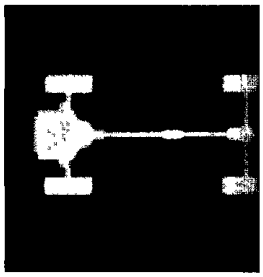
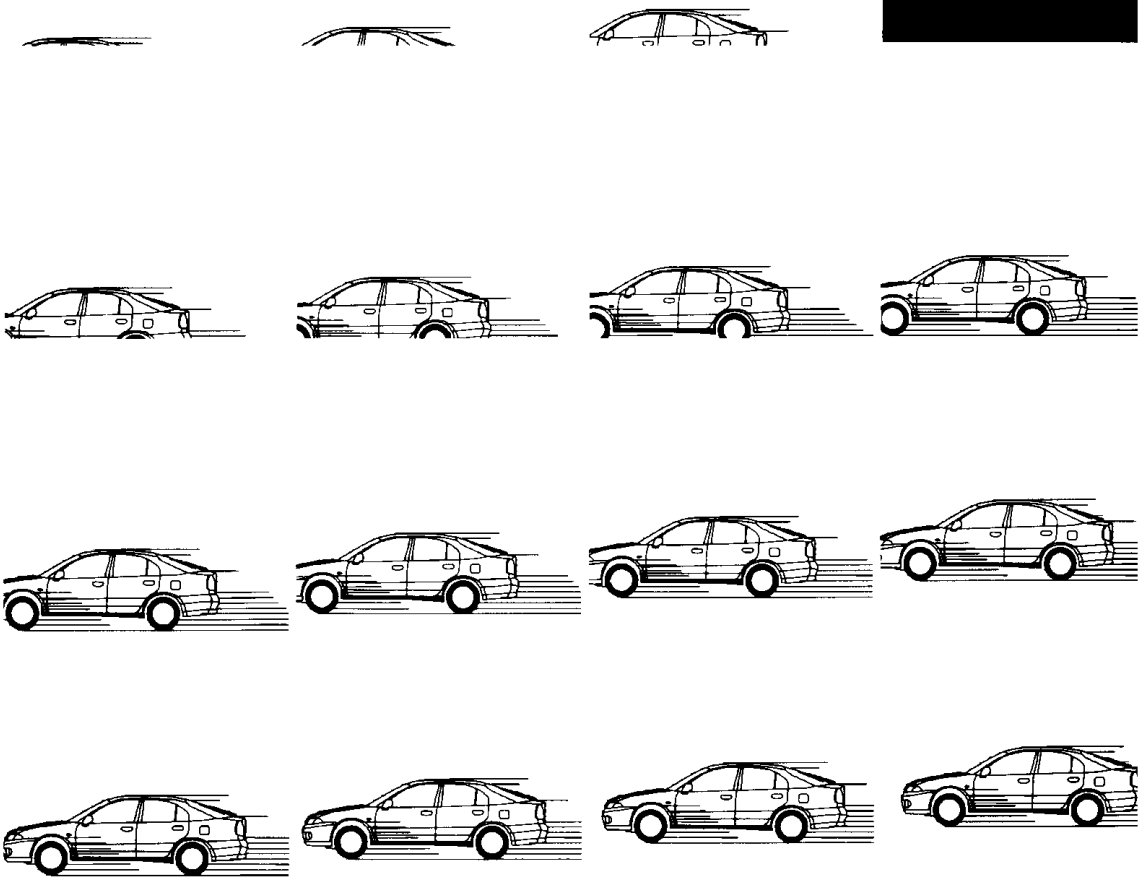
MITSUBISHI MOTORS

Workshop Manual

chassis

CARISMA '96





Pub. No. PWDE9502

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CARISMA

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	PYGE95E1
WORKSHOP MANUAL	
ENGINE GROUP	PWEE□□□□ (Looseleaf edition)
ELECTRICAL WIRING	PHDE9501
BODY REPAIR MANUAL	PBGE95E1
PARTS CATALOGUE	N606C006D□

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.

MITSUBISHI MOTOR SALES
Europe B.V.

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WARNING!

(1) Improper service or maintenance of any component of the SRS and seat belt with pre-tensioner, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag and seat belt with pre-tensioner) or to the driver and passenger (from rendering the SRS inoperative).

(2) SRS components and seat belt with pre-tensioner should not be subjected to heat, so remove the SRS-ECU, air bag module, clock spring and seat belt with pre-tensioner before drying or baking the vehicle after painting.
SRS-ECU, air bag module, clock spring: 93°C or more
Seat belt with pre-tensioner: 90°C or more

(3) Service or maintenance of any SRS component and seat belt with pre-tensioner or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(4) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS), before beginning any service or maintenance of any component of the SRS and seat belt with pre-tensioner or any SRS-related component.

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

GENERAL

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HOW TO USE THIS MANUAL

00100010081

SCOPE OF MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model. Note, however, that for engine and transmission-related component parts, this manual covers only on-vehicle inspections, adjustments, and the removal and installation procedures for major components.
For detailed information concerning the inspection, checking, adjustment, disassembly and reassembly of the engine, transmission and major components after they have been removed from the vehicle, please refer to separate manuals covering the engine and the transmission.

ON-VEHICLE SERVICE

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

INSPECTION

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

DEFINITION OF TERMS

STANDARD VALUE

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

LIMIT

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

REFERENCE VALUE

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

CAUTION

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

INDICATION OF TIGHTENING TORQUE

The tightening torque shown in this manual is a basic value with a tolerance of +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 +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 the manual transmission, or models equipped with the manual transmission.
A/T:	Indicates the automatic transmission, or models equipped with the automatic transmission.
SOHC:	Indicates an engine with the single overhead camshaft, or a model equipped with such an engine.
DOHC:	Indicates an engine with the double overhead camshaft, or a model equipped with such an engine.
MPI:	Indicates the multi-point injection, or engines equipped with the multi-point injection.
2WD:	Indicates the front wheel-drive vehicles.

EXPLANATION OF MANUAL CONTENTS

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

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

Indicates (by symbols) where lubrication is necessary.

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

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

Classifications of Major Maintenance/Service Points

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

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

Symbols for Lubrication, Sealants and Adhesives

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

: Grease
(multipurpose grease unless there is a brand or type specified)

: Sealant or adhesive

: Brake fluid or automatic transmission fluid

: Engine oil, gear oil or air conditioner compressor oil

: Adhesive tape or butyl rubber tape

Indicates the group title.

Indicates the section title.

Indicates the group number.

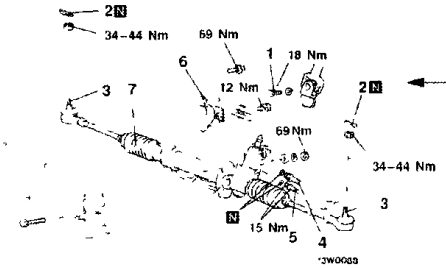
Indicates the page number.

STEERING – Power Steering Oil Pump 37A-29

POWER STEERING GEAR BOX

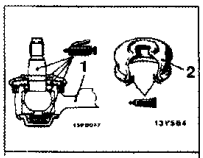
REMOVAL AND INSTALLATION

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

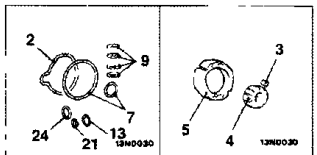


Denotes non-reusable part.

Denotes tightening torque.
For bolts and nuts which do not have a tightening torque listed, refer to the "Standard Parts-tightening-torque Table".



Sealant: 3M ATD Part No. 8661 or equivalent

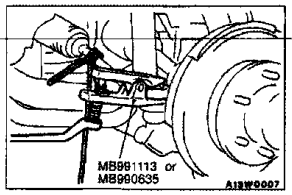


Oil pump seal kit | Oil pump cartridge kit

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

Removal steps
1 Lower shaft assembly and gear box connecting bolt
2 Split pin
3 Connection for tie-rod end and knuckle
4 Connection for return tube
5 Connection for pressure tube
6 Clamp
7 Gear box assembly

◀A▶ ◀B▶

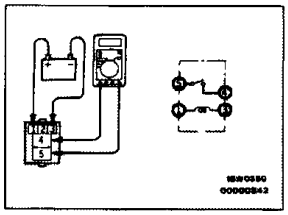


REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

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

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



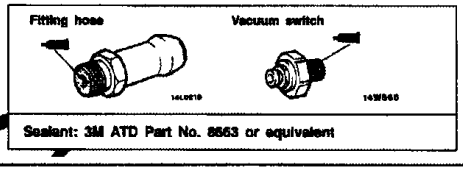
HEADLAMP RELAY CONTINUITY INSPECTION

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

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

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

Lubrication and sealing points



Sealant: 3M ATD Part No. 8663 or equivalent

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.

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HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

00100020046

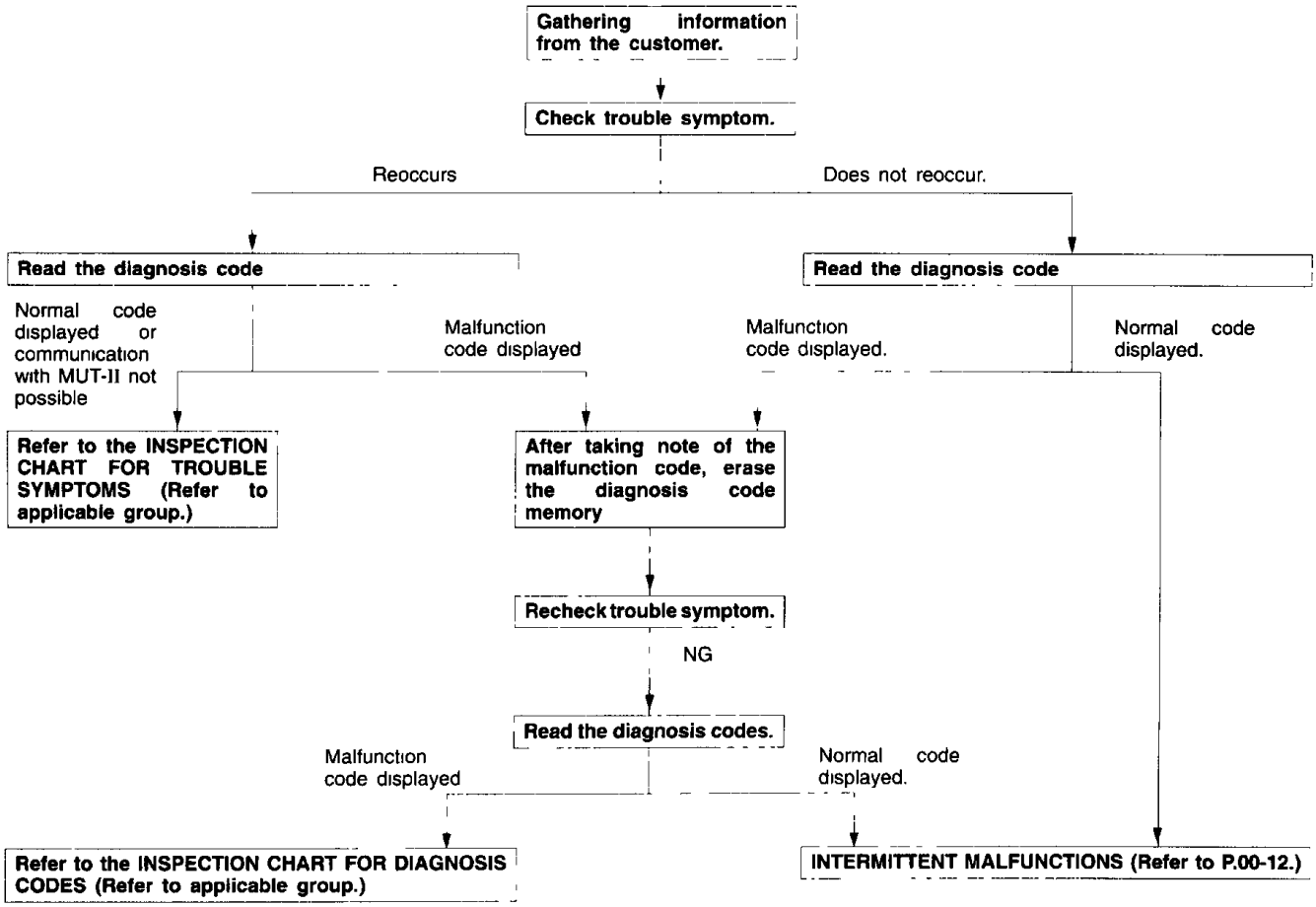
Troubleshooting of electronic control systems for which the MUT-II can be used follows the basic outline described below. Furthermore, even in systems for which the MUT-II cannot be used, part of these systems still follow this outline.

TROUBLESHOOTING CONTENTS

1. STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

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

Diagnosis method



2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

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

3. DIAGNOSIS FUNCTION

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

4. INSPECTION CHART FOR DIAGNOSIS CODES

5. INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Indicates the inspection procedures corresponding to each diagnosis code. (Refer to the next page for how to read the inspection procedures.)

6. INSPECTION CHART FOR TROUBLE SYMPTOMS

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

7. INSPECTION PROCEDURE FOR DIAGNOSIS SYMPTOM

Indicates the inspection procedures corresponding to each trouble symptoms classified in the Inspection Chart for Trouble Symptoms. (Refer to the next page for how to read the inspection procedures.)

8. SERVICE DATA REFERENCE TABLE

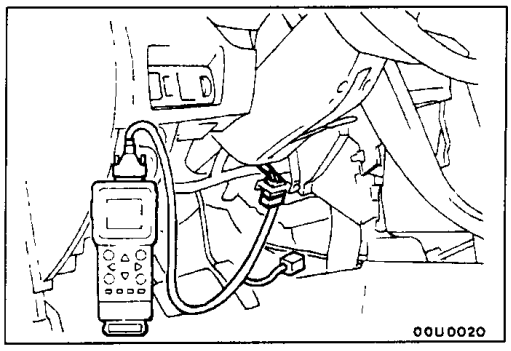
Inspection items and normal judgement values have been provided in this chart as reference information.

9. CHECK AT ECU TERMINALS

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

10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE

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



DIAGNOSIS FUNCTION

METHOD OF READING DIAGNOSIS CODES

When using the MUT-II

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

Caution

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

2. METHOD OF ERASING DIAGNOSIS CODES

When using the MUT-II

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

Caution

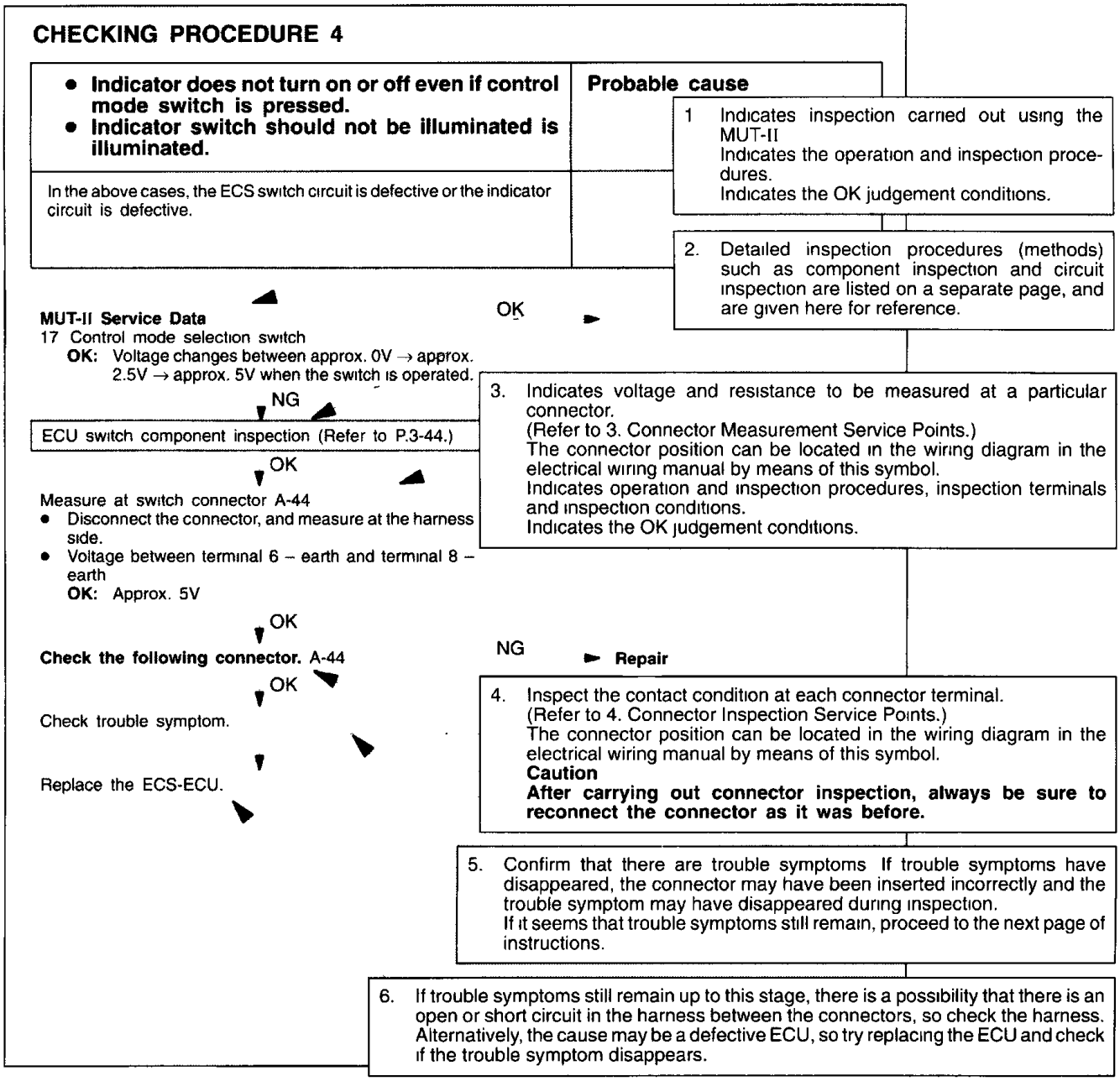
- **Connection and disconnection of the MUT-II should always be carried out with the ignition switch in the OFF position.**

When not using the MUT-II

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

HOW TO USE THE INSPECTION PROCEDURES

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



HARNESS INSPECTION

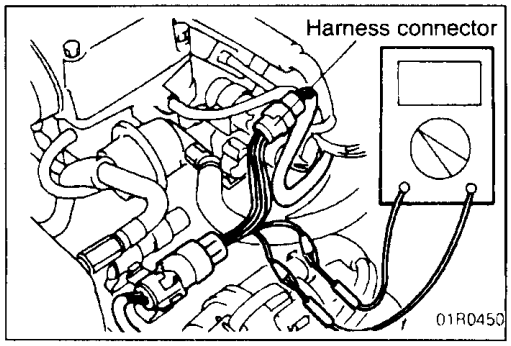
Check for an open or short circuit in the harness between the terminals which were defective according to the connector measurements. Carry out this inspection while referring to the electrical wiring manual. Here, "Check harness between power supply and terminal xx" also includes checking for blown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

MEASURES TO TAKE AFTER REPLACING THE ECU

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

CONNECTOR MEASUREMENT SERVICE POINTS

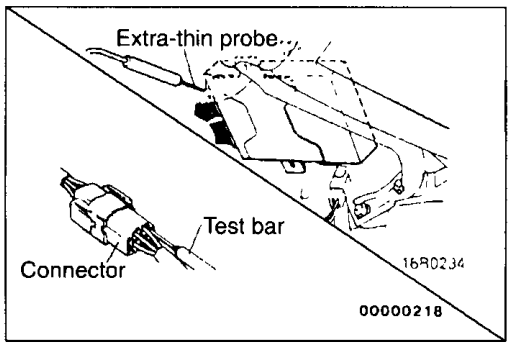
Turn the ignition switch to OFF when connecting disconnecting the connectors, and turn the ignition switch to ON when measuring if there are no instructions to be contrary.



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

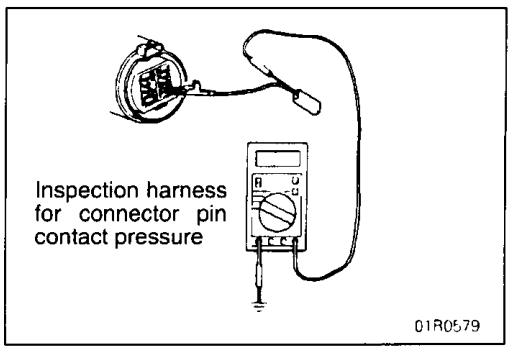
Waterproof Connectors

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



Ordinary (non-waterproof) Connectors

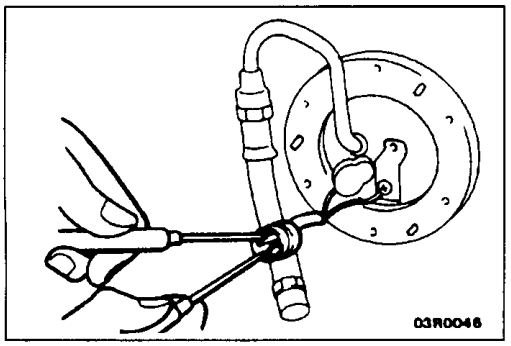
Check by inserting the test bar from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test bar, it should not be forced; use a special tool (the extra-thin probe in the harness set for checking for this purpose.



IF INSPECTING WITH THE CONNECTOR DISCONNECTED

<When Inspecting a Female Pin>

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



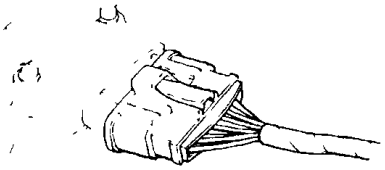
<When Inspecting a Male Pin>

Touch the pin directly with the test bar.

Caution

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

Connector disconnected or improperly connected



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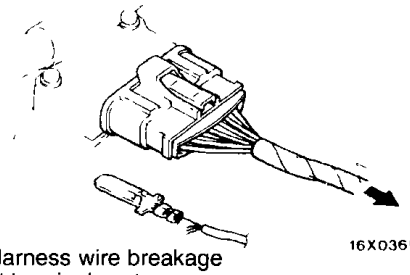
Defective connector contact



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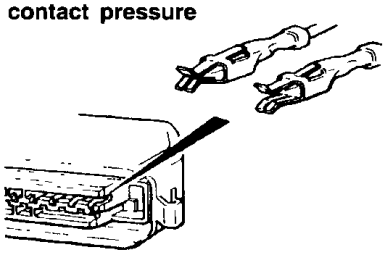
Harness wire breakage at terminal section

Low contact pressure



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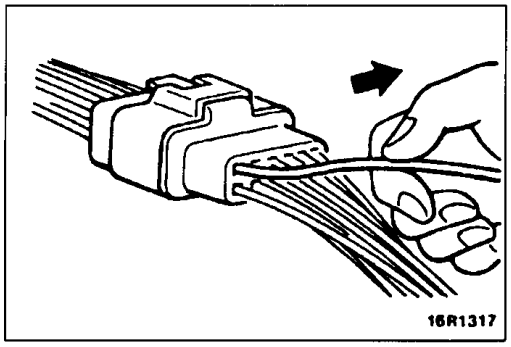
CONNECTOR INSPECTION

VISUAL INSPECTION

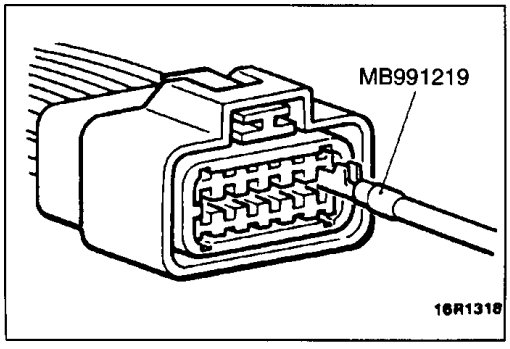
- Connector is disconnected or improperly connected
- Connector pins are pulled out
- Due to harness tension at terminal section
- Low contact pressure between male and female terminals
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals



16R1317

CONNECTOR PIN INSPECTION

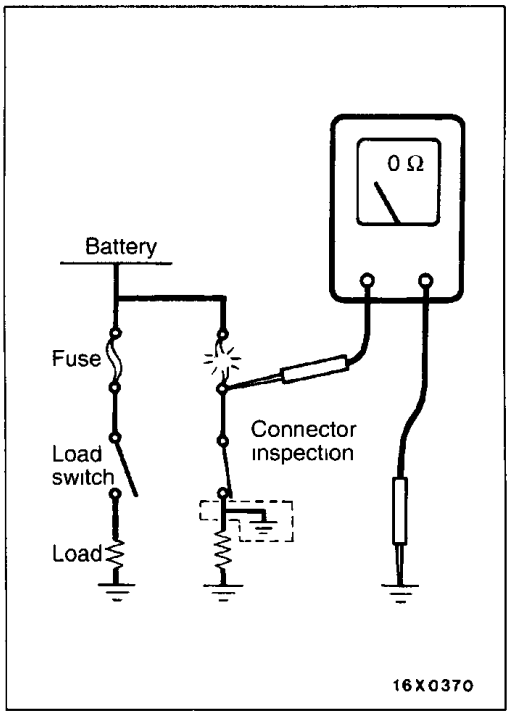
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even if the connector body is connected, and the pins may pull out of the reverse side of the connector. Therefore, gently pull the harnesses one by one to make sure that no pins pull out of the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



16R1318

CONNECTOR ENGAGEMENT INSPECTION

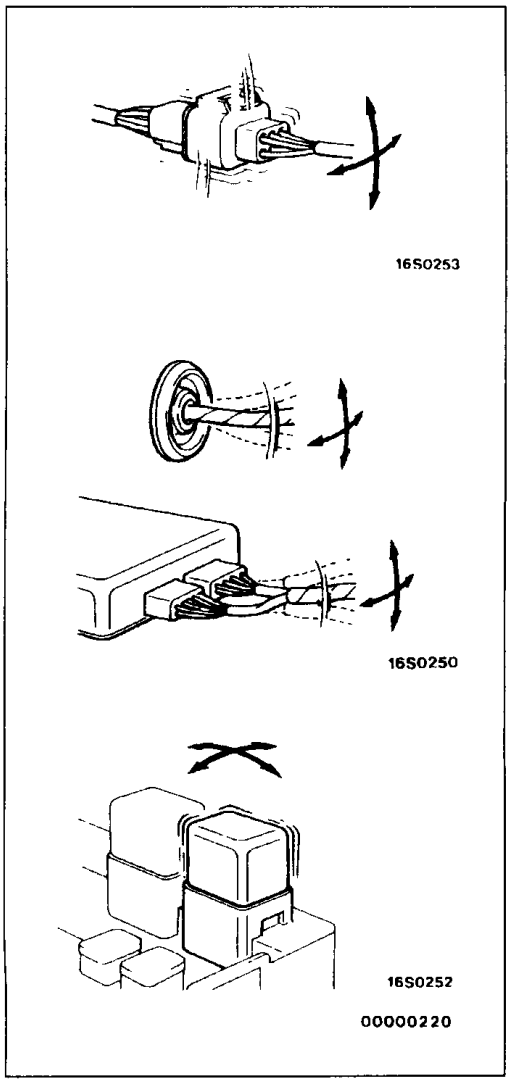
Use the special tool (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and females pins. (Pin drawing force : 1 N or more)



INSPECTION SERVICE POINTS FOR A BLOWN FUSE

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

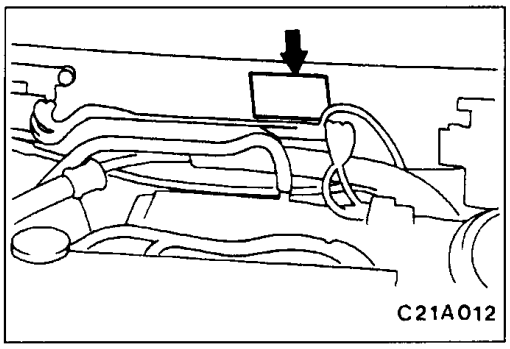
The main causes of a short circuit are the following.
- Harness being clamped by the vehicle body
- Damage to the outer casing of the harness due to wear or heat
- Water getting into the connector or circuitry
- Human error (mistakenly shorting a circuit, etc.)

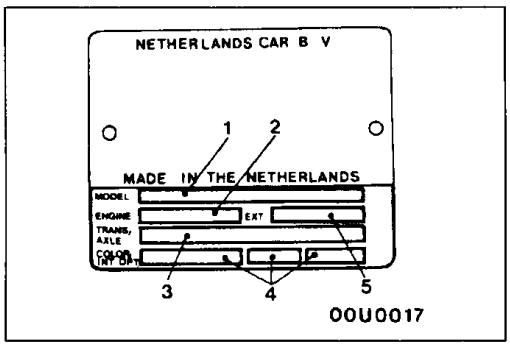


POINTS TO NOTE FOR INTERMITTENT MALFUNCTIONS

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

00100540023

VEHICLE INFORMATION CODE PLATE

LOCATION

Vehicle information code plate is riveted on the toeboard inside the engine compartment.

CODE PLATE DESCRIPTION

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

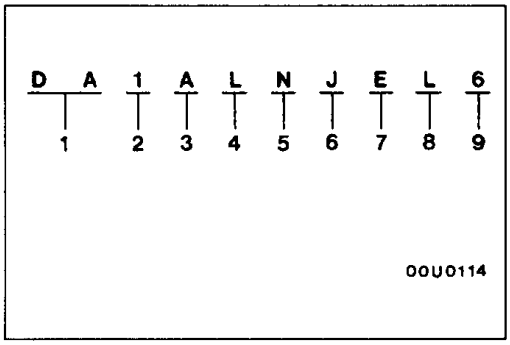
No.	Item	Contents	
1	MODEL	DA2A LNJEL6	DA2A: Vehicle model LNJEL6: Model series
2	ENGINE	4G93	Engine model
3	TRANS AXLE	F5MR2	Transmission code
4	COLOR INT OPT	B60 41H 03V	B60: Body colour code 41H: Interior code 03V: Equipment code
5	EXT	B60B	Exterior code

For monotone colour vehicles, the body colour code shall be indicated. For two-tone or three-way two-tone colour vehicles, each colour code only shall be indicated in series.

MODELS

00100030100

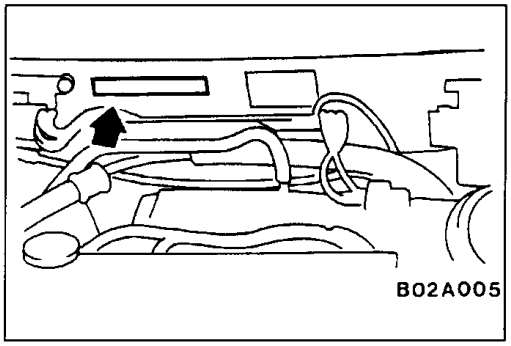
Model code		Engine model	Transmission model	Fuel supply system
DA1A	LNDEL6/R6	4G92-SOHC (1,597mℓ)	F5MR1 (2WD-5M/T)	MPI
	LRDEL6/R6		F4A41 (2WD-4A/T)	
	LNJEL6/R6		F5MR1 (2WD-5M/T)	
	LRJEL6/R6		F4A41 (2WD-4A/T)	
DA2A	LNJEL6/R6	4G93-SOHC (1,834 mℓ)	F5MR2 (2WD-5M/T)	
	LRJEL6/R6		F4A42 (2WD-4A/T)	
	LNPEL6/R6		F5MR2 (2WD-5M/T)	
	LRPEL6/R6		F4A42 (2WD-4A/T)	
	LNGML6	4G93-DOHC (1,834 mℓ)	F5MR2 (2WD-5M/T)	



MODEL CODE

00100040035

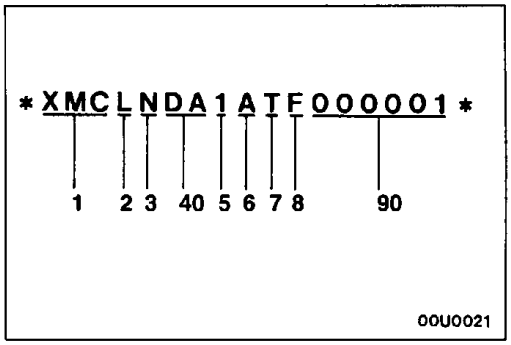
No.	Items	Contents
1	Development	DA: MITSUBISHI CARISMA
2	Engine type	1: 1,597 mℓ petrol engine
		2: 1,834 mℓ petrol engine
3	Sort	A: Passenger car
4	Body style	L: 5-door hatchback
5	Transmission type	N: 5-speed manual transmission
		R: 4-speed automatic transmission
6	Trim level	D: GL
		J: GLX
		P: GLS
		G: MSX
7	Specified engine feature	E: MPI-SOHC
		M: MPI-DOHC
8	Steering wheel location	L: Left hand
		R: Right hand
9	Destination	6: For Europe



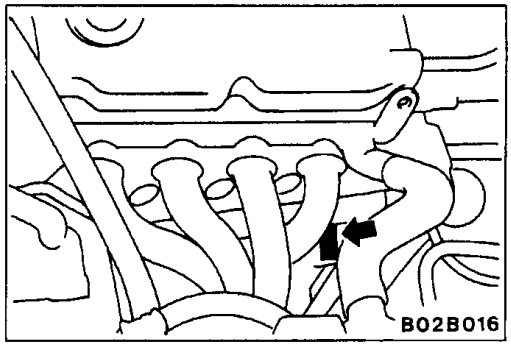
CHASSIS NUMBER

00100560029

The chassis number is stamped on the toeboard inside the engine compartment.



No.	Items		Contents
1	Steering wheel location	XMC	Left hand drive
		XMD	Right hand drive
2	Body style	L	5-door hatchback
3	Transmission type	N	5-speed manual transmission
		R	4-speed automatic transmission
4	Vehicle line	DA	CARISMA
5	Development order	1	1,597 mℓ petrol engine
		2	1,834 mℓ petrol engine
6	Sort	A	Passenger car
7	Model year	T	1996
8	Factory code	F	Netherlands Car B.V.
9	Serial number	–	–



ENGINE MODEL NUMBER

00100570022

1. The engine model number is stamped at the cylinder block as shown in the following.

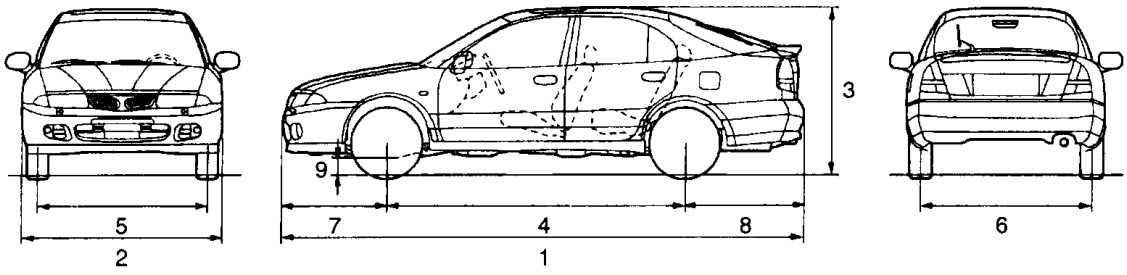
Engine model	Engine displacement
4G92	1,597
4G93	1,834

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

Engine serial number	AA0201 to YY9999

MAJOR SPECIFICATIONS

00100080044



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Items			DA1A LNDE L6, LNDE R6	DA1A LRDE L6, LRDE R6	DA1A LNJE L6, LNJE R6	DA1A LRJE L6, LRJE R6	DA2A LNJE L6, LNJE R6	DA2A LRJE L6, LRJE R6	DA2A LNPE L6, LNPE R6	DA2A LRPE L6, LRPE R6	DA2A LNG ML6
Vehicle dimensions mm	Overall length	1	4,435	4,435	4,435	4,435	4,435	4,435	4,435	4,435	4,435
	Overall width	2	1,695	1,695	1,695	1,695	1,695	1,695	1,695	1,695	1,695
	Overall height (unladen)	3	1,405	1,405	1,405	1,405	1,405	1,405	1,405	1,405	1,405
	Wheelbase (laden)	4	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550	2,550
	Track-front	5	1,455	1,455	1,455	1,455	1,455	1,455	1,455	1,455	1,455
	Track-rear	6	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475	1,475
	Overhang-front	7	880	880	880	880	880	880	880	880	880
	Overhang-rear	8	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005	1,005
	Ground clearance (unladen)	9	155	150	155	150	155	150	155	150	155
Vehicle weight kg	Kerb weight		1,105	1,135	1,110	1,140	1,130	1,160	1,135	1,165	1,175
	Max. gross vehicle weight rating		1,630	1,660	1,630	1,660	1,660	1,690	1,660	1,690	1,685
	Max. axle weight rating-front		900	900	900	900	900	900	900	900	900
	Max. axle weight rating-rear		865	865	865	865	875	875	875	875	880
Seating capacity			5								
Engine	Model No.		4G92				4G93				
	Total displacement mℓ		1,597				1,834				
Transmission	Model No.		F5MR 1	F4A41	F5MR 1	F4A41	F5MR 2	F4A42	F5MR 2	F4A42	F5MR 2
	Type		5 speed-manual	4 speed-automatic	5 speed-manual	4 speed-automatic	5 speed-manual	4 speed-automatic	5 speed-manual	4 speed-automatic	5 speed-manual
Fuel system	Fuel supply system		Electronic control multipoint fuel injection								

PRECAUTIONS BEFORE SERVICE

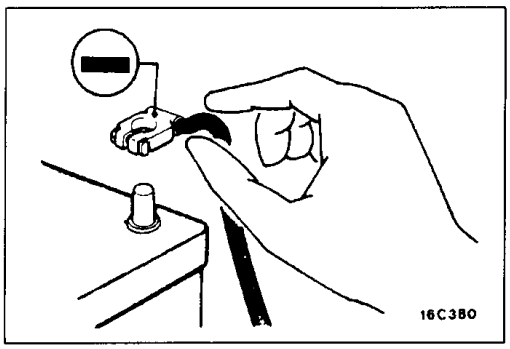
00100050045

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

1. Items to follow when servicing SRS
   (1) Be sure to read GROUP 52B – Supplemental Restraint System (SRS).
   For safe operations, please follow the directions and heed all warnings.
   (2) Always use the designated special tools and test equipment.
   (3) Wait at least 60 seconds after disconnecting the battery cable before doing any further work.
   The SRS system is designed to retain enough voltage to deploy the air bag even after the battery has been disconnected. Serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cable is disconnected.
   (4) Never attempt to disassemble or repair the SRS components, (SRS air bag control unit, air bag module and clock spring) and seat belt with pre-tensioner. If faulty, replace it.
   (5) Warning labels must be heeded when servicing or handling SRS components and seat belt with pre-tensioner. Warning labels are located in the following locations.
   - Sun visor
   - Glove box
   - SRS air bag control unit
   - Steering wheel
   - Steering gear and linkage
   - Air bag module
   - Clock spring
   - Seat belt with pre-tensioner

   (6) Store components removed from the SRS and seat belt with pre-tensioner in a clean and dry place.
   The air bag module and seat belt with pre-tensioner should be stored on a flat surface and placed so that the pad surface is facing upward.
   Do not place anything on top of it.
   (7) Be sure to deploy the air bag and seat belt with pre-tensioner before disposing of the air bag module and seat belt with pre-tensioner or disposing of a vehicle equipped with an air bag and seat belt with pre-tensioner. (Refer to GROUP 52B – Air Bag Module Disposal Procedures.)
   (8) Whenever you finish servicing the SRS and seat belt with pre-tensioner, check the SRS warning lamp operation to make sure that the system functions properly.
2. Observe the following when carrying out operations on places where SRS components and seat belt with pre-tensioner are installed, including operations not directly related to the SRS air bag and seat belt with pre-tensioner.
   (1) When removing or installing parts do not allow any impact or shock to the SRS components and seat belt with pre-tensioner.
   (2) SRS components and seat belt with pre-tensioner should not be subjected to heat, so remove the SRS components and seat belt with pre-tensioner before drying or baking the vehicle after painting.
   - SRS air bag control unit, air bag module, clock spring: 93°C or more
   - Seat belt with pre-tensioner 90°C or more

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



SERVICING THE ELECTRICAL SYSTEM

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

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

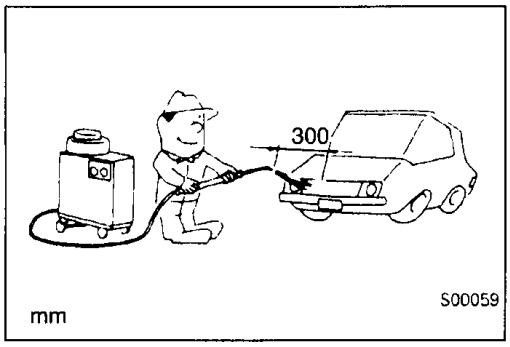
APPLICATION OF ANTI-CORROSION AGENTS AND UNDERCOATS

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

PRE-INSPECTION CONDITION

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

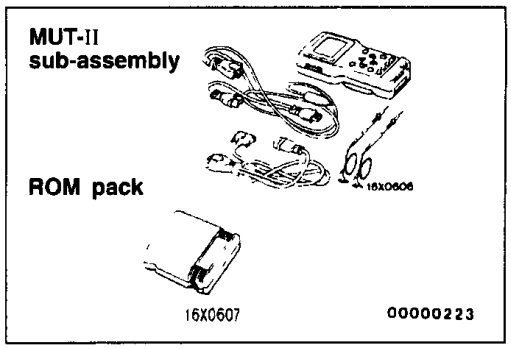
- Engine coolant temperature: 80–90°C
- Lamps, electric cooling fan and all accessories: OFF
- M/T: Neutral
- A/T: P range



VEHICLE WASHING

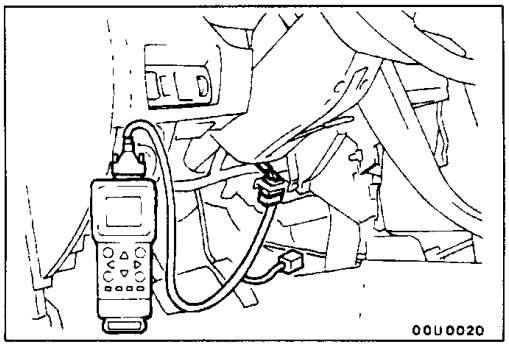
If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to note the following information in order to avoid damage to plastic components, etc.

- Spray nozzle distance: 300 mm or more
- Spray pressure: 4 MPa or less
- Spray temperature: 82°C or less
- Time of concentrated spray to one point: within 30 sec.



MUT-II

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



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

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

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 MMC'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 dermatitits. 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, kerosine, 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) AND SEAT BELT WITH PRE-TENSIONER

00100590028

To improve safety, the SRS and seat belt with pre-tensioner are available as optional parts. These systems enhance a collision safety by restraining the front passengers in case of an accident. The SRS works with the pre-tensioner simultaneously when a collision is detected.

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

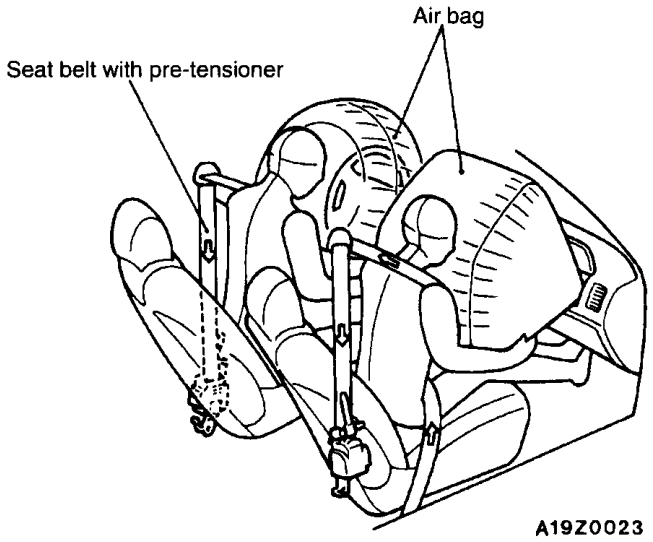
The SRS is designed to supplement the front seat belts. It eliminates or reduces an injury to the front passengers by deploying two air bags in case of a head-on collision.

SEAT BELT WITH PRE-TENSIONER

The seat belt with pre-tensioner work simultaneously with the SRS. The pre-tensioner takes up seat belt slack immediately at a collision, by that restraining the front passengers sooner than the SRS. This prevents the passengers from moving forwards.

CAUTION

1. Even if there is no passenger, the air bag and pre-tensioner will work by detecting a bigger head-on collision than a specific value.
2. The specific value is an equivalent impact when a vehicle collides against a concrete (fixed) wall at approx. 25 km/h or more.
3. The SRS and pre-tensioner may not work under the following conditions:
   - A head-on collision is smaller than the specific value.
   - A vehicle collides on its side or rear end.
   - A vehicle rolls over or upsets.

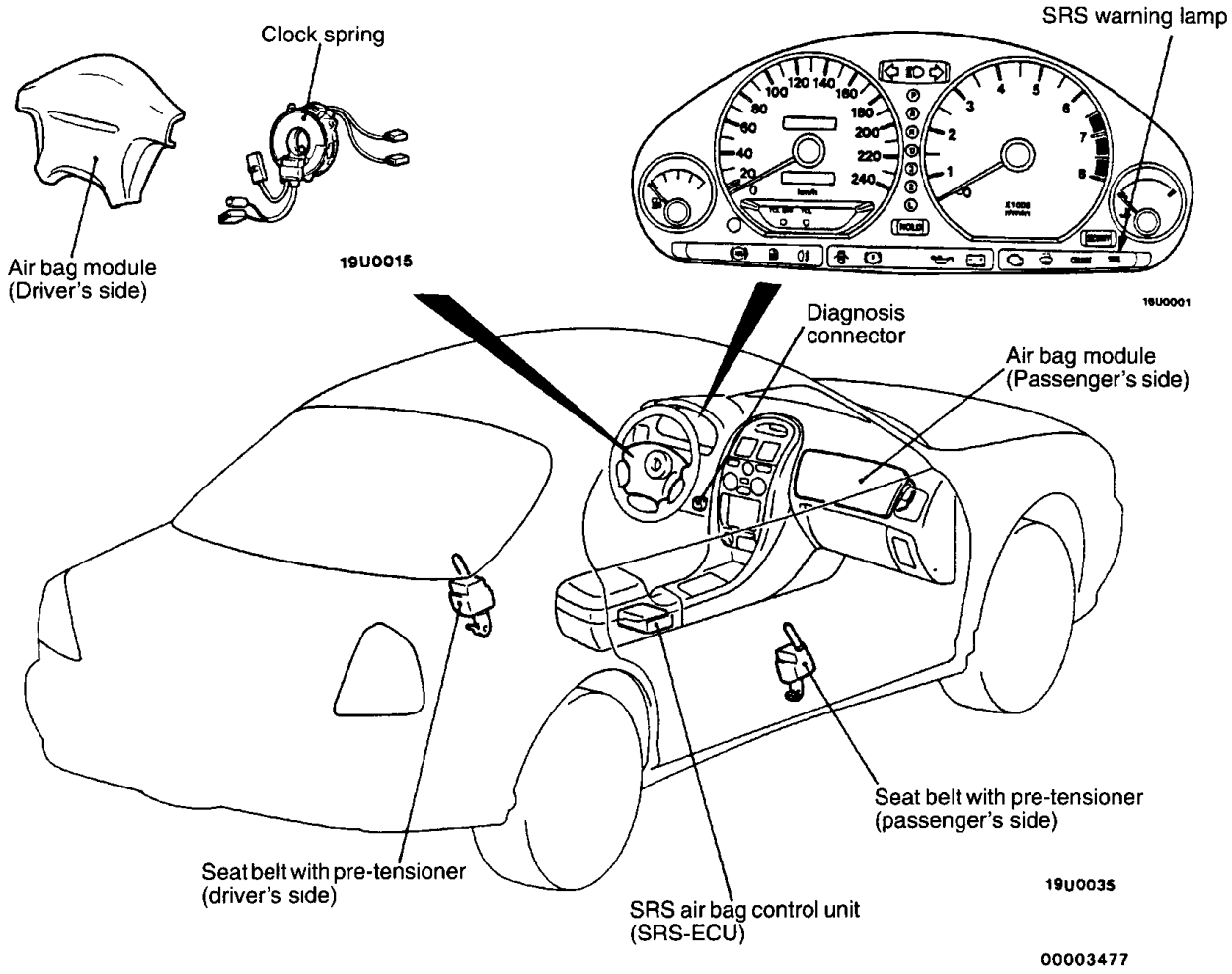


The SRS and seat belt tightening systems consist of two air bag modules, SRS air bag control unit (SRS-ECU), SRS warning lamp and clock spring and seat belt pre-tensioner. One air bag is located in the centre of the steering wheel and another above the glove box. Each air bag has the folded air bag and an inflator unit. The control unit under the floor console monitors the system and a safing G sensor and an analogue 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.

The SRS-ECU has the following functions:

- Back up function (charging condenser for power supply) in case of a power failure when the SRS air bag is deployed (in a collision).
- Voltage raising function (DC – DC converter circuit) in case of a drop in the battery voltage
- Self-diagnosis function to improve safety and reliability

CONSTRUCTION DIAGRAM



SRS SERVICE PRECAUTIONS

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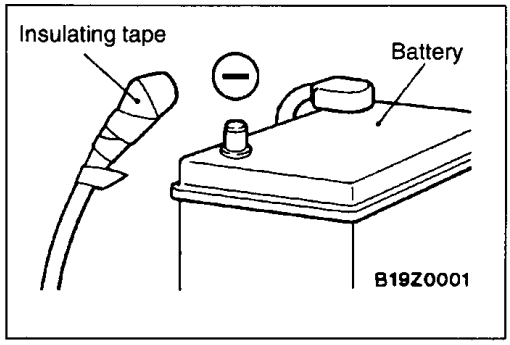
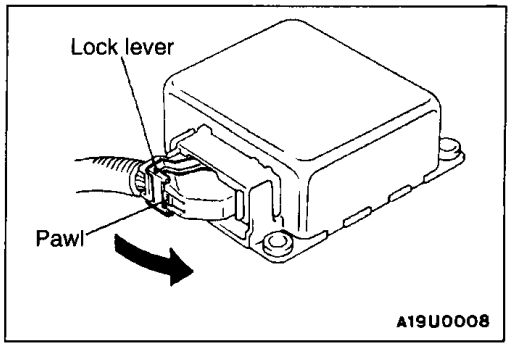
1. In order to avoid injury to yourself or others from accidental deployment of the air bag or accidental operation of the seat belt pretensioner during servicing, read and carefully follow all the precautions and procedures which are described in this manual.
2. Do not use any electrical test equipment 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*)
   - Seat Belt with Pre-tensioner

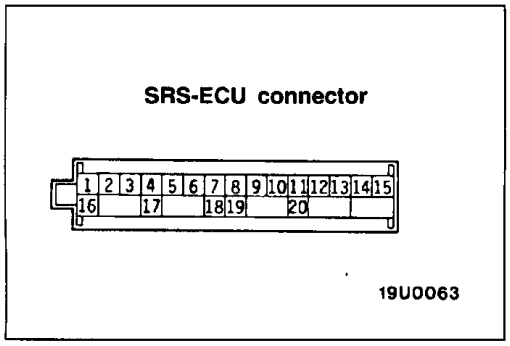
NOTE
*: Vehicles with front passenger's air bag
If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENTS SERVICE procedures in this manual, starting at page GROUP 52B.



4. **After disconnecting the battery cable, with 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. To disconnect the SRS-ECU connector, push the connector pawl to unlock the connector, and then turn the lock lever in the direction of the arrow.



6. 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.

Harness Connector (No. of Terminal, Colour)	SRS-ECU Terminal No.	Destination of Harness	Corrective Action
20 pins, orange	1 10	Body wiring harness → Earth	Correct or replace each wiring harness.
	2* 3*	Body wiring harness → Air bag module (Front passenger's side)	
	4	Body wiring harness → Junction block (fuse No. 11)	
	5 6	Body wiring harness → Clock spring → Air bag module (Driver's side)	Correct or replace each wiring harness. Replace clock spring.
	7	Body wiring harness → Diagnosis connector	Correct or replace each wiring harness.
	8 9	Body wiring harness → Combination meter (SRS warning lamp)	
	11	Body wiring harness → Junction block (fuse No. 4)	
	12 13	Body wiring harness → Seat belt with pre-tensioner (Front passenger's side)	
	14 15	Body wiring harness → Seat belt with pre-tensioner (Driver's side)	
	16~20	–	–

NOTE
*: Vehicles with front passenger's air bag.

7. SRS component and seat belt with pre-tensioner should not be subjected to heat, so remove the SRS-ECU, air bag module, clock spring and seat belt with pre-tensioner before drying or baking the vehicle after painting.
   - SRS-ECU, air bag module, clock spring: 93°C or more
   - Seat belt with pre-tensioner: 90°C or more
8. Whenever you finish servicing the SRS, check warning lamp operation to make sure that the system functions properly. (Refer to GROUP 52B.)
9. Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.
10. If you have any questions about 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.

SUPPORT LOCATIONS FOR LIFTING AND JACKING

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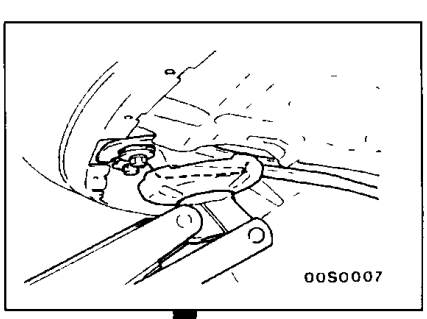
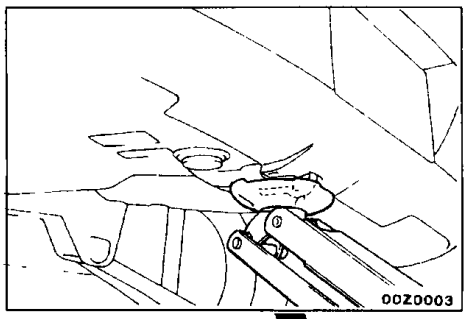
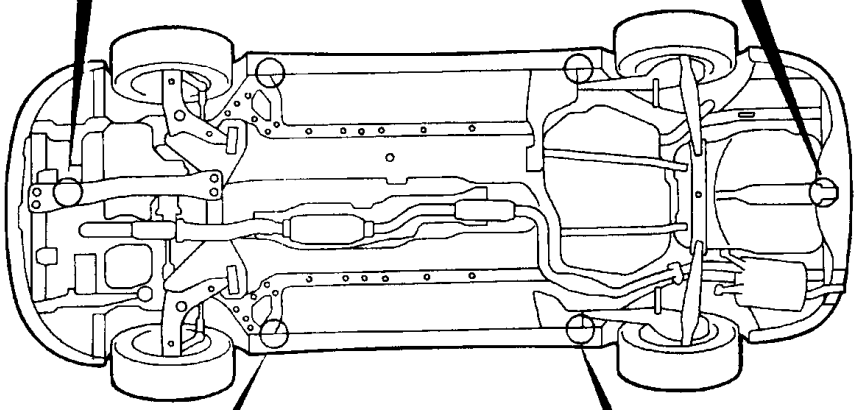
Caution
Do not support the vehicles at locations other than specified supporting points. If do so, this will cause damage, etc.

SUPPORT POSITIONS FOR A GARAGE JACK AND AXLE STANDS

GARAGE JACK







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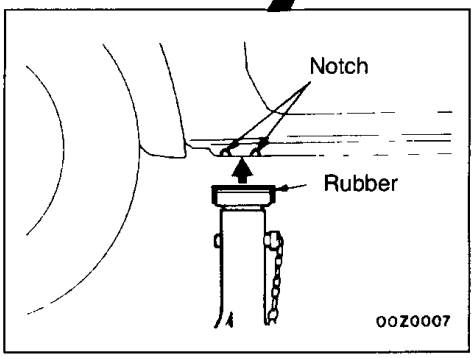
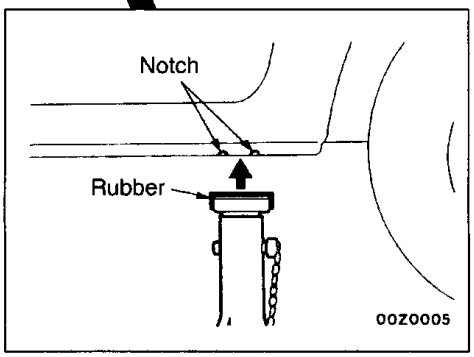
AXLE STANDS





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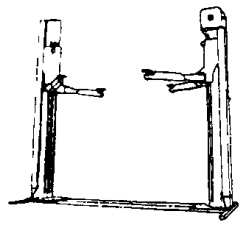
SUPPORT POSITIONS FOR A SINGLE-POST LIFT OR DOUBLE-POST LIFT

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

DOUBLE-POST LIFT



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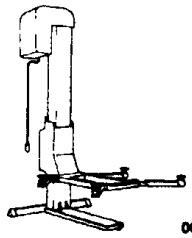
SINGLE-POST LIFT



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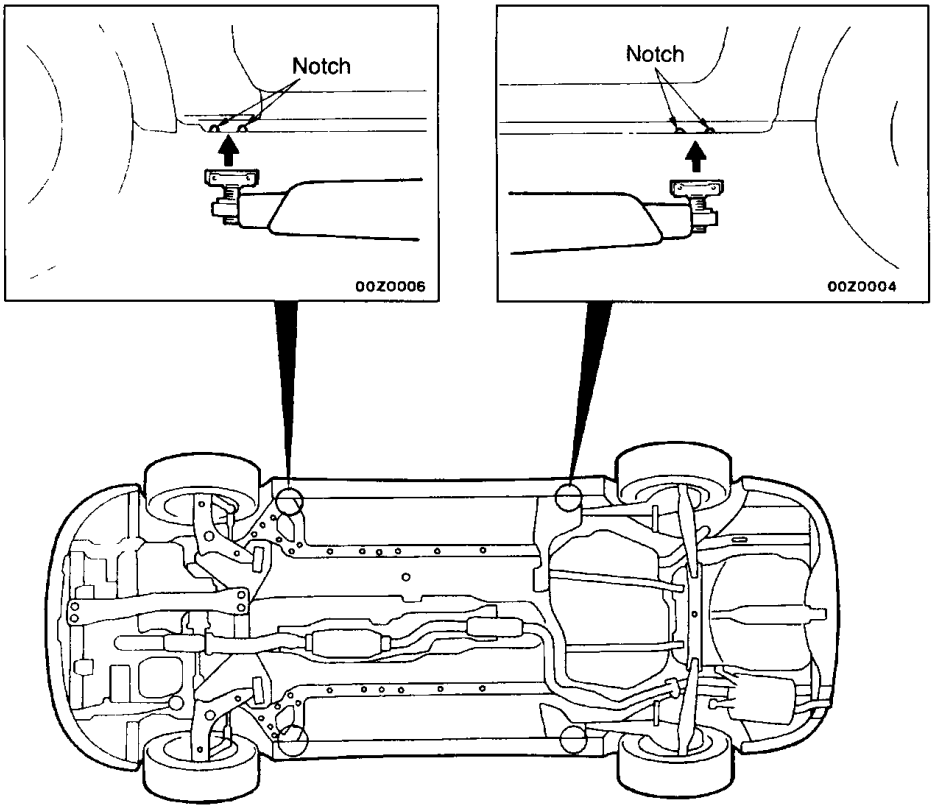

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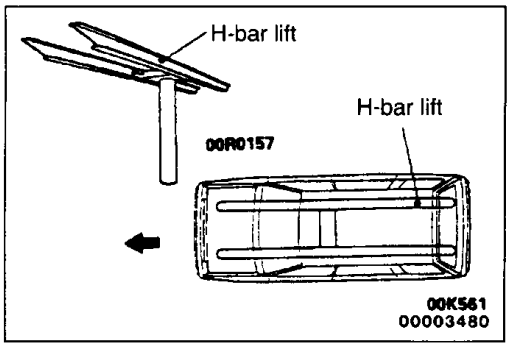
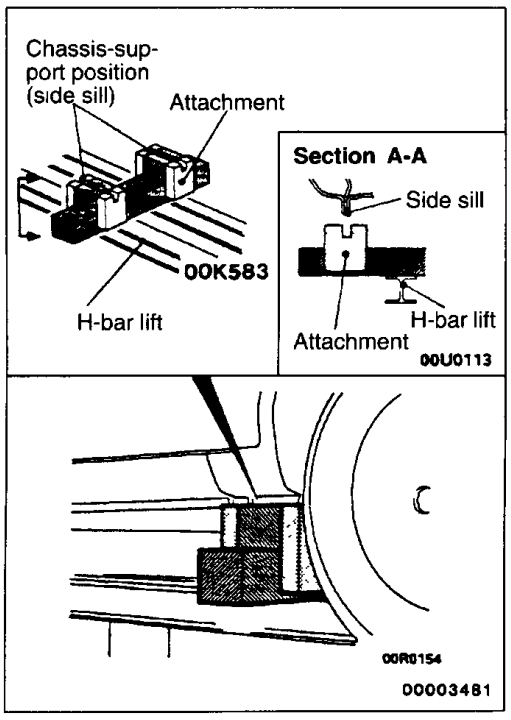


SUPPORT POSITIONS AND SUPPORT METHOD FOR AN H-BAR LIFT

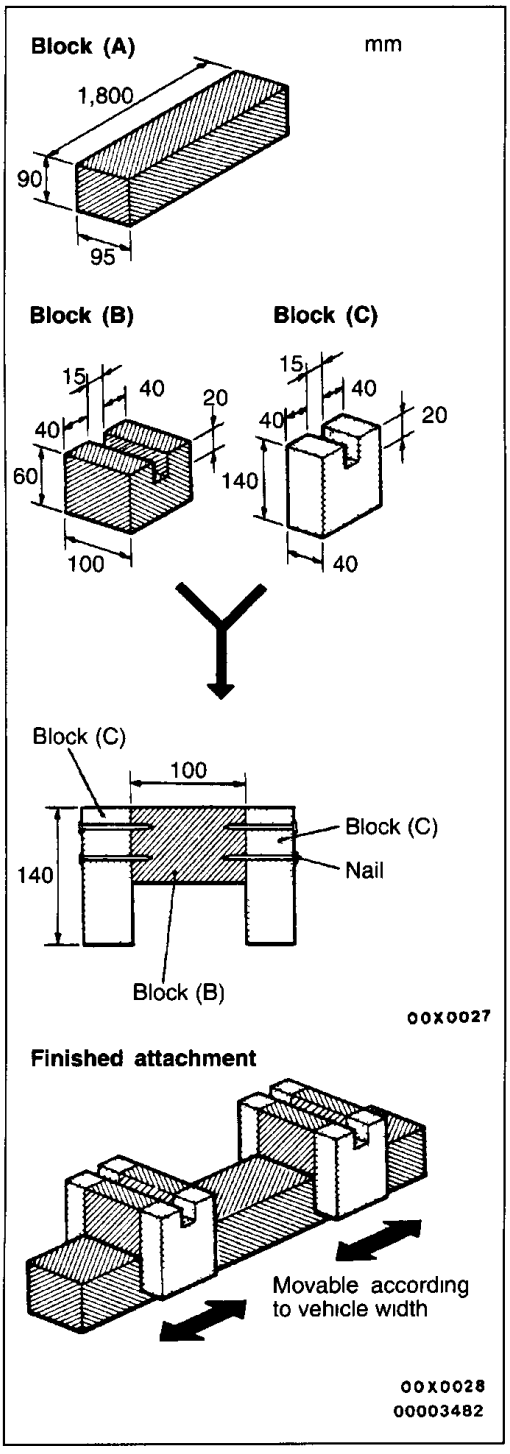
Caution
When service procedures require removing rear suspension, fuel tank, spare tyre and rear bumper, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping of centre of gravity changes.

When H-bar lift is used to lift up vehicles, use of metallic attachment attached to the H-bar lift may cause damage to the suspension arm etc. Therefore, lift up the vehicle by the following procedure.



1. Place the vehicle on the H-bar lift (same direction).
2. Place attachments on the H-bar lift at the designated chassis-support positions. When making the attachments, refer to the section concerning making them.

   Caution
   If support is at any location other than the designated positions, the body or suspension might be deformed or otherwise damaged, so care should be taken to support only at the correct (designated) positions.
3. Raise the H-bar lift to the height at which the vehicle is slightly raised and check to be sure that the vehicle is correctly and sufficiently secured; then raise the vehicle.



PREPARATION OF "ATTACHMENTS"

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

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

Caution
The wood selected for the blocks must be hard.

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

STANDARD PARTS-TIGHTENING-TORQUE TABLE

00100110033

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

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

Standard bolt and nut tightening torque

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

Flange bolt and nut tightening torque

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

4G9 ENGINE

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11109000085

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GENERAL INFORMATION

11100010087

Items			4G92	4G93	4G93
Total displacement mℓ			1,597	1,834	1,834
Bore × Stroke mm			81.0×77.5	81.0×89.0	81.0×89.0
Compression ratio			10.0	10.0	10.5
Combustion chamber			Pentroof type	Pentroof type	Pentroof type
Camshaft arrangement			SOHC	SOHC	DOHC
Number of valve	Intake		8	8	8
	Exhaust		8	8	8
Valve timing	Intake	Opening	20	14	20
		Closing	42	50	60
	Exhaust	Opening	54	58	61
		Closing	2	10	15
Fuel system			Electronic control multipoint fuel injection	Electronic control multipoint fuel injection	Electronic control multipoint fuel injection
Rocker arm			Roller type	Roller type	Roller type
Auto-lash adjuster			Not equipped	Not equipped	Equipped

SERVICE SPECIFICATIONS

11100030106

Items			Standard value	Limit
Alternator 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	8.0–10.5	–
		When a used belt is installed	8.5–10.0	–
		When a new belt is installed	7.0–8.0	–

Items			Standard value	Limit
Power steering oil pump 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	10.0–12.0	–
		When a used belt is installed	10.0–11.0	–
		When a new belt is installed	7.0–9.0	–
Valve clearance (at hot) mm <SOHC>		Intake valve	0.20	–
		Exhaust valve	0.30	–
Basic ignition timing		SOHC	5° BTDC±2°	–
		DOHC	5° BTDC±3°	–
Idle speed r/min		4G92–SOHC	750±100	–
		4G93–SOHC, 4G93–DOHC	800±100	–
CO contents %			0.5 or less	–
HC contents ppm			100 or less	–
Compression pressure (250–400 r/min) kPa		SOHC	1,270	min. 960
		DOHC	1,320	min. 1,000
Compression pressure difference of all cylinder kPa			–	max. 100
Intake manifold vacuum kPa			min. 60	–
Cylinder head bolt shank length mm			–	96.4
Auto-tensioner push rod movement mm			Within 1	–
Timing belt tension torque Nm (Reference value)			2.5–4.0	–
Auto tensioner rod protrusion mm			3.8–4.5	–

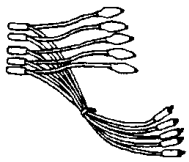
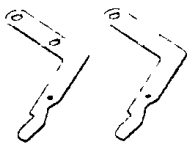
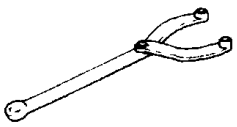
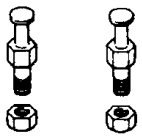
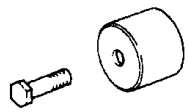
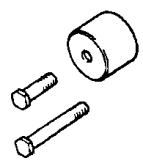
SEALANTS

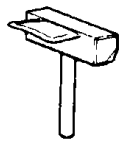
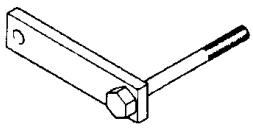
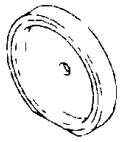
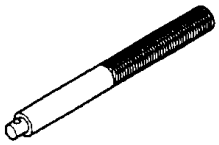
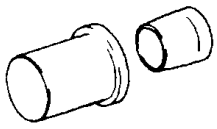
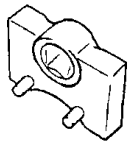
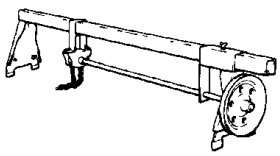
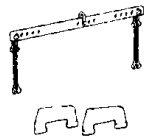
11100050102

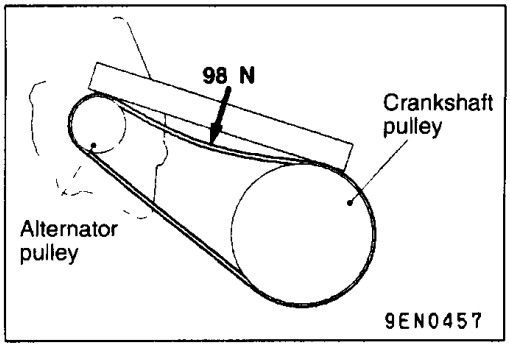
Items	Specified sealant	Remarks
Cam cup <DOHC> Rocker cover and cylinder head <DOHC> Semi-circular packing	3M ATD Part No. 8660 or equivalent	Semi-drying sealant
Oil pan Thermostat case	MITSUBISHI GENUINE PART MD970389 or equivalent	
Fly wheel bolt <M/T> or drive plate bolt <A/T>	3M Stud locking 4170 or equivalent	

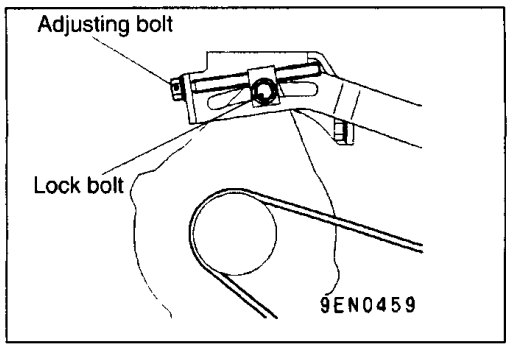
SPECIAL TOOLS

11100060105

Tool	Number	Name	Use
	MB991348	Test harness set	Check the idle speed
	MD998782	Valve lifter set	Removal of roller rocker arm
	MB990767	End yoke holder	• Holding the camshaft pulley <SOHC> • Holding the crankshaft pulley
	MD998719 or MD998754	Crankshaft pulley holder pin	
	MD998713	Camshaft oil seal installer	Press-in of the camshaft oil seal
	MD998761	Camshaft oil seal installer	Press-in of the circular packing <DOHC>

Tool	Number	Name	Use
	MD998727	Oil pan remover	Removing the oil pan <SOHC>
	MD998781	Fly wheel stopper	Securing the flywheel <M/T> or drive plate <A/T>
	MD998776	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal
	MB990938	Handle	Press-fitting the crankshaft rear oil seal
	MD998717	Crankshaft front oil seal installer	Press-fitting the crankshaft front oil seal
	MD998767	Tension pulley socket wrench	Timing belt tension adjustment <DOHC>
	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
	MB991453	Engine hanger assembly	





ON-VEHICLE SERVICE

11100090142

DRIVE BELT TENSION CHECK AND ADJUSTMENT

ALTERNATOR DRIVE BELT TENSION CHECK

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

Standard value:

Tension N	294–490
Deflection (Reference value) mm	8.0–10.5

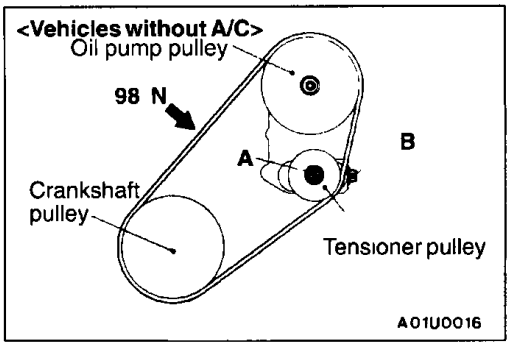
ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

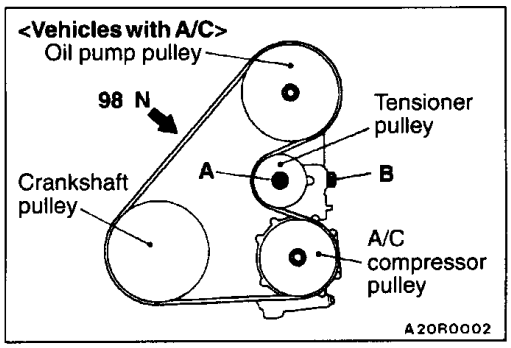
1. Loosen the nut of the alternator pivot bolt.
2. Loosen the lock bolt.
3. Use the adjusting bolt to adjust the belt tension and belt deflection to the standard values.

Standard value:

Items	When a used belt is installed	When a new belt is installed
Tension N	343–441	490–686
Deflection (Reference value) mm	8.5–10.0	7.0–8.0

4. Tighten the lock bolt.
   Tightening torque: 23 Nm
5. Tighten the nut of the alternator pivot bolt.
   Tightening torque: 44 Nm
6. Tighten the adjusting bolt.
   Tightening torque: 6 Nm





POWER STEERING OIL PUMP AND AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

11100130035

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 98 N and check that the amount of belt deflection is at the standard value.

   Standard value:

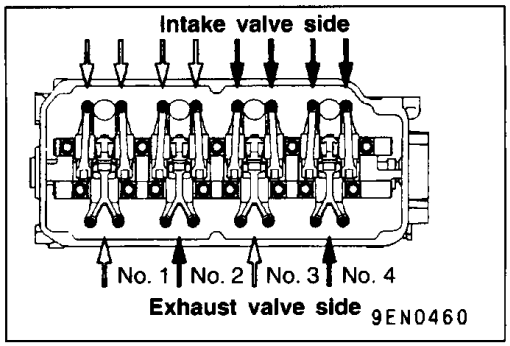
Items	When checked	When a used belt is installed	When a new belt is installed
Tension N	392–588	441–539	637–833
Deflection mm	10.0–12.0	10.0–11.0	7.0–9.0

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen tension pulley fixing bolt A.
   (2) Adjust the amount of belt deflection using adjusting bolt B.
   (3) Tighten fixing bolt A.
   (4) Check the belt deflection amount and tension, and readjust if necessary.

   Caution
   - **Check after turning the crankshaft once or more clockwise (right turn).**

VALVE CLEARANCE CHECK AND ADJUSTMENT <SOHC>

11100150031



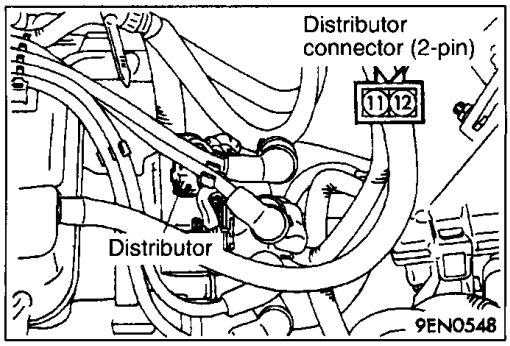
1. Start the engine and allow it to warm up until the engine coolant temperature reaches 80 to 95°C.
2. Remove all spark plugs from the cylinder head for easy inspection.
3. Remove the rocker cover.
4. Turn the crankshaft clockwise until the notch on the pulley is lined up with the "T" mark on the timing indicator.
5. Move the rocker arms on the No. 1 and No. 4 cylinders up and down by hand to determine which cylinder has its piston at the top dead centre on the compression stroke. If both intake and exhaust valve rocker arms have a valve lash, the piston in the cylinder corresponding to these rocker arms is at the top dead centre on the compression stroke.
6. Valve clearance inspection and adjustment can be performed on rocker arms indicated by white arrow mark when the No. 1 cylinder piston is at the top dead centre on the compression stroke, and on rocker arms indicated by black arrow mark when the No. 4 cylinder piston is at the top dead centre on the compression stroke.
7. Measure the valve clearance.
   If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge while turning the adjusting screw.

   Standard value (hot engine):
   Intake valve: 0.20 mm
   Exhaust valve: 0.30 mm
8. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut to the specified torque.

   Tightening torque: 9 Nm

9. Turn the crankshaft through 360° to line up the notch on the crankshaft pulley with the "T" mark on the timing indicator.
10. Repeat steps (7) and (8) on other valves for clearance adjustment.
11. Install the rocker cover.
12. Install the spark plugs and tighten to the specified torque.

    Tightening torque: 25 Nm



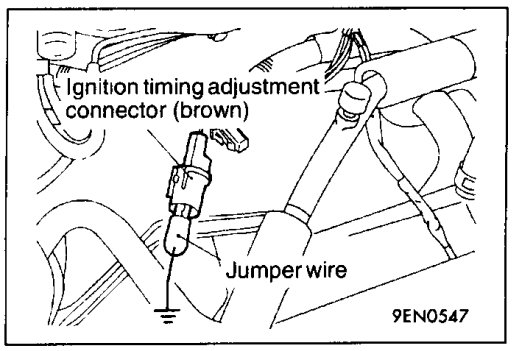
IGNITION TIMING CHECK AND ADJUSTMENT <SOHC>

11100160072

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Disconnect the distributor connector (2-pin), and connect the special tool (test harness set: MB991348) in between. All terminals should be connected.
3. Connect a primary voltage-detection type of tachometer to terminal (12) of the distributor connector.

   NOTE
   Do not use the MUT-II.
   If tested with the MUT-II connected to the diagnosis connector, the ignition timing will not be the basic timing but be ordinary timing.
4. Set up a timing light.
5. Start the engine and run it at idle.
6. Check that engine idle speed is within the standard value.

   Standard value:
   4G92 engine: 750±100 r/min
   4G93 engine: 800±100 r/min



7. Turn the ignition switch to OFF.
8. Remove the waterproof connector from the ignition timing adjustment connector (brown).
9. Connect the jumper wire with the clip to the ignition timing adjustment terminal, and earth this to the body as illustrated.

   NOTE
   Earthing this terminal sets the engine to the basic ignition timing.
10. Start the engine and run it at idle.

11. Check that basic ignition timing is within the standard value.

    Standard value: 5° BTDC±2°

12. If not within the standard value, loosen distributor mounting bolt and adjust by rotating distributor body.
13. Tighten mounting bolt after adjusting.

    Tightening torque: 24 Nm

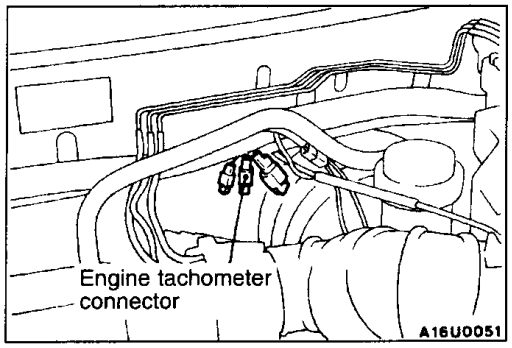
14. Stop the engine, remove the jumper wire from the ignition timing adjustment connector (brown), and return the connector to its original condition.
15. Start the engine and check that ignition timing at the standard value.

    Standard value: Approx. 10° BTDC

    NOTE
    1. Ignition timing is variable within about ± 7°, even under normal operating.
    2. And it is automatically further advanced by about 5° from 10° BTDC at higher altitudes.

16. Sealing tape is to be attached to the fitting nut only for vehicles for Switzerland.

    NOTE
    Sealing tape is attached to all vehicles when new.



IGNITION TIMING CHECK AND ADJUSTMENT <DOHC>

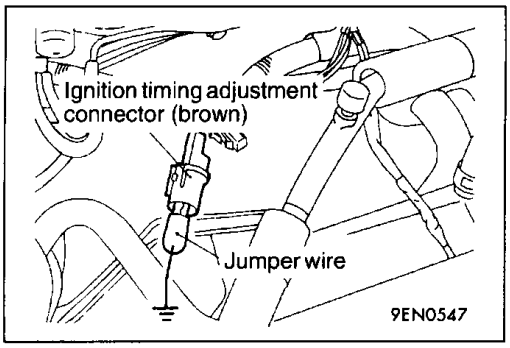
11100170013

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Insert a paper clip from the harness side into the 1 pin connector as shown in the illustration at left.
3. Connect a primary-voltage-detection type of tachometer to the paper clip.

    NOTE
    Do not use the MUT-II.
    If tested with the MUT-II connected to the diagnosis connector, the ignition timing will not be the basic timing but be ordinary timing.

4. Set up a timing light.
5. Start the engine and run at idle.
6. Check that engine idle speed is within the standard value.

    Standard value: 800±100 r/min



7. Turn the ignition switch to OFF.
8. Remove the waterproof connector from the ignition timing adjustment connector (brown).
9. Connect the jumper wire with the clip to the ignition timing adjustment terminal, and earth this to the body as illustrated.

   NOTE
   Earthing this terminal sets the engine to the basic ignition timing.
10. Start the engine and run it at idle.
11. Check that basic ignition timing is within the standard value.

    Standard value: 5° BTDC±3°
12. If the basic ignition timing is outside the standard value, inspect the MPI system while referring to GROUP 13A – Troubleshooting.
13. Stop the engine, remove the jumper wire from the ignition timing adjustment connector (brown), and return the connector to its original condition.
14. Start the engine and check that ignition timing at the standard value.

    Standard value: Approx. 8° BTDC

    NOTE
    1. Ignition timing is variable within about ± 7°, even under normal operating.
    2. And it is automatically further advanced by about 5° from 8° BTDC at higher altitudes.

IDLE SPEED CHECK

11100190088

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Check the basic ignition timing. Adjust if necessary.

   Standard value:
   SOHC: 5° BTDC±2°
   DOHC: 5° BTDC±3°
3. After turning the ignition switch to OFF, connect the MUT-II to the diagnosis connector.
4. Start the engine and run it at idle.
5. Run the engine at idle for 2 minutes.
6. Check the idle speed. Select item No. 22 and take a reading of the idle speed.

   Curb idle speed:
   4G92 engine: 750±100 r/min
   4G93 engine: 800±100 r/min

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

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

IDLE MIXTURE CHECK

11100210036

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

   Standard value:
   SOHC: 5° BTDC±2°
   DOHC: 5° BTDC±3°

3. Turn the ignition switch to OFF and connect the MUT-II to the diagnosis connector.
4. Start the engine and run it at 2,500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

   Standard value
   CO contents: 0.5% or less
   HC contents: 100 ppm or less

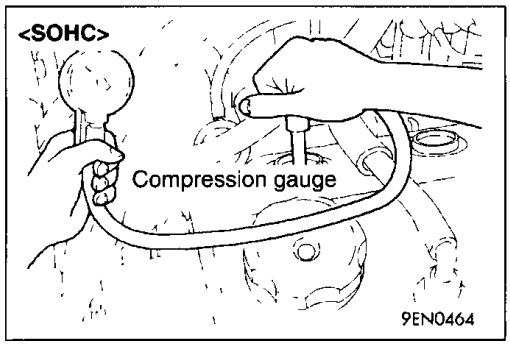
7. If there is a deviation from the standard value, check the following items:
   - Diagnosis output
   - Closed-loop control (When the closed-loop control is normal, the output signal of the oxygen sensor changes between 0–400 mV and 600–1,000 mV at idle.)
   - Combustion pressure
   - Injector
   - Ignition coil, spark plug cable, spark plug
   - Leak in the EGR system and in the EGR valve
   - Evaporative emission control system
   - Compression pressure

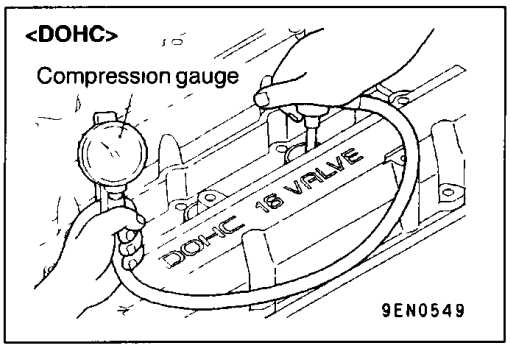
   NOTE
   Replace the three way catalyst when the CO and HC contents are not within the standard value, even though the result of the inspection is normal on all items.

COMPRESSION PRESSURE CHECK 11100260086

1. Before inspection, check that the engine oil, starter and battery are normal. In addition, set the vehicle to the pre-inspection condition.
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the distributor 6-pin connector <SOHC> or the crank angle sensor connector <DOHC>.

   NOTE
   Doing this will prevent the engine control unit from carrying out ignition and fuel injection.
5. Cover the spark plug hole with a shop towel etc., 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. **If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.**

6. Set compression gauge to one of the spark plug holes.
7. Crank the engine with the throttle valve fully open and measure the compression pressure.

   Standard value (at engine speed of 250–400 r/min):
   SOHC: 1,270 kPa
   DOHC: 1,320 kPa

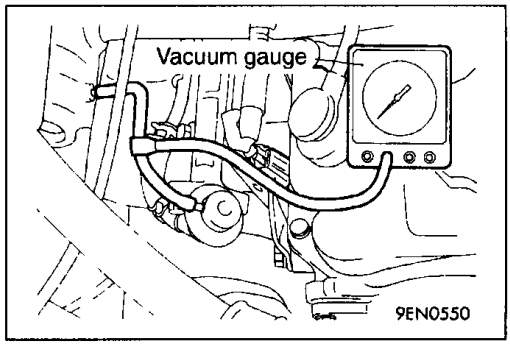
   Limit (at engine speed of 250–400 r/min):
   SOHC: min. 960 kPa
   DOHC: min. 1,000 kPa
8. Measure the compression pressure for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   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 (7) and (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 is leaking from the gasket.

10. Connect the distributor connector.
11. Install the spark plugs and spark plug cables.
12. Use the MUT-II to erase the diagnosis codes.

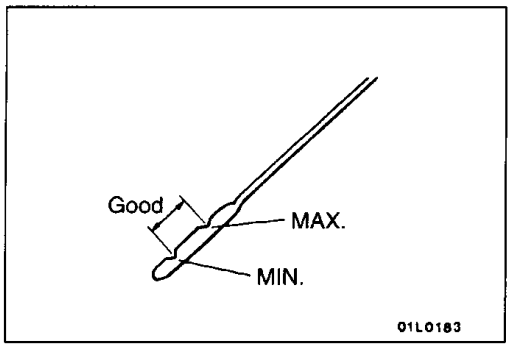
NOTE
This will erase the problem code resulting from the distributor connector being disconnected.

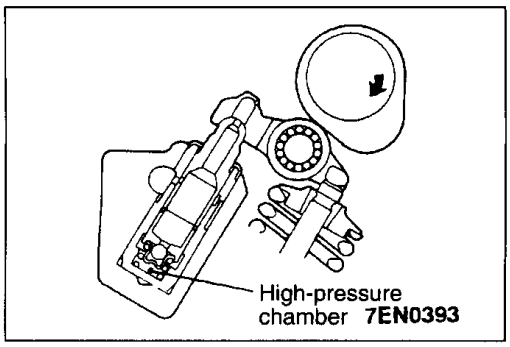


MANIFOLD VACUUM CHECK 11100270072

1. Start the engine and allow it to warm up until the temperature of the engine coolant reaches 80 to 95°C.
2. Connect a tachometer.
3. Attach a three-way union to the vacuum hose between the fuel pressure regulator and the air intake plenum, and connect a vacuum gauge.
4. Start the engine and check that idle speed is within specification. Then read off the vacuum gauge.

Standard value: min. 60 kPa





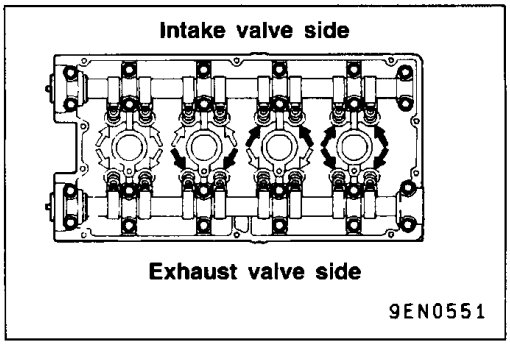
LASH ADJUSTER CHECK <DOHC> 11100290061

NOTE
Soon after the engine is started or while it is running, abnormal noise (clattering) which may be attributed to the adjuster sounds but does not stop. In this case, check the following.

1. Check the engine oil, and refil or replace oil if necessary.

   NOTE
   1. If the oil amount is small, air will be sucked from the oil strainer and mixed in the oil passage.
   2. If the oil amount is excessive, the oil will be stirred by the crank and mixed with a large amount of air.
   3. Air and oil can not be separated easily in the deteriorated oil, and the amount of air mixed in the oil increases.
      If such mixed-in air enters the high pressure chamber in the lash adjuster, the air in the high-pressure chamber will be compressed while the valve is opened, the lash adjuster will be excessively compressed and abnormal noise will be produced when the valve is closed.
      This is the same phenomenon which occurs when the valve clearance is improperly adjusted to be excessively large.
      However, it will return to be normal if the air entrapped in the adjuster is released in this case.
2. Start the engine, and slowly race* it several times (10 times or less).
   If the abnormal noise is eliminated by racing the engine, it means that the air is released from the high-pressure chamber of the lash adjuster and the function of the lash adjuster is returned to normal.
   * Gradually increase the engine speed from the idle speed to 3,000 r/min (for 30 seconds), and then gradually slow down the engine to the idling speed (for 30 seconds).

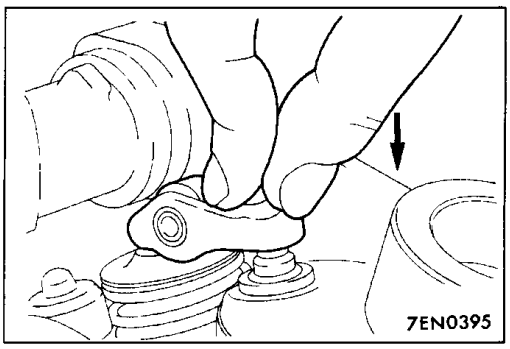
NOTE
1. If the vehicle is parked on a slope for a long time, the oill will be sometimes reduced in the lash adjuster, and air will enter the high-pressure chamber when the engine is started.
2. After the vehicle is parked for a long time, the oil will go out of the oil passage. Since it takes a little time to supply oil to the lash adjuster, air sometimes enters the high-pressure chamber.



3. If any abnormal noise is not eliminated by racing, check the lash adjuster.
   (1) Stop the engine.
   (2) Set the engine so that cylinder No. 1 is positioned at the top dead centre of the compression.
   (3) Press the rocker arm at the area indicated by the white arrow mark to check whether the rocker arm is lowered or not.
   (4) Slowly turn the crankshaft 360 degrees clockwise.
   (5) In the same procedure as step (3), check the rocker arm at the area indicated by the black arrow mark.
   (6) If the rocker arm is easily lowered when the section directly above the lash adjuster of the rocker arm is pressed, the lash adjuster is defective, so replace it according to the procedure in step (4).
   When the lash adjuster is replaced, bleed air from all adjusters and assemble them. Re-check them following steps (1) to (5).

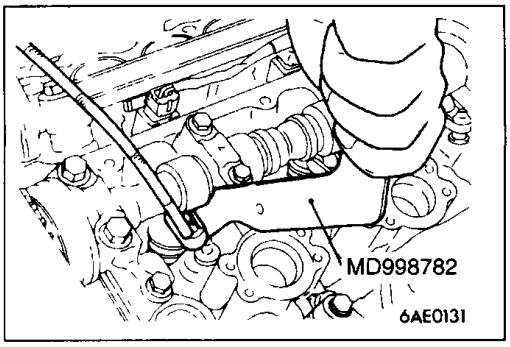
NOTE
1. A leak down test can be performed to accurately determine whether the lash adjuster is defective or not.
2. For the procedures for the leak down test and air bleeding of the lash adjuster, refer to the Engine Workshop Manual.

Moreover, if it is felt to be so hard that the rocker arm is not lowered when it is pressed, the lash adjuster is normal. Check for other causes of the abnormality.

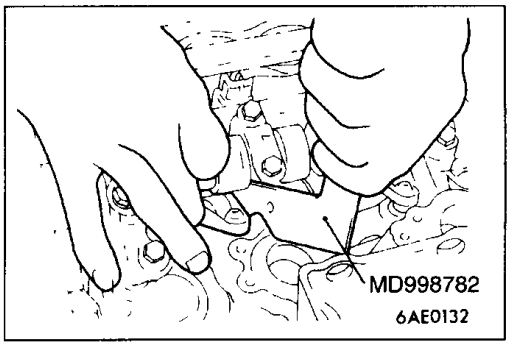


4. Lash adjuster replacement procedure.

Caution
In the cylinders which are being removed, the valves will touch the pistons when the valves are pushed down, so the crankshaft should be turn to lower the piston positions.
In addition, places where the rocker arms are lifted by the cams cannot be removed. In these cases, the crankshaft should be turned so that the rocker arms are not lifted.

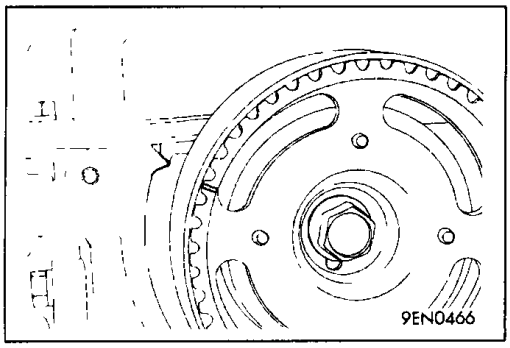


(1) Use the special tool to push down the valve, and remove the roller rocker arm.
(2) Remove the lash adjuster from the cylinder head.
(3) Install a new lash adjuster from which the air has been bled to the cylinder head.



(4) Use the special tool to push down the valve, and install the roller rocker arm.

NOTE
When installing the roller rocker arm, first set the pivot side of the rocker arm onto the top of the lash adjuster, and then after pushing down the valve, set the slipper side of the rocker arm on top of the end of the valve stem.



TIMING BELT TENSION ADJUSTMENT <SOHC>

11100280037

1. Remove the timing belt upper cover.
2. Turn the crankshaft clockwise to set the No. 1 cylinder to top dead compression centre.

   Caution
   As the purpose of this procedure is to apply the proper amount of tension to the timing belt by means of the cam drive torque, be sure not to rotate the crankshaft in the opposite direction.

3. Remove the access cover.
4. Loosen the timing belt tensioner fixing bolt to apply tension to the belt by means of the force of the tensioner spring.

   Caution
   The bolt can be loosened 80°–200°.
   If the belt is loosened more than necessary, the bolt may fall in side the cover.

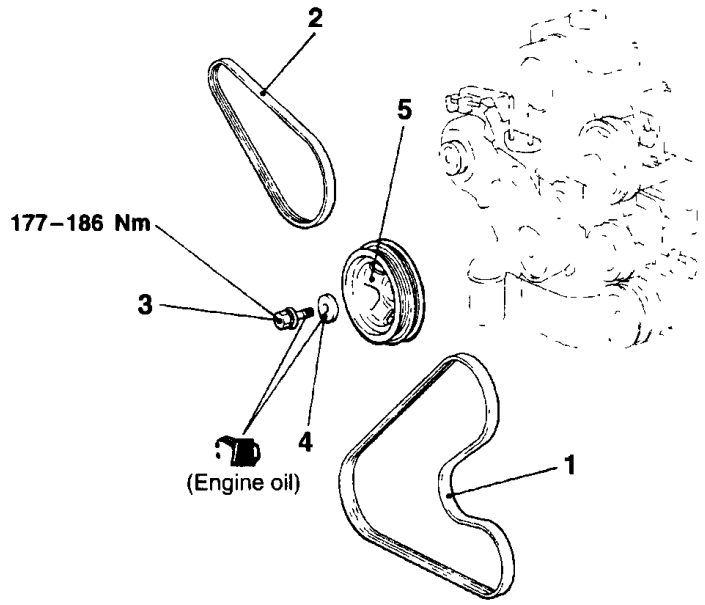
5. Tighten the timing belt tensioner fixing bolt.
6. Install the access cover.
7. Install the timing belt upper cover.

CRANKSHAFT PULLEY

11200160082

REMOVAL AND INSTALLATION

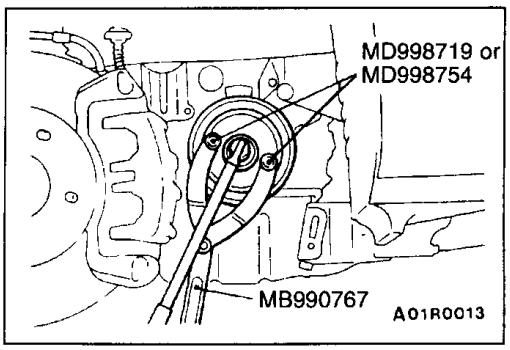
Pre-removal and Post-installation Operation
- Under Cover (R.H.) Removal and Installation



Removal steps
- Drive belt tension adjustment (Refer to P.11-6.)

1. Drive belt (Power steering and A/C)
2. Drive belt (Alternator)

◀A▶ ▶A◀ 3. Crankshaft pulley bolt
4. Crankshaft pulley washer
5. Crankshaft pulley



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY BOLT REMOVAL

INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT PULLEY BOLT INSTALLATION

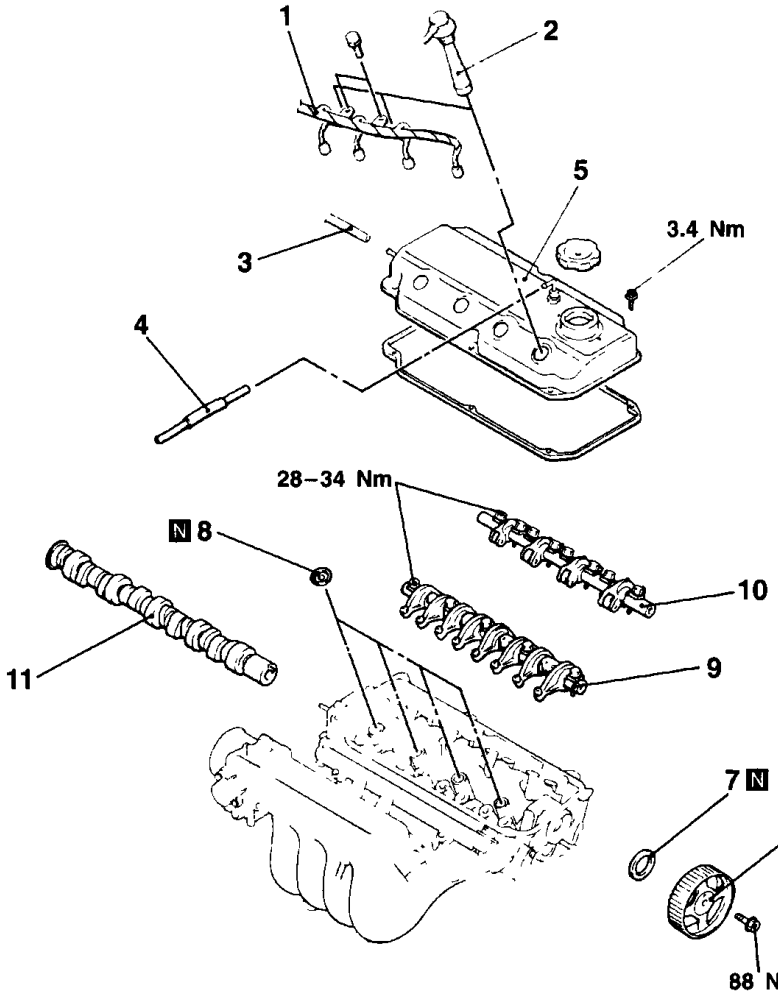
When installing the crankshaft bolt, apply the minimum amount of engine oil to the bearing surface and thread of the bolt.

CAMSHAFT AND CAMSHAFT OIL SEAL <SOHC>

11200190074

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Distributor Removal and Installation (Refer to GROUP 16.)
- Timing Belt Removal and Installation (Refer to P.11-40.)



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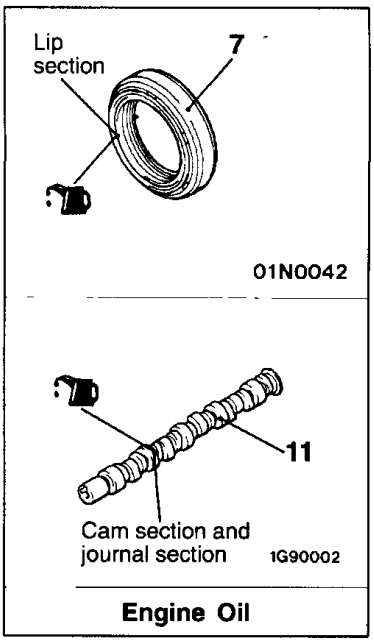


Removal steps

1. Control harness connection
2. Spark plug cable
3. Breather hose connection
4. PCV hose connection
5. Rocker cover
   - Valve clearance adjustment (Refer to P.11-8.)

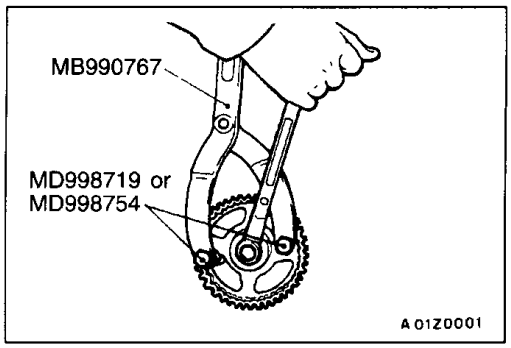
◀A▶ ▶B◀ 6. Camshaft sprocket

▶A◀ 7. Camshaft oil seal
8. Spark plug guide oil seal

◀B▶ 9. Rocker arm and shaft assembly (intake side)

◀B▶ 10. Rocker arm and shaft assembly (exhaust side)

11. Camshaft



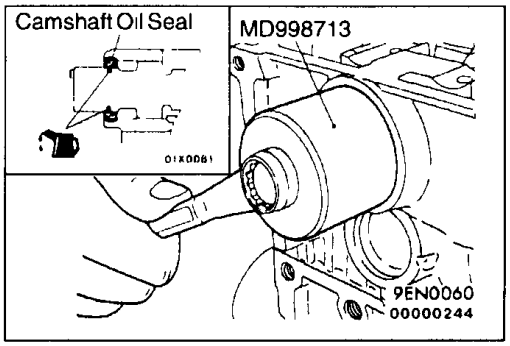
REMOVAL SERVICE POINTS

◀A▶ CAMSHAFT SPROCKET REMOVAL

◀B▶ ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

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◀ CAMSHAFT OIL SEAL INSTALLATION

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

▶B◀ CAMSHAFT SPROCKET INSTALLATION

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

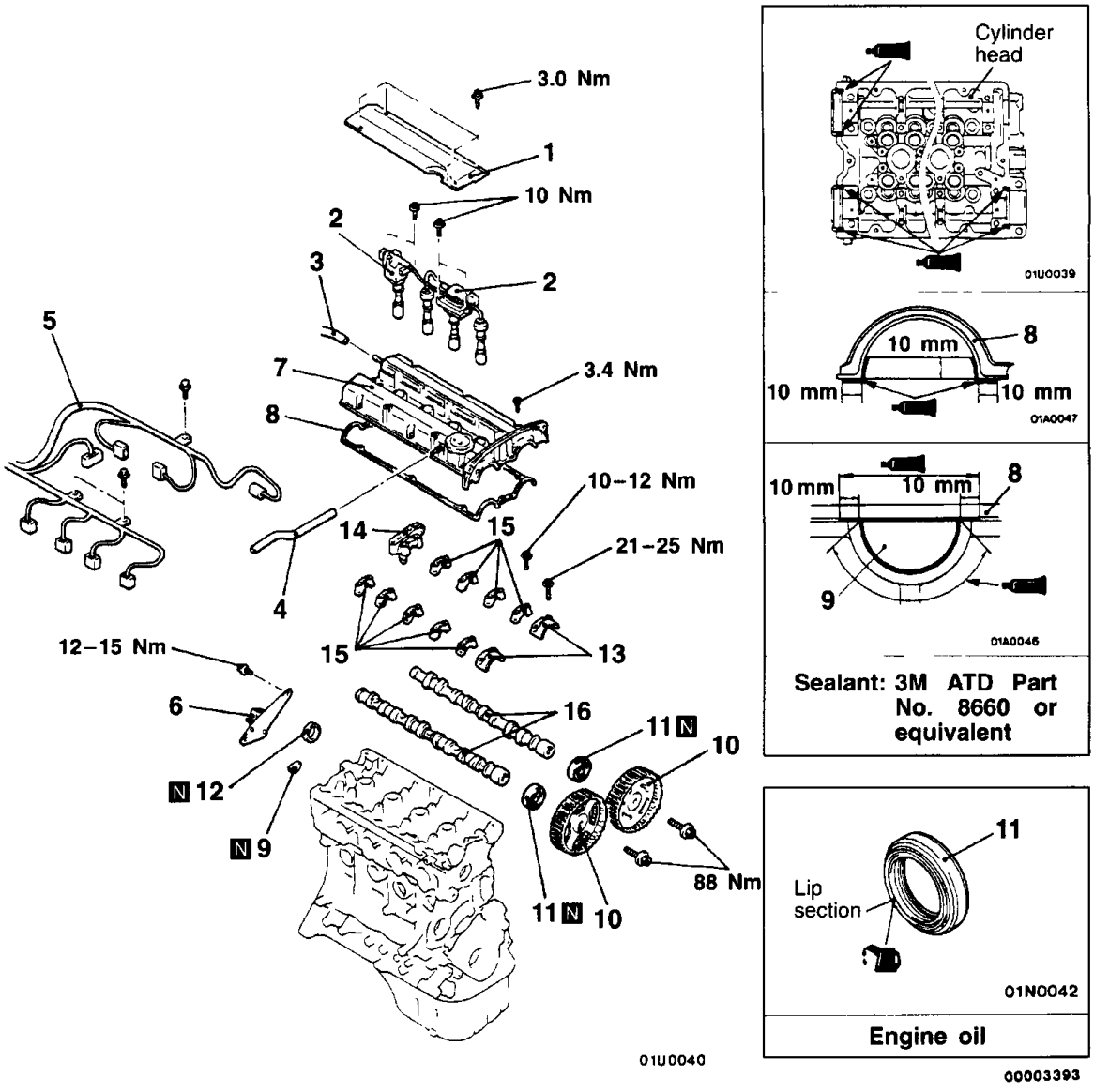
Specified torque: 88 Nm

CAMSHAFT AND CAMSHAFT OIL SEAL <DOHC>

11200190081

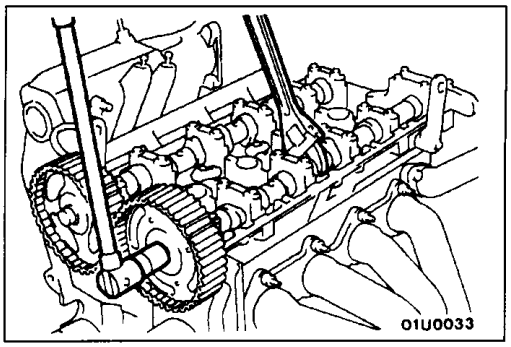
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11-43.)



Removal steps

1. Center cover
2. Ignition coil assembly
3. Breather hose connection
4. PCV hose connection
5. Control harness connection
6. Ignition failure sensor assembly
7. Rocker cover
8. Rocker cover gasket
9. Semi-circular packing
10. Camshaft sprocket ◀A▶ ▶E◀
11. Camshaft oil seal ▶D◀
12. Circular packing ▶C◀
13. Front cam cap ▶B◀
14. Rear cam cap ▶B◀
15. Cam cap ▶B◀
16. Camshaft ▶A◀

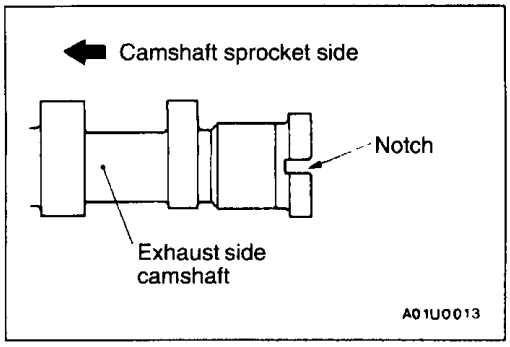


REMOVAL SERVICE POINT

◀A▶ CAMSHAFT SPROCKET REMOVAL

Hold the hexagonal section of the camshaft with a wrench, etc., and loosen the camshaft sprocket bolt.

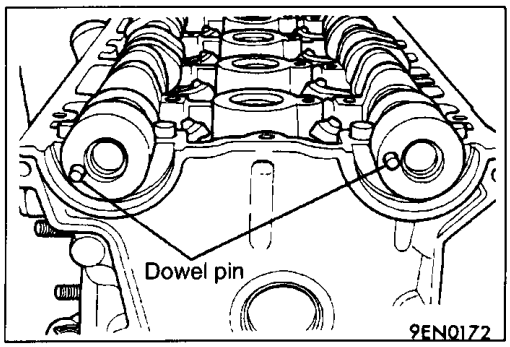
Caution
As the sprocket could become damaged, do not apply the wrench to the camshaft sprocket.



INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT INSTALLATION

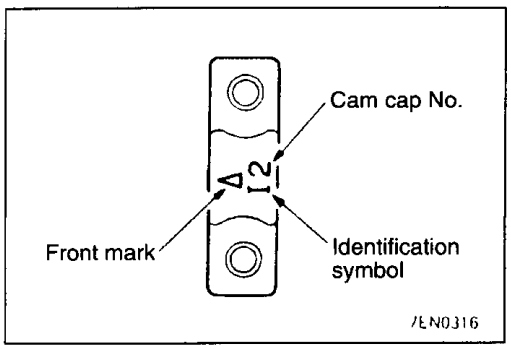
1. Apply engine oil to journals and cams of the camshafts.
2. Install the camshafts on the cylinder head.
   Be careful not to confuse the intake camshaft with the exhaust one. The exhaust camshaft has a notch on its rear end.



▶B◀ CAM CAP/REAR CAM CAP/FRONT CAM CAP INSTALLATION

1. Set the camshaft dowel pins in the positions shown in the illustration.

   NOTE
   Place the notch for tightening the camshaft head bolt in the correct position.



2. Check the identification symbols and the cap numbers of the bearing caps and install them so that they are aligned with the front marks on the cylinder head.

   Identification symbol:
   Intake side I
   Exhaust side E

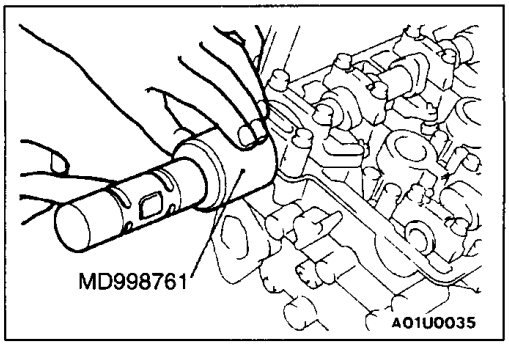
3. Apply specified sealant to the cylinder head in the specified places.

   Specified sealant:
   3M ATD Part No. 8660 or equivalent

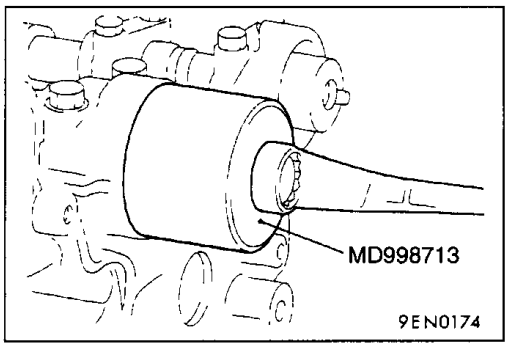
4. After provisionally tightening the cam caps in 2–3 turns, tighten to the specified torque.

   Specified torque:
   Front and rear cam cap 21–25 Nm
   Cam cap 10–12 Nm

5. Check to ensure that the rocker arm is held in position on the lash adjuster and valve stem end.



▶C◀ CIRCULAR PACKING INSTALLATION



▶D◀ CAMSHAFT OIL SEAL INSTALLATION

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

▶E◀ CAMSHAFT SPROCKET INSTALLATION

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

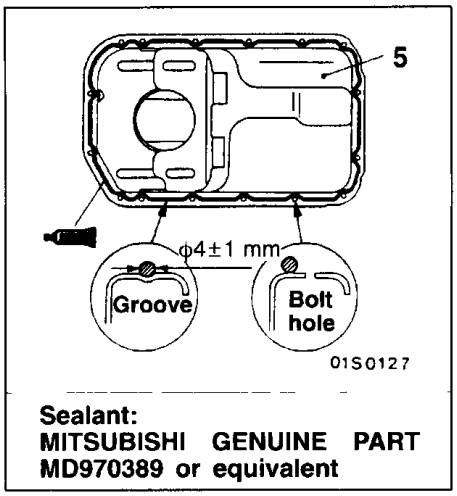
Specified torque: 88 Nm

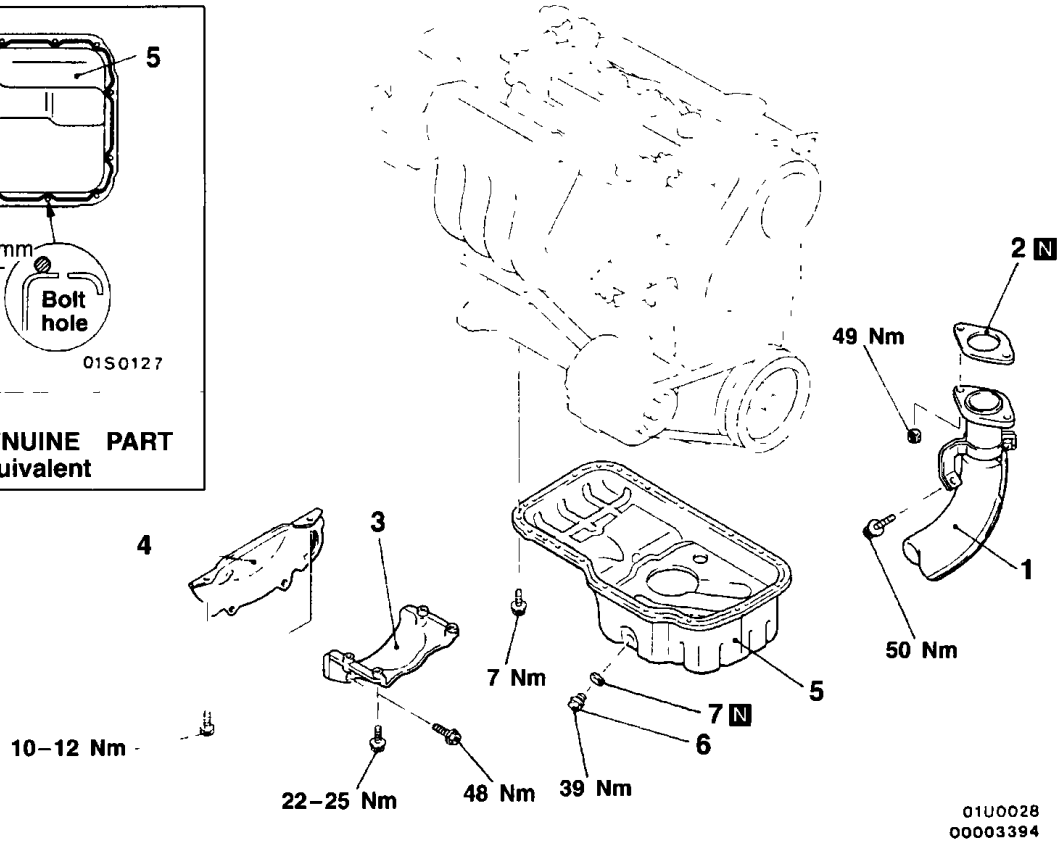
OIL PAN <SOHC>

11200280061

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Oil Draining and Supplying (Refer to GROUP 12 – On-vehicle Service.)
- Oil Level Gauge Removal and Installation
- Under Cover Removal and Installation



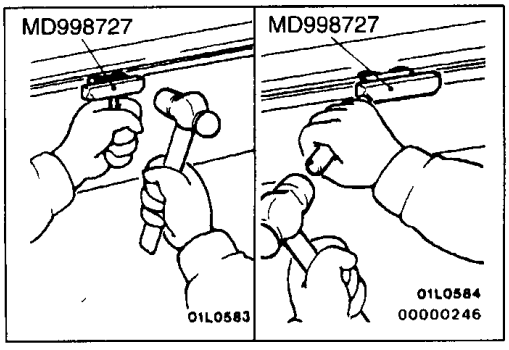


Removal steps

1. Front exhaust pipe connection
2. Gasket
3. Transmission stay
4. Bell housing cover

◀A▶
5. Oil pan
6. Drain plug

▶A◀
7. Drain plug gasket

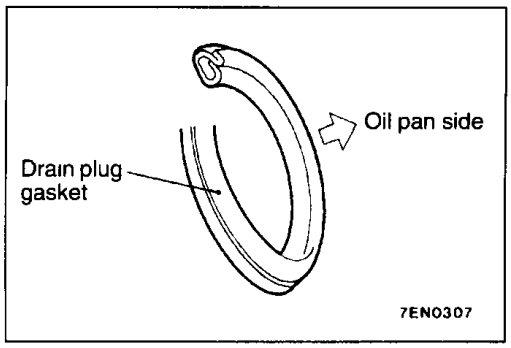


REMOVAL SERVICE POINT

◀A▶ OIL PAN REMOVAL

After removing the oil pan mounting bolts, remove the oil pan with the special tool and a brass bar.

Caution
Perform this slowly to avoid deformation of the oil pan flange.



INSTALLATION SERVICE POINT

▶A◀ DRAIN PLUG GASKET INSTALLATION

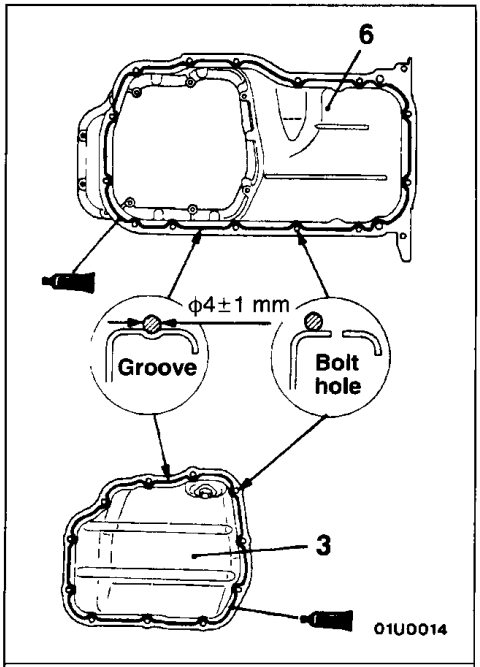
Install the drain plug gasket in the direction so that it faces as shown in the illustration.

OIL PAN <DOHC>

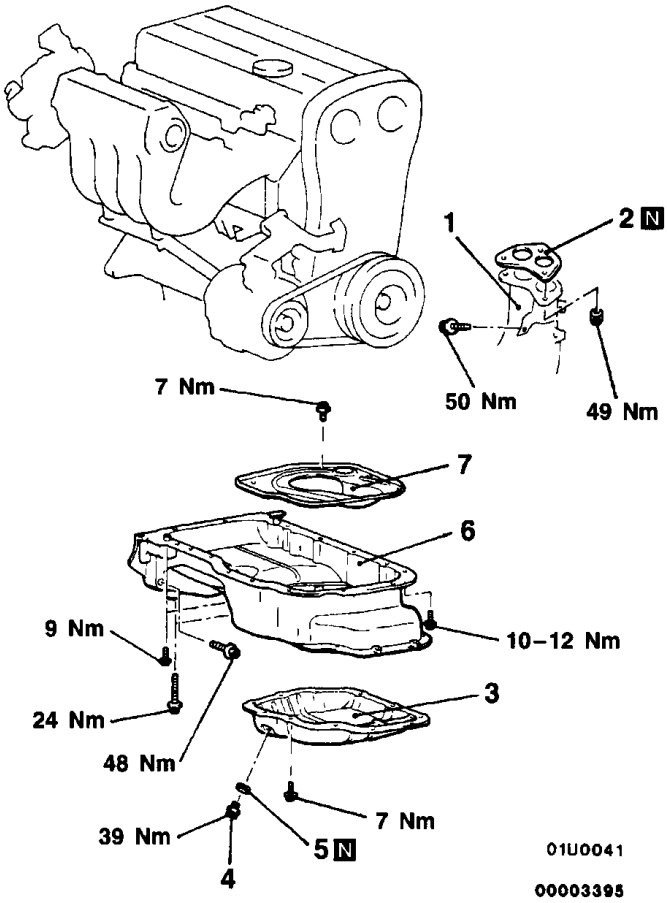
11200280078

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Oil Draining and Supplying (Refer to GROUP 12 – On-vehicle Service.)
- Oil Level Gauge Removal and Installation
- Centermember Assembly Removal and Installation (Refer to GROUP 32.)
- Under Cover Removal and Installation



Sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent



Removal steps

1. Front exhaust pipe connection
2. Gasket

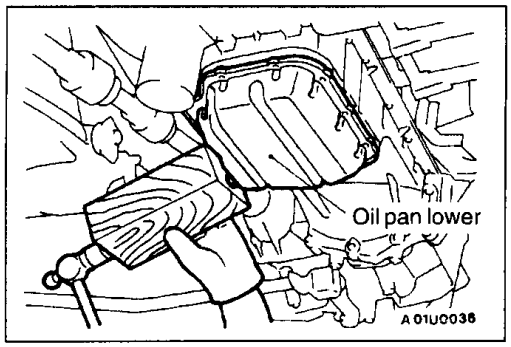
◀A▶ ▶B◀ 3. Oil pan lower

4. Drain plug

▶A◀ 5. Drain plug gasket

◀B▶ 6. Oil pan upper

7. Baffle plate

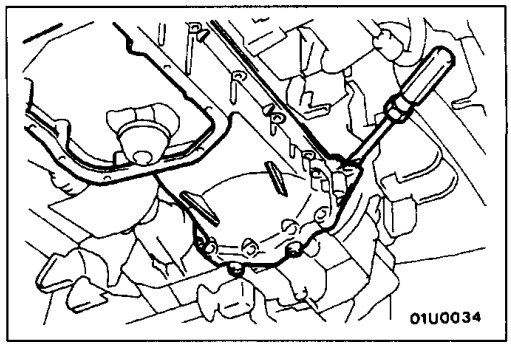


REMOVAL SERVICE POINTS

◀A▶ OIL PAN LOWER REMOVAL

Place a piece of wood against the oil pan lower, and tap the piece of wood with a hammer to remove the oil pan lower.

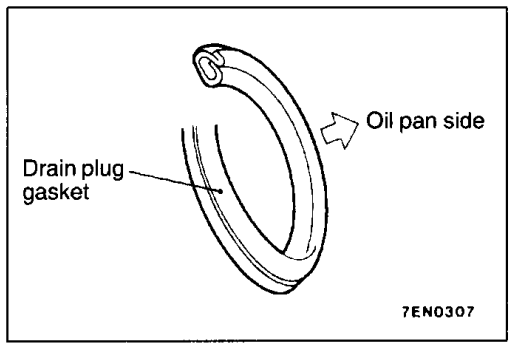
Caution
Do not use the oil pan remover (MD998727) to remove the oil pan lower.



◀B▶ OIL PAN UPPER REMOVAL

Insert a flat-tipped screwdriver into the notch of the upper oil pan as shown in the illustration, and turn it to remove the oil pan.

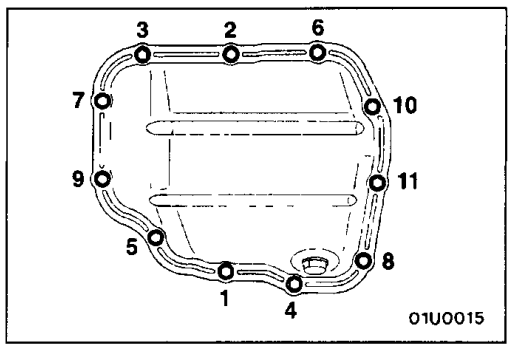
Caution
Do not use the oil pan remover (MD998727) to remove the oil pan upper.



INSTALLATION SERVICE POINTS

▶A◀ DRAIN PLUG GASKET INSTALLATION

Install the drain plug gasket in the direction so that it faces as shown in the illustration.



▶B◀ OIL PAN LOWER INSTALLATION

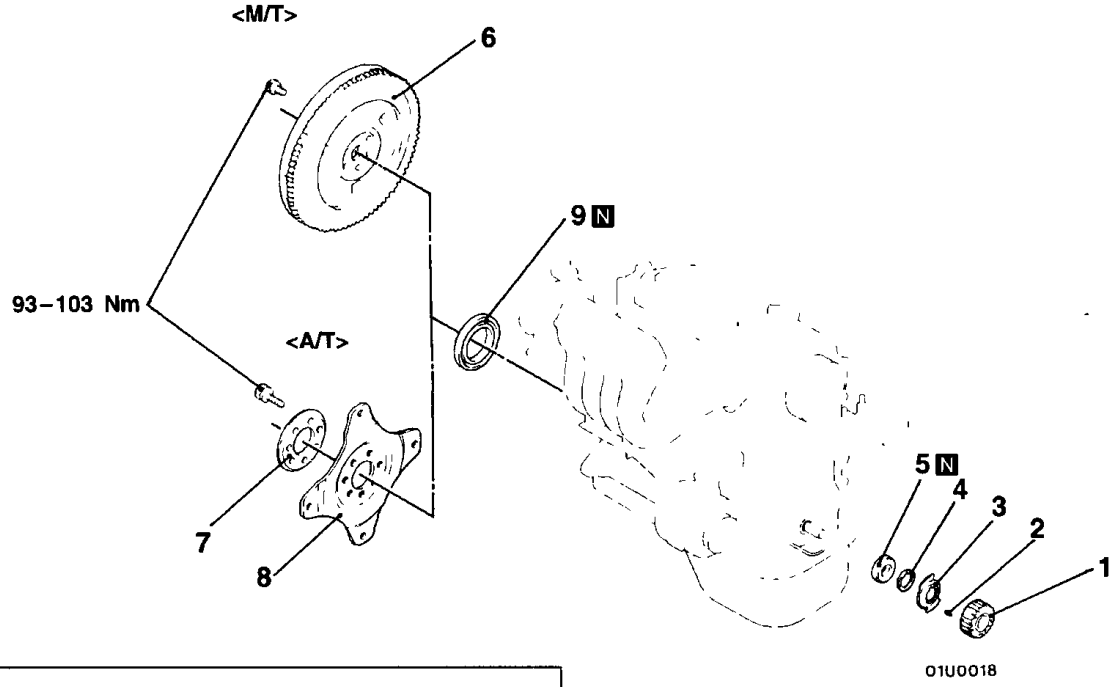
After applying the specified sealant, tighten the bolts in the order shown in the illustration.

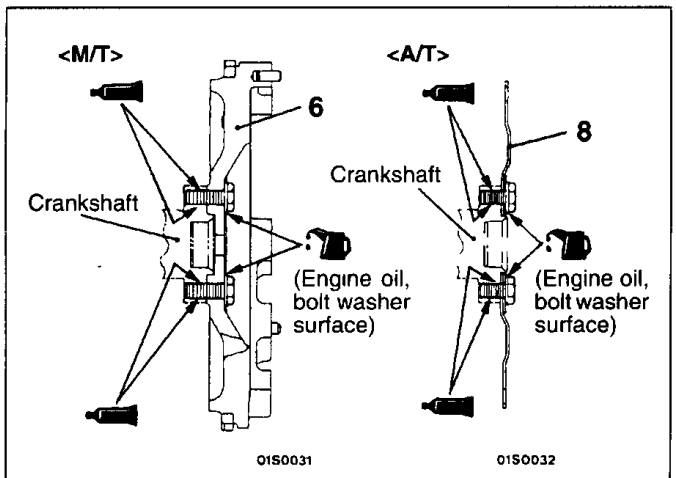
Specified sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent

CRANKSHAFT OIL SEAL

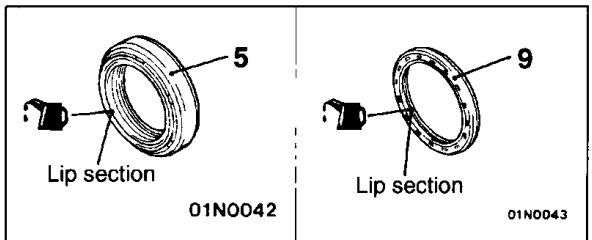
11200310012

REMOVAL AND INSTALLATION





Sealant: 3M Stud locking 4170 or equivalent



Engine oil

00003396

Crankshaft front oil seal removal steps

- Timing belt
  (SOHC: Refer to P.11-40.)
  (DOHC: Refer to P.11-43.)
- Crank angle sensor <DOHC>
  (Refer to GROUP 16.)

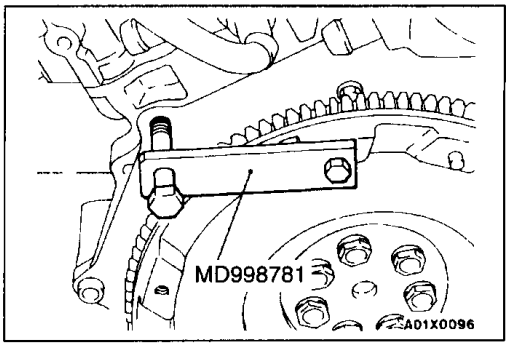
1. Crankshaft sprocket
2. Key
3. Crankshaft sensing blade <DOHC>
4. Crankshaft spacer <DOHC>

▶C◀ 5. Crankshaft front oil seal

Crankshaft rear oil seal removal steps

- Oil pan
  (SOHC: Refer to P.11-25.)
  (DOHC: Refer to P.11-26.)
- Transmission assembly
  (M/T: Refer to GROUP 22.)
  (A/T: Refer to GROUP 23.)
- Clutch cover and disc <M/T>

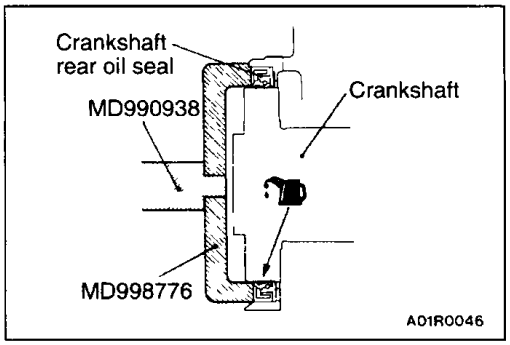
◀A▶ ▶B◀ 6. Flywheel assembly <A/T>
◀A▶ ▶B◀ 7. Adapter plate <A/T>
◀A▶ ▶B◀ 8. Drive plate <A/T>
▶A◀ 9. Crankshaft rear oil seal



REMOVAL SERVICE POINT

◀A▶ FLYWHEEL ASSEMBLY <M/T>/ADAPTOR PLATE <A/T>/DRIVE PLATE <A/T> REMOVAL

Use the special tool to secure the flywheel or drive plate, and remove the bolts.



INSTALLATION SERVICE POINTS

▶A◀ CRANKSHAFT REAR OIL SEAL INSTALLATION

1. Apply a small mount of engine oil to the entire circumference of the oil seal lip.
2. Install the oil seal by tapping it as far as the chamfered position of the oil seal case as shown in the illustration.

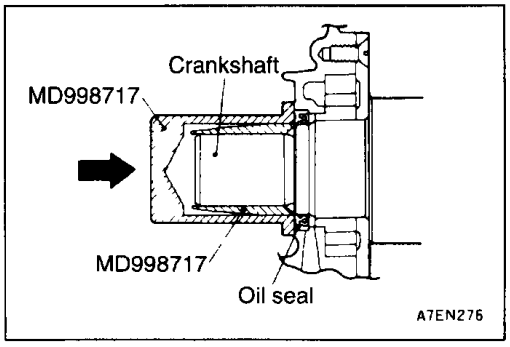
▶B◀ FLYWHEEL ASSEMBLY <M/T>/ADAPTOR PLATE <A/T>/DRIVE PLATE <A/T> INSTALLATION

1. Clean off all sealant, oil and other substances which are adhering to the threaded bolts, crankshaft thread holes and the flywheel <M/T> or drive plate <A/T>.
2. Apply oil to the bearing surface of the flywheel <M/T> or drive plate <A/T> bolts.
3. Apply oil to the crankshaft thread holes.
4. Apply sealant to the threaded mounting holes.

   Specified sealant: 3M Stud locking 4170 or equivalent

5. Use the special tool to secure the flywheel <M/T> or drive plate <A/T>, and then tighten the bolts to the specified torque.

   Specified torque: 93–103 Nm



▶C◀ CRANKSHAFT FRONT OIL SEAL INSTALLATION

1. Apply a small amount of engine oil to the entire circumference of the oil seal lip.
2. Tap the oil seal unit it is flush with the oil seal case.

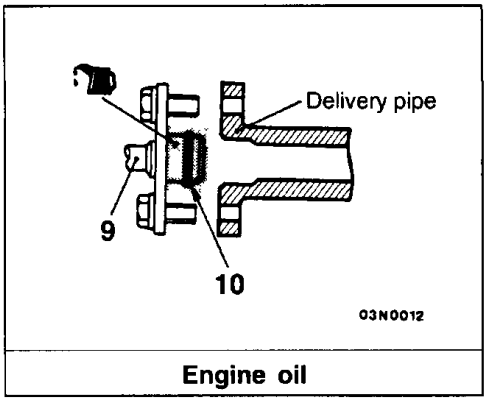
CYLINDER HEAD GASKET <SOHC>

11200400085

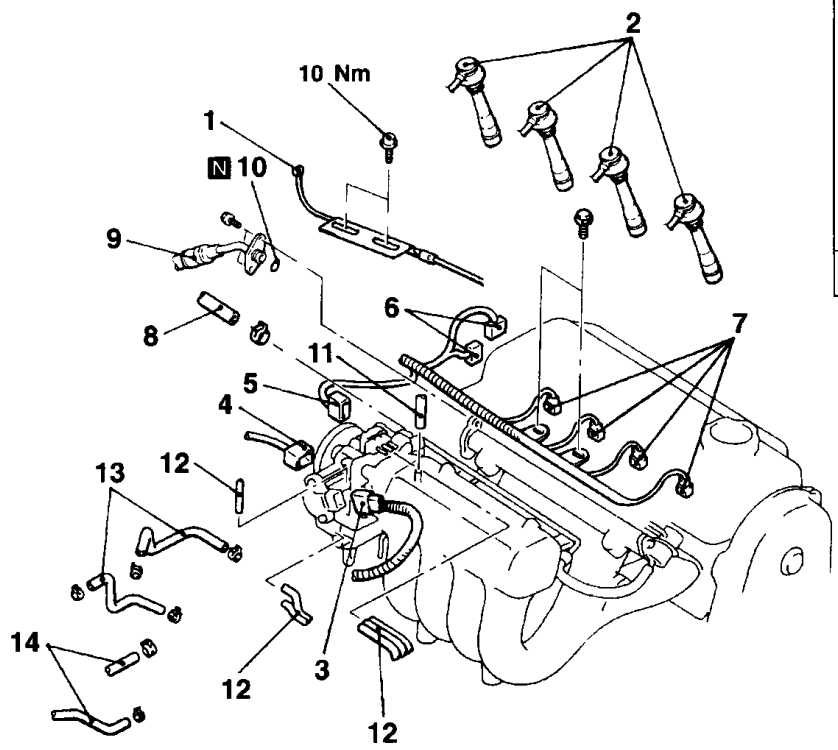
REMOVAL AND INSTALLATION

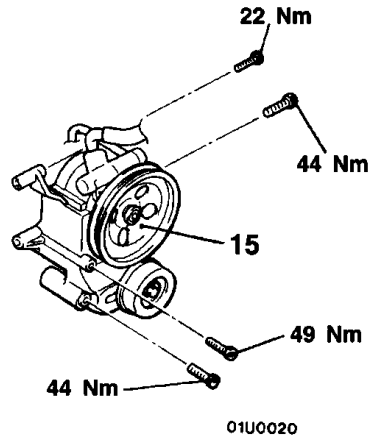
Pre-removal Operation
- Fuel Line Pressure Releasing (Refer to GROUP 13A – On-vehicle Service.)
- Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service.)
- Air Intake Hose Removal
- Timing Belt Removal (Refer to P.11-40.)

Post-Installation Operation
- Timing Belt Installation (Refer to P.11-40.)
- Air Intake Hose Installation
- Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – On-vehicle Service.)



Engine oil





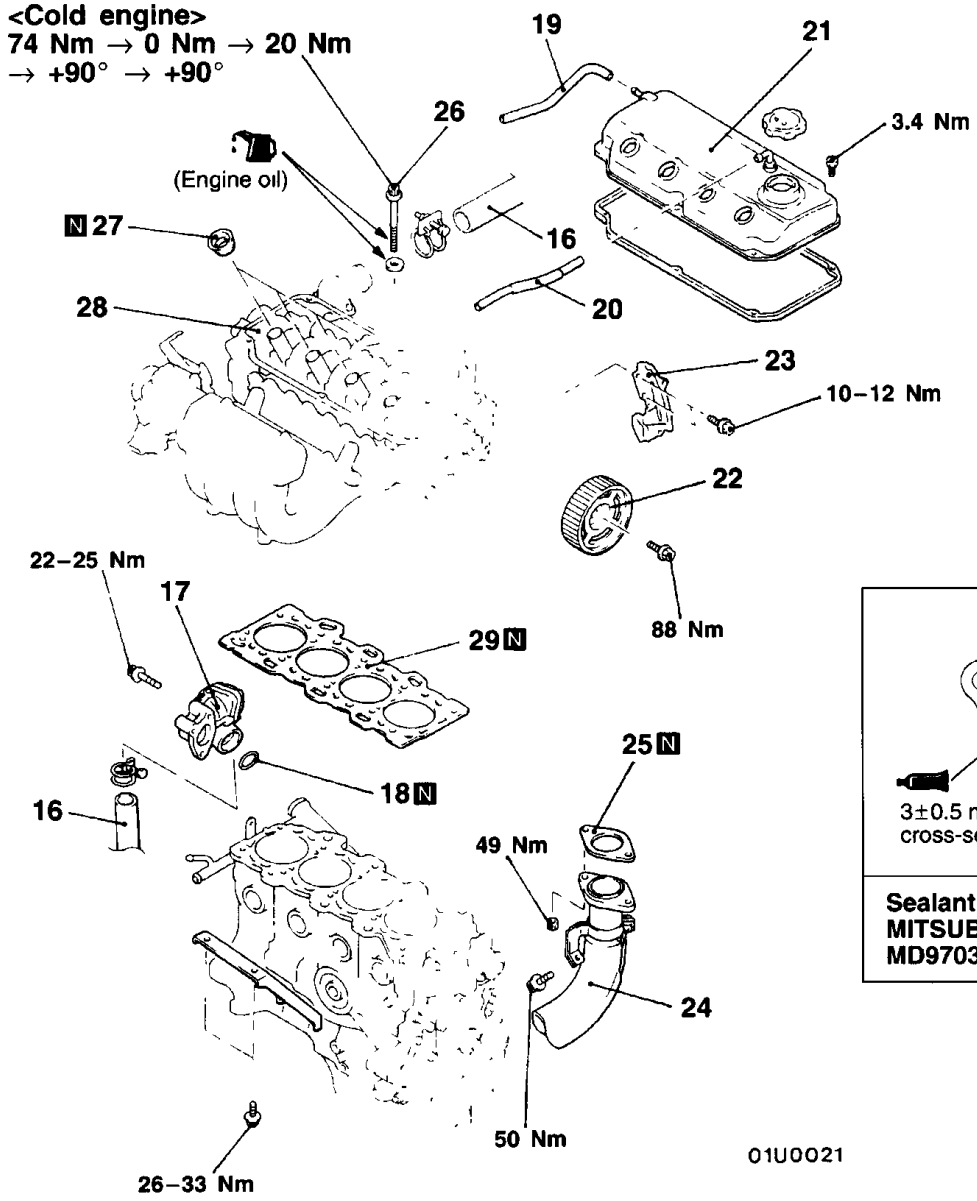
00003397

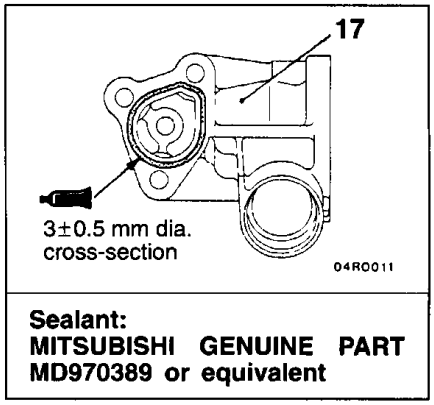
Removal steps

1. Accelerator cable connection
2. Spark plug cable
3. TPS connector
4. Idle speed control servo connector
5. Accelerator pedal position sensor connector <vehicles with TCL>
6. Distributor connector
7. Injector connector
8. Fuel return hose connection

▶E◀ 9. Fuel high pressure hose connection
10. O-ring
11. Brake booster vacuum hose connection
12. Vacuum hoses connection
13. Water hoses connection
14. Heater hoses connection

◀A▶ 15. Power steering oil pump and bracket assembly





00003398

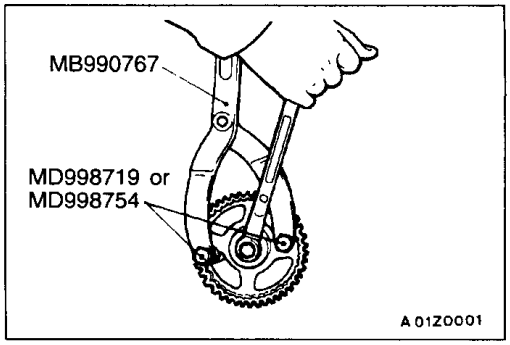
16. Radiator hose connection
▶D◀ 17. Water inlet fitting and thermostat case assembly
18. O-ring
19. Breather hose
20. PCV hose
21. Rocker cover
◀B▶ ▶C◀ 22. Camshaft sprocket
23. Timing belt rear cover
24. Front exhaust pipe connection
25. Gasket
◀C▶ ▶B◀ 26. Cylinder head bolt
27. Spark plug guide oil seal
28. Cylinder head assembly
▶A◀ 29. Cylinder head gasket

REMOVAL SERVICE POINTS

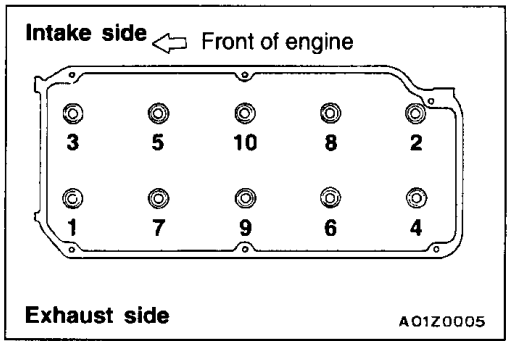
◀A▶ POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the cylinder head assembly, and tie it with a cord.



◀B▶ CAMSHAFT SPROCKET REMOVAL



◀C▶ CYLINDER HEAD BOLT REMOVAL

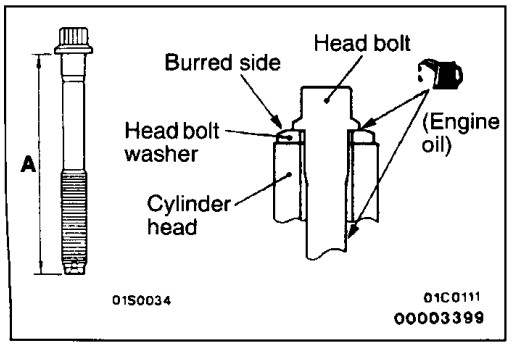
Loosen the bolts in 2 or 3 steps in order of the numbers shown in the illustration, and remove the cylinder head assembly.

Caution
Because the plug guides cannot be replaced by themselves, be careful not to damage or deform the plug guides when removing the cylinder head bolts.

INSTALLATION SERVICE POINTS

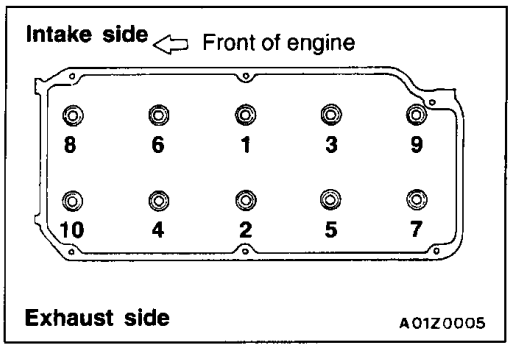
▶A◀ CYLINDER HEAD GASKET INSTALLATION

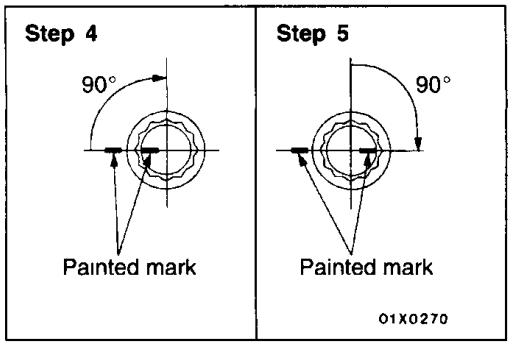
1. Wipe off all oil and grease from the gasket mounting surface.
2. Install so that the shapes of the cylinder head holes match the shapes of the respective cylinder head gasket holes.



▶B◀ CYLINDER HEAD BOLT INSTALLATION

1. When installing the cylinder head bolts, the length below the head of the bolts should be within the limit.
   If it is outside the limit, replace the bolts.
   Limit (A): 96.4 mm
2. The head bolt washer should be installed with the burred side caused by tapping out facing upwards.





3. Apply a small amount of engine oil to the thread section and the washer of the cylinder head bolt.
4. Tighten the bolts by the following procedure.

Step	Operation	Remarks
1	Tighten to 78 Nm.	Carry out in the order shown in the illustration.
2	Fully loosen.	Carry out in the reverse order of that shown in the illustration.
3	Tighten to 20 Nm.	Carry out in the order shown in the illustration.
4	Tighten 90° of a turn.	In the order shown in the illustration. Mark the head of the cylinder head bolt and cylinder head by paint.
5	Tighten 90° of a turn.	In the order shown in the illustration. Check that the painted mark of the head bolt is lined up with that of the cylinder head.

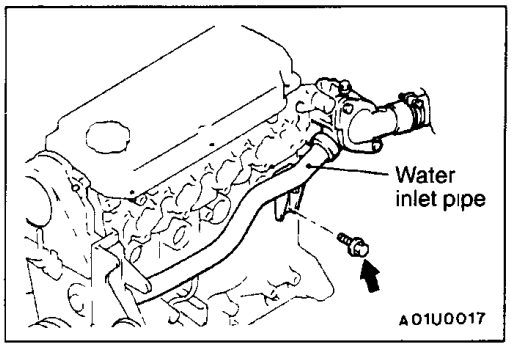
Caution

1. **Always make a tightening angle just 90°. If it is less than 90°, the head bolt will be loosened.**
2. **If it is more than 90°, remove the head bolt and repeat the procedure from step 1.**

▶C◀ CAMSHAFT SPROCKET INSTALLATION

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

Specified torque: 88 Nm



▶D◀ WATER INLET FITTING AND THERMOSTAT CASE ASSEMBLY INSTALLATION

1. Loosen the waer inlet pipe bolt shown in the illustration.
2. Apply specified sealant to the thermostat case assembly in the specified places.

   Specifed sealant:
   MITSUBISHI GENUINE PART MD970389 or equivalent
3. Apply a small amount of water to the O-ring of the water inlet pipe, and then press thermostat case assembly into the water inlet pipe.
4. Tighten the thermostat case assembly mounting bolts.
5. Tighten the water inlet bolts.

▶E◀ FUEL HIGH PRESSURE HOSE INSTALLATION

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

   Caution
   - **Do not let any engine oil get into the delivery pipe.**
2. While turning the fuel high-pressure hose to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the fuel high-pressure hose and check the O-ring for damage. After this, re-insert the delivery pipe and check that the hose turns smoothly.
4. Tighten to the specified torque.

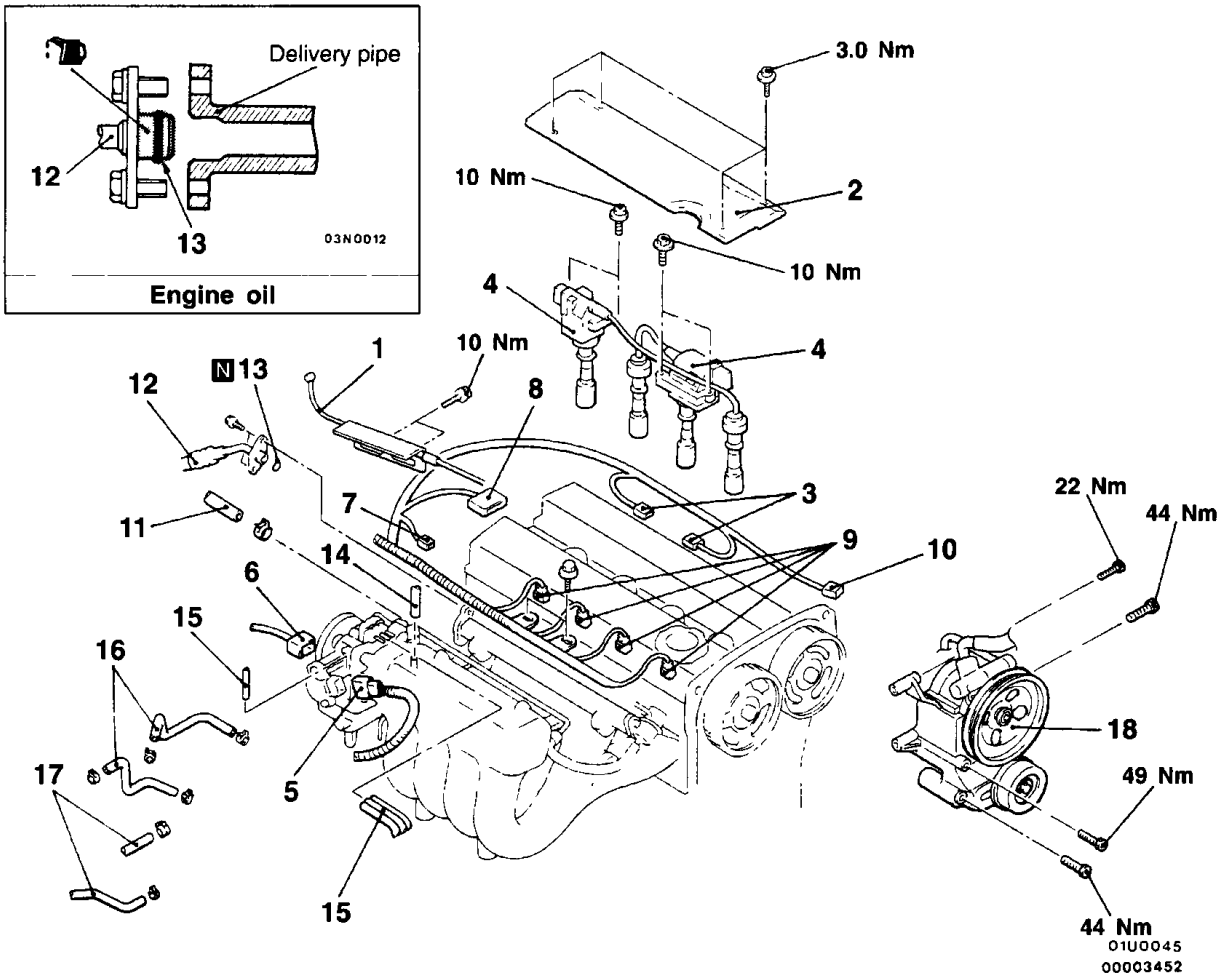
CYLINDER HEAD GASKET <DOHC>

11200400092

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Line Pressure Releasing (Refer to GROUP 13A – On-vehicle Service.)
- Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service.)
- Air Intake Hose Removal
- Timing Belt Removal (Refer to P.11-43.)

Post-installation Operation
- Timing Belt Installation (Refer to P.11-43.)
- Air Intake Hose Installation
- Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – On-vehicle Service.)



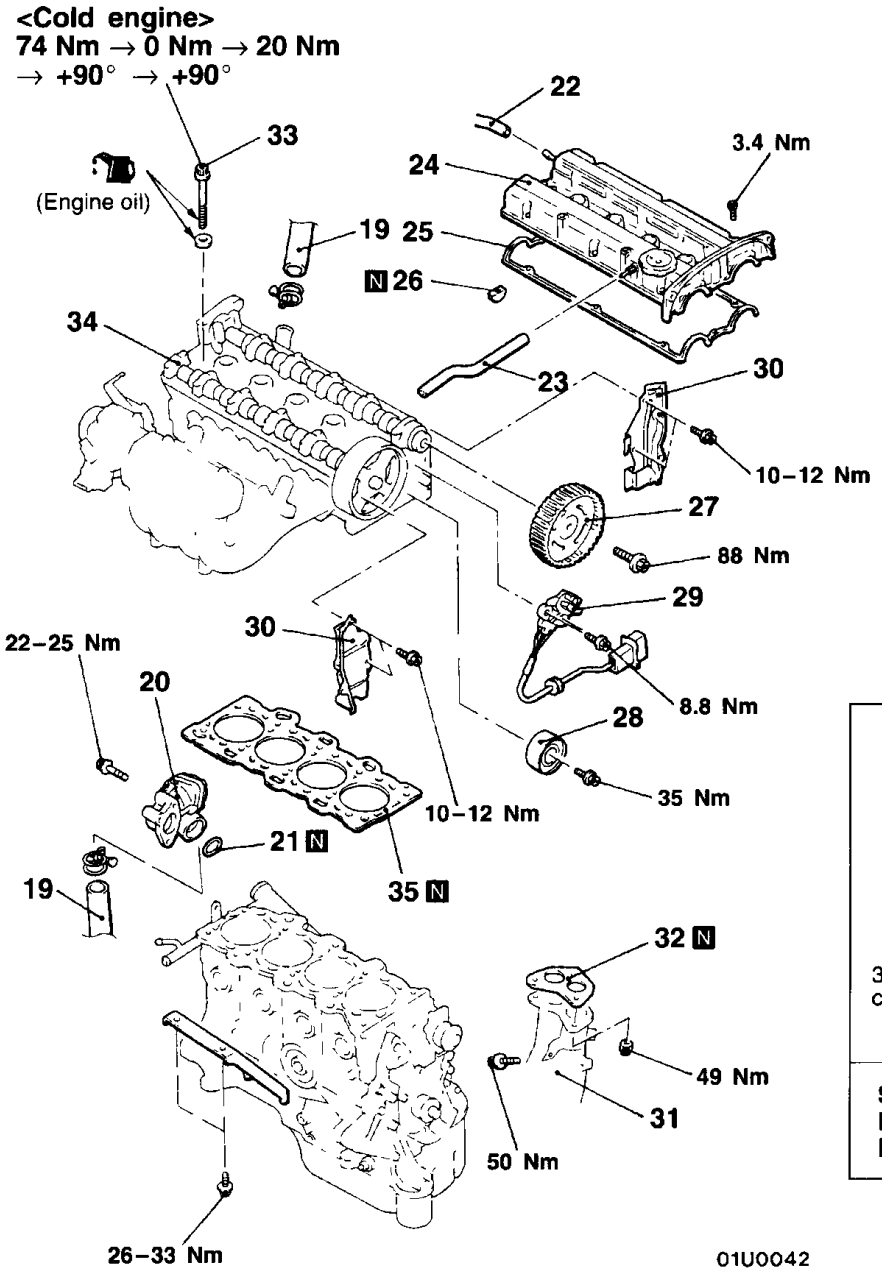
Removal steps

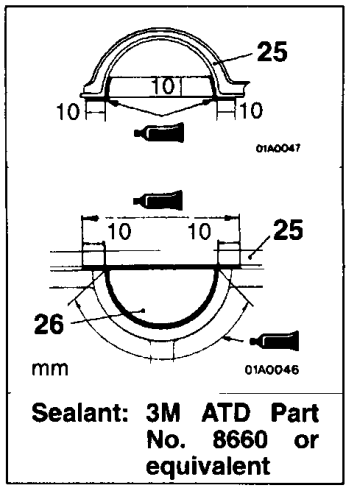
1. Accelerator cable connection
2. Center cover
3. Ignition coil connector
4. Ignition coil assembly
5. TPS connector
6. Idle speed control servo connector
7. Oil presser switch connector
8. Ignition failure sensor connector
9. Injector connector
10. Cam position sensor connector
11. Fuel return hose connection

▶E◀ 12. Fuel high pressure hose connection

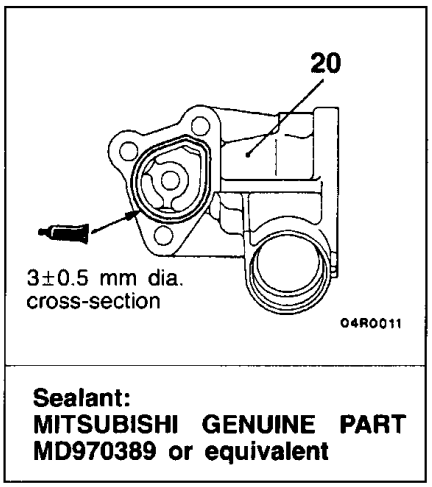
13. O-ring
14. Brake booster vacuum hose connection
15. Vacuum hoses connection
16. Water hoses connection
17. Heater hoses connection

◀A▶ 18. Power steering oil pump and bracket assembly





Sealant: 3M ATD Part No. 8660 or equivalent



Sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent

00003453

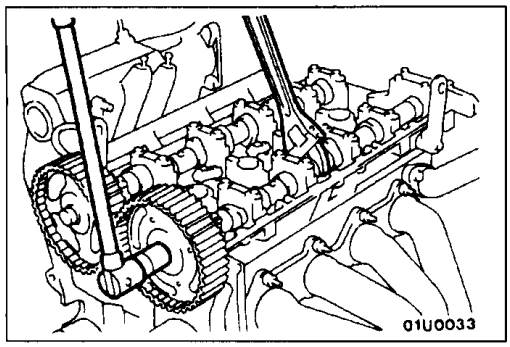
19. Radiator hose connection
▶D◀ 20. Water inlet fitting and thermostat case assembly
21. O-ring
22. Breather hose
23. PCV hose
24. Rocker cover
25. Rocker cover gasket
26. Semi-circular packing
◀B▶ ▶C◀ 27. Camshaft sprocket (exhaust side)
28. Idler pulley
29. Cam position sensor
30. Timing belt rear cover
31. Front exhaust pipe connection
32. Gasket
◀C▶ ▶B◀ 33. Cylinder head bolt
34. Cylinder head assembly
▶A◀ 35. Cylinder head gasket

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

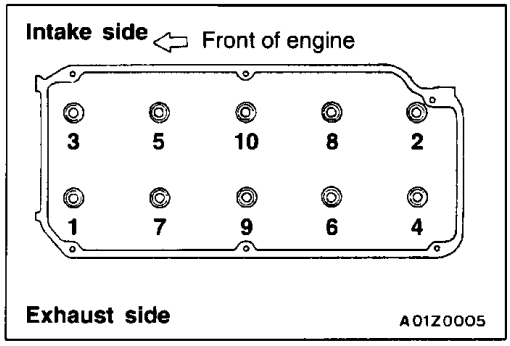
NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the cylinder head assembly, and tie it with a cord.



◀B▶ CAMSHAFT SPROCKET (EXHAUST SIDE) REMOVAL

Hold the hexagonal section of the camshaft with a wrench, etc., and loosen the camshaft sprocket bolt.

Caution
As the sprocket could become damaged, do not apply the wrench to the camshaft sprocket.



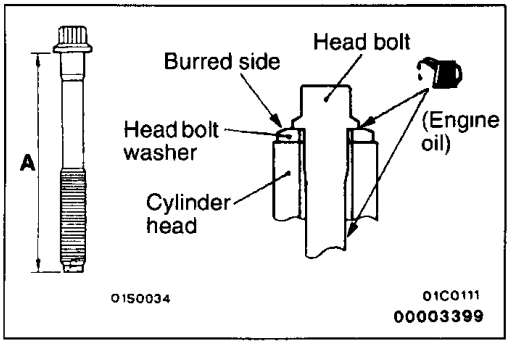
◀C▶ CYLINDER HEAD BOLT REMOVAL

Loosen the bolts in 2 or 3 steps in order of the numbers shown in the illustration, and remove the cylinder head assembly.

INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAR GASKET INSTALLATION

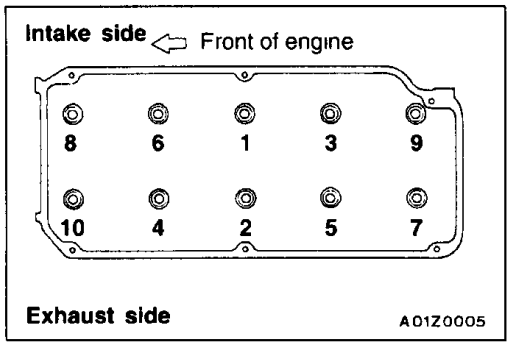
1. Wipe off all oil and grease from the gasket mounting surface.
2. Install so that the shapes of the cylinder head holes match the shapes of the respective cylinder head gasket holes.

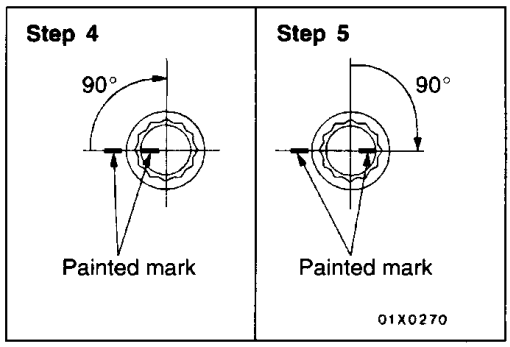


▶B◀ CYLINDER HEAD BOLT INSTALLATION

1. When installing the cylinder head bolts, the length below the head of the bolts should be within the limit.
   If it is outside the limit, replace the bolts.
   Limit (A): 96.4 mm
2. The head bolt washer should be installed with the burred side caused by tapping out facing upwards.

3. Apply a small amount of engine oil to the thread section and the washer of the cylinder head bolt.





4. Tighten the bolts by the following procedure.

Step	Operation	Remarks
1	Tighten to 78 Nm.	Carry out in the order shown in the illustration.
2	Fully loosen.	Carry out in the reverse order of that shown in the illustration.
3	Tighten to 20 Nm.	Carry out in the order shown in the illustration.
4	Tighten 90° of a turn.	In the order shown in the illustration. Mark the head of the cylinder head bolt and cylinder head by paint.
5	Tighten 90° of a turn.	In the order shown in the illustration. Check that the painted mark of the head bolt is lined up with that of the cylinder head.

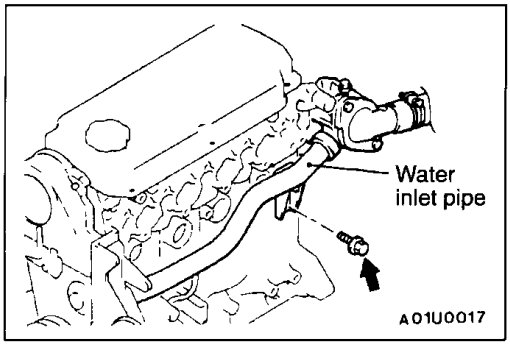
Caution

1. **Always make a tightening angle just 90°. If it is less than 90°, the head bolt will be loosened.**
2. **If it is more than 90°, remove the head bolt and repeat the procedure from step 1.**

▶C◀ CAMSHAFT SPROCKET (EXHAUST SIDE) INSTALLATION

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

Specified torque: 88 Nm



▶D◀ WATER INLET FITTING AND THERMOSTAT CASE ASSEMBLY INSTALLATION

1. Loosen the waer inlet pipe bolt shown in the illustration.
2. Apply specified sealant to the thermostat case assembly in the specified places.

   Specified sealant:
   MITSUBISHI GENUINE PART MD970389 or equivalent
3. Apply a small amount of water to the O-ring of the water inlet pipe, and then press thermostat case assembly into the water inlet pipe.
4. Tighten the thermostat case assembly mounting bolts.
5. Tighten the water inlet pipe bolts.

▶E◀ FUEL HIGH PRESSURE HOSE INSTALLATION

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

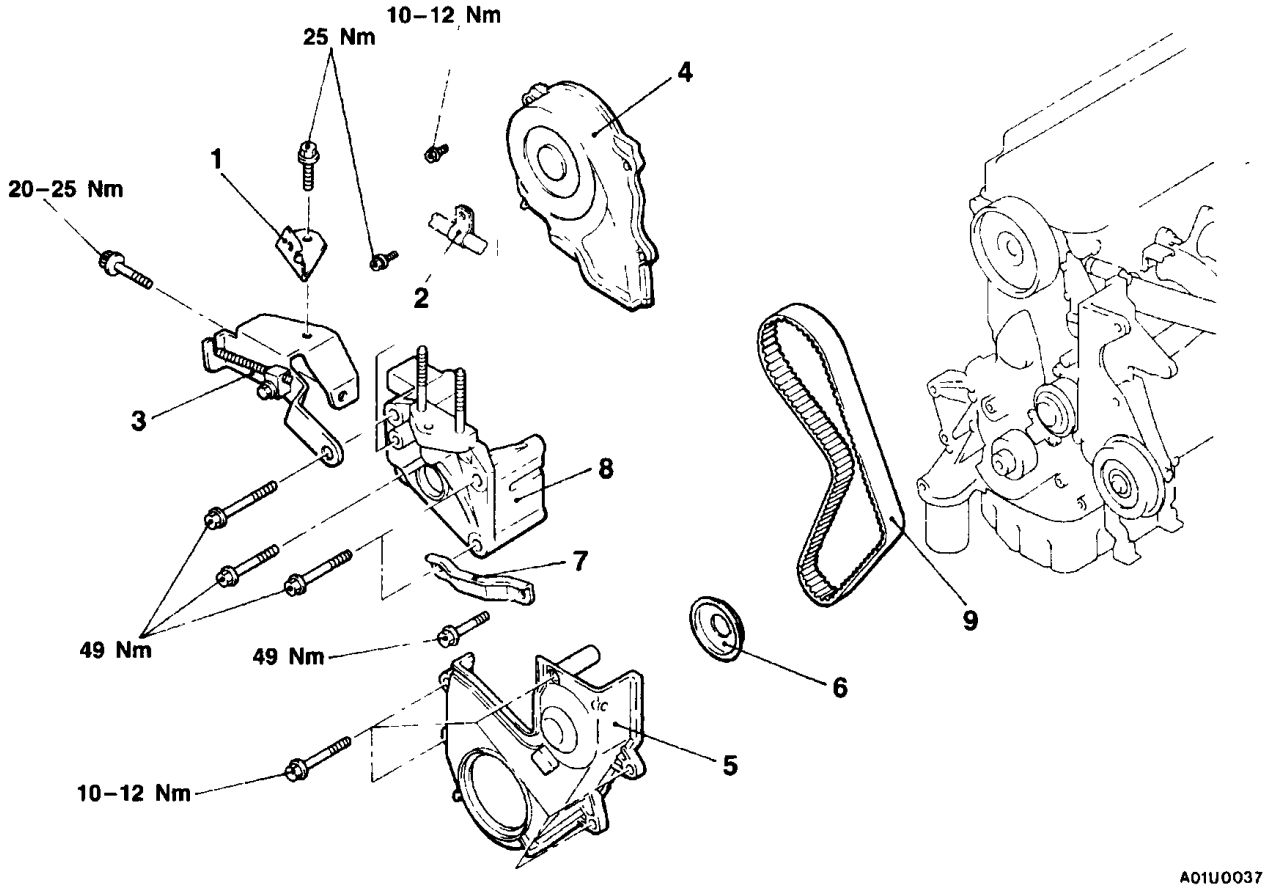
   Caution
   - **Do not let any engine oil get into the delivery pipe.**
2. While turning the fuel high-pressure hose to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the fuel high-pressure hose and check the O-ring for damage. After this, re-insert the delivery pipe and check that the hose turns smoothly.
4. Tighten to the specified torque.

TIMING BELT <SOHC>

11200430084

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Cover (L.H.) Removal and Installation
- Engine Mount Bracket Removal and Installation (Refer to GROUP 32.)
- Crankshaft Pulley Removal and Installation (Refer to P.11-19.)



A01U0037

Removal steps

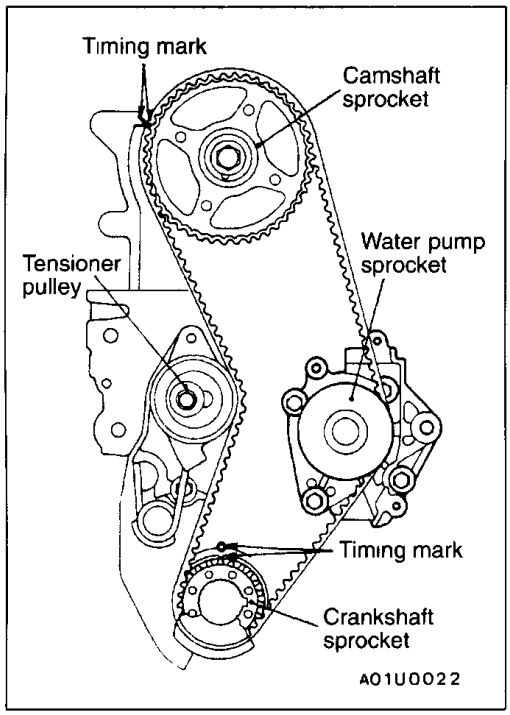
1. Power steering pressure hose bracket
2. Power steering pressure hose clip
3. Alternator brace
4. Timing belt upper cover
5. Timing belt lower cover

▶C◀ 6. Flange

7. Power steering pump bracket stay
8. Engine support bracket

▶B◀ • Timing belt tension adjustment

◀A▶ ▶A◀ 9. Timing belt

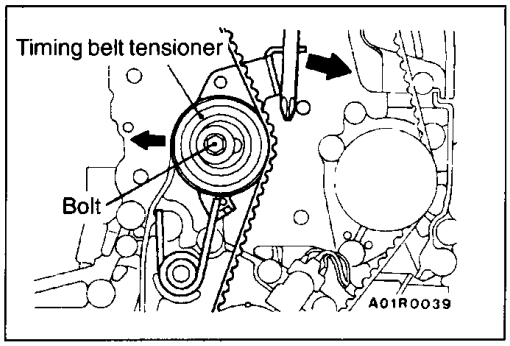


REMOVAL SERVICE POINT

◀A▶ TIMING BELT REMOVAL

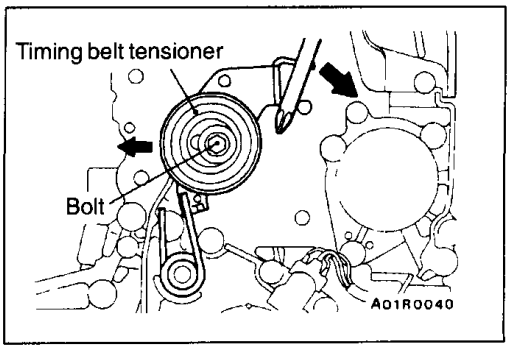
1. Turn the crankshaft clockwise (right turn) to align each timing mark and to set the No. 1 cylinder at compression top dead centre.

Caution
The crankshaft should always be turned only clockwise.



2. Loosen the timing belt tensioner bolt.
3. Set a screwdriver to the timing belt tensioner and press it fully back in the direction of the arrow.
4. Provisionally tighten the timing belt tensioner bolt.
5. Remove the timing belt.

Caution
If the timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (right turn).

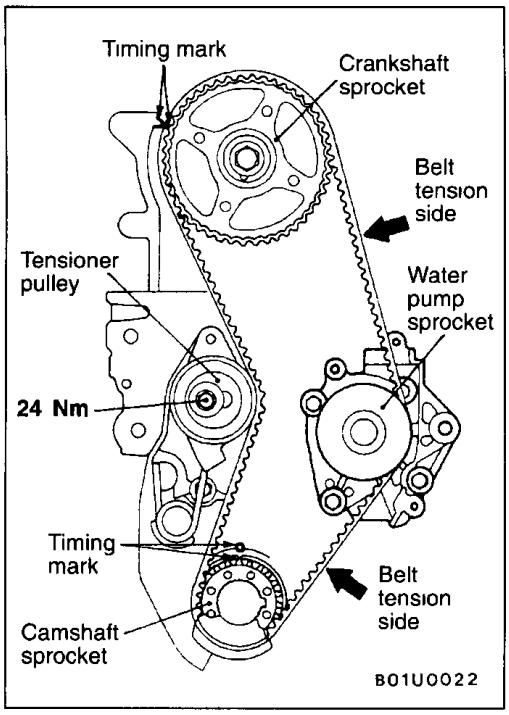


INSTALLATION SERVICE POINTS

▶A◀ TIMING BELT INSTALLATION

1. With the timing belt tensioner bolt loosened, use a screwdriver to fully turn the timing belt tensioner as close to the engine mount as possible, and then provisionally tighten the tensioner bolt.
2. Align each of the camshaft sprocket and the crankshaft sprocket timing marks.
3. Install the timing belt in the following order, while making sure that the tension side of the belt is not slackened.
   (1) Crankshaft sprocket
   (2) Water pump sprocket
   (3) Camshaft sprocket
   (4) Tensioner pulley

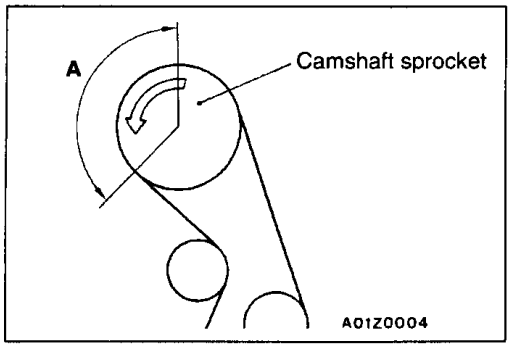
Caution
After installing the timing belt, apply force to turn the camshaft sprocket in the reverse direction, and recheck to be sure that the belt is fully tensioned and that each timing mark is in the proper position.



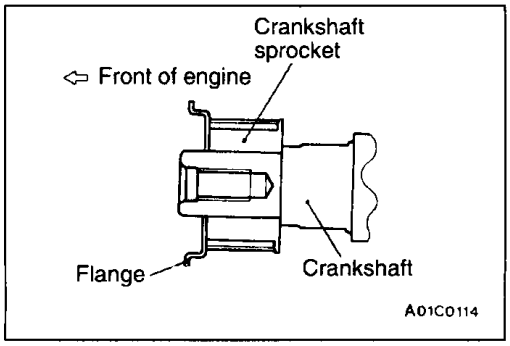
▶B◀ TIMING BELT TENSION ADJUSTMENT

1. Initially loosen the fixing bolt of the tensioner pulley fixed to the engine mount side by 1/2-1/4 turn, and use the force of the tensioner spring to apply tension to the belt.
2. Turn the crankshaft in the proper rotation direction (right turn) for two rotations, and recheck to be sure that the timing marks on each sprocket are aligned.

Caution
As the purpose of this procedure is to apply the proper amount of tension to the tension side of the timing belt by using the cam driving torque, turn the crankshaft only by the amount given above. Be sure not to turn the crankshaft in the opposite direction (left turn).



3. After checking to be sure that no belt teeth in the section marked with A are lifted up and that the teeth in each sprocket are engaged, secure the tensioner pulley.



▶C◀ FLANGE INSTALLATION

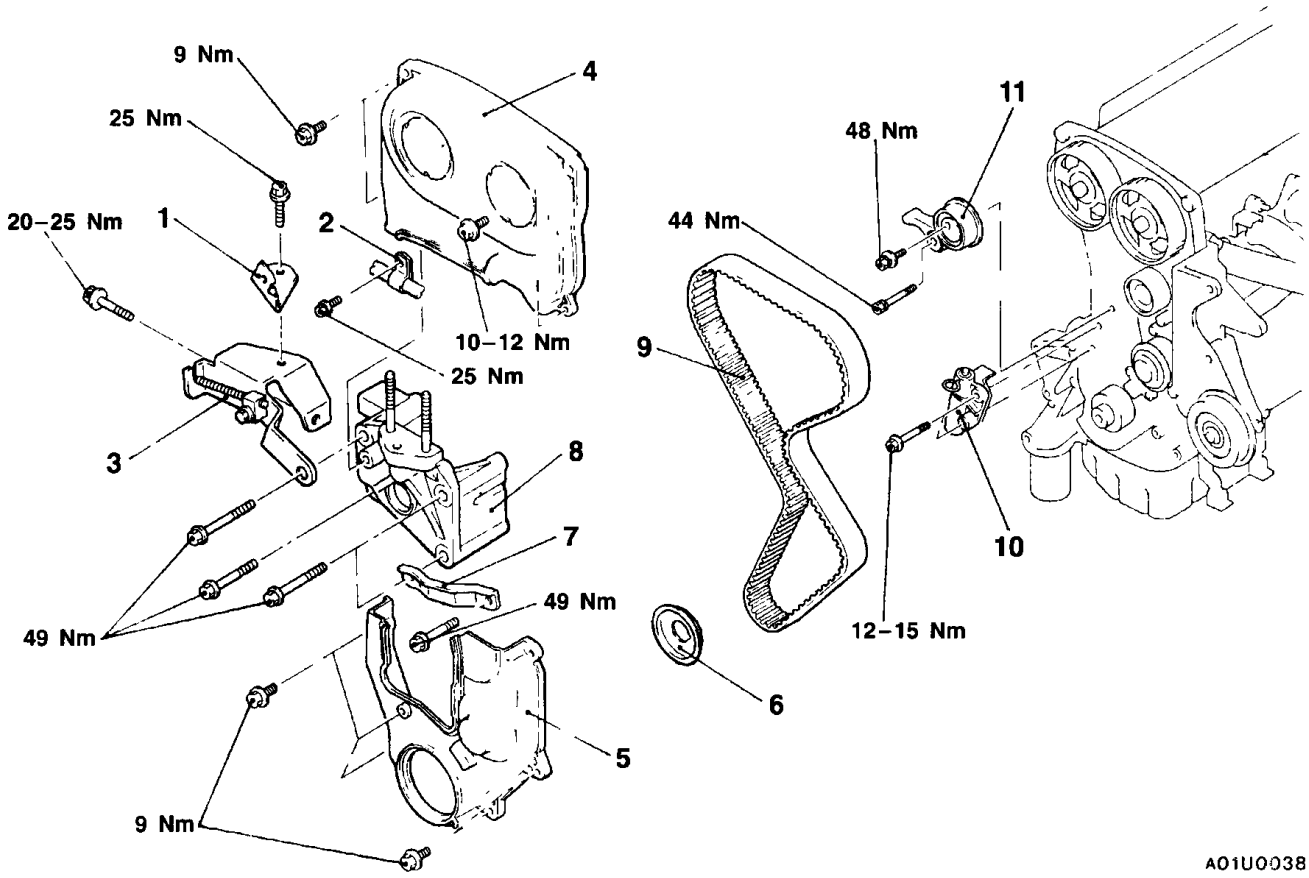
Install the flange as shown in the illustration.

TIMING BELT <DOHC>

11200430091

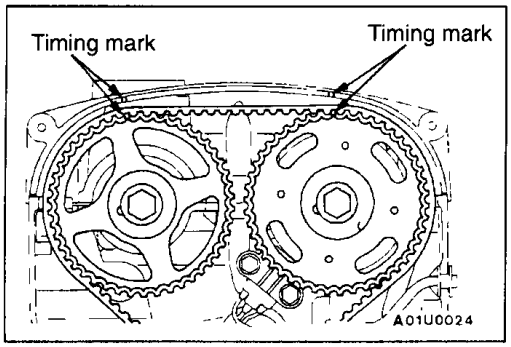
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Cover (L.H.) Removal and Installation
- Engine Mount Bracket Removal and Installation (Refer to GROUP 32.)
- Crankshaft Pulley Removal and Installation (Refer to P.11-19.)



Removal steps

1. Power steering pressure hose bracket
2. Power steering pressure hose clip
3. Alternator brace
4. Timing belt upper cover
5. Timing belt lower cover
▶D◀ 6. Flange
7. Power steering pump bracket stay
8. Engine support bracket
▶C◀ • Timing belt tension adjustment
◀A▶ ▶B◀ 9. Timing belt
▶A◀ 10. Auto tensioner
11. Tension pulley and arm assembly



REMOVAL SERVICE POINT

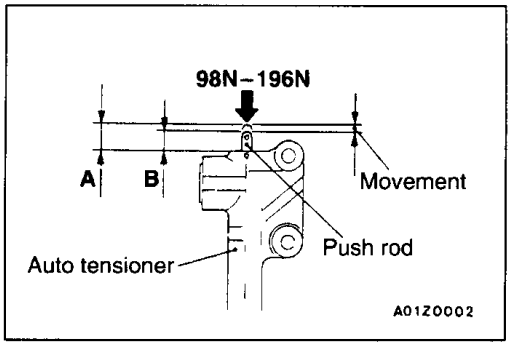
◀A▶ TIMING BELT REMOVAL

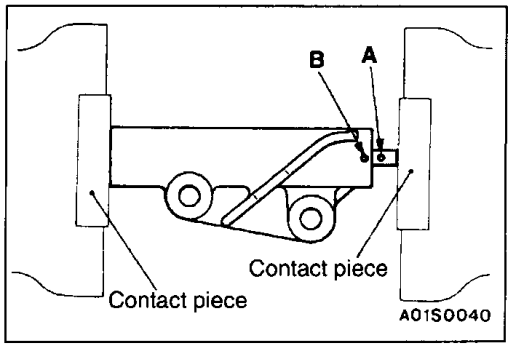
1. Turn the crankshaft clockwise to align each timing mark.

   Caution
   The crankshaft must always be turned clockwise.

2. Loosen the tensioner pulley center bolt and remove the timing belt.

   Caution
   If the timing belt is to be re-used, use chalk to mark (on its flat side) an arrow indicating the clockwise direction.





INSTALLATION SERVICE POINTS

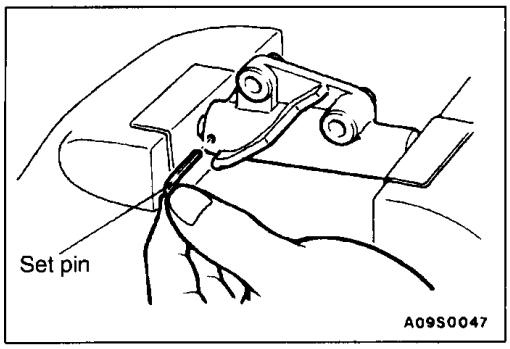
▶A◀ AUTO TENSIONER INSTALLATION

1. Apply 98–196 N force to the push rod of the auto tensioner by pressing it against a metal (cylinder block, etc.), and measure the movement of the push rod.

   Standard value:
   Within 1 mm
   A: Length when it is free (not pressed)
   B: Length when it is pressed
   A – B: Movement

2. If it is out of the standard value, change the auto tensioner.
3. Use a press or vice to gently compress the auto tensioner push rod until pin hole A of the push rod and pin hole B of the tensioner cylinder are aligned.

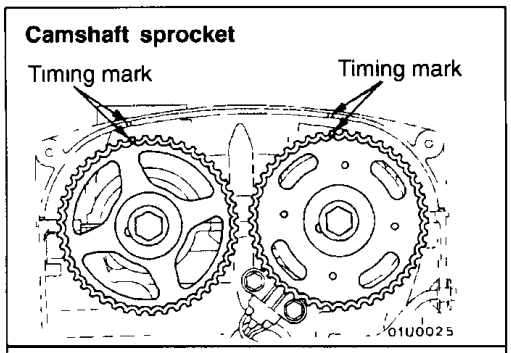
   Caution
   If the compression speed is too fast, the push rod may become damaged, so be sure to carry out this operation slowly.

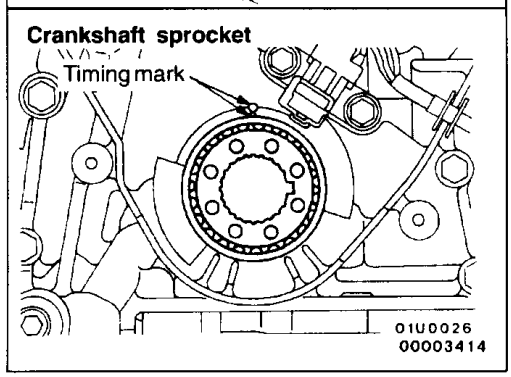


4. Once the holes are aligned, insert the set pin.

   NOTE
   When replacing the auto tensioner with a new part, the pin will be in the auto tensioner.

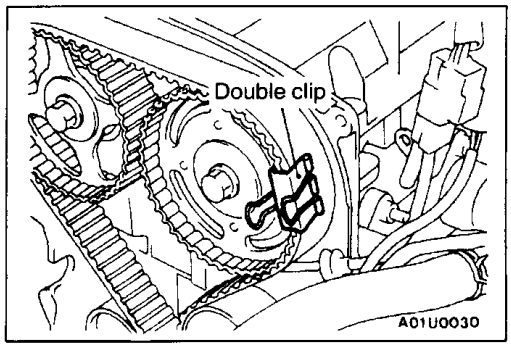
5. Install the auto tensioner to the engine.



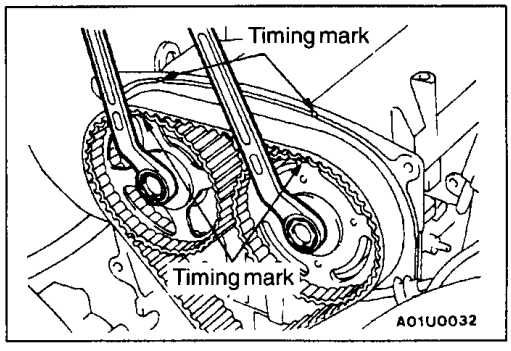


▶B◀ TIMING BELT INSTALLATION

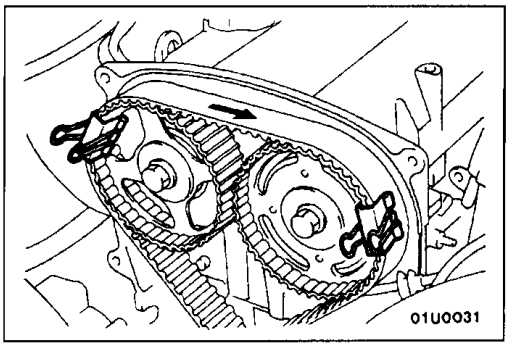
1. Align the timing marks of each camshaft sprocket and the crankshaft sprocket.
2. Loosen the tensioner pulley center bolt.
3. Move the crankshaft sprocket half a tooth width in the anti-clockwise direction.



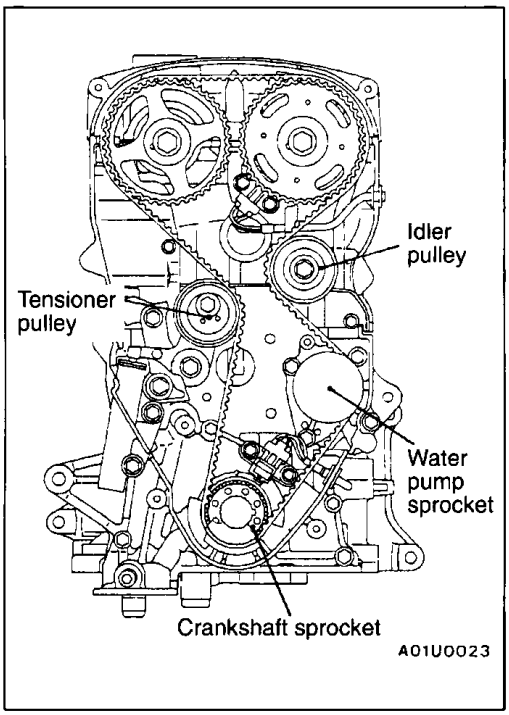
4. Place the timing belt on the exhaust-side camshaft sprocket, and hold it in the position shown in the illustration with a double clip.



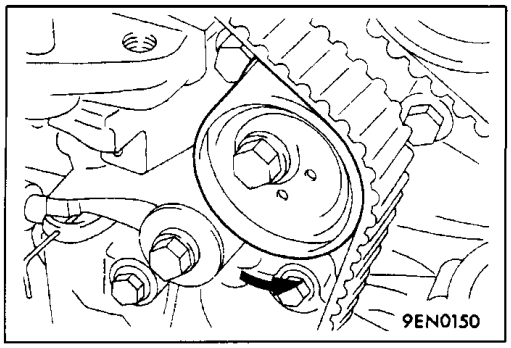
5. Place the timing belt on the intake-side sprocket while using two wrenches to align the timing marks.



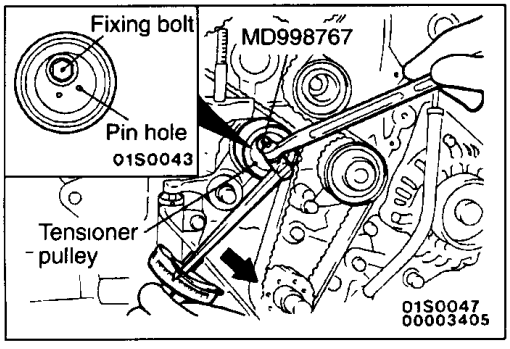
6. Hold the belt in the position shown in the illustration with another double clip.



7. Place the belt onto the idler pulley, water pump sprocket, crankshaft sprocket and tensioner pulley in that order.
8. Remove the two double clips.



9. Lift the tensioner pulley in the direction of the arrow and tighten the tensioner pulley bolt.
10. Check to be sure that all timing marks are aligned.
11. Adjust the timing belt tension.

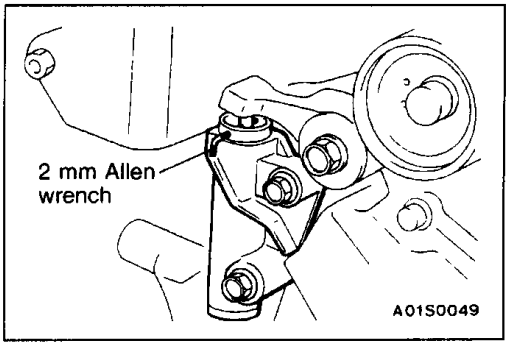


▶C◀ TIMING BELT TENSION ADJUSTMENT

1. After turning the crankshaft a 1/4 turn anti-clockwise, turn it clockwise to the position where the timing marks are aligned.
2. Loosen the fixing bolt of the tensioner pulley and using the special tool and a torque wrench, apply tension to the timing belt; then tighten the fixing bolt at the specified torque.

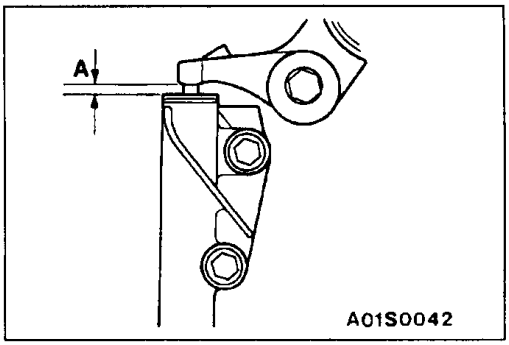
   Standard Value:

   2.5–4.0 Nm {timing belt tension torque (reference value)}



Caution
When tightening the fixing bolt, ensure that the tensioner pulley shaft doesn't rotate with the bolt.

3. Take out the 2 mm Allen wrench from the auto tensioner. At this time, check to be sure that 2 mm Allen wrench can be pulled out easily.
   Turn the crankshaft clockwise 2 turns, and after leaving it in this position for 5 minutes or more, check again to be sure that the auto tensioner 2 mm Allen wrench can be pulled out or inserted easily.

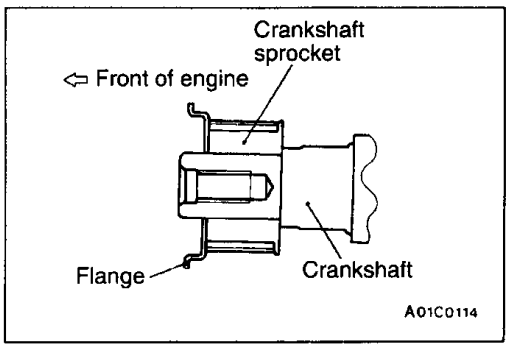


NOTE
Even if the 2 mm Allen wrench cannot be easily inserted, then it is satisfactory if the amount of protrusion of the auto tensioner rod is within the standard value.

Standard value (A): 3.8 – 4.5 mm

If it is outside the standard value, repeat the operations in steps 1 to 4.

4. Check to be sure that the timing marks on all sprockets are aligned.



▶D◀ FLANGE INSTALLATION

Install the flange as shown in the illustration.

ENGINE ASSEMBLY <SOHC>

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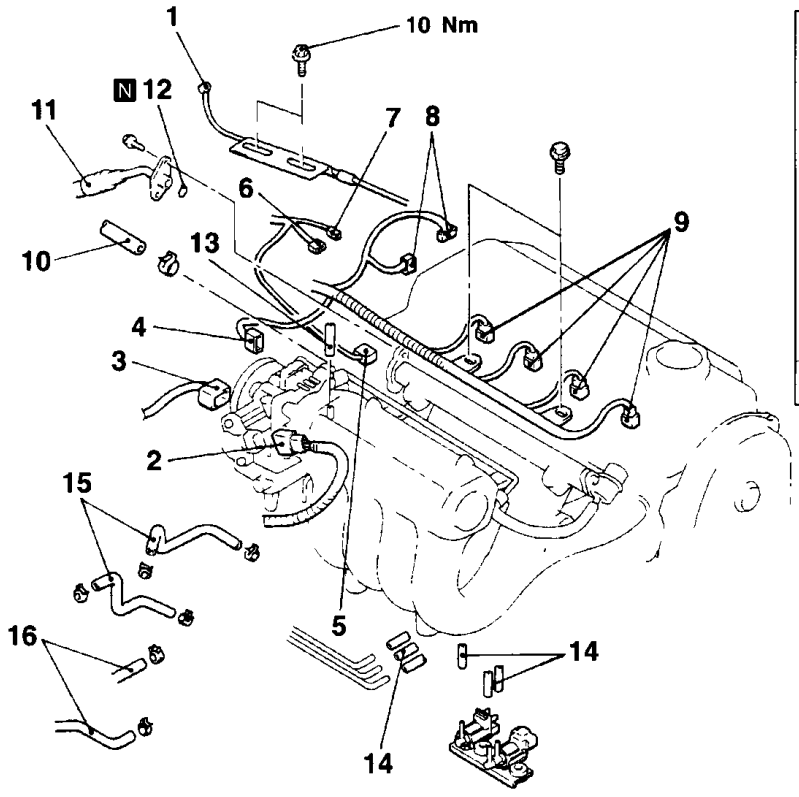
REMOVAL AND INSTALLATION

Pre-removal Operations
- Fuel Line Pressure Releasing (Refer to GROUP 13A – On-vehicle Service.)
- Hood Removal (Refer to GROUP 42.)
- Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service.)
- Transmission Assembly Removal (M/T: Refer to GROUP 22.) (A/T: Refer to GROUP 23.)
- Radiator Assembly Removal (Refer to GROUP 14.)

Post-installation Operations
- Radiator Assembly Installation (Refer to GROUP 14.)
- Transmission Assembly Installation (M/T. Refer to GROUP 22.) (A/T: Refer to GROUP 23.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – On-vehicle Service.)
- Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service.)
- Drive Belt Tension Adjustment (Refer to P.11-6.)
- Hood Installation (Refer to GROUP 42.)



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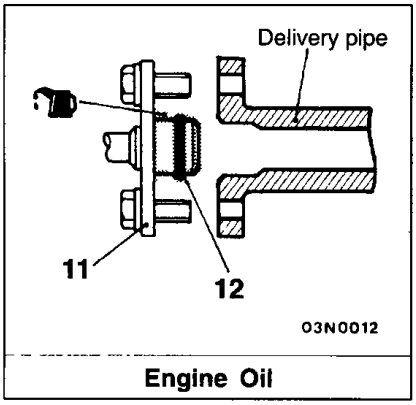

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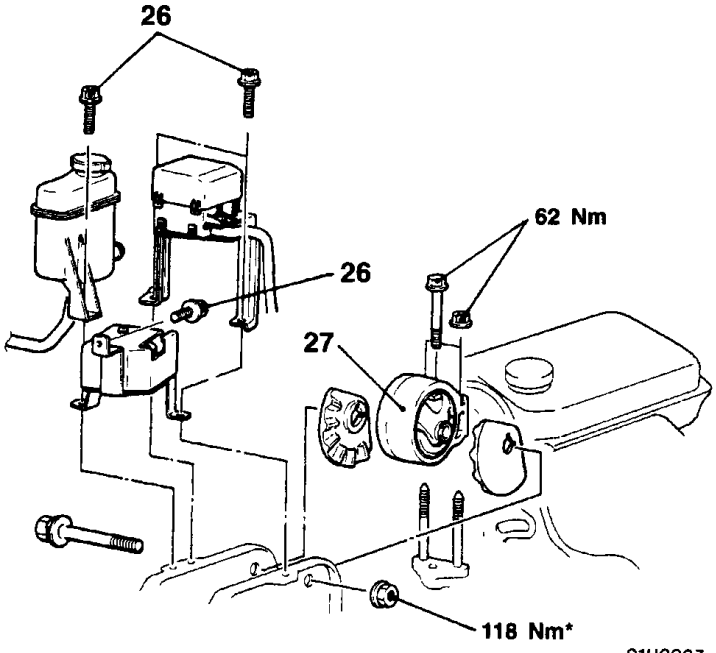
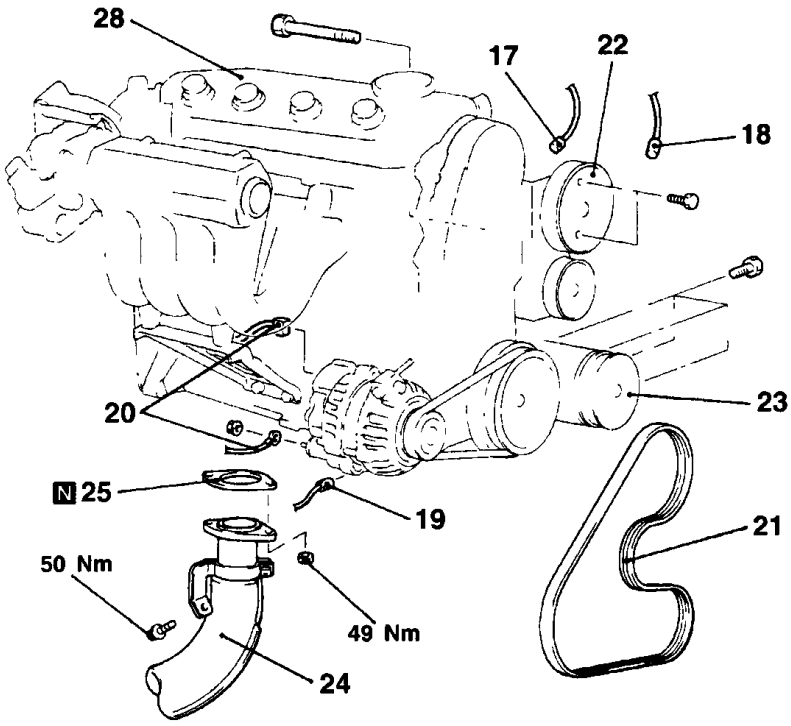
Removal steps
1. Accelerator cable connection
2. TPS connector
3. Idle speed control servo connector
4. Accelerator pedal position sensor connector <Vehicles with TCL>
5. Detonation sensor connector
6. Engine coolant temperature sensor connector
7. Engine coolant temperature gauge unit connector
8. Distributor connector
9. Injector connector
10. Fuel return hose connection
▶C◀ 11. Fuel high pressure hose connection
12. O-ring
13. Brake booster vacuum hose connection
14. Vacuum hoses connection
15. Water hoses connection
16. Heater hoses connection





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17. Power steering oil pressure switch connector
18. A/C compressor connector
19. Oil pressure switch connector
20. Alternator connector
21. Drive belt (power steering, A/C)
◀A▶ 22. Power steering oil pump connection
◀B▶ 23. A/C compressor connection
24. Front exhaust pipe connection
25. Gasket
26. Bolts
◀C▶ ▶B◀ 27. Engine mount bracket
◀D▶ ▶A◀ 28. Engine 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▶ POWER STEERING OIL PUMP REMOVAL

Remove the power steering oil pump from the bracket with the hose attached.

NOTE
Place the removed power steering oil pump where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

◀B▶ A/C COMPRESSOR REMOVAL

Disconnect the A/C compressor connector and remove the compressor from the compressor bracket with the hose still attached.

NOTE
Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

◀C▶ ENGINE MOUNT BRACKET REMOVAL

1. Support the engine with a garage jack.
2. Remove the mechanical hanger (recommended tool) which was attached when the transmission assembly was removed.
3. Hold the engine assembly with a chain block or similar tool.
4. Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mount bracket, and then remove the engine mount bracket.

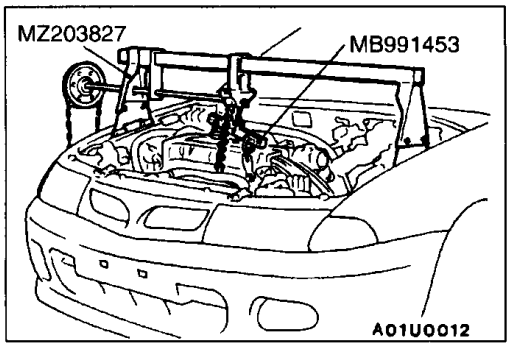
◀D▶ ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, 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, checking that the cables, hoses, and harness connectors are not clamped.



▶B◀ ENGINE MOUNT BRACKET INSTALLATION

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

▶C◀ FUEL HIGH PRESSURE HOSE INSTALLATION

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

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

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

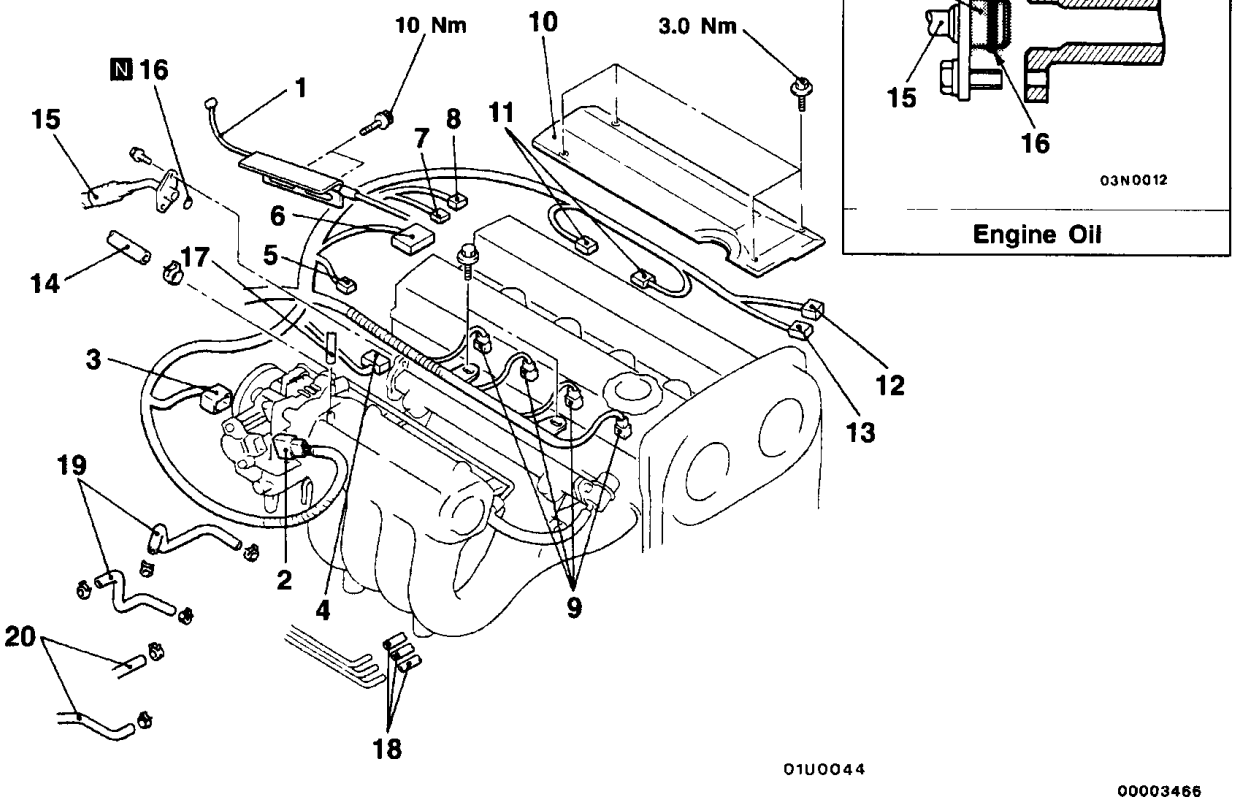
ENGINE ASSEMBLY <DOHC>

11200100091

REMOVAL AND INSTALLATION

Pre-removal Operations
- Fuel Line Pressure Releasing (Refer to GROUP 13A – On-vehicle Service.)
- Hood Removal (Refer to GROUP 42.)
- Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service.)
- Transmission Assembly Removal (Refer to GROUP 22.)
- Radiator Assembly Removal (Refer to GROUP 14.)

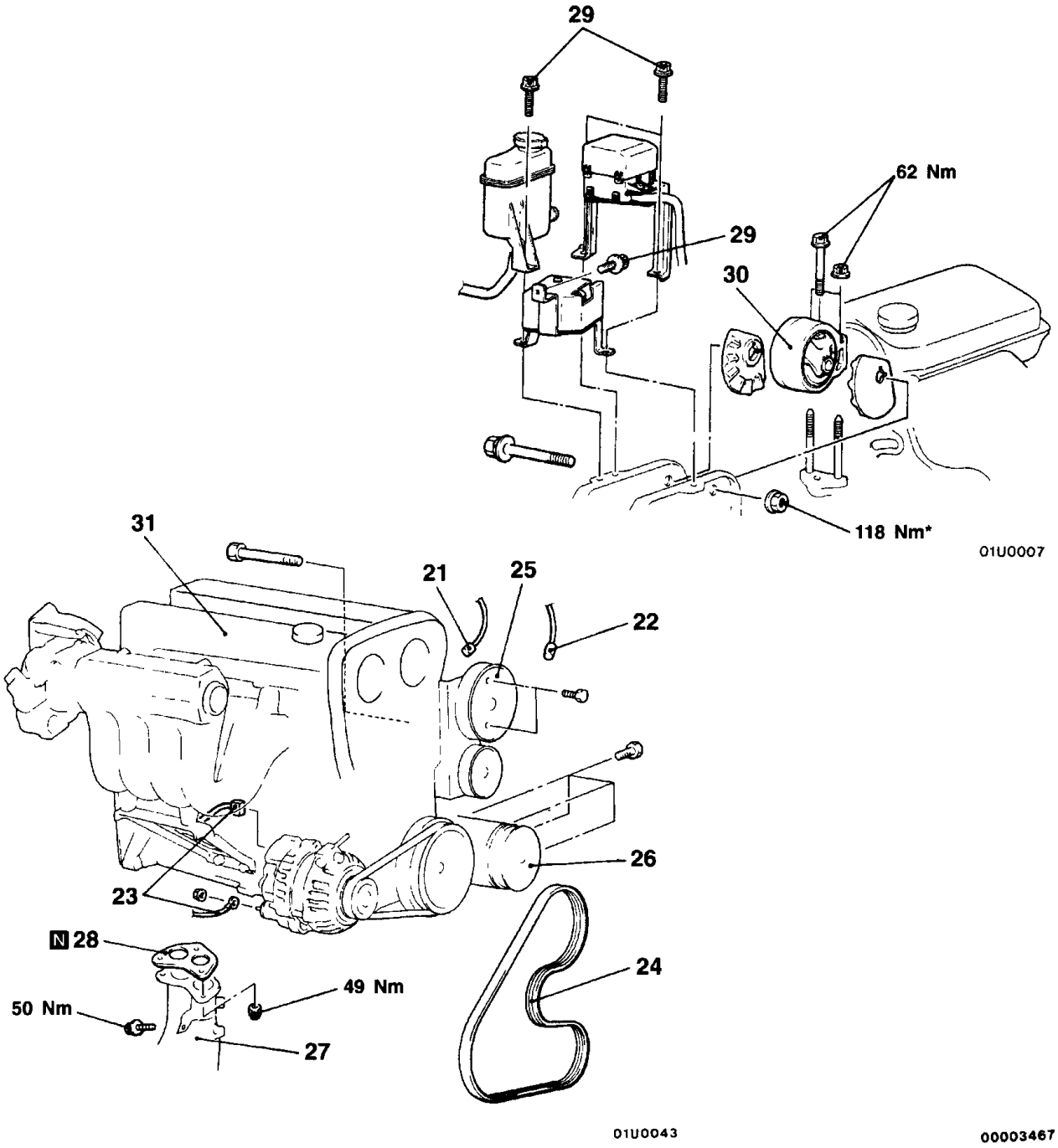
Post-installation Operations
- Radiator Assembly Installation (Refer to GROUP 14.)
- Transmission Assembly Installation (Refer to GROUP 22.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – On-vehicle Service.)
- Engine Coolant Refilling (Refer to GROUP 14 – On-vehicle Service.)
- Drive Belt Tension Adjustment (Refer to P.11-6.)
- Hood Installation (Refer to GROUP 42.)



00003466

Removal steps

1. Accelerator cable connection
2. TPS connector
3. Idle speed control servo connector
4. Detonation sensor connector
5. Oil presser switch connector
6. Ignition failure sensor connector
7. Engine coolant temperature sensor connector
8. Engine coolant temperature gauge unit connector
9. Injector connector
10. Center cover
11. Ignition coil connector
12. Cam position sensor connector
13. Crank angle sensor connector
14. Fuel return hose connection
- ▶C◀ 15. Fuel high pressure hose connection
16. O-ring
17. Brake booster vacuum hose connection
18. Vacuum hoses connection
19. Water hoses connection
20. Heater hoses connection



21. Power steering oil pressure switch connector
22. A/C compressor connector
23. Alternator connector
24. Drive belt (power steering, A/C)
25. Power steering oil pump connection
26. A/C compressor connection
27. Front exhaust pipe connection
28. Gasket
29. Bolts
30. Engine mount bracket
31. Engine 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▶ POWER STEERING OIL PUMP REMOVAL

Remove the power steering oil pump from the bracket with the hose attached.

NOTE
Place the removed power steering oil pump where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

◀B▶ A/C COMPRESSOR REMOVAL

Disconnect the A/C compressor connector and remove the compressor from the compressor bracket with the hose still attached.

NOTE
Place the removed A/C compressor where it will not be a hindrance when removing and installing the engine assembly, and tie it with a cord.

◀C▶ ENGINE MOUNT BRACKET REMOVAL

1. Support the engine with a garage jack.
2. Remove the mechanical hanger (recommended tool) which was attached when the transmission assembly was removed.
3. Hold the engine assembly with a chain block or similar tool.
4. Place a garage jack against the engine oil pan with a piece of wood in between, jack up the engine so that the weight of the engine is no longer being applied to the engine mount bracket, and then remove the engine mount bracket.

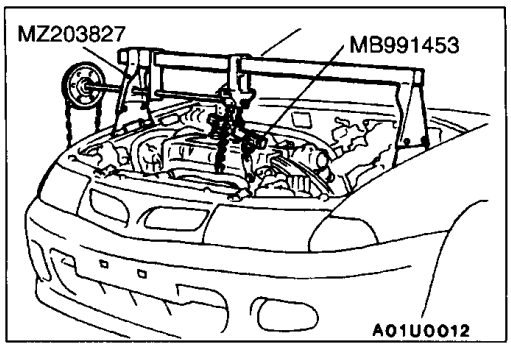
◀D▶ ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, 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, checking that the cables, hoses, and harness connectors are not clamped.



▶B◀ ENGINE MOUNT BRACKET INSTALLATION

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

▶C◀ FUEL HIGH PRESSURE HOSE INSTALLATION

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

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

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

ENGINE LUBRICATION

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12109000020

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SPECIAL TOOL 3

ON-VEHICLE SERVICE 3

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Engine Oil Replacement 3

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GENERAL INFORMATION

12100010022

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 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, kerosine, 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

12100040021

Items	Engine oil (API classification)	Quantity ℓ
Oil filter	SG or higher	0.3
Total quantity		3.8

SPECIAL TOOL

12100060027

Tool	Number	Name	Use
	MB991396	Oil filter wrench	Removal and installation of engine oil filter <4G93>

ON-VEHICLE SERVICE

12100090026

ENGINE OIL INSPECTION

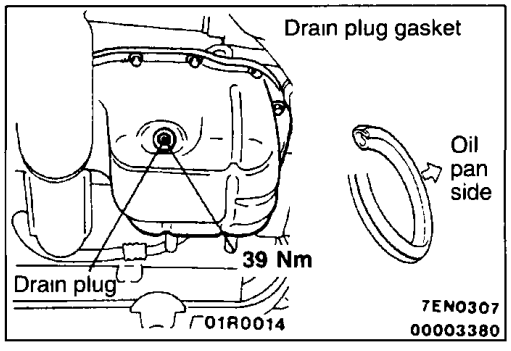
1. Pull out the level gauge slowly and check that the oil level is in the illustrated range.
2. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it has sufficient viscosity.

ENGINE OIL REPLACEMENT

12100100026

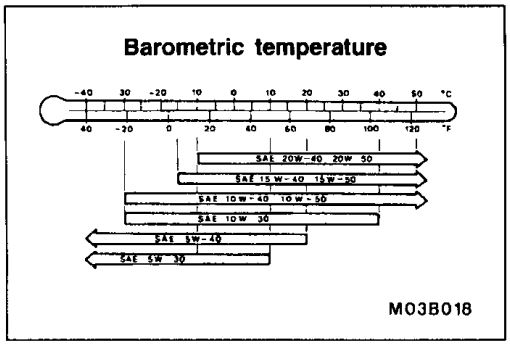
1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C to 90°C.
2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.

   Caution
   Use care as oil could be hot.



4. Fit the drain plug after oil has been drained completely.

   NOTE
   Install the drain plug gasket so it faces in the direction shown in the illustration.



5. Refill with specified quantity of oil.

   Specified Engine Oil (API classification): SG or higher

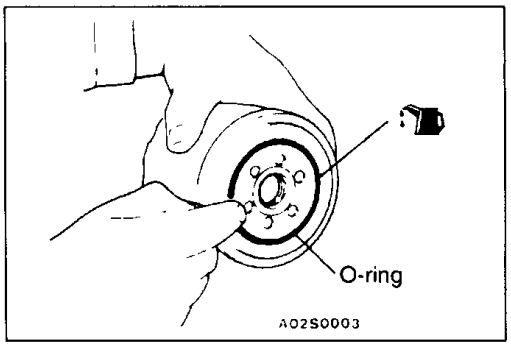
   Total quantity (Includes volume inside oil filter): 3.8 ℓ

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

OIL FILTER REPLACEMENT

12100110029

1. After removing the engine oil filler cap, remove the engine oil drain plug to drain the engine oil.
2. Use the special tool (MB991396) to remove the engine oil filter from the underside of the vehicle.
3. Clean the filter bracket side mounting surface.



4. Apply a small amount of engine oil to the O-ring of the new oil filter.
5. Use the special tool (MB991396) to install the engine oil filter.

   NOTE
   Tightening torque: 14 Nm
6. Fill with engine oil.
7. Race the engine 2–3 times, and check to be sure that no engine oil leaks from installation section of the oil filter.

FUEL

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13109000058

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NOTE
THE GROUPS MARKED BY ARE NOT IN THIS MANUAL

MULTIPOINT FUEL INJECTION (MPI)

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MULTIPOINT FUEL INJECTION (MPI)

13100010036

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. The engine ECU carries out activities such as fuel injection control, idle speed control and ignition timing control. In addition, the engine ECU is equipped with several diagnosis modes which simplify troubleshooting when a problem develops.

FUEL INJECTION CONTROL

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

A single injector 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 1-3-4-2. This is called sequential fuel injection. The 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.

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 speed 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 conditioner 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 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 force-driven 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 Relay Control
   Turns the compressor clutch of the A/C ON and OFF.
3. Fan Relay Control
   The revolutions of the radiator fan and condenser fan are controlled in response to the engine coolant temperature and vehicle speed.
4. Traction Control
   Engine output torque is reduced based on signals from the TCL-ECU in response to the conditions under which slipping of the driven wheels and turning of the vehicle occur.
   Furthermore, reduction of output torque is performed by closing the throttle valve and retarding the ignition timing.
5. Purge Control Solenoid Valve Control
   Refer to GROUP 17.
6. EGR Control Solenoid Valve Control
   Refer to GROUP 17.

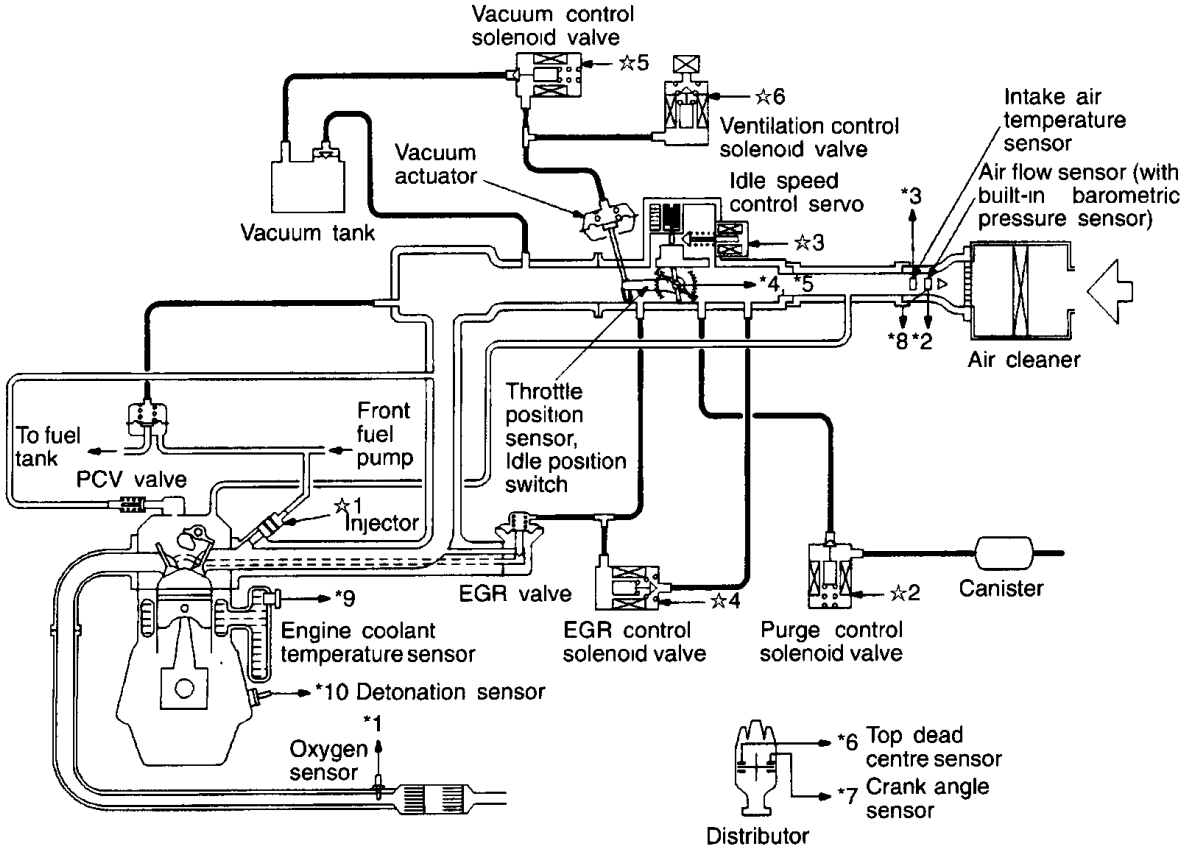
Items		Specifications
Throttle body	Throttle bore mm	50 <4G92, 4G93-SOHC> 54 <4G93-DOHC>
	Throttle position sensor	Variable resistor type
	Accelerator pedal position sensor <Vehicles with TCL>	Variable resistor type
	Idle speed control servo	Stepper motor type (Stepper motor type by-pass air control system with the air volume limiter)
	Idle position switch <Vehicle without TCL>	Rotary contact type, within throttle position sensor
	Idle position switch <Vehicle with TCL>	Rotary contact type, within accelerator pedal position sensor

Items		Specifications
Engine ECU	Identification model No.	E2T63276 <4G92> E2T63277 <4G93-SOHC (Vehicles without TCL)> E2T63278 <4G93-SOHC (Vehicles with TCL)> E2T63279 <4G93-DOHC>
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	Zirconia type
	Vehicle speed sensor	Magnetic resistive element type
	Inhibitor switch	Contact switch type
	No. 1 cylinder top dead centre sensor	Hall element type
	Camshaft position sensor	Hall element type
	Crank angle sensor	Hall element type
	Detonation sensor	Piezoelectric type
	Power steering fluid pressure switch	Contact switch type
Actuators	Control relay type	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH210 <4G92, 4G93-SOHC> CDH275 <4G93-DOHC>
	EGR control solenoid valve	Duty cycle type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
	Ventilation control solenoid valve	Duty cycle type solenoid valve
	Vacuum control solenoid valve	Duty cycle type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	329

MULTI POINT FUEL INJECTION SYSTEM DIAGRAM

<4G92, 4G93-SOHC>

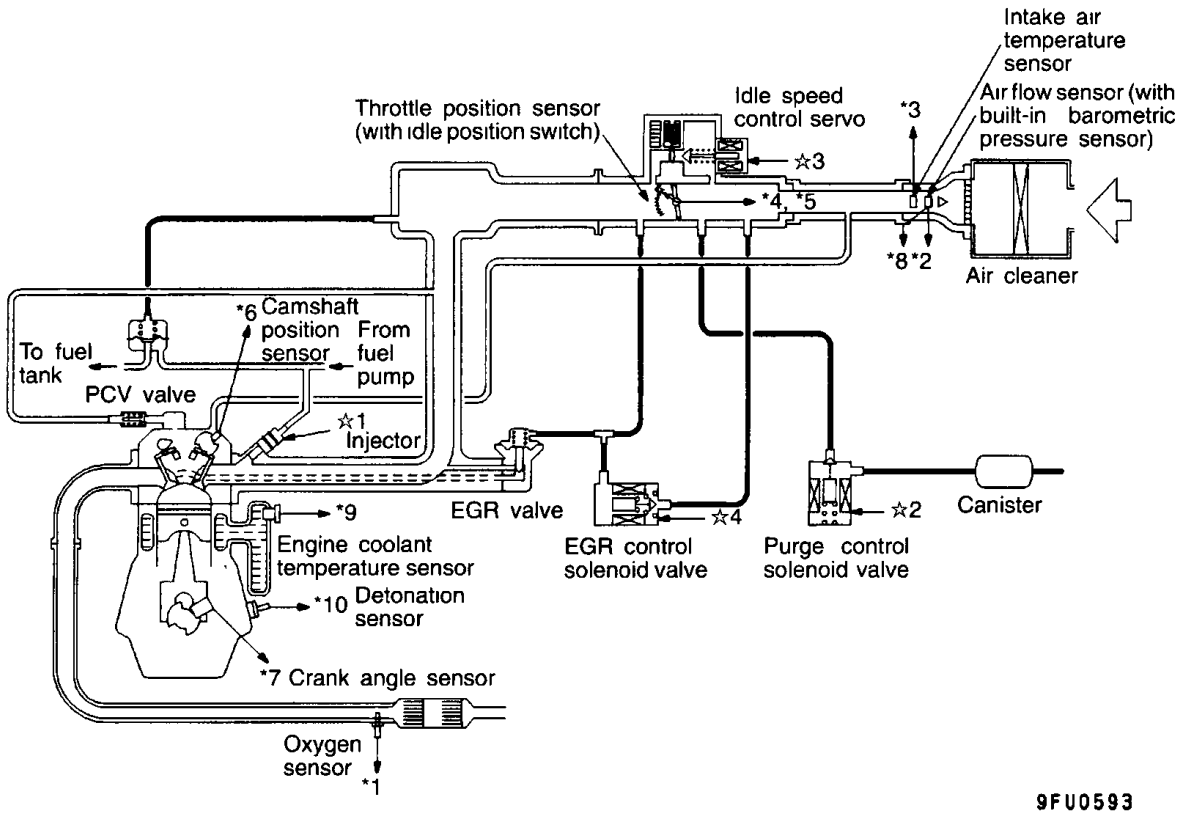
*1 Oxygen sensor *2 Air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Idle position switch *6 Top dead centre sensor *7 Crank angle sensor *8 Barometric pressure sensor *9 Engine coolant temperature sensor *10 Detonation sensor	• Power supply • Vehicle speed sensor • A/C switch • Inhibitor switch • Power steering fluid pressure switch • Ignition switch-ST • Ignition switch-IG • A/T-ECU • TCL-ECU <Vehicles with TCL> • Electric load switch	⇨	Engine ECU	⇨	☆1 Injector ☆2 Purge control solenoid valve ☆3 Idle speed control servo ☆4 EGR control solenoid valve ☆5 Vacuum control solenoid valve <Vehicles with TCL> ☆6 Ventilation control solenoid valve <Vehicles with TCL>	• Control relay (Fuel pump relay) • Control relay • A/C power relay • Engine warning lamp • Diagnosis signal • Ignition coil, power transistor • A/T-ECU • TCL-ECU <Vehicles with TCL>



9FU0592

<4G93-DOHC>

*1 Oxygen sensor *2 Air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Idle position switch *6 Camshaft position sensor *7 Crank angle sensor *8 Barometric pressure sensor *9 Engine coolant temperature sensor *10 Detonation sensor	• Power supply • Vehicle speed sensor • A/C switch • Power steering fluid pressure switch • Ignition switch-ST • Electric load switch • Ignition switch-IG	⇨	Engine ECU	⇨	☆1 Injector ☆2 Purge control solenoid valve ☆3 Idle speed control servo ☆4 EGR control solenoid valve	• Control relay (Fuel pump relay) • Control relay • A/C power relay • Engine warning lamp • Diagnosis signal • Ignition coil



9FU0593

SERVICE SPECIFICATIONS

13100030032

Items		Specifications
Basic idle speed r/min	4G92	750±50
	4G93	800±50
Idle speed when A/C is ON r/min		850 at neutral position
Throttle position sensor adjusting voltage mV	Vehicles without TCL	400–1,000
	Vehicles with TCL	580–690
Accelerator pedal position sensor adjusting voltage mV		400–1,000
Throttle position sensor resistance kΩ		3.5–6.5
Accelerator pedal position sensor resistance kΩ		3.5–6.5
Idle speed control servo coil resistance Ω		28–33 (at 20°C)
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 disconnection	324–343 at curb idle
	Vacuum hose connection	Approx. 265 at curb idle
Injector coil resistance Ω		13–16 (at 20°C)
Ventilation control solenoid valve coil resistance Ω		36–44 (at 20°C)
Vacuum control solenoid valve coil resistance Ω		36–44 (at 20°C)

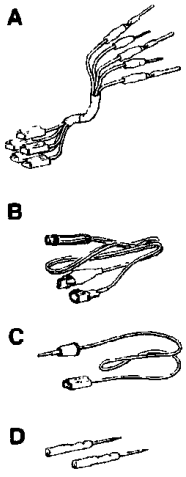
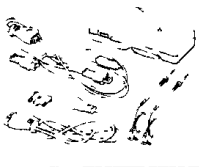
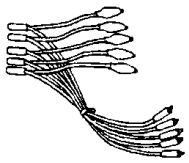
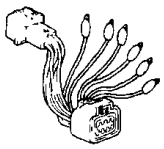
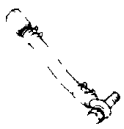
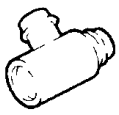
SEALANT

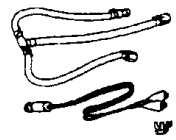
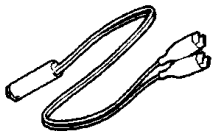
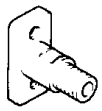
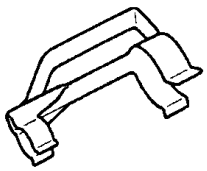
13100050038

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

SPECIAL TOOLS

13100060031

Tool	Number	Name	Use
	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Fuel gauge simple inspection A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
	MB991502	MUT-II sub assembly	• Reading diagnosis code • MPI system inspection
	MB991348	Test harness set	Inspection using an analyzer
	MD998463	Test harness (6-pin, square)	• Inspection of idle speed control servo • Inspection using an analyzer
	MD998478	Test harness (3-pin, triangle)	Inspection using an analyzer
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	

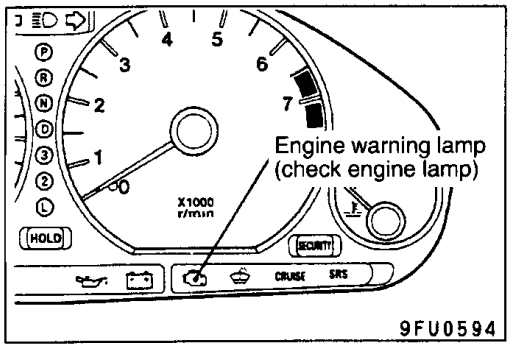
Tool	Number	Name	Use
	MD998706	Injector test set	Checking the spray condition of injectors
 MB991607	MB991607	Injector test harness	
 MD998741	MD998741	Injector test adaptor	
	MB991608	Clip	

TROUBLESHOOTING

13100850034

DIAGNOSIS TROUBLESHOOTING FLOW

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



DIAGNOSIS FUNCTION

13100860037

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

If an abnormality occurs in any of the following items related to the Multipoint Fuel Injection (MPI) system, the engine warning lamp will illuminate.
If the lamp remains illuminated or if the lamp illuminates while the engine is running, check the diagnosis code output.

Engine warning lamp inspection items

Engine ECU
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Camshaft position sensor <DOHC>
Barometric pressure sensor
Detonation sensor
Ignition timing adjustment signal
Injector
Ignition coil, power transistor <DOHC>
Immobilizer system
Vacuum control solenoid valve <TCL>
Ventilation control solenoid valve <TCL>

Caution
Engine warning lamp will come on even when terminal for ignition timing adjustment is short-circuited. Therefore, it is not abnormal that the lamp comes on even when terminal for ignition timing adjustment is short-circuited at the time of ignition timing adjustment.

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

INSPECTION USING MUT-II SERVICE DATA 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

13100910039

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 (crank angle sensor signal) to take readings of the basic injector drive timing and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Top dead centre sensor <SOHC>	Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Camshaft position sensor <DOHC>	1. Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.) 2. Cuts off the fuel supply 4 seconds after a problem is detected. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Ignition coil, power transistor <DOHC>	Cuts off the fuel supply to cylinders with an abnormal ignition signal.
Oxygen sensor	Air/fuel ratio feedback control (closed loop control) is not performed.
Communication wire with transmission control unit <A/T>	Ignition timing is not retarded during transmission gear shifting (overall engine and transmission control).

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

INSPECTION CHART FOR DIAGNOSIS CODES

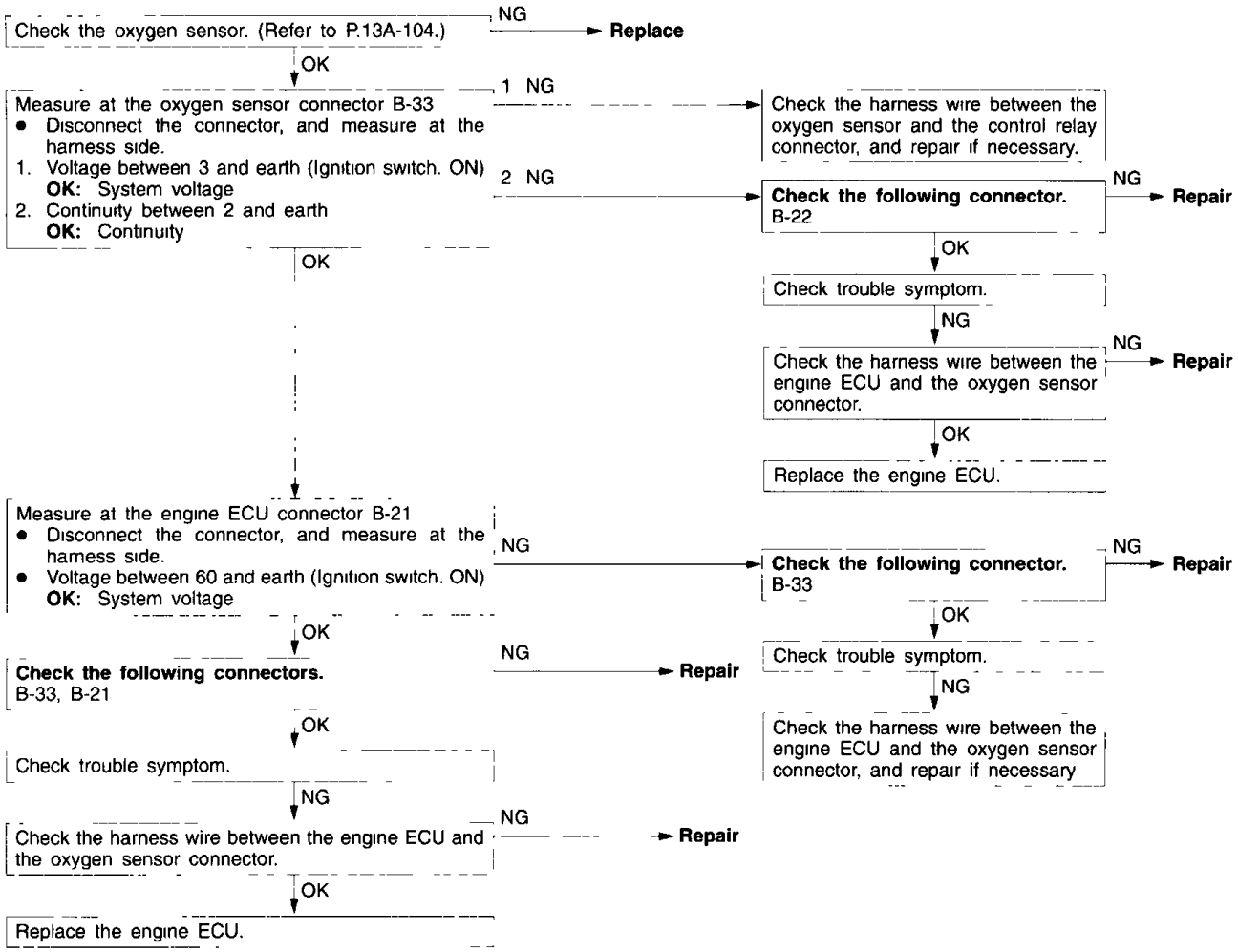
13100870030

Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13A-15
12	Air flow sensor system	13A-16
13	Intake air temperature sensor system	13A-16
14	Throttle position sensor system	13A-17
21	Engine coolant temperature sensor system	13A-18
22	Crank angle sensor system	13A-19 <SOHC> 13A-20 <DOHC>
23	Top dead centre sensor <SOHC>	13A-21
	Camshaft position sensor <DOHC>	13A-22
24	Vehicle speed sensor system	13A-23
25	Barometric pressure sensor system	13A-24
31	Detonation sensor system	13A-25
36*1	Ignition timing adjustment signal system	13A-26
41	Injector system	13A-26
44	Ignition coil and power transistor unit system <DOHC>	13A-27
54*2	Immobilizer system	GROUP 54 – Ignition key and Immobilizer
61	Communication wire with A/T-ECU system <A/T>	13A-28
71	Vacuum control solenoid valve system <Vehicles with TCL>	13A-29
72	Ventilation control solenoid valve system <Vehicles with TCL>	13A-30

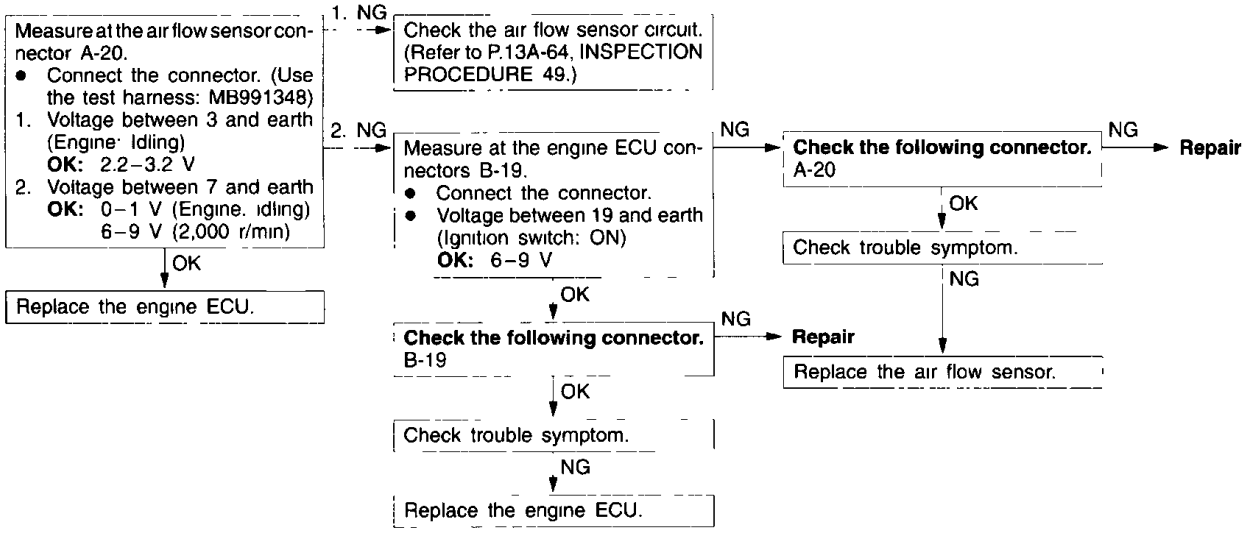
NOTE
*1: Malfunction code No. 36 is not memorized.
*2: Refer to GROUP 54 – Ignition key and Immobilizer-Troubleshooting.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

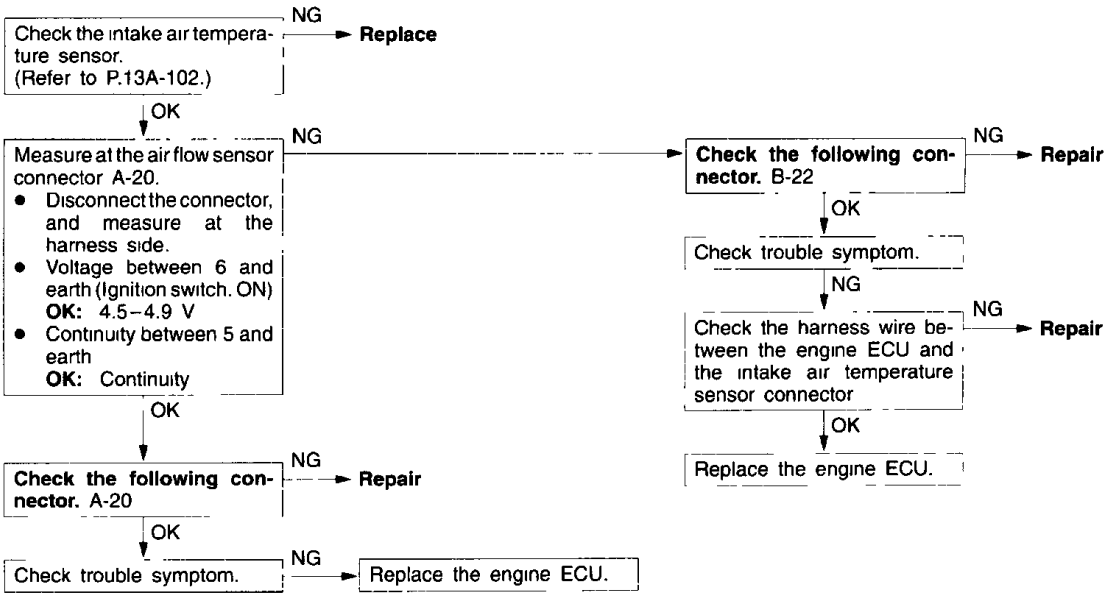
Code No. 11 Oxygen sensor system	Probable cause
Range of Check • 3 minutes have passed after engine was started. • Engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20–50°C. • Engine speed is approx. 2,000–3,000 r/min • Vehicle is moving at constant speed on a flat, level 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 time 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



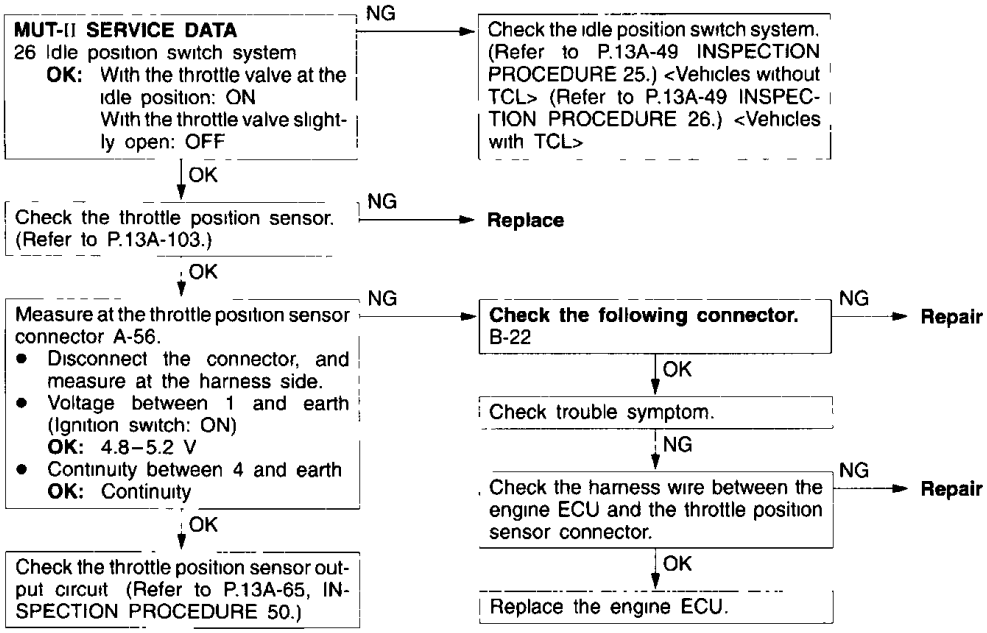
Code No. 12 Air flow sensor system	Probable cause
Range of Check • Engine speed is 500 r/min or more. Set conditions • Sensor output frequency is 3 Hz or less for 4 seconds.	• Malfunction of the air flow sensor • Improper connector contact, open circuit or short-circuited harness wire of the air flow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



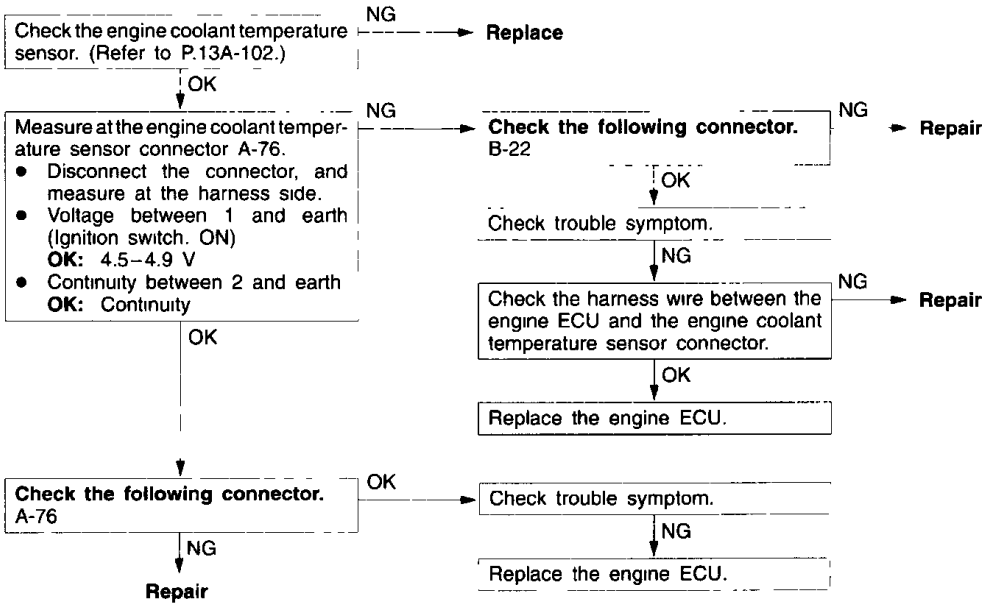
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4 6 V or more (corresponding to an intake air temperature of –45°C or less) for 4 seconds. or • Sensor output voltage is 0.2V or less (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



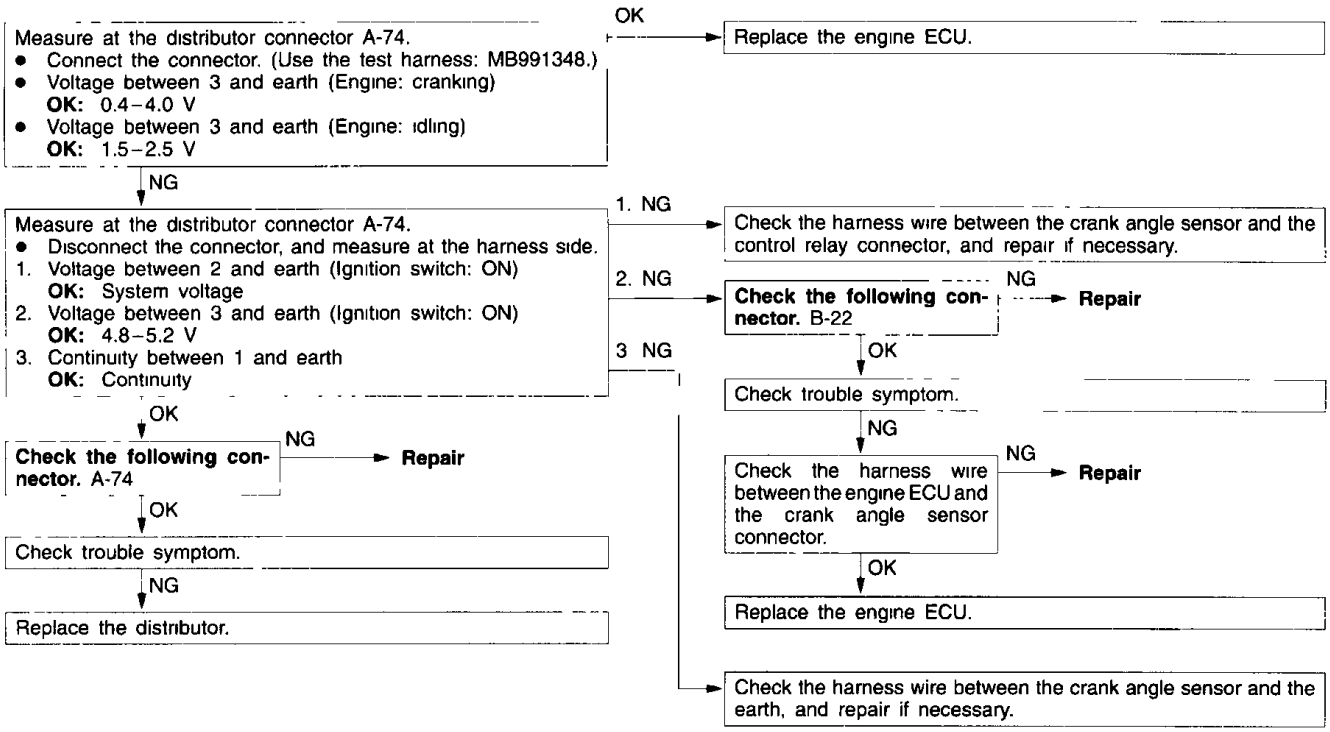
Code No. 14 Throttle position sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds. or • The sensor output voltage is 0 2 V or less for 4 seconds	• Malfunction of the throttle position sensor or maladjustment • Improper connector contact, open circuit or short-circuited harness wire of the throttle position sensor circuit • Improper "ON" state of idle position switch • Short circuit of the idle position switch signal line • Malfunction of the engine ECU



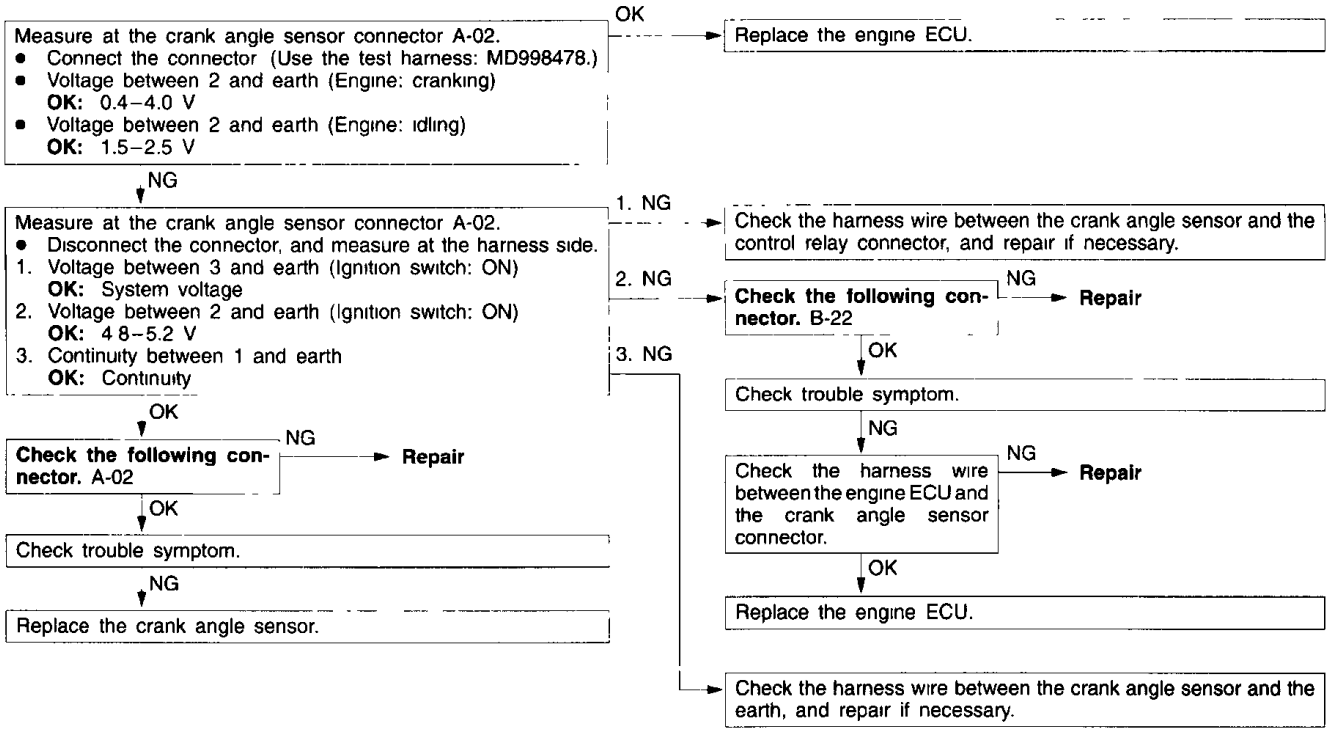
Code No. 21 Engine coolant temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an engine coolant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



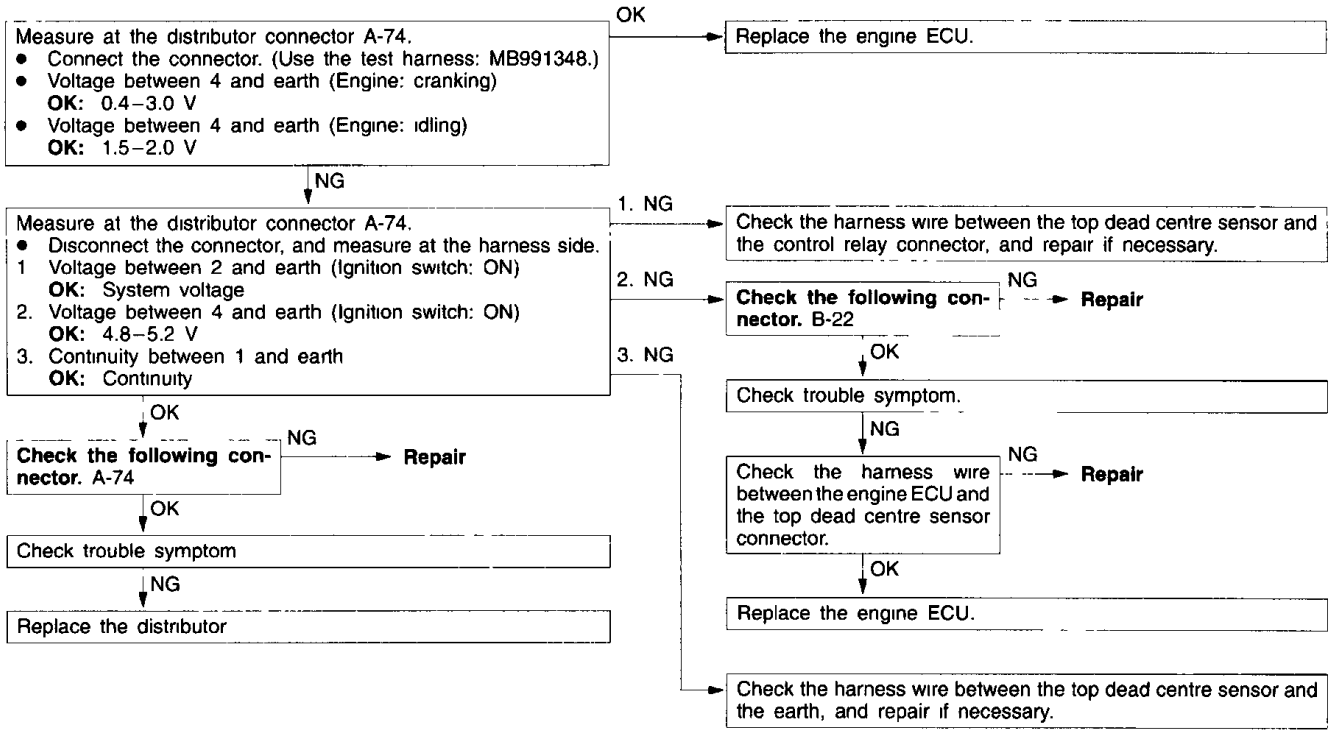
Code No. 22 Crank angle sensor system <SOHC>	Probable cause
Range of Check • Engine is cranking. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness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



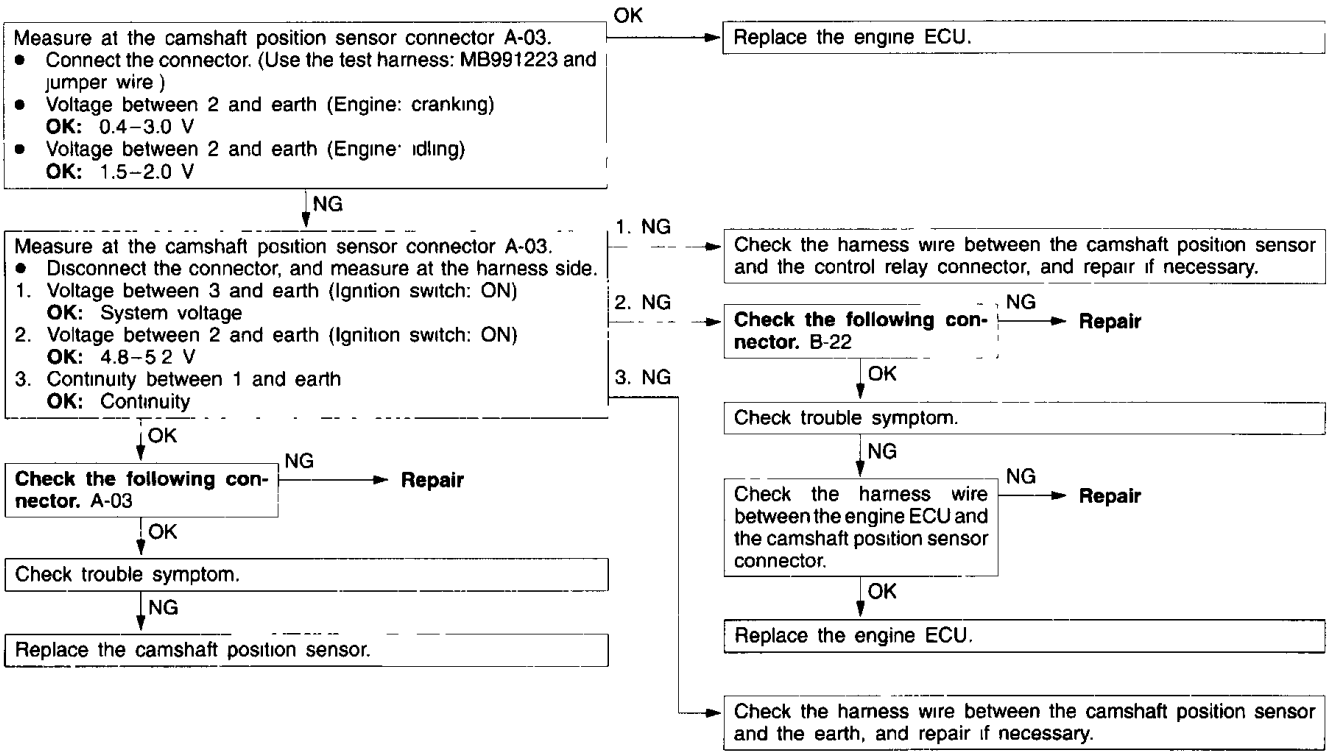
Code No. 22 Crank angle sensor system <DOHC>	Probable cause
Range of Check • Engine is cranking. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input)	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness wire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



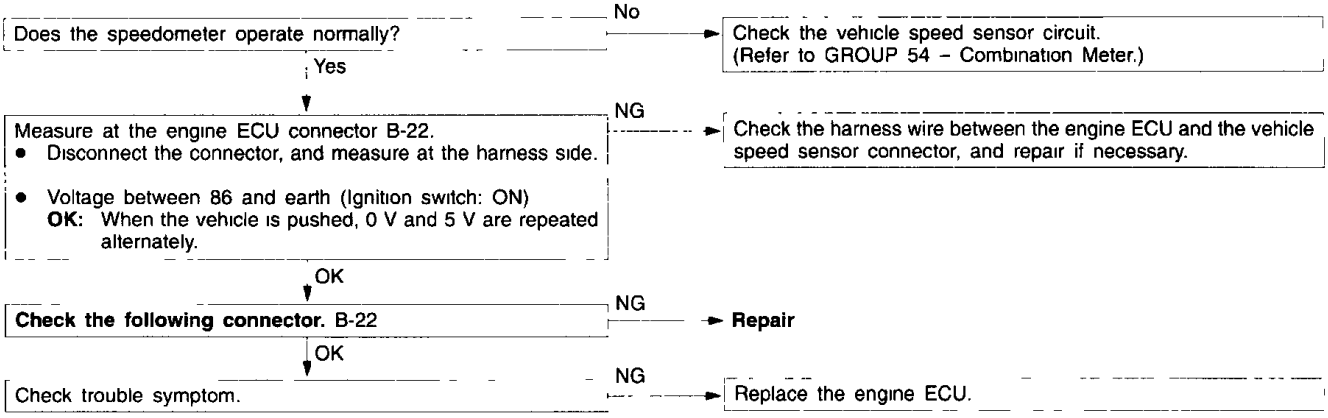
Code No. 23 Top dead centre sensor system <SOHC>	Probable cause
Range of Check • Ignition switch: ON • Engine speed is approx. 50 r/min or more. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the top dead centre sensor • Improper connector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



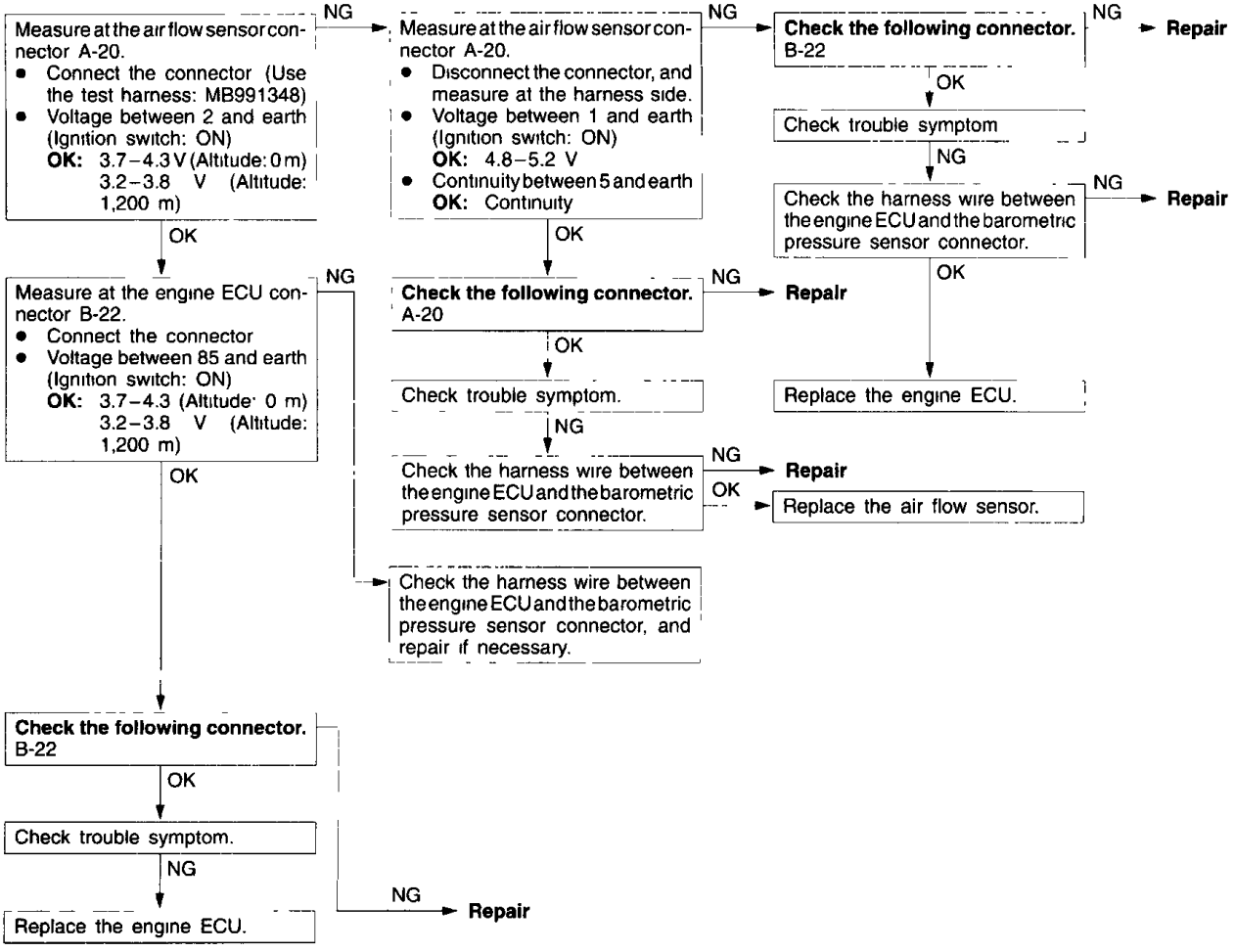
Code No. 23 Camshaft position sensor system <DOHC>	Probable cause
Range of Check • Ignition switch: ON • Engine speed is approx. 50 r/min or more. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the camshaft position sensor • Improper connector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



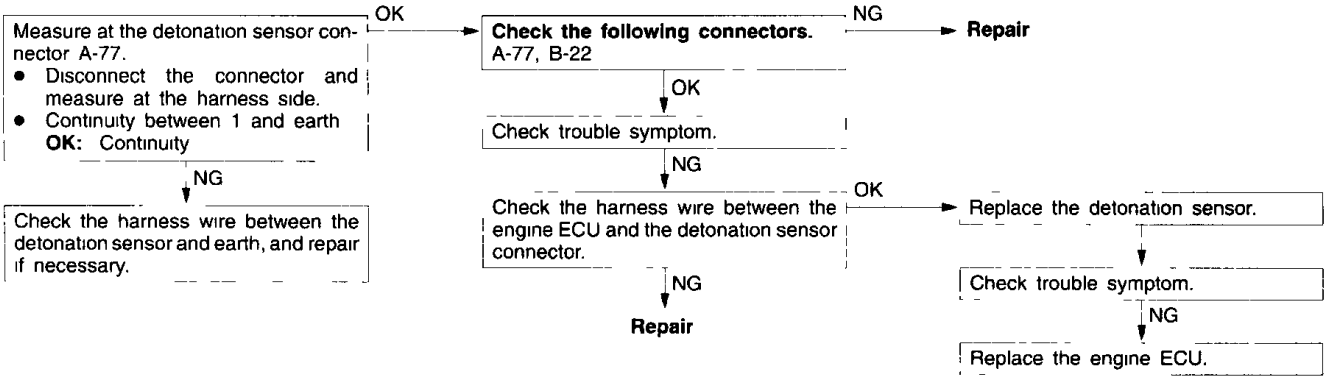
Code No. 24 Vehicles speed sensor system	Probable cause
Range of check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Idle position switch: OFF • Engine speed is 3,000 r/min or more. • Driving under high engine load conditions. 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



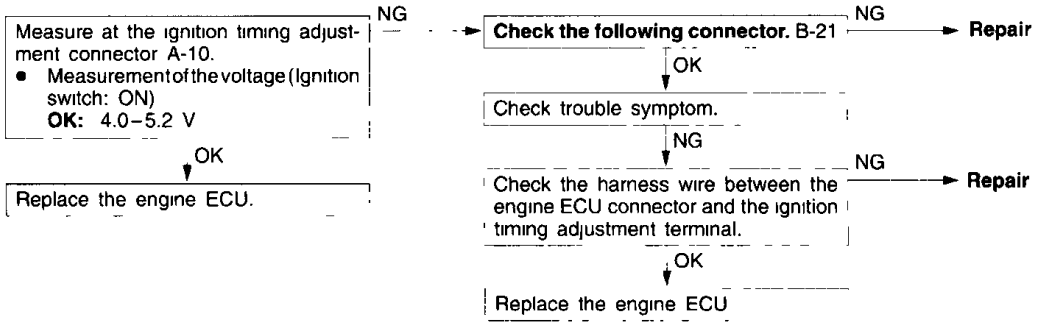
Code No. 25 Barometric pressure sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Battery voltage is 8 V or more. Set conditions • Sensor output voltage is 4.5 V or more (corresponding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



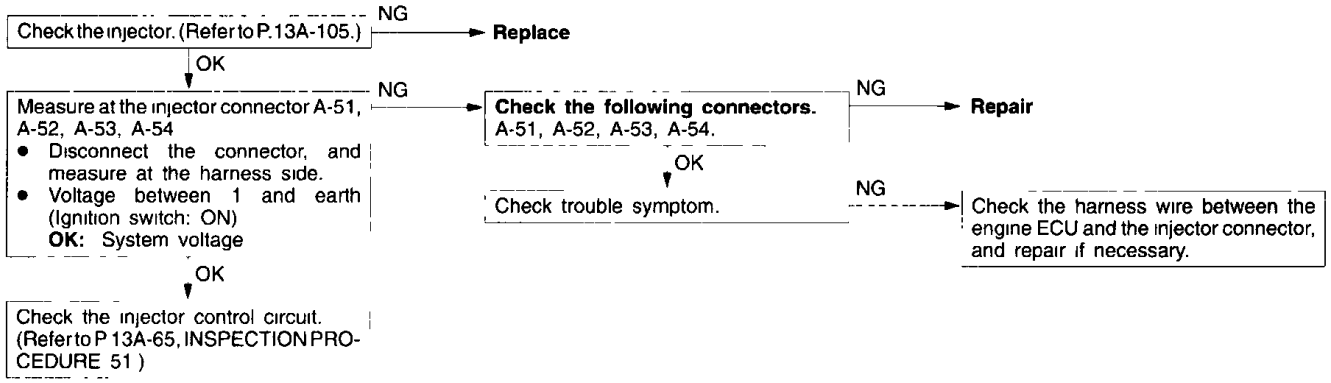
Code No. 31 Detonation sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Engine speed is approx. 5,000 r/min or more Set conditions The change in the detonation sensor output voltage (detonation sensor peak voltage at each 1/2 revolution of the crankshaft) is less than 0.06 V for 200 times in succession.	• Malfunction of the detonation sensor • Improper connector contact, open circuit or short-circuited harness wire of the detonation sensor circuit • Malfunction of the engine ECU



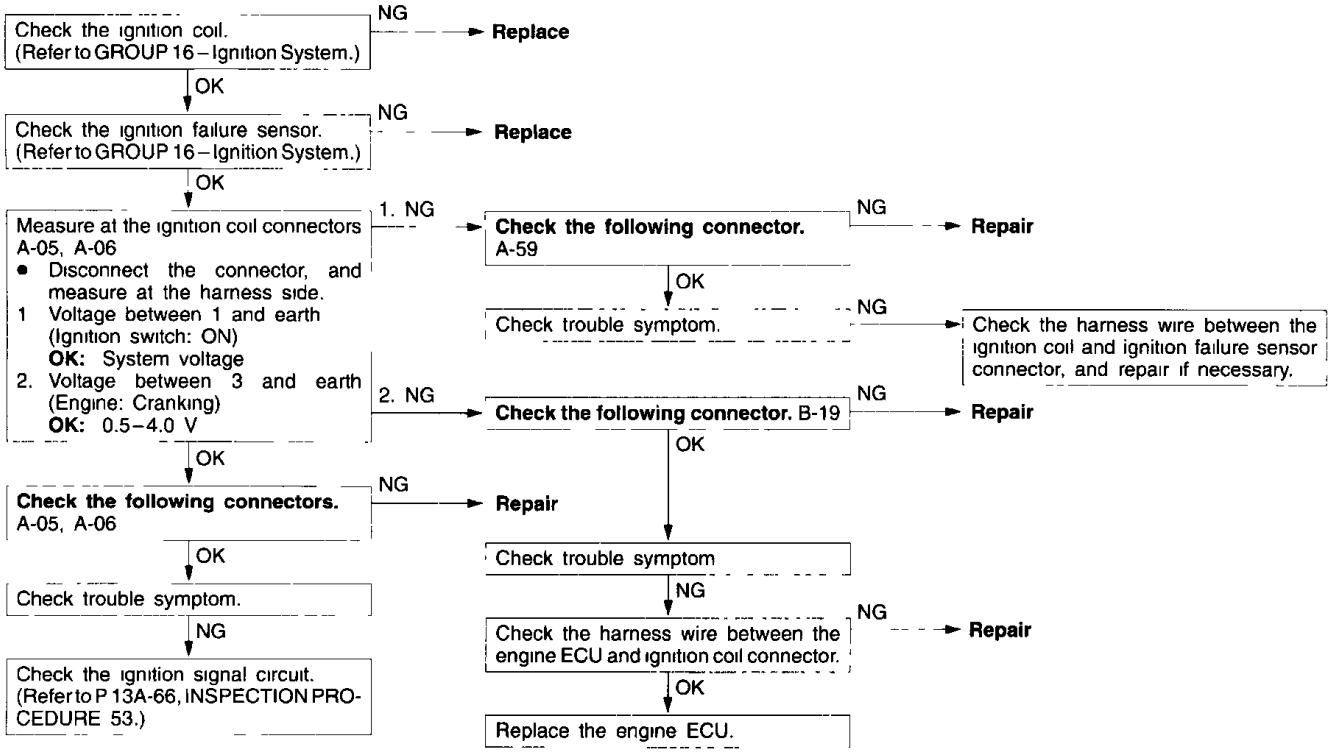
Code No. 36 Ignition timing adjustment signal system	Probable cause
Range of Check • Ignition switch: ON Set conditions • The ignition timing adjusting signal wire is shorted to the earth	• Short circuit to earth of the ignition timing adjustment signal line • Malfunction of the engine ECU



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

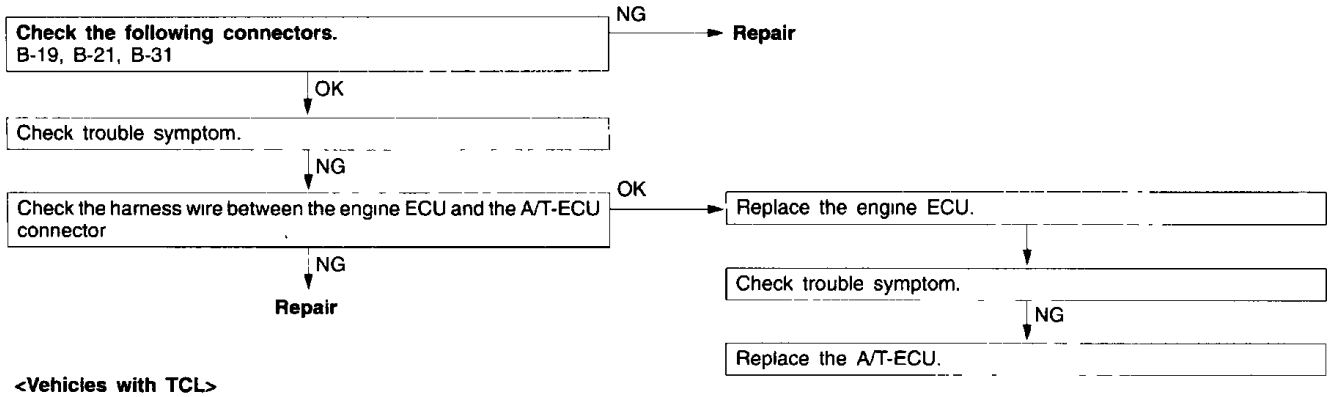


Code No. 44 Ignition coil and power transistor unit system <DOHC>	Probable cause
Range of Check • Engine speed is approx. 50–4,000 r/min • Engine is not cranking. Set conditions • The ignition signal from the same coil is not input for 4 seconds. However, this excludes cases where no ignition signal 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 ignition failure sensor • Malfunction of the engine ECU

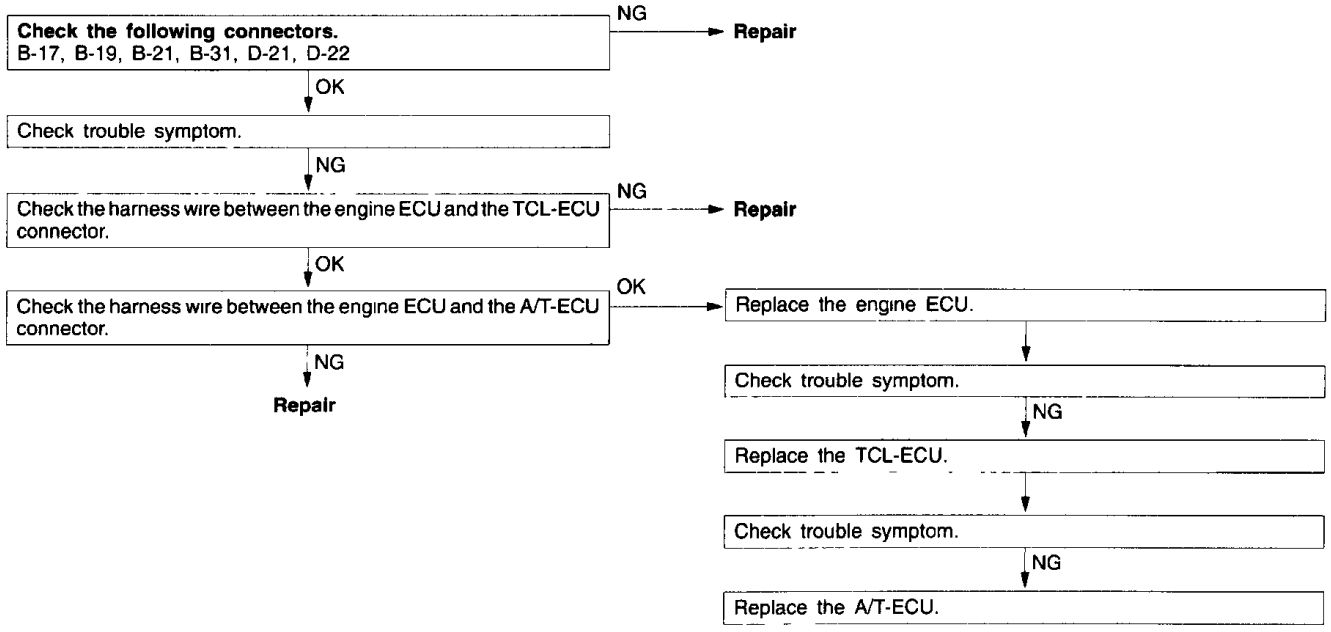


Code No. 61 Communication wire with A/T-ECU system <A/T>	Probable cause
Range of Check • 60 seconds or more have passed immediately after engine was started. • Engine speed is approx. 50 r/min or more Set conditions The voltage of the torque reduction request signal from the A/T-ECU is LOW for 1.5 seconds or more.	• Malfunction of the harness wire and the connector • Malfunction of the engine ECU • Malfunction of the A/T-ECU • Malfunction of the TCL-ECU <Vehicles with TCL>

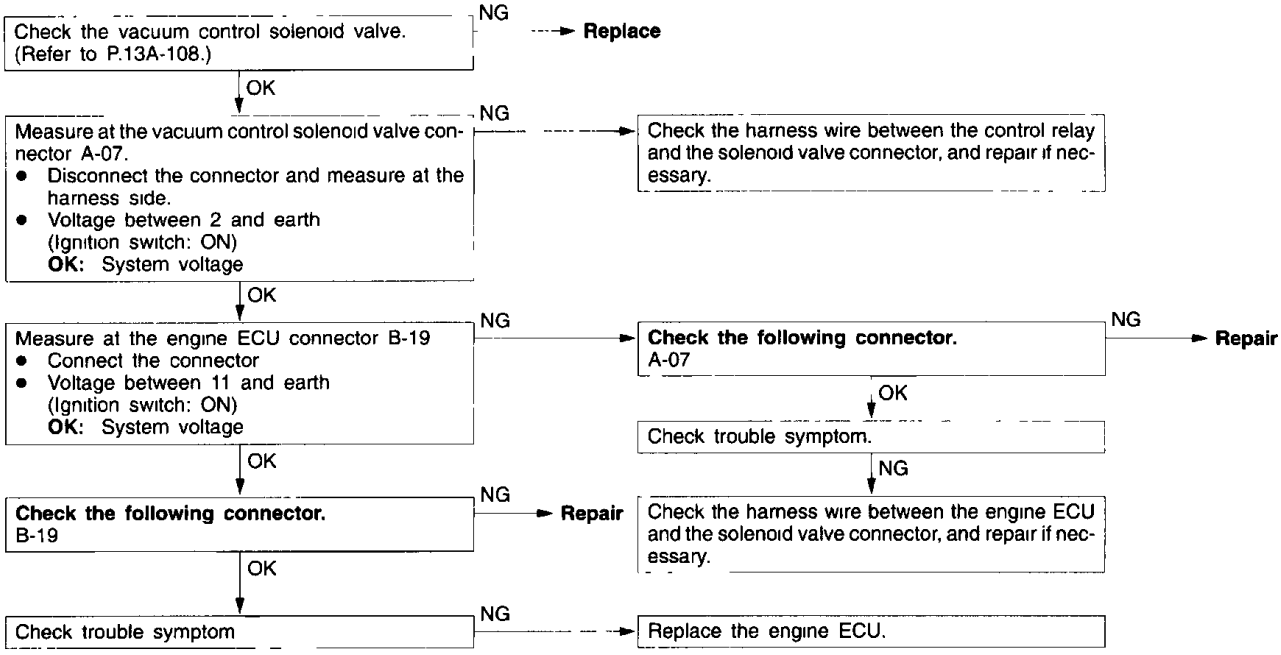
<Vehicles without TCL>



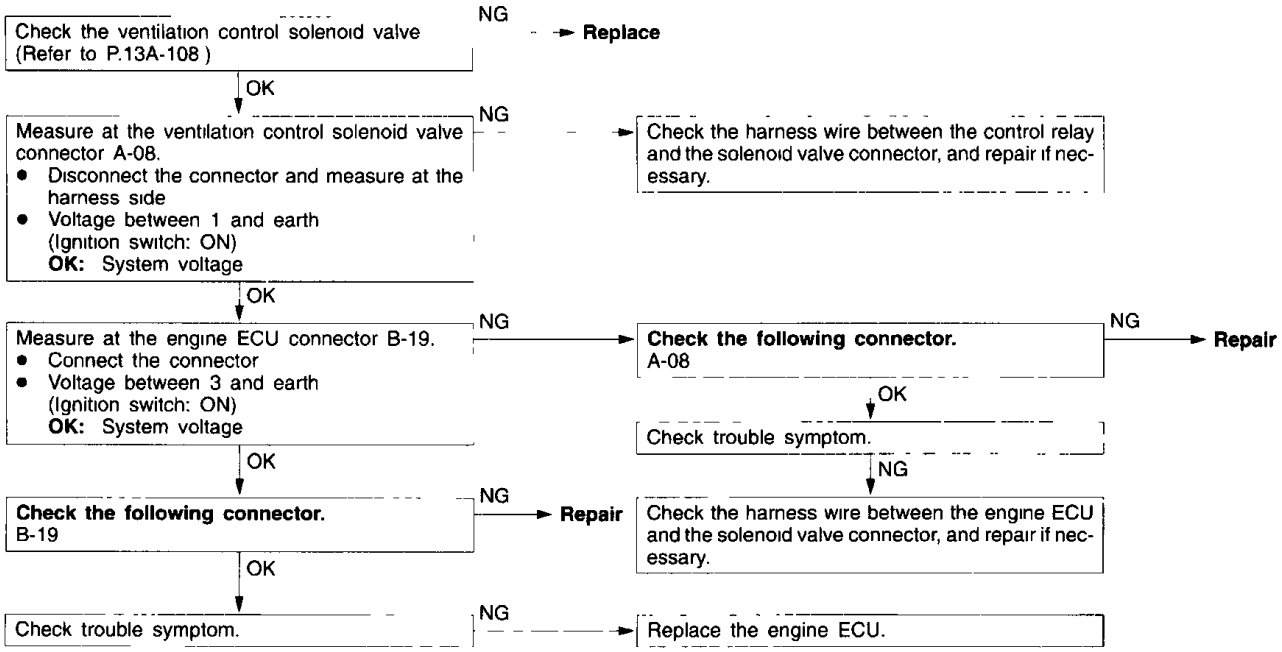
<Vehicles with TCL>



Code No. 71 Vacuum control solenoid valve system <Vehicles with TCL>	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds immediately after the engine starts. • Battery voltage is 10 V or more. • Forced actuation by means of MUT-II is not being carried out. Set condition Solenoid valve drive or non-drive instruction and energized condition of solenoid coil are different.	• Malfunction of the vacuum control solenoid valve • Improper connector contact, open circuit or short-circuited harness wire of the vacuum control solenoid valve • Malfunction of the engine ECU



Code No. 72 Ventilation control solenoid valve system <Vehicles with TCL>	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds immediately after the engine starts. • Battery voltage is 10 V or more. • Forced actuation by means of MUT-II is not being carried out. Set condition Solenoid valve drive or non-drive instruction and energized condition of solenoid coil are different.	• Malfunction of the ventilation control solenoid valve • Improper connector contact, open circuit or short-circuited harness wire of the ventilation control solenoid valve • Malfunction of the engine ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880033

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-33
	Communication with engine ECU only is not possible.	2	13A-33
Engine warning lamp and related parts	The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	13A-34
	The engine warning lamp remains illuminating and never goes out.	4	13A-34
Starting	No initial combustion (starting impossible)	5	13A-35
	Initial combustion but no complete combustion (starting impossible)	6	13A-36
	Long time to start (improper starting)	7	13A-37
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-38
	Idling speed is high. (Improper idling speed)	9	13A-39
	Idling speed is low. (Improper idling speed)	10	13A-40
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-41
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-42
	The engine stalls when starting the car. (Pass out)	13	13A-43
	The engine stalls when decelerating.	14	13A-43
Driving	Hesitation, sag or stumble	15	13A-44
	The feeling of impact or vibration when accelerating	16	13A-44
	The feeling of impact or vibration when decelerating	17	13A-45
	Poor acceleration	18	13A-45
	Surge	19	13A-46
	Knocking	20	13A-46
Dieseling		21	13A-46
Too high CO and HC concentration when idling		22	13A-47

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

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

Fig. 1

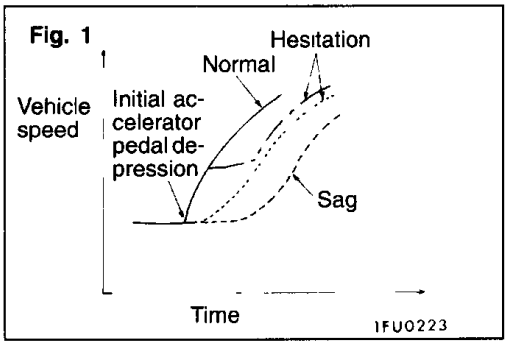
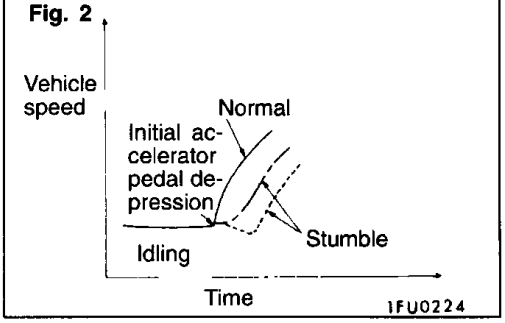


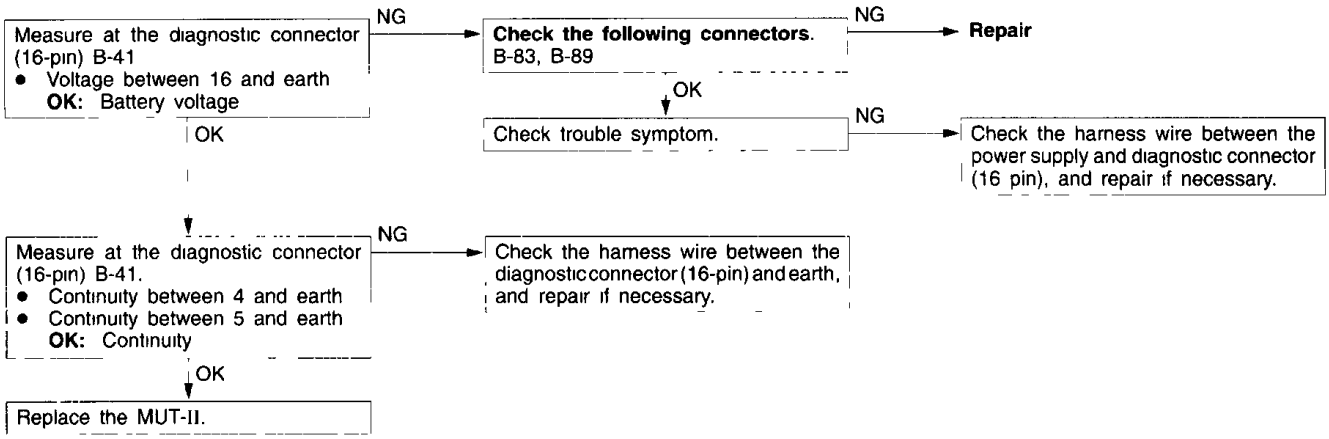
Fig. 2



INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

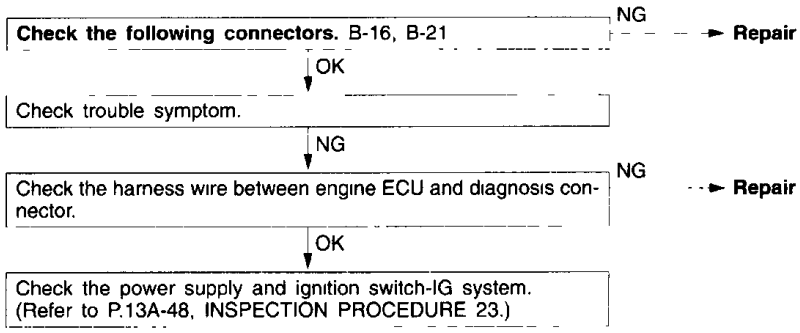
INSPECTION PROCEDURE 1

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 earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



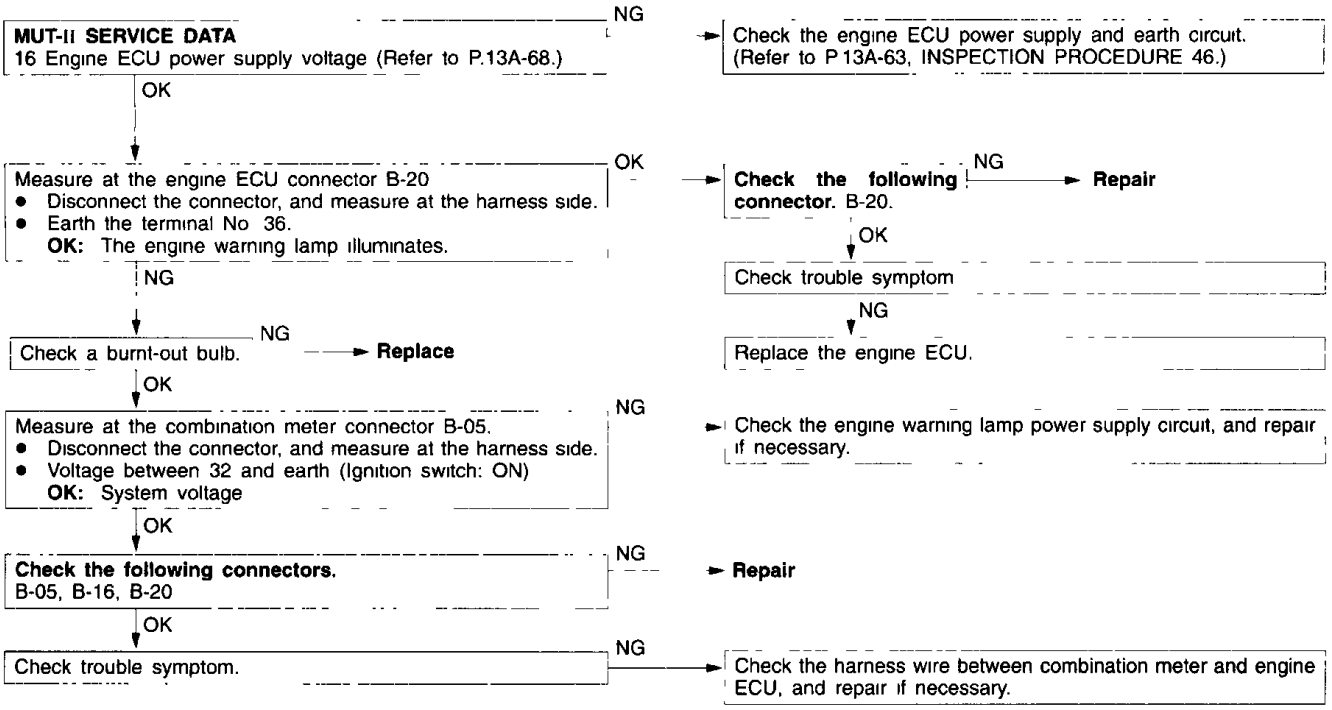
INSPECTION PROCEDURE 2

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



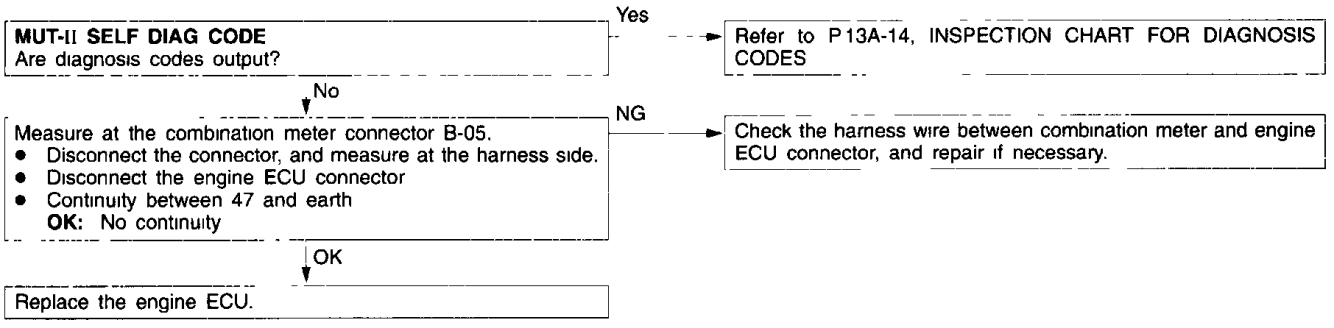
INSPECTION PROCEDURE 3

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



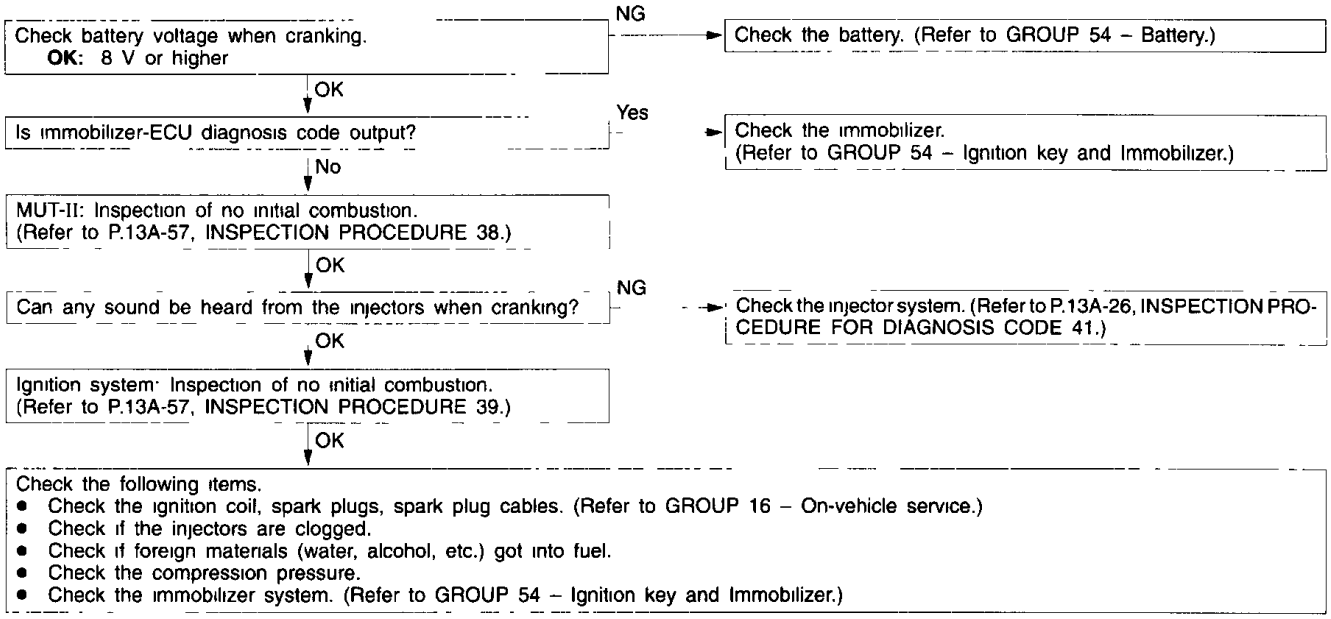
INSPECTION PROCEDURE 4

The engine warning lamp remains illuminating and never goes out.	Probable cause
In cases such as the above, the cause is probably that the engine ECU is detecting a problem in a sensor or actuator, or that one of the malfunctions listed at right has occurred.	• Short-circuit between the engine warning lamp and engine ECU • Malfunction of the engine ECU



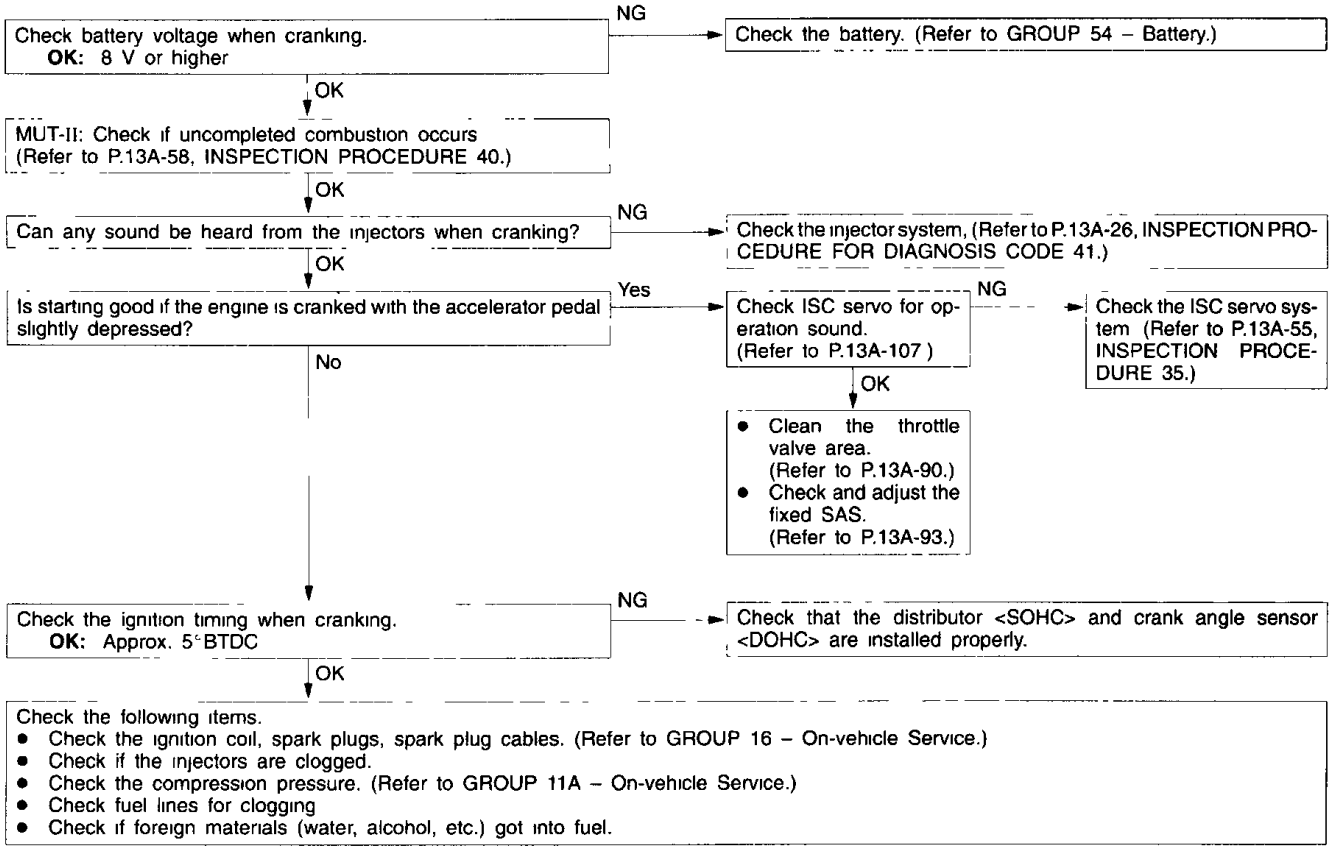
INSPECTION PROCEDURE 5

No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	• Malfunction of the ignition system • Malfunction of the fuel pump system • Malfunction of the injectors • Malfunction of the engine ECU • Malfunction of the immobilizer system • Foreign materials in fuel



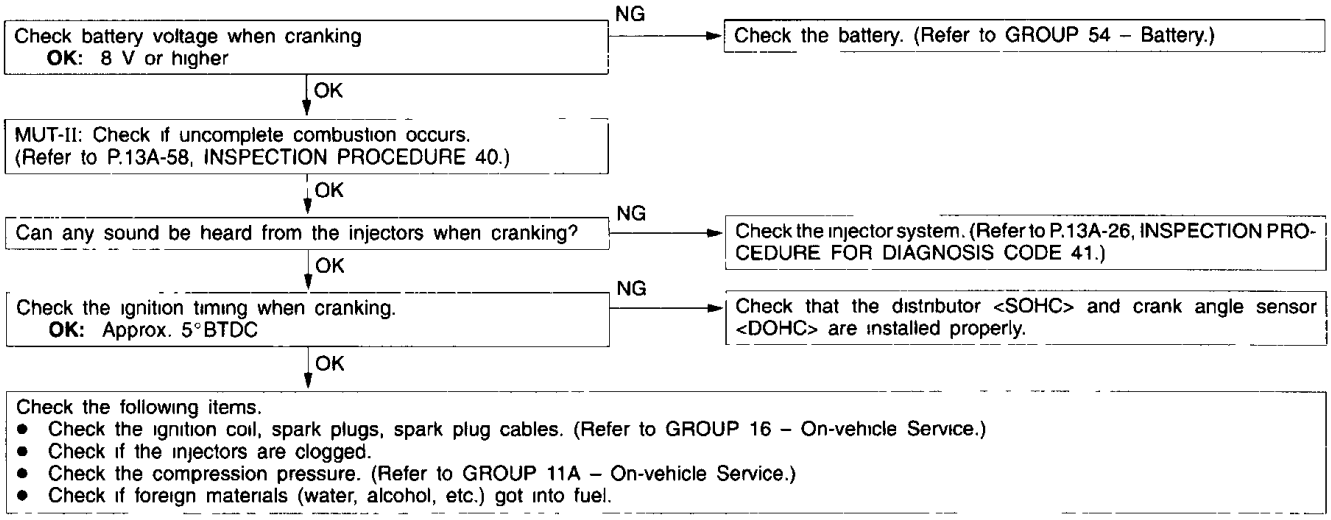
INSPECTION PROCEDURE 6

Initial combustion but no complete combustion (starting impossible)	Probable cause
In such cases as the above, the cause is probably that the spark plugs are generating sparks but the sparks are weak, or the initial mixture for starting is not appropriate.	• Malfunction of the ignition system • Malfunction of the injector system • Foreign materials in fuel • Poor compression • Malfunction of the engine ECU



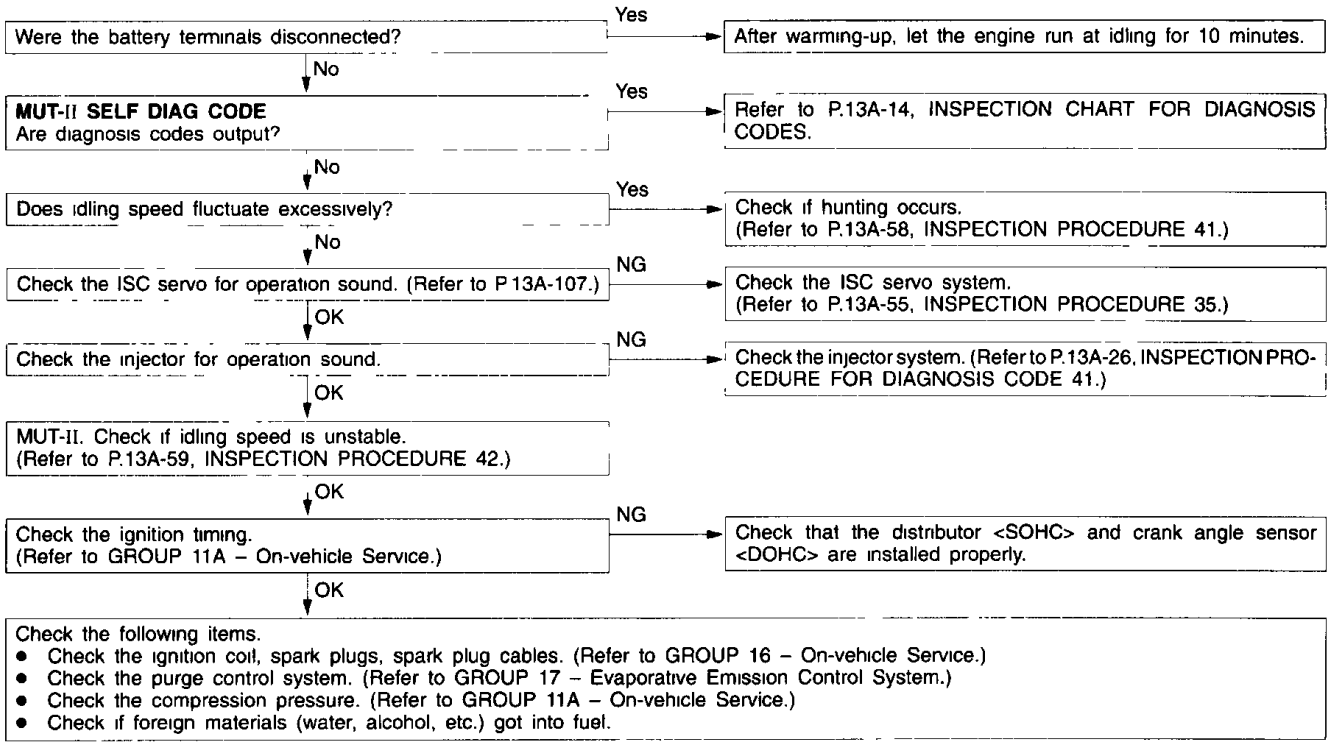
INSPECTION PROCEDURE 7

In takes too long time to start. (Incorrect 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



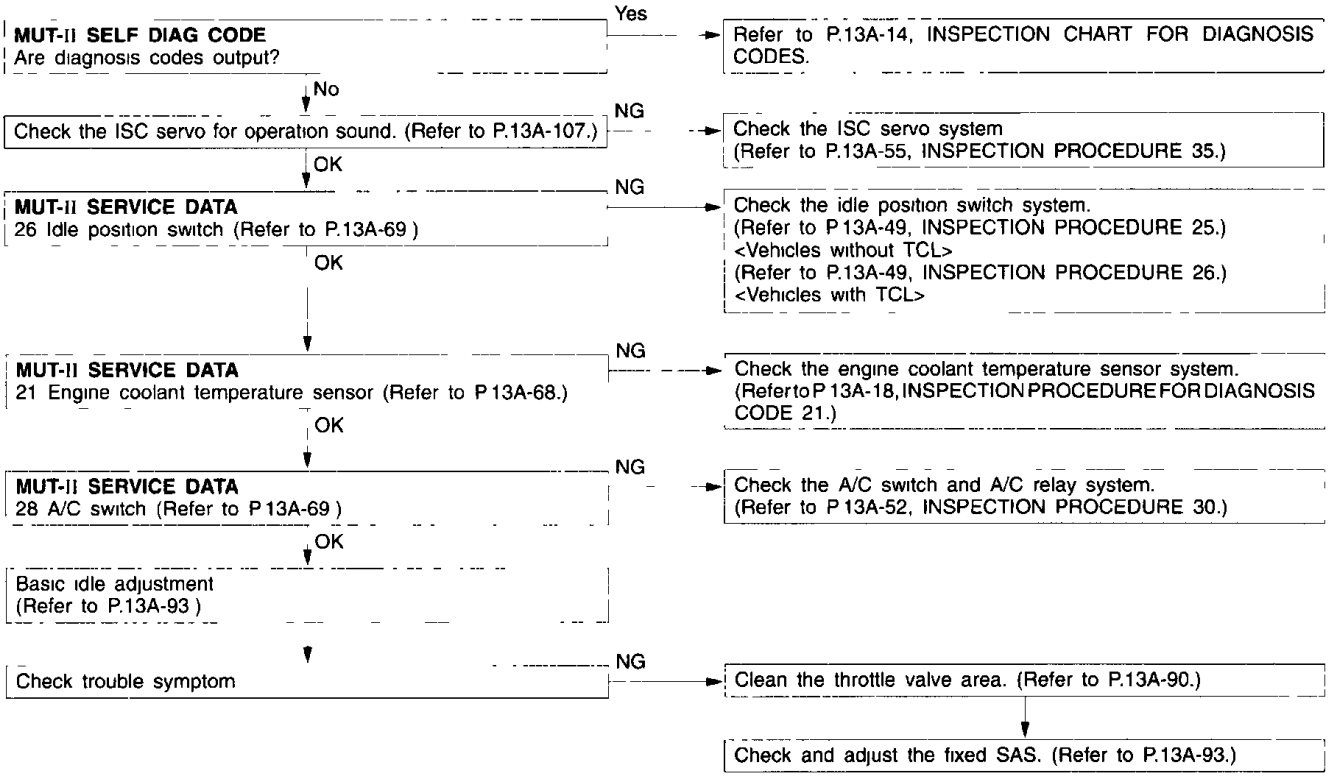
INSPECTION PROCEDURE 8

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



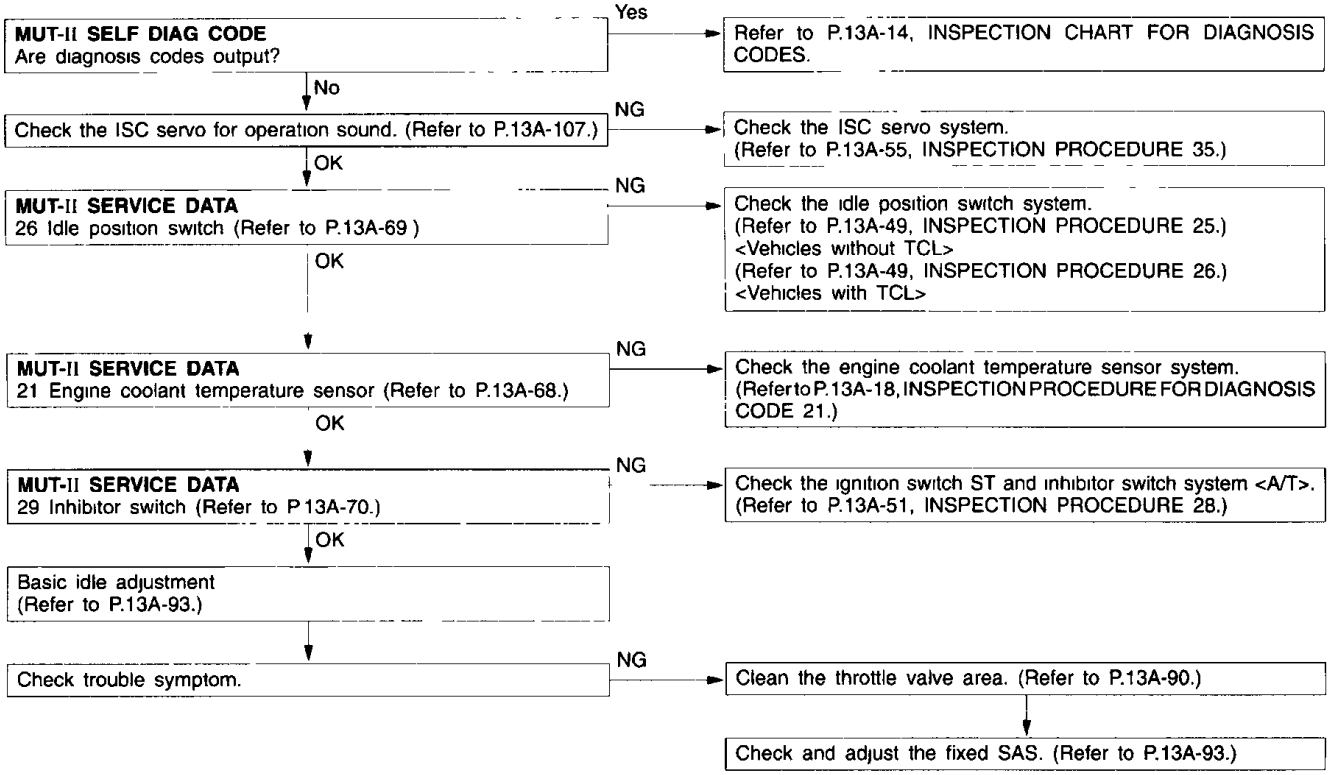
INSPECTION PROCEDURE 9

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



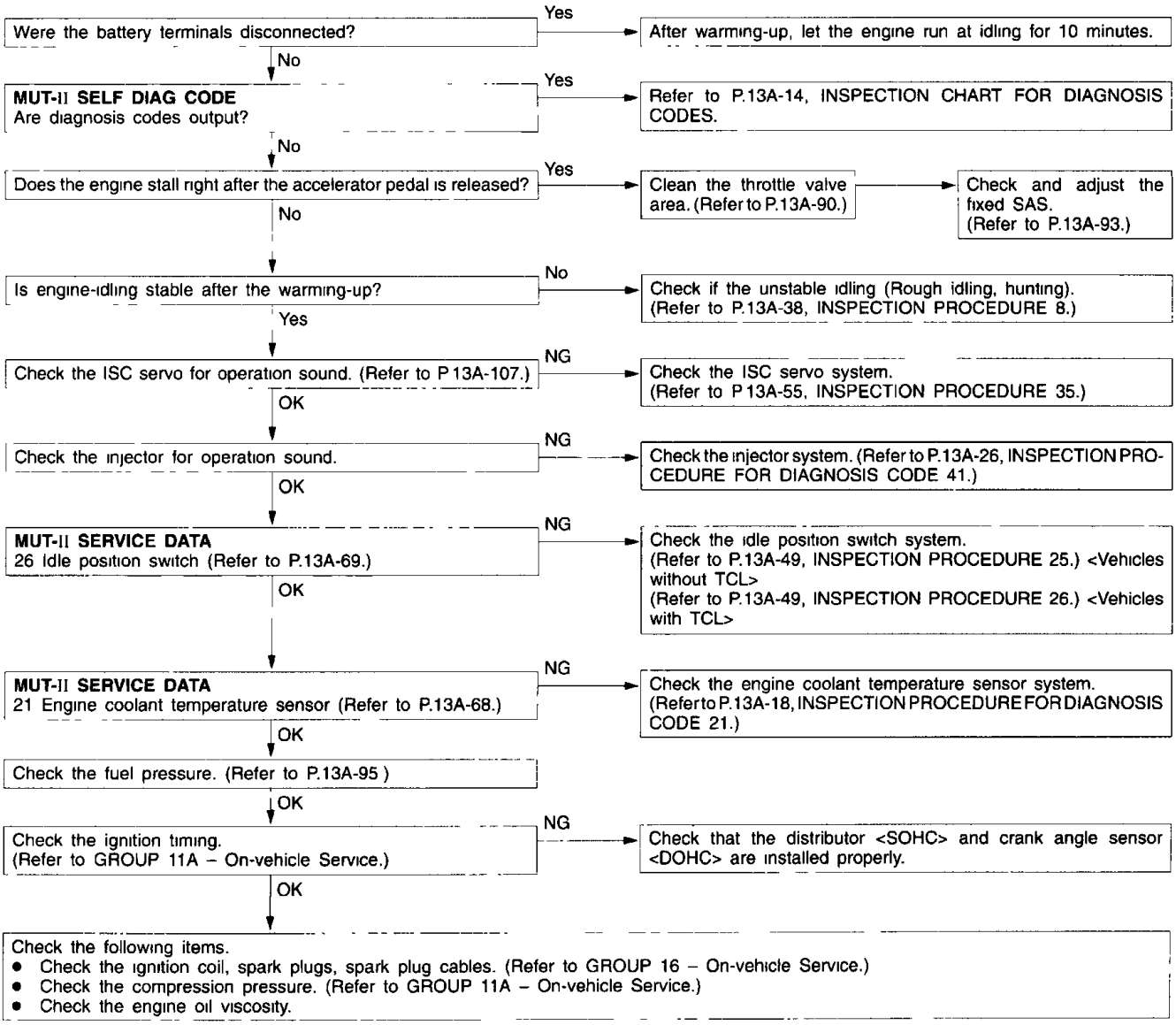
INSPECTION PROCEDURE 10

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



INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	• 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 idling. (Die out)	Probable cause
In such cases as the above, the cause is probably that ignition system, air/fuel mixture, idle speed control (ISC) or compression pressure is defective. In addition, if the engine suddenly stalls, the cause may also be a defective connector contact	• 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

Were the battery terminals disconnected? — Yes → After warming-up, let the engine run at idling for 10 minutes.

