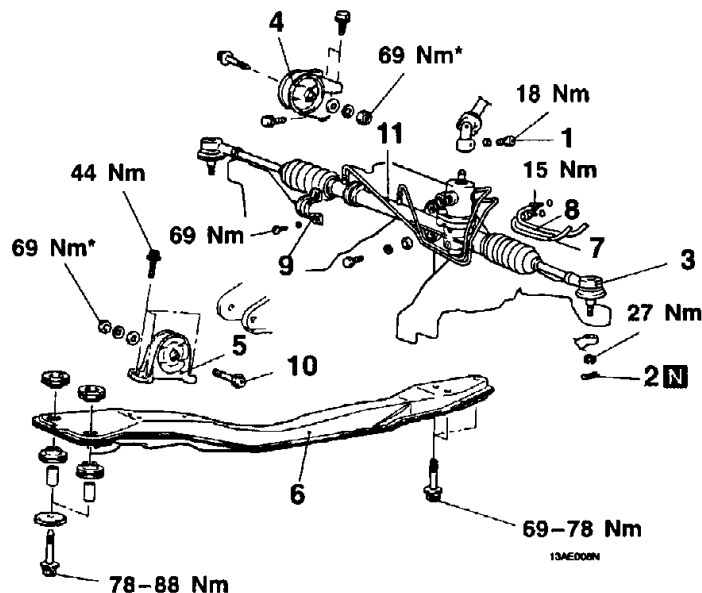
- Power Steering Fluid Draining (Refer to P.37A-9.)
- Disconnect the centre member (Refer to GROUP 32 – Power Plant Mount)
- Disconnect the front exhaust pipe (Refer to GROUP 15 – Intake and Exhaust)

CAUTION: SRS

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

Post-installation Operation

- Fit the front exhaust pipe (Refer to GROUP 15 – Intake and Exhaust)
- Fit the centre member (Refer to GROUP 32 – Power Plant Mount)
- Power Steering Fluid Supplying (Refer to P.37A-9.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-9.)
- Steering Wheel Position with Wheels Straight Ahead Checking
- Front Wheel Alignment Adjustment (Refer to GROUP 33A – On-vehicle Service.)



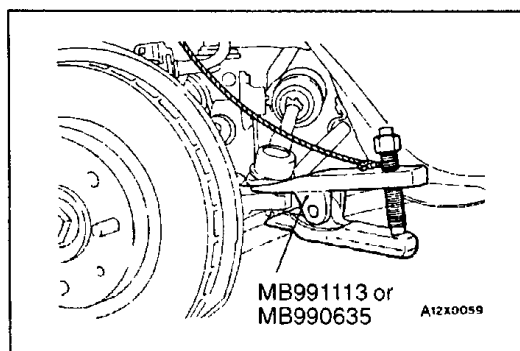
Removal steps

1. Joint assembly and gear box connecting bolt
2. Cotter pin
3. Connection for tie rod end and knuckle
4. Rear roll stopper
5. Front roll stopper
6. Centre member assembly
7. Pressure pipe
8. Return pipe

9. Clamp
10. Bolt
11. Gear box assembly

Caution

The fasteners marked * should be temporarily tightened before they are finally tightened once the total weight of the engine has been placed on the vehicle body.

**REMOVAL SERVICE POINTS****◀A▶ TIE-ROD END DISCONNECTION****Caution**

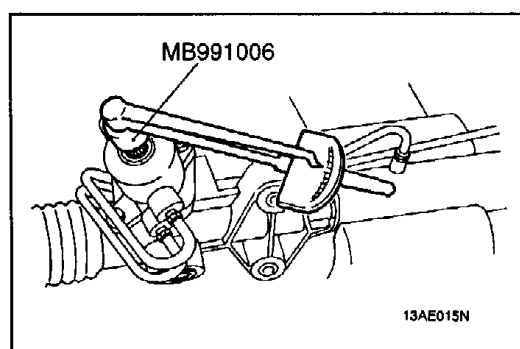
1. Be sure to tie the cord of the special tool to the nearby part.
2. Loosen the nut but do not remove it until the tie rod end is separated from the knuckle.

◀B▶ GEAR BOX ASSEMBLY REMOVAL**Caution**

Be careful not to 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: 0.8–1.6 Nm

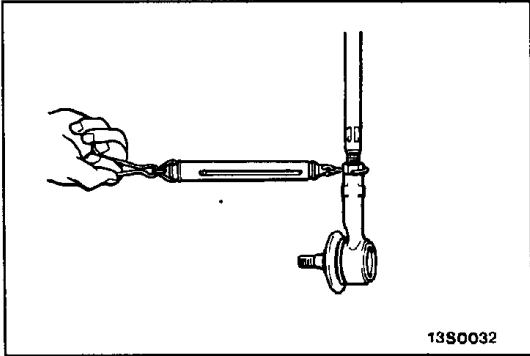
Torque variation: 0.5 Nm

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 necessary.

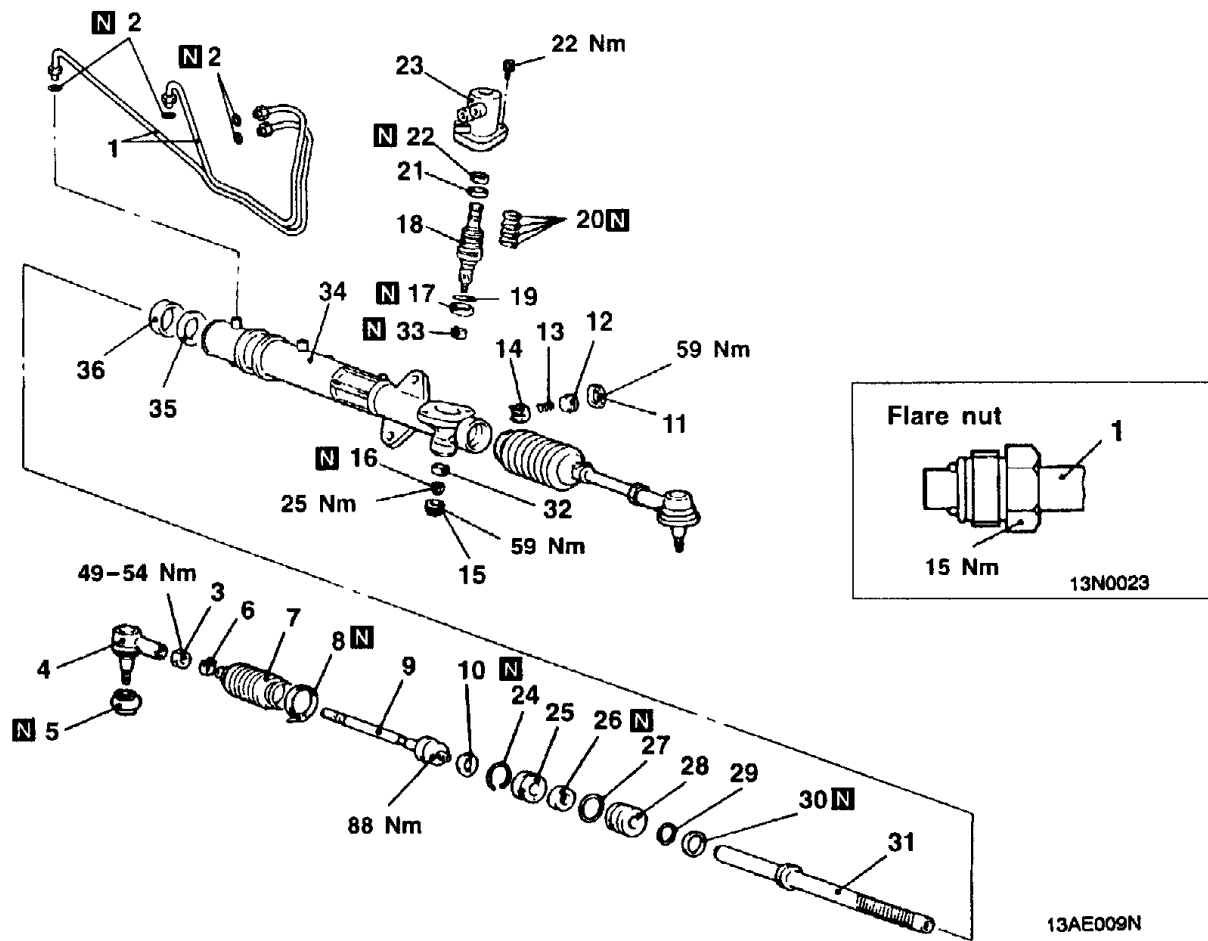
**CHECK THE TIE ROD FOR SWING RESISTANCE**

1. Give 10 hard swings to the tie rod.
2. Measure the tie rod swing resistance with a spring balance.

Standard value: 6–20 N

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

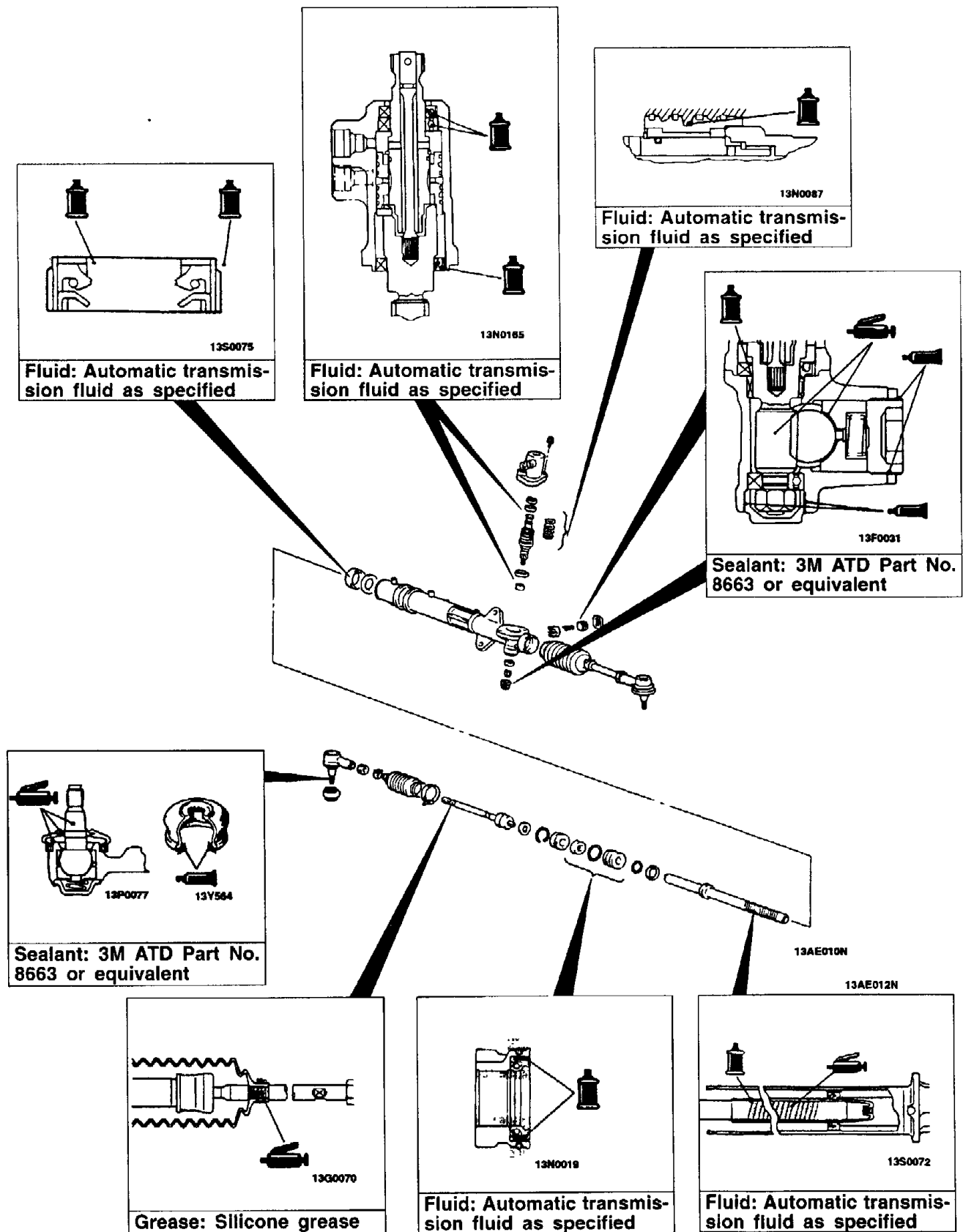
DISASSEMBLY AND REASSEMBLY

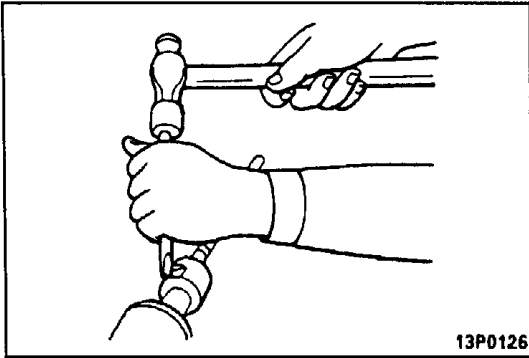


Disassembly steps

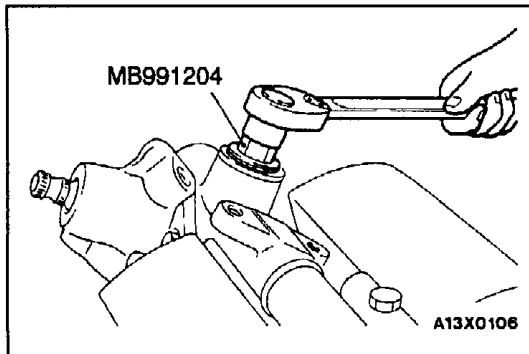
- | | | | |
|--------|----------------------------------|--------|---------------------------|
| | 1. Feed tube | | 19. O-ring |
| | 2. O-ring | ◀D▶▶J▶ | 20. Seal ring |
| | 3. Lock nut | ◀E▶▶I▶ | 21. Ball bearing (upper) |
| ▶Q▶▶P▶ | 4. Tie rod end | ◀E▶▶H▶ | 22. Oil seal (upper) |
| | 5. Dust cover | ◀F▶▶G▶ | 23. Valve housing |
| | 6. Bellows clip | | 24. Circlip |
| | 7. Bellows | ◀G▶▶D▶ | 25. Rack stopper |
| ▶A▶▶N▶ | 8. Bellows band | ▶D▶▶D▶ | 26. Oil seal |
| ▶A▶▶N▶ | 9. Tie rod | ▶F▶▶F▶ | 27. O-ring |
| ▶M▶ | 10. Tab washer | | 28. Rack bushing |
| | • Total pinion torque adjustment | | 29. O-ring |
| | 11. Lock nut | | 30. Seal ring |
| ◀B▶ | 12. Rack support cover | ◀H▶▶E▶ | 31. Rack |
| | 13. Rack support spring | ◀I▶▶C▶ | 32. Ball bearing (lower) |
| | 14. Rack support | ◀J▶▶B▶ | 33. Needle roller bearing |
| ▶L▶ | 15. End plug | | 34. Rack housing |
| | 16. Lock nut | | 35. Back-up washer |
| ◀C▶▶K▶ | 17. Oil seal (lower) | ◀K▶▶A▶ | 36. Oil seal |
| ◀C▶ | 18. Pinion and valve assembly | | |

Lubrication and Sealing Points

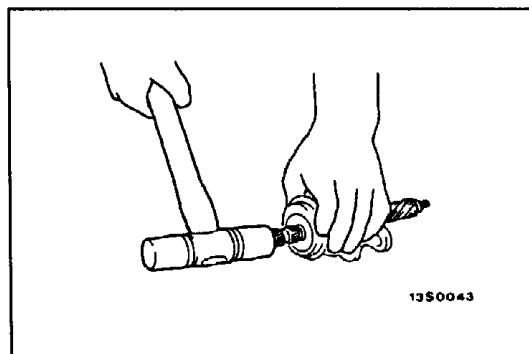


**DISASSEMBLY SERVICE POINTS****◀A▶ TIE ROD/TAB WASHER REMOVAL**

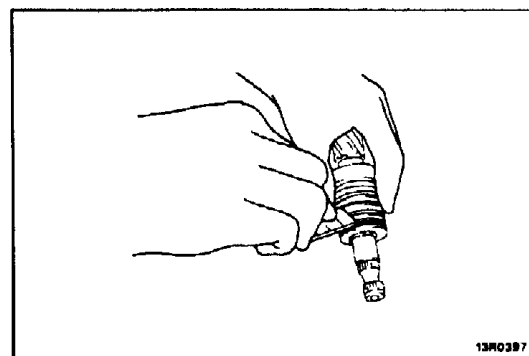
Unstake the tab washer which fixes the tie rod and rack with a chisel.

**◀B▶ RACK SUPPORT COVER REMOVAL**

Using the special tool, remove the rack support cover from the gear box.

**◀C▶ OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL**

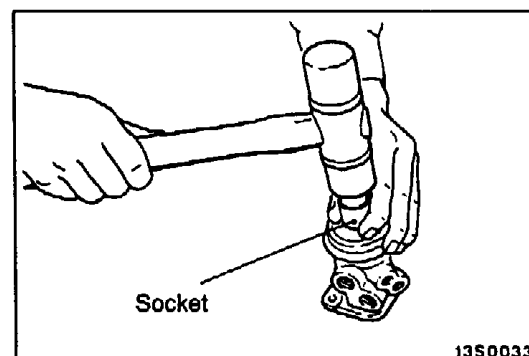
Using a plastic hammer, gently tap the pinion to remove it.

**◀D▶ SEAL RING REMOVAL**

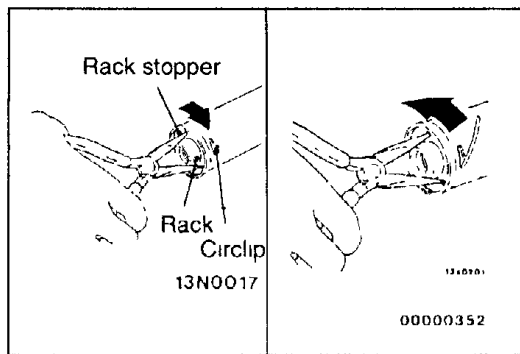
Cut the seal ring and remove it from the pinion and valve assembly and the rack.

Caution

When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.

**◀E▶ BALL BEARING/OIL SEAL REMOVAL**

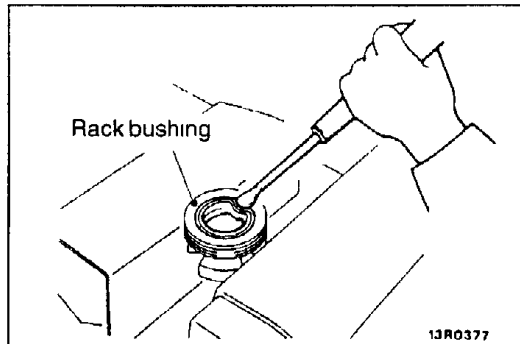
Using a socket, remove the oil seal and the ball bearing from the valve housing simultaneously.

**◀F▶ 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 counterclockwise to remove the circlip.

Caution

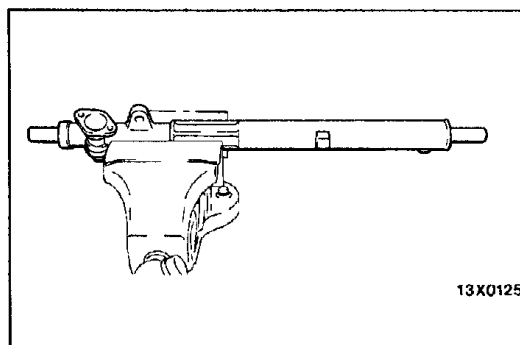
Note that if the rack stopper is first turned counterclockwise, the circlip will get caught in the slot in the housing and the rack stopper will not turn.

**◀G▶ OIL SEAL REMOVAL**

Partially bend oil seal and remove from rack bushing.

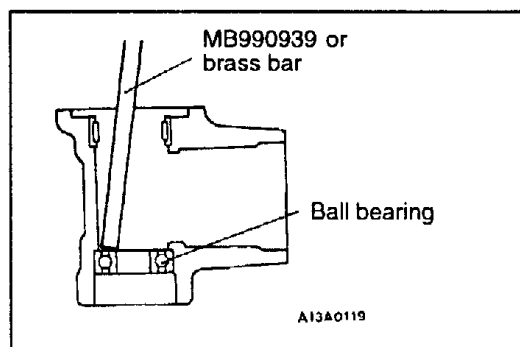
Caution

Do not damage oil seal press fitting surface.

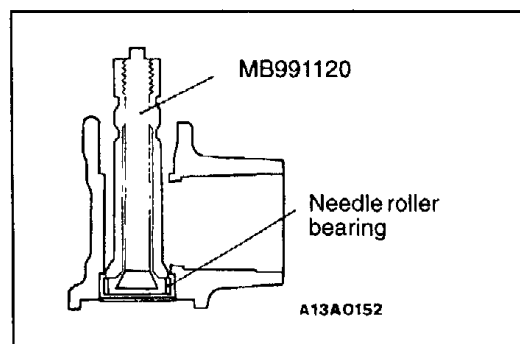
**◀H▶ RACK REMOVAL**

Pull out the rack slowly.

At this time also take out the rack stopper and the rack bushing simultaneously.

**◀I▶ BALL BEARING REMOVAL**

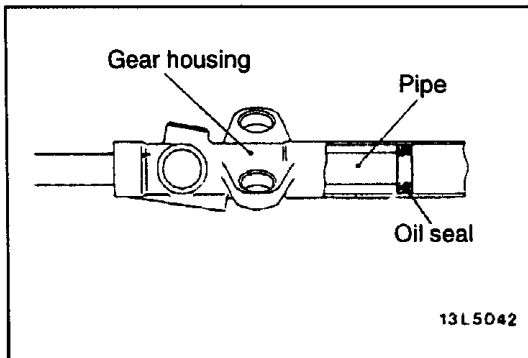
Use a brass bar or special tool to remove the ball bearing from the gear housing.

**◀J▶ NEEDLE ROLLER BEARING REMOVAL**

Use the special tool to remove the needle roller bearing from the rack housing.

Caution

Do not open special tool excessively to prevent damaging housing interior.

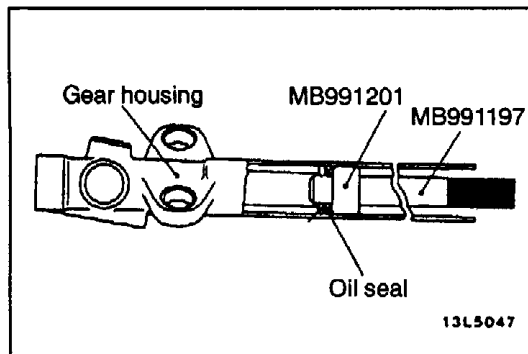


◀K▶ OIL SEAL REMOVAL

Use a piece of pipe, [outside diameter 23mm] 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

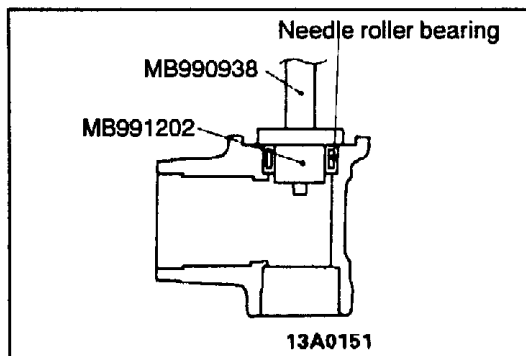
▶A◀ OIL SEAL INSTALLATION

1. Apply a coating of the specified fluid to the outside of the oil seal.

Specified fluid:

Automatic transmission fluid DEXRON or DEXRON II

2. Using the special tools, press the oil seal into the rack housing to the specified position (where the upper surface of press-in guide coincides with the stepped part of the press-in tool).



▶B◀ NEEDLE ROLLER BEARING INSTALLATION

1. Apply specified fluid to housing, bearing and oil seal press fitting surface.

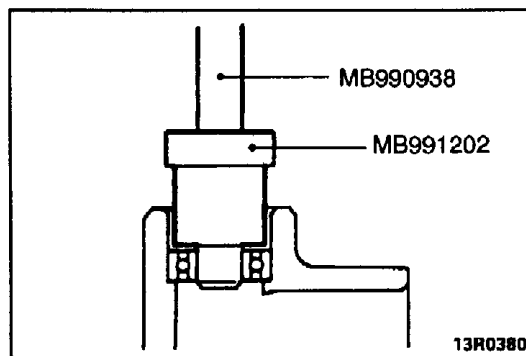
Specified fluid:

Automatic transmission fluid DEXRON or DEXRON II

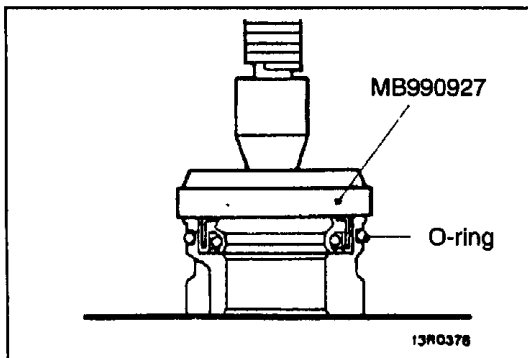
2. Press fit needle roller bearing with special tools.

Caution

Press fit straight as valve housing is aluminium.



▶C◀ BALL BEARING INSTALLATION



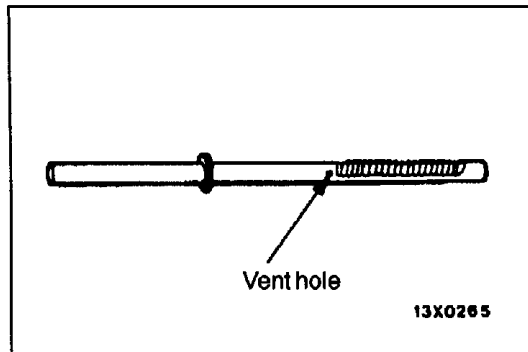
►D◄ OIL SEAL/O-RING INSTALLATION

1. Apply a coating of the specified fluid to the outside of the oil seal and O-ring.

Specified fluid:

Automatic transmission fluid DEXRON or DEXRON II

2. Use special tool to press fit oil seal until it touches the rack bush end.

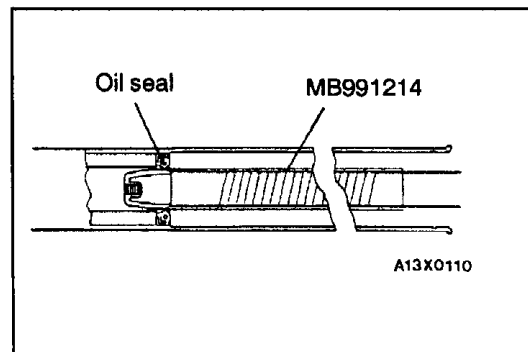


►E◄ RACK INSTALLATION

1. Apply a coating of multipurpose grease to the rack teeth face.

Caution

Do not block the vent hole in the rack with grease.

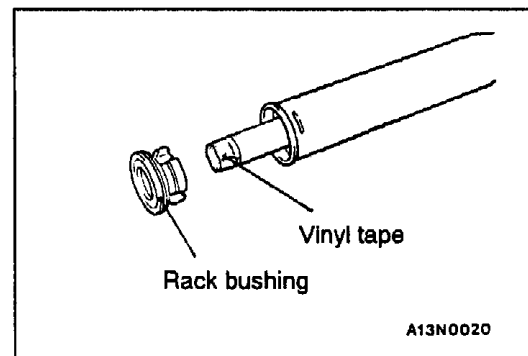


2. Cover rack teeth with special tool.
3. Apply specified fluid on special tool.

Specified fluid:

Automatic transmission fluid DEXRON or DEXRON II

4. Match oil seal centre with rack to prevent retainer spring from slipping and slowly insert rack from power cylinder side.



►F◄ RACK BUSHING INSTALLATION

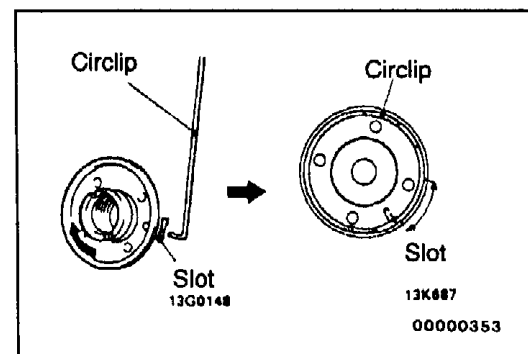
Wrap the rack end with vinyl tape, apply a coating of the specified fluid, and then install the rack bushing and rack stopper.

Specified fluid:

Automatic transmission fluid DEXRON or DEXRON II

Caution

Do not allow oil seal retainer spring to slip out.

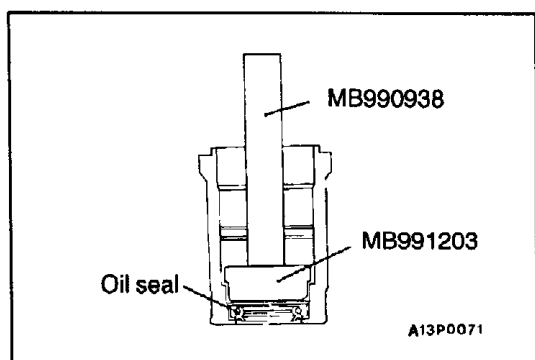


►G◄ CIRCLIP INSTALLATION

Insert circlip to rack stopper hole through cylinder hole. Turn rack stopper clockwise and insert circlip firmly.

Caution

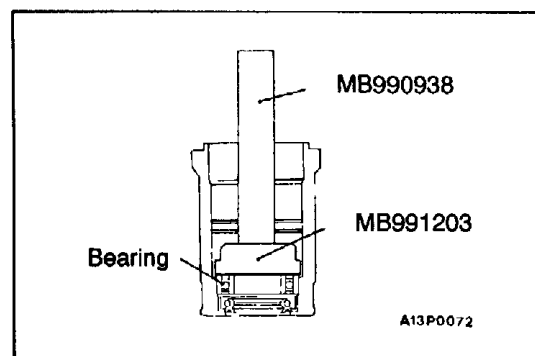
Insert circlip to rack stopper hole whilst turning rack stopper clockwise.

**►H◄ OIL SEAL INSTALLATION**

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:

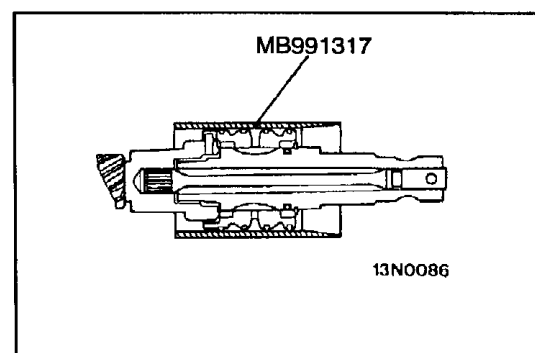
Automatic transmission fluid DEXRON or DEXRON II

**►I◄ BALL BEARING INSTALLATION**

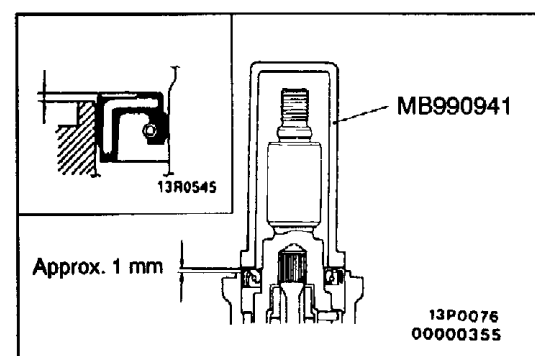
Apply a coating of the specified fluid to the outside of the ball bearing. Using the special tools, press the oil seal into the valve housing.

Specified fluid:

Automatic transmission fluid DEXRON or DEXRON II

**►J◄ SEAL RING INSTALLATION**

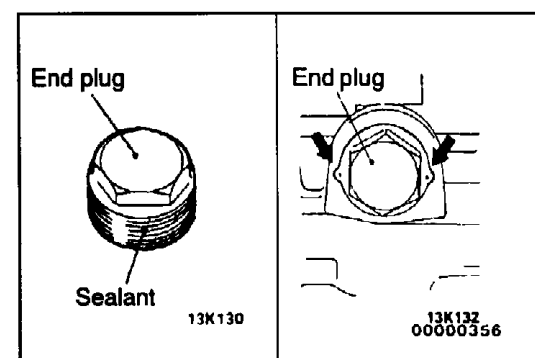
Because the seal rings expand at the time of installation, tighten after installation by using the special tool to compress the rings, or press down by hand.

**►K◄ OIL SEAL INSTALLATION**

Using the special tool, press the oil seal into the valve housing.

Caution

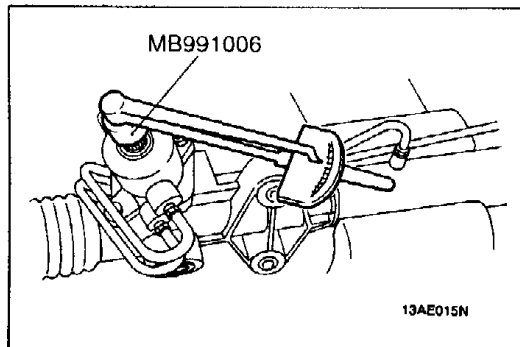
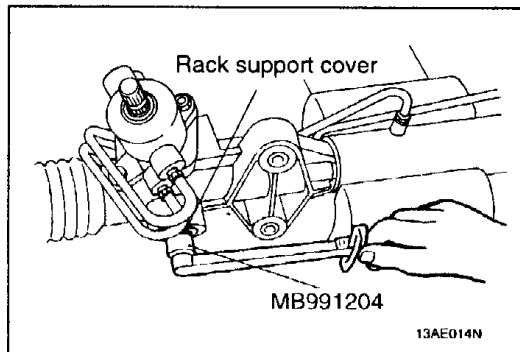
To ensure effective sealing at the valve housing alignment surface, the upper surface of the oil seal should project outward approximately 1 mm from the housing edge surface.

**►L◄ END PLUG INSTALLATION**

1. Apply the specified sealant to the threaded part of the end plug.

Specified sealant: 3M ATD Part No. 8663 or equivalent

2. Secure the threaded portion of the end plug at two places by using a punch.



►M◄ TOTAL PINION TORQUE ADJUSTMENT

1. Position rack at its centre. Tighten rack support cover to 15 Nm.
2. Reverse rotate the rack support cover by about 30°.

3. 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.

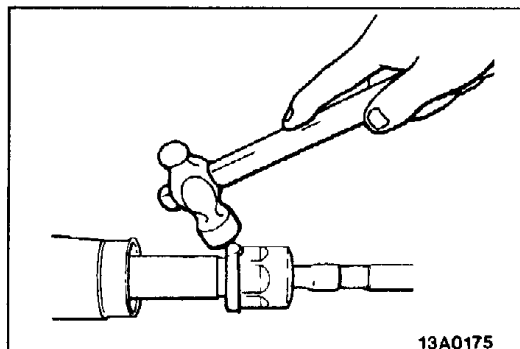
Standard value: 0.8–1.6 Nm

Torque variation: 0.5 Nm or less

4. If the rotation torque or torque fluctuation is outside the standard value, adjust by reverse rotating the rack support cover to within a range of 0–30°.
5. After adjusting, lock rack support cover with lock nut.

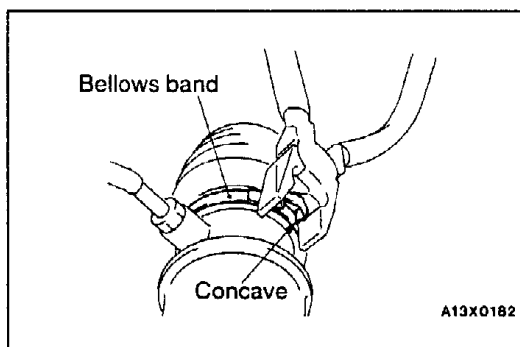
Caution

1. When adjusting, set the standard value at its highest value.
2. When operating the rack in the axial direction, ensure there is no roughness or snagging.
3. Measure the torque at all points.
4. If it is impossible to adjust the rack support cover to the standard values while within the regulated reverse rotation angle, carry out an inspection of the rack support cover and replace if necessary.



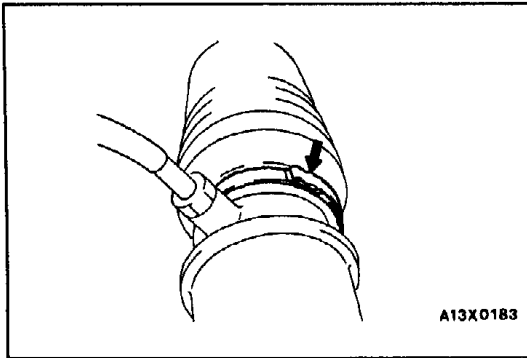
►N◄ TAB WASHER/TIE ROD INSTALLATION

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

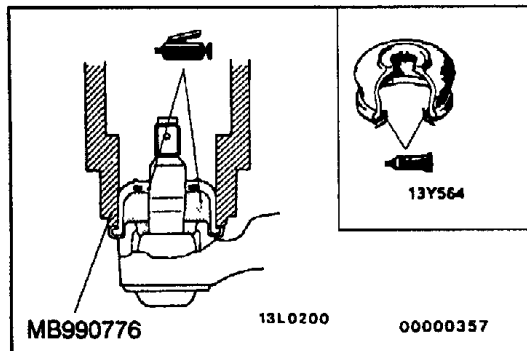


►O◄ BELLOWS BAND INSTALLATION

1. Apply pliers to the concave section of the bellows band and tighten the bellows band.

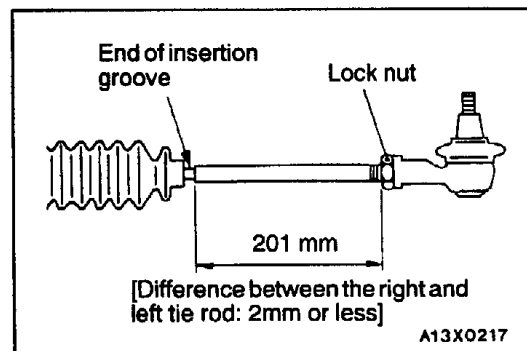


2. Use a plastic hammer or similar to bend the convex section of the bellows band as shown in the illustration.



►P◄ DUST COVER INSTALLATION

1. Pack dust cover interior with multipurpose grease.
2. Apply specified sealant to dust cover lip.
Specified sealant: 3M ATD Part No. 8663 or equivalent
3. Using the special tool, install the dust cover to the tie rod end ball joint.



►Q◄ TIE ROD END INSTALLATION

Screw in tie-rod end to have its right and left length as illustrated. Lock with lock nut.

INSPECTION

RACK

- 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 the pinion gear tooth surfaces for damage or wear.
- Check for worn or defective seal ring.

BEARING

- Check for roughness or abnormal noise during bearing operation.
- Check the bearing for play.
- Check the needle roller bearings for roller slip-off.

OTHERS

- 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.

POWER STEERING OIL PUMP

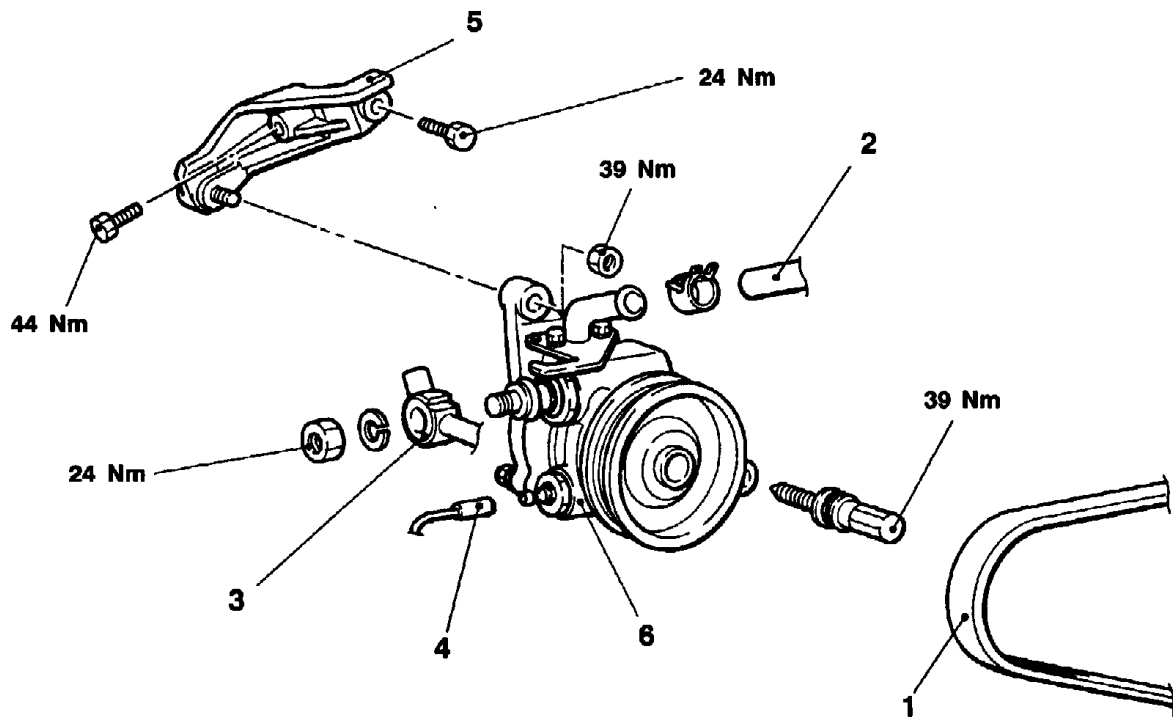
REMOVAL AND INSTALLATION

Pre-removal Operation

- Power Steering Fluid Draining
(Refer to P.37A-9.)

Post-Installation Operation

- Power Steering Fluid Supplying
(Refer to P.37A-9.)
- Drive-belt Tension Adjusting (Refer to GROUP 11 – On-vehicle Service.)
- Power Steering Fluid Line Bleeding
(Refer to P.37A-9.)
- Oil Pump Pressure Check (Refer to P.37A-10.)

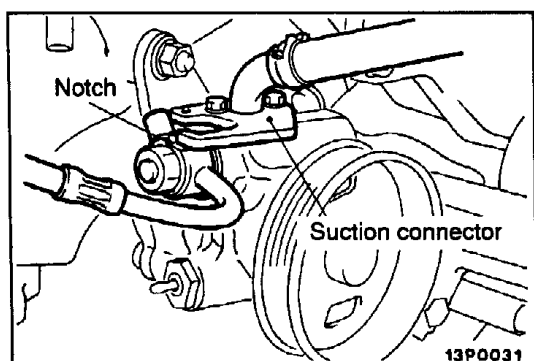


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Removal steps

- A◄
1. Drive-belt
 2. Suction hose
 3. Pressure hose

4. Pressure switch connector
5. Power steering pump bracket stay
6. Oil pump

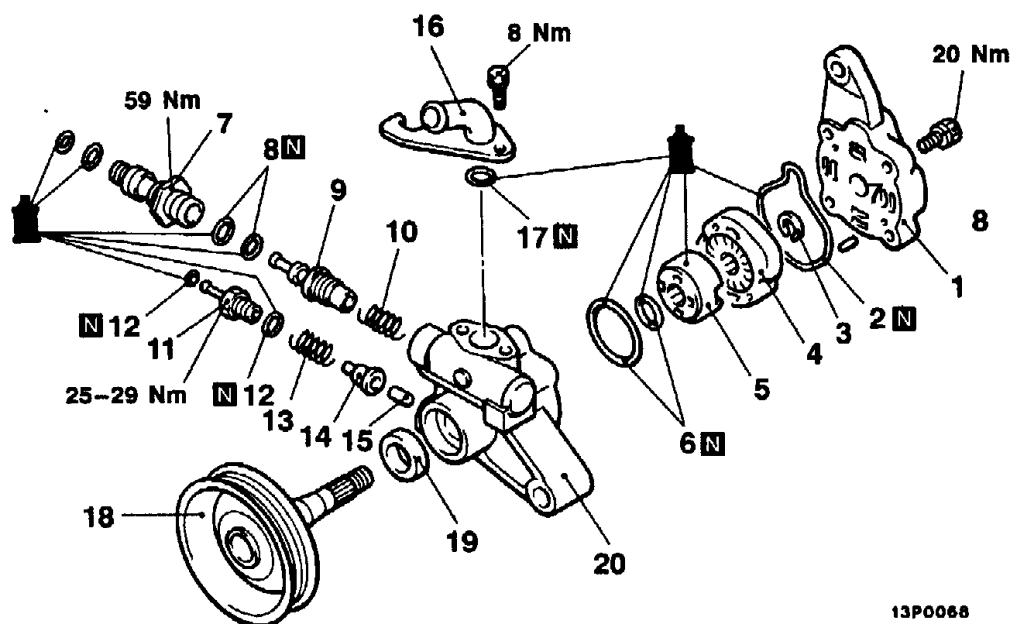
**INSTALLATION SERVICE POINT****►A◄ PRESSURE HOSE INSTALLATION**

Connect the pressure hose so that its notched part contacts the suction connector.

INSPECTION

- Check the drive-belt for cracks
- Check the pulley assembly for uneven rotation.

DISASSEMBLY AND REASSEMBLY



13P0068

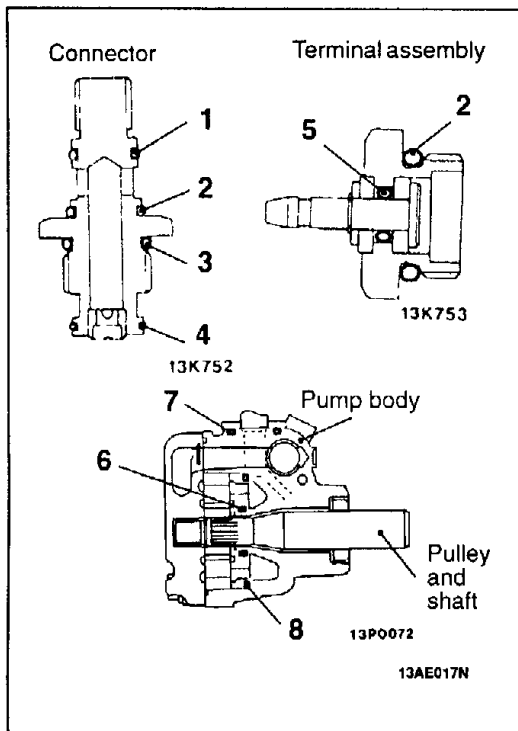
13P0069	13P0070	13P0071
Oil pump pulley and shaft kit	Oil pump seal kit	Oil pump cartridge kit

13AE016N

Disassembly steps

1. Pump cover
2. O-ring
3. Snap ring
4. Oil pump cartridge
5. Side plate
- ▶A◀ 6. O-ring
- ▶A◀ 7. Connector
- ▶A◀ 8. O-ring
9. Flow control valve
10. Flow control spring

11. Terminal assembly
- ▶A◀ 12. O-ring
13. Plunger spring
14. Plunger
15. Piston rod
- ▶A◀ 16. Suction connector
- ▶A◀ 17. O-ring
18. Pulley and shaft
19. Shaft oil seal
20. Oil pump

**REASSEMBLY SERVICE POINT****►A◄ O-RINGS INSTALLATION**

No.	I.D.×Width mm
1	11×1.9
2	13×1.9
3	17.8×2.4
4	13.5×1.5
5	3.8×1.9
6	16.8×2.4
7	17.8×2.4
8	47.2×2.4

INSPECTION

- Check the flow control valve for clogging.
- Check the pulley assembly for wear or damage.
- Check the groove of rotor and vane for “stepped” wear.
- Check the contact surface of cam ring and vanes for “stepped” wear.
- Check the vanes for damage.

POWER STEERING HOSES

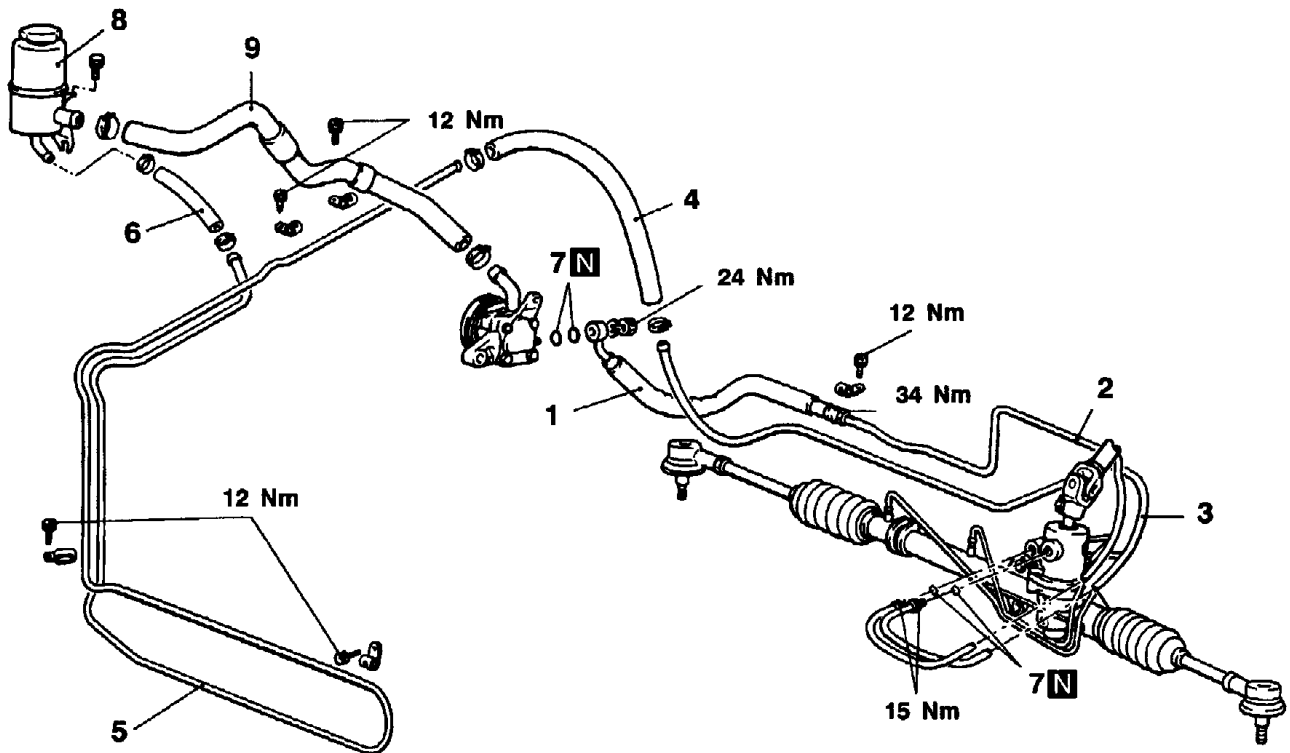
REMOVAL AND INSTALLATION

Pre-removal Operation

- Power Steering Fluid Draining (Refer to P.37A-9.)
- Front Bumper Removal (Refer to GROUP 51 – Front Bumper)

Post-installation Operation

- Front Bumper Installation (Refer to GROUP 51 – Front Bumper)
- Power Steering Fluid Supplying (Refer to P.37A-9.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-9.)

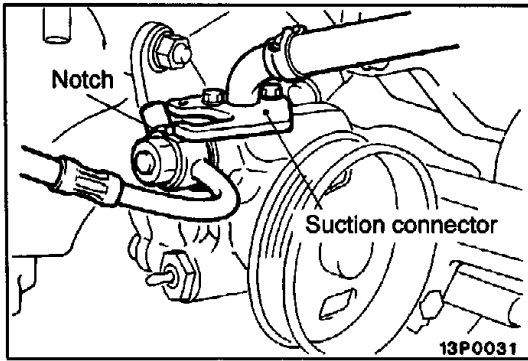


13AE013N

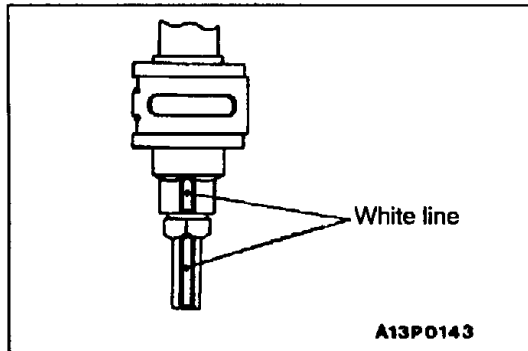


1. Pressure hose
2. Pressure tube
3. Return tube
4. Return hose
5. Cooler tube

6. Hose
7. O-ring
8. Oil reservoir
9. Suction hose

**INSTALLATION SERVICE POINT****►A◄ PRESSURE HOSE INSTALLATION**

1. Connect the pressure hose so that its slot section contacts the oil pump's guide bracket.



2. When the pressure hose is installed, align the white line on the pressure hose with the white line on the pressure tube so that together they form a straight line.

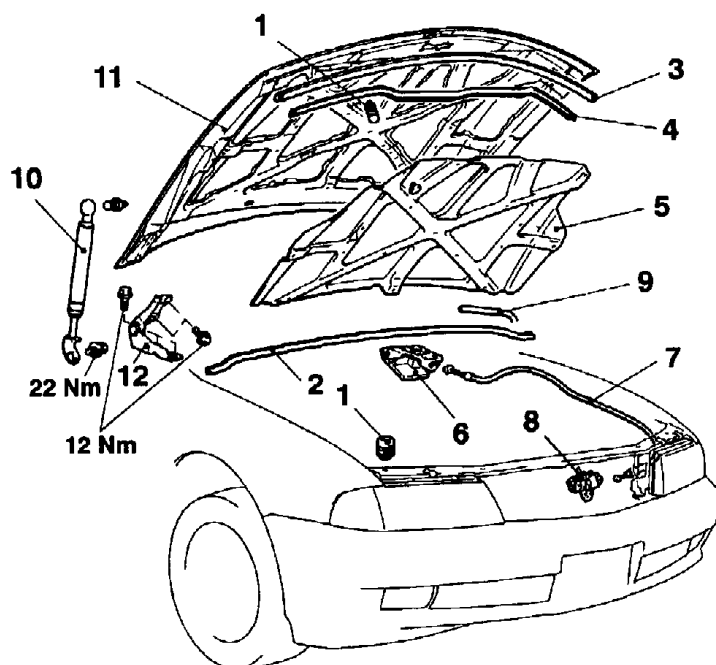
BODY

CONTENTS

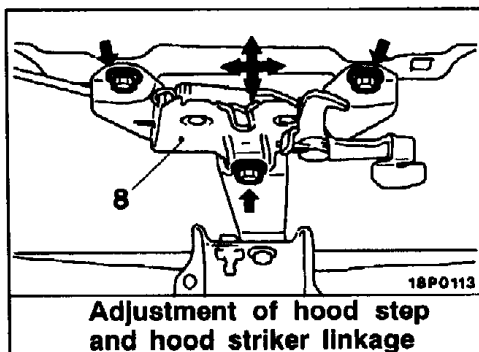
HOOD	2	Troubleshooting	19
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HOOD

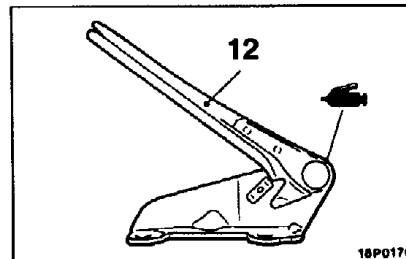
REMOVAL AND INSTALLATION



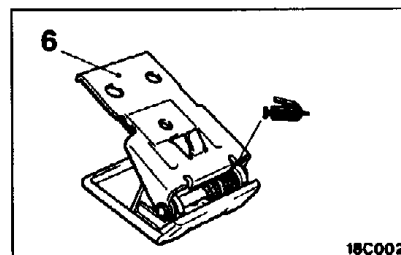
18P0088



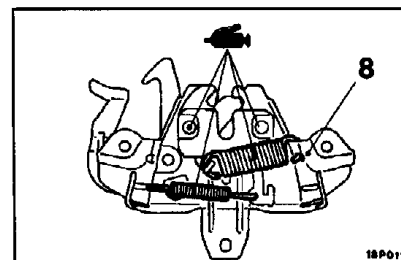
18P0113



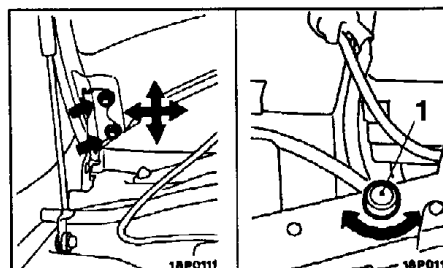
18P0170



18C0021



18P0114



Adjustment of clearance around hood and height

18AE011N



1. Bumper
2. Hood weatherstrip
3. Hood front weatherstrip
4. Hood weatherstrip
5. Hood silencer
6. Lock release handle

Hood lock release cable removal steps

- Splash shield (Refer P.42-8)
- 7. Hood lock release cable

Hood latch removal steps

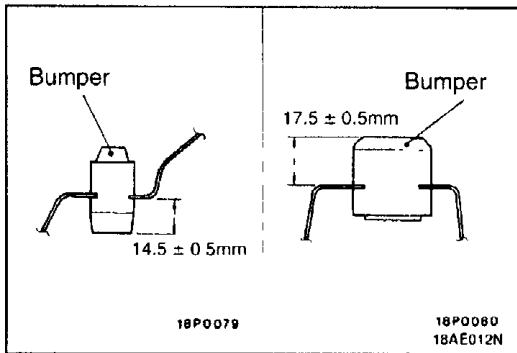
- Radiator grille (Refer Group 51-Grille)
- 8. Hood latch

Hood and hinges removal steps

9. Washer tube connection
10. Hood gas spring
11. Hood
12. Hood hinge

Caution:

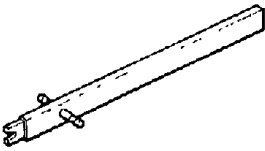
1. Do not disassemble or dispose of the hood gas spring in a fire.
2. Before disposing of the hood gas spring, punch a hole to release the gas.

**INSTALLATION SERVICE POINT****►A◄ BUMPER INSTALLATION**

Install the bumper as shown in the diagram.

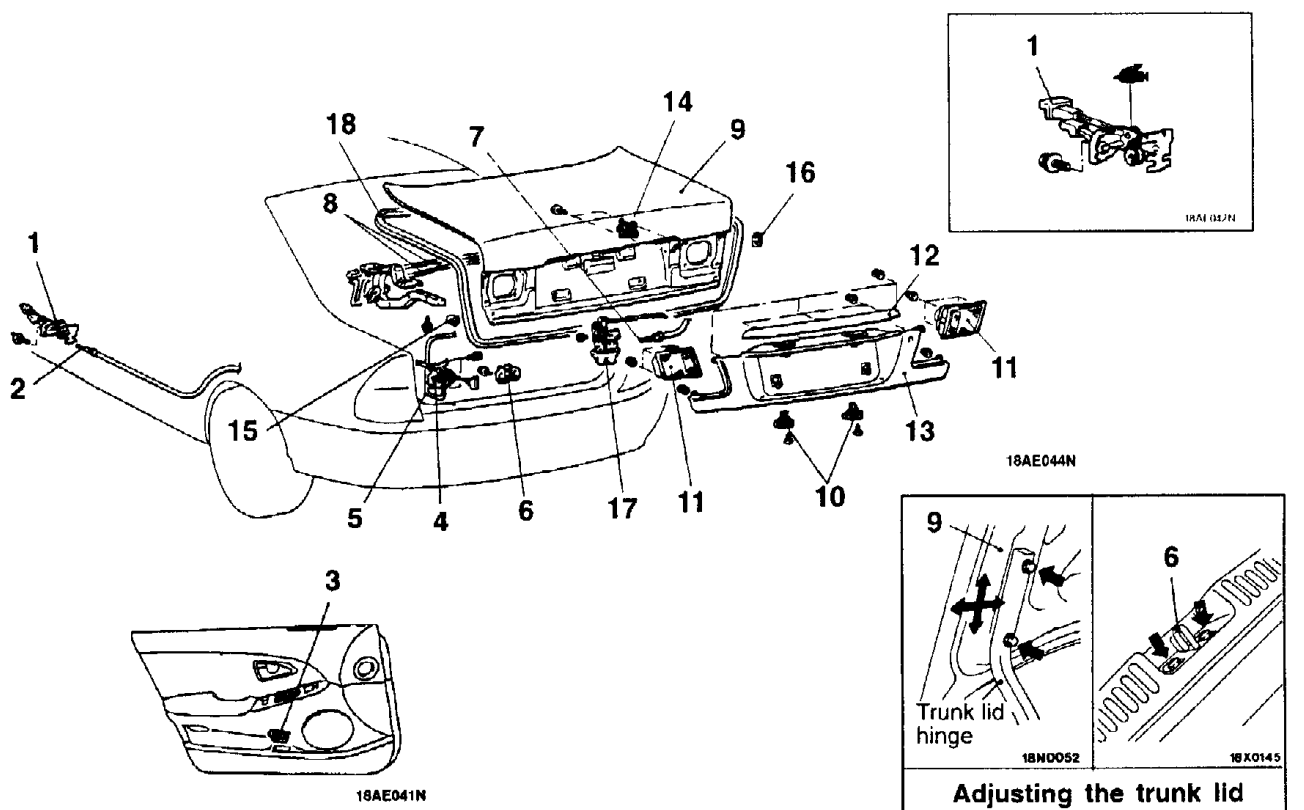
TRUNK LID

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991244	Torsion bar remover and installer	Removal and installation of trunk lid torsion bar

TRUNK LID

REMOVAL AND INSTALLATION



18AE045N

Trunk lid release cable and lid lock release handle (wire-type opener) removal steps

- Front seat (driver side) (Refer Group 52A)
- Rear seat (Refer Group 52A)
- Front scuff plate (LH) (Refer Group 52A-Trim)
- centre pillar lower trim A (LH) (Refer Group 52A)
- Rear scuff plate (LH) (Refer Group 52A-Trim)
- Trunk rear trim cover (Refer Group 52A)
- Trunk rear centre trim (Refer Group 52A)
- Trunk rear side trim (LH) (Refer Group 52A)
- Trunk side trim (LH) (Refer Group 52A)
- 1. Lid lock release handle
- 2. Trunk lid release cable

Electric trunk lid release cable removal steps

- Trunk rear side trim (LH) (Refer Group 52A)
- Trunk lid trim (Refer Group 52A)
- 3. Trunk lid and fuel filler door opening switch

- 4. Trunk lid and fuel filler door opener actuator
- 5. Trunk lid release cable

Trunk lid striker removal steps

- Trunk rear trim cover (Refer Group 52A)
- 6. Trunk lid striker

Trunk lid removal steps

- Trunk lid trim (Refer Group 52A)
- Rear lid harness connection
- 7. Trunk lid release cable connection
- 8. Trunk lid torsion bar
- 9. Trunk lid panel assembly
- 10. Licence plate lamp
- 11. Rear lid lamp
- 12. Rear panel upper garnish
- 13. Rear panel lower garnish
- 14. Trunk lid lock cylinder
- 15. Bumper
- 16. Bumper

Trunk lid latch removal steps

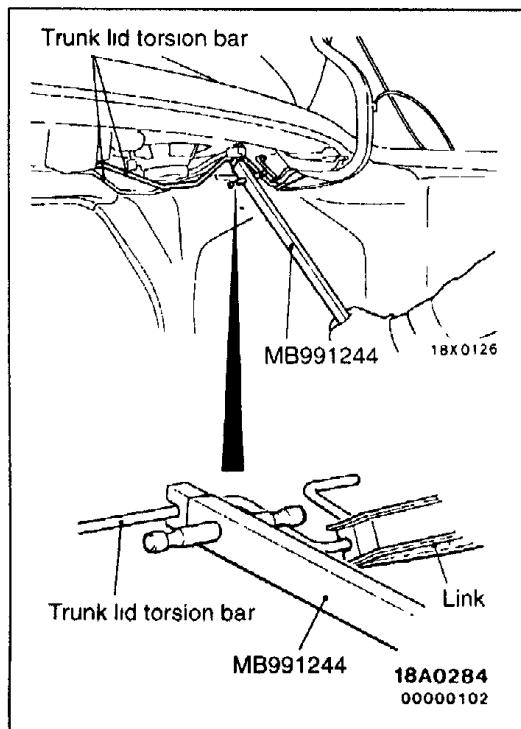
- Trunk lid trim (Refer Group 52A)
- 17. Trunk lid latch assembly

Trunk lid weatherstrip removal

- 18. Trunk lid weatherstrip

◀A▶ ▶C▶

▶B▶
▶B▶



REMOVAL SERVICE POINT

◀A▶ TRUNK LID TORSION BAR REMOVAL

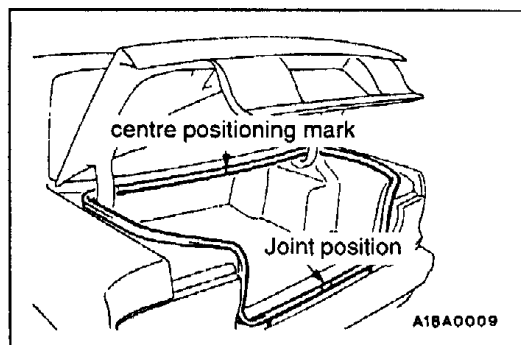
1. Disconnect the body harness and the harness connector of the rear shelf lower panel.
2. Attach the special tool to the link side of the torsion bar as shown in the figure, and push downwards to remove the torsion bar from the link.

NOTE

When removing the torsion bars, the left and right torsion bars cross at the centre, so the bar that is towards you at the crossed section should be removed first.

Caution

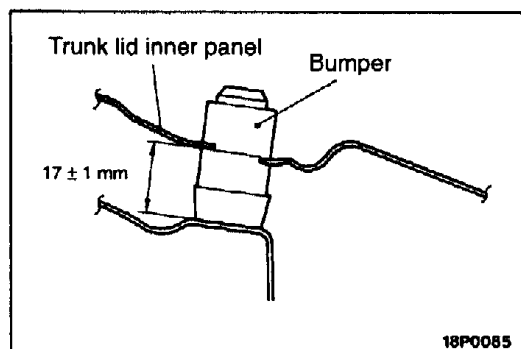
Be sure to attach the special tool properly, as the body or parts could be damaged when the torsion is removed from the special tool.



INSTALLATION SERVICE POINTS

▶A◀ TRUNK LID WEATHERSTRIP INSTALLATION

Install the trunk lid weatherstrip so that the marked part is at the position shown in the illustration.



▶B◀ BUMPER INSTALLATION

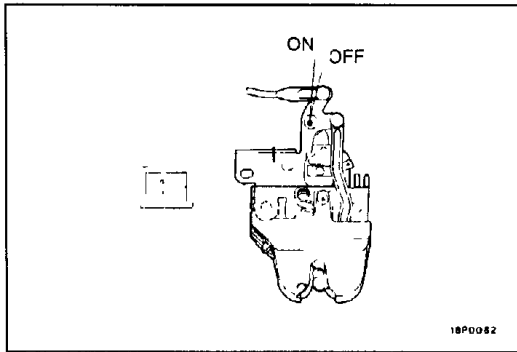
Install the bumper as shown in the figure.

▶C◀ TRUNK LID TORSION BAR INSTALLATION

1. Insert the end of the torsion bar through the link side mounting hole.
2. Attach the special tool as described previously. Refer to – Trunk Lid Torsion Bar Removal.

Caution

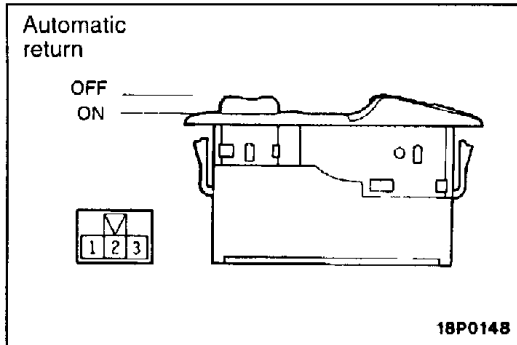
Be sure to attach the special tool properly, as the body or parts could be damaged when the torsion bar is removed from the special tool.



INSPECTION

TRUNK LID LATCH SWITCH CONTINUITY CHECK

Switch position	Terminal No.	
	1	Body earth
ON (Latch open)	○	○
OFF (Latch shut)		



TRUNK LID AND FUEL FILLER DOOR OPENER ACTUATOR

1. Connect a battery directly to the actuator terminals and check that the motor rotates smoothly.
2. Check that the motor rotates in the reverse direction when the polarity of the battery is reversed.

TRUNK LID AND FUEL FILLER DOOR OPENER SWITCH CONTINUITY CHECK

Switch position	Terminal No.	
	1	2
OFF	○	○
ON		

NOTE

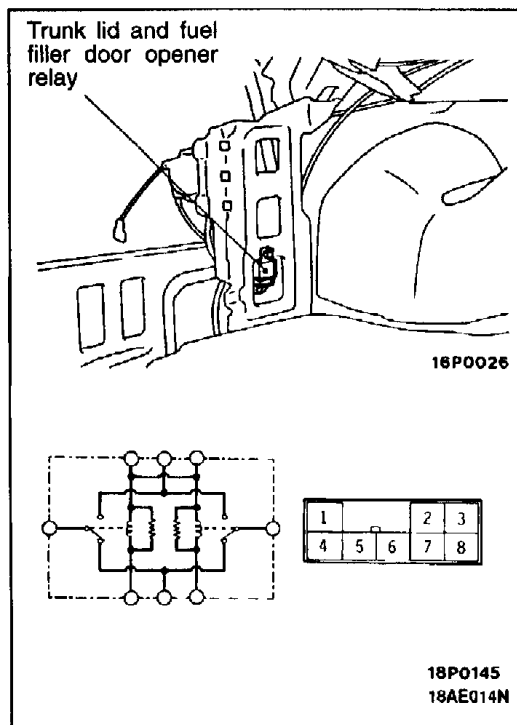
See the Fuel Filler Door section for section for instructions on checking the fuel filler door side.

TRUNK LID AND FUEL FILLER DOOR OPENER RELAY CONTINUITY CHECK

Battery Voltage	Terminal No.					
	1	2	3	4	5	7
Continuity no voltage	○		○		○	
Continuity with voltage	○	○		⊖	---	⊕

NOTE

See the Fuel Filler Door section for section for instructions on checking the fuel filler door side.



FENDER

SEALANT

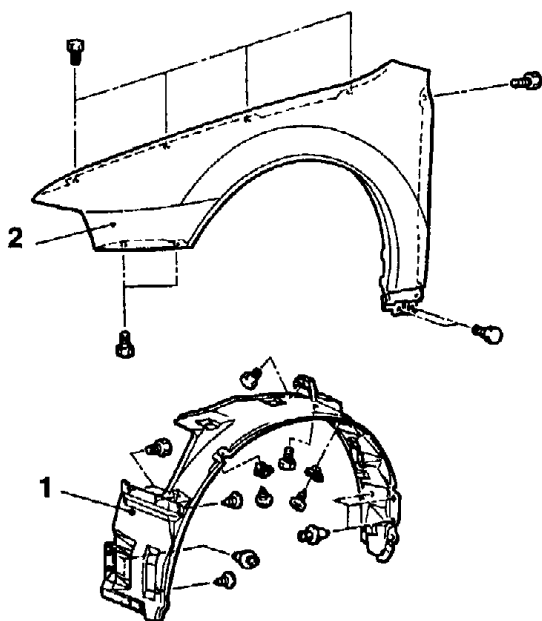
Items	Specified sealant
Fender to body panel	3M ATD Part No. 8625 or equivalent
Splash shield to fender	3M ATD Part No. 8625 or equivalent

FENDER

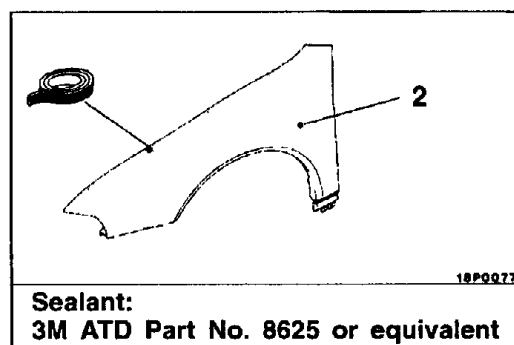
REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operation

- Front Bumper Removal and Installation
(Refer to GROUP 51 – Front Bumper)
- Front Side Air Dam Removal and Installation
(Refer to GROUP 51 – Aero Parts)

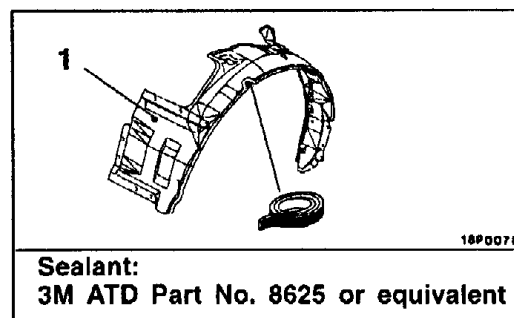


18P0067



18P0077

Sealant:
3M ATD Part No. 8625 or equivalent



18P0078

Sealant:
3M ATD Part No. 8625 or equivalent

18AE013N

Removal steps

1. Splash shield
2. Fender

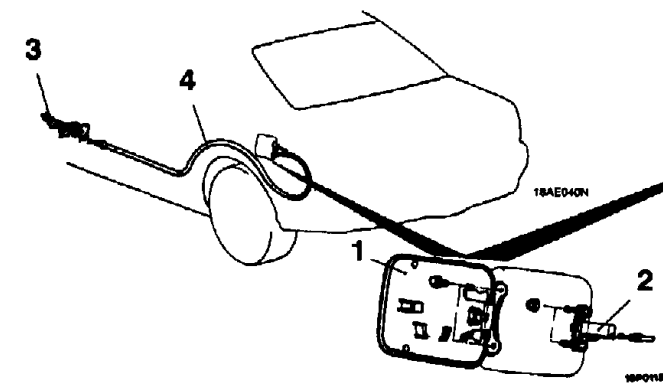
FUEL FILLER DOOR

REMOVAL AND INSTALLATION

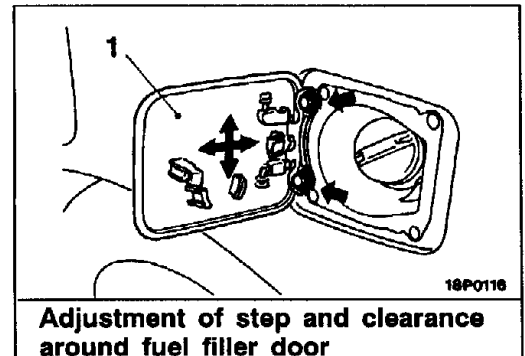
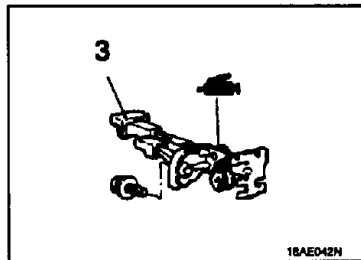
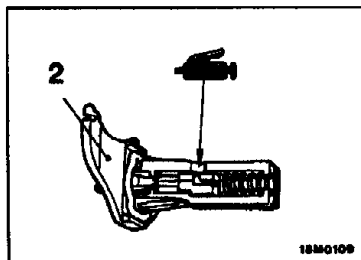
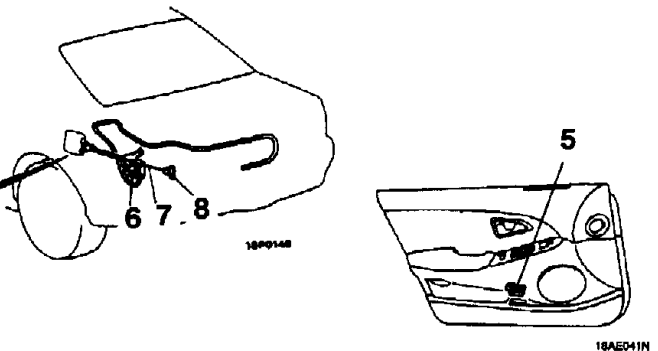
Pre-removal and Post-Installation Operation

- Front Seat (driver's side) Removal and Installation (Refer to 52A–Front Seat)
Rear Seat Removal and Installation (Refer to GROUP 52A–Rear Seat)
- centre Pillar Lower Trim (driver's side), Front Scuff Plate (driver's side), Rear Scuff Plate (driver's side), Trunk Side Trim, Rear End Trim Cover, Trunk Rear Trim Removal and Installation (Refer to GROUP 52A–Trim)

<Wire-type opener>



<Electric opener>



18AE043N

Removal steps

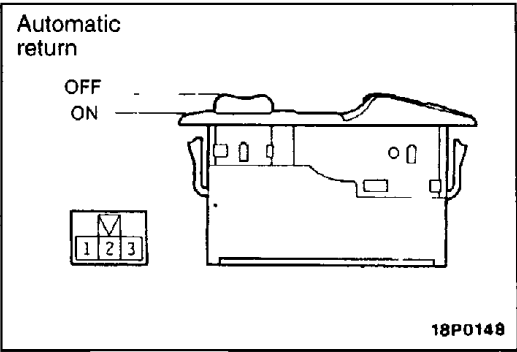
<Wire type opener>

1. Fuel filler door panel
2. Fuel filler door hook
3. Lid lock release handle
4. Fuel filler door lock release cable

Electric Removal steps

<Electric opener>

1. Fuel filler door panel
2. Fuel filler door hook
5. Trunk and fuel filler door opener switch
6. Trunk and fuel filler door opener actuator
7. Fuel filler door lock release cable
8. Emergency lever



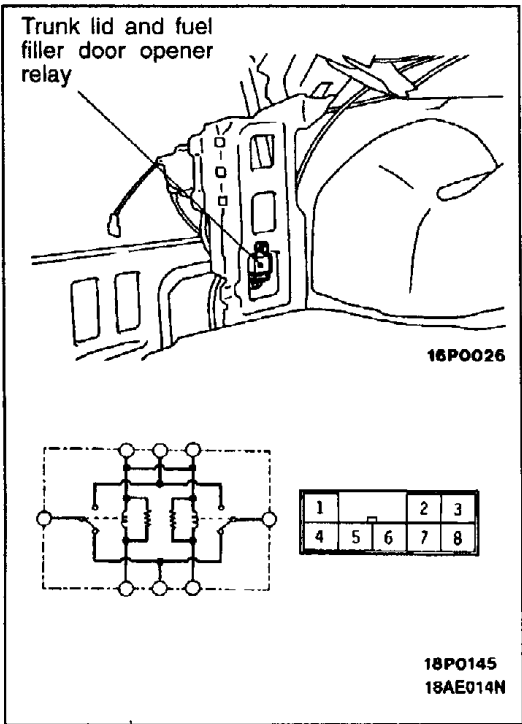
INSPECTION

TRUNK LID AND FUEL FILLER DOOR OPENER SWITCH CONTINUITY CHECK

Switch position	Terminal No.	
	2	3
OFF		
ON	○ —	○ —

NOTE

See the Trunk Lid section for instructions on checking the trunk lid side.



TRUNK LID AND FUEL FILLER DOOR OPENER RELAY CONTINUITY CHECK

Battery Voltage	Terminal No.					
	1	2	3	5	7	8
Continuity no voltage	○ —		○ —	○ —		
Continuity with voltage		○ —	○ —		⊕ — ⊖	⊖ — ⊕

NOTE

See the Trunk Lid section for instructions on checking the trunk lid side.

TRUNK LID AND FUEL FILLER DOOR OPENER ACTUATOR CHECK

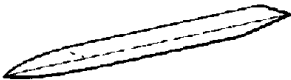
Refer to P.42-7

WINDSHIELD AND WINDOW GLASS

SEALANT AND ADHESIVE

Items	Specified sealant and adhesive
Windshield, Rear window glass	3M ATD Parts No. 8609 Super Fast Urethane and 3M ATD Parts No. 8608 Super Fast Urethane Primer or equivalent

SPECIAL TOOLS

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch, trim, etc.
	MB990480	Glass holder	Removal and installation of window glass

WINDOW GLASS

GENERAL

The windshield and rear window glass are attached by an urethane-base adhesive to the window frame. This adhesive not only provides improved glass holding and sealing, but also permits use of body openings having a greater structural strength.

ITEMS NEEDED

Name	Remarks
Adhesive	3M ATD Part No.8609 Super Fast Urethane Auto Glass Sealant or equivalent
Primer	3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent
Spacers	Available as service part
Anti-rust solvent (or Tectyl 506T – Valvoline Oil Company)	For rust prevention
Isopropyl alcohol	For grease removal from bonded surface
Steel piano wire	Dia. x length – 0.6mm x 1mm For cutting adhesive
Adhesive gun	For pressing-out adhesive

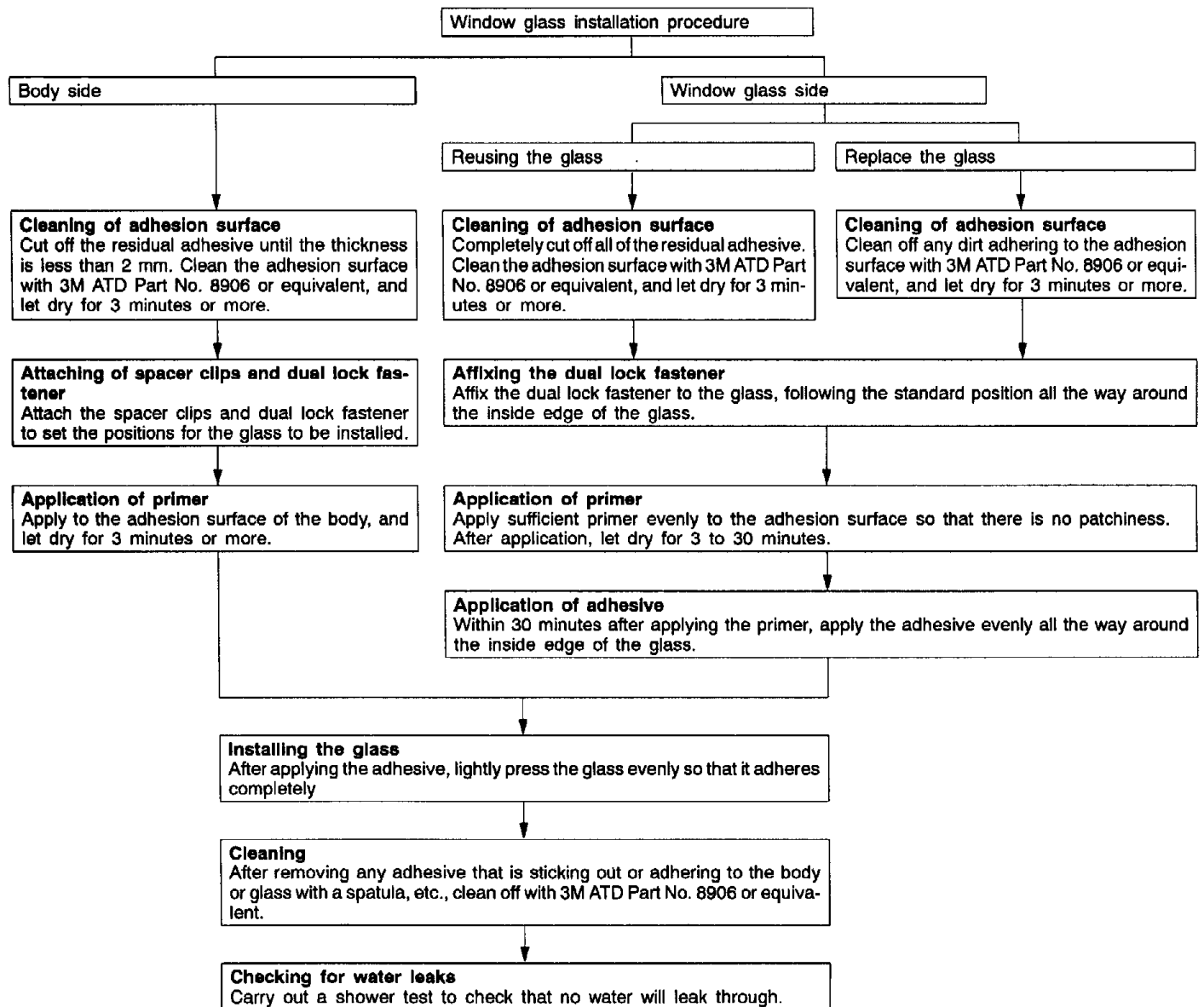
HANDLING OF AUTO WINDOW SEALER

Keep the sealant in a cool place, not exposed to the direct rays of the sun. Do not place any heavy article on the sealant nor press it, otherwise it will become deformed. Avoid storing the sealant for more than 6 months, because it will lose its sealing effect.

BODY PINCH-WELD FLANGE SERVICING

Before servicing the body pinch-weld flange, remove old adhesive completely. If the flange requires painting, bake it after painting is completed.

WORKING PROCESS

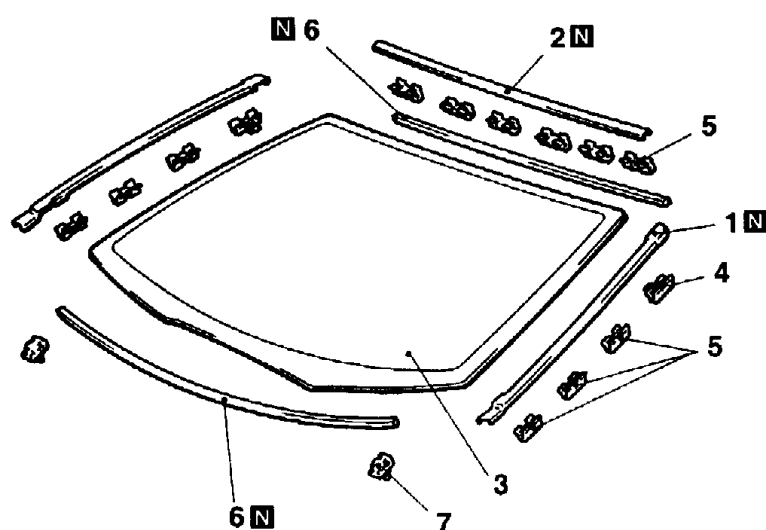
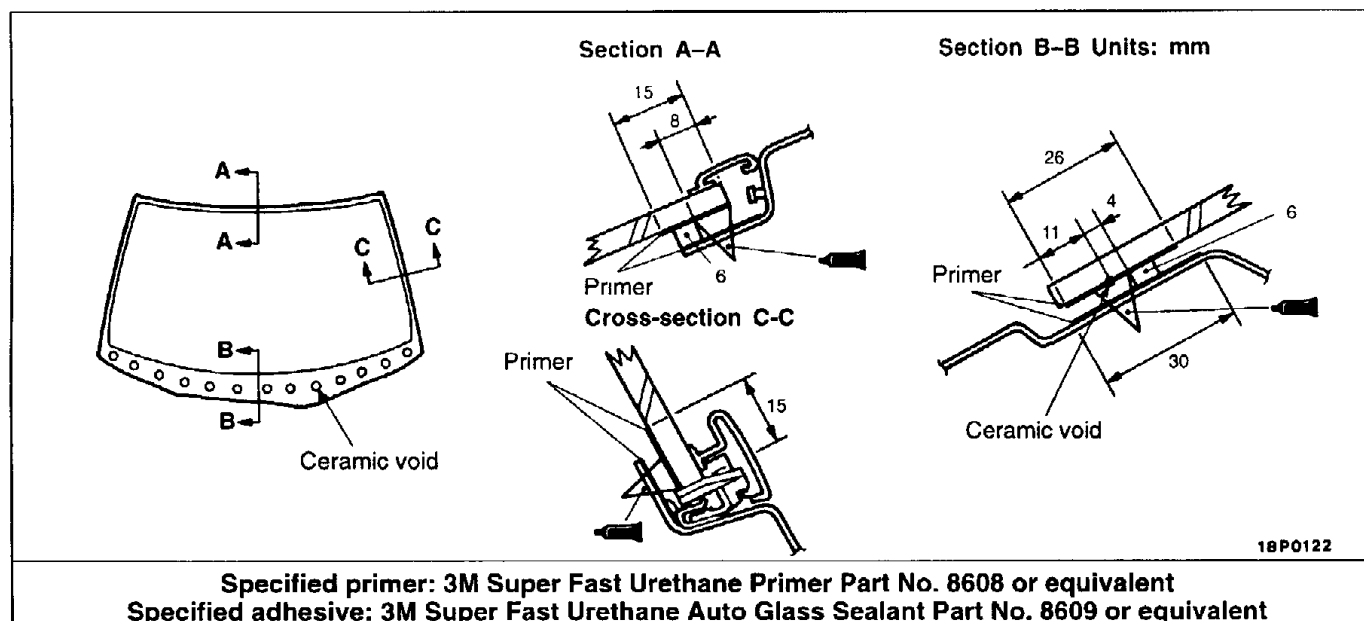


WINDSHIELD

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation

- Front Deck Garnish (Refer to GROUP 51–Grille and Garnishes)
- Front Pillar Trim (Refer to GROUP 52A–Trims)
- Headlining (Refer to GROUP 52A–Headlining)



18P0123
After applying primer to the fasteners, attach double sided tape.

Double-sided tape, primer:
3M 4 253 (width 5.5mm, thickness 0.8mm, length 23mm),
3M C100

18P0125

18AE015N

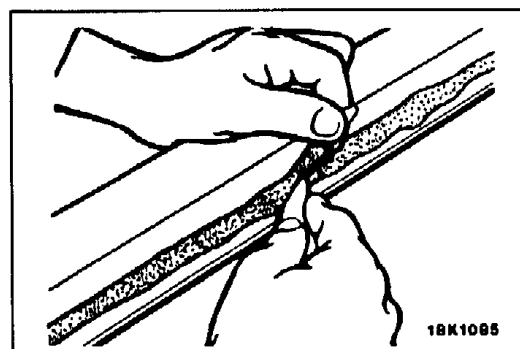
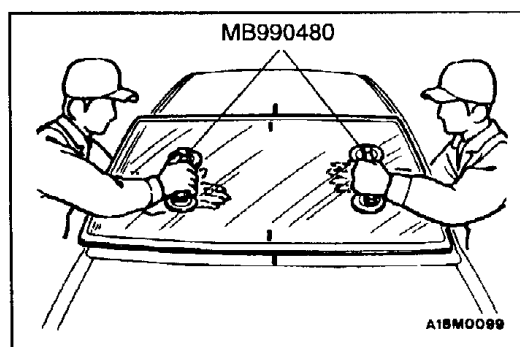
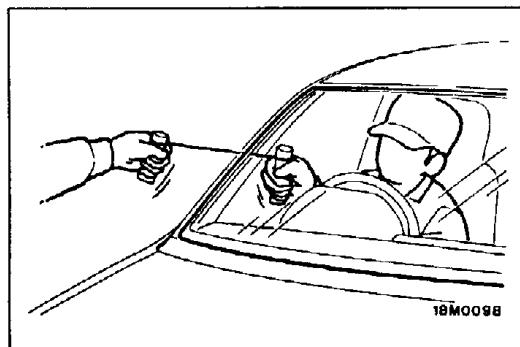
Removal steps

1. Windshield side moulding
2. Windshield upper moulding
3. Windshield
4. Windshield moulding fastener

5. Windshield moulding clip
6. Window spacer
7. Windshield spacer

REMOVAL SERVICE POINT**◀A▶ WINDSHIELD REMOVAL**

1. In order to protect the body (paint surface), apply cloth tape to all body areas around the installed windshield glass.
2. Remove the windshield side and upper mouldings.



3. Using a sharp-point drill, make hole in the windshield glass adhesive.
4. Pass the piano wire from the inside of the vehicle through the hole.
5. Pull the piano wire alternately from the inside and outside along the windshield glass to cut the adhesive.

Caution

Do not let the piano wire touch the edge of the windshield glass.

6. If the glass is to be reused make mating marks on the windshield glass and body.
7. Use the special tool to remove the windshield glass.

8. Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm around the entire circumference of the body flange.
9. Finish the flange surfaces so that they are smooth.

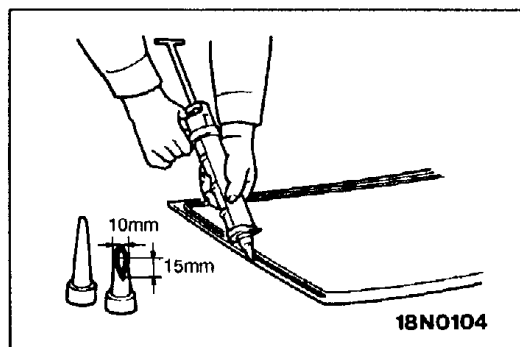
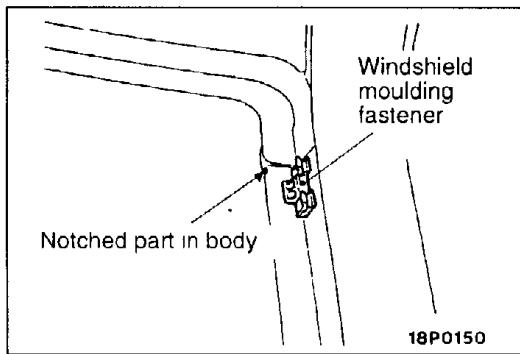
Caution

1. Be careful not to remove more adhesive than is necessary.
2. Be careful also not damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with repair paint or anti-rust agent.

10. When reusing the glass, remove the adhesive still adhering to the glass, and clean with isopropyl alcohol.
11. Clean the body side in the same way.

Caution

Let the cleaned places stand for 3 minutes or more, and carry out the next procedures after they have dried. Also, do not touch any surface that has been cleaned.



INSTALLATION SERVICE POINTS

►A◄ WINDOW SPACER/WINDSHIELD MOULDING CLIP/WINDSHIELD MOULDING FASTENER

1. When replacing a windshield, temporarily fit the windshield to the body and make matchmarks on the body and windshield.
2. Degrease the inner perimeter of the windshield and the flange on the body side with isopropyl alcohol.
3. Soak a sponge in primer, and apply uniformly to the specified locations on the entire perimeter of the windshield and the body.
4. Allow to dry for 3-30 min after applying primer.

Specified primer:

3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent.

Caution

1. The primer strengthens the adhesive strength, so be sure to apply it evenly around the entire circumference. But, a too thick application will cause lowering of the adhesive strength.
2. Do not touch the coated surface.
5. If there are any bends or lifts on the inside of the windshield, install the window spacers so that the clearance on the right and left are uniform.
6. Match the edge of the windshield moulding fastener to the notch on the body and bond.
7. Fit the windshield moulding clip into the clip stud.

Caution

If heat is applied with an infra-red lamp to shorten the setting time, keep the surface temperature of the adhesive below 60°C.

8. Fill a sealant gun with adhesive within 30 min of applying primer, and apply uniformly to the entire perimeter of the windshield.

NOTE

Cutting a V-shape in the tip of the sealant gun nozzle will facilitate application.

9. After applying the adhesive, match up marks on the glass and the body.
10. After removing any adhesive that is sticking out or adhering to the body or glass with a spatula, etc., clean off with isopropyl alcohol.
11. After completion of this operation (after installing the glass), place it somewhere where it will not be disturbed, until the adhesive sets.
12. After attaching the windshield glass to the body, let it stand for 30 minutes or more, and then test for water leakage.

Caution

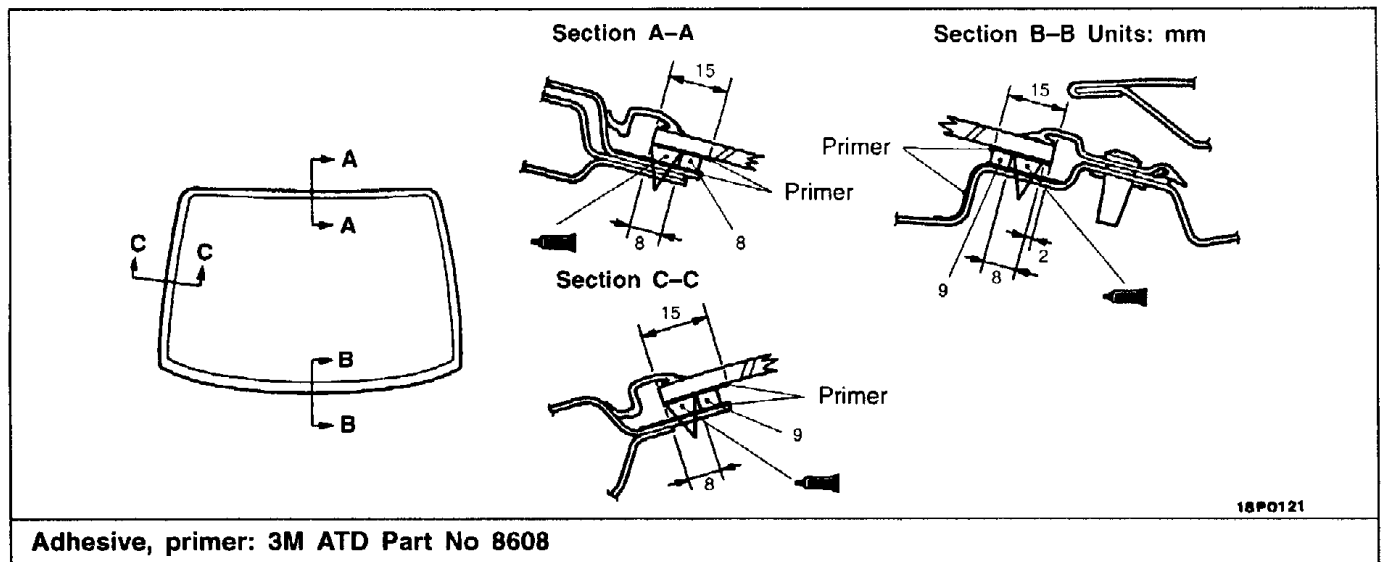
1. If moving the vehicle, it should be done gently.
2. When testing for water leakage, do not pinch the end of the hose to spray the water.

REAR WINDOW GLASS

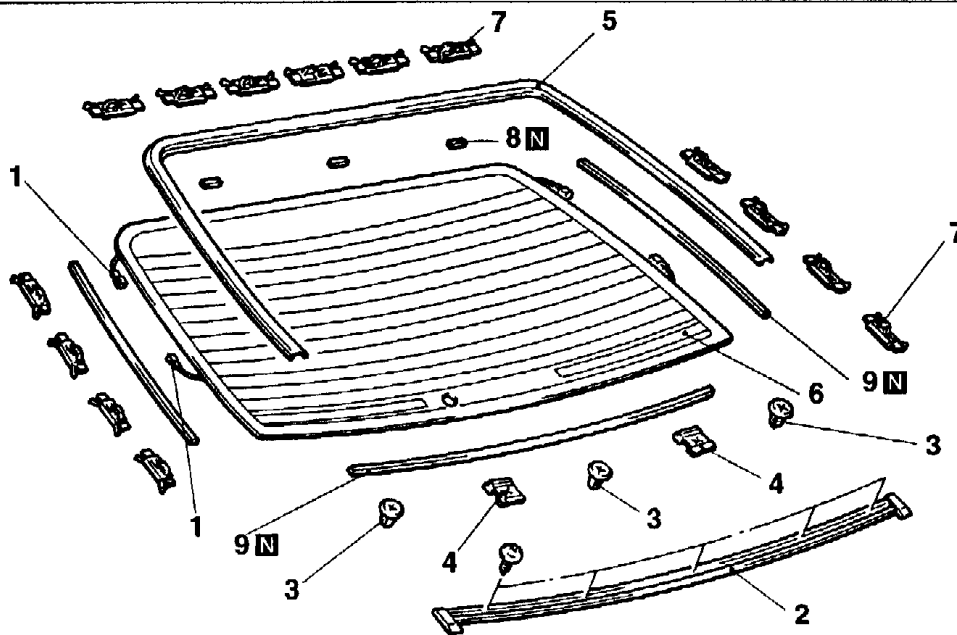
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation Removal and Installation

- Trunk Lid (Refer to P.42-5)
- Rear shelf trim (Refer to GROUP 52A-Trims)
- Rear Pillar Trim (Refer to GROUP 52A-Trims)
- Headlining (Refer to GROUP 52A-Headlining)



Adhesive, primer: 3M ATD Part No 8608



Removal steps

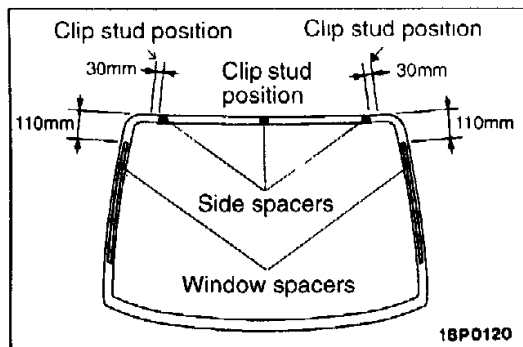
1. Harness connector
2. Rear window lower moulding
3. Screw grommet
4. Rear window glass spacer
5. Rear window upper moulding



6. Rear window glass
7. Rear window moulding clip
8. Side spacer
9. Window spacer

REMOVAL SERVICE POINT**◀A▶ REAR WINDOW GLASS REMOVAL**

Remove the window glass by the same procedure as for the windshield. (Refer to P.42-14)

**INSTALLATION SERVICE POINT****▶A◀ WINDOW SPACER/SIDE SPACERS/REAR WINDOW MOULDING CLIPS/REAR WINDOW GLASS INSTALLATION**

Install using the same procedure as for the windshield. (Refer to P.42-14)

NOTE

Install so that the window spacer at the lower side of the glass provides the same space on the right and left, and correctly install in the illustrated positions, the window spacers on the right and left, and the side spacers (bonded to the body side) at the top of the glass.

DOOR

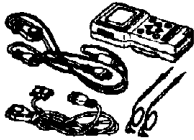
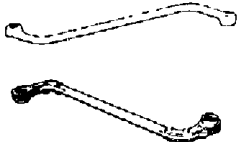
SERVICE SPECIFICATIONS

Items		Standard value
Inside handle play mm	Front door	2.1–10.8
	Rear door	4.1–12.7
Outside handle play mm	Front door	1.7–6.0
	Rear door	1.9–5.8

SEALANT

Items	Specified sealant
Waterproof film	3M ATD Part No. 8625 or equivalent

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II Sub-assembly	Checking the power window and door lock (SWS Diagnosis displayed using the MUT-II)
	MB991529	Diagnostic trouble code check harness	Checking using the SWS Simplified Fault Diagnosis Mode
	MB990784	Ornament remover	Removal of switch, trim, etc
	MB990900 or MB991164	Door adjusting wrench	Adjustment of door fit

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp.

(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.

SWS SIMPLIFIED FAULT DIAGNOSTIC MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to Group 54 – SWS for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSIS CODE CLASSIFICATION TABLE

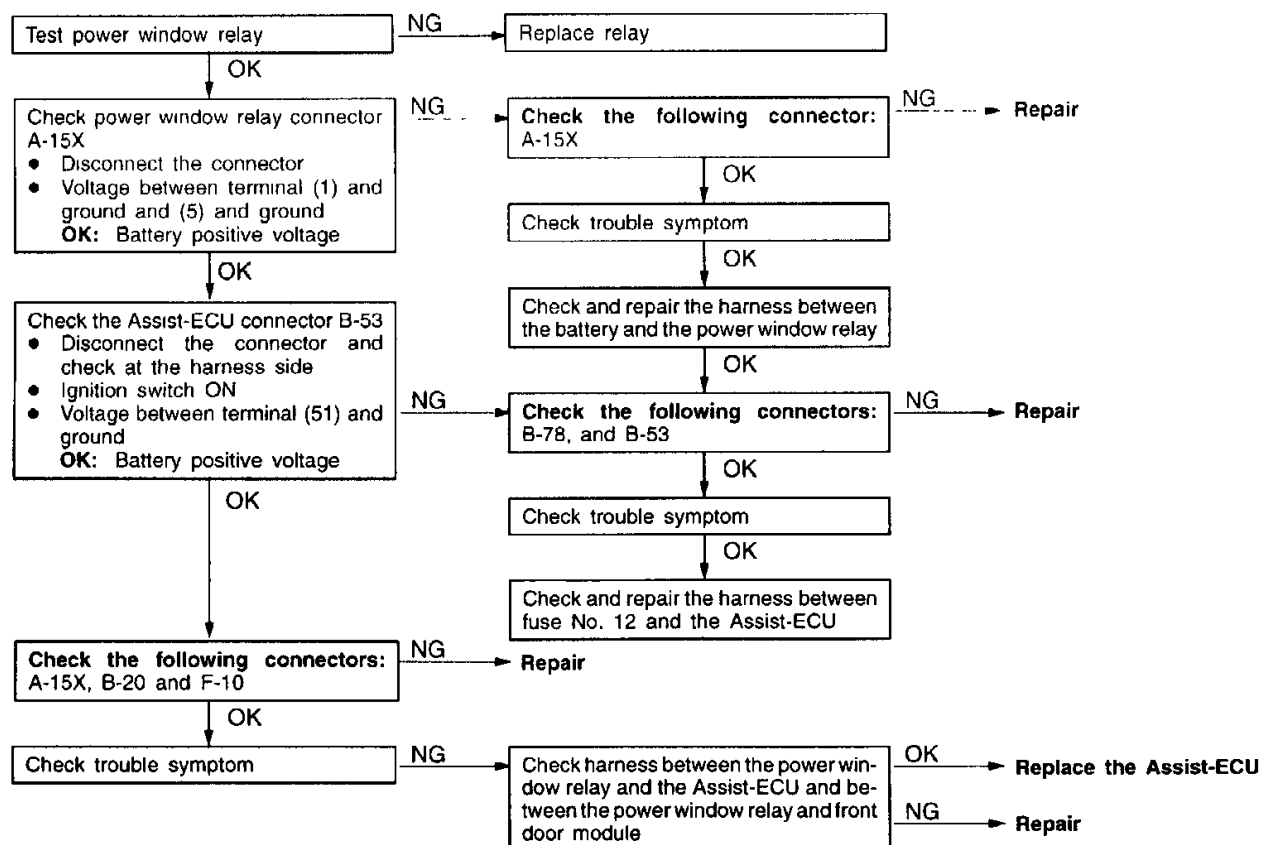
Refer to Group 54–SWS.

INSPECTION CHART FOR TROUBLE SYMPTOMS**POWER WINDOW**

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Refer to Group 54-SWS	
Switching to SWS simplified diagnostic mode is not possible.		
Power windows do not operate with any power window switch.	1	42-21
The driver's power window does not operate with the main power window switch (in driver's door module).	2	42-22
Passenger power window does not operate from the sub-switch.	3	42-23
The rear left power window does not operate from the sub-switch.	4	42-24
The rear right power window does not operate from the sub-switch.	5	42-25
The passenger power window does not operate with the main power window switch (however, it does operate from the sub-switch).	6	42-26
The rear left power window does not operate with the main power window switch (however, it does operate from the sub-switch).	7	42-27
The rear right power window does not operate with the main power window switch (however, it does operate from the sub-switch).	8	42-28
The passenger and rear power windows operate even when the power window lock switch is ON.	9	42-29

INSPECTION PROCEDURE 1

Power windows do not operate with any power window switch	Probable cause
The power window relay or the power window relay circuit may be defective or the Assist-ECU IG1 power circuit may be defective	- Defective power window relay - Defective Assist-ECU - Defective harness or connector



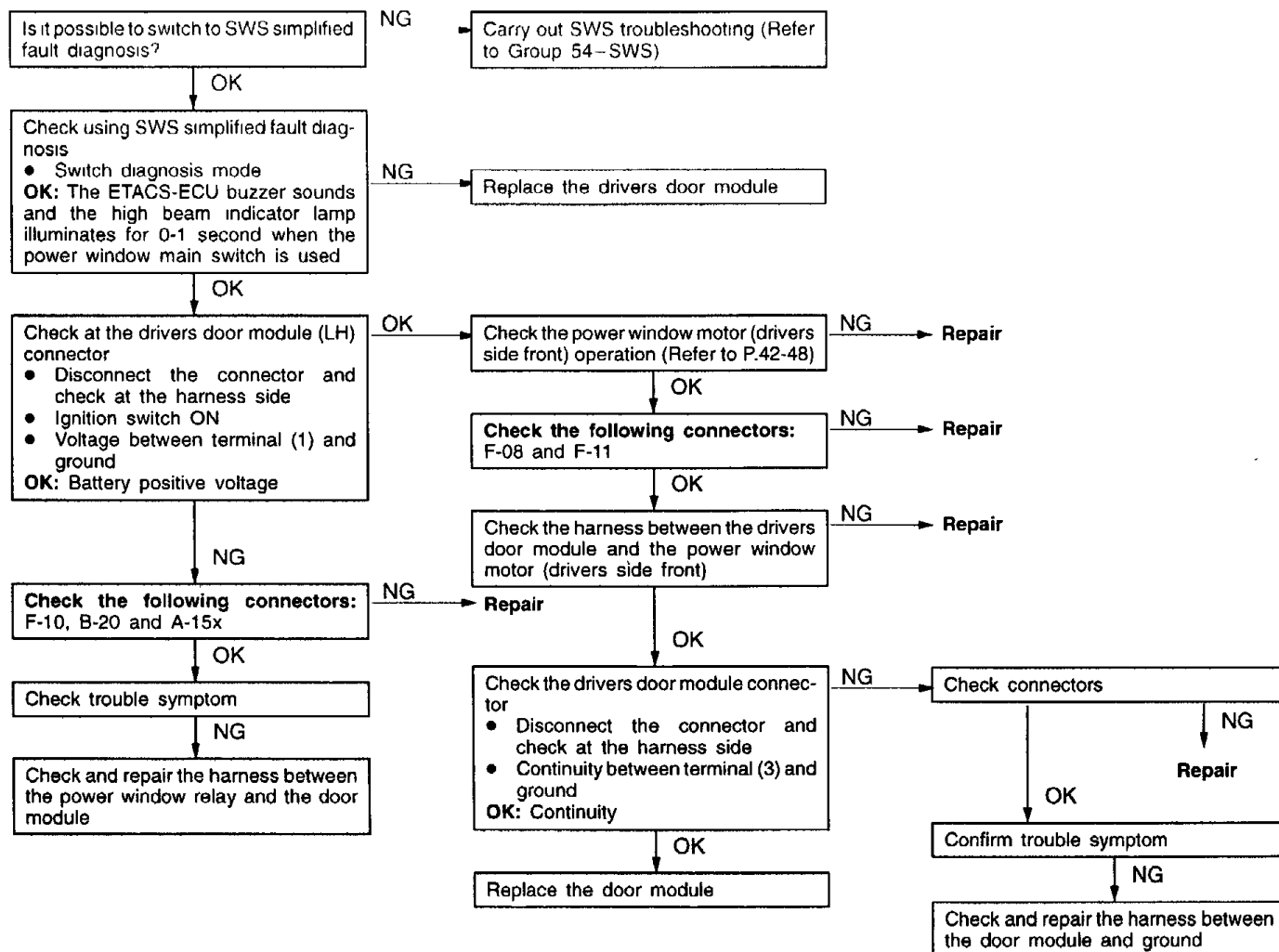
INSPECTION PROCEDURE 2

The drivers power window does not operate with the main power window switch (in the driver's door module)

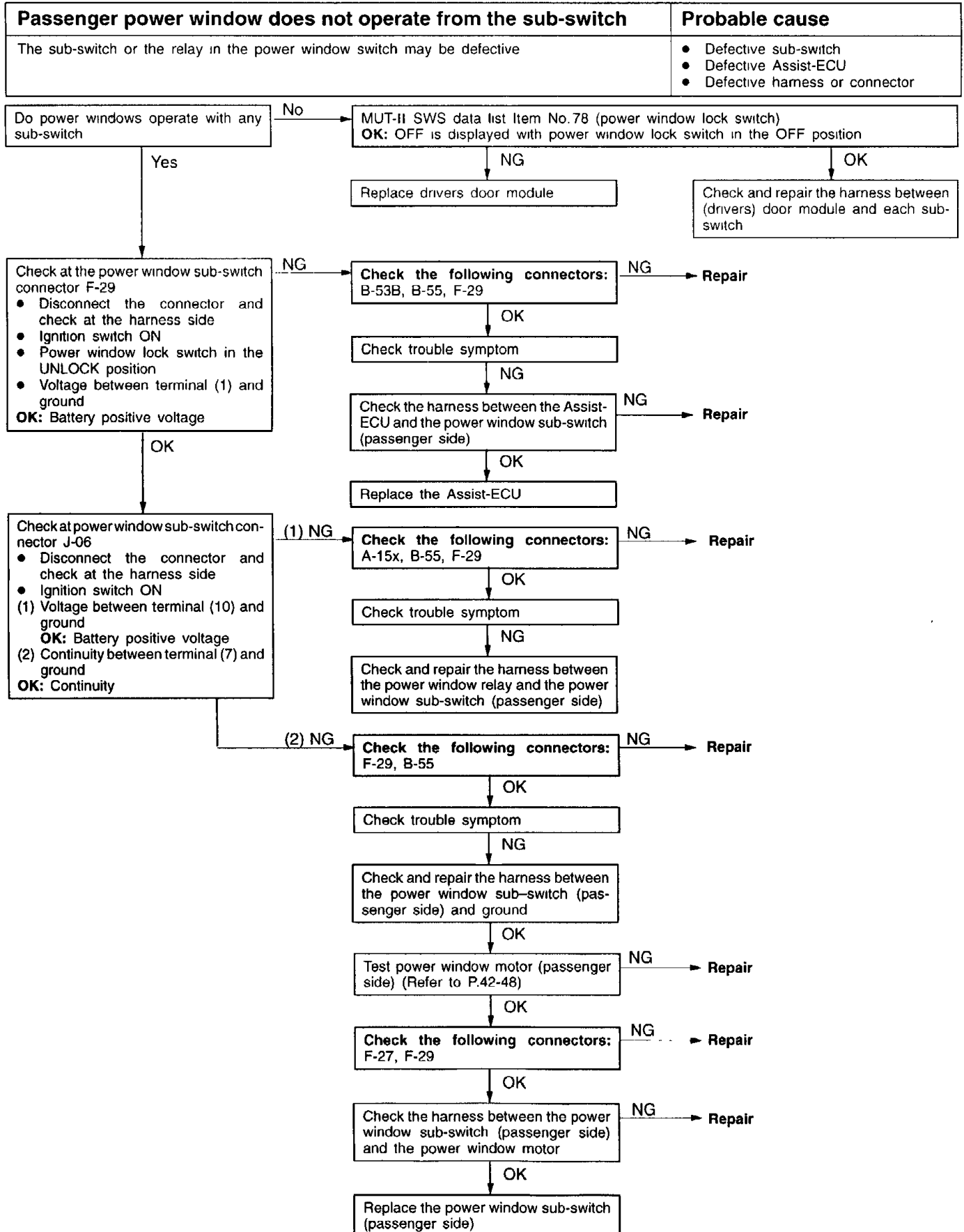
The main power switch in the driver's door module is defective or the power window relay has been installed incorrectly

Probable cause

- Defective power window main switch
- Defective driver's door module
- Defective power window motor
- Defective harness or connector

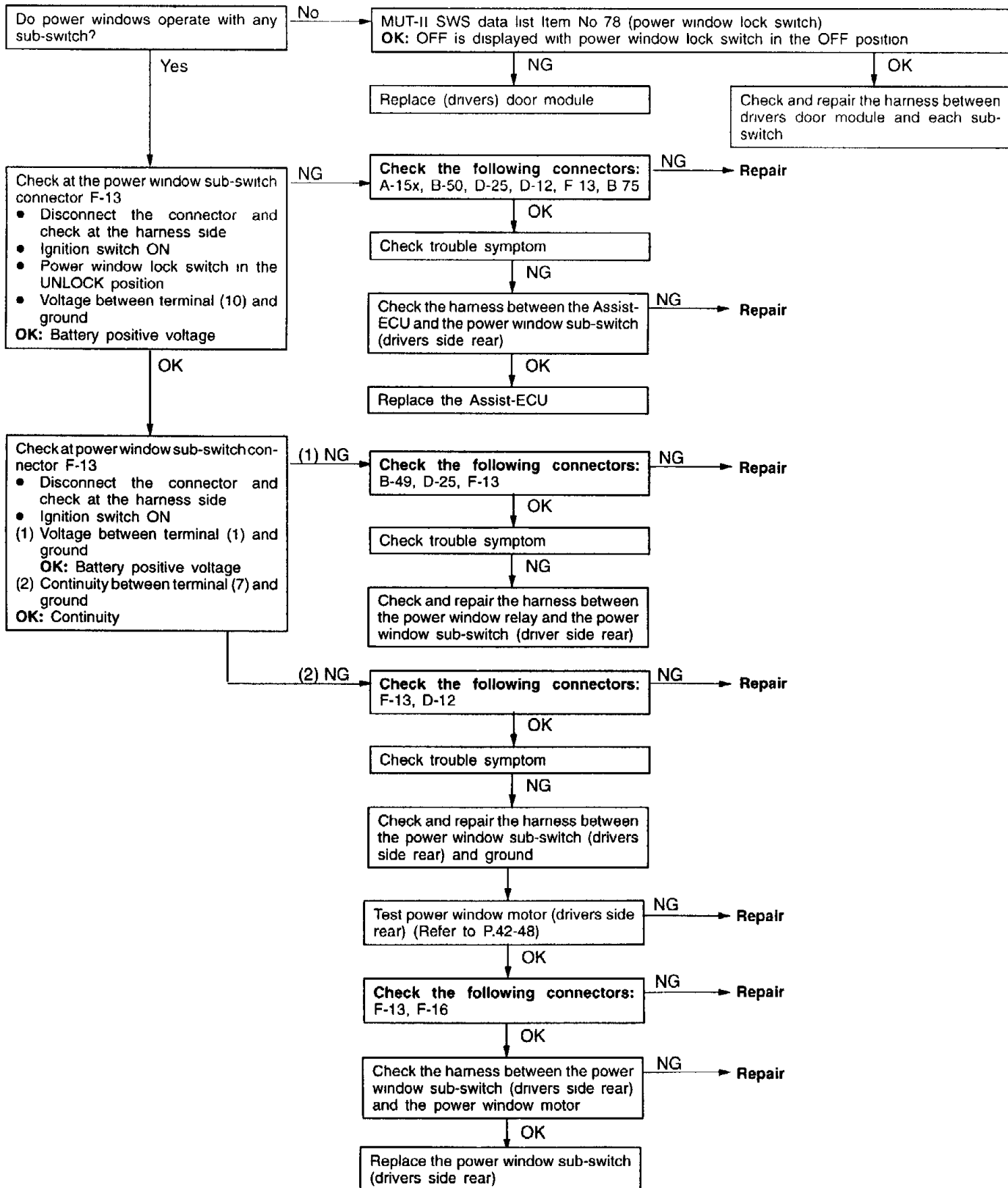


INSPECTION PROCEDURE 3

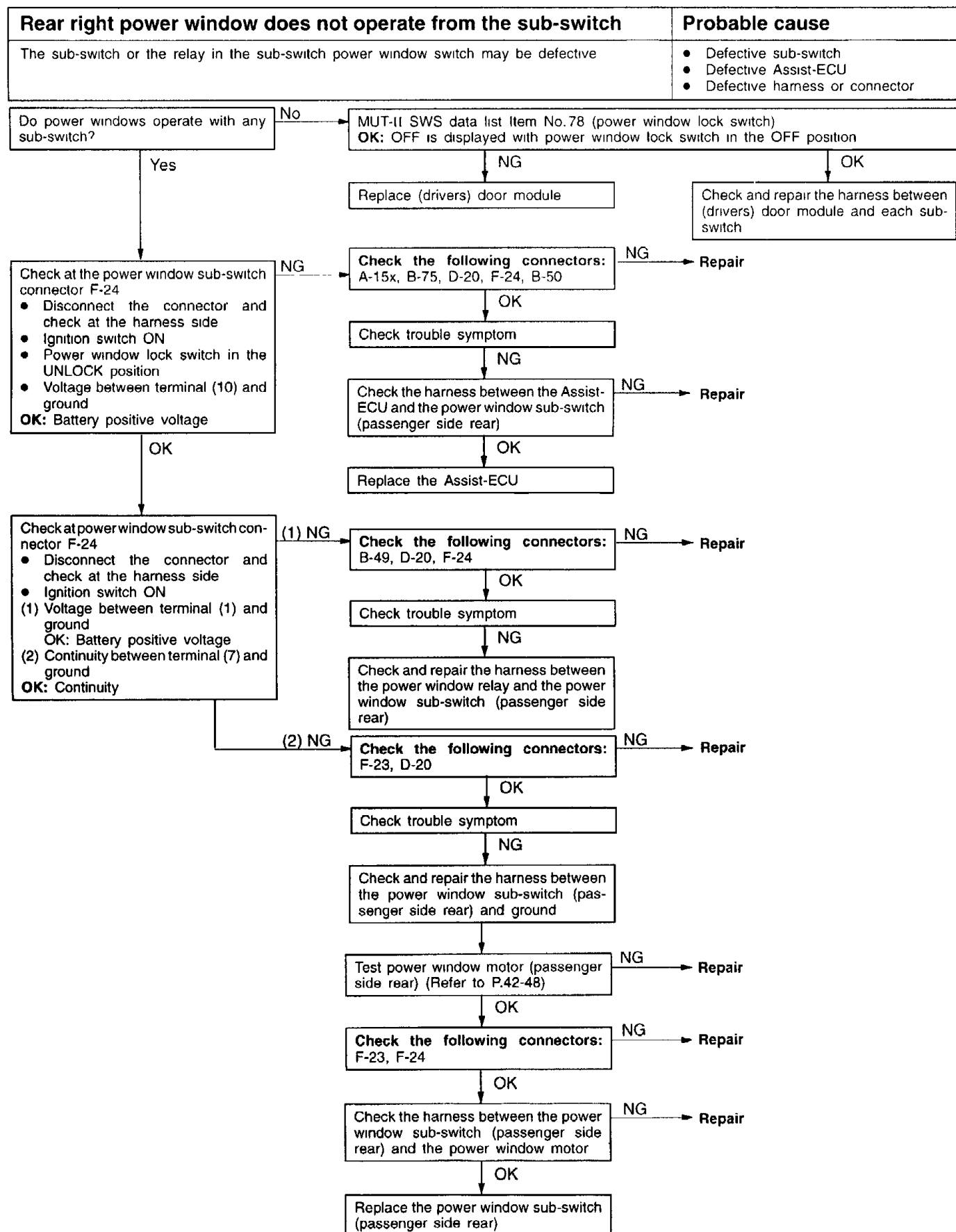


INSPECTION PROCEDURE 4

Rear left power window does not operate from the sub-switch	Probable cause
The sub-switch or the relay in the sub-switch power window switch may be defective	- Defective sub-switch - Defective Assist-ECU - Defective harness or connector



INSPECTION PROCEDURE 5



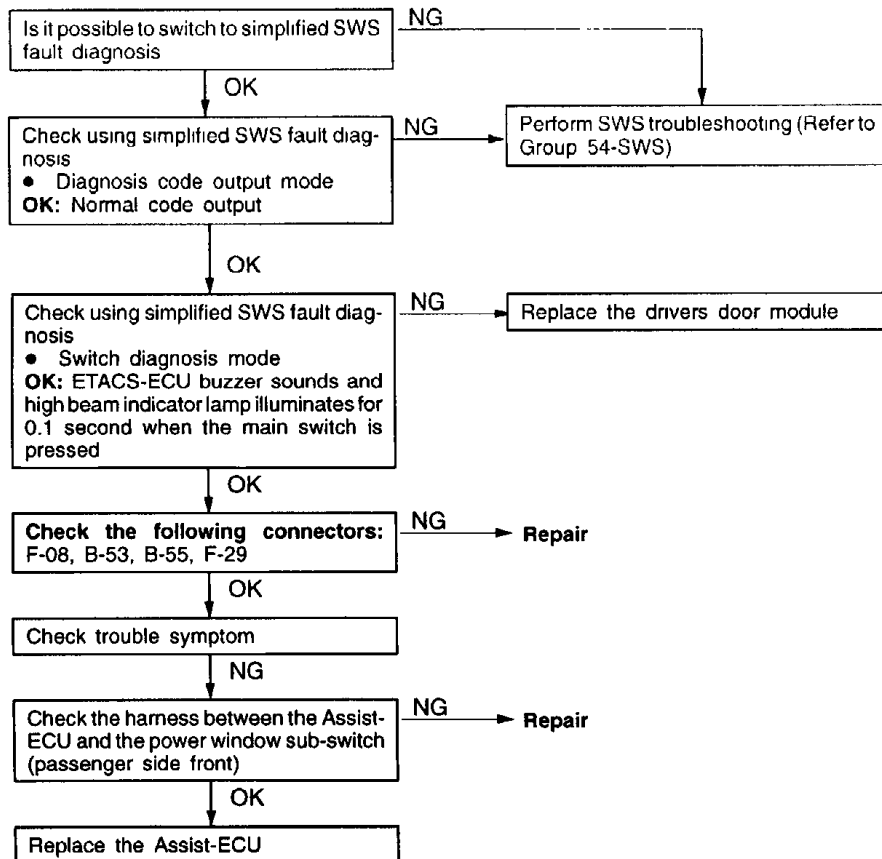
INSPECTION PROCEDURE 6

The passenger power window does not operate with the main power window switch (however, it does operate with the sub-switch)

The harness between the Assist-ECU and the power window sub-switch (FR), the Assist-ECU or the door module which includes the main power window switch may be defective

Probable cause

- Defective door module (LH)
- Defective Assist-ECU
- Defective harness or connector



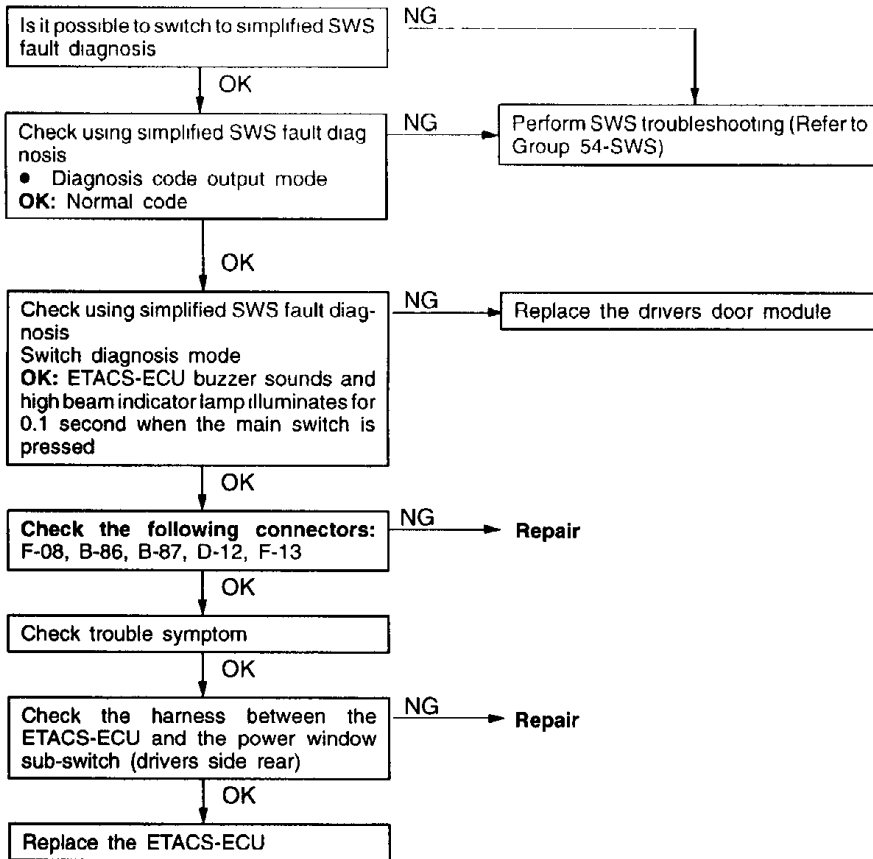
INSPECTION PROCEDURE 7

The rear left power window does not operate with the main switch (however, it does operate with the sub-switch)

The harness between the ETACS-ECU and the power window sub-switch, the Assist-ECU or the door module which incorporates the main power window switch may be defective

Probable cause

- Defective drivers door module
- Defective Assist-ECU
- Defective harness or connector



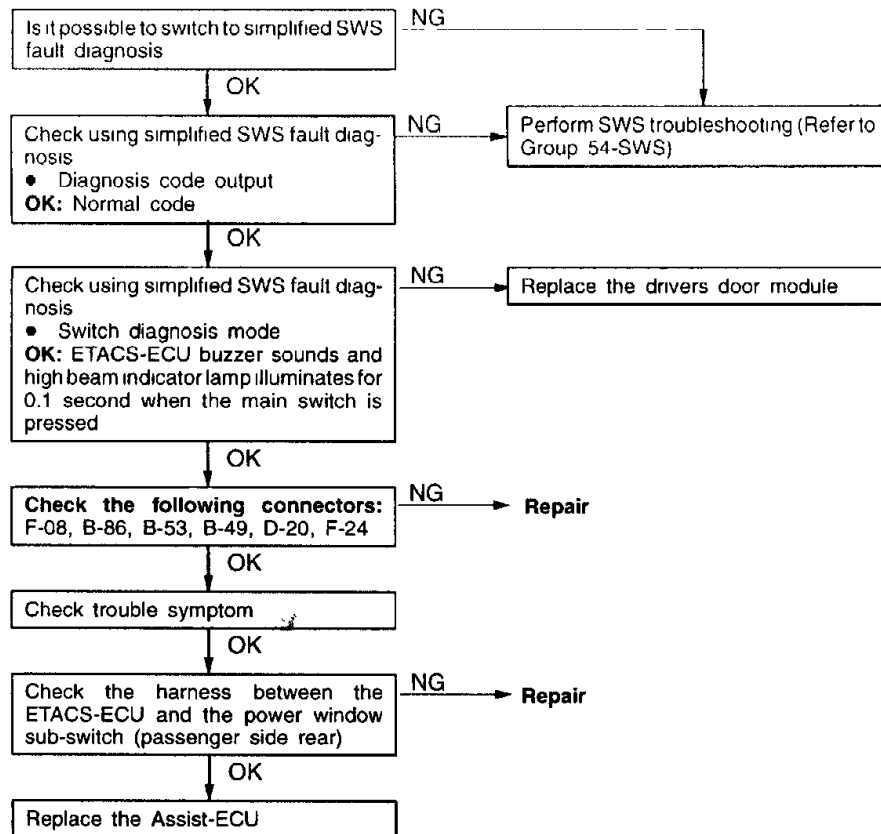
INSPECTION PROCEDURE 8

The rear right power window does not operate with the power window main switch (however, it does operate with the sub-switch)

The harness between the Assist-ECU and the power window sub-switch, the Assist-ECU or the door module that incorporates the main power window switch may be defective

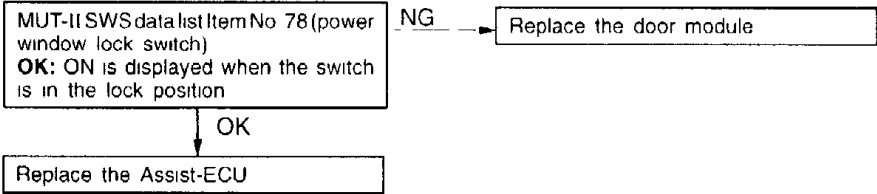
Probable cause

- Defective drivers door module
- Defective Assist-ECU
- Defective harness or connector



INSPECTION PROCEDURE 9

The passenger and rear power windows operate even when the lock switch is ON The door module which incorporates the lock switch or the Assist-ECU, which receives the lock signal and executes control, may be defective	Probable cause • Defective door lock activator • Defective harness or connector
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CENTRAL DOOR LOCKING SYSTEM

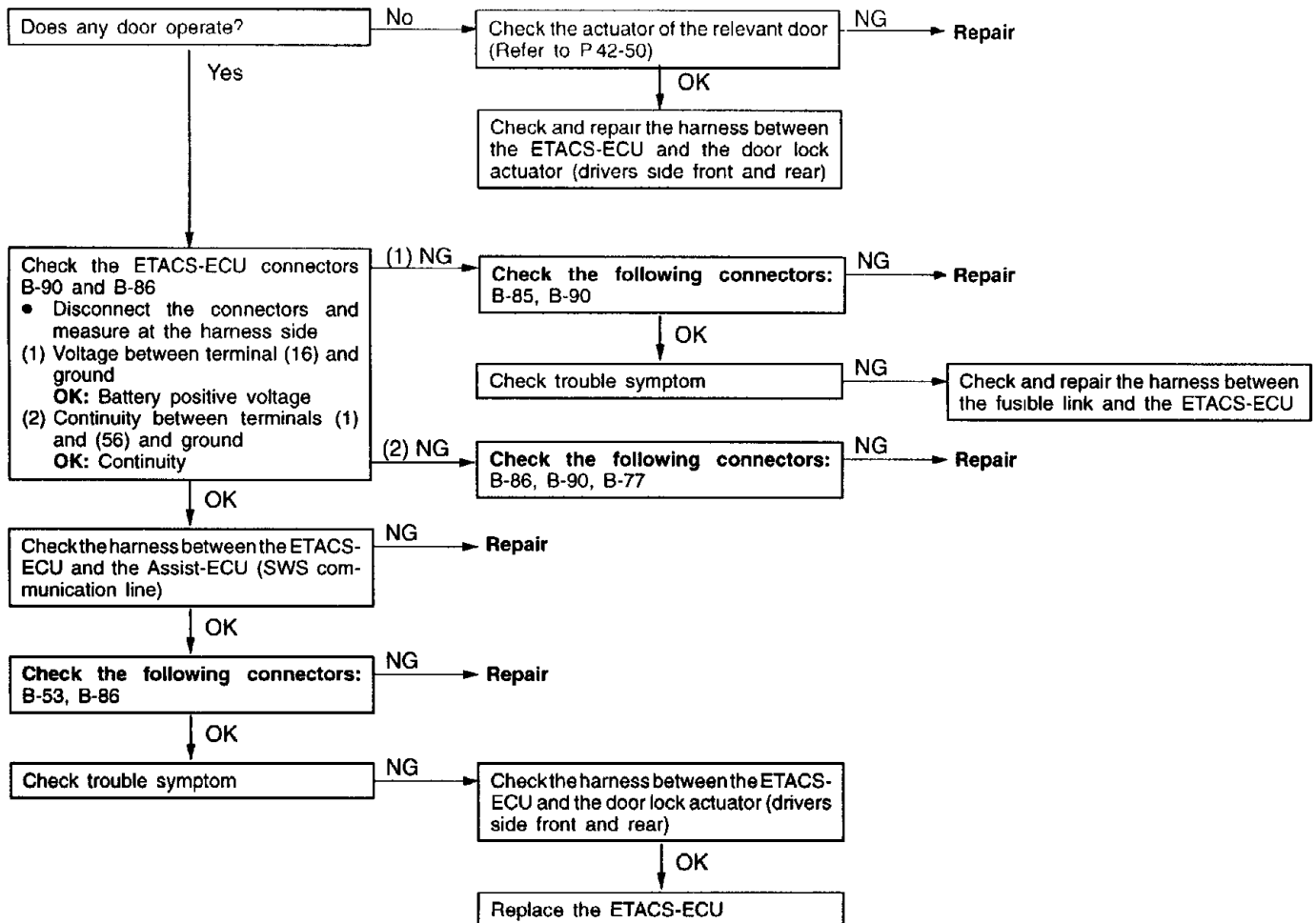
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure no.	Reference page
Communication with MUT-II is not possible Switching to SWS simplified diagnostic mode is not possible	Refer to Group 54-SWS	
None of the doors lock or unlock with any of the passenger or driver's door locking switches, the door keys, or with the inside locking knob (driver's door only).	1	42-31
No door can be locked or unlocked with the door key on the driver's side (however, doors can be locked or unlocked with the passenger door key).	2	42-32
No door can be locked or unlocked with the inside locking knob on the driver's side (however, doors can be locked or unlocked with the key).	3	42-33
No door can be locked or unlocked by pressing the central locking switch (lock or unlock) on the driver's door module (however, doors can be locked or unlocked with the inside locking knob or the keys).	4	42-33
No door can be locked or unlocked with the door key on the passenger side (however, the doors can be locked or unlocked with the driver's key).	5	42-34
No door can be locked or unlocked by pressing the central locking switch (lock or unlock) on the passenger door (however, doors can be locked or unlocked with the passenger key).	6	42-35
When the key is in the ignition and the driver's door is open, the driver's door can be locked if the inside lock knob is pressed.	7	42-36

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

None of the doors lock or unlock with any of the passenger or driver's central locking switch, the door keys, or the inside locking knob (driver's door).	Probable cause
When none of the doors operate, the ETACS-ECU power or ground circuit, or the ETACS-ECU may be defective. If only some doors do not operate, the door lock actuator or driving circuit may be defective	• Defective door lock actuator • Defective harness or connector



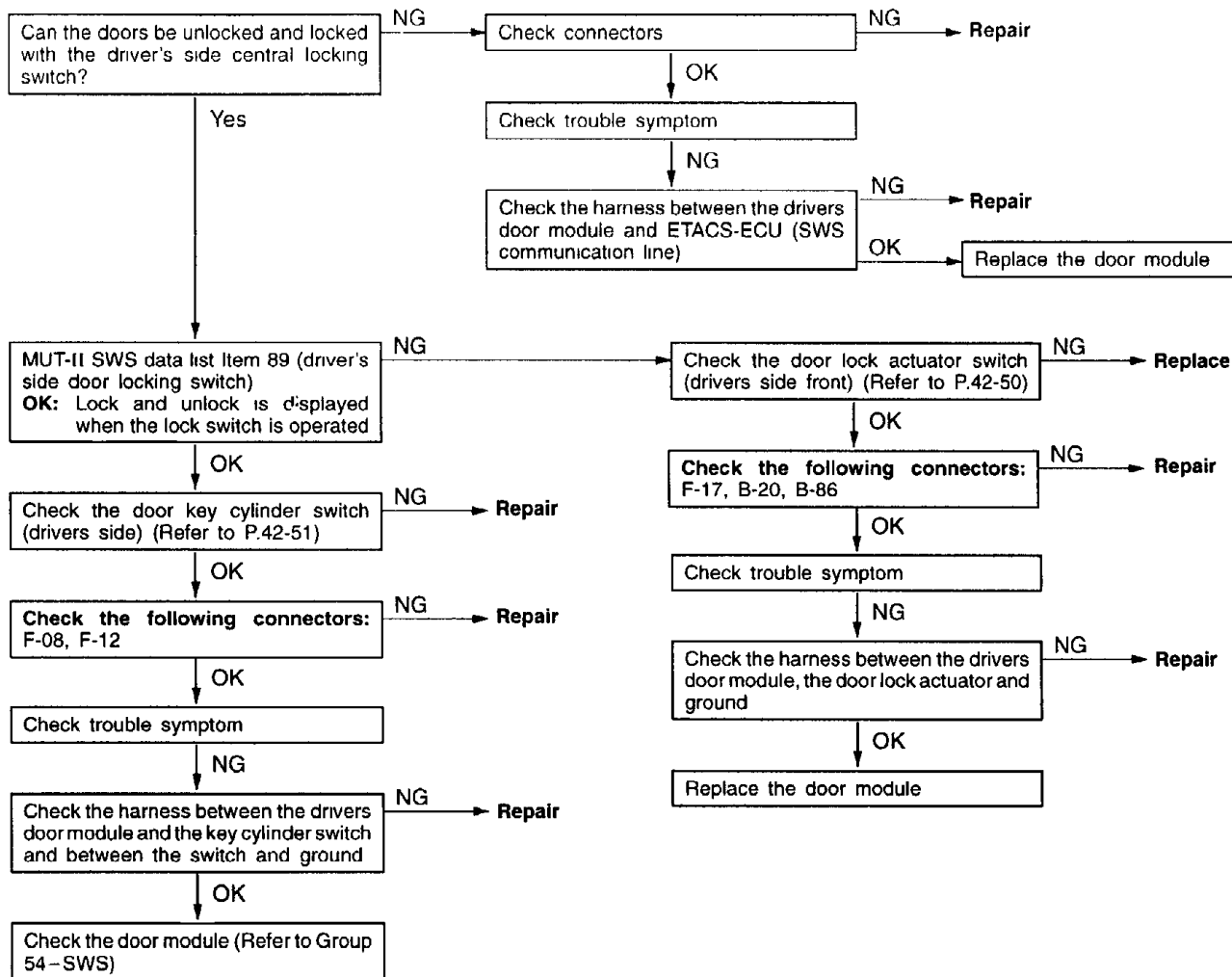
INSPECTION PROCEDURE 2

No door can be locked or unlocked with the key from the driver's side (however doors can be locked or unlocked with the passenger key).