No ↓

MUT-II SELF DIAG CODE
Are diagnosis codes output? — Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES

No ↓

Check the ISC servo for operation sound. (Refer to P.13A-107) — NG → Check the ISC servo system. (Refer to P.13A-55, INSPECTION PROCEDURE 35.)

OK ↓

Check the injector for operation sound. — NG → Check the injector system. (Refer to P.13A-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)

OK ↓

Does the engine stall right after the accelerator pedal is released? — Yes → Clean the throttle valve area. (Refer to P.13A-90.) → Check and adjust the fixed SAS. (Refer to P.13A-93.)

No ↓

Does the engine stall easily again? — No → While carrying out an intermittent malfunction simulation test (Refer to GROUP 00 – Points to Note for Intermittent Malfunctions.), check for sudden changes in the signals shown below.
- Crank angle sensor signal
- Air flow sensor signal
- Injector drive signal
- Primary and secondary ignition signal
- Fuel pump drive signal
- Engine ECU power supply voltage

Yes ↓

MUT-II: Engine stalling inspection when the engine is warm and idling. (Refer to P.13A-60, INSPECTION PROCEDURE 43.)

OK ↓

Check the ignition timing (Refer to GROUP 11A – On-vehicle Service.) — NG → Check that the distributor <SOHC> and crank angle sensor <DOHC> are installed properly.

OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if the injectors are clogged.
- Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
- Check if foreign materials (water, alcohol, etc.) got into fuel.

INSPECTION PROCEDURE 13

The engine stalls when starting the car. (Pass out)	Probable cause
In cases such as the above, the cause is probably misfiring due to a weak spark, or an inappropriate air/fuel mixture when the accelerator pedal is depressed.	• Drawing air into intake system • Malfunction of the ignition system

MUT-II SELF DIAG CODE
Are diagnosis codes output?
→ Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES
↓ No

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check if air was drawn into the intake system.
  - Broken intake manifold gasket
  - Broken or disconnected vacuum hose
  - Improper operation of the PCV valve
  - Broken air intake hose

INSPECTION PROCEDURE 14

The engine stalls when decelerating.	Probable cause
In cases such as the above, the cause is probably that the intake air volume is insufficient due to a defective idle speed control (ISC) servo system.	• Malfunction of the ISC system

Were the battery terminals disconnected?
→ Yes → After warming-up, let the engine run at idling for 10 minutes.
↓ No

MUT-II SELF DIAG CODE
Are diagnosis codes output?
→ Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES.
↓ No

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-69.)
→ NG → Check the idle position switch system.
(Refer to P.13A-49, INSPECTION PROCEDURE 25.)
<Vehicles without TCL>
(Refer to P.13A-49, INSPECTION PROCEDURE 26.)
<Vehicles with TCL>
↓ OK

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-68.)
→ NG → Check the throttle position sensor system. (Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
↓ OK

MUT-II SERVICE DATA
45 ISC servo position
- Is the idle speed control (ISC) servo position drops to 0–2 steps when decelerating (engine r/min less than 1,000)?

→ Yes → Check the vehicle speed sensor system. (Refer to P.13A-23, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 24.)
↓ No

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables (Refer to GROUP 16 – On-vehicle Service.)
- Clean the throttle valve area. (Refer to P.13A-90.)
- Check and adjust the fixed SAS. (Refer to P.13A-93.)

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 control solenoid valve system • Poor compression

MUT-II SELF DIAG CODE
Are diagnosis codes output?
- Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the injectors for operation sound.
- NG → Check the injector system. (Refer to P.13A-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
- OK ↓

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

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur.
(Refer to P.13A-61, INSPECTION PROCEDURE 44.)
- OK ↓

Check the fuel pressure. (Refer to P.13A-95.)
- OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Negative pressure check during traction control operation <Vehicles with TCL> (Refer to 13A-110.)
- Throttle valve operation check <Vehicles with TCL> (Refer to 13A-110.)
- Vacuum tank and vacuum actuator check <Vehicles with TCL> (Refer to 13A-109, 110.)
- Check the EGR system. (Refer to GROUP 17 – EGR System.)
- Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.

INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating	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

MUT-II SELF DIAG CODE
Are diagnosis codes output?
- Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check for occurrence of ignition leak.

INSPECTION PROCEDURE 17

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

MUT-II SELF DIAG CODE
Are diagnosis codes output?
- Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the ISC servo for operation sound. (Refer to P.13A-107.)
- NG → Check the ISC servo system. (Refer to P.13A-55, INSPECTION PROCEDURE 35.)
- OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-68.)
- NG → Check the throttle position sensor system. (Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-69.)
- NG → Check the idle position switch system (Refer to P.13A-49, INSPECTION PROCEDURE 25.) <Vehicles without TCL> (Refer to P.13A-49, INSPECTION PROCEDURE 26.) <Vehicles with TCL>
- OK ↓

Clean the throttle valve area. (Refer to P.13A-90.)

INSPECTION PROCEDURE 18

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

MUT-II SELF DIAG CODE
Are diagnosis codes output?
- Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

Check the injectors for operation sound.
- NG → Check the injector system. (Refer to P.13A-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
- OK ↓

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

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur (Refer to P.13A-61, INSPECTION PROCEDURE 44.)
- OK ↓

Check the fuel pressure. (Refer to P.13A-95.)
- OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Negative pressure check during traction control operation <Vehicles with TCL> (Refer to 13A-110.)
- Throttle valve operation check <Vehicles with TCL> (Refer to 13A-110.)
- Vacuum tank and vacuum actuator check <Vehicles with TCL> (Refer to 13A-109, 110.)
- Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner

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 control solenoid valve system

MUT-II SELF DIAG CODE
Are diagnosis codes output?
Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P 13A-26, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

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

MUT-II: Check if surge occurs.
(Refer to P.13-62, INSPECTION PROCEDURE 45.)
OK ↓

Check the fuel pressure (Refer to P.13A-95.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR system. (Refer to GROUP 17 – EGR system.)

INSPECTION PROCEDURE 20

Knocking	Probable cause
In cases as the above, the cause is probably that the detonation control is defective or the heat value of the spark plug is inappropriate.	• Defective detonation sensor • Inappropriate heat value of the spark plug

MUT-II SELF DIAG CODE
Are diagnosis codes output?
Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Does knocking occur when driving with the sensor disconnected? At this time, use the MUT-II to check if the timing is retarded compared to when the detonation sensor connector is connected
No → Check the detonation sensor system. (Refer to P.13A-25, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 31.)
Yes ↓

Check the following items.
- Spark plugs
- Check if foreign materials (water, alcohol, etc.) got into fuel.

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

MUT-II SELF DIAG CODE
Are diagnosis codes output?
Yes → Refer to P.13A-14, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

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

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-68.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-68.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-69.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-24, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25)
OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: 600–1,000 mV when racing suddenly (Refer to P.13A-67.)
NG → Check the oxygen sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Repeat 0–400 mV and 600–1,000 mV alternately when idling (Refer to P.13A-67.)
OK → Replace the oxygen sensor.
NG ↓

Check the fuel pressure (Refer to P.13A-95.)
OK ↓

Check trouble symptom.
NG ↓

Check the following items.
- Check the injectors for operation sound.
- Check the injectors for fuel leakage.
- Check the ignition coil, spark plugs, spark plug cables (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
- Check the positive crankcase ventilation system. (Refer to GROUP 17 – Crankcase Emission Control System.)
- Check the purge control system. (Refer to GROUP 17 – Evaporative Emission Control System.)
- Check the EGR control system. (Refer to GROUP 17 – EGR System)

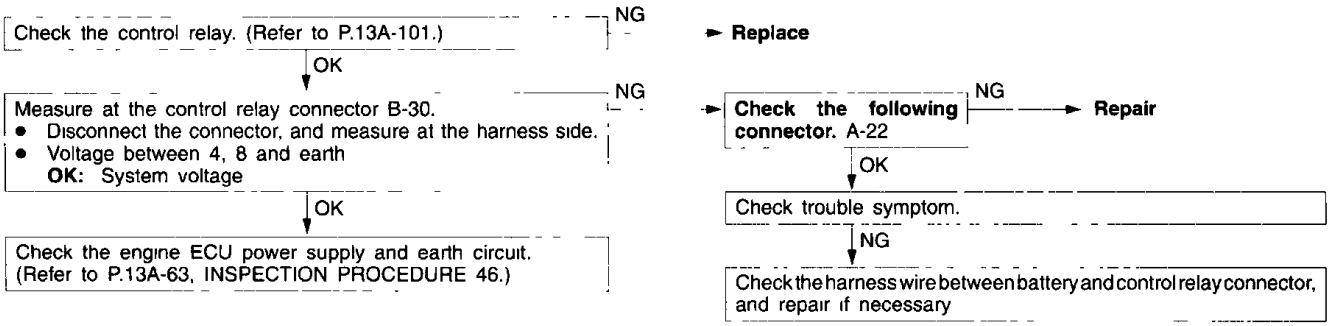
↓

Check the trouble symptom
NG ↓

Replace the catalytic converter.

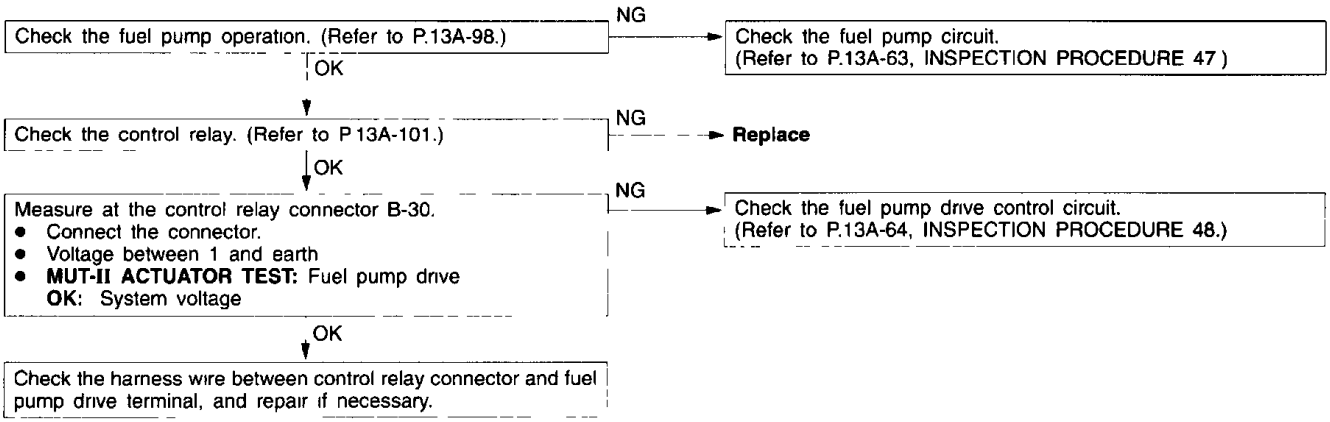
INSPECTION PROCEDURE 23

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



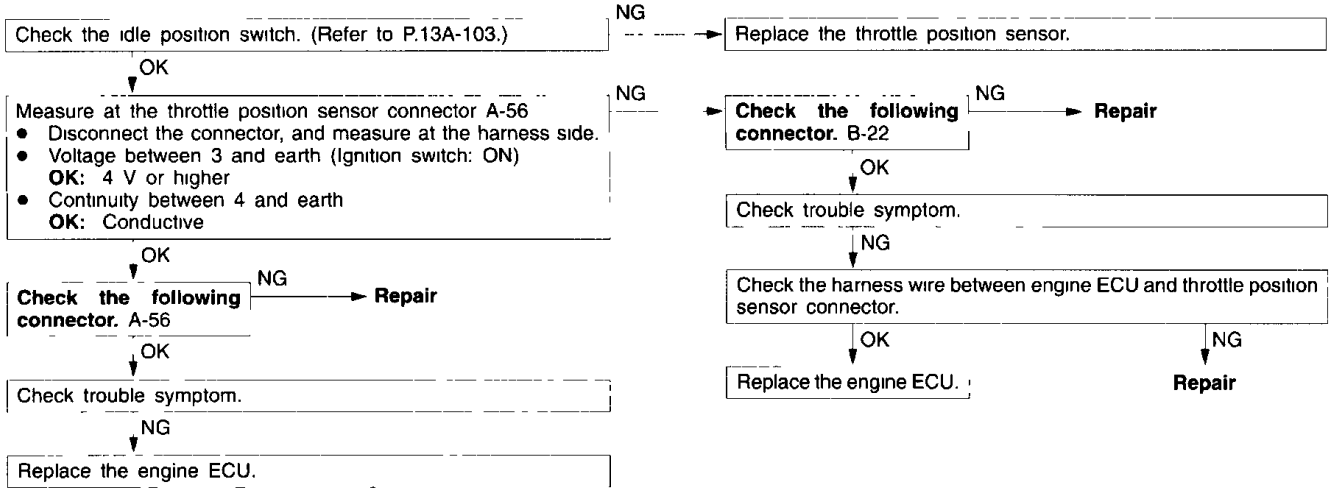
INSPECTION PROCEDURE 24

Fuel pump system	Probable cause
The engine ECU turns the control relay ON when the engine is cranking or running, and this supplies power to drive the fuel pump.	• Malfunction of the control relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine ECU



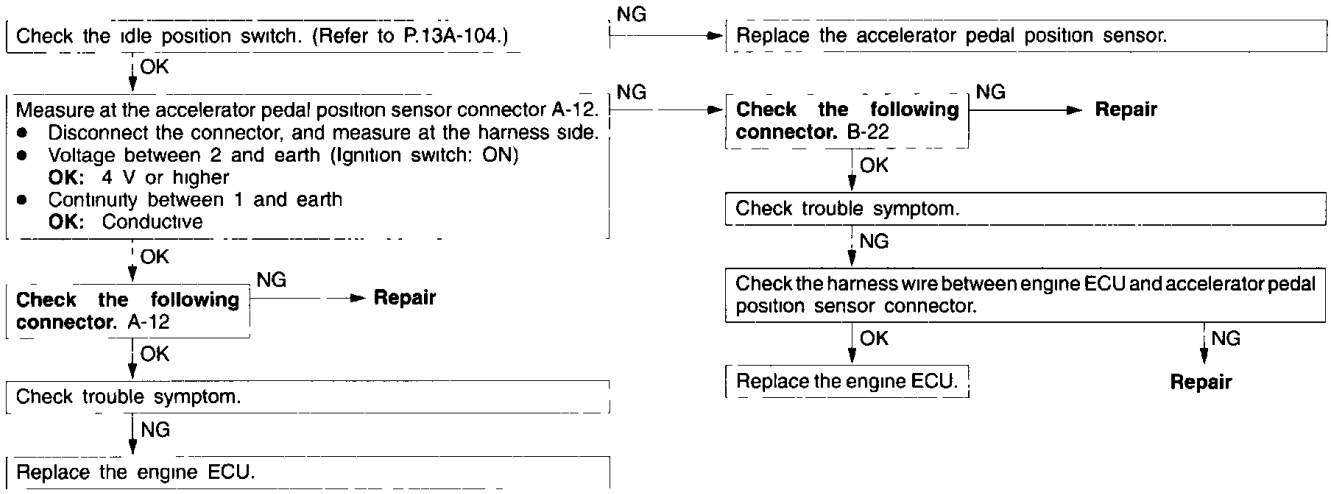
INSPECTION PROCEDURE 25

Idle position switch system <Vehicles without TCL>	Probable cause
The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine ECU. The engine ECU controls the idle speed control servo based on this input.	• 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



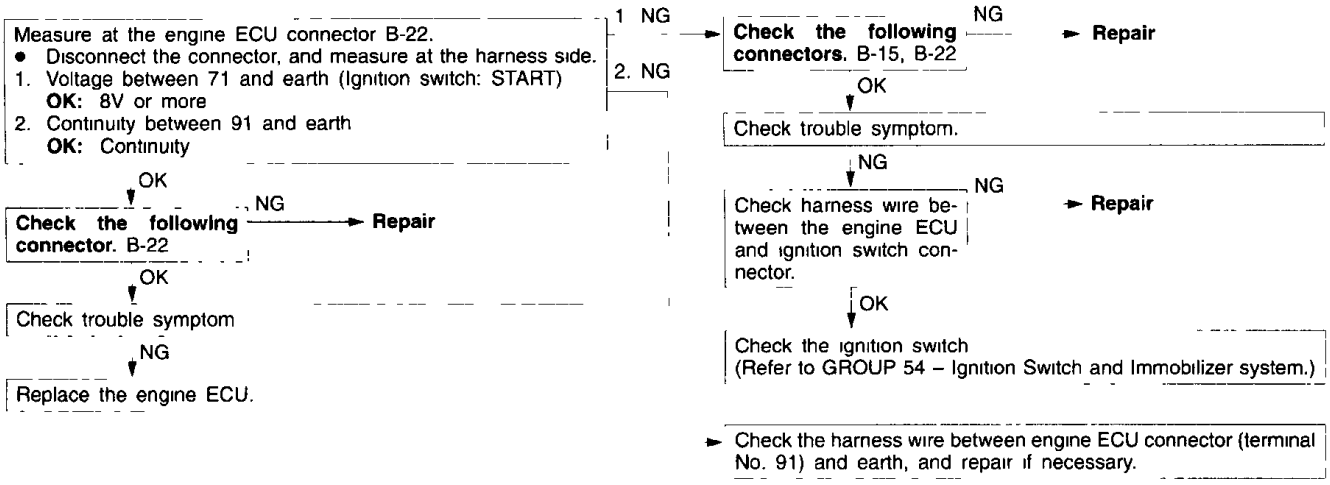
INSPECTION PROCEDURE 26

Idle position switch system <Vehicles with TCL>	Probable cause
The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine ECU. The engine ECU controls the idle speed control servo based on this input.	• Maladjustment of the accelerator pedal • Maladjustment of the fixed SAS • Maladjustment of the idle position switch and accelerator pedal position sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine ECU



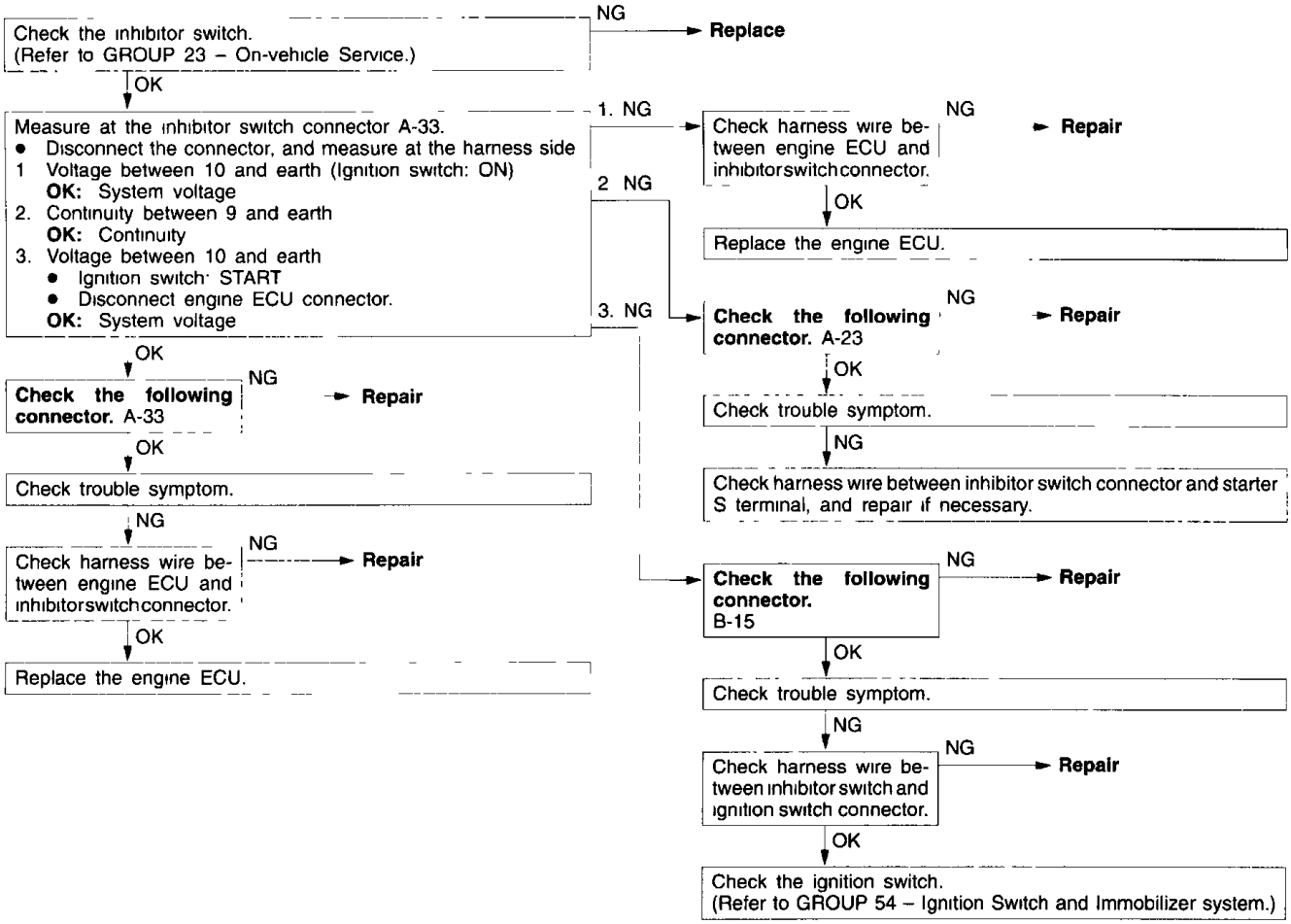
INSPECTION PROCEDURE 27

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 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



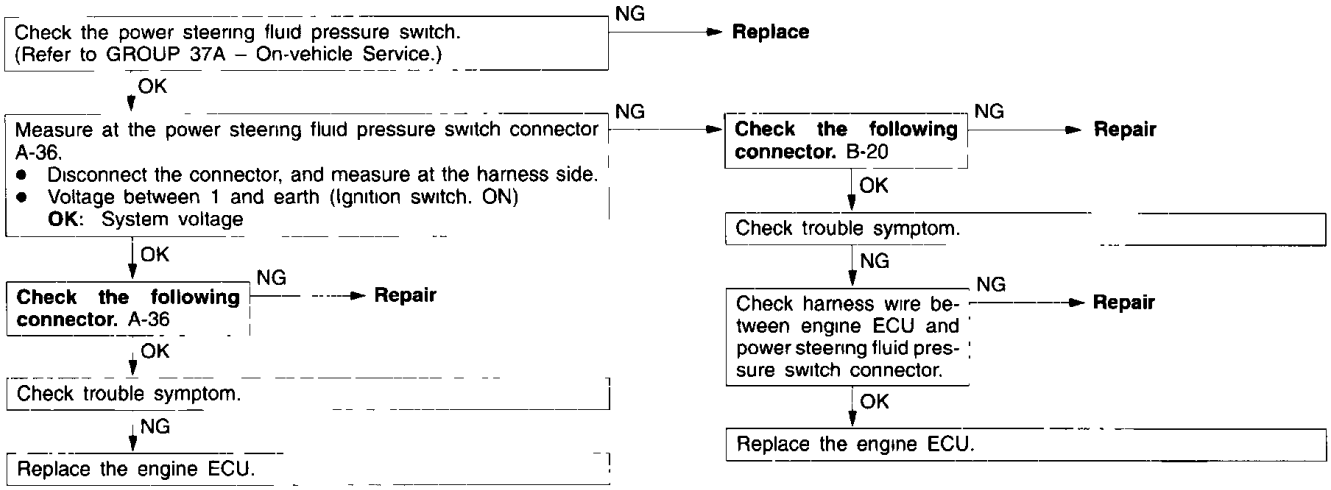
INSPECTION PROCEDURE 28

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 idle speed control (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.



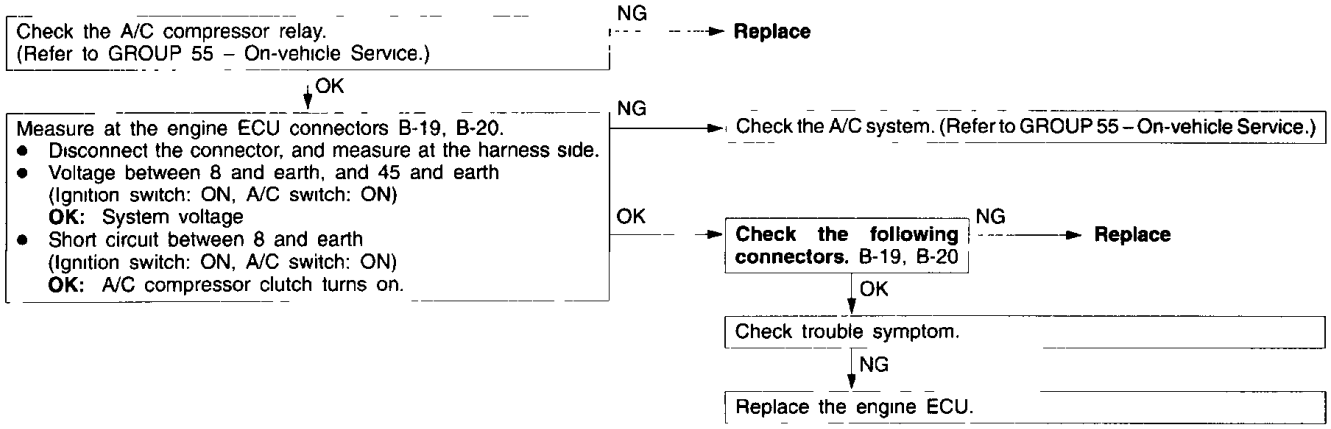
INSPECTION PROCEDURE 29

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 the engine ECU



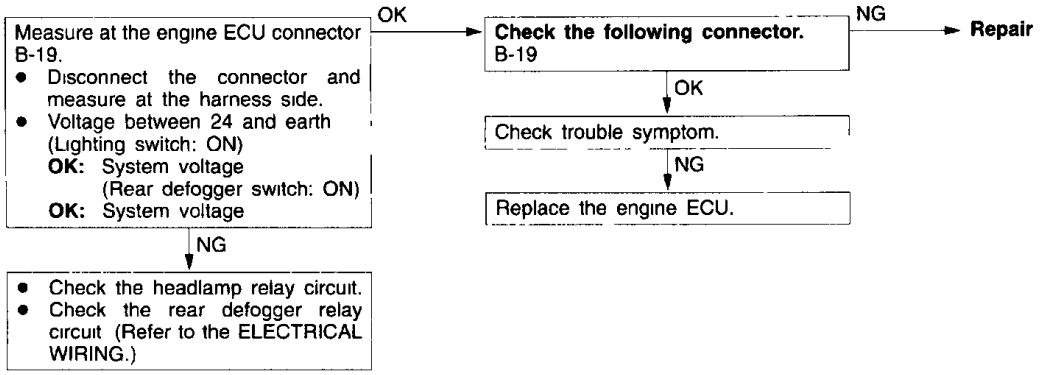
INSPECTION PROCEDURE 30

A/C switch and A/C relay system	Probable cause
When an A/C ON signal is input to the engine ECU, the engine ECU carries out control of the idle speed control (ISC) servo, and also operates the A/C compressor magnetic clutch.	• Malfunction of A/C control system • Malfunction of A/C switch • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine ECU



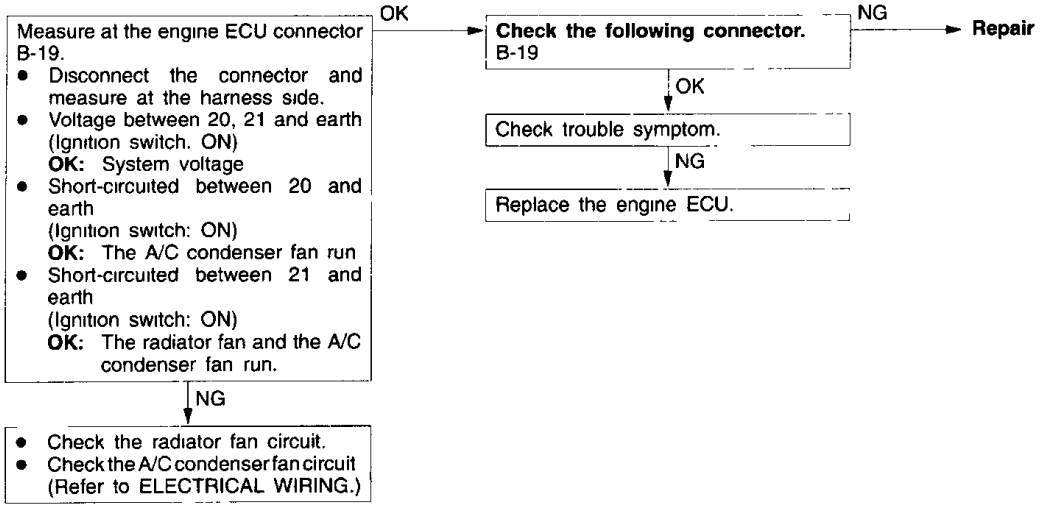
INSPECTION PROCEDURE 31

Electrical load switch system	Probable cause
The electrical load switch inputs ON/OFF state of the switch of equipment that consumes much power during idling, namely with a large electrical load, to the engine ECU. Based on this signal the engine ECU controls idle speed control servo.	• Improper connector contact, open circuit or short-circuited harness wire of the headlamp relay • Improper connector contact, open circuit or short-circuited harness wire of the rear defogger relay. • Malfunction of the engine ECU



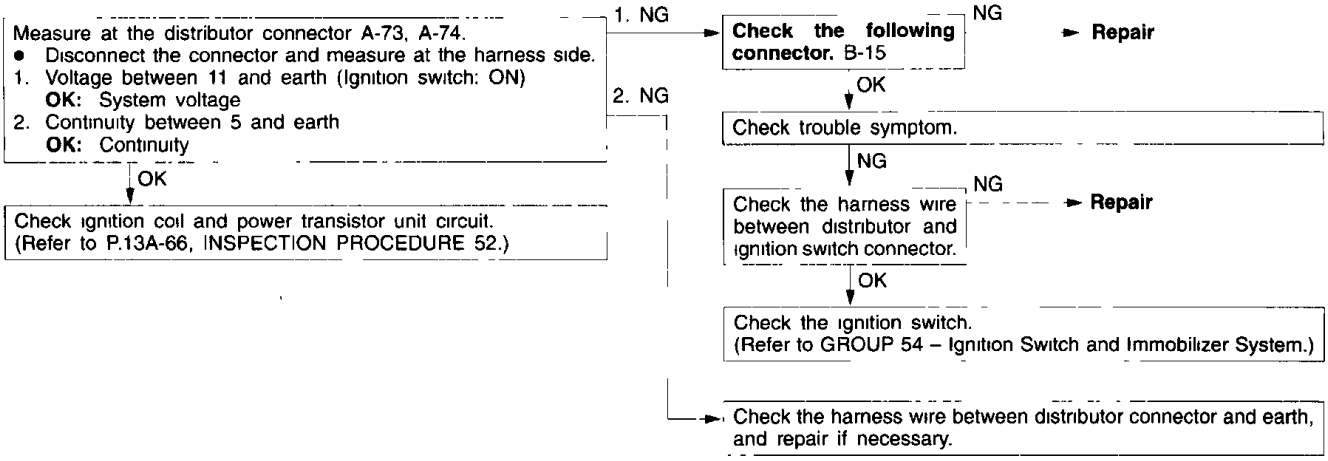
INSPECTION PROCEDURE 32

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



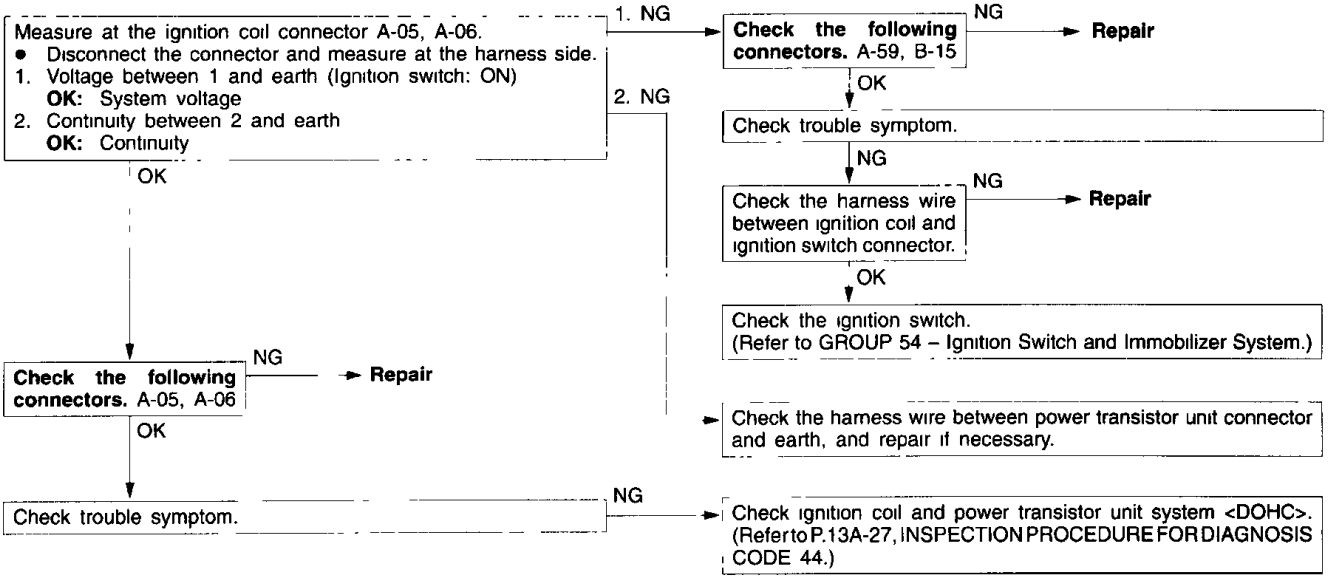
INSPECTION PROCEDURE 33

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



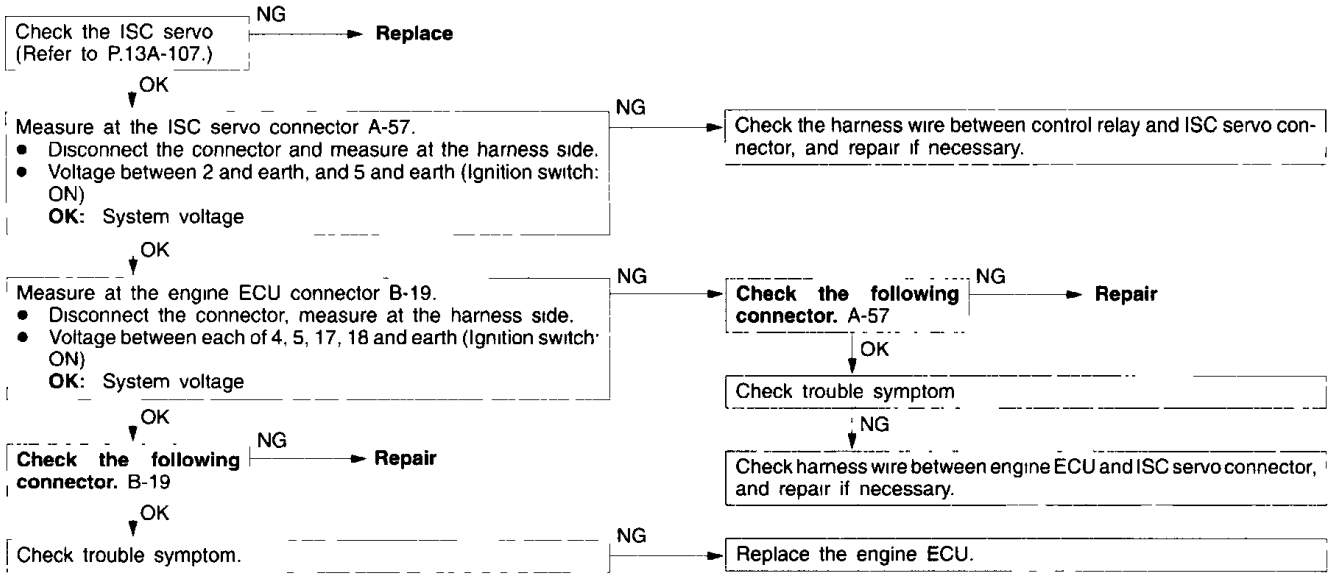
INSPECTION PROCEDURE 34

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



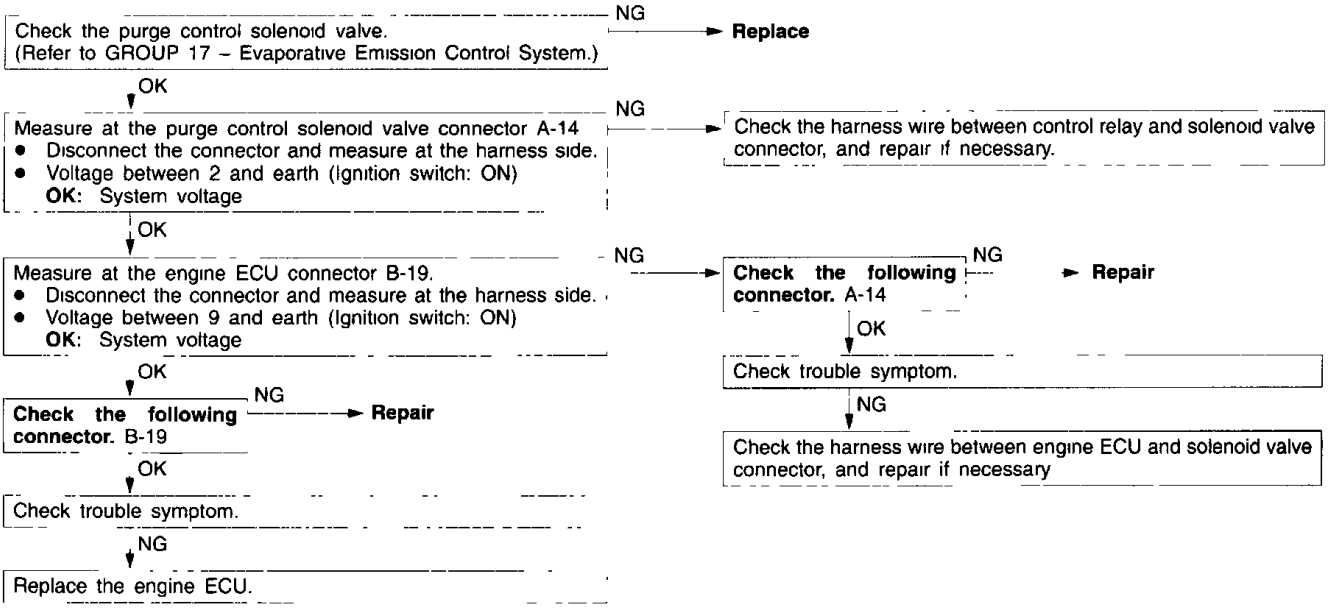
INSPECTION PROCEDURE 35

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



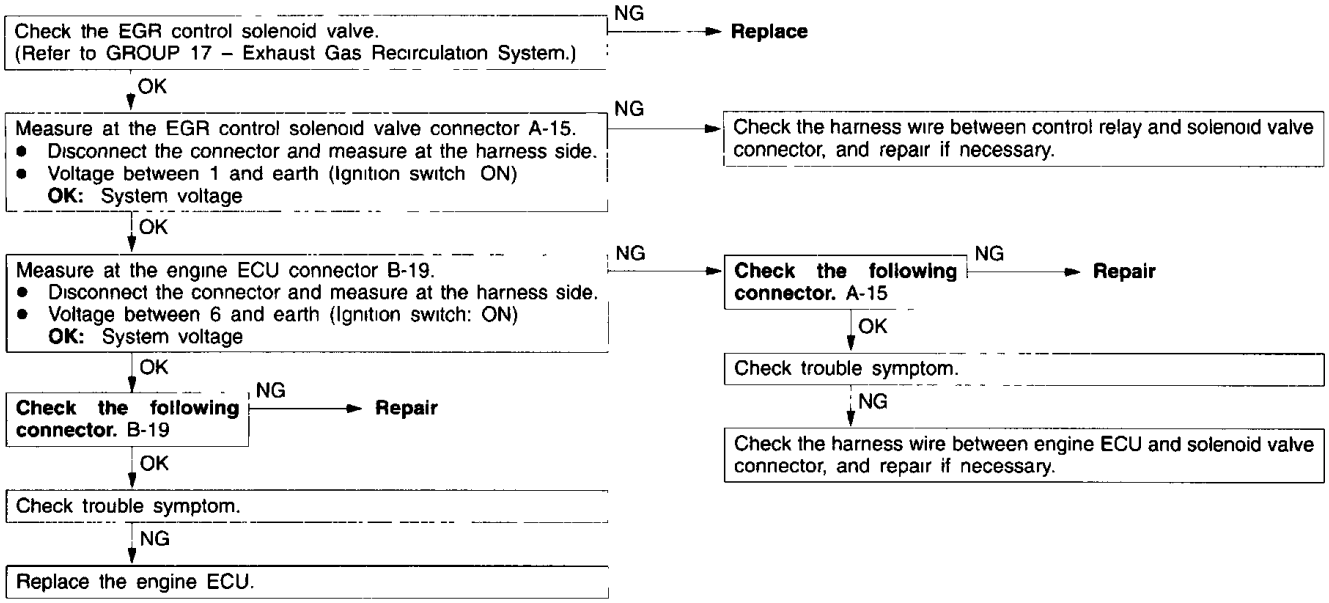
INSPECTION PROCEDURE 36

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



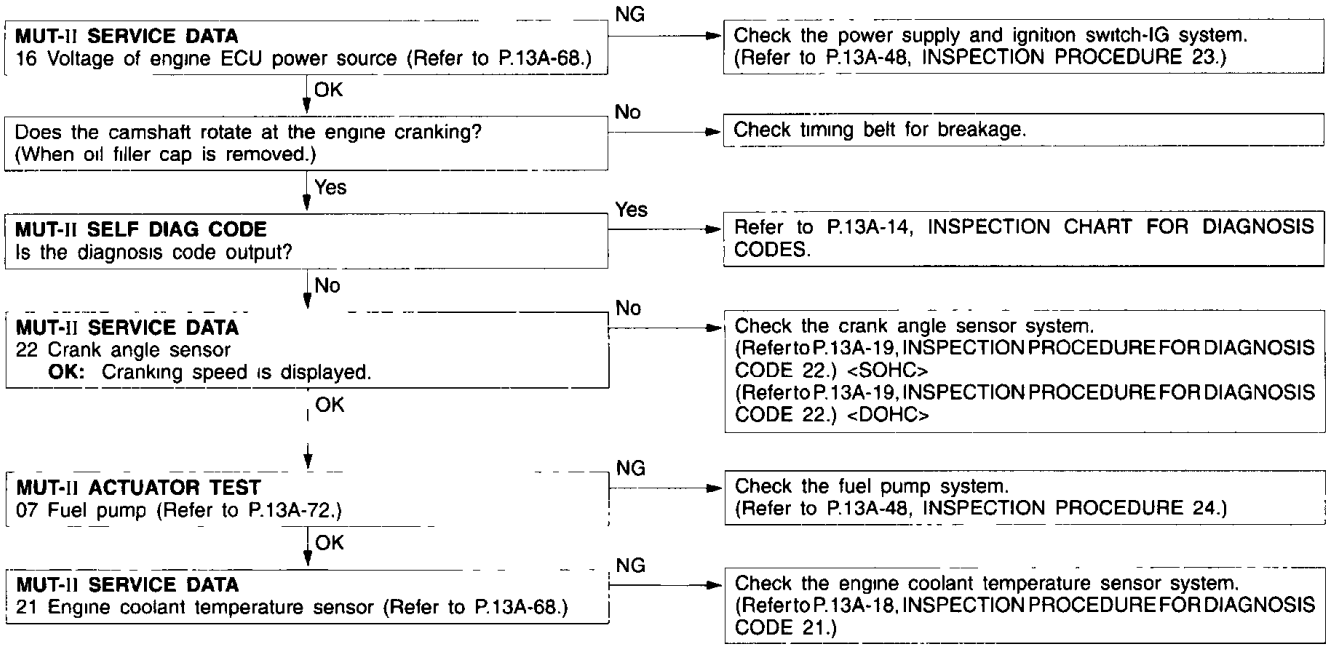
INSPECTION PROCEDURE 37

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



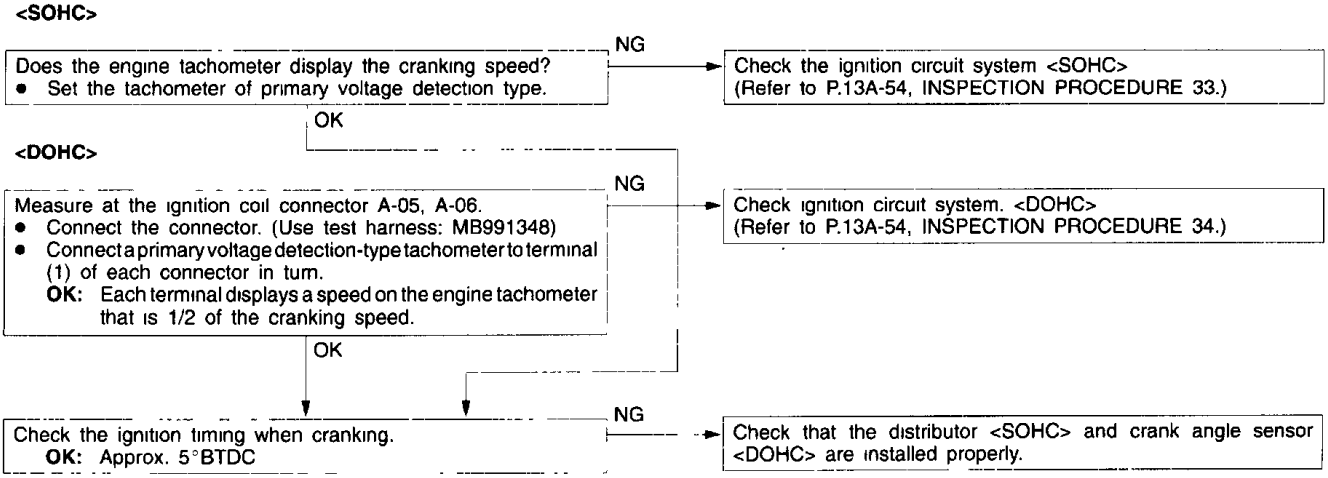
INSPECTION PROCEDURE 38

MUT-II: Inspection of no initial combustion



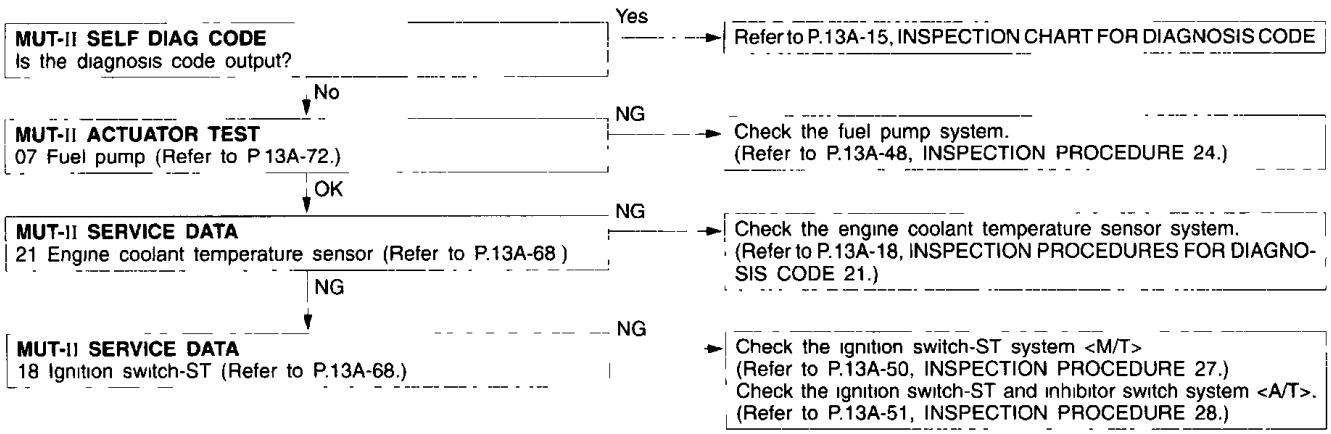
INSPECTION PROCEDURE 39

Ignition system: Inspection of no initial combustion.



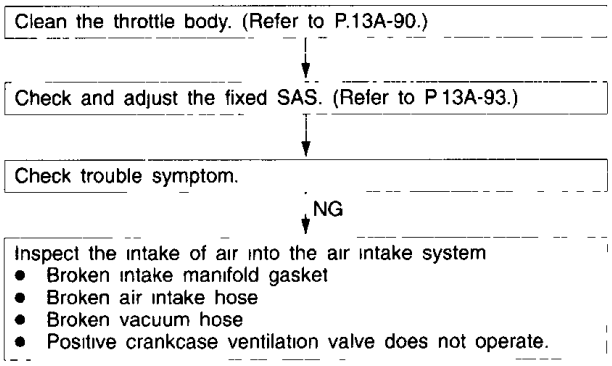
INSPECTION PROCEDURE 40

MUT-II: Check if uncomplete combustion occurs.



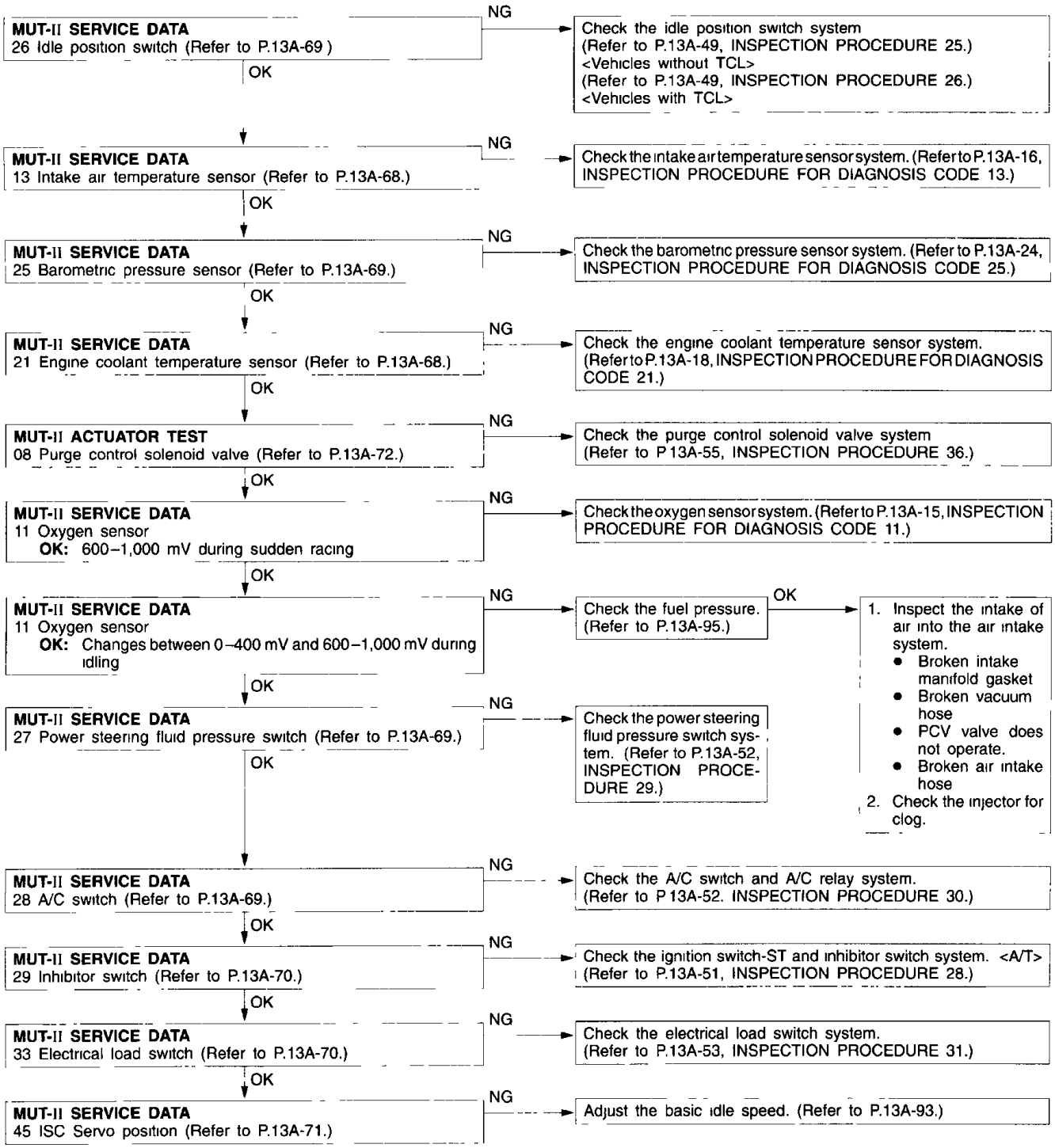
INSPECTION PROCEDURE 41

Check if hunting occurs.



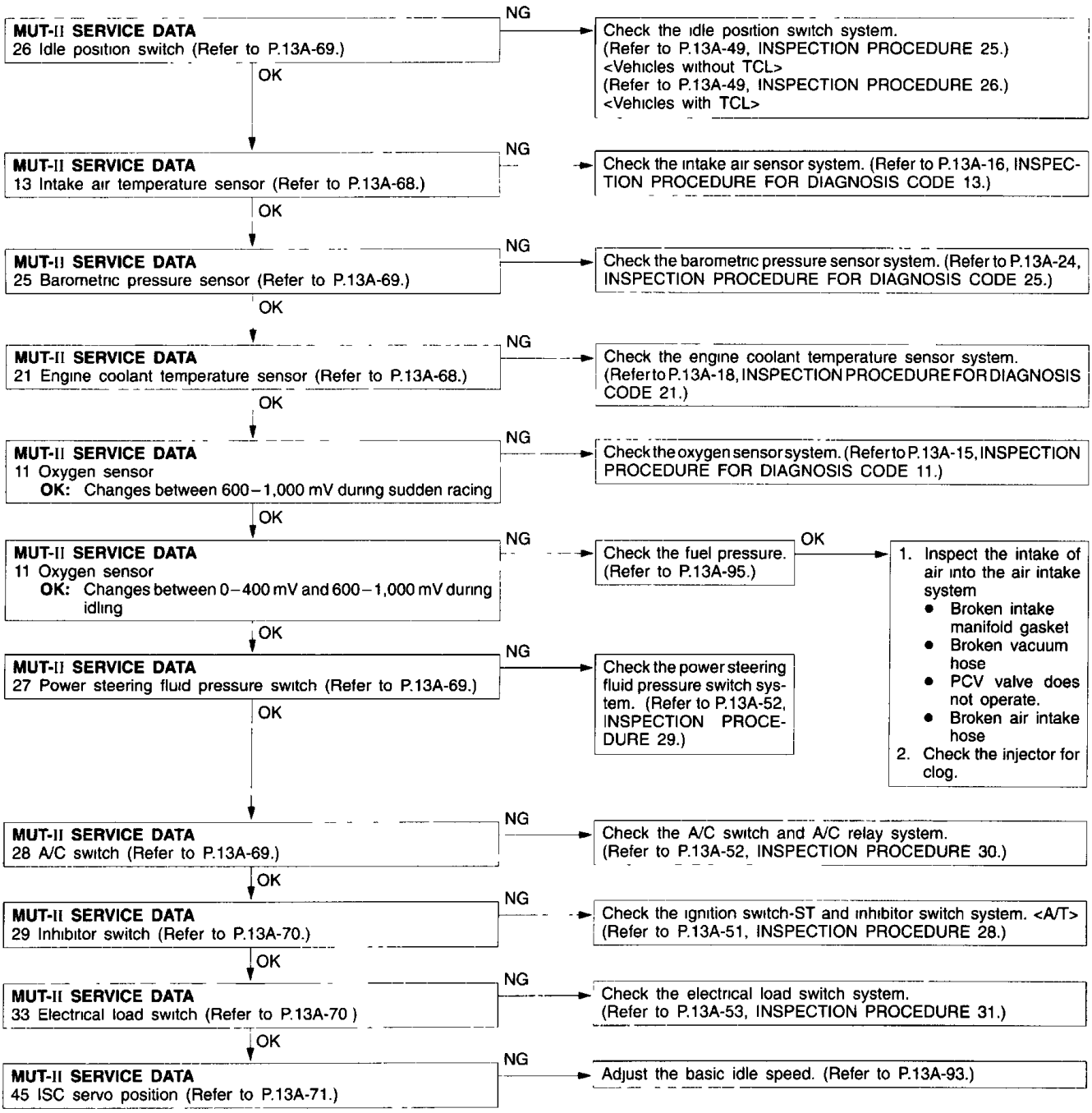
INSPECTION PROCEDURE 42

MUT-II: Check if idling speed is unstable.



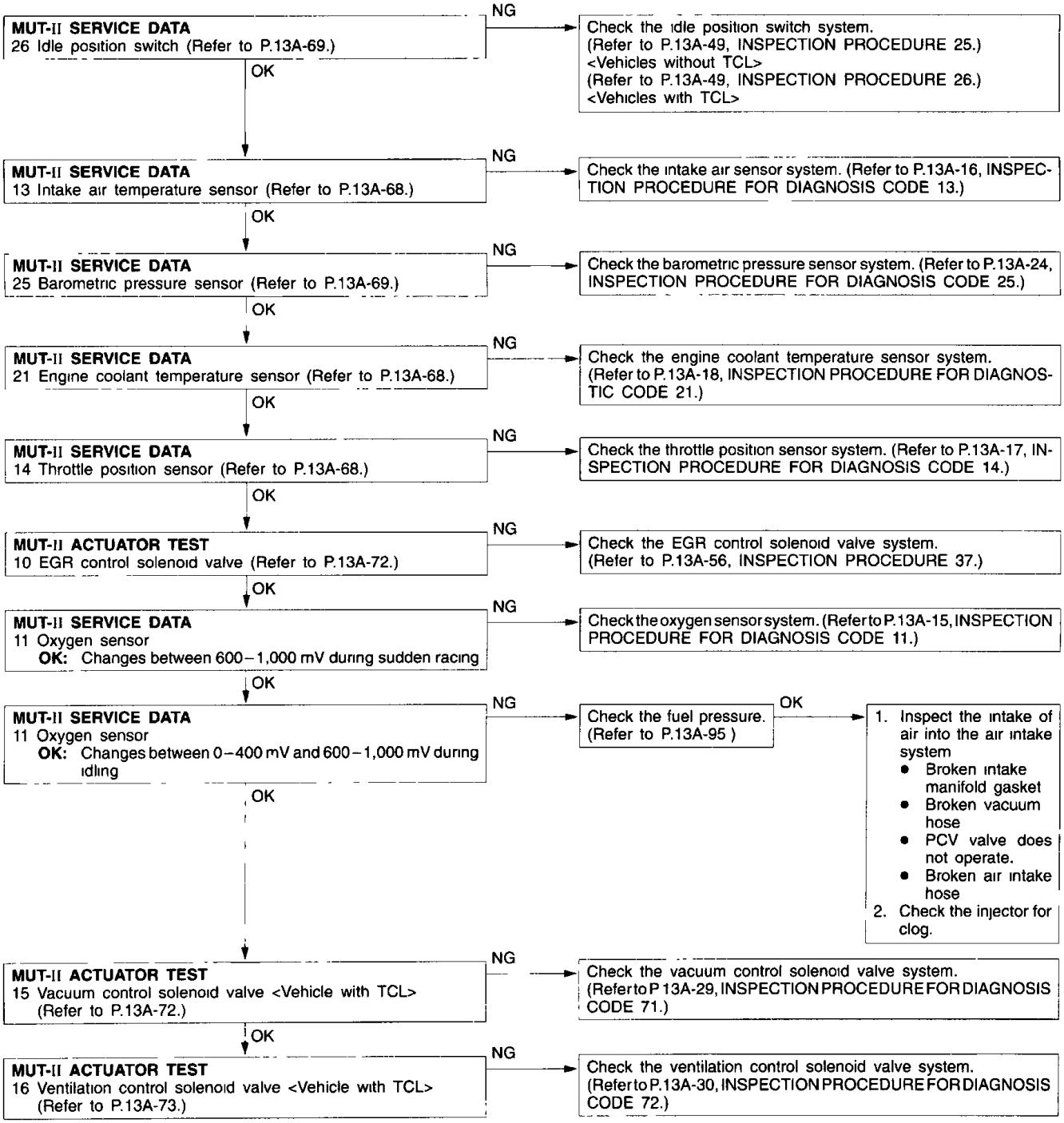
INSPECTION PROCEDURE 43

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



INSPECTION PROCEDURE 44

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



INSPECTION PROCEDURE 45

MUT-II Check if surge occurs.

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-69.)
- NG → Check the idle position switch system (Refer to P.13A-49, INSPECTION PROCEDURE 25.) <Vehicles without TCL> (Refer to P.13A-49, INSPECTION PROCEDURE 26.) <Vehicles with TCL>
- OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-68.)
- NG → Check the intake air sensor system (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
- OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-69.)
- NG → Check the barometric pressure sensor system. (Refer to P.13A-24, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
- OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-68.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-18, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
- OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-68)
- NG → Check the throttle position sensor system. (Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

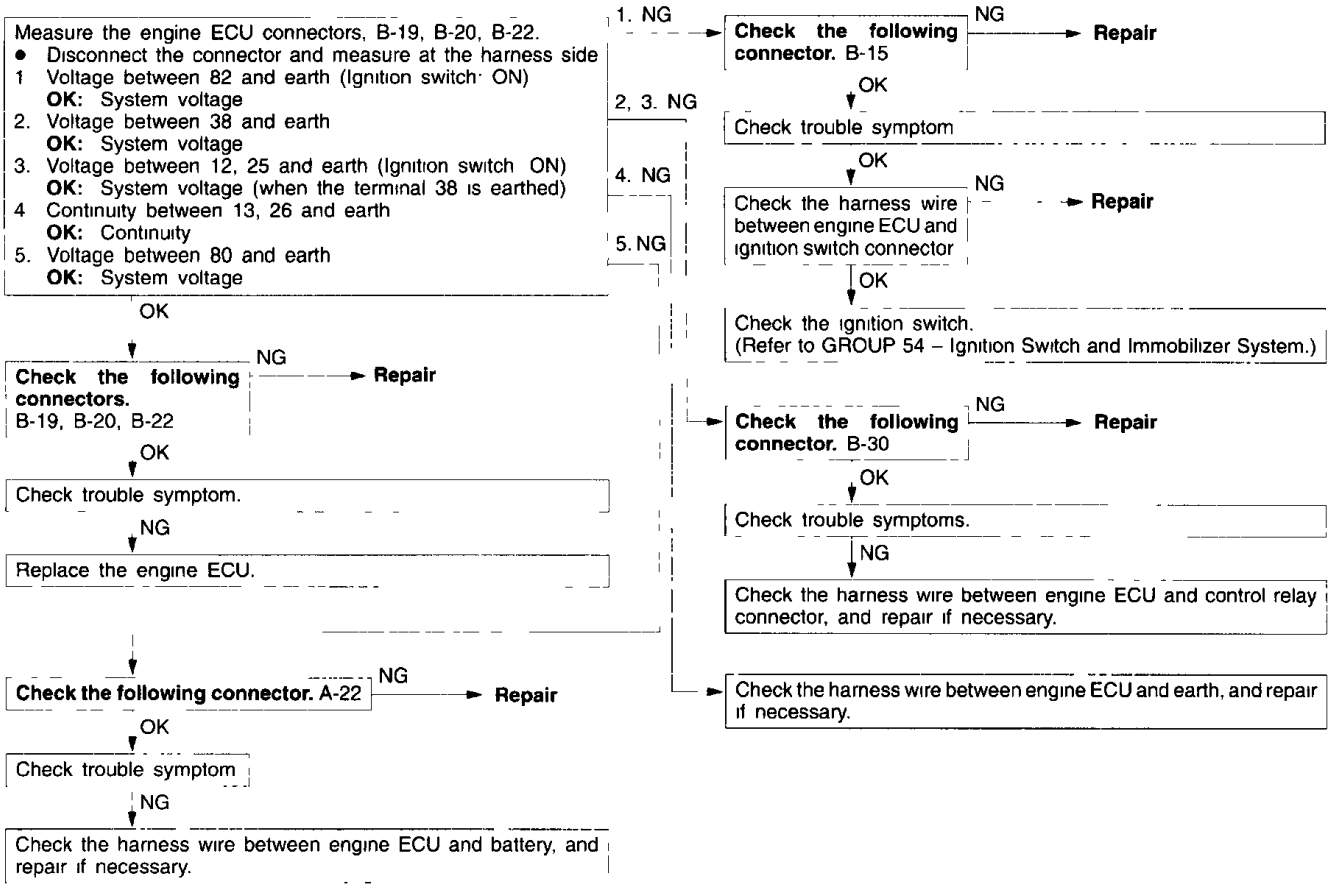
MUT-II ACTUATOR TEST
10 EGR control solenoid valve (Refer to P.13A-72.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13A-56, INSPECTION PROCEDURE 37.)
- OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 600 – 1,000 mV during sudden racing
- NG → Check the oxygen sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
- OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
- NG → Check the fuel pressure. (Refer to P.13A-95.)
  - OK →
    1. Inspect the intake of air into the air intake system
       - Broken intake manifold gasket
       - Broken vacuum hose
       - PCV valve does not operate.
       - Broken air intake hose
    2. Check the injector for clog.

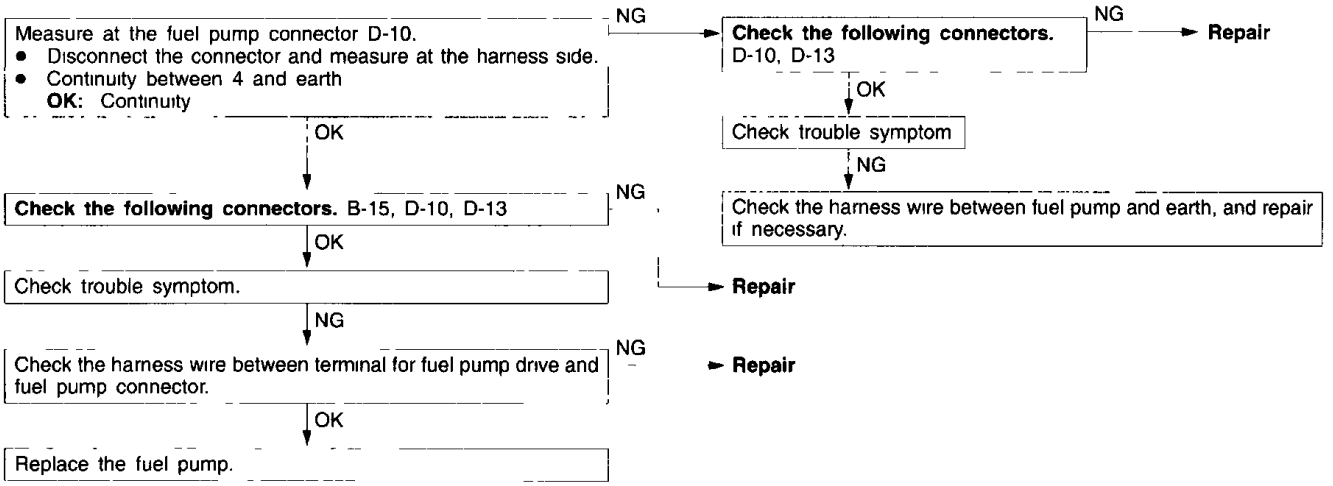
INSPECTION PROCEDURE 46

Check the engine ECU power supply and earth circuit.



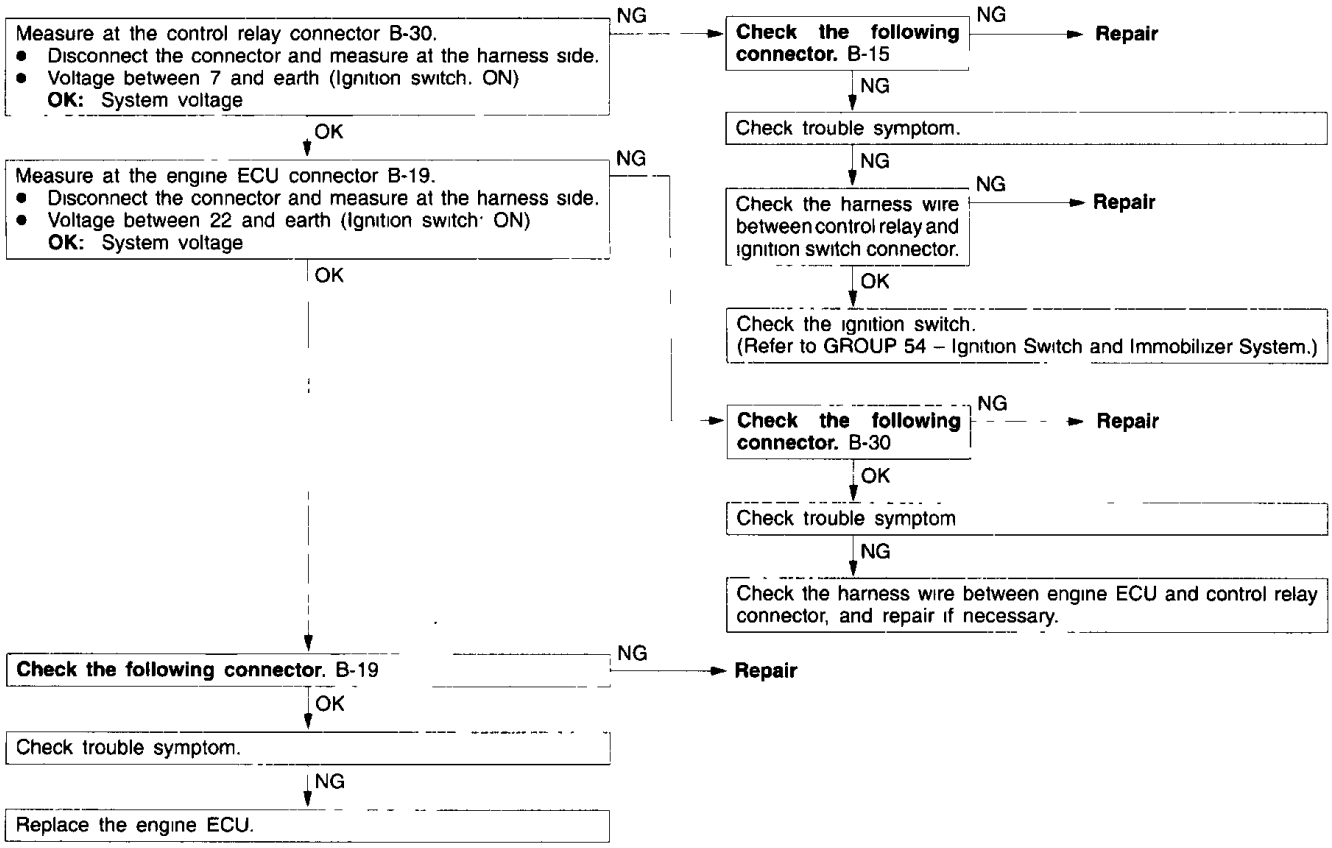
INSPECTION PROCEDURE 47

Check fuel pump circuit.



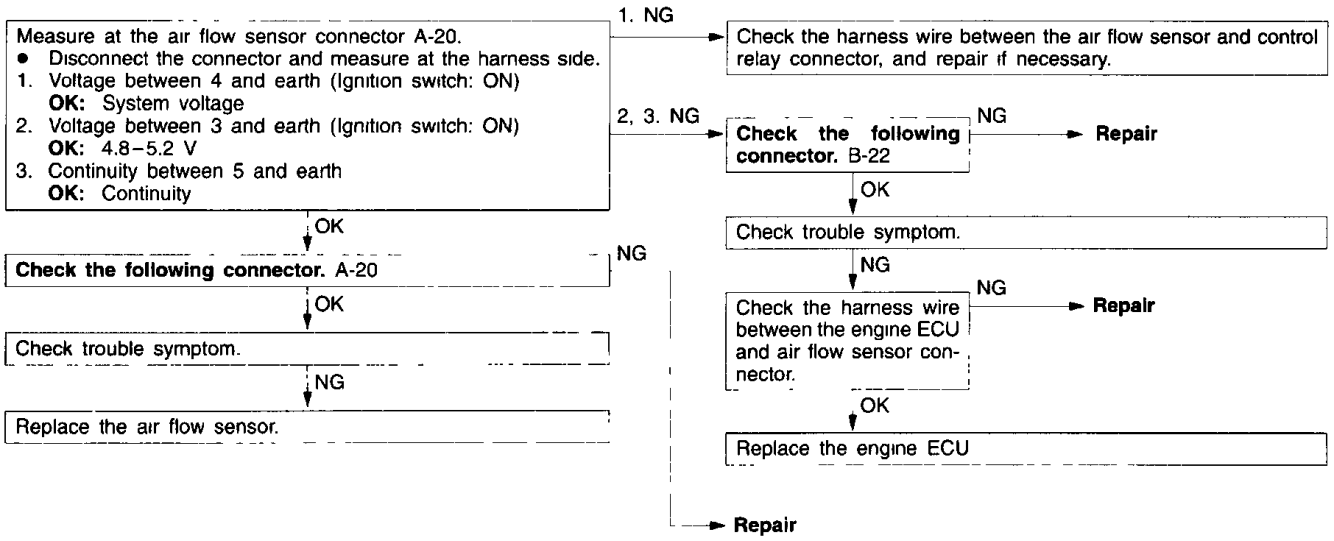
INSPECTION PROCEDURE 48

Check the fuel pump drive control circuit.



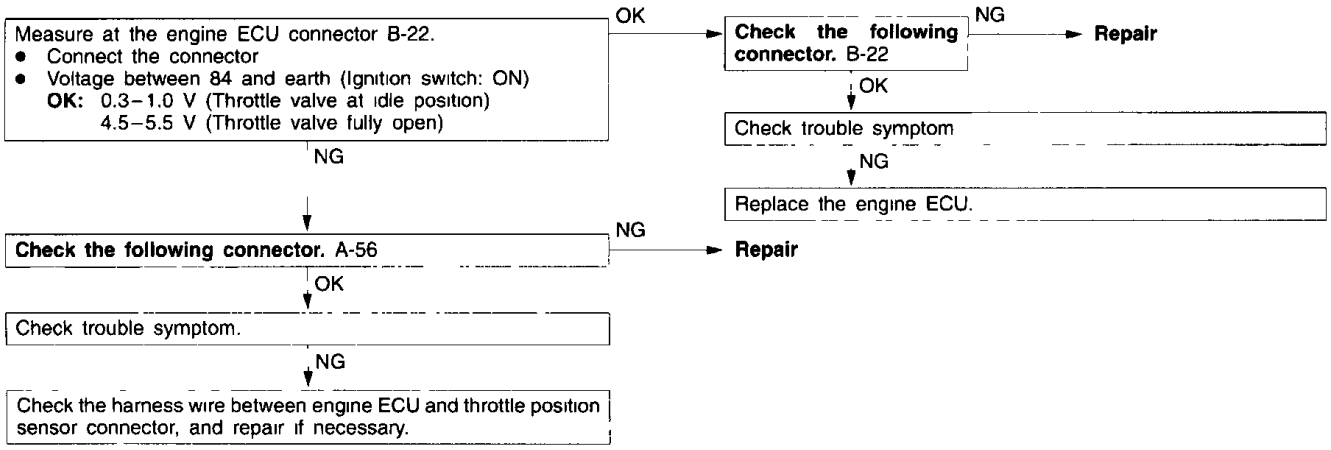
INSPECTION PROCEDURE 49

Check air flow sensor (AFS) control circuit.



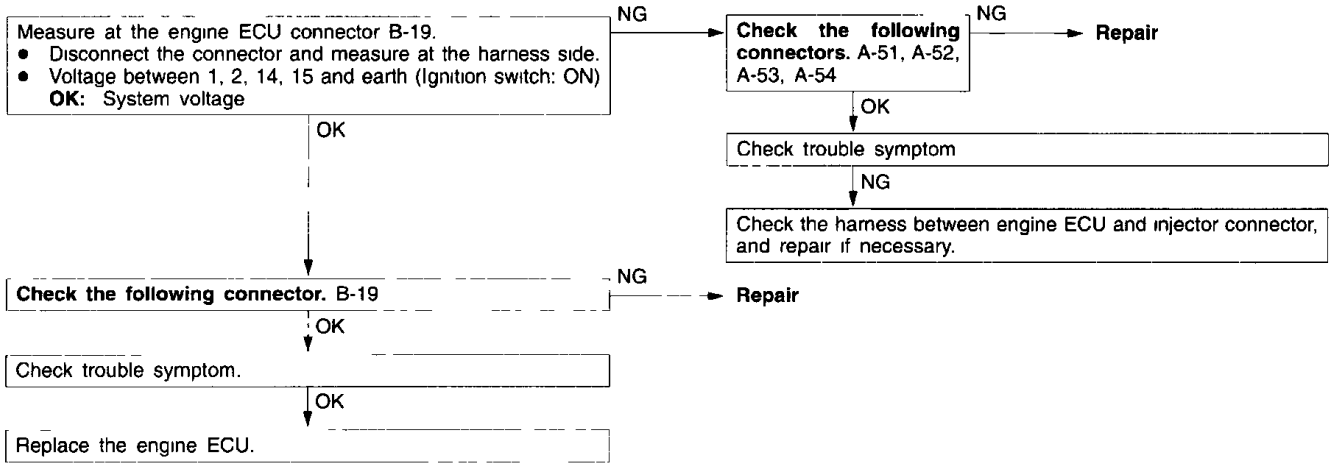
INSPECTION PROCEDURE 50

Check throttle position sensor (TPS) output circuit.



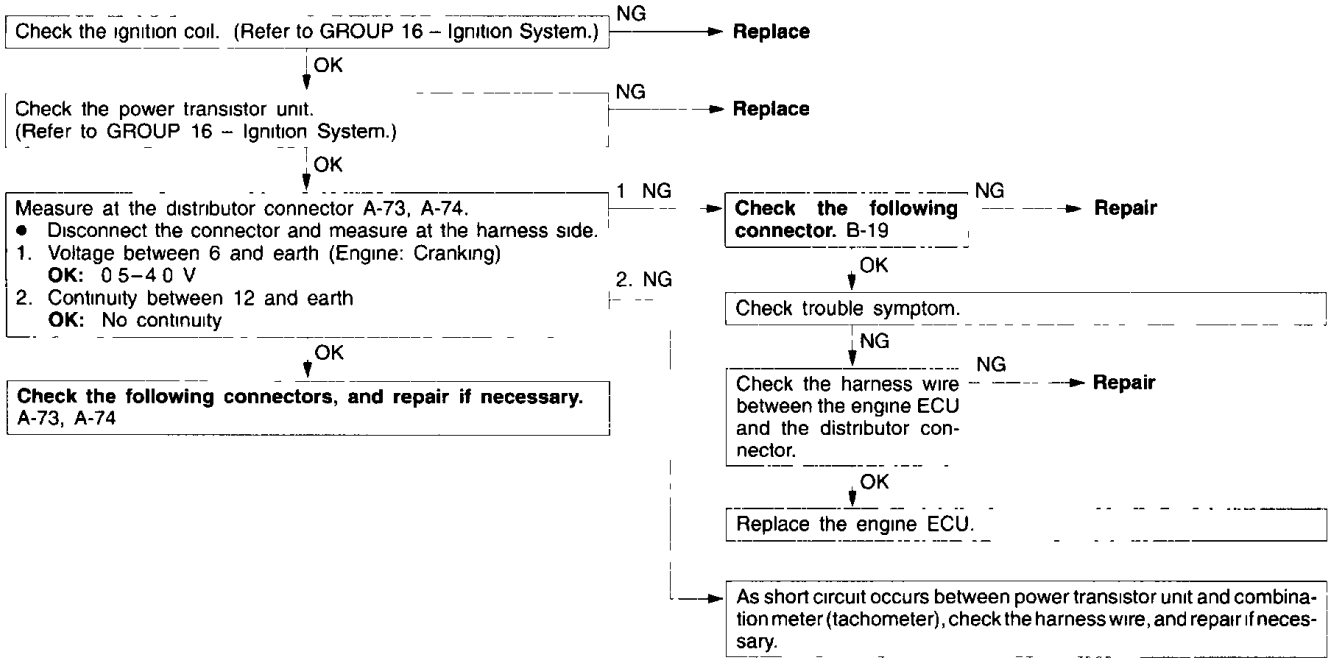
INSPECTION PROCEDURE 51

Check injector control circuit



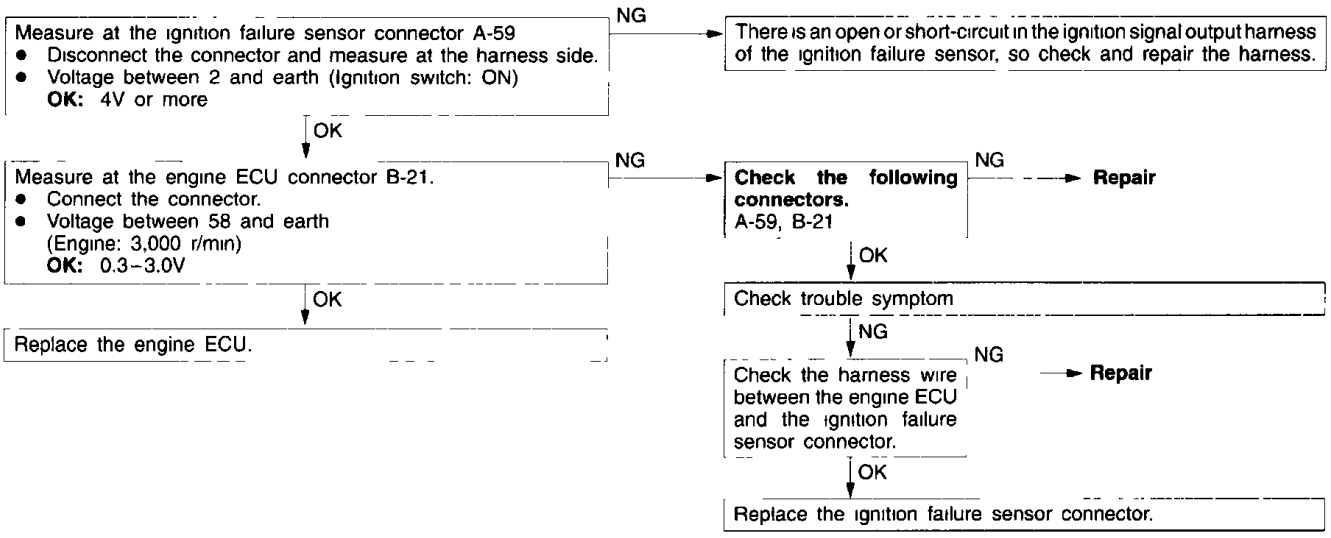
INSPECTION PROCEDURE 52

Check ignition coil and power transistor unit circuit. <SOHC>



INSPECTION PROCEDURE 53

Check ignition signal circuit. <DOHC>



SERVICE DATA REFERENCE TABLE

13100890036

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

NOTE
*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. 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.
*3. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
*4. In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.
*5. The idle position switch normally turns off when the voltage of the throttle position sensor is 50–100 mV higher than the voltage at the idle position. If the throttle position switch turns back on after the throttle position sensor voltage has risen by 100 mV and the throttle valve has opened, the idle position switch and the throttle position sensor need to be adjusted.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine:After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-15
			When engine is suddenly raced	600–1,000 mV		
		Engine:After having warmed up The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.	Engine is idling	400 mV or less (Changes)		
			2,500 r/min	600–1,000 mV		
12	Air flow sensor*1	• Engine coolant temperature: 80–95°C • Lamps and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	25–51 Hz	–	–
			2,500 r/min	80–120 Hz <4G92> 74–114 Hz <4G93 – SOHC> 55–95 Hz <4G93 – DOHC>		
			Engine is raced	Frequency increases in response to racing		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
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-16
			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		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300–1,000 mV	Code No. 14	13A-17
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 23	13A-48
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27 <M/T> Procedure No. 28 <A/T>	13A-50 13A-51
			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-18
			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		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. 22	13A-19 <SOHC> 13A-20 <DOHC>
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,400–1,600 rpm		
			When engine coolant temperature is 0°C	1,350–1,550 rpm		
			When engine coolant temperature is 20°C	1,300–1,500 rpm <4G92, 4G93 – DOHC> 1,250–1,200 rpm <4G93 – SOHC>		
			When engine coolant temperature is 40°C	1,100–1,300 rpm <4G92, 4G93 – DOHC> 1,000–1,200 rpm <4G93 – SOHC>		
			When engine coolant temperature is 80°C	650–850 rpm <4G92> 700–900 rpm <4G93>		
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-24
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 25 <Vehicles without TCL> Procedure No. 26 <Vehicles with TCL>	13A-49
			Throttle valve: Slightly open	OFF*5		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 29	13A-52
			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. 30	13A-52
			A/C switch: ON	ON		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 28	13A-51
			D, 2, L or R	D, 2, L or R		
33	Electrical load switch	All accessories: OFF	Lighting switch only: OFF → ON	OFF → ON	Procedure No. 31	13A-53
			Rear defogger switch only: OFF → ON	OFF → ON		
41	Injectors *2	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13–19 ms <4G92> 15–22 ms <4G93 – SOHC> 12–18 ms <4G93 – DOHC>	–	–
			When engine coolant temperature is 20°C	27–40 ms <4G92> 31–46 ms <4G93 – SOHC> 25–38 ms <4G93 – DOHC>		
			When engine coolant temperature is 80°C	5.9–8.9 ms <4G92> 7.2–10.8 ms <4G93 – SOHC> 6.0–9.0 ms <4G93 – DOHC>		
	Injectors*3	• Engine coolant temperature: 80–95°C • Lamps and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	1.7–2.9 ms <4G92> 2.2–3.4 ms <4G93 – SOHC> 2.0–3.2 ms <4G93 – DOHC>		
			2,500 r/min	1.4–2.6 ms <4G92, 4G93 – DOHC> 2.0–3.2 ms <4G93 – DOHC>		
			When engine is suddenly raced	Increases		

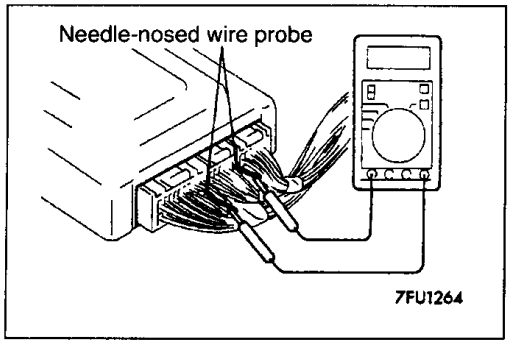
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
44	Ignition coils and power transistors	• Engine: After having warmed up • Timing lamp is set. (The timing lamp is set in order to check actual ignition timing.)	Engine is idling	2–18 °BTDC <4G92, 4G93 – DOHC> 0–16 °BTDC <4G93 – SOHC>	–	–
			2,500 r/min	30–50 °BTDC <4G92> 22–42 °BTDC <4G93>		
45	ISC (stepper) motor position *4	• Engine coolant temperature: 80–95°C • Lamps and all accessories: OFF • Transmission: Neutral (A/T : P range) • Idle position switch: ON • Engine: Idling • When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	2–25 STEP		
			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 relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 30	13A-52
			A/C switch: ON	ON (Compressor clutch is operating)		

ACTUATOR TEST REFERENCE TABLE

13100900036

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. 41	13A-26
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Forced driving 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-48
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 36	13A-55
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 37	13A-56
15	Vacuum control solenoid valve <Vehicles with TCL>	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Code No. 71	13A-29

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
16	Ventilation control solenoid valve <Vehicles with TCL>	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Code No. 72	13A-30
21	Radiator fan Condenser fan	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON	Fan motor operates at low speed.	Procedure No. 32	13A-53



CHECK AT THE ENGINE ECU TERMINALS

13100920032

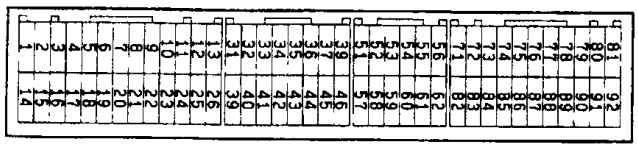
TERMINAL VOLTAGE CHECK CHART

1. Connect a needle-nosed wire probe (test harness: MB991223 or paper clip) 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. Make the voltage measurement 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. The checks can be carried out off the order given in the chart.

   Caution
   Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, engine ECU or all of them. Be careful to prevent this!
3. If voltmeter shows any division 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



9FU0393

Terminal No. <SOHC>	Terminal No. <DOHC>	Check item	Check condition (Engine condition)	Normal condition
1	1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11 – 14 V, momentarily drops slightly
14	14	No. 2 injector		
2	2	No. 3 injector		
15	15	No. 4 injector		
3	–	Ventilation control solenoid valve <Vehicles with TCL>	Ignition switch: ON	System Voltage
4	4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	17	Stepper motor coil <A2>		
5	5	Stepper motor coil <B1>		
18	18	Stepper motor coil <B2>		
6	6	EGR control solenoid valve	Ignition switch: ON	System Voltage
			While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops

Terminal No. <SOHC>	Terminal No. <DOHC>	Check item	Check condition (Engine condition)		Normal condition
8	8	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)		System voltage or momentarily 6V or more → 0–3V
9	9	Purge control solenoid valve	Ignition switch: ON		System voltage
			Running at 3,000r/min while engine is warming up after having been started.		0–3V
10	–	Power transistor unit	Engine r/min: 3,000 r/min		0.3–3.0V
–	10	Ignition coil – No. 1, No. 4 (power transistor)	Engine r/min: 3,000 r/min		0.3–3.0V
–	23	Ignition coil – No. 2, No. 3 (power transistor)			
11	–	Vacuum control solenoid valve <Vehicles with TCL>	Ignition switch: ON		System voltage
12	12	Power supply	Ignition switch: ON		System voltage
25	25				
19	19	Air flow sensor reset signal	Engine: Idle speed		0–1V
			Engine r/min: 3,000 r/min		6–9V
21	21	Fan motor relay	Engine: Idle speed	Radiator fan is not operating	System voltage
				Radiator fan is operating	0–3V
22	22	Control relay (Fuel pump)	Ignition switch: ON		System voltage
			Engine: Idle speed		0–3V
36	36	Engine warning lamp	Ignition switch: OFF → ON		0–3V → 9–13V (After several seconds have elapsed)
37	37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
				When steering wheel is turned	0–3V

Terminal No. <SOHC>	Terminal No. <DOHC>	Check item	Check condition (Engine condition)		Normal condition
38	38	Control relay (Power supply)	Ignition switch: OFF		System voltage
			Ignition switch: ON		0–3V
45	45	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)	System voltage
52	52	Ignition timing adjustment terminal	Ignition switch: ON	Earth the ignition timing adjustment terminal	0–1V
				Remove the earth connection from the ignition timing adjustment terminal	4.0–5.5V
–	58	Engine ignition signal	Engine r/min: 3,000 r/min		0.3–3.0V
60	60	Oxygen sensor heater	Engine: Idling after warming up		0–3V
			Engine r/min: 5,000r/min.		System voltage
71	71	Ignition switch – ST	Engine: Cranking		8V or more
72	72	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 intake air temperature is 40°C	1.5–2.1V
				When intake air temperature is 80°C	0.4–1.0V
76	76	Oxygen sensor	Engine: Running at 2,000 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
80	80	Backup power supply	Ignition switch: OFF		System voltage
81	81	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
82	82	Ignition switch – IG	Ignition switch: ON		System voltage

Terminal No. <SOHC>	Terminal No. <DOHC>	Check item	Check condition (Engine condition)		Normal condition
83	83	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	84	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3–1.0V
				Fully open throttle valve	4.5–5.5V
85	85	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7–4.3V
				When altitude is 1,200m	3.2–3.8V
86	86	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5V (Changes repeatedly)
87	87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
				Slightly open throttle valve	4V or more
88	–	Top dead centre sensor	Engine: Cranking		0.4–3.0V
			Engine: Idle speed		0.5–2.0V
–	88	Camshaft position sensor	Engine: Cranking		0.4–3.0V
			Engine: Idle speed		0.5–2.0V
89	89	Crank angle sensor	Engine: Cranking		0.4–4.0V
			Engine: Idle speed		1.5–2.5V
90	90	Air flow sensor	Engine: Idle speed		2.2–3.2V
			Engine r/min: 2,000r/min		
91	–	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0–3V
				Set selector lever to Other than P or N	8–14V

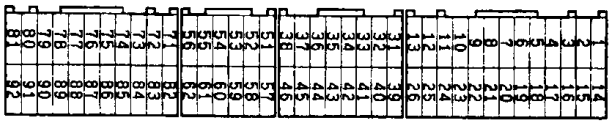
CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

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. Checking need not be carried out in the order given in the chart.

   Caution
   If the terminals that should be checked are mistaken, or if connector terminals are not correctly shorted to earth, damage may be caused to the vehicle wiring, sensors, engine ECU and/or ohmmeter.
   Be careful to prevent this!
4. If the ohmmeter shows any deviation from the standard value, 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.

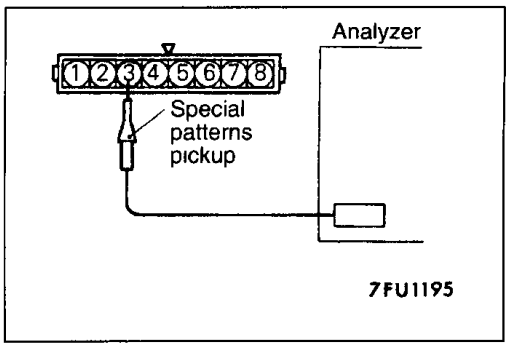
Engine ECU Harness Side Connector Terminal Arrangement



9FU0392

Terminal No.	Inspection item	Normal condition (Check condition)
1–12	No. 1 injector	13–16 Ω (At 20°C)
14–12	No. 2 injector	
2–12	No. 3 injector	
15–12	No. 4 injector	

Terminal No.	Inspection item	Normal condition (Check condition)
3–12	Ventilation control solenoid valve <Vehicles with TCL>	36–44 Ω (At 20°C)
4–12	Stepper motor coil (A1)	28–33 Ω (At 20°C)
17–12	Stepper motor coil (A2)	
5–12	Stepper motor coil (B1)	
18–12	Stepper motor coil (B2)	
6–12	EGR control solenoid valve	62–74 Ω (At 20°C)
9–12	Purge control solenoid valve	62–74 Ω (At 20°C)
11–12	Vacuum control solenoid valve <Vehicles with TCL>	36–44 Ω (At 20°C)
13–Body earth	ENGINE ECU earth	Continuity (0Ω)
26–Body earth	ENGINE ECU earth	
60–12	Oxygen sensor heater	Approx. 12 Ω (At 20°C)
72–92	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)
		0.30–0.42 kΩ (When intake air temperature is 80°C)
83–92	Engine coolant temperature sensor	5.1–6.5 kΩ (When coolant temperature is 0°C)
		2.1–2.7 kΩ (When coolant temperature is 20°C)
		0.9–1.3 kΩ (When coolant temperature is 40°C)
		0.26–0.36 kΩ (When coolant temperature is 80°C)
87–92	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
91–Body earth	Inhibitor switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)



INSPECTION PROCEDURE USING AN ANALYZER

13100930035

AIR FLOW SENSOR (AFS)

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 analyzer special patterns pickup to air flow sensor connector terminal 3.

Alternate Method (Test harness not available)

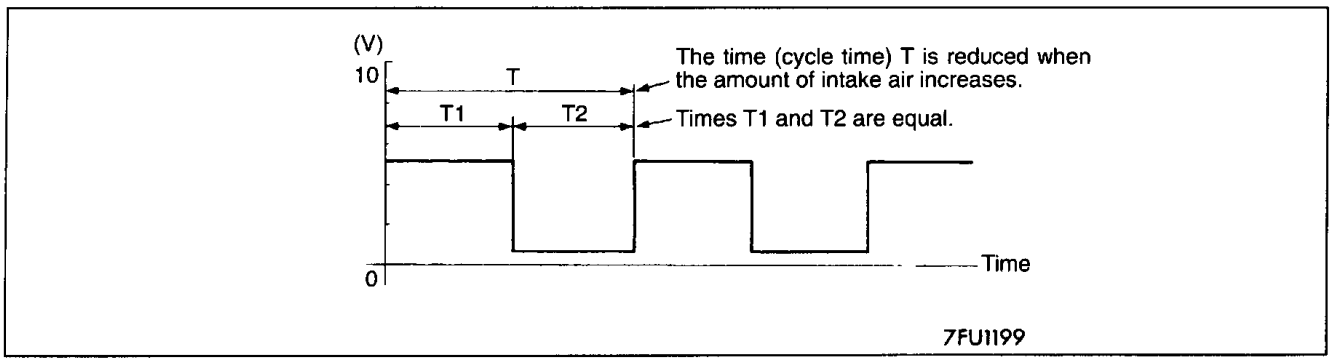
1. Connect the analyzer special patterns pickup to engine ECU terminal 90.

Standard Wave Pattern

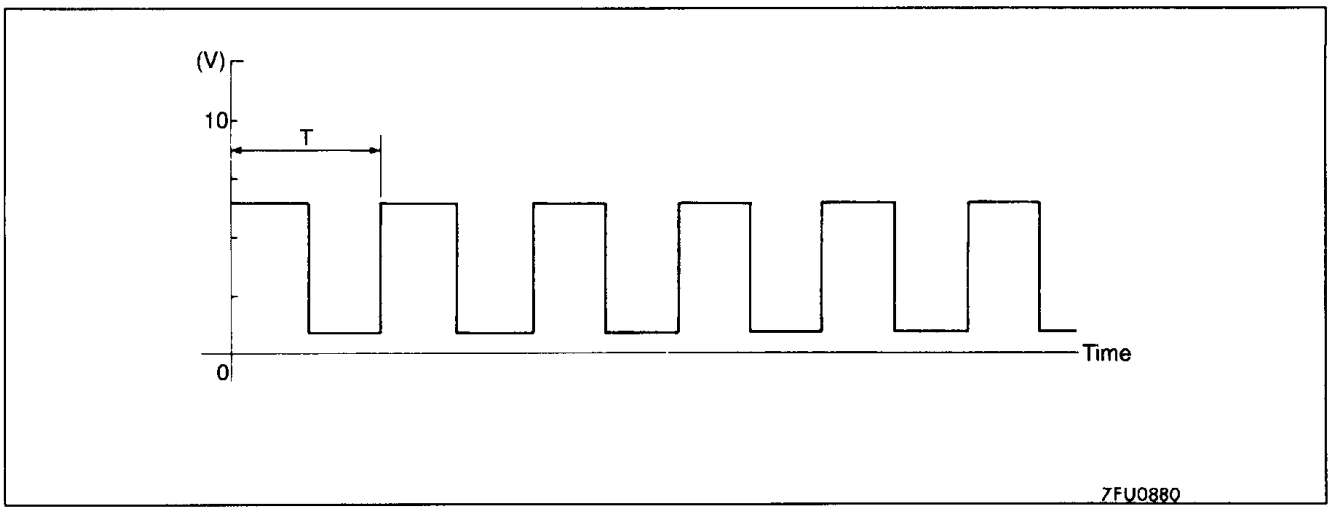
Observation conditions

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

Standard wave pattern

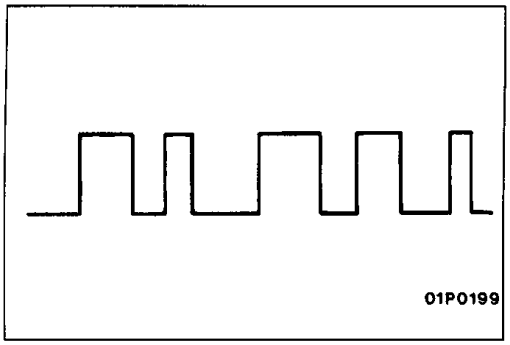


Observation conditions (from conditions above engine speed is increased by racing.)



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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

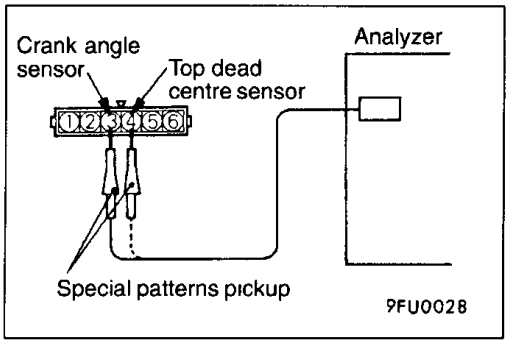
- Example 2

  Cause of problem

  Damaged rectifier or vortex generation column

  Wave pattern characteristics

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



TOP DEAD CENTRE SENSOR AND CRANK ANGLE SENSOR <SOHC>

Measurement Method

1. Disconnect the distributor (top dead centre sensor and crank angle sensor) connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor terminal 4. (When checking the top dead centre sensor signal wave pattern)
3. Connect the analyzer special patterns pickup to distributor connector terminal 3. (When inspecting the crank angle sensor signal wave pattern.)

Alternate Method (Test harness not available)

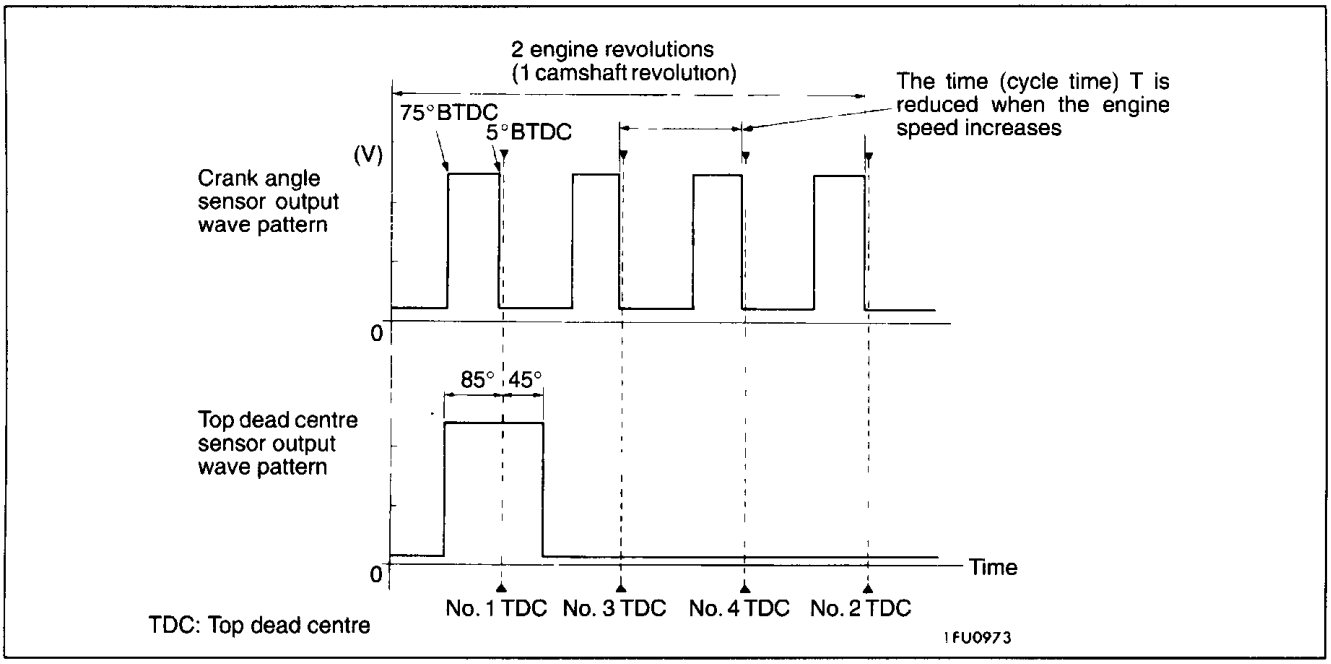
1. Connect the analyzer special patterns pickup to engine ECU terminal 88. (When checking the top dead centre sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions

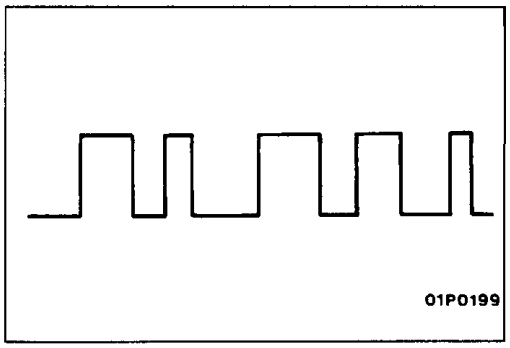
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

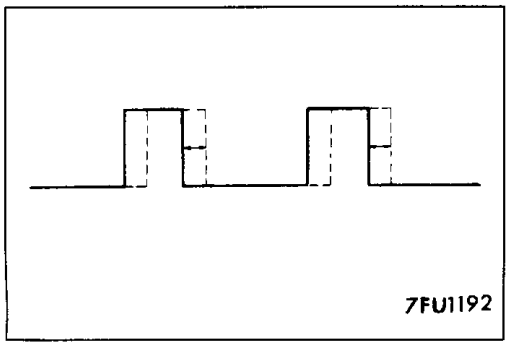
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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



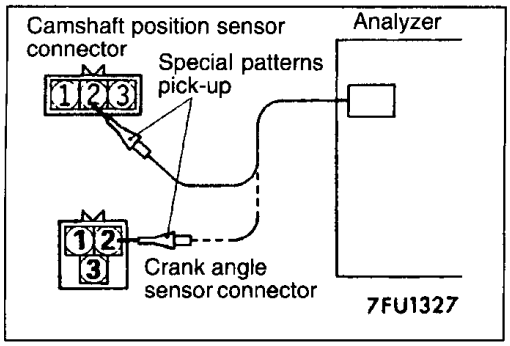
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR <DOHC>

Measurement Method

1. Disconnect the camshaft position sensor connector and connect the special tool (test harness: MB991223) and jumper wire in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to camshaft position sensor terminal 2.
3. Disconnect the crank angle sensor connector and connect the special tool (test harness: MD998478) in between.
4. Connect the analyzer special patterns pickup to crank angle sensor terminal 2.

Alternate Method (Test harness not available)

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

Standard Wave Pattern

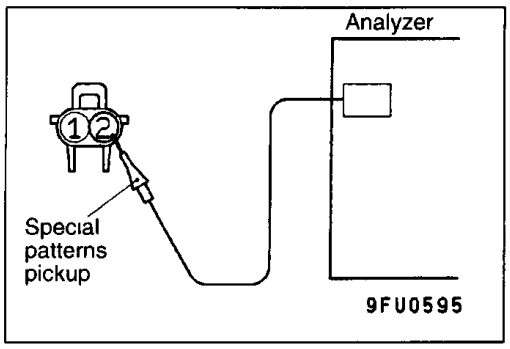
Observation conditions

Standard wave pattern

Wave Pattern Observation Points

Examples of Abnormal Wave Patterns

Refer to P.13A-82.



INJECTOR

Measurement Method

1. Disconnect the injector connector, and then connect the special tool (test harness: MB991348) in between. (Both the power supply side and engine-ECU side should be connected.)
2. Connect the analyzer special patterns pickup to terminal (2) of the injector connector.

Alternate Method (Test harness not available)

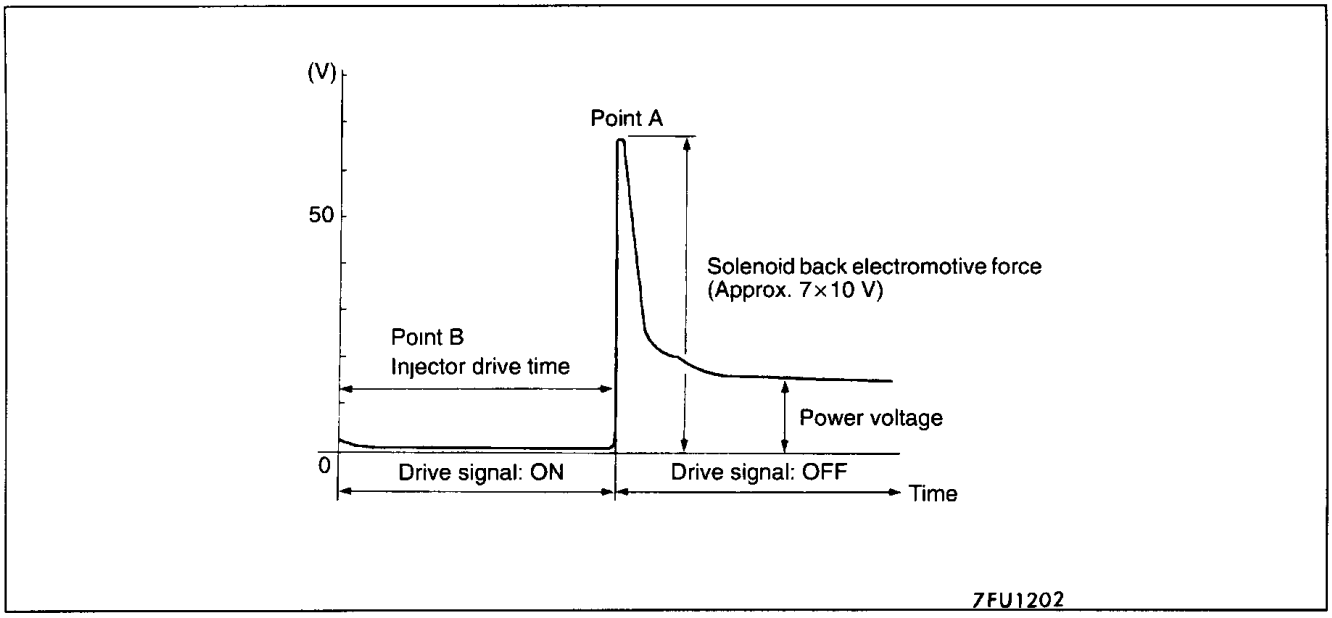
1. Connect the analyzer special patterns pickup to engine ECU terminal 1. (When checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine ECU terminal 14. (When checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine ECU terminal 2. (When checking the No. 3 cylinder.)
4. Connect the analyzer special patterns pickup to engine ECU terminal 15. (When checking the No. 4 cylinder.)

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 speed

Standard wave pattern



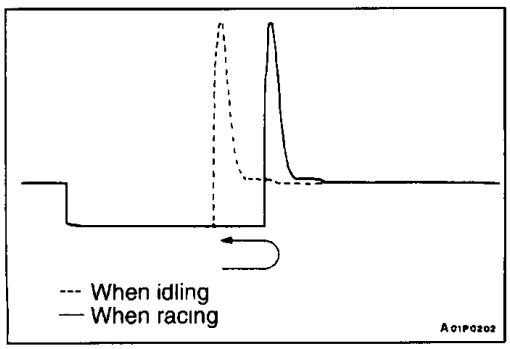
Wave Pattern Observation Points

Explanation of Wave Pattern

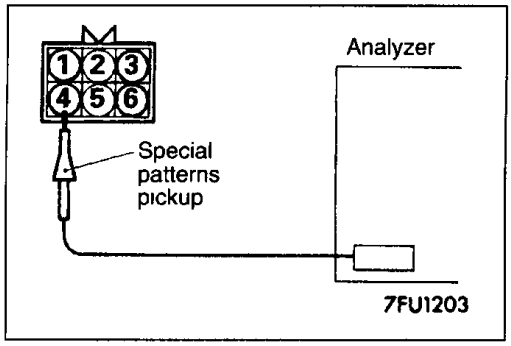
Point A: Height of solenoid back electromotive force

Contrast with standard wave pattern	Probable cause
Solenoid coil back electromotive force is low or doesn't appear at all.	Short in the injector solenoid

Point B: Injector drive time



- The injector drive time will be synchronized 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.



STEPPER MOTOR

Measurement Method

1. Disconnect the stepper motor connector, and connect the special tool (test harness: MD998463) in between.
2. Connect the analyzer special patterns pickup to the stepper motor-side connector terminal 1 (red clip of special tool), terminal 3 (blue clip), terminal 4 (black clip) and terminal 6 (yellow clip) respectively.

Alternate Method (Test harness not available)

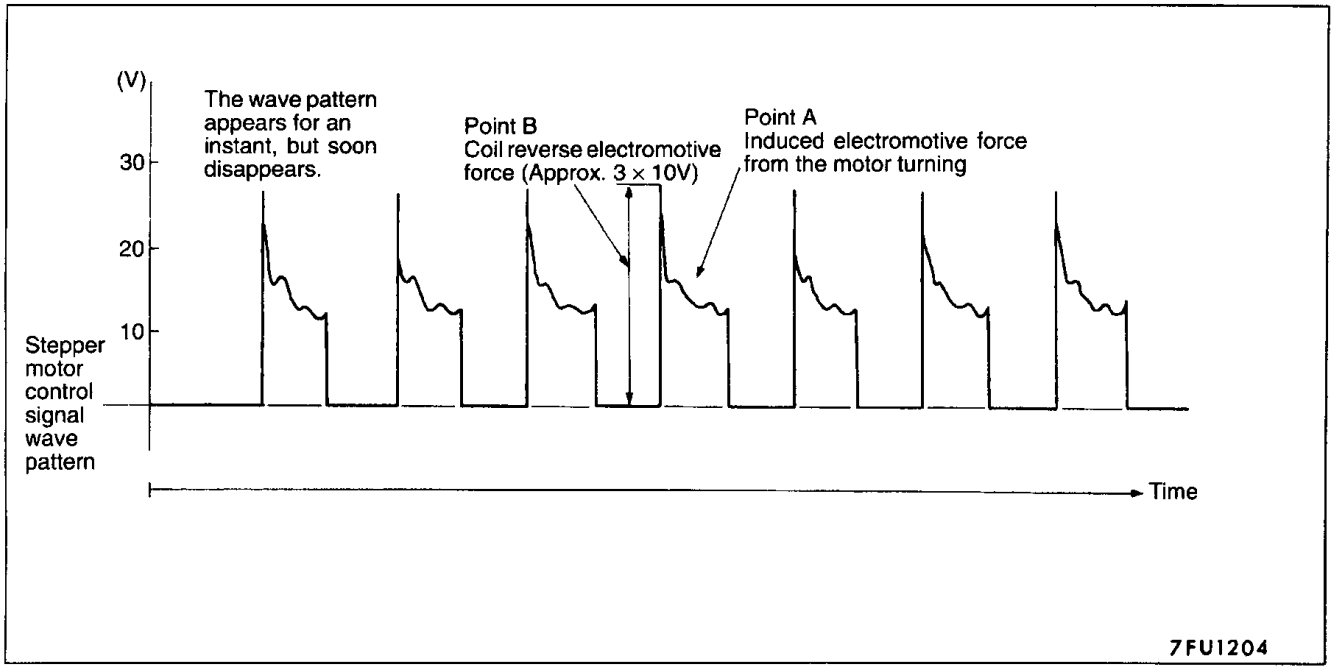
1. Connect the analyzer special patterns pickup to ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	When the engine coolant temperature is 20°C or below, 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

Standard wave pattern



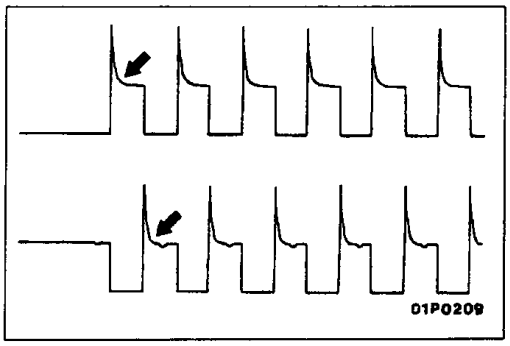
Wave Pattern Observation Points

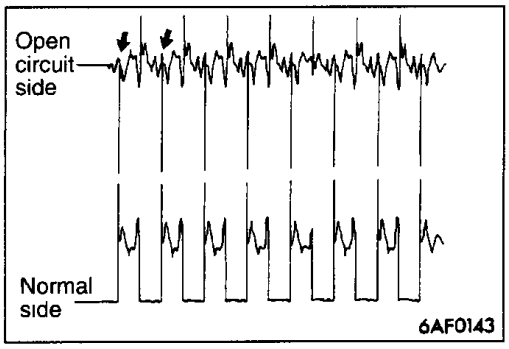
Check that the standard wave pattern appears when the stepper motor is operating.
Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

Contrast with standard wave pattern	Probable cause
Induced electromotive force does not appear or is extremely small.	Motor is malfunctioning

Point B: Height of coil reverse electromotive force

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





Examples of Abnormal Wave Pattern

- Example 1

  Cause of problem

  Motor is malfunctioning. (Motor is not operating.)

  Wave pattern characteristics

  Induced electromotive force from the motor turning does not appear.

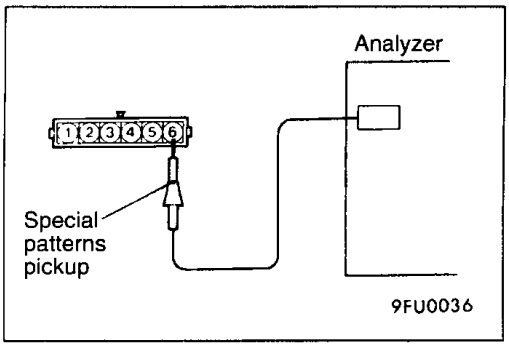
- Example 2

  Cause of problem

  Open circuit in the line between the stepper motor and the 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 waveform at the normal side is slightly different from the normal waveform.



IGNITION COIL AND POWER TRANSISTOR <SOHC>

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

Measurement Method

1. Disconnect the distributor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to distributor connector terminal 6.

Alternate Method (Test harness not available)

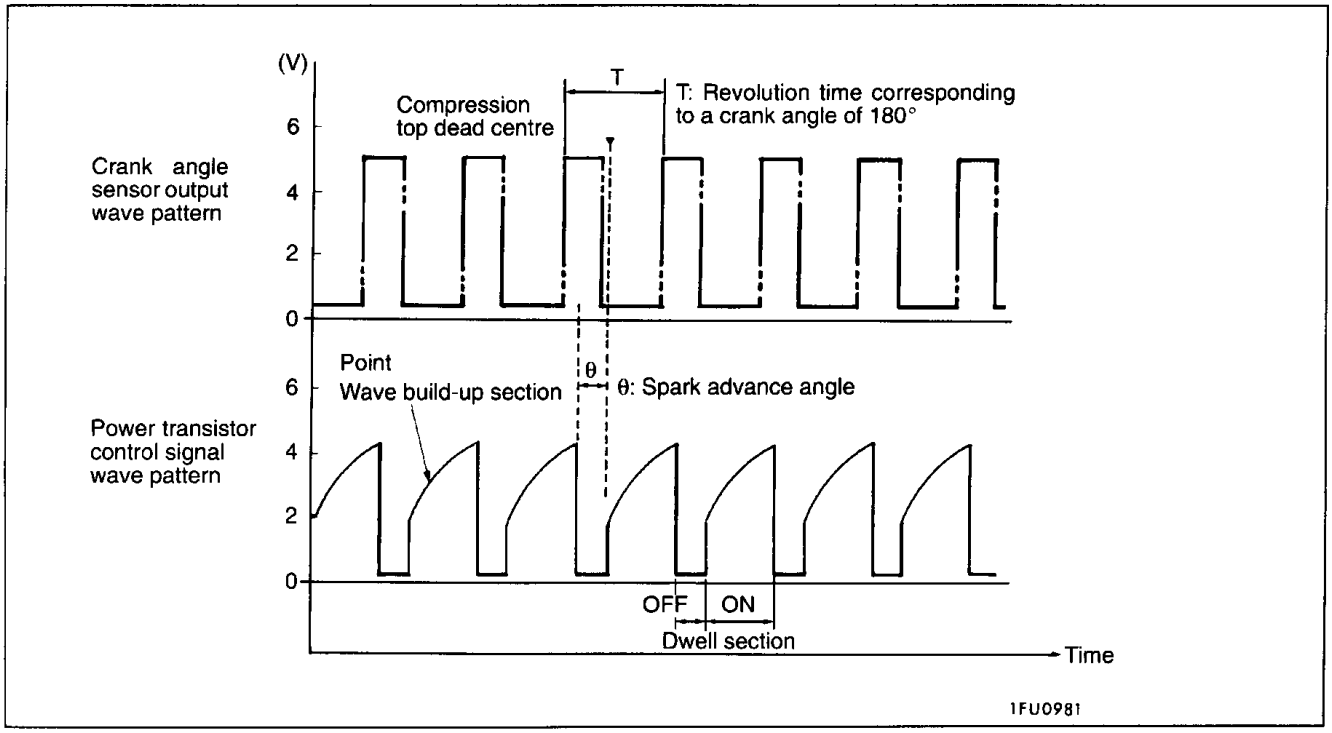
1. Connect the analyzer special patterns pickup to engine ECU terminal 10.

Standard Wave Pattern

Observation condition

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

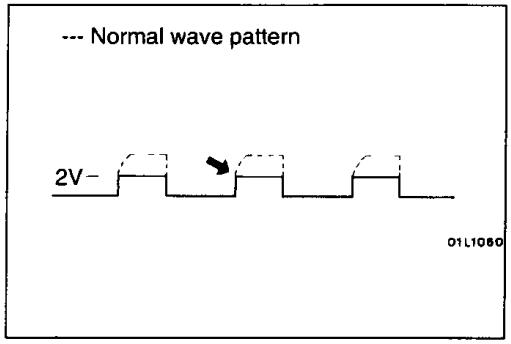
Standard wave pattern

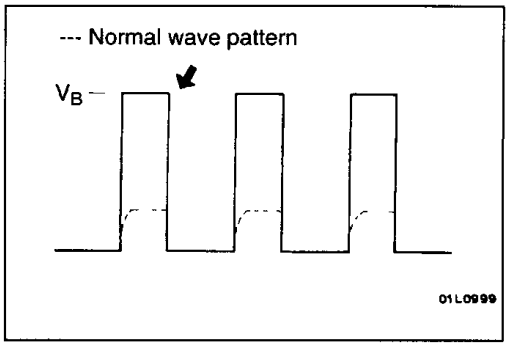


Wave Pattern Observation Points

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	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

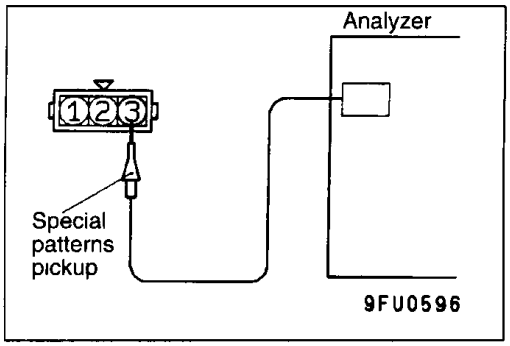
  Wave pattern during engine cranking

  Cause of problem

  Malfunction in power transistor

  Wave pattern characteristics

  Power voltage results when the power transistor is ON.



IGNITION COIL AND POWER TRANSISTOR <DOHC>

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

Measurement Method

1. Disconnect the ignition coil connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to terminal (3) of each ignition coil connector in turn.

Alternate Method (Test harness not available)

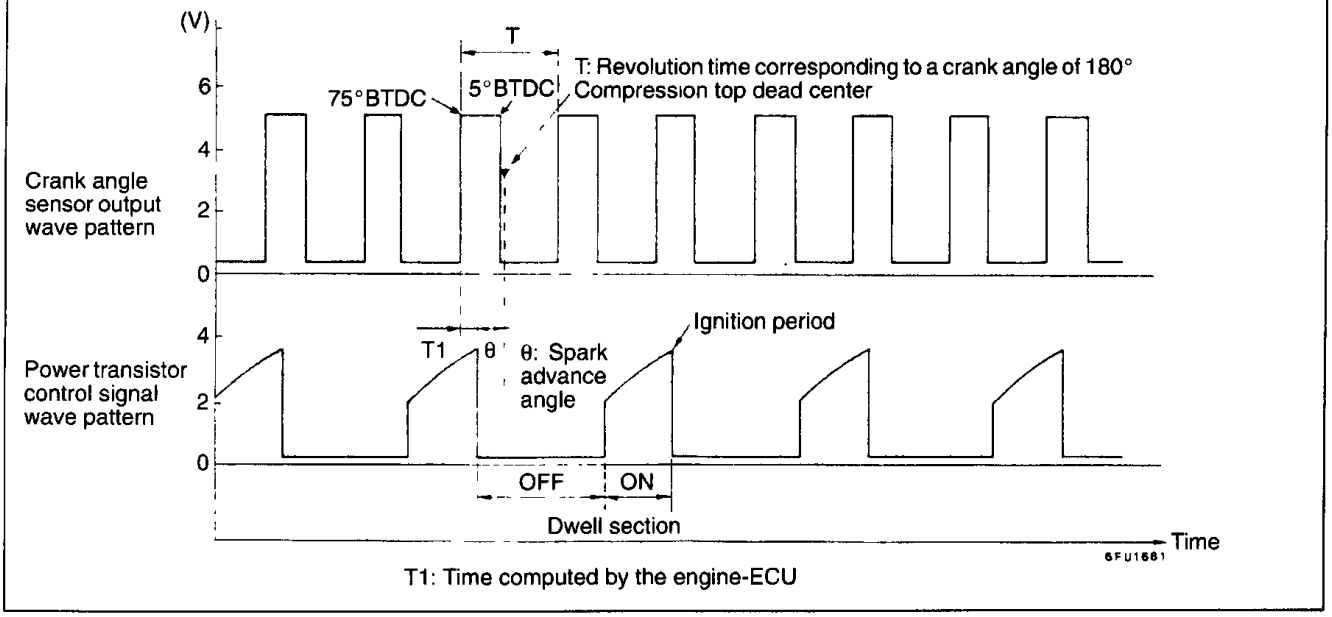
1. Connect the analyzer special patterns pickup to engine ECU terminal 10 (No. 1 – No. 4), terminal 23 (No. 2 – No. 3) respectively.

Standard Wave Pattern

Observation condition

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

Standard wave pattern



T1: Time computed by the engine-ECU

Wave Pattern Observation Points

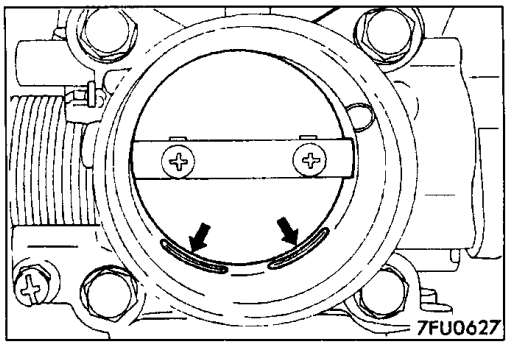
Examples of Abnormal Wave Patterns

Refer to P.13A-88.

ON-VEHICLE SERVICE 13100100030

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.

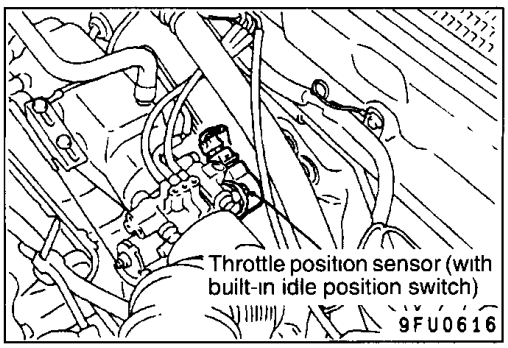


3. Plug the bypass passage inlet of the throttle body.

   Caution
   Do not allow cleaning solvent to enter the bypass passage.

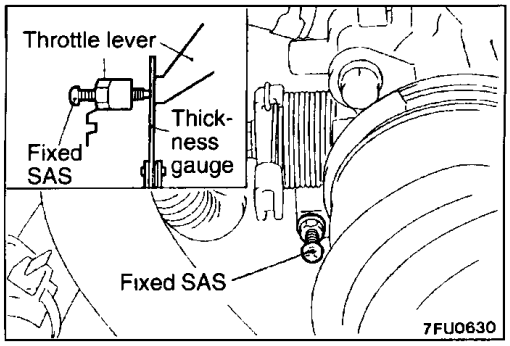
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly 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 self-diagnosis code.
10. Adjust the basic idle speed. (Refer to P.13A-93.)

    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.

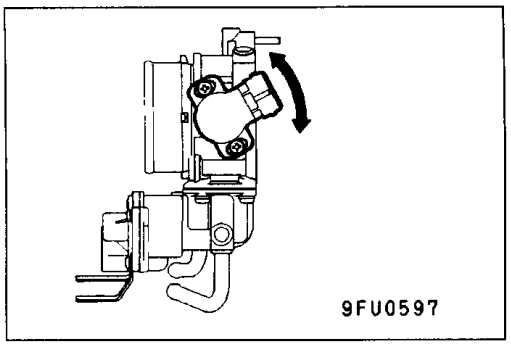


IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles without TCL> 13100130039

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



2. Insert a thickness gauge with a thickness of 0.65 mm between the fixed SAS and the throttle lever.
3. Turn the ignition switch to ON (but do not start the engine).

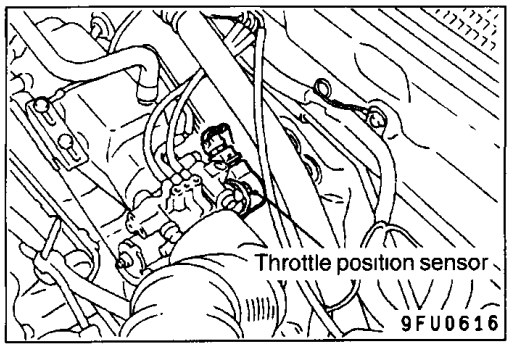


4. Loosen the throttle position sensor mounting bolt, and then turn the throttle position sensor anti-clockwise as far as it will go.
5. Check that the idle position switch is on at this position.
6. Slowly turn the throttle position sensor clockwise and find the point where the idle position switch turns off. Securely tighten the throttle position sensor mounting bolt at this point.

7. Check the throttle position sensor output voltage.

   Standard value: 400–1,000 mV

8. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
9. Remove the thickness gauge.
10. Turn the ignition switch to OFF.
11. Disconnect the MUT-II.

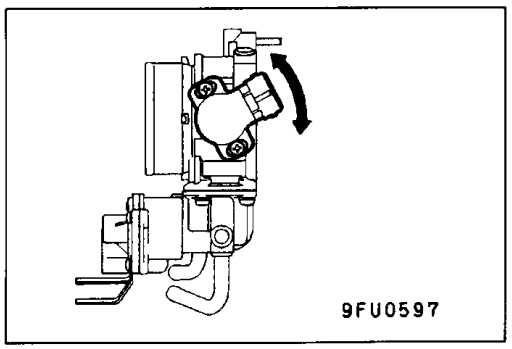


THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles with TCL>

13100110026

1. Connect the MUT-II to the diagnosis connector.
2. Turn the ignition switch to ON (but do not start the engine).
3. Check the throttle position sensor output voltage.

   Standard value: 580–690 mV

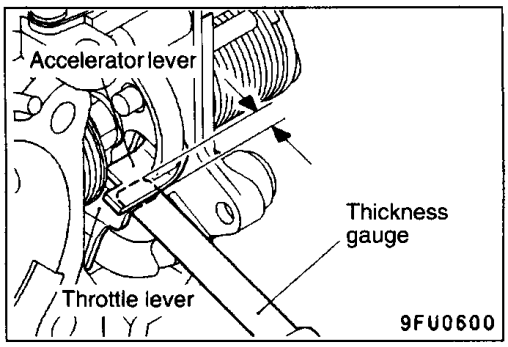


4. If the voltage is outside the standard value, adjust by loosening the throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Turn the ignition switch to OFF.
6. Disconnect the MUT-II.
7. If a diagnosis code is output while adjusting the throttle position sensor, use the MUT-II to erase the diagnosis code.

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

13100140025

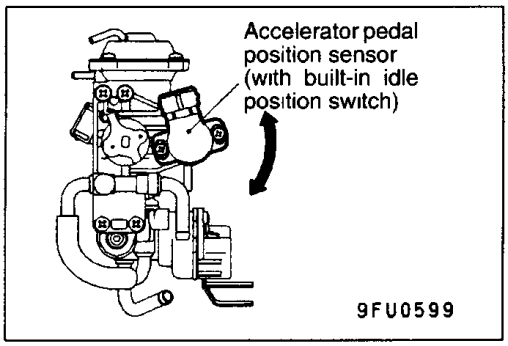
1. Connect the MUT-II to the diagnosis connector.



2. Insert a thickness gauge with a thickness of 0.5 mm in between the accelerator lever and throttle lever to a depth of approximately 3 mm.

   NOTE
   If the thickness gauge is inserted more than 3 mm, the accelerator lever opening angle will become greater than the set opening angle, which will result in defective adjustment.

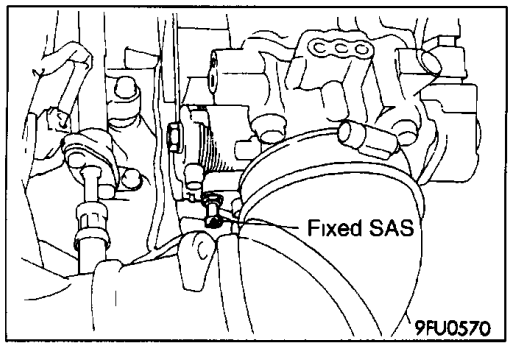
3. Turn the ignition switch to ON (but do not start the engine).



4. Loosen the accelerator pedal position sensor mounting bolt, and then turn the accelerator pedal position sensor clockwise as far as it will go.
5. Check that the accelerator pedal position switch is on at this position.
6. Slowly turn the accelerator pedal position sensor anti-clockwise and find the point where the idle position switch turns off.
   Securely tighten the accelerator pedal position sensor mounting bolt at this point.
7. Select "Traction Control System" on the MUT-II.
8. Check the accelerator pedal position sensor output voltage.

   Standard value: 400–1,000 mV

9. If the voltage is outside the standard value, check the accelerator pedal position sensor and related harnesses.
10. Remove the thickness gauge.
11. Turn the ignition switch to OFF.
12. Disconnect the MUT-II.



FIXED SAS ADJUSTMENT

13100150035

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 counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point at which the throttle valve begins to open) is found.
   From that point, tighten the fixed SAS 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 idling speed.
8. For vehicles without TCL, adjust the idle position switch and the throttle position sensor (P.13A-90).
   For vehicles with TCL, adjust the throttle position sensor, idle position switch and accelerator pedal position sensor (P.13A-91, 92).

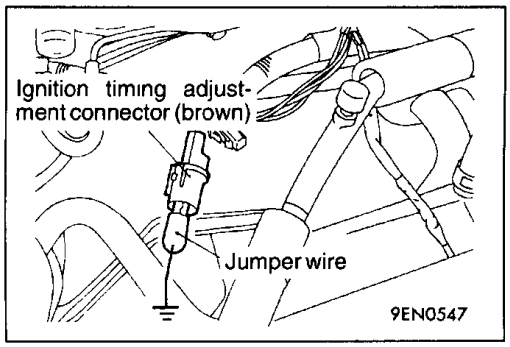
BASIC IDLE SPEED ADJUSTMENT

13100180041

NOTE
1. The standard idling speed has been adjusted, by the speed adjusting screw (SAS), by the manufacturer, and there should usually be no need for readjustment.
2. If the adjustment has been changed by mistake, the idle speed may become too high or the idle speed may drop too low when loads from components such as the A/C are placed on the engine. If this occurs, adjust by the following procedure.
3. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle speed control servo, the compression pressure, etc., are all normal.

1. Before inspection and adjustment, set the vehicle to the pre-inspection condition.
2. Connect the MUT-II to the diagnosis connector (16-pin).

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

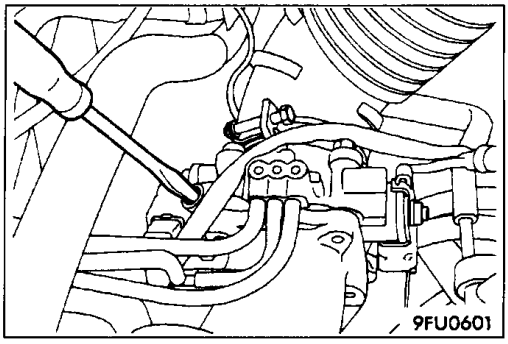


3. Remove the waterproof female connector from the ignition timing adjustment connector.
4. Use a jumper wire to earth the ignition timing adjustment terminal.

5. Start the engine and run at idle.
6. Check the idle speed.

Standard value:
750±50 r/min <4G92>
800±50 r/min <4G93>

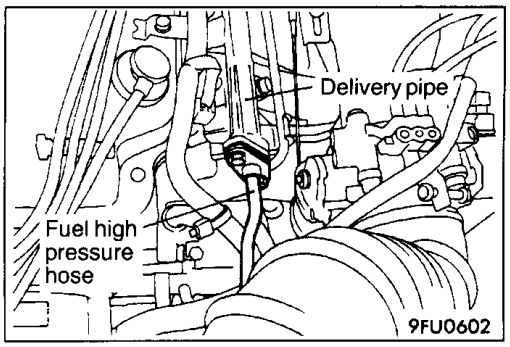
NOTE
1. The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
2. If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-90.)



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

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

8. Switch OFF the ignition switch.
9. Disconnect the jumper wire from the ignition timing adjustment terminal and return the connector to its original condition.
10. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

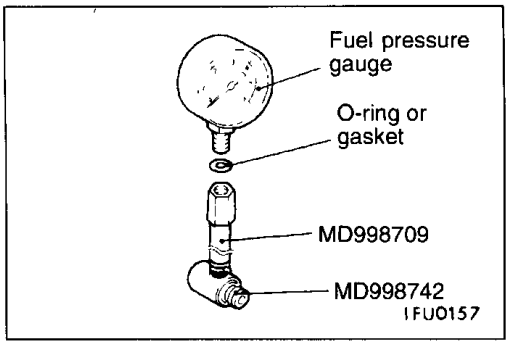


FUEL PRESSURE TEST

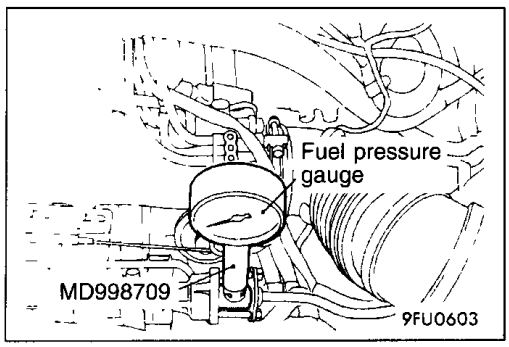
13100190037

1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-98.)
2. Disconnect the fuel high pressure hose at the delivery pipe side.

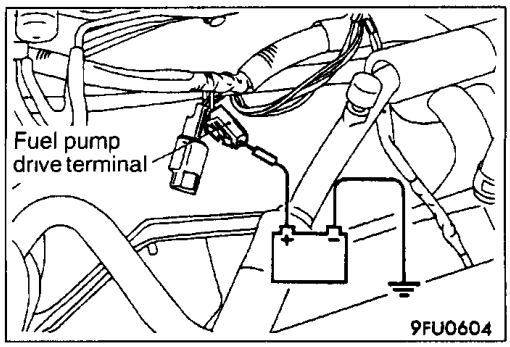
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



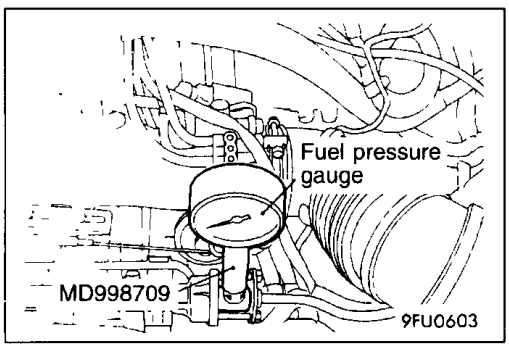
3. Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.
4. Install a fuel pressure gauge on the adapter hose that was set up in step 3.
   Use a suitable O-ring or gasket between the fuel pressure 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 set in place in steps 3 and 4 between the delivery pipe and the high pressure hose.

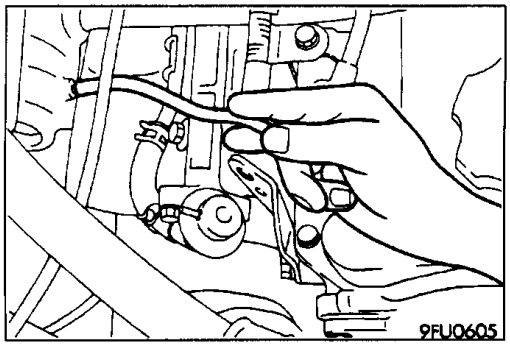


6. Connect the fuel pump drive terminal with the battery (+) terminal using a jumper wire and drive the fuel pump. Under fuel pressure, check the fuel pressure gauge and special tool connections for leaks.
7. Disconnect the jumper wire from the fuel pump drive terminal to stop the fuel pump.
8. Start the engine and run at idle.



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

Standard value:
Approx. 265 kPa at curb idle



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

    Standard value:
    324–343 kPa at curb idle

11. Check to see that fuel pressure at idle does not drop even after the engine has been raced several times.
12. 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.

13. If any of fuel pressure measured in steps 9 to 12 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

14. Stop the engine and check change of 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

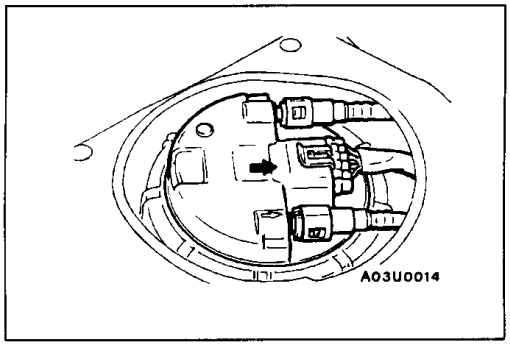
15. Release residual pressure from the fuel pipe line. (Refer to P.13A-98.)
16. Remove the fuel pressure gauge and special tool from the delivery pipe.

    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.

17. Replace the O-ring at the end of the fuel high pressure hose with a new one. Furthermore, apply engine oil to the new O-ring before replacement.
18. Fit the fuel high pressure hose over the delivery pipe and tighten the bolt to specified torque.

    Tightening torque: 5 Nm

19. Check for fuel leaks.
    (1) Apply the battery voltage to the fuel pump drive terminal to drive the fuel pump.
    (2) Under fuel pressure, check the fuel line for leaks.

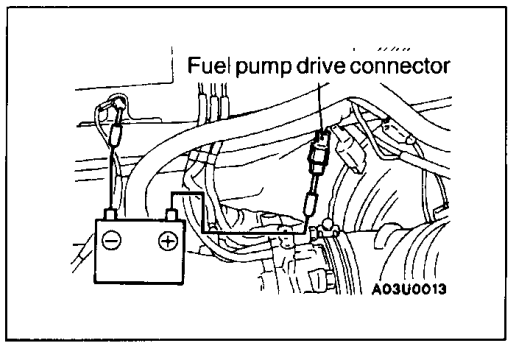


FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

13100090030

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) Raise the rear seat cushion.
(2) Remove the protector.
(3) Disconnect the harness connector.
(4) After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
(5) Connect the fuel wiring harness and floor wiring harness.
(6) Install the rear seat cushion.



FUEL PUMP OPERATION CHECK

13100200044

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, and if it is normal, check the drive circuit.
   (1) Turn the ignition switch to OFF.
   (2) When the fuel pump drive connector (black) 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 filler cap and check from the tank inlet.

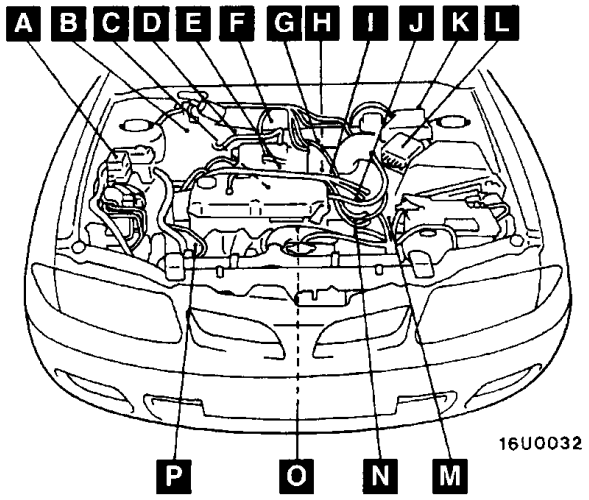
   (3) Check the fuel pressure by pinching the fuel hose with the fingertips.

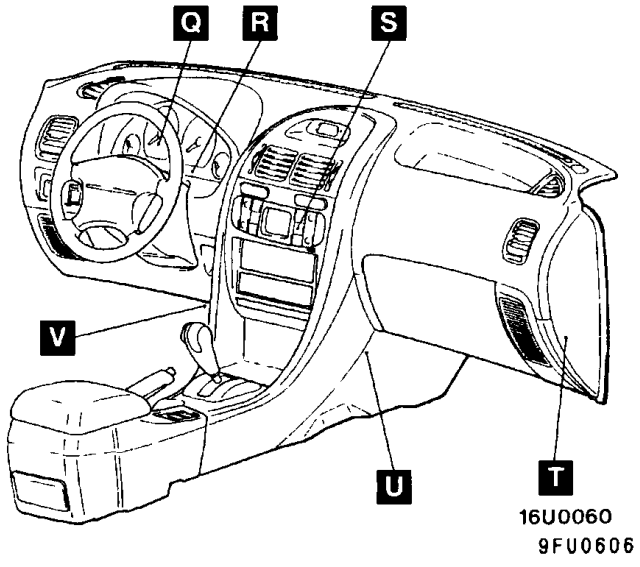
COMPONENT LOCATION

13100210054

<SOHC>

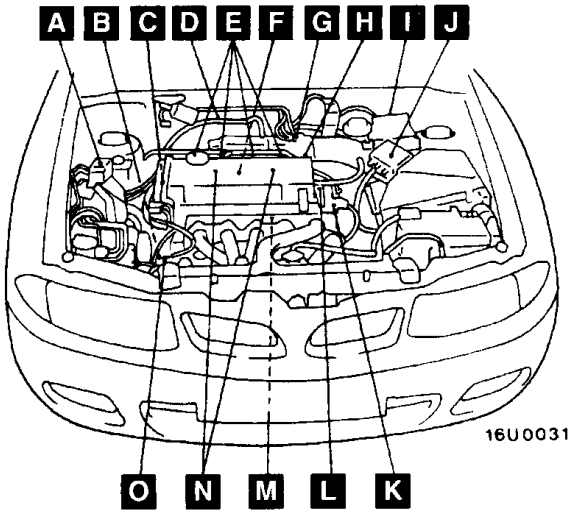
Name	Symbol	Name	Symbol
Accelerator pedal position sensor (with idle position switch) <Vehicles with TCL>	I	Fuel pump check terminal	D
		Idle speed control servo	H
A/C relay	A	Ignition timing adjustment connector	D
A/C switch	S	Inhibitor switch <A/T>	M
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	L	Injector	E
		Oxygen sensor	O
Control relay	U	Power steering fluid pressure switch	P
Detonation sensor	C	Purge control solenoid valve <L.H. drive vehicles>	K
Diagnosis connector	V	Purge control solenoid valve <R.H. drive vehicles>	B
Distributor (with ignition coil, power transistor, top dead centre sensor and crank angle sensor)	J	Throttle position sensor <Vehicles with TCL>	G
EGR control solenoid valve <L.H. drive vehicles>	K	Throttle position sensor (with idle position switch) <Vehicles without TCL>	G
EGR control solenoid valve <R.H. drive vehicles>	B	Vacuum control solenoid valve <Vehicles with TCL>	F
Engine coolant temperature sensor	N	Vehicle speed sensor	Q
Engine ECU	T	Ventilation control solenoid valve <Vehicles with TCL>	F
Engine warning lamp (check engine lamp)	R		

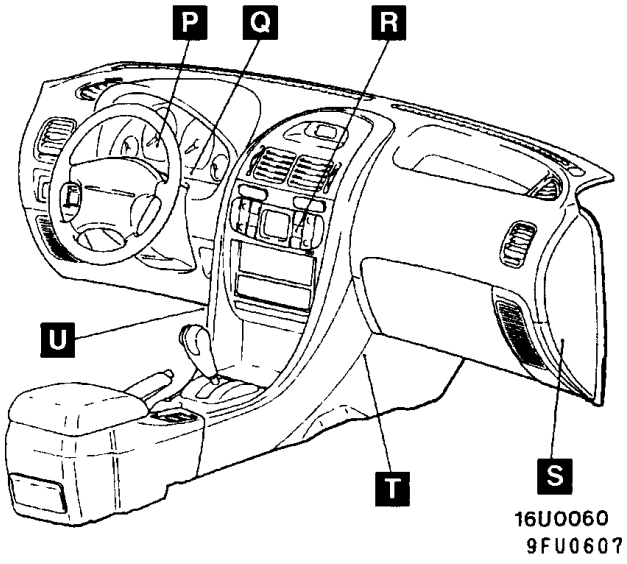


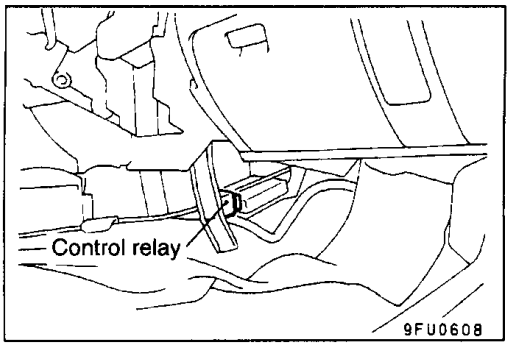


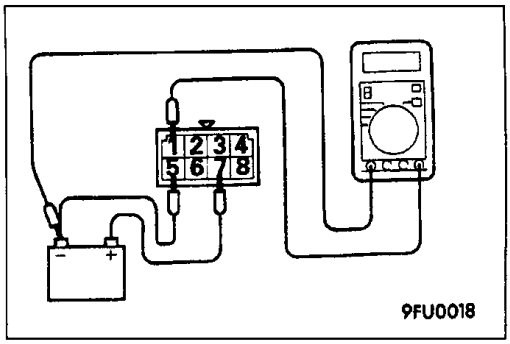
<DOHC>

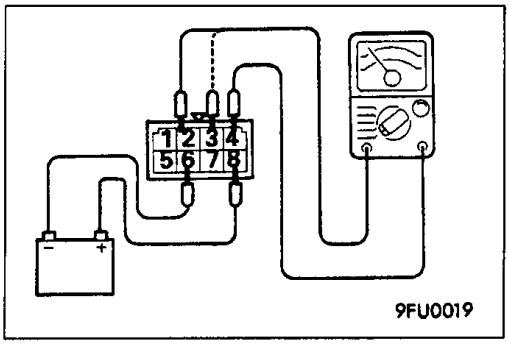
Name	Symbol	Name	Symbol
A/C relay	A	Engine warning lamp (check engine lamp)	Q
A/C switch	R	Fuel pump check terminal	D
Air flow sensor (with intake air temperature sensor and barometric pressure sensor)	J	Idle speed control servo	H
		Ignition coil	N
Camshaft position sensor	C	Ignition failure sensor	L
Control relay	T	Ignition timing adjustment connector	D
Crank angle sensor	B	Injector	E
Detonation sensor	F	Oxygen sensor	M
Diagnosis connector	U	Power steering fluid pressure switch	O
EGR control solenoid valve	I	Purge control solenoid valve	I
Engine coolant temperature sensor	K	Throttle position sensor (with idle position switch)	G
Engine ECU	S	Vehicle speed sensor	P











CONTROL RELAY CHECK

13100800039

1. Remove the control relay.
2. Check the continuity between the control relay terminals.

Normal condition:

Inspection terminals	Continuity
5–7	Continuity
6–8	Continuity in one direction

3. Use jumper leads to connect control relay terminal 7 to the battery (+) terminal and terminal 5 to the battery (–) terminal.

   Caution
   When connecting the jumper leads, be careful not to mistake the connection terminals, as damage to the relay will result.

4. Check the voltage at control relay terminal 1 while connecting and disconnecting the jumper lead at the battery (–) terminal.

Normal condition:

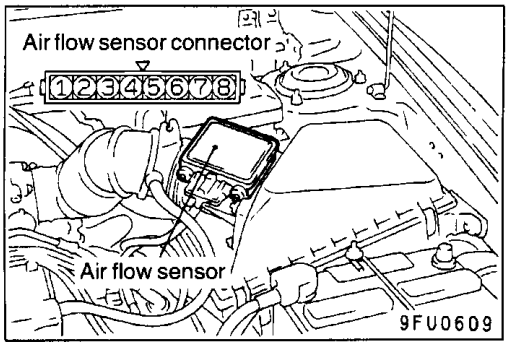
Jumper lead	Voltage at terminal 1
Connected	S V
Disconnected	0 V

5. Use the jumper leads to connect control relay terminal 8 to the battery (+) terminal and terminal 6 to the battery (–) terminal.
6. Check the continuity between control relay terminals 2 – 4 and terminals 3 – 4 while connecting and disconnecting the jumper lead at the battery (–) terminal.

Normal condition

Jumper lead	Continuity between terminals 2 – 4	Continuity between terminals 3 – 4
Connected	Continuity (0Ω)	Continuity (0Ω)
Disconnected	No continuity (∞Ω)	No continuity (∞Ω)

7. If there is a defect, replace the control relay.



INTAKE AIR TEMPERATURE SENSOR CHECK

13100280031

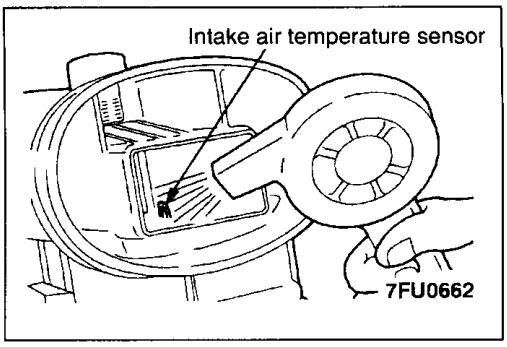
1. Disconnect the air flow sensor connectors.
2. Measure resistance between terminals 5 and 6.

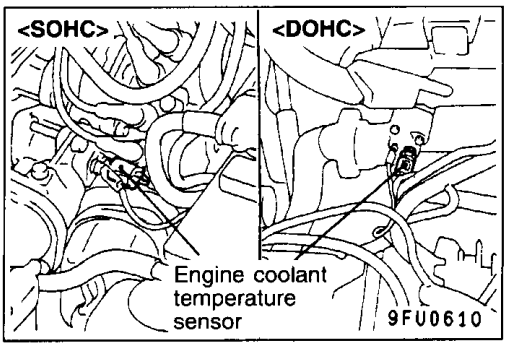
   Standard value:
   2.3–3.0 kΩ (at 20°C)
   0.30–0.42 kΩ (at 80°C)
3. Measure resistance while heating the sensor using a hair drier.

Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

4. If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.



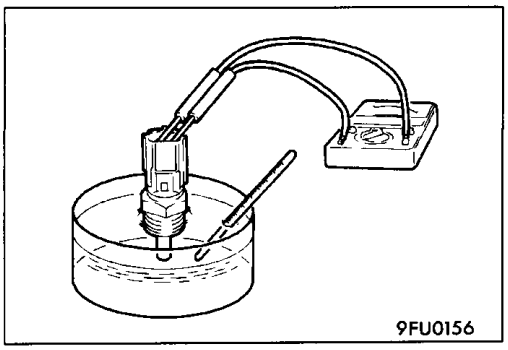


ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310037

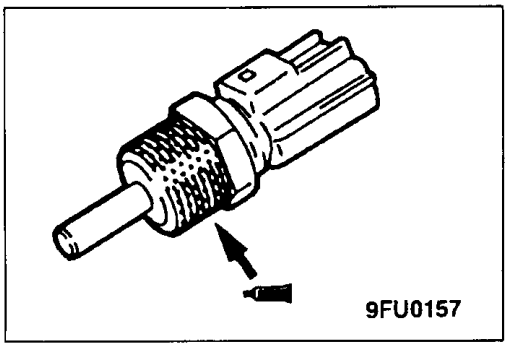
Caution
Be careful not to touch the connector (resin section) with the tool when removing and installing.

1. Remove engine coolant temperature sensor.



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

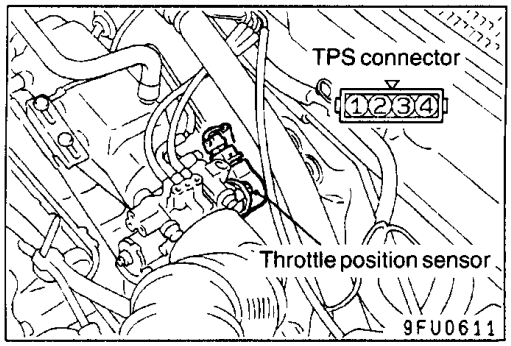
   Standard value:
   2.1–2.7 kΩ (at 20°C)
   0.26–0.36 kΩ (at 80°C)
3. If the resistance deviates from the standard value greatly, replace the sensor.



4. Apply sealant to threaded portion.

   Specified sealant:
   3M NUT locking Part No. 4171 or equivalent
5. Install engine coolant temperature sensor and tighten it to the specified torque.

   Sensor tightening torque: 30 Nm
6. Fasten harness connectors securely.



THROTTLE POSITION SENSOR CHECK 13100320030

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 kΩ

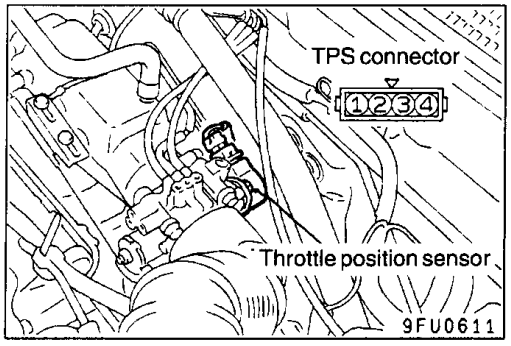
3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

Normal condition:

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
   For the throttle position sensor adjustment procedure, refer to P.13A-90 <Vehicles without TCL>, P.13A-91 <Vehicles with TCL>.



IDLE POSITION SWITCH CHECK <Vehicles without TCL> 13100330033

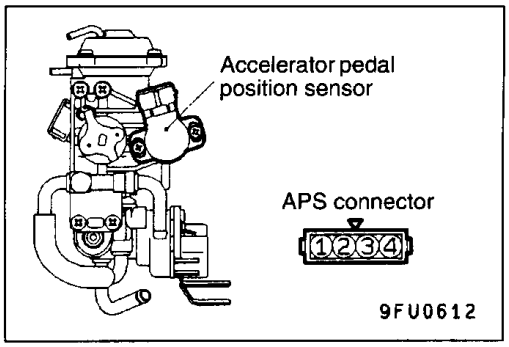
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 3 and terminal 4.

Normal condition:

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

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

   NOTE
   After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P.13A-91, 92.)



IDLE POSITION SWITCH CHECK <Vehicles with TCL>

13100330040

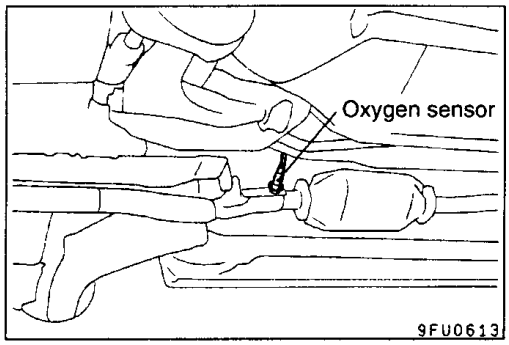
1. Disconnect the accelerator pedal position sensor connector.
2. Check the continuity between the accelerator pedal position sensor connector side terminal 1 and terminal 2.

Normal condition:

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

3. If out of specification, replace the accelerator pedal position sensor.

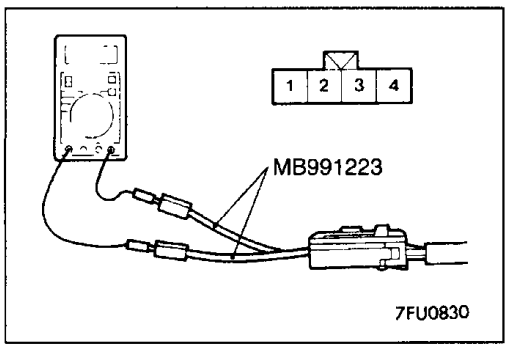
   NOTE
   After replacement, the idle position switch and accelerator pedal position sensor should be adjusted. (Refer to P.13A-92.)



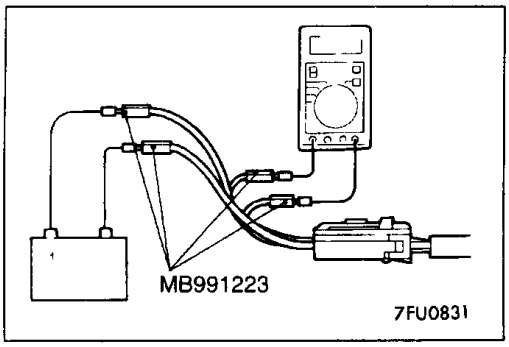
OXYGEN SENSOR CHECK

13100510017

1. Disconnect the oxygen sensor connector and connect the special tool (test harness set) 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 oxygen sensor connector.
3. If there is no continuity, replace the 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 oxygen sensor connector to the battery (+) terminal and terminal 4 to the battery (–) terminal.

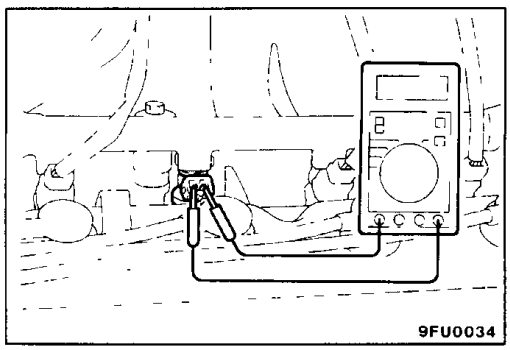
   Caution
   Be very careful when connecting the jumper wires; incorrect connection can damage the oxygen sensor.
6. Connect a digital voltage meter between terminal 1 and terminal 2.
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

Normal condition:

Engine	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 oxygen sensor will output a voltage of 0.6–1.0V.

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

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



INJECTOR CHECK

13100520034

Measurement of Resistance between Terminals

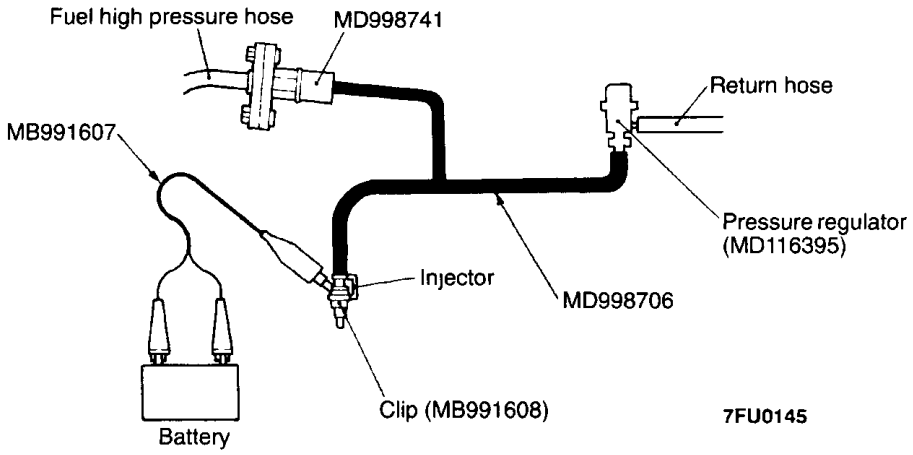
1. Remove the injector connector.
2. Measure the resistance between terminals.

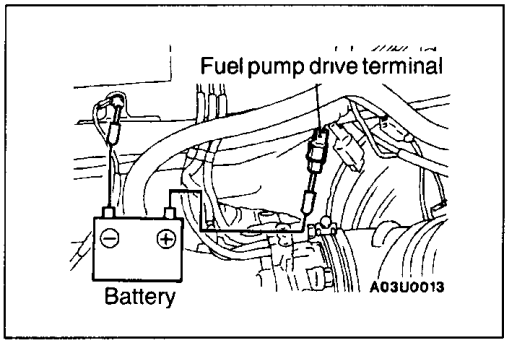
   Standard value: 13–16 Ω (at 20°C)
3. Install the injector connector.

Checking the Injection Condition

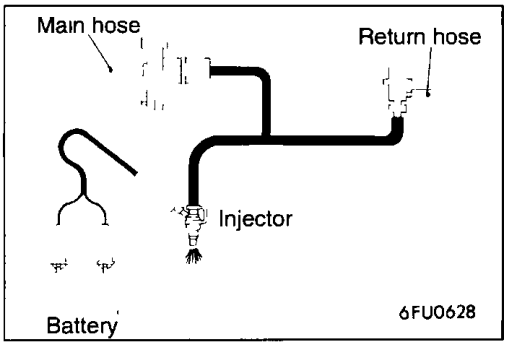
1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13-98.)
2. Remove the injector.

3. Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clips as shown in the illustration below.

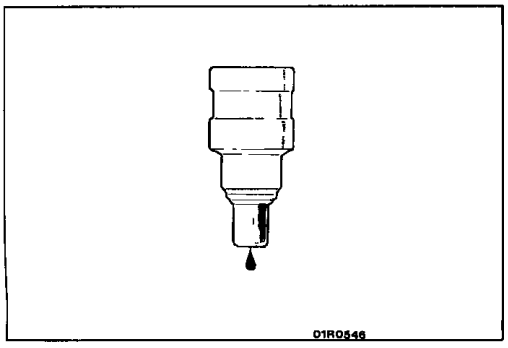




4. Apply battery voltage to the fuel pump drive terminal (black) and activate the fuel pump.



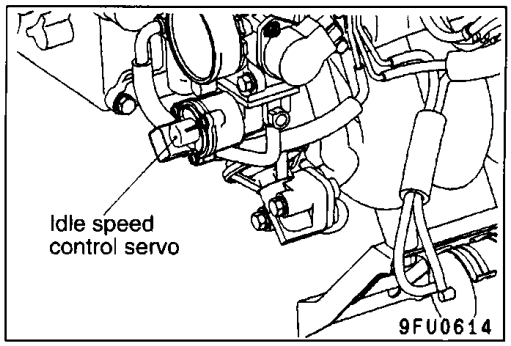
5. Activate the injector and check the atomized spray condition of the fuel.
   The condition can be considered satisfactory unless it is extremely poor.

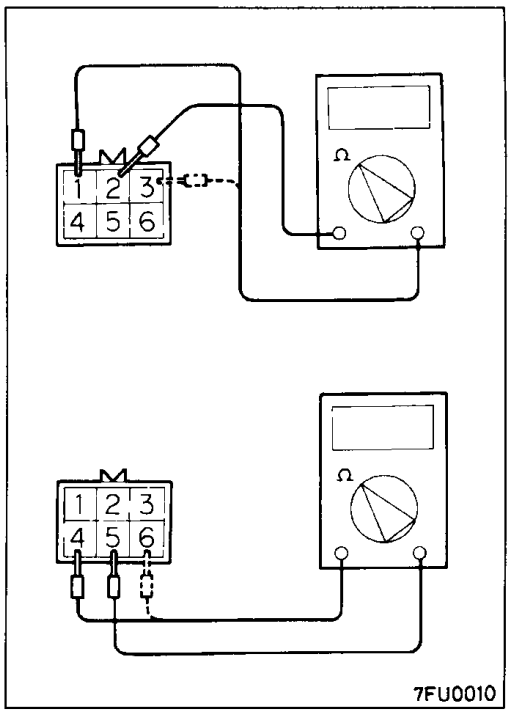


6. Stop the actuation of the injector, and check for leakage from the injector's nozzle.

   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

13100540054

Checking the Operation Sound

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

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

Checking the Coil Resistance

1. Disconnect the idle speed control servo connector and connect the special tool (test harness).
2. Measure the resistance between terminal 2 (white clip of the special tool) and either terminal 1 (red clip) or terminal 3 (blue clip) of the connector at the idle speed control servo side.

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

   Standard value: 28–33 Ω (at 20°C)

PURGE CONTROL SOLENOID VALVE CHECK

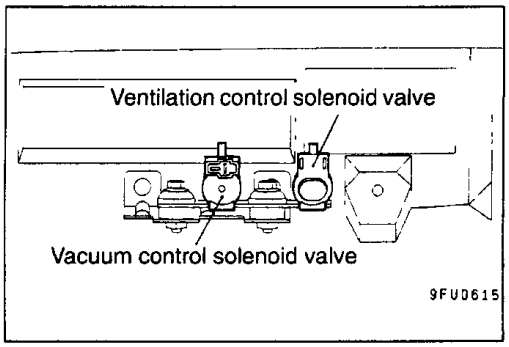
13100560036

Refer to GROUP 17 – Evaporative Emission Control System.

EGR CONTROL SOLENOID VALVE CHECK

13100570039

Refer to GROUP 17 – Exhaust Gas Recirculation (EGR) System.

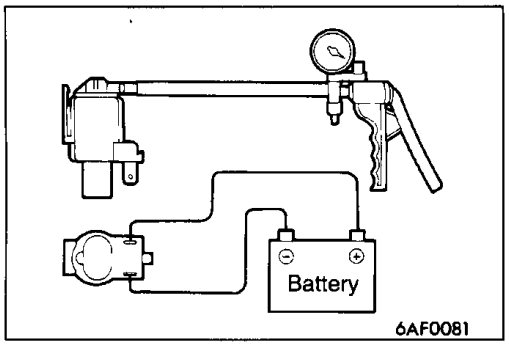


VENTILATION CONTROL SOLENOID VALVE CHECK <Vehicles with TCL>

13100630027

NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

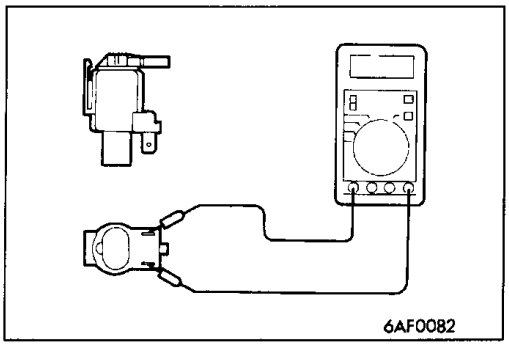
1. Disconnect the vacuum hose (black) from the solenoid valve.
2. Disconnect the harness connector.



3. Connect a hand vacuum pump to the nipple.
4. Check air-tightness by applying a vacuum with voltage applied directly from the battery to the solenoid valve and without applying voltage.

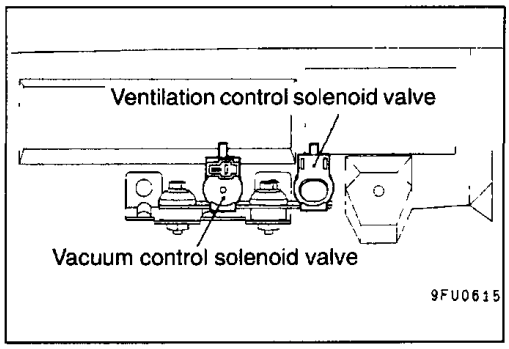
Normal condition:

Battery voltage	Normal condition
Applied	Vacuum maintained
Not applied	Vacuum leaks



5. Measure the resistance between the terminals of the solenoid valve.

Standard value: 36–44 Ω (at 20°C)

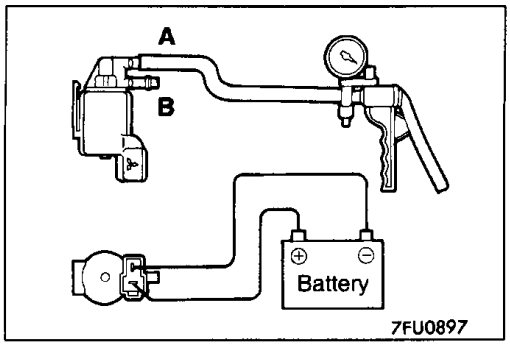


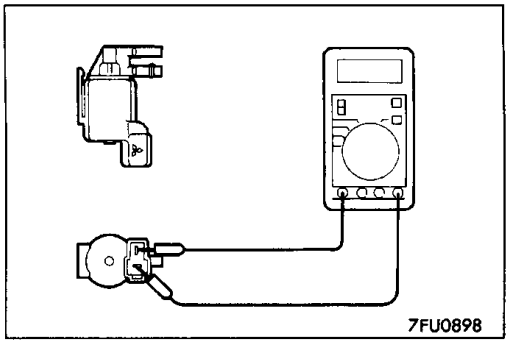
VACUUM CONTROL SOLENOID VALVE CHECK <Vehicles with TCL>

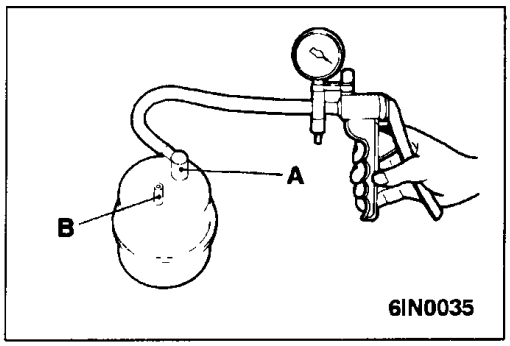
13100620024

NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

1. Disconnect the vacuum hose (blue stripe, green stripe) from the solenoid valve.
2. Disconnect the harness connector.







3. Connect a hand vacuum pump to nipple A of the solenoid valve.
4. Use jumper wires to connect the terminals of the solenoid valve and the battery.
5. Check the air-tightness when negative pressure is applied while the jumper wire is connected to the battery (–) terminal and while it is disconnected.

Normal condition:

Jumper wire	Nipple B condition	Normal condition
Connected	Open	Negative pressure leaks
	Closed	Negative pressure is maintained
Discon-nected	Open	Negative pressure is maintained

6. Measure the resistance between the terminals of the solenoid valve.

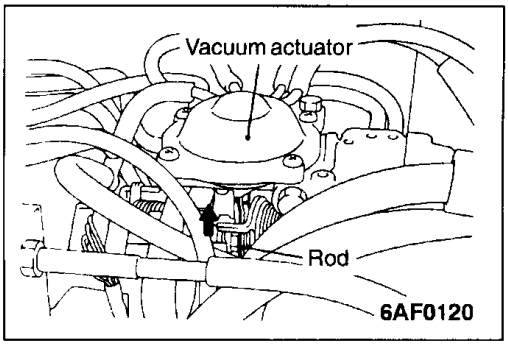
Standard value: 36–44 Ω (at 20°C)

VACUUM TANK CHECK

13100810025

<Vehicles with TCL>

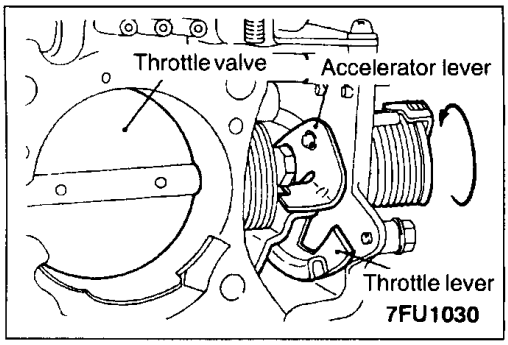
1. Connect a hand vacuum pump to vacuum tank A nipple, apply 67 kPa of vacuum and check that the vacuum is held.
2. Connect a hand vacuum pump to vacuum tank B nipple.
3. First, close A nipple with your finger and apply 67 kPa of vacuum. Then, check that the vacuum leaks immediately when you remove the finger blocking the nipple.



VACUUM ACTUATOR CHECK 13100820028

<Vehicles with TCL>

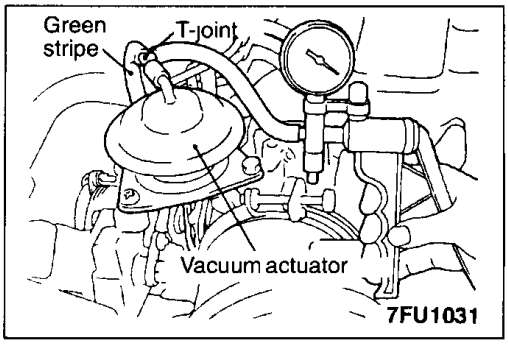
1. Remove the vacuum hose (green stripe) from the vacuum actuator and connect a hand vacuum pump to the vacuum actuator.
2. With the accelerator pedal depressed, check that the rod is pulled up and that vacuum is held when 27 kPa of vacuum is applied.



THROTTLE VALVE OPERATION CHECK 13100830021

<Vehicles with TCL>

1. Check that the throttle valve opens and closes smoothly (throttle lever moves) according to the opening and closing of the accelerator lever.
2. If the throttle valve does not open and close smoothly, there might be a deposit on the throttle valve, so clean the throttle body. (Refer to page 13A-90.)



NEGATIVE PRESSURE CHECK DURING TRACTION CONTROL OPERATION 13100840024

<Vehicles with TCL>

1. Disconnect the vacuum hose (green stripe) from the vacuum actuator, connect a hand vacuum pump between the actuator nipple and the vacuum hose via a T-joint. Set the hand vacuum pump near the driver's seat so that the negative pressure check can be carried out at the driver's seat.
2. Check the negative pressure during traction control operation.
   Inspection service points are the same as for the traction control operation inspection.
   (Refer to GROUP 13H or 23 – On-vehicle Service.)

   Normal condition:

Vehicle condition	Normal negative pressure when accelerator pedal is depressed
Vehicle is lifted up	20 kPa or more
Driving on a dry, sealed road surface	No change

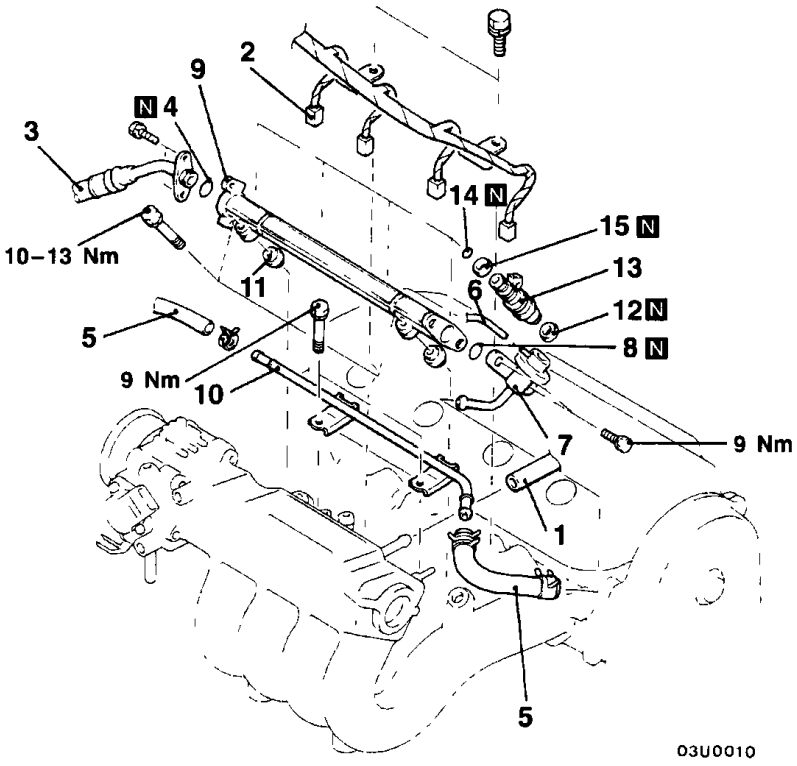
NOTE
The traction control system function will stop 20 seconds after the accelerator pedal has been depressed, and negative pressure will gradually drop.

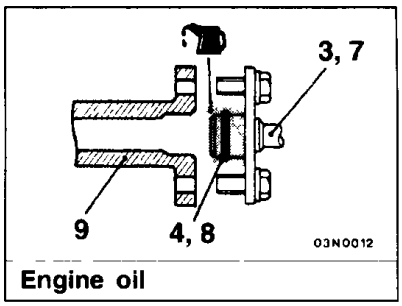
INJECTOR

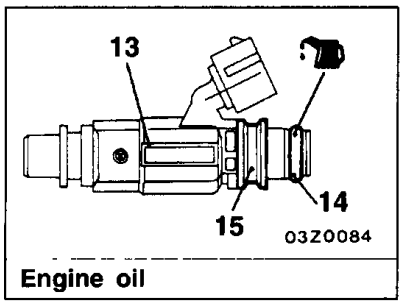
13100710042

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-98.)







00003384

Removal steps

1. PCV hose
2. Injector connector
▶A◀ 3. Fuel high pressure hose
4. O-ring
5. Fuel return hose connection
6. Vacuum hose
▶A◀ 7. Fuel pressure regulator
8. O-ring
◀A▶ 9. Delivery pipe
10. Return pipe
11. Insulator
12. Insulator
◀A▶ ▶A◀ 13. Injector
14. O-ring
15. Grommet

REMOVAL SERVICE POINT

◀A▶ DELIVERY PIPE/INJECTOR REMOVAL

Remove the delivery pipe (with the injectors attached to it).

Caution
Care must be taken, when removing the delivery pipe, not to drop the injector.

INSTALLATION SERVICE POINT

▶A◀ INJECTOR/FUEL PRESSURE REGULATOR/FUEL HIGH PRESSURE HOSE INSTALLATION

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

Caution
Be sure not to let engine oil in the delivery pipe.

(2) While turning the injector, fuel high-pressure hose and fuel pressure regulator to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.

(3) If it does not turn smoothly, the O-ring may be trapped, remove the fuel pressure regulator and then re-insert it into the delivery pipe and check once again.

(4) Tighten the fuel high pressure hose to the standard torque, and tighten the fuel pressure regulator to the specified torque.

Specified tightening torque:
9 Nm (Fuel pressure regulator)

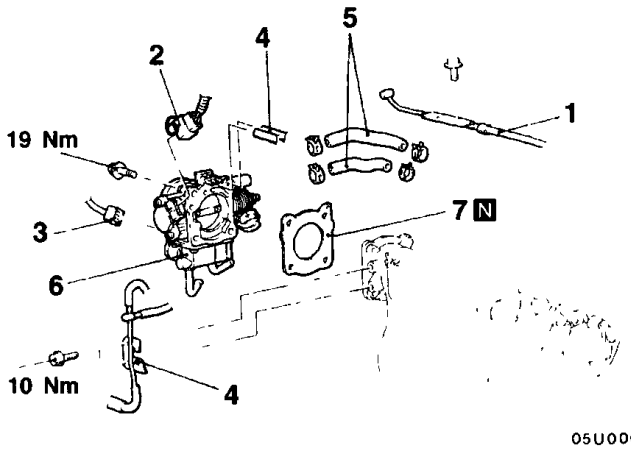
THROTTLE BODY

13100770019

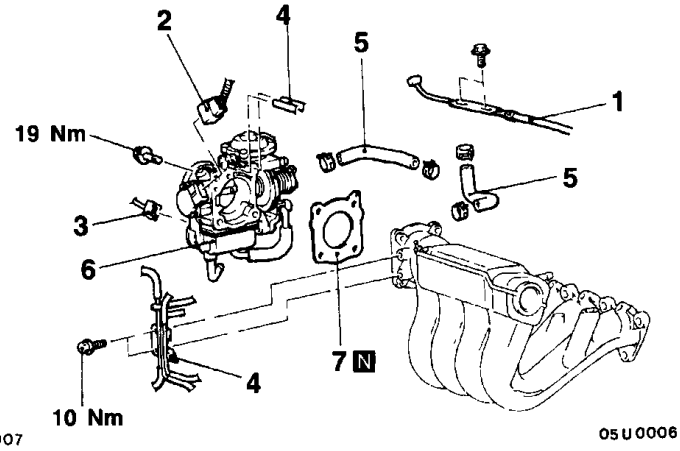
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Supplying
(2) Air Cleaner Removal and Installation

<Vehicles without TCL>



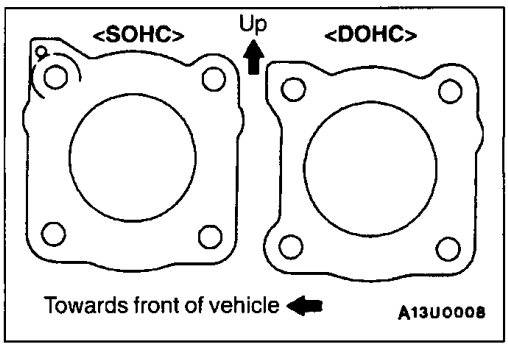
<Vehicles with TCL>



00003385

Removal steps

1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control motor connector
4. Vacuum pipe and hose assembly
5. Water hose connection
6. Throttle body
▶A◀ 7. Gasket



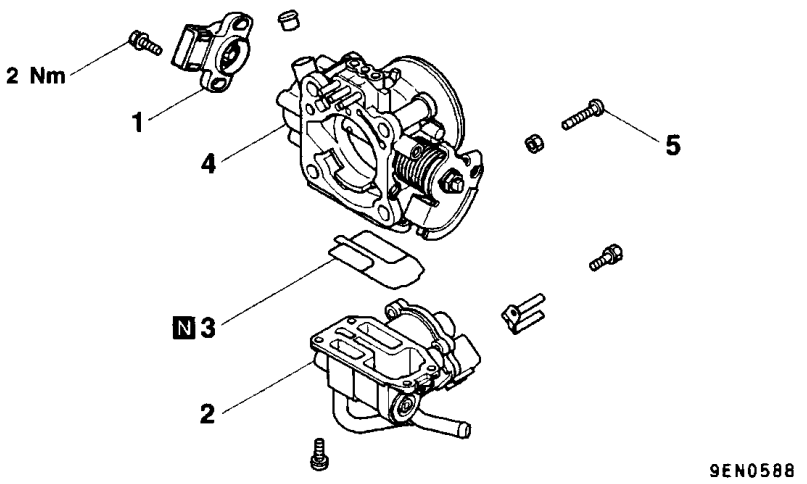
INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

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

DISASSEMBLY AND REASSEMBLY <Vehicles without TCL>

13100970013

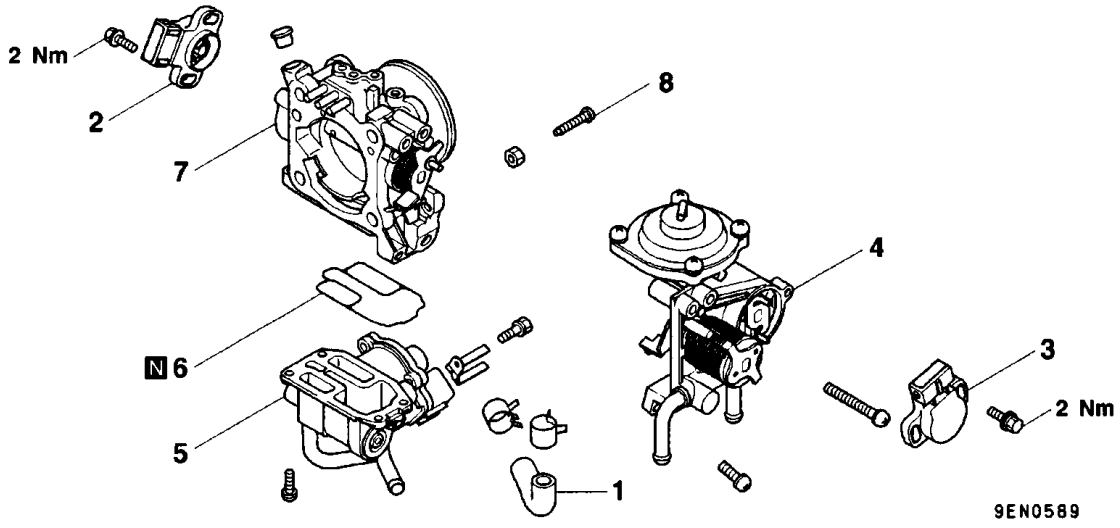


Disassembly steps

▶B◀ 1. Throttle position sensor
2. Idle speed control body assembly
3. O-ring
4. Throttle body
5. Fixed SAS

NOTE
1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A – 93.)

DISASSEMBLY AND REASSEMBLY <Vehicles with TCL>



Disassembly steps

1. Water hose
▶B◀ 2. Throttle position sensor
▶A◀ 3. Accelerator pedal position sensor
4. Lever assembly
5. Idle speed control body assembly
6. O-ring
7. Throttle body
8. Fixed SAS

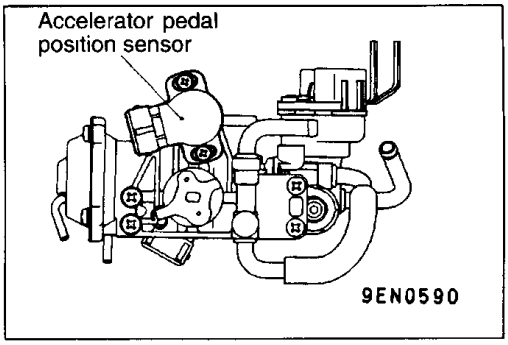
NOTE
1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A – 93.)

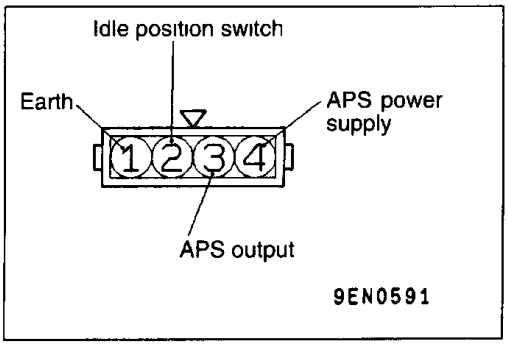
CLEANING THROTTLE BODY PARTS

(1) Clean all throttle body parts.
Do not use solvent to clean the following parts:
- Throttle position sensor
- Accelerator pedal position sensor
- Idle speed control body assembly

If these parts are immersed in solvent, their insulation will deteriorate.
Wipe them with cloth only.

(2) Check if the vacuum port or passage is clogged. Use compressed air to clean the vacuum passage.





REASSEMBLY SERVICE POINTS

▶A◀ ACCELERATOR PEDAL POSITION SENSOR (APS) INSTALLATION

(1) Install the APS so that it faces as shown in the illustration, and then tighten it with the screw.

(2) Connect a multimeter between terminal (3) (APS output) and terminal (4) (APS power supply) of the APS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.

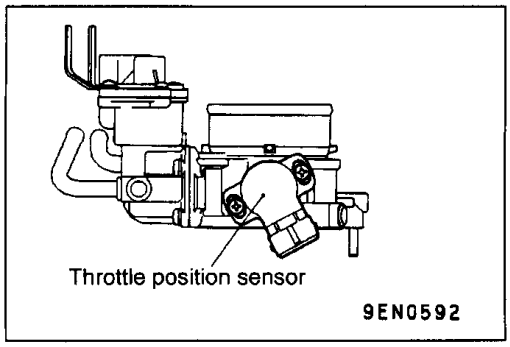
(3) Check the continuity between terminal (2) (idle position switch) and terminal (1) (earth) of the APS connector when the throttle valve is fully closed and fully open.

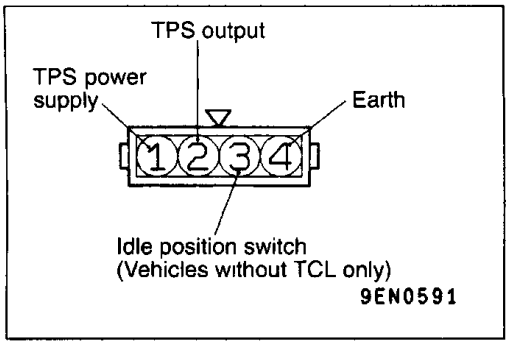
Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

If there is no continuity when the throttle valve is fully closed, turn the APS body clockwise and then check again.

(4) If there is an abnormality, replace the APS.





▶B◀ THROTTLE POSITION SENSOR (TPS) INSTALLATION

(1) Install the TPS so that it faces as shown in the illustration, and then tighten it with the screw.
(2) Connect a multimeter between terminal (1) (TPS power supply) and terminal (2) (TPS output) of the TPS connector, and check that the resistance increases gradually as the throttle valve is opened slowly to the fully-open position.
(3) For vehicles without TCL, check the continuity between terminal (3) (idle position switch) and terminal (4) (earth) of the TPS connector when the throttle valve is fully closed and fully open.

Normal condition:

Throttle valve condition	Continuity
Fully closed	Continuity
Fully open	No continuity

If there is no continuity when the throttle valve is fully closed, turn the TPS body anti-clockwise and then check again.
(4) If there is an abnormality, replace the TPS.

FUEL SUPPLY

CONTENTS

13509000036

FUEL TANK 2
GENERAL INFORMATION 2
SPECIAL TOOL 2
FUEL TANK 3

FUEL TANK

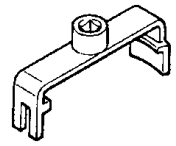
13500010038

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.
(3) A plastic fuel tank has been adopted to reduce weight, and improve anti-corrossion effectiveness.

SPECIAL TOOL

13500060026

Tool	Number	Name	Use
	MB996009	Tank cap wrench	Installation of tank cap

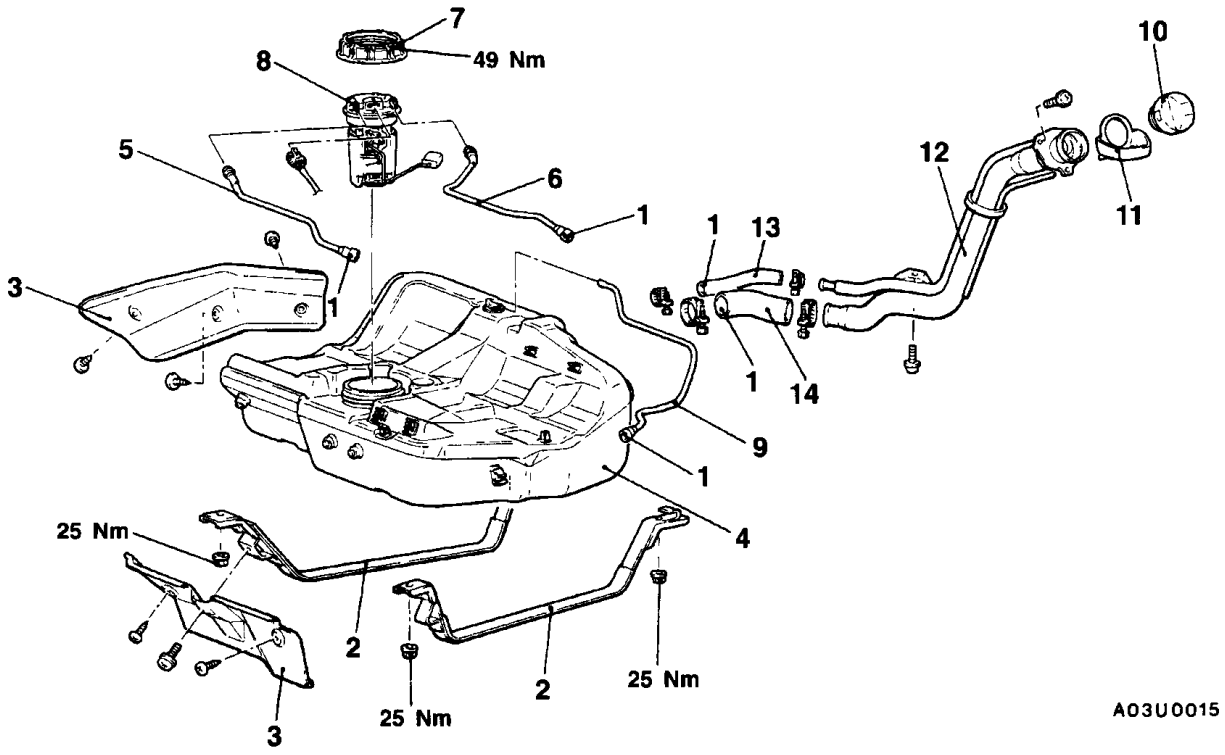
FUEL TANK

13500190046

REMOVAL AND INSTALLATION

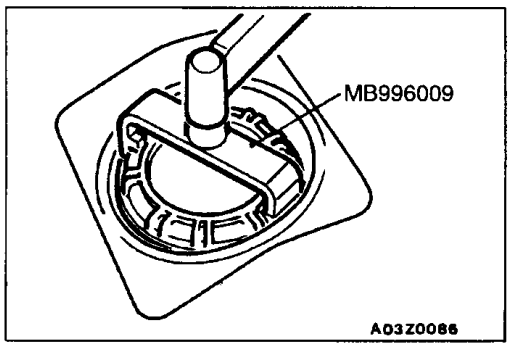
Pre-removal Operation
(1) Draining the Fuel
(2) Reduce the Inner Pressure of Fuel Line and Hose (Refer to GROUP 13A – On-vehicle Service.)
(3) Removal of the Center Exhaust Pipe (Refer to GROUP 15.)

Post-installation Operation
(1) Installation of Exhaust Pipe (Refer to GROUP 15.)
(2) Refilling the Fuel.
(3) Checking for Fuel Leaks



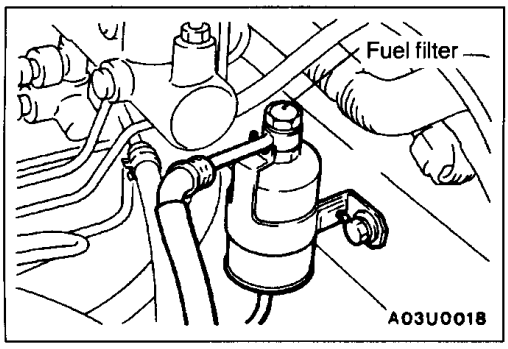
Removal steps

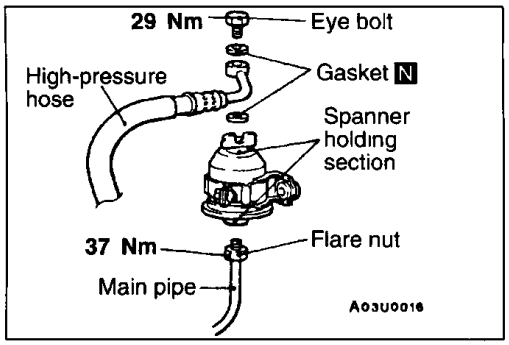
1. Hoses connection
2. Band
3. Protector
4. Fuel tank assembly
5. Fuel main hose
6. Fuel return hose
▶A◀ 7. Cap
8. Fuel pump module
9. Fuel vapor hose
10. Fuel filler cap
11. Fuel rubber drain
12. Filler neck assembly
13. Leveling hose
14. Filler hose

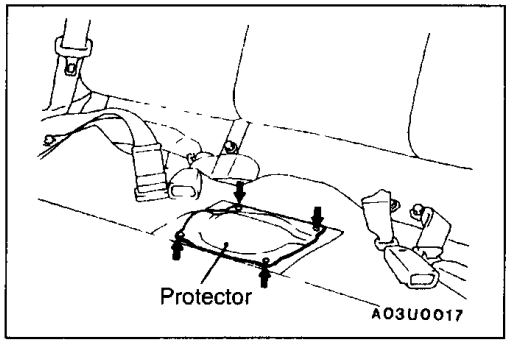


INSTALLATION SERVICE POINT

▶A◀ CAP INSTALLATION







INSPECTION

13500130031

FUEL FILTER REPLACEMENT

(1) Bleed the residual pressure from inside the fuel line.
(2) Remove the air intake hose.
(3) Hold the fuel filter with a spanner and remove the eye bolt. Then remove the high-pressure hose.

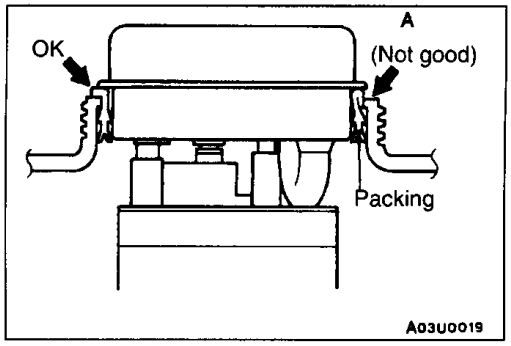
Caution
As there will be some pressure remaining in the fuel pipe line, cover it with a rag to prevent fuel from spraying out.

(4) Hold the fuel filter with a spanner and loosen the flare nut. Then disconnect the main pipe connection.
(5) Remove the fuel filter.
(6) When installing the fuel filter, use a new gasket, and tighten the flare nut of the high-pressure hose and the main pipe to the specified torque.
(7) After installation, check that there are no fuel leaks.
   1. Apply battery voltage to the fuel pump drive terminal to operate the fuel pump. (Refer to GROUP 13A – On-vehicle Service.)
   2. Check for leaks when fuel pressure is applied.

FUEL PUMP MODULE REPLACEMENT

13500160047

(1) Raise the rear seat cushion.
(2) Remove the protector.
(3) Bleed the residual pressure from inside the fuel pipe line to prevent the fuel from spraying out. (Refer to GROUP 13A – On-vehicle Service.)
(4) Disconnect the hose and connector connections, and then remove the fuel pump module.

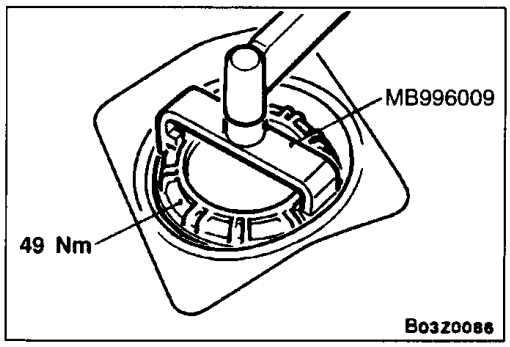


(5) Check to be sure that the fuel tank packing is not damaged or deformed, and then securely install the packing.

NOTE
If the packing is damaged or deformed, replace with new packing.

(6) Apply soapy water to the inside of the packing, and then install the fuel pump module.

Caution
- **Do not tilt the fuel pump module when installing.**
- **The packing should not be folded over as shown by (A) in the illustration.**



(7) Use the special tool to tighten the cap to the specified torque.

(8) Check for leaks from the installation section of the fuel pump module by the following procedure.
1. Apply soapy water to the circumference of the cap.
2. Choke the vapor hose and main hose, apply an internal pressure of 10 kPa or less from the return hose and check to be sure that no bubbles form in the soapy water.

FUEL GAUGE CHECK 13500310039

Refer to GROUP 54 – Combination Meter.

TRACTION CONTROL SYSTEM (TCL)

CONTENTS

13609000022

GENERAL INFORMATION 2

SERVICE SPECIFICATION 3

SPECIAL TOOLS 3

TROUBLESHOOTING 3

ON-VEHICLE SERVICE 25

- System Check Using the TCL Indicator Lamps 25
- TCL Operation Check 25
- Stop Lamp Switch Check 27
- Wheel Speed Sensor Check 27
- Vacuum Solenoid Valve Check 27
- Ventilation Solenoid Valve Check 27
- Vacuum Tank Check 27
- Vacuum Actuator Check 27
- Accelerator Pedal Position Sensor (APS) Check 27

TCL SWITCH 28

TCL-ECU* 28

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

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

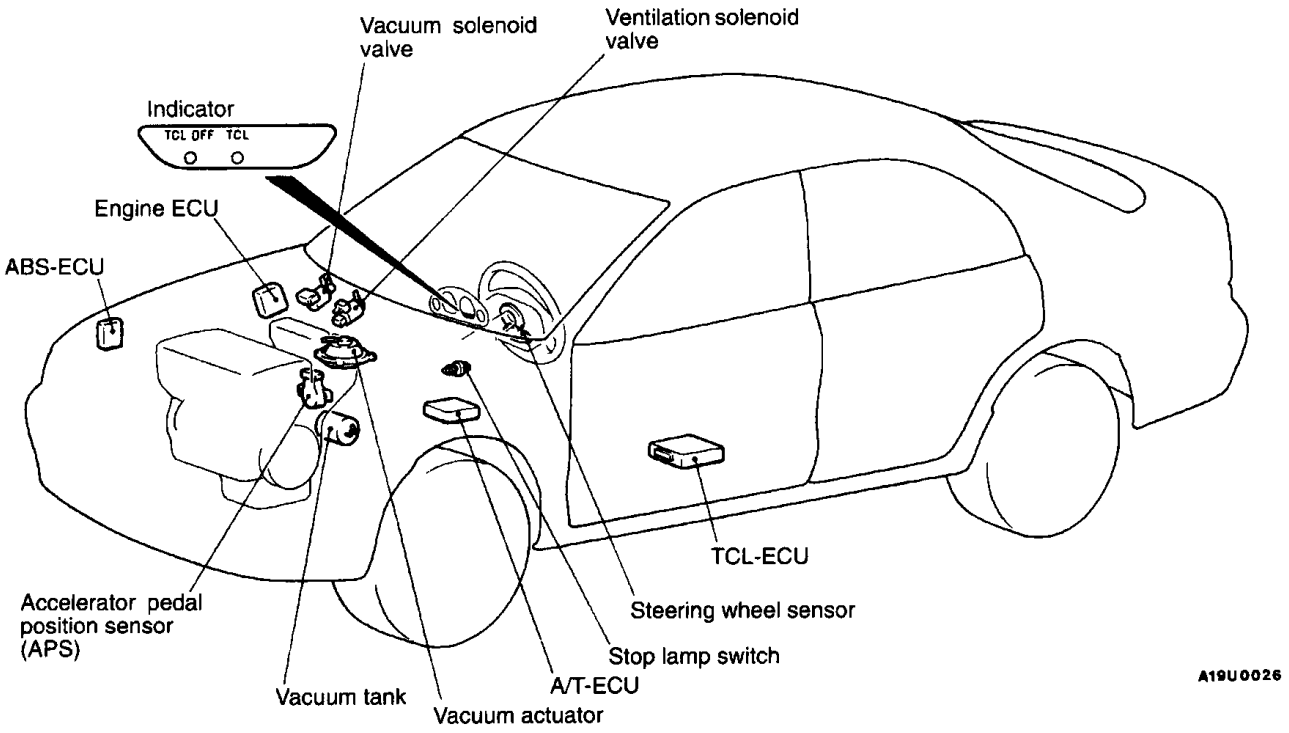
NOTE

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

GENERAL INFORMATION

13600010024

For GLS, the TCL system (slip control and trace control) is available as an option. This system facilitates starting, accelerating, and cornering on slippery roads such as snowy roads. In addition, this system improves driveability while cornering on normal roads and contributes to easier driving.



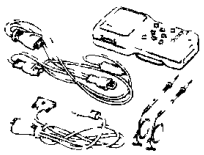
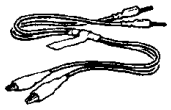
SERVICE SPECIFICATION

13600030013

Item	Standard value
Accelerator pedal position sensor resistance kΩ	3.5–6.5

SPECIAL TOOLS

13600060012

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	For checking of TCL (Diagnosis code display when using the MUT-II)
	MB991529	Diagnosis code check harness	For checking of TCL (Diagnosis code display when using the TCL-OFF warning lamp)

TROUBLESHOOTING

13600070022

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

NOTE
Before carrying out trouble diagnosis, check to be sure that all of the following items are normal.

- Is the standard steering wheel being used, and has it been correctly installed to the straight-ahead position on the steering shaft?
- Are the size, specifications, air pressure, balance and wear conditions of the tyres and wheels normal?
- Is the wheel alignment normal?
- Have any other modifications been made to the engine or suspension which could conceivably have an effect on the TCL system?

DIAGNOSTIC FUNCTION

METHOD OF READING THE DIAGNOSIS CODES

Use the MUT-II or the warning lamp to read the diagnosis codes.
(Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)

NOTE
Connect the MUT-II to the diagnosis connector (16 pin) under the instrument under cover.

METHOD OF ERASING THE DIAGNOSIS CODES

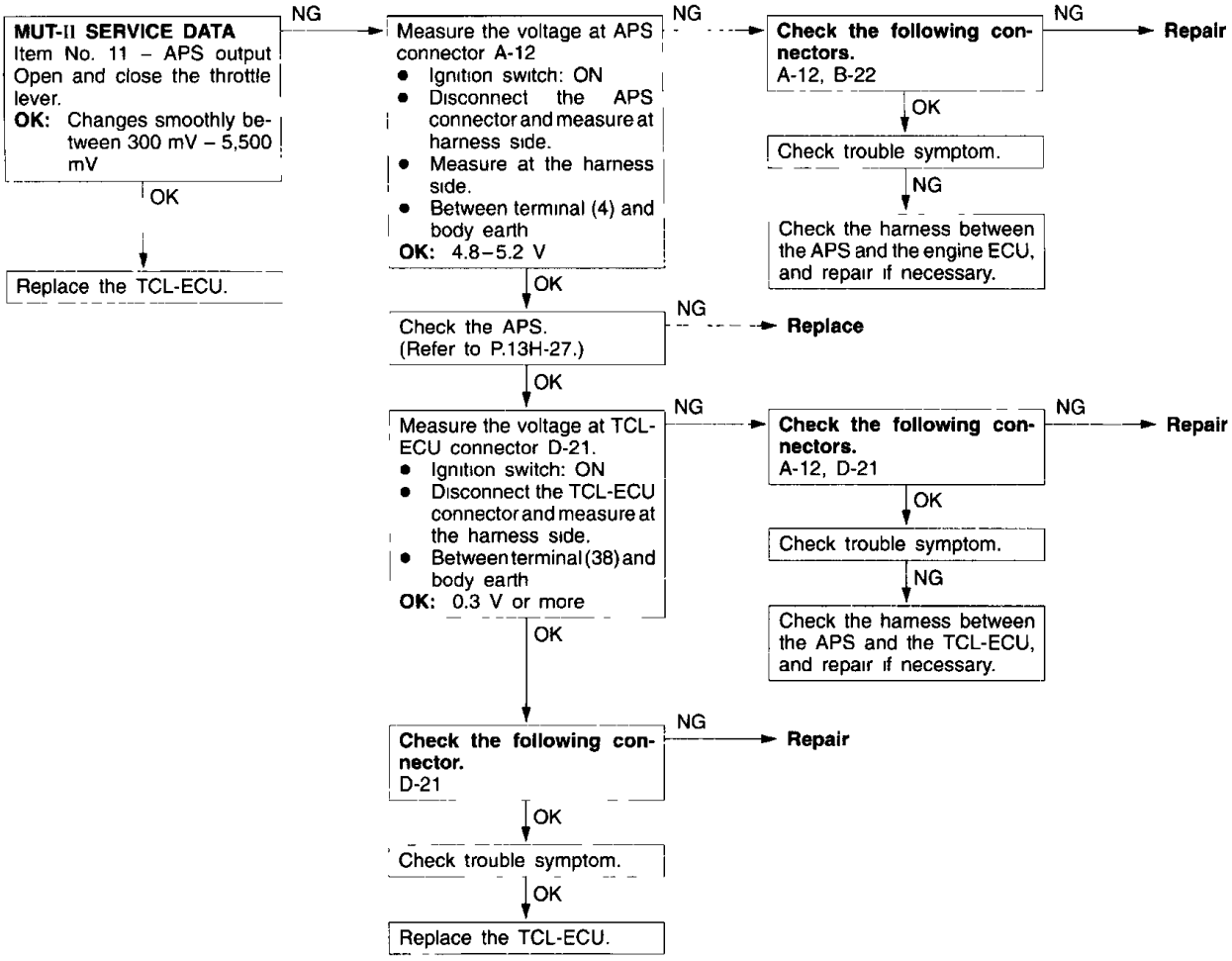
Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

INSPECTION CHART FOR DIAGNOSIS CODES

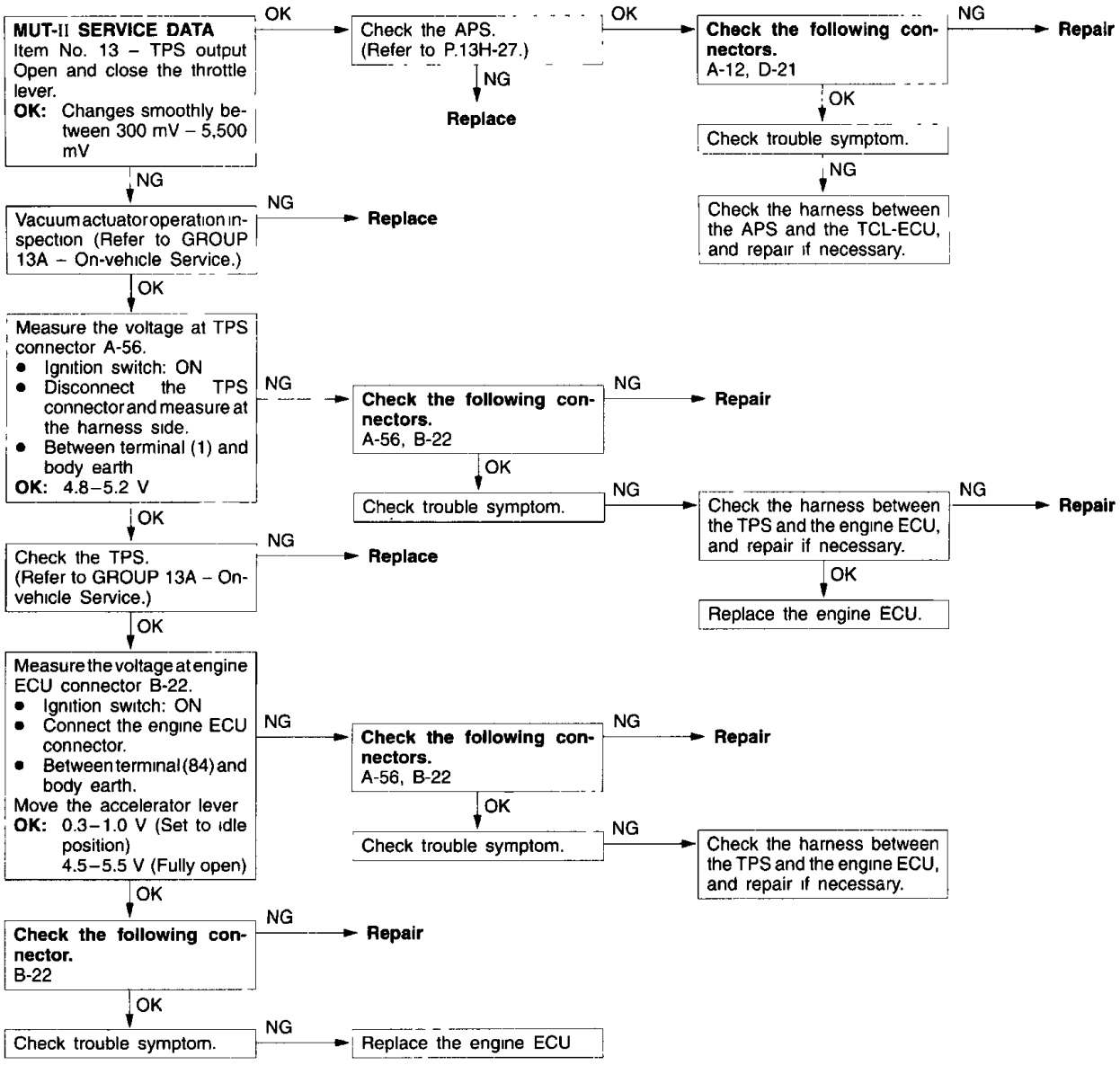
Code No.	Diagnosis item	Reference page
11	APS circuit system	13H-5
12	APS or TPS circuit system	13H-6
13	TPS or APS circuit system	13H-7
23	Stop lamp switch circuit system	13H-7
24	TCL switch circuit system	13H-8
26	Ignition switch (IG2) circuit system	13H-8
27	TCL-ECU power supply voltage circuit (engine control relay circuit) system	13H-9
31	Front right wheel speed sensor circuit system	13H-10
32	Front left wheel speed sensor circuit system	13H-10
33	Rear right wheel speed sensor circuit system	13H-10
34	Rear left wheel speed sensor circuit system	13H-10
35	Rear wheel speed sensor circuit system (1)	13H-11
36	Rear wheel speed sensor circuit system (2)	13H-11
41	Steering wheel sensor (ST-1) circuit system (open circuit)	13H-12
42	Steering wheel sensor (ST-2) circuit system (open circuit)	13H-12
43	Steering wheel sensor (ST-N) circuit system (open circuit)	13H-12
44	Steering wheel sensor circuit system (short circuit)	13H-13
45	Steering wheel sensor (ST-N) circuit system (short circuit)	13H-13
71	Engine ECU communication circuit system	13H-14
72	Engine ECU circuit system	GROUP 13A – Troubleshooting
73		
74	A/T-ECU communication circuit system	13H-14
76	ABS circuit system	13H-15

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

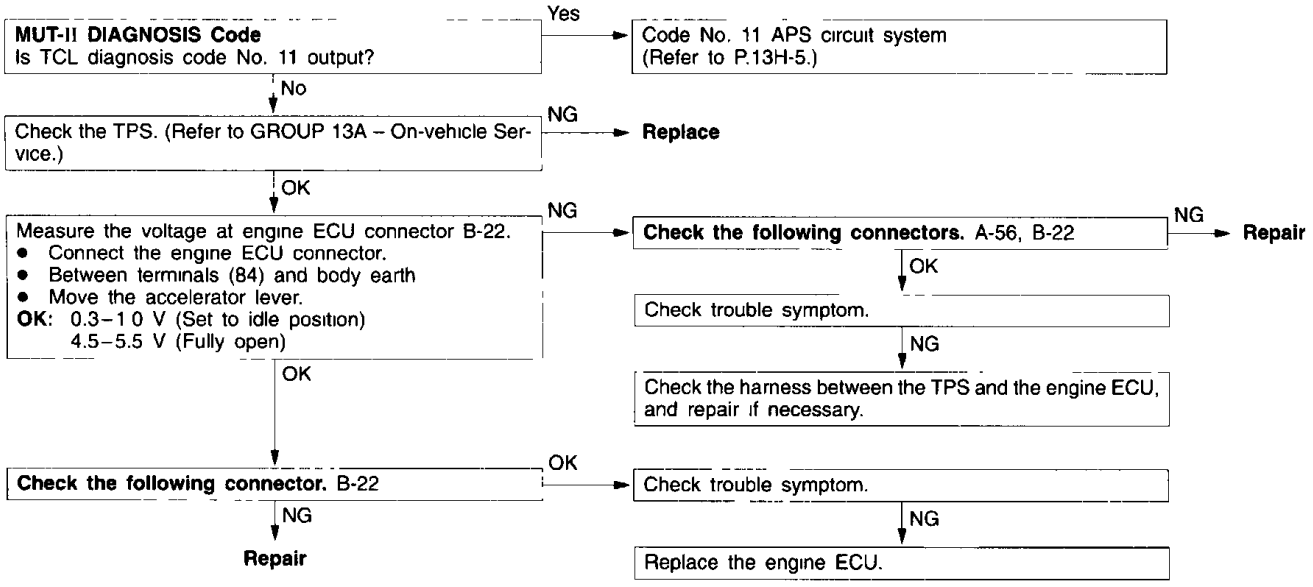
Code No. 11 APS circuit system	Probable cause
This diagnosis code is output if the APS output voltage is less than 0.2 V due to an open circuit or other malfunction in the APS circuit. The APS power supply and earth are supplied from the engine ECU, and the output signal is used by the A/T-ECU and auto-cruise control-ECU as well as by the TCL-ECU	• Malfunction of APS • Malfunction of TCL-ECU • Malfunction of engine ECU • Malfunction of harness or connector



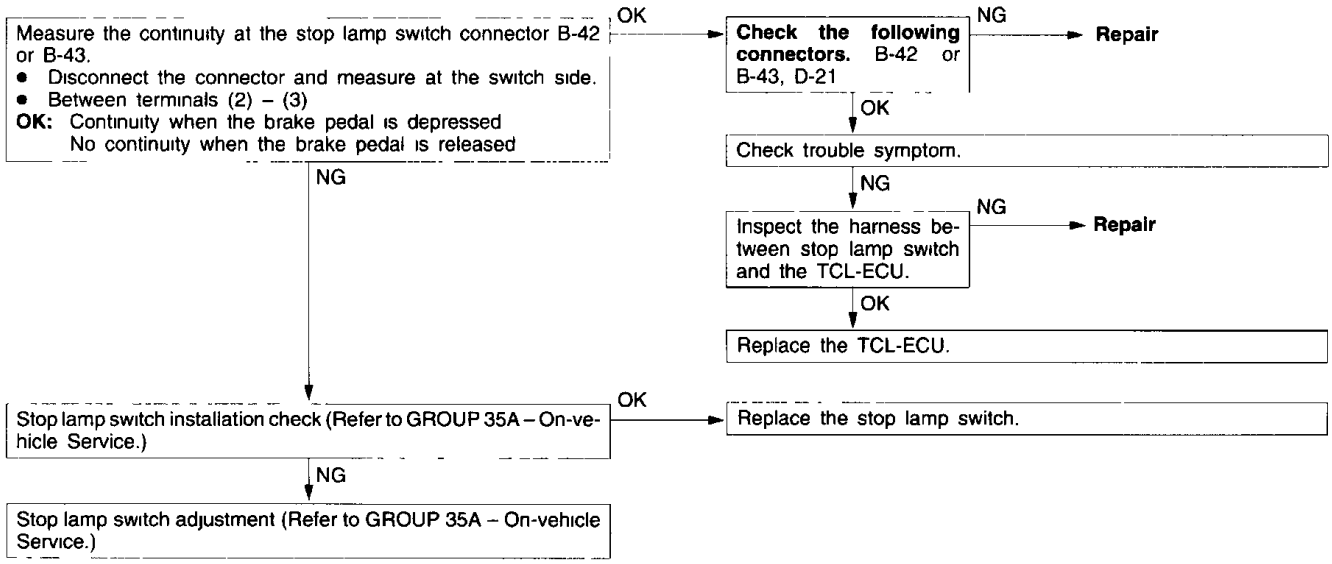
Code No. 12 APS or TPS circuit system	Probable cause
This diagnosis code is output if the APS opening angle is 20° or greater than the TPS opening angle because of a short in the APS, an open circuit in the TPS or sticking of the vacuum actuator. As this detection condition can be applicable during throttle control, trouble diagnosis is invalid at this time.	• Malfunciton of APS • Malfunction of TPS • Malfunction of TCL-ECU • Malfunction of harness or connector • Malfunction of vacuum actuator



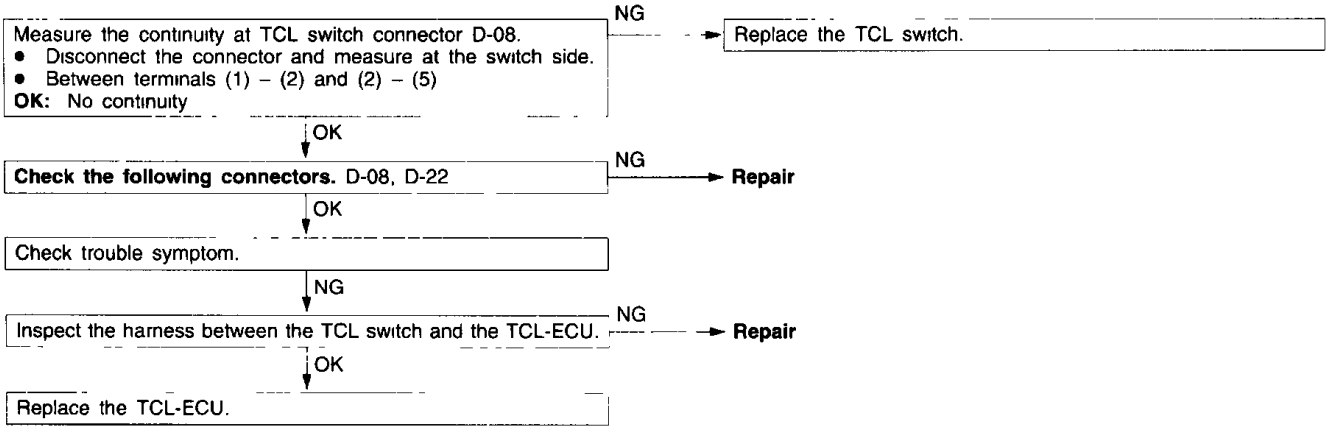
Code No. 13 TPS or APS circuit system	Probable cause
This diagnosis code is output if the TPS opening angle is 20° or greater than the APS opening angle because of a short in the TPS or an open circuit in the APS. If there is an open circuit in the APS, diagnosis code No. 11 is output at the same time. Accordingly, if only diagnosis code No. 11 is output, the cause is probably an abnormality in the TPS circuit system.	• Malfunction of APS • Malfunction of TPS • Malfunction of harness or connector • Malfunction of engine ECU



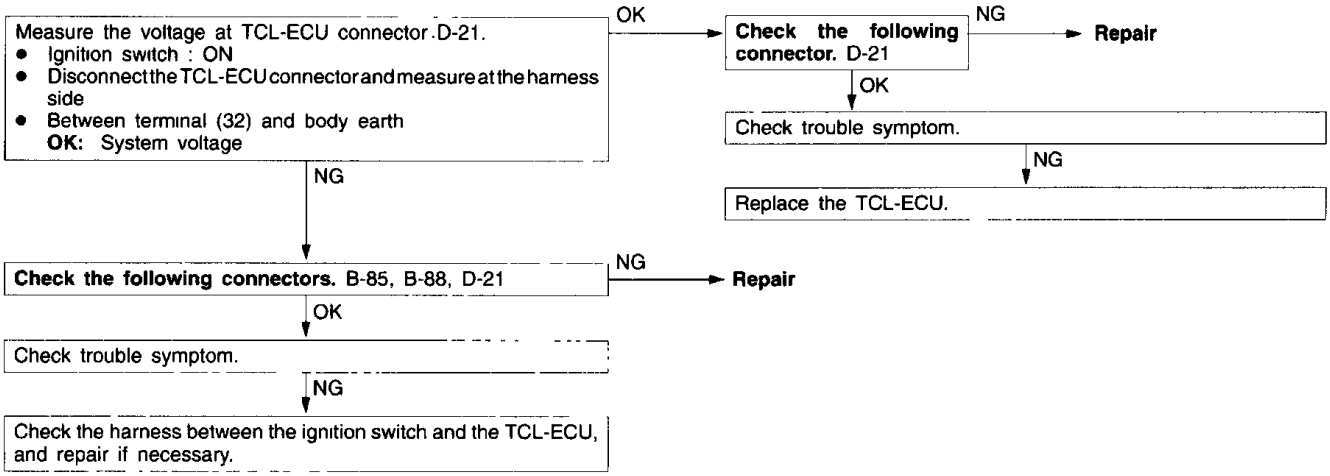
Code No. 23 Stop lamp switch circuit system	Probable cause
This diagnosis code is output if the stop lamp switch remains ON for a continuous period of 15 minutes or more, or for a continuous period of 1 minute or more when driving at a speed of 10 km/h or more, because of a short circuit or defective adjustment of the stop lamp switch. This diagnosis code No. may also occur while driving in traffic jams or if the foot is resting on the brake pedal with driving.	• Malfunction of stop lamp switch • Malfunction of harness or connector • Malfunction of TCL-ECU



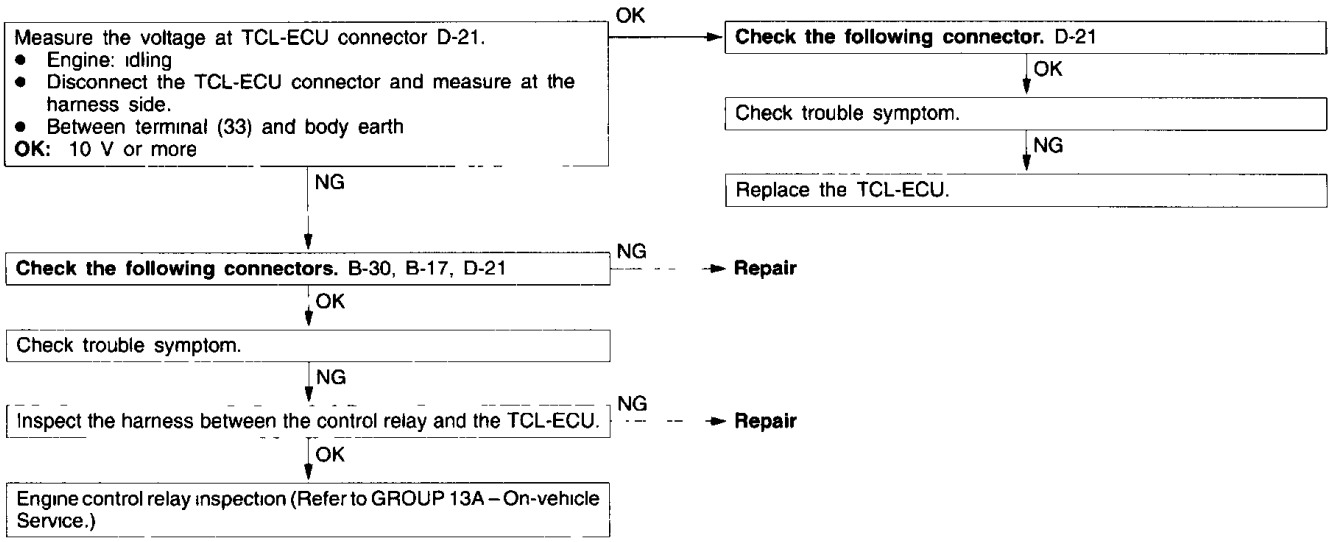
Code No. 24 TCL switch circuit system	Probable cause
This diagnosis code is output if signals are input simultaneously from both the TCL-OFF and TCL-ON positions because of a short circuit in the TCL switch circuit.	• Malfunction of the TCL switch • Malfunction of harness or connector • Malfunction of TCL-ECU



Code No. 26 Ignition switch (IG2) circuit system	Probable cause
This diagnosis code is output if the IG2 power supply is not distributed, even though the engine speed is 450 r/min or more.	• Malfunction of harness or connector • Malfunction of TCL-ECU

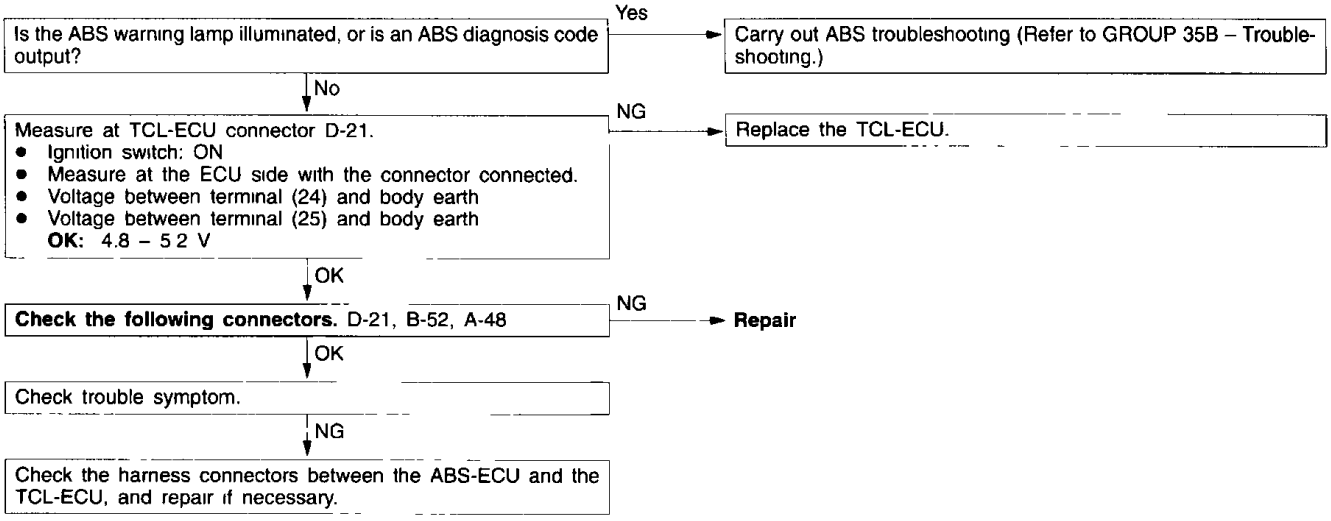


Code No. 27 TCL-ECU power supply voltage circuit (engine control relay circuit) system	Probable cause
This diagnosis code is output if the TCL-ECU power supply voltage (engine control relay supply voltage) is lower than the specified value. If the voltage returns to the specified value or greater, the diagnosis code is erased.	• Malfunction of control relay • Malfunction of harness or connector • Malfunction of TCL-ECU



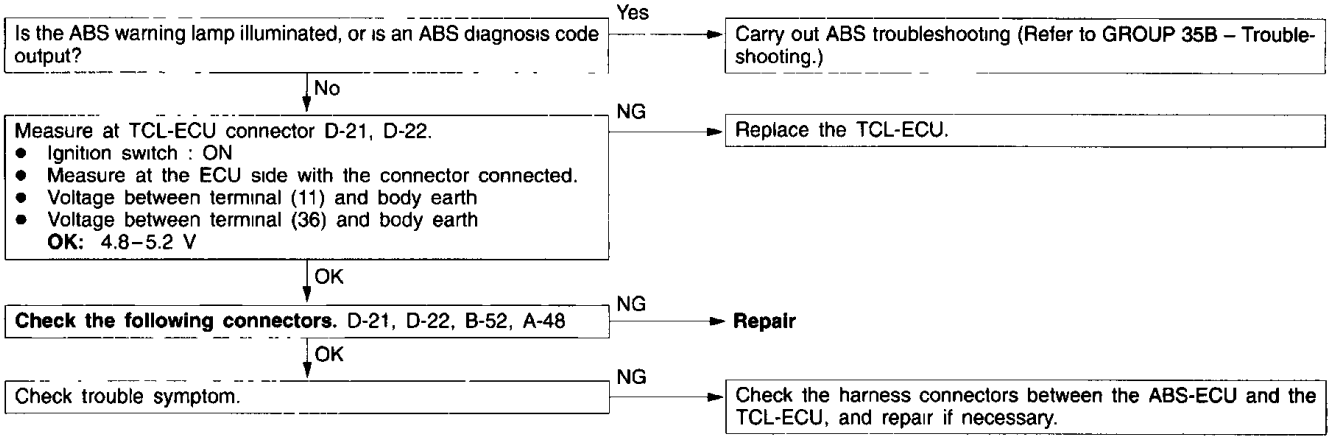
Code No. 31 Front right wheel speed sensor circuit system Code No. 32 Front left wheel speed sensor circuit system	Probable cause
These diagnosis codes are output if a pulse (from the front wheels) indicates that the difference between the front wheels and the rear wheels is 8km/h or more because of an open or short circuit in a wheel speed sensor or a malfunction of sensor.	• Malfunction of front speed sensor • Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of ABS-ECU

NOTE
When these diagnosis codes are output, erase the diagnosis code memory after carrying out repairs, and then carry out a road test at 20 km/h or more and check to be sure that the diagnosis codes are not output again.



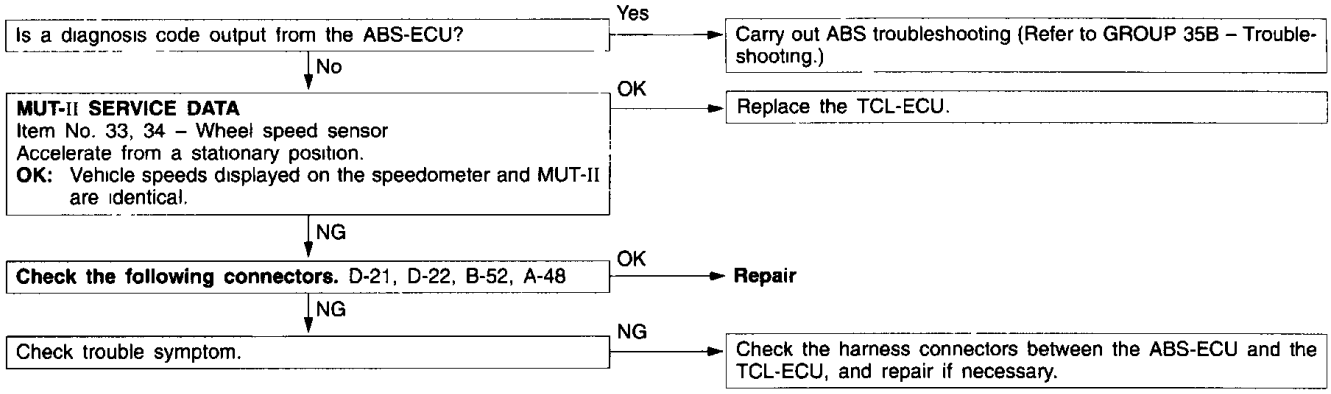
Code No. 33 Rear right wheel speed sensor circuit system Code No. 34 Rear left wheel speed sensor circuit system	Probable cause
These diagnosis codes are output if a pulse (from the wheels on one side of rear) indicates that the difference between the left wheel and the right wheel is 8km/h or more because of an open or short circuit in a wheel speed sensor or a defective sensor.	• Malfunction of rear wheel speed sensor • Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of ABS-ECU

NOTE
When these diagnosis codes are output, erase the diagnosis code memory after carrying out repairs, and then carry out a road test at 20 km/h or more and check to be sure that the diagnosis codes are not output again.

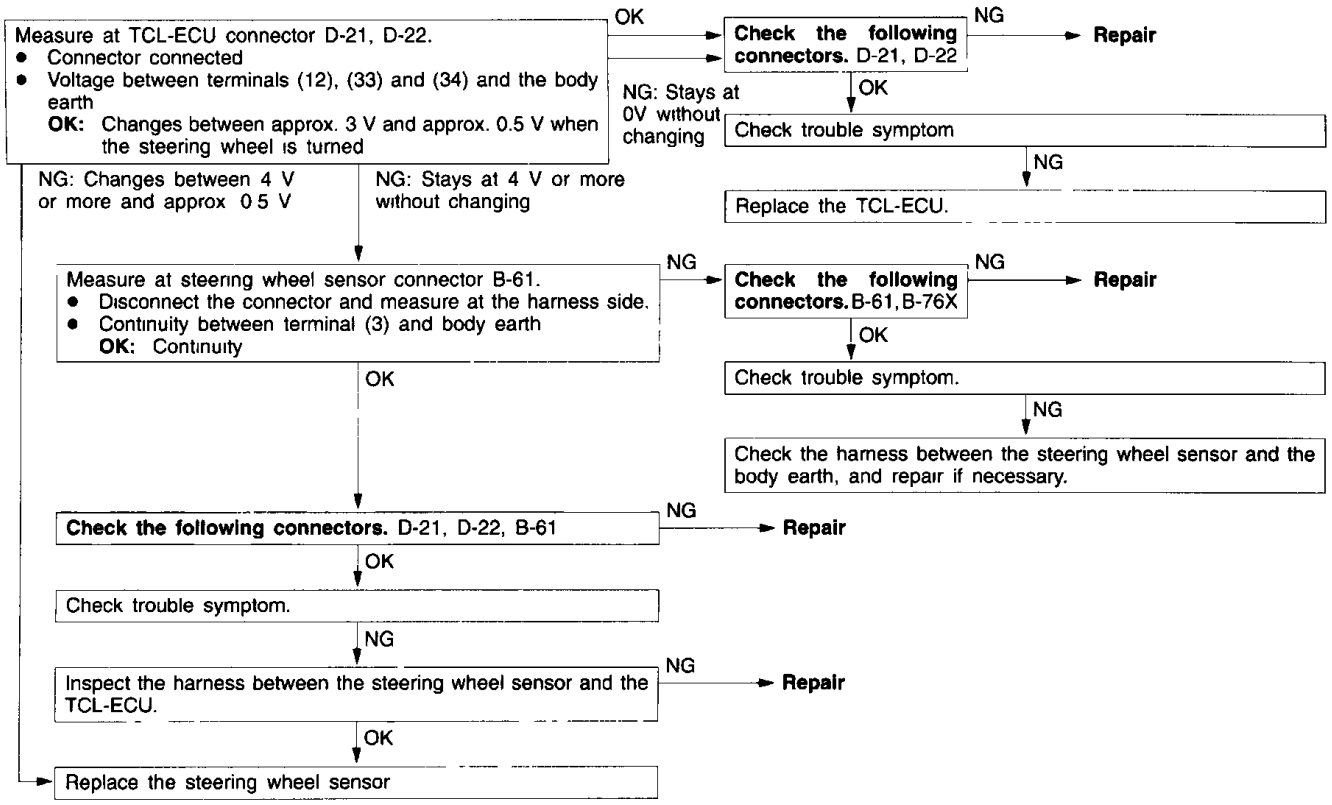


Code No. 35 Rear wheel speed sensor circuit system (1) Code No. 36 Rear wheel speed sensor circuit system (2)	Probable cause
Diagnosis code No. 35 is output if the pulse signal from a rear wheel sensor is momentarily interrupted (0.02 sec.) because of a transient open circuit in a rear wheel speed sensor. Diagnosis code No. 36 is output if a rear wheel speed sensor abnormality is judged when the turning speed of both rear wheels is 0 km/h for 20 seconds or more while TCL is operating.	• Malfunction of rear wheel speed sensor • Malfunction of harness or connector • Malfunction of ABS-ECU • Malfunction of TCL-ECU

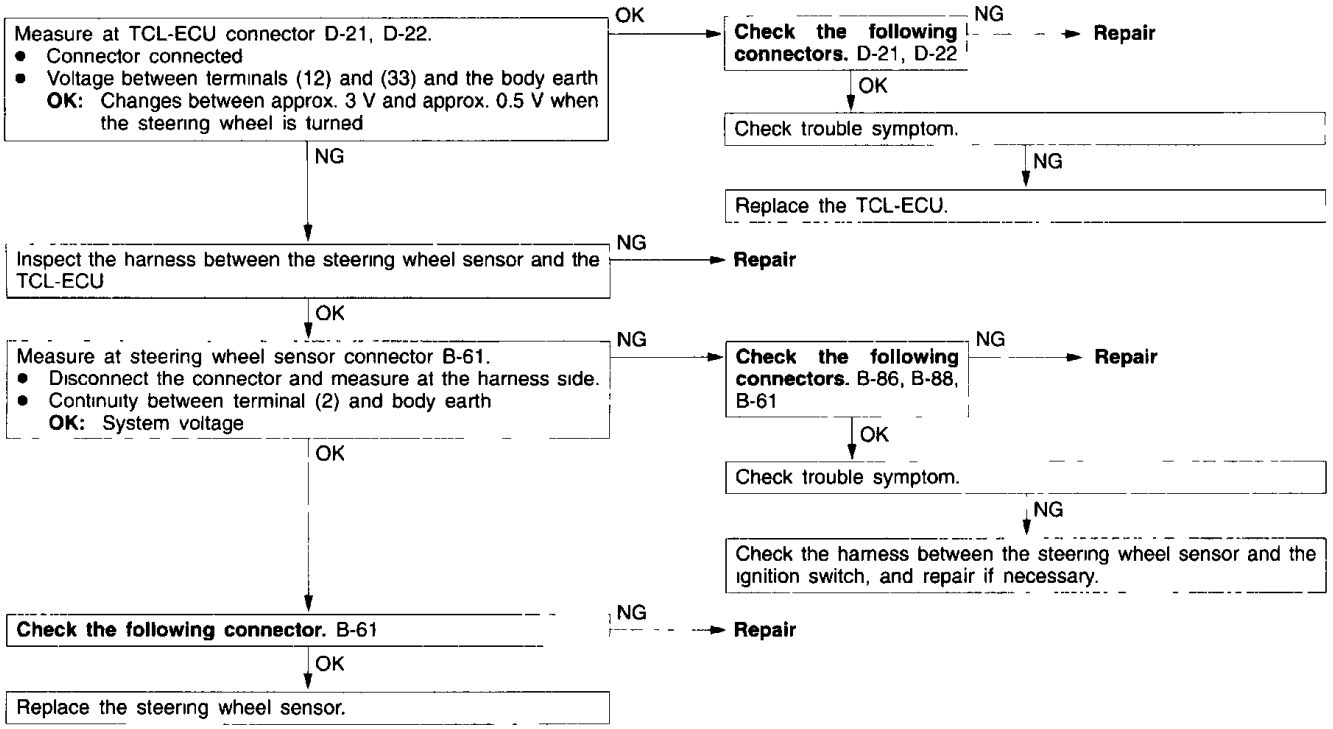
NOTE
(1) If the front wheels only are turning while the rear wheels are stationary (wheel slip), the TCL-OFF indicator will start flashing after 20 seconds, and the system will be isolated.
(2) When these diagnosis codes are output, erase the diagnosis code memory after carrying out repairs, and then carry out a road test at 20 km/h or more and check to be sure that the diagnosis codes are not output again.



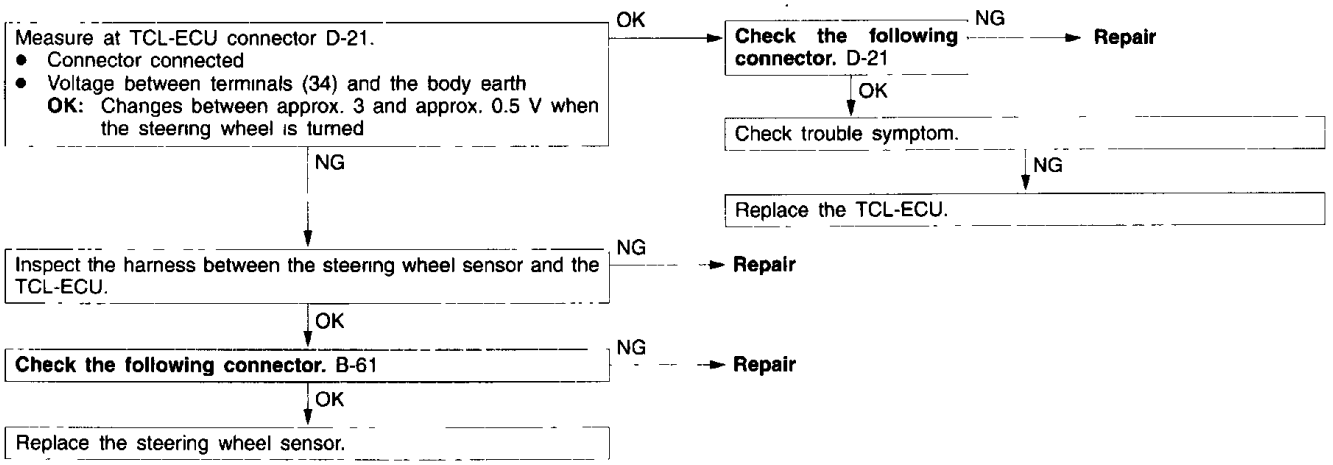
Code No. 41 Steering wheel sensor (ST-1) circuit system (open circuit) **Code No. 42 Steering wheel sensor (ST-2) circuit system (open circuit)** **Code No. 43 Steering wheel sensor (ST-N) circuit system (open circuit)**	**Probable cause**
These diagnosis codes are output if there is an open circuit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



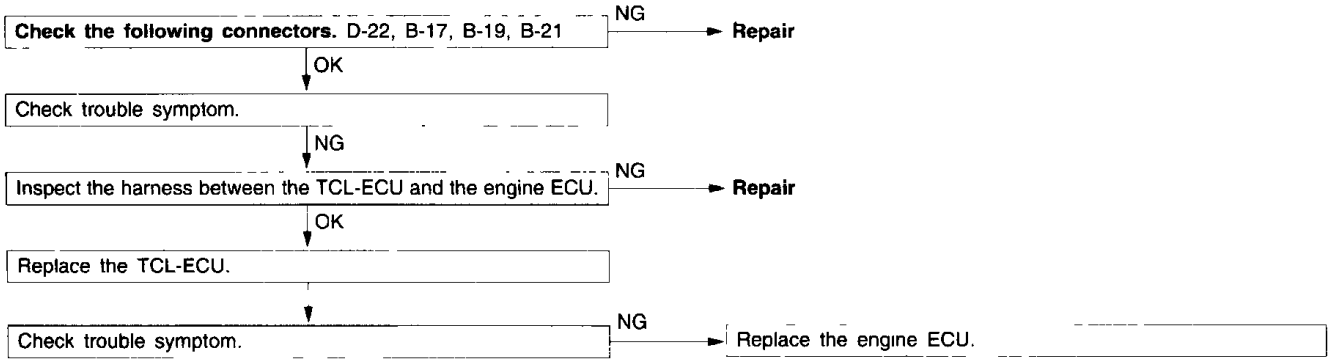
Code No. 44 Steering wheel sensor circuit system (short circuit)	Probable cause
This diagnosis code is output when no steering angle signal is output because there is a short-circuit in either steering wheel sensor ST-1 or steering wheel sensor ST-2 when the speed averages output by the left and right rear wheel speed sensors are 10 km/h or more.	• Malfunction of harness or connector • Malfunction of steering wheel sensor • Malfunction of TCL-ECU



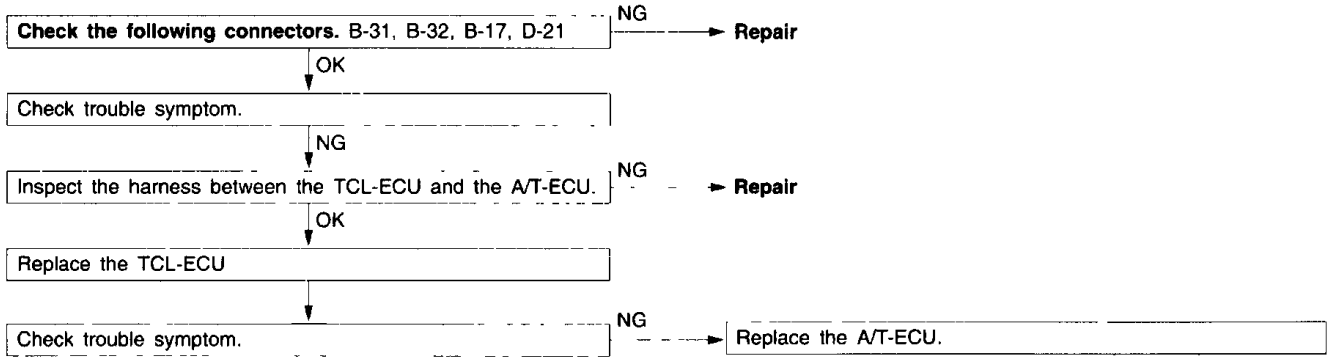
Code No. 45 Steering wheel sensor (ST-N) circuit system (short circuit)	Probable cause
This diagnosis code is output if it is considered that there is an abnormality in the steering wheel sensor (ST-N) circuit system when the straight-ahead position is continuously detected even though the steering wheel is turned 20° or more.	• Malfunction of steering wheel sensor • Malfunction of harness or connector • Malfunction of TCL-ECU



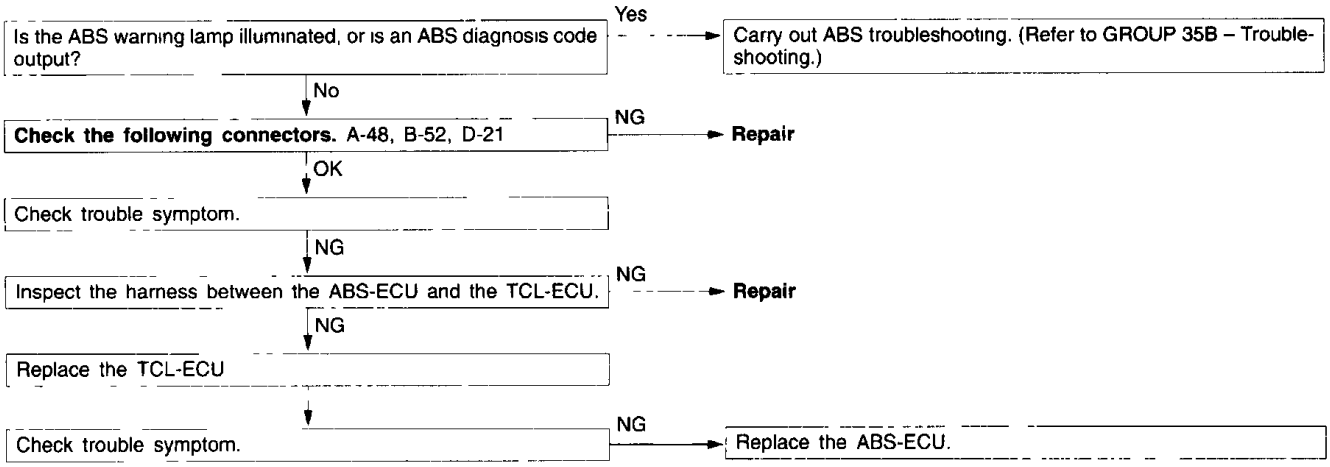
Code No. 71 Engine-ECU communication circuit system	Probable cause
This diagnosis code is output if an error is detected in the communication contents because of an open or short circuit in the serial communication circuit between the TCL-ECU and the engine ECU, a malfunction of ECU and a defective shielding of the shield wire.	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of engine ECU



Code No. 74 A/T-ECU communication circuit system	Probable cause
This diagnosis code is output if an error is detected in the communication contents because of an open or short circuit in the serial communication circuit between the TCL-ECU and the A/T-ECU, a malfunction of ECU and a defective shielding of the shield wire.	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of A/T-ECU



Code No. 76 ABS circuit system	Probable cause
This diagnosis code is output if the ABS-ECU detects the system abnormality (when ABS warning lamp illumination is controlled).	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of ABS-ECU



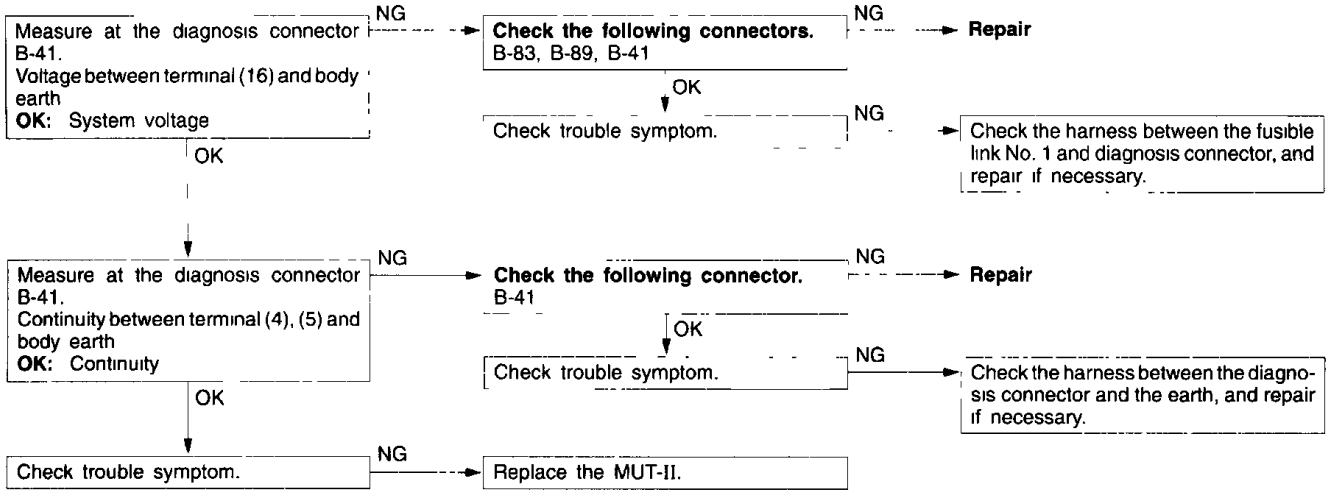
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with the MUT-II is not possible.	Communication with all systems is not possible.	1	13H-16
	Communication with TCL-ECU only is not possible.	2	13H-17
Malfunction of TCL indicator lamp display	None of the TCL indicator lamps (TCL OFF, TCL) illuminate when the ignition switch is ON.	3	13H-18
	One of the TCL indicator lamps does not illuminate when the ignition switch is ON (Another lamp does illuminate).	4	13H-18
	TCL OFF indicator lamp remains illuminated even after the engine is started.	5	13H-19
	TCL OFF indicator lamp flashes after the engine is started.		
	TCL remains illuminated even after the engine is started.	6	13H-19
	TCL OFF indicator lamp does not illuminate even if the TCL switch is continuously pressed to the OFF side while the engine is idling.	7	13H-20
Malfunction of TCL operation	TCL illuminates in the TCL operation range, but torque is not reduced.	8	13H-20
Poor starting Poor acceleration	Engine output is reduced in the TCL non-operation range (TCL indicator lamp does not illuminate) and starting and acceleration performance is poor.		

INSPECTION PROCEDURES FOR EACH TROUBLE SYMPTOM

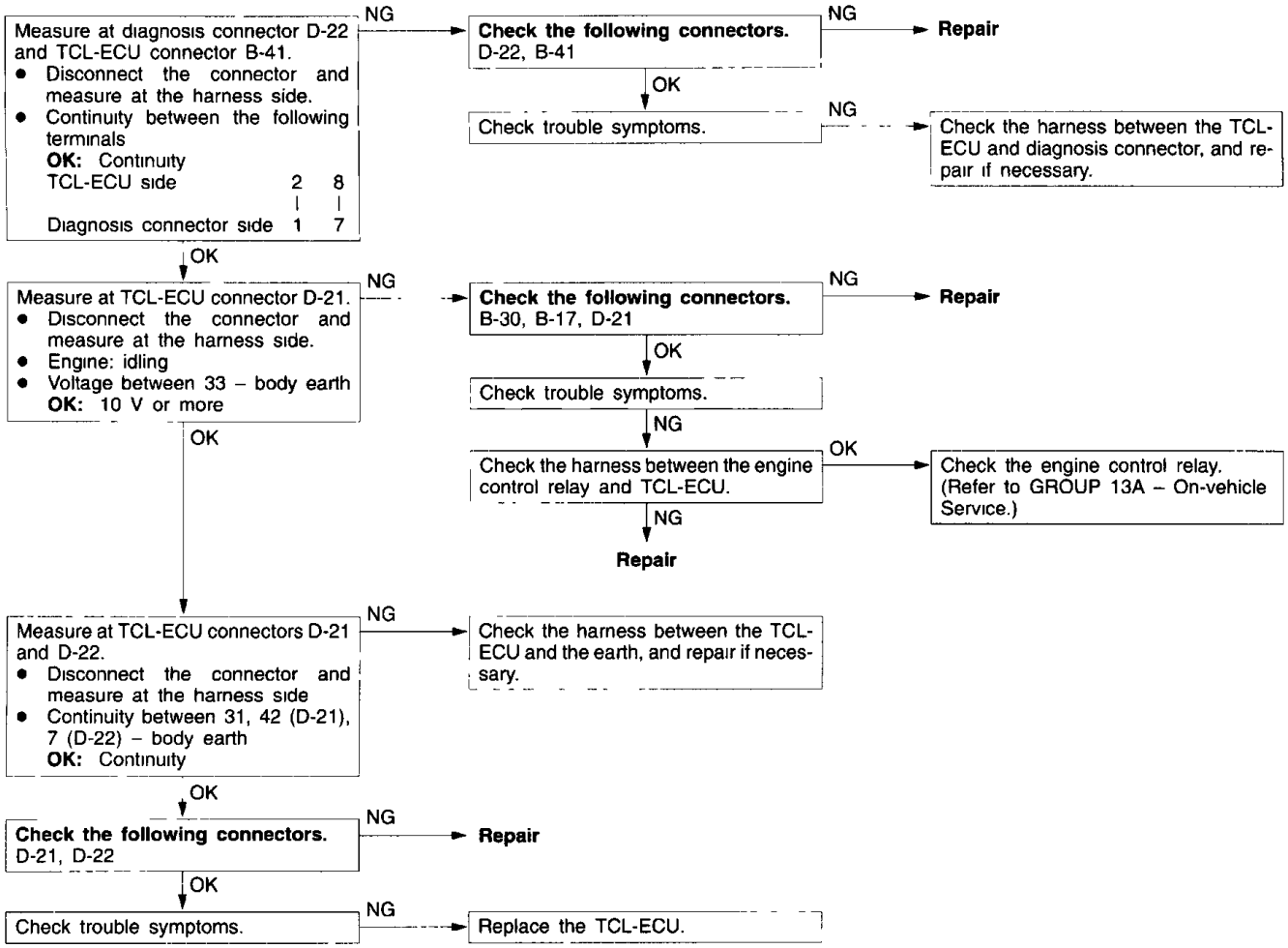
Inspection Procedure 1

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



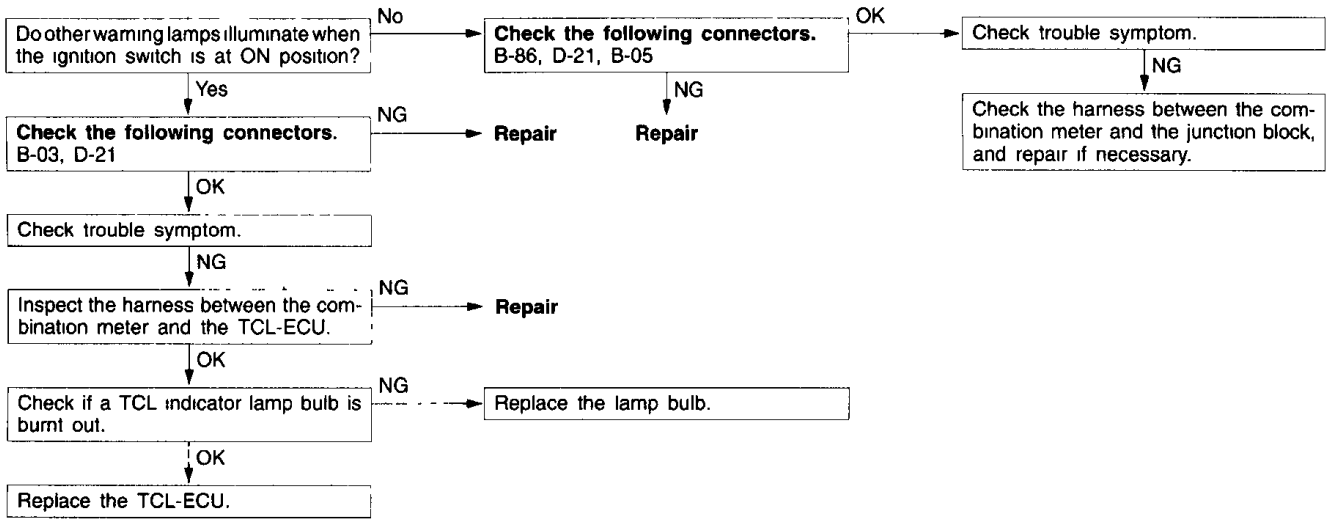
Inspection Procedure 2

Communication with the MUT-II is not possible. (Communication with TCL-ECU only is not possible.)	Probable cause
If the MUT-II cannot communicate with the TCL-ECU only, the cause is probably an abnormality in the TCL diagnosis line or in the TCL-ECU power supply line or earth line.	• Malfunction of harness or connector • Malfunction of engine control relay • Malfunction of TCL-ECU



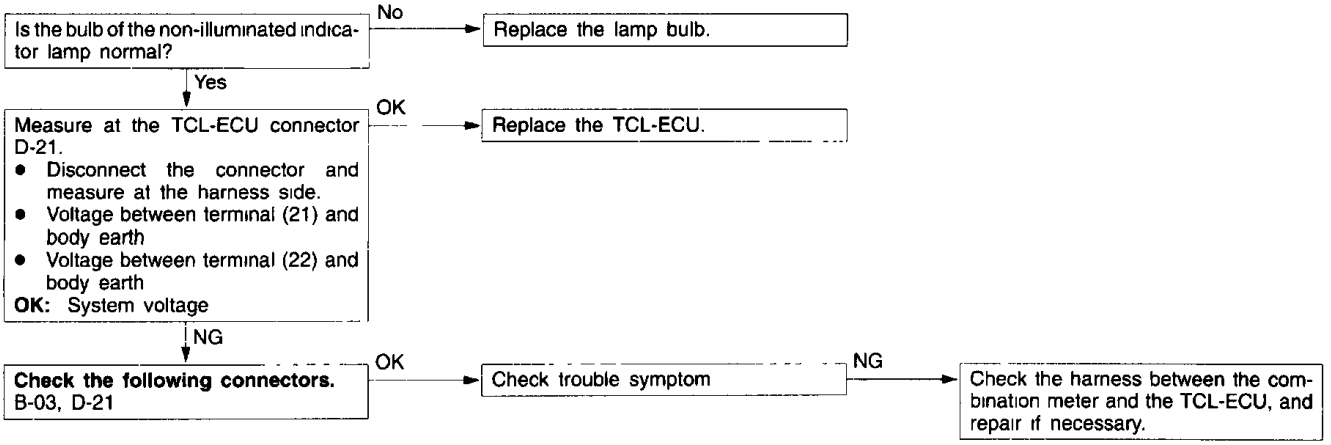
Inspection Procedure 3

None of the TCL indicator lamps (TCL OFF, TCL) illuminate when the ignition switch is ON.	Probable cause
The main cause is an open circuit in the indicator circuit because of a burnt-out indicator lamp bulb.	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of indicator lamp bulb



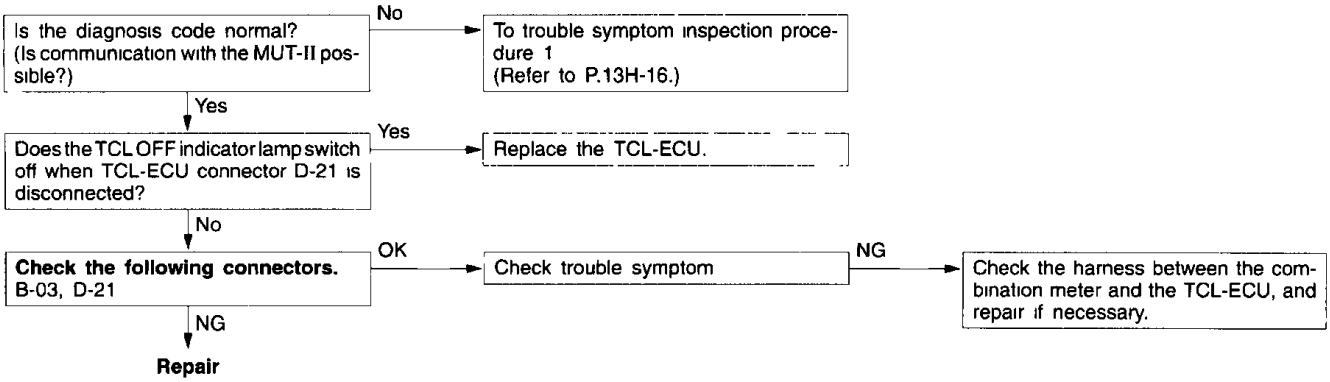
Inspection Procedure 4

One of the TCL indicator lamps does not illuminate when the ignition switch is ON.	Probable cause
Because the TCL indicators utilise shared power supply circuits, if one of the indicator lamps is illuminated, the power supply circuit can be judged to be normal.	• Open circuit in indicator lamp power supply circuit. • Burnt-out indicator lamp bulb



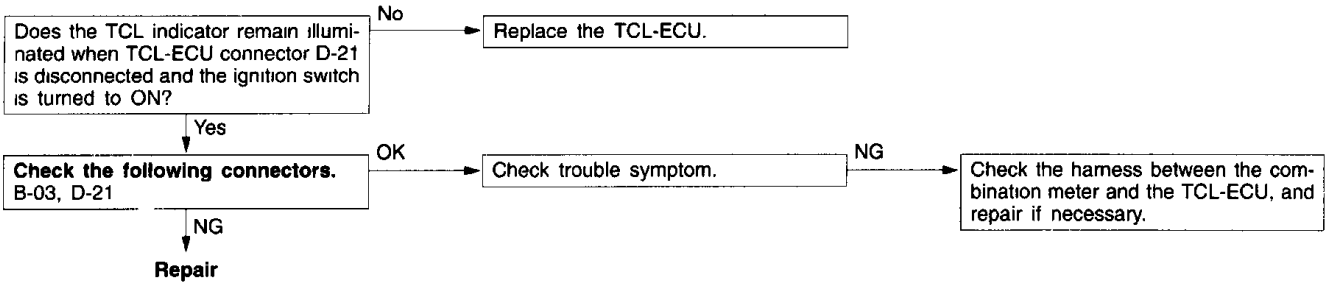
Inspection Procedure 5

• TCL OFF indicator lamp remains illuminated even after the engine is started. • TCL OFF indicator lamp illuminate after the engine is started.	Probable cause
The TCL-OFF indicator is also used as a system warning indicator. If there is a system abnormality, this indicator will illuminate or flash.	• Other system related to the TCL • Malfunction of harness or connector



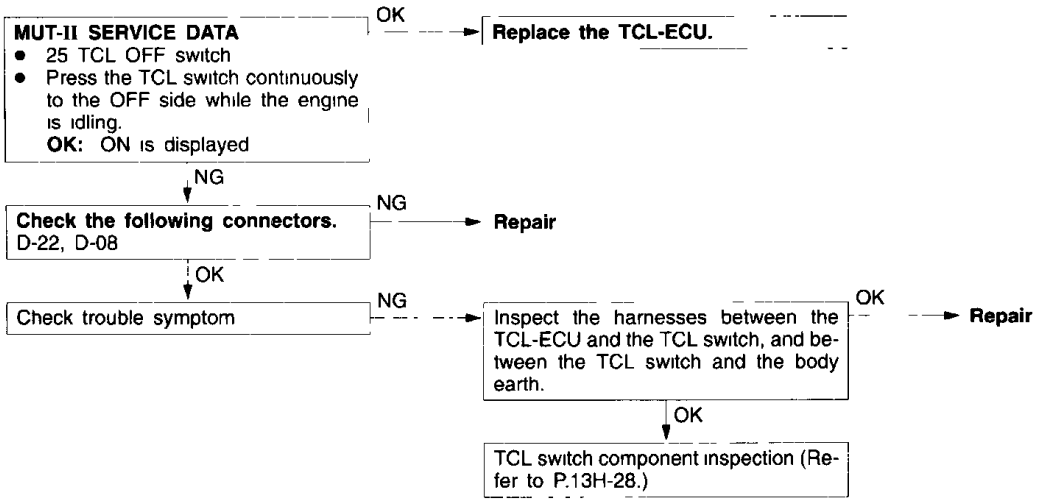
Inspection Procedure 6

TCL indicator lamp remains illuminated even after the engine is started.	Probable cause
The TCL indicator lamp only illuminates while the engine is running if the TCL is operating.	• Malfunction of TCL indicator power supply circuit • Malfunction of TCL-ECU • Malfunction of harness or connector



Inspection Procedure 7

• **TCL OFF indicator lamp does not illuminate even if the TCL switch is continuously pressed to the OFF side while the engine is idling.**	**Probable cause**
If the indicator lamp does not illuminate when the switch is operated, there is a malfunction in the switch, switch circuit or in the TCL-ECU.	• Malfunction of harness or connector • Malfunction of TCL switch • Malfunction of TCL-ECU



Inspection Procedure 8

• **TCL illuminates in the TCL operation range, but torque is not reduced.** • **Engine output is reduced in the TCL non-operation range (TCL indicator lamp does not illuminate) and starting and acceleration performance is poor.**	**Probable cause**
In cases such as the above, the electrical system is normal, and the cause is probably an abnormality in the mechanical system (vacuum actuator).	• Malfunction of vacuum solenoid valve • Malfunction of ventilation solenoid valve • Malfunction of vacuum actuator • Incorrect vacuum hose connector • Malfunction of throttle link • Malfunction of vacuum tank • Blocked air cleaner element

As the cause is probably a malfunction of the vacuum actuator system, carry out inspection of the following items in order.

- Vacuum solenoid valve operation inspection (Refer to GROUP 13A – On-vehicle Service.)
- Ventilation solenoid valve operation inspection (Refer to GROUP 13A – On-vehicle Service.)
- Disconnected or mis-connected vacuum hose inspection (Refer to GROUP 13A – On-vehicle Service.)
- Throttle link operation inspection (Refer to GROUP 13A – On-vehicle Service.)
- Vacuum tank inspection (Refer to GROUP 13A – On-vehicle Service.)
- Air cleaner element blockage inspection

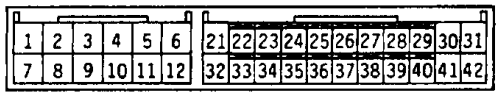
SERVICE DATA REFERENCE TABLE

No.	Check item	Check condition		Normal condition
11	APS	Accelerator pedal position Engine stop Selector lever position: P	Fully closed	300–1,000 mV
			Depressed	Gradually rises from the above value
			Fully open	4,500–5,500 mV
13	TPS	Accelerator pedal position Engine stop Selector lever position: P	Fully closed	300–1,000 mV
			Depressed	Gradually rises from the above value
			Fully open	4,500–5,500 mV
15*1	Inhibitor switch	Ignition switch: ON Engine stop	Selector lever: P position	P
			Selector lever: R position	R
			Selector lever: N position	N
			Selector lever: D position	D
			Selector lever: 3 position	3
			Selector lever: 2 position	2
			Selector lever: L position	L
16*1	Shift position	Shift lever position: D	Driving at constant speed of 10 km/h in 1 range	1st
			Driving at constant speed of 30 km/h in 2 range	2nd
			Driving at constant speed of 50 km/h in 3 range	3rd
			Driving at constant speed of 70 km/h in 4 range	4th
21	Idle switch	Accelerator pedal position Ignition switch: ON	Depressed	OFF
			Released	ON
22	Ignition switch	Ignition switch: ON		ON
		Ignition switch: OFF		OFF
23	Stop lamp switch	Brake pedal position Ignition switch: ON	Depressed	ON
			Released	OFF
24	TCL ON switch	TCL ON switch operation Ignition switch : ON	Pressed	ON
			Released	OFF
25	TCL OFF switch	TCL OFF switch operation Ignition switch: ON	Pressed	ON
			Released	OFF

No.	Check item	Check condition		Normal condition
27	ECU power supply voltage	Ignition switch: ON		System voltage
31	Front right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
32	Front left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
33	Rear right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
34	Rear left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
40	Engine speed	Ignition switch: ON	Engine: idling	Engine speeds displayed on the MUT-II and tachometer are identical.
44	Steering angle	Steering wheel position Ignition switch: ON	Turned 90° to the right	R 88 deg or R 92 deg
			Turned 90° to the left	L 88 deg or L 92 deg
45	Steering straight-ahead point learning	Steering wheel position Ignition switch: ON	Immediately after ignition switch is ON	OFF
			Immediately after city driving	ON
51	Slip control	TCL switch: ON Driving on low frictional resistance road	TCL indicator lamp illuminated	ON
			TCL indicator lamp switched off	OFF
52	Trace control	TCL switch: ON Driving on winding road	TCL indicator lamp illuminated	ON
			TCL indicator lamp switched off	OFF
74	Steering wheel sensor (ST-N)	Steering wheel position Engine idling	Neutral position	LOW
			Steering wheel turned 90° from neutral position	HIGH
75	Steering wheel sensor (ST-1)	Steering wheel position Ignition switch: ON	Steering wheel turned slowly to left	HIGH and LOW display alternately
76	Steering wheel sensor (ST-2)	Steering wheel position Ignition switch: ON	Steering wheel turned slowly to right	HIGH and LOW display alternately
81	Engine model	Ignition switch: ON		4G93
82	Valve type	Ignition switch: ON		SOHC
83	Aspiration type	Ignition switch: ON		N/A
84	Engine classification	Ignition switch: ON		NORMAL
85	Destination	Ignition switch: ON		EC*2

NOTE
1. *1: A/T
2. *2: Indicates European Communities.

CHECK AT ECU TERMINALS



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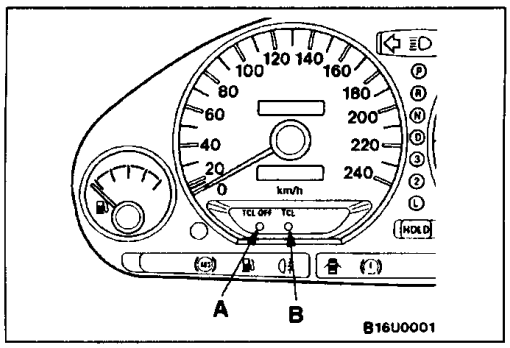
Terminal No.	Check item	Measurement condition	Normal condition
2	Diagnosis control	Do not connect the MUT-II	Approx. 12V
		Connect the MUT-II	0V
3	TCL ON switch	Ignition switch: ON TCL switch: Pressed to ON side	2V or less
		Ignition switch: ON TCL switch: Release	System voltage
4	Engine ECU data communication	Engine: Idling	Other than 0V
7	Earth	At all times	0V
8	Diagnosis data input	Connect the MUT-II	Serial communication with MUT-II
		Do not connect the MUT-II	1V or less
9	TCL OFF switch	Ignition switch: ON TCL switch: Pressed to OFF side	2V or less
		Ignition switch: ON TCL switch: Release	System voltage
10	Engine ECU data communication	Engine: Idling	Other than 0V
11	Rear left wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Changes between 0V and approx. 5V
12	Steering wheel sensor ST1 input	Ignition switch: ON Steering wheel turned slowly	Flashes between 0V and approx. 3V
21	TCL OFF indicator	Ignition switch: ON TCL ON condition	System voltage
		Ignition switch: ON TCL OFF condition	2V or less
22	TCL indicator	Ignition switch: ON TCL ON condition	2V or less
		Ignition switch: ON TCL OFF condition	System voltage
24	Front left wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Changes between 0V and approx. 5V
25	Front right wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Changes between 0V and approx. 5V

Terminal No.	Check item	Measurement condition	Normal condition
27	Stop lamp switch input	Ignition switch: ON Brake pedal depressed	System voltage
		Ignition switch: ON Brake pedal released	0V
29	A/T-ECU data communication	Engine: Idling	Other than 0V
30	ECU power supply	Ignition switch: ON	System voltage
31	Earth	At all times	0V
32	Ignition switch (IG2)	Ignition switch: ON	System voltage
33	Steering wheel sensor ST2 input	Ignition switch: ON Steering wheel turned slowly	Flashes between 0V and approx. 3V
34	Steering wheel sensor STN input	Engine: Idling Steering wheel in straight-ahead position	0.5V or less
		Engine: Idling Steering wheel turned 90° straight-ahead position	2.5–3.5V
36	Rear right wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Flashes between 0V and approx. 5V
38	APS output	Ignition switch: ON Accelerator pedal fully open	4.5–5.5V
		Ignition switch: ON Accelerator pedal fully closed	0.3–1.0V
39	ABS fail signal	During ABS fail	2V or less
		When ABS is normal	System voltage
40	A/T-ECU data communication	Engine: Idling	Other than 0V
41	ECU back-up power supply	At all times	System voltage
42	Earth	At all times	0V



ON-VEHICLE SERVICE

13600090028

SYSTEM CHECK USING THE TCL INDICATOR LAMPS

Press the TCL switch and check if each TCL indicator lamp illuminates or switches off.

TCL switch mode	Inspection conditions	TCL OFF indicator (A)	TCL indicator (B)
Switch does not operate	Turn the ignition switch to the ON position.	○	○
	Start the engine.	×	×
TCL OFF mode	Engine is idling.	○	–
TCL ON mode	Drive the vehicle at 30 km/h for 2 minutes or more.	No illumination	–

NOTE
O: illuminated, X: extinguished; – : not relevant

Caution
If a different result is obtained when checking, refer to the "Troubleshooting" section for remedy.

TCL OPERATION CHECK

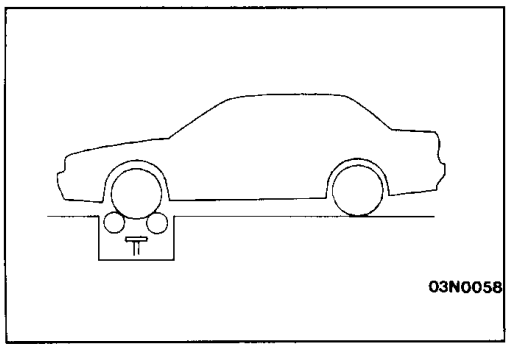
13600110021

<When using the MUT-II>

1. Connect the MUT-II to the diagnosis connector.
2. Move the selector lever to P range <A/T>, or move the shift lever to the neutral position <M/T>.
3. Start the engine.
4. Turn the TCL switch to ON.
5. Operate the MUT-II to start the actuator test (item No. 05) and fully depress the accelerator pedal at the same time. Check that the engine speed is kept down to 3,000 r/min at this time.

Caution
The actuator test should only be carried out for 3 seconds. Because the engine speed will increase once the actuator test is stopped, the accelerator pedal should be released quickly after it has been depressed.

NOTE
The TCL-ECU will output a "request torque: 0" signal to the engine-ECU for 3 seconds while the actuator test is being carried out, and the TCL OFF indicator will illuminate during this time.



<When not using the MUT-II>

1. Turn the TCL switch to ON.
2. Place the front wheels onto a speedometer tester or a chassis dynamo and start the engine. (The front wheels may also be jacked up.)
3. Move the shift lever to 1st position <M/T> or the selector lever to D range <A/T>.
4. Check to be sure that the engine speed is restrained when the accelerator pedal is depressed.

NOTE
If the following symptoms occur when the accelerator pedal is depressed, refer to "Troubleshooting."
1. If the TCL indicator lamp does not illuminate
2. If the TCL indicator lamp illuminates but the engine is not restrained

Caution
1. **Inspection should be completed within 20 seconds after the accelerator pedal was depressed. If it takes longer than 20 seconds, the TCL system function will stop and the engine speed will gradually increase.**
2. **Because the TCL OFF indicator will flash when the TCL system operation is stopped, the diagnosis codes should be erased if you notice that the indicator is flashing. (Refer to P.13H-3.)**

STOP LAMP SWITCH CHECK 13600120024

Refer to GROUP 35A – On-vehicle Service.

WHEEL SPEED SENSOR CHECK 13600130027

Refer to GROUP 35B – On-vehicle Service.

VACUUM SOLENOID VALVE CHECK 13600390012

Refer to GROUP 13A – On-vehicle Service.

VENTILATION SOLENOID VALVE CHECK 13600400012

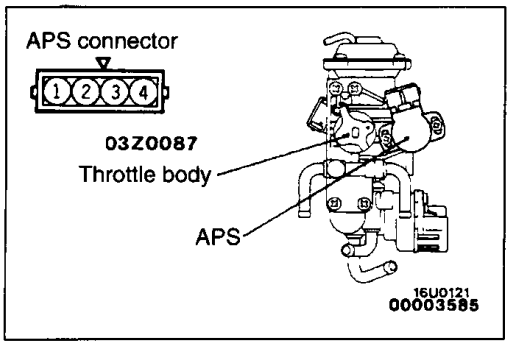
Refer to GROUP 13A – On-vehicle Service.

VACUUM TANK CHECK 13600410015

Refer to GROUP 13A – On-vehicle Service.

VACUUM ACTUATOR CHECK 13600420018

Refer to GROUP 13A – On-vehicle Service.

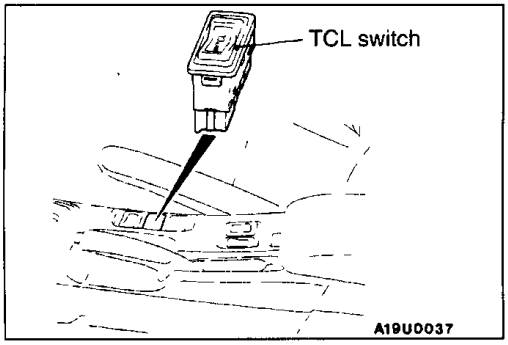


ACCELERATOR PEDAL POSITION SENSOR (APS) CHECK. 13600430011

1. Disconnect the APS connector.
2. Measure the resistance between terminals (1) and (4) of the APS connector.

Standard value: 3.5–6.5 kΩ

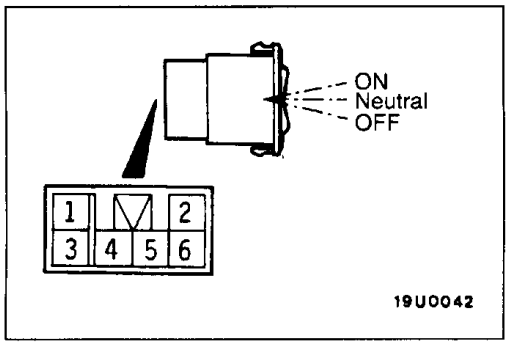
3. When the accelerator pedal is gradually depressed, check that the resistance between terminals (1) and (3) of the APS connector changes smoothly in proportion to the pedal opening amount.
4. If the resistance is outside the standard value, or if the resistance does not change smoothly, replace the APS. Adjust the APS after it has been replaced. (Refer to GROUP 13A – On-vehicle Service.)



TCL SWITCH

13600160026

REMOVAL AND INSTALLATION



INSPECTION

13600170029

TCL SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	2	4	5	3	–	6
ON	○	○					
Neutral					○	○	○
OFF	○			○			

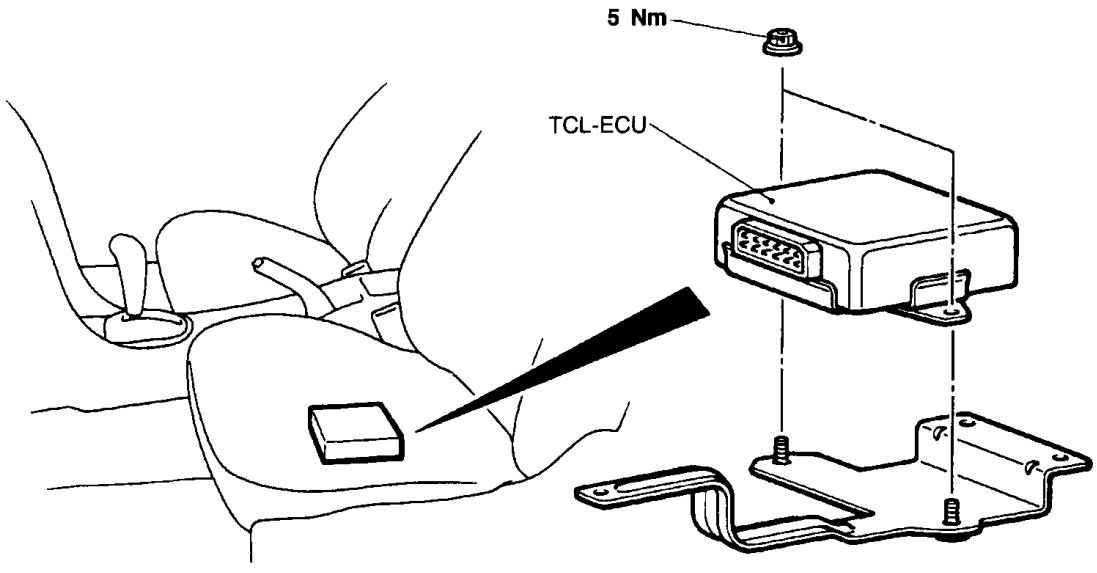
TCL-ECU

13600280029

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Left Side Front Seat Assembly Removal and Installation (Refer to GROUP 52A.).

CAUTION: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or other components.



ENGINE COOLING

CONTENTS

14109000031

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SERVICE SPECIFICATIONS 2

LUBRICANT 2

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ON-VEHICLE SERVICE 3

- Engine Coolant Leak Checking 3
- Radiator Cap Valve Opening Pressure Check .. 3
- Engine Coolant Replacement 3
- Concentration Measurement 4

THERMOSTAT 5

WATER PUMP

- **<SOHC>** 7
- **<DOHC>** 8

WATER HOSE AND WATER PIPE 9

RADIATOR 11

GENERAL INFORMATION

14100010033

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 pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate 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 timing belt or drive belt from the crankshaft.
The radiator is the corrugated fin, down flow type and is cooled by the electrical radiator fan.
The electrical radiator fan is controlled by the engine ECU in accordance with the engine running condition.

Items		Specifications
Radiator	Performance kJ/h	168,120
Automatic transmission oil cooler	Performance kJ/h	6,195

SERVICE SPECIFICATIONS

14100030039

Items		Standard value	Limit
High pressure valve opening pressure of radiator cap kPa		75–105	65
Range of coolant antifreeze concentration of radiator %		30–60	–
Thermostat	Valve opening temperature of thermostat °C	82±1.5	–
	Full-opening temperature of thermostat °C	95	–
Valve lift (at 95°C) mm		8 or more	–

LUBRICANT

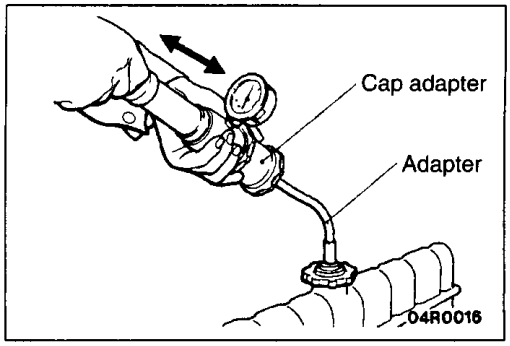
14100040032

Items	Quantity ℓ
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	6

SEALANTS

14100050035

Items	Specified sealant	Remarks
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent	Drying sealant
Water pump, Thermostat case	Mitsubishi Genuine Parts No. MD970389 or equivalent	Semi-Drying sealant



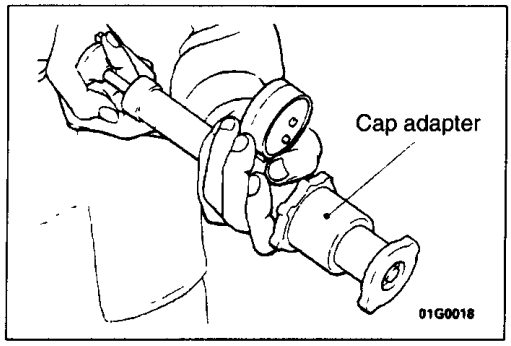
ON-VEHICLE SERVICE 14100100037

ENGINE COOLANT LEAK CHECKING

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.



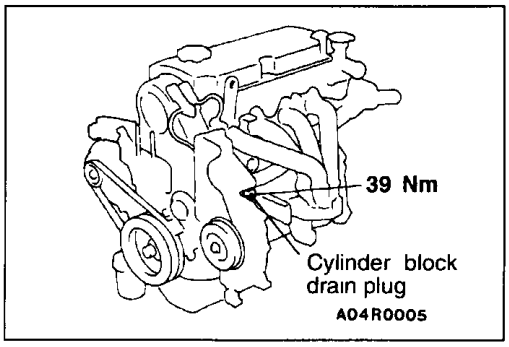
RADIATOR CAP VALVE OPENING PRESSURE CHECK 14100130036

1. Use a cap adapter 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

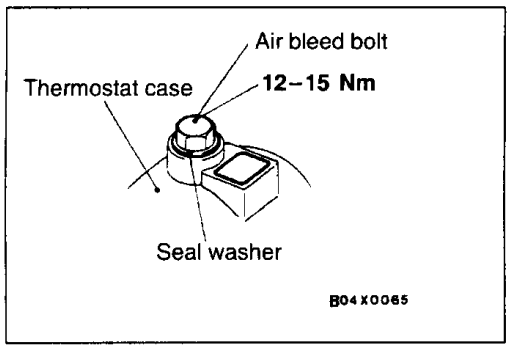
3. Replace the radiator cap if the reading does not remain at or above the limit.

   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 14100120033

1. Drain the engine coolant by removing the drain plug and then the radiator cap.
2. Remove the drain plug from the cylinder block to drain the engine coolant.
3. Remove the reserve tank to drain the engine coolant.
4. When the engine coolant has drained, pour in water from the radiator cap to clean the engine coolant line.



5. Coat the thread of the cylinder block drain plug with the specified sealant and tighten to the specified torque.

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

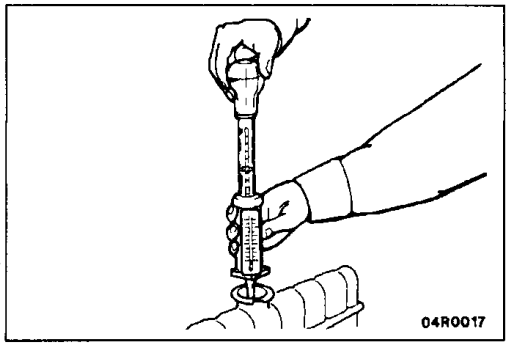
6. Securely tighten the radiator drain plug.
7. Install the reserve tank.
8. Remove the air bleed bolt and replace the seal washer.
9. Fill the radiator until the engine coolant flows from the air bleed bolt section, and then close the air bleed bolt.
10. Slowly pour the engine coolant into the mouth of the radiator until the radiator is full, and pour also into the reserve tank up to the FULL line.

    Recommended antifreeze:
    HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT

    Quantity: 6 ℓ

    NOTE
    For Norway, the non-amine type of antifreeze should be used.

11. Install the radiator cap securely.
12. Start the engine and warm the engine until the thermostat opens. (Touch the radiator hose with your hand to check that warm water is flowing.)
13. After the thermostat opens, race the engine several times, and then stop the engine.
14. Cool down the engine, and then pour engine coolant into the reserve tank until the level reaches the FULL line. If the level is low, repeat the operation from step 11.



CONCENTRATION MEASUREMENT 14100110030

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%

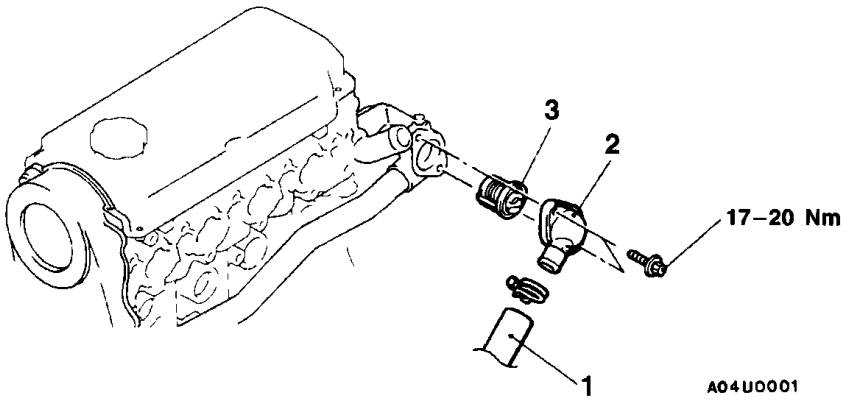
Caution
If the concentration of the antifreeze is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freezing and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain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

THERMOSTAT

14100240036

REMOVAL AND INSTALLATION

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



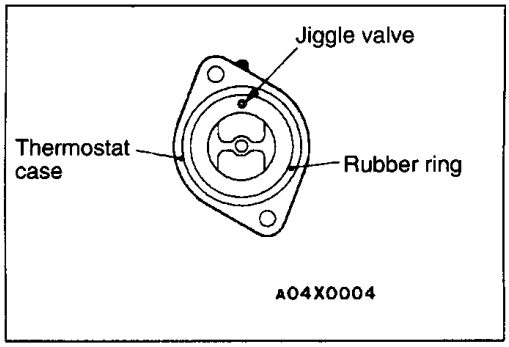
Removal steps

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

REMOVAL SERVICE POINT

◀A▶ RADIATOR LOWER HOSE DISCONNECTION

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



INSTALLATION SERVICE POINTS

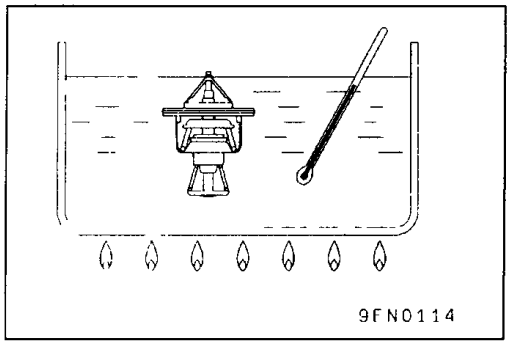
▶A◀ THERMOSTAT INSTALLATION

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

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

▶B◀ RADIATOR LOWER HOSE CONNECTION

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



INSPECTION

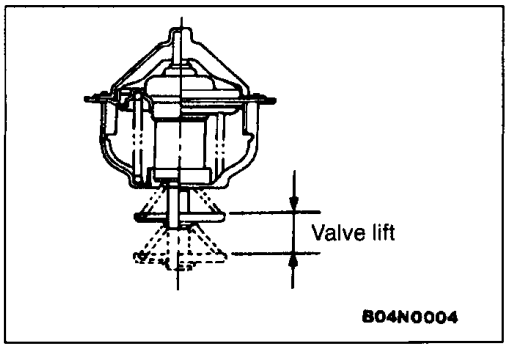
14100250046

THERMOSTAT CHECK

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

   Standard value:

   Valve opening temperature: 82±1.5°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 °C	Amount of valve lift mm
95	8 or more

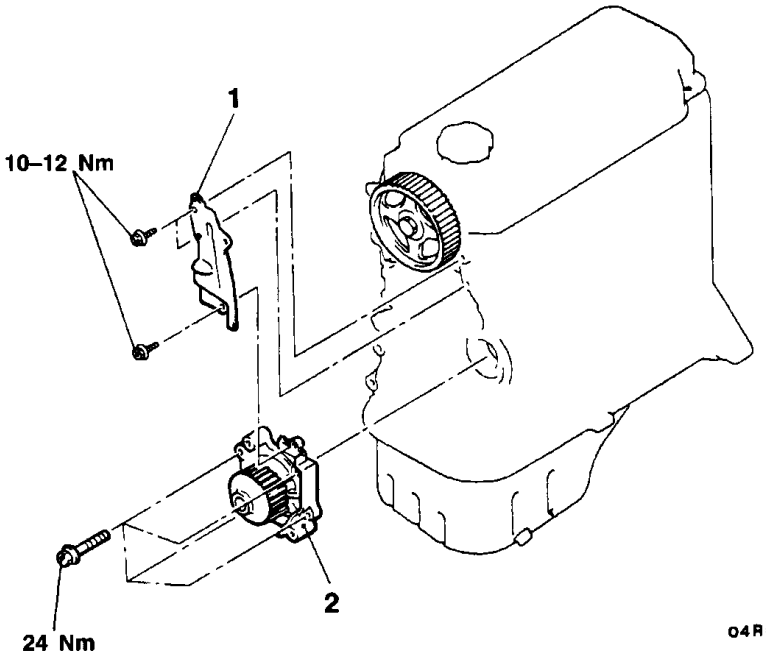
NOTE
Measure the valve height when the thermostat is fully closed, and use this measurement to calculate the valve height when the thermostat is fully open.

WATER PUMP <SOHC>

14100270073

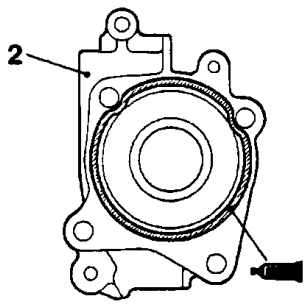
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Supplying (Refer to P.14-3.)
(2) Timing Belt Removal and Installation (Refer to GROUP 11A.)



04R0001

00003351



04R0006

(Beed diameter: 2.4 – 3.0 mm)

Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent

Removal steps
1. Timing belt rear cover
▶A◀ 2. Water pump

INSTALLATION SERVICE POINT

▶A◀WATER PUMP INSTALLATION

Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

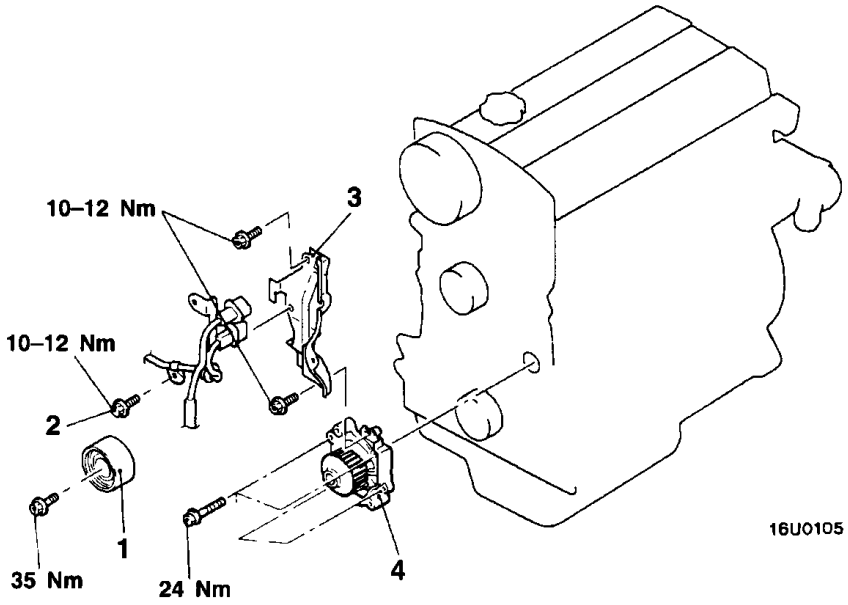
Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent

WATER PUMP <DOHC>

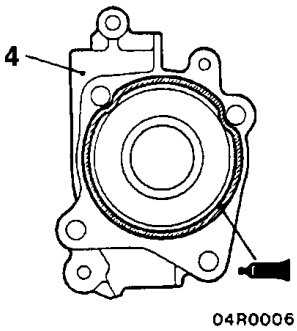
14100270080

REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operation
(1) Engine Coolant Draining and Supplying (Refer to P.14-3.)
(2) Exhaust Camshaft Sprocket Removal and Installation (Refer to GROUP 11A – Camshaft and Camshaft Oil seal.)



00003352



(Beed diameter: 2.4 – 3.0 mm)

Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent

Removal steps
1. Idler pulley
2. Camshaft position sensor clamp bolt
3. Timing belt rear cover
▶A◀ 4. Water pump

INSTALLATION SERVICE POINT

▶A◀ WATER PUMP INSTALLATION

Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

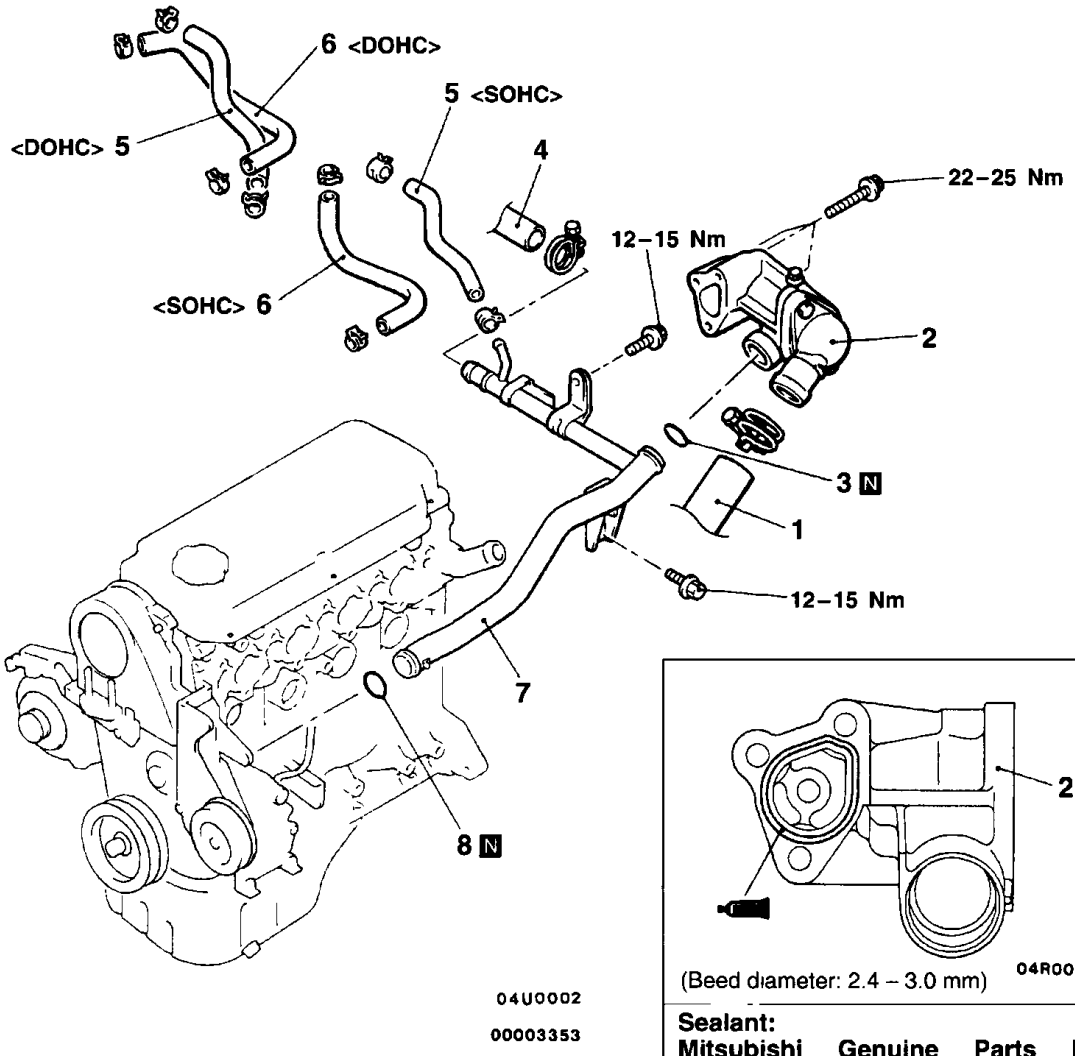
Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent

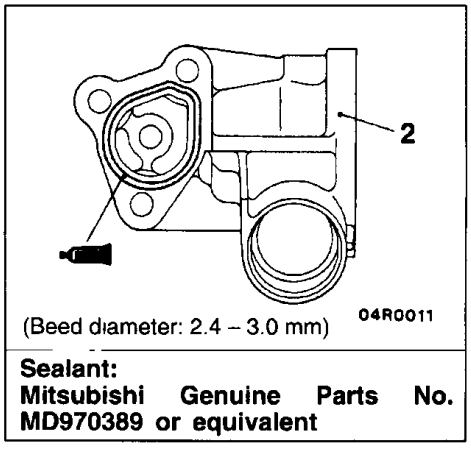
WATER HOSE AND WATER PIPE

14100330078

REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operation
(1) Engine Coolant Draining and Supplying (Refer to P.14-3.)
(2) Air Cleaner, Air Intake Hose Removal and Installation
(3) Distributor Removal and Installation <SOHC> (Refer to GROUP 16.)





Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent

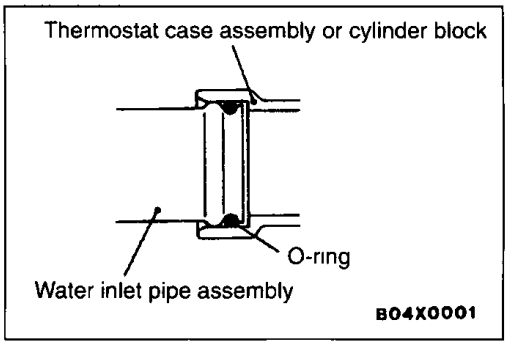
Removal steps

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

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◀ O-RING INSTALLATION

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

Caution
Do not allow engine oil or other greases to adhere to the O-ring

▶B◀ THERMOSTAT CASE ASSEMBLY INSTALLATION

Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent

▶C◀ RADIATOR LOWER HOSE CONNECTION

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

INSPECTION

14100340064

WATER PIPE AND HOSE CHECK

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

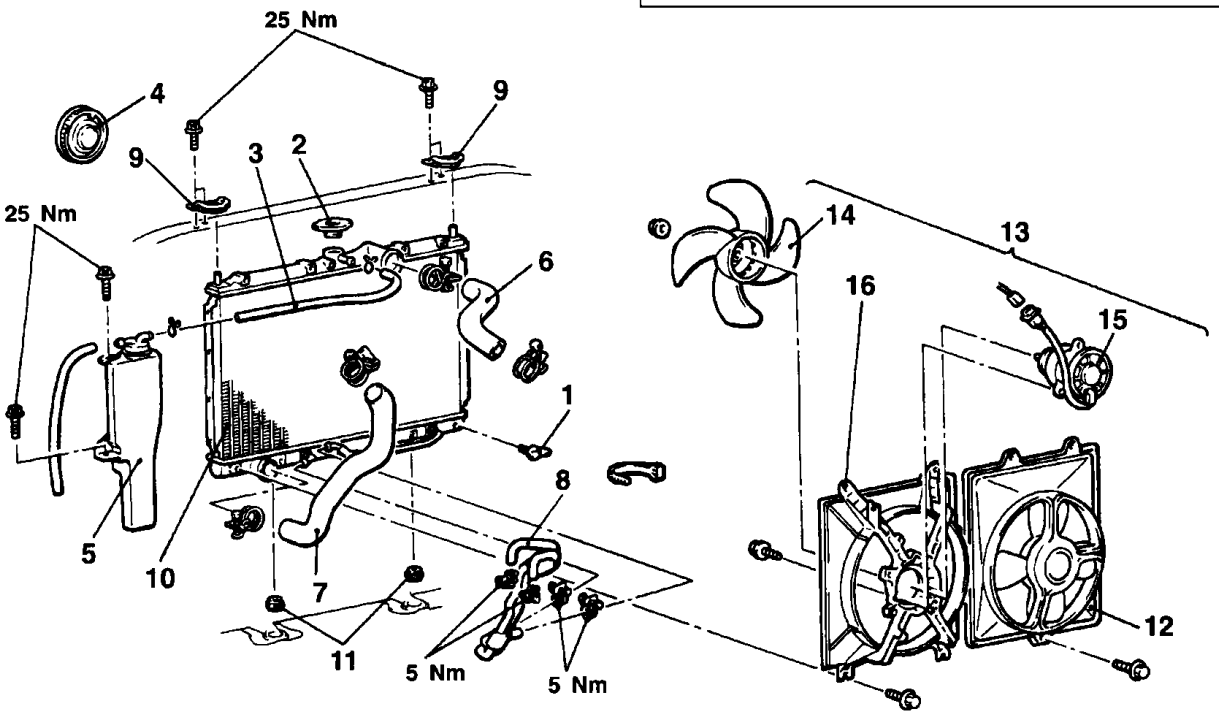
RADIATOR

14100150032

REMOVAL AND INSTALLATION

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

Post-installation Operation
(1) Engine Coolant Supplying (Refer to P.14-3.)
(2) A/T Fluid Supplying and Checking (Refer to GROUP 23 – On-vehicle Service.)



A04U0004

Radiator removal steps

1. Drain plug
2. Radiator cap
3. Overflow hose
4. Headlamp cap
5. Reserve tank
◀A▶ ▶A◀ 6. Radiator upper hose
◀A▶ ▶A◀ 7. Radiator lower hose
◀B▶ 8. Transmission fluid cooler hose
9. Upper insulator
10. Radiator assembly
11. Lower insulator
12. Condenser fan motor assembly <Vehicles with A/C>
13. Radiator fan motor assembly
14. Fan
15. Radiator fan motor
16. Shroud

Radiator fan motor removal steps

4. Headlamp cap
5. Reserve tank
13. Radiator fan motor assembly
14. Fan
15. Radiator fan motor
16. Shroud

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.

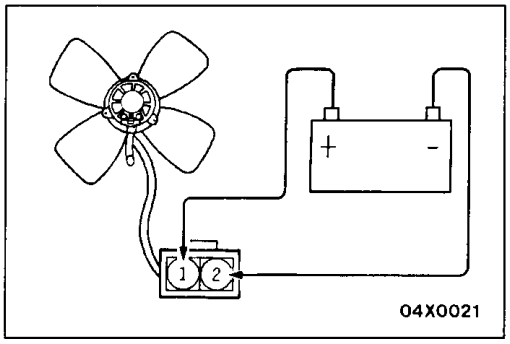
◀B▶ TRANSMISSION FLUID COOLER HOSE REMOVAL

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

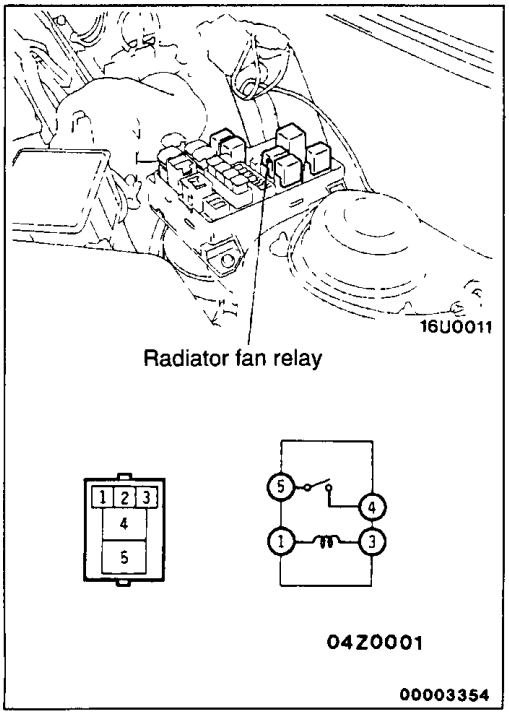
1. Insert each hose as far as the projection of the water inlet fitting.
2. Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.



INSPECTION 14100190034

RADIATOR FAN MOTOR CHECK

1. Check to be sure that the radiator fan rotates when battery voltage is applied between terminals (as shown in the figure).
2. Check to see that abnormal noises are not produced, while motor is turning.



RADIATOR FAN RELAY CONTINUITY CHECK 14100440030

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

INTAKE AND EXHAUST

CONTENTS

15109000038

GENERAL INFORMATION 2
SERVICE SPECIFICATIONS 2
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ON-VEHICLE SERVICE 2
Intake Manifold Vacuum Check 2
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EXHAUST MANIFOLD 6
EXHAUST PIPE AND MAIN MUFFLER 7

GENERAL INFORMATION

15100010030

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 manifold is made of a stainless steel. The exhaust pipe is divided into three parts: the front pipe, the center pipe, and the main muffler.

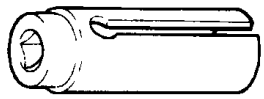
SERVICE SPECIFICATIONS

15100030036

Items	Standard value	Limit
Manifold distortion of the installation surface mm	0.15 or less	0.20

SPECIAL TOOL

15100060042

Tool	Number	Name	Use
	MD998770	Oxygen sensor wrench	Removal/Installation of oxygen sensor

ON-VEHICLE SERVICE

15100180038

INTAKE MANIFOLD VACUUM CHECK

Refer to GROUP 11A – On-vehicle Service.

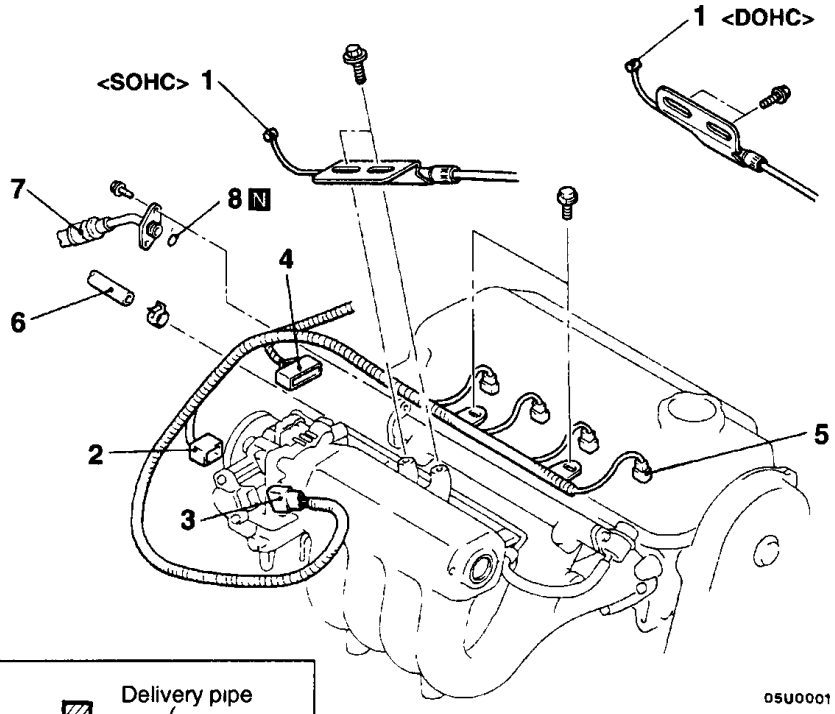
INTAKE MANIFOLD

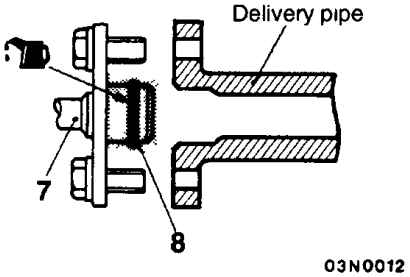
15100300069

REMOVAL AND INSTALLATION

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

Post-Installation Operation
(1) Engine Coolant Supplying
(Refer to GROUP 14 – On-vehicle Service.)
(2) Accelerator Cable Adjustment
(Refer to GROUP 17 – On-vehicle Service.)
(3) Air Cleaner and Air Intake Hose Installation



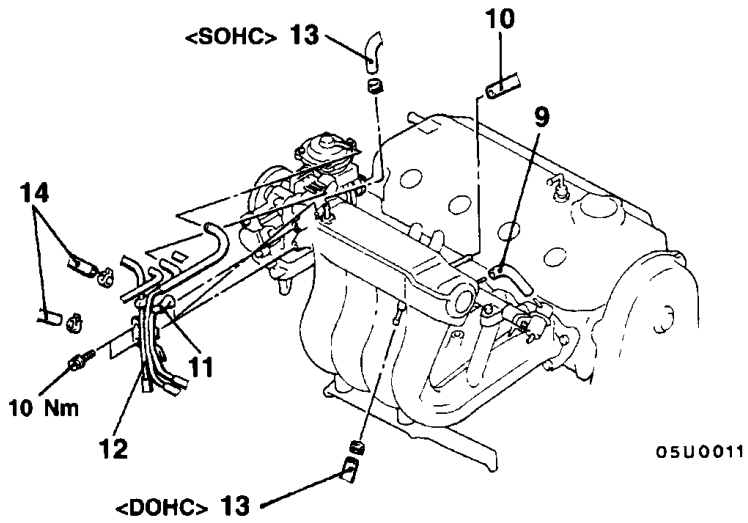


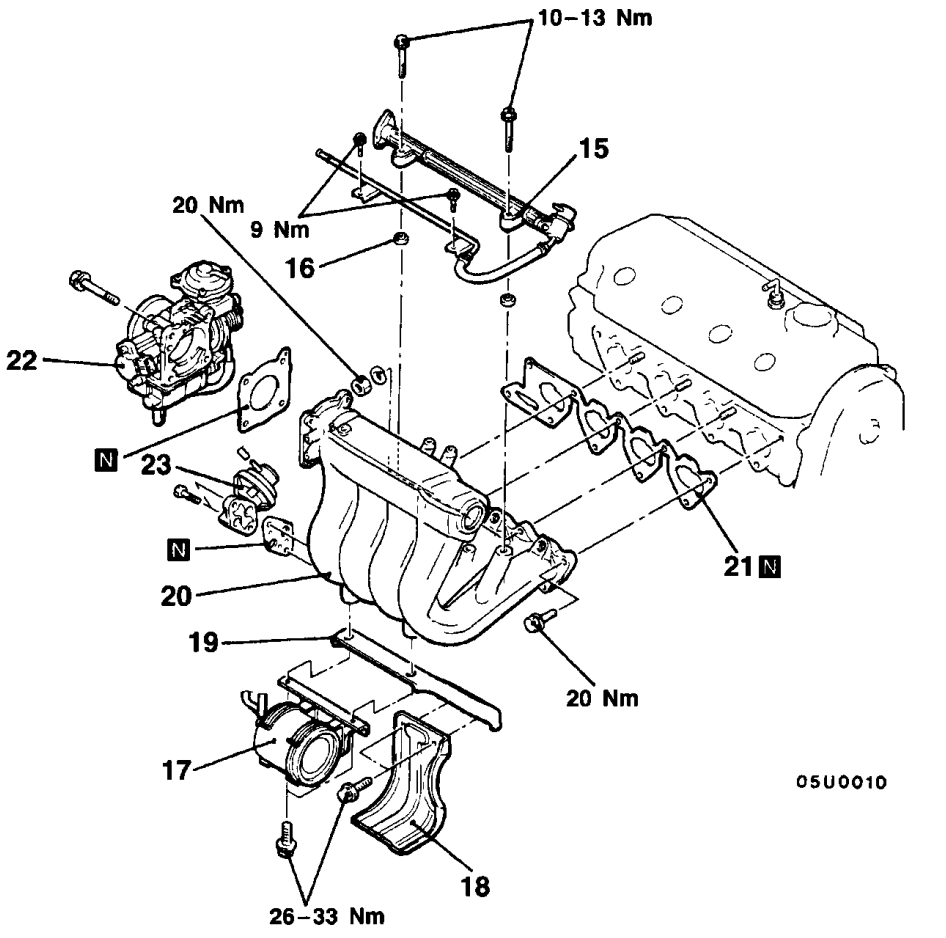
Engine Oil

00003355

Removal steps

1. Accelerator cable connection
2. ISC connector
3. TPS connector
4. APS connector
<Vehicles with TCL>
5. Injector connector
6. Fuel return hose connection
▶A◀ 7. Fuel high pressure hose connection
▶A◀ 8. O-ring





00003356

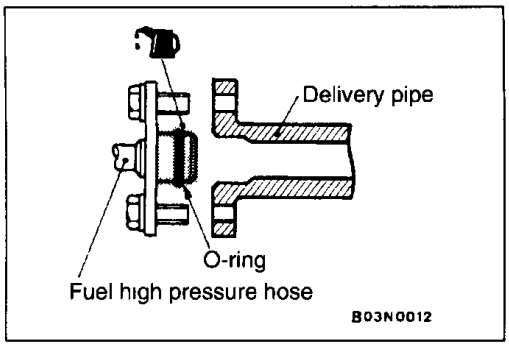
9. Vacuum hose connection
10. PCV hose connection
11. Vacuum hose connection
12. Vacuum pipe
13. Brake booster vacuum hose connection
14. Water hose connection
◀A▶ 15. Delivery pipe, injector and pressure regulator assembly
16. Insulator
17. Vacuum tank and vacuum tank bracket assembly <Vehicles with TCL>
18. Heat protector <4G93-M/T>
19. Intake manifold stay
20. Intake manifold
21. Intake manifold gasket
22. Throttle body
23. EGR valve

REMOVAL SERVICE POINT

◀A▶ DELIVERY PIPE, INJECTOR AND PRESSURE REGULATOR REMOVAL

Remove the delivery pipe (with the injectors and pressure regulator attached to it).

Caution
Care must be taken, when removing the delivery pipe, not to drop the injector.



INSTALLATION SERVICE POINT

▶A◀ O-RING/FUEL HIGH PRESSURE HOSE INSTALLATION

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

   Caution
   Be careful not to let any engine oil get into the delivery pipe.

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

INSPECTION 15100310079

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

INTAKE MANIFOLD CHECK

1. Check for damage or cracking of any part.
2. Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
3. Using a straight edge and thickness gauge, check for distortion of the cylinder head installation surface.

   Standard value: 0.15 mm or less

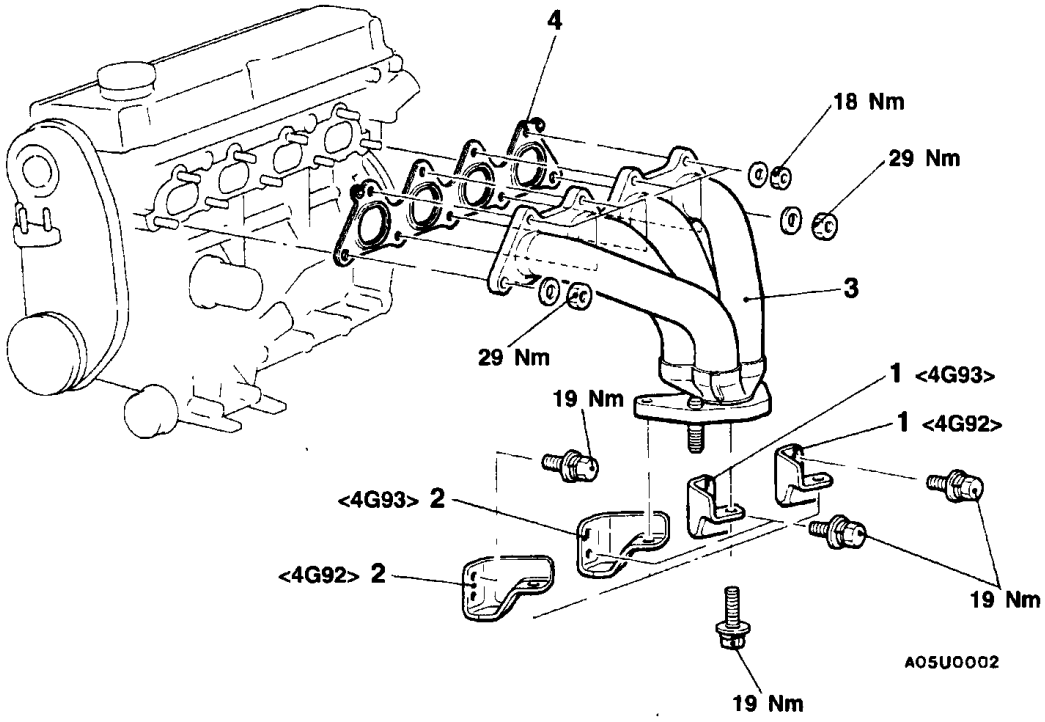
   Limit: 0.20 mm

EXHAUST MANIFOLD

15100330075

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to P.15-7.)



Removal steps

1. Exhaust manifold bracket (B)
2. Exhaust manifold bracket (A)
3. Exhaust manifold
4. Exhaust manifold gasket

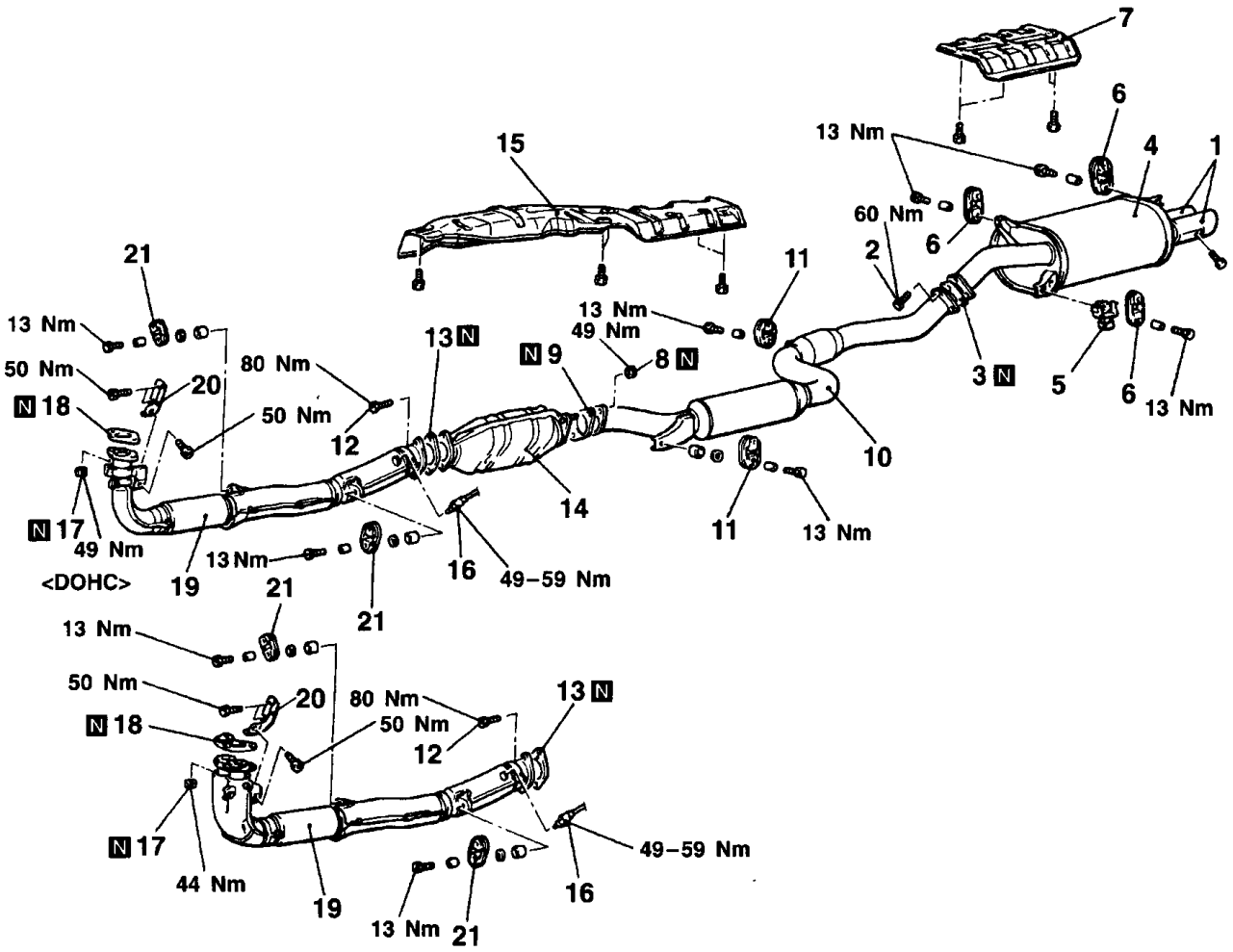
EXHAUST PIPE AND MAIN MUFFLER

15100540034

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation

<SOHC>

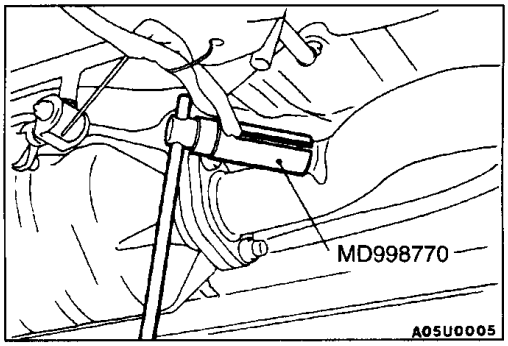


A05U0008

Main muffler removal steps
1. Mouldings <DOHC>
2. Bolt
3. Gasket
4. Main muffler
5. Dynamic damper
6. Hanger
7. Rear floor heat protector panel

Center exhaust pipe removal steps
2. Bolt
3. Gasket
8. Self locking nuts
9. Gasket
10. Center exhaust pipe
11. Hanger
12. Bolt
13. Gasket
14. Catalytic converter
15. Front floor heat protector panel

Front exhaust pipe removal steps
12. Bolt
13. Gasket
◀A▶ ▶A◀ 16. Oxygen sensor
17. Self locking nuts
18. Gasket
19. Front exhaust pipe
20. Front exhaust pipe bracket
21. Hanger



REMOVAL SERVICE POINT

◀A▶ OXYGEN SENSOR REMOVAL

INSTALLATION SERVICE POINT

▶A◀ OXYGEN SENSOR INSTALLATION

ENGINE ELECTRICAL

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16109000035

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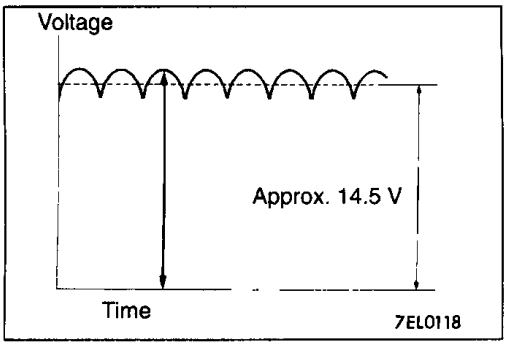
CHARGING SYSTEM

16100010037

GENERAL INFORMATION

The charging system uses the alternator output to keep the battery charged at a constant level under various electrical loads.

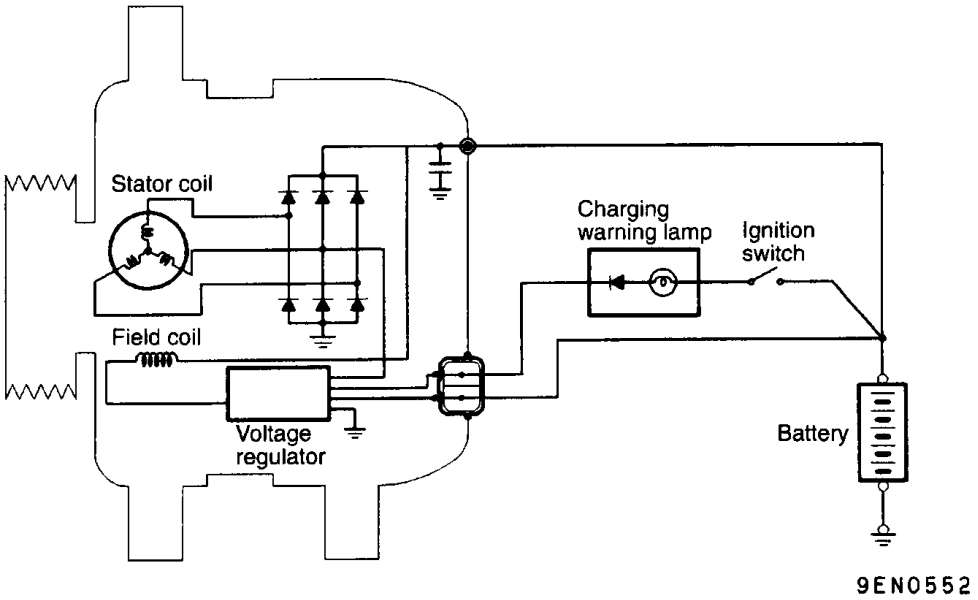


OPERATION

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.
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. 14.4 V, 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.

SYSTEM DIAGRAM



ALTERNATOR SPECIFICATIONS

Items	Only 1.6L-M/T	Except 1.6L-M/T
Type	Battery voltage sensing	Battery voltage sensing
Rated output V/A	12/70	12/90
Voltage regulator	Electronic built-in type	Electronic built-in type

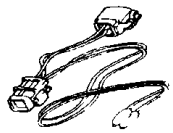
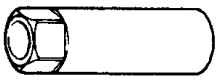
SERVICE SPECIFICATIONS

16100030033

Items		Standard value	Limit
Alternator output line voltage drop (at 30A) V		–	max. 0.3
Regulated voltage ambient temp. at voltage regulator V	–20°C	14.2–15.4	–
	20°C	13.9–14.9	–
	60°C	13.4–14.6	–
	80°C	13.1–14.5	–
Output current		–	70% of normal output current
Rotor coil resistance		Approx. 2.6	–

SPECIAL TOOL

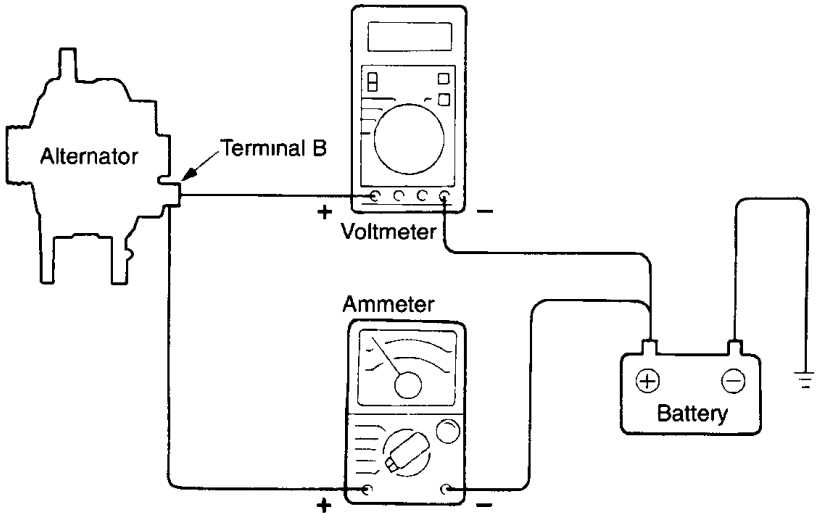
16100060025

Tool	Number	Name	Use
	MD998467	Alternator harness connector	Checking the alternator (S terminal voltage)
	MD998703	Oxygen sensor wrench	Alternator pulley removal and installation

ON-VEHICLE SERVICE

16100090031

ALTERNATOR OUTPUT LINE VOLTAGE DROP TEST



5ELD015

This test determines whether the wiring from the alternator "B" terminal to the battery (+) terminal (including the fusible line) 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 11A – On-vehicle Service.)
- Fusible link
- Abnormal noise from the alternator while the engine is running

(2) Turn the ignition switch off.

(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 0–100 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 should be recommended. Using this equipment will lessen the possibility of a voltage drop caused by a loose "B" terminal connection.

(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 the connect the (–) lead of the voltmeter to the battery (+) cable.)

(6) Connect a tachometer. (For the procedure for connecting the tachometer, refer to GROUP 11A – On-vehicle Service.)
(7) Reconnect the negative battery cable.
(8) Leave the hood open.
(9)Start the engine.
(10)With the engine running at 2,500 r/min, turn the headlamps and other lamps on and off to adjust the alternator load so that the value displayed on the ammeter is slightly above 30 A.
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.

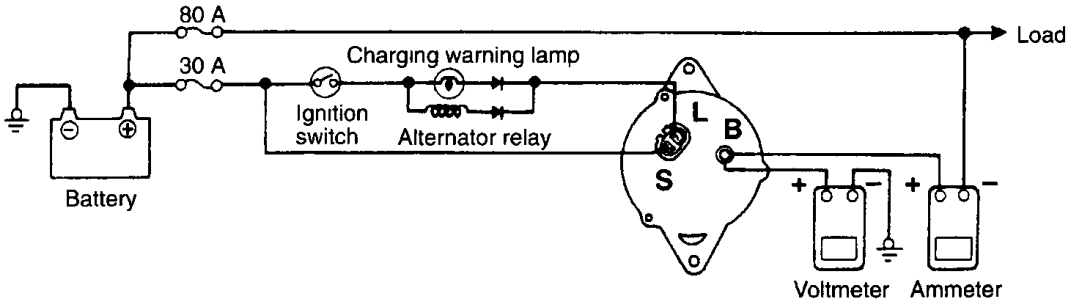
Limit: max. 0.3 V

NOTE
When the alternator output is high and the value displayed on the ammeter does not decrease until 30 A, set the value to 40 A. Read 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 discolored due to overheating, repair and then test again.
(12)After the test, run the engine at idle.
(13)Turn all lamps and the ignition at idle.
(14)Disconnect the negative batter 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

16100100031



16P0482

This test determines whether the 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 used battery should be slightly discharged. The load needed by a fully-charged battery is insufficient for an accurate test.

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

(2) Turn the ignition switch off.
(3) Disconnect the negative battery cable.
(4) Disconnect the alternator output wire from the alternator "B" terminal. Connect a DC test ammeter with a range of 0–100 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal. Connect the (–) lead of the ammeter to the disconnected output wire.)

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 should be recommended.

(5) Connect a voltmeter with a range of 0–20 V between the alternator "B" terminal and the earth. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (–) lead of the voltmeter to the earth.)
(6) Connect a tachometer. (For the procedure for connecting the tachometer, refer to GROUP 11A – On-vehicle Service.)
(7) Connect the negative battery cable.
(8) Leave the hood open.
(9) 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 "B" terminal and the battery (+) terminal.

(10) Turn the light switch on to turn on headlamps and then start the engine.
(11) Immediately after setting the headlamps to high beam and turning the heater blower switch to the high revolution position, increase the engine speed to 2,500 r/min and read the maximum current output value displayed on the ammeter.

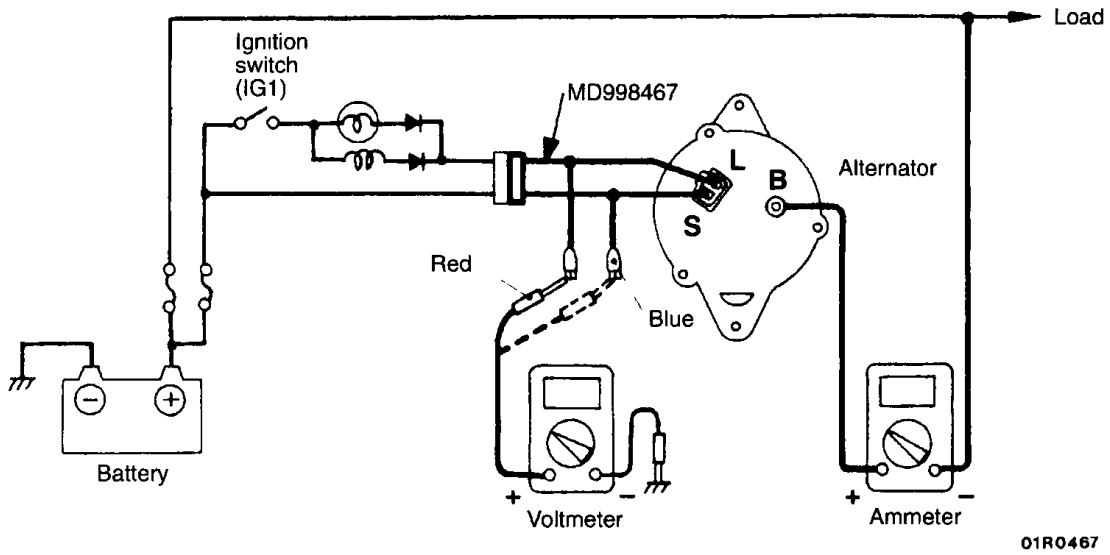
Limit: 70% of normal current output

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 headlamps 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 after the test.
(14) Turn the ignition switch off.
(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

16100110034



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

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

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

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

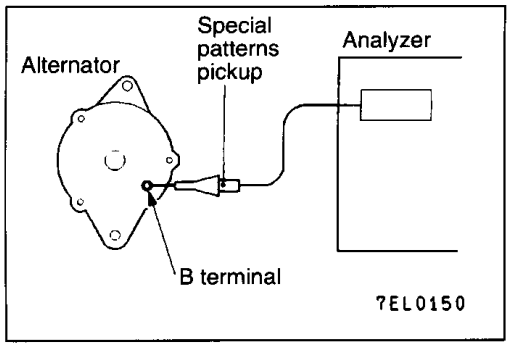
(10) Turn all lamps and accessories off.
(11) Start the engine.
(12) Increase the engine speed to 2,500 r/min.
(13) Read the value displayed on the voltmeter when the alternator output current alternator becomes 10 A or less.

(14)If the voltage reading conforms to the value in the voltage regulation, then the voltage regulator is operating normally.
If the voltage is not within the standard value, there is a malfunction of the voltage regulator or of the alternator.
(15)After the test, lower the engine speed to the idle speed.
(16)Turn the ignition switch off.
(17)Disconnect the negative batter cable.
(18)Disconnect the ammeter, voltmeter and tachometer.
(19)Connect the alternator output wire to the alternator "B" terminal.
(20)Connect the negative battery cable.

Voltage Regulation Table

Standard value:

Inspection terminal	Voltage regulator ambient temperature °C	Voltage V
Terminal "S"	−20	14.2−15.4
	20	13.9−14.9
	60	13.4−14.6
	80	13.1−14.5



WAVEFORM CHECK USING AN ANALYZER

16100120037

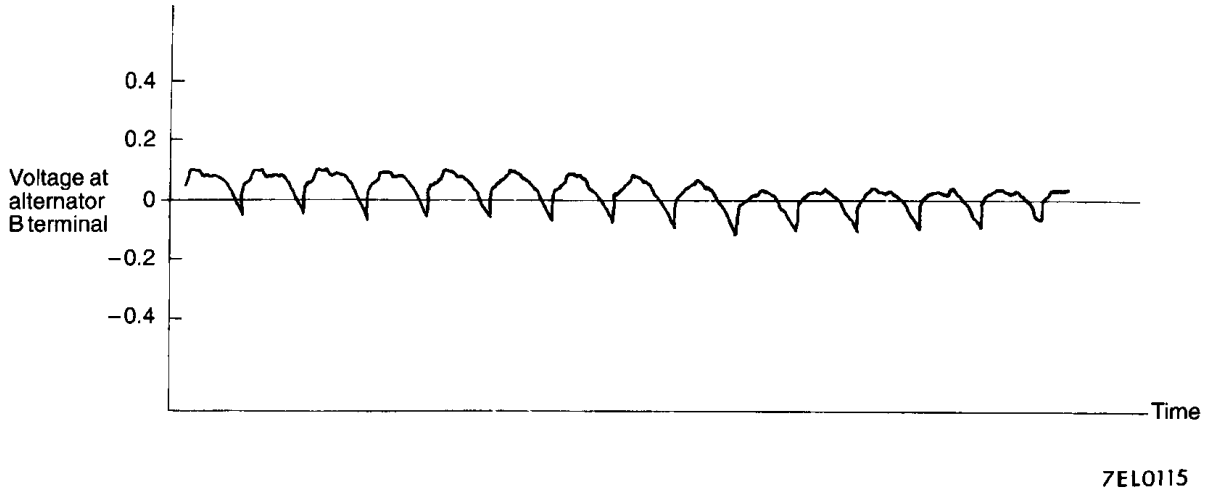
MEASUREMENT METHOD

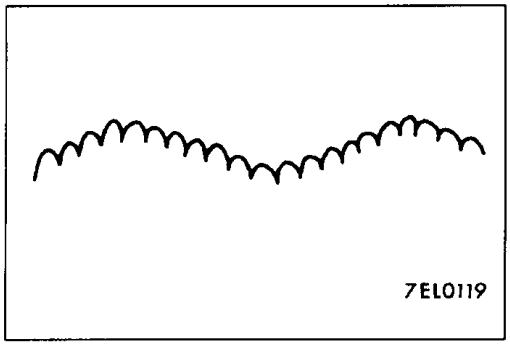
Connect the analyzer special patterns pick-up to the alternator B terminal.

STANDARD WAVEFORM

Observation Conditions

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

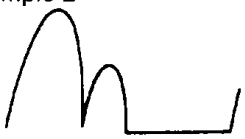




NOTE
The voltage waveform of the alternator B terminal can undulate as shown at left. This waveform is produced when the regulator operates according to fluctuations in the alternator load (current), and is normal for the alternator.

EXAMPLES OF ABNORMAL WAVEFORMS

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

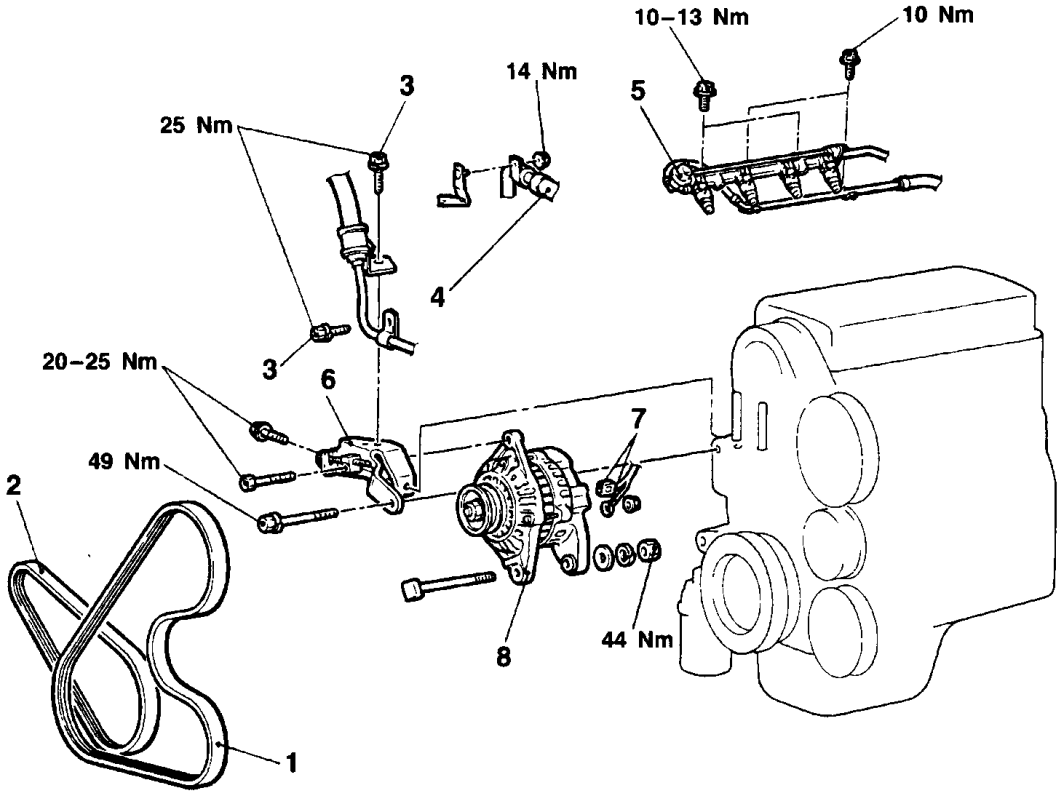
Abnormal waveforms	Problem cause	Abnormal waveforms	Problem cause
Example 1 A7EL0120	• Open diode	Example 4 A7EL0123	• Short in stator coil
Example 2  A7EL0121	• Short in diode	Example 5 A7EL0124 At this time, the charging warning lamp is illuminated.	• Open supplementary diode
Example 3 A7EL0122	• Broken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

ALTERNATOR

16100140071

REMOVAL AND INSTALLATION

Post-installation Operation
- Drive Belt Tension Adjustment
  (Refer to GROUP 11A – On-vehicle Service.)



A16U0046

Removal steps

1. Drive belt (Power steering, A/C)
2. Drive belt (Alternator)
3. Oil pressure tube clamp bolts

◀A▶ 4. A/C hose connection

◀A▶ 5. Delivery pipe and fuel return pipe assembly <DOHC>
6. Alternator brace
7. Alternator connector
8. Alternator

REMOVAL SERVICE POINT

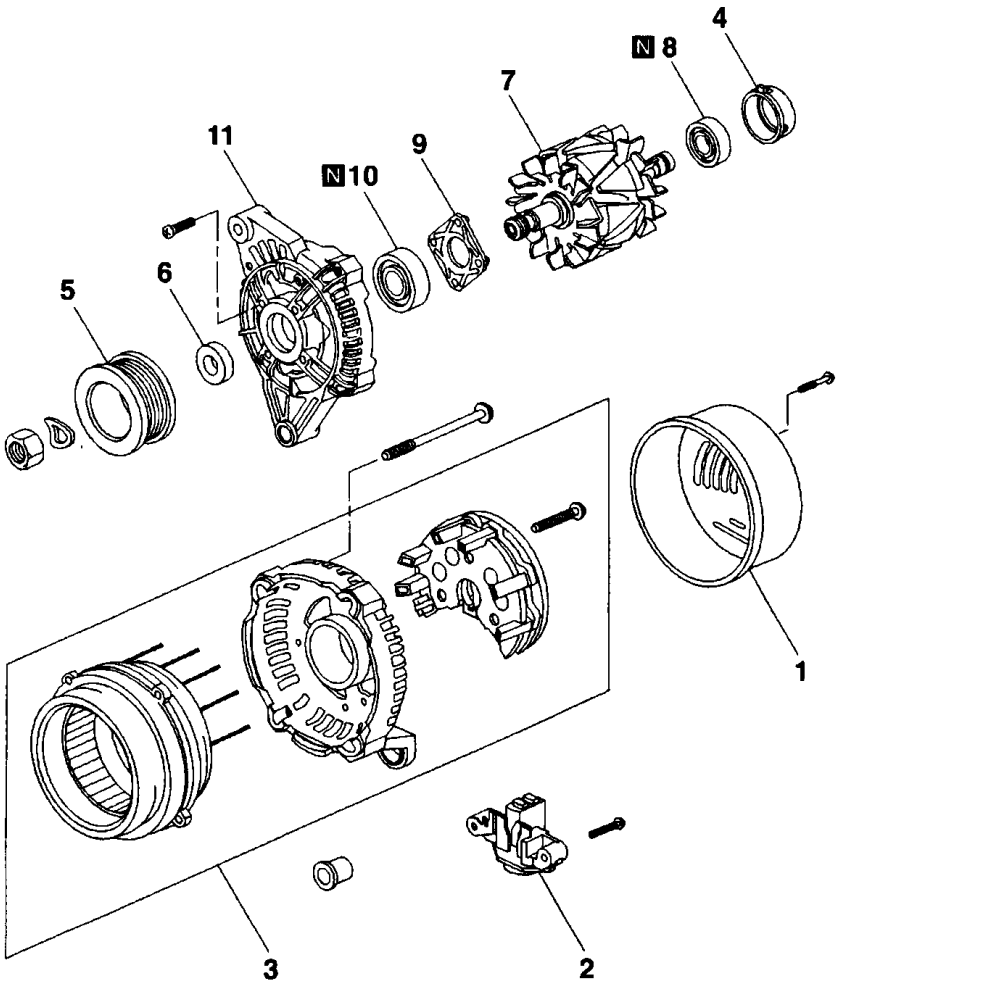
◀A▶ A/C HOSE CONNECTION/DELIVERY PIPE AND FUEL RETURN HOSE ASSEMBLY REMOVAL

NOTE
Move the respective parts slightly to make enough space for removal of the alternator.

Caution
Care must be taken, when removing the delivery pipe, not to drop the injector.

DISASSEMBLY AND REASSEMBLY

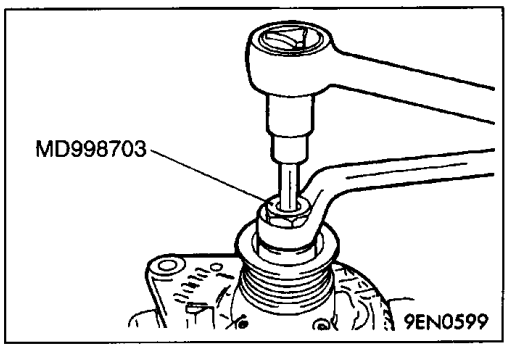
16100160084



9EN0598

Disassembly steps

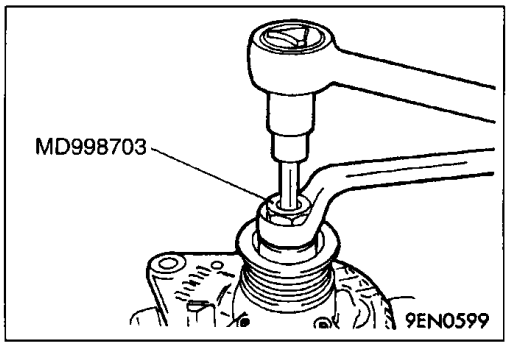
1. Rear end cover
2. Brush holder assembly
3. Stator and rectifier assembly
4. Bearing cover
◀A▶ ▶A◀ 5. Alternator pulley
6. Space collar
7. Rotor assembly
8. Rear bearing
9. Bearing retainer
10. Front bearing
11. Front bracket



DISASSEMBLY SERVICE POINT

◀A▶ ALTERNATOR PULLEY REMOVAL

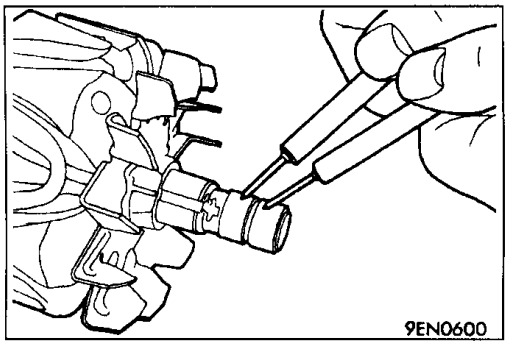
1. Clamp the front bracket in a vise with soft jaws.
2. Use the special tool and a box wrench to hold the nut. Then attach a double hexagonal wrench to the rotor shaft and loosen the nut.



REASSEMBLY SERVICE POINT

▶A◀ ALTERNATOR PULLEY INSTALLATION

1. Clamp the front bracket in a vise with soft jaws.
2. Use the special tool and a box wrench to hold the nut. Then attach a double hexagonal wrench to the rotor shaft and tighten the nut.

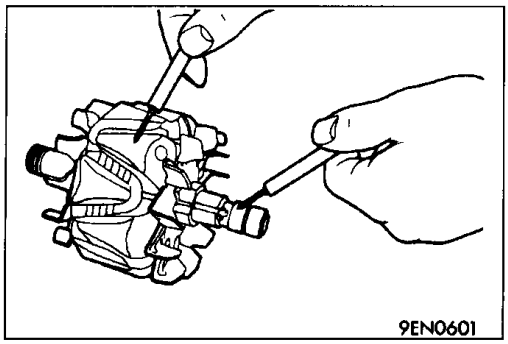


INSPECTION 16100170087

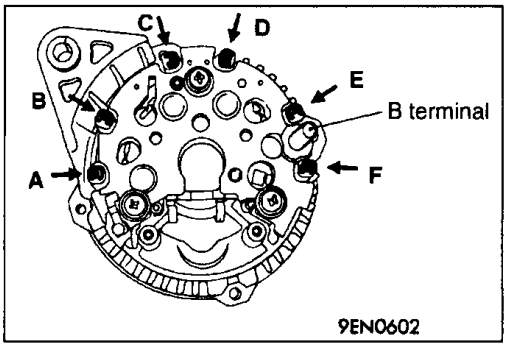
ROTOR

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

   Resistance value: Approx. 2.6 Ω

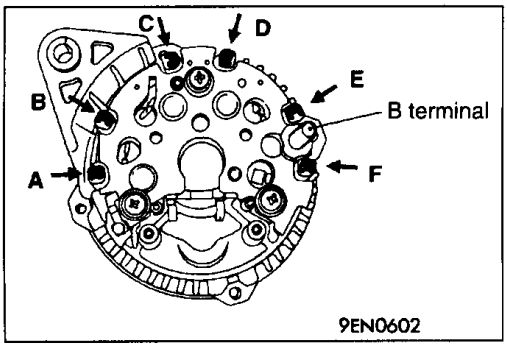


2. Check field coil for grounding. Check to ensure that there is no continuity between slip ring and core. If there is continuity, replace rotor assembly.



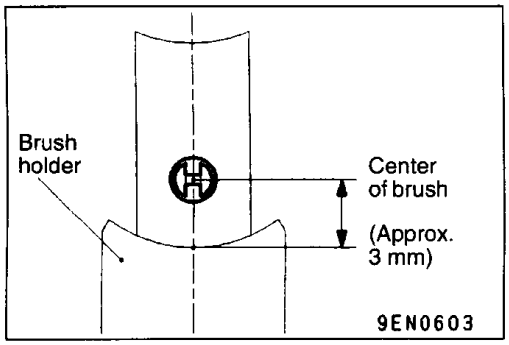
STATOR

1. Carry out a continuity test for the stator coil. Check that there is continuity between coil leads (A)–(B), (C)–(D) and (E)–(F).
   If there is no continuity, replace the stator and rectifier assembly.
2. Check the earth connection of the stator coil. Check that there is no continuity between each coil lead and the core.
   If there is continuity, replace the stator and rectifier assembly.



RECTIFIERS

1. Check the continuity between terminal (B) and coil leads (A), (C) and (E). If there is continuity in both directions, there is a short-circuit in the diode, so replace the stator and rectifier assembly.
2. Check the continuity between coil leads (B), (D) and (F) and the earth. If there is continuity in both directions, there is a short-circuit in the diode, so replace the stator and rectifier assembly.



BRUSH

If the brush has been worn down to the centre of the mark (3 mm from the centre of the brush holder), replace the brush holder assembly.

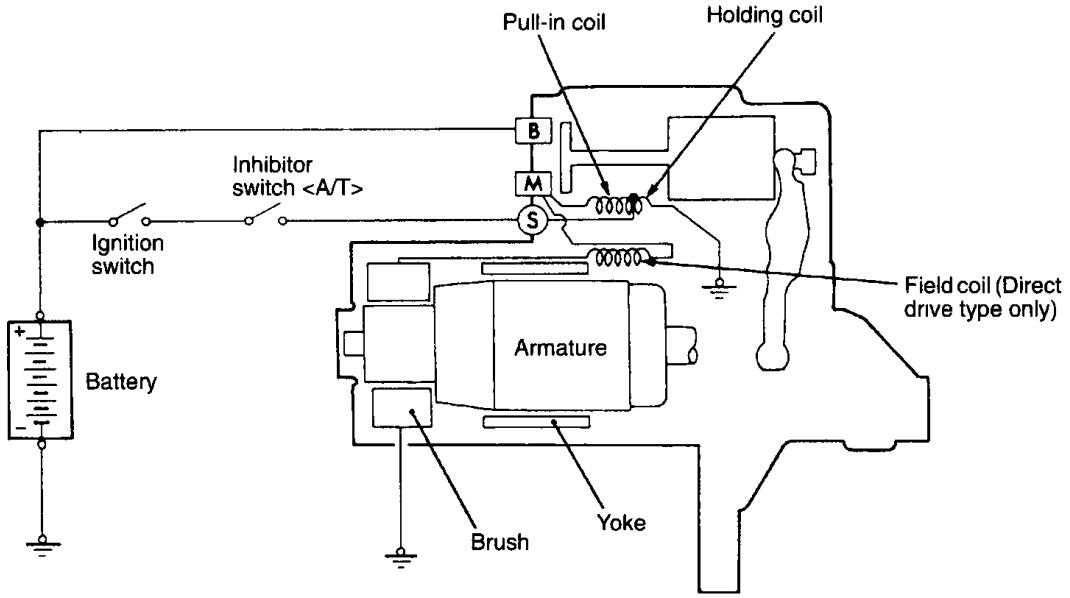
STARTING SYSTEM

16200010030

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. On the other hand, 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.

SYSTEM DIAGRAM



9EN0288

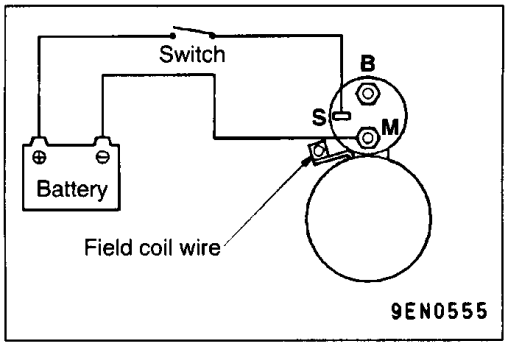
STARTER MOTOR SPECIFICATIONS

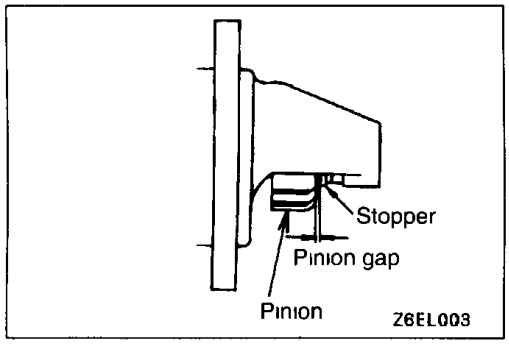
Items	M/T	A/T
Type	Reduction drive with planetary gear	Direct drive
Rated output kW/V	0.9/12	0.9/12
No. of pinion teeth	8	8

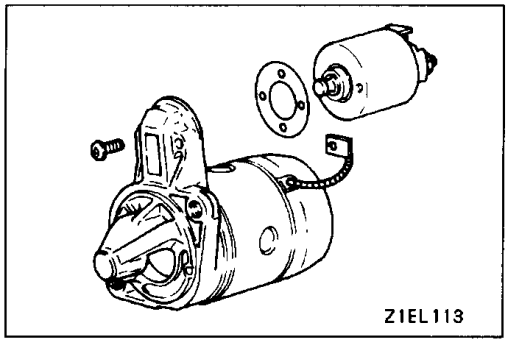
SERVICE SPECIFICATIONS

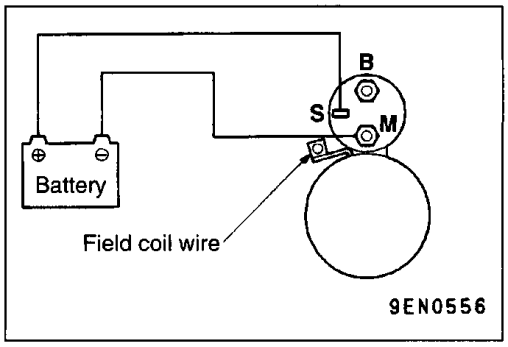
16200030029

Items	Standard value	Limit
Pinion gap <Direct drive type> mm	0.5–2.0	–
Commutator outer diameter <Direct drive type> mm	32.0	31.0
Commutator runout <Direct drive type> mm	0.05	0.1
Commutator undercut <Direct drive type> mm	0.5	0.2
Brush length <Reduction drive type> mm	–	11









STARTER MOTOR

16200110020

INSPECTION

PINION GAP ADJUSTMENT <Direct drive type>

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

   Pinion gap: 0.5–2.0 mm

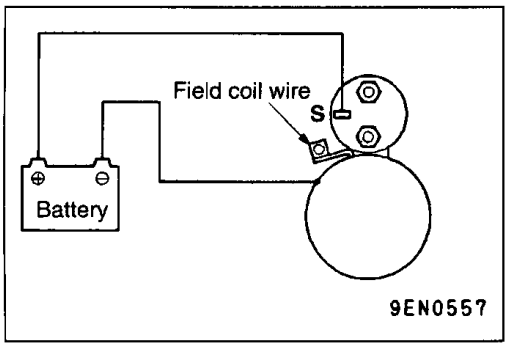
5. If pinion gap is out of specification, adjust by adding or removing gaskets between magnetic switch and front bracket.

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.

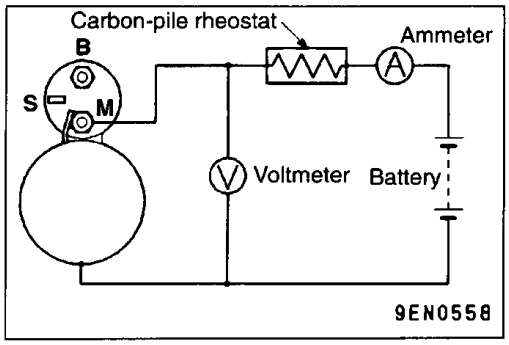
3. If pinion moves out, then pull-in coil is good. If it doesn't, replace magnetic switch.



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.

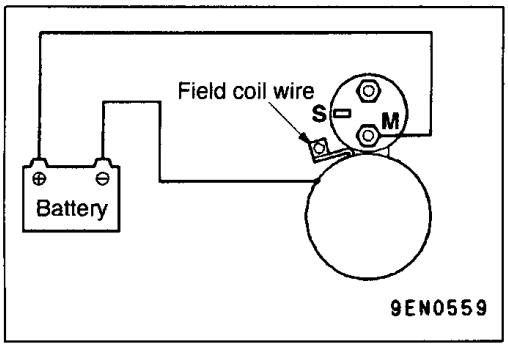
   Caution
   This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.
3. Manually pull out the pinion as far as the pinion stopper position.
4. If pinion remains out, everything is in order. If pinion moves in, hold-in circuit is open. Replace magnetic switch.



FREE RUNNING TEST

1. Place starter motor in a vise equipped with soft jaws and connect a fully-charged 12-volt battery to starter motor as follows:
2. Connect a test ammeter (100-ampere scale) and carbon pile rheostat in series with battery positive post and starter motor terminal.
3. Connect a voltmeter (15-volt scale) across starter motor.
4. Rotate carbon pile to full-resistance position.
5. Connect battery cable from battery negative post to starter motor body.
6. Adjust the rheostat until the battery voltage shown by the voltmeter is 11.5V.
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

   Current: max. 60 Amps



MAGNETIC SWITCH RETURN TEST

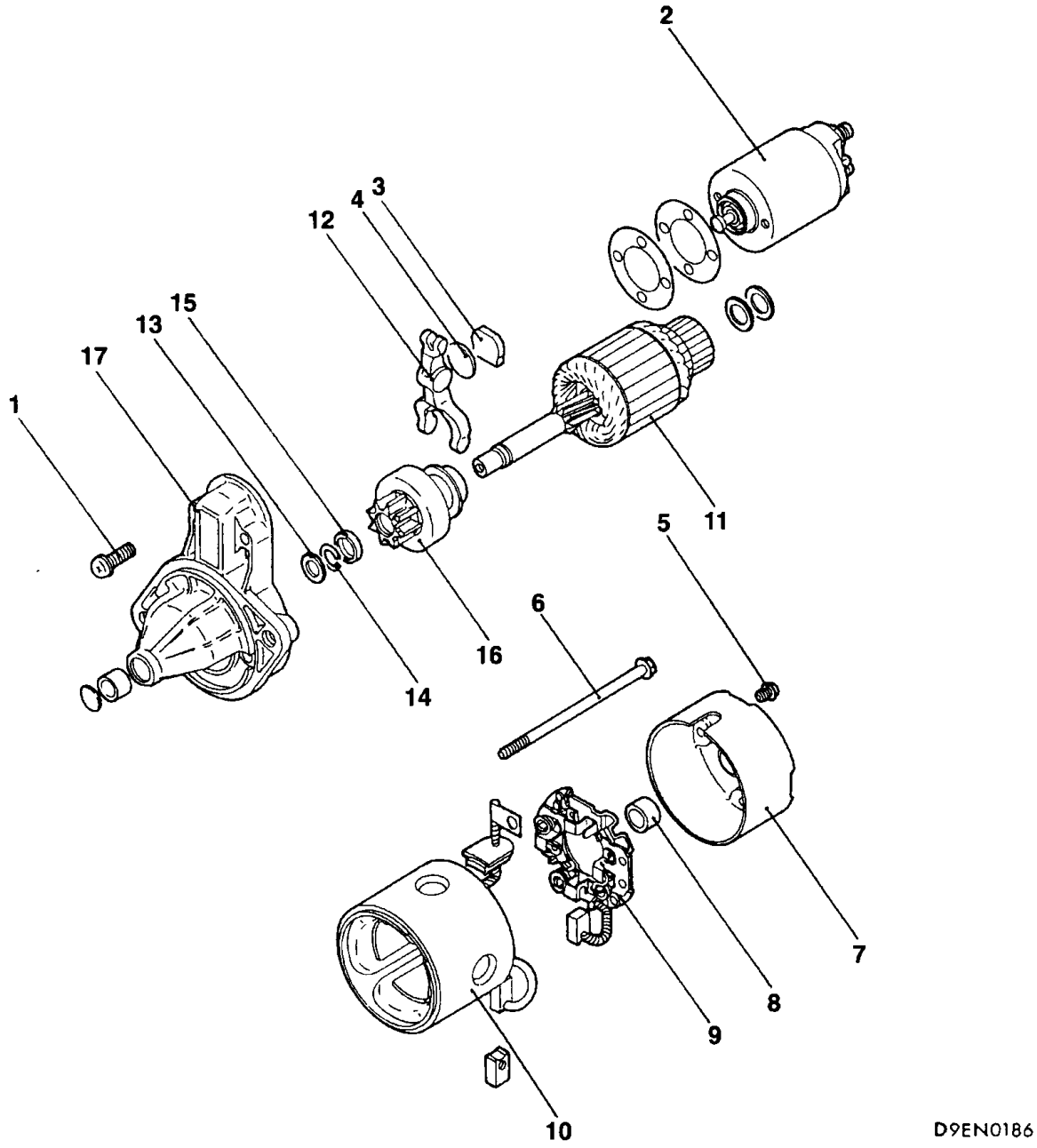
1. Disconnect field coil wire from M-terminal of magnetic switch.
2. Connect a 12V battery between M-terminal and body.

   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.

   Caution
   Be careful not to get your fingers caught when pulling out the pinion.

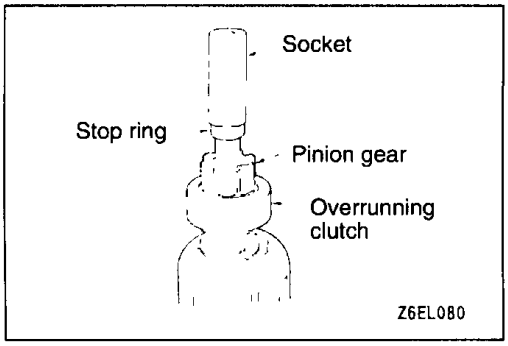
DISASSEMBLY AND REASSEMBLY <DIRECT DRIVE TYPE>

16200120085



Disassembly steps

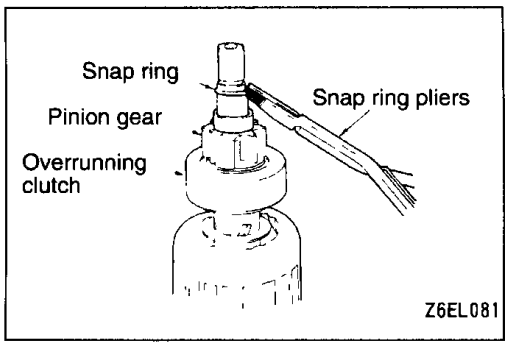
1. Screw
2. Magnetic switch
3. Packing
4. Plate
5. Screw
6. Through bolt
7. Rear bracket
8. Rear bearing
9. Brush holder assembly
10. Yoke assembly
11. Armature
12. Lever
13. Washer
14. ◀A▶ ▶A◀ Snap ring
15. ◀A▶ ▶A◀ Stop ring
16. Overrunning clutch
17. Front bracket



DISASSEMBLY SERVICE POINTS

◀A▶ SNAP RING/STOP RING REMOVAL

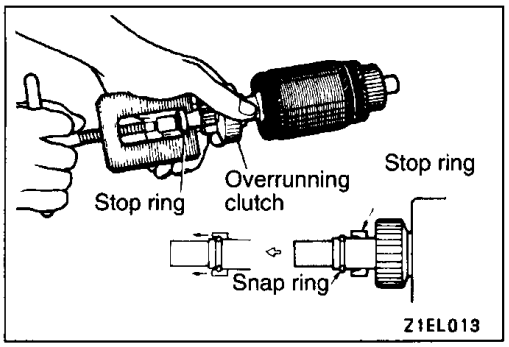
1. Press stop ring off snap ring with a suitable socket.



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

STARTER MOTOR PARTS CLEANING

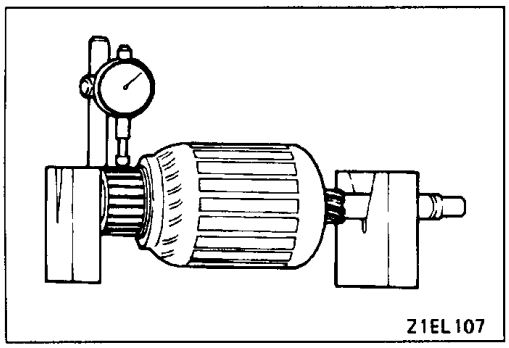
1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from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



REASSEMBLY SERVICE POINTS

▶A◀ STOP RING/SNAP RING INSTALLATION

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

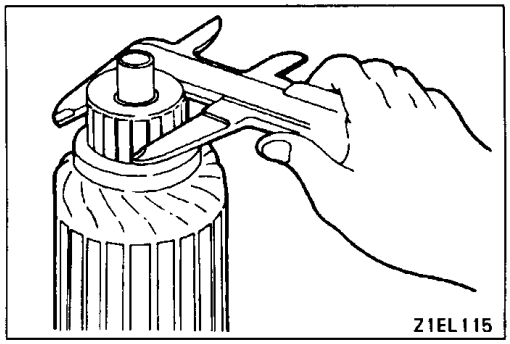

Z1EL107

INSPECTION

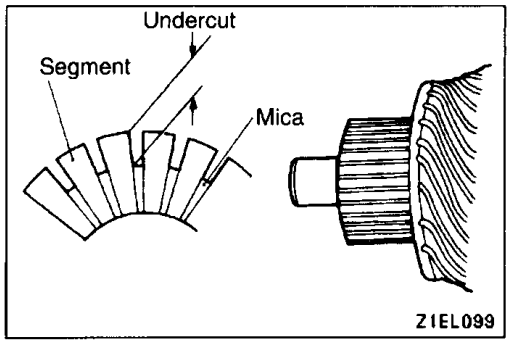
16200130088

COMMUTATOR

1. Place the armature in a pair of "V" blocks and check the runout with a dial indicator.
   Standard value: 0.05 mm
   Limit: 0.1 mm

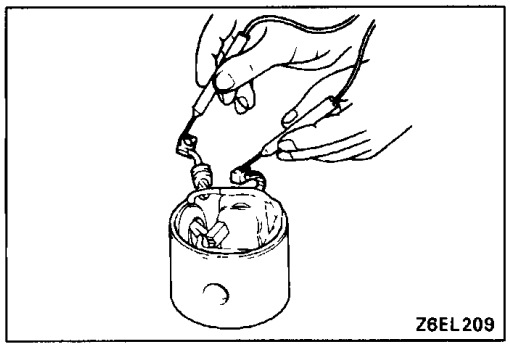

Z1EL115

2. Measure the commutator outer diameter.
   Standard value: 32.0 mm
   Limit: 31.0 mm



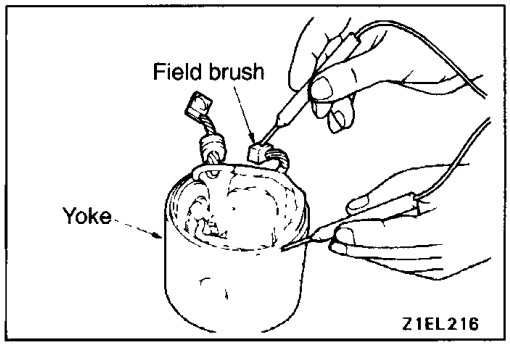
Z1EL099

3. Check the undercut depth between segments.
   Standard value: 0.5 mm
   Limit: 0.2 mm


Z6EL209

FIELD COIL OPEN-CIRCUIT TEST

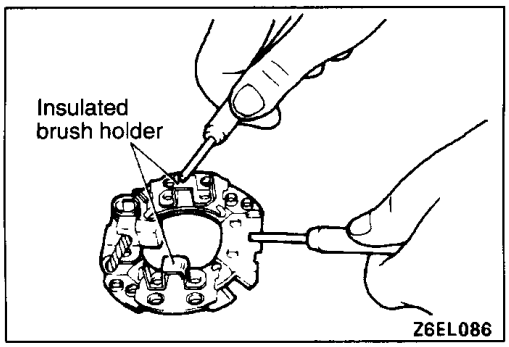
Check the continuity between field brushes. If there is continuity, the field coil is in order.



Z1EL216

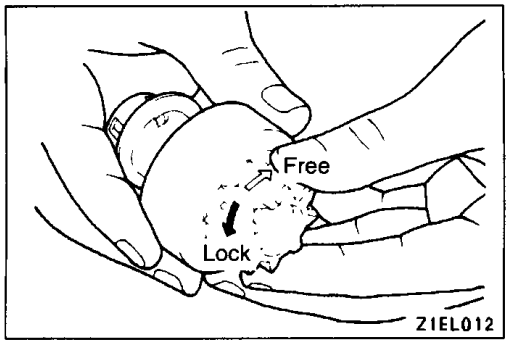
FIELD COIL GROUND TEST

Check the continuity between field coil brush and yoke. If there is no continuity, the field coil is free from earth.



BRUSH HOLDER

Check the continuity between brush holder plate and brush holder.
If there is no continuity, the brush holder is in order.

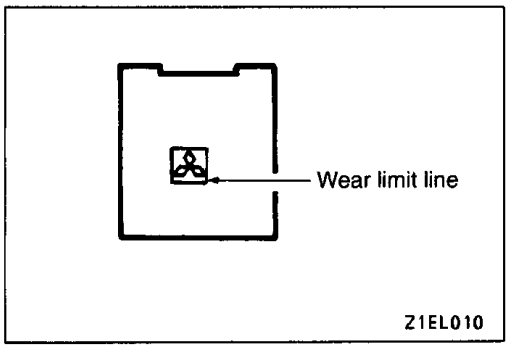


OVERRUNING CLUTCH

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.

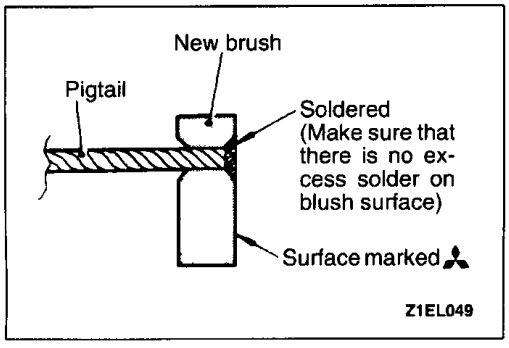
FRONT AND REAR BRACKET BUSHING

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

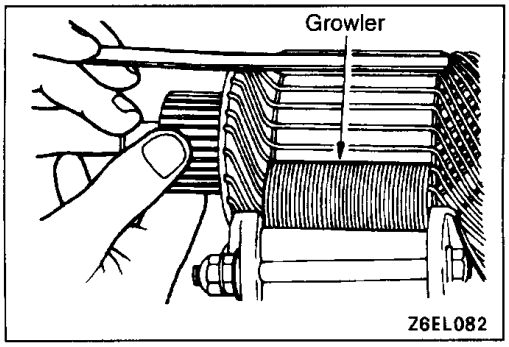


BRUSH AND SPRING REPLACEMENT

1. Brushes that are worn beyond wear limit line, or are oil-soaked, should be replaced.
2. When replacing field coil brushes, crush worn brush with pliers, taking care not to damage pigtail.



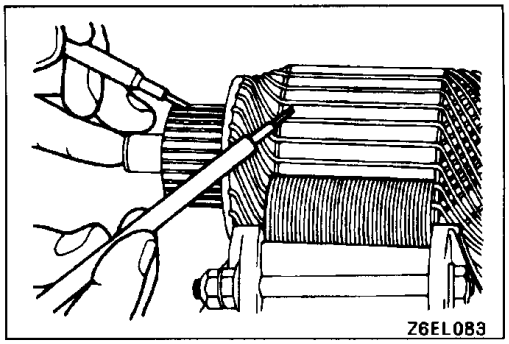
3. Sand pigtail end with sandpaper to ensure good soldering.
4. Insert pigtail into hole provided in new brush and solder it.
   Make sure that pigtail and excess solder do not come out onto brush surface.
5. When replacing ground brush, slide the brush from brush holder by prying retainer spring back.



ARMATURE TEST

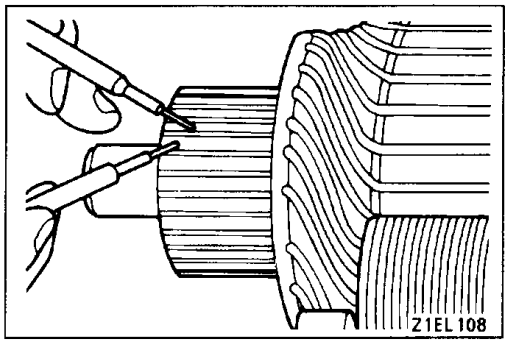
ARMATURE SHORT-CIRCUIT TEST

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



ARMATURE COIL EARTH TEST

Check the insulation between each commutator segment and armature coil core.
If there is no continuity, the insulation is in order.

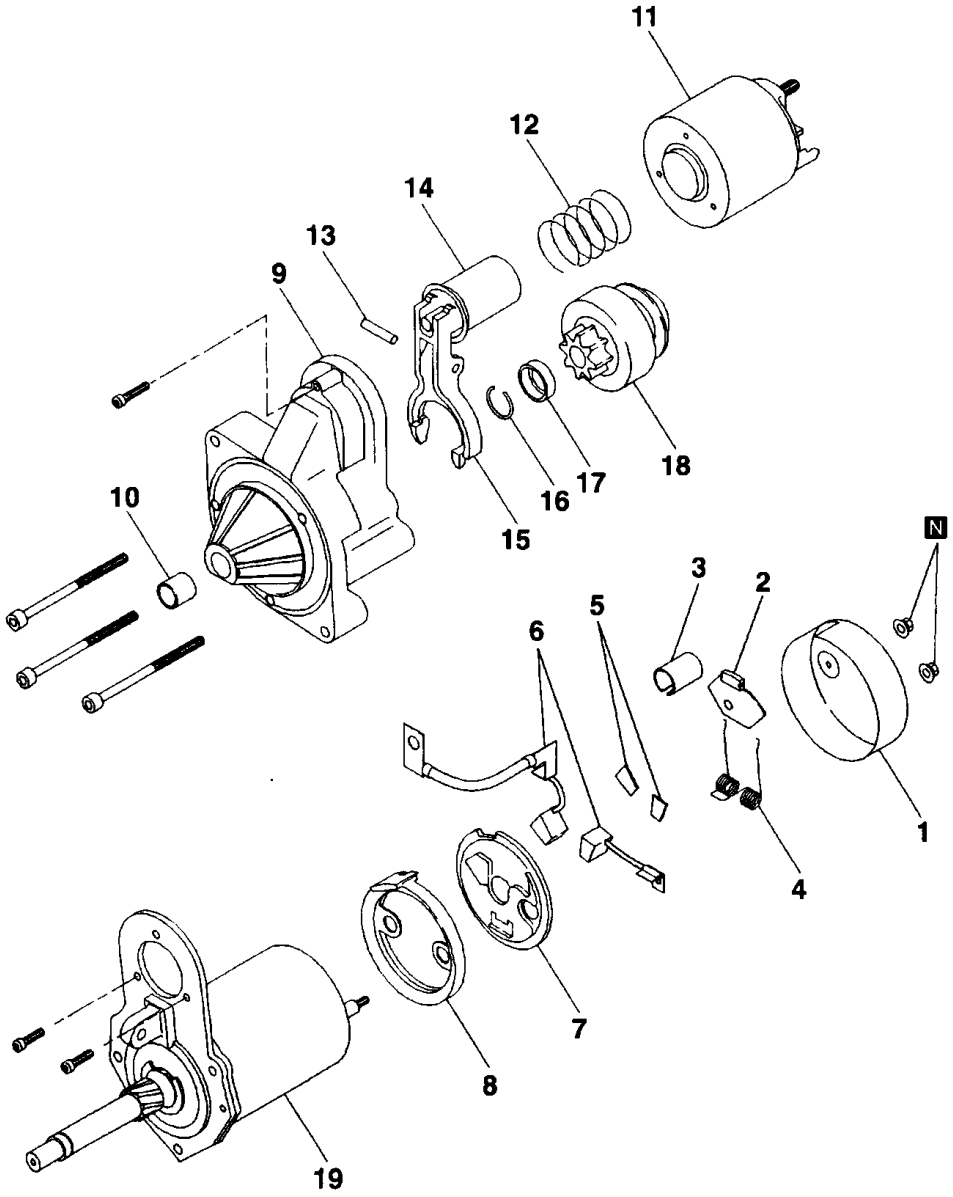


ARMATURE COIL OPEN-CIRCUIT INSPECTION

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

DISASSEMBLY AND REASSEMBLY <REDUCTION DRIVE TYPE>

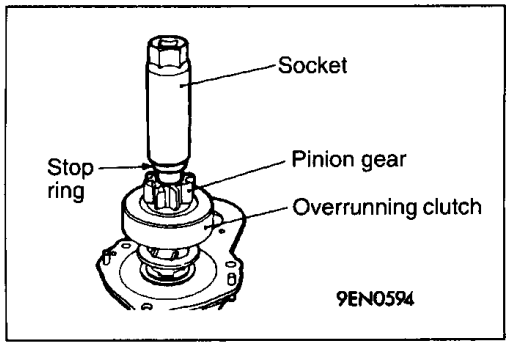
16200120115



9EN0593

Disassembly steps

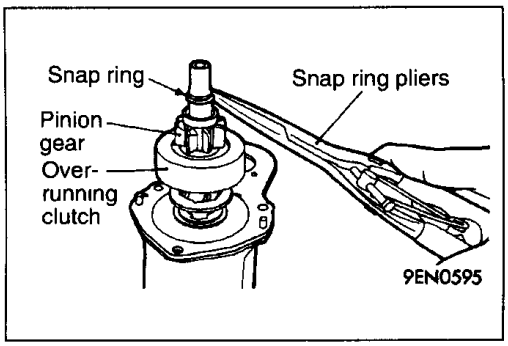
1. Rear cover
2. Rubber
3. Cover
4. Brush spring
5. Plate
6. Brush
7. Brush holder
8. Packing
9. Front bracket
10. Bushing
11. Magnetic switch
12. Spring
13. Pin
14. Plunger
15. Lever
16. ◀A▶ ▶A◀ Snap ring
17. ◀A▶ ▶A◀ Stop ring
18. Overrunning clutch
19. Motor assembly



DISASSEMBLY SERVICE POINTS

◀A▶ SNAP RING/STOP RING REMOVAL

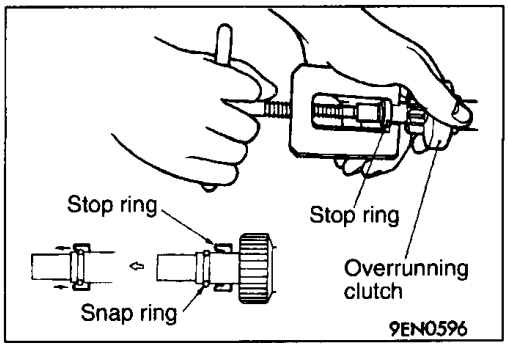
1. Press stop ring off snap ring with a suitable socket.



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

STARTER MOTOR PARTS CLEANING

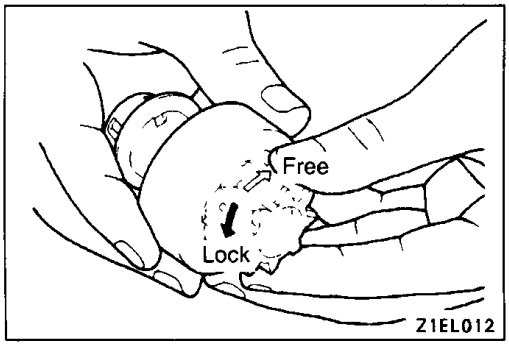
1. Do not immerse parts in cleaning solvent. Immersing the motor assembly will damage insulation. Wipe motor assembly with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from clutch.
3. The drive unit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

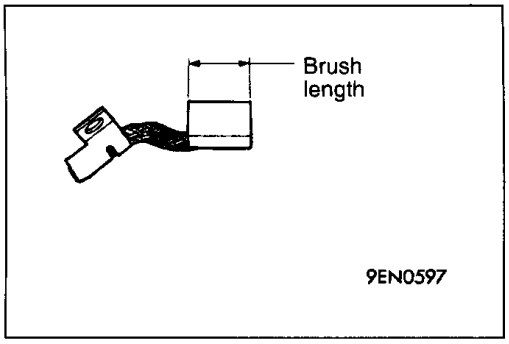


REASSEMBLY SERVICE POINTS

▶A◀ STOP RING/SNAP RING INSTALLATION

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





INSPECTION

16200130118

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.

BRUSH

1. Check the brush length.
   Limit: 11 mm

IGNITION SYSTEM

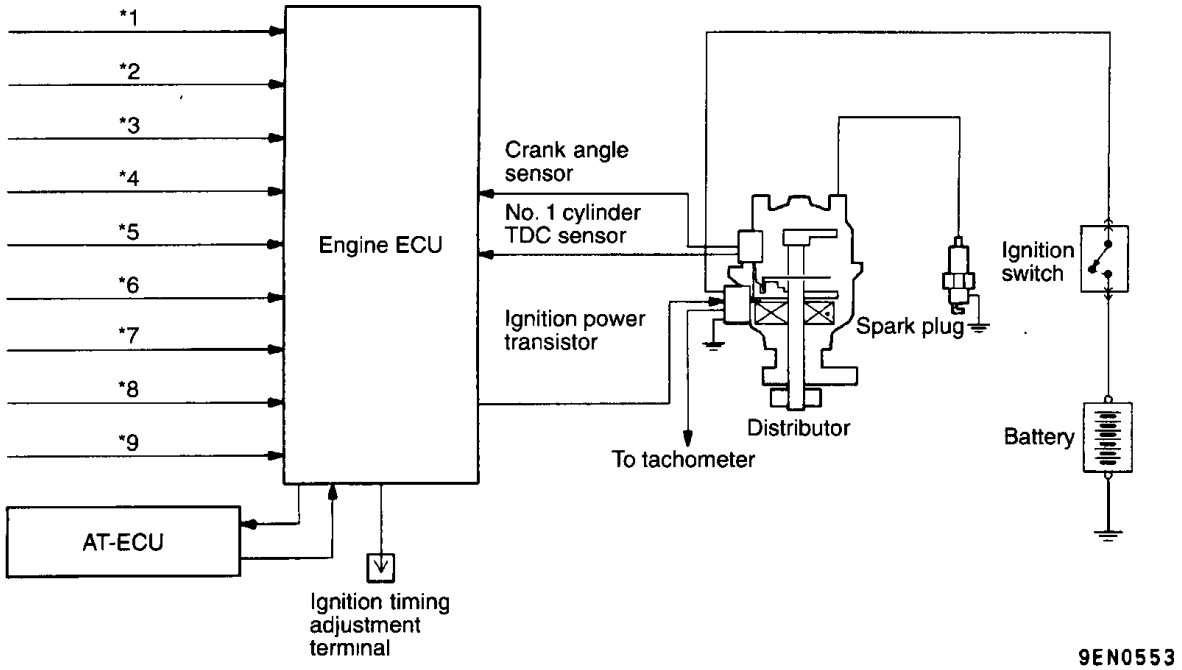
16300010033

GENERAL INFORMATION

<SOHC>

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 1–3–4–2 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 incorporated in the distributor 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.
Furthermore, if knocking occurs, the ignition timing is gradually retarded until knocking ceases.
When the automatic transmission shifts gears, the ignition timing is also retarded in order to reduce output torque, thereby alleviating shifting shocks.

SYSTEM DIAGRAM

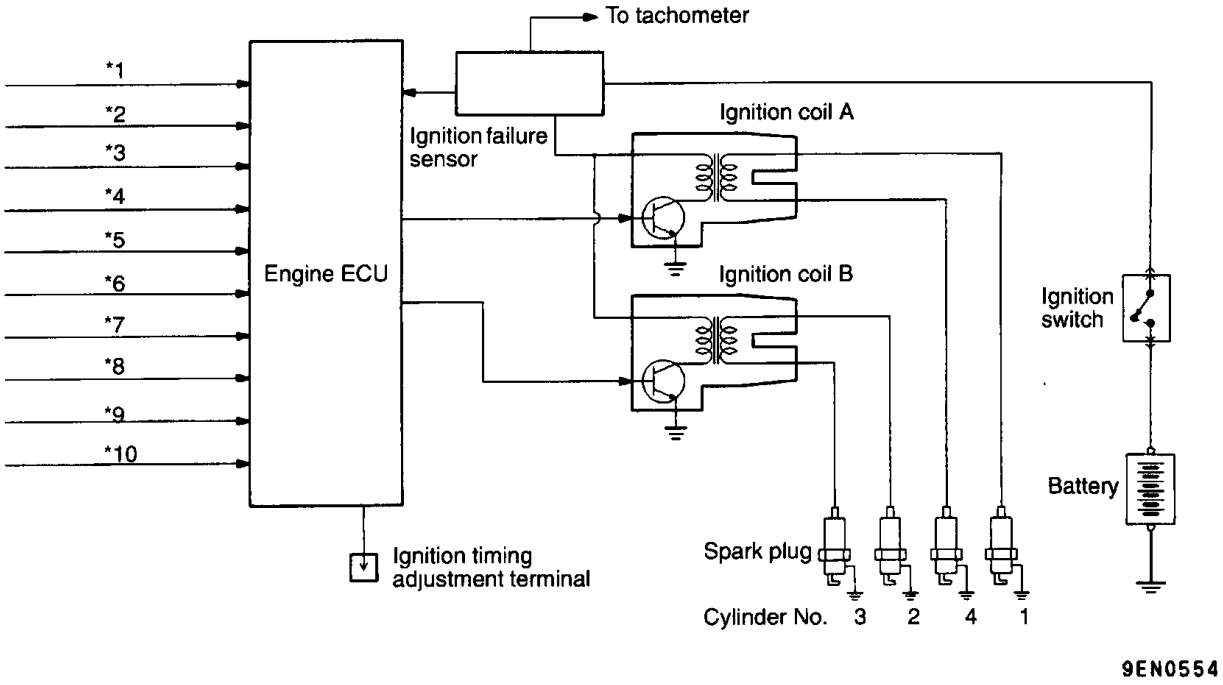


*1: Air flow sensor
*2: Barometric pressure sensor
*3: Intake air temperature sensor
*4: Engine coolant temperature sensor
*5: Idle position switch
*6: Detonation sensor
*7: Vehicle speed sensor
*8: Inhibitor switch
*9: Ignition switch-ST

<DOHC>

This system is equipped with two ignition coils (A and B) with built-in power transistors for the No. 1 and No. 4 cylinders and the No. 2 and No. 3 cylinders respectively.
Interruption of the primary current flowing in the primary side of ignition coil A generates a high voltage in the secondary side of ignition coil A.
The high voltage thus generated is applied to the spark plugs of No. 1 and No. 4 cylinders to generate sparks. At the time that the sparks are generated at both spark plugs, if one cylinder is at the compression stroke, the other cylinder is at the exhaust stroke, so that ignition of the compressed air/fuel mixture occurs only for the cylinder which is at the compression stroke.
In the same way, when the primary current flowing in ignition coil B is interrupted, the high voltage thus generated is applied to the spark plugs of No. 2 and No. 3 cylinders.
The engine-ECU turns the two power transistors inside the ignition coils alternately on and off. This causes the primary currents in the ignition coils to be alternately interrupted and allowed to flow to fire the cylinders in the order 1–3–4–2.
The engine ECU determines which ignition coil should be controlled by means of the signals from the camshaft position sensor which is incorporated in the camshaft and from the crankshaft position sensor which is incorporated in the crankshaft. It also detects the crankshaft position in order to provide ignition at the most appropriate timing in response to the engine operation conditions.
When the engine is cold or operated at high altitudes, the ignition timing is slightly advanced to provide optimum performance.
Furthermore, if knocking occurs, the ignition timing is gradually retarded until knocking ceases.

SYSTEM DIAGRAM



*1: Air flow sensor
*2: Barometric pressure sensor
*3: Intake air temperature sensor
*4: Engine coolant temperature sensor
*5: Idle position switch
*6: Camshaft position sensor
*7: Crank angle sensor
*8: Ignition switch-ST
*9: Detonation sensor
*10: Vehicle speed sensor

DISTRIBUTOR SPECIFICATIONS

Items	SOHC
Type	Contact pointless with built-in ignition coil
Advance mechanism	Electronic
Firing order	1–3–4–2

IGNITION COIL SPECIFICATIONS

Items	SOHC	DOHC
Type	Molded single-coil with a built-in distributor	Molded 2-coil

SPARK PLUG SPECIFICATIONS

Items	SOHC, DOHC
NGK	BKR6E-11
NIPPON DENSO	K20PR-U11
BOSCH	FR7DC
CHAMPION	RC9YC4

SERVICE SPECIFICATIONS

16300030039

IGNITION COIL

Items	SOHC	DOHC
Primary coil resistance Ω	0.5–0.7	–
Secondary coil resistance kΩ	21–30	17–25

IGNITION FAILURE SENSOR

Items	DOHC
Resistance Ω	0.1 or less

SPARK PLUG

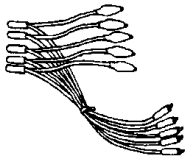
Items	SOHC, DOHC
Spark plug gap mm	1.0–1.1

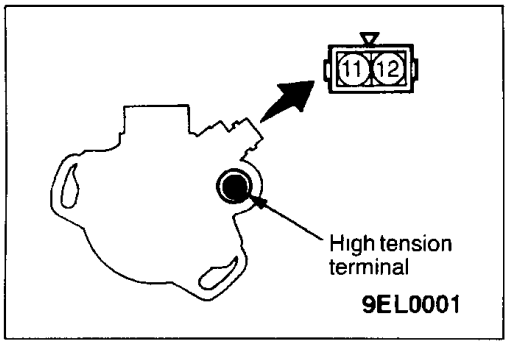
RESISTIVE CORD

Items	SOHC, DOHC
Resistance kΩ	max. 22

SPECIAL TOOL

16300060038

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



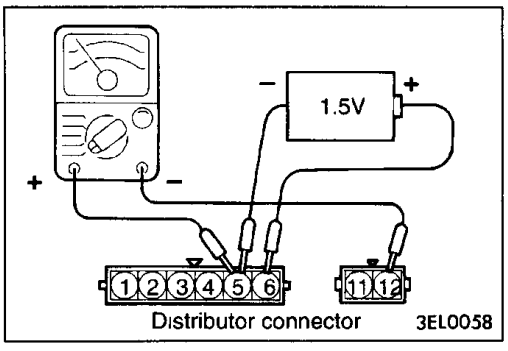
ON-VEHICLE SERVICE

16300120040

IGNITION COIL CHECK

<SOHC>

1. Measurement of the primary coil resistance
   Measure the resistance between connector terminal 11 and 12 of the distributor.
   Standard value: 0.5–0.7 Ω
2. Measurement of secondary coil resistance
   Measure the resistance between the high-voltage terminals and connector terminals 11 or 12.
   Standard value: 21–30 kΩ



POWER TRANSISTOR CONTINUITY CHECK

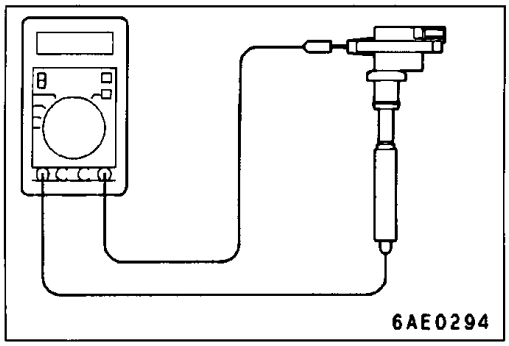
16300130043

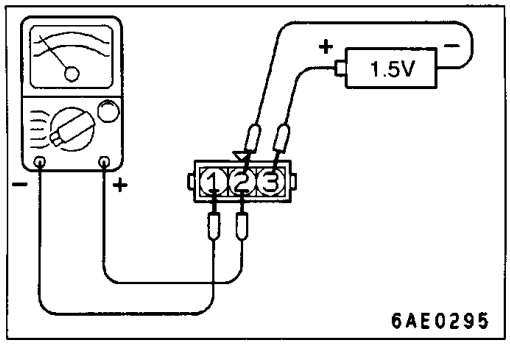
<SOHC>

NOTE
An analog-type circuit tester should be used.

Voltage: 1.5V	Terminal No.		
	5	6	12
When current is flowing	⊖	⊕	○
When current is not flowing			

Replace the power transistor if there is a malfunction.





IGNITION COIL (WITH BUILT-IN POWER TRANSISTOR) CHECK

16300120057

<DOHC>

Check by the following procedure, and replace if there is a malfunction.

SECONDARY COIL RESISTANCE CHECK

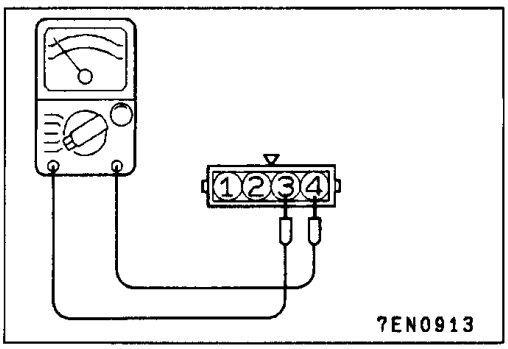
Measure the resistance between the high-voltage terminals of the ignition coil.

Standard value: 17–25 kΩ

PRIMARY COIL AND POWER TRANSISTOR CONTINUITY CHECK

NOTE
An analog-type circuit tester should be used.

Voltage: 1.5V	Terminal No.		
	1	2	3
When current is flowing	○	⊖	⊕
When current is not flowing			



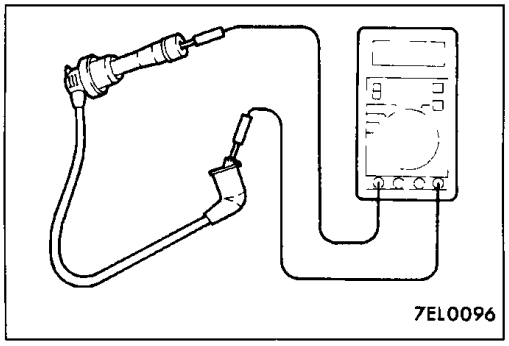
IGNITION FAILURE SENSOR CHECK <DOHC>

16300300017

NOTE
An analog-type circuit tester should be used.

Check that the resistance between terminals 3 and 4 is at the standard value.

Standard value: 0.1Ω or less



RESISTIVE CORD CHECK 16300140039

Measure the resistance of the all spark plug cables.
1. Check cap and coating for cracks.
2. Measure resistance.

   Limit: Max. 22 kΩ

DETONATION SENSOR CHECK 16300180031

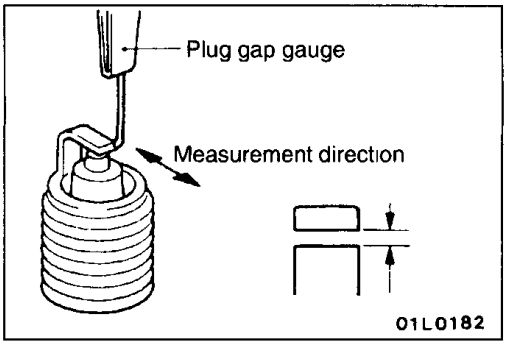
Check the detonation sensor circuit if self-diagnosis code, No. 31 is shown.

NOTE
For information concerning the self-diagnosis codes, after to GROUP 13A – Troubleshooting.

SPARK PLUG CHECK AND CLEANING 16300150056

1. Remove the spark plug cables.

   Caution
   When pulling off the spark plug cable from the plug always hold the cable cap, not the cable.
2. Remove the spark plugs.
3. Check for burned out electrode or damaged insulator. Check for even burning.
4. Remove carbon deposits with wire brush or plug cleaner. Remove sand from plug screw with compressed air.



5. Use a plug gap gauge to check that the plug gap is within the standard value range.

   Standard value: 1.0–1.1 mm

   If the plug gap is not within the standard value range, adjust by bending the earth electrode.
6. Clean the engine plug holes.

   Caution
   Be careful not to allow foreign matter in cylinders.
7. Install the spark plugs.

CRANK ANGLE SENSOR, TOP DEAD CENTER SENSOR <SOHC>, CAMSHAFT POSITION SENSOR, CRANKSHAFT POSITION SENSOR <DOHC> CHECK

16300260049

Refer to GROUP 13A – Troubleshooting.

WAVEFORM CHECK USING AN ANALYZER

16300170052

Ignition Secondary Voltage Check

<SOHC>

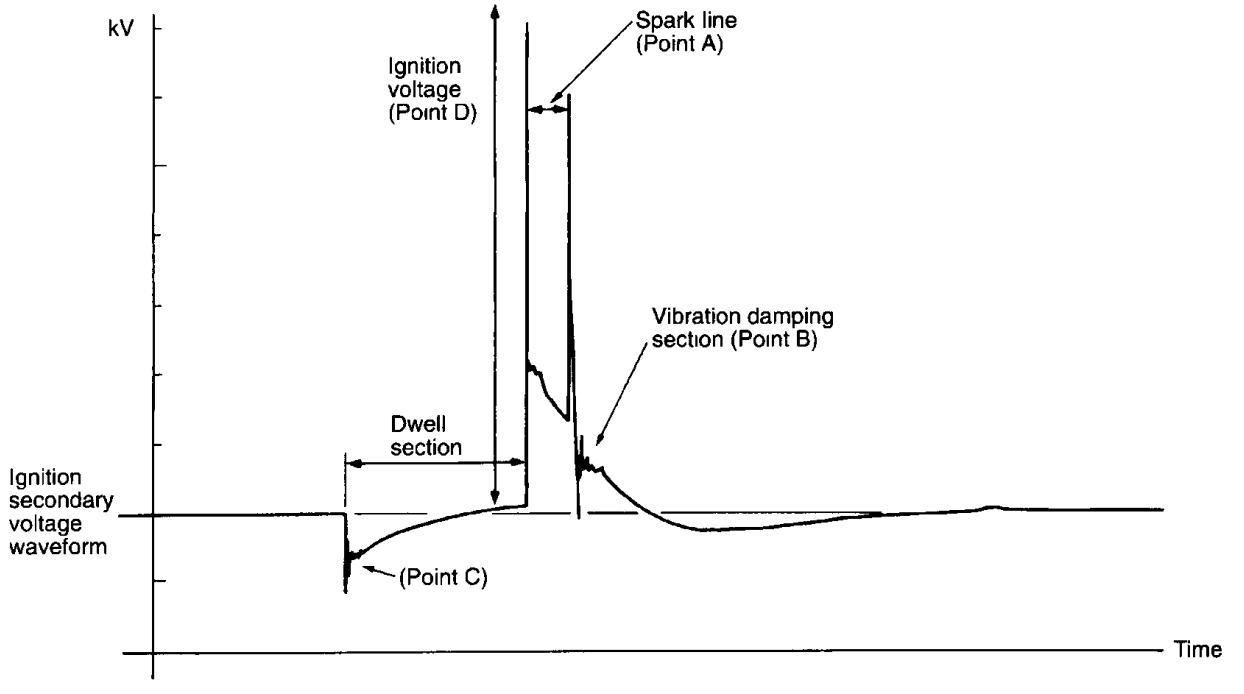
MEASUREMENT METHOD

1. Clamp the spark plug cable of the No. 1 cylinder with the secondary pickup and check the waveform.
2. Connect the secondary pickup to the other cylinders in turn and check the waveforms for each cylinder.

STANDARD WAVEFORM

Observation Conditions

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



7EL0128

WAVEFORM OBSERVATION POINTS

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

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
	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
	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

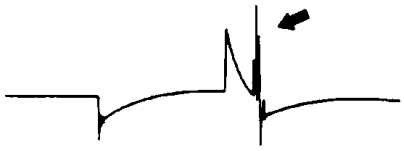
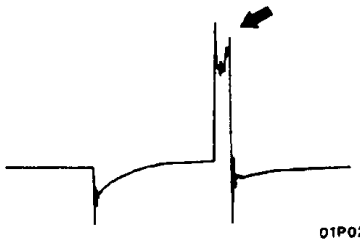
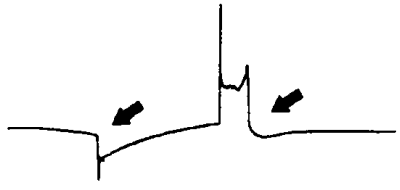
Point C: Number of vibrations at beginning of dwell section (Refer to abnormal waveform example 5)

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

EXAMPLES OF ABNORMAL WAVEFORMS

Abnormal waveform	Wave characteristics	Cause of problem
Example 1 01P0215	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 waveform 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.

<DOHC>

MEASUREMENT METHOD

1. Clamp the SECONDARY PICKUP around the spark plug cable.

   NOTE
   1. The peak ignition voltage will be reversed when the spark cables No. 2 and No. 4, or No. 1 and No. 3 cylinders are clamped.
   2. Because of the two-cylinder simultaneous ignition system, the waveforms for two cylinders in each group appear during waveform observation (No. 1 cylinder – No. 4 cylinder, No. 2 cylinder – No. 3 cylinder). However, waveform observation is only applicable for the cylinder with the spark plug cable clamped by the secondary pickup.
   3. Identifying which cylinder waveform is displayed can be difficult. For reference, remember that the waveform of the cylinder attached to the secondary pickup will be displayed as stable.

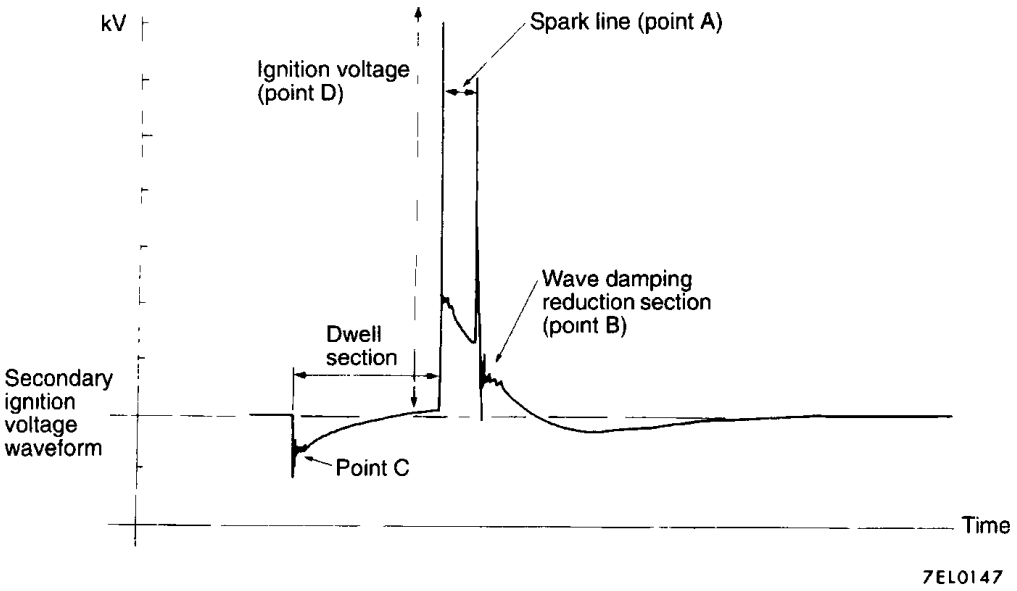
2. Clamp the spark plug cable with the trigger pickup.

   NOTE
   - Clamp the trigger pickup to the same spark plug cable clamped by the secondary pickup.

STANDARD WAVEFORM

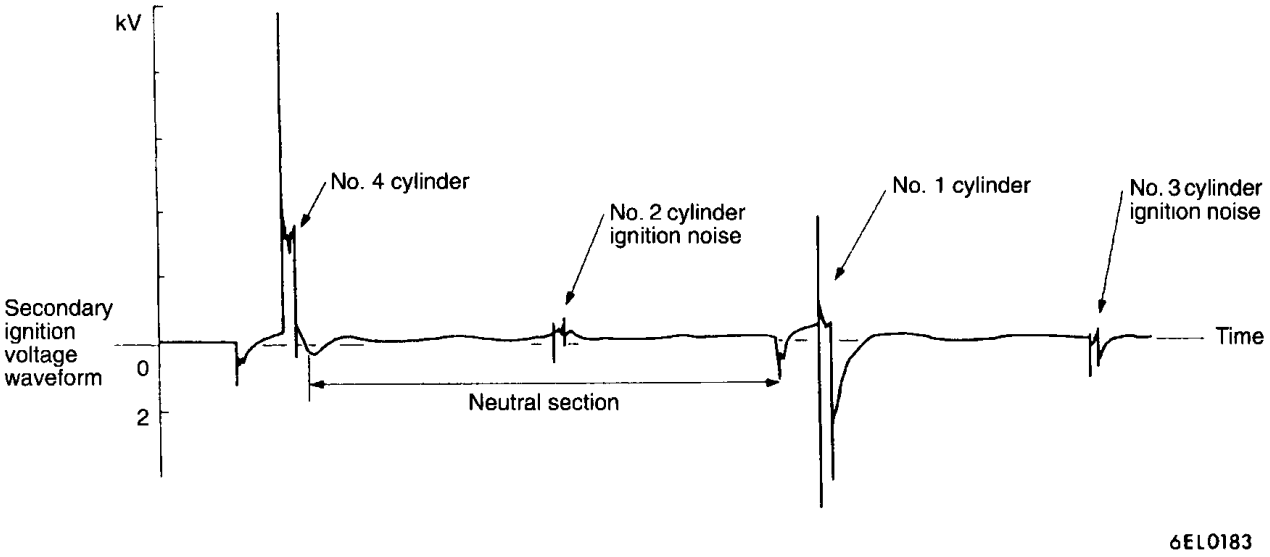
Observation Conditions

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



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

Pattern selector	Display



WAVEFORM OBSERVATION POINTS

For waveform observation points, refer to P.16-34.

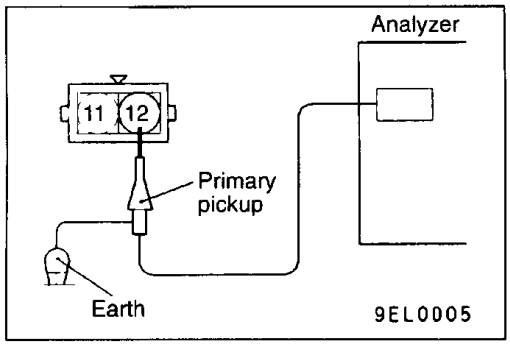
EXAMPLES OF ABNORMAL WAVEFORMS

For examples of abnormal waveforms, refer to P.16-35.

Ignition Primary Voltage Waveform Check <SOHC>

MEASUREMENT METHOD

1. Disconnect the distributor 2 pin connector and connect the special tool (test harness: MB991348) in between. (All of the terminals should be connected.)



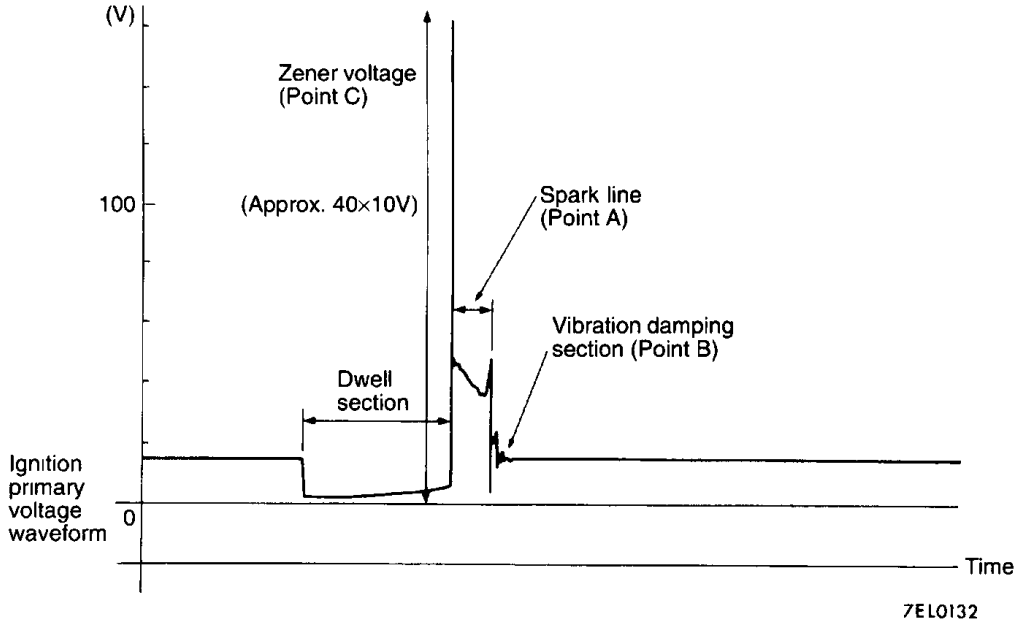
2. Connect the analyzer primary pickup to the distributor connector terminal 12.
3. Connect the primary pickup earth terminal.
4. Clamp the spark plug cable with the trigger pickup.

NOTE
The waveform of the cylinder clamped to the trigger pickup will appear at the left edge of the screen.

STANDARD WAVEFORM

Observation conditions

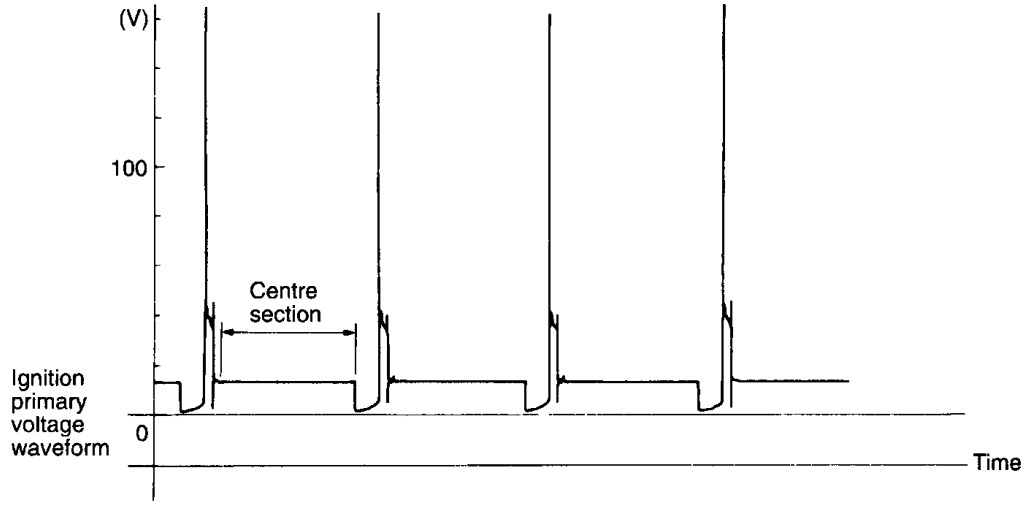
FUNCTION	SECONDARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine Speed	Curb idle speed



Observation conditions

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

PATTERN SELECTOR	DISPLAY



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	High tension cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
	Short	Large	Large wear	High	Lean	Retarded	High resistance
Height	High	Large	Large wear	High	Lean	Retarded	High resistance
	Low	Small	Normal	Low	Rich	Advanced	Leak
Slope		Large	Plug is fouled	–	–	–	–

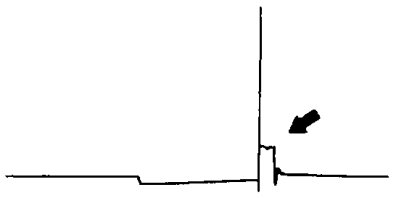
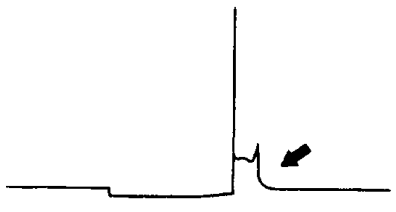
Point B: Number of vibration in reduction vibration section (Refer to abnormal waveform example 5)

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

EXAMPLES OF ABNORMAL WAVEFORMS

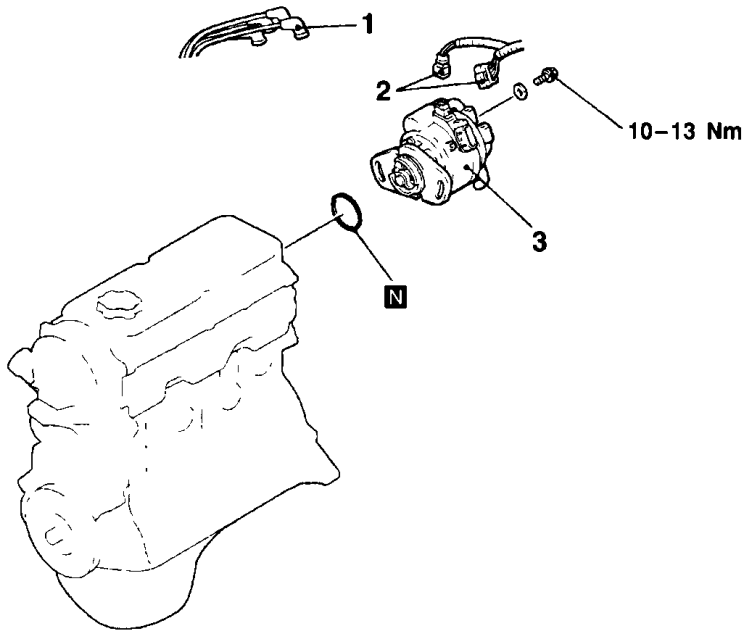
Abnormal waveform	Wave characteristics	Cause of problem
Example 1 01P0210	Spark line is high and short.	Spark plug gap is too large.
Example 2 01P0211	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.	Spark plug gap 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.

DISTRIBUTOR <SOHC>

16300200034

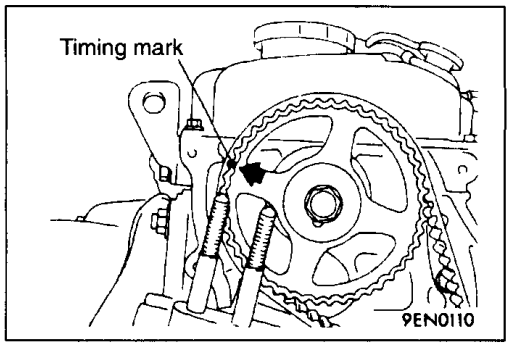
REMOVAL AND INSTALLATION

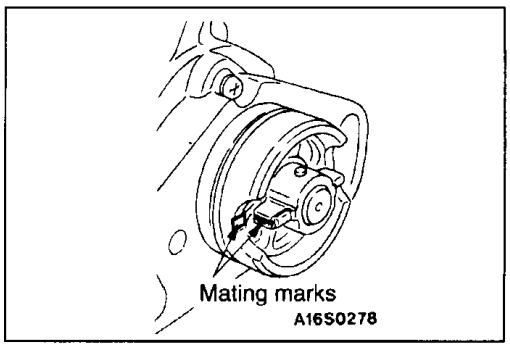
Pre-removal and Post-installation Operation
- Engine Adjustment
  (Refer to GROUP 11A – On-vehicle Service.)



A16U0145

Removal steps
1. Spark plug cable connection
2. Distributor connector
▶A◀ 3. Distributor





INSTALLATION SERVICE POINTS

▶A◀ DISTRIBUTOR INSTALLATION

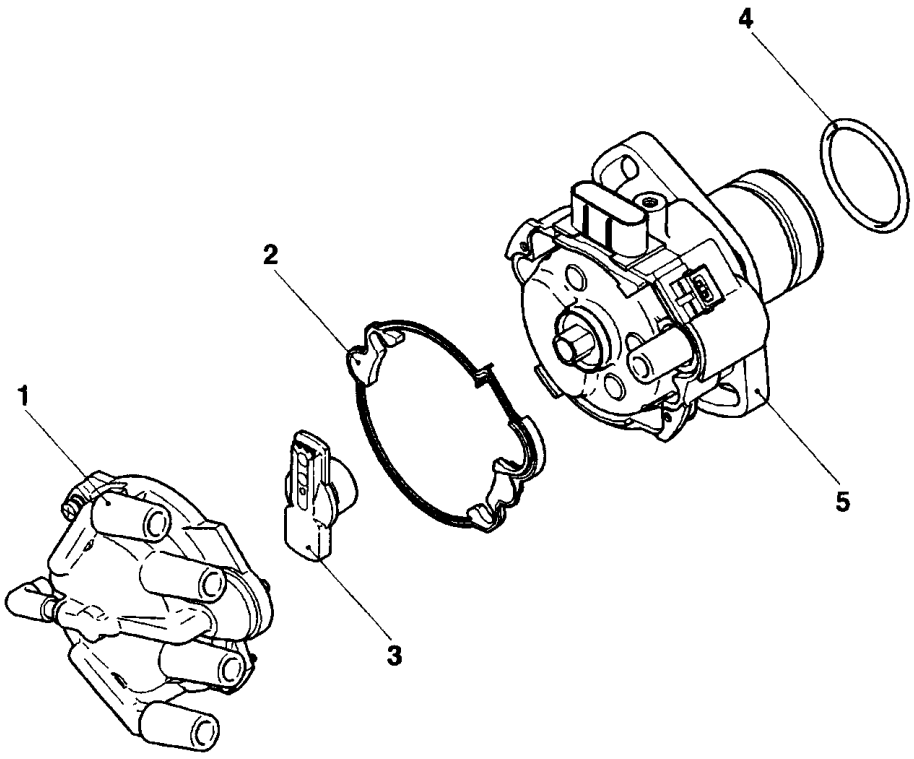
1. Remove the timing belt upper cover.
2. Turn the crankshaft clockwise to align the timing marks.

   NOTE
   The No. 1 cylinder will be at compression top dead centre if the timing mark on the camshaft sprocket is aligned with the timing mark on the cylinder head.

3. Align the mating mark on the distributor housing side with the mating mark on the coupling side.
   Install the distributor to the engine.

DISASSEMBLY AND REASSEMBLY

16300220047



9EN0561

1. Distributor cap
2. Packing
3. Rotor
4. O-ring
5. Distributor housing

INSPECTION

16300230040

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

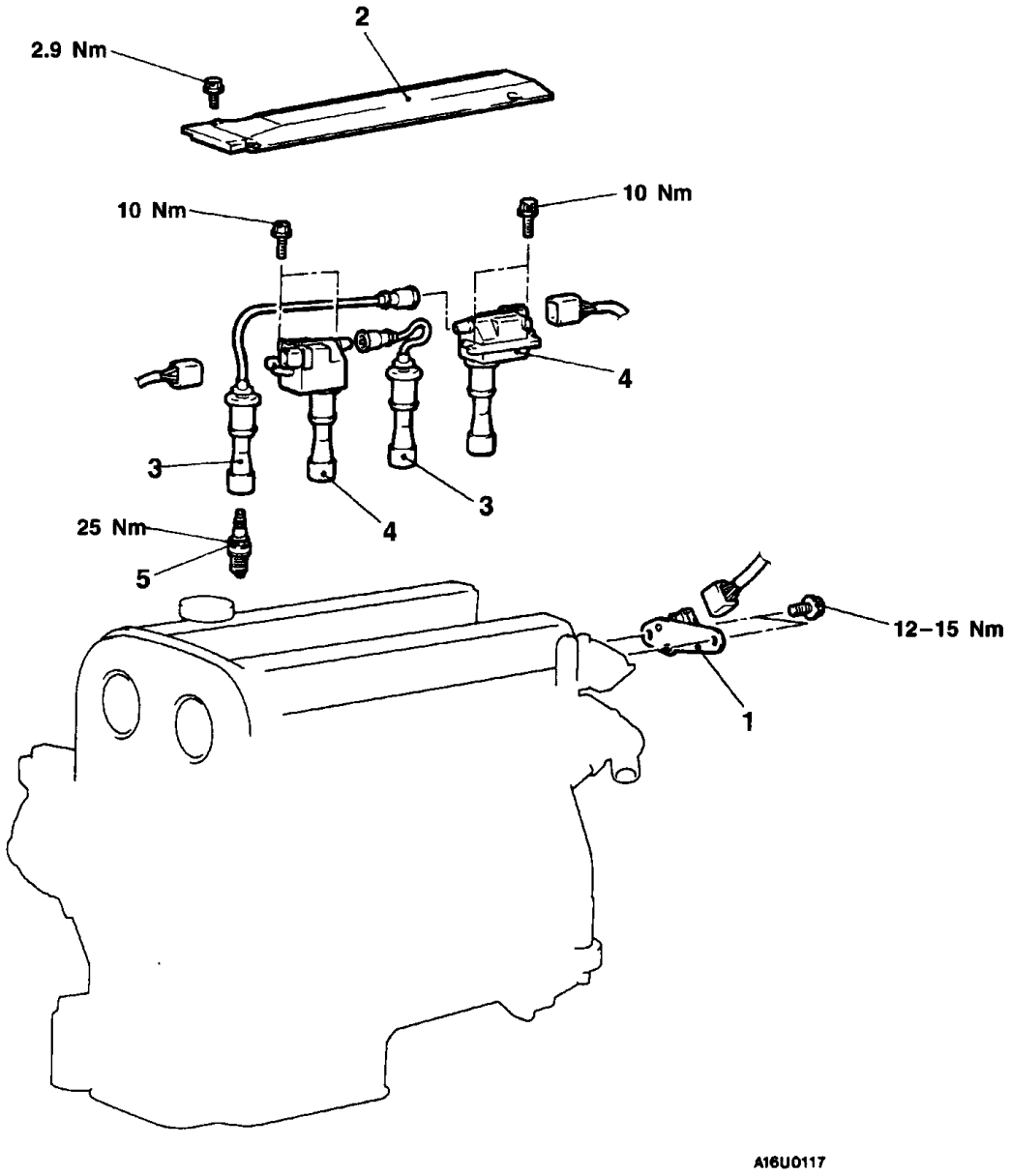
CAP, MOTOR

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.

IGNITION SYSTEM <DOHC>

16300320013

REMOVAL AND INSTALLATION



Removal steps

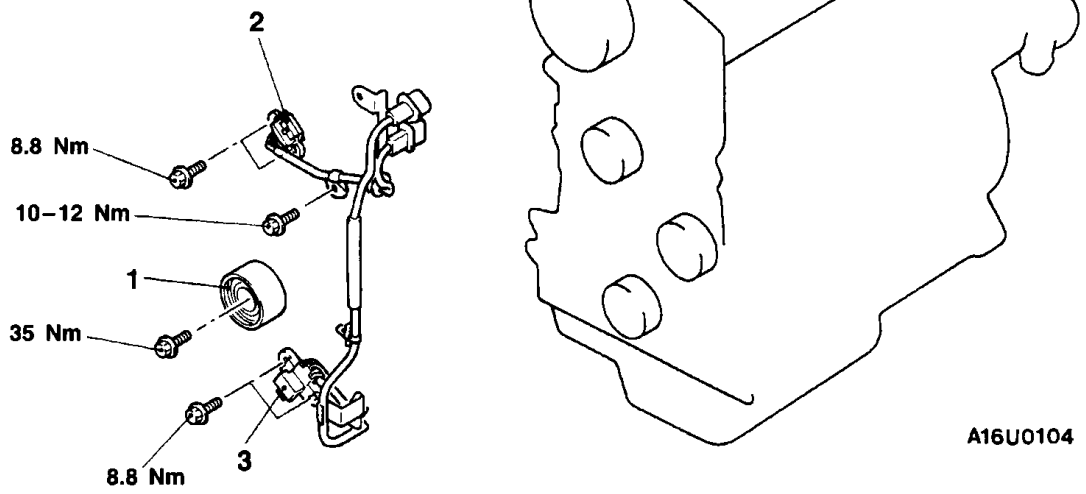
1. Ignition failure sensor
2. Center cover
3. Spark plug cable assembly
4. Ignition coil assembly
5. Spark plug

CAMSHAFT POSITION SENSOR AND CRANKSHAFT POSITION SENSOR <DOHC>

16300250039

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Timing Belt Removal and Installation
(Refer to GROUP 11A.)
(2) Exhaust Camshaft Sprocket Removal and Installation
(Refer to GROUP 11A – Camshaft and Camshaft Oil seal.)



Removal steps
1. Idler pulley
2. Camshaft position sensor
3. Crankshaft position sensor

INSPECTION

16300260056

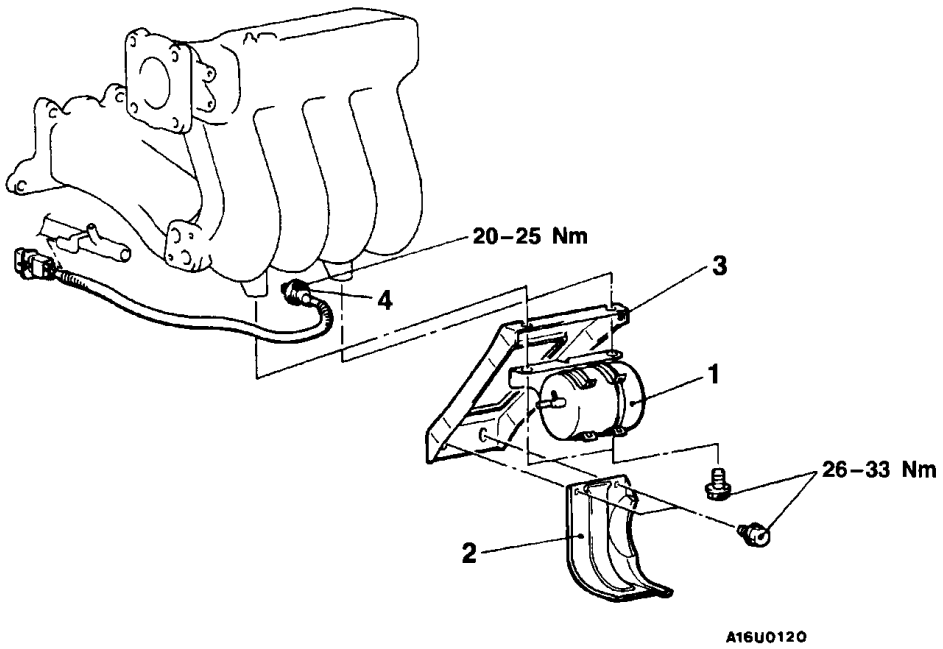
CAMSHAFT POSITION SENSOR, CRANKSHAFT POSITION SENSOR CHECK

Refer to GROUP 13A – Troubleshooting.

DETONATION SENSOR

16300280045

REMOVAL AND INSTALLATION



Removal steps

1. Vacuum tank and vacuum tank bracket assembly <Vehicles with TCL>
2. Heat protector <4G93-M/T>
3. Intake manifold stay
4. Detonation sensor

Caution
Do not subject the detonation sensor to any shocks.

INSPECTION

16300290048

DETONATION SENSOR CHECK

Refer to GROUP 13A – Troubleshooting.

ENGINE AND EMISSION CONTROL

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17109000018

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

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

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ENGINE CONTROL SYSTEM

17100010027

GENERAL INFORMATION

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

SERVICE SPECIFICATIONS

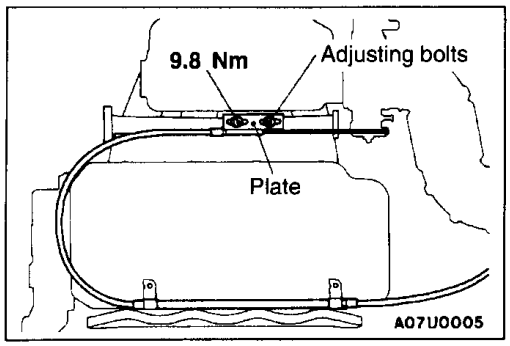
17100030030

Items		Standard value
Accelerator cable play mm		1–2
Engine idle speed r/min	4G92	750±50
	4G93	800±50

ON-VEHICLE SERVICE

17100090052

ACCELERATOR CABLE CHECK AND ADJUSTMENT



1. Turn A/C and lamps OFF.
   Inspect and adjust at no load.
2. Warm engine until stabilized at idle.
3. Confirm idle speed is at prescribed value.

   Standard value:
   <4G92> 750±50 r/min
   <4G93> 800±50 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.

   Standard value: 1–2 mm

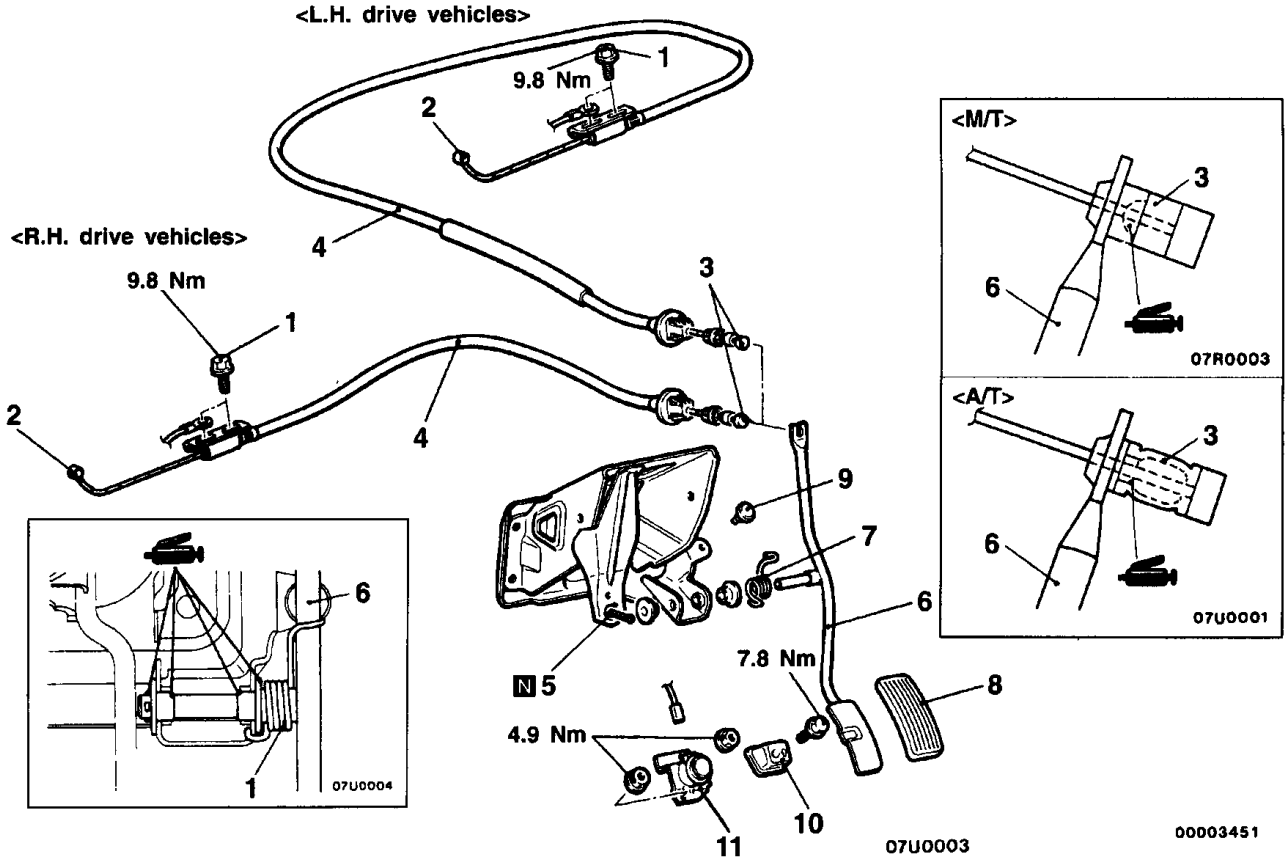
7. If there is too much slack or no slack, adjust play by the following procedures.
   (1) Loosen the adjusting bolt to release the cable.
   (2) Move the plate until the inner cable play is at the standard value, and then tighten the adjusting bolt to the specified torque.

ACCELERATOR CABLE AND PEDAL

17100120058

REMOVAL AND INSTALLATION

Post-installation Operation
- Adjusting the Accelerator Cable (Refer to P.17-3.)



Removal steps

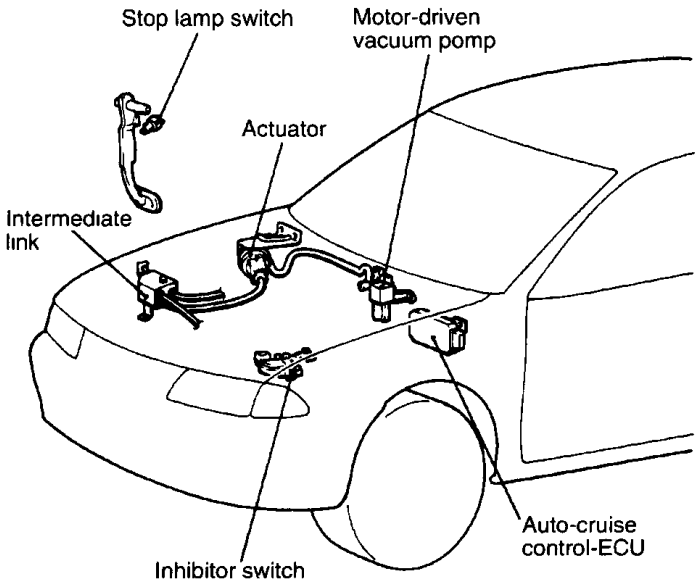
1. Adjusting bolts
2. Inner cable connection (Throttle body side)
3. Inner cable connection (Accelerator pedal side)
4. Accelerator cable
5. Split pin
6. Accelerator pedal
7. Spring
8. Pedal pad
9. Stopper
10. Accelerator pedal stopper <M/T>
11. Kick down switch <A/T>

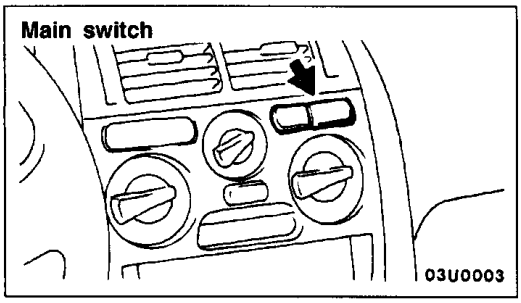
AUTO-CRUISE CONTROL SYSTEM

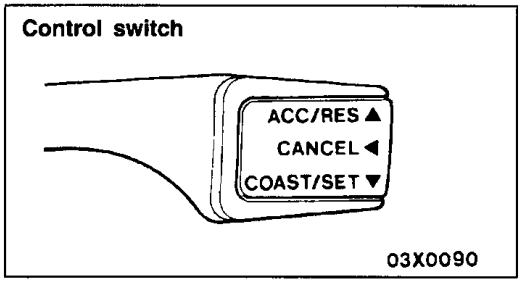
17200010044

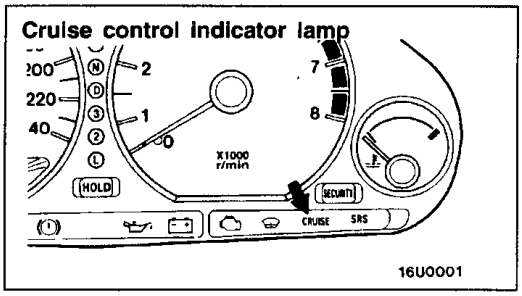
GENERAL INFORMATION

By using the auto-cruise control, the driver can drive at the speed he/she likes (in a range of approximately 40–20 km/h) without depressing the accelerator pedal.









00003536

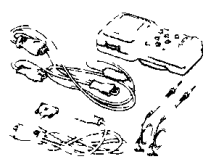
SERVICE SPECIFICATIONS

17200030040

Items		Standard value
Accelerator cable play mm	M/T	0–1
	A/T	2–3
Throttle cable play mm		1–2
Auto-cruise control cable play mm		1–2

SPECIAL TOOL

17200060049

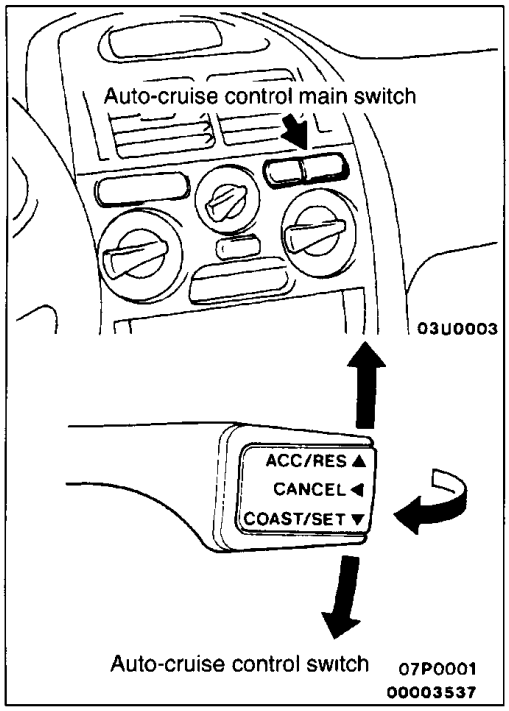
Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Reading diagnosis codes • Auto-cruise control system check

TROUBLESHOOTING

17200070042

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

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



DIAGNOSIS FUNCTION

METHOD OF READING THE DIAGNOSIS CODES

1. Connect the MUT-II to the diagnosis connector (16-pin) under the instrument under cover. (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)
2. With the ignition switch in the ON position, turn the auto-cruise control main switch to ON and take a reading of the diagnosis codes.

METHOD OF ERASING THE DIAGNOSIS CODES

The diagnosis codes can 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. After pushing the auto-cruise control switch in the direction of arrow (B) in the illustration, press the cruise control main switch to the ON position, and within 1 second after doing this, push the cruise control switch back in the direction of arrow (A).
3. After pushing the auto-cruise control switch once more in the direction of arrow (A) in the illustration and keeping it in this position, press the stop lamp switch to the ON position for 5 seconds or more.

INPUT SWITCH CODE CHECK METHOD

1. Connect the MUT-II to the diagnosis connector (16-pin) under the instrument under cover.
2. Turn the ignition switch to ON.
3. After pushing the auto-cruise control switch in the direction of arrow (B) in the illustration, press the cruise control main switch to the ON position, and within 1 second after doing this, push the cruise control switch back in the direction of arrow (A).
4. Operate each switch listed in the input check table and take a reading of the input switch codes with the MUT-II.

Input Check 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 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	• Clutch switch <M/T> (ON when clutch pedal depressed) • Inhibitor switch <A/T> (ON when select lever in N range)	Auto-cruise control-ECU judges that clutch switch <M/T> or inhibitor switch <A/T> is ON
27	CANCEL switch ON	Auto-cruise control-ECU judges that CANCEL switch is ON
28	Throttle position sensor (accelerator pedal position sensor*) signal	Auto-cruise control-ECU judges that throttle position sensor (accelerator pedal position sensor*) voltage is 1.5 V or more
29	Idle switch	Auto-cruise control-ECU judges that idle switch is OFF

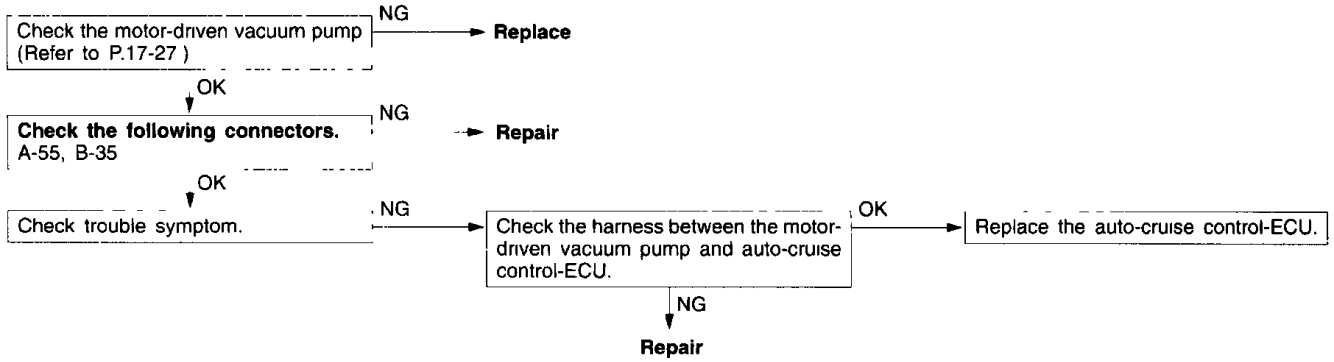
NOTE
* : Vehicles with TCL

INSPECTION CHART FOR DIAGNOSIS CODES

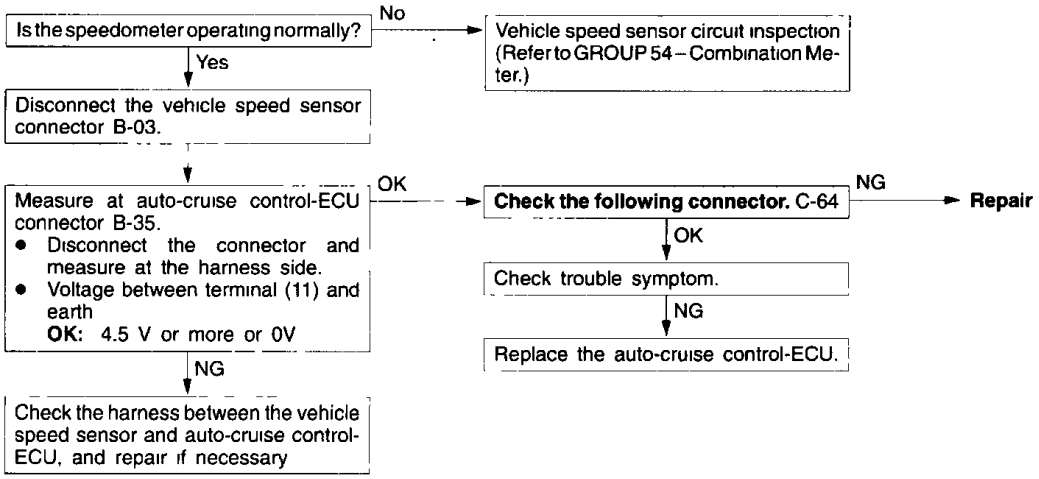
Code No.	Diagnosis item	Reference page
11	Motor-driven vacuum pump drive system	17–8
12	Vehicle speed sensor system	17–8
14	Motor-driven vacuum pump power supply system	17–9
15	Auto-cruise control switch	17–9
16	Auto-cruise control-ECU	17–9
17	Throttle position sensor system <Vehicles without TCL> or accelerator pedal position sensor system <Vehicles with TCL>	17–10

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

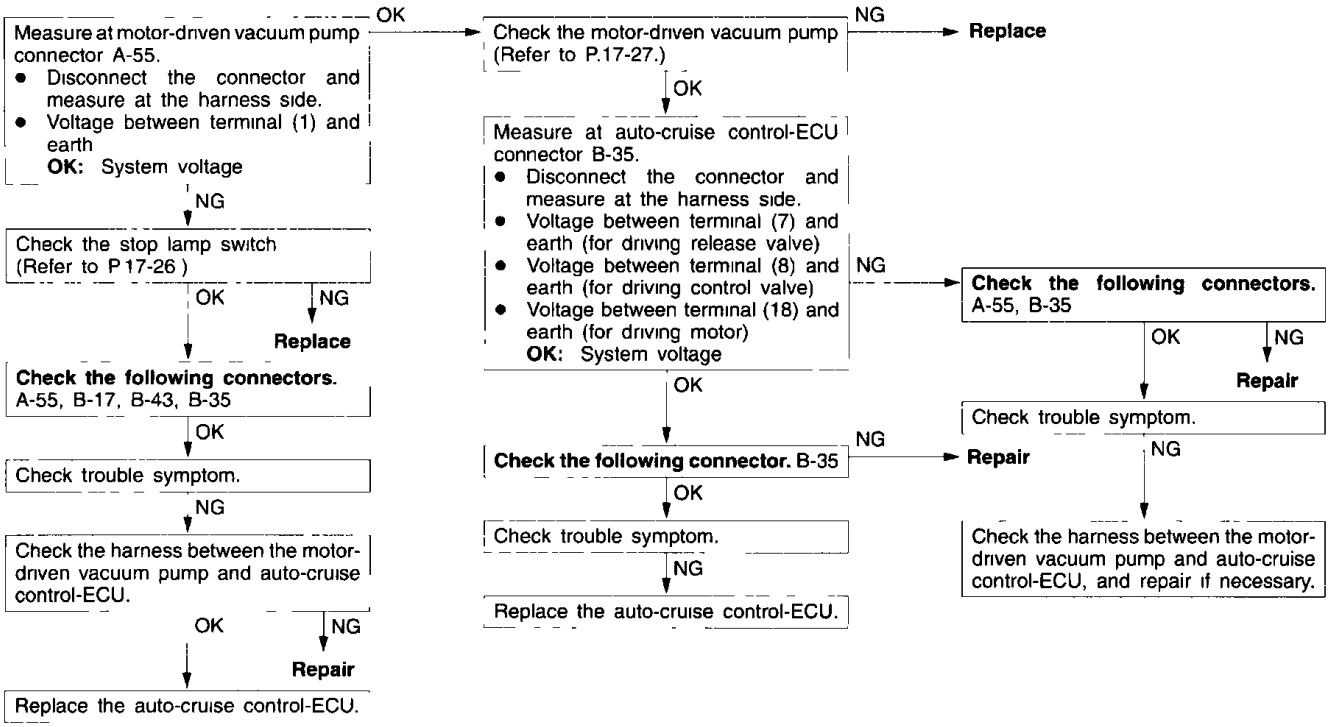
Code No. 11 Motor-driven vacuum pump drive system	Probable cause
This diagnosis code is output if the release valve, control valve or motor drive signals from the electric vacuum pump are not input to the auto-cruise control-ECU.	• Malfunction of the motor-driven vacuum pump • Malfunction of the connector • 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 Motor-driven vacuum pump power supply system	Probable cause
This diagnosis code is output when none of the drive signals from the release valve, control valve and motor of the motor-driven vacuum pump are input to the auto-cruise control-ECU.	• Malfunction of the stop lamp switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU • Malfunction of the motor-driven vacuum pump



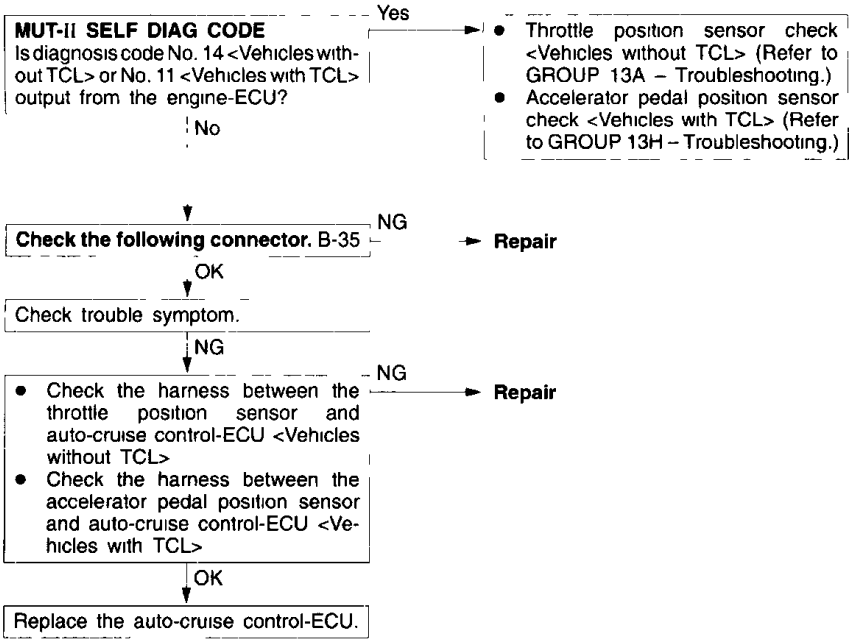
Code No. 15 Auto-cruise control switch	Probable cause
This diagnosis code is output if the cruise control RESUME switch, SET switch or CANCEL switch remains ON.	• Malfunction of the auto-cruise control switch

Replace the auto-cruise control switch.

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 <Vehicles without TCL> or accelerator pedal position sensor system <Vehicles with TCL>	Probable cause
This diagnosis code is output if a voltage of 1.5 V or more when the idle switch is ON or 0.2 V or less when the idle switch is OFF is output for a continuous period of 4 seconds or more.	• Malfunction of the throttle position sensor <Vehicles without TCL> • Malfunction of the accelerator pedal position sensor <Vehicles with TCL> • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

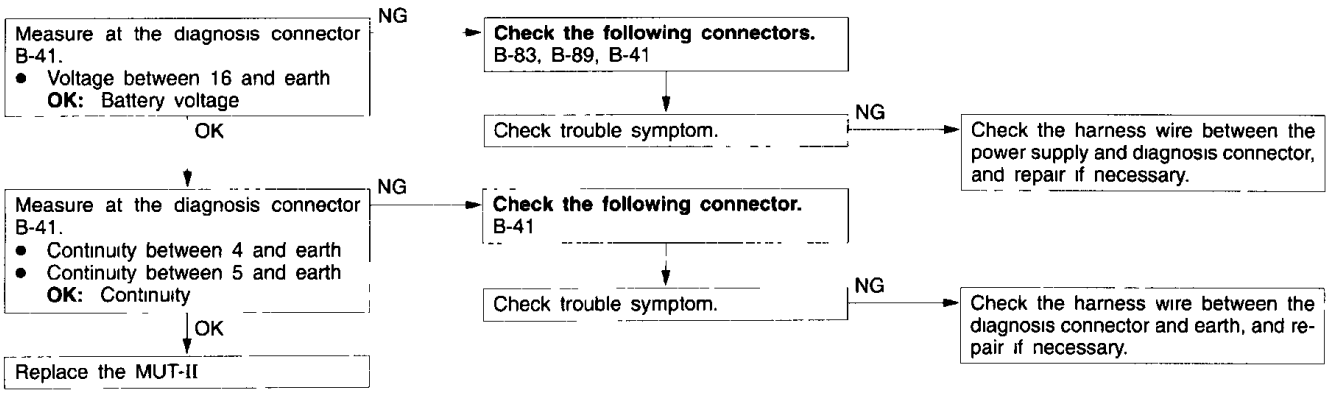
Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	17-11
	Communication with auto-cruise control-ECU only is not possible.	2	17-12
Input switch inspection using the MUT-II is not possible. (However, diagnosis inspection is possible.)		3	17-13

Trouble symptom		Inspection procedure No.	Reference page
Auto-cruise control is not cancelled.	Even if brake pedal is depressed	4	17-14
	Even if clutch pedal is depressed <M/T>	5	17-15
	Even if select lever is set to N range <A/T>	6	17-15
	Even if CANCEL switch is set to ON	7	17-16
The diagnosis result displayed on the MUT-II is normal even though auto-cruise control cannot be set.		8	17-16
Auto-cruise control cannot be set.		9	17-17
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		10	17-18
Even though auto-cruise control main switch is ON, switch indicator lamp does not illuminate. (However, auto-cruise control is normal.)		11	17-18
Auto-cruise control main switch illumination lamp does not illuminate.		12	17-19
Auto-cruise control indicator lamp inside combination meter does not illuminate. (However, auto-cruise control is normal.)		13	17-19

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

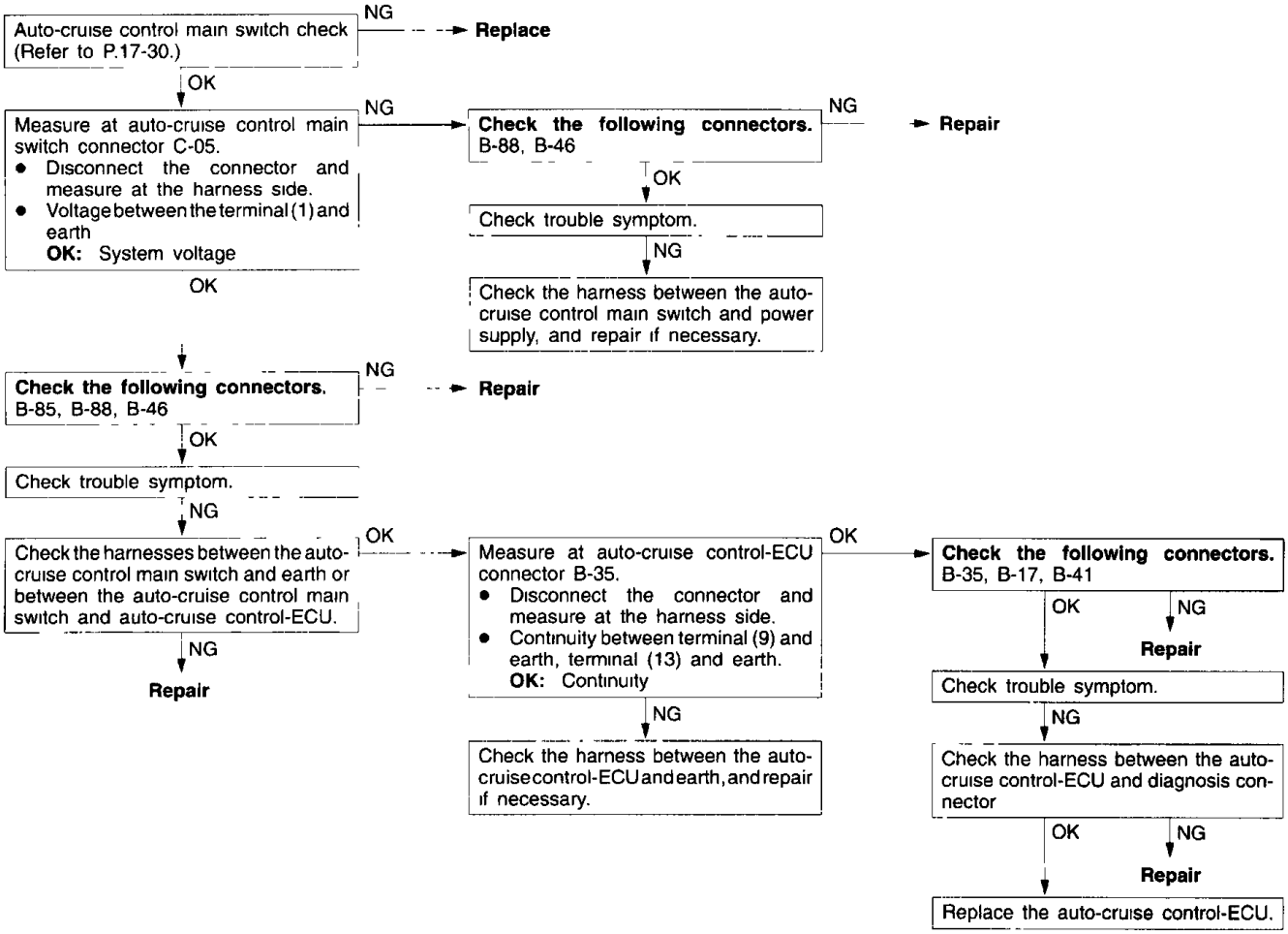
Inspection Procedure 1

Communication with MUT-II is not possible. (Communication with all system 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



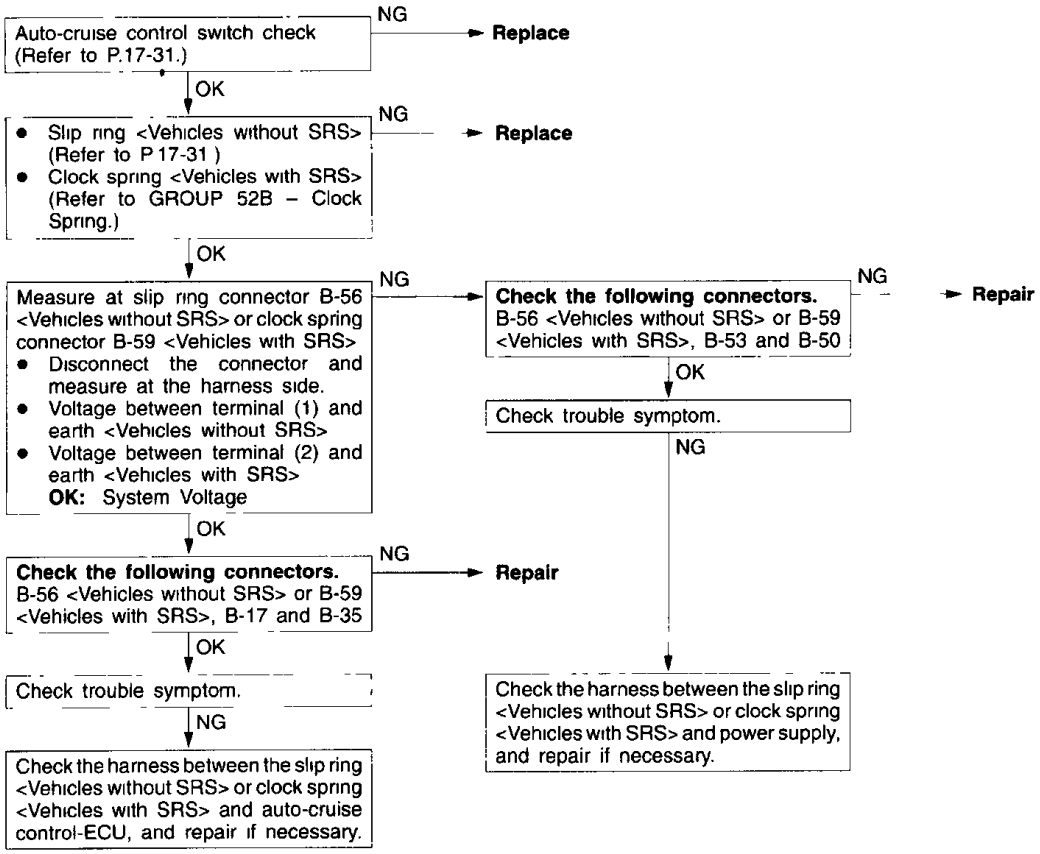
Inspection Procedure 2

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



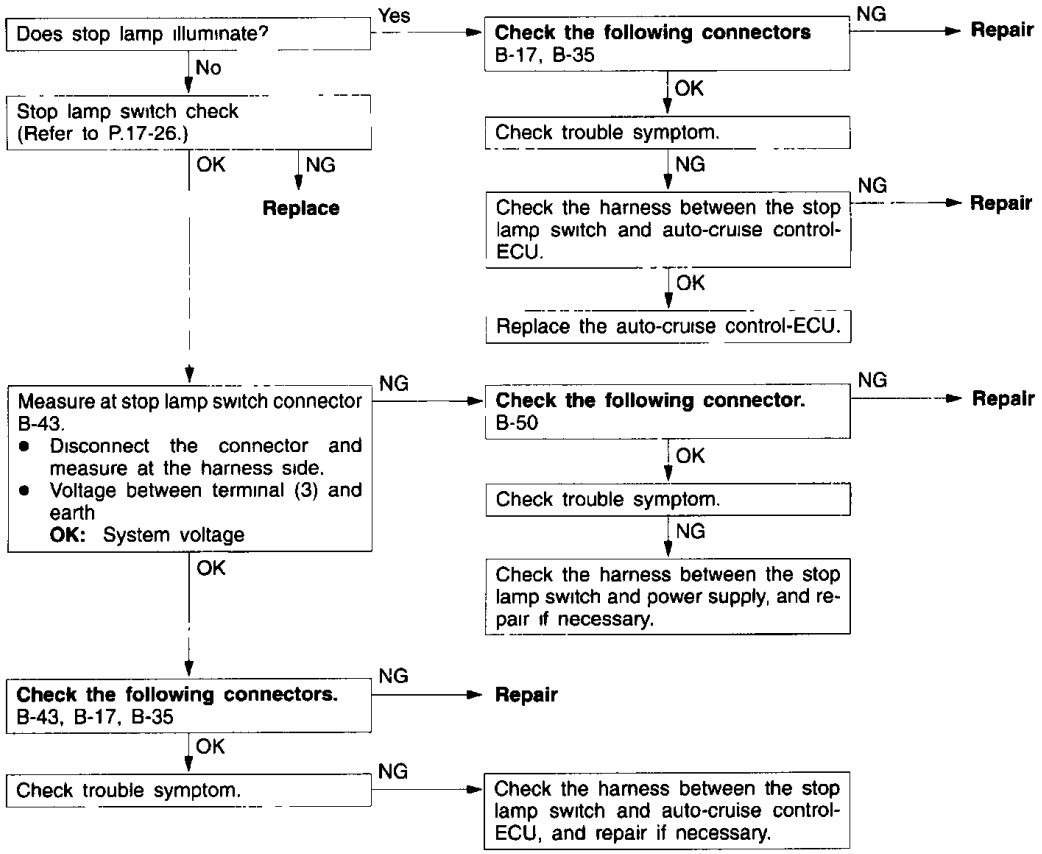
Inspection Procedure 3

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 slip ring <Vehicles without SRS> • Malfunction of the clock spring <Vehicles with SRS> • Malfunction of the connector • Malfunction of the harness



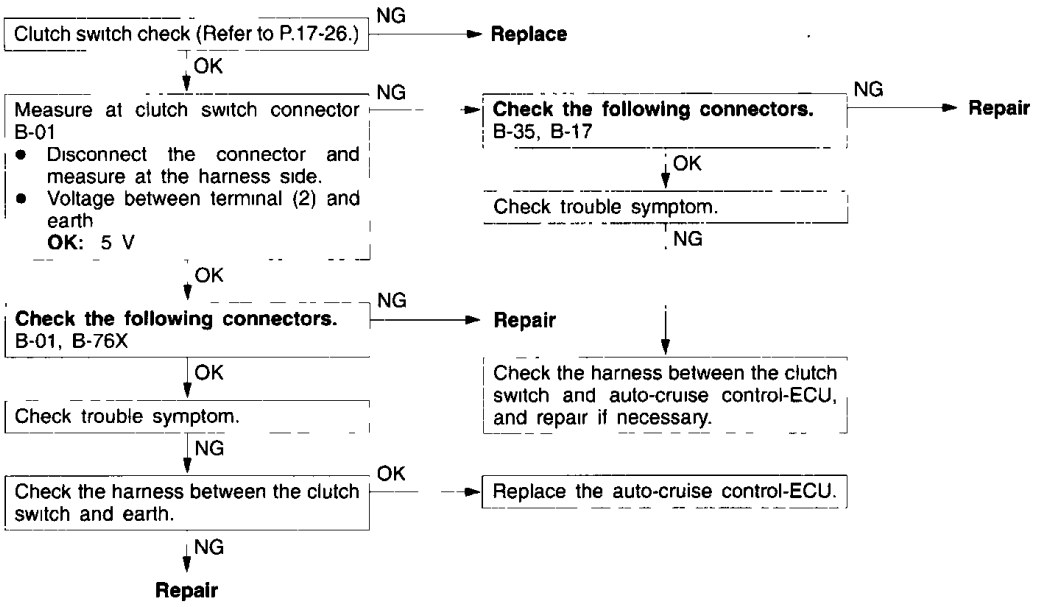
Inspection Procedure 4

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



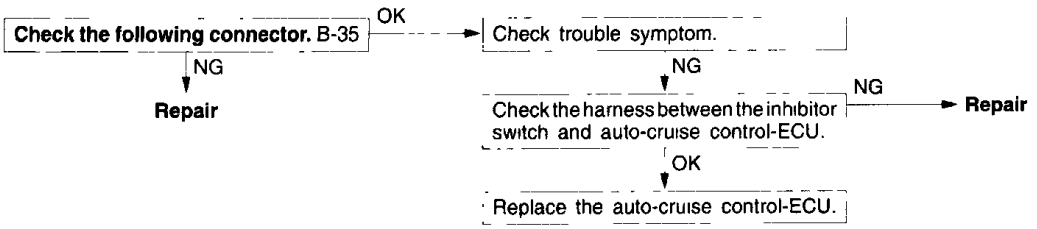
Inspection Procedure 5

Even if clutch pedal is depressed, auto-cruise control is not cancelled. <M/T>	Probable cause
The cause is probably a malfunction of clutch switch or clutch circuit.	• Malfunction of the clutch switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



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



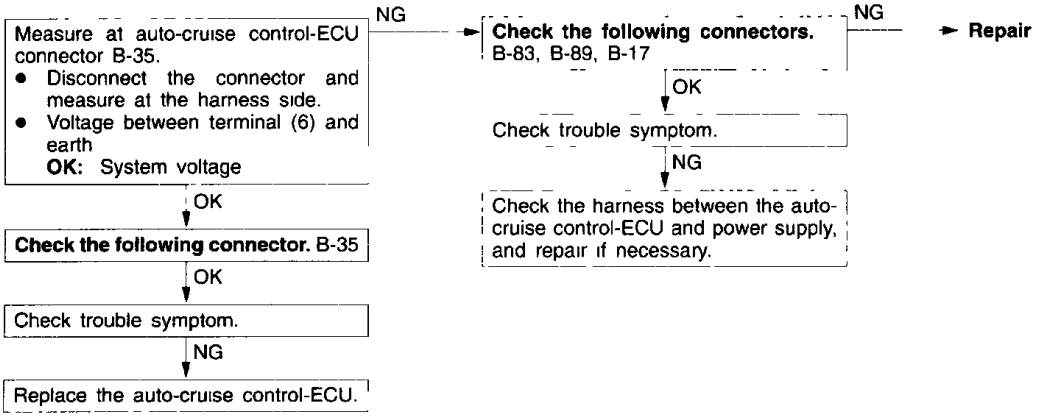
Inspection Procedure 7

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.

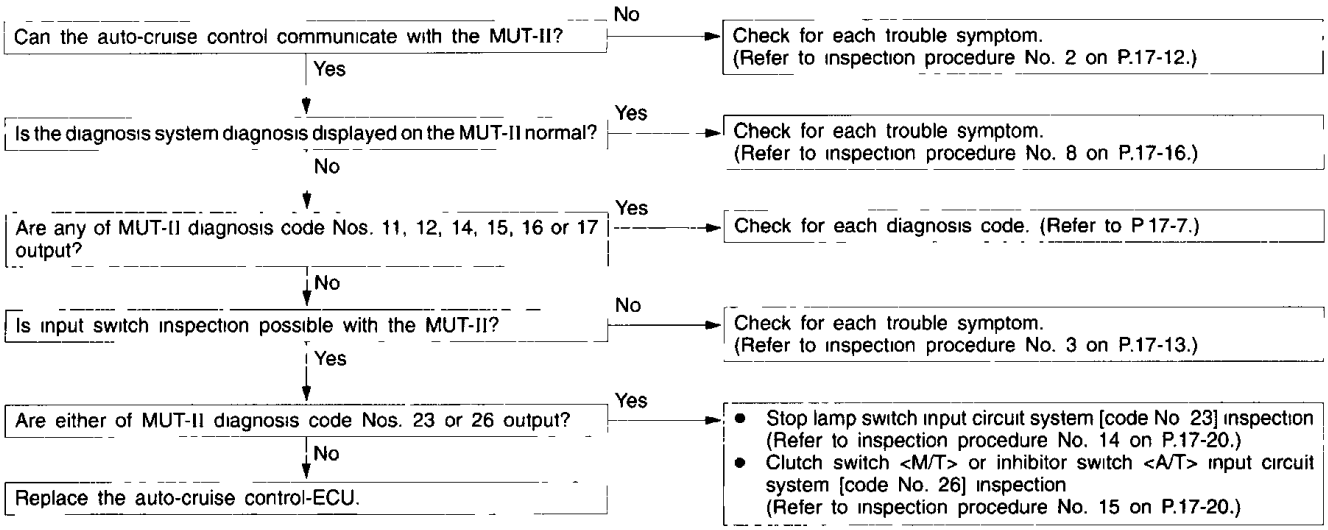
Inspection Procedure 8

The diagnosis 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



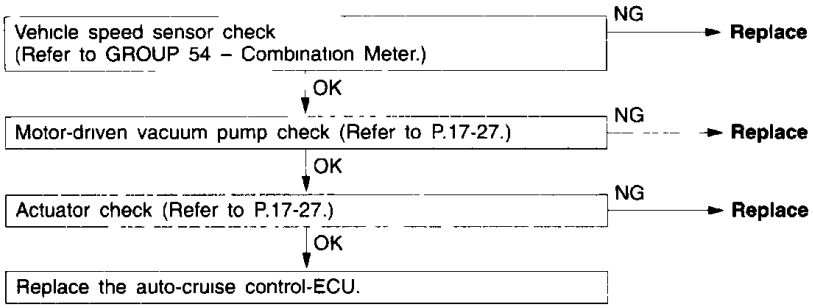
Inspection Procedure 9

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 slip ring <Vehicles without SRS> • Malfunction of the clock spring <Vehicles with SRS> • Malfunction of the harnesses or connectors • Malfunction of the clutch switch <M/T> • 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 motor-driven vacuum pump or actuator.	• Malfunction of the vehicle speed sensor • Malfunction of the motor-driven vacuum pump • Malfunction of the actuator • Malfunction of the auto-cruise control-ECU



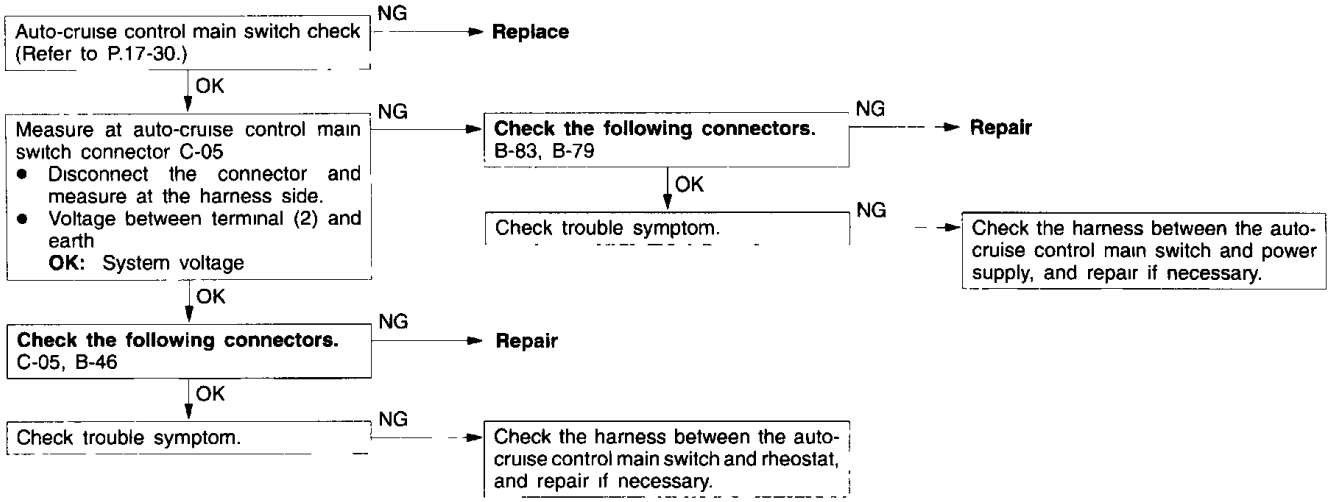
Inspection Procedure 11

Even though auto-cruise control main switch is ON, switch indicator lamp 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.

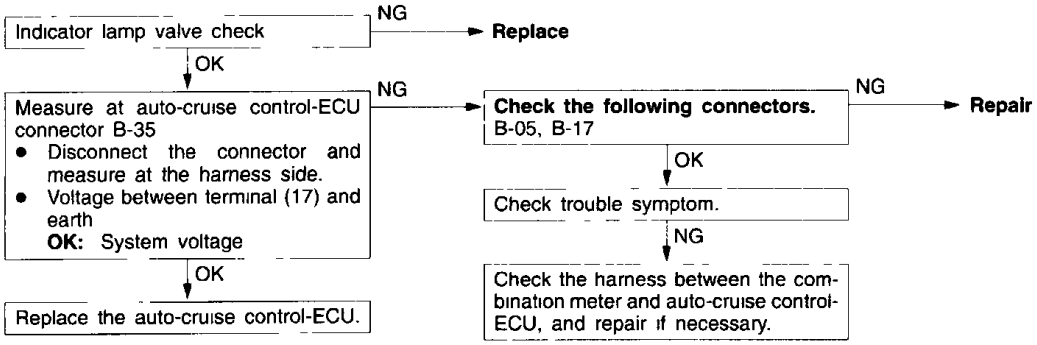
Inspection Procedure 12

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



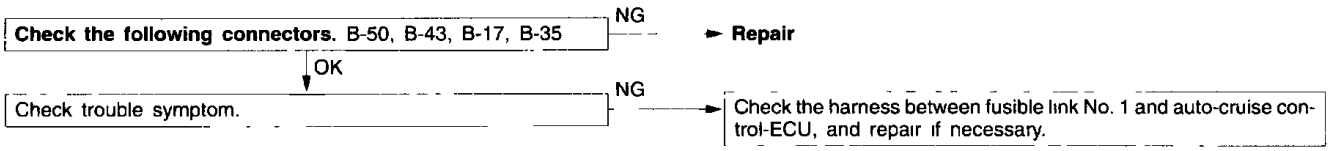
Inspection Procedure 13

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 valve or a malfunction of connector or harness.	• Malfunction of the valve • Malfunction of the harness • Malfunction of the connector • Malfunction of the auto-cruise control-ECU



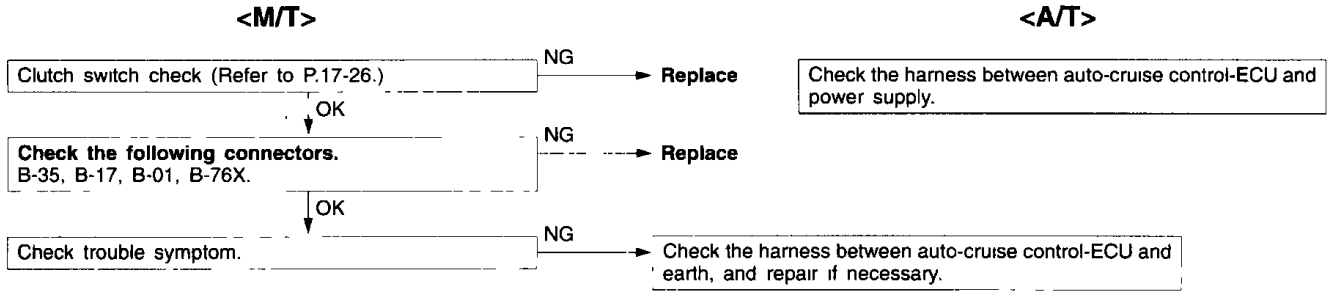
Inspection Procedure 14

Stop lamp switch input circuit system inspection (Code No. 23)

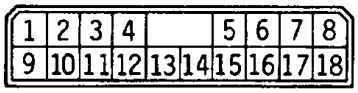


Inspection Procedure 15

Clutch switch <M/T> or inhibitor switch <A/T> input circuit system inspection (Code No. 26)



CHECK AT THE ECU TERMINALS



03U0031

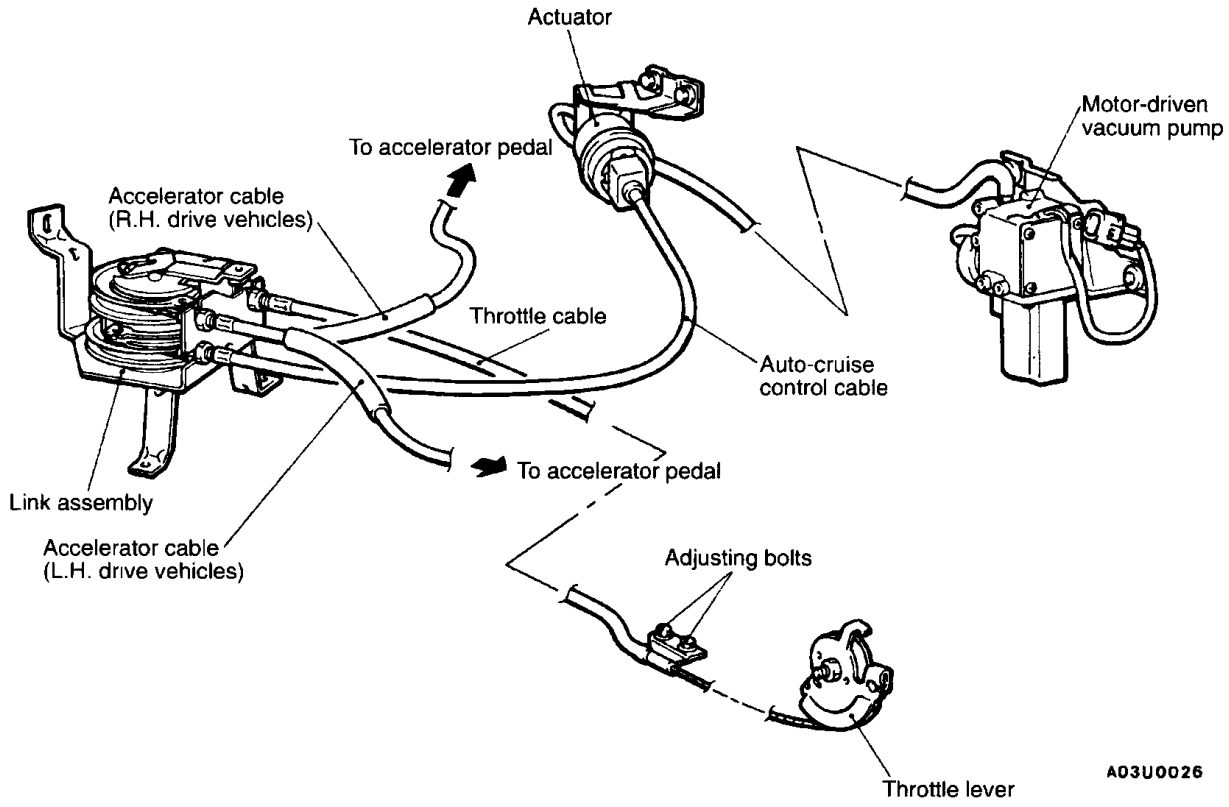
Terminal No.	Check item	Check conditions		Normal condition
1	Throttle position sensor input	When accelerator pedal is fully depressed		4.5–5.5V
		When accelerator pedal is released		0.3–1.0V
2	Idle switch output	When accelerator pedal is depressed	When idle switch is OFF	4.5–5.5V
		When accelerator pedal is not depressed	When idle switch is ON	0V
3	ACC power supply	When ignition switch is in ACC position		System voltage
4	Stop lamp switch input	When brake pedal is depressed	When stop lamp switch is ON	System voltage
		When brake pedal is not depressed	When stop lamp switch is OFF	0V
5	Diagnosis control input	When ignition switch is ON		4V or more
6	ECU backup power supply	At any time		System voltage
7	Motor-driven vacuum pump release valve and control valve input	When decelerating with the SET switch while driving at constant speed	Release valve closed	0V
8			Control valve open	System voltage
7		When cancelling constant speed driving with the CANCEL switch	Release valve open	System voltage
8			Control valve open	System voltage
9	Earth	At any time		Continuity
10	A/T control output	No OD-OFF request		System voltage
		OD-OFF request		0V

Terminal No.	Check item	Check conditions		Normal condition
11	Vehicle speed sensor input	When vehicle is moved forwards and backwards, sensor turns ON and OFF repeatedly	When sensor is ON	0V
			When sensor is OFF	4.5V or more
12	Auto-cruise control switch input	When input switch has not been operated	When all switches are OFF	0V
		When input switch is pushed down	When SET switch is ON	3V
		When input switch is pushed up	When RESUME switch is ON	6V
		When input switch is pulled forward	When CANCEL switch is ON	System voltage
13	Earth	At any time		Continuity
14	Clutch switch input <M/T>	When pedal is not depressed	When clutch switch is OFF	5V
		When pedal is depressed	When clutch switch is ON	0V
	Inhibitor switch input <A/T>	When select lever is in a position other than N range	When inhibitor switch is OFF	System voltage
		When select lever is in N range	When inhibitor switch is ON	0V
15	Pump power supply	Ignition switch : ON Main switch : ON Stop lamp switch : OFF		System voltage
16	ECU power supply	Ignition switch : ON Main switch : ON		System voltage
17	Indicator lamp input (inside combination meter)	When driving at constant speed	When indicator lamp is illuminated	0V
		When constant-speed driving is cancelled	When indicator lamp is switched off	System voltage
18	Motor-driven vacuum pump motor input	When driving at constant speed using the SET switch	Motor stopped/running	System voltage/0V
		When accelerating with the RESUME switch while driving at constant speed	Motor stopped/running	System voltage/0V
		When decelerating with the SET switch while driving at constant speed	Motor stopped	System voltage
		When cancelling constant speed driving with the CANCEL switch	Motor stopped	System voltage

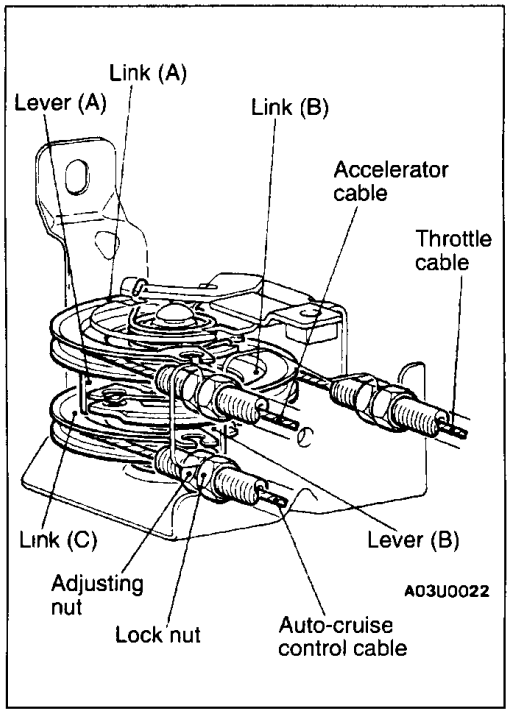
ON-VEHICLE SERVICE

17200090048

AUTO-CRUISE CONTROL CABLE CHECK AND ADJUSTMENT



1. Remove the link protector. (Refer to P.17-28.)
2. Check the slack in each of the inner cables in the accelerator cable, auto-cruise control cable and throttle cable.
   If the slack in an inner cable is excessive, or if there is no play, loosen the adjusting bolts and the nuts in the throttle lever and each link, to release the throttle lever and each link. (The bolts and nuts should not be removed.)



ACCELERATOR CABLE

1. While holding link (A) at the position where it is touching the stopper, turn the adjusting nut to adjust the accelerator cable play to the standard value.

   Amount to unscrew the adjusting nut:
   <M/T> Approx. half a turn (inner cable play 0–1 mm)
   <A/T> Approx. 2 turns (inner cable play 2–3 mm)
2. Fix the accelerator cable with the lock nut.

THROTTLE CABLE

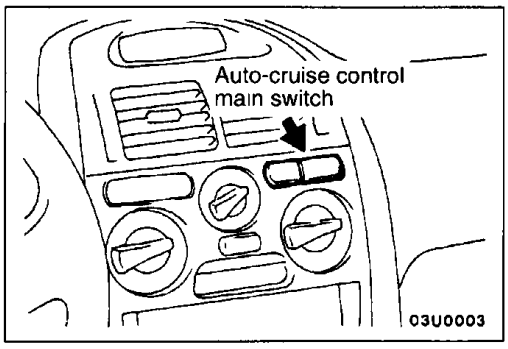
1. While holding link (B) at the position where it is touching the lever of link (A), turn the adjusting nut to adjust the throttle cable play to the standard value.

   Amount to unscrew the adjusting nut:
   Approx. 1 turn (inner cable play 1–2 mm)
2. Fix the throttle cable with the lock nut.
3. Tighten the throttle lever-side adjusting bolt to the specified torque.

AUTO-CRUISE CONTROL CABLE

1. While holding link (C) at the position where it is touching the lever of link (B), turn the adjusting nut to adjust the auto-cruise control cable play to the standard value.

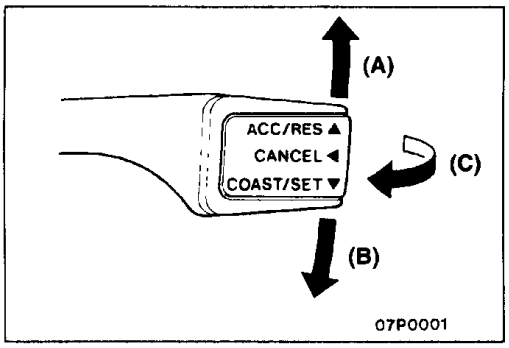
   Amount to unscrew the adjusting nut:
   Approx. 1 turn (inner cable play 1–2 mm)
2. Fix the auto-cruise control cable with the lock nut.



AUTO-CRUISE CONTROL MAIN SWITCH CHECK

17200110041

1. Turn the ignition key to ON.
2. Check to be sure that the indicator lamp within the switch illuminates when the main switch is switched ON.



AUTO-CRUISE CONTROL SWITCH CHECK

17200120044

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. Push the auto-cruise control switch in the direction of arrow (B).
4. Check to be sure that when the switch is released the speed is the desired constant speed.

NOTE
If the vehicles 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. Push the auto-cruise control switch in the direction of arrow (A).
3. Check to be sure that acceleration continues while the switch is hold, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE
Acceleration can be continued even if the vehicle speed has passed the high-speed limit (approx. 200 km/h). But the speed when the auto-cruise control switch is released will be recorded as the high-speed limit.

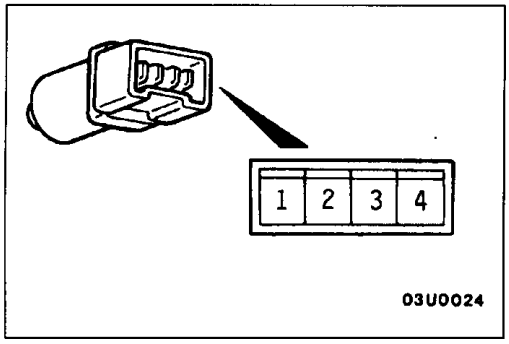
SPEED-REDUCTION SETTING

1. Set to the desired speed.
2. Push the auto-cruise control switch in the direction of arrow (B).
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.
   a. The auto-cruise control switch is pushed in the direction of arrow (C).
   b. The brake pedal is depressed.
   c. The clutch pedal is depressed. (M/T)
   d. The selector lever is moved to the "N" range. (A/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.



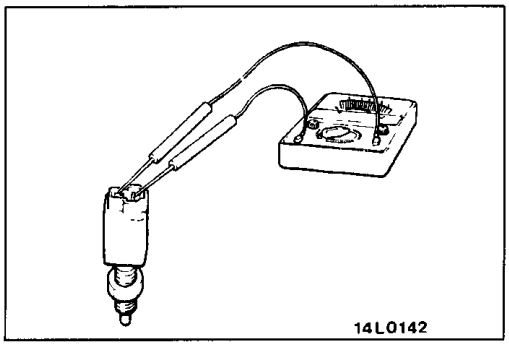
AUTO-CRUISE CONTROL COMPONENT CHECK

17200170049

STOP LAMP SWITCH

1. Disconnect the connector.
2. Check for continuity between the terminals of the switch.

Measurement conditions	Terminal No.			
	1	2	3	4
When brake pedal depressed. (for stop lamp circuit)		○	○	
When brake pedal not depressed. (for auto-cruise control circuit)	○			○



CLUTCH SWITCH

1. Remove the clutch switch connector.
2. Check if there is continuity between the clutch terminals while the clutch pedal is depressed, and if there is no continuity when the clutch pedal is released.

INHIBITOR SWITCH ("N" POSITION)

Refer to GROUP 23 – On-vehicle Service.

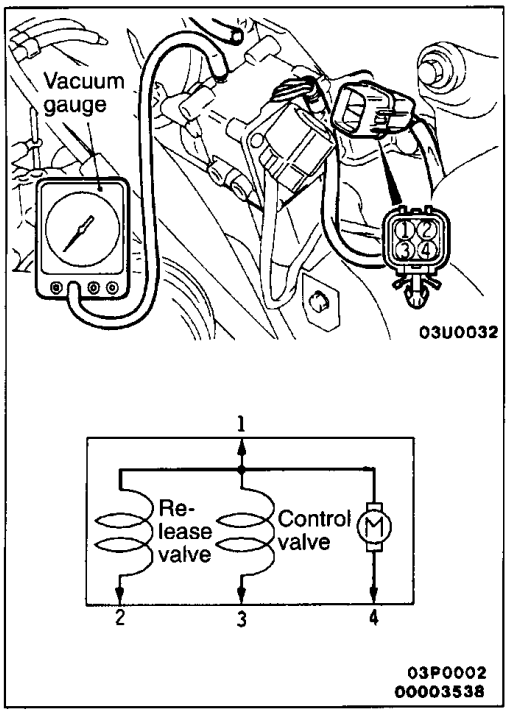
THROTTLE POSITION SENSOR

Refer to GROUP 13A – On-vehicle Service.

ACCELERATOR PEDAL POSITION SENSOR

<Vehicle with TCL>

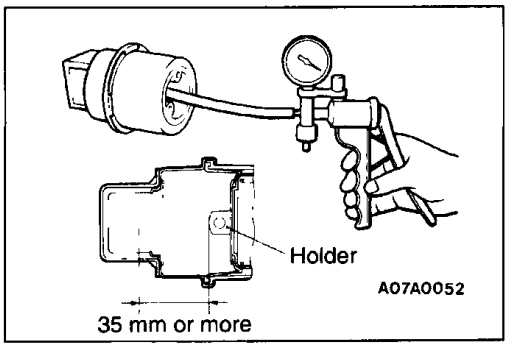
Refer to GROUP 13 H – On-vehicle Service.



MOTOR-DRIVEN VACUUM PUMP

1. Disconnect the vacuum hose from the motor-driven vacuum pump and connect a vacuum gauge to the vacuum pump.
2. Disconnect the electric vacuum pump connector.
3. Check that the reading on the vacuum gauge matches the values in the table below when the battery is connected to each connector terminal.

Terminal No.				Valve condition	Vacuum gauge kPa
1	2	3	4		
⊕	⊖	⊖	⊖	Release valve closed Control valve closed	53 or more
⊕		⊖	⊖	Release valve open	20 or less
⊕	⊖		⊖	Control valve open	



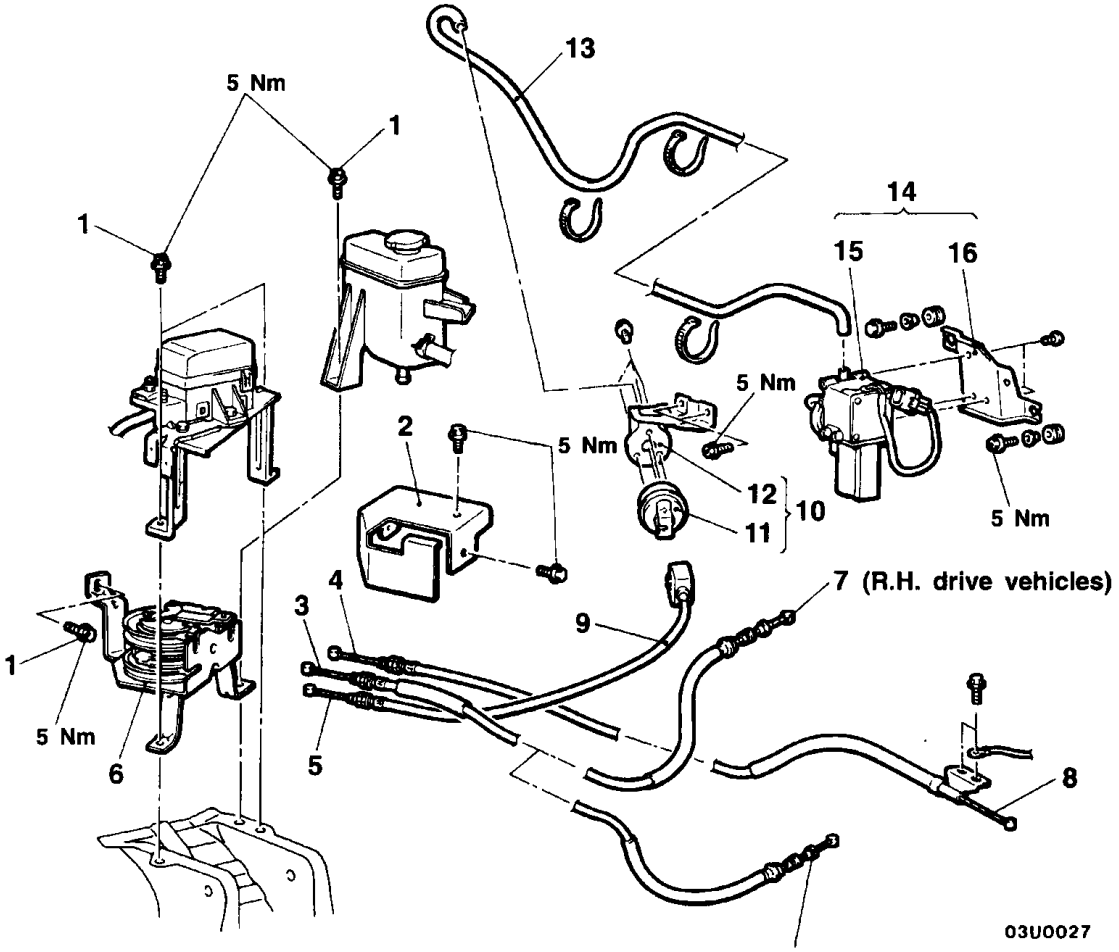
ACTUATOR

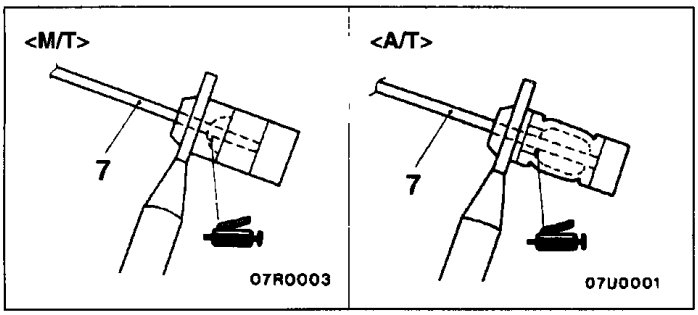
1. Remove the actuator.
2. Apply negative pressure to the actuator with the vacuum pump and check that the holder moves more than 35 mm. In addition, check that there is no change in the position of the holder when negative pressure is maintained in that condition.
3. First install the actuator and then inspect and adjust the auto-cruise control cable (Refer to P.17-24.)

AUTO-CRUISE CONTROL

17200140040

REMOVAL AND INSTALLATION





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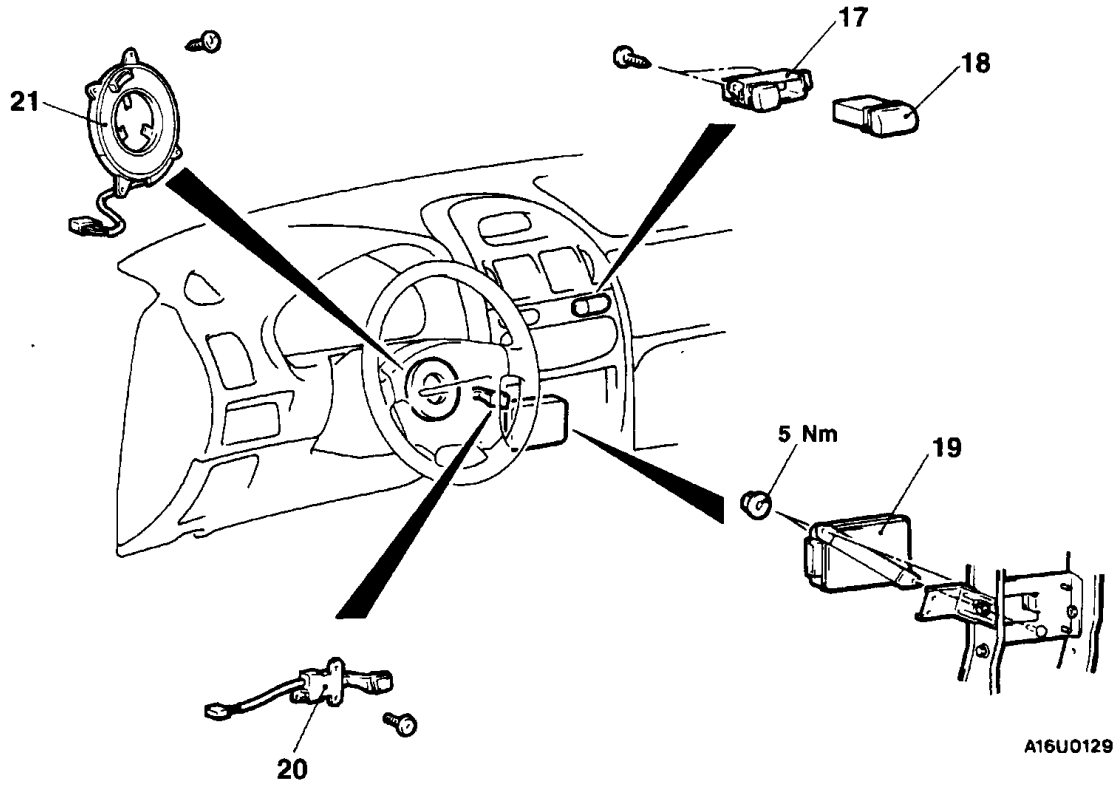
Link assembly removal steps

1. Bolts
2. Link protector
3. Accelerator cable connection
4. Throttle cable connection
5. Auto-cruise control cable connection
6. Link assembly
7. Accelerator cable connection
8. Throttle cable connection

Actuator removal steps

9. Auto-cruise control cable connection
10. Actuator and bracket assembly
11. Actuator
12. Actuator bracket
13. Vacuum hose
14. Auto-cruise vacuum pump and bracket assembly
15. Motor-driven vacuum pump assembly
16. Pump bracket

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



Main switch removal steps

- Center console panel (Refer to GROUP 52A – Floor Console.)
- Center pillar lower trim (Refer to GROUP 52A.)

17. Switch case
18. Main switch

Control unit removal

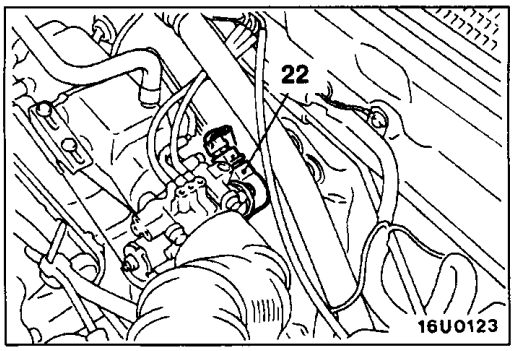
- Console side cover, radio and tape player (Refer to GROUP 52A.)

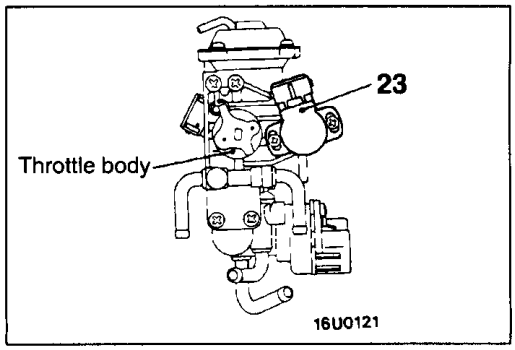
19. Auto-cruise control ECU

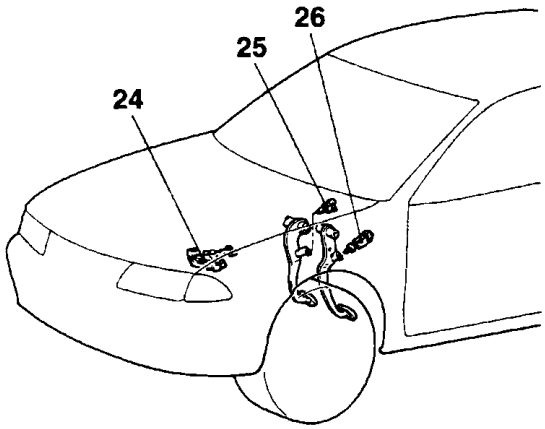
Control switch removal steps

- Air bag module <Vehicles with SRS> (Refer to GROUP 52B.)
- Horn switch (Refer to GROUP 37A – Steering Wheel and Shaft.)

20. Control switch
    - Steering wheel <Vehicles without SRS> (Refer to GROUP 37A.)
21. Slip ring <Vehicles without SRS>







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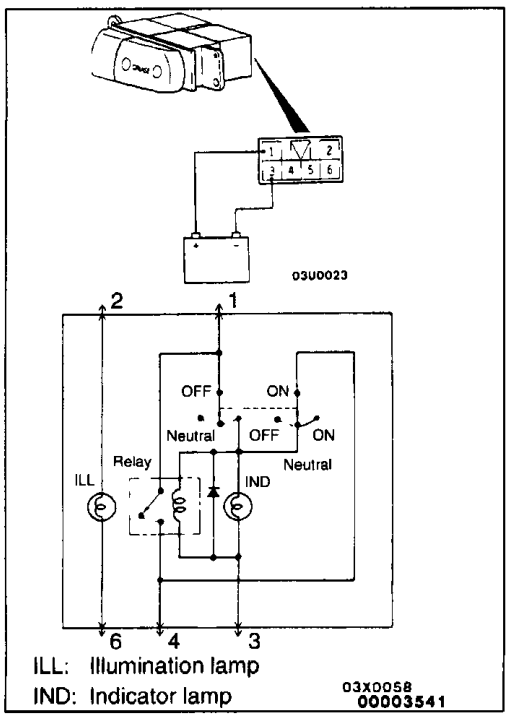
Sensor removal

22. Throttle position sensor
23. Accelerator pedal position sensor <Vehicles with TCL>
24. Inhibitor switch <A/T>
25. Stop lamp switch
26. Clutch switch <M/T>

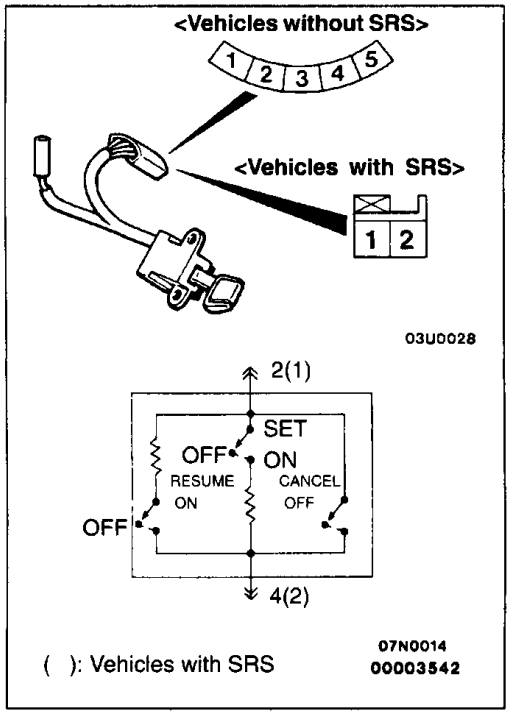


INSPECTION

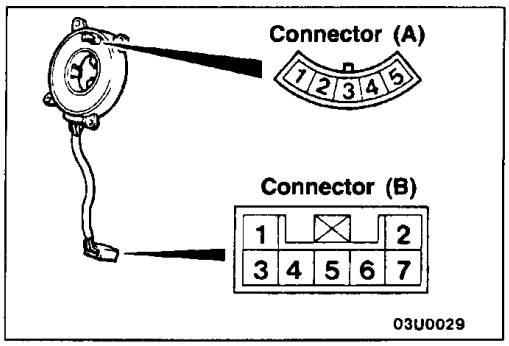
17200110058

AUTO-CRUISE CONTROL MAIN SWITCH CHECK

1. When the battery (+) side is connected to terminal 1 and the (–) side is connected to terminal 3, and the main switch is turned to ON, check if battery voltage is output between terminal 4 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 4 and the earth becomes 0V.
2. Check the continuity between terminals 2 and 6.



( ): Vehicles with SRS



AUTO-CRUISE CONTROL SWITCH CHECK 17200120051

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

SLIP RING CHECK 17200180028

Terminal used	Connector (A) terminal No.					Connector (B) terminal No.				
	1	2	3	4	5	1	2	3	6	7
ACC power supply		○				○				
Earth					○					○
Auto-cruise control				○					○	
Horn	○						○			

NOTE
1. Check to be sure that there is no change in continuity when the steering wheel is turned.
2. For vehicles with SRS, refer to GROUP 52B – Clock Spring.

EMISSION CONTROL SYSTEM

17300010047

GENERAL INFORMATION

The emission control system consists of the following subsystems:
- Crankcase emission control 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 solenoid valve	Equipped ON/OFF type solenoid valve (Purpose: HC reduction)
Exhaust emission control system	Air-fuel ratio control device–MPI system	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	×					17-37
Purge control solenoid valve		×				17-40
MPI system component		×	×			GROUP 13A
Catalytic converter				×		17-45
EGR valve					×	17-42
EGR control solenoid valve					×	17-44

SERVICE SPECIFICATIONS

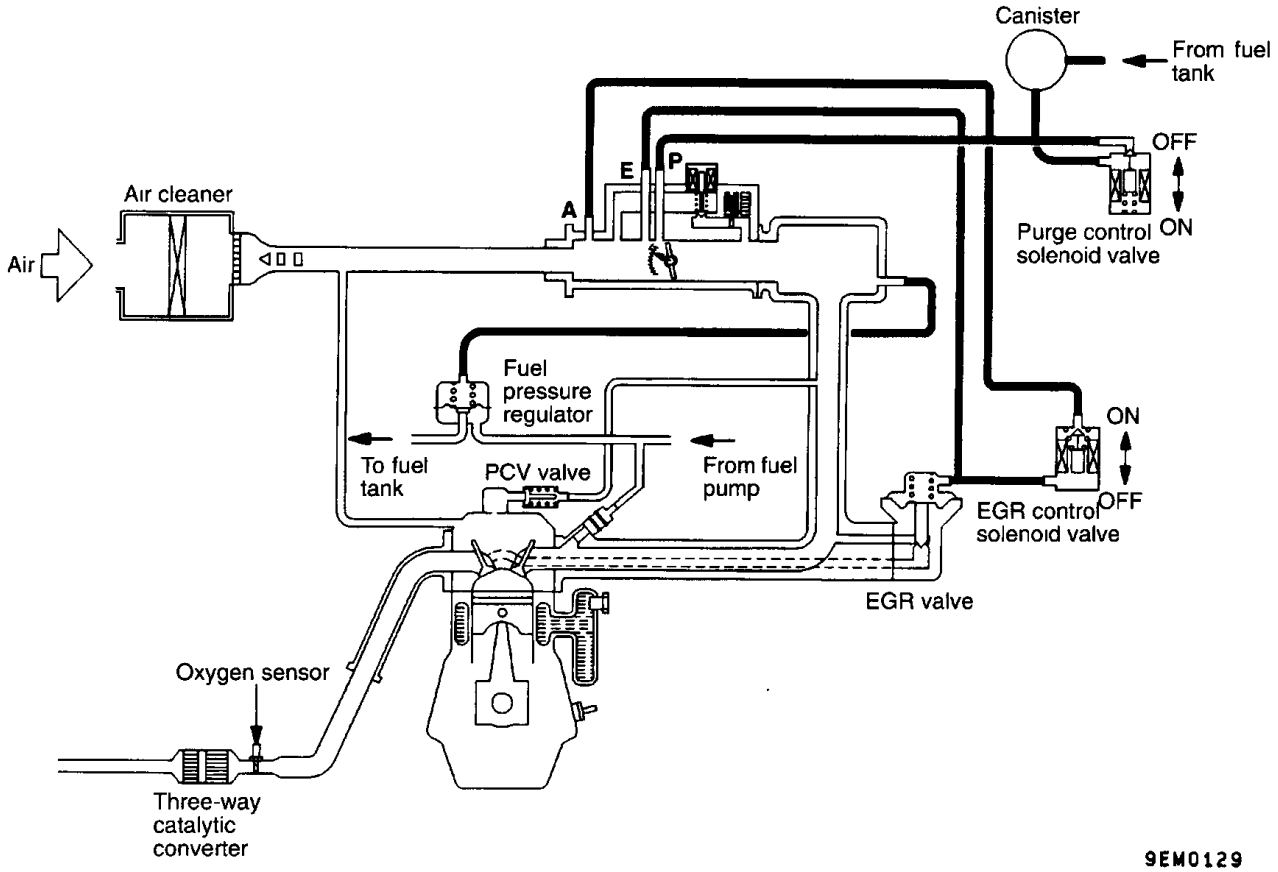
17300030043

Items	Standard value
Purge control solenoid valve coil resistance (at 20°C) Ω	62–74
EGR control solenoid valve coil resistance (at 20°C) Ω	62–74

VACUUM HOSE

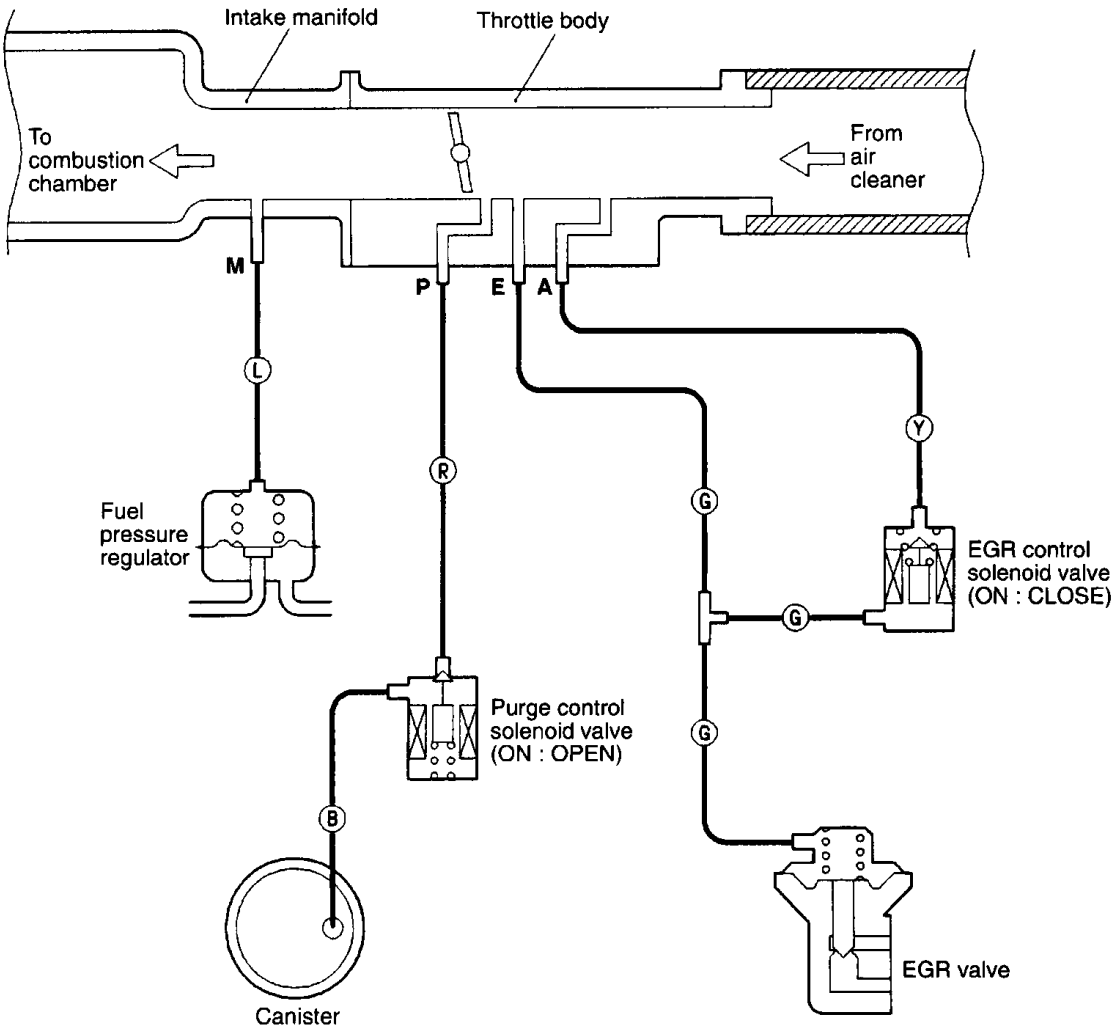
17300090041

VACUUM HOSE PIPING DIAGRAM



VACUUM CIRCUIT DIAGRAM

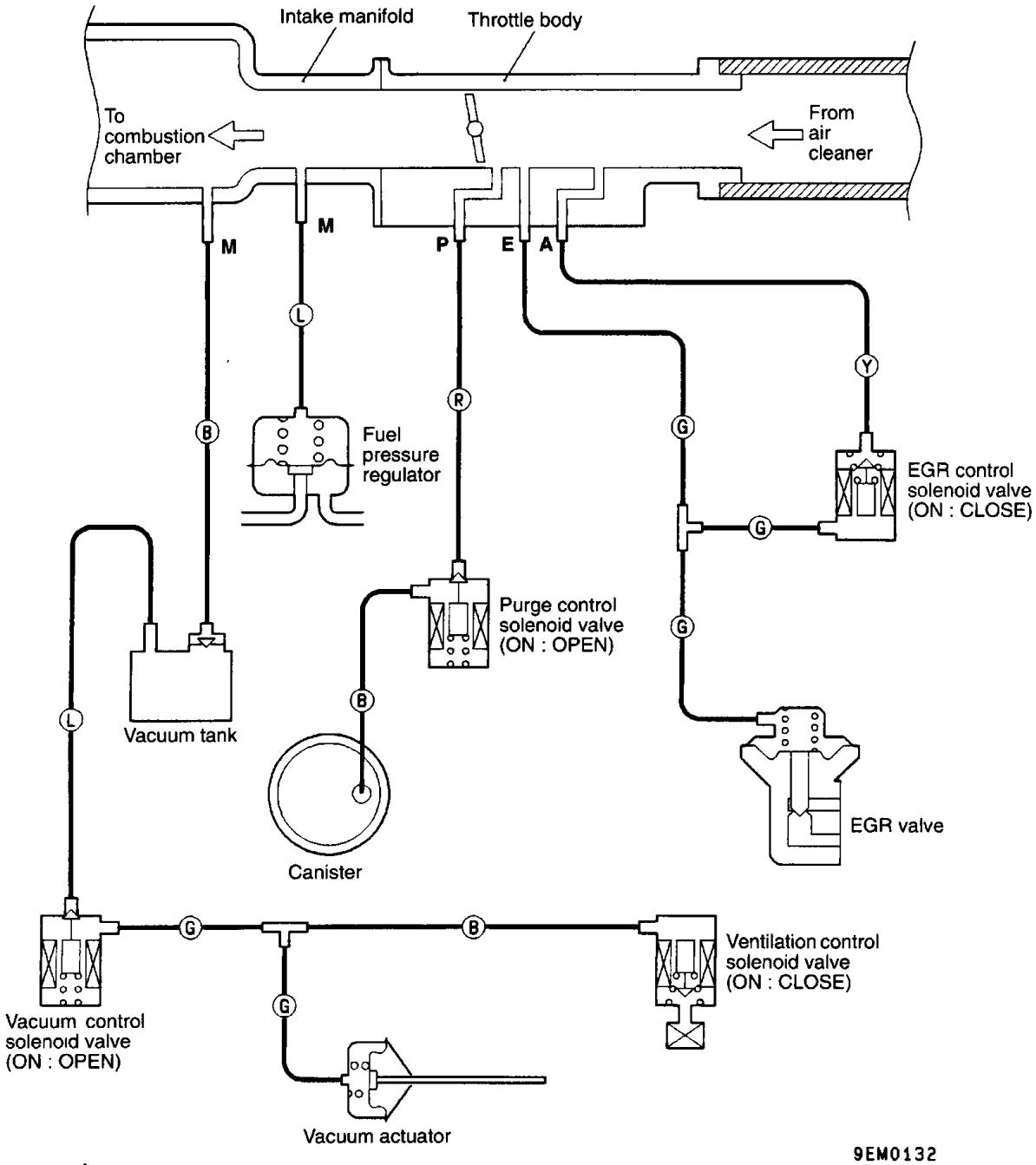
<Vehicles without TCL>



Vacuum hose colour

B: Black
G: Green
L: Light blue
R: Red
Y: Yellow

<Vehicles with TCL>



Vacuum hose colour
G: Green
Y: Yellow
L: Light blue
R: Red
B: Black

VACUUM HOSE CHECK

1. Using the 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.

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.

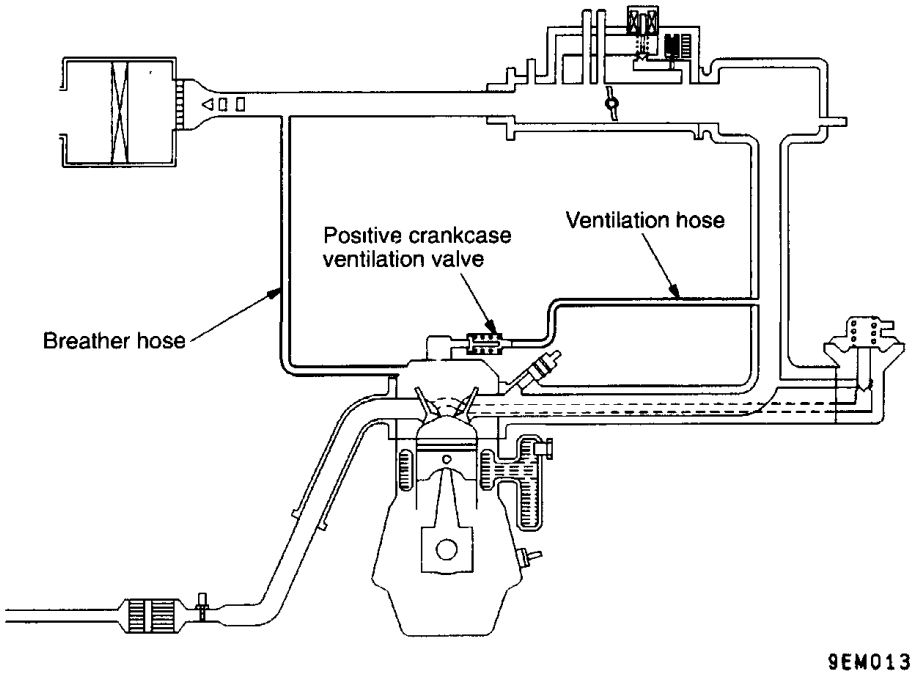
CRANKCASE EMISSION CONTROL SYSTEM

17300500049

GENERAL INFORMATION

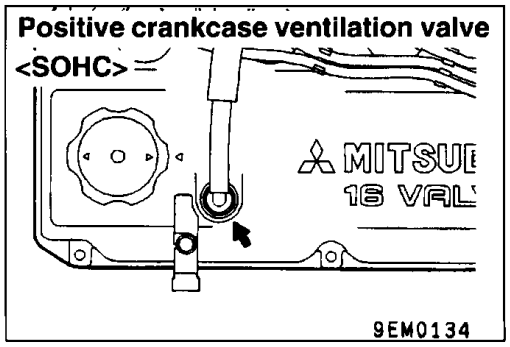
The crankcase emission control system prevents blow-by gases from escaping inside the crankcase into the atmosphere.
Fresh air is sent from the air cleaner into the crankcase through the breather hose. The air becomes mixed with the blow-by gases inside the crankcase.
The blow-by gas inside the crankcase is drawn into the intake manifold through the positive crankcase ventilation valve.
The positive crankcase ventilation valve lifts 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.

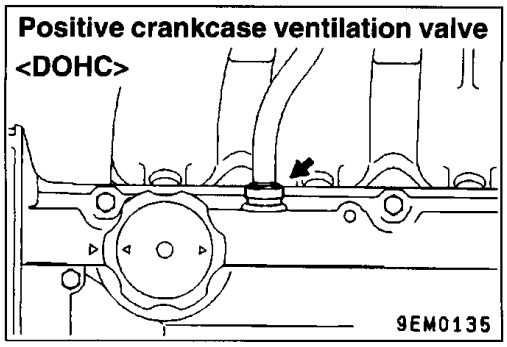
SYSTEM DIAGRAM



9EM0133

COMPONENT LOCATION

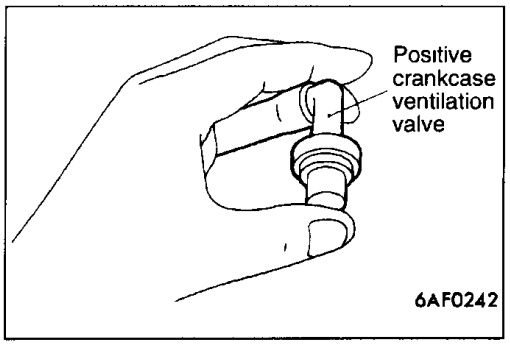




POSITIVE CRANKCASE VENTILATION SYSTEM CHECK

17300110044

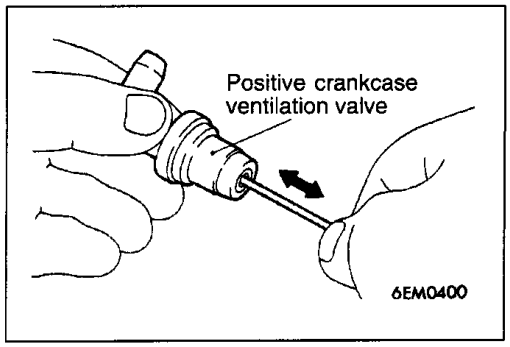
1. Remove the ventilation hose from the positive crankcase ventilation valve.
2. Remove the positive crankcase ventilation valve from the rocker cover.
3. Reinstall the positive crankcase ventilation valve at the ventilation hose.
4. Start the engine and run at idle.



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

   NOTE
   At this moment, the plunger in the positive crankcase ventilation valve moves back and forth.

6. If vacuum is not felt, clean the positive crankcase ventilation valve or replace it.



PCV VALVE CHECK

17300120047

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 check 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.

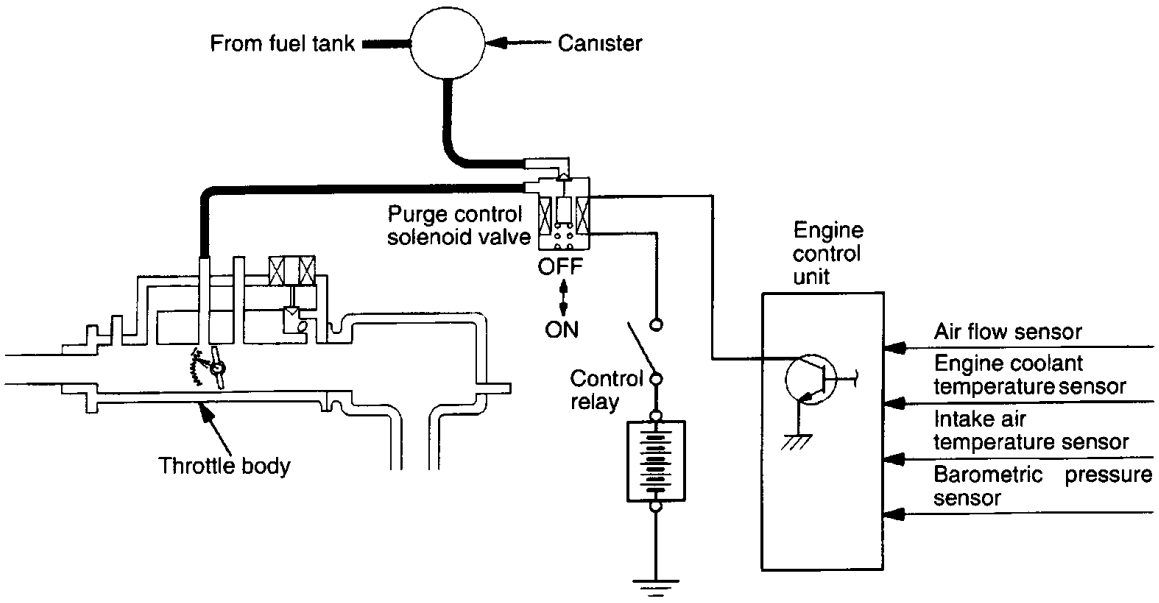
EVAPORATIVE EMISSION CONTROL SYSTEM

17300510059

GENERAL INFORMATION

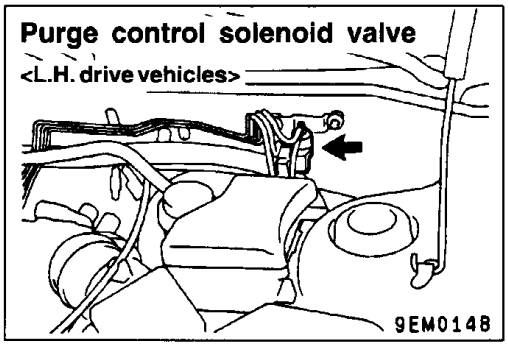
The evaporative emission control system prevents fuel vapours generated in the fuel tank from escaping into the atmosphere.
Fuel vapours from the fuel tank flow through the fuel tank pressure control valve and vapour pipe/hose to be stored temporarily in the canister.
When driving the vehicle, fuel vapours stored in the canister flow through the purge solenoid and purge port and go into the intake manifold to be sent to the combustion chamber.
When the engine coolant temperature is low or when the intake air quantity is small (when the engine is at idle, for example), the engine control unit turns the purge solenoid off to shut off the fuel vapour flow to the intake manifold.
This does not only insure the driveability when the engine is cold or running under low load but also stabilize the emission level.

SYSTEM DIAGRAM

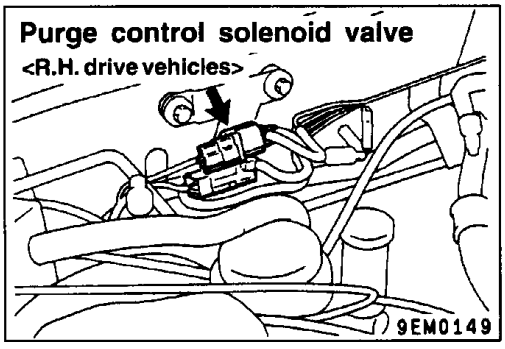


6FU2235

COMPONENT LOCATION



9EM0148



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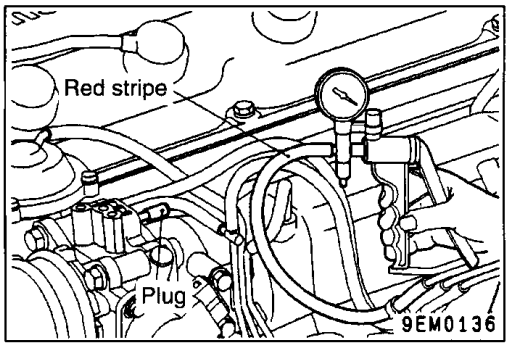


PURGE CONTROL SYSTEM CHECK 17300140043

1. Disconnect the vacuum hose (red stripe) from the throttle body and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold or hot, apply a vacuum while the engine is idling, and check the condition of the engine and the vacuum.

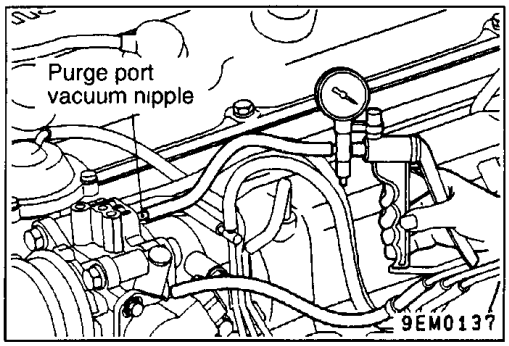
When engine is cold
(Engine coolant temperature: 40°C or less)

Vacuum	Engine condition	Normal condition
53 kPa	3,000 r/min	Vacuum is maintained

When engine is hot
(Engine coolant temperature: 80°C or higher)

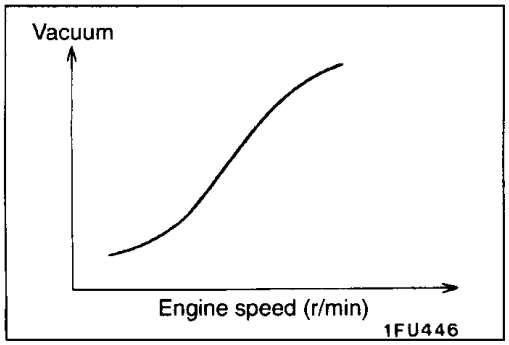
Vacuum	Engine condition	Normal condition
53 kPa	At idle	Vacuum is maintained
	3,000 r/min	Vacuum will leak for approximately 3 minutes after the engine is started. After 3 minutes have passed, the vacuum will be maintained momentarily, after which it will again leak.*

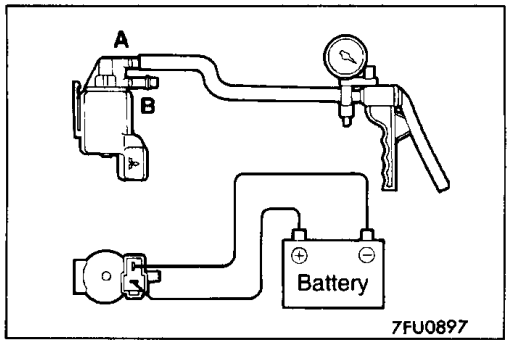
NOTE
*: The vacuum will leak continuously if the atmospheric pressure is approximately 77 kPa or less, or the temperature of the intake air is approximately 50°C or higher.

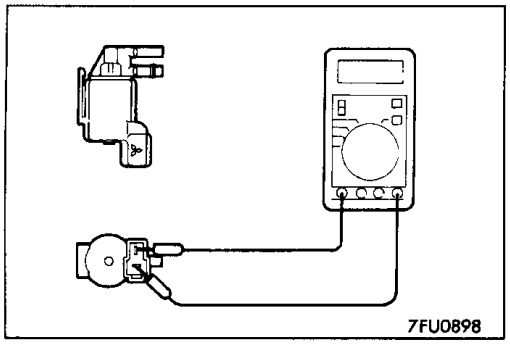


PURGE PORT VACUUM CHECK 17300150046

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 that, after raising the engine speed by racing the engine, purge vacuum raises according to engine speed.

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

PURGE CONTROL SOLENOID VALVE CHECK

17300170042

NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

1. Disconnect the vacuum hose (black stripe, red stripe) from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to nipple (A) of the solenoid valve (refer to the illustration at left).
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the purge control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained

5. Measure the resistance between the terminals of the solenoid valve.

   Standard value: 62–74 Ω (at 20°C)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

17300520045

GENERAL INFORMATION

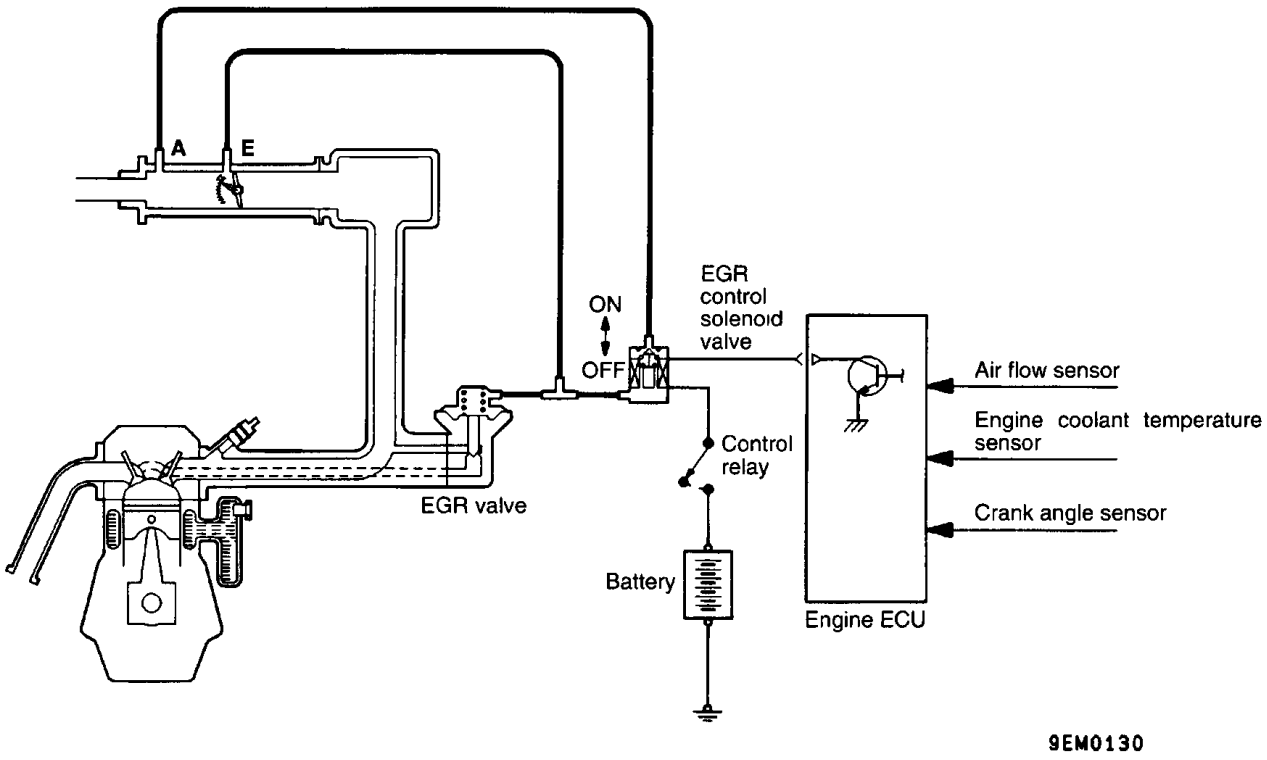
The exhaust gas recirculation (EGR) system lowers the nitrogen oxide (NOx) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of nitrogen oxides (NOx) is generated in the combustion chamber. Therefore, this system recirculates part of emission gas from the exhaust 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 NOx.
The EGR flow rate is controlled by the EGR valve so as not to decrease the driveability.

OPERATION

The EGR valve is being closed and does not recirculate exhaust gases under one of the following conditions. Otherwise, the EGR valve is opened and recirculates exhaust gases.

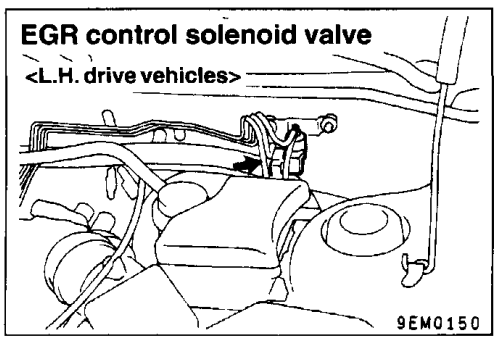
- The engine coolant temperature is low.
- The engine is at idle.
- The throttle valve is widely opened.

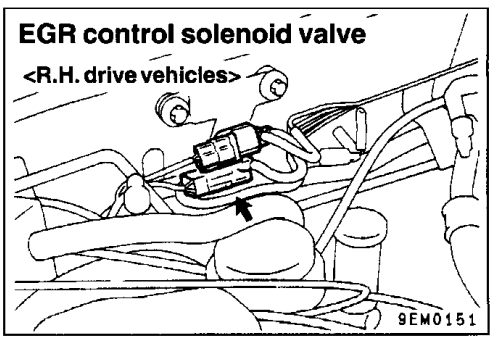
SYSTEM DIAGRAM

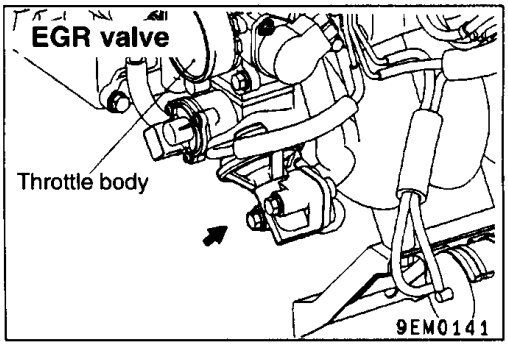


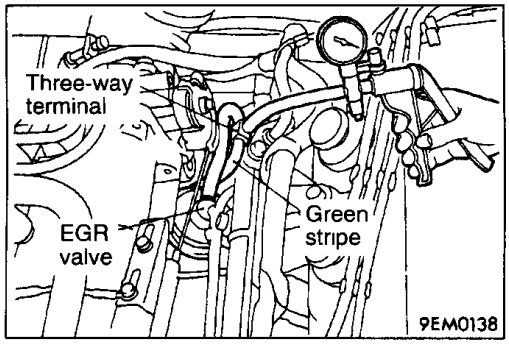
9EM0130

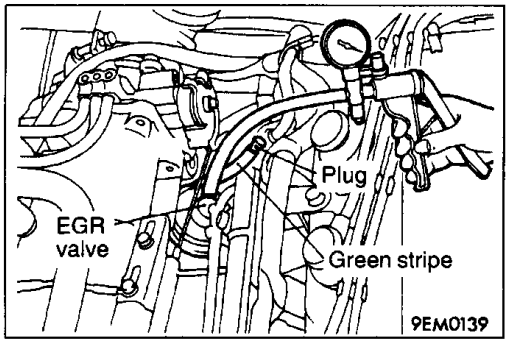
COMPONENT LOCATION











EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM CHECK 17300260053

1. Disconnect the vacuum hose (green stripe) from the EGR valve, and then connect a hand vacuum pump via the three-way terminal.
2. When the engine is hot or cold, check the condition of vacuum by racing the engine.

When engine is cold
(Engine coolant temperature: 20°C or less)

Throttle valve	Normal vacuum condition
Open quickly	No vacuum will generate (the same as barometric pressure.)

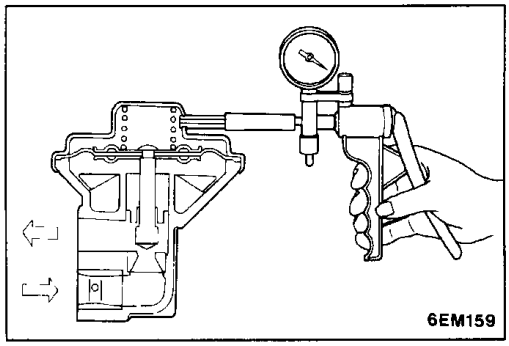
When engine is hot
(Engine coolant temperature: 80°C or higher)

Throttle valve	Normal vacuum condition
Open quickly	It will momentarily rise over 13 kPa

3. Disconnect the three-way terminal.
4. Connect the hand vacuum pump to the EGR valve.
5. Check whether the engine stalls or the idling is unstable when a vacuum of 30 kPa or higher is applied during idling.

EGR VALVE CHECK 17300280042

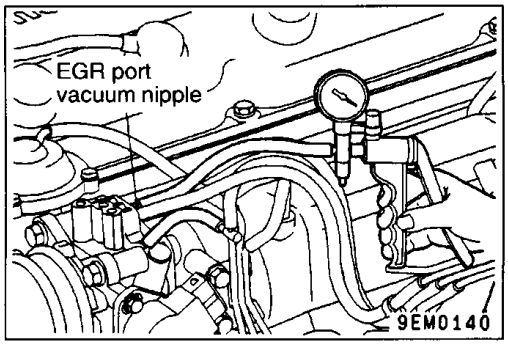
1. Remove the EGR valve and inspect for sticking, carbon deposits, etc. If found, clean with a suitable solvent so that the valve seats correctly.
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67 kPa of vacuum, and check that the vacuum is maintained.



4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

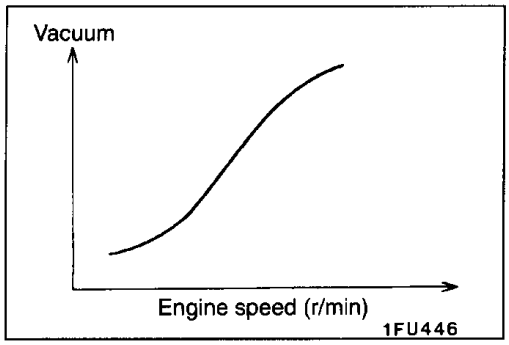
Vacuum	Passage of air
5.3 kPa or less	Air is not blown out
26 kPa or more	Air is blown out

5. Replace the gasket, and tighten to the specified torque.
   Specified torque: 22 Nm



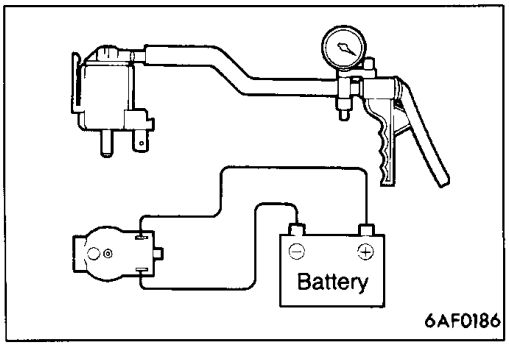
EGR PORT VACUUM CHECK 17300290045

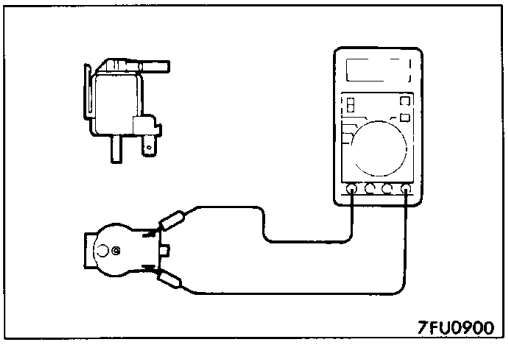
1. Disconnect the vacuum hose (green stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.



2. Start the engine and check to see that, after raising the engine speed by racing the engine, EGR 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 EGR port may be clogged and require cleaning.





EGR CONTROL SOLENOID VALVE CHECK

17300310048

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: 62–74Ω (at 20°C)

CATALYTIC CONVERTER

17300530055

GENERAL INFORMATION

The three-way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC) and reduces nitrogen oxides (NOx).

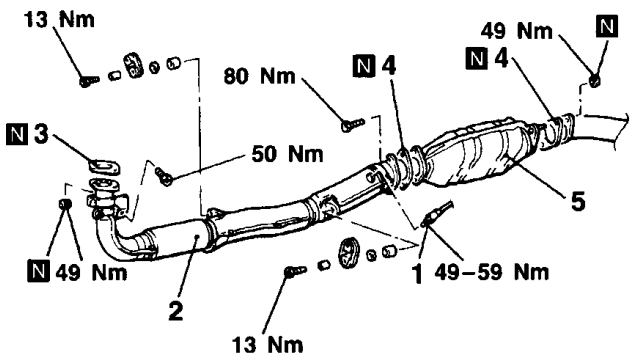
When the mixture is controlled at stoichiometric air-fuel ratio, the three-way catalytic converter provides the highest purification against the three constituents, namely, CO, HC and NOx.

REMOVAL AND INSTALLATION

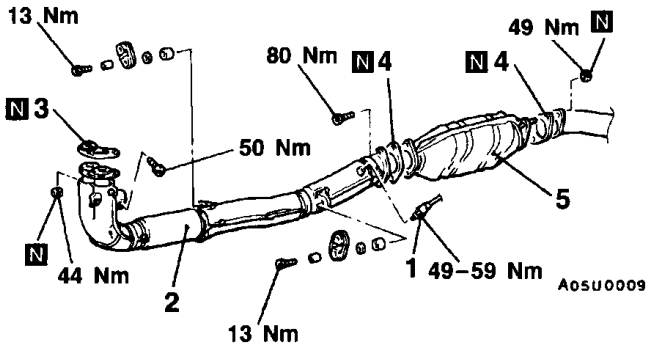
17300390042

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation

<SOHC>



<DOHC>



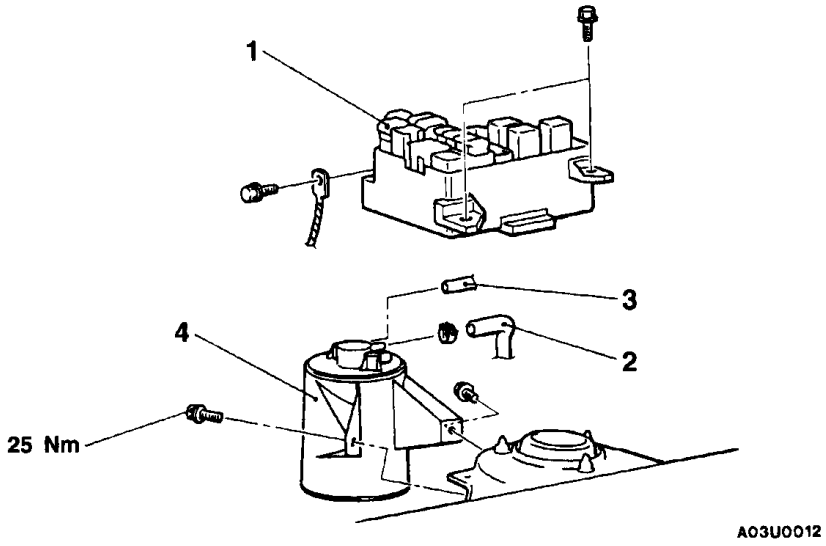
Removal steps
1. Oxygen sensor
2. Front exhaust pipe
3. Gasket
4. Gasket
5. Catalytic converter

CANISTER

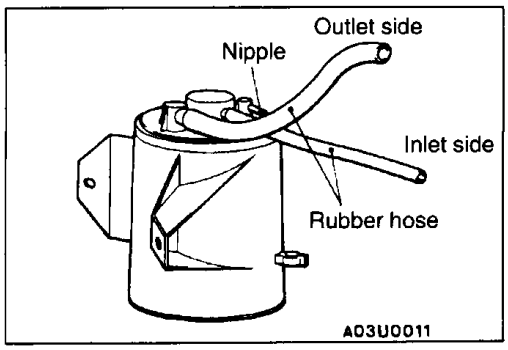
17300420024

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Air Cleaner, Air Intake Hose Removal and Installation



Removal steps
1. Relay box
2. Vapor hose
3. Purge hose
4. Canister



INSPECTION

17300430027

SIMPLE INSPECTION OF CHECK VALVE INSIDE CANISTER

1. Connect clean rubber hoses to the nipples on the inlet side and outlet side.
2. Close off the other nipple with your finger and then check the operation of the check valve.

Inspection procedure	Normal condition
Lightly blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance.
Lightly blow from outlet side (atmosphere side).	Air passes through.

CLUTCH

CONTENTS

21109000039

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Bleeding 3

CLUTCH PEDAL **4**

CLUTCH CONTROL **5**

Clutch Master Cylinder 6

CLUTCH

21100010031

GENERAL INFORMATION

The clutch is a dry single-disc, diaphragm type; hydraulic pressure is used for the clutch control.

SERVICE SPECIFICATIONS

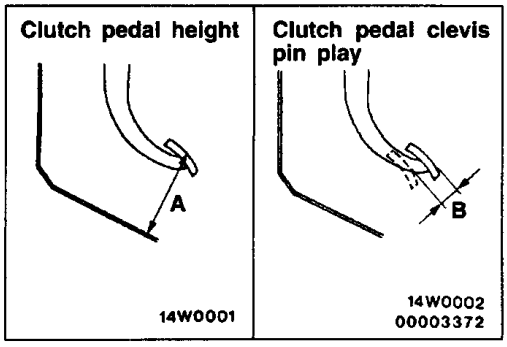
21100030037

Items	Standard value
Clutch pedal height mm	163.5–166.5 (L.H. drive vehicles) 162.5–165.5 (R.H. drive vehicles)
Clutch pedal free play mm	6–13
Clutch pedal clevis pin play mm	1–3
Distance between the clutch pedal and the toeboard when the clutch is disengaged mm	85

LUBRICANTS

21100040023

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

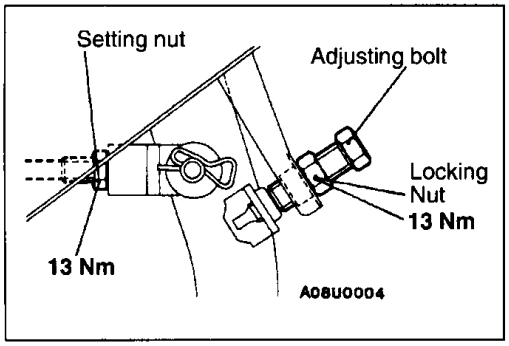


ON-VEHICLE SERVICE

21100090035

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

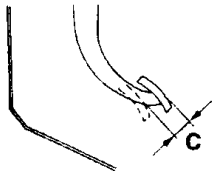
1. Measure the clutch pedal height and the clutch pedal clevis pin play.
   Standard value (A): 163.5–166.5 <L.H. drive vehicles>
   162.5–165.5 <R.H. drive vehicles>
   Standard value (B): 1–3 mm



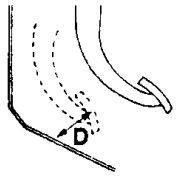
2. If the height of the clutch pedal is outside the standard value, loosen the lock nut and adjust the pedal height to the standard value using the adjusting bolt or push rod.
3. If the clutch pedal play is not within the standard value, loosen the locking nut and move the push rod to adjust.