Probable cause

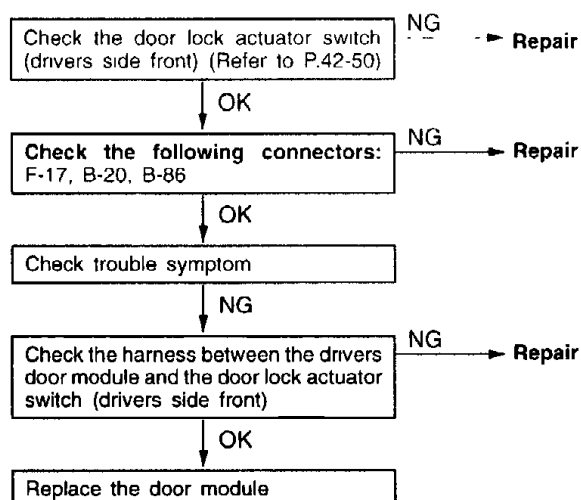
The input circuit of the door key cylinder switch may be defective. If doors cannot be locked or unlocked with the inside lock knob or the central locking switch on the driver's side the SWS communication line between the door module and the ETACS-ECU may be defective.

- Defective door key cylinder switch
- Defective drivers door module
- Defective harness or connector



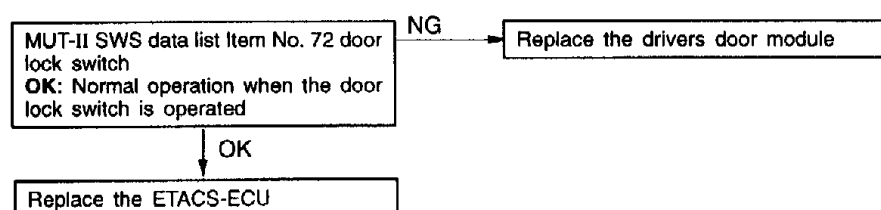
INSPECTION PROCEDURE 3

No door can be locked or unlocked with the inside locking knob on the driver's side (however, doors can be locked or unlocked with the key) The input circuit of the drivers door module or door lock actuator switch (drivers side front) may be defective.	Probable cause • Defective door key cylinder switch • Defective drivers door module • Defective harness or connector
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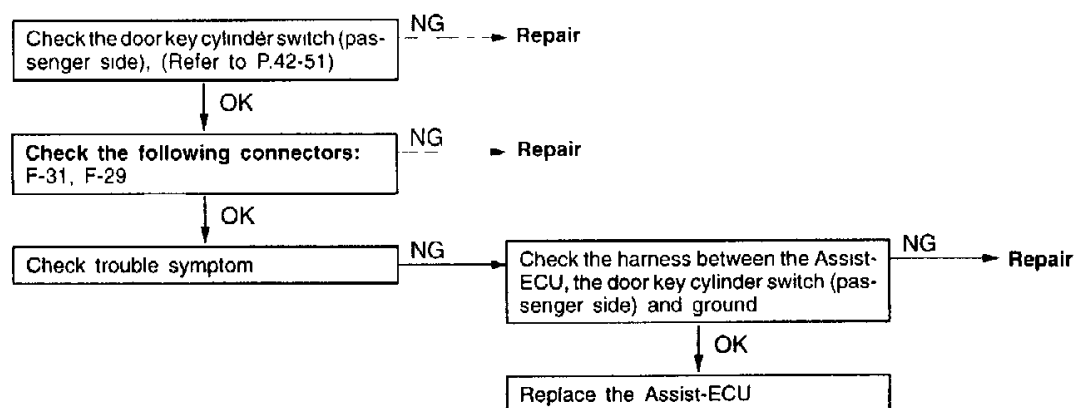
INSPECTION PROCEDURE 4

No door can be locked or unlocked using the central locking switch on the door module (doors can be locked or unlocked with the key or inside lock knob). The drivers door module may be defective.	Probable cause • Defective drivers door module • Defective harness or connector
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INSPECTION PROCEDURE 5

No door can be locked or unlocked with the key on the passenger side (however, doors can be locked or unlocked with the driver's key)	Probable cause
The door key cylinder switch (passenger side) input circuit to the Assist-ECU or the SWS communication line between the ETACS-ECU and Assist-ECU may be defective	• Defective door key cylinder switch • Defective Assist-ECU • Defective harness or connector



NOTE

If, after completing this procedure, the doors still cannot be locked or unlocked with the passenger door key switch, carry out Inspection Procedure No. 6 (Refer to P.42-35)

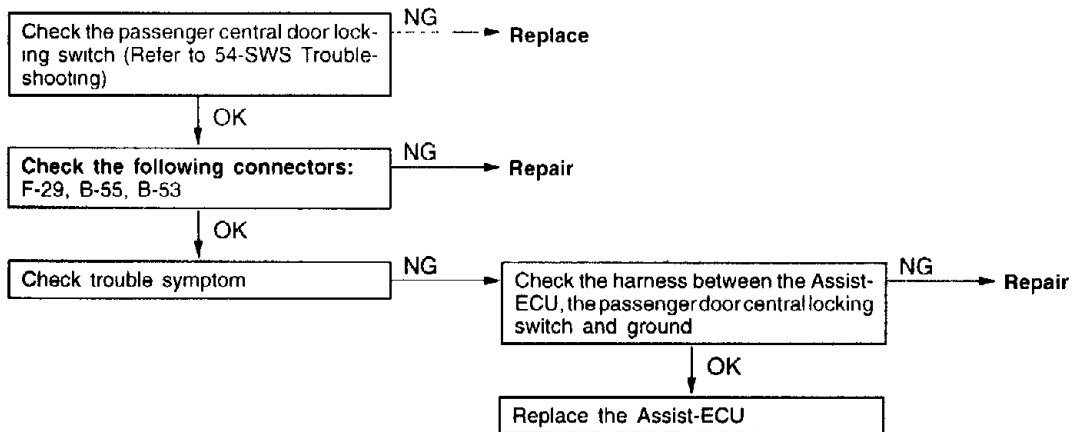
INSPECTION PROCEDURE 6

No door can be locked or unlocked by pressing the central locking switch (lock or unlock) on the passenger door (however, doors can be locked or unlocked using the passenger key)

The central locking switch input to the Assist-ECU may be defective

Probable cause

- Defective central locking switch
- Defective Assist-ECU



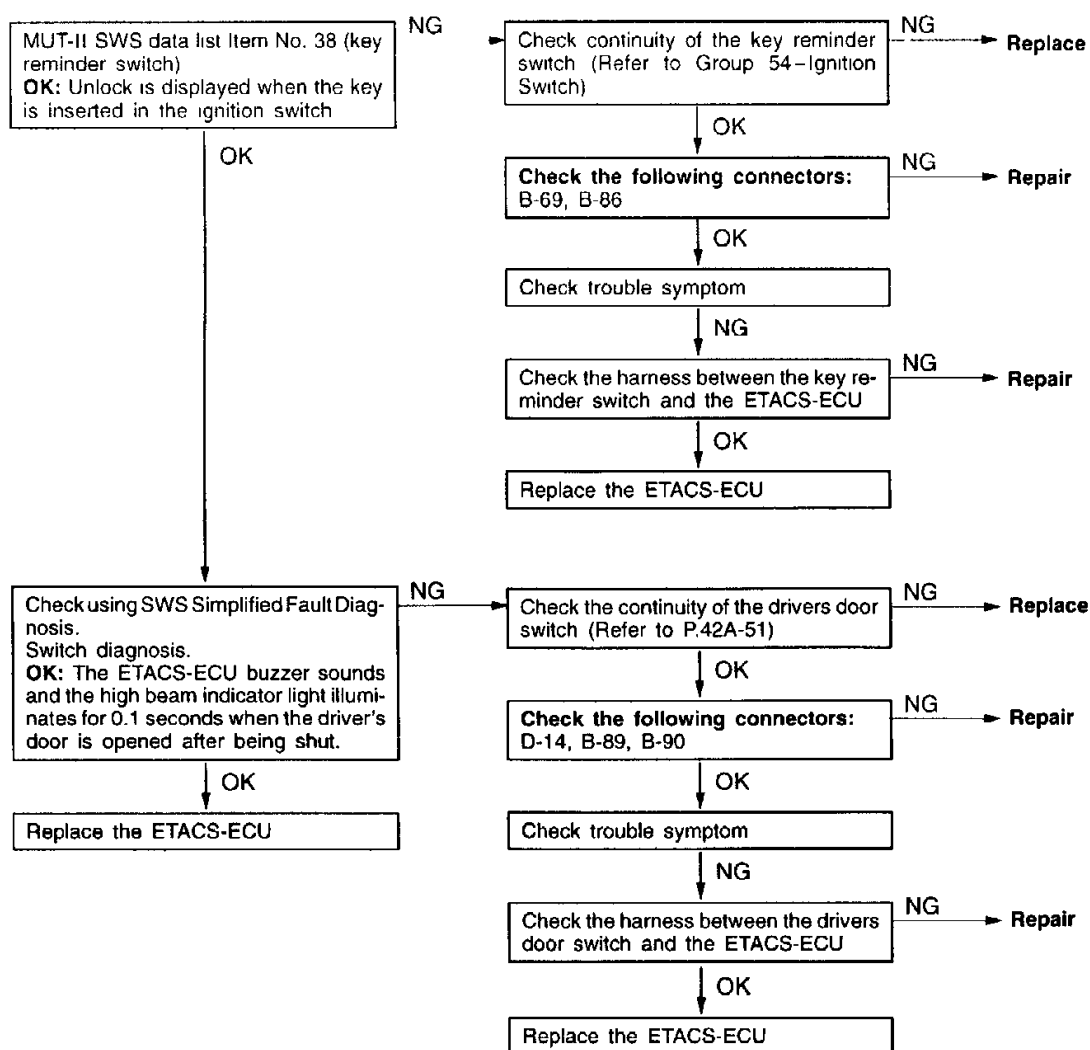
INSPECTION PROCEDURE 7

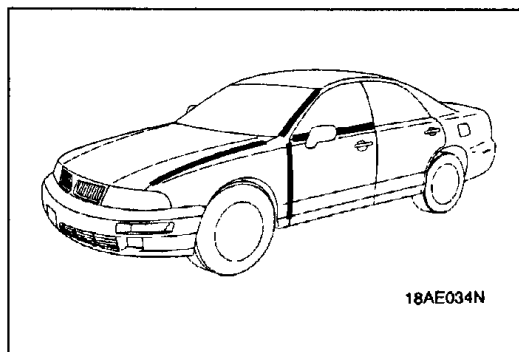
When the key is in the ignition and the driver's door is open, the driver's door will lock when the inside locking knob is pressed

When the system is operating normally, the driver's door cannot be locked under these conditions. The key reminder switch or driver's door switch may be defective.

Probable cause

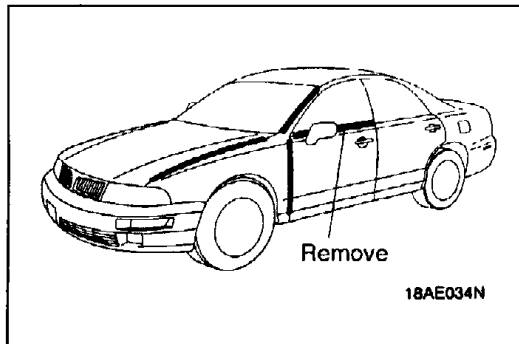
- Defective key reminder switch
- Defective driver's door switch
- Defective ETACS-ECU
- Defective harness or connector



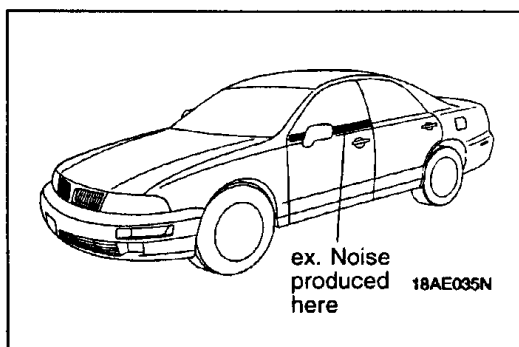


HOW TO LOCATE WIND NOISES

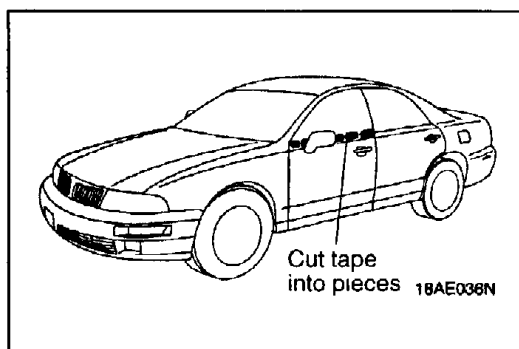
1. Attach cloth tape to every place which might conceivably be the source of wind noise, such as panel seams, projections, moulding seams, glass and body seams, etc.
2. Then make a road test in order to determine that the places not covered by tape are not sources of wind noise.



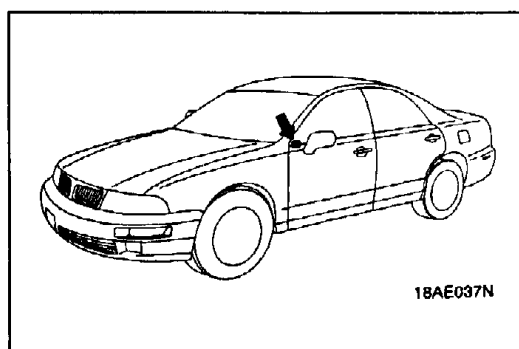
3. Then remove the strips of tape one by one, making a road test after each is removed, until a wind noise source is discovered.



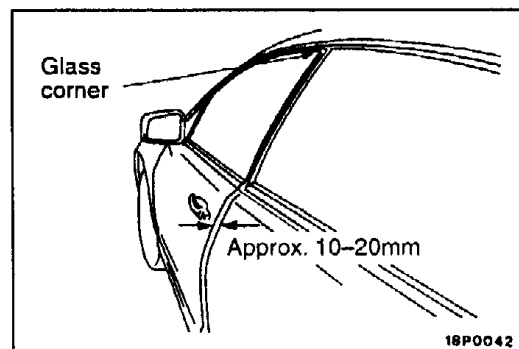
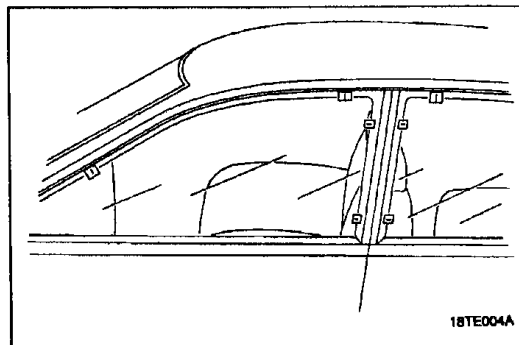
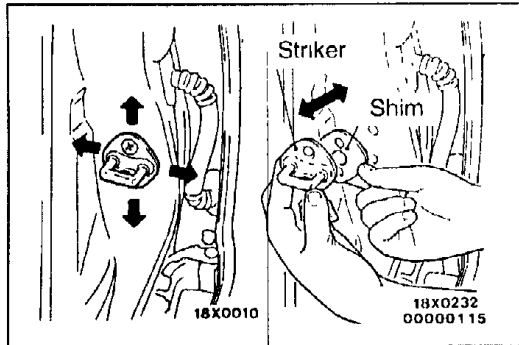
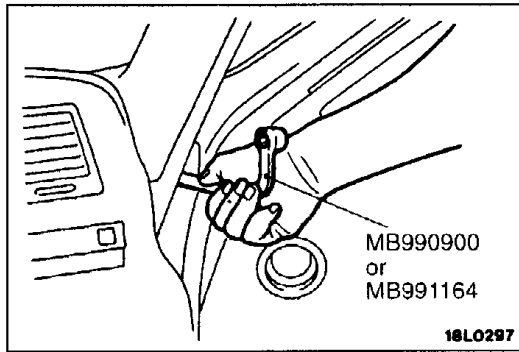
4. When such a place is found, cover it again and continue with the procedure so as to determine if there are any other noise source.
5. If no others are found, the last remaining tape is the only source.



6. Cut the remaining piece of tape into smaller pieces, attach it again as it was before, and then remove the pieces one by one in the same way so as to narrow down the source.



7. Check to confirm that wind noise occurs when the last remaining tape is removed, and that noise does not occur when it is re-attached.
8. When the source(s) of the wind noise is finally located, attach butyl tape, body sealer or similar material to obstruct this source as much as possible.



ON-VEHICLE SERVICE

DOOR FIT ADJUSTMENT

1. Use the special tool to loosen the hinge mounting bolts on the body side, and then adjust the clearance around the door so that it is uniform on all sides.
2. When there is a stepped section in the door and body, use the special tool to loosen the door hinge mounting bolt on the door side and adjust the door fit.

Caution

Attach protection tape to the fender edges where the hinge is installed.

3. If the door opening or closing is stiff, adjust the engagement of the striker and the door latch using the shim, while moving the striker up and down, or left and right.

DOOR GLASS ADJUSTMENT

CHECKING THE DOOR WINDOW GLASS SETTINGS

FRONT

1. Place masking tape on the edge of the door glass in the positions as shown in the illustration.
2. Mark the tape from the catch lip as in sections A-A and B-B and measure from the edge of the door glass to the mark on the tape with the door open. This will give dimensions "D" and "E" (glass intrusion).

Standard value:

(D) 2.4 ± 1.0 mm

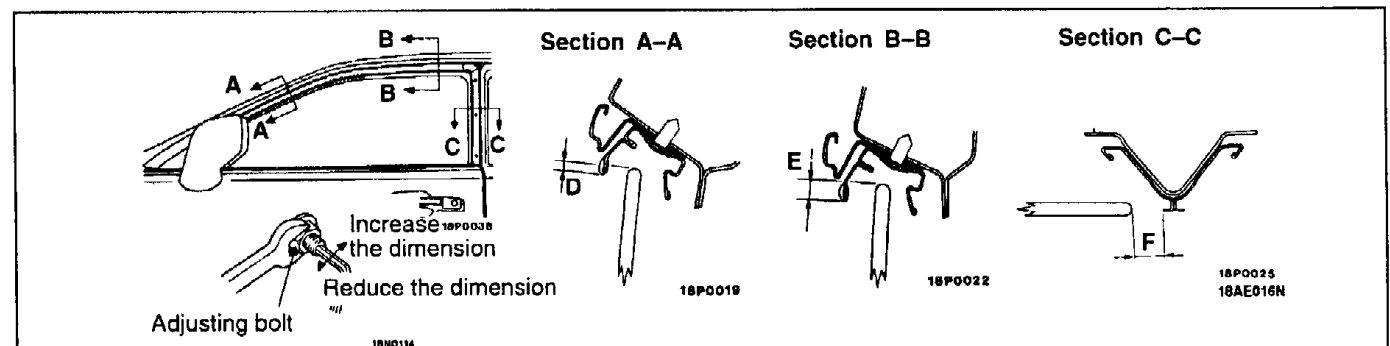
(E) 3.4 ± 1.0 mm

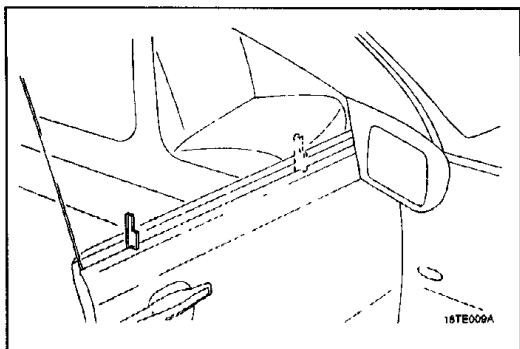
3. Mark the tape on the "B" pillar 100 mm from the top and 100 mm from the bottom. Measure from "B" pillar to the edge of the glass in both positions. This will give section C-C Measurement "F" (glass margin).

Standard value: 12.7 ± 1.0 mm (parallel within 1.5 mm)

4. With the glass fully raised, close the door until the rear corner of the door glass just contacts the door seal and measure the distance between the rear edge of the opened door panel and the adjacent panel (rear door) at a line through the centre of the door handle ("soft touch").

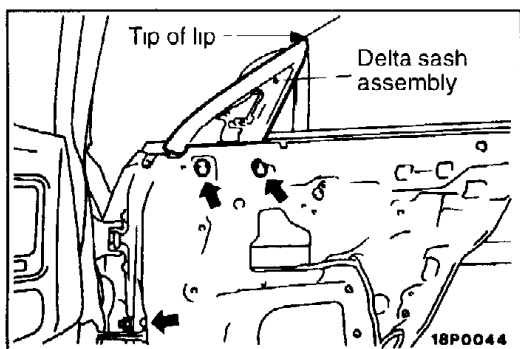
Standard value: 10 – 20 mm





5. If the door glass operation is slow or the door glass rattles, remove the belt line moulding and check the door glass stabiliser setting using a suitable gauge.

Standard value: 11.0 ± 0.5 mm

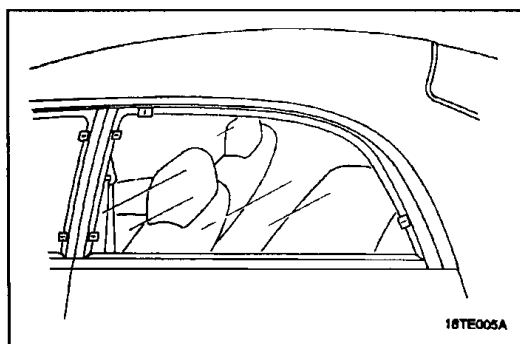


6. Check the top delta setting position.

Standard value: 0.5 mm

NOTE

If all dimensions are in specification the customer concern is probably caused by a condition other than door glass settings.



REAR

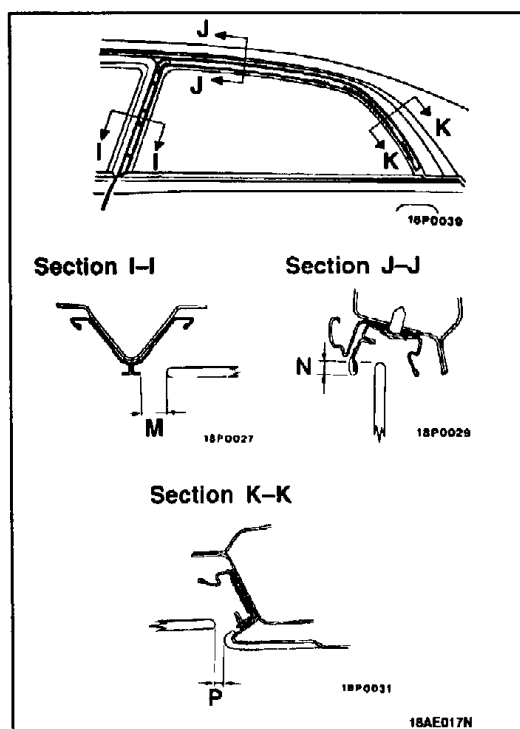
1. Place masking tape on the edge of the door glass in the positions as shown in the illustration.
2. Mark the tape from the catch lip on the top front piece of tape at section J-J.
Measure from the edge of the door glass to mark on the tape. This gives dimension "N" (glass intrusion).
3. Mark the tape on the "B" pillar 100 mm up and 100 mm down. Measure from "B" pillar to the edge of the glass in both positions. This will give section I-I dimension "M" (glass margin).
4. Measure the distance between the rear edge of the glass and the "C" pillar moulding at section K-K. This will give dimension "P".

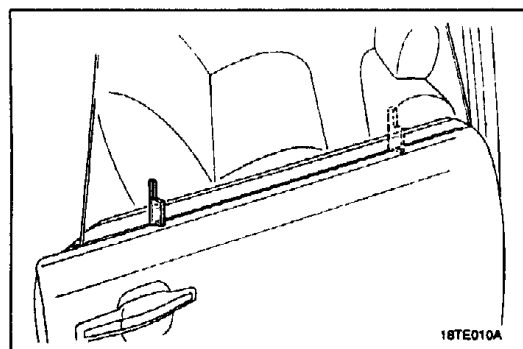
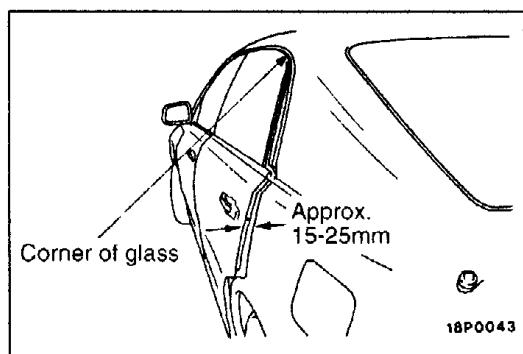
Standard value:

(M) 12.7 ± 1.0 mm (parallel within 1.5 mm)

(N) 3.4 ± 1.0 mm

(P) 4.2 ± 1.0 mm





5. With the glass fully raised, close the door until the rear corner of the door glass just contacts the door seal and measure the distance between the rear edge of the opened door panel and the adjacent panel (rear fender) at a line through the centre of the door handle ("soft touch")

Standard value: 15–25 mm

6. If door glass operation is slow or the door glass rattles, remove the belt line moulding and check the door glass stabiliser settings.

Standard value:

Front stabiliser 11.0 ± 0.5 mm

Rear stabiliser 12 ± 0.5 mm

NOTE

If all dimensions are in specification, the customer concern is probably caused by a condition other than door glass settings.

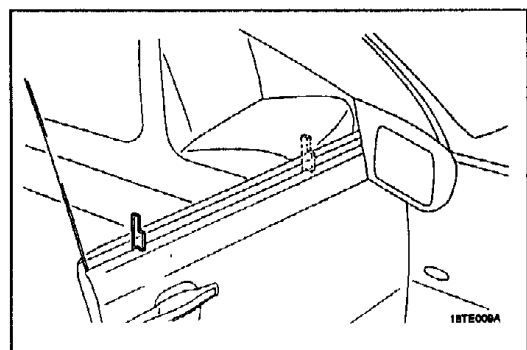
DOOR GLASS ADJUSTMENTS

NOTE

Do not attempt door glass adjustment unless glass settings have been confirmed as being incorrect.

FRONT

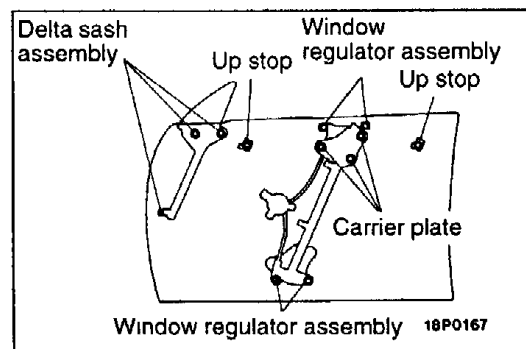
1. Remove the door trim, waterproof film (refer P.42-46) and belt line moulding.



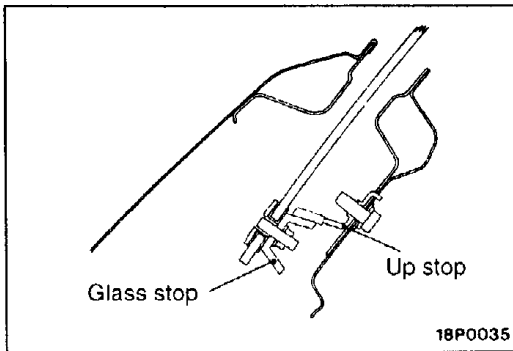
2. Check and adjust the door glass stabiliser settings then re-install the belt line moulding.
3. Loosen the mounting bolts and nuts for up stops, delta sash, carrier plate, and regulator (bottom).

NOTE

Mark the position of all bolts and nuts before loosening so that they can be returned to the original position if necessary.



4. With the window up, close door carefully.
5. Hold the door glass with both hands, (one hand through the rear window) push the glass towards the glass catch to achieve the glass position specification in the glass catch (glass intrusion) and the "B" pillar glass margin (refer P.42-38).



6. If the specification is achieved, keep the door closed and from the inside of the vehicle push the up stops to the glass and tighten. Tighten the carrier plate bolts.
7. Open the door and tighten the regulator bottom bolts.
8. Recheck and confirm all dimensions.

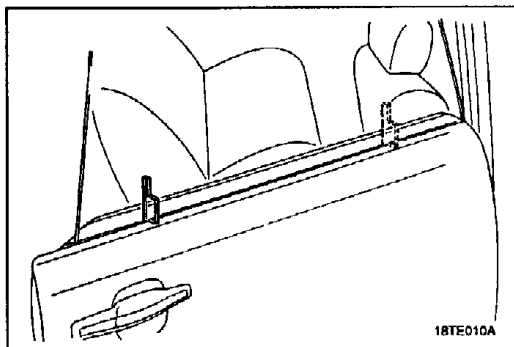
9. Recheck the glass intrusion, "soft touch" and glass margin. Alter glass intrusion by moving the up stops. Alter "soft touch" by adjusting the regulator mounting studs.

Caution

Always turn each stud or bolt the same amount.

If margin is incorrect, repeat steps 3–9.

10. With the glass fully raised, press the delta onto the glass so that the delta setting is the standard value (refer P.42-40).
11. Perform a leak test to confirm that water does not leak into the interior.
12. Install the waterproof film and door trim (refer P.42-46).

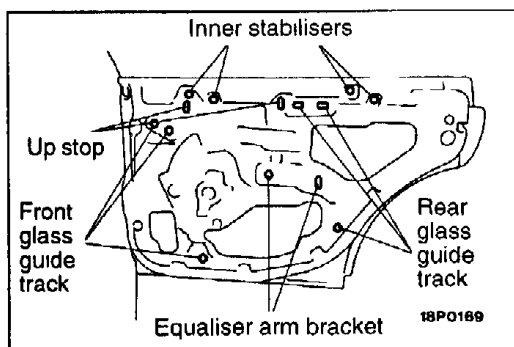


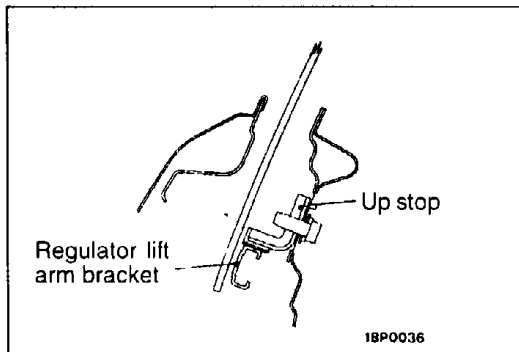
REAR DOOR

NOTE

Do not attempt door glass adjustment unless glass settings have been confirmed as incorrect.

1. Remove the door trim, waterproof film, (refer P.42-46) and belt line moulding.
2. Fully raise the door glass and check and adjust the door glass stabiliser settings using a suitable gauge then re-install the belt line moulding.
3. Loosen the mounting studs and nuts for the front glass guide track, rear glass guide track, up stops and equaliser arm bracket.
4. Move the door glass backwards and forwards by moving the rear glass guide track and at the same time tilt the glass by moving the equaliser arm bracket to set the glass margin, "C" pillar gap and door glass intrusion then tighten the equaliser arm bracket and guide track lower studs.





5. Hold the up stops against the regulator lift arm and tighten.
6. Verify the "soft touch" setting and if necessary adjust by turning the glass track upper studs.

Caution

Always turn each adjustment stud the same amount and ensure that the amount of stud protrusion is equal.

7. Lower and raise the door glass and verify that all dimensions are correct.
 Alter glass intrusion by moving the up stops.
 Alter "soft touch" by adjusting the regulator guide track upper stops.
 If glass margin or "C" pillar gap is incorrect repeat steps 3-7.
8. Perform a leak test to confirm that water does not leak into the interior.

9. Install the waterproof film and door trim.

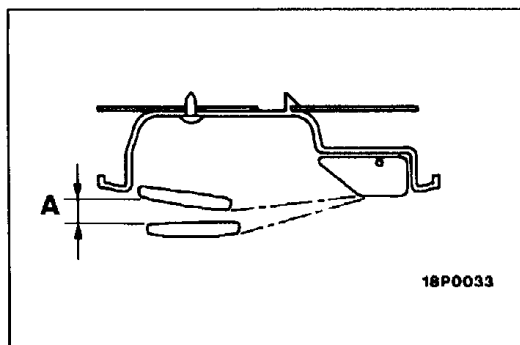
INSIDE HANDLE PLAY ADJUSTMENT

1. Remove the door trim and waterproof film. (Refer to P.42-46)
2. Move the door inside handle installation position back and forth to adjust so that the inside handle play allowance agrees with the standard value.

Standard value (A):

Front; 2.1 – 10.8 mm

Rear; 4.1 – 12.7 mm



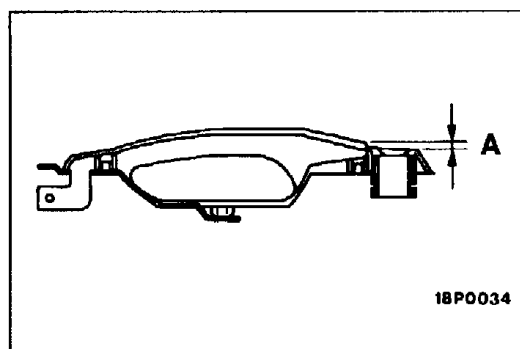
OUTSIDE HANDLE PLAY CHECK

If the door outside handle play does not conform to the standard value, check the door outside handle or door latch assembly, and replace if necessary.

Standard value (A):

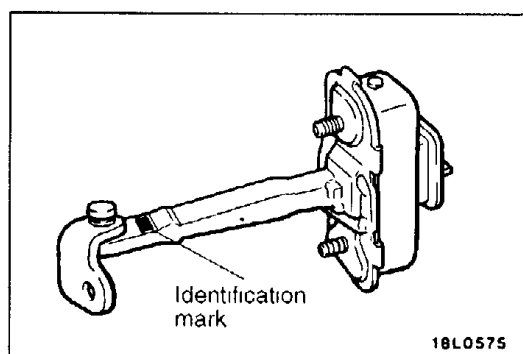
Front; 1.7 – 6.0 mm

Rear; 1.9 – 5.8 mm



CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR) INSPECTION

1. Lift the UP switch to fully close the window glass, and continue to lift the switch for 40 seconds.
2. At the moment that the UP switch is released, press the DOWN switch. The circuit breaker can be considered good if at this time the door window glass begins to open within 60 seconds.



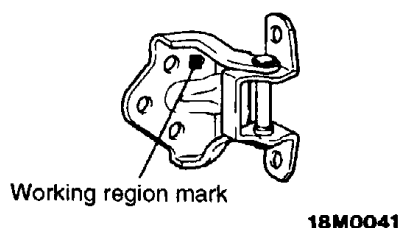
INSTALLATION SERVICE POINTS

►A◄ DOOR CHECK INSTALLATION

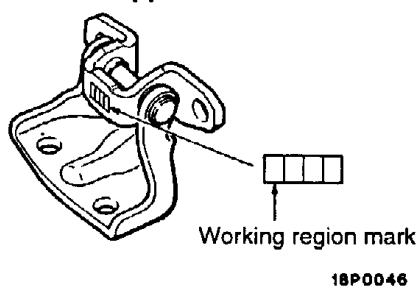
Install the door check so that the identification mark faces upwards.

Applicable location		Identification mark
RH	Front door	1R
	Rear door	2R
LH	Front door	1L
	Rear door	2L

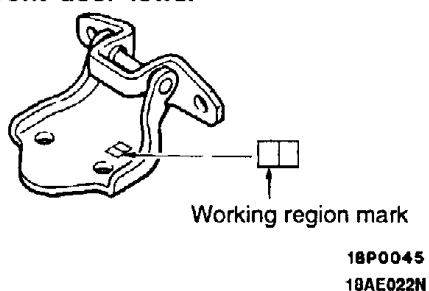
Front door



Front door upper



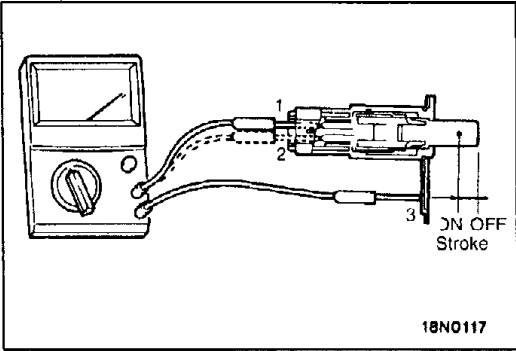
Front door lower



►B◄ DOOR LOWER HINGE/ DOOR UPPER HINGE INSTALLATION

The door hinges differ according to where they are used, so check the identification mark before installation.

Applicable location		Identification mark
Front left door	Upper hinge	V
	Lower hinge	U
Front right door	Upper hinge	U
	Lower hinge	V
Rear left door	Upper hinge	1
	Lower hinge	02
Rear right door	Upper hinge	2
	Lower hinge	P2



INSPECTION

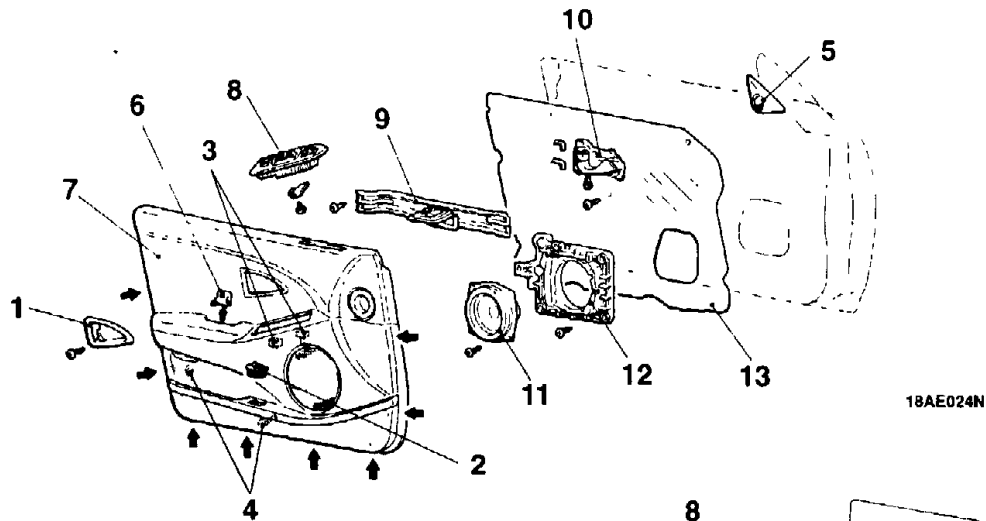
DOOR SWITCH CONTINUITY CHECK

Driver's door switch and passenger's door switch

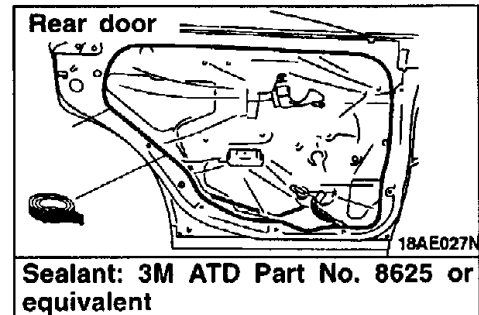
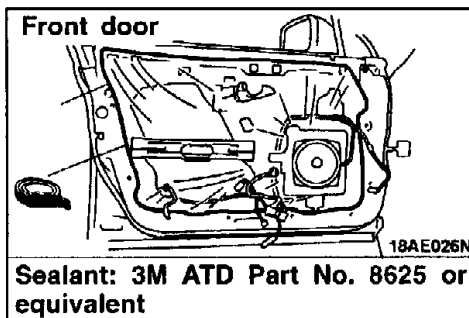
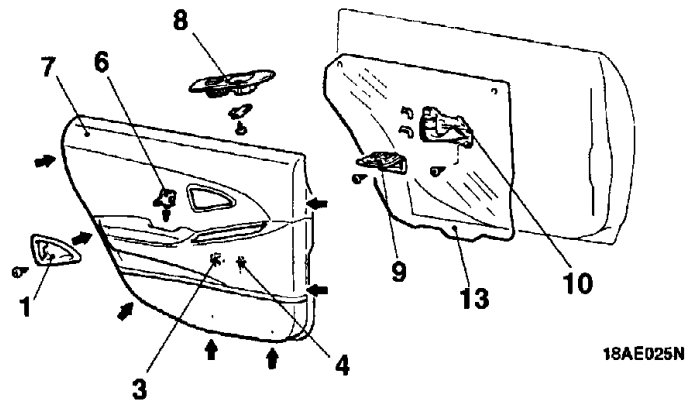
Switch position	1	2	3
Open (ON)			
Depressed (OFF)			

DOOR TRIM AND WATERPROOF FILM REMOVAL AND INSTALLATION

Front door



Rear door



18AE028N

Removal steps

1. Inside handle cover
2. Trunk lid and fuel filler door opener switch (vehicles fitted with electric trunk lid and fuel filler door opener)
3. Harness connector
4. Harness
5. Inner delta cover or tweeter cover
6. Cap

7. Door trim
8. Driver side door module or power window sub-switch
9. Pull handle bracket
10. Door inside handle
11. Speaker
12. Speaker cover
13. Waterproof film

DOOR GLASS AND REGULATOR

REMOVAL AND INSTALLATION

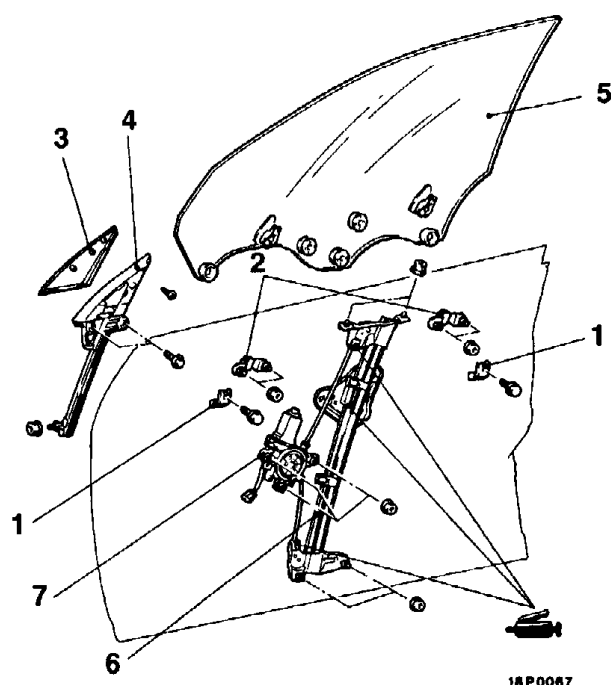
Pre-removal Operation

- Door Trim and Waterproof Film Removal (Refer to P.42-46.)
- Door Belt Line Moulding, Removal (Refer to P.42-52)

Post-installation Operation

- Door Window Glass Adjustment (Refer to P.42-39)
- Door Trim and Waterproof Film Installation (Refer to P.42-46)
- Door Belt Line Moulding, Installation (Refer to P.42-52)

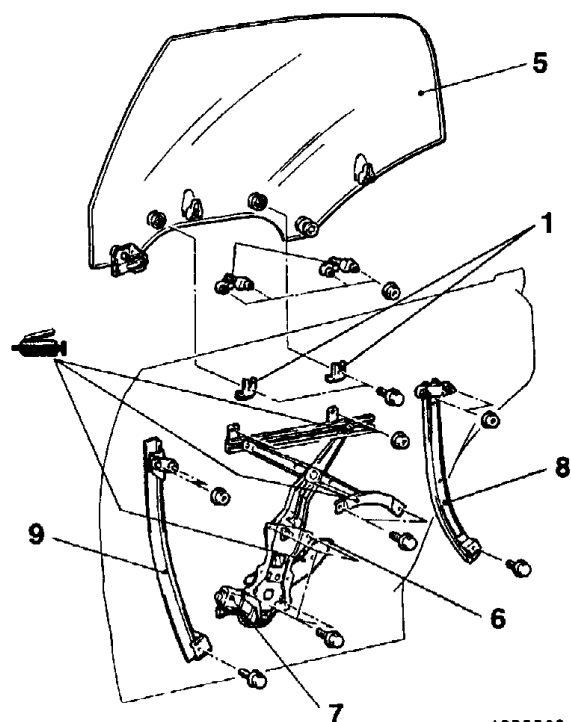
Front door



Front window regulator assembly removal steps

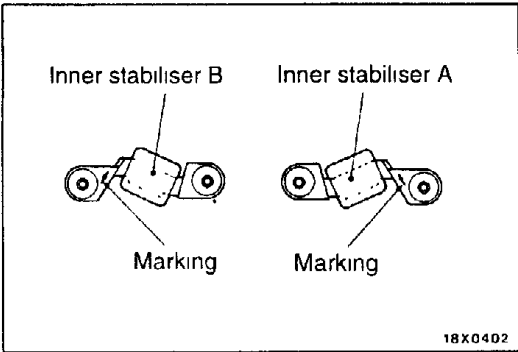
- A◄
1. Up stop
 2. Inner stabiliser A (left front door)
Inner stabiliser B (right front door)
 3. Outer delta cover
 4. Delta sash assembly
 5. Door window glass
 6. Window regulator assembly
 7. Power window motor

Rear door



Rear window regulator assembly removal steps

- A◄
1. Up stop
 2. Inner stabiliser A (right rear door)
Inner stabiliser B (left rear door)
 5. Door window glass
 6. Window regulator assembly
 7. Power window motor
 8. Rear glass guide track
 9. Front glass guide track



INSTALLATION SERVICE POINTS

►A◄ INNER STABILISER A AND INNER STABILISER B INSTALLATION

- 1. Confirm the difference between inner stabilisers A and B using the identification marks.

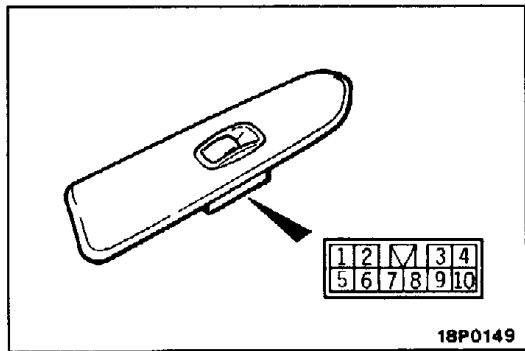
Applicable location		Identifying Colour
Inner stabiliser A	Left door front	Yellow
	Right door rear	
Inner stabiliser B	Right door front	Gray
	Left door rear	

- 2. Install each inner stabiliser so the arrow symbol points upwards.

INSPECTION

POWER WINDOW MOTOR

- 1. Check if the slider moves smoothly when the battery is directly connected to the motor terminals.
- 2. Check if the slider moves in the opposite direction when the battery is connected with the polarities reversed.



POWER WINDOW SWITCH CONTINUITY CHECK

Main switch (Driver side door module)

Refer to Group 54–SWS Troubleshooting

Sub Switch

Terminal Number	Switch position			
	Up	OFF		Down
		Not Live	Live	
2		○	⊖	
4		○		○
5		○	⊖	
6	○	○	⊖	○
7	○	○	⊕	○
9			○	
10			○	

DOOR HANDLE AND LATCH

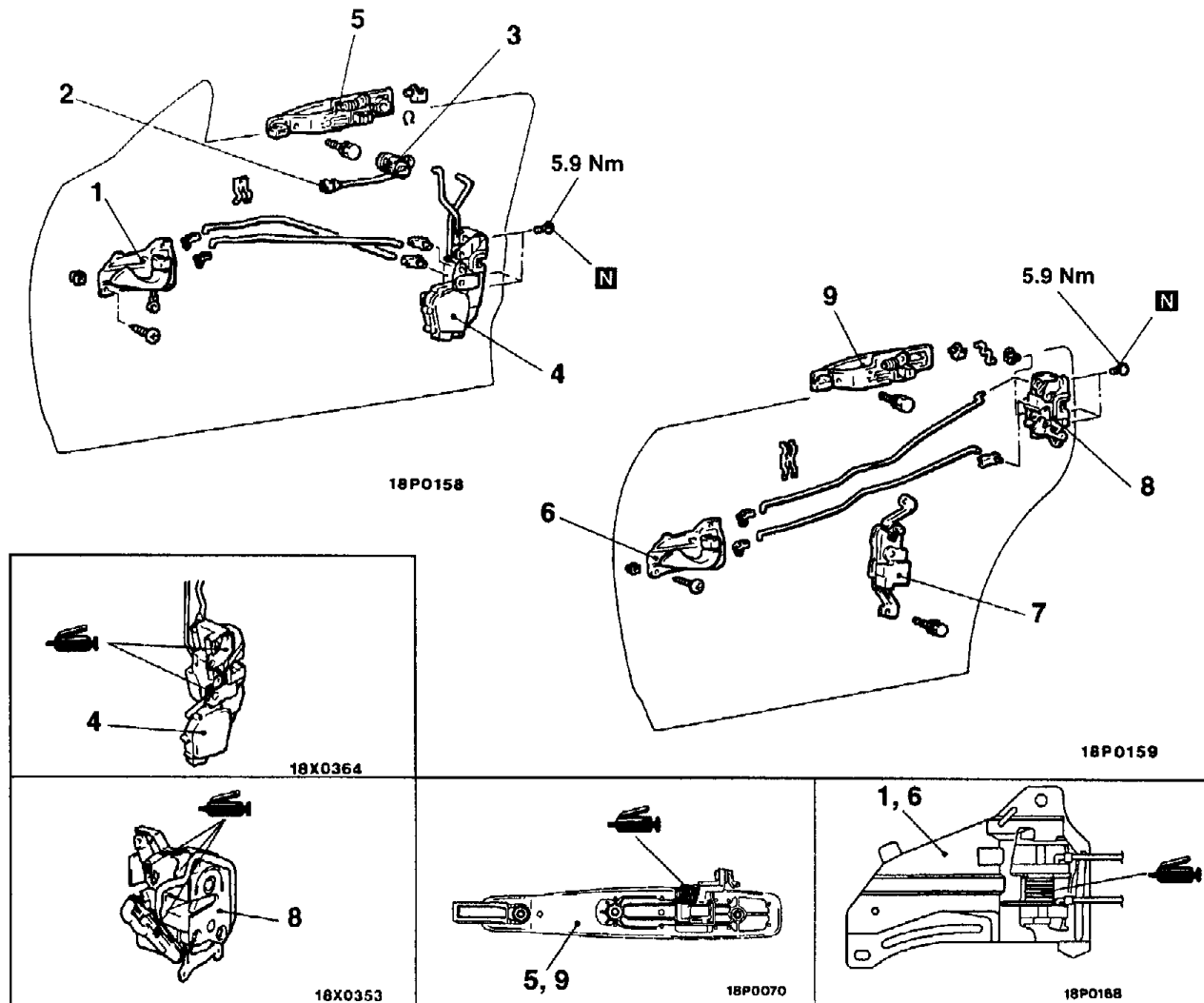
REMOVAL AND INSTALLATION

Pre-removal Operation

- Door Trim Removal (Refer to P.42-46.)

Post-installation Operation

- Inside Handle Play Adjustment (Refer to P.42-42.)
- Door Trim Installation (Refer to P.42-46.)



18AE030N

Front door inside handle removal steps

1. Front door inside handle

Front door outside handle and door latch assembly removal steps

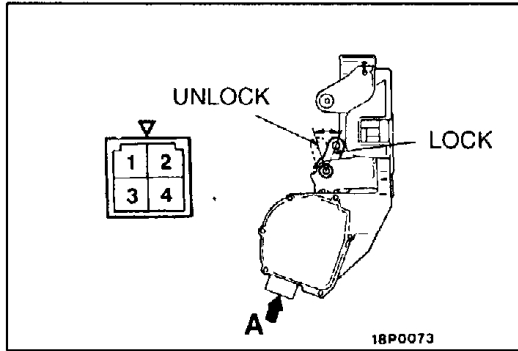
1. Front door inside handle
- Waterproof film (Refer to P.42-46.)
2. Harness connector
3. Door lock key cylinder
4. Front door latch assembly
5. Front door outside handle

Rear door inside handle removal steps

6. Rear door inside handle

Rear door outside handle and door latch assembly removal steps

6. Rear door inside handle
- Waterproof film (Refer to P.42-46.)
7. Rear door lock actuator
8. Rear door latch assembly
9. Rear door outside handle

**INSPECTION****FRONT DOOR LOCK ACTUATOR CHECK****<L.H.>**

1. After setting the rod to the LOCK position, apply battery voltage to terminal 3 and check if the rod moves as far as the UNLOCK position when terminal 4 is grounded.
2. After setting the rod to the UNLOCK position and applying battery voltage to terminal 4, check if the rod moves as far as the LOCK position when terminal 3 is grounded.
3. When the rod is set to the UNLOCK position, check if there is continuity between terminal 1 and terminal 2, and when the rod is set to the LOCK position, check that there is no continuity.

<R.H.>

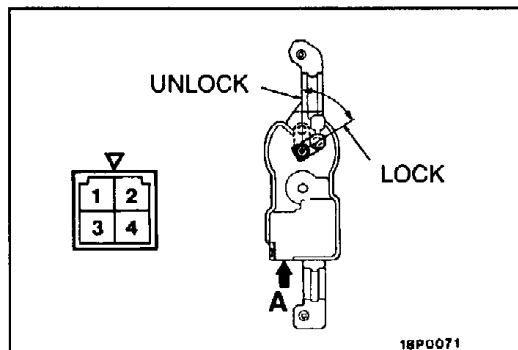
1. After setting the rod to the LOCK position, apply battery voltage to terminal 4 and check if the rod moves as far as the UNLOCK position when terminal 3 is grounded.
2. After setting the rod to the UNLOCK position and applying battery voltage to terminal 3, check if the rod moves as far as the LOCK position when terminal 4 is grounded.
3. When the rod is set to the UNLOCK position, check if there is continuity between terminal 2 and terminal 1, and when the rod is set to the LOCK position, check that there is no continuity.

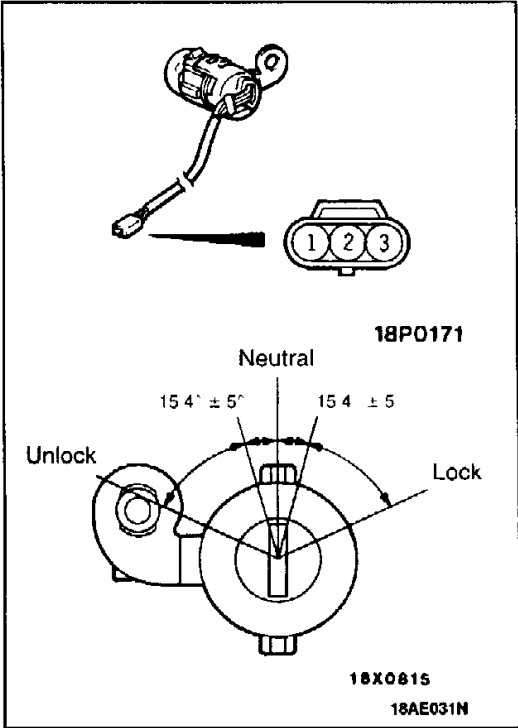
REAR DOOR LOCK ACTUATOR CHECK**<L.H.>**

1. After setting the rod to the LOCK position, apply battery voltage to terminal 1 and check if the rod moves to the UNLOCK position when terminal 3 is grounded.
2. After setting the rod to the UNLOCK position and applying battery voltage to terminal 3, check if the rod moves to the LOCK position when terminal 1 is grounded.

<R.H.>

1. After setting the rod to the LOCK position and applying battery voltage to terminal 3, check if the rod moves to the UNLOCK position when terminal 1 is grounded.
2. After setting the rod to the UNLOCK position and applying battery voltage to terminal 1, check if the rod moves to the LOCK position when terminal 3 is grounded.





DOOR LOCK KEY CYLINDER SWITCH CONTINUITY CHECK

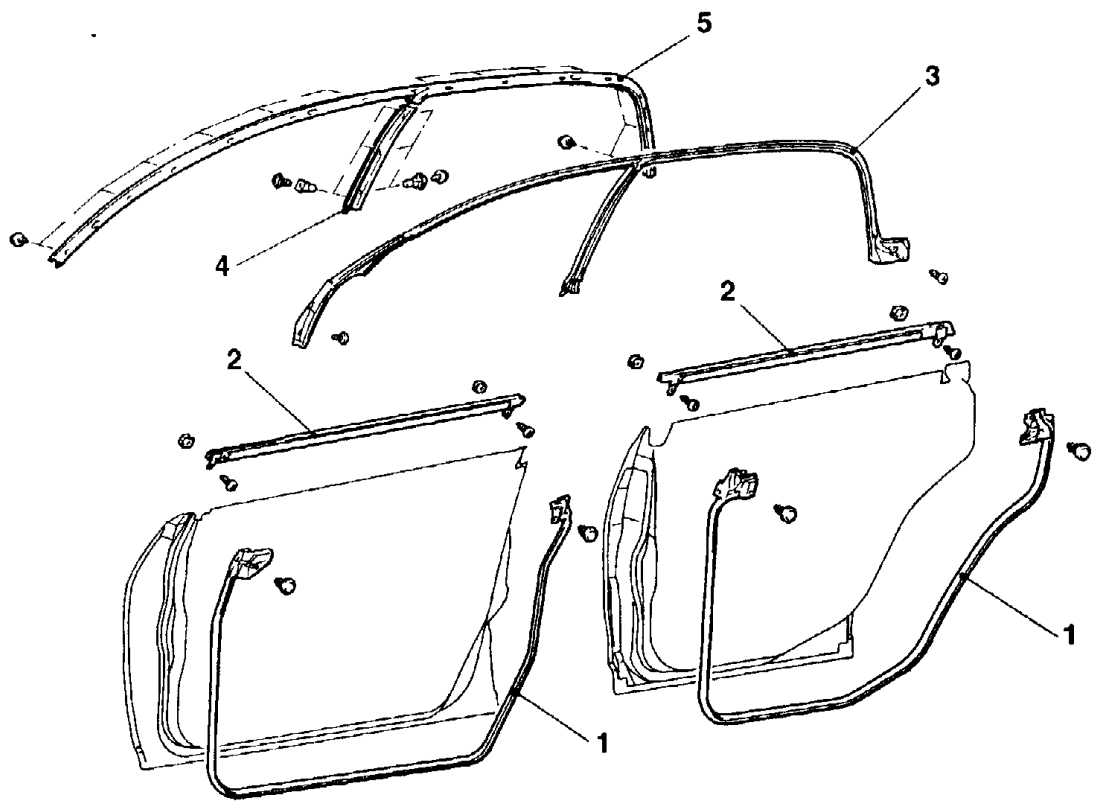
Switch position	Terminal No.		
	1	2	3
LOCK	○	—○	
Neutral (OFF)			
UNLOCK		○—	○

CENTRAL DOOR LOCK SWITCH CHECK

Refer to Group 54–SWS Troubleshooting.

DOOR BELT LINE MOULDING AND DOOR OPENING WEATHERSTRIP

REMOVAL AND INSTALLATION



18P0068

Door outer opening weatherstrip removal steps

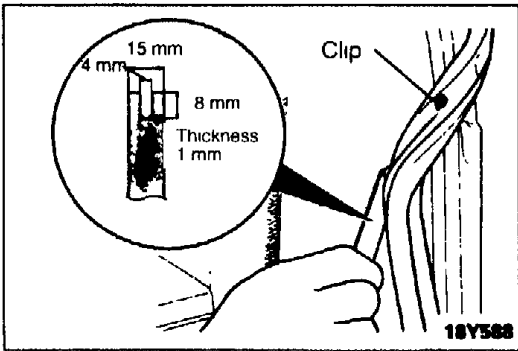
- Door trim (Refer to P.42-46)
- 1. Door outer opening weatherstrip

Beltline moulding removal steps

- 1. Door outer opening weatherstrip
- 2. Beltline moulding

Dripline weatherstrip removal steps

- 3. Dripline weatherstrip
- 4. Centre pillar holder
- 5. Door weatherstrip holder



REMOVAL SERVICE POINT

DOOR OUTER OPENING WEATHERSTRIP REMOVAL

Make a tool as shown in the illustration to remove the door opening weatherstrip.

INSTALLATION SERVICE POINT

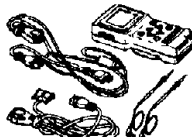
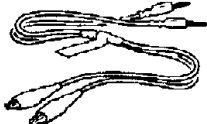
DOOR OUTER OPENING WEATHERSTRIP INSTALLATION

The clip colour identifies the left and right weatherstrips, so be sure to use the colours so as to install correctly.

Applicable side	Identification colour
Left door	White
Right door	Yellow

KEYLESS ENTRY SYSTEM

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	Checking the keyless entry system (SWS Diagnosis displayed using the Scan tool)
	MB991529	Check harness	Checking using the SWS Simplified Check Diagnosis Mode

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp.

(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.

SWS SIMPLIFIED FAULT DIAGNOSIS MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS-ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to Group 54–SWS for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSIS CODE CLASSIFICATION TABLE

Refer to Group 54–SWS.

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure no.	Reference page
Communication with MUT-II is not possible.	1	42-55
Switching to SWS simplified diagnostic mode is not possible		
No door can be locked or unlocked with the transmitter (central locking system operates normally)	2	42-57
No door can be locked with the transmitter (central locking system locking function operates normally)	3	42-58
No door can be unlocked with the transmitter (central locking system unlocking function operates normally)	4	42-58
The trunk lid cannot be unlocked with the transmitter	5	42-59
The interior light either flashes or does not illuminate when the doors are either locked or unlocked with the transmitter (the light functions normally when doors are opened or closed)	6	42-60
The transmitter secret code cannot be registered		

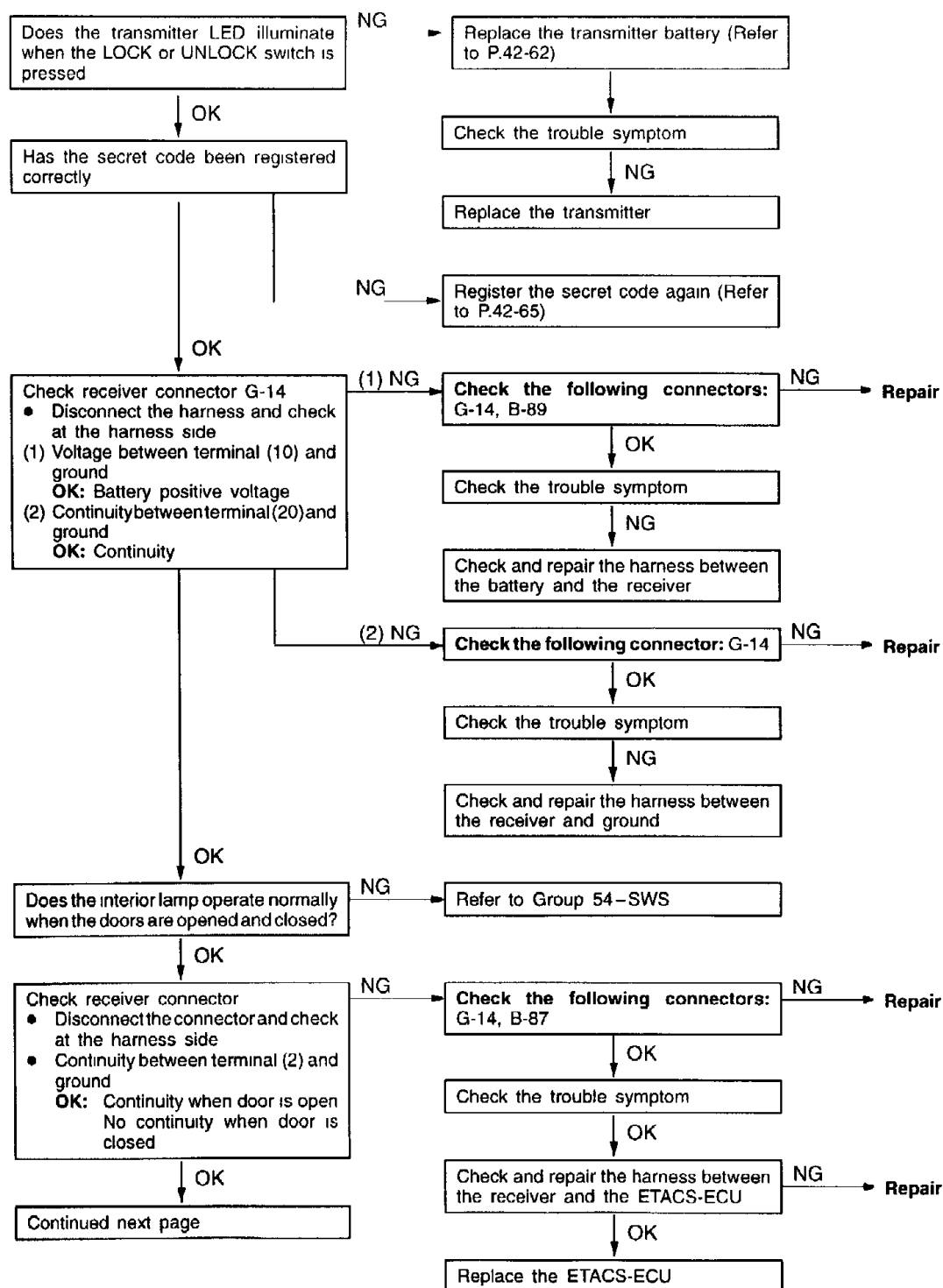
INSPECTION PROCEDURE 1

No door can be locked or unlocked with the transmitter (central locking system operates normally)

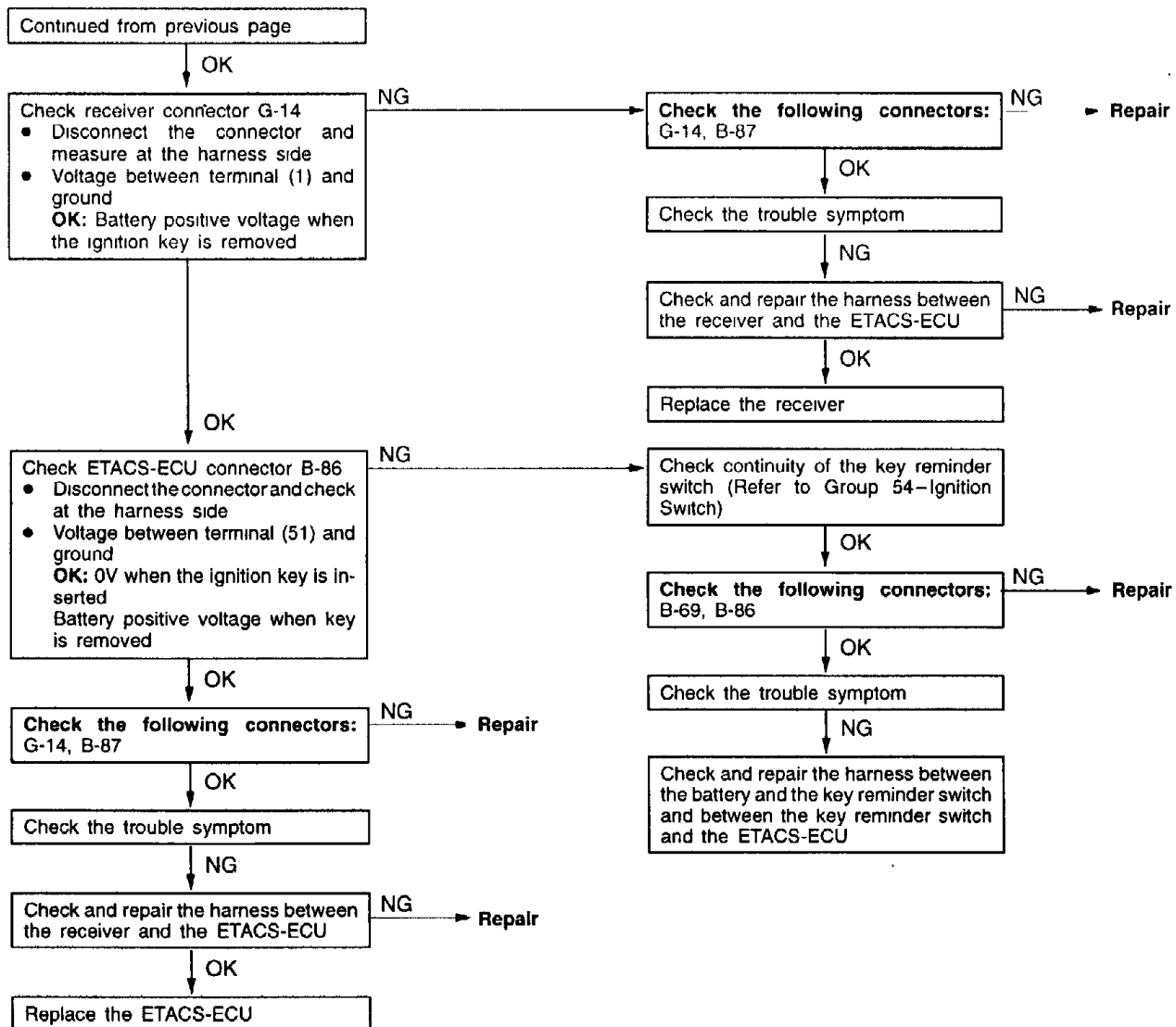
The transmitter, receiver, receiver power or ground circuit, key reminder switch or a door switch may be defective.

Probable cause

- Defective transmitter
- Defective receiver
- Defective harness or connector

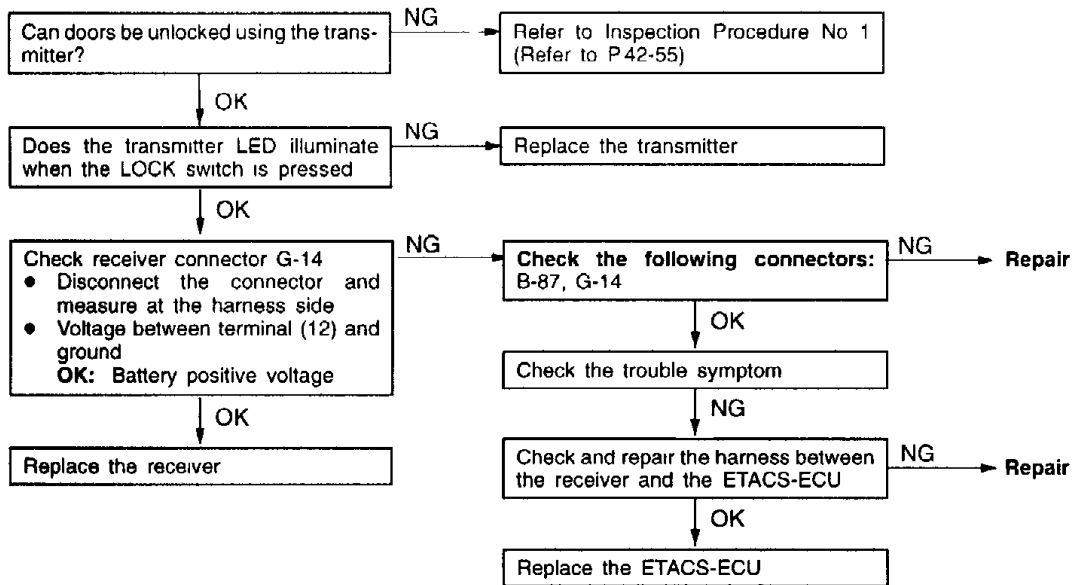


INSPECTION PROCEDURE 1 (continued)



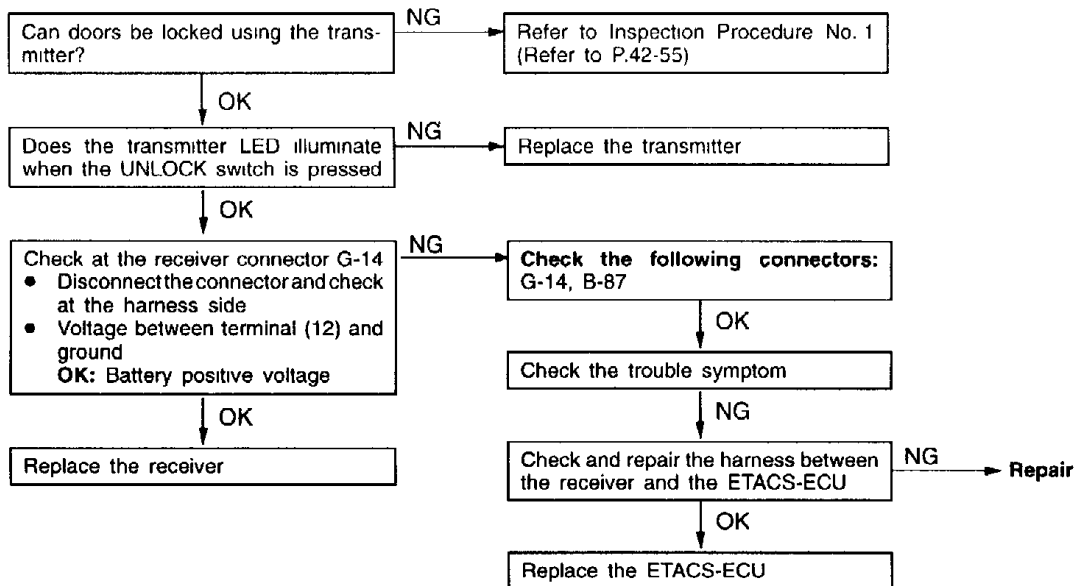
INSPECTION PROCEDURE 2

No door can be locked with the transmitter (central locking system operates normally)	Probable cause
The transmitter receiver or ETACS-ECU or the harness between the ETACS-ECU and receiver may be defective	• Defective transmitter • Defective receiver • Defective ETACS-ECU • Defective harness or connector



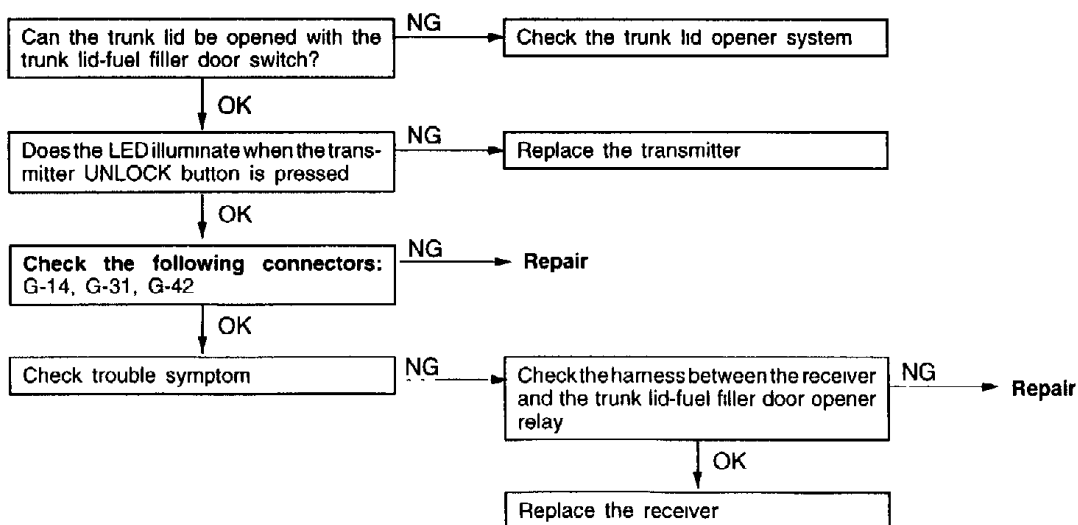
INSPECTION PROCEDURE 3

No door can be unlocked with the transmitter (central locking system operates normally) The transmitter, receiver ETACS-ECU or the harness between the receiver and ETACS-ECU may be defective	Probable cause • Defective transmitter • Defective receiver • Defective ETACS-ECU • Defective harness or connector
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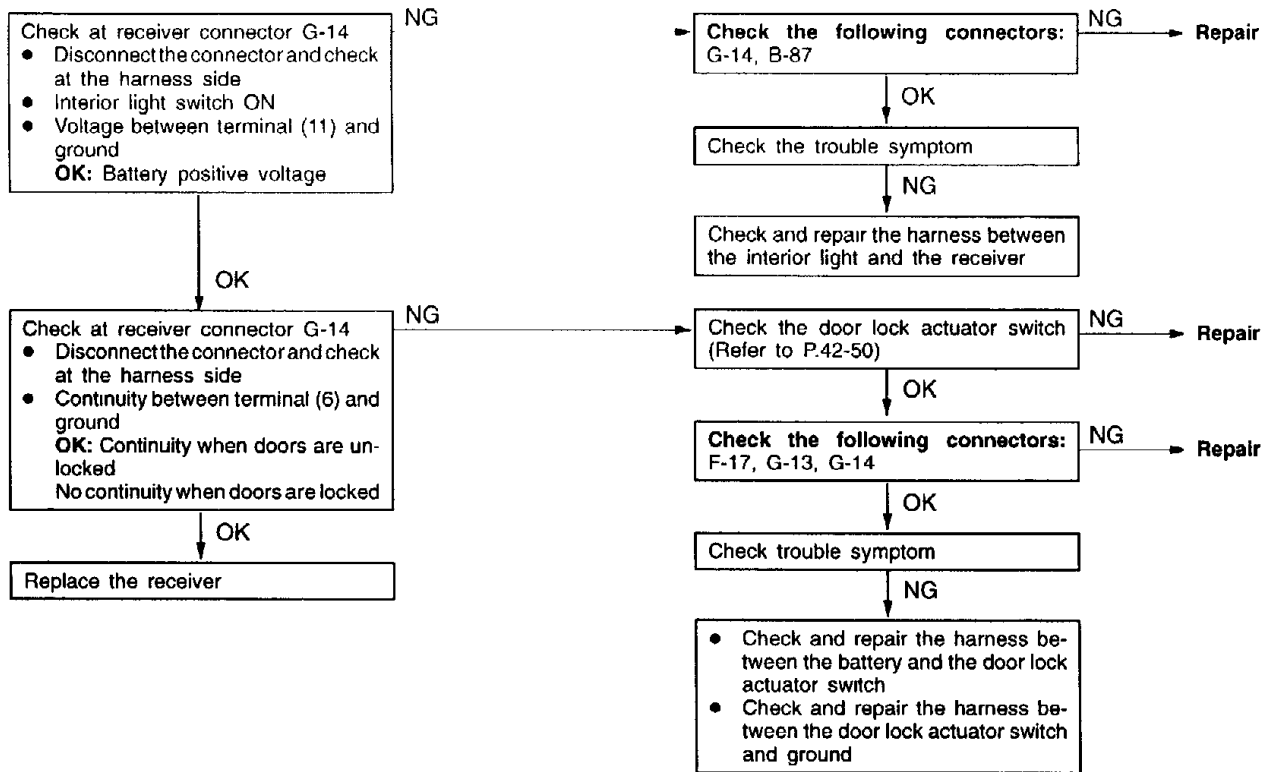
INSPECTION PROCEDURE 4

The trunk lid cannot be unlocked with the transmitter The transmitter, receiver or the harness between the receiver and trunk lid-fuel filler door opener relay may be defective	Probable cause • Defective receiver • Defective transmitter • Defective harness or connector
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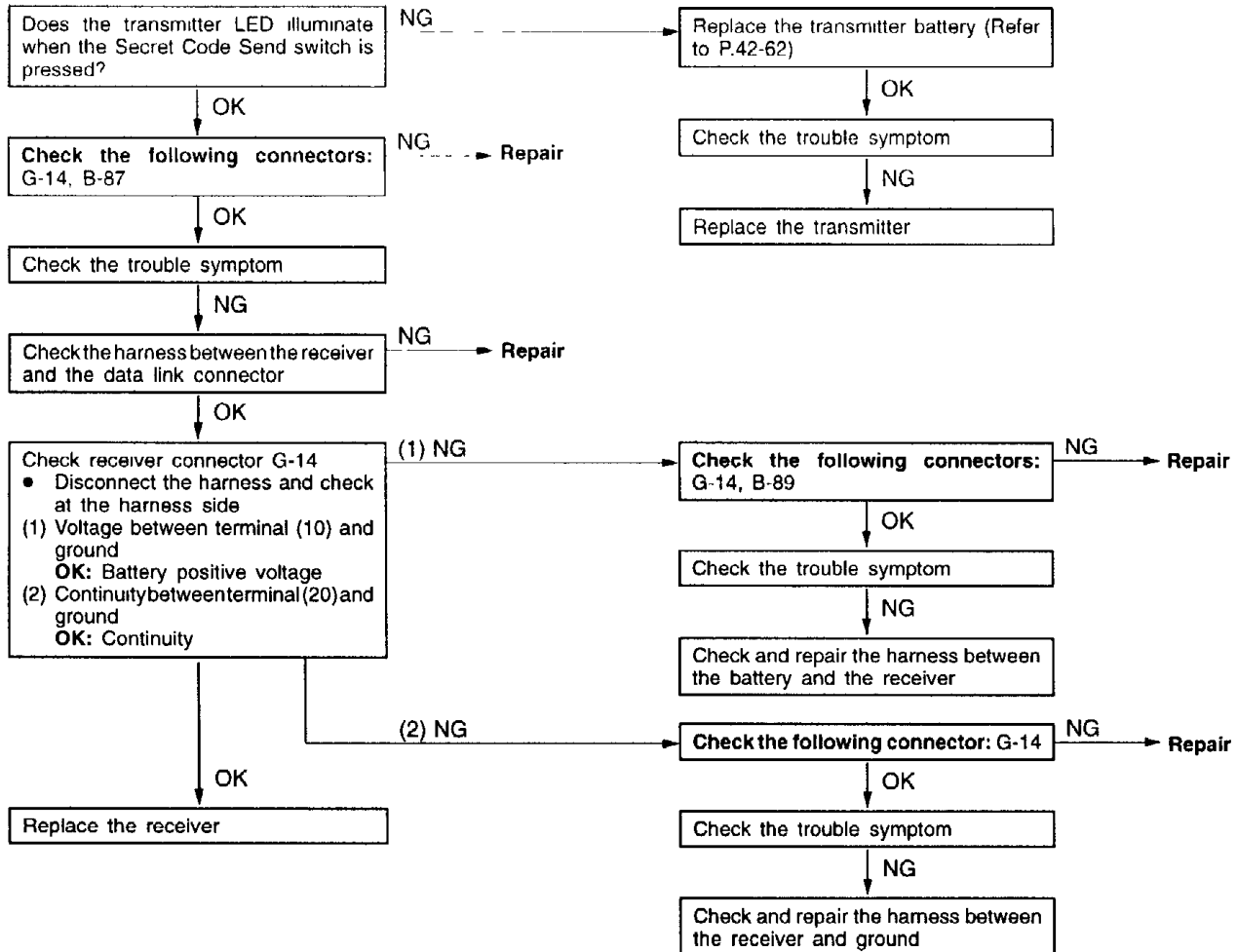
INSPECTION PROCEDURE 5

The interior light either flashes or does not illuminate when all doors are locked or unlocked with the transmitter (the interior light operates normally when the doors are opened or closed) The door lock actuator switch input circuit to the receiver, the interior light drive circuit or the receiver may be defective	Probable cause • Defective transmitter • Defective receiver • Defective harness or connector
--	--



INSPECTION PROCEDURE 6

The transmitter secret code cannot be registered	Probable cause
The transmitter, receiver or the harness between the receiver and the data link connector may be defective	- Defective transmitter - Defective receiver - Defective harness or connector



CHECKING THE RECEIVER TERMINALS



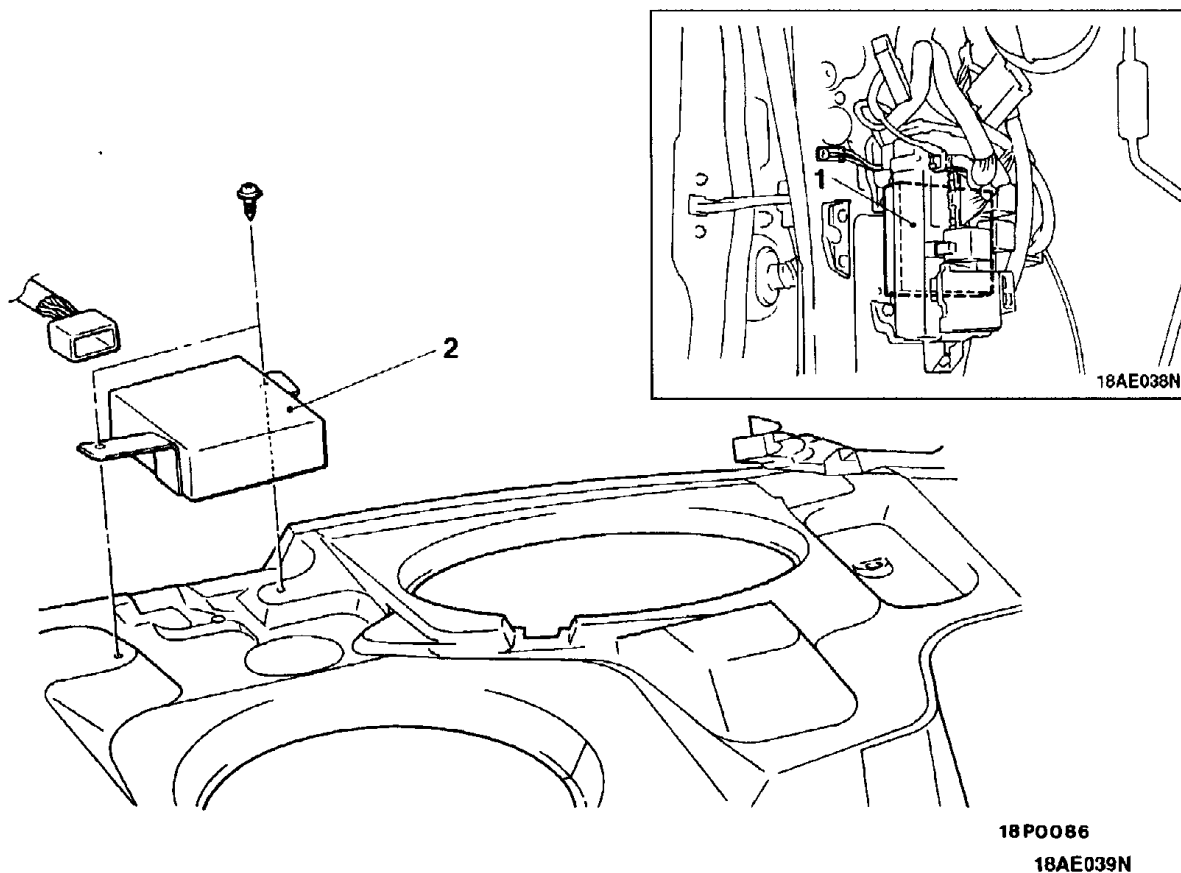
18W0311

Terminal	Signal Name	Conditions	Terminal Voltage
1	Key reminder	Ignition Key inserted	Battery positive voltage
		Ignition Key removed	0V
2	Door switch	Either door open (door switch: ON)	0V
		All doors closed (door switch: OFF)	Battery positive voltage
6	Door lock actuator switch (driver side)	LOCK	5V (Pulse output*)
		UNLOCK	0V
7	Diagnostic selection	When scan tool is connected	0V
		When scan tool is not connected	Battery positive voltage
9	Ignition switch	Ignition switch: ACC or ON	Battery positive voltage
		Ignition switch: OFF	0V
10	Receiver power supply	Full time	Battery positive voltage
11	Room lamp output	Either door open (door switch: ON)	0V
		All doors closed (door switch: OFF)	Battery positive voltage
12	Door lock output	When operating	0V
		When not operating	Battery positive voltage
13	Door unlock output (all doors)	When operating	0V
		When not operating	Battery positive voltage
14	Door unlock output (driver side)	When operating	0V
		When not operating	Battery positive voltage
16	Driver identification signal output	When operating	5V (Pulse output*)
		When not operating	5V
18	Trunk lid and fuel filler door opener relay output	When operating	0V
		When not operating	Battery positive voltage
20	Ground	Full time	0V

NOTE

*: Measure with an oscilloscope. However, if measuring with a tester, around 0~0.03V is repeatedly displayed.

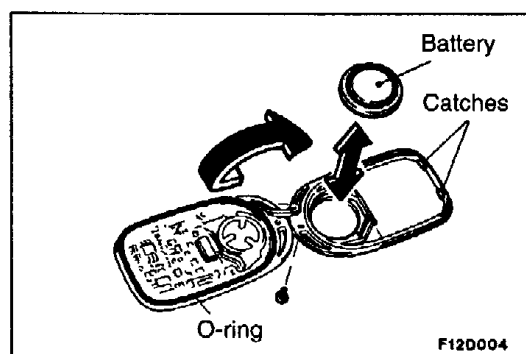
REMOVAL AND INSTALLATION

**ETACS-ECU removal steps**

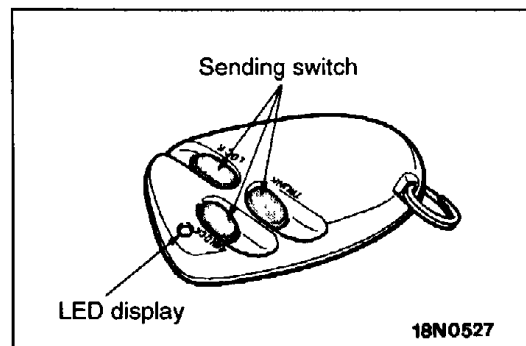
1. ETACS-ECU

Receiver removal steps

- Rear shelf trim (see Group 52A)
- 2. Receiver

**REPLACING THE BATTERY**

1. Undo the mounting screw and remove the battery from the transmitter.
2. Insert a new battery with the + side down.
Replacement battery: Lithium battery CR2032
3. Push together the catches of the battery cover, and take care not to twist or displace the O-ring.

**Caution:**

Be careful not to deform the battery electrodes when replacing, ensure that water and dirt do not enter, and that you do not directly touch the printed circuit board.

4. Press the send switch on the transmitter and confirm that the LED display lights up.

TRANSMITTER CODE REGISTRATION METHOD

Each transmitter has its own stored secret code. When replacing the transmitter and receiver, or when it is concluded that a system malfunction is caused by a transmitter code registration fault, the code must be registered in the receiver EEPROM.

Since only two different codes can be stored in the EEPROM memory space, when the registration procedure below is repeated twice, the old code can no longer be used. Registration of the code should be performed after confirming with the key that the door lock function is operative.

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

NOTE

The No. 1 terminal of the diagnosis connector is in the grounded state at this time, and the unit is ready for code registration.

Caution

Ensure that the ignition switch is in the OFF position when connecting and disconnecting the MUT-II.

2. Close all doors.
3. Turn the ignition switch to the ACC position, then return to the OFF position.

NOTE

The door lock will lock and unlock to confirm that the registration mode is enabled.

4. Press the "Lock" or "Unlock" switch on the first transmitter to be registered once, then press twice more within 10 seconds and the code is registered.
5. After completing registration, the door locks will lock and unlock once.
6. If there are two transmitters, register the first, then register the second using the same procedure within one minute. After completing the second registration, the door locks will lock and unlock once.

NOTE

The registration mode is cancelled under the following conditions.

- When registration of the two transmitter codes is complete
 - When 1 min has elapsed after setting registration mode
 - When the MUT-II connection is disconnected (ground released)
 - When the ignition switch is turned ON
 - When any door is opened
7. Disconnect the MUT-II and confirm that the transmitter(s) function(s) correctly.

SUNROOF

SERVICE SPECIFICATIONS

Items	Specifications
Roof lid operating current A	9 or less (at 20°C)
Slipping force of sunroof motor clutch N	47–62

SEALANT

Items	Specified sealant
Rail cover assembly	3M ATD Part No. 8531 or 3M ATD Part No. 8646 or equivalent

SPECIAL TOOLS

Tool	Number	Name	Use
A  MB991219	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adaptor D: Probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
B  MB991220			
C  MB991221			
D  MB991222 MB991223			

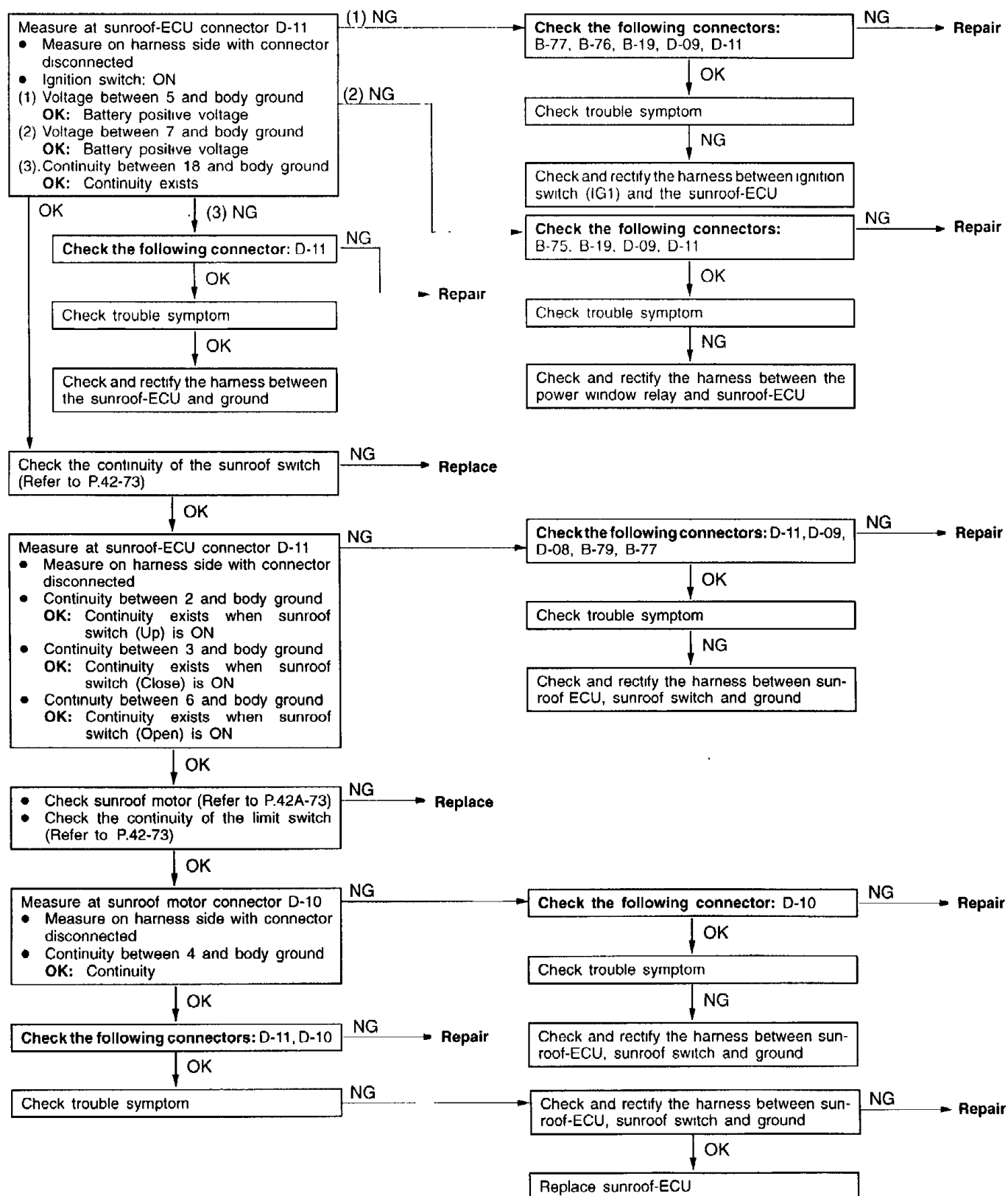
TROUBLESHOOTING**INSPECTION CHART FOR TROUBLE SYMPTOMS**

Trouble symptom	Inspection procedure no.	Page reference
Sunroof does not operate with ignition ON	1	42-65
When the sunroof is closing, the motor does not reverse when a load of 140N or more is applied.	2	42-67
The timer does not operate for 30 seconds after the ignition is switched off (power window timer operates normally)	3	42-67

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS**INSPECTION PROCEDURE 1**

The sunroof does not operate with the ignition switch ON	Probable cause
Possible causes include faults in the sunroof switch, sunroof motor or sunroof-ECU power supply circuit, or ground circuit.	• Sunroof switch fault • Sunroof motor fault • Harness or connector fault • Sunroof-ECU fault

Continued next page:

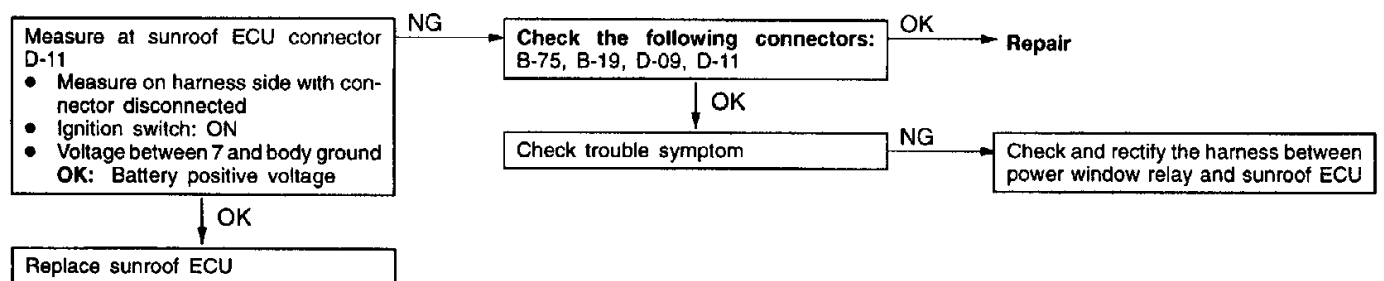


INSPECTION PROCEDURE 2

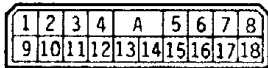
The motor does not reverse when a load of at least 140N (14.3kgf) is applied to the sunroof when closing The sunroof ECU monitors the load status from the current flowing in the motor, and if the load exceeds a preset level, reverses the motor to prevent fingers etc. being trapped. If the motor doesn't reverse when the load is excessive, the cause is probably a fault in the sunroof ECU.	Probable cause • Sunroof ECU fault
Replace sunroof ECU	

INSPECTION PROCEDURE 3

The timer does not operate for 30 sec after the ignition switch is turned OFF (However, the power window is timer-operable) The sunroof ECU has a timer function for the 30 sec after the ignition switch is turned OFF. In addition, power is supplied from the power window relay while the timer is operating. If the timer does not operate therefore, possible causes include a sunroof ECU fault or a fault in the connector harness between the power window relay and the sunroof ECU.	Probable cause • Harness or connector fault • Sunroof ECU fault
---	--

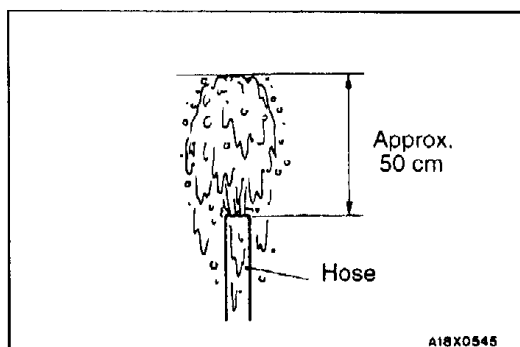


CHECKING THE SUNROOF ECU TERMINALS



18P0142

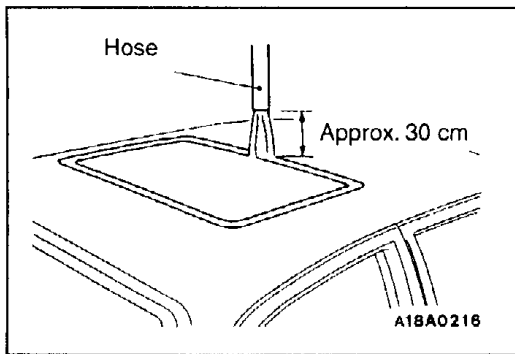
Terminal	Check Item	Conditions	Terminal Voltage
1	Door switch input	Driver side door switch	ON 0V
			OFF Battery positive voltage
2	Sunroof switch (up) input	Sunroof switch (up)	ON 0V
			OFF Battery positive voltage
3	Sunroof switch (close, down) input	Sunroof switch (close, down)	ON 0V
			OFF Battery positive voltage
4	Sunroof switch (open) input	Sunroof switch (open)	ON 0V
			OFF Battery positive voltage
5	ECU power supply	Ignition switch: ON	Battery positive voltage
6	Motor output (when opening)	During sunroof opening, down operations	Battery positive voltage
		Other than the above	0V
7	Timer operation power supply	Power window relay: ON	Battery positive voltage
8	Motor output (when closing)	During sunroof closing and up operations	Battery positive voltage
		Other than the above	0V
9	Limit switch 3 input	When sunroof tilting up and fully open	0V
		Other than the above	Battery positive voltage
10	Limit switch 1 input	When sunroof tilting up	Battery positive voltage
		When sunroof is fully closed and fully open	0V
		When sunroof is sliding to close	0V→Battery positive voltage→0V
12	Limit switch 2 input	When sunroof tilting up, fully closed	Battery positive voltage
		Other than the above	0V
13, 18	Earth	At all times	0V



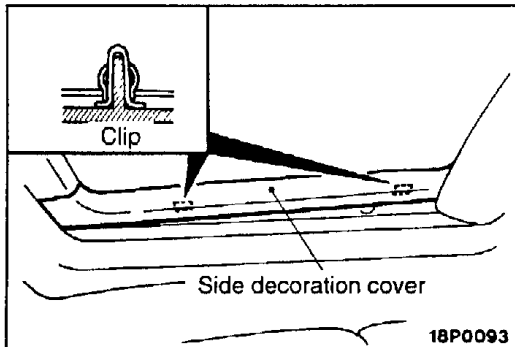
ON-VEHICLE SERVICE

WATER TEST

1. Close roof lid tightly.
2. Hold hose upward and adjust water fountain to about 50 cm high.



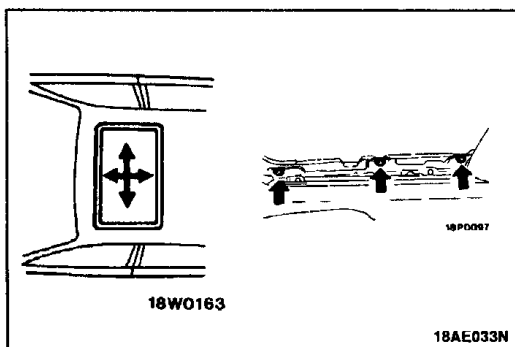
3. Pour water over the roof from about 30 cm above roof for more than 5 minutes.
4. While pouring water, check for leak around roof lid.
5. In the event of leakage, check drain pipe, weatherstrip contact and others.



SUNROOF FIT ADJUSTMENT

FORWARD, BACKWARD AND SIDEWAYS ADJUSTMENT OF THE SUNROOF GLASS

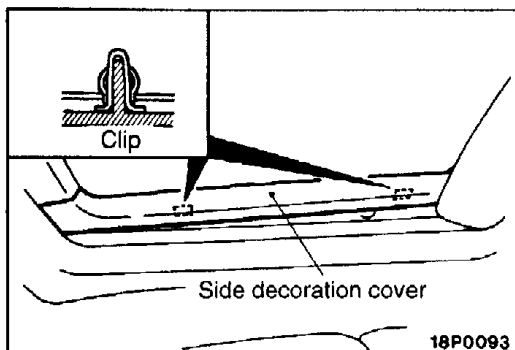
1. Fully close the roof lid glass.
2. Fully open the sun shade.
3. Remove the decoration cover.



4. Loosen the 6 roof lid glass mounting nuts and adjust the glass forward, backward or sideways.

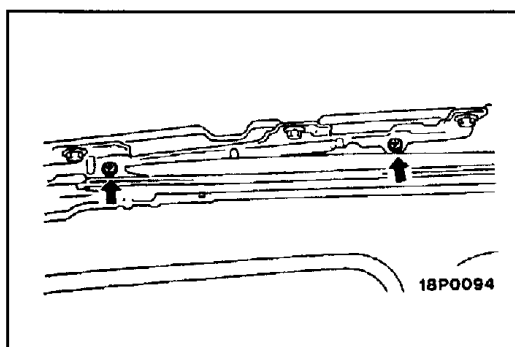
NOTE

If the adjustment cannot be made by loosening the mounting nuts, the roof lid glass or the motor have not been fully closed, so they should be adjusted to the fully closed positions.



HEIGHT ADJUSTMENT OF THE ROOF LID GLASS AND THE ROOF

1. Fully close the roof lid glass.
2. Fully open the sun shade.
3. Remove the decoration cover.



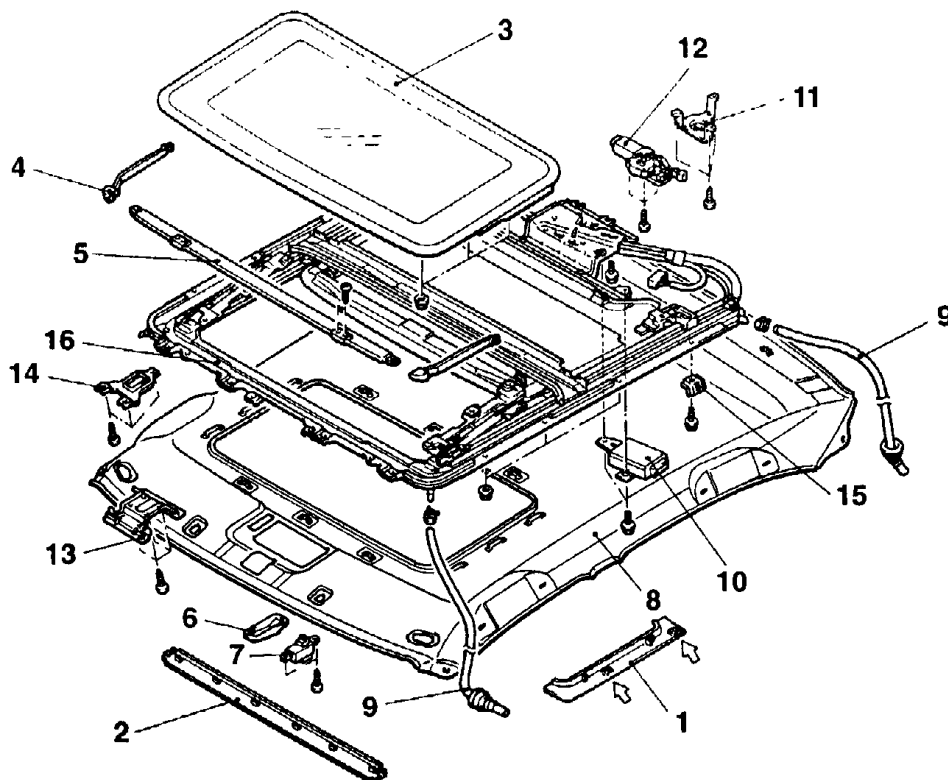
4. Loosen the four guide (A) assembly mounting screws and move the roof lid glass assembly along the grooves in the guide (A) assembly.
5. After adjustment, confirm that the sunroof operates smoothly.

SUNROOF

REMOVAL AND INSTALLATION

Post-installation Operation

- Sunroof Fit Adjustment (Refer to P.42-69.)
- Water Test.(Refer to P.42-68.)



18P0104

NOTE

⇐: Indicates the clip positions

◀A▶

Roof lid glass removal steps

1. Side decoration cover
2. Front decoration cover
3. Roof lid glass assembly

Deflector removal steps

4. Deflector link assembly
5. Deflector

Sunroof motor and sunroof control unit removal steps

6. Sunroof switch cover
7. Sunroof switch
8. Headlining (Refer to GROUP 52A – Headlining.)
10. Sunroof-ECU
11. Headlining bracket
12. Sunroof motor

◀B▶

Sunroof assembly removal steps

6. Sunroof switch cover

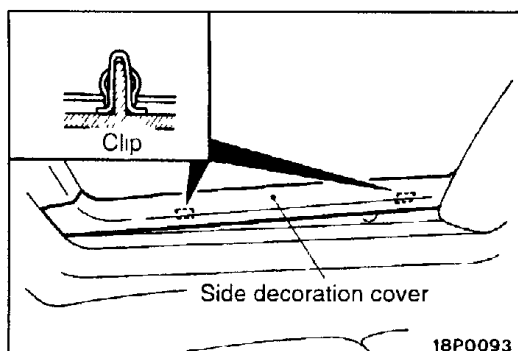
7. Sunroof switch
8. Headlining (Refer to GROUP 52A – Headlining.)
9. Drain hose connection
13. Sunroof switch bracket
15. Set bracket
16. Sunroof assembly

Drain hose removal steps

- Splash shield <Front drain hose> (Refer to P.42-8.)
- Trunk side trim <Rear drain hose> (Refer to GROUP 52A – Trims)

6. Sunroof switch cover
7. Sunroof switch cover
8. Headlining (Refer to GROUP 52A – Headlining.)
9. Drain hose

◀C▶ ▶A▶

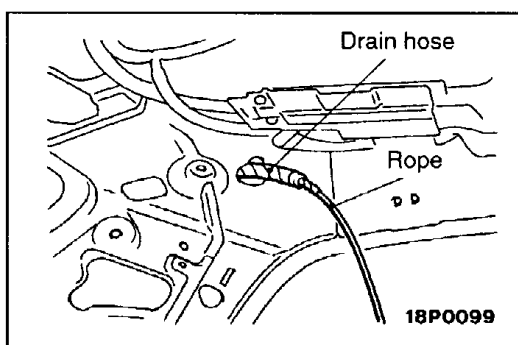
**REMOVAL SERVICE POINTS****◀A▶ SIDE DECORATION COVER REMOVAL**

There are clips in the positions shown in the illustration, so be careful of them while pushing the decoration cover downwards with your hand to remove it.

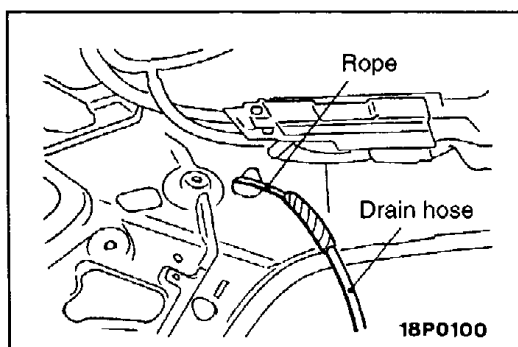
◀B▶ SUNROOF MOTOR REMOVAL**Caution**

When removing the sunroof motor, always be sure to fully close the roof lid glass.