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

Clutch pedal free play



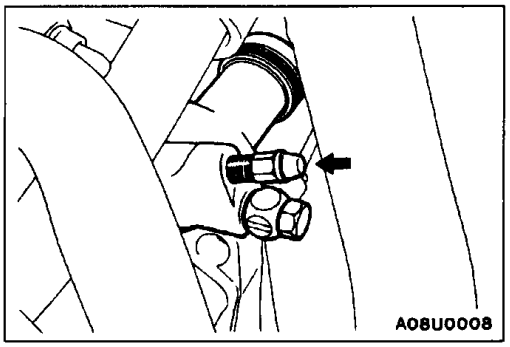
Distance between the clutch pedal and the toeboard when the clutch is disengaged



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

Standard value (C): 6–13 mm
Standard value (D): 85 mm

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



BLEEDING

21100140037

Specified brake fluid: DOT 3 or DOT 4

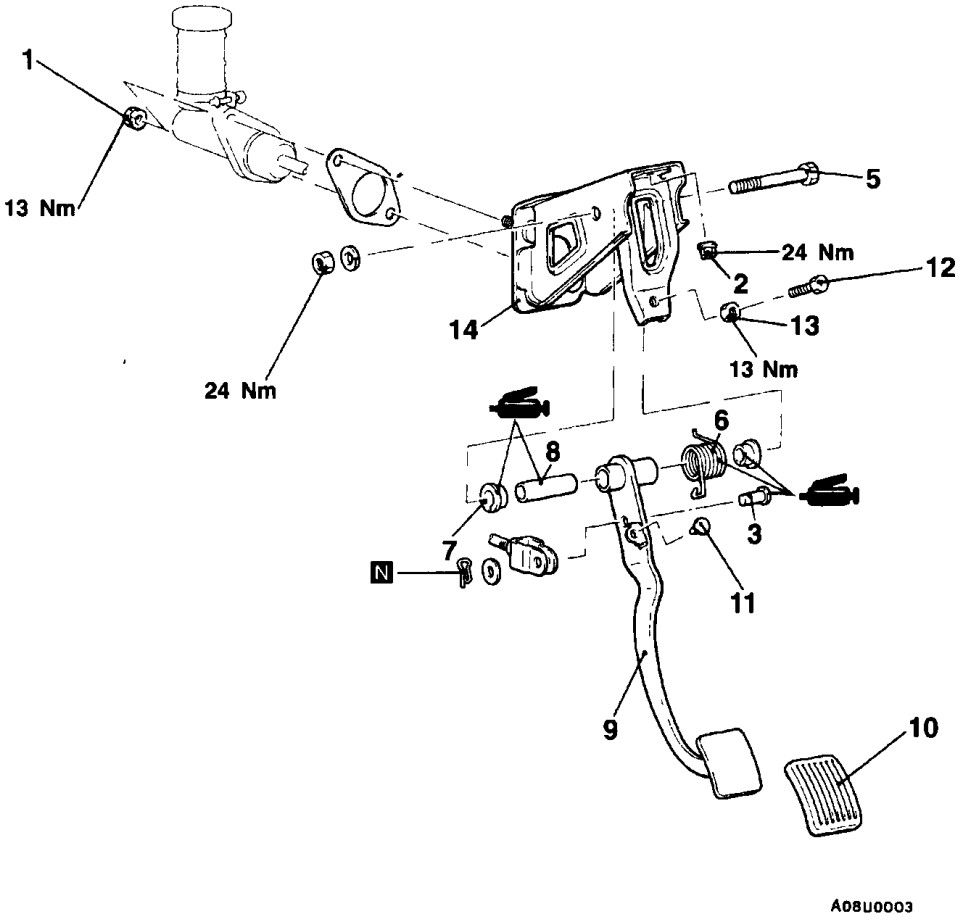
Caution
Use the specified brake fluid. Avoid using a mixture of the specified fluid and other fluid.

CLUTCH PEDAL

21100160033

REMOVAL AND INSTALLATION

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



Removal steps
1. Clutch master cylinder installation nut
2. Master cylinder member installation nut
3. Clevis pin
4. Pedal support member and clutch pedal assembly
5. Bolt
6. Clutch pedal return spring
7. Clutch pedal bushing
8. Pipe
9. Clutch pedal
10. Pedal pad
11. Stopper
12. Adjusting Bolt
13. Lock nut
14. Master cylinder member assembly

CLUTCH CONTROL

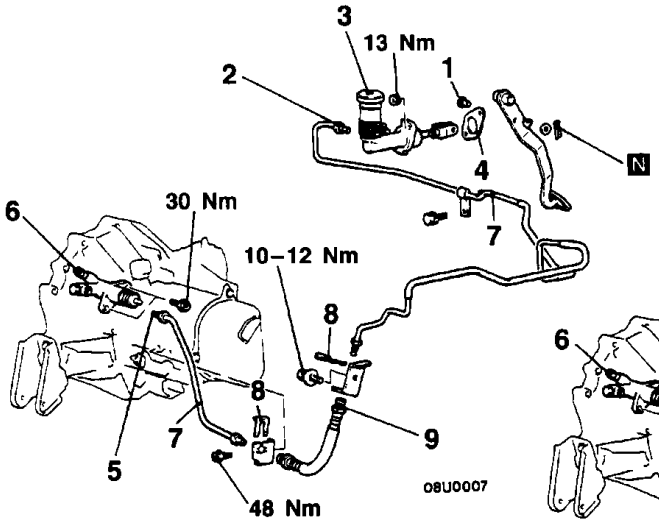
21100190032

REMOVAL AND INSTALLATION

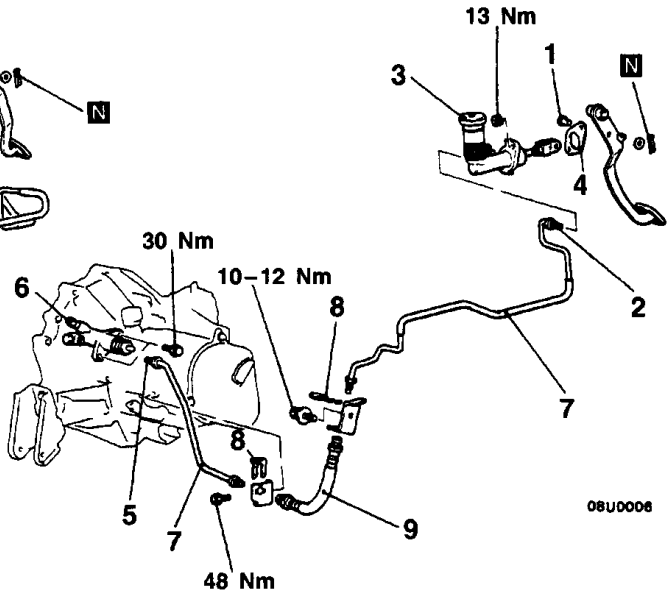
Pre-removal Operation
- Clutch Fluid Draining

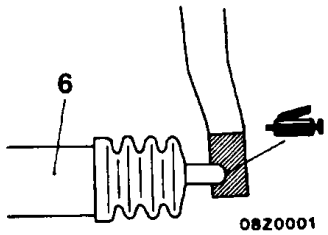
Post-installation Operation
1. Clutch Fluid Supplying
2. Clutch Line Bleeding (Refer to P.21-3.)
3. Clutch pedal adjustment (Refer to P.21-2.)

<L.H. drive vehicles>

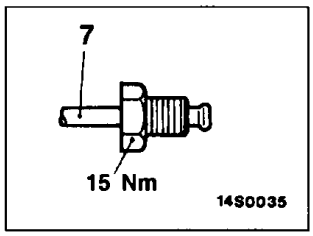


<R.H. drive vehicles>





Specified grease:
MITSUBISHI genuine grease
Part No. 0101011



00003379

Clutch master cylinder removal steps
1. Clevis pin
2. Clutch pipe connection
3. Clutch master cylinder
4. Sealer

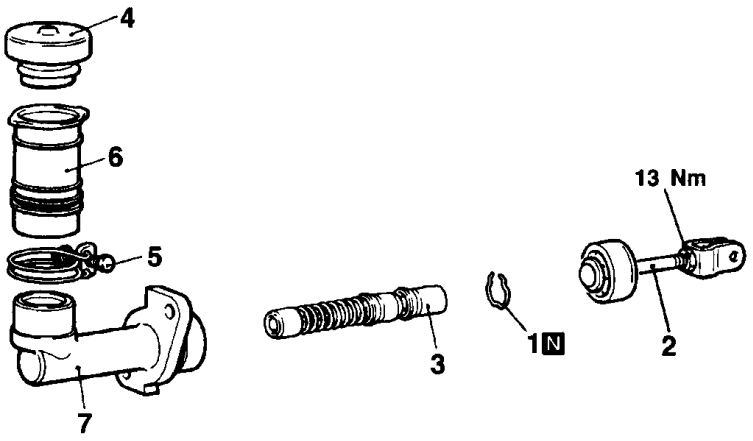
Clutch release cylinder removal steps
5. Clutch pipe connection
6. Clutch release cylinder

Clutch line removal steps
7. Clutch pipe
8. Hose clip
9. Clutch hose

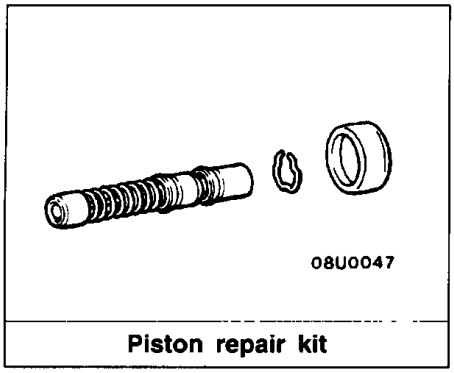
DISASSEMBLY AND REASSEMBLY

21100210035

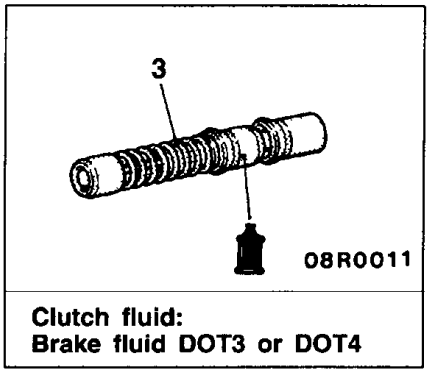
CLUTCH MASTER CYLINDER



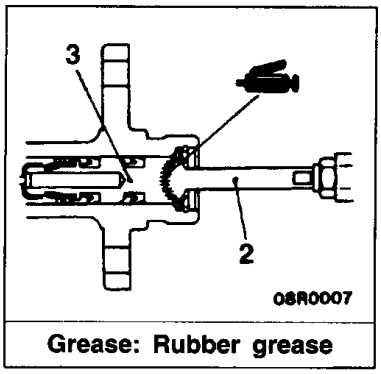
00003360



Piston repair kit



Clutch fluid:
Brake fluid DOT3 or DOT4



Grease: Rubber grease

Disassembly steps

1. Piston stopper ring
2. Push rod assembly
3. Piston assembly
4. Reservoir cap
5. Reservoir band
6. Reservoir tank
7. Clutch master cylinder body

Caution
Do not disassemble piston assembly.

MANUAL TRANSMISSION

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22109000036

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GENERAL INFORMATION

22100010038

The F5MR1 and F5MR2 manual transmissions are designed.

Items		Specifications
Model		F5MR1, F5MR2
Type		Manual, 5-speed, Front wheel drive
Gear ratio	1st	3.363
	2nd	2.074
	3rd	1.321
	4th	0.967
	5th	0.795
	Reverse	3.550
Final reduction ratio		4.067

LUBRICANTS

22100040037

Item	Specified lubricant	Quantity ℓ
Transmission oil	Elf Tranself TRX 75W-80W (XT3556)	3.4

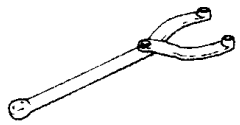
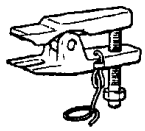
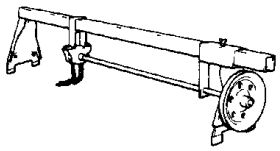
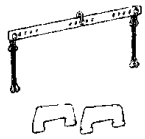
SEALANT

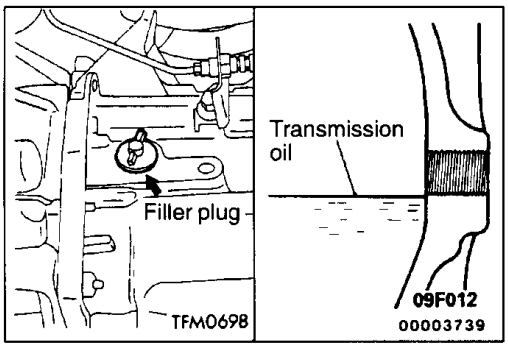
22100050016

Item	Specified sealant	Remark
Spring pin	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant

SPECIAL TOOLS

22100060040

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



ON-VEHICLE SERVICE

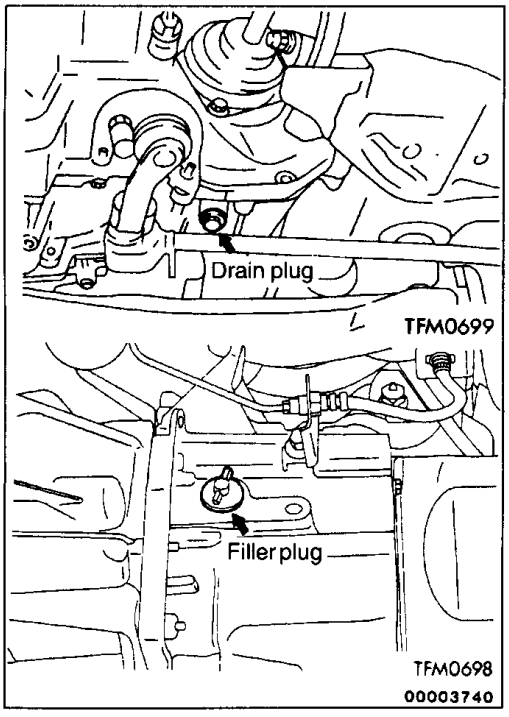
22100090049

TRANSMISSION OIL LEVEL CHECK

Inspect each component for evidence of leakage, and check the oil level by remaining the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

1. Oil level should be at the lower portion of the filler plug hole.
2. Check that the transmission oil is not noticeably dirty, and that it has a suitable viscosity.
3. Tighten filler plug to specified torque.

   Specified torque: 22 Nm



TRANSMISSION OIL REPLACEMENT

22100100032

1. Remove transmission drain plug.
2. Drain oil.
3. Tighten drain plug to specified torque.

   Specified torque: 38 Nm

4. Remove filler plug and fill with specified oil till the level comes to the lower portion of filler plug hole.

   Speficied oil: Elf Tranself TRX 75W-80W (XT3556)

   Quantity: 3.4 ℓ

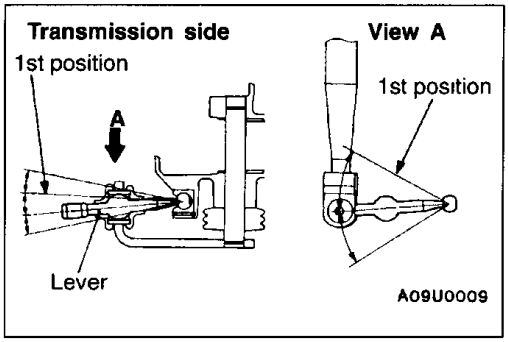
5. Tighten filler plug to specified torque.

   Specified torque: 22 Nm

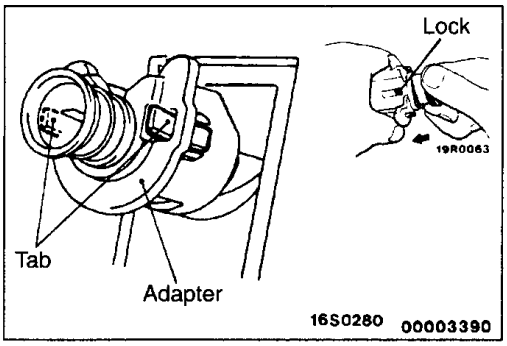
REVERSE MIS-OPERATION PREVENTION FUNCTION CHECK 22100570017

1. Carry out the following checks.

Checking procedure	Check conditions		Check contents (normal condition)
1	Locking knob: Cannot be pulled up	Shift lever: Move the lever in the select direction (reverse direction) until it stops, and then move it forward.	Shifts to 1st
2	Locking knob: Can be pulled up		Shifts to reverse



2. If the above operations cannot be carried out, adjust the shift rod by the following procedure.
   a. Loosen the shift rod adjustment bolt.
   b. Move the transmission-side lever and the shift lever assembly to 1st position.
   c. Tighten the shift rod adjustment bolt.



SPEEDOMETER CABLE REPLACEMENT 22100250010

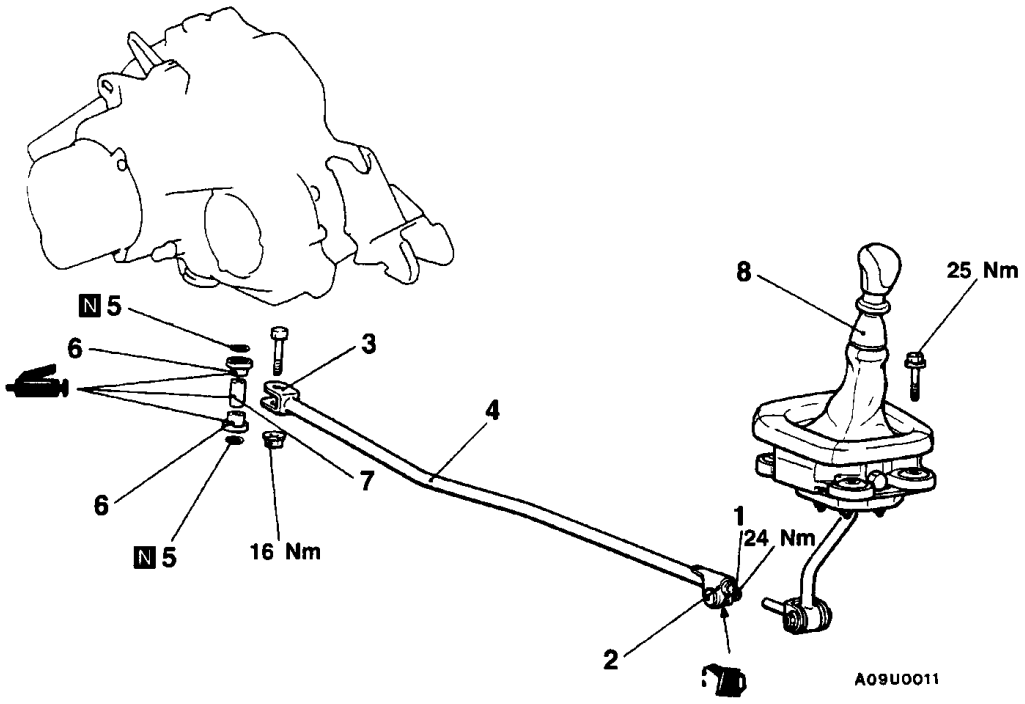
1. Remove the meter bezel and combination meter.
2. Remove the adapter lock.
3. Pull the speedometer cable slightly into the passenger compartment, and remove the rear side of the adapter from the cable.
4. After turning the adapter so that the notched section is aligned with the tab on the cable side, remove the adapter by sliding it backwards.
5. Tie a rope to the end of the speedometer cable that is in the passenger compartment. Then remove the grommet inside the engine compartment, and pull the cable into the engine compartment.
6. Pull out the retainer pin, and then remove the speedometer cable from the transmission.

TRANSMISSION CONTROL

22100380030

REMOVAL AND INSTALLATION

Post-installation Operation
(1) Reverse Mis-operation Prevention Function Check (Refer to P.22-5.)
(2) Shift Lever Operation Check



Shift rod assembly removal steps
1. Shift rod adjusting bolt
2. Shift rod assembly connection (Shift lever side)
3. Shift rod assembly connection (Transmission side)
4. Shift rod assembly
5. O-ring
6. Shift rod bushing
7. Collar

◀A▶

Shift lever assembly removal steps
2. Shift rod assembly connection (Shift lever side)
8. Shift lever assembly

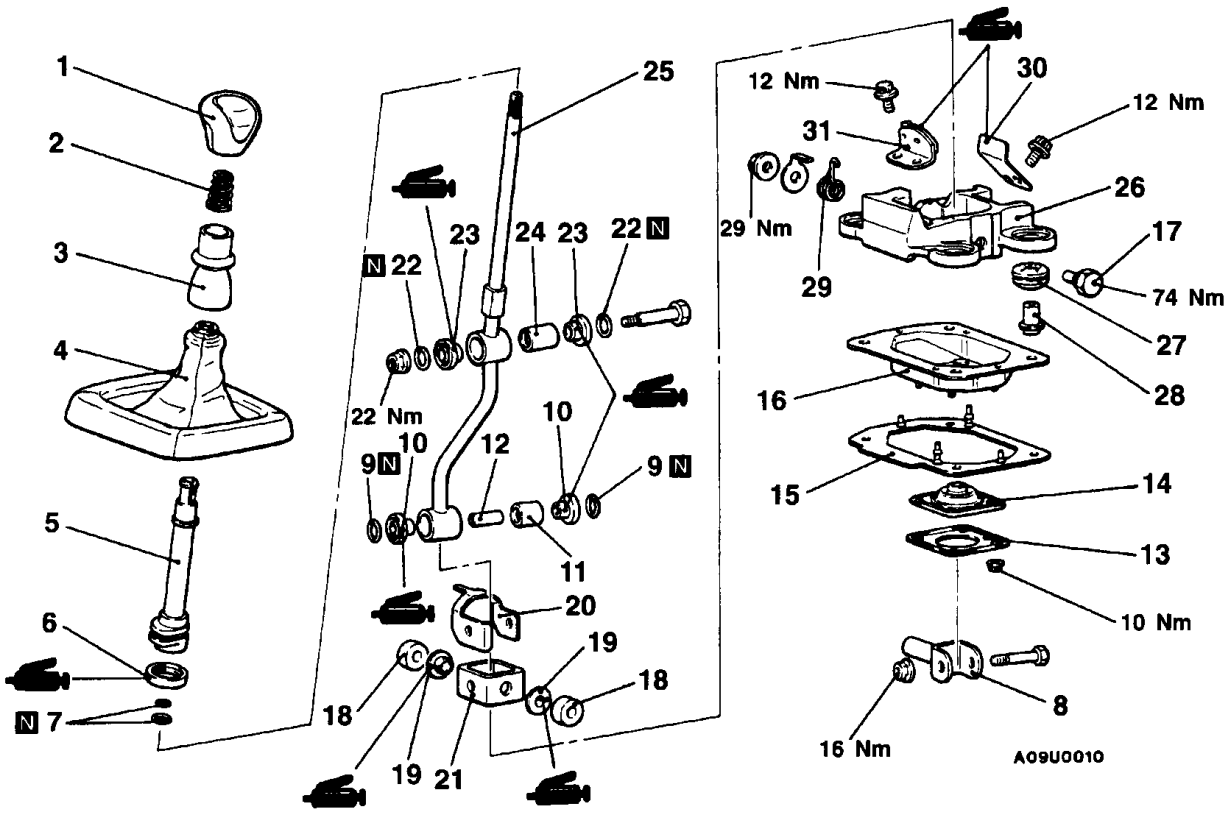
REMOVAL SERVICE POINT

◀A▶ SHIFT ROD ASSEMBLY DISCONNECTION

Suspend the shift rod assembly from the vehicle with wire.

SHIFT LEVER ASSEMBLY
DISASSEMBLY AND REASSEMBLY

22100400033



Disassembly steps

1. Shift knob
2. Spring
3. Locking knob
4. Shift lever cover assembly
5. Locking tube
6. Stopper rubber A
7. O-ring
8. Shift fork
9. O-ring
10. Shift bushing
11. Rubber bushing
12. Collar
13. Retainer
14. Dust cover
15. Packing
16. Base bracket
17. Bolt B
18. Rubber bushing
19. Bushing
20. Detent plate
21. Base
22. O-ring
23. Shift bushing
24. Rubber bushing
25. Shift lever
26. Bracket assembly
27. Bushing
28. Distance piece
29. Select return spring
30. 5th stopper plate
31. Reverse stopper plate

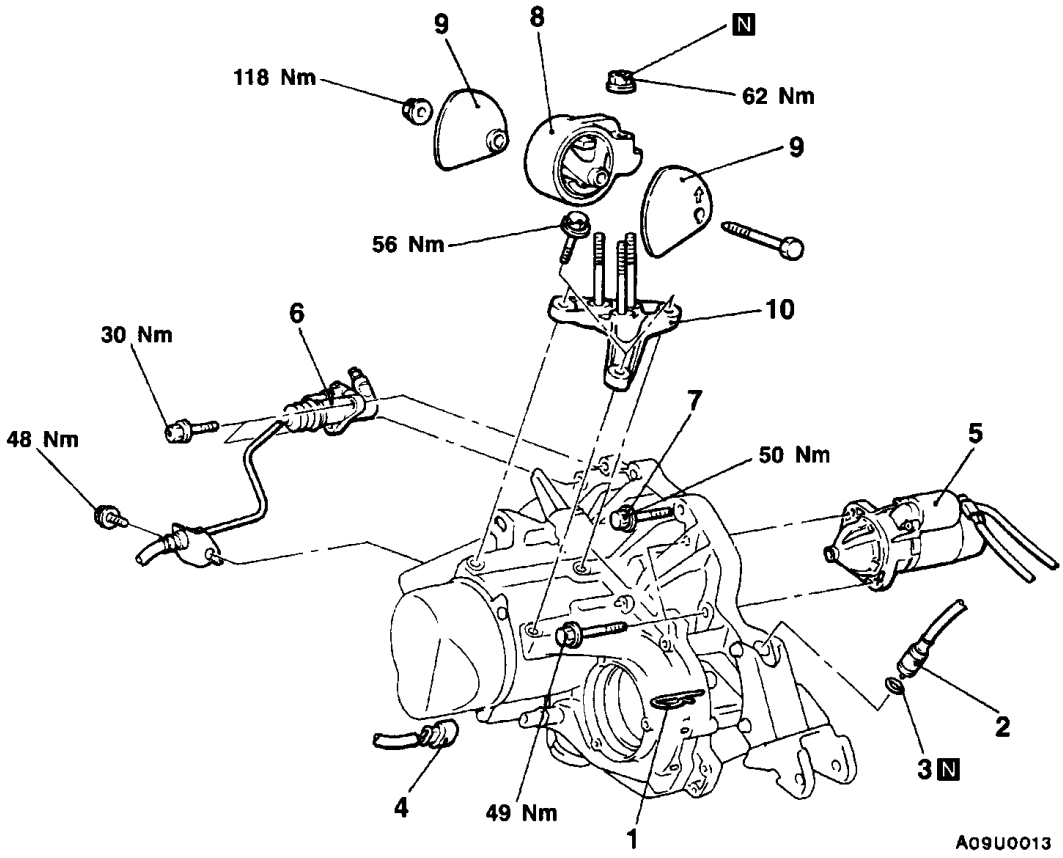
TRANSMISSION ASSEMBLY

22100270047

REMOVAL AND INSTALLATION

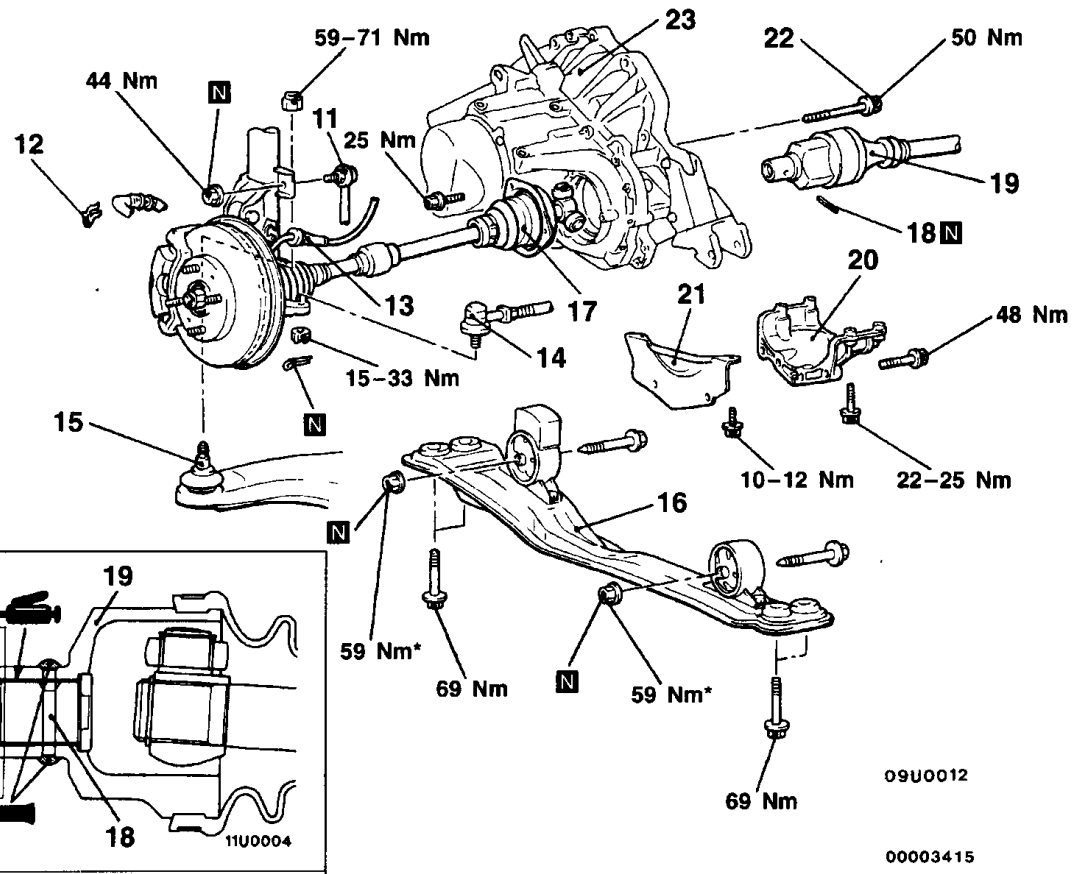
Pre-removal Operation
(1) Transmission Oil Draining (Refer to P.22-4.)
(2) Under Cover Removal
(3) Air Cleaner Assembly Removal
(4) Battery Removal
(5) Canister Removal (Refer to GROUP 17.)
(6) Shift Rod Assembly Removal (Refer to P.22-6.)

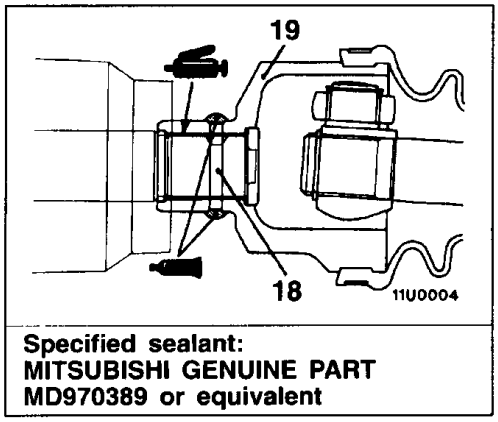
Post-installation Operation
(1) Shift Rod Assembly Installation (Refer to P.22-6.)
(2) Canister Installation (Refer to GROUP 17.)
(3) Battery Installation
(4) Air Cleaner Assembly Installation
(5) Under Cover Installation
(6) Transmission Oil Supplying (Refer to P.22-4.)
(7) Shift Lever Operation Check
(8) Speedometer Operation Check



Removal steps

1. Retainer pin
2. Speedometer cable connection
3. O-ring
4. Backup lamp switch connector
◀A▶ 5. Starter motor
◀B▶ 6. Clutch release cylinder connection
7. Transmission assembly upper part coupling bolts
◀C▶ 8. Transmission mount bracket
▶B◀ 9. Transmission mount stopper
10. Transmission mount lower bracket
◀D▶ • Engine assembly supporting





Specified sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent

Lifting up of the vehicle

11. Stabilizer link connection
12. Brake hose clamp
13. Speed sensor cable connection <Vehicles with ABS>
◀E▶ 14. Tie rod end connection
◀E▶ 15. Lower arm ball joint connection
16. Centermember assembly
◀F▶ 17. Drive shaft <L.H.> connection
▶A◀ 18. Spring pin
▶A◀ 19. Drive shaft <R.H.> connection
20. Transmission stay <SOHC>
21. Bell housing cover <SOHC>
22. Transmission assembly lower part coupling bolts
23. 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

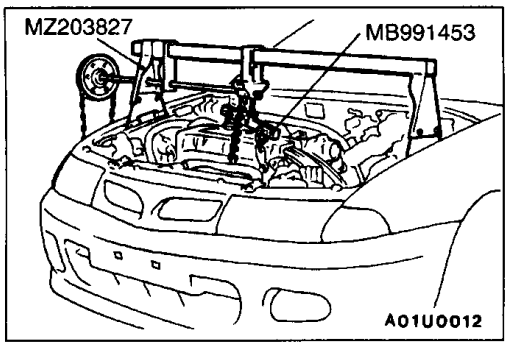
Remove the starter motor with the starter motor harness still connected and secure it inside the engine compartment.

◀B▶ CLUTCH RELEASE CYLINDER REMOVAL

Remove the clutch release cylinder without disconnecting the oil line connection, and fix it to the vehicle chassis.

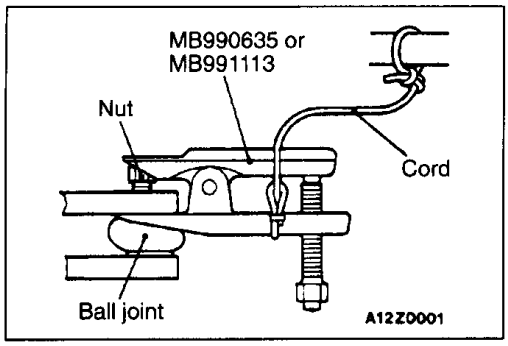
◀C▶ TRANSMISSION MOUNT BRACKET REMOVAL

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 DISCONNECTION

Caution

1. **Use the special tool to 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. not to let it come off.**

◀F▶ DRIVE SHAFT <L.H.> REMOVAL

1. Remove the drive shaft with the hub and knuckle, etc., still attached.
2. Suspend the removed drive shaft inside the wheel housing with wire so that there are no sharp bends in any of the joints.

INSTALLATION SERVICE POINTS

▶A◀ DRIVE SHAFT <R.H.>/SPRING PIN INSTALLATION

1. After applying multipurpose grease to the transmission-side spline of the drive shaft, align the spring pin hole at the end of the drive shaft with the spring pin hole at the end of the shaft at the transmission side, and then install the drive shaft.
   If the spring pin hole is slightly off-line, turn the drive shaft 180° and then install it again.

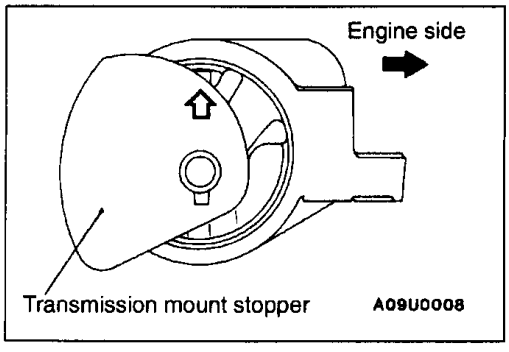
NOTE
Because there are an odd number of splines on the drive shaft, the pin hole will be off-line by half the width of the hole if the drive shaft is turned 180°.

2. Apply specified sealant to the spring pin, and then insert it into the drive shaft.

   Specified sealant:
   MITSUBISHI GENUINE PART MD970389 or equivalent

3. After inserting the pin, apply sealant to both ends of the pin hole to fully seal the hole.

   Specified sealant:
   MITSUBISHI GENUINE PART MD970389 or equivalent



▶B◀ TRANSMISSION MOUNT STOPPER INSTALLATION

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

AUTOMATIC TRANSMISSION

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23109000040

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Accelerator Pedal Position Sensor Adjustment <Vehicles with TCL> 49

Inhibitor Switch Continuity Check 49

Inhibitor Switch Control Cable Adjustment 50

A/T Control Component Location 51

CONTINUED ON NEXT PAGE

WARNING REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICULES

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 driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

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TRANSMISSION ASSEMBLY 72

SERVICE SPECIFICATIONS

23100030031

Items		Specifications
Oil temperature sensor kΩ	at 0°C	16.5 – 20.5
	at 100°C	0.57 – 0.69
Resistance of damper clutch control solenoid valve coil (at 20°C) Ω		2.9 – 3.5
Resistance of Low-Reverse solenoid valve coil (at 20°C) Ω		2.9 – 3.5
Resistance of second solenoid valve coil (at 20°C) Ω		2.9 – 3.5
Resistance of underdrive solenoid valve coil (at 20°C) Ω		2.9 – 3.5
Resistance of overdrive solenoid valve coil (at 20°C) Ω		2.9 – 3.5
Stall speed r/min		2,100 – 2,600

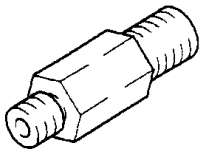
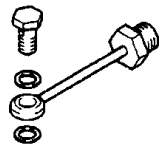
LUBRICANTS

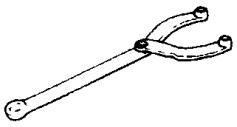
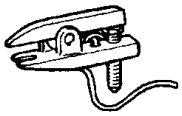
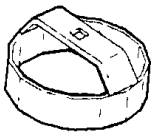
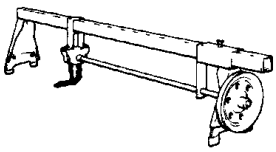
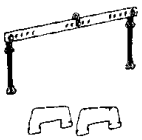
23100040034

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

SPECIAL TOOLS

23100060030

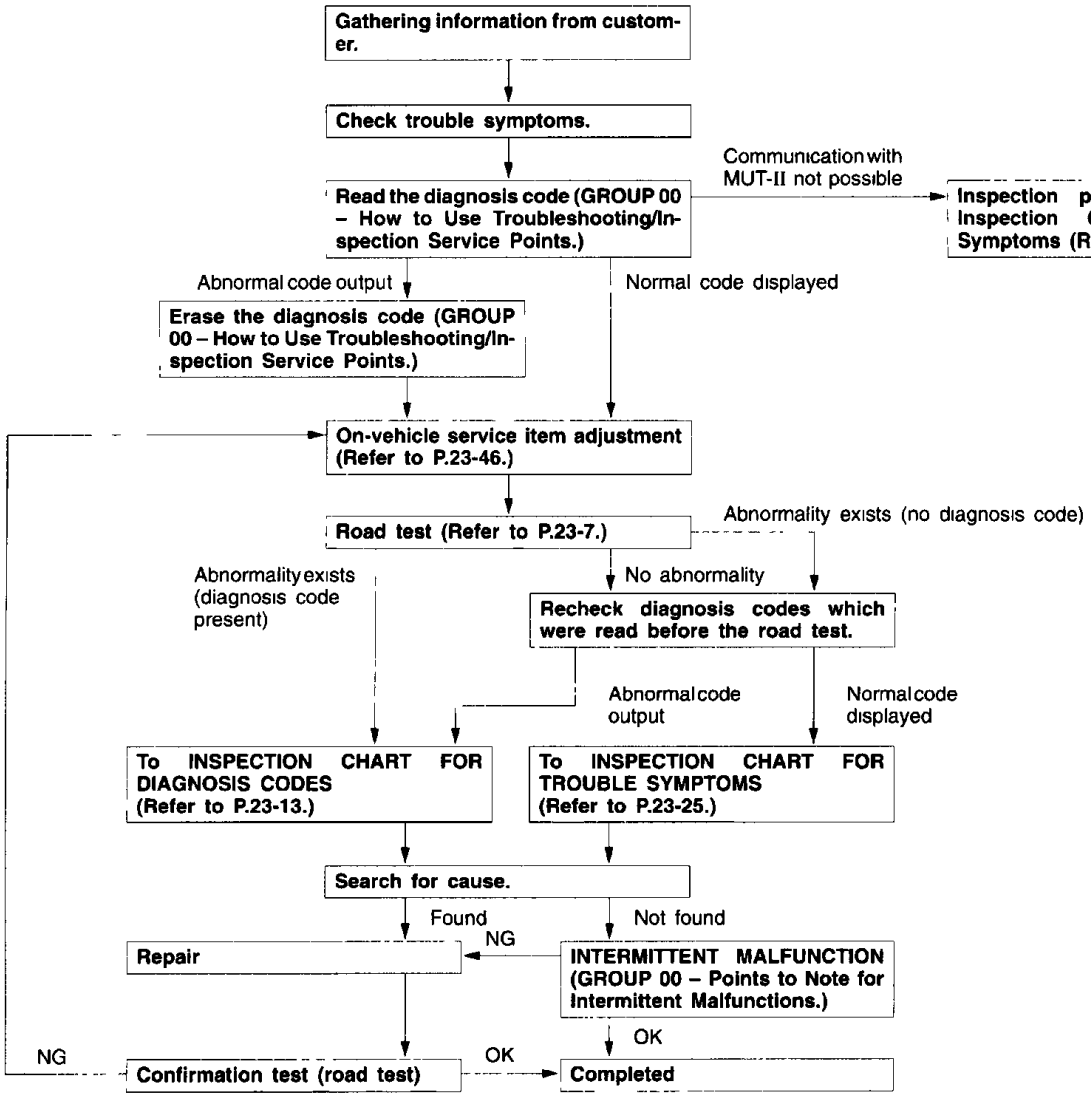
Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	Checking of the diagnosis code
	MD998330 (including MD998331)	Oil pressure gauge (2,942 kPa)	Measurement of oil pressure
	MD998332	Adapter	
	MD998900	Adapter	

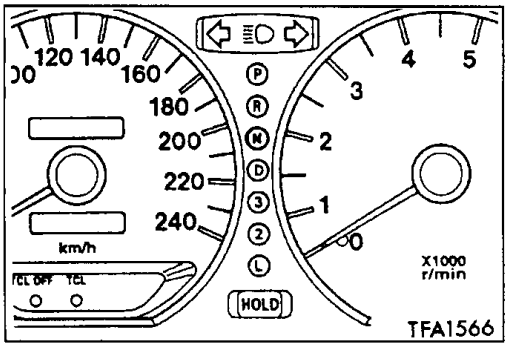
Tool	Number	Name	Use
	MB990767	End yoke holder	Fixing the hub
	MB990635 or MB991113	Steering linkage puller	Removal of the tie rod end and the lower arm
	MB991610	Oil filter wrench	Removal and installation of automatic transmission oil filter
	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
	MB991453	Engine hanger assembly	Supporting the engine assembly during removal and installation of the transmission

TROUBLESHOOTING

23100760039

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING





DIAGNOSIS FUNCTION

23100770032

1. N range lamp

The N range lamp flashes at a frequency of approximately 1 Hz if there is an abnormality in any of the items in the table below which are related to the A/T system. Check the diagnosis code output if the N range lamp is flashing at a frequency of approximately 1 Hz.

N range lamp flashing items

Crank angle sensor
Input shaft speed sensor
Output shaft speed sensor
Each solenoid valve
Out of phase at each shift point

Caution

- **If the N range lamp is flashing at a frequency of approximately 2 Hz (faster than at 1 Hz), it means that the automatic transmission fluid temperature is too high. Stop the vehicle in a safe place and wait until the N range lamp 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

23100780035

Check by the following procedure.

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 Battery voltage [mV]	Control relay	54	A/T Control relay system (23-24)
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	–	Inhibitor switch system (23-35)
		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 <without TCL> APS <with TCL>	11 12 14	TPS <without TCL> APS <with TCL> (23-14)
		Brake pedal (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stop lamp switch	26	Stop lamp switch system (23-17)
3	Ignition switch: ST Engine: Stopped	Starting test with lever P or N range	Starting should be possible	Starting possible or impossible	–	Starting impossible (23-27)
4	Warming up	Drive for 15 minutes or more so that the automatic fluid temperature becomes 70 – 90°C.	Data list No. 15 Gradually rises to 70 – 90°C	Oil temperature sensor	15	Oil temperature sensor system (23-14)

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 lamp switch	26	Stop lamp switch system (23-17)
		A/C switch (1) ON (2) OFF	Data list No. 65 (1) ON (2) OFF	Dual pressure switch	–	Dual pressure switch system (23-36)
		Accelerator pedal (1) Fully closed (2) Depressed	Data list No. 64 (1) ON (2) OFF	Idle switch	–	Idle switch system (23-36)
			Data list No. 21 (1) 650 – 900 rpm Gradually rises from (1)	Crank angle sensor	21	Crank angle sensor system (23-15)
			Data list No. 57 (2) Data changes	Communication with engine ECU <without TCL> Communication with TCL-ECU <with TCL>	51	Serial communication system (23-24)
		Selector lever position (1) N → D (2) N → R	Should be no abnormal shifting shocks Time lag should be within 2 seconds	Malfunction when starting	–	Engine stalling during shifting (23-29)
					–	Shocks when changing from N to D and large time lag (23-29)
					–	Shocks when changing from N to R and large time lag (23-30)
					–	Shocks when changing from N to D,N to R and large time lag (23-31)
				Driving impossible	–	Does not move forward (23-27)
					–	Does not reverse (23-28)
					–	Does not move (forward or reverse) (23-28)

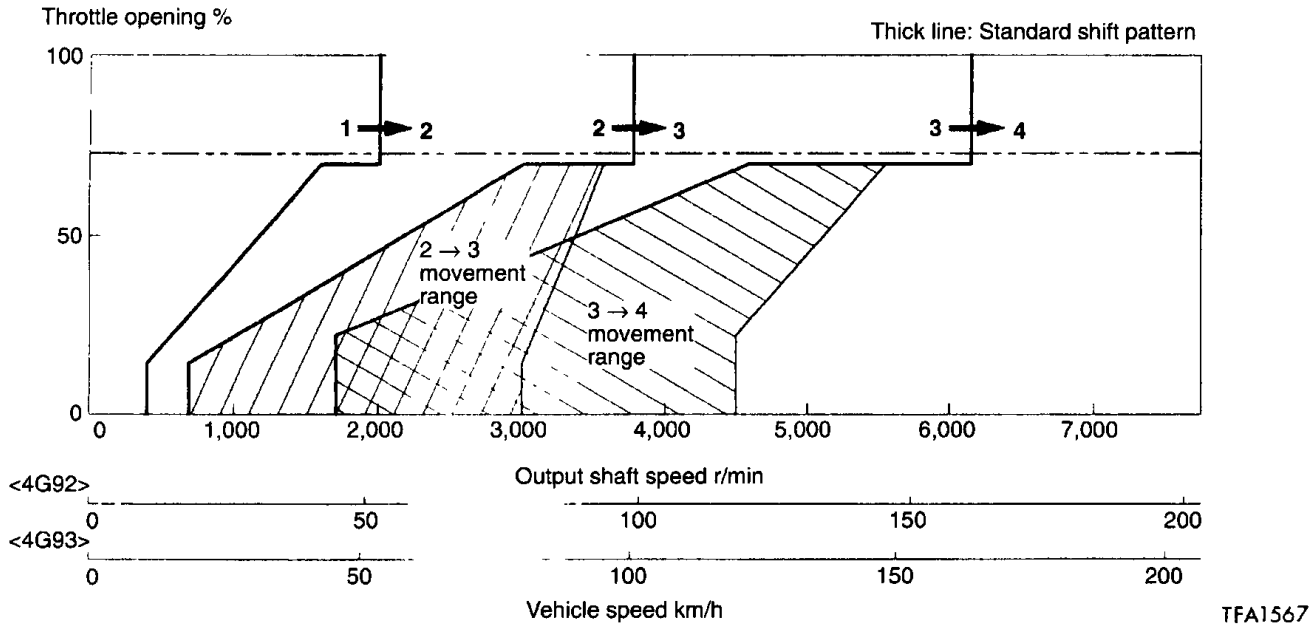
No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
6	HOLD mode	Selector lever position and vehicle speed (1) Idling in L range (Vehicle stopped) (2) Driving at constant speed of 10 km/h in L position (3) Driving at constant speed of 30 km/h in 2 position (4) Driving at 50 km/h in 3 position with accelerator fully closed (5) Driving at constant speed of 70 km/h in 3 position (6) Driving at constant speed of 70 km/h in D position (Each condition should be maintained for 10 seconds or more.)	Data list No. 63 (2) 1st, (4) 3rd, (3) 2nd, (6) 4th	Shift condition	–	–
			Data list No. 31 (2) 0 %, (4) 100 %, (3) 100 %, (6) 100 %	Low and reverse solenoid valve	31	Low and reverse solenoid valve system (23-18)
			Data list No. 32 (2) 0 %, (4) 0 %, (3) 0 %, (6) 100 %	Underdrive solenoid valve	32	Underdrive solenoid valve system (23-18)
			Data list No. 33 (2)100 %, (4) 0 %, (3) 0 %, (6) 0 %	Second solenoid valve	33	Second solenoid valve system (23-18)
			Data list No. 34 (2) 100 %, (4) 0 %, (3) 100 %, (6) 0 %	Overdrive solenoid valve	34	Overdrive solenoid valve system (23-18)
			Data list No. 29 (1) 0 km/h (4) 50 km/h	Vehicle speed sensor	–	Vehicle speed sensor system (23-37)
			Data list No. 22 (4) 1,900 – 2,100 rpm	Input shaft speed sensor	22	Input shaft speed sensor system (23-15)
			Data list No. 23 (4) 1,900 – 2,100 rpm	Output shaft speed sensor	23	Output shaft speed sensor system (23-16)
			Data list No. 36 (3) 0 % (5) Approx. 70 – 90 % Data list No. 52 (3) Approx. 100 – 300 rpm (5) Approx. 0 – 10 rpm	Damper clutch control solenoid valve	36 52	Damper clutch control solenoid valve system (23-18)

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
7	Use the MUT-II to stop the INVECS-II function. Selector lever position: D	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 torque, and no abnormal shocks should occur. For (4), (5) and (6), downshifting should occur immediately after the shifting operation is made.	Malfunction when shifting	–	Shocks and running up (23-31)
				Displaced shifting points	–	All points (23-32)
					–	Some points (23-33)
				Does not shift	–	No diagnosis code (23-33)
					22	Input shaft speed sensor system (23-15)
					23	Output shaft speed sensor system (23-16)
				Does not shift from 1 to 2 or 2 to 1	31	Low and reverse solenoid valve system (23-18)
					33	Second solenoid valve system (23-18)
					41	1st gear ratio is not specified (23-19)
					42	2nd gear ratio is not specified (23-20)
				Does not shift from 2 to 3 or 3 to 2	33	Second solenoid valve system (23-18)
					34	Overdrive solenoid valve system (23-18)
					42	2nd gear ratio is not specified (23-20)
					43	3rd gear ratio is not specified (23-21)
				Does not shift from 3 to 4 or 4 to 3	32	Underdrive solenoid valve system (23-18)
					33	Second solenoid valve system (23-18)
					43	3rd gear ratio is not specified (23-21)
					44	4th gear ratio is not specified (23-22)

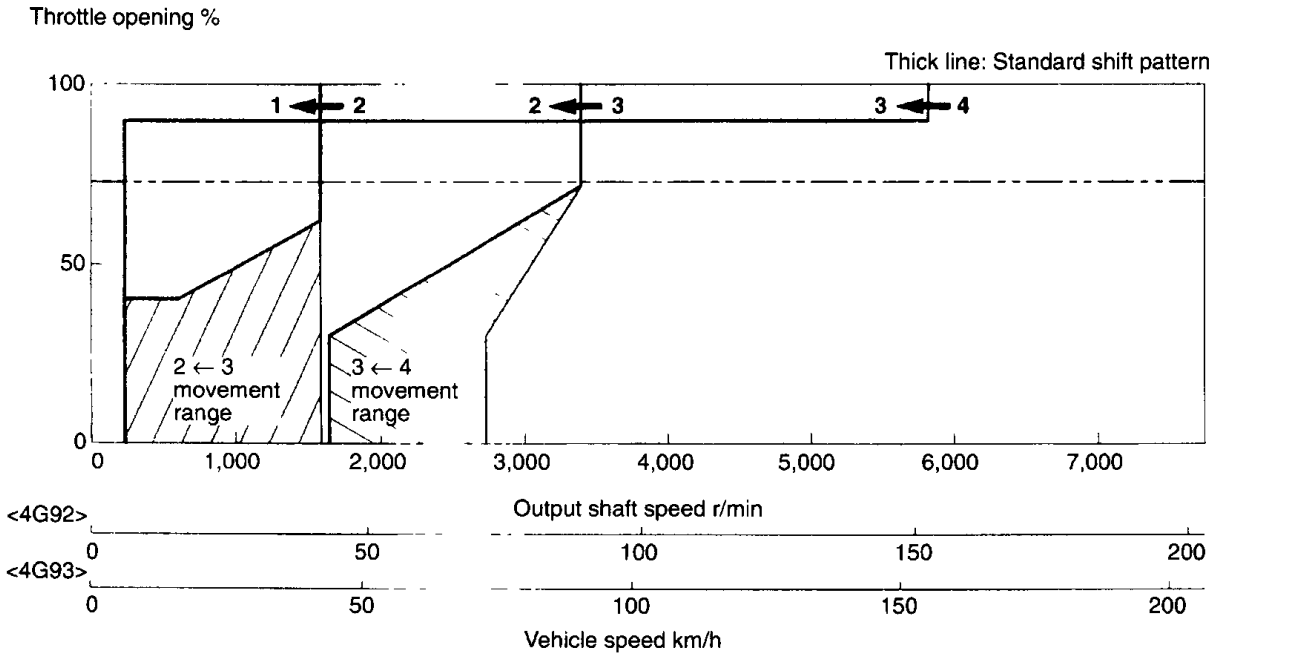
No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
8	Selector lever position: N	Monitor data list No. 22 and No. 23 with the MUT-II. (1) Move selector lever to R range, drive at constant speed of 10 km/h.	The ratio between data list No. 22 and No. 23 should be the same as the gear ratio when reversing.	Does not shift	22	Input shaft speed sensor system (23-15)
					23	Output shaft speed sensor system (23-16)
					46	Reverse gear ratio is not specified (23-23)

SHIFT PATTERN

UPSHIFT PATTERN

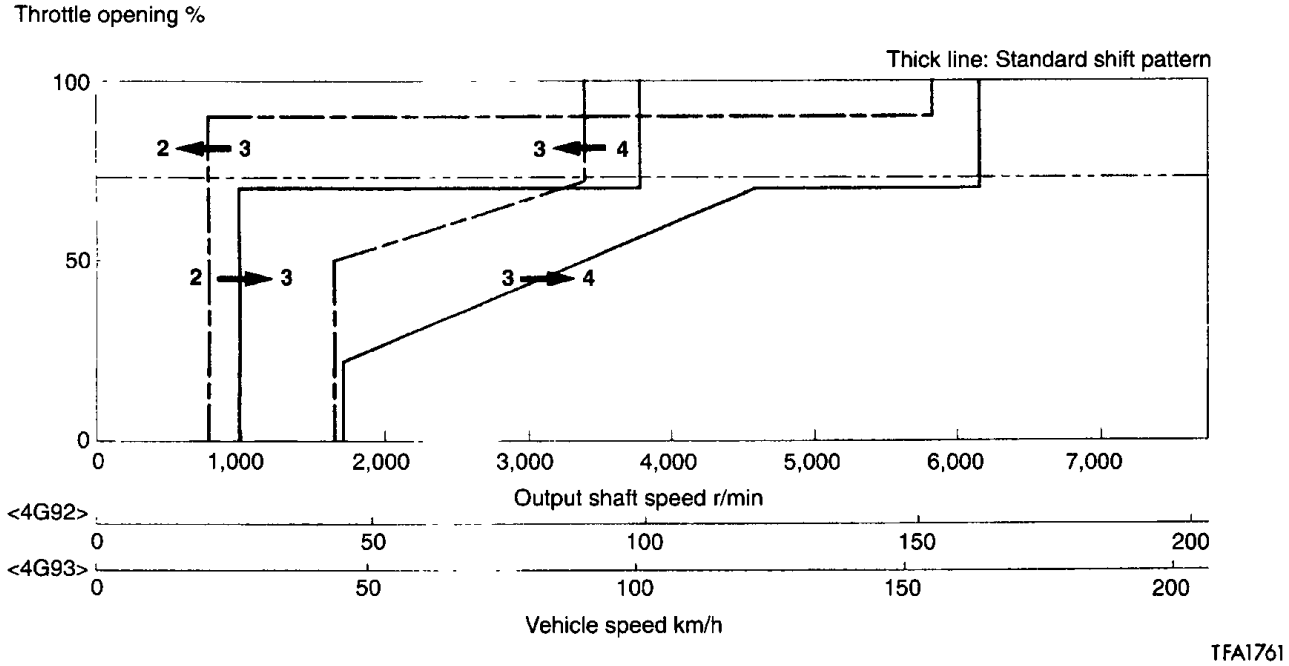


DOWNSHIFT PATTERN



TFA1760

HOLD MODE PATTERN



TFA1761

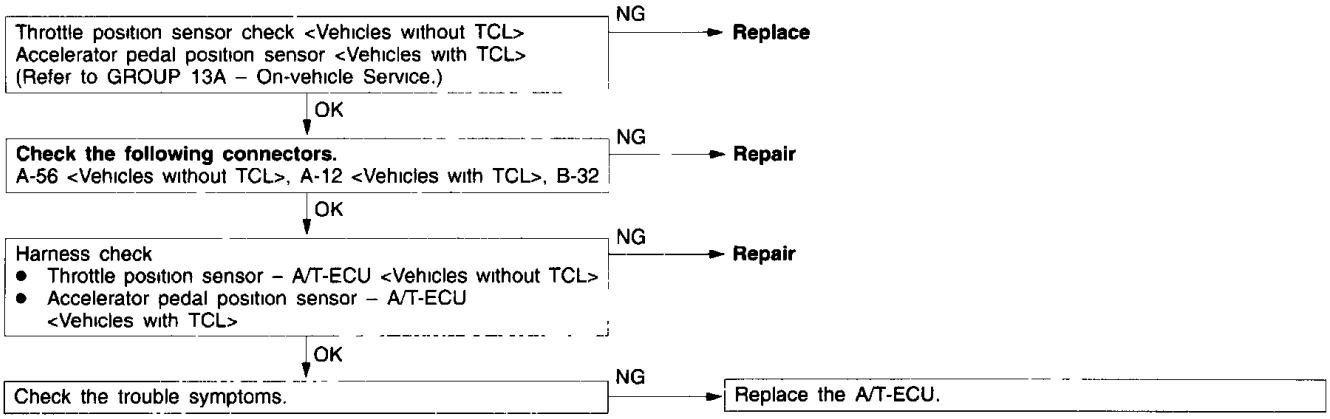
INSPECTION CHART FOR DIAGNOSIS CODE

23100790038

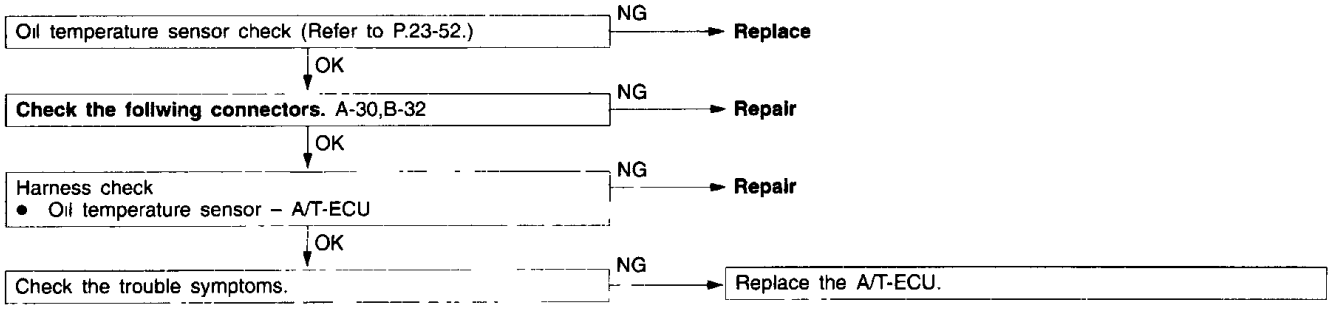
Code	Diagnosis item		Reference page
11	Throttle position sensor system <Vehicles without TCL> Accelerator pedal position sensor <Vehicles with TCL>	Short circuit	23-14
12		Open circuit	23-14
14		Sensor maladjustment	23-14
15	Oil temperature sensor system	Open circuit	23-14
21	Crank angle sensor system	Open circuit	23-15
22	Input shaft speed sensor system	Short circuit/open circuit	23-15
23	Output shaft speed sensor system	Short circuit/open circuit	23-16
25	Wide open throttle switch system	Short circuit	23-17
26	Stop lamp switch system	Short circuit/open circuit	23-17
31	Low and reverse solenoid valve system	Short circuit/open circuit	23-18
32	Underdrive solenoid valve system	Short circuit/open circuit	23-18
33	Second solenoid valve	Short circuit/open circuit	23-18
34	Overdrive solenoid valve	Short circuit/open circuit	23-18
36	Damper control clutch solenoid valve	Short circuit/open circuit	23-18
41	1st gear ratio is not specified		23-19
42	2nd gear ratio is not specified		23-20
43	3rd gear ratio is not specified		23-21
44	4th gear ratio is not specified		23-22
46	Reverse gear ratio is not specified		23-23
51	Abnormal communication with engine ECU <Vehicles without TCL> Abnormal communication with TCL-ECU <Vehicles with TCL>		23-24
52	Damper control clutch solenoid valve system	Defective system	23-18
54	A/T Control relay system	Short circuit to earth/ open circuit	23-24
56	N range lamp system	Short circuit to earth	23-25
71	Malfunction of A/T-ECU		23-25

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

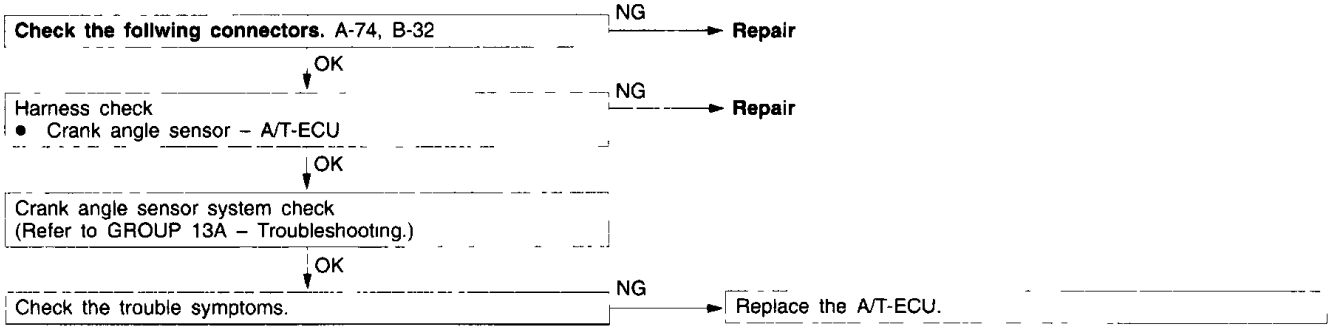
Code No. 11, 12, 14 Throttle position sensor system <Vehicles without TCL>, accelerator pedal position sensor <Vehicles with TCL>	Probable cause
If the TPS or APS output voltage is 4.8 V or higher when the engine is idling, the output is judged to be too high and diagnosis code No. 11 is output. Code No. 11 is also output if there is a problem with the APS and an APS fail-safe signal is received from the TCL-ECU. If the TPS or APS output voltage is 0.2 V or lower at times other than when the engine is idling, the output is judged to be too low and diagnosis code No. 12 is output. If the TPS or APS output voltage is 0.2 V or lower or if it is 1.2 V or higher when the engine is idling, the TPS or APS adjustment is judged to be incorrect and diagnosis code No. 14 is output.	• Malfunction of the throttle position sensor <Vehicles without TCL> • Malfunction of the accelerator pedal position sensor <Vehicles with TCL> • Malfunction of connector • Malfunction of the A/T-ECU



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

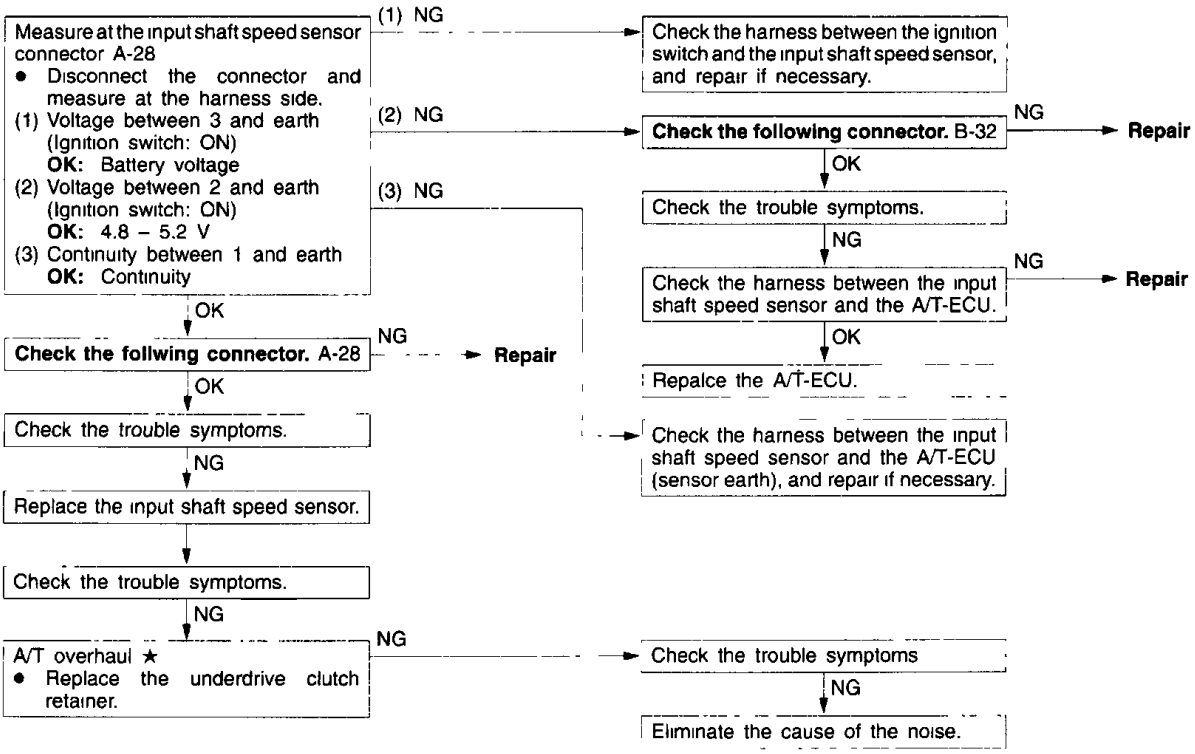


Code No. 21 Crank angle sensor system	Probable cause
If no output pulse is detected from the crank angle sensor for 5 seconds or more while driving at 25 km/h or more, it is judged that there is an open circuit in the crank angle sensor and diagnosis code No. 21 is output.	• Malfunction of the crank angle sensor • Malfunction of connector • Malfunction of the A/T-ECU



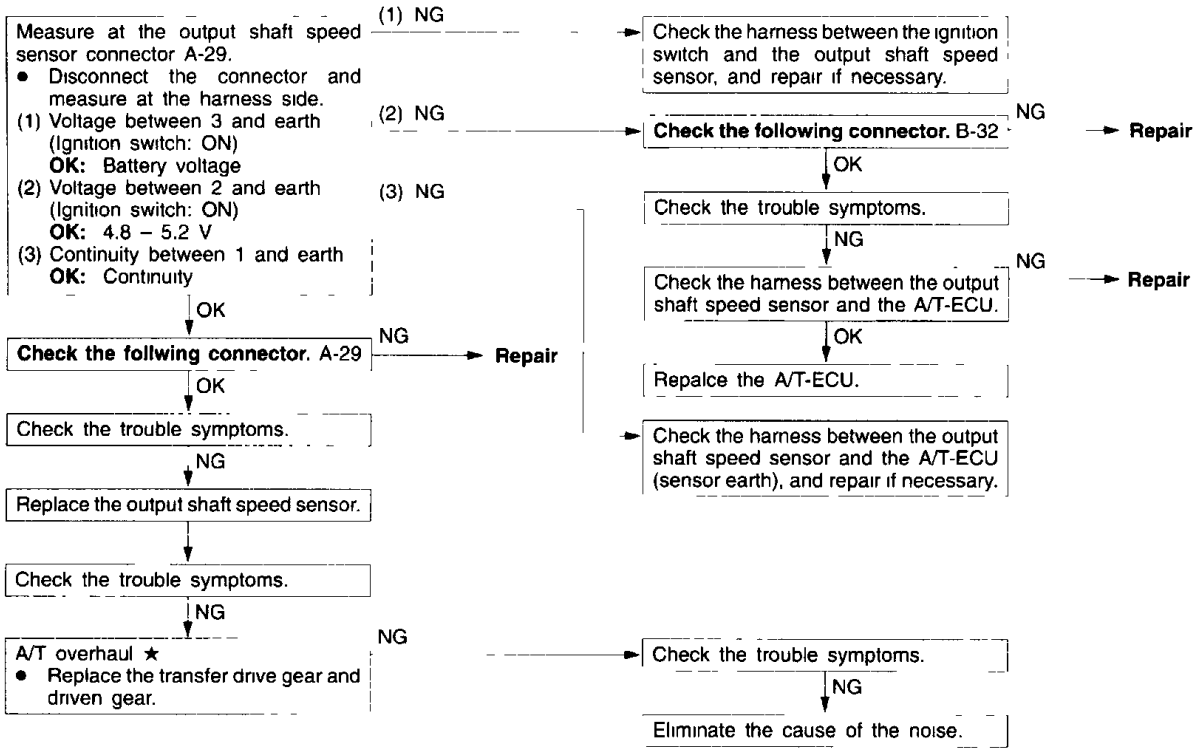
Code No. 22 Input shaft speed sensor system	Probable cause
If no output pulse is detected from the input shaft speed sensor for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more or while driving in 1st or 2nd gear at an engine speed of 2,600 r/min or more, there is judged 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 lamp 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.

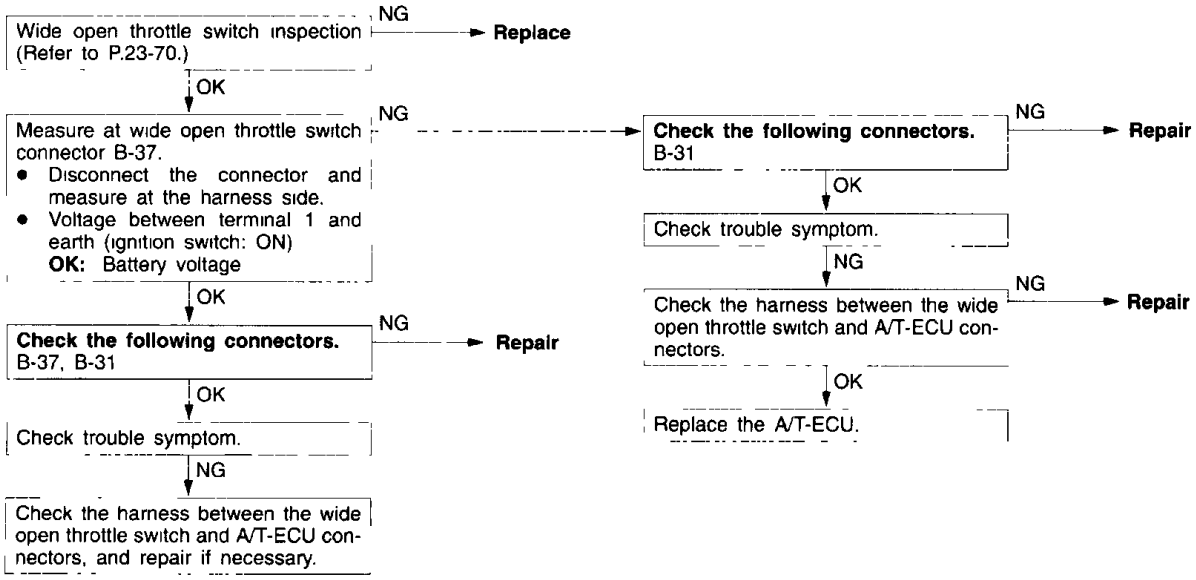


Code No. 23 Output shaft speed sensor system	Probable cause
If the output from the output shaft speed sensor is continuously 50% lower than the vehicle speed for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more or while driving in 1st or 2nd gear at an engine speed of 2,600 r/min or more, there 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 lamp 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

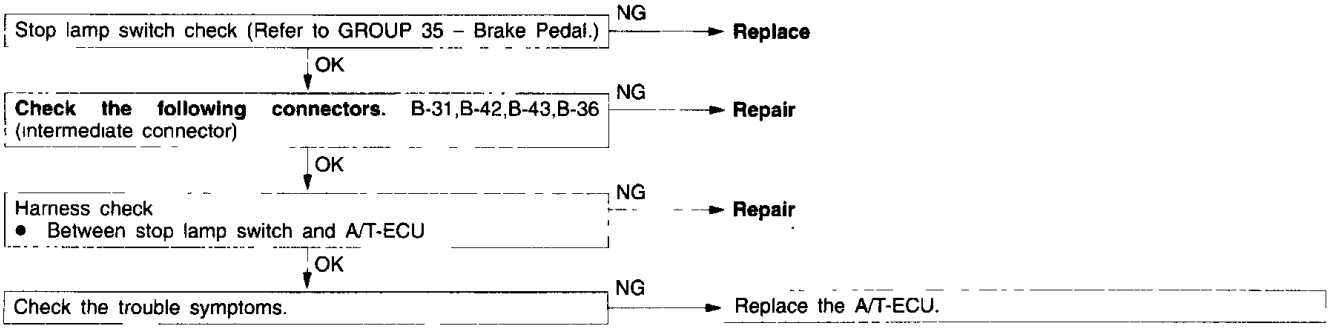
★: Refer to the Transmission Workshop Manual.



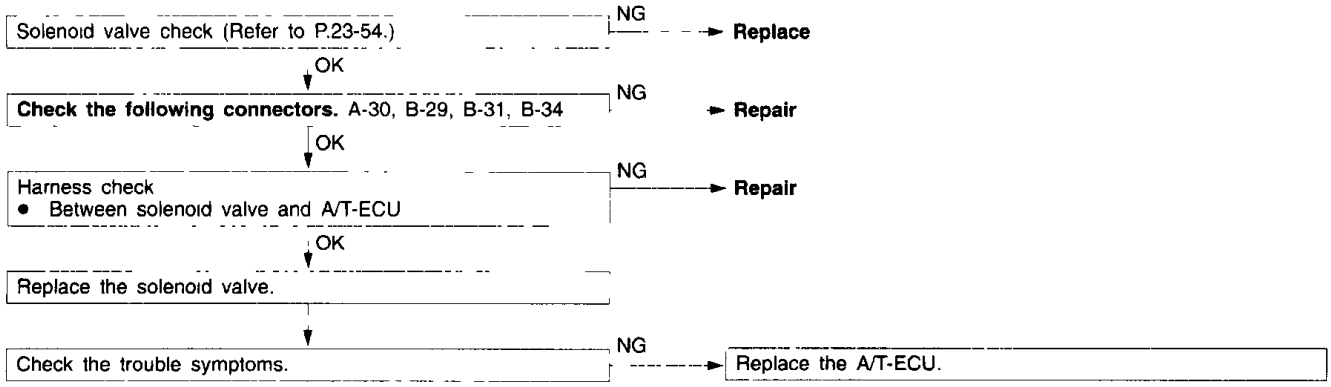
Code No. 25 Wide open throttle switch system	Probable cause
If the wide open throttle switch does not turn OFF when the accelerator pedal is not depressed, there is a short circuit in the wide open throttle switch and diagnosis code No. 25 is output.	• Malfunction of wide open throttle switch • Malfunction of connector • Malfunction of A/T-ECU



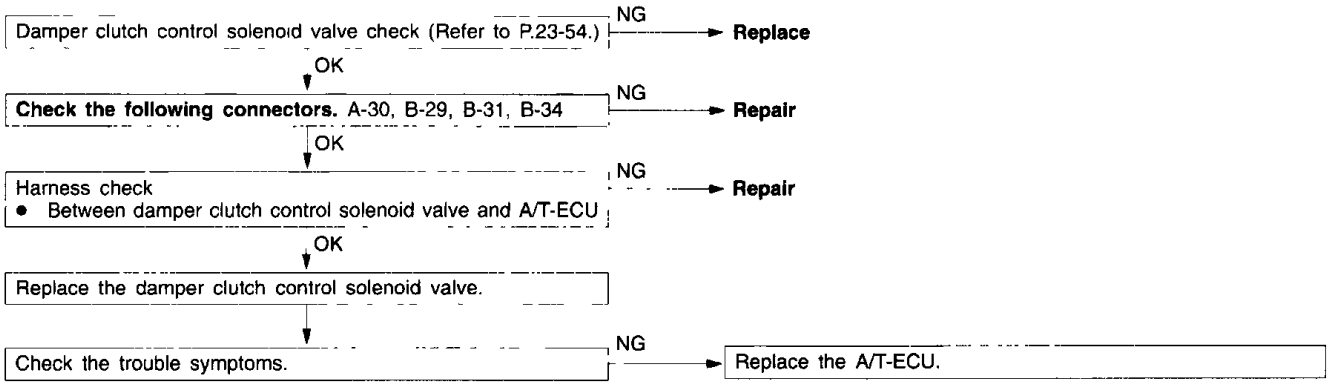
Code No. 26 Stop lamp switch system	Probable cause
If the stop lamp switch is on for 5 minutes or more while driving, it is judged that there is a short circuit in the stop lamp switch and diagnosis code No. 26 is output.	• Malfunction of the stop lamp switch • Malfunction of connector • Malfunction of the A/T-ECU



Code No. 31 Low and reverse solenoid valve system **Code No. 32 Underdrive solenoid valve system** **Code No. 33 Second solenoid valve system** **Code No. 34 Overdrive solenoid valve system**	**Probable cause**
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 lamp flashes at a frequency of 1 Hz.	• Malfunction of solenoid valve • Malfunction of connector • Malfunction of the A/T-ECU

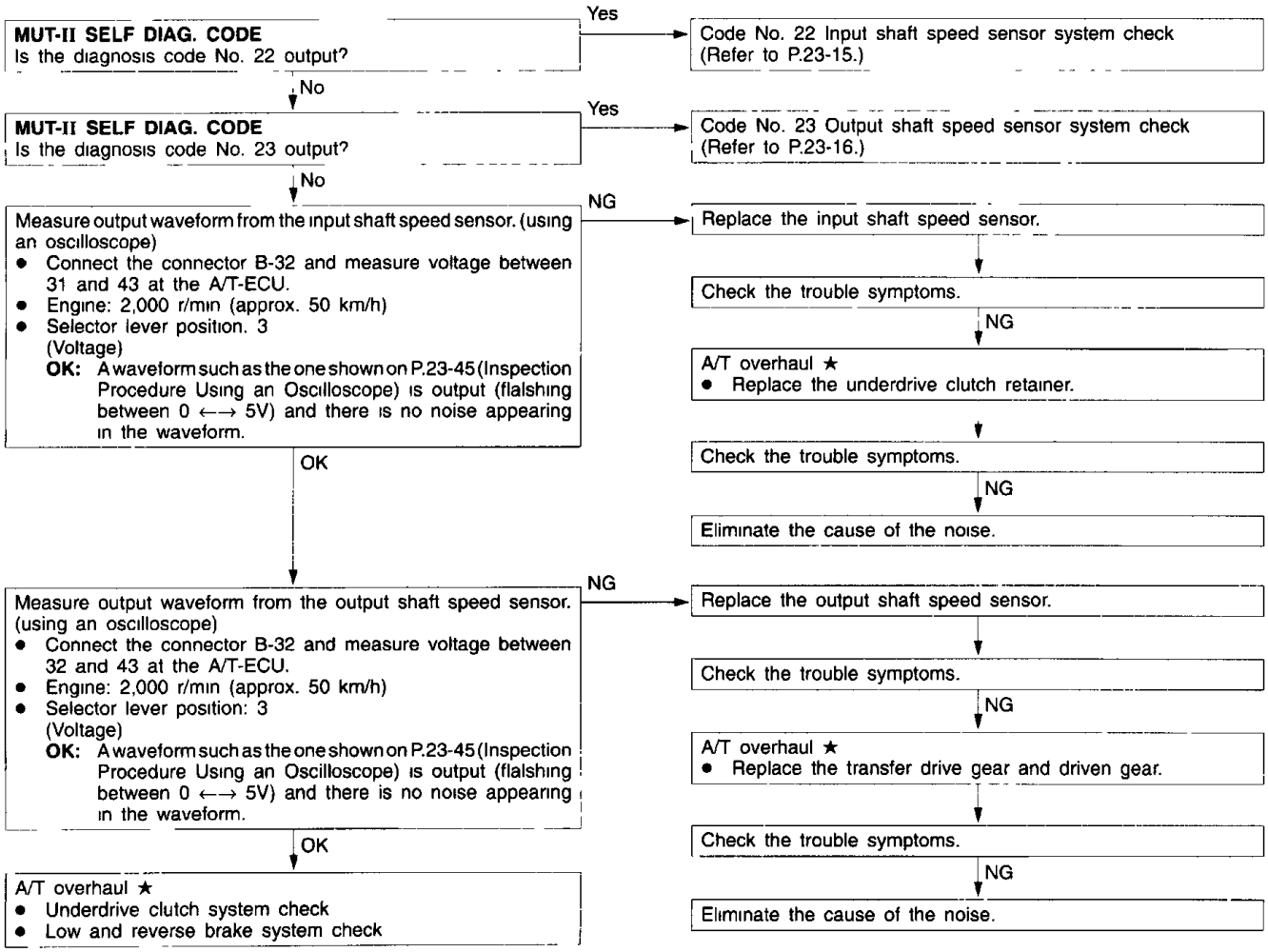


Code No. 36, 52 Damper clutch control solenoid valve system	**Probable cause**
If the resistance value for the damper clutch control solenoid valve is too large or too small, it is judged that there is a short-circuit or an open circuit in the damper clutch control solenoid valve and diagnosis code No. 36 is output. If the drive duty rate for the damper clutch control solenoid valve is 100 % for a continuous period of 4 seconds or more, it is judged that there is an abnormality in the damper clutch control 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 lamp flashes at a frequency of 1 Hz.	• Malfunction of the damper clutch control solenoid valve • Malfunction of connector • Malfunction of the A/T-ECU



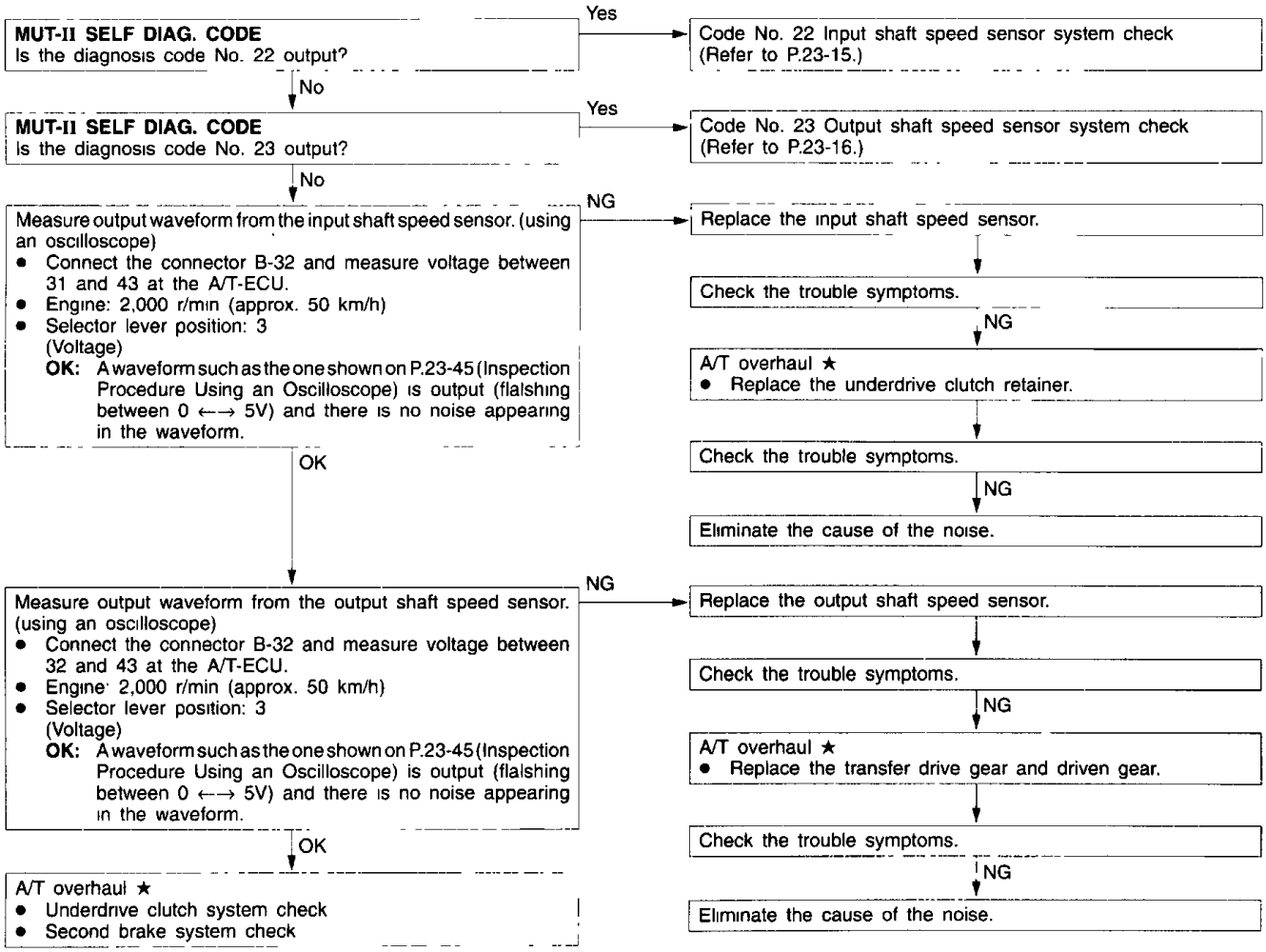
Code No. 41 1st gear ratio is not specified	Probable cause
If the output from the output shaft speed sensor multiplied by the 1st gear ratio is not the same as the output from the input shaft speed sensor after shifting to 1st gear has been completed, diagnosis code No. 41 is output. If diagnosis code No. 41 is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the 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.



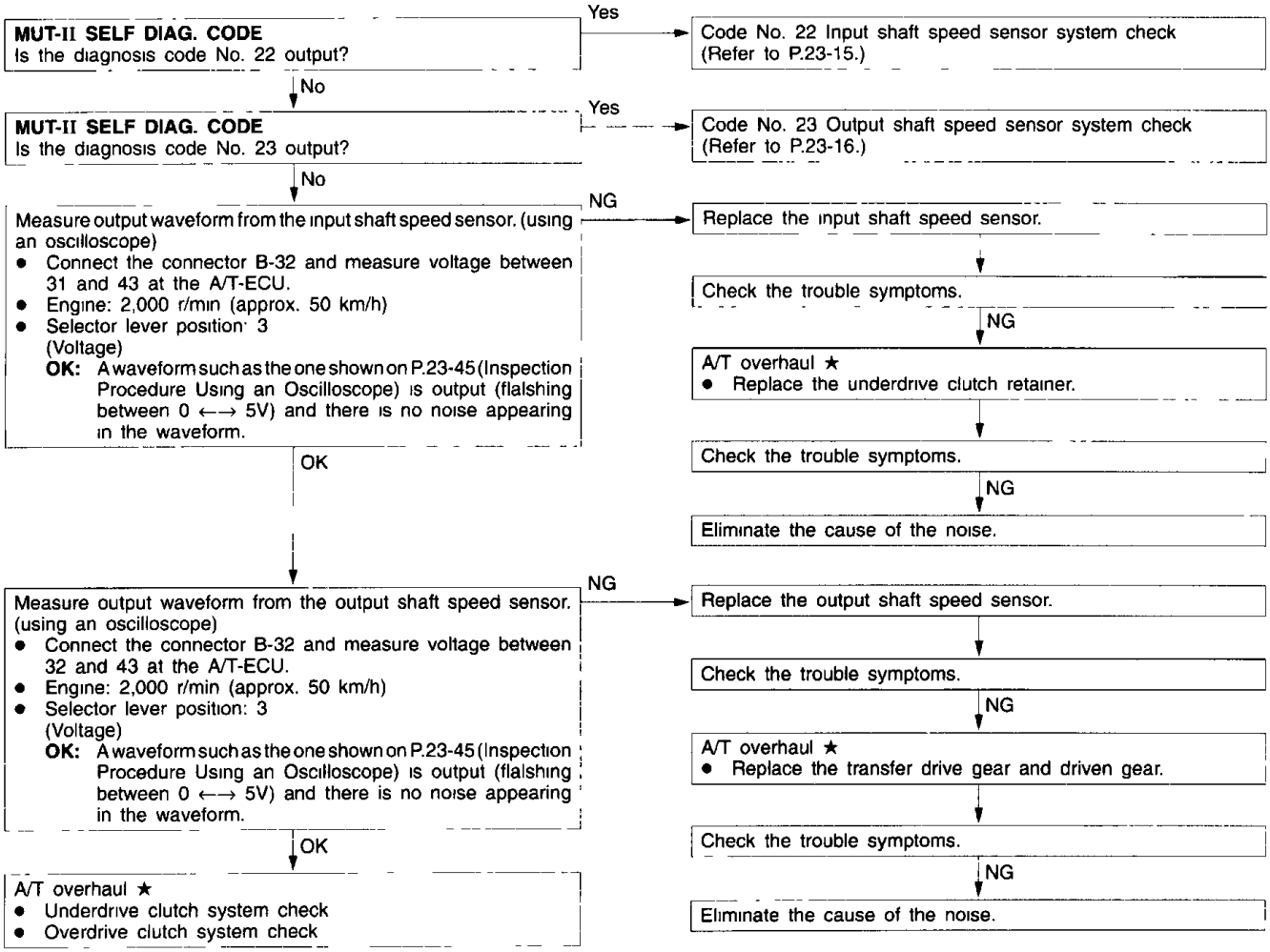
Code No. 42 2nd gear ratio is not specified	Probable cause
If the output from the output shaft speed sensor multiplied by the 2nd gear ratio is not the same as the output from the input shaft speed sensor after shifting to 2nd gear has been completed, diagnosis code No. 42 is output. If diagnosis code No. 42 is output four times, the transmission is locked into 3rd gear as a fail-safe measure, and the N range lamp flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the 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 ratio is not specified	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 lamp flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunciton 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 ratio is not specified	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 lamp flashes at a frequency of 1 Hz.	• Malfunction of the input shaft speed sensor • Malfunction of the output shaft speed sensor • Malfunction of the underdrive clutch retainer • Malfunction of the 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.

MUT-II SELF DIAG. CODE
Is the diagnosis code No. 22 output?
- Yes → Code No. 22 Input shaft speed sensor system check (Refer to P.23-15.)
- No ↓

MUT-II SELF DIAG. CODE
Is the diagnosis code No. 23 output?
- Yes → Code No. 23 Output shaft speed sensor system check (Refer to P.23-16.)
- No ↓

Measure output waveform from the input shaft speed sensor. (using an oscilloscope)
- Connect the connector B-32 and measure voltage between 31 and 43 at the A/T-ECU.
- Engine: 2,000 r/min (approx. 50 km/h)
- Selector lever position: 3

(Voltage)
OK: A waveform such as the one shown on P.23-45 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform

- NG → Replace the input shaft speed sensor.
  - Check the trouble symptoms.
    - NG → A/T overhaul ★
      - Replace the underdrive clutch retainer
      - Check the trouble symptoms.
        - NG → Eliminate the cause of the noise.
- OK ↓

Measure output waveform from the output shaft speed sensor. (using an oscilloscope)
- Connect the connector B-32 and measure voltage between 32 and 43 at the A/T-ECU.
- Engine. 2,000 r/min (approx. 50 km/h)
- Selector lever position: 3

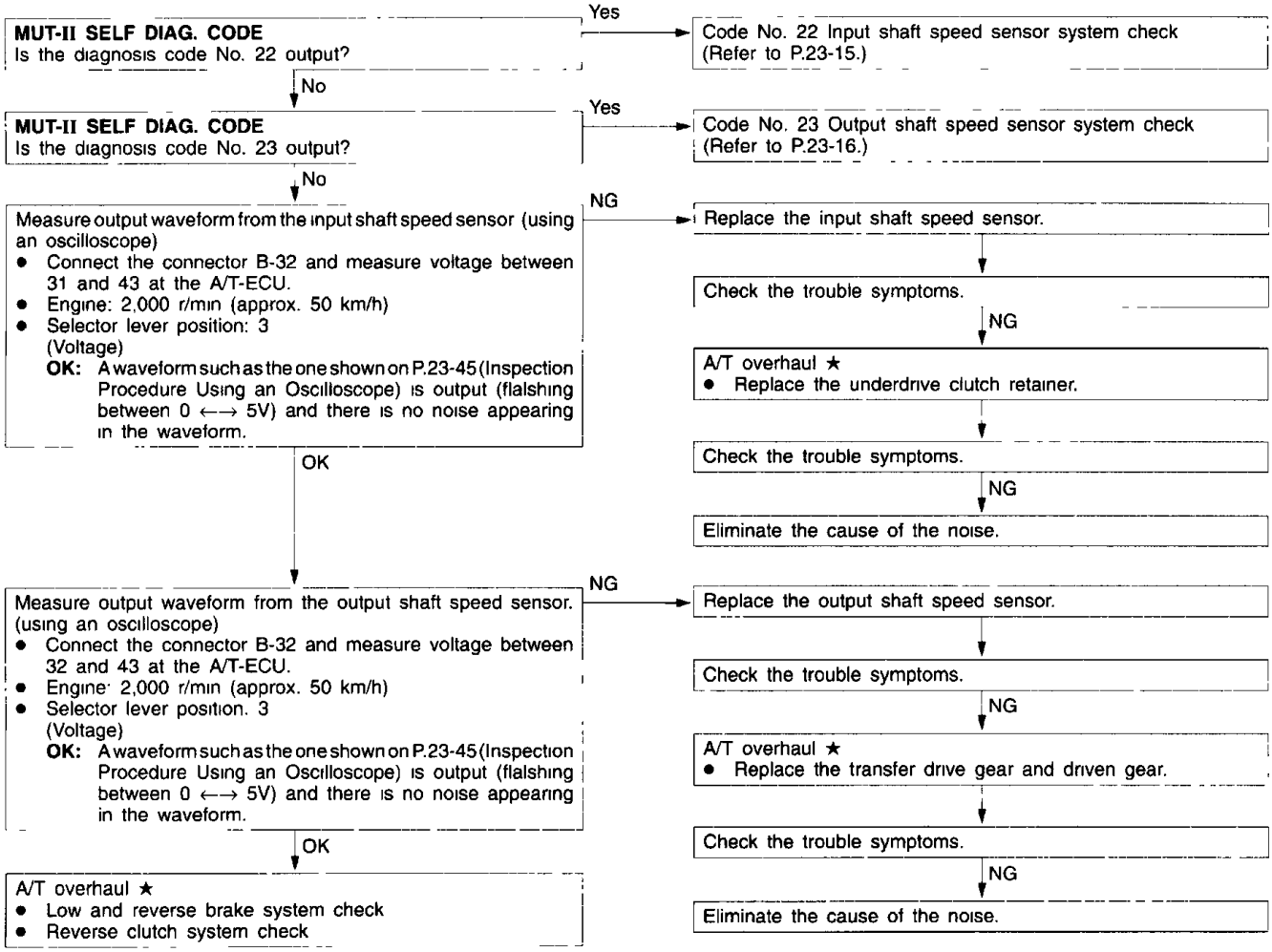
(Voltage)
OK: A waveform such as the one shown on P.23-45 (Inspection Procedure Using an Oscilloscope) is output (flashing between 0 ←→ 5V) and there is no noise appearing in the waveform.

- NG → Replace the output shaft speed sensor.
  - Check the trouble symptoms.
    - NG → A/T overhaul ★
      - Replace the transfer drive gear and driven gear.
      - Check the trouble symptoms.
        - NG → Eliminate the cause of the noise.
- OK ↓

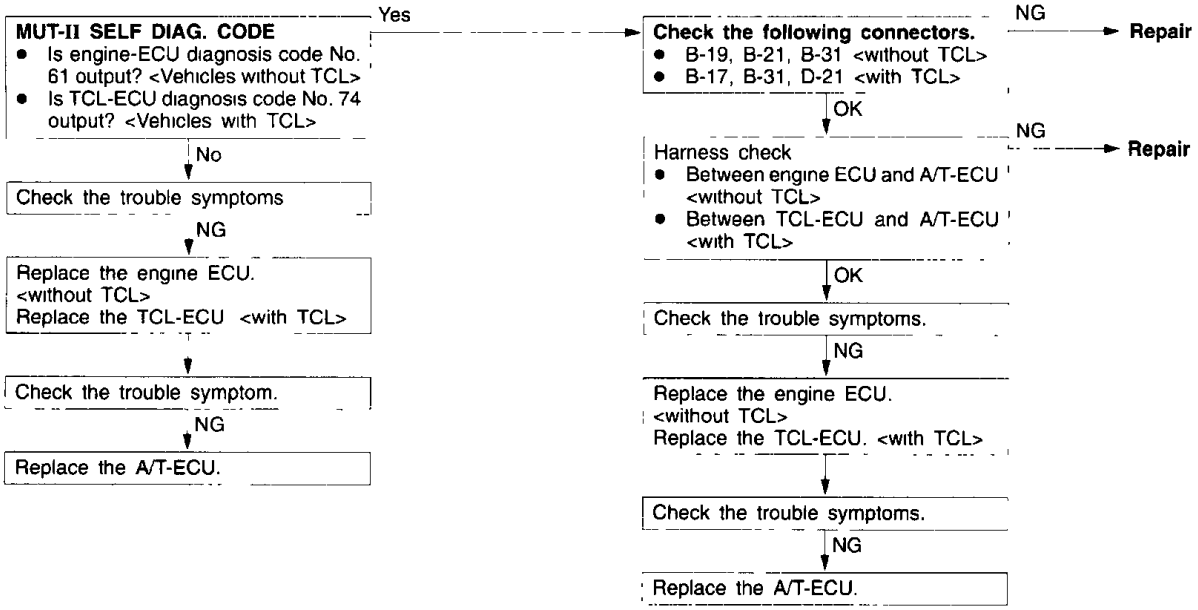
A/T overhaul ★
- Second brake system check
- Overdrive clutch system check

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

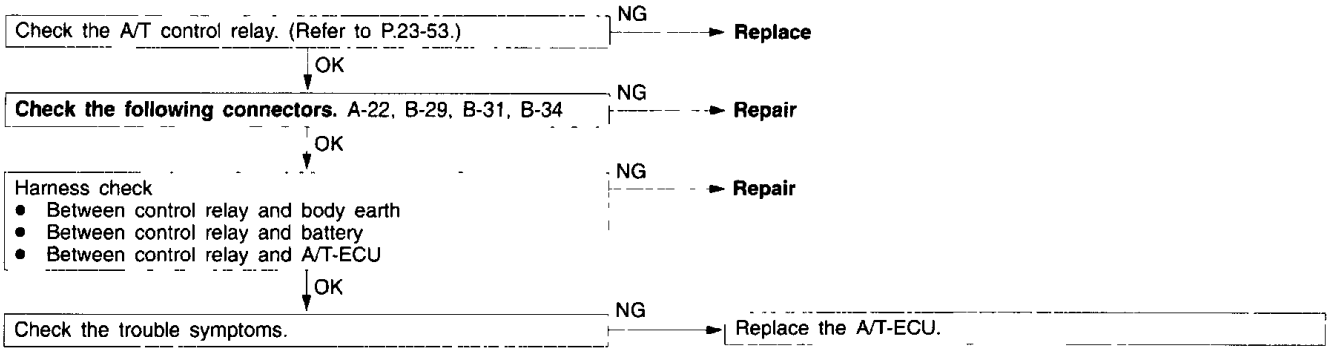
★: Refer to the Transmission Workshop Manual.



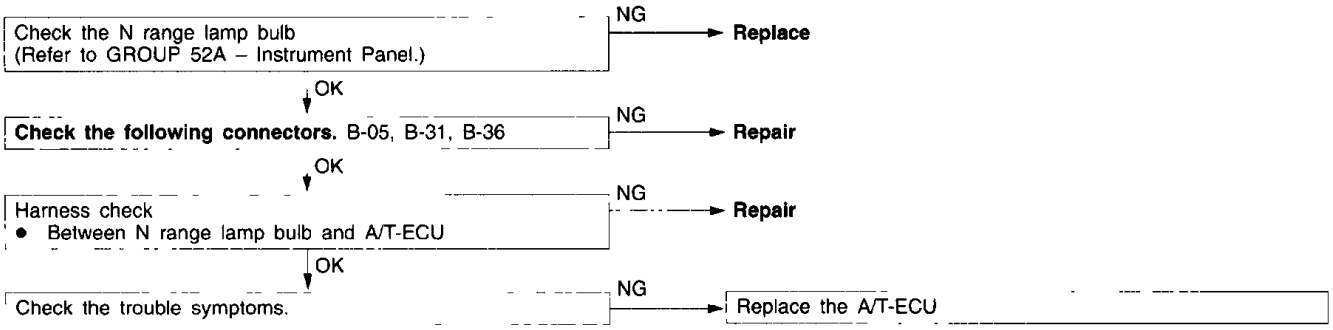
Code No. 51 Abnormal communication with engine ECU <Vehicles without TCL> Abnormal communication with TCL-ECU <Vehicles with TCL>	Probable cause
If normal communication is not possible for a continuous period of 1 second or more when the ignition switch is at the ON position, the battery voltage is 10 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 connector • Malfunction of the engine ECU <Vehicles without TCL> • Malfunction of the TCL-ECU <Vehicles with TCL> • Malfunction of the 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 lamp 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 lamp system	Probable cause
If the N range signal is off after an N range lamp illumination instruction (ON instruction) has been given, it is judged that there is a short-circuit in the N range lamp earth and diagnosis code No 56 is output.	• Malfunction of the N range lamp bulb • Malfunction of connector • Malfunction of the A/T-ECU



Code No. 71 Malfunction of A/T-ECU	Probale 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 A/T-ECU.

INSPECTION CHART FOR TROUBLE SYMPTOMS

23100800038

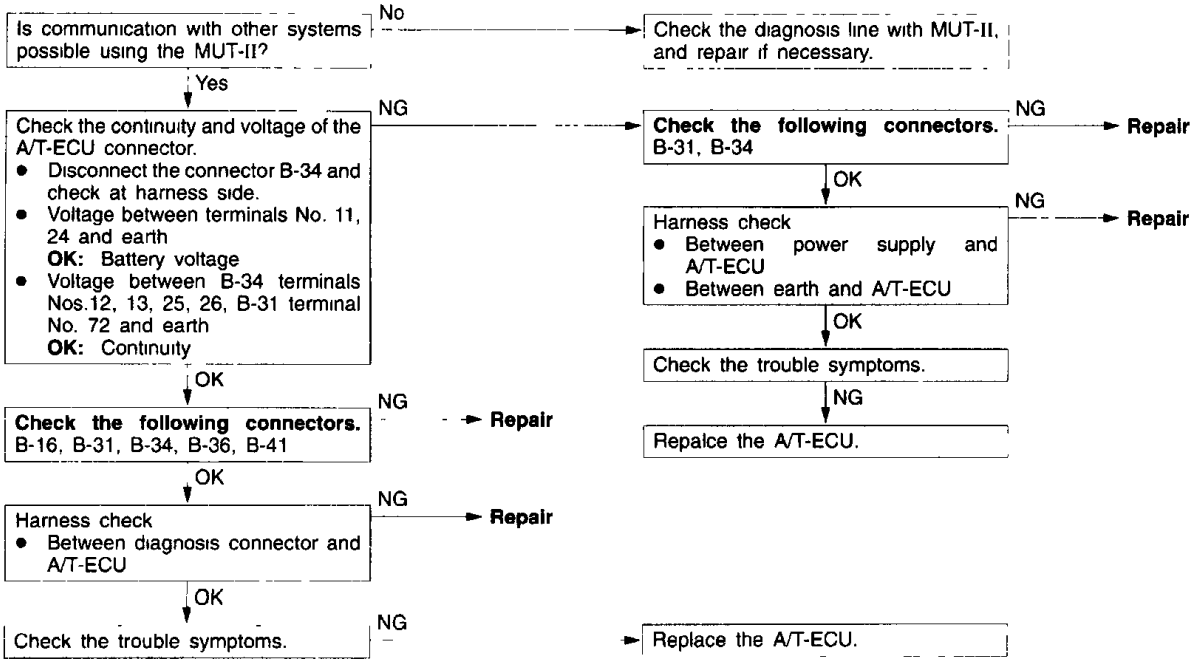
Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible		1	23-26
Driving impossible	Starting impossible	2	23-27
	Does not move forward	3	23-27
	Does not reverse	4	23-28
	Does not move (forward or reverse)	5	23-28
Malfunction when starting	Engine stalling when shifting	6	23-29
	Shocks when changing from N to D and large time lag	7	23-29
	Shocks when changing from N to R and large time lag	8	23-30
	Shocks when changing from N to D, N to R and large time lag	9	23-31
Malfunction when shifting	shocks and running up	10	23-31
Displaced shifting points	All points	11	23-32
	Some points	12	23-33
Does not shift	No diagnosis codes	13	23-33
Malfunction while driving	Poor acceleration	14	23-34
	Vibration	15	23-34
Inhibitor switch system		16	23-35

Trouble symptom	Inspection procedure No.	Reference page
Mode control switch system	17	23-35
Idle position switch system	18	23-36
Dual pressure switch system	19	23-36
Vehicle speed sensor system	20	23-37
Auto-cruise-ECU signal system <F4A42>	21	23-37

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

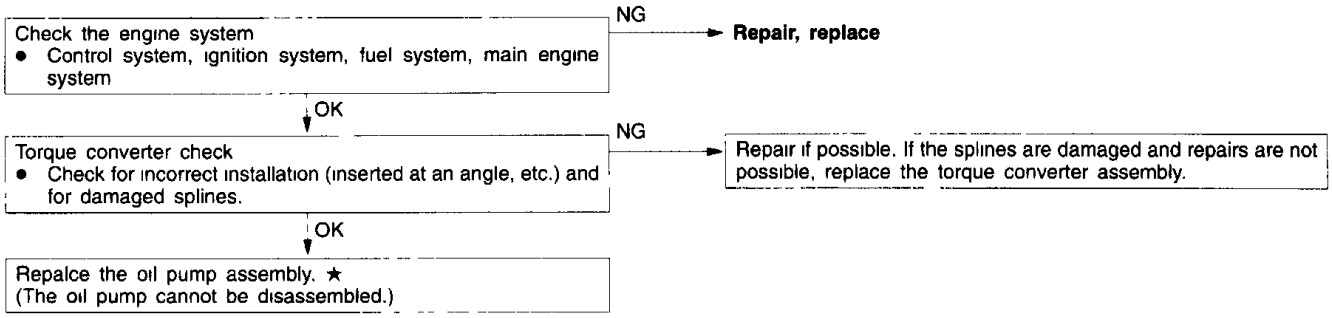
Communication with MUT-II is not possible	Probable cause
If communication with the MUT-II is not possible, the cause is probably a defective diagnosis line or the A/T-ECU is not functioning.	• Malfunction of diagnosis line • Malfunction of connector • Malfunction of the A/T-ECU



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.	• Malfunction of the engine system • Malfunction of the torque converter • Malfunction of the oil pump

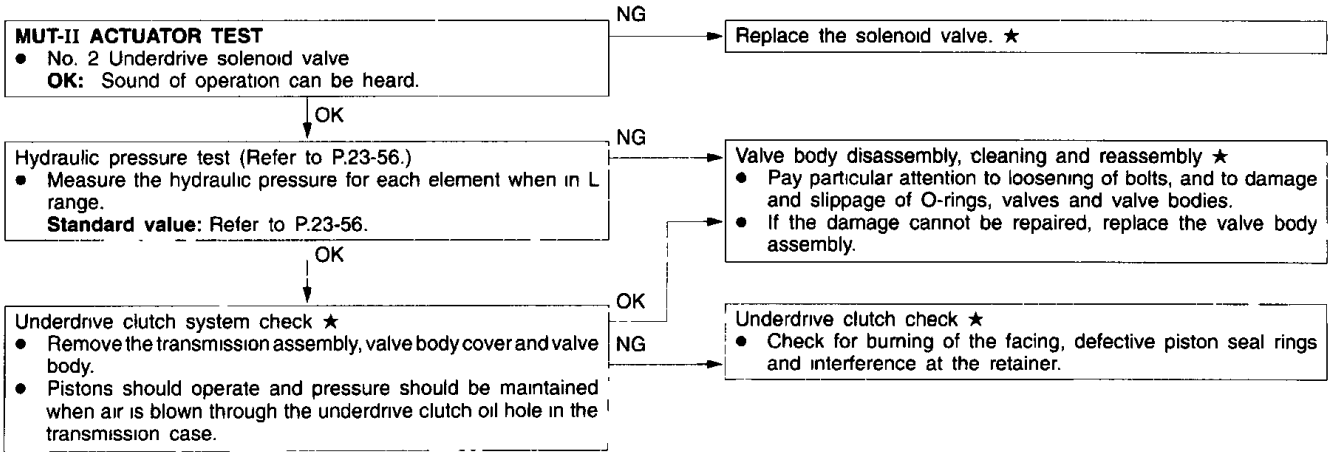
★: Refer to the Transmission Workshop Manual.



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

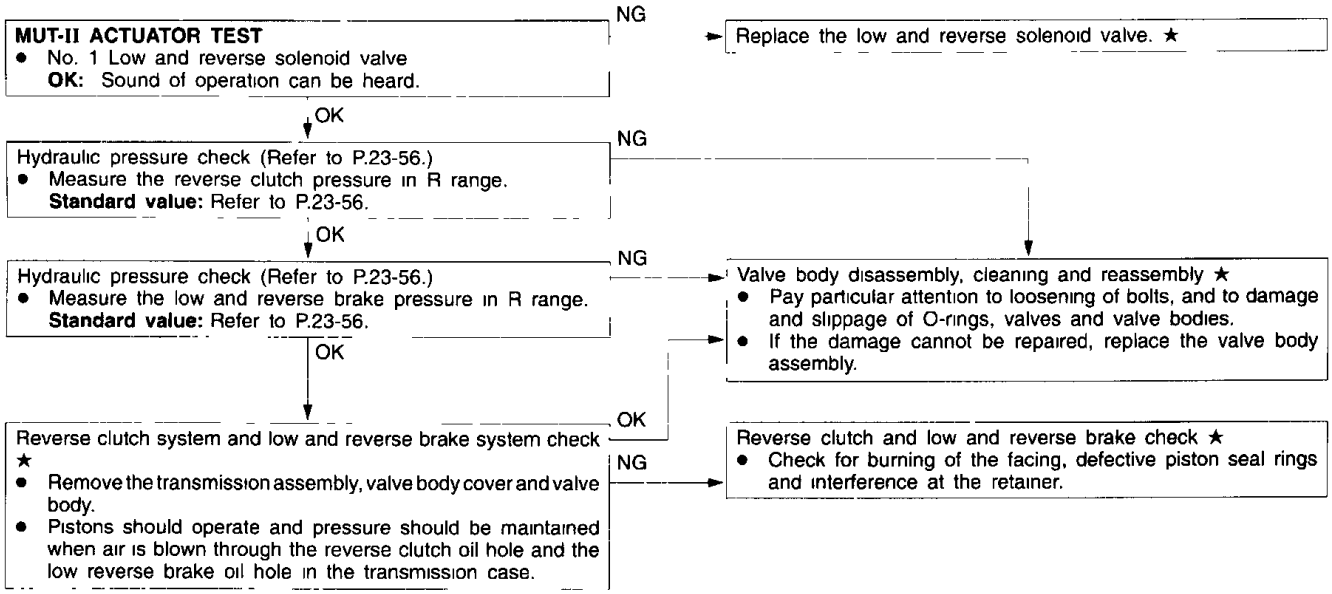
★: Refer to the Transmission Workshop Manual.



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

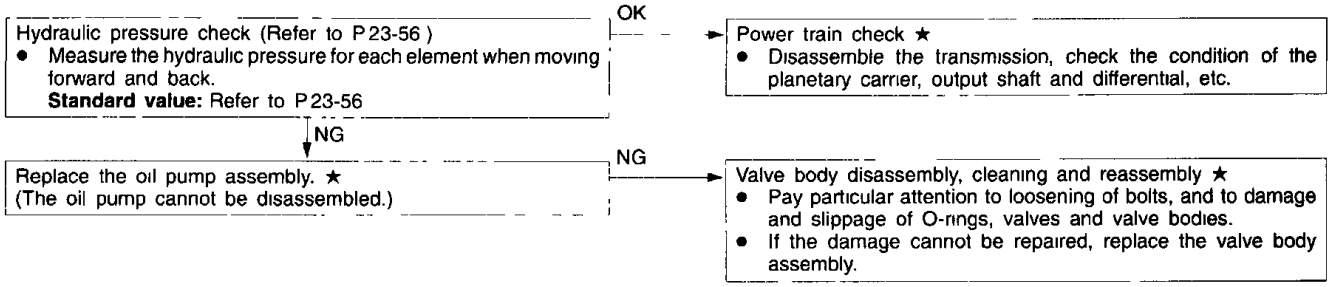
★: Refer to the Transmission Workshop Manual.



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 solenoid valve, valve body or torque converter (damper clutch malfunction).	• Malfunction of the engine system • Malfunction of the damper clutch control solenoid valve • Malfunction of the valve body • Malfunction of the torque converter (Malfuction of the damper clutch)

★: Refer to the Transmission Workshop Manual.

Engine system check
- Check the control system, ignition system, fuel system and main system

NG → **Repair, replace**

OK ↓

Replace the damper clutch control solenoid valve.

↓

Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies.
- If the damage cannot be repaired, replace the valve body assembly.

NG → Repalce the torque converter.

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.

MUT-II ACTUATOR TEST
- No. 2 Underdrive solenoid valve
  OK: Sound of operation can be heard.

NG → Replace the underdrive solenoid valve. ★

OK ↓

When does the shock occur?

When starting → Shocks sometimes occur

When shifting ↓

Hydraulic pressure test (Refer to P.23-56.)
- Measure the underdrive clutch pressure when shifting from N to D.
  Standard value: Refer to P.23-56.

NG

OK ↓

Underdrive clutch system check ★
- Remove the transmission assembly, valve body cover and valve body.
- Pistons should operate and pressure should be maintained when air is blown through the underdrive clutch oil hole in the transmission case.

OK

NG ↓

Underdrive clutch check ★
- Check for burning of the facing, defective piston seal rings and interference at the retainer

No / Yes

MUT-II SERVICE DATA
- No. 64 Idle switch
  OK: Turns from on to off when the accelerator pedal is slightly depressed from the fully closed position

OK / NG

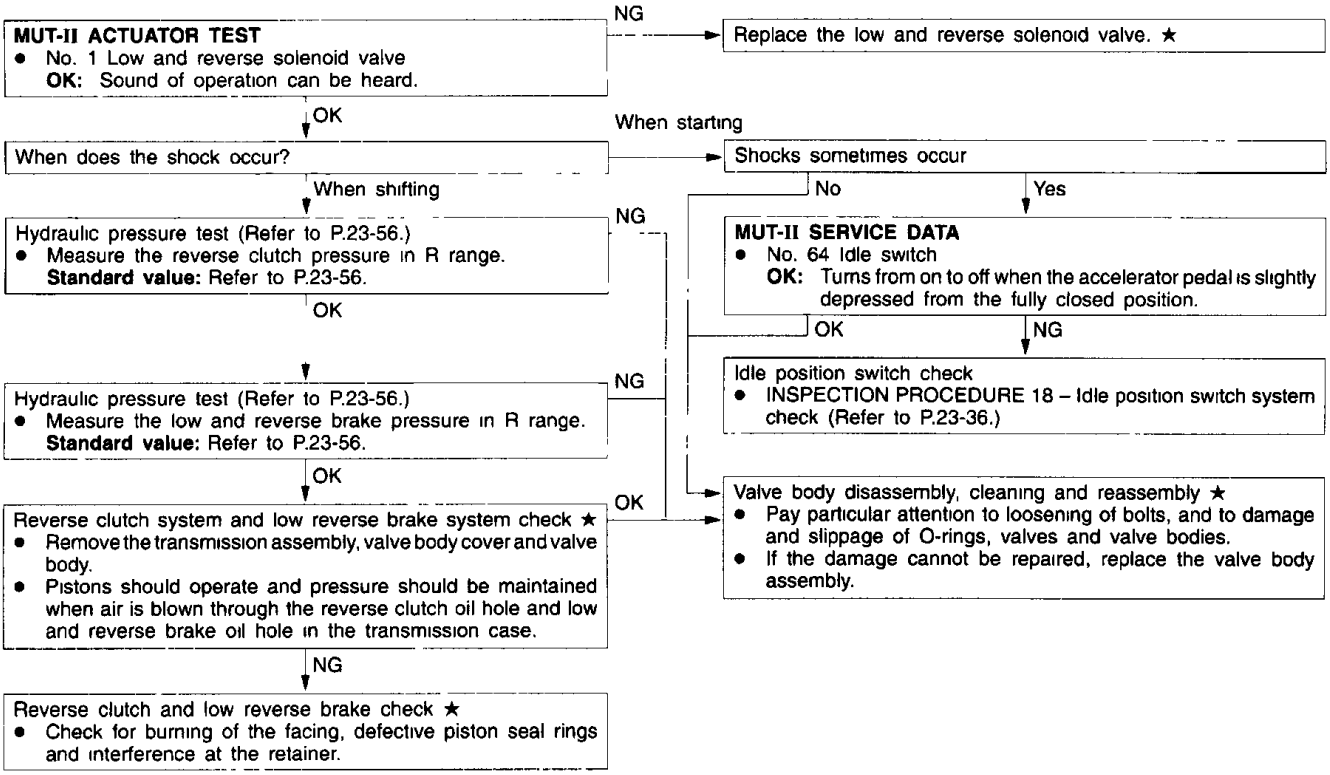
Idle position switch check
- INSPECTION PROCEDURE 18 – Idle position switch system check (Refer to P.23-36.)

Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies.
- If the damage cannot be repaired, replace the valve body assembly.

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 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

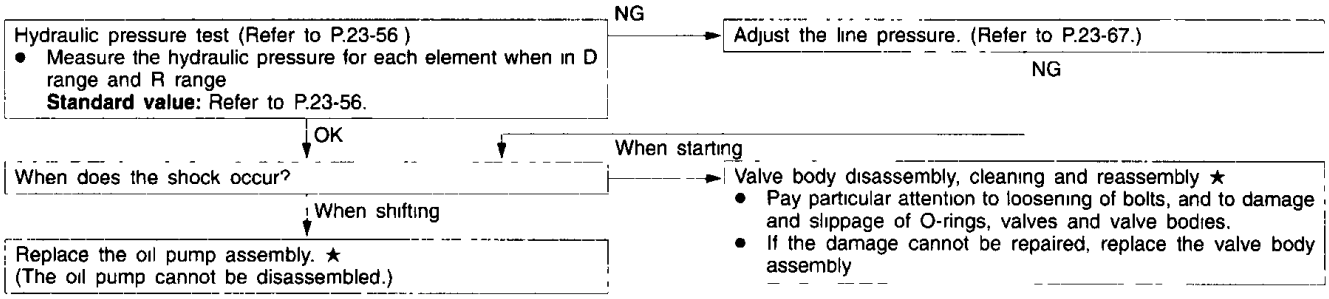
★: Refer to the Transmission Workshop Manual.



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

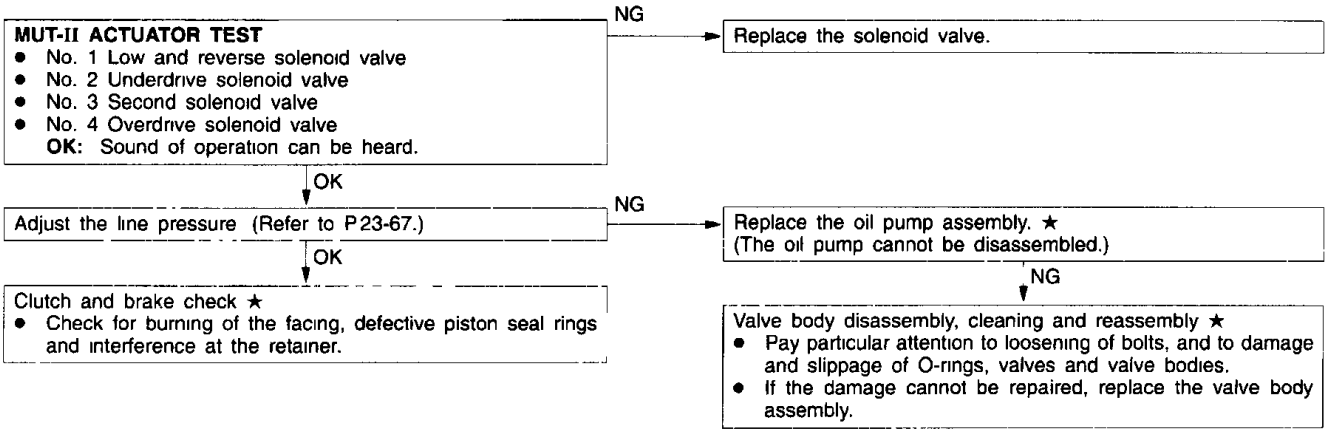
★: Refer to the Transmission Workshop Manual.



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

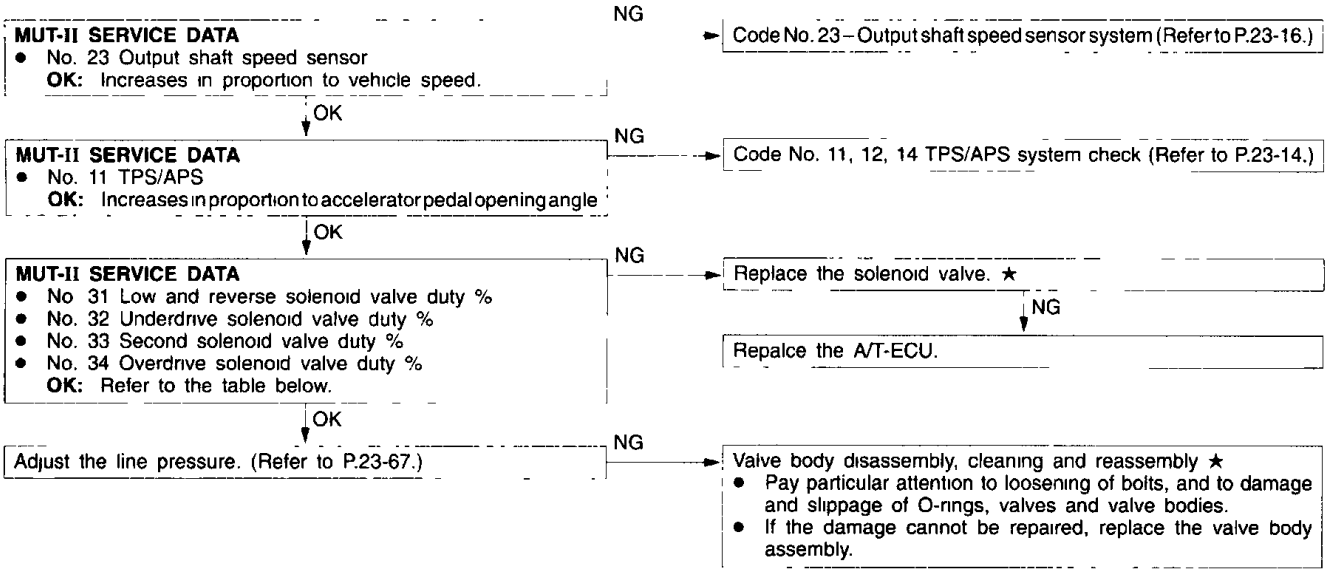
★: Refer to the Transmission Workshop Manual.



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/APS or of a solenoid valve.	• Malfunction of the output shaft speed sensor • Malfunction of the throttle position sensor or the accelerator pedal 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.

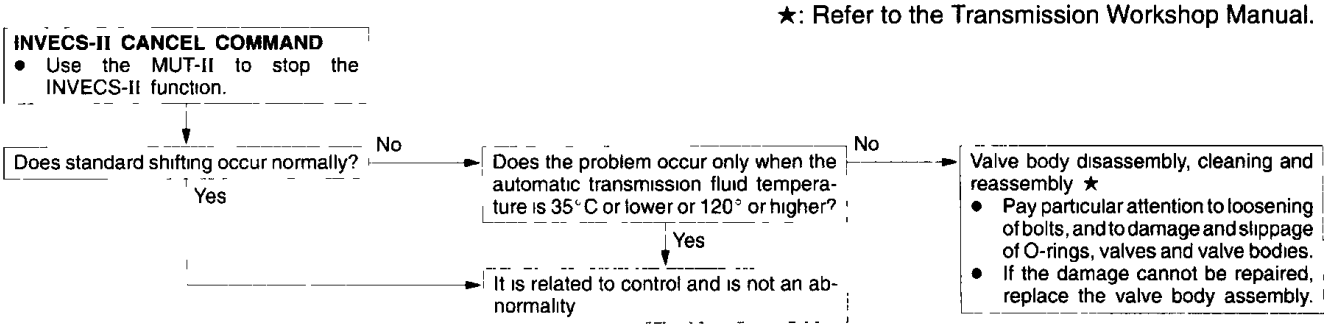


	No. 31	No. 32	No. 33	No. 34
Driving at constant speed in 1st gear	0 %	0 %	100 %	100 %
Driving at constant speed in 2nd gear	100 %	0 %	0 %	100 %
Driving at constant speed in 3rd gear	100 %	0 %	100 %	0 %
Driving at constant speed in 4th gear	100 %	100 %	0 %	0 %

INSPECTION PROCEDURE 12

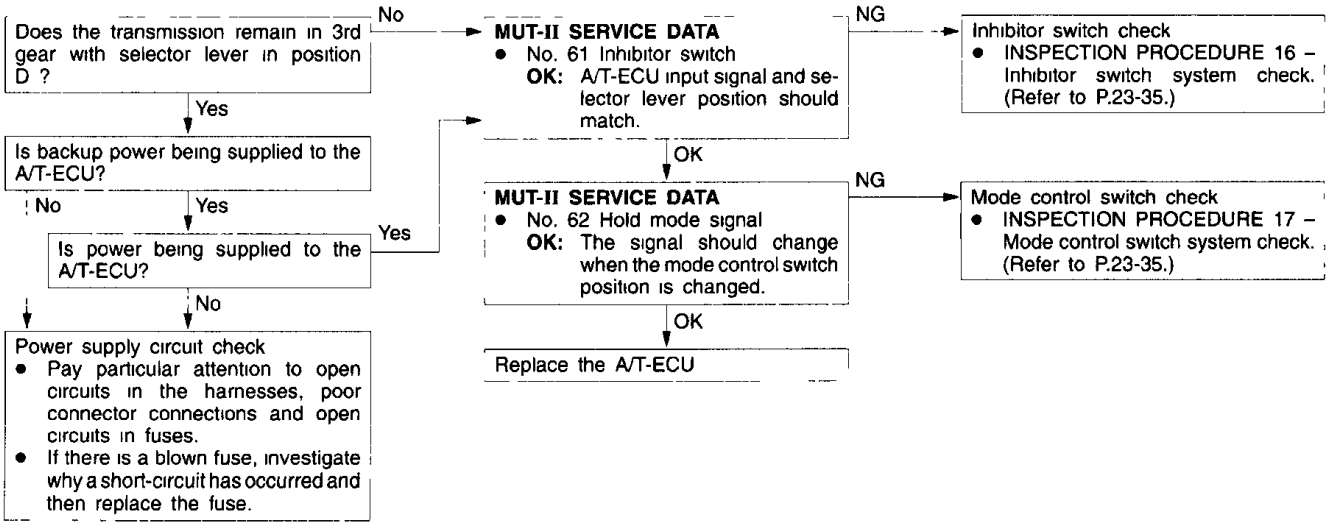
Some points (Displaced shifting points)	Probable cause
If some of the shift points are displaced while driving, the cause is probably a malfunction of the valve body, or it is related to control and is not an abnormality.	• Malfunction of the valve body

★: 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, mode control switch or A/T-ECU.	• Malfunction of the inhibitor switch • Malfunction of the mode control 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.

Engine system check
- Check the control system, ignition system, fuel system and main system.

NG → **Replace, repair**

OK ↓

Brake or clutch check ★
- Check for burning of the facing, defective piston seal rings and interference at the retainer.

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 control solenoid valve, torque converter or valve body.	• Abnormal damper clutch pressure • Malfunction of the engine system • Malfunction of the damper clutch control solenoid valve • Malfunction of the torque converter • Malfunction of the valve body

★: Refer to the Transmission Workshop Manual.

MUT-II ACTUATOR TEST
- No. 6 Damper clutch control solenoid valve
  OK: Sound of operation can be heard.

NG → Replace the damper clutch control solenoid valve. ★

OK ↓

Does the problem occur even when the oil temperature sensor connector is disconnected?

Yes → Engine system check
- Check the control system, ignition system, fuel system and main system.

No ↓

Hydraulic pressure test (Refer to P.23-56.)
- Measure the damper clutch pressure.
  Standard value: Refer to P.23-56.

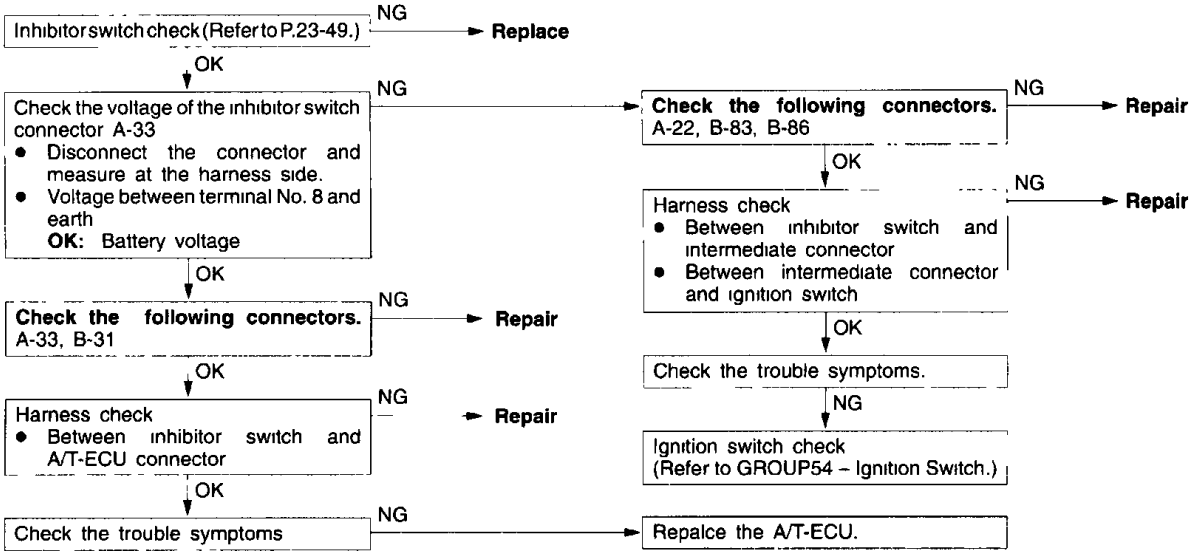
NG → Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies.
- If the damage cannot be repaired, replace the valve body assembly.

OK ↓

Replace the torque converter assembly.

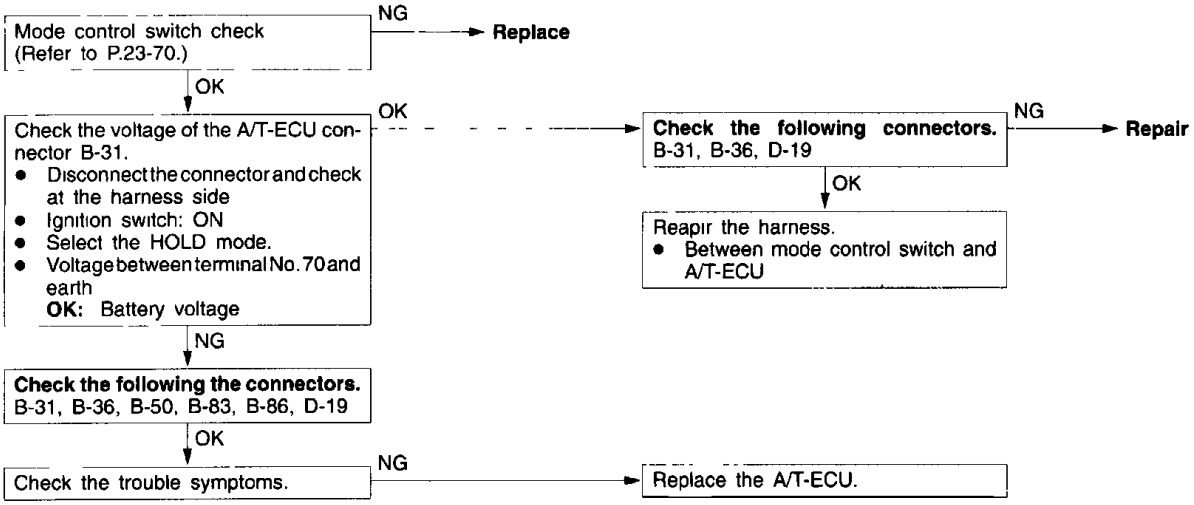
INSPECTION PROCEDURE 16

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



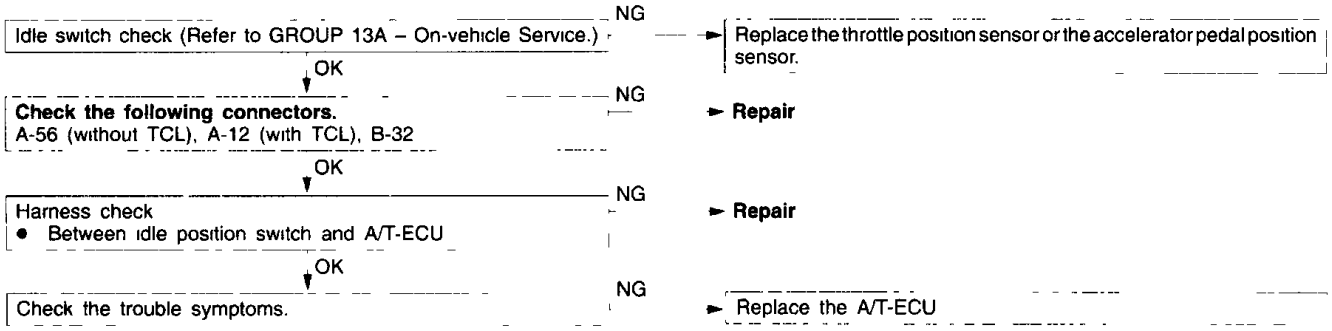
INSPECTION PROCEDURE 17

Mode control switch system	Probable cause
The cause is probably a defective mode control switch circuit or a defective A/T-ECU.	• Malfunction of the mode control switch • Malfunction of connector • Malfunction of the A/T-ECU



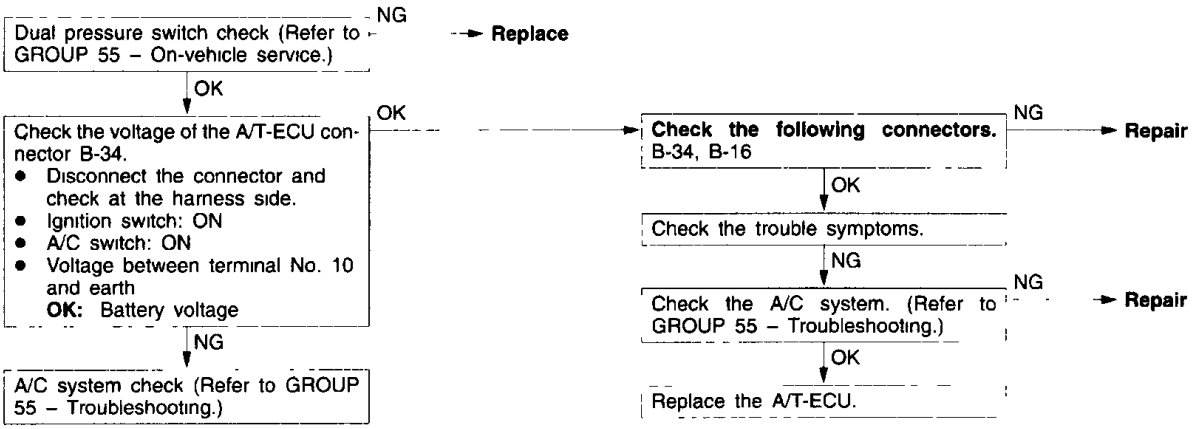
INSPECTION PROCEDURE 18

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



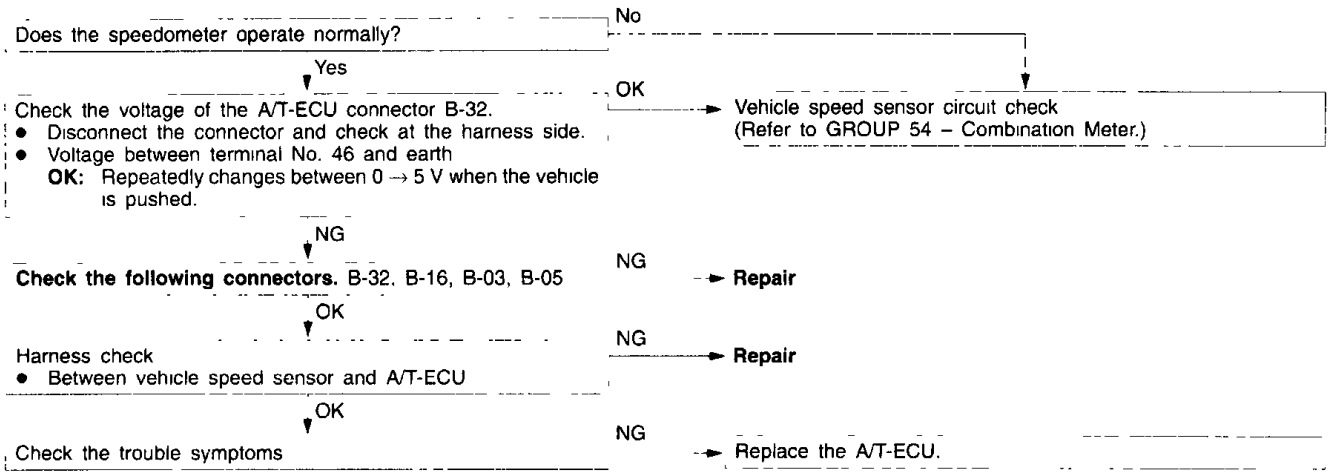
INSPECTION PROCEDURE 19

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



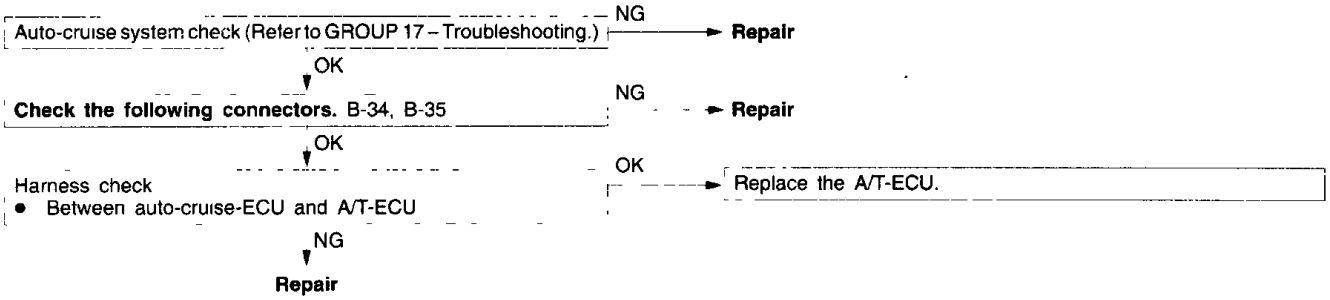
INSPECTION PROCEDURE 20

Vehicle speed sensor system	Probable cause
The cause is probably a defective vehicle speed sensor circuit or a defective A/T-ECU.	• Malfunction of the vehicle speed sensor • Malfunction of connector • Malfunction of the A/T-ECU



INSPECTION PROCEDURE 21

Auto-cruise-ECU signal system <F4A42>	Probable cause
The cause is probably a defective auto-cruise signal line circuit or a defective A/T-ECU.	• Malfunction of connector • Malfunction of the A/T-ECU • Malfunction of the auto-cruise-ECU



SERVICE DATA REFERENCE TABLE

23100810031

Item No.	Check item	Check requirement		Normal value
11	Trottle position sensor (without TCL) Accelerator pedal position sensor (with TCL)	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	Crank angle sensor	Engine: Idling Selector lever position: P	Accelerator pedal: Fully closed	650 – 900 rpm
			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 in 3rd gear	1,900 – 2,100 rpm
23	Output shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear	1,900 – 2,100 rpm
25	Wide open throttle switch	Accelerator pedal position	Fully closed	OFF
			Fully open	ON
26	Stop lamp switch	Ignition switch: ON Engine: Stopped	Brake pedal: Depressed	ON
			Brake pedal: Released	OFF
29	Vehicle speed sensor		Idling with 1st gear (Vehicle stopped)	0 km/h
			Driving at constant speed of 50 km/h in 3rd gear	50 km/h

Item No.	Check item	Check requirement		Normal value
31	Low and reverse solenoid valve duty %	Driving at constant speed	10 km/h in 1st gear	No. 31: 0 %, No. 32: 0 %, No. 33: 100 %, No. 34: 100%
32	Underdrive solenoid valve duty %		30 km/h in 2nd gear	No. 31: 100 %, No. 32: 0 %, No. 33: 0 %, No. 34: 100%
33	Second solenoid valve duty %		50 km/h in 3rd gear	No. 31: 100 %, No. 32: 0 %, No. 33: 100 %, No. 34: 0%
34	Overdrive solenoid valve duty %		70 km/h in 4th gear	No. 31: 100 %, No. 32: 100 %, No. 33: 0 %, No. 34: 0%
36	Damper clutch control solenoid vlave duty %		Driving at 50 km/h in 3rd gear with accelerator fully closed	0 %
			Driving at constant speed of 70 km/h in 3rd gear	Approx. 70 – 90 %
52	Amount of damper clutch slippage		Driving at 50 km/h in 3rd gear with accelerator fully closed	Approx. 100 – 300 rpm*
			Driving at constant speed of 70 km/h in 3rd gear	Approx. 0 – 10 rpm
54	Control relay output voltage		Ignition switch: ON → OFF	Battery voltage (mV) → 0 mV
57	Engine volumetric efficiency (except MIVEC engine)		N range with 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

NOTE
*: The damper clutch is released when the accelerator is fully closed (Idle position switch: ON).

Item No.	Check item	Check requirement		Normal value
62	HOLD mode signal	Mode control switch position	HOLD	ON
			AUTO	OFF
63	Shift position	Selector lever position: HOLD mode	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 70 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 auro-cruise operating	Plain road	OFF
			Sloping road	ON

ACTUATOR TEST JUDGEMENT VALUE

23100820034

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 (Accelerator) opening voltage: Less than 0 V Idle switch: ON	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 control solenoid valve			
12	Control relay	Control relay is OFF for 3 seconds.		Data list No. 54 (1) During test: 0 mV (2) Normal: Battery voltage [mV]

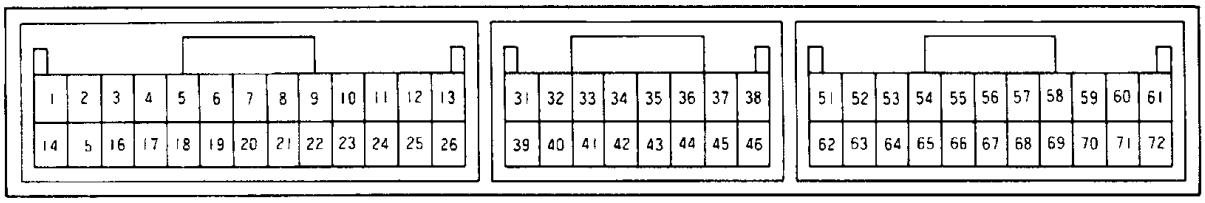
INVECS-II CANCEL COMMAND

23100950016

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 7 in the road tests.

CHECK AT A/T-ECU TERMINALS

23100840030



A9FA0133

Terminal No.	Check item	Check requirement	Standard value	Remarks
1	Underdrive solenoid valve	Selector lever position: D (1st gear)	Battery voltage	
		Selector lever position: R	Approx.7 – 9 V	
2	Solenoid valve power supply	Ignition switch: OFF	0 V	
		Ignition switch: ON	Battery voltage	
3	Solenoid valve power supply	Ignition switch: OFF	0 V	
		Ignition switch: ON	Battery voltage	
8	Auto-cruise control unit	No OD-OFF request	Battery voltage	F4A42
		OD-OFF request	0 V	
10	A/C compressor load signal	A/C switch: OFF	0 V	
		A/C switch: ON	Battery voltage	
11	Power supply	Ignition switch: OFF	0 V	
		Ignition switch: ON	Battery voltage	
12	Earth	Always	0 V	
13	Earth	Always	0 V	
14	Overdrive solenoid valve	Selector lever position: D (3rd gear)	Battery voltage	
		Selector lever position: D (1st gear)	Approx. 7 – 9 V	

Terminal No.	Check item	Check requirement	Standard value	Remarks
15	Damper clutch control solenoid valve	Selector lever position: D (1st gear)	Battery voltage	
		Selector lever position: D (60 km/h in 3rd gear)	Other than battery voltage	
16	Second solenoid valve	Selector lever position: D (2nd gear)	Battery voltage	
		Selector lever position: D (1st gear)	Approx. 7 – 9 V	
21	Engine ECU torque reduction request signal	Ignition switch: ON (except during shifting)	4 – 5 V	with TCL
23	Diagnosis control	–	–	
24	Power supply	Ignition switch: OFF	0 V	
		Ignition switch: ON	Battery voltage	
25	Earth	Always	0 V	
26	Earth	Always	0 V	
31	Input shaft speed sensor	Measure between terminal No. 31 and No. 43 by an oscilloscope. Engine: 2,000 r/min Selector lever position: 3	Refer to P.23-45, Oscilloscope inspection procedure.	
32	Output shaft speed sensor	Measure between terminal No. 32 and No. 43 by an oscilloscope. Engine: 2,000 r/min Selector lever position: 3	Refer to P.23-45, Oscilloscope inspection procedure.	
33	Crank angle sensor	Engine: Idling	2.0 – 2.4 V	
36	Idle position switch	Engine: Idling	0 V	
		Engine: Other than idling	5 V	
38	Back up power suuply	Ignition switch: OFF	Battery voltage	

Terminal No.	Check item	Check requirement	Standard value	Remarks
43	Sensor earth	Always	0 V	
44	Oil temperature sensor	ATF temperature: 25 °C	3.8 – 4.0 V	
		ATF temperature: 80 °C	2.3 – 2.5 V	
45	Thottle openning sensor (TPS, APS)	Accelerator pedal: Fully closed (Engine stopped)	0.5 – 1.0 V	
		Accelerator pedal: Fully open (Engine stopped)	4.5 – 5.0 V	
46	Vehicle speed sensor	When stopped	0 V	
		Move forward slowly	0 → 5 V flashing	
53	Communication with engine ECU	Engine: Idling Selector lever position: D	Other than 0 V	without TCL
	Communication with TCL-ECU			with TCL
54	Communication with engine ECU	Engine: Idling Selector lever position: D	Other than 0 V	without TCL
	Communication with TCL-ECU			with TCL
55	Inhibitor switch P	Selector lever position: P	Battery voltage	
		Selector lever position: Other than above	0 V	
56	Inhibitor switch N	Selector lever position: N	Battery voltage	
		Selector lever position: Other than above	0 V	
57	Inhibitor switch 3	Selector lever position: 3	Battery voltage	
		Selector lever position: Other than above	0 V	
58	Inhibitor switch L	Selector lever position: L	Battery voltage	
		Selector lever position: Other than above	0 V	
59	Stop lamp switch	Brake pedal: Depressed	Battery voltage	
		Brake pedal: Released	0 V	
62	Low and reverse solenoid valve	Selector lever position: D (1st gear)	Battery voltage	
		Selector lever position: D (2nd gear)	Approx. 7 – 9 V	

Terminal No.	Check item	Check requirement	Standard value	Remarks
63	Diagnosis output	Normal (No diagnosis code output)	0 → 5 V flashing	
65	Wide open throttle switch	Accelerator pedal: Fully closed	4.5 – 5.5 V	
		Accelerator pedal: Fully open	Less than 0.4 V	
66	Inhibitor switch R	Selector lever position: R	Battery voltage	
		Selector lever position: Other than above	0 V	
67	Inhibitor switch D	Selector lever position: D	Battery voltage	
		Selector lever position: Other than above	0 V	
68	Inhibitor switch 2	Selector lever position: 2	Battery voltage	
		Selector lever position: Other than above	0 V	
70	Mode control switch	Select HOLD mode	Battery voltage	
		Select AUTO mode	0 V	
71	A/T control relay	Ignition switch: OFF	0 V	
		Ignition switch: ON	Battery voltage	
72	Earth	Ignition switch: ON	0 V	

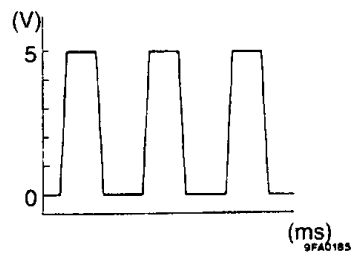
OSCILLOSCOPE INSPECTION PROCEDURE

23100850033

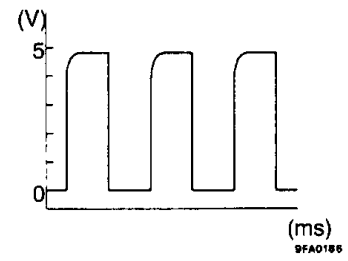
Check item	Check requirement		Normal condition (Waveform sample)
Crank angle sensor	Selector lever position: N	Idling (Vehicle stopped)	Waveform A
Input shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear (Engine: 1,900 – 2,100 r/min)	Waveform B
Output shaft 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 Idle switch: ON	Force drive each solenoid valve (Actuator test)	Waveform C
Underdrive solenoid valve			
Second solenoid valve			
Overdrive solenoid valve			
Damper clutch control solenoid valve			

Waveform sample

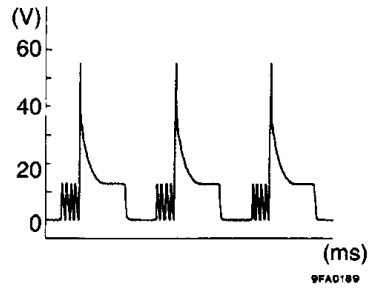
Waveform A

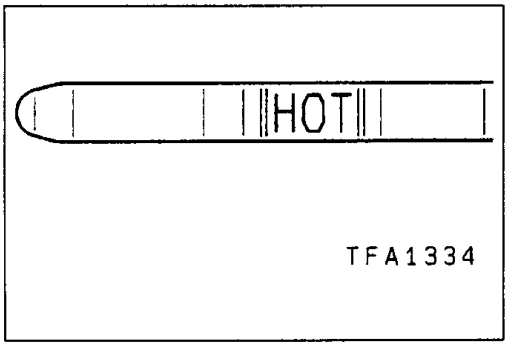


Waveform B



Waveform C





ON-VEHICLE SERVICE

23100090046

AUTOMATIC TRANSMISSION FLUID CHECK

(1) Drive the vehicle until the fluid temperature rises to the normal temperature (70–80°C).
(2) Park the vehicle on a level surface.
(3) Move the selector lever through all positions to fill the torque converter and the hydraulic circuits with fluid, and then move the selector lever to the N position.
(4) After wiping off any dirt around the oil level gauge, remove the oil level gauge and check the condition of the fluid.

NOTE
If the fluid smells as if it is burning, it means that the fluid has been contaminated by fine particles from the bushes and friction materials, a transmission overhaul may be necessary.

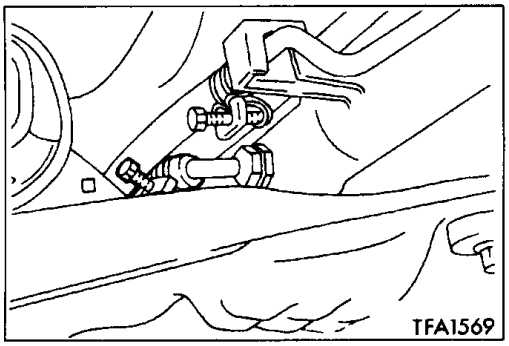
(5) Check that the fluid level is at the HOT mark on the oil level gauge. If the fluid level is lower than this, pour in more fluid until the level reaches the HOT mark.

Automatic transmission fluid:

Dia Queen ATF SP II or equivalent

NOTE
If the fluid level is low, the oil pump will draw in air along with the fluid, which will cause bubbles to form inside the hydraulic circuit. This will in turn cause the hydraulic pressure to drop, which will result in late shifting and slipping of the clutches and brakes.
If there is too much fluid, the gears can churn it up into foam and cause the same conditions that can occur with low fluid levels.
In either case, air bubbles can cause overheating and oxidation of the fluid which can interfere with normal valve, clutch, and brake operation. Foaming can also result in fluid escaping from the transmission vent, in which case it may be mistaken for a leak.

(6) Securely insert the oil level gauge.
(7) The fluid and the oil filters should always be replaced when overhauling the transmission or after the vehicle has been driven under severe conditions.
The replacement procedures are given below.
Furthermore, the oil filters are special filters which are only to be used for the automatic transmission.


TFA1569

AUTOMATIC TRANSMISSION FLUID REPLACEMENT

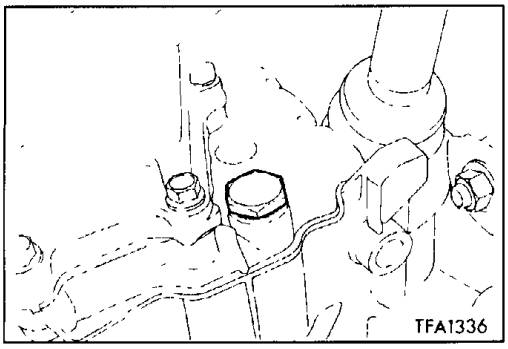
23100100039

If you have a fluid changer, use this changer to replace the fluid. If you do not have a fluid changer, replace the fluid by the following procedure.
(1) Disconnect the hose shown in the illustration which connects the transmission and the oil cooler (inside the radiator).
(2) Start the engine and let the fluid drain out.

Running conditions: N range with engine idling

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

Discharge volume: Approx. 3.5 ℓ


TFA1336

(3) Remove the drain plug from the bottom of the transmission case to drain the fluid.

Discharge volume: Approx. 2.0 ℓ

(4) Replace the oil filters. (Refer to P.23-48.)
(5) Install the drain plug via the gasket, and tighten it to the specified torque.

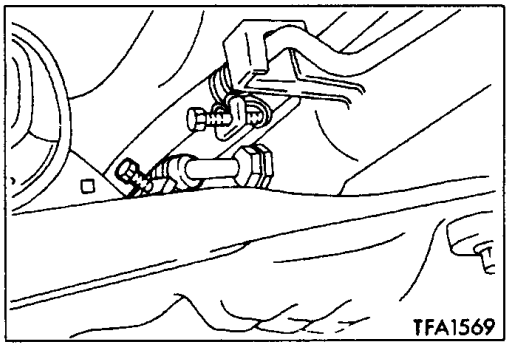
Tightening torque: 32 Nm

(6) Pour the new fluid in through the oil filler tube.

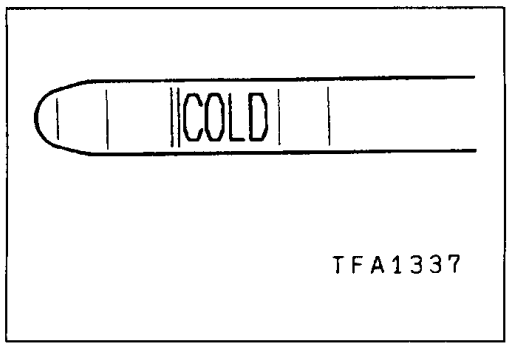
Adding volume: Approx. 5.5 ℓ

NOTE
If the full volume of fluid cannot be poured in, carry out the following step (7) while pouring.

(7) Repeat the procedure from step (2) to discharge all of the fluid from the hose.
(8) Pour the new fluid in through the oil filler tube.



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

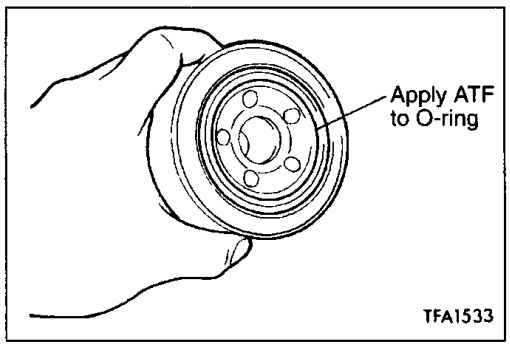


(12) Check that the fluid level is at the COLD mark on the oil level gauge. If the level is lower than this, pour in more fluid.
(13) Drive the vehicle until the fluid temperature rises to the normal temperature (70–80°C), and then check the fluid level again.
The fluid level much be at the HOT mark.

NOTE
The COLD level is for reference only; the HOT level should be regarded as the standard level.

(14) Firmly insert the oil level gauge into the oil filler tube.

OIL FILTER REPLACEMENT 23101050012



1. Use the special tool (MB991610) to remove the automatic transmission oil filter.
2. Clean the filter bracket 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. (Refer to P.23-46.)

THROTTLE POSITION SENSOR ADJUSTMENT <VEHICLES WITHOUT TCL>

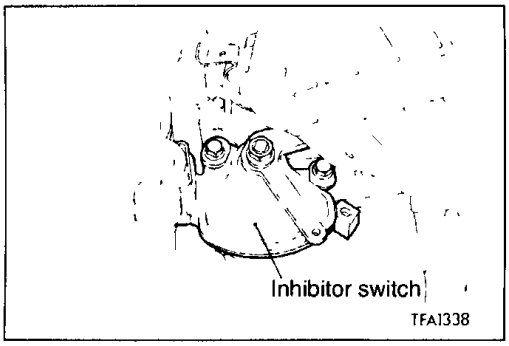
23100190036

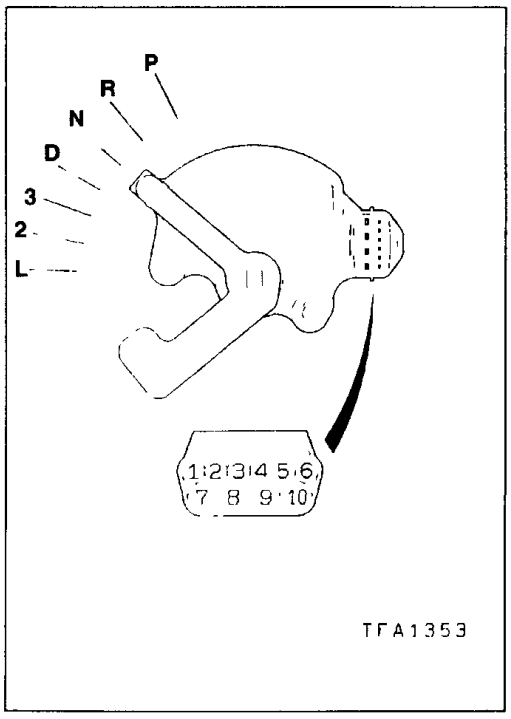
Refer to GROUP 13A – On-vehicle Service.

ACCELERATOR PEDAL POSITION SENSOR ADJUSTMENT <VEHICLES WITH TCL>

23100250024

Refer to GROUP 13A – On-vehicle Service.

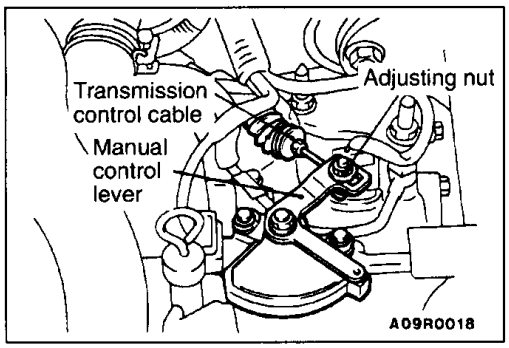




INHIBITOR SWITCH CONTINUITY CHECK

23100140055

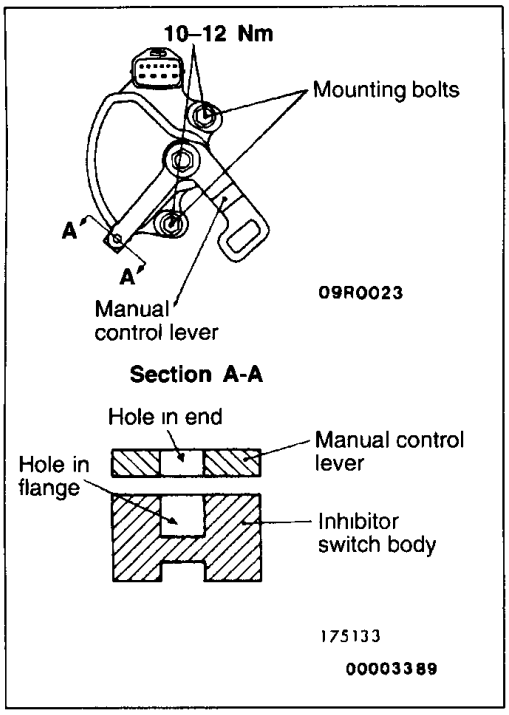
Items	Terminal No.									
	1	2	3	4	5	6	7	8	9	10
P			○					○	○	○
R							○	○		
N				○				○	○	○
D	○							○		
3					○			○		
2		○						○		
L						○		○		



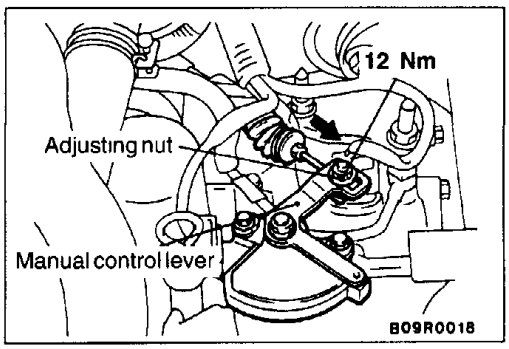
INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT

23100150034

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 the 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.

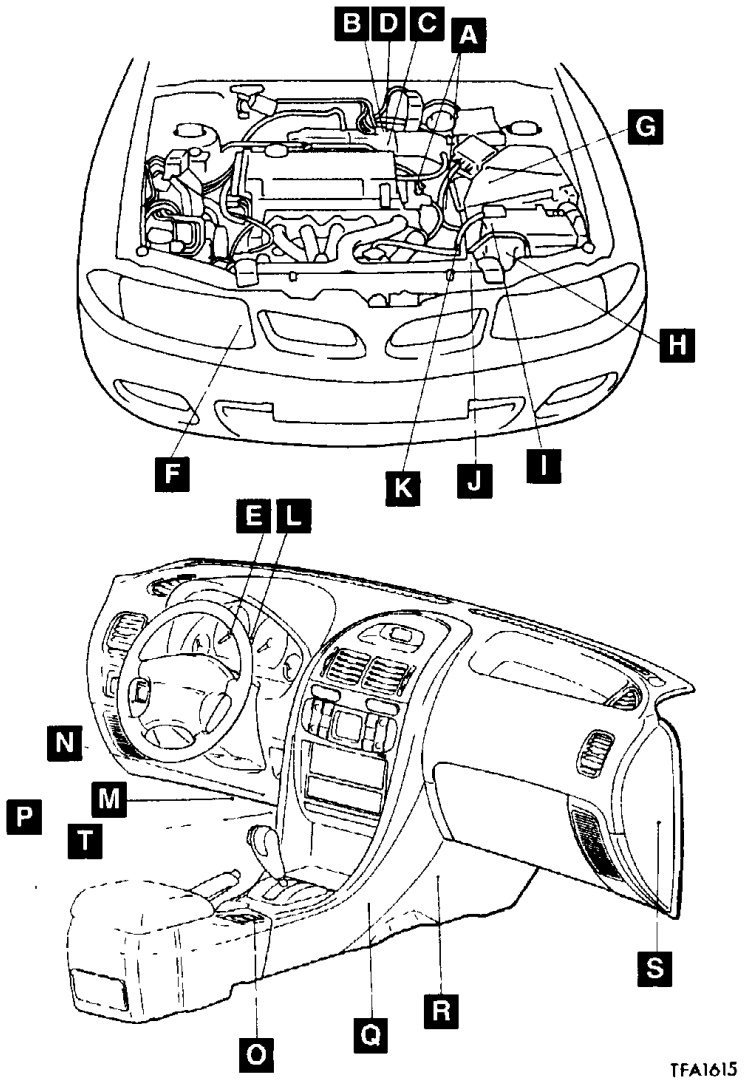


6. Gently pull the transmission control cable in the direction of the arrow, and then tighten the adjusting nut.
7. Check that the selector lever is in the "N" position.
8. Check that each range on the transmission side operates and functions correctly for each position of the selector lever.

A/T CONTROL COMPONENT LOCATION

23100860036

Name	Symbol	Name	Symbol
Accelerator position sensor <Vehicles with TCL>	C	Mode control switch	O
A/T control relay	R	Oil temperature sensor	J
A/T-ECU	Q	Output shaft speed sensor	G
Crank angle sensor	A	Shift indicator lamp	L
Diagnosis connector	N	Solenoid valve	H
Dual pressure sensor	F	Stop lamp switch	M
Engine ECU	S	TCL-ECU	P
Idle position switch	D	Throttle position sensor <Vehicles without TCL>	B
Inhibitor switch	I	Vehicle speed sensor	E
Input shaft speed sensor	K	Wide open throttle switch	T



A/T CONTROL COMPONENT CHECK 23100900011

1. CRANK ANGLE SENSOR CHECK

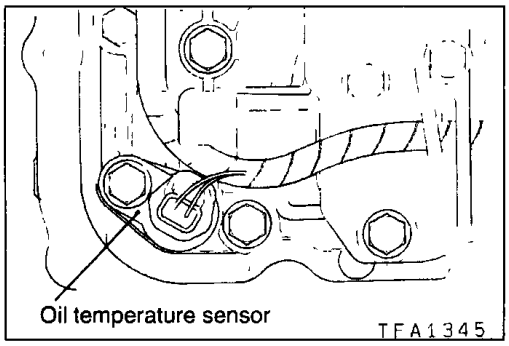
Refer to GROUP 13A – Troubleshooting.

2. THROTTLE POSITION SENSOR CHECK <Vehicles without TCL> 23100390030

Refer to GROUP 13A – On-vehicle Service.

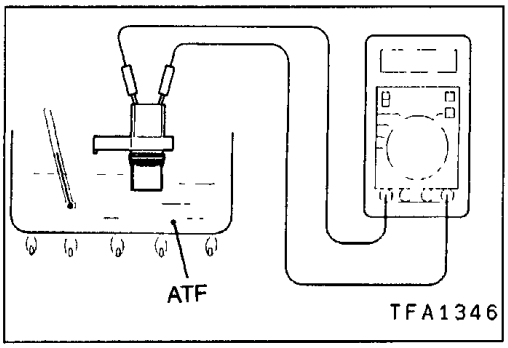
3. ACCELERATOR PEDAL POSITION SENSOR CHECK <Vehicles with TCL> 23100420029

Refer to GROUP 13A – On-vehicle Service.



4. OIL TEMPERATURE SENSOR CHECK 23100450035

(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	16.7–20.5
100	0.57–0.69

5. INHIBITOR SWITCH CHECK 23100140062

Refer to P.23-49.

6. STOP LAMP SWITCH CHECK 23100910014

Refer to GROUP 35 – Brake Pedal.

7. VEHICLE SPEED SENSOR CHECK 23100460038

Refer to GROUP 54 – On-vehicle Service.

8. DUAL POSITION PRESSURE SWITCH CHECK 23100470031

Refer to GROUP 55 – On-vehicle Service.

9. IDLE POSITION SWITCH CHECK 23100410033

Refer to GROUP 13A – On-vehicle Service.

10. MODE CONTROL SWITCH CHECK 23100920017

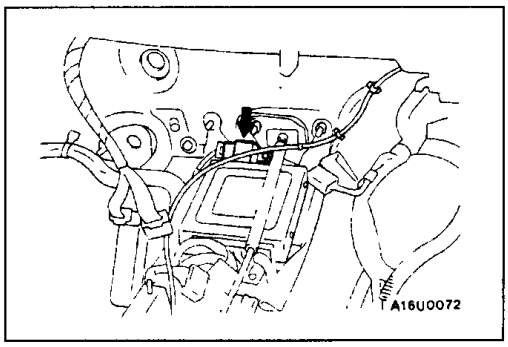
Refer to P.23-70.

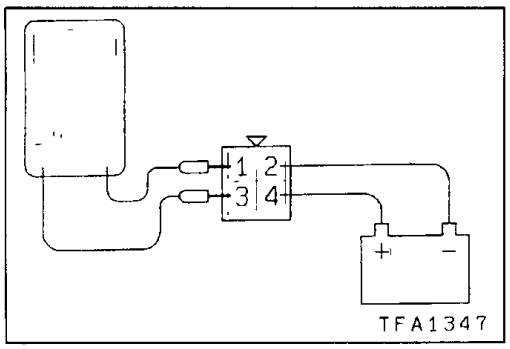
11. WIDE OPEN THROTTLE SWITCH CHECK 23100890042

Refer to P.23-70.

12. A/T CONTROL RELAY CHECK 23100930010

(1) Remove the A/T control relay.

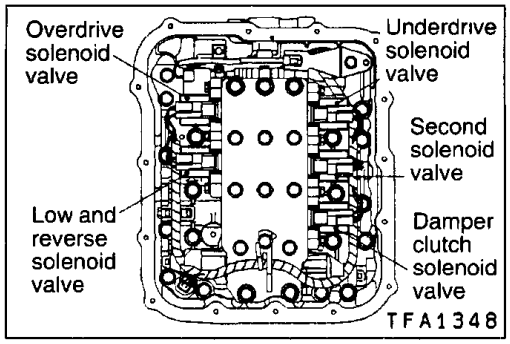




(2) Use jumper wires to connect A/T control relay terminal (2) to the battery (–) terminal and terminal (4) to the battery (+) terminal.
(3) Check the continuity between terminal (1) and terminal (3) of the A/T control relay when the jumper wires are connected to and disconnected from the battery.

Jumper wire	Continuity between terminals No. 1 and No. 3
Connected	Continuity
Disconnected	No continuity

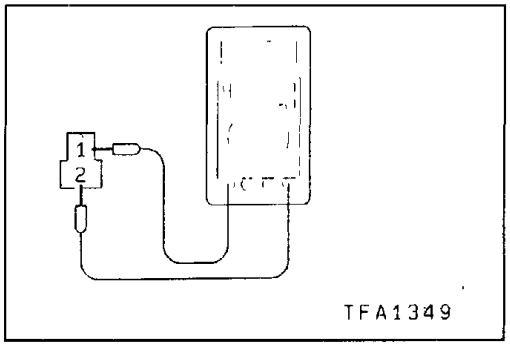
(4) If there is a problem, replace the A/T control relay.



13. SOLENOID VALVE CHECK

23100940013

(1) Remove the valve body cover.
(2) Disconnect the connectors of each solenoid valve.

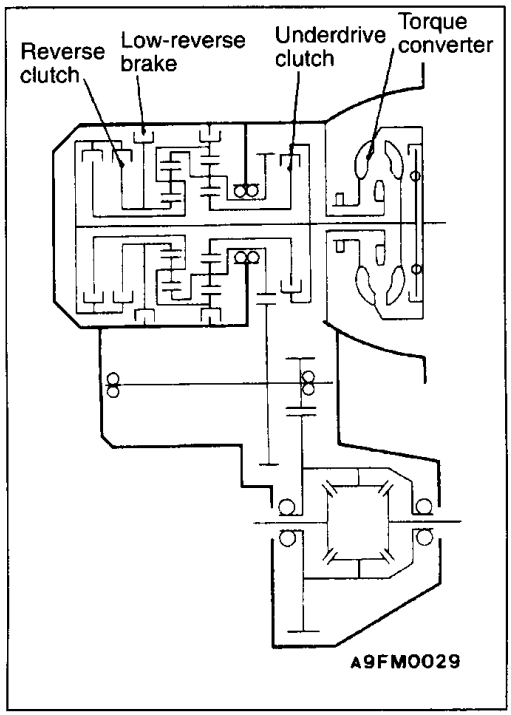


(3) Measure the resistance between terminals 1 and 2 of each solenoid valve.

Standard value:

Name	Resistance
Damper clutch solenoid valve	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 outside the standard value, replace the solenoid valve.



TORQUE CONVERTER STALL TEST 23100540039

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) Check both rear wheels (left and right).
(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

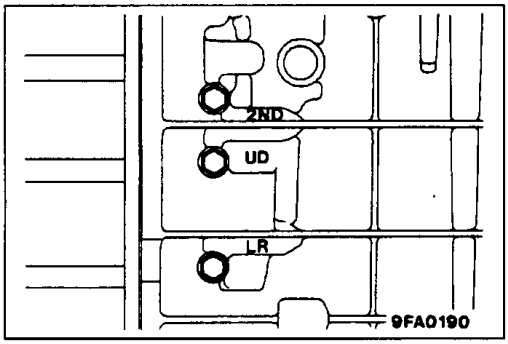
TORQUE CONVERTER STALL TEST JUDGEMENT RESULTS

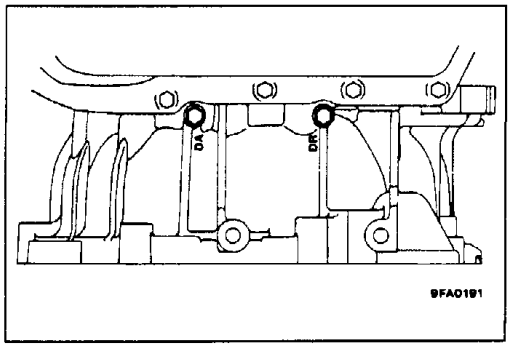
a. Stall speed is too high in both D and R ranges
   - Low line pressure
   - Low & reverse brake slippage

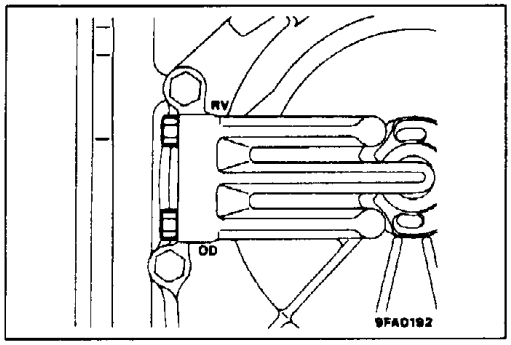
b. Stall speed is too high in D range only
   - Underdrive clutch slippage

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 23100550032

(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 (rpm)	Underdrive clutch pressure	Reverse clutch pressure	Overdrive clutch pressure	Low and reverse brake pressure	Second brake pressure	Torque converter pressure
P	–	2,500	–	–	–	310–390	–	250–390
R	Reverse	2,500	–	1,270–1,770	–	1,270–1,770	–	500–700
N	2,500	–	–	–	–	310–390	–	250–390
D	1st gear	2,500	1,010–1,050	–	–	1,010–1,050	–	500–700
	2nd gear	2,500	–	–	–	–	1,010–1,050	500–700
	3rd gear	2,500	–	–	590–690	–	–	450–650
	4th gear	2,500	–	–	590–690	–	590–690	450–650

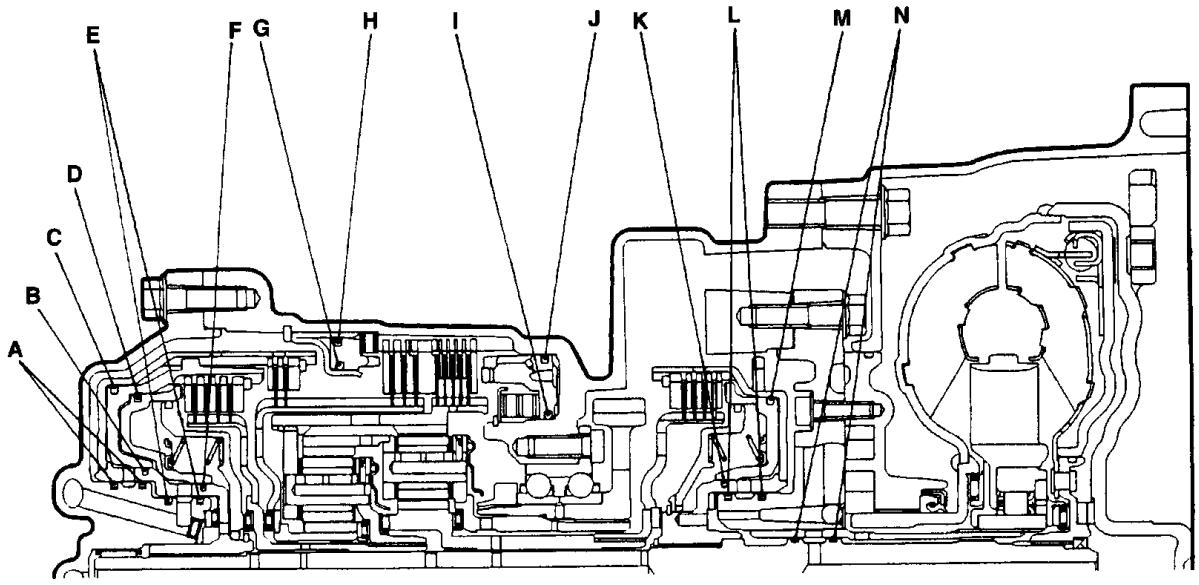
HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

Trouble symptom	Probable cause
All hydraulic pressures are high.	Incorrect transmission control cable adjustment
	Malfunction of the regulator valve
All hydraulic pressures are low.	Incorrect transmission control cable adjustment
	Malfunction of the oil pump
	Clogged internal oil filter
	Clogged external oil filter
	Clogged oil cooler
	Malfunction of the regulator valve
	Malfunction of the relief valve
	Incorrect valve body installation

Trouble symptom	Probable cause
Hydraulic pressure is abnormal in "R" range only.	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
Hydraulic pressure is abnormal in "3" or "4" range only.	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the regulator valve
	Malfunction of the switch valve
	Clogged orifice
	Incorrect valve body installation
Only underdrive hydraulic pressure is abnormal.	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal.	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation
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 check ball
	Clogged orifice
	Incorrect valve body installation

Trouble symptom	Probable cause
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
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.	Malfunction of the oil cooler
	Malfunction of the oil seal N
	Malfunction of the damper clutch control solenoid valve
	Malfunction of the damper clutch control valve
	Malfunction of the torque converter pressure control valve
	Clogged orifice
	Incorrect valve body installation
Pressure applied to non operating element.	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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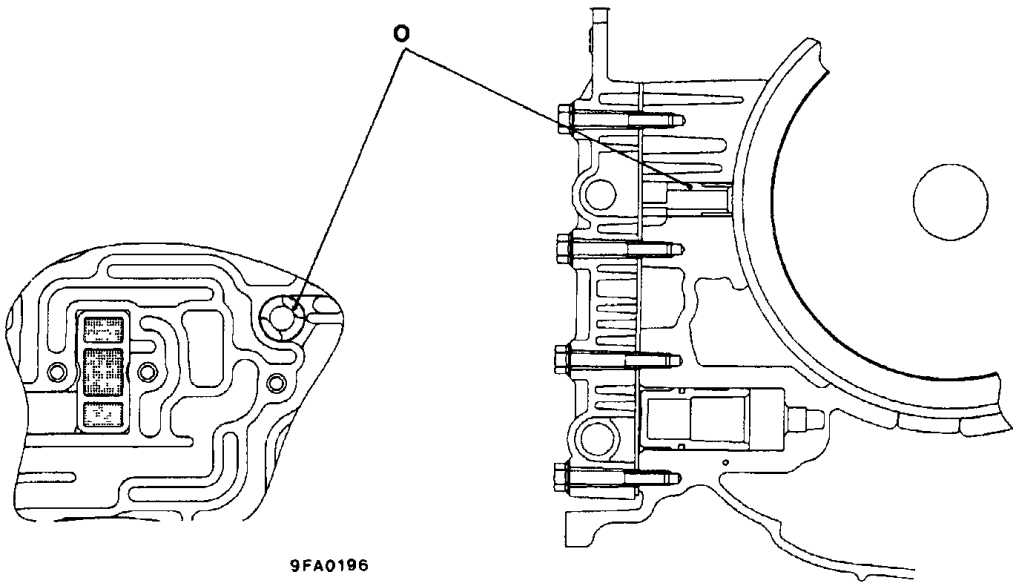

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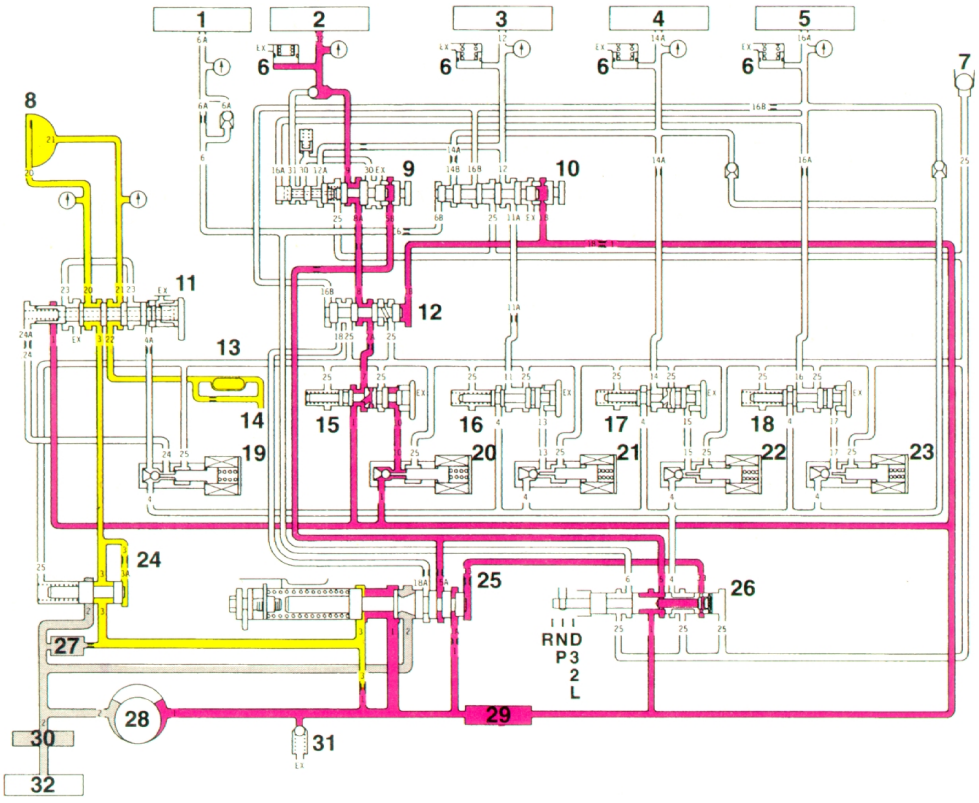
HYDRAULIC CIRCUIT

23100880032

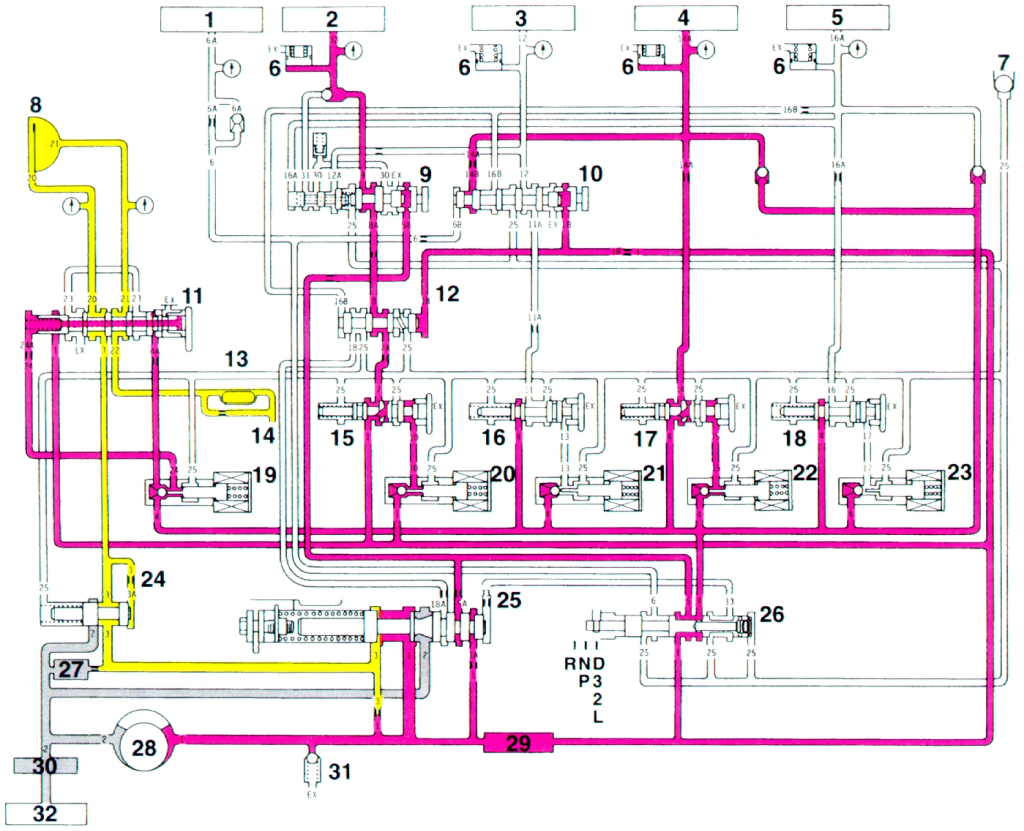
PARKING AND NEUTRAL



: Line pressure
: Oil pump suction pressure
: Damper clutch pressure
: Torque converter and lubrication pressure
: Damper clutch control solenoid valve pressure

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

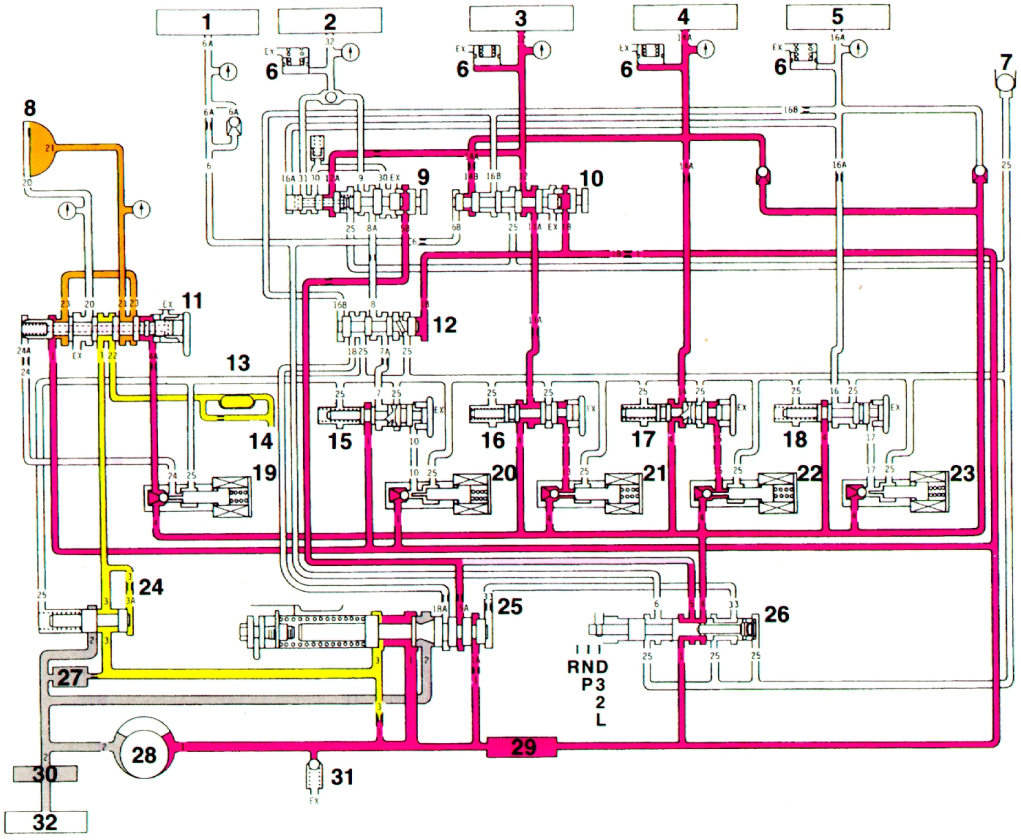
1ST GEAR



: Line pressure
: Oil pump suction pressure
: Damper clutch pressure
: Torque converter and lubrication pressure
: Damper clutch control solenoid valve pressure

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

2ND GEAR

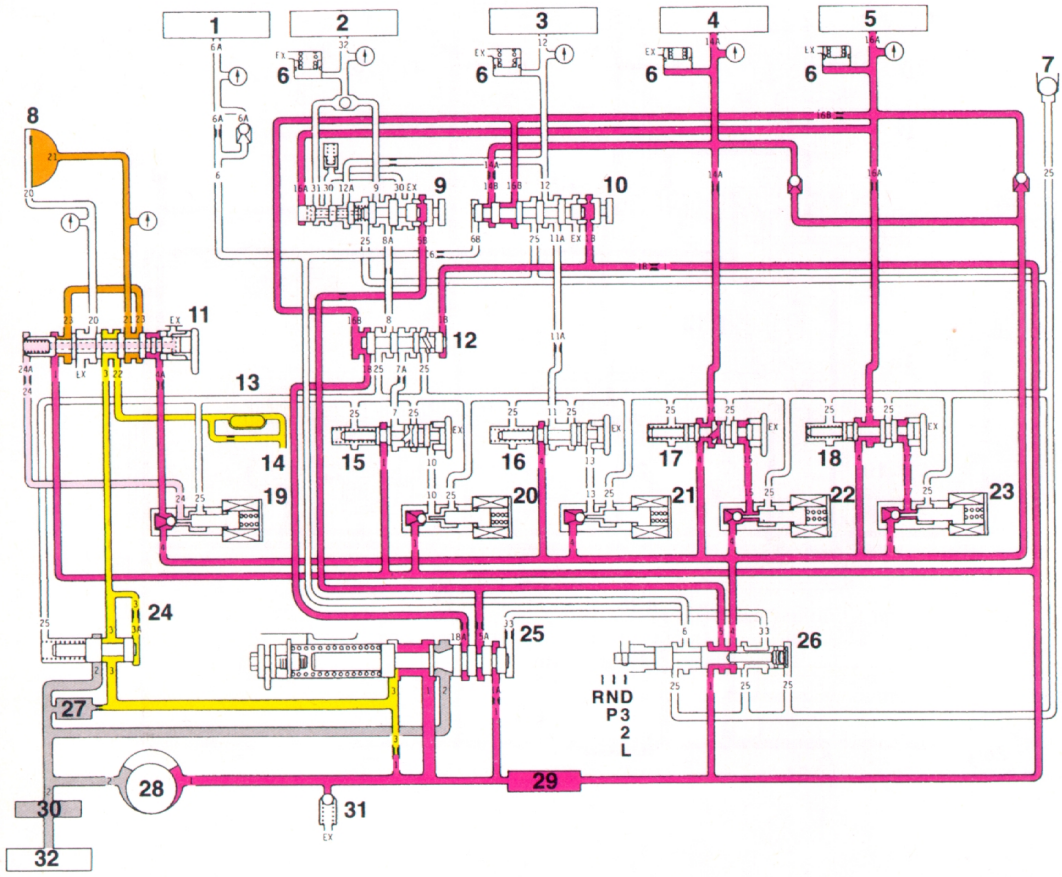


TFA1600

: Line pressure
: Oil pump suction pressure
: Damper clutch pressure
: Torque converter and lubrication pressure
: Damper clutch control solenoid valve pressure

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

3RD GEAR

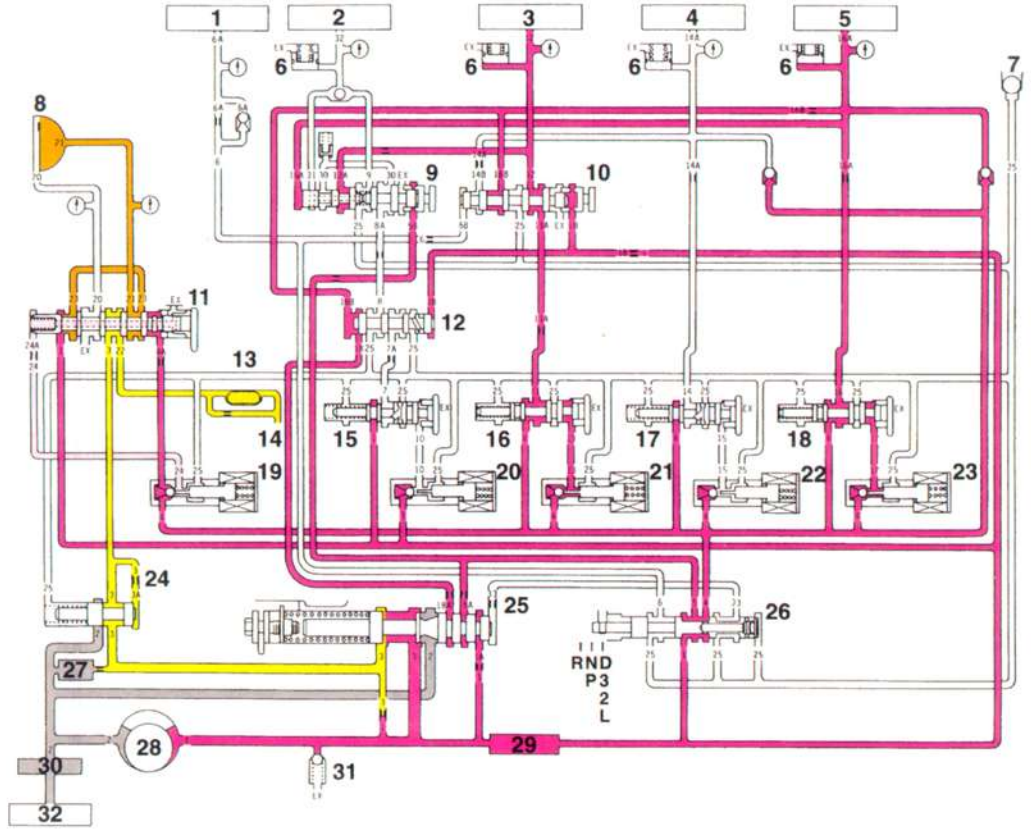


TFA1601

: Line pressure
: Oil pump suction pressure
: Damper clutch pressure
: Torque converter and lubrication pressure
: Damper clutch control solenoid valve pressure

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

4TH GEAR

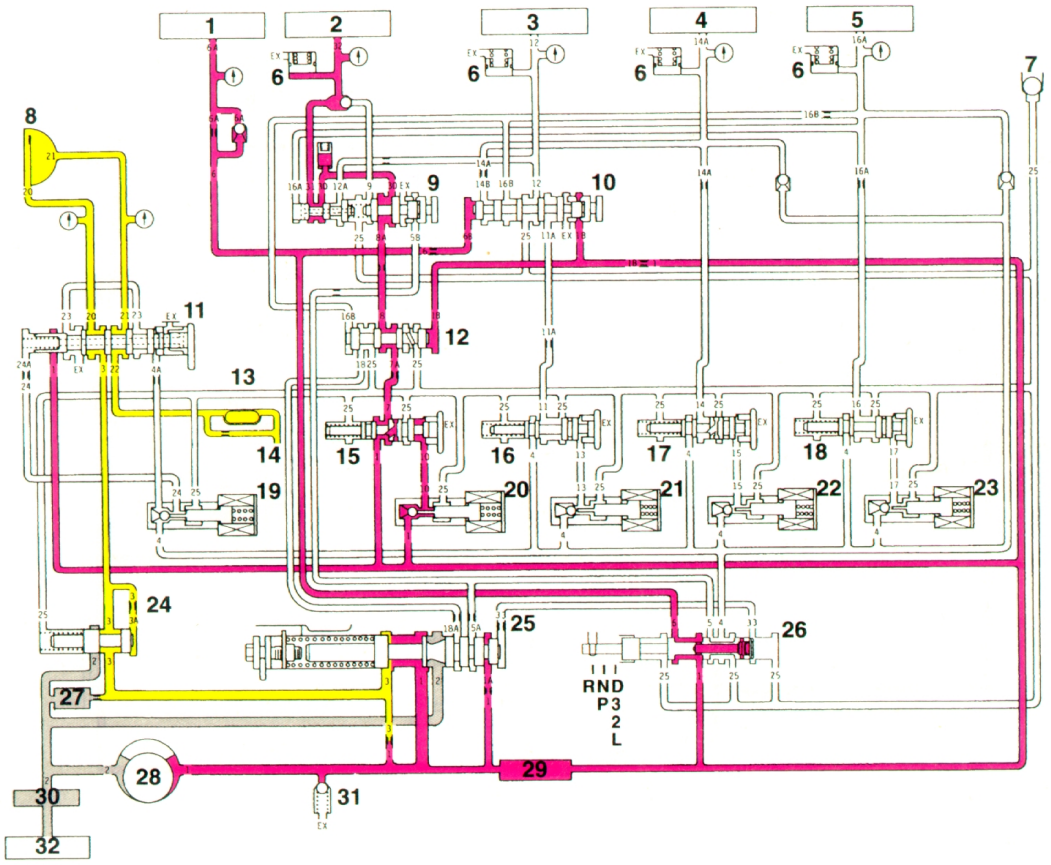


TFA1602

: Line pressure
: Oil pump suction pressure
: Damper clutch pressure
: Torque converter and lubrication pressure
: Damper clutch control solenoid valve pressure

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

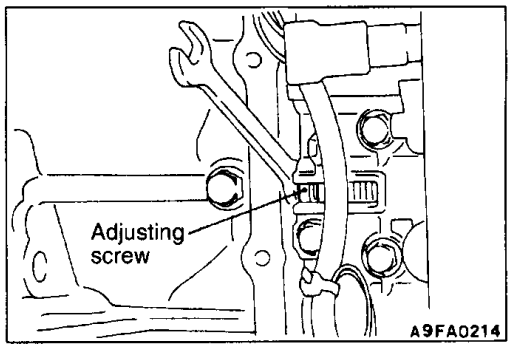
REVERSE



TFA1603

: Line pressure
: Oil pump suction pressure
: Damper clutch pressure
: Torque converter and lubrication pressure
: Damper clutch control solenoid valve pressure

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



LINE PRESSURE ADJUSTMENT 23100170030

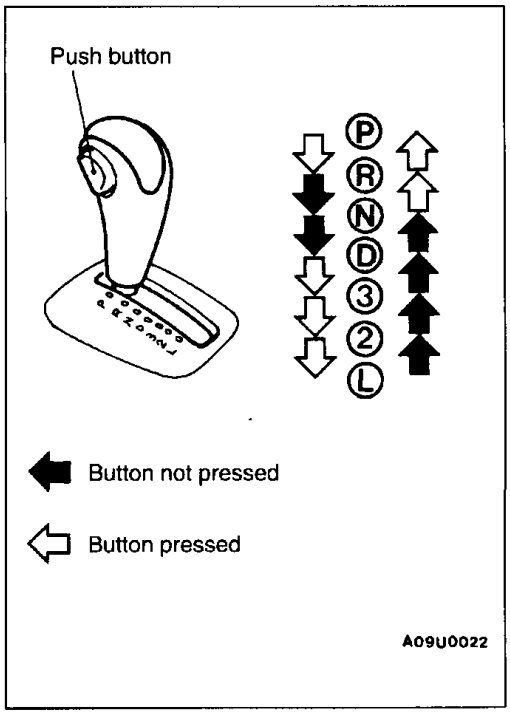
(1) Discharge the automatic transmission fluid, and then remove the valve body cover.
(2) Turn the adjusting screw shown in the illustration at left to adjust the underdrive pressure to the standard value. The pressure increases when the screw is turned to the left.

NOTE
When adjusting the underdrive pressure, adjust to the middle of the standard value range.

Standard value: 1,010–1,050 kPa

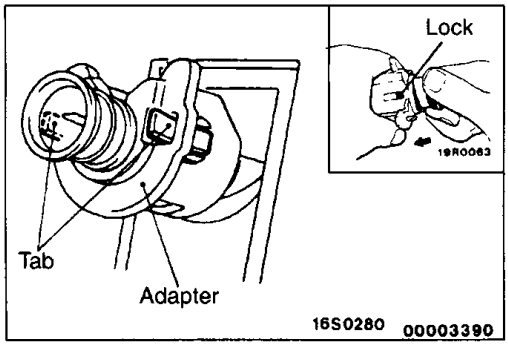
Change in pressure for each turn of the adjusting screw: 35 kPa

(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.23-56.) Readjust the line pressure if necessary.



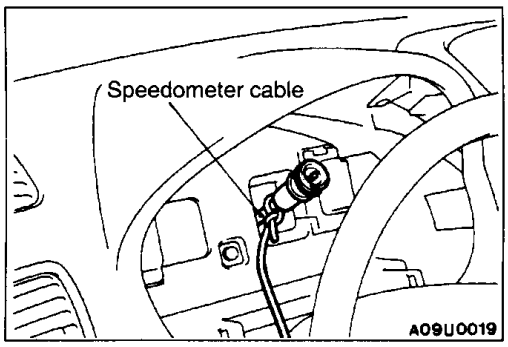
SELECTOR LEVER OPERATION CHECK 23100130038

1. Shift selector lever to each range and check that lever moves smoothly and is controlled. Check that position indicator is correct.
2. Check the selector lever can be moved 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 moved from N or D, and moves backward when moved to R.
4. When the shift lever malfunctions, adjust control cable and selector lever sleeve. Check for worm shift lever assembly sliding parts.

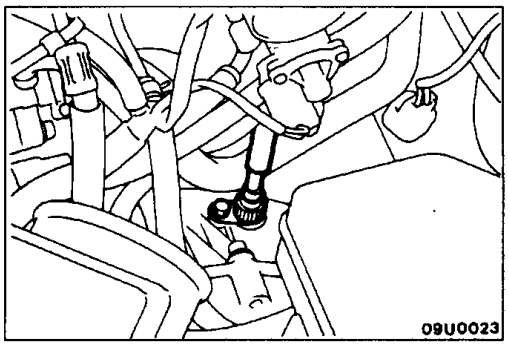


SPEEDOMETER CABLE REPLACEMENT 23100230011

1. Remove the meter bezel and combination meter.
2. Remove the adapter lock.
3. Pull the speedometer cable slightly into the passenger compartment, and remove the rear side of the adapter from the cable.
4. After turning the adapter so that the notched section is aligned with the tab on the cable side, remove the adapter by sliding it backwards.



5. Tie a rope to the end of the speedometer cable that is in the passenger compartment. Then remove the grommet inside the engine compartment, and pull the cable into the engine compartment.
6. Install the new speedometer cable, and install it securely to the adapter.



7. At the transmission end of the speedometer cable, the key joint should be inserted into the transmission, and the nut should be securely tightened.

Caution
If the cable is not correctly and securely connected, it may cause incorrect indication by the speedometer, or abnormal noise. Be sure to connect it correctly.

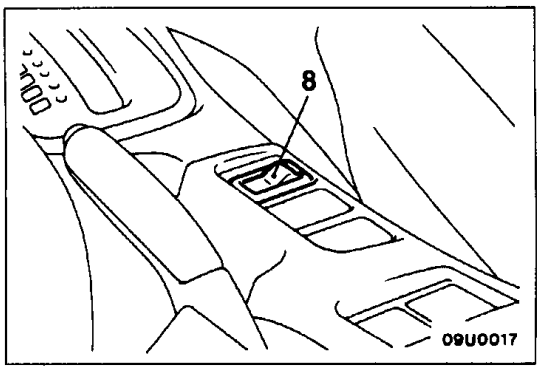
TRANSMISSION CONTROL

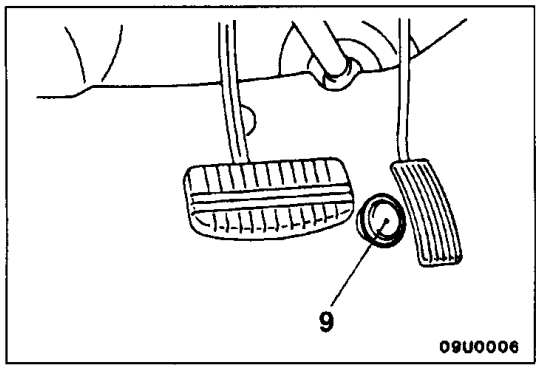
23100660032

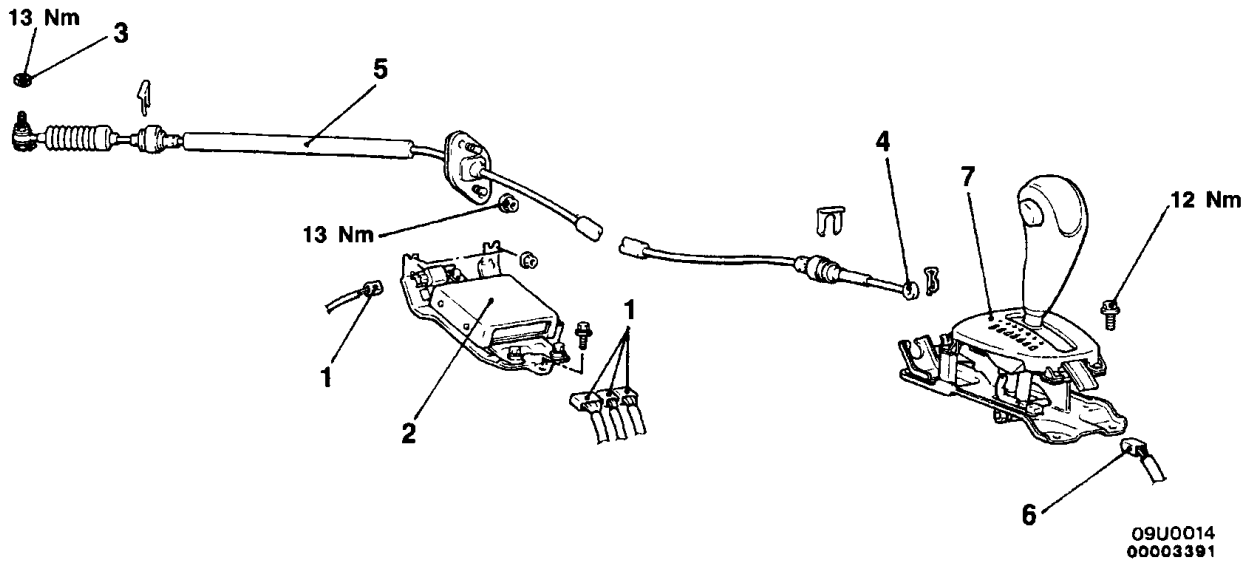
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Floor Console Removal and Installation (Refer to GROUP 52A – Floor Console.)

Caution: SRS
Be careful not to subject the SRS-ECU to any shocks during removal and installation of the floor console, transmission control cable and shift lever assembly.







Transmission control cable assembly removal steps
- Air cleaner assembly
- Battery and battery tray

1. Wiring harness connector
2. A/T-ECU and bracket assembly
3. Nut ▶A◀
4. Transmission control cable connection
5. Transmission control cable

Selector lever assembly removal steps

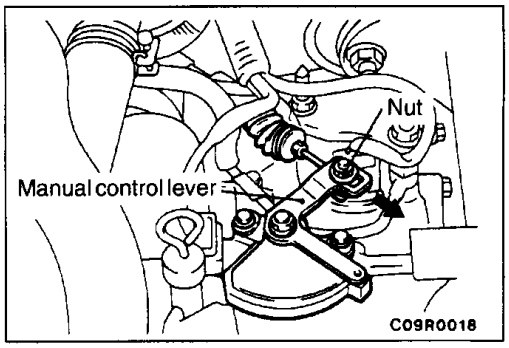
4. Transmission control cable connection
6. Wiring harness connector
7. Selector lever assembly

Mode control switch removal

8. Mode control switch

Wide open throttle switch removal

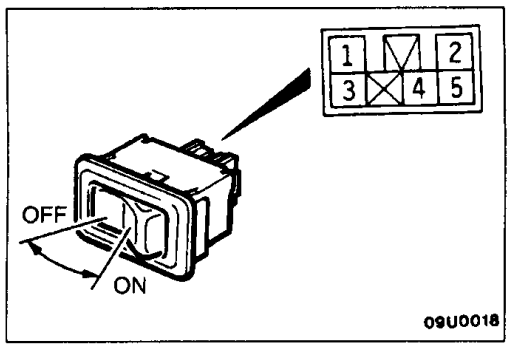
9. Wide open throttle switch



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.

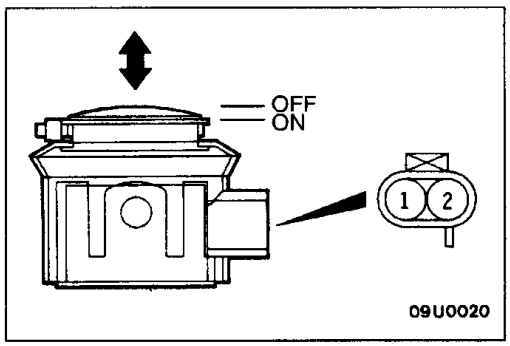


INSPECTION

23100480034

MODE CONTROL SWITCH CHECK

Switch position	Terminal No.					
	2	3	4	1		5
OFF	○	○		○	⌀	○
ON	○		○			



WIDE OPEN THROTTLE SWITCH CHECK

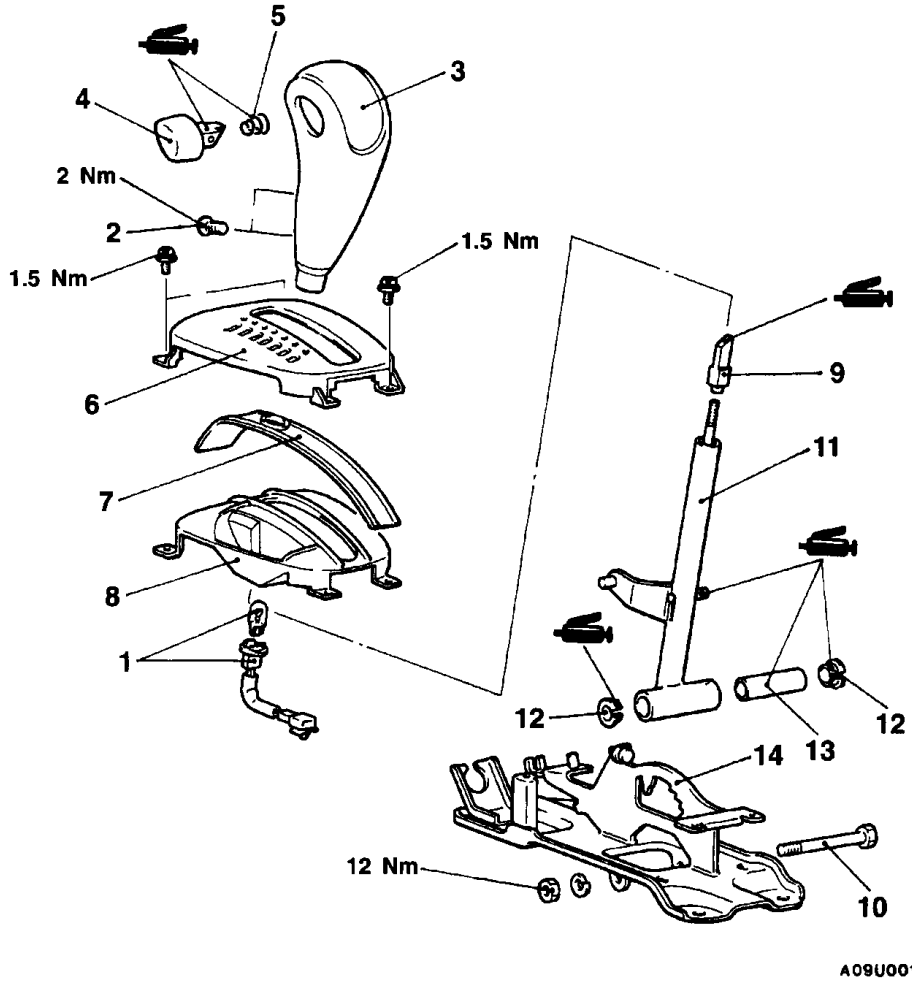
23100890035

Switch position	Terminal No.	
	1	2
OFF		
ON	○	○

SELECTOR LEVER ASSEMBLY

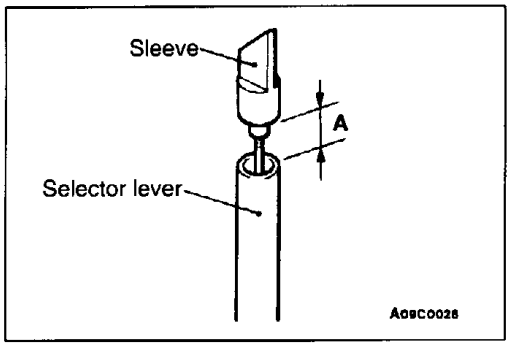
23100680038

DISASSEMBLY AND REASSEMBLY



Disassembly steps

1. Position indicator lamp
2. Screw
3. Selector knob
4. Push button
5. Spring
6. Upper panel
7. Slider
8. Lower panel
▶A◀ 9. Sleeve
10. Bolt
11. Selector lever assembly
12. Bush
13. Pipe
14. Bracket assembly



REASSEMBLY SERVICE POINT

▶A◀ SLEEVE INSTALLATION

Put the selector lever to the "N" position, turn the sleeve and adjust dimension "A" between the sleeve and the end of the lever so it reaches the standard value.

Standard value (A): 21 mm

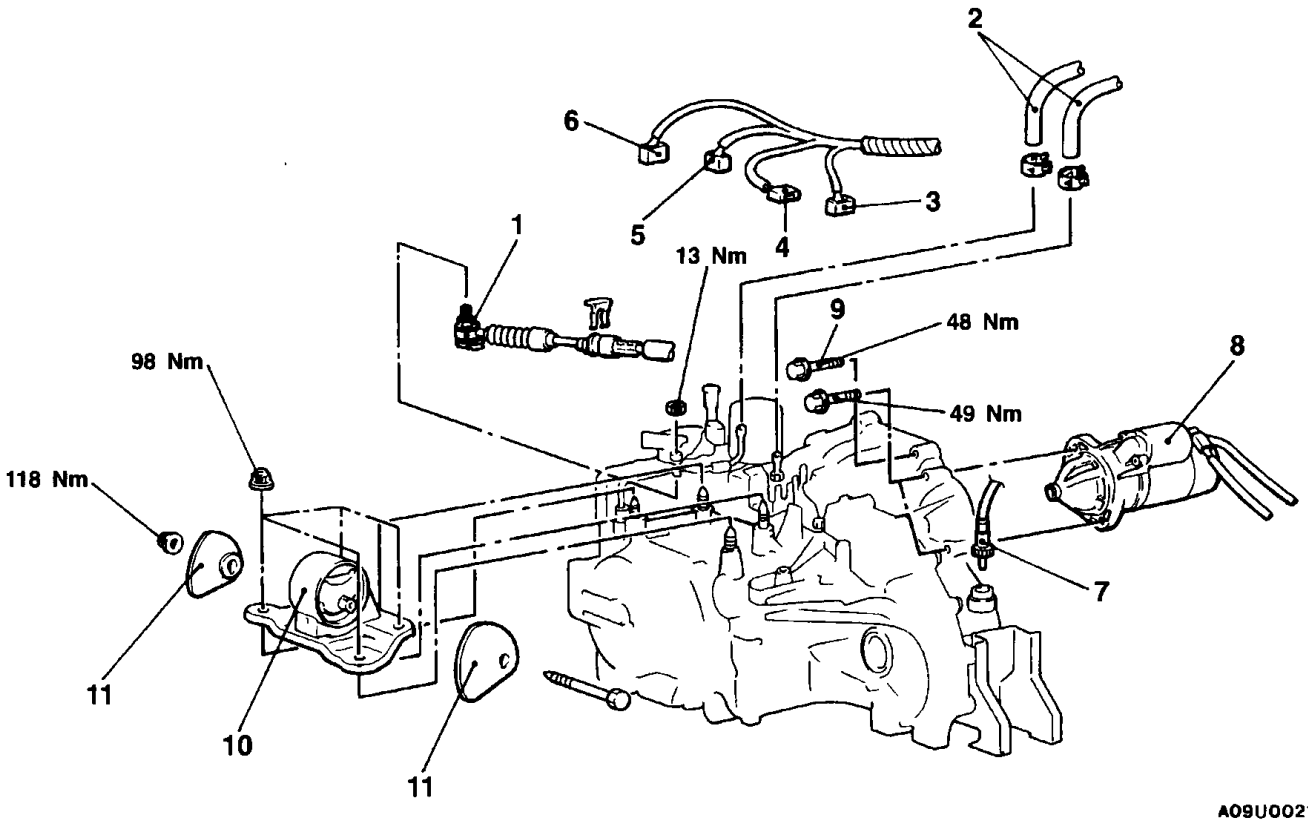
TRANSMISSION ASSEMBLY

23100570038

REMOVAL AND INSTALLATION

Pre-removal Operation
- Transmission Fluid Draining (Refer to P.23-47.)
- Under Cover Removal
- Air Cleaner Assembly Removal
- Battery and Battery Tray Removal
- Canister Removal (Refer to GROUP 17.)

Post-installation Operation
- Transmission Fluid Supplying (Refer to P.23-47.)
- Under Cover Installation
- Canister Installation (Refer to GROUP 17.)
- Battery and Battery Tray Installation
- Air Cleaner Assembly Installation
- Selector Lever Operation Check
- Speedometer operation Check



A09U0021

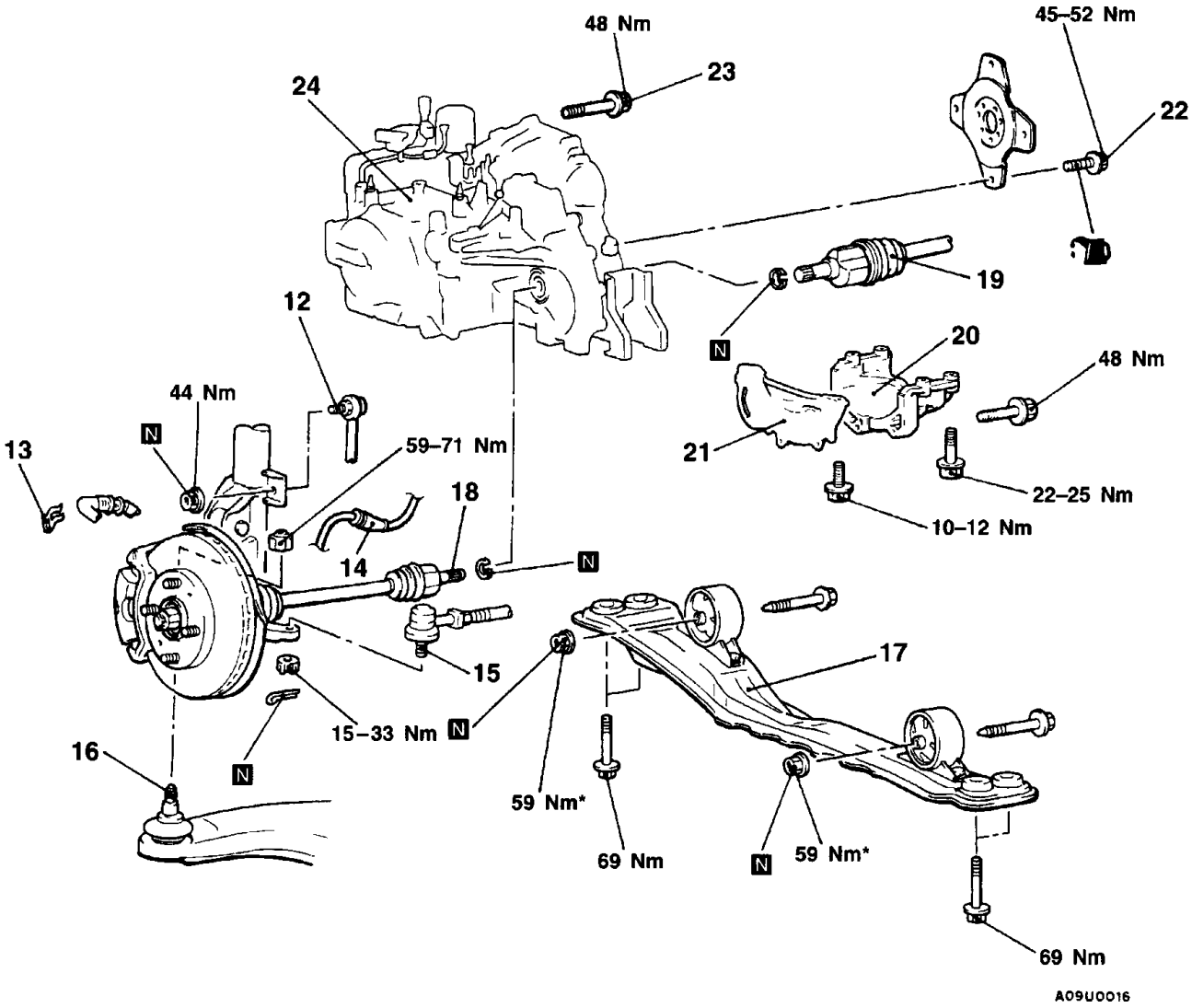
Removal steps
1. Transmission control cable connection
2. Transmission oil cooler hoses connection
3. Pulse generator "A" connector
4. Pulse generator "B" connector
5. Inhibitor switch connector
6. A/T control solenoid valve connector
7. Speedometer cable connection

◀A▶ 8. Starter motor
9. Transmission assembly upper part coupling bolts

◀B▶ 10. Transmission mount bracket

▶C◀ 11. Transmission mount stopper

◀C▶ • Engine assembly supporting



Lifting up of the vehicle

12. Stabilizer link connection
13. Brake hose clamp
14. Speed sensor cable connection <Vehicles with ABS>
◀D▶ 15. Tie rod end connection
◀D▶ 16. Lower arm ball joint connection
17. Centermember assembly
◀E▶ ▶B◀ 18. Drive shaft <L.H.> connection
◀E▶ ▶B◀ 19. Drive shaft <R.H.> connection
20. Transmission stay
21. Bell housing cover
◀F▶ 22. Drive plate bolts
◀F▶ 23. Transmission assembly lower part coupling bolts
◀F▶ ▶A◀ 24. Transmission assembly

Caution

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

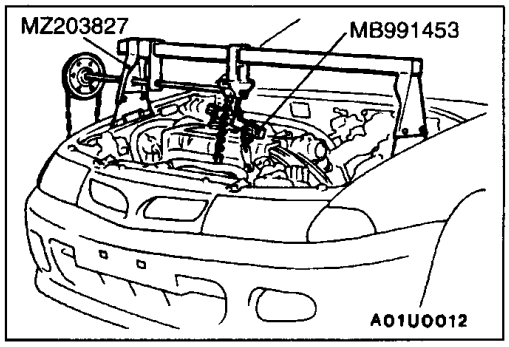
REMOVAL SERVICE POINTS

◀A▶ STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harness still connected, and secure it inside the engine compartment.

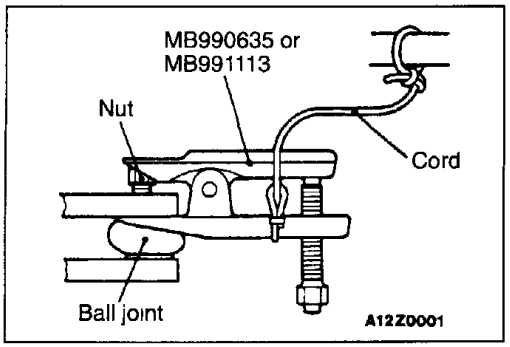
◀B▶ TRANSMISSION MOUNT BRACKET REMOVAL

Jack up the transmission assembly gently with a garage jack, and then remove the transmission mounting.



◀C▶ ENGINE ASSEMBLY SUPPORTING

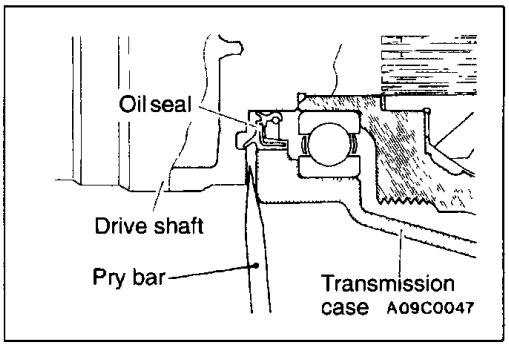
Set the special tool to the vehicle to support the engine assembly.



◀D▶ 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.**

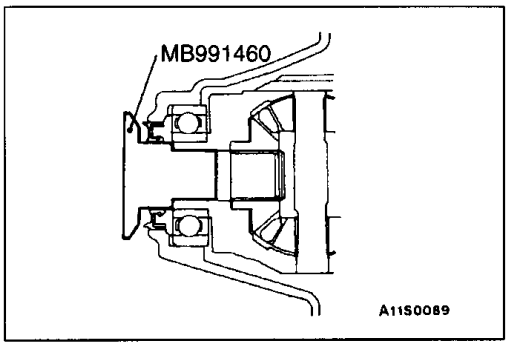


◀E▶ DRIVE SHAFT REMOVAL

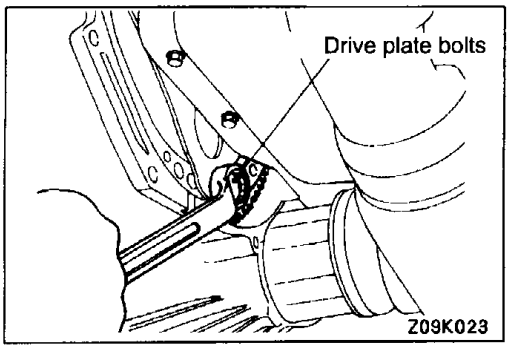
1. Insert a pry bar between the transmission case and the drive shaft, and then pry the drive shaft from the transmission.

   NOTE
   Take out the drive shaft with the hub and knuckle, etc., still attached.

   Caution
   1. Do not pull on the drive shaft; doing so will damage the T.J. assembly; be sure to use the pry bar.
   2. Do not insert the pry bar too deep because this may damage the oil seal.

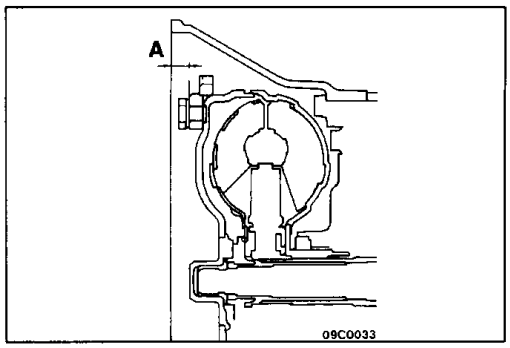


2. Suspend the removed drive shaft with wire so that there are no sharp bends in any of the joints.
3. Use the special tool provided as a cover to prevent the entry of foreign objects into the transmission case.



◀F▶ 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.

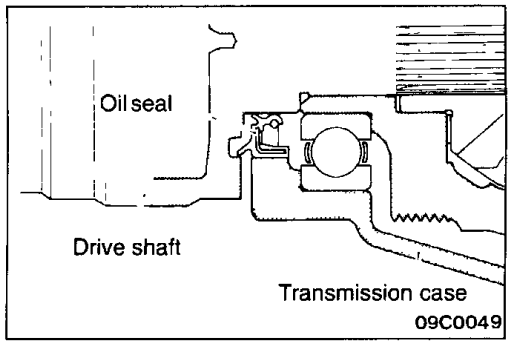


INSTALLATION SERVICE POINTS

▶A◀ TRANSMISSION ASSEMBLY INSTALLATION

After securely inserting the torque converter into the transmission side so that the value shown in the illustration becomes the reference value, install the transmission assembly to the engine.

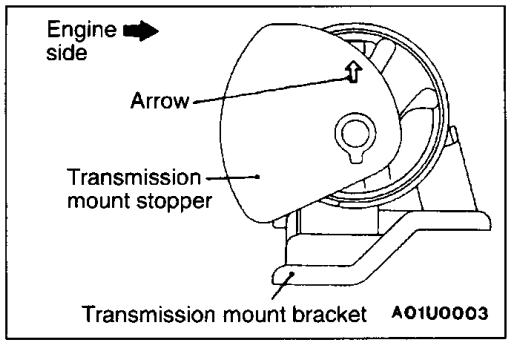
Reference value (A): Approx. 12.2 mm



▶B◀ DRIVE SHAFT INSTALLATION

Provisionally install the drive shaft so that the T.J. case of the drive shaft is straight, and not bent relative to the transmission.

Caution
Care must be taken to ensure that the oil seal lip part of the transmission is not damaged by the serrated part of the drive shaft.



▶C◀ TRANSMISSION MOUNT STOPPER INSTALLATION

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

FRONT AXLE

CONTENTS

26109000034

GENERAL INFORMATION 2

SERVICE SPECIFICATIONS 2

SEALANT 2

SPECIAL TOOLS 3

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- Hub bolt replacement 5

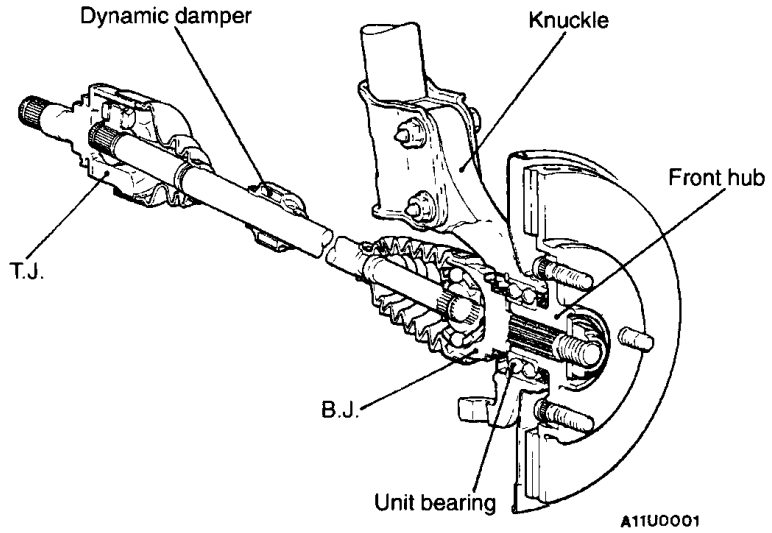
AXLE HUB 6

DRIVE SHAFT 11

GENERAL INFORMATION

26100010036

The wheel bearing and front hub are press-fitted in the axle housing portion of the knuckle to support the drive shaft. In addition, the drive shaft uses B.J. – T.J.-type constant velocity joints to improve power transmission efficiency and to reduce vibration or noise.



SERVICE SPECIFICATIONS

26100030032

Items	Standard value	Limit
Hub axial play mm	–	0.05
Wheel bearing starting torque Nm	–	1.8 or less

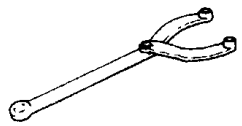
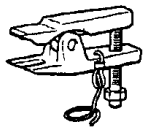
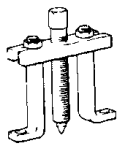
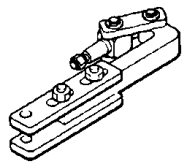
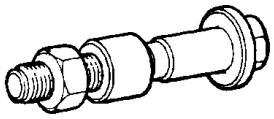
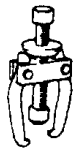
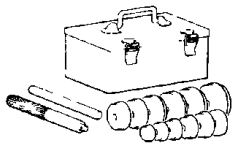
SEALANT

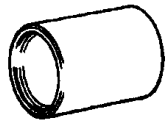
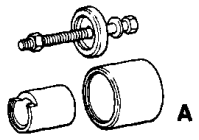
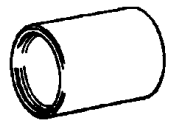
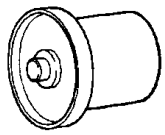
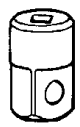
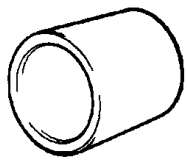
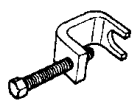
26100050014

Items	Specified sealant	Remarks
Drive shaft lock pin	MITSUBISHI GENUINE PART MD997110 or equivalent	Semi-drying sealant

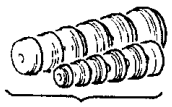
SPECIAL TOOLS

26100060031

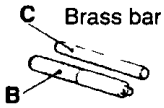
Tool	Number	Name	Use
	MB990767	End yoke holder	Fixing of the hub
	MB991113 or MB990635	Steering linkage puller	• Removal of the lower arm ball joint and knuckle • Removal of the knuckle and tie rod end ball joint
	MB990241	Axle shaft puller	Removal of the drive shaft
	MB991056 or MB991355	Knuckle arm bridge	Removal of the hub
	MB990998	Front hub remover and installer	• Removal of or pressing-in the hub • Provisional holding of the wheel bearing
	MB990810	Side bearing puller	Removal of the wheel bearing inner race (outside)
	MB990925	Bearing and oil seal installer set	Removal of wheel bearing MB990932 MB990938
	MB990883	Rear suspension arbor	Press-fitting of wheel bearing

Tool	Number	Name	Use
	MB990890	Rear suspension bushing base	Press-fitting of wheel bearing Use together with MB990883 <1800>
	MB991045 A: MB991050	Bushing remover and installer	Press-fitting of wheel bearing Use together with MB990883 <1600>
	MB990847	Rear suspension bushing remover and installer base	Press-fitting of the outer oil seal <1800>
	MB990947	Lower arm bushing arbor	
	MB991387	Bushing remover and installer	Press-fitting of the outer oil seal <1600>
	MB990685	Torque wrench	Measurement of the wheel bearing starting torque
	MB990326	Preload socket	Measurement of the wheel bearing starting torque
	MB991389	Bushing remover base	Press-fitting of the inner oil seal <1600>
	MB991618	Hub bolt remover	Removal of the hub bolt

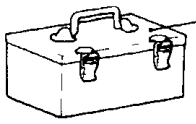
MB990925



A
Installer adapter

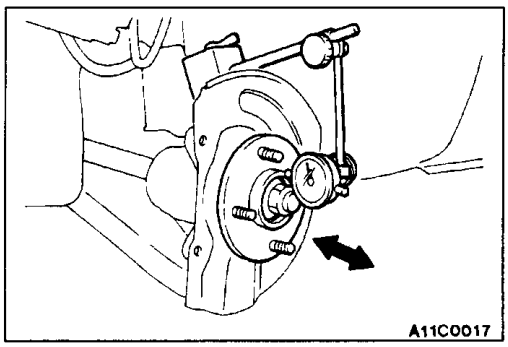


Bar (snap-in type)



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	–



A11C0017

ON-VEHICLE SERVICE

26100090030

HUB AXIAL PLAY CHECK

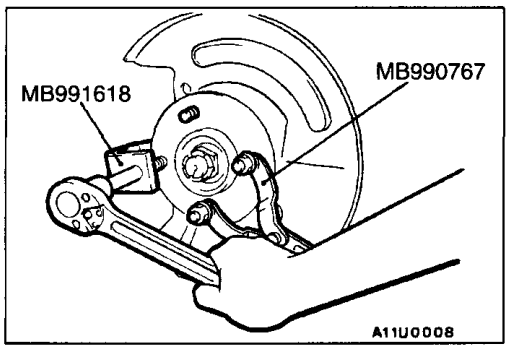
1. Remove the disc brake caliper and suspend it with a wire.
2. Remove the brake disc from the front hub.
3. Attach a dial gauge as shown in the illustration, and then measure the axial play while moving the hub in the axial direction.

   Limit: 0.05 mm
4. If axial play exceeds the limit, disassemble and check parts.

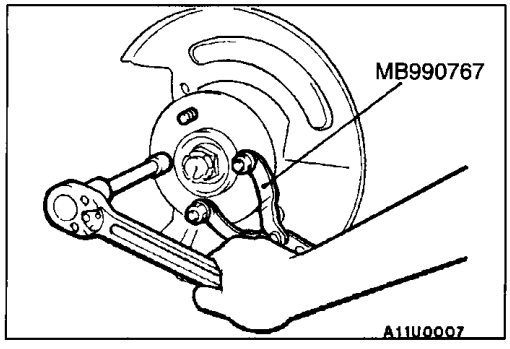
HUB BOLT REPLACEMENT

26100100023

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



A11U0008



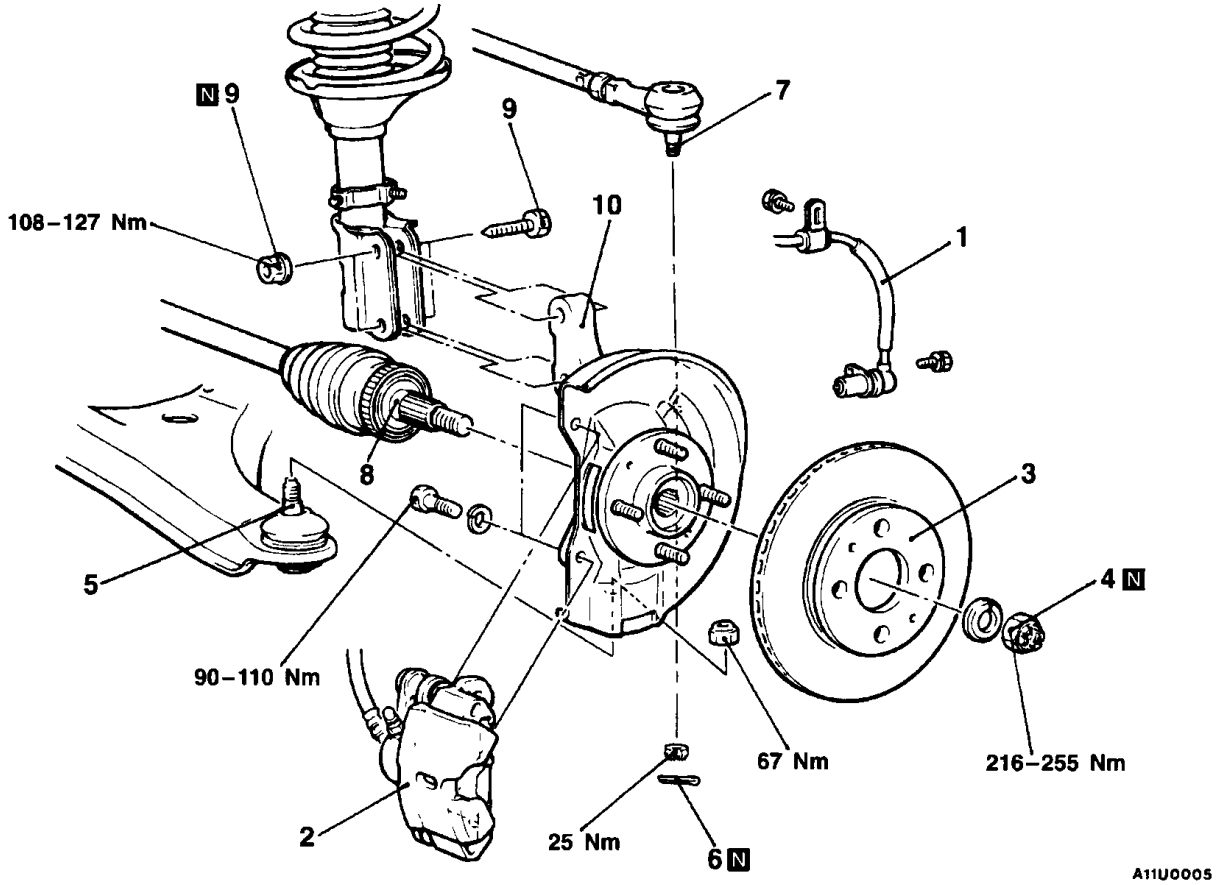
A11U0007

4. Use the wheel nuts to securely install the new hub bolts, while being careful of the serrations of the hub bolts and hub.

AXLE HUB

26100170031

REMOVAL AND INSTALLATION



Removal steps

1. Front speed sensor <Vehicles with ABS>
◀A▶ 2. Caliper assembly
3. Brake disc
◀B▶ ▶A◀ 4. Drive shaft nut
◀C▶ 5. Connection for lower arm ball joint
6. Split pin
◀C▶ 7. Connection for tie rod end
8. Drive shaft
9. Front strut mounting bolt and nut
10. Hub and knuckle

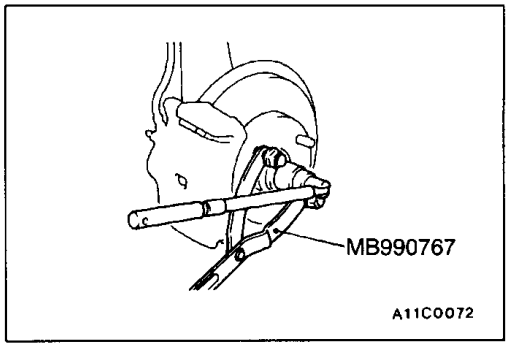
Caution

1. **Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.**
2. **For vehicles with ABS, be careful not to damage the rotors installed to the R.J. (or B.J.) outer race during removal and installation of the drive shaft.**

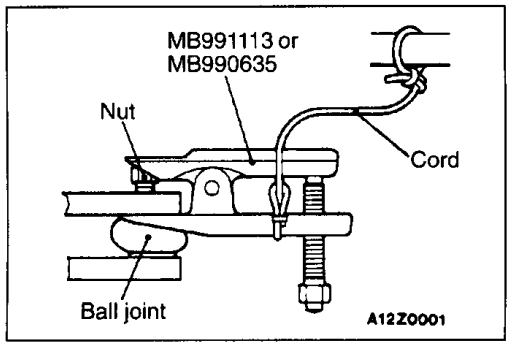
REMOVAL SERVICE POINTS

◀A▶ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire, etc.

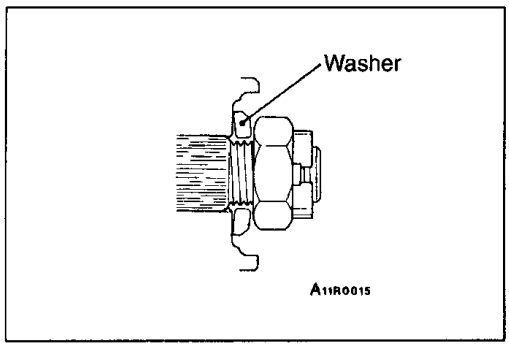


◀B▶ DRIVE SHAFT NUB REMOVAL



◀C▶ LOWER ARM BALL JOINT/TIE ROD END DISCONNECTION

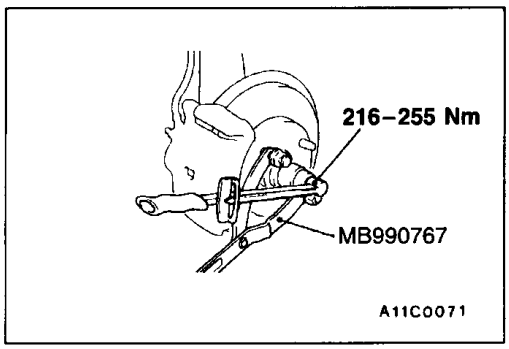
Caution
1. **Loosen the nut only; do not remove it from the ball joint.**
2. **The special tool should be suspended by a cord to prevent it from coming off.**



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.

Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

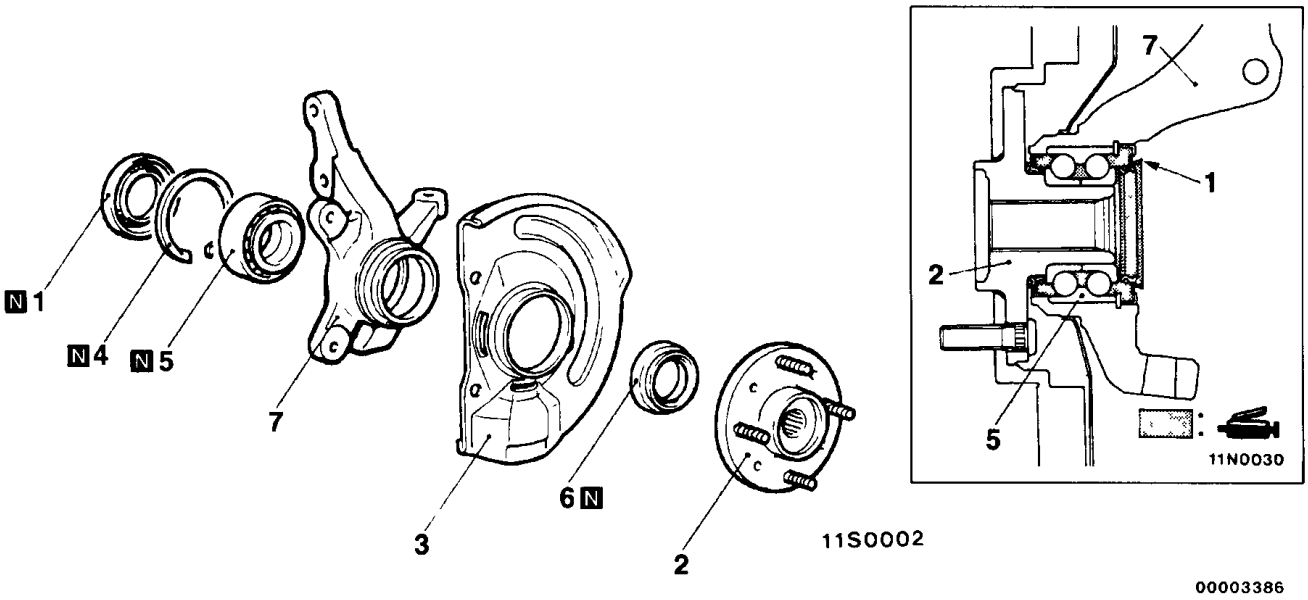
INSPECTION 26100180034

- Check the hub for cracks and spline for wear.
- Check the oil seal for damage.
- Check the knuckle for cracks.
- Check for defective bearing.

NOTE
If the meshing of the wheel bearing outer race and the knuckle, or of the wheel bearing inner race and the hub, is loose, replace the bearing or damaged parts.

DISASSEMBLY AND REASSEMBLY

26100190013

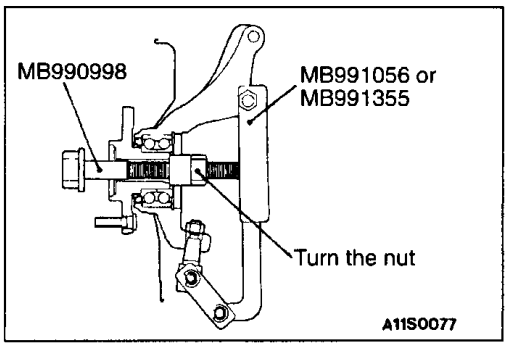


Disassembly steps

1. Inner oil seal
◀A▶ 2. Hub
3. Dust cover
4. Snap ring
◀B▶ 5. Wheel bearing
6. Outer oil seal
7. Knuckle

Reassembly steps

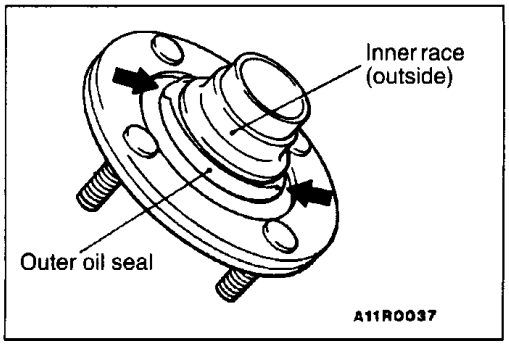
7. Knuckle
▶A◀ 5. Wheel bearing
4. Snap ring
▶B◀ 6. Outer oil seal
3. Dust cover
2. Hub
▶C◀ • Wheel bearing starting torque check
▶D◀ • Hub axial play check
▶E◀ 1. Inner oil seal



DISASSEMBLY SERVICE POINTS

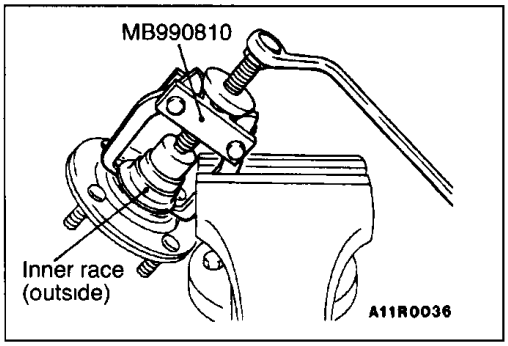
◀A▶ HUB REMOVAL

Caution
When removing the hub, always replace the wheel bearing with a new part.



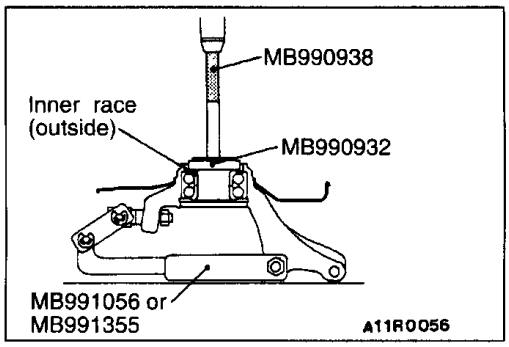
◀B▶ WHEEL BEARING REMOVAL

(1) Crush the oil seal in two places so that the tabs of the special tool will be caught on the wheel bearing inner race (outside).

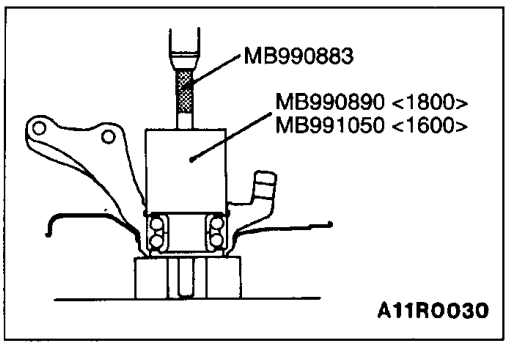


(2) Remove the wheel bearing inner race (outside) from the front hub by using the special tool.

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



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

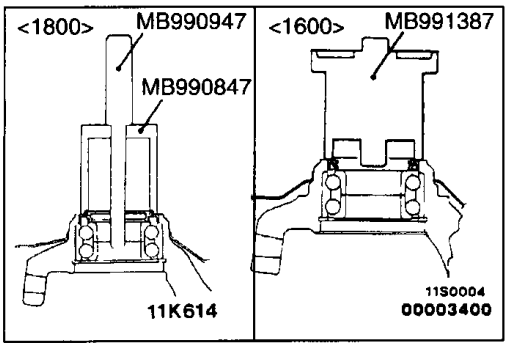


REASSEMBLY SERVICE POINTS

▶A◀ WHEEL BEARING INSTALLATION

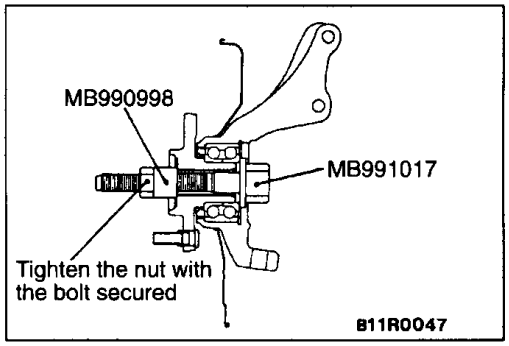
(1) Fill the wheel bearing with multipurpose grease.
(2) Apply a thin coating of multipurpose grease to the knuckle and bearing contact surfaces.
(3) Press-in the bearing by using the special tools.

Caution
Press the outer race when pressing-in the wheel bearing.



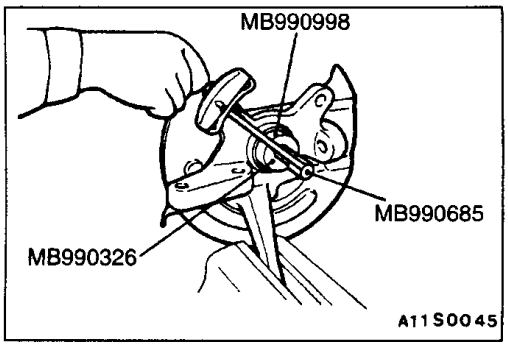
▶B◀ OUTER OIL SEAL INSTALLATION

(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◀ WHEEL BEARING STARTING TORQUE CHECK

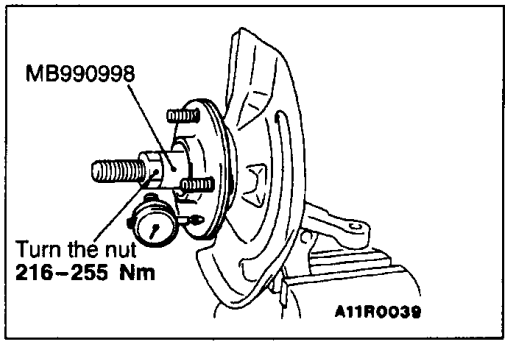
(1) Use the special tool to mount the hub onto the knuckle.
(2) Tighten the nut of the special tool to 216–255 Nm.
(3) Rotate the hub in order to seat the bearing.



(4) Measure the wheel bearing starting torque (hub starting torque) by using the special tools.

Limit: 1.8 Nm or less

(5) The starting torque must be within the limit and, in addition, the bearing must not feel rough when rotated.

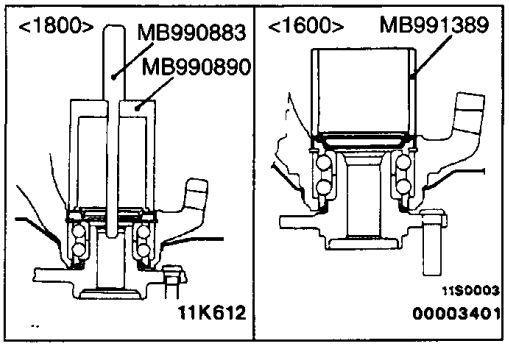


▶D◀ HUB AXIAL PLAY CHECK

(1) Measure to determine whether the axial play of the hub is within the specified limit or not.

Limit: 0.05 mm

(2) If the starting torque and hub axial play are not within the limit range while the nut is tightened to 216–255 Nm, the bearing, hub and/or knuckle have probably not been installed correctly. Replace the bearing and re-install.



▶E◀ INNER OIL SEAL INSTALLATION

(1) Apply multipurpose grease to the reverse side of the inner oil seal.
(2) Drive the inner oil seal into the knuckle until it contacts the snap ring.
(3) Apply multipurpose grease to the lip of the inner oil seal.

INSPECTION

26100200013

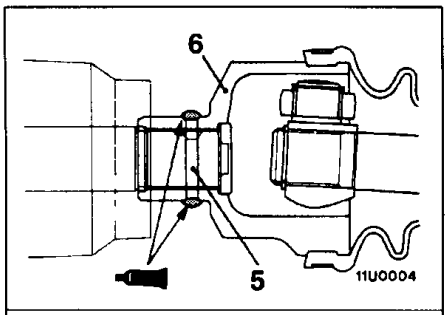
- Check the front hub and brake disc mounting surfaces for galling and contamination.
- Check the knuckle inner surface for galling and cracks.
- Check for defective bearing.

DRIVE SHAFT

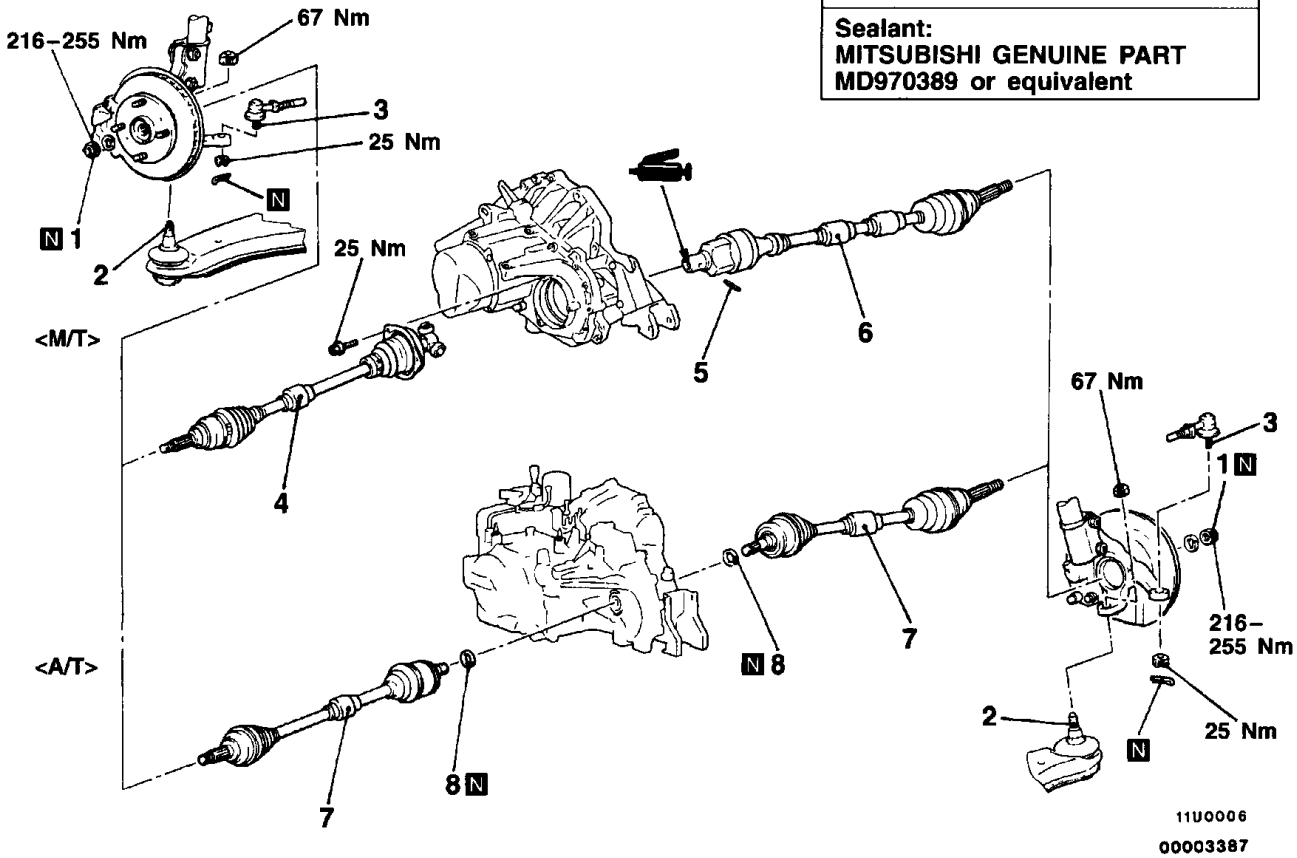
26100350046

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Brake hose Clamp, Speed Sensor Cable Connection <Vehicles with ABS>, Stabilizer Link Connection Removal and Installation.
  (Refer to GROUP 33A-Start Assembly.)



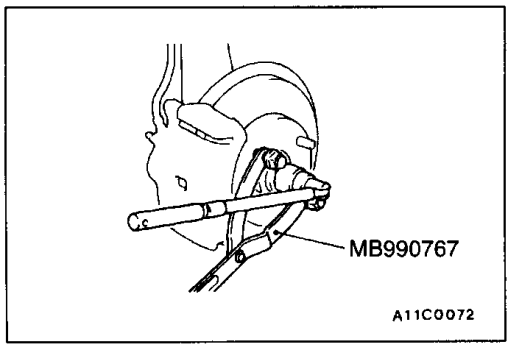
Sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent



Removal steps

◀A▶ ▶B◀ 1. Drive shaft nut
◀B▶ 2. Lower arm ball joint connection
◀B▶ 3. Tie rod end connection
◀C▶ 4. Drive shaft L.H. <M/T>
▶A◀ 5. Spring pin <M/T>
◀C▶ ▶A◀ 6. Drive shaft R.H. <M/T>
◀C▶ 7. Drive shaft <A/T>
8. Circlip <A/T>

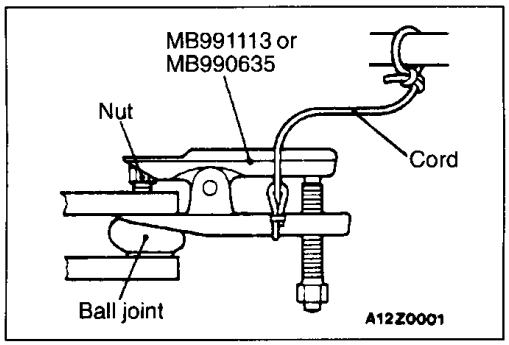
Caution
For vehicles with ABS, be careful not to damage the rotors installed to the B.J. outer race during removal and installation of the drive shaft.



REMOVAL SERVICE POINTS

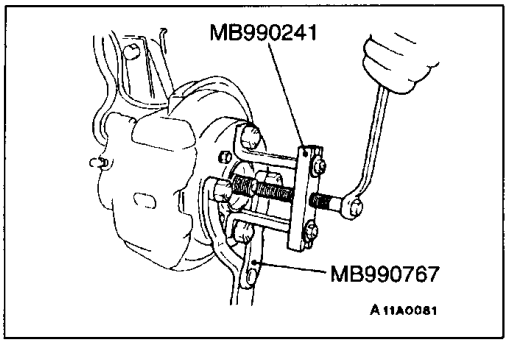
◀A▶ DRIVE SHAFT NUT REMOVAL

Caution
Do not apply the vehicle weight to the wheel bearing while loosening the drive shaft nut.



◀B▶ LOWER ARM BALL JOINT/TIE ROD END DISCONNECTION

Caution
1. **Loosen the nut only; do not remove it from the ball joint.**
2. **The special tool should be suspended by a cord to prevent it from coming off.**

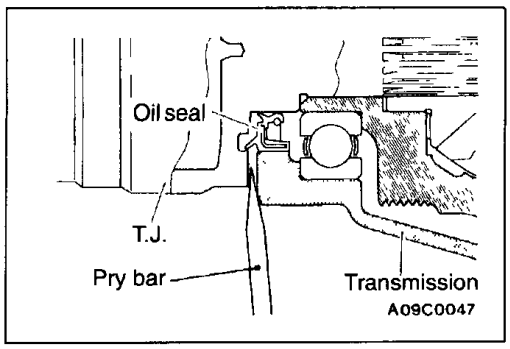


◀C▶ DRIVE SHAFT REMOVAL

(1) Use the special tools to push out the drive shaft from the hub.
(2) Remove the drive shaft by the following procedures.

<M/T>

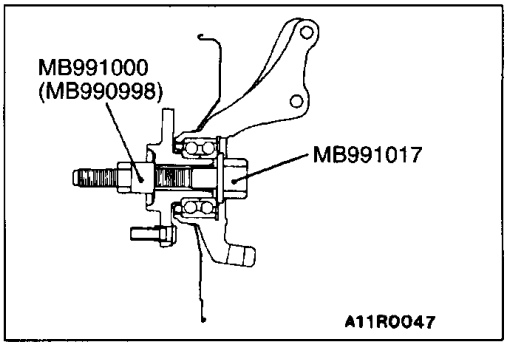
- Remove the bolt (L.H.) and the spring pin (R.H.) and pull out the drive shaft from the transmission.



<A/T>

- 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.**



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

INSTALLATION SERVICE POINTS

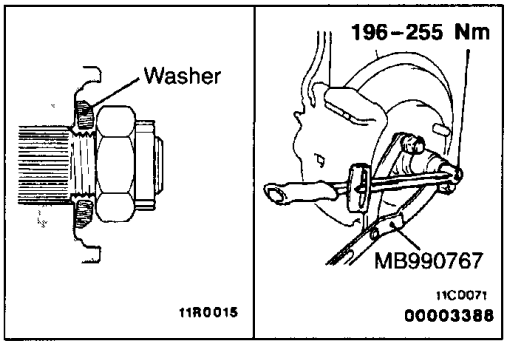
▶A◀ DRIVE SHAFT R.H./SPRING PIN INSTALLATION

(1) Install the drive shaft to the hub and the transmission. When installing the drive shaft to the transmission, apply multipurpose grease to the transmission-side spline and make sure that the spring pin hole at the end of the drive shaft is aligned with the spring pin hole at the end of the shaft at the transmission side. If the spring pin hole is slightly off-line, turn the drive shaft 180° and then install it again.

NOTE
Because there are an odd number of splines on the drive shaft, the pin hole will be off-line by half the width of the hole if the drive shaft is turned 180°.

(2) Apply specified sealant to the spring pin and then insert it into the drive shaft. After inserting the pin, apply sealant to both ends of the pin hole to fully seal the hole.

Specified sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent



▶B◀ 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.

Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

REAR AXLE

CONTENTS

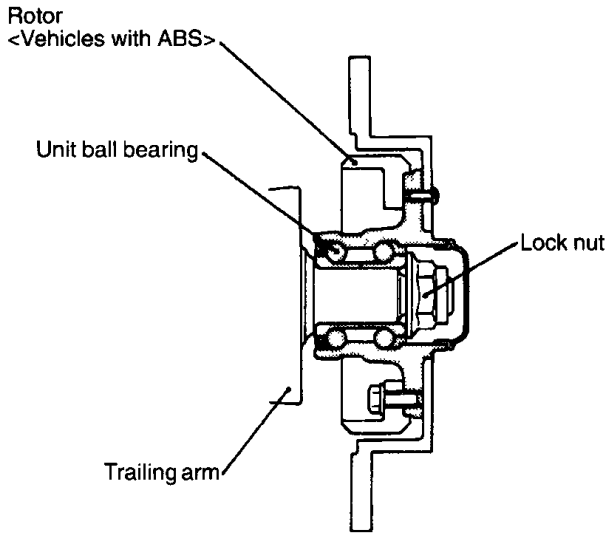
27109000031

GENERAL INFORMATION 2
SERVICE SPECIFICATIONS 2
ON-VEHICLE SERVICE 3
Wheel Bearing Axial Play Check 3
Rear Hub Rotary-Sliding Resistance Check 3
REAR AXLE HUB 4

GENERAL INFORMATION

27100010040

The wheel bearing adopted is a unit ball bearing (double-row angular contact ball bearing), which uses the inside surface of the rear hub as the bearing outer race to reduce weight and size.
This bearing has excellent service efficiency since it is so constructed that appropriate bearing preload is available just by tightening the lock nut to the specified torque.
On vehicles with ABS, the rotor for detecting the wheel speed is installed on the rear hub.

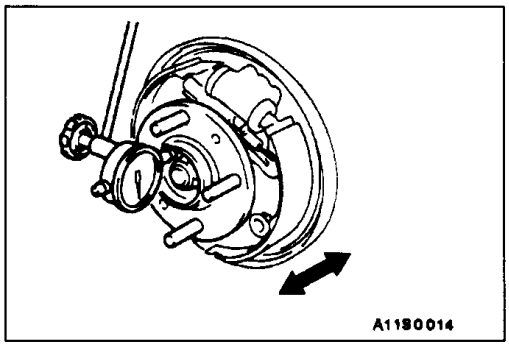


A11S0058

SERVICE SPECIFICATIONS

27100030046

Items	Standard value	Limit
Clearance of the rear speed sensor's pole piece and rotor <Vehicles with ABS> mm	0.3–0.9	–
Wheel bearing axial play mm	–	0.05
Wheel bearing rotary-sliding resistance N	–	19 or less

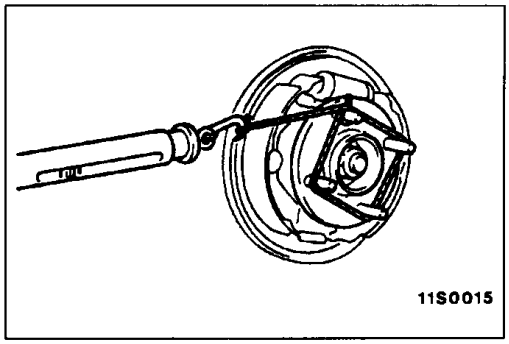


ON-VEHICLE SERVICE 27100090020

WHEEL BEARING AXIAL PLAY CHECK

1. Remove the hub cap and then release the parking brake.
2. Remove the brake drum.
3. For vehicles with rear disc brake, remove the caliper assembly and the brake disc.
4. Check the bearing's 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
5. If the axial play exceeds the limit, the flange nut should be tightened to the specified torque (180 Nm) and check the axial play again.
6. Replace the rear hub assembly if an adjustment cannot be made to within the limit.



REAR HUB ROTARY-SLIDING RESISTANCE CHECK 27100110030

1. Release the parking brake.
2. Remove the brake drum.
3. For vehicles with rear disc brake, remove the caliper assembly and the brake disc.
4. After turning the hub a few times to seat the bearing, wind a rope 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: 19 N or less
5. If the limit value is exceeded, loosen the flange nut and then tighten it to the specified torque (180 Nm) and check the rear hub rotary sliding resistance again.
6. Replace the rear hub assembly if an adjustment cannot be made to within the limit.

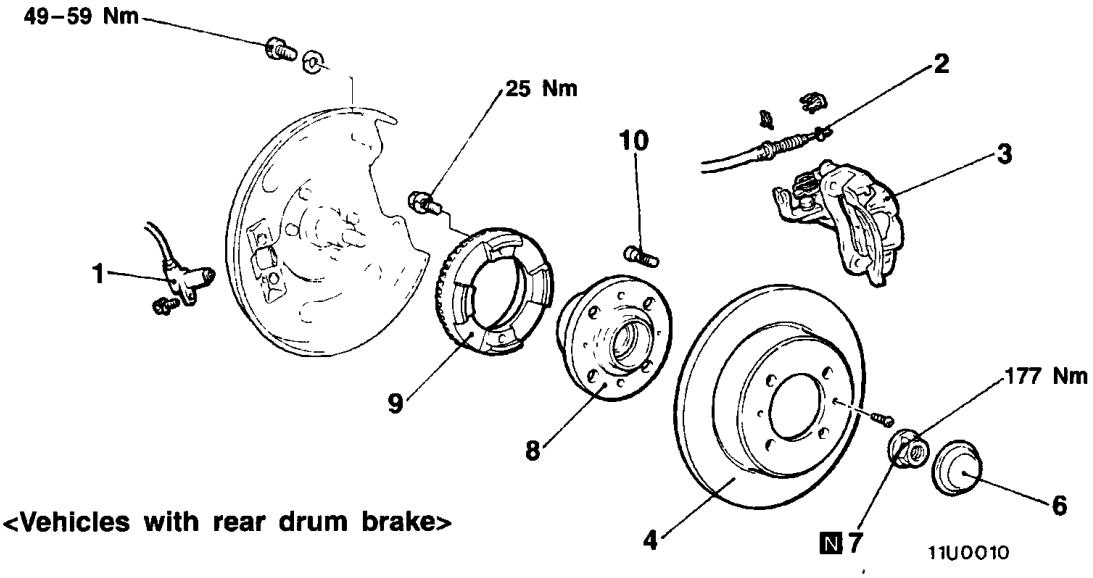
REAR AXLE HUB

27100200041

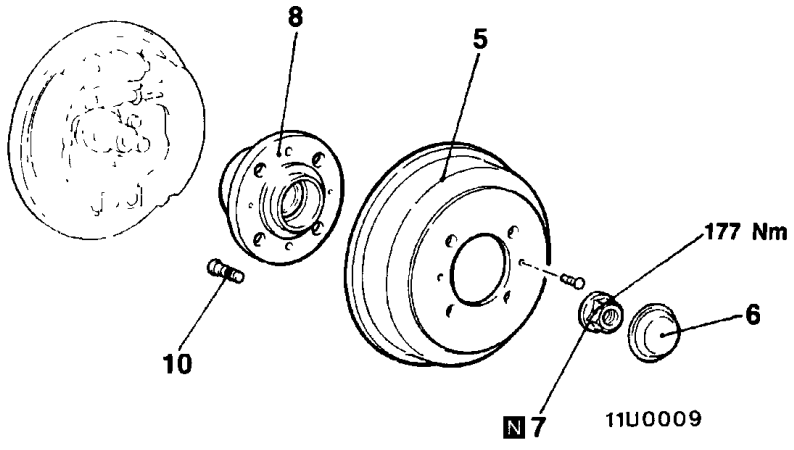
REMOVAL AND INSTALLATION

Post-installation Operation
- Adjustment of Parking Brake
  <Vehicles with rear disc brake>
  (Refer to GROUP 36 – On-vehicle Service.)

<Vehicles with rear disc brake>



<Vehicles with rear drum brake>



00003288

Removal steps

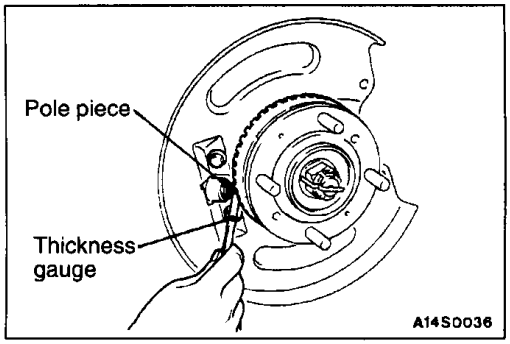
▶A◀ 1. Rear speed sensor <Vehicles with ABS>
2. Parking brake cable connection
◀A▶ 3. Caliper assembly
4. Brake disc
5. Brake drum
6. Hub cap
7. Flange nut
8. Rear hub assembly
9. Rotor <Vehicles with ABS>
10. Hub bolt

Caution
The rear hub unit bearing should not be dismantled. Care must be taken not to scratch or otherwise damage the teeth of the rotor. The rotor must never be dropped. If the teeth of the rotor are chipped, resulting in a deformation of the rotor, it will not be able to accurately detect the wheel rotation speed, and the system will not function normally.
Replace rear hub assembly with new one, if bearing inner-ring comes out.

REMOVAL SERVICE POINT

◀A▶ CALIPER ASSEMBLY REMOVAL

Remove the caliper assembly and suspend it.



INSTALLATION SERVICE POINT

▶A◀ REAR SPEED SENSOR INSTALLATION <VEHICLES WITH ABS>

(1) Provisionally install the speed sensor to the sensor bracket.

(2) With the caliper assembly and brake disc removed, insert a thickness gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor bracket at the position where the clearance at all places is within the standard value.

Standard value: 0.3–0.9 mm

INSPECTION

27100210075

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

WHEEL AND TYRE

CONTENTS

31109000038

GENERAL INFORMATION 2
SERVICE SPECIFICATIONS 2
TROUBLESHOOTING 3
ON-VEHICLE SERVICE 4
Tyre Inflation Pressure Check 4
Tyre Wear Check 4
Wheel Runout Check 4
WHEEL AND TYRE 4

GENERAL INFORMATION

31100010030

Both steel type and aluminium type wheels have been adopted. The type of wheel used depends on the vehicle model.

A compact spare tyre has been adopted as the spare tyre in some models.

Items		1600	1800	1800	1800
			GLX	GLS	MSX
Wheel	Type	Steel type	Steel type	Steel type Aluminium type*	Aluminium type
	Size	14 × 5.5J	14 × 5.5J	14 × 5.5J	14 × 5.5J 15 × 6.0J*
	Amount of wheel offset mm	44	44	44	44
	Pitch circle diameter (P.C.D.) mm	100.0	114.3	114.3	114.3
Tyre	Size	175/65R14 82T 175/70R14 84T*	185/65R14 86H	185/65R14 86H 195/60R14 86V*	195/60R14 86V 205/50R15 86V*
Spare wheel	Type	Steel type	Steel type	Steel type Aluminium type*	Steel type Aluminium type*
	Size	14×4.0T 15×4.0T*1 14×5.5J*2	15×4.0T 14×5.5J*2	15×4.0T 14×5.5*2	15×4.0T 15×6.0J*2
	Amount of wheel offset mm	46	46	46	46
	Pitch circle diameter (P.C.D.) mm	100.0	114.3	114.3	114.3
Spare tyre	Size	T105/70D14 (High pressure) 175/65R14 82T*2 T125/70D15*1 (High pressure)	T125/70D15 (High pressure) 185/65R14 86H*2	T125/70D15 (High pressure) 185/65R14 86H*2 195/60R14 86V*2	T125/70D15 (High pressure) 195/60R14 86V*2 205/50R15 86V*2

NOTE
*1: Vehicles for France
*2: Optional items

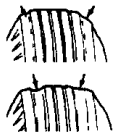
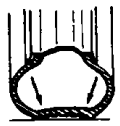
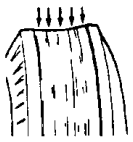
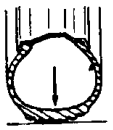
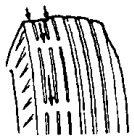
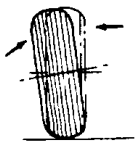
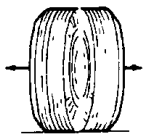
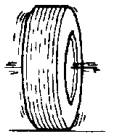
SERVICE SPECIFICATIONS

31100030036

Items		Limit
Tread depth of tyre mm		1.6
Wheel runout (Radial runout) mm	Steel wheel	1.2 or less
	Aluminium wheel	1.0 or less
Wheel runout (Lateral runout) mm	Steel wheel	1.2 or less
	Aluminium wheel	1.0 or less

TROUBLESHOOTING

31100070038

Symptom		Probable cause		Remedy	Reference page
Rapid wear at shoulders	 11X0109	Under-inflation or lack of rotation	 11X0116	Adjust the tyre pressure.	31-5.
Rapid wear at centre	 11X0110	Over-inflation or lack of rotation	 11X0117		
Cracked treads	11X0111	Under-inflation		Adjust the tyre pressure.	31-5.
Wear on one side	 11X0112	Excessive camber	 11X0118	Inspect the camber.	Refer to GROUP 33A – On-vehicle Service.
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 and inspect the front suspension alignment.	Refer to GROUP 33A – On-vehicle Service.

ON-VEHICLE SERVICE 31100090034

TYRE INFLATION PRESSURE CHECK

Check the inflation pressure of the tyres. If it is not within the standard value, make the necessary adjustment.

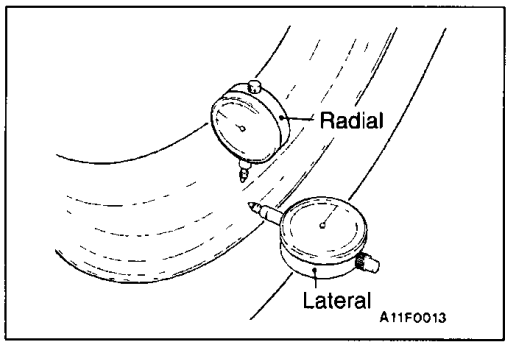
TYRE WEAR CHECK 31100100034

Measure the tread depth of tyres.

Limit: 1.6 mm

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

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



WHEEL RUNOUT CHECK 31100110037

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

Limit:

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

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TYRE 31100130033

INSTALLATION SERVICE POINT

Tighten the wheel nut to the specified torque.

Tightening torque: 98–117 Nm

POWER PLANT MOUNT

CONTENTS

32109000035

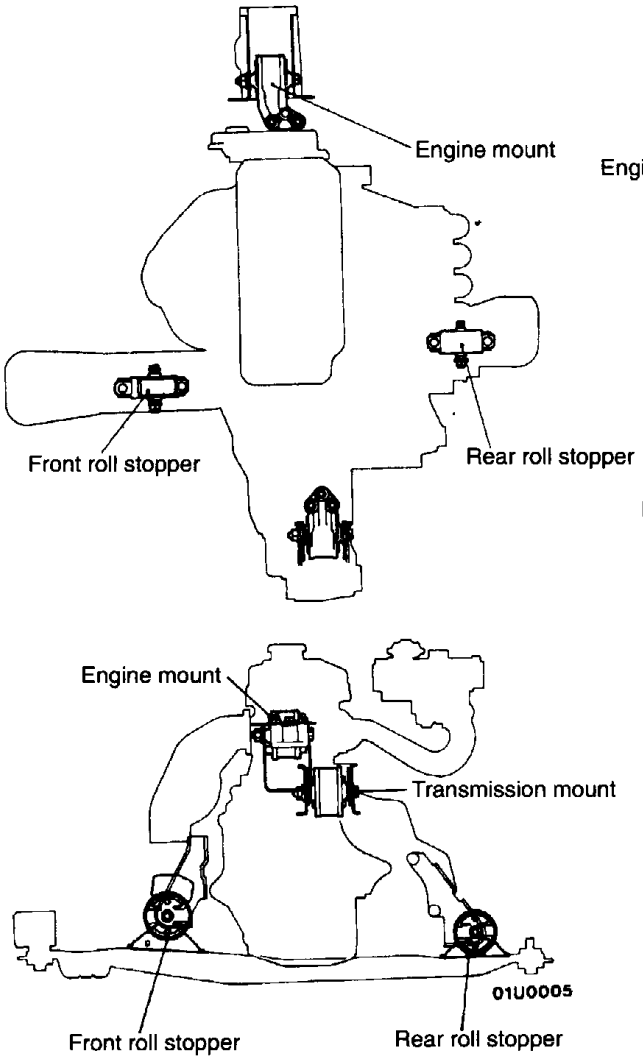
GENERAL INFORMATION 2
SPECIAL TOOLS 3
ENGINE MOUNTING 3
TRANSMISSION MOUNTING 4
ENGINE ROLL STOPPER, CENTERMEMBER 5
CROSSMEMBER 7

GENERAL INFORMATION

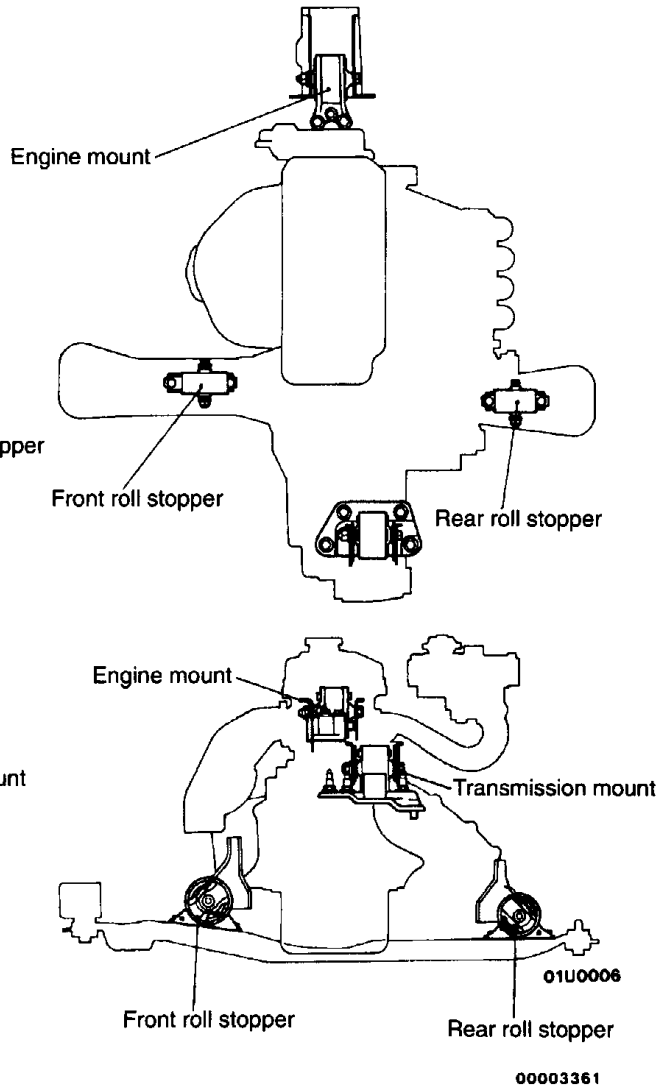
32100010037

The engine-transmission mount is of an inertial axis supporting type whose excellent features have already been proven in many Mitsubishi vehicles. The inertial axis supporting type mount supports the front upper part of the engine at the front and the rear upper part of the transmission at the rear. This arrangement effectively supresses the engine vibration.

<M/T>



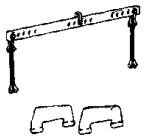
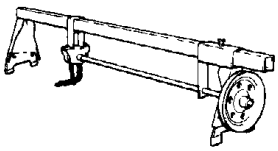
<A/T>



00003361

SPECIAL TOOLS

32100060032

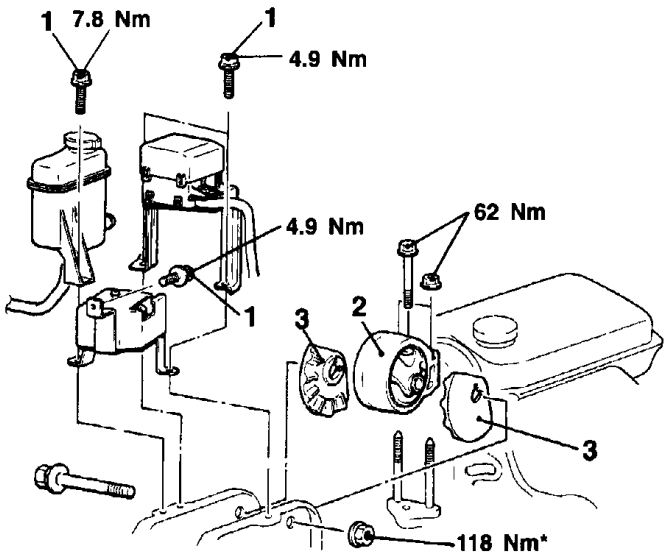
Tool	Number	Name	Use
	MB991453	Engine hanger	To support the engine assembly during removal and installation of the centermember
	GENERAL SERVICE TOOL MZ203827	Engine lifter	

ENGINE MOUNTING

32100110034

REMOVAL AND INSTALLATION

Pre-removal Operation
- Jack Up the Engine and Transmission Assembly Until There is no Weight on the Engine Mount Bracket Insulator.

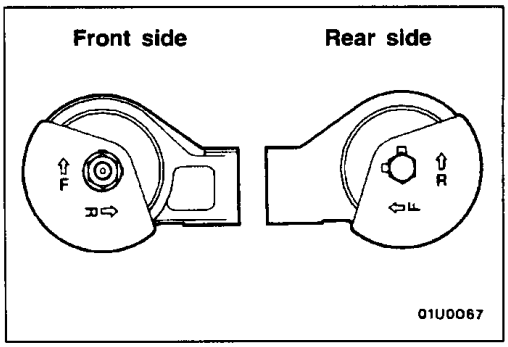


A01U0007

Removal steps

1. Bolts
2. Engine mount bracket
- ▶A◀ 3. Engine mount stopper <Except 4G92 – SOHC – M/T>

Caution
- **Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.**



INSTALLATION SERVICE POINT

▶A◀ ENGINE MOUNT STOPPER INSTALLATION

(1) At the front, install so that the arrow with the "F" mark is facing upward.
(2) At the rear, install so that the arrow with the "R" mark is facing upward.

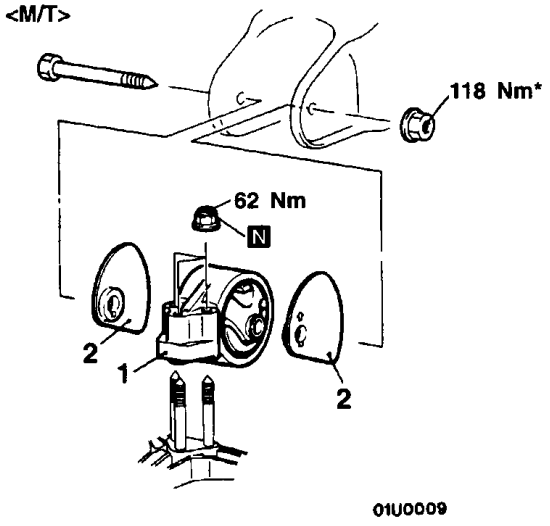
TRANSMISSION MOUNTING

32100140033

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Air Cleaner Assembly Installation and Removal
(2) Battery and Battery Tray Removal and Installation

<M/T>



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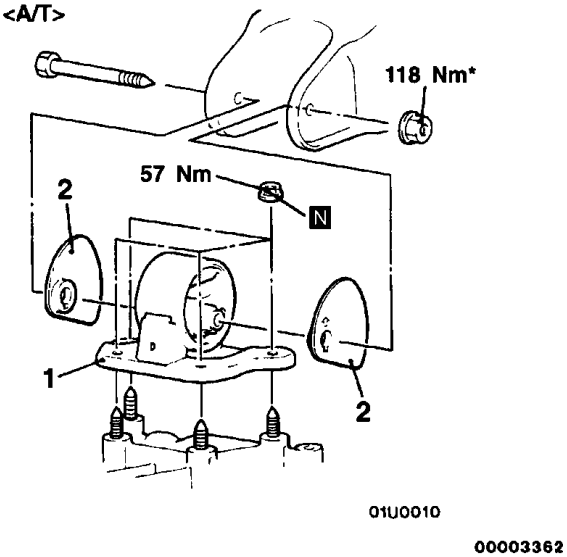


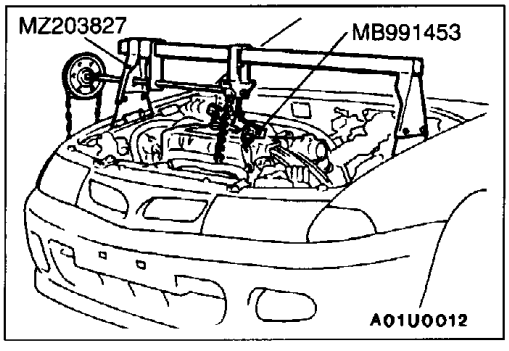
00003362

Removal steps

◀A▶ • Centermember mounting bolt
◀A▶ 1. Transmission mount bracket
▶A◀ 2. Transmission mount stopper

Caution

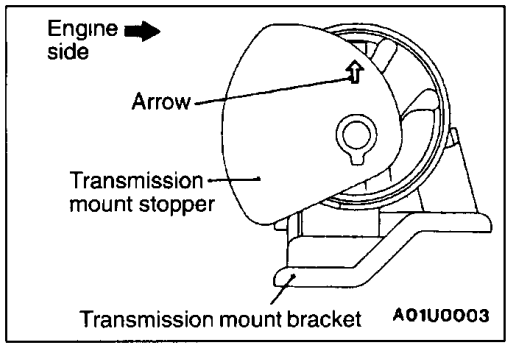
- **Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.**



REMOVAL SERVICE POINT

◀A▶ TRANSMISSION MOUNT BRACKET REMOVAL

(1) Install the special tool to the vehicle body to support the engine and transmission assembly.
(2) Remove the centermember mounting bolt.



(3) Remove the bolt and nut of the transmission mount bracket.
(4) After lowering the engine and transmission assembly, remove the transmission mount bracket.

INSTALLATION SERVICE POINT

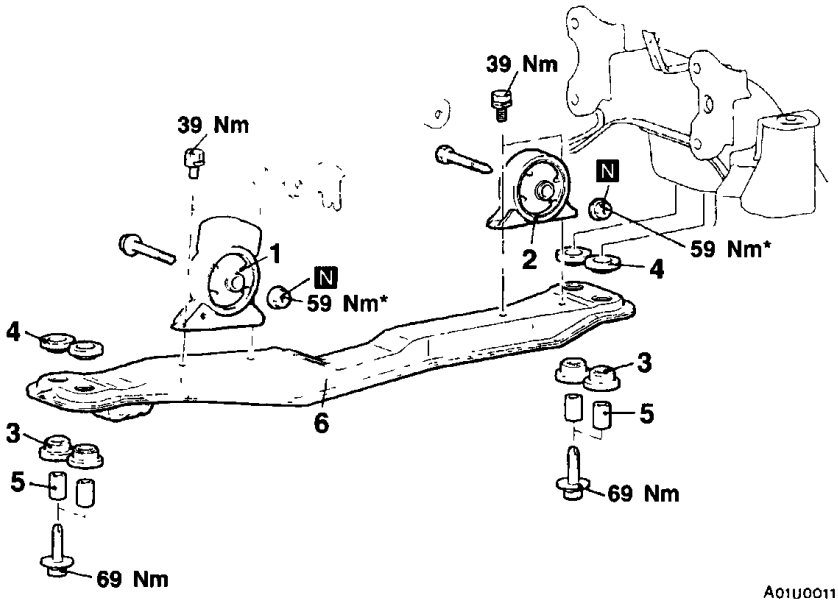
▶A◀ TRANSMISSION MOUNT STOPPER INSTALLATION

Clamp the transmission mount stopper so that the arrow points in the direction as shown in the diagram.

ENGINE ROLL STOPPER, CENTERMEMBER

32100200038

REMOVAL AND INSTALLATION

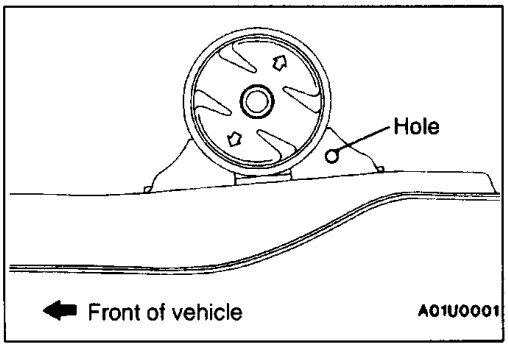


Roll stopper removal steps

▶B◀ 1. Front roll stopper bracket assembly
▶A◀ 2. Rear roll stopper bracket assembly
3. Bushing (lower)
4. Bushing (upper)
5. Collar
6. Centermember

Caution

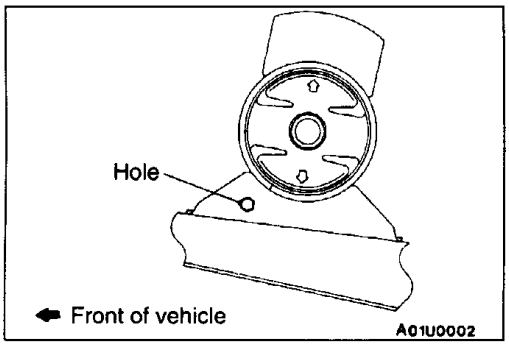
- **Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.**



INSTALLATION SERVICE POINTS

▶A◀ REAR ROLL STOPPER BRACKET ASSEMBLY INSTALLATION

Install so that the hole in the rear roll stopper bracket is facing towards the rear of the vehicle.



▶B◀ FRONT ROLL STOPPER BRACKET ASSEMBLY INSTALLATION

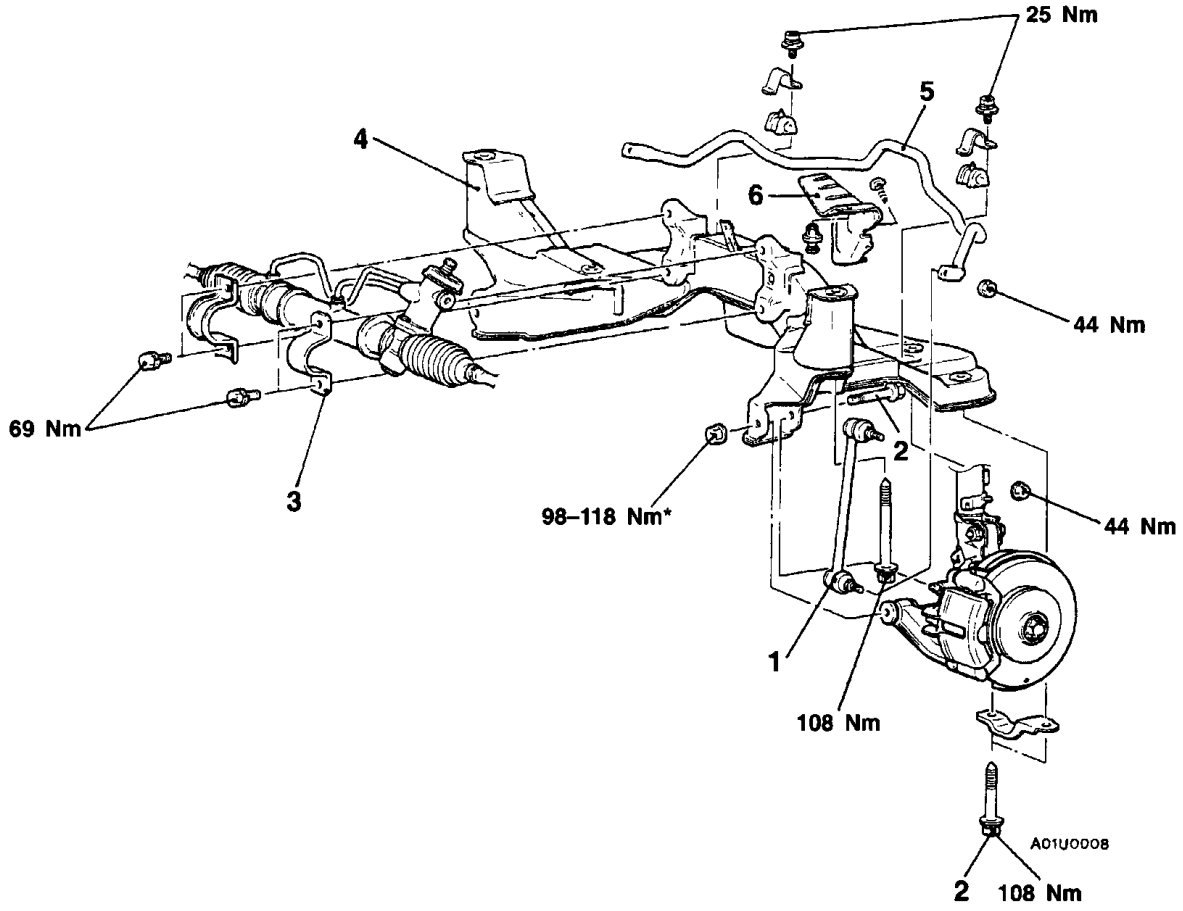
Install so that the hole in the front roll stopper bracket is facing towards the front of the vehicle.

CROSSMEMBER

32100320031

REMOVAL AND INSTALLATION

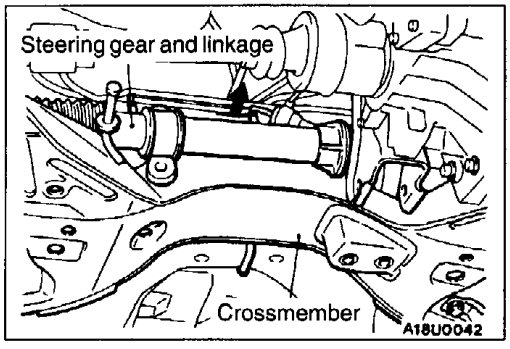
Pre-removal and Post-Installation Operation
(1) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15.)
(2) Centermember Assembly Removal and Installation (Refer to P.32-5.)



Removal steps for crossmember

1. Pillow ball link
2. Lateral lower arm mounting bolt
3. Steering gear and linkage clamp
◀A▶ ▶A◀ 4. Crossmember assembly
5. Stabilizer bar
6. Water proof panel

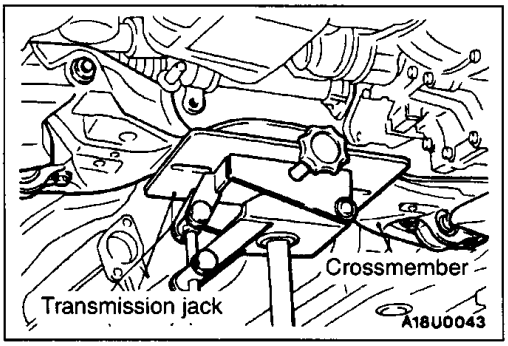
Caution
*: **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**



REMOVAL SERVICE POINT

◀A▶ CROSSMEMBER ASSEMBLY REMOVAL

(1) Move the crossmember while supporting the steering gear and linkage in the direction shown by the arrow.



(2) Remove the crossmember while supporting it with a transmission jack.

INSTALLATION SERVICE POINT

▶A◀ CROSSMEMBER ASSEMBLY INSTALLATION

Install the crossmember while supporting it with a transmission jack.

FRONT SUSPENSION

CONTENTS

33109000018

GENERAL INFORMATION 2

SERVICE SPECIFICATIONS 3

SPECIAL TOOLS 4

ON-VEHICLE SERVICE 5

Front Wheel Alignment Check and Adjustment 5

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LOWER ARM 10

STABILIZER BAR 12

GENERAL INFORMATION

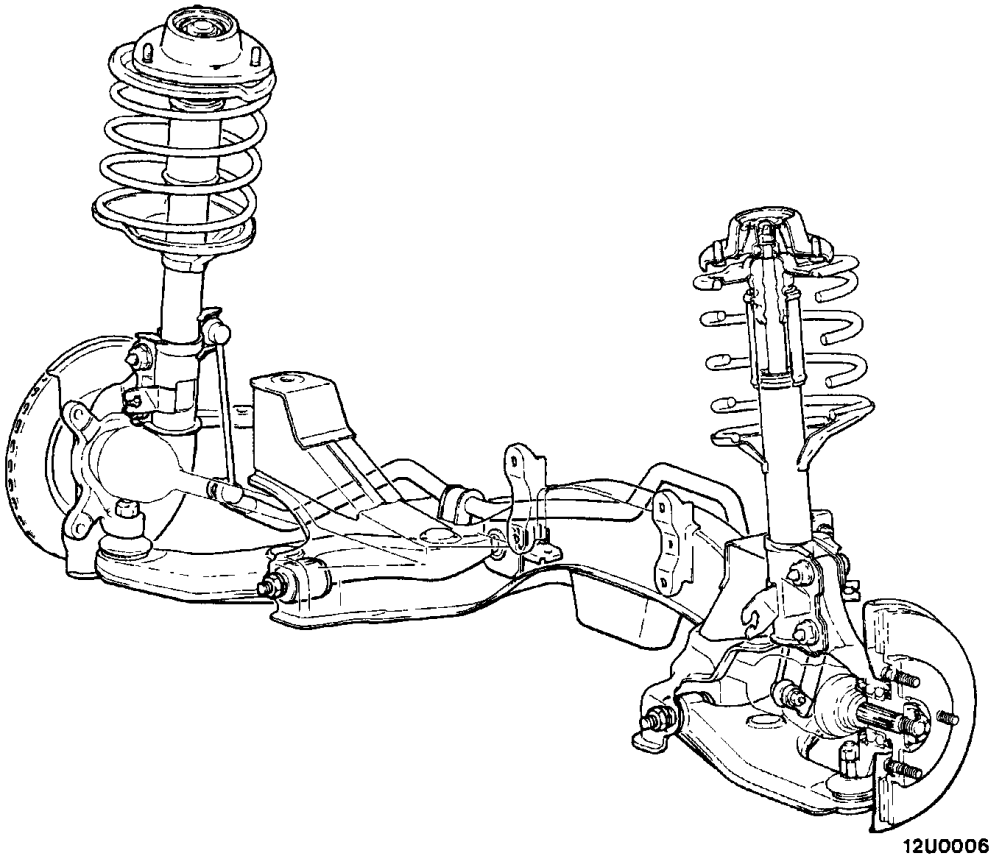
33100010010

The front suspension is a Mcpherson strut with coil spring. The shock absorber is hydraulic double-acting type.

COIL SPRING

Items	1600		1800	
	M/T	A/T	M/T	A/T
Wire dia. × O.D. × free length mm	12×138×328	13×138×334	13×160×344	13×160×351

CONSTRUCTION DIAGRAM



12U0006

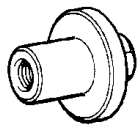
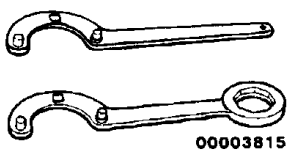
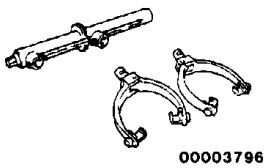
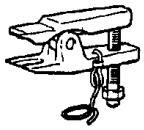
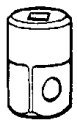
SERVICE SPECIFICATIONS

33100030016

Items		Standard value
Toe-in	At the centre of tyre tread mm	1±2
	Toe-angle (per wheel)	0° 03'±06'
Toe-out angle on turns (inner wheel when outer wheel at 20°)		21.8°
Steering angle	Inner wheel	39°00'±1°30'
	Outer wheel	32°00'
Camber		0° 00'±30'
Caster		2° 12'
Kingpin inclination		12° 41'
Lower arm ball joint starting torque Nm		1.0–6.5
Lower arm ball joint turning torque Nm		1.0–3.9
Stabilizer link ball joint turning torque Nm		1.7–3.1

SPECIAL TOOLS

33100060015

Tools	Number	Name	Use
	MB991004	Wheel alignment gauge attachment	Measurement of the wheel alignment
 00003815	MB990278 or MB990775	Special spanner	Disassembly/assembly of the strut assembly
 00003796	MB991237 MB991238	Spring compressor body Arm set	Compression of the front coil spring
	MB991113	Steering linkage puller	Removal of the ball joint
	MB990326	Preload socket	Measurement of the ball joint rotation starting torque and turning torque
	MB990968	Torque wrench	

ON-VEHICLE SERVICE

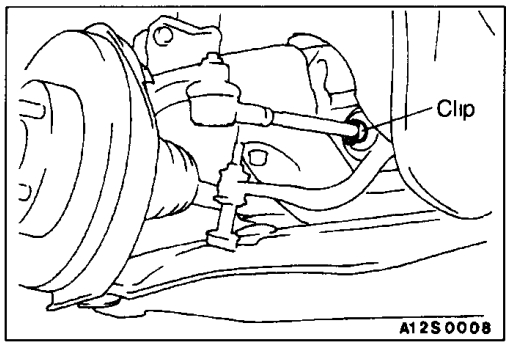
33100090045

FRONT WHEEL ALIGNMENT CHECK AND ADJUSTMENT

Measure the wheel alignment with the vehicle parked 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:
At the centre of tyre tread 1±2 mm
Toe angle (per wheel) 0°03'±06'



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 turn buckles 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.
   For each one turn of the left and right tie rods, the toe-in will be adjusted by approx. 0°35' (per wheel).

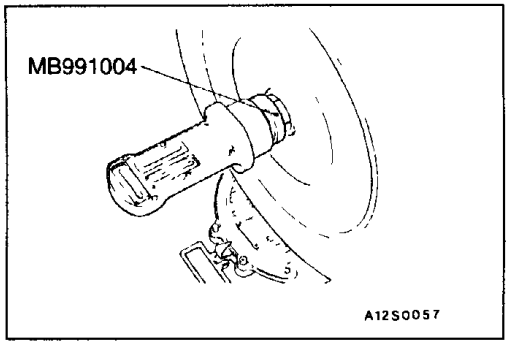
TOE-OUT ANGLE ON TURNS

To check the steering linkage, especially after the vehicle has been involved in an accident or if an accident is presumed, it is advisable to check the toe-out angle on turns in addition to the wheel alignment.
Conduct this test on the left turn as well as on the right turn.

Standard value:
21.8° (inner wheel when outer wheel at 20°)

STEERING ANGLE

Standard value:
Inner wheel 39°00'±1°30'
Outer wheel 32°00'



CAMBER, CASTER AND KINGPIN INCLINATION

Standard value:
Camber 0°00'±30'
Caster 2°12'
Kingpin inclination 12°41'

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 200–260 Nm as the drive shaft nut.

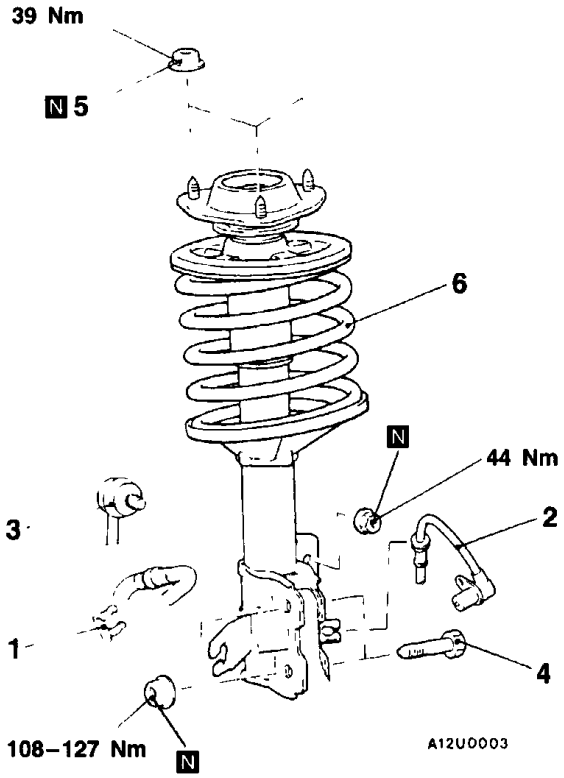
Caution
Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

STRUT ASSEMBLY

33200110027

REMOVAL AND INSTALLATION

Post-installation Operation
- Front Wheel Alignment Adjustment (Refer to P.33A-5.)



Removal steps

1. Brake hose clamp
2. Front speed sensor <Vehicles with ABS>
3. Stabilizer link
- ◀A▶
4. Bolts
5. Self locking nut
6. Strut assembly

REMOVAL SERVICE POINT

◀A▶ BOLTS REMOVAL

(1) Suspend the lower arm from the vehicle with wire.
(2) Remove the strut and knuckle connection.

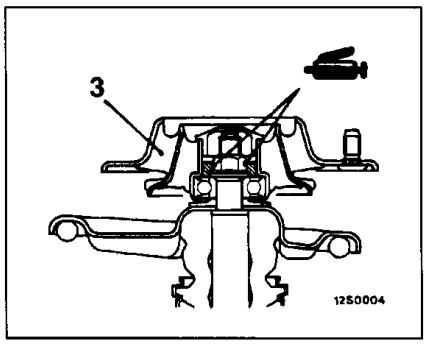
INSPECTION

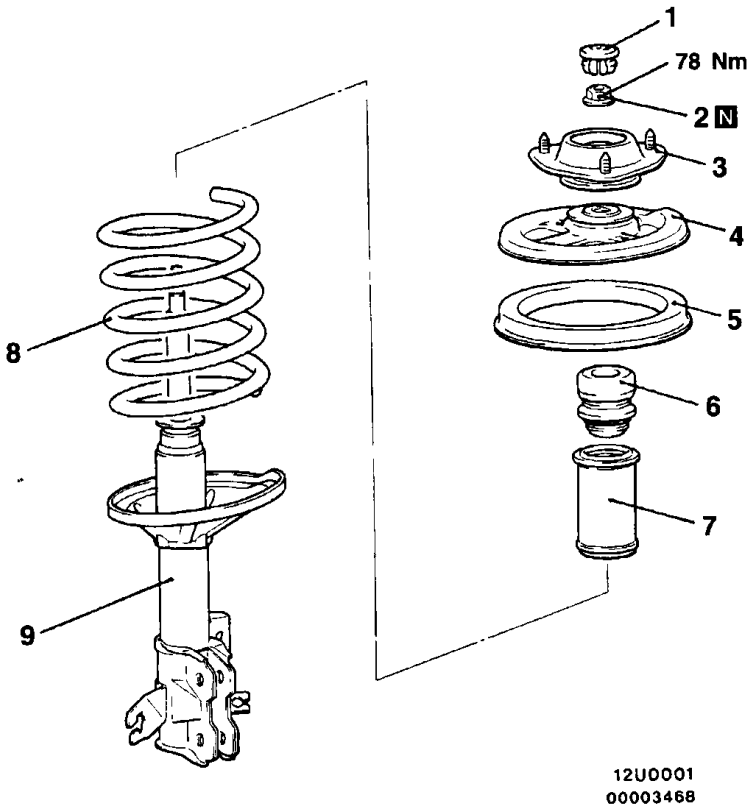
33200120020

- Check for oil leaks from the strut assembly.
- Check the strut assembly for damage or deformation

DISASSEMBLY AND REASSEMBLY

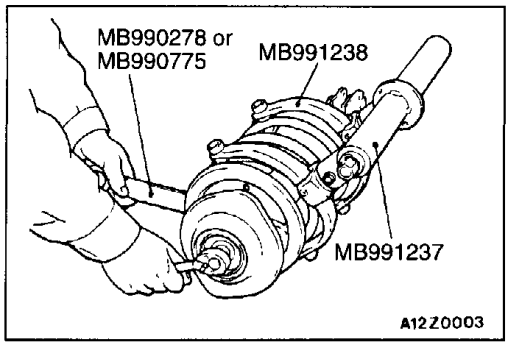
33200130030





Disassembly steps

◀A▶ ▶A◀ 1. Dust cover
2. Self locking nut
3. Strut insulator
4. Spring seat, upper
5. Spring pad, upper
6. Bump rubber
7. Dust cover
8. Coil spring
◀B▶ 9. Strut assembly



DISASSEMBLY SERVICE POINTS

◀A▶ SELF LOCKIING NUT REMOVAL

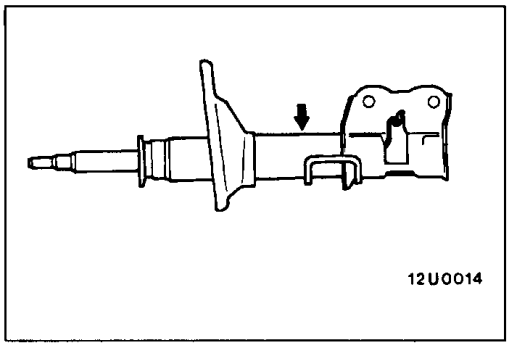
(1) Using the special tools, compress the coil spring.

NOTE
Install the special tools evenly, and so that the maximum length will be attained within the installation range.

Caution
Do not use an impact wrench to tighten the special tool bolt.

(2) Holding the spring upper seat with the special tool, loosen the self locking nut.

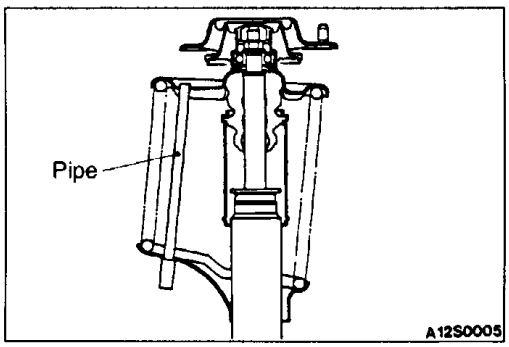
Caution
Do not use an impact wrench.



◀B▶ STRUT ASSEMBLY REMOVAL

To discard the strut assembly, place the assembly horizontally with its piston rod extended. Then drill a hole approx. 3 mm in diameter at the location shown in the illustration and discharge the gas.

Caution
The gas itself is harmless but it may issue out of the hole together with chips generated by the drill. Therefore, be sure to wear goggles.



REASSEMBLY SERVICE POINT

▶A◀ SELF LOCKING NUT INSTALLATION

(1) With the coil spring held compressed by the special tools (MB991237 and MB991238), provisionally tighten the self locking nut.

Caution
Do not use an impact wrench to tighten the special tool bolt.

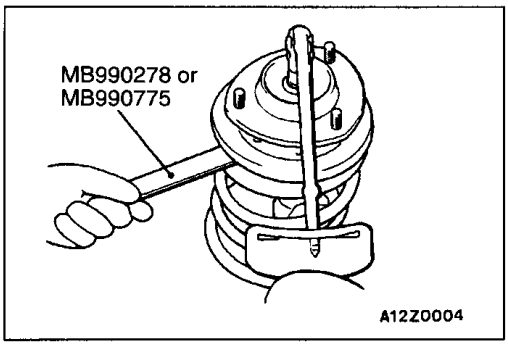
(2) Line up the holes in the strut assembly spring lower seat with the hole in the spring upper seat.

NOTE
The job is easily accomplished with a pipe.

(3) Correctly align both ends of the coil spring with the grooves in the spring seat, and then loosen the special tools (MB991237 and MB991238).

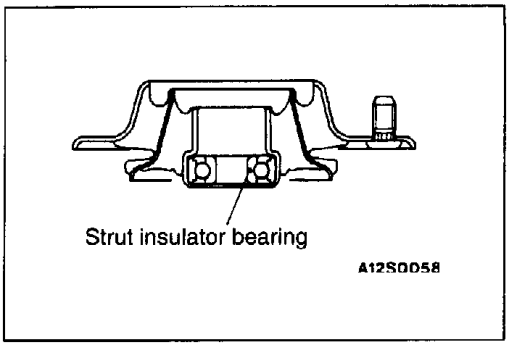
(4) Using the special tool, tighten the self locking nut to the specified torque.

Caution
Do not use an impact wrench.



(5) Apply multipurpose grease to the bearing part of the strut insulator.

Caution
When applying the grease, take care that grease does not adhere to the insulator's rubber part.



INSPECTION

33200140026

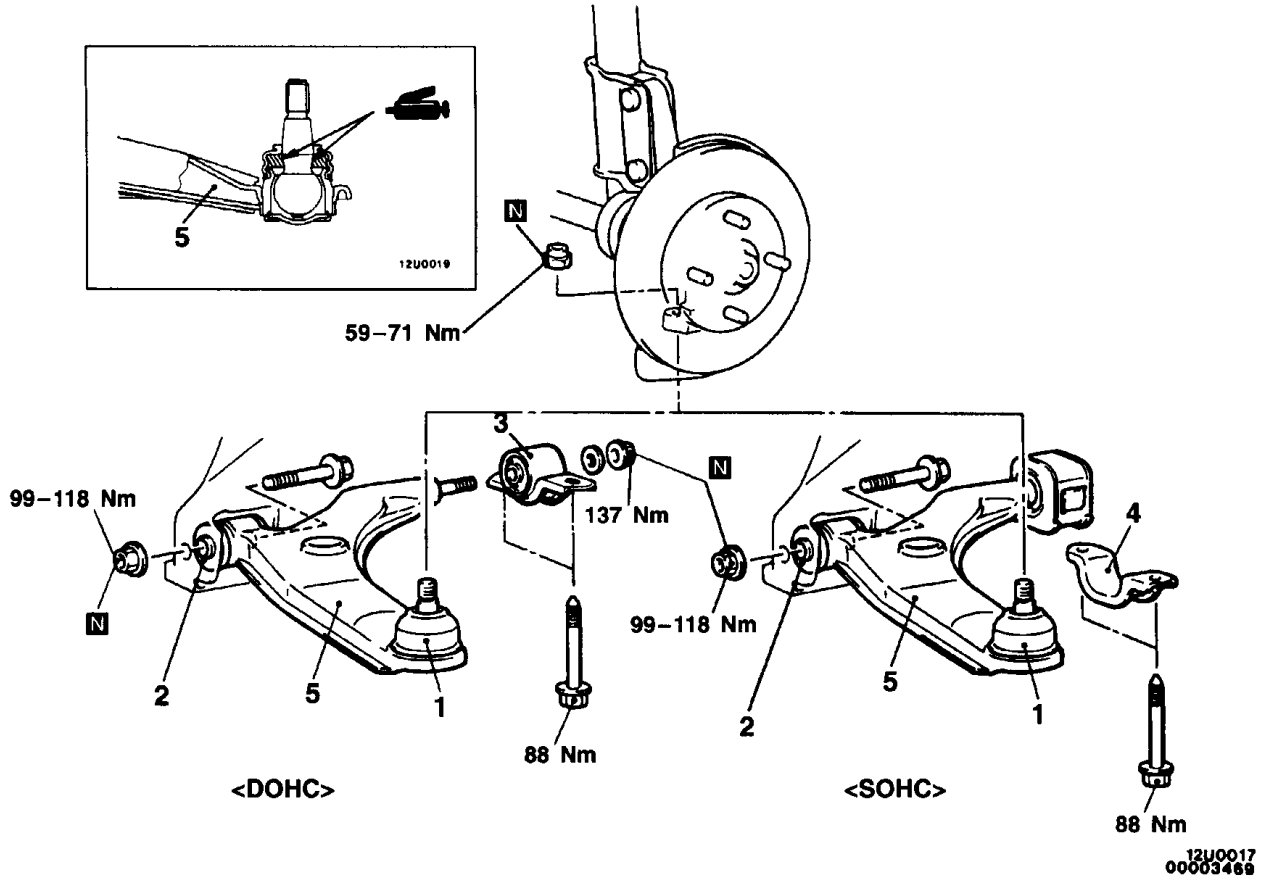
- Check the strut insulator bearing for wear or rust.
- Check the rubber parts for damage or deterioration.
- Check the spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.

LOWER ARM

33200160022

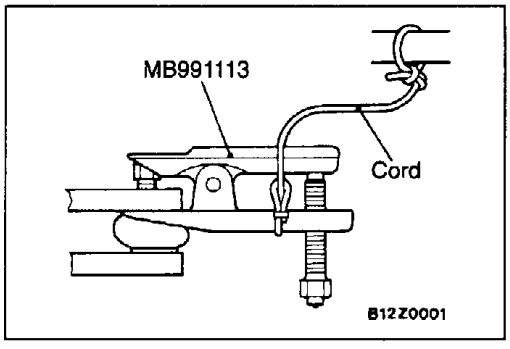
REMOVAL AND INSTALLATION

Post-installation Operation
- Front Wheel Alignment Adjustment (Refer to P.33A-5.)



Removal steps

◀A▶ 1. Lower arm ball joint connection
2. Lower arm front bushing connection
3. Lower arm rear bushing <DOHC>
4. Support bracket <SOHC>
5. Lower arm assembly



REMOVAL SERVICE POINT

◀A▶ LOWER ARM BALL JOINT DISCONNECTION

Using the special tool, disconnect the lower arm ball joint from the knuckle.

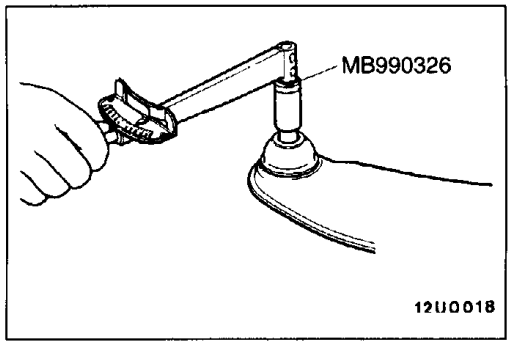
Caution

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

INSPECTION

33200170025

- Check the bushing for wear and deterioration.
- Check the lower arm for bend or breakage.
- Check the support bracket for deterioration or damage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.

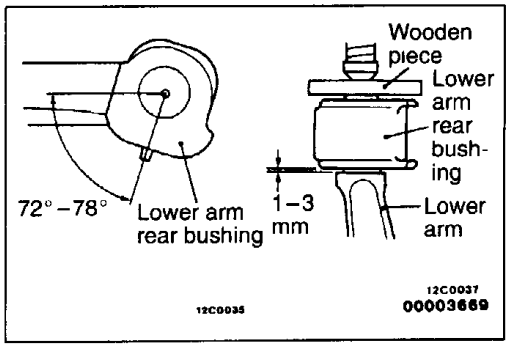


BALL JOINT STARTING TORQUE/TURNING TORQUE CHECK

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

Standard value:
Starting torque 1.0–6.5 Nm
Turning torque 1.0–3.9 Nm

(2) If the measured values exceed the standard values, replace the ball joint.
(3) If the measured values are lower than the standard values, check that the ball joint does not feel stiff. If it doesn't feel stiff, it is possible to use the ball joint.



LOWER ARM REAR BUSHING REPLACEMENT <SOHC>

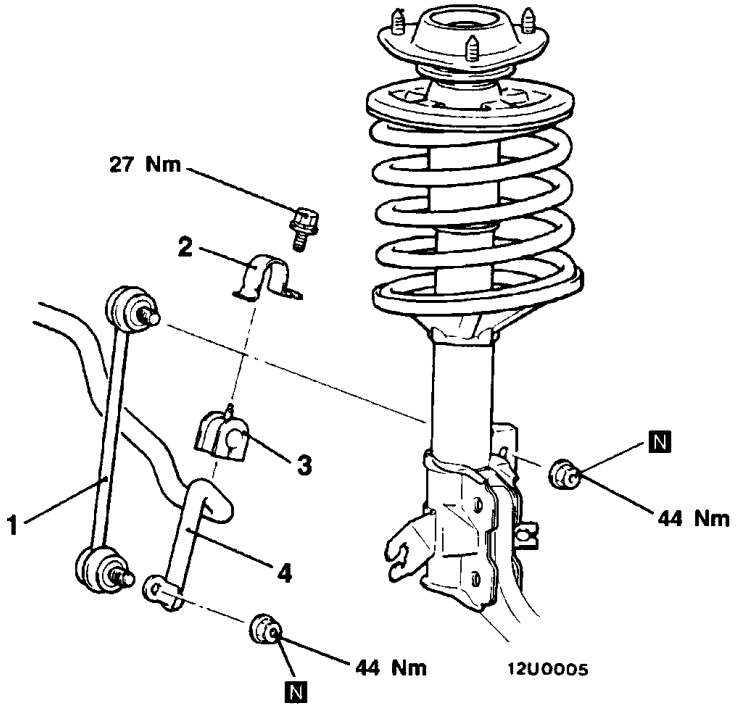
(1) Apply soapy water between the shaft and old bushing, and pry up bushing using a screwdriver.
(2) Apply soapy water to the shaft and new bushing and install new bushing into the shaft at the angle shown in the illustration.
(3) Press in the bushing as illustrated.

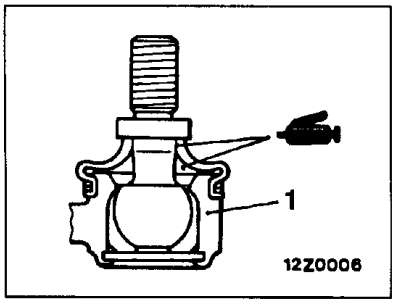
STABILIZER BAR

33200190014

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Cross-member Removal and Installation (Refer to GROUP 32 – Cross-member.)





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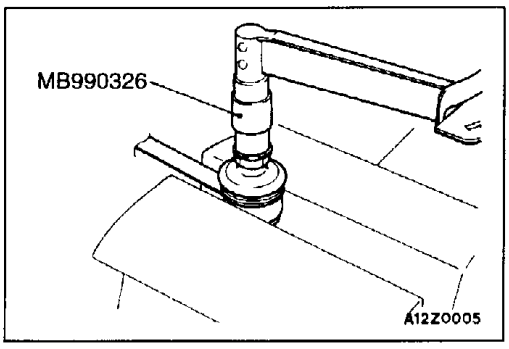
Removal steps
1. Stabilizer link
2. Fixture
3. Bush
4. Stabilizer bar



INSPECTION

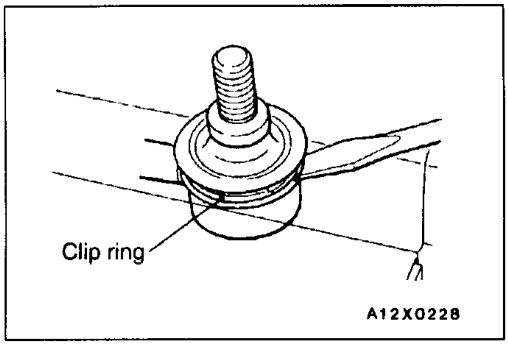
33200200014

STABILIZER LINK BALL JOINT TURNING TORQUE INSPECTION

(1) Shake the stabilizer link ball joint stud several times before installing the nut to the stud. Then use the special tool to measure the turning torque of the stabilizer link ball joint.

Standard value: 1.7–3.1 Nm

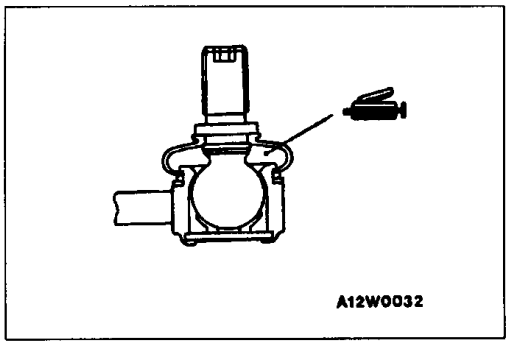
(2) If the turning torque exceeds the standard value, replace the stabilizer link.
(3) If the turning torque is lower than the standard value, check that the ball joint does not feel stiff. If it doesn't feel stiff, it is possible to use the ball joint.



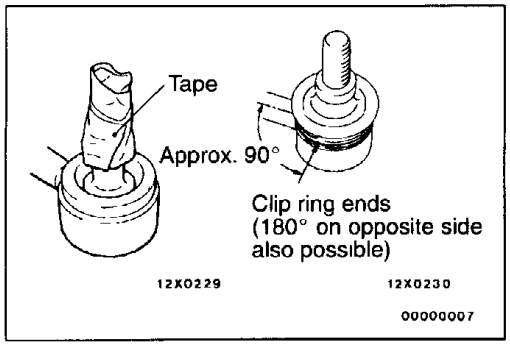
STABILIZER LINK DUST COVER REPLACEMENT

(1) Remove the clip ring and the dust cover.

Caution
Do not damage the dust cover.



(2) Apply multipurpose grease to inside of the dust cover.



(3) Use vinyl tape to tape the stabilizer link where shown in the illustration, and then install the dust cover to the stabilizer link.
(4) Secure the dust cover by the clip ring.

NOTE
When installing the clip ring, align it so that its ends are located at a 90° angle from the axis of the stabilizer link.

REAR SUSPENSION

CONTENTS

34109000046

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SERVICE SPECIFICATION 3

SPECIAL TOOLS 3

ON-VEHICLE SERVICE 4

Rear Wheel Alignment Check and Adjustment 4

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TRAILING ARM 9

STRUT ASSEMBLY 12

STABILIZER BAR 15

GENERAL INFORMATION

34100010048

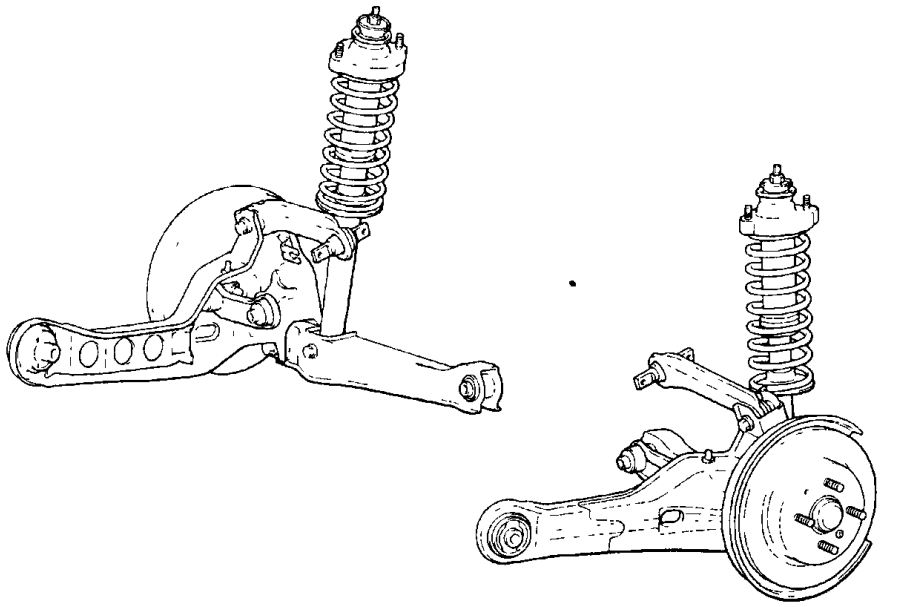
The rear suspension is a trailing arm type multi-link suspension. The shock absorber used on the strut assembly is a hydraulic, cylindrical double-acting type.

COIL SPRING

Items	Specifications
Wire dia. × O.D. × free length mm	10×87×385

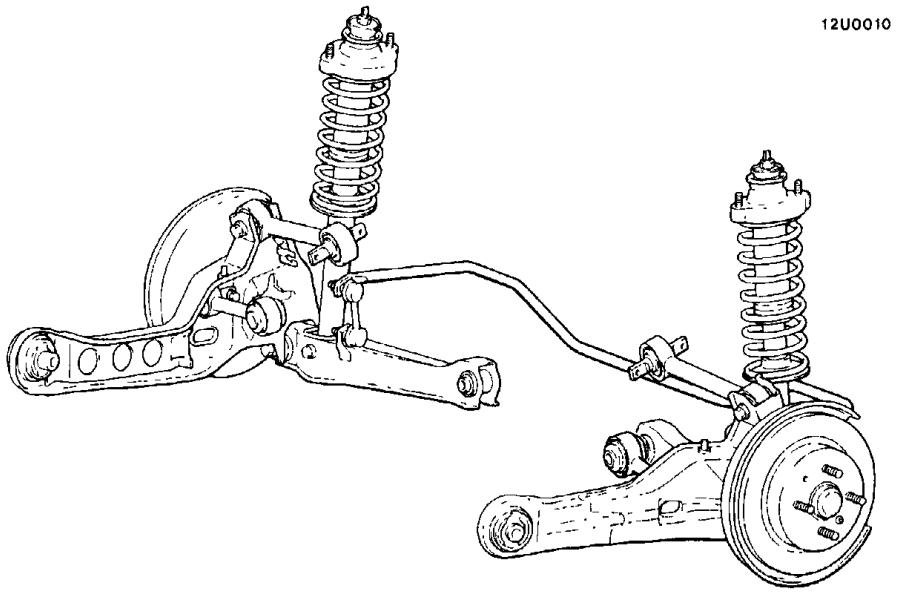
CONSTRUCTION DIAGRAMS

<SOHC>



12U0010

<DOHC>



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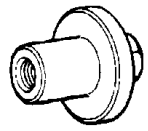
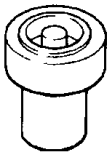
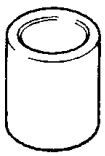
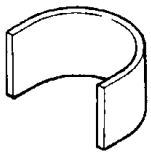
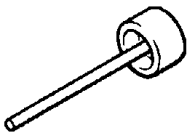
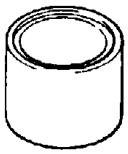
SERVICE SPECIFICATIONS

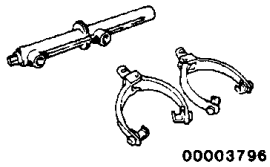
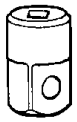
34100030051

Items		Specifications
Toe-in	At the centre of tyre tread mm	3±2
	Toe-angle (per wheel)	0°09'±06'
Camber		−0°40'±30'
Stabilizer link ball joint turning torque Nm		1.7−3.1
Clearance between rear speed sensor pole piece and rotor mm		0.3−0.9

SPECIAL TOOLS

34100060043

Tool	Number	Name	Use
	MB991004	Wheel alignment gauge attachment	Measurement of the wheel alignment (Vehicles with aluminium type wheels)
	MB991447	Bushing remover and installer	Driving out and press-fitting of lower arm bushing
	MB991448	Bushing remover and installer base	
	MB991449	Bushing remover and installer supporter	
	MB991444	Bushing remover and installer arbor	Driving out and press-fitting of trailing arm bushing
	MB991445	Bushing remover and installer base	
	MB991446	Bushing remover and installer spacer	

Tool	Number	Name	Use
 00003796	MB991237 MB991239	Spring compressor body Arm set	Compression of the front coil spring
	MB990326	Preload socket	Checking of stabilizer link ball joint for turning torque
	MB990685	Torque wrench	

ON-VEHICLE SERVICE

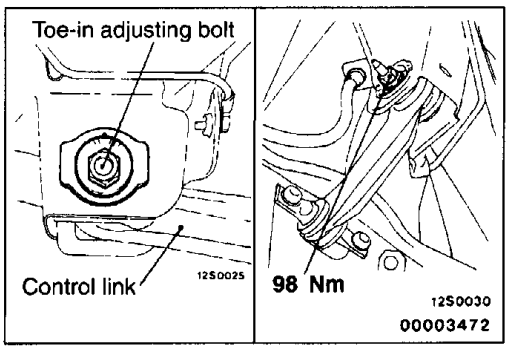
33100100045

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.

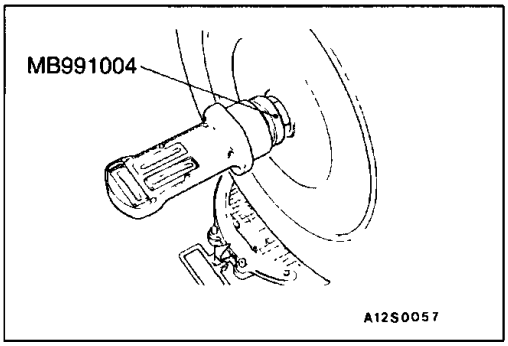
TOE-IN

Standard value:
At the centre of tyre tread 3±2 mm
Toe angle (per wheel) 0°09'±06'



If outside the standard value, adjust by the following procedure.
(1) Be sure to adjust the camber before adjusting the toe-in.
(2) Adjust by turning the toe adjusting bolt (mounting bolt on the inside of the control link).
LH: Turning clockwise → toe-in direction
RH: Turning clockwise → toe-out direction

The scale has gradations of approximately 2.6 mm (single side toe angle equivalent to 16')

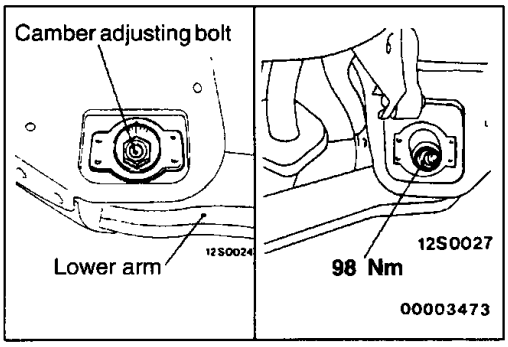


CAMBER

Standard value: –0°40'±30'
(The difference between the left and right wheels should be 30' or less.)

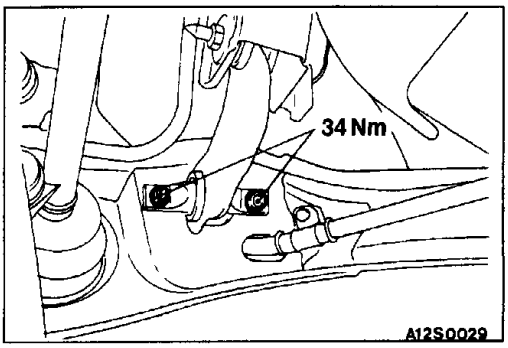
NOTE
For vehicles equipped with aluminium wheels, measure the camber after tightening the special tool (MB991004) to the specified torque 180 Nm.

Caution
Never subject the wheel bearings to the full vehicle load when the flange nuts are loosened.



If outside the standard value, adjust by the following procedure.
(1) Remove the connection between the control link and the trailing arm.
(2) Adjust by turning the camber adjusting bolt (mounting bolt for the lower arm and rear crossmember).

Left wheel: clockwise + camber
Right wheel: clockwise – camber
The scale has gradations of approximately 14'



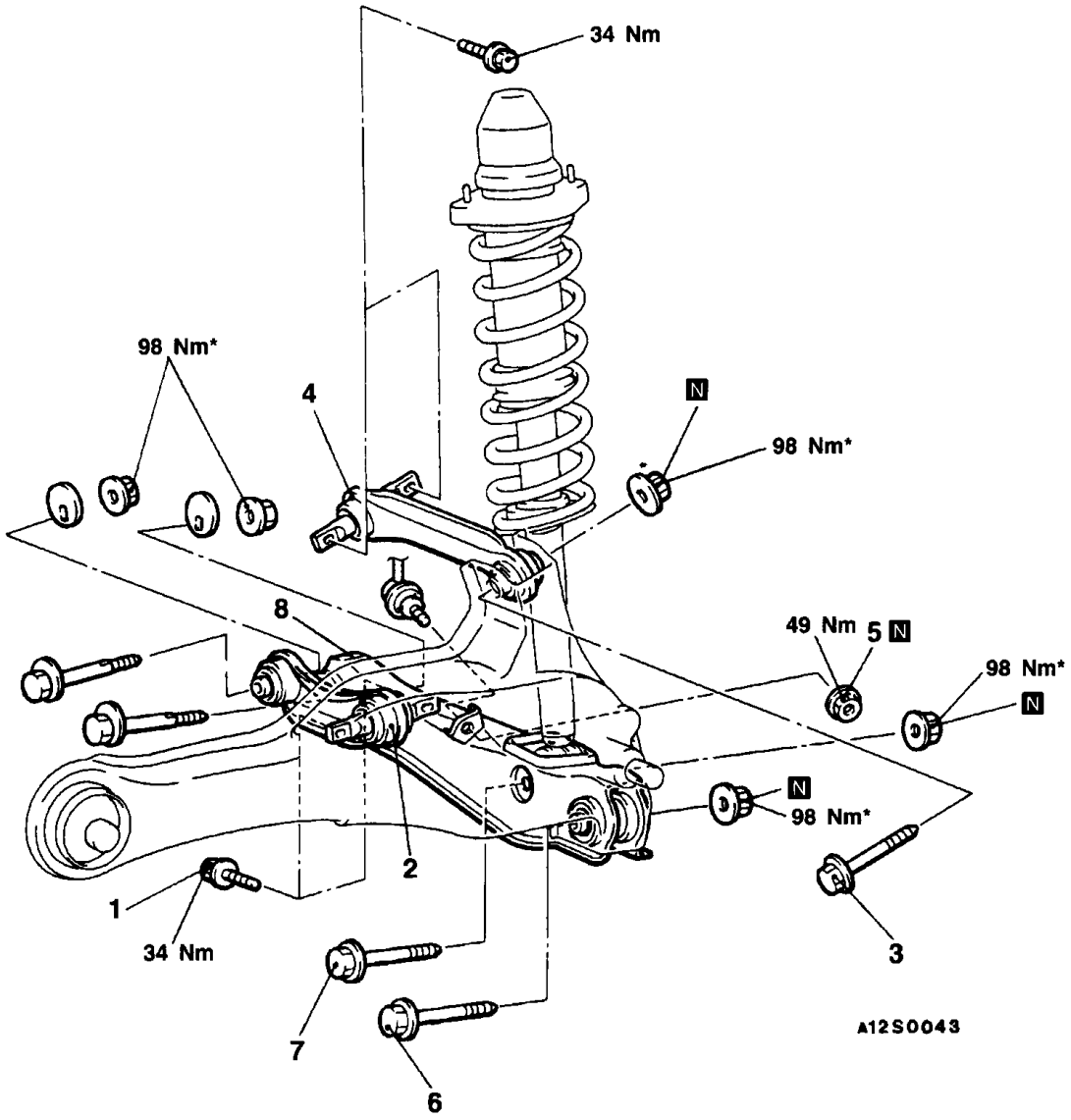
(3) Tighten the control link to the trailing arm at the specified torque.
(4) After adjusting the camber, be sure to adjust the toe-in.

CONTROL LINK, UPPER LINK AND LOWER ARM

34100480023

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Alignment Check (Refer to P.34-4.)



Control link removal steps

1. Control link and trailing arm connection
◀A▶ 2. Control link

Upper link removal steps

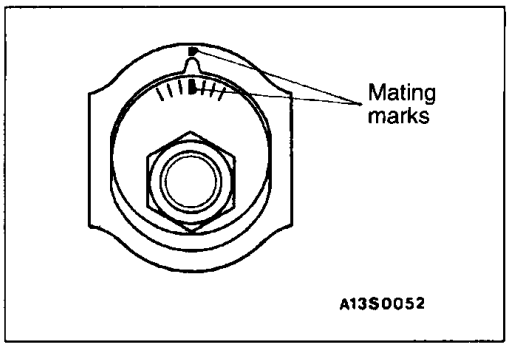
◀B▶ 3. Upper link and trailing arm connection
4. Upper link

Lower arm removal steps

1. Control link and trailing arm connection
5. Stabilizer link and lower arm connection
<Vehicles with stabilizer bar>
◀C▶ 6. Lower arm and trailing arm connection
7. Shock absorber assembly and lower arm connection
◀A▶ 8. Lower arm

Caution

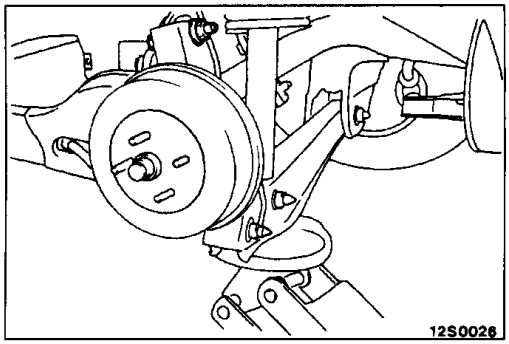
*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.**



REMOVAL SERVICE POINTS

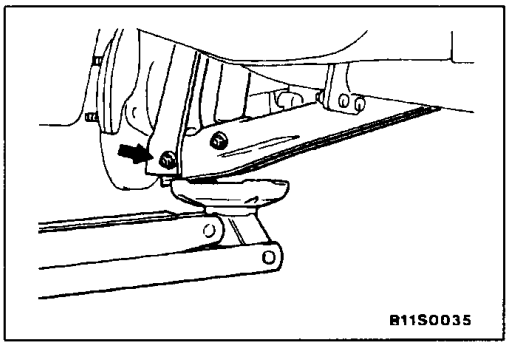
◀A▶ CONTROL LINK/LOWER ARM REMOVAL

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



◀B▶ UPPER LINK AND TRAILING ARM DISCONNECTION

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



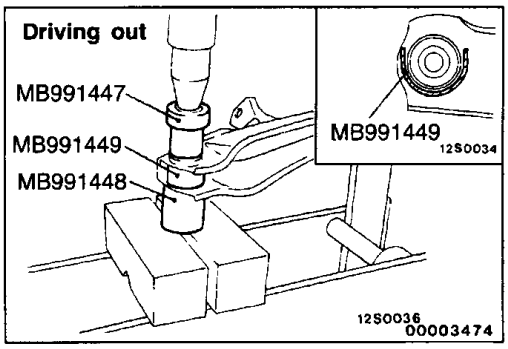
◀C▶ LOWER ARM AND TRAILING ARM DISCONNECTION

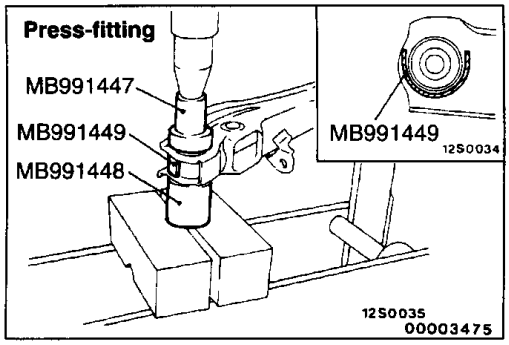
After supporting the lower arm with a jack, separate the connection.

INSPECTION

34100490026

- Check the bushing for wear and deterioration.
- Check the control link upper link and lower arm for bends or breakage.
- Check all bolts for condition and straightness.





LOWER ARM BUSHING REPLACEMENT

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

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

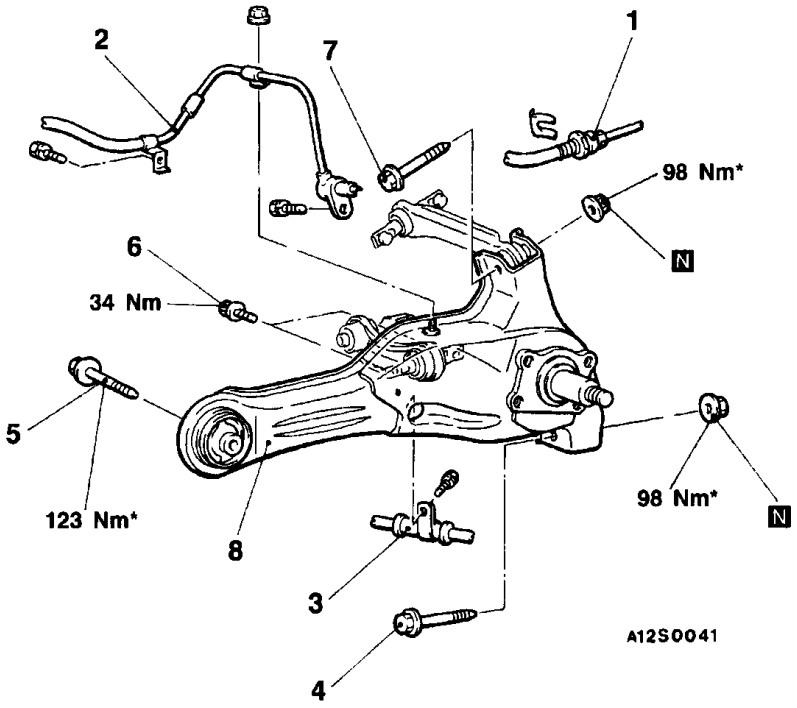
Caution
Because the outside diameter of both edges of the bushing are different, be careful not to mistake the direction when driving out and press-fitting.

TRAILING ARM

34100420049

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Rear Drum Brake or Rear Disc Brake Removal and Installation (Refer to GROUP 35A – Rear Drum Brake or Rear Disc Brake.)
- Rear Axle Hub Removal and Installation (Refer to GROUP 27 – Rear Axle Hub.)



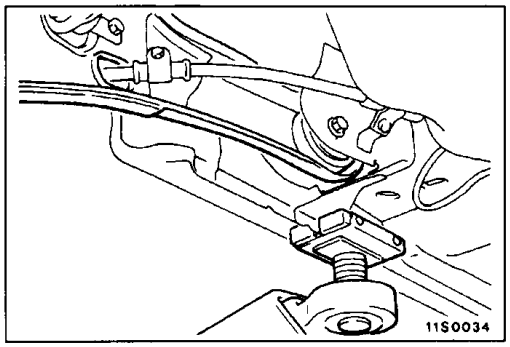
Removal steps

◀A▶ • Lifting point
1. Brake hose

◀B▶ ▶A◀ 2. Rear speed sensor <Vehicles with ABS>
3. Parking brake cable

◀C▶ 4. Lower arm and trailing arm connection
5. Trailing arm and body connection
6. Control link and trailing arm connection
7. Upper link and trailing arm connection
8. Trailing arm

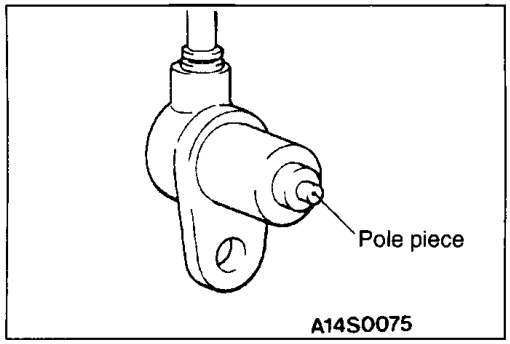
Caution
* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.**



REMOVAL SERVICE POINTS

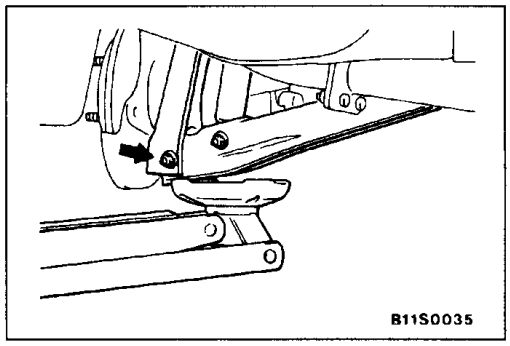
◀A▶ LIFTING POINT

When removing the trailing arm, move the lifting arm slightly towards the front of the vehicle so that it will not be in the way.



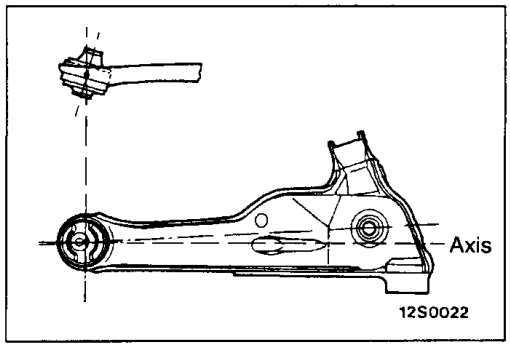
◀B▶ REAR SPEED SENSOR REMOVAL

Caution
When removing the speed sensor, be careful that the pole piece at the end does not touch the surface of the rotor teeth or other parts.

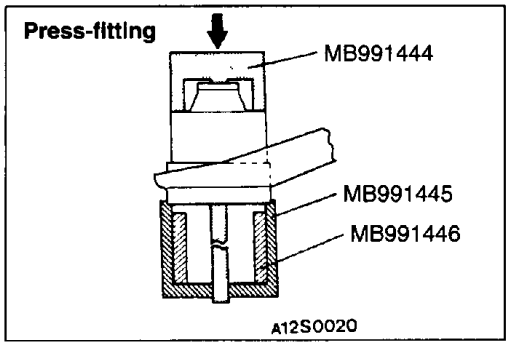


◀C▶ LOWER ARM AND TRAILING ARM DISCONNECTION

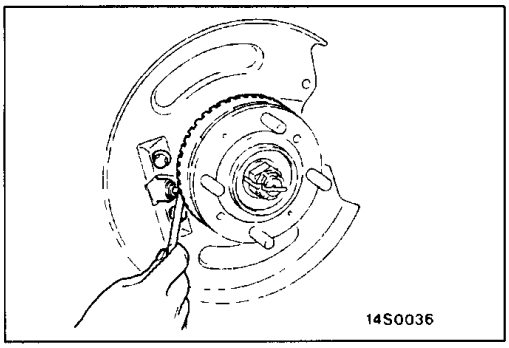
(1) After supporting the lower arm with a jack, separate the lower arm and trailing arm connection.



(2) Set the installation direction and installation location of the trailing arm bushing.
   1. Place the long projecting end of the trailing arm bushing inner pipe towards the inside of the vehicle.
   2. Set so that the trailing arm bushing is symmetrical to the axis between the centre of the trailing arm bushing and the centre of the spindle.



(3) Use the special tools to press-fit the trailing arm bushing.



INSTALLATION SERVICE POINT

▶A◀ REAR SPEED SENSOR INSTALLATION

Insert a thickness gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the sensor bracket at the position where the clearance is the standard value all around.

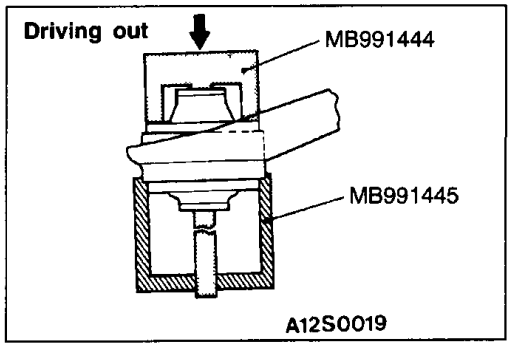
Standard value: 0.3–0.9 mm

Caution
Be careful that the pole piece at the end of the speed sensor and the surface of the rotor teeth do not become damaged by touching metal parts, etc.

INSPECTION

34100430035

- Check trailing arm for cracks and deformation.
- Check bushing for cracks, deterioration and wear.



TRAILING ARM BUSHING REPLACEMENT

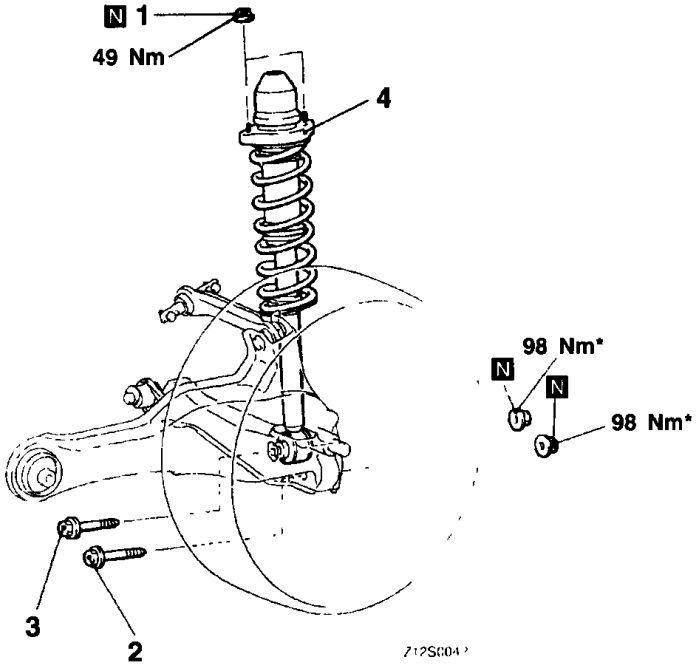
Use the special tools to drive out the trailing arm bushing.

STRUT ASSEMBLY

34100510043

REMOVAL AND INSTALLATION

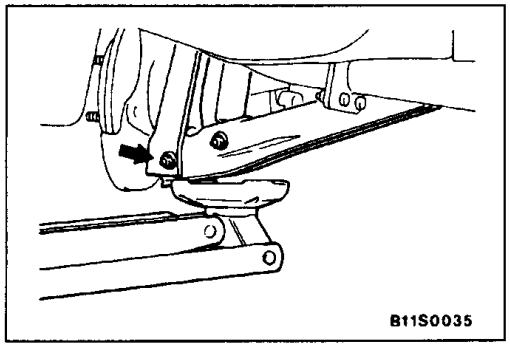
Pre-removal and Post-installation Operation
Lower arm and trailing arm disconnection
(Refer to P.34-9.)



Removal steps

1. Self-locking flange nut
◀A▶ 2. Lower arm and trailing arm connection
3. Shock absorber assembly and lower arm connection
4. Strut assembly

Caution
* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.**



REMOVAL SERVICE POINT

◀A▶ LOWER ARM AND TRAILING ARM DISCONNECTION

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

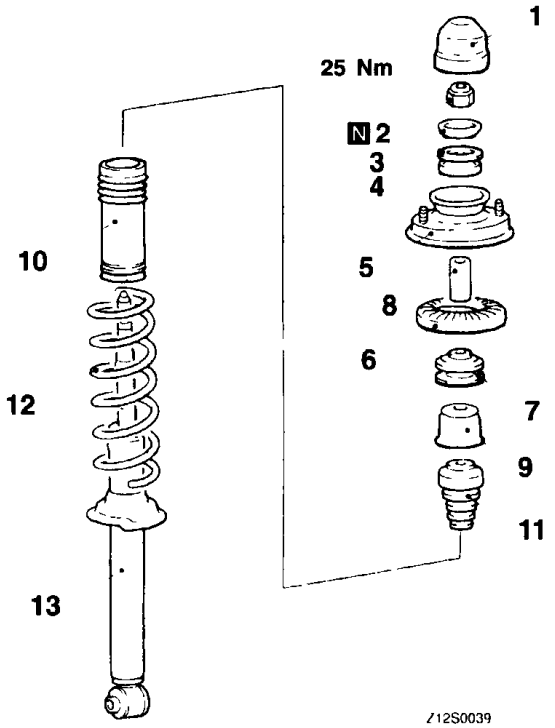
INSPECTION

34100520022

- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage or abnormal noise.

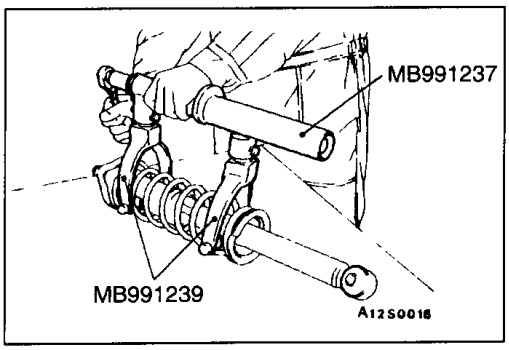
DISASSEMBLY AND REASSEMBLY

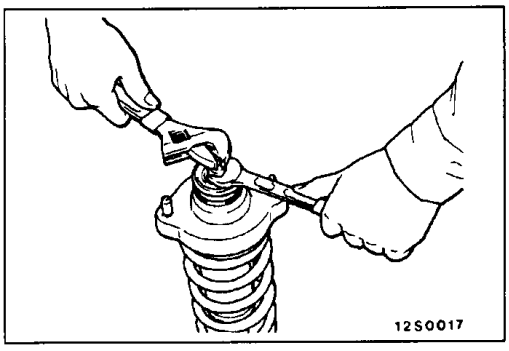
34100530049



Disassembly steps

◀A▶ ▶D◀ 1. Cap
2. Self-locking nut
3. Washer
4. Upper bushing B
▶C◀ 5. Bracket
▶B◀ 6. Spring pad
7. Upper bushing A
8. Coller
9. Cup
10. Dust cover
11. Bump rubber
▶A◀ 12. Coil spring
◀B▶ 13. Shock absorber





DISASSEMBLY SERVICE POINTS

◀A▶ SELF-LOCKING NUT REMOVAL

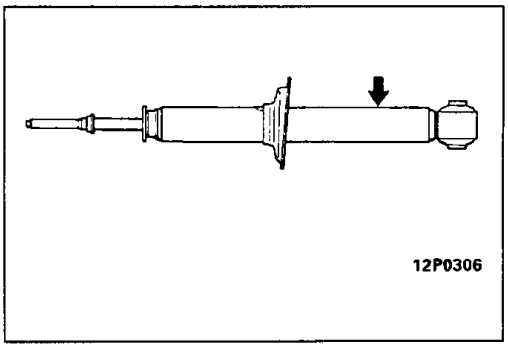
(1) Use the special tools to compress the coil spring.

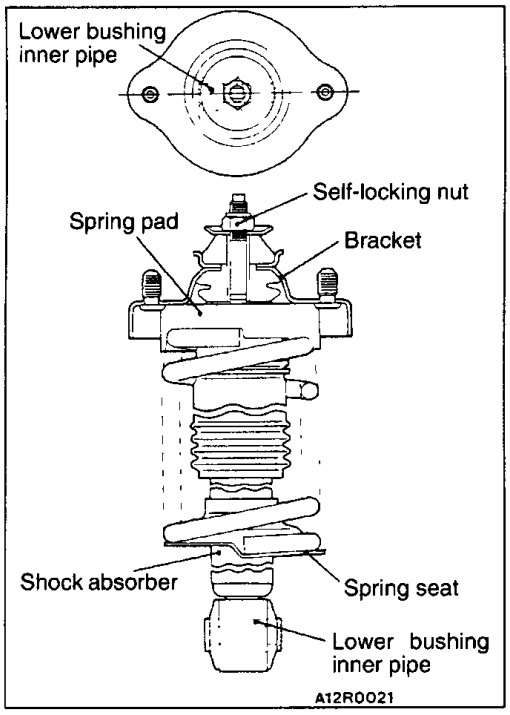
NOTE
Install the special tools evenly, and so that the maximum length will be attained within the installation range.

Caution
Do not use an impact wrench to tighten the special tool bolt.

(2) Holding the piston rod, remove the self-locking nut.

Caution
Do not use an impact wrench.





◀B▶ SHOCK ABSORBER REMOVAL <1800>

To discard the low pressure gas-filled shock absorber, place the assembly horizontally with its piston rod extended. Then drill a hole approx. 3 mm in diameter at the location shown in the illustration and discharge the gas.

Caution
The gas itself is harmless but it may issue out of the hole together with chips generated by the drill. Therefore, be sure to wear goggles.

REASSEMBLY SERVICE POINTS

▶A◀ COIL SPRING INSTALLATION

(1) Use the special tools (MB991237, MB991239) to compress the coil spring, and install it to the shock absorber.

Caution
Do not use an impact wrench to tighten the bolt of the special tool.

(2) Align the end of the coil spring with the stepped section of the spring seat of the shock absorber.

▶B◀ SPRING PAD INSTALLATION

Align the stepped section of the spring pad with the end of the coil spring, and install the spring pad.

▶C◀ BRACKET INSTALLATION

Install the bracket so that the lower bushing inner pipe of the shock absorber and the line between the bracket mounting bolts are straight when looking from above.

▶D◀ SELF-LOCKING NUT INSTALLATION

(1) Provisionally tighten the self-locking nut.
(2) Remove the special tools (MB991237, MB991239), tighten the self-locking nut at the specified torque.

Caution
Do not use an impact wrench.

INSPECTION

34100540035

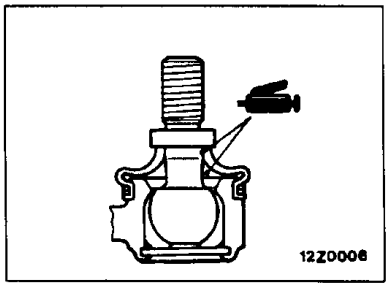
- Check the rubber parts for damage.
- Check the coil springs for crack, damage or deterioration.

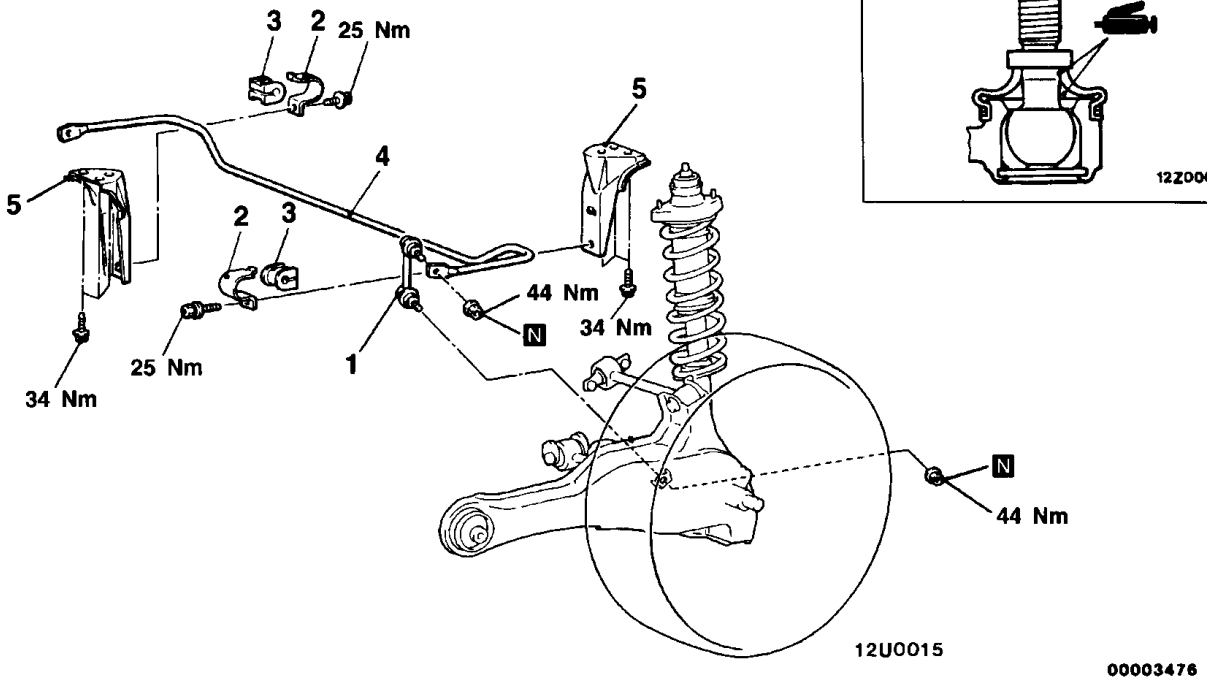
STABILIZER BAR

34100560031

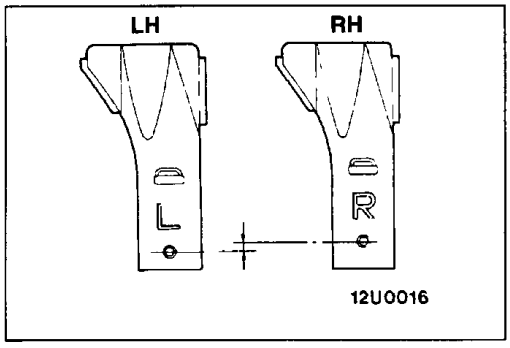
REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Alignment Check (Refer to P.34-4.)





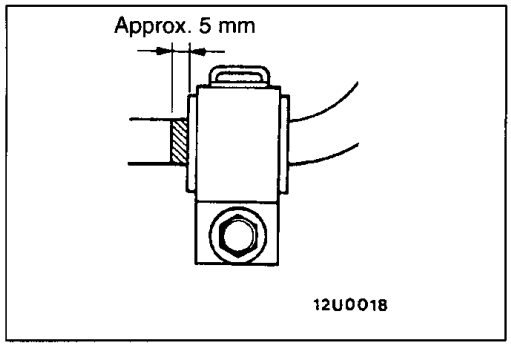
Removal steps
1. Stabilizer link
2. Fixture
▶B◀ 3. Bushing
▶B◀ 4. Stabilizer bar
▶A◀ 5. Stabilizer bracket



INSTALLATION SERVICE POINTS

▶A◀ STABILIZER BRACKET INSTALLATION

Because the left and right installation positions of the fixtures are different, be careful not to make a mistake when installing the stabilizer bracket.



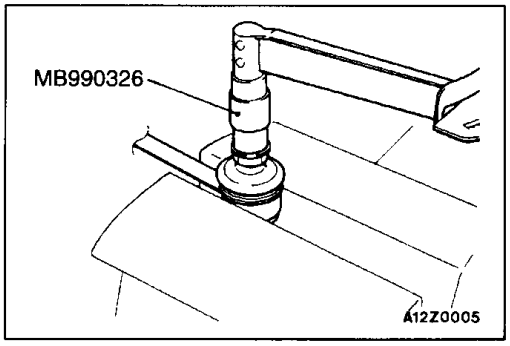
▶B◀ STABILIZER BAR/BUSHING INSTALLATION

Place the identification mark of the stabilizer bar to the right, and install the bushing so that the identification mark protrudes approximately 5 mm from the edge of the inside of the bushing.

INSPECTION

34100570058

- Check the bushing for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check the stabilizer link ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



STABILIZER LINK BALL JOINT TURNING TORQUE INSPECTION

(1) Shake the stabilizer link ball joint stud several times before installing the nut to the stud. Then use the special tool to measure the turning torque of the stabilizer link ball joint.

Standard value: 1.7–3.1 Nm

(2) If the turning torque exceeds the standard value, replace the stabilizer link.
(3) If the turning torque is lower than the standard value, check that the ball joint does not feel stiff. If it doesn't feel stiff, it is possible to use the ball joint.

STABILIZER LINK DUST COVER REPLACEMENT

Refer to GROUP 33A.

SERVICE BRAKES

CONTENTS

35109000081

BASIC BRAKE SYSTEM 35A

ANTI-SKID BRAKING SYSTEM (ABS) 35B

BASIC BRAKE SYSTEM

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35109000074

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- Front Disc Brake Pad Check and Replacement 11
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FRONT DISC BRAKE 20

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Wheel Cylinder 24

PROPORTIONING VALVE 25

GENERAL INFORMATION

35100010052

The brake system offers high dependability and durability along with improved braking performance and brake sensitivity.

MASTER CYLINDER

Type	Tandem type
I.D. mm	22. 22

BRAKE BOOSTER

Type	Vacuum type, single
Effective dia. of power cylinder mm	225
Boosting ratio	5.0

PROPORTIONING VALVE

Decompression ratio	0.25

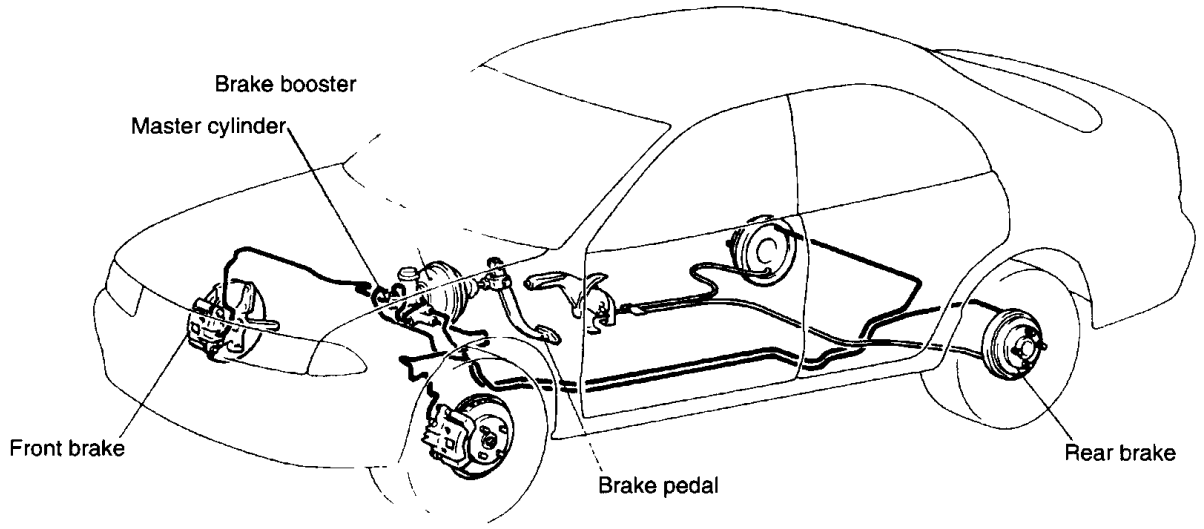
FRONT BRAKES

Items	1600	1800
Type	Ventilated disc	Ventilated disc
Disc effective dia. × thickness mm	190.8 × 18	211.0 × 24
Wheel cylinder I.D. mm	53.97	53.97
Pad thickness mm	10.0	10.0
Clearance adjustment	Automatic	Automatic

REAR DRUM BRAKE

Type	Leading trailing
Drum I.D. mm	203
Wheel cylinder I.D. mm	19.05
Lining thickness mm	4.4
Clearance adjustment	Automatic

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

35100030058

Items			Standard value	Limit
Brake pedal height mm	L.H. drive vehicles		163.5–166.5	–
	R.H. drive vehicles		162.5–165.5	–
Brake pedal free play mm			3–8	–
Brake pedal to floor board clearance mm			80	–
Proportioning valve	Split point MPa	1600	3.43 ± 0.25	–
		1800	3.92 ± 0.25	–
	Output fluid pressure (Input fluid pressure) MPa	1600	5.03 ± 0.4 (9.81)	–
		1800	5.39 ± 0.4 (9.81)	–
	Output fluid pressure difference between left and right MPa		–	0.8
Brake booster push rod to master cylinder piston clearance mm			0.6–0.8	–
Front disc brake	Pad thickness mm		10.0	2.0
	Disc thickness mm	1600	18.0	16.4
		1800	24.0	22.4
	Disc runout mm		–	0.07
	Drag force (tangential force of wheel mounting bolts) N		40 or less	–

Items		Standard value	Limit
Rear drum brake	Lining thickness mm	4.4	1.0
	Drum inside diameter mm	203	205

LUBRICANTS

35100040044

Items	Specified Lubricant
Brake fluid	DOT3 or DOT4
Wheel cylinder body inner surfaces	Repair kit grease
Rear brake shoe and backing plate contact surfaces	Brake grease SAE J310, NLGI No.1
Shoe assembly and auto adjuster assembly contact surfaces	
Shoe and lever assembly and auto adjuster assembly contact surfaces	

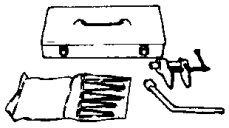
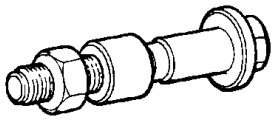
SEALANTS

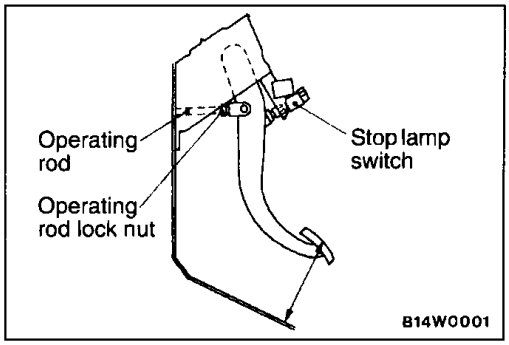
35100050047

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Shoe hold-down pin	3M ATD Part No. 8513 or equivalent	Drying sealant

SPECIAL TOOLS

35100060040

Tool	Number	Name	Use
	MB990964 MB990520 MB990773	Brake tool set	Pushing-in of the disc brake piston Installation of drum brake wheel cylinder piston cup
	MB990998	Front hub remover and installer	Provisional holding of the wheel bearing



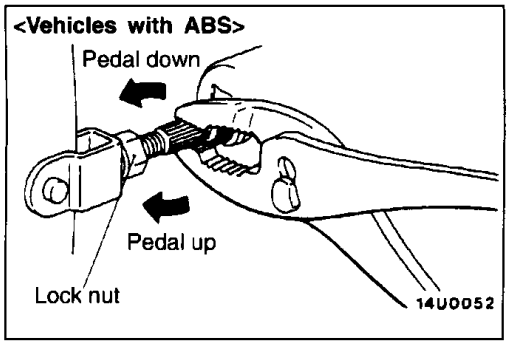
ON-VEHICLE SERVICE

35100090049

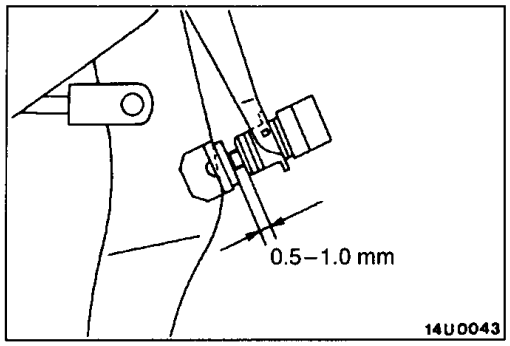
BRAKE PEDAL CHECK AND ADJUSTMENT

1. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, adjust or replace.

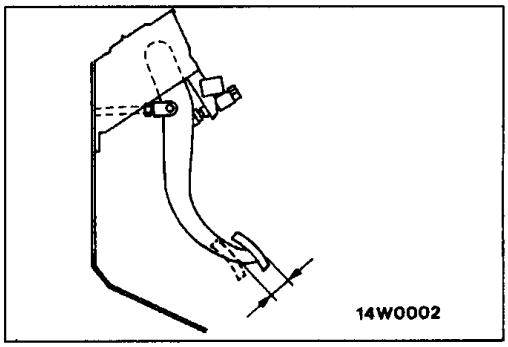
   Standard value:
   <L.H. drive vehicles> 163.5–166.5 mm
   <R.H. drive vehicles> 162.5–165.5 mm

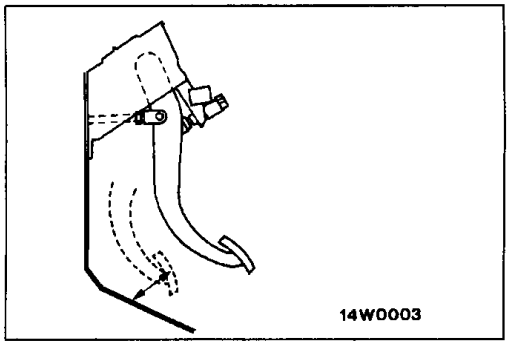


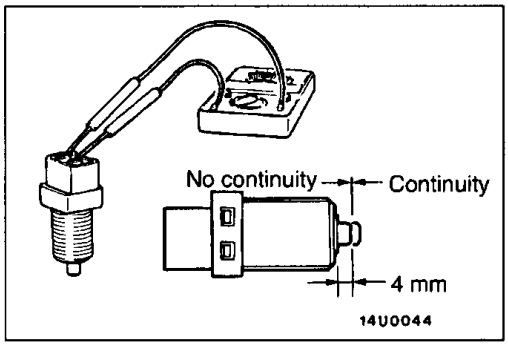
(1) Disconnect the stop lamp switch connector.
(2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained. <Vehicles with ABS>
(3) Secure by tightening the lock nut of the operating rod. <Vehicles with ABS>



(4) Push the stop lamp switch in the direction of the pedal stroke until it stops. (The switch will slide if it is pushed firmly.)
(5) Lift up the pedal until the operating rod is fully extended, and then slide the stop lamp switch back to the required position. Adjust the position of the switch by turning it until the distance shown in the illustration is correct.
(6) Connect the connector of the stop lamp switch.
(7) Check that the stop lamp is not illuminated with the brake pedal unpressed.







2. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.

   Standard value: 3–8 mm

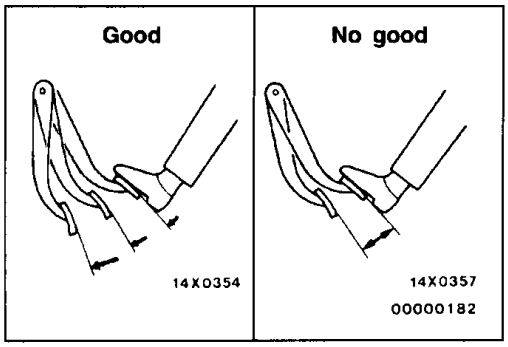
   If the free play exceeds the standard value, it is probably due to excessive play between the retaining ring bolt and brake pedal arm.
   Check for excessive clearance and replace faulty parts as required.
3. Start the engine, depress the brake pedal with approximately 490 N of force, and measure the clearance between the brake pedal and the floorboard.

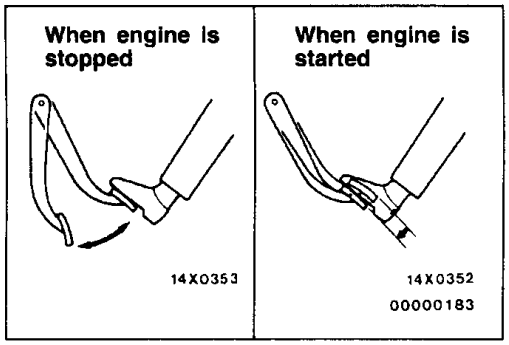
   Standard value: 80 mm or more

   If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake.
   Adjust and replace defective parts as required.

STOP LAMP SWITCH CHECK 35100890045

Connect a circuit tester to the stop lamp switch, 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 35100100049

For simple checking of the brake booster operation, carry out the following tests:

1. Run the engine for one or two minutes, and then stop it.
   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.

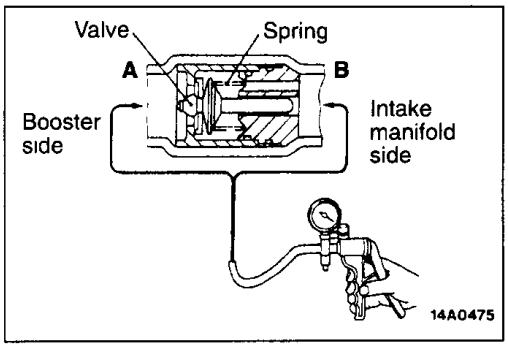
2. With the engine stopped, step on the brake pedal several times.
   Then step on the brake pedal and start the engine.
   If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.

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.
   If the above three tests are okay, the booster performance can be determined as good.
   If one of the above three tests is not okay at last, the check valve, vacuum hose, or booster will be defective.

CHECK VALVE OPERATION CHECK 35100900052

1. Remove the vacuum hose. (Refer to P.35A-17.)

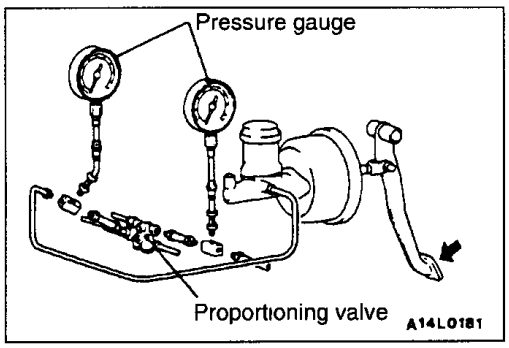
   Caution
   - **The check valve should not be removed from the vacuum hose.**

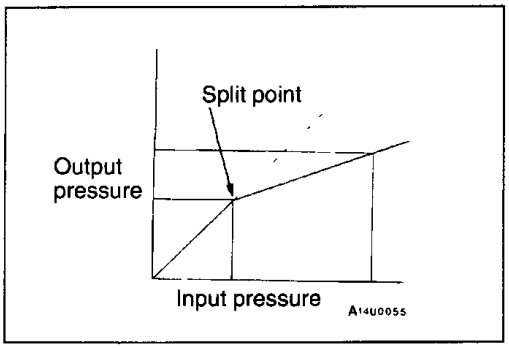


2. Check the operation of the check valve by using a vacuum pump.

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 unit together with the vacuum hose.





PROPORTIONING VALVE FUNCTION TEST

35100110059

1. Connect two pressure gauges, one each to the input side and output side of the proportioning valve, as shown.
2. Bleed the air in 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:

MPa

1600	1800
3.43 ± 0.25	3.92 ± 0.25

(2) Check to be sure that the output fluid pressure is at the standard value when the pedal depression force is increased so that the input fluid pressure is at the values shown in the table below.

Standard value:

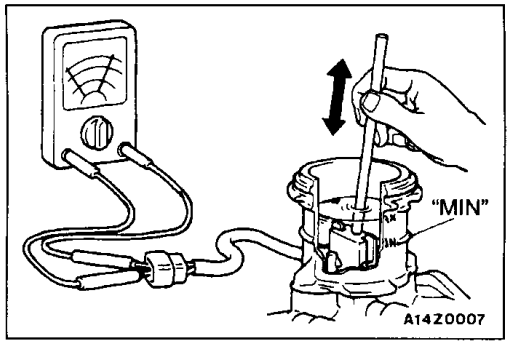
MPa

	1600	1800
Output fluid pressure (Input fluid pressure)	5.03 ± 0.4 (9.81)	5.39 ± 0.4 (9.81)

(3) Output pressure difference between left and right brake lines.

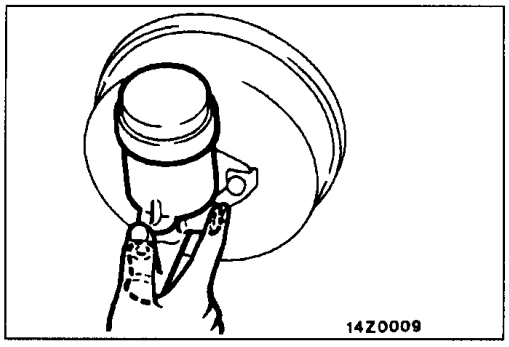
Limit: 0.8 MPa

4. If the measured pressures are not within the permissible ranges, replace the proportioning valve.



BRAKE FLUID LEVEL SENSOR CHECK 35100910048

The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "MIN" and if there is continuity when the float surface is below "MIN".



BLEEDING 35100140041

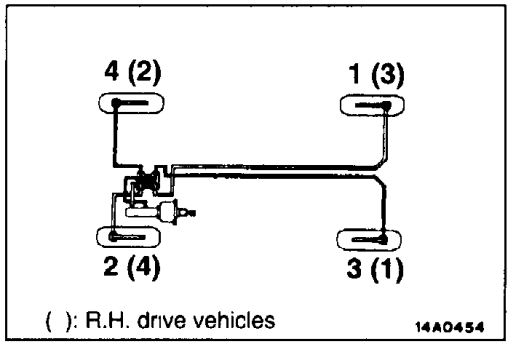
Caution
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING

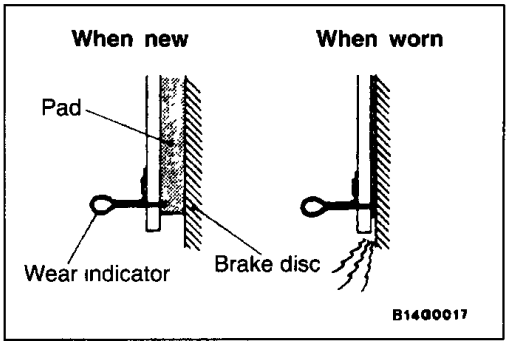
The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

(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 steps2.–4. three or four times to fill the inside of the master cylinder with brake fluid.



BRAKE PIPE LINE BLEEDING

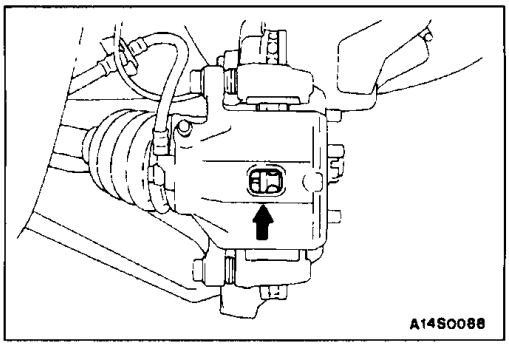
Bleed the air in the sequence shown in the figure.



FRONT DISC BRAKE PAD CHECK AND REPLACEMENT

35100150044

NOTE
The brake pads have wear indicators that contact the brake disc when the brake pad thickness becomes 2 mm and emit a squealing sound to warn the driver.

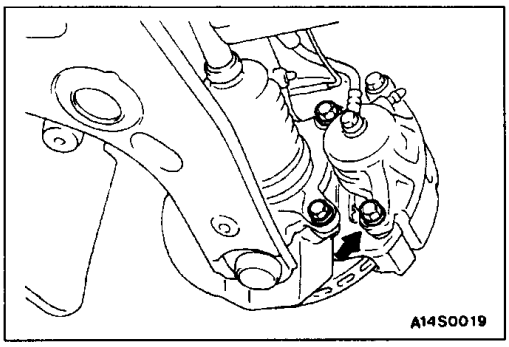


1. Check brake pad thickness through caliper body check port.

   Standard value: 10 mm

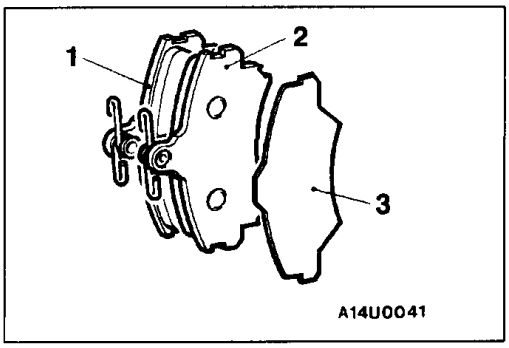
   Limit: 2.0 mm

   Caution
   1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
   2. **If there is a significant difference in the thickness of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**



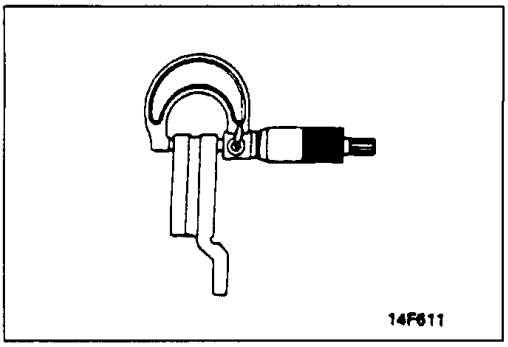
2. Remove lock pin. Lift caliper assembly and retain with wires.

   Caution
   Do not wipe off the special grease that is on the lock pin or allow it to contaminate the lock pin.



3. Remove the following parts from caliper support.
   1. Pad & wear indicator assembly
   2. Pad assembly
   3. Outer shim

4. In order to measure the brake drag torque after pad installation, measure the rotary-sliding resistance of the hub (A) with the pads removed. (Refer to P.35A-20.)
5. Install the pads and the caliper assembly, and then check the brake drag torque. (Refer to P.35A-20.)



BRAKE DISC THICKNESS CHECK 35100160047

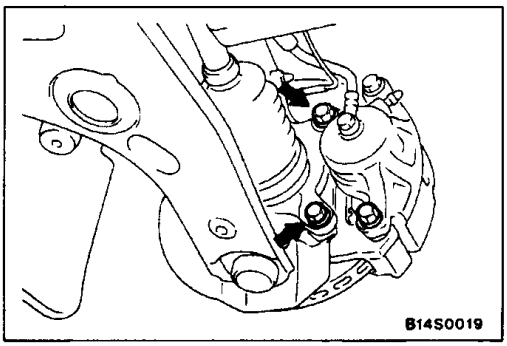
1. Using a micrometer, measure disc thickness at eight positions, approximately 45° apart and 10 mm in from the outer edge of the disc.

   Brake disc thickness

   Standard value:
   <1600> 18.0 mm
   <1800> 24.0 mm

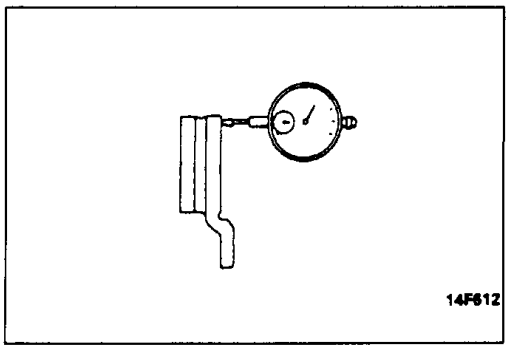
   Limit:
   <1600> 16.4 mm
   <1800> 22.4 mm

   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 on the car type brake lathe ("MAD, DL-8700PF" or equivalent).



BRAKE DISC RUN-OUT CHECK 35100170040

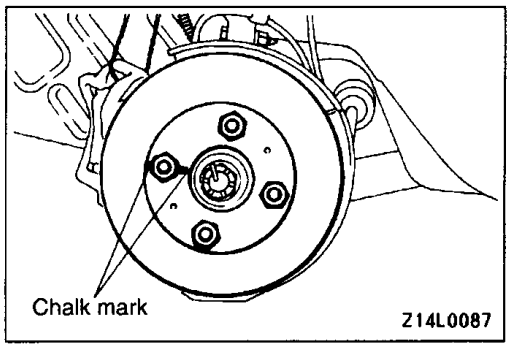
1. Remove the caliper support; then raise the caliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.



3. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the run-out of the disc.

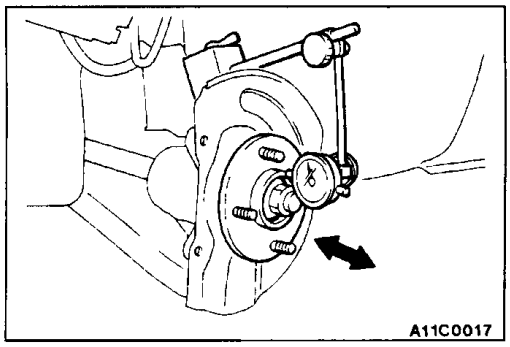
   Limit: 0.07 mm or less

   NOTE
   Tighten the nuts in order to secure the disc to the hub.



BRAKE DISC RUN-OUT CORRECTION 35100180043

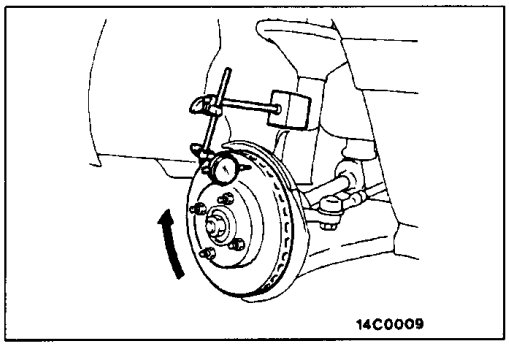
1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.
   (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.



   (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.

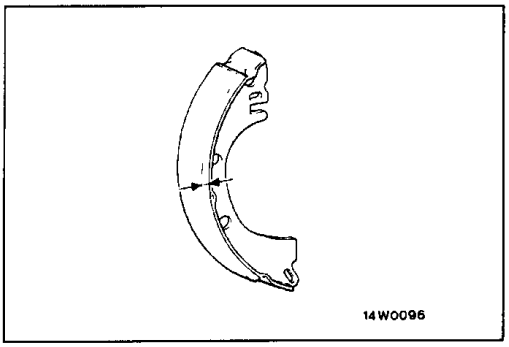
   Limit: 0.05 mm

   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 disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF or equivalent).



BRAKE LINING THICKNESS CHECK 35100300050

1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

   Standard value: 4.4 mm

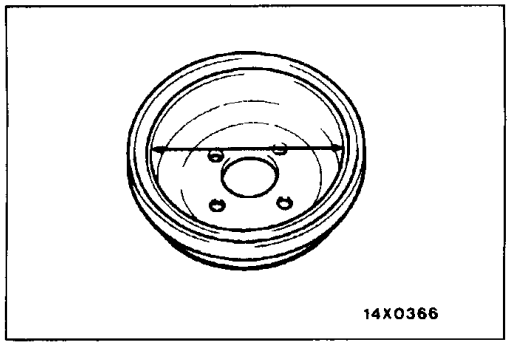
   Limit: 1.0 mm

   Replace the shoe and lining assembly if brake lining thickness is less than the limit if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35A-22.

   Caution

   1. Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent car from pulling to one side when braking.

2. **If there is a significant difference in the thickness of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.**



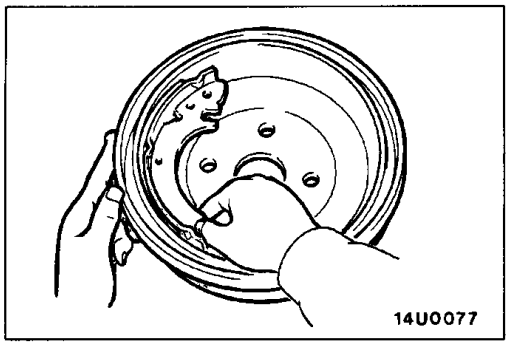
BRAKE DRUM INSIDE DIAMETER CHECK

35100320049

1. Remove the brake drum.
2. Measure the inside diameter of the brake drum at two or more locations.

   Standard value: 203 mm

   Limit: 205 mm
3. Replace brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.



BRAKE LINING AND BRAKE DRUM CONNECTION CHECK

35100310053

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35A-22.)
3. Chalk inner surface of brake drum and rub with shoe and lining assembly.
4. Replace shoe and lining assembly or brake drums if there are any irregular contact area.

   NOTE
   Clean off chalk after check.

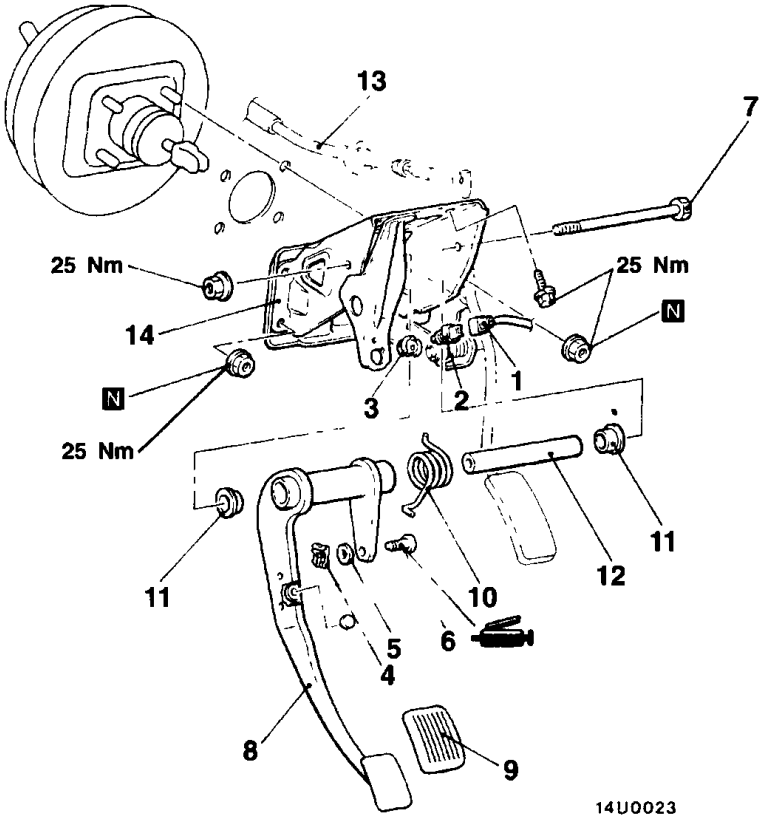
BRAKE PEDAL

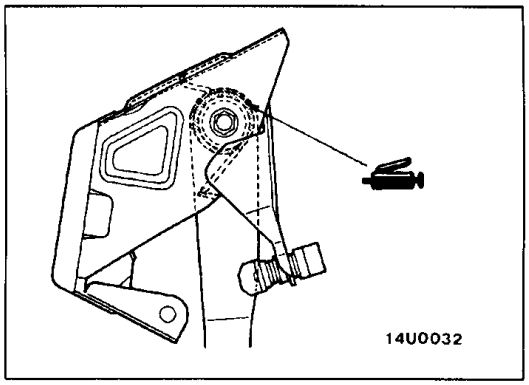
35100340076

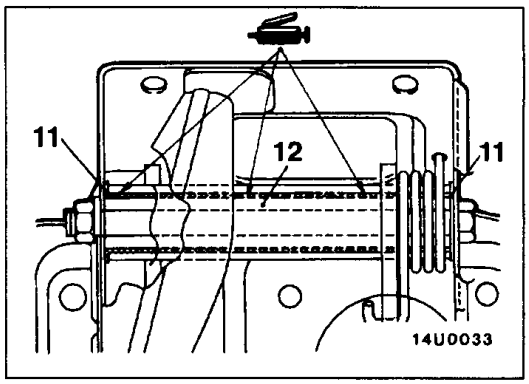
REMOVAL AND INSTALLATION <L.H. drive vehicles>

Pre-removal Operation
- Instrument Under Cover Removal (Refer to GROUP 52A – Instrument Panel.)
- Steering Column Assembly Removal (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Relay Box Removal

Post-installation Operation
- Relay Box Installation
- Steering Column Assembly Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Instrument Under Cover Installation (Refer to GROUP 52A – Instrument Panel.)
- Brake Pedal Adjustment (Refer to P.35A-6.)







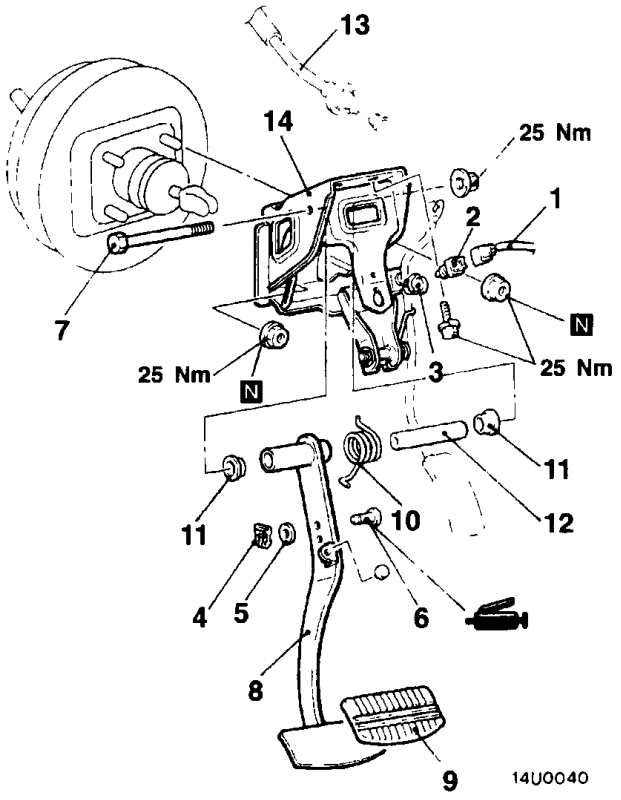
00003579

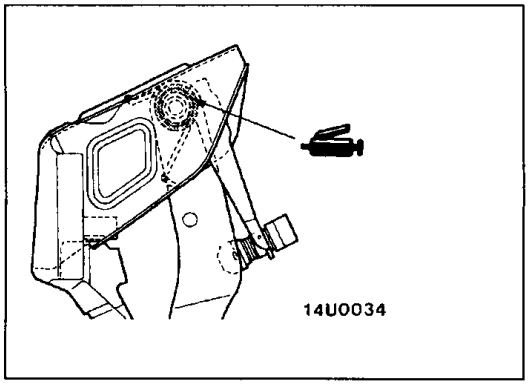
Removal steps
1. Stop lamp switch connector
2. Stop lamp switch
3. Ring
4. Retaining clip
5. Washer
6. Retaining ring bolt
7. Brake pedal shaft bolt
8. Brake pedal
9. Brake pedal pad
10. Brake pedal return spring
11. Bushing
12. Pipe
13. Accelerator cable connection
14. Pedal support member

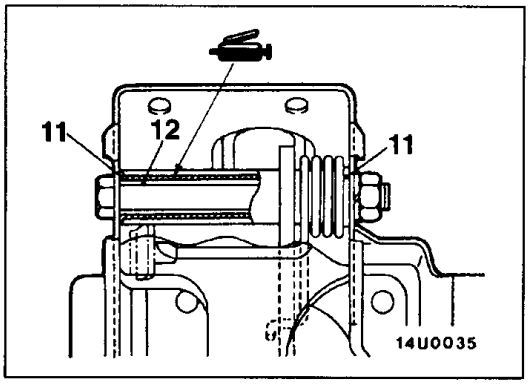
REMOVAL AND INSTALLATION <R.H. drive vehicles>

Pre-removal Operation
- Instrument Under Cover Removal (Refer to GROUP 52A – Instrument Panel.)
- Steering Column Assembly Removal (Refer To GROUP 37A – Steering Wheel and Shaft.)
- Relay Box Removal

Post-installation Operation
- Relay Box Installation
- Steering Column Assembly Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Instrument Under Cover Installation (Refer to GROUP 52 – Instrument Panel.)
- Brake Pedal Adjustment (Refer to P.35A-6.)







00003580

Removal steps
1. Stop lamp switch connector
2. Stop lamp switch
3. Ring
4. Retaining clip
5. Washer
6. Retaining ring bolt
7. Brake pedal shaft bolt
8. Brake pedal
9. Brake pedal pad
10. Brake pedal return spring
11. Bushing
12. Pipe
13. Accelerator cable connection
14. Pedal support member

MASTER CYLINDER AND BRAKE BOOSTER

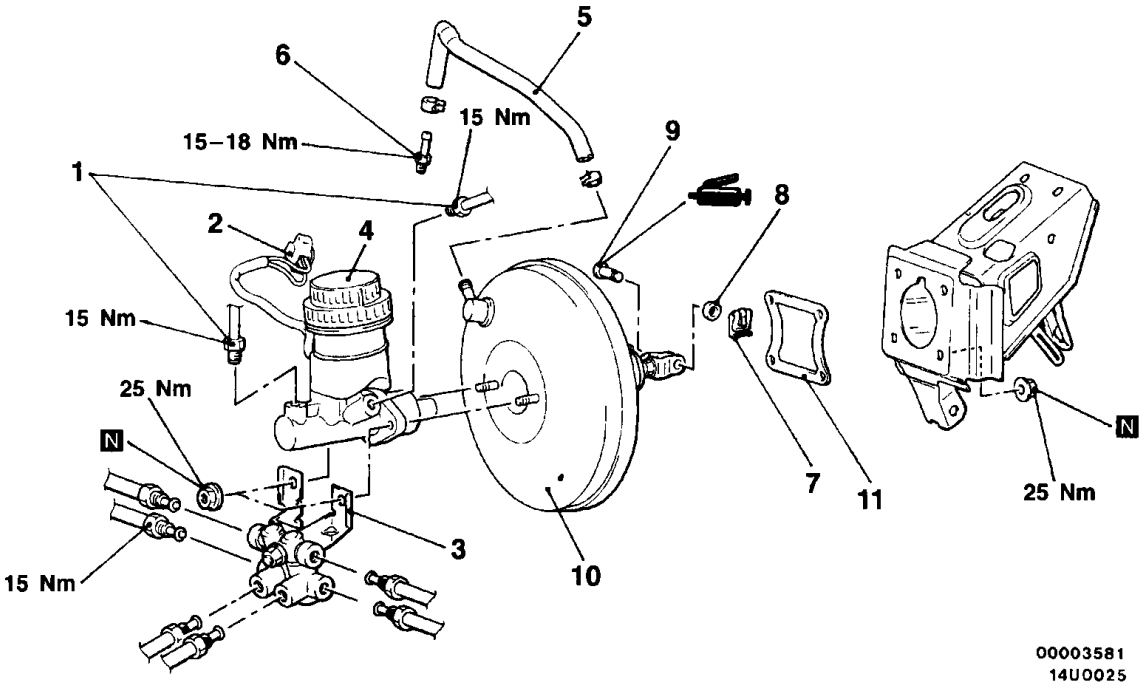
35100370068

REMOVAL AND INSTALLATION

<L.H. drive vehicles>

Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-9.)
- Brake Pedal Adjustment (Refer to P.35A-6.)



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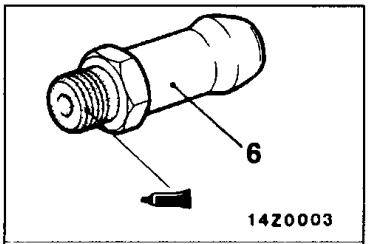


Sealant: 3M ATD Part No. 8661 or equivalent

Removal steps

1. Brake pipe connection
2. Brake fluid level sensor connector
3. Proportioning valve bracket
4. Master cylinder assembly

▶B◀ • Clearance adjustment between brake booster push rod and primary piston

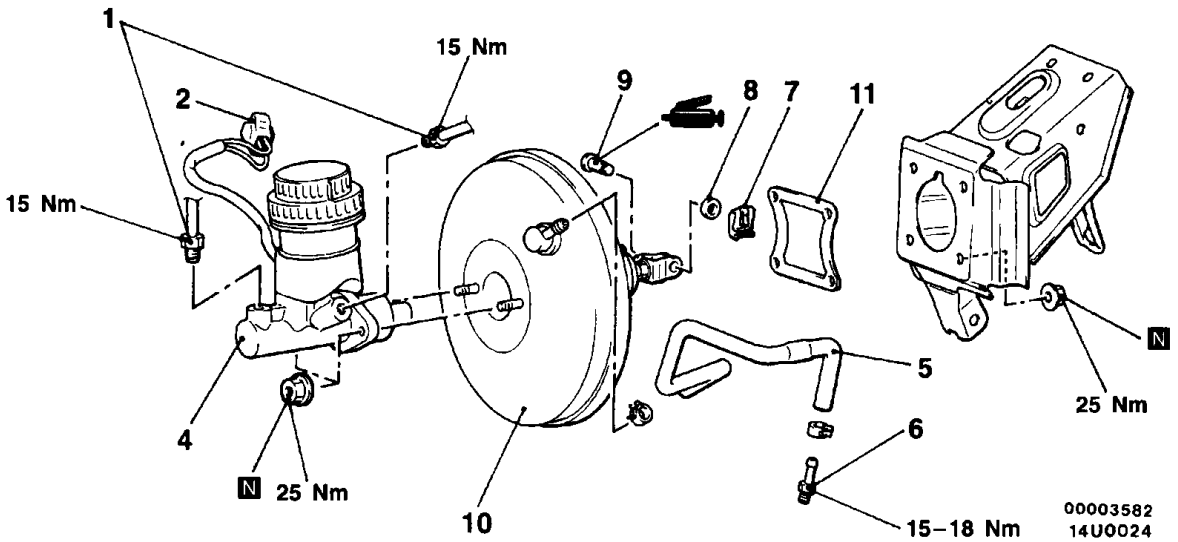
▶A◀ 5. Vacuum hose (With built-in check valve)

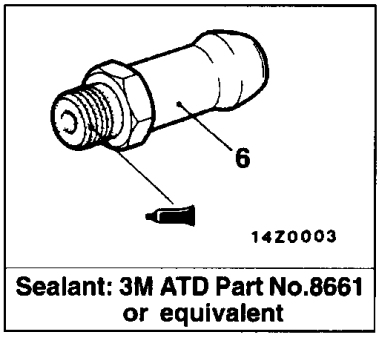
6. Fitting
7. Retaining clip
8. Washer
9. Retaining ring bolt
10. Brake booster
11. Sealer

<R.H drive vehicles>

Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-9.)
- Brake Pedal Adjustment (Refer to P.35A-6.)





Sealant: 3M ATD Part No.8661 or equivalent

Removal Steps

1. Brake pipe connection
2. Brake fluid level sensor connector
4. Master cylinder assembly

▶B◀ • Clearance adjustment between brake booster push rod and primary piston

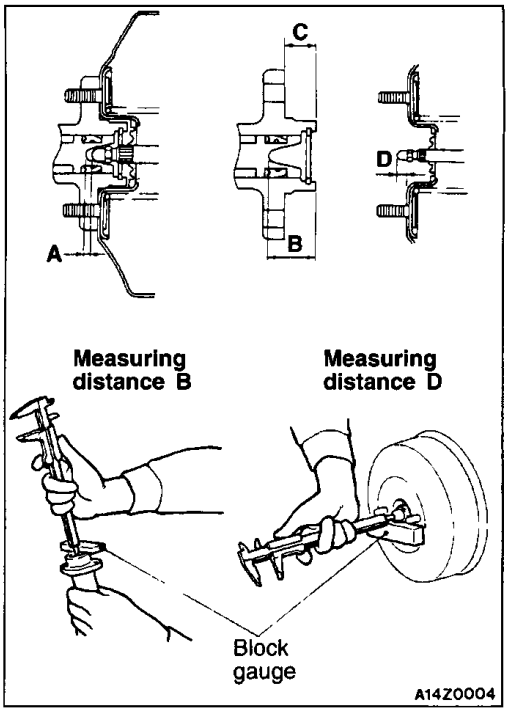
▶A◀ 5. Vacuum hose (With built-in check valve)

6. Fitting
7. Retaining clip
8. Washer
9. Retaining ring bolt
10. Brake booster
11. Sealer

INSTALLATION SERVICE POINTS

▶A◀ VACUUM HOSE CONNECTION

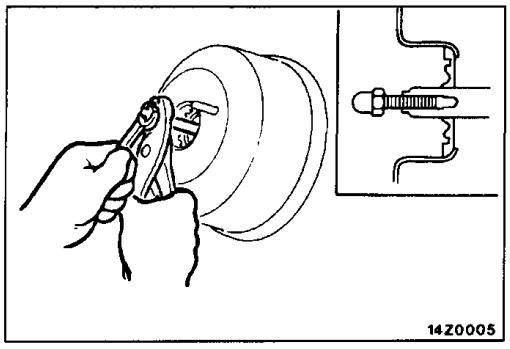
Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.



▶B◀ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

Calculate clearance A from the B, C and D measurements.
A = B – C – D

Standard value: 0.6–0.8 mm



If the clearance is not within the standard value range, adjust by changing the push rod length by turning the screw of the push rod.

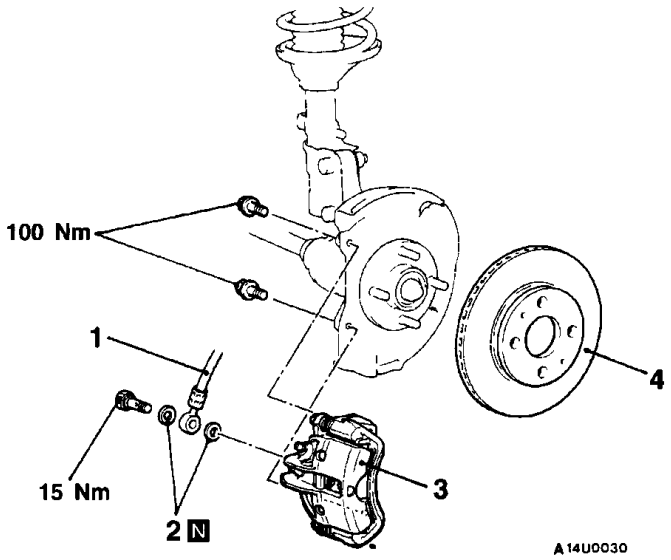
FRONT DISC BRAKE

35100600051

REMOVAL AND INSTALLATION

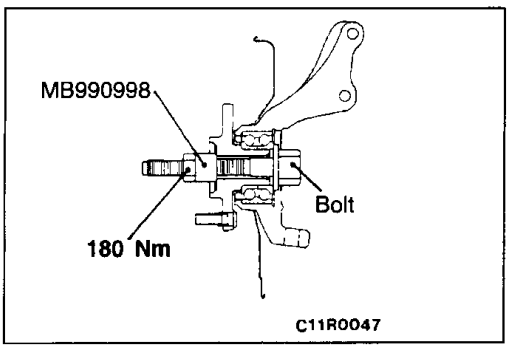
Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-9.)



Removal steps

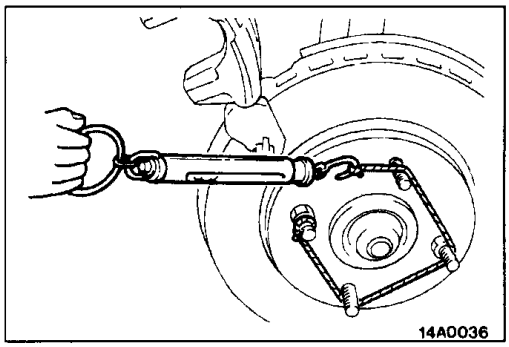
1. Brake hose connection
2. Gasket
▶A◀ 3. Disc brake assembly
4. Brake disc



INSTALLATION SERVICE POINT

▶A◀ DISC BRAKE ASSEMBLY INSTALLATION

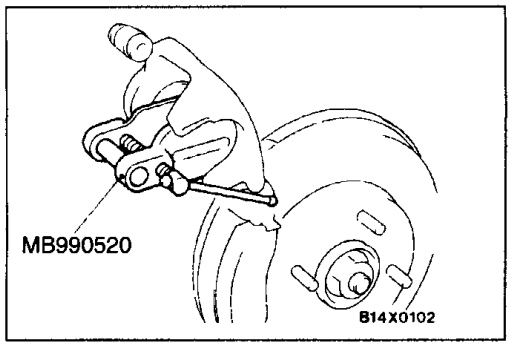
1. In order to measure the brake drag torque after pad installation, measure the rotary-sliding resistance of the hub (A) by the following procedure with the pads removed.
   (1) Remove the drive shaft. (Refer to GROUP 26 – Front Axle.)
   (2) Attach the special tool to the front hub assembly as shown in the illustration, and tighten it to the specified torque.
   (3) Use a spring balance to measure the rotary-sliding resistance of the hub in the forward direction.



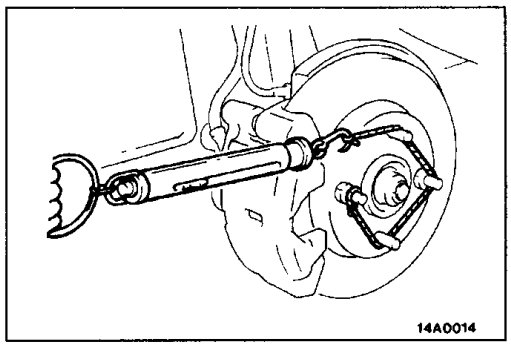
2. After installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.

Caution

- **Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.**



3. Clean piston and insert into cylinder with special tool.
4. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the lock pin.
5. Check brake drag torque as follows.
   (1) Start the engine and then depress the brake pedal 2-3 times.
   (2) Stop engine.
   (3) Turn brake disc forward 10 times.



6. Check hub torque (B) with spring balance.
7. Calculate the drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

   Standard value: 40 N or less

8. If the difference between brake drag torque and hub torque exceeds the standard value, replace the disc brake assembly.

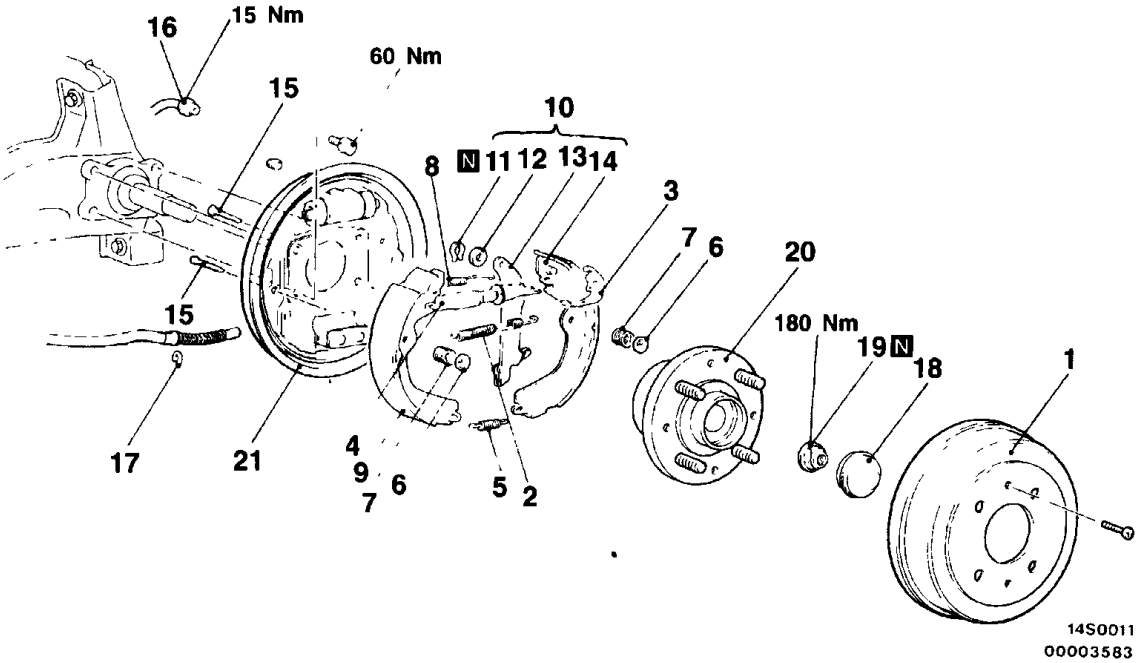
REAR DRUM BRAKE

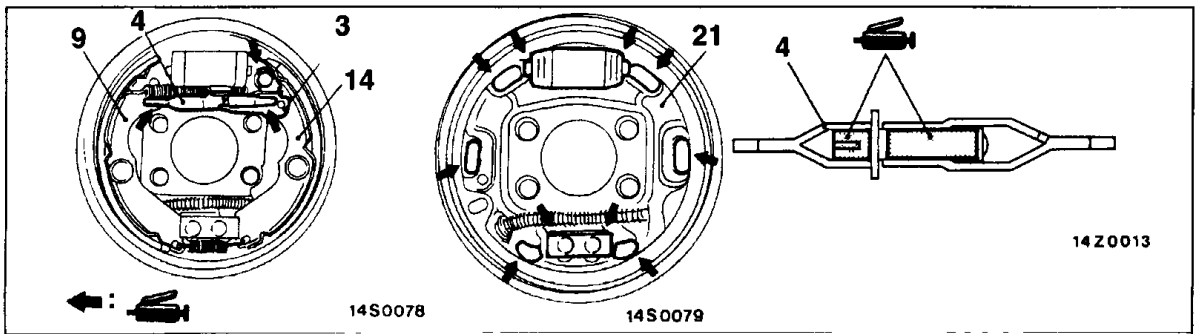
35100750053

REMOVAL AND INSTALLATION

Pre-removal Operation
- Loosening the Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-installation Operation
- Brake Line Bleeding (Refer to P.35A–9.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – On-vehicle Service.)





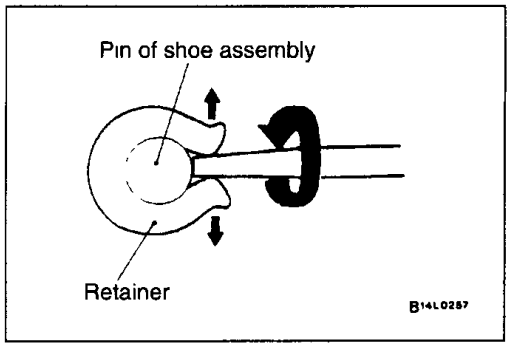
Specified grease: Brake grease SAE J310, NLGI No.1

Rear drum brake removal steps

1. Brake drum
2. Shoe-to-lever spring
3. Adjuster lever
4. Auto adjuster assembly
5. Retainer spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe-to-shoe spring
9. Shoe and lining assembly
10. Shoe, lining and lever assembly

◀A▶ ▶B◀ 11. Retainer

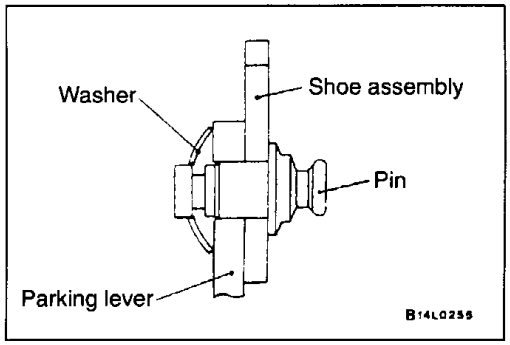
▶A◀ 12. Wave washer
13. Parking lever
14. Shoe and lining assembly
15. Shoe hold-down pin
16. Brake pipe connection
17. Snap ring
18. Hub cap
19. Flange nut
20. Rear hub assembly
21. Backing plate



REMOVAL SERVICE POINT

◀A▶ RETAINER REMOVAL

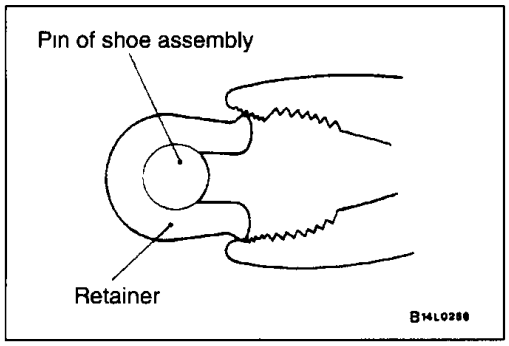
Use a flat-tipped screwdriver or the like to open up the retainer joint, and remove retainer.



INSTALLATION SERVICE POINTS

▶A◀ WAVE WASHER INSTALLATION

Install the washer in the direction shown in the illustration.

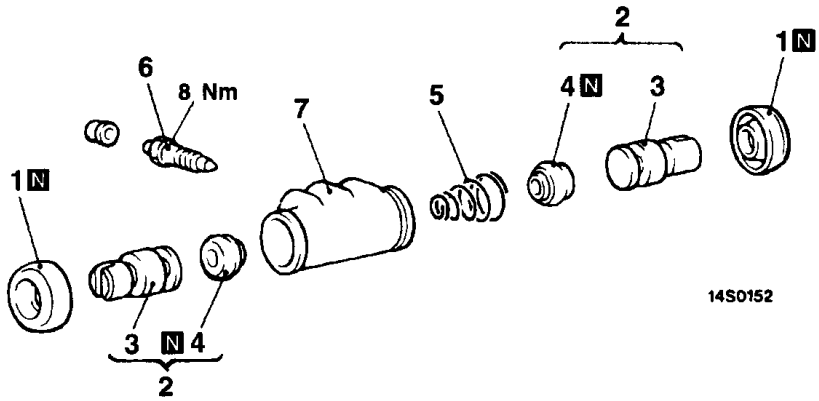


▶B◀ RETAINER INSTALLATION

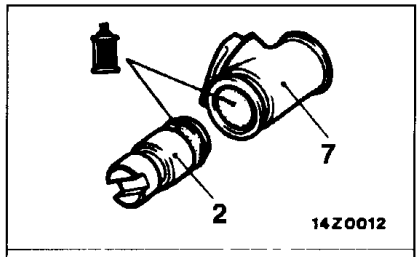
Use pliers or the like to install the retainer or the pin positively.

WHEEL CYLINDER
DISASSEMBLY AND REASSEMBLY

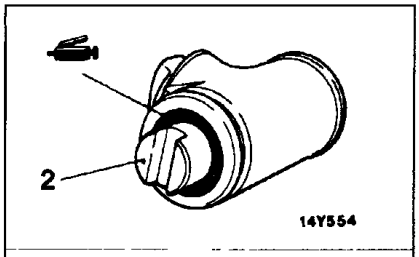
35100770042



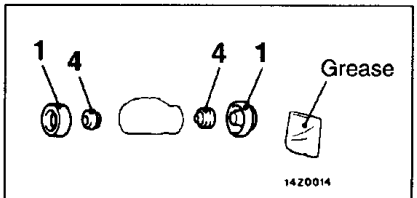
00003584



Brake fluid: DOT3 or DOT4



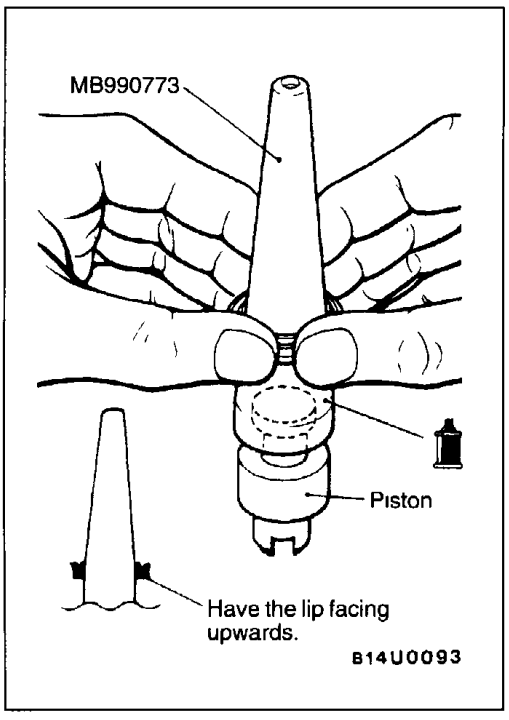
Grease: Repair kit grease



Wheel cylinder repair kit

Disassembly steps

1. Boots
2. Piston assembly
3. ▶A◀ Pistons
4. ▶A◀ Piston cups
5. Spring
6. Bleeder
7. Wheel cylinder body



REASSEMBLY SERVICE POINT

▶A◀ PISTON CUP/PISTON REASSEMBLY

(1) Use alcohol or specified brake fluid to clean the wheel cylinder and the piston.

(2) Apply the specified brake fluid to the piston cups and the special tool.

Specified brake fluid: DOT3 or DOT4

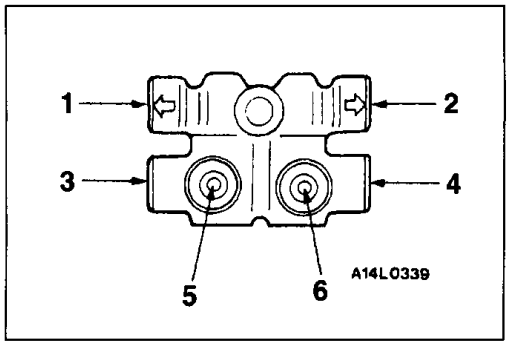
(3) Set the piston cup on the special tool with the lip of the cup facing up, fit the cup onto the special tool, and then slide it down the outside of the tool into the piston groove.

Caution
In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down the tool slowly and carefully, without stopping.

INSPECTION

35100780038

Check the piston and wheel cylinder walls for rust or damage, and if there is any abnormality, replace the entire wheel cylinder assembly.



PROPORTIONING VALVE

35100570055

INSTALLATION SERVICE POINT

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 – Front brake (R.H.)
4. Proportioning valve – Front brake (L.H.)
5. Proportioning valve – Master cylinder (secondary)
6. Proportioning valve – Master cylinder (primary)

ANTI-SKID BRAKING SYSTEM (ABS) <2WD>

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35209000053

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

Stop Lamp Switch Check ..... Refer to GROUP 35A

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

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) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must throughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before begining any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

Proportioning Valve Function Test 20
Brake Fluid Level Sensor Check ..... Refer to GROUP 35A
Bleeding 21
Rear Disc Brake Pad Check and Replacement 22
Brake Disc Run-out Check 23
Brake Disc Run-out Correction 23
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BRAKE PEDAL ..... Refer to GROUP 35A

MASTER CYLINDER AND BRAKE BOOSTER 28

FRONT DISC BRAKE ..... Refer to GROUP 35A

REAR DISC BRAKE 31

PROPORTIONING VALVE 36

HYDRAULIC UNIT* 37

WHEEL SPEED SENSOR 39

GENERAL INFORMATION

35200010055

The ABS consists of components such as the wheel speed sensors, stop lamp switch, hydraulic unit assembly (integrated with the ABS-ECU) and the ABS warning lamp. If a problem occurs in the system, the malfunctioning component can be identified and the trouble symptoms will be memorized by the diagnosis function.
In addition, reading of diagnosis codes and service data and actuator testing are possible by using the MUT-II.

MASTER CYLINDER

Type	Tandem type
I.D. mm	23.81

BRAKE BOOSTER

Type	Vacuum type, tandem
Effective dia. of power cylinder mm	190±217
Boosting ratio	6.0

PROPORTIONING VALVE

Decompression ratio	0.25

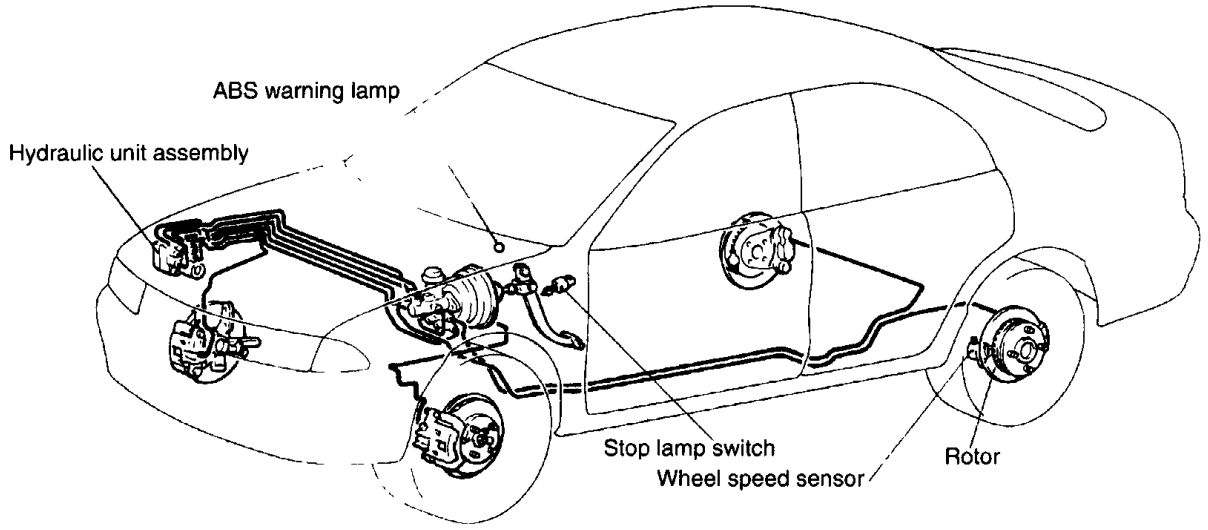
REAR DISC BRAKE

Item	1600	1800
Type	Solid disc	Solid disc
Disc effective dia.xthickness mm	200.0x10	224.0x10
Wheel cylinder I.D. mm	34.92	34.92
Pad thickness mm	9.5	9.5
Clearance adjustment	Automatic	Automatic

WHEEL SPEED SENSOR

Type	Magnet coil type
Rotor teeth	43

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

35200030051

Items			Standard value	Limit
Proportioning valve	Split point MPa	1600	3.92±0.25	–
		1800	3.43±0.25	–
	Output fluid pressure MPa (Input fluid pressure MPa)	1600	5.39±0.4 (9.81)	–
		1800	5.03±0.4 (9.81)	–
	Output fluid pressure difference between left and right MPa		–	0.8
Rear disc brake	Pad thickness mm		9.5	2.0
	Disc thickness mm		10.0	8.4
	Disc runout mm		–	0.08
	Drag force (tangential force of wheel mounting bolts) N		20 or less	–
Booster push rod to master cylinder piston clearance mm			0.4–0.6	–
Wheel speed sensor's internal resistance kΩ			1.28–1.92	–
Wheel speed sensor insulation resistance kΩ			100 or more	–

LUBRICANTS

35200040016

Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease
Guide pin boot inner surfaces	
Lock pin boot inner surfaces	
Piston boot mounting grooves	
Brake piston boot inner surfaces	
Pad assembly and shim contact surfaces	
Lock pin sleeve	

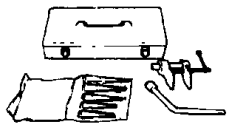
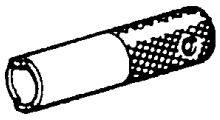
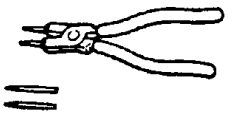
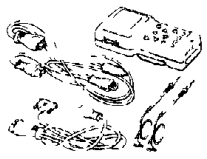
SEALANT

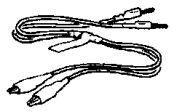
35200050033

Item	Specified sealant	Remark
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant

SPECIAL TOOLS

35200060050

Tool	Number	Name	Use
	MB990964 MB990520	Brake tool set	Pushing-in of the disc brake piston
	MB990652	Rear disc brake piston driver	Pressing of the rear disc brake pistons
	MB991041	Snap ring pliers	Removal of the rear disc brake circlips
	MB991502	MUT-II sub assembly	For checking of ABS (Diagnosis code display when using the MUT-II)

Tool	Number	Name	Use
	MB991529	Diagnosis code check harness	For checking of ABS (Diagnosis code display when using the ABS warning lamp)

TROUBLESHOOTING

35200070039

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

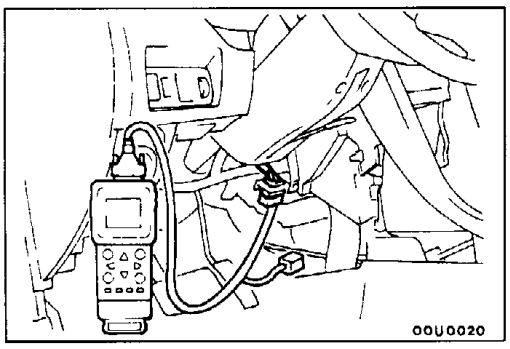
Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.

NOTES WITH REGARD TO DIAGNOSIS

The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation of phenomenon
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this is because the system operation check is being performed, and is not an abnormality.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operation. (whine) 2. Sound is the 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 too overconfident.

Diagnosis detection condition can vary depending on the diagnosis code.
Make sure that checking requirements listed in the "Comment" are satisfied when checking the trouble symptom again.



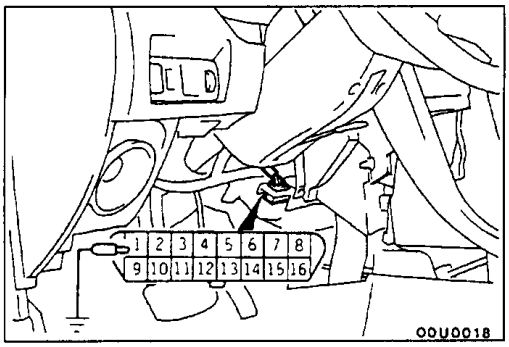
DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

With the MUT-II

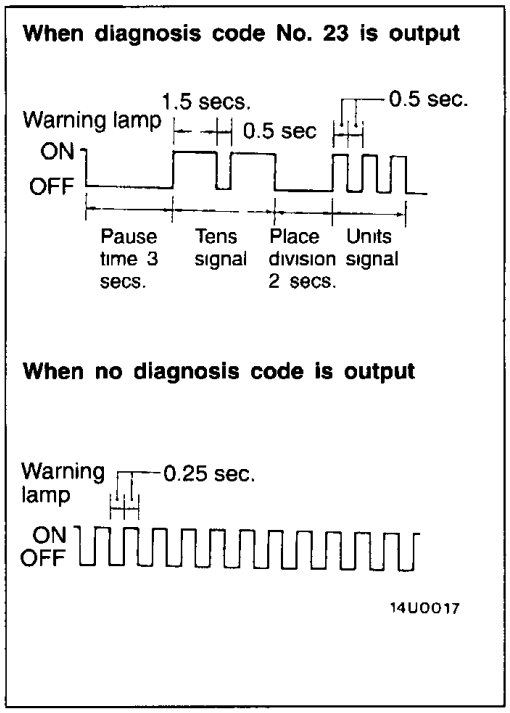
Connect the MUT-II to the diagnosis connector (16-pin), then check diagnosis codes.

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



Without the MUT-II

1. Use the special tool to earth diagnosis connector terminal No. 1.

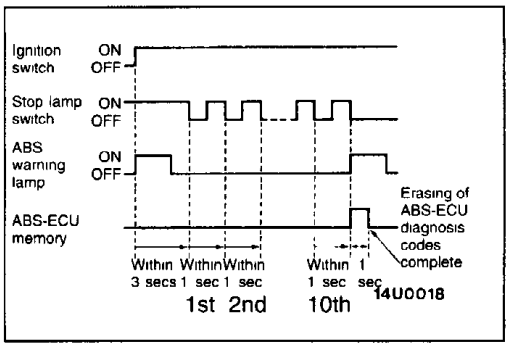


2. Turn the ignition switch to ON and then take a reading of the diagnosis codes from the flashing of the ABS warning lamp.

ERASING DIAGNOSIS CODES

With the MUT-II

Connect the MUT-II to the diagnosis connector (16-pin), then erase the diagnosis codes.



Without the MUT-II

The diagnosis codes can only be erased by operating the brake switch ten times according to the pattern shown in the illustration at left while the ABS is active and while driving at a speed of 10 km/h or less.

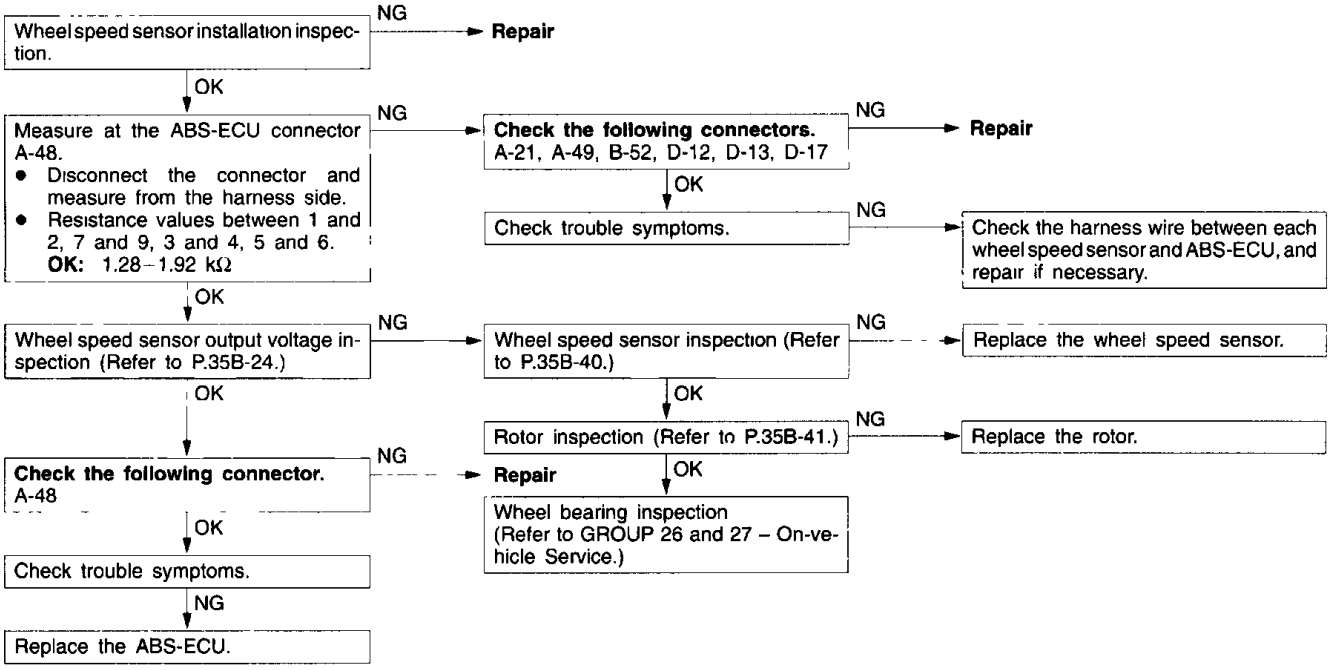
INSPECTION CHART FOR DIAGNOSIS CODES

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

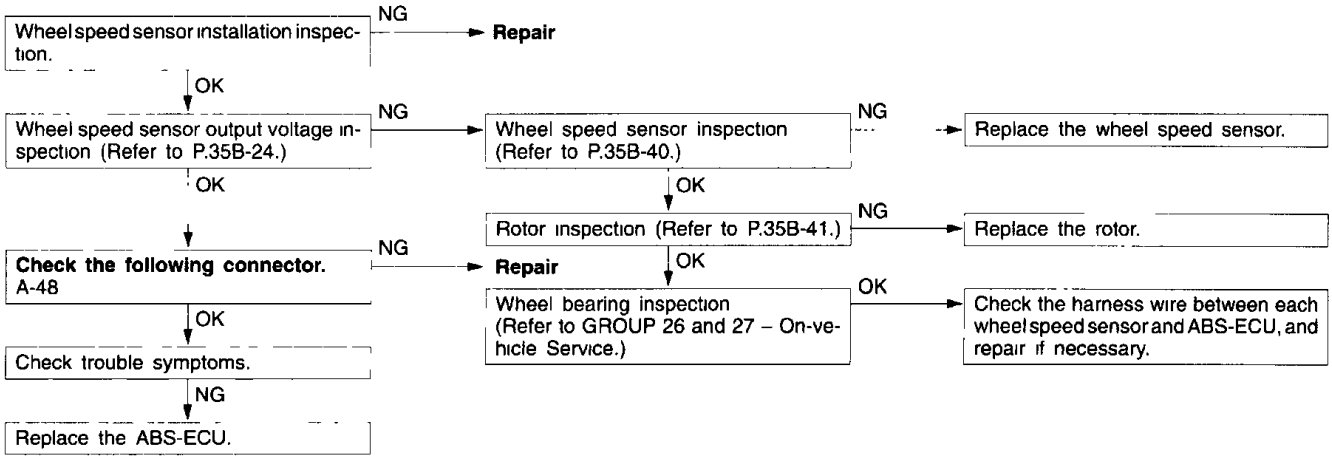
Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front right wheel speed sensor	Open circuit	35B-9
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	35B-10
16	Power supply system		35B-10
21	Front right wheel speed sensor	Short circuit	35B-11
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
38	Stop lamp switch system		35B-12
41	Front right inlet solenoid valve		35B-37 (Replace the HU assembly)
42	Front left inlet solenoid valve		
43	Rear right inlet solenoid valve		
44	Rear left inlet solenoid valve		
45	Front right outlet solenoid valve		35B-37 (Replace the HU assembly)
46	Front left outlet solenoid valve		
47	Rear right outlet solenoid valve		
48	Rear left outlet solenoid valve		
51	Valve power supply		35B-12
53	Pump motor		35B-13
63	ABS-ECU		35B-37 (Replace the ABS-ECU)

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code No. 11, 12, 13, 14 Wheel speed sensor open circuit	Probable cause
The ABS-ECU determines that an open circuit occurs in more than one line of wheel speed sensors.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

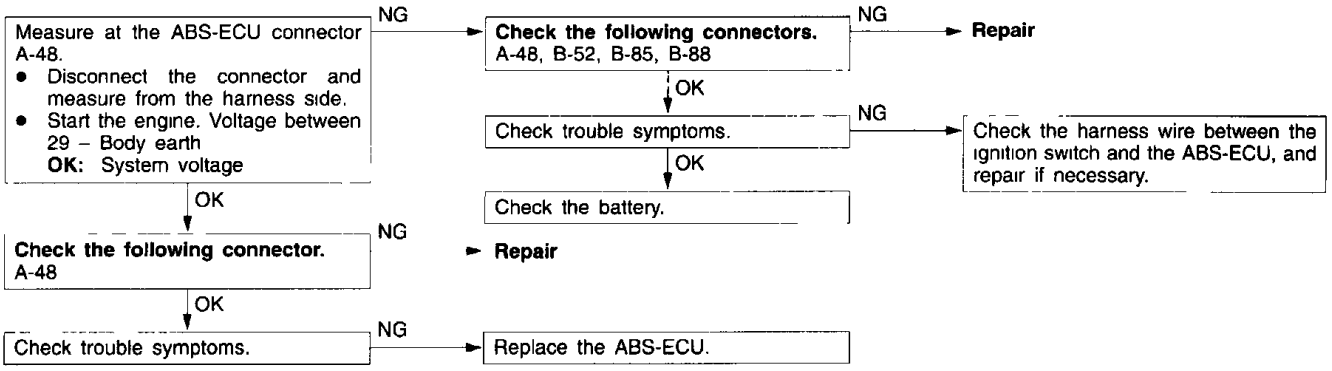


Code No. 15 Wheel speed sensor (Abnormal output signal)	Probable cause
A wheel speed sensor outputs an abnormal signal (other than an open or short-circuit).	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

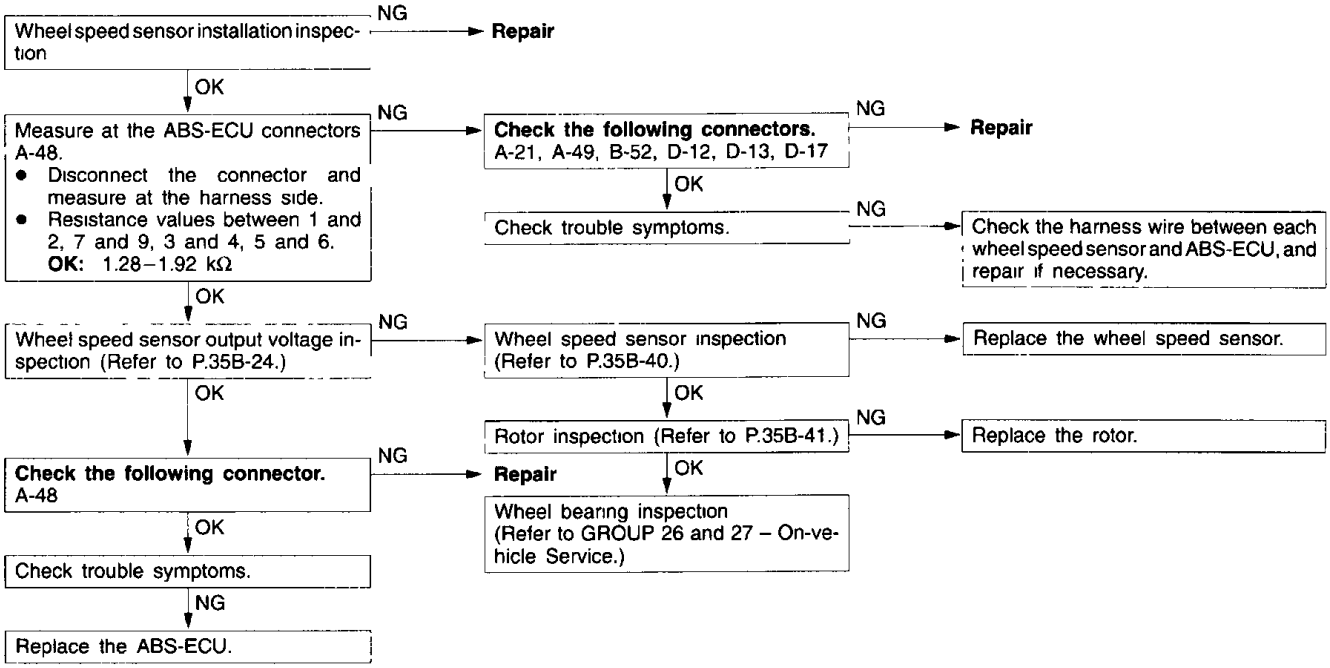


Code No. 16 Power supply system	Probable cause
The voltage of the ABS-ECU power supply drops lower or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector. • Malfunction of ABS-ECU

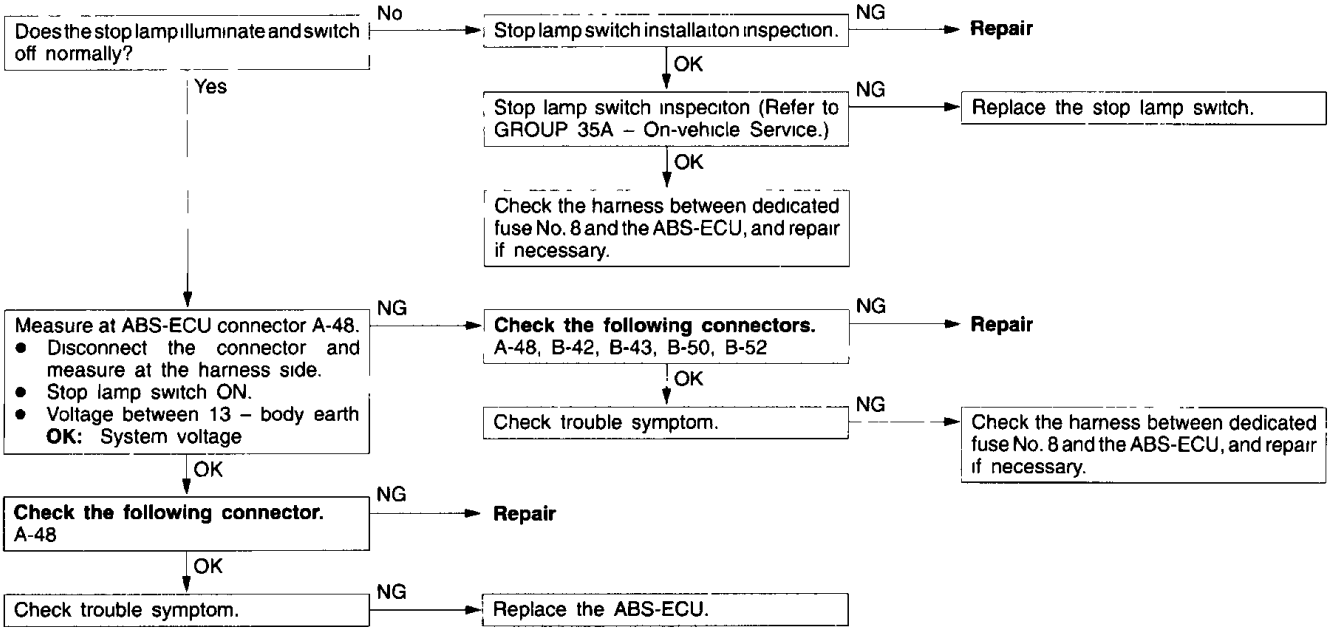
Caution
If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to standard value, this code is no longer output.
Before carrying out the following inspection, check the battery level, and refill it if necessary.



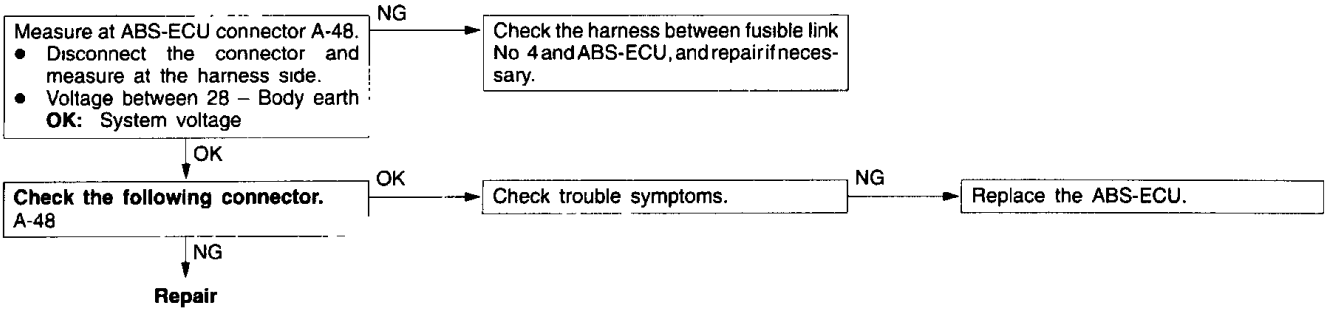
Code No. 21, 22, 23, 24 Wheel speed sensor short circuit	Probable cause
These codes are output at the following times: • When an open circuit cannot be found, but more than one wheel speed sensor does not output any signal during driving at 12 km/h or higher. • When a chipped or plugged-up rotor tooth, etc. is detected. • When the input signal from the wheel speed sensor is interrupted for a moment during driving at 12 km/h or higher.	• Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



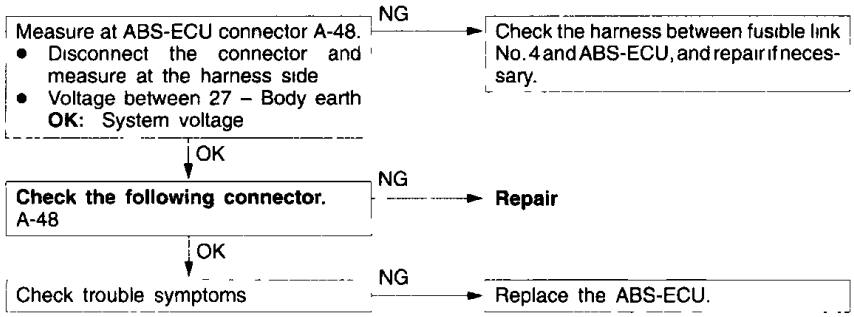
Code No. 38 Stop lamp switch system	Probable cause
These codes are output at the following times: • When the stop lamp switch is not be turned off (when the stop lamp switch stays on for 15 minutes or more although the ABS is not operating). • When the ABS-ECU determines that there is an open circuit in harness of the stop lamp switch system.	• Malfunction of stop lamp switch • Malfunction of harness or connector • Malfunction of ABS-ECU

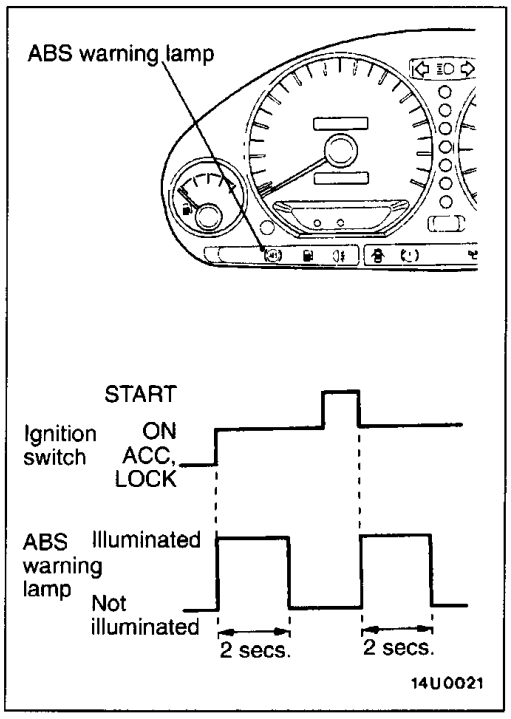


Code No. 51 Valve power supply	Probable cause
This code is output when there is an abnormality in the solenoid valve power supply system.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Code No. 53 Pump motor	Probable cause
This code is output when there is an abnormality in the pump motor system.	• Malfunction of wiring harness or connector • Malfunction of hydraulic unit • Malfunction of ABS-ECU





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 2 seconds and then switches off.
2. When the ignition key is turned to "START", the ABS warning lamp remains switched off.
3. When the ignition key is turned from "START" back to "ON", the ABS warning lamp illuminates for approximately 2 seconds and then stays switched off.
4. If the illumination is other than the above, check the diagnosis codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptoms		Inspection procedure No.	Reference page
Communication 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-16
Faulty ABS operation	Unequal braking power on both sides	5	35B-17
	Insufficient braking power ABS operates under normal braking conditions		
	ABS operates before vehicle stops under normal braking conditions		
	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, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.**

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

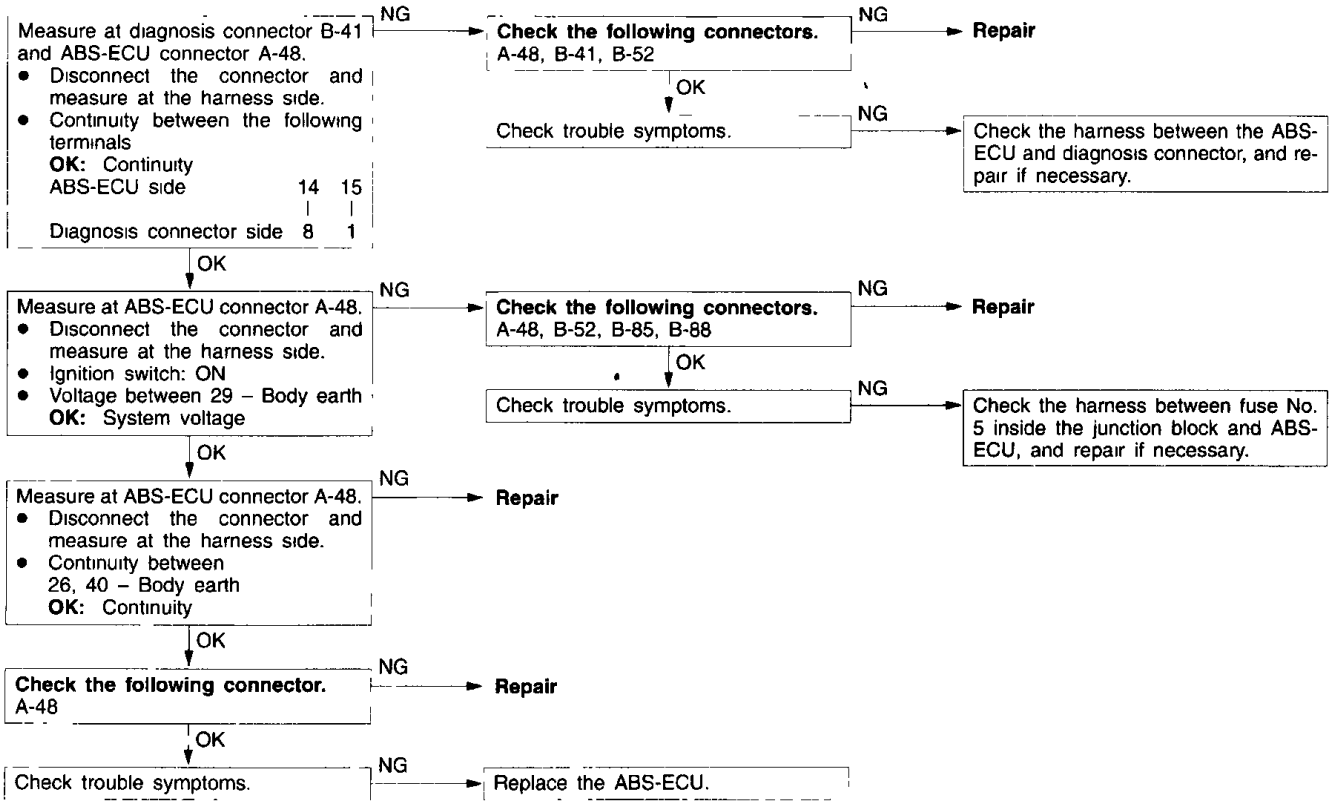
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting.

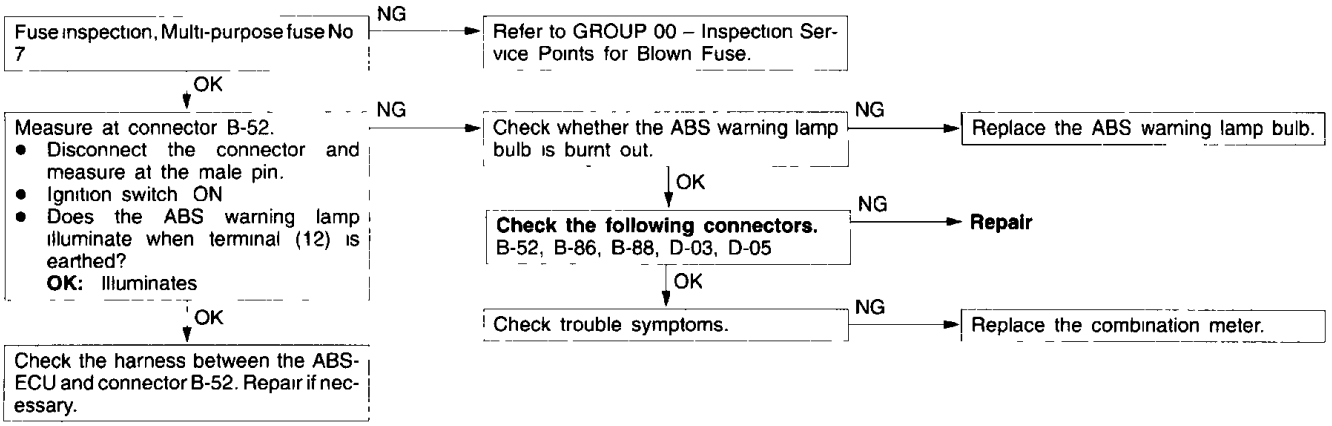
Inspection Procedure 2

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 diagnosis output circuit.	• Blown fuse • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Inspection Procedure 3

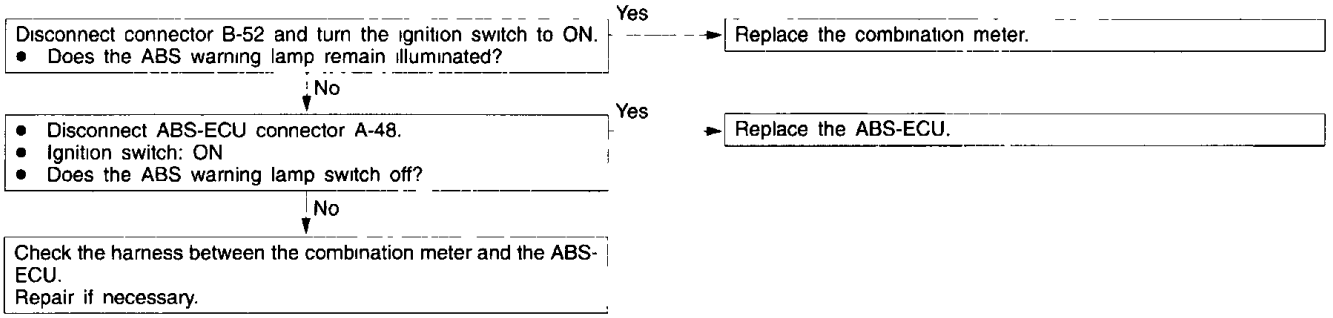
When ignition key is turned to "ON" (engine stopped), ABS warning lamp does not illuminate.	Probable cause
The cause may be: an open circuit in the lamp power supply circuit, a blown lamp bulb, an open circuit in both the circuit between the ABS warning lamp and the ABS-ECU.	• Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector



Inspection Procedure 4

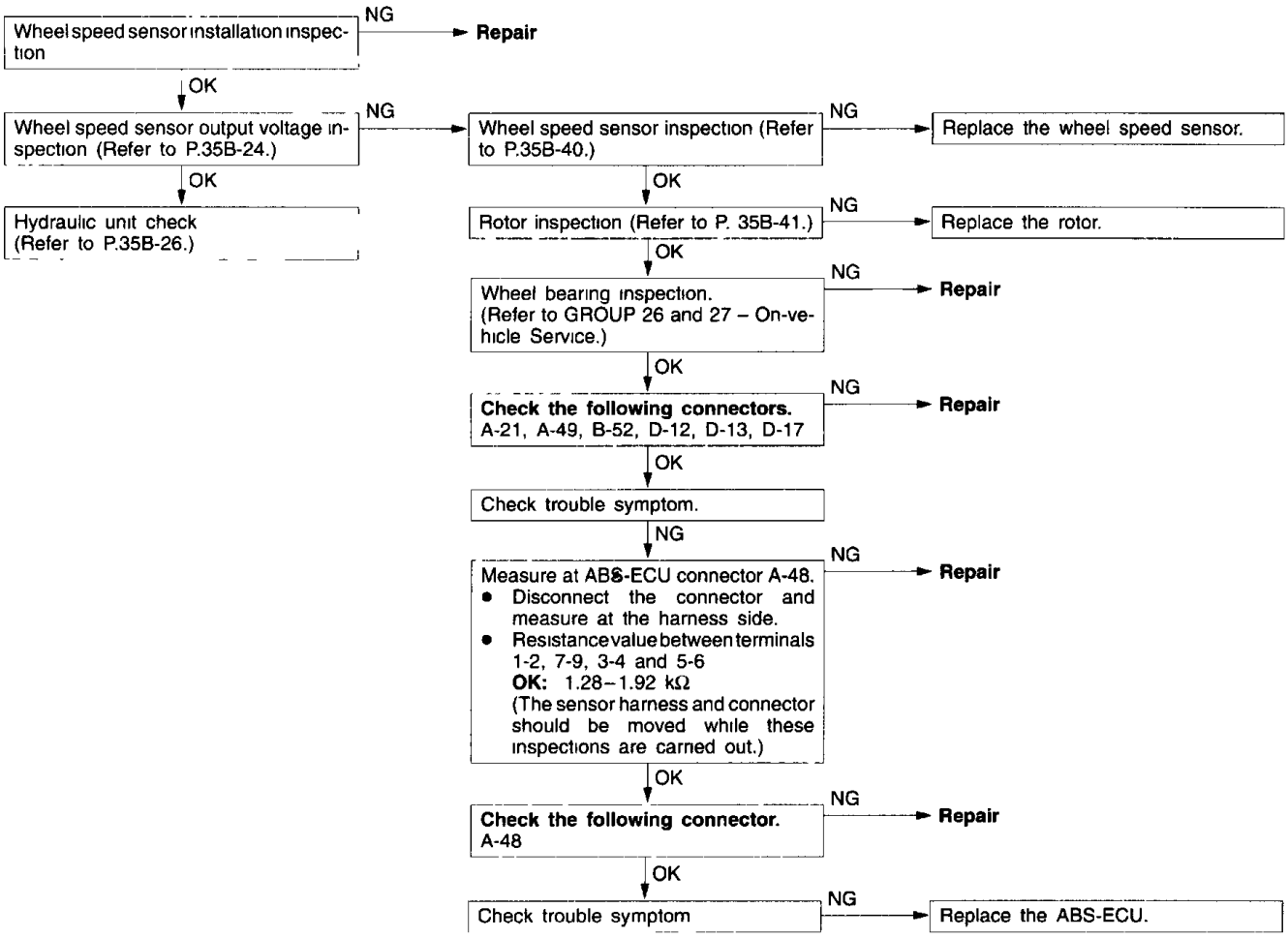
Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
The cause is probably a short-circuit in the ABS warning lamp illumination circuit.	• Malfunction of combination meter • Malfunction of ABS-ECU • Malfunction of wiring harness

NOTE
This trouble symptom is limited to cases where communication with the MUT-II is possible (ABS-ECU power supply is normal) and the diagnosis code is a normal diagnosis code.



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.	• Improper installation of wheel speed sensor • Incorrect sensor harness contact • Foreign material adhering to wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU



SERVICE DATA REFERENCE TABLE

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

1. When the system is normal

Item No.	Check item	Checking requirements	Normal value
11	Front-right wheel speed sensor	Perform a test run	Vehicle speeds displayed on the speedometer and MUT-II are identical.
12	Front-left wheel speed sensor		
13	Rear-right wheel speed sensor		
14	Rear-left wheel speed sensor		
16	ABS-ECU power supply voltage	Ignition switch power supply voltage and valve monitor voltage	9–16 V
38	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF

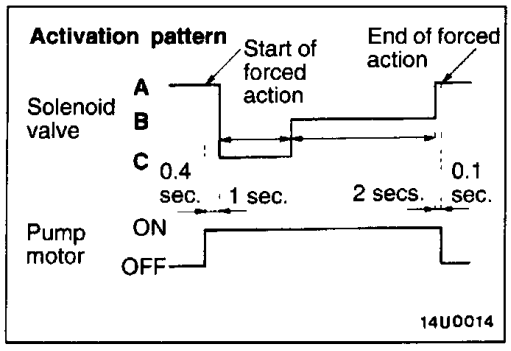
2. When the ABS-ECU shut off ABS operation.

When the diagnosis system stops the ABS-ECU, the MUT-II display data will be unreliable.

ACTUATOR TEST REFERENCE TABLE

The MUT-II activates the following actuators for testing.

NOTE
1. If the ABS-ECU runs down, actuator testing cannot be carried out.
2. Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h, forced actuation will be canceled.



ACTUATOR TEST SPECIFICATIONS

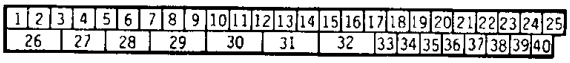
No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

NOTE
A: Hydraulic pressure increase
B: Hydraulic pressure holds
C: Hydraulic pressure decrease

CHECK AT ABS-ECU

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (26) and (40) (earth terminals) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.

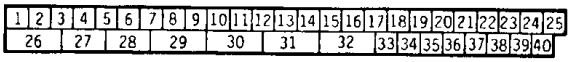


14U0036

Connector terminal No.	Signal	Checking requirements		Normal condition
13	Input from stop lamp switch	Ignition switch: ON	Stop lamp switch: ON	System voltage
			Stop lamp switch: OFF	1 V or less
14	MUT-II	Connect the MUT-II.		Serial communication with MUT-II
		Do not connect the MUT-II.		1 V or less
15	Input from diagnosis indication selection	Connect the MUT-II.		0 V
		Do not connect the MUT-II.		Approx. 12 V
25	Output to ABS warning lamp	Ignition switch: ON	The lamp is switched off.	System voltage
			The lamp is illuminated.	0–2 V
27	Solenoid valve power supply	Always		System voltage
28	Pump motor power supply	Always		System voltage
29	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0 V

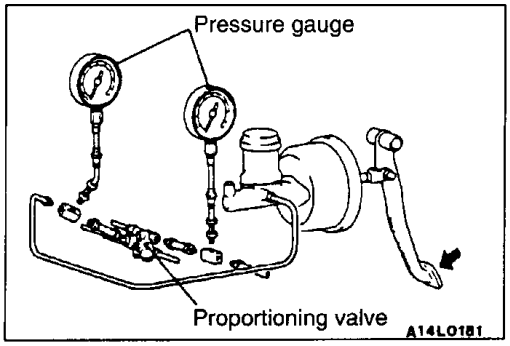
RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

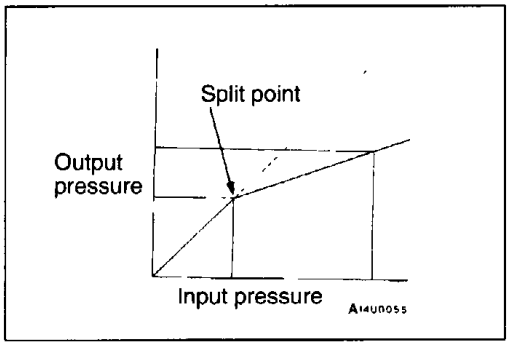
1. Turn the ignition switch off and disconnect the ABS-ECU connectors before checking resistance and continuity.
2. Check them between the terminals indicated in the table below.
3. The terminal layouts are shown in the illustrations below.



14U0036

Connector terminal No.	Signal	Normal condition
1-2	Front-left wheel speed sensor (+ wire)	1.28–1.92 kΩ
3-4	Rear-left wheel speed sensor (+ wire)	1.28–1.92 kΩ
5-6	Rear-right wheel speed sensor (+ wire)	1.28–1.92 kΩ
7-9	Front-right wheel speed sensor (+ wire)	1.28–1.92 kΩ
26 – Body earth	ABS-ECU earth	Continuity
40 – Body earth		





ON-VEHICLE SERVICE

35200120017

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 that the measured values are within the allowable range.

(1) Output pressure begins to drop relative to input pressure (split point).

Standard value:
<1600> 3.92±0.25 MPa
<1800> 3.43±0.25 MPa

(2) Check that the output fluid pressure is at the standard value when the pedal depression force is increased so that the input fluid pressure is at the values shown in the table below.

Standard value:

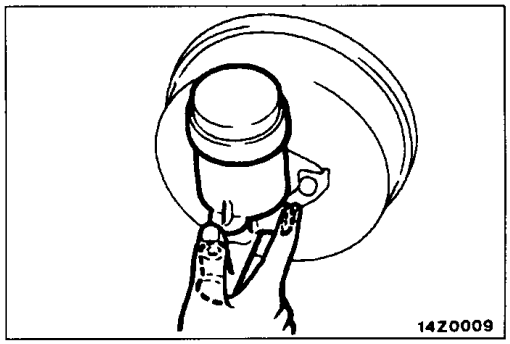
MPa

Items	1600	1800
Output fluid pressure	5.39±0.4	5.03±0.4
Input fluid pressure	9.81	9.81

(3) Output pressure difference between left and right brake lines

Limit: 0.8 MPa

4. If the measured pressures are not within the permissible ranges, replace the proportioning valve.



BLEEDING

35200150030

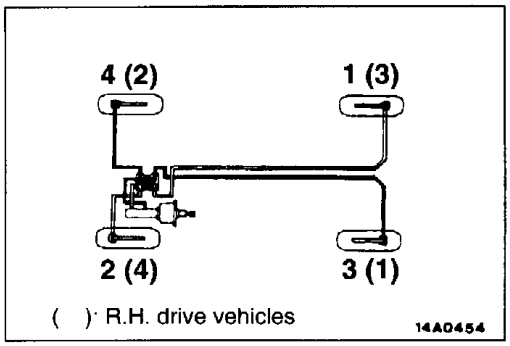
Caution
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING

The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

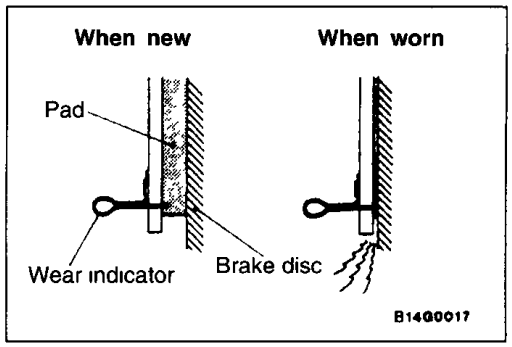
(1) Fill the reserve tank with brake fluid.
(2) Keep the brake pedal depressed.
(3) Have another person cover the master cylinder outlet with a finger.
(4) With the outlet still closed, release the brake pedal.
(5) Repeat steps 2.–4. three or four times to fill the inside of the master cylinder with brake fluid.



BRAKE PIPE LINE BLEEDING

Start the engine and bleed the air in the sequence shown in the figure.

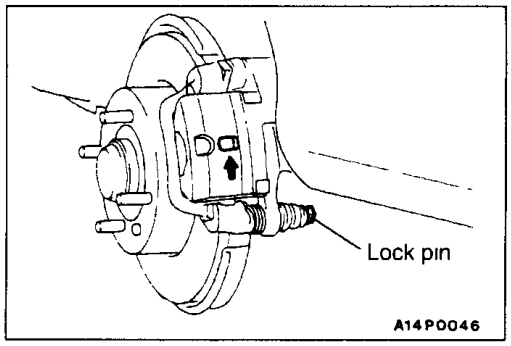
Caution
For vehicles with ABS, be sure to install a filter to the master cylinder reservoir tank when supplying brake fluid.



REAR DISC BRAKE PAD CHECK AND REPLACEMENT

35200240027

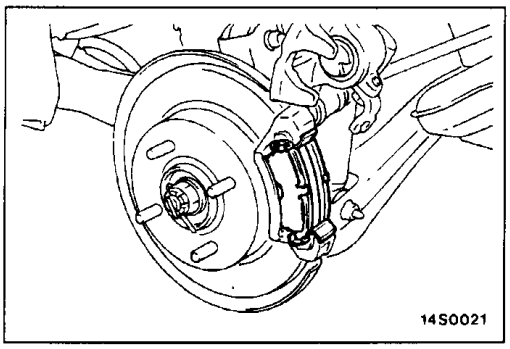
NOTE
The brake pads have wear indicators that contact the brake disc when the brake pad thickness becomes 2 mm and emit a squealing sound to warn the driver.



1. Check brake pad thickness through caliper body check port.

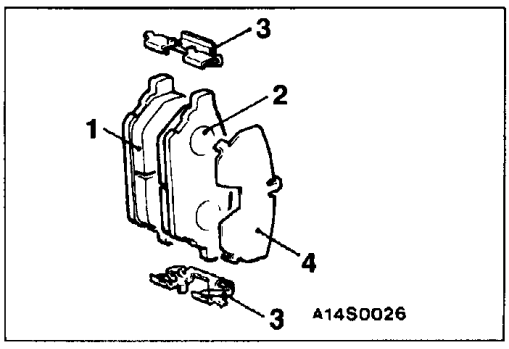
   Standard value: 9.5 mm
   Limit: 2.0 mm

   Caution
   1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
   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.**

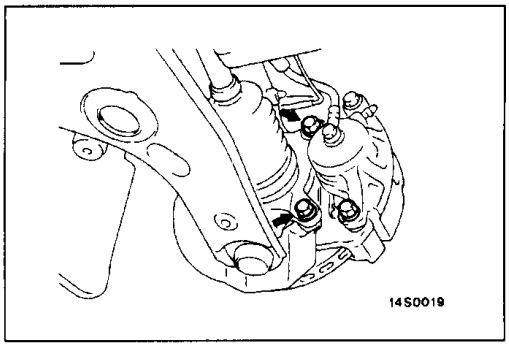


2. Remove lock pin. Lift caliper assembly and retain with wires.

   Caution
   Do not wipe off the special grease that is on the lock pin or allow it to contaminate the lock pin.

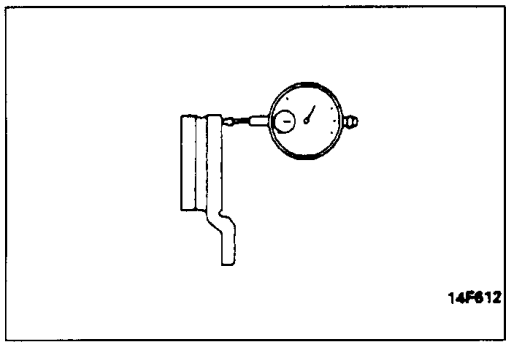


3. Remove the following parts from caliper support.
   1. Pad & wear indicator assembly
   2. Pad assembly
   3. Clip
   4. Outer shim
4. In order to measure the brake drag torque after pad installation, measure the rotary-sliding resistance (A) of the hub with the pads removed. (Refer to P.35B-32.)
5. Install the pads and the caliper assembly, and then check the brake drag torque. (Refer to P.35B-32.)



BRAKE DISC RUN-OUT CHECK 35200300015

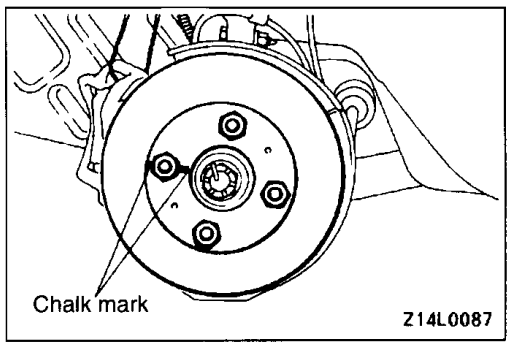
1. Remove the caliper support; then raise the caliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.



3. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the run-out of the disc.

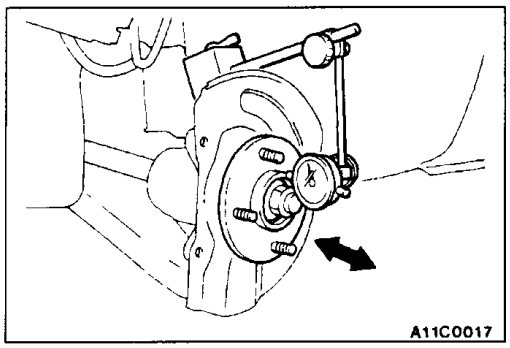
   Limit: 0.08 mm or less

   NOTE
   Tighten the nuts in order to secure the disc to the hub.



BRAKE DISC RUN-OUT CORRECTION 35200310018

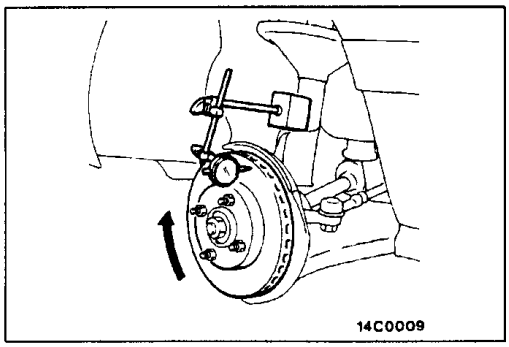
1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.
   (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.



   (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.

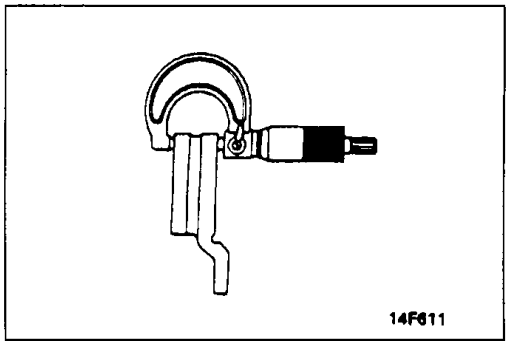
   Limit: 0.05 mm

   If the play is equivalent to or exceeds the limit, disassemble the hub knukle and check each part.



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

2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF or equivalent).



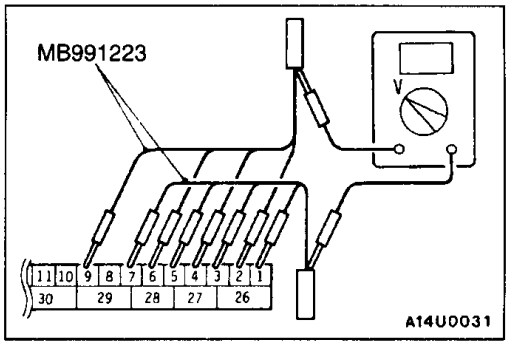
BRAKE DISC THICKNESS CHECK 35200290015

1. Using a micrometer, measure disc thickness at eight positions, approximately 45° apart and 10 mm in from the outer edge of the disc.

   Standard value: 10.0 mm
   Limit: 8.4 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 on the car type brake lathe ("MAD, DL-8700PF" or equivalent).



WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK 35200160071

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ABS-ECU connector, and then use the special tool (inspection harness for connector pin contact pressure) to measure the output voltage at the harness-side connector.

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.	1	7	3	5
	2	9	4	6

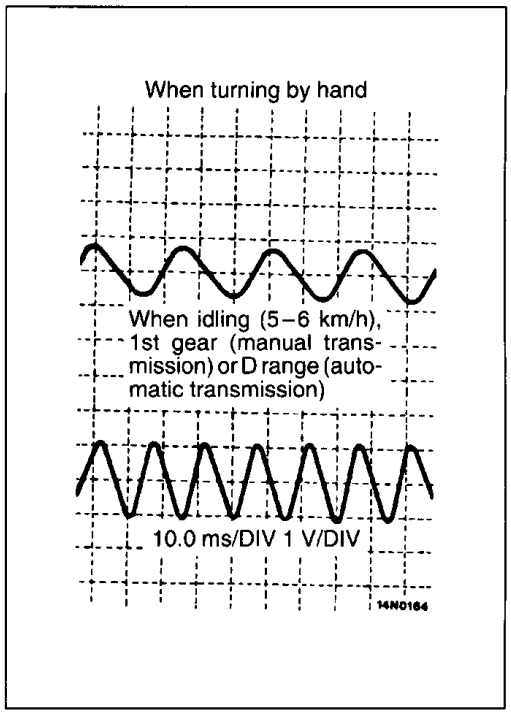
Output voltage

When measuring with a circuit tester:
50 mV or more

When measuring with an oscilloscope:
120 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 Waveforms With An Oscilloscope

Use the following method to observe the output voltage waveform from each wheel sensor with an oscilloscope.

- Start the engine, and rotate the front wheels by engaging 1st gear (vehicles with manual transmission) or D range (vehicles with automatic transmission). Turn the rear wheels manually so that they rotate at a constant speed.

NOTE

1. Check the connection of the sensor harness and connector before using the oscilloscope.
2. The waveform measurements can also be taken while the vehicle is actually moving.
3. The output voltage will be small when the wheel speed is low, and similarly it will be large when the wheel speed is high.

Points In Waveform Measurement

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
Waveform amplitude fluctuates excessively (this is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
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 (HU) CHECK

35200170081

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

1. Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

   Caution
   1. The roller of the braking force tester and the tyre should be dry during testing.
   2. When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.

2. 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.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.

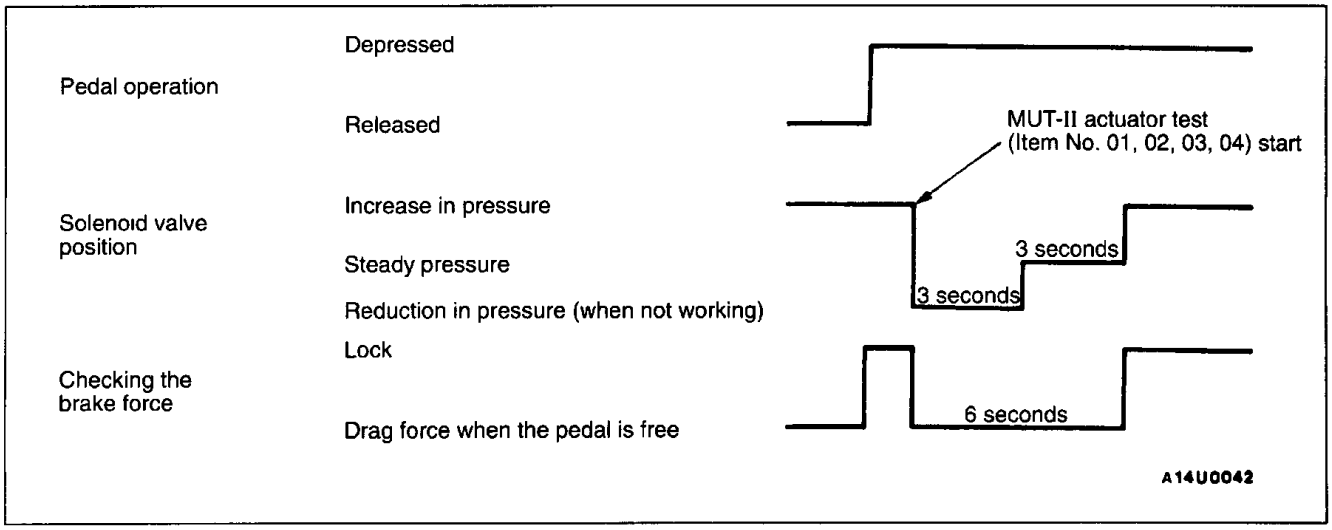
   NOTE
   1. At this time, the ABS system will switch to the MUT-II mode and the ABS warning lamp will illuminate.
   2. When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.

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 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
Rear wheel	294–490 N

   The result should be as shown in the following diagram.

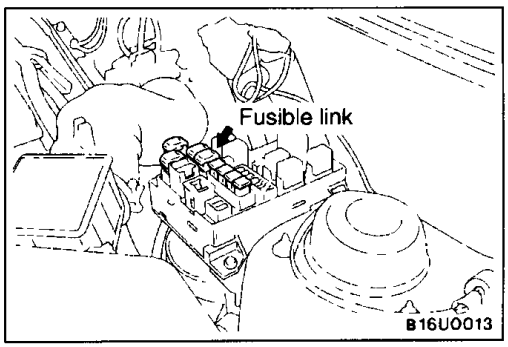
7. If the result of inspection is abnormal, correct according to the "Diagnosis Table".



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 1 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.



REMEDY FOR A FLAT BATTERY 35200350058

When booster cables are used to start the engine when the battery is completely flat and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire, and driving might not be possible.

This happens because ABS consumes a great amount of current for its self-check function; the remedy is to either allow the battery to recharge sufficiently, or to remove the fusible link for ABS circuit, thus disabling the anti-skid brake system. The ABS warning lamp will illuminate when the fusible link (for ABS) is removed.

After the battery has sufficiently recharged, install the fusible link (for ABS) and restart the engine; then check to be sure the ABS warning lamp is not illuminated.

MASTER CYLINDER AND BRAKE BOOSTER

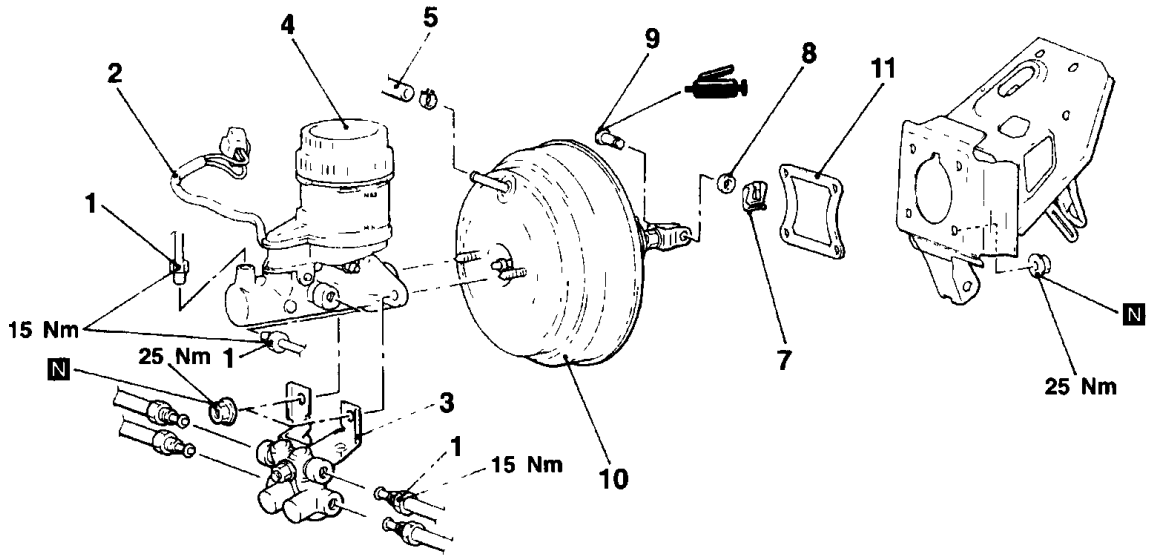
35200400098

REMOVAL AND INSTALLATION

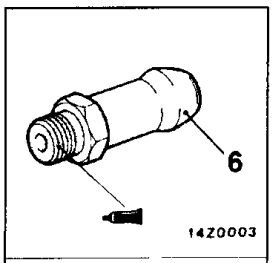
<L.H. drive vehicles>

Pre-removal Operation
- Brake Fluid Draining

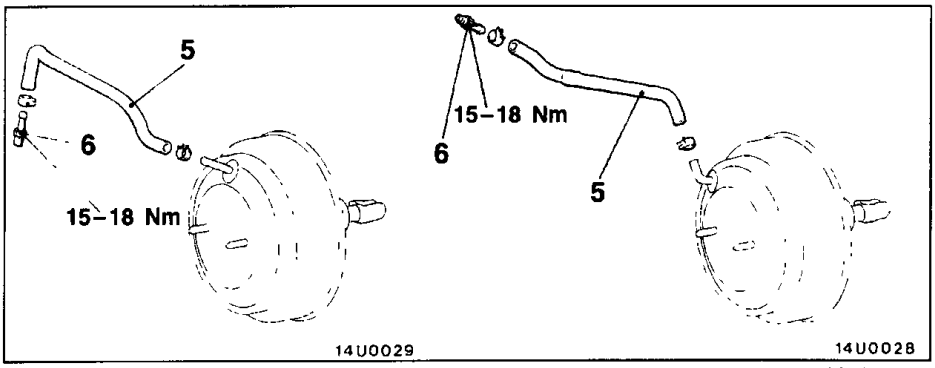
Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding
  (Refer to GROUP 35A – On-vehicle Service.)
- Brake Pedal Adjustment
  (Refer to GROUP 35A – On-vehicle Service.)



14U0026



Sealant: 3M ATD Part No. 8661 or equivalent



00003662

Removal steps

1. Brake pipe connection
2. Brake fluid level sensor connector
3. Proportioning valve bracket
4. Master cylinder assembly

▶B◀ • Clearance adjustment between brake booster push rod and primary piston

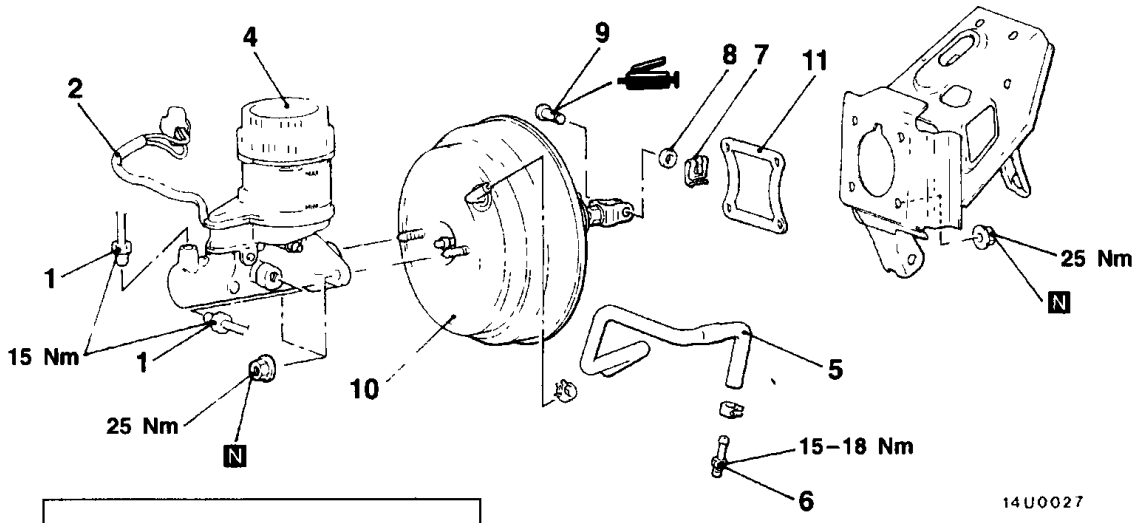
▶A◀ 5. Vacuum hose
(With built-in check valve)

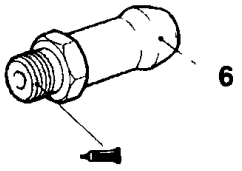
6. Fitting
7. Retaining clip
8. Washer
9. Retaining ring bolt
10. Brake booster
11. Sealer

<R.H. drive vehicles>

Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding
  (Refer to GROUP 35A – On-vehicle Service.)
- Brake Pedal Adjustment
  (Refer to GROUP 35A – On-vehicle Service.)





Sealant: 3M ATD Part No. 8661 or equivalent

00003663

Removal steps

1. Brake pipe connection
2. Brake fluid level sensor connector
4. Master cylinder assembly

▶B◀ • Clearance adjustment between brake booster push rod and primary piston

▶A◀ 5. Vacuum hose (With built-in check valve)

6. Fitting
7. Retaining clip
8. Washer
9. Retaining ring bolt
10. Brake booster
11. Sealer

INSTALLATION SERVICE POINTS

▶A◀ VACUUM HOSE CONNECTION

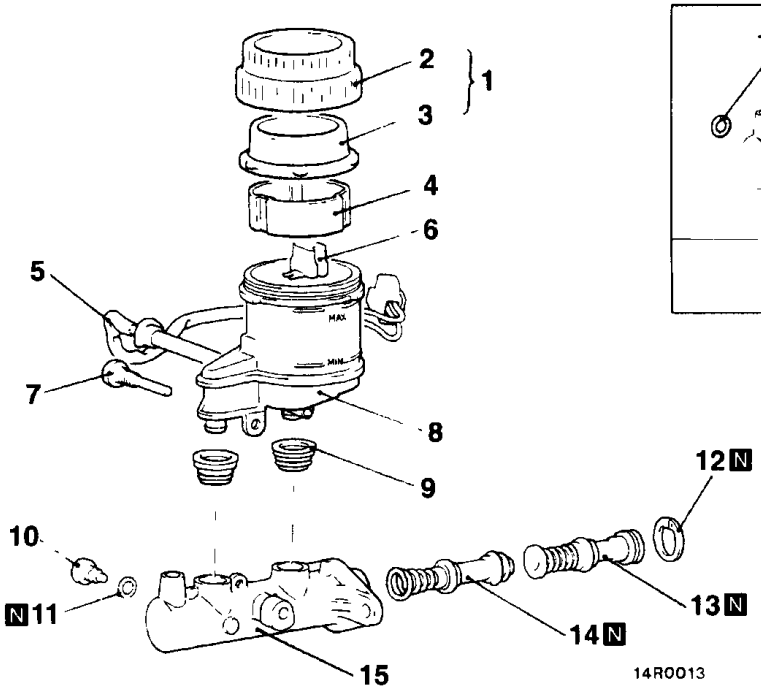
Refer to GROUP 35A – Master Cylinder and Brake Booster.

▶B◀ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

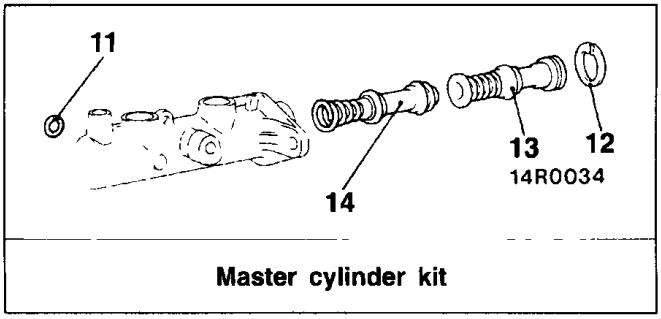
Refer to GROUP 35A – Master Cylinder and Brake Booster.

MASTER CYLINDER
DISASSEMBLY AND REASSEMBLY

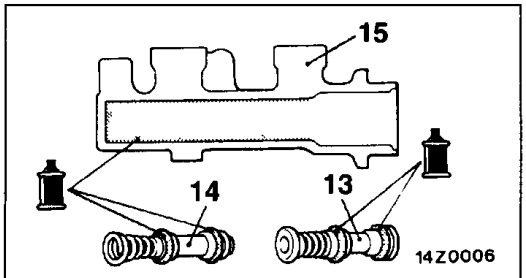
35200450062



00003664



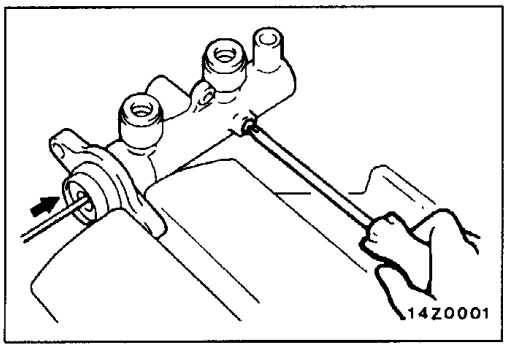
Master cylinder kit

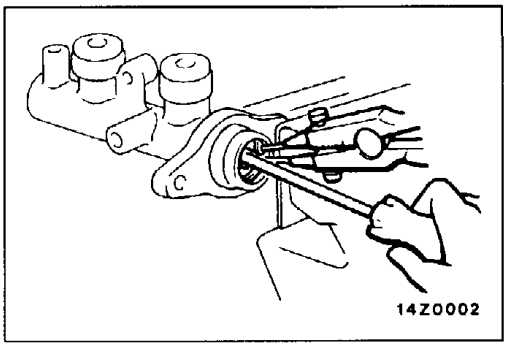


Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Filter
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt
8. Reservoir tank
9. Reservoir seal
◀A▶ 10. Piston stopper bolt
11. Gasket
◀B▶ 12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body





DISASSEMBLY SERVICE POINTS

◀A▶ PISTON STOPPER BOLT DISASSEMBLY

Remove the piston stopper bolt, while depressing the piston.

◀B▶ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION

35200460027

- 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.

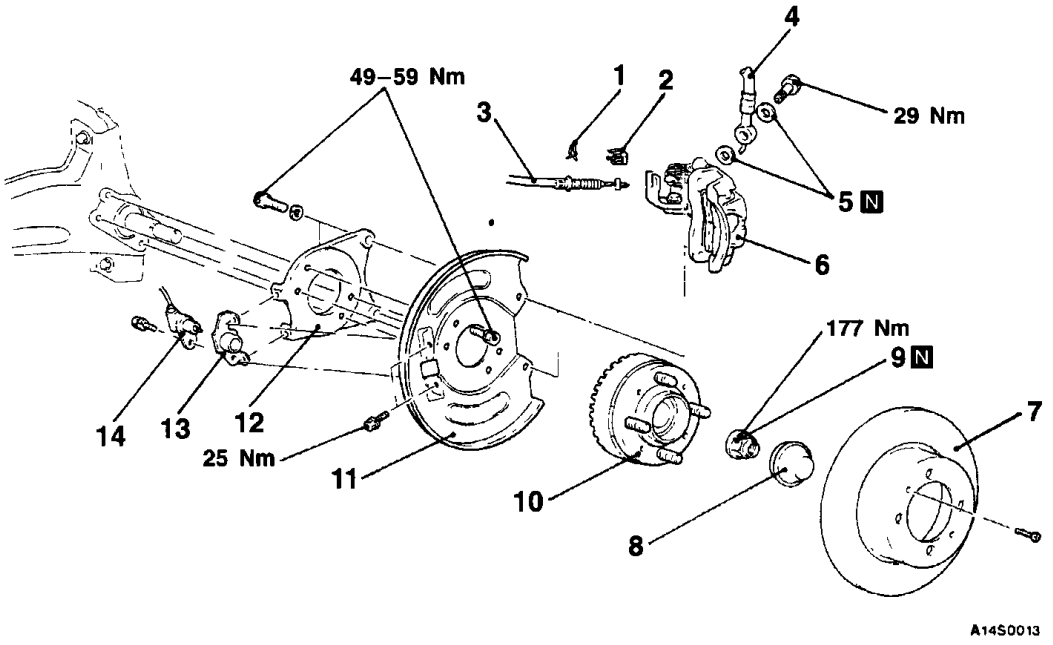
REAR DISC BRAKE

35200650028

REMOVAL AND INSTALLATION

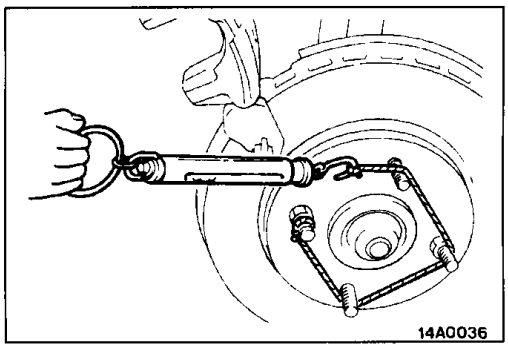
Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding
  (Refer to GROUP 35A – On-vehicle Service.)



Removal steps

1. Clip
2. Retainer spring
3. Parking brake cable connection
4. Brake hose connection
5. Gasket
▶A◀ 6. Disk brake assembly
7. Brake disc
8. Hub cap
9. Self locking nut
10. Rear hub assembly (Refer to GROUP 27 – Rear Axle Hub.)
11. Dust shield
12. Disc brake adapter
13. Sensor bracket
    (Refer to P.35B-38.)
14. Rear speed sensor
    (Refer to P.35B-38.)



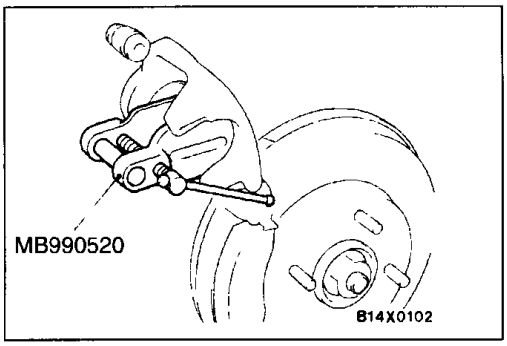
INSTALLATION SERVICE POINT

▶A◀ DISC BRAKE ASSEMBLY INSTALLATION

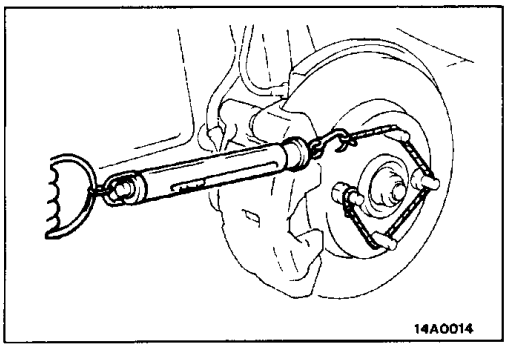
1. In order to measure the brake drag torque after pad installation, use a spring balance to measure the rotary-sliding resistance (A) of the hub in the forward direction with the pads removed.
2. After installing the caliper support to the knuckle, install the pad clips and the pads to the caliper support.

Caution

- **Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.**



3. Clean piston and insert into cylinder with special tool.
4. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the lock pin.
5. Check brake drag torque as follows.
   (1) Start the engine and then depress the brake pedal 2→3 times.
   (2) Stop engine.
   (3) Turn brake disc forward 10 times.



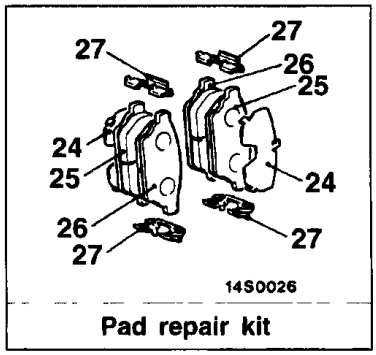
6. Check hub torque (B) with spring balance.
7. Calculate the drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

   Standard value: 20 N or less

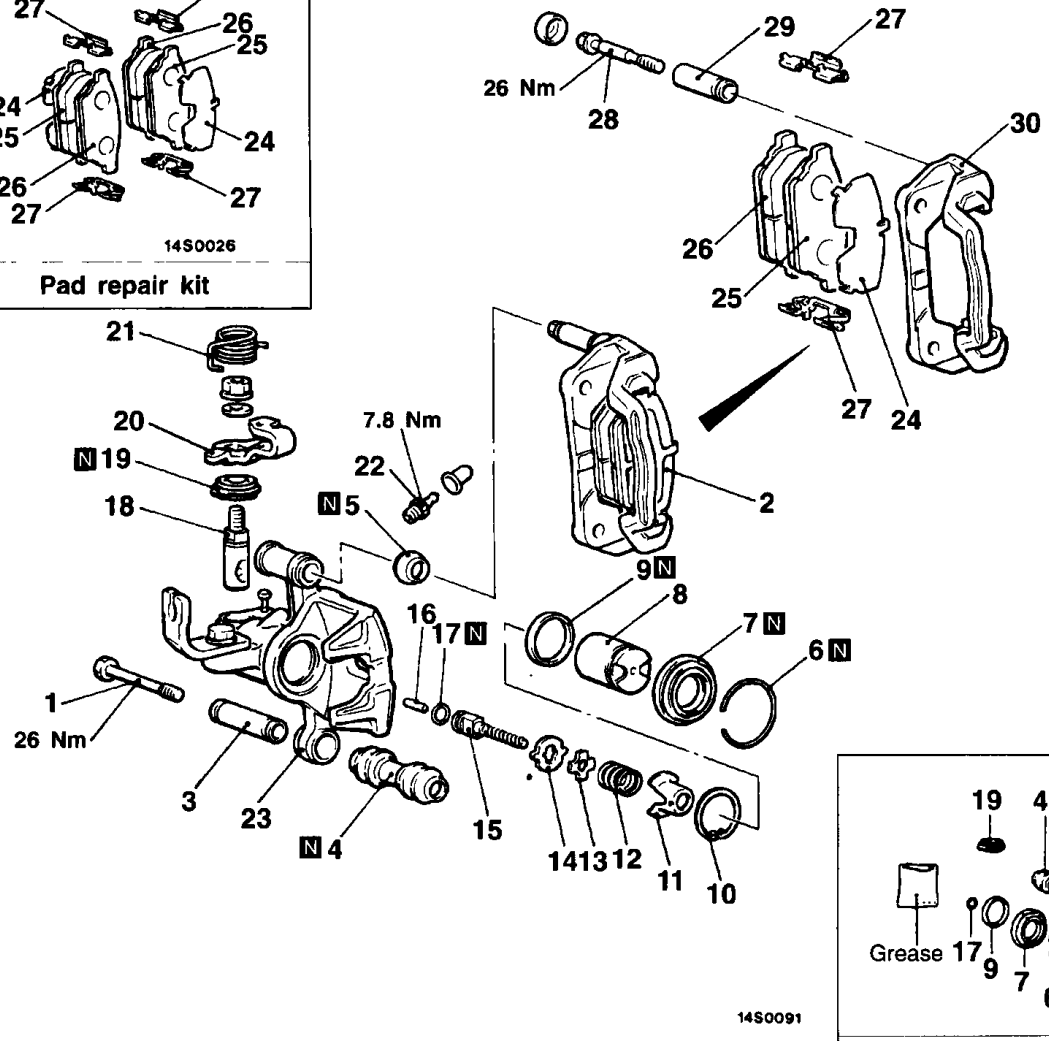
8. If the difference between brake drag torque and hub torque exceeds the standard vlaue, disassemble piston and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

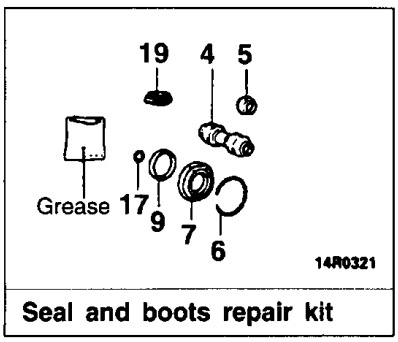
DISASSEMBLY AND REASSEMBLY

35200670024



Pad repair kit





Seal and boots repair kit

Caliper assembly disassembly steps

1. Lock pin
2. Caliper support (pad, clip, shim)
3. Lock pin sleeve
4. Lock pin boot
5. Guide pin boot
6. Boot ring
7. Piston boot

◀A▶ ▶B◀ 8. Piston assembly

◀B▶ 9. Piston seal

◀C▶ ▶A◀ 10. Snap ring

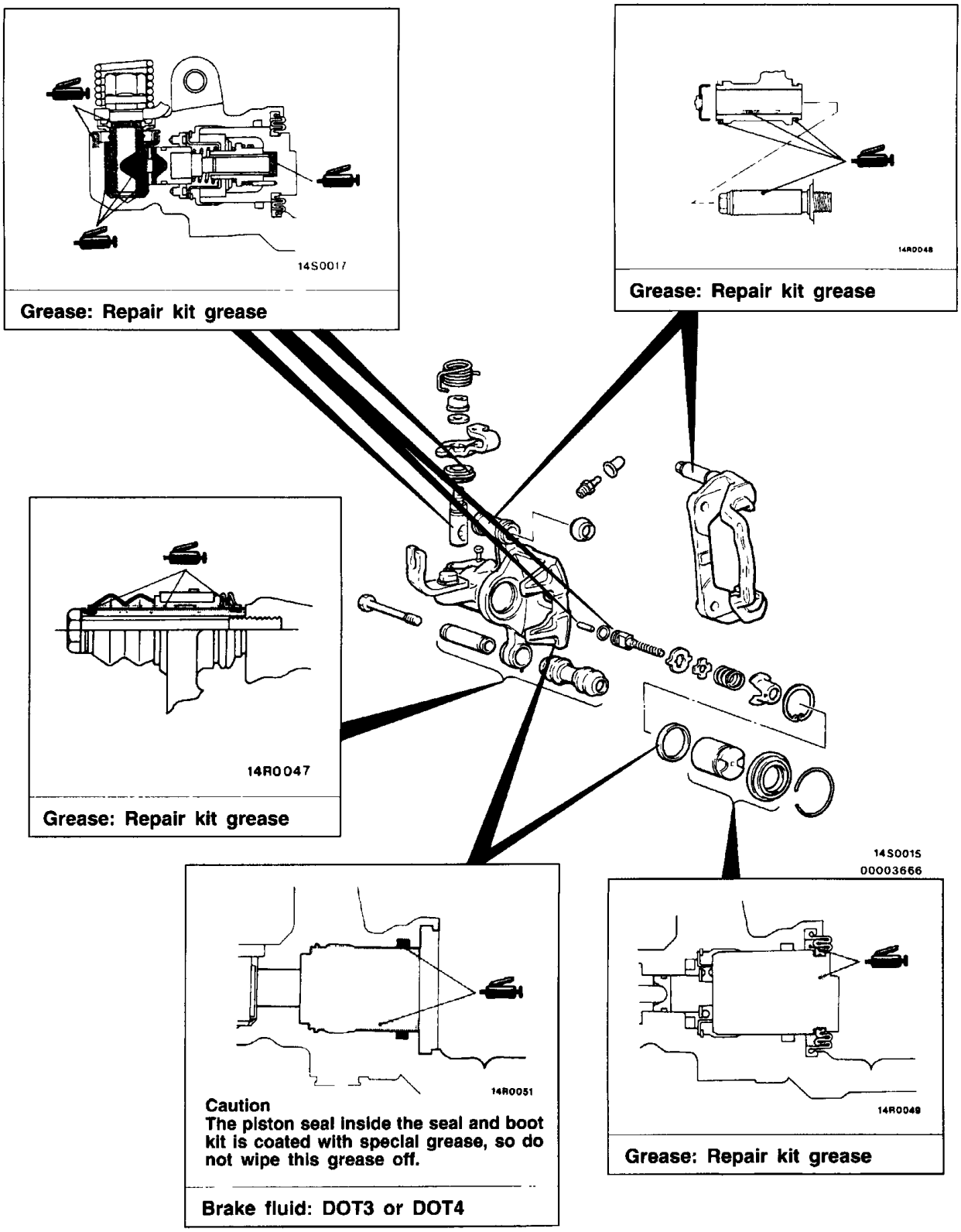
11. Spring case
12. Return spring
13. Stopper plate
14. Stopper
15. Adjuster spindle
16. Connecting link
17. O-ring
18. Spindle lever
19. Lever boot
20. Parking brake lever
21. Return spring
22. Bleeder screw
23. Caliper body

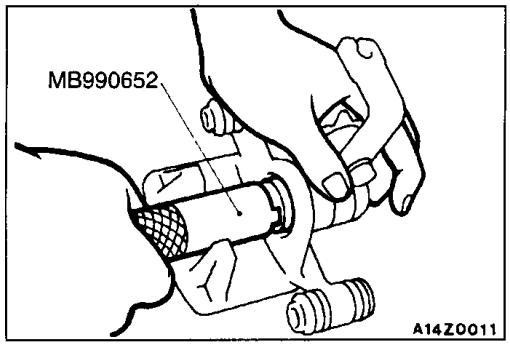
Pad assembly disassembly steps

1. Lock pin
2. Caliper support (pad, clip, shim)
24. Outer shim
25. Pad assembly
26. Pad and wear indicator assembly
27. Clip
28. Guide pin
29. Guide pin sleeve
30. Support mounting

Lubrication points

<Rear disc brake>

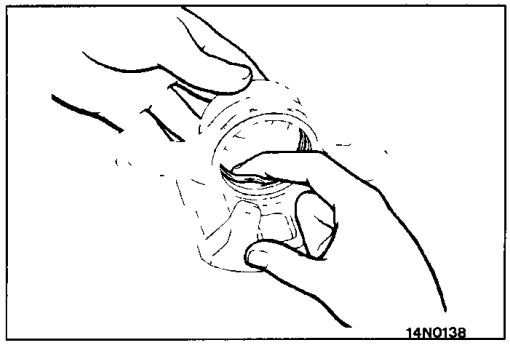




DISASSEMBLY SERVICE POINTS

◀A▶ PISTON ASSEMBLY REMOVAL

Use the special tool to twist the piston out of the caliper body.



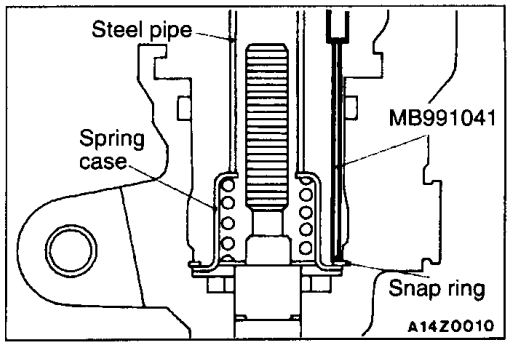
◀B▶ PISTON SEAL REMOVAL

(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 trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4



◀C▶ SNAP RING REMOVAL

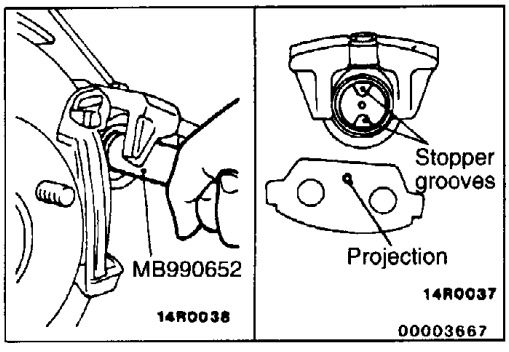
While using a 19 mm diameter steel pipe to press the spring case into the caliper body, use the special tool to remove the snap ring from the caliper body.

REASSEMBLY SERVICE POINTS

▶A◀ SNAP RING INSTALLATION

Use a steel pipe with a diameter of approximately 19 mm and the special tool in the same way as for removal to install the snap ring.

Caution
Attach the snap ring to the caliper body with the opening facing the bleeder.



▶B◀ PISTON ASSEMBLY INSTALLATION

(1) Push the piston into the caliper with special tool.

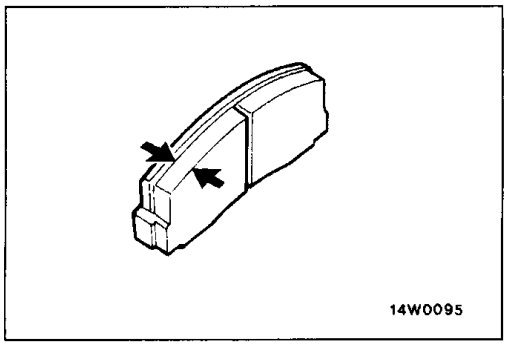
NOTE
Align the grooves as illustrated.

(2) The pins on the back side of the brake pad must be placed in the grooves in the position.

INSPECTION

35200680027

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.



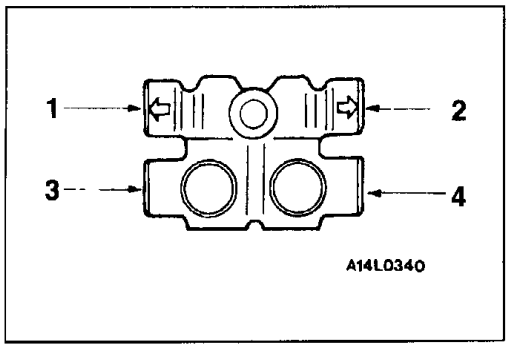
PAD WEAR CHECK

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly if pad thickness is less than the limit value.

Standard value: 9.0 mm
Limit value: 2.0 mm

Caution

1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thicknesses of the pads of the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**



PROPORTIONING VALVE

35200570041

INSTALLATION SERVICE POINT

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

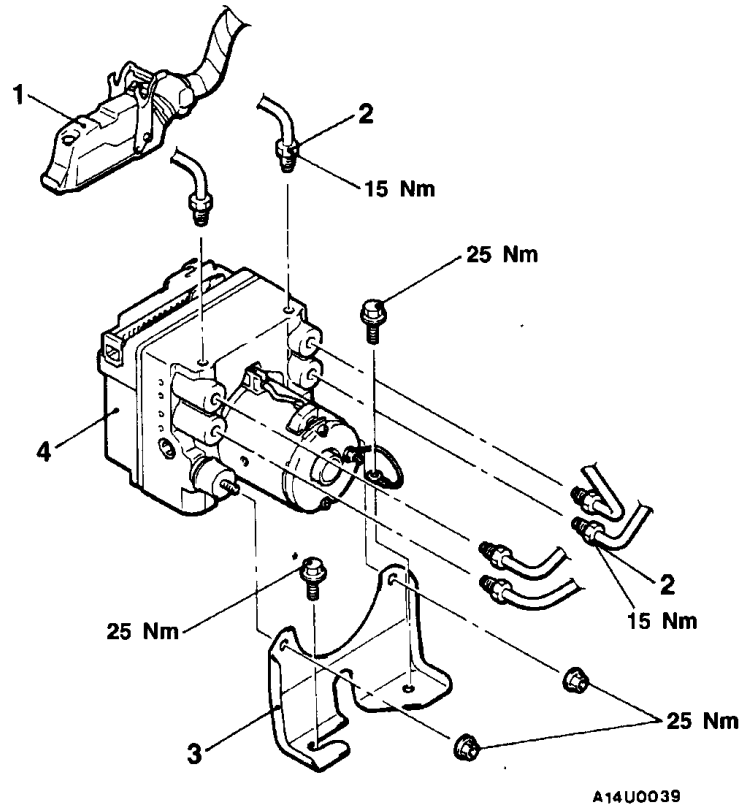
HYDRAULIC UNIT

35200860070

REMOVAL AND INSTALLATION

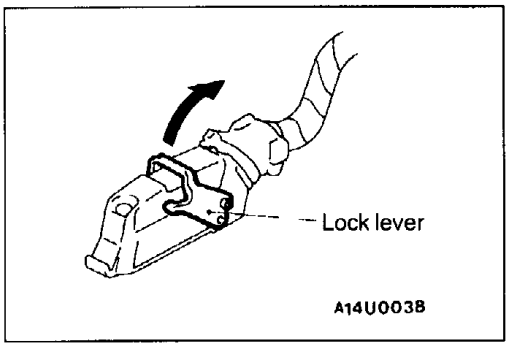
Pre-removal Operation
- Brake Fluid Draining
- A/C Relay Box Removal

Post-installation Operation
- A/C Relay Box Installation
- Brake Fluid Supplying
- Brake Line Bleeding
  (Refer to GROUP 35A – On-vehicle Service.)
- Brake Pedal Adjustment
  (Refer to GROUP 35A – On-vehicle Service.)



Removal steps

◀A▶ 1. ABS-ECU connector
▶A◀ 2. Brake pipe connection
3. Hydraulic unit bracket
◀B▶ 4. Hydraulic unit assembly



REMOVAL SERVICE POINTS

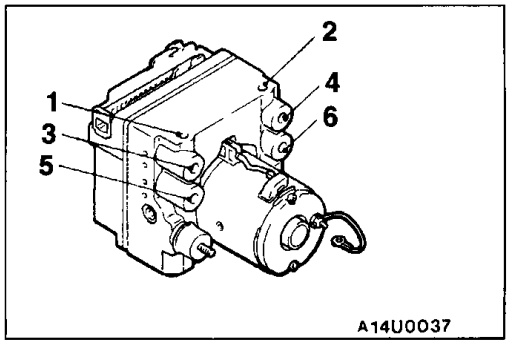
◀A▶ ABS-ECU CONNECTOR REMOVAL

Raise the lock lever in the direction of the arrow to unlock the connector, and then disconnect the connector.

◀B▶ HYDRAULIC UNIT ASSEMBLY REMOVAL

Caution

1. **The hydraulic unit assembly is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit assembly is not to be disassembled; its nuts and bolts should absolutely not be loosened.**
3. **The hydraulic unit assembly must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit assembly must not be turned upside down or laid on its side.**



INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit assembly as shown in the illustration.

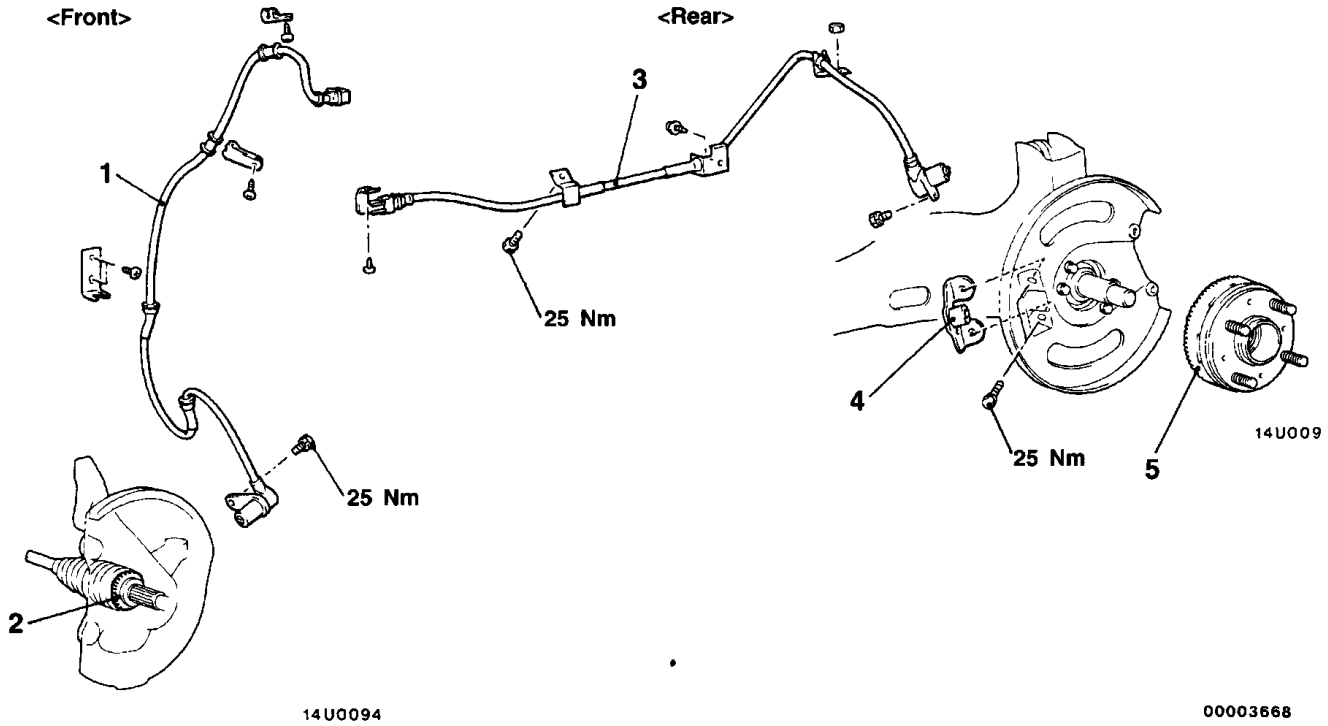
1. From the master cylinder (Primary)
2. From the master cylinder (Secondary)
3. To the proportioning valve (RH)
4. To the proportioning valve (LH)
5. To the front brake (LH)
6. To the front brake (RH)

WHEEL SPEED SENSOR

35200830064

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Speed Sensor Output Voltage Check (Refer to P35B-23.)



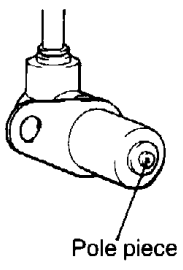
Front speed sensor removal steps

◀A▶ 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 speed sensor removal steps

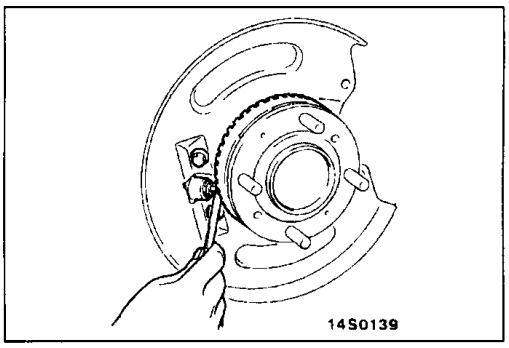
◀A▶ ▶A◀ 3. Rear speed sensor
4. Sensor bracket
5. Rear rotor
(Refer to GROUP 27 – Rear Axle Hub.)



REMOVAL SERVICE POINT

◀A▶ FRONT SPEED SENSOR/REAR SPEED SENSOR REMOVAL

Caution
Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.



INSTALLATION SERVICE POINT

▶A◀REAR SPEED SENSOR INSTALLATION

Caution
Be careful that the pole piece at the end of the speed sensor and the rotor teeth do not become damaged by striking them against the metal parts.

Insert a thickness gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor bracket at the position where the clearance is the standard value all around.

Standard value: 0.3–0.9 mm

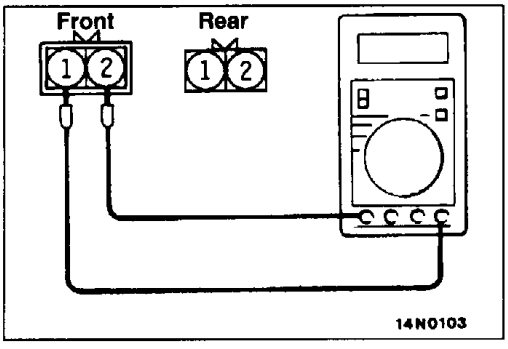
INSPECTION

35200840067

SPEED SENSOR

(1) Check whether any metallic foreign material has adhered to the pole piece at the speed sensor tip, and if so, remove it.
Also check whether the pole piece is damaged, and if so, replace it with a new one.

NOTE
The pole piece can become magnetized because of the magnet but into the speed sensor, with the result that metallic foreign material easily adheres to it. Moreover, the pole piece may not be able to function to correctly sense the wheel rotation speed if it is damaged.



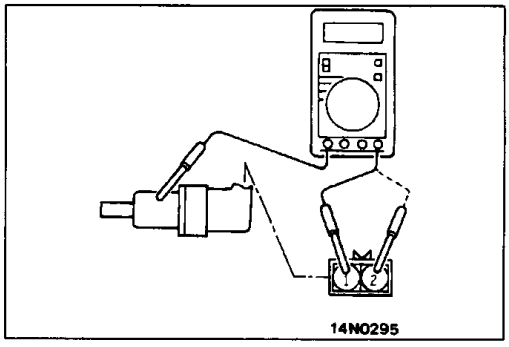
(2) Measure the resistance between the speed sensor terminals.

Standard value: 1.28–1.92 kΩ

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 temporary disconnection occurs.



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 kΩ 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.

PARKING BRAKES

CONTENTS

36109000033

GENERAL INFORMATION 2

SERVICE SPECIFICATIONS 3

LUBRICANTS 3

ON-VEHICLE SERVICE 3

Parking Brake Lever Stroke Check 3

Parking Brake Switch Check 4

PARKING BRAKE LEVER* 5

PARKING BRAKE CABLE* 6

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 airbag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or SRS-related component.

NOTE

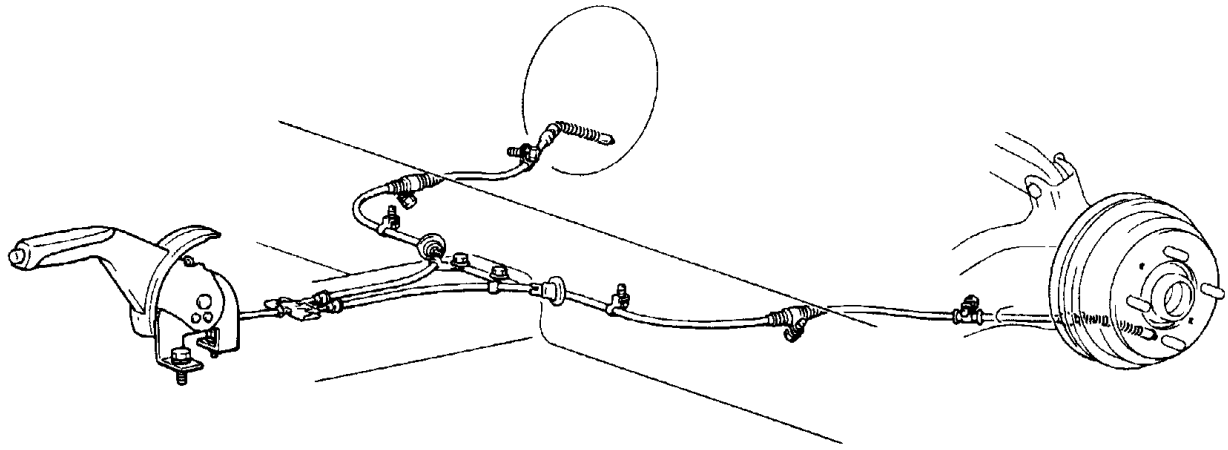
The SRS includes the following components: SRS-ECU, SRS warning lamp, air bag module, clock spring and interconnecting wiring. Other SRS-related components (that may have to be removed/installed in connection with SRS service or maintenance) are indicated in the table of contents by an asterisk (*).

GENERAL INFORMATION

36100010035

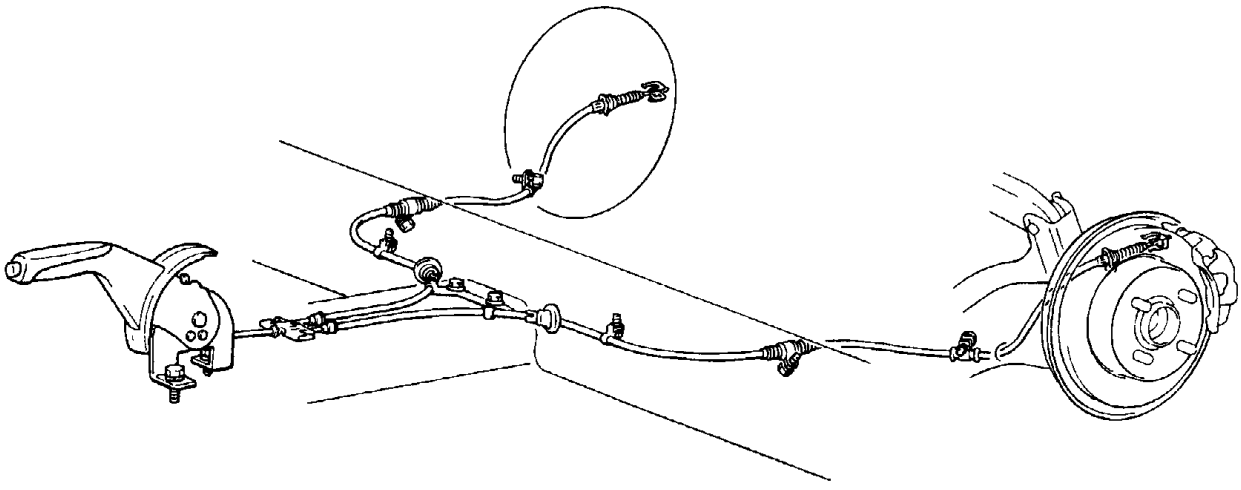
The parking brake is of a mechanical rear-wheel brake construction in all vehicles. Drum-type or drum in disc-type brakes are employed depending on the vehicle model.

<Vehicles with rear drum brakes>



14U0003

<Vehicles with rear disc brakes>



14U0002

00003375

SERVICE SPECIFICATIONS

36100030031

Item	Specifications
Parking brake lever stroke [Operation force: Approx. 196N]	5–7 notches

LUBRICANTS

36100040034

Items	Specified lubricants
Backing plate	Brake grease SAE J310, NLGI No. 1
Shoe and lining assembly	
Adjuster	

ON-VEHICLE SERVICE

36100090039

PARKING BRAKE LEVER STROKE CHECK

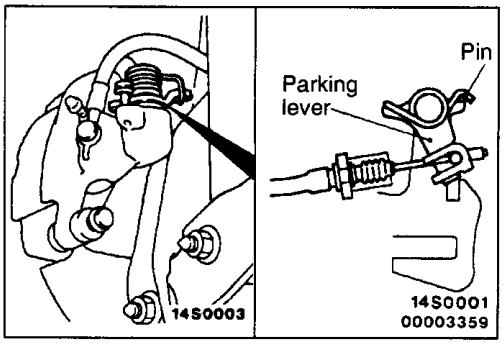
1. Pull the parking brake lever with a force of approx. 196 N and count the number of notches.

   Caution
   The 196 N force of the parking brake lever must be strictly observed.

   Standard value:
   5–7 notches [Operation force: Approx. 196N]

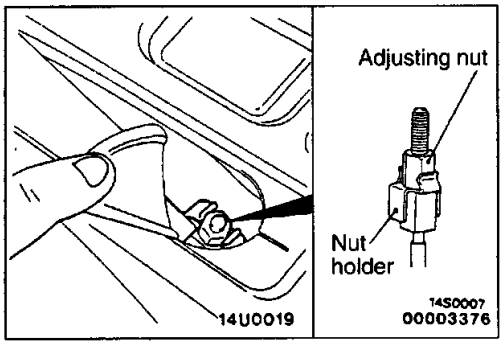
2. If the parking brake lever stroke is not the standard value, adjust as described below.
   (1) Loosen the adjusting nut to the end of the cable rod, thus freeing the parking brake cable.
   (2) With the engine idling, forcefully depress the brake pedal five or six times and confirm that the pedal stroke stops changing.

   NOTE
   If the pedal stroke stops changing, the automatic-adjustment mechanism is functioning normally, and the clearance between the shoe and drum is correct.



(3) For vehicles with rear disc brakes, check that the parking brake lever on the caliper side is touching the pin.

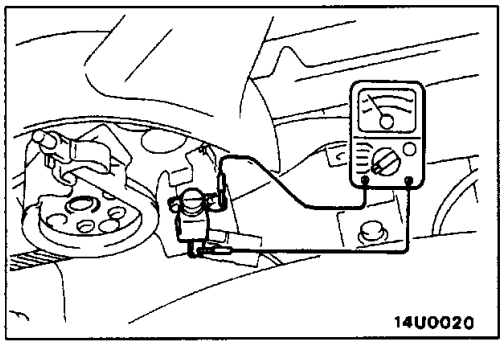
NOTE
If the parking brake lever is not touching the pin, the parking brake cable might be stuck or routed incorrectly, or there might be a problem with the automatic adjustment mechanism inside the rear brake calipers. Therefore, it is necessary to check the parking brake cable and to disassemble and inspect the rear brake calipers.



(4) Turn the adjusting nut to adjust the parking brake lever stroke to the standard value. After adjusting, check that there is no space between the adjusting nut and the parking brake lever.
Check that the adjusting nut is also securely held by the nut holder.

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

(5) After adjusting the parking brake lever stroke, jack up the rear of the vehicle. Release the parking brake and turn the rear wheels to check that the rear brakes are not dragging. In addition, for vehicles with rear disc brakes, check that the parking brake lever on the caliper side is touching the pin.



PARKING BRAKE SWITCH CHECK 36100330032

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

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

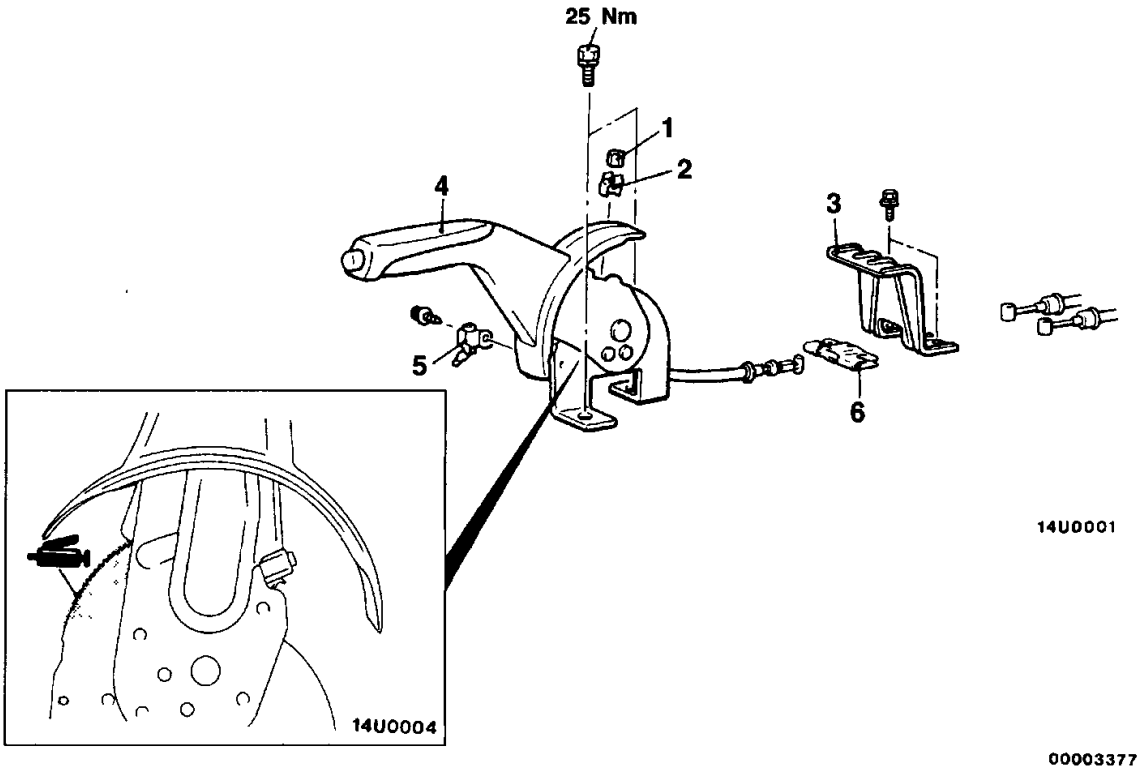
PARKING BRAKE LEVER

36100130038

REMOVAL AND INSTALLATION

Pre-removal Operation
1. Floor Console Removal (Refer to GROUP 52A.)
2. Rear Seat Removal (Refer to GROUP 52A.)

Post-installation Operation
1. Parking Brake Lever Stroke Adjustment (Refer to P.36-4.)
2. Floor Console Installation (Refer to GROUP 52A.)
3. Rear Seat Installation (Refer to GROUP 52A.)



Removal steps
1. Adjusting nut
2. Nut holder
- Rear scuff plate
3. Bracket
4. Parking brake lever assembly
5. Parking brake switch
6. Cable equalizer

PARKING BRAKE CABLE

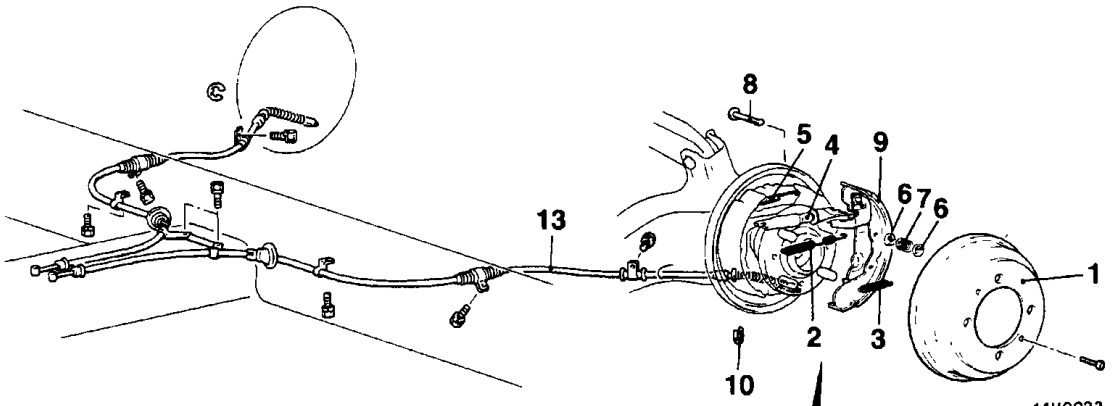
36100190050

REMOVAL AND INSTALLATION

Pre-removal Operation
- Floor Console Removal (Refer to GROUP 52A.)

Post-installation Operation
- Parking Brake Lever Stroke Adjustment (Refer to P.36-4.)
- Floor Console Installation (Refer to GROUP 52A.)

<Vehicles with rear drum brakes>



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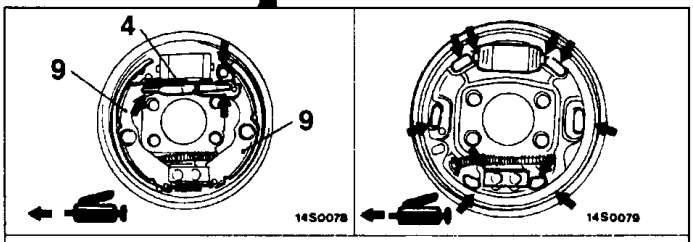
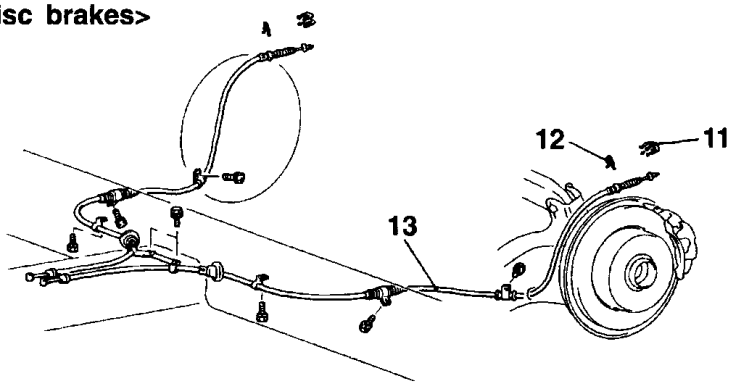


Brake grease: Brake grease SAE J310, NLGI No. 1

<Vehicles with rear disc brakes>



A14R0006

Removal steps
<Vehicles with rear drum brakes>

1. Rear brake drum
2. Shoe-to-lever spring
3. Retainer spring
4. Auto adjuster assembly
5. Shoe-to-shoe spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe hold-down pin
9. Shoe and lining assembly
10. Clip
13. Parking brake cable

<Vehicle with rear disc brakes>

11. Cable retainer
12. Parking clip
13. Parking brake cable

STEERING

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37209000057

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

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

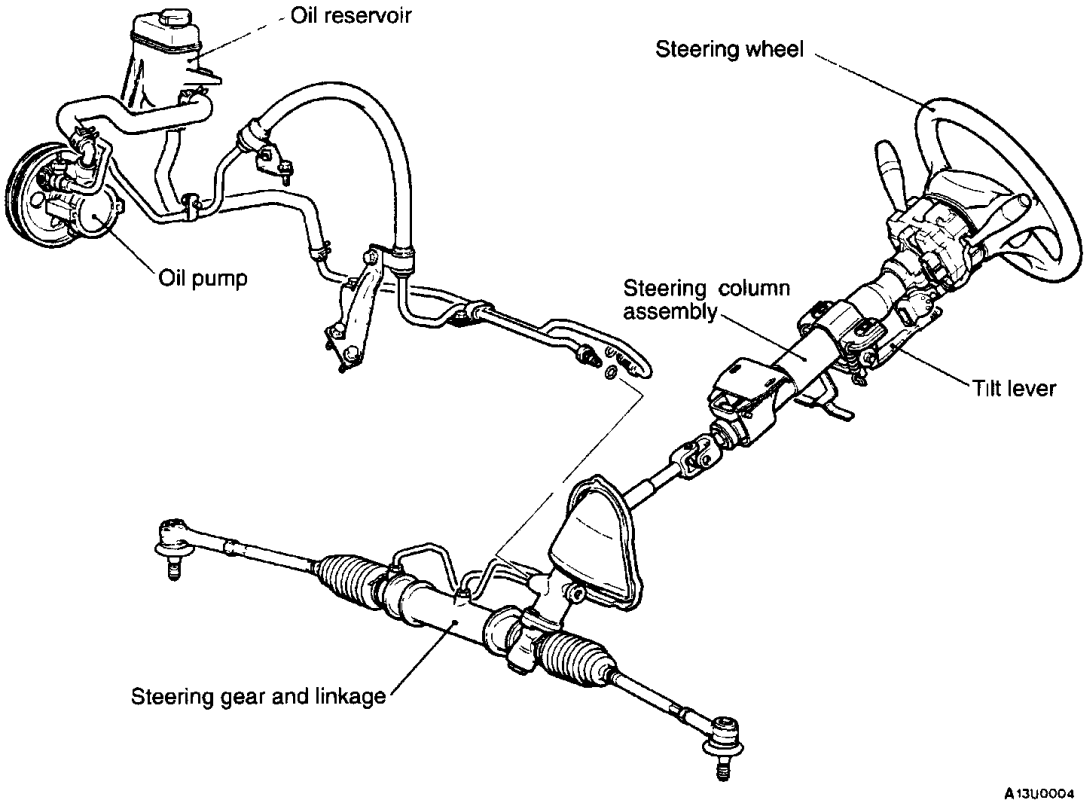
GENERAL INFORMATION

37200010059

The steering wheel is a 3-spoke type for standard models and a 4-spoke type for vehicles with SRS.
The steering column is equipped with both shock absorbing and a tilt steering mechanism.
The power steering is an integral rack and pinion type that combines the steering gear and linkage into one light-weight and compact assembly.
The steering system uses a vane oil pump with a fluid flow control system, so that steering effort varies with engine speed.

Items		Specifications
Steering gear and linkage	Type	Integral type
	Gear type	Rack and pinion
Oil pump	Type	Vane type
	Displacement mℓ/rev.	7.1
	Relief set pressure MPa	9.8

CONSTRUCTION DIAGRAM



SERVICE SPECIFICATIONS

37200030055

Items			Standard value	Limit
Steering wheel free play mm	with engine stopped		10 or less	–
	when hydraulic operation		–	30
Steering angle	Inner wheel		39°00'±1°30	–
	Outer wheel		32°00'	–
Tie rod end ball joint starting torque Nm			1.0–3.0	–
Stationary steering effort N (Fluctuation allowance)			34 or less (5.9 or less)	–
Oil pump pressure MPa	Oil pump relief pressure		9.8	–
	Pressure under no-load conditions		0.3–0.8	–
	Steering gear retention hydraulic pressure		9.8	–
Oil pressure switch operating pressure MPa		OFF→ON	1.8–2.4	–
		ON→OFF	1.0	–
Total pinion preload Nm (Change in torque: 0.4 Nm)			0.6–1.3	–
Tie-rod joint swing resistance N (Tie-rod joint swing torque Nm)			6–20 (1.5–4.9)	–

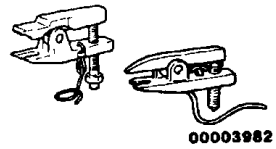
LUBRICANTS

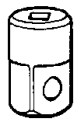
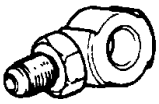
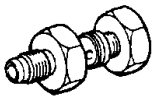
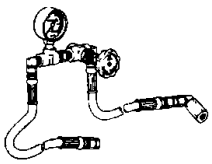
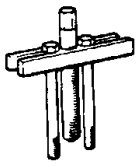
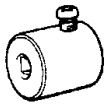
37200040041

Items	Specified lubricant	Quantity
Power steering fluid	Automatic transmission fluid DEXRON or DEXRON II	As required
O-ring	Automatic transmission fluid DEXRON or DEXRON II	As required

SPECIAL TOOLS

37200060054

Tool	Number	Name	Use
 00003982	MB991113 or MB990635	Steering linkage puller	Disconnection of tie-rod end

Tool	Number	Name	Use
	MB990685	Torque wrench	• Measurement of the ball joint starting torque • Measurement of the pinion shaft preload
	MB990326	Preload socket	Measurement of the ball joint starting torque
	MB990993 or MB991217	Power steering oil pressure gauge adapter (pump side)	Measurement of oil pressure
	MB990994	Power steering oil pressure gauge adapter (hose side)	
	MB990662	Oil pressure gauge assembly	
	MB990803	Steering wheel puller	Disconnection of the steering wheel
	MB991006	Preload socket	Measurement of the pinion shaft preload
	MB990776	Front axle base	Installation of dust cover for tie rod end ball joint

ON-VEHICLE SERVICE 37200100046

STEERING WHEEL FREE PLAY CHECK

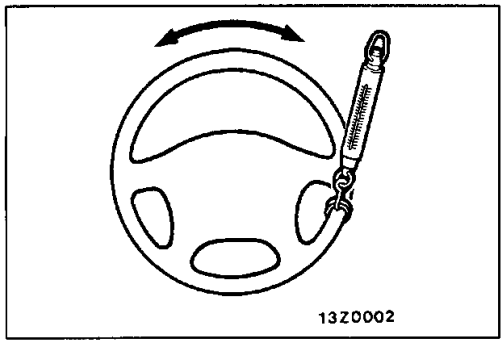
1. With engine running (hydraulic operation), set front wheels straight ahead.
2. Measure the play on steering wheel circumference before wheels start to move when slightly moving steering wheel in both directions.

   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): 10 mm or less

   If the play exceeds the standard value, remove steering gear box and check total pinion torque.

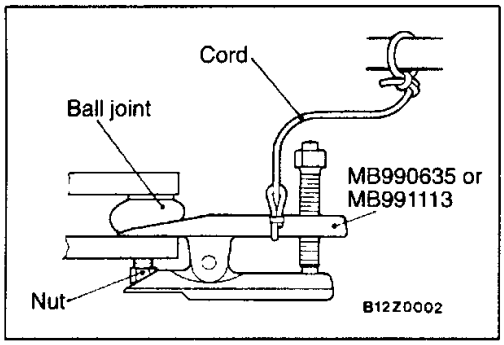


STEERING ANGLE CHECK 37200110056

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

   Standard value:
   Inner wheel 39°00'±1°30'
   Outer wheel 32°00'

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.

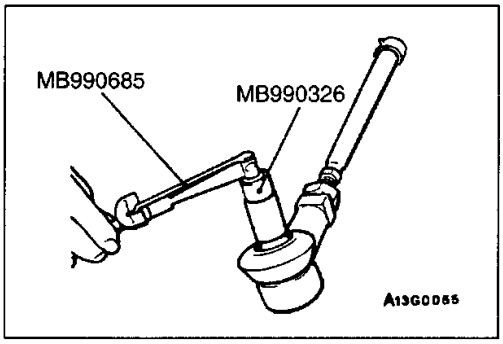


TIE ROD END BALL JOINT STARTING TORQUE CHECK

37200150058

1. Disconnect tie rod and knuckle with special tool.

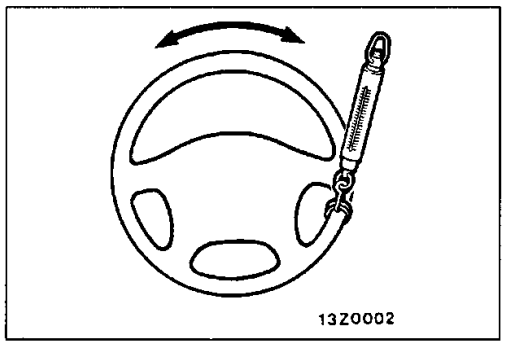
   Caution
   1. Using the special tool, loosen the tie rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.
   2. Support the special tool with a cord, etc. to prevent it from coming off.



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

   Standard value: 1.0–3.0 Nm

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



STATIONARY STEERING EFFORT CHECK

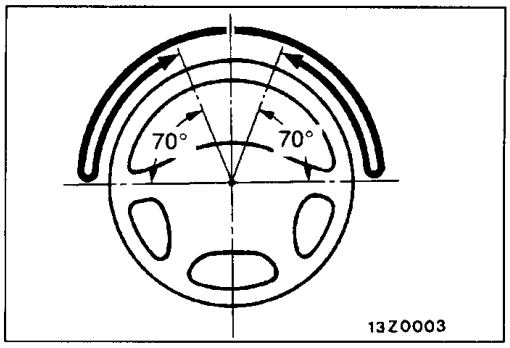
37200170054

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

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

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

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



CHECKING STEERING WHEEL RETURN TO CENTRE

37200180057

To make this test, conduct a road test and check as follows.

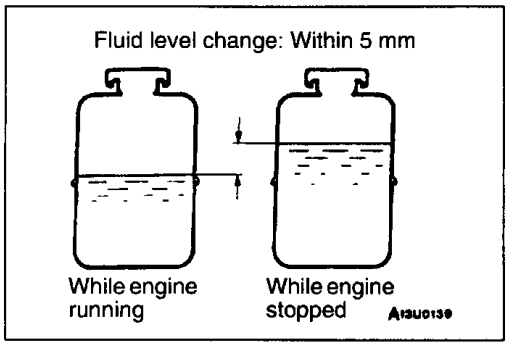
1. Make both gradual and sudden turns and check the steering "feeling" to be sure that there is not difference in the steering force required and the wheel return between left and right turns.
2. At a speed of 35 km/h, turn the steering wheel 90° and release the steering wheel after 1 or 2 seconds. If the steering wheel then returns 70° or more, the return can be judged to the 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 especially apt to be insufficient during idling.)

DRIVE BELT TENSION CHECK

37200190029

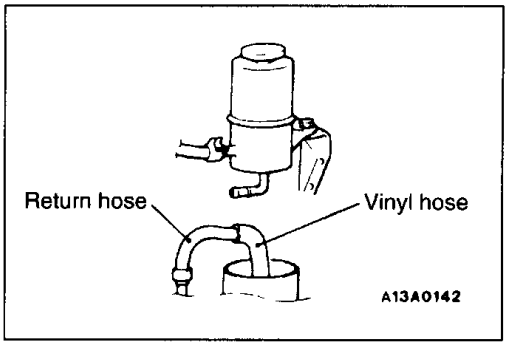
Refer to GROUP 11A – On-vehicle Service.



FLUID LEVEL CHECK

37200200043

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°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. Check the difference of the fluid level when the engine is stopped, and while it is running. If the change of the fluid level is 5 mm or more, air bleeding should be done.



FLUID REPLACEMENT

37200210046

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 high tension cable.

   Caution
   Be careful not to position the high-tension cable near the delivery pipe.
5. While operating the starting motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.
6. Connect the return hoses securely, and then secure it with the clip.
7. 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

37200220049

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 high-tension cable.

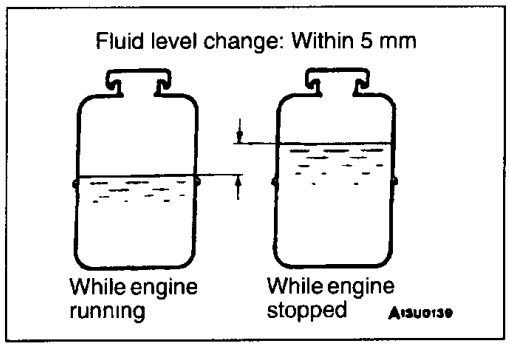
   Caution
   Be careful not to position the high-tension cable near the delivery pipe.

5. 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.**

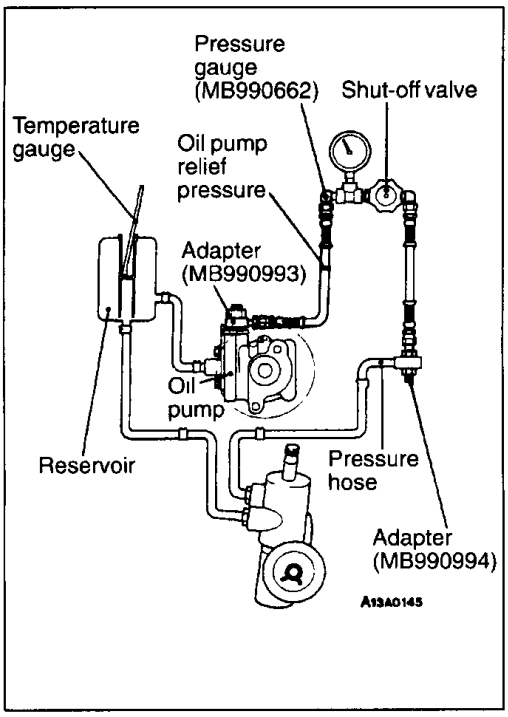
6. Connect the ignition cable.
7. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
8. Confirm that the fluid is not milky, and that the level is up to the specified position on the level gauge.
9. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.



10. Check whether or not the change in the fluid level is within 5 mm when the engine is stopped and when it is running.
11. 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.

Caution

1. **If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled.**
2. **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 37200230059

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±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: 9.8 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, replace the oil pump.
6. 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: 0.3–0.8 MPa

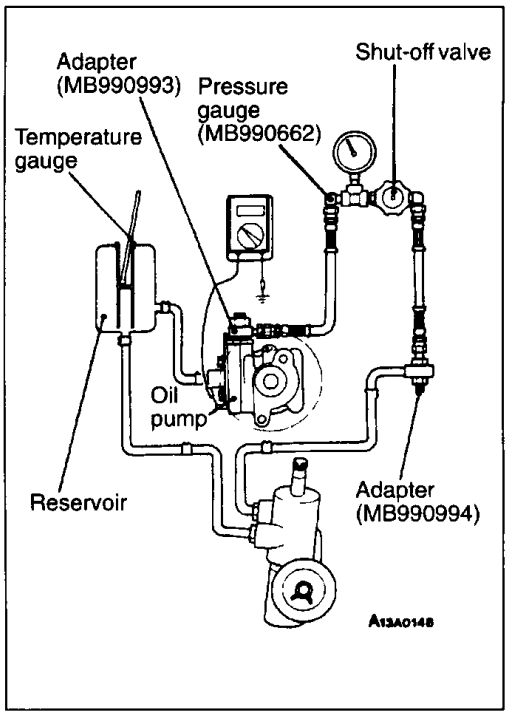
7. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
8. Fully open the shut-off valve of the pressure gauge.
9. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is the standard value.

   Standard value: 9.8 MPa

10. When not within the standard value, replace the power steering gear box.
    Remeasure fluid pressure.
11. Remove the special tools, and then tighten the pressure hose to the specified torque.

    Tightening torque: 44 Nm

12. Bleed the system.



POWER STEERING OIL PRESSURE SWITCH CHECK

37200720037

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 oil 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: 1.8–2.4 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: 1.0 MPa

7. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 44 Nm

8. Bleed the system.

STEERING WHEEL AND SHAFT

37200260058

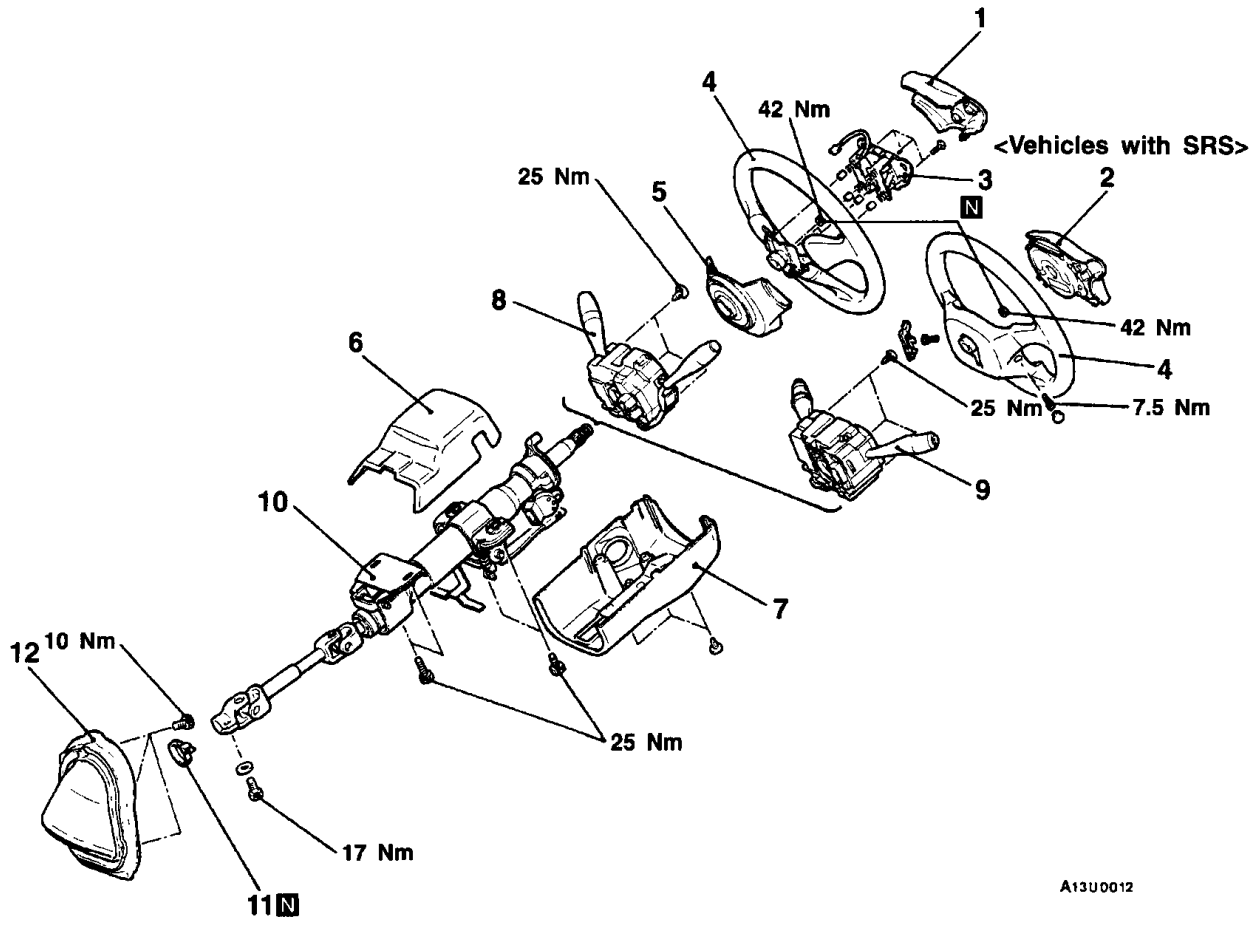
REMOVAL AND INSTALLATION

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

Pre-removal Operation
- Instrument Under Cover Removal (Refer to GROUP 52A – Instrument Panel.)

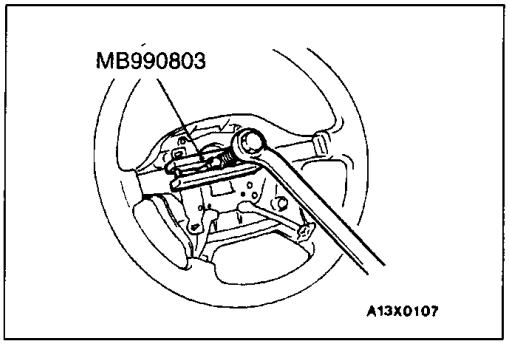
Post-installation Operation
(1) Instrument Under Cover Installation (Refer to GROUP 52A – Instrument Panel.)
(2) Checking Steering Wheel Position with Wheels Straight Ahead

<Vehicles without SRS>



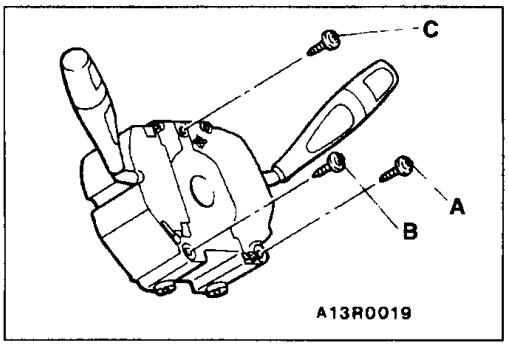
Removal steps

1. Horn pad <Vehicles without SRS>
2. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
3. Horn switch <Vehicles without SRS>
◀A▶ 4. Steering wheel
5. Steering wheel lower cover <Vehicles without SRS>
6. Upper column cover
7. Lower column cover
▶A◀ 8. Column switch <Vehicles without SRS>
▶A◀ 9. Clock spring and column switch (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
10. Steering shaft assembly
11. Band
12. Retainer assembly



REMOVAL SERVICE POINT

◀A▶ STEERING WHEEL REMOVAL



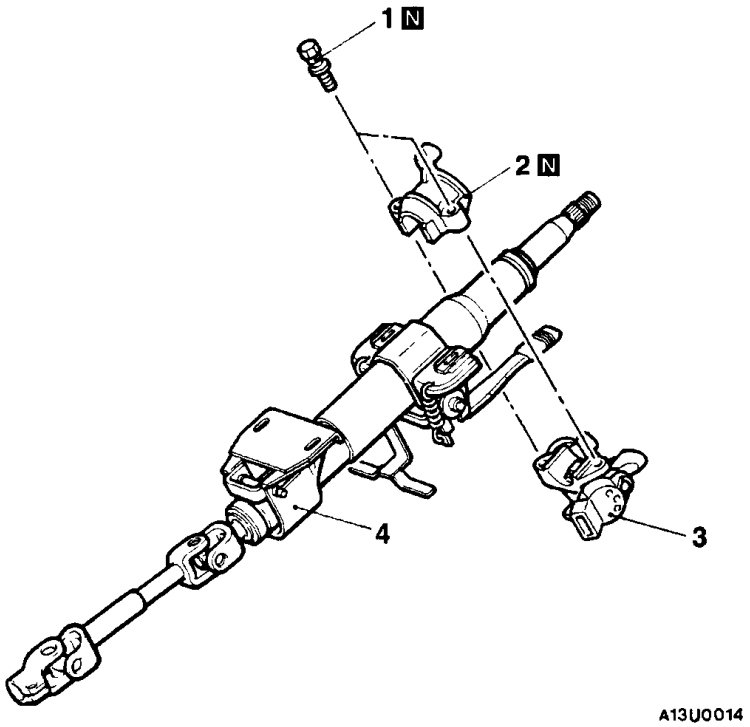
INSTALLATION SERVICE POINT

▶A◀ CLOCK SPRING AND COLUMN SWITCH/COLUMN SWITCH INSTALLATION

Tighten the screws in an alphabetical order.

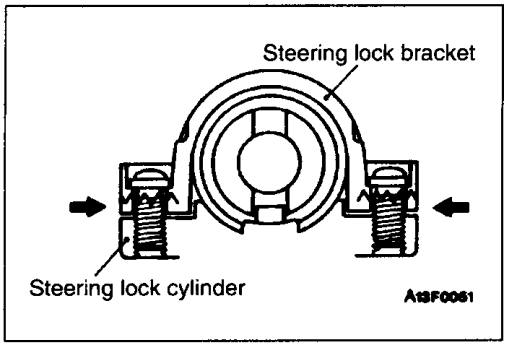
DISASSEMBLY AND REASSEMBLY

37200280054



Disassembly steps

◀A▶ ▶A◀ 1. Special bolt
▶A◀ 2. Steering lock bracket
▶A◀ 3. Steering lock cylinder
4. Steering shaft



DISASSEMBLY SERVICE POINT

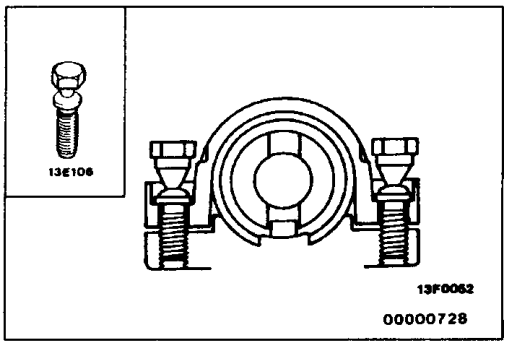
◀A▶ STEERING LOCK BRACKET/STEERING LOCK CYLINDER REMOVAL

If it is necessary to remove the steering lock cylinder, use a hacksaw to cut the special bolts at the steering lock bracket side.

REASSEMBLY SERVICE POINT

▶A◀ STEERING LOCK CYLINDER/STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION

(1) When installing the steering lock cylinder and steering lock bracket to the column tube, temporarily install the steering lock in alignment with the column boss.



(2) After checking that the lock works properly, tighten the special bolts until the head twists off.

Caution
The steering lock bracket and bolts must be replaced with new ones when the steering lock is installed.

POWER STEERING GEAR BOX

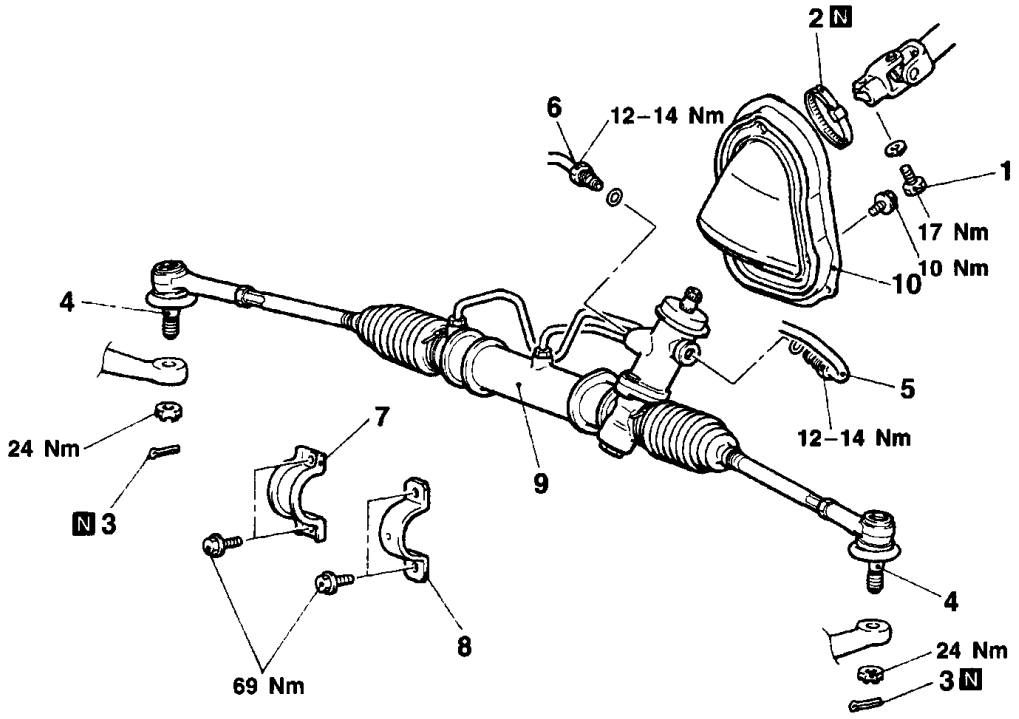
37200390054

REMOVAL AND INSTALLATION

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

Pre-removal Operation
(1) Power Steering Fluid Draining (Refer to P.37A-8.)
(2) Center Member Removal (Refer to GROUP 32.)
(3) Front Exhaust Pipe Removal (Refer to GROUP 15.)

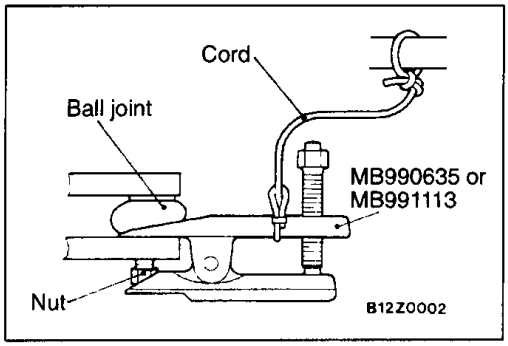
Post-installation Operation
(1) Front Exhaust Pipe Installation (Refer to GROUP 15.)
(2) Center Member Installation (Refer to GROUP 32.)
(3) Power Steering Fluid Supplying (Refer to P.37A-8.)
(4) Power Steering Fluid Line Bleeding (Refer to P.37A-8.)
(5) Checking Steering Wheel Position with Wheels Straight Ahead
(6) Front Wheel Alignment Adjustment (Refer to GROUP 33A.)



Removal steps

1. Steering shaft assembly and gear box connecting bolt
2. Band
3. Split pin
4. Tie-rod end and knuckle connection
5. Return hose connection
6. Pressure hose connection
7. Cylinder clamp
8. Gear housing clamp
9. Gear box assembly
10. Retainer assembly

◀A▶ ◀B▶



REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

Caution

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

◀B▶ GEAR BOX ASSEMBLY REMOVAL

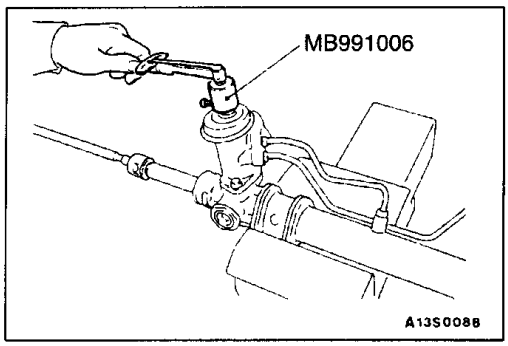
Caution

Be careful not to damage the bellows and the tie-rod end dust cover when removing the gear box assembly.

INSPECTION

37200400047

- 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: 0.6–1.3 Nm
[Change in torque: 0.4 Nm]

NOTE

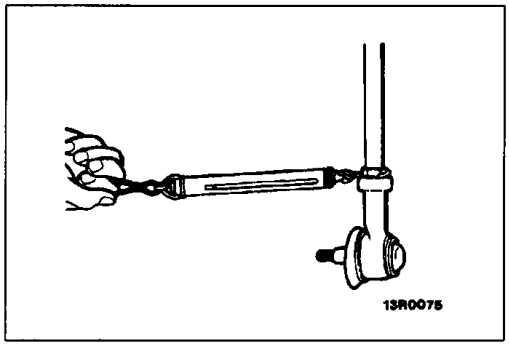
When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.

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 torque cannot be adjusted to the standard value, replace the power steering gear box assembly.

Caution

The power steering gear box assembly should be secured at the mounting sections. If it is secured in any other places, the gear housing may become deformed or damaged.



CHECK THE TIE ROD FOR SWING RESISTANCE

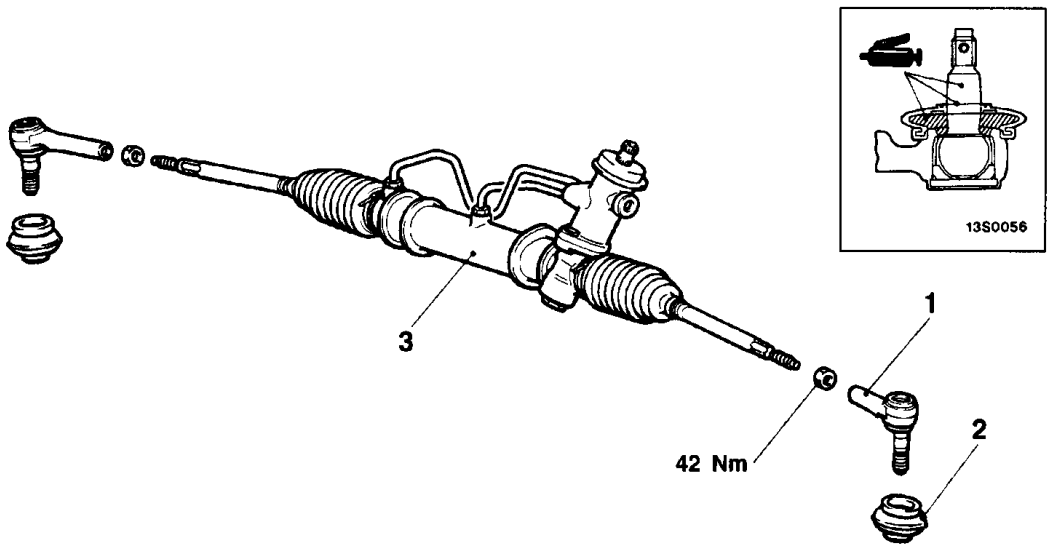
(1) Give 10 hard swings to the tie rod.
(2) Measure the tie rod swing resistance with a spring balance.

Standard value: 6–20 N [1.5–4.9 Nm]

(3) If the measured value exceeds the standard value, replace gear box assembly.
(4) Even if the measured value is below the standard value, the tie rod which swings smoothly without excessive play may be used.

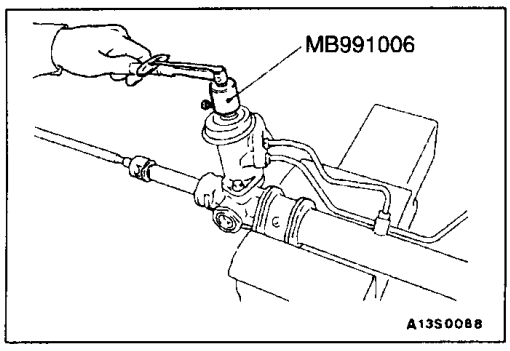
DISASSEMBLY AND REASSEMBLY

37200410057



Disassembly steps

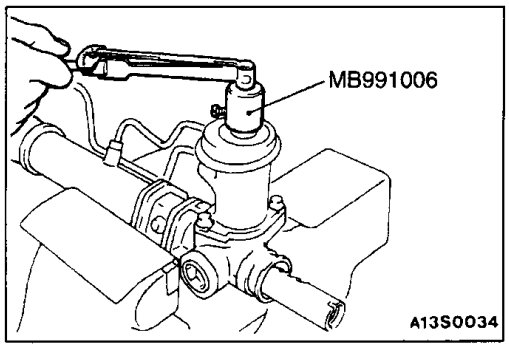
▶C◀ 1. Tie rod end
▶B◀ 2. Dust cover
3. Gear box assembly
▶A◀ • Total pinion torque adjustment



REASSEMBLY SERVICE POINTS

▶A◀ TOTAL PINION TORQUE ADJUSTMENT

(1) Position rack at its centre. Tighten rack support cover to 15 Nm.
(2) In neutral position, rotate pinion shaft clockwise one turn/4–6 seconds with special tool. Return rack support cover 30°–60° and adjust torque to the standard value.