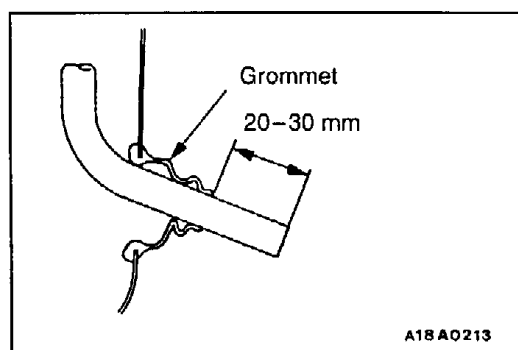
If the roof lid glass and the sunroof motor are not both in the fully-closed positions, the sunroof will not operate properly.

**◀C▶ DRAIN HOSE REMOVAL**

Remove the grommet. Tie a cord to the end of the drain hose, wind tape around it so that there is no unevenness, and pull the drain hose out into the wheel house.

**INSTALLATION SERVICE POINTS****▶A◀ DRAIN HOSE INSTALLATION**

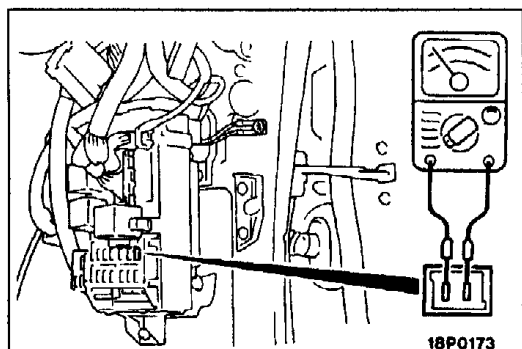
1. Tie the cord that was used during removal to the end of the drain hose, and wind tape around it so that there is no unevenness.
2. Pull the cord to pull through the drain hose
3. Make the protrusion from the drain hose grommet as shown in the illustration.



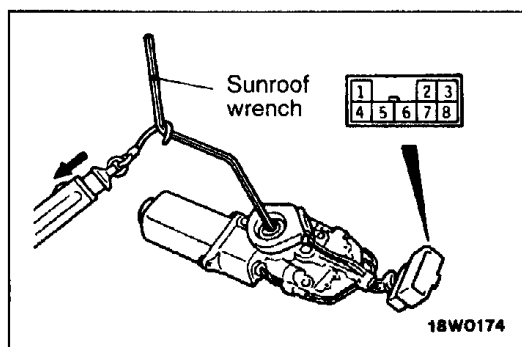
INSPECTION**ROOF LID GLASS OPERATING CURRENT CHECK**

1. Remove the sunroof fuse, and connect a circuit tester as illustrated.
2. Turn the sunroof switch ON, and measure the current at an intermediate point, excluding the following times: start-up, fully closed, fully open, fully tilted up.

Standard value: 9A or below (at 20°C)



3. If the roof lid glass operating current exceeds specification check for the following.
 - (1) The fitting of the sunroof assembly, any deformation or entrapped foreign objects
 - (2) Sticking of the drive cable
 - (3) Tilted roof lid glass

**SLIDING FORCE OF SUNROOF MOTOR'S CLUTCH CHECK**

Inspect the sliding force of the clutch by the following procedure.

1. Place the sunroof wrench from the on-board tools into the hexagonal socket of the sunroof motor drive shaft, and set a spring scale in a position 100 mm from the drive shaft.
2. Connect the battery to sunroof motor connector terminals 1 and 2 to rotate the sunroof motor.
3. Measure the spring scale reading when the rotating force of the sunroof motor equals the spring force of the spring balance.

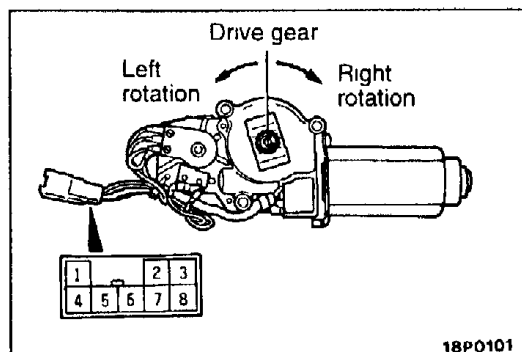
Standard value: 47–62 N (4.8–6.3 kgf)

Caution

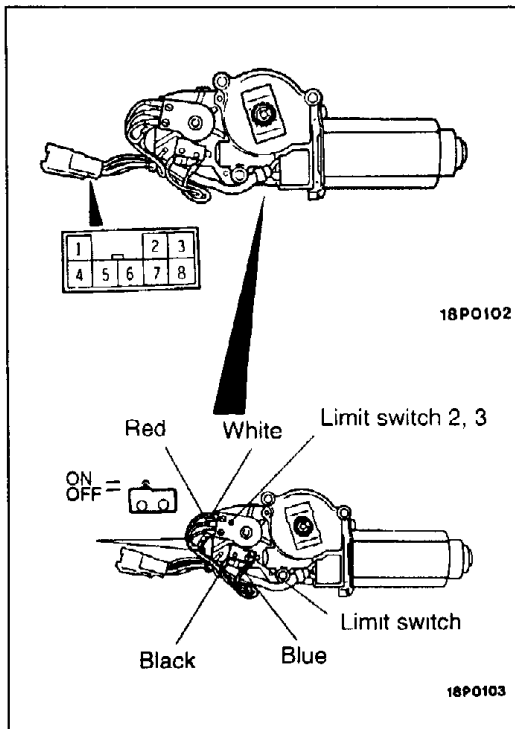
- (1) The spring scale should be kept a right angle to the sunroof wrench.
 - (2) If a wrench other than that in the on-board tools is used, the value for the clutch sliding force will be different, so only the on-board tool should be used.
4. If the clutch sliding force is outside the standard value, replace the motor.

SUNROOF MOTOR OPERATION CHECK

Check the direction of rotation of the drive gear when the battery is connected to the connector.



Terminal 1	Terminal 2	Drive gear rotation direction
–	+	Right
+	–	Left

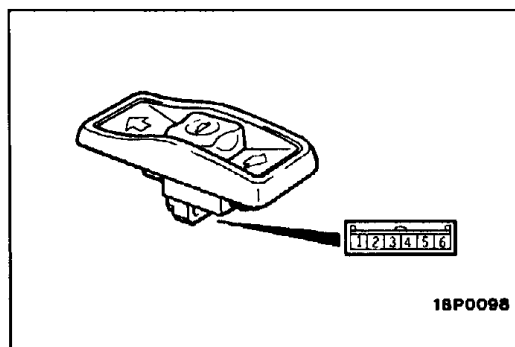


LIMIT SWITCH CONTINUITY CHECK

1. Remove the limit switch from the sunroof motor; then operate the limit switch and check for continuity between the terminals.

Switch		Terminal No.			
		3	5	6	7
Limit switch 1	ON	○	○		
	OFF				
Limit switch 2	ON	○		○	
	OFF				
Limit switch 3	ON	○			○
	OFF				

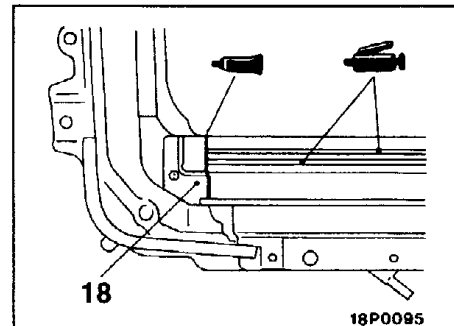
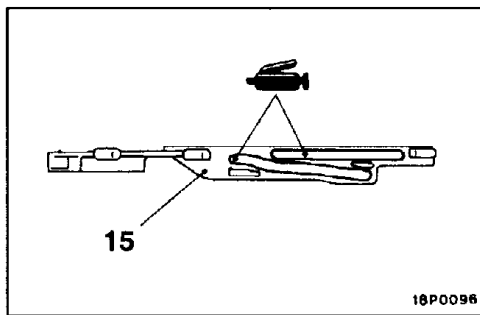
2. When installing the limit switch, check the wire colours for the limit switches, and install so that the position and direction are as shown in the illustration.



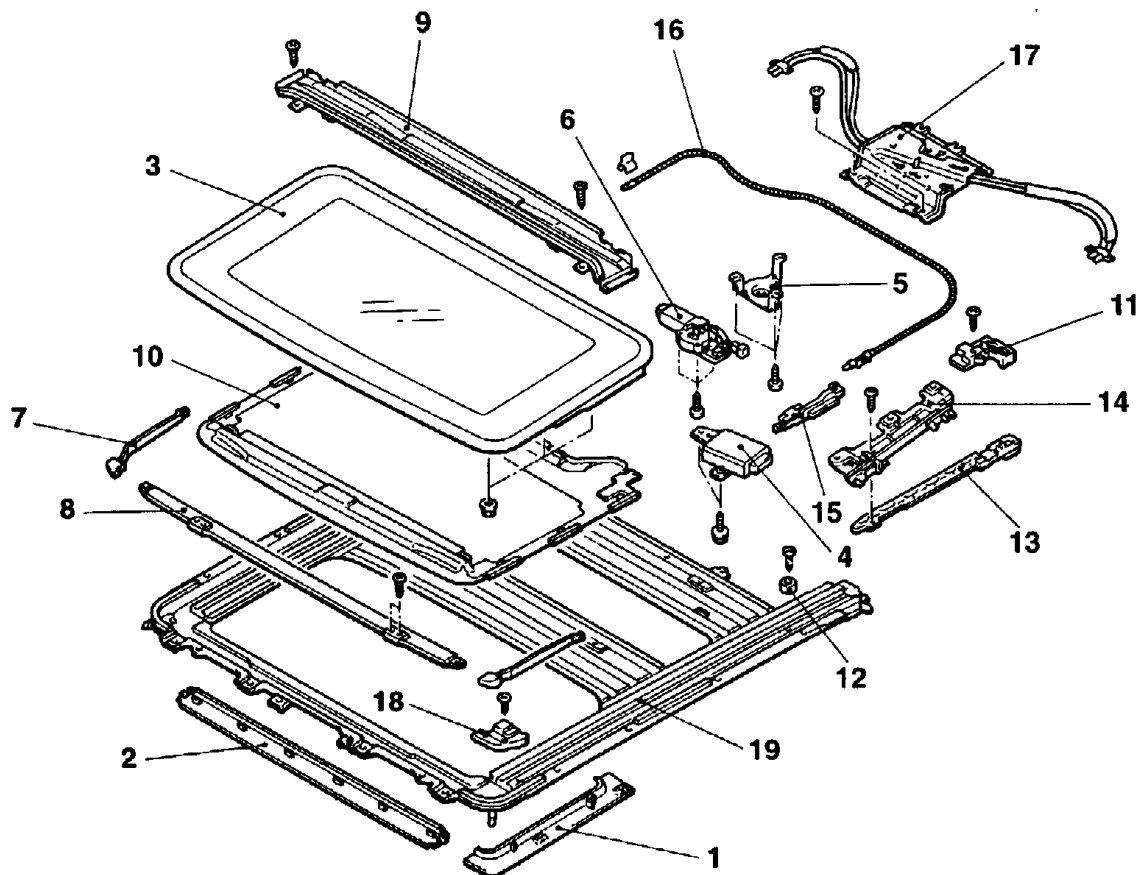
SUNROOF SWITCH CONTINUITY CHECK

Switch Position	Terminal No.			
	4	5	6	7
Open		○	○	
OFF				
Up	○	○		
Close, Down		○		○

DISASSEMBLY AND REASSEMBLY



Sealant:
3M ATD Part No. 8531 or 3M ATD
Part No.8646, or equivalent



18P0105

18AE032N

Deflector removal steps

- | | |
|--|-------------------------------|
| 1. Side decoration cover (See P.42-70) | 11. Sun shade slider assembly |
| 2. Front decoration cover | 12. Cushion (B) assembly |
| 3. Roof lid glass assembly | 13. Decoration link |
| 4. Sunroof-ECU | 14. Guide (A) assembly |
| 5. Head lining bracket | 15. Slider sub-assembly |
| 6. Sunroof motor (See P.42-70) | 16. Cable assembly |
| 7. Deflector link assembly | 17. Drive unit assembly |
| 8. Deflector assembly | 18. Rail cover assembly |
| 9. Drip rail assembly | 19. Frame assembly |
| 10. Sun shade assembly | |

EXTERIOR

CONTENTS

SERVICE SPECIFICATION	2	GRILLES AND GARNISHES	6
SEALANT AND ADHESIVE	2	MOULDINGS	8
SPECIAL TOOLS	2	AERO PARTS	12
FRONT BUMPER	3	WINDSHIELD WIPER AND WASHER*	14
REAR BUMPER	5	DOOR MIRROR	26

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) If it is possible that the SRS components are subjected to heat over 93°C in baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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 the asterisk (*) in the table of contents in each group indicate operations requiring warnings.

SERVICE SPECIFICATION

Item	Standard value
Windshield wiper blade installation position mm	65–80 (driver) 20–35 (passenger)

SEALANT AND ADHESIVE

Items	Specified sealant and adhesive
Side sill splash protector	3M ATD Part No. 5357 or equivalent
Side protector moulding	3M ATD Part No. 4213 or equivalent
Side air dam	3M ATD Part No. 5356 or equivalent

SPECIAL TOOLS

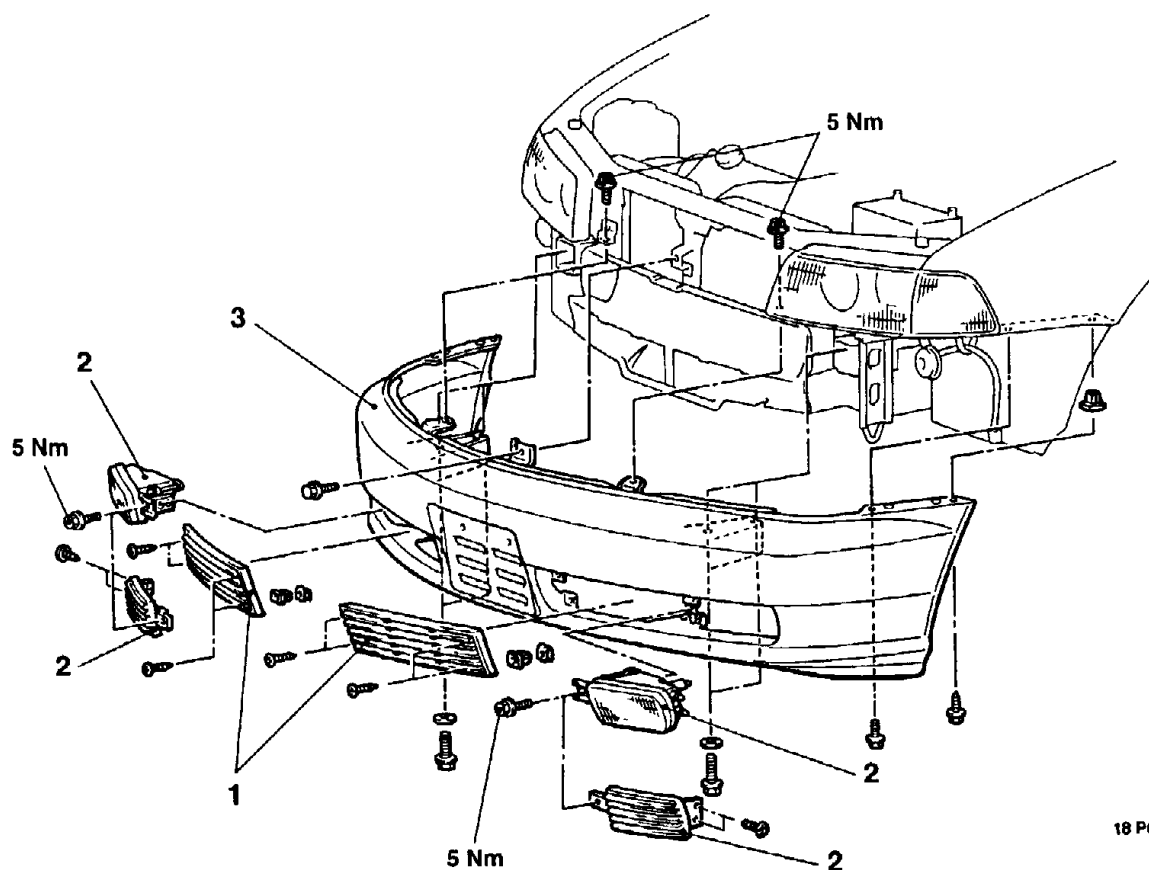
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of door mirror control switch
	MB990449	Window moulding remover	Removal of roof drip moulding, etc.

FRONT BUMPER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

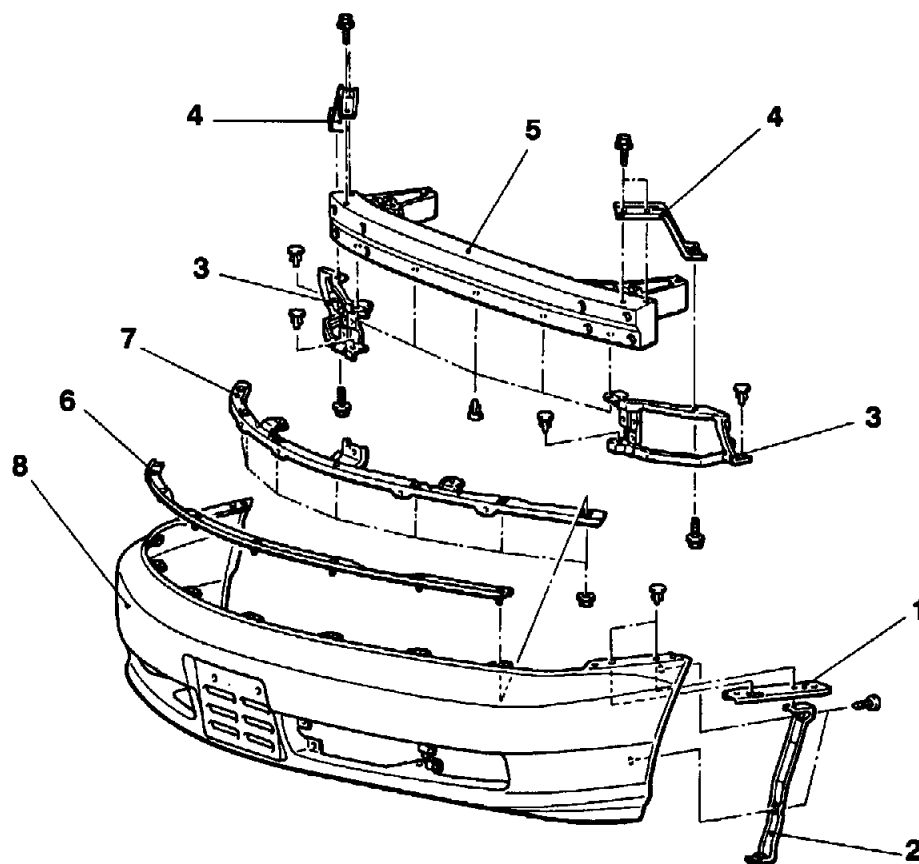
- Undercover panel Removal and Installation
- Splash shield Removal and Installation
- Radiator grille Removal and Installation (Refer to P.51-7)

**Removal steps**

1. Under grille
2. Fog lamp or fog lamp cover

3. Bumper assembly

DISASSEMBLY AND REASSEMBLY



18P0107

Disassembly steps

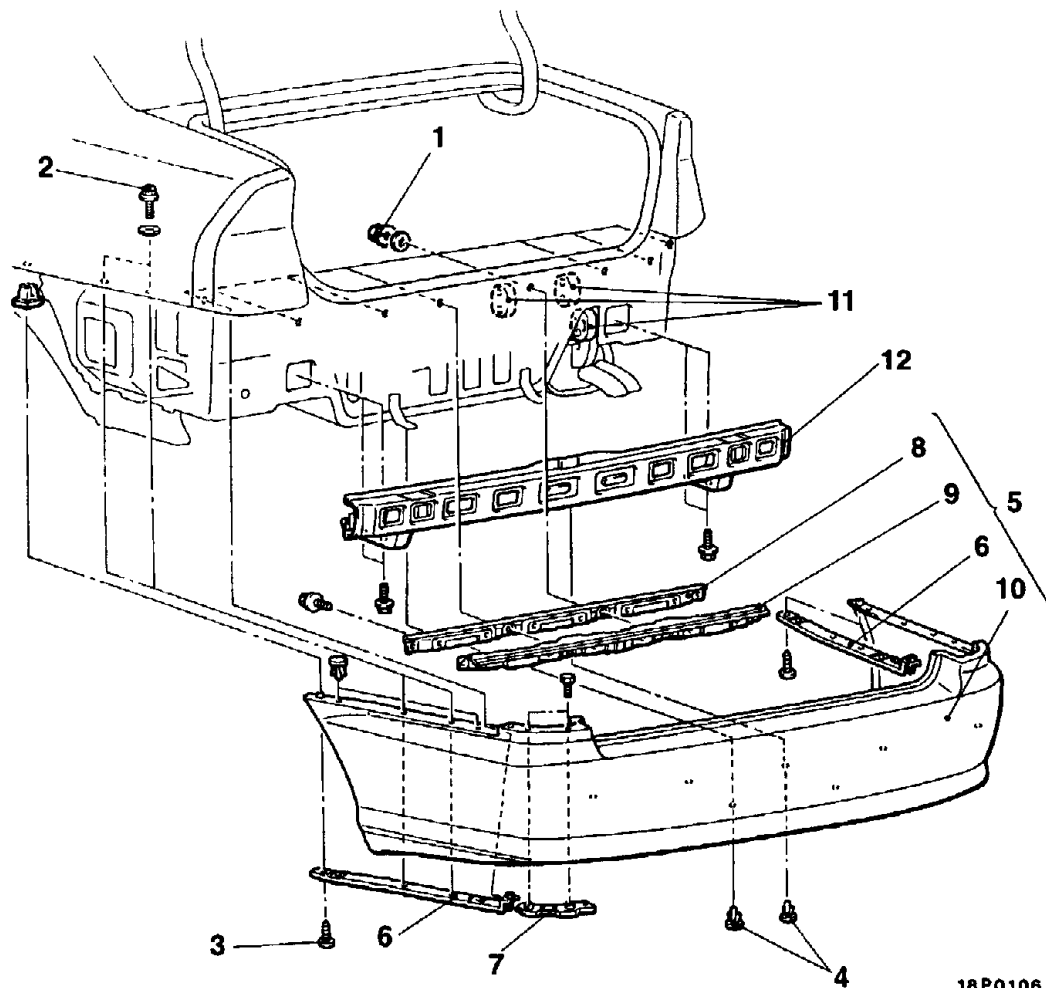
- | | |
|----------------------------|-------------------------|
| 1. Upper side plate | 5. Bumper reinforcement |
| 2. Rear side plate | 6. Upper plate |
| 3. Lower reinforcement | 7. Upper support |
| 4. Reinforcement extension | 8. Bumper face |

REAR BUMPER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

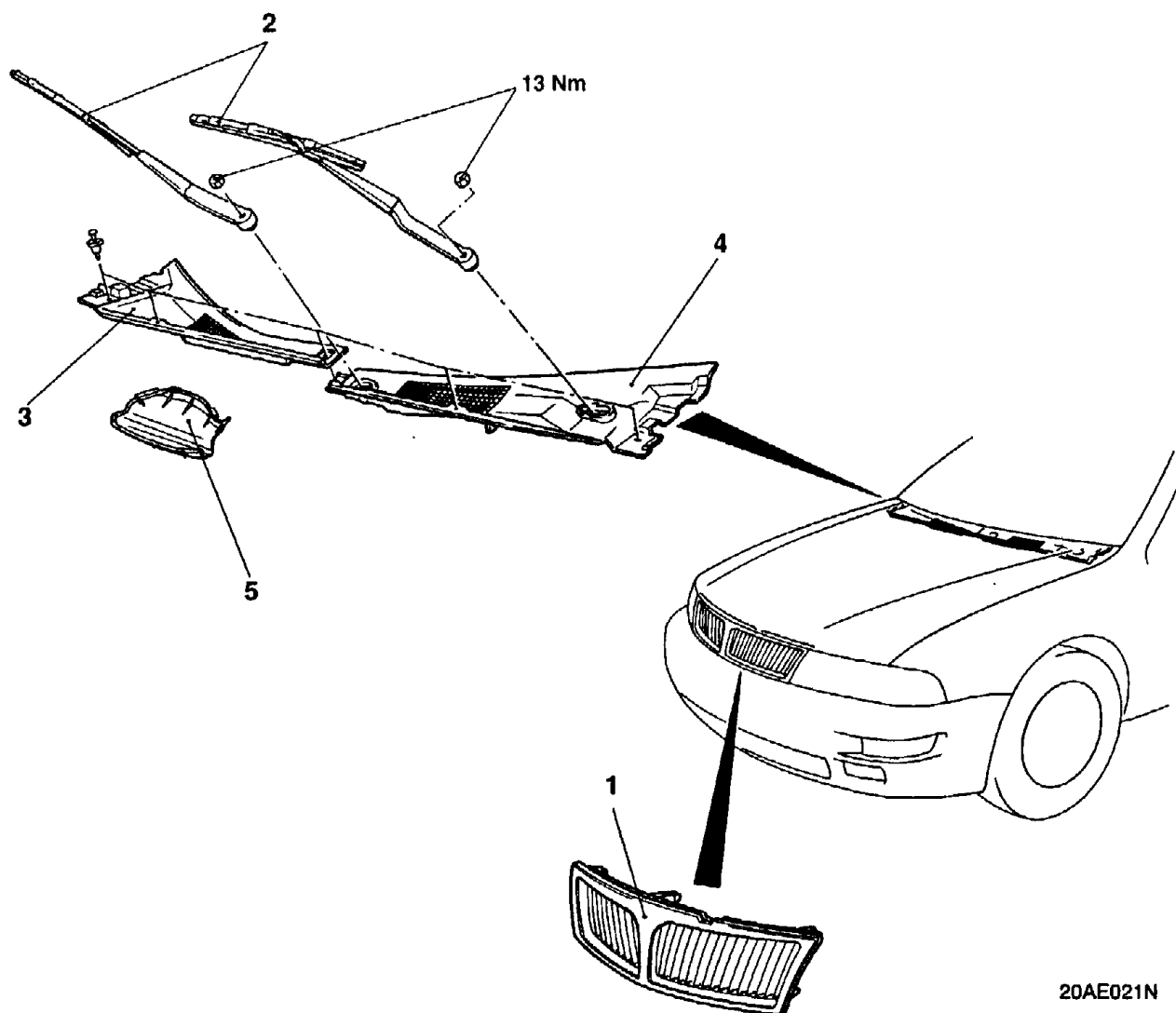
- Trunk rear trim cover, trunk rear centre trim and trunk rear side trim Removal and Installation (Refer to Group 52A)
- Splash shield Removal and Installation



18P0106

Removal steps

- | | |
|-------------------------|------------------------------------|
| 1. Nut | 7. Side support |
| 2. Bolt | 8. Upper centre plate |
| 3. Screw | 9. Upper support |
| 4. Clip | 10. Bumper face |
| 5. Bumper face assembly | 11. Main muffler hanger connection |
| 6. Side reinforcement | 12. Bumper reinforcement |

GRILLES AND GARNISHES**REMOVAL AND INSTALLATION**

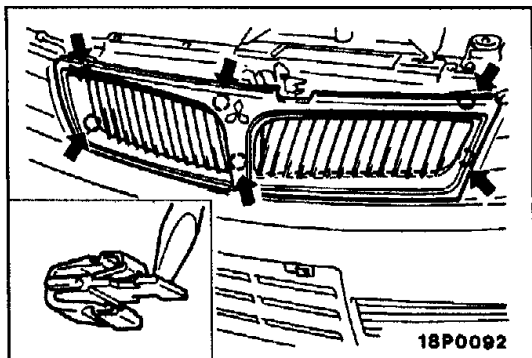
20AE021N

**Radiator grille removal**

1. Radiator grille

Air inlet grille removal steps

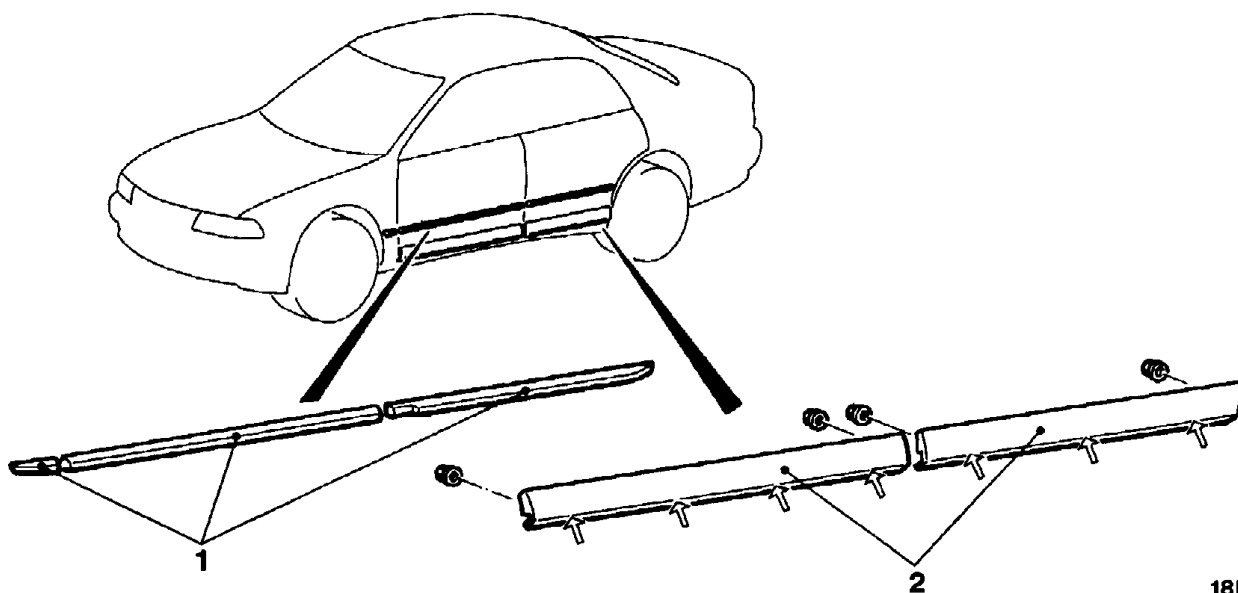
2. Wiper arm assembly
3. Front deck garnish (R.H.)
4. Front deck garnish (L.H.)
5. Air intake garnish

**REMOVAL SERVICE POINT****◀A▶ RADIATOR GRILLE REMOVAL**

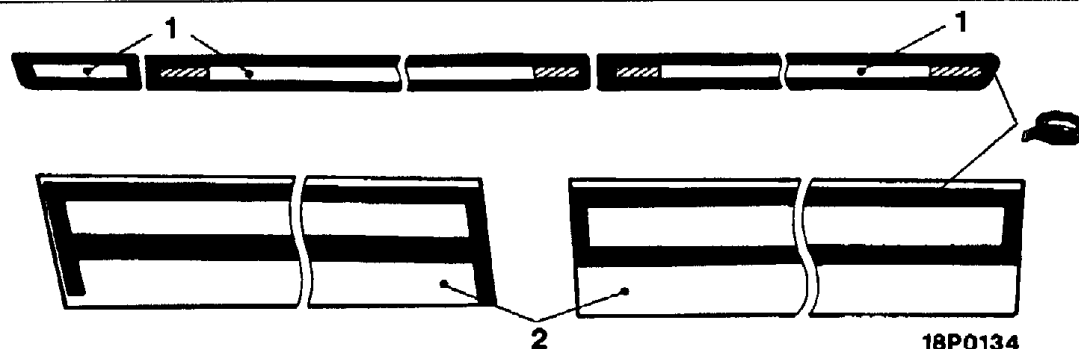
While gently pulling the radiator grille towards you, use a flat-bladed screwdriver to push the clip catches in the direction indicated by the arrows.

MOULDINGS

REMOVAL AND INSTALLATION



18P0138

18P0134
20AE019N**Adhesive tape:**

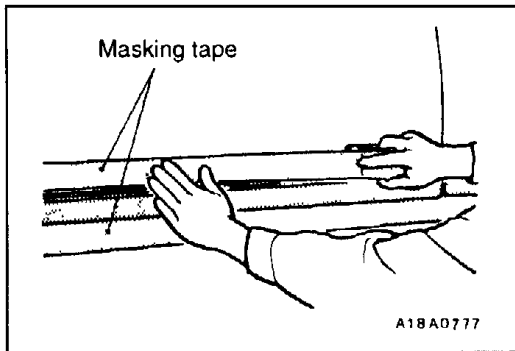
- Side sill splash protector: 3M Part No. 5357 or equivalent
8 mm wide and 1.2 mm thick
- Side protector moulding: 3M Part No. 4213 or equivalent 5 mm wide and 0.8 mm thick

Primer:

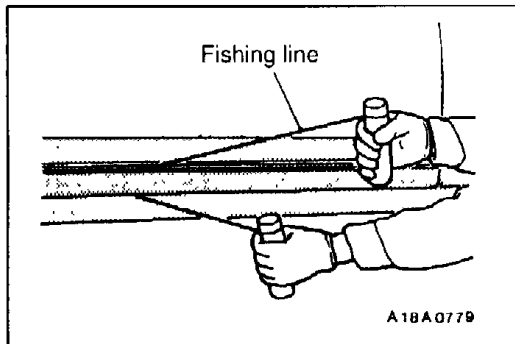
3M Part No. K500 or equivalent polypropylene primer



1. Side protector moulding
2. Side sill splash protector

**REMOVAL SERVICE POINT****◀A▶ SIDE PROTECTOR MOULDING/SIDE SILL
SPLASH PROTECTOR REMOVAL**

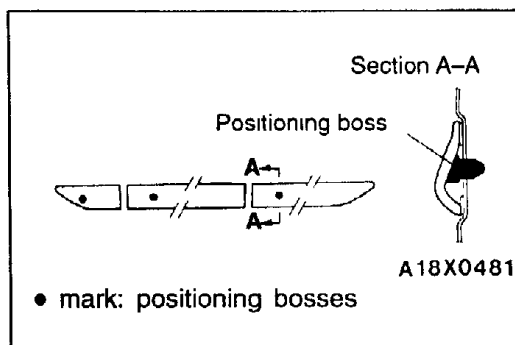
1. Apply masking tape along the outside edges(s) of the moulding.



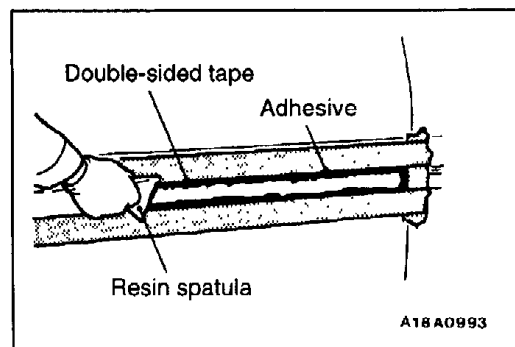
2. Insert fishing line [ø0.8 mm] in between the body and the moulding, and pull both ends alternately to cut the adhesive section and remove the moulding.

Caution

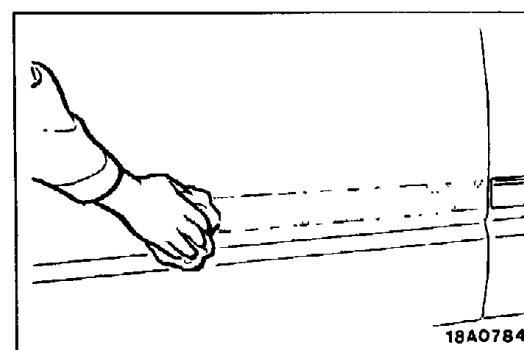
1. If the moulding is to be reused, pull the fishing line along the edge of the body so as not to damage the edge of the moulding.
2. If the adhesive is difficult to remove, heat it to 40°C.



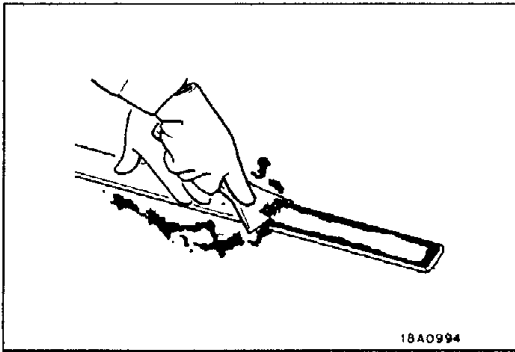
3. Pull the section of the side protector moulding with the positioning bosses towards you to remove the bosses from the mounting holes.



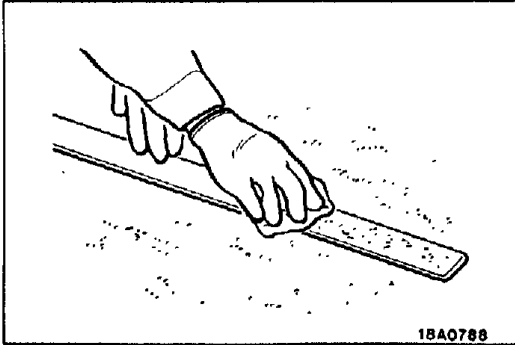
4. Scrape off the double-sided tape with a resin spatula.
5. Pull off the masking tape.
6. Scrape off a small amount of the adhesive with a cutter knife.



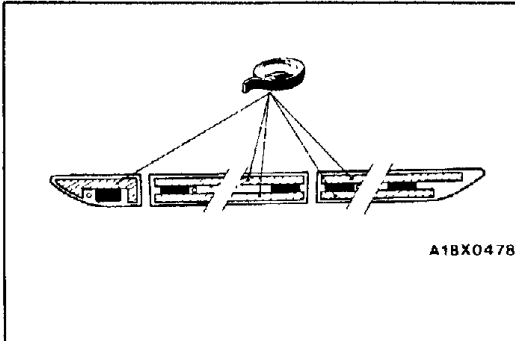
7. Wipe the body surface clean with a rag moistened with isopropyl alcohol.



18A0994



18A0788



A18X0478

INSTALLATION SERVICE POINT

►A◄ SIDE PROTECTOR MOULDING/SIDE SILL SPLASH PROTECTOR INSTALLATION

Affixing double-sided tape to the mouldings (when re-using mouldings)

1. Scrape off the double-sided tape with a resin spatula or gasket scraper.

2. Wipe the moulding adhesion surface clean with a rag moistened with isopropyl alcohol.

3. Apply the specified primer to the area where the double-sided tape is to be attached and allow to dry thoroughly.

Specified primer: 3M Part No. K500 or equivalent polypropylene primer

4. Heat the adhesive surface of the double-sided tape on the side protector moulding to about 40–60°C.

5. Affix the specified double-sided tape to the moulding.

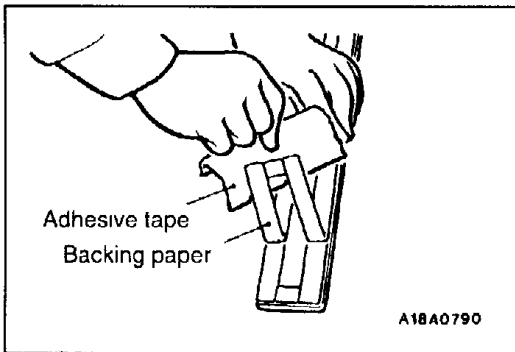
Specified adhesive tape:

Side protector moulding:

3M ATD Part No. 5357 or equivalent
8 mm wide and 1.2 mm thick

Side sill splash protector

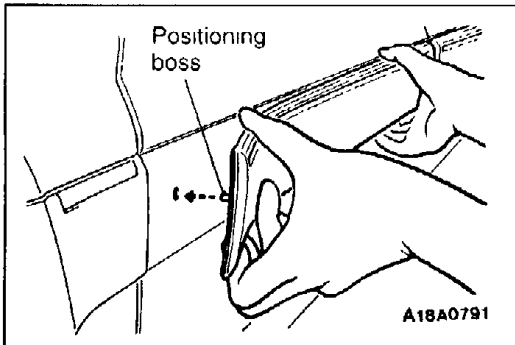
3M ATD Part No. 4213 or equivalent
5 mm wide and 0.8 mm thick

**MOULDING INSTALLATION**

1. Tear off the double-sided tape backing paper.

NOTE

If you attach adhesive tape to the edge of the backing paper, it will be easy to tear off.

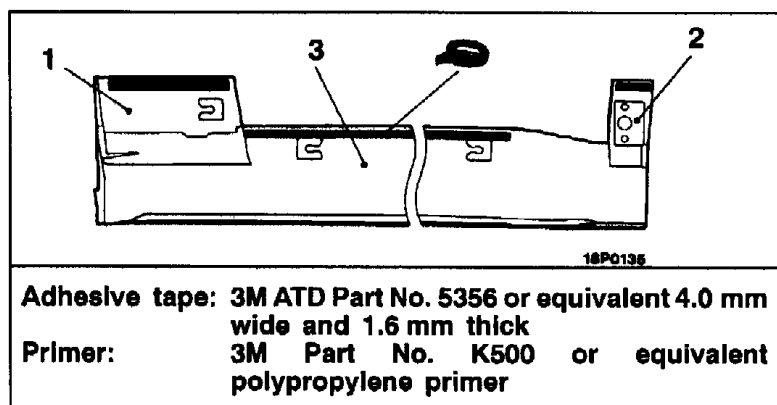
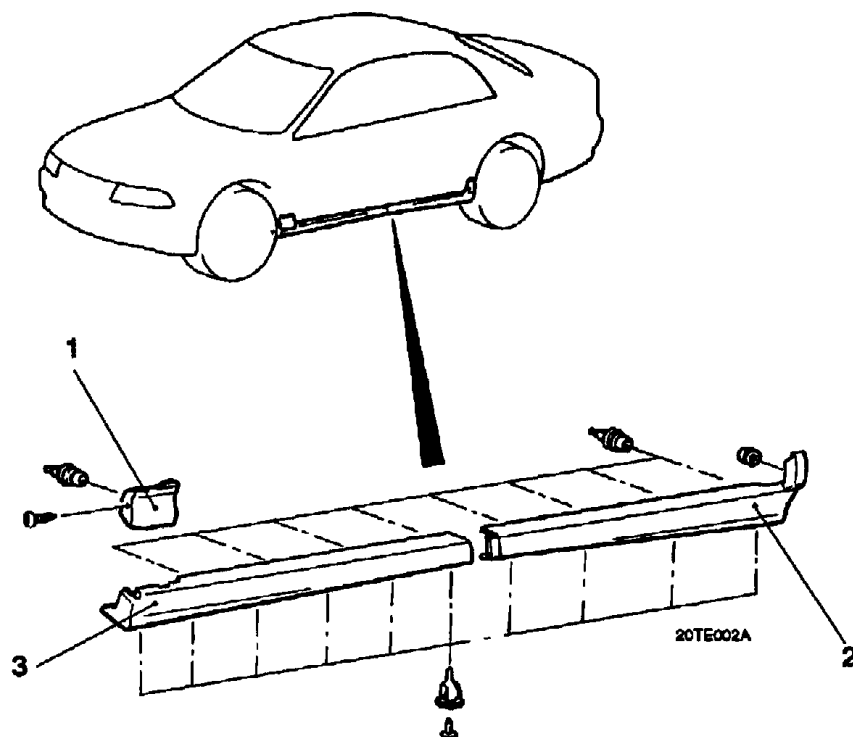


2. Install the side protector moulding so that the positioning bosses match the body holes.

NOTE

If the double-sided tape is difficult to affix during winter, etc., warm the bonding surfaces of the body and the side protector moulding to about 40–60°C before affixing the tape.

3. Firmly press in the side protector moulding.

AERO PARTS**REMOVAL AND INSTALLATION**

20AE009N

Removal steps

1. Front side air dam
2. Rear side air dam
3. Lower side air dam

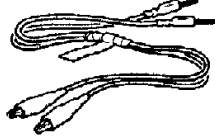
REMOVAL SERVICE POINTS**◀A▶ FRONT SIDE AIR DAM/REAR SIDE AIR
DAM/LOWER SIDE AIR DAM REMOVAL**

Remove by following the procedure described for the side protector moulding and side sill splash protector. Refer to P.51-9.

INSTALLATION SERVICE POINTS**▶A◀ FRONT SIDE AIR DAM/REAR SIDE AIR
DAM/LOWER SIDE AIR DAM INSTALLATION**

Install by following the procedure described for the side protector moulding and side sill splash protector. Refer to P.51-10.

WINDSHIELD WIPER AND WASHER**SPECIAL TOOLS**

Tool	Number	Name	Use
	MB991502	MUT-II	Simplified Wiring System (SWS) diagnostic checking
		ROM pack	
	MB991529	Diagnostic trouble code check harness	Simplified Wiring System (SWS) diagnostic checking (when using a voltmeter)

TROUBLESHOOTING**STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING**

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

DIAGNOSIS FUNCTION**DIAGNOSIS CODE FUNCTION**

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSTIC MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS-ECU specification
- Switch input signals for each ECU
- Diagnosis trouble code output

Refer to Group 54 – SWS for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSIS CODE CLASSIFICATION TABLE

Refer to Group 54–SWS.

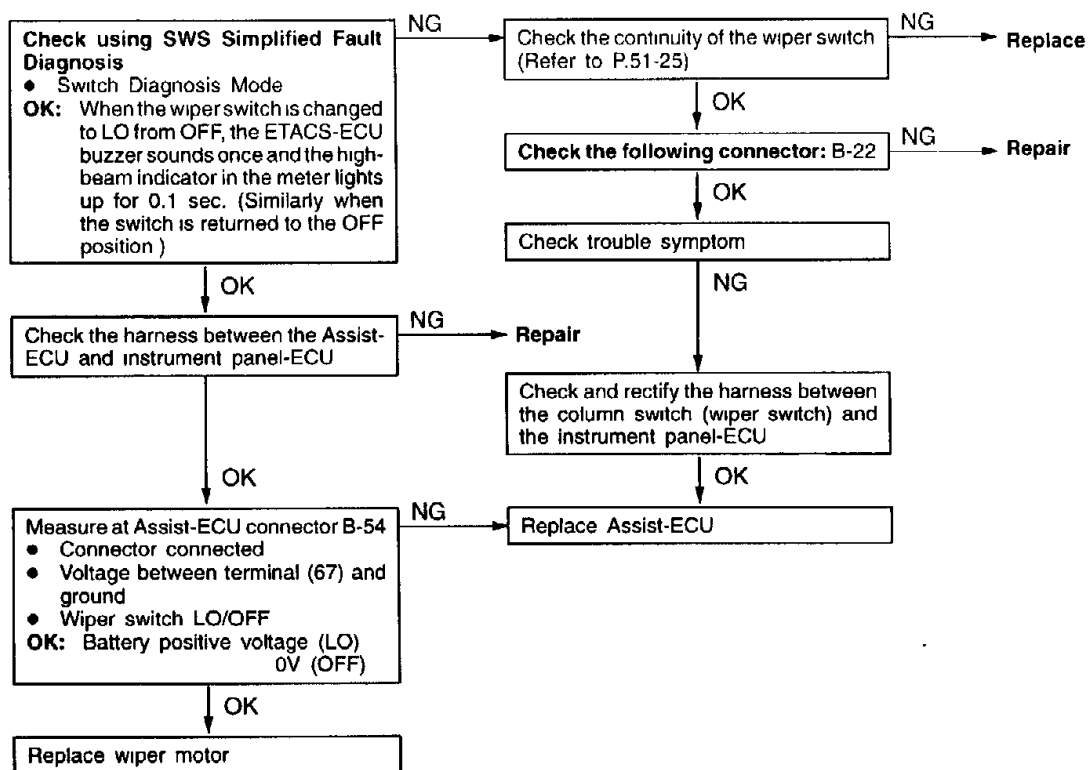
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II not possible	Refer to Group 54 – SWS	
Switching to SWS Simplified Fault Diagnosis mode not possible		
The wipers do not operate on LO with the wiper switch in the LO position	1	51-16
The wipers operate on LO but not on HI with the wiper switch in the HI position	2	51-17
The wipers do not operate intermittently with the wiper switch in the INT position (wipers operate normally on LO and HI)	3	51-18
The wipers do not stop when the wiper switch is OFF (wiper speed is LO)	4	51-18
The wipers do not operate intermittently but continuously (at LO speed) with the wiper switch set on INT (the wipers stop when switched OFF)	5	51-19
The intermittent wiper speed does not vary when the variable speed switch is changed (vehicle speed is constant)	6	51-20
The intermittent wiper speed does not change when the vehicle speed changes (variable speed setting is constant)		
The washers do not operate when the washer switch is pressed	7	51-21
When the washer switch is pressed the wipers do not operate (washers operate normally)	8	51-22

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

The wipers do not operate on LO with the wiper switch in the LO position	Probable cause
Possible causes include a wiper switch input circuit system fault, a harness or connector fault, or a backup circuit and Assist-ECU breakdown	• Wiper switch malfunction • Harness or connector defective • Wiper motor malfunction • Assist-ECU breakdown



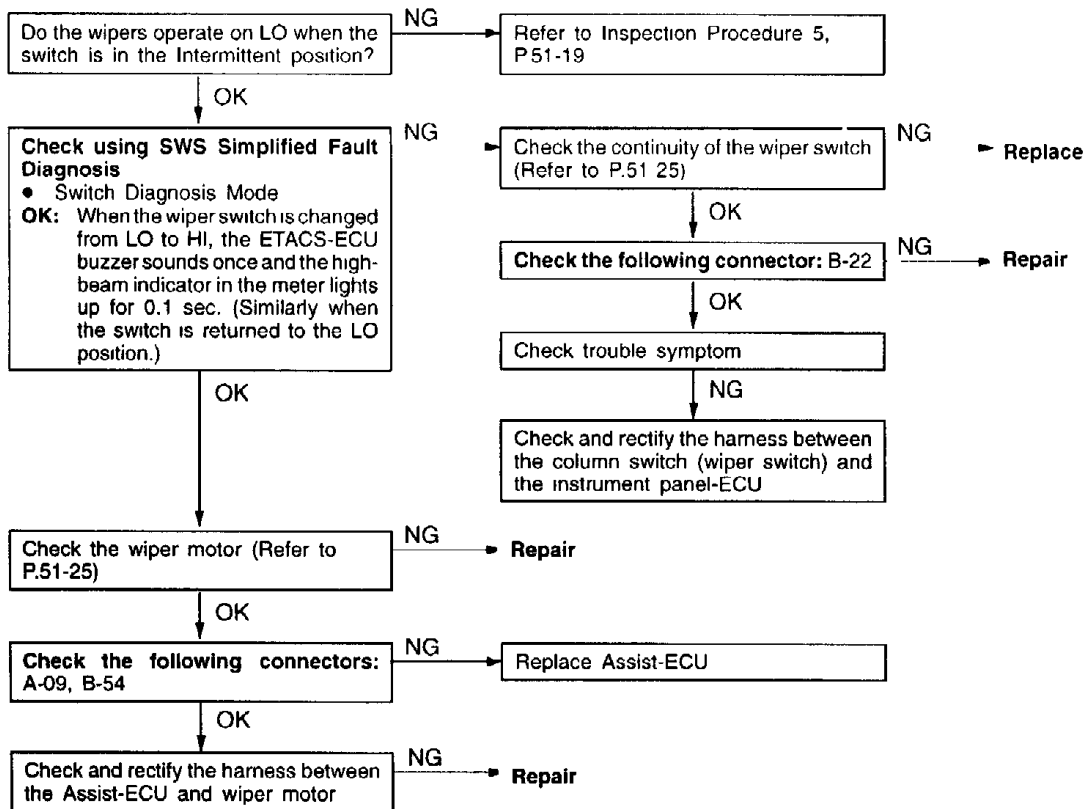
INSPECTION PROCEDURE 2

The wipers operate on LO and not on HI with the wiper switch in the HI position

Possible causes include an instrument panel-ECU breakdown, a wiper motor breakdown, a harness or connector fault, or an assist-ECU breakdown. Because the wipers operate on LO, it is possible that the failsafe is operating with the backup circuit.

Probable cause

- Wiper switch fault
- Harness or connector fault
- Assist-ECU breakdown
- Instrument panel-ECU breakdown



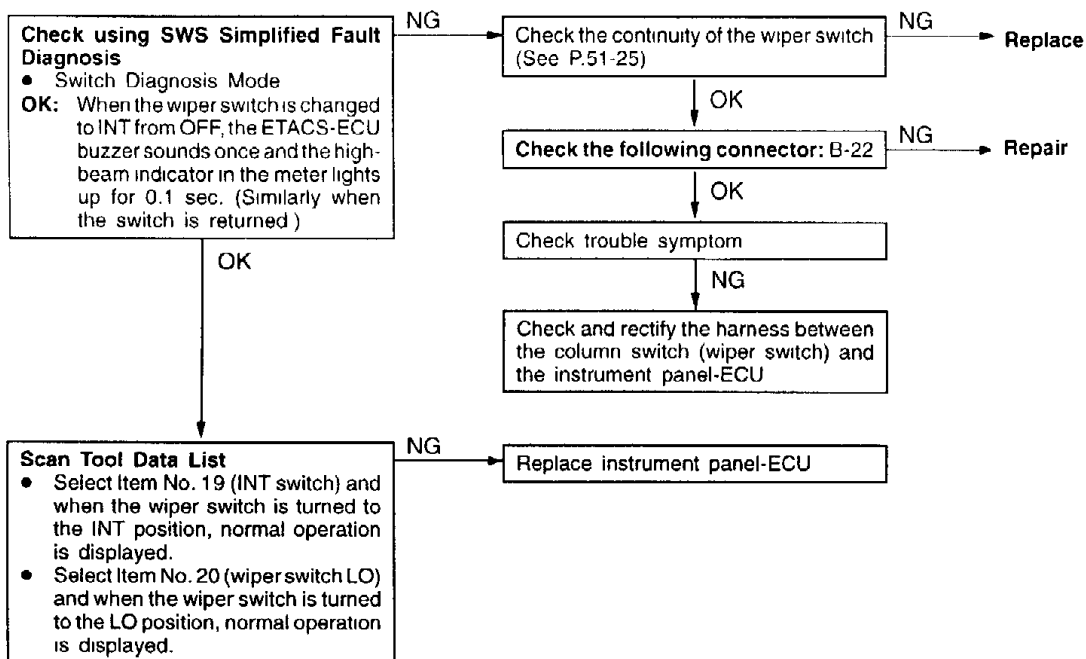
INSPECTION PROCEDURE 3

The wipers do not operate intermittently with the wiper switch in the INT position (wipers operate normally on Lo and HI)

Possible causes include a wiper switch input circuit system fault, or a harness or connector fault. Because the wipers work normally with the wiper switch on LO or HI, the Assist-ECU is probably normal.

Probable cause

- Wiper switch defective
- Harness or connector fault
- Instrument panel ECU malfunction



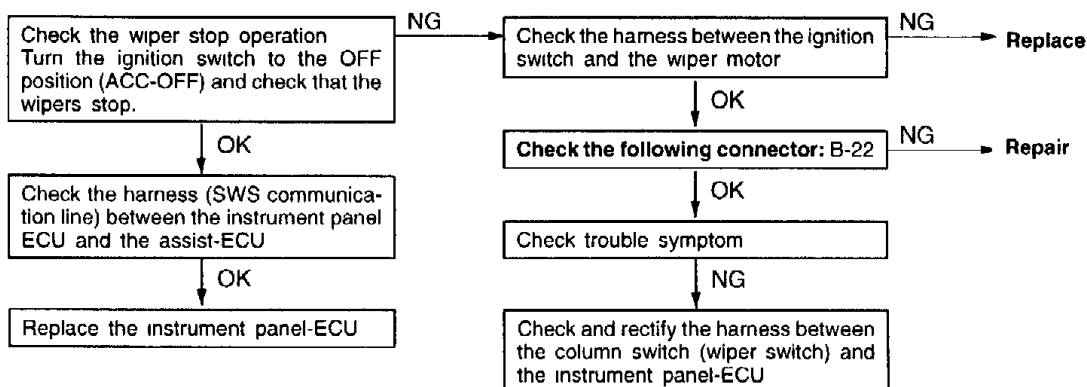
INSPECTION PROCEDURE 4

The wipers do not stop when the wiper switch is turned OFF (wiper speed is LO)

It is possible that a fault has occurred in the communication line during wiper operation, and that the status prior to breakdown is maintained by the Assist-ECU failsafe function.

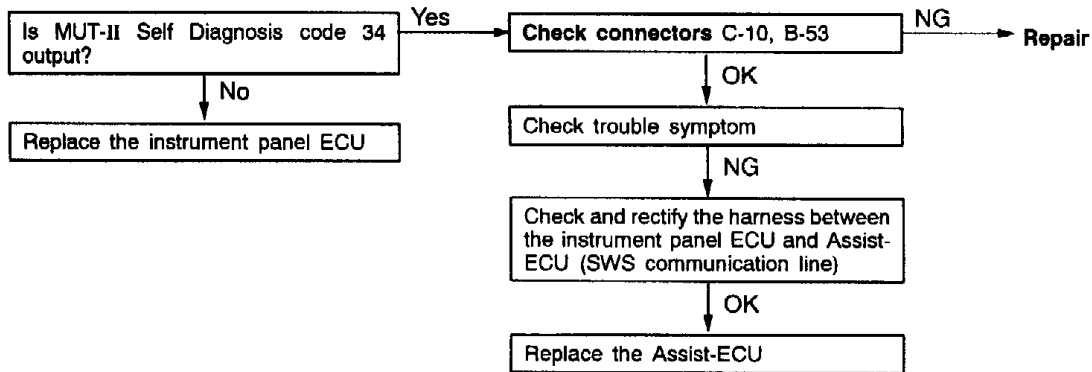
Probable cause

- Harness or connector fault
- Instrument panel ECU malfunction



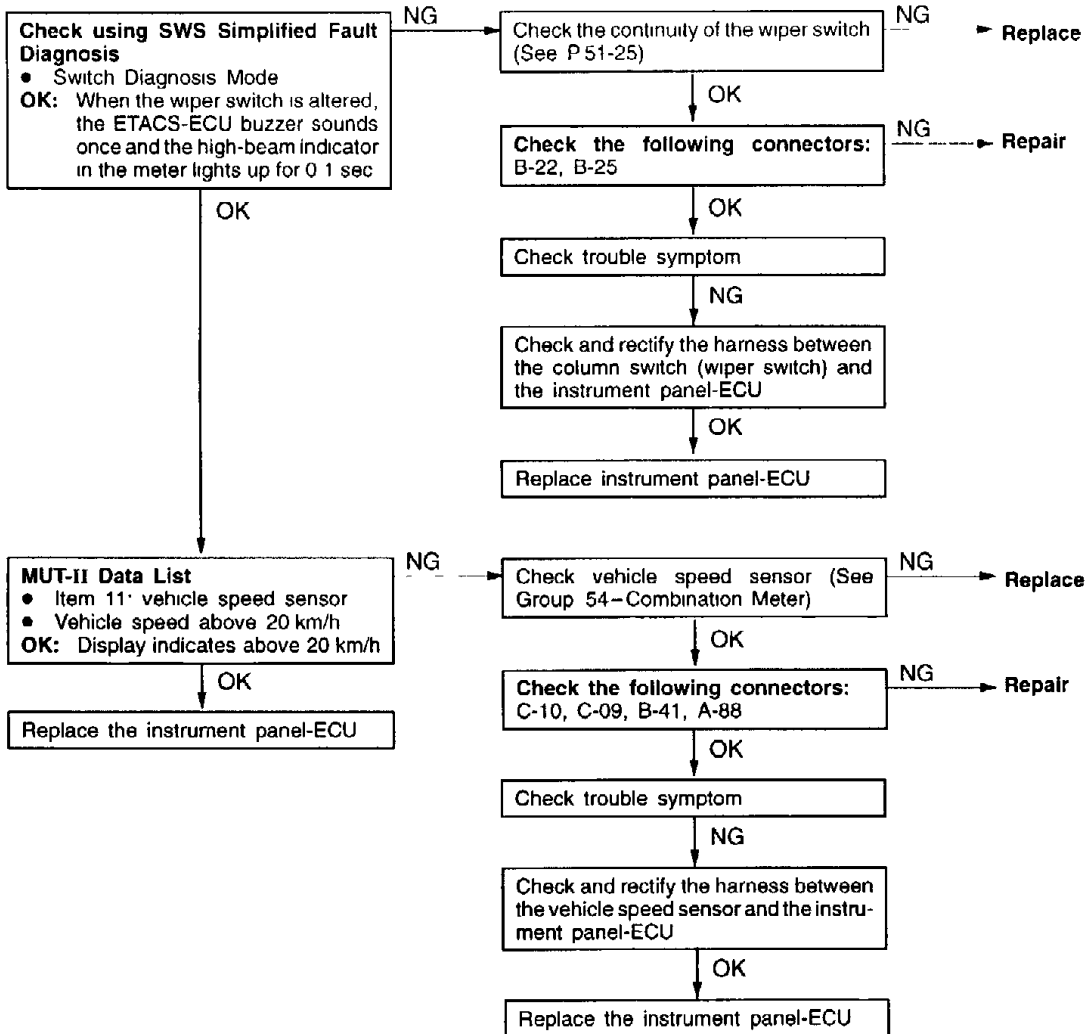
INSPECTION PROCEDURE 5

The wipers do not operate Intermittently but continuously (at LO speed) with the wiper switch set to INT (the wipers stop when switched OFF)	Probable cause
Possible causes include an wiper switch input circuit fault,, a harness or connector fault, or an instrument panel ECU breakdown. Because the wipers operate on LO, it is possible that the failsafe is operating with the backup circuit.	• Wiper switch fault • Harness or connector fault • Instrument panel ECU breakdown



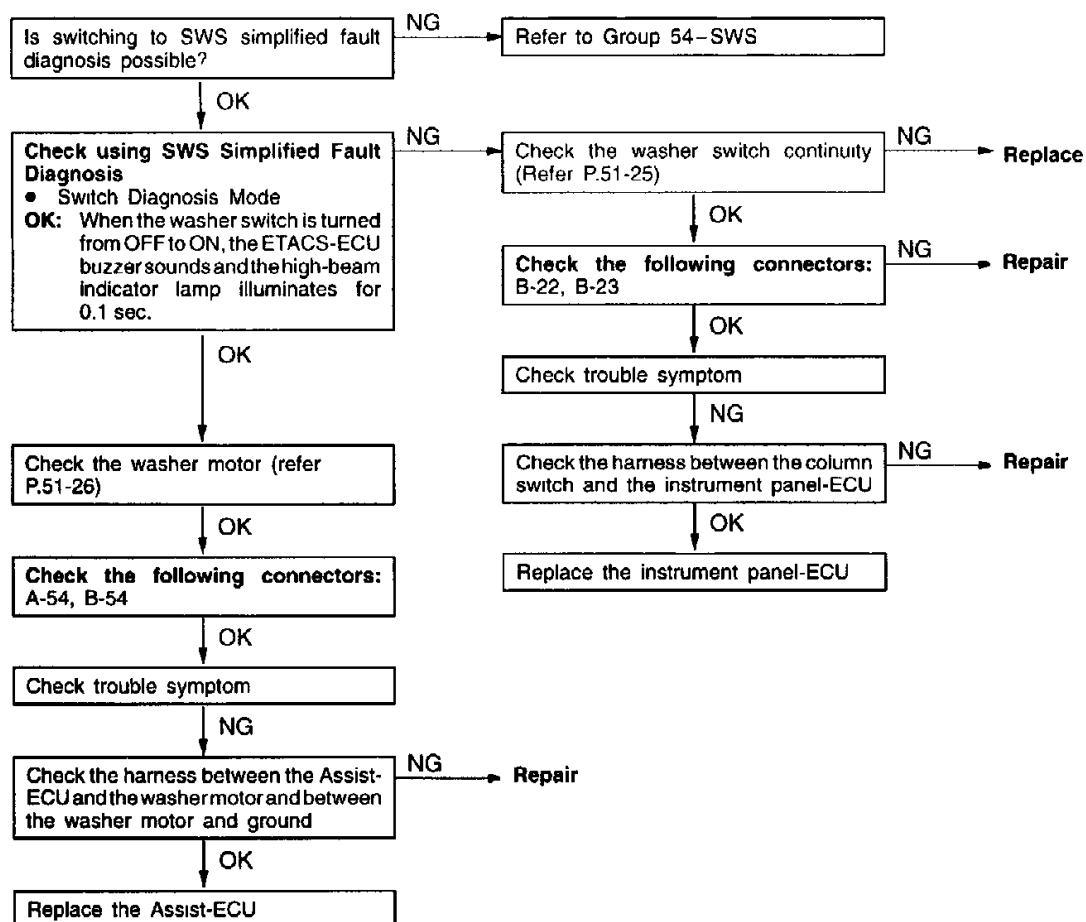
INSPECTION PROCEDURE 6

• The intermittent wiper speed does not vary when the variable speed switch is changed (vehicle speed is constant) • The intermittent wiper speed does not change when the vehicle speed changes (variable speed setting is constant)	Probable cause
Possible causes include a wiper switch input circuit system fault, or a harness or connector fault. Because the wipers work normally with the wiper switch on LO or HI, the Assist-ECU is probably normal.	• Wiper switch fault • Harness or connector fault • Instrument panel ECU breakdown • Vehicle speed sensor breakdown



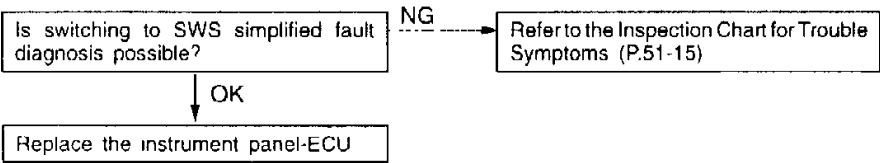
INSPECTION PROCEDURE 7

The washers do not operate when the washer switch is pressed	Probable cause
Washer switch input circuit, Assist-ECU, instrument panel ECU, harness or connector defective or communication line malfunction.	• Washer switch malfunction • Harness or connector defective • Washer motor malfunction • Assist-ECU malfunction • Instrument panel ECU malfunction



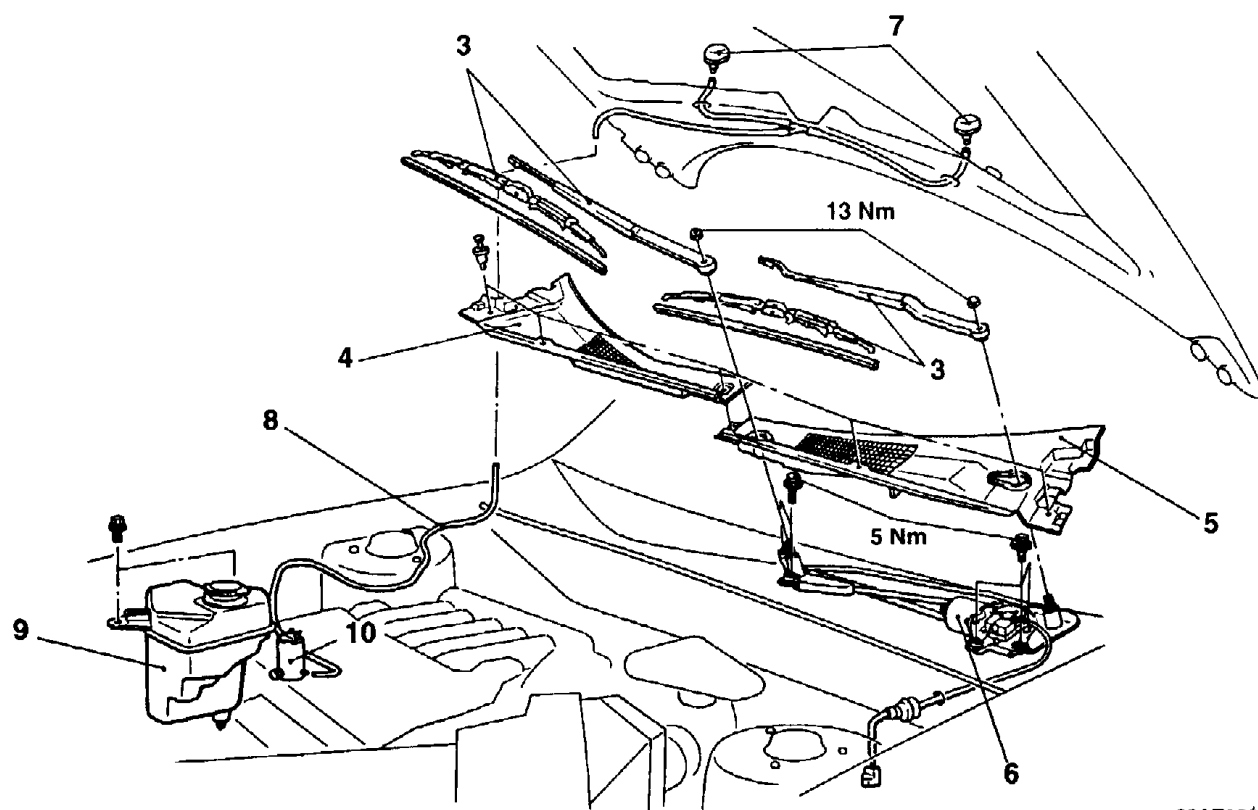
INSPECTION PROCEDURE 8

When the washer switch is pressed, the wipers do not operate (washers operate normally) The wiper motor, instrument panel ECU, the Assist-ECU, a harness or connector may be defective	Probable cause • Wiper motor malfunction • Instrument panel ECU malfunction • Assist-ECU malfunction • Harness or connector defective
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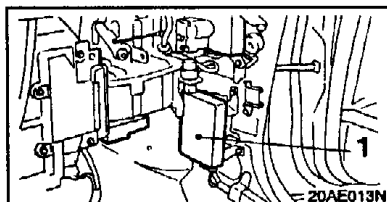


WINDSHIELD WIPER AND WASHER

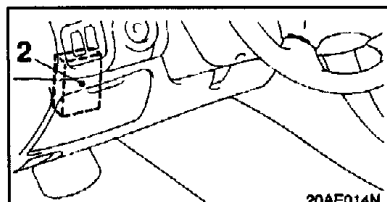
REMOVAL AND INSTALLATION



20AE022N



20AE013N



20AE014N

20AE023N

1. Assist-ECU (Refer to Group 54-SWS)
2. Instrument panel-ECU (Refer to Group 54-SWS)

Wiper motor and linkage removal steps

- A◄
3. Wiper arm and blade assembly
 4. Front deck garnish (R.H.)
 5. Front deck garnish (L.H.)
 6. Wiper motor and linkage

Washer nozzle removal

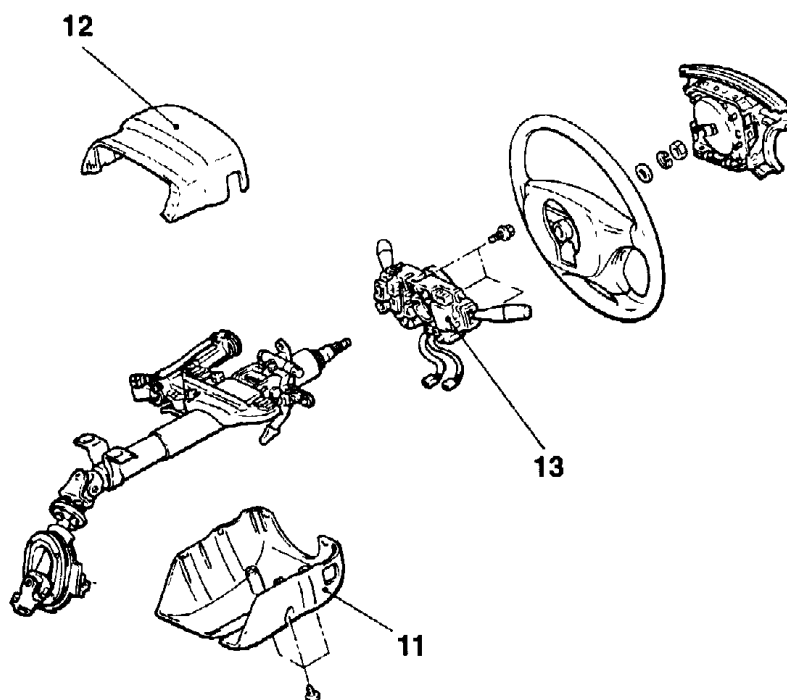
7. Washer nozzle

Washer tank removal steps

8. Washer hose
9. Washer tank
10. Washer motor

CAUTION: SRS

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



20AE010N

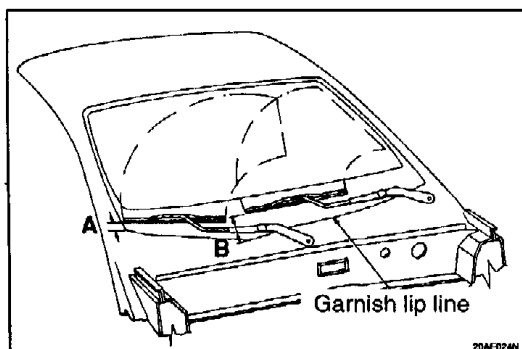
Column switch removal steps

- Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
 - Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)
11. Column cover lower
 12. Column cover upper
 13. Column switch assembly (with built-in wiper and washer switch)

- Clock spring* (Refer to GROUP 52B – Air Bag Module and Clock Spring.)

NOTE

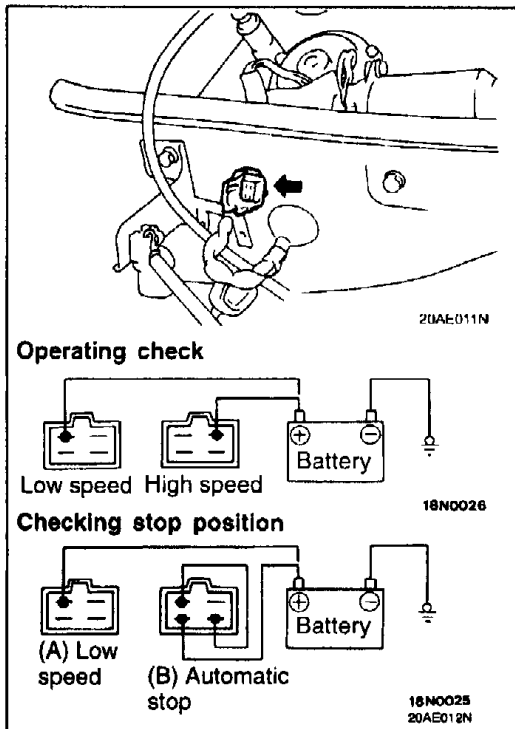
Parts marked with * should not be removed from the column switch except when removal is absolutely necessary.

**INSTALLATION SERVICE POINT****►A◄ WIPER ARM AND BLADE ASSEMBLY INSTALLATION**

1. The movements of the left and right wiper arms are different, so check the identification marks.
2. Install the wiper blade in the specified position (standard value) as shown in the illustration.

Standard value (A): 20–35 mm

Standard value (B): 65–80 mm



INSPECTION

WIPER MOTOR CHECK

Check the wiper motor after disconnecting the wiring harness connector, and with the wiper motor installed.

Wiper Motor Low Speed and High Speed Operation

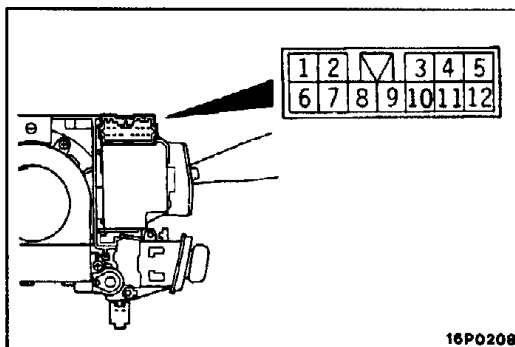
Connect a battery to the wiper motor as shown in the illustration and inspect motor operation at low speed and high speed.

Wiper Motor Stop Position Operation

1. Run the wiper motor at low speed, disconnect the battery, and stop the motor.
2. Reconnect the battery as shown in the illustration, and confirm that after the motor starts turning at low speed, it stops at the automatic stop position.

ASSIST-ECU CHECK

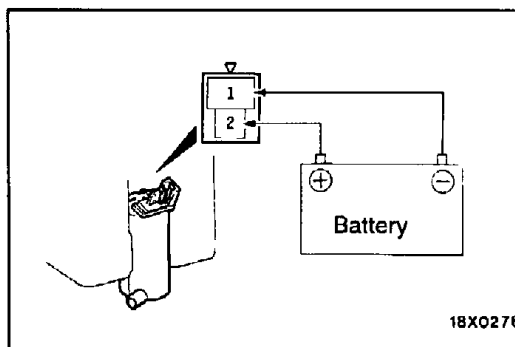
Refer to Group 54–SWS.



COLUMN SWITCH CHECK

Wiper and Washer Switch Continuity check

Switch position		Terminal No.						
		3	7	8	9	10	11	6
Wiper switch	OFF							
	INT		○				○	
	LO			○		○		
	HI				○	○		
Intermittent variable speed switch		○					○	
Washer switch ON						○		○

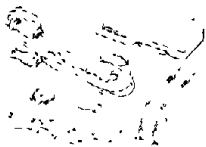
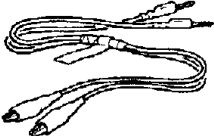


WASHER MOTOR CHECK

1. With the washer motor installed to the washer tank, fill the washer tank with water.
2. When the battery is connected as shown in the figure, check that the water squirts out strongly.

DOOR MIRROR

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	Simplified Wiring System (SWS) diagnostic checking
		ROM pack	
	MB991529	Diagnostic trouble code check harness	Simplified Wiring System (SWS) diagnostic checking (when using a voltmeter)

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODE FUNCTION

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSTIC MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS-ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to Group 54 – SWS for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSIS CODE CLASSIFICATION TABLE

Refer to Group 54 – SWS.

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is not possible	Refer to Group 54 – SWS	
Switching to SWS Simplified Fault Diagnosis mode is not possible		
The remote control mirror switch does not operate the passenger door mirror.	1	51-28
The remote control mirror switch does not operate the passenger door mirror.	2	51-29

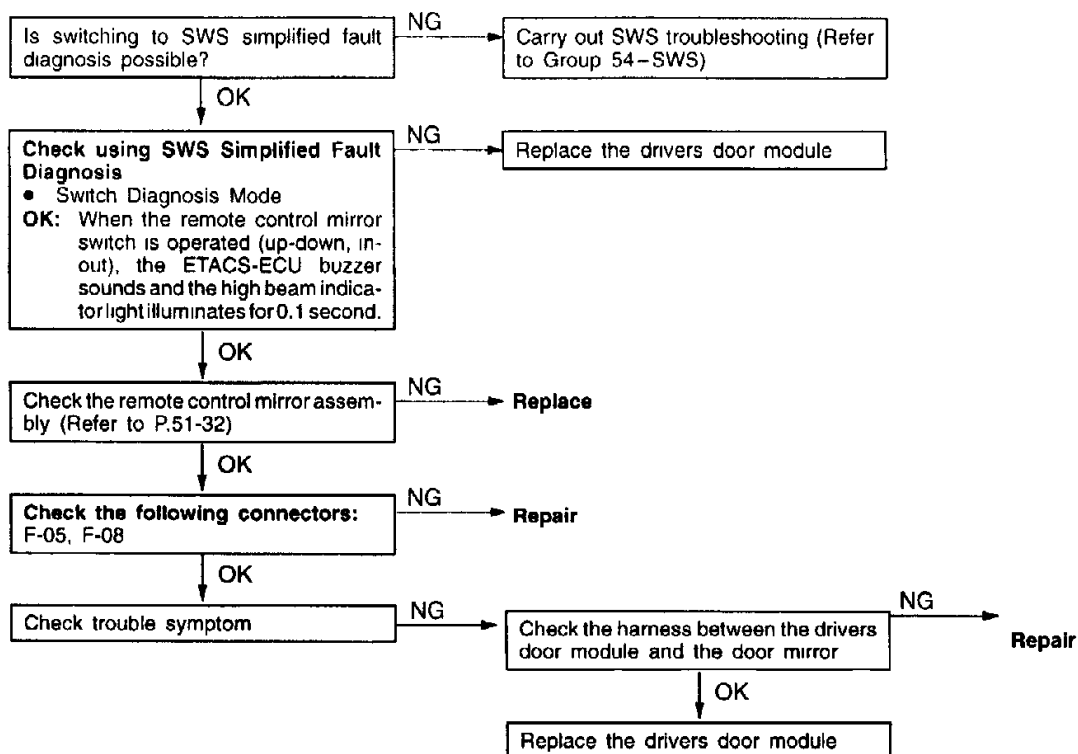
INSPECTION PROCEDURE 1

The remote control mirror switch does not operate the driver's door mirror

The remote control mirror switch input circuit, the drivers door module, the door mirror actuator or the harness or a connector may be defective.

Probable cause

- Defective mirror actuator
- Defective drivers door module
- Defective harness or connector



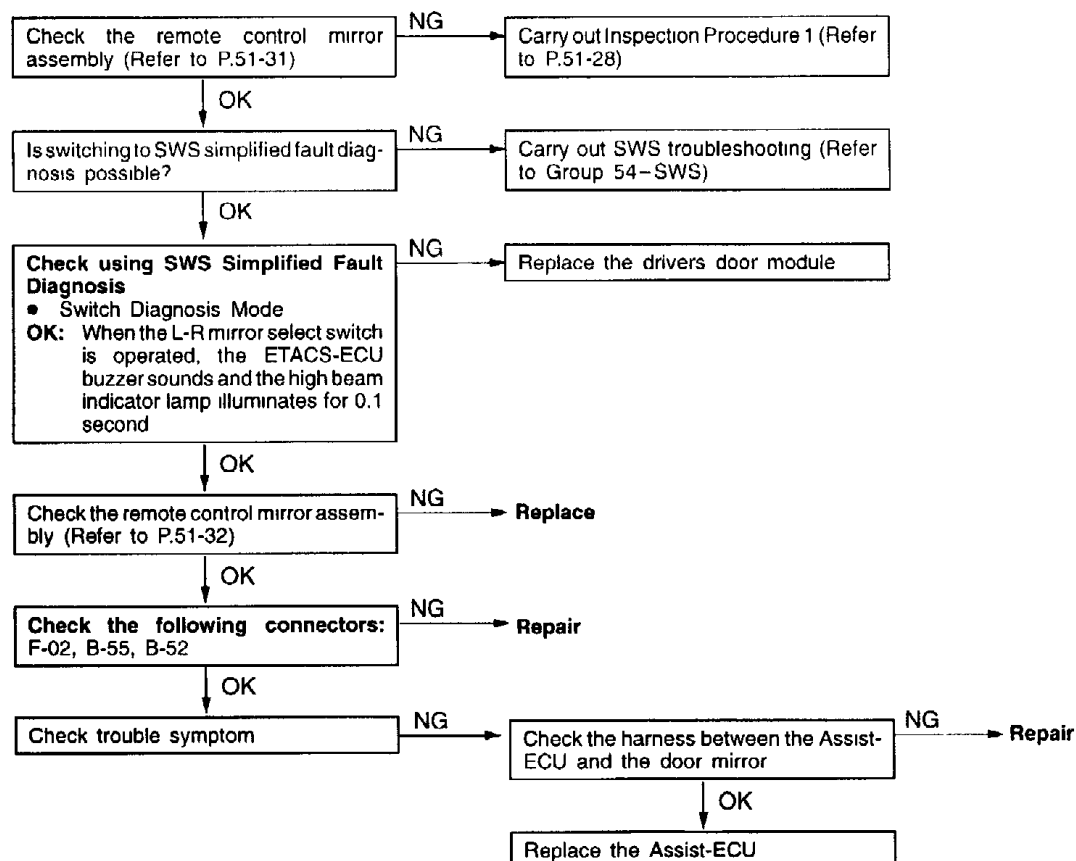
INSPECTION PROCEDURE 2

The remote control mirror switch does not operate the passenger door mirror

The mirror switch, the drivers door module, the Assist-ECU, the mirror actuator or a harness or connector may be defective

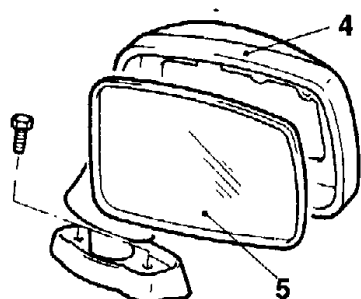
Probable cause

- Defective mirror actuator
- Defective Assist-ECU
- Defective harness or connector

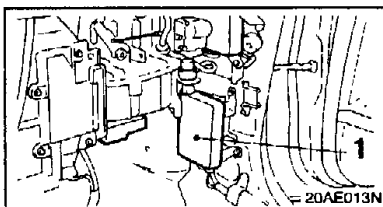


DOOR MIRROR

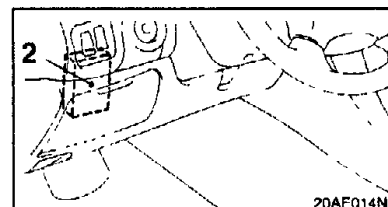
REMOVAL AND INSTALLATION



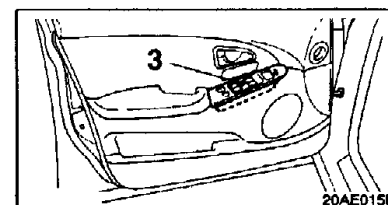
18P0131



20AE013N



20AE014N



20AE015N

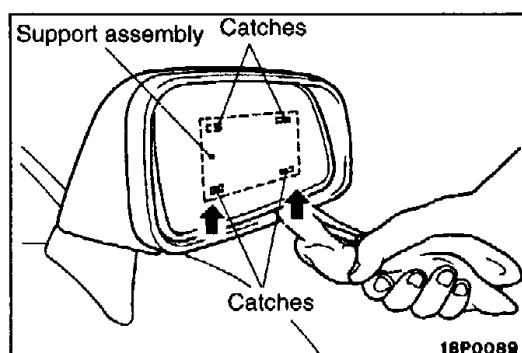
20AE016N

1. Assist-ECU (Refer to Group 54-SWS)
2. Instrument panel ECU (Refer to Group 54-SWS)
3. Front door module (LH) (Refer to Group 54-SWS)



Door mirror removal steps

4. Door mirror
5. Mirror

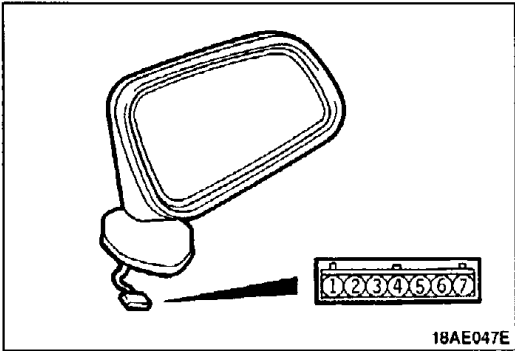


18P0089

REMOVAL SERVICE POINT

◀A▶ MIRROR REMOVAL

Turn the mirror by hand so that it faces upwards, insert the (-) driver wound with masking tape into the notched section, and lever out to release the mirror from the bottom catches. Remove the mirror from the upper catches by pulling downwards.



INSPECTION

REMOTE CONTROL MIRROR ASSEMBLY CHECK

Check to be sure that the mirror moves as described in the table when each terminal is connected to the battery.

Direction of operation	Terminal No.		
	3	4	5
LEFT	⊖ - - - - -	- - - - -	⊕
RIGHT	⊕ - - - - -	- - - - -	⊖
UP	⊕ - - - -	- - - - -	⊖
DOWN	⊖ - - - -	⊕ - - - -	- - - - -

ASSIST-ECU, INSTRUMENT PANEL-ECU AND FRONT DOOR MODULE (DRIVER SIDE) CHECK

Refer to Group 54–SWS.

INTERIOR

CONTENTS

INTERIOR	52A
SUPPLEMENTAL RESTRAINT SYSTEM (SRS)	52B

INTERIOR

CONTENTS

SPECIAL TOOLS	2	FRONT SEAT	12
INSTRUMENT PANEL*	3	REAR SEAT	18
FLOOR CONSOLE*	7	FRONT SEAT BELT	19
TRIMS	8	REAR SEAT BELT	20
HEADLINING AND INSIDE REAR VIEW MIRROR	10		

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) If it is possible that the SRS components are subjected to heat over 93°C in baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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 the asterisk (*) in the table of contents in each group indicate operations requiring warnings.

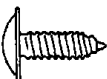
SPECIAL TOOLS

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch, trim, etc.
	MB991502	MUT-II	SWS input signal and data list checking
		ROM pack	
	MB991529	Diagnostic check harness	SWS Simplified Fault Diagnosis Mode entry

INSTRUMENT PANEL

REMOVAL AND INSTALLATION

For installation of the instrument panel, the bolts and screws described below are used. They are indicated by symbols in the illustration.

Name	Symbol	Size mm (D × L)	Colour	Shape
Tapping screw	A	4 × 12	—	
	B	5 × 10	—	
	C	5 × 12	—	
	D	5 × 16	—	
	E	5 × 12	—	
	F	5 × 16	Black	
	G	5 × 20	Black	
	H	5 × 12	—	
	I	5 × 6	Black	
Screw with washer	J	4 × 12	—	
	K	5 × 16	—	
Bolt with washer	L	6 × 16	—	
	M	6 × 16	—	
	N	6 × 12	—	
	O	6 × 16	—	
	P	8 × 20	—	

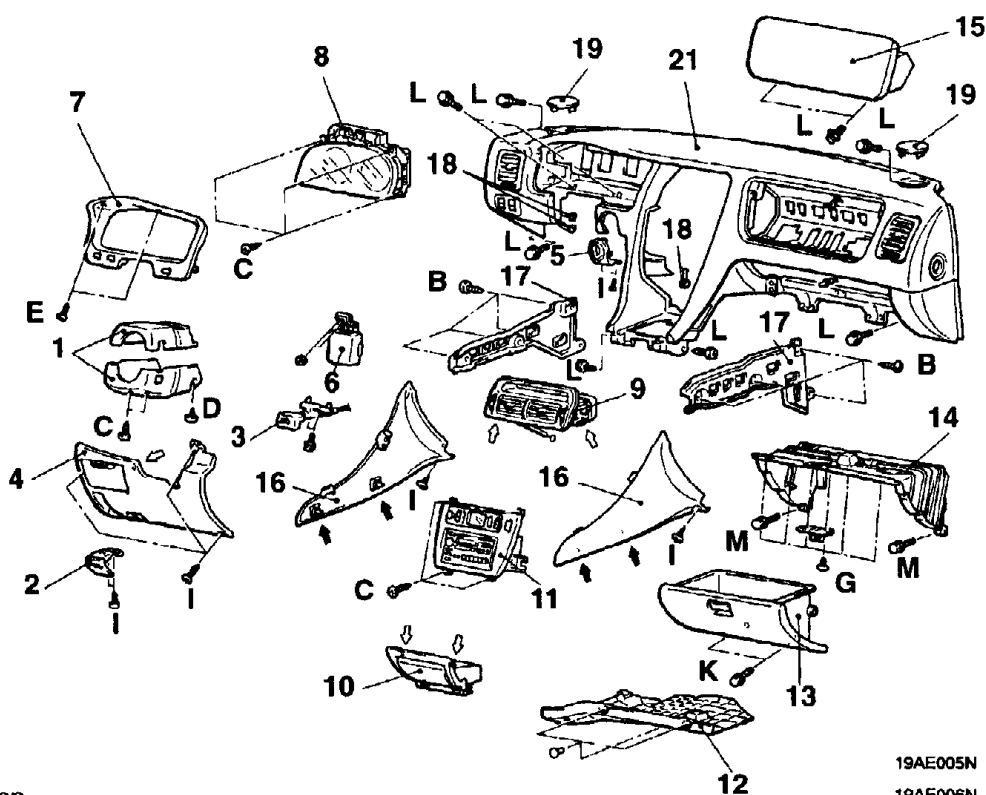
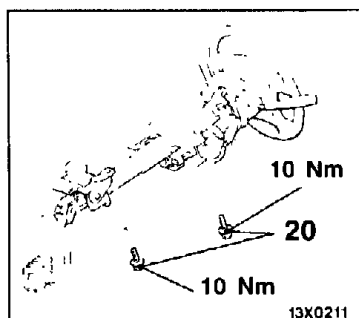
D = Thread diameter
L = Effective thread length

Pre-removal and Post-installation Operation

- Floor Console Assembly Removal and Installation (Refer to P. 52A-7).
- Front Pillar Trim Removal and Installation (Refer to P.52A-8).

CAUTION: SRS

- (1)When removing and installing the floor console, do not let it bump against the SRS-ECU.
- (2)For the passenger side air bag module removal/installation, always observe the service procedures of GROUP 52B – Air Bag Modules and Clock Spring.

**NOTE**

- (1) ⇐ : metal clip position
 (2) ⇐ : plastic clip position

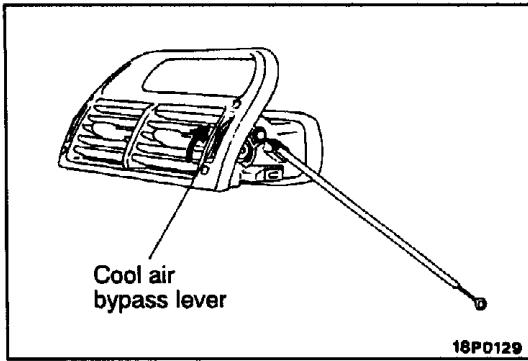
19AE005N

19AE006N

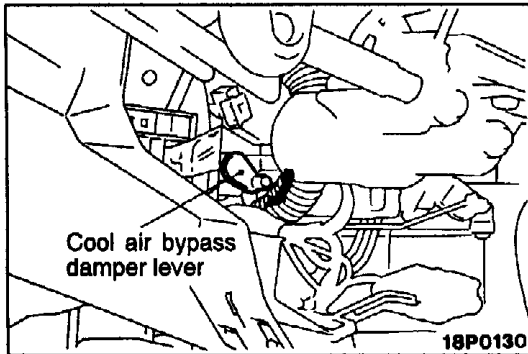
Removal steps

1. Column cover
2. Hood lock release handle
3. Parking brake release handle
4. Instrument panel lower cover assembly (LH)
5. Key cylinder panel
6. Instrument panel-ECU
7. Meter bezel
8. Combination meter
9. Centre air outlet assembly
10. Ashtray
11. Air control panel assembly & audio unit

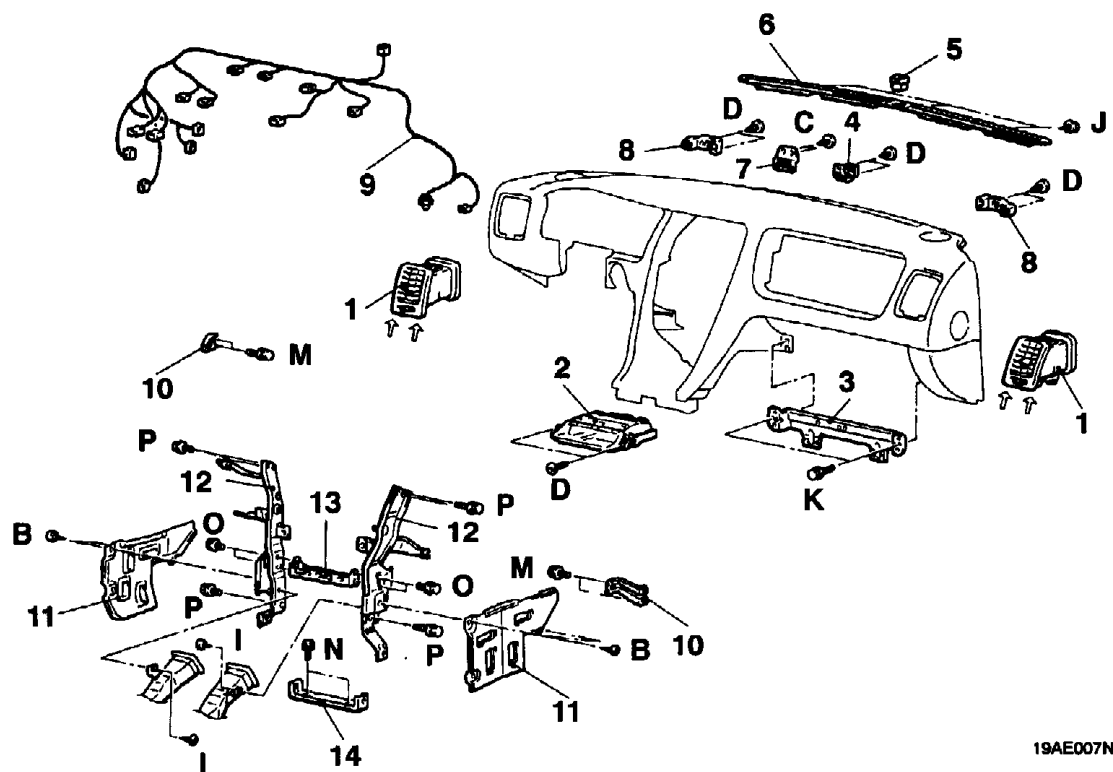
12. Undercover assembly
13. Glovebox assembly
14. Glovebox outer case
15. Passenger side airbag module (or upper glove box)
16. Console side cover assembly
17. Floor carpet rear reinforcement
18. Harness connector
19. Plug
20. Steering column mounting bolt
21. Instrument panel

**INSTALLATION SERVICE POINTS****►A◄ CENTRE AIR OUTLET ASSEMBLY
INSTALLATION**

1. Turn the cool air bypass lever of the air outlet centre panel assembly fully upward.
2. Turn the cool air bypass damper lever at the heater unit side fully downward, and install the cool air bypass lever cable.



DISASSEMBLY AND REASSEMBLY



19AE007N

NOTE

⇐ : metal clip position

Disassembly steps

- Heater ducts (See Group 55)
- 1. Side air outlet assembly
- 2. Centre display
- 3. Glovebox frame
- 4. Instrument panel centre support panel
- 5. Photo sensor
- 6. Defroster garnish
- 7. Centre display bracket

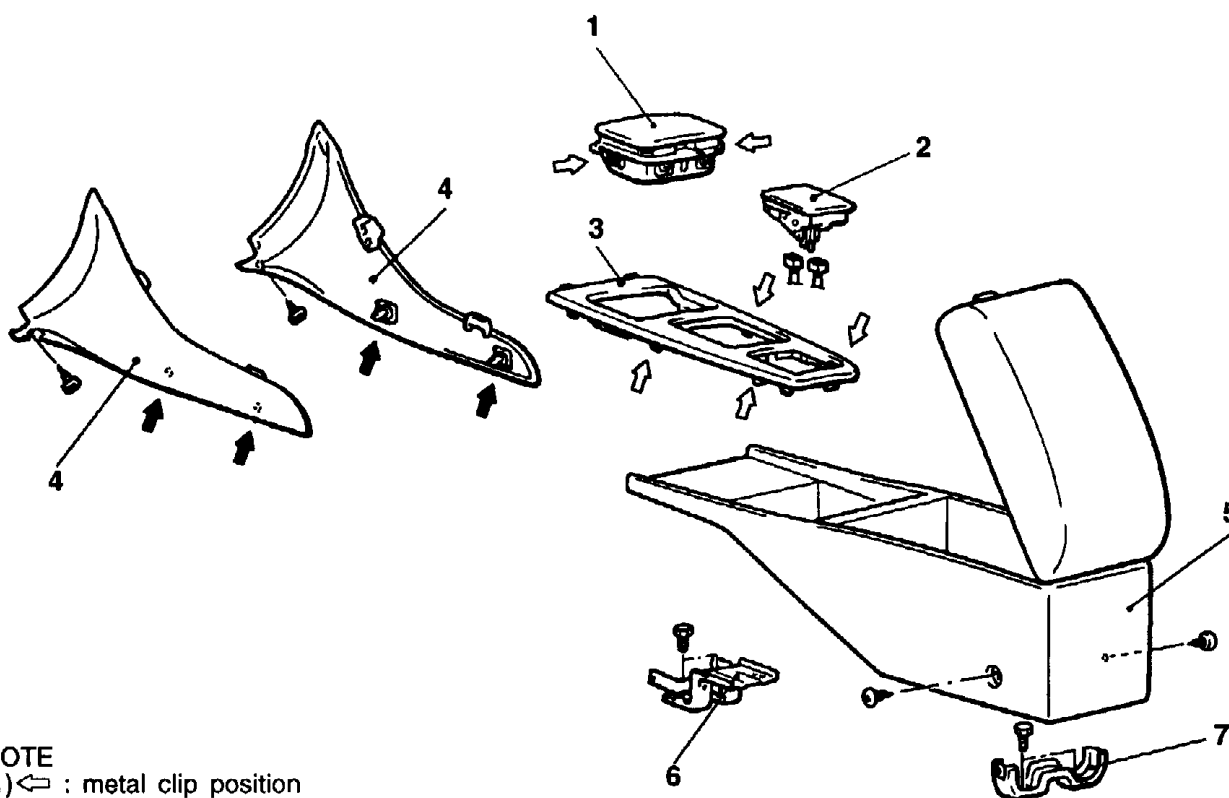
- 8. Instrument panel side support panel
- 9. Instrument panel wiring harness
- 10. Instrument panel lower bracket
- 11. Floor carpet front reinforcement
- 12. Centre stay assembly
- 13. ECU bracket
- 14. Centre console bracket

FLOOR CONSOLE

REMOVAL AND INSTALLATION

CAUTION: SRS

When removing and installing the floor console assembly, do not let it bump against the SRS-ECU or other components.


NOTE

- (1) ⇐ : metal clip position
 (2) ⇐ : plastic clip position

19AE008N

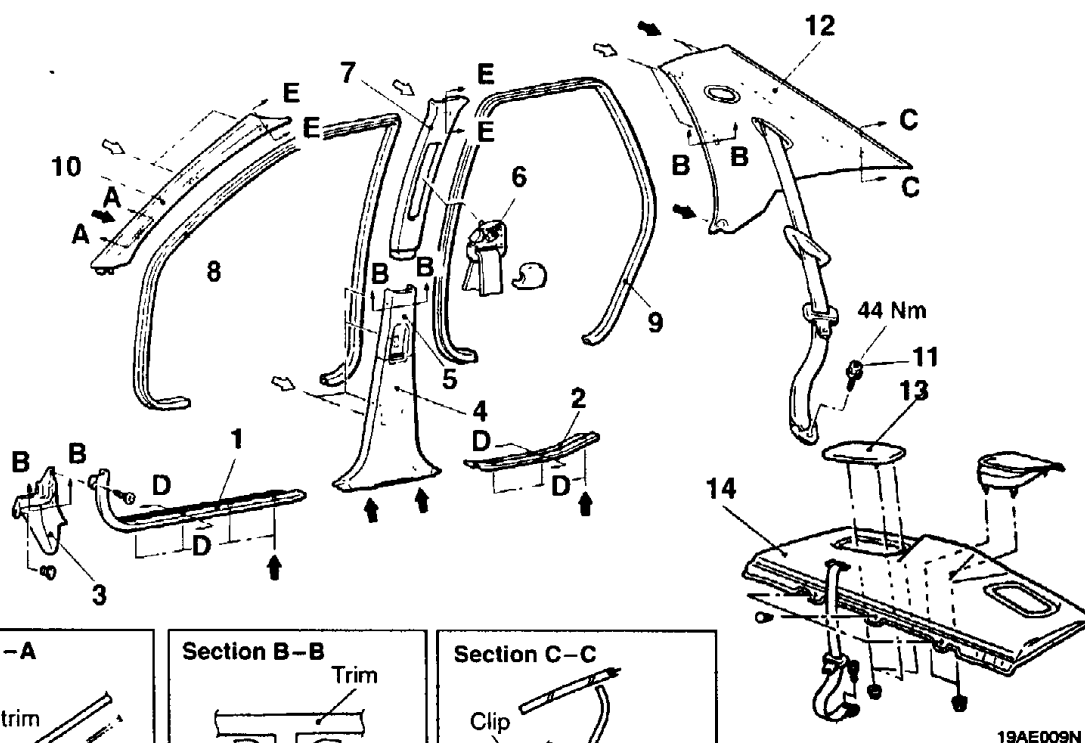
Removal steps

1. Cup holder assembly
2. Coin box assembly
3. Floor console panel
4. Console side cover assembly

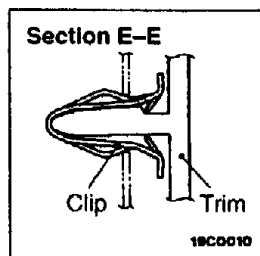
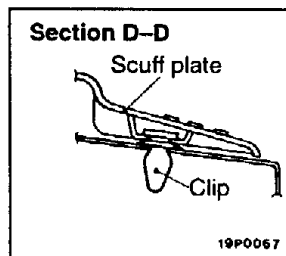
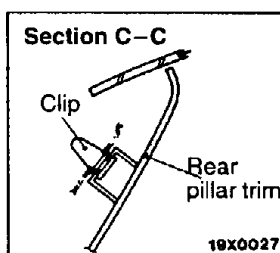
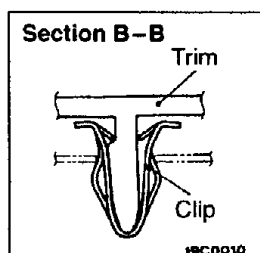
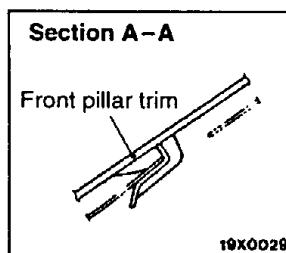
5. Floor console box
6. Console bracket A
7. Console bracket C

TRIMS

REMOVAL AND INSTALLATION



19AE009N



NOTE

- (1) ← : metal clip position
(2) → : plastic clip position

19AE010N

Cowl side trim removal steps

1. Front scuff plate
3. Cowl side trim

Front pillar trim removal

8. Front door opening trim
10. Front pillar trim

Centre pillar trim removal steps

1. Front scuff plate
2. Rear scuff plate
4. Centre pillar lower trim B
5. Centre pillar lower trim A
6. Sash guide
7. Centre pillar upper trim

Rear pillar trim removal steps

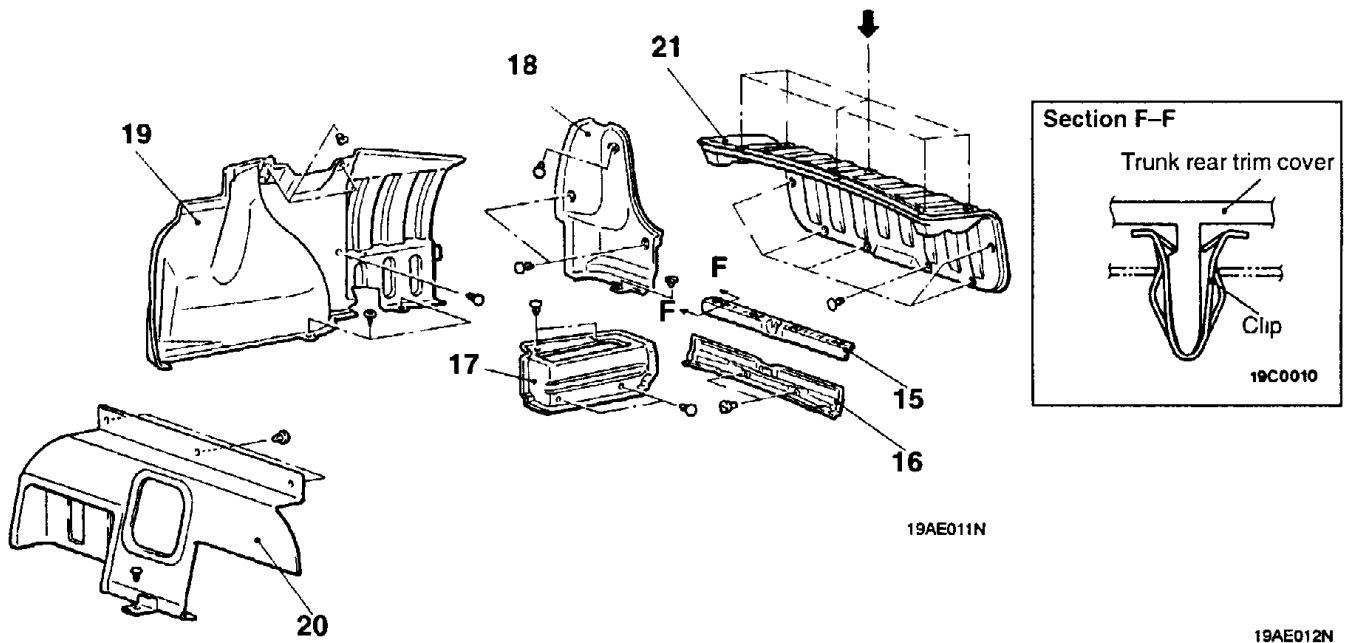
- Rear seat assembly
(Refer to P.52A-18)
- 11. Rear seatbelt anchor plate
- 12. Rear pillar trim

Door opening trim removal

8. Front door opening trim
9. Rear door opening trim

Rear shelf trim removal steps

- Rear seat assembly
(Refer to P.52A-18)
- 13. Speaker garnish
- 14. Rear shelf trim



NOTE
← : plastic clip position

Trunk rear trim removal steps

15. Trunk rear trim cover
16. Trunk rear centre trim
17. Trunk rear side trim

Trunk side trim removal steps

15. Trunk rear trim cover
16. Trunk rear centre trim
17. CD changer cover
18. Trunk rear side trim
19. Trunk side trim

Trunk front trim removal steps

20. Trunk front trim
21. Trunk lid trim

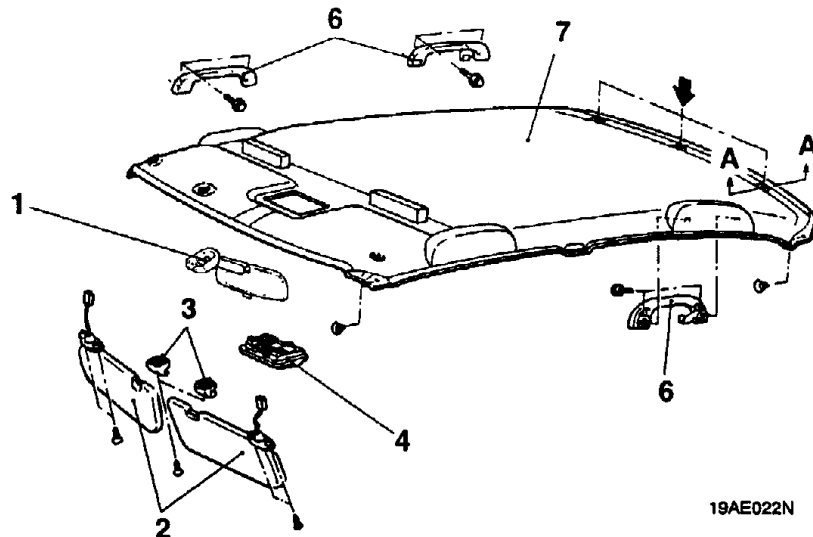
HEADLINING AND INSIDE REAR VIEW MIRROR

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

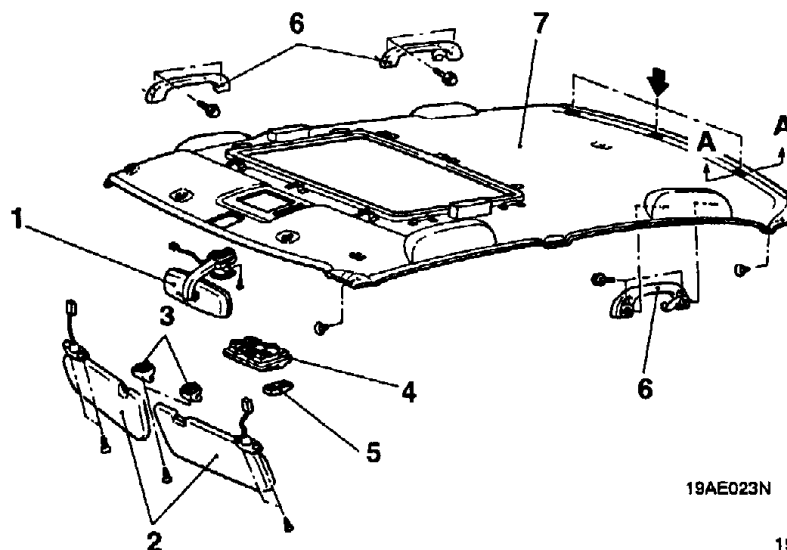
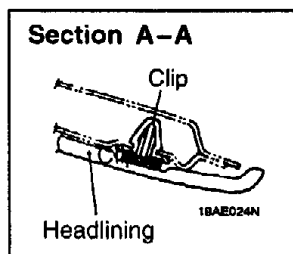
- Door opening trim, Front Pillar Trim, Centre Pillar Upper Trim and Rear Pillar Trim Removal and Installation (Refer to P.52A-8).

<Vehicles without sunroof>



19AE022N

<Vehicles with sunroof>



19AE023N

19AE025N

NOTE

← : plastic clip position

◀A▶

Inside rear view mirror removal

1. Inside rear view mirror

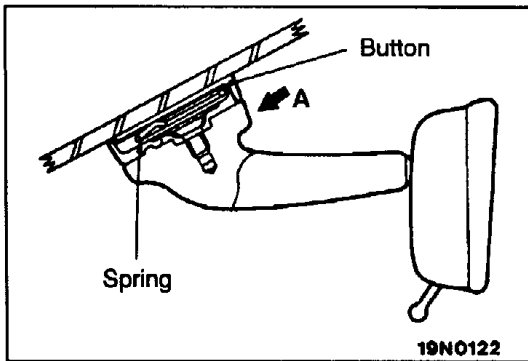
◀B▶

Headlining removal steps

2. Sunvisor assembly

◀C▶

3. Sunvisor holder
4. Room light assembly
5. Sunroof switch cover
6. Assist grip
7. Headlining



REMOVAL SERVICE POINTS

◀A▶ INSIDE REAR VIEW MIRROR REMOVAL

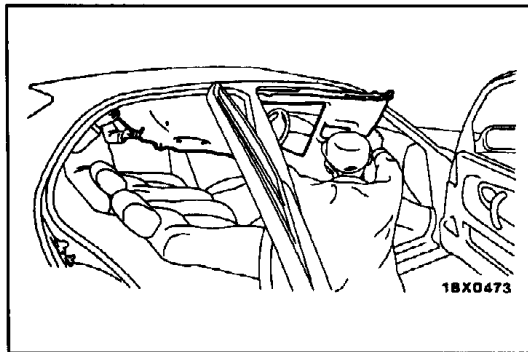
Remove by pushing in the direction of the arrow in the illustration.

NOTE

1. The mirror is fitted in the groove of the button that is attached to the glass, and is fixed by the spring.
2. The mirror breaking load is within 450 N.

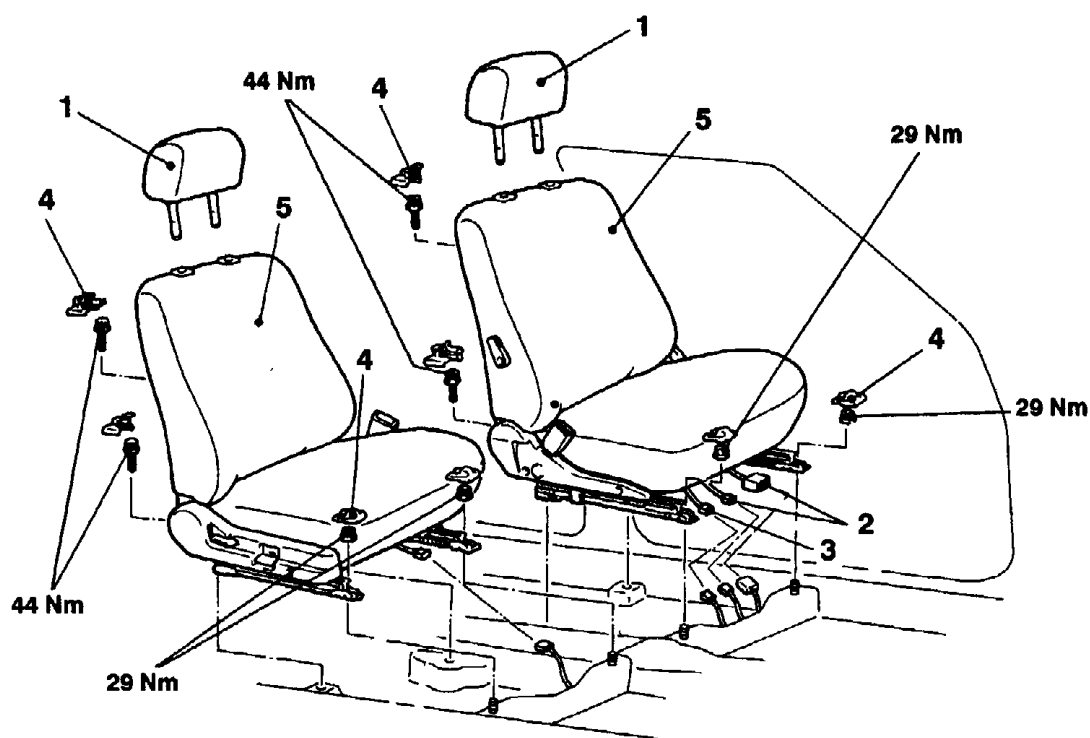
◀B▶ ROOM LIGHT ASSEMBLY REMOVAL

1. Insert a screwdriver into the notch of the room light lens and pry gently to remove it.
2. Remove the mounting screws and pull the room light assembly downwards to remove it.



◀C▶ HEADLINING REMOVAL

While bending the headlining slightly, pull it through the front door opening to the outside of the vehicle.

FRONT SEAT**REMOVAL AND INSTALLATION**

19AE013N

Headrest removal

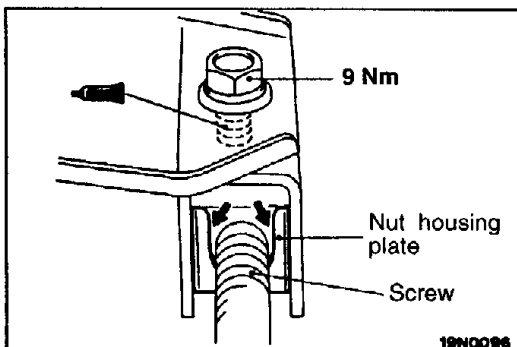
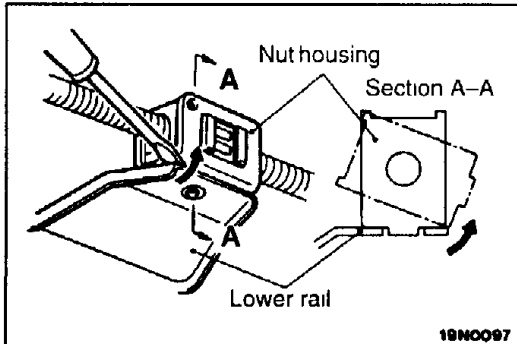
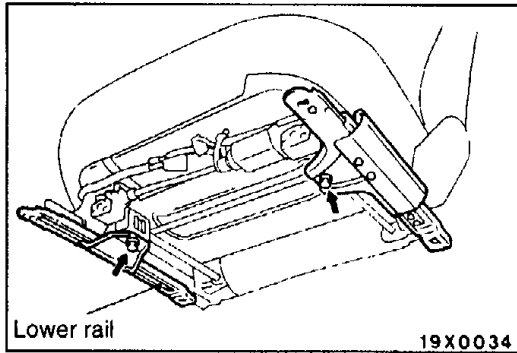
1. Headrest

Front seat assembly removal steps

2. Harness connector – power seat
3. Harness connector – seat belt
4. Seat anchor cover
5. Front seat assembly

NOTE

1. After provisionally tightening the seat assembly mounting nuts and bolts in every installation location, fully tighten them to the specified torque.
2. When installing a manual seat assembly, tighten after firmly locking the seat adjuster



REMOVAL AND INSTALLATION

If removal of the seat mounting nut and bolt is impossible when there is a malfunction in the slide motor or the slide switch and the seat cannot slide, remove and install the front seat assembly by the following procedure.

1. Remove the bolts below the seat cushion as shown in the illustration.
2. Insert a flat-tipped screwdriver in between the lower rail and the nut housing, and detach the nut housing from the lower rail hole and turn it.
3. Slide the seat, and remove the seat mounting nuts and bolts.

4. When reusing the power height adjuster assembly, apply specified adhesive to the mounting bolt, and tighten the specified torque.

Specified adhesive:

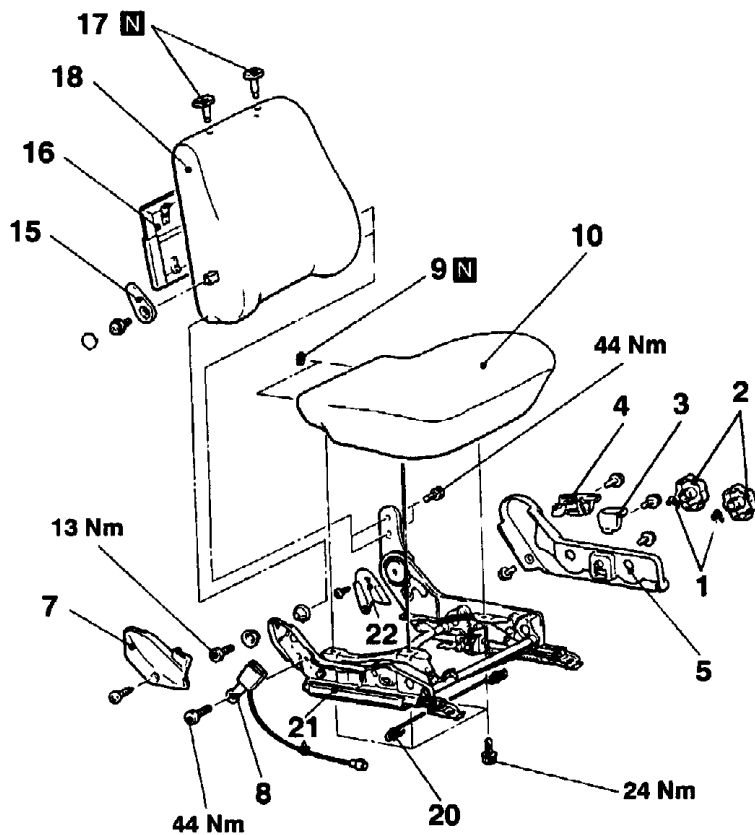
3M Stud Locking Part No.4170 or equivalent

Caution

1. Match to the left and right nut housing positions.
2. Install so that the screw and nut housing plate do not cause interference.

DISASSEMBLY AND REASSEMBLY

<Manual seat>

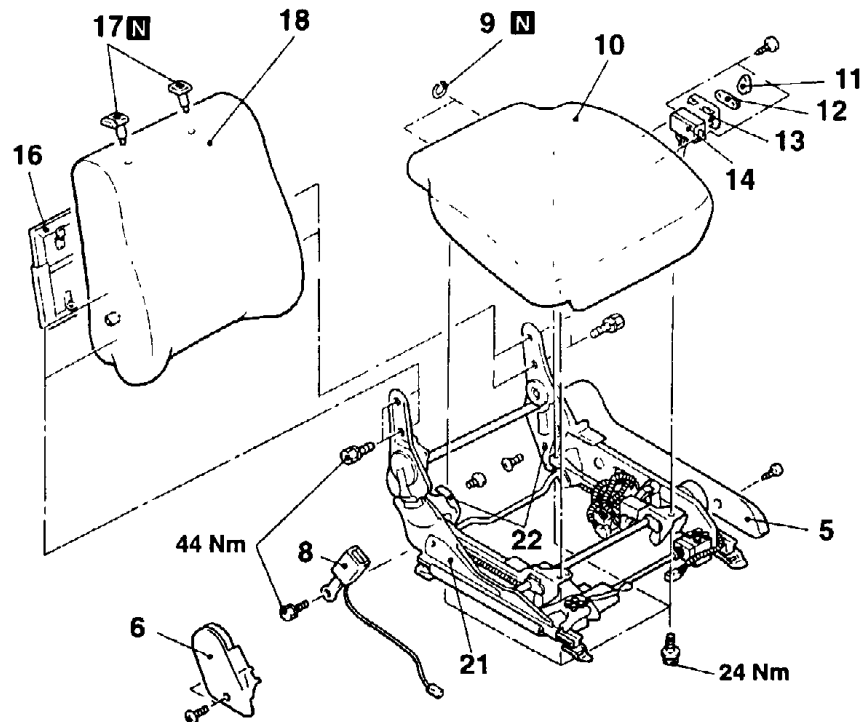


19AE014N

Disassembly steps

- | | | |
|---|--|--|
| <ol style="list-style-type: none"> 1. Clip 2. Height adjustment knob <driver side> 3. Slide adjustment knob 4. Reclining adjustment knob 5. Front seat side shield cover 7. Front seat hinge cover 8. Inner seat belt 9. Hog ring | | <ol style="list-style-type: none"> 10. Seat cushion assembly 15. Lumbar support lever <driver side> 16. Front back panel assembly 17. Head rest guide 18. Seat back assembly 20. Pull wire 21. Seat adjuster assembly 22. Reclining adjuster inner cover |
|---|--|--|

<Power seat>

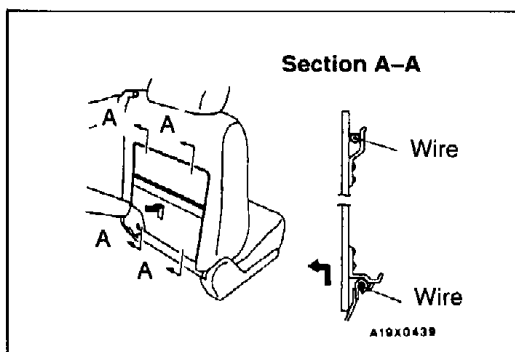


Disassembly steps

5. Front seat side shield cover
6. Reclining adjuster cover
8. Inner seat belt
9. Hog ring
10. Seat cushion assembly
11. Power seat reclining lever
12. Power seat adjuster lever

19AE027E

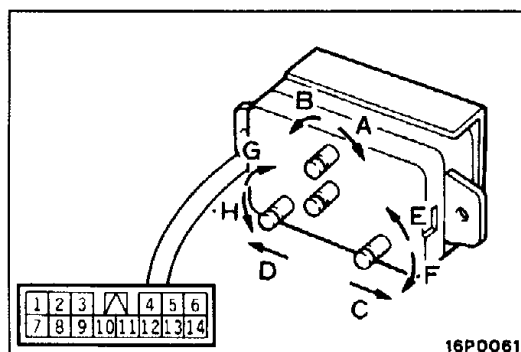
13. Garnish
14. Power seat switch
16. Front-back panel assembly
17. Head rest guide
18. Seat back assembly
21. Seat adjuster assembly
22. Reclining adjuster inner cover



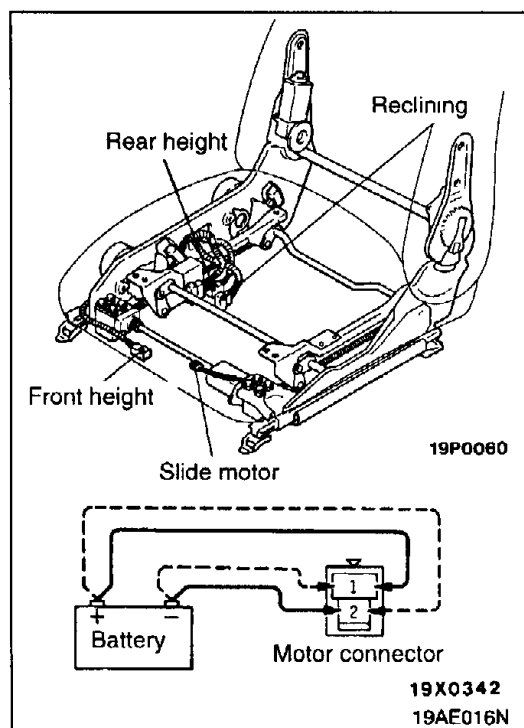
DISASSEMBLY SERVICE POINT

◀A▶ FRONT-BACK PANEL ASSEMBLY REMOVAL

Lift the front-back panel assembly upwards, and pull the lower portion towards you to remove.