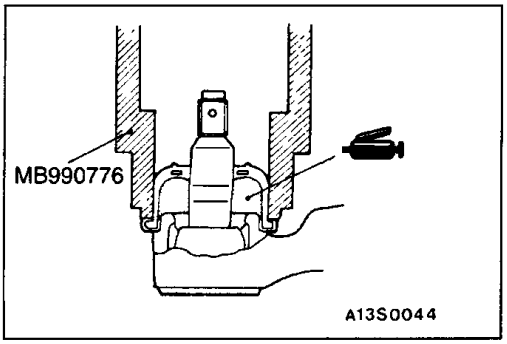
(3) Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value: 0.6–1.3 Nm
[Change in torque: 0.4 Nm]

Caution
1. **When adjusting, set the standard value at its highest value.**
2. **Assure no ratcheting or catching when operating rack towards the shaft direction.**

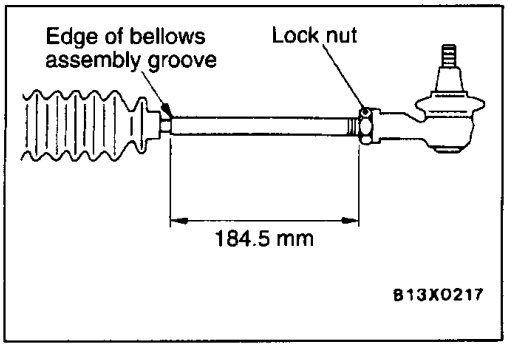
NOTE
When it cannot be adjusted within the specified return angle, check rack support cover components or replace.

(4)After adjusting, lock rack support cover with lock nut.



▶B◀ DUST COVER INSTALLATION

(1) Pack dust cover interior with multipurpose grease.
(2) Apply specified sealant to dust cover lip.
Specified fluid: 3M ATD Part No. 8661 or equivalent
(3) Using the special tool, install the dust cover to the tie rod end ball joint.



▶C◀ TIE ROD END INSTALLATION

Screw in tie-rod end to have its right and left length as illustrated. Lock with lock nut.

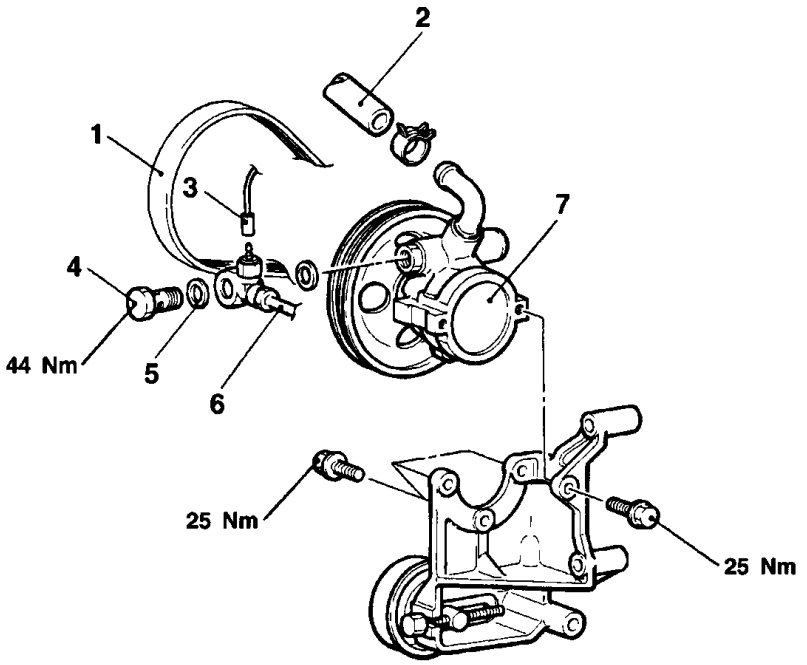
POWER STEERING OIL PUMP

37200520057

REMOVAL AND INSTALLATION

Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-8.)

Post-installation Operation
- Power Steering Fluid Supplying (Refer to P.37A-8.)
- Drive-belt Tension Adjusting (Refer to P.37A-7.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-8)
- Oil Pump Pressure Check (Refer to P.37A-10.)



A13U0013

Removal steps

1. Drive-belt
2. Suction hose
3. Pressure switch connector
4. Eye bolt
5. Washer
6. Banjo block
7. Oil Pump

INSPECTION

37200530036

Check the drive-belt for cracks.
Check the pulley assembly for uneven rotation.

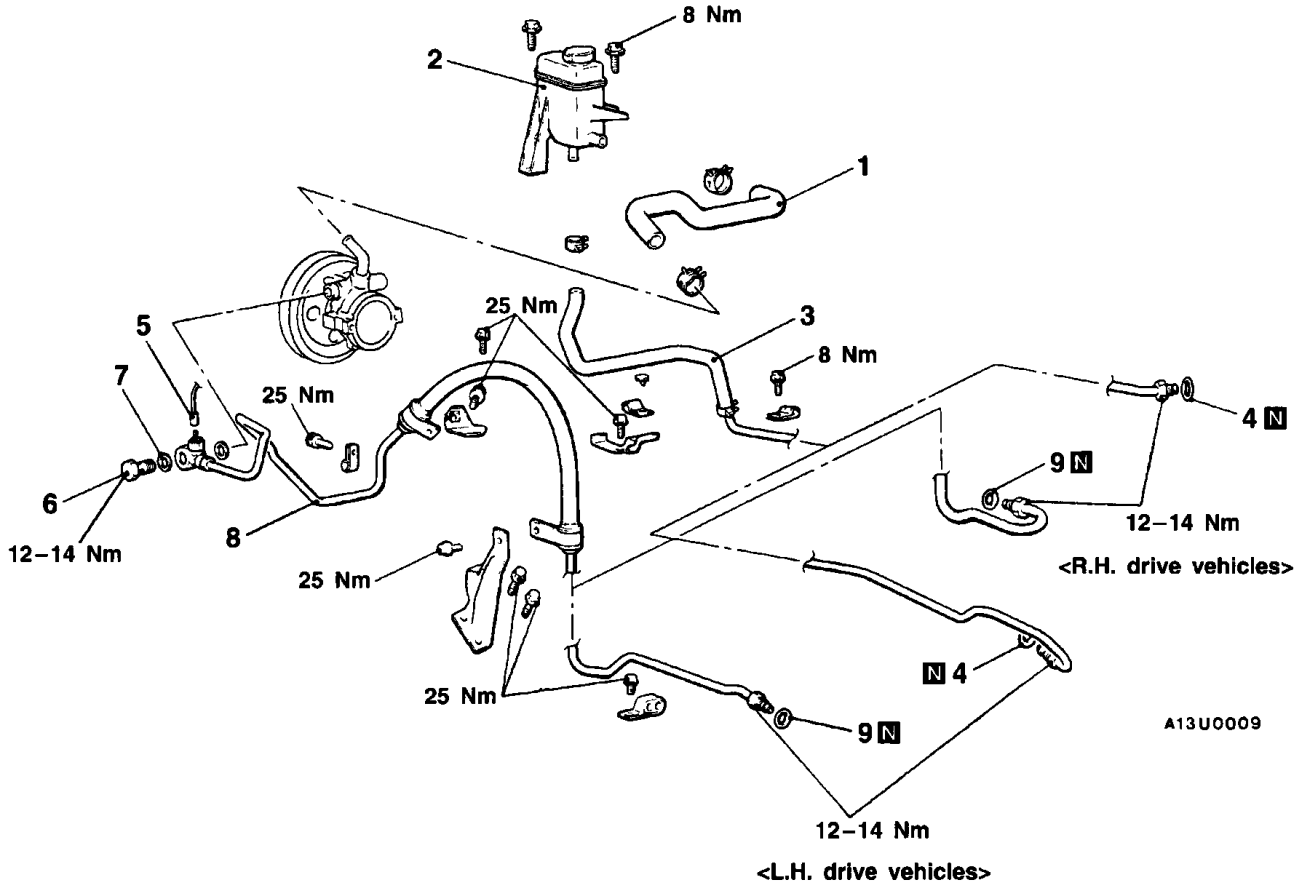
POWER STEERING HOSES

37200570069

REMOVAL AND INSTALLATION

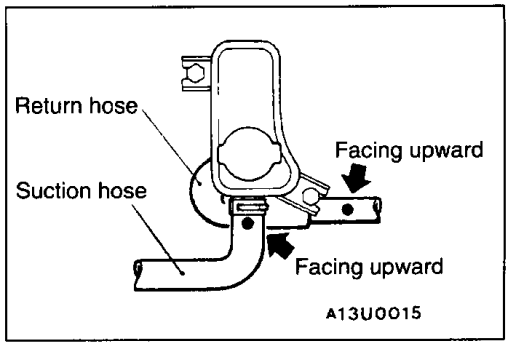
Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-8.)

Post-installation Operation
- Power Steering Fluid Supplying (Refer to P.37A-8.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-8.)



Removal steps

▶A◀ 1. Suction hose
2. Oil reservoir
▶A◀ 3. Return hose
4. O-ring
5. Pressure switch connector
6. Eye bolt
7. Washer
8. Pressure hose
9. O-ring



INSTALLATION SERVICE POINT

▶A◀ RETURN HOSE/SUCTION HOSE INSTALLATION

Connect the hose so that the marking is facing upwards.

BODY

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42109000041

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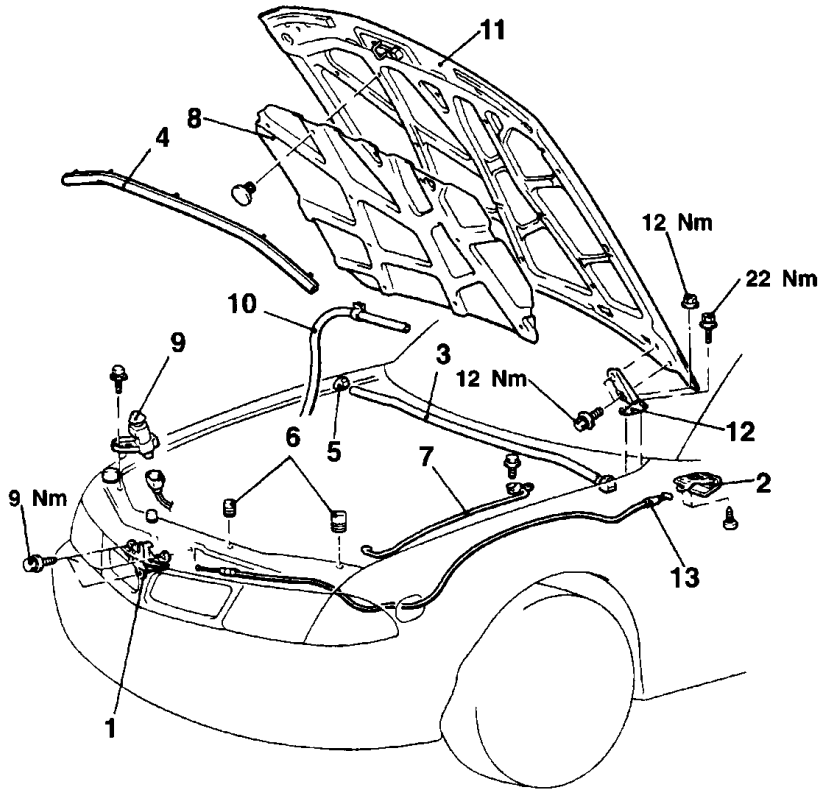
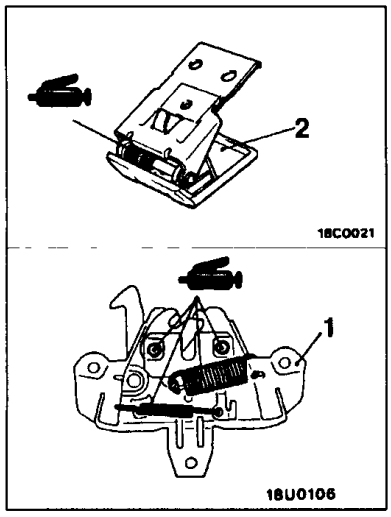
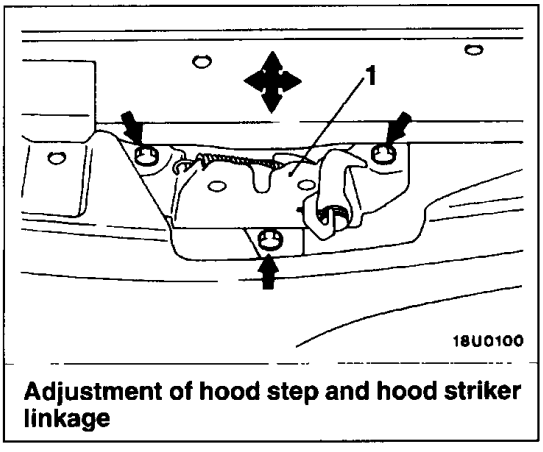
HOOD

42100160045

REMOVAL AND INSTALLATION

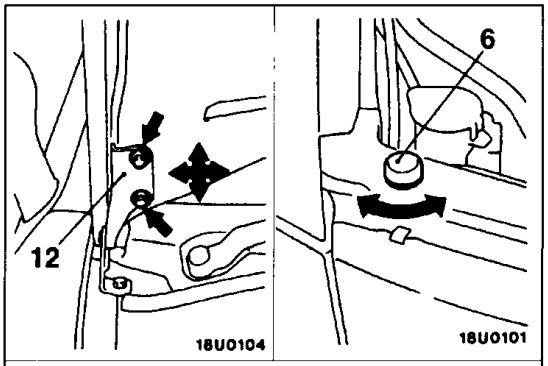






Adjustment of hood step and hood striker linkage

18U0085 00003430



Adjustment of clearance around hood and height

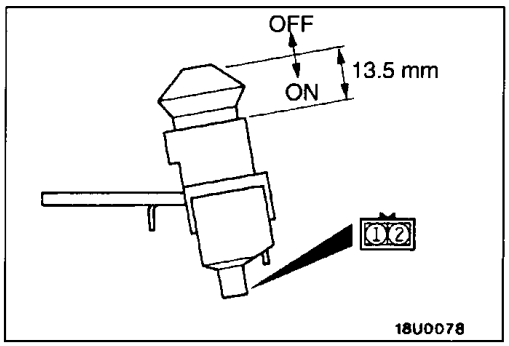
1. Hood latch
2. Hood lock release handle
3. Hood weatherstrip
4. Hood weatherstrip
   <Vehicles with air conditioner>
5. Hood side weatherstrip
6. Bumper
7. Hood support rod
8. Hood insulator
9. Hood switch
   <Vehicles with shaftalarm system>

Hood and hood hinge removal steps

10. Washer hose connection
11. Hood
    • Front deck garnish
12. Hood hinge

Hood lock release cable removal steps

• Splash shield <Driver's side> (Refer to P.42-4.)
13. Hood lock release cable



INSPECTION

42100390024

HOOD SWITCH CONTINUITY CHECK

Switch position	Terminal No.	
	1	2
Hood switch unpressed (OFF)	○	○
Hood switch depressed (ON)		

FENDER

42100050045

SEALANT

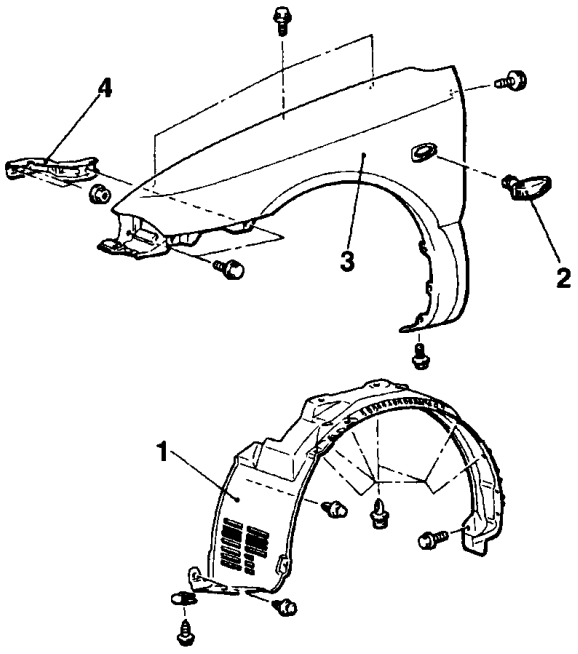
Item	Specified sealant	Remark
Splash shield	3M ATD Part No. 8625 or equivalent	Ribbon sealer

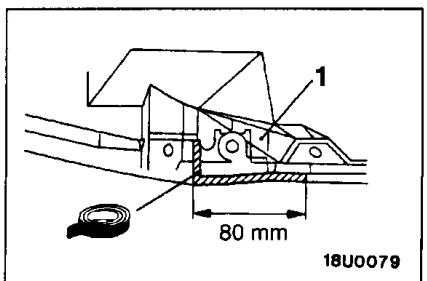
FENDER

42100190044

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Front Bumper Removal and Installation (Refer to GROUP 51.)
(2) Headlamp Removal and Installation (Refer to GROUP 54.)
(3) Side Airdam Removal and Installation (Refer to GROUP 51 – Aero Parts.)





Sealant: 3M ATD Part No. 8625 or equivalent

00003431

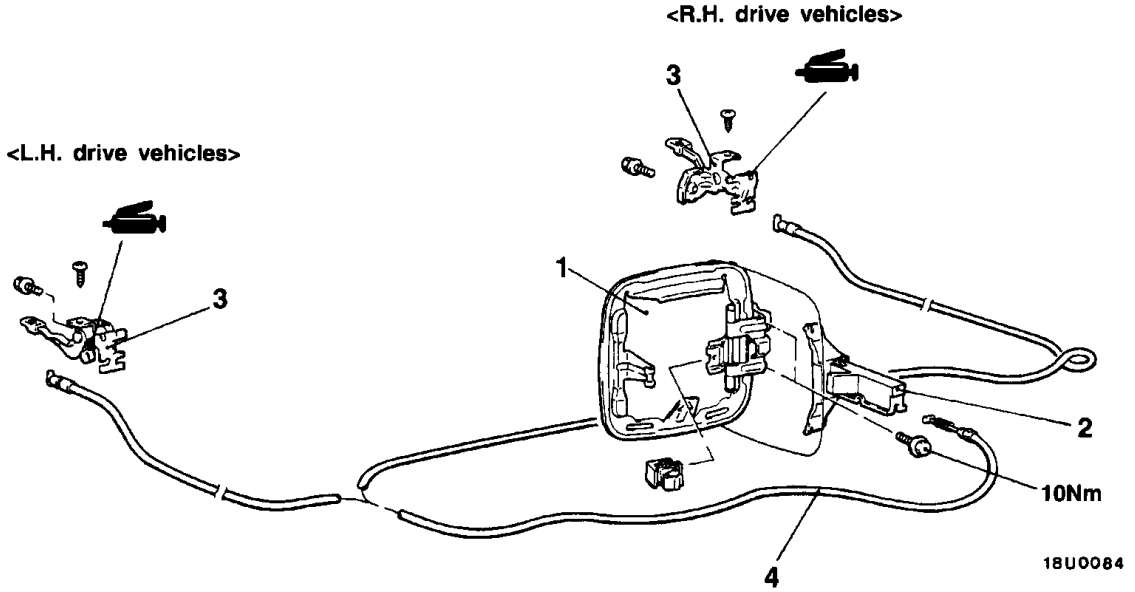
Removal steps
1. Splash shield
2. Side turn signal lamp (Refer to GROUP 54.)
3. Fender
4. Fender support bracket

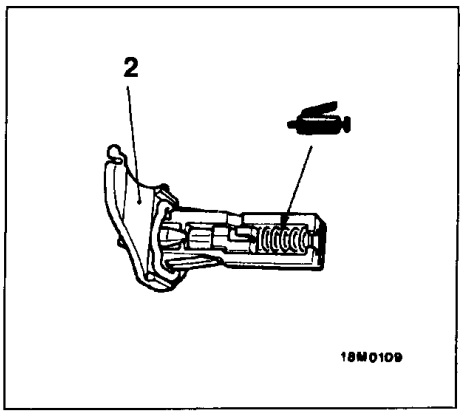
FUEL FILLER DOOR

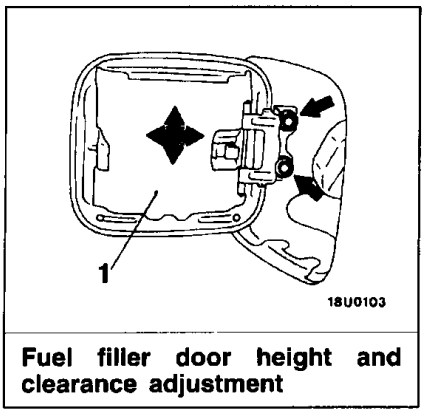
42100250056

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Front Seat (driver's side), Rear Seat Removal and Installation (Refer to GROUP 52A.)
(2) Centre Pillar Lower Trim (driver's side), Front Scuff Plate (driver's side), Rear Scuff Plate (driver's side), Rear End Trim, Rear Side Trim (L.H.) Removal and Installation (Refer to GROUP 52A.)







Fuel filler door height and clearance adjustment

Removal steps
1. Fuel filler door assembly
2. Fuel filler lock hook assembly
3. Lid lock release handle
4. Fuel filler door lock release cable

WINDOW GLASS

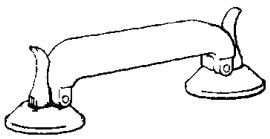
42200050031

ADHESIVES

Items	Specified adhesives
Windshield	3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealants or equivalent
Tailgate window glass	

SPECIAL TOOL

42200060034

Tool	Number	Name	Use
	MB990480	Glass holder	• Removal and installation of windshield • Removal and installation of tailgate window glass

WINDOW REPAIR

42200560015

The following glass sections are installed by means of a liquid urethane adhesive method.

- Windshield
- Tailgate window glass

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. × length...0.6mm × 1m For cutting adhesive
Adhesive gun	For pressing-out adhesive

NOTE
The TEROSON 127.37V auto window sealer kit can also be used. If using the TEROSON 127.37V auto window sealer kit, follow the instructions in the manual included with the kit.

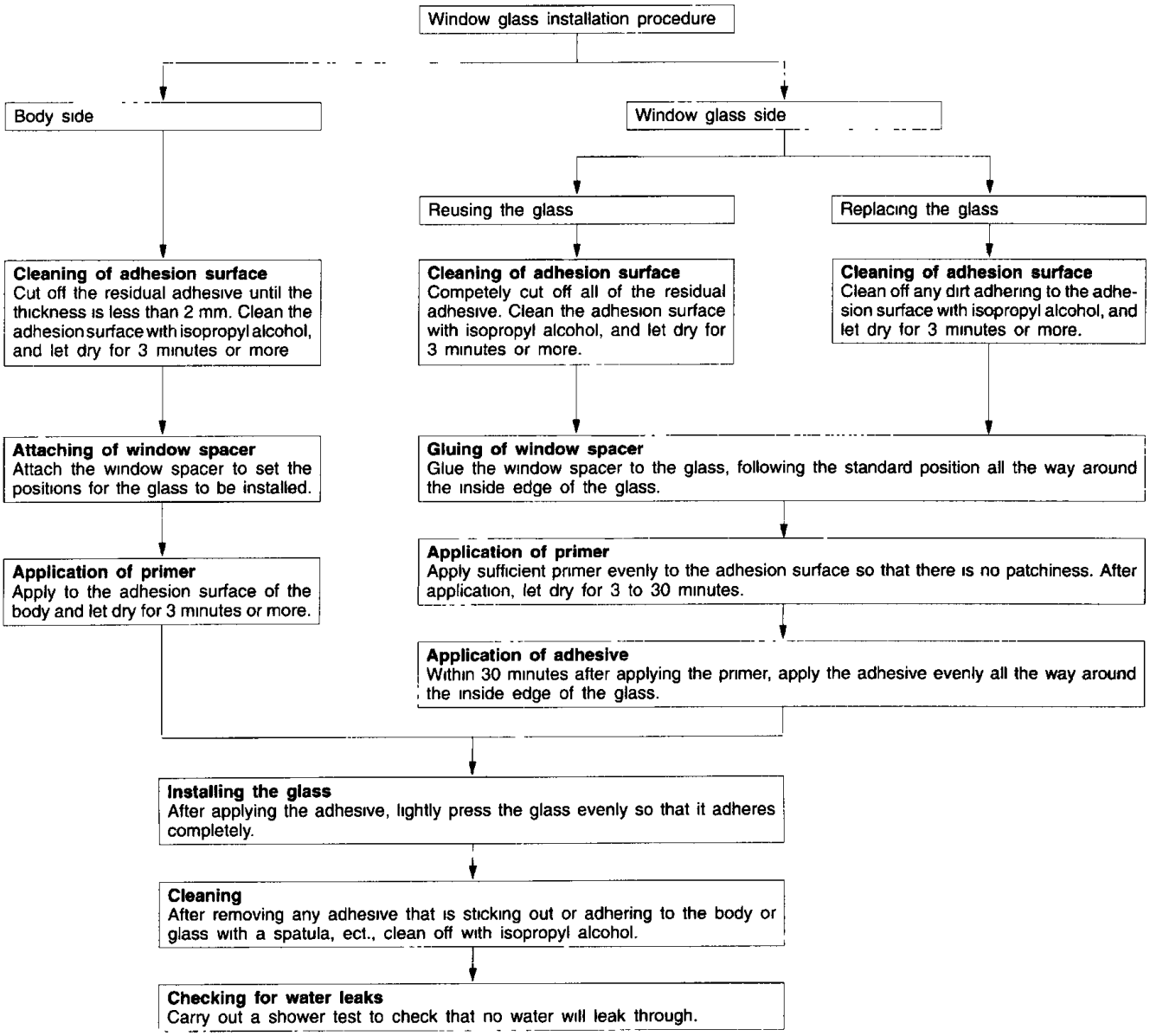
HANDLING OF AUTO WINDOW SEALER

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

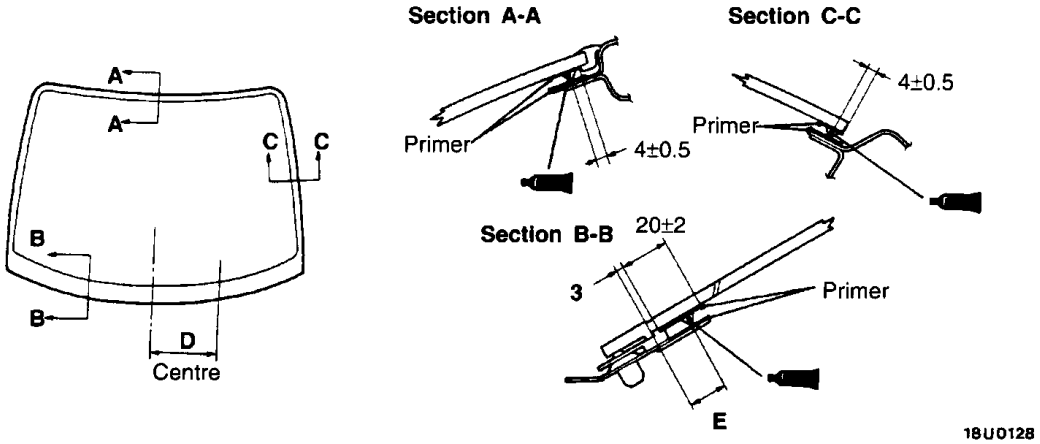
42200100040

REMOVAL AND INSTALLATION

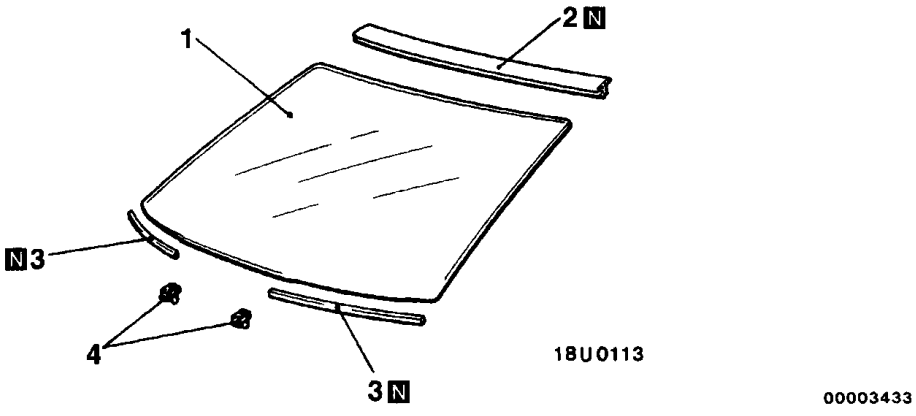
Pre-removal and Post-installation Operation
Removal and Installation
(1) Front Deck Garnish
(2) Front Pillar Trim (Refer to GROUP 52A.)
(3) Headlining
(4) Front Pillar Drip Moulding (Refer to GROUP51.)

Adhesive application dimension of D point

D mm	0	100	200	300	400	500	600
E mm	6	7.5	12	16	13.5	17.5	25.5



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



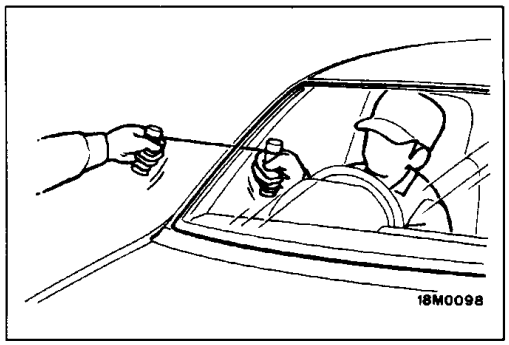
Removal steps

◀A▶ ▶B◀ 1. Windshield
2. Windshield moulding
▶A◀ 3. Window spacer
4. Window spacer

REMOVAL SERVICE POINT

◀A▶ WINDSHIELD REMOVAL

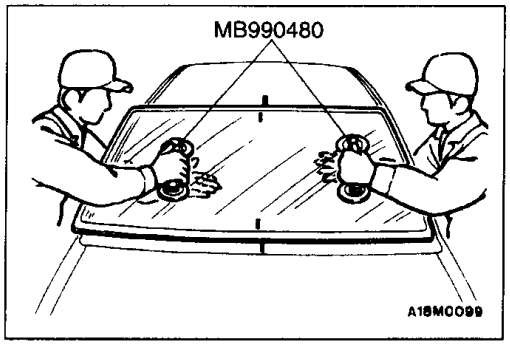
1. In order to protect the body (paint surface), apply cloth tape to all body areas around the installed windshield glass.
2. Cut the moulding with a cutter knife.



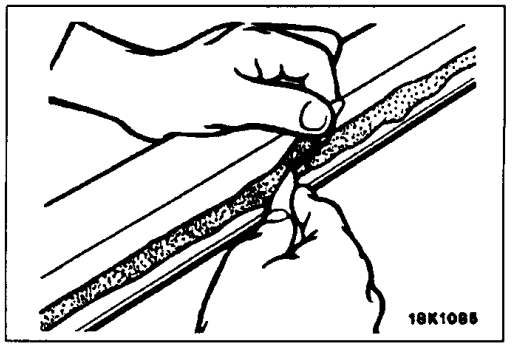
3. Using a sharp-point drill, make hole in the windshield glass adhesive.
4. Pass the piano wire from the inside of the vehicle through the hole.
5. Pull the piano wire alternately from the inside and outside along the windshield glass to cut the adhesive.

Caution
Do not let the piano wire touch the edge of the windshield glass.

6. Make mating marks on the windshield glass and body.



7. Use the special tool to remove the windshield glass.

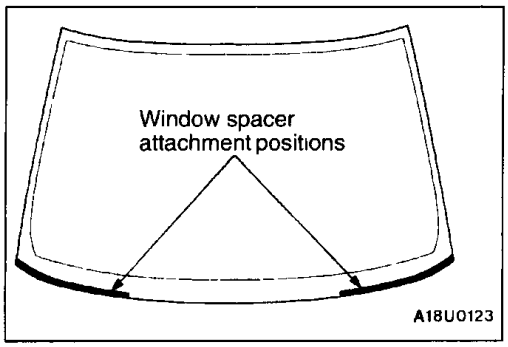


8. Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm around the entire circumference of the body flange.
9. Finish the flange surfaces so that they are smooth

Caution
(1) Be careful not to remove more adhesive than is necessary.
(2) Be careful also not to 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

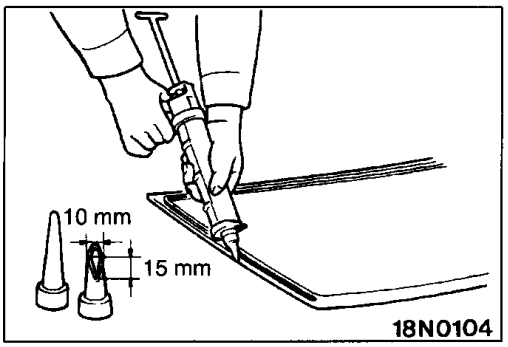
▶A◀ WINDOW SPACER INSTALLATION

After wiping the window spacer adhesion surfaces of the windshield with isopropyl alcohol to remove any grease, attach the window spacers in the positions shown in the illustration.

▶B◀ WINDSHIELD INSTALLATION

1. When replacing the glass, temporarily set the glass against the body, and place a mating mark on the glass and body.
2. Use isopropyl alcohol to degrease the inside and outside of the windshield glass and the body flanges.
3. Soak a sponge in the primer, and apply evenly to the glass and the body in the specified places.
4. Apply the primer, and then let it dry for 3 to 30 minutes.

Caution
(1) The primer strengthens the adhesive, so be sure to apply it evenly around the entire circumference. However, a too thick application will weaken the adhesive.
(2) Do not touch the coated surface.



5. Fill a sealant gun with adhesive. Then apply the adhesive evenly around the windshield within 30 minutes after applying the primer.

NOTE
Cut the tip of the sealant gun nozzle into a V shape to simplify adhesive application.

6. Align the mating marks on the glass and the body, and lightly press the windshield glass evenly so that it adheres completely.
7. Use a spatula or the like to remove any excessive adhesive. Then clean the surface with isopropyl alcohol. Try not to move the vehicle until the adhesive sets.
8. Wait 30 minutes or more, and then test for water leakage.

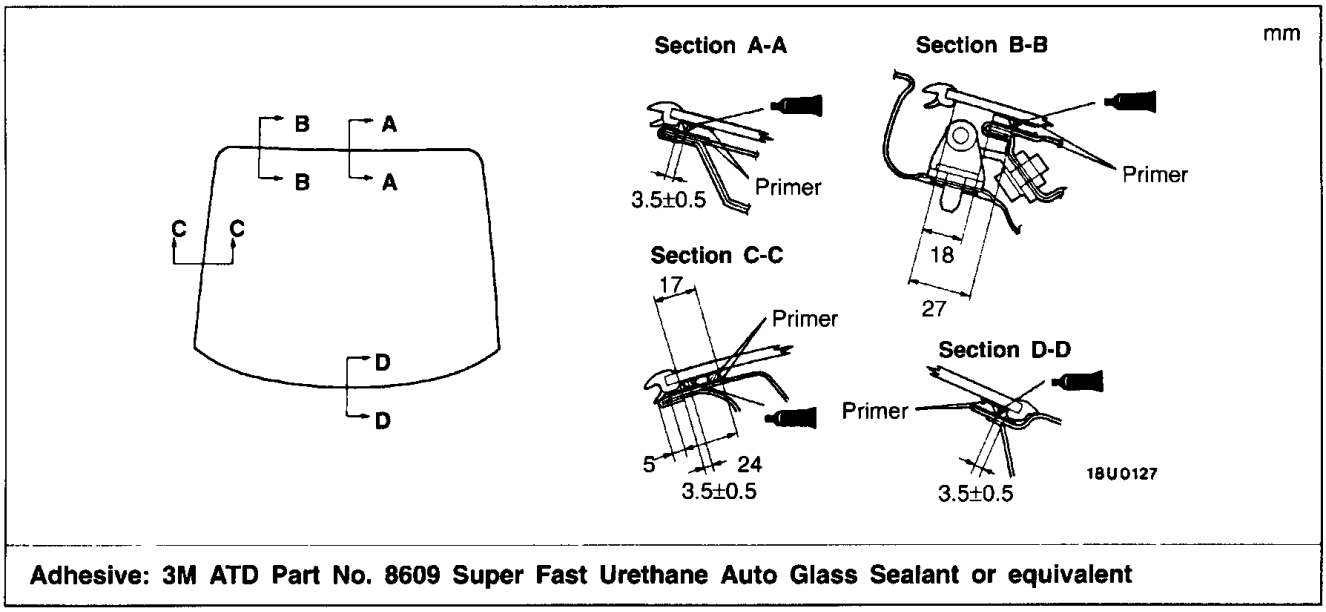
Caution
(1) Do not move the vehicle unless absolutely necessary.
(2) When testing for water leakage, do not pinch the end of the hose to spray the water.

TAILGATE WINDOW GLASS

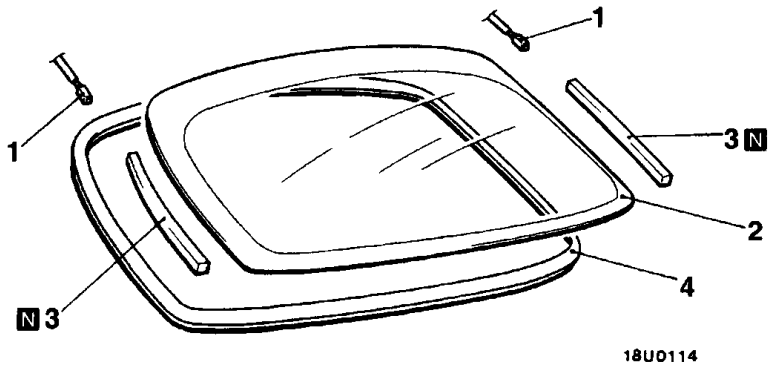
42200370021

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
Removal and Installation
(1) Rear Wiper Blade and Arm Assembly (Refer to GROUP 51.)
(2) High Mounted Stop Lamp (Refer to GROUP 54.)
(2) Tailgate Upper Trim, Tailgate Side Trim and Tailgate Lower Trim (Refer to P.42-42.)



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



00003434

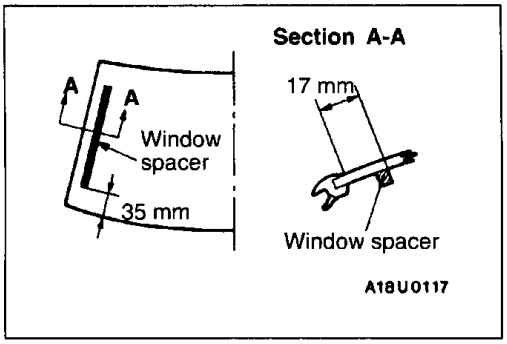
Removal steps

◀A▶ ▶B◀ 1. Harness connector
2. Tailgate window glass
▶A◀ 3. Window spacer
4. Tailgate moulding

REMOVAL SERVICE POINT

◀A▶ TAILGATE WINDOW GLASS REMOVAL

Remove the tailgate window glass by the same procedure as for the windshield. (Refer to P.42-9.)



INSTALLATION SERVICE POINTS

▶A◀ WINDOW SPACER INSTALLATION

After wiping the window spacer adhesion surfaces of the tailgate window glass with isopropyl alcohol to remove any grease, attach the window spacers in the positions shown in the illustration.

▶B◀ TAILGATE WINDOW GLASS INSTALLATION

Apply primer and adhesive in the specified position, and then install the tailgate window glass by the same procedure as for the windshield. (Refer to P.42-10.)

DOOR

42300030038

SERVICE SPECIFICATIONS

Items		Standard value
Door outside handle play mm	FRONT DOOR	3.7–4.7
	REAR DOOR	2.9–4.9
Door inside handle play mm	FRONT DOOR	20.5–22.5
	REAR DOOR	14.2–15.2

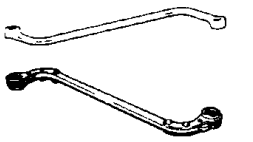
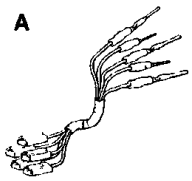
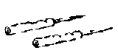
SEALANT

42300050034

Items	Specified sealant	Remark
Waterproof film	3M ATD Part No. 8625 or equivalent	Ribbon sealer

SPECIAL TOOLS

42300060037

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of front door trim
 00003936	MB990900 or MB991164	Door adjusting wrench	Adjustment of door fit
A  B C D 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LET harness C: LED harness adapter D: probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection

TROUBLESHOOTING

42300070030

INSPECTION CHART FOR TROUBLE SYMPTOMS

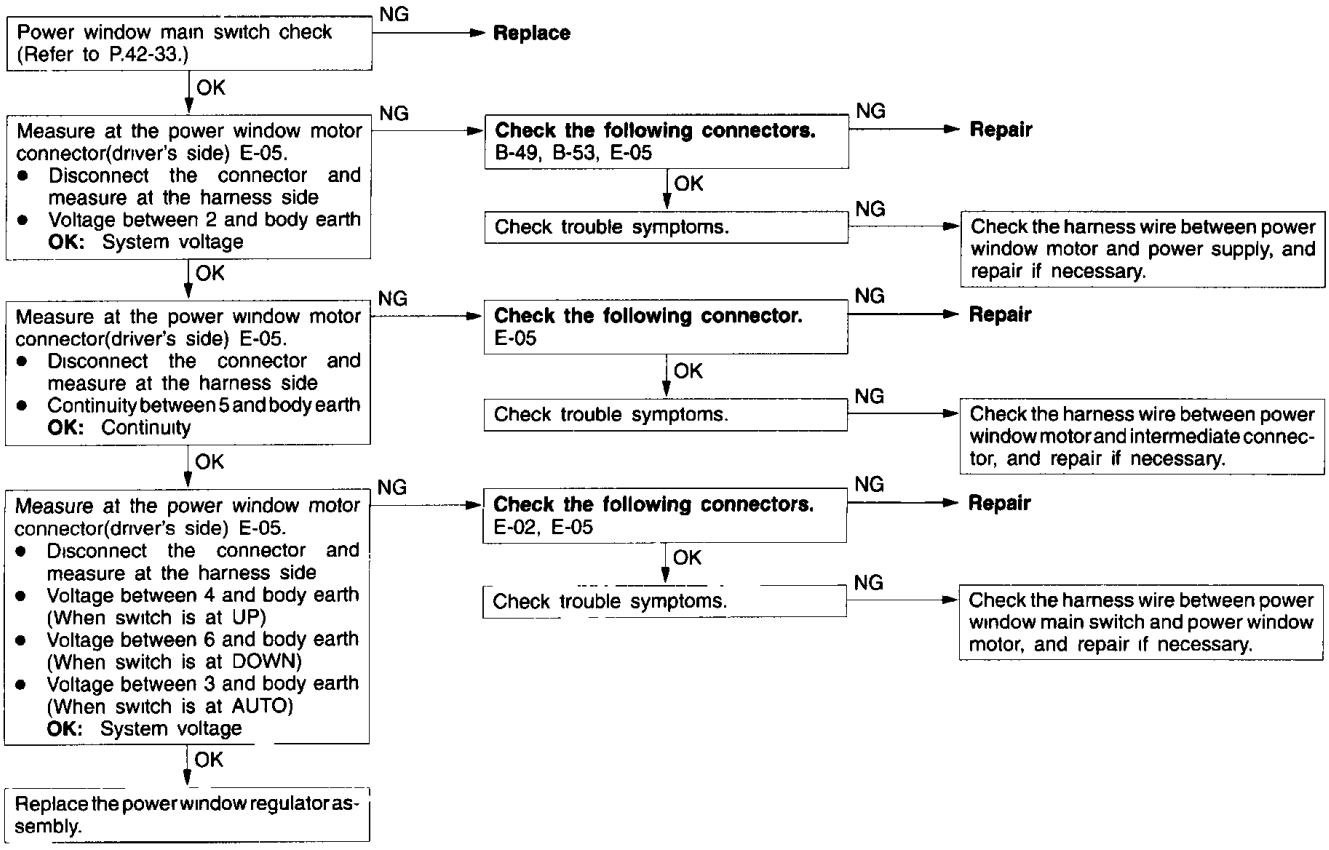
Trouble symptom			Inspection procedure	Reference page
Power windows	Driver's power window cannot be operated by the power window main switch.		1	42-15
	No power window can be operated by the power window main switch (but they can be operated by the sub-switches).		2	42-16
	No power window can be operated by the power window sub-switches (but they can be operated by the main switch).		3	42-16
	No power window can be operated by the power window sub-switches (nor can they be operated by the main switch).		4	42-17
	Automatic operation is not possible.		5	42-19
	When the glass is raised, it then lowers automatically.		6	42-20
	The window does not lower if it clamps something, or it lowers automatically after closing fully.		7	42-21
	The key off timer does not operate.		8	42-21
	If the driver's side door is opened while the key off timer is operating, the power windows do not operate for a further 30 seconds after the door is opened.		9	42-21
Door locking mechanism	Vehicles without keyless entry system	None of the door lock functions operate.	10	42-21
		Doors do not lock or unlock when the key cylinders (except the one at the driver's side door) are operated.	11	42-22
		When the key cylinders (except the one at the driver's side door) are operated and the doors are unlocked, they lock again when the key is turned to the neutral position; or the doors do not lock or unlock when the driver's door inside lock knob or the driver's door key cylinder is operated.	12	42-23
		Some doors do not lock or unlock.	13	42-23

Trouble symptom			Inspection procedure	Reference page
Door locking mechanism	Vehicles with keyless entry system	None of the door lock functions operate. (The keyless entry system also does not operate.)	14	42-24
		The doors do not lock or unlock when the driver's door inside lock knob is operated.	15	42-24
		The doors do not lock or unlock when the key cylinders are operated.	16	42-25
		Some doors do not lock or unlock.	17	42-25

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

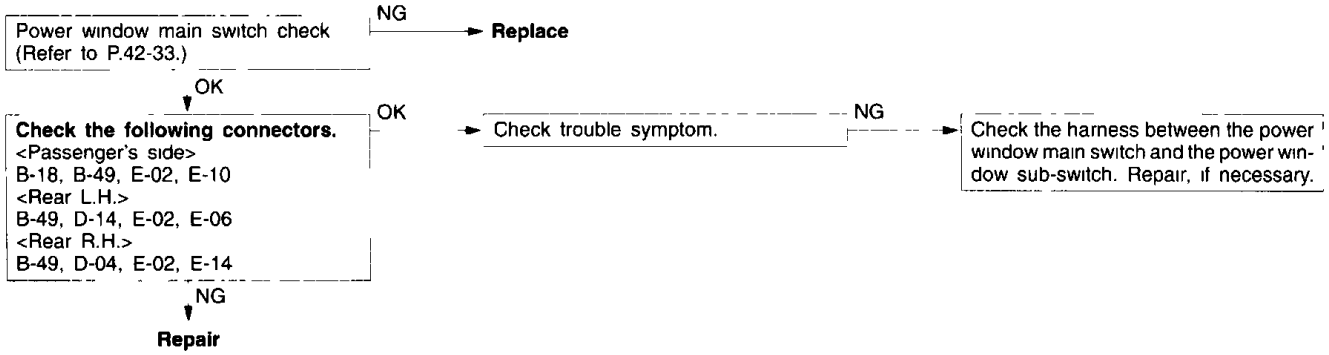
Inspection Precedure 1

Driver's power window cannot be operated by the power window main switch.	**Probable cause**
The power window main switch or power window regulator assembly may be defective.	• Malfunction of power window regulator assembly • Malfunction of power window main switch • Malfunction of wiring harness or connector



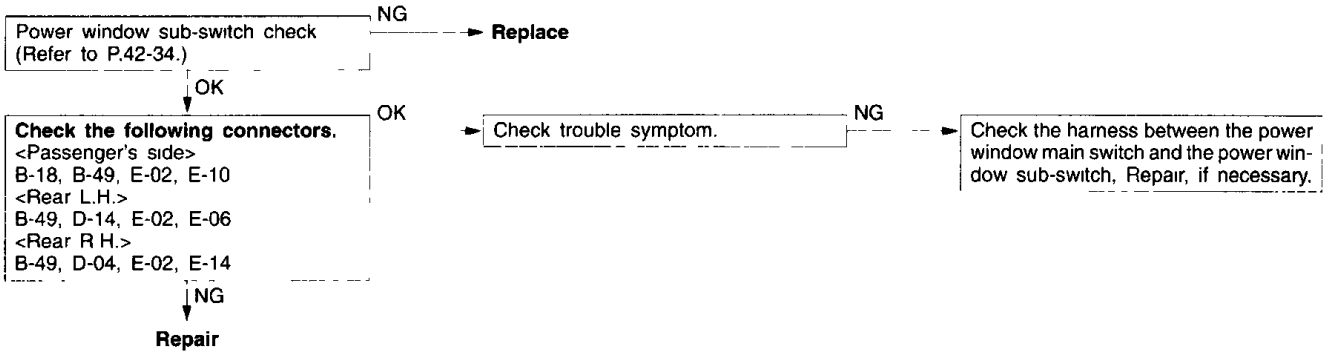
Inspection Procedure 2

No power window can be operated by the power window main switch (but they can be operated by the sub-switches).	Probabble cause
The power window main switch or the harness between power window main switch and power window sub switch may be defective.	• Malfunction of power window main switch • Malfunction of wiring harness or connector



Inspection Procedure 3

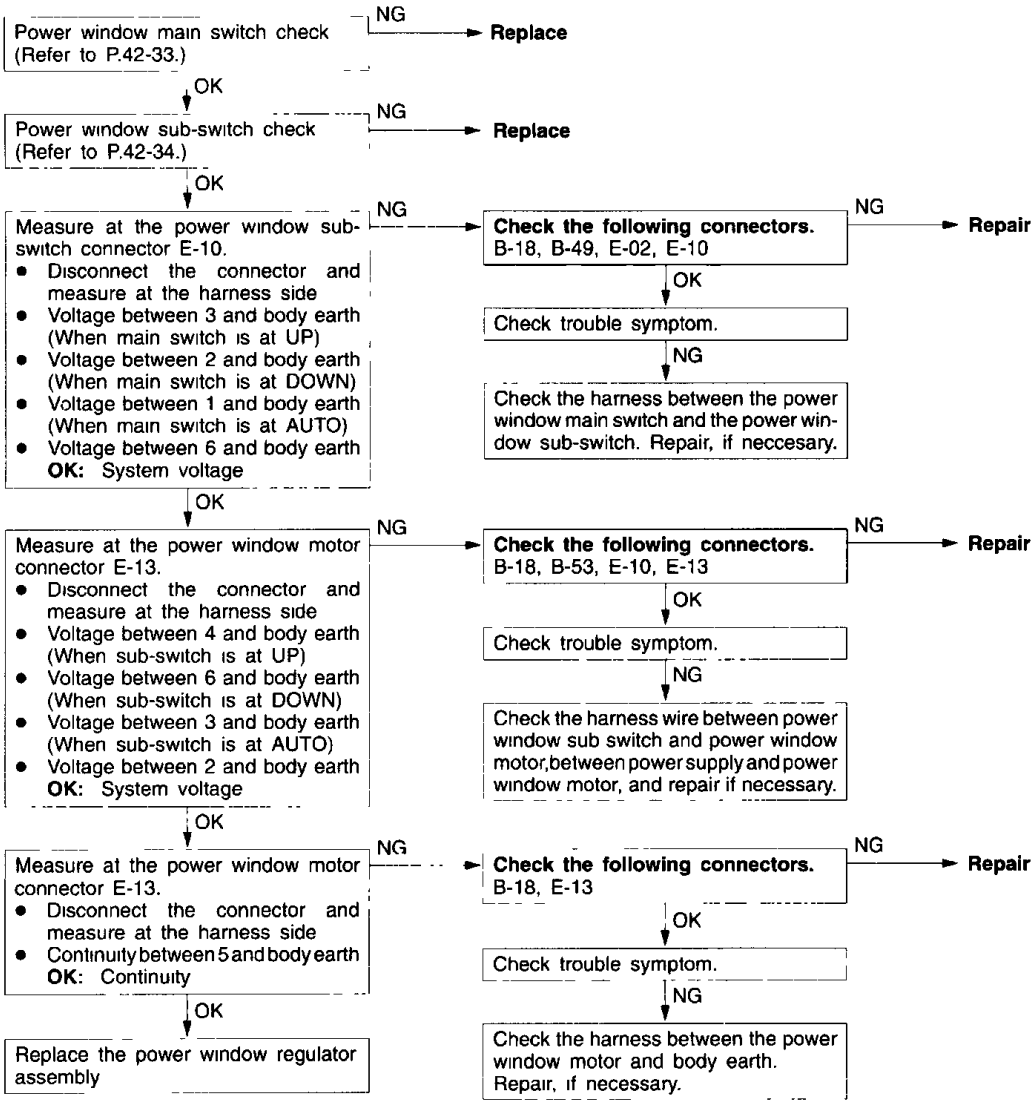
No power window can be operated by the power window sub-switches (but they can be operated by the main switch).	Probable cause
The power window sub-switch or the power supply circuit of power window sub-switch may be defective.	• Malfunction of power window sub-switch • Malfunction of wiring harness or connector



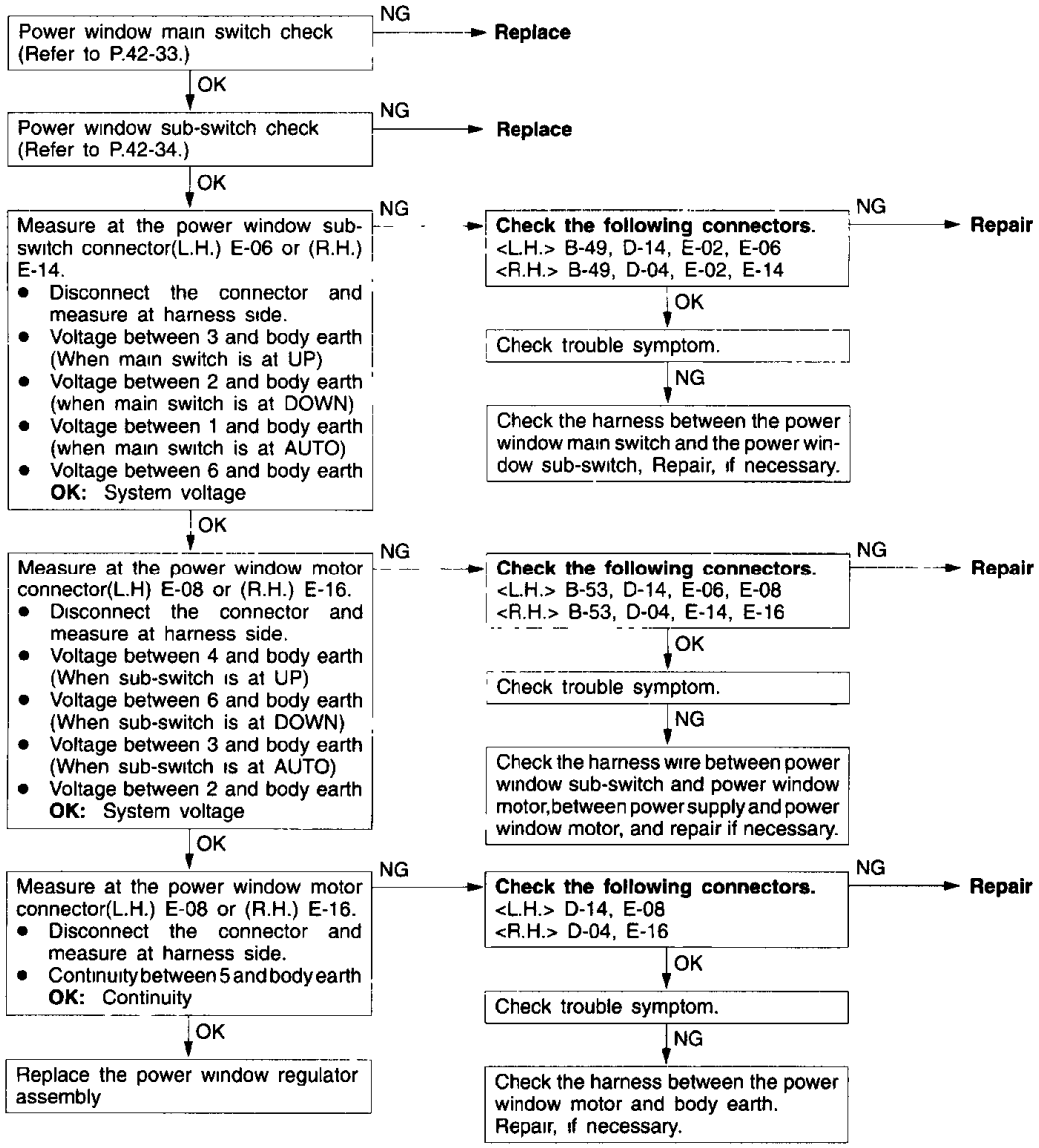
Inspection Procedure 4

No power window can be operated by the power window sub-switches (nor can they be operated by the main switch).	Probable cause
The power window main switch, the power window sub-switch or power window regulator assembly may be defective.	• Malfunction of power window main switch • Malfunction of power window sub-switch • Malfunction of power window regulator assembly • Malfunction of wiring harness or connector

<Passenger's side>



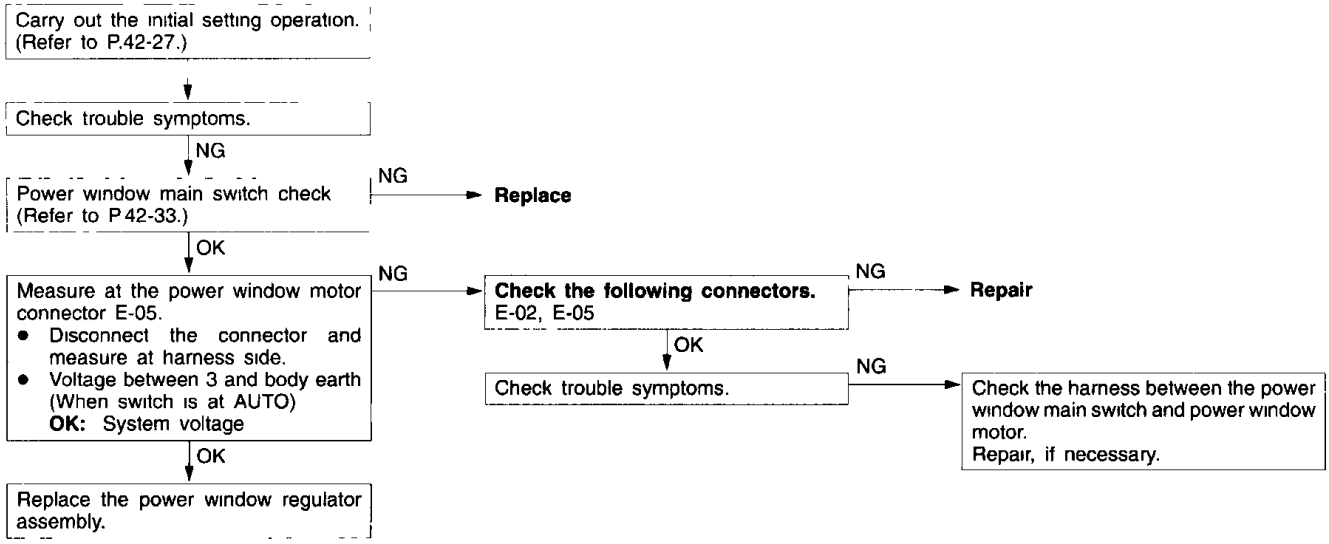
<Rear>


Power window main switch check (Refer to P.42-33.)
NG
Replace
OK
Power window sub-switch check (Refer to P.42-34.)
NG
Replace
OK
Measure at the power window sub-switch connector(L.H.) E-06 or (R.H.) E-14.
• Disconnect the connector and measure at harness side.
• Voltage between 3 and body earth (When main switch is at UP)
• Voltage between 2 and body earth (when main switch is at DOWN)
• Voltage between 1 and body earth (when main switch is at AUTO)
• Voltage between 6 and body earth
OK: System voltage
NG
Check the following connectors.
<L.H.> B-49, D-14, E-02, E-06
<R.H.> B-49, D-04, E-02, E-14
NG
Repair
OK
Check trouble symptom.
NG
Check the harness between the power window main switch and the power window sub-switch, Repair, if necessary.
OK
Measure at the power window motor connector(L.H) E-08 or (R.H.) E-16.
• Disconnect the connector and measure at harness side.
• Voltage between 4 and body earth (When sub-switch is at UP)
• Voltage between 6 and body earth (When sub-switch is at DOWN)
• Voltage between 3 and body earth (When sub-switch is at AUTO)
• Voltage between 2 and body earth
OK: System voltage
NG
Check the following connectors.
<L.H.> B-53, D-14, E-06, E-08
<R.H.> B-53, D-04, E-14, E-16
NG
Repair
OK
Check trouble symptom.
NG
Check the harness wire between power window sub-switch and power window motor,between power supply and power window motor, and repair if necessary.
OK
Measure at the power window motor connector(L.H.) E-08 or (R.H.) E-16.
• Disconnect the connector and measure at harness side.
• Continuity between 5 and body earth
OK: Continuity
NG
Check the following connectors.
<L.H.> D-14, E-08
<R.H.> D-04, E-16
NG
Repair
OK
Check trouble symptom.
NG
Check the harness between the power window motor and body earth. Repair, if necessary.
OK
Replace the power window regulator assembly

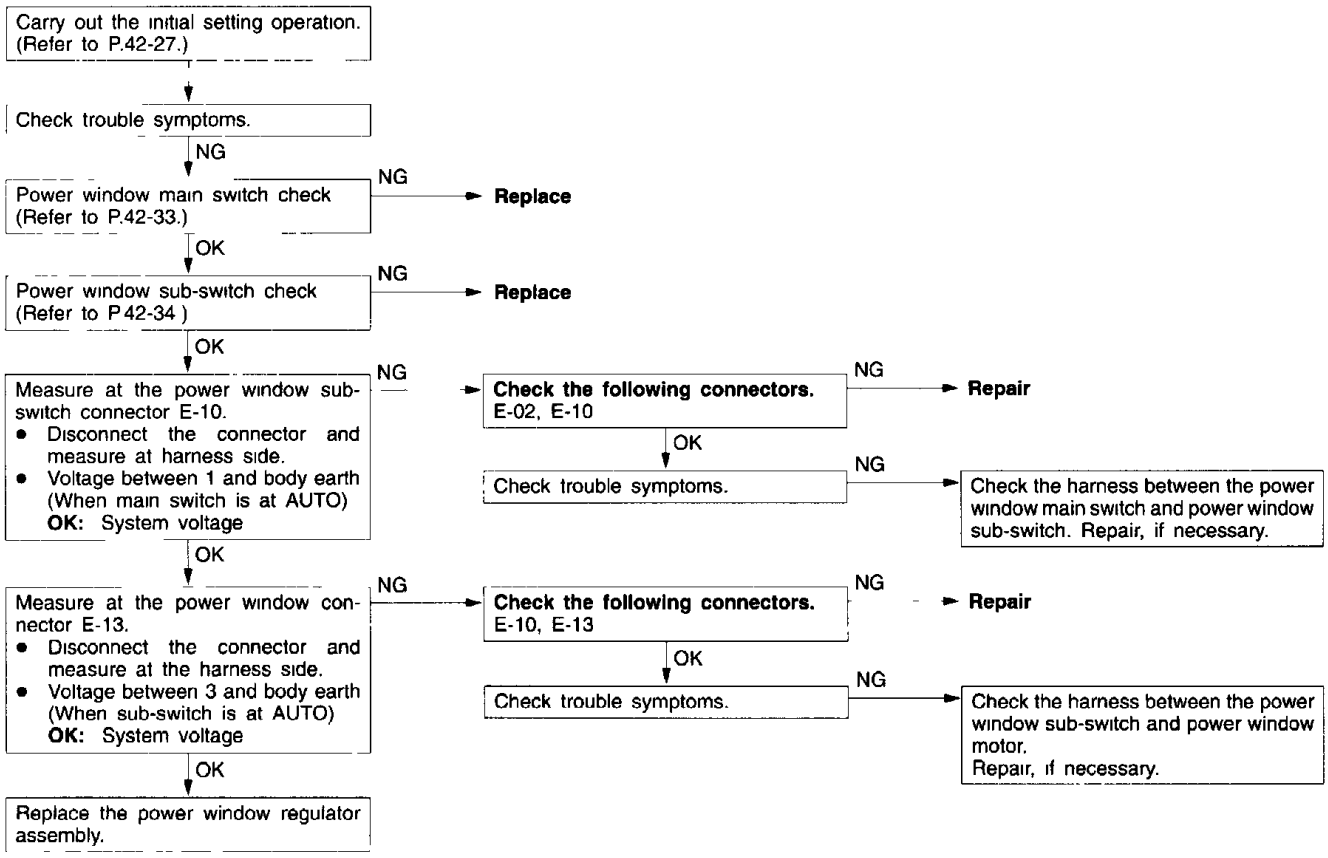
Inspection Procedure 5

Automatic operation is not possible.	Probable cause
Automatic operation is not possible before carrying out the initial setting operation when the battery terminals are disconnected or a fuse or power window regulator assembly is replaced. The cause may also be a malfunction of the power window switch or the power window regulator assembly.	• Incorrect initial settings • Malfunction of power window main switch • Malfunction of power window sub-switch • Malfunction of wiring harness or connector

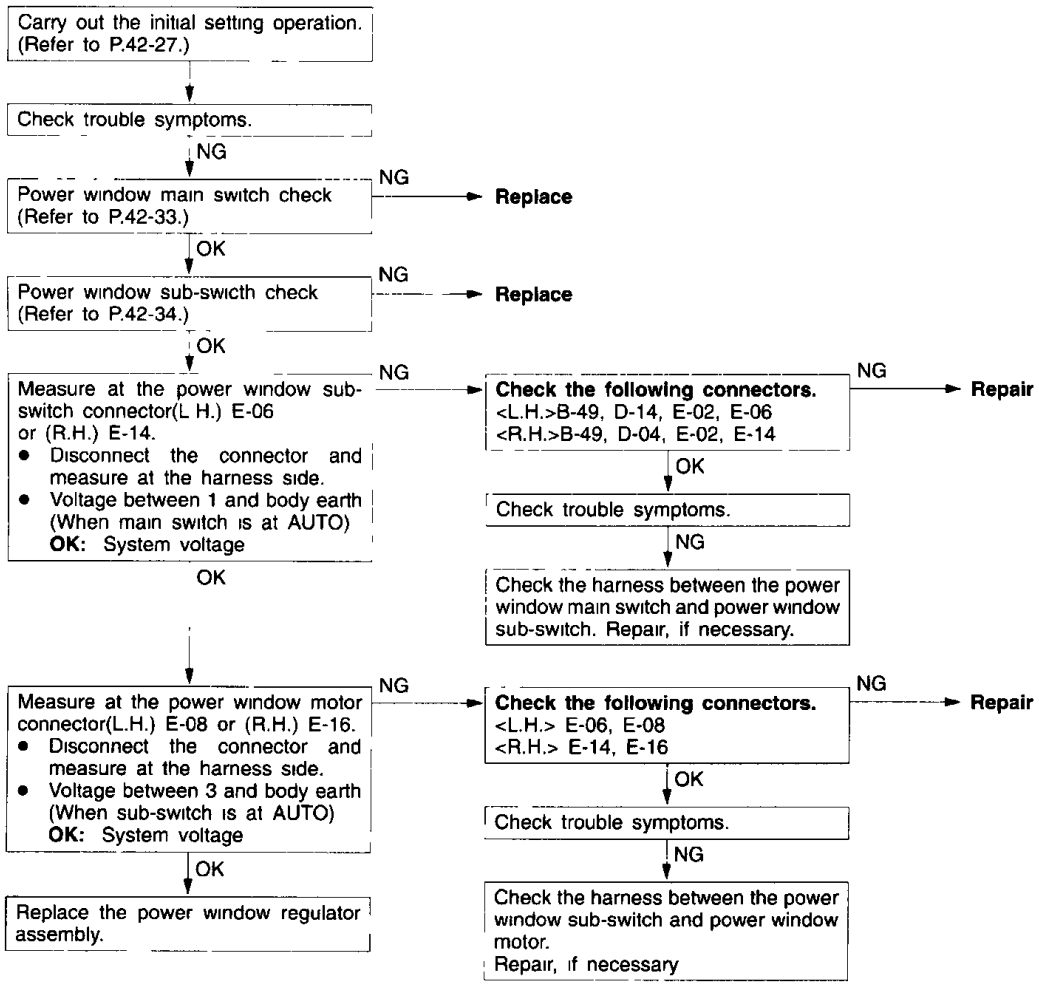
<Driver's side>



<Passenger's side>

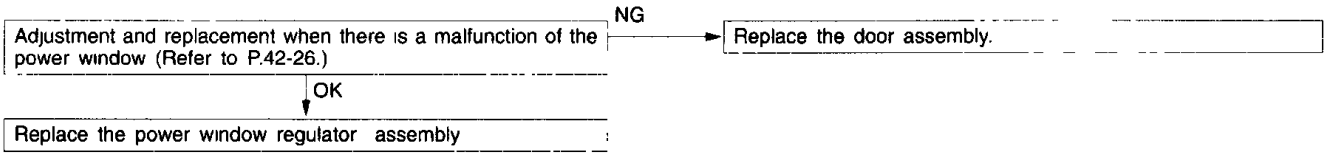


<Rear>



Inspection Procedure 6

When the glass is raised, it then lowers automatically.	Probable cause
The sliding resistance is too large when the glass rises. So it is misjudged that something is jammed in the window, and the window is lowered automatically.	• Incorrect installation or bending of the glass runners. • Malfunction of the power window regulator assembly



Inspection Procedure 7

The window does not lower if it clamps something, or it lowers automatically after closing fully.	Probable cause
If the window is not lowered when it is obstructed by something while it is more than 4 mm from the fully-closed position, or if it lowers automatically after it is fully closed, the cause is probably a malfunction of the power window regulator assembly.	• Malfunction of the power window regulator

Carry out the initial setting operation. (Refer to P.42-27)

↓

Check trouble symptoms.

↓ NG

Replace the power window regulator assembly.

Inspection Procedure 8

The key off timer does not operate.	Probable cause
The power windows can be operated for a further 30 seconds after the ignition switch is turned to OFF, but if they cannot be operated during this time there is probably a malfunction of the power window main switch.	• Malfunction of the power window main switch.

Replace the power window main switch

Inspection Procedure 9

If the driver's side door is opened while the key off timer is operating, the power windows do not operate for a further 30 seconds after the door is opened.	Probable cause
If the driver's door is opened within 30 seconds after the ignition switch is turned to OFF, the power windows can still be operated for 30 seconds after that point. If they cannot be operated during this time, there is probably a malfunction of the driver's side door switch or power window main switch.	• Malfunction of the front door switch(driver's side) • Malfunction of the power window main switch • Malfunction of harness or connector

Front door switch (driver's side) continuity check (Refer to P.42-29.) → NG → **Replace**

↓ OK

Check the following connectors. B-49, D-16, E-02 → OK → Check trouble symptoms.

↓ NG

Repair

NG

↓

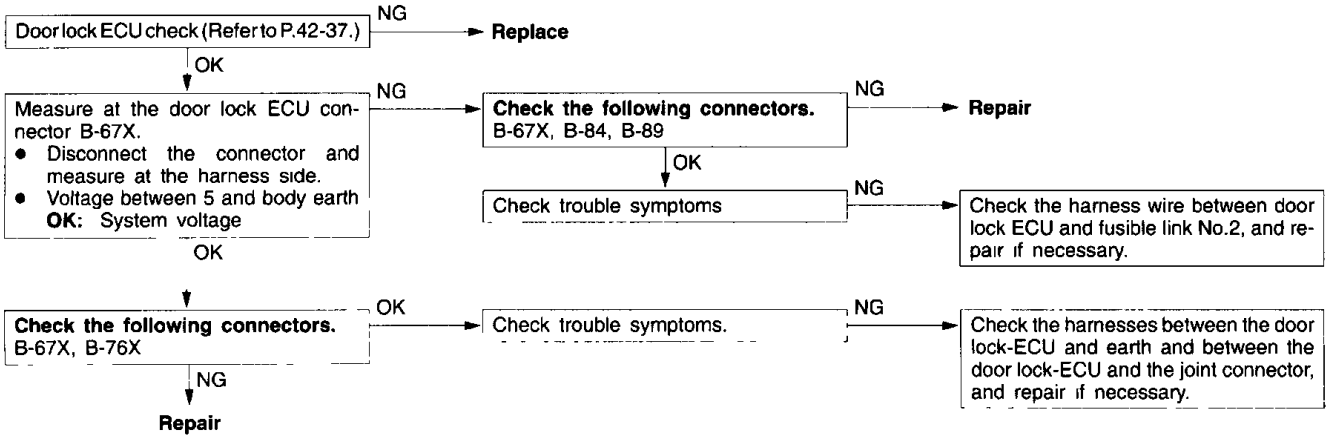
Check the harness wire between power window main switch and front door switch (driver's side). → OK → Replace the power window main switch.

↓ NG

Repair

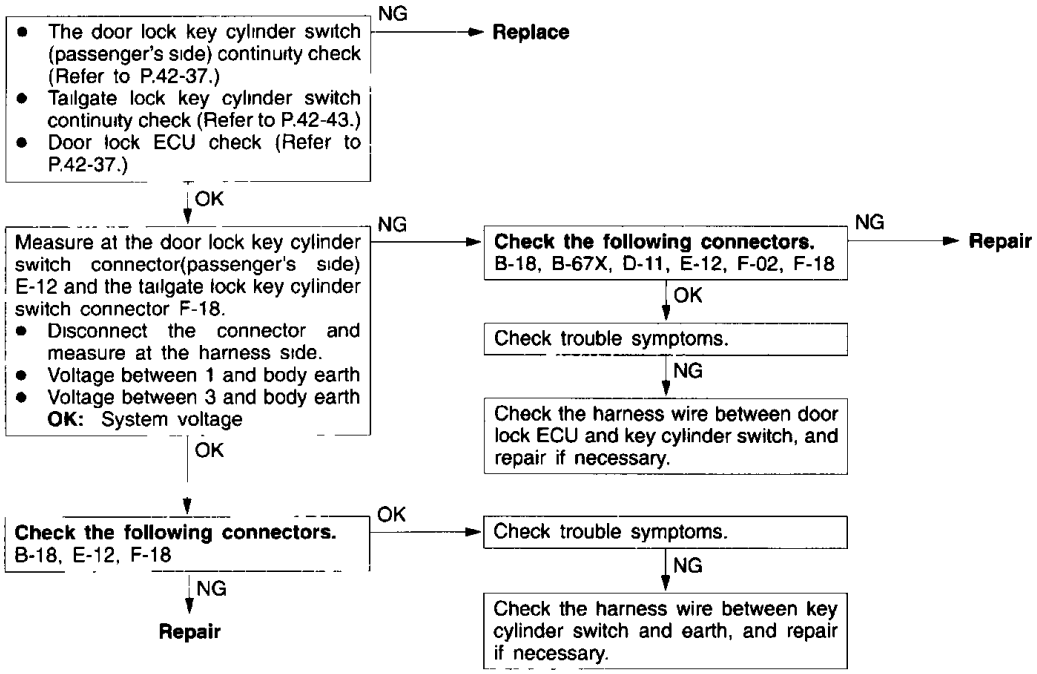
Inspection Precedure 10

None of the door lock functions operate.	Probable cause
Power circuit system or earth circuit system of the door lock control unit may be defective	• Malfunction of door lock ECU • Malfunction of wiring harness or connector



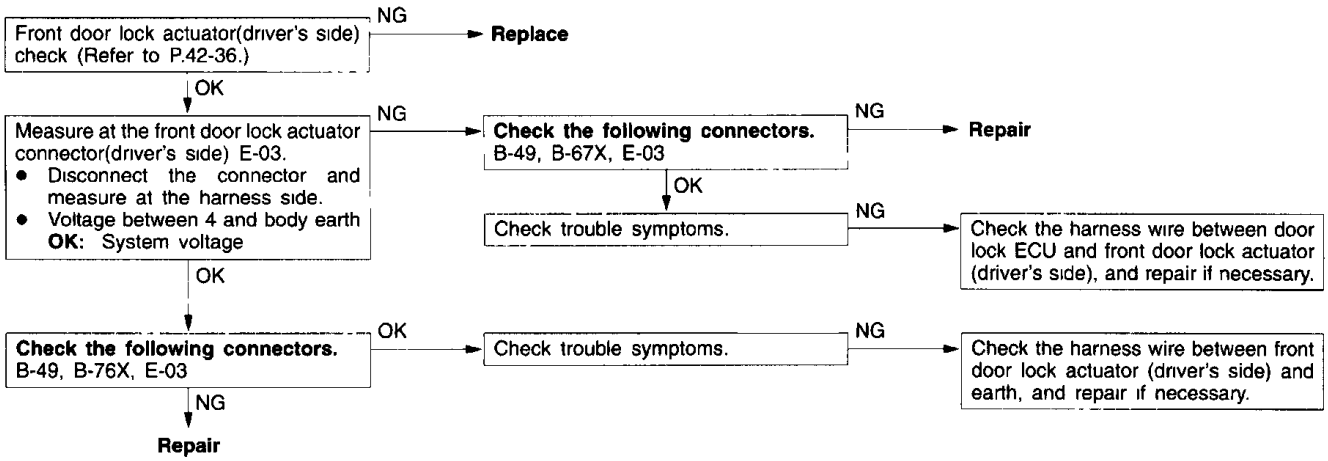
Inspection Procedure 11

Doors do not lock or unlock when the key cylinders (except the one at the driver's side door) are operated.	Probable cause
The key cylinder switch or the door lock ECU may be defective.	• Malfunction of the door lock key cylinder switch • Malfunction of the tailgate lock key cylider switch • Malfunction of the door lock ECU • Malfunction of harness or connector



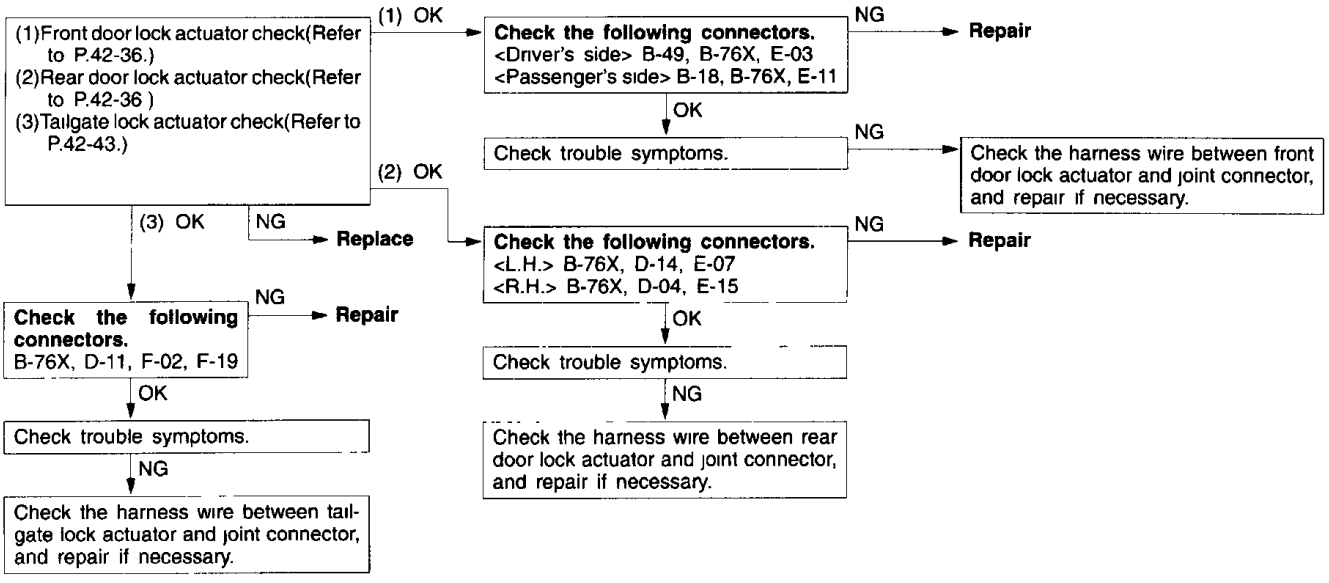
Inspection Procedure 12

When the key cylinders (except the one at the driver's side door) are operated and the doors are unlocked, they lock again when the key is turned to the neutral position; or the doors do not lock or unlock when the driver's door inside lock knob or the driver's door key cylinder is operated.	Probable cause
The front door lock actuator(driver's side) may be defective or there may be open circuit in the input line of front door lock actuator(driver's side).	• Malfunction of the front door lock actuator(driver's side) • Malfunction of the harness or connector



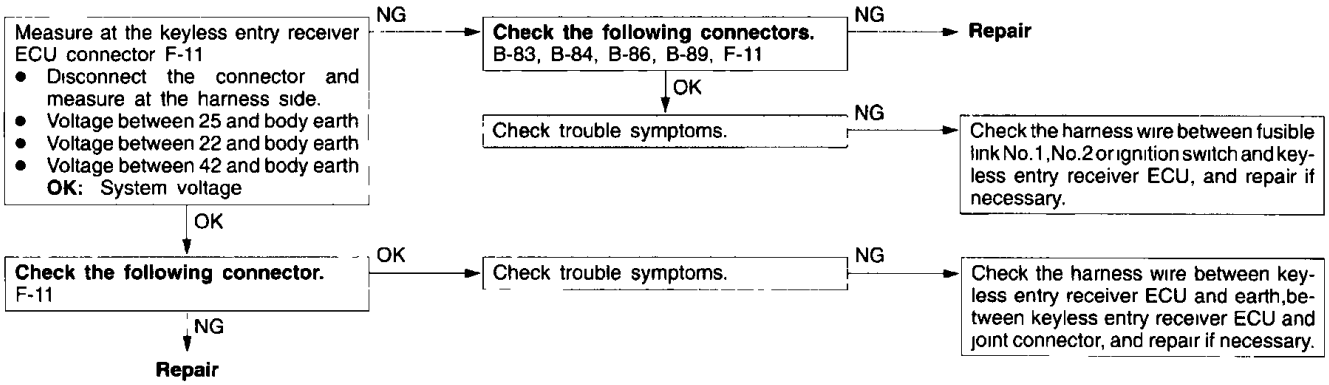
Inspection Procedure 13

Some doors do not lock or unlock.	Probable cause
The door lock actuator, a harness or connector may be defective.	• Malfunction of door lock actuator • Malfunction of wiring harness or connector



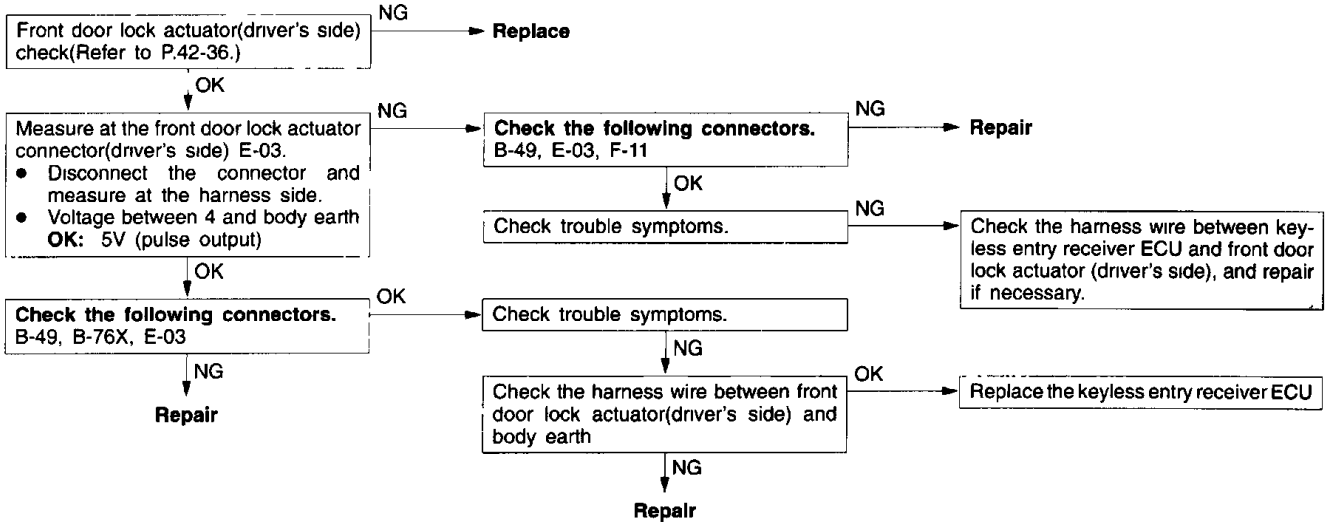
Inspection Procedure 14

None of the door lock functions operate.(The keyless entry system does not operate,either.)	Probable cause
Power circuit system or earth circuit system of the keyless entry receiver ECU may be defective.	• Malfunction of keyless entry receiver ECU • Malfunction of wiring harness or connector



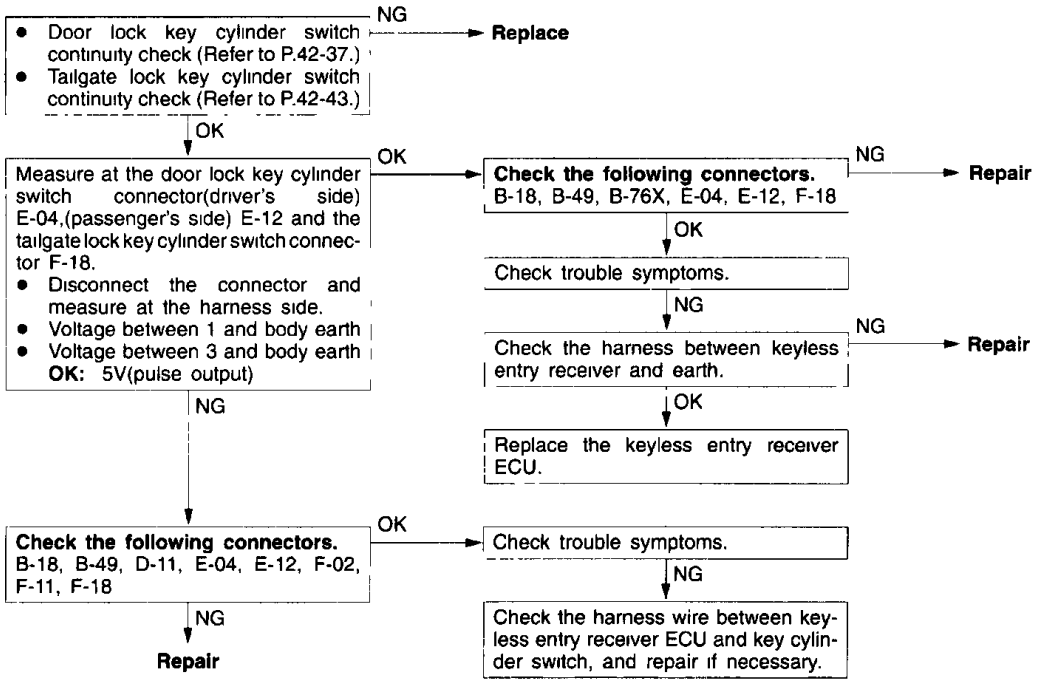
Inspection Procedure 15

The doors do not lock or unlock when the driver's door inside lock knob is operated.	Probable cause
The front door lock actuator(driver's side) or the keyless entry receiver ECU may be defective.	• Malfunction of the front door lock actuator(driver's side) • Malfunction of the keyless entry receiver ECU • Malfunction of harness or connector



Inspection Procedure 16

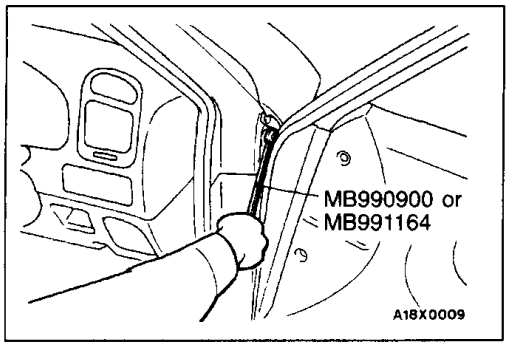
The doors do not lock or unlock when the key cylinders are operated.	Probable cause
The keyless entry receiver ECU or the key cylinder switch may be defective.	• Malfunction of the door lock key cylinder switch • Malfunction of the tailgate lock key cylinder switch • Malfunction of the keyless entry receiver ECU • Malfunction of harness or connector

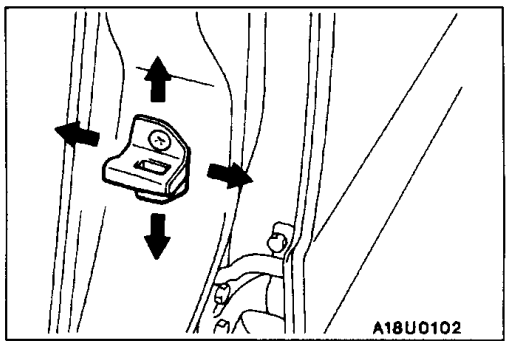


Inspection Procedure 17

Some doors do not lock or unlock.	Probable cause
The door lock actuator, a harness or connector may be defective.	• Malfunction of door lock actuator • Malfunction of wiring harness or connector

INSPECTION PROCEDURE 13 FOR TROUBLE SYMPTOMS(Refer to P.42-23.)





ON-VEHICLE SERVICE

42300090043

DOOR FIT ADJUSTMENT

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

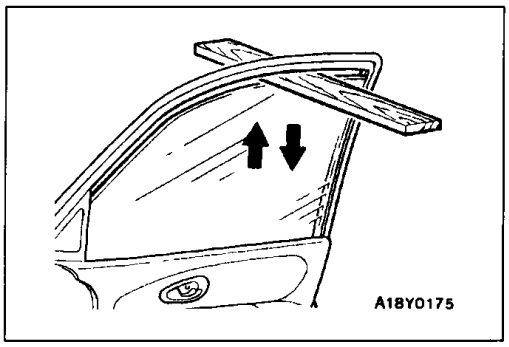
ADJUSTMENT AND REPLACEMENT WHEN THERE IS A MALFUNCTION OF THE POWER WINDOW

42900190017

If the window glass automatically starts moving downwards at the wrong time while it is being raised, carry out the following adjustment or replacement procedures.

1. Remove the door trim and waterproof film. (Refer to P.42-30.)
2. Remove the window regulator assembly from the door window glace, and then raise and lower the door window glass by hand to check the operation force.
3. If the door window glace does not move up and down smoothly, repair the twisting in the door sash, or adjust the sash span by loosening the lower sash or center sash mounting bolts and pushing apart the lower sash or center sash while tightening the bolts again. If repair or adjustment is not possible, replace the door assembly.

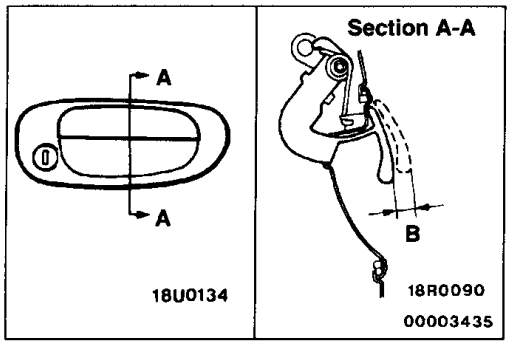
   NOTE
   The lower sash cannot normally be adjusted, but it may be possible to adjust it slightly within the range by manufacturing tolerances.



POWER WINDOW SAFETY MECHANISM CHECK

42900100034

1. Lower the window glass by 50 mm or less from the fully-closed position.
2. Place a wooden board with a thickness of 4 mm or less as shown in the illustration and then close the window glass.
3. Check that the window glass lowers by approximately 50 mm after it clamps the wooden board.
4. Lower the window glass by 50 mm or more from the fully-closed position and repeat the test given in step 2. above. Check that the window glass lowers by approximately 150 mm at this time.
5. If the window operation is not correct, replace the power window regulator assembly.

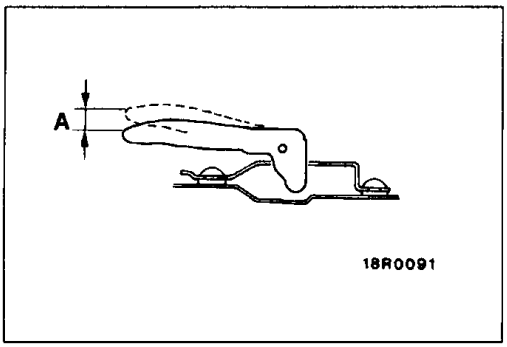


DOOR OUTSIDE HANDLE PLAY CHECK 42300160034

1. Check that the door outside handle play is within the standard value range.

   Standard value (B): FRONT DOOR 3.7–4.7 mm
   REAR DOOR 2.9–4.9 mm

2. If the door outside handle play is not within the standard value range, check the door outside handle or the door latch assembly. Replace, if necessary.



DOOR INSIDE HANDLE PLAY CHECK 42300150031

1. Check that the door inside handle play is within the standard value range.

   Standard value (A): FRONT DOOR 20.5–22.5 mm
   REAR DOOR 14.2–15.2 mm

2. If the door inside handle play in not within the standard value range, check the door inside handle or the door latch assembly. Replace, if necessary.

POWER WINDOW INITIAL SETTING 42900200017

For all doors, after fully raising the window glass, continuously push the power window switch to the UP side for 1 second or more.

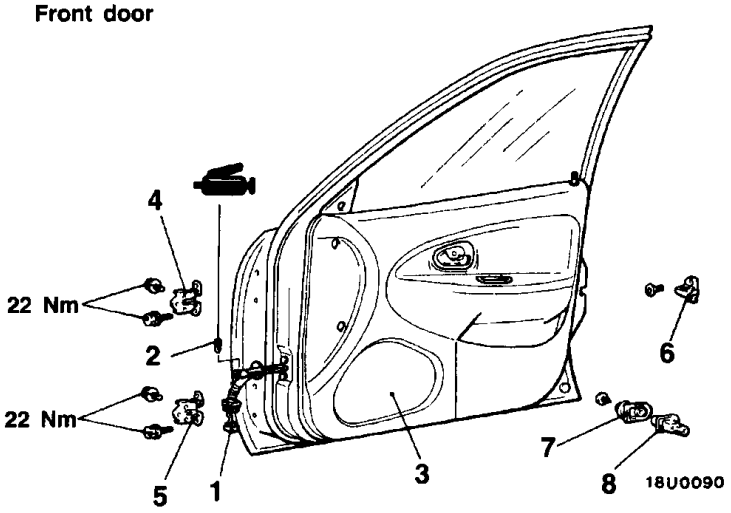
DOOR ASSEMBLY

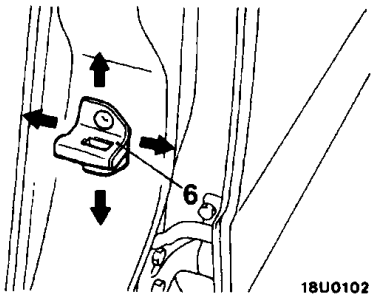
42300220053

REMOVAL AND INSTALLATION

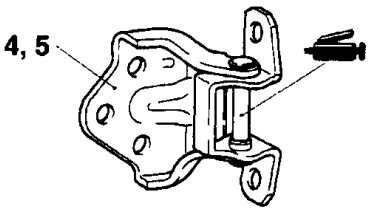
Post-installation Operation
- Door Adjustment (Refer to P.42-26.)

Front door

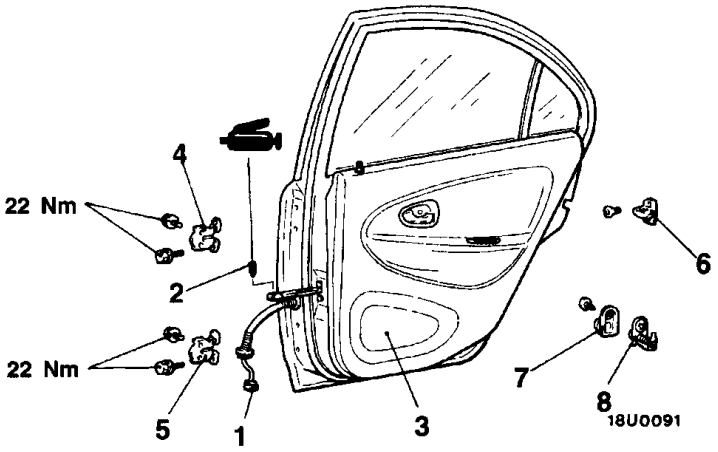




Adjustment of the door stepping and the door latch linkage



Rear door

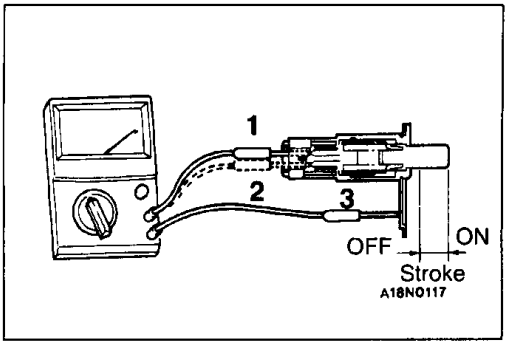


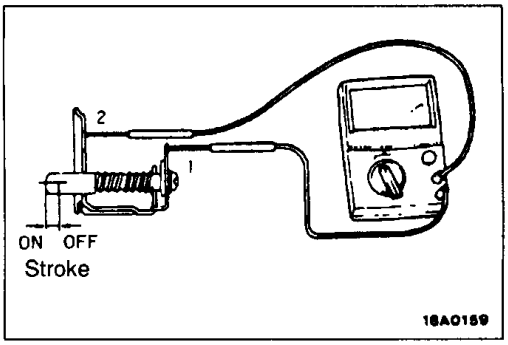
00003436

Door assembly removal steps
1. Harness connector
2. Spring pin
3. Door assembly
4. Door upper hinge
5. Door lower hinge

Striker removal
6. Striker

Door switch removal steps
7. Door switch cap
8. Door switch





INSPECTION

42300600031

DOOR SWITCH CONTINUITY CHECK

Driver's door switch

Switch position	Terminal No.		
	1	2	3
Open (ON)	○	○	○
Depressed (OFF)			

Passenger's door and rear door switch

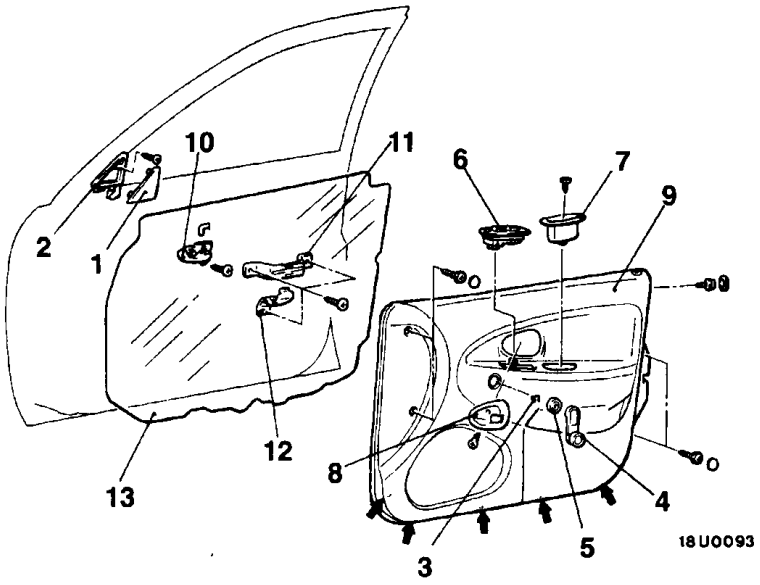
Switch position	Terminal No.	
	1	2
Open (ON)	○	○
Depressed (OFF)		

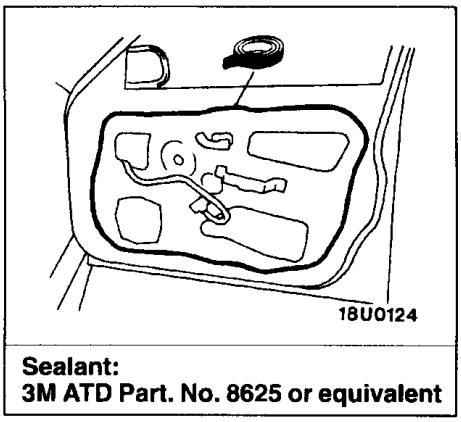
DOOR TRIM AND WATERPROOF FILM

42300430050

REMOVAL AND INSTALLATION

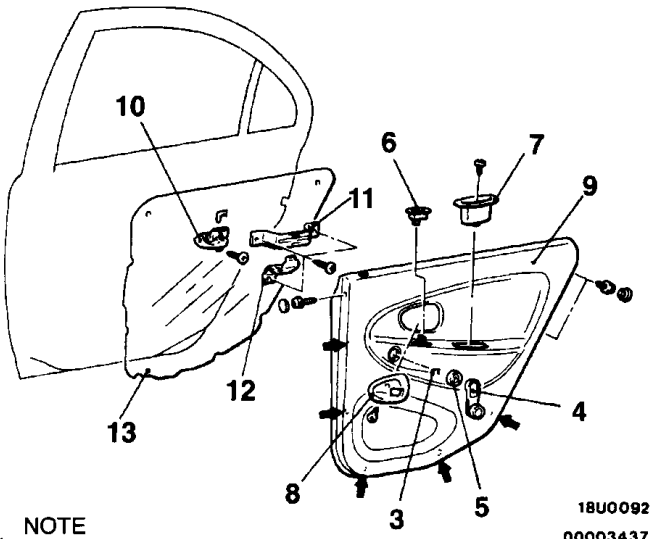
Front door

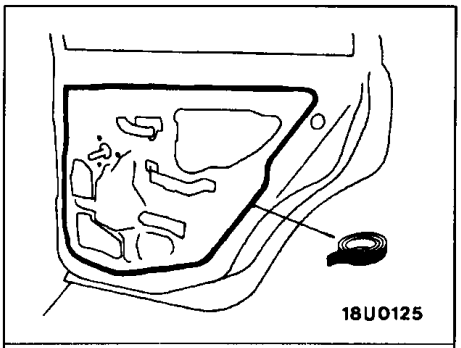




Sealant:
3M ATD Part. No. 8625 or equivalent

Rear door



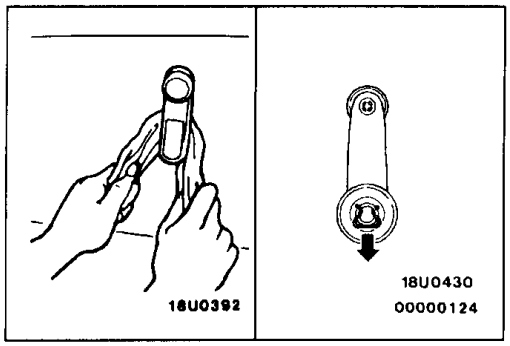


Sealant:
3M ATD Part. No. 8625 or equivalent

NOTE
◀▬: Resin clip position

Removal steps

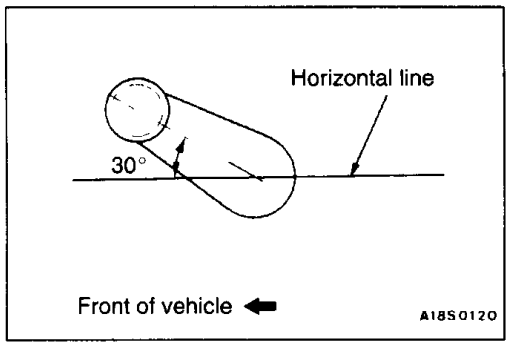
1. Delta cover inner lid
2. Delta cover inner frame
◀A▶ 3. Clip <Vehicles without power window>
▶A◀ 4. Regulator handle <Vehicles without power window>
5. Escutcheon <Vehicles without power window>
6. Power window switch <Vehicles with power window>
7. Pull handle box
8. Cover
9. Door trim
10. Door inside handle
11. Pull handle bracket A
12. Pull handle bracket B
13. Waterproof film



REMOVAL SERVICE POINT

◀A▶ CLIP REMOVAL

Remove the clip by using a rag, and then remove the regulator handle.



INSTALLATION SERVICE POINT

▶A◀ REGULATOR HANDLE INSTALLATION

1. Install the escutcheon and the clip to the regulator handle.
2. Fully close the front door glass, and install the regulator handle so that it faces as shown in the illustration.

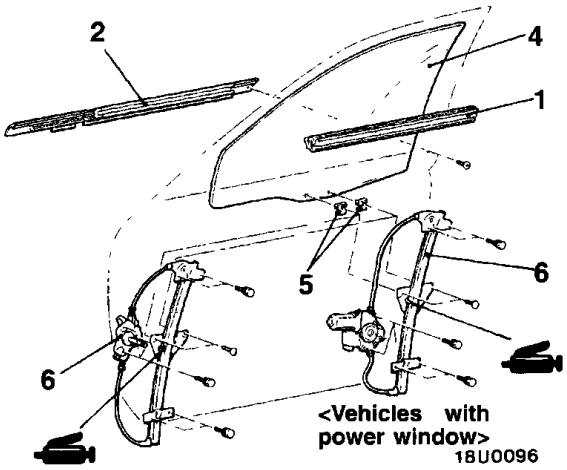
DOOR GLASS AND REGULATOR

42900130040

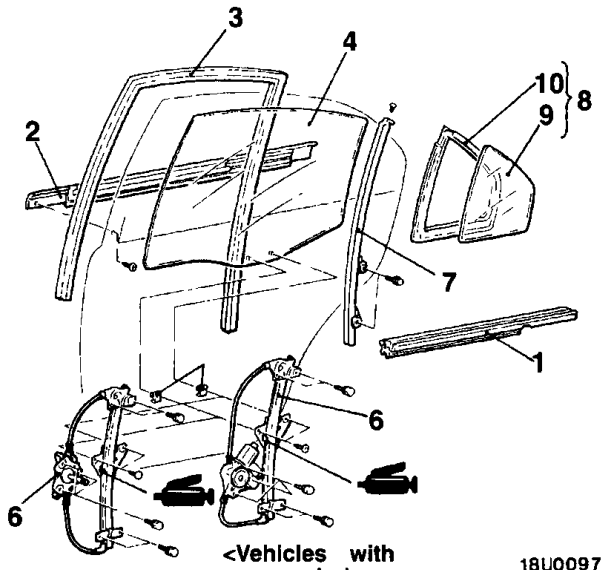
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Door Trim and Waterproof Film Removal and Installation (Refer to P.42-30.)

Front door



Rear door



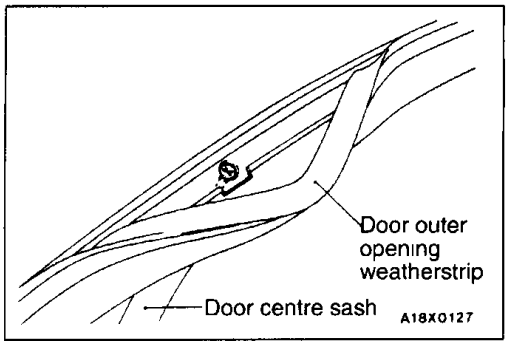
00003438

Front window regulator assembly removal steps
1. Door belt line inner weatherstrip
2. Belt line outer weatherstrip
4. Door window glass
5. Door glass holder
6. Window regulator assembly

Rear window regulator assembly removal steps
1. Door belt line inner weatherstrip
2. Belt line outer weatherstrip
3. Door window glass runchannel
4. Door window glass
5. Door window glass holder
6. Window regulator assembly

◀A▶

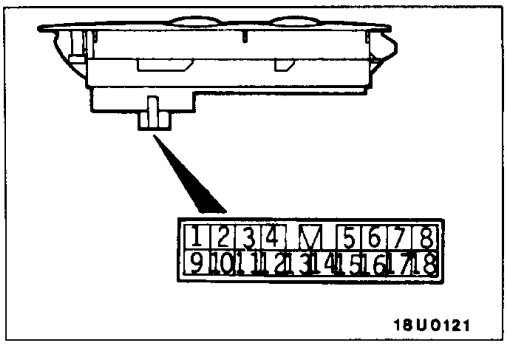
Stationary window glass removal steps
1. Door belt line inner weatherstrip
2. Belt line outer weatherstrip
3. Door window glass runchannel
4. Door window glass
7. Door centre sash
8. Stationary window glass and weatherstrip assembly
9. Stationary window glass
10. Stationary window weatherstrip



REMOVAL SERVICE POINT

◀A▶ DOOR CENTRE SASH REMOVAL

Remove the portion of the door outer opening weatherstrip which is shown in the illustration and remove the door centre sash mounting screw.



INSPECTION 42900160032

POWER WINDOW MAIN SWITCH CHECK

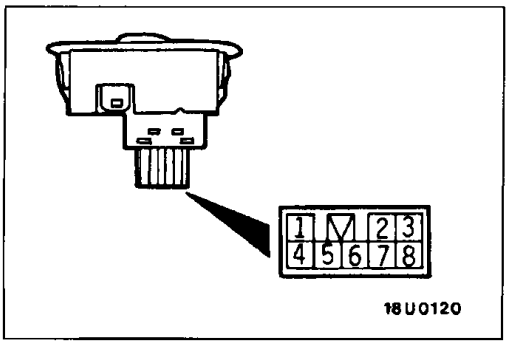
1. Operate the switch, and check the continuity between terminals.

Window lock switch	Switch position	Terminal No.															
		Front (L.H.)				Front (R.H.)				Rear (L.H.)				Rear (R.H.)			
		1	5	14	15	2	6	14	16	3	7	14	17	4	8	14	18
Normal	UP		○	○			○	○			○	○			○	○	
	AUTO UP	○	○	○		○	○	○		○	○	○		○	○	○	
	DOWN			○	○			○	○			○	○			○	○
	AUTO DOWN	○		○	○	○		○	○	○		○	○	○		○	○
LOCK	UP										○	○			○	○	
	AUTO UP	○	○			○	○			○	○	○		○	○	○	
	DOWN											○	○			○	○
	AUTO DOWN	○			○	○			○	○		○	○	○		○	○

2. Apply battery voltage to terminal 10, and connect terminal 12 to earth.

3. Move the window lock switch to the normal position, and then measure the voltage at terminal (14) under the measurement conditions given below.

Measurement condition	Voltage
Apply battery voltage to terminal 9	Battery voltage
Remove voltage from terminal (9).	Battery voltage (for 30 seconds after voltage is removed) → 0 V
Earth terminal (11) within 30 seconds after voltage is removed from terminal (9).	Battery voltate (for 30 seconds after earthing) → 0 V
Disconnect earth from terminal (11) within 30 seconds after earthing it.	0V



POWER WINDOW SUB-SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	2	3	4	6	7	8
UP			○		○		○
AUTO UP	○		○	○	○		○
OFF	○			○			
		○				○	
			○				○
DOWN		○			○	○	
AUTO DOWN	○	○		○	○	○	

DOOR HANDLE AND LATCH

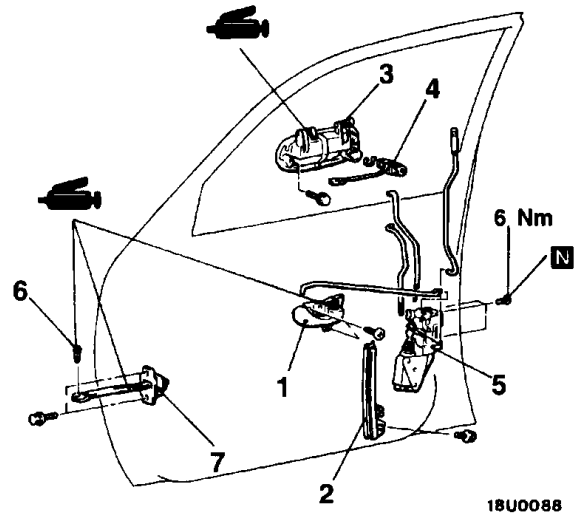
42300460042

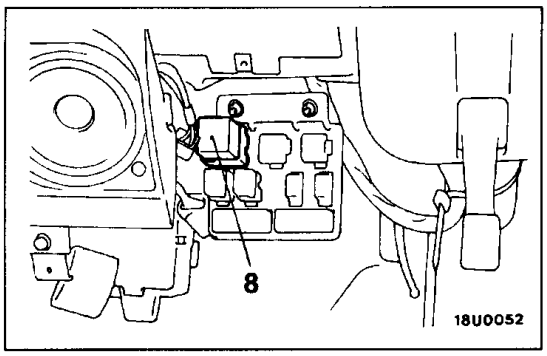
REMOVAL AND INSTALLATION

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

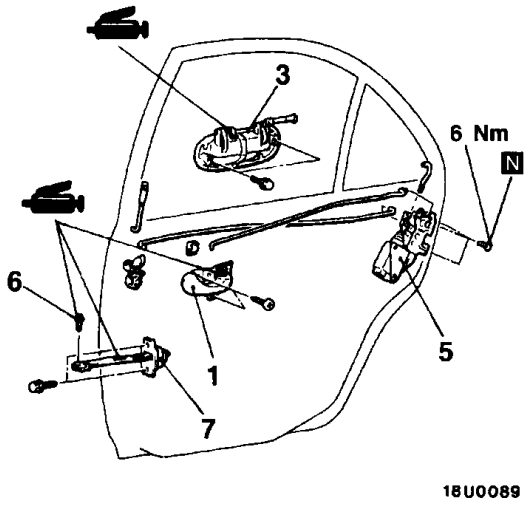
Post-installation Operation
(1) Door Inside Handle Play Check (Refer to P.42-27.)
(2) Door Trim Installation (Refer to P.42-30.)
(3) Door Fit Adjustment (Refer to P.42-26.)

Front door





Rear door



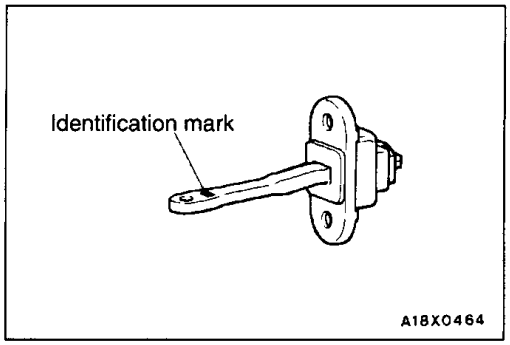
00003439

Front door handle and door latch assembly removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-30.)
2. Lower sash rear
3. Door outside handle
4. Door lock key cylinder
5. Door latch assembly

Rear door handle and door latch assembly removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-30.)
3. Door outside handle
5. Door latch assembly

Door check removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-30.)
6. Spring pin
▶A◀ 7. Door check

Door lock ECU removal
8. Door lock ECU
<Vehicles with central door locking system (except vehicles keyless entry system)>

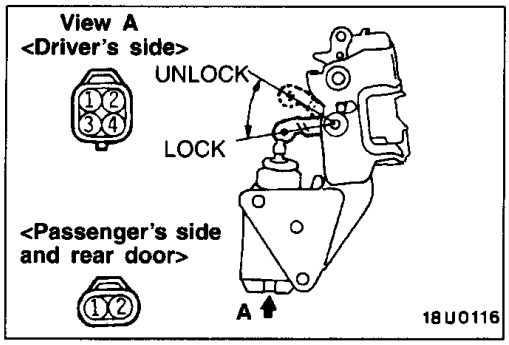


INSTALLAITON SERVICE POINT

▶A◀ DOOR CHECK INSTALLATION

Install the door check so that the identification mark faces upwards.

Applicable location		Identification mark
L.H.	Front door	FL
	Rear door	RL
R.H.	Front door	FR
	Rear door	RR



INSPECTION

42300610034

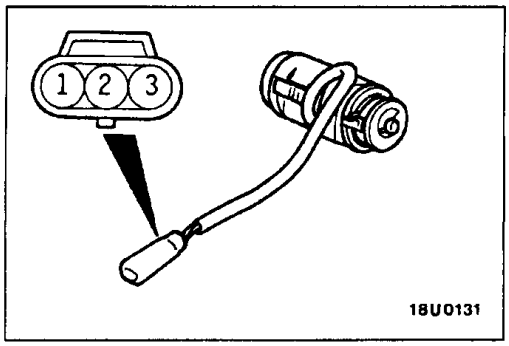
DOOR LOCK ACTUATOR CHECK

<Driver's side>

Rod position	Terminal No.				Rod operation
	1	2	3	4	
LOCK	⊕	⊖			LOCK position → UNLOCK position
UNLOCK	⊖	⊕			UNLOCK position → LOCK position
LOCK					
UNLOCK			○	○	

<Passenger's side and rear door>

Rod position	Terminal No.		Rod operation
	1	2	
LOCK	⊕	⊖	LOCK position → UNLOCK position
UNLOCK	⊖	⊕	UNLOCK position → LOCK position



DOOR LOOK KEY CYLINDER SWITCH CONTINUITY CHECK

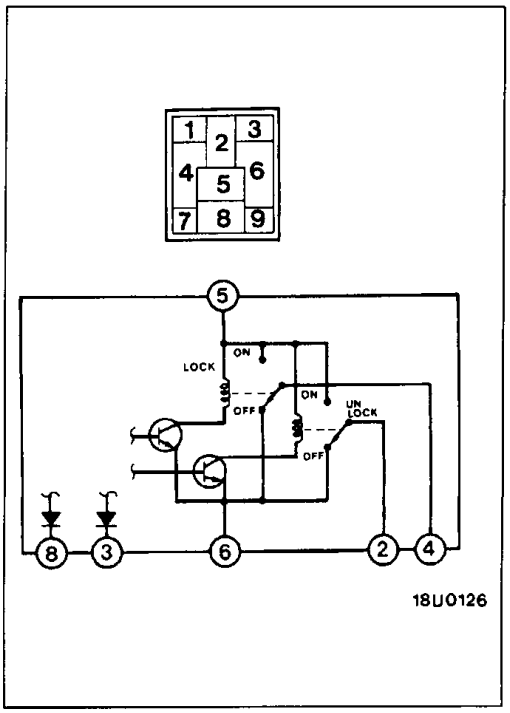
42300630030

<L.H.>

Switch position	Terminal No.		
	1	2	3
LOCK		○	○
Neutral (OFF)			
UNLOCK	○	○	

<R.H.>

Switch position	Terminal No.		
	1	2	3
LOCK	○	○	
Neutral (OFF)			
UNLOCK		○	○



DOOR LOCK ECU CHECK

42300650029

1. Apply battery voltage to terminal 5, and connect terminal 6 to earth.
2. Use a needle-type multimeter to measure the voltage under the measurement conditions given below.

Measurement condition	Terminal No.	
	2	4
Connect terminal (8) to earth.	Needle swings at the point when terminal is earthed.	0V
Disconnect earth from terminal (8).	0V	Needle swings at the point when earth is disconnected.
Connect terminal (3) to earth.	0V	Needle swings at the point when terminal is earthed.

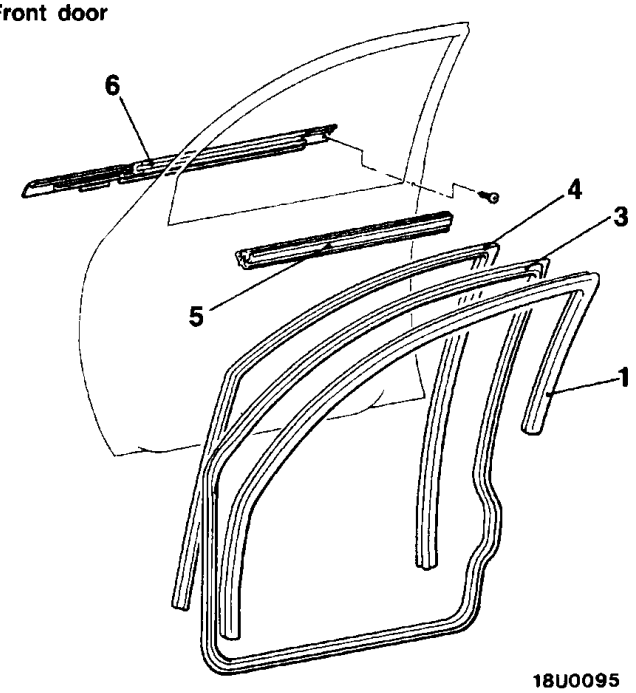
3. Check the continuity between terminals 2, 4, 6.

WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP

42300310040

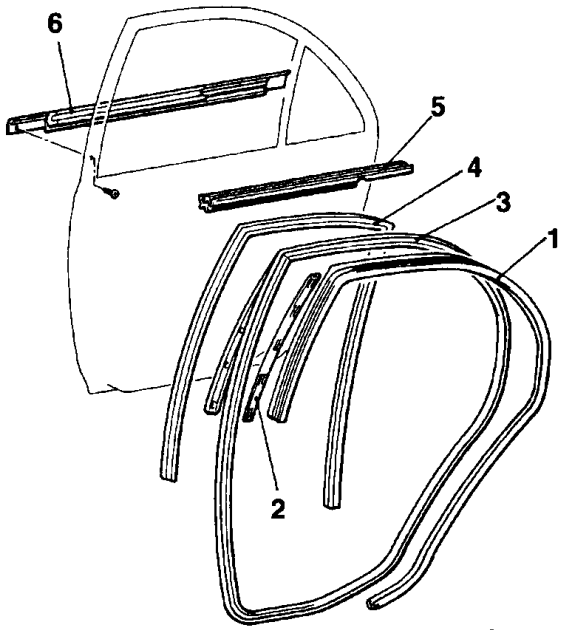
REMOVAL AND INSTALLATION

Front door



18U0095

Rear door



18U0094

00003440

Door inner opening weatherstrip removal steps

- Centre pillar lower trim (Refer to GROUP 52A.)
- Front scuff plate (Refer to GROUP 52A – Trims.)
- Rear scuff plate (Refer to GROUP 52A – Trims.)

1. Door inner opening weatherstrip

Door outer opening weatherstrip removal

2. Weatherstrip retainer

◀A▶ ▶A◀ 3. Door outer opening weatherstrip

Window glass runchannel removal

4. Window glass runchannel

Door beltline inner weatherstrip removal steps

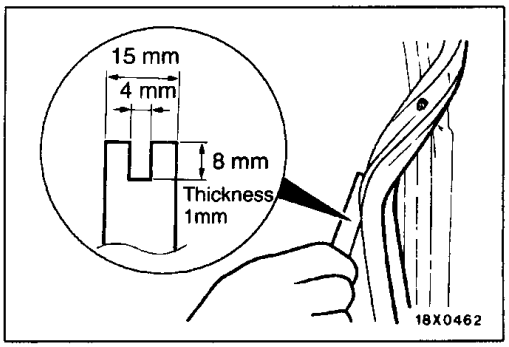
- Door trim (Refer to P.42-30.)

5. Door beltline inner weatherstrip

Door beltline outer weatherstrip removal steps

- Delta cover outer (Refer to GROUP 51 – Door Mirror.)

6. Door beltline outer weatherstrip



REMOVAL SERVICE POINT

◀A▶ DOOR OUTER OPENING WEATHERSTRIP REMOVAL

Make a tool as shown in the illustration to remove the door opening weatherstrip.

INSTALLATION SERVICE POINT

▶A◀ 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	Green
Right door	Red

TAILGATE

42400060016

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of the tailgate trim

TROUBLESHOOTING

42400070019

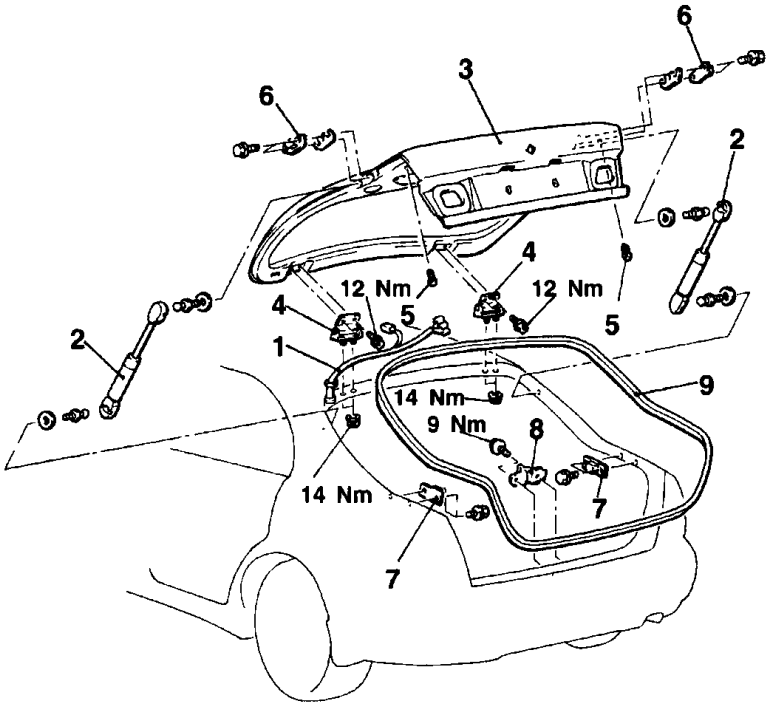
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Reference page
Door lock mechanism does operate.	42-14.

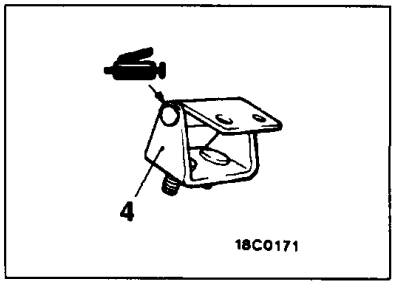
TAILGATE ASSEMBLY

42400110025

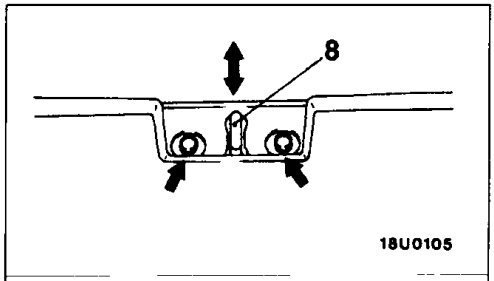
REMOVAL AND INSTALLATION



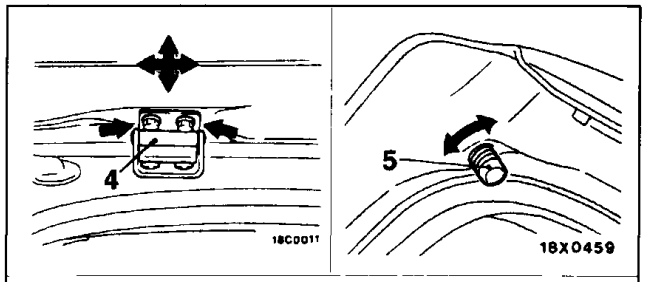
18U0081



00003441



Adjustment of tailgate step and tailgate striker linkage



Adjustment of clearance around tailgate

Tailgate and tailgate hinge removal steps

- Tailgate trim (Refer to P.42-42.)
- Rear fog lamp
- License plate lamp

1. Harness connection

◀A▶ 2. Tailgate gas spring

3. Tailgate assembly
   - Rear roof rail trim (Refer to GROUP 52A.)
4. Tailgate hinge

▶B◀ 5. Bumper

6. Damper upper
7. Damper lower

Tailgate striker removal steps

- Rear end trim (Refer to GROUP 52A.)

8. Tailgate striker

Tailgate opening weatherstrip removal

▶A◀ 9. Tailgate opening weatherstrip

REMOVAL SERVICE POINT

◀A▶ TAILGATE GAS SPRING REMOVAL

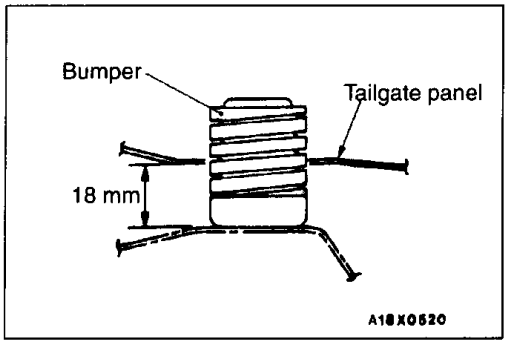
Caution

1. **Never try to disassemble the tailgate gas spring or burn it.**
2. **Always bore a hole in the tailgate gas spring to release the interior gas before the gas spring is discarded.**

INSTALLATION SERVICE POINTS

▶A◀ TAILGATE OPENING WEATHERSTRIP INSTALLATION

Install the tailgate opening weatherstrip so that the joint is at the centre of the body.



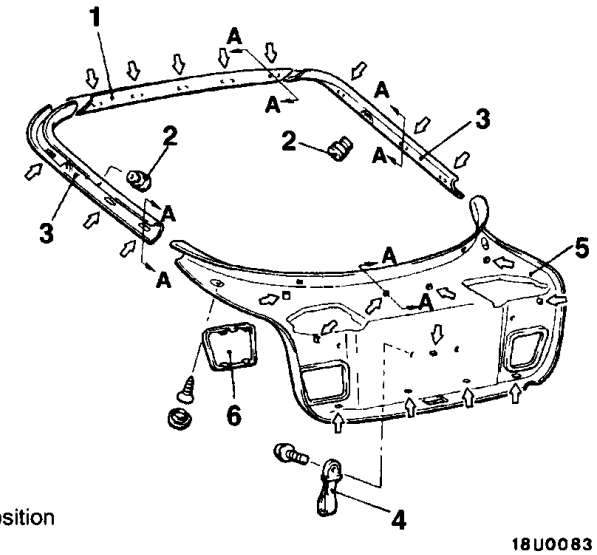
▶B◀ BUMPER INSTALLATION

Install the bumper so that the amount of projection from the tailgate panel is as shown in the illustration.

TAILGATE TRIM

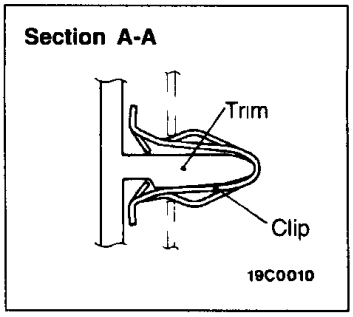
42400140017

REMOVAL AND INSTALLATION



NOTE
⇦ : metal clip position

18U0083



00003442

Removal steps

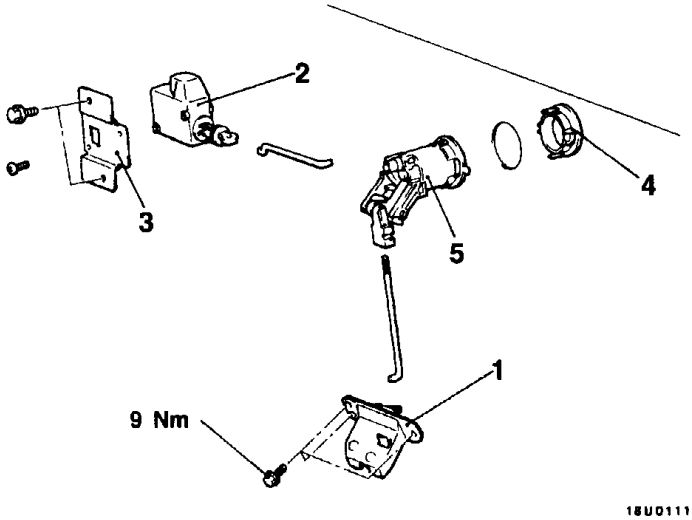
1. Tailgate upper trim
2. Tailgate trim hook
3. Tailgate side trim
4. Pull down strap assembly
5. Tailgate lower trim
6. Lid

TAILGATE LATCH

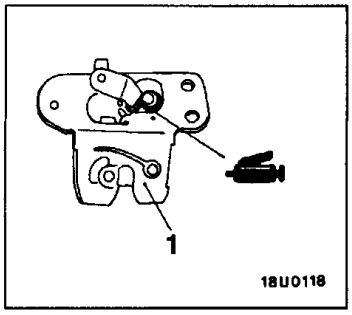
42400170016

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Tailgate Lower Trim Removal and Installation (Refer to P.42-42.)



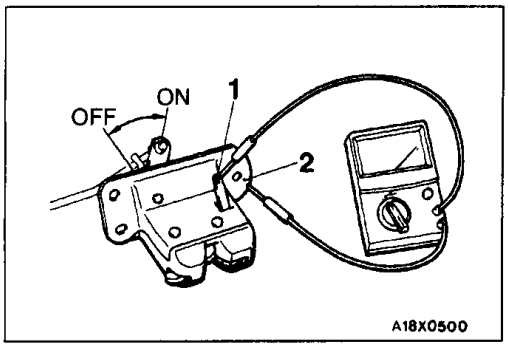
18U0111

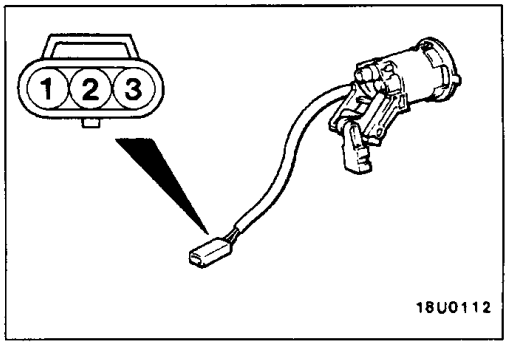


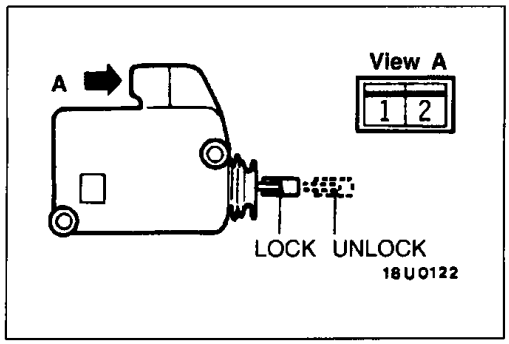
00003443

Removal steps

1. Tailgate latch
2. Tailgate lock actuator
3. Tailgate lock actuator bracket
4. Tailgate cylinder cap
5. Tailgate lock cylinder







INSPECTION

42400190036

TAILGATE SWITCH CONTINUITY CHECK

Switch position	Terminal No.	
	1	2
ON (Latch open)	○	○
OFF (Latch shut)		

TAILGATE LOCK KEY CYLINDER SWITCH CONTINUITY CHECK

42400200029

Switch position	Terminal No.		
	1	2	3
LOCK	○	○	
Neutral (OFF)			
UNLOCK		○	○

TAILGATE LOCK ACTUATOR CHECK

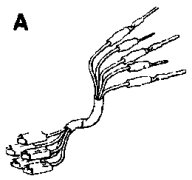
42400210015

Rod position	Terminal No.		Rod operation
	1	2	
LOCK	⊕	⊖	LOCK position → UNLOCK position
UNLOCK	⊖	⊕	UNLOCK position → LOCK position

KEYLESS ENTRY SYSTEM

42800060018

SPECIAL TOOLS

Tool	Number	Name	Use
A 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
B			
C			
D			

TROUBLESHOOTING

42800180011

INSPECTION CHART FOR TROUBLE SYMPTOMS

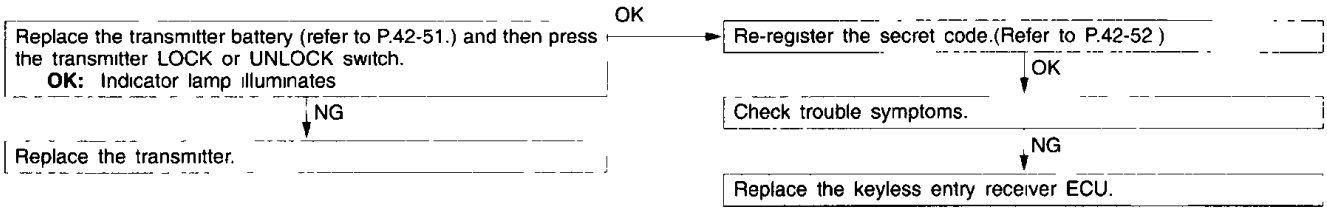
Trouble symptoms		Inspection procedure	Reference page
Keyless entry system	None of the doors, including the tailgate, can be locked or unlocked. (However, the central door locking system is functioning normally.)	1	42-45
	All of the doors, including the tailgate, can be locked and unlocked, but the hazard lamp does not illuminate or does not flash. (However, the hazard lamp flashes normally when the hazard lamp switch is used.)	2	42-45
	Secret codes cannot be registered.	3	42-46
Theft-alarm system	The security indicator lamp does not flash after the system has been set. (However, the central door locking system and keyless entry system are functioning normally.)	4	42-47
	The security indicator lamp keeps flashing even after the theft-alarm system has been disarmed. (However, the central door locking system and keyless entry system are functioning normally.)	5	42-47

Trouble symptoms		Inspection procedure	Reference page
Theft-alarm system	The horn does not sound after the hood switch, door switch or tailgate switch turns on, even though the theft-alarm system has been armed.	6	42-48
	The hazard lamp does not flash after the hood switch, door switch or tailgate switch turns on, even though the theft-alarm system has been armed. (However, the hazard lamp flashes normally when the hazard lamp switch is used.)	7	42-49

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

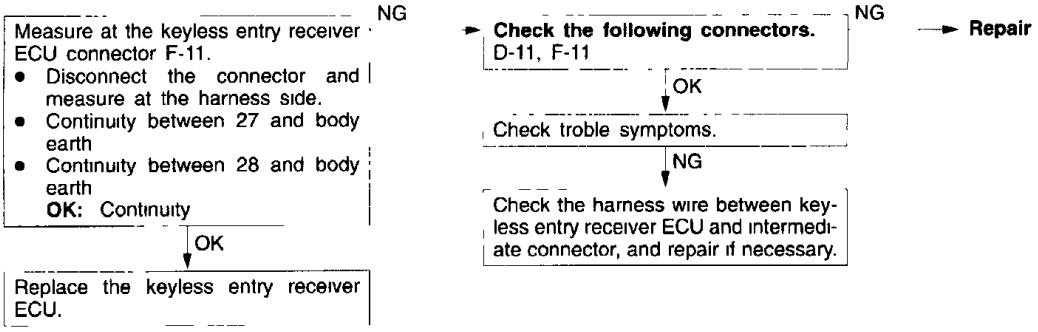
Inspection Procedure 1

None of the doors, including the tailgate, can be locked or unlocked. (However, the central door locking system is functioning normally.)	**Probabble cause**
The transmitter battery may be spent, the secret code may not have been registered correctly, or there may be a malfunction of the transmitter. If the transmitter is normal, the cause is probably a malfunction of the keyless entry receiver-ECU.	• Malfunction of the battery • Malfunction of the transmitter • Malfunction of the keyless entry receiver ECU



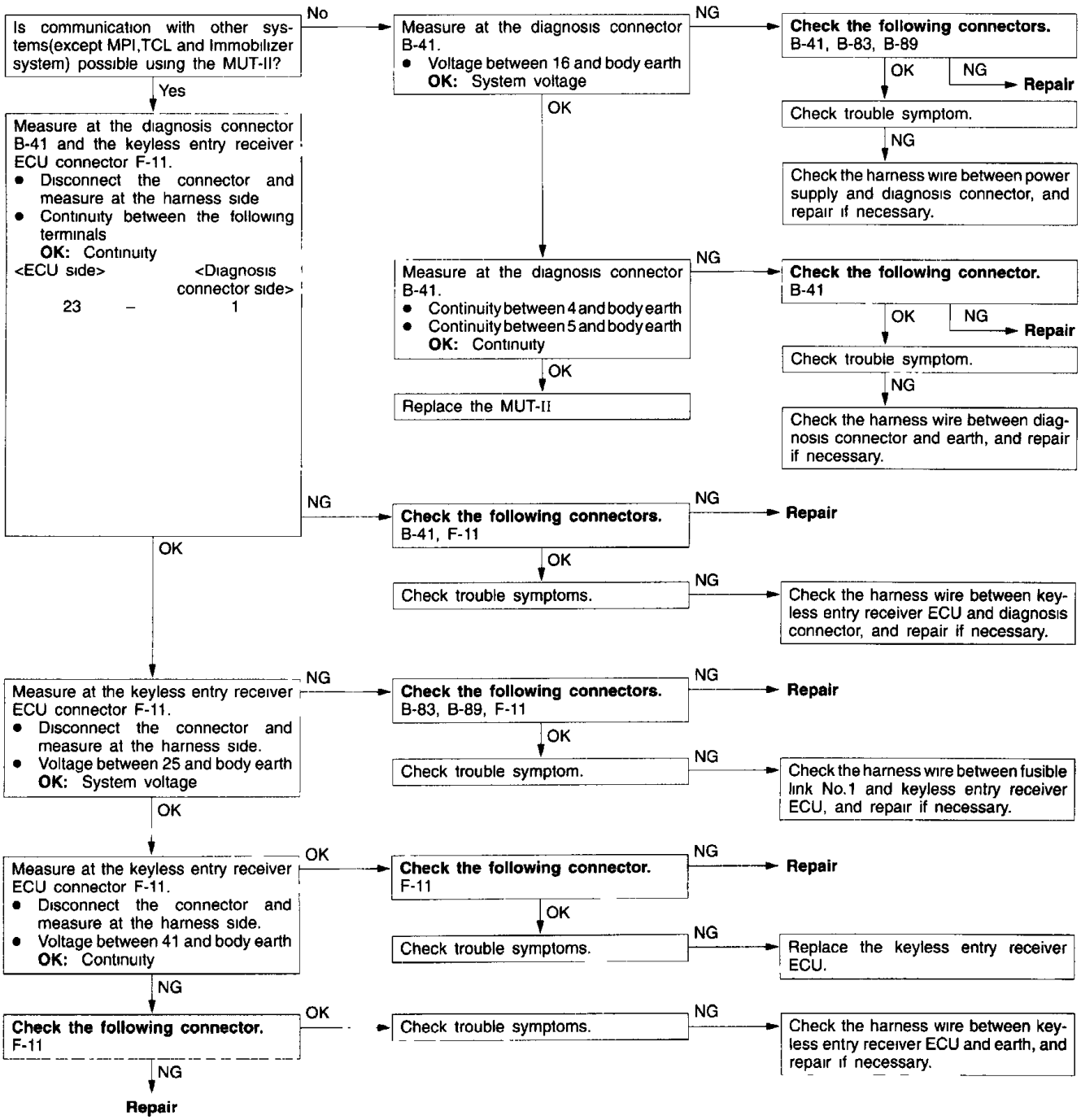
Inspection Procedure 2

All of the doors, including the tailgate, can be locked and unlocked, but the hazard lamp does not illuminate or does not flash. (However, the hazard lamp flashes normally when the hazard lamp switch is used.)	**Probable cause**
The keyless entry receiver ECU or the harness between hazard lamp and keyless entry receiver ECU may be defective	• Malfunction of the keyless entry receiver ECU • Malfunction of harness or connector



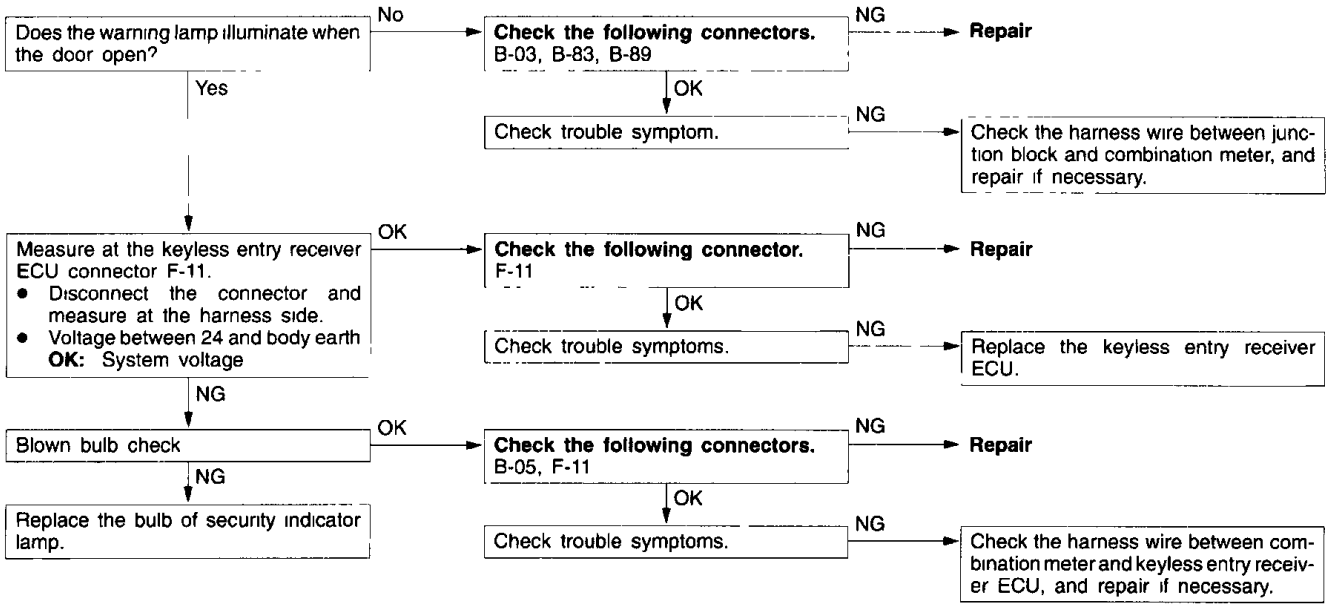
Inspection Procedure 3

Secret codes cannot be registered.	Probable cause
One of the following items may be defective. Diagnosis connector Keyless entry receiver ECU power supply circuit Earth circuit Diagnosis output circuit	• Malfunction of the keyless entry receiver ECU • Malfunction of the MUT-II • Malfunction of harness or connector



Inspection Procedure 4

The security indicator lamp does not flash after the system has been set. (However, the central door locking system and keyless entry system are functioning normally.)	Probable cause
If the central door locking system and keyless entry system are normal, the cause is probably a blown bulb or a malfunction of the keyless entry receiver-ECU.	• Malfunction of the security indicator lamp bulb • Malfunction of the keyless entry receiver ECU • Malfunction of harness or connector



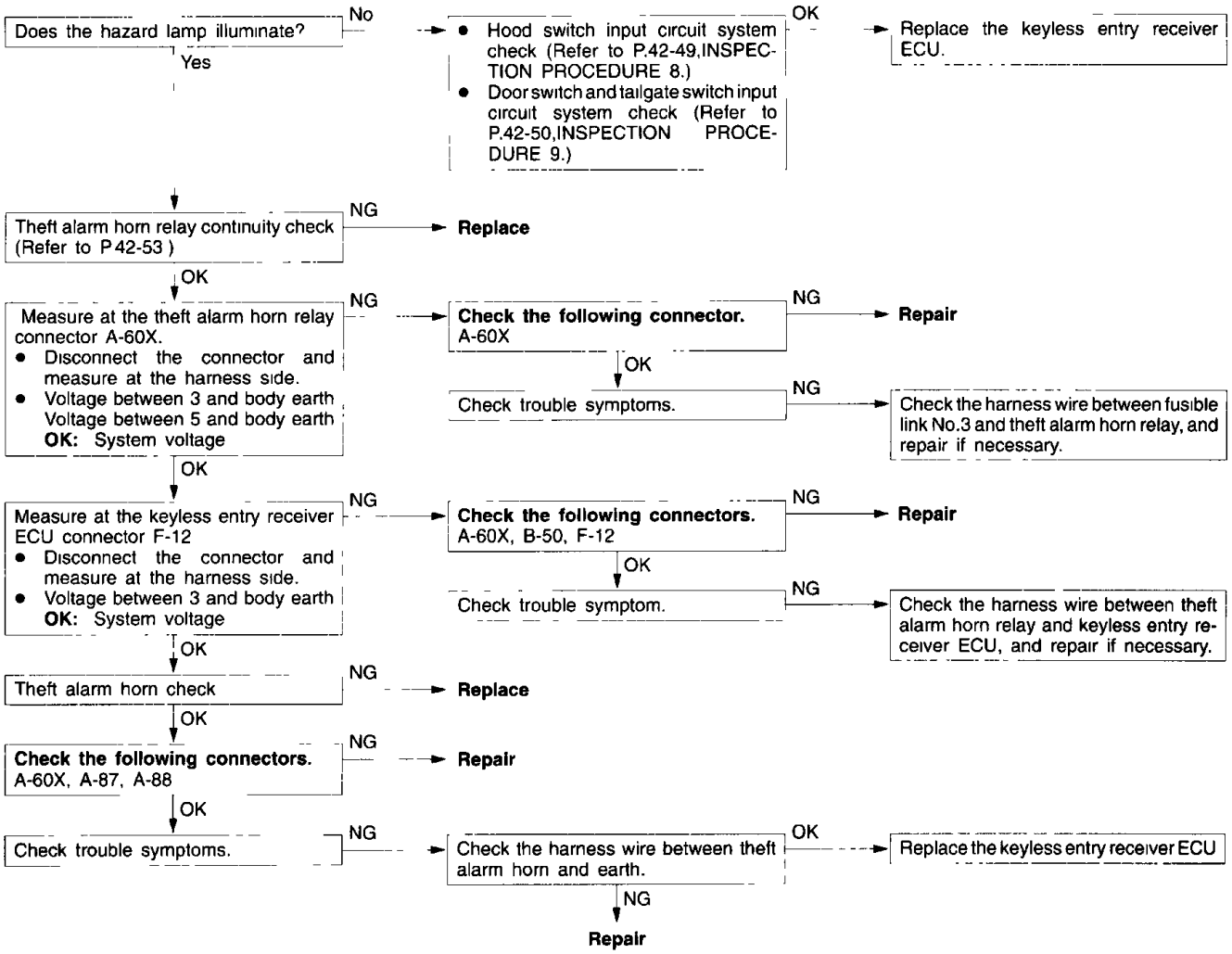
Inspection Procedure 5

The security indicator lamp keeps flashing even after the theft-alarm system has been disarmed. (However, the central door locking system and keyless entry system are functioning normally.)	Probable cause
The keyless entry receiver ECU may be defective.	• Malfunction of the keyless entry receiver ECU

Replace the keyless entry receiver ECU.

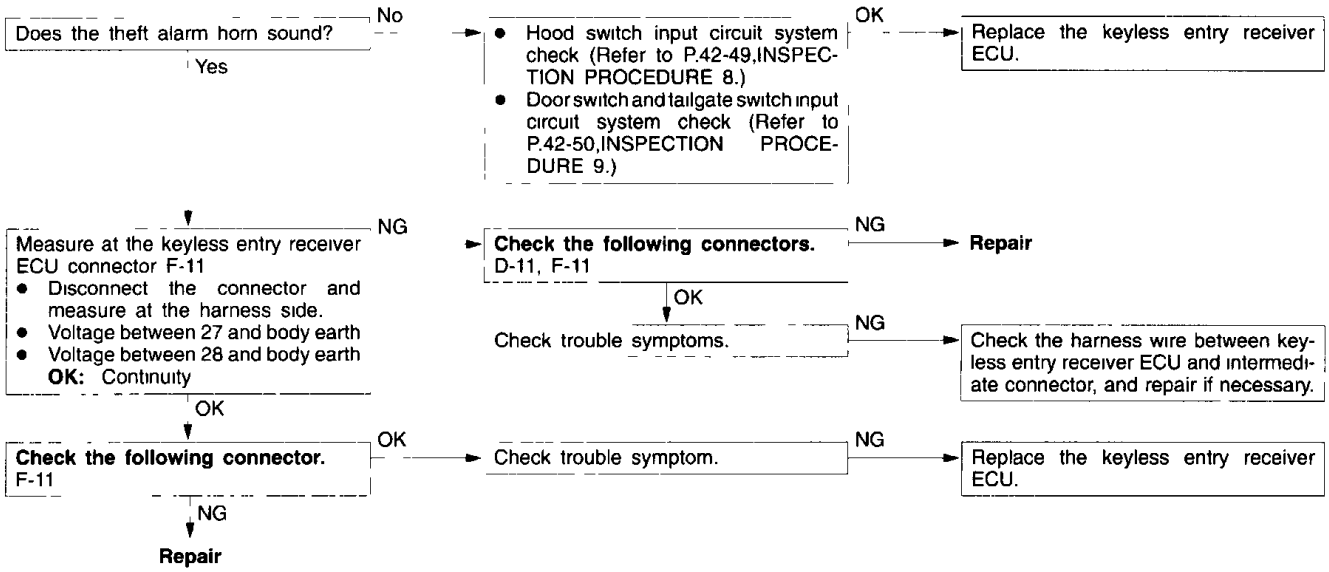
Inspection Procedure 6

The horn does not sound after the hood switch, door switch or tailgate switch turns on, even though the theft-alarm system has been armed.	Probable cause
One of the following items may be defective. Hood switch input circuit Door switch input circuit Tailgate switch input circuit Each switch Horn Horn relay Keyless entry receiver ECU	• Malfunction of the hood switch • Malfunction of the door switch • Malfunction of the tailgate switch • Malfunction of the horn • Malfunction of the horn relay • Malfunction of the keyless entry receiver ECU • Malfunction of harness or connector



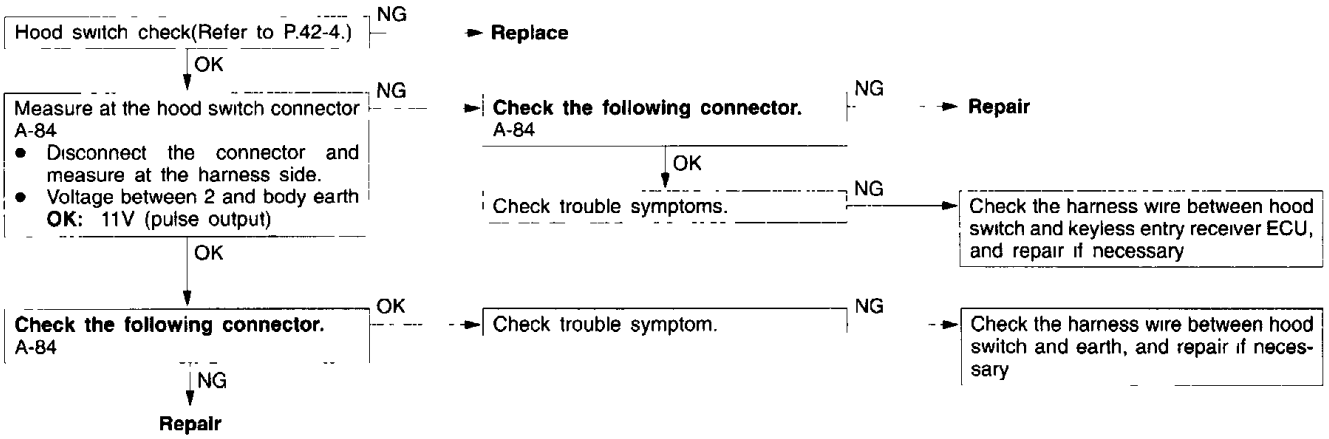
Inspection Procedure 7

The hazard lamp does not flash after the hood switch, door switch or tailgate switch turns on, even though the theft-alarm system has been armed. (However, the hazard lamp flashes normally when the hazard lamp switch is used.)	Probable cause
One of the following items may be defective. Hood switch input circuit Door switch input circuit Tailgate switch input circuit Each switch Keyless entry receiver ECU Harness between hazard lamp and keyless entry receiver ECU	• Malfunction of the hood switch • Malfunction of the door switch • Malfunction of the tailgate switch • Malfunction of the keyless entry receiver ECU • Malfunction of the harness or connector



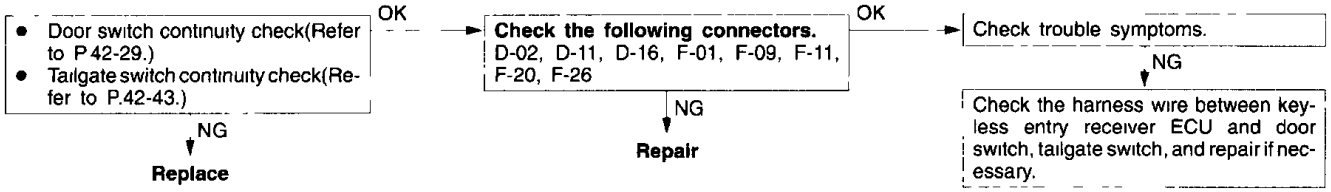
Inspection Procedure 8

Hood switch input circuit system check



Inspection Procedure 9

Door switch and tailgate switch input circuit system check

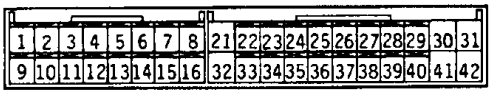


INSPECTION AT KEYLESS ENTRY RECEIVER ECU TERMINALS

42800220010

TERMINAL VOLTAGE CHART

1. Measure the voltages between terminal (41) (earth terminal) and each respective terminal.
2. The terminal arrangements are shown in the illustrations below.

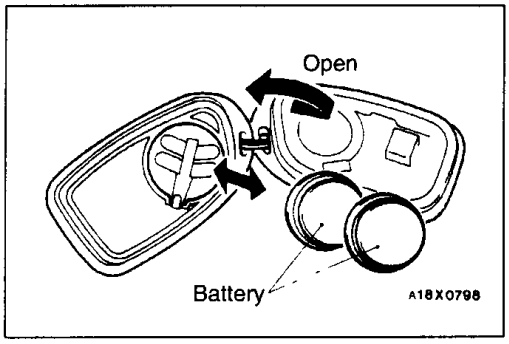


18U0130

Connector Terminal No.	Signal	Checking Requirements	Normal Condition
3	Theft afram horn relay	ON	0V
		OFF	System voltage
11	Hood switch	Hood closed (Hood switch: ON)	0V
		Hood open (Hood switch: OFF)	11V (pulse output)*
21	Door lock output	When operating	System voltage
		When not operating	0V
22	Ignition switch	Ignition switch: ACC or ON	System voltage
		Ignition switch: OFF	0V
23	Diagnostic selection (Input)	MUT-II : Connected	0V
		MUT-II : Disconnected	Apporox. 4V
24	Security indicator lamp	When lamp illuminates	0V*
		When lamp is switched off	System voltage
25, 42	Keyless entry receiver ECU power supply	Always	System voltage
27, 28	Hazard warning lamp	When lamp is switched off	0V
		When lamp illuminates	System voltage

Connector Terminal No.	Signal	Checking Requirements	Normal Condition
30	Door unlock output	When operating	System voltage
		When not operating	0V
34	Door switch or tailgate switch	Some door is open(Switch: ON)	0V
		All doors are closed(Switch: OFF)	11V (pulse output)*
35	Front door lock actuator (driver's side)	LOCK	11V (pulse output)*
		UNLOCK	0V
36	Key cylinder switch	UNLOCK	0V
		NEUTRAL	11V (pulse output)*
37		LOCK	0V
		NEUTRAL	11V (pulse output)*
41	Earth	Always	0V

NOTE
*: Measurements are impossible using a voltmeter, but are possible using an oscilloscope.



ON-VEHICLE SERVICE

42800090017

BATTERY REPLACEMENT

1. Insert a screwdriver in a slit in the transmitter case and pry it lightly to open the case. Then take the battery out of the transmitter.
2. Install a new battery with its positive side down.

   Replacement battery: Lithium battery CR2016 × 2
3. Firmly close the transmitter case.
4. Check that the keyless entry system operates properly.

Caution
When the transmitter is opened, be careful not to allow water, dust, etc. to stick to the transmitter. In addition, do not touch the precision electronic device.

HOW TO REGISTER A SECRET CODE

42800100017

Each transmitter is programmed with an individual secret code.
If the transmitter or receiver is replaced or the secret code is improperly registered, re-register the code into the receiver.
Before registering, check that doors can be properly locked or unlocked by the key.

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

   NOTE
   Terminal (1) of the diagnosis connector will be earthed at this time and the mode will switch to the secret code registration preparation mode.

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

2. Close all of the doors.
3. Turn the ignition switch to ACC and then to OFF.

   NOTE
   The doors will lock and then unlock at this time, and the mode will then switch to the secret code registration mode.

4. Press the desired switch on the transmitter once, and then press it two more times within 10 seconds. The secret code will then be registered.
5. After registration is completed, the doors will lock and then unlock once.

   NOTE
   If there are two transmitters, register the secret code for the first one, and then within one minute after doing this, register the secret code for the second one by following the same procedure as given above.

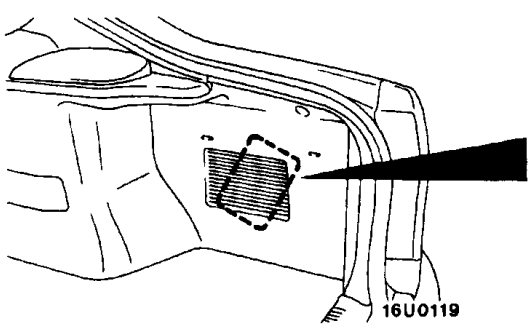
6. After registration for the second transmitter has been completed, the doors will lock and then unlock once.
7. The registration mode will be cleared under any of the following conditions.
   - After the secret codes have been registered for two transmitters
   - After one minute elapses since registration mode was set
   - If the MUT-II is disconnected (if the earth connection is broken)
   - If the ignition switch is turned to ON
   - If any of the doors are opened

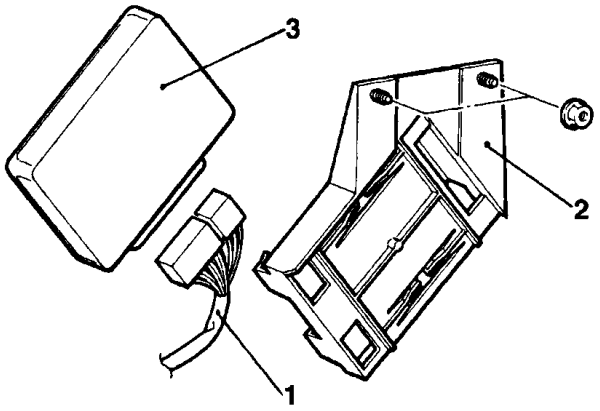
KEYLESS ENTRY RECEIVER ECU

42800130016

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Rear Side Trim (R.H.) Removal and Installation (Refer to GROUP 52A.)

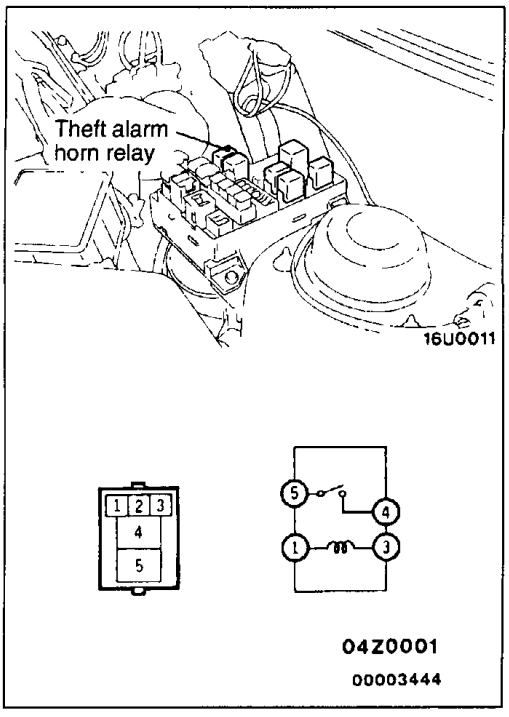




18U0129

00003416

Removal steps
1. Harness connector
2. Keyless entry receiver bracket
3. Keyless entry receiver ECU



THEFT ALARM HORN

42800230013

INSPECTION

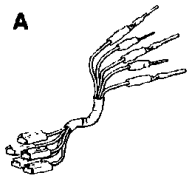
THEFT ALARM HORN RELAY CONTINUITY CHECK

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

SUNROOF

42600060012

SPECIAL TOOLS

Tool	Number	Name	Use
A 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
B			
C			
D			

TROUBLESHOOTING

42600200018

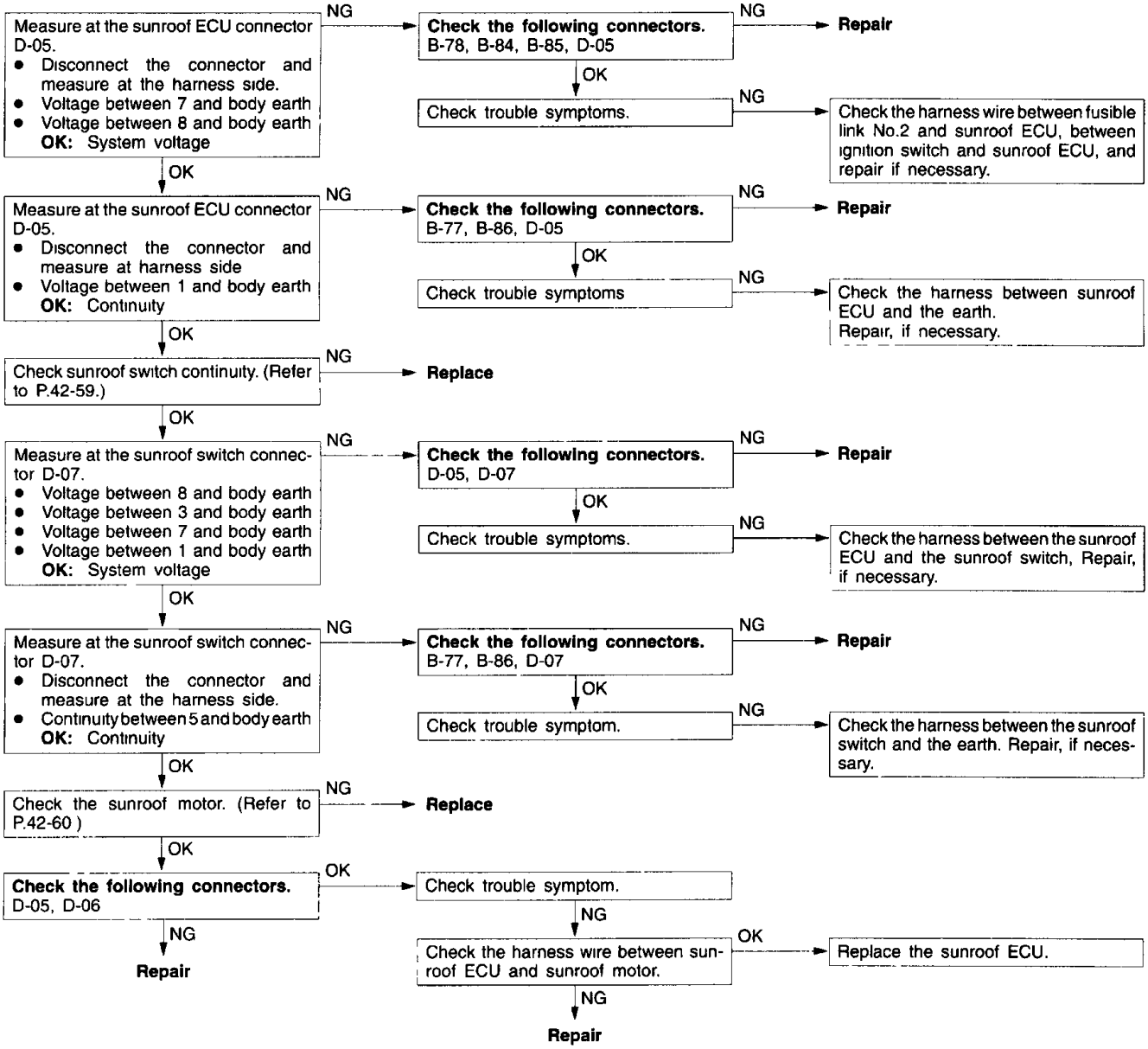
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Sunroof does not operate at all.	1	42-54
Sunroof does not operate correctly or it does not re-open if it clamps something.	2	42-56
The key off timer does not operate.	3	42-56
If the driver's side door is opened while the key off timer is operating, the sunroof does not operate for a further 30 seconds after the door is opened.	4	42-56

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

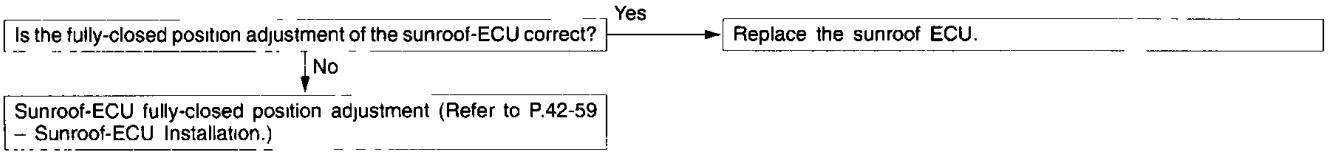
Inspection Procedure 1

Sunroof does not operate at all.	Probable cause
One of the following items may be defective Sunroof switch Sunroof motor Sunroof ECU Power supply circuit Earth circuit	• Malfunction of sunroof switch • Malfunction of front sunroof motor • Malfunction of front sunroof-ECU • Malfunction of wiring harness or connector


Measure at the sunroof ECU connector D-05.
• Disconnect the connector and measure at the harness side.
• Voltage between 7 and body earth
• Voltage between 8 and body earth
OK: System voltage
NG
Check the following connectors. B-78, B-84, B-85, D-05
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between fusible link No.2 and sunroof ECU, between ignition switch and sunroof ECU, and repair if necessary.
OK
Measure at the sunroof ECU connector D-05.
• Disconnect the connector and measure at harness side
• Voltage between 1 and body earth
OK: Continuity
NG
Check the following connectors. B-77, B-86, D-05
NG
Repair
OK
Check trouble symptoms
NG
Check the harness between sunroof ECU and the earth. Repair, if necessary.
OK
Check sunroof switch continuity. (Refer to P.42-59.)
NG
Replace
OK
Measure at the sunroof switch connector D-07.
• Voltage between 8 and body earth
• Voltage between 3 and body earth
• Voltage between 7 and body earth
• Voltage between 1 and body earth
OK: System voltage
NG
Check the following connectors. D-05, D-07
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the sunroof ECU and the sunroof switch, Repair, if necessary.
OK
Measure at the sunroof switch connector D-07.
• Disconnect the connector and measure at the harness side.
• Continuity between 5 and body earth
OK: Continuity
NG
Check the following connectors. B-77, B-86, D-07
NG
Repair
OK
Check trouble symptom.
NG
Check the harness between the sunroof switch and the earth. Repair, if necessary.
OK
Check the sunroof motor. (Refer to P.42-60)
NG
Replace
OK
Check the following connectors. D-05, D-06
OK
Check trouble symptom.
NG
Check the harness wire between sunroof ECU and sunroof motor.
OK
Replace the sunroof ECU.
NG
Repair
NG
Repair

Inspection Procedure 2

Sunroof does not operate correctly or it does not re-open if it clamps something.	Probable cause
The fully-closed position for the sunroof-ECU may have been adjusted incorrectly, or there may be a malfunction of the sunroof-ECU.	• Incorrect adjustment of sunroof-ECU fully-closed position • Malfunction of the sunroof ECU • Malfunction of the harness or connector

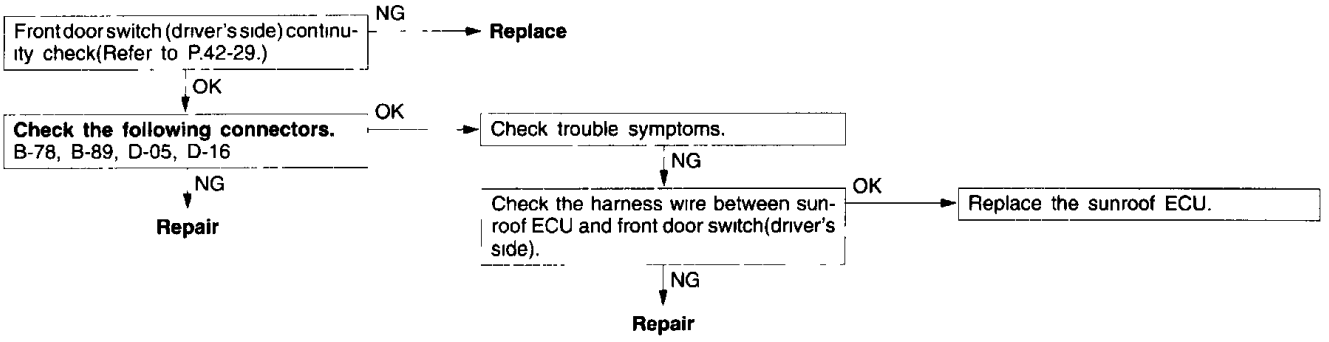


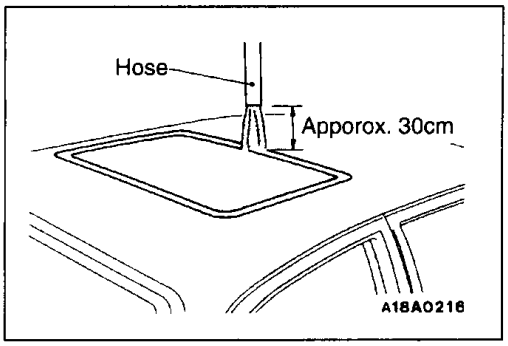
Inspection Procedure 3

The key off timer does not operate.	Probable cause
The sunroof can be operated for a further 30 seconds after the ignition switch is turned to OFF, but if it cannot be operated during this time, there is probably a malfunction of the sunroof-ECU.	• Malfunction of the sunroof ECU

Inspection Procedure 4

If the driver's side door is opened while the key off timer is operating, the sunroof does not operate for a further 30 seconds after the door is opened.	Probable cause
If the driver's door is opened within 30 seconds after the ignition switch is turned to OFF, the sunroof can still be operated for 30 seconds after that point. If it cannot be operated during this time, there is probably a malfunction of the driver's side door switch or of the sunroof-ECU.	• Malfunction of the front door switch(driver's side) • Malfunction of the sunroof ECU • Malfunction of harness or connector





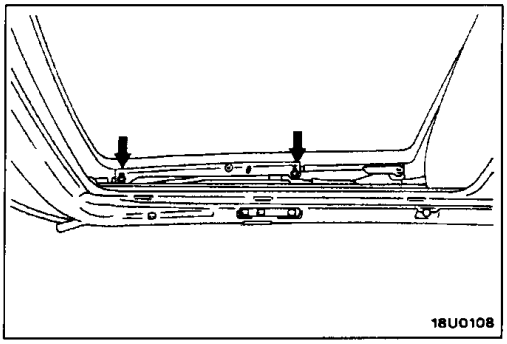
ON-VEHICLE SERVICE

42600090035

WATER TEST

Check if there are any leaks in the sunroof by the following procedure.

(1) Fully close the roof lid glass.
(2) Adjust the water pressure so that water comes out of the hose to a height of approximately 50 cm when the hose is held vertically facing upwards.
(3) Hold the end of the hose about 30 cm above the roof and let the water run onto the weatherstrip for 5 minutes or more.
(4) While doing this, check if any water leaks through into the passenger compartment from around the roof lid glass.



SUNROOF FIT ADJUSTMENT

42600100035

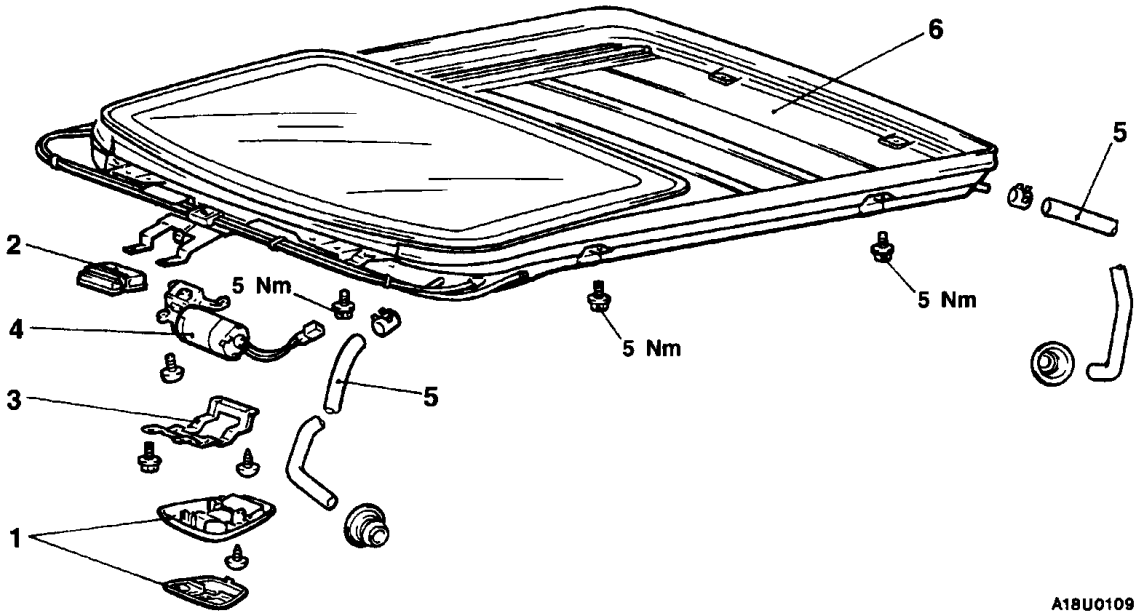
1. Fully close the roof lid glass.
2. Fully open the sunshade.
3. Remove the cover.
4. Loosen the screws and adjust the position of the roof lid glass so that it is flush with the surface of the roof.

SUNROOF

42600120031

REMOVAL AND INSTALLATION

Post-installation Operation
(1) Sunroof Water Test (Refer to P.42-57.)
(2) Sunroof Fit Adjustment (Refer to P.42-57.)



Sunroof ECU removal steps
1. Sunroof switch and room lamp assembly
- Headlining

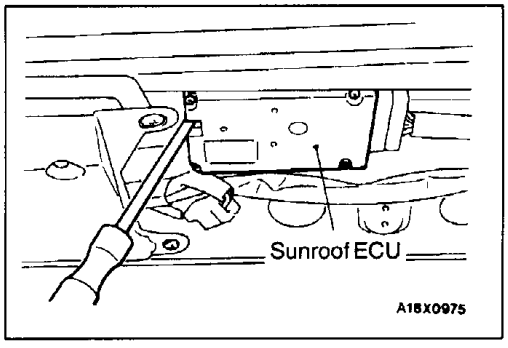
◀A▶ ▶B◀ 2. Sunroof ECU

Sunroof motor removal steps
1. Sunroof switch and room lamp assembly
- Headlining
3. Room lamp bracket
4. Sunroof motor

Drain hose removal steps
- Splash shield (Refer to P.42-4.)
1. Sunroof switch and room lamp assembly
- Headlining

◀B▶ ▶A◀ 5. Drain hose

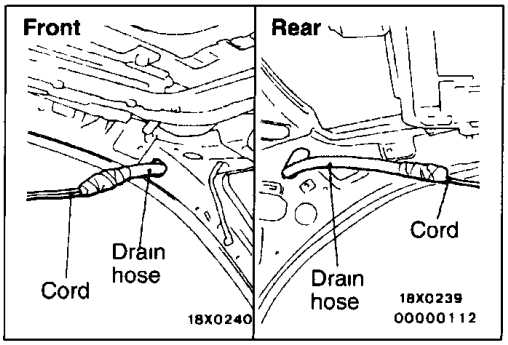
Sunroof assembly removal steps
1. Sunroof switch and room lamp assembly
- Headlining
5: Drain hose connection
6. Sunroof assembly



REMOVAL SERVICE POINTS

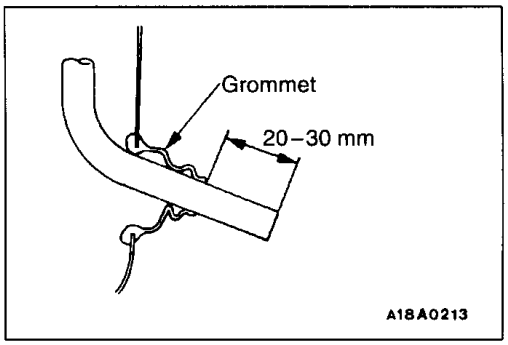
◀A▶ SUNROOF ECU REMOVAL

1. Close the roof lid glass fully.
2. Insert a flat-tipped screwdriver, place it on the tab, and then press it to the right.
3. Lower sunroof ECU and slide to left.



◀B▶ DRAIN HOSE REMOVAL

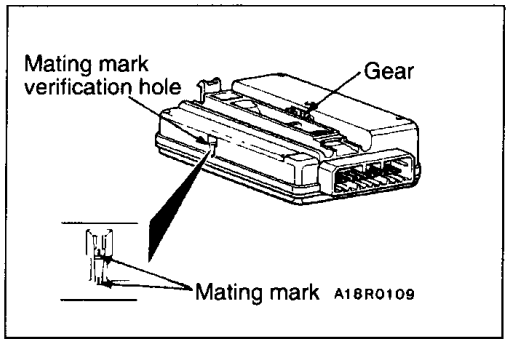
Remove the grommet. Tie a cord to the end of the drain hose, wind tape around it so that there is no unevenness, and pull the drain hose out into the wheel house.



INSTALLATION SERVICE POINTS

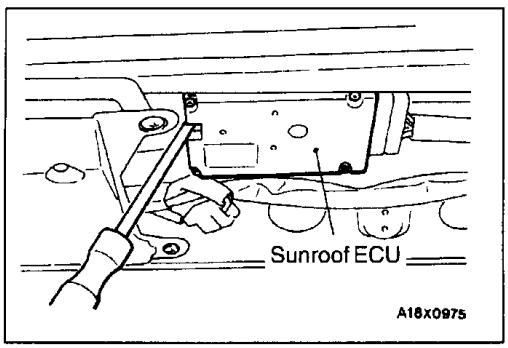
▶A◀ DRAIN HOSE INSTALLATION

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.

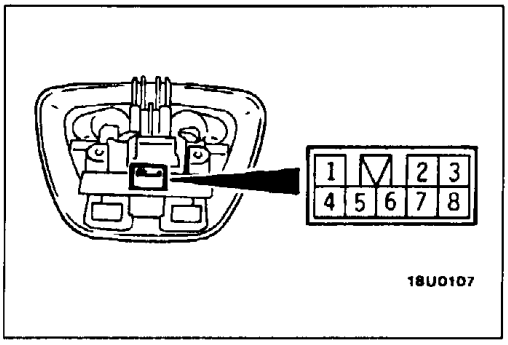


▶B◀ SUNROOF ECU INSTALLATION

1. Fully close the roof lid glass.
2. Turn the gear of the sunroof-ECU until the two mating marks are aligned.



3. Insert a flat-tipped screwdriver, place it on the tab, and press it to the right, being careful not to pinch wiring.

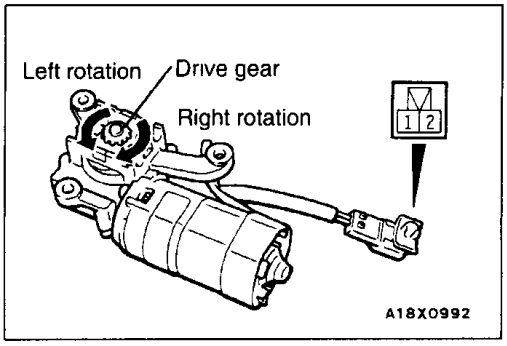


INSPECTION

42600160033

SUNROOF SWITCH CONTINUITY CHECK

Switch position		Terminal No.				
		1	2	3	7	8
Slide switch	OPEN		○			○
	CLOSE		○	○		
Tilt switch	UP		○		○	
	DOWN	○	○			



SUNROOF MOTOR CHECK

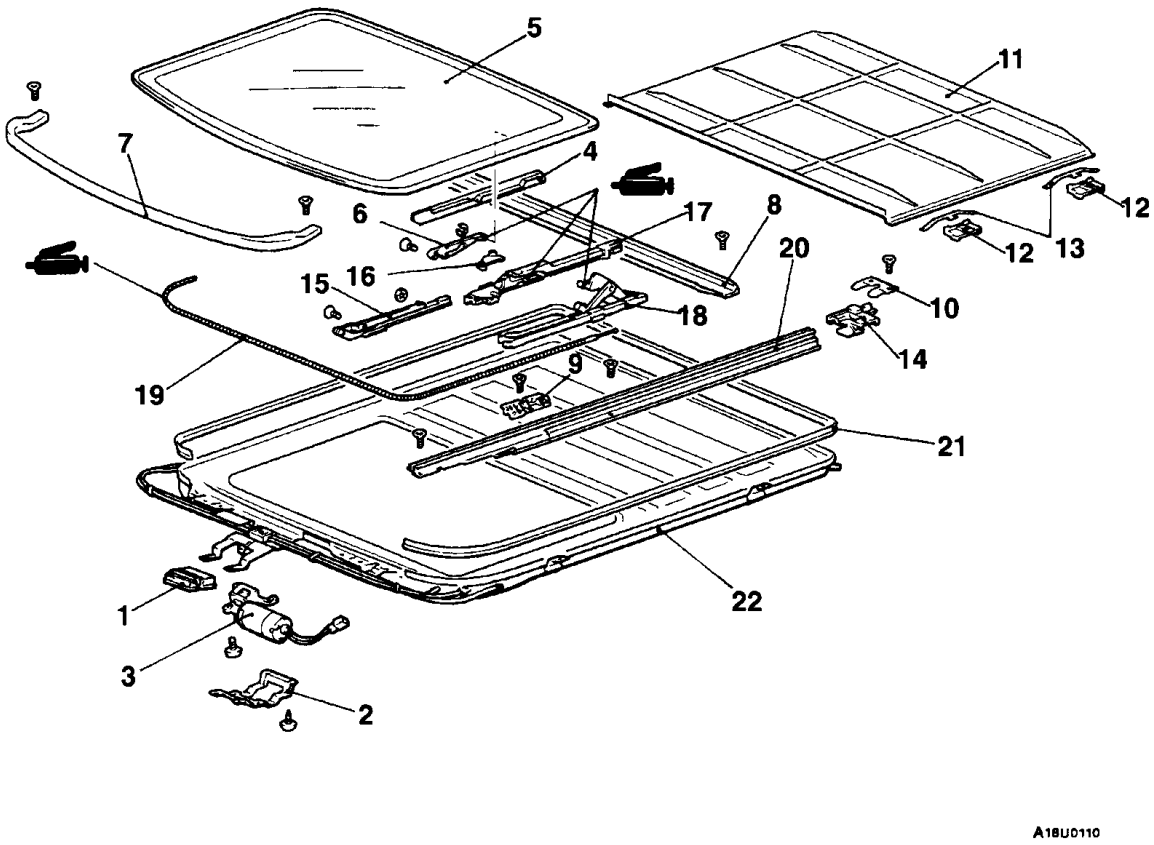
42600250013

Check the direction of rotation of the drive gear when the battery is connected to the connector.

Battery connection terminal		Drive gear rotation direction
1	2	
⊖	⊕	Right
⊕	⊖	Left

DISASSEMBLY AND REASSEMBLY

42600140037



Disassembly steps

1. Sunroof ECU (Refer to P.42-58.)
2. Room lamp bracket
3. Sunroof motor
4. Cover
5. Roof lid glass
6. Curve on panel
7. Winddeflector assembly
8. Drain channel assembly
9. Locator
10. Strong rear stop
11. Sunshade
12. Slide bloke
13. Spring
14. Mechanism stop
15. Basic slide front
16. Blocking catch
17. Basic slid rear
18. Driving slide rear
19. Drive cable
20. Guide
21. Tray seal outer
22. Welded tray assembly

EXTERIOR

CONTENTS

51109000036

SERVICE SPECIFICATIONS 2
SEALANT AND ADHESIVE 2
SPECIAL TOOLS 2
FRONT BUMPER 3
REAR BUMPER 4
MOULDINGS 5
AERO PARTS 6
WINDSHIELD WIPER AND WASHER* 9
REAR WIPER AND WASHER* 12
HEADLAMP WASHER* 15
MARKS 17
DOOR MIRROR 19

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

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

SERVICE SPECIFICATIONS

51100030034

Items		Standard value
Windshield wiper blade installation position mm	Driver's side	25±5
	Passenger's side	20±5
Rear wiper blade installation position mm		15

SEALANT AND ADHESIVE

51100050030

Items	Specified sealant and adhesive
Side airdam to body panel	Double-sided tape [5 mm wide and 1.2 mm thick]
Rear spoiler	Double-sided tape [10 mm wide and 1.2 mm thick]

SPECIAL TOOLS

51100060033

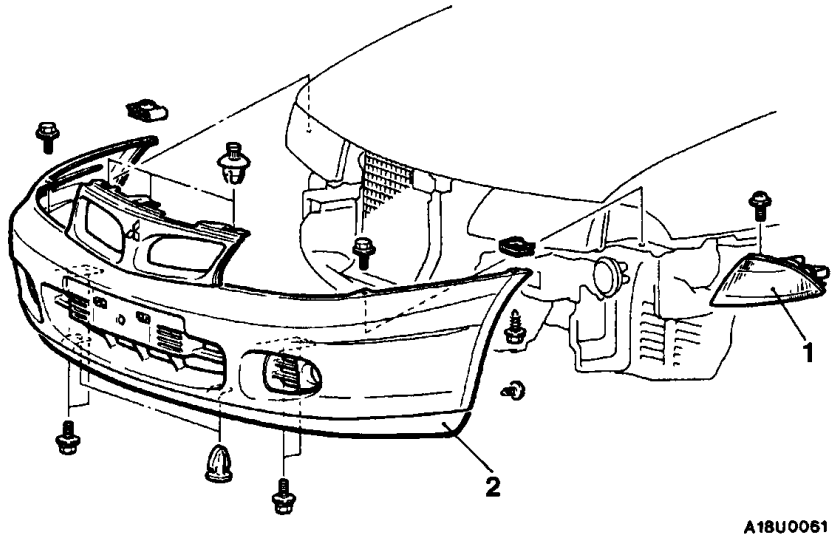
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of rear wiper and washer switch and door mirror control switch.
	MB990449	Window moulding remover	Removal of roof drip moulding, etc.

FRONT BUMPER

51100140034

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Under Cover Panel Removal and Installation

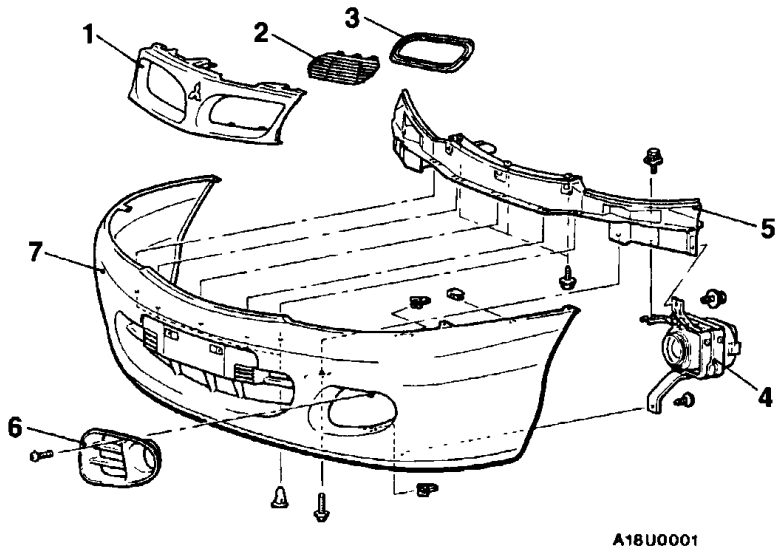


A18U0061

Removal steps
1. Front turn signal lamp
2. Bumper assembly

DISASSEMBLY AND REASSEMBLY

51100160030



A18U0001

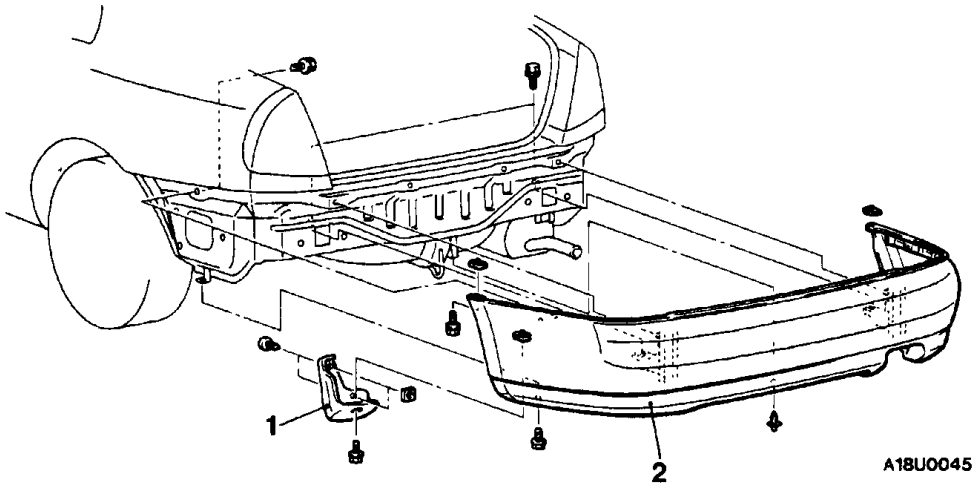
Disassembly steps
1. Radiator grille, outer
2. Radiator grille, inner
3. Radiator grille cover
4. Front fog lamp
5. Bumper reinforcement
6. Fog lamp cover
7. Bumper face

REAR BUMPER

51100190039

REMOVAL AND INSTALLATION

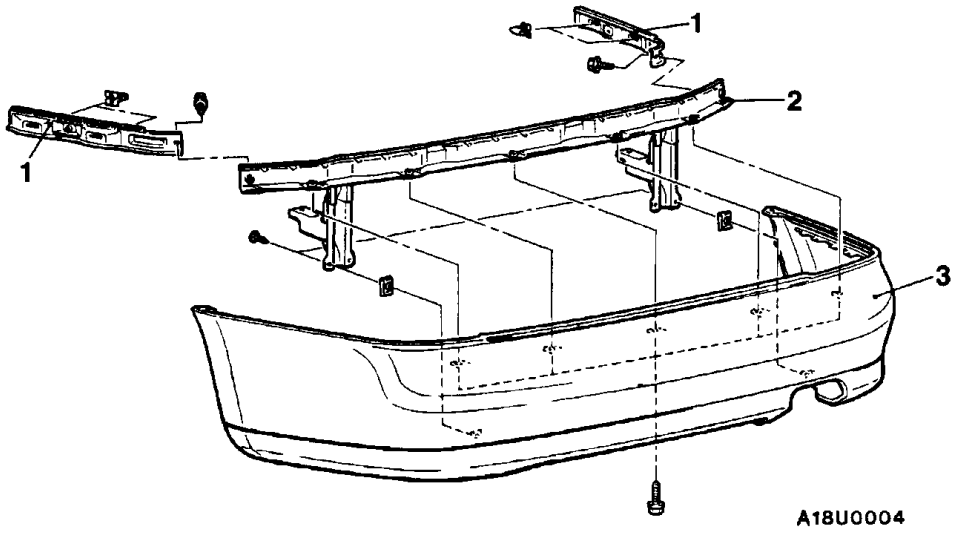
Pre-removal and Post-installation Operation
- Rear End Trim Removal and Installation (Refer to GROUP 52A.)



Removal steps
1. Mud guard
2. Bumper assembly

DISASSEMBLY AND REASSEMBLY

51100210032

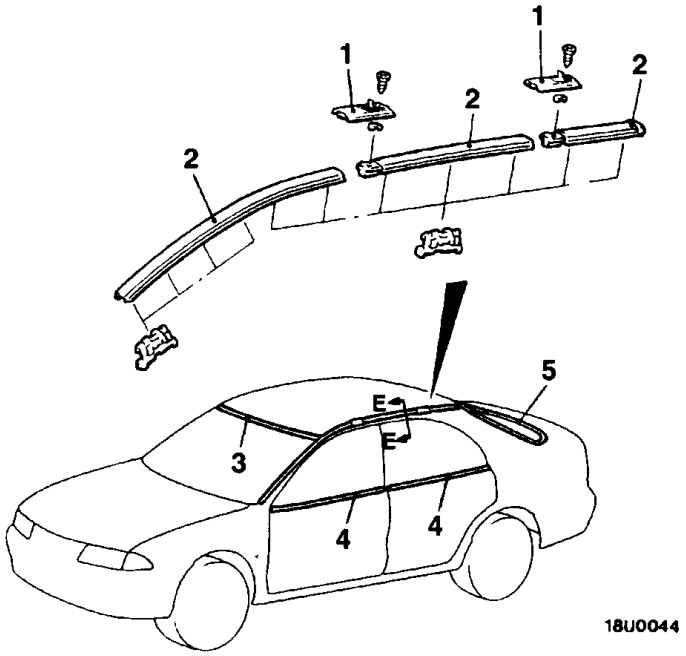


Disassembly steps
1. Side reinforcement
2. Bumper reinforcement
3. Bumper face

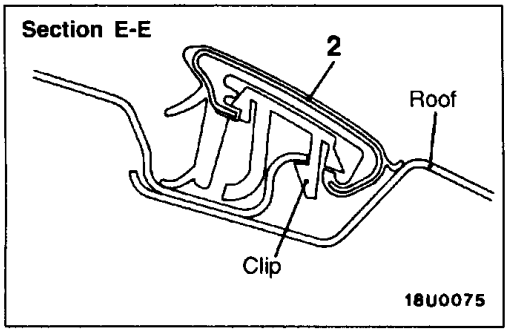
MOULDINGS

51100470034

REMOVAL AND INSTALLATION

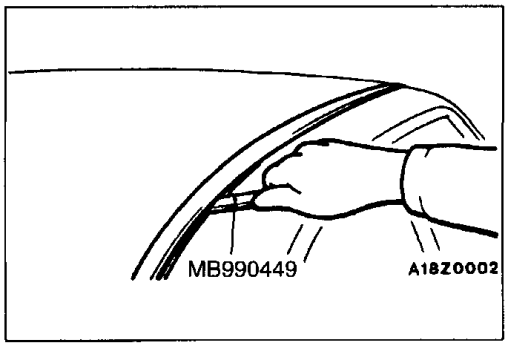


18U0044



00003363

1. Roof carrier caps
◀A▶ ▶A◀ 2. Roof drip moulding
3. Windshield upper moulding (Refer to GROUP 42 – Windshield.)
4. Belt line moulding (Refer to GROUP 42.)
5. Tailgate moulding (Refer to GROUP 42 – Tailgate Window Glass.)



REMOVAL SERVICE POINT

◀A▶ ROOF DRIP MOULDING REMOVAL

Use the special tool to lever out the moulding.

Caution
If the moulding has become warped, it should not be reused.

INSTALLATION SERVICE POINT

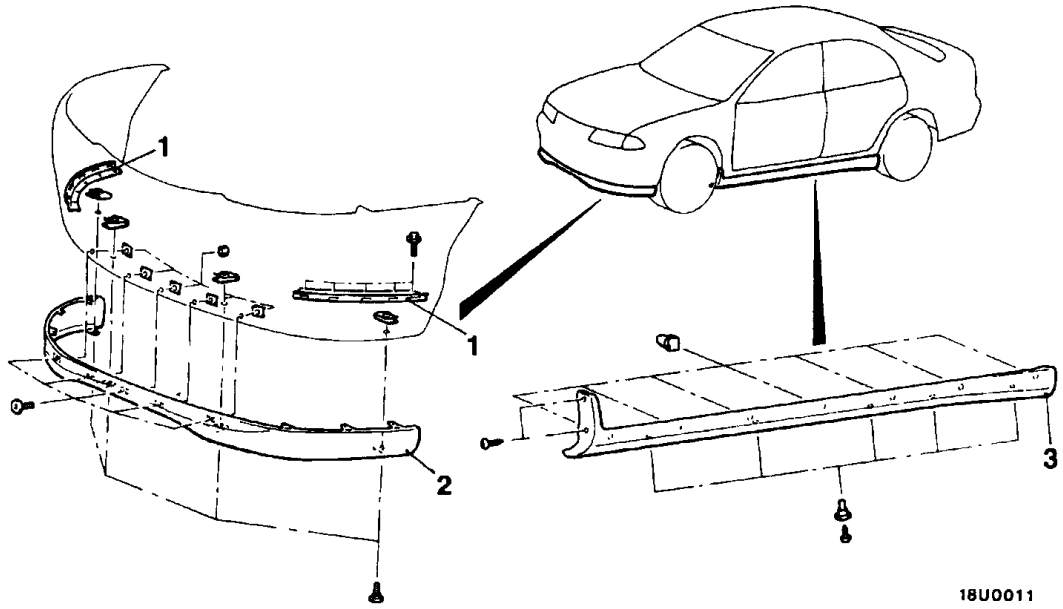
▶A◀ ROOF DRIP MOULDING INSTALLATION

(1) Install the clips to the clip installation bosses on the roof.
(2) Install the roof moulding with the clips.

AERO PARTS

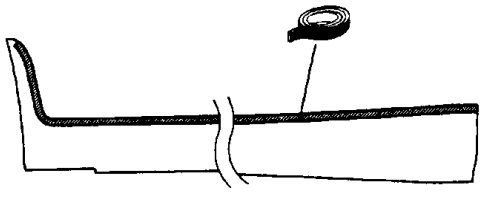
51100500030

REMOVAL AND INSTALLATION



18U0011

00003364



18U0002

Adhesive tape: Double-sided tape [5 mm wide and 1.2 mm thick]

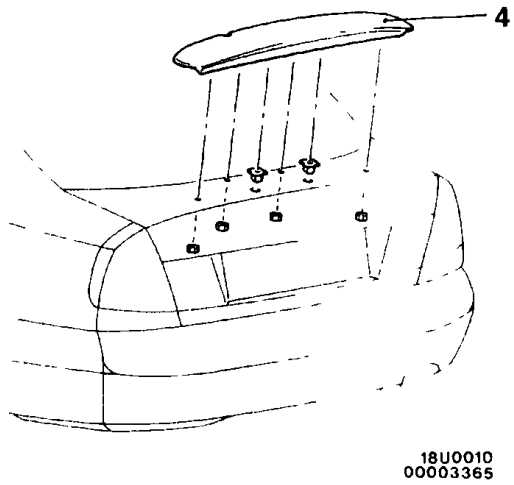
Airdam panel removal steps

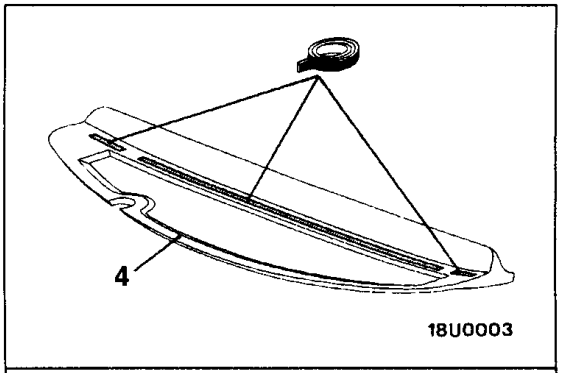
- Front under cover panel

1. Airdam side plate
2. Airdam skirt panel

Side airdam removal

◀A▶ ▶A◀ 3. Side airdam



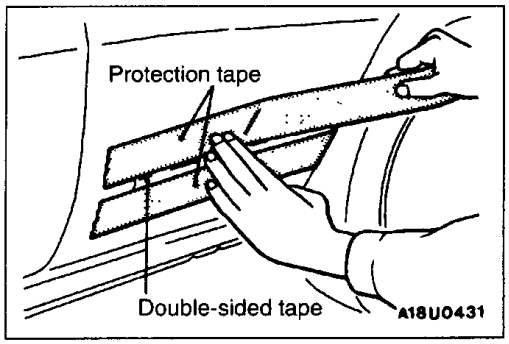


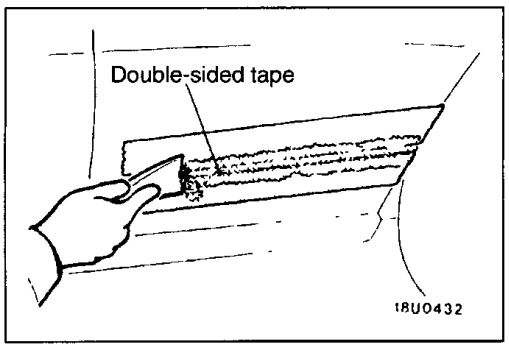
Adhesive tape:	Double-sided tape [10 mm wide and 1.2 mm thick]

Rear spoiler removal steps

- Tailgate lower trim (Refer to GROUP 52A.)

◀A▶ ▶A◀ 4. Rear spoiler



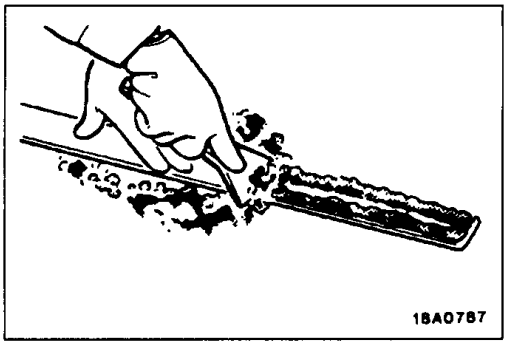


REMOVAL SERVICE POINT

◀A▶ SIDE AIRDAM/REAR SPOILER REMOVAL

(1) Attach protection tape all the way along the edges of the double-sided tape which is still adhering to the body.

(2) Use a resin spatula to scrape off the double-sided tape.
(3) Peel off the protection tape.
(4) Wipe the body surface and clean it with a rag moistened with isopropyl alcohol.



INSTALLATION SERVICE POINTS

▶A◀ SIDE AIRDAM/REAR SPOILER INSTALLATION

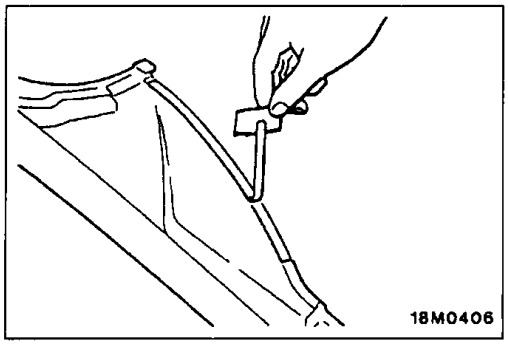
Double-sided tape affixing to the side airdam or rear spoiler (when reusing)

(1) Scrape off the double-sided tape with a resin spatula or gasket scraper.

(2) Wipe the side airdam or rear spoiler adhesion surface and clean it with a rag moistened with isopropyl alcohol.

(3) Affix specified pressure sensitive double-sided tape to the side airdam or rear spoiler.

Specified adhesive tape:
Double-sided tape [5 mm wide and 1.2 mm thick]



(4) Remove strip paper from the pressure sensitive double-sided tape.

NOTE
Affix double-sided tape to the end of strip paper for ease of strip paper removal.

(5) Install the side airdam or rear spoiler.

NOTE
If it is hard to affix the pressure sensitive double-sided tape in winter, heat the application surface of the body and the adhesive surface of the side airdam or rear spoiler before affixing the tape.

Body ..... 40–60°C
Side airdam or rear spoiler ..... 20–30°C

Apply pressure fully to the side airdam or rear spoiler.

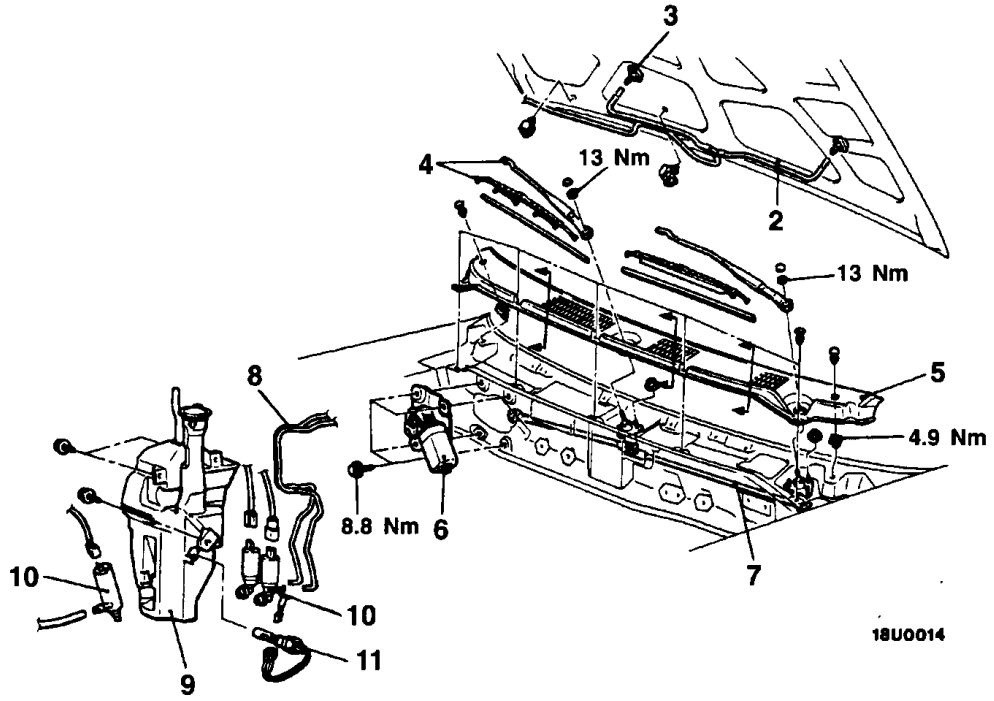
WINDSHIELD WIPER AND WASHER

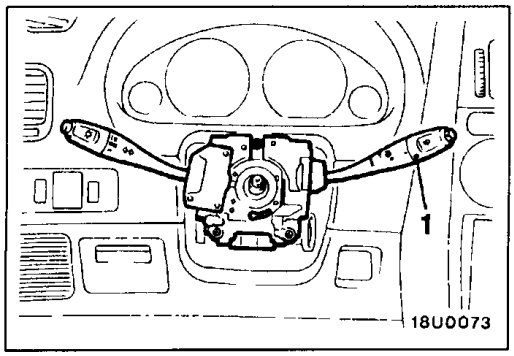
51100760032

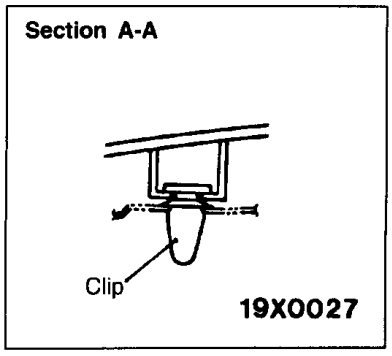
REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operation
- Relay Box Removal and Installation <R.H. drive vehicles>

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







00003366

1. Column switch assembly (with built-in wiper and washer switch, and wiper relay) (Refer to GROUP 37A – Steering wheel and shaft.)
2. Washer hose
3. Washer nozzle

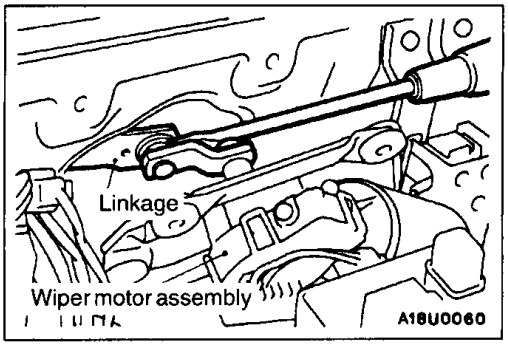
Wiper motor and linkage removal steps

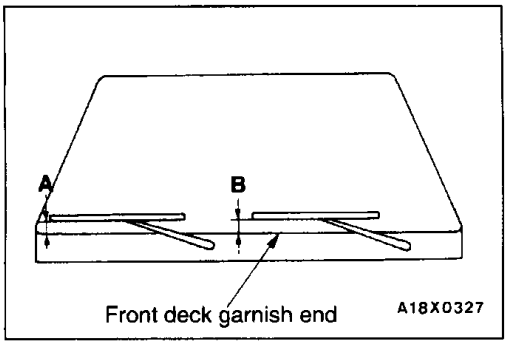
▶A◀ 4. Wiper arm and blade assembly
5. Front deck garnish
◀A▶ 6. Wiper motor
7. Linkage

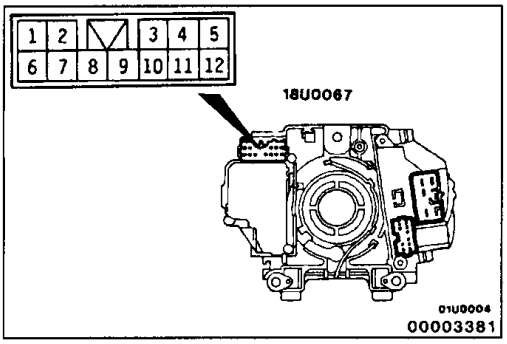
Washer tank removal steps

- Draining of washer fluid
- Front bumper (Refer to P.51-3.)

8. Washer hose
9. Washer tank
10. Washer motor
11. Washer fluid level switch







REMOVAL SERVICE POINT

◀A▶ WIPER MOTOR REMOVAL

Loosen the wiper motor assembly mounting bolts, and then remove the wiper motor assembly. Disconnect the linkage and the motor assembly, and then remove the linkage.

Caution
Because the installation angle of the crank arm and the motor has been set, do not remove them unless it is necessary to do so. If they must be removed, remove them only after marking their mounting positions.

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:
Passenger's side (A): 20±5 mm
Driver's side (B): 25±5 mm

INSPECTION

51100770035

COLUMN SWITCH CHECK

Wiper and Washer Switch

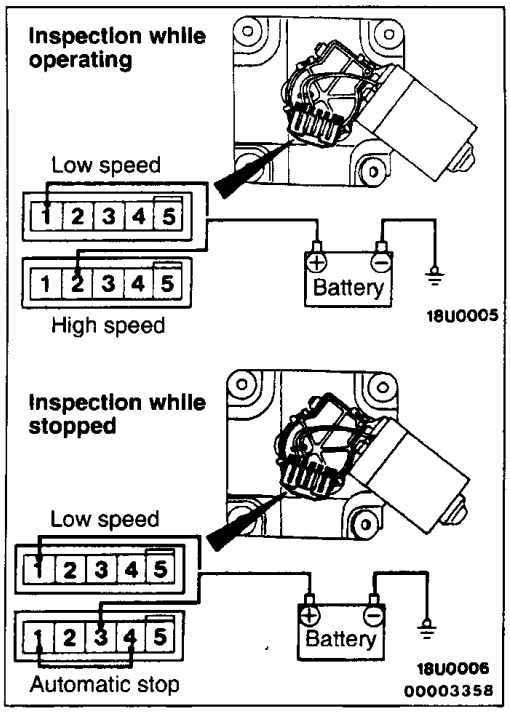
Switch position		Terminal No.				
		6	7	8	9	10
Wiper switch	OFF		○	○		
	INT		○	○		
	1 (LO)			○		○
	2 (HI)				○	○
Washer switch	ON	○				○

Intermittent Wiper Relay (Intermittent Operation Inspection)

(1) Connect the column switch connector.
(2) Turn the ignition switch to ACC.

(3) Inspect the intermittent operation time when the wiper switch is turned to INT.

Vehicles with variable intermittent control
FAST: Approx. 3 seconds
SLOW: Approx. 12 seconds



WIPER MOTOR CHECK 51101260012

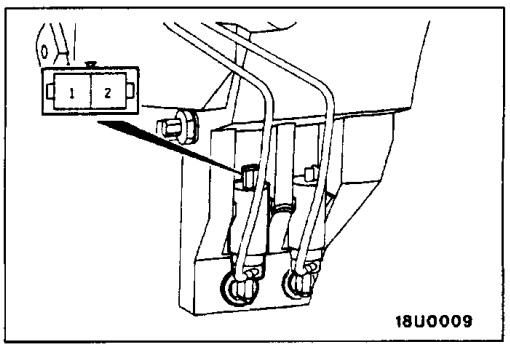
Check the wiper motor after disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

Wiper Motor at 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.

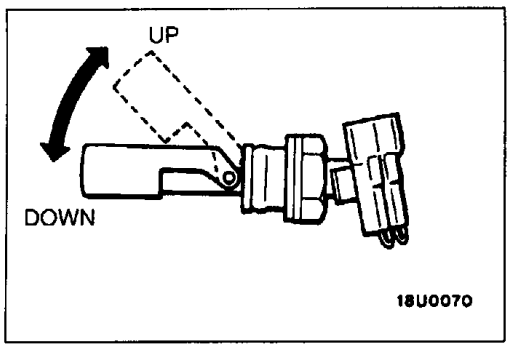
Wiper Motor at Stop Position Operation

(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 the after the motor starts turning at low speed, it stops at the automatic stop position.



WASHER MOTOR CHECK 51101270015

(1) With the washer motor installed to the washer tank, fill the washer tank with water.
(2) Check that the water squirts out strongly when battery voltage is applied to terminals (1) and (2).



WASHER FLUID LEVEL SWITCH CHECK 51101280018

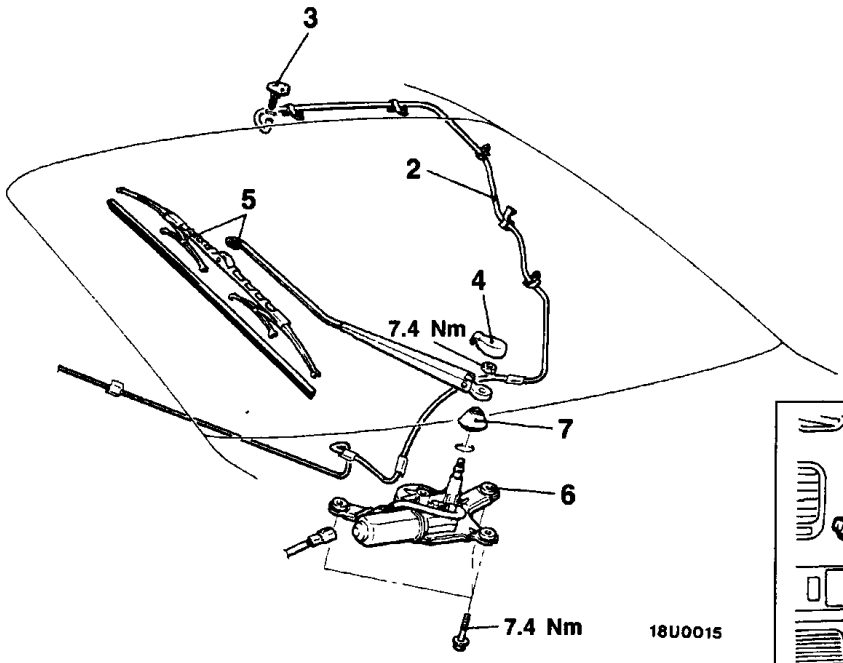
(1) Remove the washer fluid level switch from the washer tank.
(2) Connect a circuit tester to the connector of washer fluid level switch.
(3) Move the float up and down.
(4) Check to be sure that there is continuity between the terminals when the float is down.

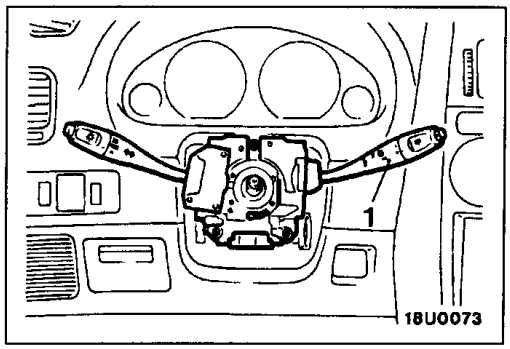
REAR WIPER AND WASHER

51100880011

REMOVAL AND INSTALLATION

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





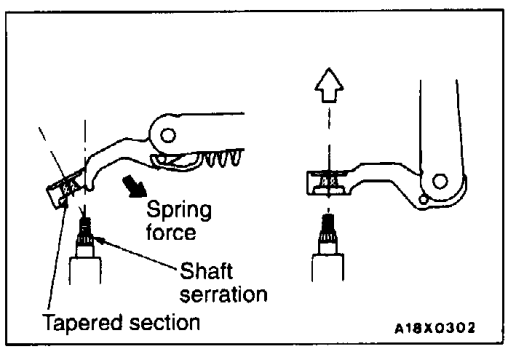
00003367

1. Column switch assembly (with built-in rear wiper and washer switch) (Refer to GROUP 37A – Steering wheel and shaft.)
2. Washer hose
3. Washer nozzle

◀A▶ ▶A◀

Wiper motor removal steps

4. Cover
5. Wiper arm and blade
6. Wiper motor
7. Grommet



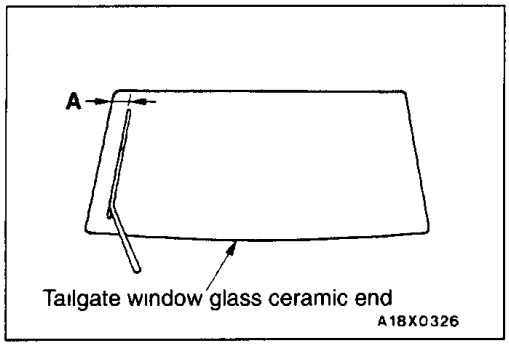
REMOVAL SERVICE POINT

◀A▶ WIPER ARM AND BLADE REMOVAL

Remove the wiper arm from the shaft while the wiper arm is raised.

Caution

If the wiper arm is forced while it is still lowered, the tapered section of the wiper arm will be scraped by the shaft serrations and the diameter of the tapered section will become too big, so sufficient care should be exercised.

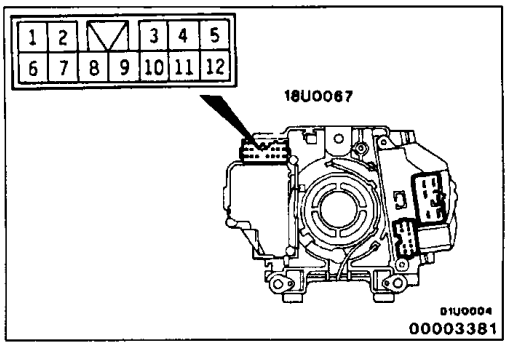


INSTALLATION SERVICE POINT

▶A◀ WIPER ARM ASSEMBLY INSTALLATION

Install the wiper arm to the pivot shaft so that the wiper blade's stop position is the position (standard value) shown in the illustration.

Standard value (A): 15 mm



INSPECTION 51100950026

REAR WIPER AND WASHER SWITCH CHECK

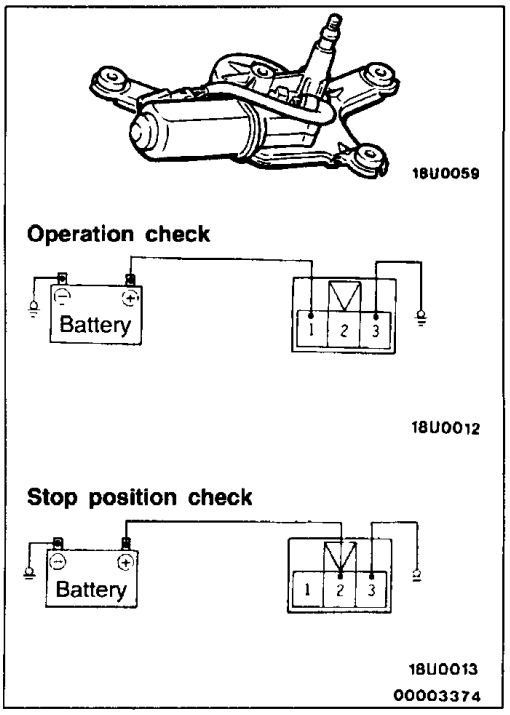
Rear Wiper and Washer Switch

<VEHICLES WITHOUT INTERMITTENT WIPER>

Switch position		Terminal No.		
		3	4	10
Wiper Switch	OFF	○	○	
	ON		○	○

<VEHICLES WITH INTERMITTENT WIPER>

Switch position		Terminal No.		
		3	4	10
Wiper Switch	OFF			
	INT	○		○
	ON		○	○



WIPER MOTOR CHECK 51101290011

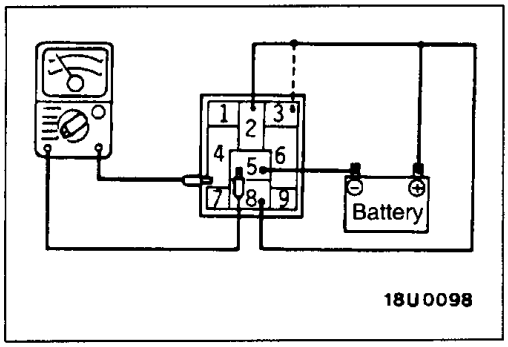
Check the wiper motor after first disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

Wiper Motor Operation

Connect a battery to the wiper motor as shown in the illustration and inspect the motor operation.

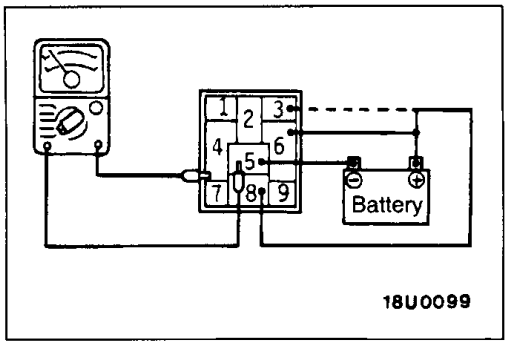
Wiper Motor at Stop Position Operation

(1) Run the wiper motor, disconnect the battery, and stop the motor.
(2) Reconnect the battery as shown in the illustration, and confirm that after the motor starts turning, it stops at the automatic stop position.

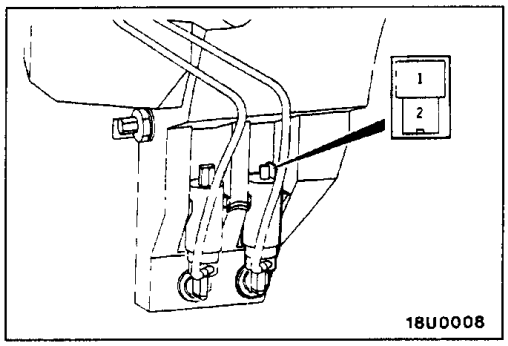


INTERMITTENT WIPER RELAY CHECK 51101300011

(1) After checking that there is continuity between terminals (4) and (5), connect a multimeter and battery as shown in the illustration.
(2) Check that the multimeter displays battery voltage at this time.
(3) Check that the multimeter needle moves approximately once every 10 seconds when the battery (+) terminal disconnected from terminal (2) is connected to terminal (3).



(4) Check that the multimeter displays battery voltage approximately one second after the battery (+) terminal is disconnected from terminal (3) and connected to terminal (6).
(5) Check that the multimeter displays battery voltage for approximately 6 seconds and then displays 0 V after the battery (+) terminal is disconnected from terminal (6).



WASHER MOTOR CHECK 51101310014

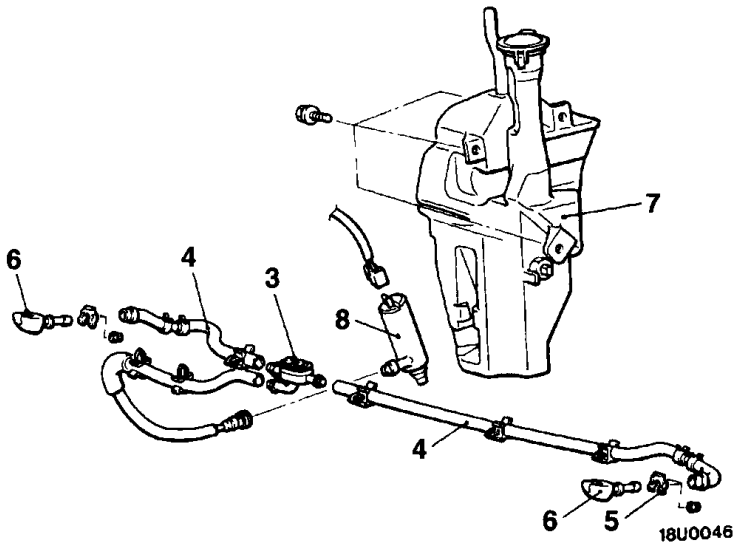
(1) With the washer motor installed to the washer tank, fill the washer tank with water.
(2) Check that the water squirts out strongly when battery voltage is applied to terminals (1) and (2).

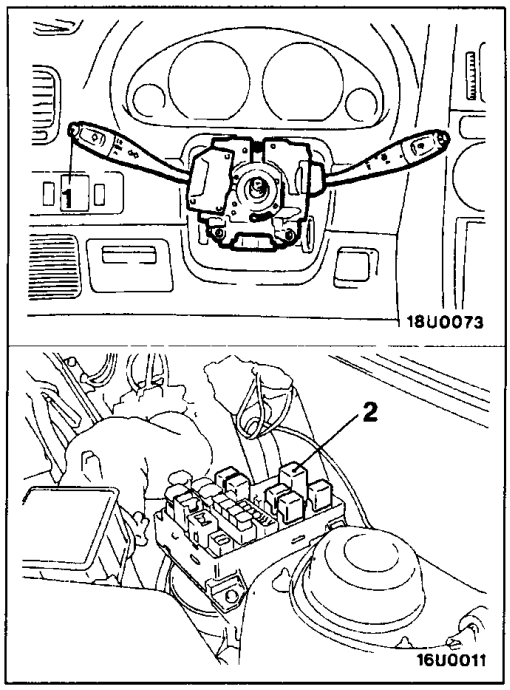
HEADLAMP WASHER

51100970022

REMOVAL AND INSTALLATION

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





00003368

1. Column switch assembly (with built-in headlamp washer switch) (Refer to GROUP 37A – Steering Wheel and Shaft.)
2. Headlamp washer relay

Nozzle and check valve removal steps

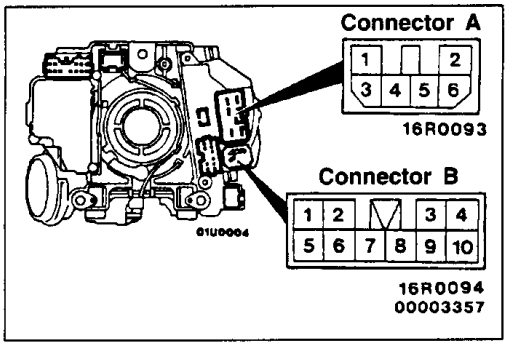
- Draining of washer fluid
- Front bumper (Refer to P.51-3.)

3. Check valve
4. Washer hose assembly
5. Bracket
6. Nozzle

Washer tank removal steps

- Draining of washer fluid
- Front bumper (Refer to P.51-3.)

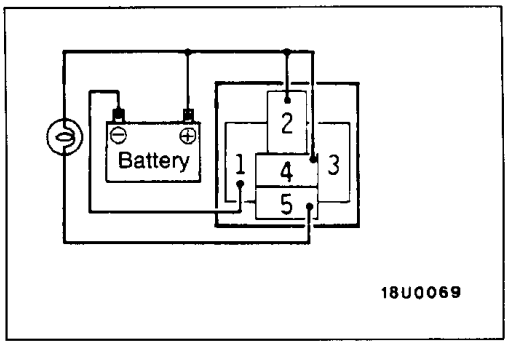
7. Washer tank assembly
8. Headlamp washer motor



INSPECTION 51100980025

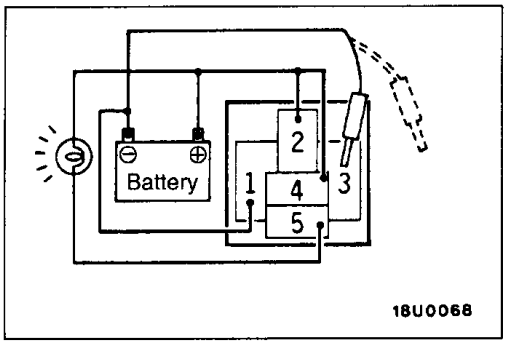
HEADLAMP WASHER SWITCH CHECK

Switch position		Connector A Terminal No. 1	Connector B Terminal No. 3
Washer switch	OFF		
	ON	○——○	

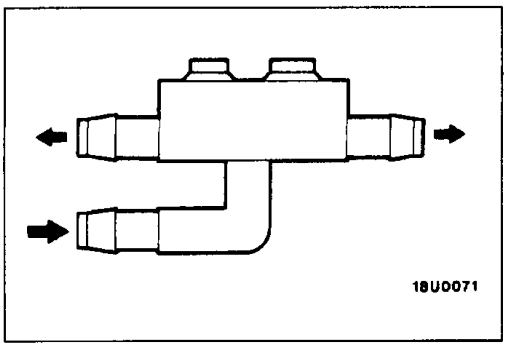


HEADLAMP WASHER RELAY CHECK 51101320017

(1) Connect battery and test lamp to the relay as illustrated.



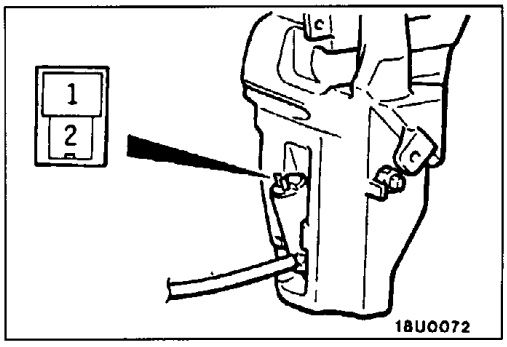
(2) The relay is normal if the lamp lights for approximately 0.5 second upon connection of terminal (3) to battery (–).



CHECK VALVE CHECK 51101330010

Apply pressure to the inlet of the check valve to check its opening pressure.

Opening pressure: 78 kPa



HEADLAMP WASHER MOTOR CHECK 51101340013

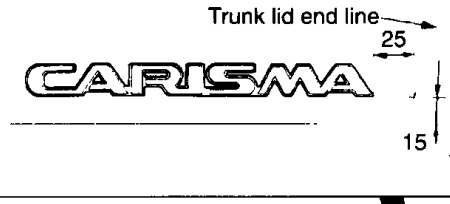
(1) With the washer motor installed to the washer tank, fill the washer tank with water.
(2) Connect battery (+) and (–) cables to terminals (2) and (1) respectively to see that the washer motor runs and water is injected.

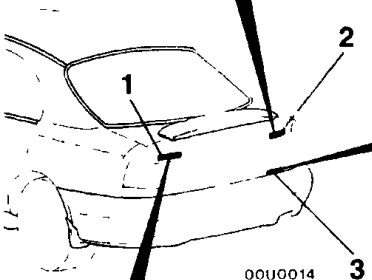
MARKS

51101180011

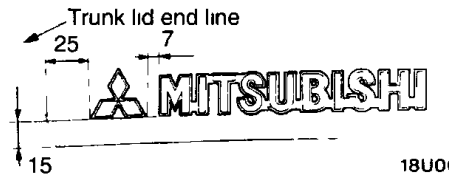
REMOVAL AND INSTALLATION

CARISMA MARK





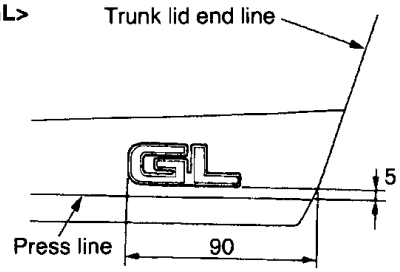
MITSUBISHI MARK



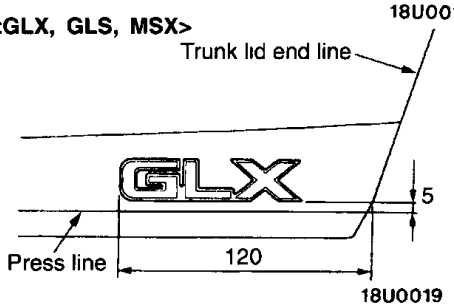
Unit: mm

GRADE MARK

<GL>



<GLX, GLS, MSX>



NOTE
The installation dimensions of GLS and MSX are the same as GLX.

1. MITSUBISHI MARK
2. CARISMA MARK
3. GRADE MARK

INSTALLATION SERVICE POINT

MARKS INSTALLATION

1. Clean the mark installation surfaces on the body with unleaded petrol.
2. Peel off the backing paper from the reverse side of the marks, and then attach the marks to the vehicle body so that they fit properly into position.

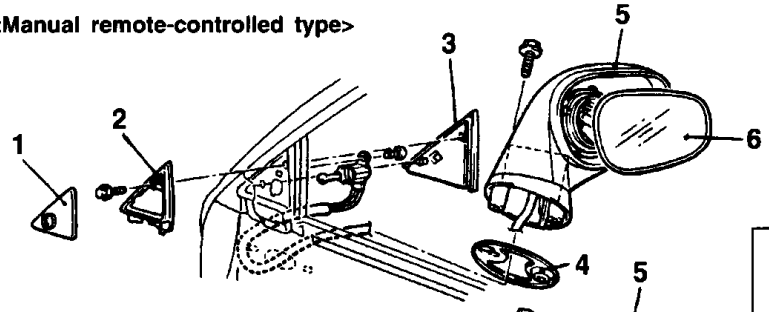
Caution
When attaching the marks, the surrounding temperature should be 20–38°C and the air should be completely free from dust.
If the surrounding temperature is lower than 20°C, the marks and the places on the body where the marks are to be attached should be heated to 20–38°C.

DOOR MIRROR

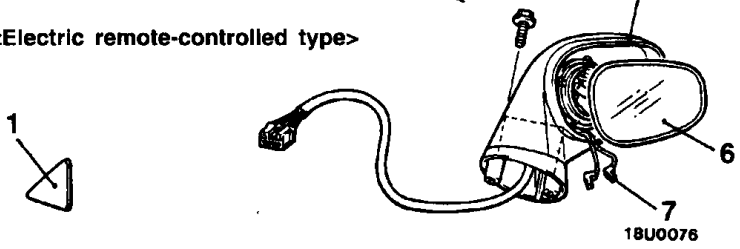
51100670038

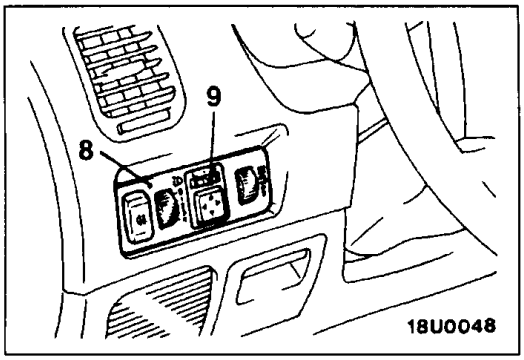
REMOVAL SERVICE POINT

<Manual remote-controlled type>



<Electric remote-controlled type>





00003370

Door mirror removal steps

- Front door trim (Refer to GROUP 42.)

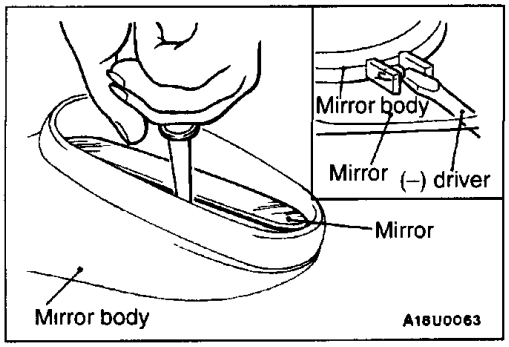
1. Delta cover, inner
2. Delta cover inner flame
3. Delta cover, outer
4. Gasket
5. Door mirror

◀A▶ 6. Mirror

7. Harness connector

Door mirror control switch removal steps

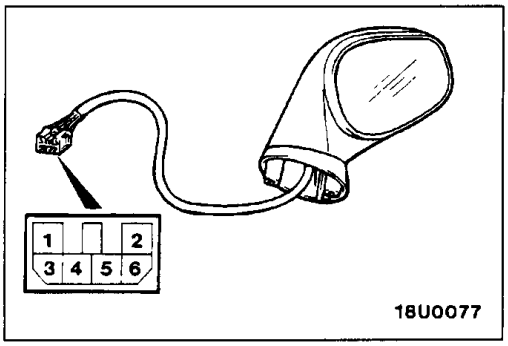
8. Instrument panel switch assembly
9. Door mirror control switch



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 the mirror to remove it.



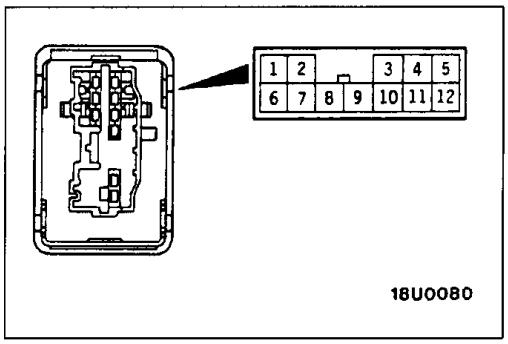
INSPECTION

51100650018

REMOTE CONTROL MIRROR ASSEMBLY CHECK

(1) Check to be sure that the mirror moves as described in the table when each terminal is connected to the battery.
(2) Check if there is continuity between terminals (1) and (2).

Battery connection terminal					Direction of operation
3	4	5	1	2	
⊕		⊖	Printed heating wire		UP
⊖		⊕			DOWN
	⊕	⊖			RIGHT
	⊖	⊕			LEFT



DOOR MIRROR CONTROL SWITCH CONTINUITY CHECK

51101350016

Switch position		Terminal No.								
		3	4	5	6	7	9	10	11	12
Left side	UP	○	○	○					○	
	DOWN	○	○	○					○	
	RIGHT	○	○						○	○
	LEFT	○	○						○	○
Right side	UP	○	○					○	○	
	DOWN	○	○					○	○	
	RIGHT	○	○				○		○	
	LEFT	○	○				○		○	

SWITCH AND RELAY OF DOOR MIRROR PRINTED HEATING WIRE CHECK

51101360019

The printed heating wire of the door mirror operates in conjunction with the rear window defogger.
The switch and relay are used for the rear window defogger also, so refer to GROUP 54 for inspection service points.

INTERIOR AND SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

52109000057

INTERIOR 52A

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) 52B

INTERIOR

CONTENTS

52109000095

SERVICE SPECIFICATIONS 3

SPECIAL TOOL 3

INSTRUMENT PANEL* 3

FLOOR CONSOLE* 6

TRIMS 8

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SEAT* 10

Front Seat 10

Rear Seat 13

SEAT BELT 14

Front Seat Belt 14

Rear Seat Belt 15

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

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

SERVICE SPECIFICATIONS

52100030024

Items		Standard value
Seatback heater resistance (between terminals) Ω (When ambient temperature is 20°C)		6.84–7.92
Seat cushion heater resistance (between terminals) Ω (When ambient temperature is 20°C)	Between terminals 1 and 2	0.38–0.44
	Between terminals 2 and 3	6.84–7.92
	Between terminals 1 and 3	6.46–7.48

SPECIAL TOOL

52100060030

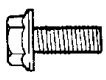
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch, trim, etc.

INSTRUMENT PANEL

52100170030

REMOVAL AND INSTALLATION

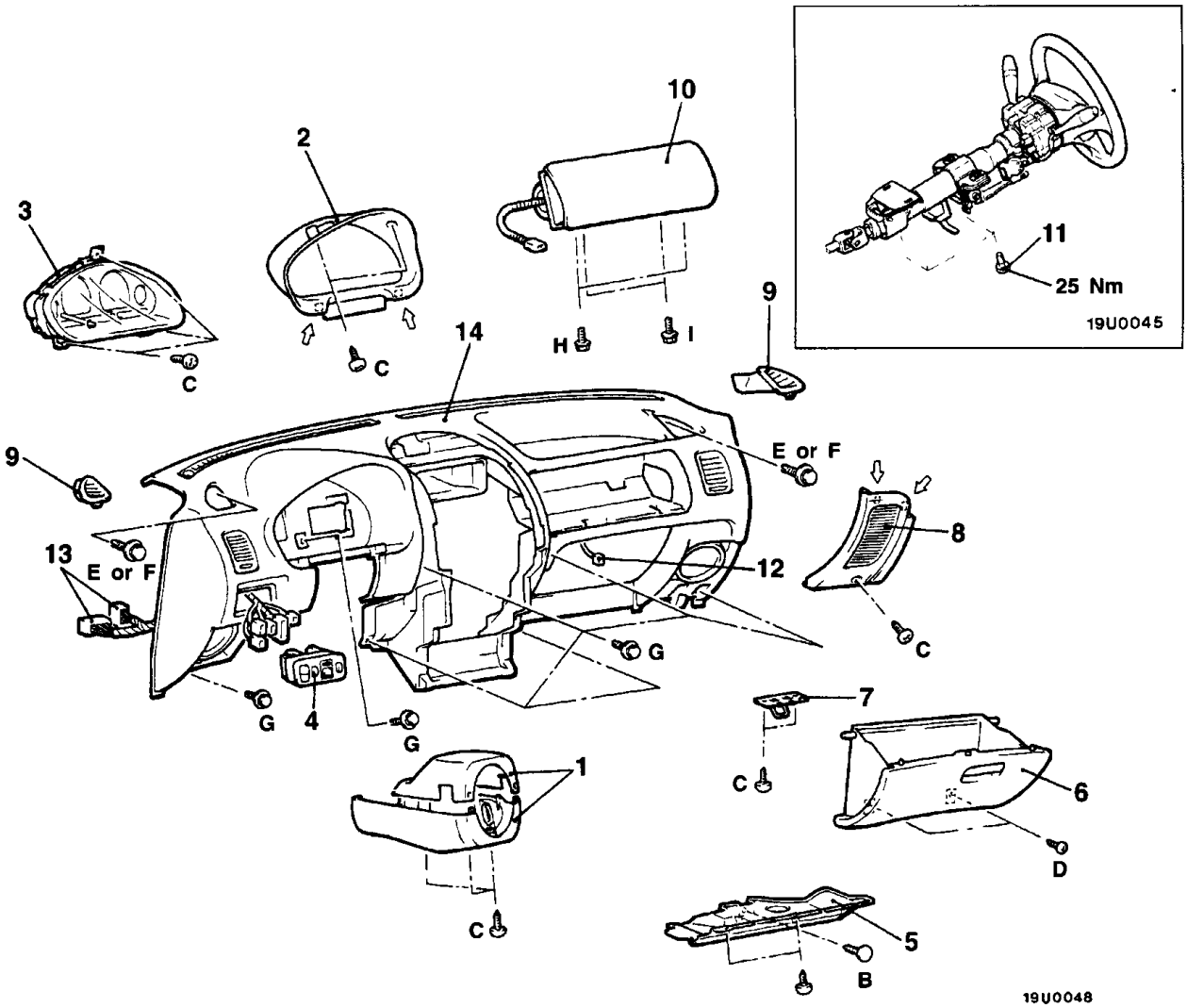
For installation of the instrument panel, the bolts and screws described below are used. They are indicated by symbols in the illustration.

Name	Symbol	Size mm (D × L)	Colour	Shape
Tapping screw	A	5 × 16	–	19Z0026
	B	4.8 × 13		
	C	4.8 × 16	Black	
Machine screw	D	5 × 16	–	19Z0025
Washer assembled bolt	E	6 × 12	–	19Z0005
Gimlet bolt	F	6 × 16	–	19Z0012
Flange bolt	G	6 × 14.29	–	 19Z0024
	H	6 × 16		
	I	5 × 16		

D = Thread diameter
L = Effective thread length

CAUTION: SRS
(1) When removing and installing the floor console (vehicles equipped with SRS), 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 Module and Clock Spring.

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



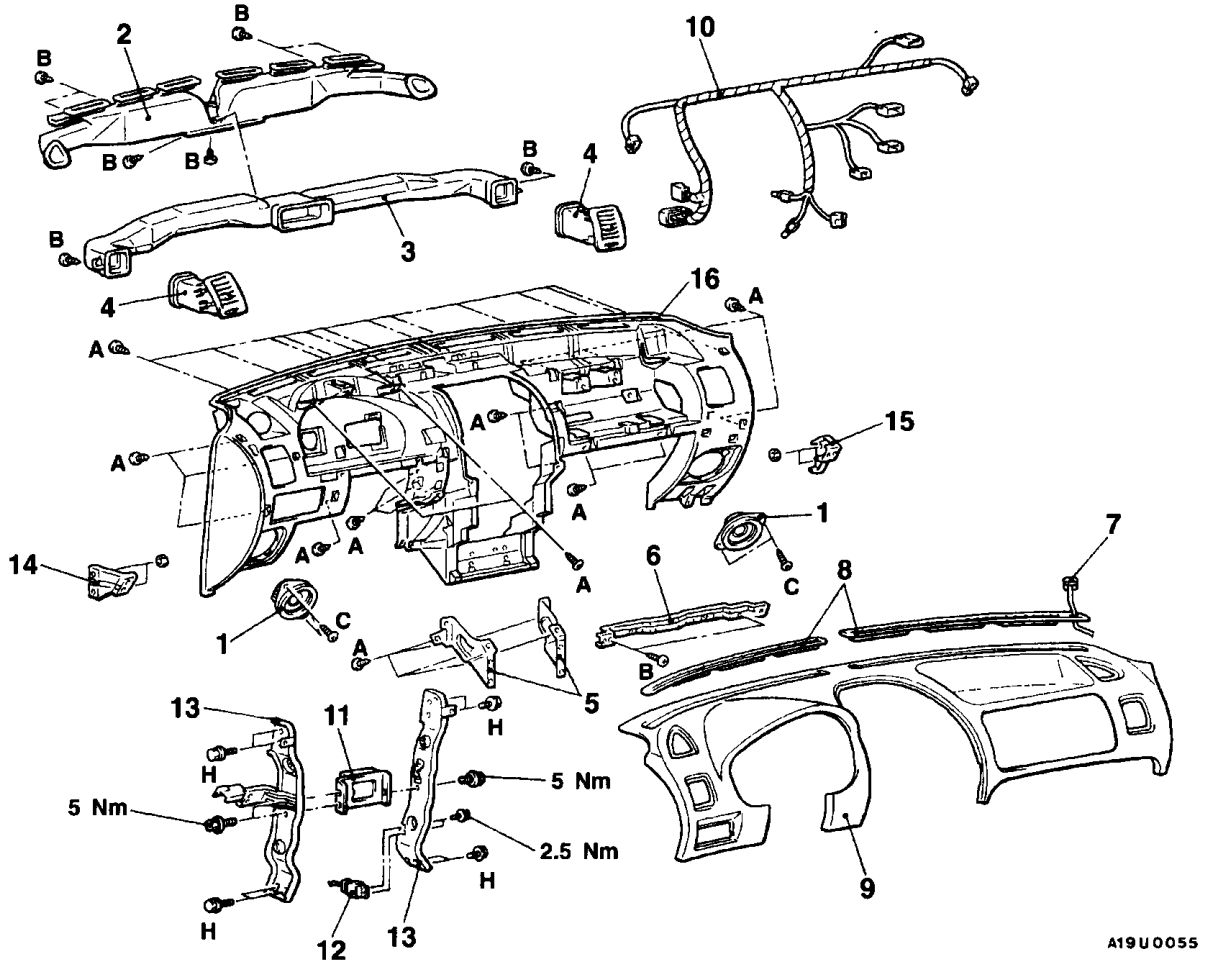
NOTE
⇦ : metal clip position

00003408

Removal steps
1. Column cover
2. Meter bezel
3. Combination meter
4. Instrument panel switch
5. Under cover
6. Glove box
7. Glove box striker
8. Corner panel
9. Side defroster grille
10. Front passenger's air bag module assembly
11. Steering column assembly installation bolts
12. Photo sensor connector
13. Harness connector
14. Instrument panel assembly

DISASSEMBLY AND REASSEMBLY

52100190043



Disassembly steps

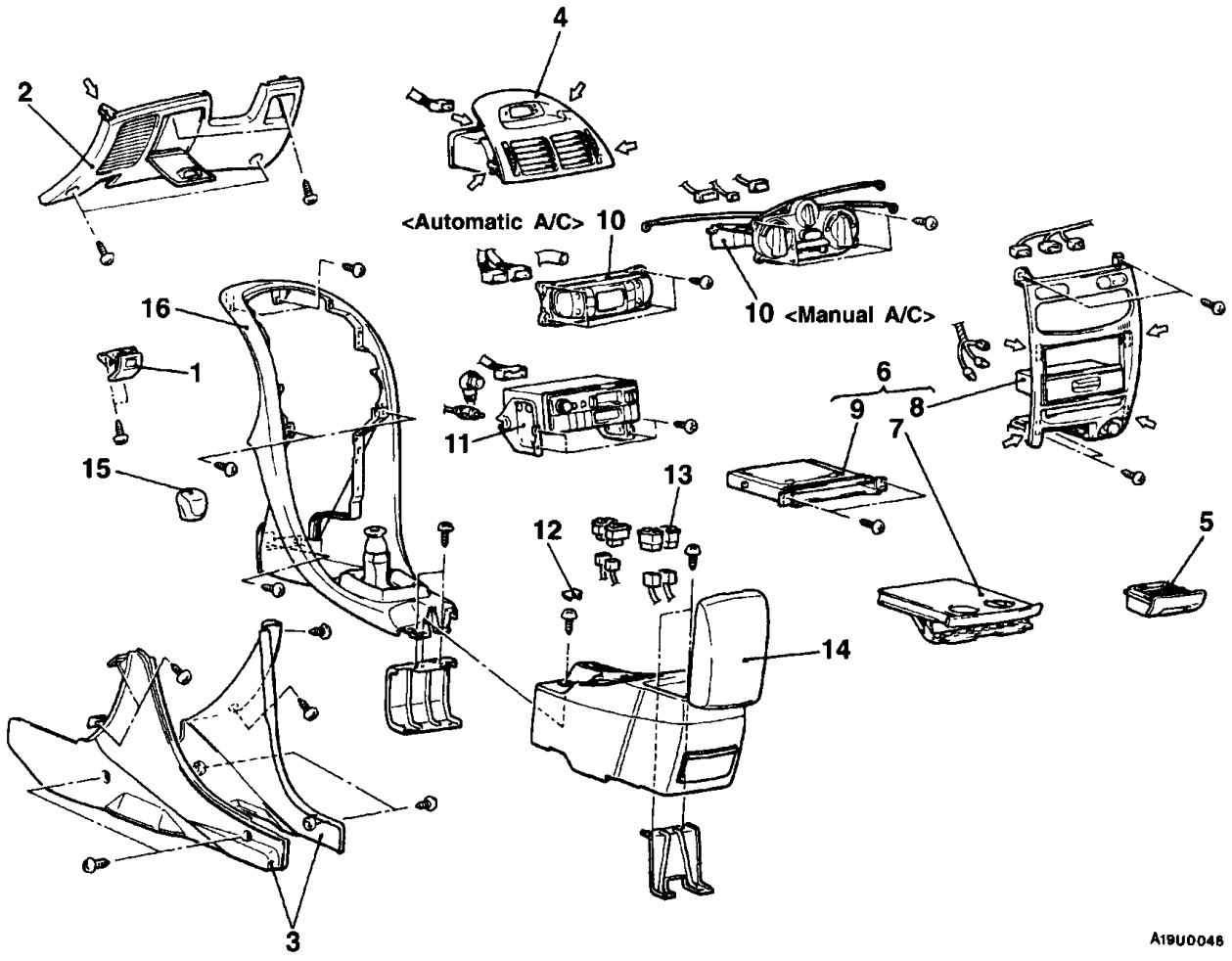
1. Speaker
2. Defroster nozzle assembly
3. Distribution duct
4. Side air outlet assembly
5. Instrument panel reinforcement
6. Glove box frame
7. Photo sensor
8. Defroster garnish
9. Instrument pad
10. Instrument panel wiring harness
11. Auto-cruise control unit and bracket assembly
12. Engine control relay
13. Center reinforcement
14. Driver's side lower bracket
15. Passenger's side lower bracket
16. Instrument panel

FLOOR CONSOLE

52100220032

REMOVAL AND INSTALLATION

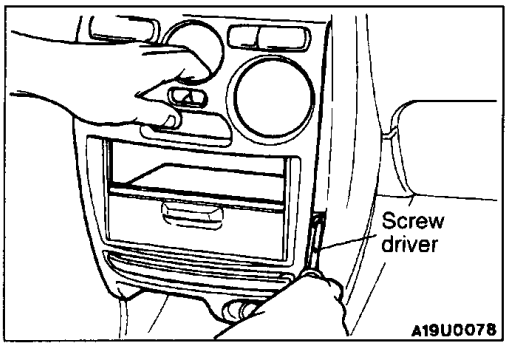
CAUTION: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or other components.



NOTE
⇦ : metal clip position

Removal steps

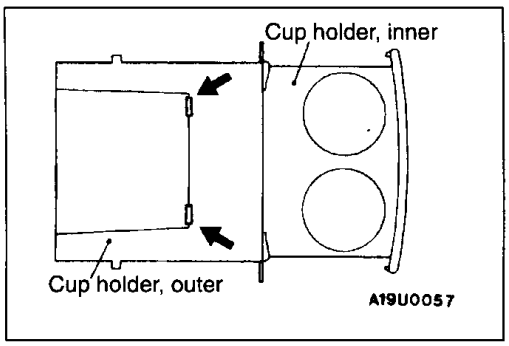
1. Hood lock release handle
2. Instrument under cover
3. Console side cover
▶A◀ 4. Center air outlet assembly
5. Ashtray
◀A▶ 6. Center console and cup holder assembly
◀B▶ 7. Cup holder, inner
8. Center console panel
9. Cup holder, outer
10. Heater control assembly
11. Radio and tape player
12. Console plug
13. Switch
14. Rear floor console assembly
15. Shift lever knob <M/T>
16. Front floor console assembly



REMOVAL SERVICE POINTS

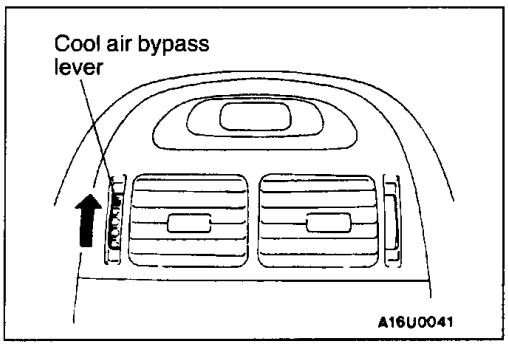
◀A▶ CENTER CONSOLE PANEL AND CUP HOLDER ASSEMBLY REMOVAL

1. After removing the center console mounting screws, pull the center console panel towards you to remove it together with the cup holder, inner.
2. Insert a screwdriver into the space as shown in the illustration to remove the center console panel and cup holder assembly.



◀B▶ CUP HOLDER, INNER REMOVAL

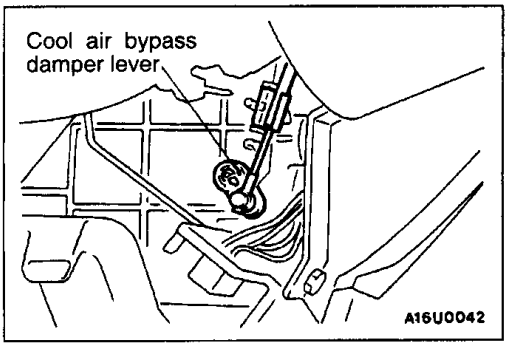
Push the cup holder, outer in the places shown in the illustration to remove the cup holder, inner.



INSTALLATION SERVICE POINT

▶A◀ CENTER AIR OUTLET ASSEMBLY INSTALLATION

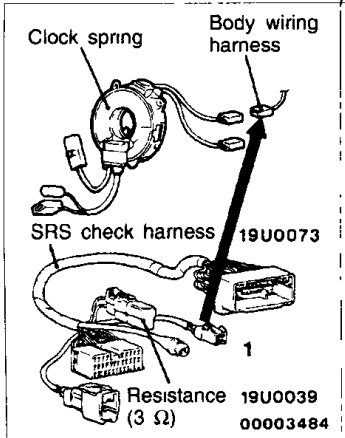
1. Turn the cool air bypass lever of the center air outlet assembly fully upward.



2. Turn the cool air bypass damper at the heater unit side fully downward, and install the cool air bypass lever cable.

Clock spring check (Refer to P.52B-27.) → NG → **Replace**

OK



MUT-II DIAGNOSIS CODE
- Disconnect clock spring connector B-60
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

Are code Nos. 21 and 22 output?

Yes → **Check the following connectors.** B-60, B-63 → NG → **Repair**

OK → Check trouble symptom → NG → Check the harness between the SRS-ECU and clock spring. → NG → **Repair**

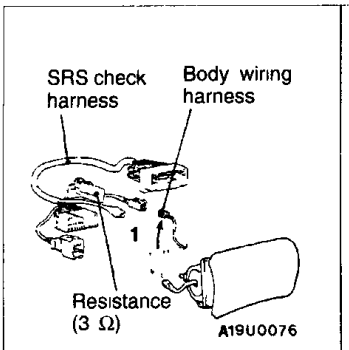
OK → Replace the SRS-ECU.

No → Replace the driver's side air bag module (squib)

Code No. 24 or 25 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 code No. are as follows. (Refer to chart 1.)	• Malfunction of harness of connectors • Malfunction of front passenger's side air bag module (squib) • Malfunction of SRS-ECU

Chart 1

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



MUT-II DIAGNOSIS CODE
- Disconnect front passenger's side air bag module connector B-12.
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

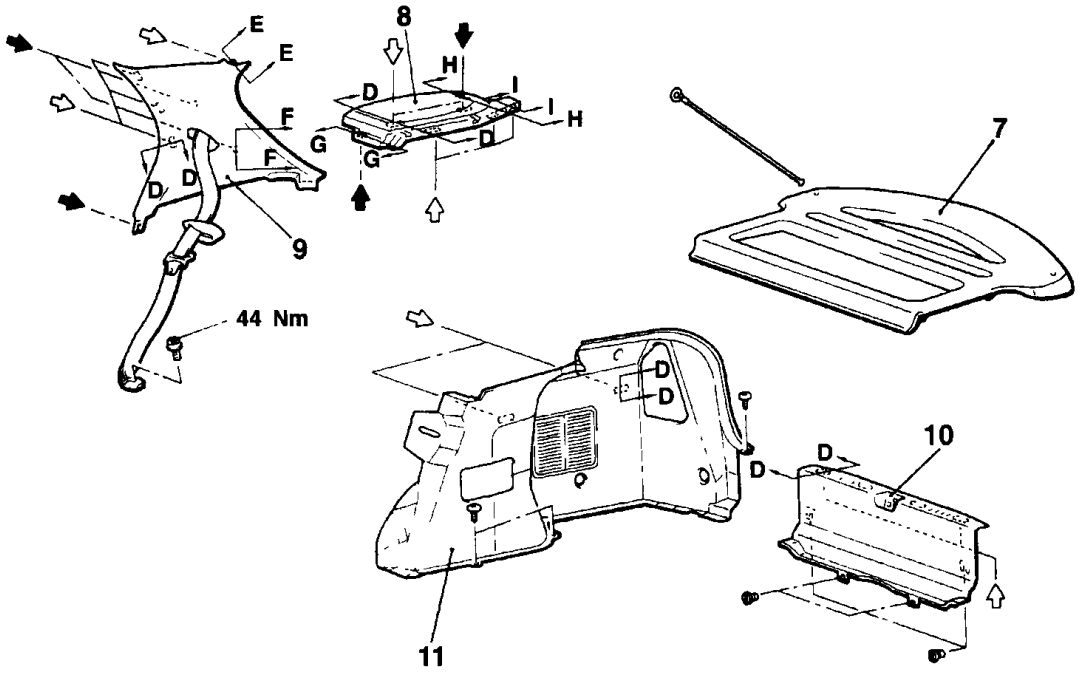
Are code Nos. 24 and 25 output?

Yes → **Check the following connector.** B-12 → NG → **Repair**

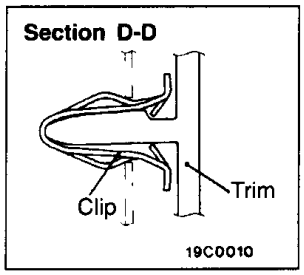
OK → Check trouble symptom → NG → Check the harness between the SRS-ECU and front passenger's side air bag module (squib). → NG → **Repair**

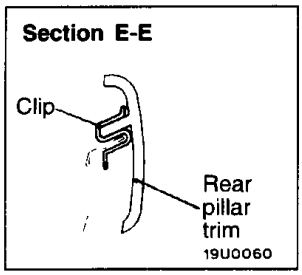
OK → Replace the SRS-ECU.

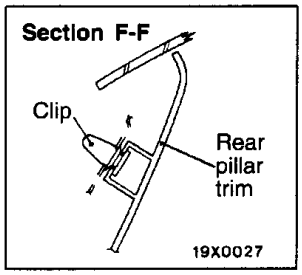
No → Replace the front passenger's side air bag module (squib)

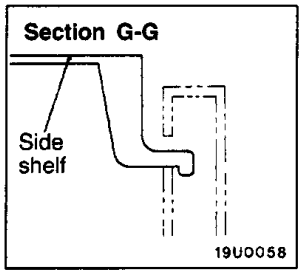


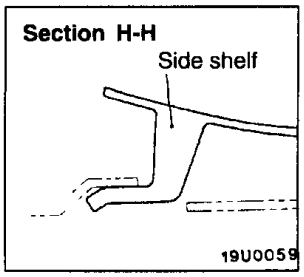
NOTE
1. ⇦ : metal clip position
2. ⬅ : resin clip position

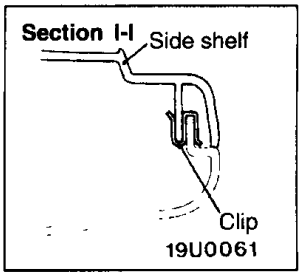






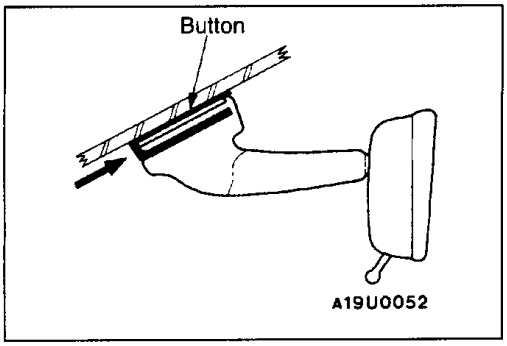






00003410

7. Center shelf
8. Side shelf
9. Rear pillar trim
10. Rear end trim
11. Rear side trim



INSIDE REAR VIEW MIRROR

52100270013

REMOVAL SERVICE POINT

Remove by pushing in the direction of the arrow in the illustration.

SEAT

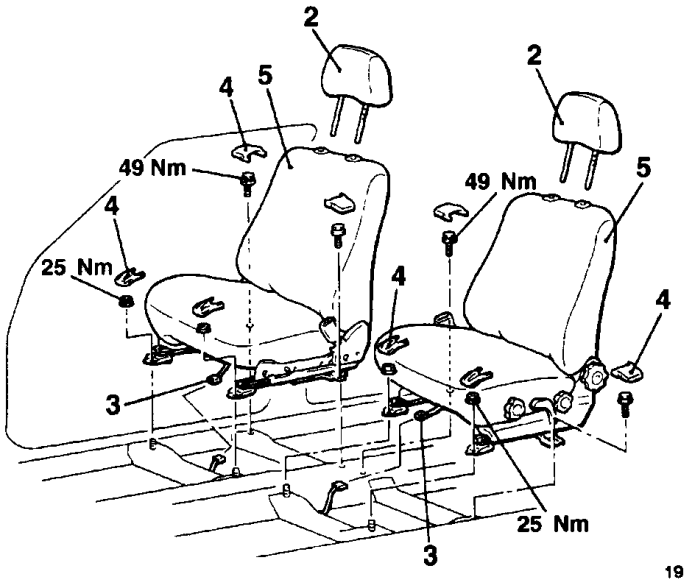
52200100018

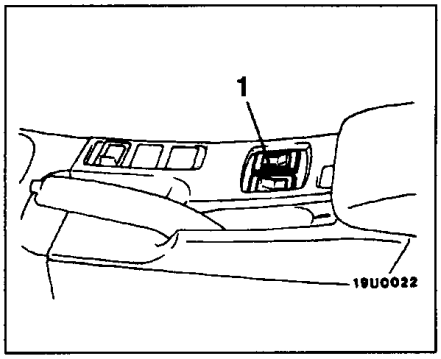
FRONT SEAT

REMOVAL AND INSTALLATION

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

CAUTION: SRS
When removing and installing the rear floor console (vehicles equipped with SRS), do not let it bump against the SRS-ECU.





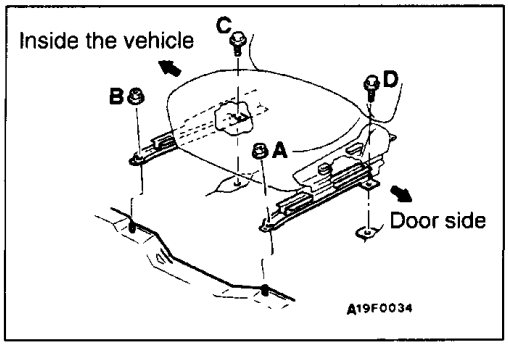
00003411

NOTE
After provisionally tightening the seat assembly mounting nuts and bolts in every installation location, fully tighten them to the specified torque.

1. Heated seat switch <vehicles with heated seat>
2. Headrestraint

Front seat assembly removal steps

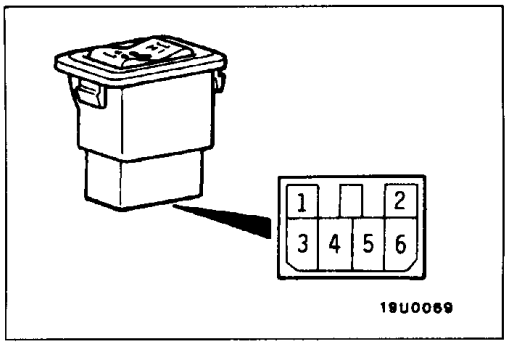
3. Harness connector <vehicles with heated seat>
4. Seat anchor cover
▶A◀ 5. Front seat assembly



INSTALLATION SERVICE POINT

▶A◀ FRONT SEAT ASSEMBLY INSTALLATION

Tighten the front seat mounting bolts in the order A, B, C, and D.



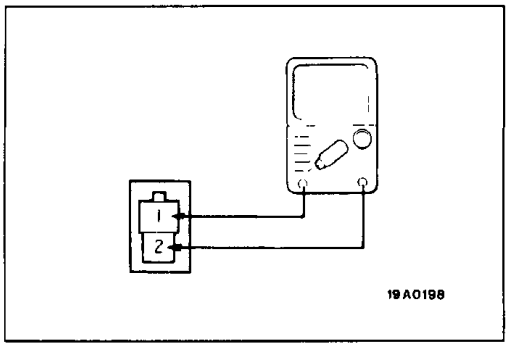
INSPECTION

52200140027

HEATED SEAT SWITCH CONTINUITY CHECK

Switch position	Terminal No.								
	1	4	–	5	–	6	2	–	3
HI	⊖	⊕		⊖		⊕			
	⊖			⊕					
				⊖		⊕			
LO				⊖		⊕			
				⊕		⊖			
	⊖			⊕					
OFF	⊖			⊕					

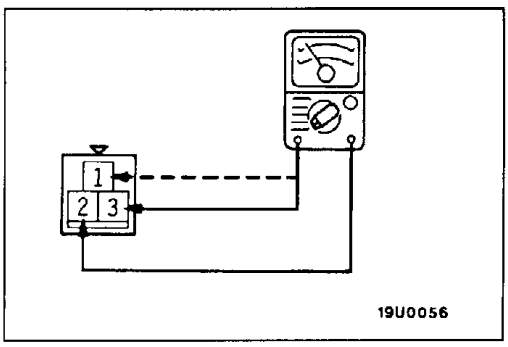
NOTE
To inspect the diode, match the polarity of the circuit tester with the (+) (–) polarities in the table.



SEATBACK HEATER CHECK

Measure the resistance between terminals.

Standard value (When ambient temperature is 20°C):
Between terminals 6.84–7.92 Ω



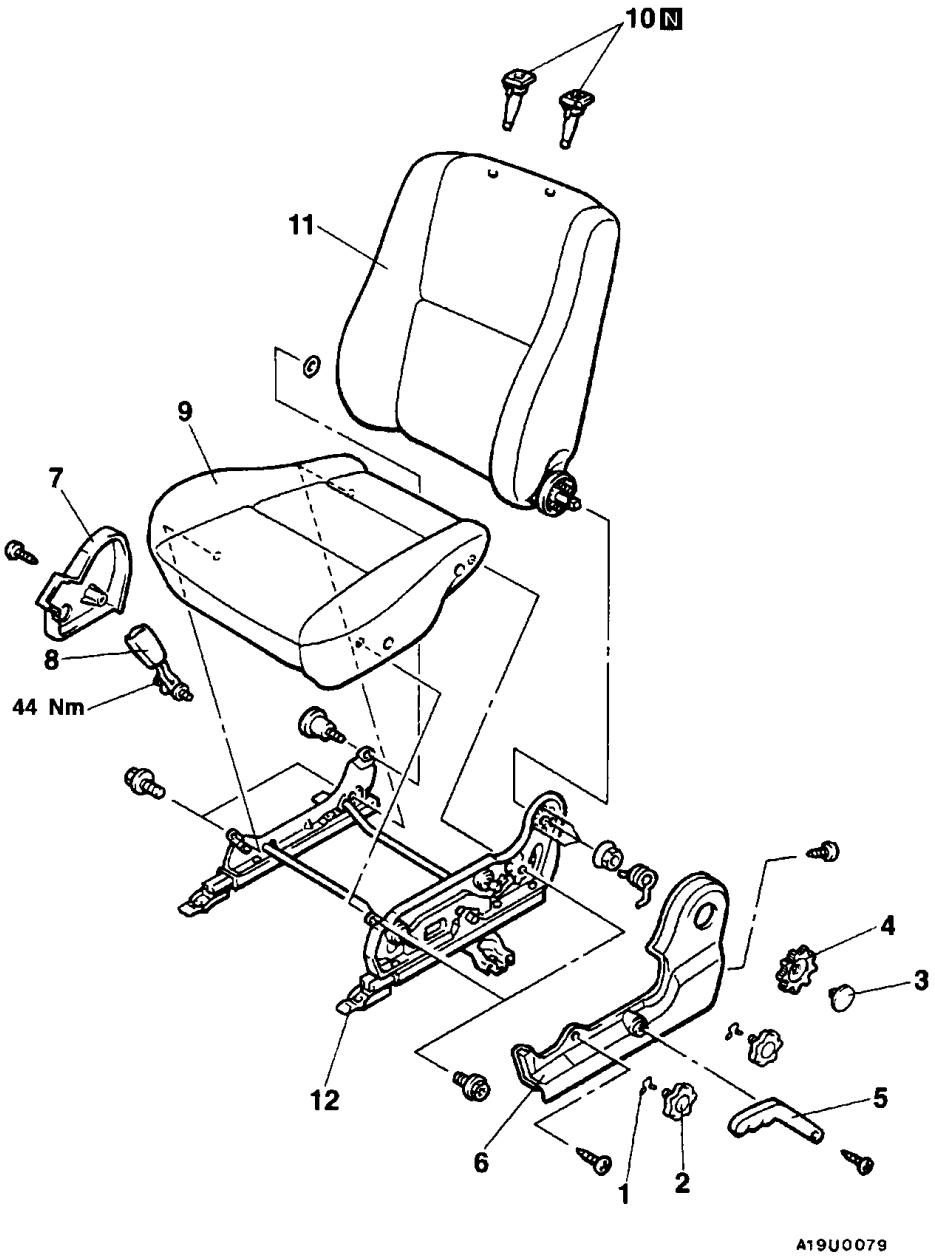
SEAT CUSHION HEATER CHECK

Measure the resistance between terminals.

Standard value (When ambient temperature is 20°C):
Between terminals 1 and 2 0.38–0.44 Ω
Between terminals 2 and 3 6.84–7.92 Ω
Between terminals 1 and 3 6.46–7.48 Ω

DISASSEMBLY AND REASSEMBLY

52200150044



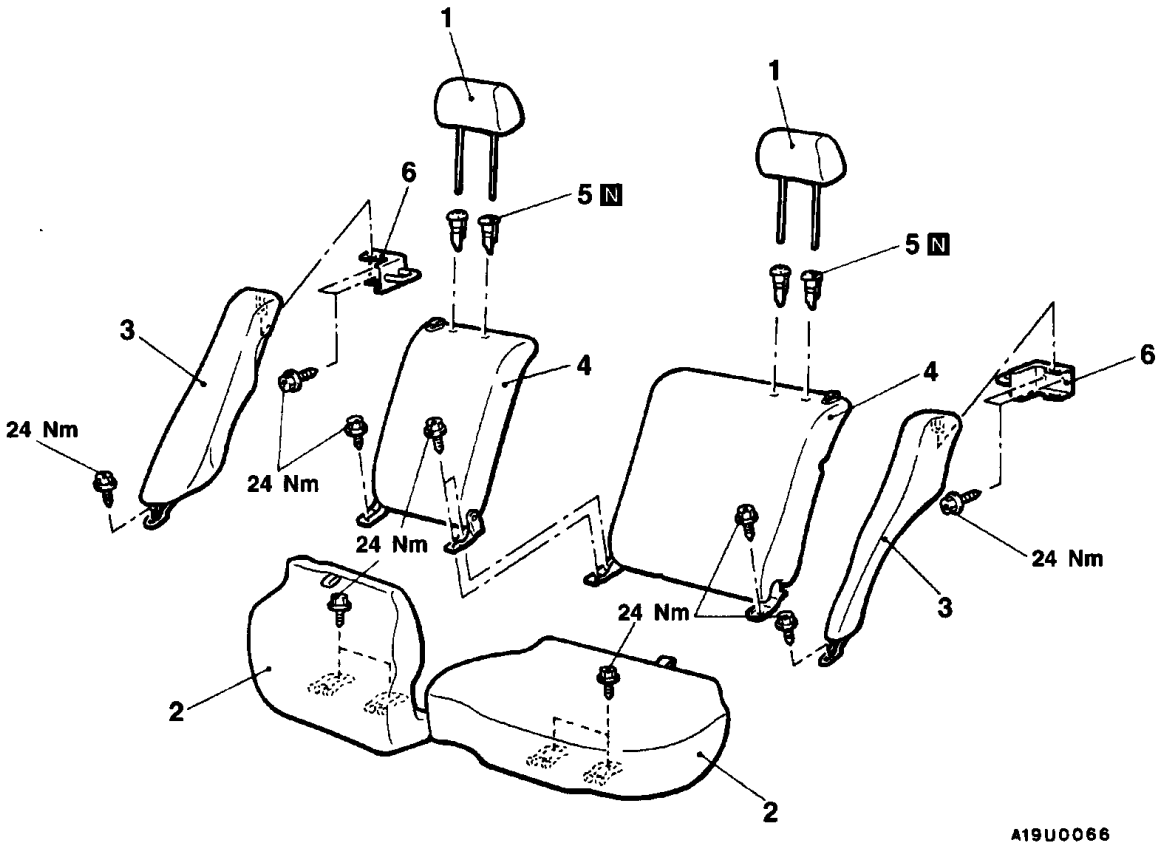
Seat disassembly steps

1. Shaft snap ring
2. Height adjuster knob
3. Cap
4. Reclining knob
5. Seat adjuster lever
6. Front seat side shield cover
7. Front seat hinge cover
8. Inner seat belt
9. Seat cushion assembly
10. Headrestraint guide
11. Seatback assembly
12. Seat adjuster assembly

REAR SEAT

52200180036

REMOVAL AND INSTALLATION



Removal steps

1. Headrestraint
2. Seat cushion
3. Side seatback assembly
4. Rear seatback assembly
5. Headrestraint guide
6. Rear seat striker

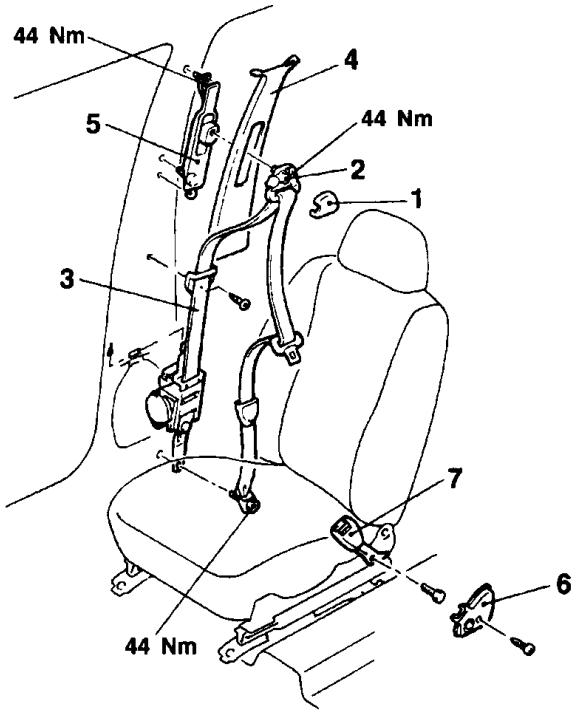
SEAT BELT

52300130034

For removal and installation procedures for the seat belt with pre-tensioner, refer to GROUP 52B – Seat Belt with Pre-tensioner.

FRONT SEAT BELT

REMOVAL AND INSTALLATION



A19U0050

Outer seat belt removal steps

- Front scuff plate and rear scuff plate (Refer to P.52A-8.)
- Center pillar lower trim (Refer to P.52A-8.)

1. Sash guide cover
2. Sash guide
3. Outer seat belt
4. Center pillar upper trim (Refer to P.52A-8.)
5. Adjustable seat belt anchor

Inner seat belt removal steps

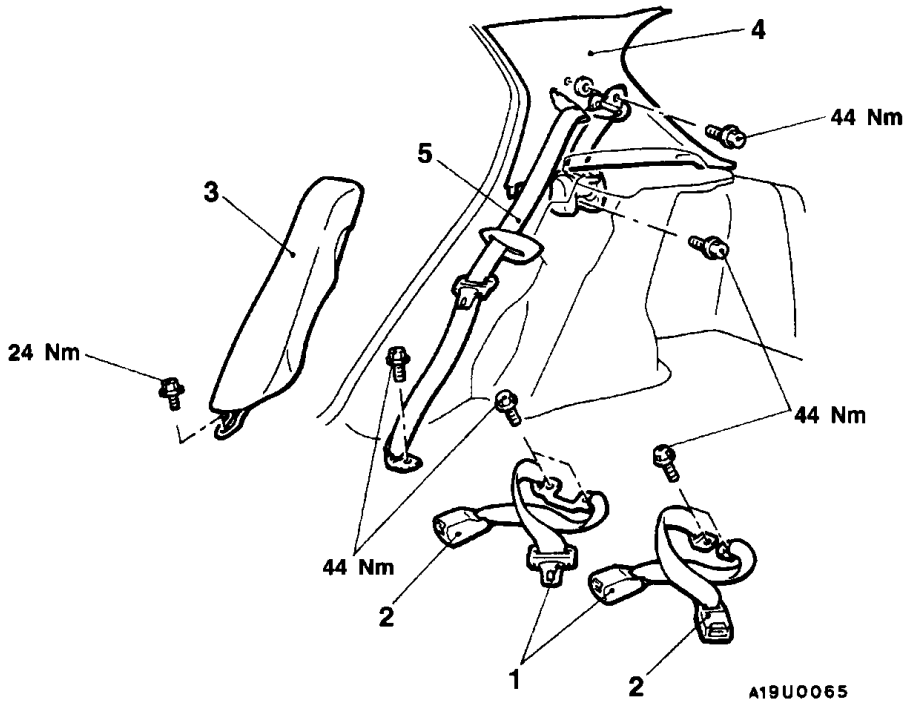
- Front seat assembly (Refer to P.52A-10.)

6. Front seat hinge cover
7. Inner seat belt

REAR SEAT BELT

52300160033

REMOVAL AND INSTALLATION



Removal steps

- Rear seat cushion (Refer to P.52A-13.)

1. Inner, outer seat belt (center seat belt)
2. Inner seat belt
3. Side seatback assembly (Refer to P.52A-13.)
4. Rear pillar trim (Refer to P.52A-9.)
5. Outer seat belt

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

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52409000049

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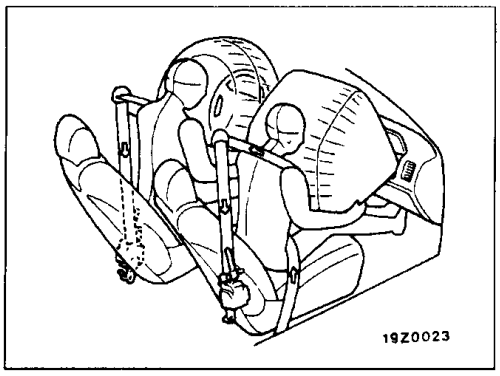
CAUTION

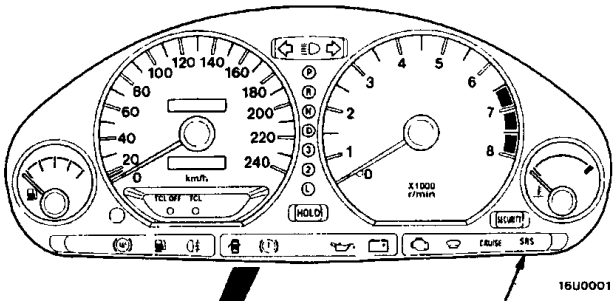
- **Carefully read and observe the information in the SERVICE PRECAUTIONS (P.52B-3.) prior to any service.**
- **For information concerning troubleshooting or maintenance, always observe the procedures in the Troubleshooting (P.52B-5.) section.**
- **If any SRS components are removed or replaced in connection with any service procedures, be sure to follow the procedures in the INDIVIDUAL COMPONENT SERVICE section (P.52B-18.) for the components involved.**
- **If you have any questions about the SRS, please contact your local distributor.**

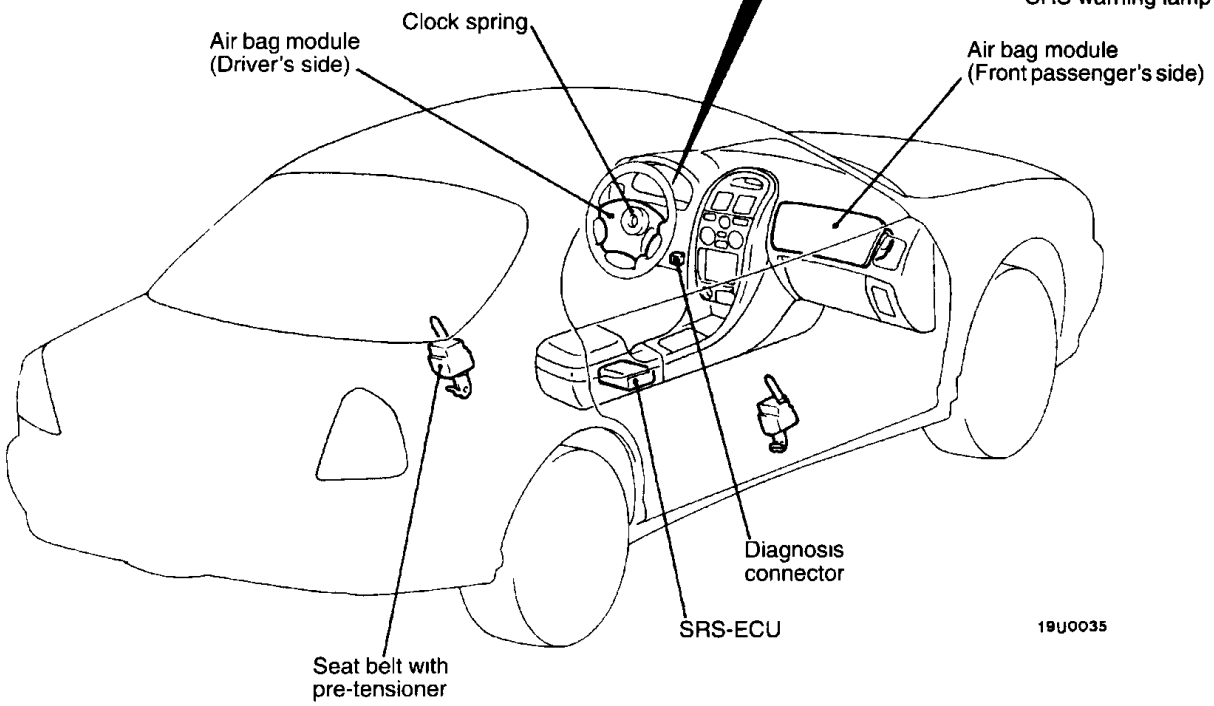
GENERAL INFORMATION

52400010058

To improve safety, the SRS and seat belts with pre-tensioner are available as optional parts. These systems enhance collision safety by restraining the front passengers in case of an accident. The SRS works with the pre-tensioner simultaneously when a collision is detected.
The SRS and seat belt tightening systems consist of two air bag modules, SRS air bag control unit (SRS-ECU), SRS warning lamp and clock spring, and seat belt pre-tensioner. One air bag is located in the centre of the steering wheel and another above the glove box. Each air bag has a folded air bag and an inflator unit. The control unit under the floor console monitors the system and has a safing G sensor and an analog G sensor. The warning lamp on the instrument panel indicates the operational status of the SRS. The clock spring is installed in the steering column.
Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work. Extreme care must be used when servicing the SRS to avoid injury to the service personnel (by inadvertent deployment of the air bags) or the driver (by rendering the SRS inoperative).







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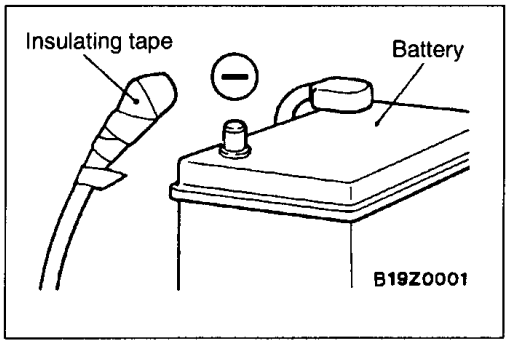
SRS SERVICE PRECAUTIONS

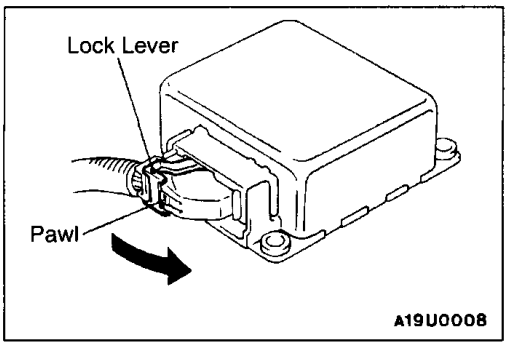
52400030054

1. In order to avoid injury to yourself or others from accidental deployment of the air bag and accidental operation of the seat belt with pre-tensioner during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment on or near SRS components, except those specified on P.52B-5.
3. **Never Attempt to Repair the Following Components:**
   - SRS air bag control unit (SRS-ECU)
   - Clock Spring
   - Air Bag Module (Driver's side or front passenger's side*)
   - Seat belt with Pre-tensioner

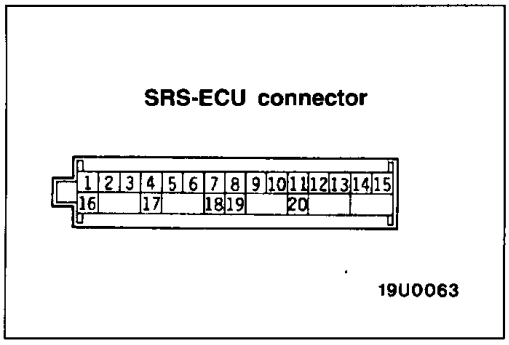
NOTE
*: Vehicles with front passenger's air bag
If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENTS SERVICE procedures in this manual, starting at page 52B-18.



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. To disconnect the SRS-ECU connector, push the connector pawl to unlock the connector, and then turn the lock lever in the direction of the arrow.



6. 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.

Harness Connector (No. of Terminal, Colour)	SRS-ECU Terminal No.	Destination of Harness	Corrective Action
20 pins, orange	1 10	Body wiring harness → Earth	Correct or replace each wiring harness
	2* 3*	Body wiring harness → Air bag module (Front passenger's side)	
	4	Body wiring harness → Junction block (fuse No. 11)	
	5 6	Body wiring harness → Clock spring → Air bag module (Driver's side)	Correct or replace each wiring harness. Replace clock spring
	7	Body wiring harness → Diagnosis connector	Correct or replace each wiring harness
	8 9	Body wiring harness → Combination meter (SRS warning lamp)	
	11	Body wiring harness → Junction block (fuse No. 4)	
	12 13	Body wiring harness → Seat belt with pre-tensioner (Front passenger's side)	
	14 15	Body wiring harness → Seat belt with pre-tensioner (Driver's side)	
	16–20	–	–

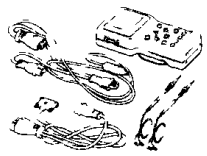
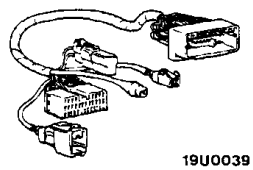
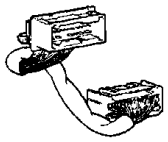
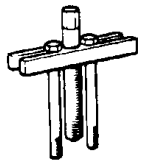
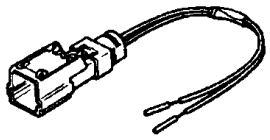
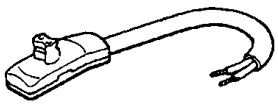
NOTE
*: Vehicles with front passenger's air bag.

7. SRS components and seat belt with pre-tensioner should not be subjected to heat, so remove the SRS-ECU, air bag module, clock spring and seat belt with pre-tensioner before drying or baking the vehicle after painting.
   - SRS-ECU, air bag module, clock spring: 93°C or more
   - Seat belt with pre-tensioner: 90°C or more
8. Whenever you finish servicing the SRS, check warning lamp operation to make sure that the system functions properly. (Refer to P.52B-6.)
9. Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.
10. If you have any questions about the SRS, please contact your local distributor.

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

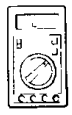
SPECIAL TOOLS

52400070049

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Reading diagnosis codes • Erasing diagnosis code • Reading trouble period • Reading erase times
 19U0039	MB991613	SRS check harness	Checking the SRS electrical circuitry
 19U0038	MB991623	SRS adapter harness	
	MB990803	Steering wheel puller	Steering wheel removal
	MB686560	SRS air bag adapter harness A	• Deployment of air bag modules and seat belt with pre-tensioner inside the vehicle • Deployment of air bag module (front passenger's side) outside the vehicle
 19U0080	MR172069	SRS air bag adapter harness B	Deployment of air bag module (driver's side) outside the vehicle

TEST EQUIPMENT

52400080035

Tool	Name	Use
	Digital multi-meter	Checking the SRS electrical circuitry Use a multi-meter for which the maximum test current is 2 mA or less at the minimum range of resistance measurement

TROUBLESHOOTING

52400090021

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

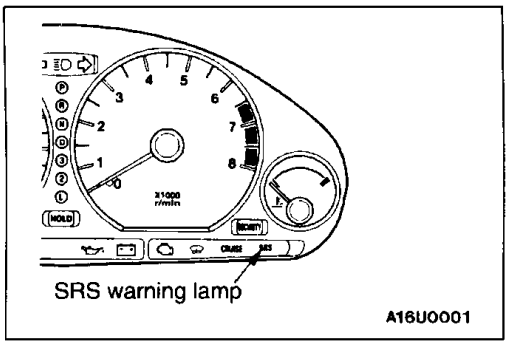
DIAGNOSIS FUNCTION

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.



"SRS" WARNING LAMP CHECK

Turn the ignition with the key "ON" position. Does the "SRS" warning lamp illuminate for about 7 seconds, turn OFF and then remain extinguished for at least 5 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-6.

INSPECTION CHART FOR DIAGNOSIS CODES

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

Code No.	Diagnosis item		Reference page
14	Analog G sensor system		52B-7
15	Safing G sensor system		52B-7
21, 22	Driver's side air bag module (squib) system		52B-7
24*1, 25*1	Front passenger's side air bag module (squib) system		52B-8
26, 27	Driver's side pre-tensioner (squib) system		52B-9
28, 29	Front passenger's side pre-tensioner (squib) system		52B-9
31, 32	SRS-ECU capacitor system		52B-10
35	SRS-ECU system (ignition of the air bag or activation of the seat belt pre-tensioner completed)		52B-10
41*2	IG1 (A) power circuit system		52B-10
42*2	IG1 (B) power circuit system		53B-11
43*2	SRS warning lamp drive circuit system	Lamp does not illuminate	52B-12
		Lamp does not switch off	52B-13
44*2	SRS warning lamp drive circuit system		52B-13

Code No.	Diagnosis item	Reference page
45	SRS-ECU non-volatile memory (EEPROM) and A/D converter system	52B-13
51, 52	Driver's side air bag module (squib ignition drive circuit) system	52B-14
54, 55	Passenger's side air bag module (squib ignition drive circuit) system	52B-14
56, 57	Driver's side pre-tensioner (squib ignition drive circuit) system	52B-14
58, 59	Passenger's side pre-tensioner (squib ignition drive circuit) system	52B-14

NOTE
(1) *1: Vehicles with front passenger's air bag.
(2) *2: This diagnosis code will be automatically cleared from memory and the SRS warning lamp will switch off when the system returns to normal.
(3) If the vehicle has a discharged battery it will store the fault codes 41 or 42. When these diagnosis codes are displayed, check the battery.

INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODES

Code No. 14 Analog G sensor system	**Probable cause**
The SRS-ECU monitors the analog G sensor output and outputs this code when it detects a sensor failure, abnormal sensor characteristics or abnormal sensor output.	• Malfunction of SRS-ECU

Replace the SRS-ECU

Code No. 15 Safing G sensor system	**Probable cause**
This code is output when there is a short-circuit between the terminals of the safing G sensor. The cause of the problem is probably a short-circuit in the safing G sensor.	• Malfunction of SRS-ECU

Replace the SRS-ECU

Code No. 21 or 22 Driver's side air bag module (squib) system	**Probable cause**
These diagnosis codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The trouble causes for each code No. are as follows. (Refer to chart 1.)	• Malfunction of clock spring • Malfunction of harnesses or connectors • Malfunction of driver's side air bag module (squib) • Malfunction of SRS-ECU

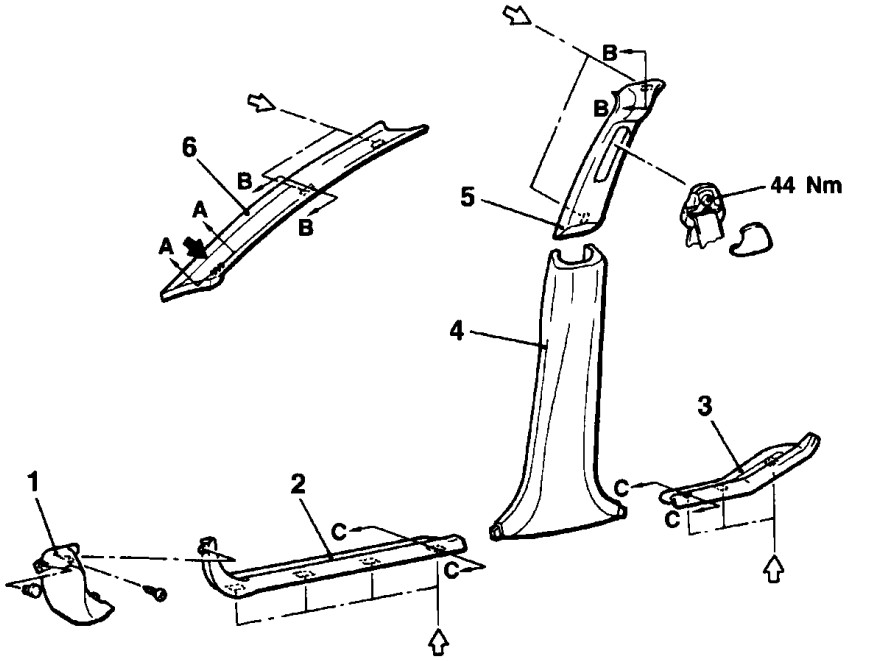
Chart 1

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

TRIMS

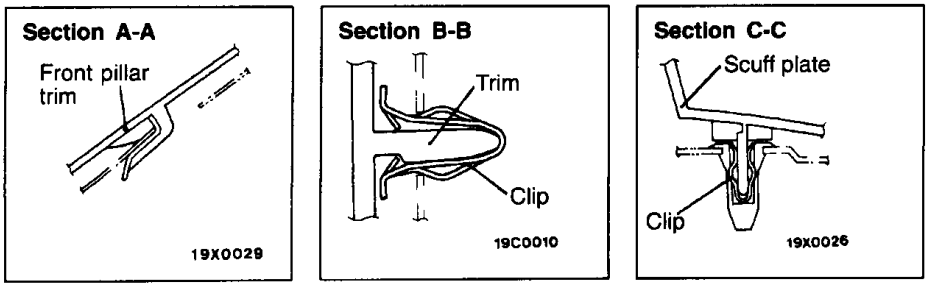
52100110049

REMOVAL AND INSTALLATION



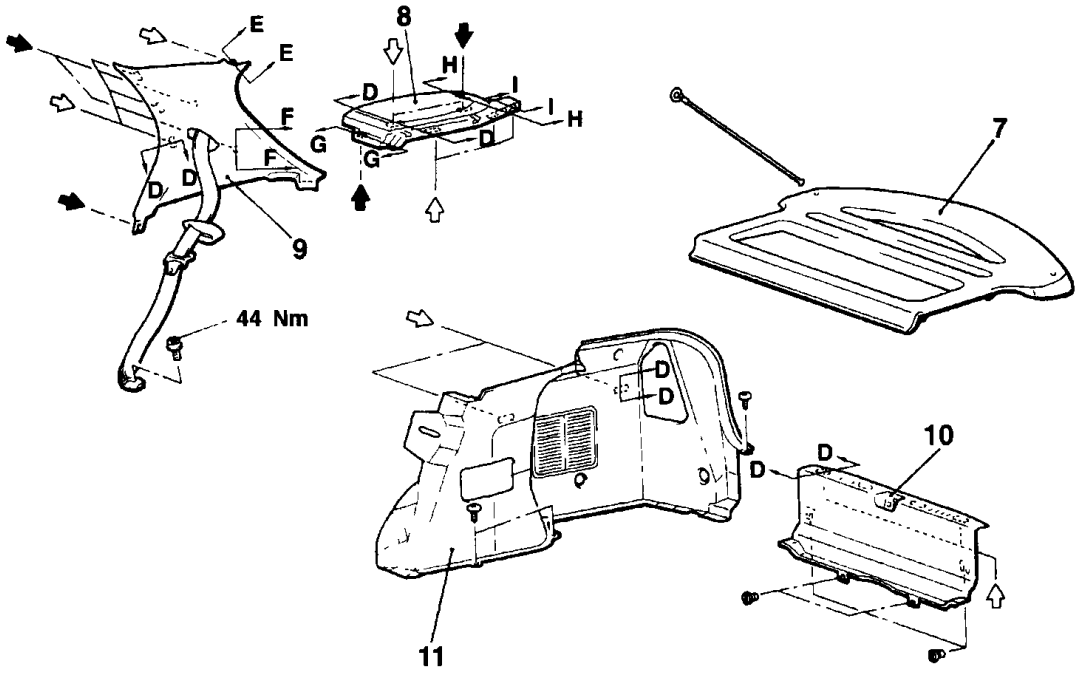
19U0068

NOTE
1. ⇦ : metal clip position
2. ⬅ : resin clip position

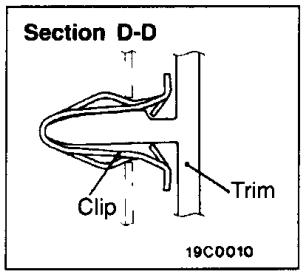


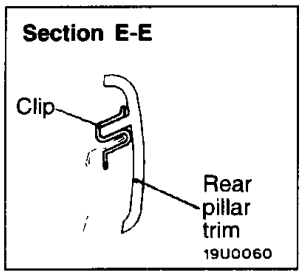
00003409

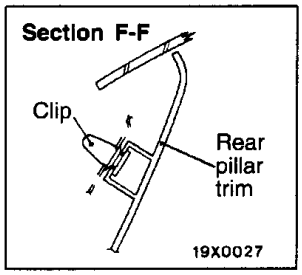
1. Cowl side trim
2. Front scuff plate
3. Rear scuff plate
4. Center pillar lower trim
5. Center pillar upper trim
6. Front pillar trim

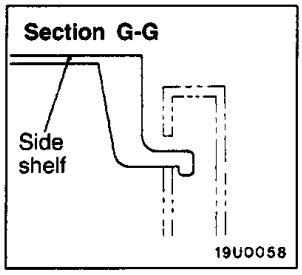


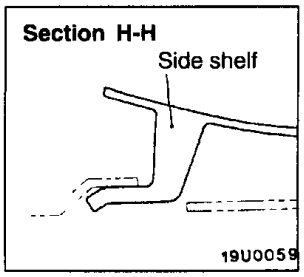
NOTE
1. ⇦ : metal clip position
2. ⬅ : resin clip position

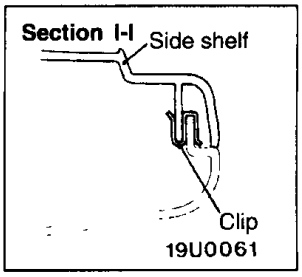






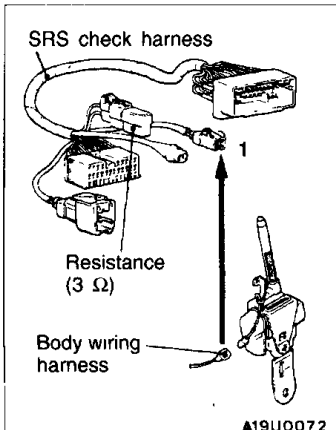






00003410

7. Center shelf
8. Side shelf
9. Rear pillar trim
10. Rear end trim
11. Rear side trim



MUT-II DIAGNOSIS CODE
- Disconnect front passenger's side pre-tensioner connector D-03.
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

Are code Nos. 28 and 29 output?

Yes → **Check the following connector.** D-03 — NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness between the SRS-ECU and front passenger's side pre-tensioner. — NG → **Repair**

OK ↓

Replace the SRS-ECU.

No ↓

Replace the front passenger's side pre-tensioner.

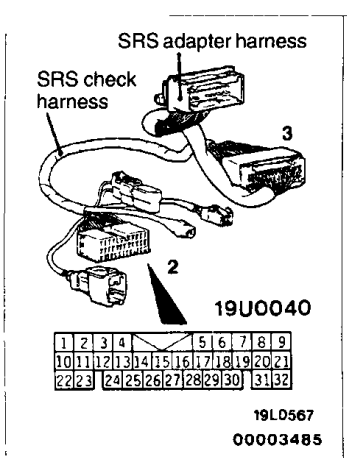
Code No. 31 or 32 SRS-ECU capacitor system	**Probable cause**
These diagnosis codes are output if the voltage at the SRS-ECU capacitor terminals is higher (No. 31) or lower (No. 32) than the specified value for 5 seconds or more. However, if diagnosis code Nos. 41 and 42 are being output due to a drop in battery voltage, code No. 32 will not be detected.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No. 35 SRS-ECU system (ignition of the air bag or activation of the seat belt pre-tensioner completed)	**Probable cause**
This code is output after the air bag has been deployed and after the seat belt pre-tensioner has operated If it is output before the air bag has been deployed or before the seat belt pre-tensioner has operated, there is probably a malfunction inside the SRS-ECU.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No. 41 IG_1 (A) power circuit system	**Probable cause**
This diagnosis code is output if the voltage between the IG_1 (A) terminal [SRS-ECU connector terminal (11)] and the earth is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle conditions returns to normal diagnosis code No. 41 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of harnesses or connectors • Malfunction of SRS-ECU



Measure at SRS check harness connector (2).
- Disconnect SRS-ECU connector D-23
- Connect the SRS check harness connector 3 to the SRS adapter harness.
- Continuity between terminals (1), (10) and body earth

OK: Continuity

NG → **Check the following connector.** D-23 NG → **Repair**

OK → Check trouble symptom.

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

OK → Measure at SRS check harness connector (2).
- Ignition switch ON
- Voltage between terminal (11) and body earth

OK: 9 V or more

NG → **Check the following connectors.** B-86, B-88 NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the SRS-ECU and ignition switch IG1 (A), and repair if necessary.

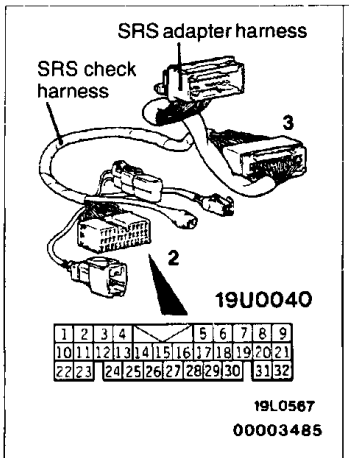
OK → Replace the SRS-ECU.

Code No. 42 IG_1 (B) power circuit system

This diagnosis code is output if the voltage between the IG_1 (B) terminal [SRS-ECU connector terminal (4)] and the earth is lower than the specified value for a continuous period of 5 seconds or more However, if the vehicle condition returns to normal, diagnosis code No. 42 will be automatically erased, and SRS warning lamp will switch off.

Probable cause

- Malfunction of harnesses or connectors
- Malfunction of SRS-ECU



Measure at SRS check harness connector (2).
- Disconnect SRS-ECU connector D-23.
- Connect the SRS check harness connector 3 to the SRS adapter harness.
- Continuity between terminals (1), (10) and body earth

OK. Continuity

NG → **Check the following connector.** D-23 NG → **Repair**

OK → Check trouble symptom.

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

OK → Measure at SRS check harness connector (2).
- Ignition switch: ON
- Voltage between terminal (4) and body earth

OK: 9 V or more

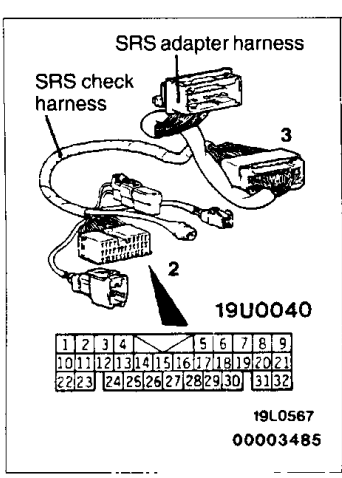
NG → **Check the following connectors.** B-86, B-88 NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the SRS-ECU and ignition switch IG1 (B), and repair if necessary.

OK → Replace the 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 harnesses or connectors • Blown bulb • Malfunction of SRS-ECU • Malfunction of combination meter



Measure at SRS check harness connector (2)
- Disconnect SRS-ECU connector D-23.
- Connect the SRS check harness connector (3) to the SRS adapter harness.
- Continuity between terminals (1), (10) and body earth
  OK: Continuity

NG → **Check the following connector.** D-23 NG → **Repair**

OK → Check trouble symptom.

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

Measure at SRS check harness connector (2).
- Ignition switch: ON
- Connect terminal (9) to body earth.
  OK: Lamp illuminates

NG → Blown bulb inspection NG → **Repair**

OK → **Check the following connectors.** B-86, B-88, B-05 NG → **Repair**

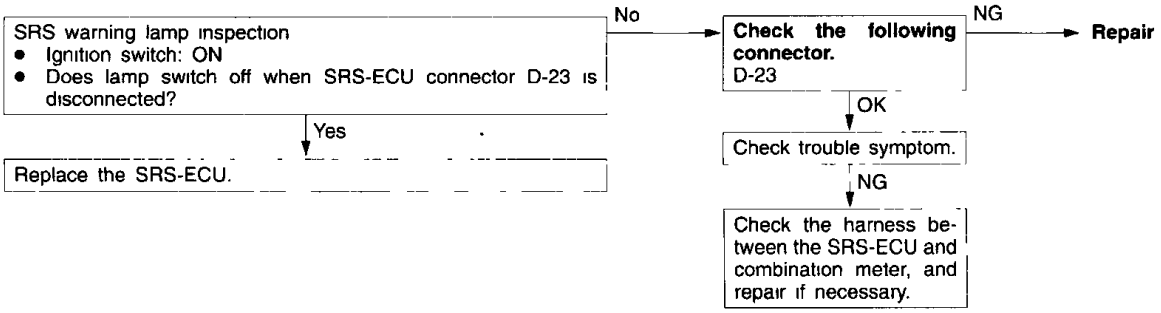
OK → Replace the SRS-ECU

OK → Check trouble symptom.

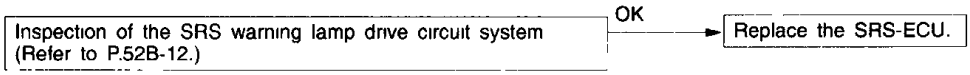
NG → Check the harness among the SRS-ECU, combination meter and ignition switch (IG1), and repair if necessary. NG → **Repair**

OK → Replace the combination meter.

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



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.	• Malfunction of 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) or A/D converter.	• Malfunction of SRS-ECU

Code No. 51 or 52 Driver's side air bag module (squib ignition drive circuit) system	Probable cause
These codes are output when there is a short-circuit (code No. 51) or open circuit (code No. 52) in the squib ignition drive circuit.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No. 54 or 55 Passenger's side air bag module (squib ignition drive circuit) system	Probable cause
These codes are output when there is a short-circuit (code No. 54) or open circuit (code No. 55) in the squib ignition drive circuit.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No. 56 or 57 Driver's side pre-tensioner (squib ignition drive circuit) system	Probable cause
These codes are output when there is a short-circuit (code No. 56) or open circuit (code No. 57) in the squib ignition drive circuit.	• Malfunction of SRS-ECU

Replace the SRS-ECU

Code No. 58 or 59 Passenger's side pre-tensioner (squib ignition drive circuit) system	Probable cause
These codes are output when there is a short-circuit (code No. 58) or open circuit (code No. 59) in the squib ignition drive circuit.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

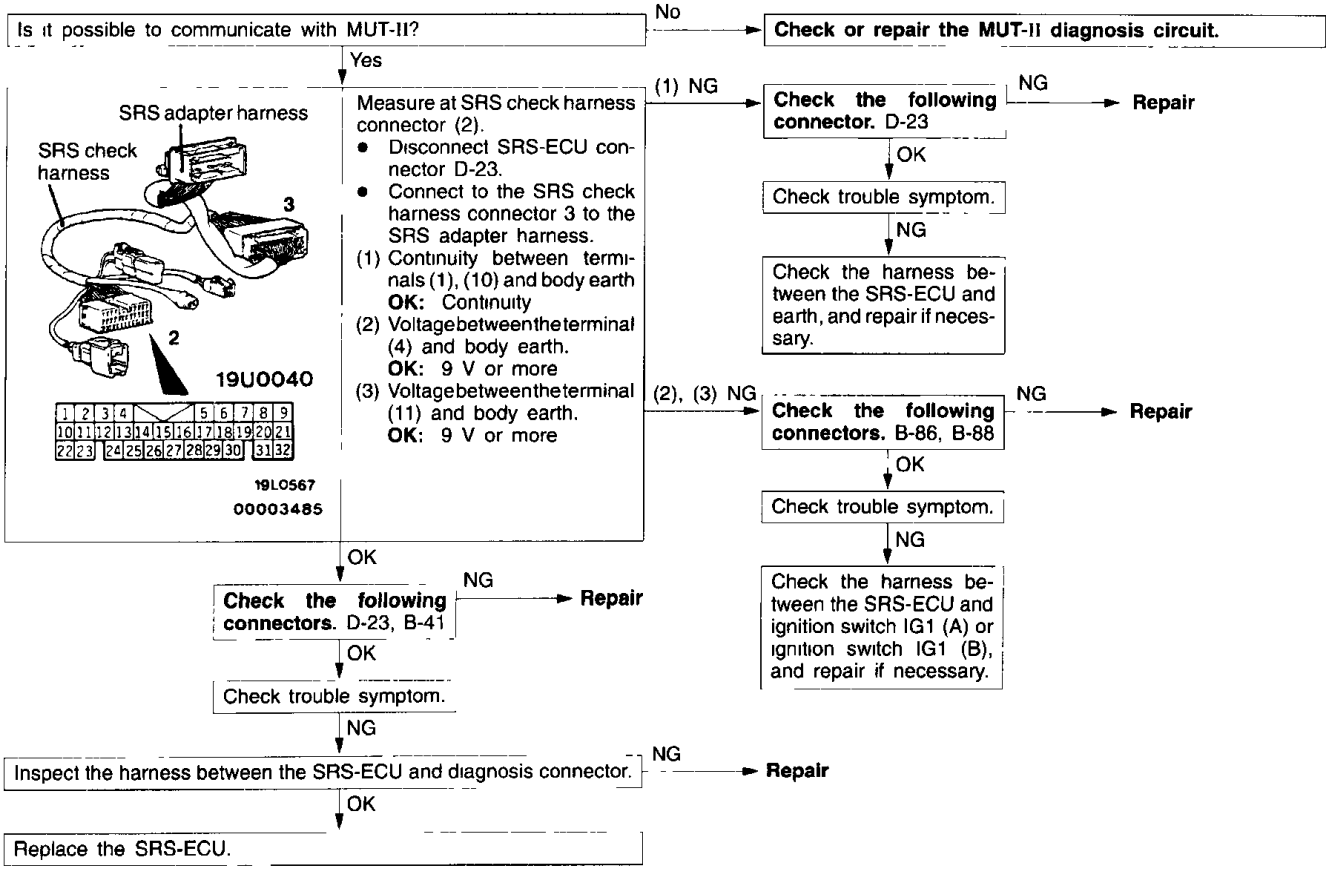
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection Procedure No.	Reference page
Communication with MUT-II is not possible.	1	P.52B-15
SRS warning lamp does not illuminate.	Refer to diagnosis code No. 43.	P.52B-12
SRS warning lamp is still on		P.52B-13

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection procedure 1

Communication with MUT-II is not possible.	Probable cause
If communication with all system is not possible, the cause is probably diagnosis circuit malfunction. If communication is not possible with the SRS only, the cause is probably an open circuit in the diagnosis output circuit of the SRS-ECU or in the power circuit (including earth circuit).	• Malfunction of harnesses or connectors • Malfunction of harness



POST-COLLISION DIAGNOSIS 52400110048

To inspect and service the SRS after a collision (whether or not the air bags have deployed), perform the following steps.

SRS-ECU MEMORY CHECK

1. Connect the MUT-II to the diagnosis connector (16-pin).

   Caution
   Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.

2. Read (and write down) all displayed diagnosis codes. (Refer to P.52B-6.)

   NOTE
   If the battery power supply has been disconnected or disrupted by the collision, the MUT-II cannot communicate with the SRS-ECU. Inspect and, if necessary, repair the body wiring harness before proceeding further.

3. Read the service data (fault duration and how many times memories are erased) using the MUT-II.

   NOTE
   1. Maximum stored period: 9999 minutes (approximately 7 days)
   2. Maximum number of times to be stored: 250

4. Erase the diagnosis codes and after waiting 5 seconds or more read (and write down) all displayed diagnosis codes. (Refer to P.52B-6.)

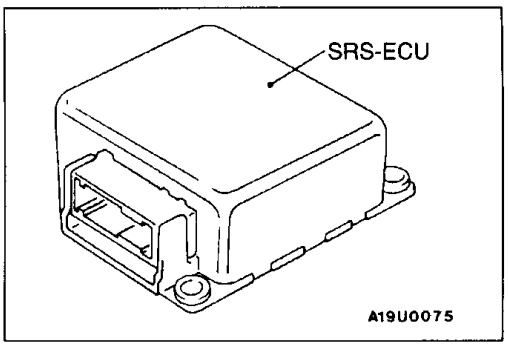
REPAIR PROCEDURE

WHEN AIR BAG DEPLOYS OR SEAT BELT PRE-TENSIONER OPERATES IN A COLLISION.

1. Replace the following parts with new ones.
   - SRS-ECU (Refer to P.52B-20.)
   - Air bag module (Refer to P.52B-22.)
   - Seat belt with pre-tensioner (Refer to P.52B-28.)
2. Check the following parts and replace if there are any malfunctions.
   - Clock spring (Refer to P.52B-22.)
   - Steering wheel, steering column and intermediate joint
     (1) Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
     (2) Install air bag module to check fit or alignment with steering wheel.
     (3) Check steering wheel for noise, binds or difficult operation and excessive free play.
3. Check harnesses for binding, connectors for damage, poor connections, and terminals for deformation. (Refer to P.52B-4.)

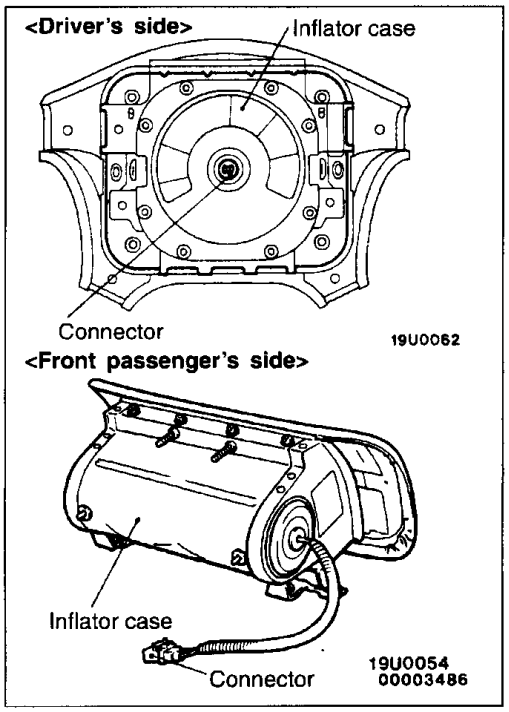
WHEN AIR BAG OR SEAT BELT PRE-TENSIONER DOES NOT DEPLOY IN LOW-SPEED COLLISION.

Check the SRS components and seat belt with pre-tensioner. If the SRS components and seat belt with pre-tensioner 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-18.



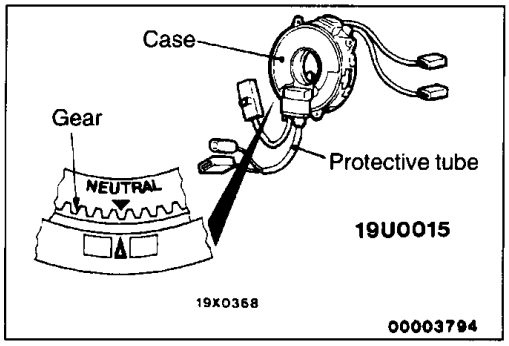
SRS-ECU

1. Check SRS-ECU case and brackets for dents, cracks or deformation.
2. Check connectors 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 and the gear for damage.

Steering wheel, steering column and intermediate joint

1. Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
2. Install air bag module to check fit or alignment with steering wheel.
3. Check steering wheel for noise, binds or difficult operation and excessive free play.

Harness connector (body wiring harness)

Check harnesses for binding, connectors for damage, poor connection, and terminals for deformation. (Refer to P.52B-4.)

Seatbelt with pre-tensioner

1. Check the seatbelt for damage or deformation.
2. Check the pre-tensioner cylinder for denting, cracks or deformation.
3. Check that the unit is installed correctly to the vehicle body.

INDIVIDUAL COMPONENT SERVICE

52400290049

If the SRS components and seatbelt with pre-tensioner are to be removed or replaced as a result of maintenance, troubleshooting, etc., follow each procedure (P.52B-20 – P.52B-30.)

Caution

1. **SRS components and seatbelt with pre-tensioner should not be subjected to heat, so remove the SRS-ECU, air bag module, clock spring and seatbelt with pre-tensioner before drying or baking the vehicle after painting.**
   - **SRS-ECU, Air bag module, clock spring: 93°C or more**
   - **Seatbelt with pre-tensioner: 90°C or more**

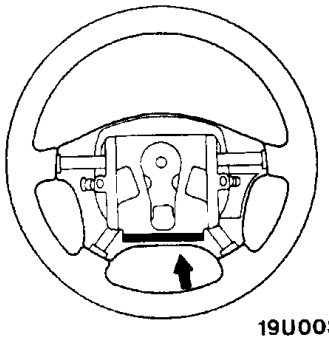
   Recheck SRS system operability after re-installing them.
2. **If the SRS components and seatbelt with pre-tensioner are removed for the purpose of check, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.**

WARNING/CAUTION LABELS

52400300025

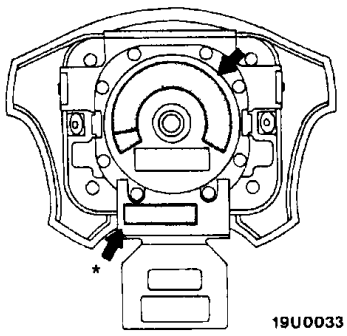
A number of caution labels relating to the SRS and seatbelt with pre-tensioner are found in the vehicle, as shown in the following illustration. Follow label instructions when servicing SRS and seatbelt pre-tensioner. If labels are dirty or damaged, replace them with new ones.

Steering wheel



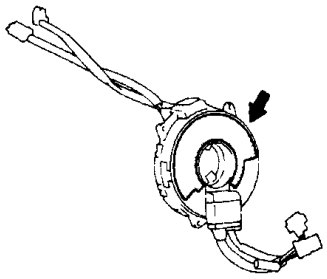
19U0034

Air bag module (driver's side)



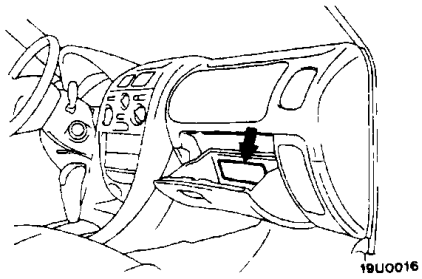
19U0033

Clock spring



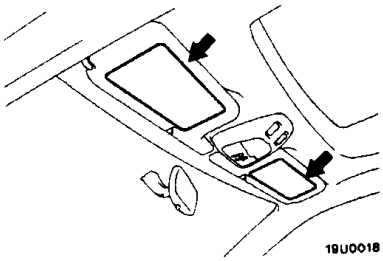
19X0015

Glove box



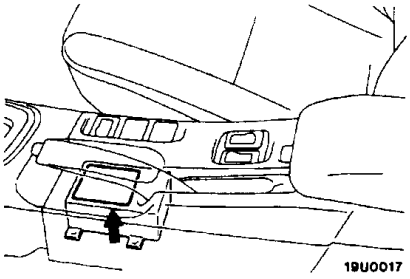
19U0016

Sun visor



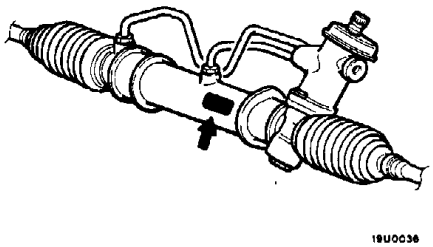
19U0018

SRS-ECU



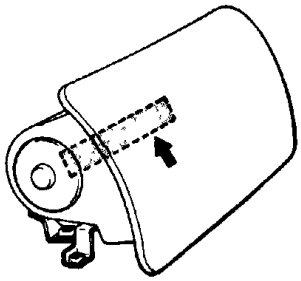
19U0017

Steering gear and linkage



19U0036

Air bag module (front passenger's side)



19U0032

Seatbelt pre-tensioner

19U0031

NOTE
*: If a new part is installed.

00003487

SRS AIR BAG CONTROL UNIT (SRS-ECU)

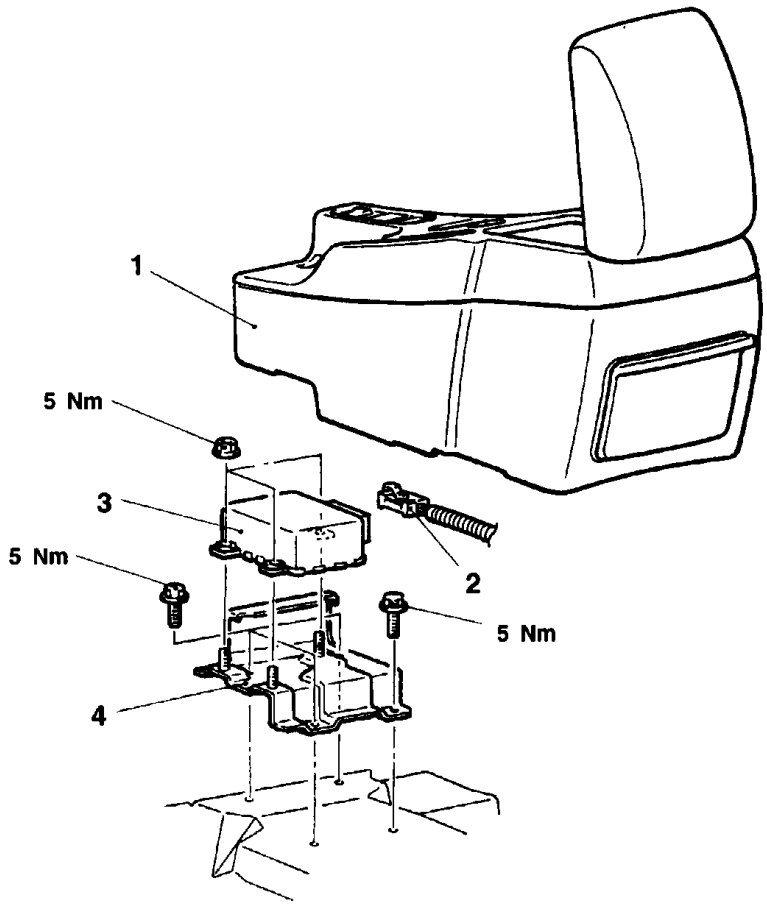
52400210045

Caution

1. **Disconnect the battery (–) terminal and wait for 60 seconds or more before starting work. Furthermore, the disconnected battery terminal should be covered with tape to insulate it. (Refer to P.52B-3.)**
2. **Never attempt to disassemble or repair the SRS-ECU. If faulty, replace it.**
3. **Do not drop or subject the SRS-ECU to impact or vibration. If denting, cracking, deformation, or rust are discovered in the SRS-ECU, replace it with a new SRS-ECU. Discard the old one.**
4. **After deployment of an air bag, replace the SRS-ECU with a new one.**
5. **Never use an ohmmeter on or near the SRS-ECU, and use only the special test equipment described on P.52B-5.**

REMOVAL AND INSTALLATION

Pre-removal Operation
- Turn the ignition key to the "LOCK" position.

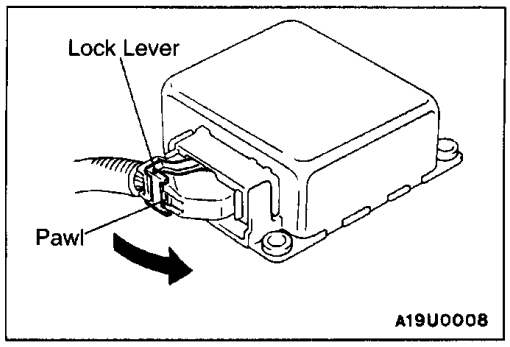


A19U0051

Removal steps

▶C◀ • Post-installation inspection
• Negative (–) battery cable connection
1. Rear floor console assembly (Refer to GROUP 52A – Floor Console.)

◀A▶ ▶B◀ 2. Harness connector
▶A◀ 3. SRS-ECU
4. Bracket



REMOVAL SERVICE POINT

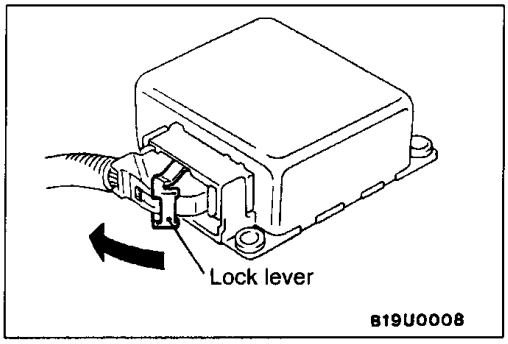
◀A▶ HARNESS CONNECTOR DISCONNECTION

Push the connector pawl to unlock the connector, and then turn the lock lever in the direction of the arrow to disconnect the connector.

INSTALLATION SERVICE POINTS

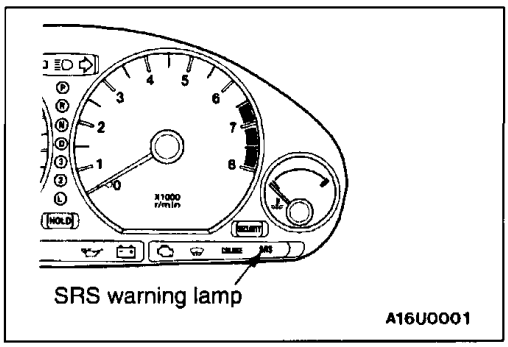
▶A◀ SRS-ECU INSTALLATION

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◀ HARNESS CONNECTOR CONNECTION

Connect the harness-side connector securely to the SRS-ECU connector, and then turn the lock lever in the direction of the arrow to lock the connector.



▶C◀ POST INSTALLATION INSPECTION

1. Reconnect the negative battery terminal.
2. Turn the ignition key to the "ON" position.
3. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 5 seconds after turning OFF?
4. If yes, SRS system is functioning properly.
   If no, consult page 52B-6.

INSPECTION

52400220031

- Check the SRS-ECU and brackets for dents, cracks or deformation.
- Check connectors and lock lever 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- 5.)

AIR BAG MODULES AND CLOCK SPRING

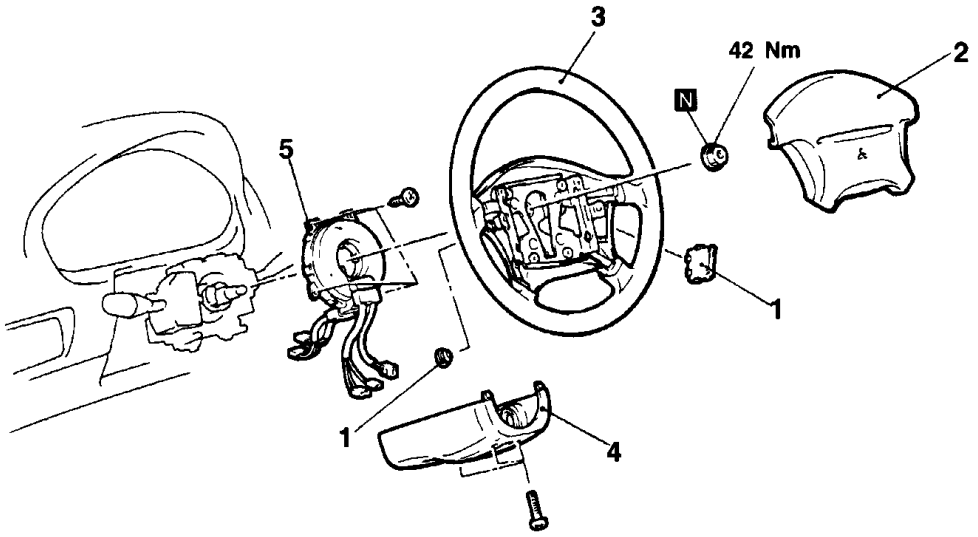
52400240044

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



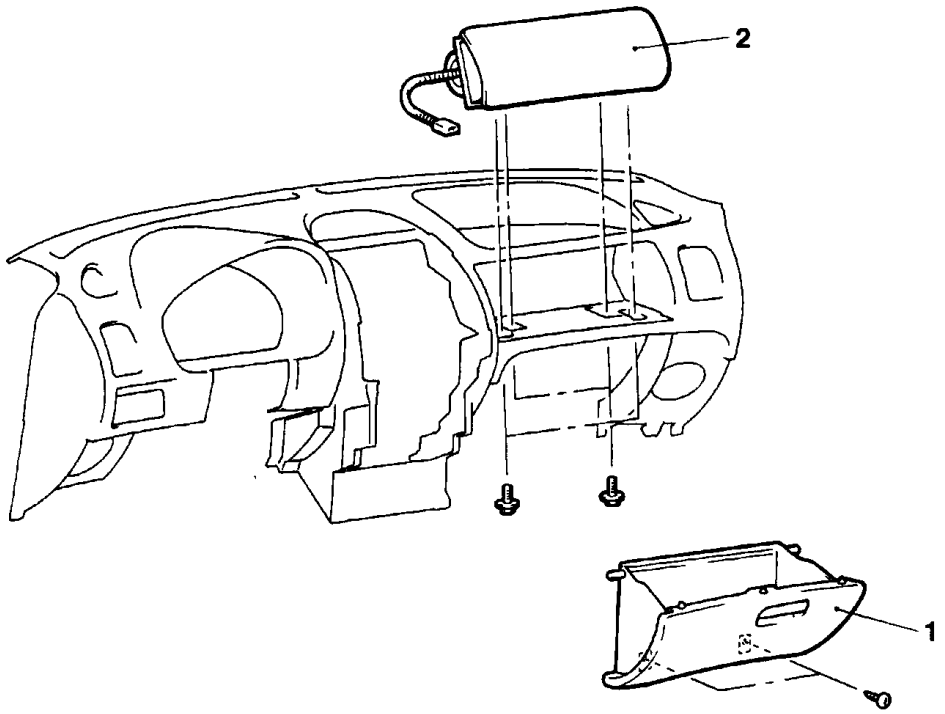
Air bag module removal steps

▶E◀ • Post-installation inspection
• Negative (–) battery cable connection
1. Cap
◀A▶ ▶D◀ 2. Air bag module
▶A◀ • Pre-installation inspection

Clock spring removal steps

▶E◀ • Post-installation inspection
• Negative (–) battery cable connection
1. Cap
◀A▶ ▶D◀ 2. Air bag module
◀B▶ ▶C◀ 3. Steering wheel
4. Column cover lower
◀C▶ ▶B◀ 5. Clock spring
▶A◀ • Pre-installation inspection

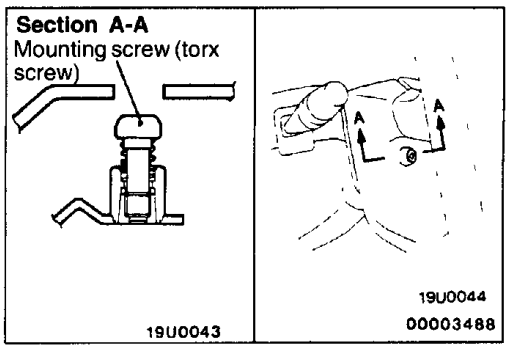
<Air bag module (front passenger's side>



A19U0047

Air bag module removal steps

▶E◀ • Post-installation inspection
• Negative (–) battery cable connection
1. Glove box
◀D▶ 2. Air bag module
▶A◀ • Pre-installation inspection



REMOVAL SERVICE POINTS

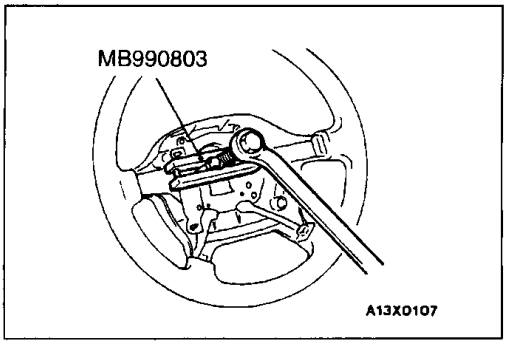
◀A▶ AIR BAG MODULE REMOVAL (DRIVER'S SIDE)

Remove the air bag module mounting screw (torx screw) from the side of the steering wheel.

NOTE
Do not remove the air bag module mounting screw (torx screw) from the sleeve.

Caution

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



◀B▶ STEERING WHEEL REMOVAL

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

◀C▶ CLOCK SPRING REMOVAL

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

◀D▶ AIR BAG MODULE REMOVAL (FRONT PASSENGER'S SIDE)

Caution
The removed air bag module should be stored in a clean, dry place with the pad cover face up.

INSTALLATION SERVICE POINTS

▶A◀ PRE-INSTALLATION INSPECTION

1. When installing the new air bag modules and clock spring, refer to "INSPECTION".

   Caution
   Dispose of air bag modules only according to the specified procedure. (Refer to P.52B-31.)

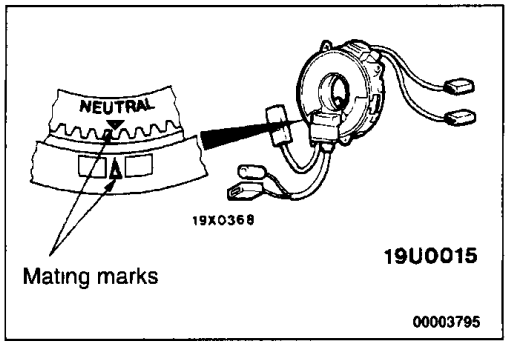
2. Connect the battery (–) terminal.

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

   Caution
   Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.

4. Turn the ignition key to the "ON" position.
5. Conduct self-diagnosis using the MUT-II to ensure entire SRS operates properly, except open circuit of air bag modules.
6. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal.

   Caution
   Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No. 4.)



▶B◀ CLOCK SPRING INSTALLATION

Align the mating mark and "NEUTRAL" position indicator of the clock spring, and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch.

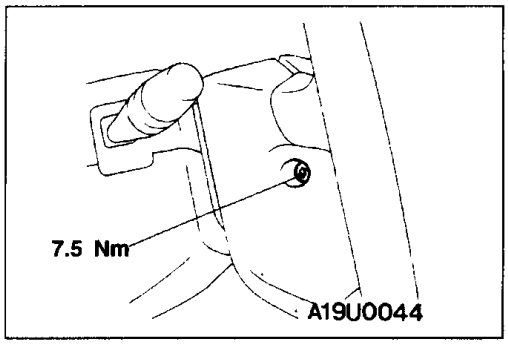
Caution
If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver.

▶C◀ STEERING WHEEL INSTALLATION

1. Before installation the steering wheel, be sure to first turn the vehicle's front wheels to the straight-ahead position and align the mating marks of the clock spring.

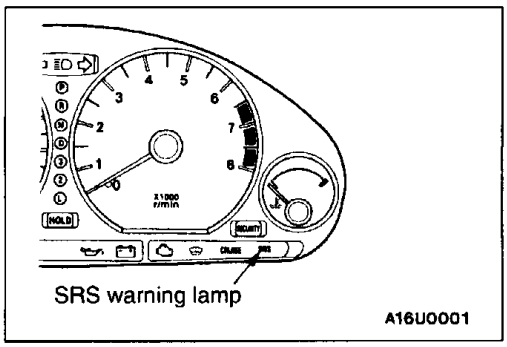
   Caution
   Be sure when installing the steering wheel, that the harness of the clock spring does not become caught or tangled.

2. After clamping, turn the steering wheel all the way in both directions to confirm that steering is normal.



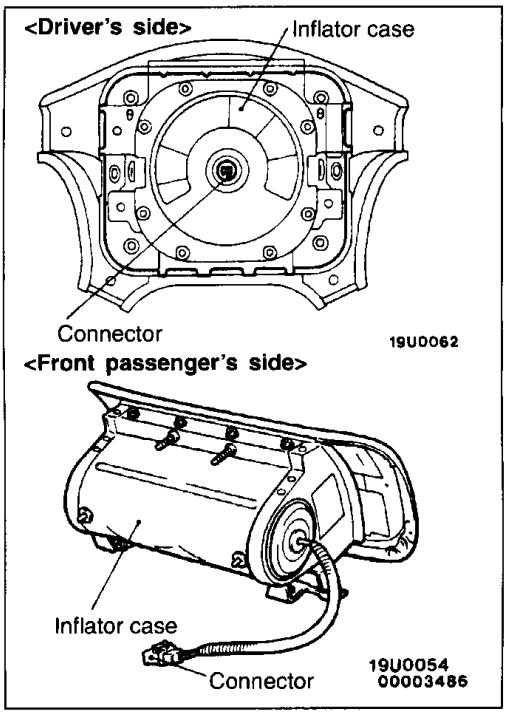
▶D◀ AIR BAG MODULE INSTALLATION

1. Securely connect the air bag module connector.
2. Tighten the air bag module mounting screw to the specified torque.



▶E◀ POST-INSTALLATION INSPECTION

1. Reconnect the negative battery terminal.
2. Turn the ignition key to the "ON" position.
3. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 5 seconds after turning OFF?
4. If yes, SRS system is functioning properly.
   If no, consult page 52B-6.



INSPECTION 52400250030

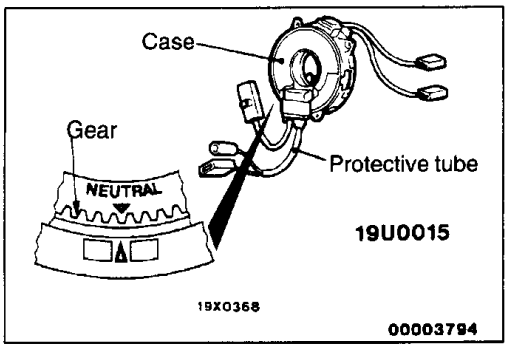
AIR BAG MODULES CHECK

If any improper part is found during the following inspection, replace the air bag modules with a new one.
Dispose the old one according to the specified procedure. (Refer to P.52B-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 bags deployment will result in serious personal injury.

1. Check pad cover for dents, cracks or deformation.
2. Check connectors for damage, terminals for deformation, and harness for binds.
3. Check air bag inflator case for dents, cracks or deformation.
4. Install the air bag module to steering wheel to check fit or alignment with the wheel.

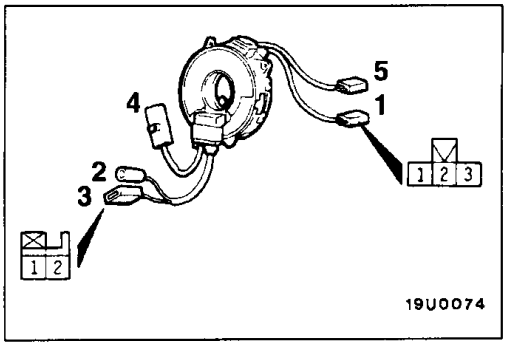
Caution
If dents, cracks, deformation, or rust are discovered in the air bag module, replace it with a new one.
Dispose of the old one according to the specified procedure. (Refer to P.52B-31.)



CLOCK SPRING CHECK 52400250047

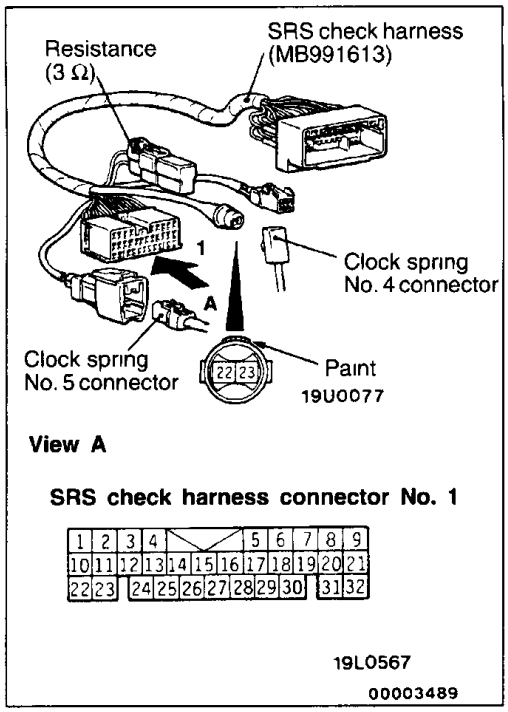
If, as result of following checks, even one abnormal point is discovered, replace the clock spring with a new one.

1. Check connectors and protective tube for damage, and terminals for deformation.
2. Visually check the case and the gears for damage.



3. Check for continuity between the No. 1 connector of the clock spring and connectors No. 2 and 3.

Connector No.	1			2	3	
Terminal No.	1	2	3	1	1	2
Continuity between terminals			○	○		
		○			○	
	○					○



4. Joint the No. 4 and 5 connectors of the clock spring to the connector of the SRS Check Harness.
5. Check for continuity between terminal 22 and terminal 25, and terminal 23 and terminal 24, of SRS Check Harness connector No. 1 using a digital multi-meter.

SEAT BELT WITH PRE-TENSIONER

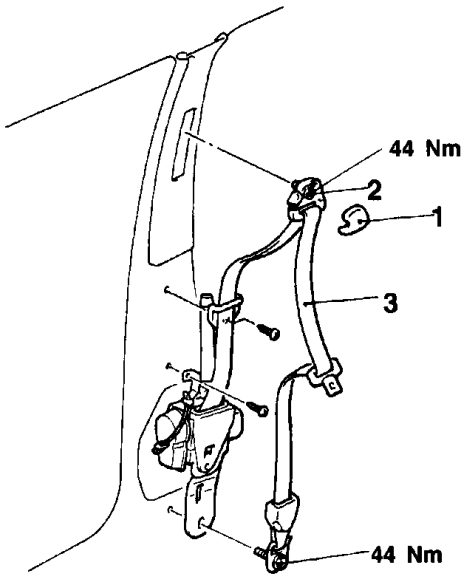
52400410018

Caution

1. **Disconnect the battery (–) terminal and cover with tape to insulate it and wait for 60 seconds or more before starting work. (Refer to P.52B-3.)**
2. **Never attempt to disassemble or repair the seat belt with pre-tensioner. If faulty, replace it.**
3. **Do not drop the seat belt with pre-tensioner or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust is detected.**
4. **Do not place anything on top of the seat belt pre-tensioner.**
5. **Do not expose the seat belt with pre-tensioner to temperatures over 90°C.**
6. **After operating the seat belt pre-tensioner, replace the seat belt pre-tensioner with a new part.**
7. **Gloves and protective goggles should be worn when handling a pre-tensioner once it has been used.**
8. **If disposing of a seat belt with pre-tensioner which has not yet been used, its pre-tensioner should be operated first before disposal. (Refer to P.52B-31.)**

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Center Pillar Lower Trim Removal and Installation (Refer to GROUP 52A.)



A19U0049

Removal steps

▶B◀ • Post-installation inspection
• Negative (–) battery cable connection
1. Sash guide cover
2. Sash guide
3. Seat belt with pre-tensioner

▶A◀ • Pre-installation inspection

INSTALLATION SERVICE POINTS

▶A◀ PRE-INSTALLATION INSPECTION

1. When installing a new seat belt with pre-tensioner refer to "INSPECTION".

   Caution
   Disposal of the pre-tensioner must be carried out as stated in the procedure. (Refer to P.52B-31.)

2. Connect the battery (–) terminal.

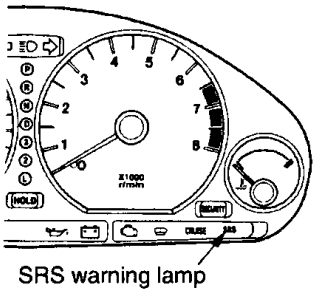
3. Connect the MUT-II to the diagnosis connector.

Caution
Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.

4. Turn the ignition key to the "ON" position.
5. Conduct self-diagnosis using the MUT-II to ensure entire SRS operates properly, except open circuit of seatbelt with pre-tensioner.

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 P52B-3, No. 4.)



▶B◀ POST-INSTALLATION INSPECTION

1. Reconnect the negative battery terminal.
2. Turn the ignition key to the "ON" position.
3. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 5 seconds after turning OFF?
4. If yes, SRS system is functioning properly.
   If no, refer to page 52B-6.

INSPECTION

52400420011

SEAT BELT WITH PRE-TENSIONER CHECK

If any part is found to be faulty during the inspection. It must be replaced with a new one.
Dispose of the old one according to the specified procedure. (Refer to P.52B-31.)

Caution
Never attempt to measure the circuit resistance of the seat belt-tensioner even if you are using the specified tester. If the circuit resistance is measured with a tester, the seat belt pre-tensioner may accidentally operate, which could result in serious personal injury.

1. Check seat belt pre-tensioner for dents, cracks or deformation.
2. Check connectors for damage, terminals for deformation, and harness for binds.

AIR BAG MODULE AND SEAT BELT PRE-TENSIONER DISPOSAL PROCEDURES

52400120041

Before disposing of a vehicle which is equipped with air bag or seat belts with pre-tensioner, or when disposing of the air bags or seat belt pre-tensioner themselves, follow the procedures must be used to deploy the air bags or operate the seat belt pre-tensioners before disposal.

UNDEPLOYED AIR BAG MODULE AND SEAT BELT PRE-TENSIONER DISPOSAL

Caution

1. **If the vehicle is to be scrapped or otherwise disposed of, deploy the air bags and operate the seat belt pre-tensioners inside the vehicle. If the vehicle will continue to be operated and only the air bag modules and seat belt pre-tensioner are to be disposed of, deploy the air bags and operate the seat belt pre-tensioners outside the vehicle.**
2. **Since a large amount of smoke is produced when the air bag are deployed or the seat belt pre-tensioner is operated, avoid residential areas whenever possible.**
3. **Since there is a loud noise when the air bags are deployed and when the seat belt pre-tensioners are operated, 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

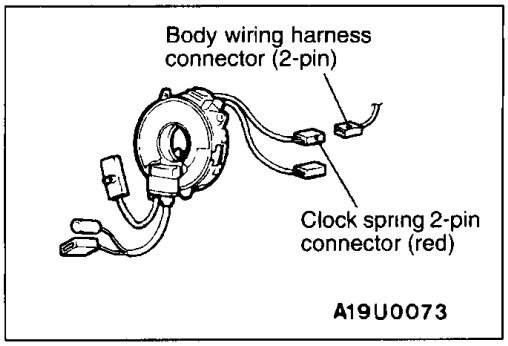
(when disposing of a vehicle)

(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

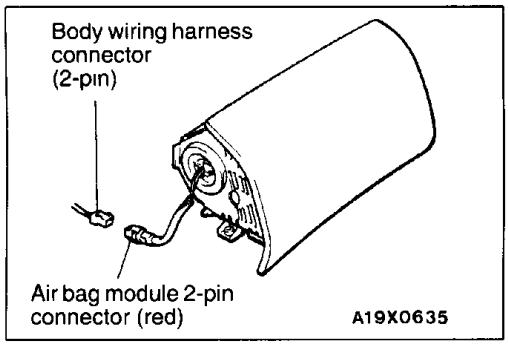
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-3.)



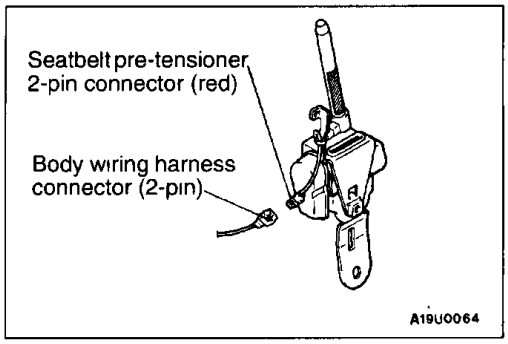
(3) To deploy the air bag module (driver's side):
1. Remove the steering column cover lower.
2. Remove the connection between the clock spring 2-pin connector (red) and the body wiring harness connector.

NOTE

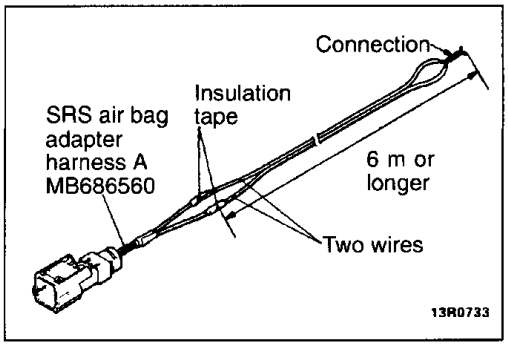
If the clock spring connector is disconnected from the body wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.



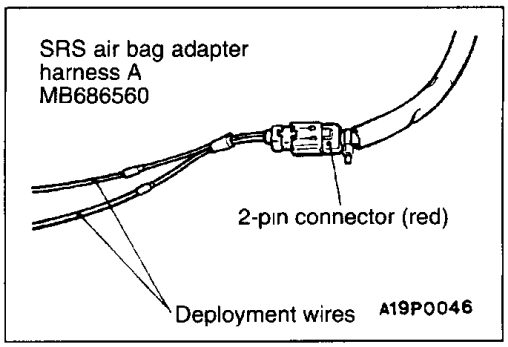
(4) To deploy the air bag module (front passenger's side):
1. Remove the glove box. (Refer to P.52B-24.)
2. Remove the connection between the air bag module (front passenger's side) connector (red 2-pin) and the body wiring harness connector.

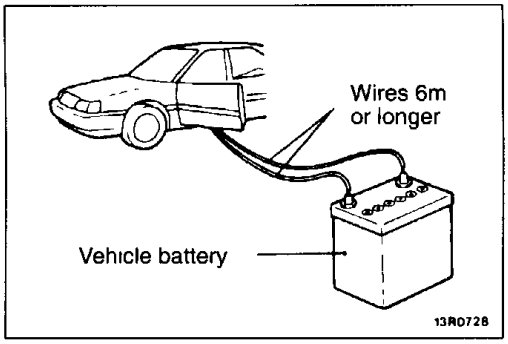


(5) To operate the seat belt pre-tensioner:
1. Remove the center pillar lower trim. (Refer to GROUP 52A).
2. Remove the connection between the seatbelt pre-tensioner connector (red 2-pin) and the body wiring harness connector.



(6) Connect two wires, each six meters or longer, to the two leads of SRS air bag adapter harness A and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.





(7) Connect the block spring, air bag module (front passenger's side) or seat belt pre-tensioner 2-pin connector (red) to SRS air bag adapter harness A and pass the deployment wires out of the vehicle.

(8) 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 or to operate the seat belt pre-tensioner.

Caution

1. **Before deploying the air bag or operating the seat belt pre-tensioner 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 and Seat Belt Pre-tensioner Disposal Procedures (P.52B-38.) for post-deployment handling instructions.
3. **If the air bag module fails to deploy or the seat belt pre-tensioner fails to operate when the procedures above are followed, do not go near the module or the seat belt pre-tensioner. Contact your local distributor.**

(9) After deployment or operation, dispose of air bag module or seatbelt pre-tensioner according to the Deployed Air Bag Module and Seat Belt Pre-tensioner Disposal Procedures. (Refer to P.52B-38.)

DEPLOYMENT OUTSIDE THE VEHICLE

Caution

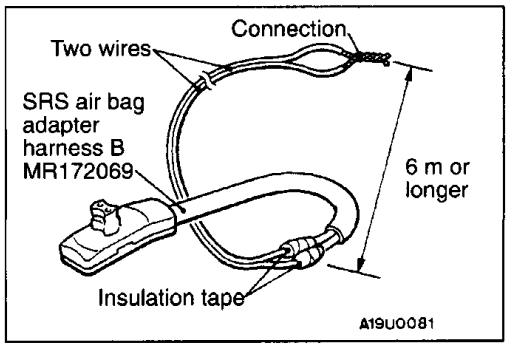
1. **This should be carried out in a wide, flat area at least 6 m away from obstacles and other people.**
2. **Do not perform deployment outside, if a strong wind is blowing, and if there is even a slight breeze, the air bag module should be placed and deployed downwind from the battery.**

(1) Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

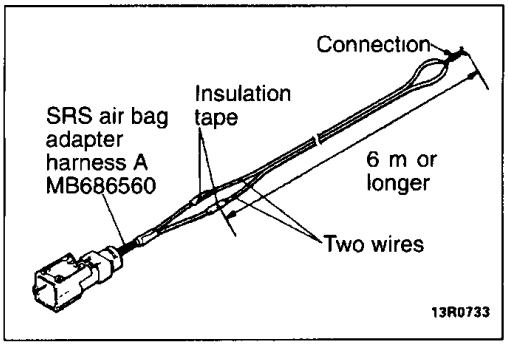
Caution
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-3.).

(2) Remove the air bag module and seat belt with pre-tensioner for the vehicle. (Refer to P.52B-22, 28.).

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.

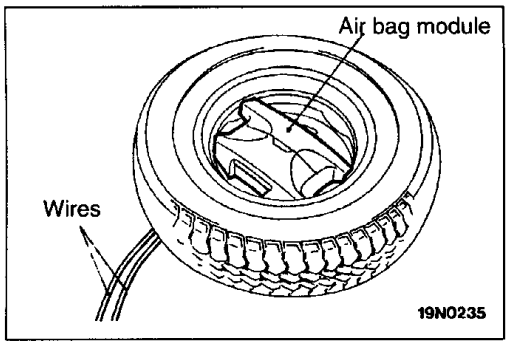


(3) When deploying the driver's side air bag module:
Connect two wires, each six meters or longer, to the two leads of SRS air bag adapter harness B, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.



When deploying the passenger's side air bag module or operating the seat belt pre-tensioner:

Connect two wires, each six meters or longer, to the two leads of SRS air bag adapter harness A, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module or operation of the seat belt pre-tensioner.



(4) Set the Air Bag Modules or Seat Belt Pre-tensioner as follows:

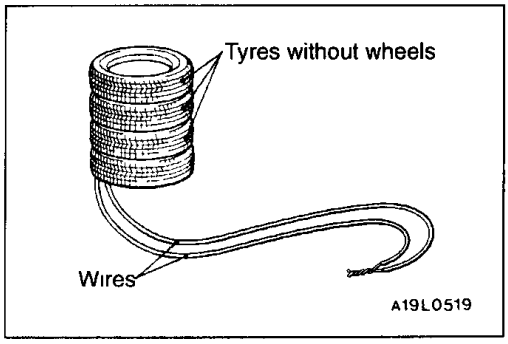
<Air Bag Module (driver's side)>

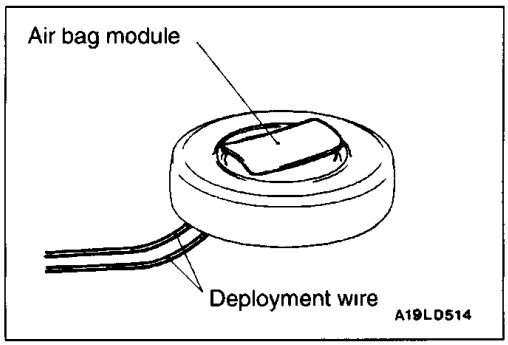
1. Take the SRS air bag adapter harness B that is connected to the wires, pass it beneath the old tyre wheel assembly, and connect it to the air bag module.
2. Pass the thick wire through the air bag module mounting hole, and then secure the air bag module to an old tyre with a wheel in it so that the pad on the module is facing upwards.

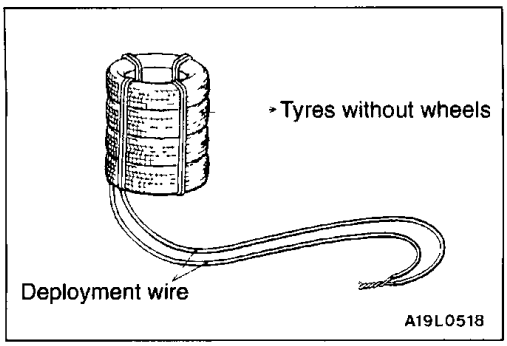
   Caution

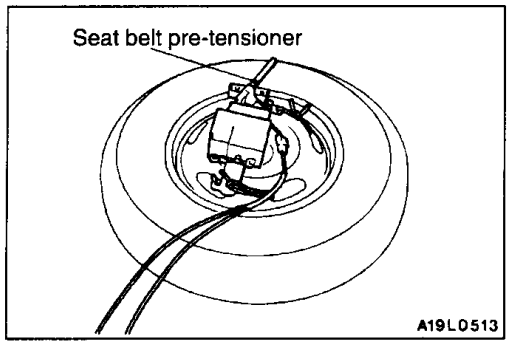
   Leave some space below the wheel for the adaptor harness. If there is no space, the reaction when the air bag deploys could damage the adaptor harness.

3. Place three old tyres with no wheels on top of the tyre secured to the air bag module.









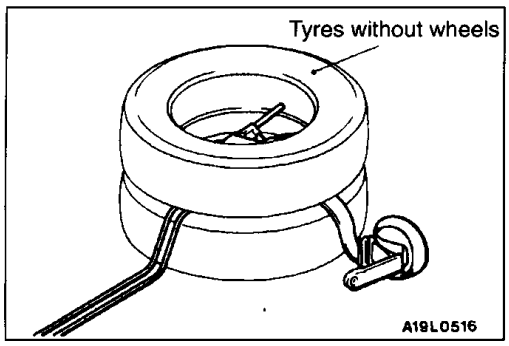
<Air Bag Module (front passenger's side)>

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 the thick wires into the hole of the air bag module bracket, and secure it to the wheel of the old tyre with wheel (4 locations), with the air bag facing upwards.

   Caution
   1. **Leave some space below the wheel for the deployment wires.**
      If there is no space, the reaction of the air bag deployment could result in damage of the adaptor harness.
   2. **While deployment takes place, do not have the connector of the SRS air bag adaptor harness A inserted between the tyres.**
3. Place four old tyres, without wheels, on top of the tyre secured to the air bag module, and secure all tyres with ropes (4 locations).

<Seat Belt Pre-tensioner>

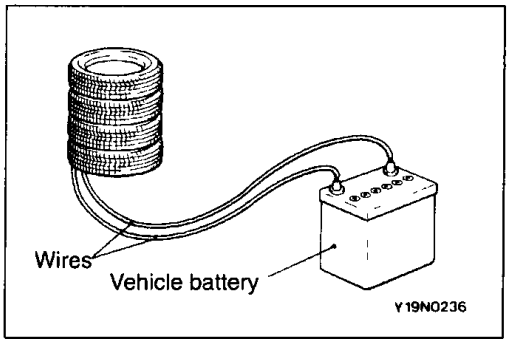
1. Connect SRS air bag adapter harness A (with the deployment harness connected) to the seat belt pre-tensioner from the top of the old tyre with the wheel in it.
2. Pass the wires through the hole on the seat belt retractor bracket and secure them to the front (raised part) of the wheel on two places.



Caution

1. **The deployment harness should be left with some slack. If it is too tight, the adapter harness may become damaged during deployment.**
2. **The connector of the SRS air bag adapter harness A should be placed so that it is not clamped by the tyres during deployment or operation.**
3. **Pull the seat belt out the outside of the tyre, and then place one tyre without a wheel inside on top of the existing tyre.**

NOTE
The cylinder of the seat belt pre-tensioner should be placed inside the cavity of top tyre.



(5) At a location as far away from the air bag module or seat belt pre-tensioner 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 or to operate the seat belt pre-tensioner.

Caution

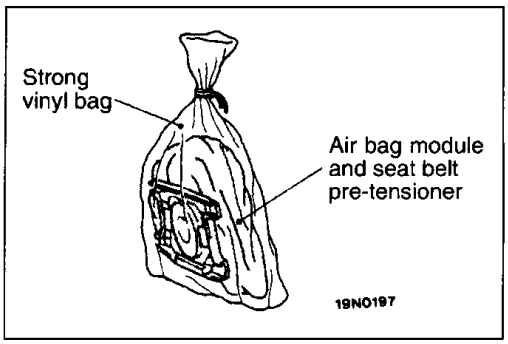
1. **Before deployment, check carefully to be sure that no one is nearby.**
2. **The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although the gas resulting from air bag deployment is not poisonous, it should not be inhaled. Refer to the Deployed Air Bag Module and Seat Belt Pre-tensioner Disposal Procedures below for post-deployment handling instructions.**
3. **If the air bag fails to deploy or seat belt pre-tensioner fails to operate when the procedures above are followed, do not go near the module or the seat belt pre-tensioner. Contact your local distributor.**

(6) After deployment or operation, dispose of the air bag module or seat belt pre-tensioner according to the Deployed Air Bag Module and Seat Belt Pre-tensioner Disposal Procedures.

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

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

1. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it cool before attempting to handle it.
2. Do not put water or oil on the air bag after deployment or on the seat belt pre-tensioner after operation.
3. There may be, adhered to the deployed air bag module or the operated seat belt pre-tensioner, material that could irritate the eye and/or skin, so wear gloves and safety glasses when handling a deployed air bag module or a operated seat belt pre-tensioner. IF AFTER FOLLOWING THESE PRECAUTIONS, ANY MATERIAL DOES GET INTO THE EYES OR ON THE SKIN, IMMEDIATELY RINSE THE AFFECTED AREA WITH A LARGE AMOUNT OF CLEAN WATER.
   IF ANY IRRITATION DEVELOPS, SEEK MEDICAL ATTENTION.



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

CHASSIS ELECTRICAL

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54109000037

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

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

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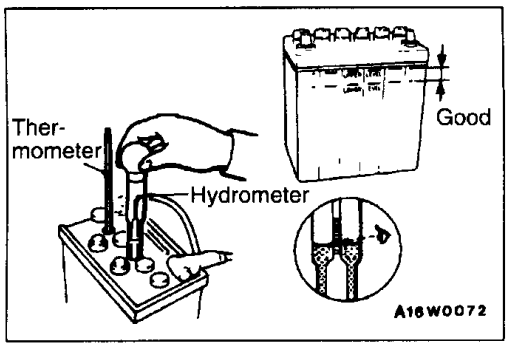
HEATER ..... Refer to GROUP 55
AIR CONDITIONER ..... Refer to GROUP 55

BATTERY

54100030028

SERVICE SPECIFICATION

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



ON-VEHICLE SERVICE

54100090026

FLUID LEVEL AND SPECIFIC GRAVITY CHECK

1. Inspect whether or not the battery fluid is between the UPPER LEVEL and LOWER LEVEL marks.
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.

   D20=Dt+0.0007 (t–20)

   D20: Specific gravity of the battery fluid calculated for 20°C.

   Dt: Actually measured specific gravity

   t: Actually measured temperature

CHARGING

54100110029

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

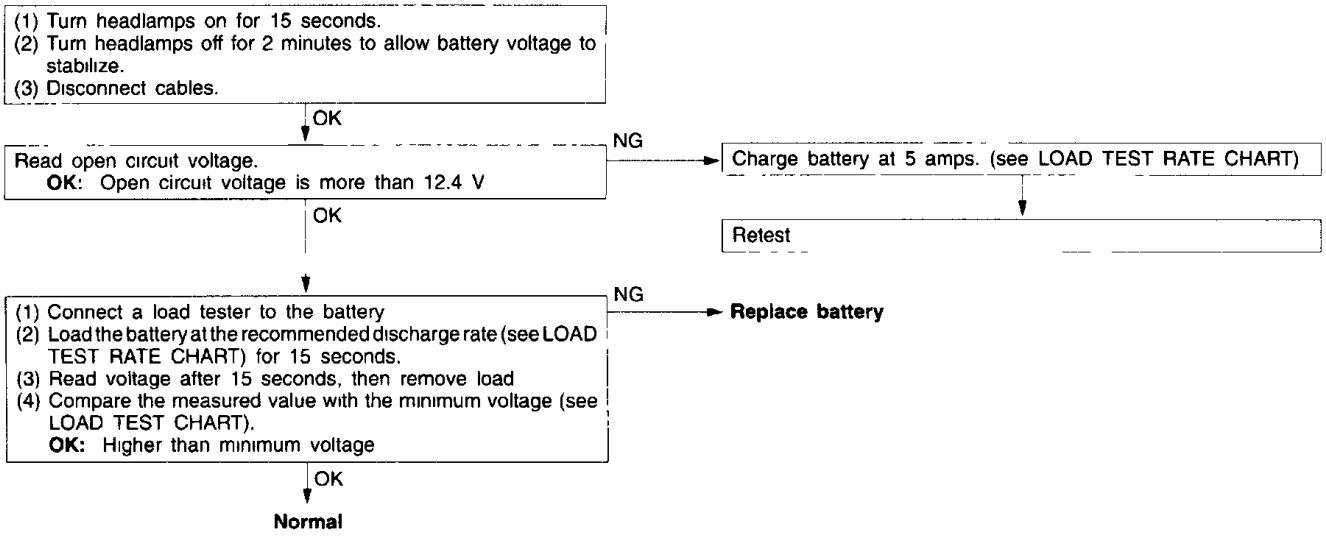
Caution

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

BATTERY TESTING PROCEDURE

54100120039

TEST STEP



LOAD TEST RATE CHART

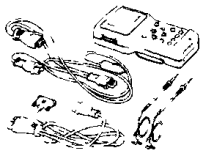
Battery type	55530 or 55559	56216 or 56219	56332 or 56638
Charging time when fully discharged h [5-amp rated current charging]	10	11	11
Load test (Amps)	170	210	210

LOAD TEST CHART

Temperature °C	21 and above	16	10	4	–1	–7	–12	–18
Minimum voltage V	9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

IGNITION SWITCH AND IMMOBILIZER SYSTEM 54300060092

SPECIAL TOOL

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Immobilizer system check (Diagnosis display using the MUT-II) • Registration of the ID code

TROUBLESHOOTING 54300070057

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

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

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

ERASING DIAGNOSIS CODES

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

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

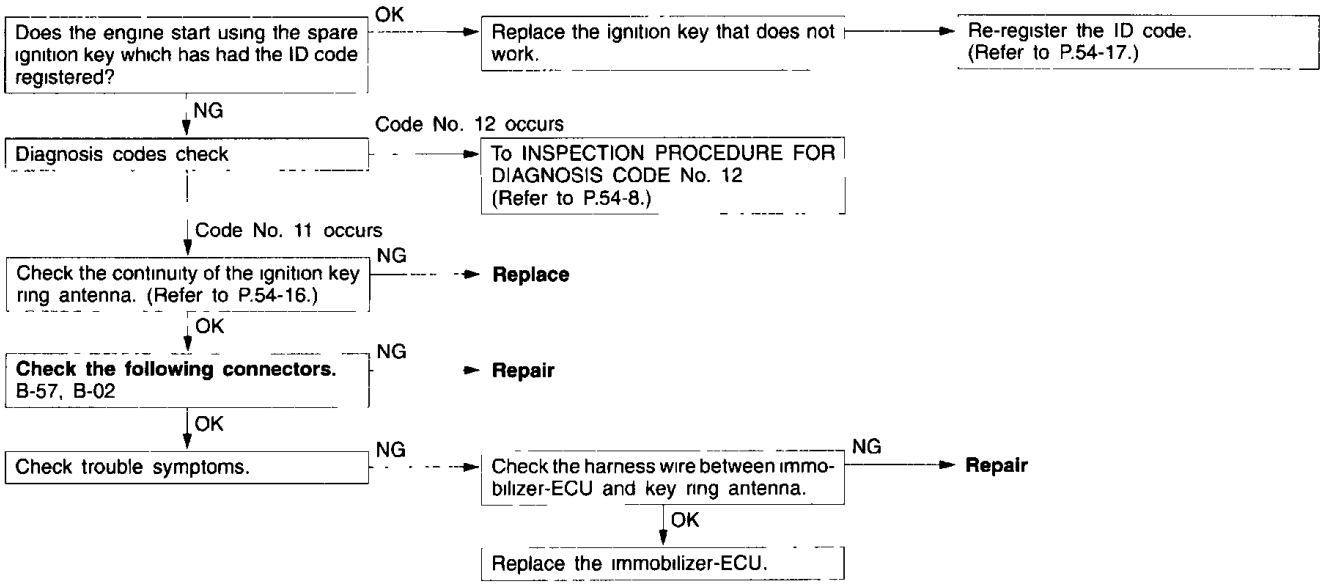
INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code No.	Inspection items	Reference page
11	Transponder communication system	54-8
12*	ID code are not the same or are not registered	54-8
21	Communication system between MUT-II and engine-ECU	54-9
31	EEPROM abnormality inside immobilizer-ECU	54-9
32	Ignition switch IG signal circuit system	54-10

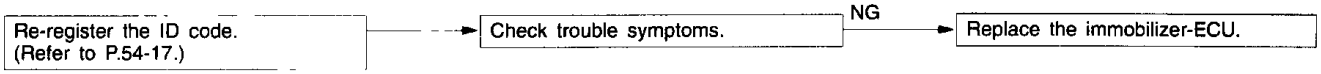
NOTE
*: Diagnosis code No. 12 is not recorded.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

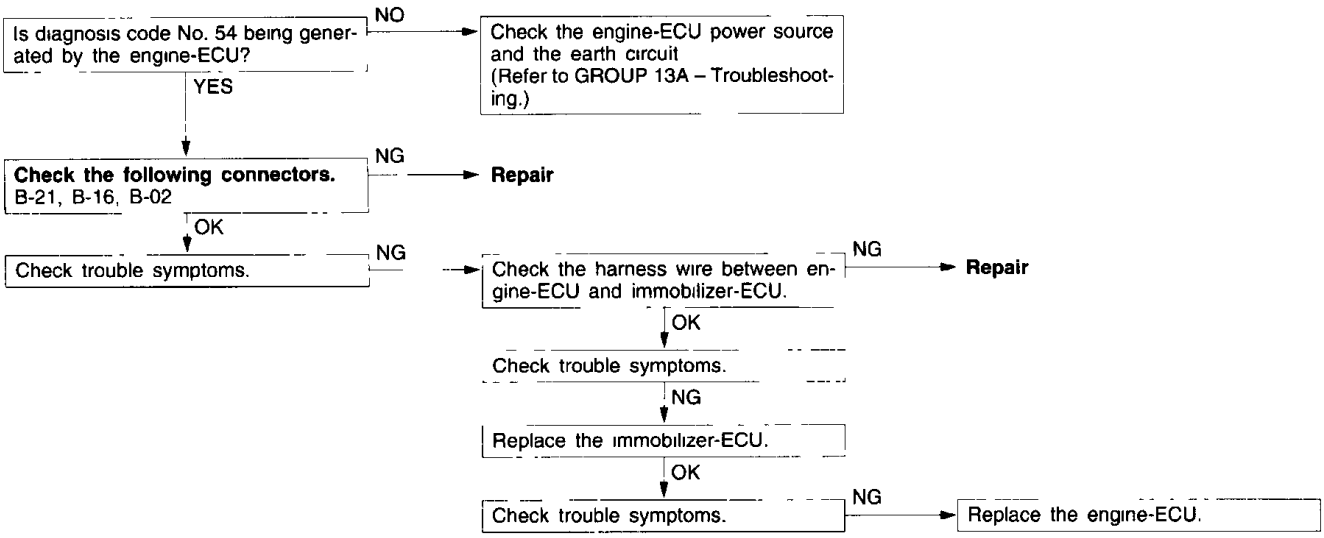
Code No. 11 Transponder communication system	Probable cause
The ID code of the transponder is not sent to the immobilizer-ECU immediately after the ignition switch is turned to the ON position.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



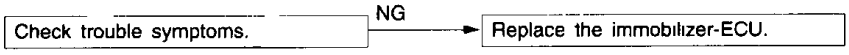
Code No. 12 ID code are not the same or are not registered	Probable cause
The ID code which is sent from the transponder is not the same as the ID code which is registered in the immobilizer-ECU.	• The ID code in the ignition key being used has not been properly registered. • Malfunction of the immobilizer-ECU



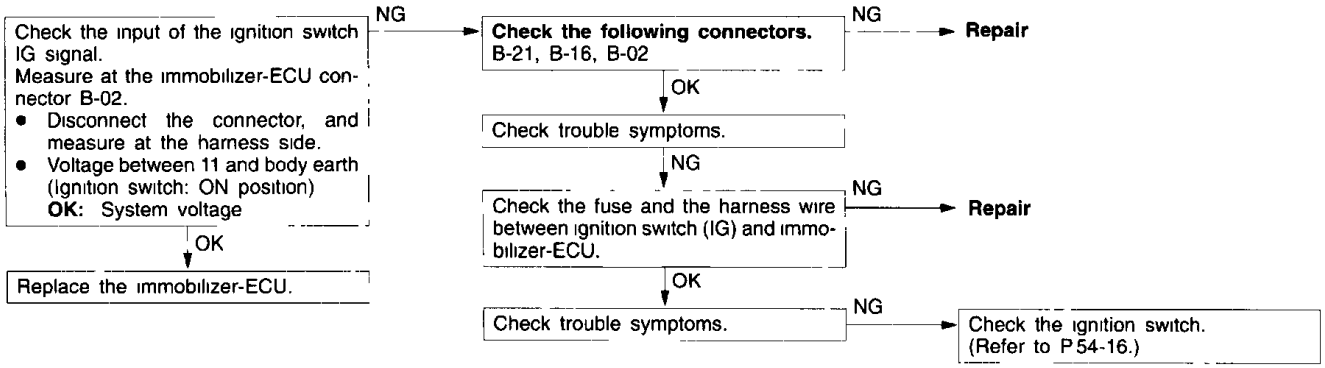
Code No. 21 Communication system between MUT-II and engine-ECU	Probable cause
After the ignition switch is turned to the ON position, the confirmation code is not received from the engine-ECU within the allowable time, or an abnormal code is received.	• Malfunction of harness or connector • Malfunction of the engine-ECU • Malfunction of the immobilizer-ECU



Code No. 31 EEPROM abnormality inside immobilizer-ECU	Probable cause
No data has been written to the EEPROM inside the immobilizer-ECU.	• Malfunction of the immobilizer-ECU



Code No. 32 Ignition switch IG signal circuit system	Probable cause
The ignition switch signal is not being input to the immobilizer-ECU.	• Malfunction of harness or connector • Malfunction of the ignition switch • Malfunction of the immobilizer-ECU



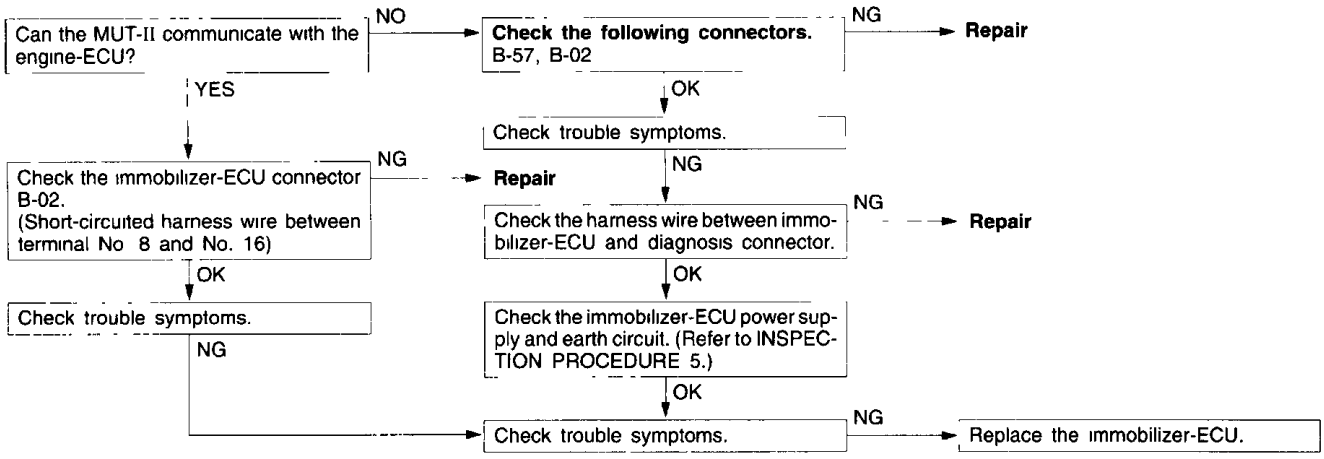
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	1	54-11
Diagnosis code No. 54 has been generated by the engine-ECU.	2	54-12
ID code cannot be registered using the MUT-II.	3	54-12
Engine does not start (Cranking but no initial combustion).	4	54-13
Malfunction of the immobilizer-ECU power source and earth circuit	5	54-14

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

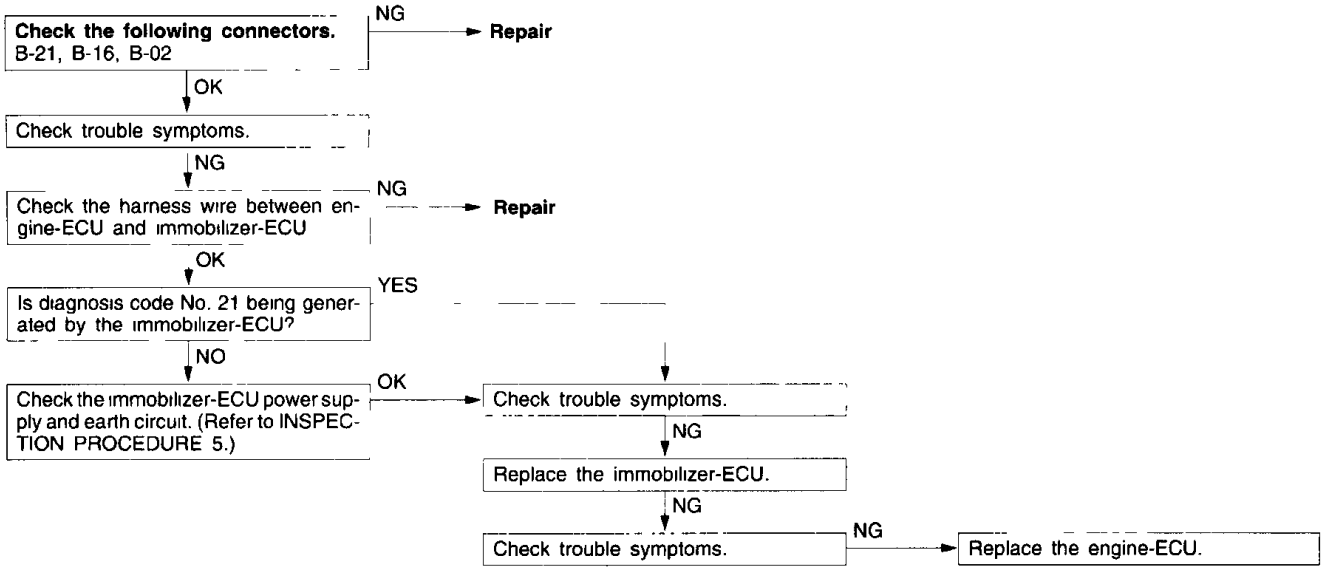
Inspection Procedure 1

Communication with MUT-II is impossible.	Probable cause
The cause is probably that a malfunction of the diagnosis line or the immobilizer-ECU is not functioning.	• Malfunction of the diagnosis line • Malfunction of harness or connector • Malfunction of the immobilizer



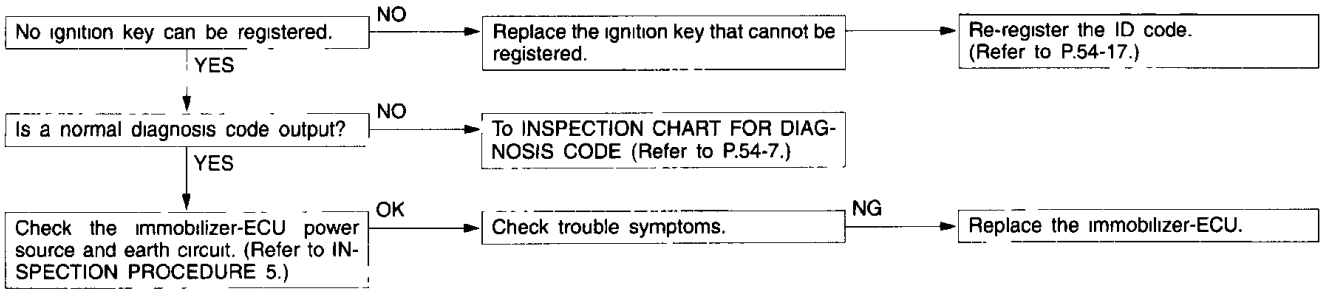
Inspection Procedure 2

Diagnosis code No. 54 has been generated by the engine-ECU.	Probable cause
There is a problem with communication between the engine-ECU and the immobilizer-ECU.	• Malfunction of harness or connector • Malfunction of the immobilizer-ECU • Malfunction of the engine-ECU



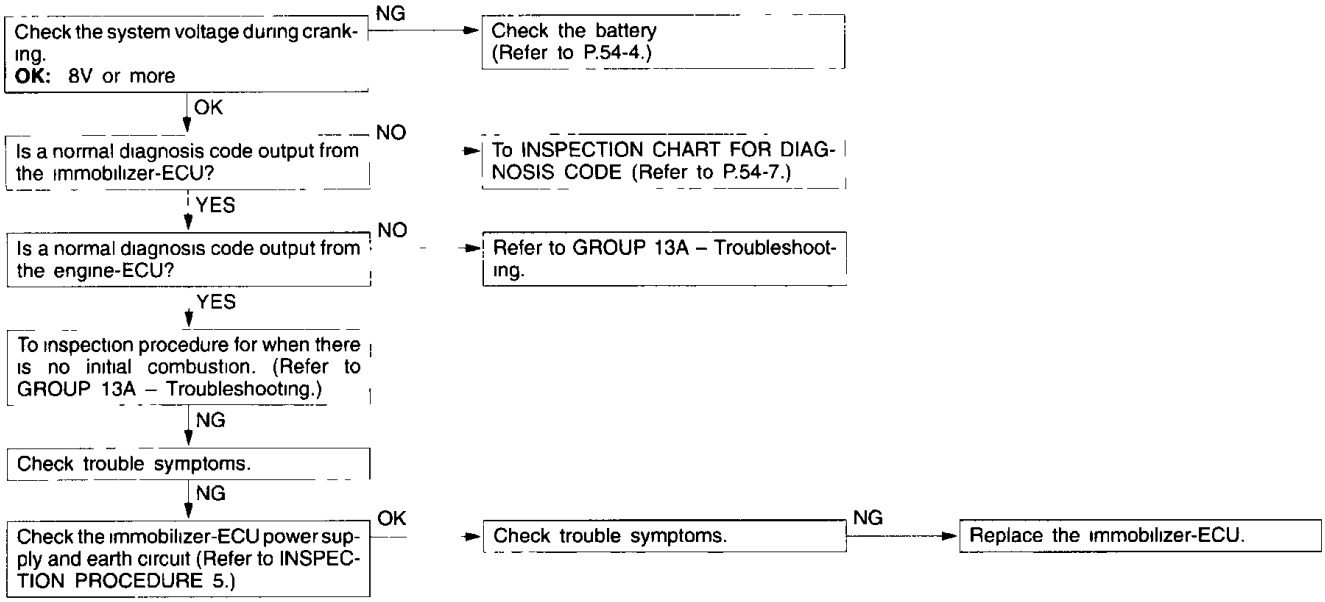
Inspection Procedure 3

ID code cannot be registered using the MUT-II.	Probable cause
The cause is probably that there is no ID code registered in the immobilizer-ECU, or there is a malfunction of the immobilizer-ECU.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



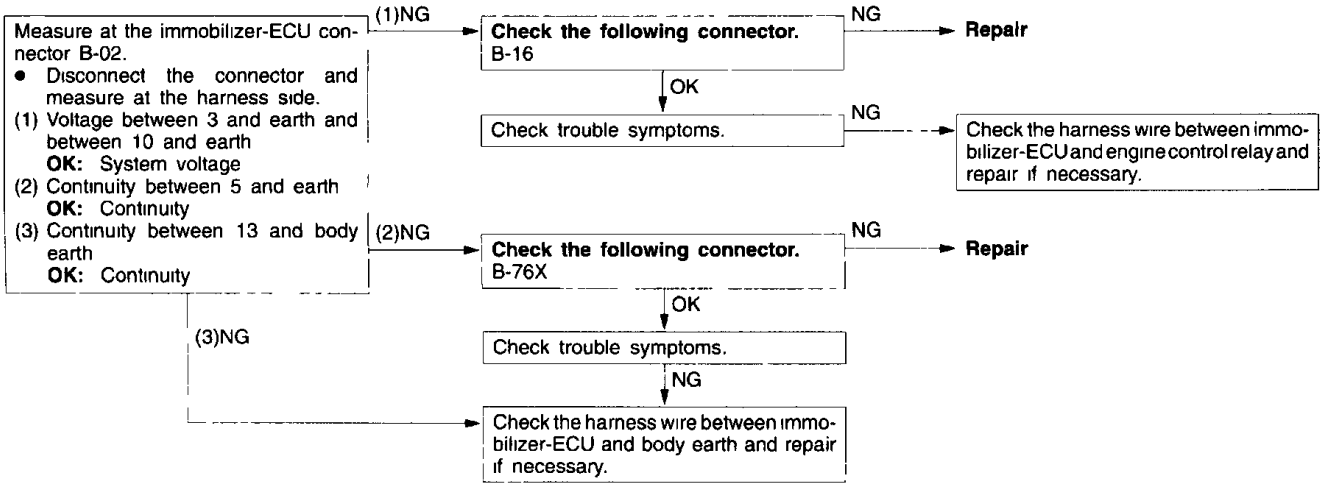
Inspection Procedure 4

Engine does not start (cranking but no initial combustion).	Probable cause
If the fuel injectors are not operating, there might be a problem with the MPI system in addition to a malfunction of the immobilizer system. It is normal for this to occur if an attempt is made to start the engine using a key that has not been properly registered.	• Malfunction of the MPI system • Malfunction of the immobilizer-ECU



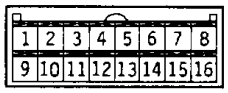
Inspection Procedure 5

Malfunction of the immobilizer-ECU power supply and earth circuit



CHECK AT IMMOBILIZER-ECU

TERMINAL VOLTAGE CHECK CHART



16W0390

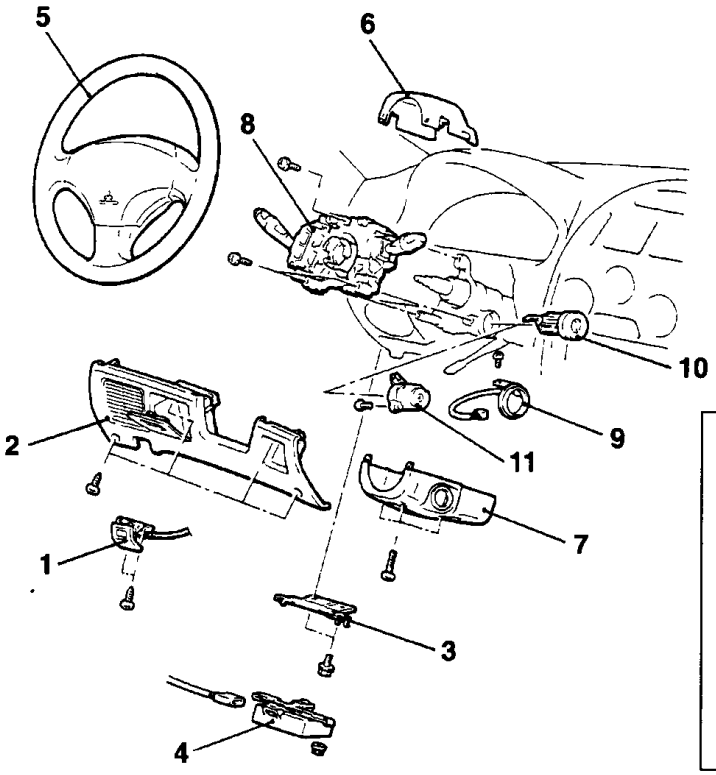
Terminal No.	Signal	Checking requirements	Terminal voltage
3	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
5	Immobilizer-ECU earth	Always	0V
10	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
11	Ignition switch-IG	Ignition switch: OFF	0V
		Ignition switch: ON	System voltage
13	Immobilizer-ECU earth	Always	0V

IGNITION SWITCH AND IMMOBILIZER SYSTEM

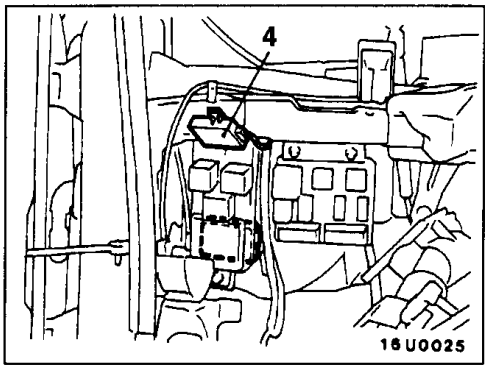
54300210039

REMOVAL AND INSTALLATION

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



16U0116



00003454

Immobilizer-ECU removal steps

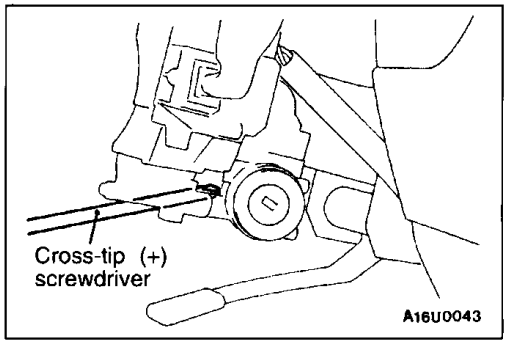
1. Hood lock release handle
2. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
3. Bracket
4. Immobilizer-ECU

Ignition switch and ignition key ring antenna removal steps

1. Hood lock release handle
2. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
5. Steering wheel (Refer to GROUP 37A.)
6. Column cover, upper
7. Column cover, lower
8. Column switch (Refer to GROUP 37A – Steering Wheel and Shaft.)
9. Ignition key ring antenna

◀A▶

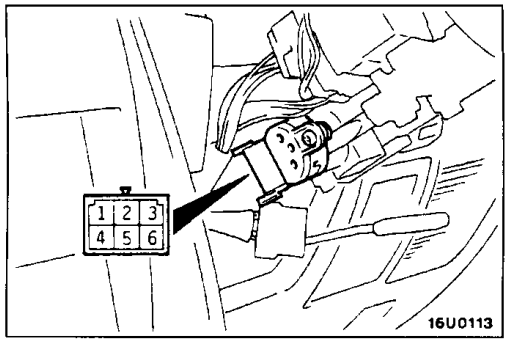
10. Steering lock cylinder
11. Ignition switch



REMOVAL SERVICE POINTS

◀A▶ STEERING LOCK CYLINDER REMOVAL

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



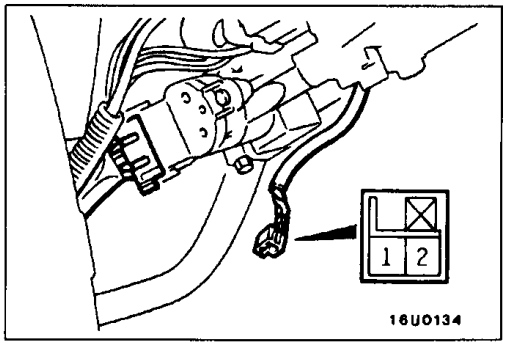
INSPECTION

54300220032

IGNITION SWITCH CONTINUITY CHECK

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

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



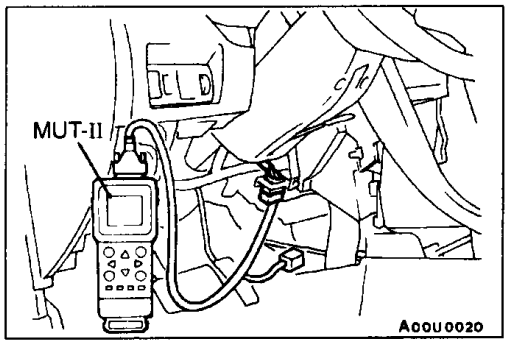
IGNITION KEY RING ANTENNA CONTINUITY CHECK

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

ID CODE REGISTRATION METHOD 54300810017

If using an ignition key that has just been newly purchased, or if the immobilizer-ECU has been replaced, you will need to register the ID codes for each ignition key being used into the immobilizer-ECU. (A maximum of eight different ID codes can be registered.)
Moreover, when the immobilizer-ECU has been replaced, you will need to use the MUT-II to register the ID number that the user specifies into the immobilizer-ECU. (Refer to the MUT-II instruction manual for instructions on using the MUT-II.)

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



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

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

(2) Use the ignition key that is to be registered to turn the ignition switch to the ON position.
(3) Use the MUT-II to register the ID code. If you are registering two or more codes, use the next key to be registered to turn the ignition switch to the ON position without disconnecting the MUT-II.
(4) Disconnect the MUT-II. This completes the registration operation.

COMBINATION METERS

54300030031

SERVICE SPECIFICATIONS

Items			Standard value
Speedometer indication error km/h(mph)		40 (20)	40–48 (20–25)
		80 (40)	80–92 (40–47)
		120 (60)	120–136 (60–69)
		160 (80)	160–180 (80–91)
		– (100)	– (100–114)
Tachometer indication error r/min	Vehicles with SOHC engine	700	±100
		3,000	±150
		5,000	±250
		6,000	±300
	Vehicles with DOHC engine	700	±100
		3,000	+225, –100
		5,000	+325, –125
		7,000	+400, –100
Fuel gauge unit resistance Ω	Float point F		7.9–14.6
	Float point E		107.9–118.9
Fuel gauge unit float height mm	A (Float point F)		142.4
	B (Float point E)		28
Fuel gauge resistance Ω	Power supply and earth		122–153
	Power supply and fuel gauge		27–35
	Fuel gauge and earth		95–119
Engine coolant temperature gauge resistance Ω	Power supply and earth		185–227
	Power supply and engine coolant temperature gauge		54–58
	Engine coolant temperature gauge and earth		239–285
Engine coolant temperature gauge unit resistance (at 70°C) Ω			104±13.5

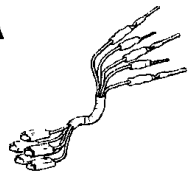
SEALANT

54300050037

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

SPECIAL TOOLS

54300060108

Tool	Number	Name	Use
A  B C D	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Fuel gauge simple check A: Connector pin contact pressure check B, C: Power circuit check D: Commercial tester connection
	MB990784	Ornament remover	Removal of meter hood

TROUBLESHOOTING

54300070064

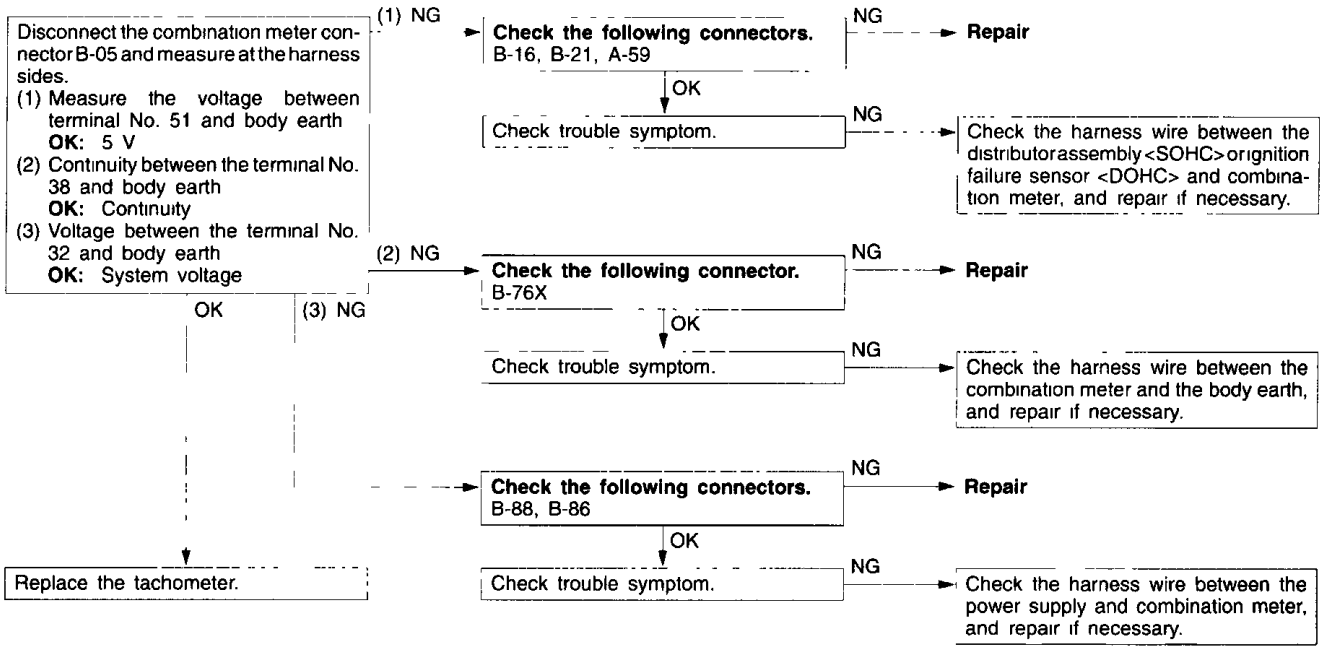
INSPECTION CHART FOR TROUBLE SYMPTOMS

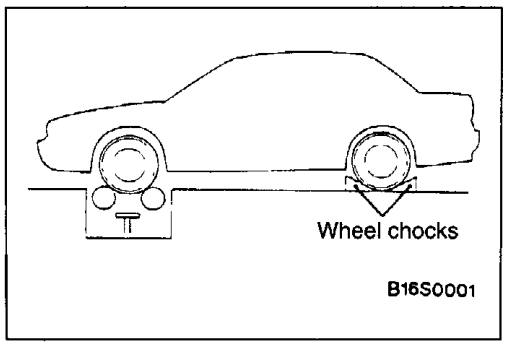
Trouble symptom	Inspection procedure	Reference page
Tachometer does not operate.	1	54-20

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1

Tachometer does not operate.	Probable cause
The ignition signal may not be input from the engine, or there may be a malfunction in the power supply or earth circuit.	• Malfunction of tachometer • Malfunction of harness or connector



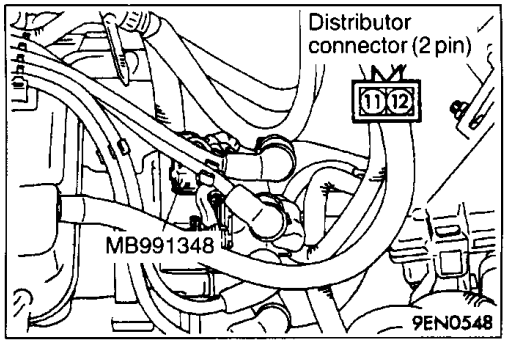


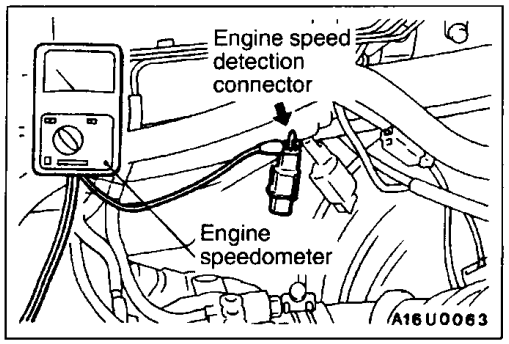
ON-VEHICLE SERVICE

54300090039

SPEEDOMETER CHECK

1. Adjust the pressure of the tyres to the specified level. (Refer to GROUP 31 – Service Specifications.)
2. Set the vehicle onto a speedometer tester and use wheel chocks to hold the rear wheels.





3. Check if the speedometer indicator range is within the standard values.

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

Standard values:

Standard indication km/h (mph)	Allowable range km/h (mph)
40 (20)	40–48 (20–25)
80 (40)	80–92 (40–47)
120 (60)	120–136 (60–69)
160 (80)	160–180 (80–91)
– (100)	– (100–114)

TACHOMETER CHECK

54300100039

<SOHC>

1. Disconnect the distributor connector (2-pin), and connect the special tool in between. All terminals should be connected.
2. Connect a primary voltage-detection type of tachometer to terminal (12) of the distributor connector.
3. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variations are within the standard values.

Standard values:
700 r/min: ±100 r/min
3,000 r/min: ±150 r/min
5,000 r/min: ±250 r/min
6,000 r/min: ±300 r/min

<DOHC>

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach the engine speedometer.

   NOTE
   For tachometer check, 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.

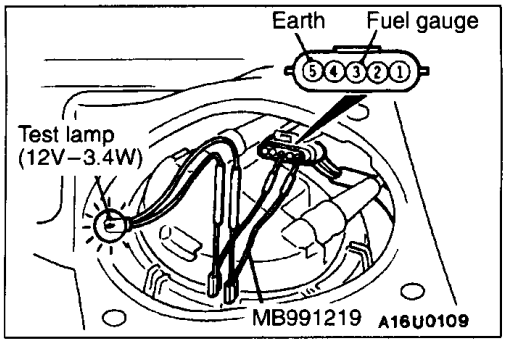
Standard values:
700 r/min. : ±100 r/min.
3,000 r/min : +225 r/min, –100 r/min
5,000 r/min : +325 r/min, –125 r/min
7,000 r/min : +400 r/min, –100 r/min

FUEL GAUGE SIMPLE CHECK

54300110032

Remove the fuel gauge unit connector.
↓
Use the special tool to connect a test lamp (12 V – 3.4 W) to the harness connector.
↓
When the ignition switch is turned to ON, the test lamp illuminates. —OK→ The needle of the fuel gauge moves. —OK→ Replace the fuel gauge unit.
↓ NG
Repair the harness.

The needle of the fuel gauge moves. —NG→ Replace the fuel gauge.



FUEL GAUGE UNIT CHECK

54300120059

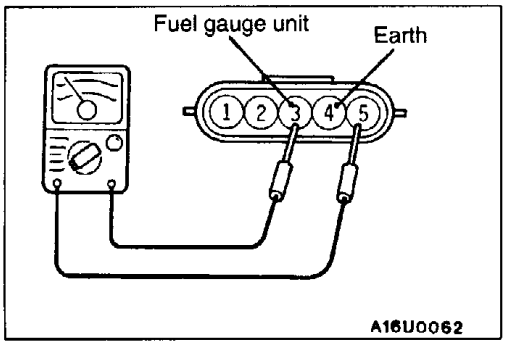
Remove the fuel gauge unit from the fuel tank.
(Refer to GROUP 13F.)

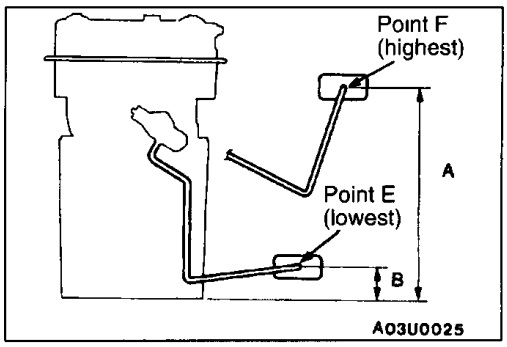
FUEL GAUGE UNIT RESISTANCE

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

   Standard value:
   Point F: 7.9–14.6 Ω
   Point E: 107.9–118.9 Ω

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





FUEL GAUGE UNIT FLOAT HEIGHT

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

Standard value:
A: 142.4 mm
B: 28 mm

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE CHECK

54300140048

Remove the engine coolant gauge unit connector.

↓

Connect a test lamp (12 V – 3.4 W) between the harness side connector and the earth.

↓

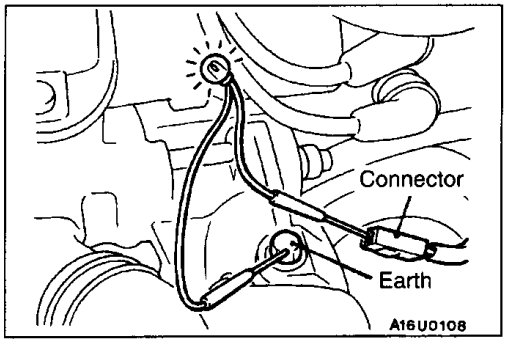
When the ignition switch is turned to ON, the test lamp illuminates

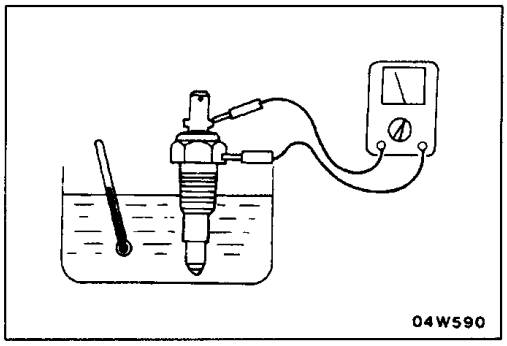
OK → The needle of the engine coolant temperature gauge moves.

NG → Replace the engine coolant temperature gauge.

NG ↓ Repair the harness.

OK ↓ Replace the engine coolant temperature gauge unit.



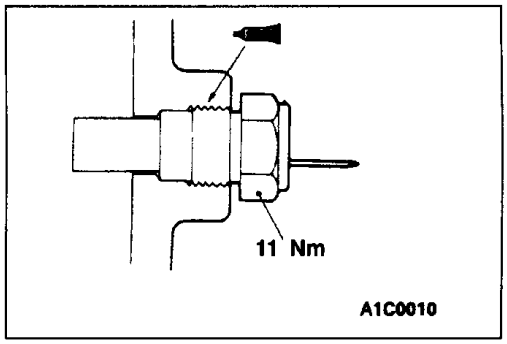


ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK

54300150041

1. Bleed 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±13.5 Ω



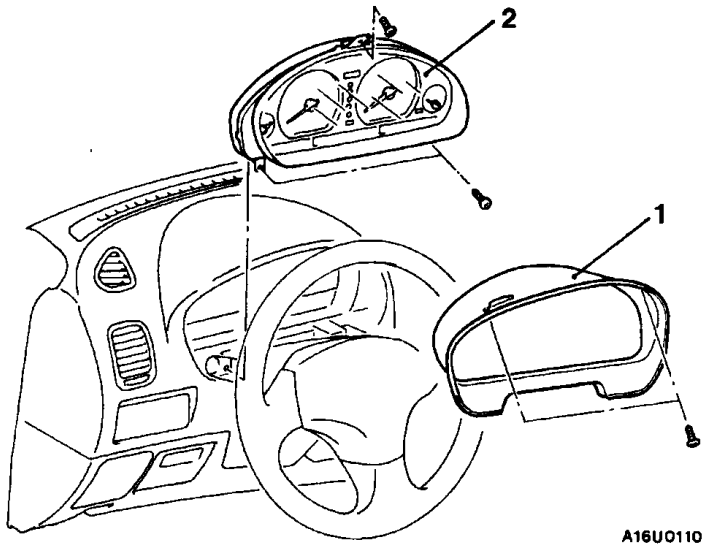
4. After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit.

   Specified sealant:
   3M Adhesive Nut Locking No. 4171 or equivalent
5. Add engine coolant. (Refer to GROUP 14 – On-vehicle Service.)

COMBINATION METERS

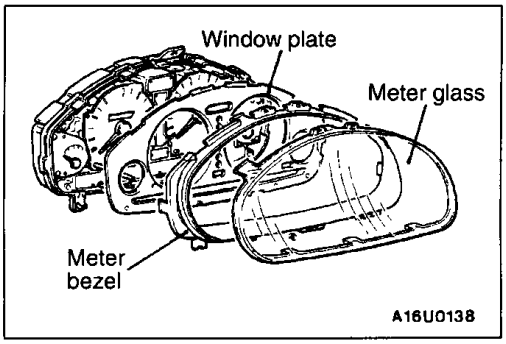
54300290033

REMOVAL AND INSTALLATION



Removal steps

1. Meter hood
2. Combination meter

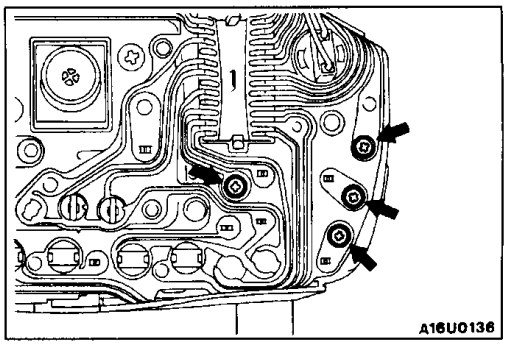


INSPECTION

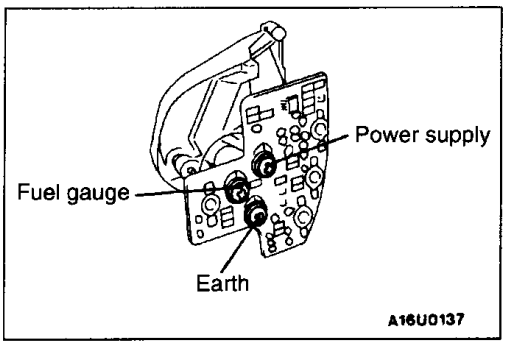
54300300019

FUEL GAUGE RESISTANCE CHECK

(1) Remove the meter glass, meter bezel and window plate.



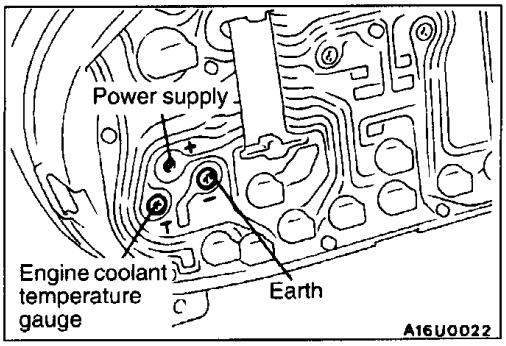
(2) Remove the fuel gauge mounting screws, and then remove the fuel gauge from the meter case.



(3) Use a circuit tester to measure the resistance value between the terminals.

Standard value:

Power supply – Earth: 122–153 Ω
Power supply – Fuel gauge: 27–35 Ω
Fuel gauge – Earth: 95–119 Ω



ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE CHECK

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

NOTE
The terminal positions are indicated by T, (–) and (+).

Standard value:

Power supply (+)–Earth (–): 185–227 Ω
Power supply (+)–Engine coolant temperature gauge (T): 54–58 Ω
Engine coolant temperature gauge(T) –Earth (–): 239–285 Ω

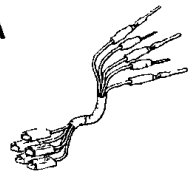
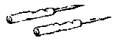
Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.

HEADLAMP AND FRONT TURN-SIGNAL LAMP 54200030052

SERVICE SPECIFICATIONS

Items		Standard value	Limit
Headlamp aiming for low beam	Vertical direction	60 mm below horizontal (H)	–
	Horizontal direction	Position where the 15° sloping section intersects the vertical line (V)	–
Headlamp intensity cd		–	30,000 or more

SPECIAL TOOLS 54200060099

Tool	Number	Name	Use
A  B C D 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Making voltage and resistance measurements during troubleshooting A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
	MB990784	Ornament remover	Removal of switch garnish

TROUBLESHOOTING 54200070054

The special tool (MB991223) should always be used to measure voltages and resistances when carrying out troubleshooting.

INSPECTION CHART FOR TROUBLE SYMPTOMS

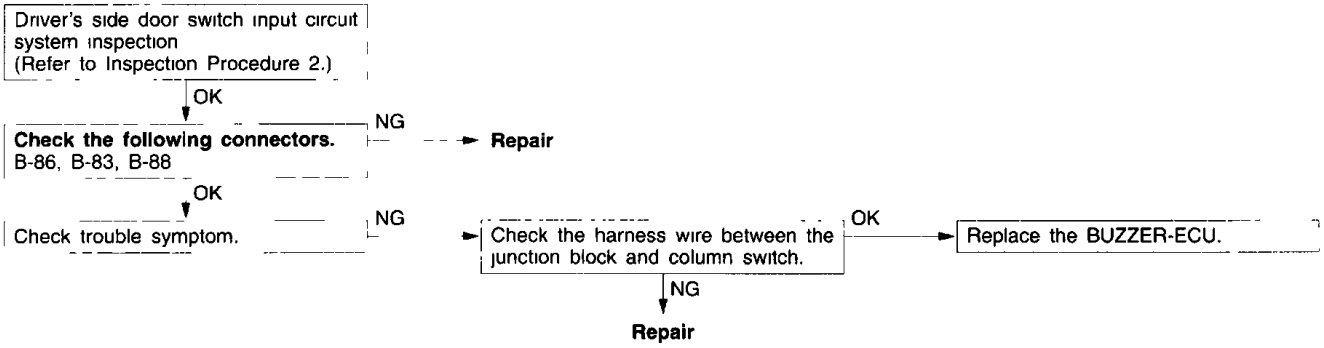
Trouble symptoms	Inspection procedure	Reference page
The lighting monitor buzzer doesn't sound under the following conditions while tail lamps or headlamps illuminate. • When the ignition switch is turned to OFF and the driver's side door is open.	1	54-27
Headlamp leveling does not occur when the headlamp leveling switch is operated.	3	54-28

Trouble symptoms	Inspection procedure	Reference page
The headlamps do not illuminate when the vehicle is in the following condition and the ignition switch is at the ON position. However, the headlamps illuminate when the lighting switch is moved to the HEAD position. <Vehicles with daytime running lamp system> • Lighting switch: OFF • Passing switch: OFF	4	54-29
The headlamps do not switch off when the vehicle is in the following condition and the lighting switch is moved to the TAIL position. <Vehicles with daytime running lamp system> • Ignition switch: OFF • Passing switch: OFF	5	54-30

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

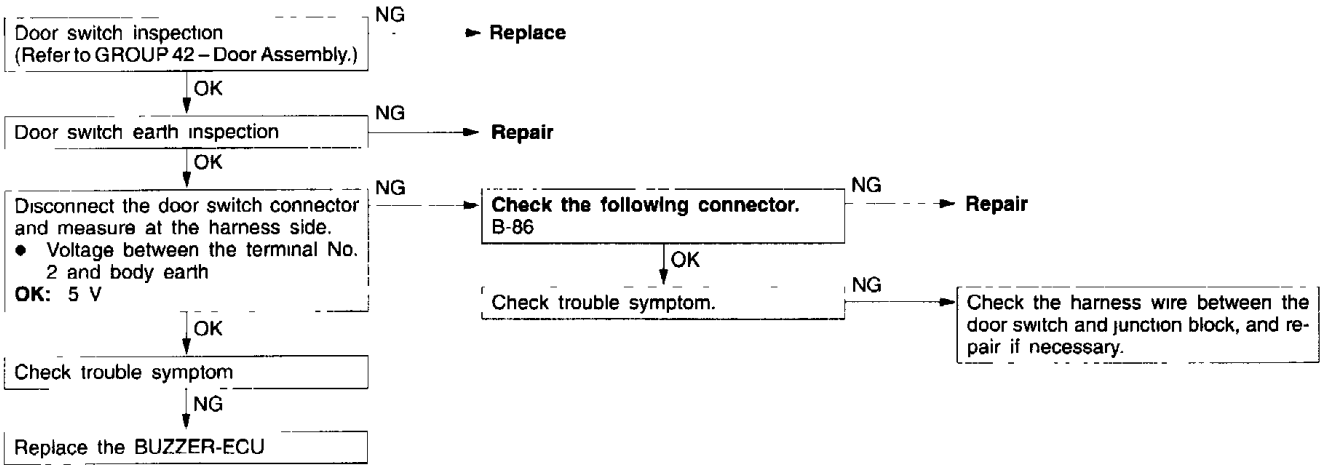
Inspection Procedure 1

The ignition switch is turned to the OFF position and the driver's side door is opened while the tail lamps or headlamps are operating, but the light reminder warning buzzer does not sound.	**Probable cause**
The cause is probably a defective lighting switch input circuit system or a defective driver's side door switch input circuit system.	• Malfunction of driver's side door switch • Malfunction of harness or connector • Malfunction of BUZZER-ECU



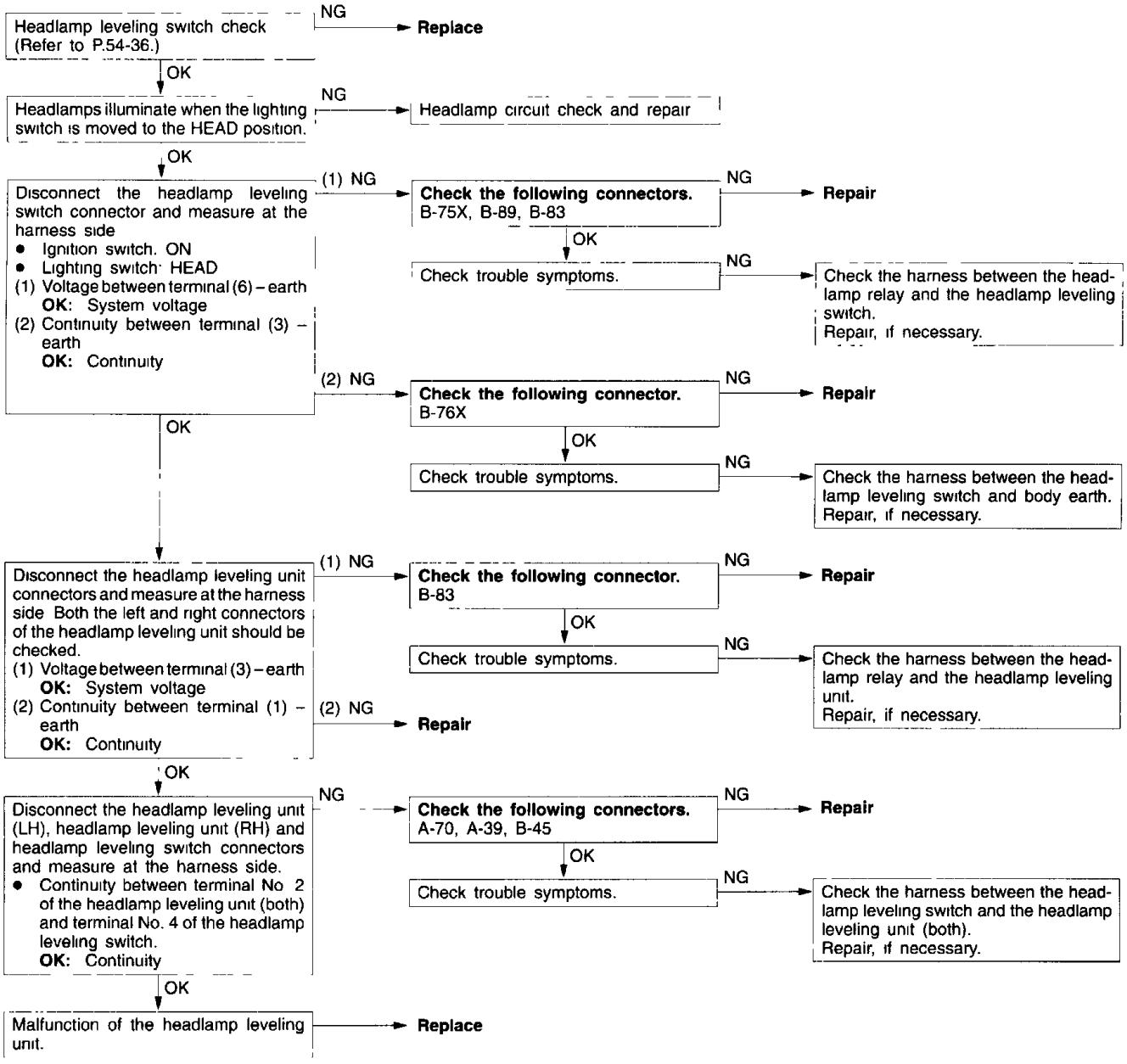
Inspection Procedure 2

Driver's side door switch input circuit system inspection



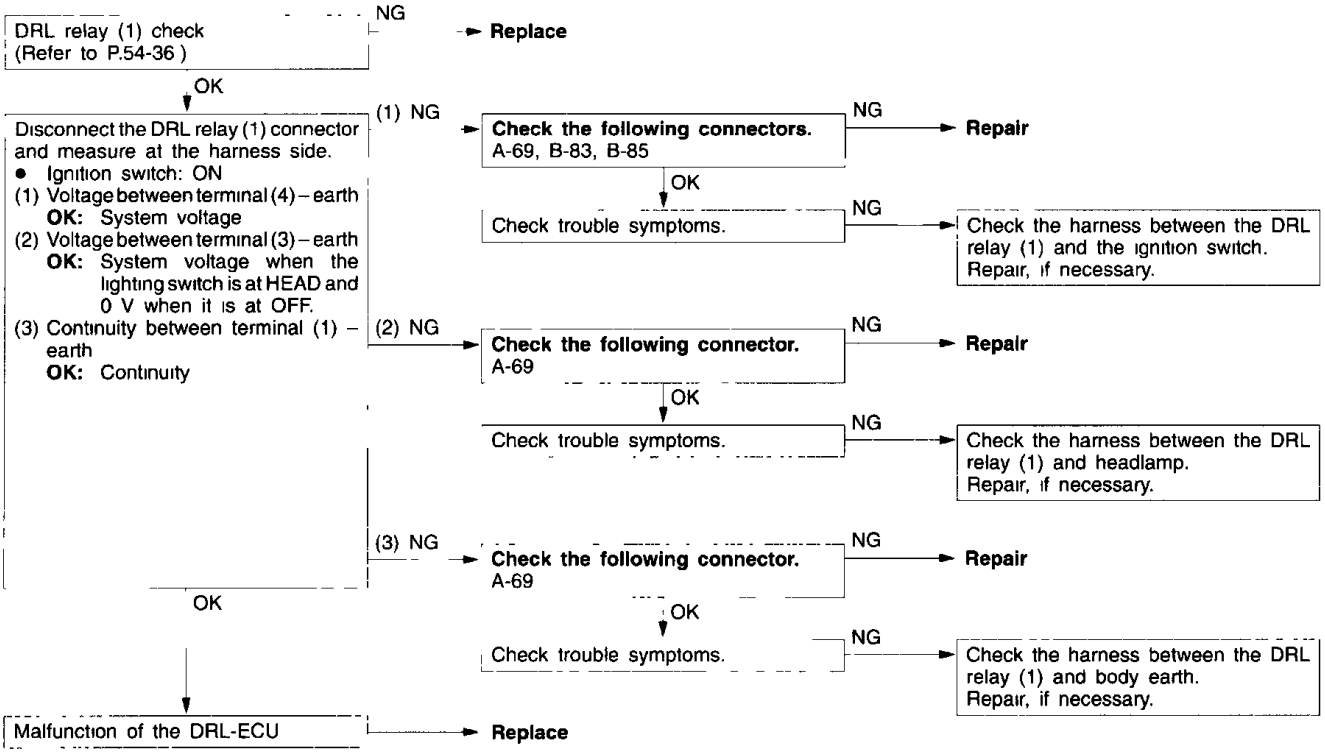
Inspection procedure 3

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



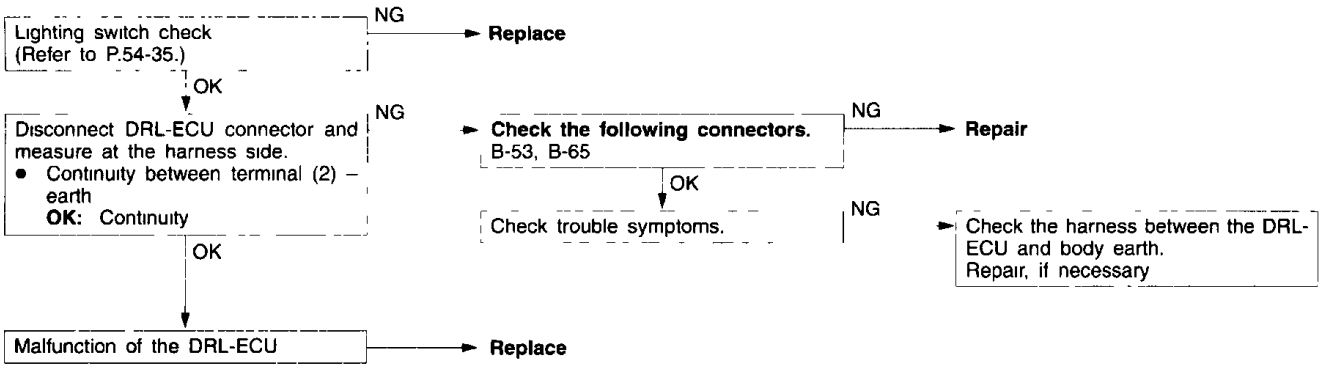
Inspection procedure 4

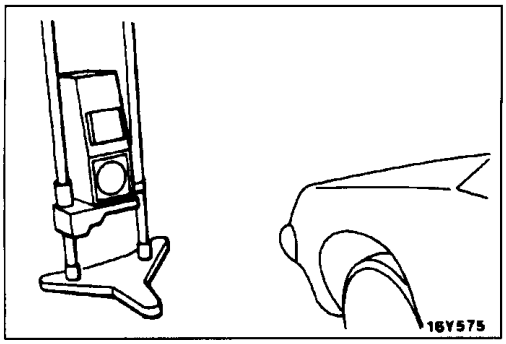
The headlamps do not illuminate when the vehicle is in the following condition and the ignition switch is moved to the ON position. However, they illuminate when the lighting switch is moved to the HEAD position. **<Vehicles with daytime running lamp>** • **Lighting switch: OFF** • **Passing switch: OFF**	**Probable cause**
The cause is probably a malfunction of the daytime running lamp control unit (DRL-ECU) circuit system. If there is a blown fuse, there may also be a short-circuit in a harness.	• Malfunction of fuse • Malfunction of connector • Malfunction of harness • Malfunction of the DRL relay (1) • Malfunction of the DRL-ECU



Inspection procedure 5

The headlamps do not switch off when the vehicle is in the following condition and the lighting switch is moved to the TAIL position. **<Vehicles with daytime running lamp>** • **Ignition switch: OFF** • **Passing switch: OFF**	**Probable cause**
The cause is probably a malfunction of the daytime running lamp control unit (DRL-ECU) circuit system. If there is a blown fuse, there may also be a short-circuit in a harness.	• Malfunction of fuse • Malfunction of connector • Malfunction of harness • Malfunction of the tail lamp relay • Malfunction of the DRL-ECU





ON-VEHICLE SERVICE

54200090036

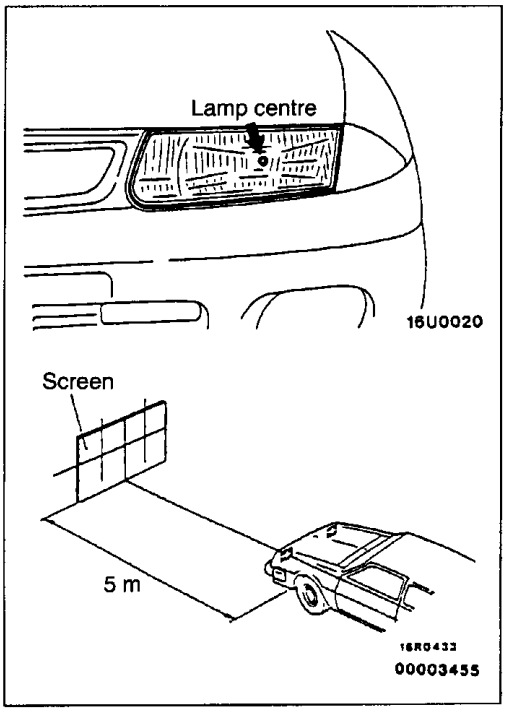
HEADLAMP AIMING

<USING A BEAMSETTING EQUIPMENT>

1. The headlamps should be aimed with the proper beamsetting equipment, and in accordance with the equipment manufacture's instructions.

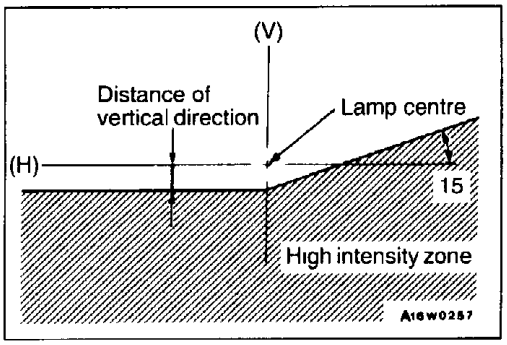
   NOTE
   If there are any regulations pertinent to the aiming of headlamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

2. Alternately turn the adjusting screw to adjust the headlamp aiming. (Refer to P.54-32.)



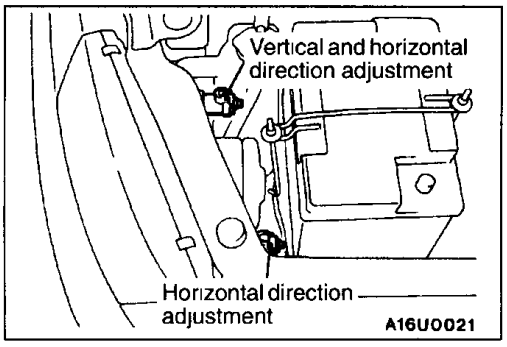
<USING A SCREEN>

1. Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in driver's position.
2. Set the distance between the screen and the centre marks of the headlamps as shown in the illustration.



3. Check if the beam shining onto the screen is at the standard value.

   Standard value:
   (Vertical direction)
   60 mm below horizontal (H)
   (Horizontal direction)
   Position where the 15° sloping section intersects the vertical line (V)



4. Alternately turn the adjusting screw to adjust the headlamp aiming.

Caution
Be sure to adjust the aiming adjustment screw in the tightening direction.

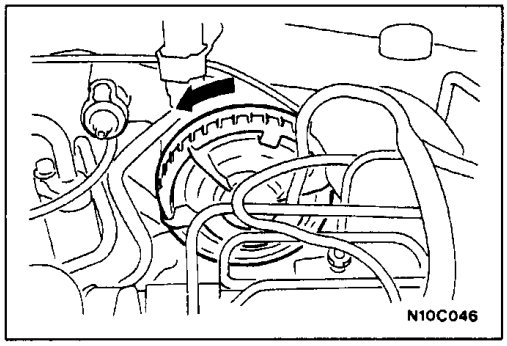
INTENSITY MEASUREMENT 54200100036

Using a photometer, and following its manufacture's instruction manual, measure the headlamp intensity and check to be sure that the limit value is satisfied.

Limit: 30,000 cd or more

NOTE
1. When measuring the intensity, maintain an engine speed of 2,000 r/min, with the battery in the charging condition.
2. There may be special local regulations pertaining to headlamp intensity, be sure to make any adjustments necessary to satisfy such regulations.
3. If an illuminometer is used to make the measurements, convert its values to photometer values by using the following formula.

$I = Er^2$ Where: I = intensity (cd)
E = illumination (lux)
r = distance (m) from headlamps to illuminometer

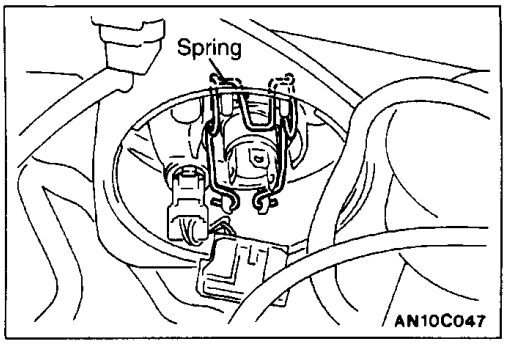


BULB REPLACEMENT

54200130035

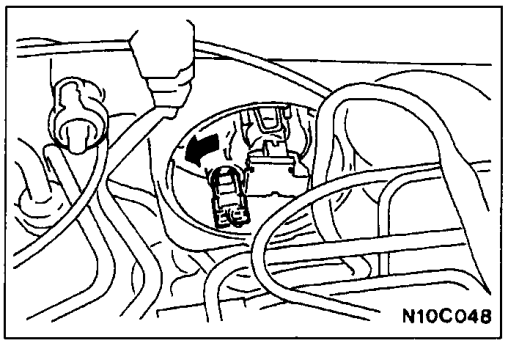
<Headlamp Bulb>

1. Remove the sealing cover by turning it anti-clockwise and disconnect the connector.



2. Unhook the spring which secures the bulb, and then remove the bulb.

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



<Position Lamp Bulb>

1. Remove the sealing cover by turning it anti-clockwise.
2. Remove the lamp socket by turning it anti-clockwise, then pull out the bulb from the socket.

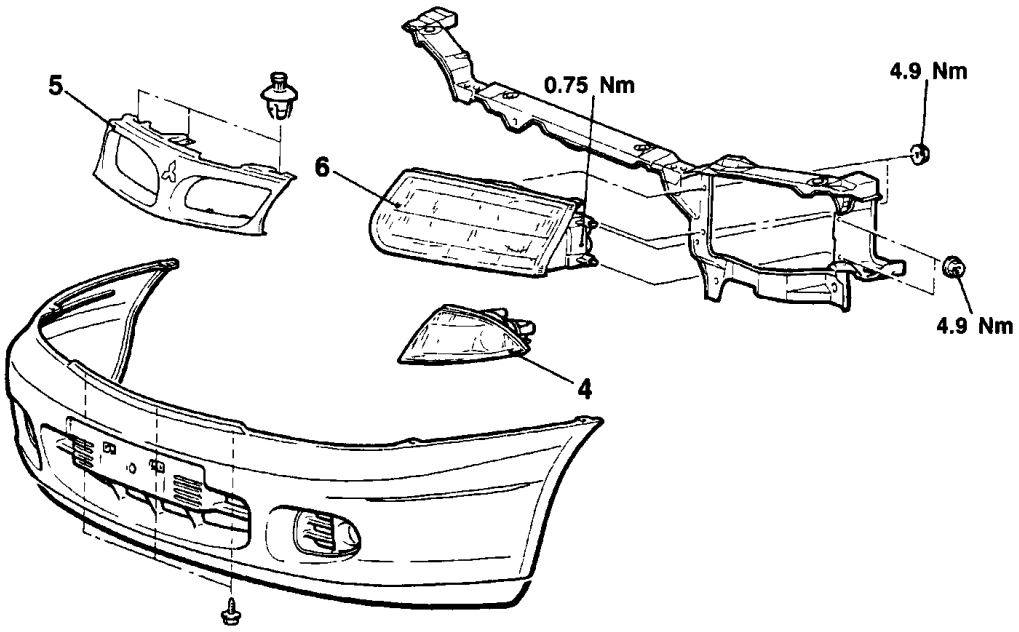
HEADLAMP AND FRONT TURN-SIGNAL LAMP

54200240028

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and installation of radiator reserve tank (When replacing only left side headlamp).

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



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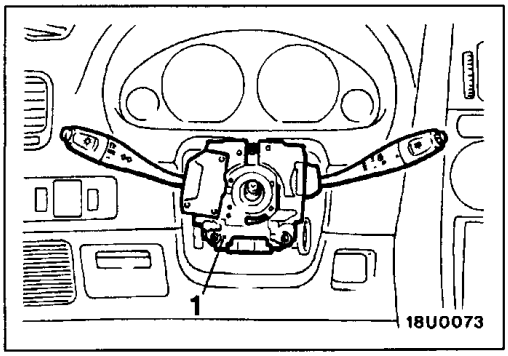
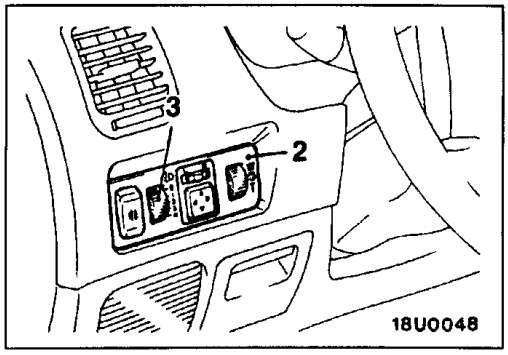




00003456

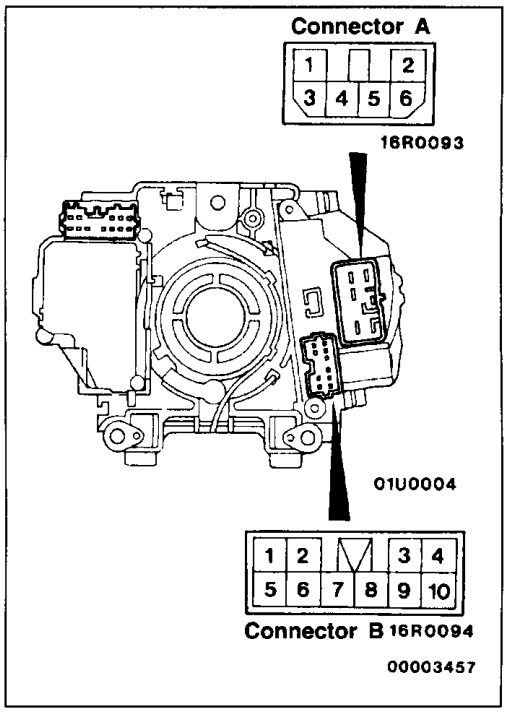
1. Column switch <Lighting switch and dimmer/passing switch> (Refer to GROUP 37A – Steering Wheel and Shaft.)

Headlamp leveling switch removal steps

2. Switch garnish
3. Headlamp leveling switch

Headlamp removal steps

4. Front turn-signal lamp
5. Radiator grille (Refer to GROUP 51 – Front Bumper.)
6. Headlamp



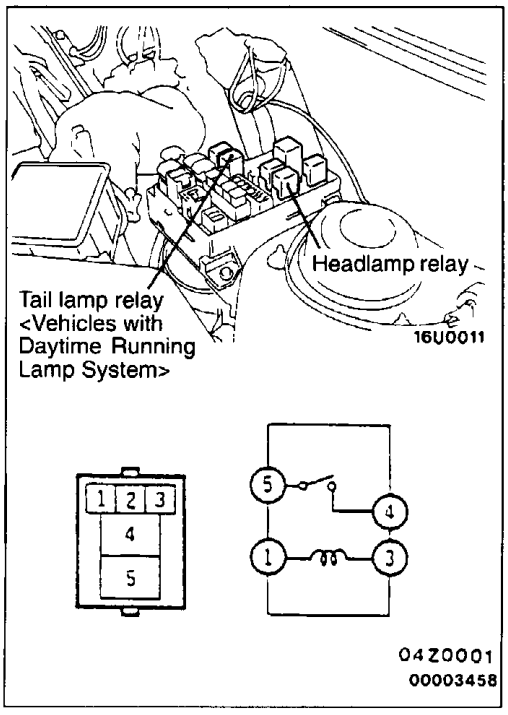
INSPECTION

54200250014

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

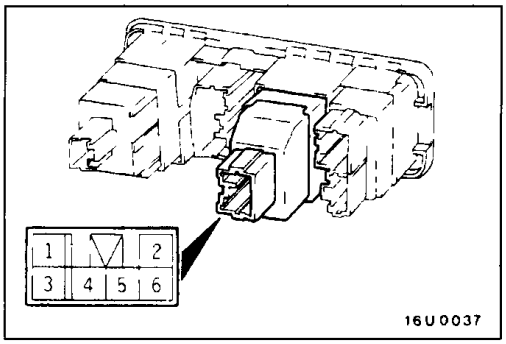
Switch position		Connector A–terminal No.					Connector B–terminal No.					
		1	2	3	4	6	3	5	6	7	8	9
LIGHTING SWITCH	OFF											
	TAIL							○	○			
	HEAD	○				○		○	○			
DIMMER/PASSING SWITCH	LOWER			○	○							
	UPPER				○	○						
	PASSING	○	○		*1 ○	○ *2						
TURN-SIGNAL LAMP SWITCH	RH										○	○
	OFF											
	LH						○				○	

NOTE
1. *1 indicates continuity when the dimmer switch is in the lower position.
2. *2 indicates continuity when the dimmer switch is in the upper position.



HEADLAMP RELAY AND TAIL LAMP RELAY CHECK

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

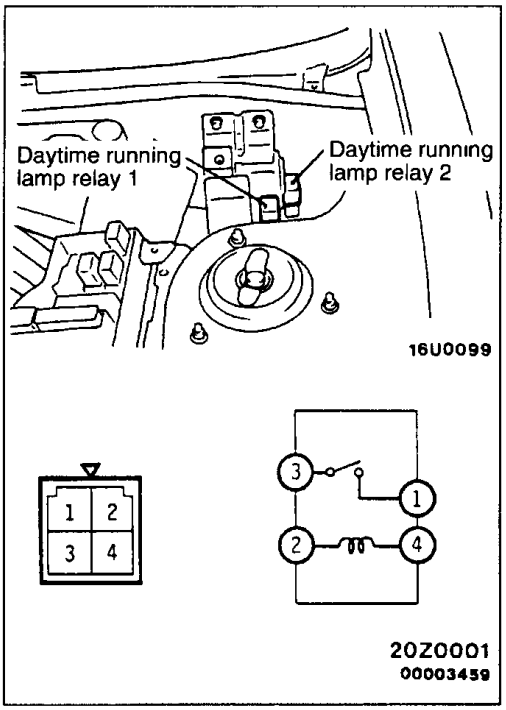


HEADLAMP LEVELING SWITCH CHECK

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

Standard value:

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



DAYTIME RUNNING LAMP RELAY I AND II CHECK

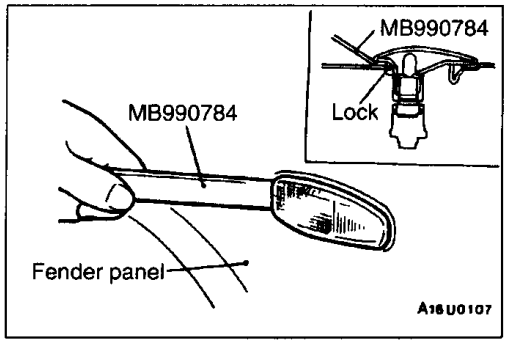
Battery voltage	Terminal No.			
	1	2	3	4
Supplied	○	⊕	○	⊖
Not supplied		○		○

SIDE TURN-SIGNAL LAMP

54200060105

SPECIAL TOOL

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

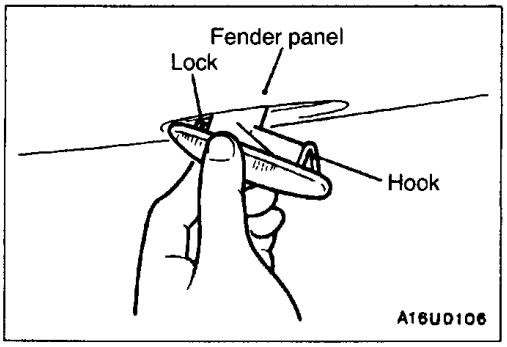


REMOVAL SERVICE POINT

54200330022

◀A▶ SIDE TURN-SIGNAL LAMP REMOVAL

Use a special tool to remove the lock from the fender panel, and then remove the side turn-signal lamp.



INSTALLATION SERVICE POINT

▶A◀ SIDE TURN-SIGNAL LAMP INSTALLATION

(1) Fit the lock into the fender panel.
(2) Push the side turn-signal lamp into the fender, and secure it with the hook.

FRONT FOG LAMP

54200030069

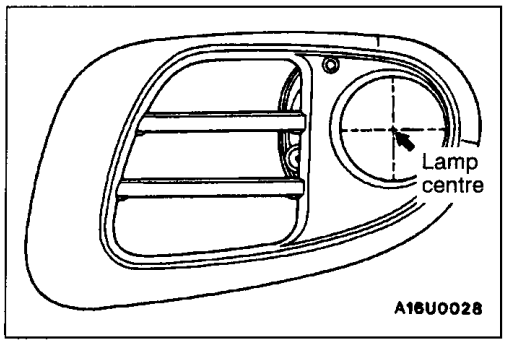
SERVICE SPECIFICATIONS

Items		Standard value
Front fog lamp aiming	Vertical direction	100 mm below horizontal (H)
	Horizontal direction	Parallel to direction of vehicle travel

SPECIAL TOOL

54200060112

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch garnish

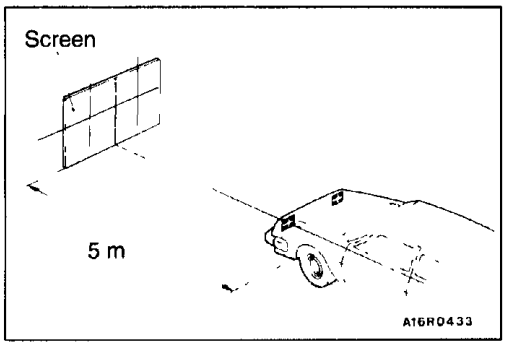


ON-VEHICLE SERVICE

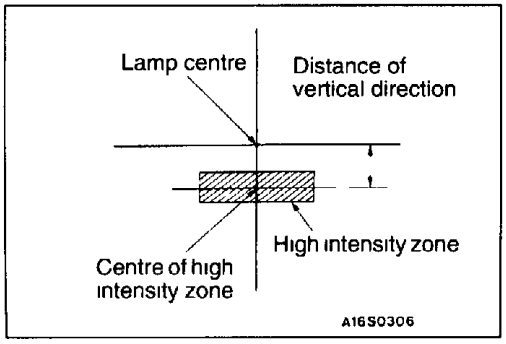
54200110039

FRONT FOG LAMP AIMING

(1) Measure the centre of the fog lamps, as shown in the illustration.

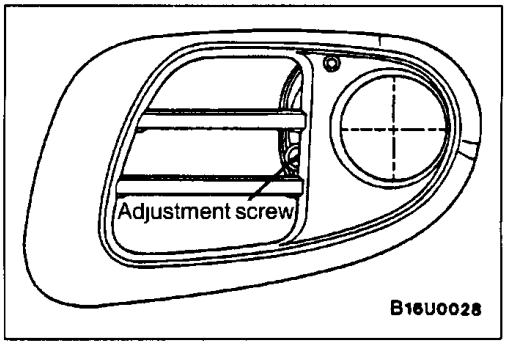


(2) Set the distance between the screen and the centre of the fog lamps as shown in the illustration.
(3) Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in the driver's position.
(4) With the engine running at 2,000 r/min, aim the fog lamp.



(5) Check if the beam shining onto the screen is at the standard value.

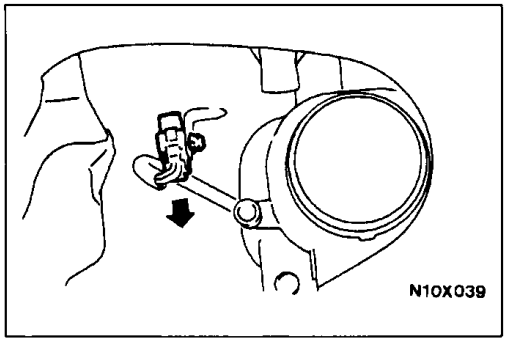
Standard value:
(Vertical direction)
100 mm below horizontal (H)
(Horizontal direction)
Parallel to direction of vehicle travel



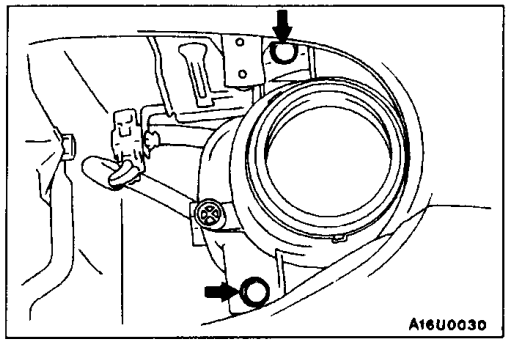
NOTE
The horizontal direction is non-adjustable. If the deviation of the light beam axis exceeds the standard value, check to be sure that the mounting location or some other point is not defective.

Caution
When making the aiming adjustment, be sure to mask those lamps which are not being adjusted.

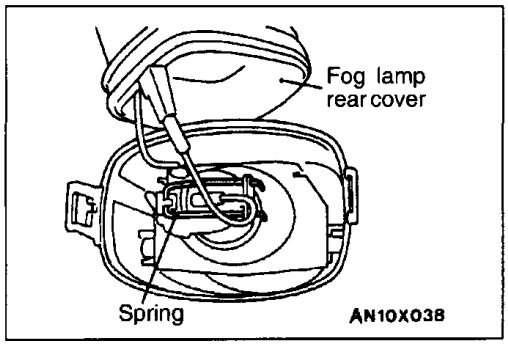
BULB REPLACEMENT 54200130042



(1) Remove the fog lamp cover.
(2) Disconnect the connector which is secured to the fog lamp bracket.



(3) Remove the fog lamp unit.



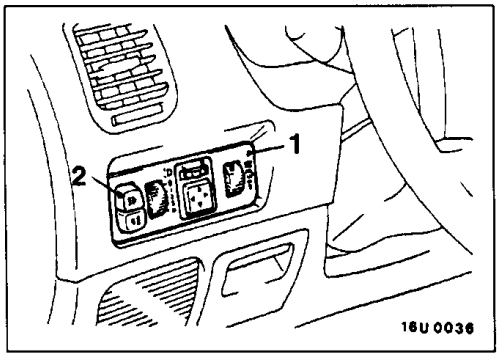
(4) Undo the fog lamp rear cover.
(5) Unhook the spring which secures the bulb and then remove the bulb.

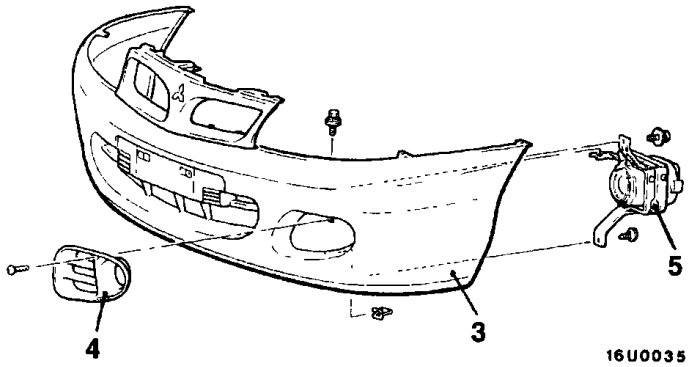
Caution
Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.

FRONT FOG LAMP

54200150031

REMOVAL AND INSTALLATION





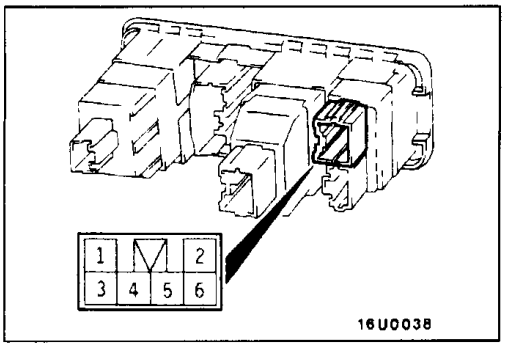
Front fog lamp switch removal steps

1. Switch garnish
2. Front fog lamp switch

Front fog lamp removal steps

3. Front bumper (Refer to GROUP 51.)
4. Fog lamp cover
5. Front fog lamp assembly

NOTE
For the fog lamp unit removal procedure, refer to P.54-39.



INSPECTION

54200160010

FRONT FOG LAMP SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1		2	3	4	5	6
OFF		ILL					
ON		ILL					

REAR COMBINATION LAMP, REAR LID LAMP

54200060129

SPECIAL TOOL

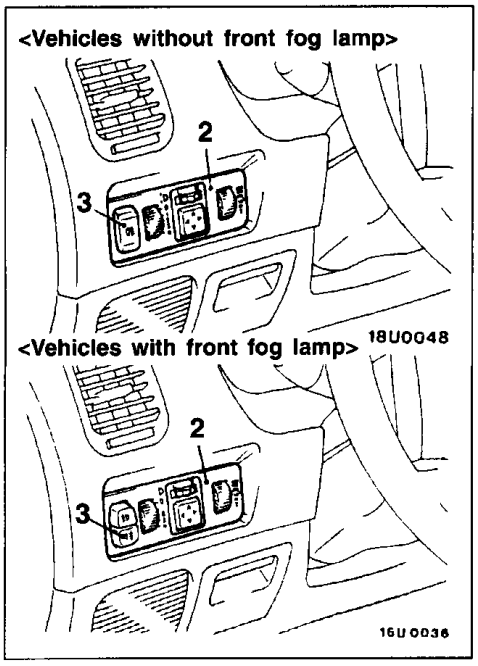
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch garnish

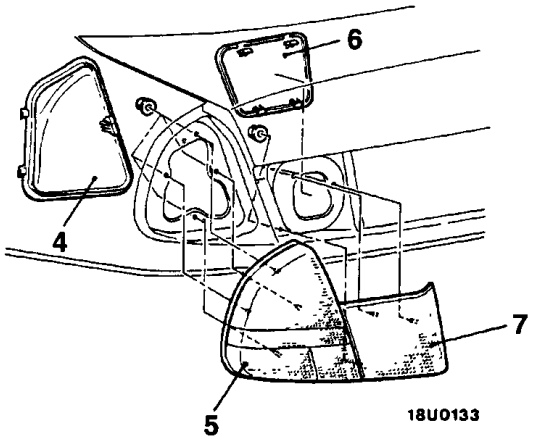
REAR COMBINATION LAMP, REAR LID LAMP

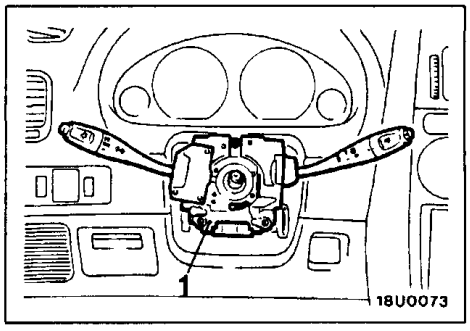
54200450032

REMOVAL AND INSTALLATION

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







00003461

1. Column switch <Lighting switch and turn-signal lamp switch> (Refer to GROUP 37A – Steering Wheel and Shaft.)

Rear fog lamp switch removal steps

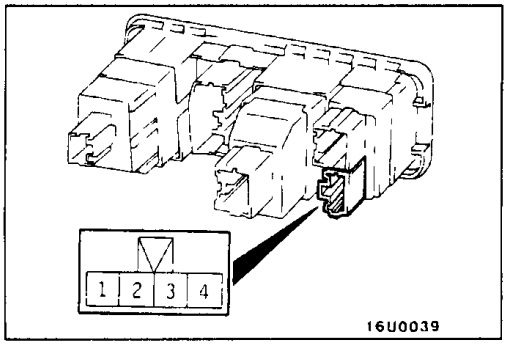
2. Switch garnish
3. Rear fog lamp switch

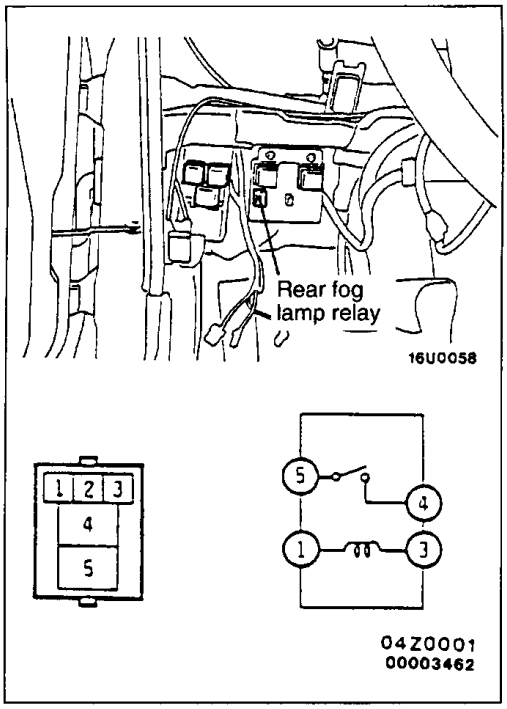
Rear combination lamp removal steps

4. Lamp lid
5. Rear combination lamp assembly

Rear lid lamp removal steps

6. Lamp lid
7. Rear lid lamp assembly





INSPECTION

54200460011

REAR FOG LAMP SWITCH CHECK

Switch position	Terminal No.				
	1	2	3		4
OFF				ILL	
ON				ILL	

REAR FOG LAMP RELAY CHECK

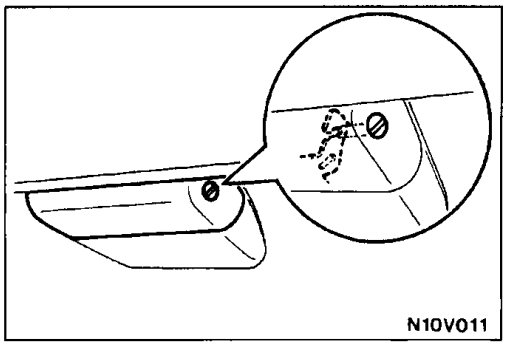
Battery voltage	Terminal No.			
	1	3	4	5
Supplied	⊕	⊖		
Not supplied				

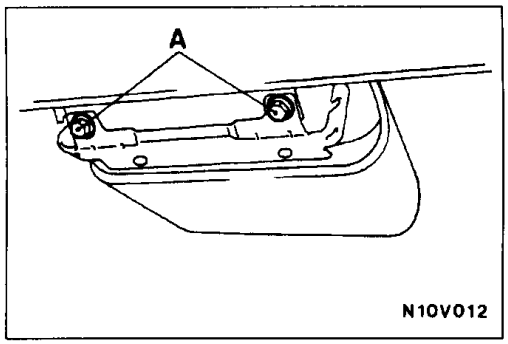
LIGHTING SWITCH AND TURN-SIGNAL LAMP SWITCH CHECK

Refer to P.54-35.

TAIL LAMP RELAY CHECK <Vehicles with Daytime Running Lamp System>

Refer to P.54-35.


N10V011



N10V012

HIGH MOUNTED STOP LAMP

54200510037

REMOVAL SERVICE POINT

HIGH MOUNTED STOP LAMP REMOVAL

1. Set so that the clip groove is facing as shown in the illustration, and then remove the cover.

2. Remove the two bolts (A) and then remove the high mounted stop lamp.

RHEOSTAT

54200060136

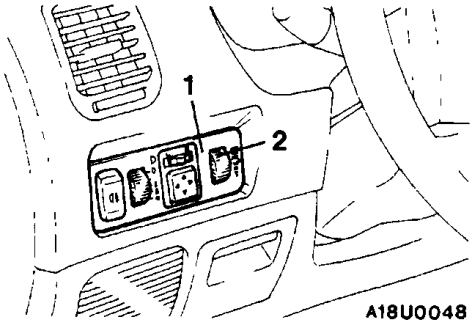
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch garnish

RHEOSTAT

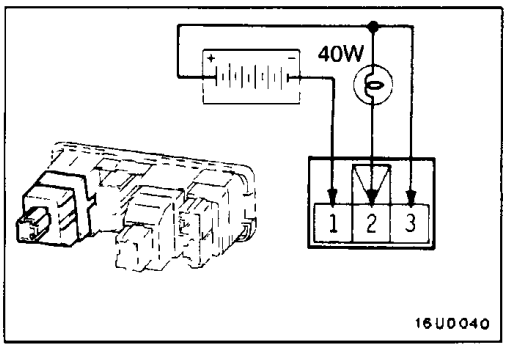
54200600031

REMOVAL AND INSTALLATION



Removal steps

1. Switch garnish
2. Rheostat



INSPECTION

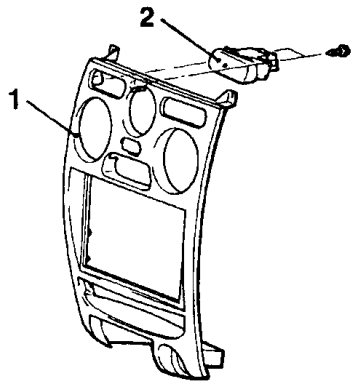
54200610034

(1) Connect the battery and the test bulb (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

54200660039

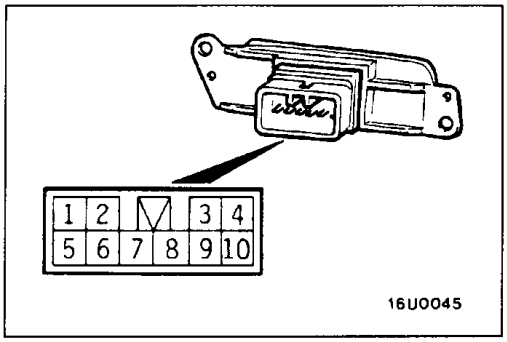
REMOVAL AND INSTALLATION



A16U0047

Removal steps

1. Center console panel (Refer to GROUP 52A – Floor Console.)
2. Hazard warning lamp switch



INSPECTION

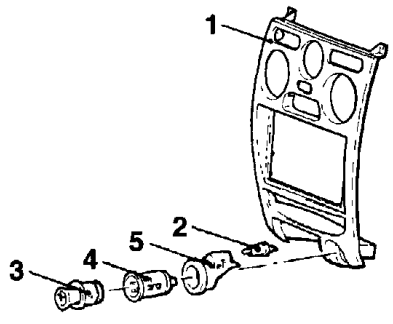
54200670049

Switch position	Terminal No.									
	1	2		3	5	6	7	8	9	10
OFF			ILL							
ON			ILL							

CIGARETTE LIGHTER

54300560035

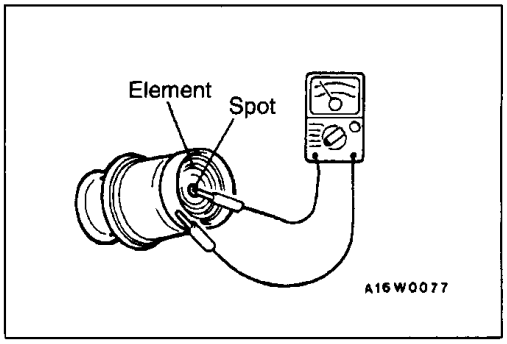
REMOVAL AND INSTALLATION



A16U0048

Removal steps

1. Center console panel (Refer to GROUP 52A – Floor Console.)
2. Bulb
3. Plug
4. Socket
5. Socket case



INSPECTION

54300570038

- 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 circuit tester, check the continuity of the element.

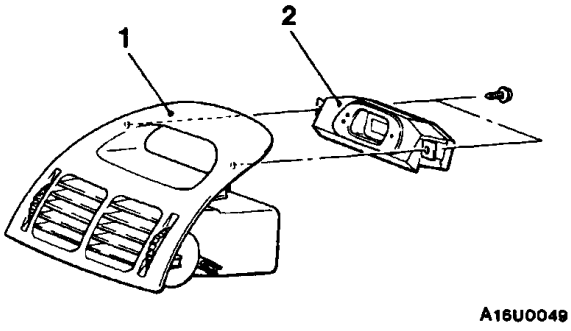
CAUTIONS FOR USE OF THE CIGARETTE LIGHTER SOCKET AS AUXILIARY POWER SOURCE

1. When using a "plug-in" type of accessory, do not use anything with a load of more than 120W.
2. It is recommended that only the lighter be inserted in the receptacle.
   Use of "plug-in" type accessories may damage the receptacle and result in poor retention of the lighter.
3. The specified load should be strictly observed, because overloaded cord burns the ignition switch and harness.

CLOCK

54300590034

REMOVAL AND INSTALLATION



Removal steps

1. Center air outlet assembly (Refer to GROUP 52A – Floor Console.)
2. Clock

RADIO AND TAPE PLAYER

54400070036

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

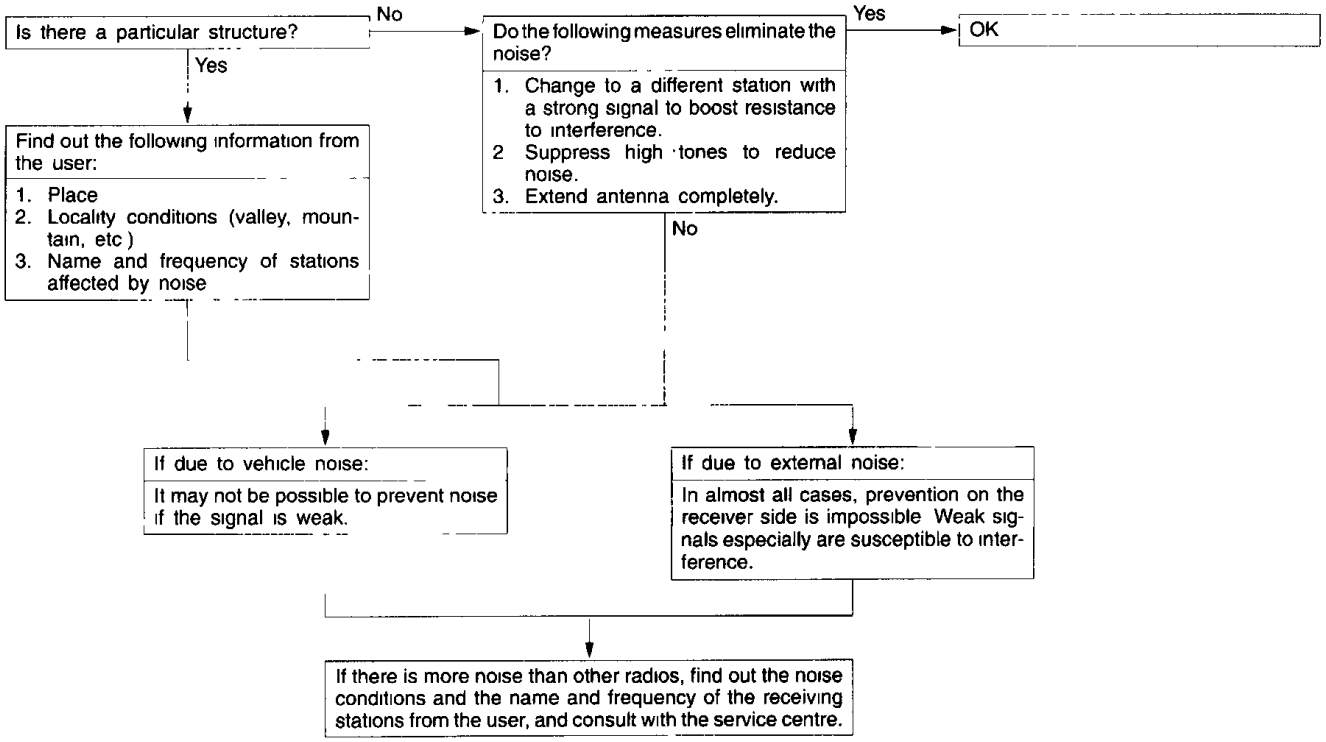
NOTE
Refer to problem symptoms of AM radio for MW radio.

Items	Problem symptom	Relevant chart
Tape player	Cassette tape will not be inserted.	C–1
	No sound.	C–2
	No sound from one speaker.	C–3
	Sound quality is poor, or sound is weak.	C–4
	Cassette tape will not be ejected.	C–5
	Uneven revolution. Tape speed is fast or slow.	C–6
	Faulty auto reverse.	C–7
	Tape gets caught in mechanism.	C–8

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

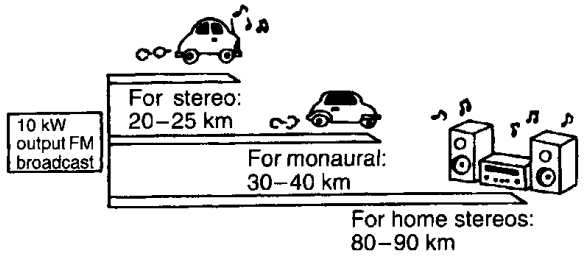
No ↓

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.

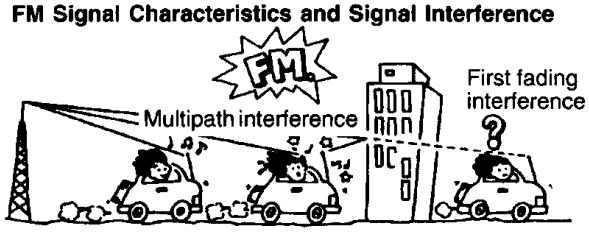
NOTE
About FM waves:
FM waves have the same properties as light, and can be deflected and blocked. Wave reception is not possible in the shadow of obstructions such as buildings or mountains.

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



FM Signal Characteristics and Signal Interference

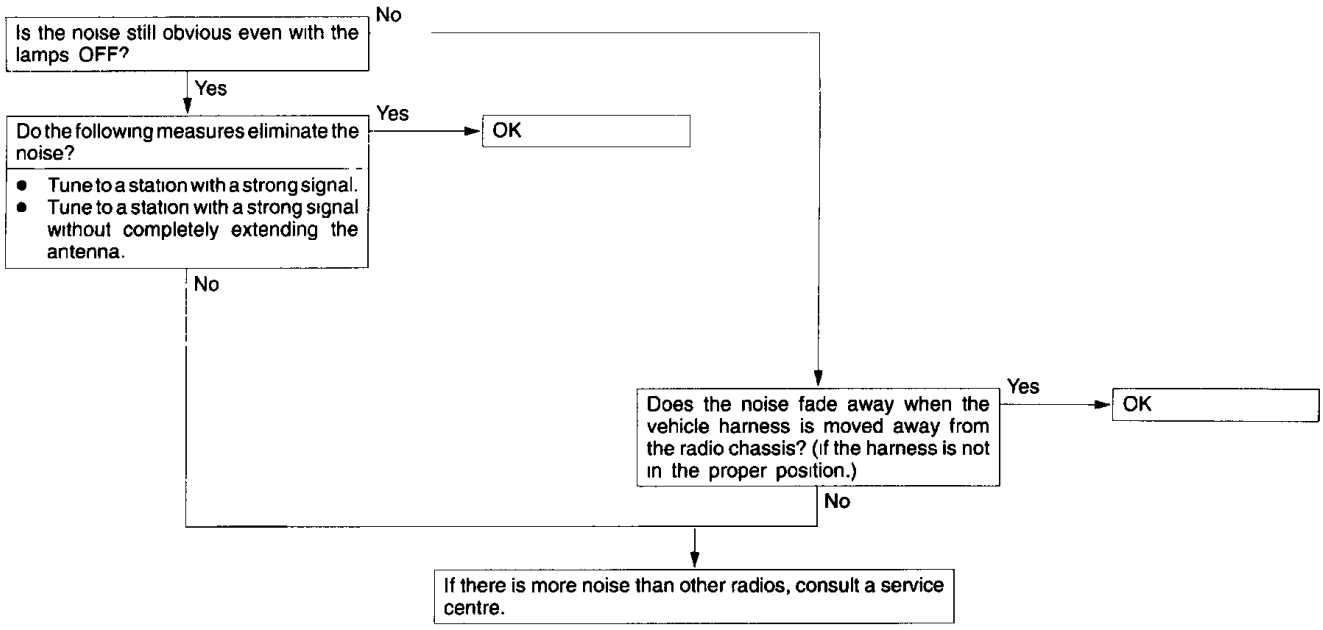


16W0268

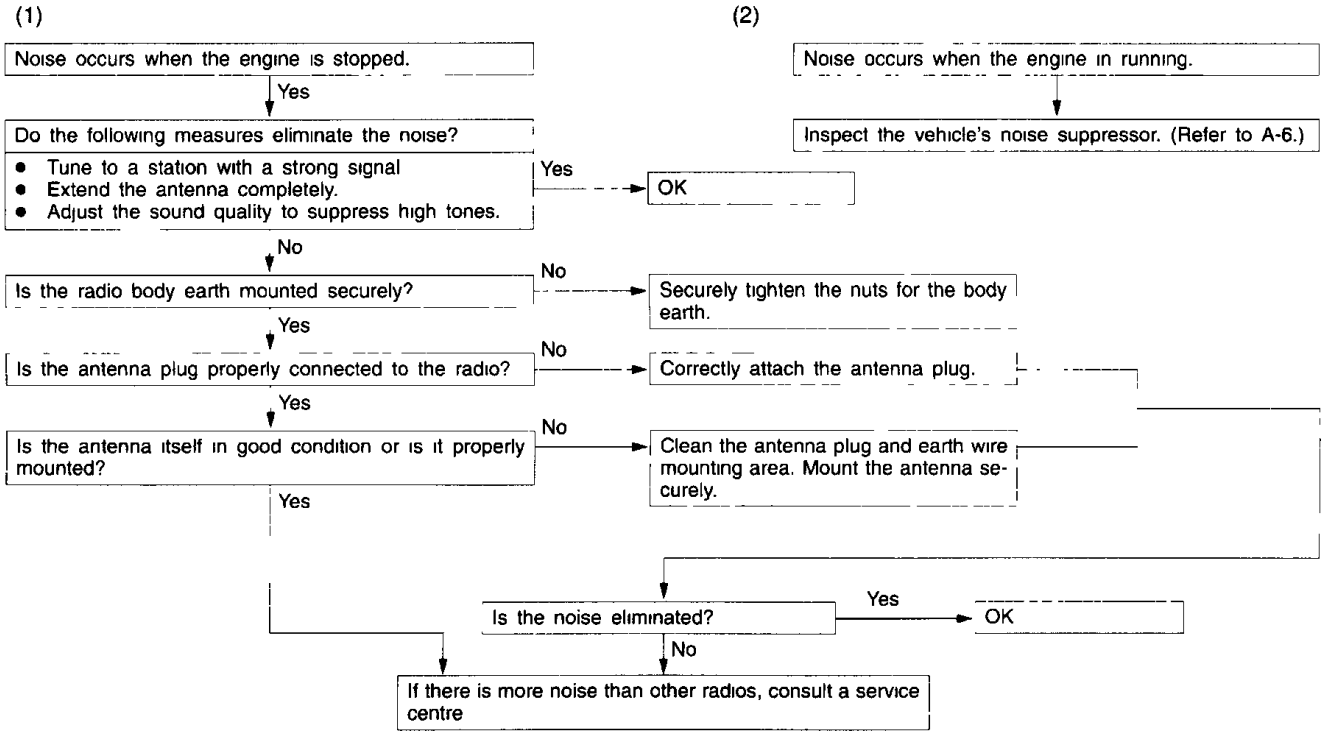
A–3 Mixed with noise, only at night (AM).

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.



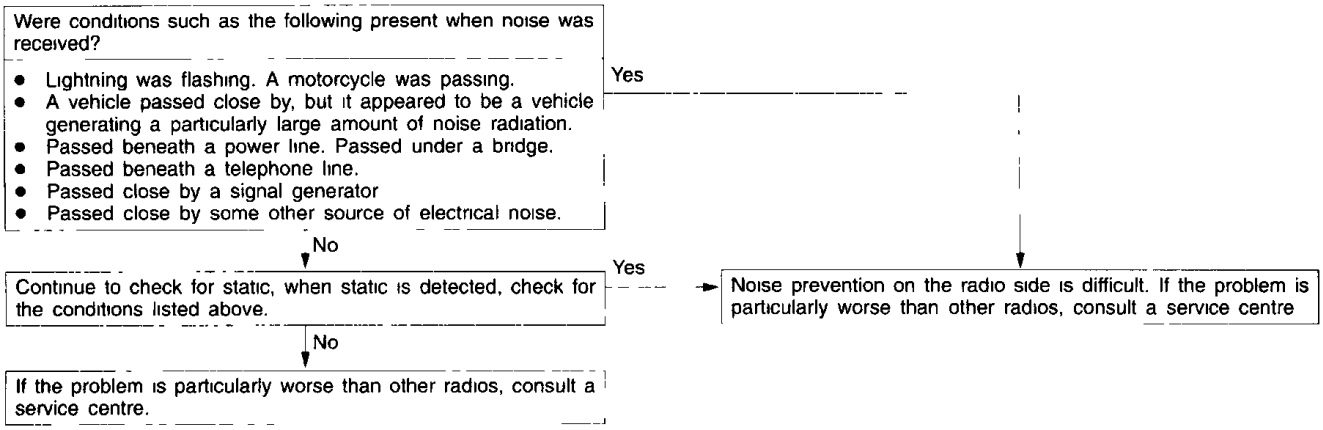
A-4 Broadcasts can be heard but both AM and FM have a lot of noise.



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 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–6 There is noise when starting the engine.

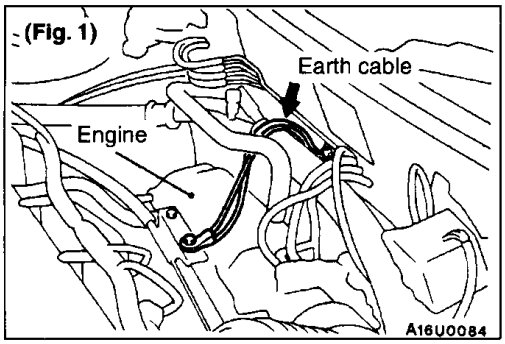
Noise type Sounds are in parentheses ( ).	Conditions	Cause	Remedy
AM, FM: Ignition noise (Popping, snapping, cracking, buzzing)	• Increasing the engine speed causing the popping sound to speed up, and volume decreases. • Disappears when the ignition switch is turned to ACC.	• Mainly due to the spark plugs. • Due to the engine noise.	• Check or replace the earth cable. (Refer to Fig. 1 on P.54-54.) • 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.	Tighten the mounting bolts securely. Cases where the problem is not eliminated by a single response to one area are common, due to several body parts being imperfectly earthed.

Caution

1. **Connecting a high tension cable to the noise filter may destroy the noise filter and should never be done.**
2. **Check that there is no external noise. Since failure caused by this may result in misdiagnosis due to inability to identify the noise source, this operation must be performed.**
3. **Noise prevention should be performed by suppressing strong sources of noise step by step.**

NOTE

1. 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 earth. This suppresses noise by earthing 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.

Are connectors properly connected?
- No → Ensure proper connection
- Yes ↓

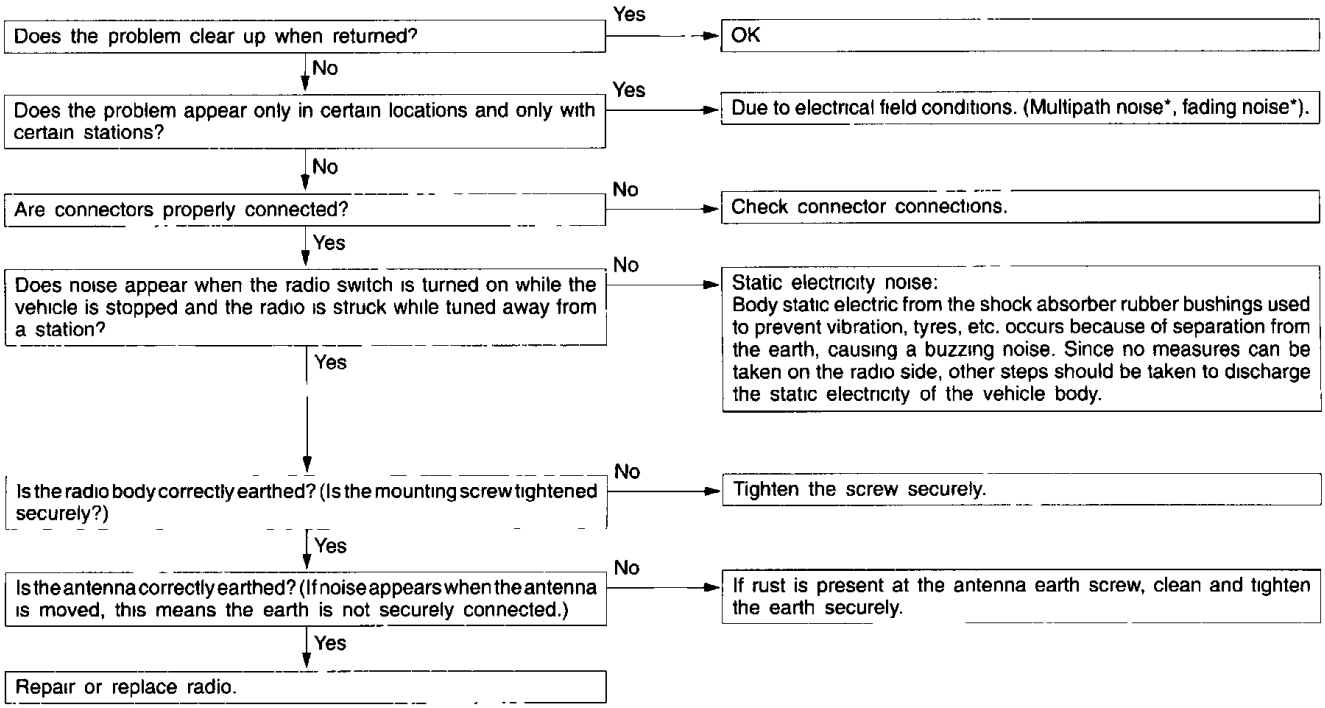
Does noise appear when the radio switch is turned on while the vehicle is stopped and the radio is struck while tuned away from a station?
- No → Static electricity noise: Body static electric from the shock absorber rubber bushings used to prevent vibration, tyres, etc occurs because of separation from the earth, causing a buzzing noise. Since no measures can be taken on the radio side, other steps should be taken to discharge the static electricity of the vehicle body.
- Yes ↓

Is the radio correctly earthed? (Is the mounting screw tightened securely?)
- No → Tighten the screw securely.
- Yes ↓

Is the antenna correctly earthed? (If noise appears when the antenna is moved, this means the earth is not securely connected.)
- No → If rust is present at the antenna earth screw, clean and tighten the earth securely.
- Yes ↓

Repair or replace radio.

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.

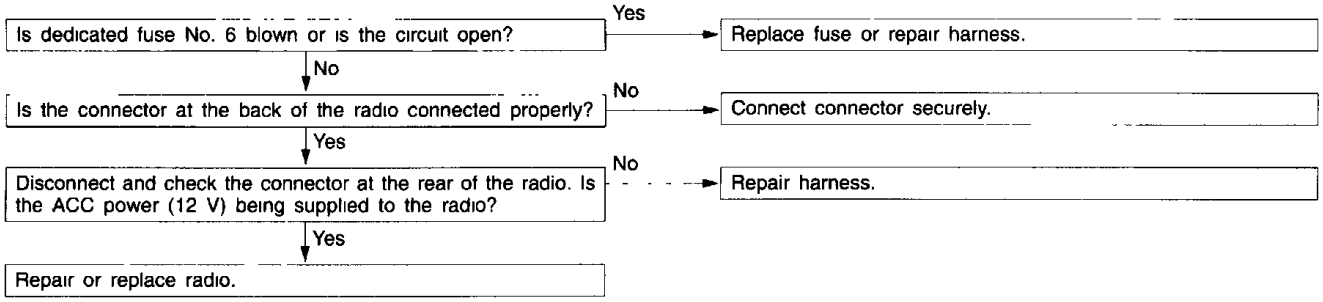
Noise is often created by the following factors, and often the radio is OK when it is checked individually.

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

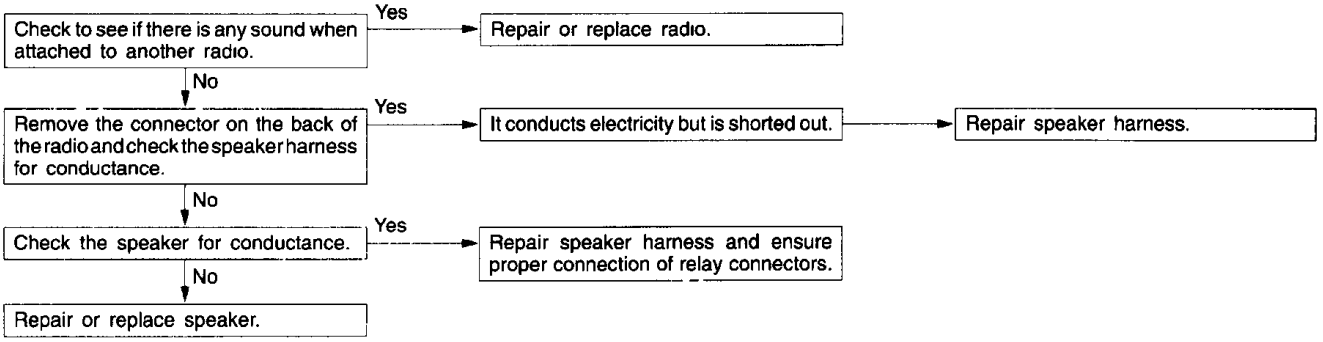
For this reason, if there are still problems with noise even after the measures described in steps A–1 to A–8 have been taken, get information on the factors listed above as well as determining whether the problem occurs with AM or FM, the station names, frequencies, etc., and contact a service centre.

B. RADIO

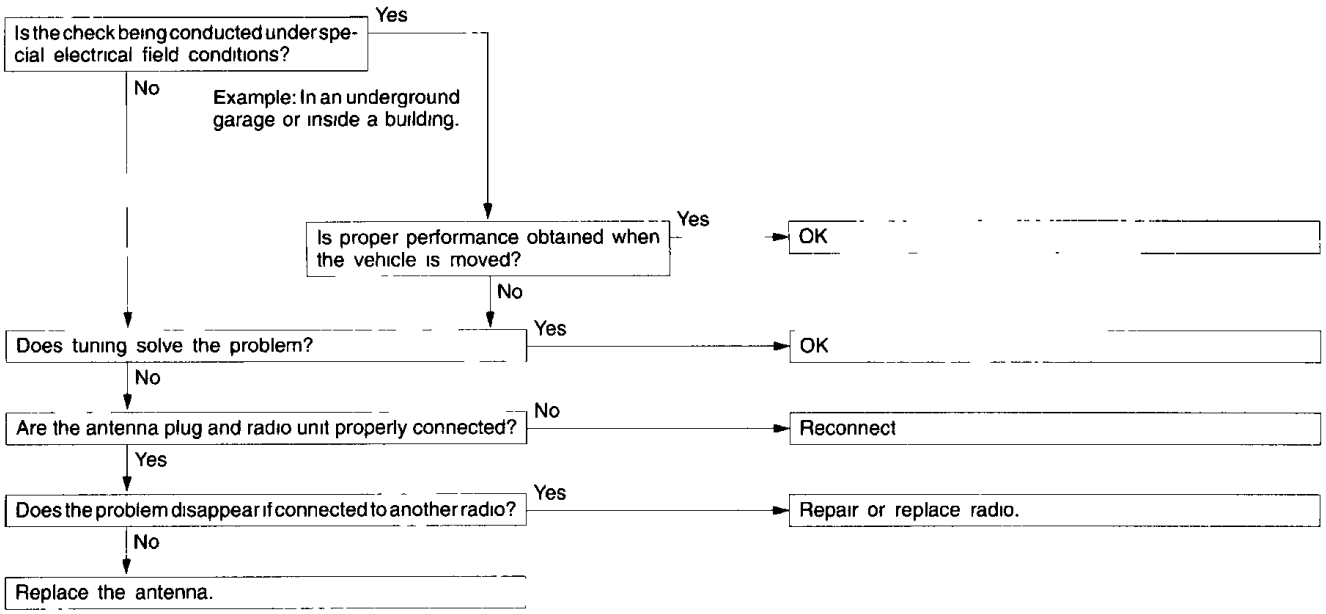
B–1 No power is supplied when the switch is set to ON.



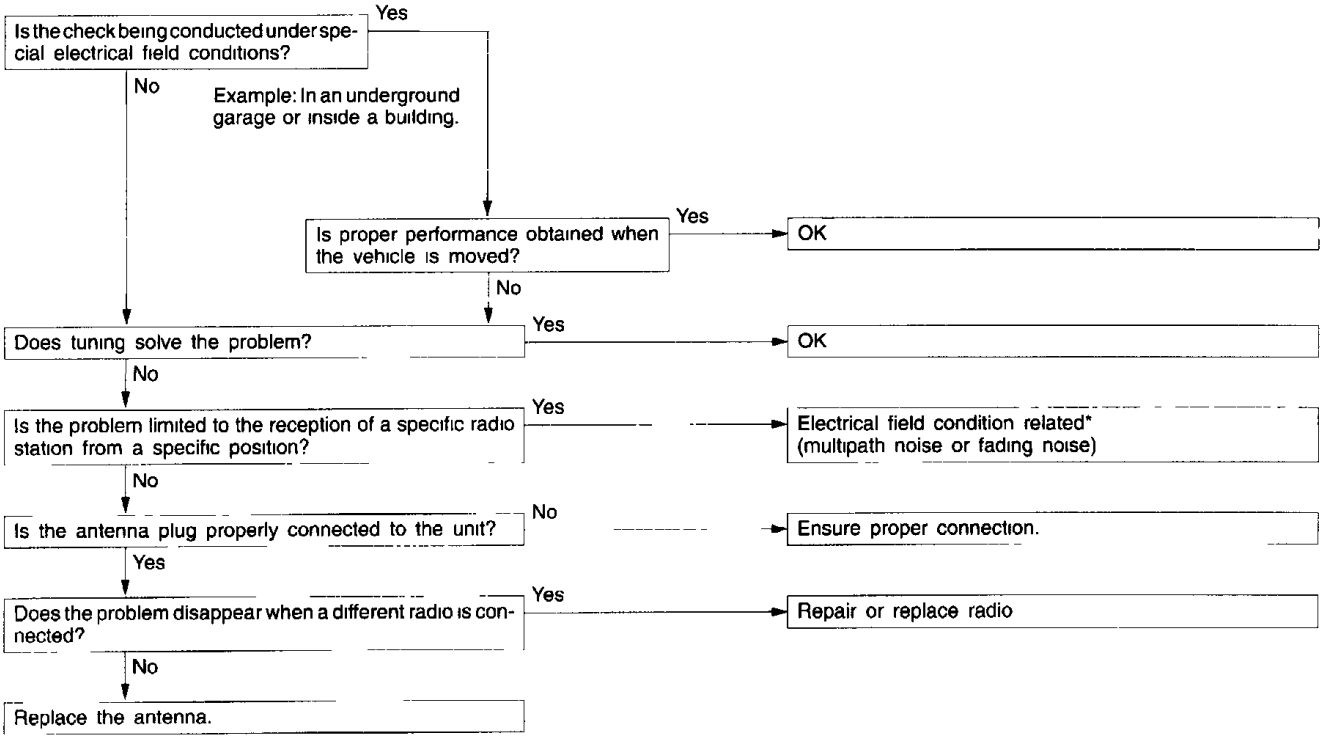
B–2 No sound from one speaker.



B–3 There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.

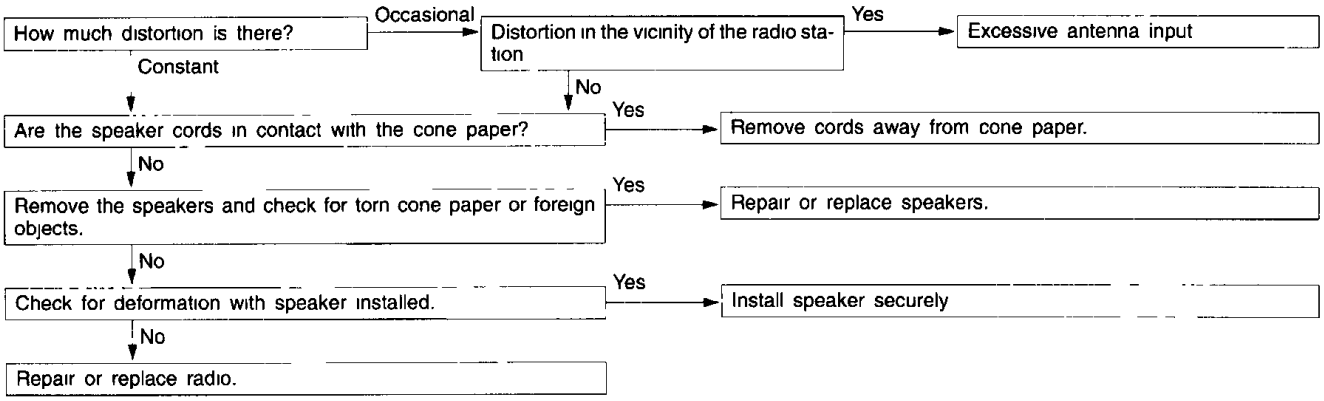


B–4 Insufficient sensitivity.

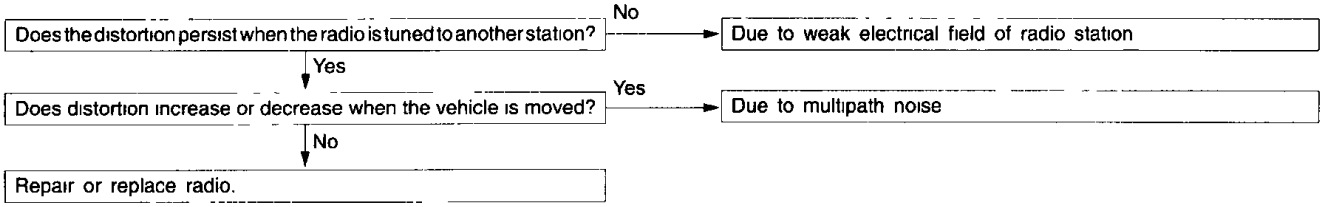


* For multipath noise and fading noise problems, refer to P. 54-55.

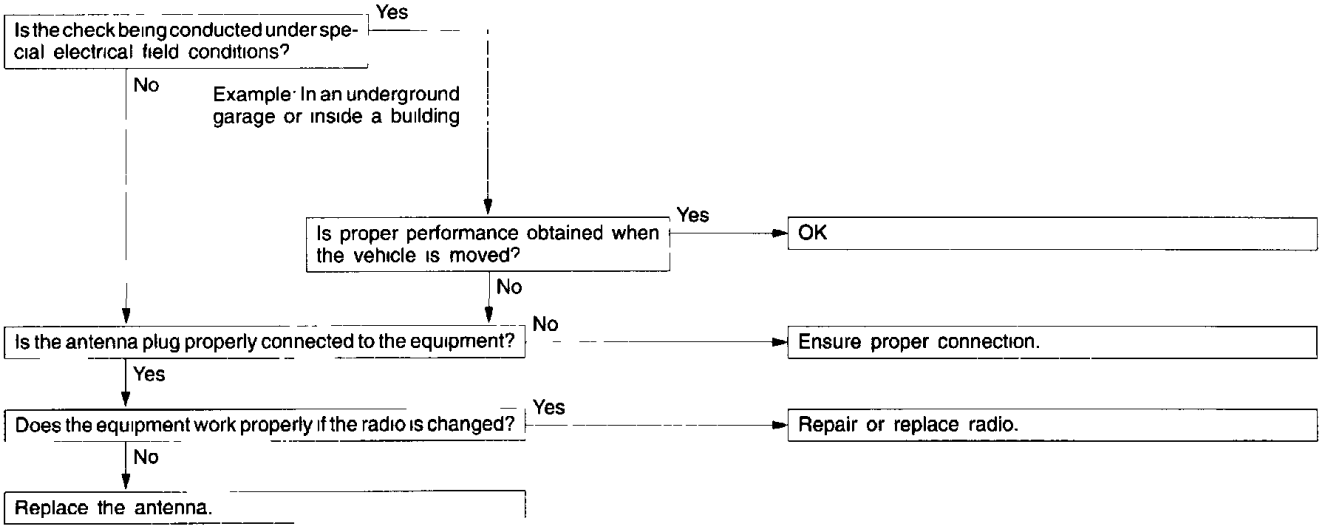
B–5 Distortion on AM or on both AM and FM.



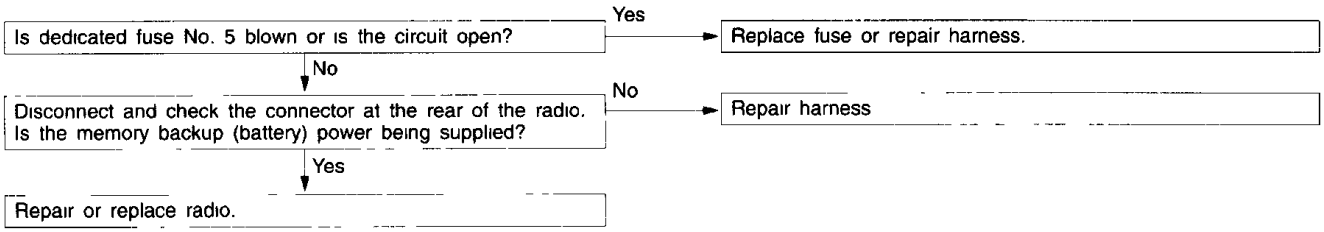
B–6 Distortion on FM only



B–7 Too few automatic select stations.

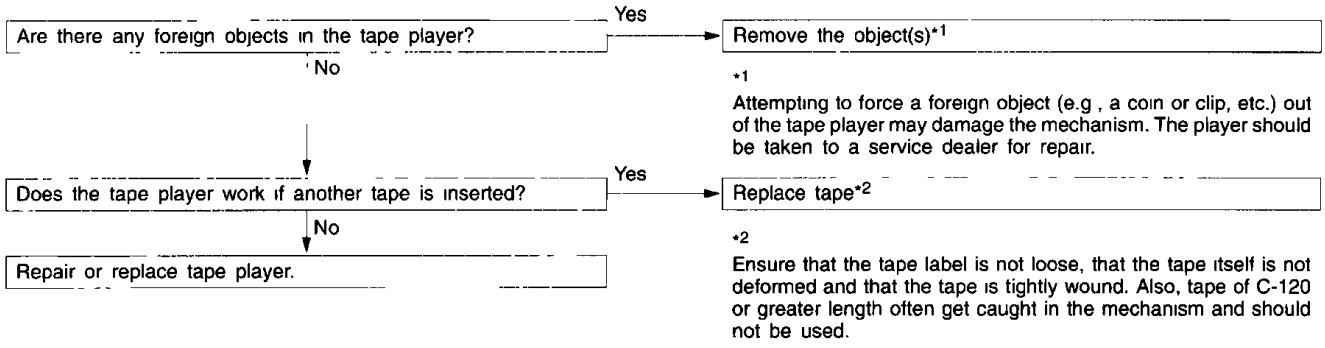


B–8 Insufficient memory (preset stations are erased).



C. TAPE PLAYER

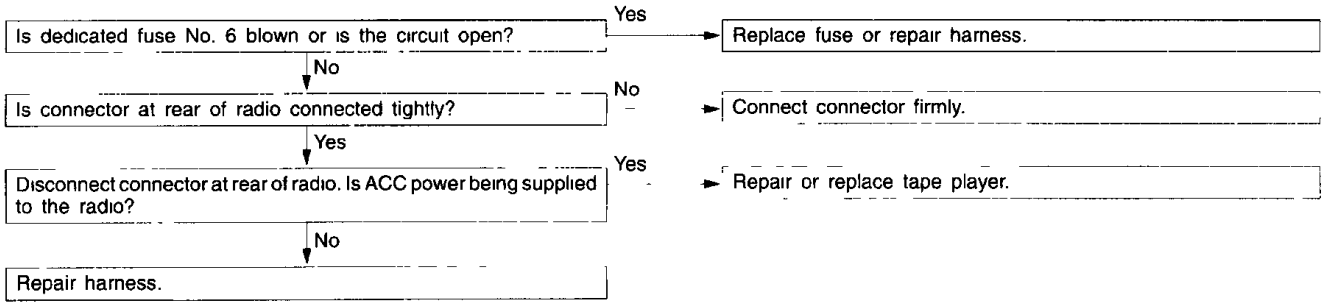
C–1 Cassette tape will not be inserted.



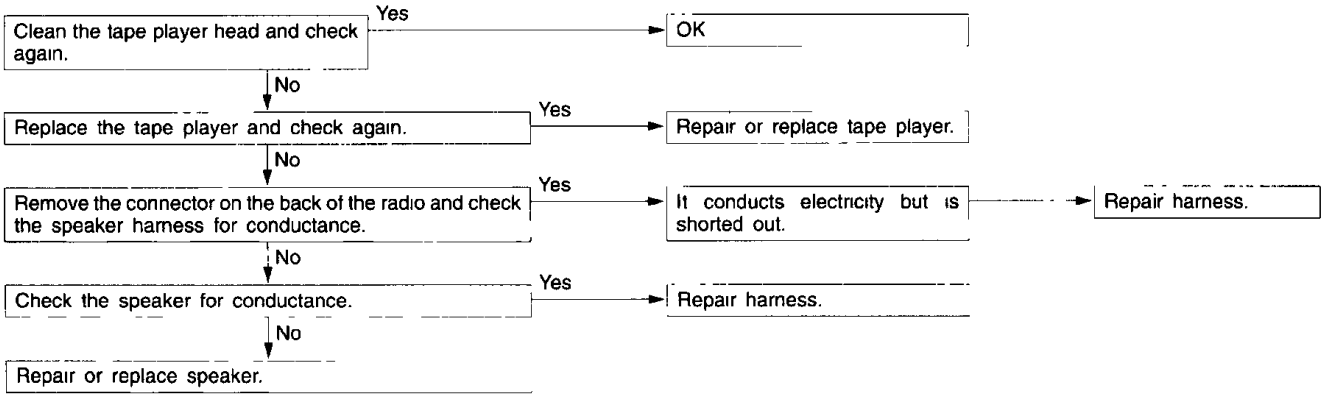
*1
Attempting to force a foreign object (e.g , a coin or clip, etc.) out of the tape player may damage the mechanism. The player should be taken to a service dealer for repair.

*2
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.

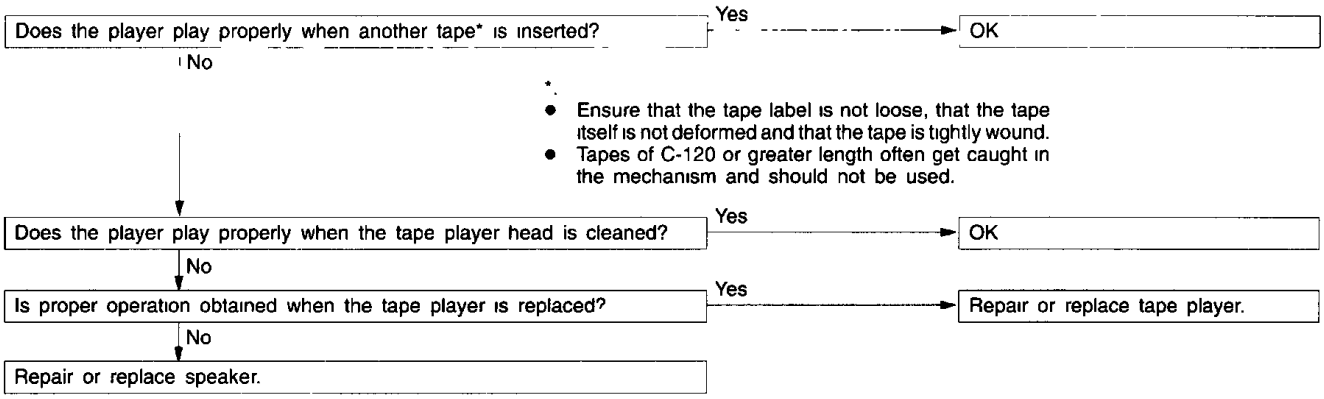
C–2 No sound (even after a tape has been inserted).



C–3 No sound from one speaker.



C–4 Sound quality is poor, or sound is weak.



C–5 Cassette tape will not be ejected.

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.

Does the player play OK if the tape*1 is changed?
- Yes → OK
- No

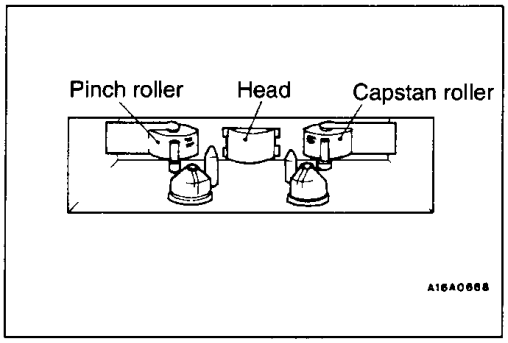
*1
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

Are there any foreign objects *2 inside the tape player?
- Yes → Remove foreign object(s).
- No

*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.

Is the head or capstan roller dirty? (Refer to the illustration below.)
- Yes → Clean.
- No

Repair or replace tape player.



C–7 Faulty auto reverse.

Does the player play OK if the tape* is changed?
- Yes → OK
- No

*:
- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound.
- Tapes of C-120 or greater length often get caught in the mechanism and should not be used

Does the problem only occur while the vehicle is being driven?
- No → Repair or replace tape player.
- Yes

Is the tape player properly installed to the vehicle?
- No → Ensure tape player installation.
- Yes

Repair or replace tape player

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

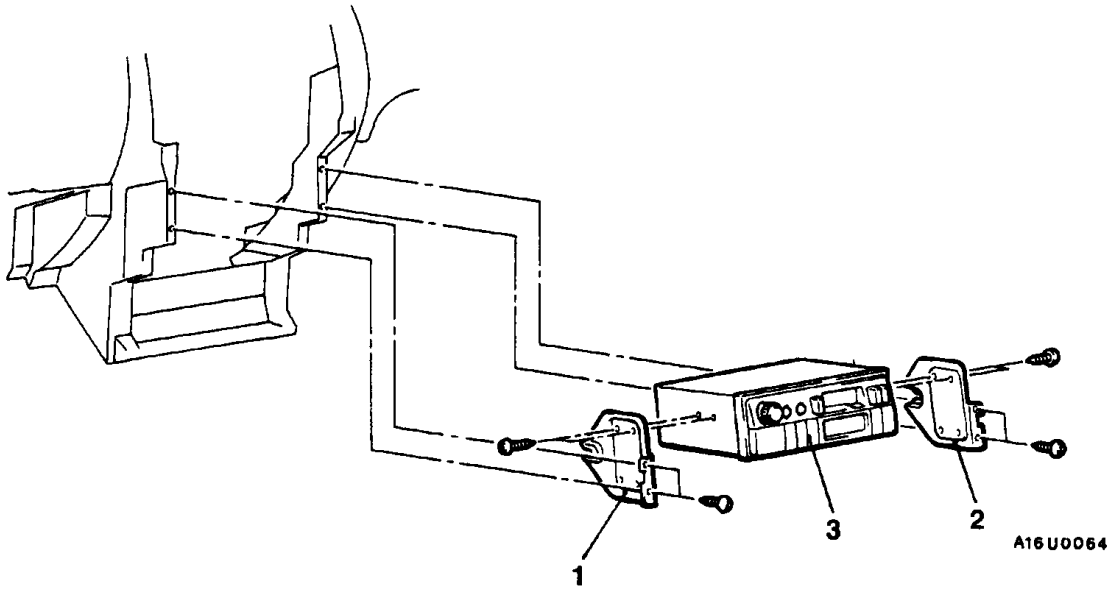
*2
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Repair or replace tape player

RADIO AND TAPE PLAYER

54400140027

REMOVAL AND INSTALLATION



Removal steps

- Centre console panel (Refer to GROUP 52A – Floor Console.)

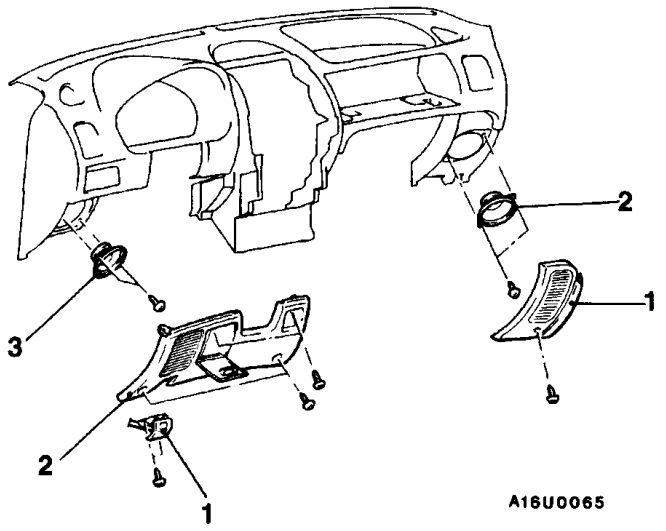
1. Radio bracket (LH)
2. Radio bracket (RH)
3. Radio and tape player

SPEAKER

54400260051

REMOVAL AND INSTALLATION

<Driver's Side> <Front Passenger's Side>



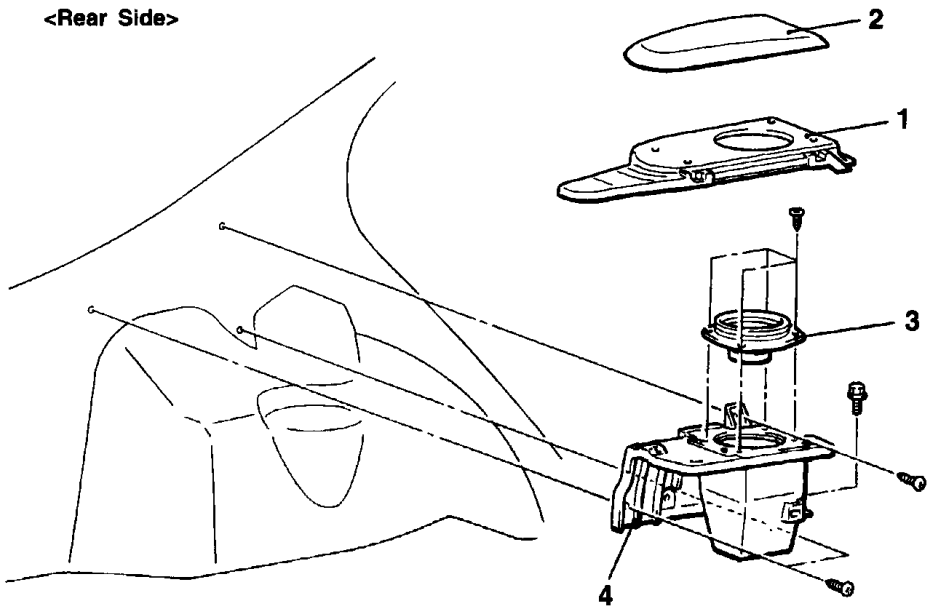
A16U0065

Removal steps

<Driver's Side>
1. Hood lock release handle
2. Instrument under cover
3. Speaker

<Front Passenger's Side>
1. Corner panel
2. Speaker

<Rear Side>



A16U0068

Removal steps
1. Side shelf
2. Speaker garnish
3. Speaker
- Rear side trim (Refer to GROUP 52A.)

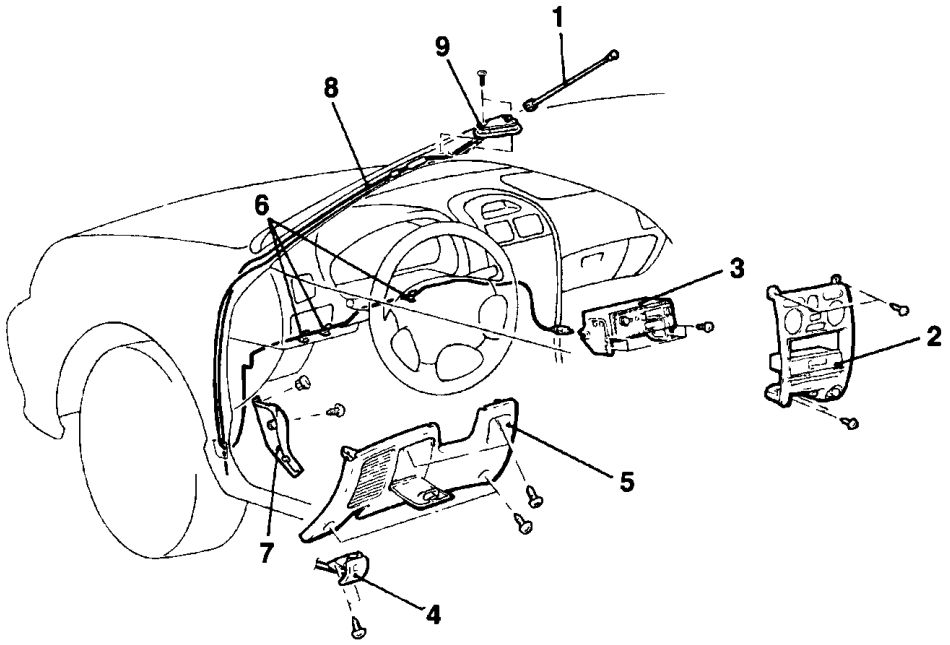
4. Speaker bracket

ANTENNA

54400290043

POLE ANTENNA

REMOVAL AND INSTALLATION



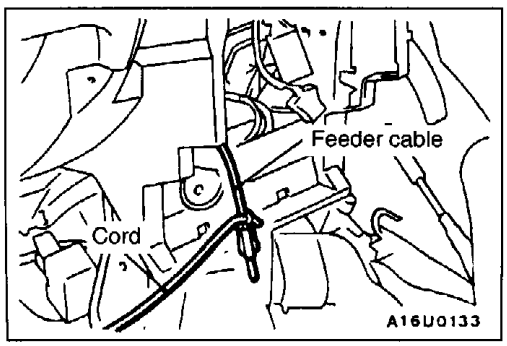
A16U0066

Removal steps

1. Pole
2. Center console panel (Refer to GROUP 52A – Floor Console.)
3. Radio and tape player
4. Hood lock release handle
5. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)

◀A▶

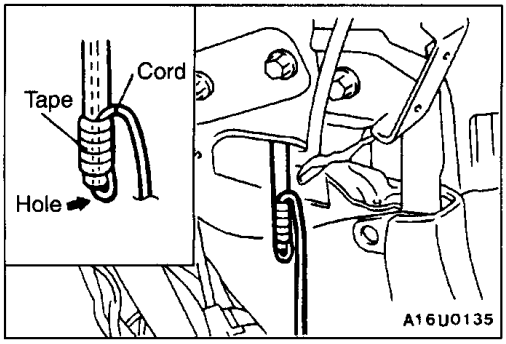
6. Clip
7. Cowl side trim (Refer to GROUP 52A.)
8. Antenna base
9. Base



REMOVAL SERVICE POINT

◀A▶ ANTENNA BASE REMOVAL

(1) Tie a cord to the end of the feeder cable.



(2) Pull out the antenna base until the end of the drain pipe can be seen.
(3) Pass the cord through the hole in the end of the drain pipe and wrap it with vinyl tape.

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

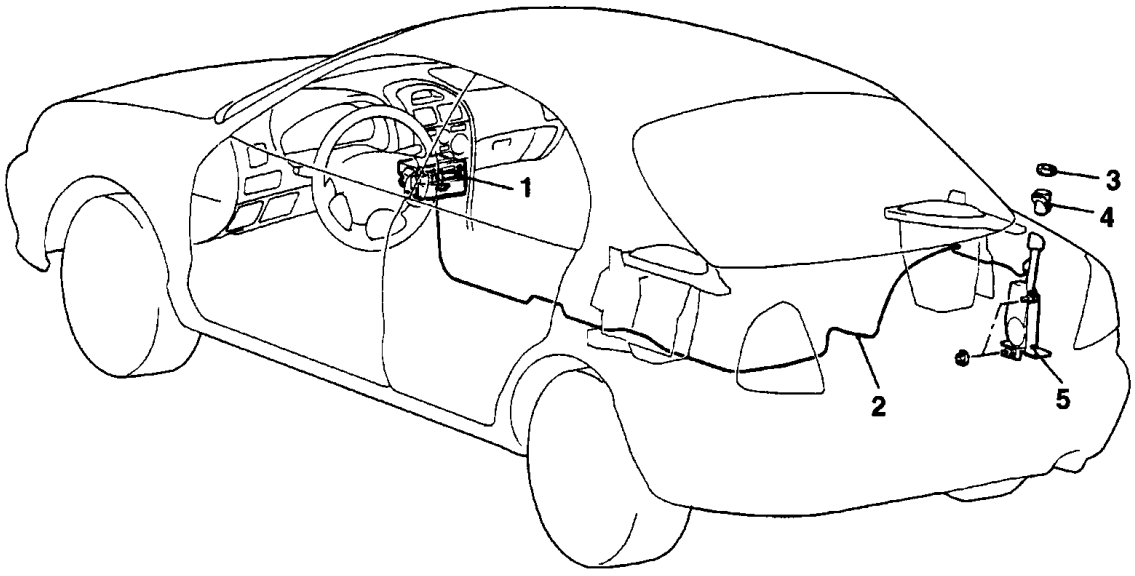
(4) Pull out the antenna base little by little to remove it.

MOTOR ANTENNA

54400350024

REMOVAL AND INSTALLATION

CAUTION: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or other components.



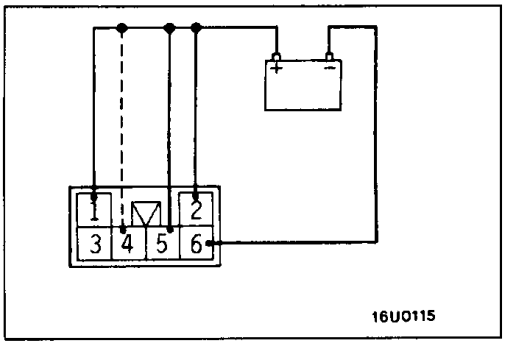
A16U0067

Antenna feeder cable removal steps

1. Radio and tape player (Refer to P.54-62.)
   - Front and rear floor console assembly (Refer to GROUP 52A.)
   - Front seat assembly (R.H.) (Refer to GROUP 52A.)
   - Rear seat cushion and side seatback assembly (R.H.) (Refer to GROUP 52A.)
   - Cowl side trim (R.H.), front scuff plate (R.H.), rear scuff plate (R.H.), center piller lower trim (R.H.) and rear side trim (R.H.) (Refer to GROUP 52A.)
   - Speaker bracket (Refer to P.54-63.)
2. Antenna feeder cable

Motor antenna assembly removal steps

- Rear side trim (R.H.) (Refer to GROUP 52A.)
3. Ring nut
4. Base
5. Motor antenna assembly

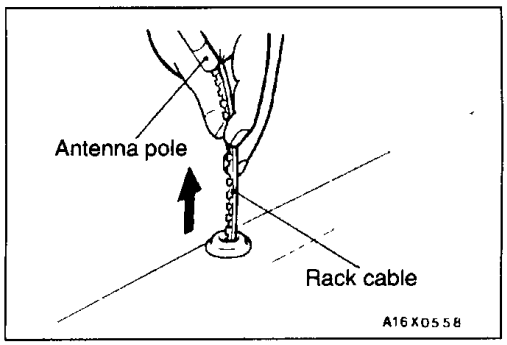


INSPECTION

54400360027

MOTOR ANTENNA ASSEMBLY CHECK

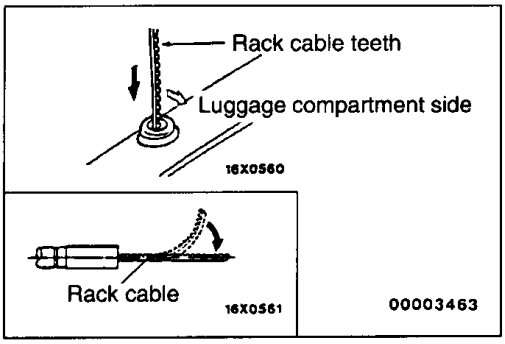
1. Connect the circuit as indicated by the solid lines in the illustration.
2. Check that the motor antenna extends when the connection indicated by the broken line is made.
3. Check that the motor antenna retracts fully when the connection indicated by the broken line is removed.



ANTENNA POLE REPLACEMENT

54400090032

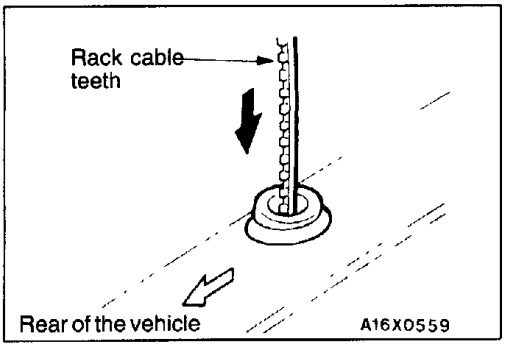
(1) Remove the ring nut.
(2) After turning the ignition switch to ACC or ON, turn the radio switch to ON to raise the antenna pole, and remove it, together with the rack cable.



(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.

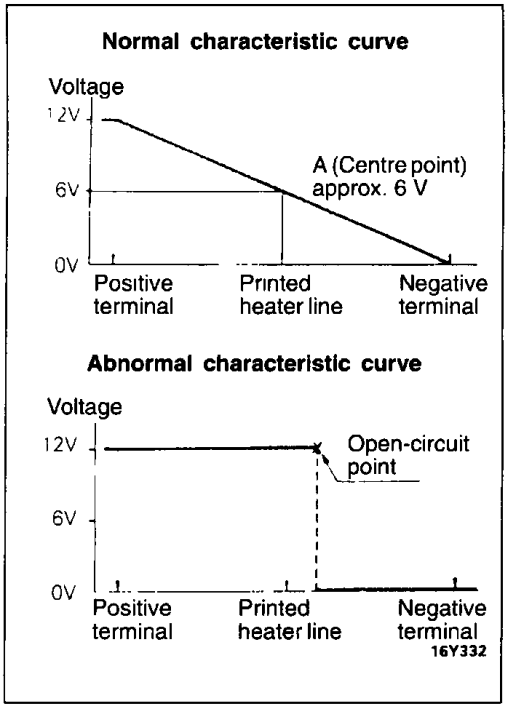
(4) Insert the rack cable into the motor assembly with the rack cable teeth facing the luggage compartment side.



(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

54300180033



ON-VEHICLE SERVICE

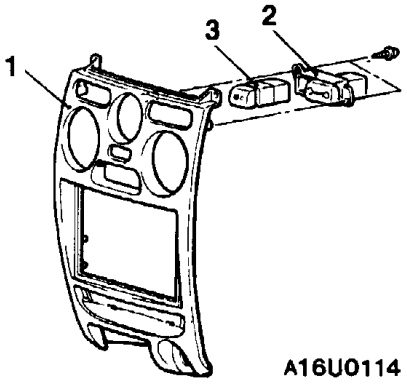
PRINTED-HEATER LINE CHECK

(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 circuit tester at rear window glass centre A.
Condition is good if it indicates about 6V.
(3) If 12 V is indicated at A, there is a break in the negative terminals from A.
Move test bar slowly to negative terminal to detect where voltage changes suddenly (0V).
(4) If 0 V is indicated at A, there is a break in the positive terminals from A. Defect where the voltage changes suddenly (12 V) in the same method described above.

REAR WINDOW DEFOGGER SWITCH

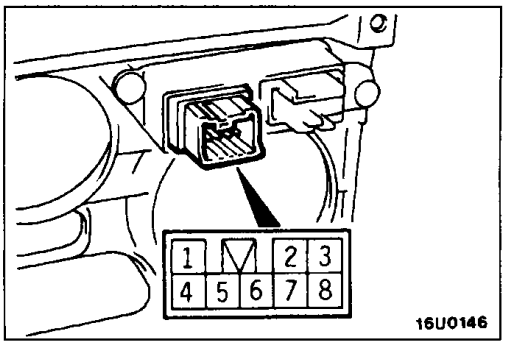
54300620030

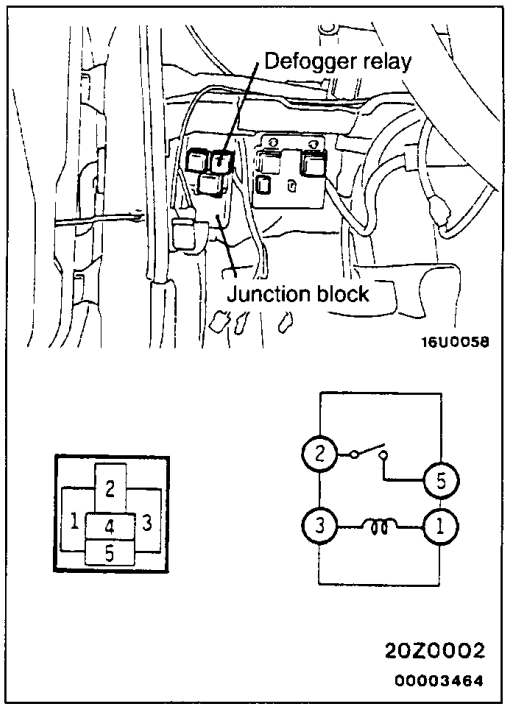
REMOVAL AND INSTALLATION



Removal steps

1. Center console panel
(Refer to GROUP 52A – Floor Console.)
2. Switch case
3. Rear window defogger switch





INSPECTION

54300630019

DEFOGGER SWITCH CONTINUITY CHECK

Switch position	Terminal No. 1	3	2	4	5
OFF	ILL				
ON	ILL			IND	

REAR WINDOW DEFOGGER RELAY CONTINUITY CHECK

Battery voltage	Terminal No. 1	2	3	5
Power is not supplied				
Power is supplied				

CHASSIS ELECTRICAL

CONTENTS

54109000037

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- SERVICE SPECIFICATION 4
- ON-VEHICLE SERVICE 4
  - Fluid Level and Specific Gravity Check 4
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WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

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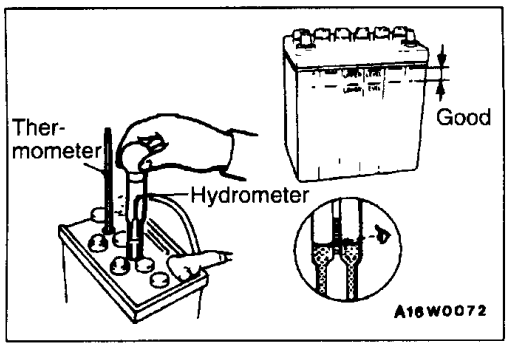
HEATER ..... Refer to GROUP 55
AIR CONDITIONER ..... Refer to GROUP 55

BATTERY

54100030028

SERVICE SPECIFICATION

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



ON-VEHICLE SERVICE

54100090026

FLUID LEVEL AND SPECIFIC GRAVITY CHECK

1. Inspect whether or not the battery fluid is between the UPPER LEVEL and LOWER LEVEL marks.
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.

   D20=Dt+0.0007 (t–20)

   D20: Specific gravity of the battery fluid calculated for 20°C.

   Dt: Actually measured specific gravity

   t: Actually measured temperature

CHARGING

54100110029

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

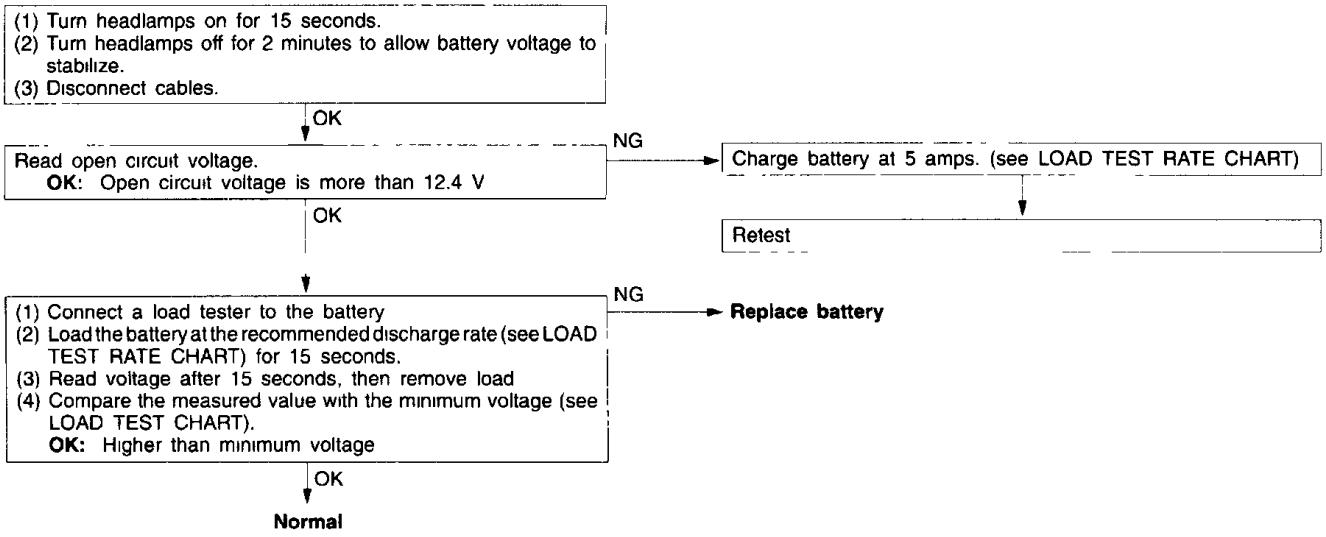
Caution

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

BATTERY TESTING PROCEDURE

54100120039

TEST STEP



LOAD TEST RATE CHART

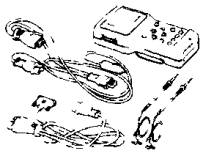
Battery type	55530 or 55559	56216 or 56219	56332 or 56638
Charging time when fully discharged h [5-amp rated current charging]	10	11	11
Load test (Amps)	170	210	210

LOAD TEST CHART

Temperature °C	21 and above	16	10	4	–1	–7	–12	–18
Minimum voltage V	9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

IGNITION SWITCH AND IMMOBILIZER SYSTEM 54300060092

SPECIAL TOOL

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Immobilizer system check (Diagnosis display using the MUT-II) • Registration of the ID code

TROUBLESHOOTING 54300070057

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

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

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

ERASING DIAGNOSIS CODES

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

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

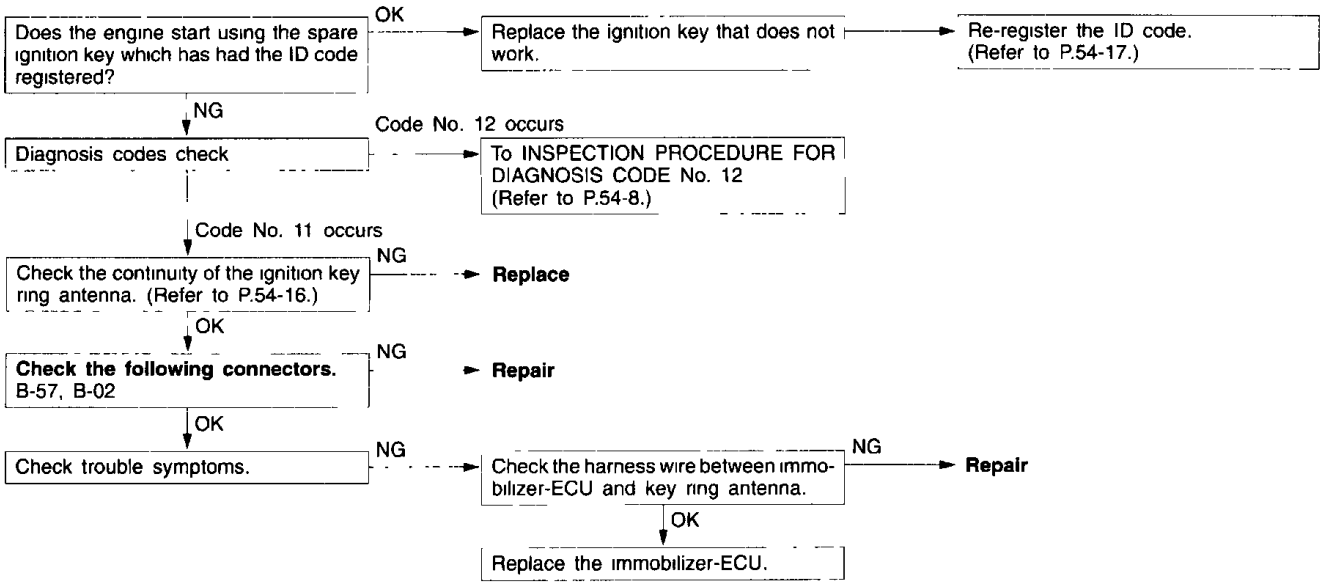
INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code No.	Inspection items	Reference page
11	Transponder communication system	54-8
12*	ID code are not the same or are not registered	54-8
21	Communication system between MUT-II and engine-ECU	54-9
31	EEPROM abnormality inside immobilizer-ECU	54-9
32	Ignition switch IG signal circuit system	54-10

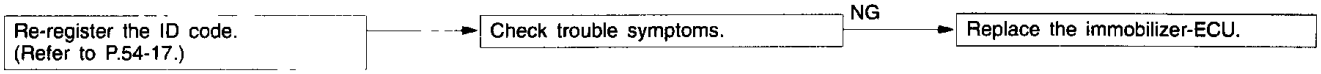
NOTE
*: Diagnosis code No. 12 is not recorded.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

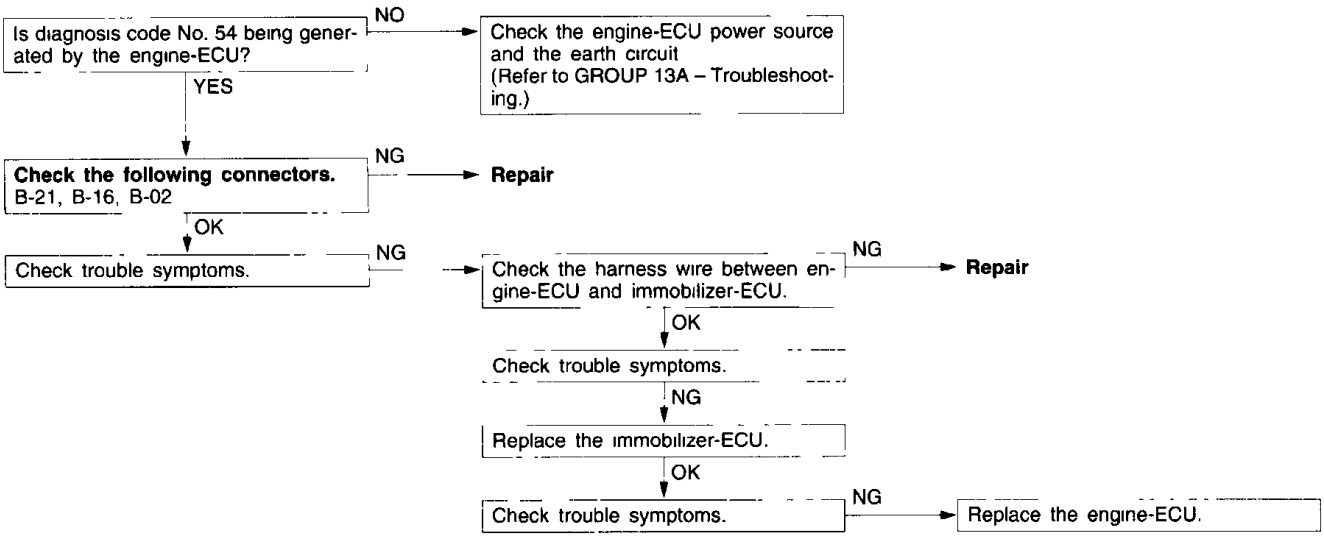
Code No. 11 Transponder communication system	Probable cause
The ID code of the transponder is not sent to the immobilizer-ECU immediately after the ignition switch is turned to the ON position.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



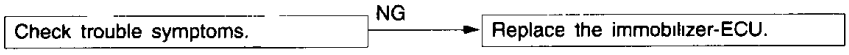
Code No. 12 ID code are not the same or are not registered	Probable cause
The ID code which is sent from the transponder is not the same as the ID code which is registered in the immobilizer-ECU.	• The ID code in the ignition key being used has not been properly registered. • Malfunction of the immobilizer-ECU



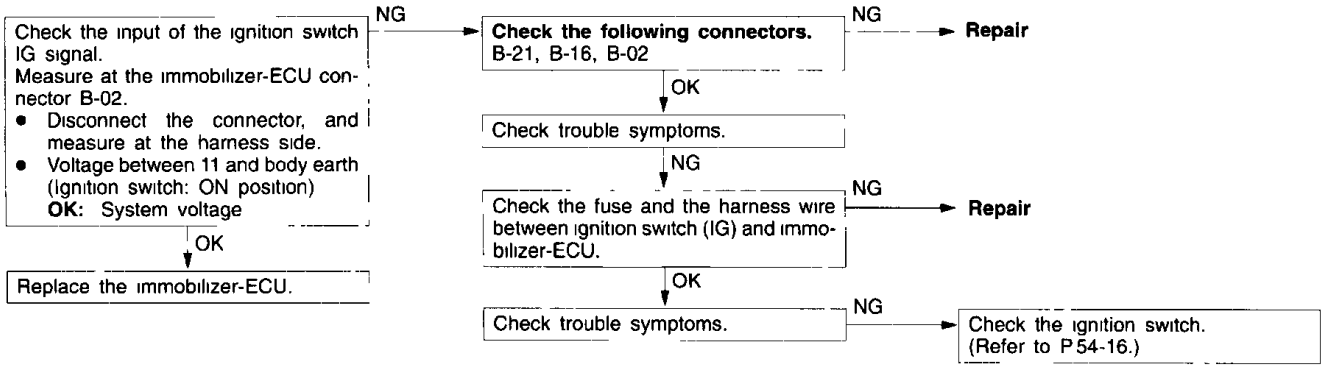
Code No. 21 Communication system between MUT-II and engine-ECU	Probable cause
After the ignition switch is turned to the ON position, the confirmation code is not received from the engine-ECU within the allowable time, or an abnormal code is received.	• Malfunction of harness or connector • Malfunction of the engine-ECU • Malfunction of the immobilizer-ECU



Code No. 31 EEPROM abnormality inside immobilizer-ECU	Probable cause
No data has been written to the EEPROM inside the immobilizer-ECU.	• Malfunction of the immobilizer-ECU



Code No. 32 Ignition switch IG signal circuit system	Probable cause
The ignition switch signal is not being input to the immobilizer-ECU.	• Malfunction of harness or connector • Malfunction of the ignition switch • Malfunction of the immobilizer-ECU



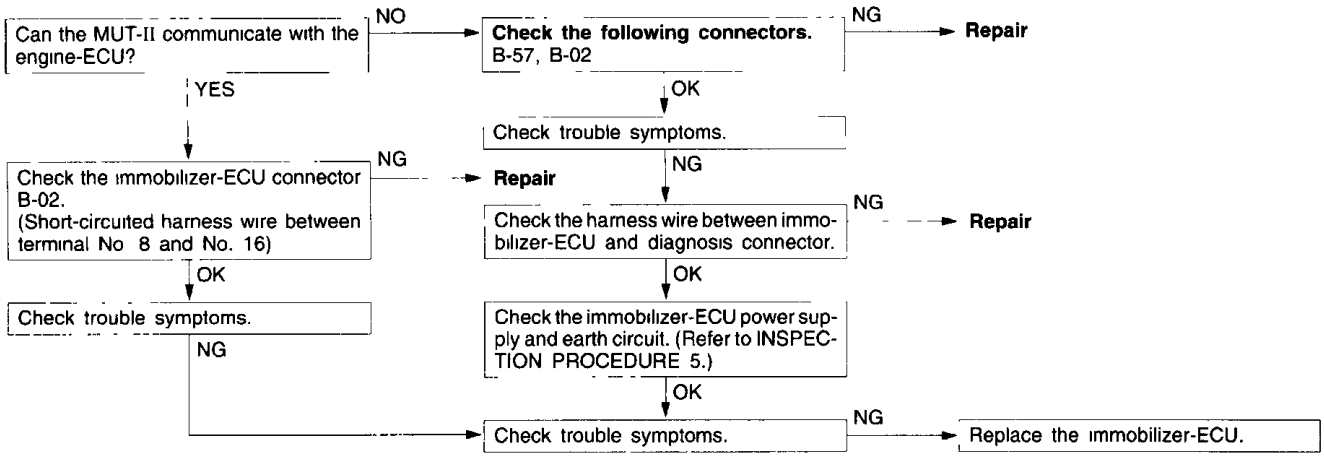
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	1	54-11
Diagnosis code No. 54 has been generated by the engine-ECU.	2	54-12
ID code cannot be registered using the MUT-II.	3	54-12
Engine does not start (Cranking but no initial combustion).	4	54-13
Malfunction of the immobilizer-ECU power source and earth circuit	5	54-14

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

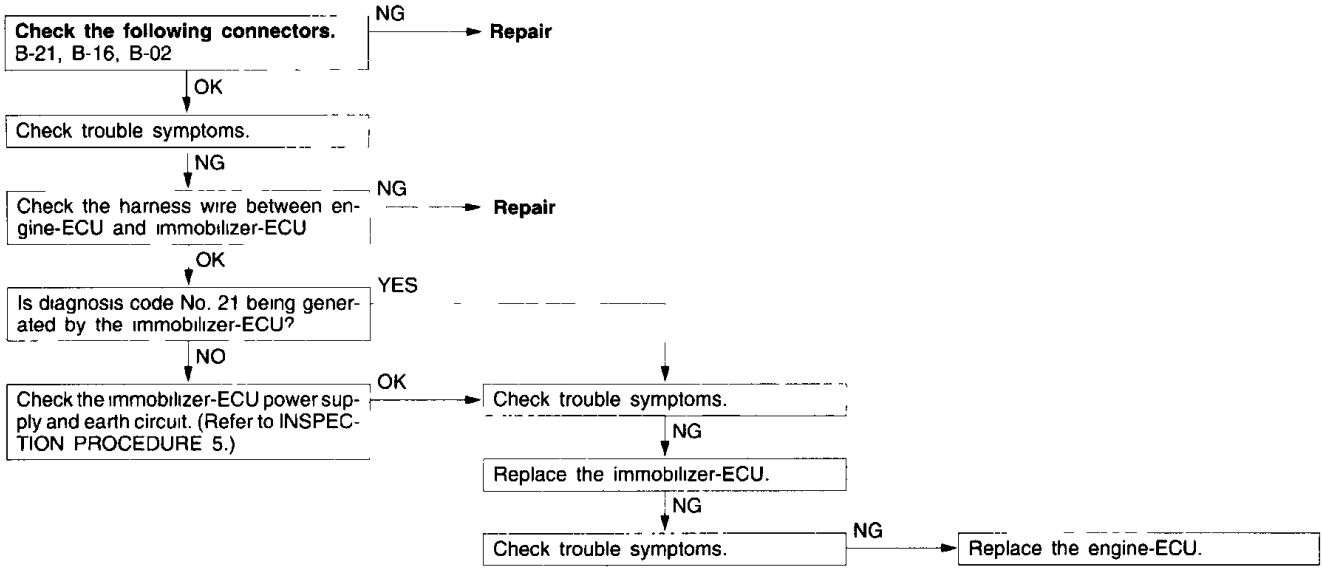
Inspection Procedure 1

Communication with MUT-II is impossible.	Probable cause
The cause is probably that a malfunction of the diagnosis line or the immobilizer-ECU is not functioning.	• Malfunction of the diagnosis line • Malfunction of harness or connector • Malfunction of the immobilizer



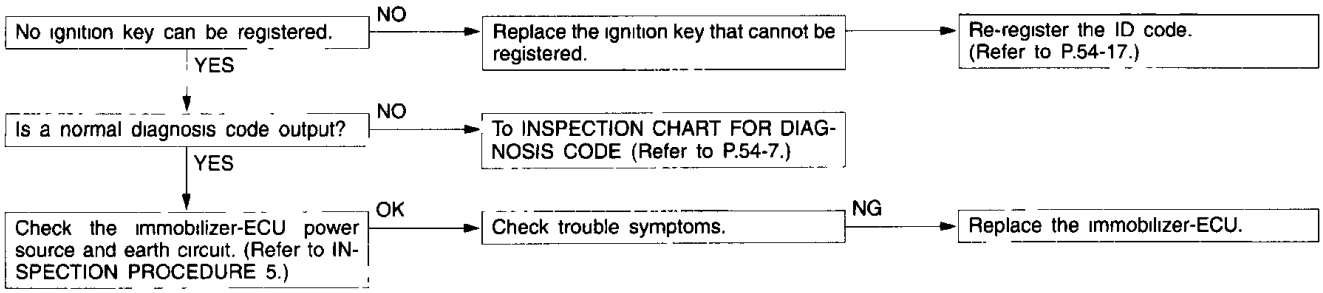
Inspection Procedure 2

Diagnosis code No. 54 has been generated by the engine-ECU.	Probable cause
There is a problem with communication between the engine-ECU and the immobilizer-ECU.	• Malfunction of harness or connector • Malfunction of the immobilizer-ECU • Malfunction of the engine-ECU



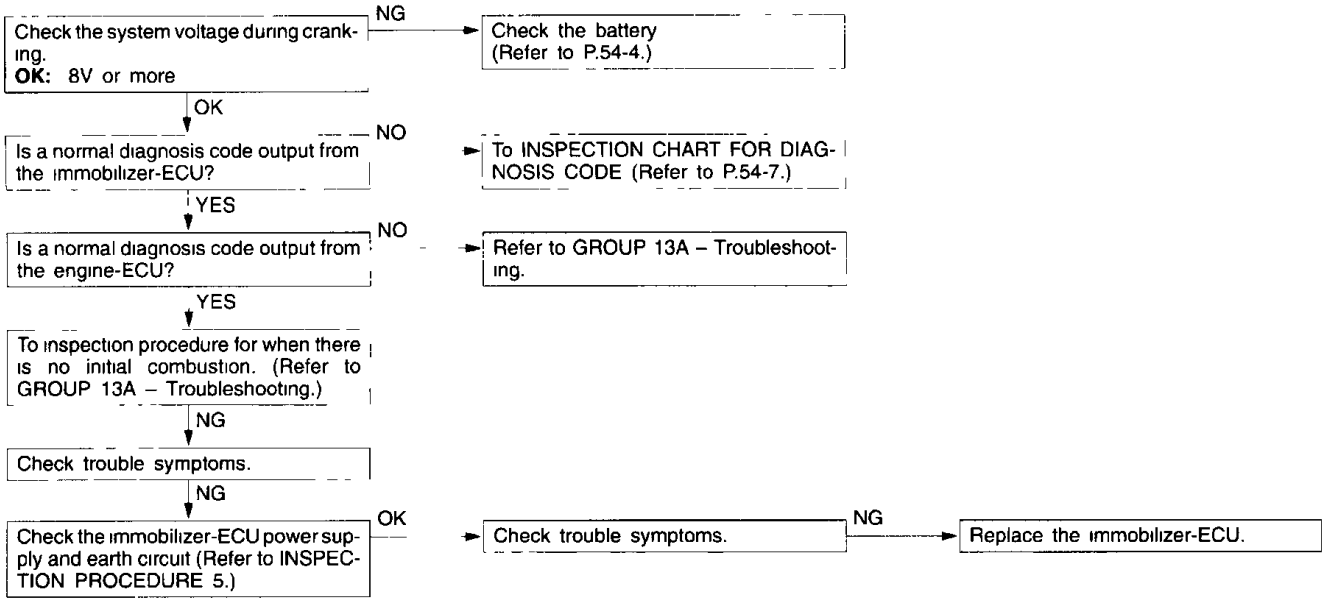
Inspection Procedure 3

ID code cannot be registered using the MUT-II.	Probable cause
The cause is probably that there is no ID code registered in the immobilizer-ECU, or there is a malfunction of the immobilizer-ECU.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



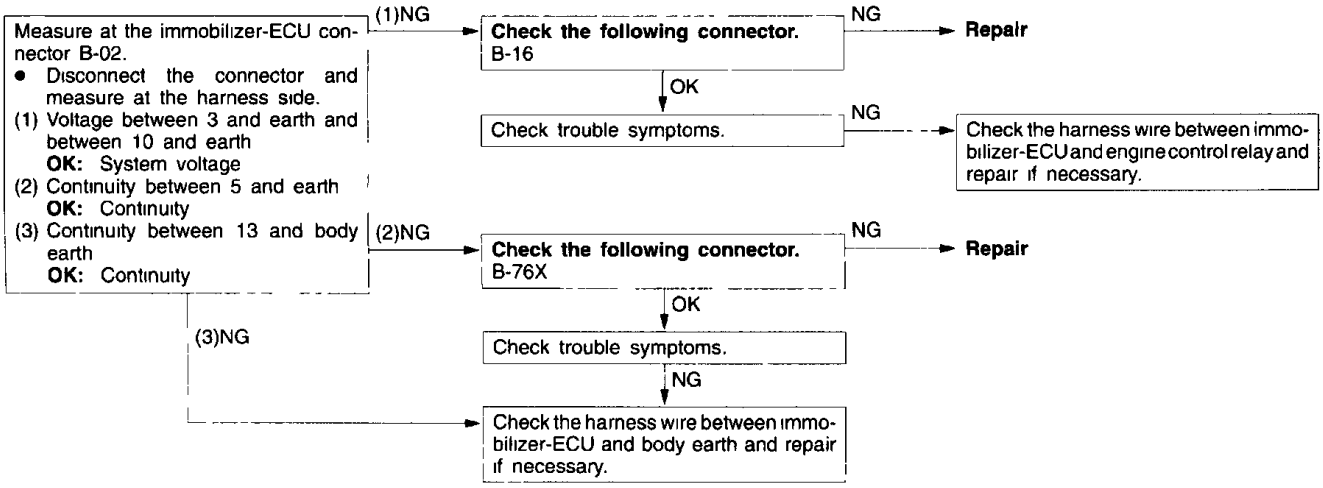
Inspection Procedure 4

Engine does not start (cranking but no initial combustion).	Probable cause
If the fuel injectors are not operating, there might be a problem with the MPI system in addition to a malfunction of the immobilizer system. It is normal for this to occur if an attempt is made to start the engine using a key that has not been properly registered.	• Malfunction of the MPI system • Malfunction of the immobilizer-ECU



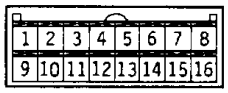
Inspection Procedure 5

Malfunction of the immobilizer-ECU power supply and earth circuit



CHECK AT IMMOBILIZER-ECU

TERMINAL VOLTAGE CHECK CHART



16W0390

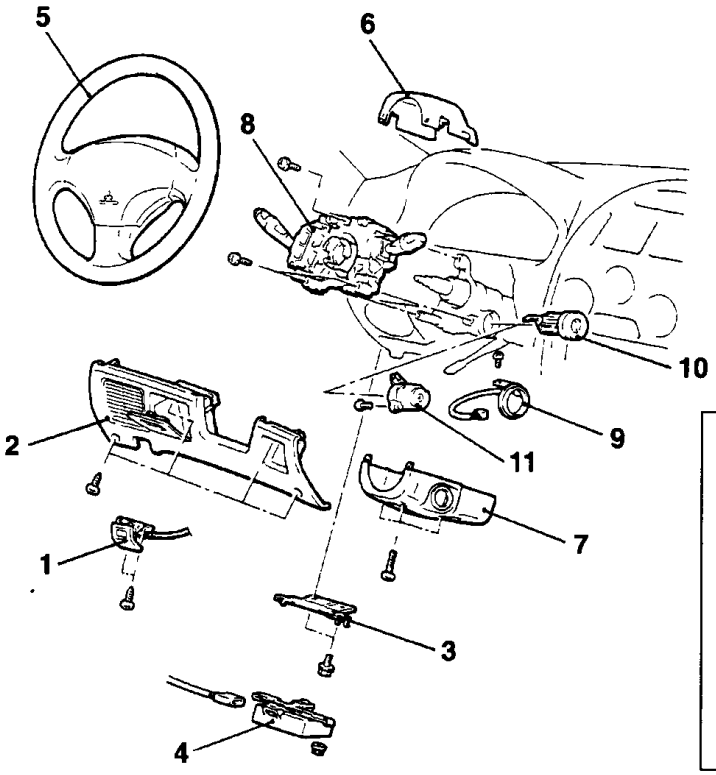
Terminal No.	Signal	Checking requirements	Terminal voltage
3	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
5	Immobilizer-ECU earth	Always	0V
10	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
11	Ignition switch-IG	Ignition switch: OFF	0V
		Ignition switch: ON	System voltage
13	Immobilizer-ECU earth	Always	0V

IGNITION SWITCH AND IMMOBILIZER SYSTEM

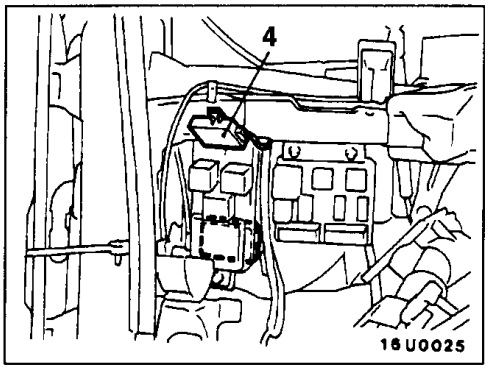
54300210039

REMOVAL AND INSTALLATION

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



16U0116



00003454

Immobilizer-ECU removal steps

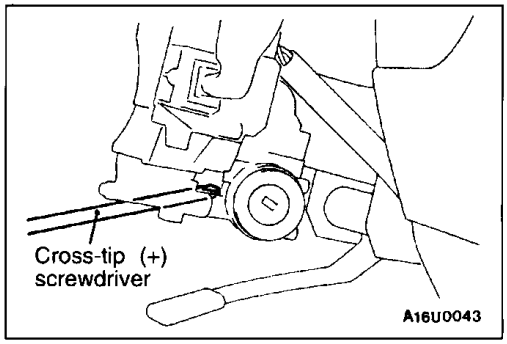
1. Hood lock release handle
2. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
3. Bracket
4. Immobilizer-ECU

Ignition switch and ignition key ring antenna removal steps

1. Hood lock release handle
2. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
5. Steering wheel (Refer to GROUP 37A.)
6. Column cover, upper
7. Column cover, lower
8. Column switch (Refer to GROUP 37A – Steering Wheel and Shaft.)
9. Ignition key ring antenna

◀A▶

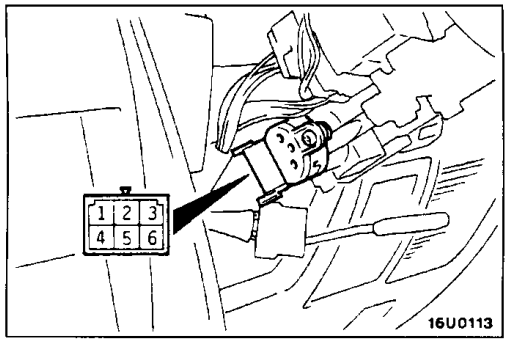
10. Steering lock cylinder
11. Ignition switch



REMOVAL SERVICE POINTS

◀A▶ STEERING LOCK CYLINDER REMOVAL

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



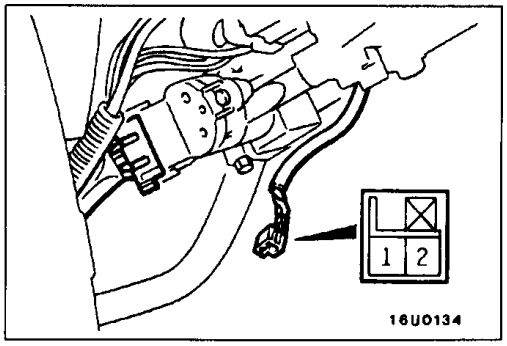
INSPECTION

54300220032

IGNITION SWITCH CONTINUITY CHECK

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

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



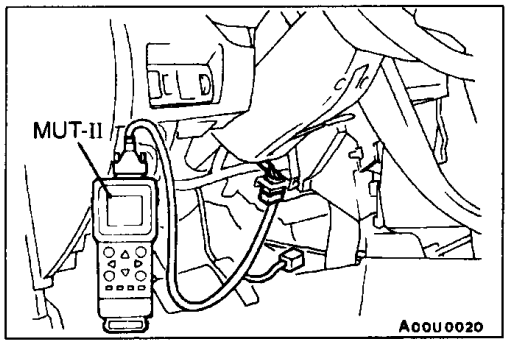
IGNITION KEY RING ANTENNA CONTINUITY CHECK

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

ID CODE REGISTRATION METHOD 54300810017

If using an ignition key that has just been newly purchased, or if the immobilizer-ECU has been replaced, you will need to register the ID codes for each ignition key being used into the immobilizer-ECU. (A maximum of eight different ID codes can be registered.)
Moreover, when the immobilizer-ECU has been replaced, you will need to use the MUT-II to register the ID number that the user specifies into the immobilizer-ECU. (Refer to the MUT-II instruction manual for instructions on using the MUT-II.)

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



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

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

(2) Use the ignition key that is to be registered to turn the ignition switch to the ON position.
(3) Use the MUT-II to register the ID code. If you are registering two or more codes, use the next key to be registered to turn the ignition switch to the ON position without disconnecting the MUT-II.
(4) Disconnect the MUT-II. This completes the registration operation.

COMBINATION METERS

54300030031

SERVICE SPECIFICATIONS

Items			Standard value
Speedometer indication error km/h(mph)		40 (20)	40–48 (20–25)
		80 (40)	80–92 (40–47)
		120 (60)	120–136 (60–69)
		160 (80)	160–180 (80–91)
		– (100)	– (100–114)
Tachometer indication error r/min	Vehicles with SOHC engine	700	±100
		3,000	±150
		5,000	±250
		6,000	±300
	Vehicles with DOHC engine	700	±100
		3,000	+225, –100
		5,000	+325, –125
		7,000	+400, –100
Fuel gauge unit resistance Ω	Float point F		7.9–14.6
	Float point E		107.9–118.9
Fuel gauge unit float height mm	A (Float point F)		142.4
	B (Float point E)		28
Fuel gauge resistance Ω	Power supply and earth		122–153
	Power supply and fuel gauge		27–35
	Fuel gauge and earth		95–119
Engine coolant temperature gauge resistance Ω	Power supply and earth		185–227
	Power supply and engine coolant temperature gauge		54–58
	Engine coolant temperature gauge and earth		239–285
Engine coolant temperature gauge unit resistance (at 70°C) Ω			104±13.5

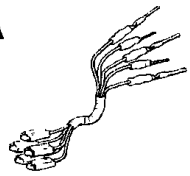
SEALANT

54300050037

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

SPECIAL TOOLS

54300060108

Tool	Number	Name	Use
A  B C D	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Fuel gauge simple check A: Connector pin contact pressure check B, C: Power circuit check D: Commercial tester connection
	MB990784	Ornament remover	Removal of meter hood

TROUBLESHOOTING

54300070064

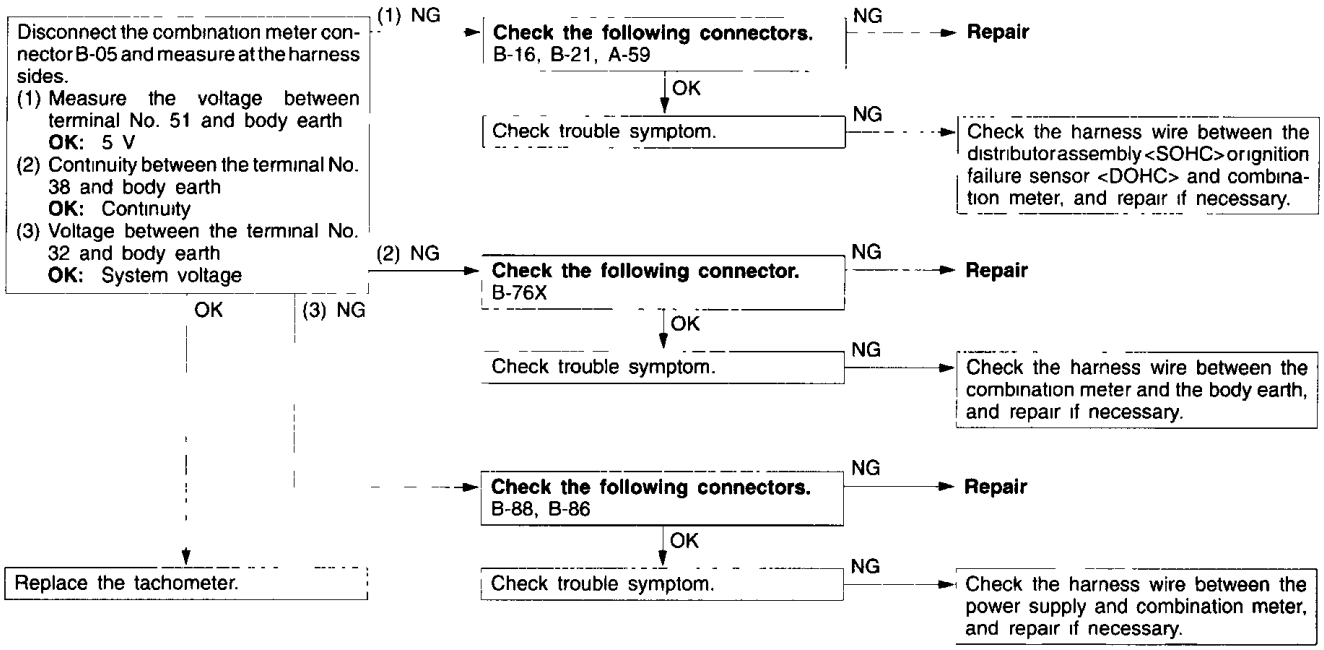
INSPECTION CHART FOR TROUBLE SYMPTOMS

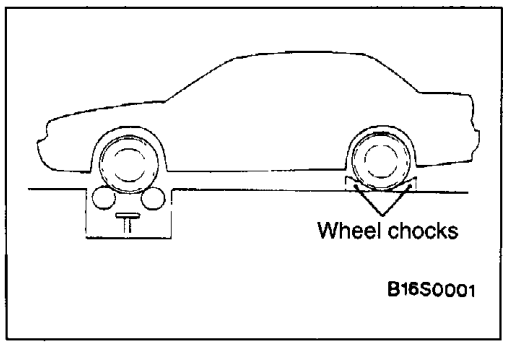
Trouble symptom	Inspection procedure	Reference page
Tachometer does not operate.	1	54-20

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1

Tachometer does not operate.	Probable cause
The ignition signal may not be input from the engine, or there may be a malfunction in the power supply or earth circuit.	• Malfunction of tachometer • Malfunction of harness or connector



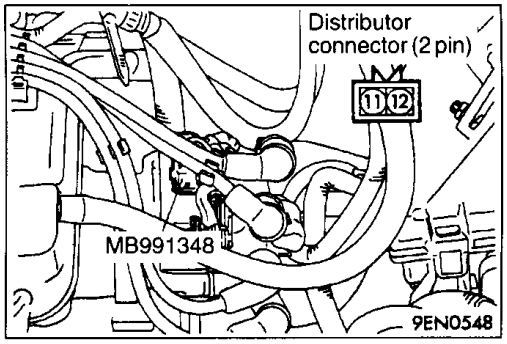


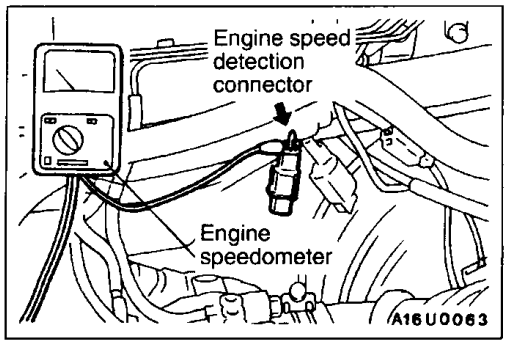
ON-VEHICLE SERVICE

54300090039

SPEEDOMETER CHECK

1. Adjust the pressure of the tyres to the specified level. (Refer to GROUP 31 – Service Specifications.)
2. Set the vehicle onto a speedometer tester and use wheel chocks to hold the rear wheels.





3. Check if the speedometer indicator range is within the standard values.

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

Standard values:

Standard indication km/h (mph)	Allowable range km/h (mph)
40 (20)	40–48 (20–25)
80 (40)	80–92 (40–47)
120 (60)	120–136 (60–69)
160 (80)	160–180 (80–91)
– (100)	– (100–114)

TACHOMETER CHECK

54300100039

<SOHC>

1. Disconnect the distributor connector (2-pin), and connect the special tool in between. All terminals should be connected.
2. Connect a primary voltage-detection type of tachometer to terminal (12) of the distributor connector.
3. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variations are within the standard values.

Standard values:
700 r/min: ±100 r/min
3,000 r/min: ±150 r/min
5,000 r/min: ±250 r/min
6,000 r/min: ±300 r/min

<DOHC>

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach the engine speedometer.

   NOTE
   For tachometer check, 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.

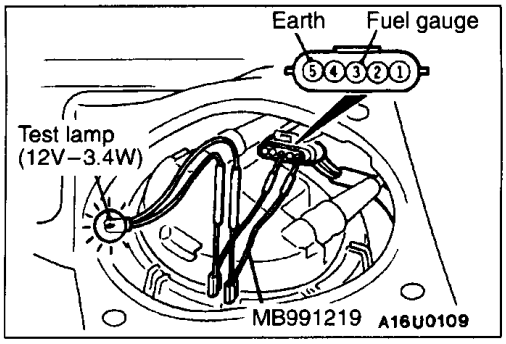
Standard values:
700 r/min. : ±100 r/min.
3,000 r/min : +225 r/min, –100 r/min
5,000 r/min : +325 r/min, –125 r/min
7,000 r/min : +400 r/min, –100 r/min

FUEL GAUGE SIMPLE CHECK

54300110032

Remove the fuel gauge unit connector.
↓
Use the special tool to connect a test lamp (12 V – 3.4 W) to the harness connector.
↓
When the ignition switch is turned to ON, the test lamp illuminates. —OK→ The needle of the fuel gauge moves. —OK→ Replace the fuel gauge unit.
↓ NG
Repair the harness.

The needle of the fuel gauge moves. —NG→ Replace the fuel gauge.



FUEL GAUGE UNIT CHECK

54300120059

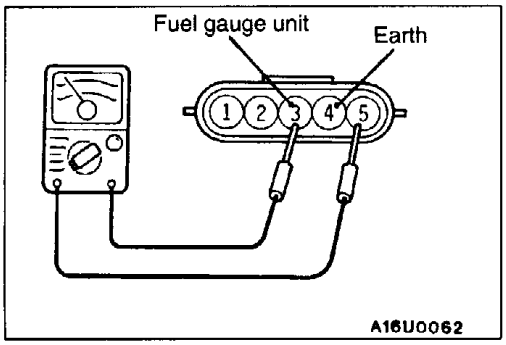
Remove the fuel gauge unit from the fuel tank.
(Refer to GROUP 13F.)

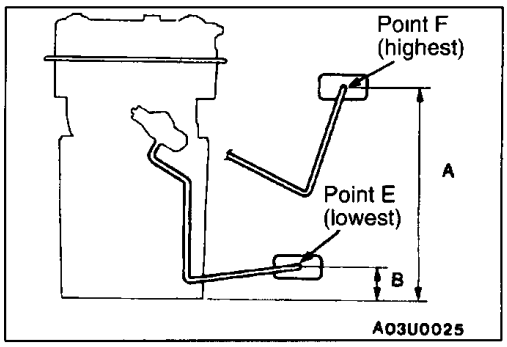
FUEL GAUGE UNIT RESISTANCE

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

   Standard value:
   Point F: 7.9–14.6 Ω
   Point E: 107.9–118.9 Ω

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





FUEL GAUGE UNIT FLOAT HEIGHT

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

Standard value:
A: 142.4 mm
B: 28 mm

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE CHECK

54300140048

Remove the engine coolant gauge unit connector.

↓

Connect a test lamp (12 V – 3.4 W) between the harness side connector and the earth.

↓

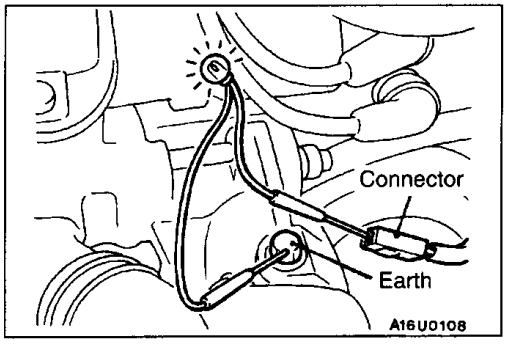
When the ignition switch is turned to ON, the test lamp illuminates

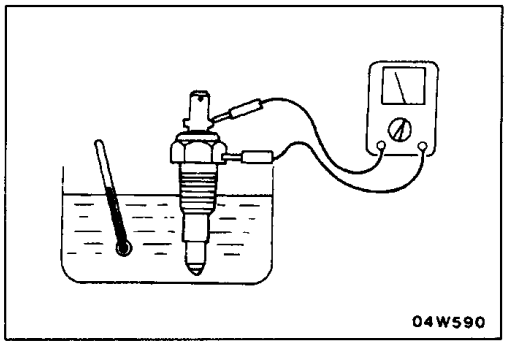
OK → The needle of the engine coolant temperature gauge moves.

NG → Replace the engine coolant temperature gauge.

NG ↓ Repair the harness.

OK ↓ Replace the engine coolant temperature gauge unit.



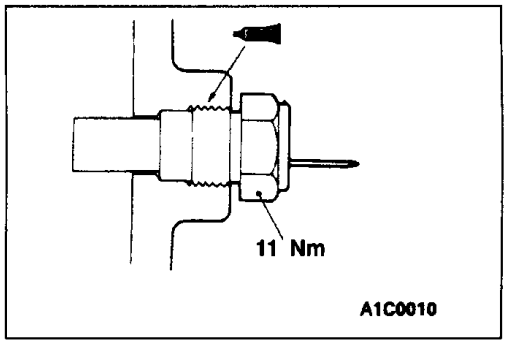


ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK

54300150041

1. Bleed 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±13.5 Ω



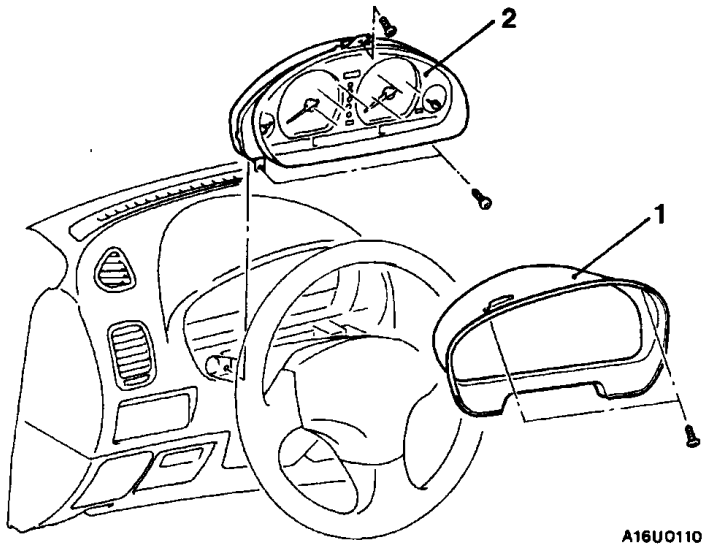
4. After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit.

   Specified sealant:
   3M Adhesive Nut Locking No. 4171 or equivalent
5. Add engine coolant. (Refer to GROUP 14 – On-vehicle Service.)

COMBINATION METERS

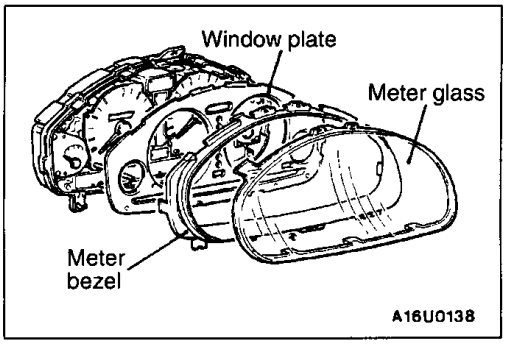
54300290033

REMOVAL AND INSTALLATION



Removal steps

1. Meter hood
2. Combination meter

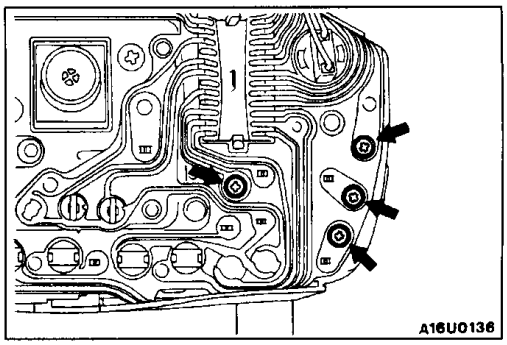


INSPECTION

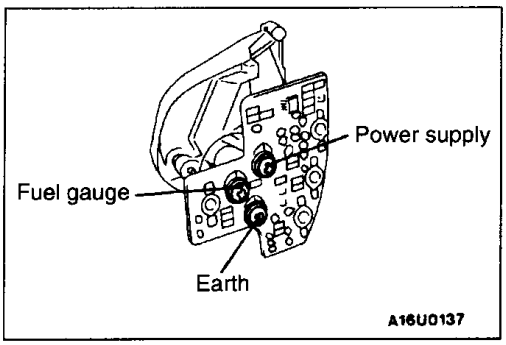
54300300019

FUEL GAUGE RESISTANCE CHECK

(1) Remove the meter glass, meter bezel and window plate.



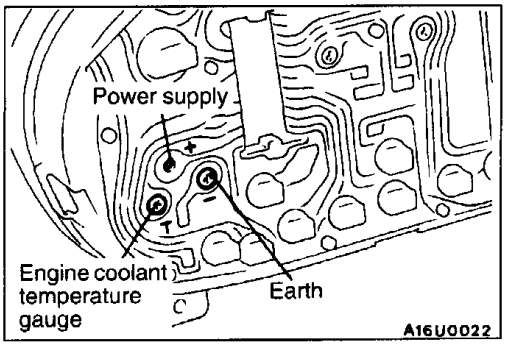
(2) Remove the fuel gauge mounting screws, and then remove the fuel gauge from the meter case.



(3) Use a circuit tester to measure the resistance value between the terminals.

Standard value:

Power supply – Earth: 122–153 Ω
Power supply – Fuel gauge: 27–35 Ω
Fuel gauge – Earth: 95–119 Ω



ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE CHECK

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

NOTE
The terminal positions are indicated by T, (–) and (+).

Standard value:

Power supply (+)–Earth (–): 185–227 Ω
Power supply (+)–Engine coolant temperature gauge (T): 54–58 Ω
Engine coolant temperature gauge(T) –Earth (–): 239–285 Ω

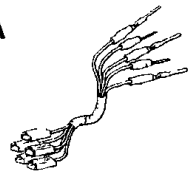
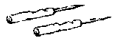
Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.

HEADLAMP AND FRONT TURN-SIGNAL LAMP 54200030052

SERVICE SPECIFICATIONS

Items		Standard value	Limit
Headlamp aiming for low beam	Vertical direction	60 mm below horizontal (H)	–
	Horizontal direction	Position where the 15° sloping section intersects the vertical line (V)	–
Headlamp intensity cd		–	30,000 or more

SPECIAL TOOLS 54200060099

Tool	Number	Name	Use
A  B C D 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Making voltage and resistance measurements during troubleshooting A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
	MB990784	Ornament remover	Removal of switch garnish

TROUBLESHOOTING 54200070054

The special tool (MB991223) should always be used to measure voltages and resistances when carrying out troubleshooting.