**INSPECTION****POWER SEAT SWITCH CONTINUITY CHECK**

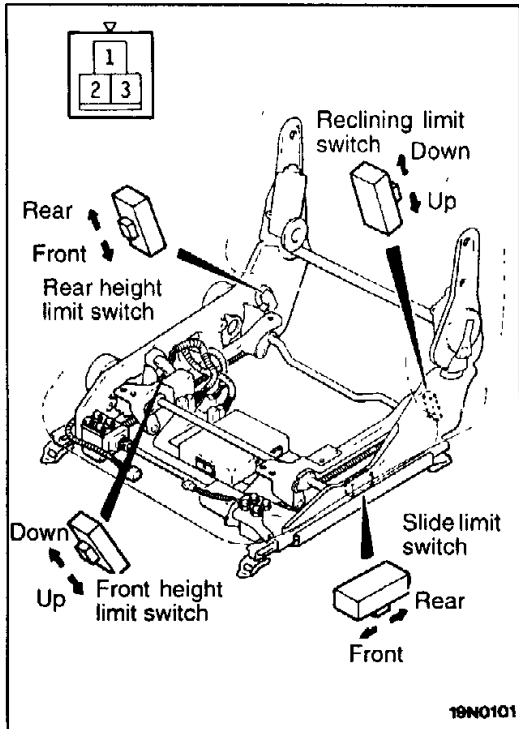
Switch position			Terminal No.													
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
Reclining switch	Front (Rear)	A			○	○									○	○
	Rear (Front)	B			○	○									○	○
Slide switch	Front (Rear)	C							○	○					○	○
	Rear (Front)	D							○	○					○	○
Front height switch (Rear height switch)	Up	E	○	○								○				○
	Down	F	○	○								○				○
Rear height switch (Front height switch)	Up	G					○	○					○			○
	Down	H					○	○						○		○

**POWER SEAT MOTOR CHECK**

Check the operation of each motor using the following procedure.

1. Disconnect the connector for each motor.
2. Check that each motor runs smoothly when the battery is directly connected to the motor terminals, and that each adjustment mechanism operates in the directions in the table below.
3. If there is a problem, replace the power seat adjuster assembly.

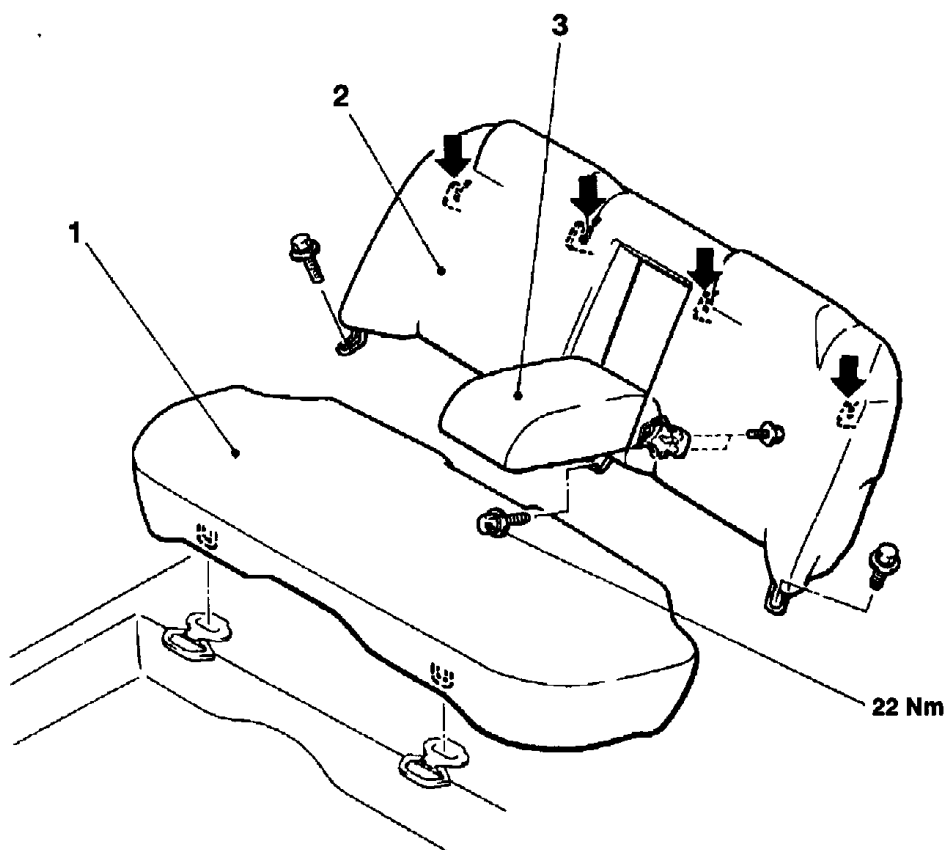
Motor Name	Operating Direction	Terminal No.		Stop Position
		1	2	
Front height	Down	⊕	⊖	Stops at limit switch OFF
	Up	⊖	⊕	
Rear height	Down	⊕	⊖	Stops at limit switch OFF
	Up	⊖	⊕	
Slide	Down	⊕	⊖	Stops at operating range limit
	Up	⊖	⊕	
Reclining	Down	⊕	⊖	Stops at operating range limit
	Up	⊖	⊕	



LIMIT SWITCH CONTINUITY CHECK

1. Disconnect the limit switch connector and connect a circuit tester to the terminals.
2. Operate the switch and check that there is continuity between the terminals.
3. If there is a problem, replace the power seat adjuster assembly.

Switch Name	Switch position	Terminal No.		
		1	2	3
Front height limit switch	Up	○	○	
	Down	○	○	○
Rear height limit switch	Up	○	○	
	Down	○	○	○
All limit switches	Middle (ON)	○	○	○

REAR SEAT**REMOVAL AND INSTALLATION****NOTE**

➡ : Indicates hook location

Seat cushion removal

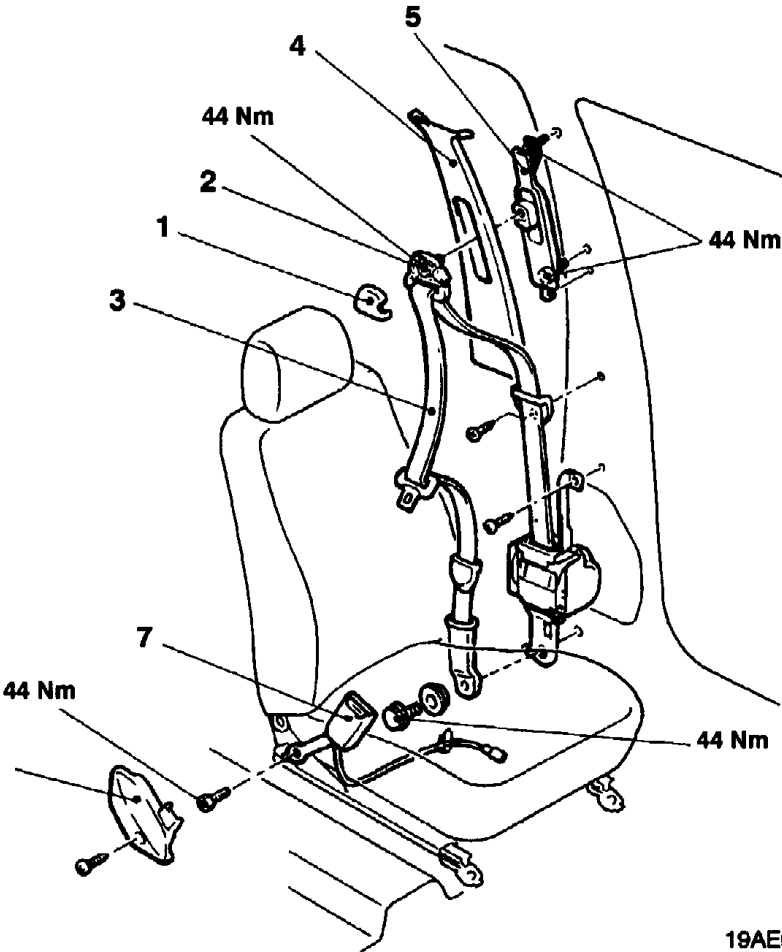
1. Seat cushion

19AE019N

Rear seatback removal

2. Rear seatback assembly
3. Armrest

FRONT SEAT BELT
REMOVAL AND INSTALLATION



19AE017N

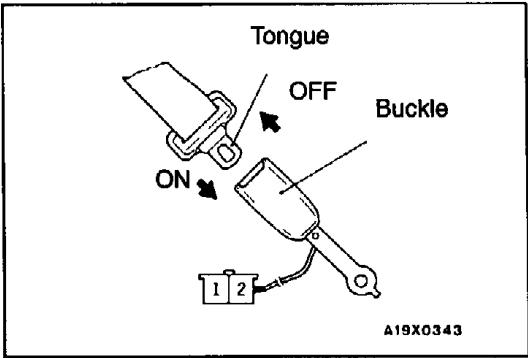
Outer seat belt removal steps

- Front scuff plate and rear scuff plate (Refer to P.52A-8).
- Centre pillar lower trim (Refer to P.52A-8).
- 1. Sash guide cover
- 2. Sash guide
- 3. Outer seat belt
- 4. Centre pillar upper trim (Refer to P.52A-8).

5. Adjustable seat belt anchor

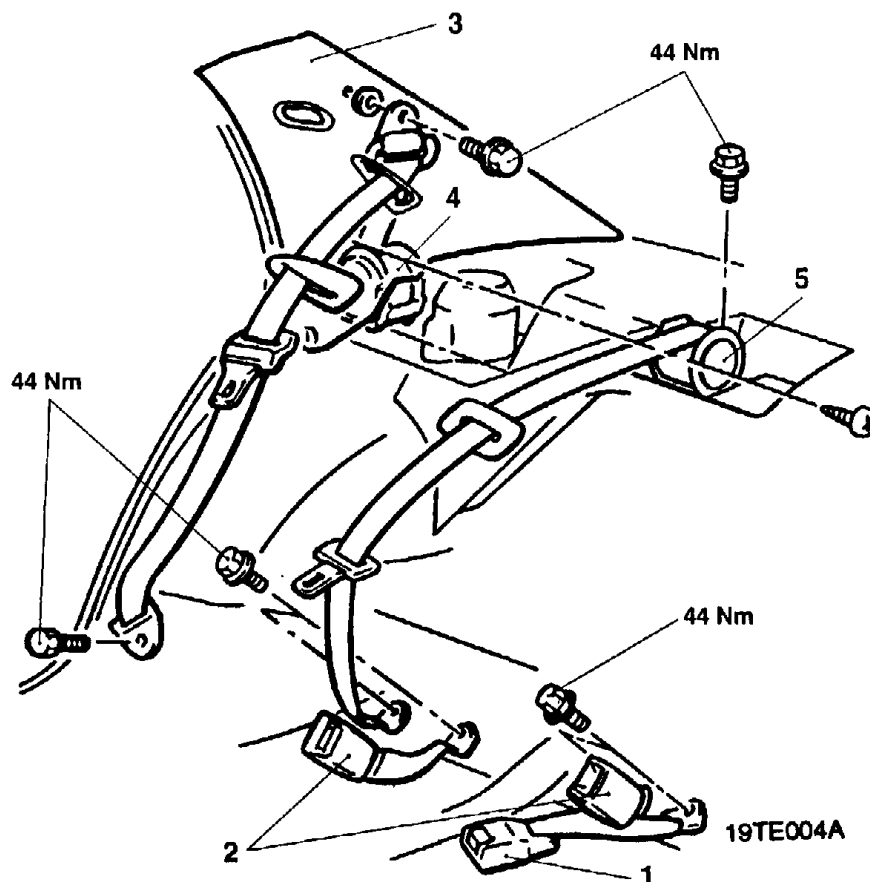
Inner seat belt removal steps

- Front seat assembly (Refer to P.52A-12).
- 6. Front seat belt hinge cover
- 7. Inner seat belt



INSPECTION
FRONT SEAT BELT BUCKLE SWITCH CONTINUITY CHECK

Switch position	Terminal No.	
	1	2
ON		
OFF		

REAR SEAT BELT**REMOVAL AND INSTALLATION****Removal steps**

- Rear seat cushion
(Refer to P.52A-18.)
- 1. Inner seat belt
(centre seat belt)
- 2. Inner seat belt
(outer seat belt)
- Rear seat back assembly
(Refer to P.52A-18.)
- Rear shelf trim
(Refer to P.52A-8.)
- 3. Rear pillar trim
(Refer to P.52A-8.)
- 4. Outer seat belt
- 5. Centre seat belt

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

GENERAL INFORMATION	2	INDIVIDUAL COMPONENT SERVICE	22
Warning/Caution Labels	4	SRS AIR BAG CONTROL UNIT (SRS-ECU)	23
SRS SERVICE PRECAUTIONS	6	AIR BAG MODULES AND CLOCK SPRING	24
SPECIAL TOOLS	7	AIR BAG MODULE DISPOSAL PROCEDURES	31
TEST EQUIPMENT	7	Undeployed Air Bag Module Disposal	31
TROUBLESHOOTING	8	Deployed Air Bag Module Disposal	36
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POST-COLLISION DIAGNOSIS	19		

CAUTION

- Carefully read and observe the information in the SRS SERVICE PRECAUTIONS (P.52B-6.) prior to any service.
- For information concerning troubleshooting or maintenance, always observe the procedures in the Troubleshooting (P.52B-8.) or the SRS Maintenance (P.52B-16.) sections, respectively.
- 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 occupant safety, the vehicle is equipped with a driver SRS airbag and a passenger SRS airbag is available as an option.

The Supplemental Restraint System (SRS) is designed to supplement the driver's and front passenger's seat belts to help reduce the risk or severity of injury to the driver and front passenger by activating and deploying the air bag in certain frontal collisions.

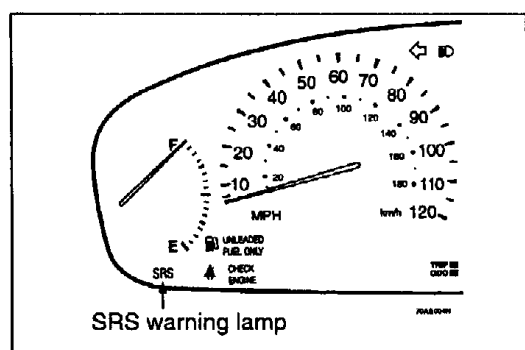
The SRS Airbag consists of two air bag modules, SRS air bag control unit (SRS-ECU), SRS warning lamp, and clock spring. The driver's air bag is located in the centre of the steering wheel and the passenger's airbag above the glove box (optional). Each air bag is made up of a folded air bag and an inflator 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 authorised service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work.

Caution

Extreme care must be used when servicing the SRS or performing repairs on components mounted near SRS components to avoid injury to the service personnel (by inadvertent deployment of the air bags) or the driver (by rendering the SRS inoperative).

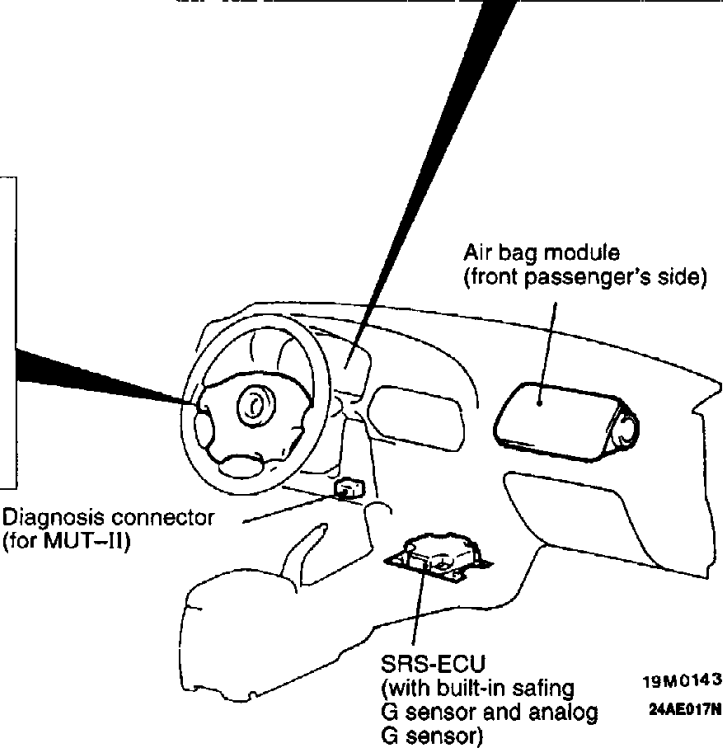
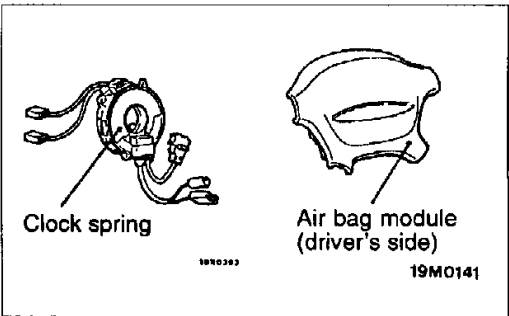
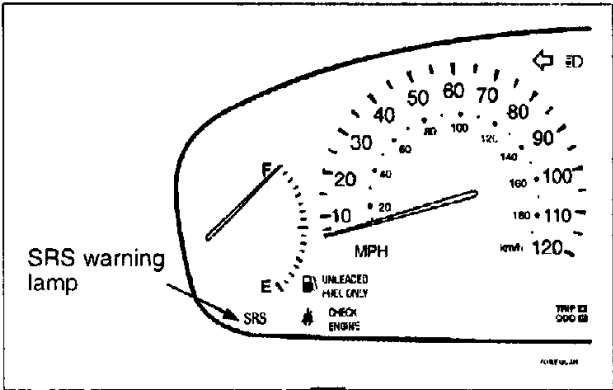


SRS WARNING LAMP FUNCTION

The SRS-ECU monitors the SRS Airbag system and stores data concerning any detected faults in the system. When the ignition key is in "ON" or "START" position, the SRS warning lamp should illuminate for about 7 seconds and then turn off. That indicates that the SRS system is in operational order. If the SRS warning lamp does any of the following, immediate inspection by an authorised dealer is needed.

- (1) The SRS warning lamp does not illuminate as described above.
- (2) The SRS warning lamp stays on for more than 7 seconds.
- (3) The SRS warning lamp illuminates while driving.

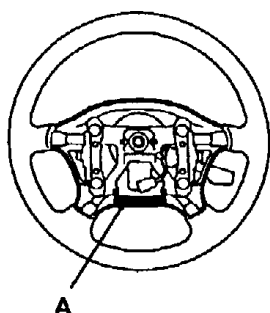
If a vehicle's SRS warning lamp is in any of these three conditions when brought in for inspection, the SRS system must be inspected, diagnosed and serviced in accordance with this manual.



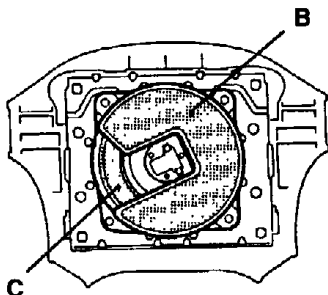
WARNING/CAUTION LABELS

A number of caution labels related to the SRS are found in the vehicle, as shown in the following

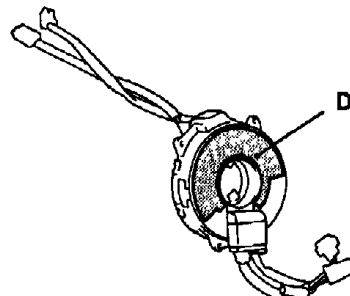
illustration. Follow label instructions when servicing SRS. If labels are dirty or damaged, replace them.

Steering wheel

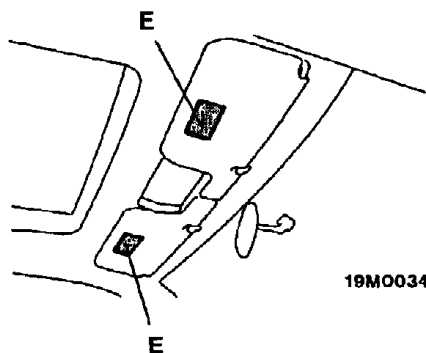
19X0541

Air bag module (driver's side)

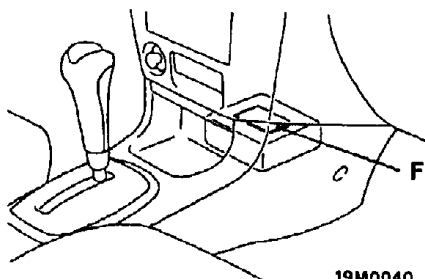
19M0147

Clock spring

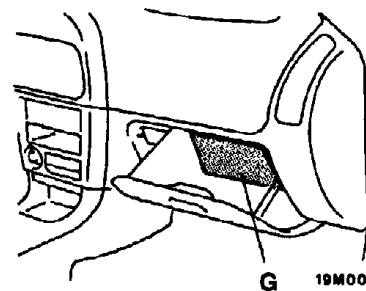
19X0015

Sun visor

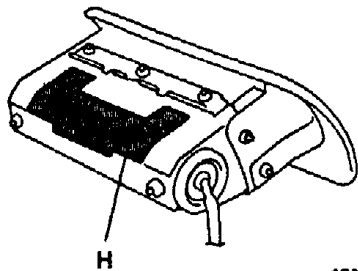
19M0034

SRS-ECU

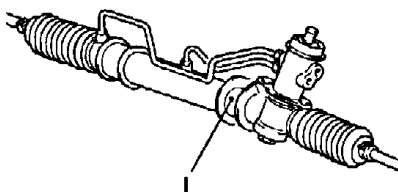
19M0040

Glove box

19M0039

Air bag module (front passenger's side)

19M0021

Steering gear box

19S0223

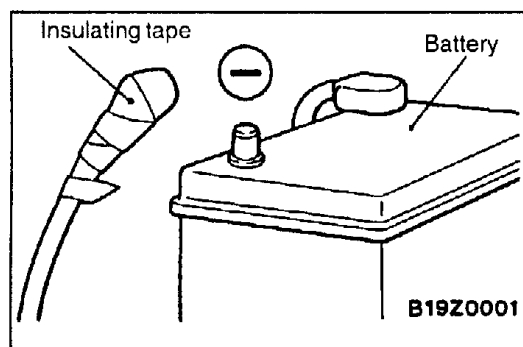
24AE018N

Label contents	Label contents
A. CAUTION: SRS Before replacing the steering wheel, read the service manual, centre the front wheels, and align SRS clock spring neutral marks. Failure to do so may render SRS system inoperative, risking serious driver injury.	G. AIR BAG SYSTEM INFORMATION This vehicle has an air bag system which will supplement the seatbelt in certain frontal collisions. The air bag is not a substitute for the seatbelt in any type of collision. The driver and all other occupants should wear seatbelts at all times. WARNING! If the "SRS" warning light does not illuminate for several seconds when the ignition key is turned to "ON" or the engine is started, or if the warning light stays on while driving, take the vehicle to your nearest authorised dealer immediately. Also, if the vehicle's front end is damaged or if the air bag has deployed, take the vehicle for service immediately. The air bag system must be inspected by an authorised dealer ten years after the vehicle manufacture date shown on the certification label located on the left front door-latch post or door frame. Read the "SRS" section of your owner's manual before driving for important information about operation and service of the air bag system. When you are going to discard your gas generator or vehicle, please see your dealer.
B. WARNING: SRS This air bag module cannot be repaired. Do not disassemble or tamper. Do not perform diagnosis. Do not touch with electrical test equipment or probes. Refer to service manual for further instructions, and for special handling, storage, and disposal procedures. Tampering or mishandling can result in injury.	
C. DANGER POISONOUS FLAMMABLE MATERIAL To prevent personal injury, do not dismantle, incinerate, or bring into contact with electricity. Store below 93 °C.	H. WARNING: SRS This air bag module cannot be repaired. Do not disassemble or tamper. Do not perform diagnosis. Do not touch with electrical test equipment or probes. Refer to service manual for further instructions, and for special handling, storage, and disposal procedures. Tampering or mishandling can result in injury. DANGER POISON Keep out of the reach of children. Contains sodium azide and potassium nitrate. Contents are poisonous and extremely flammable. Contact with acid, water, or heavy metals may produce harmful and irritating gases or explosive compounds. Do not dismantle, incinerate, bring into contact with electricity, or store at temperatures exceeding 93 °C. FIRST AID: If contents are swallowed, induce vomiting. For eye contact flush eye with water for 15 minutes. If gases from acid or water contact are inhaled, breath in fresh air. In every case, get prompt medical attention.
D. CAUTION: SRS clock spring This is not a repairable part. Do not disassemble or tamper. If defective, replace entire unit per service manual instructions. To re-centre: rotate clockwise until tight. Then rotate in opposite direction approximately 3 4/5 turns and align arrows .	
E. WARNING TO AVOID SERIOUS INJURY: ● For maximum safety protection in all types of crashes, you must always wear your safety belt. ● Do not install rearward-facing child seats in any front passenger seat position. ● Do not sit or lean unnecessarily close to the air bag. ● Do not place any objects over the air bag or between the air bag and yourself. ● See the owner's manual for further information and explanations.	I. CAUTION: SRS Before removal of steering gear box, read the service manual, centre the front wheels and remove the ignition key. Failure to do so may damage SRS clock spring and render SRS system inoperative, risking serious driver injury.
F. CAUTION: Do not disassemble or drop. If defective refer to service manual.	

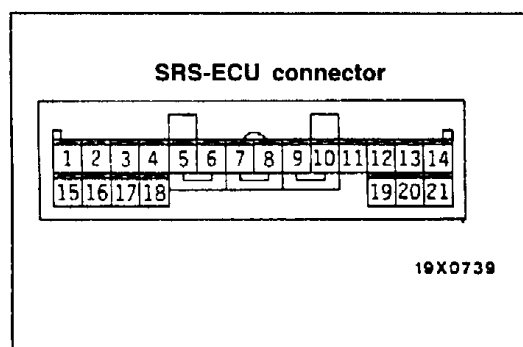
SRS SERVICE PRECAUTIONS

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 Airbag components, except those specified on P.52B-7.
3. **Never Attempt to Repair the Following Components:**
 - SRS air bag control unit (SRS-ECU)
 - Clock Spring
 - Air Bag Module

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 airbag. 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.

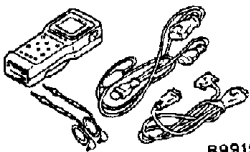
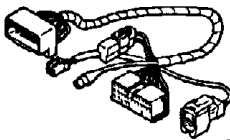
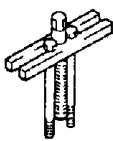
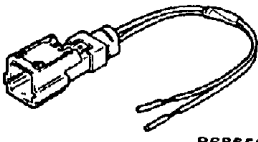
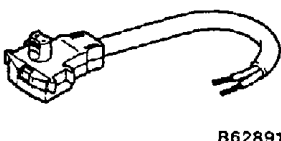
SRS-ECU terminal No.	Destination of harness	Corrective action
1 to 4	—	—
5	Body wiring harness → Clock spring → Air bag module (Driver's side)	Correct or replace each wiring harness. Replace clock spring.
6		
7	Body wiring harness → Air bag module (Front passenger's side)	Correct or replace each wiring 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 body wiring harness.
21		

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 airbag, check warning lamp operation to make sure that the system functions properly. (Refer to P.52B-2.)
8. Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.

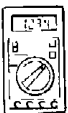
WARNING

AS SERIOUS INJURY CAN RESULT FROM UNINTENDED DEPLOYMENT OF THE AIRBAGS, USE ONLY THE PROCEDURES AND EQUIPMENT SPECIFIED IN THIS MANUAL.

SPECIAL TOOLS

Tool	Tool Number	Name	Use
 B991502	MB991502	MUT-II	• Reading diagnosis codes • Erasing diagnosis codes • Reading trouble period • Reading erase times
 B991613	MB991613	SRS check harness	Checking the SRS electrical circuitry with a digital multi-meter
 B990803	MB990803	Steering wheel puller	Removal of steering wheel
 B686560	MB686560	SRS air bag adaptor harness A	• Deployment of air bag module inside the vehicle • Deployment of air bag module (front passengers side) outside the vehicle
 B628919	MR203491 or MB628919	SRS air bag adaptor harness B	Deployment of air bag module (driver's side) outside the vehicle

TEST EQUIPMENT

Tool	Name	Use
 1580744	Digital multi-meter Use a multi-meter for which the maximum test current is 2 mA or less at the minimum range of resistance measurement	Checking the SRS electrical circuitry with SRS check harness

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

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

INSPECTION CHART FOR DIAGNOSIS CODES

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

Code No.	Diagnosis item	Reference page
14	Analog G-sensor system in the SRS-ECU	52B-8
15,16	Safing G-sensor system in the SRS-ECU	52B-9
21, 22, 61, 62	Driver's side air bag module (squib) system	52B-9
24, 25, 64, 65	Front passenger's side air bag module (squib) system	52B-10
31, 32	SRS-ECU capacitor system	52B-10
34*	Connector lock system	52B-10
35	SRS-ECU (deployed air bag) system	52B-11
41*	IG ₁ (A) power circuit system	52B-11
42*	IG ₁ (B) power circuit system	52B-12
43	SRS warning lamp drive circuit system	Lamp does not illuminate.*
		Lamp does not switch off.
44*	SRS warning lamp drive circuit system	52B-14
45	SRS-ECU non-volatile memory (EEPROM) and A/D converter system	52B-14
51, 52	Driver's side air bag module (squib ignition drive circuit) system	52B-14
54, 55	Front passenger's side air bag module (squib ignition drive circuit) system	52B-14

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 diagnosis codes 41 or 42. When these diagnosis codes are displayed, check the battery.

INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

Code No.14 Analog G-sensor system in the SRS-ECU	Probable cause
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. • When the analog G-sensor is not operating • When the characteristics of the analog G-sensor are abnormal • When the output from the analog G-sensor is abnormal	• Malfunction of SRS-ECU

Replace the SRS-ECU.

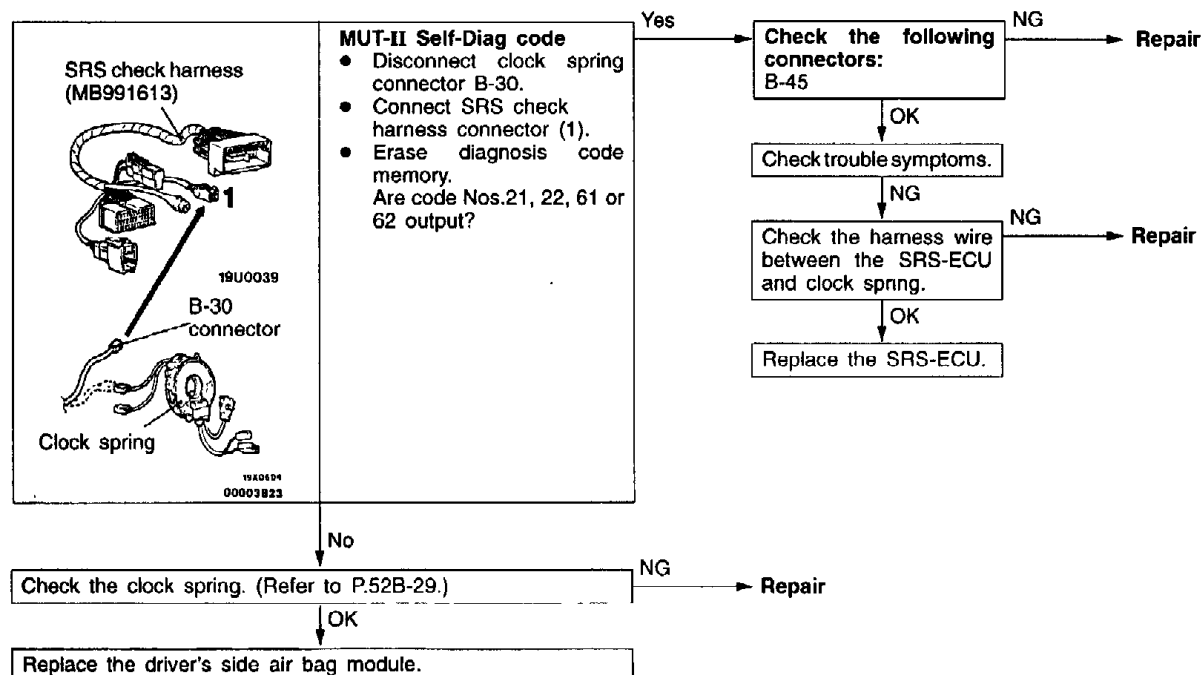
Code No.15 or 16 Safing G-sensor system in the SRS-ECU	Probable cause
This code is output if there is a short or open circuit inside the SRS-ECU between the terminals of the safing G-sensor. The trouble causes for each diagnosis code No. are as follows.	Malfunction of SRS-ECU

Code No.	Trouble symptom
15	Short circuit in the safing G-sensor
16	Open circuit in the safing G-sensor

Replace the SRS-ECU.

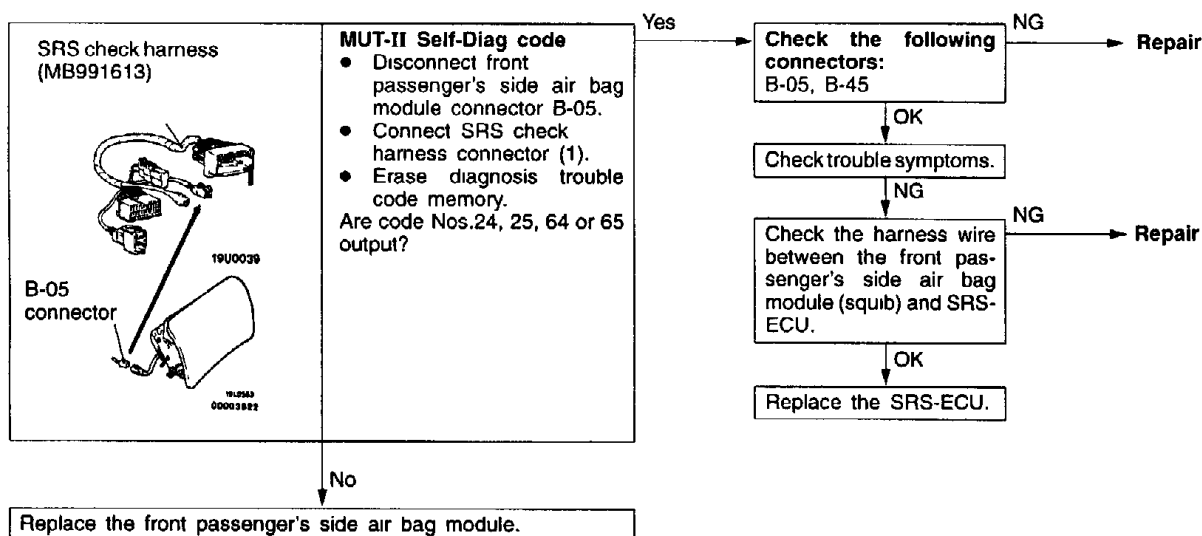
Code No.21, 22, 61 or 62 Driver's side air bag module (squib) system	Probable cause
These diagnosis trouble codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The trouble causes for each diagnosis trouble code No. are as follows.	- Malfunction of clock spring - Malfunction of wiring harnesses or connectors - Malfunction of driver's side air bag module (squib) - Malfunction of SRS-ECU

Code No.	Trouble symptom
21	- Short in driver's side air bag module (squib) or harness short - Short in clock spring
22	- Open circuit in driver's side air bag module (squib) or open harness - Open circuit in clock spring - Malfunction of connector contact
61	Short in driver's side air bag module (squib) harness leading to the power supply
62	Short in driver's side air bag module (squib) harness leading to the earth



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 front passenger's side air bag module (squib). The trouble causes for each diagnosis code No. are as follows.	• Malfunction of wiring harnesses or connectors • Malfunction of front passenger's side air bag module (squib) • Malfunction of SRS-ECU

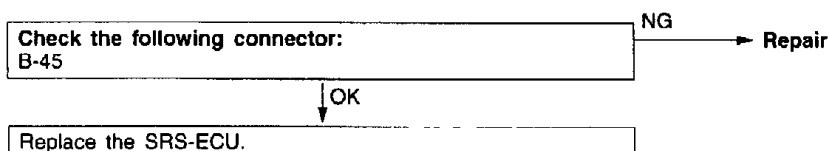
Code No.	Trouble symptom
24	• Short in front passenger's side air bag module (squib) or harness short
25	• Open circuit in front passenger's side air bag module (squib) or open harness • Malfunction of connector contact
64	• Short in front passenger's side air bag module (squib) harness leading to the power supply
65	• Short in front passenger's side air bag module (squib) harness leading to the earth



Code No.31 or 32 SRS-ECU capacitor system	Probable cause
These diagnosis codes are output if the voltage at the SRS-ECU capacitor terminals is higher (No.31) or lower (No.32) than the specified value for 5 seconds or more. However, if the diagnosis code Nos. 41 and 42 are being output due to a drop in battery voltage, code No. 32 will not be detected.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

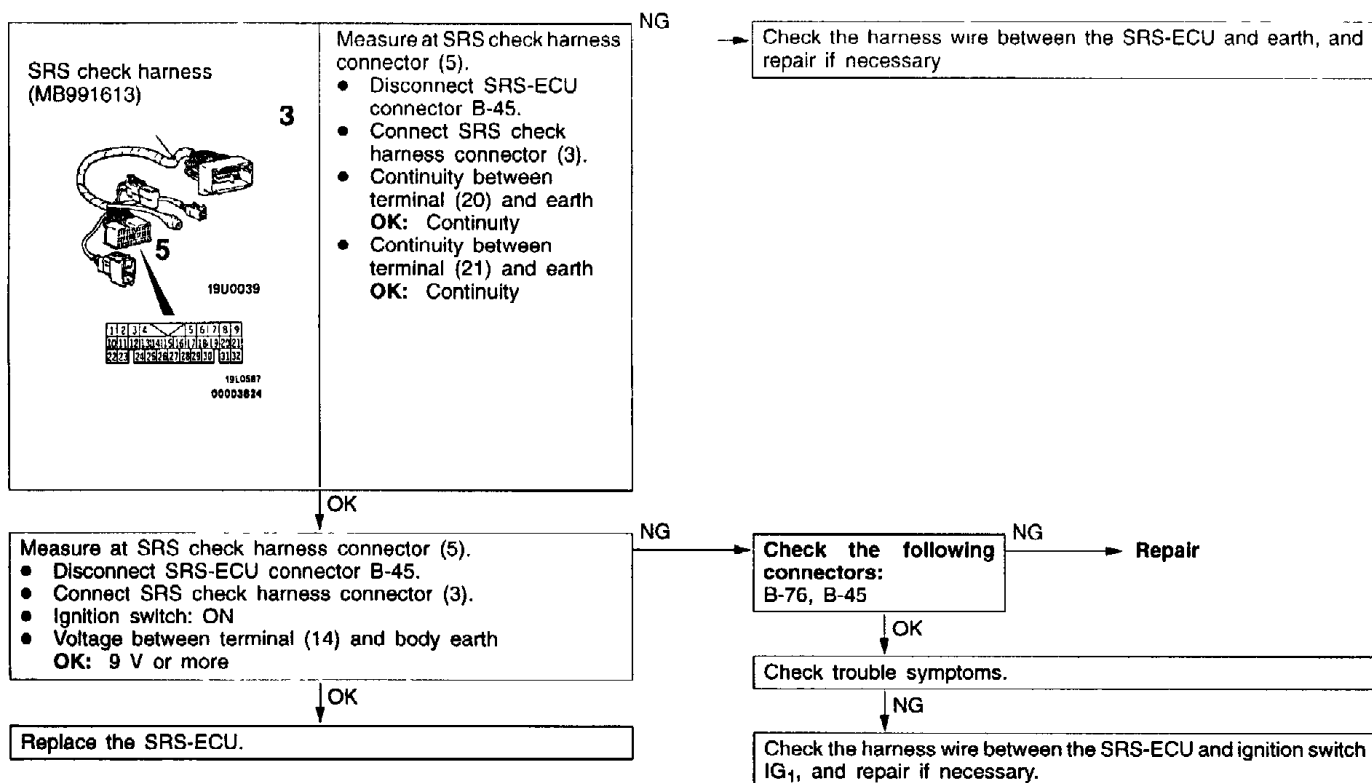
Code No.34 Connector lock system	Probable cause
This diagnosis code is output if a poor connection at the SRS-ECU is detected. However, if the vehicle condition returns to normal, diagnosis code No.34 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of connectors • Malfunction of SRS-ECU



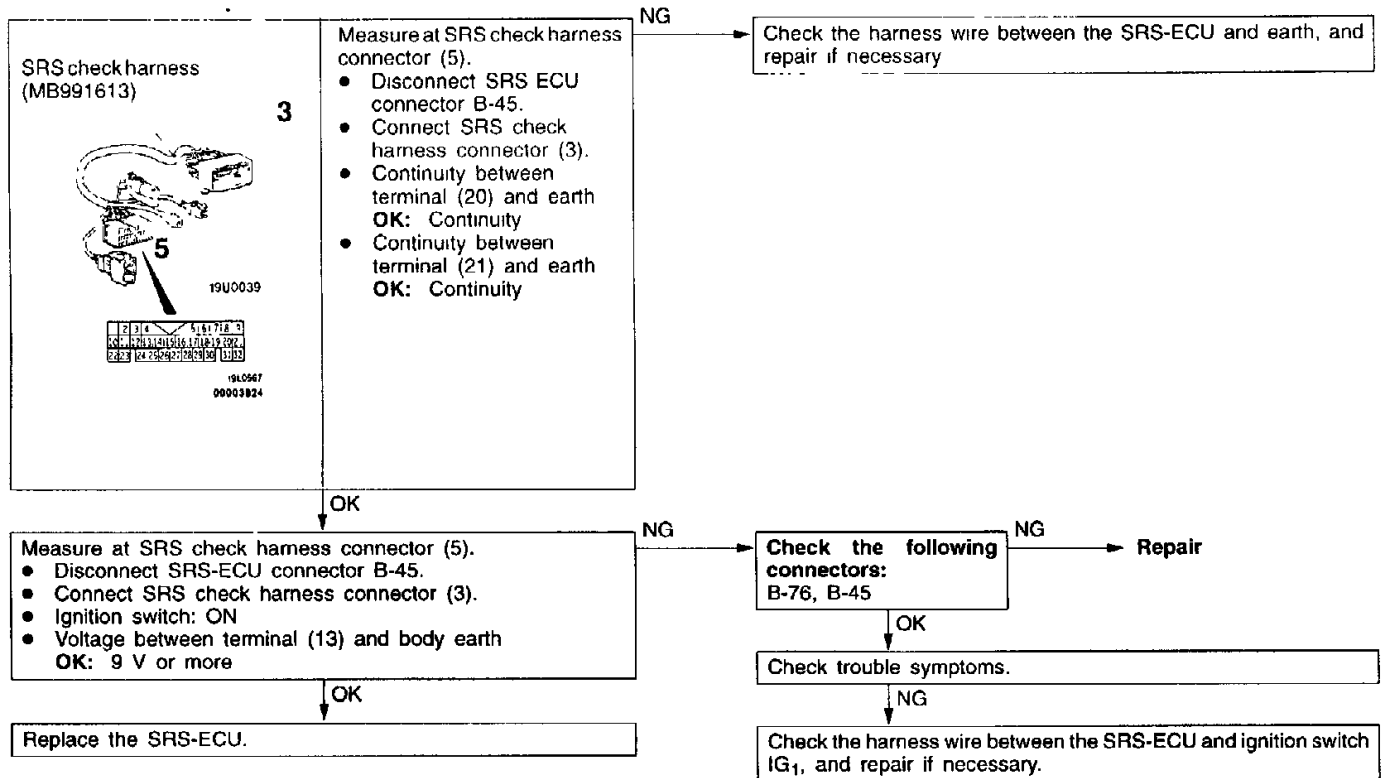
Code No.35 SRS-ECU (deployed air bag) system	Probable cause
This diagnosis code is output after the air bag deploys. If this code is output before the air bag has deployed, the cause is probably a malfunction inside the SRS-ECU.	Malfunction of SRS-ECU

Replace the SRS-ECU.

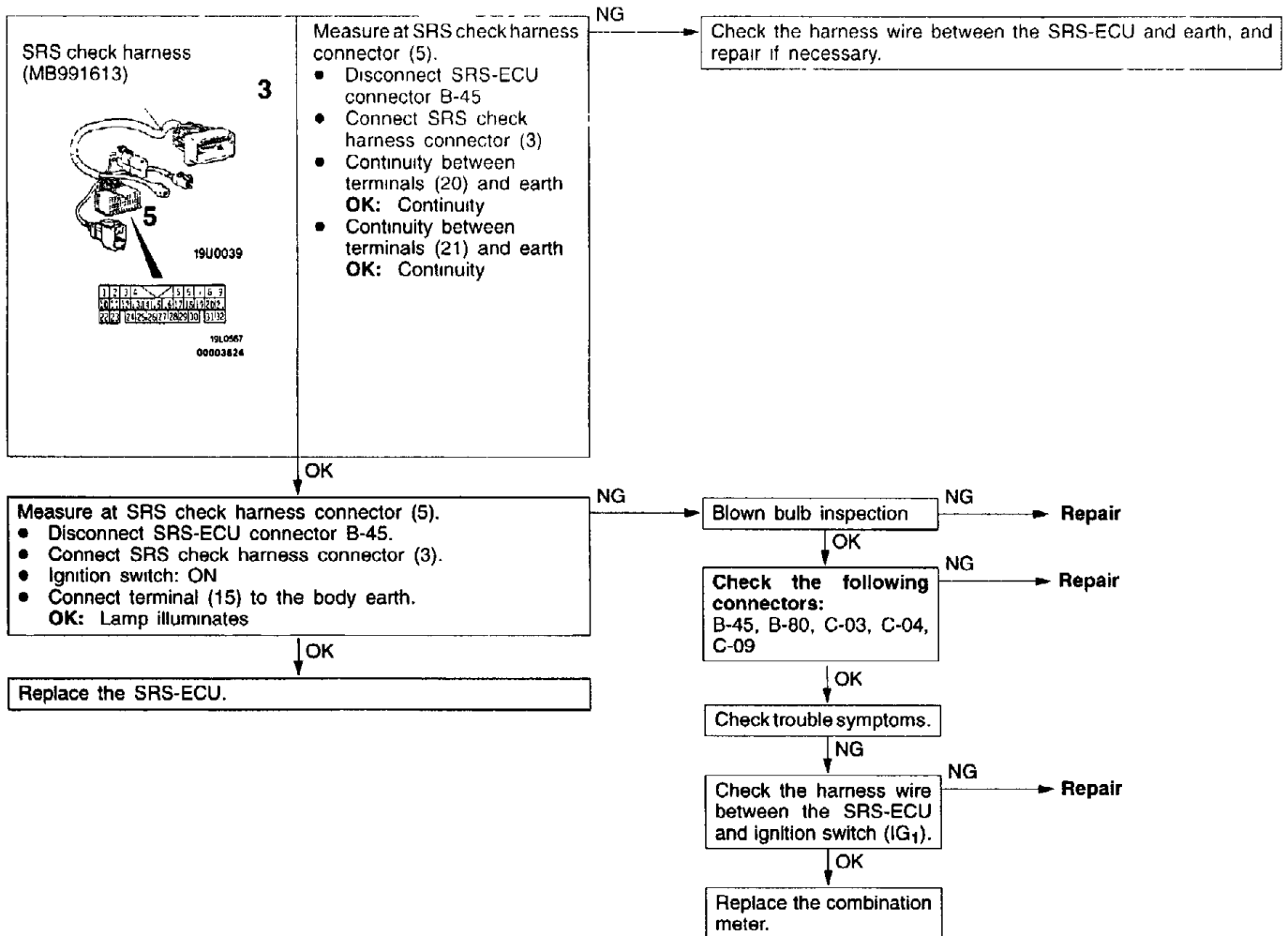
Code No.41 IG ₁ (A) power circuit system	Probable cause
This diagnosis code is output if the voltage between the IG ₁ (A) terminal and ground is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnosis code No.41 will be automatically erased, and the SRS warning lamp will switch off.	- Malfunction of wiring harnesses or connectors - Malfunction of SRS-ECU



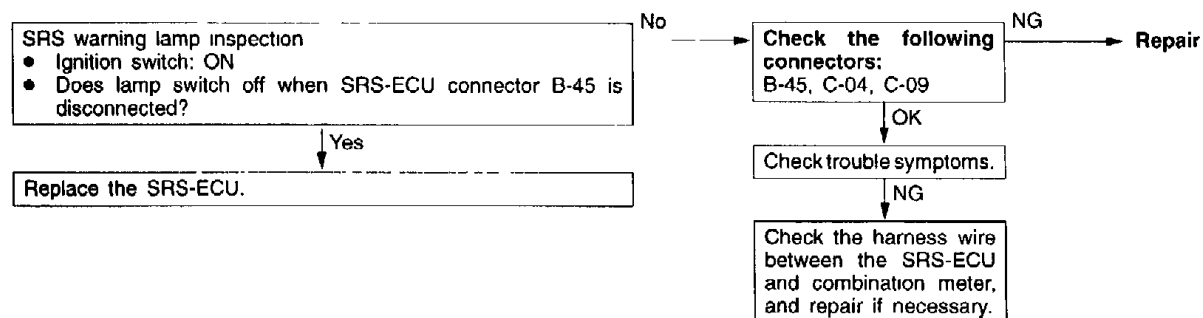
Code No.42 IG ₁ (B) power circuit system	Probable cause
This diagnosis code is output if the voltage between the IG ₁ (B) terminal and ground is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnosis code No.42 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU



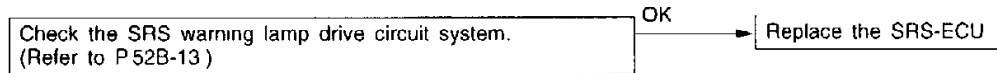
Code No.43 SRS warning lamp drive circuit system (Lamp does not illuminate.)	Probable cause
This diagnosis code is output when an open circuit occurs for a continuous period of 5 seconds while the SRS-ECU is monitoring the SRS warning lamp and the lamp is OFF (transistor OFF). However, if this code is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



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



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



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.	• Malfunction of SRS-ECU

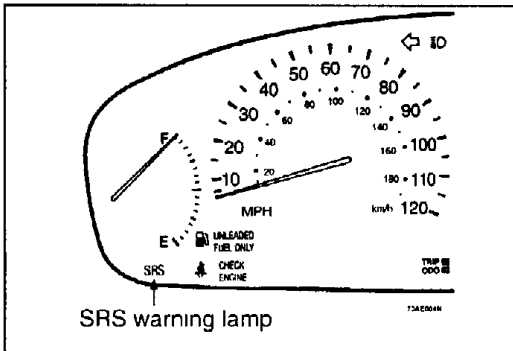
Replace the SRS-ECU.

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.	• Malfunction of SRS-ECU

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.	• Malfunction of SRS-ECU

Replace the SRS-ECU.



SRS WARNING LAMP CHECK

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 case, inspect for 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-15
	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-13
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-13

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

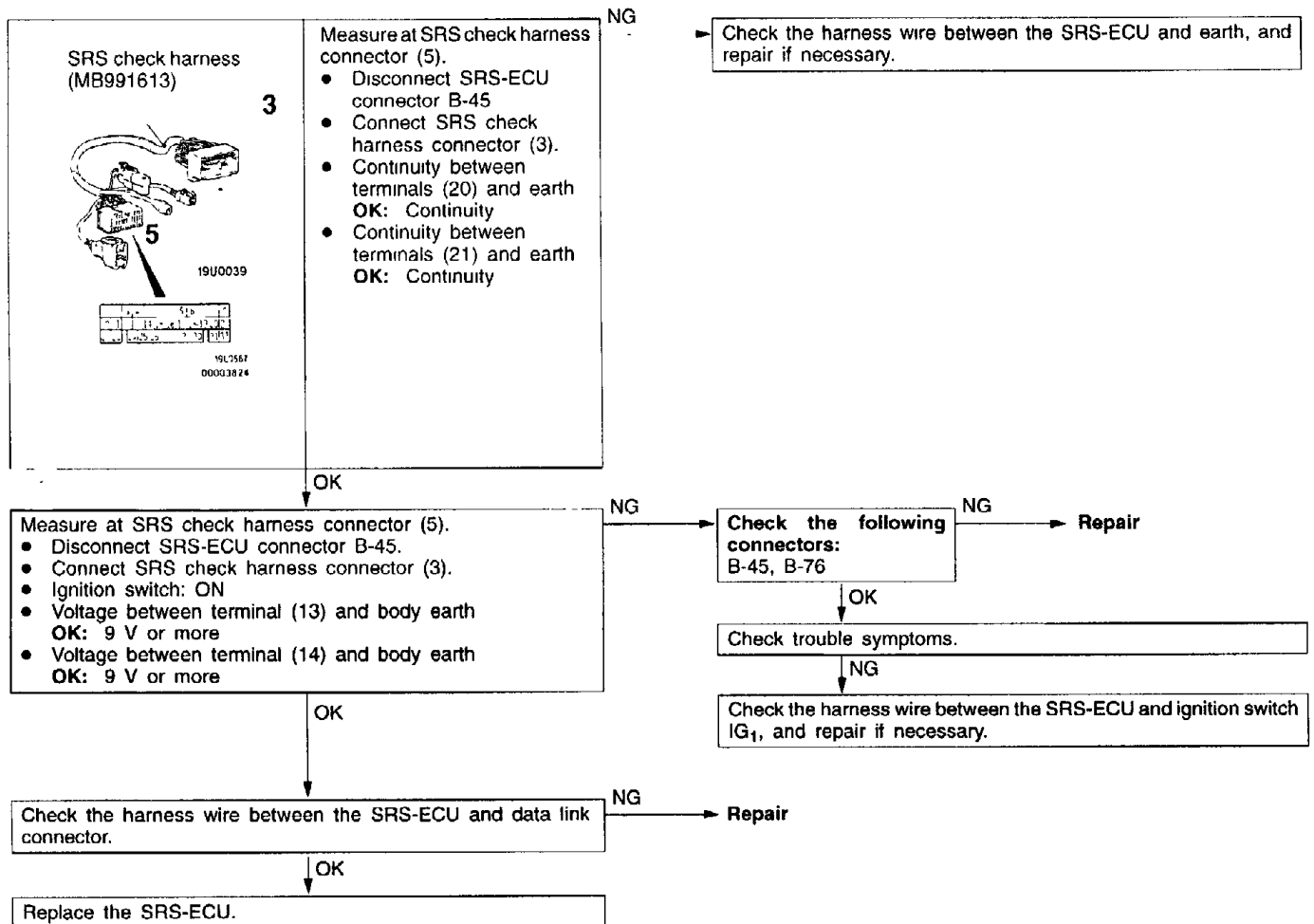
Inspection Procedure 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably in the power supply system (including ground circuit) of the diagnostic line.	• Malfunction of wiring harnesses or connectors

Refer to GROUP 13A – Troubleshooting.

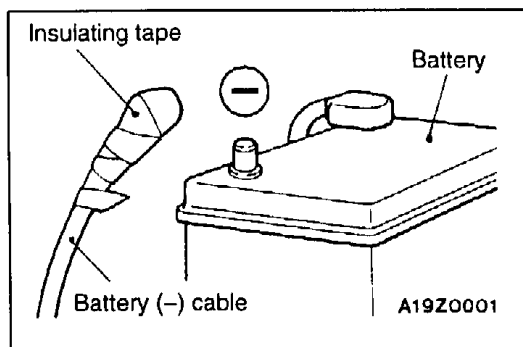
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication is not possible with SRS only.)	Probable cause
If communication is not possible only with the SRS, the cause is probably an open circuit in the diagnostic output circuit of the SRS or in the power circuit (including ground circuit).	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU



SRS MAINTENANCE

The SRS must be inspected by an authorised dealer up to 10 years after the date of vehicle registration.

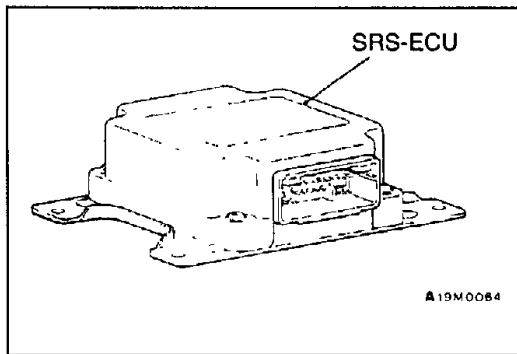


SRS COMPONENT VISUAL CHECK

Turn the ignition key to the "LOCK" 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-6.)

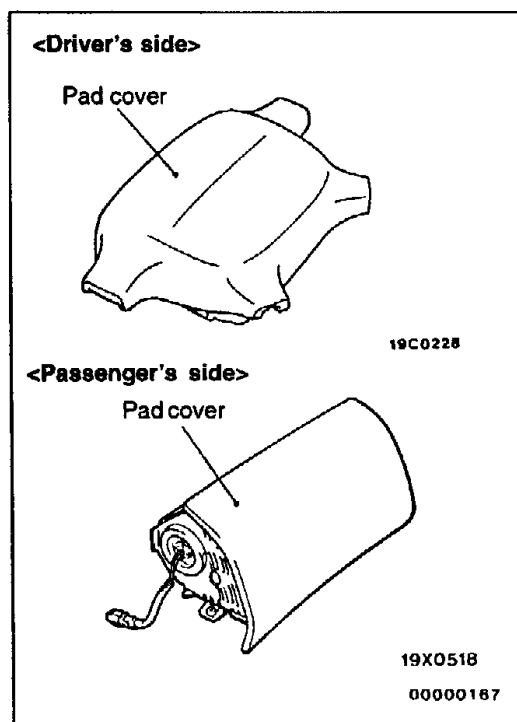
**SRS CONTROL UNIT (SRS-ECU)**

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-23.)

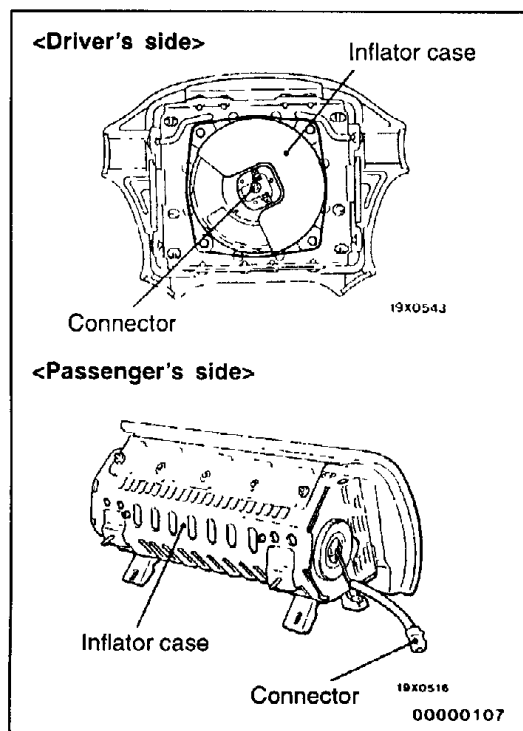
**AIR BAG MODULES, STEERING WHEEL AND CLOCK SPRING**

1. Remove the air bag modules, steering wheel and clock spring. (Refer to P.52B-24.)

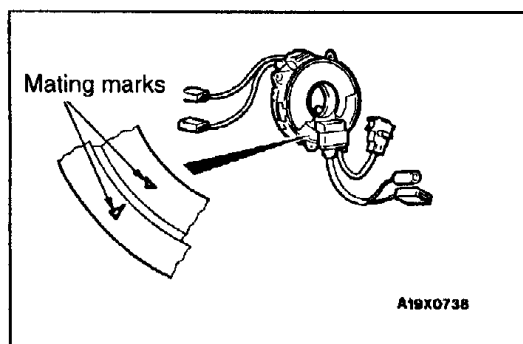
Caution

The removed air bag module should be stored in a clean, dry place with the pad cover face up.

2. Check pad cover for dents, cracks or deformities.



3. Check connector for damage, terminals for deformities, and harness for binding.
4. Check air bag inflator case for dents, cracks or deformities.
5. Check harness (built into steering wheel) and connectors for damage and terminals for deformities.



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 vehicles 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 it back approx. 3 4/5 turns counterclockwise to align the mating marks.

Caution

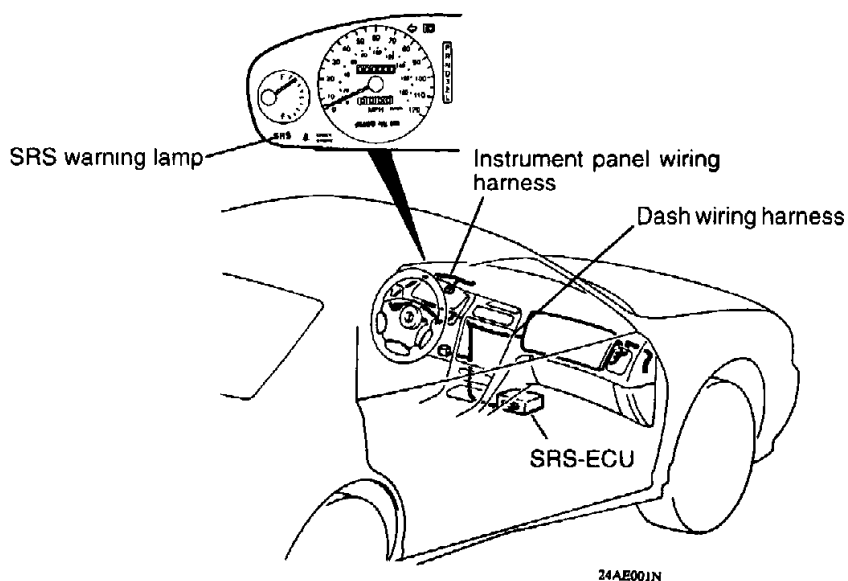
If the clock spring's mating marks are not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver and passenger.

9. Install the steering column covers, steering wheel and the air bag module.
10. Check the steering wheel for noise, binds or difficult operation.
11. Check the steering wheel for excessive free play.
REPLACE ANY VISUALLY INSPECTED PART IF IT FAILS THAT INSPECTION. (Refer to P.52B-24.)

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



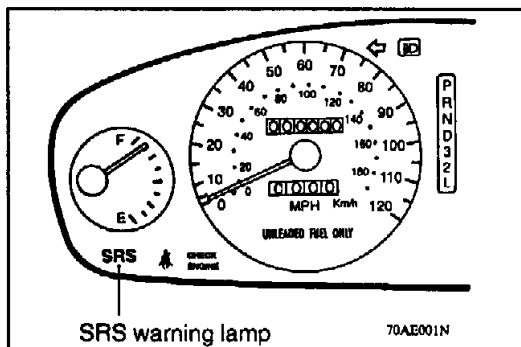
1. Check connectors for poor connection.
2. Check harnesses for binding, connectors for damage, and terminals for deformities.
REPLACE ANY CONNECTORS OR HARNESS THAT FAIL THE VISUAL INSPECTION.
 (Refer to GROUP 52B – SRS Service Precautions.)

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 and 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 45 seconds? If yes, SRS system is functioning properly. If not, refer to GROUP 52B – Troubleshooting.

**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

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

2. Read (and write down) all displayed diagnosis codes. (Refer to P.52B-8.)

NOTE

If the battery power supply has been disconnected or disrupted by the collision, the MUT-II cannot communicate with the SRS-ECU. Check the battery then 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 air bag squib igniting signal)	Maximum time to be stored: 9999 minutes (approximately 7 days)
94	How long a problem has lasted (How long it takes from the first air bag squib igniting signal till now)	

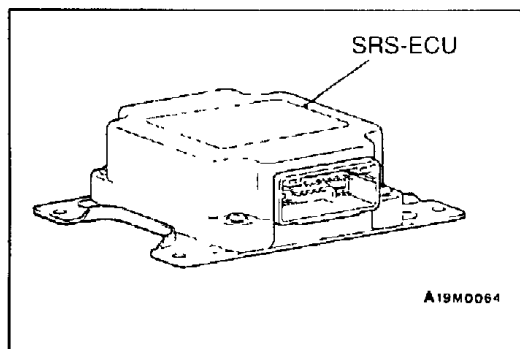
4. Erase the diagnosis codes and after waiting 5 seconds or more read (and write down) all displayed diagnosis codes. (Refer to P.52B-8.)

REPAIR PROCEDURE**WHEN AIR BAG DEPLOYS IN A COLLISION.**

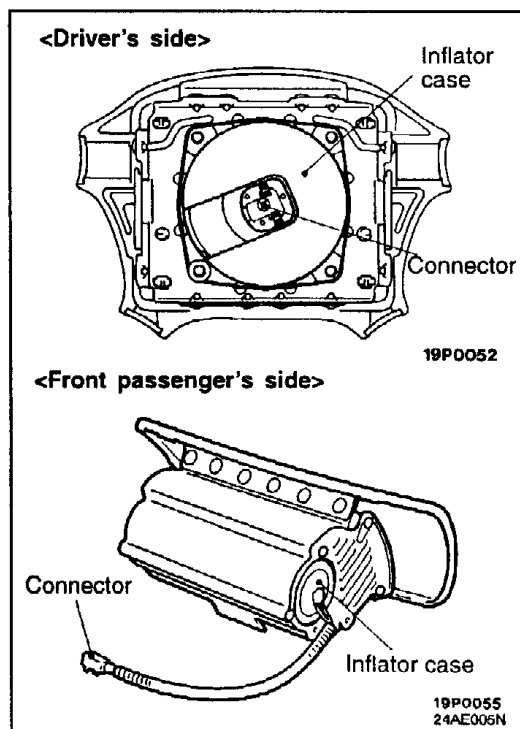
1. Replace the following parts with new ones.
 - SRS-ECU (Refer to P.52B-23.)
 - Air bag module (Refer to P.52B-24.)
2. Check the following parts and replace if there are any malfunctions.
 - Clock spring (Refer to P.52B-24.)
 - Steering wheel, steering column and intermediate joint
 - (1) Check wiring 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, binding 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-6.)

WHEN AIR BAG DOES NOT DEPLOY IN LOW-SPEED COLLISION.

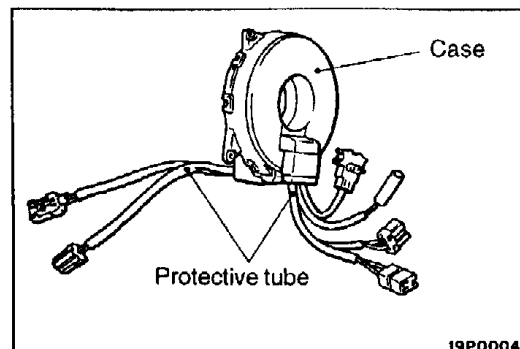
Check the SRS components. If the SRS components are showing any visible damage such as dents, cracks, or deformation, replace them with new ones. Concerning parts removed for inspection, replacement with new parts and cautionary points for working, refer to appropriate INDIVIDUAL COMPONENT SERVICE, P.52B-22.

**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, binding 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-6.)

INDIVIDUAL COMPONENT SERVICE

If the SRS components are to be removed or replaced as a result of maintenance, troubleshooting, etc., follow each procedure. (SRS Air Bag Control Unit: refer to P.52B-23, Air Bag Modules and Clock Spring: refer to P.52B-24.)

Caution

1. **SRS components should not be subjected to heat over 93°C, so remove the SRS-ECU, air bag modules and clock spring before drying or baking the vehicle after painting. Recheck SRS airbag system after re-installing components. (Refer to GROUP 00 – Maintenance Service.)**
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.**

SRS AIR BAG CONTROL UNIT (SRS-ECU)

Caution

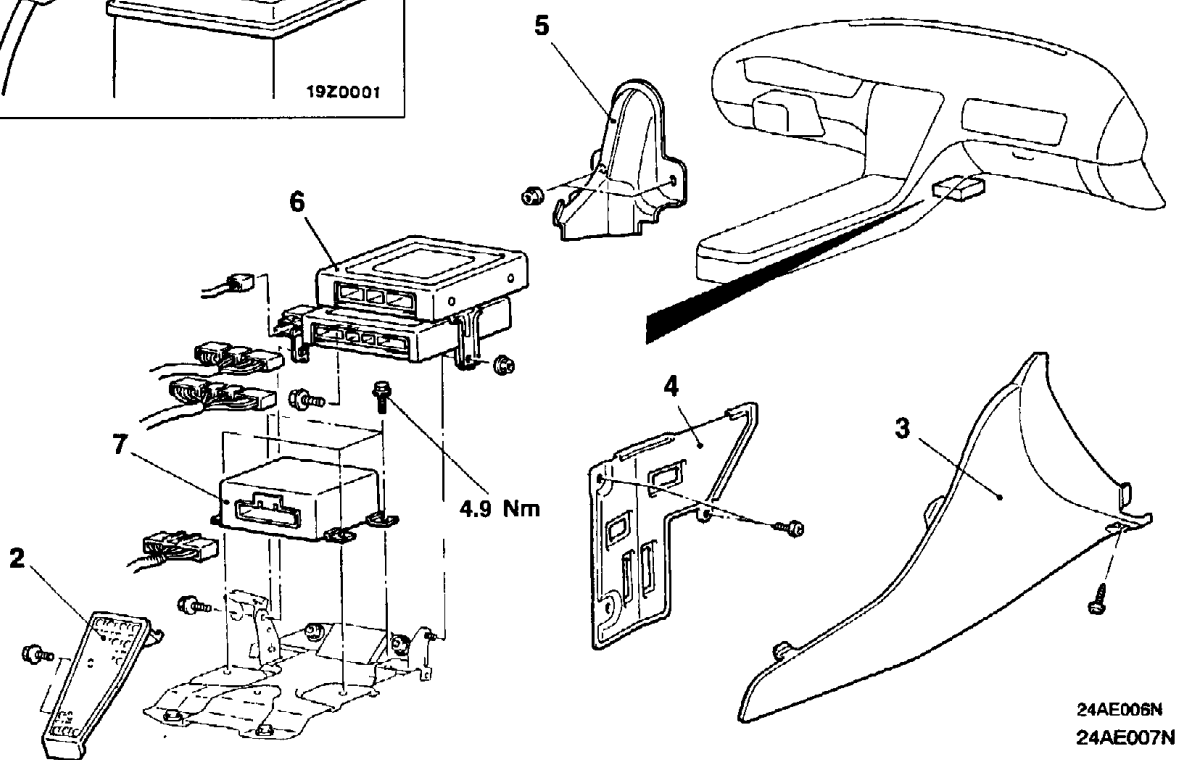
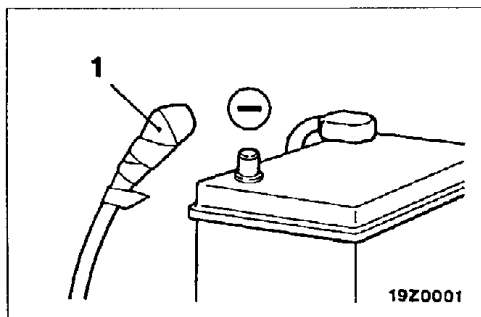
1. Never attempt to disassemble or repair the SRS-ECU. If faulty, replace it.
2. Do not drop or subject the SRS-ECU to impact or vibration. If denting, cracking, deformation, or rust are discovered in the SRS-ECU, replace it with a new SRS-ECU. Discard the old one.

3. After deployment of an air bag, replace the SRS-ECU with a new one.
4. Never use an ohmmeter on or near the SRS-ECU, and use only the special test equipment described on P.52B-7.

REMOVAL AND INSTALLATION

Pre-removal Operation

- Turn the ignition key to the "LOCK" position.



Removal steps

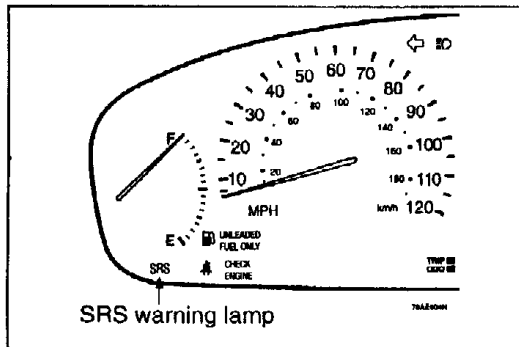
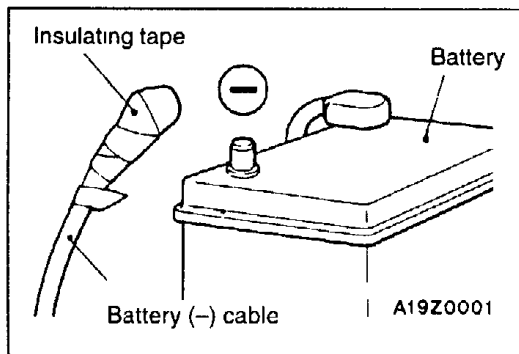
- Post-installation inspection
- 1. Negative (-) battery cable connection
- 2. Footrest
- 3. Console side cover (LH and RH)
- 4. Floor carpet reinforcement (LH and RH)

- 5. Harness protector
- 6. Engine-A/T-ECU and A/T control relay
- 7. SRS-ECU

◀A▶

▶B▶

▶A▶



REMOVAL SERVICE POINT

◀A▶ NEGATIVE (-) BATTERY CABLE DISCONNECTION

Disconnect the negative battery cable from the battery and tape the terminal.

Caution

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-6.)

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. Turn the ignition key to the "ON" position.
2. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain off for at least 45 seconds after turning off?
3. If yes, SRS system is functioning properly.
If no, consult page 52B-8.

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-8.)

AIR BAG MODULES AND CLOCK SPRING

Caution

1. Never attempt to disassemble or repair the air bag modules or clock spring. If faulty, replace the component.
2. Do not drop the air bag modules or clock spring or allow contact with water, grease or oil.
Replace the component if a dent, crack, deformation or rust is detected.
3. 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.

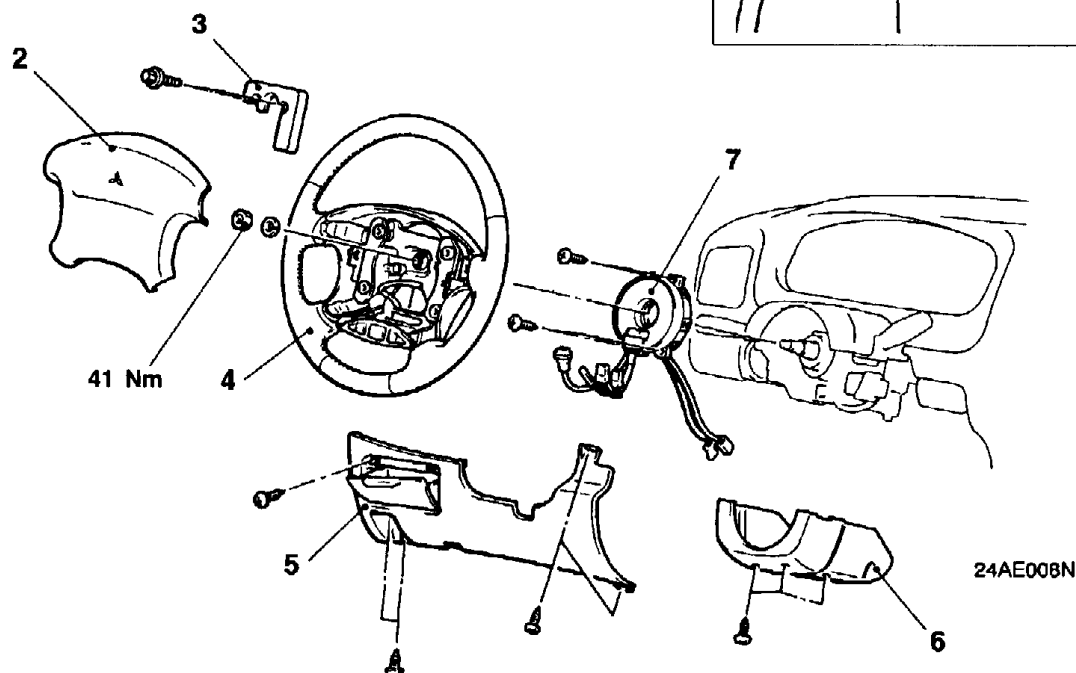
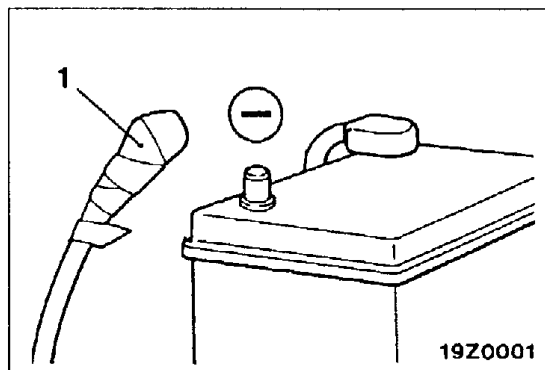
4. Do not expose the air bag modules to temperatures over 93°C.
5. After deployment of an air bag, replace the clock spring with a new one.
6. Wear gloves and safety glasses when handling air bags that have already deployed.
7. An undeployed air bag module should only be disposed of in accordance with the procedures on page 52B-31.

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.

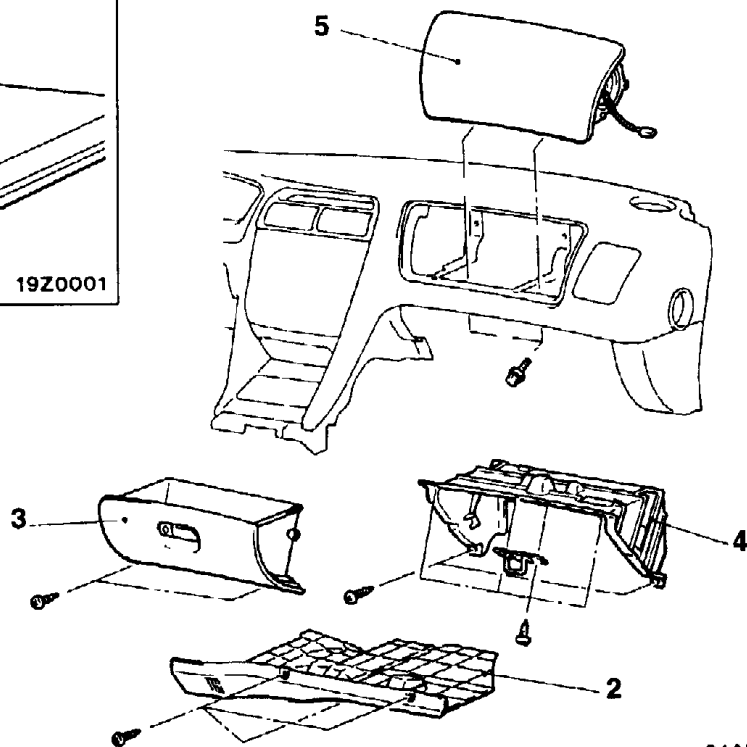
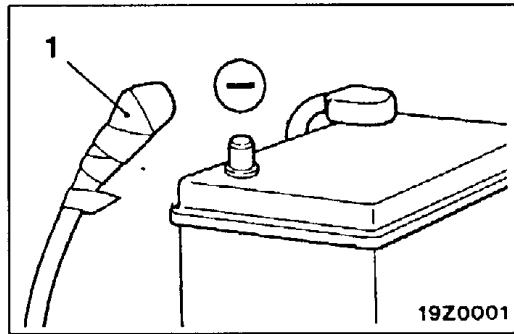
**Air bag module removal steps**

- ◀A▶ ▶D▶ • Post-installation inspection
 ▶B▶ 1. Negative (-) battery cable connection
 ▶A▶ 2. Air bag module
 ▶A▶ • Pre-installation inspection

Clock spring removal steps

- ◀A▶ ▶D▶ • Post-installation inspection
 ▶B▶ 1. Negative (-) battery cable connection
 ▶C▶ 2. Air bag module
 ▶C▶ 3. Weight
 ▶D▶ ▶C▶ 4. Steering wheel
 ▶B▶ 5. Instrument lower panel
 ▶A▶ 6. Column cover lower
 ▶A▶ 7. Clock spring
 ▶A▶ • Pre-installation inspection

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



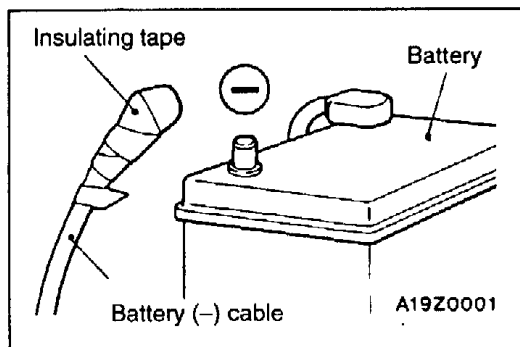
24AE010N

24AE011N

Air bag module removal steps

- ◀A▶ ▶D▶
- Post-installation inspection
 - 1. Negative (-) battery cable connection
 - 2. Undercover

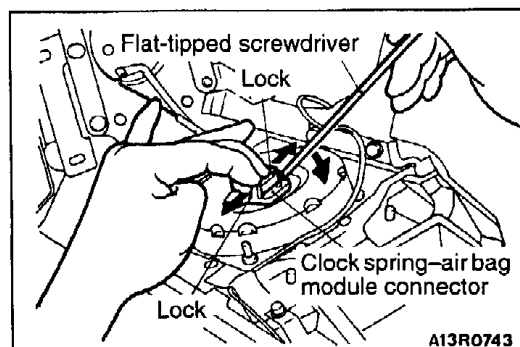
- ◀E▶ ▶A▶
- 3. Glove box assembly
 - 4. Glove box case
 - 5. Air bag module
 - Pre-installation inspection

**REMOVAL SERVICE POINTS****◀A▶ NEGATIVE (-) BATTERY CABLE DISCONNECTION**

Disconnect the negative battery cable from the battery and tape the terminal.

Caution

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-6.)

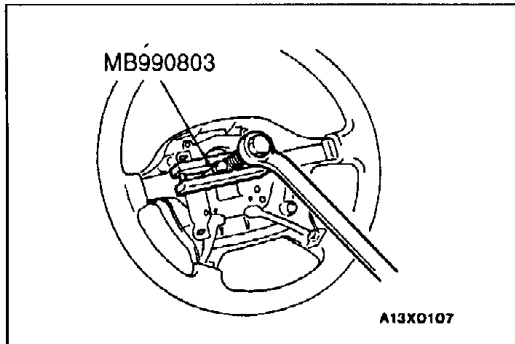
**◀B▶ AIR BAG MODULE REMOVAL (DRIVER'S SIDE)**

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

Caution

1. When disconnecting 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.



◀C▶ STEERING WHEEL REMOVAL

Caution

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

◀D▶ CLOCK SPRING REMOVAL

Caution

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

◀E▶ 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" (P.52B-29).

Caution

Dispose of air bag modules only according to the specified procedure. (Refer to P.52B-31.)

2. Connect the battery (–) terminal.
3. Connect the MUT-II to the diagnosis connector.

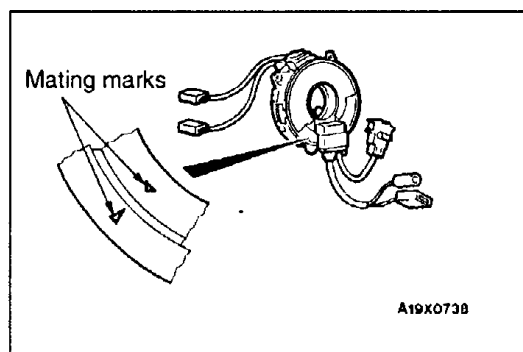
Caution

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

4. Turn the ignition key to the "ON" position.
5. Conduct diagnostic test using the MUT-II to ensure entire SRS operates properly.
6. Turn the ignition key to the "LOCK" 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-6.)



►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 it back 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 rotate completely 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.

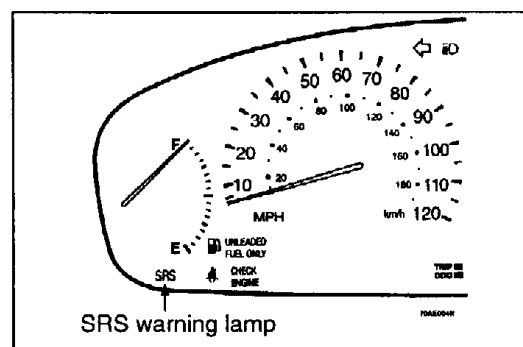
►C◄ STEERING WHEEL INSTALLATION

1. Before installing 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

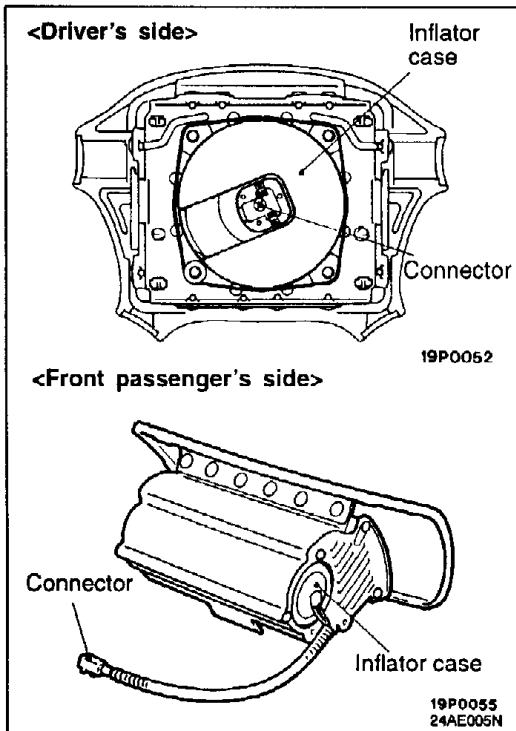
Be sure when installing the steering wheel, that the harness of the clock spring does not become caught or tangled.

2. After securing the steering wheel, turn the steering wheel all the way in both directions to confirm that steering wheel rotation is normal.



►D◄ POST-INSTALLATION INSPECTION

1. Turn the ignition key to the "ON" position.
2. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain off for at least 45 seconds after turning off?
3. If yes, SRS system is functioning properly. If no, consult page 52B-8.



INSPECTION

AIR BAG MODULE CHECK

If any improper part is found during the following inspection, replace the air bag module with a new one. Dispose the old one according to the specified procedure. (Refer to P.52B-31)

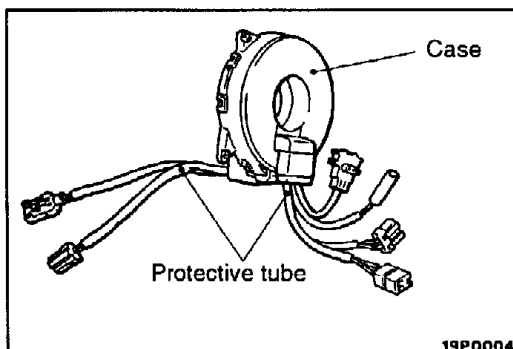
Caution

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 bag 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 or dash to check fit or alignment.

Caution

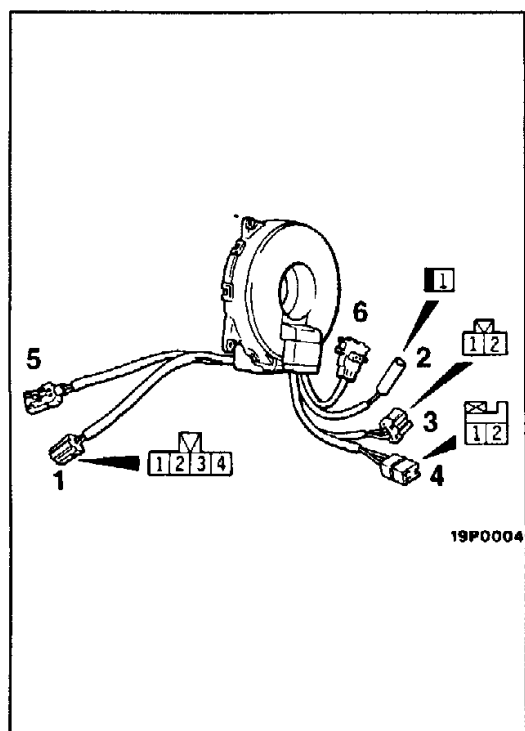
If dents, cracks, deformation, or rust are discovered in the air bag module, replace it with a new one. Dispose of the old one according to the specified procedure. (Refer to P.52B-31.)



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.

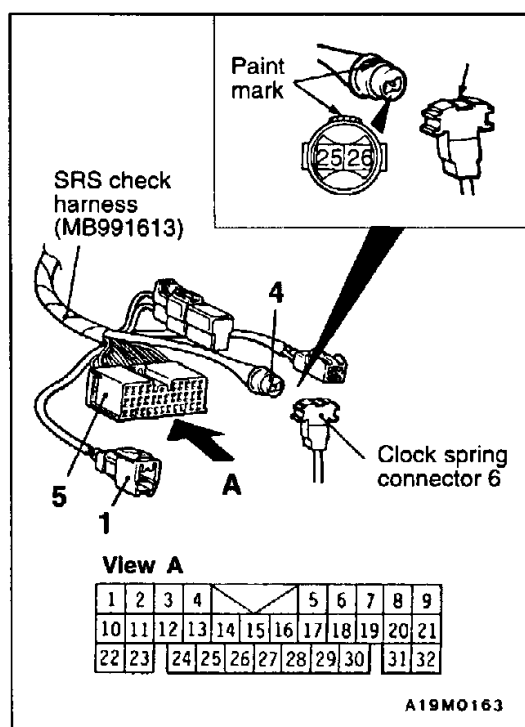


3. Check for continuity between the No.1 connector of the clock spring and connectors No.2, 3 and 4

NOTE:

Connector No.1 terminal 4 and connector No.3 are provided only on vehicles equipped with audio system remote control.

Connector No.	1				2	3		4	
Terminal No.	1	2	3	4	1	1	2	1	2
Continuity between terminals	○					○			○
		○							
		○						○	
			○	○					
			○	○			○		



4. Align the paint mark of the SRS check harness connector No.4 with the notch in clock spring connector No.6 (arrow in the illustration) to connect the connectors Nos.6 and 4.
5. Connect SRS check harness connector No.1 with clock spring connector No.5.
6. Check continuity between terminals 22 and 25 and between terminals 23 and 24 of the SRS check harness connector No.5.

AIR BAG MODULE DISPOSAL PROCEDURES

Before disposing of an air bag or a vehicle which is equipped with it, follow the procedures below to deploy the air bag (s).

UNDEPLOYED AIR BAG MODULE DISPOSAL

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.

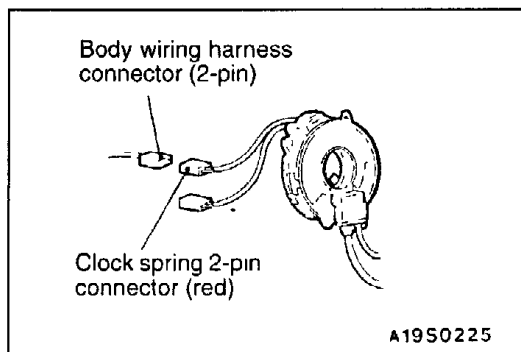
DEPLOYMENT INSIDE THE VEHICLE

(when disposing of a vehicle)

1. Open all windows and doors of the vehicle. 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

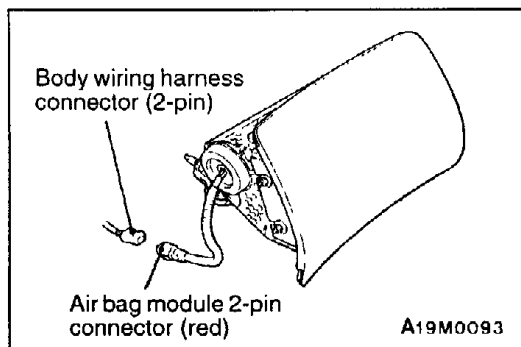
Wait at least 60 seconds after disconnecting the battery cables before doing any further work.
(Refer to P.52B-6.)



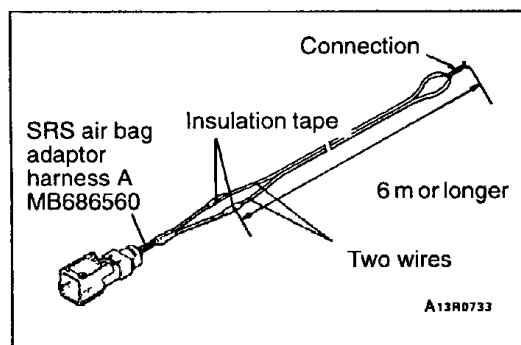
3. To deploy the air bag module (driver's side):
 - (1) Remove the steering column cover lower.
 - (2) Remove the connection between the clock spring 2-pin connector (red) and the body wiring harness connector.

NOTE

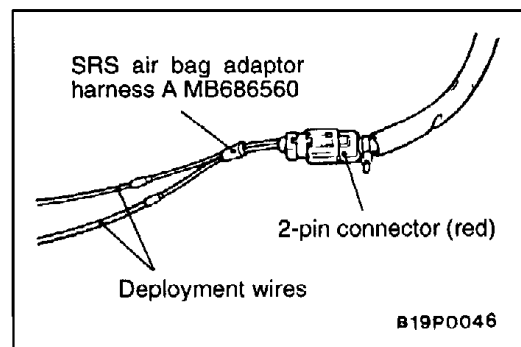
If the clock spring connector is disconnected from the body wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.



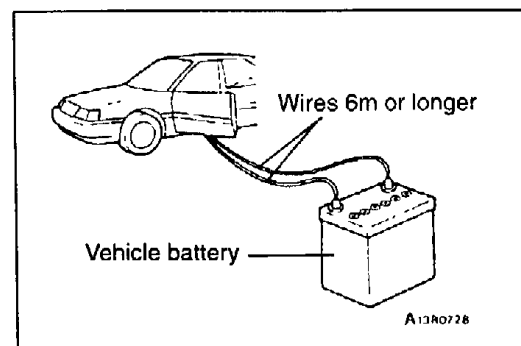
4. To deploy the air bag module (front passenger's side):
 - (1) Remove the glove box. (Refer to P.52B-26.)
 - (2) Remove the connection between the air bag module (front passenger's side) connector (red 2-pin) and the body wiring harness connector.



5. Connect two wires, each six metres or longer, to the two leads of SRS air bag adaptor 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.



6. Connect the clock spring or air bag module (front passenger's side) 2-pin connector (red) to SRS air bag adaptor harness A and pass the deployment wires out of the vehicle.



7. 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. Wear safety glasses.

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-36) 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
8. After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-36)

DEPLOYMENT OUTSIDE THE VEHICLE

Caution

1. This should be carried out in a wide, flat area at least 6 metres 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.

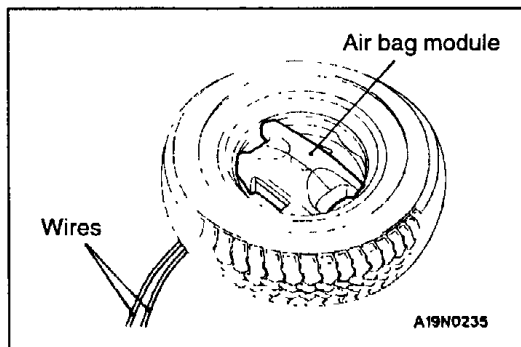
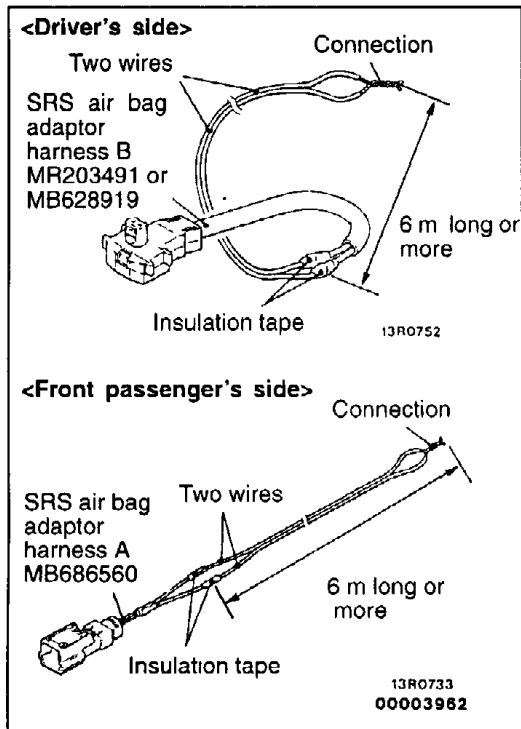
Caution

Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-6.)

2. Remove the air bag module from the vehicle. (Refer to P.52B-26.)

Caution

The air bag module should be stored on a flat surface and placed so that the pad cover face up. Do not place anything on top of it.



3. Connect two wires, each six metres or longer, to the two leads of SRS air bag adaptor harness B <driver's side> or SRS air bag adaptor harness A <front passenger'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.

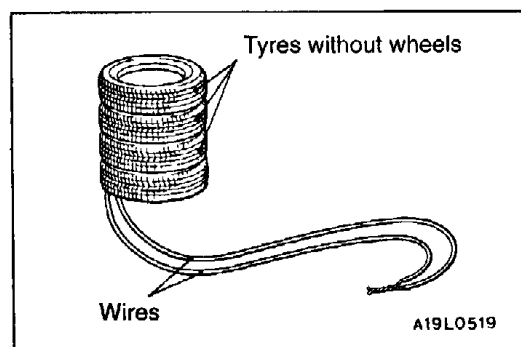
4. Set the air bag modules as follows:

<Air bag module (driver's side)>

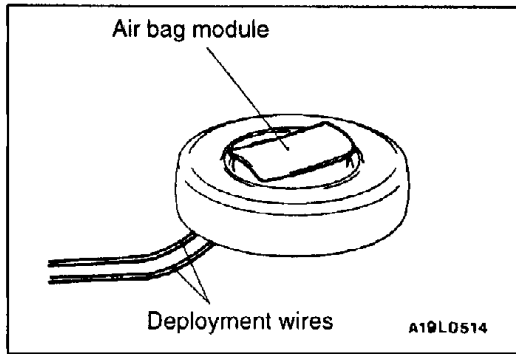
- (1) Take the SRS air bag adaptor harness B that is connected to the wires, pass it beneath an old tyre and wheel assembly, and connect it to the air bag module.
- (2) Pass thick wire through the air bag module mounting hole, and then secure the air bag module to an old tyre with a wheel in it so that 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.



- (3) Place three old tyres with no wheels on top of the tyre secured to the air bag module.

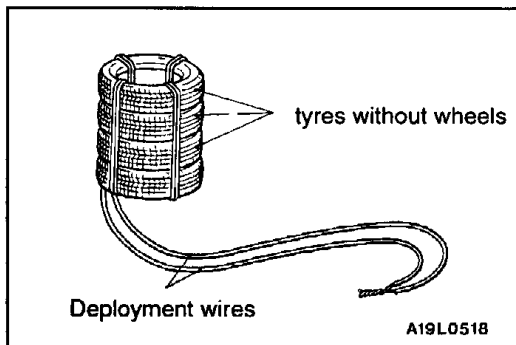


<Air bag module (front passenger's side)>

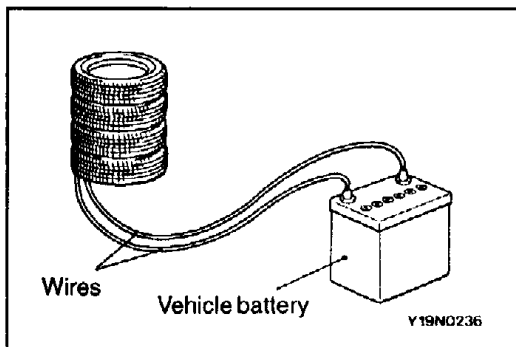
- (1) Connect the deployment wires to the SRS air bag adaptor harness A, pass it beneath the tyre and wheel assembly, and connect it to the air bag module.
- (2) Pass thick wires into the hole of the air bag module bracket, and secure it to the wheel of an old tyre and wheel (4 locations), with the air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



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



5. At a location as far away from the air bag module as possible, and from a shielded position, disconnect the two connected 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-36) 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.
6. After deployment, dispose of the air bag module according to the Deployed Air Bag Module Disposal Procedures.

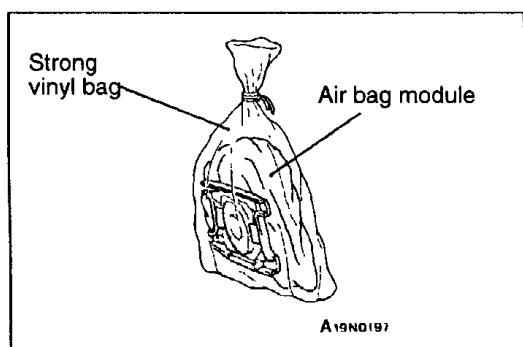
DEPLOYED AIR BAG MODULE DISPOSAL

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.

Caution

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



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

CHASSIS ELECTRICAL

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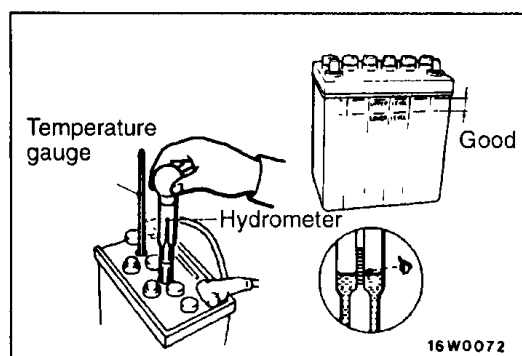
WARNING!

- (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) If it is possible that the SRS components are subjected to heat over 93°C baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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 the asterisk (*) in the table of contents in each group indicate operations requiring warnings.

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BATTERY

ON-VEHICLE SERVICE

FLUID LEVEL AND SPECIFIC GRAVITY CHECK

1. Check the battery electrolyte level at regular intervals. Maintain the electrolyte at a level approximately 6 mm above the plate using mineral free water.
2. 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.

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

D₂₀: Specific gravity of the battery fluid calculated for 20°C.

D_t: Actually measured specific gravity

t: Actually measured temperature

BATTERY INSPECTION

Make sure ignition switch is in OFF position and all battery feed accessories are OFF.

1. Disconnect ground cable from battery before disconnecting (+) cable.
2. Remove battery from vehicle.

Caution

Care should be taken in the event battery case is cracked or leaking to protect hands from the electrolyte. A suitable pair of rubber gloves (not the household type) should be worn when removing battery by hand.

3. Inspect battery carrier for damage caused by loss of acid from battery. If acid damage is present, it will be necessary to clean area with a solution of clean warm water and baking soda. Scrub area with a stiff bristle brush and wipe off with a cloth moistened with ammonia or baking soda in water.
4. Clean top of battery with same solutions as described in step 3
5. Inspect battery case and cover for cracks. If cracks are present, battery must be replaced.
6. Clean the battery post with a suitable battery post cleaning tool.
7. Clean the inside surfaces of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cables and broken terminal clamps.
8. Install the battery in vehicle.
9. Connect (+) and (–) cables to battery in the order of mention.
10. Tighten the clamp nut securely.

BATTERY CHARGING**Caution**

When batteries are being charged, an explosive gas forms beneath the cover of each cell. Do not smoke near batteries on charge or which have recently been charged. Do not break live circuits at the terminals of the batteries on charge. A spark will occur where the live circuit is broken.

Keep all open flames away from the battery.

Battery electrolyte temperature may temporarily be allowed to rise to 55°C. Increase of electrolyte temperature above 55°C is harmful to the battery, causing deformation of battery cell, decrease in life of battery, etc.

CHARGE RATE

If the battery specific gravity is below 1.220, the battery should be charged as outlined below.

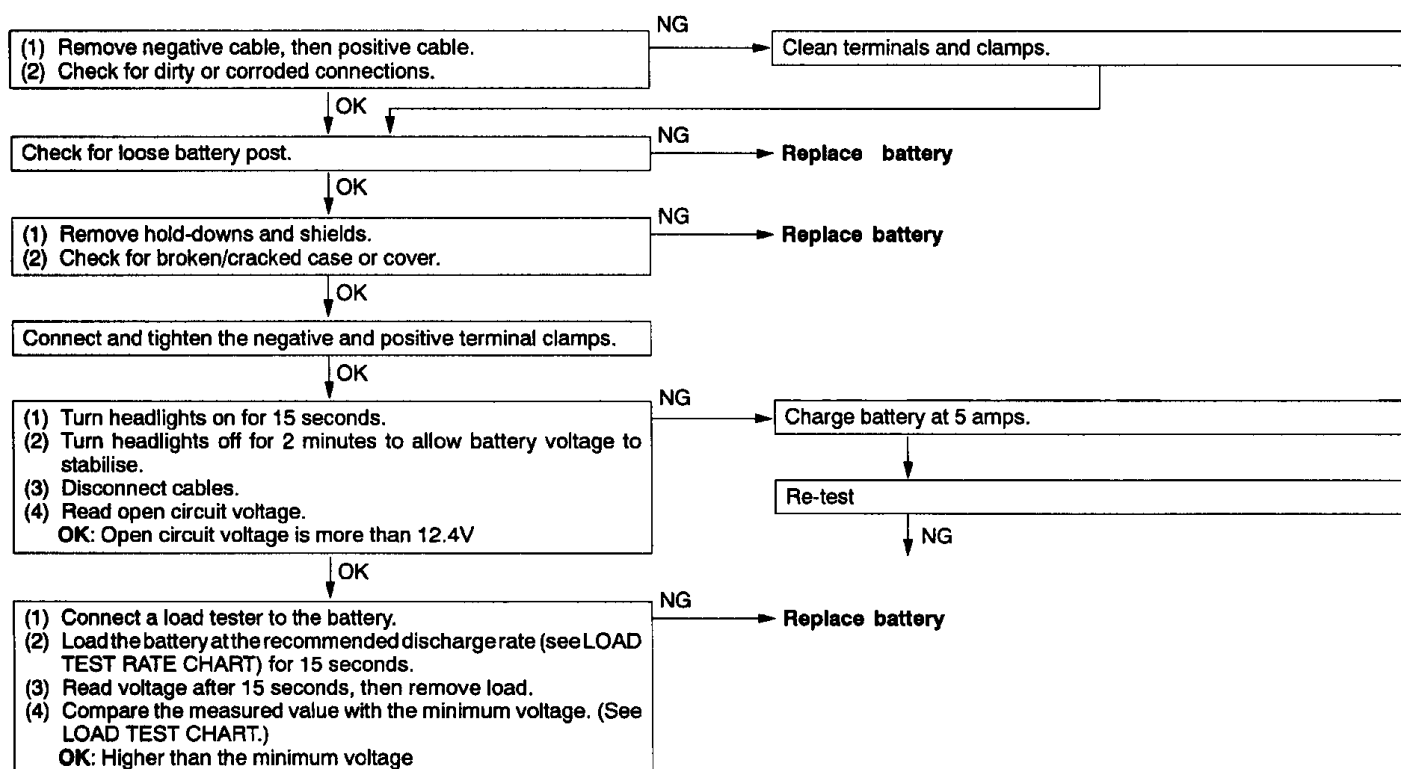
When the battery fluid specific gravity reaches 1.250–1.290 and the constant is maintained for more than an hour, charging should be stopped.

NOTE

If the battery is charged, the battery should be replaced; do not overcharge

Charge Rate Chart

Battery	12V 13 plate, 520 CCA
Slow charging	5 amps 15 hrs.
	10 amps 7.5 hrs.
Fast charging	20 amps 3.75 hrs.
	30 amps 2.5 hrs

BATTERY TESTING PROCEDURE**TEST STEP****LOAD TEST CHART**

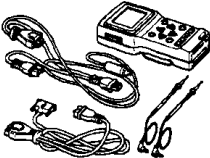
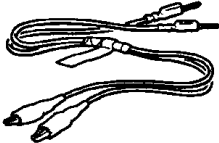
Temperature °C	21 and above	16	10	4	-1	-7	-12	-18
Minimum voltage	9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

LOAD TEST RATE CHART

	China	Except China
Load test (AMPS)	240 amps	←
Cranking rating (0°F)	520 amps	420 amps
Reserve capacity	95 minutes	←
Application	57 NAS	57 HEE

IGNITION SWITCH

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	Simplified Wiring System (SWS) diagnostic checking
		ROM pack	
	MB991529	Diagnosis code check harness	Simplified Wiring System (SWS) diagnostic checking

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSIS MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS-ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to P.54-104 for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSIS CODE CLASSIFICATION TABLE

Refer to P.54-107.

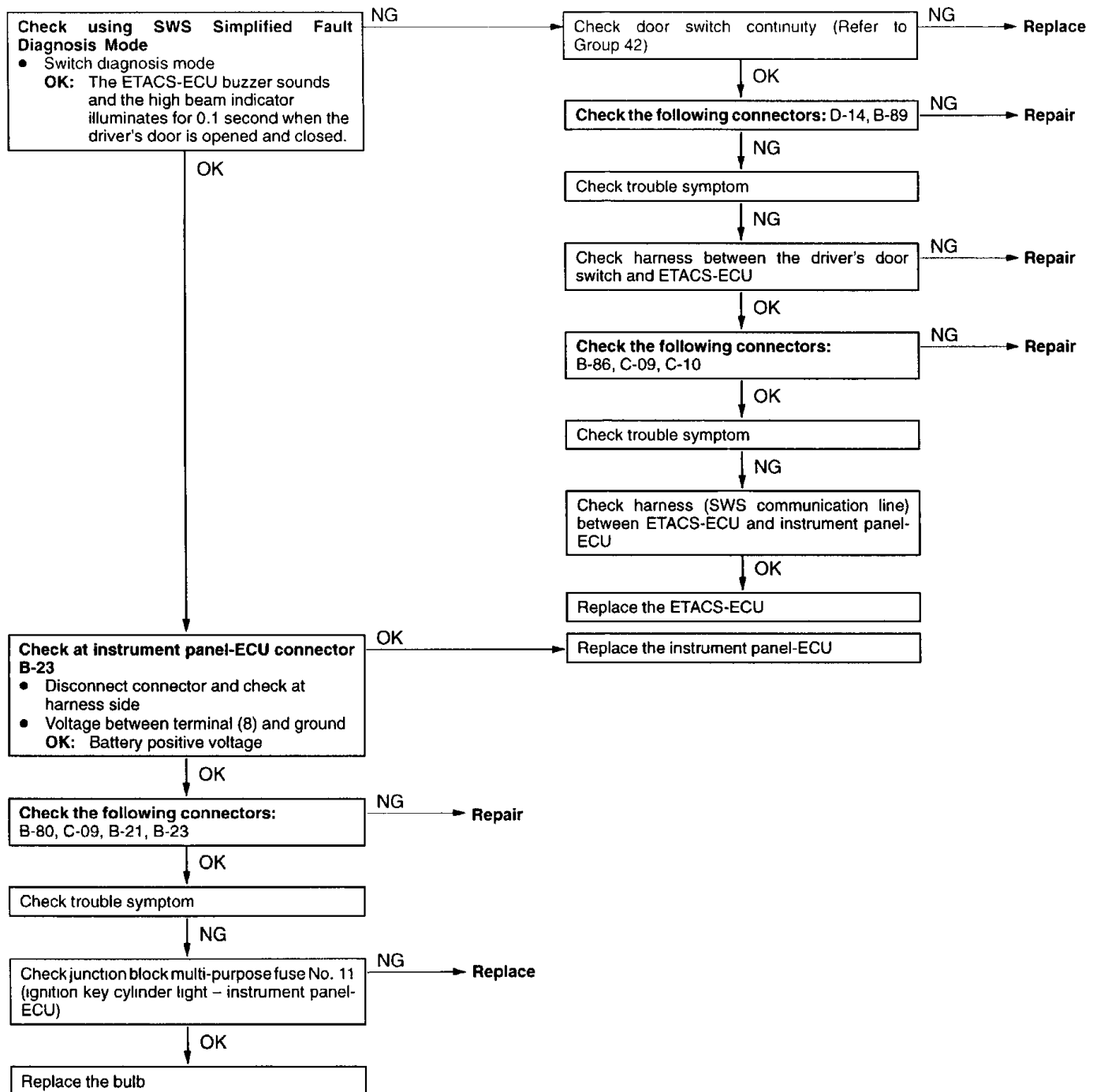
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II not possible	Refer to SWS Troubleshooting (P.54-118)	
Switching to SWS Simplified Fault Diagnosis mode not possible.		
The ignition key cylinder light does not illuminate when the drivers door is opened with the ignition OFF.	1	54-8
The warning buzzer does not sound when the drivers door is opened with the ignition key inserted.	2	54-9
When the warning buzzer is sounding, it does not stop when the ignition key is turned to ACC position.	3	54-10
When the warning buzzer is sounding, turning the ignition key to ST position or removing the key does not stop the buzzer.	4	54-10

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

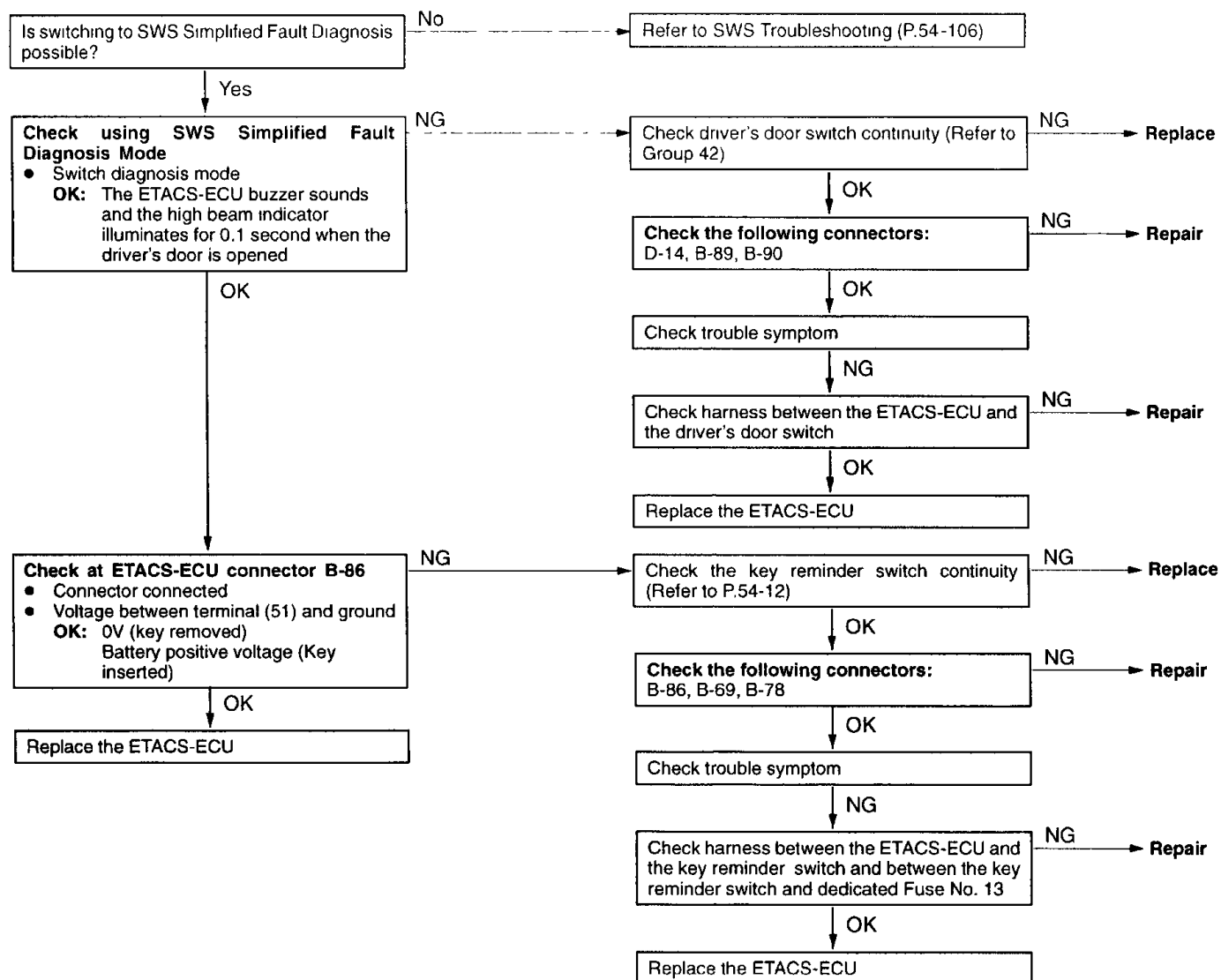
INSPECTION PROCEDURE 1

The ignition key cylinder light does not illuminate when the driver's door is opened with the ignition OFF	Probable cause
The door switch input signal circuit, instrument panel-ECU, illumination light circuit or a harness or connector may be defective.	• Door switch defective • Harness or connector defective • ETACS-ECU or instrument panel-ECU malfunction • Defective bulb



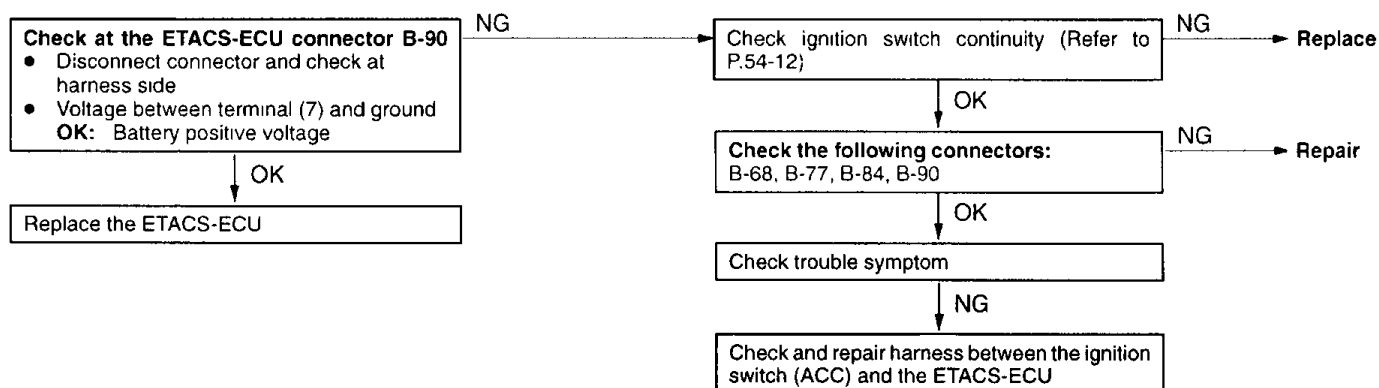
INSPECTION PROCEDURE 2

The warning buzzer does not sound when the driver's door is opened with the ignition key inserted The door switch input circuit system or key reminder switch input system may be defective	Probable cause • Door switch defective • Key reminder switch malfunction • Harness or connector defective • ETACS-ECU (buzzer) malfunction
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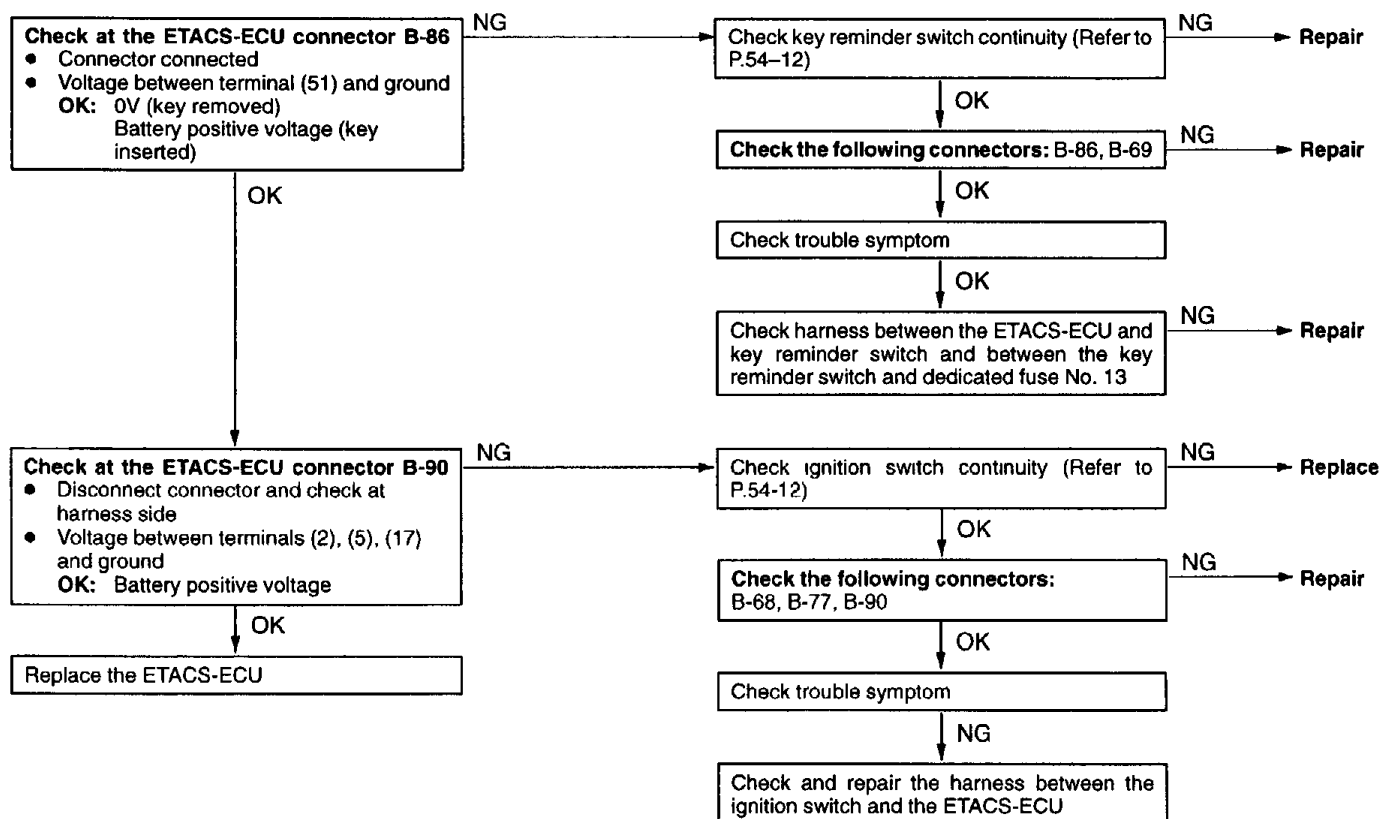
INSPECTION PROCEDURE 3

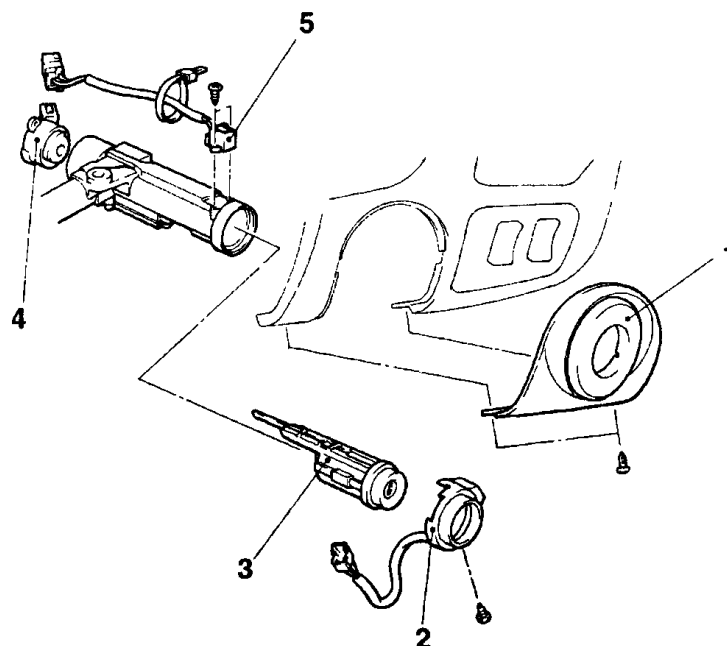
When the warning buzzer is sounding, it does not stop when the ignition key is turned to the ACC position	Probable cause
The ACC input circuit system may be defective	• Harness or connector defective • Defective bulb



INSPECTION PROCEDURE 4

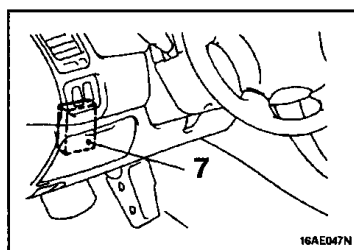
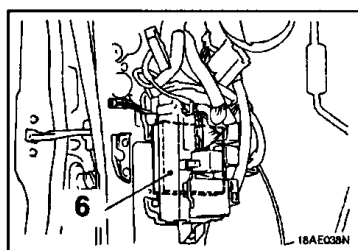
When the buzzer is sounding, turning the ignition key to ST position or removing the ignition key does not stop the buzzer	Probable cause
The ignition switch input system or key reminder input system may be defective.	• ETACS-ECU malfunction • Key reminder switch malfunction • Harness or connector defective



IGNITION SWITCH**REMOVAL AND INSTALLATION**

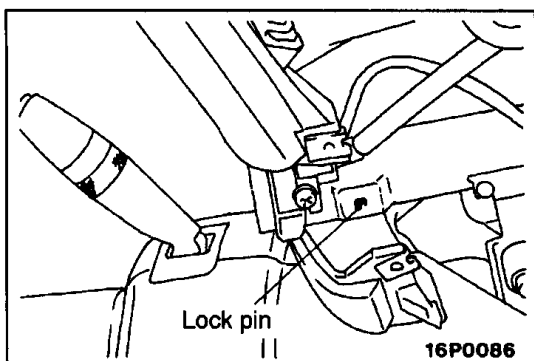
16P0232

16AE046N

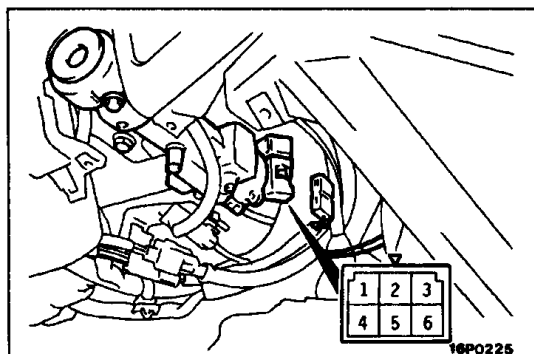
**Steering lock cylinder and ignition switch removal steps**

- Instrument lower cover (driver) (Refer to Group 52A – Instrument Panel).
1. Key cylinder panel
 2. Keyhole lighting ring

- ◀A▶
3. Steering lock cylinder
 4. Ignition switch
 5. Key reminder switch
 6. ETACS-ECU (Refer to P.54-128)
 7. Instrument panel ECU (Refer to P.54-128)

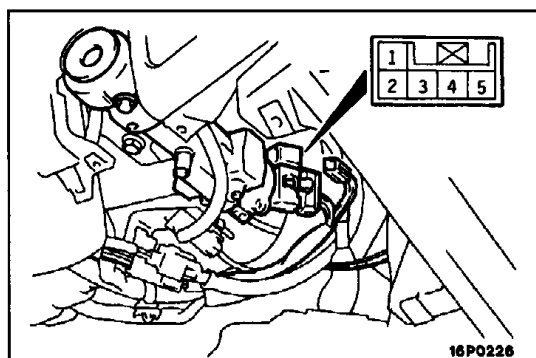
**REMOVAL SERVICE POINT****◀A▶ STEERING LOCK CYLINDER REMOVAL**

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 pull the steering lock cylinder toward you.

**INSPECTION****IGNITION SWITCH CONTINUITY CHECK**

1. Remove the instrument under cover. (Refer to Group 52A-Instrument Panel).
2. Disconnect the wiring connector from the ignition switch and connect an ohmmeter to the switch side connector.
3. Operate the ignition switch and check the continuity.

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

**KEY REMINDER SWITCH, KEY HOLE ILLUMINATION LIGHT CONTINUITY CHECK**

1. Remove the instrument undercover (Refer to Group 52A-Instrument Panel).
2. Disconnect the wiring connector from the key reminder switch and connect an ohmmeter to the switch side connector.
3. Check the continuity when the ignition key is pulled out of and inserted into the steering lock cylinder.

Ignition key	Terminal No.	
	Key reminder switch	
	2	5
Removed	○	○
Inserted		

COMBINATION METERS

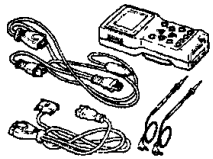
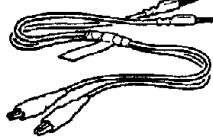
SERVICE SPECIFICATIONS

Items		Standard values
Speedometer indication error km/h	40	40–48
	80	80–92
	120	120–136
	160	160–180
Tachometer indication error r/min	1,000	±100
	3,000	±225
	5,000	±350
	6,000	±400
Fuel gauge unit resistance Ω	Float point "F"	4±1
	Float point "E"	107±1
Fuel gauge unit float height mm	A (Float point "F")	0±3
	B (Float point "E")	144±3
Fuel gauge resistance Ω	Power supply and ground	256±13
	Power supply and fuel gauge	106±5
	Fuel gauge and ground	150±8
Engine coolant temperature gauge unit resistance [at 70°C] Ω		104±13.5

SEALANT

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

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	Simplified Wiring System (SWS) diagnostic testing
		ROM pack	
	MB991529	Diagnosis code check harness	Simplified Wiring System (SWS) diagnostic testing

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSTIC MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to P.54-104 for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSTIC TROUBLE CODE CLASSIFICATION TABLE

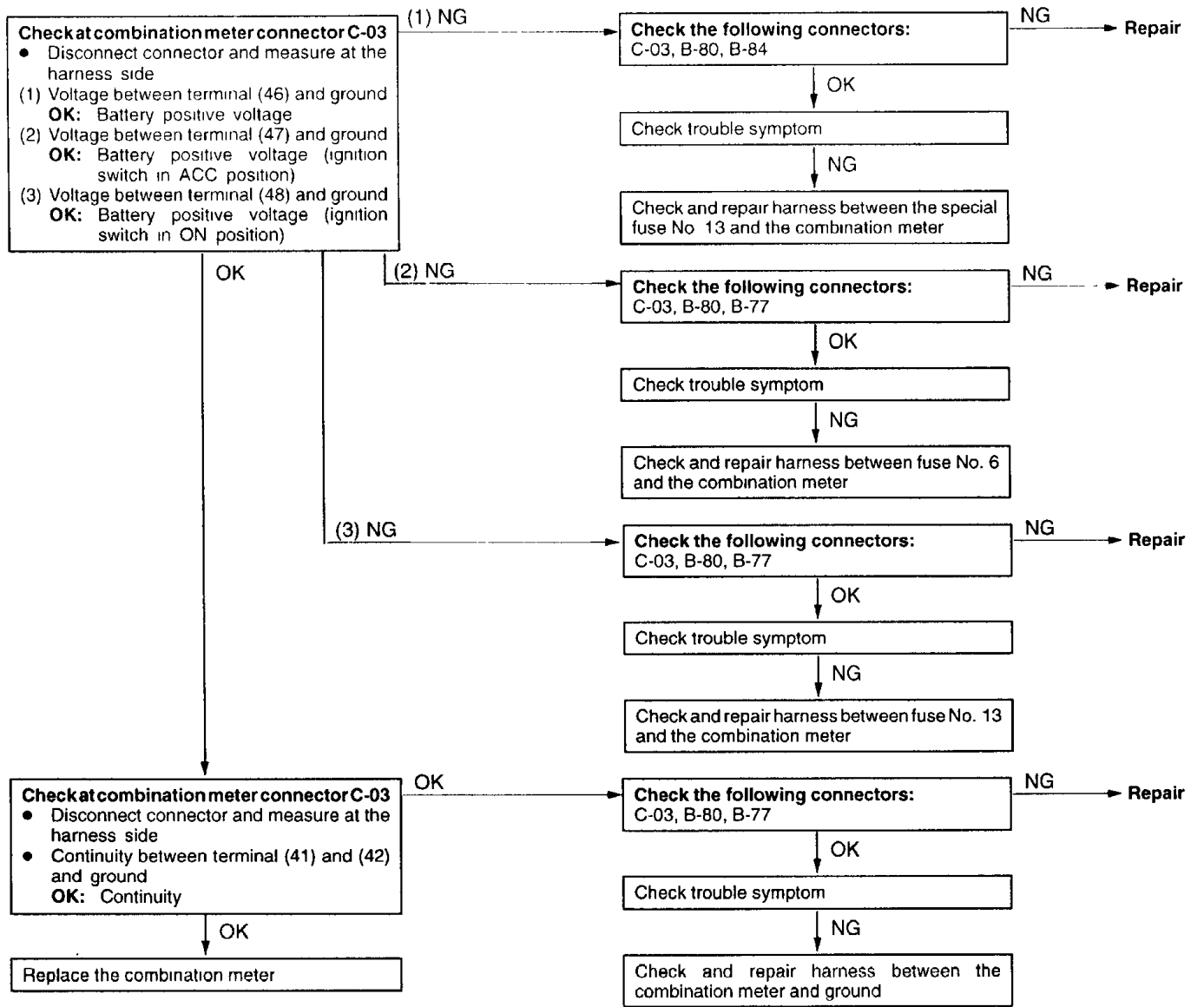
Refer to Simplified Wiring System P.54-107.

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II not possible	Refer to SWS Troubleshooting (P.54-104)	
Switching to SWS Simplified Fault Diagnosis mode not possible		
Nothing is displayed on the combination meter when the ignition is switched ON	1	54-16
Speedometer does not operate	2	54-17
Tachometer does not operate	3	54-17
Warning and indicator lamps do not illuminate when the ignition is switched ON (centre display warning lights operate normally)	4	54-18
The shift position indicator lamp does not illuminate	5	54-19
The seat belt warning lamp either does not illuminate or does not go off	6	54-20
The door open warning lamp either does not illuminate or does not go off	7	54-21
The high beam indicator lamp either does not illuminate or does not go off	8	54-22
The brake warning lamp either does not illuminate or does not go off	9	54-23
The check engine lamp either does not illuminate or does not go out	10	54-24
Vehicle speed sensor circuit check	11	54-26

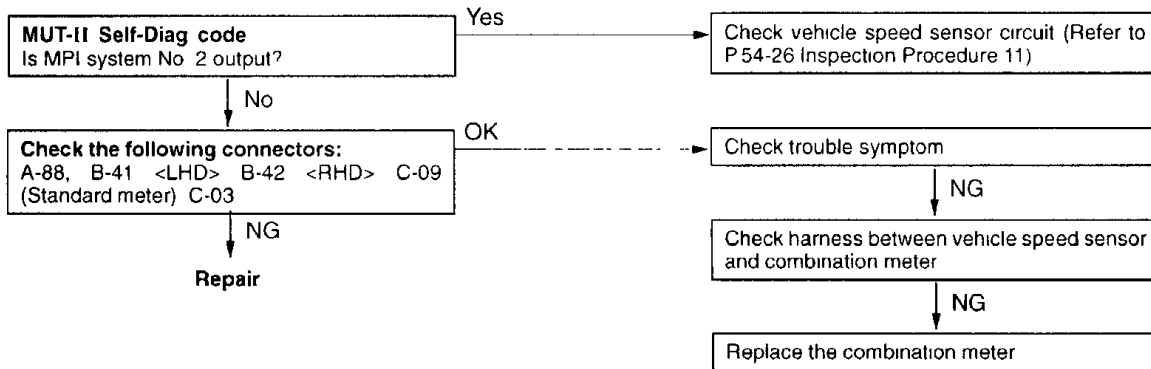
INSPECTION PROCEDURE 1

Nothing is displayed on the combination meter when the ignition is switched ON <High Contrast Meter> The combination meter power or ground circuit(s) may be defective	Probable cause • Harness or connector defective • Combination meter malfunction
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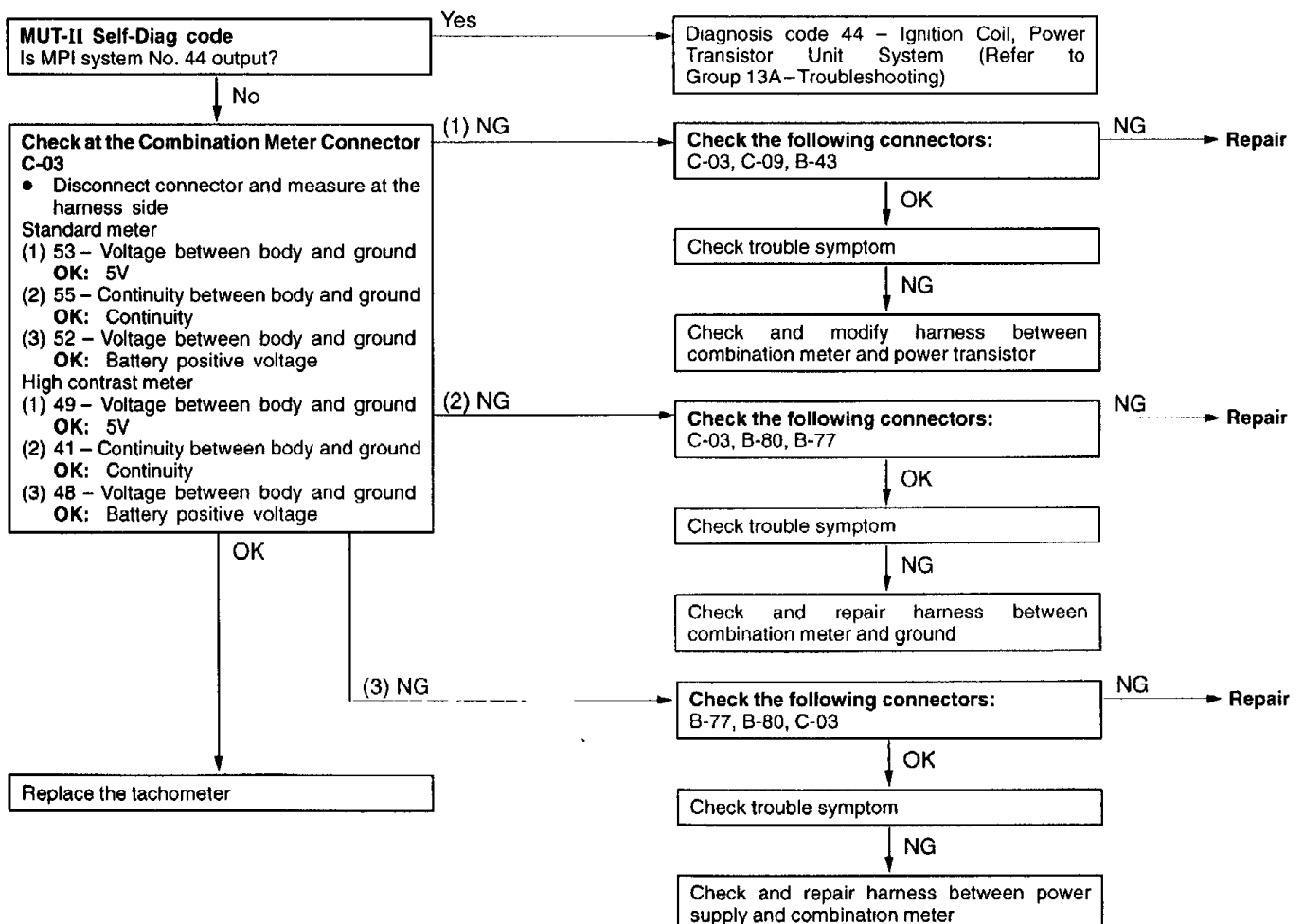
INSPECTION PROCEDURE 2

Speedometer does not operate	Probable cause
Vehicle speed sensor input system defective	- Vehicle speed sensor defective - Harness or connector defective - Combination meter malfunction



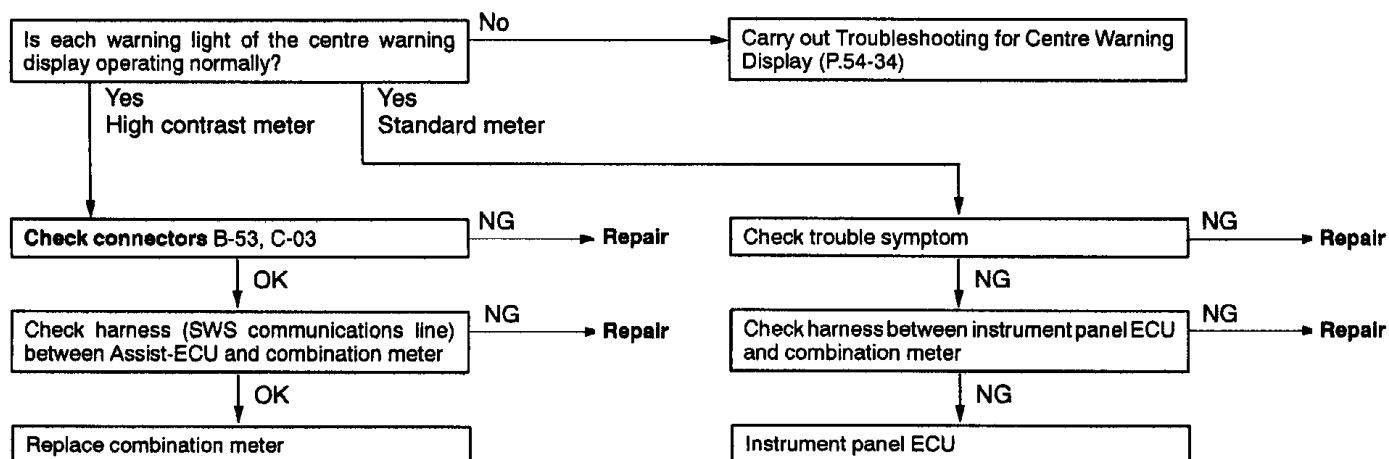
INSPECTION PROCEDURE 3

Tachometer does not operate	Probable cause
The problem could be meter power supply failure or earth circuit failure.	- Tachometer malfunction - Harness or connector defective



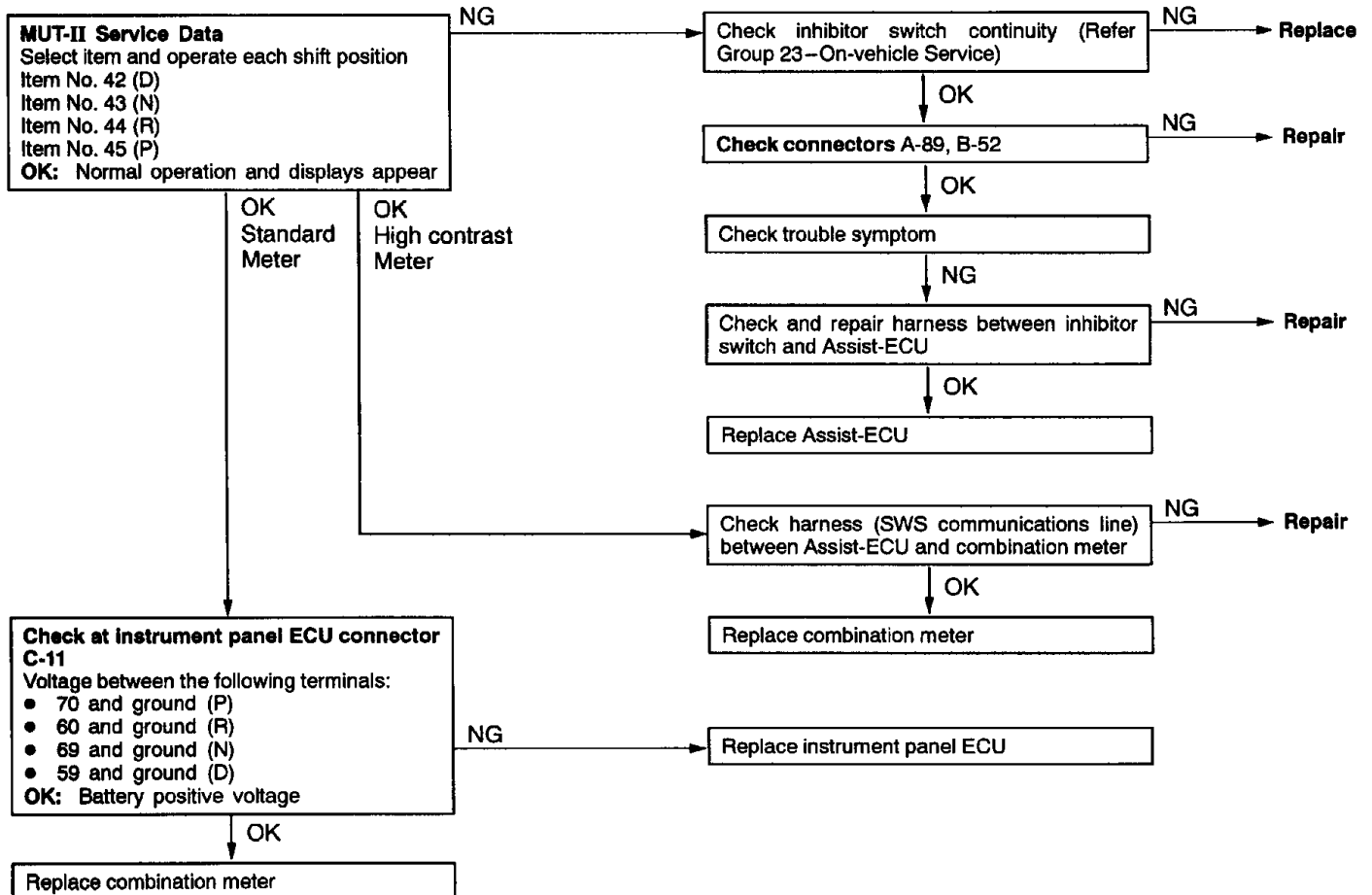
INSPECTION PROCEDURE 4

Warning and indicator lamps do not illuminate when the Ignition is switched ON (centre display warning lamps operate normally)	Probable cause
The harness between the Assist-ECU and the combination meter (SWS communication line) or the combination meter itself may be defective	• Combination meter malfunction • Harness or connector defective • Assist-ECU malfunction



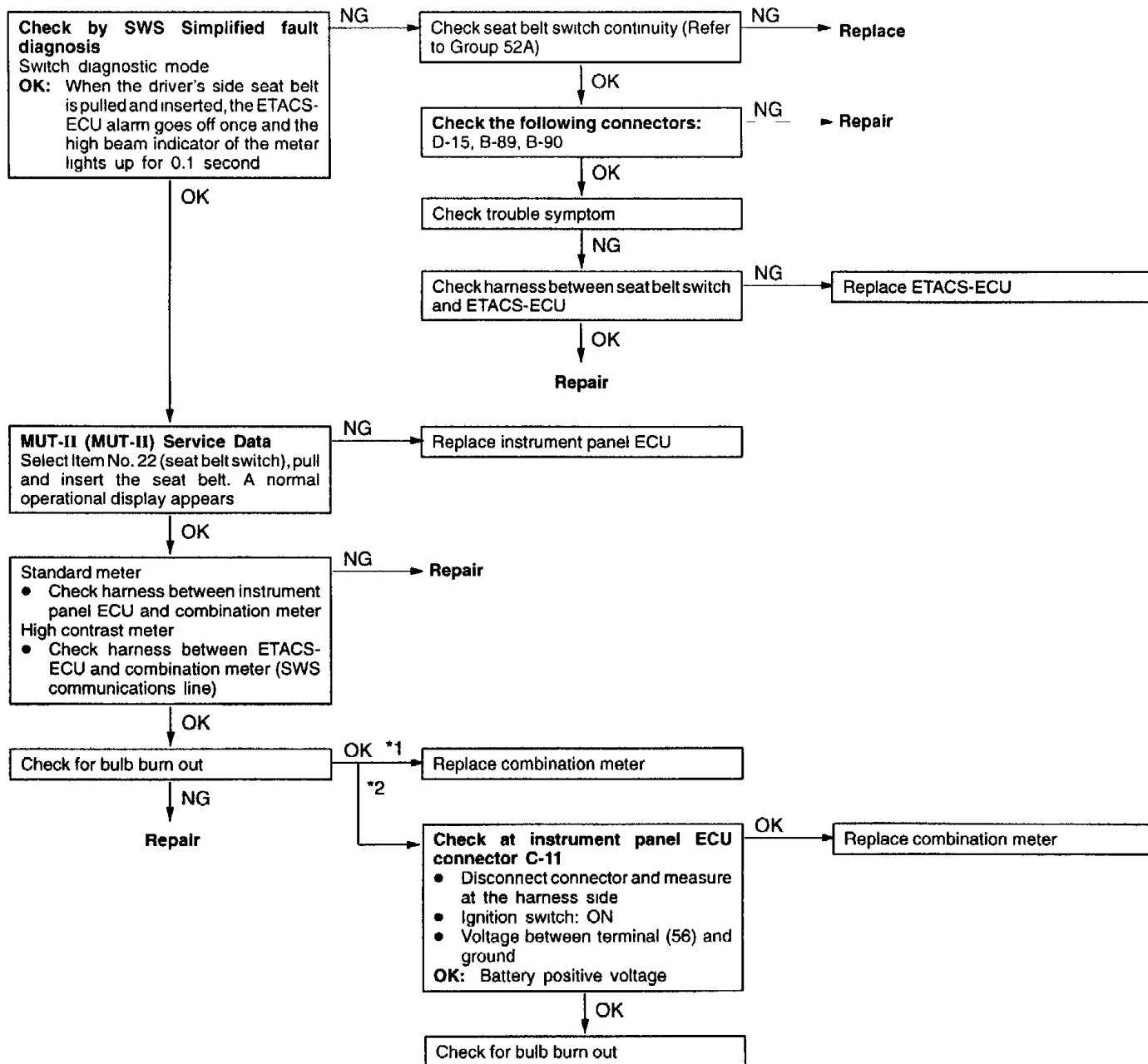
INSPECTION PROCEDURE 5

The shift position indicator does not illuminate <A/T>	Probable cause
The problem could either lie in the inhibitor switch input circuit or it may be an indicator input circuit failure.	• Inhibitor switch defective • Harness or connector defective • Instrument panel ECU malfunction • Assist-ECU malfunction • Combination meter malfunction



INSPECTION PROCEDURE 6

Seat belt warning lamp either does not illuminate or does not go out	Probable cause
The seat belt switch or warning lamp circuit may be defective	• Seat belt switch defective • ETACS-ECU or instrument panel ECU malfunction • Harness or connector defective • Combination meter malfunction



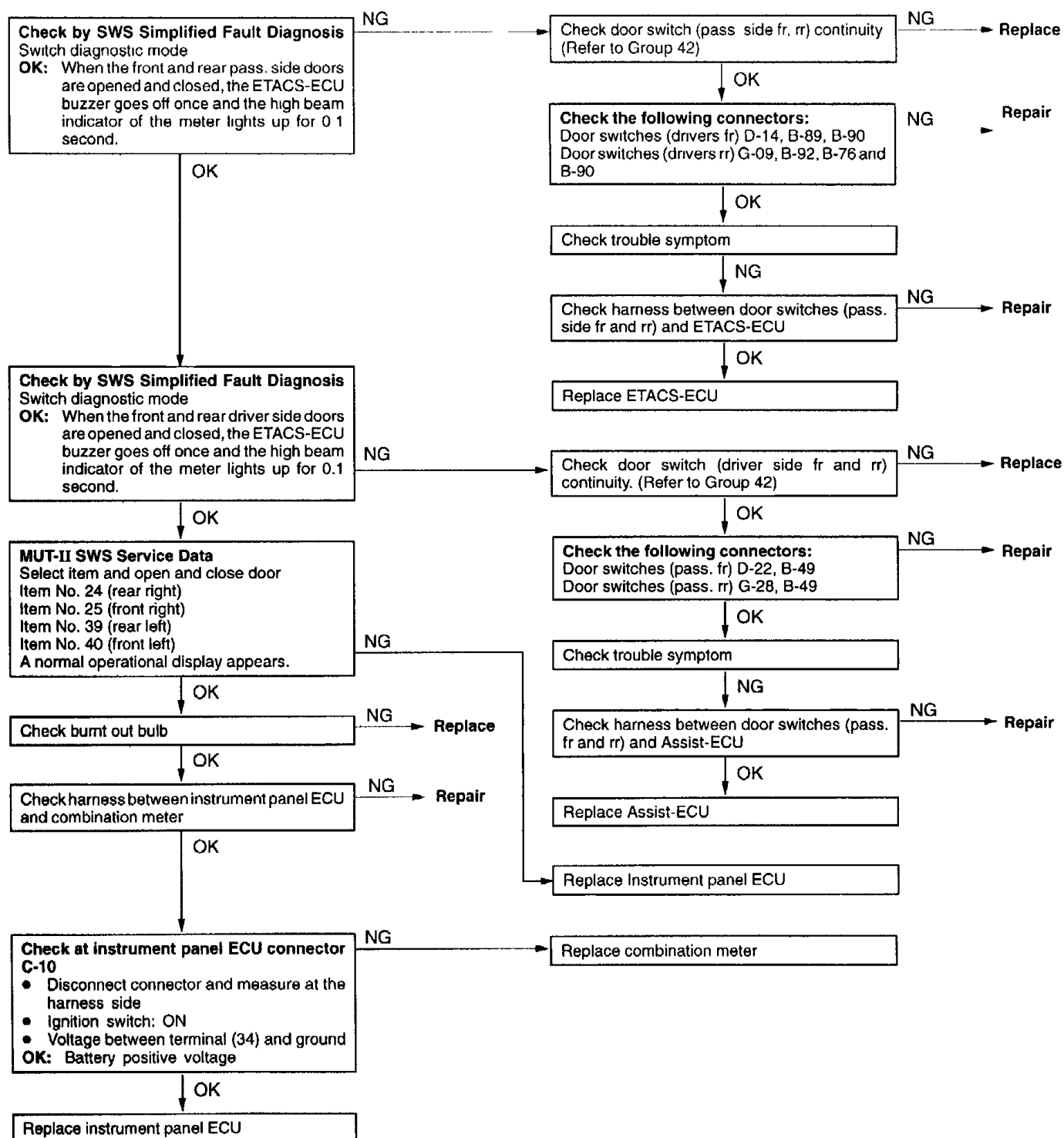
NOTE:

*1: High contrast meter

*2: Standard meter

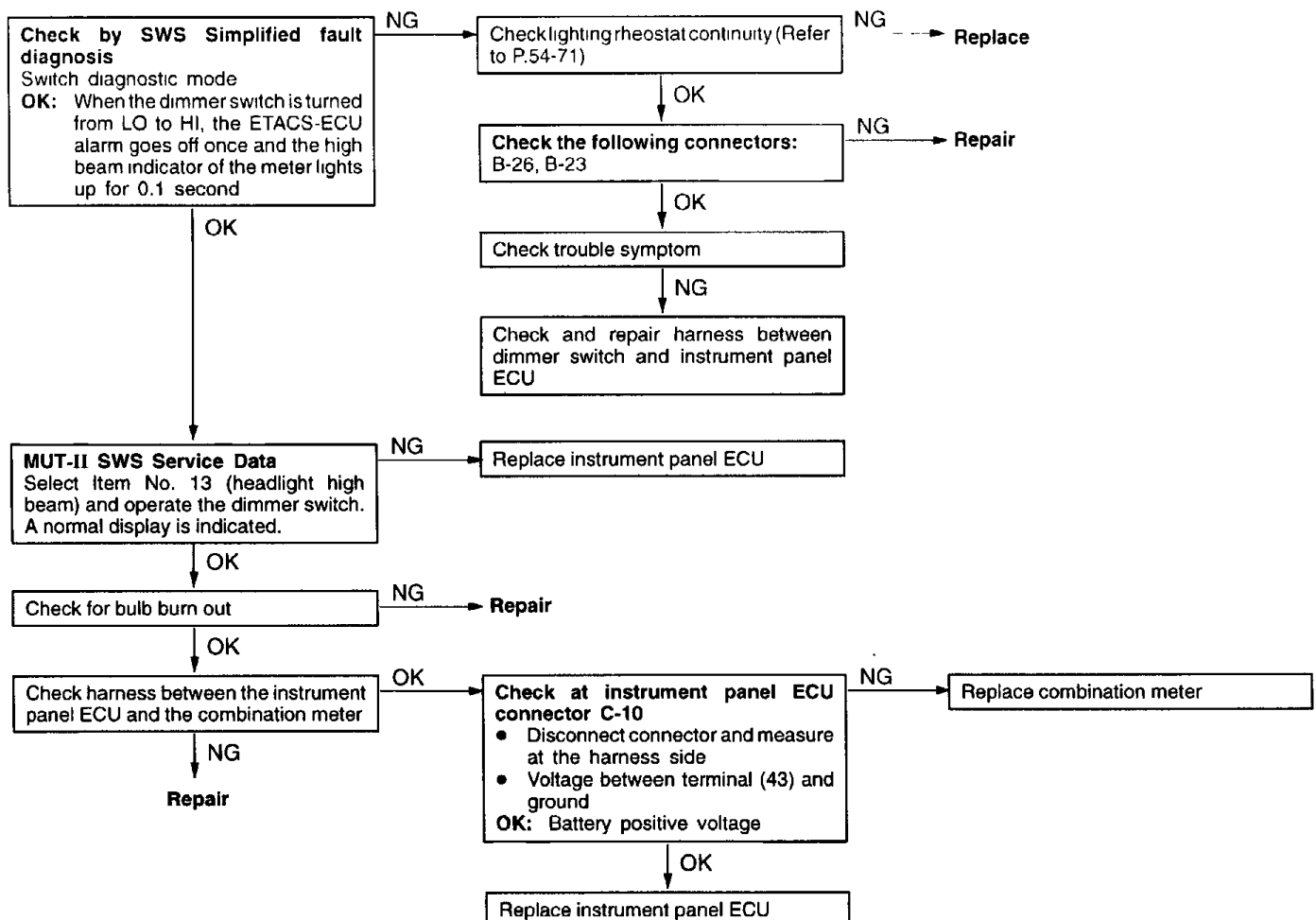
INSPECTION PROCEDURE 7

The door open warning lamp either does not illuminate or does not go out	Probable cause
Door switch or warning lamp circuit defective.	• Door switch defective • ETACS-ECU or Assist-ECU malfunction • Instrument panel ECU malfunction • Combination meter malfunction • Harness or connector defective

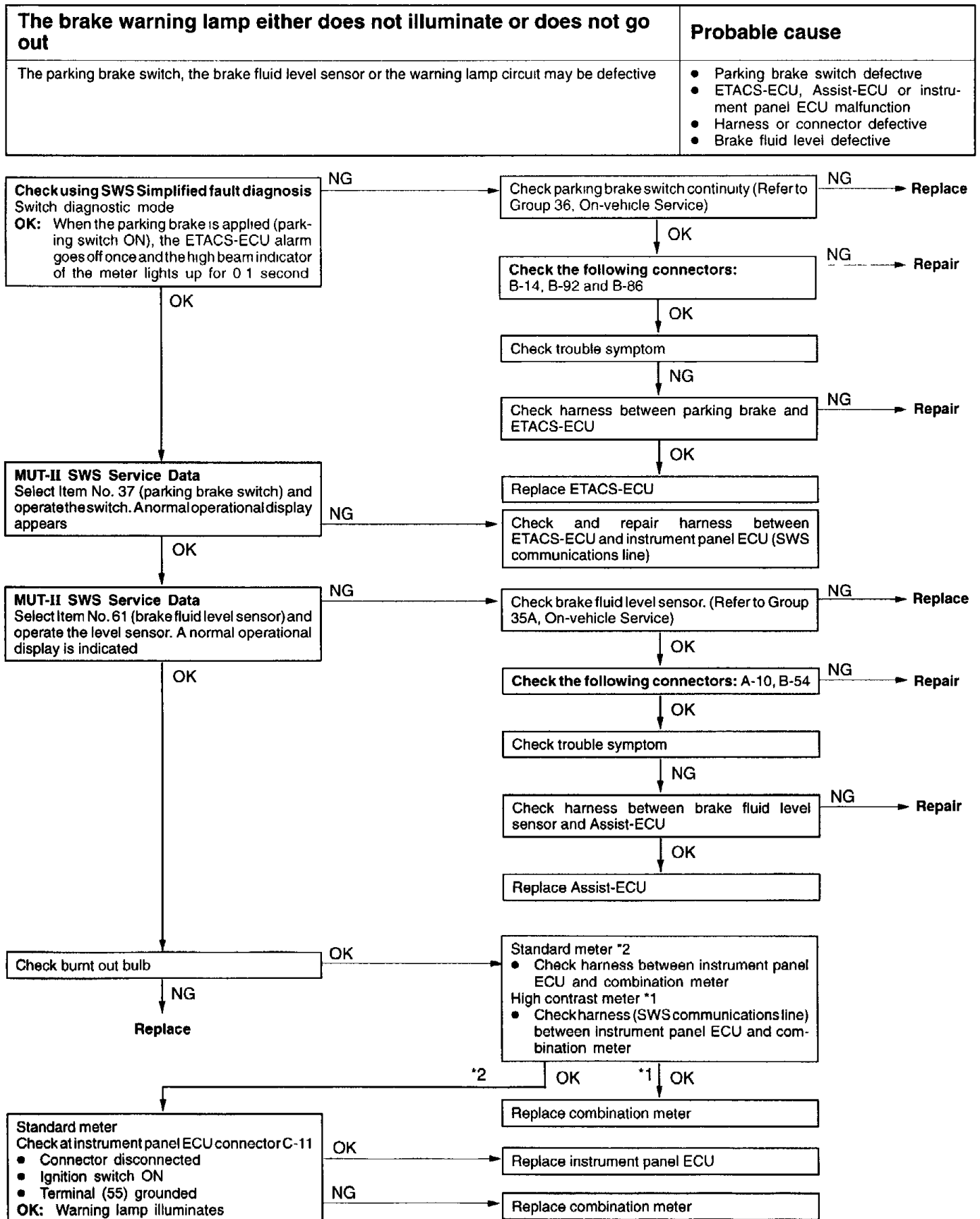


INSPECTION PROCEDURE 8

The high beam indicator lamp either does not illuminate or does not go out The lighting switch (dimmer switch) or indicator lamp circuit may be defective.	Probable cause • Lighting switch (dimmer switch) malfunction • Instrument panel malfunction • Harness or connector defective
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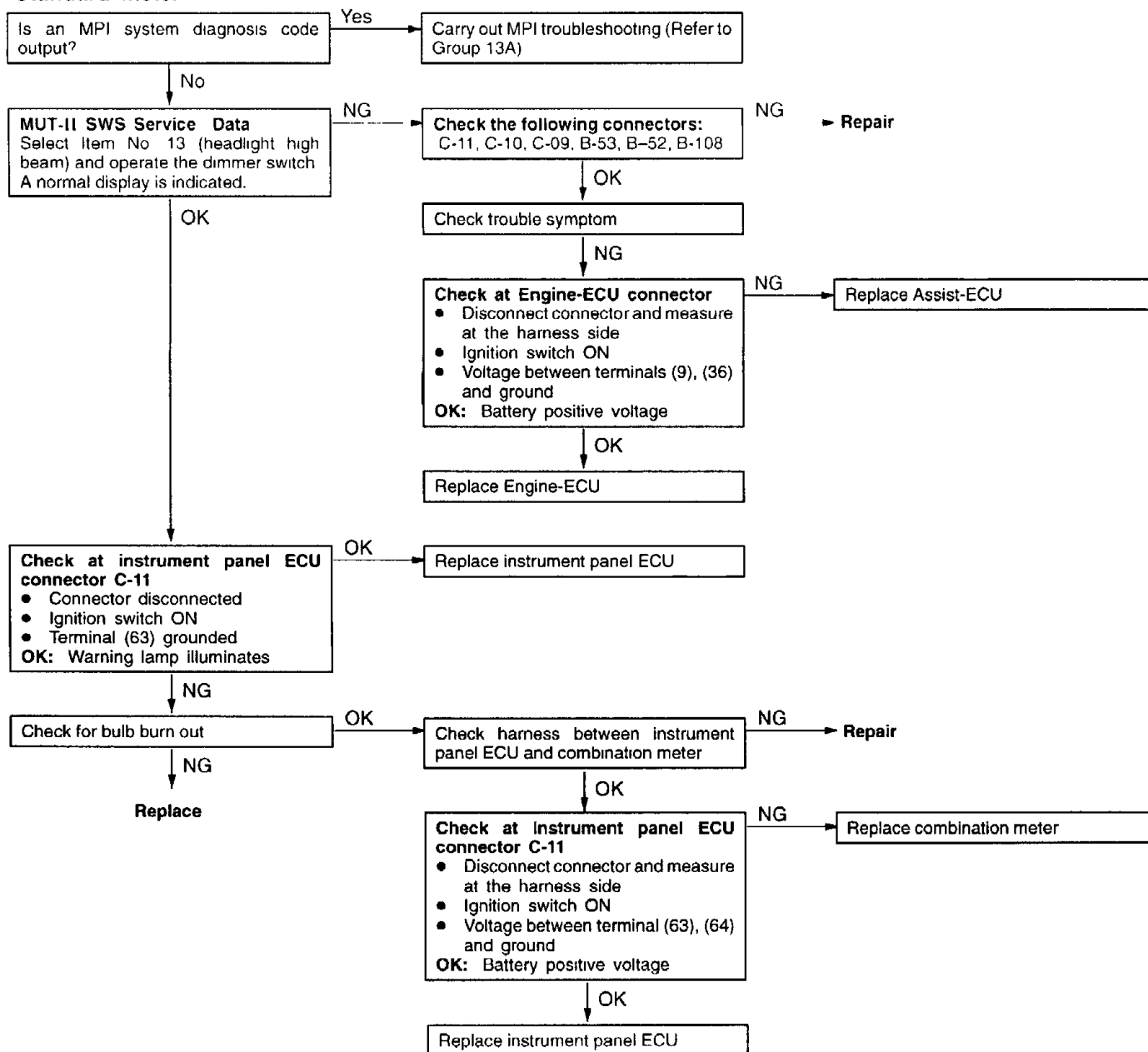
INSPECTION PROCEDURE 9



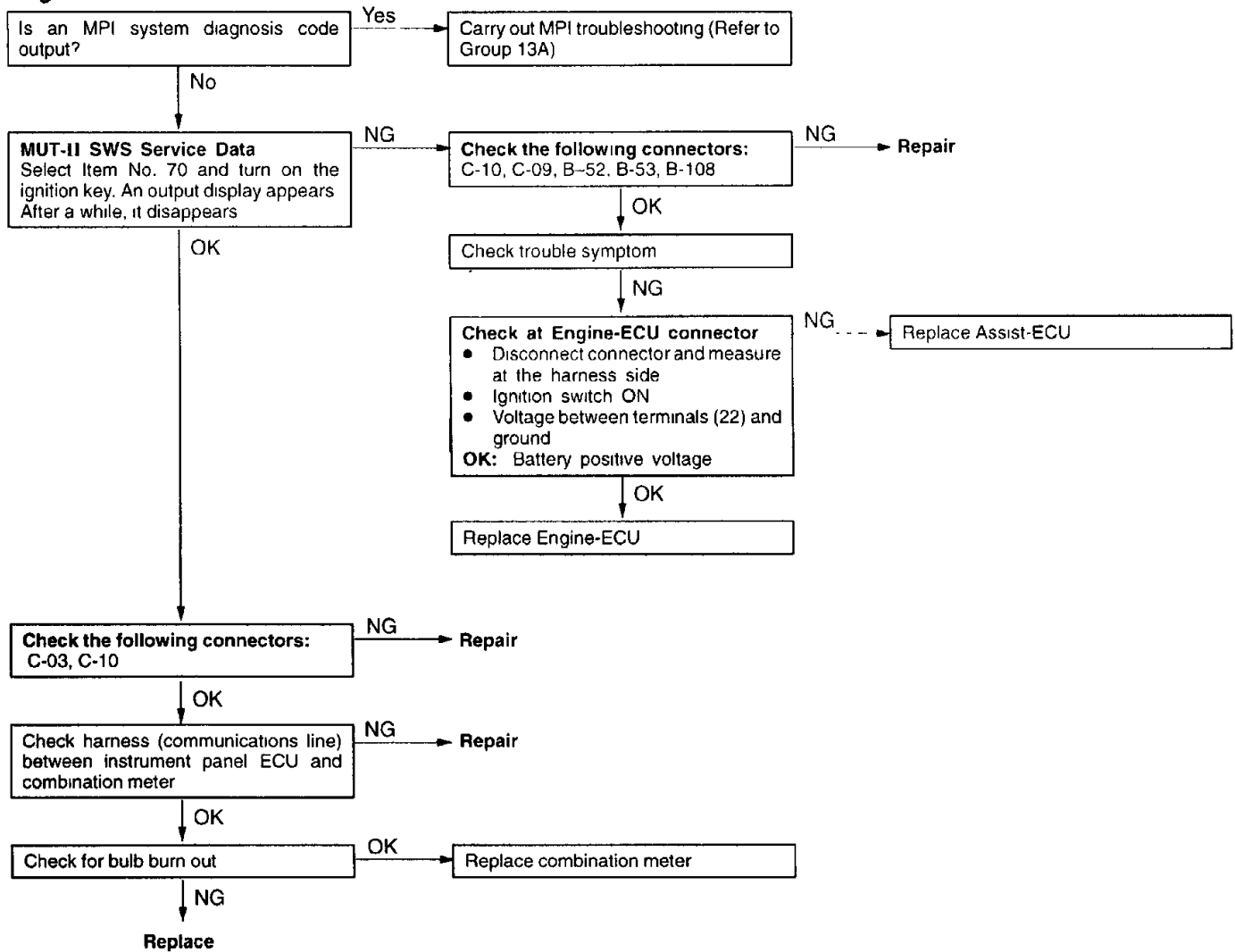
INSPECTION PROCEDURE 10

The check engine lamp either does not illuminate or does not go out	Probable cause
The Assist-ECU or the warning lamp circuit may be defective	• Assist-ECU malfunction • Harness or connector defective

Standard meter

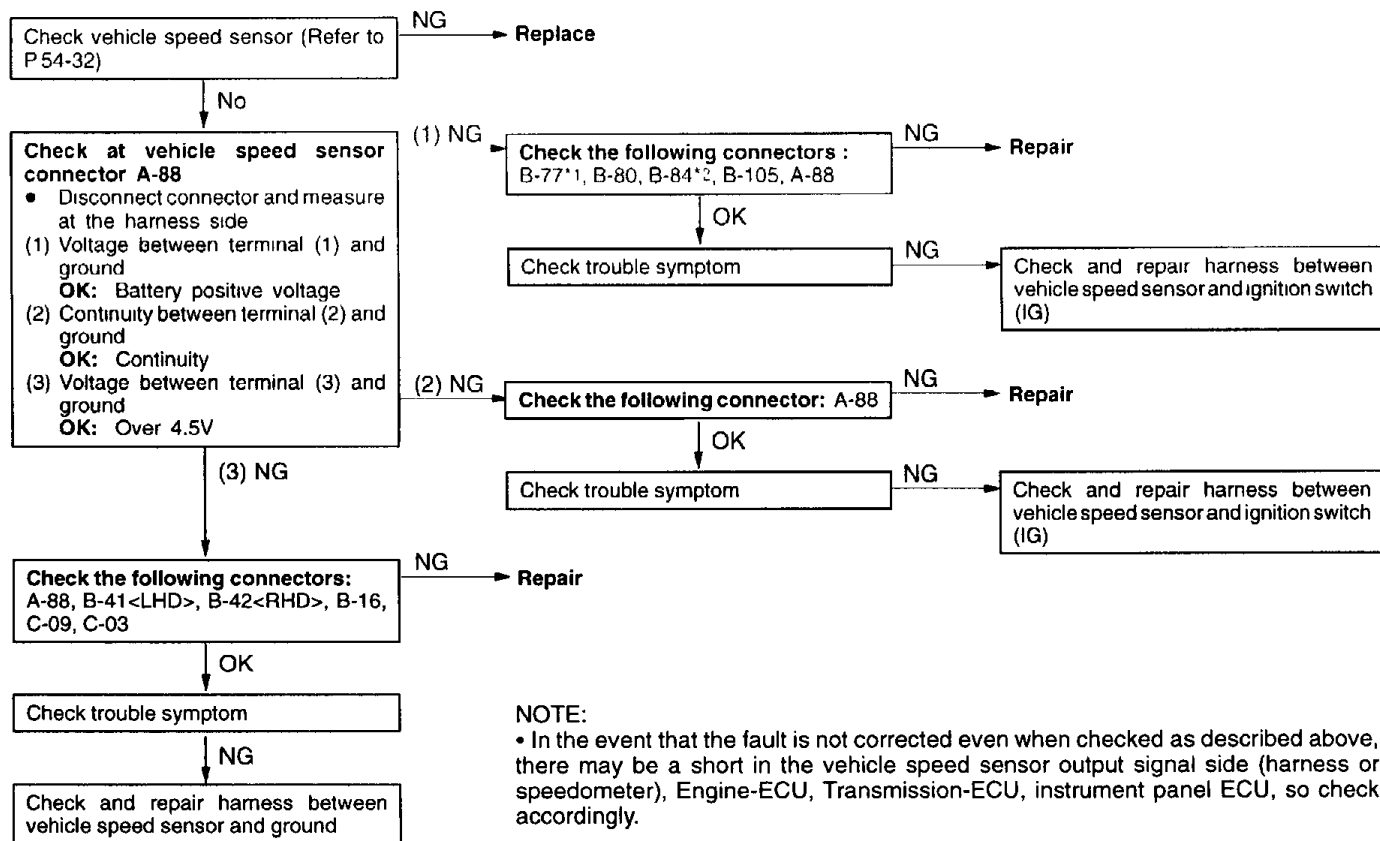


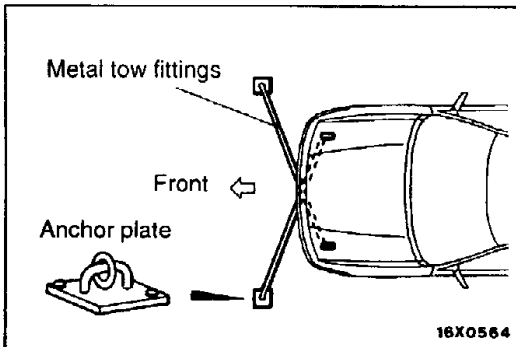
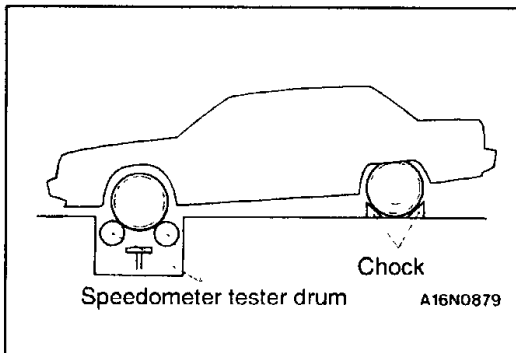
Continued next page:

High contrast meter

INSPECTION PROCEDURE 11

Vehicle speed sensor circuit check	Probable cause
The vehicle speed sensor signal is shared by the speedometer, Engine-ECU, Transmission-ECU and the instrument panel ECU	• Harness or connector defective • Combination meter malfunction





ON-VEHICLE SERVICE

SPEEDOMETER CHECK

1. Adjust the pressure of the tyres to the specified value. (Refer to GROUP 31 – On-vehicle Service.)
2. Position the vehicle on a speedometer tester drum.
3. Make sure the parking brake has been applied.

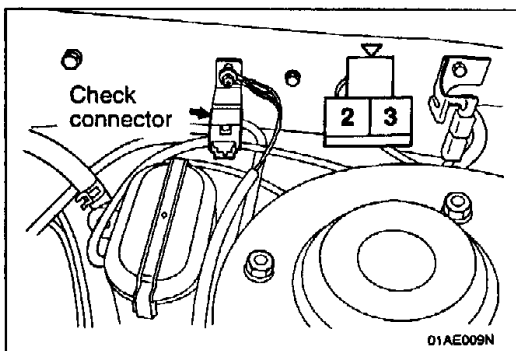
4. Attach metal fittings to the tow hook and the tie-down hook to prevent the front wheels from slipping sideways. Attach both ends to the anchor plate.
5. Securely anchor one end of the chain or a wire and attach the other end to the rear tow hook to prevent the car from jumping forward
6. Take all other necessary precautions.
7. Check if the speedometer indication range is within the standard values.

Caution

Do not increase/decrease speed rapidly while testing.

Standard values:

Standard indication km/h	40	80	120	160
Allowable range km/h	40–48	80–92	120–136	160–180



TACHOMETER CHECK

1. Disconnect the check connector and insert a paper clip into terminal No.2 and attach the engine speedometer.

NOTE

For tachometer inspection, use of a fluxmeter-type engine speedometer is recommended. (Because a fluxmeter only needs to be clipped to the high tension cable.)

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 value:

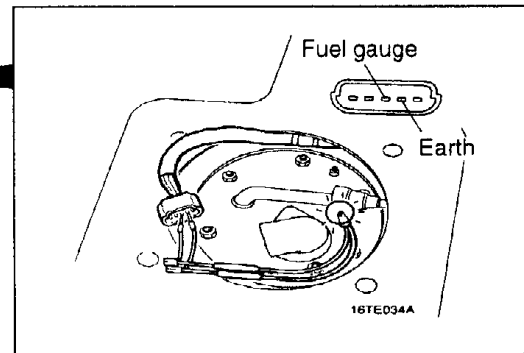
Engine speed rpm	1,000	3,000	5,000	6,000
Indicated variation rpm	+100	+100 -200	+100 -375	+100 -450

FUEL GAUGE SIMPLE CHECK

Disconnect the fuel gauge unit connector.
(Refer to GROUP 13F – Fuel Tank)

Connect a test lamp to the harness side connector.

Turn the ignition switch to ON.



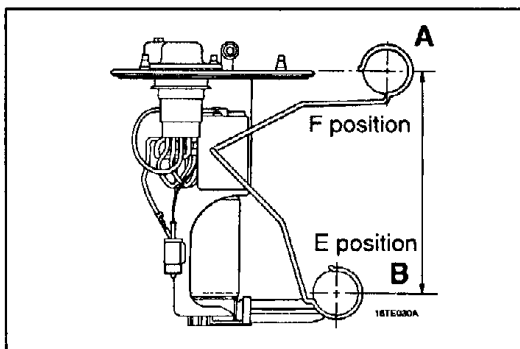
Check the condition of the test lamp and the gauge.

1. Test lamp is illuminated (Gauge needle is not moving)
2. Test lamp is illuminated (Gauge needle is moving)
3. Test lamp is not illuminated (Gauge needle is not moving)

Replace the fuel gauge.

Replace the fuel gauge unit.

Repair the harness.

**FUEL GAUGE UNIT CHECK**

To check, remove fuel gauge unit from fuel tank. (Refer to GROUP 13F – Fuel Tank.)

FUEL GAUGE UNIT FLOAT HEIGHT

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

Standard value:

A: $0 \pm 3\text{mm}$

B: $144 \pm 3\text{mm}$

FUEL GAUGE UNIT RESISTANCE

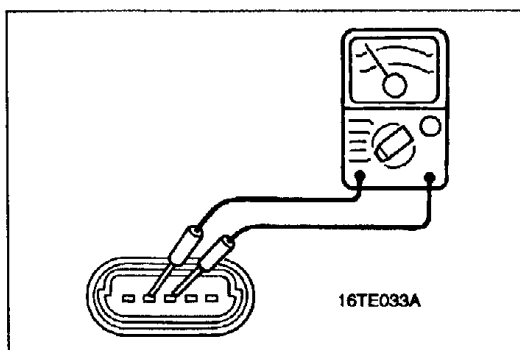
1. Check that resistance value between the fuel gauge terminal and ground terminal is at standard value when fuel gauge unit float is at point F (highest) and point E (lowest).

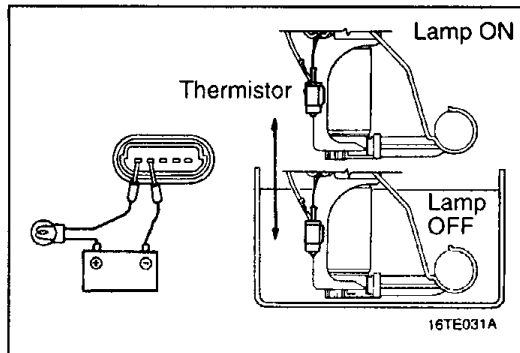
Standard value:

POINT F: $4 \pm 1 \Omega$

POINT E: $107 \pm 1 \Omega$

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



**THERMISTOR**

1. Connect fuel gauge unit to battery via test lamp (12V–3.4W). Immerse in water.
2. Condition good if light goes off when thermistor is in water and lights when it is removed from water.

Caution

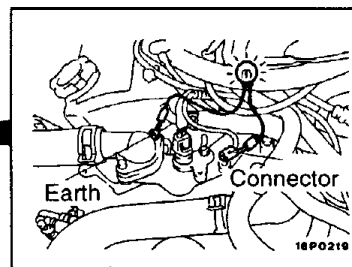
After completing this test, wipe the unit dry and install it in the fuel tank.

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE CHECK

Remove the engine coolant gauge unit connector.

Connect a test lamp (12V–3.4W) between the harness side connector and the earth.

Turn the ignition switch ON.



Check the condition of the test lamp and the gauge.

1. Test lamp is illuminated (Gauge needle is not moving)

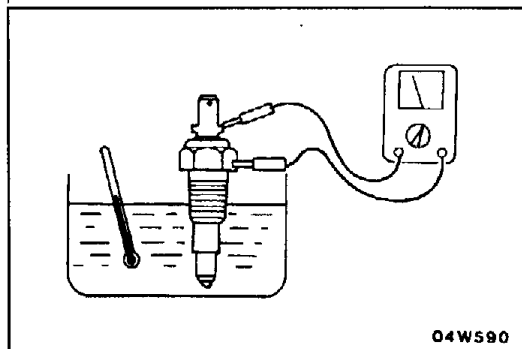
Replace the engine coolant temperature gauge.

2. Test lamp is illuminated (Gauge needle is moving)

Replace the engine coolant temperature gauge unit.

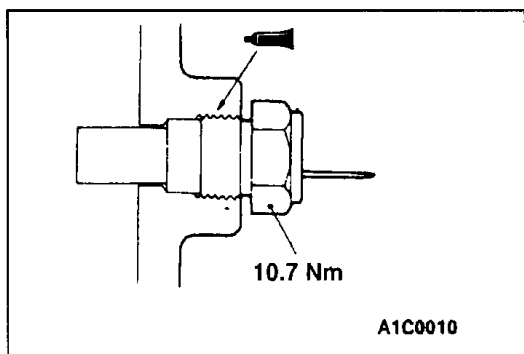
3. Test lamp is not illuminated (Gauge needle is not moving)

Repair the harness.

**ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK**

1. Drain the engine coolant. (Refer to GROUP 14 – On-vehicle Service.)
2. Remove the engine coolant temperature gauge unit.
3. Immerse the unit in 70°C water to measure the resistance.

Standard value: $104 \pm 13.5 \Omega$



4. After checking, apply the specified sealant around the thread of engine coolant temperature gauge unit.

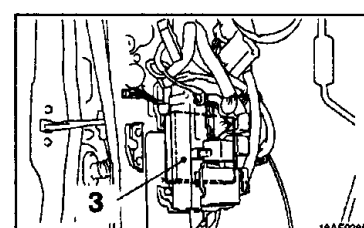
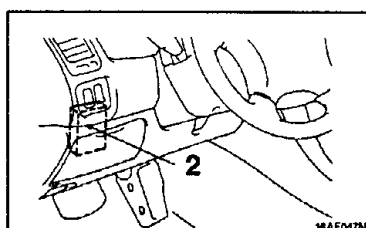
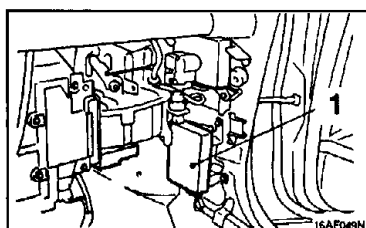
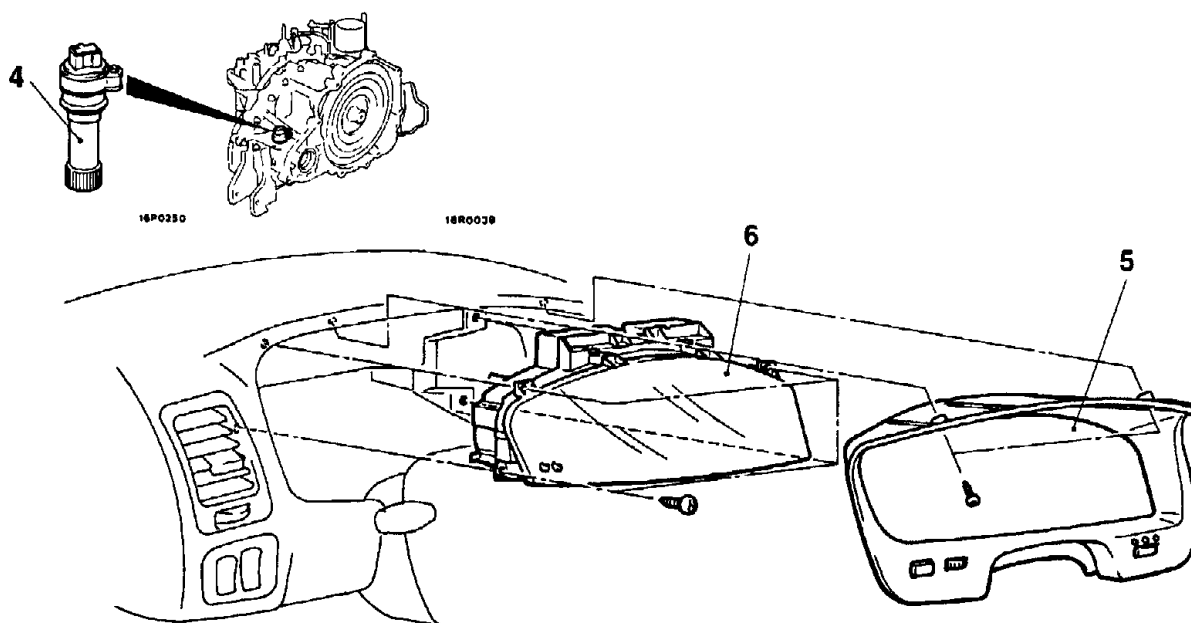
Specified sealant:

3M Adhesive Nut Locking No. 4171 or equivalent

5. Add engine coolant.
(Refer to GROUP 14 – On-vehicle Service.)

COMBINATION METERS

REMOVAL AND INSTALLATION



16AE050N

16AE051N

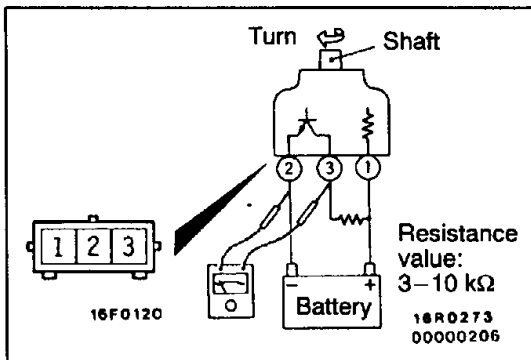
1. Assist-ECU (Refer to P.54-128)
2. Instrument panel ECU (Refer to P.54-132)
3. ETACS-ECU (Refer to P.54-128)

Vehicle speed sensor removal steps

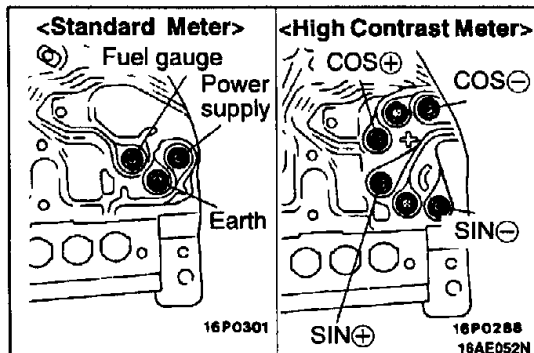
- Air cleaner assembly (Refer to Group 15)
- 4. Vehicle speed sensor

Combination meter removal steps

5. Meter bezel
6. Combination meter

**INSPECTION****VEHICLE SPEED SENSOR CHECK**

1. Remove the vehicle speed sensor and connect a 3-10 kΩ resistance as shown in the illustration at left.
2. Turn the shaft of the vehicle speed sensor and check to be sure that there is voltage between terminals 2 - 3.
3. (1 turn = 4 pulses)

**FUEL GAUGE CHECK**

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

Caution

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

Standard value:**<Standard Meter>**

Power supply-Earth: 56.3 Ω

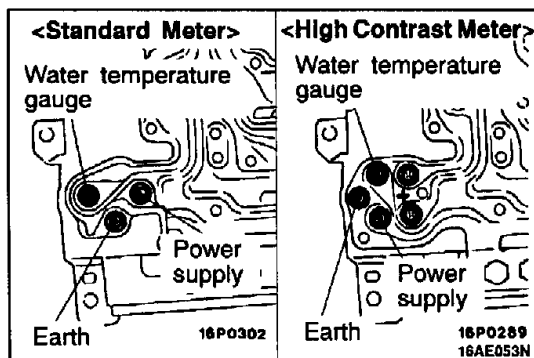
Power supply-Fuel gauge: 106 Ω

Fuel gauge-Earth: 150.3 Ω

<Hi Contrast Meter>

SIN+ -SIN- 151.8 Ω

COS+ -COS- 164.2 Ω

**ENGINE COOLANT TEMPERATURE GAUGE CHECK**

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

Caution

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

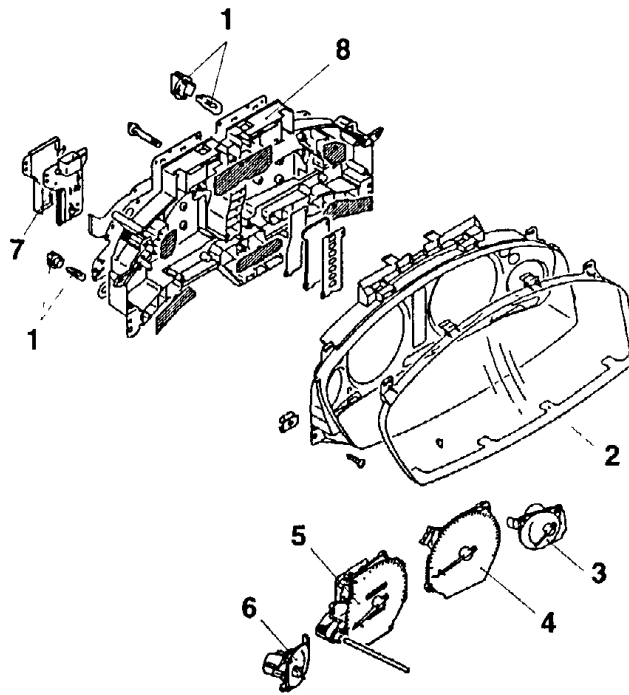
Standard values:**<Standard Meter/Hi Contrast Meter>**

Power supply-Water temperature gauge:

54 Ω/59 Ω

Power supply-Earth: 176.5 Ω

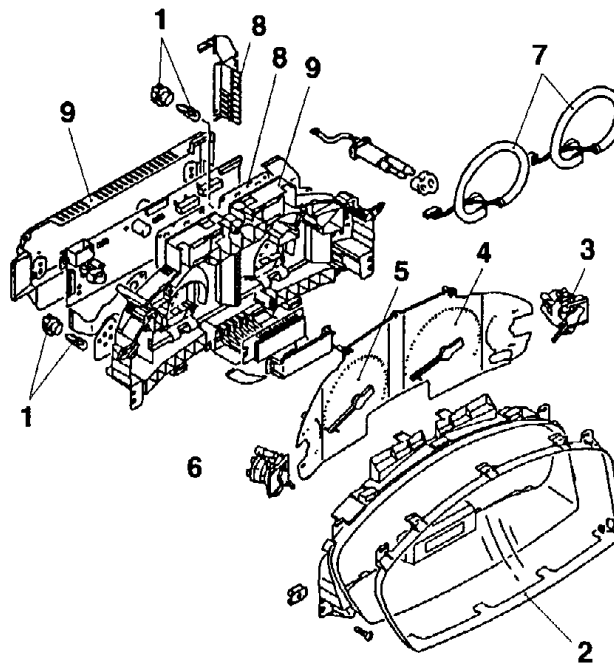
Water temperature gauge-Earth: 230.5 Ω/230.5 Ω

DISASSEMBLY AND REASSEMBLY**Standard meter**

16AE084N

Disassembly steps

- | | |
|---------------------------------|-------------------------------------|
| 1. Bulb, socket | 5. Speedometer |
| 2. Meter glass and window plate | 6. Engine coolant temperature gauge |
| 3. Fuel gauge | 7. Printed-circuit board |
| 4. Tachometer | 8. Meter case |

High contrast meter

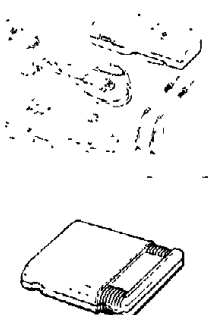
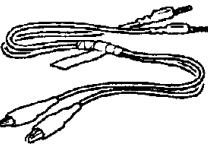
16AE083N

Disassembly steps

- | | |
|---------------------------------|-------------------------------------|
| 1. Bulb, socket | 6. Engine coolant temperature gauge |
| 2. Meter glass and window plate | 7. Bulb |
| 3. Fuel gauge | 8. Printed-circuit board |
| 4. Tachometer | 9. Meter case |
| 5. Speedometer | |

CENTRE WARNING DISPLAY

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	Simplified Wiring System (SWS) diagnostic checking
		ROM pack	
	MB991529	Diagnosis code check harness	Simplified Wiring System (SWS) diagnostic checking

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSTIC MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS-ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to P.54-104 for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSTIC TROUBLE CODE CLASSIFICATION TABLE

Refer to Simplified Wiring System P.54–107.

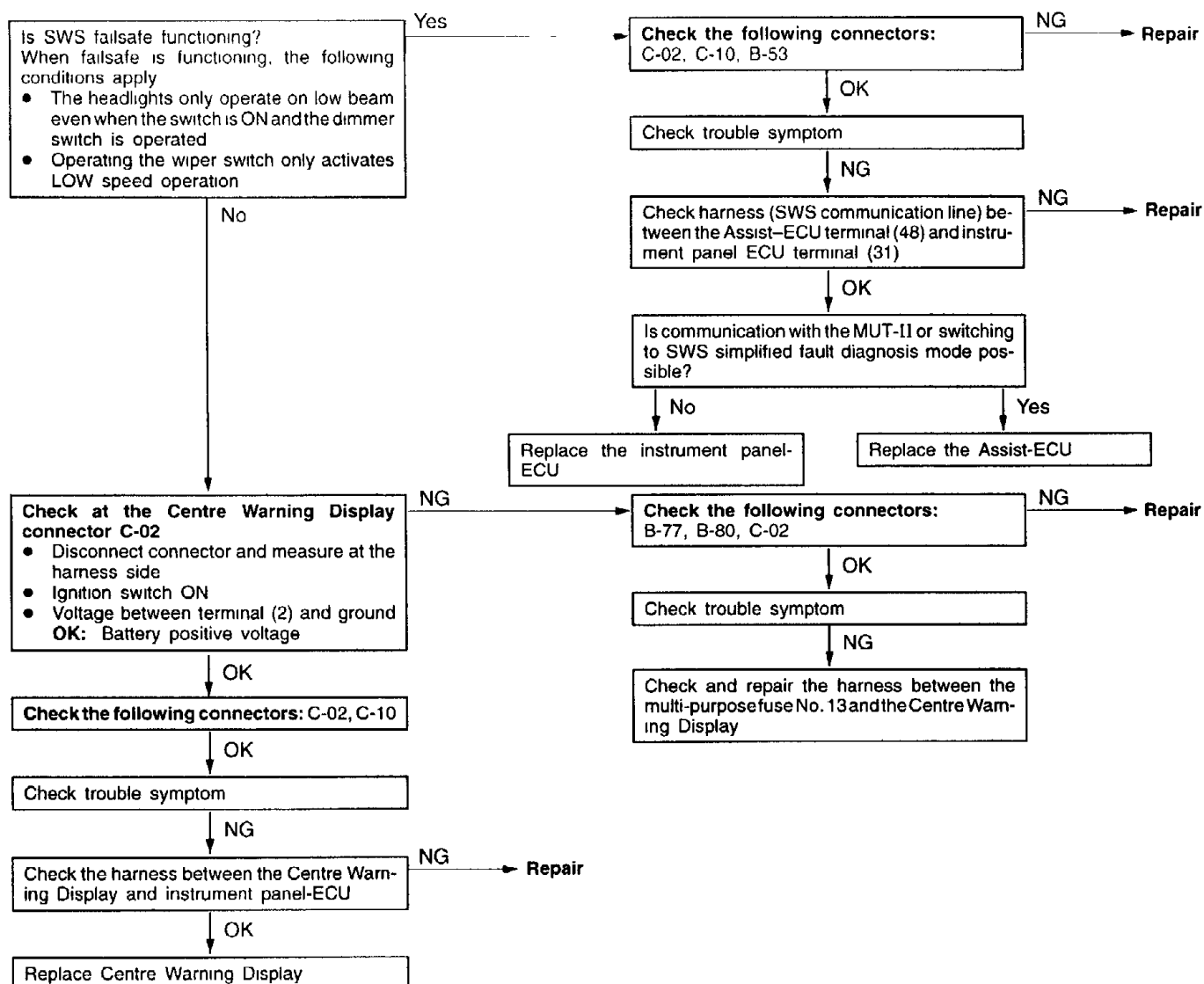
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II not possible	Refer to SWS Troubleshooting (P.54-118)	
Switching to SWS Simplified Fault Diagnosis mode not possible		
None of the Centre Warning Display warning lamps illuminate	1	54-36
The charge warning lamp either does not illuminate when the ignition is ON or does not go out after the engine starts (and battery operation is normal)	2	54-37
The engine oil pressure warning lamp either does not illuminate when the ignition is ON or does not go out when the engine starts	3	54-38
The remaining fuel warning lamp either does not illuminate or does not go out	4	54-39

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

None of the Centre Warning Display warning lamps illuminate	Probable cause
The Centre Warning Display warning lamp sensor and switch signals are input to the Assist-ECU. These input signals are sent to the instrument panel-ECU via the SWS communication line and the warning lamps are activated by the instrument panel-ECU. When none of the warning lamps illuminate, the Centre Warning Display power or ground circuit, the Assist-ECU, the instrument panel-ECU or the SWS communication line may be defective	• Centre Message Display malfunction • Assist-ECU malfunction • Instrument panel-ECU malfunction • Harness or connector defective



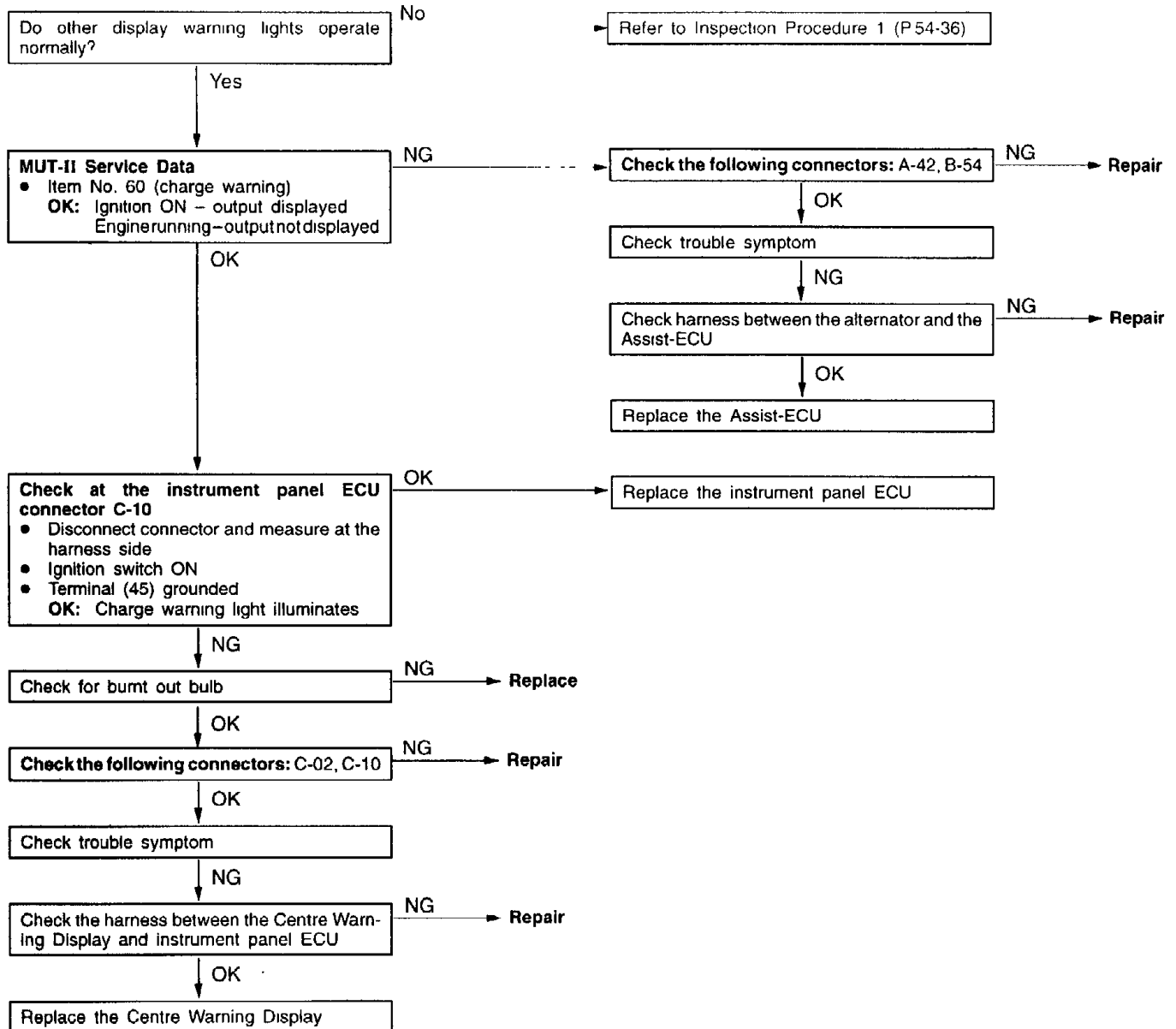
INSPECTION PROCEDURE 2

The charge warning lamp either does not illuminate when the ignition is ON or does not go out after the engine starts (alternator and battery operation is normal)

The warning lamp circuit or the Centre Warning Display may be defective

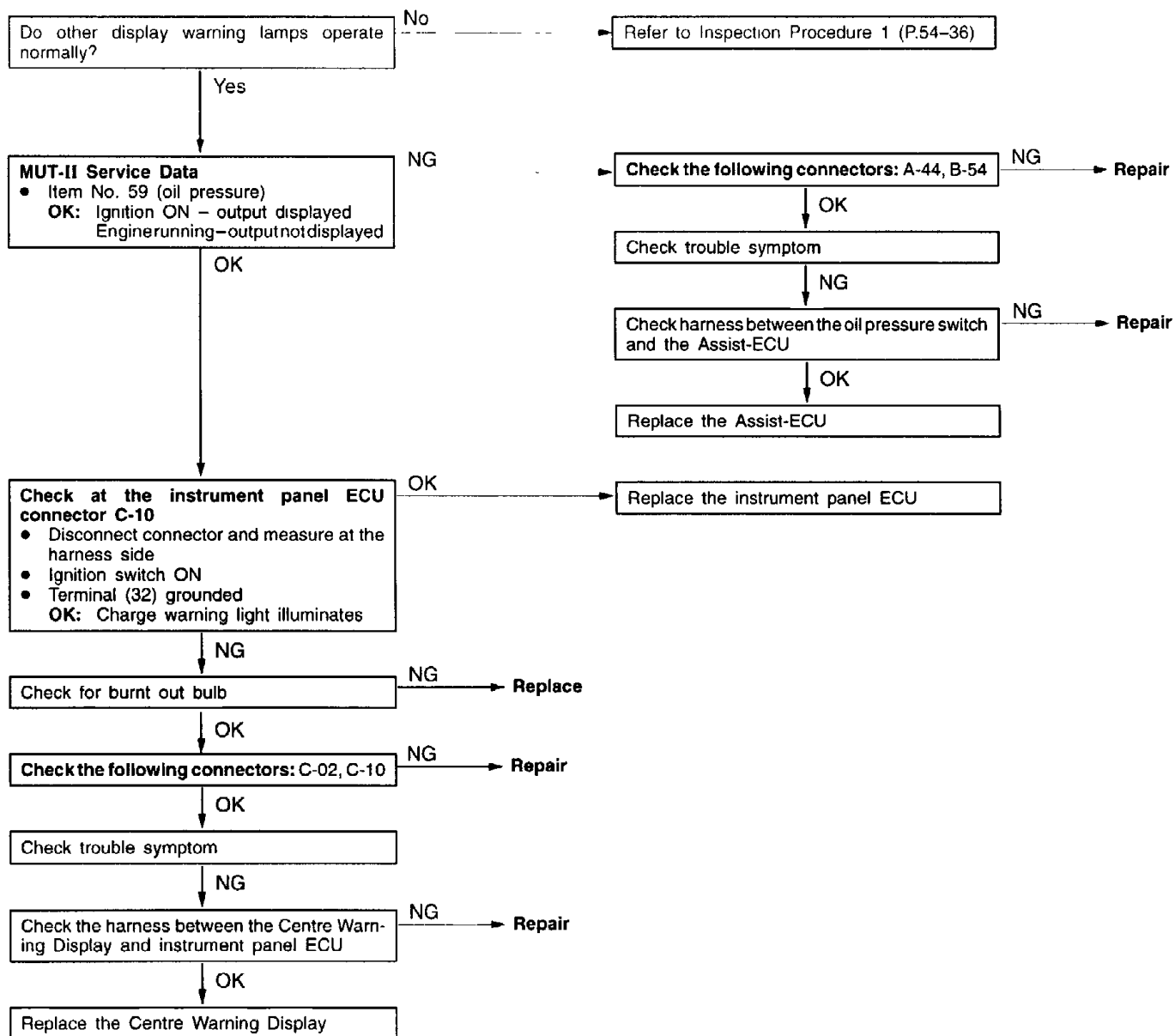
Probable cause

- Harness or connector defective
- Assist-ECU or instrument panel ECU malfunction
- Centre Warning Display malfunction



INSPECTION PROCEDURE 3

The engine oil pressure warning lamp either does not illuminate when the ignition is ON or does not go out after the engine starts	Probable cause
The oil pressure switch circuit or the Centre Warning display may be defective	- Oil pressure switch defective - Assist-ECU or instrument panel ECU malfunction - Harness or connector defective - Centre Warning Display malfunction



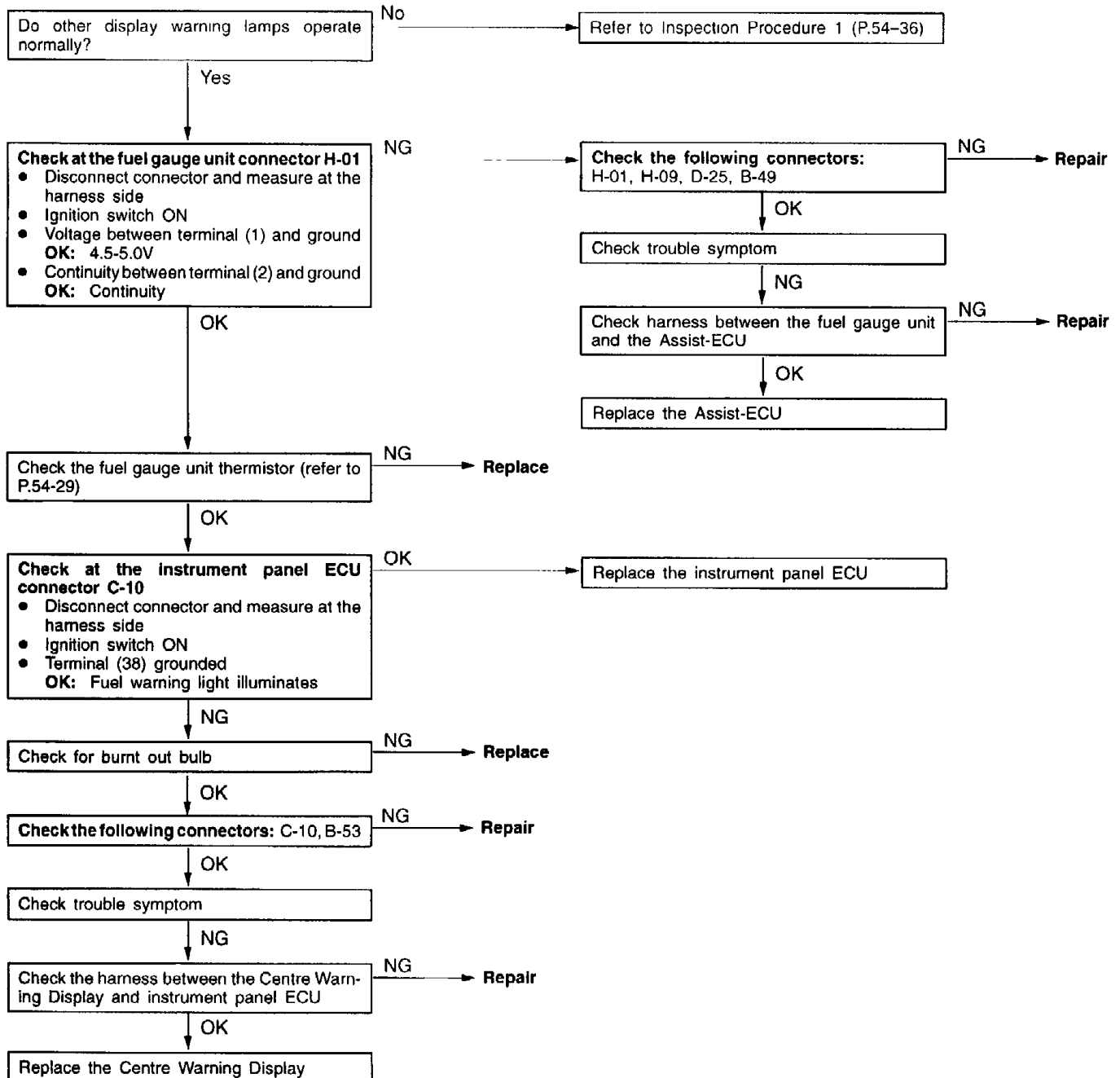
INSPECTION PROCEDURE 4

The remaining fuel warning lamp either does not illuminate or does not go out

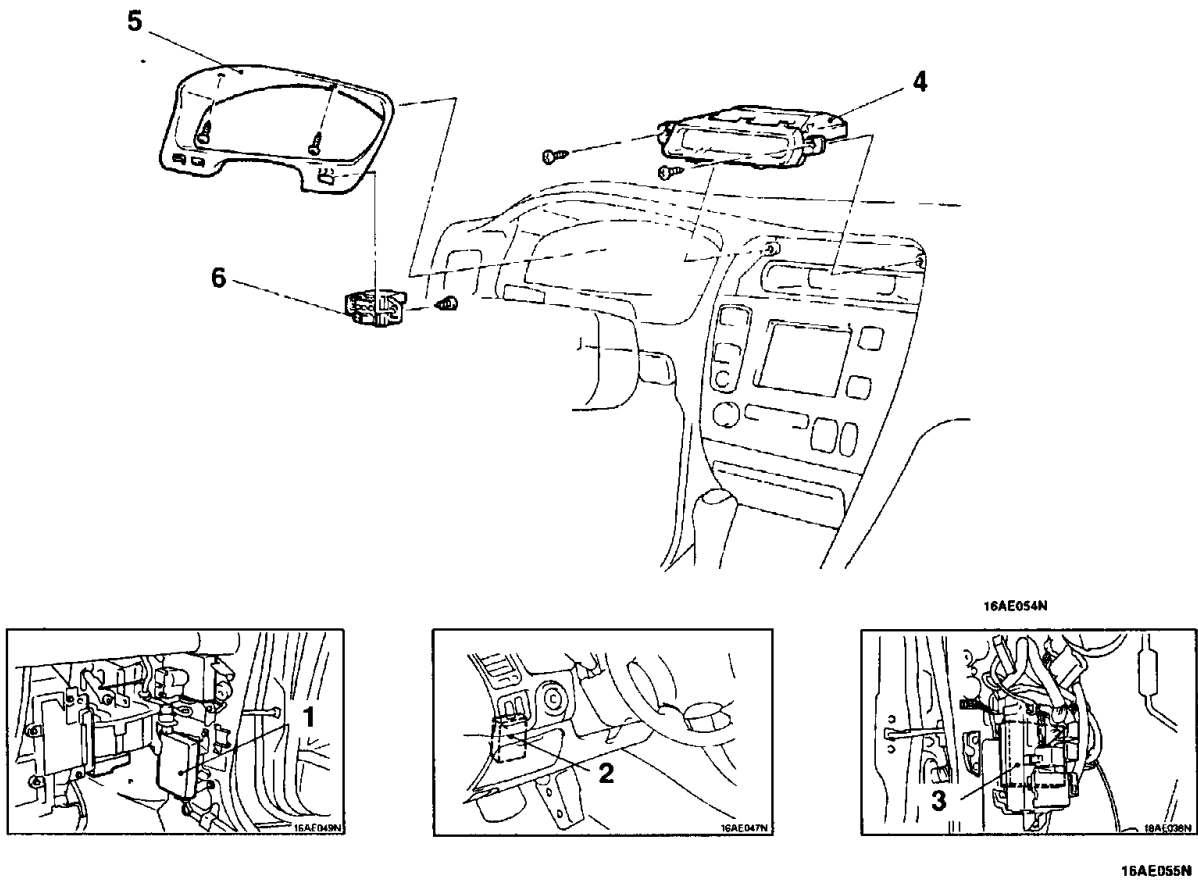
The oil pressure switch circuit or the Centre Warning display may be defective

Probable cause

- Fuel gauge unit defective
- Assist-ECU malfunction
- Instrument panel malfunction
- Harness or connector defective
- Centre Warning Display malfunction



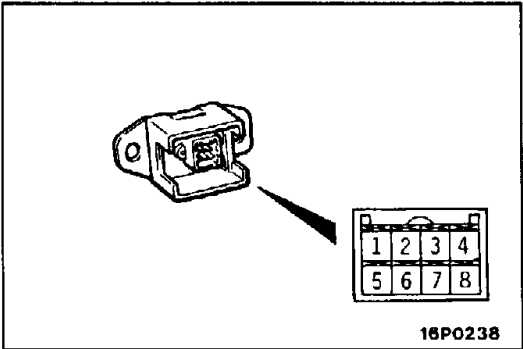
CENTRE WARNING DISPLAY
REMOVAL AND INSTALLATION



- 1. Assist-ECU (Refer to P.54-128)
- 2. Instrument panel-ECU (Refer to P.54-128)
- 3. ETACS-ECU (Refer to P.54-128)

Centre warning display removal steps

- Centre Air Outlet Assembly. (Refer to Group 52A–Instrument Panel)
- 4. Centre warning display
- 5. Meter bezel
- 6. Clock switch



INSPECTION
CLOCK SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	2	3	4	5	6	7
SET	○			○		○—○—○	
H			○	○			
M		○		○			

HEADLAMP, POSITION LAMP ASSEMBLY AND FRONT TURN SIGNAL LAMP ASSEMBLY

SERVICE SPECIFICATIONS

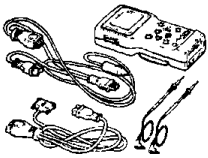
Items	Limit	
Headlamp intensity	High-beam cd	18,000 or more
	Low-beam cd	7,000 or more

HOW TO HANDLE HEADLAMP AND POSITION LAMP ASSEMBLY

Plastic outer lenses are used for the headlamp and position lamp assembly, so pay attention to the following items.

- Do not touch the outer lens surface with a sharp tool.
- Use the specified genuine parts; bulbs.
- Don't apply masking tape to the outer lens surface.

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	Simplified Wiring System (SWS) diagnostic checking
		ROM pack	
	MB991529	Diagnosis code check harness	Simplified Wiring System (SWS) diagnostic checking

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSIS MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS-ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to P.54-104 for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSIS CODE CLASSIFICATION TABLE

Refer to P.54-107.

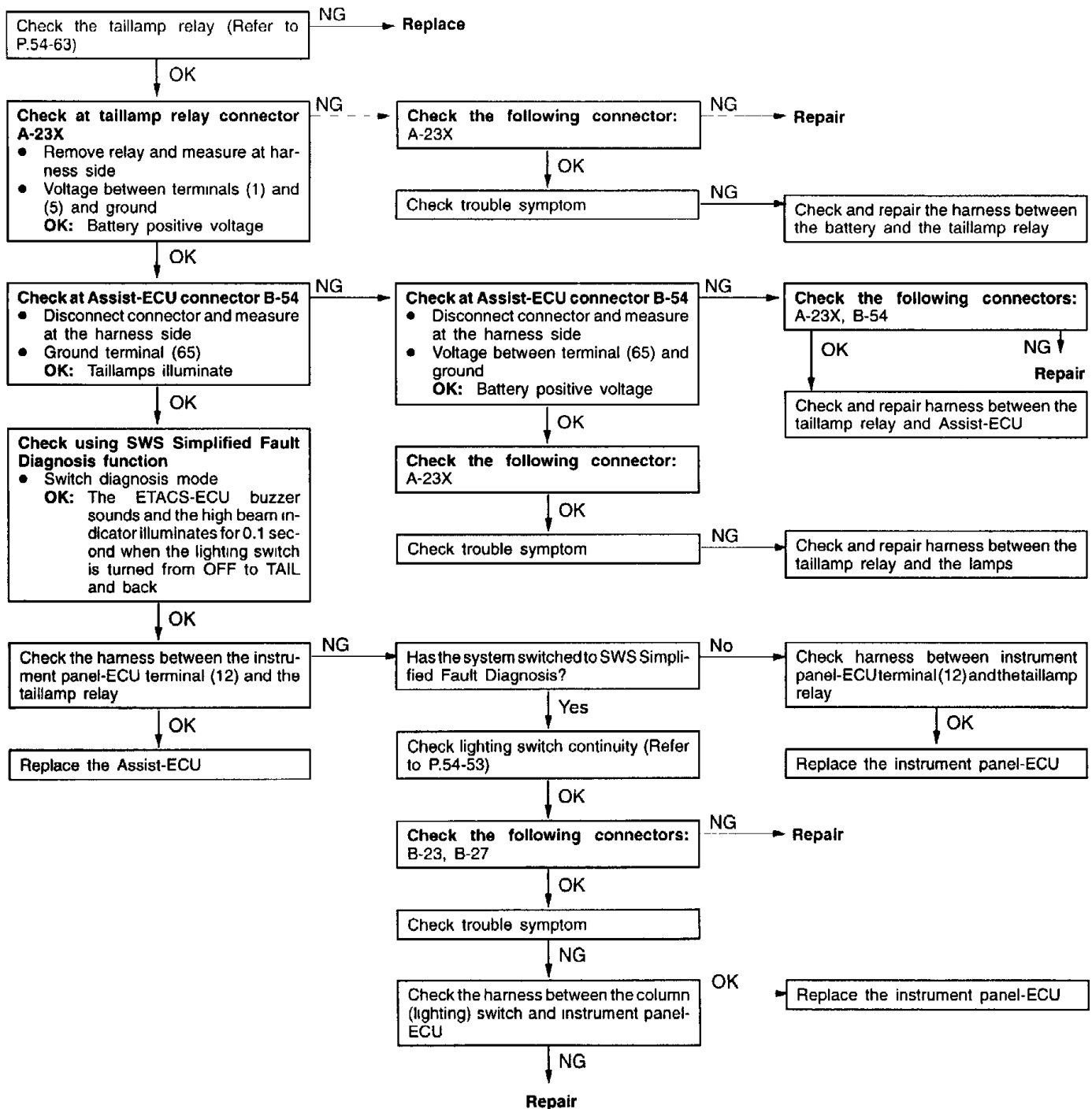
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II not possible	Refer to SWS Troubleshooting (P.54-118)	
Switching to SWS Simplified Fault Diagnosis mode not possible		
With the lighting switch in the TAIL position, the tail-lamps, license plate lamps and side markers do not illuminate	1	54-43
With the lighting switch in the HEAD position, the head-lamps (low beam) do not illuminate (dimmer switch is in the low beam position)	2	54-44
With the lighting switch in the HEAD position and the dimmer switch in the high beam position, the high beam does not illuminate (low beam operates normally)	3	54-45
With the lighting switch ON (TAIL or HEAD position) and the ignition switch OFF, the warning buzzer does not sound when the driver's door is opened with the ignition switch OFF	4	54-46
The taillamps and headlamps do not switch off with the lamp switch.	5	54-47
The high beam indicator lamp does not illuminate when high beam is operating	6	54-48

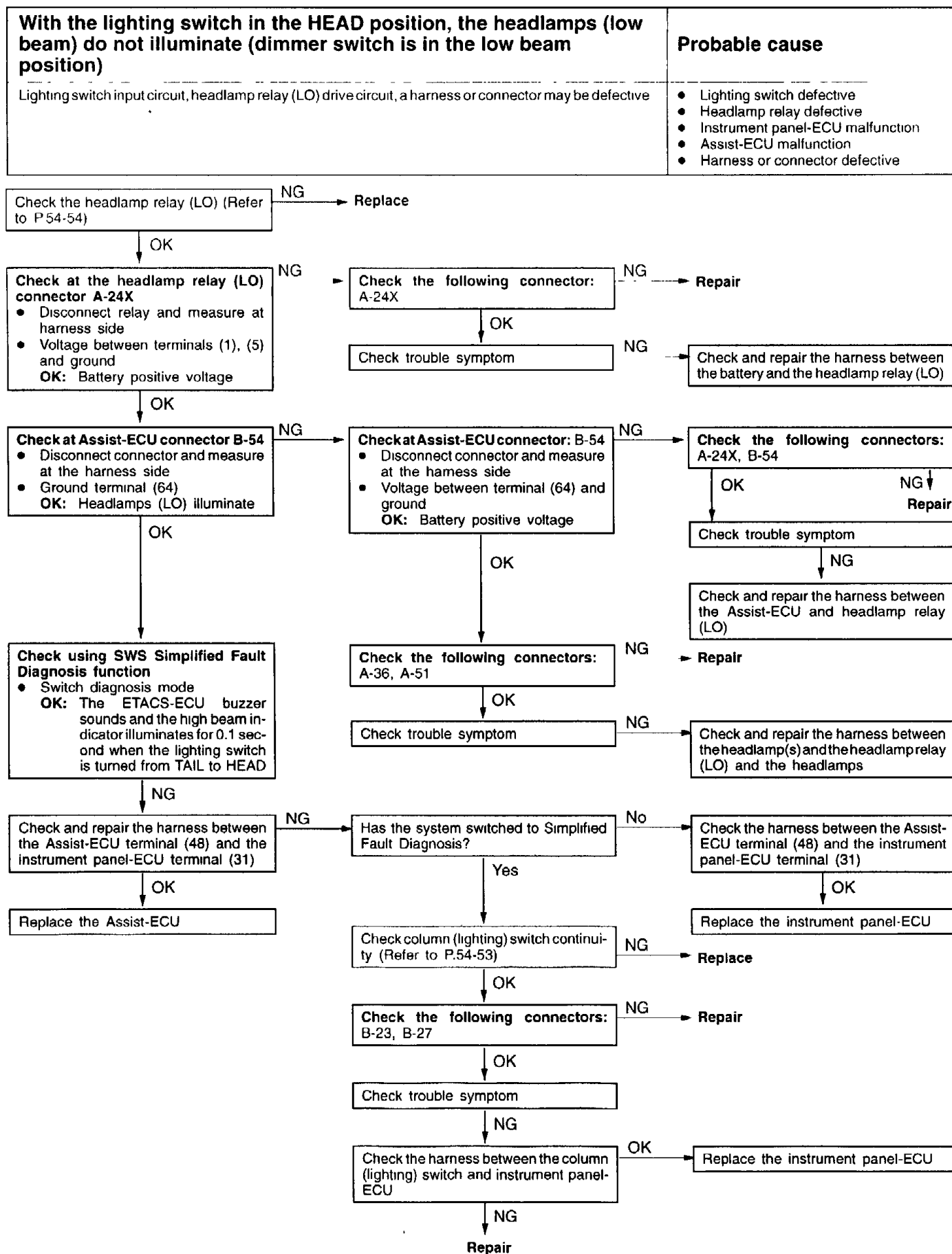
INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

With the lighting switch in the TAIL position, the taillamps, license plate lamps and side markers do not illuminate	Probable cause
The lighting switch input circuit, taillamp relay drive circuit or a harness or connector may be defective.	• Lighting switch defective • Taillamp relay defective • Assist-ECU malfunction • Instrument panel-ECU malfunction • Harness or connector defective



INSPECTION PROCEDURE 2



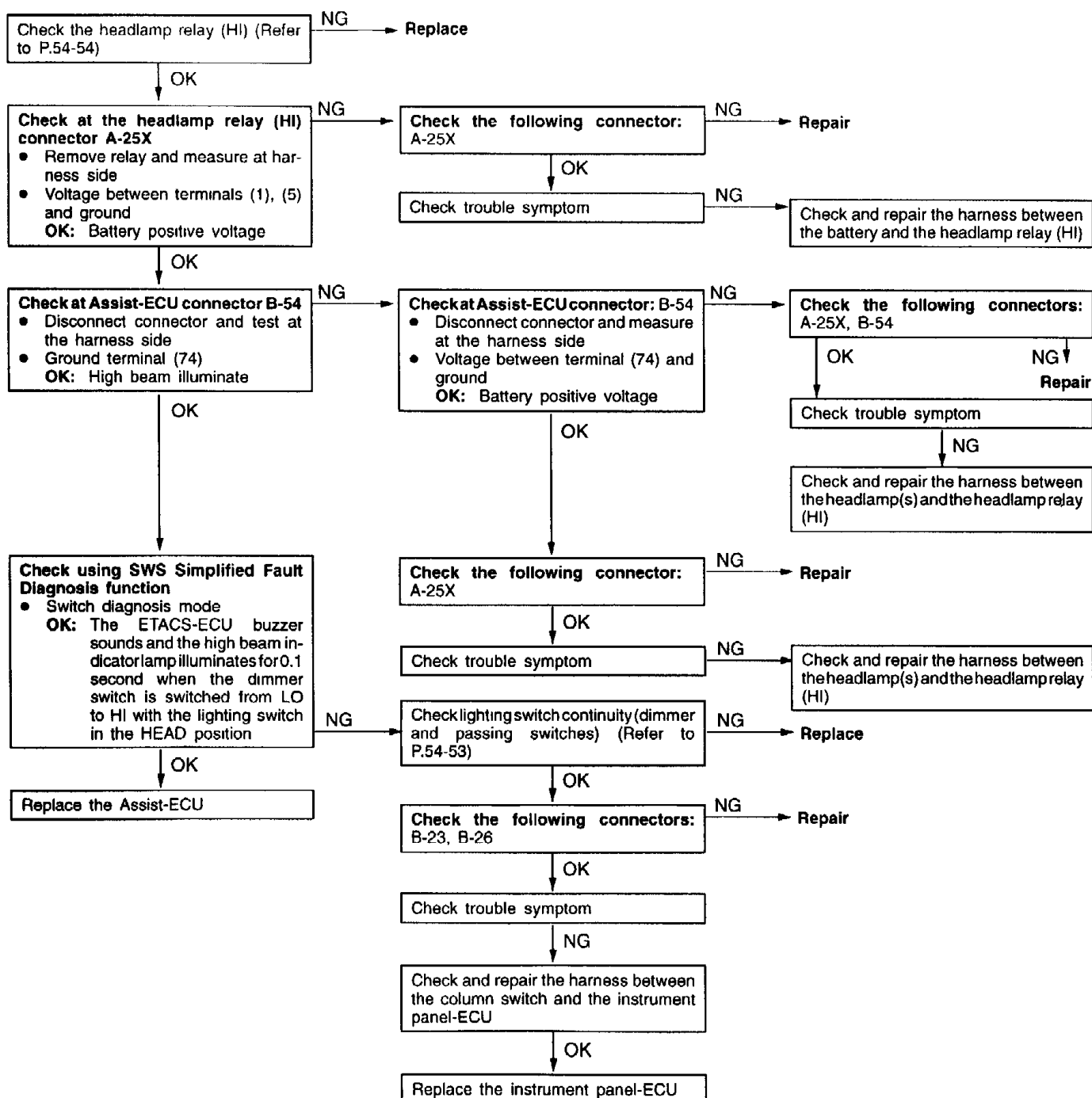
INSPECTION PROCEDURE 3

With the lighting switch in the HEAD position and the dimmer switch in the high beam position, the high beam does not illuminate (low beam operates normally)

Dimmer switch input circuit system, the instrument panel-ECU, Assist-ECU, the harness or a connector may be defective

Probable cause

- Dimmer switch defective
- Assist-ECU malfunction
- Instrument panel-ECU malfunction
- Headlamp relay (HI)
- Blown lamp bulb(s)



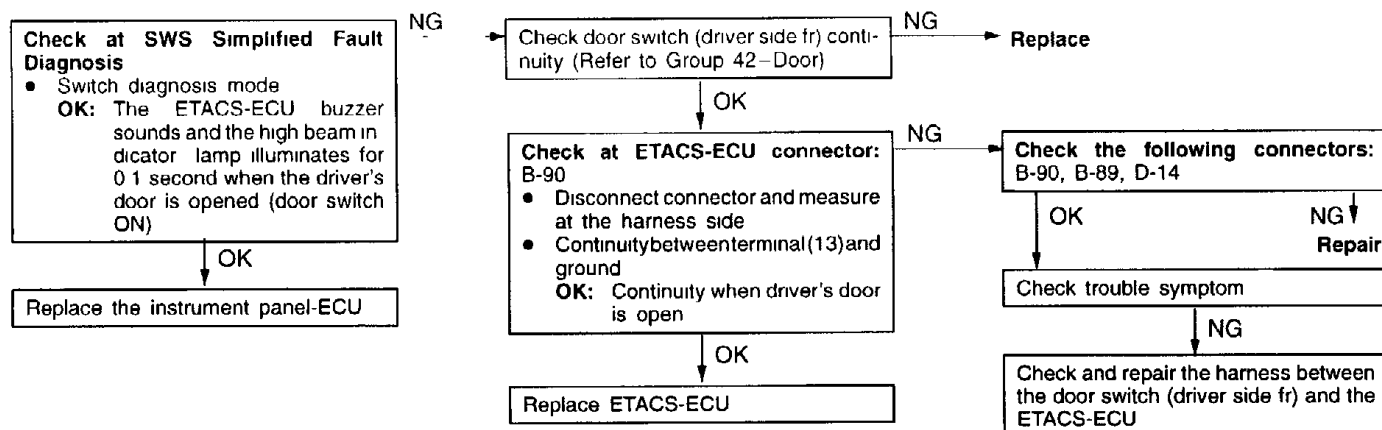
INSPECTION PROCEDURE 4

With the lighting switch ON (TAIL or HEAD position) and the ignition switch OFF, the warning buzzer does not sound when the driver's door is opened with the ignition switch OFF

The front left door switch, ETACS-ECU, instrument panel-ECU, the harness or a connector may be defective

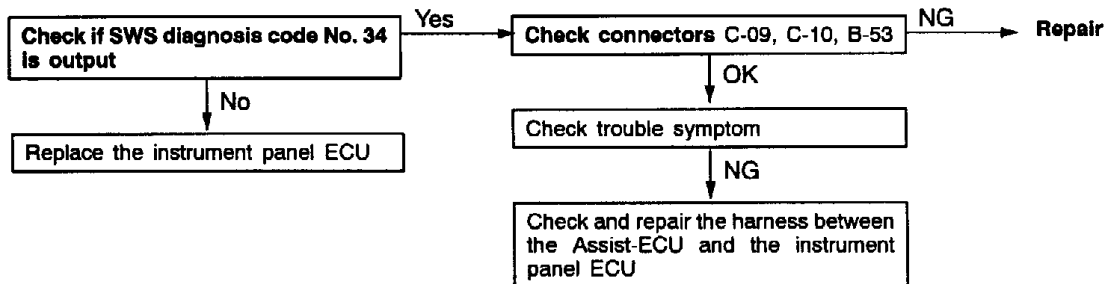
Probable cause

- Harness or connector defective
- ETACS-ECU malfunction
- driver side fr door switch defective
- Instrument panel-ECU malfunction



INSPECTION PROCEDURE 5

The taillamps and headlamps do not switch off with the lighting switch.	Probable cause
If a communication malfunction between the Assist-ECU and instrument panel ECU exists with the ignition switch ON, the Assist-ECU failsafe maintains a headlamp drive status. Therefore an SWS communication malfunction is indicated	• Instrument panel ECU malfunction • Harness or connector defective



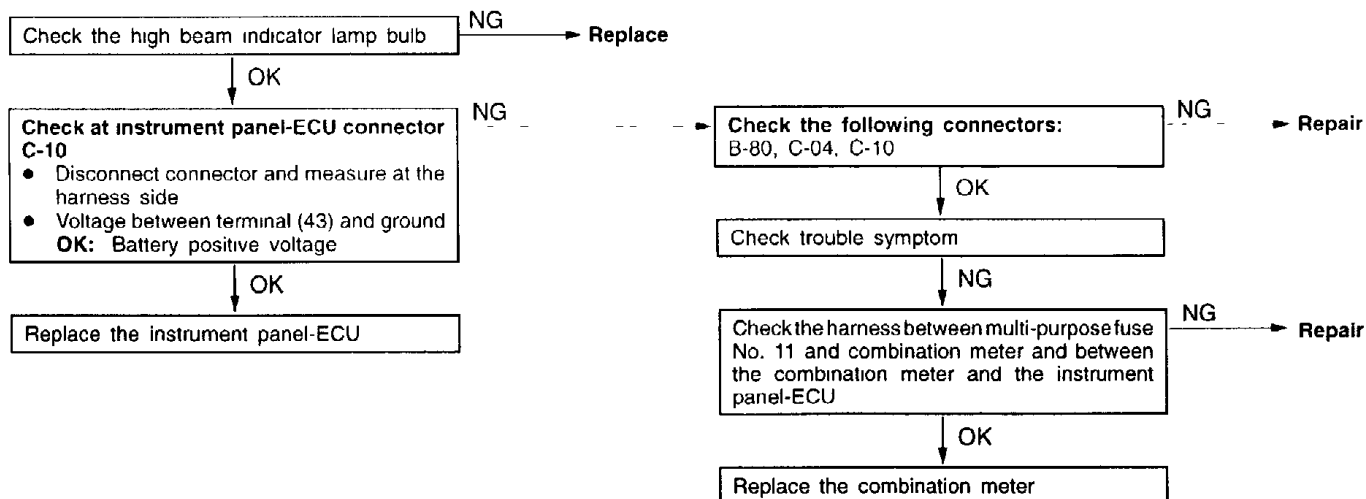
INSPECTION PROCEDURE 6

The high beam indicator lamp does not illuminate when high beam is operating

The instrument panel-ECU, the harness or a connector may be defective

Probable cause

- Instrument panel-ECU malfunction
- Harness or connector defective
- High beam indicator bulb blown



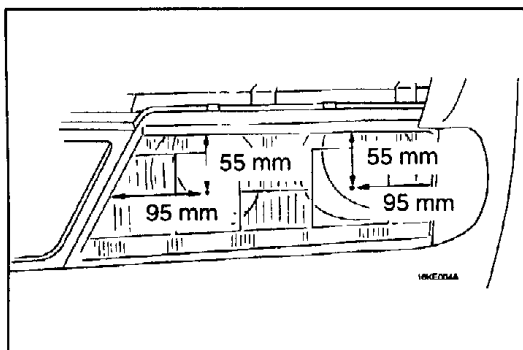
ON-VEHICLE SERVICE

HEADLAMP AIMING

PRE-AIMING INSTRUCTIONS

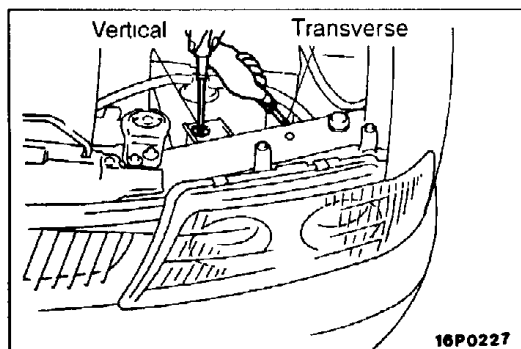
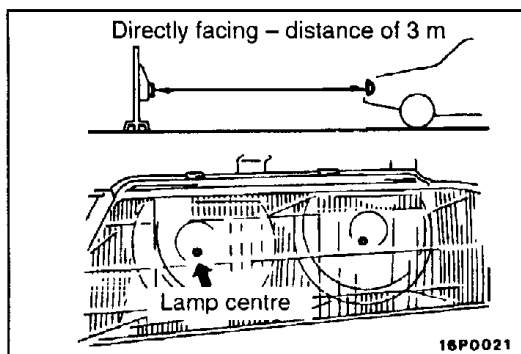
1. Inspect for badly rusted or faulty headlamp assemblies.
2. These conditions must be corrected before a satisfactory adjustment can be made.
3. Place vehicle on a level floor.
4. Bounce front suspension through three (3) oscillations by applying body weight to hood or bumper.
5. Inspect tyre inflation.
6. Rock vehicle sideways to allow vehicle to assume its normal position.
7. If fuel is not full, place a weight in trunk of vehicle to simulate weight of a full tank [0.72kg per litre]
8. There should be no other load in the vehicle other than driver or substituted weight of approximately 70 kg placed in driver's position.

Thoroughly clean headlamp lenses.

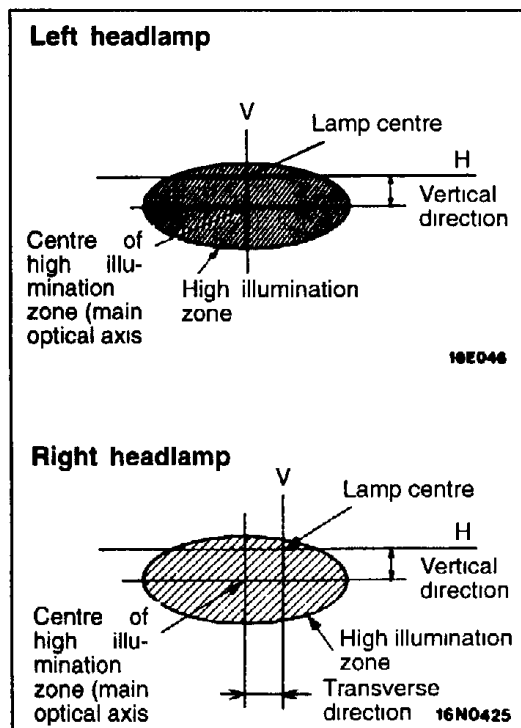


HIGH BEAM ADJUSTMENT

1. Calculate the centre of both the high and low beam lamps as shown in the illustration and mark with a marking pen or similar.



- Set the beam so that the centre of the tester focusing lens meets the lamp centre with a distance of 3 m in between.
- Turn the adjusting screw until the deviation of the main optical axis falls within the standard values.



Standard Values

Vertical direction	25' (22 mm) downward from horizontal line H
Transverse direction	Left headlamp parallel to advancing direction
	Right headlamp 15' (13 mm) to left of vertical line V

NOTE

- Remove the connector and adjust an unadjusted lamp while it is not lit. Be sure not to deviate the optical axis when connecting the connector. When you must cover the lens surface with a shade, the lamp must not be lit for more than three minutes.
- Do not mask the outer lens surface with tape, etc.

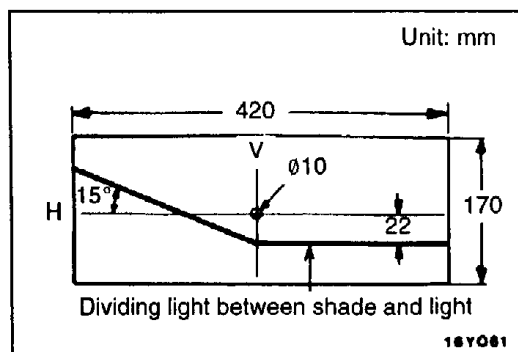
LOW BEAM ADJUSTMENTS

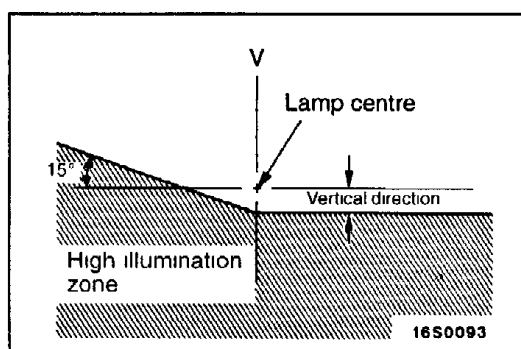
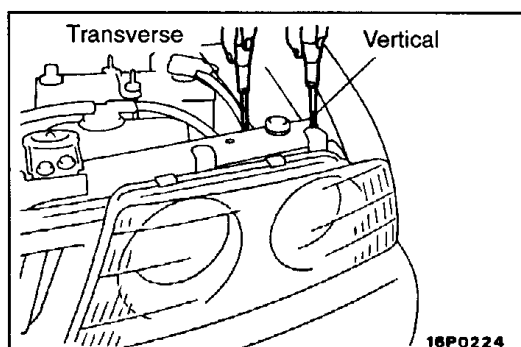
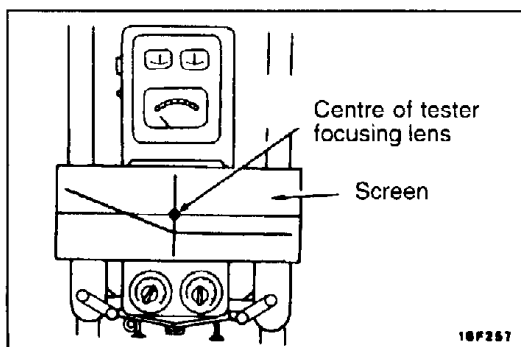
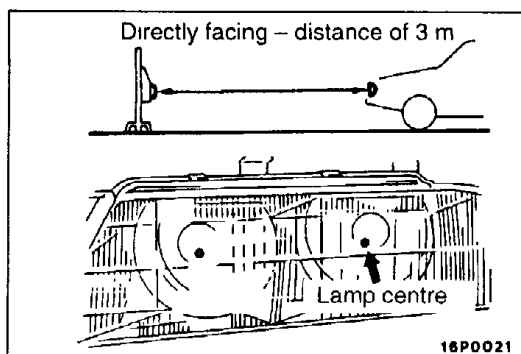
- Prepare an adjustment screen as shown.

NOTE

Use thick white paper for the adjustment screen.

- Draw in the line that divides the light and shade.





- Set the tester and the lamp in such a way that the centre of the tester focusing lens meets the lamp centre with a distance of 3 m in between.

NOTE

Refer to step 1 of the high beam adjustment procedure to calculate the lamp centre.

- Match the centre hole of the adjustment screen to the centre of the tester focusing lens and attach the screen with tape.

- Turn the adjusting screw until the deviation of the high illumination zone on the adjustment screen is within the standard values (dividing line between light and shade).

Standard Values

Vertical	25' (22 mm) downward from horizontal line H
Transverse	Point at which 15° start up portion intersects perpendicular line V

NOTE

- Remove the connector and adjust an unadjusted lamp while it is not lit. Be sure not to deviate the optical axis when connecting the connector. When you must cover the lens surface with a shade, the lamp must not be lit for more than three minutes.
- Do not mask the outer lens surface with tape, etc.

LUMINOUS INTENSITY MEASUREMENT

Measure the luminous intensity of headlamps with a photometer in accordance with the instruction manual prepared by the manufacturer of the photometer and make sure that the luminous intensity is within the following limit.

Limit:

High-beam: 18,000 cd or more

Low-beam: 7,000 cd or more

NOTE

- When measuring the luminous intensity of headlamp, keep the engine at 2,000 rpm and have the battery charged.
- If there are specific regulations for luminous intensity of headlamps in the region where the vehicle is operated, make sure that the intensity conforms to the requirements of such regulations.

HEADLAMP, POSITION LAMP ASSEMBLY AND FRONT TURN SIGNAL LAMP ASSEMBLY

REMOVAL AND INSTALLATION

CAUTION: SRS

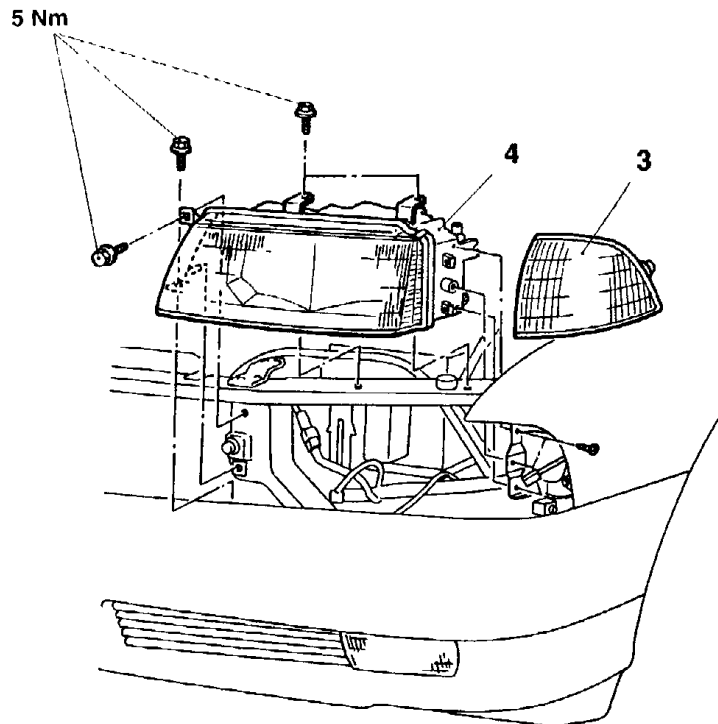
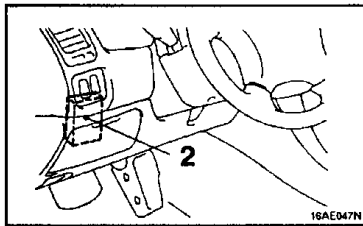
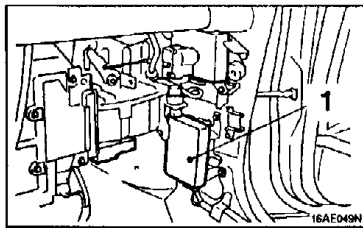
Before removal of air bag module and clock spring, refer to the followings:

GROUP 52B – SRS Service Precautions

GROUP 52B – Air Bag Module and Clock Spring

Pre-removal and Post-installation Operation

- Removal and Installation of Battery (When replacing only left side headlamp)
- Radiator Grille Removal and Installation (Refer to Group 51–Garnishes and Grilles)



1. Assist-ECU

2. Instrument panel-ECU

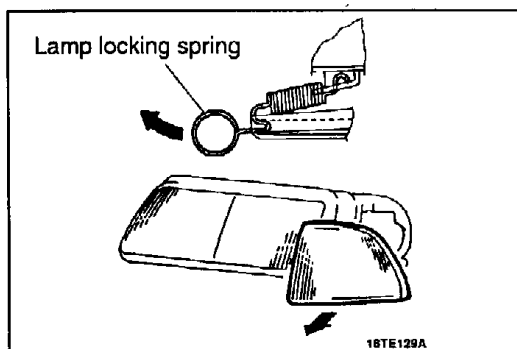
Headlamp, position lamp and front turn signal lamp removal steps

◀▶ 3. Front turn signal lamp assembly

4. Headlamp assembly

For removal and installation of column switch assembly Refer to GROUP 37A – Steering Wheel

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REMOVAL SERVICE POINT

◀▶ FRONT TURN SIGNAL LAMP ASSEMBLY REMOVAL

1. Remove the lamp locking spring.
2. Pull the lamp assembly forward and out.

INSPECTION

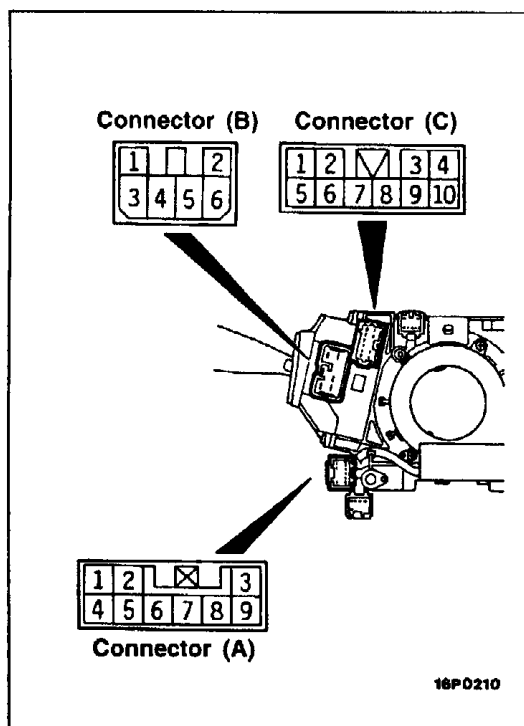
Refer to GROUP 51 – Windshield Wiper and Washer for removal and installation of the column switch.

Caution

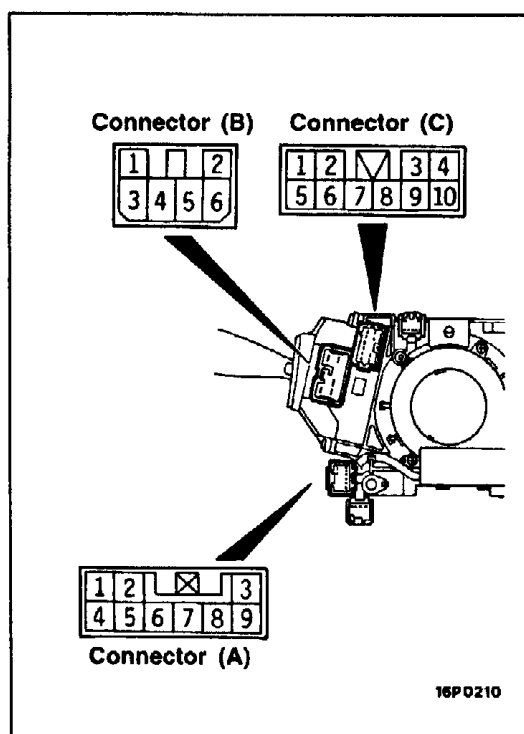
Before removal of air bag module and clock spring, refer to the followings:

GROUP 52B – SRS Service Precautions

GROUP 52B – Air Bag Module and Clock Spring

**COLUMN SWITCH CONTINUITY CHECK <Lighting Switch and Dimmer/Passing Switch>**

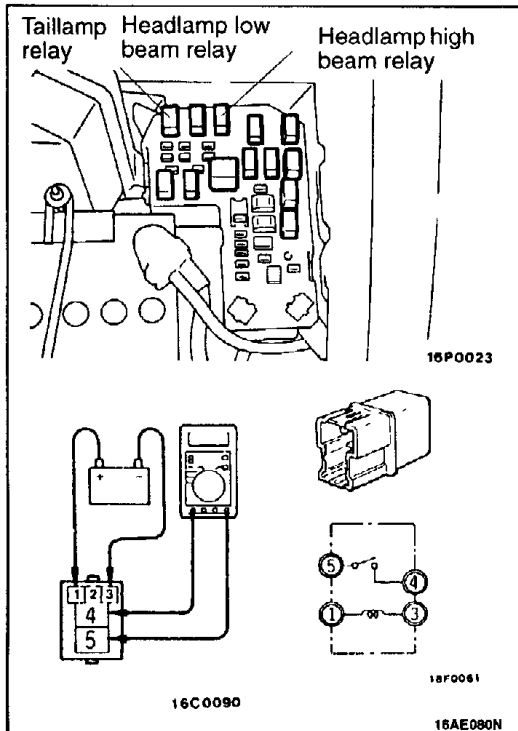
Switch position		Connector (A) terminal No.				Connector (B) terminal No.				
		2	5	8	9	1	2	3	4	6
OFF										
Lighting Switch	Position taillamp		○	○						
	Headlamp	○	○	○						
Dimmer Switch	Low-beam							○	○	
	High-beam								○	○
	PASSING					○	○		○	○
						○	○		○	○

**COLUMN SWITCH CONTINUITY CHECK <Turn-signal light switch>**

Switch position		Connector (C) terminal No.		
		5	7	8
Turn signal lamp switch	LH	○		○
	OFF			
	RH		○	○

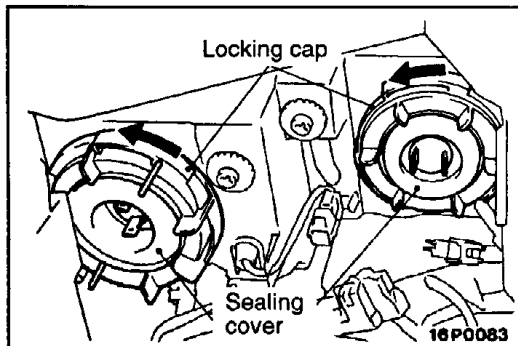
HAZARD LIGHT SWITCH CONTINUITY CHECK

Refer to P.54-72.



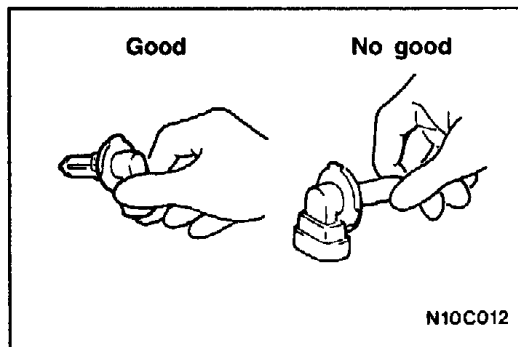
HEADLAMP RELAY CONTINUITY CHECK

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



HEADLAMP BULB REPLACEMENT

1. Remove the sealing cover by turning it counterclockwise.



2. Detach the bulb fitting spring, and then remove the bulb.

Caution

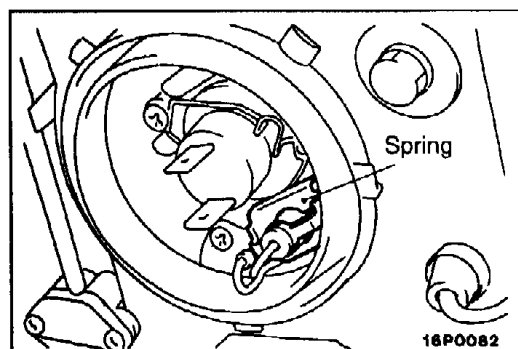
Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.

3. Install the sealing cover securely after the bulb replacement.

If the sealing cover is not securely installed, the lens will be out of focus, or water will get inside the lamp unit, so the cover should be securely installed.

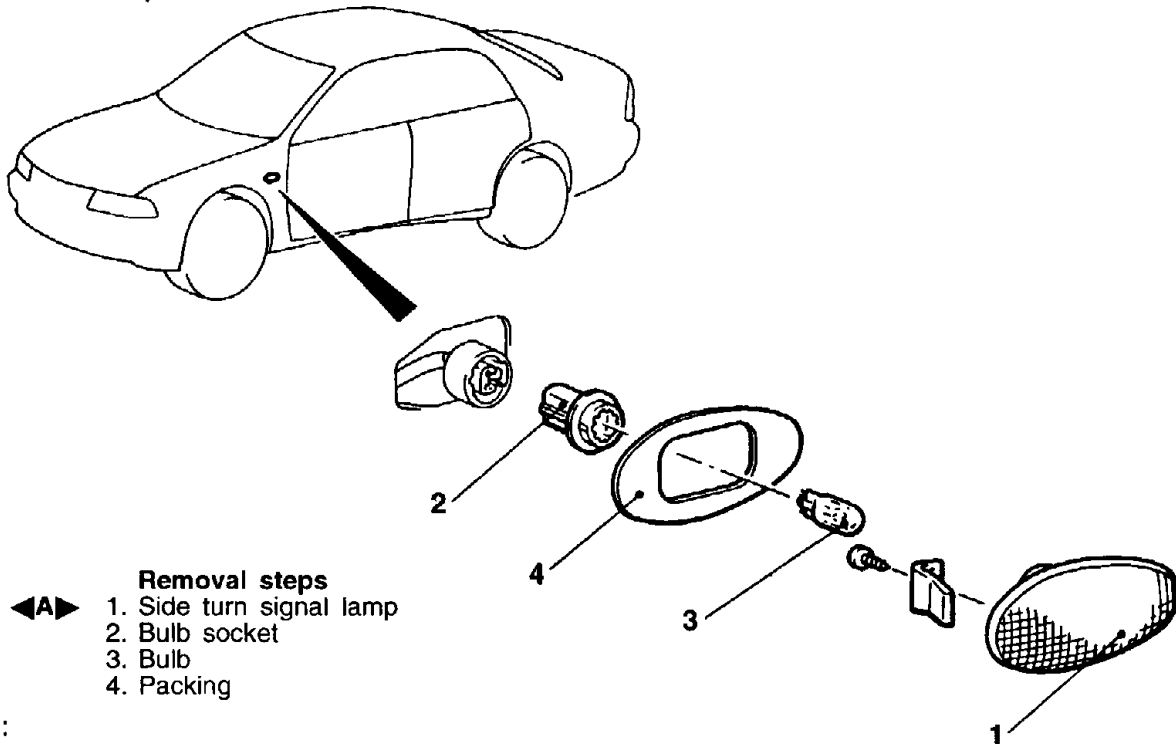
POSITION LAMP BULB REPLACEMENT

1. Disconnect the connector and remove the sealing cover of the headlamp low beam.
2. Lift the spring and pull out the position lamp bulb.



SIDE TURN SIGNAL LAMP

REMOVAL AND INSTALLATION

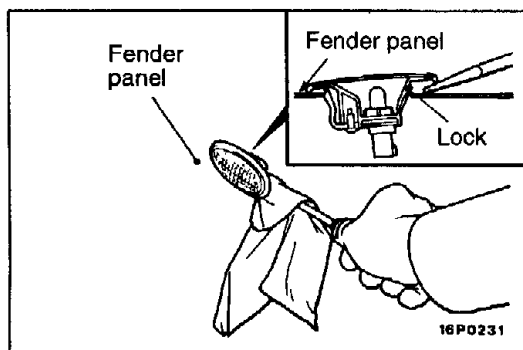


- Removal steps**
- ◀A▶
1. Side turn signal lamp
 2. Bulb socket
 3. Bulb
 4. Packing

NOTE:

Refer to Group 37A - Steering Wheel and Shaft, for removal and installation of the column switch assembly (lighting switch).

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REMOVAL SERVICE POINT

◀A▶ SIDE TURN SIGNAL LAMP REMOVAL

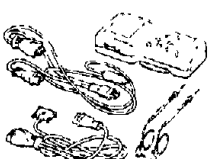
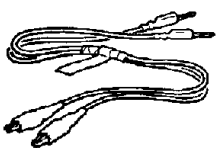
With a flat-bladed screwdriver, remove the lock from the fender panel and take out the side turn signal lamp.

FOG LAMP

SERVICE SPECIFICATIONS

Items		Standard value
Fog lamp aiming	Vertical direction	47mm below horizontal (H)
	Horizontal direction	35mm to left of vertical line (V)

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II	Simplified Wiring System (SWS) diagnostic checking
		ROM pack	
	MB991529	Diagnosis code check harness	Simplified Wiring System (SWS) diagnostic checking

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSTIC MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS-ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to P.54-104 for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSIS CODE CLASSIFICATION TABLE

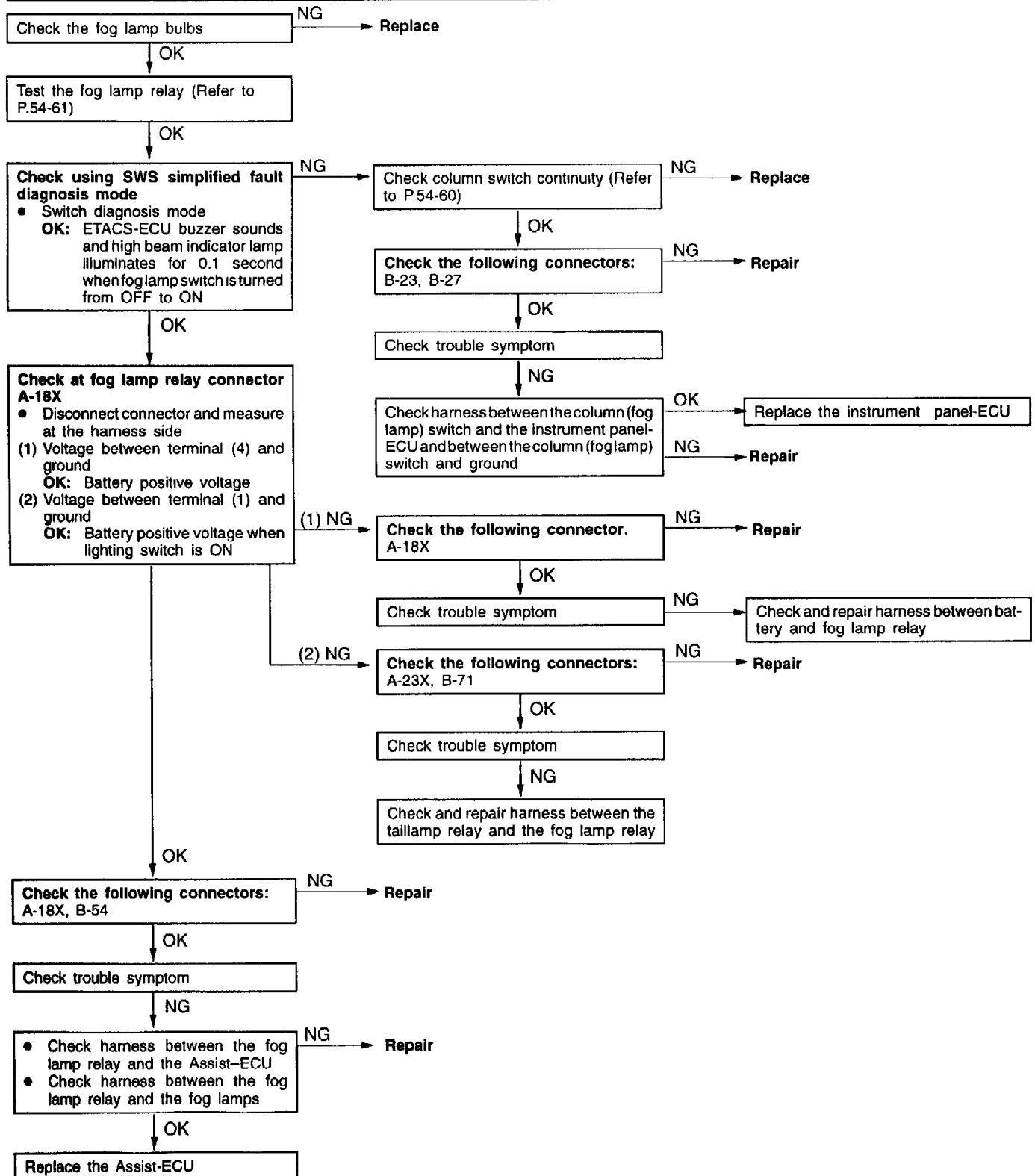
Refer to Simplified Wiring System P.54-107.

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II not possible	Refer to SWS Troubleshooting (P.54-104)	
Switching to SWS Simplified Fault Diagnosis mode not possible		
Fog lamp does not operate normally (taillamps and headlamps operate normally)	1	54-57

INSPECTION PROCEDURE 1

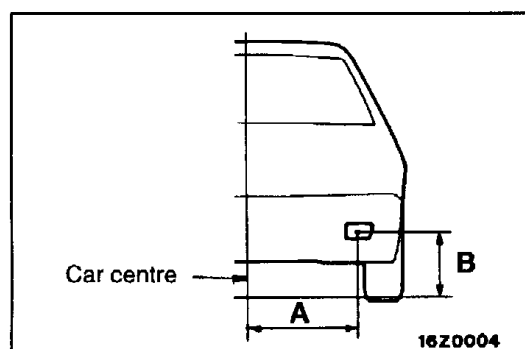
Fog lamp does not operate normally (tail lamps and headlamps operate normally)	Probable cause
The fog lamp switch input circuit, relay drive circuit harness or connector may be defective	• Fog lamp bulbs blown • Fog lamp switch defective • Fog lamp relay defective • Harness or connector defective • Instrument panel-ECU malfunction • Assist-ECU malfunction



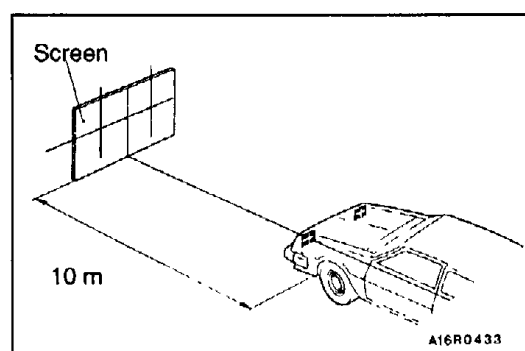
ON-VEHICLE SERVICE

FOG LAMP AIMING

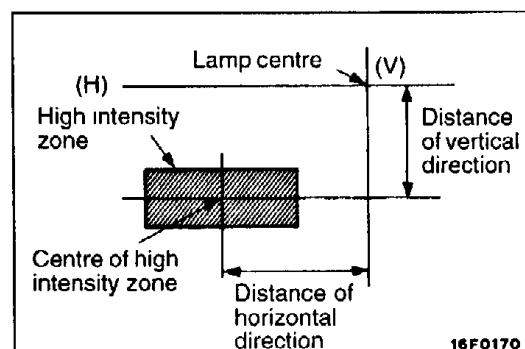
1. Inspect for badly rusted or faulty fog lamp.
2. These conditions must be corrected before a satisfactory adjustment can be made.
3. Place vehicle on a level floor.
4. Bounce front suspension through three (3) oscillations by applying body weight to hood or bumper.
5. Inspect tyre inflation.
6. Rock vehicle sideways to allow vehicle to assume its normal position.
7. If fuel tank is not full, place a weight in trunk of vehicle to simulate weight of a full tank [0.72kg per litre].
8. There should be no other load in the vehicle other than driver or substituted weight of approximately 70 kg placed in driver's position.
Thoroughly clean fog lamp lenses.



9. Measure the centre of the fog lamps as shown in the illustration.



10. Set the distance between the screen and the centre of the fog lamps as shown in the illustration.



11. Check if the beam shining onto the screen is at the standard value.

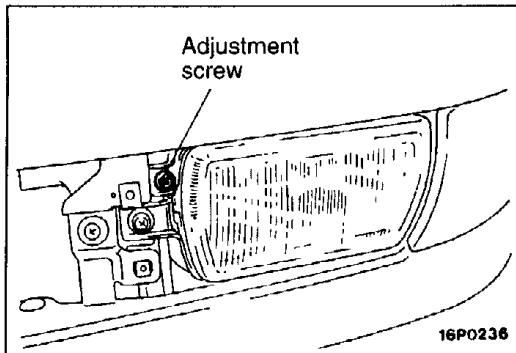
Standard value:

(Vertical direction)

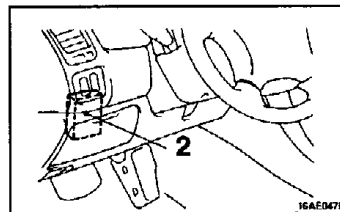
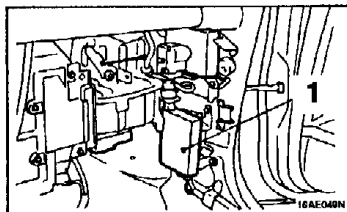
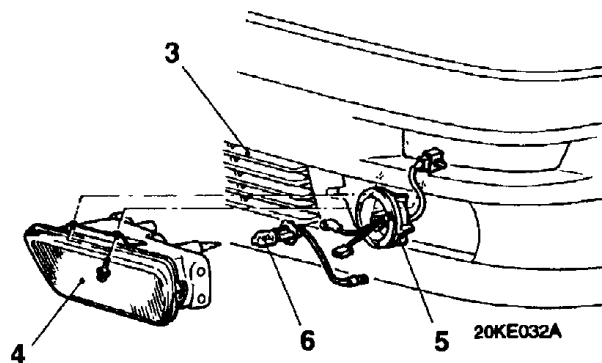
47mm below horizontal (H)

(Horizontal direction)

35mm to left of vertical line (V)

**NOTE**

The horizontal direction is non-adjustable. If the deviation of the lamp beam axis exceeds the standard value, check to be sure that the mounting location or some other point is not defective.

FOG LAMP**REMOVAL AND INSTALLATION**

16AE130E

1. Assist-ECU (Refer to P.54-128)
2. Instrument panel-ECU (Refer to P.54-128)

Fog lamp switch removal steps

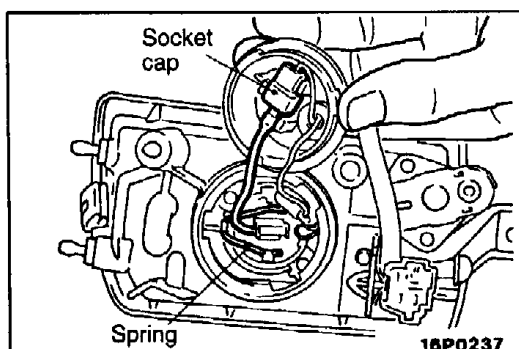
- Column switch (Refer to Group 51 Windshield Wiper and Washer)

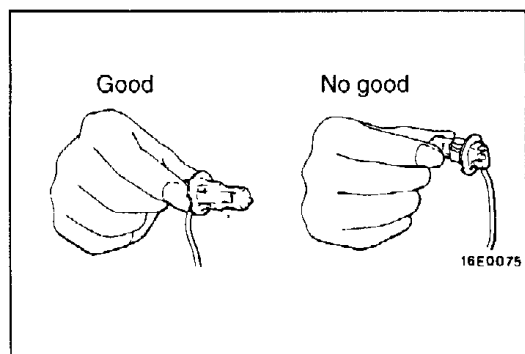
Fog lamp removal steps

3. Under grille
4. Fog lamp
5. Sealing cover
6. Bulb

**REMOVAL SERVICE POINT****◀A▶ BULB REMOVAL**

1. Remove the bulb socket cap.
2. Remove the bulb attachment spring and pull out the bulb.



**Caution**

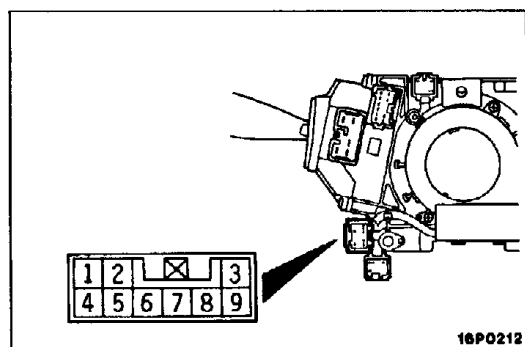
Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.

INSTALLATION SERVICE POINT**▶A◀ SEALING COVER INSTALLATION**

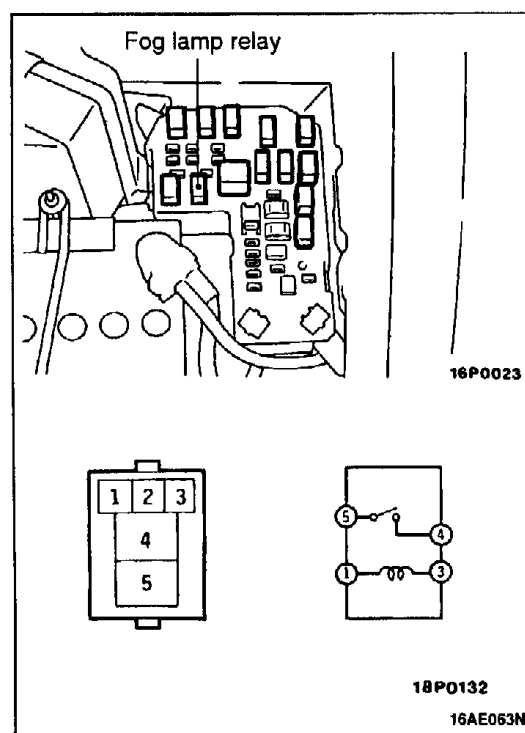
Install the sealing cover securely.

Caution

If the sealing cover is not securely installed, the lens will be out of focus, or water will get inside the lamp unit, so the sealing cover should be securely installed.

**INSPECTION****FOG LAMP SWITCH CONTINUITY CHECK**

Switch position		Terminal No.	
		3	7
Fog lamp switch	OFF		
	ON	○ — ○	○ — ○

**FOG LAMP RELAY CONTINUITY CHECK**

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

REAR COMBINATION LAMP AND REAR LID LAMP

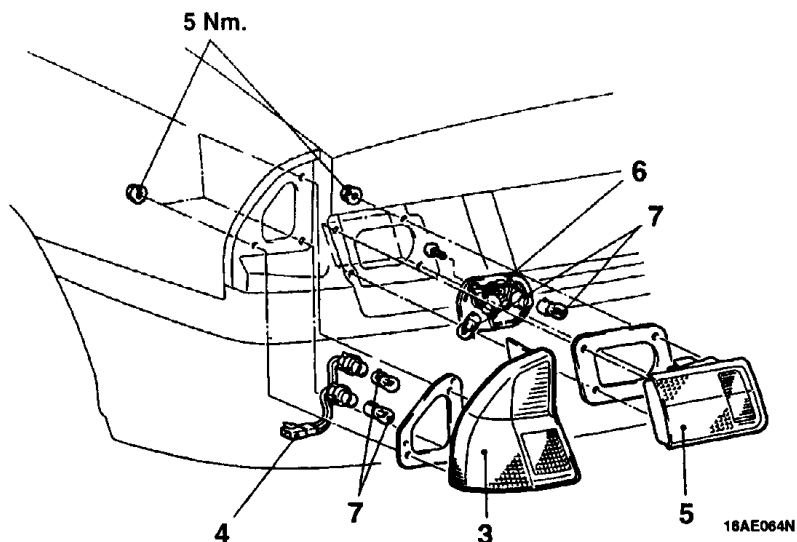
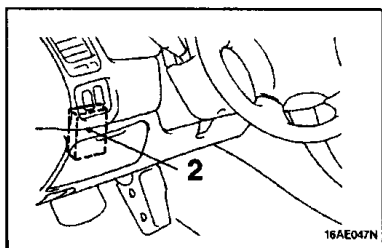
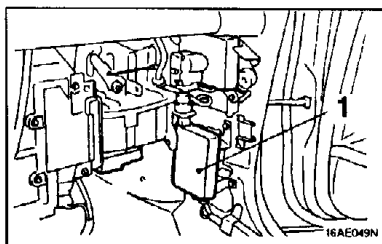
REMOVAL AND INSTALLATION

CAUTION: SRS

Before removal of air bag module and clock spring, refer to the followings:

GROUP 52B – SRS Service Precautions

GROUP 52B – Air Bag Module and Clock Spring



16AE065N

1. Assist-ECU (Refer to P.54-128)

2. Instrument panel-ECU
(Refer to P.54-128)

Rear combination lamp removal steps

- Trunk rear side trim (Refer to Group 52A)
- 3. Rear combination lamp
- 4. Socket holder/bulb assembly

Rear lid lamp removal steps

- Trunk rear trim (Refer to Group 52A–Trims)
- 5. Rear lid lamp
- 6. Socket assembly
- 7. Bulb

Column switch removal

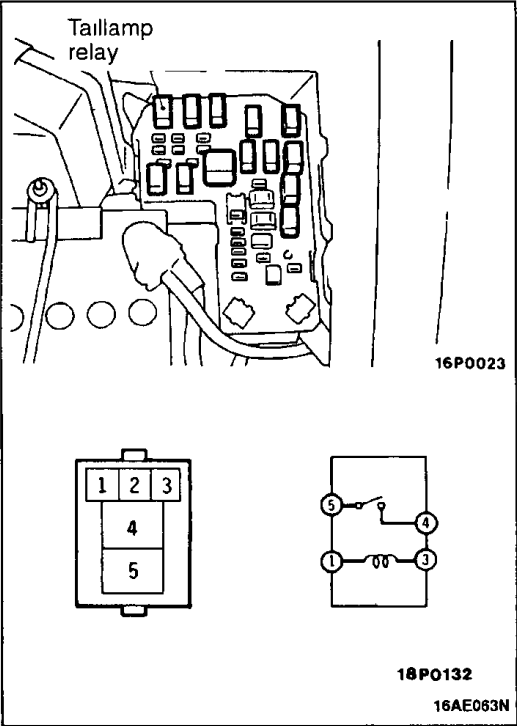
- Column switch <Lighting switch> (Refer to GROUP 51 – Windshield Wiper and Washer)

INSPECTION

FOG LAMP SWITCH CONTINUITY CHECK

Refer to P.54-60.

54-62 CHASSIS ELECTRICAL – Rear Combination Lamp and Rear Lid Lamp

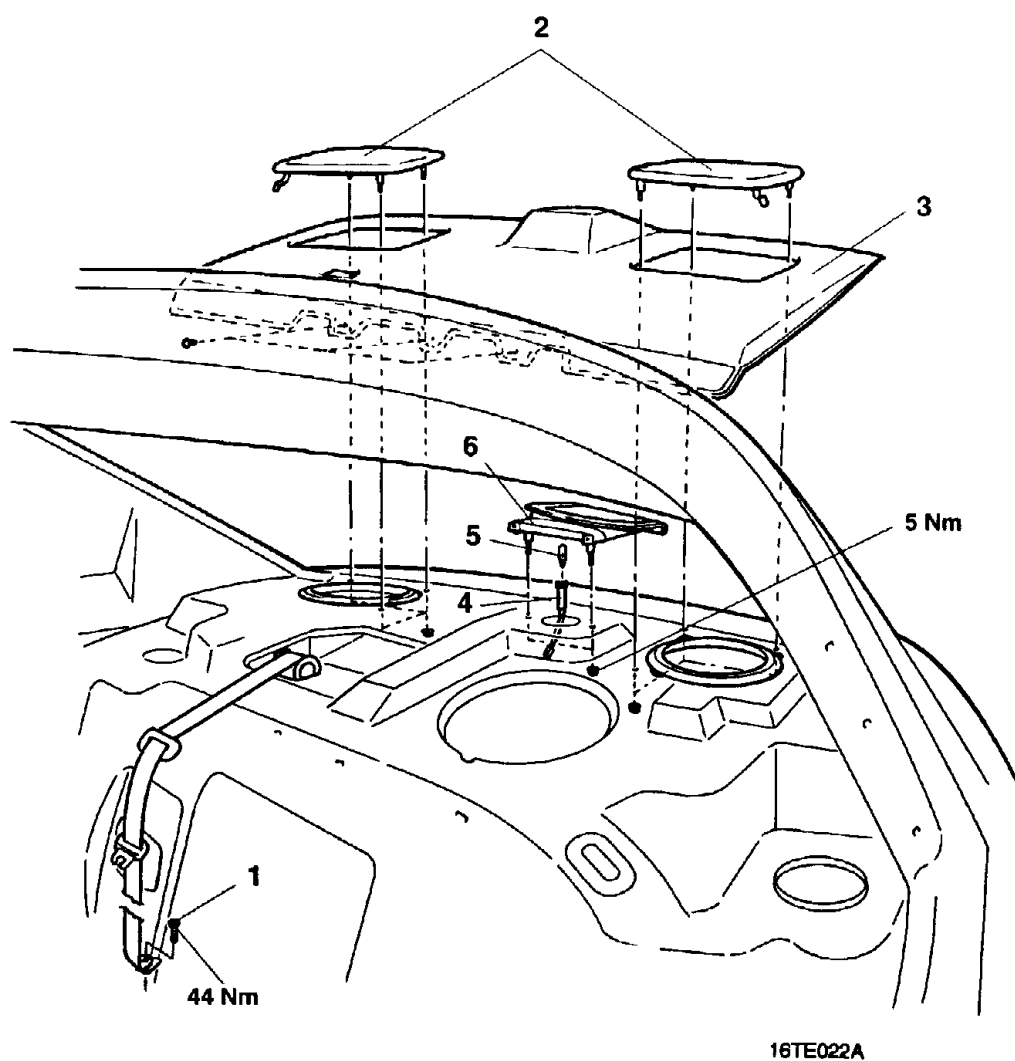


TAILLAMP RELAY CONTINUITY CHECK

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

HIGH MOUNTED STOP LAMP

REMOVAL AND INSTALLATION

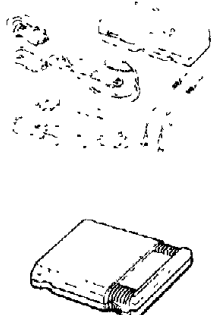


Removal steps

- Rear shelf trim removal (Refer to Group 52 – Trims)
- 1. Centre seatbelt retaining bolt
- 2. Speaker mesh
- 3. Rear shelf trim
- 4. Socket assembly
- 5. Bulb
- 6. High mounted stop lamp

INTERIOR LAMP

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II ROM pack	Simplified Wiring System (SWS) diagnostic checking
	MB991529	Diagnosis code check harness	Simplified Wiring System (SWS) diagnostic checking

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLE SHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSTIC MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS-ECU specification
- Switch input signals for each ECU
- Diagnosis code output

Refer to P.54-104 for details of the SWS Simplified Fault Diagnosis Mode.

SWS DIAGNOSIS CODE CLASSIFICATION TABLE

Refer to Simplified Wiring System P.54-107.

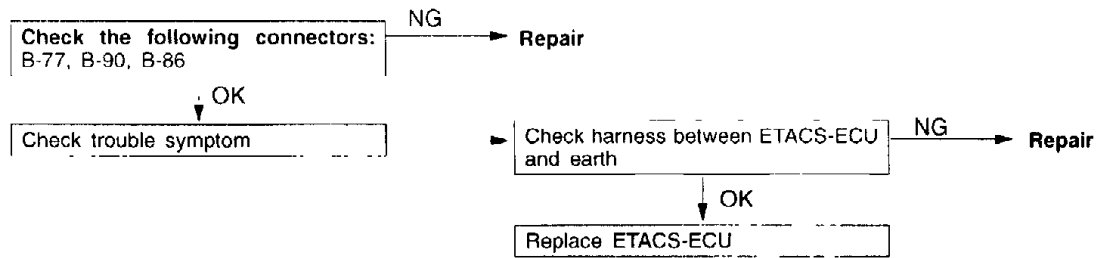
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II not possible	Refer to SWS Troubleshooting (P.54-104)	
Switching to SWS Simplified Fault Diagnosis mode not possible		
When all doors are closed with the interior lamp in the Door position, the lamp intensity does not reduce (75%) and the lamp does not fade out	1	54-66
With the ignition switch OFF and one of the doors open, the interior lamp does not come on 100%	2	54-67
If the ignition is turned ON when the interior lamp is at reduced intensity or during fade out, the interior lamp does not go out	3	54-68

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

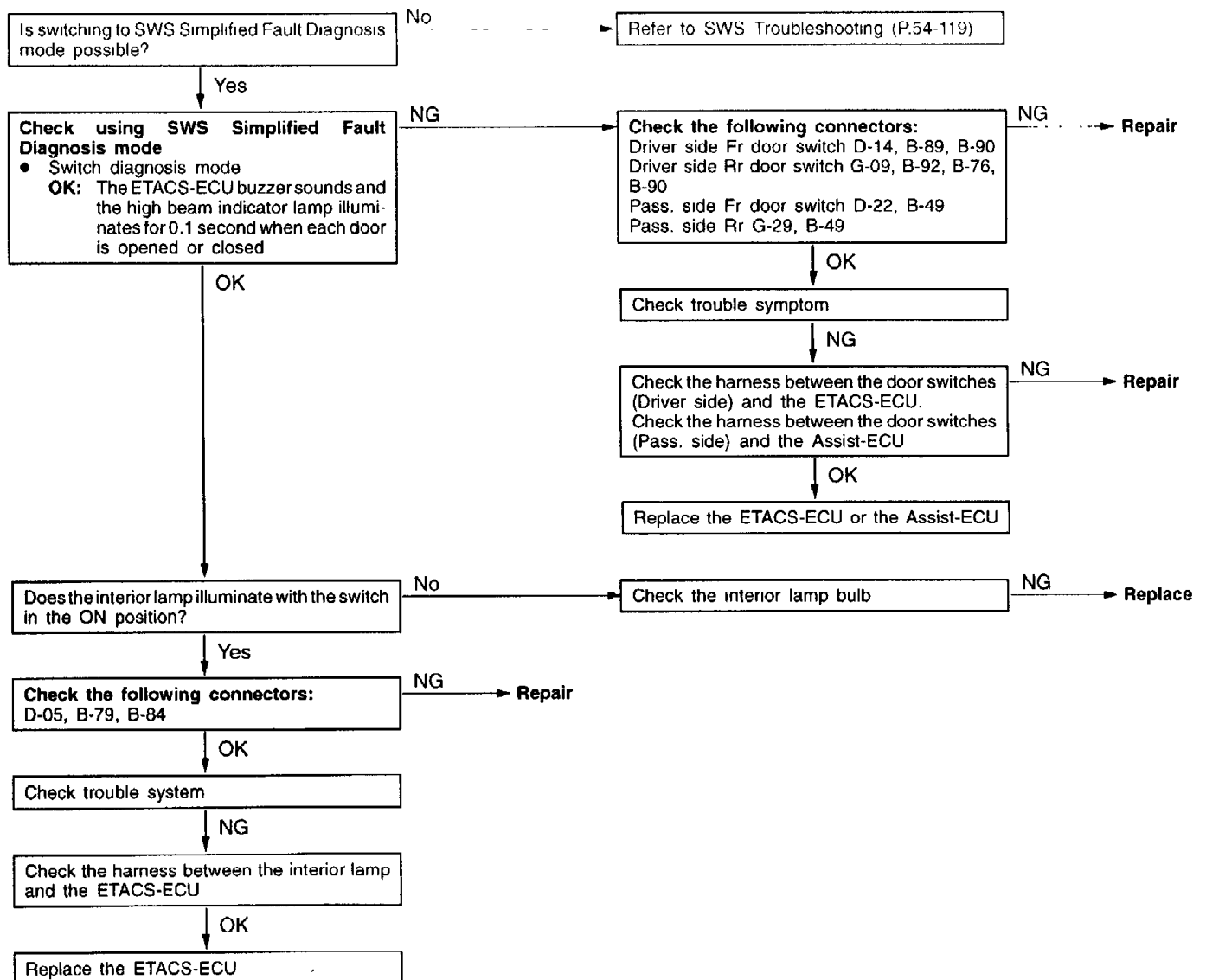
INSPECTION PROCEDURE 1

When all doors are closed with the interior lamp in the DOOR position, the lamp intensity does not reduce (75%) and the lamp does not fade out	Probable cause
The ETACS-ECU ground circuit or the ETACS-ECU may be defective.	• Harness or connector defective • ETACS-ECU malfunction



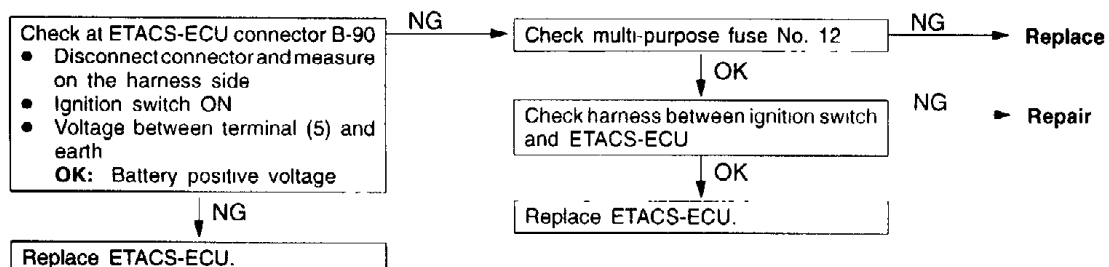
INSPECTION PROCEDURE 2

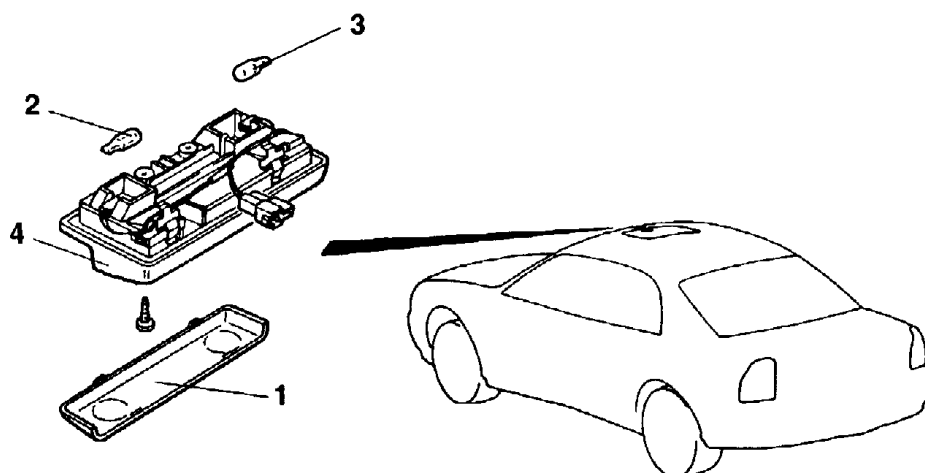
With the ignition switch OFF and one of the doors open, the interior lamp does not come on (100%)	Probable cause
The door switch input circuit or the interior lamp lighting circuit may be defective	- Overhead lamp defective - Harness or connector may be defective - ETACS-ECU malfunction (driver side door system) - Assist-ECU malfunction (pass. side door system)



INSPECTION PROCEDURE 3

If the ignition switch is turned ON when the interior lamp is at reduced intensity or during fade-out, the interior lamp does not go out	Probable cause
The ignition circuit system or the ETACS-ECU may be defective. In the case of fuse failure, combination meter indicator-related items may also be defective.	• Fuse defective • Harness or connector defective • ETACS-ECU malfunction



INTERIOR LAMP**REMOVAL AND INSTALLATION <Vehicles With Sunroof>**

16AE099N

Removal steps

◀A▶

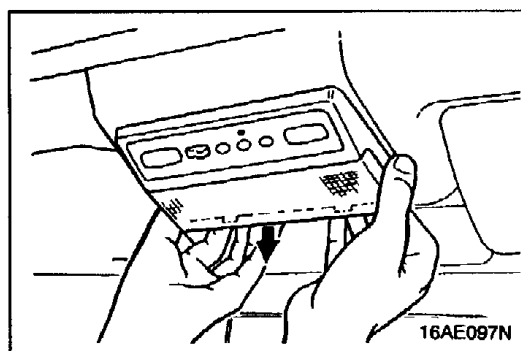
1. Room lamp lens

◀B▶

2. Room lamp bulb

3. Room lamp bulb

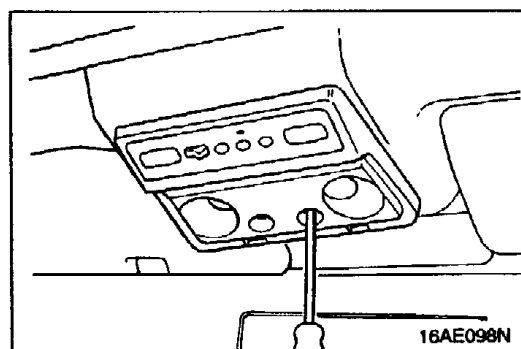
4. Room lamp body



16AE097N

REMOVAL SERVICE POINTS**◀A▶ ROOM LAMP LENS REMOVAL**

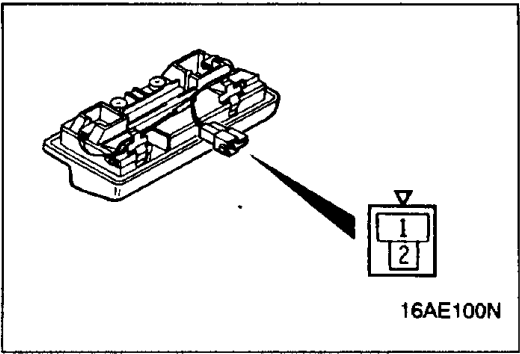
To remove, press the room lamp tab while pulling downwards.



16AE098N

◀B▶ ROOM LAMP BODY REMOVAL

To remove, undo the two screws in the room lamp body and pull the lamp downwards.

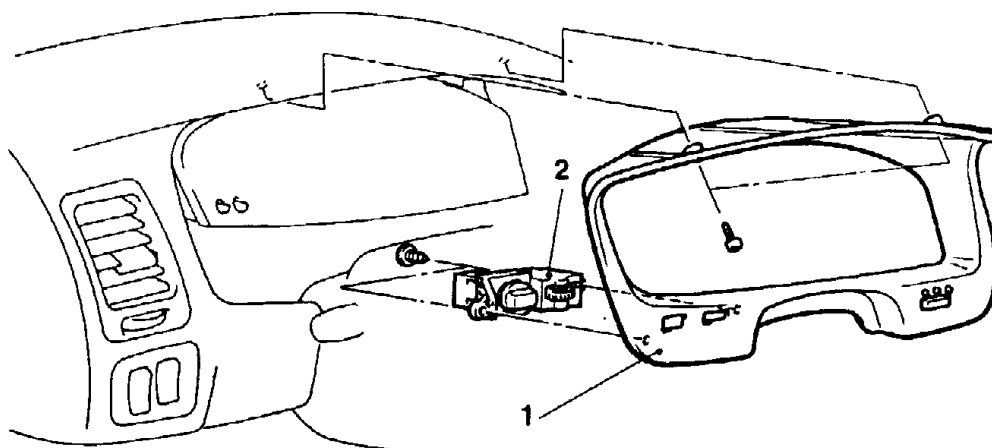


INSPECTION
ROOM LAMP SWITCH CONTINUITY CHECK

Switch position	Terminal No.		
	1		2
OFF			
ON		 Body earth	
DOOR			

RHEOSTAT

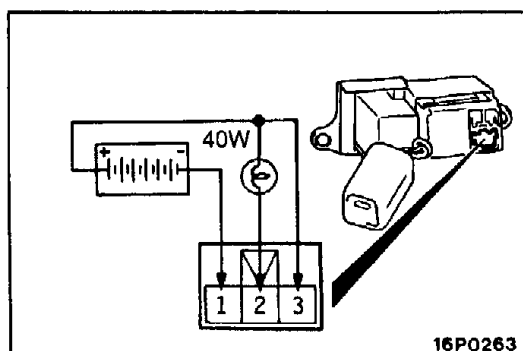
REMOVAL AND INSTALLATION



16AE066N

Removal steps

1. Meter bezel
2. Rheostat

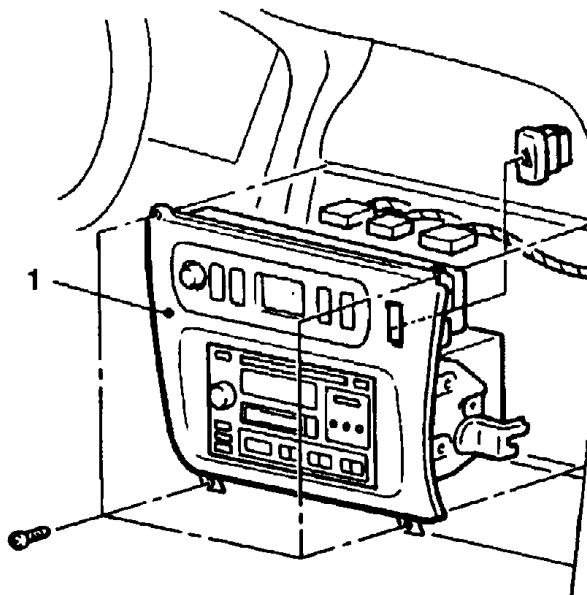


INSPECTION

1. Connect a battery and test lamp (40W) as shown in the illustration.
2. Operate the rheostat, and if the brightness changes smoothly without switching off, then the rheostat function is normal.

HAZARD WARNING LAMP SWITCH

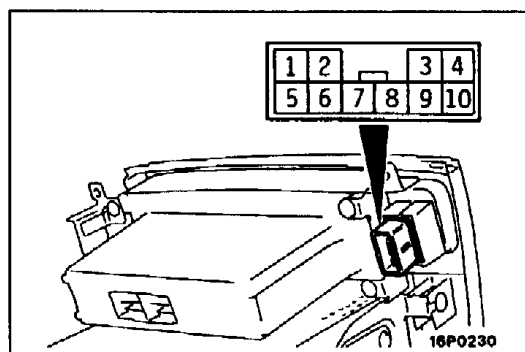
REMOVAL AND INSTALLATION



16AE067N

Removal steps

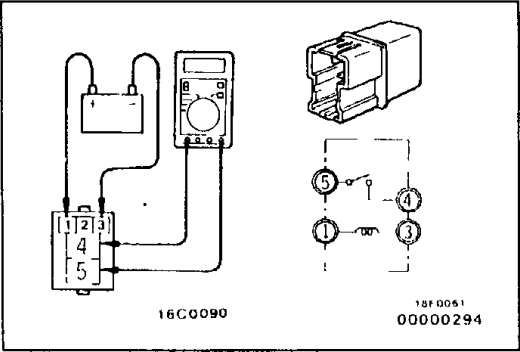
- Floor console assembly (Refer to Group 52A – Floor console)
- Centre air outlet assembly (Refer to Group 52A – Instrument panel)
- Ashtray (Refer to P.54-75)
- 1. Air conditioner control panel assembly



INSPECTION

HAZARD WARNING LAMP SWITCH CONTINUITY CHECK

Switch position	Terminal No.									
	1	2	3	4	5	6	7	8	9	10
OFF					○	—	○	○	○	ILL
ON	○	○	○	○	○	○			○	ILL



HORN

INSPECTION

HORN RELAY CONTINUITY CHECK

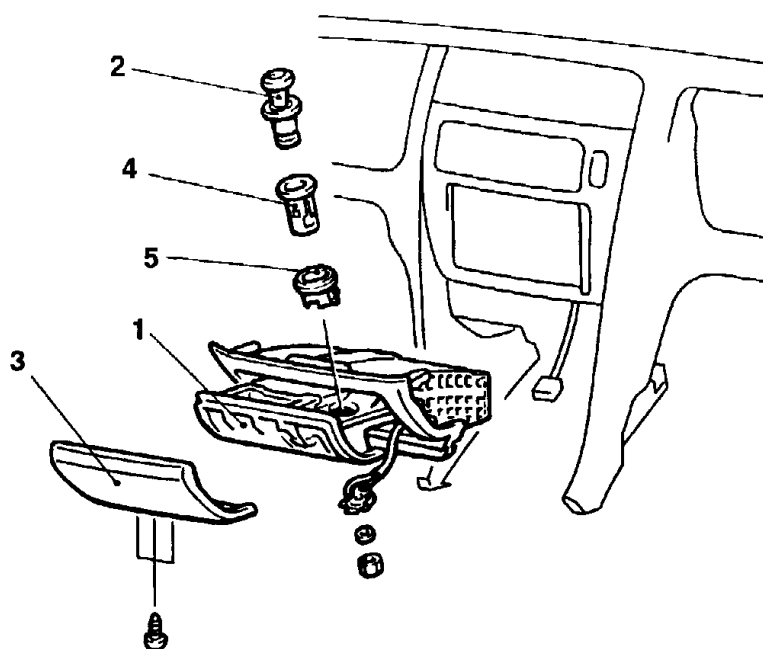
Battery voltage	Terminal No.			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○

CIGARETTE LIGHTER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation procedures

- Floor Console Assembly Removal and Installation (Refer to Group 52A–Floor Console)

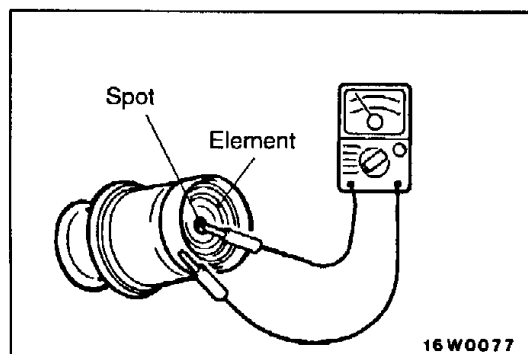


16AE068N

Removal steps

1. Ashtray
2. Plug
3. Ashtray cover

4. Protector
5. Socket assembly



INSPECTION

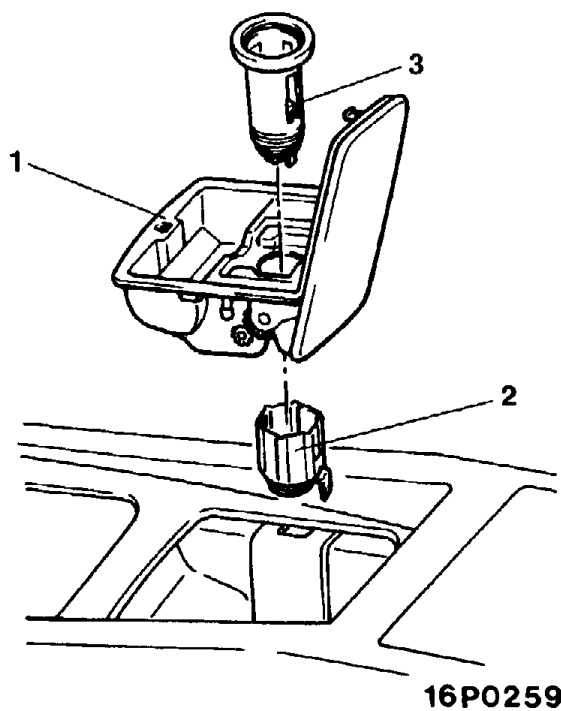
- Take out the plug, and check for a worn edge on the element spot connection, and for shreds of tobacco or other material on the element.
- Using a ohmmeter, check the continuity of the element.

CAUTIONS FOR USE OF THE CIGARETTE LIGHTER SOCKET AS AUXILIARY POWER SOURCE

1. It is recommended that only the lighter be inserted in the socket.
Using "plug-in" type accessories in the cigarette lighter socket may damage the socket and result in poor retention of the lighter.
2. "Plug-in" accessories should only be used in the accessory socket provided.

ACCESSORY SOCKET

REMOVAL AND INSTALLATION



Removal steps

1. Coin tray assembly
2. Socket
3. Socket assembly

RADIO, TAPE PLAYER AND CD PLAYER TROUBLESHOOTING

QUICK-REFERENCE TROUBLESHOOTING CHART

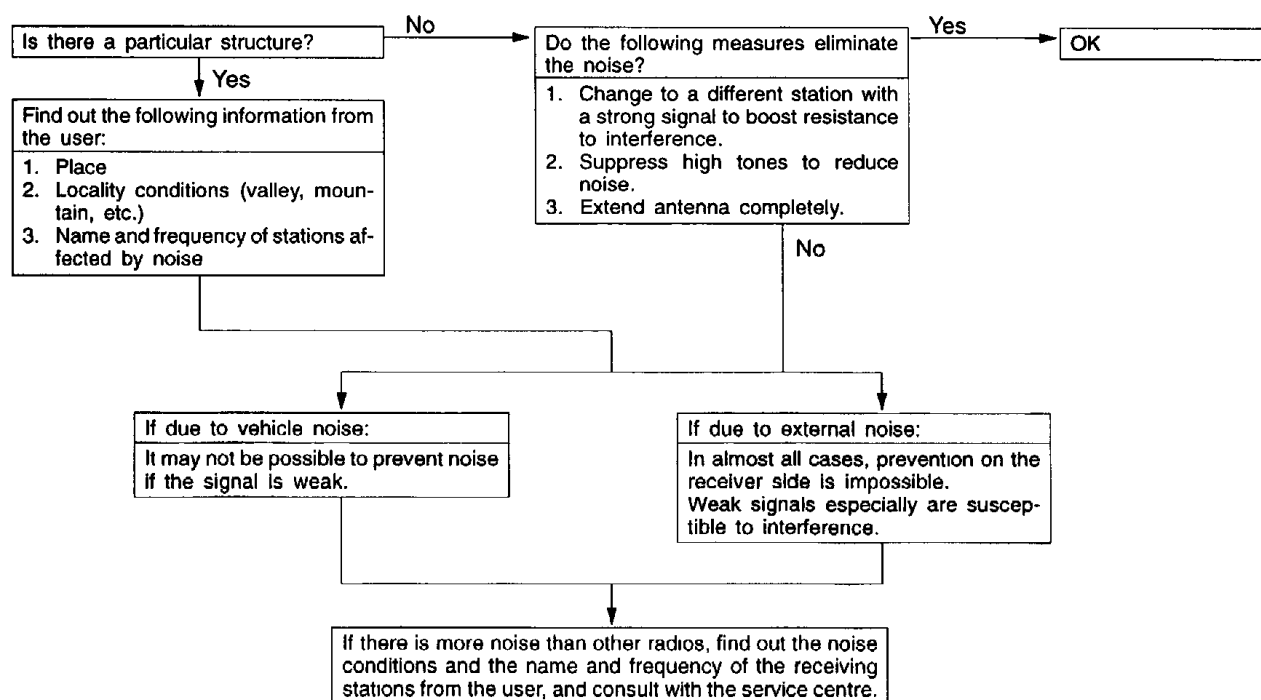
Items	Problem symptom	Relevant chart
Noise	Noise appears at certain places when travelling (AM).	A-1
	Noise appears at certain places when travelling (FM).	A-2
	Mixed with noise, only at night (AM).	A-3
	Broadcasts can be heard but both AM and FM have a lot of noise	A-4
	There is more noise either on AM or on FM.	A-5
	There is noise when starting the engine.	A-6
	Some noise appears when there is vibration or shocks during travelling	A-7
	Noise sometimes appears on FM during travelling.	A-8
	Ever-present noise.	A-9
Radio	When switch is set to ON, no power is available.	B-1
	No sound from one speaker.	B-2
	There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.	B-3
	Insufficient sensitivity.	B-4
	Distortion on AM or on both AM and FM.	B-5
	Distortion on FM only.	B-6
	Too few automatic select stations.	B-7
	Insufficient memory (preset stations are erased).	B-8
Tape player	Cassette tape will not insert.	C-1
	No sound.	C-2
	No sound from one channel.	C-3
	Sound quality is poor, or sound is weak.	C-4
	Cassette tape will not eject.	C-5
	Uneven revolution. Tape speed is fast or slow.	C-6
	Faulty auto reverse.	C-7
	Tape gets caught in mechanism.	C-8
	Automatic search does not work	C-9

Items	Problem symptom	Relevant chart
CD player	CD will not be accepted.	D-1
	No sound.	D-2
	CD sound skips.	D-3
	Sound quality is poor.	D-4
	CD will not be ejected.	D-5
	No sound from one channel.	D-6
Motor antenna	Motor antenna won't extend or retract.	E-1
	Motor antenna extends and retracts but does not receive.	E-2

CHART

A. NOISE

A-1	Noise appears at certain places when travelling (AM).
------------	--



A-2 Noise appears at certain places when travelling (FM).

Do the following measures eliminate the noise?

- Change to a different station with a strong signal to boost resistance to interference.
- Suppress high tones to reduce noise
- Extend antenna completely

Yes →

OK

↓ No

If there is more noise than other radios, find out the noise conditions and the name and frequency of the receiving stations from the user, and consult with the service centre

NOTE

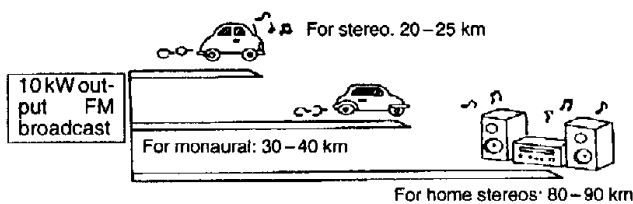
About FM waves:

FM waves have the same properties as light, and can be deflected and blocked. Wave reception is not possible in the shadow of obstructions such as buildings or mountains.

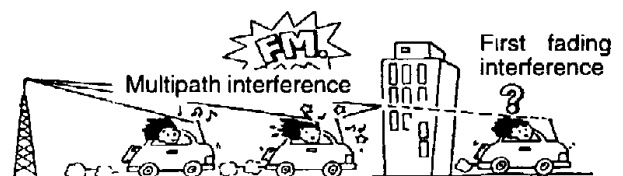
1. The signal becomes weak as the distance from the station's transmission antenna increases. Although this may vary according to the signal strength of the transmitting station and intervening geographical formation or buildings, the area of good reception is approx. 20–25 km for stereo reception, and 30–40 km for monaural reception.
2. The signal becomes weak when an area of shadow from the transmitting antenna (places where there are obstructions such as mountains

or buildings between the antenna and the car), and noise will appear. <This is called first fading, and gives a steady buzzing noise.>

3. If a direct signal hits the antenna at the same time as a signal reflected by obstructions such as mountains or buildings, interference of the two signals will generate noise. During travelling, noise will appear each time the vehicle's antenna passes through this kind of obstructed area. The strength and interval of the noise varies according to the signal strength and the conditions of deflection. <This is called multipath noise, and is a repetitious buzzing.>
4. Since FM stereo transmission and reception has a weaker field than monaural, it is often accompanied by a hissing noise.

FM Broadcast Good Reception Areas

16A0663

FM Signal Characteristics and Signal Interference

16A0664

00000295

A-3 Mixed with noise, only at night (AM).

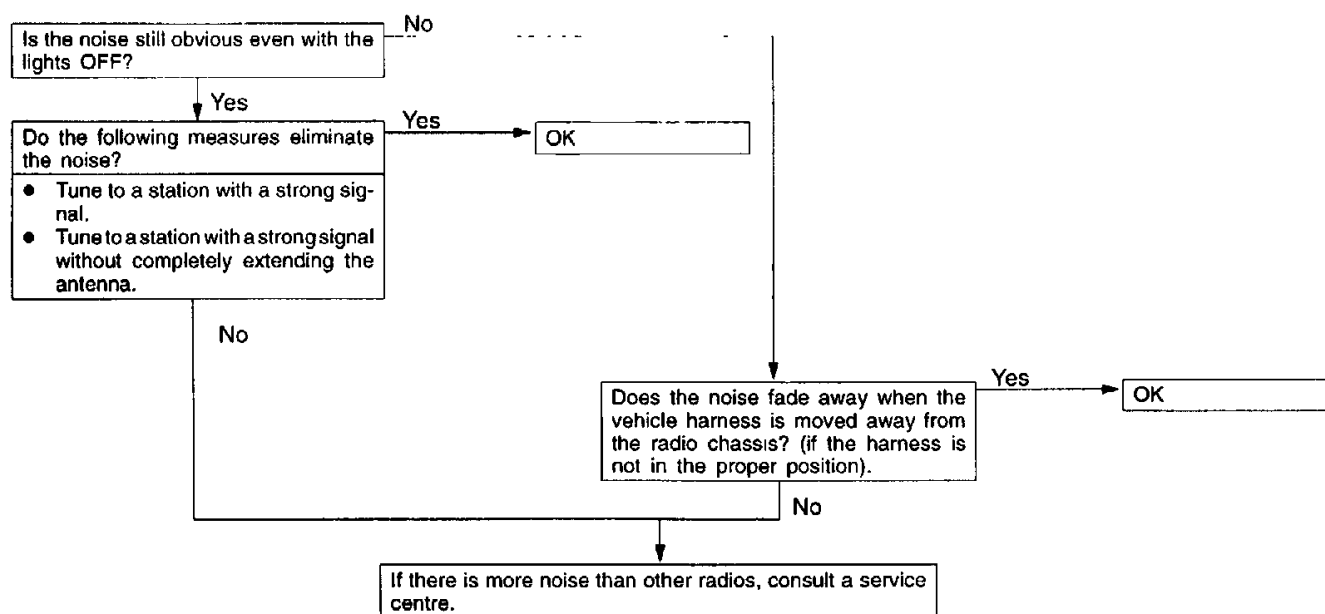
The following factors can be considered as possible causes of noise appearing at night.

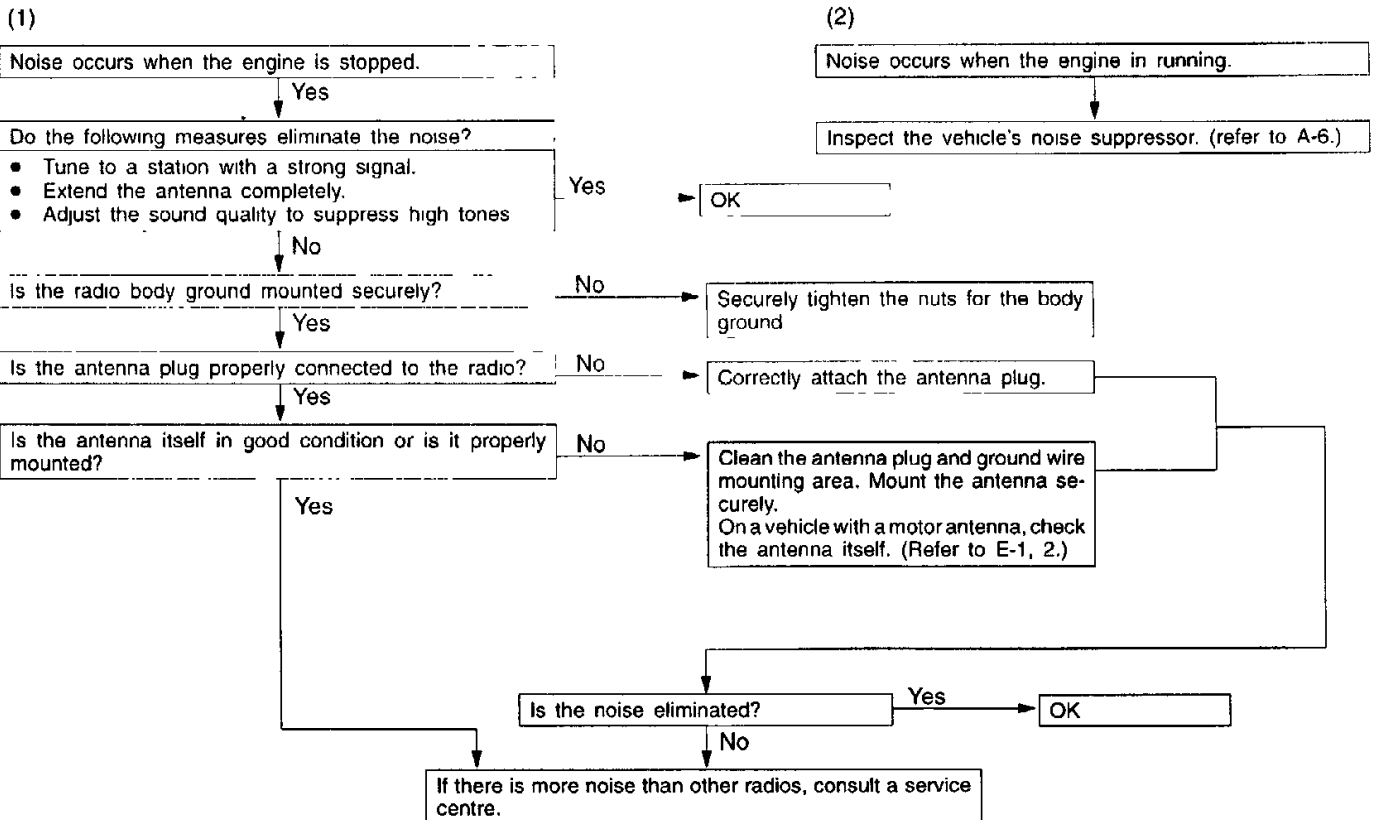
1. Factors due to signal conditions: Due to the fact that long-distance signals are more easily received at night, even stations that are received without problem during the day may experience interference in a general worsening of reception conditions. The weaker a station is the more susceptible it is to interference,

and a change to a different station or the appearance of a beating sound* may occur.

Beat sound*: Two signals close in frequency interfere with each other, creating a repetitious high-pitched sound. This sound is generated not only by sound signals but by electrical waves as well.

2. Factors due to vehicle noise: Alternator noise may be a cause.



A-4 Broadcasts can be heard but both AM and FM have a lot of noise.**NOTE**

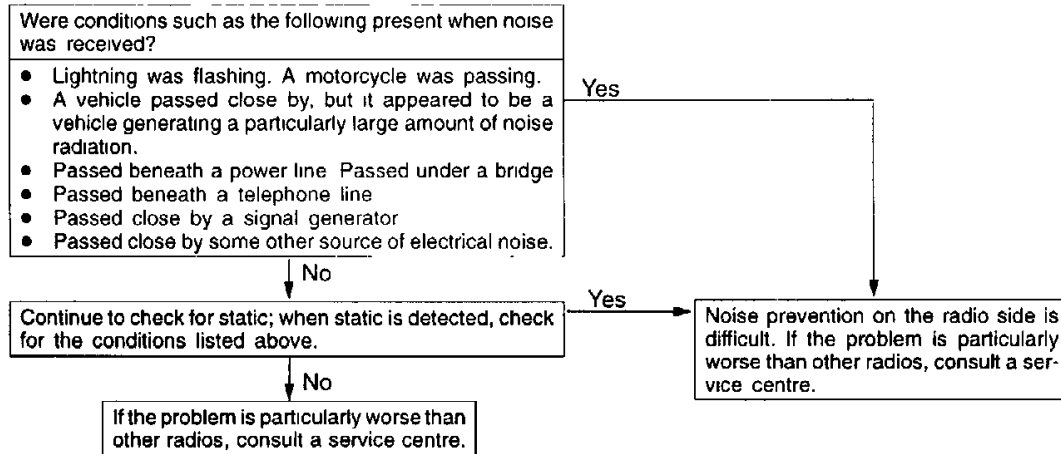
About noise encountered during FM reception only. Due to differences in FM and AM systems, FM is not as susceptible as AM to interference from engines, power lines, lightning, etc. On the other hand, there are cases due to the characteristics

of FM waves of noise or distortion generated by typical noise interference (first fading and multipath). (Refer to A-2.)

<Noise (hissing) occurs in weak signal areas such as mountainous regions, but this is not due to a problem with the radio.>

A-5 There is more noise either on AM or on FM.**1. There is much noise only on AM**

Due to differences in AM and FM systems, AM is more susceptible to noise interference.

**2. There is much noise only on FM**

Due to differences in FM and AM systems, FM is not as susceptible as AM to interference from engines, power lines, lightning, etc. On the other hand, there are cases due to the characteristics of FM waves of noise or distur-

tion generated by typical noise interference (first fading and multipath). (Refer to A-2) <Noise (hissing) occurs in weak signal areas such as mountainous regions, but this is not due to a problem with the radio.>

A-6 There is noise when starting the engine.

Noise type Sounds are in parentheses ().	Conditions	Cause	Inspection or replacement (Noise-preventive part)	
AM, FM: Ignition noise (Popping, Snapping, Cracking, Buzzing)	- Increasing the engine speed causing the popping sound to speed up, and volume decreases. - Disappears when the ignition switch is turned to ACC.	- Mainly due to the spark plugs. - Due to the engine noise.	Ground cable	Check or replace the ground cable.
			Noise capacitor	Check or replace the noise capacitor.
Other electrical components	—	Noise may appear as electrical components become older.	Repair or replace electrical components.	
Static electricity (Cracking, Crinkling)	- Disappears when the vehicle is completely stopped. - Severe when the clutch is engaged.	Occurs when parts or wiring move for some reason and contact metal parts of the body.	Return parts or wiring to their proper position.	
	Various noises are produced depending on the body part of the vehicle.	Due to detachment from the body of the front hood, bumpers, exhaust pipe and muffler, suspension, etc.	Ground parts by bonding. Cases where the problem is not eliminated by a single response to one area are common, due to several body parts being imperfectly grounded.	

Caution

- Connecting a high tension cable to the noise filter may destroy the noise filter and should never be done.**
- Check that there is no external noise. Since failure due to this may result in misdiagnosis due to inability to identify the noise source, this operation must be performed.**
- Noise prevention should be performed by suppressing strong sources of noise step by step.**

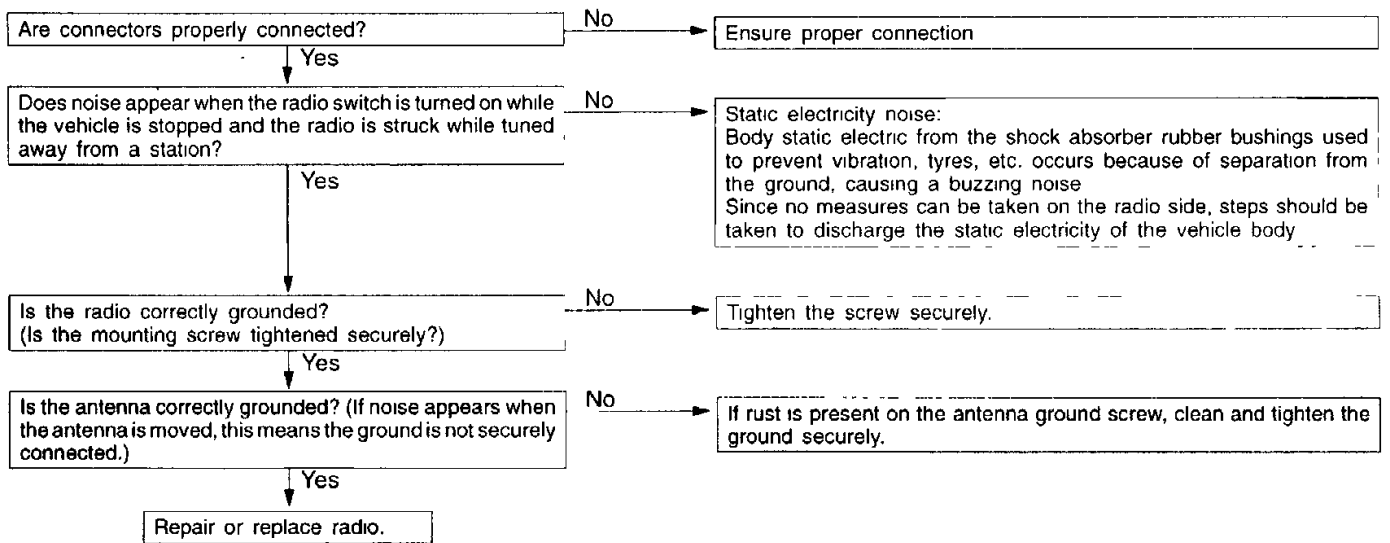
NOTE

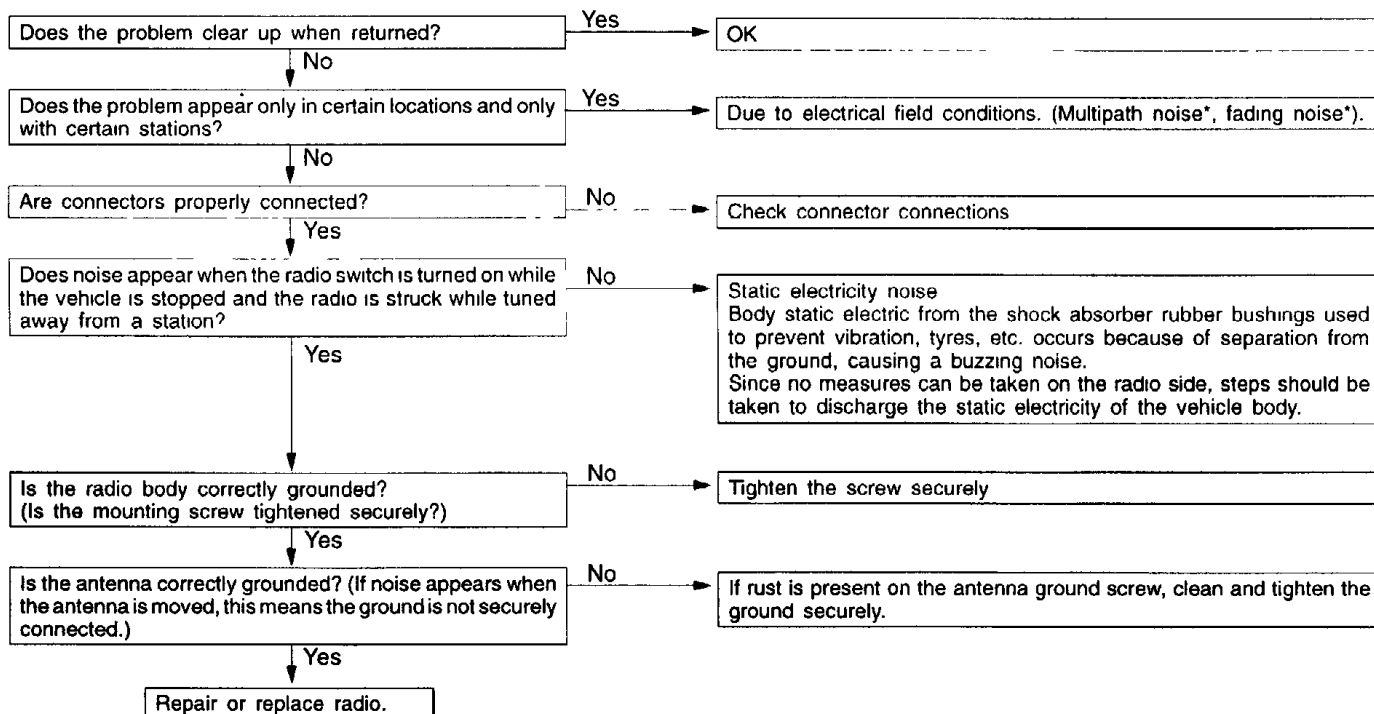
- Capacitor**
The capacitor does not pass D.C. current, but as the number of waves increases when it passes A.C. current, impedance (resistance

against A.C.) decreases, and current flow is facilitated. A noise suppressing condenser which takes advantage of this property is inserted between the power line for the noise source and the ground. This suppresses noise by grounding the noise component (A.C. or pulse signal) to the body of the vehicle.

2. **Coil**

The coil passes D.C. current, but impedance rises as the number of waves increases relative to the A.C. current. A noise suppressing coil which takes advantage of this property is inserted into the power line for the noise source, and works by preventing the noise component from flowing or radiating out of the line.

A-7 Some noise appears when there is vibration or shocks during travelling.

A-8 Noise sometimes appears on FM during travelling.

* About multipath noise and fading noise
Because the frequency of FM waves is extremely high, it is highly susceptible to effects from geological formations and buildings. These effects disrupt the broadcast signal and obstruct reception in several ways.

- **Multipath noise**
This describes the echo that occurs when the broadcast signal is reflected by a large

obstruction and enters the receiver with a slight time delay relative to the direct signal (repetitious buzzing).

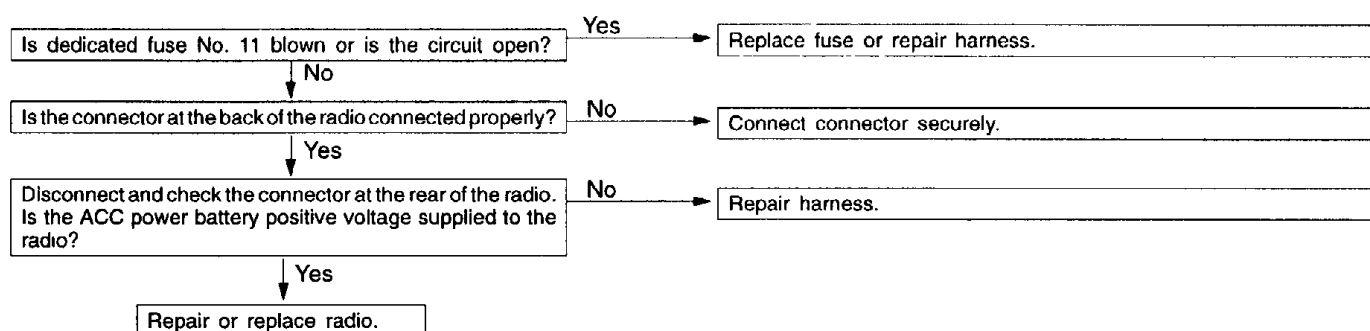
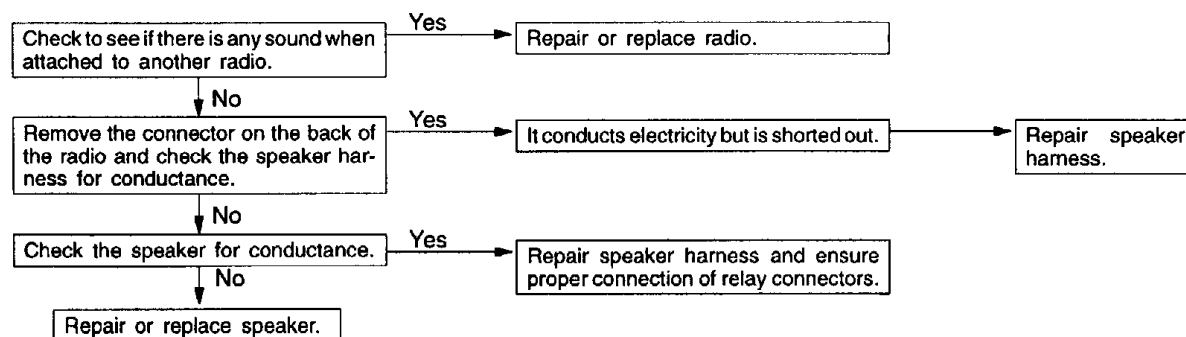
- **Fading noise**
This is a buzzing noise that occurs when the broadcast beam is disrupted by obstructing objects and the signal strength fluctuates intricately within a narrow range.

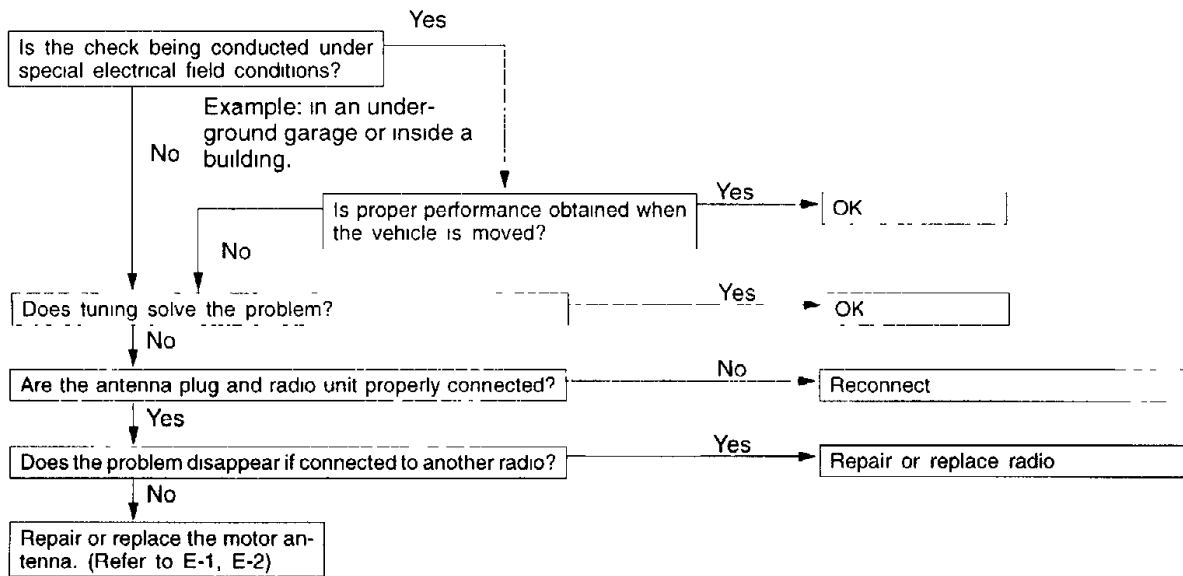
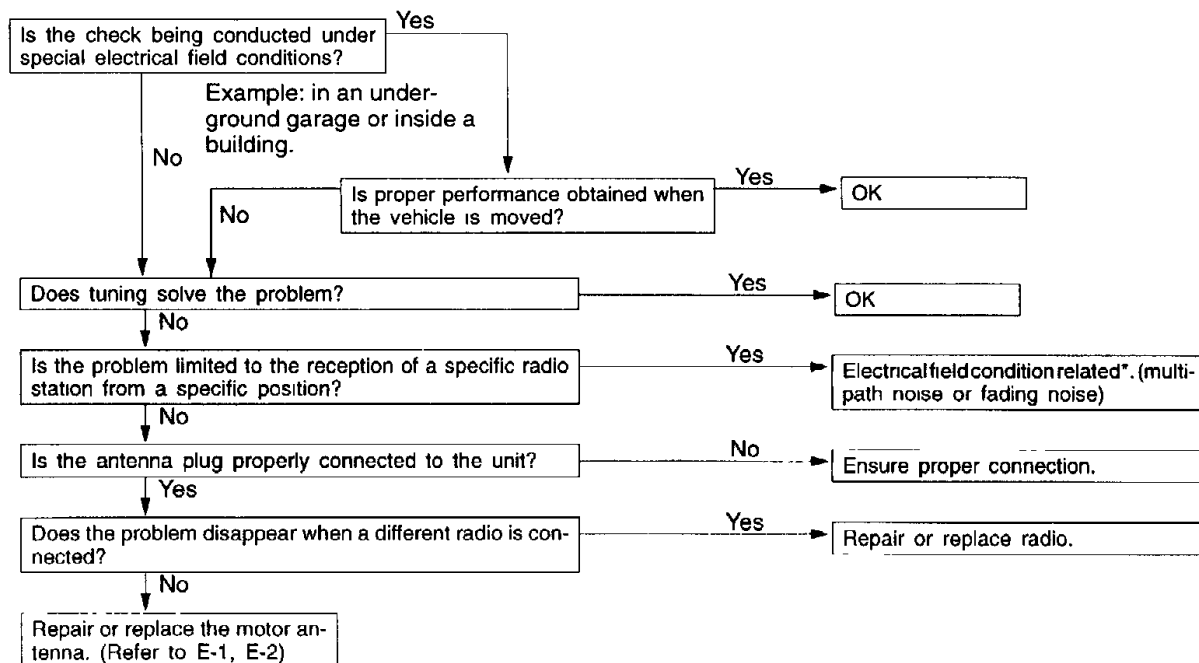
A-9 Ever-present noise.

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

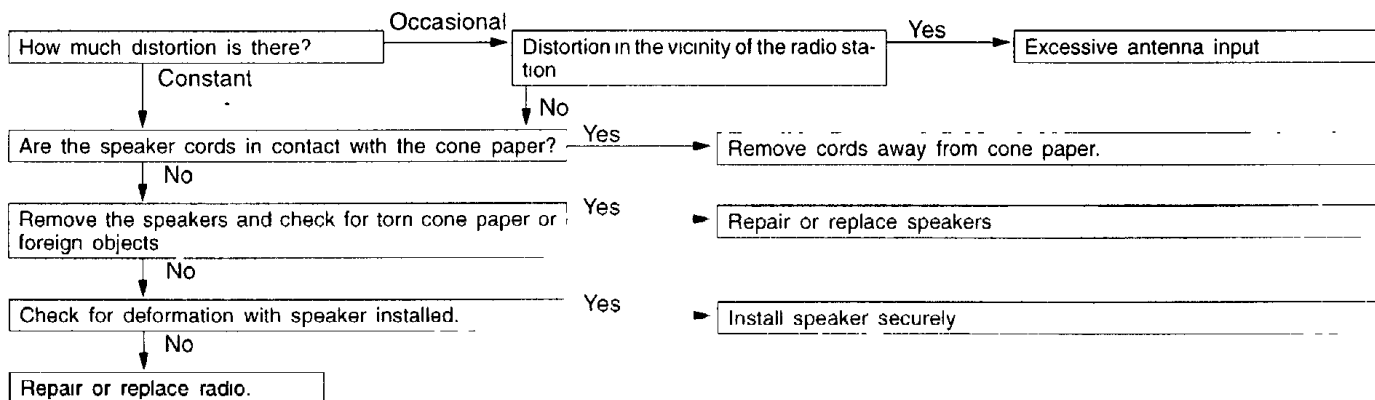
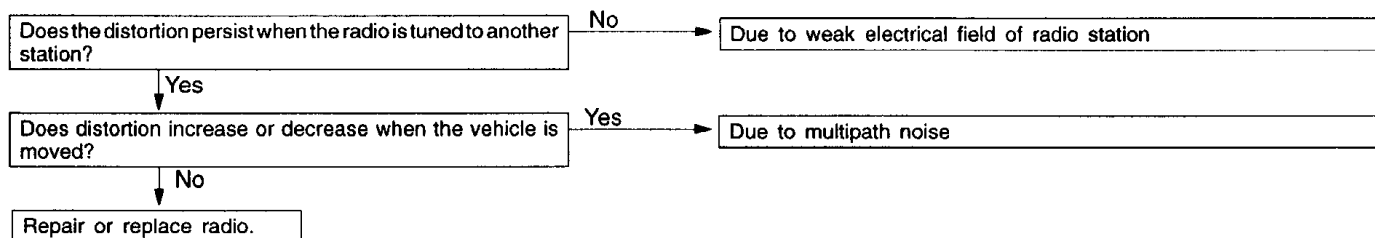
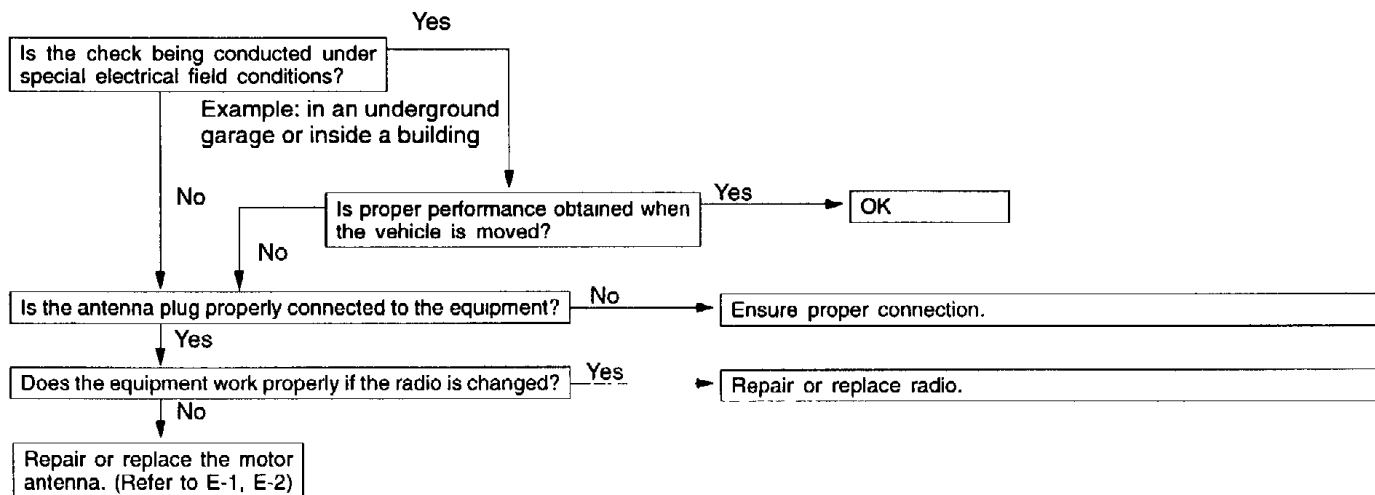
- Travelling conditions of the vehicle
- Terrain of area travelled through
- Surrounding buildings
- Signal conditions
- Time period

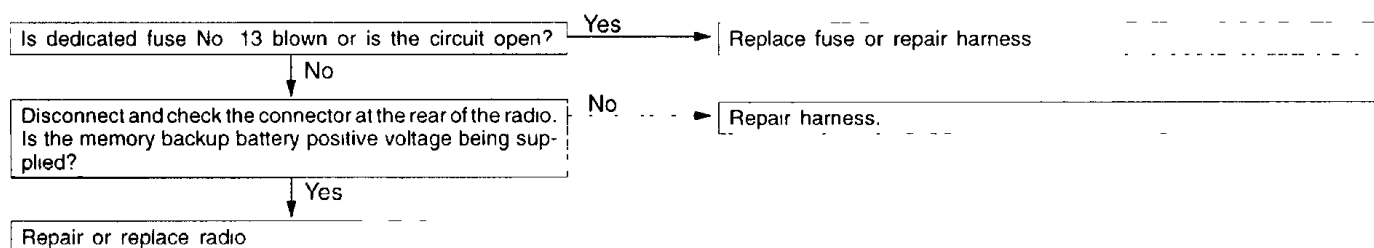
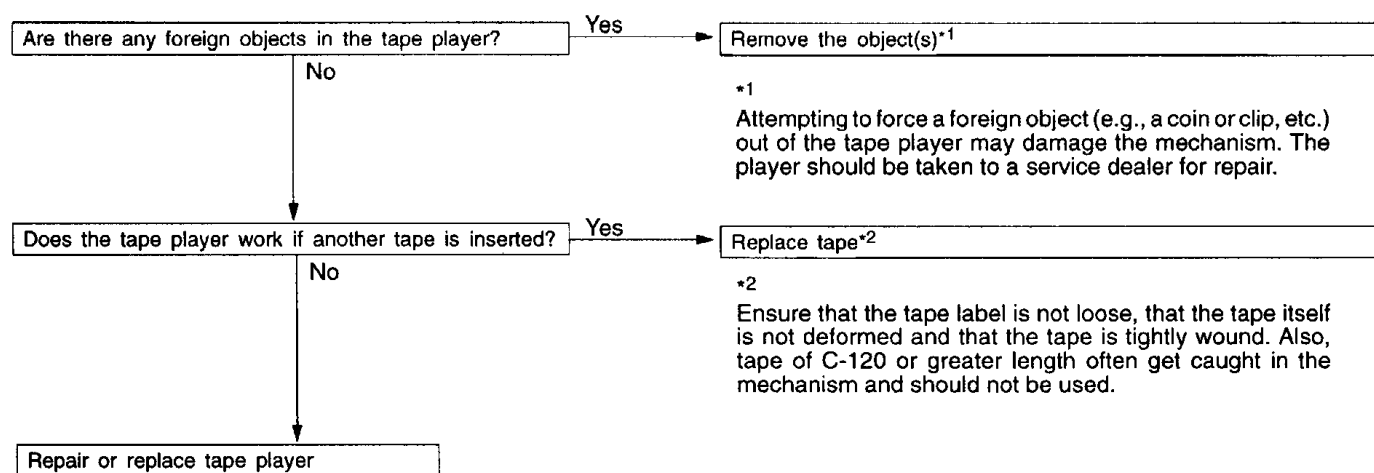
For this reason, if there are still problems with noise even after the measures described in steps A-1 to A-8 have been taken, get information on the factors listed above as well as determining whether the problem occurs with AM or FM, the station names, frequencies, etc., and contact a service centre.

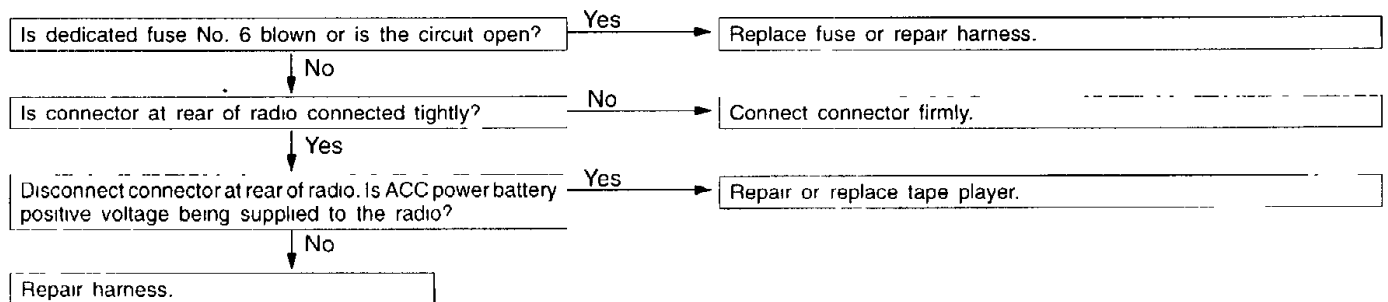
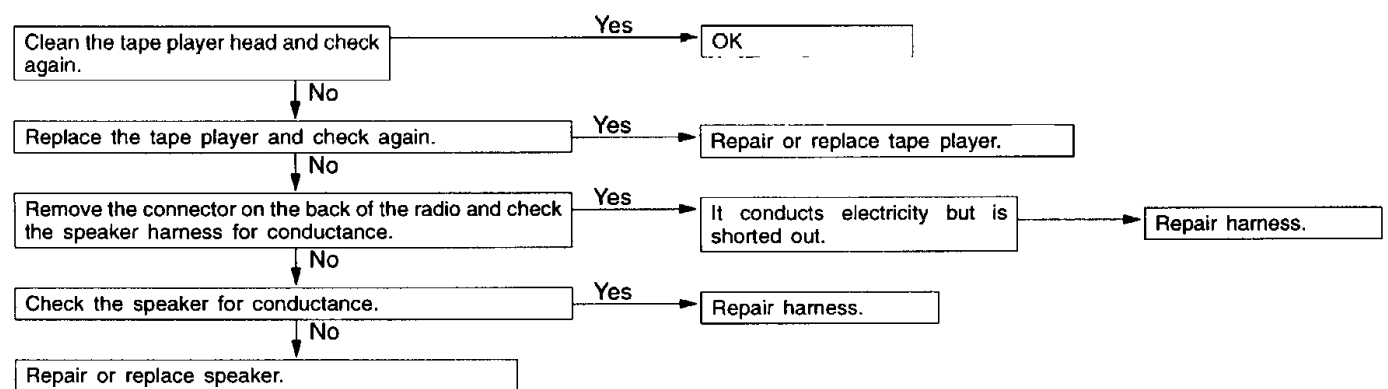
B. RADIO**B-1 No power is supplied when the switch is set to ON.****B-2 No sound from one speaker.**

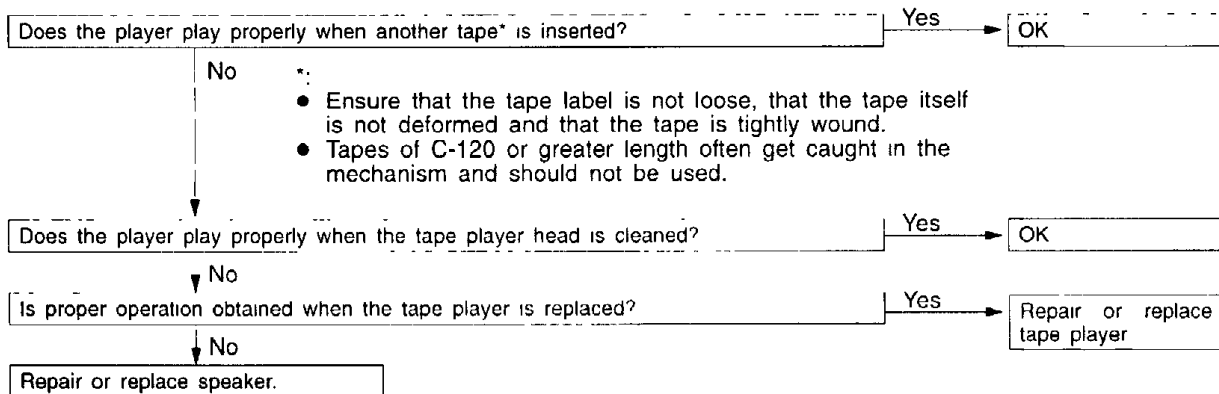
B-3 There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.**B-4 Insufficient sensitivity.**

- * About multipath noise and fading noise
Because the frequency of FM waves is extremely high, it is highly susceptible to effects from geological formations and buildings. These effects disrupt the broadcast signal and obstruct reception in several ways.
 - Multipath noise
This describes the echo that occurs when the broadcast signal is reflected by a large obstruction and enters the receiver with a slight time delay relative to the direct signal (repetitious buzzing).
 - Fading noise
This is a buzzing noise that occurs when the broadcast beam is disrupted by obstructing objects and the signal strength fluctuates intricately within a narrow range.

B-5 Distortion on AM or on both AM and FM.**B-6 Distortion on FM only****B-7 Too few automatic select stations.**

B-8 Insufficient memory (preset stations are erased).**C. TAPE PLAYER****C-1 Cassette tape will not be inserted.**

C-2 No sound (even after a tape has been inserted).**C-3 No sound from one speaker.**

C-4 Sound quality is poor, or sound is weak.**C-5 Cassette tape will not eject.**

The problems covered here are all the result of the use of a bad tape (deformed or not properly tightened) or of a malfunction of the tape player itself. Malfunctions involving the tape becoming caught in the mechanism and ruining the case are

also possible, and attempting to force the tape out of the player can cause damage to the mechanism. The player should be taken to a service dealer for repair.

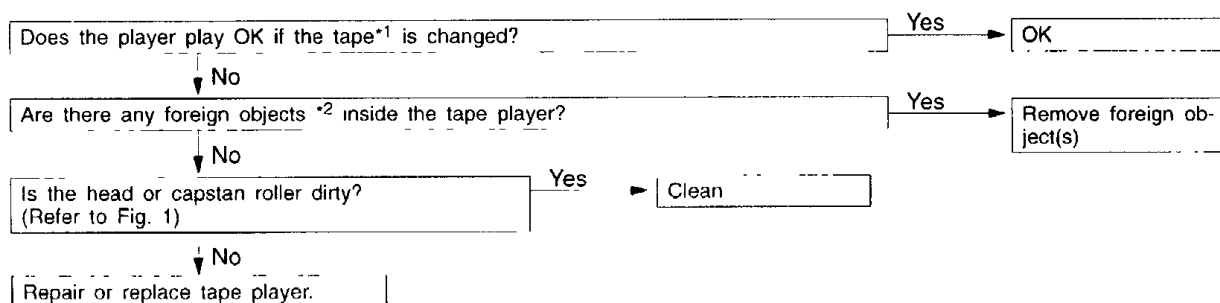
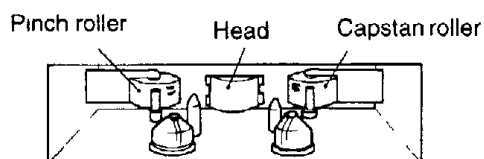
C-6 Uneven revolution. Tape speed is fast or slow.

Fig. 1



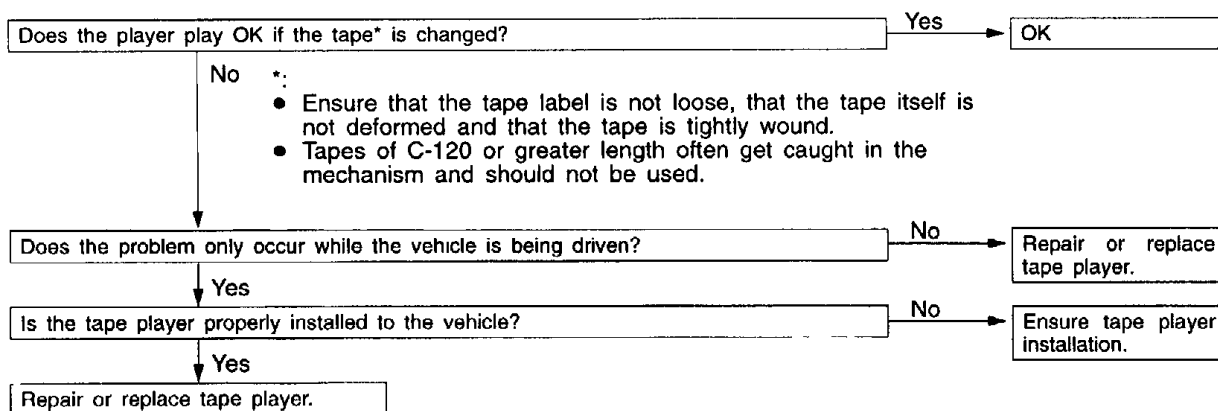
A16A0668

*1

Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

*2

Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the tape player may damage the mechanism. The player should be taken to a service dealer for repair.

C-7 Faulty auto reverse.

C-8 Tape gets caught in mechanism*1.

*1

When the tape is caught in the mechanism, the case may not eject. When this occurs, do not try to force the tape out as this may damage the tape player mechanism. Take the cassette to a service dealer for repair.

Does the player play OK if the tape*2 is changed?

Yes → Tape used is bad.

No

*2

Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Repair or replace tape player.

C-9 Automatic search does not work

Does the MSS (automatic search) button*1 depress properly?

No → Button improperly operated.

Yes

Does the player play OK if the tape*2 is changed?

Yes → Tape used is bad.

No

*1

- When the time between songs on a tape is less than three seconds, or when there is a three second period in the middle of a song in which the volume level is extremely low, the automatic search function may not work properly.

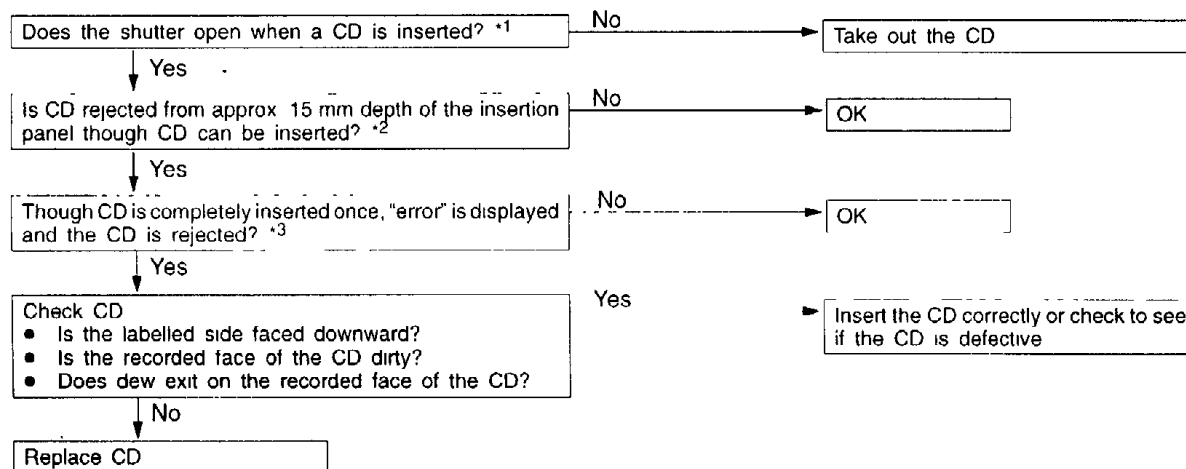
*2

- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Repair or replace the tape player.

D. CD PLAYER

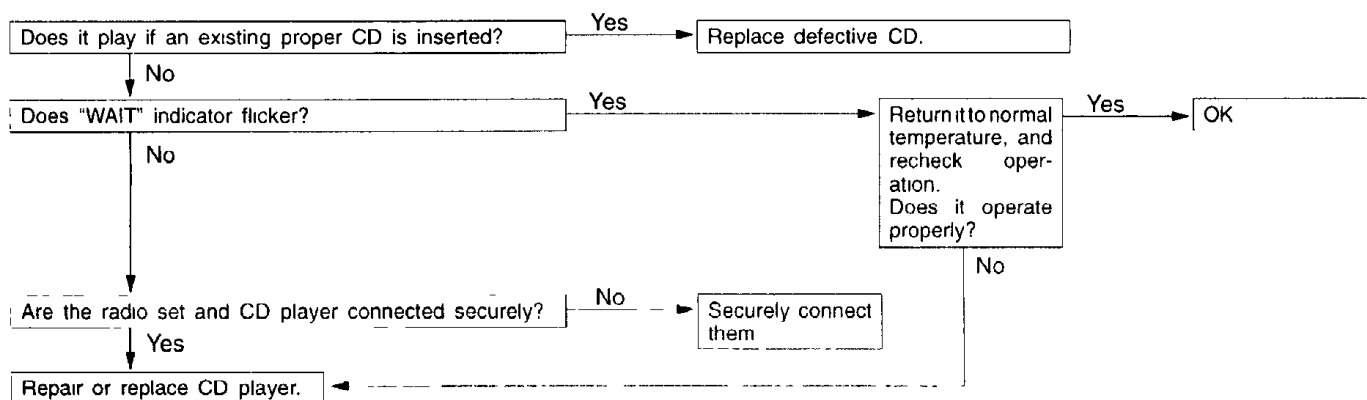
D-1 CD will not be accepted.



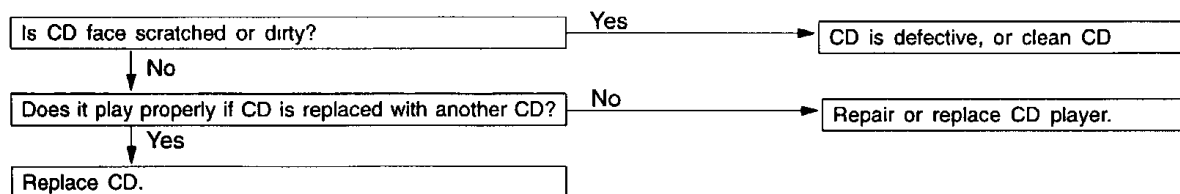
*1 If the CD is already loaded, doesn't the shutter open to allow insertion when another CD is inserted?

*2 If the key switch is not at ACC or ON, the CD stops at depth of 15 mm below the panel surface even when it is inserted, and it will be rejected when pushed farther?

*3 Even though the CD is loaded, E (error) is sometimes displayed with the CD rejected because of vibration/shock or dew on the CD face or optical lens.

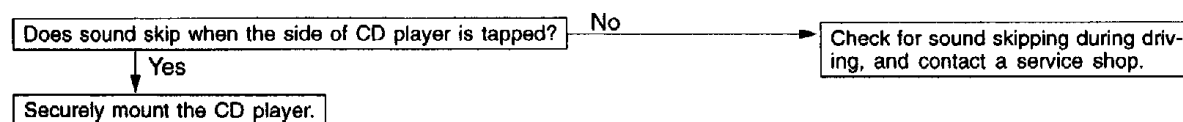
D-2 No sound.

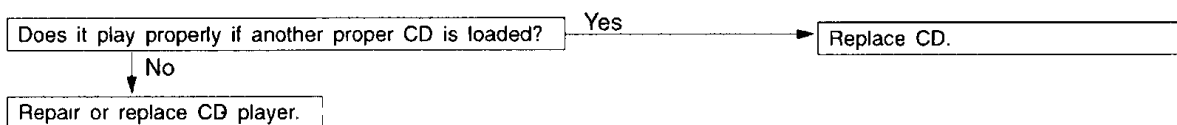
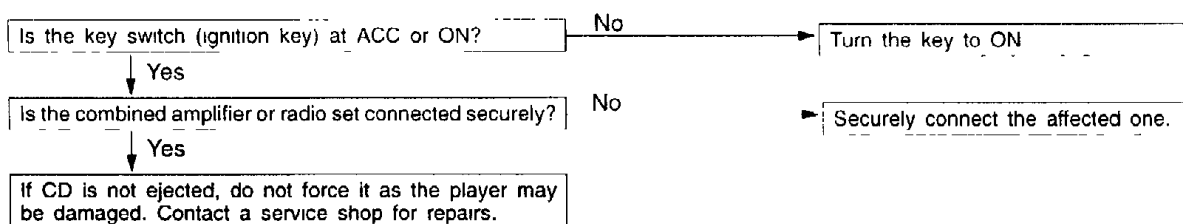
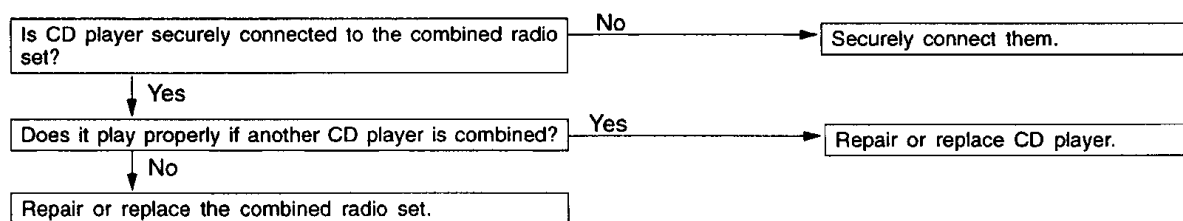
(The combined radio cassette must operate properly.)

D-3 CD sound skips.**1. Sound sometimes skips during parking.****2. Sound sometimes skips during driving.**

(Stop vehicle, and check it.)

(Check it by using a CD which is free of scratch, dirt or other abnormality.)



D-4 Sound quality is poor**D-5 CD will not be ejected.****D-6 No sound from one speaker.**

E. MOTOR ANTENNA**E-1 Motor antenna won't extend or retract.**

Clean and polish the surface of the antenna rod.

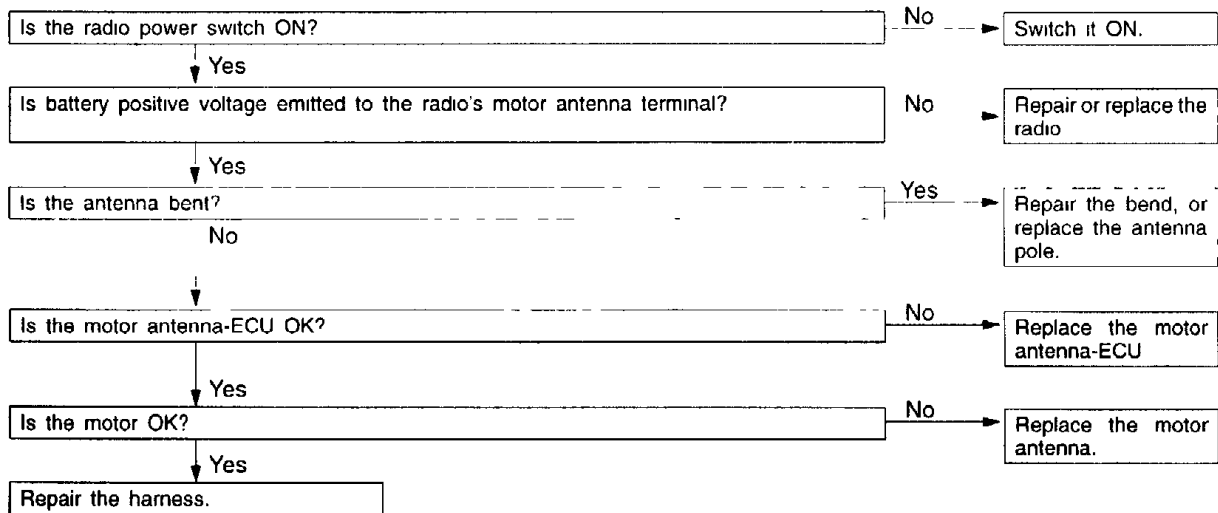
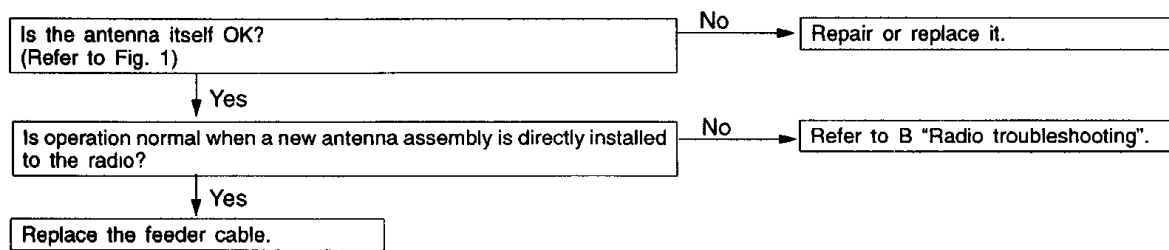
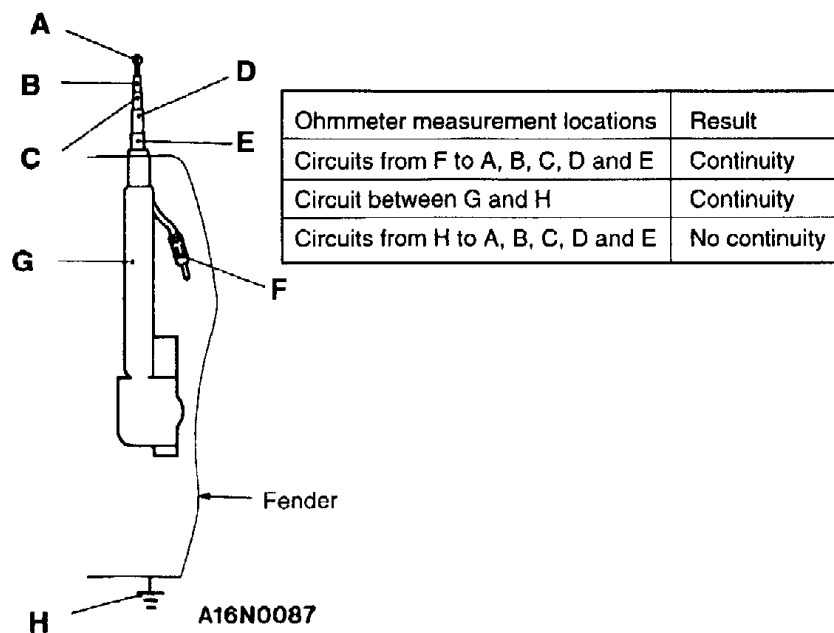
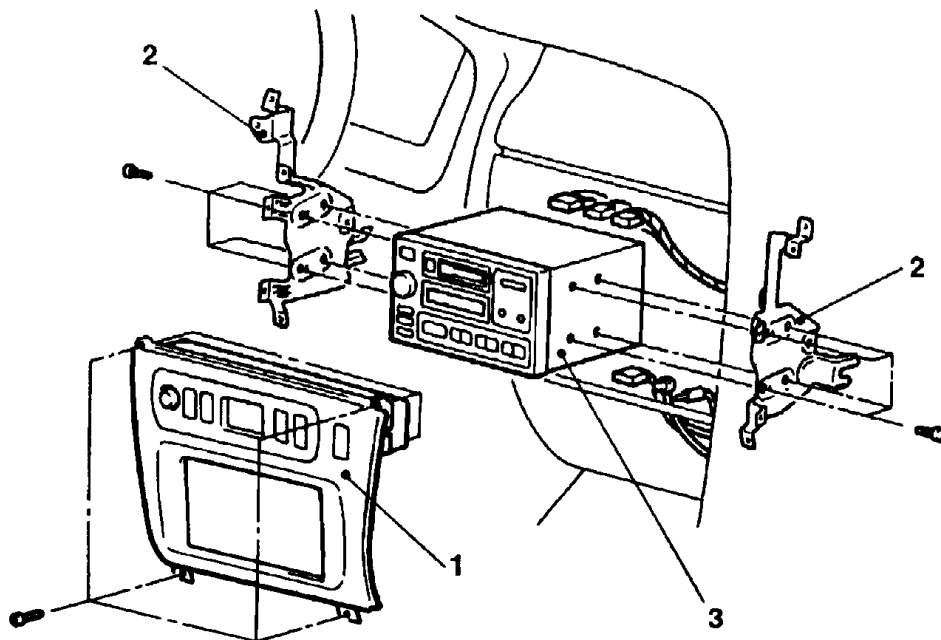
**E-2 Motor antenna extends and retracts but does not receive signals.**

Fig. 1



RADIO WITH TAPE PLAYER AND CD PLAYER**REMOVAL AND INSTALLATION**

16AE069N

Removal steps

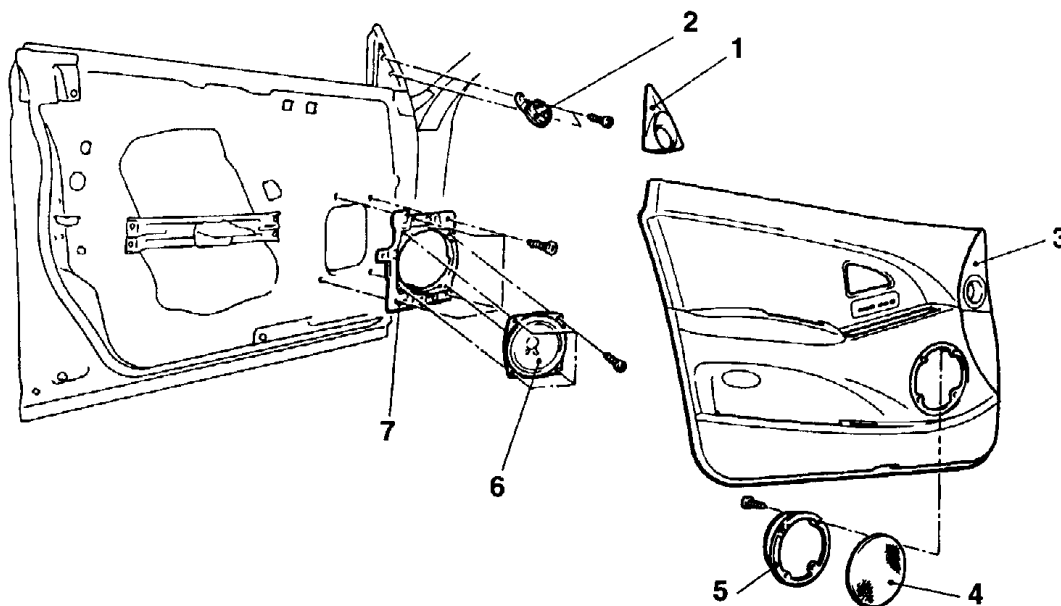
- Floor console assembly (Refer to Group 52A–Floor console)
- Centre air outlet assembly (Refer to Group 52A–Instrument panel)
- Ashtray (Refer to P.54-74)

- 1. Air conditioner control panel assembly
- 2. Radio bracket
- 3. Radio and cassette player

DOOR SPEAKER AND REAR SPEAKER

REMOVAL AND INSTALLATION

<Door speaker>



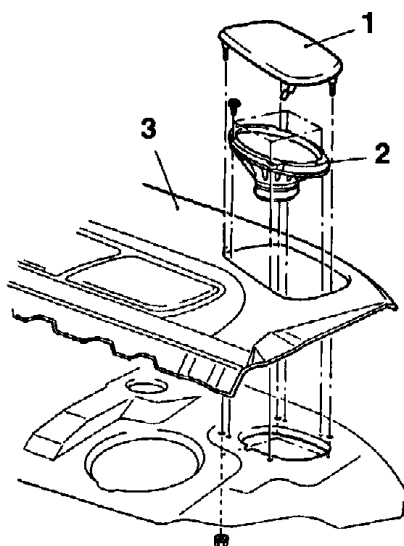
16AE070N

Door speaker removal steps

1. Tweeter cover
2. Tweeter speaker
3. Door trim (Refer to Group 42--Door Trim and Waterproof Film)

4. Speaker mesh
5. Speaker cover
6. Speaker
7. Speaker base

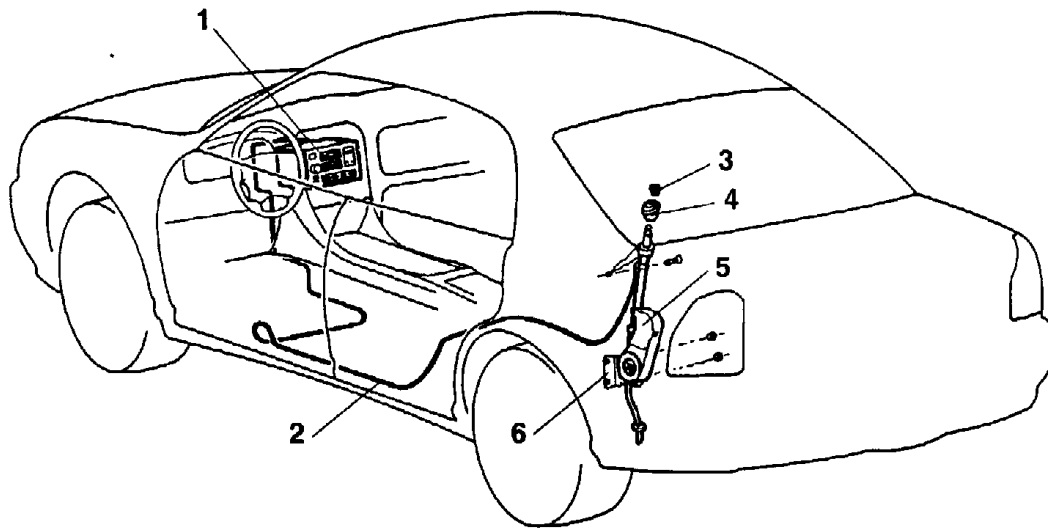
<Rear speaker>



16TE002A

Rear speaker removal steps

1. Speaker mesh
2. Speaker
- Rear seat cushion (Refer to group 52A – Rear seat)
3. Rear shelf trim (Refer to group 52A –Trims)

ANTENNA**REMOVAL AND INSTALLATION**

16AE101N

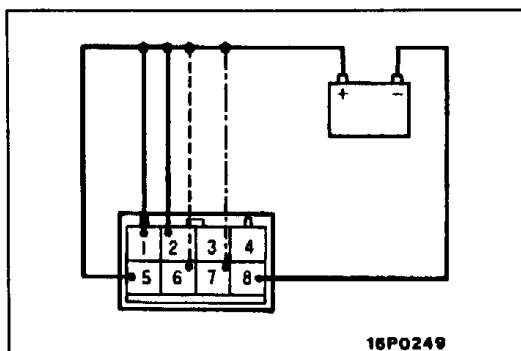
Antenna feeder cable removal steps

1. Audio unit (Refer to P. 54-98.)
- Front seat (Driver's side)
(Refer to GROUP 52A – Front Seat)
- Console box (Refer to GROUP 52A – Floor Console)
- Front scuff plate (L.H.)
(Refer to GROUP 52A – Trims)
- Cowl side trim (L.H.)
(Refer to GROUP 52A – Trims)
- Rear scuff plate (L.H.)
(Refer to GROUP 52A – Trims)
- Centre pillar trim lower (L.H.)
(Refer to GROUP 52A – Trims)

- Rear seat assembly (Refer to GROUP 52A – Rear Seat)
 - Rear pillar trim (L.H.)
(Refer to GROUP 52A – Trims)
 - Trunk side trim (L.H.)
(Refer to GROUP 52A – Trims)
2. Antenna feeder cable

Motor antenna removal steps

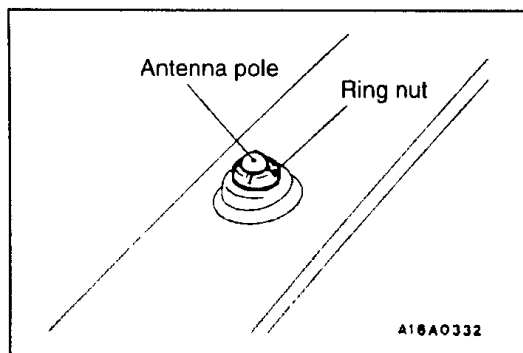
- Trunk side trim
(Refer to GROUP 52A – Trims)
3. Ring nut
 4. Base
 5. Antenna bracket
 6. Motor antenna



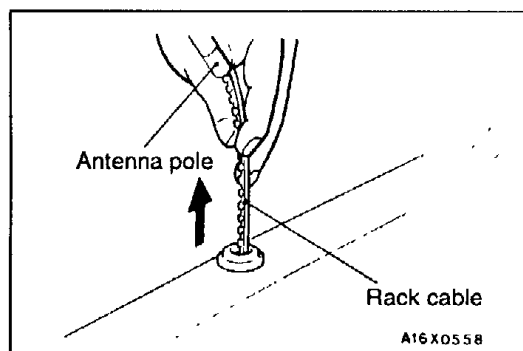
16P0249

INSPECTION**ANTENNA MOTOR**

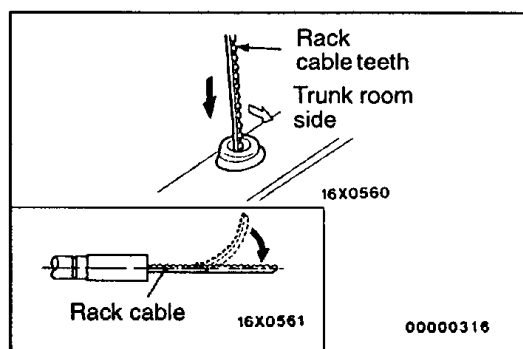
1. Connect the circuits shown as solid lines.
2. Check that when circuits shown as broken lines are connected, the antenna rises.
3. Verify that when the circuits shown as broken lines are disconnected and the circuits shown as dotted lines are connected, the antenna descends to the intermediate position.
4. Verify that when the circuits shown as dotted lines are disconnected, the antenna descends all the way.

**ANTENNA POLE REPLACEMENT**

1. Remove the ring nut.



2. After turning the ignition switch to ACC or ON, turn the radio switch to ON to raise the antenna pole, and remove it, together with the rack cable.

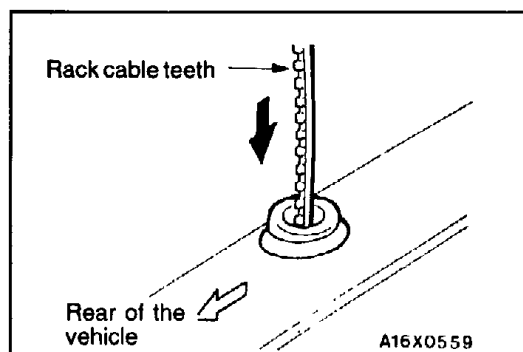


3. Draw out the antenna pole to the maximum extension.

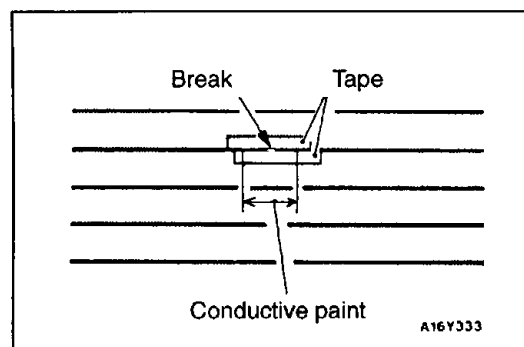
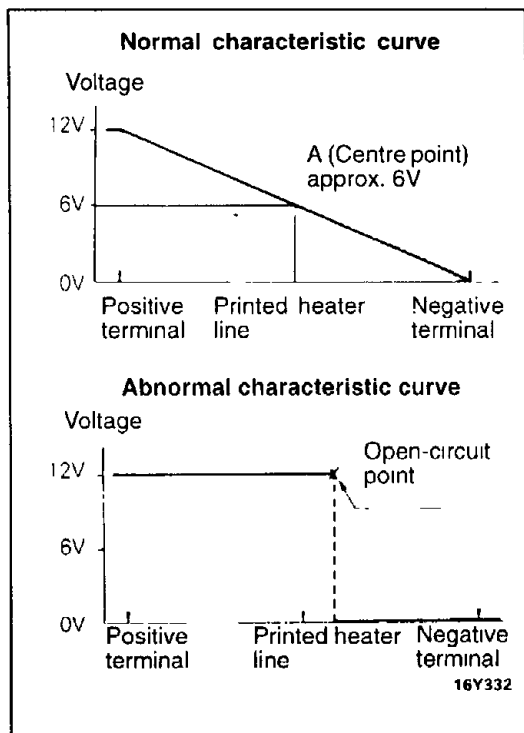
NOTE

If there is a bend in the motor end of the rack cable, remove the bend.

4. Insert the rack cable into the motor assembly with the rack cable teeth facing the trunk room side.



5. Turn the rack cable teeth towards the rear of the vehicle (right 90°) so that the rack cable meshes with the motor gear.
6. If the rack cable pulls out with no resistance when it is lightly pulled, then the cable is not meshed with the motor gear, so check that there are no bends in the end of the rack cable, and then repeat steps (4) and (5) above.
7. Set the antenna pole vertically and turn the radio switch OFF to wind up the rack cable. Insert the antenna to the motor antenna side to align it with the wound-up rack cable.
8. After tightening the ring nut, check the movement of the antenna by turning the radio switch ON and OFF.



REAR WINDOW DEFOGGER ON-VEHICLE SERVICE

PRINTED-HEATER LINE 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 voltmeter at rear window glass centre A.
Condition good of indicating about 6V.
3. If battery positive voltage 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 0V is indicated at A, there is a break in the positive terminals from A. Defect where the voltage changes suddenly (battery positive voltage) with the same method described.

PRINTED-HEATER LINE REPAIR

REQUIRED MATERIALS

- Thinner
- Tape
- Conductive paint
- Lead-free gasoline
- Fine brush

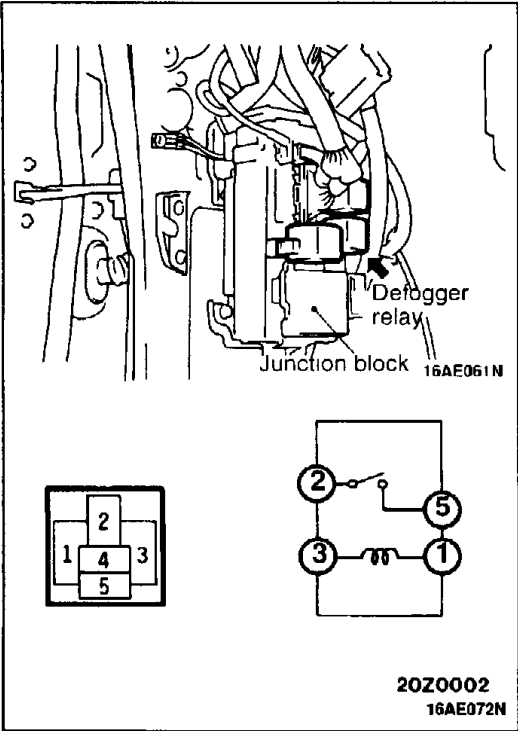
1. Clean disconnected area with lead-free gasoline. Tape along both sides of heater element.
2. Mix conductive paint thoroughly. Thin the required amount of paint in a separate container with a small amount of thinner and paint break three times at 15 minutes intervals.
3. Remove tape and leave for a while before use (circuit complete).
4. When completely dry (after 24 hours) finish exterior with a knife.

Caution

Clean glass with a soft cloth (dry or damp) along defogger heater element.

REAR WINDOW DEFOGGER SWITCH REMOVAL AND INSTALLATION

Refer to Group 55—Air Conditioning Control Unit Assembly.

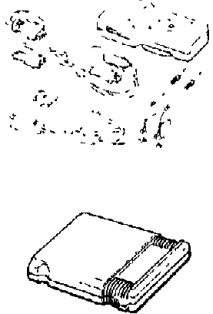
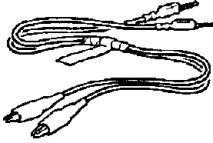


DEFOGGER RELAY CONTINUITY CHECK

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

SIMPLIFIED WIRING SYSTEM (SWS)

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II ROM pack	Simplified Wiring System (SWS) diagnostic checking
	MB991529	Diagnosis trouble code check harness	Simplified Wiring System (SWS) diagnostic checking

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or high beam indicator lamp. (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.

SWS SIMPLIFIED FAULT DIAGNOSTIC MODE

The following tests can be performed using the SWS Simplified Fault Diagnosis Mode:

- SWS ECU specification
- Switch input signals for each ECU
- Diagnosis trouble code output

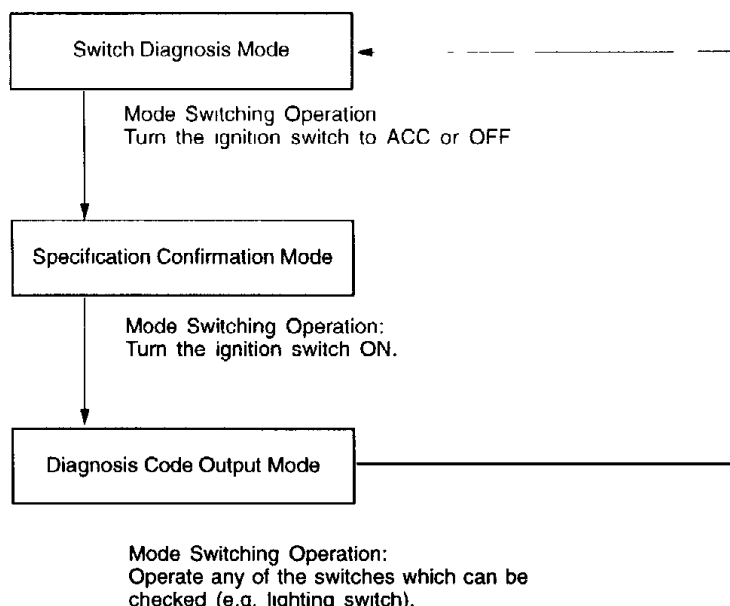
SWITCHING TO SIMPLIFIED FAULT DIAGNOSTIC MODE

1. Ground the No. 1 terminal of the diagnosis connector (diagnostic control terminal) using a special tool.
2. Turn the ignition switch ON.
3. Operate the passing switch twice or more within five seconds.

SIMPLIFIED FAULT DIAGNOSTIC MODE SELECTION

The Simplified Fault Diagnostic Mode comprises the following three modes; these modes can be switched by operating the ignition or other switches.

When the ignition is switched ON initially, the system will be in Diagnosis Code Output Mode.



NOTE

Refer to P.54-109 for switches which can be checked.

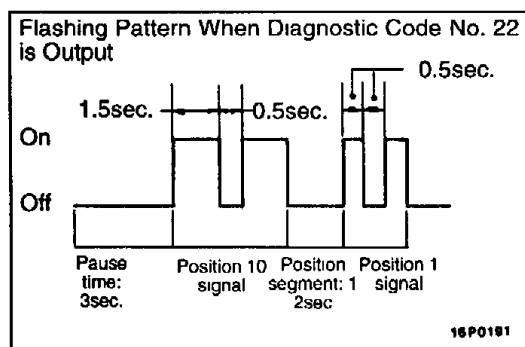
Specification Confirmation Mode

This is a mode which displays a flashing pattern for the various ECU specifications of the Simplified Wiring System (SWS) on the high beam indicator lamp, similar to that shown at left, enabling the operator to confirm whether the vehicle is fitted with the correct specification ECU. If the codes in the table below are output, it can be concluded that the situation is normal.

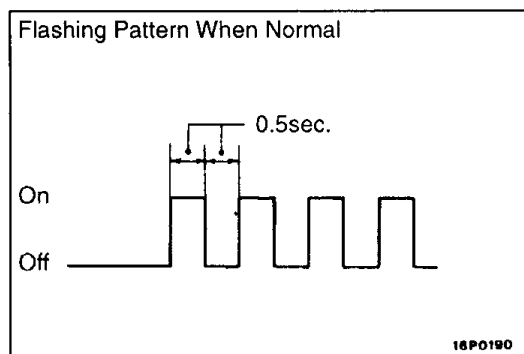
NOTE

Because the code is output only once, it is necessary to switch once to another mode when you wish to re-confirm a code.

Display for Normal Parameters



Display Sequence	Normal Codes		Applicable ECU
	LHD	RHD	
1	15	16	Instrument panel ECU
2	25	26	ETACS-ECU
3	35	36	Assist-ECU
4	45	46	Front Door Module



Diagnosis Code Output Mode

Diagnosis codes are displayed by the flashing of the high beam indicator lamp. A normal pattern is shown in the diagram at left, and when a breakdown occurs, the same flashing pattern as Specification Confirmation Mode is displayed.

NOTE

Diagnosis codes are output once each in diminishing number order, it is therefore necessary to switch once to another mode when you wish to reconfirm a code.

Switch Diagnosis Mode

This is a mode in which the switch input signals which are input into each ECU on the Simplified Wiring System (SWS) can be checked – if the input signal for a switch is normal when that switch is operated in this mode, the high beam indicator lamp flashes and a buzzer sounds.

Assist-ECU	Instrument panel ECU	Front door module (Driver)	ETACS-ECU
IG power source Door switch (Pass. Fr, Rr) Power window switch (Pass. Fr, Rr) • UP • DOWN Door lock switch (Pass. Fr, Rr)	IG power source Lighting switch • TAIL • HEAD Dimmer switch • HI • LO Fog lamp switch Front wiper switch • HI • LO • INT • Variable Speed Front washer switch	IG power source Door mirror switch • UP • DOWN • RIGHT • LEFT Power window lock switch Power window switch (for all windows) • UP • DOWN • AUTO DOWN (Driver only) Power window relay Door lock switch Door key switch • Lock • Unlock	IG power source Door switch (Driver. Fr, Rr) Seat belt switch Power window switch (Driver. Rr) • UP • DOWN Door lock switch (Pass. Rr) Parking brake switch

Returning to Normal Mode

1. Turn the ignition switch OFF.
2. Remove the special tool from the diagnosis connector.
The mode will now return to Normal.

DIAGNOSTIC CODE CLASSIFICATION CHART

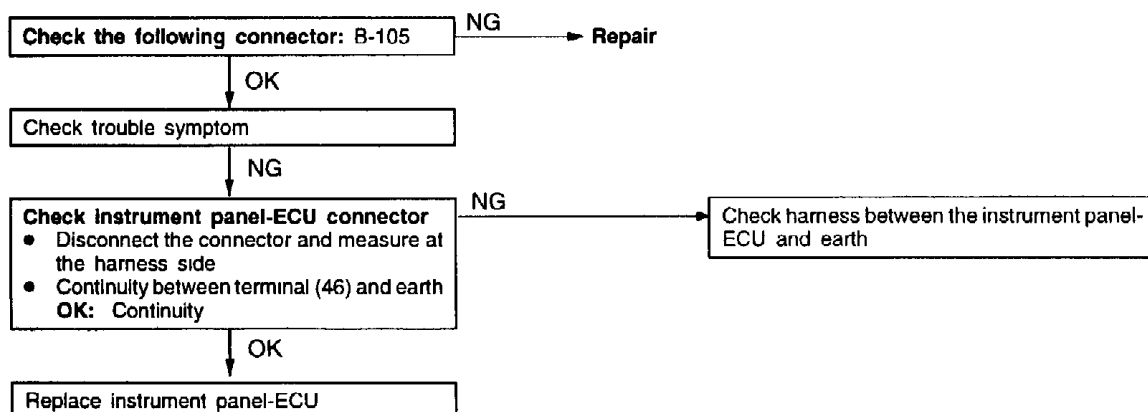
Code No.	Diagnostic item	Reference page
11	Connector for instrument panel harness and control harness disconnected	54-107
12	Connector for instrument panel harness and dash harness disconnected	54-108
21	Connector for dash panel harness and front harness disconnected	54-108
23	Connector for dash harness and front harness disconnected	54-109
24	Connector for dash harness and control harness disconnected	54-109
25	IOD fuse malfunction (ACC)	54-110
26	Ignition fuse malfunction (IG)	54-110
27	ECU fuse malfunction (IG2)	54-110
28	ECU fuse malfunction (IG2)	54-111
29	ETACS-ECU malfunction	54-111
31	Connector for control harness and front harness disconnected	54-111
32	Alternator fuse (special fuse No. 8) blown	54-112
33	MPI fuse (special fuse No. 9) blown	54-112
34*	Assist-ECU malfunction	54-113
41*	Front door module (Driver) malfunction	54-113

NOTE

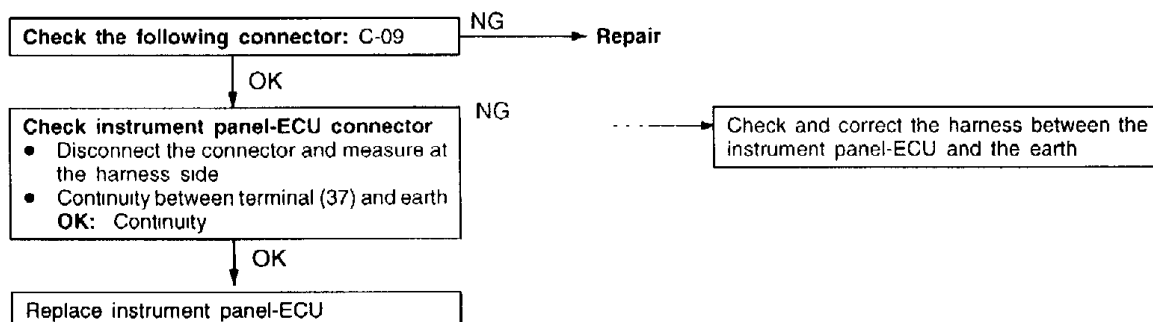
*Diagnosis codes marked with an asterisk can only detect the abbreviated confirmation diagnostic code.

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

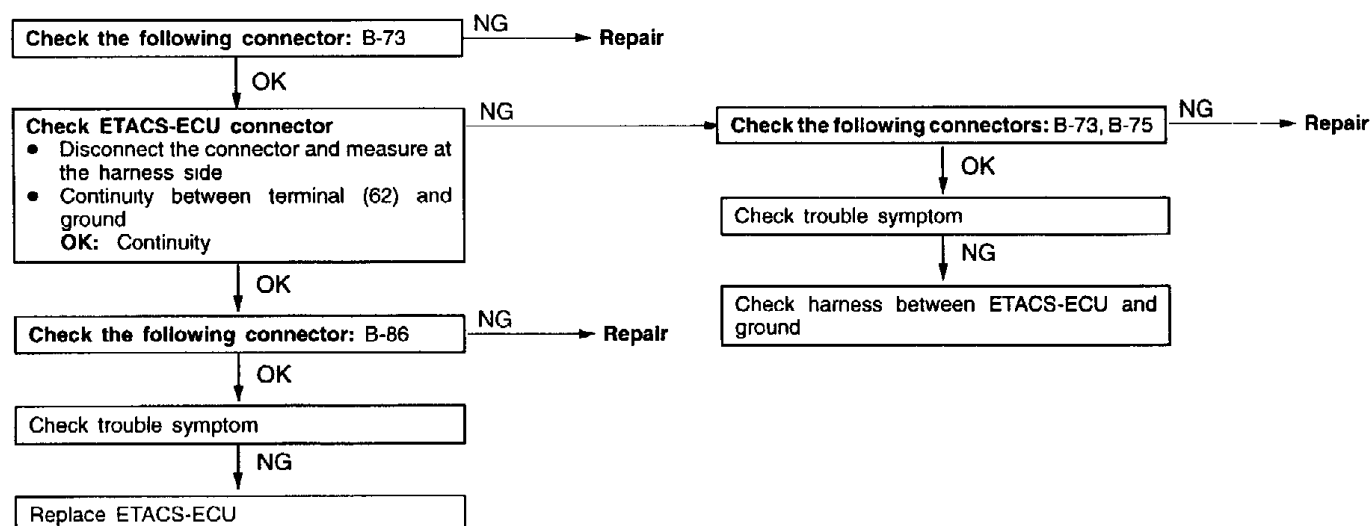
Code No. 11. Connector for instrument panel harness and control harness disconnected	Probable cause
This code is output when the connector for the instrument panel harness and the control harness is disconnected or when the disconnection detection harness of the instrument panel ECU connector is broken.	- Instrument panel-ECU malfunction - Harness malfunction - Connector for instrument panel harness and control harness disconnected



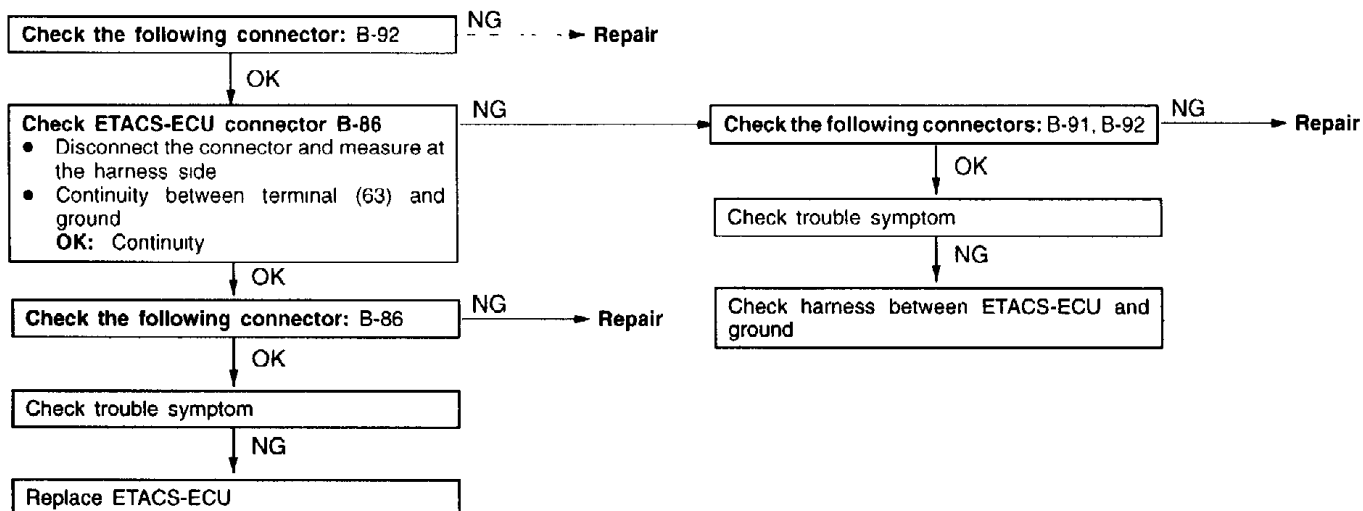
Code No. 12. Connector for instrument panel harness and dash harness disconnected	Probable cause
This code is output when the connector for the instrument panel harness and dash harness is disconnected or when the disconnection detection harness of the instrument panel-ECU connector is broken.	• Instrument panel-ECU malfunction • Connector for instrument panel harness and control harness disconnected. • Harness malfunction



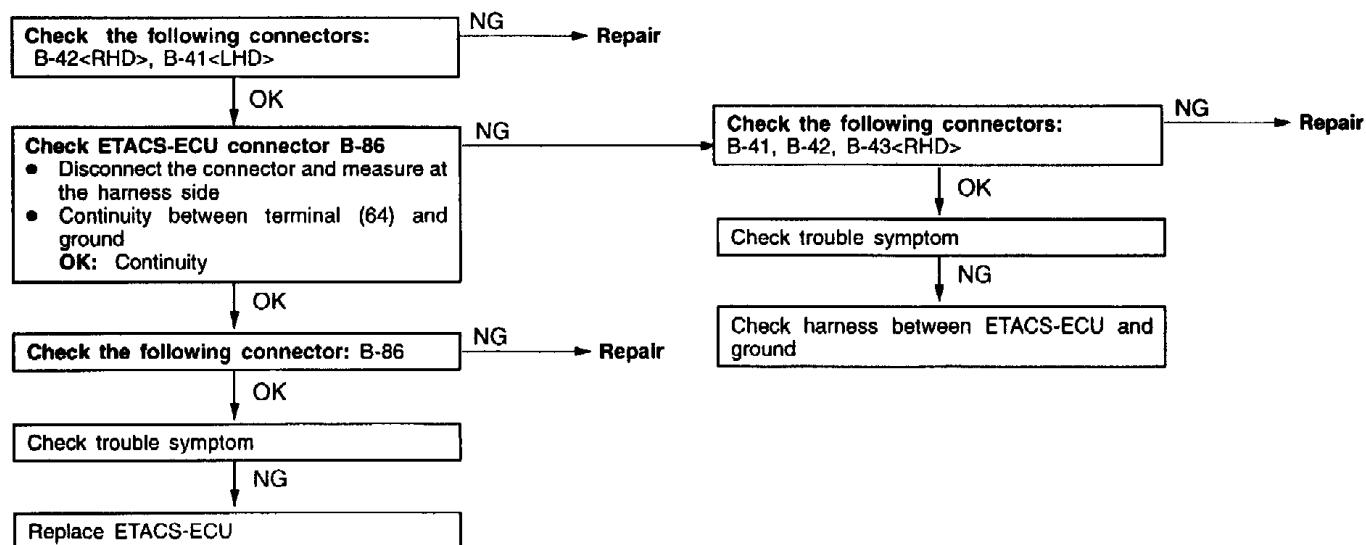
Code No. 21. Connector for dash harness and front harness disconnected	Probable cause
This code is output when the connector for the dash harness and the front harness is disconnected or when the disconnection detection harness of the ETACS-ECU connector is broken.	• ETACS-ECU malfunction • Harness malfunction • Connector for dash harness and front harness



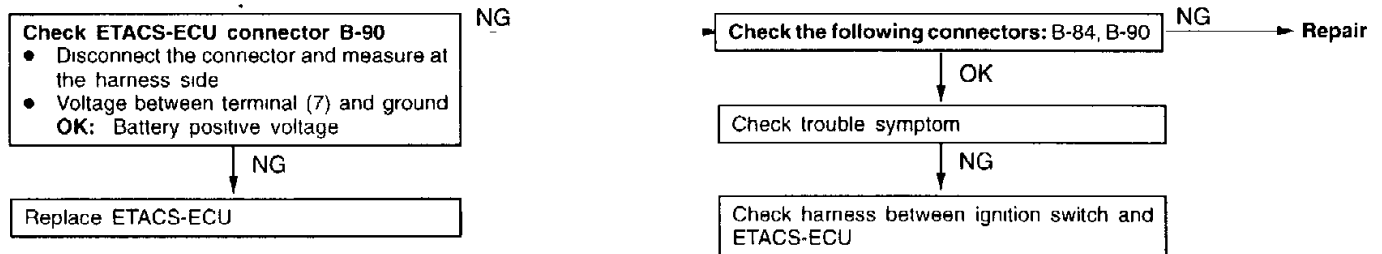
Code No. 23. Connector for dash harness and floor harness disconnected	Probable cause
This code is output when the connector for the dash harness and the floor harness is disconnected or when the disconnection detection harness of the ETACS-ECU connector is broken.	- ETACS-ECU malfunction - Harness malfunction - Connector for dash harness and floor harness disconnected



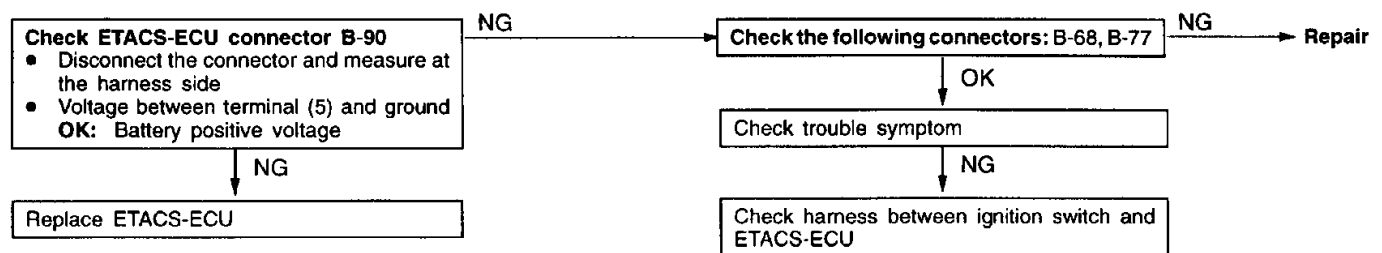
Code No. 24. Connector for dash harness and control harness disconnected	Probable cause
This code is output when the connector for the dash harness and the control harness is disconnected or when the disconnection detection harness of the ETACS-ECU connector is broken.	- ETACS-ECU malfunction - Harness malfunction - Connector for dash harness and control harness disconnected



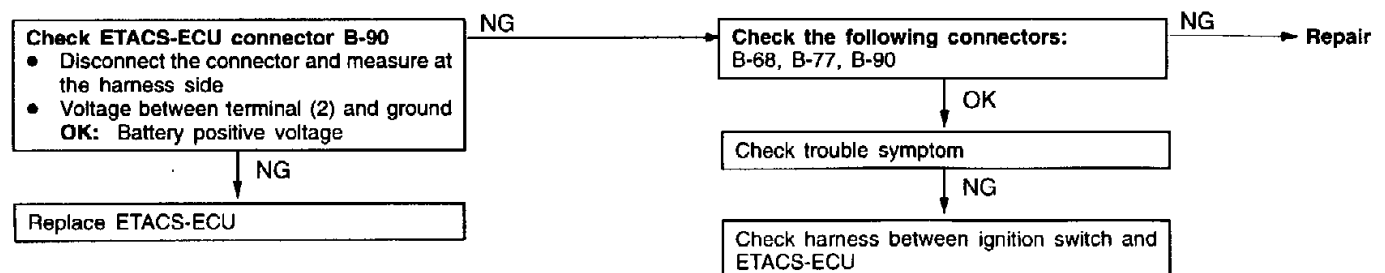
Code No. 25. IOD fuse malfunction (ACC)	Probable cause
This code is output when multipurpose fuse No. 6 (ETACS-ECU, ACC power source) blows or when the ACC power source circuit harness is disconnected.	• Multipurpose fuse No. 6 blown • Harness or connector malfunction • ETACS-ECU malfunction



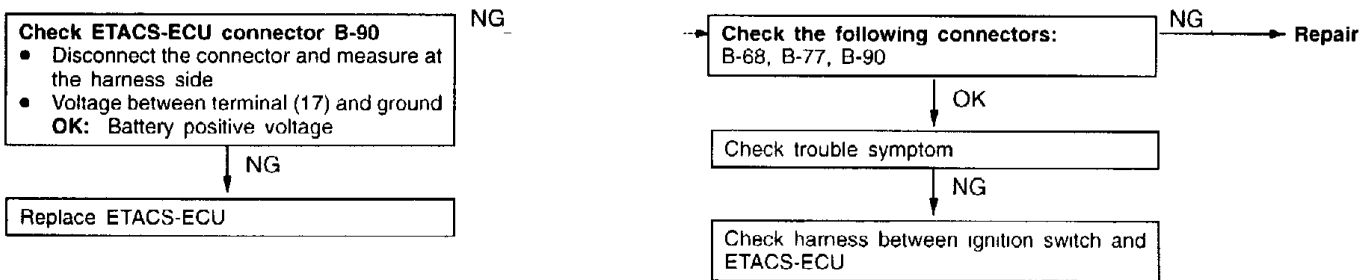
Code No. 26. Ignition fuse malfunction (IG1)	Probable cause
This code is output when multipurpose fuse No. 12 (ETACS-ECU, IG1 power source) blows or when the IG1 power source circuit harness is disconnected.	• Multipurpose fuse No. 12 blown • Harness or connector malfunction • ETACS-ECU malfunction



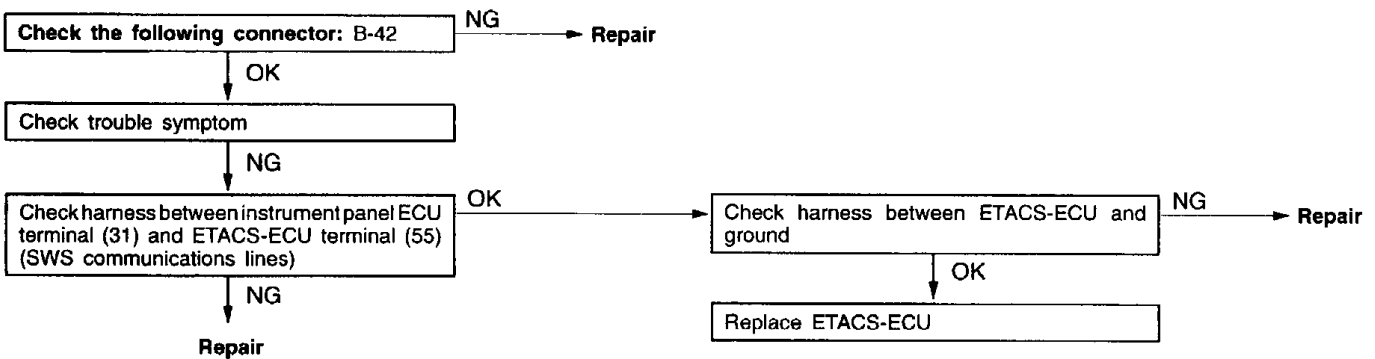
Code No. 27. ECU fuse malfunction (IG2)	Probable cause
This code is output when multipurpose fuse No. 15 (ETACS-ECU, IG2 power source) blows or when the IG2 power source circuit harness is disconnected.	• Multipurpose fuse No. 15 blown • Harness or connector malfunction • ETACS-ECU malfunction



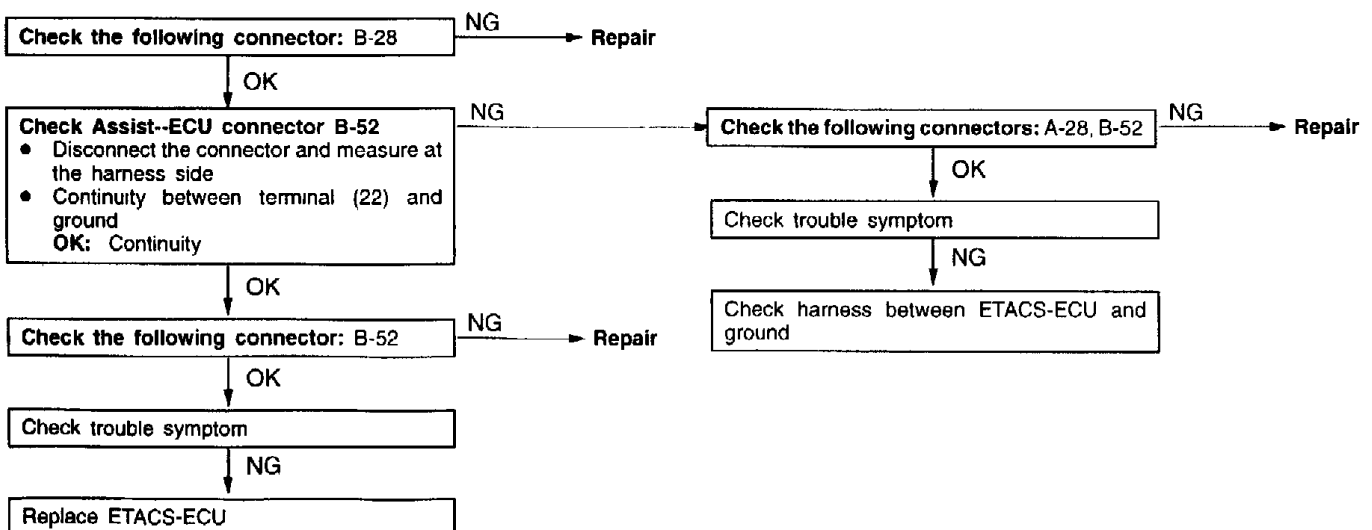
Code No. 28. ECU fuse malfunction (IG2)	Probable cause
This code is output when multipurpose fuse No. 9 (ETACS-ECU, IG2 power source) blows or when the IG2 power source circuit harness is disconnected.	• Multipurpose fuse No. 9 blown • Harness or connector malfunction • ETACS-ECU malfunction



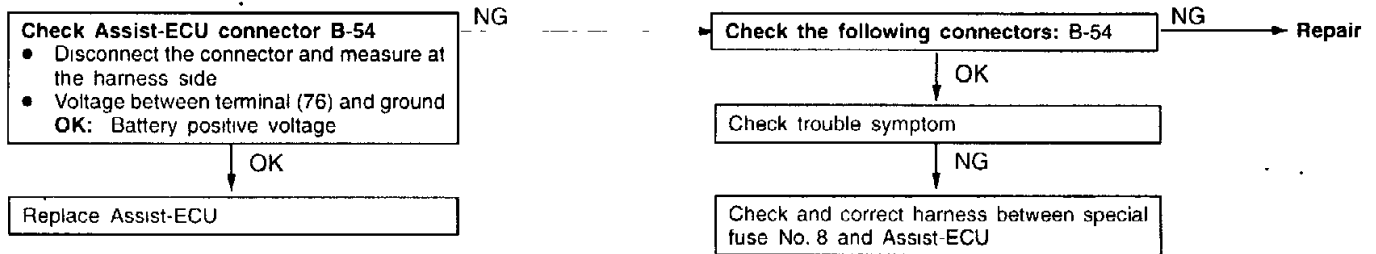
Code No. 29. ETACS-ECU malfunction	Probable cause
This code is output when the instrument panel ECU fails to receive communications data continuously from the ETACS-ECU for 1 second or longer (SWS communications line malfunction).	• ETACS-ECU malfunction • Malfunction in the harness or connector of communications lines



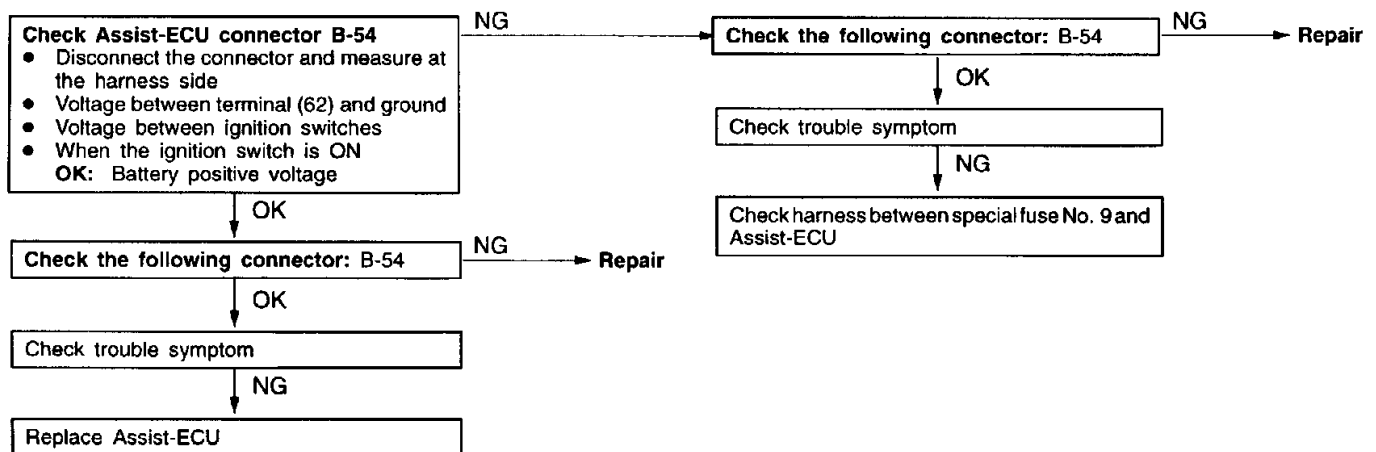
Code No. 31. Connector for control harness and front harness disconnected	Probable cause
This code is output when the connector for the control harness and the front harness is disconnected or when the disconnection detection harness of the Assist-ECU connector is broken.	• Assist-ECU malfunction • harness malfunction • Connector for control harness and front harness disconnected



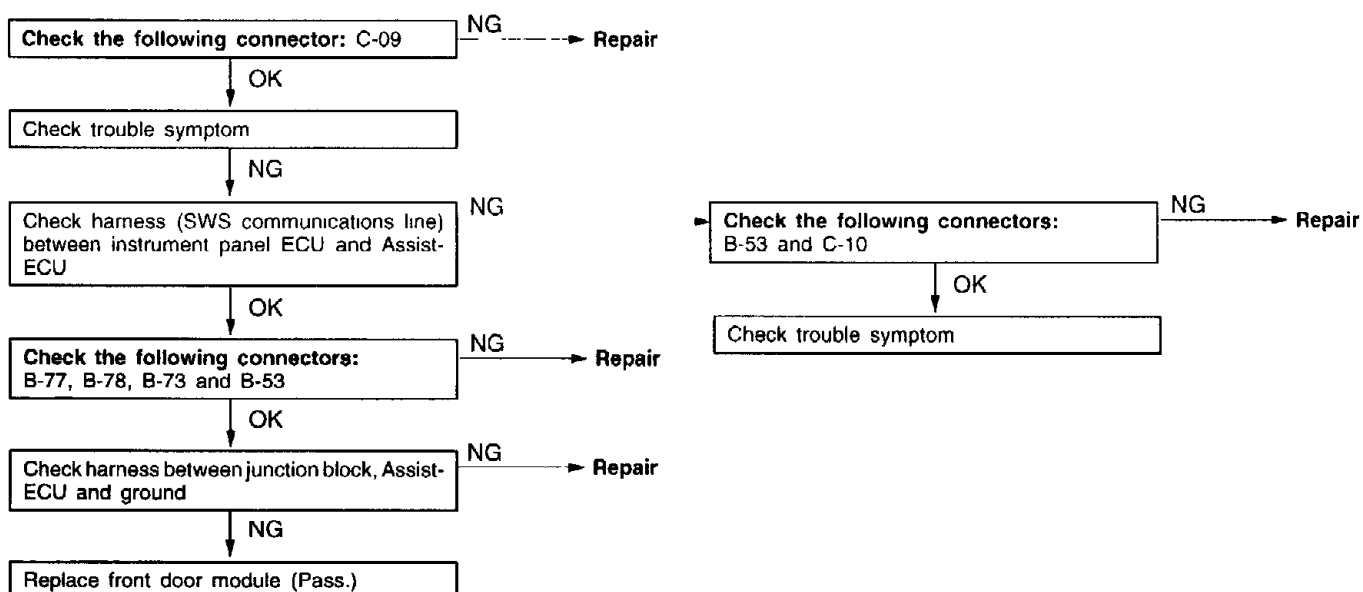
Code No. 32. Alternator fuse (special fuse No. 8) blown	Probable cause
This code is output when special fuse No. 8 (alternator) blows or when the harness is disconnected.	• Special fuse No. 8 blown • Harness and connector malfunction • Assist-ECU malfunction



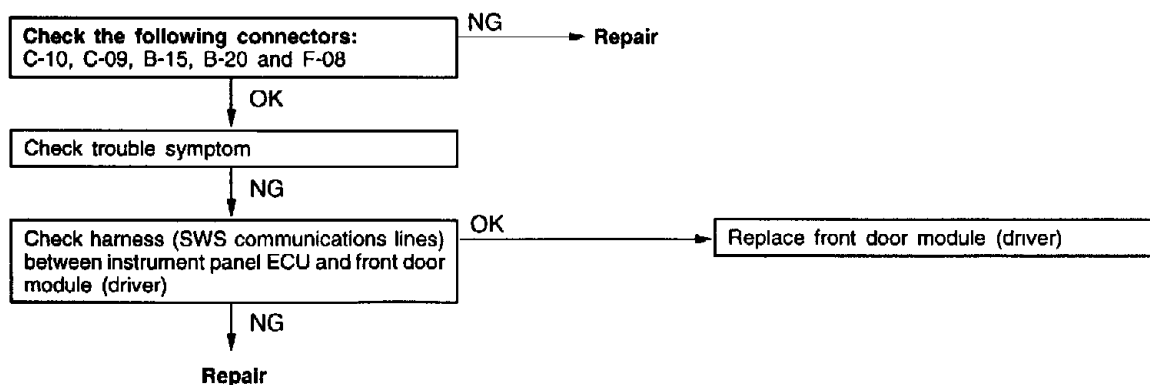
Code No. 33. MPI fuse (special fuse No. 9) blown	Probable cause
This code is output when special fuse No. 9 (MPI) blows or when the harness is disconnected.	• Special fuse No. 9 blown • Harness and connector malfunction • Assist-ECU malfunction



Code No. 34. Assist-ECU malfunction	Probable cause
This code is output when the instrument panel ECU fails to receive communications data continuously from the Assist-ECU for one second or longer (communications line malfunction)	• Assist-ECU malfunction • Malfunction in harness or connector of communications lines • Harness or connector malfunction



Code No. 41. Front door module (driver) malfunction	Probable cause
This code is output when the instrument panel ECU fails to receive communications data continuously from the front door module (driver) for one second or longer (communications line malfunction).	• Front door module (driver) malfunction. • Harness or connector malfunction • Malfunction in the harness or connector of the communications lines

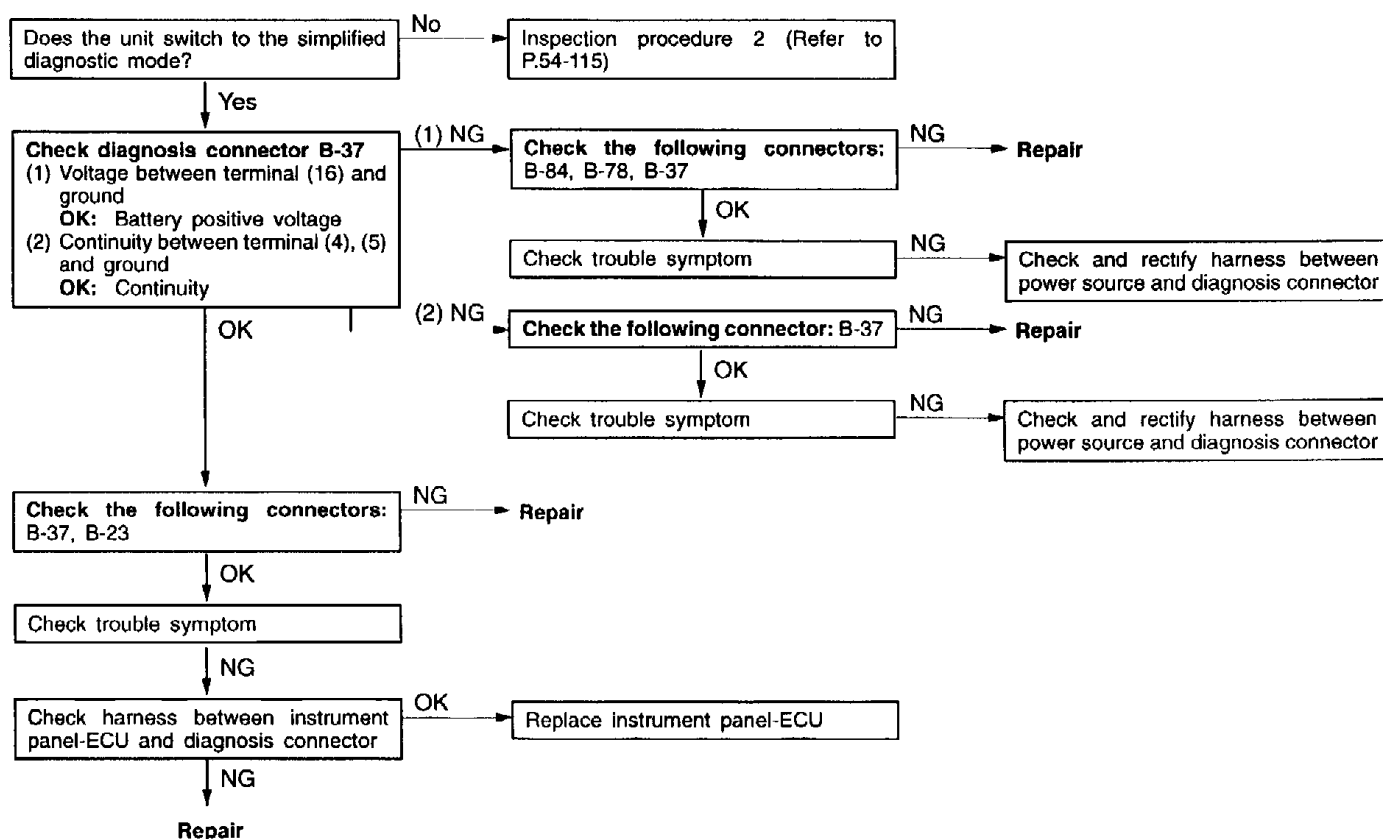


REFERENCE CHART FOR TROUBLE SYMPTOMS

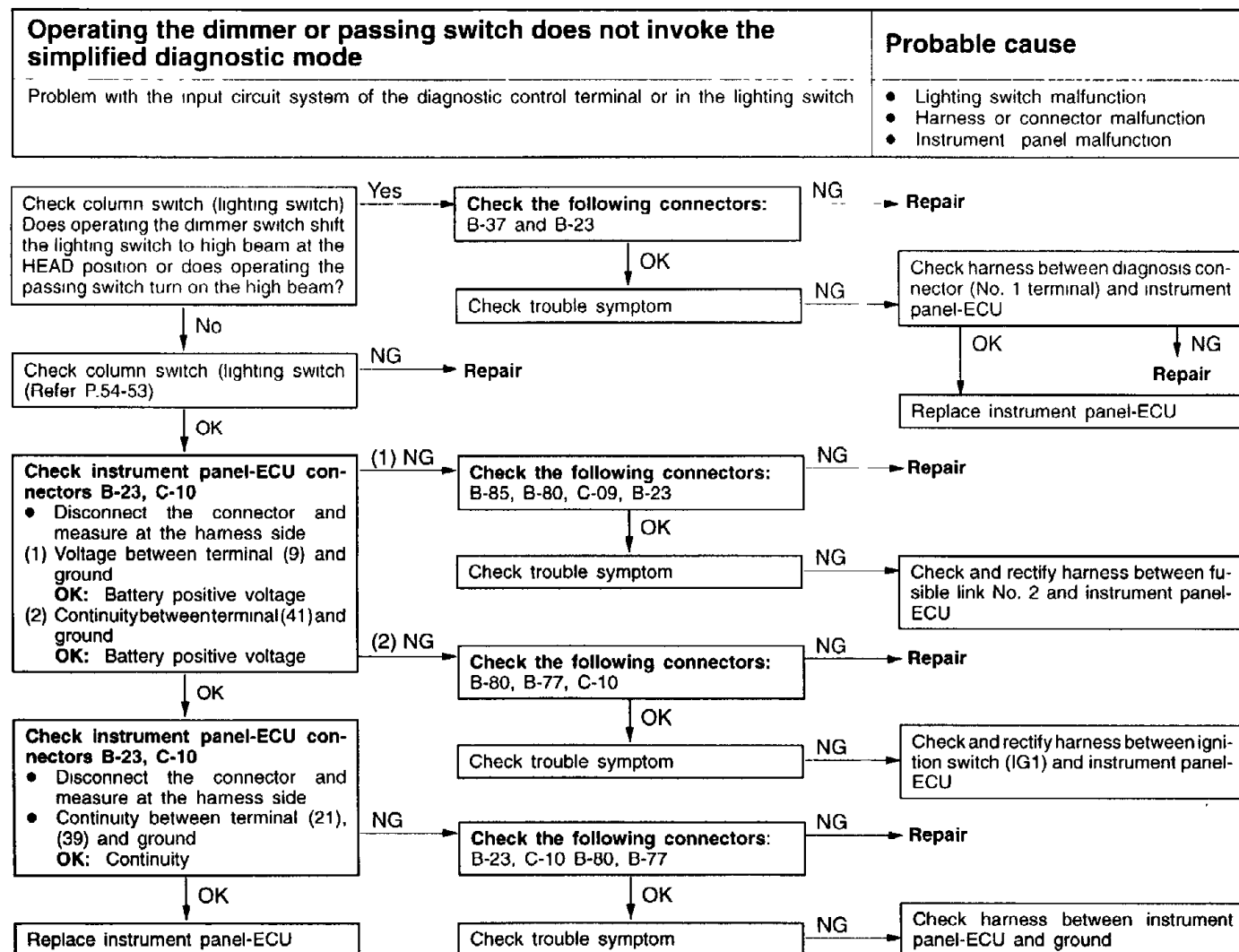
Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II not possible	1	54-114
Operating the dimmer or passing switch does not invoke the simplified diagnostic mode (driving speed is 0 km/h)	2	54-115
Simplified diagnostic mode does not cancel when the diagnostic control terminal is open circuit, or when the vehicle is driven.	3	54-116
Even if the specification confirmation mode is selected while the simplified diagnostic mode is in effect, the specification code of each unit is not displayed on the high beam indicator, or the display is wrong (the ignition switch is OFF)	4	54-117
Operating any SWS switch (P.54-109) while the switch diagnostic mode of the simplified diagnostic mode is in effect does not sound the buzzer or turn the high beam indicator on (ignition switch is ON)	5	54-118
The diagnostic code display is incorrect during the diagnostic output mode of the simplified diagnostic mode, or the display does not disappear even when the malfunction has been fixed (the ignition switch is ON)	6	54-118
The display does not read "correct", even though a malfunction does not exist while the diagnostic output mode of the simplified diagnostic mode is in effect, or the display indicates "correct", although there is a malfunction (the ignition switch is ON)	7	54-119

INSPECTION PROCEDURE 1

Communication with MUT-II not possible	Probable cause
Problem with the instrument panel-ECU power source or the ground circuit if instrument panel-ECU functions are not working	• Harness or connector malfunction • Instrument panel-ECU malfunction

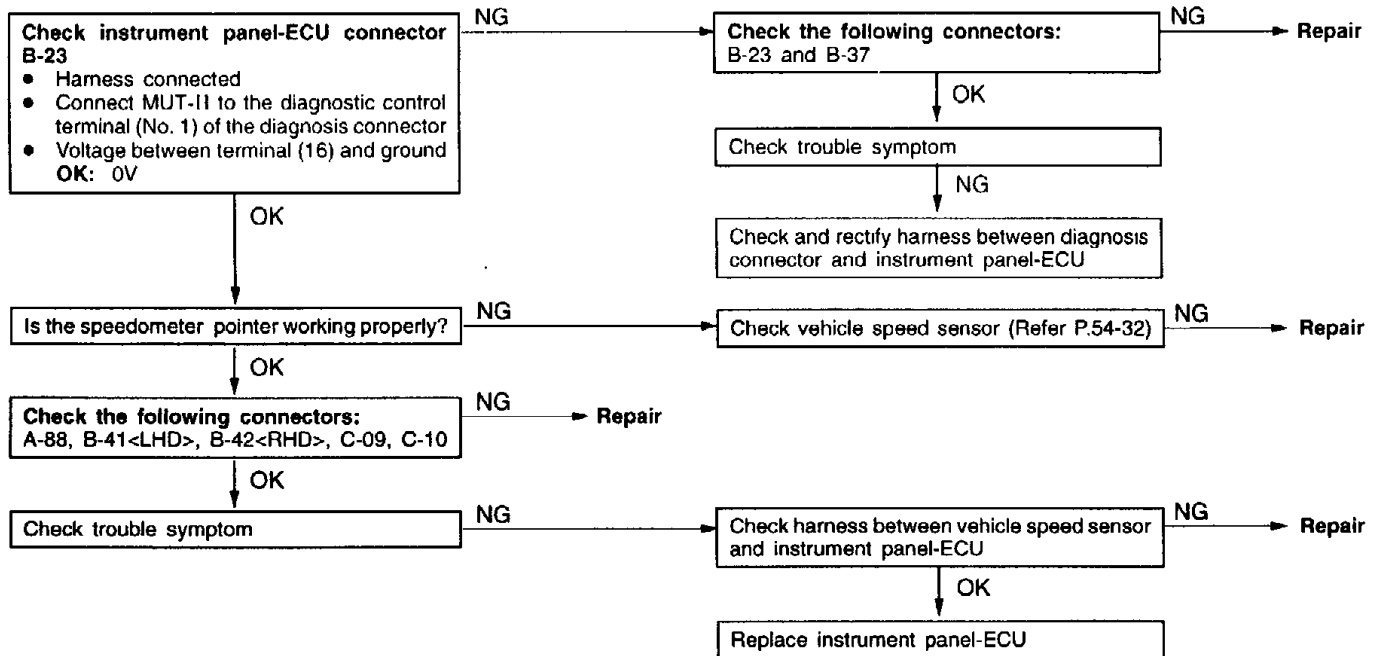


INSPECTION PROCEDURE 2



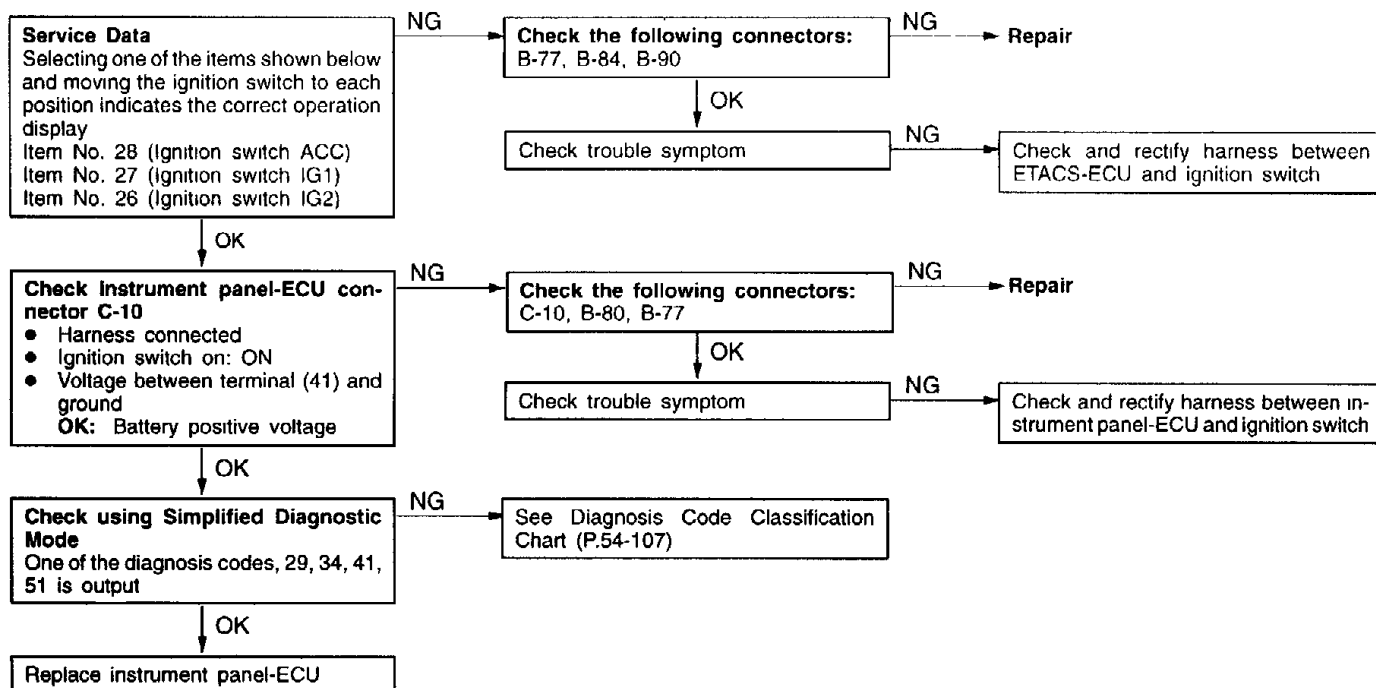
INSPECTION PROCEDURE 3

Simplified diagnostic mode does not cancel when the diagnostic control terminal is open circuit, or when the vehicle is driven	Probable cause
Grounding of the diagnostic control terminal or malfunction in the input circuit system of the speedometer driving pulse	• Speed sensor malfunction • Harness or connector malfunction • Instrument panel-ECU malfunction



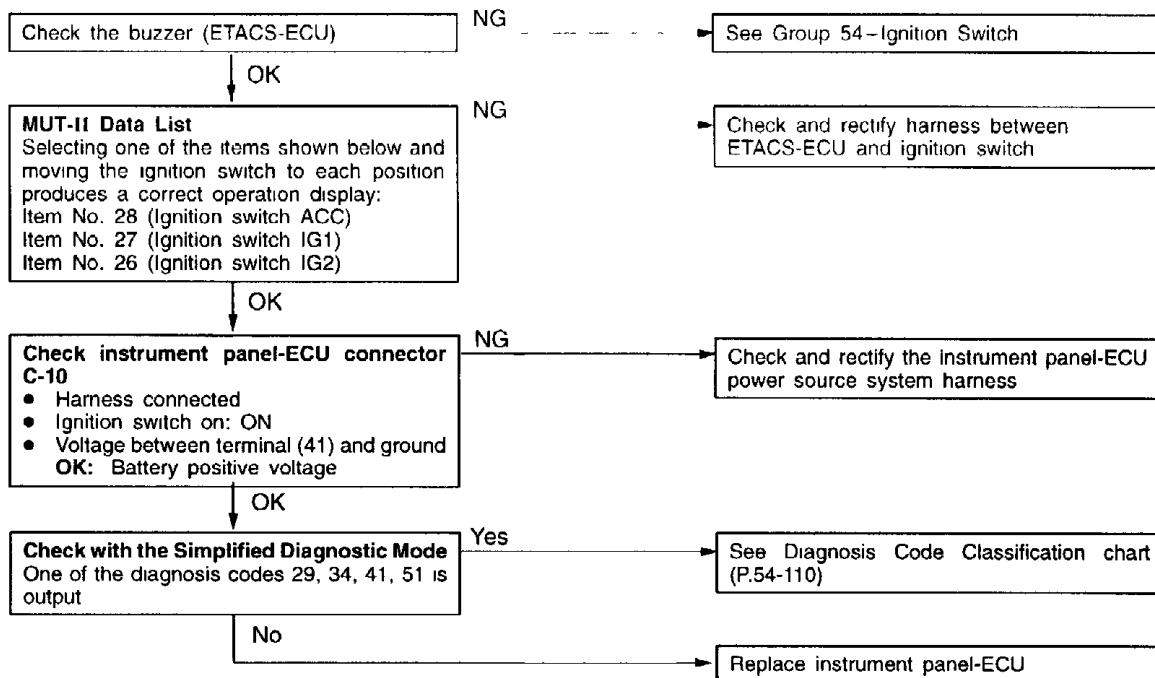
INSPECTION PROCEDURE 4

Even with the specification confirmation mode selected while the simplified diagnostic mode is in effect, the specification code of each unit is not displayed on the high beam indicator or the display is wrong. (However, the ignition switch is OFF)	Probable cause
Problem with the ignition switch input circuit of the instrument panel ECU or in the SWS communications line	• Harness or connector malfunction • Instrument panel-ECU malfunction



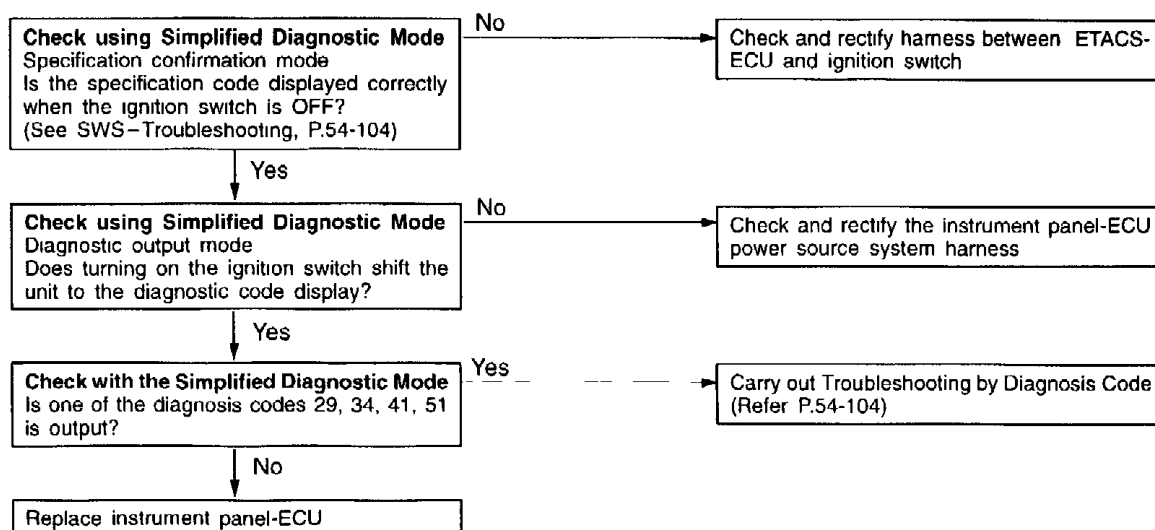
INSPECTION PROCEDURE 5

Operating any SWS switch (P.54-104) while the switch diagnostic mode of the simplified diagnostic mode is in effect does not sound the buzzer or turn on the high beam indicator. (However, the ignition switch is ON)	Probable cause
Problem with the ignition switch input circuit of the instrument panel-ECU or with the SWS communications line. The buzzer within the ETACS-ECU may also be malfunctioning	• Harness or connector malfunction • Instrument panel-ECU malfunction • ETACS-ECU malfunction



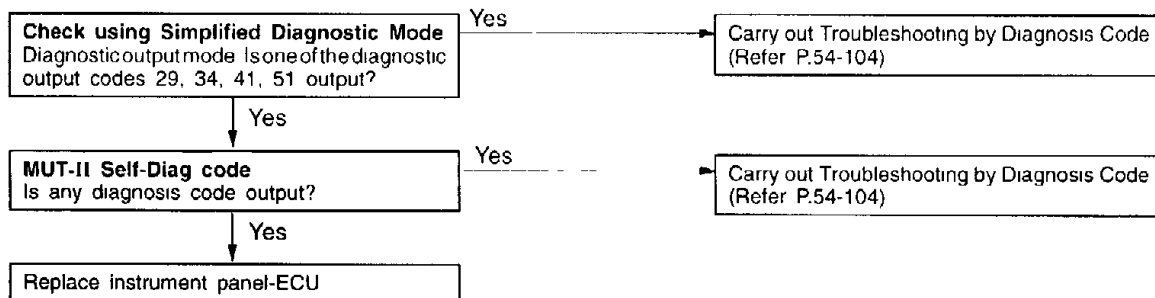
INSPECTION PROCEDURE 6

The diagnostic code display, which appears while the diagnostic output mode of the simplified diagnostic mode is in effect, is incorrect, or the display does not disappear after the malfunction has been fixed. However, the ignition switch is ON)	Probable cause
Problem with the ignition switch circuit of the instrument panel-ECU. (The malfunction in the ignition switch input circuit causes the specification confirmation code of each unit to be displayed)	• Harness or connector malfunction • Instrument panel-ECU malfunction



INSPECTION PROCEDURE 7

The display does not read “correct”, even though a malfunction does not exist while the diagnostic output mode of the simplified diagnostic mode is in effect, or the display indicates “correct”, although there is a malfunction. (However, the ignition switch is ON)	Probable cause
Problem with the SWS communications line or with the instrument panel-ECU	• Harness or connector malfunction • Instrument panel-ECU malfunction



SERVICE DATA REFERENCE CHART

Item No.	Item Operation	Item No.	Item Operation	Item No.	Item Operation
11.	Car speed (20 km/h) – above/below	42.	Shift position D – On/Off	77.	Power window (FR): (Up) – On/Off
12.	Headlamp (LO) – On/Off	43.	Shift position N – On/Off	78.	Power window lock switch – On/Off
13.	Headlamp (HI) – On/Off	44.	Shift position R – On/Off	79.	Door key unlock switch – On/Off
14.	Tail lamp – On/Off	45.	Shift position P – On/Off	80.	Door unlock switch: DM*3 – On/Off
15.	Fog lamp – On/Off	46.	Fuel warning – On/Off	81.	Electronic remote-controlled mirror (right) – On/Off
16.	Car speed (3 km/h) – above/below	47.	Door switch (RL) – Locked/Unlocked	82.	Electronic remote-controlled mirror (lower) – On/Off
17.	Front wiper mist – On/Off	48.	Door switch (RR) – Locked/Unlocked	83.	Power window (RL): (Down) – On/Off
18.	Front washer switch – On/Off	51.	Shift position 3 – On/Off	84.	Power window (RR): (Down) – On/Off
19.	Door lock switch (RR) – Locked/Unlocked	52.	Shift position 2 – On/Off	85.	Power window (FL): (Down) – On/Off
20.	Front wiper – operating/stopped	53.	Shift position 1 – On/Off	88.	Electronic remote-controlled mirror switch FL/FR
21.	Front wiper (HI) – operating/stopped	55.	Wiper motor switch *1 – On/Off	89.	Door lock switch (FL) – Locked/Unlocked
22.	Seat belt switch – On/Off	56.	Auto cruise Warning – On/Off	96.	Centre door lock switch (FR) – On/Off
23.	Door lock switch (RR) – Locked/Unlocked	59.	Oil pressure warning – On/Off	97.	Door lock switch (FR) On/Off
24.	Door switch (RR) – Opened/Closed	60.	Charge warning – On/Off	98.	Door key lock switch (FR) On/Off
25.	Door switch (FL) – Opened/Closed	61.	Brake fluid warning – On/Off	99.	Centre door unlock switch (FR) – On/Off
26.	Ignition switch (IG2) – On/Off	63.	ABS warning – On/Off		
27.	Ignition switch (IG1) – On/Off	71.	Door lock switch – On/Off		
28.	Ignition switch (ACC) – On/Off	72.	Door lock switch: DM*2 – On/Off		
37.	Parking switch – On/Off	73.	Electronic remote-controlled mirror (left) – On/Off		
38.	Key reminder switch – take out the ignition key/insert the ignition key	74.	Electronic remote-controlled mirror (upper) – On/Off		
39.	Door switch (RL) – Opened/Closed	75.	Power window (RL): (Up) – On/Off		
40.	Door switch (FL) – Opened/Closed	76.	Power window (RR): (Up) – On/Off		
41.	Power window switch effectiveness – effective/ineffective				

NOTE

*1. Rotary sliding switch in the wiper motor.

*2. Centre door lock switch signal in the door module of the driver's seat.

*3. Centre door unlock switch signal in the door module of the driver's seat.

ACTUATOR TEST REFERENCE CHART

Item No.	Item Operation	Item No.	Item Operation	Item No.	Item Operation
02	Exterior lamps	03	Windshield wiper	04	Door lock

INSTRUMENT PANEL-ECU TERMINAL CHECK

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22								

31	32	33	34	35	36	37	38
39	40	41	42	43	44	45	46

51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70

16P0264

Connector Terminal No.	Signal Name	Inspection condition	Normal state
2	Headlamp switch signal	When headlamp switch is ON	0V
3	Headlamp switch	When headlamp switch is ON	
4	Dimmer switch (HI)	When dimmer switch is HI	
5	Fog lamp switch	When fog lamp switch is ON	
6	Front wiper switch (LO)	When front wiper LO switch is ON	
7	Front washer switch	When front washer switch is ON	
8	Ignition key surround illumination	Ignition key surround illumination Off→On	Battery positive voltage→1V
9	+B power source	Normal	Battery positive voltage
11	Front wiper switch signal	When the front wiper LO or HI switch is ON	0V
12	Tail lamp signal	When the taillamp switch or the headlamp switch is ON	
14	Taillamp switch	When the taillamp switch or the headlamp switch is ON	0V
15	Dimmer switch (LO)	When the dimmer switch LO is on	
16	Diagnostic control terminal	When the diagnosis connector is connected	
17	Diagnostic data line	When the ignition switch is ON (When the MUT-II is not used)	4V
18	Front wiper switch (HI)	When the front wiper switch HI is ON	0V
19	Front wiper switch (Auto)	Front wiper switch Auto is ON	
20	Front wiper intermittent dial	Intermittent dial is ON	0–2.5V
21	Instrument panel-ECU earth	Constant	0V
31	SWS communications line	When the ignition is ON	Approx. 5V*1
32*2	Oil pressure warning	Oil pressure warning OFF→ON	Battery positive voltage→1V
34	Door open warning	Door open warning OFF→ON	
37	Disconnection sensor 2	Constant	0V
38	Fuel warning *2	Fuel warning lamp OFF→ON	Battery positive voltage→1V

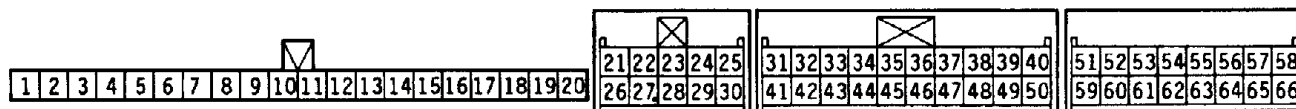
Connector Terminal No.	Signal Name	Inspection condition	Normal state
39	Instrument panel-ECU earth	Constant	0V
41	IG1	When the ignition is ON	Battery positive voltage
43	High beam indicator	High beam indicator OFF→ON	Battery positive voltage→1V
44	Vehicle speed sensor	When the ignition is ON – Stationary	0V or battery positive voltage
		When the ignition is OFF – Driving	Approx. 6V
45	Charge warning	Charge warning OFF→ON	Battery positive voltage→1V
46	Disconnection sensor 1	Constant	0V
52*2	Auto-cruise indicator	Auto-cruise indicator OFF→ON	Battery positive voltage→1V
54*2	ABS warning lamp	ABS warning lamp OFF→ON	
55*2	Brake warning lamp	Brake warning lamp OFF→ON	
56*2	Seat belt warning	Seat belt warning OFF→ON	
57*2	Shift 1 indicator	Shift 1 indicator OFF→ON	0V→Battery positive voltage
58*2	Shift 3 indicator	Shift 1 indicator OFF→ON	
59*2	Shift D indicator	Shift 1 indicator OFF→ON	
60*2	Shift R indicator	Shift 1 indicator OFF→ON	
63*2	Check engine lamp	Check engine lamp OFF→ON	Battery positive voltage→1V
67*2	Shift 2 indicator	Shift 1 indicator OFF→ON	0V→Battery positive voltage
68*2	Shift 4 indicator	Shift 1 indicator OFF→ON	
69*2	Shift N indicator	Shift 1 indicator OFF→ON	
70*2	Shift P indicator	Shift 1 indicator OFF→ON	

NOTE

*1. Reference value for pulse signals.

*2. Vehicles with standard meters.

ETACS-ECU TERMINAL CHECK



16P0265

Connector Terminal No.	Signal Name	Inspection condition	Normal state
1	Keyless entry identification signal	Constant	0V
2	Rear power window down relay (Driver side)	When the ignition switch is on	Battery positive voltage
3	Keyless entry door lock signal	When the front seat belt (FR) is not fastened	0V
5	IG ₁ power source	When the ignition switch is on	Battery positive voltage
7	ACC	When the ignition switch is ACC	Battery positive voltage
13	Driver's door switch	Driver's door Close→Open	10V→0V
14	Door switch (Driver Fr)	Close→Open	
15	Power window relay signal	When the ignition switch is ON	Battery positive voltage
16	Power Source	Constant	
17	IG ₂ power source	When the ignition switch is ON	
20	Interior lamp	Interior lamp OFF→ON	0V→Battery positive voltage
31	Door switch (Driver Rr)	Unlock→Lock	0V→10V
33	Keyless entry identification signal	When keyless entry signal is received	Approx. 1–5V
37	Rear power window down relay (Driver side)	Rear left power window Stop→Down	0V→Battery positive voltage
38	Keyless entry door unlock signal (all except driver's door)	Doors unlocked using keyless entry	Battery positive voltage
39	Keyless entry door lock signal	Doors locked using keyless entry	Battery positive voltage→0V→Battery positive voltage
41	Key reminder signal	Ignition key Insert→Remove	0V→Battery positive voltage
42	Trunk room lamp switch	Trunk lid Closed→Open	Battery positive voltage→0V
43	Door open signal	Any door Open→Closed	0V or 5V
47	Rear power window up relay (Driver side)	Rear left window Stop→Up	0V→Battery positive voltage
48	Keyless entry door unlock signal	Doors unlocked using keyless entry	Battery positive voltage→0V→Battery positive voltage
51	Key reminder switch	Ignition key Remove→Insert	0V→Battery positive voltage
53	Disconnection sensor 2	Constant	0V
55	SWS communications line	Constant	Approx. 5V*

Connector Terminal No.	Signal Name	Inspection condition	Normal state
56	Earth	Constant	0V
58	Parking brake switch	Parking brake Applied→Released	0V→Battery positive voltage
59	Door lock motor (unlock) (all doors except driver's)	Door lock OFF→UNLOCK	0V→Battery positive voltage→0V
60	Door lock motor (lock) (all doors except driver's)	Door lock OFF→LOCK	
62	Disconnection sensor 1	Constant	0V
63	Disconnection sensor 3	Constant	
64	Disconnection sensor 4	Constant	
65	Driver's door lock motor (unlock)	Door lock OFF→UNLOCK	0V→Battery positive voltage
66	Driver's door lock motor (lock)	Door lock OFF→LOCK	

NOTE

* Reference value for pulse signals.

ASSIST-ECU TERMINAL CHECK

1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18

21	22	23	24	25	26
27	28	29	30	31	32
33	34	35	36	37	38

41	42	43	44	45	46
47	48	49	50	51	52
53	54	55	56	57	58

61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78

16P0206

Connector Terminal No.	Signal Name	Inspection condition	Normal state
1	Remaining fuel warning sensor signal	Low fuel warning (Ignition switch ON)	8V or less
4	Front passenger seat door switch	Front passenger seat Open→Closed	0V→10V
5	Power window down relay (Pass. Rr)	Rear right power window Stop→Down	0V→Battery positive voltage
6	ABS signal	When conditions for turning on the ABS warning lamp are met	0V
7	Power window lock signal	Power window lock switch Lock→Unlock	0V→Battery positive voltage
11	Door lock switch (Pass. Rr)	Rear right door Unlocked	0V
12	Door switch (Pass. Rr)	Rear right door Open	
13	Power window UP relay (Pass. Rr)	Rear right power window Stop→Up	0V→Battery positive voltage
14	Remaining fuel warning sensor signal ground	Constant	0V
21	Check engine signal	When conditions for turning on the check engine warning lamp are met	0V
22	Disconnection sensor	Constant	

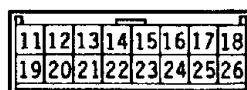
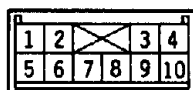
Connector Terminal No.	Signal Name	Inspection condition	Normal state
25	Shift R signal	Ignition switch is ON and shift position set at R	Battery positive voltage
26	Shift D signal	Ignition switch is ON and shift position set at D	
27	Shift 3 signal	Ignition switch is ON and shift position set at 3	
28	Shift L signal	Ignition switch is ON and shift position set at L	
30	Auto cruise signal	When conditions for turning on the Auto cruise indicator are met	0V
32	Shift P signal	Ignition switch ON and shift position set at P	Battery positive voltage
33	Shift N signal	Ignition switch ON and shift position set at N	
34	Shift 4 signal	Ignition switch ON and shift position set at 4	
35	Shift 2 signal	Ignition switch ON and shift position set at 2	
36	Starter relay	Ignition key Removed→Inserted	0V–10V
41	Power source	Constant	Battery positive voltage
42	Door mirror motor – front passenger seat	Mirror Stop→Right	0V→Approx.. 10V
43	Door mirror motor – front passenger seat	Mirror Stop→Down	
44	Door mirror motor – front passenger seat	Mirror Stop→Up	
45	Front passenger centre door lock switch (lock)	Switch Off→Lock	Battery positive voltage→0V
46	Front passenger door key cylinder switch (lock)	Key Off→Lock	Battery positive voltage→0V
47	Front passenger door key cylinder switch (unlock)	Key Off→Lock	Battery positive voltage→0V
48	SWS communications line	Ignition switch ON	Approx. 5V*
49	Power window switch on the front passenger side	Power window switch Lock→Unlock	Battery positive voltage→0V
50	Front wiper switch signal	Wiper switch LO or HI	0V
51	IG1 power source	Ignition switch is ON	Battery positive voltage
55	Headlamp switch signal	Headlamp switch is ON	0V
56	Front passenger centre door lock switch (unlock)	Switch OFF→Unlock	Battery positive voltage→0V
57	Assist-ECU ground	Constant	0V
58	Power window down relay (Pass. Fr)	Power window Stop→Down (Pass. Fr)	Battery positive voltage→0V
59	Power window up relay (Pass. Fr)	Power Stop→Up (Pass. Fr)	

Connector Terminal No.	Signal Name	Inspection condition	Normal state
60	Door lock switch on front passenger side	When the front passenger door is Unlocked	Battery positive voltage
61	Power window motor (–) (Pass. Fr)	Ignition switch ON	
62	MPI Blown fuse sensor	Ignition switch ON	
63	Power window relay	Ignition switch ON	
64	Headlamp LO relay	Headlamp is turned ON	1V
65	Taillamp relay	Taillamp is turned ON	
66	Washer motor	Ignition switch at ACC and washer switch is ON	Battery positive voltage
67	Wiper motor (LO)	Ignition switch at ACC and wiper switch at LO	Battery positive voltage
68	Wiper motor (HI)	Ignition switch at ACC and wiper switch at HI	
69	Wiper motor internal switch	When wiper motor is operating and stopped	Operating: Battery voltage Stopped: 0V
70	Wiper motor (ACC) signal	Ignition switch ACC position	Battery positive voltage
71	Blown fuse detection 2 (alternator)	Ignition switch ON	
73	Fog lamp relay	When the fog lamp is turned ON	1V
74	Headlamp HI relay	When the headlamp HI is turned ON	
75	Horn relay	When conditions for operating the theft alarm are met	0V
76	Alternator signal	Charge warning lamp is turned ON	8V or less
77	Power window relay signal	Ignition switch ON	Battery positive voltage
78	Earth	At all times	0V
79	Brake fluid level sensor signal	When conditions for turning on the brake fluid warning lamp are met	0V
81	Engine oil pressure signal	When conditions for turning on the oil pressure warning lamp are met	

NOTE

* Reference value for pulse signal.

FRONT DOOR MODULE (DRIVER) TERMINAL CHECK

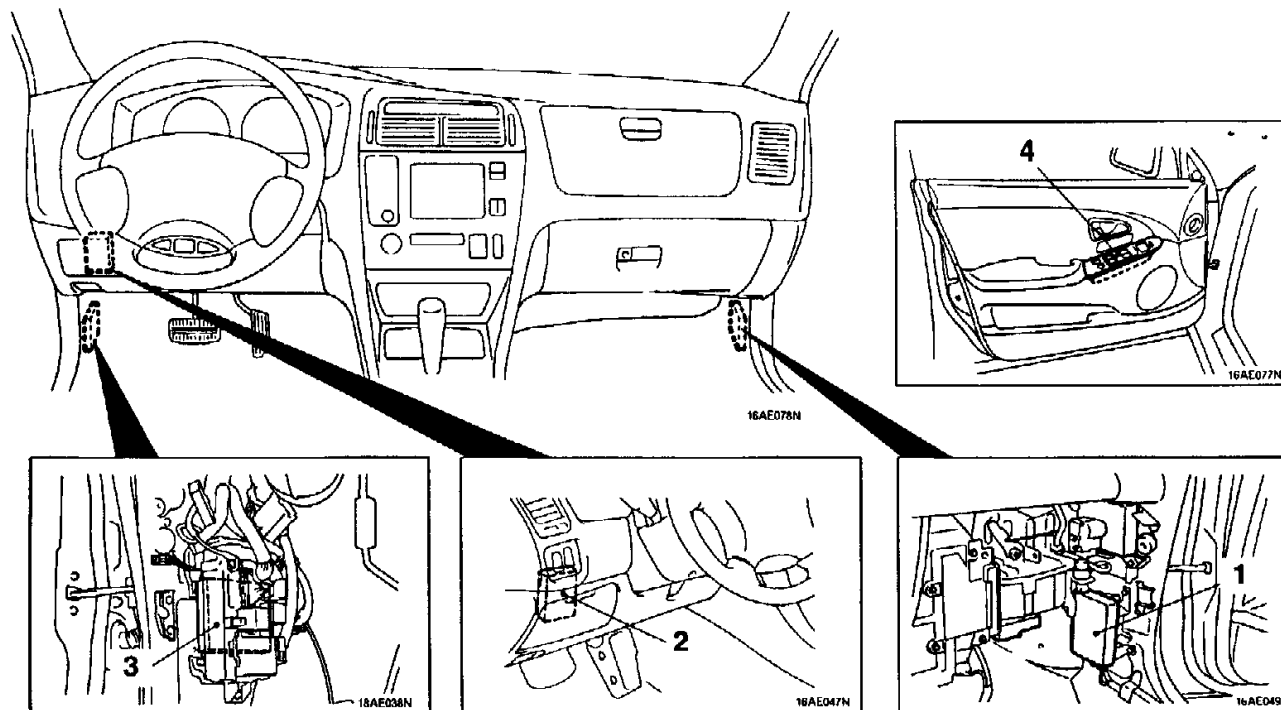


16P0267

Connector Terminal No.	Signal Name	Inspection condition		Normal state
1	Power window relay power source	Ignition switch on		Battery positive voltage
2	B power source	At all times		
3	Earth	At all times		0V
4	Power window output (driver's side) (-)	Power window Stop→Down		0V→Battery positive voltage
5	Power window output (driver's side) (+)	Power window Stop→Down		
10	Earth	At all times		0V
11	SWS communications line	When ignition switch is on		Approx. 5V*
12	Door handle signal	Door handle	Released	0V
			Pulled	Approx. 3.5V*
13	Door lock signal	Door lock knob	Lock	Approx. 3.5V*
			Unlock	0V
14	Door key signal (Lock)	Key Off→Lock		Battery positive voltage→0V
15	Door key signal (Unlock)	Key Off→Unlock		
16	Output of driver's side door mirror motor	Mirror Stop→Right		0V→10V Approximately
17	Output of driver's side door mirror motor	Mirror Stop→Up		
18	Output of driver's side door mirror motor	Mirror Stop→Down		

NOTE

* Reference value for pulse signals.

SIMPLIFIED WIRING SYSTEM (SWS)**REMOVAL AND INSTALLATION**

16AE079N

Assist-ECU removal steps

- Cowl side trim (Pass.) (Refer to Group 52A)
 - Under cover assembly (Refer to Group 52A)
1. Assist-ECU

Instrument panel-ECU removal steps

- Under cover assembly (Refer to Group 52A–Instrument Panel)
2. Instrument panel-ECU

ETACS-ECU removal steps

- Cowl side trim (Driver) (Refer to Group 52A)
 - Under cover assembly (Refer to Group 52A)
 - Junction block assembly
3. ETACS-ECU

Front door module (Driver) removal

4. Front door module (Driver)

HEATER, AIR CONDITIONING AND VENTILATION

CONTENTS

GENERAL INFORMATION	3	Compressor Drive Belt Adjustment	28
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ON-VEHICLE SERVICE	27	Idle-up Operation Check	36
Sight Glass Refrigerant Level Test	27	AIR CONDITIONING CONTROL UNIT	
Magnetic Clutch Test	28	ASSEMBLY	37
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Dual Pressure Switch Check	28	ASSEMBLY AND EVAPORATOR*	38

CONTINUED ON NEXT PAGE

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) If it is possible that the SRS components are subjected to heat over 93°C in baking or drying after painting, remove the SRS components (air bag module and SRS-ECU) beforehand.
- (3) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorised 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 the asterisk (*) in the table of contents in each group indicate operations requiring warnings.

BLOWER MOTOR ASSEMBLY AND BLOWER MOTOR HI RELAY*	39	SENSORS	52
DAMPER CONTROL MOTOR ASSEMBLY AND POWER TRANSISTOR	41	Photo Sensors	52
COMPRESSOR AND TENSION PULLEY	44	Outside Air Temperature Sensor	52
REFRIGERANT LINE	49	Heater Water Temperature Sensor	53
CONDENSER AND CONDENSER FAN MOTOR	50	VENTILATORS*	54
		VENTILATORS (AIR OUTLET)	55

GENERAL INFORMATION

The heater system uses a two-way-flow full-air-mix system that features high performance and low operating noise, and includes an independent face air blowing function and a cool air bypass function. The A/C refrigerant system is basically the same as conventional systems and R-134a refrigerant has been adopted as a response to restrictions on the use of chlorofluorocarbons. For the air condi-

tioning switch, push-button controls have been adopted for air flow control, air conditioning mode switching and blower speed. When the button is depressed, the air flow direction, air conditioning mode and blower speed are indicated on a graphic display. A rotary control is used for setting cabin temperature. When the knob is rotated, the desired temperature is indicated on the graphic display.

Items		Specifications
Heater unit	Type	Two-way-flow full-air-mix system
Heater control assembly		Push button type
Compressor	Model	Scroll type <MSC105CVS>
Dual pressure switch	High pressure switch	OFF: 3,140, ON: 2,550
	Low pressure switch	OFF: 200, ON: 220
Refrigerant and quantity g		R-134a(HFC-134a), Approx. 650–690

SAFETY PRECAUTIONS

Because R-134a refrigerant is a hydrofluorocarbon (HFC) which contains hydrogen atoms in place of chlorine atoms, it will not cause damage to the ozone layer.

Ozone filters out harmful radiation from the sun. To assist in protecting the ozone layer, the use of a R-134a refrigerant recycling device is recommended.

Refrigerant R-134a is transparent and colourless in both the liquid and vapour state. Since it has a boiling point of -29.8°C , at atmospheric pressure, it will be a vapour at all normal temperatures and pressures. The vapour is heavier than air, non-flammable, and non-explosive. The following precautions must be observed when handling R-134a.

Caution

Wear safety goggles when servicing the refrigeration system.

R-134a evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes. Always wear safety goggles when servicing the refrigeration part of the A/C system. Keep a bottle of sterile mineral oil handy when working on the refrigeration system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out. R-134a is rapidly absorbed by the oil. Next splash the eyes with plenty of cool water. Call your doctor immediately even if irritation has ceased after treatment.

Caution**Do not heat R-134a above 40°C**

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant.

A bucket or large pan of hot water not over 40°C is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

Caution

Keep R-134a containers upright when charging the system.

When adding R-134a into the refrigeration system keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

Caution

1. **A leak detector designed for R-134a should be used to check for refrigerant gas leaks.**
2. **Do not allow liquid refrigerant to touch bright metal.**

Refrigerant will tarnish bright metal and chrome surfaces, and in combination with moisture can severely corrode all metal surfaces.

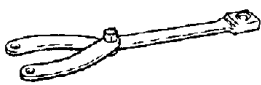
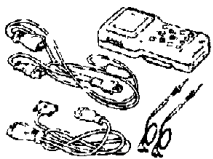
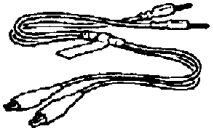
SERVICE SPECIFICATIONS

Items		Standard value
Idle speed r/min (N or P RANGE)		700±50
Idle up speed r/min		900±50
Air gap (Magnetic clutch) mm		0.4–0.65
Resistance of air mix damper potentiometer kΩ	MAX, HOT	4.82
	MAX COOL	0.18
Resistance of mode selector damper potentiometer kΩ	DEF position	0.18
	FACE position	4.82
Revolution pickup sensor resistance (at 20°C) Ω		405±35

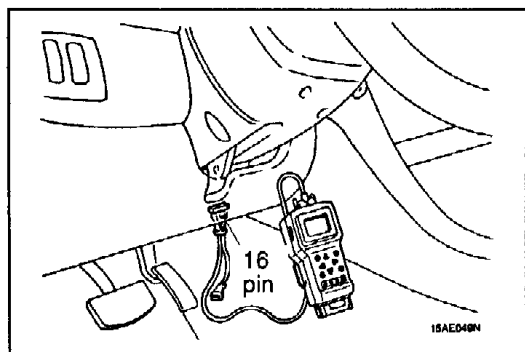
LUBRICANTS

Items	Specified lubricants	Quantity
Each connection of refrigerant line Lip seal of the compressor	SUN PAG 56	As required
Compressor refrigerant unit lubricant mℓ	SUN PAG 56	170–190

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991367	Special spanner	Armature mounting nut of compressor removal and installation
	MB991386	Pin	Armature mounting nut of compressor removal and installation
	MB991502	MUT-II	Checking the full automatic air conditioning
		ROM pack	
	MB991529	Diagnosis code check harness	Checking the full automatic air conditioning when using a voltmeter

TROUBLESHOOTING



DIAGNOSTIC FUNCTION

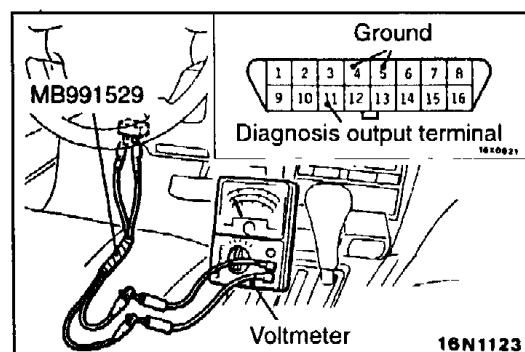
DIAGNOSIS CODE CHECK

With the MUT-II

Connect the MUT-II to the diagnosis connector then check diagnosis codes.

Caution

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



Using a Voltmeter

1. Turn OFF the ignition switch.
2. Connect an analog voltmeter across the diagnosis output terminal 11 and terminal 4 or 5 (ground terminal) of the diagnosis connector.
3. Turn ON the ignition switch.
4. According to the voltmeter pointer deflection, read the diagnosis pattern.
5. Referring to the diagnosis chart, repair the faulty item.
6. Turn OFF the ignition switch.

7. Disconnect the battery cable from the battery terminal and leave it disconnected for 10 seconds or more then reconnect the cable.
8. Turn ON the ignition switch and read the diagnosis code to check that the normal condition code is being output.

ERASING DIAGNOSIS CODES**With the MUT-II**

Connect the MUT-II to the diagnosis connector then erase the diagnosis codes.

Without the MUT-II

Remove the battery cable from the negative battery terminal for 10 seconds or more then reconnect the cable.

INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code No.	Diagnosis Item	Reference page
11	Passenger compartment temperature sensor (open circuit)	55-6
12	Passenger compartment temperature sensor (short circuit)	55-6
13	Outside air temperature sensor system (open circuit)	55-7
14	Outside air temperature sensor system (short circuit)	55-7
15	Heater water temperature sensor system (open circuit)	55-8
16	Heater water temperature sensor system (short circuit)	55-8
21	Air thermo sensor system (open circuit)	55-9
22	Air thermo sensor system (short circuit)	55-9
31	Potentiometer system for air mix damper motor	55-10
32	Potentiometer system for mode selector damper motor	55-11
41	Driving system for air mix damper motor	55-11
42	Driving system for mode selector damper motor	55-12

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

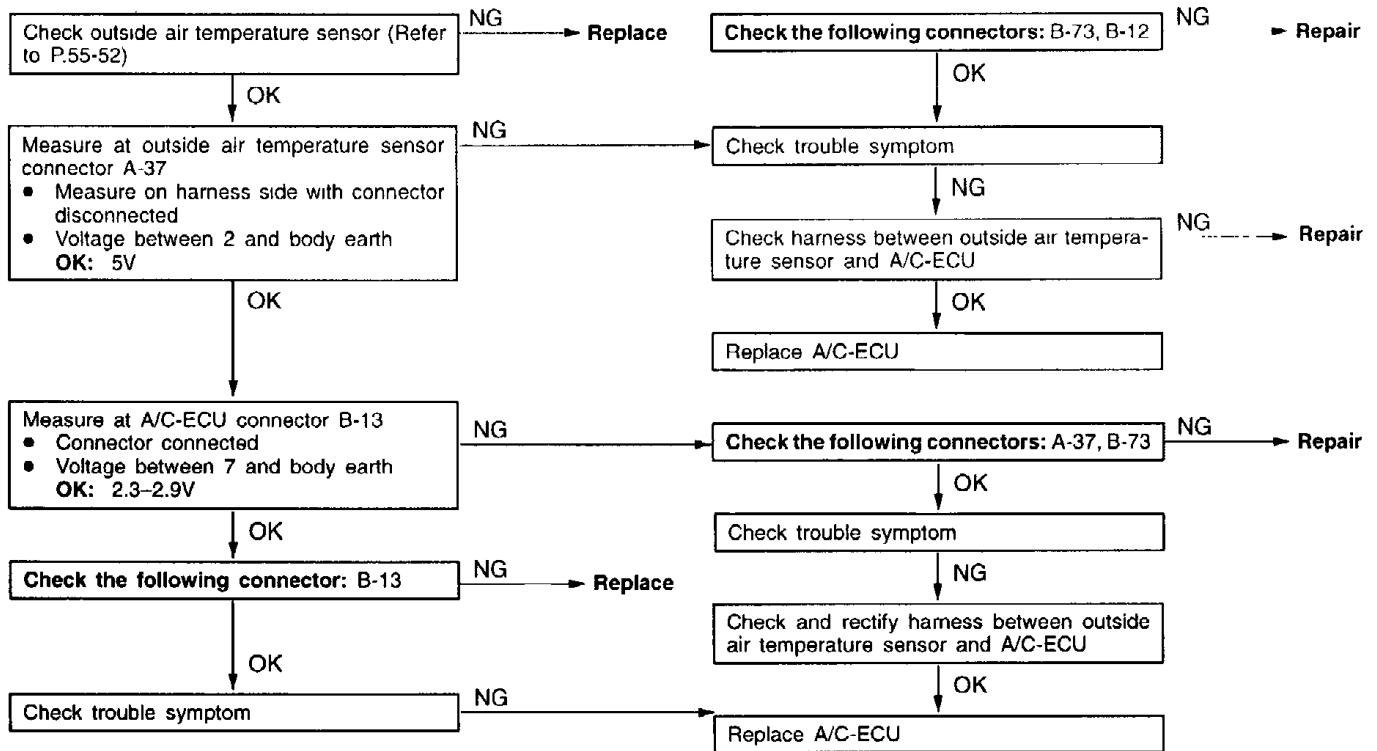
Code No. 11 Passenger compartment temperature sensor (open circuit)	Probable cause
This code is output when there is an open circuit in the power supply wiring or input wiring in the passenger compartment temperature sensor in the A/C-ECU, and there is no input from the passenger compartment temperature sensor to the A/C-ECU.	A/C-ECU fault

Replace A/C-ECU

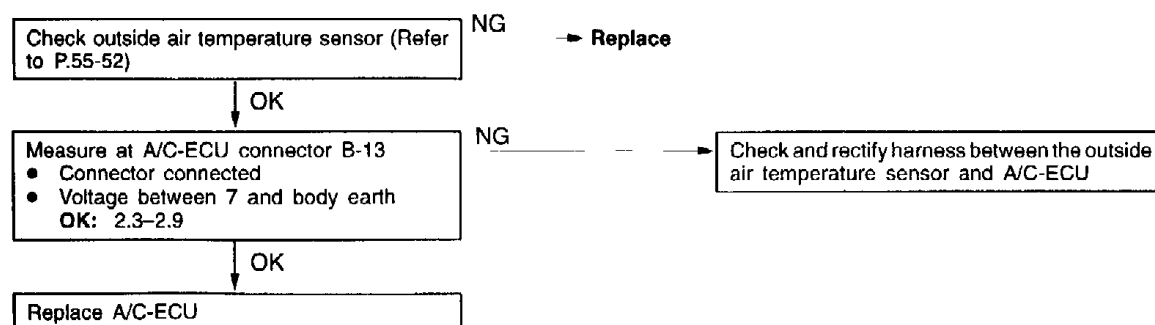
Code No. 12 Passenger compartment temperature sensor (short circuit)	Probable cause
This code is output when there is a short circuit in the power supply wiring and output wiring in the passenger compartment temperature sensor in the A/C-ECU, and the power supply voltage is input from the passenger compartment temperature sensor to the A/C-ECU.	A/C-ECU fault

Replace A/C-ECU

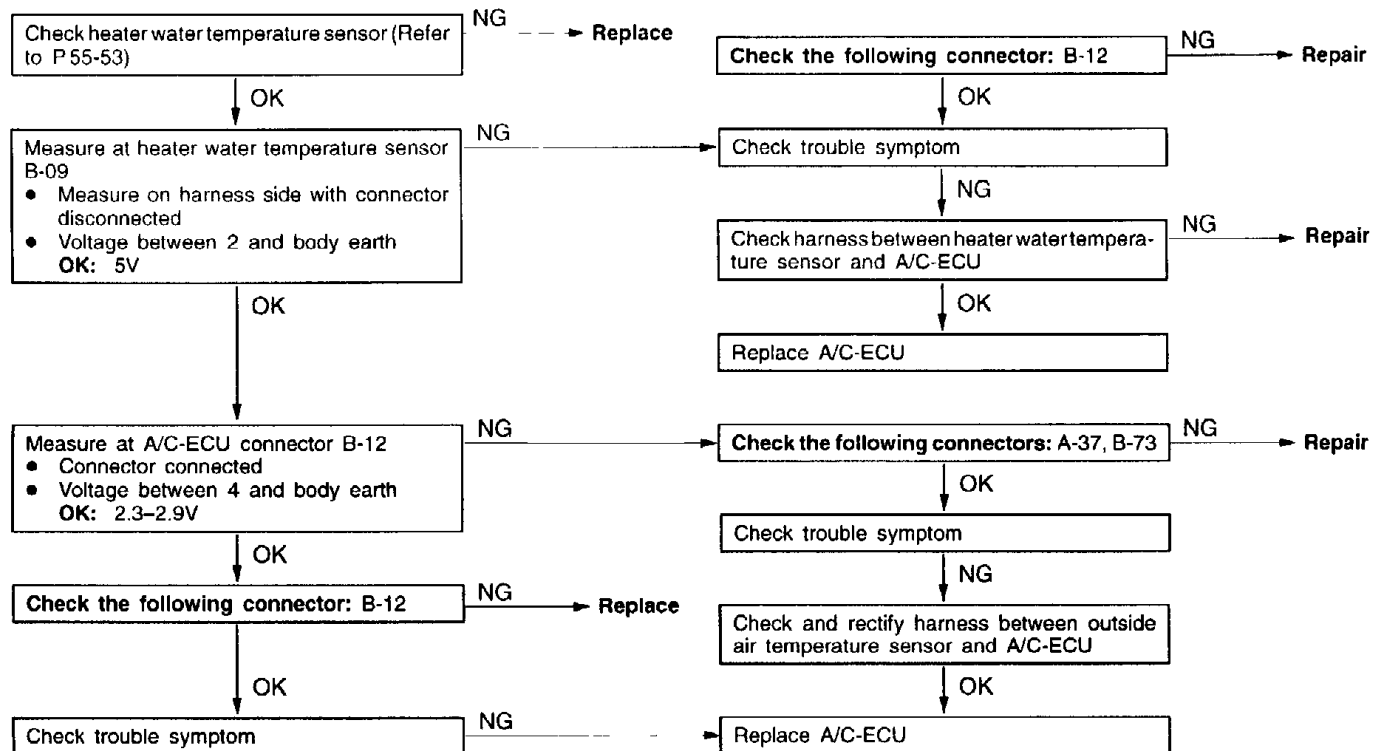
Code No. 13 Outside air temperature sensor system (open circuit)	Probable cause
This code is output when there is an open circuit in the outside air temperature sensor power supply or input wiring, and there is no input from the outside air temperature sensor in the A/C-ECU.	• Outside air temperature sensor fault • Connector or harness fault • A/C-ECU fault



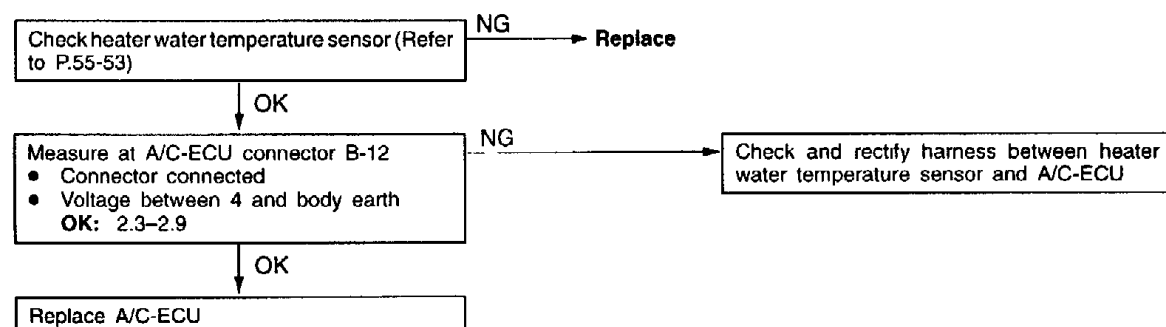
Code No. 14 Outside air temperature sensor system (short circuit)	Probable cause
This code is output when there is a short circuit in the outside air temperature sensor power supply and input wiring, and the outside air temperature sensor power supply voltage is output to the A/C-ECU.	• Outside air temperature sensor fault • Connector or harness fault • A/C-ECU fault



Code No. 15 Heater water temperature sensor system (open circuit)	Probable cause
This code is output when there is an open circuit in the heater water temperature sensor power supply or input wiring, and there is no input from the heater water temperature sensor into the A/C-ECU.	• Heater water temperature sensor fault • Harness or connector fault • A/C-ECU fault



Code No. 16 Heater water temperature sensor system (short circuit)	Probable cause
This code is output when the heater water temperature sensor power supply and output wires are shorted and the heater water temperature sensor power supply voltage has been input into the A/C-ECU.	• Heater water temperature sensor fault • Harness or connector fault • A/C-ECU fault

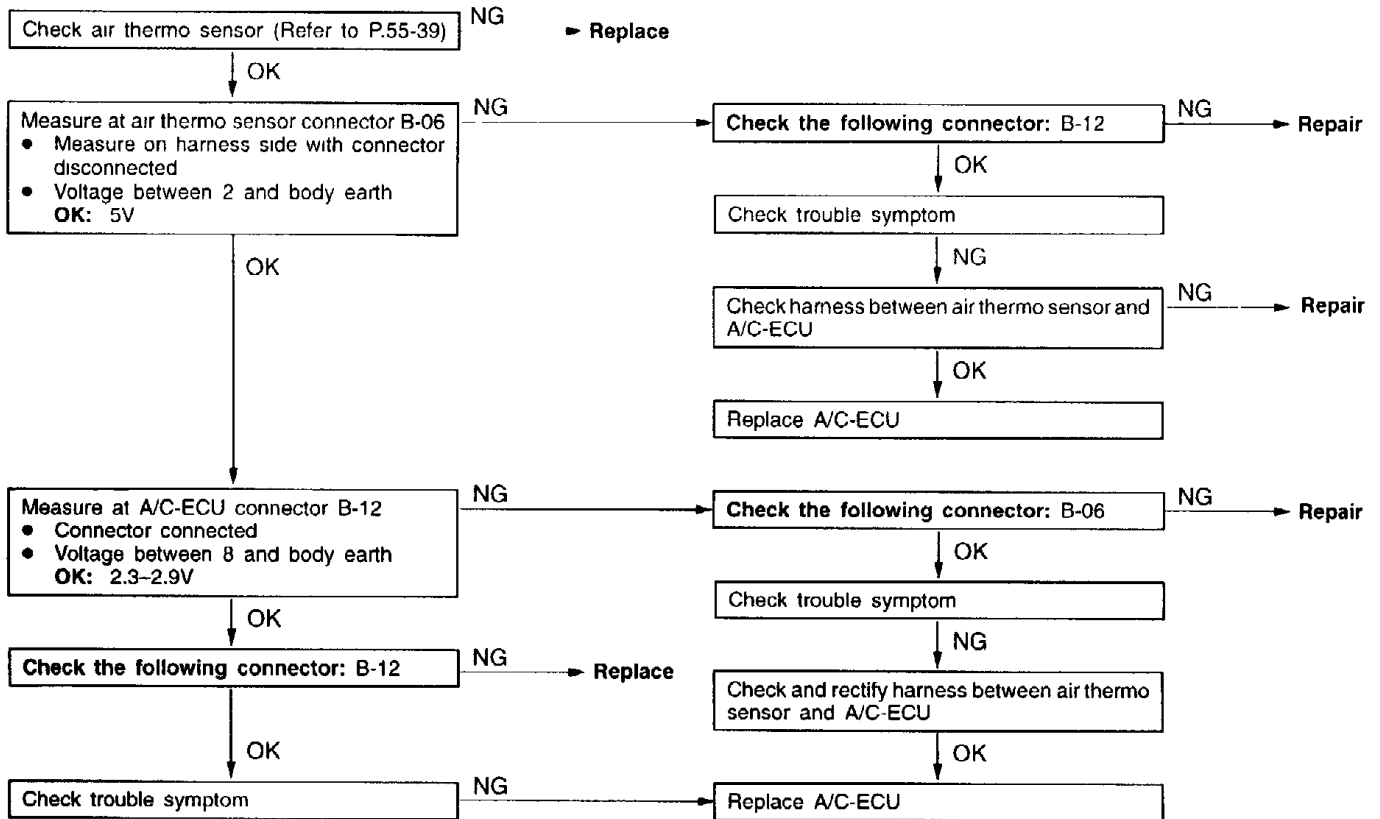


Code No. 21 Air thermo sensor system (open circuit)

This code is output when there is an open circuit in the air thermo sensor power supply or input wiring, and there is no input from the air thermo sensor to the A/C-ECU.

Probable cause

- Air thermo sensor fault
- Harness or connector fault
- A/C-ECU fault

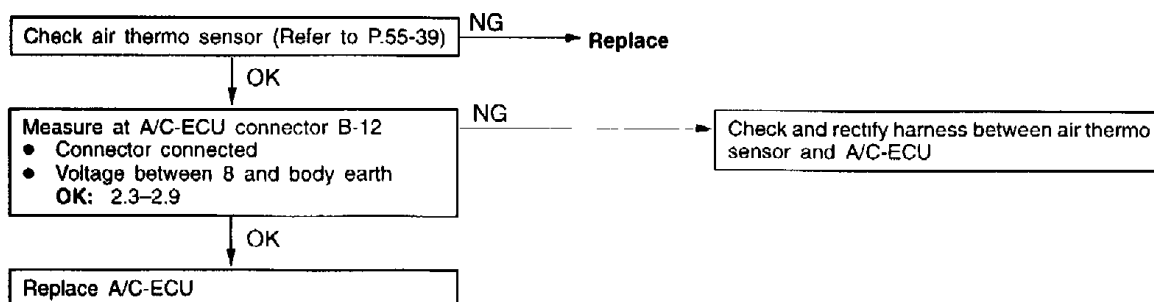


Code No. 22 Air thermo sensor system (short circuit)

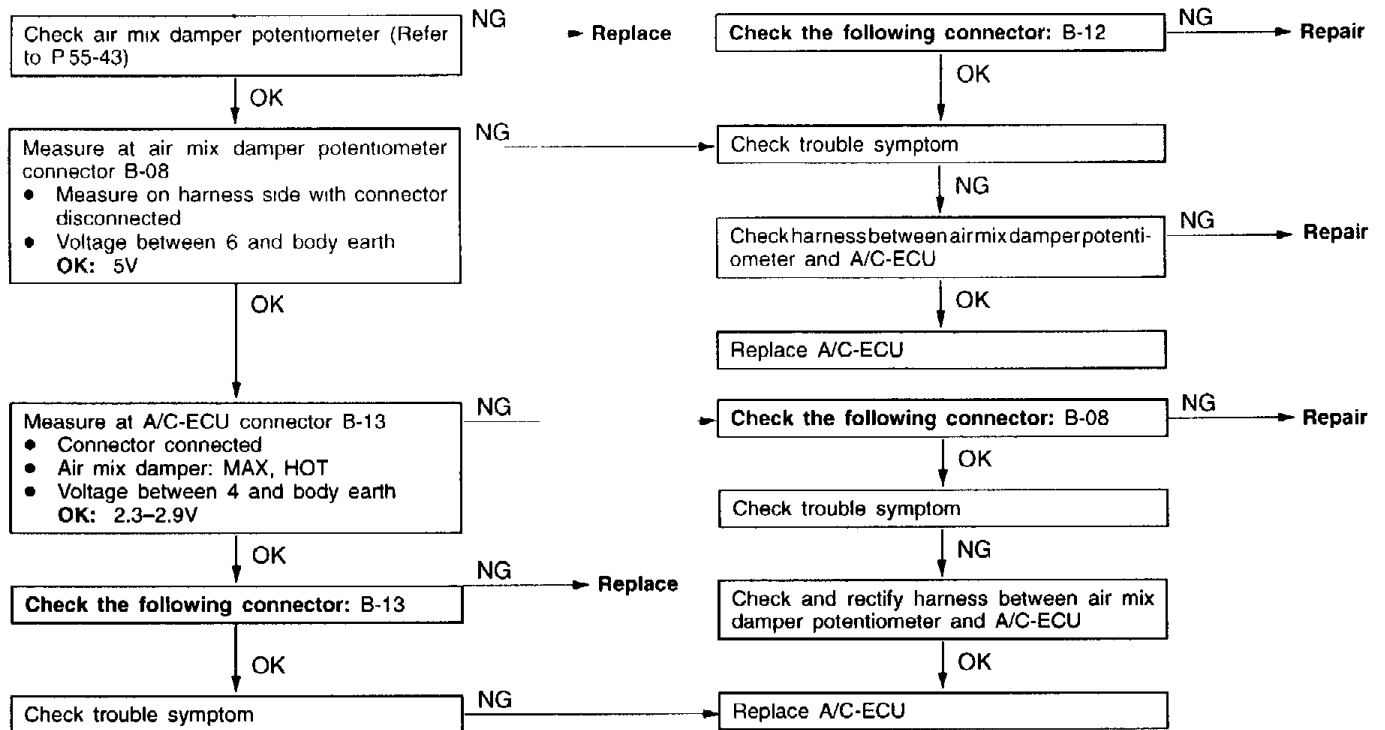
This code is output when the air thermo sensor power supply and output wires are shorted, and the air thermo sensor power supply voltage has been input into the A/C-ECU.

Probable cause

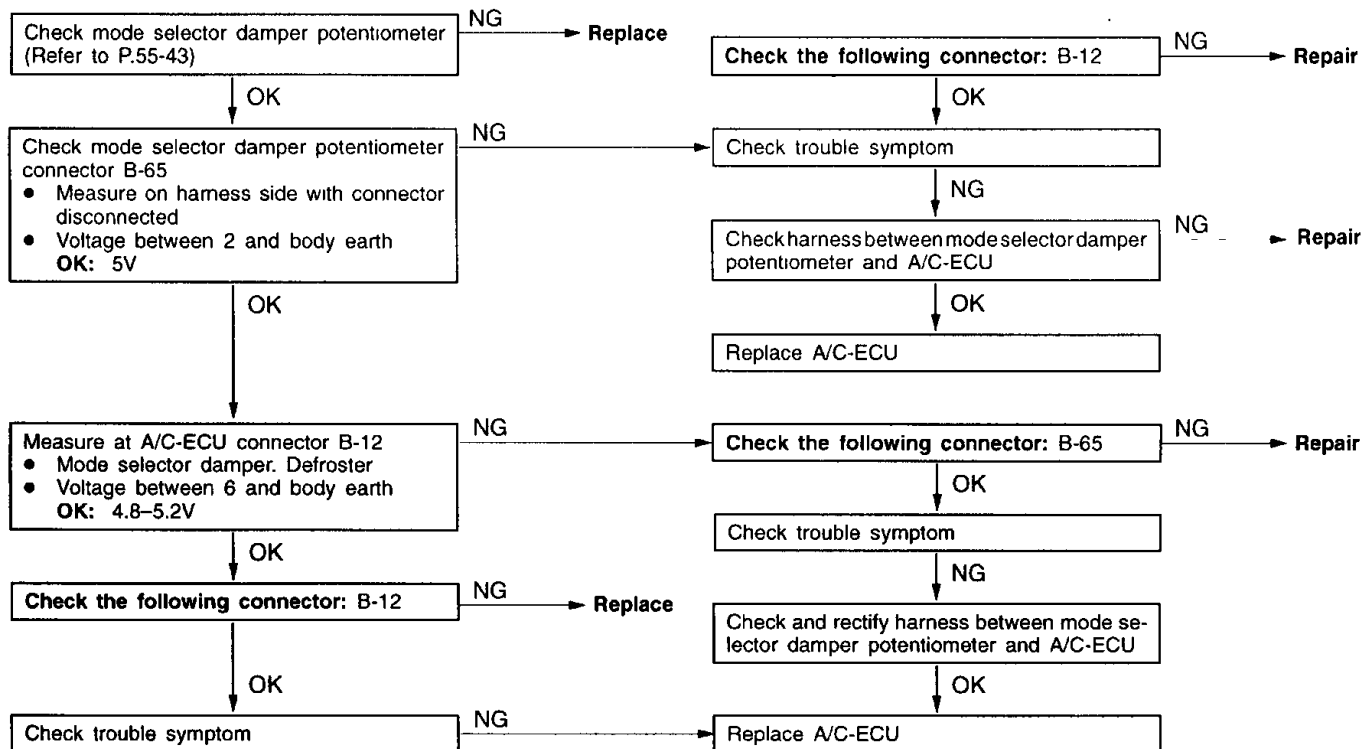
- Air thermo sensor fault
- Harness or connector fault
- A/C-ECU fault



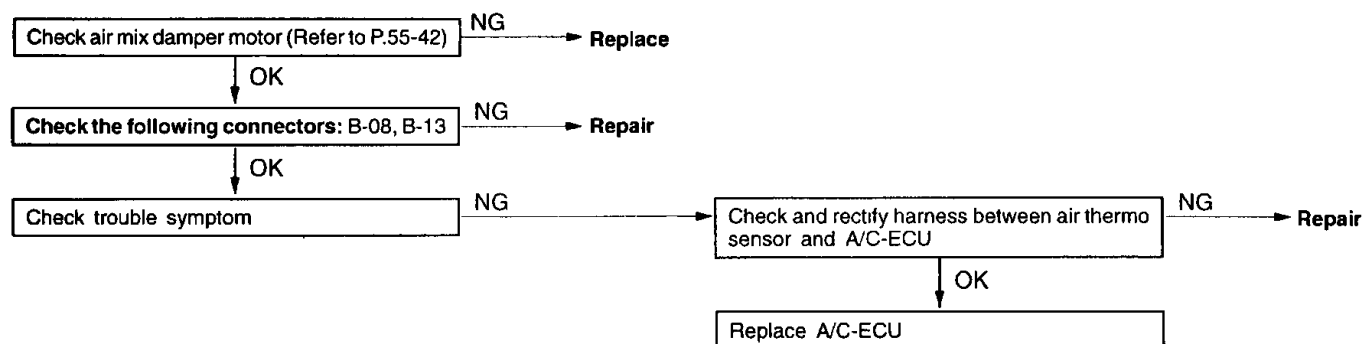
Code No. 31 Potentiometer system for air mix damper	Probable cause
This code is output when there is no input from the air mix damper potentiometer to the A/C-ECU due to an open or short circuit in the harness	• Air mix damper potentiometer fault • Harness or connector fault • A/C-ECU fault



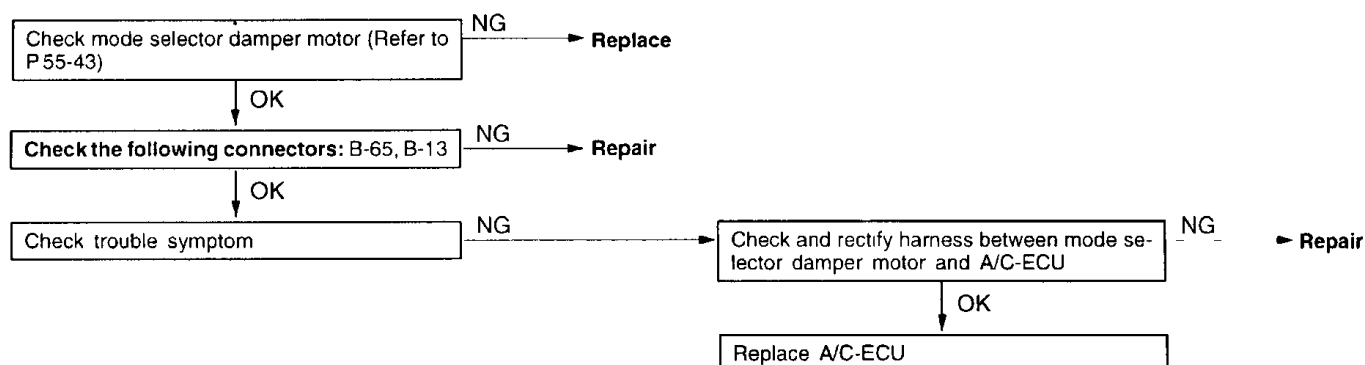
Code No. 32 Potentiometer system for mode selector damper	Probable cause
This code is output when there is no input from the mode selector damper potentiometer to the A/C-ECU due to an open or short circuit in the harness.	- Mode selector damper potentiometer fault - Harness or connector fault - A/C-ECU fault



Code No. 41 Driving system for air mix damper motor	Probable cause
This code is output when the air mix damper cannot be rotated to the set opening angle.	- Air mix damper motor fault - Harness or connector fault - A/C-ECU fault



Code No. 42 Driving system for mode selector damper motor	Probable cause
This code is output when the mode selector damper cannot be rotated to the set opening angle.	• Mode selector damper motor fault • Harness or connector fault • A/C-ECU fault



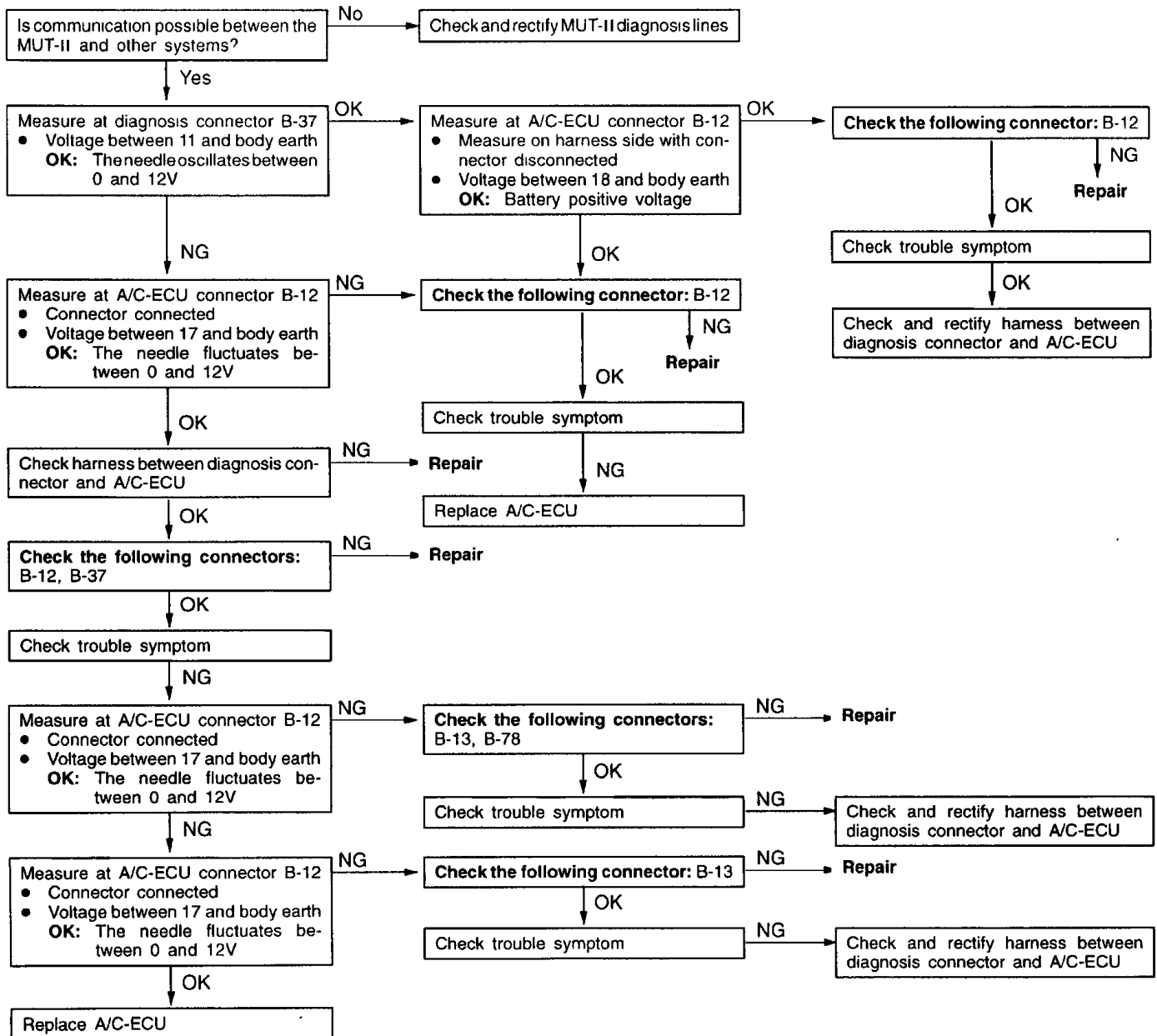
INSPECTION CHART BY TROUBLE SYMPTOM

Trouble symptom	Inspection Procedure No.	Reference page
Cannot communicate with MUT-II	1	55-13
Air conditioning does not operate	2	55-14
Graphical air conditioning display in control unit does not display	3	55-15
Cannot set the temperature	4	55-15
The air conditioning blower air temperature does not rise	5	55-15
The air conditioning blower air temperature does not fall	6	55-16
The blower does not operate	7	55-17
The blower does not operate on HI	8	55-18
Cannot change blower air volume	9	55-19
Cannot switch mode selector	10	55-19
Cannot switch air inlet selector	11	55-20
Defroster function does not operate	12	55-20
Condenser fan does not operate	13	55-21
Rear defogger does not operate	14	55-22
A/C belt lock indicator flashes	15	55-22
Check A/C-ECU power supply circuit	16	55-23
Check A/C compressor control circuit	17	55-24

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

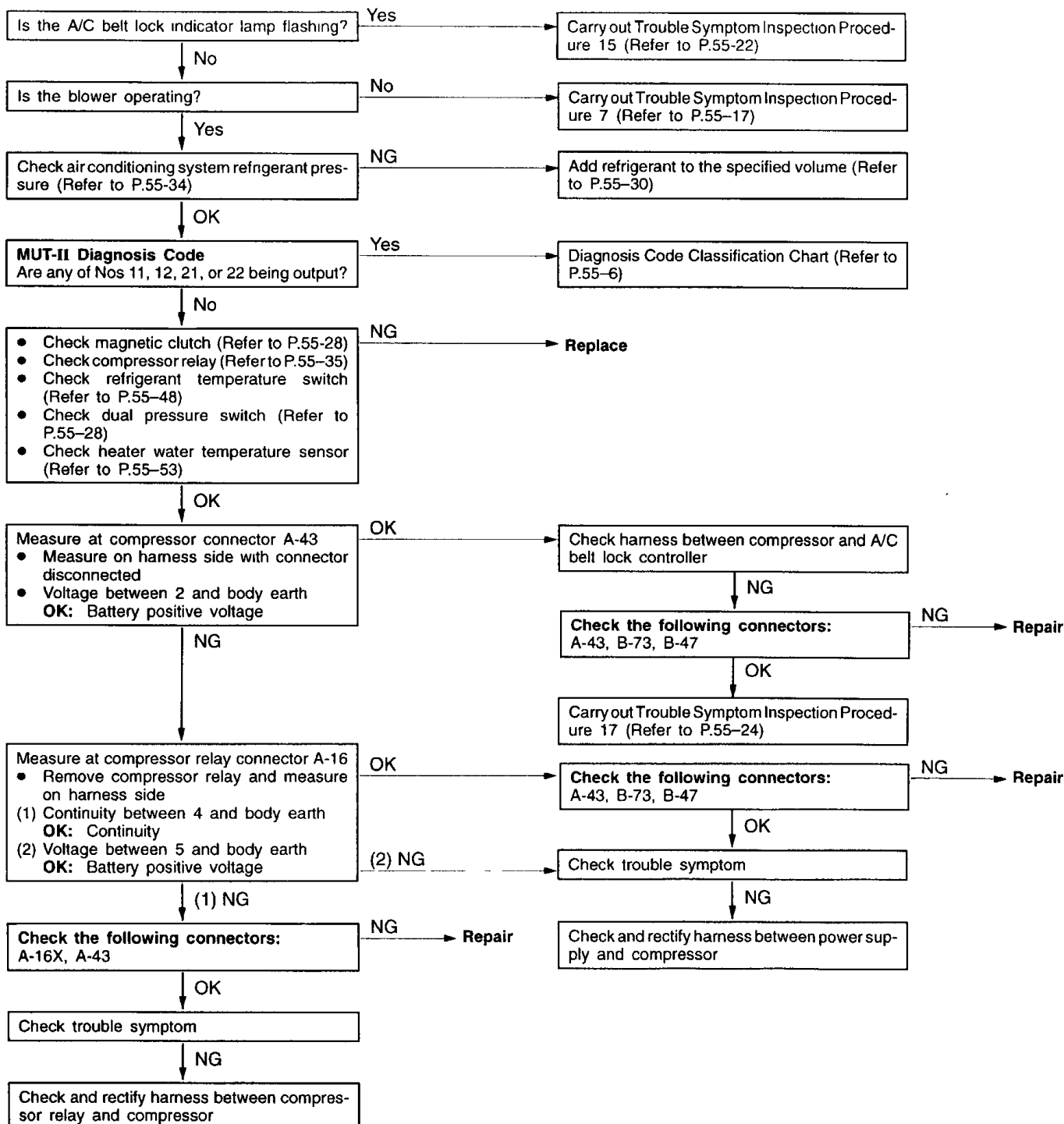
INSPECTION PROCEDURE 1

Cannot communicate with MUT-II	Probable cause
In the event that communication is impossible with all systems, it is highly likely that there is a diagnosis line fault. If communication is impossible with the air conditioning system only, possible causes include a diagnosis line fault or an A/C-ECU power supply system (ground) fault.	• Harness or connector fault • A/C-ECU fault



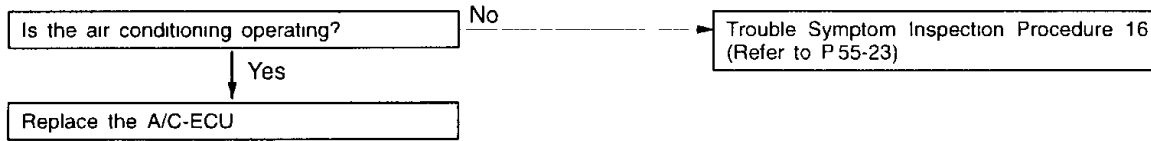
INSPECTION PROCEDURE 2

Air conditioning does not operate	Probable cause
If the air conditioning does not operate even when the temperature setting is turned to 17°C with the A/C switch ON, possible causes include a blower operation fault or a magnetic clutch power supply system fault	• Blower system fault • Insufficient refrigerant volume • Magnetic clutch fault • Air thermo sensor fault • Compressor relay fault • Refrigerant temperature switch fault • Dual pressure switch fault • Heater water temperature sensor fault • Harness or connector fault • A/C-ECU fault • A/C belt lock fault



INSPECTION PROCEDURE 3

Graphical air conditioning display in control unit does not display	Probable cause
It is possible there is a fault in the A/C-ECU power supply system (including the ground).	• Harness or connector fault • A/C-ECU fault



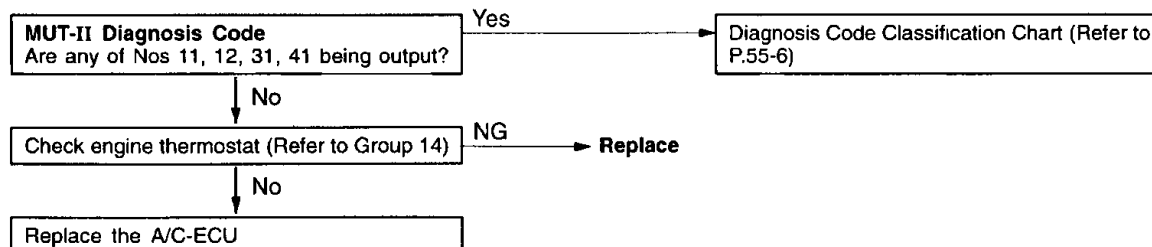
INSPECTION PROCEDURE 4

Cannot set the temperature	Probable cause
It is possible that there is a fault in the input or output systems for the temperature setting signal.	• Harness or connector fault • A/C-ECU fault

Trouble Symptom Inspection Procedure 16
(Refer to P.55-23)

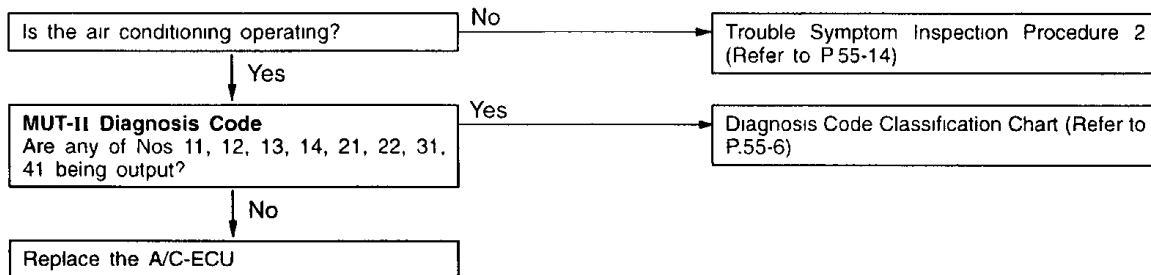
INSPECTION PROCEDURE 5

The air conditioning blower air temperature does not rise	Probable cause
If the blower air temperature does not rise even though the set temperature has been raised, possible causes include a fault in one of the sensors, or an operating fault in the air mix damper. In such a case, the breakdown causes can be verified for each system using the Scan tool to check the diagnostic trouble codes.	• Air mix damper potentiometer fault • Air mix damper motor fault • Air mix damper fault • Harness or connector fault • Thermostat fault • A/C-ECU fault



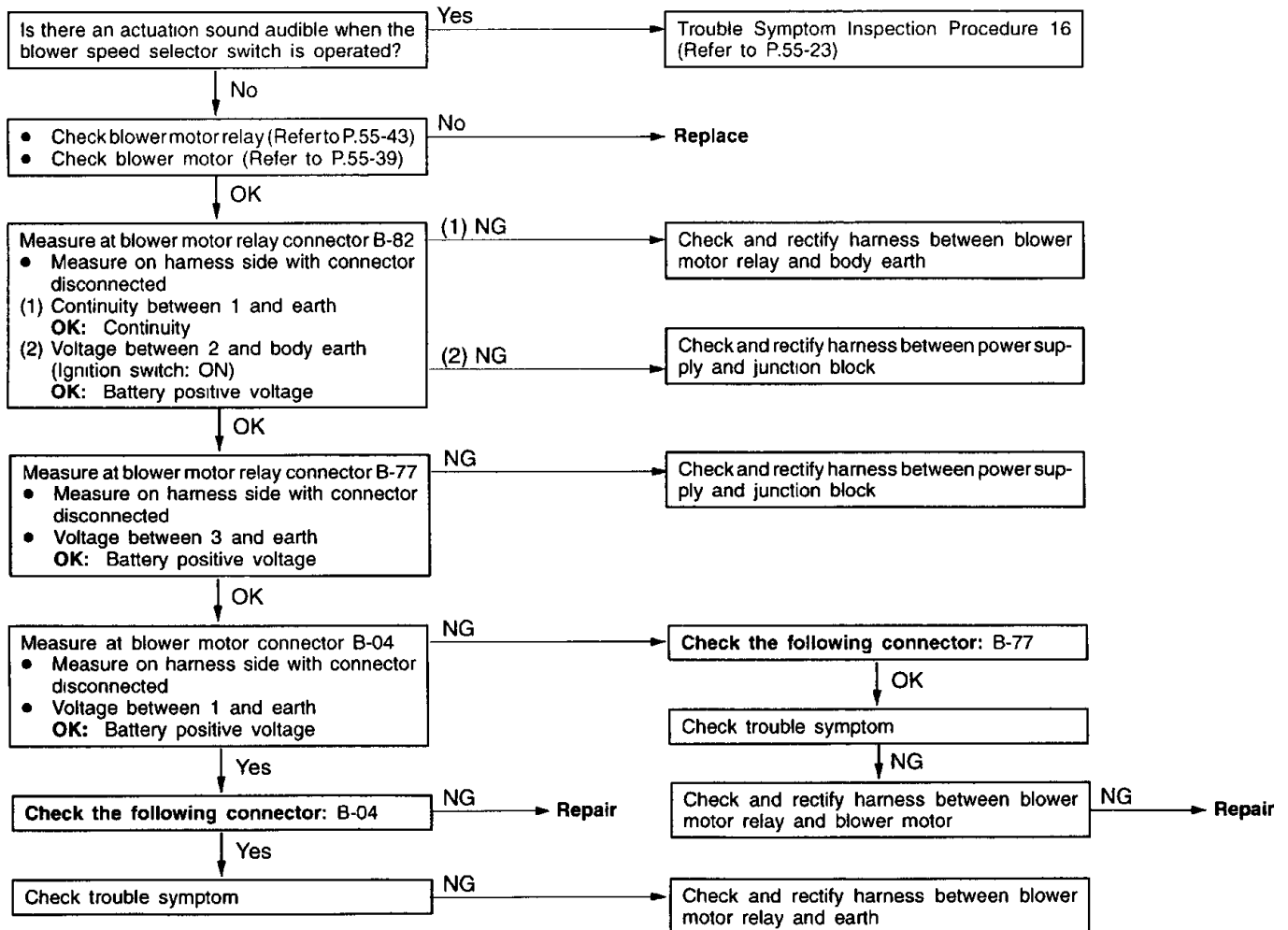
INSPECTION PROCEDURE 6

The air conditioning blower air temperature does not fall	Probable cause
If the room temperature does not fall even though the set temperature has been lowered, possible causes include mis-detections in sensors causing an air conditioning operation fault or an air mix damper operation fault. In such a case, the breakdown causes can be verified for each system using the MUT-II to check the diagnosis codes.	• Outside air temperature sensor fault • Air mix damper potentiometer fault • Air mix damper motor fault • Air thermo sensor fault • Harness or connector fault • Air mix damper fault • A/C-ECU fault



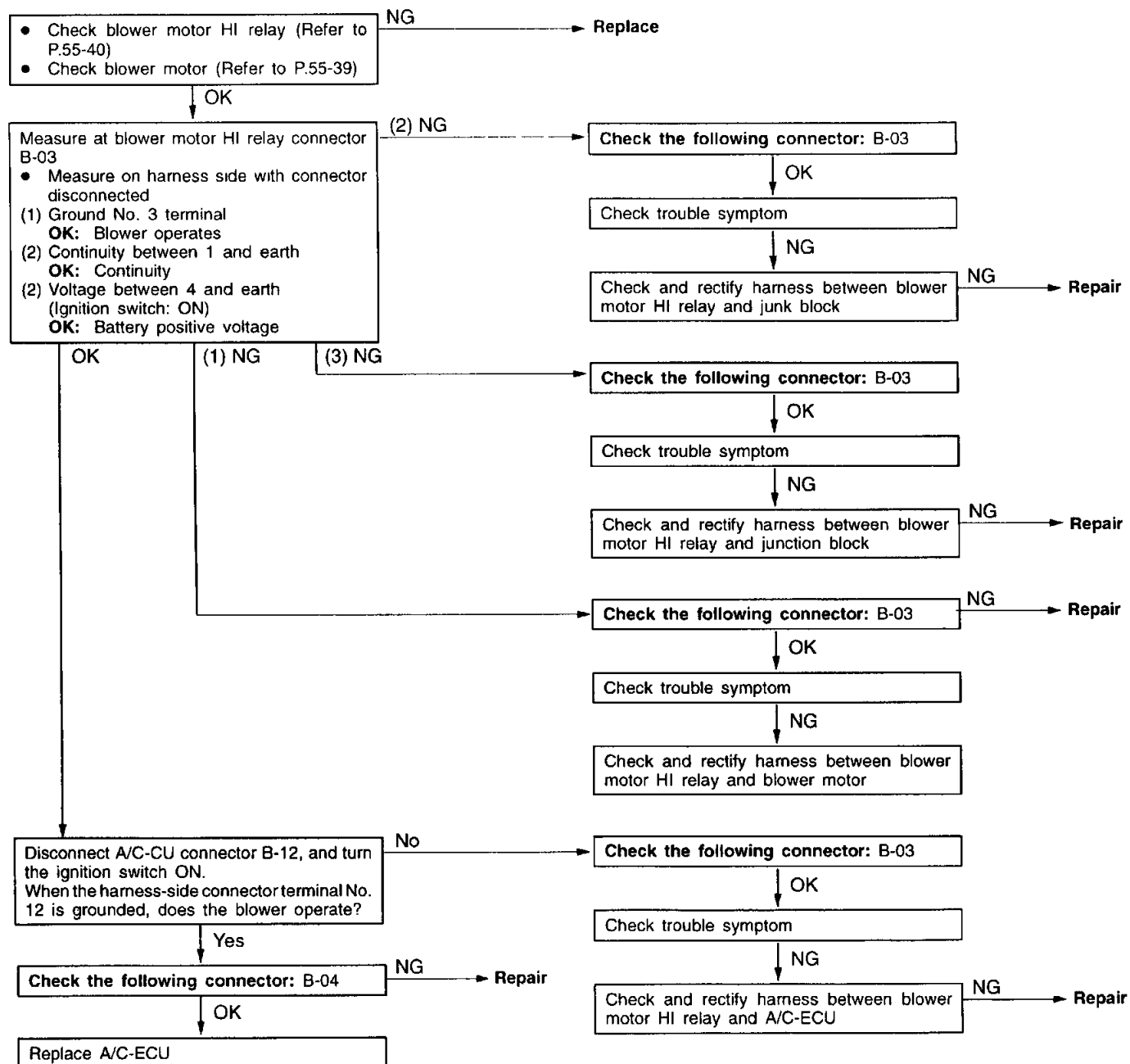
INSPECTION PROCEDURE 7

The blower does not operate	Probable cause
If no air is blown although the blower switch is ON, it is possible that there is a fault in the blower motor relay circuit system.	- Blower motor relay fault - Blower motor fault - Harness or connector fault - A/C-ECU fault

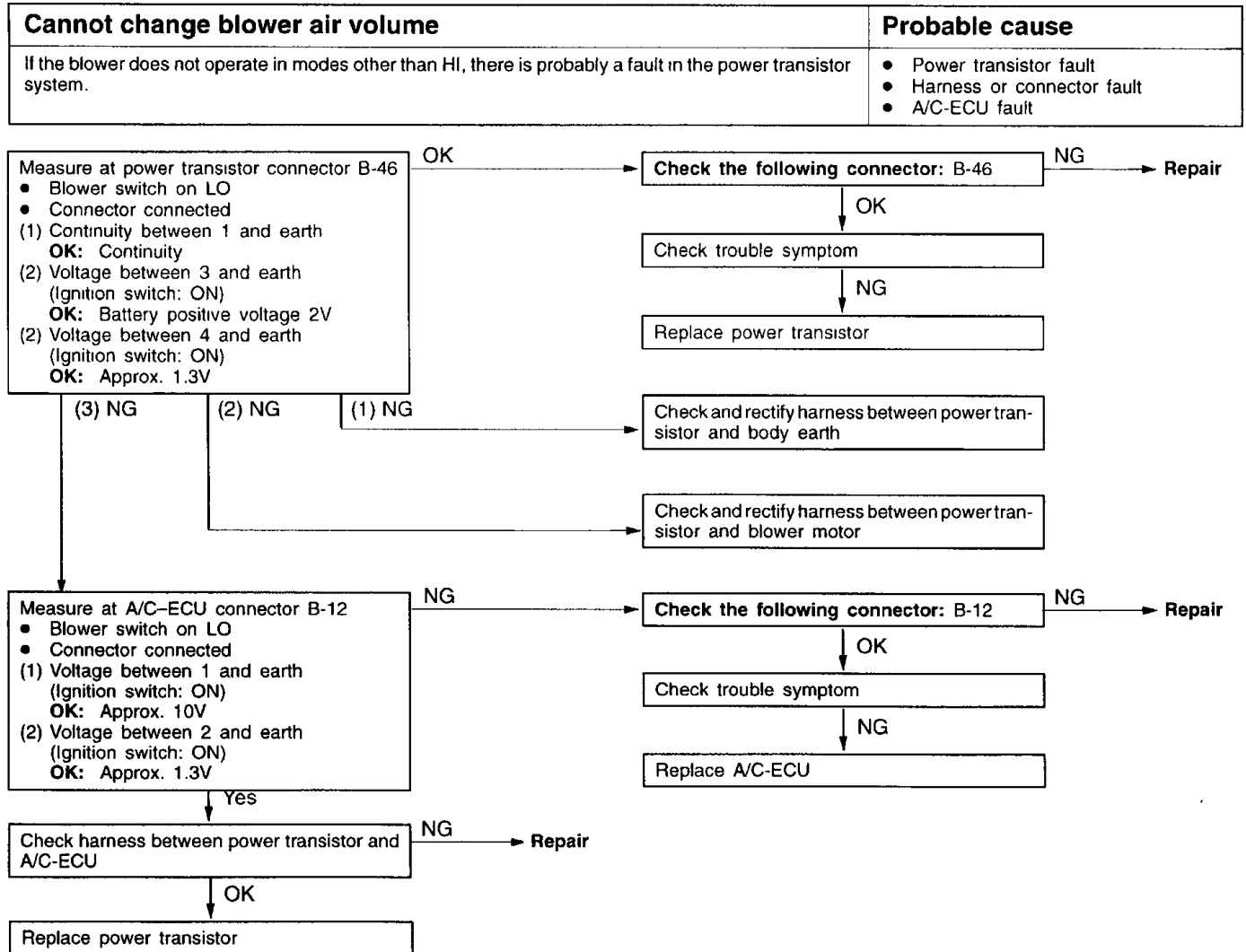


INSPECTION PROCEDURE 8

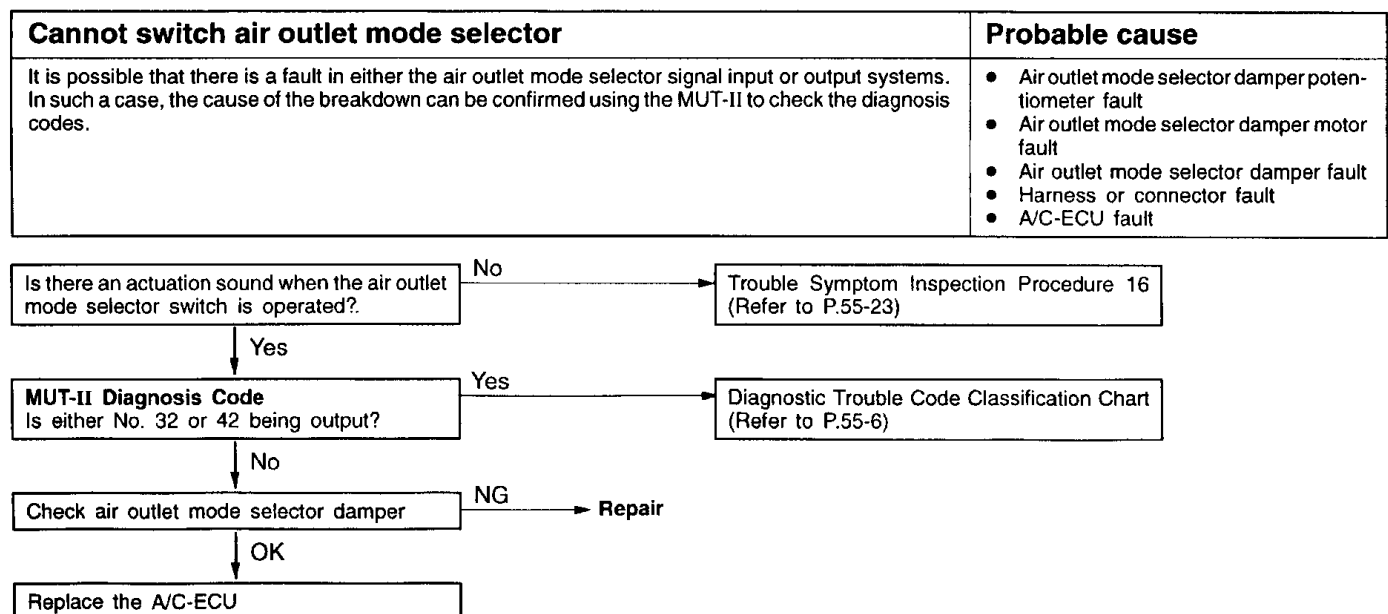
The blower does not operate on HI	Probable cause
If the blower does not operate on HI when the temperature setting is on 17 or 32, a possible cause is a fault in the blower motor HI relay circuit system.	- Blower motor HI relay fault - Blower motor fault - Harness or connector fault - A/C-ECU fault



INSPECTION PROCEDURE 9

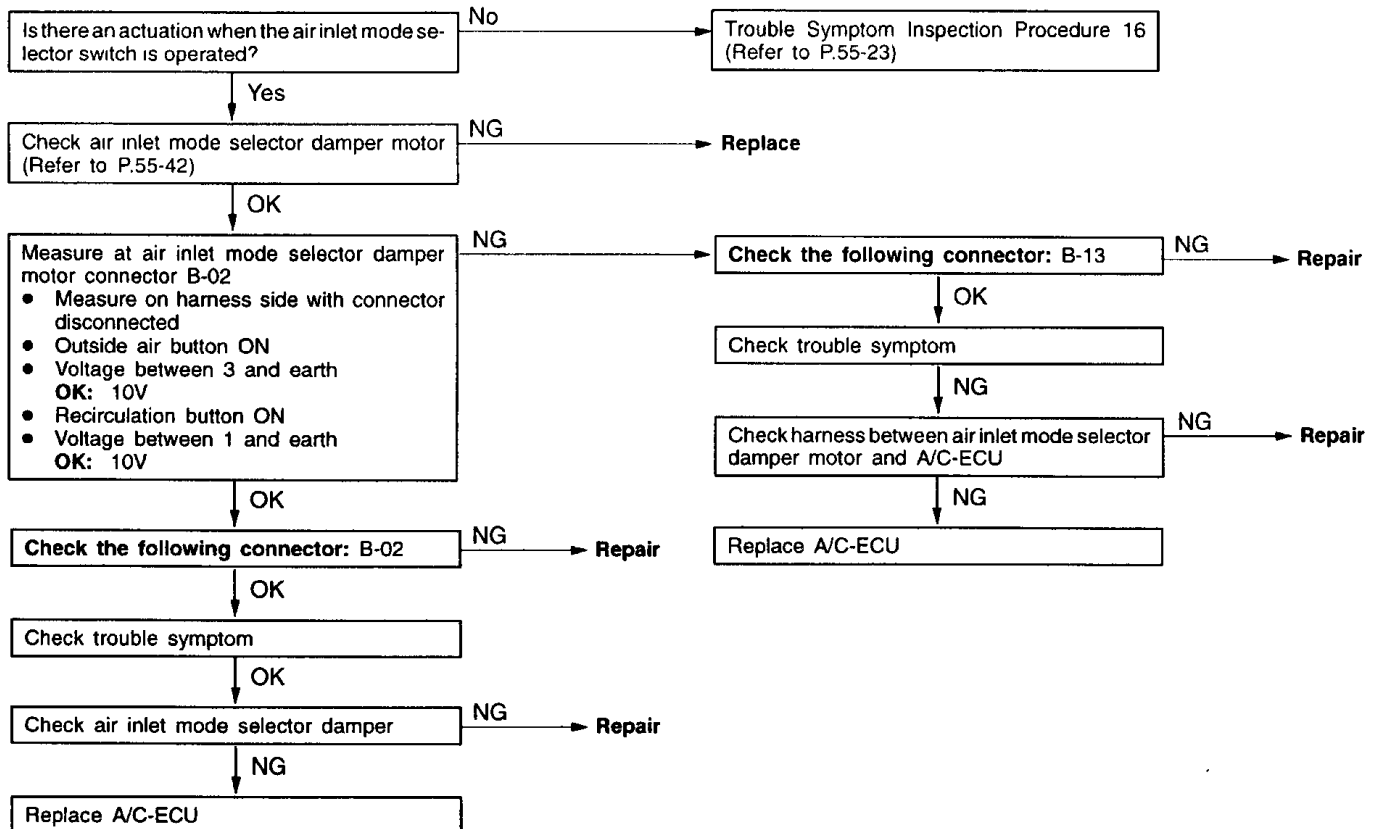


INSPECTION PROCEDURE 10



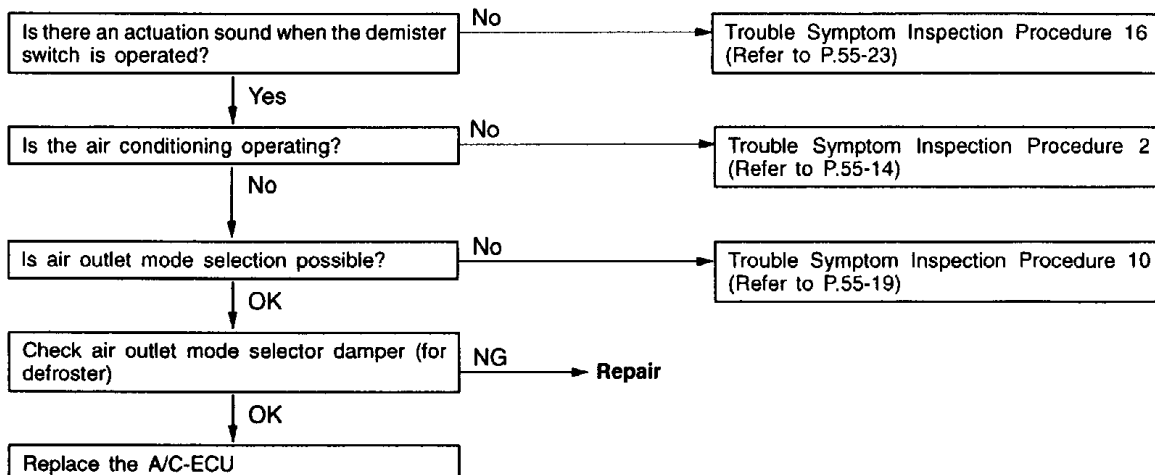
INSPECTION PROCEDURE 11

Cannot switch air inlet mode selector	Probable cause
In the event that the air inlet mode does not switch over even when the air inlet mode selector is switched, there is probably a fault with the air inlet mode selector damper motor.	• Air inlet mode selector damper motor fault • Air inlet mode selector damper fault • Harness or connector fault • A/C-ECU fault

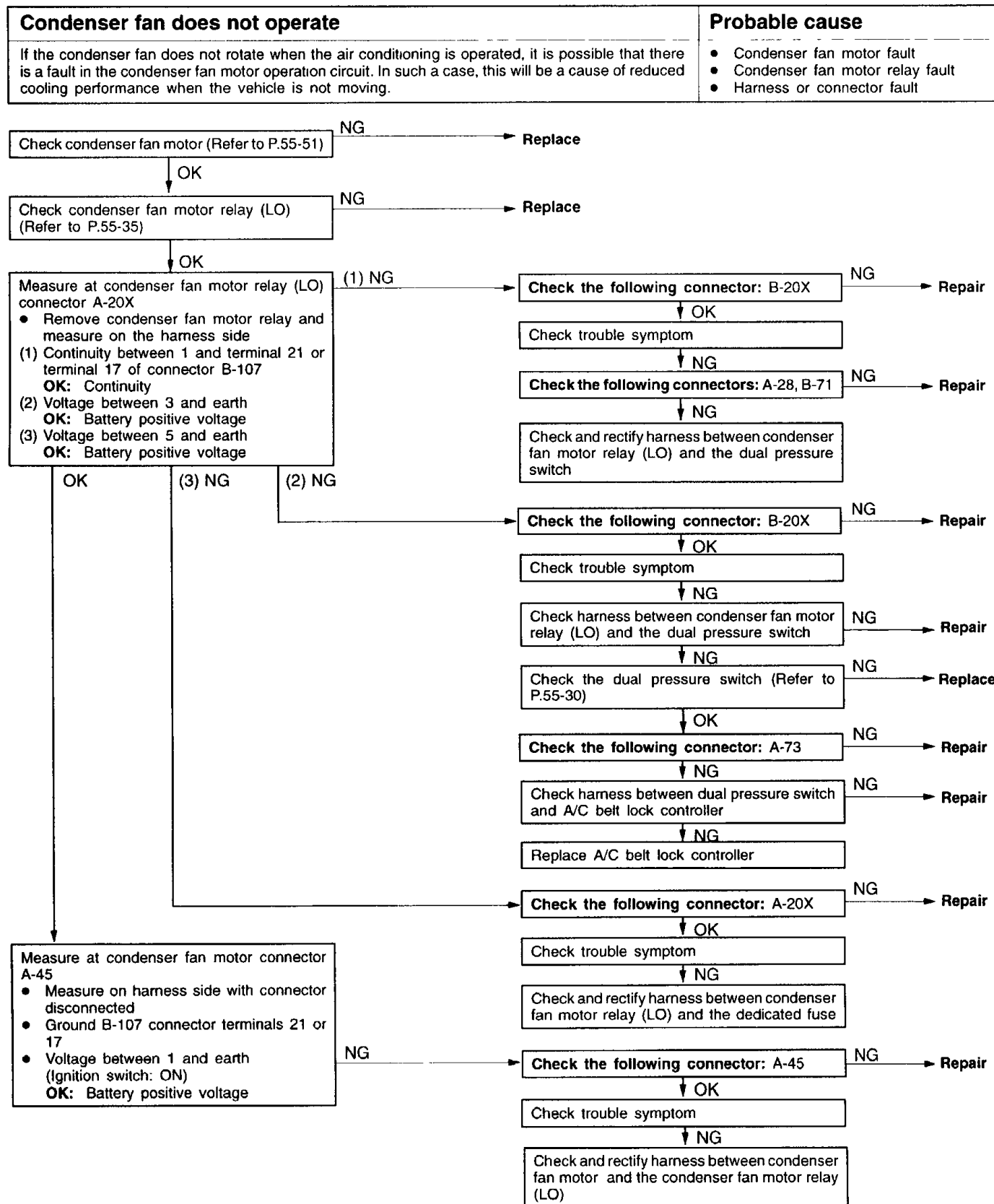


INSPECTION PROCEDURE 12

Demister function does not operate	Probable cause
If the demister function does not operate even though the demister switch is ON, possible causes include an air conditioning operation fault or an air outlet mode selector circuit fault.	• Air conditioning operation system fault • Air outlet mode selector system fault • Harness or connector fault • A/C-ECU fault

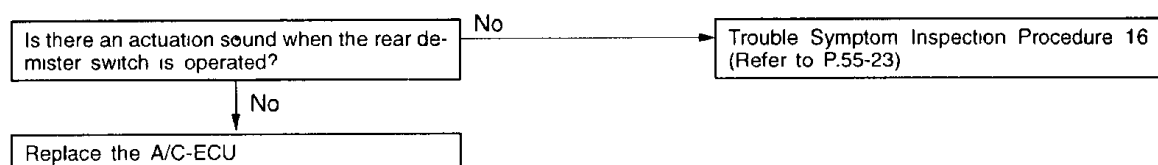


INSPECTION PROCEDURE 13



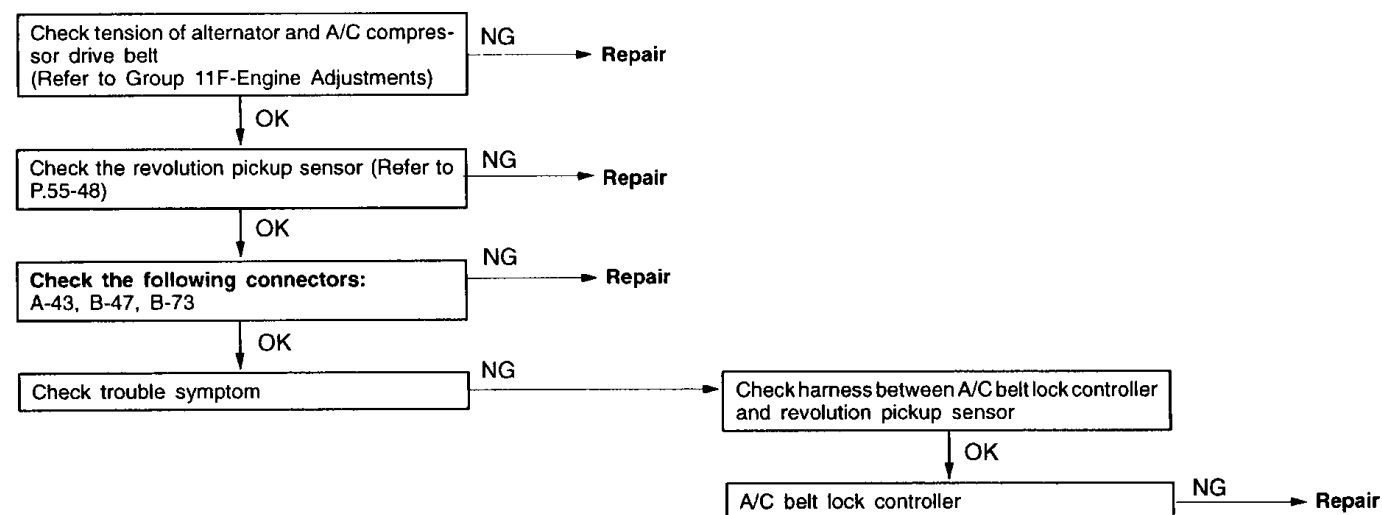
INSPECTION PROCEDURE 14

Rear defogger does not operate	Probable cause
If the rear defogger does not operate even when the switch is ON (12 min. timer operates), it is possible that there is a fault in the A/C-ECU power supply system (including ground).	• Harness or connector fault • A/C-ECU fault



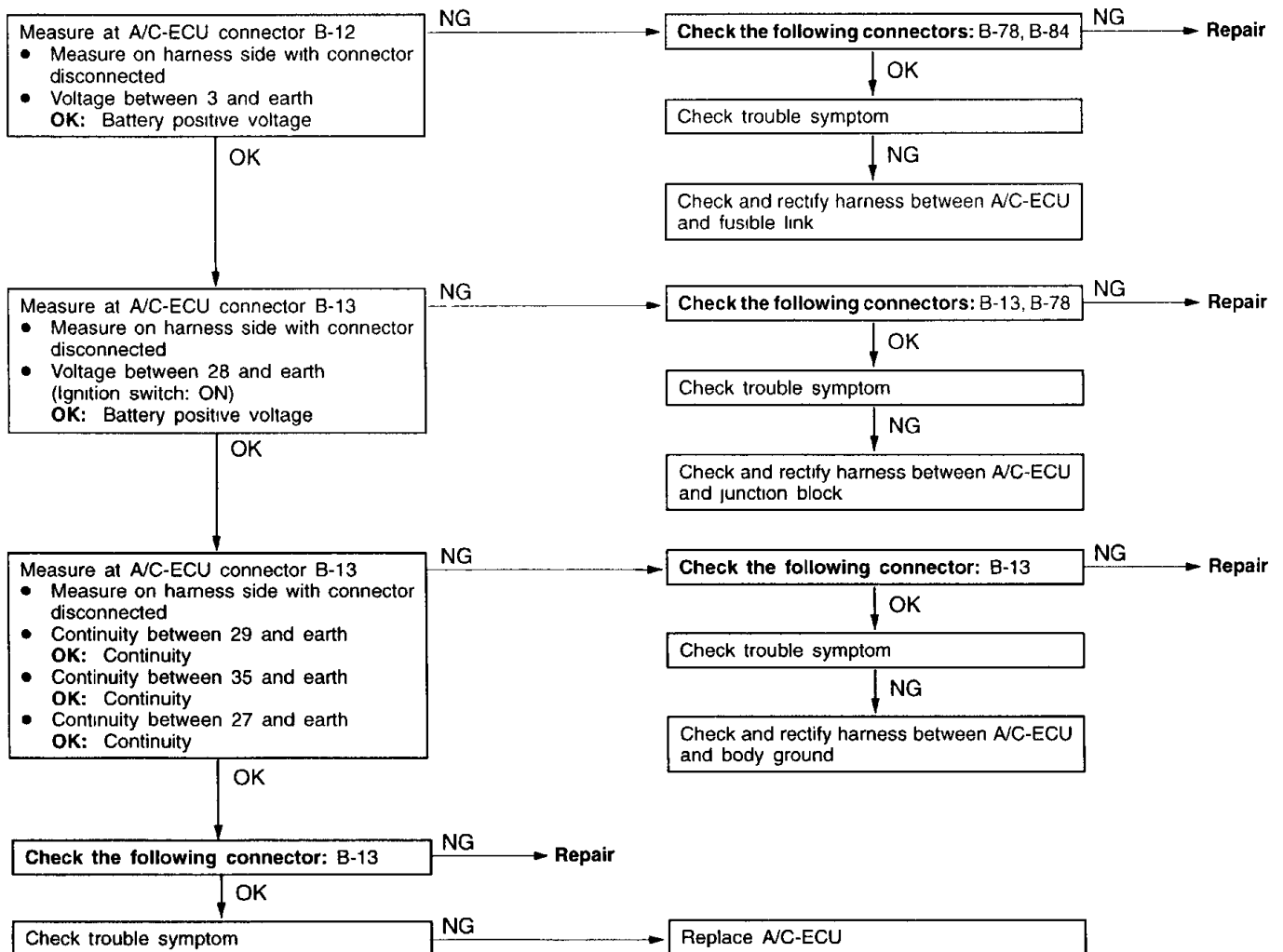
INSPECTION PROCEDURE 15

A/C belt lock indicator flashes	Probable cause
If the difference between the engine speed and compressor speed exceeds 92%, the A/C belt lock indicator flashes. At the same time, the air conditioning system stops to protect the alternator and A/C compressor drive belt.	• Alternator and A/C compressor drive belt tension fault • Revolution pickup sensor fault • Harness or connector fault • A/C-ECU fault



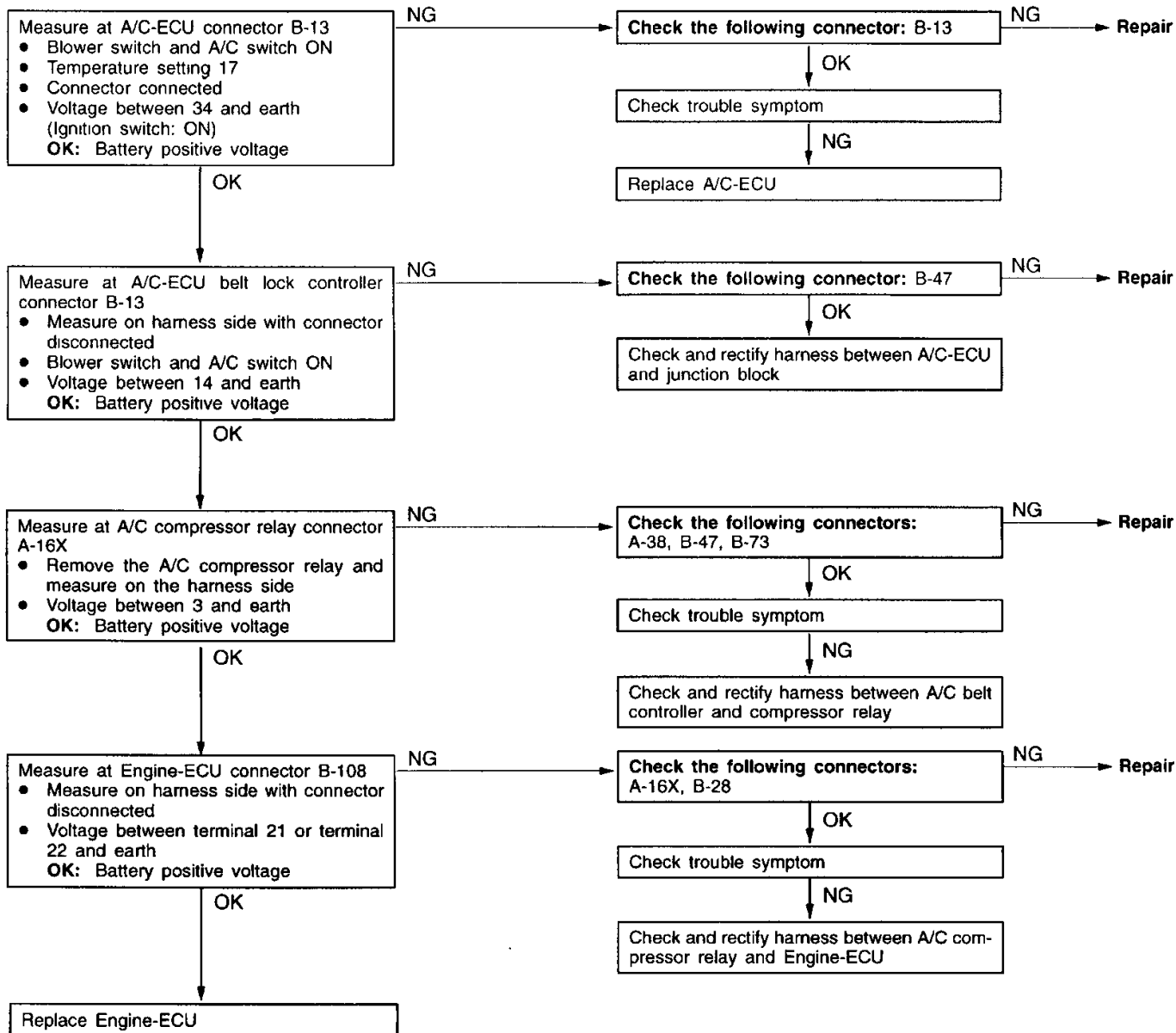
INSPECTION PROCEDURE 16

Check A/C-ECU power supply circuit



INSPECTION PROCEDURE 17

Check A/C compressor control circuit



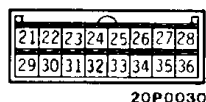
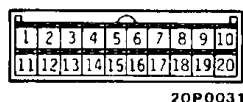
SERVICE DATA REFERENCE TABLE

Item No.	Inspection item	Inspection condition		Normal condition
11	Passenger compartment temperature sensor	Ignition switch ON		Ambient temperature at sensor and MUT-II indicated value agree
13	Outside air temperature sensor	Ignition switch ON		Outside temperature and MUT-II indicated value agree
15	Heater water temperature sensor	Ignition switch ON		Temperature at heater core wall surface and MUT-II indicated value agree
21	Air thermo sensor	Ignition switch ON		Evaporator outlet temperature and MUT-II indicated value agree
25	Photo sensor	Ignition switch ON		Voltage displayed on MUT-II is proportional to sunlight intensity
31	Air mix damper potentiometer	Ignition switch ON	Damper position	Degree of opening (%)
			MAX HOT	Approx. 100
			MAX COOL	Approx. 0
32	Air outlet mode selector damper potentiometer	Ignition switch ON	Damper position	Degree of opening (%)
			FACE	Approx. 0
			FOOT	Approx. 50
			FOOT/DEF	Approx. 75
			DEF	Approx. 100

ACTUATOR TEST REFERENCE TABLE

Item No.	Actuator test item		Item No.	Actuator test item	
01	Blower fan motor	OFF command	08	Air outlet mode	Drive FACE
02		Drive Low	09		Drive FOOT
03		Drive Medium	10		Drive DEF
04		Drive High	11	Magnetic clutch	OFF command
05	Air mix damper	Drive 0%	12		ON command
06		Drive 50%	13	Air inlet mode selection	Drive FRESH
07		Drive 100%	14		Drive RECIRC

CHECK AT THE A/C-ECU TERMINALS

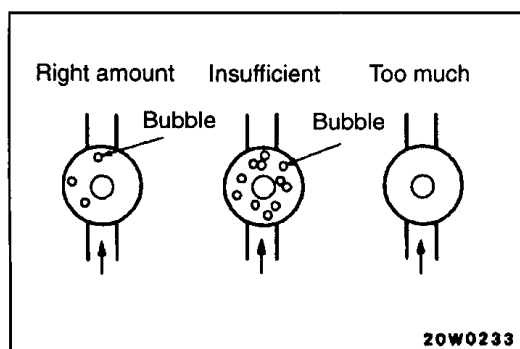


Figures in brackets
() in the Normal
condition column
are reference
values.

Terminal No.	Checking items	Checking conditions	Normal condition
1	Front power transistor collector output	Blower switch OFF	Battery voltage
		Blower switch LO	Approx. 10V
		Blower switch HI	Small voltage (0V)
		Blower switch OFF	0V
2	Front power transistor base output	Blower switch LO	Approx. 1.3V
		Blower switch HI	Approx. 2.5V
3	Backup power supply	At all times	Battery voltage
4	Heater water temperature sensor input	Sensor temperature 25°C (4kΩ)	2.3–2.9V
5	Air mix damper potentiometer input	Damper moved to MAX. HOT position	4.7–5.0V
6	Air outlet mode selector damper potentiometer input	Damper moved to Defroster position	4.8–5.2V
7	Outside air temperature sensor input	Sensor temperature 25°C (4kΩ)	2.3–2.9V
8	Air Thermo sensor input	Sensor temperature 25°C (4kΩ)	2.3–2.9V
9	Photo sensor (-)	Illumination 0 lux Illumination 100 000 lux or above	0V –0.1–0.2
10	Sensor power supply	Full-time	4.8–5.2V
12	Front blower motor HI relay (excitation circuit)	Blower switch HI Blower switch at position other than HI	1.5V or below Battery voltage
13	Belt lock indicator	Compressor ON	0.7–1.4V
		Compressor OFF	5V
		Compressor LOCK	Oscillates 0–5V
16	Rear defogger	Rear defogger switch ON	1.5V or greater
		Rear defogger switch OFF	Battery voltage
17	Diagnostic output	Ignition switch: ON	Needle oscillates between 0 and 12V
18	Diagnostic control output	Ignition switch: ON	Battery voltage–2V
19	Photo sensor (+)	At all times	0V
20	Sensor ground	At all times	0V
21	Air outlet mode selector damper motor (FACE)	Damper moved to FACE position	10V
		Damper moved to DEFROSTER position	Small voltage (0.5V)
22	Air mix damper motor (MAX. COOL)	Damper moved to MAX. COOL position	10V
		Damper moved to MAX. HOT position	Small voltage (0.5V)
23	Air inlet mode selector damper motor (RECIRC)	Selector switch on RECIRC	Small voltage (0.5V)
		Selector switch on Outside Air Intake	10V

Figures in brackets () in the Normal condition column are reference values.

Terminal No.	Checking items	Checking conditions	Normal condition
24	Air outlet mode selector damper motor	Damper moved to FACE position (DEFROSTER)	Small voltage (0.5V)
		Damper moved to DEFROSTER position	10V
25	Air mix damper motor (MAX. HOT)	Damper moved to MAX. COOL position	Small voltage (0.5V)
		Damper moved to MAX. HOT	10V
26	Air inlet mode selector damper motor (OUTSIDE AIR)	Selector switch on RECIRC Selector switch on Outside Air Intake	10V Small voltage (0.5V)
27	Ground	Full-time	Continuity exists
28	IG2 power supply	Ignition switch: ON	Battery voltage
29	Ground	Full-time	Continuity exists
30	Illumination power supply	Lighting switch ON	Battery voltage
34	Air conditioning output	Air conditioning OFF	0V
		Air conditioning ON	Battery voltage
35	Ground	Full-time	Continuity exists
36	Condenser fan HI relay	HI relay OFF	Battery voltage
		HI relay ON	0V

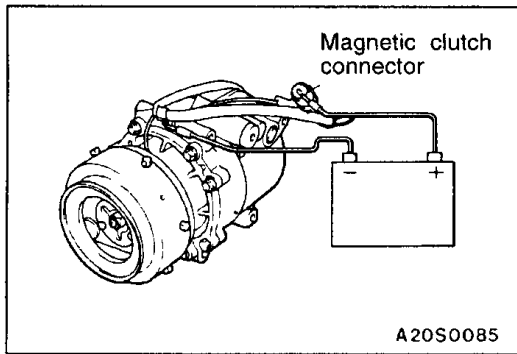


ON-VEHICLE SERVICE

SIGHT GLASS REFRIGERANT LEVEL TEST

The sight glass is a refrigerant level indicator. To check the refrigerant level, clean the sight glass and start the vehicle engine and hold engine speed at 1500 r/min. Push the A/C button to operate the compressor, place the blower switch to high and move the temperature control lever to max cool. After operating for a few minutes in this manner, check the sight glass.

1. If bubbles are visible occasionally in the sight glass and disappear when engine speed is raised, the magnetic clutch is engaged, the compressor discharge line is warm and the compressor inlet line is cool; the system may be overcharged.
2. If the sight glass is clear, the magnetic clutch is engaged and there is no significant temperature difference between compressor inlet and discharge lines; the system has most of its refrigerant charge.
3. If the sight glass shows foam or bubbles, the system could be low on refrigerant or the receiver drier is restricted. The system has to be tested, leak checked then recharged with refrigerant.

**MAGNETIC CLUTCH TEST**

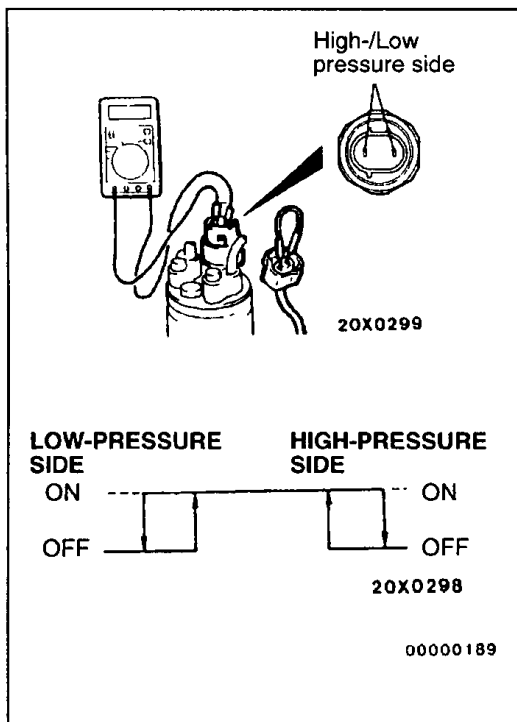
1. Disconnect the connector (1P) to the magnetic clutch.
2. Connect battery (-) to compressor body.
3. Connect battery (+) voltage directly to the connector for the magnetic clutch.
4. If the magnetic clutch is normal, there will be a "click". If the pulley and armature do not make contact ('click'), there is a malfunction.

RECEIVER DRIER TEST

Operate the unit and check the piping temperature by touching the receiver drier outlet and inlet.

If there is a difference in the temperatures, the receiver drier is restricted.

Replace the receiver drier.

**DUAL PRESSURE SWITCH CHECK**

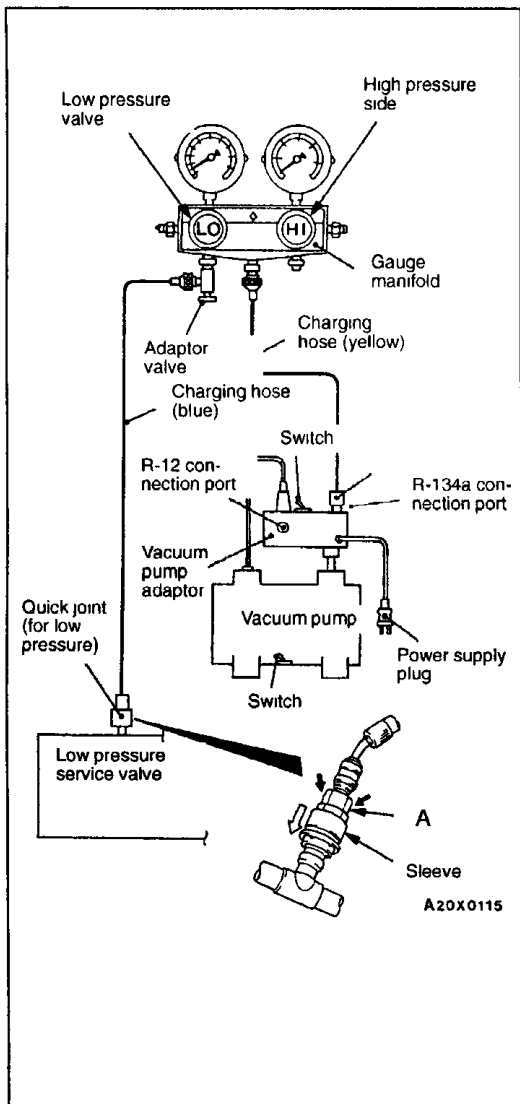
1. Remove the dual pressure switch connector and connect the high/low pressure side terminals located on the harness side as shown in the illustration.
2. Install a gauge manifold to the high pressure side service valve of the refrigerant line. (Refer to Performance Test.)
3. When the high/low pressure sides of the dual pressure switch are at operation pressure (ON) and there is continuity between the respective terminals, then the condition is normal. If there is no continuity, replace the switch.

Unit: kPa

Items	Switch position	
	OFF to ON	ON to OFF
Low-pressure side	220	200
High-pressure side	2,550	3,140

COMPRESSOR DRIVE BELT ADJUSTMENT

Refer to Group 11A – On-vehicle Service.



CHARGING

1. With the handles turned back all the way (valve closed), install the adaptor valve to the low-pressure side of the gauge manifold.
2. Connect the charging hose (blue) to the adaptor valve.
3. Connect the quick joint (for low pressure) to the charging hose (blue).
4. Connect the quick joint (for low pressure) to the low pressure service valve.

NOTE

The low-pressure service valve should be connected to the low pressure hose.

Caution

1. Use tools that are designed for R-134a.
2. To install the quick joint, press section A firmly against the service valve until a click is heard. When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.
5. Close the high and low pressure valves of the gauge manifold.
6. Install the vacuum pump adaptor to the vacuum pump.
7. Connect the vacuum pump plug to the vacuum pump adaptor.
8. Connect the charging hose (yellow) to the R-134a connection port of the vacuum pump adaptor.
9. Tighten the adaptor valve handle (valve open).
10. Open the low pressure valve of the gauge manifold.
11. 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).

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

Caution

Do not operate the A/C compressor during evacuation.

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

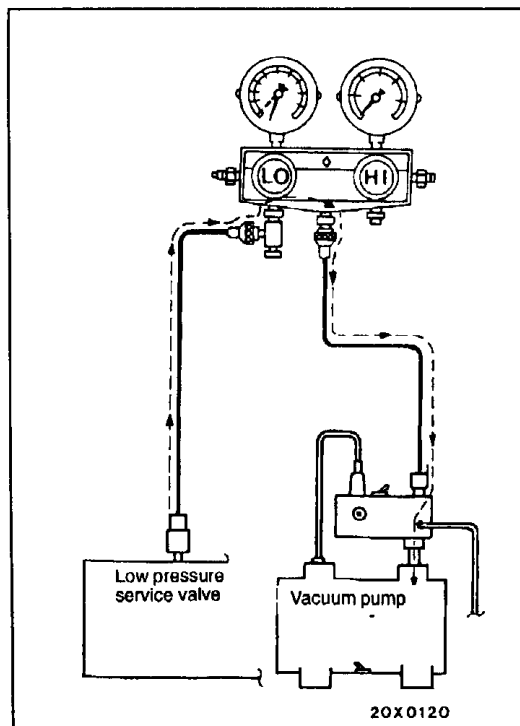
Caution

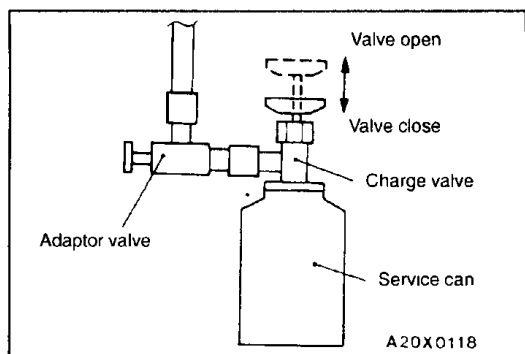
Do not operate the compressor in the vacuum condition; damage may occur.

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

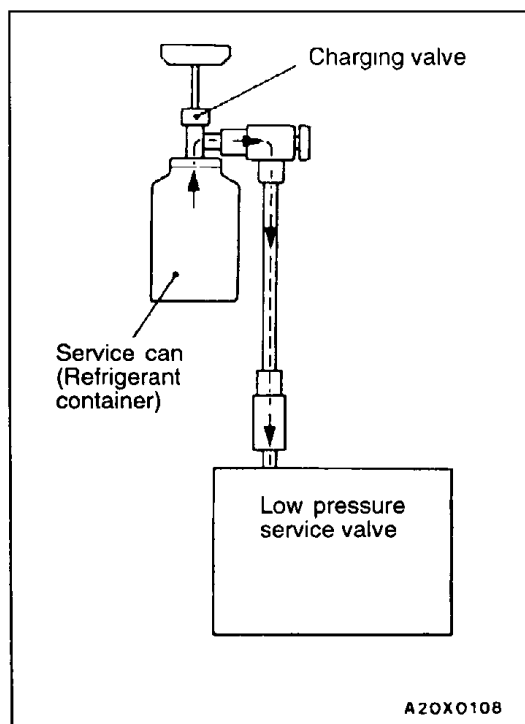
Caution

If the negative pressure (vacuum) is lost, check for loose connections. Then, repeat the evacuation procedure from step (12).





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



19. Turn the handle of the charging valve back (valve open) and tighten the handle of the adaptor valve (valve open) to charge the system with 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.

20. If the refrigerant is not drawn in, turn the handle of the adaptor valve back all the way (valve closed).
21. Check for gas leaks using a leak detector. If a gas leak is detected, re-tighten the connections, and then repeat the charging procedure from evacuation in step (12).

Caution

A leak detector designed for R-134a should be used.

22. Start the engine.
23. Operate the A/C and set to the lowest temperature (MAX. COOL).
24. Fix the engine speed at 1,500 r/min.
25. Tighten the handle of the adaptor valve (valve open) to charge the required volume of refrigerant.

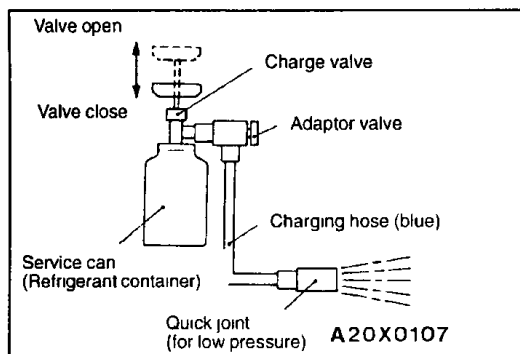
Caution

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.

26. After charging with refrigerant, turn the handle of the adaptor valve back all the way (valve closed).
27. Tighten the charging valve handle (valve closed). Remove the quick joint (for low pressure) from the low-pressure service valve.

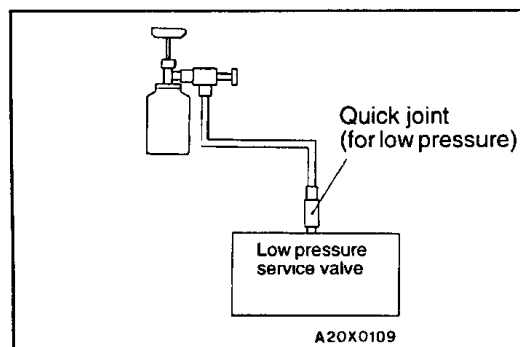
NOTE

If the service can is not emptied completely, keep the handles of the charging valve and adaptor valve closed for the next charging.



CORRECTING LOW REFRIGERANT LEVEL IN CASE THE SERVICE CAN IS USED

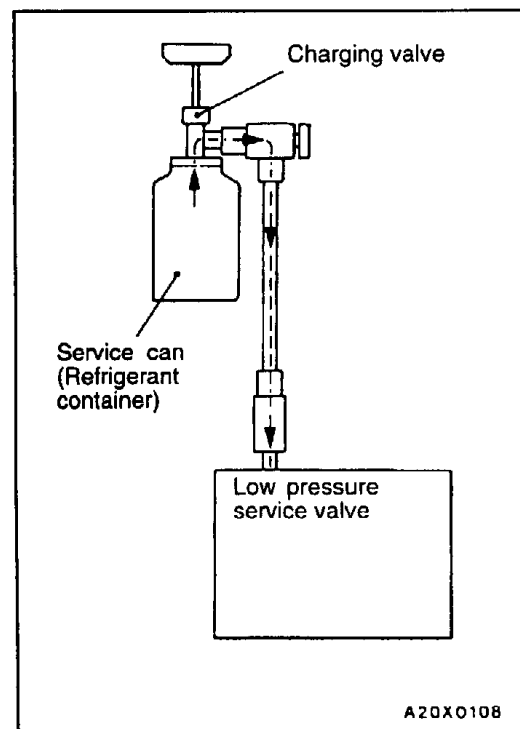
1. Install the charge valve with the handle turned all the way out (valve open) of the service can.
2. Install the adaptor valve with the handle turned all the way back (valve close) to the charging valve.
3. Connect the charging hose (blue) to the adaptor valve.
4. Connect the charging hose (blue) to the quick joint (for low pressure).
5. Tighten the handle of the charge valve (valve close), and pierce the service can.
6. Turn the handle of the adaptor valve to bleed the air.



7. Install the quick joint (for low pressure) to the low pressure service valve.

NOTE

The low-pressure service valve should be connected to the low-pressure hose.



8. Start the engine.
9. Operate the air conditioner and set at the lowest temperature (MAX. COOL).
10. Fix the engine speed at 1,500 r/min.
11. Tighten the handle of the adaptor valve (valve open), and replenish refrigerant checking the quantity through the sight glass.

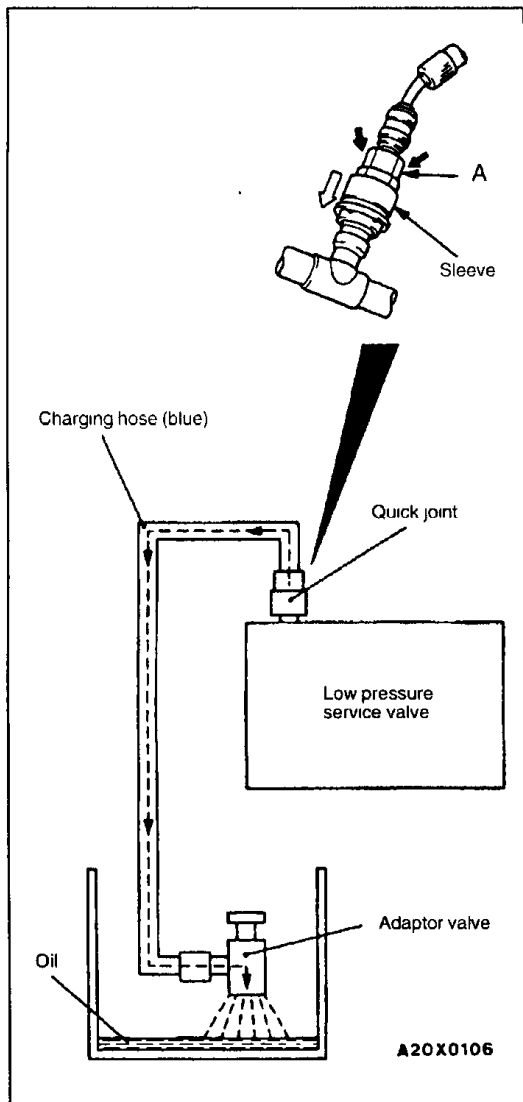
Caution

If the service can is inverted, liquid refrigerant may be draw into the compressor damaging it by liquid compression. Keep the service can upright to ensure that refrigerant is charged in gas state.

12. After replenishing is completed, turn the handle of the adaptor valve all the way back (valve close), and remove the quick joint.

NOTE

If any refrigerant is remaining in the service can, close the adaptor valve and save the refrigerant for another vehicle. Do not release into the atmosphere.

**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 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 with its handle turned back all the way (valve closed).
4. Connect the quick joint to the charging hose (blue).
5. Install the quick joint to the low pressure service valve.

NOTE

The low pressure service valve should be connected to the suction hose.

Caution

To connect the quick joint, press section “A” firmly against the service valve until a click is heard. When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.

6. Place the adaptor valve inside the container and discharge the refrigerant by opening the handle gradually so that the oil does not gush out.

NOTE

Any oil remaining in the container should be returned to the A/C system.

REFILLING OF OIL IN THE A/C SYSTEM

Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.

When a compressor is installed at the factory, it contains 170 ml of refrigerant oil. While the A/C system is in operation, the oil is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in various parts of the system.

When the following system components are changed, it is necessary to add oil to the system to replace the oil being removed with the component.

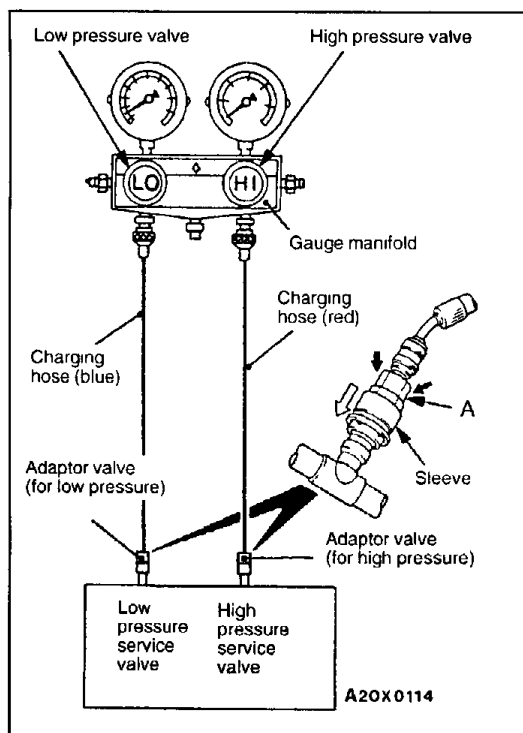
Compressor oil: SUN PAG 56**Quantity:**

Evaporator: 60 ml

Condenser: 15 ml

Suction hose: 10 ml

Receiver: 10 ml



PERFORMANCE TEST

1. The vehicles to be tested should be in a place that is not in direct sunlight.
2. Close the high and low pressure valve of the gauge manifold.
3. Connect the charging hose (blue) to the low pressure valve and connect the charging hose (red) to the high pressure valve of the gauge manifold.
4. Install the quick joint (for low pressure) to the charging hose (blue), and connect the quick joint (for high pressure) to the charging hose (red).
5. Connect the quick joint (for low pressure) to the low-pressure service valve and connect the quick joint (for high pressure) to the high-pressure service valve.

NOTE

The high-pressure service valve is on high-pressure pipe B, and the low-pressure service valve is on the low-pressure hose.

Caution

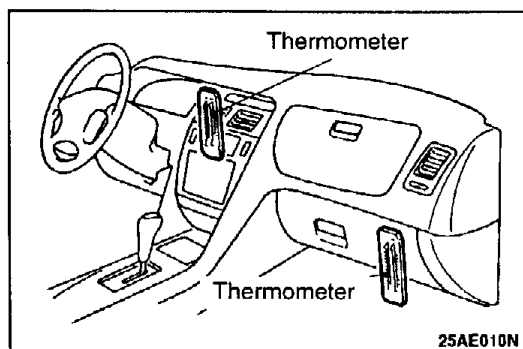
To connect the quick joint, press section A firmly against the service valve until a click is heard.

When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.

6. Start the engine.
7. Set the A/C controls as follows:
A/C switch: A/C – ON position
Mode selection: Face position
Temperature control: Max. cooling position
Air selection: Recirculation position
Blower switch: HI (Fast) position
8. Adjust engine speed to 1500 r/min with A/C clutch engaged.
9. Engine should be warmed up with doors and windows closed.
10. Insert a thermometer in the left centre A/C outlet and operate the engine for 20 minutes.
11. Note the discharge air temperature.

NOTE

If the clutch cycles, take the reading before the clutch disengages.



Performance Temperature Chart

Garage ambient temperature °C	21	26.7	32.2	37.8
Discharge air temperature °C	0.0–3.0	0.0–3.0	0.0–4.0	0.0–4.0
Compressor high pressure kPa	650–700	740–790	980–1020	1650–1200
Compressor low pressure kPa	130–140	130–190	130–190	130–190

REFRIGERANT LEAK REPAIR

LOST CHARGE

If the system has lost all charge due to a leak:

1. Evacuate the system. (See procedure.)
2. Charge the system with approximately 450 g, of refrigerant.
3. Check for leaks.
4. Discharge the system.
5. Repair leaks.
6. Replace receiver drier.

Caution

Replacement filter-drier units must be sealed while in storage. The drier used in these units will absorb water/water vapour water quickly upon exposure to the atmosphere. When installing a drier, have all tools and supplies ready for quick reassembly to avoid keeping the system open any longer than necessary.

7. Evacuate and charge system.

LOW CHARGE

If the system has not lost all of its refrigerant charge; locate and repair all leaks. If it is necessary to increase the system pressure to find the leak (because of an especially low charge) add refrigerant. If it is possible to repair the leak without discharging the refrigerant system, use the procedure for correcting low refrigerant level.

COMPRESSOR NOISE CHECK

You must first know the conditions when the noise occurs. These conditions are: weather, vehicle speed, in gear or neutral, engine temperature or any other special conditions.

Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering or alternator). Improper accessory drive belt tension can cause a misleading noise when the compressor is engaged and little or no noise when the compressor is disengaged.

Drive belts are speed-sensitive. That is, at different engine speeds, and depending upon belt tension, belts can develop unusual noises that are often mistaken for mechanical problems within the compressor.

HANDLING TUBING AND FITTINGS

Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed. The system must be completely discharged before opening any fitting or connection in the refrigeration system. Open fittings with caution even after the system has been discharged. If any pressure is noticed as a fitting is loosened, allow trapped pressure to bleed off very slowly.

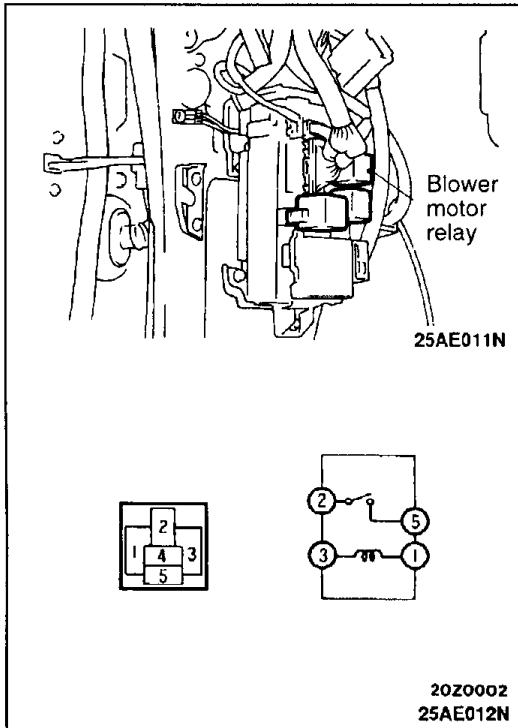
Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing. A good rule for the flexible hose lines is keep the radius of all bends at least 10 times the diameter of the hose.

Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so that they are at least 80 mm from the exhaust manifold. It is good practice to inspect all flexible hose lines at least once a year to make sure they are in good condition and properly routed.

O-rings used on connections are not reusable.

ADJUSTMENT

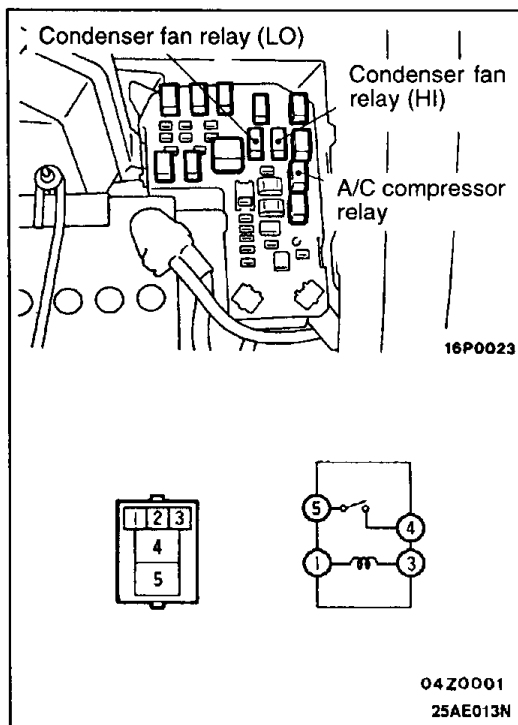
1. Select a quiet area for testing. Duplicate conditions as much as possible. Switch compressor on and off several times to clearly identify compressor noise. To duplicate high ambient conditions (high head pressure), restrict air flow through condenser. Install manifold gauge set to make sure discharge pressure doesn't exceed 2,070 kPa.
2. Tighten all compressor mounting bolts, clutch mounting bolt, and compressor drive belt. Check to assure clutch coil is tight (no rotation or wobble).
3. Check refrigerant hoses for rubbing or interference that can cause unusual noises.
4. Check refrigerant charge. (Refer to P.55-29).
5. Recheck compressor noise as in Step 1.
6. If noise still exists, loosen compressor mounting bolts and retorque. Repeat Step 1.
7. If noise continues, replace compressor and repeat Step 1.



POWER RELAY CHECK

BLOWER RELAY CONTINUITY CHECK

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



A/C COMPRESSOR CLUTCH RELAY, CONDENSER FAN RELAY (LO) AND (HI) CONTINUITY CHECK

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

IDLE-UP OPERATION CHECK

1. Before inspection and adjustment, set vehicle in the following condition:
 - Engine coolant temperature: 80–90°C
 - Lights, electric cooling fan and accessories: Set to OFF
 - Transmission: N or P
 - Steering wheel: Straightahead
2. Check whether or not the idling speed is the standard value.

Standard value: 700 ± 50 r/min

3. When the A/C is running after turning the A/C switch to ON, and the blower switch to the MED or HI position, check to be sure that the idle speed is at the standard value.

Standard value: 900 ± 50 r/min

NOTE

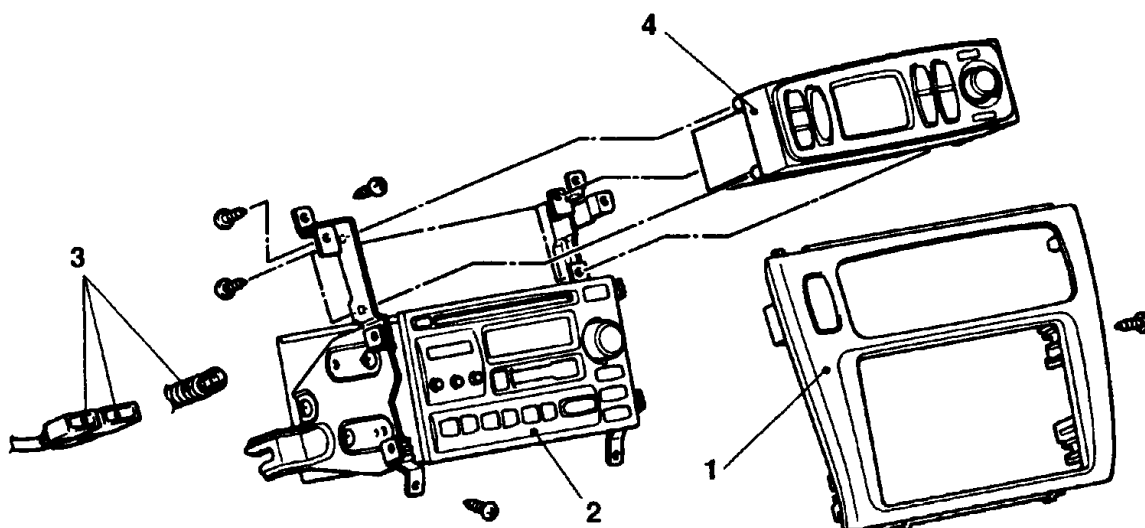
Idle speed is controlled by the ISC system and is not adjustable. If, idle speed is not within specifications, check the ISC system. (Refer to Group 13A – On-vehicle Service.)

AIR CONDITIONING CONTROL UNIT ASSEMBLY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations

- Floor Console Panel Removal and Installation (Refer to Group 52A – Floor Console)
- Centre Air Outlet and Ashtray Removal and Installation (Refer to Group 52A – Instrument Panel)



20P0038

Removal steps

1. Audio panel
2. Air control panel assembly and radio/tape player

3. Harness connector and breather hose
4. A/C-ECU

HEATER UNIT, HEATER CORE, BLOWER ASSEMBLY AND EVAPORATOR

REMOVAL AND INSTALLATION

Pre-removal Operation

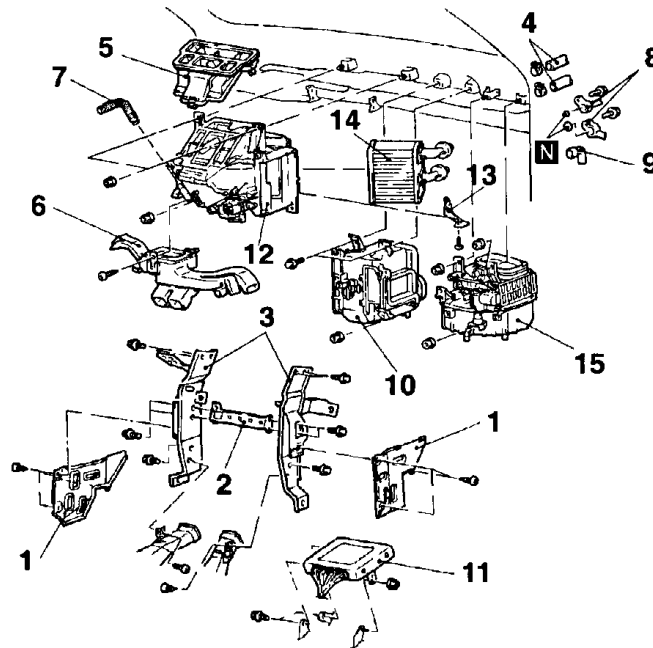
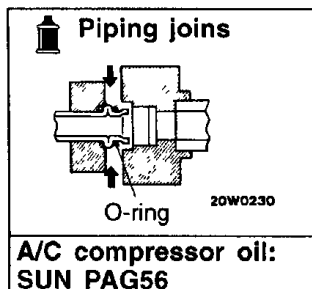
- Draining Coolant (Refer to Group 14 – On-vehicle Service.)
- Instrument Panel and Floor Console Box Removal (Refer to Group 52A – Instrument Panel.)
- Air Cleaner Cover and Intake Hose Removal (Refer to Group 15)
- Refrigerant Discharging (Refer to P.55–34)

Post-installation Operation

- Instrument Panel Installation (Refer to Group 52A – Instrument Panel.)
- Refilling Coolant (Refer to Group 14 – On-vehicle Service.)
- Refrigerant Charging (Refer to P.55–31)
- Air Cleaner Cover and Intake Hose Installation (Refer to Group 15–Air Cleaner Assembly)

CAUTION: SRS

- (1) Before removing the passenger seat air bag module, ensure that you refer to Group 52B–Servicing Cautions and the section on the Air bag Module.
- (2) When removing or installing the instrument panel or Engine-ECU, do not apply bump to the SRS-ECU.



25AE015N

25AE016N

Heater unit removal steps

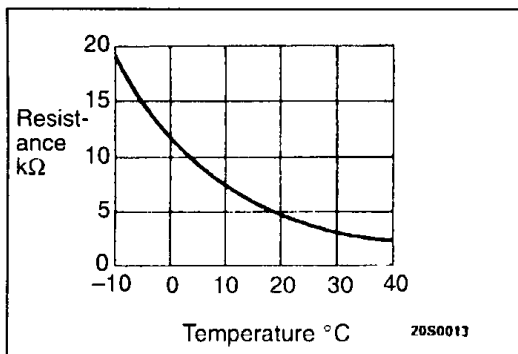
1. Floor carpet front reinforcement
2. ECU bracket
3. Centre stay assembly
4. Heater hose connection
5. Centre duct assembly
6. Foot distribution duct
7. Breather hose
8. Suction pipe, liquid pipe B and cooling unit connection
9. Drain hose
10. Evaporator
11. Engine-ECU
12. Heater unit
13. Heater core support
14. Heater core

Blower assembly removal steps

8. Suction hose, liquid pipe and cooling unit connection
- 9 Drain hose
10. Evaporator
15. Blower assembly

Cooling unit removal steps

1. Floor carpet front reinforcement
2. ECU bracket
3. Centre stay assembly
8. Suction pipe, liquid pipe B and cooling unit connection
9. Drain hose
10. Evaporator



INSPECTION

AIR THERMO SENSOR CHECK

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

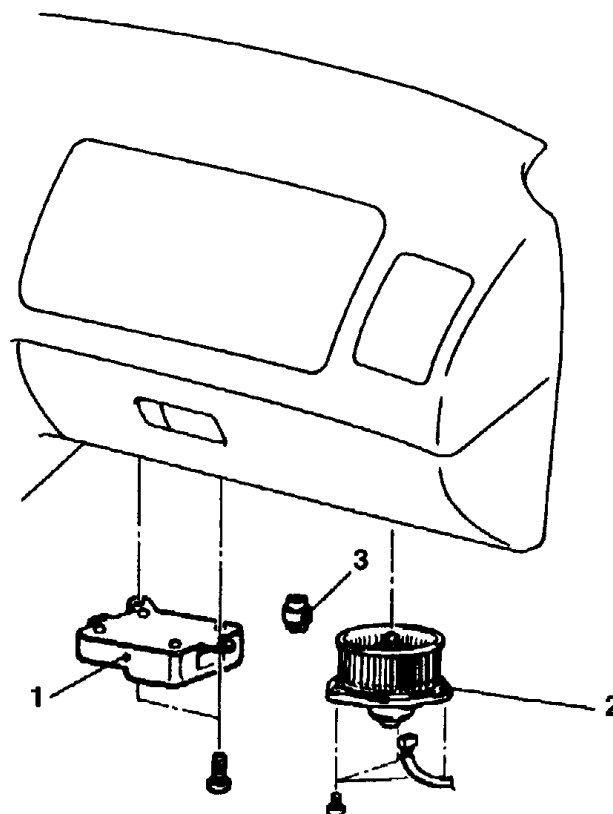
The temperature conditions when testing should not exceed the range of the characteristic curve in the graph.

BLOWER MOTOR ASSEMBLY AND BLOWER MOTOR HI RELAY

REMOVAL AND INSTALLATION

Pre-removal and Post-installation procedures

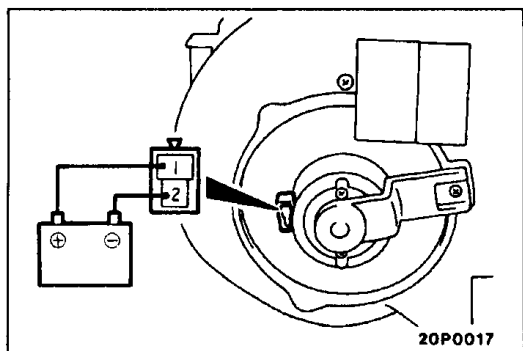
- Undercover Assembly, Glove Box Assembly, Glove Box Assembly, Glove Box Outer Case Removal and Installation (Refer to Group 52A-Instrument Panel)



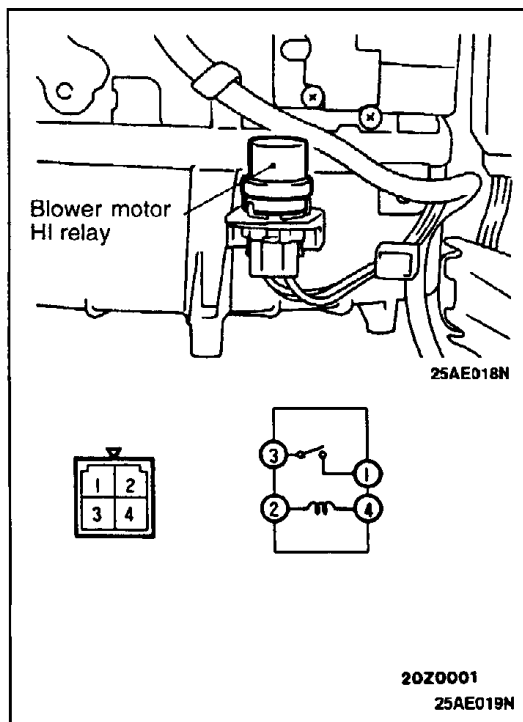
25AE017N

Removal steps

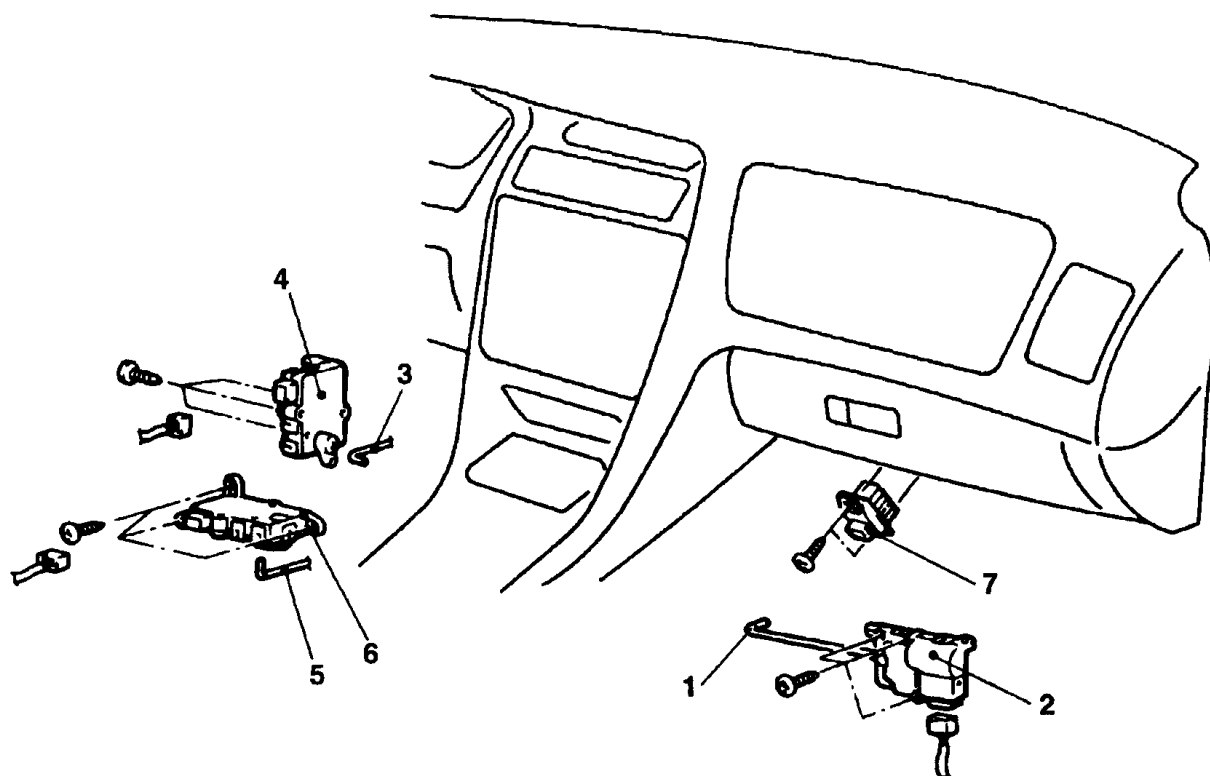
1. A/C belt lock controller
2. Blower motor assembly
3. Blower motor HI relay

**INSPECTION****BLOWER FAN AND MOTOR**

When battery voltage is applied between the terminals, check to be sure that the motor operates. Also, check to be sure that there is no abnormal noise.

**BLOWER MOTOR HI RELAY CONTINUITY CHECK**

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

DAMPER CONTROL MOTOR ASSEMBLY AND POWER TRANSISTOR**REMOVAL AND INSTALLATION**

25AE020N

Air inlet mode selector damper motor removal steps

- Undercover assembly, glove box assembly, glove box frame (Refer to Group 52A—Instrument Panel)
1. Linkage connection
 2. Air inlet mode selector damper motor

Air outlet mode selector damper motor removal steps

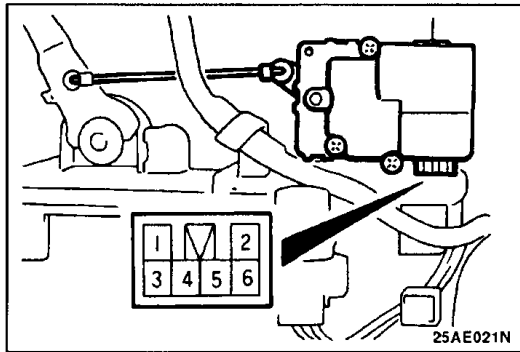
- Instrument panel lower cover assembly (Refer to Group 52A Instrument Panel)
3. Linkage connection
 4. Air outlet mode selector damper motor

Air mix damper motor removal steps

- Undercover assembly, glove box assembly, glove box outer case, console side cover assembly (Refer to Group 52A—Instrument Panel)
5. Linkage connection
 6. Air mix damper motor

Power transistor removal steps

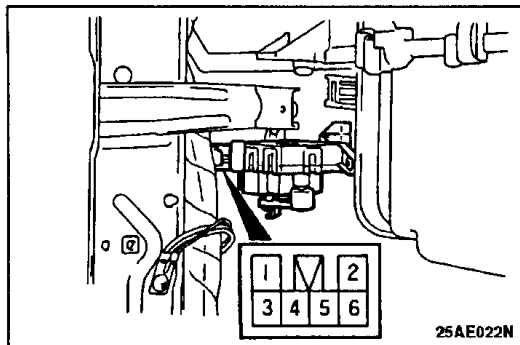
- Undercover assembly, glove box assembly, glove box frame (Refer to Group 52A—Instrument Panel)
7. Power transistor

**INSPECTION****AIR INLET MODE SELECTOR DAMPER MOTOR OPERATION CHECK**

Check that the lever moves when battery voltage is applied across terminals 1 and 3 of motor assembly side connector. Check also that the lever moves in the opposite direction when polarity is reversed.

Caution

1. Remove the voltage when the damper is at the inside air position or outside air position.
2. Remove the voltage if the motor does not turn when battery voltage is applied.

**AIR MIX DAMPER MOTOR OPERATION CHECK**

Check that the lever moves when battery voltage is applied across terminals 1 and 3 of motor assembly side connector. Check also that the lever moves in the opposite direction when polarity is reversed.

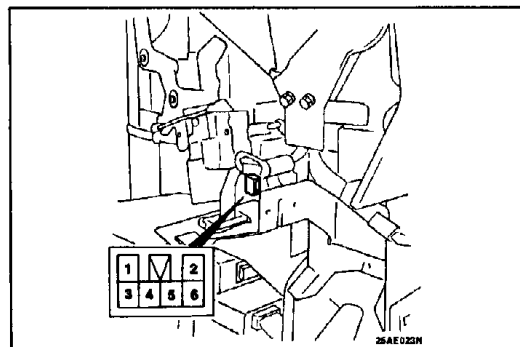
Caution

1. Remove the voltage when the damper is at the inside air position or outside air position.
2. Remove the voltage if the motor does not turn when battery voltage is applied.

AIR MIX DAMPER MOTOR POTENTIOMETER CHECK

During motor operation check, confirm that the resistance value between motor connector terminals 2 and 5 and 5 and 6 changes gradually in the range of the standard value.

Standard value: 0.18–4.82 kΩ

**AIR OUTLET MODE SELECTOR DAMPER MOTOR OPERATION CHECK**

Check that the lever moves when battery voltage is applied across terminals 1 and 3 of motor assembly side connector. Check also that the lever moves in the opposite direction when polarity is reversed.

Caution

1. Remove the voltage when the damper is at the inside air position or outside air position.

2. Remove the voltage if the motor does not turn when battery voltage is applied.

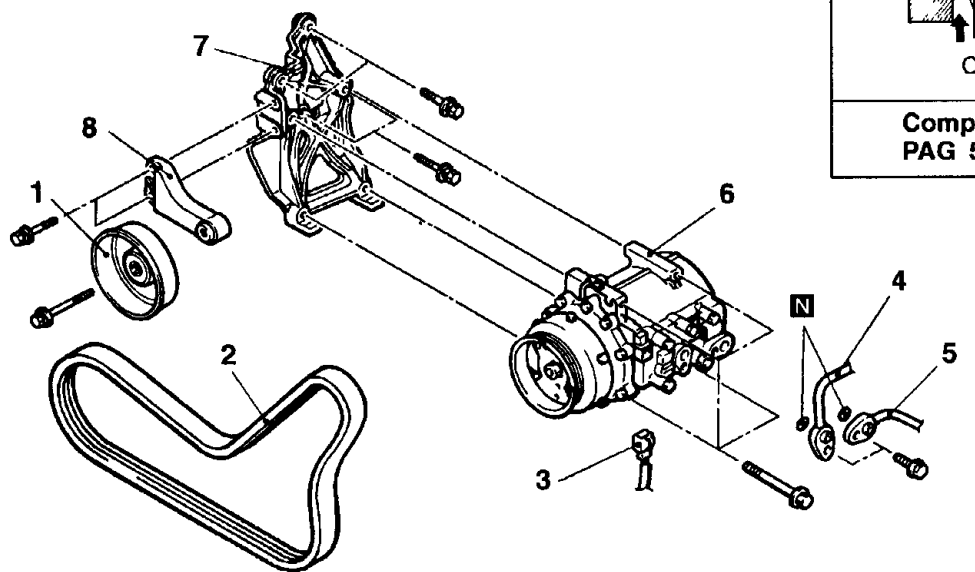
**AIR OUTLET MODE SELECTOR DAMPER MOTOR
POTENTIOMETER CHECK**

During motor operation check, confirm that the resistance value between motor connector terminals 2 and 5 and 5 and 6 changes gradually in the range of the standard value.

Standard value: 0.18–4.82 k Ω

COMPRESSOR AND TENSION PULLEY**REMOVAL AND INSTALLATION****Pre-removal and Post-installation Operation**

- Refrigerant Discharging and Charging (Refer to P.55-31.)
- Compressor Drive Belt Adjustment (Refer to Group 11–On-vehicle Service.)



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25AE024N

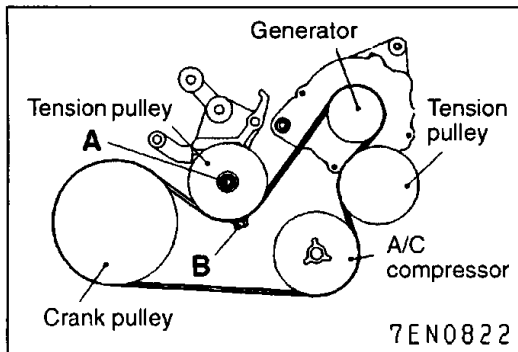
Removal steps

1. Tension pulley
2. Alternator and A/C compressor drive belt
3. Harness connector

4. Suction hose connection
5. Discharge hose connection
6. Compressor
7. Compressor bracket
8. Tension pulley bracket

◀A▶

◀B▶ ▶A◀



REMOVAL SERVICE POINTS

◀A▶ ALTERNATOR AND A/C COMPRESSOR DRIVE BELT REMOVAL

1. Loosen nut "A" for holding the tension pulley.
2. Loosen bolt "B" for adjustment.
3. Remove the alternator and compressor drive belt.

◀B▶ 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 then new compressor.

New compressor oil amount
 $170-190 \text{ ml} - X \text{ ml} = Y \text{ ml}$

NOTE

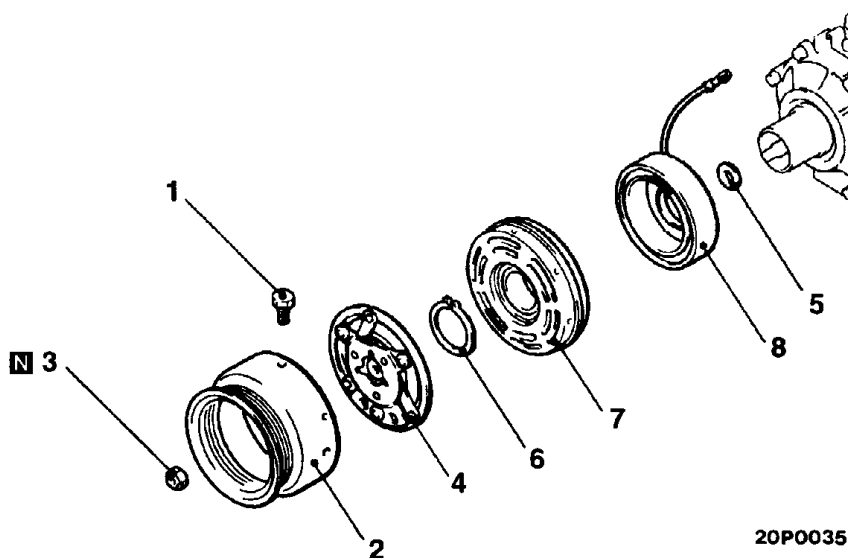
- (1) Y ml indicates the amount of oil in the refrigerant line, the condenser, the evaporator etc.
- (2) When replacing the entire A/C system parts with new ones, discharge the compressor oil including A/C system parts' oil from the new compressor.

Quantity:

Evaporator: 60 ml
 Condenser: 15 ml
 Suction hose: 10 ml
 Receiver: 10 ml

INSPECTION

- Checking for heat damage of the tension pulley.
- Check for excessive play or deflection of the tension pulley.
- Check for unusual wear of the tension pulley.
- Check for hardening of the compressor drive belt.
- Check for unusual wear or abrasion of the compressor drive belt.

DISASSEMBLY AND REASSEMBLY**Disassembly steps**

1. Bolt
2. Pulley
3. Self-locking nut
4. Armature plate

◀A▶

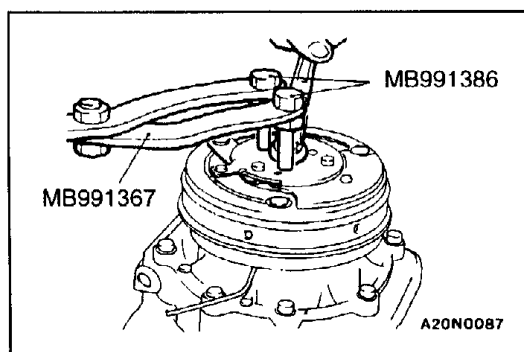
▶D▶

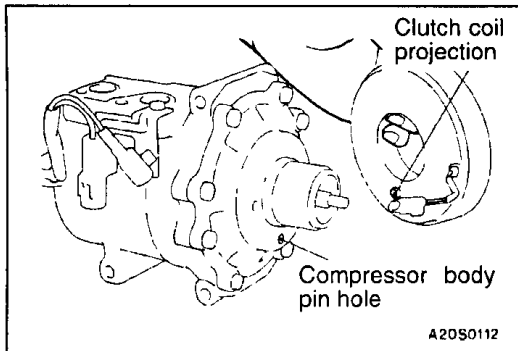
▶C▶

▶B▶

▶A▶

5. Shim
6. Snap ring
7. Rotor
8. Clutch coil

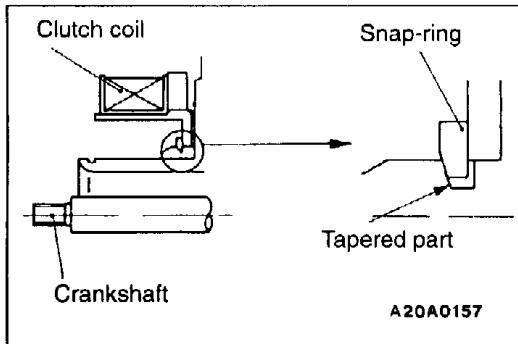
**DISASSEMBLY SERVICE POINTS****◀A▶ SELF-LOCKING NUT REMOVAL**



REASSEMBLY SERVICE POINTS

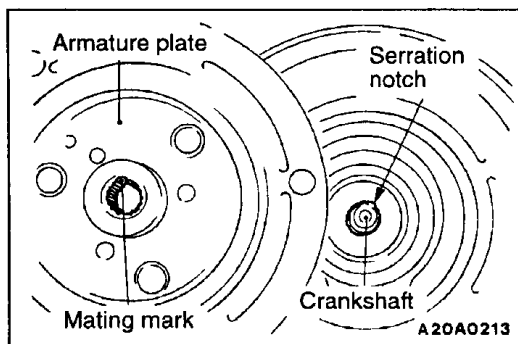
►A◄ CLUTCH COIL INSTALLATION

When installing the clutch coil to the A/C compressor body, install so that the pin hole of the A/C compressor body and the clutch coil projection are aligned.



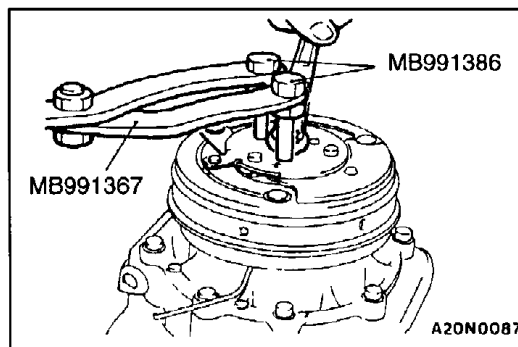
►B◄ SNAP RING INSTALLATION

Install the snap ring so that the tapered surface is at the outer side.



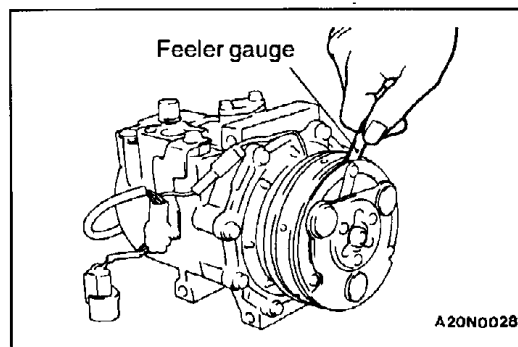
►C◄ ARMATURE PLATE INSTALLATION

Align the mating mark of the crankshaft spline and the mating mark of the armature plate, and then fit them together.



►D◄ SELF-LOCKING NUT INSTALLATION

1. Install the nut.

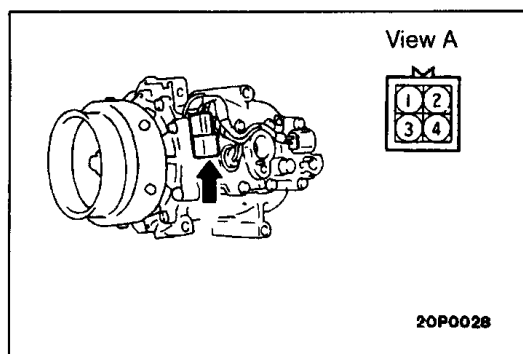


2. Check whether or not the air gap of the clutch is within the standard value.

Standard value: 0.4–0.65 mm

NOTE

If there is a deviation of the air gap from the standard value, make the necessary adjustment by adjusting the number of shims.

**INSPECTION**

- Check the surface of the armature for scoring or bluing.
- Check the surface of the rotor for scoring or bluing.
- Check the sealing surfaces for cracks, scratches and deformation.
- Check the front housing for cracks or scoring on the sealing surfaces.
- Check the compressor shaft for scoring.

REFRIGERANT-TEMPERATURE SWITCH

Check that there is continuity between connector terminals 1 and 2.

REVOLUTION PICK UP SENSOR CHECK

Check that the resistance between connector terminals 3 and 4 is in the standard value range.

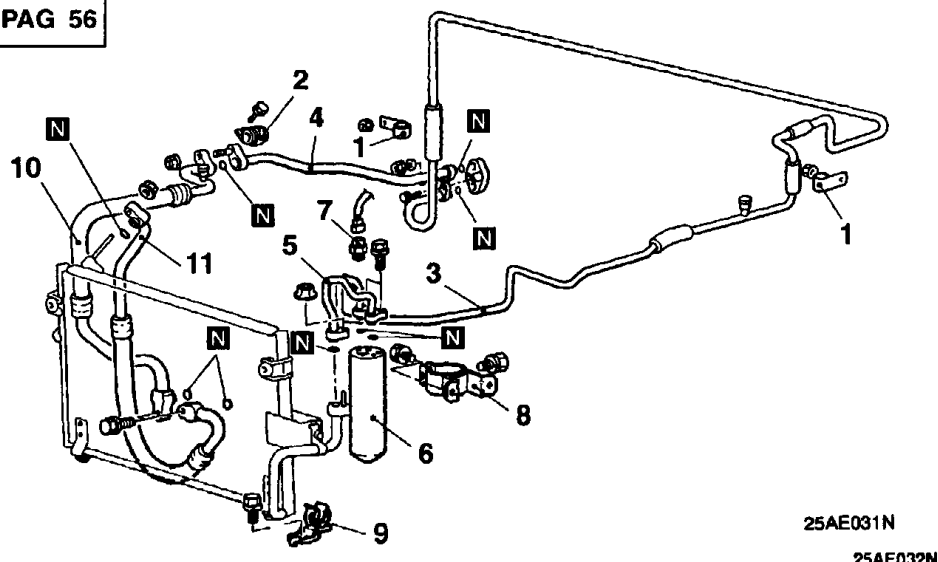
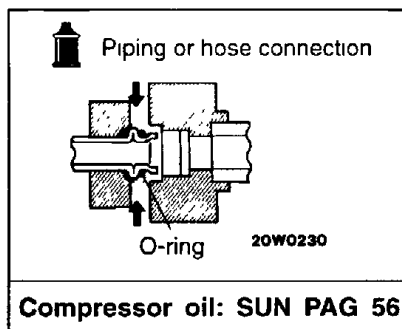
Standard value: $405 \pm 35 \Omega$ (at 20°C)

REFRIGERANT LINE

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Discharge and Charging of Refrigerant (Refer to P.55-31)
- Battery and Battery Tray Removal and Installation
- Air Cleaner Removal and Installation (Refer to Group 15 – Air Cleaner Assembly)



Removal steps

1. Clamp
 2. Clamp
 3. Liquid pipe B
 4. Suction pipe
 5. Liquid pipe A
 6. Receiver assembly
- A◄

7. Dual pressure switch
8. Receiver bracket
9. Clamp
10. Suction hose
11. Discharge hose

INSTALLATION SERVICE POINT

►A◄ SUCTION HOSE, RECEIVER ASSEMBLY INSTALLATION

When replacing the suction hose, or the receiver assembly with new ones, refill them with a specified amount of compressor oil, and then install each of them.

Compressor oil: SUN PAG 56

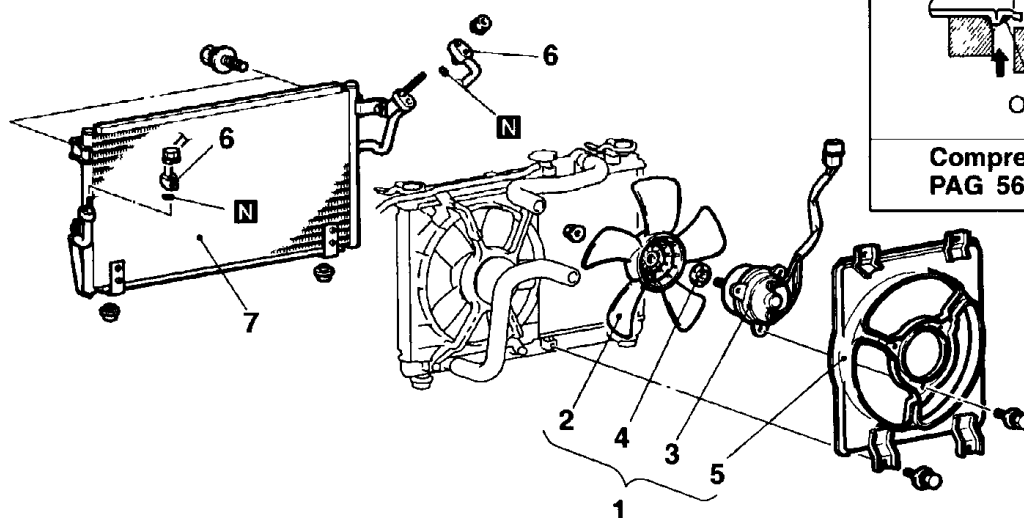
Quantity:

Suction hose: 10 mℓ

Receiver: 10 mℓ

CONDENSER AND CONDENSER FAN MOTOR**REMOVAL AND INSTALLATION****Pre-removal and Post-Installation Operation**

- Discharge and Charging of Refrigerant (Refer to P.55-29.)

**Condenser fan motor removal steps**

1. Condenser fan motor and shroud assembly
2. Condenser fan
3. Condenser fan motor

4. Spacer
5. Shroud

Condenser removal steps

6. Discharge pipe
7. Condenser



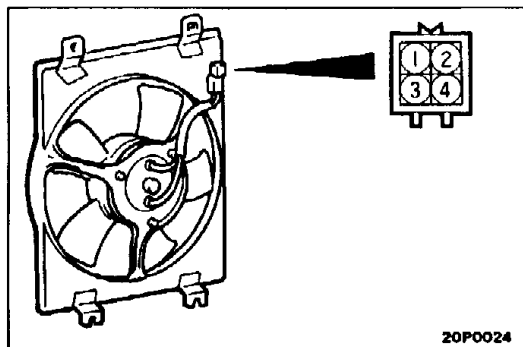
INSTALLATION SERVICE POINT

►A◄ CONDENSER INSTALLATION

When replacing the condenser with a new one, refill the condenser with a specified amount of compressor oil and install it (to the vehicle).

Compressor oil: SUN PAG 56

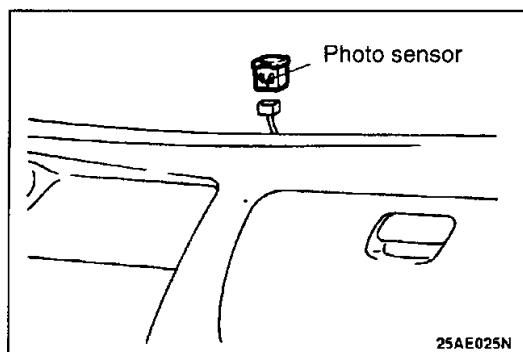
Quantity: 15 ml



INSPECTION

CONDENSER FAN MOTOR

1. Check to be sure that the condenser fan motor operates when battery voltage (+) is applied to terminal 1 and terminal 2 is grounded (-).
2. In this same condition, apply battery (+) voltage to terminal 3 and ground terminal 4. Check to be sure that the condenser fan motor operates faster at this time.



SENSORS

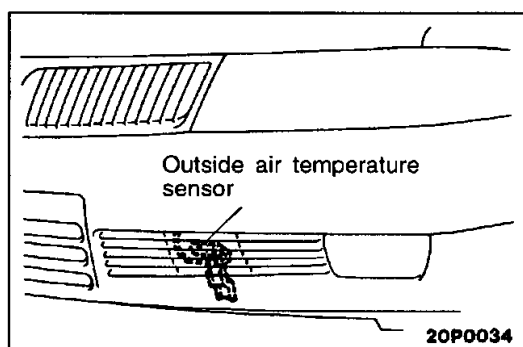
PHOTO SENSORS

REMOVAL AND INSTALLATION

1. Remove the centre air outlet assembly. (Refer to Group 52A–Instrument Panel.)
2. Remove the centre warning display (Refer to Group 54–Centre Warning Display.)
3. Remove the photo sensor.

INSPECTION

With the fully automatic air conditioning operating (during summer in daylight), cover the light-sensitive part of the photo sensor with the hand – if the blower speed drops, it is normal. If it does not drop, replace the photo sensor.



OUTSIDE AIR TEMPERATURE SENSOR

REMOVAL AND INSTALLATION

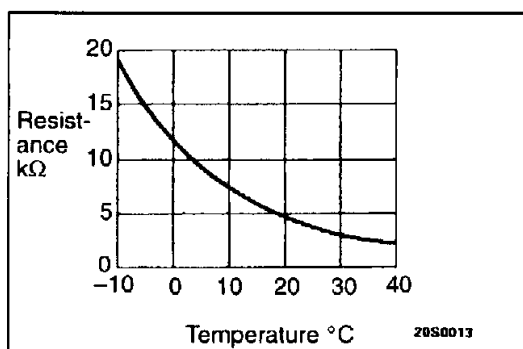
1. Remove the radiator grille. (Refer to Group 51–Grilles and Garnishes)
2. Remove the outside air temperature sensor.

INSPECTION

When the resistance between the sensor terminals is measured under two or more temperature conditions, the resistance should approximately satisfy the illustrated values.

NOTE

The temperature conditions when checking should not exceed the range shown in the diagram.



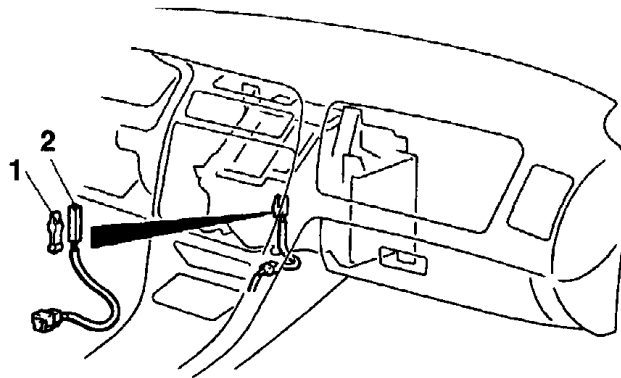
HEATER WATER TEMPERATURE SENSOR

REMOVAL AND INSTALLATION

- (1) Instrument Panel Lower Cover Assembly, Undercover Assembly, Console Side Cover Assembly, and Floor Carpet Front Reinforcement, Removal and Installation. (Refer to Group 52A–Instrument Panel.)
- (2) Engine-ECU, Transmission-ECU and A/T Control Relay Removal and Installation (Refer to Group 52B–SRS-ECU.)

Caution: SRS

- (1) Before removing the passenger seat air bag module, ensure that you refer to Group 52B–Servicing Cautions and the section on the Air bag Module.
- (2) When removing or fitting the engine control module, do not let it knock against the SRS-ECU.

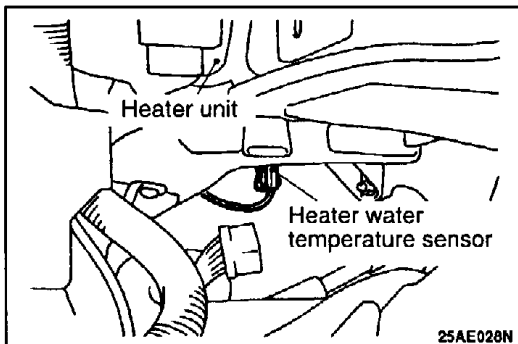


25AE027N

Removal steps



1. Heater water temperature sensor clip
2. Heater water temperature sensor



25AE028N

REMOVAL SERVICE POINT

HEATER WATER TEMPERATURE SENSOR CLIP/HEATER WATER TEMPERATURE SENSOR REMOVAL

Pull out the heater water temperature sensor clip from the base of the heater unit, and remove the heater water temperature sensor from the heater unit.

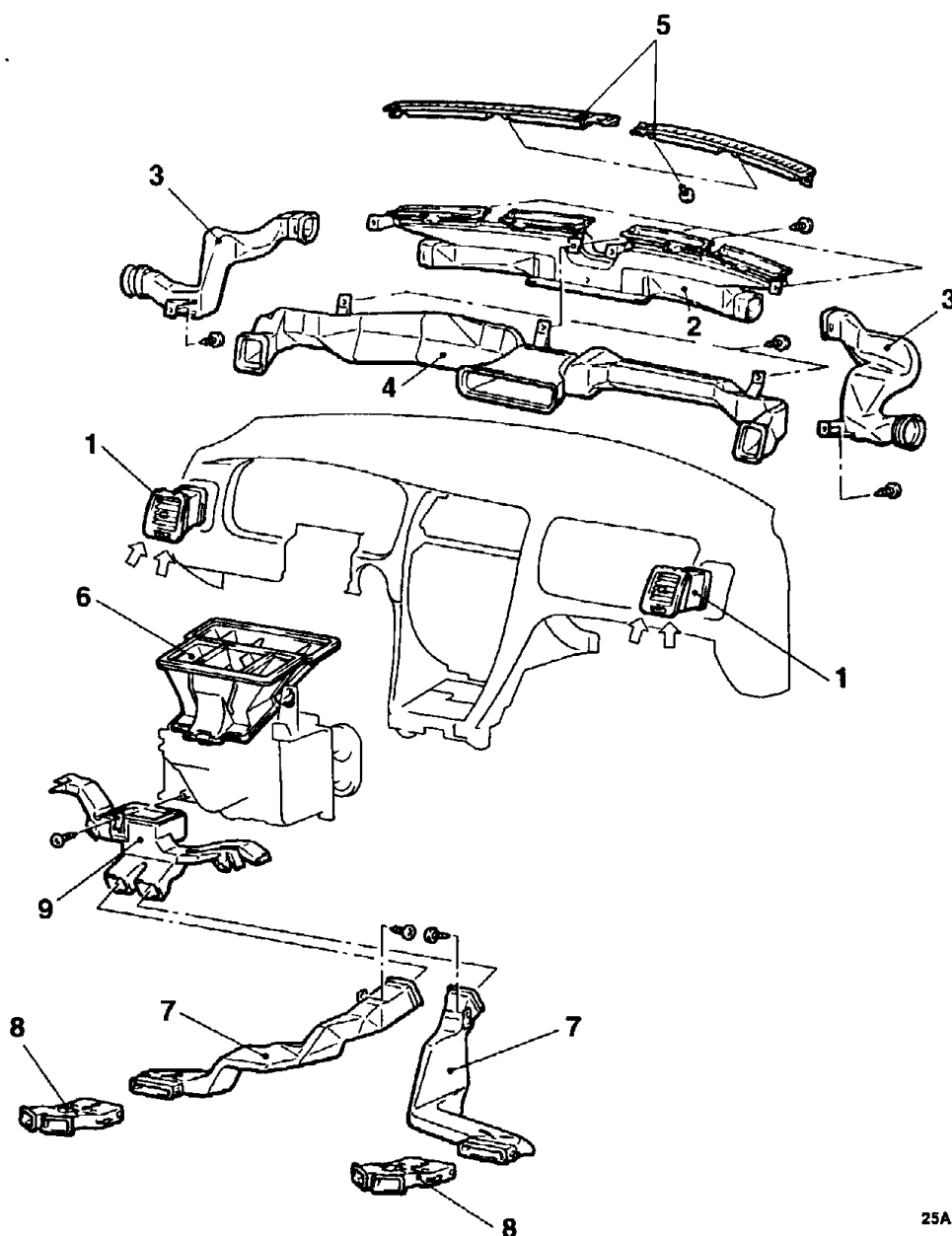
INSTALLATION SERVICE POINT

HEATER WATER TEMPERATURE SENSOR/HEATER WATER TEMPERATURE SENSOR CLIP INSTALLATION

Insert the heater water temperature sensor into the mounting hole at the base of the heater unit, and secure by plugging in the heater water temperature sensor clip.

INSPECTION

Check using the same procedure as in checking the outside air temperature sensor. (Refer to P.55-52.)

VENTILATORS**REMOVAL AND INSTALLATION**

25AE029N

Defroster nozzle and distribution duct removal steps

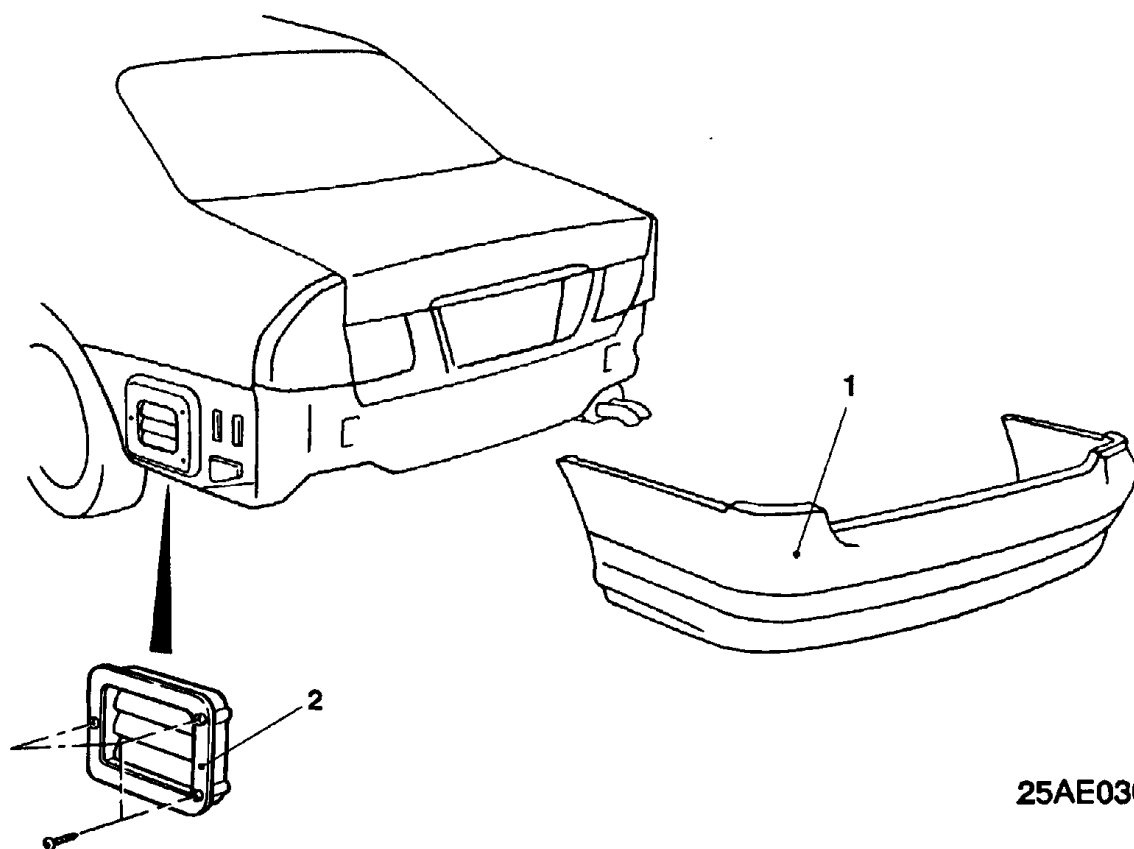
1. Side air outlet assembly
- Instrument panel (Refer to Group 52A – Instrument Panel)
2. Defroster nozzle
3. Side defroster hose
4. Distribution duct
5. Defroster garnish
6. Centre duct

Rear heater duct removal steps

- Front seat (Refer to Group 52A – Front Seat)
- Instrument Panel, centre stay assembly (Refer to Group 52A – Instrument Panel)
- 1. Rear heater duct
- 2. Rear heater nozzle
- 3. Distribution duct

VENTILATORS (AIR OUTLET)

REMOVAL AND INSTALLATION



25AE030N

Removal steps

1. Rear bumper (Refer to Group 51–Rear Bumper)
2. Rear ventilation duct