INSPECTION CHART FOR TROUBLE SYMPTOMS

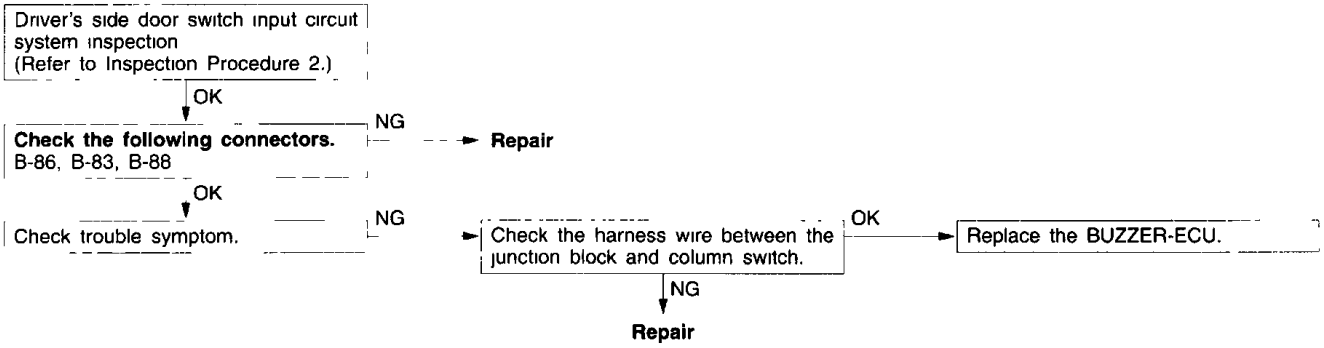
Trouble symptoms	Inspection procedure	Reference page
The lighting monitor buzzer doesn't sound under the following conditions while tail lamps or headlamps illuminate. • When the ignition switch is turned to OFF and the driver's side door is open.	1	54-27
Headlamp leveling does not occur when the headlamp leveling switch is operated.	3	54-28

Trouble symptoms	Inspection procedure	Reference page
The headlamps do not illuminate when the vehicle is in the following condition and the ignition switch is at the ON position. However, the headlamps illuminate when the lighting switch is moved to the HEAD position. <Vehicles with daytime running lamp system> • Lighting switch: OFF • Passing switch: OFF	4	54-29
The headlamps do not switch off when the vehicle is in the following condition and the lighting switch is moved to the TAIL position. <Vehicles with daytime running lamp system> • Ignition switch: OFF • Passing switch: OFF	5	54-30

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

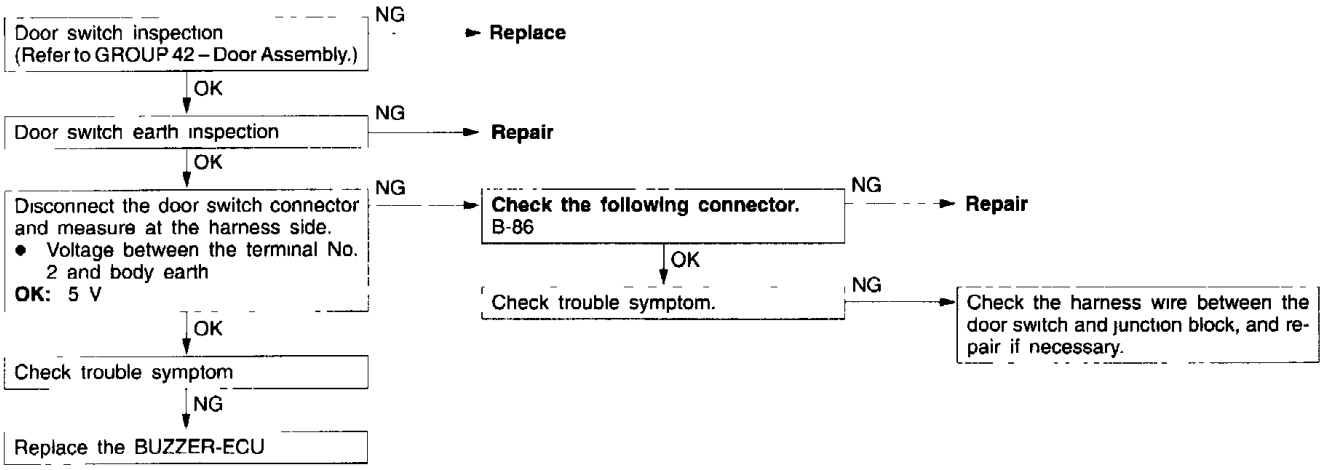
Inspection Procedure 1

The ignition switch is turned to the OFF position and the driver's side door is opened while the tail lamps or headlamps are operating, but the light reminder warning buzzer does not sound.	**Probable cause**
The cause is probably a defective lighting switch input circuit system or a defective driver's side door switch input circuit system.	• Malfunction of driver's side door switch • Malfunction of harness or connector • Malfunction of BUZZER-ECU



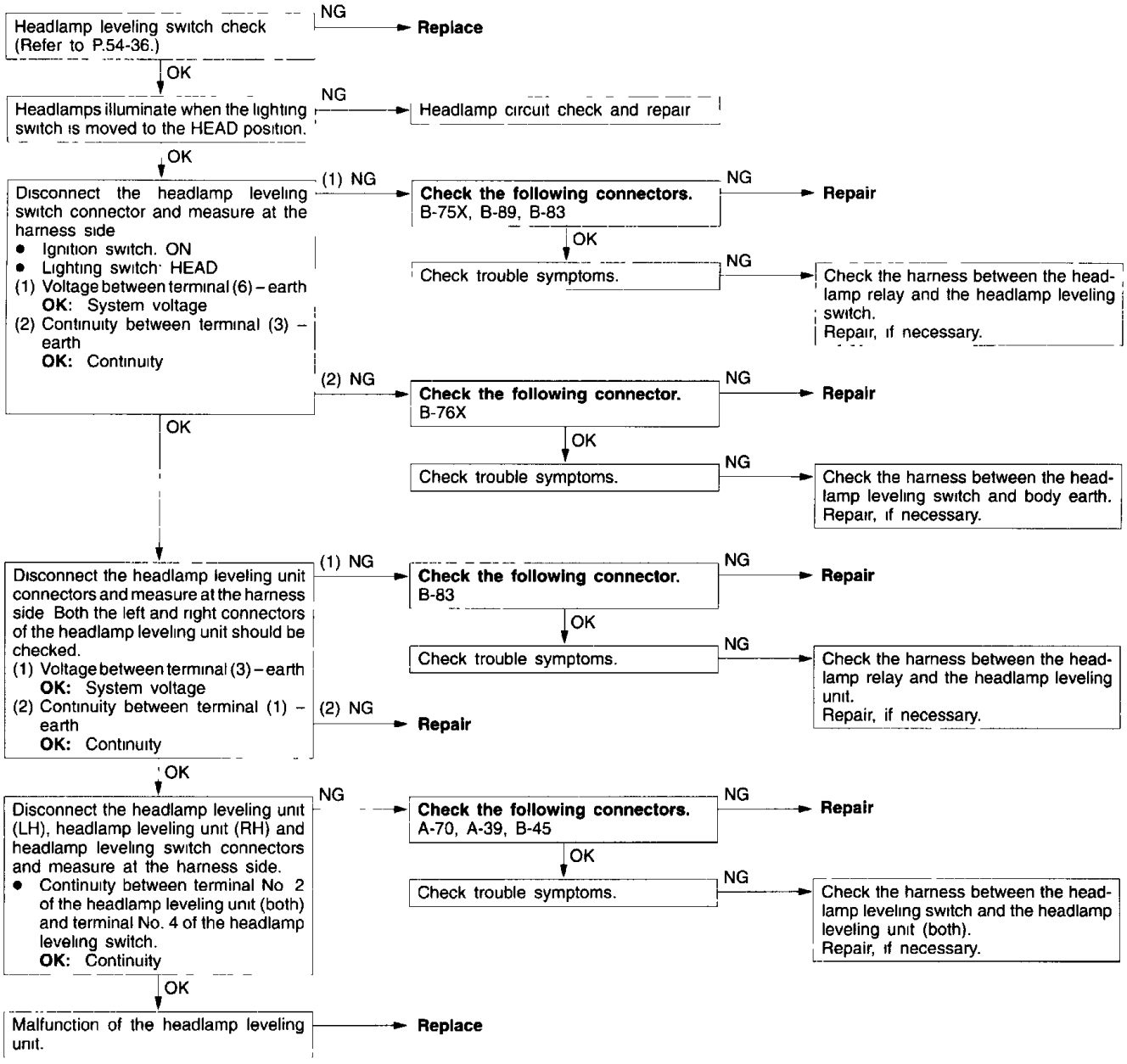
Inspection Procedure 2

Driver's side door switch input circuit system inspection



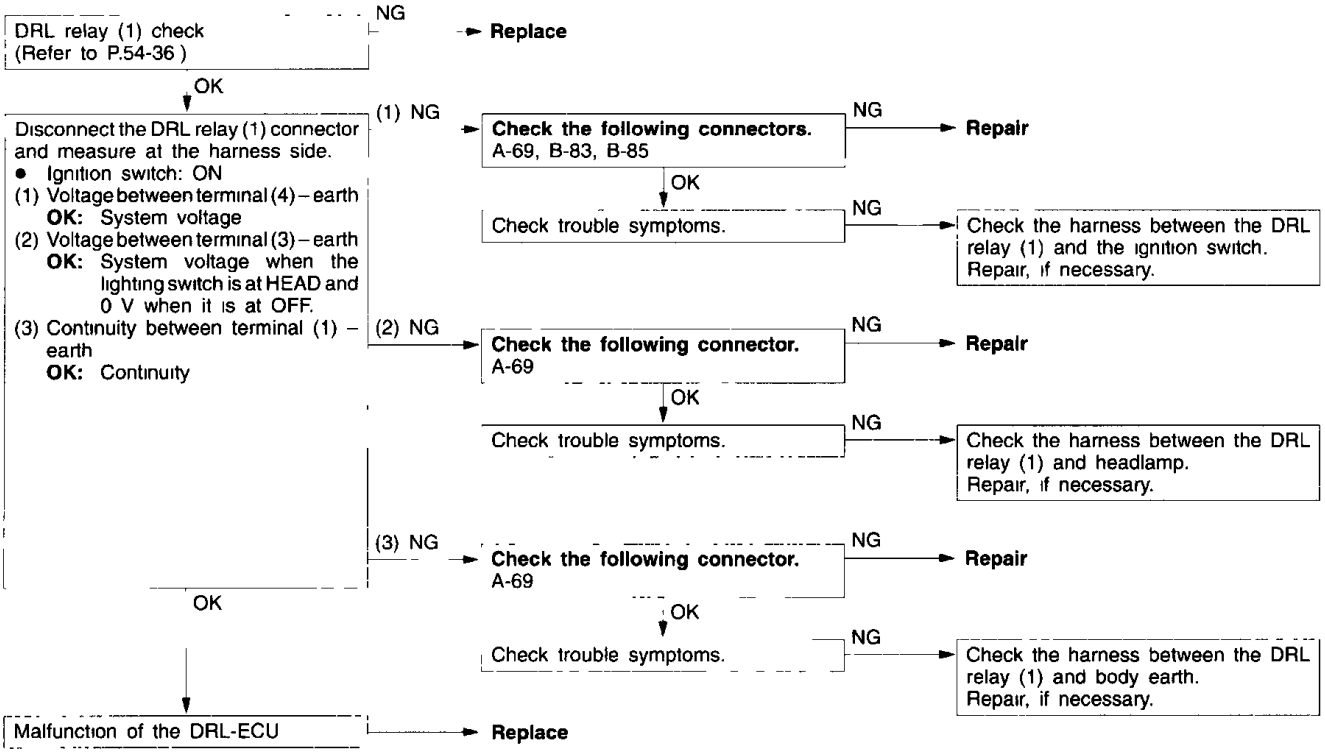
Inspection procedure 3

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



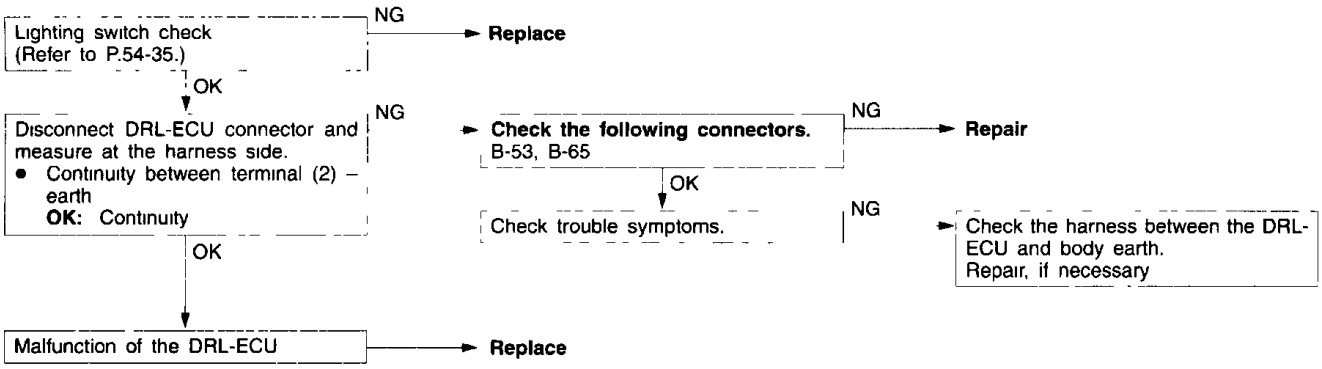
Inspection procedure 4

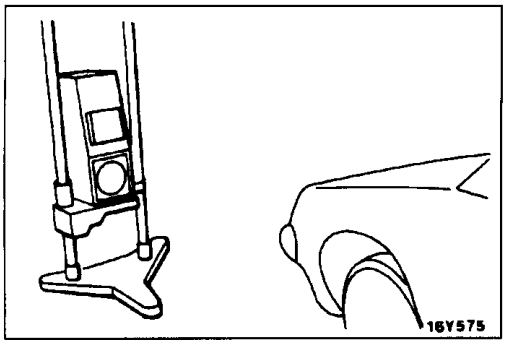
The headlamps do not illuminate when the vehicle is in the following condition and the ignition switch is moved to the ON position. However, they illuminate when the lighting switch is moved to the HEAD position. **<Vehicles with daytime running lamp>** • **Lighting switch: OFF** • **Passing switch: OFF**	**Probable cause**
The cause is probably a malfunction of the daytime running lamp control unit (DRL-ECU) circuit system. If there is a blown fuse, there may also be a short-circuit in a harness.	• Malfunction of fuse • Malfunction of connector • Malfunction of harness • Malfunction of the DRL relay (1) • Malfunction of the DRL-ECU



Inspection procedure 5

The headlamps do not switch off when the vehicle is in the following condition and the lighting switch is moved to the TAIL position. **<Vehicles with daytime running lamp>** • **Ignition switch: OFF** • **Passing switch: OFF**	**Probable cause**
The cause is probably a malfunction of the daytime running lamp control unit (DRL-ECU) circuit system. If there is a blown fuse, there may also be a short-circuit in a harness.	• Malfunction of fuse • Malfunction of connector • Malfunction of harness • Malfunction of the tail lamp relay • Malfunction of the DRL-ECU





ON-VEHICLE SERVICE

54200090036

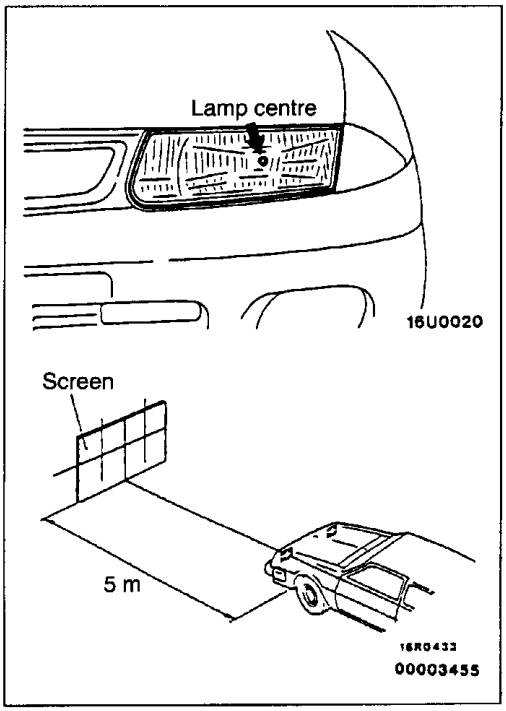
HEADLAMP AIMING

<USING A BEAMSETTING EQUIPMENT>

1. The headlamps should be aimed with the proper beamsetting equipment, and in accordance with the equipment manufacture's instructions.

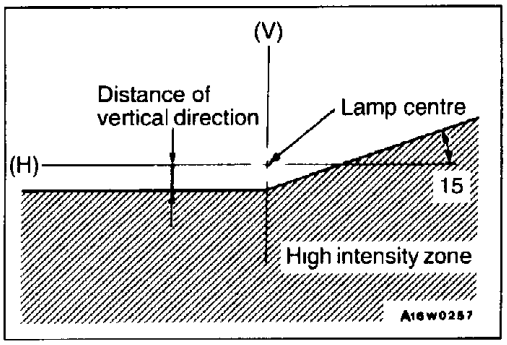
   NOTE
   If there are any regulations pertinent to the aiming of headlamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

2. Alternately turn the adjusting screw to adjust the headlamp aiming. (Refer to P.54-32.)



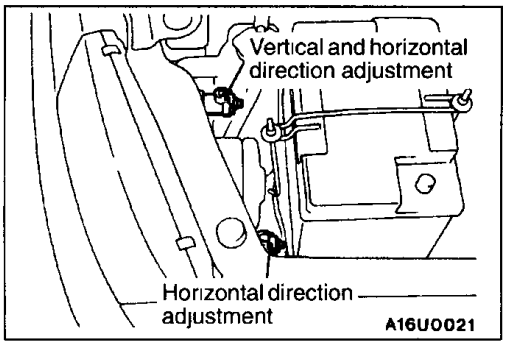
<USING A SCREEN>

1. Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in driver's position.
2. Set the distance between the screen and the centre marks of the headlamps as shown in the illustration.



3. Check if the beam shining onto the screen is at the standard value.

   Standard value:
   (Vertical direction)
   60 mm below horizontal (H)
   (Horizontal direction)
   Position where the 15° sloping section intersects the vertical line (V)



4. Alternately turn the adjusting screw to adjust the headlamp aiming.

Caution
Be sure to adjust the aiming adjustment screw in the tightening direction.

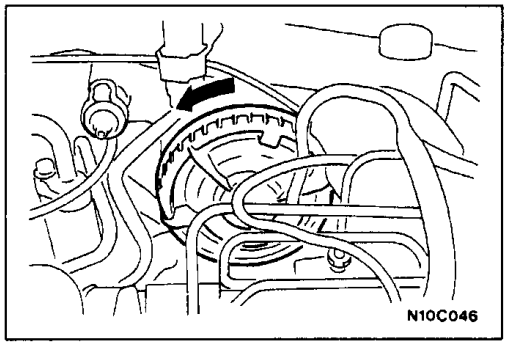
INTENSITY MEASUREMENT 54200100036

Using a photometer, and following its manufacture's instruction manual, measure the headlamp intensity and check to be sure that the limit value is satisfied.

Limit: 30,000 cd or more

NOTE
1. When measuring the intensity, maintain an engine speed of 2,000 r/min, with the battery in the charging condition.
2. There may be special local regulations pertaining to headlamp intensity, be sure to make any adjustments necessary to satisfy such regulations.
3. If an illuminometer is used to make the measurements, convert its values to photometer values by using the following formula.

$I = Er^2$ Where: I = intensity (cd)
E = illumination (lux)
r = distance (m) from headlamps to illuminometer

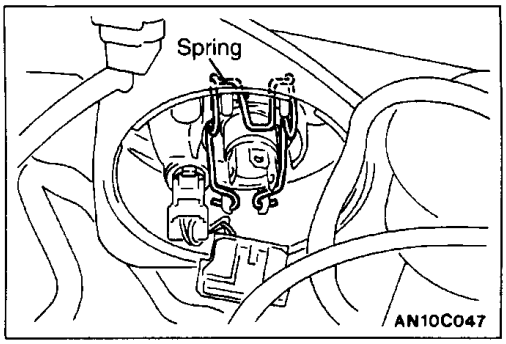


BULB REPLACEMENT

54200130035

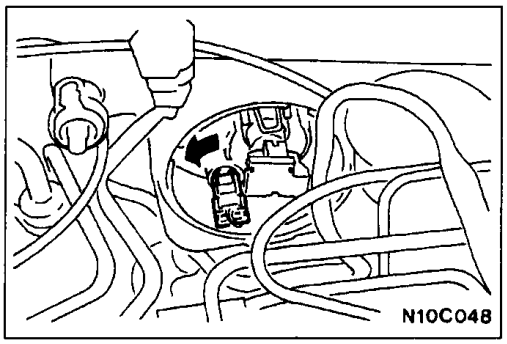
<Headlamp Bulb>

1. Remove the sealing cover by turning it anti-clockwise and disconnect the connector.



2. Unhook the spring which secures the bulb, and then remove the bulb.

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



<Position Lamp Bulb>

1. Remove the sealing cover by turning it anti-clockwise.
2. Remove the lamp socket by turning it anti-clockwise, then pull out the bulb from the socket.

CHASSIS ELECTRICAL

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54109000037

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  - Charging 5
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WARNINGS REGARDING SERVICING OF SUPPLEMENTAL RESTRAINT SYSTEM (SRS) EQUIPPED VEHICLES

WARNING!

(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

(2) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

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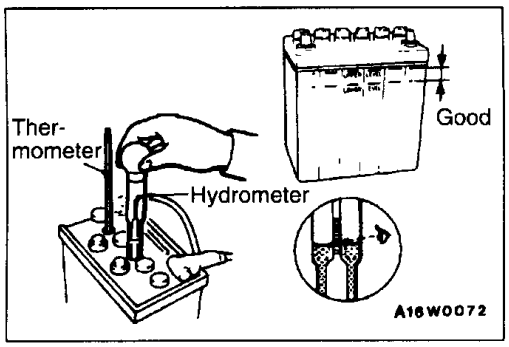
BATTERY

54100030028

SERVICE SPECIFICATION

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



ON-VEHICLE SERVICE

54100090026

FLUID LEVEL AND SPECIFIC GRAVITY CHECK

1. Inspect whether or not the battery fluid is between the UPPER LEVEL and LOWER LEVEL marks.
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.

   D20=Dt+0.0007 (t–20)

   D20: Specific gravity of the battery fluid calculated for 20°C.

   Dt: Actually measured specific gravity

   t: Actually measured temperature

CHARGING

54100110029

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

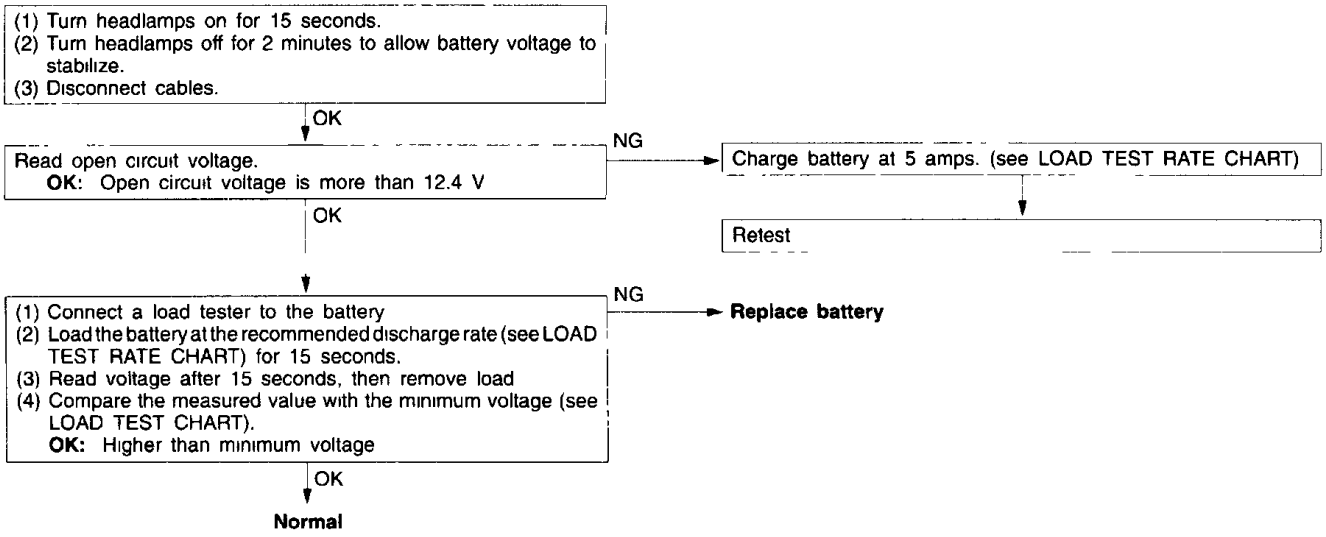
Caution

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

BATTERY TESTING PROCEDURE

54100120039

TEST STEP



LOAD TEST RATE CHART

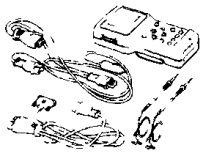
Battery type	55530 or 55559	56216 or 56219	56332 or 56638
Charging time when fully discharged h [5-amp rated current charging]	10	11	11
Load test (Amps)	170	210	210

LOAD TEST CHART

Temperature °C	21 and above	16	10	4	–1	–7	–12	–18
Minimum voltage V	9.6	9.5	9.4	9.3	9.1	8.9	8.7	8.5

IGNITION SWITCH AND IMMOBILIZER SYSTEM 54300060092

SPECIAL TOOL

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Immobilizer system check (Diagnosis display using the MUT-II) • Registration of the ID code

TROUBLESHOOTING 54300070057

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

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

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

ERASING DIAGNOSIS CODES

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

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

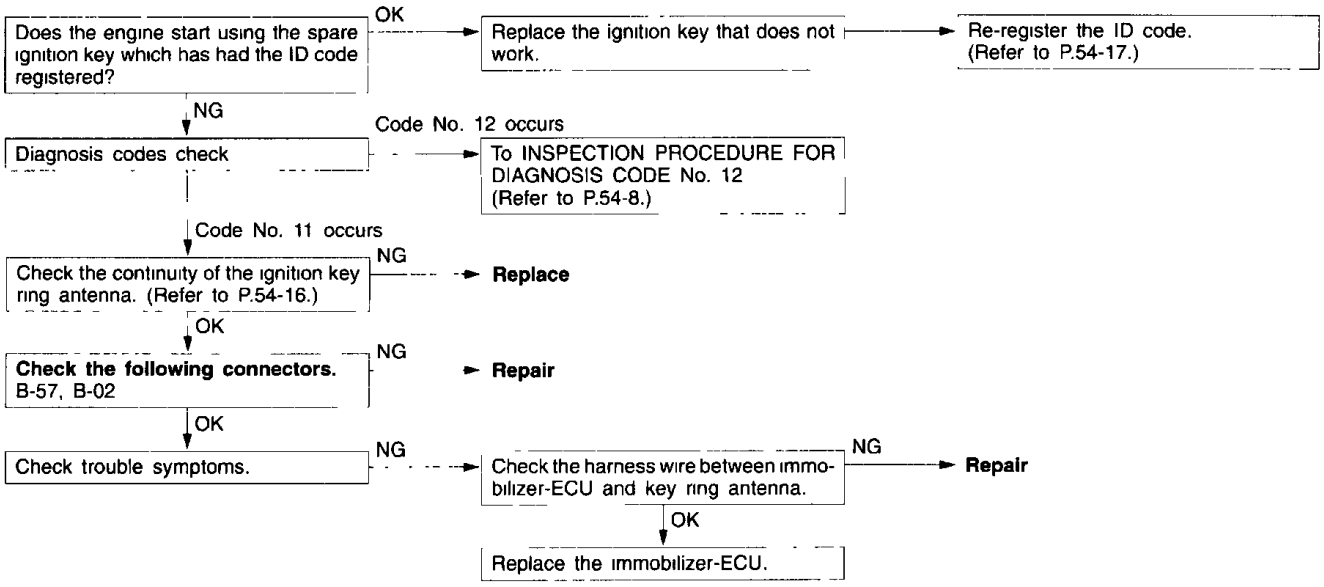
INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code No.	Inspection items	Reference page
11	Transponder communication system	54-8
12*	ID code are not the same or are not registered	54-8
21	Communication system between MUT-II and engine-ECU	54-9
31	EEPROM abnormality inside immobilizer-ECU	54-9
32	Ignition switch IG signal circuit system	54-10

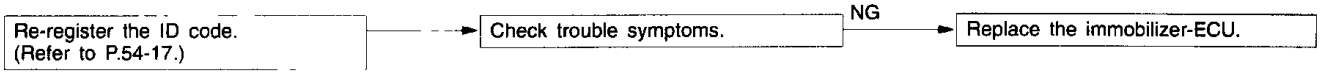
NOTE
*: Diagnosis code No. 12 is not recorded.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

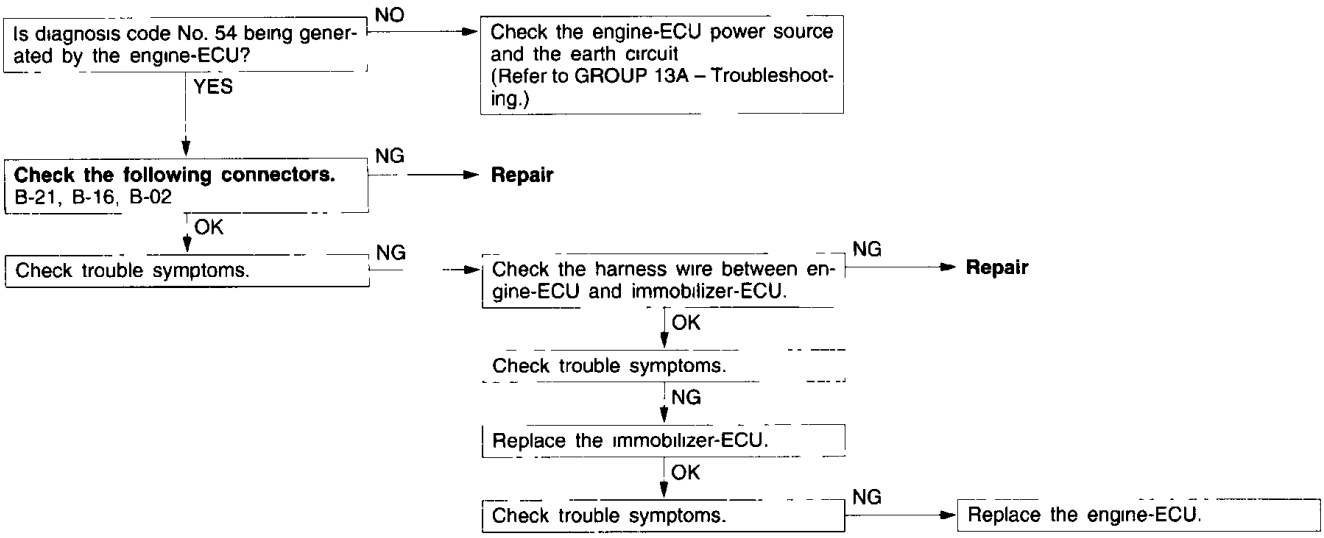
Code No. 11 Transponder communication system	Probable cause
The ID code of the transponder is not sent to the immobilizer-ECU immediately after the ignition switch is turned to the ON position.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



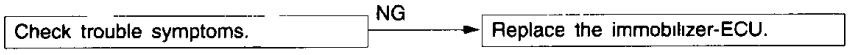
Code No. 12 ID code are not the same or are not registered	Probable cause
The ID code which is sent from the transponder is not the same as the ID code which is registered in the immobilizer-ECU.	• The ID code in the ignition key being used has not been properly registered. • Malfunction of the immobilizer-ECU



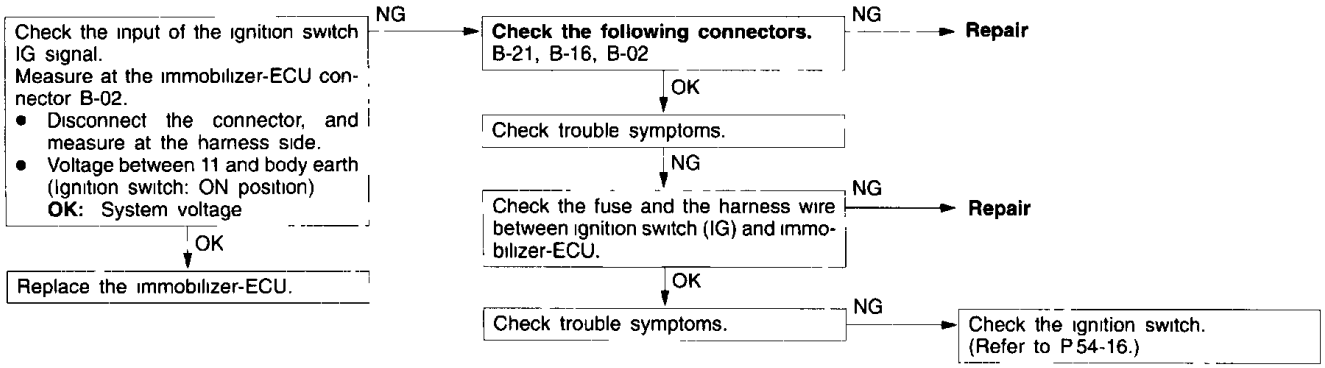
Code No. 21 Communication system between MUT-II and engine-ECU	Probable cause
After the ignition switch is turned to the ON position, the confirmation code is not received from the engine-ECU within the allowable time, or an abnormal code is received.	• Malfunction of harness or connector • Malfunction of the engine-ECU • Malfunction of the immobilizer-ECU



Code No. 31 EEPROM abnormality inside immobilizer-ECU	Probable cause
No data has been written to the EEPROM inside the immobilizer-ECU.	• Malfunction of the immobilizer-ECU



Code No. 32 Ignition switch IG signal circuit system	Probable cause
The ignition switch signal is not being input to the immobilizer-ECU.	• Malfunction of harness or connector • Malfunction of the ignition switch • Malfunction of the immobilizer-ECU



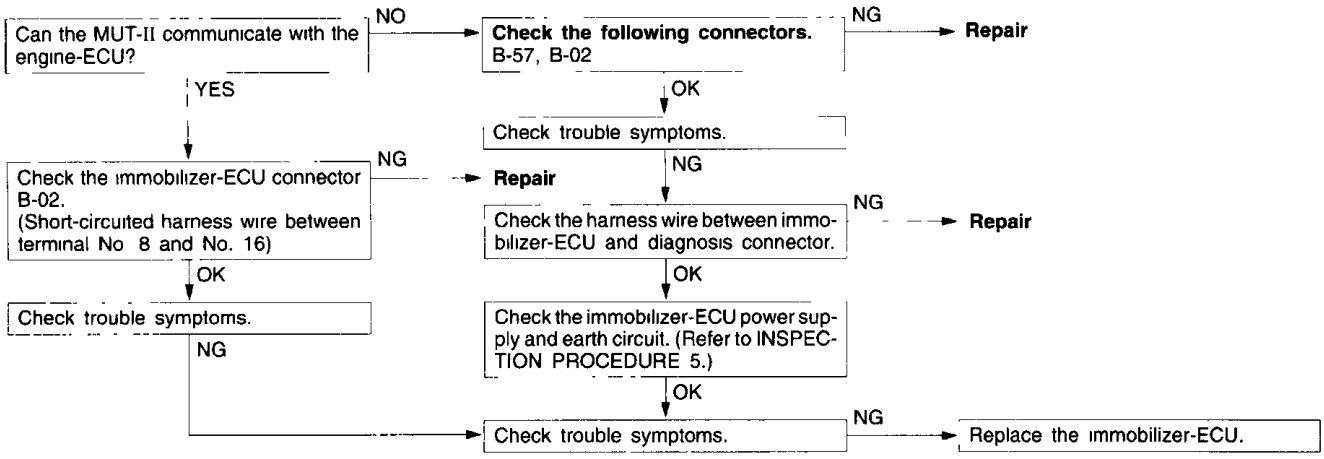
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	1	54-11
Diagnosis code No. 54 has been generated by the engine-ECU.	2	54-12
ID code cannot be registered using the MUT-II.	3	54-12
Engine does not start (Cranking but no initial combustion).	4	54-13
Malfunction of the immobilizer-ECU power source and earth circuit	5	54-14

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

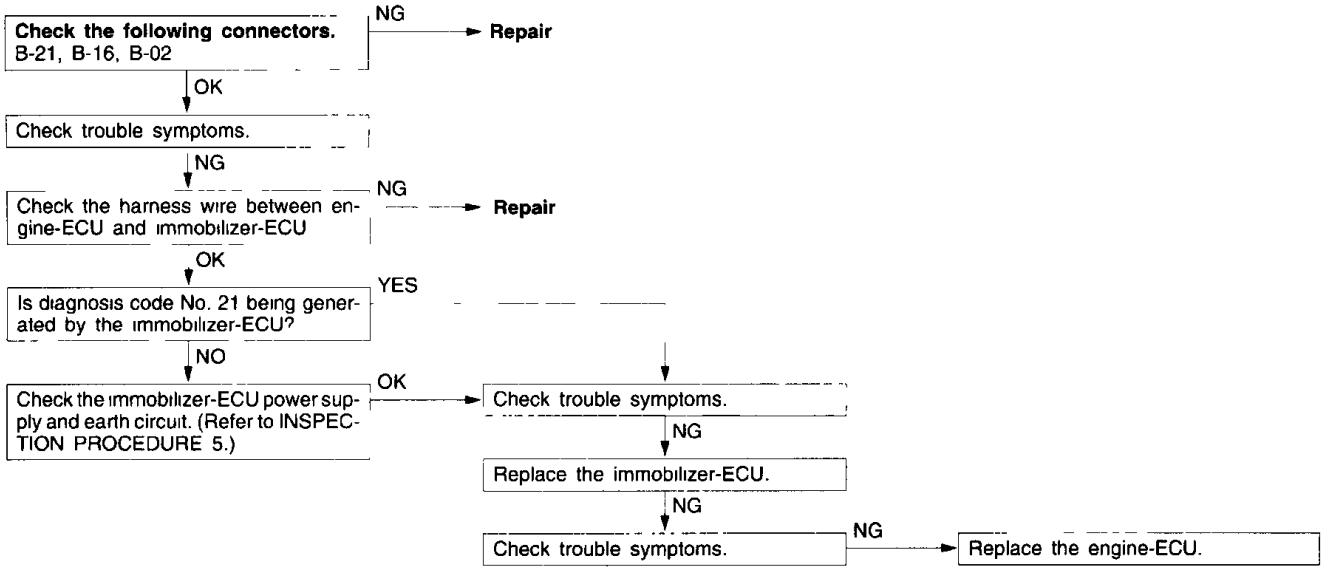
Inspection Procedure 1

Communication with MUT-II is impossible.	Probable cause
The cause is probably that a malfunction of the diagnosis line or the immobilizer-ECU is not functioning.	• Malfunction of the diagnosis line • Malfunction of harness or connector • Malfunction of the immobilizer



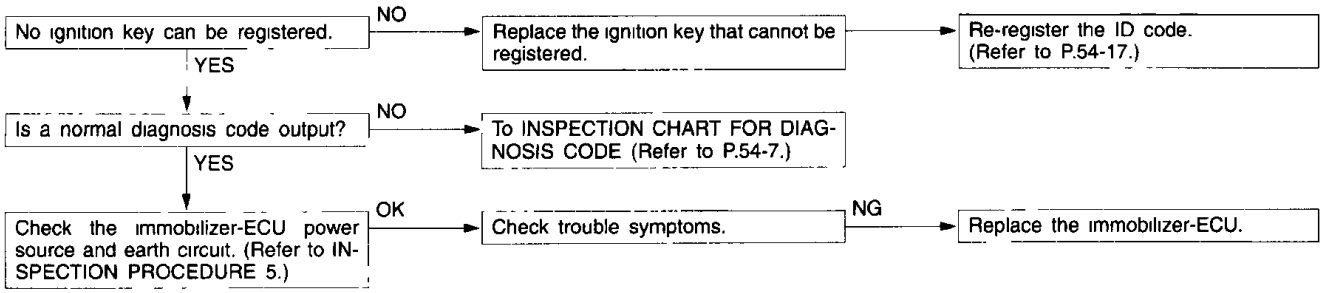
Inspection Procedure 2

Diagnosis code No. 54 has been generated by the engine-ECU.	Probable cause
There is a problem with communication between the engine-ECU and the immobilizer-ECU.	• Malfunction of harness or connector • Malfunction of the immobilizer-ECU • Malfunction of the engine-ECU



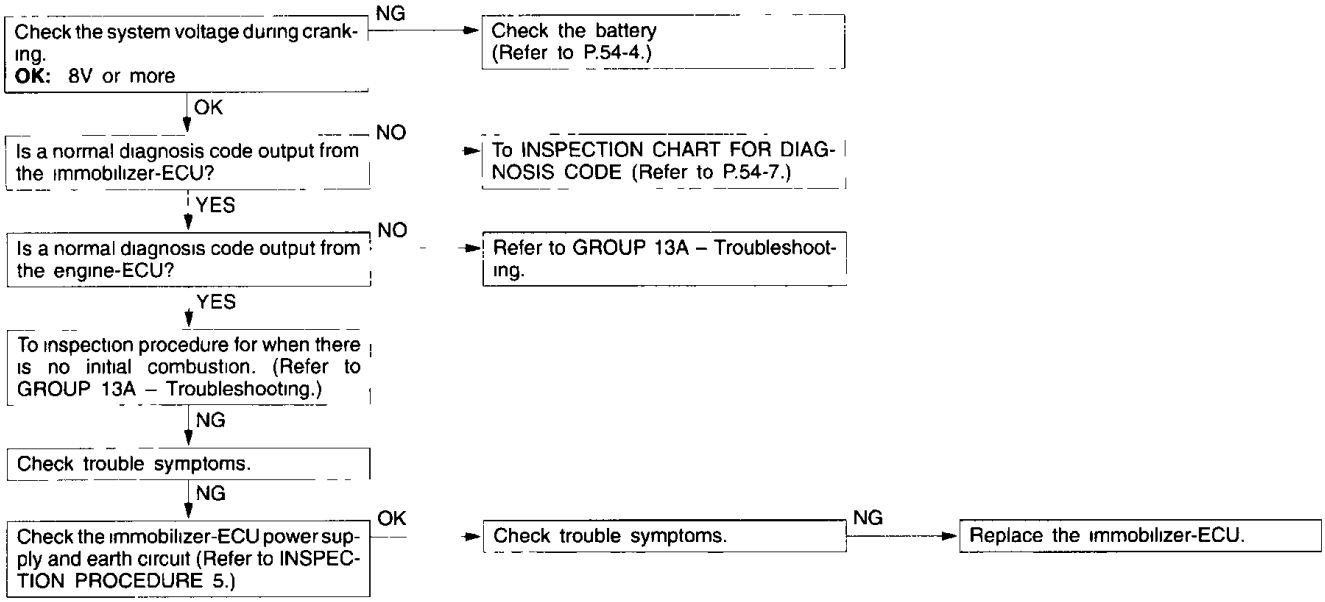
Inspection Procedure 3

ID code cannot be registered using the MUT-II.	Probable cause
The cause is probably that there is no ID code registered in the immobilizer-ECU, or there is a malfunction of the immobilizer-ECU.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



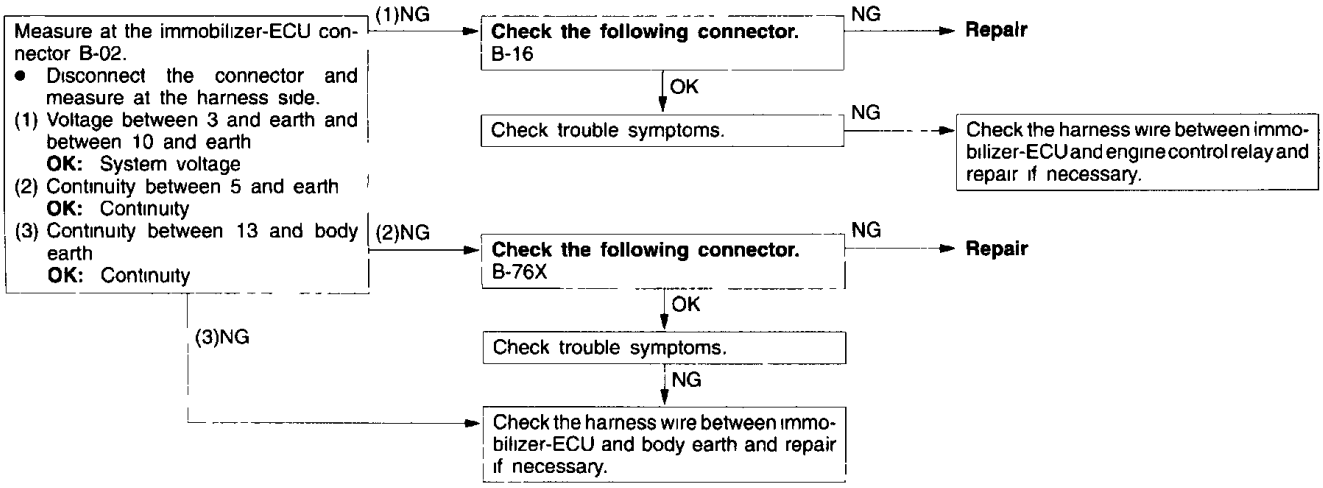
Inspection Procedure 4

Engine does not start (cranking but no initial combustion).	Probable cause
If the fuel injectors are not operating, there might be a problem with the MPI system in addition to a malfunction of the immobilizer system. It is normal for this to occur if an attempt is made to start the engine using a key that has not been properly registered.	• Malfunction of the MPI system • Malfunction of the immobilizer-ECU



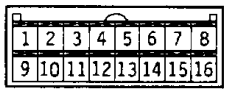
Inspection Procedure 5

Malfunction of the immobilizer-ECU power supply and earth circuit



CHECK AT IMMOBILIZER-ECU

TERMINAL VOLTAGE CHECK CHART



16W0390

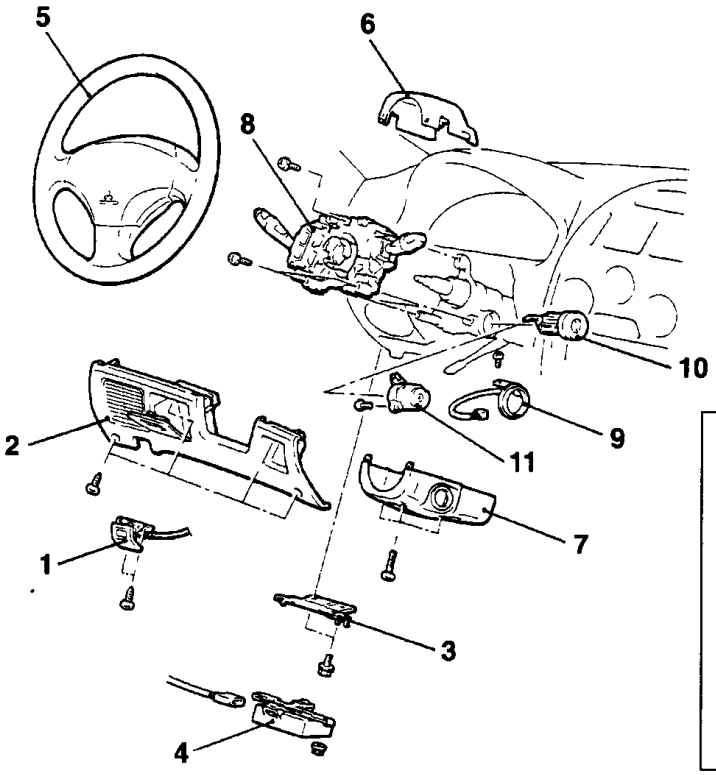
Terminal No.	Signal	Checking requirements	Terminal voltage
3	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
5	Immobilizer-ECU earth	Always	0V
10	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
11	Ignition switch-IG	Ignition switch: OFF	0V
		Ignition switch: ON	System voltage
13	Immobilizer-ECU earth	Always	0V

IGNITION SWITCH AND IMMOBILIZER SYSTEM

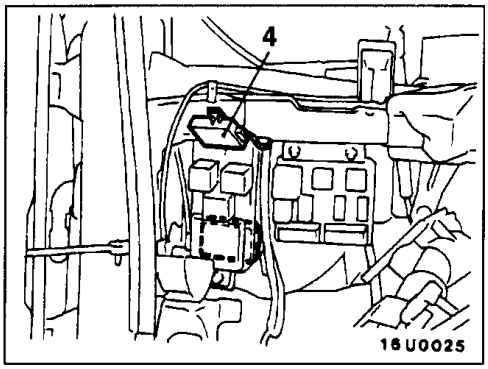
54300210039

REMOVAL AND INSTALLATION

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



16U0116



00003454

Immobilizer-ECU removal steps

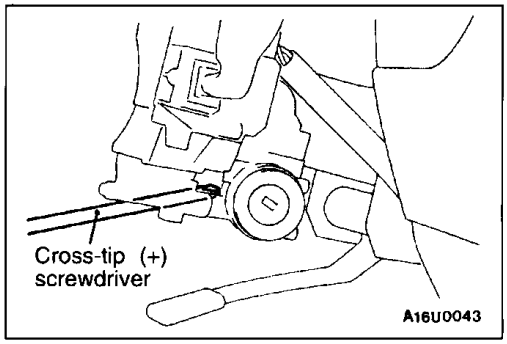
1. Hood lock release handle
2. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
3. Bracket
4. Immobilizer-ECU

Ignition switch and ignition key ring antenna removal steps

1. Hood lock release handle
2. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
5. Steering wheel (Refer to GROUP 37A.)
6. Column cover, upper
7. Column cover, lower
8. Column switch (Refer to GROUP 37A – Steering Wheel and Shaft.)
9. Ignition key ring antenna

◀A▶

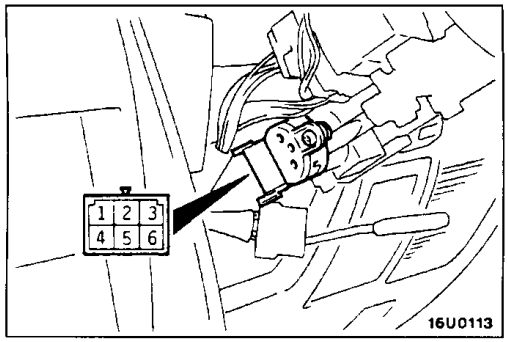
10. Steering lock cylinder
11. Ignition switch



REMOVAL SERVICE POINTS

◀A▶ STEERING LOCK CYLINDER REMOVAL

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



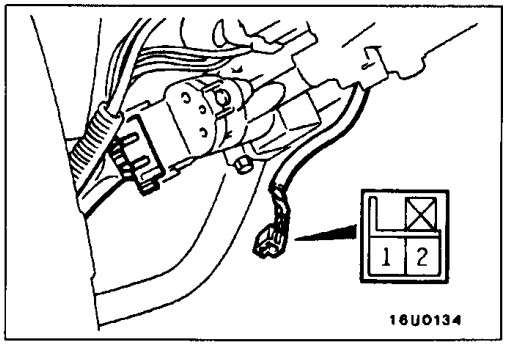
INSPECTION

54300220032

IGNITION SWITCH CONTINUITY CHECK

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

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



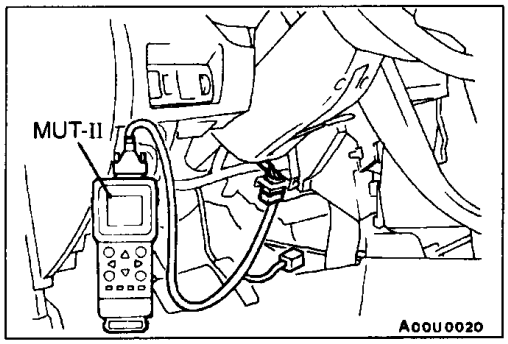
IGNITION KEY RING ANTENNA CONTINUITY CHECK

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

ID CODE REGISTRATION METHOD 54300810017

If using an ignition key that has just been newly purchased, or if the immobilizer-ECU has been replaced, you will need to register the ID codes for each ignition key being used into the immobilizer-ECU. (A maximum of eight different ID codes can be registered.)
Moreover, when the immobilizer-ECU has been replaced, you will need to use the MUT-II to register the ID number that the user specifies into the immobilizer-ECU. (Refer to the MUT-II instruction manual for instructions on using the MUT-II.)

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



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

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

(2) Use the ignition key that is to be registered to turn the ignition switch to the ON position.
(3) Use the MUT-II to register the ID code. If you are registering two or more codes, use the next key to be registered to turn the ignition switch to the ON position without disconnecting the MUT-II.
(4) Disconnect the MUT-II. This completes the registration operation.

COMBINATION METERS

54300030031

SERVICE SPECIFICATIONS

Items			Standard value
Speedometer indication error km/h(mph)		40 (20)	40–48 (20–25)
		80 (40)	80–92 (40–47)
		120 (60)	120–136 (60–69)
		160 (80)	160–180 (80–91)
		– (100)	– (100–114)
Tachometer indication error r/min	Vehicles with SOHC engine	700	±100
		3,000	±150
		5,000	±250
		6,000	±300
	Vehicles with DOHC engine	700	±100
		3,000	+225, –100
		5,000	+325, –125
		7,000	+400, –100
Fuel gauge unit resistance Ω	Float point F		7.9–14.6
	Float point E		107.9–118.9
Fuel gauge unit float height mm	A (Float point F)		142.4
	B (Float point E)		28
Fuel gauge resistance Ω	Power supply and earth		122–153
	Power supply and fuel gauge		27–35
	Fuel gauge and earth		95–119
Engine coolant temperature gauge resistance Ω	Power supply and earth		185–227
	Power supply and engine coolant temperature gauge		54–58
	Engine coolant temperature gauge and earth		239–285
Engine coolant temperature gauge unit resistance (at 70°C) Ω			104±13.5

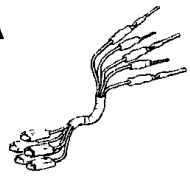
SEALANT

54300050037

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

SPECIAL TOOLS

54300060108

Tool	Number	Name	Use
A  B C D	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Fuel gauge simple check A: Connector pin contact pressure check B, C: Power circuit check D: Commercial tester connection
	MB990784	Ornament remover	Removal of meter hood

TROUBLESHOOTING

54300070064

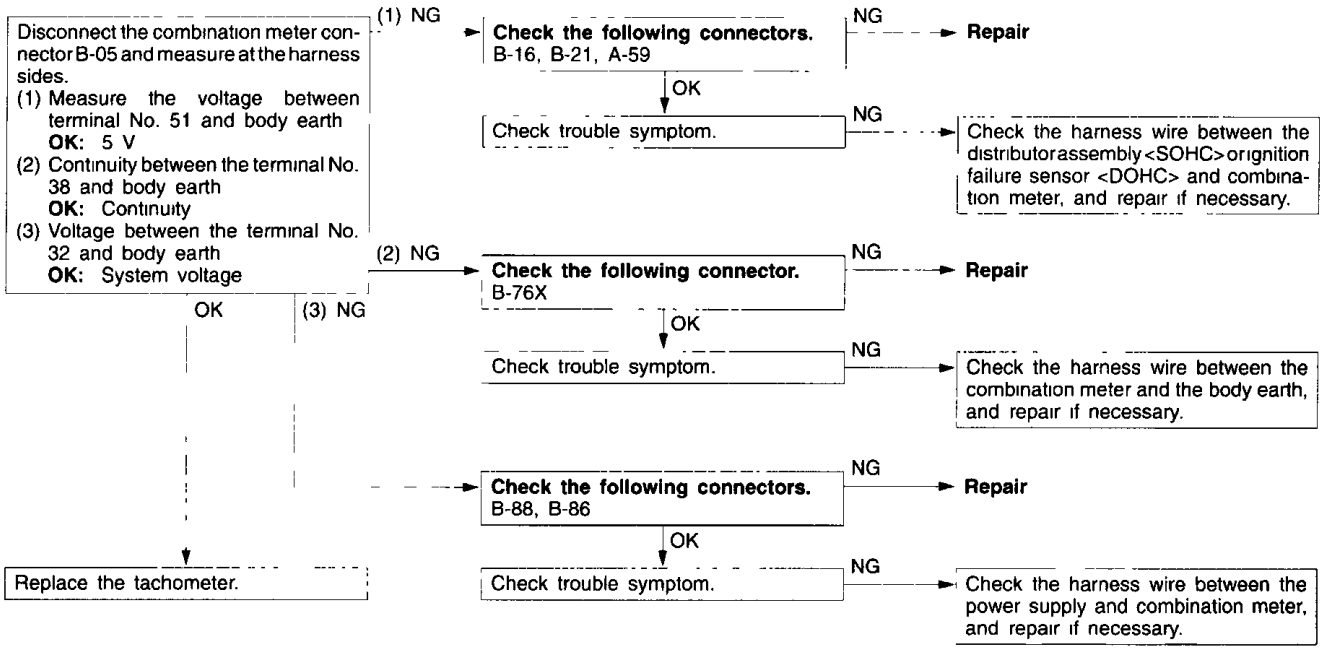
INSPECTION CHART FOR TROUBLE SYMPTOMS

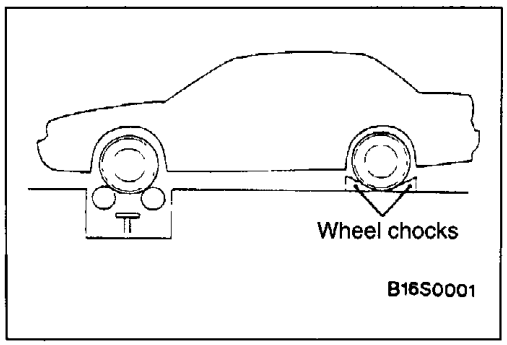
Trouble symptom	Inspection procedure	Reference page
Tachometer does not operate.	1	54-20

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1

Tachometer does not operate.	Probable cause
The ignition signal may not be input from the engine, or there may be a malfunction in the power supply or earth circuit.	• Malfunction of tachometer • Malfunction of harness or connector



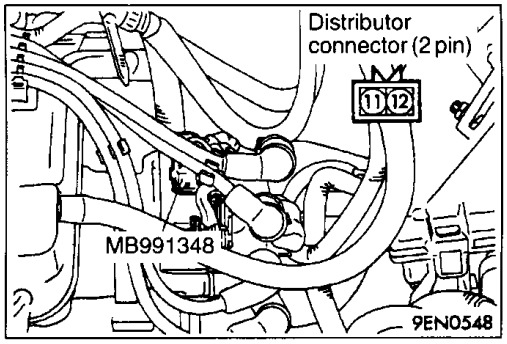


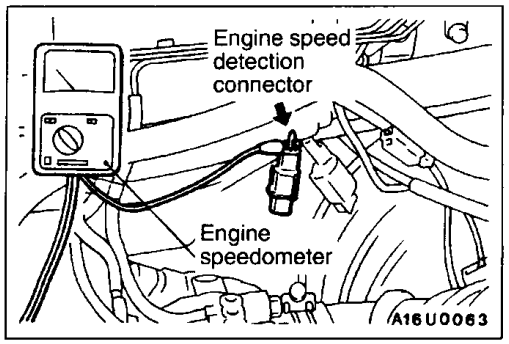
ON-VEHICLE SERVICE

54300090039

SPEEDOMETER CHECK

1. Adjust the pressure of the tyres to the specified level. (Refer to GROUP 31 – Service Specifications.)
2. Set the vehicle onto a speedometer tester and use wheel chocks to hold the rear wheels.





3. Check if the speedometer indicator range is within the standard values.

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

Standard values:

Standard indication km/h (mph)	Allowable range km/h (mph)
40 (20)	40–48 (20–25)
80 (40)	80–92 (40–47)
120 (60)	120–136 (60–69)
160 (80)	160–180 (80–91)
– (100)	– (100–114)

TACHOMETER CHECK

54300100039

<SOHC>

1. Disconnect the distributor connector (2-pin), and connect the special tool in between. All terminals should be connected.
2. Connect a primary voltage-detection type of tachometer to terminal (12) of the distributor connector.
3. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variations are within the standard values.

Standard values:
700 r/min: ±100 r/min
3,000 r/min: ±150 r/min
5,000 r/min: ±250 r/min
6,000 r/min: ±300 r/min

<DOHC>

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach the engine speedometer.

   NOTE
   For tachometer check, 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.

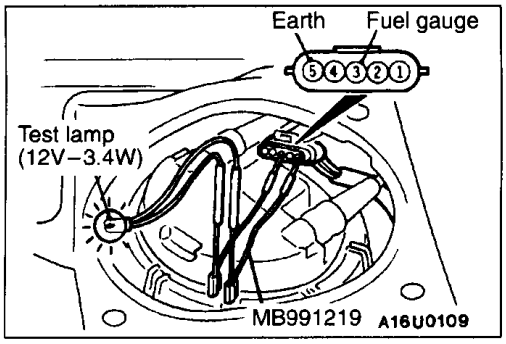
Standard values:
700 r/min. : ±100 r/min.
3,000 r/min : +225 r/min, –100 r/min
5,000 r/min : +325 r/min, –125 r/min
7,000 r/min : +400 r/min, –100 r/min

FUEL GAUGE SIMPLE CHECK

54300110032

Remove the fuel gauge unit connector.
↓
Use the special tool to connect a test lamp (12 V – 3.4 W) to the harness connector.
↓
When the ignition switch is turned to ON, the test lamp illuminates. —OK→ The needle of the fuel gauge moves. —OK→ Replace the fuel gauge unit.
↓ NG
Repair the harness.

The needle of the fuel gauge moves. —NG→ Replace the fuel gauge.



FUEL GAUGE UNIT CHECK

54300120059

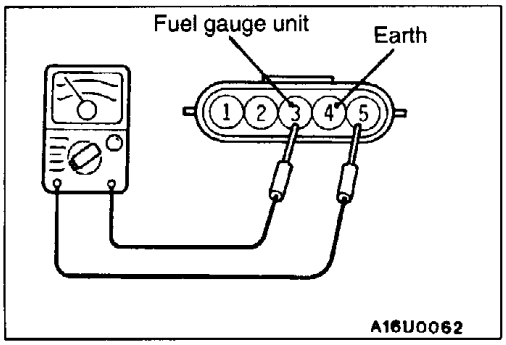
Remove the fuel gauge unit from the fuel tank.
(Refer to GROUP 13F.)

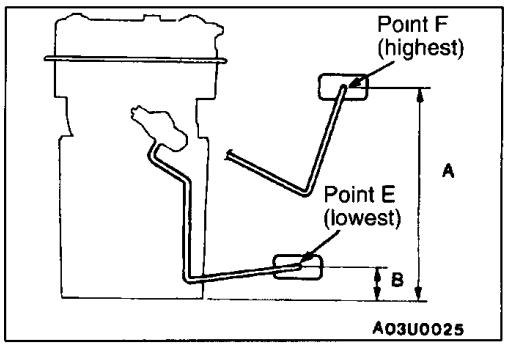
FUEL GAUGE UNIT RESISTANCE

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

   Standard value:
   Point F: 7.9–14.6 Ω
   Point E: 107.9–118.9 Ω

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





FUEL GAUGE UNIT FLOAT HEIGHT

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

Standard value:
A: 142.4 mm
B: 28 mm

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE CHECK

54300140048

Remove the engine coolant gauge unit connector.

↓

Connect a test lamp (12 V – 3.4 W) between the harness side connector and the earth.

↓

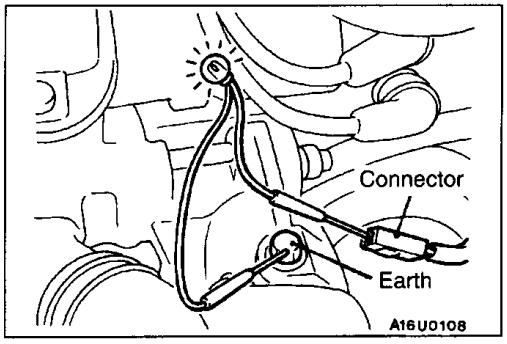
When the ignition switch is turned to ON, the test lamp illuminates

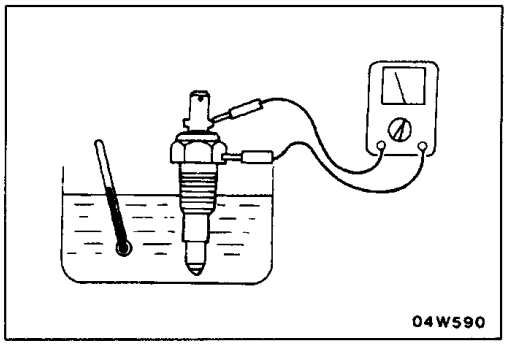
OK → The needle of the engine coolant temperature gauge moves.

NG → Replace the engine coolant temperature gauge.

NG ↓ Repair the harness.

OK ↓ Replace the engine coolant temperature gauge unit.



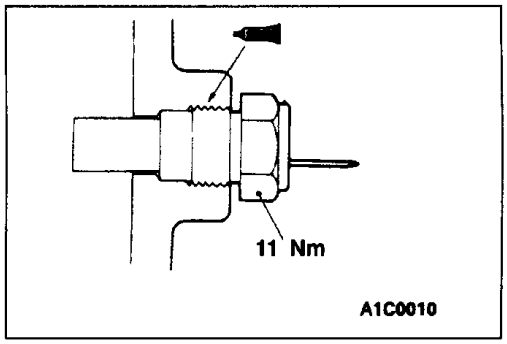


ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK

54300150041

1. Bleed 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±13.5 Ω



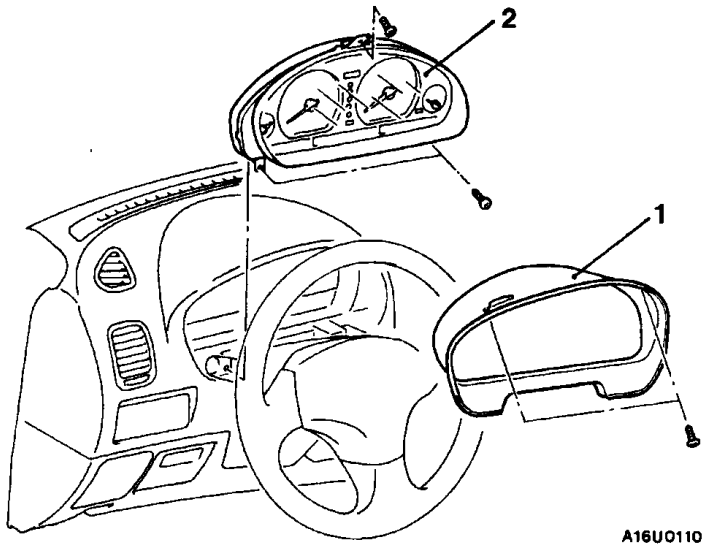
4. After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit.

   Specified sealant:
   3M Adhesive Nut Locking No. 4171 or equivalent
5. Add engine coolant. (Refer to GROUP 14 – On-vehicle Service.)

COMBINATION METERS

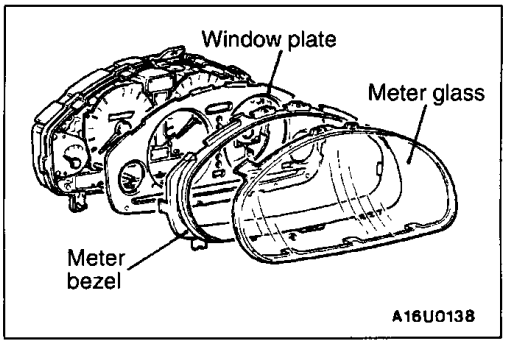
54300290033

REMOVAL AND INSTALLATION



Removal steps

1. Meter hood
2. Combination meter

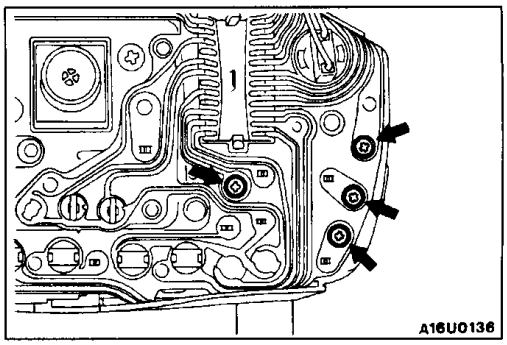


INSPECTION

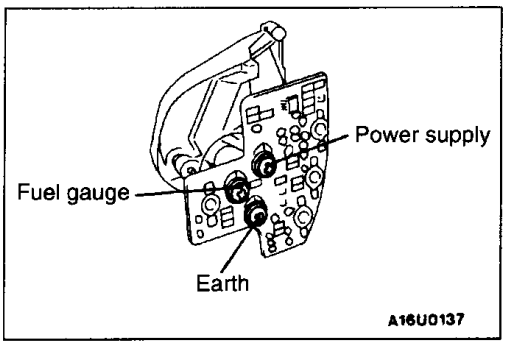
54300300019

FUEL GAUGE RESISTANCE CHECK

(1) Remove the meter glass, meter bezel and window plate.



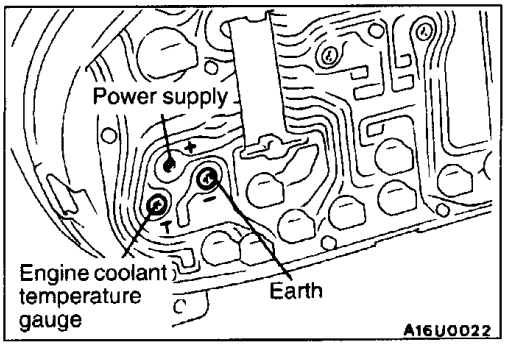
(2) Remove the fuel gauge mounting screws, and then remove the fuel gauge from the meter case.



(3) Use a circuit tester to measure the resistance value between the terminals.

Standard value:

Power supply – Earth: 122–153 Ω
Power supply – Fuel gauge: 27–35 Ω
Fuel gauge – Earth: 95–119 Ω



ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE CHECK

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

NOTE
The terminal positions are indicated by T, (–) and (+).

Standard value:

Power supply (+)–Earth (–): 185–227 Ω
Power supply (+)–Engine coolant temperature gauge (T): 54–58 Ω
Engine coolant temperature gauge(T) –Earth (–): 239–285 Ω

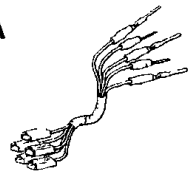
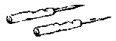
Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.

HEADLAMP AND FRONT TURN-SIGNAL LAMP 54200030052

SERVICE SPECIFICATIONS

Items		Standard value	Limit
Headlamp aiming for low beam	Vertical direction	60 mm below horizontal (H)	–
	Horizontal direction	Position where the 15° sloping section intersects the vertical line (V)	–
Headlamp intensity cd		–	30,000 or more

SPECIAL TOOLS 54200060099

Tool	Number	Name	Use
A  B C D 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	• Making voltage and resistance measurements during troubleshooting A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
	MB990784	Ornament remover	Removal of switch garnish

TROUBLESHOOTING 54200070054

The special tool (MB991223) should always be used to measure voltages and resistances when carrying out troubleshooting.

INSPECTION CHART FOR TROUBLE SYMPTOMS

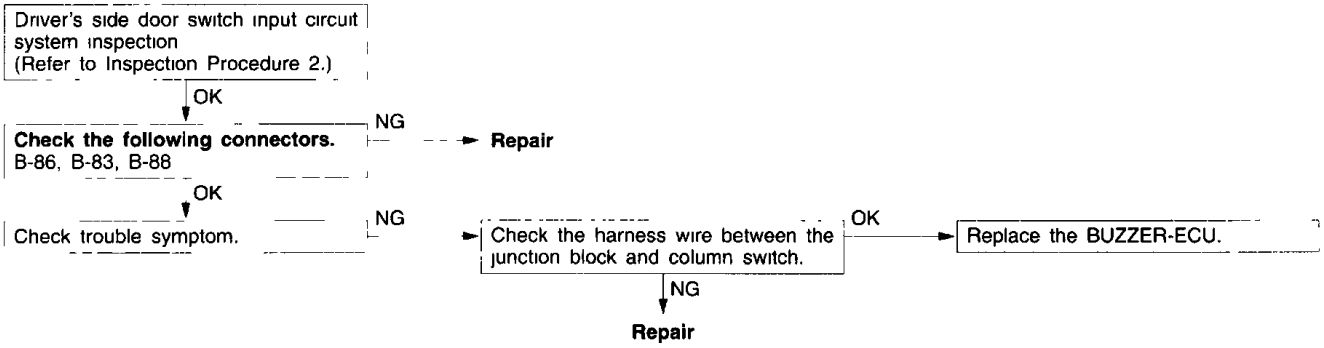
Trouble symptoms	Inspection procedure	Reference page
The lighting monitor buzzer doesn't sound under the following conditions while tail lamps or headlamps illuminate. • When the ignition switch is turned to OFF and the driver's side door is open.	1	54-27
Headlamp leveling does not occur when the headlamp leveling switch is operated.	3	54-28

Trouble symptoms	Inspection procedure	Reference page
The headlamps do not illuminate when the vehicle is in the following condition and the ignition switch is at the ON position. However, the headlamps illuminate when the lighting switch is moved to the HEAD position. <Vehicles with daytime running lamp system> • Lighting switch: OFF • Passing switch: OFF	4	54-29
The headlamps do not switch off when the vehicle is in the following condition and the lighting switch is moved to the TAIL position. <Vehicles with daytime running lamp system> • Ignition switch: OFF • Passing switch: OFF	5	54-30

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

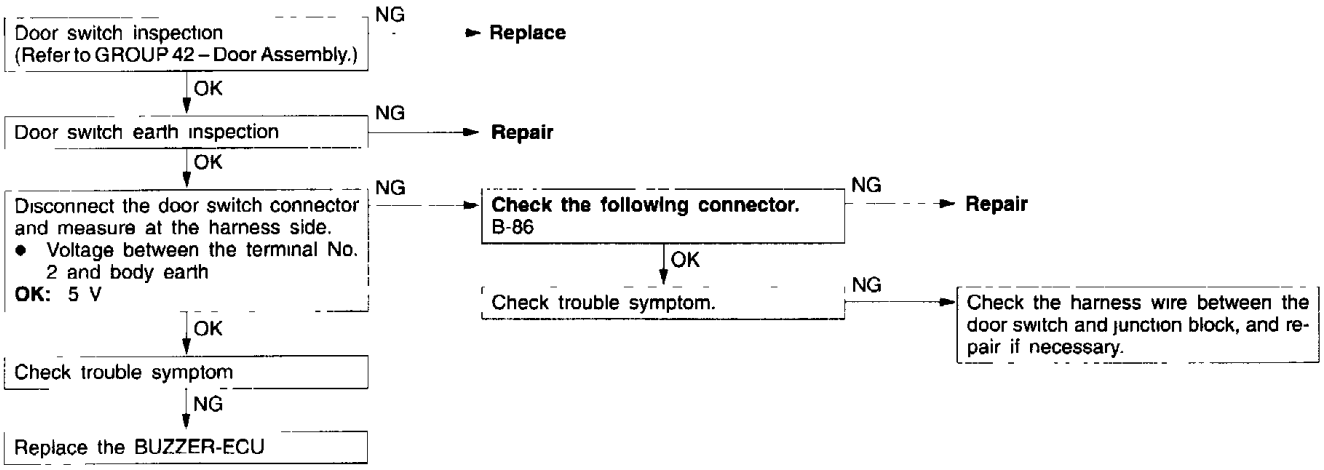
Inspection Procedure 1

The ignition switch is turned to the OFF position and the driver's side door is opened while the tail lamps or headlamps are operating, but the light reminder warning buzzer does not sound.	**Probable cause**
The cause is probably a defective lighting switch input circuit system or a defective driver's side door switch input circuit system.	• Malfunction of driver's side door switch • Malfunction of harness or connector • Malfunction of BUZZER-ECU



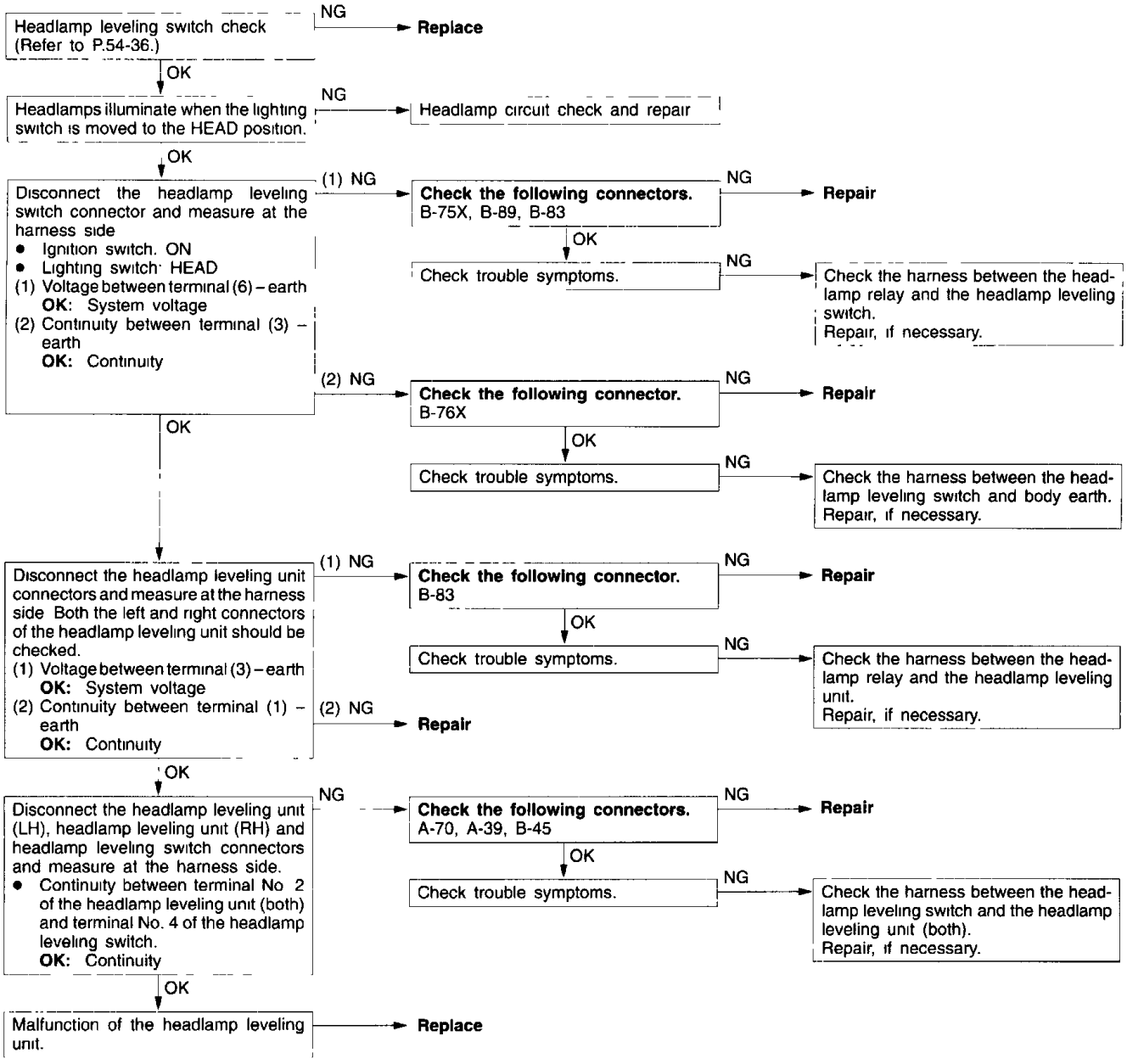
Inspection Procedure 2

Driver's side door switch input circuit system inspection



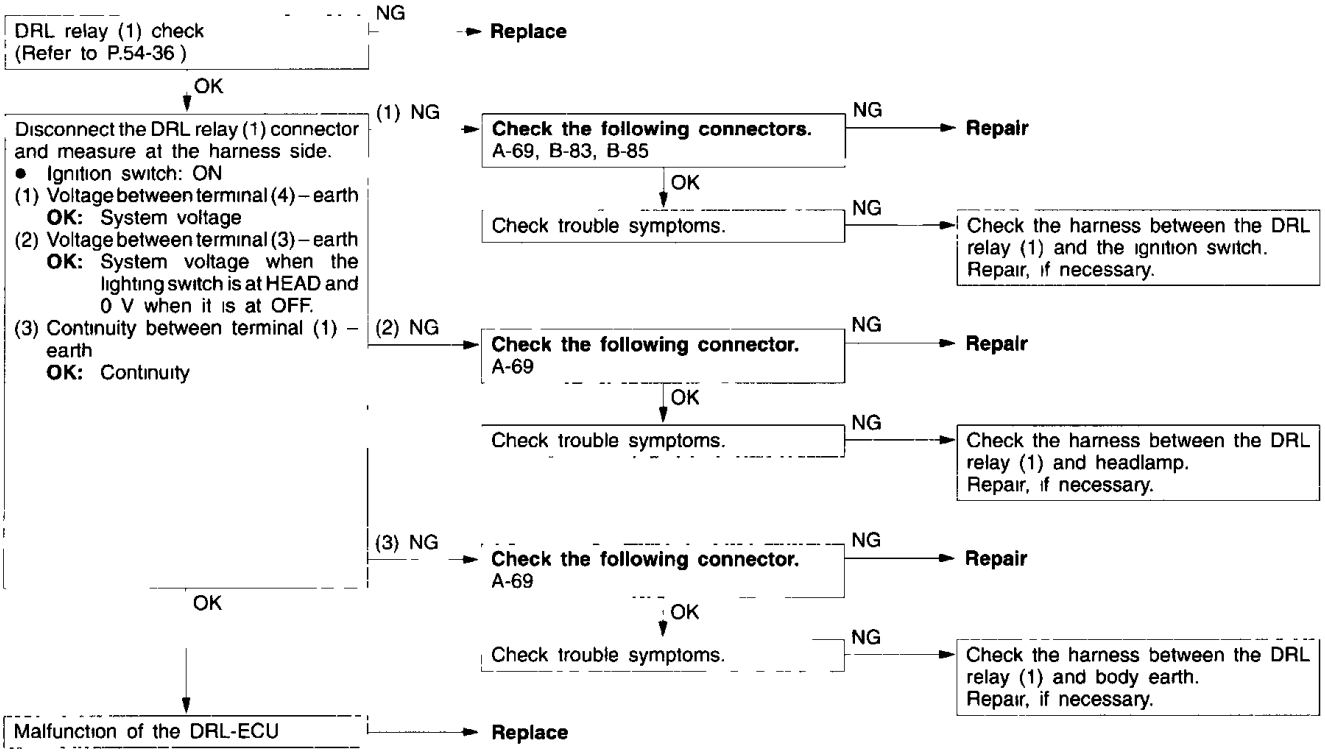
Inspection procedure 3

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



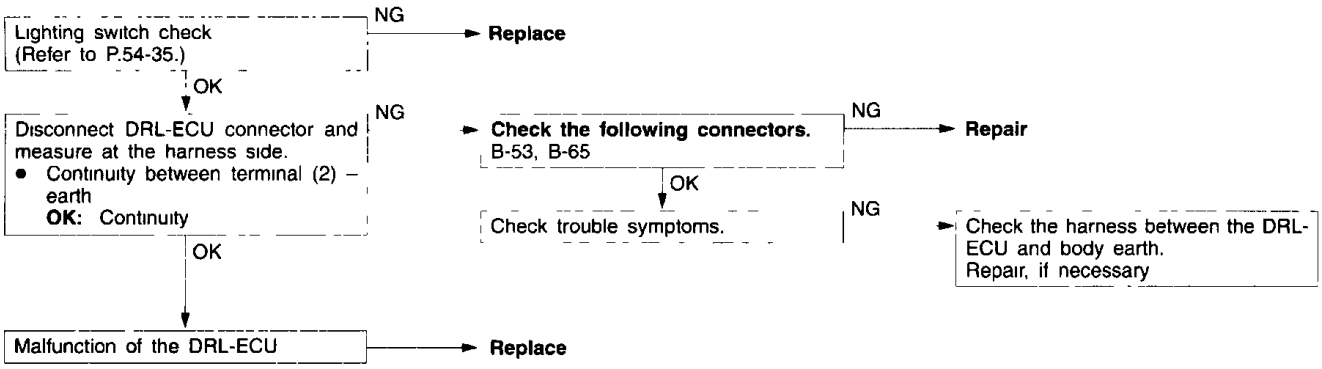
Inspection procedure 4

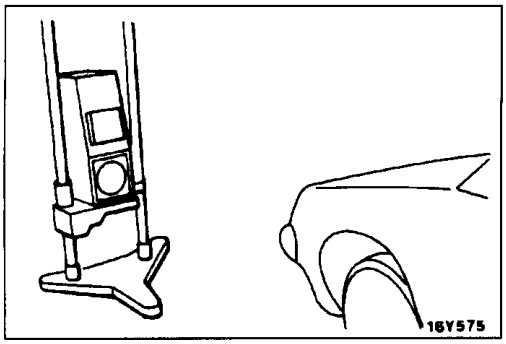
The headlamps do not illuminate when the vehicle is in the following condition and the ignition switch is moved to the ON position. However, they illuminate when the lighting switch is moved to the HEAD position. **<Vehicles with daytime running lamp>** • **Lighting switch: OFF** • **Passing switch: OFF**	**Probable cause**
The cause is probably a malfunction of the daytime running lamp control unit (DRL-ECU) circuit system. If there is a blown fuse, there may also be a short-circuit in a harness.	• Malfunction of fuse • Malfunction of connector • Malfunction of harness • Malfunction of the DRL relay (1) • Malfunction of the DRL-ECU



Inspection procedure 5

The headlamps do not switch off when the vehicle is in the following condition and the lighting switch is moved to the TAIL position. **<Vehicles with daytime running lamp>** • **Ignition switch: OFF** • **Passing switch: OFF**	**Probable cause**
The cause is probably a malfunction of the daytime running lamp control unit (DRL-ECU) circuit system. If there is a blown fuse, there may also be a short-circuit in a harness.	• Malfunction of fuse • Malfunction of connector • Malfunction of harness • Malfunction of the tail lamp relay • Malfunction of the DRL-ECU





ON-VEHICLE SERVICE

54200090036

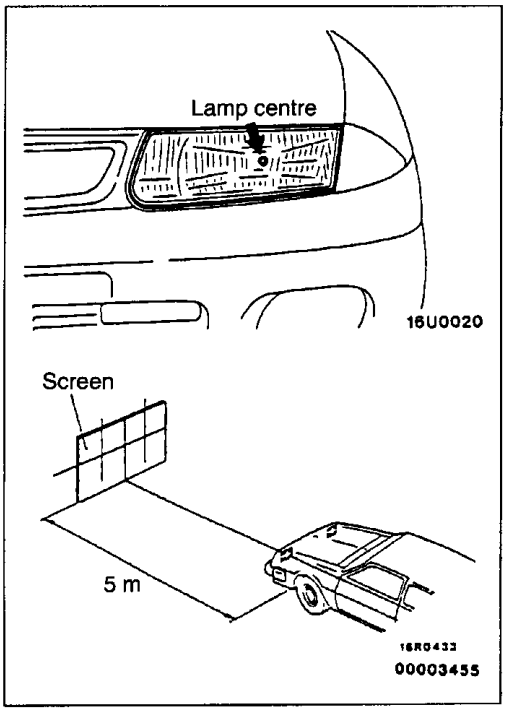
HEADLAMP AIMING

<USING A BEAMSETTING EQUIPMENT>

1. The headlamps should be aimed with the proper beamsetting equipment, and in accordance with the equipment manufacture's instructions.

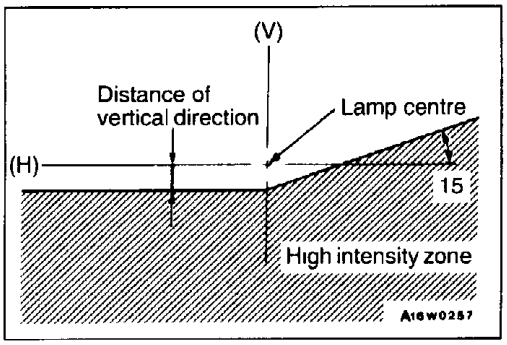
   NOTE
   If there are any regulations pertinent to the aiming of headlamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

2. Alternately turn the adjusting screw to adjust the headlamp aiming. (Refer to P.54-32.)



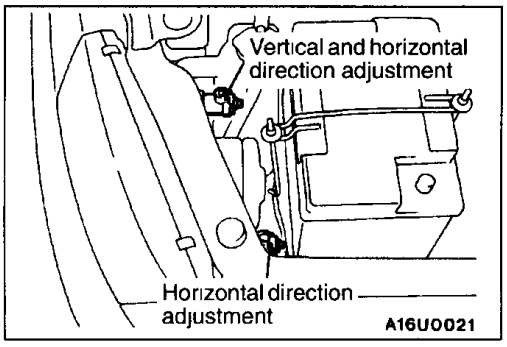
<USING A SCREEN>

1. Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in driver's position.
2. Set the distance between the screen and the centre marks of the headlamps as shown in the illustration.



3. Check if the beam shining onto the screen is at the standard value.

   Standard value:
   (Vertical direction)
   60 mm below horizontal (H)
   (Horizontal direction)
   Position where the 15° sloping section intersects the vertical line (V)



4. Alternately turn the adjusting screw to adjust the headlamp aiming.

Caution
Be sure to adjust the aiming adjustment screw in the tightening direction.

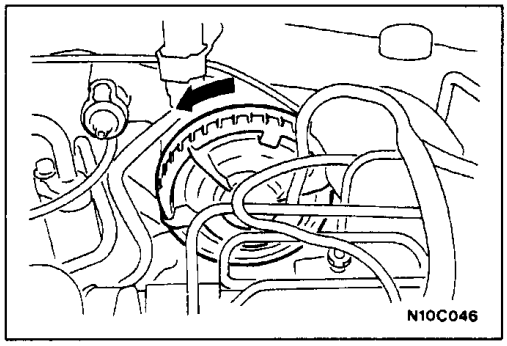
INTENSITY MEASUREMENT 54200100036

Using a photometer, and following its manufacture's instruction manual, measure the headlamp intensity and check to be sure that the limit value is satisfied.

Limit: 30,000 cd or more

NOTE
1. When measuring the intensity, maintain an engine speed of 2,000 r/min, with the battery in the charging condition.
2. There may be special local regulations pertaining to headlamp intensity, be sure to make any adjustments necessary to satisfy such regulations.
3. If an illuminometer is used to make the measurements, convert its values to photometer values by using the following formula.

$I = Er^2$ Where: I = intensity (cd)
E = illumination (lux)
r = distance (m) from headlamps to illuminometer

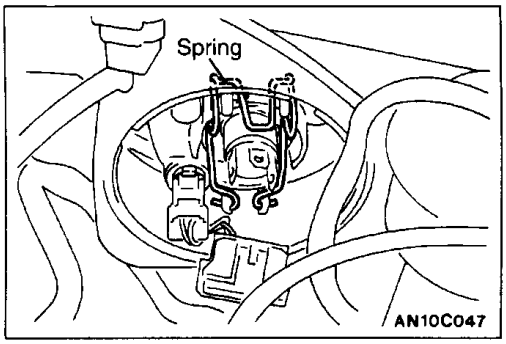


BULB REPLACEMENT

54200130035

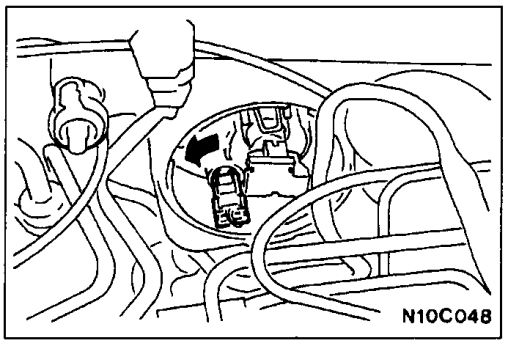
<Headlamp Bulb>

1. Remove the sealing cover by turning it anti-clockwise and disconnect the connector.



2. Unhook the spring which secures the bulb, and then remove the bulb.

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



<Position Lamp Bulb>

1. Remove the sealing cover by turning it anti-clockwise.
2. Remove the lamp socket by turning it anti-clockwise, then pull out the bulb from the socket.

HEATER, AIR CONDITIONER AND VENTILATION

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55109000034

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Magnetic Clutch Test 9

Receiver Drier Test 9

Dual Pressure Switch Check 10

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) Service or maintenance of any SRS component or SRS-related component must be performed only at an authorized MITSUBISHI dealer.

(3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B – Supplemental Restraint System (SRS) before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

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

Compressor Drive Belt Adjustment 10
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MANUAL AIR CONDITIONER

55200010046

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 system is basically the same as the conventional system, but a new refrigerant system has been adopted as a response to restrictions on the use of chlorofluorocarbons. In addition, an air purifier which carries out fine A/C control has been included.

Items		Specifications
Heater unit	Type	Two-way-flow full-air-mix system
Heater control assembly		Dial type
Compressor	Model	Scroll type <MSC90>
Dual pressure switch kPa	High pressure switch	ON → OFF: 2,942, OFF → ON: 2,354
	Low pressure switch	ON → OFF: 196, OFF → ON: 221
Refrigerant and quantity g		R-134a (HFC-134a), Approx. 680–720

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.
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 nonexplosive. 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 cold water. Call your doctor immediately even though 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 metering 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. **The leak detector 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

55200030042

Items		Standard value
Idle speed r/min	4G92	750±50
	4G93	800±50
Idle up speed r/min		850±50
Resistor (for blower motor) Ω	LO	2.30
	ML	1.10
	MH	0.40
Refrigerant temperature switch	ON (continuity) temperature	Approx. 155°C or less
	OFF (no continuity) temperature	Approx. 155°C or more (until the temperature drops to approx. 125°C when OFF)
Air gap (Magnetic clutch) mm		0.4–0.65

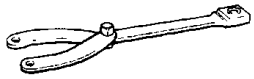
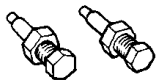
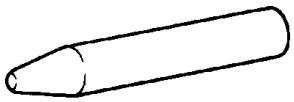
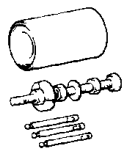
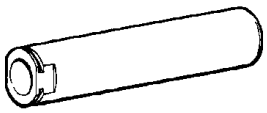
LUBRICANTS

55200040045

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	120

SPECIAL TOOLS

55200060041

Tool	Number	Name	Use
	MB991367	Special spanner	Removal and installation of armature mounting nut of compressor
	MB991386	Pin	
	MB991459	Lip seal installer guide	Installation of lip seal
	MB991456	Bearing puller	Removal of compressor bearing
	MB991458	Lip seal installer and remover	Removal and installation of lip seal

TROUBLESHOOTING

55200070044

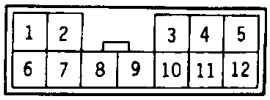
TROUBLESHOOTING PROCEDURES

Trouble symptom	Problem cause	Remedy	Reference page
When the ignition switch is "ON", the A/C does not operate.	A/C compressor relay is defective	Replace A/C compressor relay	55-19
	Magnetic clutch is defective	Replace the armature plate, rotor or clutch coil	55-31
	Refrigerant leak or overfilling of refrigerant	Replenish the refrigerant, repair the leak or take out some of the refrigerant	55-17
	Dual pressure switch is defective	Replace the dual pressure switch	55-36
	A/C switch is defective	Replace the A/C switch	55-21
	Blower switch is defective	Replace the blower switch	55-21
	Air thermo sensor is defective	Replace the sensor	55-28
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-31
	Engine coolant temperature sensor is defective	Replace the engine coolant temperature sensor	–*
	Automatic compressor-ECU is defective	Replace the automatic compressor-ECU	55-24
When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	Refrigerant leak	Replenish the refrigerant and repair the leak	55-17
	Dual pressure switch is defective	Replace the dual pressure switch	55-36
	Air thermo sensor is defective	Replace the sensor	55-28
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-31
	Engine coolant temperature sensor is defective	Replace the engine coolant temperature sensor	–*
	Automatic compressor ECU is defective	Replace the automatic compressor-ECU	55-24

NOTE
*: Refer to GROUP 13A – On-vehicle Service.

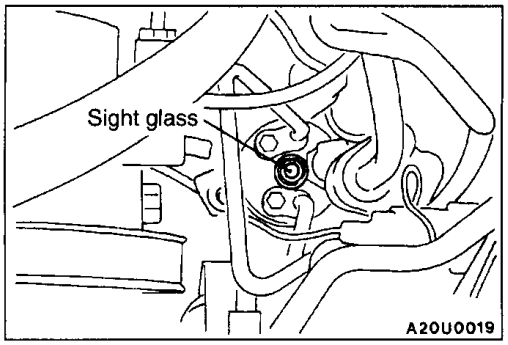
Trouble symptom	Problem cause	Remedy	Reference page
Blower fan and motor doesn't turn	Blower relay is defective	Replace the blower relay	55-19
	Blower fan and motor is defective	Replace the blower fan and motor	55-24
	Resistor (for blower motor) is defective	Replace the resistor	55-24
	Blower switch is defective	Replace the blower switch	55-21
Blower fan and motor doesn't stop turning.	Short circuit of the harness between the blower fan and motor and the blower switch	Repair the harness	–
	Blower switch is defective	Replace the blower switch	55-21
	Blower relay is defective	Replace the blower relay	55-19
When the A/C is operating condenser fan does not turn.	Condenser fan motor is defective	Replace the condenser fan motor	55-39
	Condenser fan relay (LOW) is defective	Replace the condenser fan relay (LOW)	55-19
	Condenser fan relay (HIGH) is defective	Replace the condenser fan relay (HIGH)	55-19
	Dual pressure switch is defective	Replace the dual pressure switch	55-36

INSPECTION AT THE AUTOMATIC COMPRESSOR-ECU TERMINAL



20U0014

Terminal No.	Name of Signal	Condition	Terminal voltage
2	Automatic compressor-ECU power supply (ECONO mode)	When the ignition switch and the blower switch are ON, and the A/C switch has been turned to the first level	System voltage
5	Air thermo sensor	Sensor temperature is 25°C [1.0 kΩ]	Approx. 4V
6	A/C compressor relay	When the compressor ON conditions are satisfied	System voltage
7	Automatic compressor-ECU power supply (DRY mode)	When the ignition switch and the blower switch are ON, and the A/C switch has been turned to the second level	System voltage
8, 9	Automatic compressor ECU earth	At all time	0V
12	Air thermo sensor power supply	The ignition switch, blower switch and A/C switch are all ON	5V

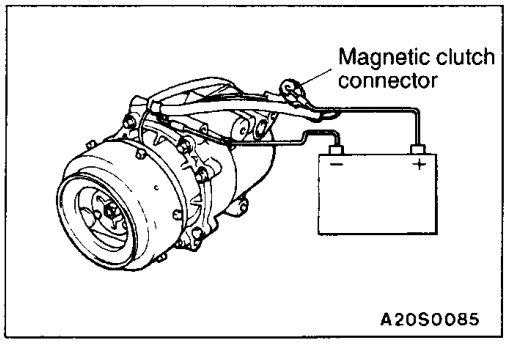


ON-VEHICLE SERVICE 55200840041

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. 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 the sight glass is clear, the magnetic clutch is engaged, the compressor discharge line is warm and the compressor inlet line is cool; the system has a full charge.
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 lost some refrigerant.
3. If the sight glass shows foam or bubbles, the system could be low on charge. The system has to be recharged with refrigerant.

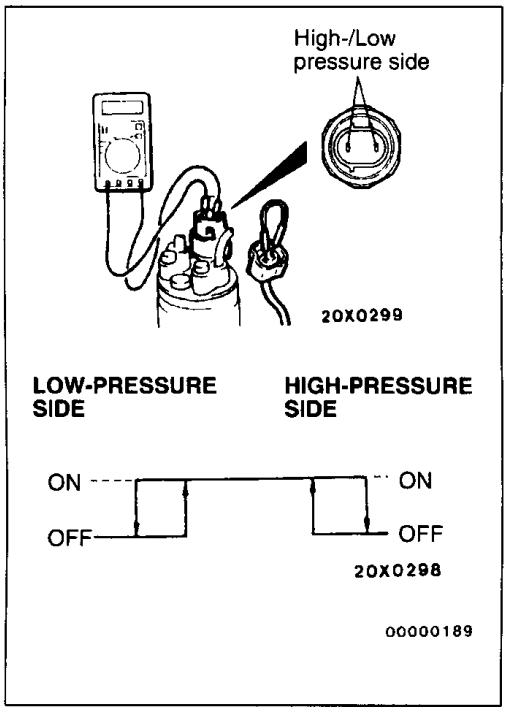


MAGNETIC CLUTCH TEST 55200850044

1. Disconnect the connector (1P) to the magnetic clutch.
2. Connect battery (+) voltage directly to the connector for the magnetic clutch.
3. If the magnetic clutch is normal, there will be "click". If the pulley and armature do not make contact ('click'), there is a malfunction.

RECEIVER DRIER TEST 55200860047

1. 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

55201040068

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.

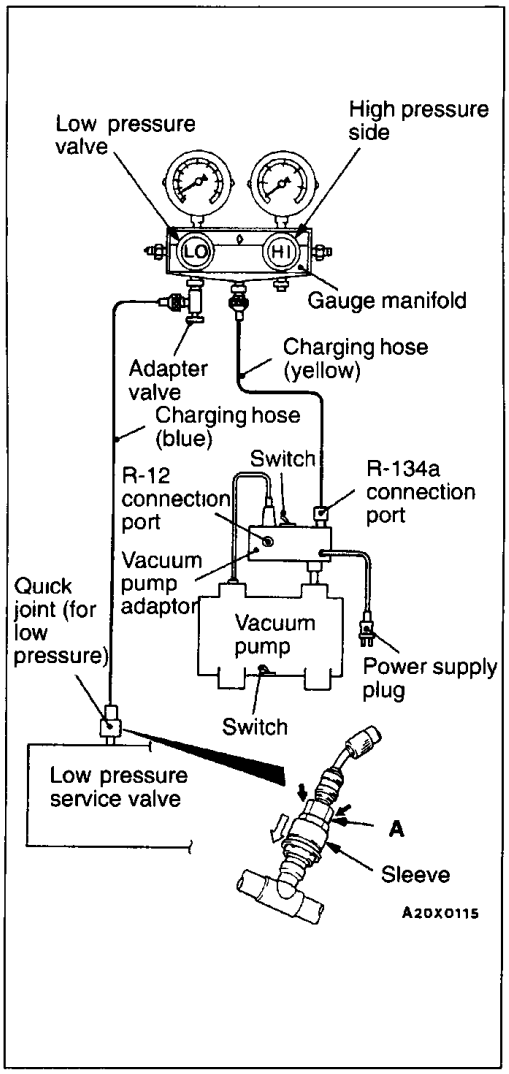
Unit: kPa

Items	Switch position	
	OFF → ON	ON → OFF
Low-pressure side	221	196
High-pressure side	2,354	2,942

COMPRESSOR DRIVE BELT ADJUSTMENT

55200100040

Refer to GROUP 11A – On-vehicle Service.



CHARGING

55200120046

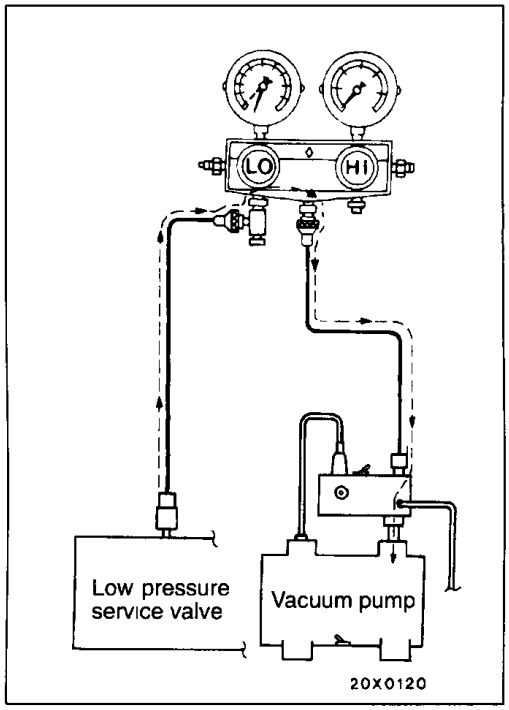
1. With the handles turned back all the way (valve closed), install the adaptor valve to the low-pressure side of the gauge manifold.
2. Connect the charging hose (blue) to the adaptor valve.
3. Connect the quick joint (for low pressure) to the charging hose (blue).
4. Connect the quick joint (for low pressure) to the low pressure service valve.

   NOTE
   The low-pressure service valve should be connected to the suction hose.

   Caution
   1. **Use tools that are suited to 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.

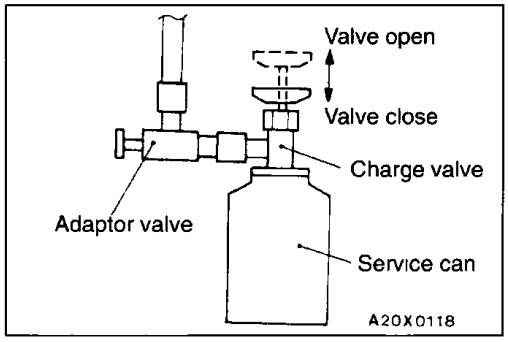
    Caution
    Do not operate the compressor for evacuation.

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

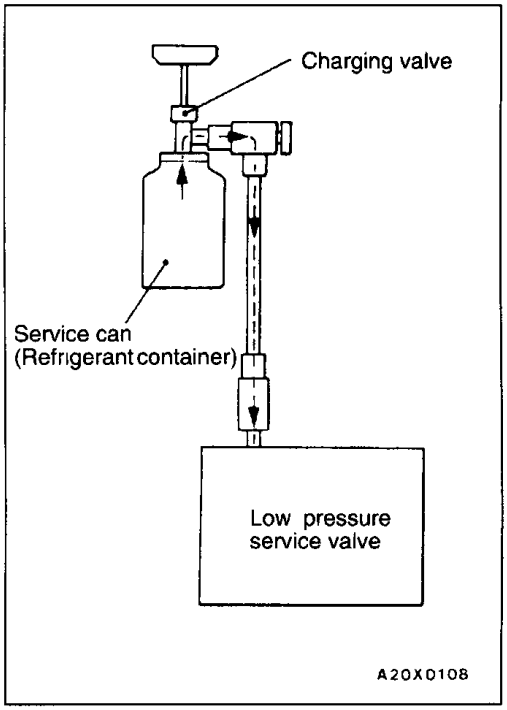
    Caution
    Do not operate the compressor in the vacuum condition; damage may occur.

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

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



16. With the handle turned back all the way (valve open), install the charging valve to the service van.
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).

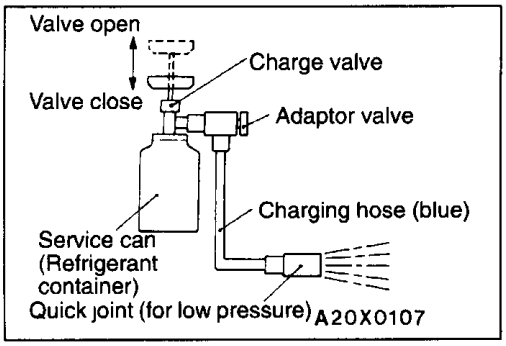
    Caution
    The leak detector for R-134a should be used.

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.

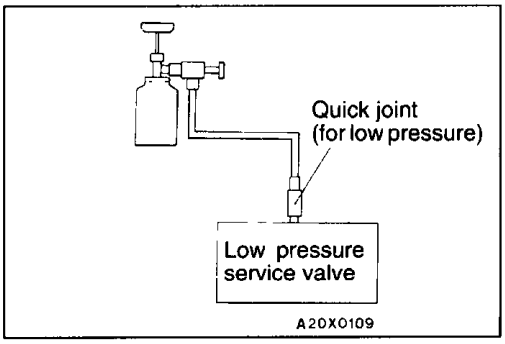
26. After charging with refrigerant, turn the handle of the adaptor valve back all the way (valve closed).
27. Tighten the charging valve handle (valve closed).
    Remove the quick joint (for low pressure) from the low-pressure service valve.

    NOTE
    If the service can is not emptied completely, keep the handles of the charging valve and adaptor valve closed for the next charging.



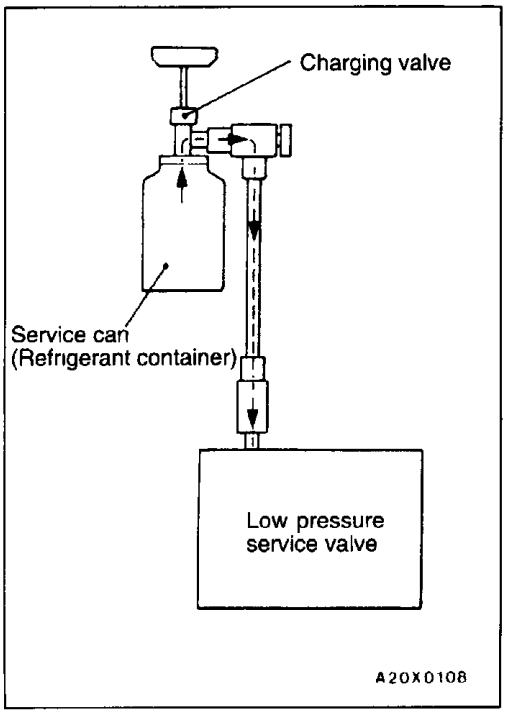
CORRECTING LOW REFRIGERANT LEVEL IN CASE THE SERVICE CAN IS USED.

1. Install the charge valve with the handle turned all the way back (valve open) to 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 suction hose.

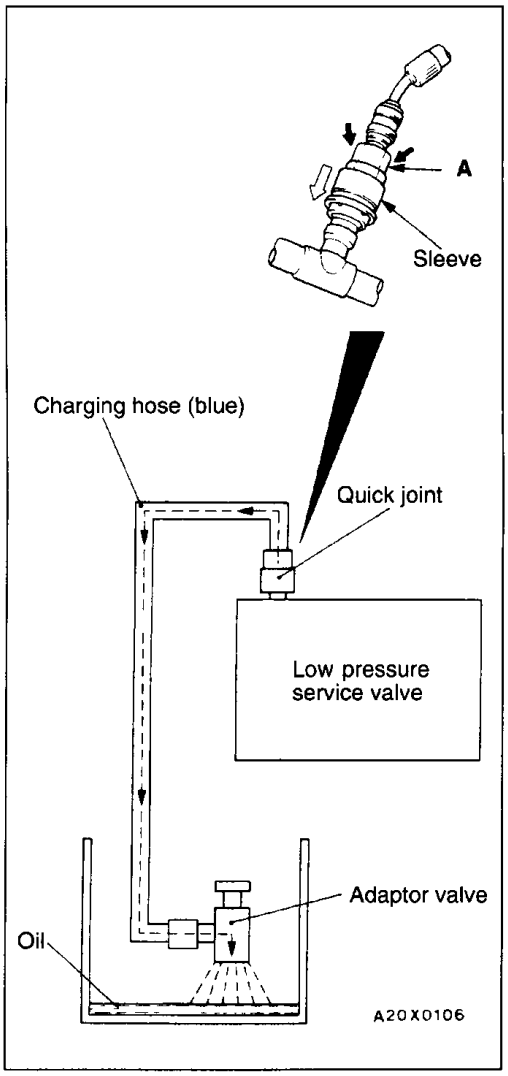


8. Start the engine.
9. Operate the air conditioner and set at the lowest temperature (MAX. COOL).
10. Fix the engine speed at 1,500 r/min.
11. Tighten the handle of the adaptor valve (valve open), and replenish refrigerant while checking the quantity through the sight glass.

    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 changed 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
    When there is remainder of refrigerant in the service can, keep it for next use with the charge value and the valve of the adaptor valve being closed.



DISCHARGING SYSTEM

1. Run the engine at an engine speed of 1,200–1,500 r/min for approximately 5 minutes with the A/C operating to return to the oil.

   NOTE
   Returning the oil will be more effective if it is done while driving.
2. Stop the engine.
3. Connect the charging hose (blue) to the adaptor valve 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 oil does not gush out.

   NOTE
   Any oil remaining in the container should be returned to the A/C system.

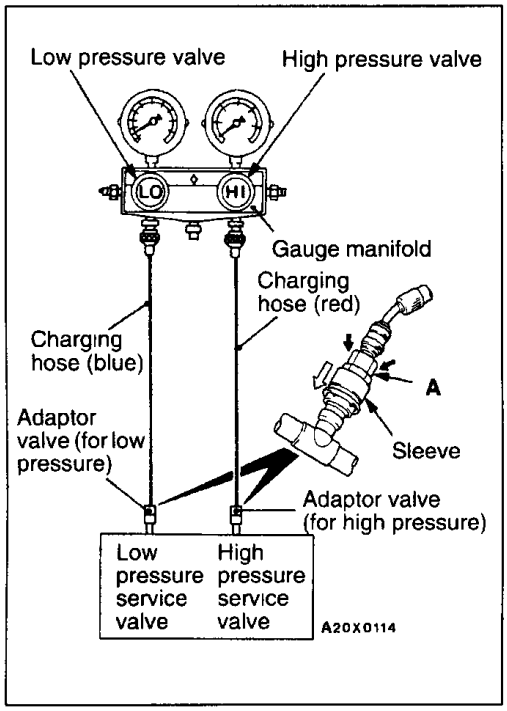
REFILLING OF OIL IN THE A/C SYSTEM

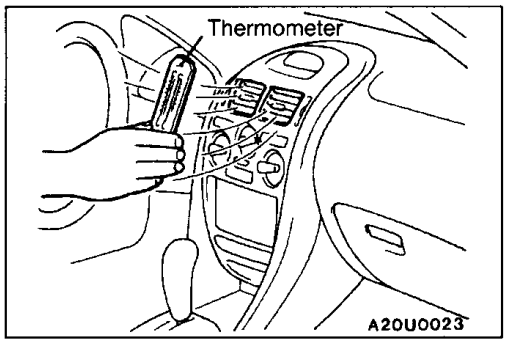
Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.
When a compressor is installed at the factory, it contains 120 mℓ of refrigerant oil. While the A/C system is in operation, the oil is carried through the 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

Condenser:	**15 mℓ**
Evaporator:	**60 mℓ**
Suction hose:	**10 mℓ**
Receiver:	**10 mℓ**





PERFORMANCE TEST

55200140042

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 discharge pipe A and the low-pressure service valve is on 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. Start the engine.
7. Set the controls to the A/C 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 1,000 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 center 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	20	25	35	40
Discharge air temperature °C	2.5–4.5	2.5–4.5	4.0–6.5	6.5–9.0
Compressor high pressure kPa	765–960	765–960	1,325–1,420	1,570–1,765
Compressor low pressure kPa	40–135	40–135	80–175	155–255

REFRIGERANT LEAK REPAIR 55200150045

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 one pound 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 saturate 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.

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 of 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.

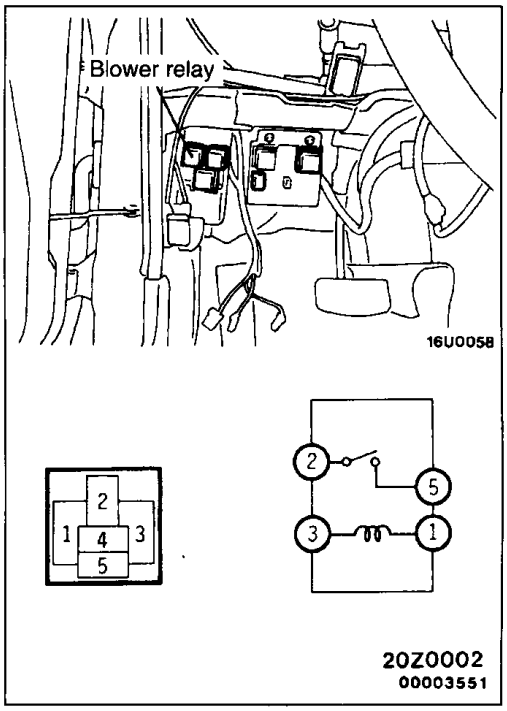
Unified plumbing connections with O-rings, these O-rings are not reusable.

COMPRESSOR NOISE 55200870033

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.

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. (See "Charging System".)
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.

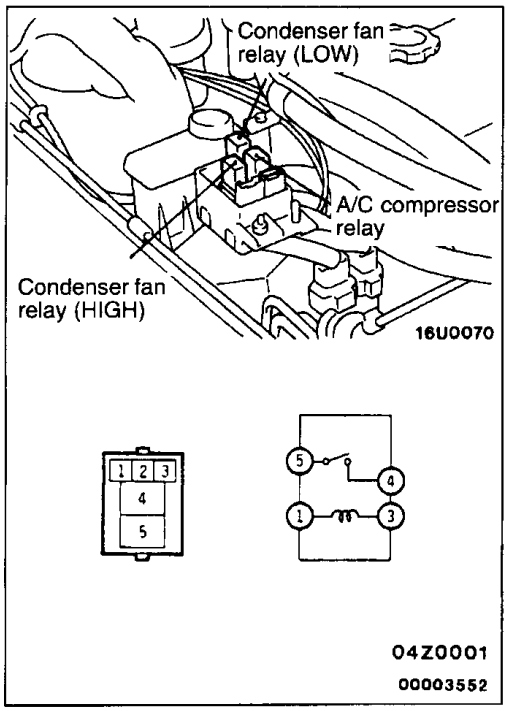


POWER RELAY CHECK

55200880043

BLOWER RELAY

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



A/C COMPRESSOR RELAY, CONDENSER FAN RELAY (LOW) AND (HIGH)

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

IDLE-UP OPERATION CHECK

55200160048

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: Neutral (N or P for vehicles with A/T)
   - Steering wheel: Straightforward
2. Check whether or not the idling speed is the standard value.

   Standard value:
   750 ± 50 r/min <4G92>, 800 ± 50 r/min <4G93>
3. When the A/C is running after turning the A/C switch to ON, and the blower switch to the MH or HI position, check to be sure that the idle speed is at the standard value.

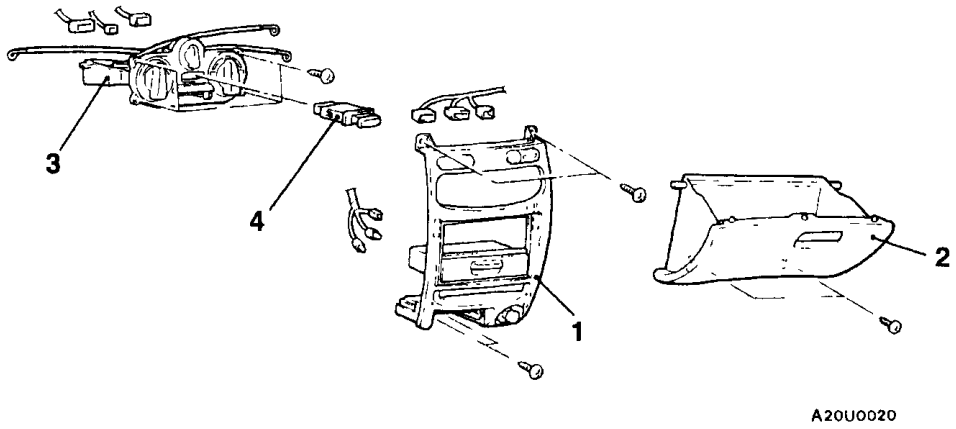
   Standard value: 850 ± 50 r/min

   NOTE
   There is no necessity to make an adjustment, because the idling speed is automatically adjusted by the ISC system. If, however, there occurs a deviation from the standard value for some reason, check the ISC system. (Refer to GROUP 13A – On-vehicle Service.)

HEATER CONTROL ASSEMBLY AND A/C SWITCH

55200240018

REMOVAL AND INSTALLATION

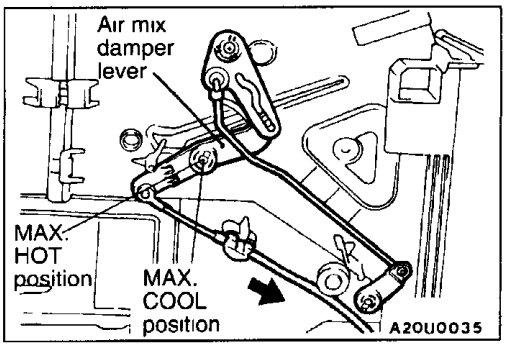


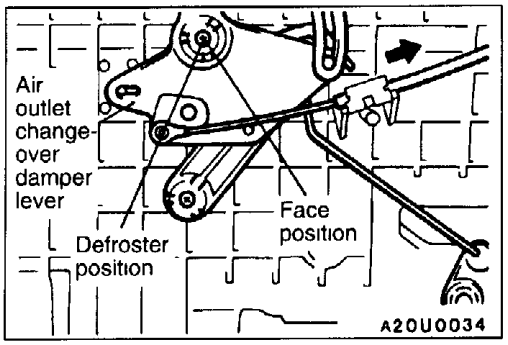
Removal steps

1. Center console panel (Refer to GROUP 52A – Floor Console.)
2. Glove box (Refer to GROUP 52A – Instrument Panel.)

▶A◀ 3. Heater control assembly

4. A/C switch





INSTALLATION SERVICE POINT

▶A◀ HEATER CONTROL ASSEMBLY INSTALLATION

(1) Set the temperature control knob on the heater control assembly to MAX HOT.

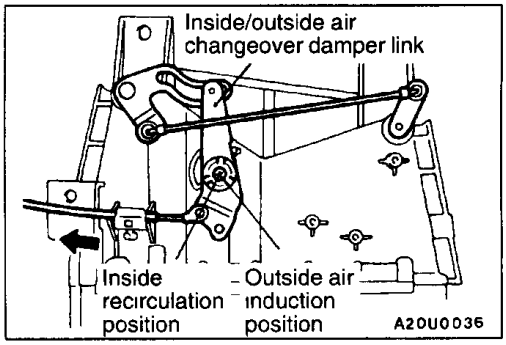
(2) Set the air mix damper lever of the heater unit to the MAX HOT position as shown in the illustration, and then connect the cable to the lever pin.

(3) Push the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.

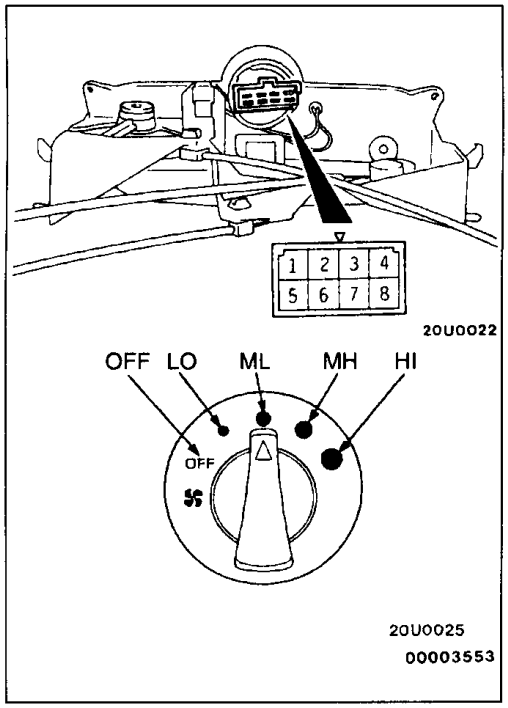
(4) Set the air outlet changeover control knob on the heater control assembly to the DEF position.

(5) Set the air outlet changeover damper lever of the heater unit to DEF position and install the cable to the lever pin.

(6) Push the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.



(7) Set the inside/outside air changeover control knob on the heater control assembly to the INSIDE position.
(8) Set the inside/outside air changeover damper lever of the heater unit to INSIDE position and install the cable to the lever pin.
(9) Push the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.

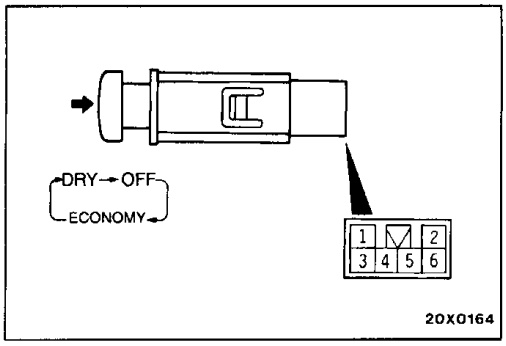


INSPECTION

55200250011

BLOWER SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	2	3	5	6	7	8
OFF							
● (LO)	○		○	○			○
● (ML)	○			○	○		○
● (MH)	○	○		○			○
● (HI)	○			○		○	○



A/C SWITCH CONTINUITY CHECK

Switch position	Terminal No.							
	1	2	4	IND	5	3	ILL	6
OFF								
ECON-OMY	○		○	○	○	○	○	○
DRY	○	○	○	○	○	○	○	○

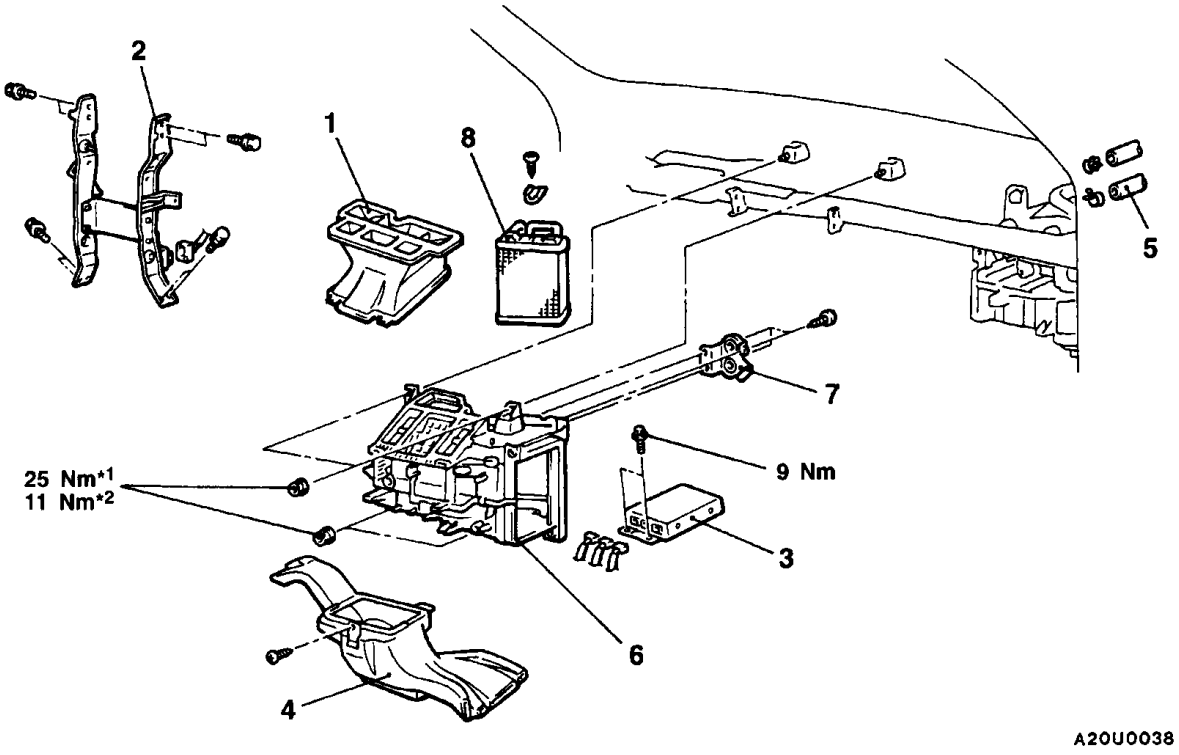
HEATER UNIT AND HEATER CORE

55100190044

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and refilling coolant
  (Refer to GROUP 14 – On-vehicle Service.)
- Instrument Panel Removal and Installation
  (Refer to GROUP 52A.)
- Evaporator Removal and Installation
  (Refer to P.55-26.)

Caution: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or the components.



NOTE
(1) *1: indicates flange nut
(2) *2: indicates nut and washer assembly

Removal steps

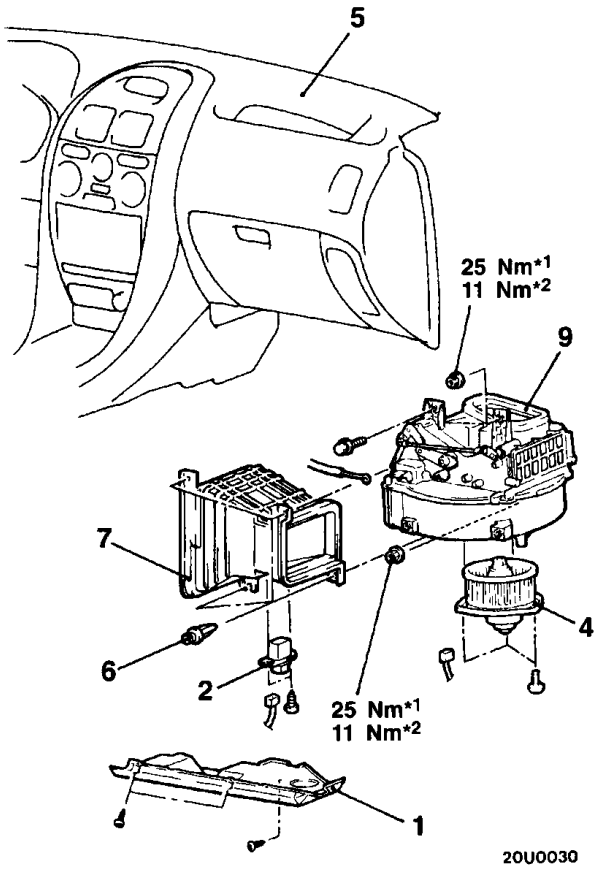
1. Center ventilation duct
2. Center reinforcement
3. A/T-ECU
4. Foot distribution duct
5. Heater hose connection
6. Heater unit
7. Plate
8. Heater core

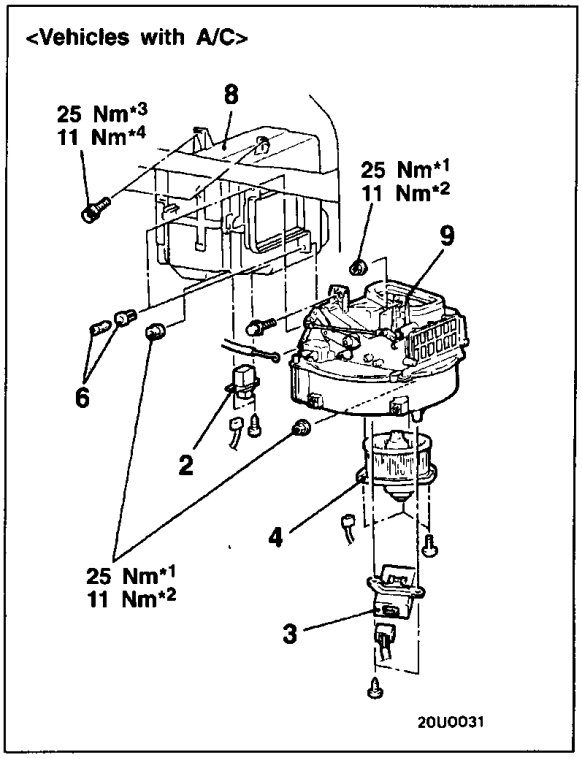
BLOWER ASSEMBLY AND RESISTOR

55100280048

REMOVAL AND INSTALLATION

Caution: SRS
When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS-ECU or the components.





00003554

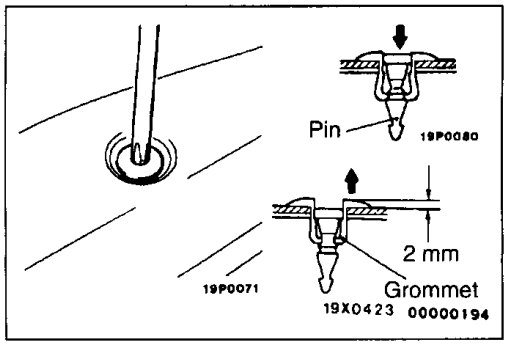
NOTE
(1) *1: indicates flange nut
(2) *2: indicates nut and washer assembly
(3) *3: indicates flange bolt
(4) *4: indicates bolt and washer assembly

Resistor removal steps
1. Under cover
2. Resistor

Blower fan and motor removal steps
1. Under cover
3. Automatic compressor-ECU <Vehicles with A/C>
4. Blower fan and motor

◀A▶ ▶A◀

Blower unit removal steps
5. Instrument panel (Refer to GROUP 52A.)
6. Clip
7. Joint duct <Vehicles without A/C>
8. Evaporator <Vehicles with A/C> (Refer to P.55-26.)
9. Blower unit assembly

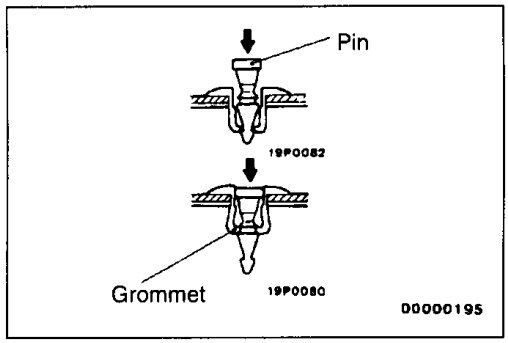


REMOVAL SERVICE POINT

◀A▶ CLIP REMOVAL

(1) Use a cross-tip (+) screwdriver to push inward the pin (at the centre of the clip) to a depth of about 2 mm.
(2) Pull the clip outward to remove it.

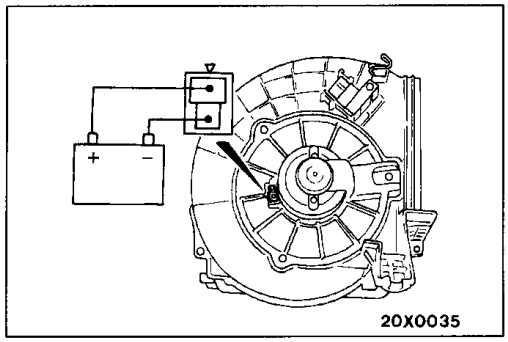
Caution
Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, if pushed too far.



INSTALLATION SERVICE POINT

▶A◀ CLIP INSTALLATION

(1) With the pin pulled out, insert the clip into the hole.
(2) Push the pin inward until the pin's head is flush with the grommet.

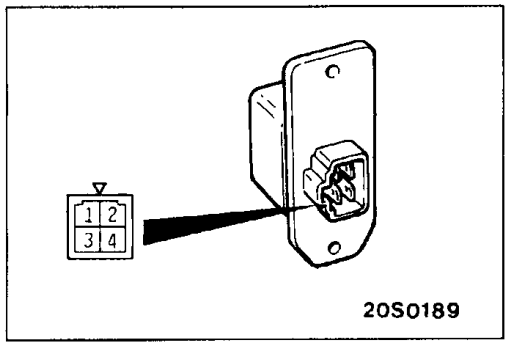


INSPECTION

55100290034

BLOWER FAN AND MOTOR CHECK

When battery voltage is applied between the terminals, check that the motor operates. Also, check that there is no abnormal noise.



RESISTOR CHECK

Use a circuit tester to measure the resistance between the terminals as indicated below. Check that the measured value is at the standard value.

Standard value:

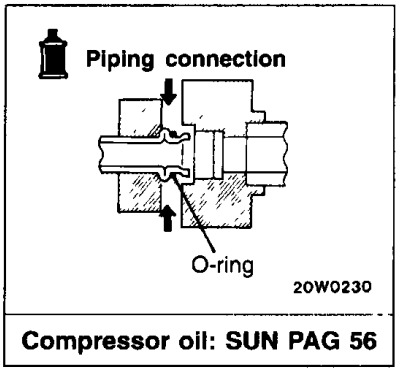
Measurement terminal	Standard value Ω
Between terminals 3–2 (LO)	2.30
Between terminals 3–4 (ML)	1.10
Between terminals 3–1 (MH)	0.40

EVAPORATOR

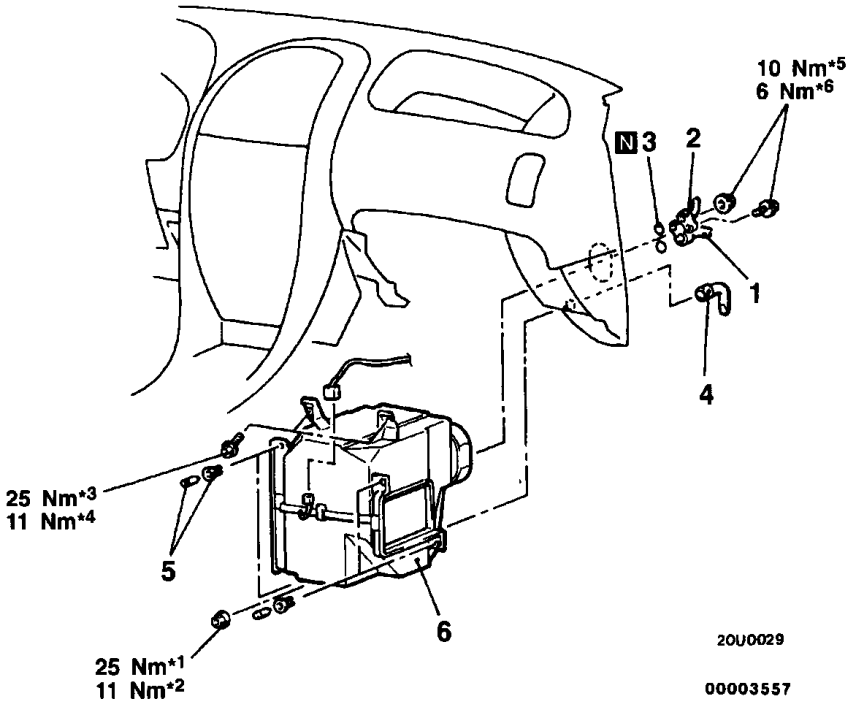
55200360042

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Discharging and Charging of Refrigerant (Refer to P.55-11.)
- Air Cleaner Cover and Hose Removal and Installation <R.H. drive vehicles>
- Under Cover, Corner Panel, Glove Box and Glove Box Frame Removal and Installation (Refer to GROUP 52A – Instrument Panel.)
- Console Side Cover (passenger side) Removal and Installation (Refer to GROUP 52A – Floor Console.)



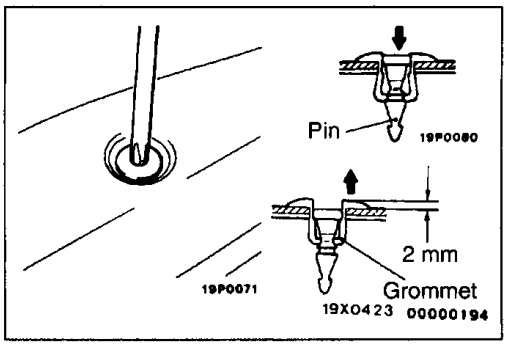
Compressor oil: SUN PAG 56



Removal steps

1. Suction hose connection
2. Discharge pipe connection
3. O-ring
4. Drain hose
◀A▶ ▶B◀ 5. Clip
▶A◀ 6. Evaporator

NOTE
(1) *1: indicates flange nut
(2) *2: indicates nut and washer assembly
(3) *3: indicates flange bolt
(4) *4: indicates bolt and washer assembly
(5) *5: indicates flange nut or flange bolt
(6) *6: indicates nut and washer assembly or bolt and washer assembly



REMOVAL SERVICE POINT

◀A▶ CLIP REMOVAL

(1) Use a cross-tip (+) screwdriver to push inward the pin (at the centre of the clip) to a depth of about 2 mm.
(2) Pull the clip outward to remove it.

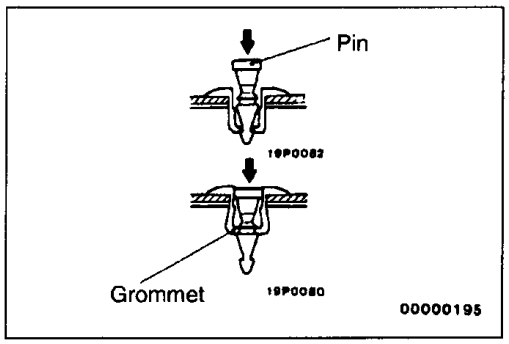
Caution
Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, if pushed too far.

INSTALLATION SERVICE POINTS

▶A◀ EVAPORATOR INSTALLATION

When replacing the evaporator, refill it with a specified amount of compressor oil and install it (to the vehicle).

Compressor oil: SUN PAG 56
Quantity: 60 mℓ

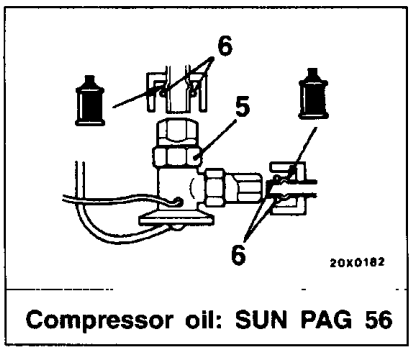


▶B◀ CLIP INSTALLATION

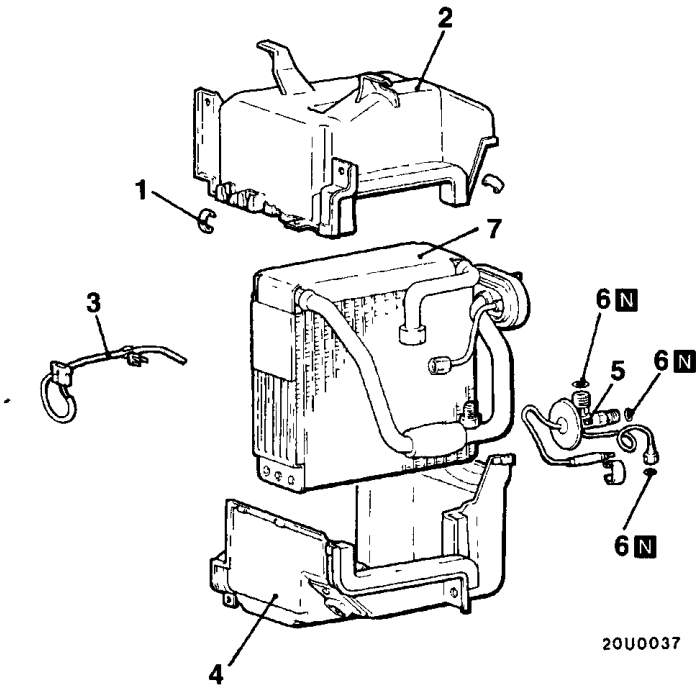
(1) With the pin pulled out, insert the clip into the hole.
(2) Push the pin inward until the pin's head is flush with the grommet.

DISASSEMBLY AND REASSEMBLY

55200380048



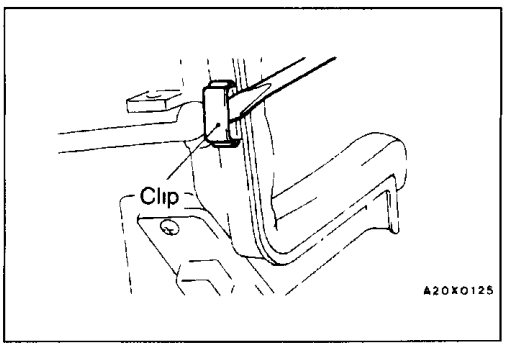
Compressor oil: SUN PAG 56



00003558

Disassembly steps

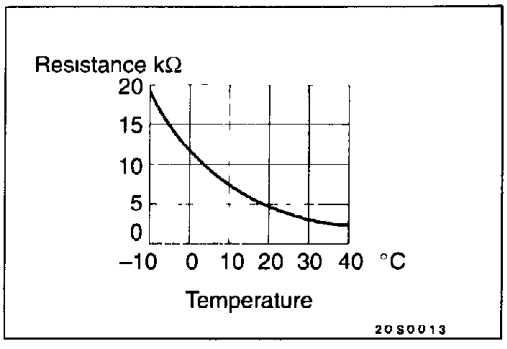
◀A▶ 1. Clip
2. Evaporator case (upper)
3. Air thermo sensor
4. Evaporator case (lower)
5. Expansion valve
6. O-ring
7. Evaporator



DISASSEMBLY SERVICE POINT

◀A▶ CLIP REMOVAL

Remove the clips with a flat-tipped screwdriver covered with a shop towel to prevent damage to case surfaces.



INSPECTION

55200390010

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.

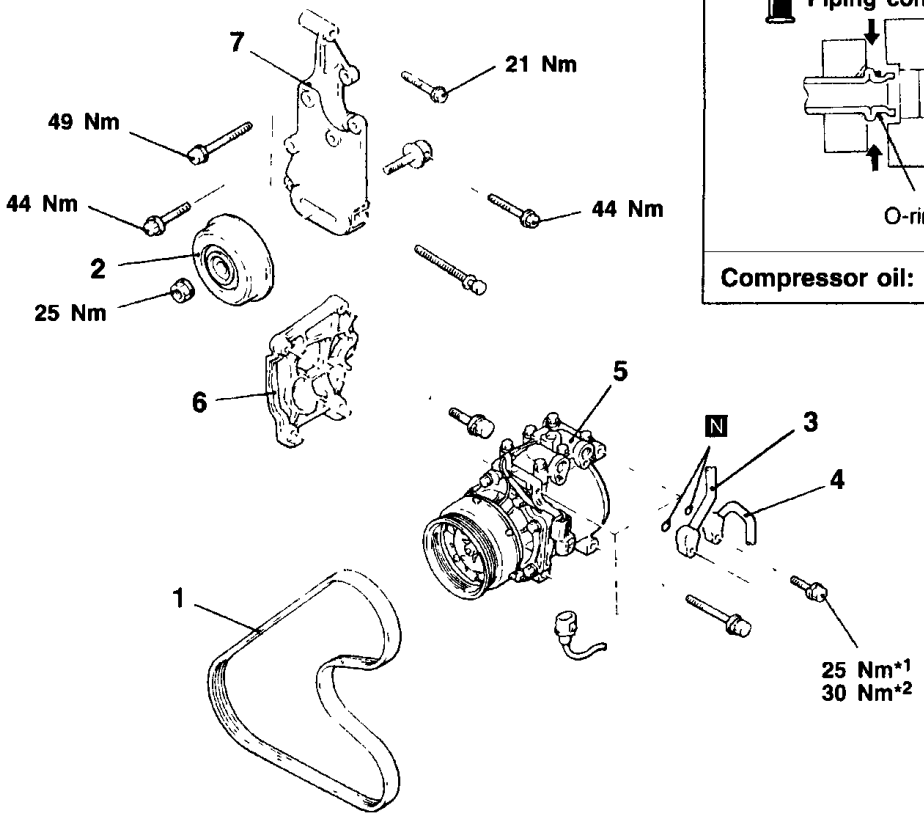
COMPRESSOR AND TENSION PULLEY

55200410068

REMOVAL AND INSTALLATION

Pre-removal Operation
- Discharging of Refrigerant (Refer to P.55-15.)
- Under Cover Removal (R.H. side)
- Power Steering Oil Pump Removal (Refer to GROUP 37A.)

Post-installation Operation
- Charging of Refrigerant (Refer to P.55-11.)
- Under Cover Installation (R.H. side)
- Power Steering Oil Pump Installation (Refer to GROUP 37A.)
- A/C Compressor Drive Belt Tension Adjustment (Refer to GROUP 11A – On-vehicle Service.)



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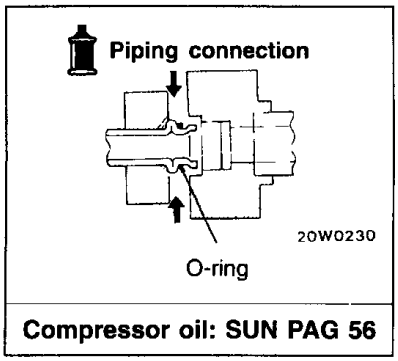
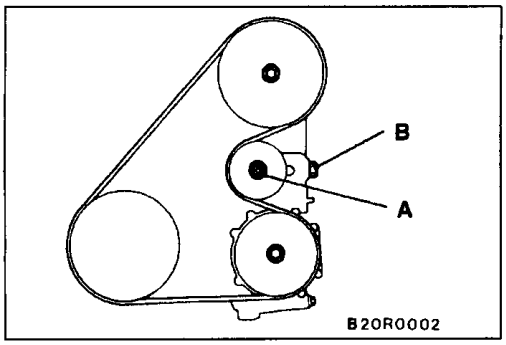


Compressor oil: SUN PAG 56

Removal steps

◀A▶ 1. A/C compressor drive belt
2. Tension pulley
◀B▶ 3. Suction hose connection
◀B▶ 4. Discharge pipe connection
◀C▶ ▶A◀ 5. Compressor
6. Compressor bracket
7. Power steering oil pump bracket

NOTE
(1) *1: indicates flange bolt
(2) *2: indicates bolt and washer assembly



REMOVAL SERVICE POINTS

◀A▶ COMPRESSOR DRIVE BELT REMOVAL

(1) Loosen nut "A" or bolt "A" for holding the tension pulley.
(2) Loosen bolt "B" or nut "B" for adjustment.
(3) Remove the compressor drive belt.

◀B▶ SUCTION HOSE, DISCHARGE HOSE DISCONNECTION

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

Caution
Seal the hoses completely. Otherwise, the compressor oil and receiver will absorb water vapour easily.

◀C▶ COMPRESSOR REMOVAL

When doing this work, be careful not to spill the compressor oil.

INSTALLATION SERVICE POINT

▶A◀ COMPRESSOR INSTALLATION

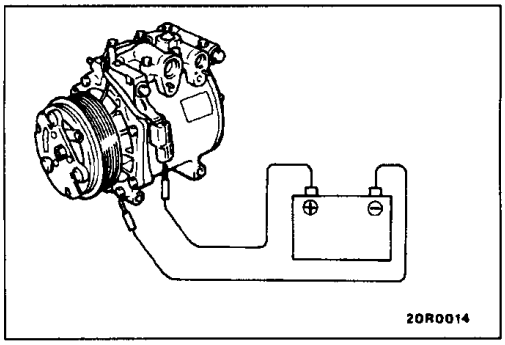
If a new compressor is installed, first adjust the amount of oil according to the procedures described below, and then install the compressor.
(1) Measure the amount (X mℓ) of oil within the removed compressor.
(2) Drain (from the new compressor) the amount of oil calculated according to the following formula, and then install the new compressor.
New compressor oil amount

120 mℓ – X mℓ = Y mℓ

NOTE
(1) Y mℓ indicates the amount of oil in the refrigerant line, the condenser, the evaporator etc.
(2) When replacing the following parts at the same times as the compressor, subtract the rated oil amount of the each part from Y mℓ and discharge from the new compressor.

Quantity

Evaporator:	**60 mℓ**
Condenser:	**15 mℓ**
Suction hose:	**10 mℓ**
Receiver:	**10 mℓ**



INSPECTION

55200420030

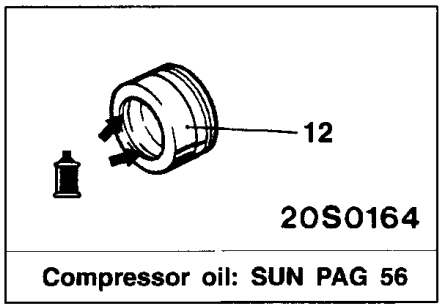
COMPRESSOR MAGNETIC CLUTCH OPERATION INSPECTION

Connect the battery (+) terminal to the compressor side terminal, and earth the battery (–) terminal to the body of the compressor. The condition is normal if the sound of the magnetic clutch (click) can be heard.

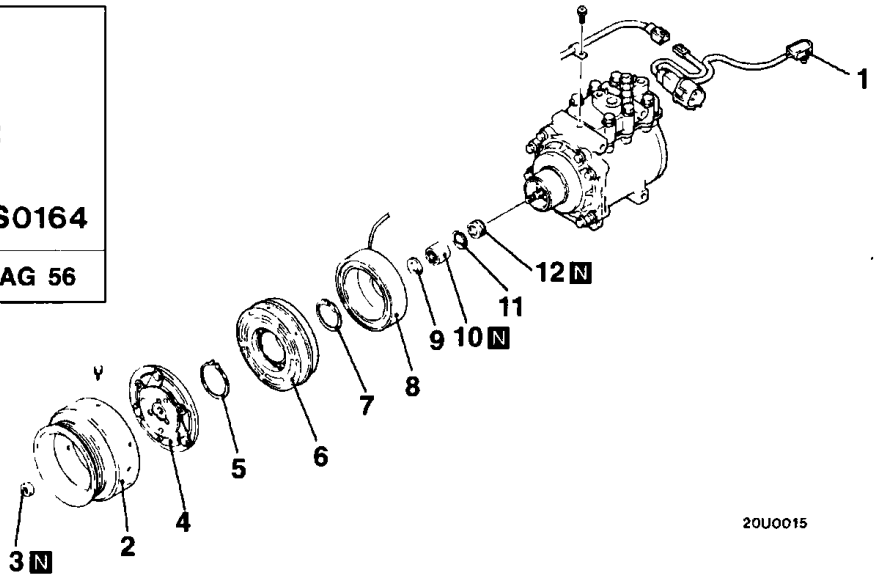
MAGNETIC CLUTCH

55200460049

DISASSEMBLY AND REASSEMBLY



Compressor oil: SUN PAG 56



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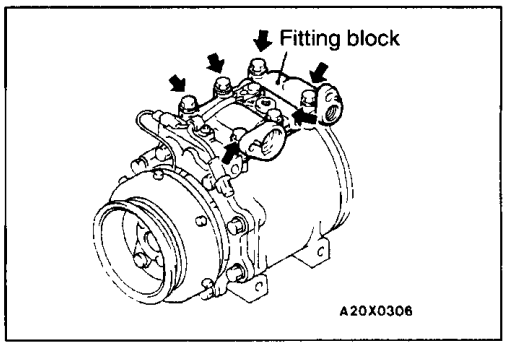
DISASSEMBLY STEPS

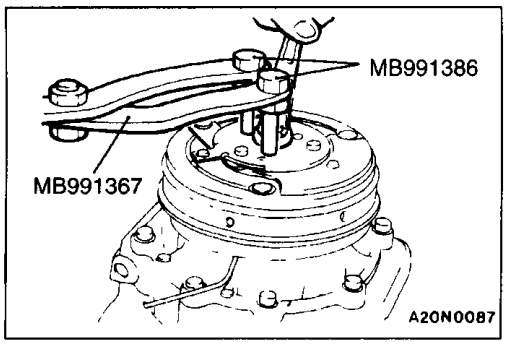
◀A▶ 1. Refrigerant-temperature switch
2. Pulley
▶G◀ • Air gap adjustment
◀B▶ ▶F◀ 3. Nut
▶E◀ 4. Armature plate
5. Snap ring
6. Rotor
▶D◀ 7. Snap ring
▶C◀ 8. Clutch coil
9. Shims
◀C▶ ▶B◀ 10. Bearing
11. Snap ring
◀D▶ ▶A◀ 12. Lip seal



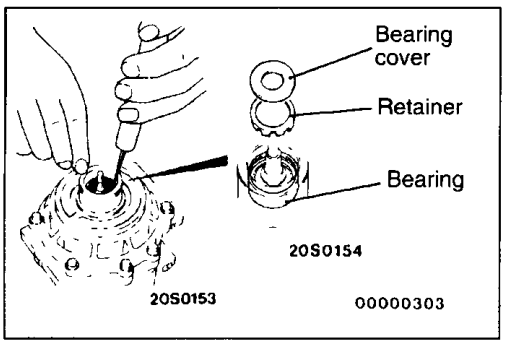
DISASSEMBLY SERVICE POINTS

◀A▶ REFRIGERANT-TEMPERATURE SWITCH REMOVAL

(1) Remove the fitting block of the compressor.
(2) Remove the snap ring from inside the fitting block, and then remove the refrigerant-temperature switch.

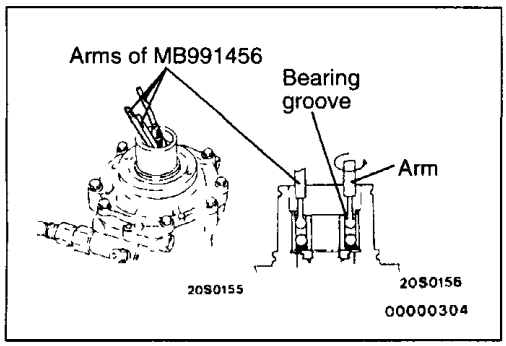


◀B▶ NUT REMOVAL

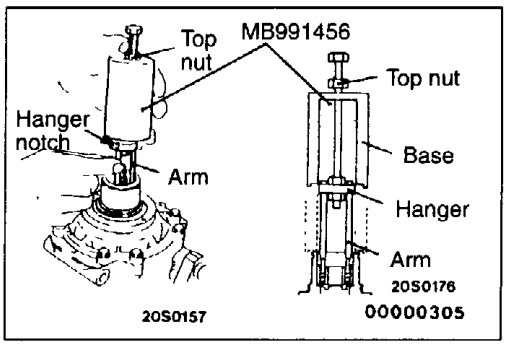


◀C▶ BEARING REMOVAL

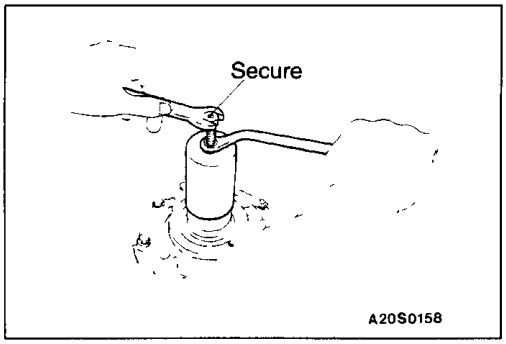
(1) Use a pointed tool such as an awl to remove the bearing cover and retainer.



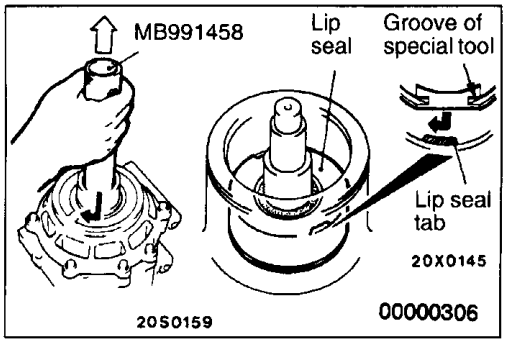
(2) Insert the arms (3) of the special tool into the bearing groove at regular intervals.
(3) Turn the arms 90° to secure the arms to the bearing.



(4) Set the 3 arms installed to the bearing into the notches (3 places) located on the hanger of the special tool.
(5) Lower the base of the special tool to cover the hanger, and tighten the top nut until it touches the base.

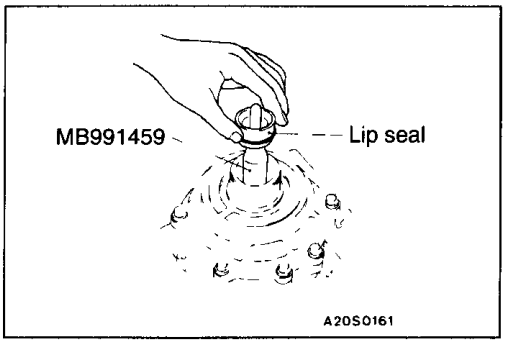


(6) Next, with the bolt of the special tool secured, tighten the nut, and remove the bearing from the compressor.



◀D▶ LIP SEAL REMOVAL

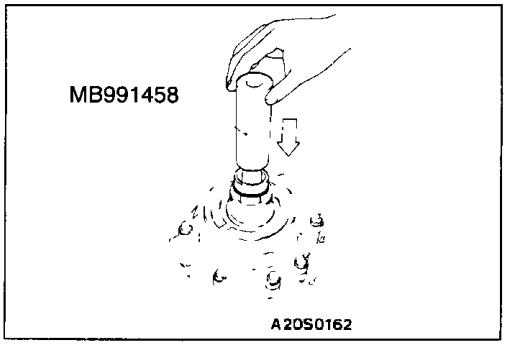
Catch the groove of the special tool on the lip seal tab, and slowly pull the lip seal straight upwards.



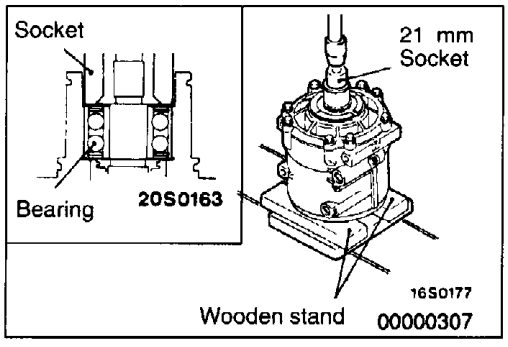
REASSEMBLY SERVICE POINTS

▶A◀ LIP SEAL INSTALLATION

(1) Install the special tool to the compressor crank shaft.
(2) Apply compressor oil to the sliding surface of the lip seal and the O-ring, and insert the lip seal.

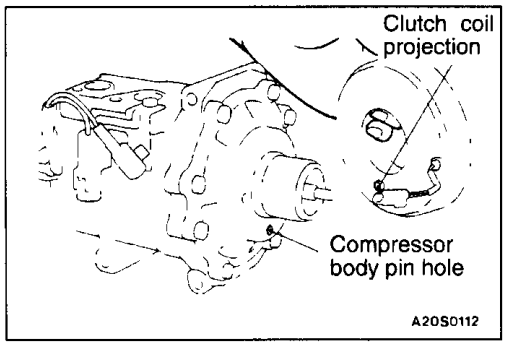


(3) Use the special tool to insert the lip seal.



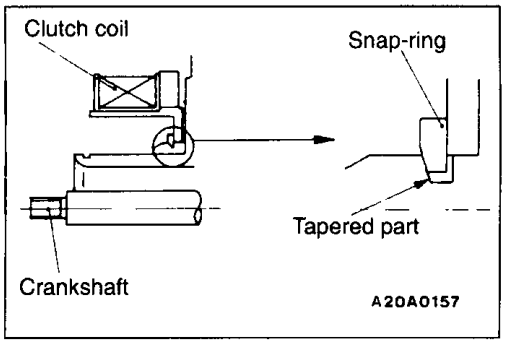
▶B◀ BEARING INSTALLATION

Use a wooden stand and a 21 mm socket to insert the bearing into the compressor.



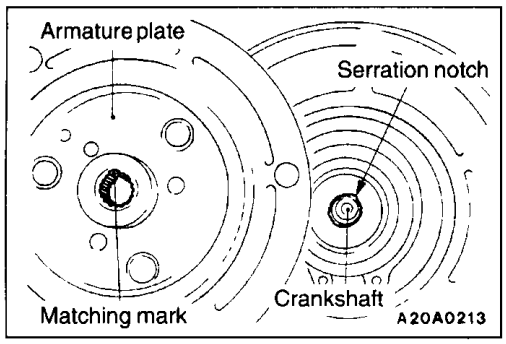
▶C◀ CLUTCH COIL INSTALLATION

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.



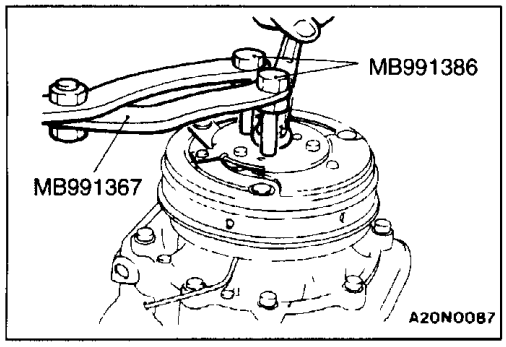
▶D◀ SNAP RING INSTALLATION

Install the snap ring so that the tapered surface is at the outer side.

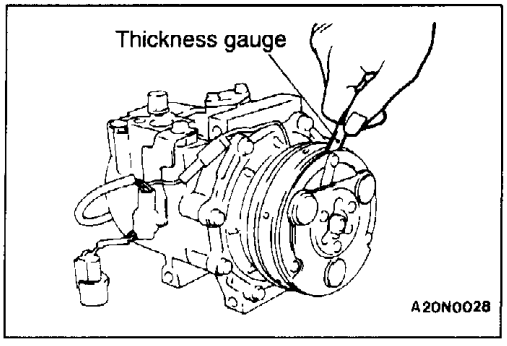


▶E◀ ARMATURE PLATE INSTALLATION

Align the mating mark of the crankshaft spline and the mating mark of the armature plate, and then fit them together.



▶F◀ NUT INSTALLATION

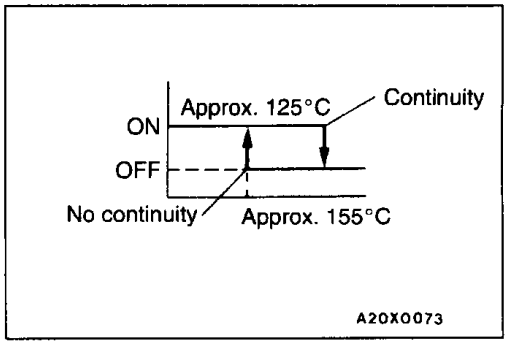


▶G◀ AIR GAP ADJUSTMENT

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

55200470035

REFRIGERANT-TEMPERATURE SWITCH

(1) Immerse the refrigerant-temperature switch in engine oil.
(2) Use a circuit tester to confirm the continuity condition when the engine oil has become heated.

Standard value:

Item	Temperature
Continuity (ON)	Less than approx. 155°C
No continuity (OFF)	Approx. 155°C or more (until the temperature drops to approx. 125°C when OFF)

Caution
Do not heat the oil more than necessary.

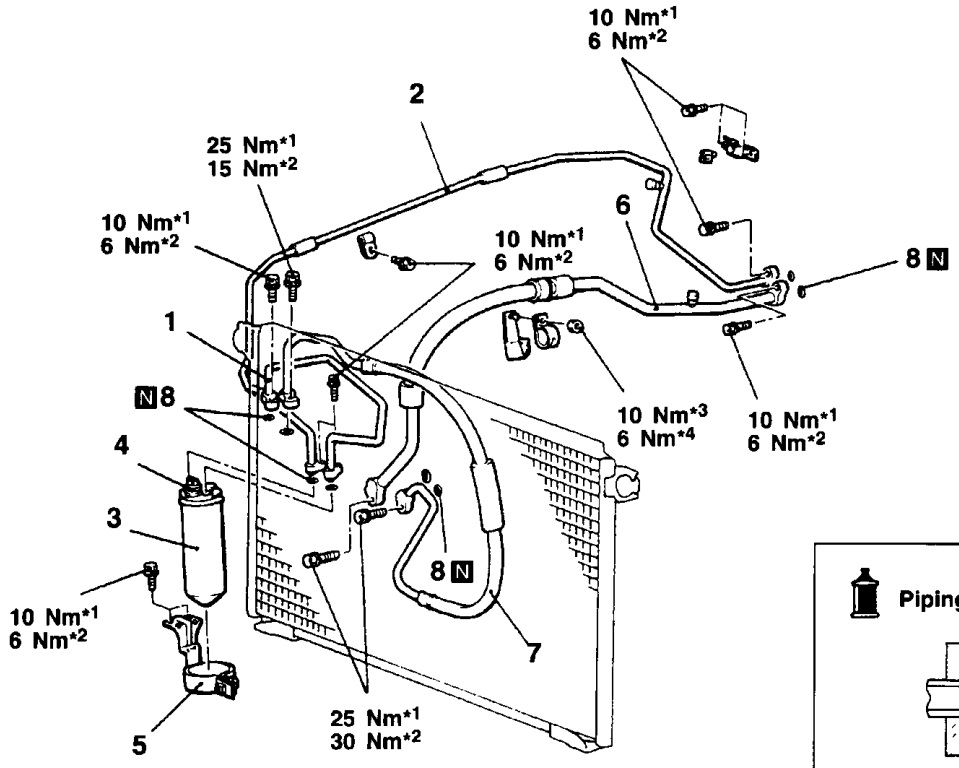
REFRIGERANT LINE

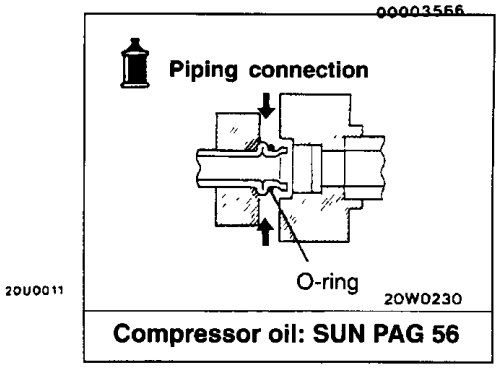
55200640054

REMOVAL AND INSTALLATION

<L.H. DRIVE VEHICLES>

Pre-removal Operation
- Discharging and Charging of Refrigerant (Refer to P.55-11.)





20U0011

Compressor oil: SUN PAG 56

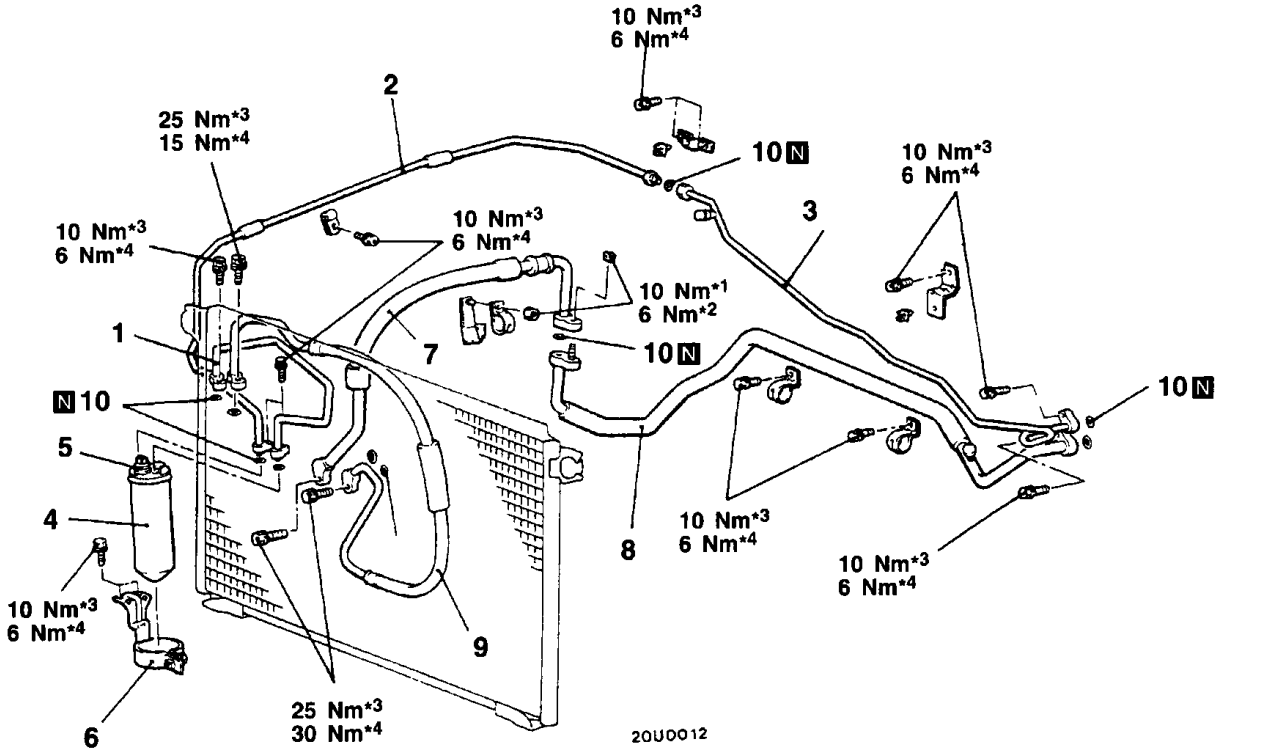
Removal steps

1. Discharge pipe A
2. Discharge pipe B
3. ▶A◀ Receiver assembly
4. Dual pressure switch
5. Receiver bracket
6. ▶A◀ Suction hose
7. Discharge hose
8. O-ring

NOTE
(1) *1: indicates flange bolt
(2) *2: indicates bolt and washer assembly
(3) *3: indicates flange nut
(4) *4: indicates nut and washer assembly

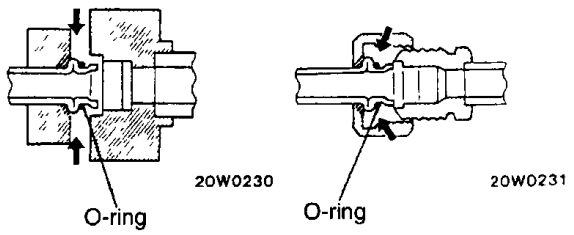
<R.H. DRIVE VEHICLES>

Pre-removal Operation
- Discharging and Charging of Refrigerant (Refer to P.55-11.)



00003567

Piping connection



Compressor oil: SUN PAG 56

Removal steps

1. Discharge pipe A
2. Discharge pipe B
3. Discharge pipe C
- ▶A◀ 4. Receiver assembly
5. Dual pressure switch
6. Receiver bracket
- ▶A◀ 7. Suction hose
- ▶A◀ 8. Suction pipe
9. Discharge hose
10. O-ring

NOTE
(1) *1: indicates flange nut
(2) *2: indicates nut and washer assembly
(3) *3: indicates flange bolt
(4) *4: indicates bolt and washer assembly

INSTALLATION SERVICE POINT

▶A◀ SUCTION HOSE, PIPE, RECEIVER ASSEMBLY INSTALLATION

When replacing the suction hose, pipe or receiver assembly, refill them with a specified amount of compressor oil, and then install them.

Compressor oil: SUN PAG 56

Quantity:

Suction hose, pipe: 10 mℓ

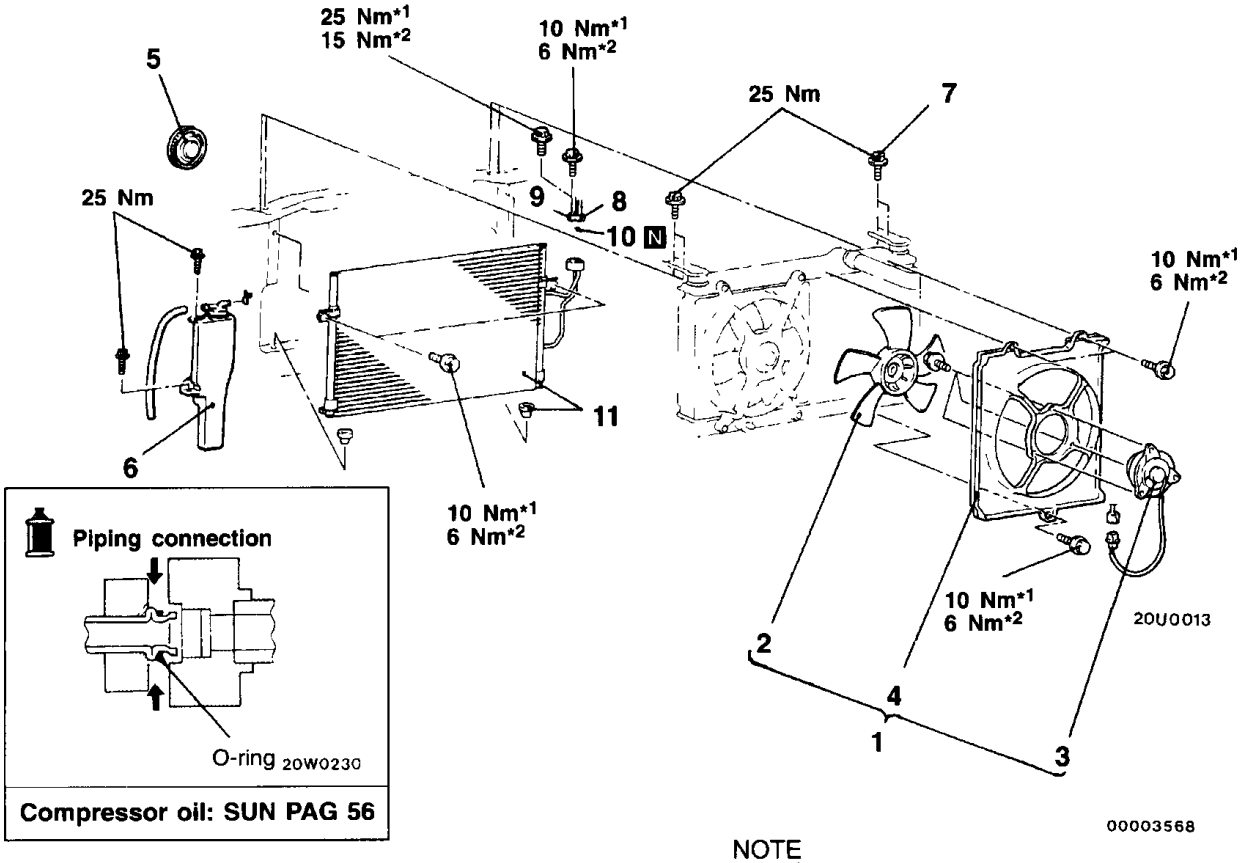
Receiver assembly: 10 mℓ

CONDENSER AND CONDENSER FAN MOTOR

55200670046

REMOVAL AND INSTALLATION

Pre-removal Operation
- Discharging and Charging of Refrigerant (Refer to P.55-11.)

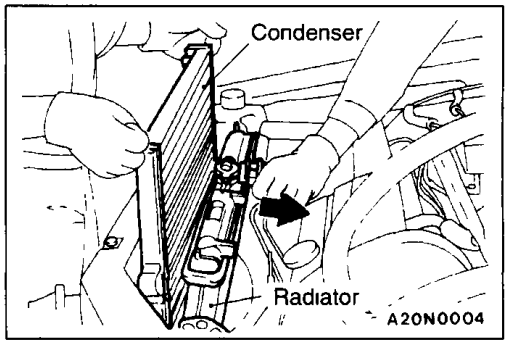


NOTE
(1) *1: indicates flange bolt
(2) *2: indicates bolt and washer assembly

Condenser fan motor removal steps
1. Condenser fan motor and shroud assembly
2. Condenser fan
3. Condenser fan motor
4. Shroud

Condenser removal steps
5. Headlamp cap
6. Reserve tank
7. Upper insulator installation bolt
8. Discharge pipe A
9. Discharge hose
10. O-ring

◀A▶ ▶A◀ 11. Condenser



REMOVAL SERVICE POINT

◀A▶ CONDENSER REMOVAL

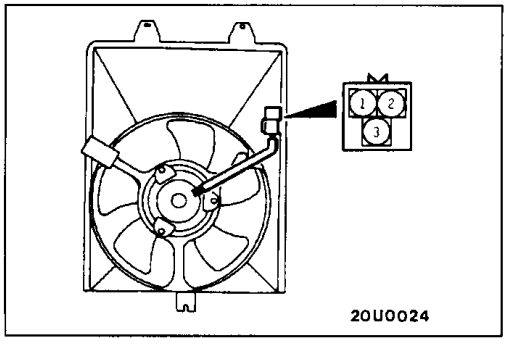
Move the radiator to the engine side and then lift up the condenser to remove it.

INSTALLATION SERVICE POINT

▶A◀ CONDENSER INSTALLATION

When replacing the condenser, refill it with a specified amount of compressor oil and install it. (to the vehicle).

Compressor oil: SUN PAG 56
Quantity: 15 mℓ



INSPECTION

55200680032

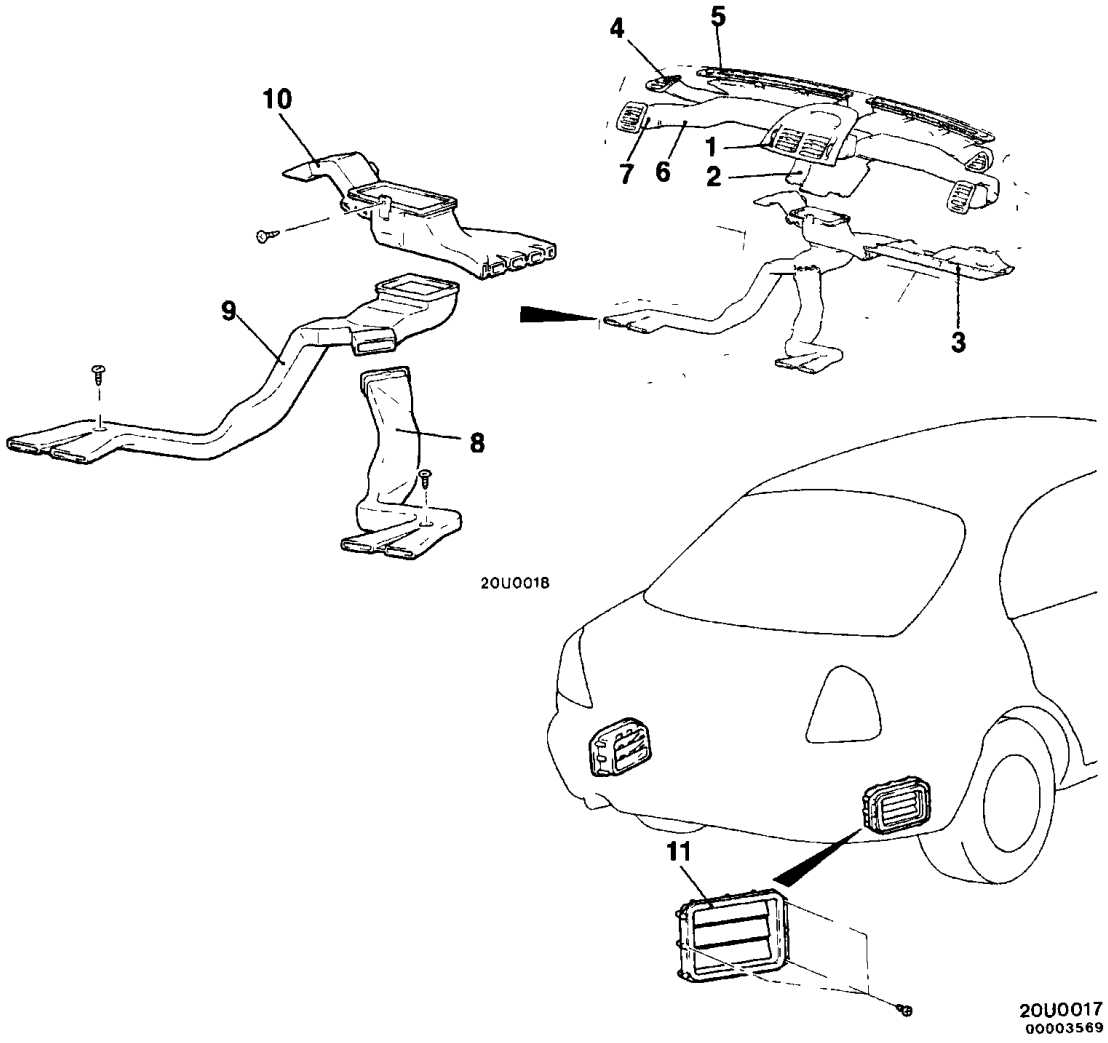
CONDENSER FAN MOTOR CHECK

(1) Check to be sure that the condenser fan motor operates when battery voltage is applied to terminal 1 and terminal 2 earthed.
(2) In this same condition, apply battery voltage to terminal 3 and earth terminal 2. Check that the condenser fan motor operates faster at this time.

VENTILATORS

55200160055

REMOVAL AND INSTALLATION



1. Center air outlet assembly (Refer to GROUP 52A – Floor Console.)
2. Center ventilation duct (Refer to P.55-23.)
3. Under cover (Refer to GROUP 52A – Instrument Panel.)
4. Side defroster grille (Refer to GROUP 52A – Instrument Panel.)
5. Defroster nozzle assembly (Refer to GROUP 52A – Instrument Panel.)
6. Distribution duct (Refer to GROUP 52A – Instrument Panel.)
7. Side air outlet assembly (Refer to GROUP 52A – Instrument Panel.)

Rear heater duct, foot distribution duct removal steps

- Front seat assembly (Refer to GROUP 52A.)
- Floor console assembly (Refer to GROUP 52A.)

8. Rear heater duct (L.H.)
9. Rear heater duct (R.H.)

- Radio and tape player (Refer to GROUP 54.)

10. Foot distribution duct

Rear ventilation duct removal steps

- Rear bumper (Refer to GROUP 51.)
- Rear side trim (Refer to GROUP 52A.)

11. Rear ventilation duct

FULLY AUTOMATIC AIR CONDITIONER

55400010028

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-directed air flow function and a cool air bypass function.
An air purifier which carries out fine A/C control has been included.

The A/C system is basically the same as the manual air conditioner in which a new refrigerant system has been adopted. However, an A/C control panel with a reduced number of buttons and a more compact arrangement of necessary functions owing to more functions being assigned to each button has been adopted.

Items		Specifications
Heater unit type		Two-way-flow full-air-mix system
Heater control assembly		Push button type
Compressor model		Scroll type <MSC90>
Dual pressure switch kPa	High-pressure switch	ON → OFF: 2,942, OFF → ON: 2,354
	Low-pressure switch	ON → OFF: 196, OFF → ON: 221
Refrigerant and quantity g		R-134a (HFC-134a), Approx. 680–720

SERVICE SPECIFICATIONS

55400030024

Items		Standard value
Idle speed r/min		800±50
Idle up speed r/min		850
Air mix damper motor potentiometer kΩ	MAX. HOT position	Approx. 4.82
	MAX. COLD position	Approx. 0.18
Outlet air changeover damper motor potentiometer kΩ	DEF position	Approx. 4.82
	FACE position	Approx. 0.18

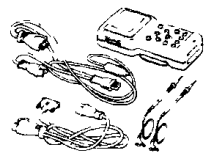
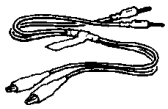
LUBRICANTS

55400040027

Items	Specified lubricants	Quantity
Each connection of refrigerant line	SUN PAG 56	As required
Compressor refrigerant unit lubricant mℓ	SUN PAG 56	120

SPECIAL TOOLS

55400060023

Tool	Number	Name	Use
	MB991502	MUT-II sub-assembly	• Checking of diagnosis codes • Read-out of service data • Testing of the actuator
	MB991529	ABS check harness	Check of the fully automatic air conditioner when using a voltmeter

NOTE
Other special tools are the same as for the manual A/C. (Refer to P.55-5.)

TROUBLESHOOTING

55400070026

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

METHOD OF READING THE DIAGNOSIS CODES

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

METHOD OF ERASING THE DIAGNOSIS CODES

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

INSPECTION CHART FOR DIAGNOSIS CODES

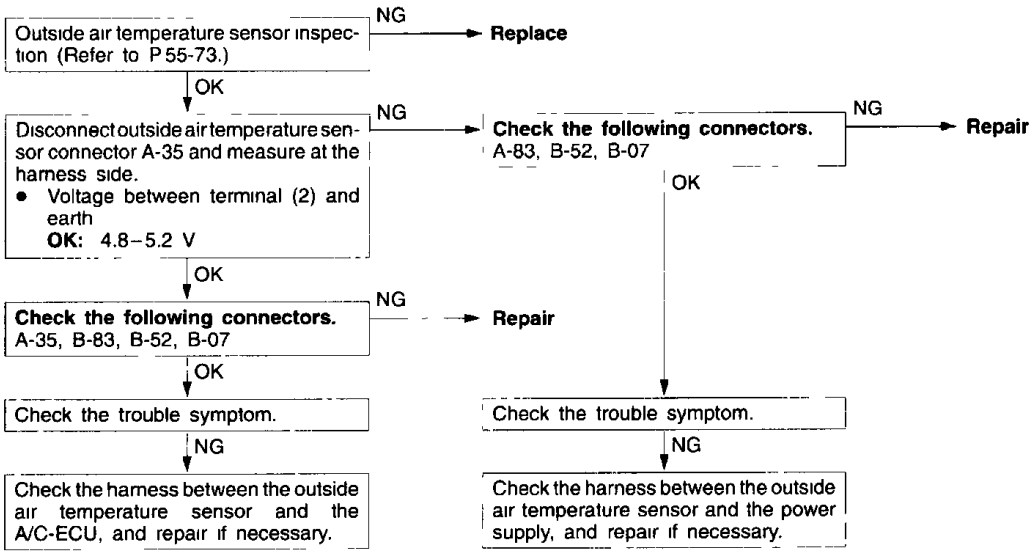
Code No.	Diagnosis item	Reference page
11	Inside air temperature sensor system (open circuit)	55-45
12	Inside air temperature sensor system (short circuit)	55-45
13	Outside air temperature sensor system (open circuit)	55-45
14	Outside air temperature sensor system (short circuit)	55-45
15	Heater water temperature sensor system (open circuit)	55-46
16	Heater water temperature sensor system (short circuit)	55-46
21	Air thermo sensor system (open circuit)	55-46
22	Air thermo sensor system (short circuit)	55-46
31	Potentiometer system of air mix damper motor assembly	55-47
32	Potentiometer system of air outlet changeover damper motor assembly	55-47
41	Drive system of air mix damper motor assembly	55-48
42	Drive system of air outlet changeover damper motor assembly	55-48

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

Code No. 11 or 12 Inside air temperature sensor system	Probable cause
This diagnosis code is output if the inside air temperature sensor inside the A/C-ECU is defective	• Malfunction of A/C-ECU

Replace the A/C-ECU.

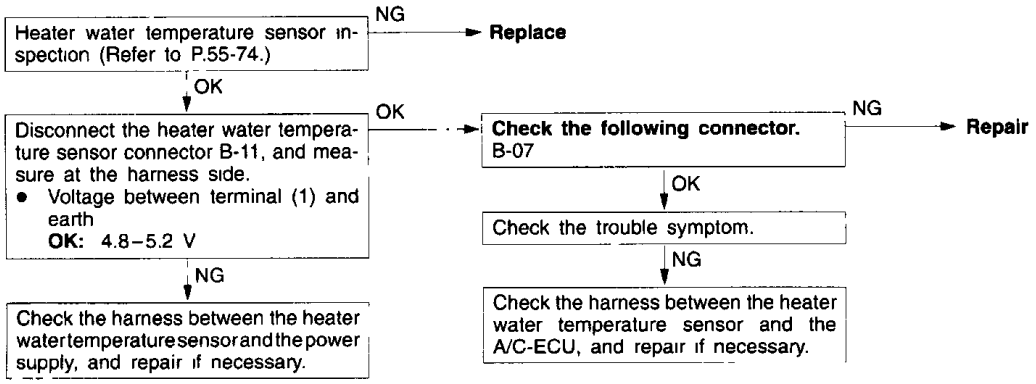
Code No. 13 Outside air temperature sensor system (open circuit)	Probable cause
This diagnosis code is output if there is a defective connector connection, or if there is an open circuit in the harness.	• Malfunction of connector • Malfunction of harness



Code No. 14 Outside air temperature sensor system (short circuit)	Probable cause
This diagnosis code is output if there is a short circuit in the outside air temperature sensor input circuit.	• Malfunction of harness

Check the harness between the outside air temperature sensor and the A/C-ECU, and repair if necessary.

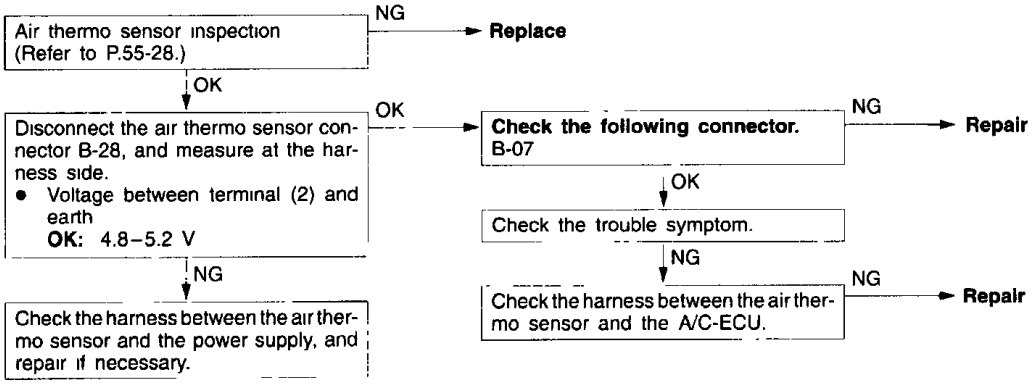
Code No. 15 Heater water temperature sensor system (open circuit)	Probable Cause
This diagnosis code is output if there is a defective connector connection or an open circuit in the harness.	• Malfunction of connector • Malfunction of harness



Code No. 16 Heater water temperature sensor system (short circuit)	Probable cause
This diagnosis code is output if there is a short circuit in the heater water temperature sensor input circuit.	• Malfunction of harness

Check the harness between the heater water temperature sensor input circuit.

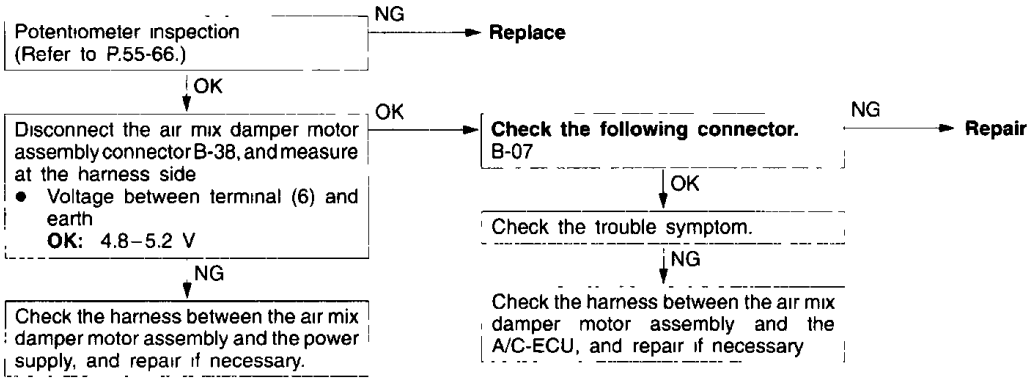
Code No. 21 Air thermo sensor system (open circuit)	Probable cause
This diagnosis code is output if there is a defective connector connection or an open circuit in the harness.	• Malfunction of connector • Malfunction of harness



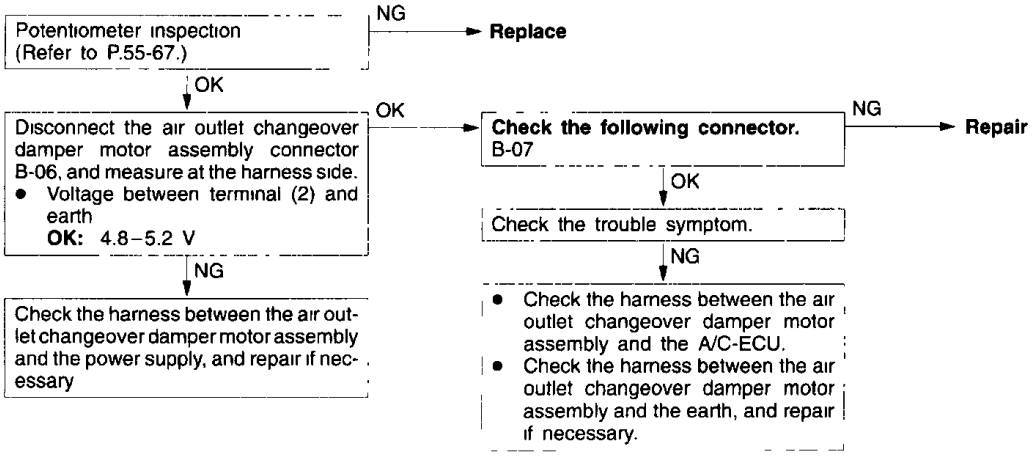
Code No. 22 Air thermo sensor system (short circuit)	Probable cause
This diagnosis code is output if there is a short circuit in the air thermo sensor input circuit.	• Malfunction of harness

Check the harness between the air thermo sensor and the A/C-ECU, and repair if necessary.

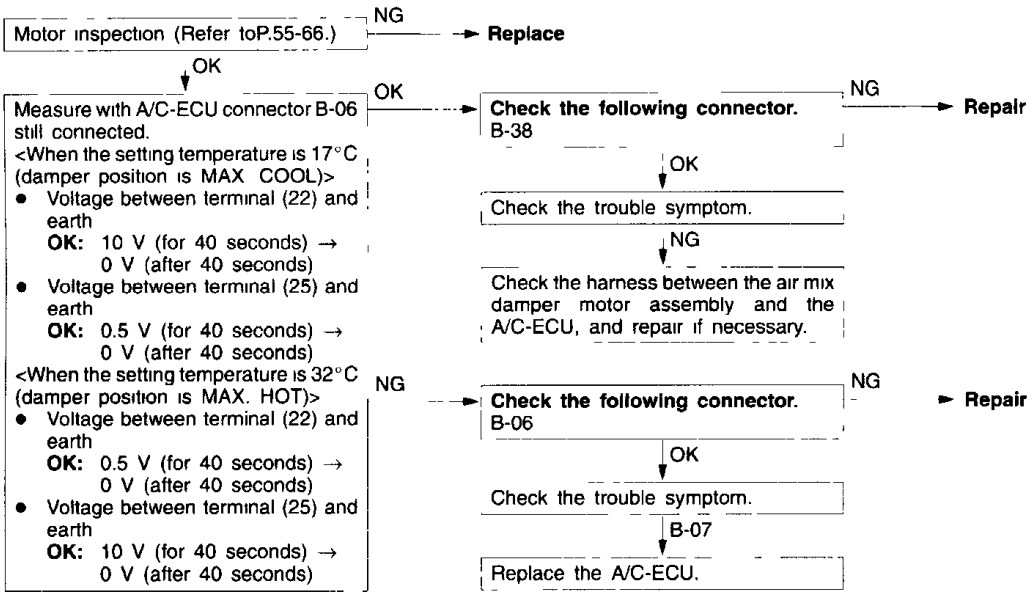
Code No. 31 Potentiometer system of air mix damper motor assembly	Probable cause
This diagnosis code is output if there is an open or short circuit in the potentiometer input circuit, or if there is an open circuit in the power circuit or earth circuit	• Malfunction of air mix damper motor assembly • Malfunction of connector • Malfunction of harness



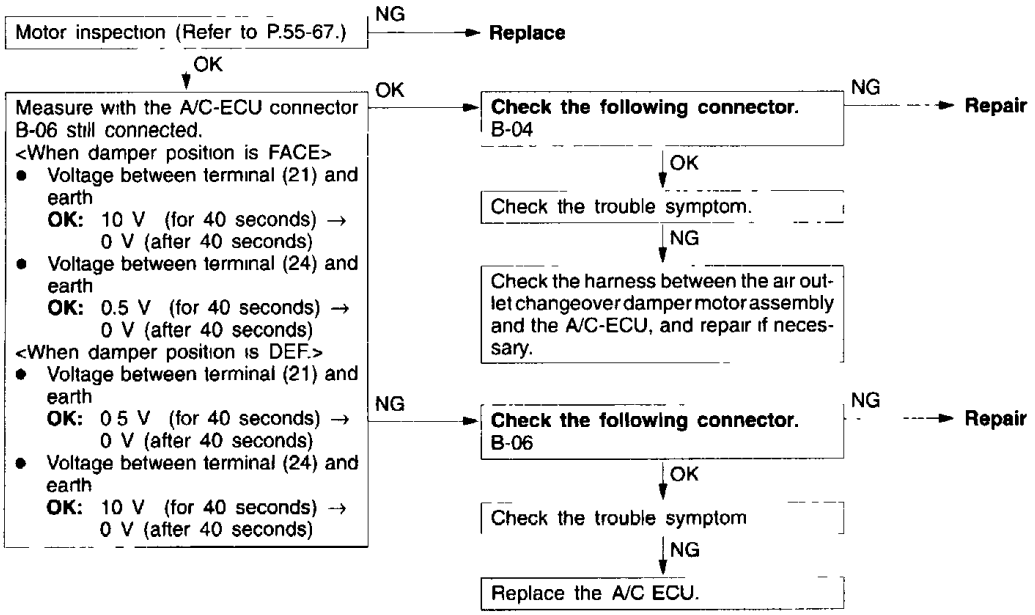
Code No. 32 Potentiometer system of air outlet changeover damper motor assembly	Probable cause
This diagnosis code is output if there is an open or short circuit in the potentiometer input circuit, or if there is an open circuit in the power circuit or earth circuit.	• Malfunction of air outlet changeover damper motor assembly • Malfunction of connector • Malfunction of harness



Code No. 41 Drive system of air mix damper motor assembly	Probable cause
This diagnosis code is output if the motor drive circuit is defective.	• Malfunction of air mix damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of the A/C-ECU



Code No. 42 Drive system of air outlet changeover damper motor assembly	Probable cause
This diagnosis code is output if the motor drive circuit is defective.	• Malfunction of air outlet changeover damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

Troubles Symptom		Inspection procedure No.	Reference Page
Communication with the MUT-II is not possible.	Communication with all systems is not possible.	1	55-50
	Communication with A/C system only is not possible.	2	55-50
Blowing of air does not stop even if blower switch is OFF.		3	55-50
No air is blown out from the air outlet even if blower switch is ON.		4	55-51
Inside/outside air changeover is not possible.		5	55-52
Air outlet is not changed over even if air outlet changeover switch is pressed.		6	55-52
When ignition switch and fan switch are ON, A/C does not operate even if A/C switch is turned to ON.		7	55-53
A/C is operated but inside air temperature is not lowered.		8	55-54
Setting display temperature returns to 25°C when ignition switch is turned ON or OFF.		9	55-55
Setting temperature is increased but inside air temperature does not rise.		10	55-55
Window glass becomes cloudy although operation is in AUTO mode.		11	55-56
Outside air temperature display does not change from 20°C.		12	55-57
Condenser fan does not operate.		13	55-57
Air purifier does not operate.		14	55-59
Air purifier indicator lamp (A/P) does not illuminate.		15	55-59
A/C compressor (magnetic clutch) circuit inspection		16	55-60

INSPECTION PROCEDURE FOR DIAGNOSIS TROUBLE SYMPTOMS

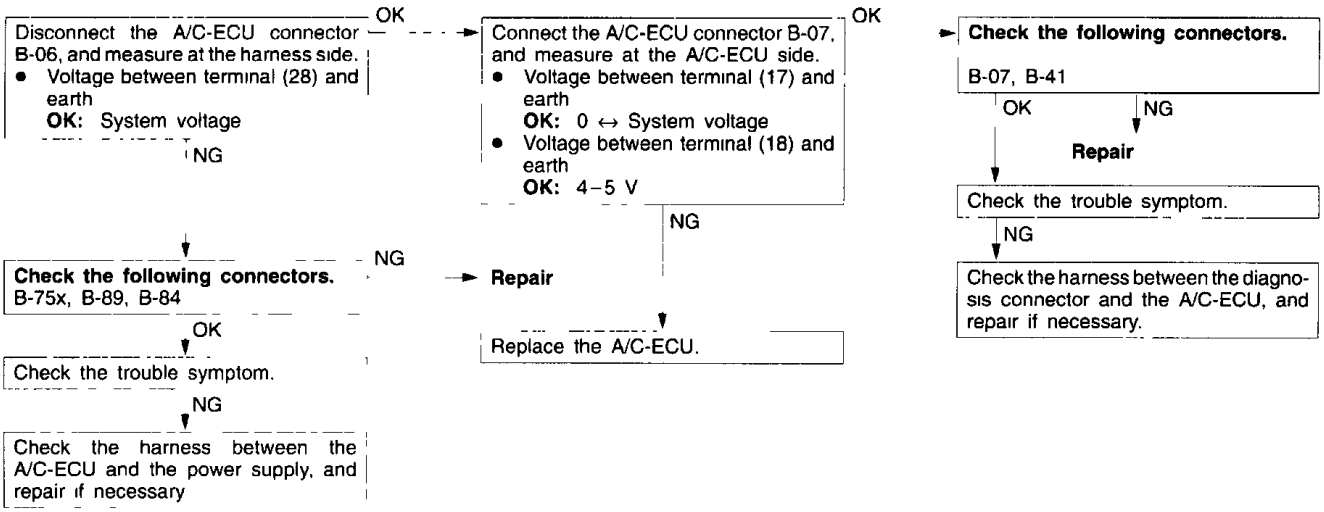
Inspection procedure 1

Communication with the 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 earth) for the diagnosis line	• Malfunction of connector • Malfunction of harness

Refer to GROUP 13A – Troubleshooting.

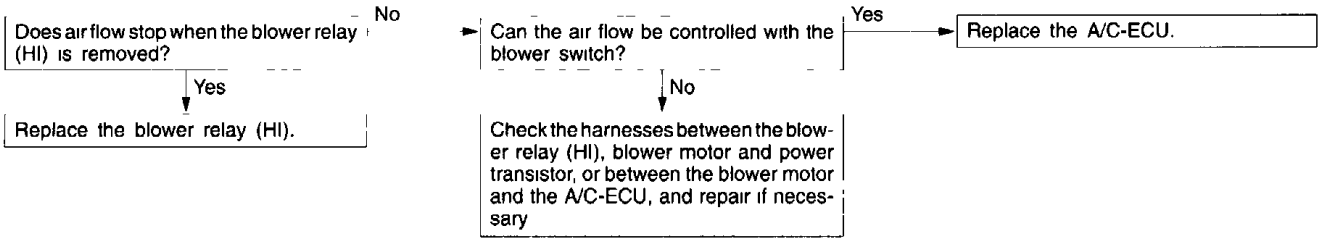
Inspection procedure 2

Communication with A/C system only is not possible.	Probable cause
The cause is probably a defective A/C-ECU power supply circuit or earth circuit, or a defective diagnosis line circuit.	• Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



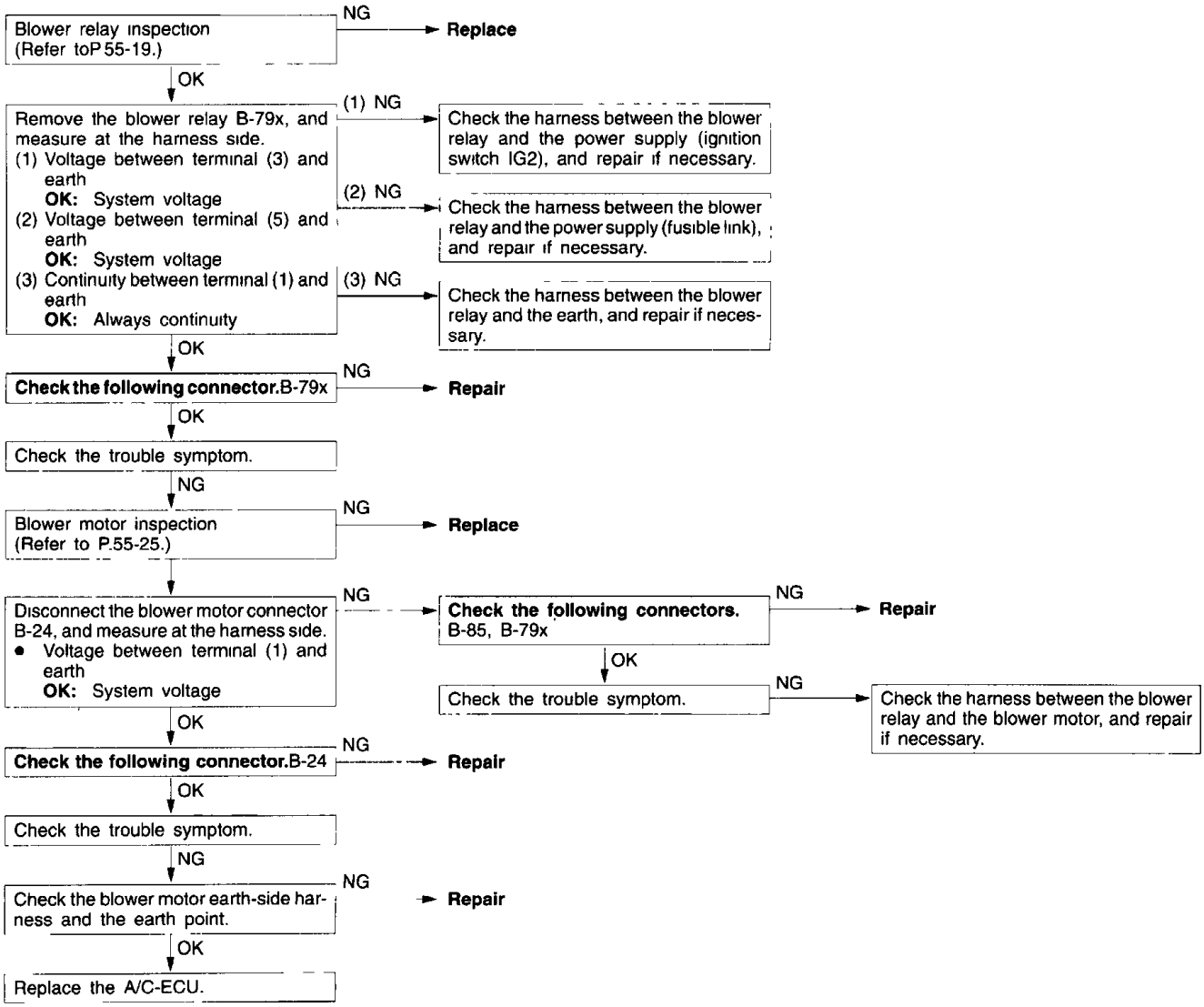
Inspection procedure 3

Blowing of air does not stop even if blower switch is OFF.	Probable cause
There is a high possibility that the blower relay (HI) is defective or there is a defective harness. If the airflow volume can be controlled with the blower switch, the cause is probably a defective A/C-ECU.	• Malfunction of blower relay (HI) • Malfunction of harness • Malfunction of A/C-ECU



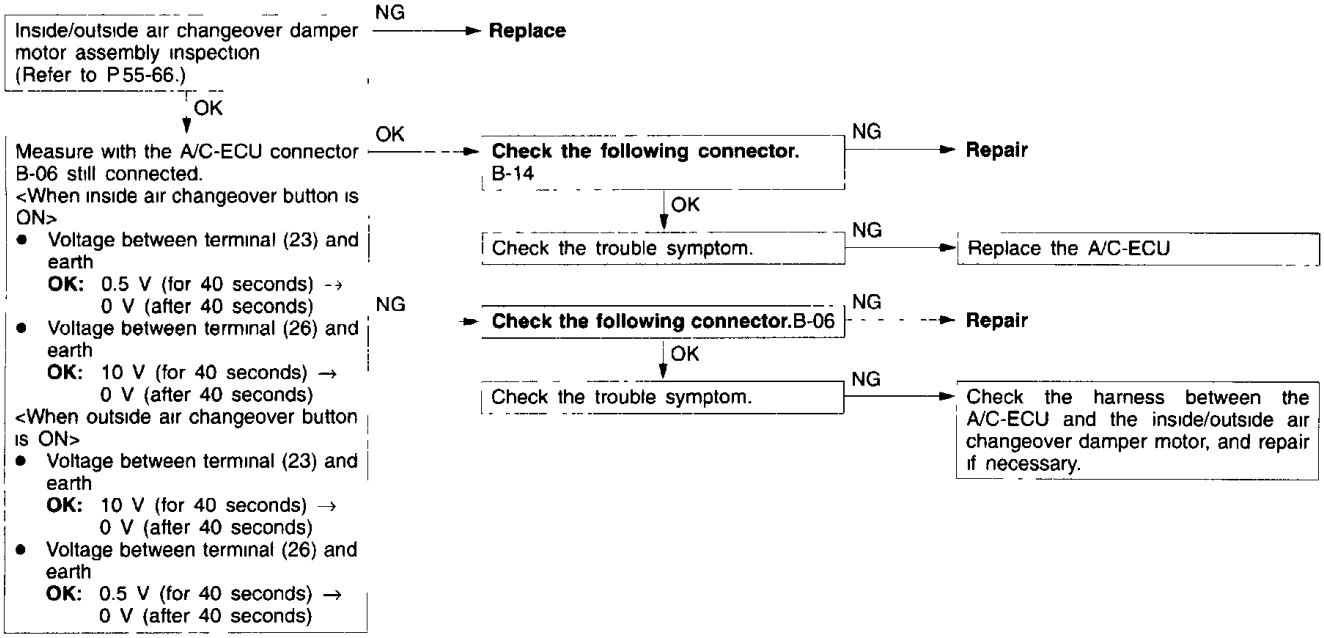
Inspection procedure 4

No air is blown out from the air outlet even if blower switch is ON.	Probable cause
The cause is probably a defective blower motor or a defective blower relay.	• Malfunction of blower motor • Malfunction of blower relay • Malfunction of A/C-ECU



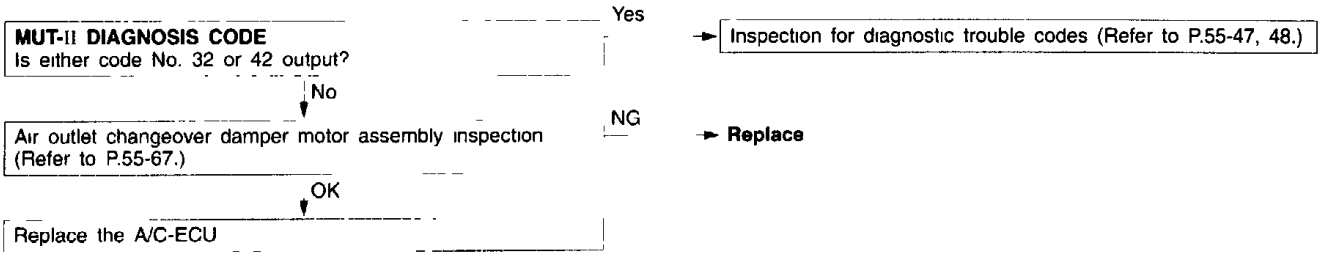
Inspection procedure 5

Inside/outside air changeover is not possible.	Probable cause
The cause is probably a defective inside/outside air changeover damper motor assembly or a defective connector or harness.	• Malfunction of inside/outside air changeover damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



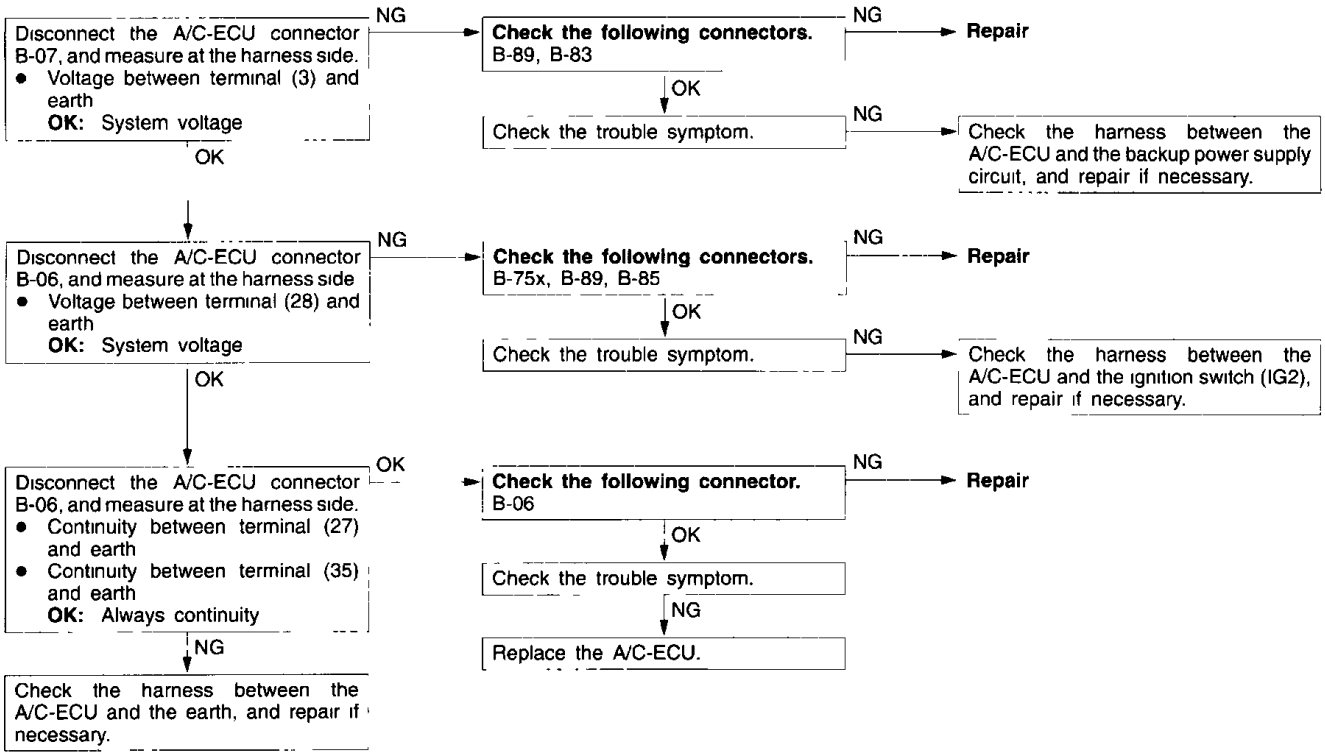
Inspection procedure 6

Air outlet is not changed over even if air outlet changeover switch is pressed.	Probable cause
The cause is probably a defective air outlet changeover damper motor assembly or a defective connector or harness. In this case, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes.	• Malfunction of air outlet changeover damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



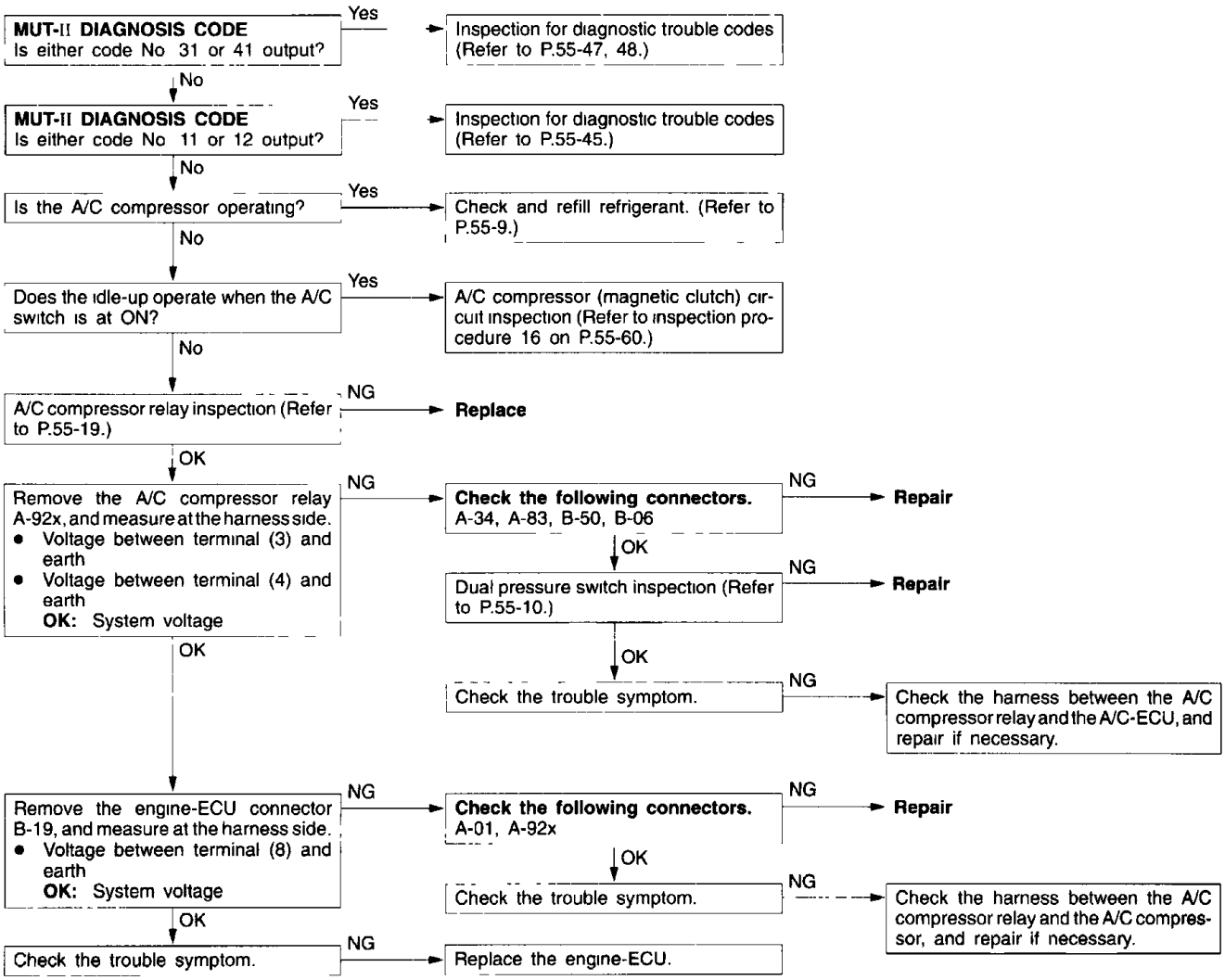
Inspection procedure 7

When ignition switch and fan switch are ON, A/C does not operate even if A/C switch is turned to ON.	Probable cause
The cause is probably a defective A/C-ECU power supply system (including earth).	• Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



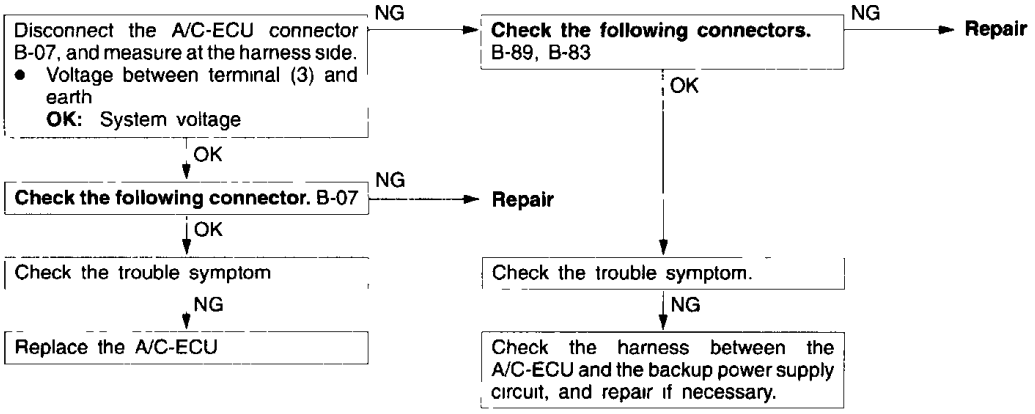
Inspection procedure 8

A/C is operated but inside air temperature is not lowered (cool air does not blow out).	Probable cause
The cause is probably a defective A/C compressor (magnetic clutch), a defective air mix damper motor assembly or a defective sensor. In this case, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes.	• Malfunction of A/C compressor (magnetic clutch) • Malfunction of refrigerant temperature switch • Malfunction of A/C compressor relay • Malfunction of dual pressure switch • Malfunction of air mix damper motor assembly • Malfunction of air thermo sensor • Malfunction of A/C-ECU • Malfunction of engine-ECU



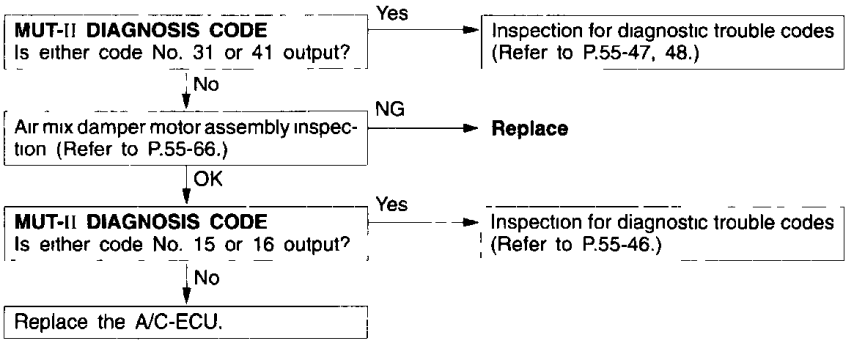
Inspection procedure 9

Setting display temperature returns to 25°C when ignition switch is turned ON or OFF.	Probable cause
The cause is probably a defective A/C-ECU or a defective connector or harness.	• Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



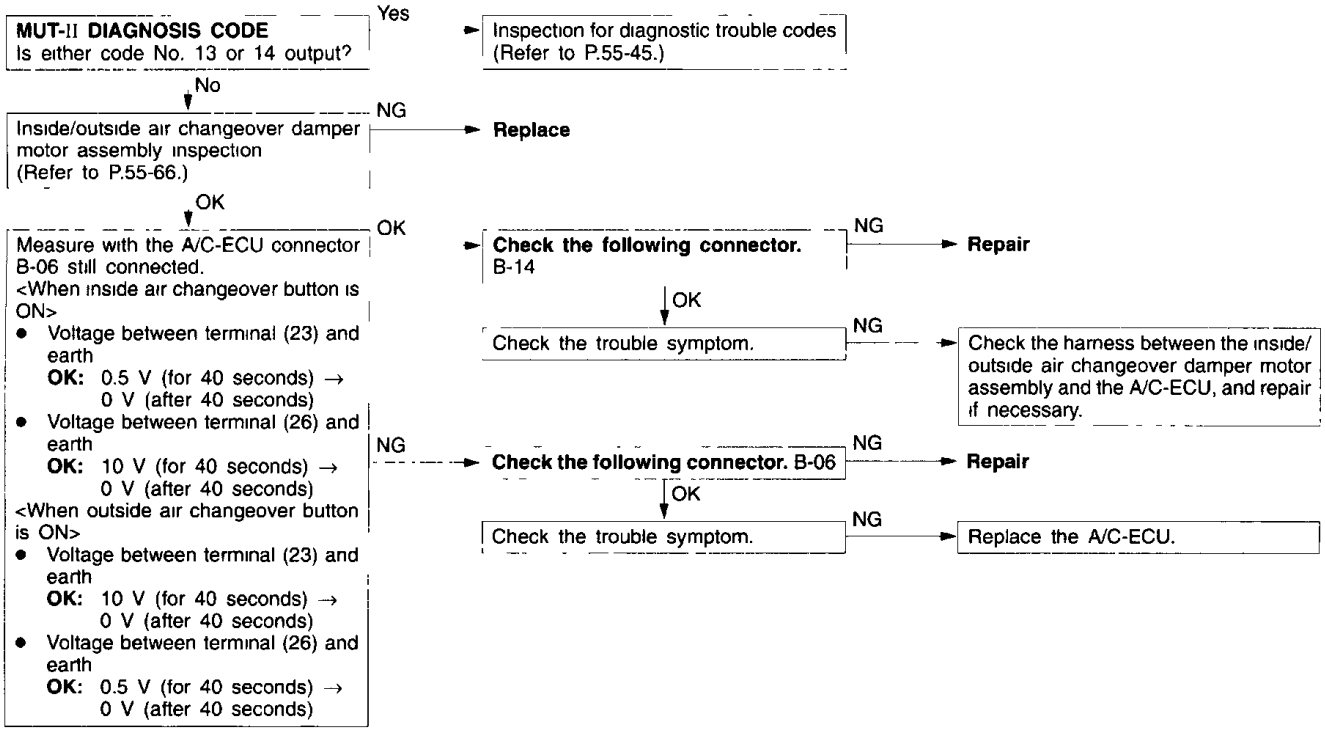
Inspection procedure 10

Setting temperature is increased but inside air temperature does not rise (warm air does not blow out).	Probable cause
The cause is probably a defective air mix damper motor assembly, or a defective engine coolant temperature sensor. In this case, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes.	• Malfunction of air mix damper motor assembly • Malfunction of engine coolant temperature sensor • Malfunction of A/C control unit



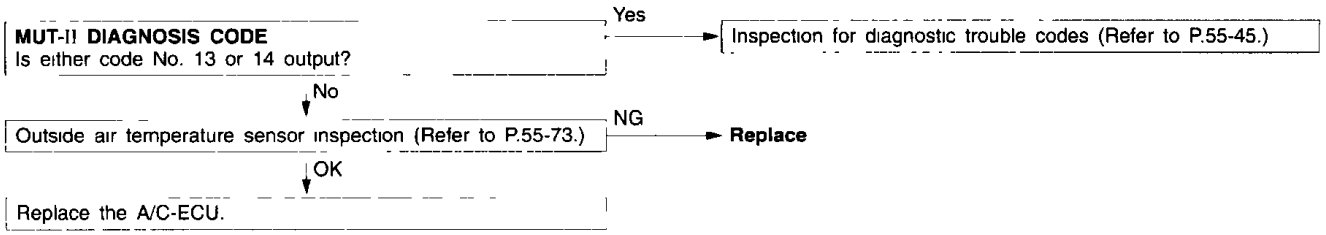
Inspection procedure 11

Window glass becomes cloudy although operation is in AUTO mode.	Probable cause
If the diagnosis codes are investigated and the outside air temperature sensor code is output, the cause is probably a defective outside air temperature sensor system. Alternatively, the cause may also be a defective inside/outside air changeover damper motor assembly system	• Malfunction of outside air temperature sensor • Malfunction of inside/outside air changeover damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



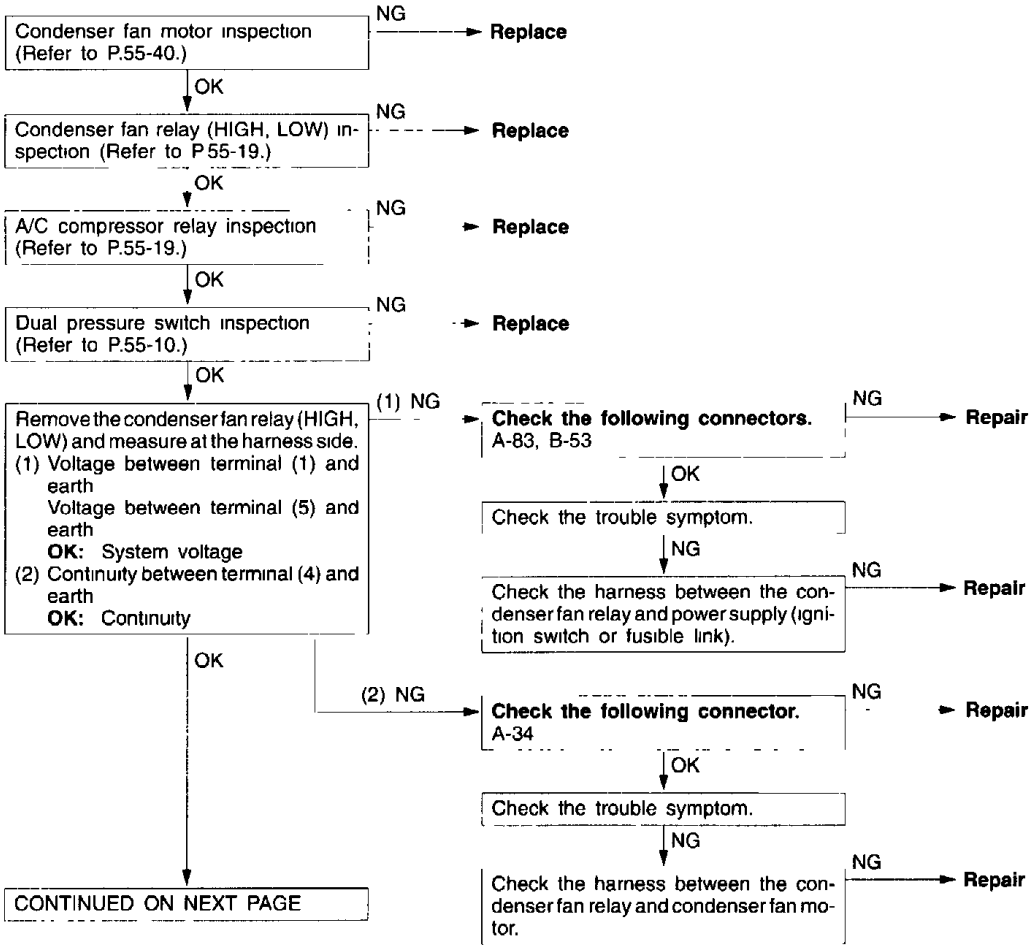
Inspection procedure 12

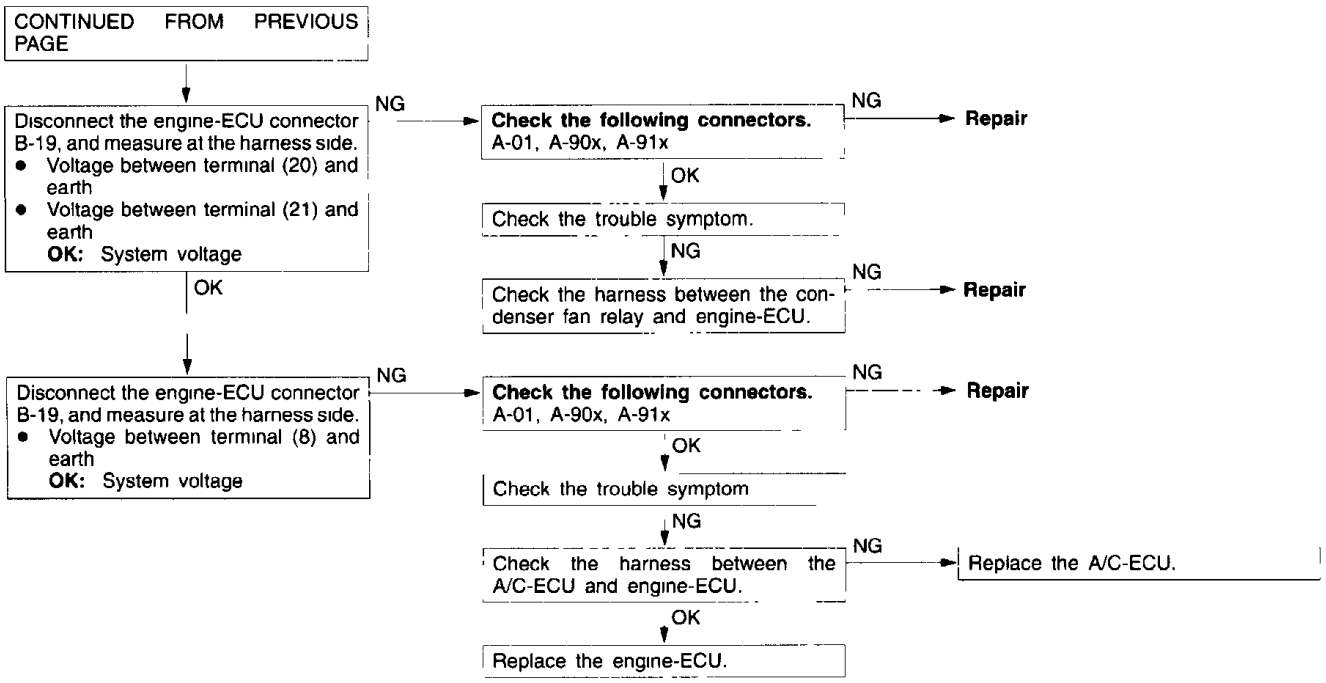
Outside air temperature display does not change from 20°C.	Probable cause
The cause is probably a defective outside air temperature sensor system or a defective A/C-ECU. Furthermore in cases where the outside air temperature sensor system is defective, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes.	• Malfunction of outside air temperature sensor • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



Inspection procedure 13

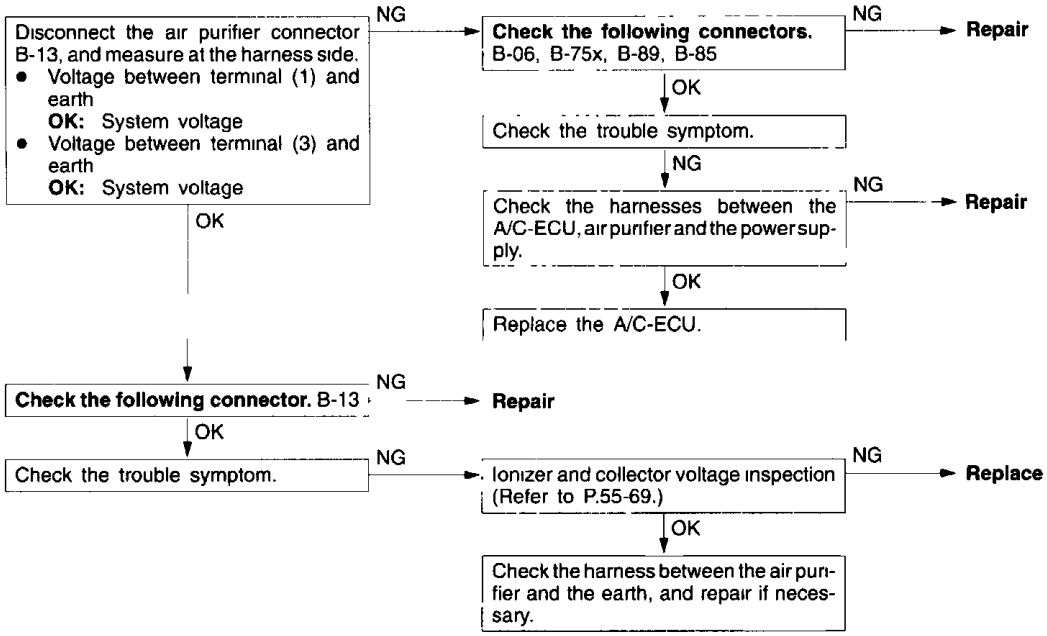
Condenser fan does not operate	Probable cause
If the condenser fan does not operate even when the air conditioner is turned on, the cause is probably a malfunction of the condenser fan operation circuit. This will cause a drop in the cooling performance while the vehicle is not moving.	• Malfunction of condenser fan motor • Malfunction of condenser fan relay • Malfunction of harness or connector • Malfunction of dual pressure switch • Malfunction A/C compressor relay • Malfunction of A/C-ECU • Malfunction of Engine-ECU




CONTINUED FROM PREVIOUS PAGE
Disconnect the engine-ECU connector B-19, and measure at the harness side.
• Voltage between terminal (20) and earth
• Voltage between terminal (21) and earth
OK: System voltage
NG
Check the following connectors.
A-01, A-90x, A-91x
NG
Repair
OK
Check the trouble symptom.
NG
Check the harness between the condenser fan relay and engine-ECU.
NG
Repair
OK
Disconnect the engine-ECU connector B-19, and measure at the harness side.
• Voltage between terminal (8) and earth
OK: System voltage
NG
Check the following connectors.
A-01, A-90x, A-91x
NG
Repair
OK
Check the trouble symptom
NG
Check the harness between the A/C-ECU and engine-ECU.
NG
Replace the A/C-ECU.
OK
Replace the engine-ECU.

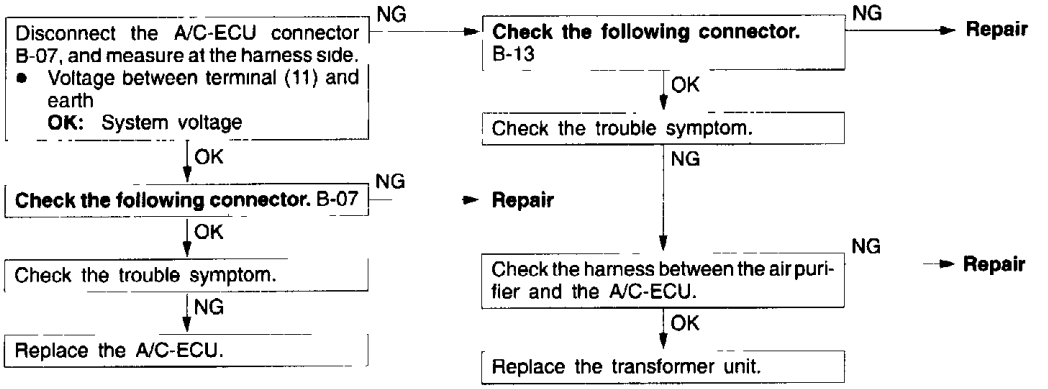
Inspection procedure 14

Air purifier does not operate.	Probabable Cause
The air purifier operates when the ignition switch is at the ON position and the blower switch is turned to ON. Accordingly, if only the blower fan operates, the cause is probably a defective air purifier power supply circuit.	• Malfunction of ionizer • Malfunction of collector • Malfunction of transformer unit • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



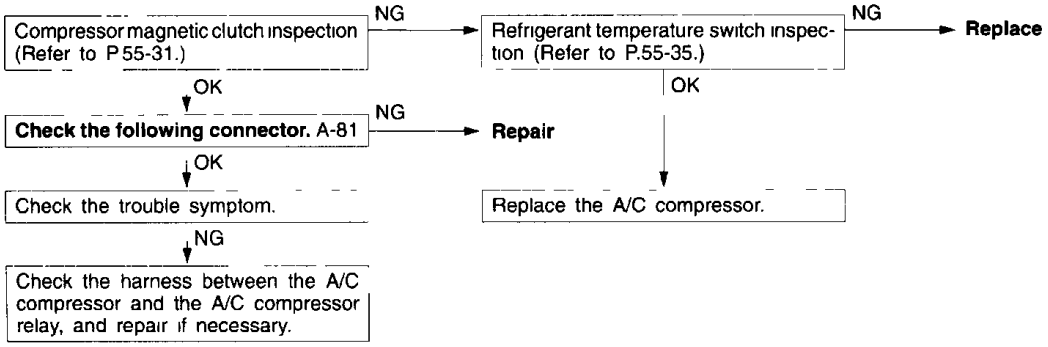
Inspection procedure 15

Air purifier indicator lamp (A/P) does not illuminate (however, air purifier is operating).	Probable cause
The cause is probably an open circuit in the harness between the air purifier and the A/C-ECU, or a defective air purifier or A/C-ECU.	• Malfunction of connector • Malfunction of harness • Malfunction of transformer unit • Malfunction of A/C-ECU



Inspection procedure 16

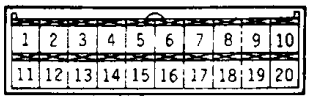
A/C compressor (magnetic clutch) circuit inspection



SERVICE DATA REFERENCE TABLE

Item No.	Check Item	Check Condition		Normal Condition
11	Inside air temperature sensor	Ignition switch: ON		Inside air temperature and temperature displayed on the MUT-II are identical.
13	Outside air temperature sensor	Ignition switch: ON		Outside air temperature and temperature displayed on the MUT-II are identical.
15	Heater water temperature switch	Ignition switch: ON		ON when heater core wall temperature is 30°C or higher
21	Air thermo sensor	Ignition switch: ON		Temperature of blow air from evaporator and temperature displayed on the MUT-II are identical.
25	Photo sensor	Ignition switch: ON		Amount of incident light is proportional to voltage displayed on the MUT-II.
31	Potentiometer of air mix damper motor	Ignition switch: ON	Damper position	Opening degree (%)
			MAX. HOT	Approx. 100
			MAX. COOL	Approx. 0
32	Potentiometer of air outlet changeover damper motor	Ignition switch: ON	Damper position	Opening degree (%)
			FACE	Approx. 0
			FOOT	Approx. 50
			FOOT/DEF.	Approx. 75
			DEF.	Approx. 100

CHECK AT THE A/C-ECU TERMINALS



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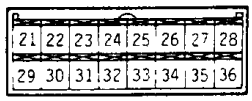

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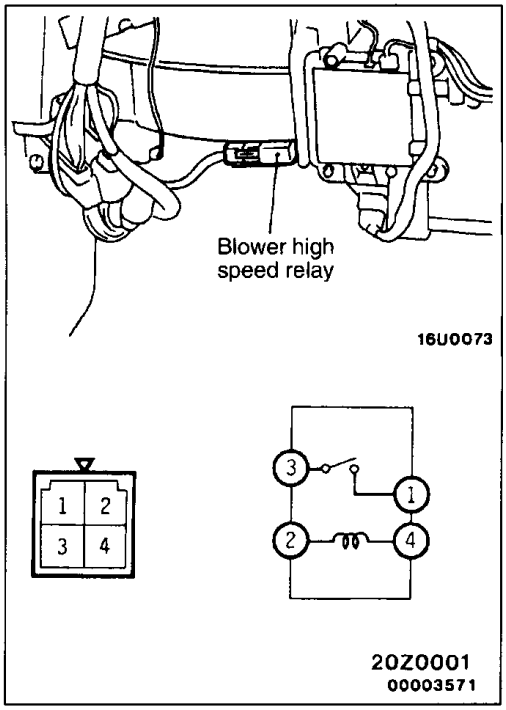
00003123

Terminal No.	Check Item	Check Condition	Normal Condition
1	Power transistor collector	When blower switch is at OFF	System voltage
		When blower switch is at LO	Approx. 7 V
		When blower switch is at HI	0 V
2	Power transistor base	When blower switch is at OFF	0 V
		When blower switch is at LO	Approx. 1.3 V
		When blower switch is at HI	Approx. 2.5 V
3	A/C-ECU backup power supply	At all times	System voltage
4	Heater water temperature sensor input	When sensor section temperature is 25°C (4 kΩ)	2.3–2.9 V
5	Air mix damper motor potentiometer input	When air mix damper is at MAX. COOL position	0.1–0.3 V
		When air mix damper is at MAX. HOT position	4.7–5.0 V
6	Air outlet changeover damper motor potentiometer input	When air outlet changeover damper is at FACE position	0.1–0.3 V
		When air outlet changeover damper is at DEF position	4.8–5.2 V
7	Outside air temperature sensor input	When sensor section temperature is 25°C (4 kΩ)	2.3–2.9 V
8	Air thermo sensor input	When A/C is OFF and sensor section temperature is 25°C (4 kΩ)	2.3–2.9 V
9	Photo sensor (–)	At luminous intensity of 100,000 lux or more	–0.1–0.2 V
		At luminous intensity of 0 lux	0 V
10	Sensor power supply	At all times	4.8–5.2 V
11	A/P indicator input	When blower switch is at ON	System voltage
12	Blower relay (HI)	When blower switch is at HI	1.5 V or less
		When blower switch is at ME, LO or OFF	System voltage
13	Earth	At all times	Continuity

Terminal No.	Check Item	Check Condition	Normal Condition
16	Earth	At all times	Continuity
17	Diagnosis data output	0 ↔ System voltage	–
18	Diagnosis control input	When ignition switch is ON	4–5 V
19	Photo sensor (+)	At all times	0 V
20	Air mix damper motor and air outlet changeover damper motor potentiometers	At all times	0 V
21	Air outlet changeover damper motor (+)	Set to FACE position (OFF after 40 seconds of output)	10 V
		Set to DEF position (OFF after 40 seconds of output)	0.5 V
22	Air mix damper motor (–)	Set the setting temperature to 17°C and set to MAX. COOL position (OFF after 40 seconds of output)	10 V
		Set the setting temperature to 32°C and set to MAX. HOT position (OFF after 40 seconds of output)	0.5 V
23	Inside/outside air changeover damper motor (–)	Set to inside air position (OFF after 40 seconds of output)	0.5 V
		Set to outside air position (OFF after 40 seconds of output)	10 V
24	Air outlet changeover damper motor (–)	Set to FACE position (OFF after 40 seconds of output)	0.5 V
		Set to DEF position (OFF after 40 seconds of output)	10 V
25	Air mix damper motor (–)	Set the setting temperature to 17°C and set to MAX. COOL position (OFF after 40 seconds of output)	0.5 V
		Set the setting temperature to 32°C and set to MAX. HOT position (OFF after 40 seconds of output)	10 V
26	Inside/outside air changeover damper motor (+)	Set to inside air position (OFF after 40 seconds of output)	10 V
		Set to outside air position (OFF after 40 seconds of output)	0.5 V
27	Earth	At all times	Continuity
28	A/C-ECU power supply	When ignition switch is ON	System voltage
29	ILL earth (rheostat)	At all times	Continuity
30	ILL power supply	When lighting switch is at ON	System voltage
33	Air purifier	When blower switch is at ON	System voltage

Terminal No.	Check Item	Check Condition	Normal Condition
34	A/C compressor relay output	When A/C compressor magnetic clutch is ON	System voltage
35	Earth	At all times	Continuity



ON-VEHICLE SERVICE

55400420029

POWER RELAY CHECK

BLOWER HIGH SPEED RELAY

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

IDLE-UP OPERATION CHECK

55400430022

1. Before inspectioin, set the vehicle to the pre-inspection condition.
2. Check whether or not the idling speed is the standard value.

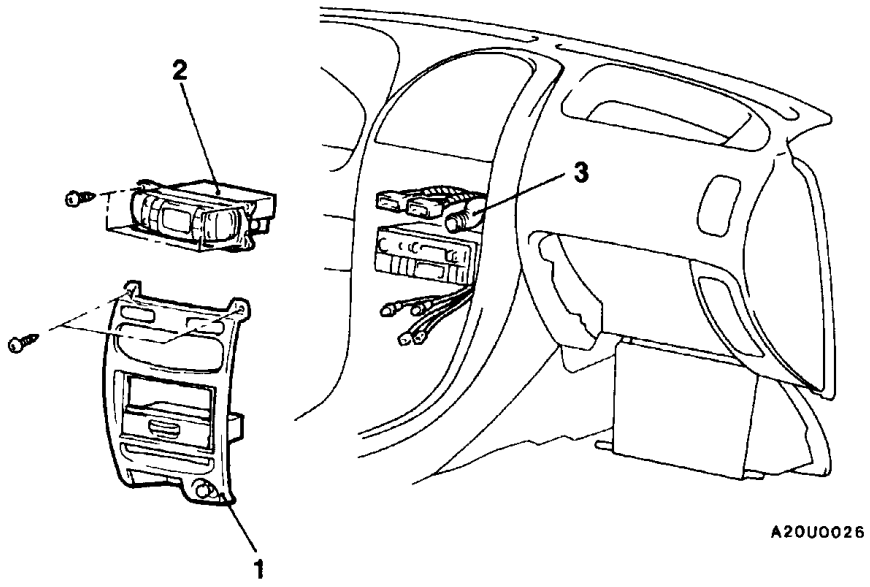
   Standard value: 800±50 r/min
3. When the A/C is running after turning the A/C switch to ON, and the blower switch to the MH or HI position, check that the idle speed is at the standard value.

   Standard value: 850 r/min

   NOTE
   There is no necessity to make an adjustment, because the idling speed is automatically adjusted by the ISC system. If, however, there occurs a deviation from the standard value for some reason, check the ISC system. (Refer to GROUP 13A – On-vehicle Service.)

AIR CONDITIONER CONTROL PANEL AND ECU ASSEMBLY 55400100022

REMOVAL AND INSTALLATION



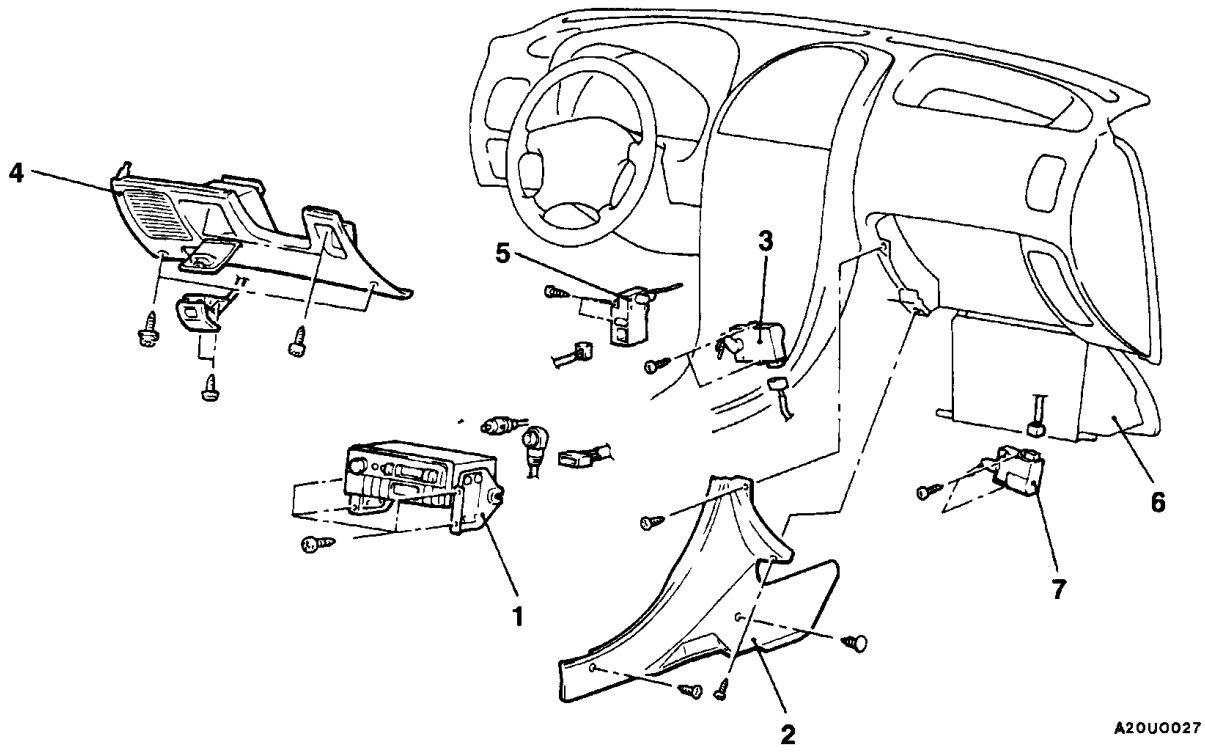
Removal steps

1. Center console panel (Refer to GROUP 52A – Floor Console.)
2. Air conditioner control panel and ECU assembly
3. Aspirator

DAMPER MOTOR ASSEMBLY

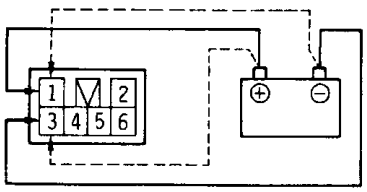
55400160020

REMOVAL AND INSTALLATION



Removal steps

1. Radio and tape player (Refer to GROUP 52A – Floor Console.)
2. Side cover (Both side) (Refer to GROUP 52A – Floor Console.)
3. Air mix damper motor assembly
4. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
5. Outlet air changeover damper motor assembly
6. Glove box (Refer to GROUP 52A – Instrument Panel.)
7. Inside/outside air changeover damper motor assembly



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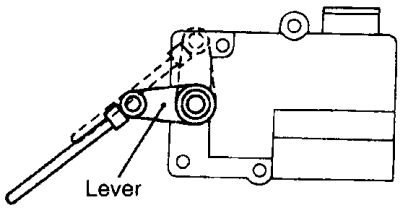


20U0039
00003572

INSPECTION

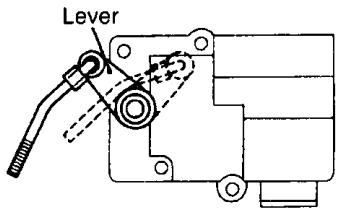
55400170023

INSIDE/OUTSIDE AIR CHANGEOVER DAMPER MOTOR ASSEMBLY 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 backward direction when polarity is changed.

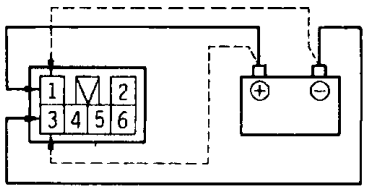
Caution

1. **Cut off the voltage when the damper is in the inside air position or outside air position.**
2. **Cut off the voltage if the motor does not turn when battery voltage is applied.**



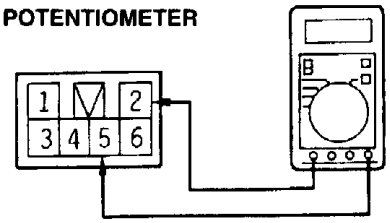
20U0041

MOTOR



20S0005

POTENTIOMETER



20S0007
00003573

AIR MIX DAMPER MOTOR ASSEMBLY CHECK

Motor

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 backward direction when polarity is changed.

Caution

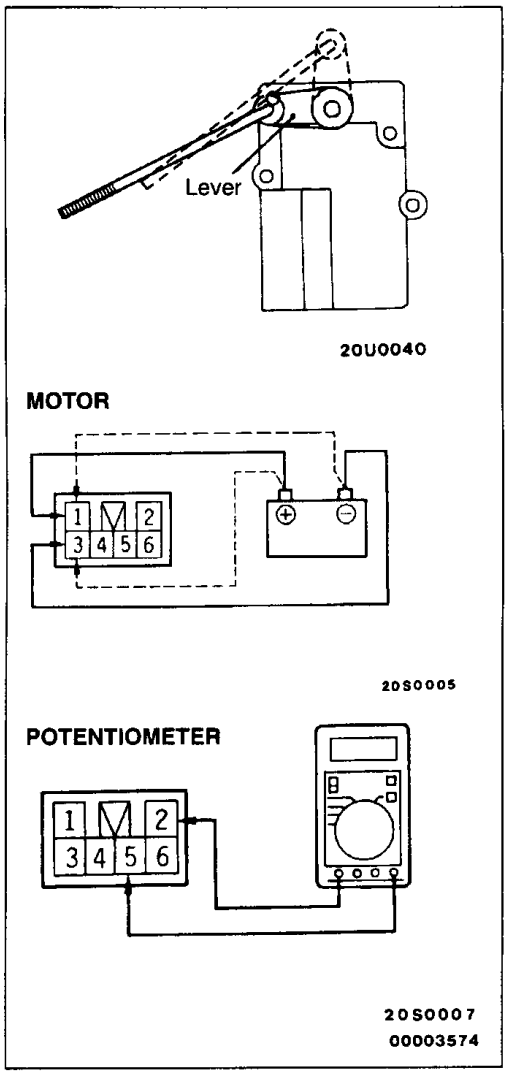
1. **Cut off the voltage when the damper is in the MAX. HOT and MAX. COOL position.**
2. **Cut off the voltage if the motor does not turn when battery voltage is applied.**

Potentiometer

Connect a circuit tester across terminals 2 and 5 of the motor assembly connector and check that resistance gradually changes as the damper is moved from MAX. HOT to MAX. COOL position.

Standard value:

MAX. HOT position: Approx. 4.82 kΩ
MAX. COOL position: Approx. 0.18 kΩ



AIR OUTLET CHANGEOVER DAMPER MOTOR ASSEMBLY CHECK

Motor

Check that the lever moves when battery voltage is applied across terminals 1 and 3 of the motor assembly connector. Check also that the lever moves in the backward direction when polarity is changed.

Caution

1. **Cut off the voltage when the damper is in the DEF. or FACE position.**
2. **Cut off the voltage if the motor does not turn when battery voltage is applied.**

Potentiometer

Connect a circuit tester across terminals 2 and 5 of the motor assembly connector and check that resistance gradually changes as the damper is moved from DEF. to FACE position.

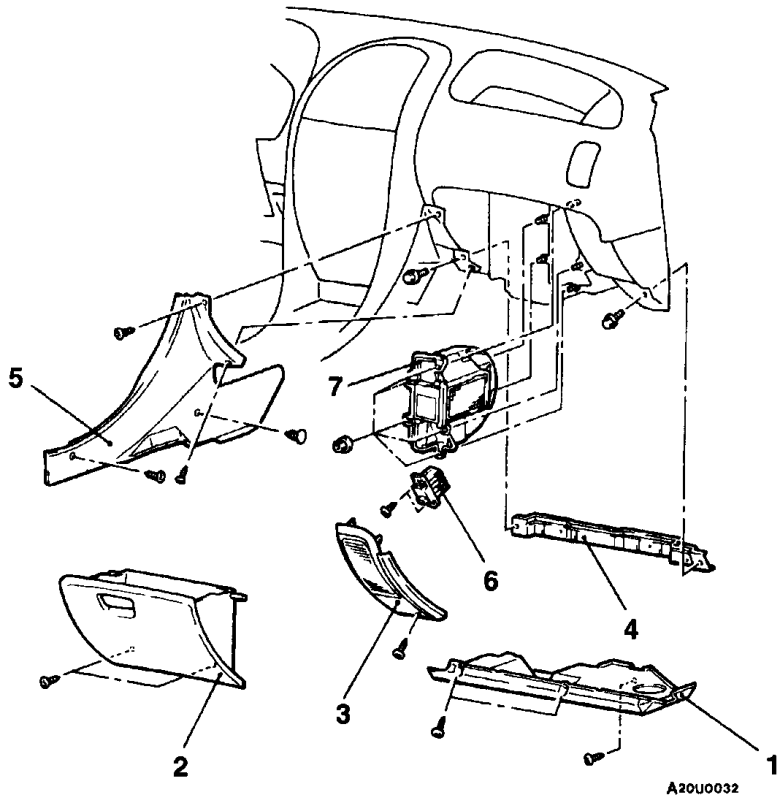
Standard value:

DEF. position: Approx. 4.82 kΩ
FACE position: Approx. 0.18 kΩ

AIR PURIFIER ASSEMBLY

55500100025

REMOVAL AND INSTALLATION



Removal steps

1. Under cover (Refer to GROUP 52A – Instrument Panel.)
2. Glove box (Refer to GROUP 52A – Instrument Panel.)
3. Corner panel (Refer to GROUP 52A – Instrument Panel.)
4. Glove box flame (Refer to GROUP 52A – Instrument Panel.)
5. Side cover (passenger side) (Refer to GROUP 52A – Instrument Panel.)
6. Power transistor
7. Air purifier assembly

◀A▶

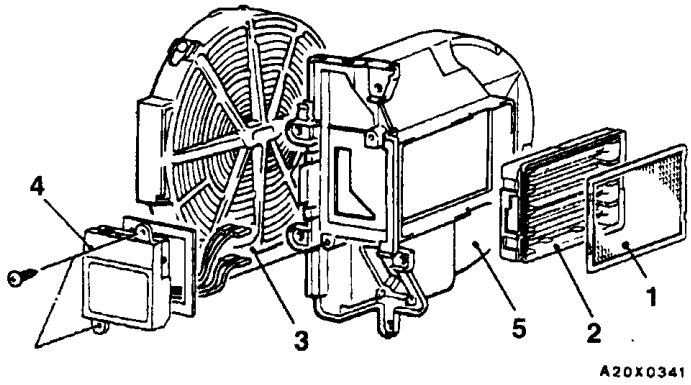
REMOVAL SERVICE POINT

◀A▶ AIR PURIFIER ASSEMBLY REMOVAL

Caution
After the power supply is turned OFF (blower switch is in OFF position or ignition switch is in ACC or LOCK position), the air purifier will still be at high pressure for approximately 5 seconds.
Accordingly, wait for 5 seconds after turning off the power supply before removing the air purifier.

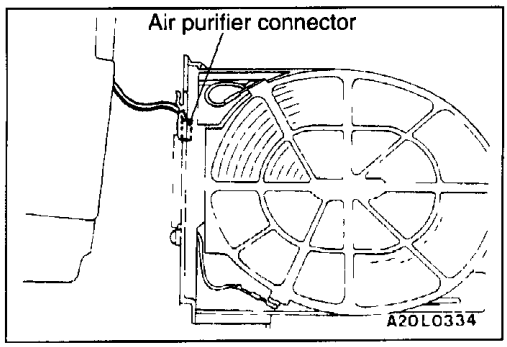
DISASSEMBLY AND REASSEMBLY

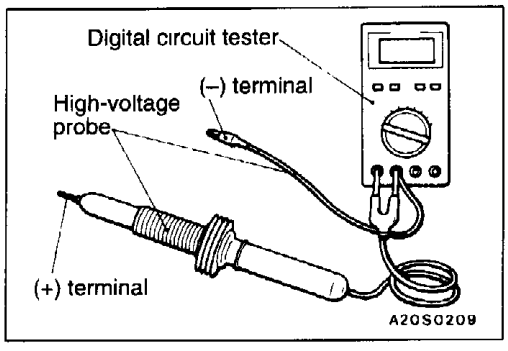
55500120021



Disassembly steps

1. Prefilter
2. Ionizer
3. Collector
4. Transformer unit
5. Case





INSPECTION

55500130017

APPROPRIATE VOLTAGE FOR COLLECTOR AND IONIZER CHECK

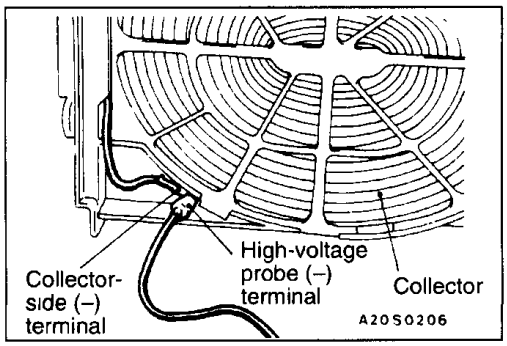
Measure the voltages at the collector and ionizer by the following procedure.

(1) Turn the air purifier in the opposite direction and reconnect the connector so that the unit can operate.

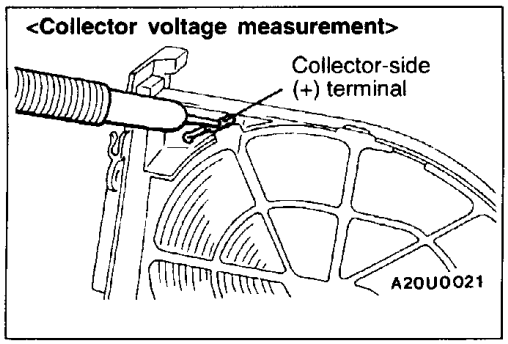
Caution
The power transistor should not be connected.

(2) Connect a high-voltage probe (one that can measure up to 10,000 V DC) to a digital circuit tester.

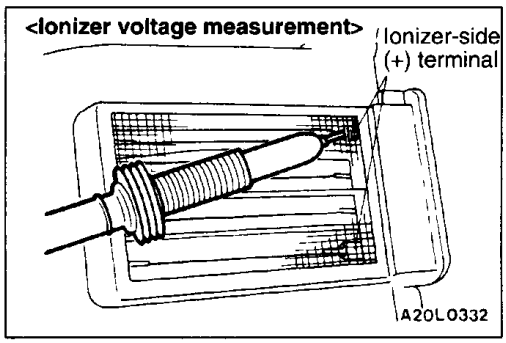
Caution
1. **When measuring, take sufficient care not to short the terminals.**
2. **A probe which is made by the same manufacturer as the digital circuit tester should be used.**



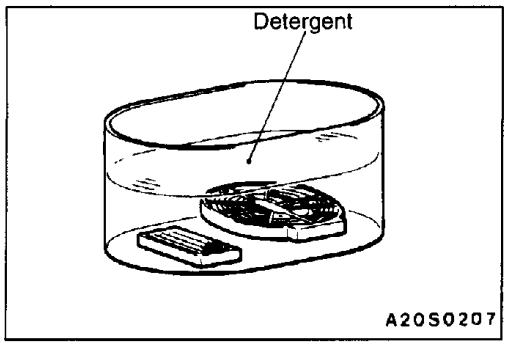
(3) Start the engine and set the blower switch to HI. Connect the (–) terminal of the high-voltage probe to the (–) terminal on the collector side.



(4) If the voltage measured when the (+) terminal of the high-voltage probe is touched against the collector-side (+) terminal is 2,000 V or higher, then the collector is normal.



(5) If the voltage measured when the (+) terminal of the high-voltage probe is touched against the ionizer-side (+) terminal is 4,000 V or higher, then the ionizer is normal.

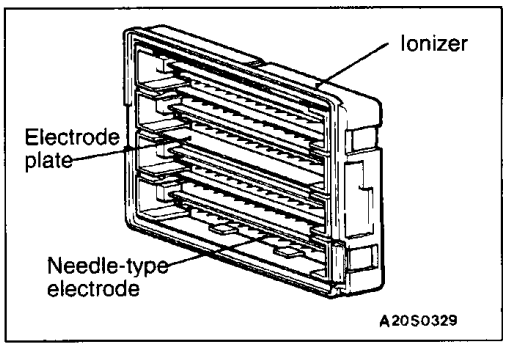


COLLECTOR AND IONIZER CLEANING

(1) Mix a weak alkali or alkali detergent into warm water (60°C or less) in a container, and dip the collector and ionizer into the solution and leave them in for approximately 10 minutes.

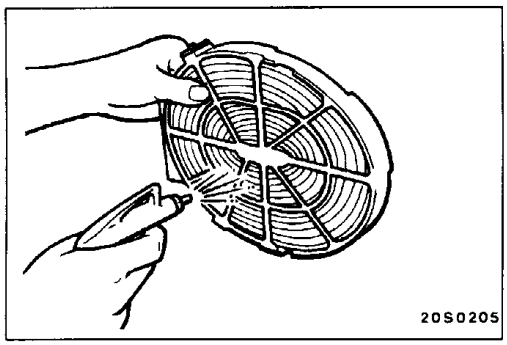
NOTE
The cleaning liquid should be mixed to about 1 part detergent to 20 parts water (by weight).

(2) After this, shake the collector and ionizer around in the detergent for 2–3 minutes to remove all dirt.



NOTE
If the electrode plate of the ionizer is extremely dirty, scrub off all dirt using a soft brush, while being careful not to break the tungsten wires.

(3) Throw away the detergent in the container, refill with clean water and then immerse the collector and ionizer in the water for approximately 2 minutes to rinse them.



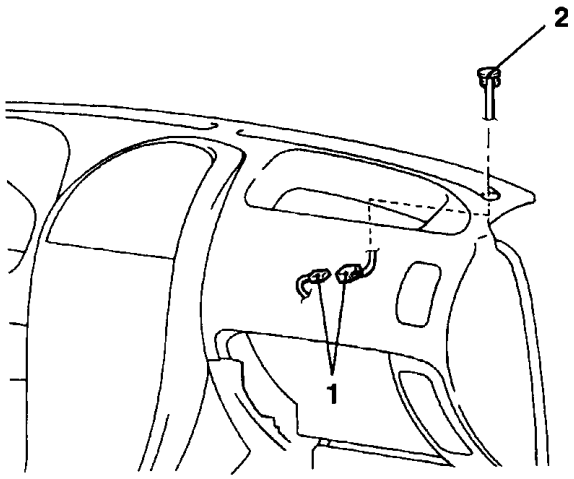
(4) After rinsing, dry off all of the water using an air blower.

Caution
If the parts are dried by heating with a drier or similar, there is the danger that plastic components may become deformed, so such a drying method should not be used.

PHOTO SENSOR

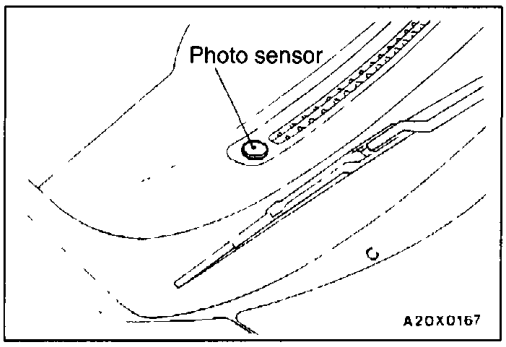
55400310029

REMOVAL AND INSTALLATION



Removal steps

1. Photo sensor connector
2. Photo sensor



INSPECTION

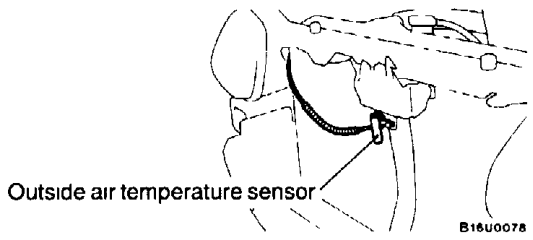
55400320022

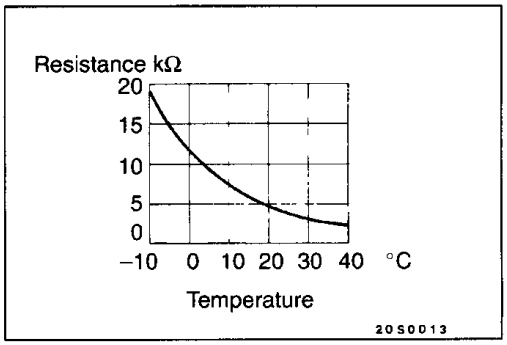
If the blower speed drops when the receiver section of the photo sensor is covered with your hand, then the photo sensor is normal. If the speed does not drop, replace the photo sensor.

OUTSIDE AIR TEMPERATURE SENSOR

55400340028

REMOVAL AND INSTALLATION





INSPECTION

55400350021

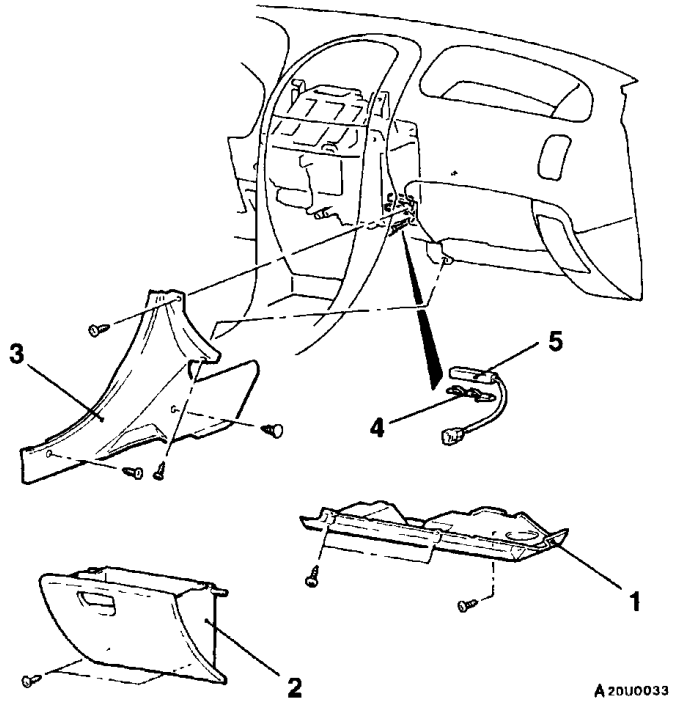
When the resistance value between the sensor terminals is measured under two or more temperature conditions, the resistance value should be close to the values shown in the graph.

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

HEATER WATER TEMPERATURE SENSOR

55400450035

REMOVAL AND INSTALLATION

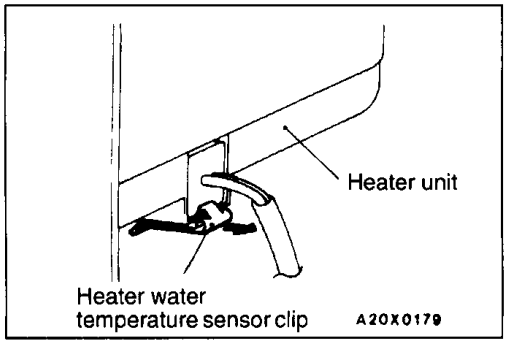


Removal steps

1. Under cover (Refer to GROUP 52A – Instrument Panel.)
2. Glove box (Refer to GROUP 52A – Instrument Panel.)
3. Side cover (passenger side) (Refer to GROUP 52A – Instrument Panel.)

◀A▶ ▶A◀ 4. Heater water temperature sensor clip

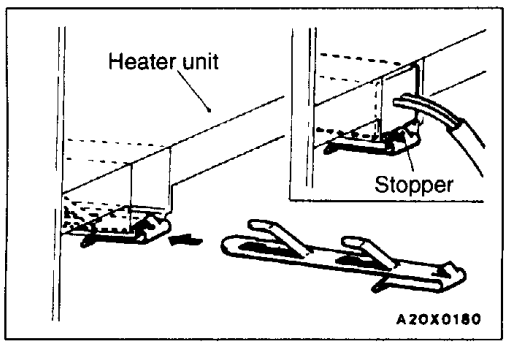
▶A◀ 5. Heater water temperature sensor



REMOVAL SERVICE POINT

◀A▶ HEATER WATER TEMPERATURE SENSOR CLIP REMOVAL

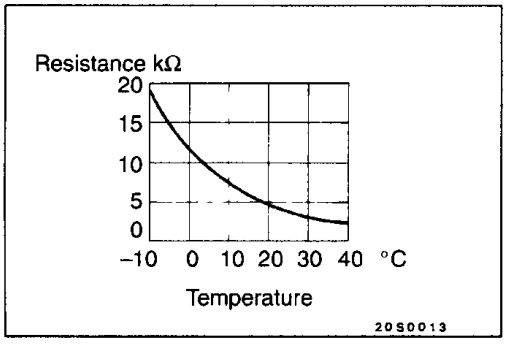
Take the heater water temperature sensor clip from the base of the heater unit out to the front of the vehicle.



INSTALLATION SERVICE POINT

▶A◀ HEATER WATER TEMPERATURE SENSOR CLIP AND TEMPERATURE SENSOR INSTALLATION

(1) Insert the heater water temperature sensor clip into the heater unit.
(2) Push in the heater water temperature sensor until the end touches against the stopper of the heater water temperature sensor clip.



INSPECTION

55400460021

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.

OTHER MAINTENANCE SERVICE POINTS

55400400023

The following maintenance service points are the same as for the manual A/C.

Items		Reference page
GENERAL INFORMATIONS	Safety Precautions	55-3
ON-VEHICLE SERVICE	Sight Glass Refrigerant Level Test	55-9
	Magnetic Clutch Test	55-9
	Receiver Drier Test	55-9
	Dual Pressure Switch Check	55-10
	Compressor Drive Belt Adjustment	55-10
	Charging	55-11
	Performance Test	55-16
	Refrigerant Leak Repair	55-17
	Compressor Noise	55-18
	Power Relay Check	55-19
HEATER UNIT AND HEATER CORE		55-23
BLOWER ASSEMBLY		55-24
EVAPORATORS		55-26
COMPRESSOR		55-29
CONDENSER		55-39
VENTILATORS		55-41

MITSUBISHI MOTORS

SERVICE BULLETIN

PUBLICATION GROUP, AFTER SALES SERVICE DEP.
MITSUBISHI MOTOR SALES EUROPE BV

SERVICE BULLETIN	No.: ESB-98E00-014		
	Date: 30-09-1999	<Model>	<M/Y>
Subject:	CHANGE IN TIGHTENING TORQUE FOR TENSIONER PULLEY MOUNTING NUT	(EC,EXP) CARISMA	96-10
Group:	GENERAL		
CORRECTION	O Kai - E.V.P. & G.M. After Sales Service Dept		

1. Description:

This Service Bulletin informs you of change in tightening torque for the mounting nut of the tensioner pulley of Volvo make.

2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
'96 CARISMA Workshop Manual chassis	PWDE9502	(English)	11A-7, 55-29
	PWDS9503	(Spanish)	
	PWDF9504	(French)	
	PWDG9505	(German)	
	PWDD9506	(Dutch)	
	PWDW9507	(Swedish)	
	PWDI96E1	(Italian)	

4. Tighten the lock bolt.

   Tighten torque: 23 Nm

5. Tighten the nut of the alternator privot bolt

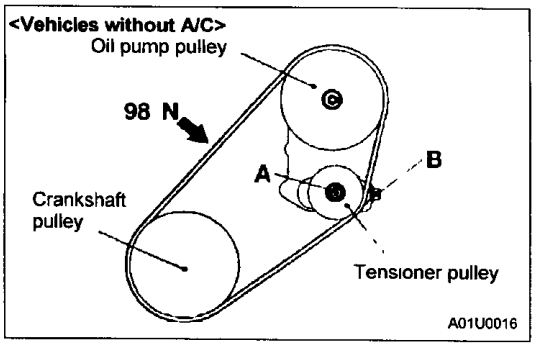
   Tighten torque: 44 Nm

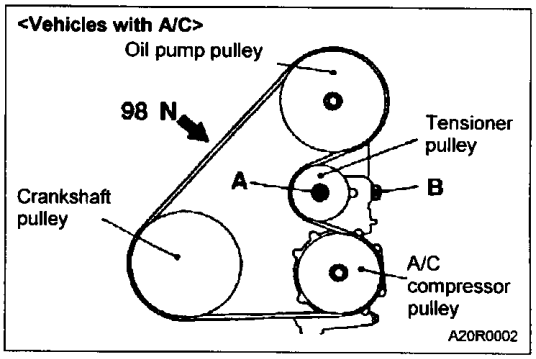
6. Tighten the adjusting bolt

   Tighten torque: 6 Nm

POWER STEERING OIL PUMO AND AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

11100130035





1. Use 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 98 N and check that the amount of belt deflection at the standard value.

   Standard value:

Items	When checked	When a used belt is installed	When a new belt is installed
Tension N	392-588	441-539	637-833
Deflection mm	10.0-12.0	10.0-11.0	7.0-9.0

2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen tension pulley fixing ~~bolt~~ A.
   (2) Adjust amount of belt deflection using adjusting bolt B.
   (3) Tighten fixing ~~bolt~~ A.
   (4) Check the belt deflection amount and tension, and readjust if necessary.

<Correct>
Flange nut

<Correct>
Flange nut

Caution

- **Check after turning the crankshaft once or more clockwise (right up).**

<Added>

Tighten torque:
25 Nm (for flange nut with flange O.D. of 19.5 mm)
38 Nm (for flange nut with flange O.D. of 21.8 mm)

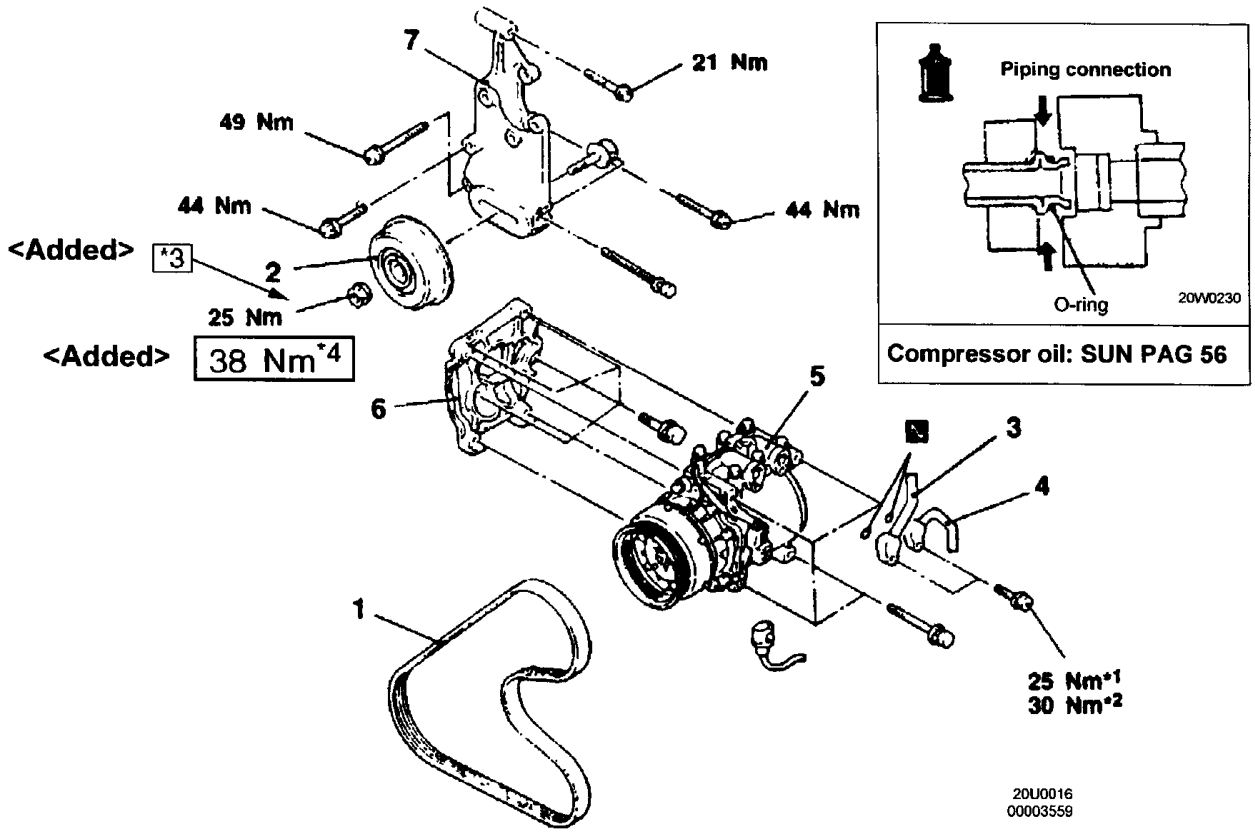
COMPRESSOR AND TENSION PULLEY

55200410068

REMOVAL AND INSTALLATION

Pre removal Operation
- Discharging of Refrigerant (Refer to P.55-15)
- Under Cover, Removal (R.H. side)
- Power Steering Oil Pump Removal (Refer to GROUP 37A)

Post-installation Operation
- Charging of Refrigerant (Refer to P.55-11.)
- Under Cover Installation (R.H. side)
- Power Steering Oil Pump Removal (Refer to GROUP 37A)
- A/C Compressor Drive Belt Tension Adjustment (Refer to GROUP 11A- On-vehicle Service.)



Compressor oil: SUN PAG 56

Removal steps

◀A▶		1. A/C compressor drive belt
		2. Tension pulley
◀B▶		3. Suction hose connection
◀B▶		4. Discharge pipe connection
◀C▶	◀A▶	5. Compressor
		6. Compressor bracket
		7. Power steering oil pump bracket

NOTE
(1) *1 : indicates flange bolt
(2) *2 : indicates flange bolt

(3) *3 : indicates flange nut with flange O.D. of 19.5 mm.
(4) *4 : indicates flange nut with flange O.D. of 21.8 mm.

<Added>

MITSUBISHI MOTORS

SERVICE BULLETIN

PUBLICATION GROUP, AFTER SALES SERVICE DEP.
MITSUBISHI MOTOR SALES EUROPE BV

SERVICE BULLETIN	No.: ESB-99E21-501	
	Date: 1999-12-15	<Model> (EC) CARISMA (EC) SPACE STAR (DG1A, DG5A) <M/Y> 96-10
Subject: CORRECTION TO CLUTCH PEDAL HEIGHT		
Group: CLUTCH		
CORRECTION	O. Kai - E.V.P. & G.M. After Sales Service Dept.	

1. Description:

The incorrectness of the clutch pedal height has been rectified.

2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
'96 CARISMA Workshop Manual chassis	PWDE9502	(English)	21-2
	PWDS9503	(Spanish)	
	PWDF9504	(French)	
	PWDG9505	(German)	
	PWDD9506	(Dutch)	
	PWDW9507	(Swedish)	
	PWDI96E1	(Italian)	
'99 SPACE STAR Workshop Manual chassis	CMXE99E1	(English)	21-2
	CMXS99E1	(Spanish)	
	CMXF99E1	(French)	
	CMXG99E1	(German)	
	CMXD99E1	(Dutch)	
	CMXW99E1	(Swedish)	
	CMXI99E1	(Italian)	

3. Details:

'96 CARISMA Workshop Manual chassis, page 2
'99 SPACE STAR Workshop Manual chassis, page 3

CLUTCH

21100010031

GENERAL INFORMATION

The clutch is a dry single-disc diaphragm type; hydraulic pressure is used for the clutch control.

SERVICE SPECIFICATIONS

<Correct>
171.2 - 174.2

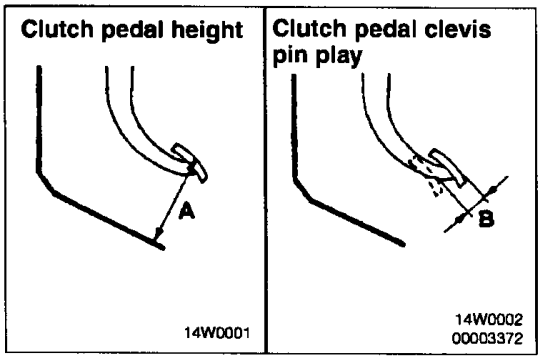
2100030037

Items	Standard value
Clutch pedal height m	163.5 - 166.5 (L.H. drive vehicles) ~~162.5 - 165.5~~ (R.H.drive vehicles <Incorrect>
Clutch pedal free play m	6 - 13
Clutch pedal clevis pin play m	1 - 3
Distance between the clutch pedal and the toeboard when the clutch is disengaged	85

LUBRICANTS

21100040023

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



ON-VEHICLE SERVICE

21100090035

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

1. Measure the clutch pedal height and the clutch pedal clevis pin relay.

Standard value (A): 163.5 - 166.5 mm <L.H. drive vehicles>

171.2 - 174.2 → **~~162.5 - 165.5~~ mm <Incorrect> <R.H. drive vehicles>**

<Correct>

GENERAL INFORMATION

21100010031

The clutch is a dry single-disc diaphragm type; hydraulic pressure is used for the clutch control.

<Correct>
173.3 - 176.3
172.8 - 175.8

SERVICE SPECIFICATIONS

21100030198

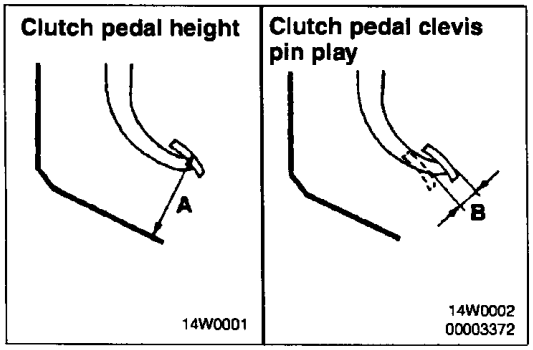
Items	Standard value
Clutch pedal height m	~~163.5 - 166.5~~ (L.H. drive vehicles) ~~162.5 - 165.5~~ (R.H.drive vehicles
Clutch pedal free play m	6 - 13
Clutch pedal clevis pin play m	1 - 3
Distance between the clutch pedal and the toeboard when the clutch is disengaged	50 <L.H. drive vehicles> 75 <R.H. drive vehicles>

<Incorrect>

LUBRICANTS

21100040023

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



ON-VEHICLE SERVICE

2100090189

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

1. Turn up carpet, etc. under the clutch pedal
2. Measure the clutch pedal height and the clutch pedal clevis pin relay.

Standard value (A):

<Incorrect> ~~163.5 - 166.5~~ mm <L.H. drive vehicles>
~~162.5 - 165.5~~ mm <R.H. drive vehicles>

Standard value (B): 1-3 mm

173.3 - 176.3
172.8 - 175.8

<Correct>

MITSUBISHI MOTORS

SERVICE BULLETIN

PUBLICATION GROUP, AFTER SALES SERVICE DEP.
MITSUBISHI MOTOR SALES EUROPE BV

SERVICE BULLETIN	No.: ESB-99E33-501	
	Date: 1999-11-15	<Model> <M/Y>
Subject: CORRECTION TO FRONT SUSPENSION CAMBER AND CASTER VALUES		(EC,EXP) CARISMA 96-10
Group: FRONT SUSPENSION		SPACE STAR
CORRECTION	O. Kai - E.V.P & G.M. After Sales Service Dept	

1. Description:

A descriptive omission found in the front suspension camber and caster values has been rectified.

2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
'96 CARISMA Technical Information Manual	PYGE95E1	(English)	3-4
'96 CARISMA Workshop Manual chassis	PWDE9502	(English)	33A-3,6
	PWDS9503	(Spanish)	
	PWDF9504	(French)	
	PWDG9505	(German)	
	PWDD9506	(Dutch)	
	PWDW9507	(Swedish)	
	PWDI96E1	(Italian)	
'99 SPACE STAR Technical Information Manual	1MXE99E1	(English)	3-4
'99 SPACE STAR Workshop Manual chassis	CMXE99E1	(English)	33A-3,6
	CMXS99E1	(Spanish)	
	CMXF99E1	(French)	
	CMXG99E1	(German)	
	CMXD99E1	(Dutch)	
	CMXW99E1	(Swedish)	
	CMXI99E1	(Italian)	

3. Details

'96 CARISMA Technical Information Manual, page 2
'96 CARISMA Workshop Manual chassis, page 3, 4
'99 SPACE STAR Technical Information Manual, page 5
'99 SPACE STAR Workshop Manual chassis, page 6, 7

SPECIFICATIONS

SUSPENSION SYSTEM

Item	Specifiactions
Suspension method	McPherson strut with coil springs and compression rods

WHEEL ALIGNMENT

Item		Specifiactions
Camber		0° 0 0' ± 3 0[*] <Added>
Caster		2° 1 2' ± 30'* <Added>
Kingpin inclination		1 2° 4 1'
Toe-In	At the centre of tyre tread mm	1 ± 2
	Toe-angle (per wheel)	0° 0 6' ± 1 2'
Toe-out angle on turns (inner wheel when outer wheel at 20°)		2 1. 8°

NOTE
*: difference between right and left wheels: less than 30'

<Added>

SERVICE SPECIFICATIONS

Items		Standard value
Toe-in	At the centre of tyre tread mm	1 ± 2
	Toe-angle (per wheel)	0° 03' ± 06'
Toe-out angle on turns (inner wheel when outer wheel at 20°)		21.8°
Steering angle	Inner wheel	39°00' ± 1°30'
	Outer wheel	32°00'
Camber		0° 00' ± 30' ✱ **<Added>**
Caster		2° 12' ± 30'* **<Added>**
Kingping inclination		12° 41'
Lower arm ball joint starting torque Nm		1.0 – 6.5
Lower arm ball joint turning torque Nm		1.0 – 3.9
Stabilizer link ball joint turning torque Nm		1.7 – 3.1

NOTE
*: difference between right and left wheels: less than 30'

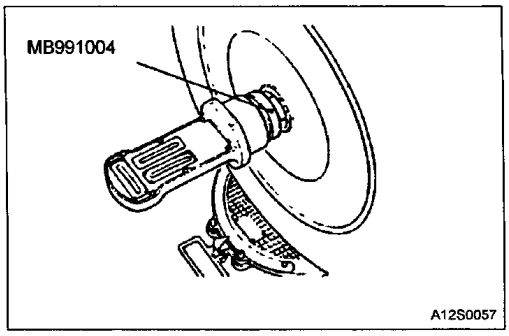
<Added>

STEERING ANGLE

Standard value:
Inner wheel 39°00' ± 1°30'
Outer wheel 32°00'

<Added>

(difference between right and left wheels: less than 30'.)



CAMBER, CASTER AND KINGPIN INCLINATION

Standard value:
Camber 0°00' ± 30'
Caster 2°12'
Kingpin inclination 12°41'

<Added>

± 30' (difference between right and left wheels: less than 30'.)

NOTE
1. Camber and caster are preset at the factory and cannot be adjusted.
2. If camber is not within the standar value, check and replace bent or damaged parts.
3. For vehicles with aluminium type wheels, attache the camber/caster/kingpin gauge to drive shaft by using the special tool. Tighten the special tool to the same torque 200-260 Nm as the drive shaft nut.

Caution
Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosended.

SPECIFICATIONS

SUSPENSION SYSTEM

Item	Specifiactions
Suspension method	McPherson strut with coil springs and compression rods

WHEEL ALIGNMENT

Item		Specifiactions
Camber		-0°40' ± 30'* **<Added>**
Caster		2°54' ± 30'* **<Added>**
Kingpin inclination		13°36'
Toe-In	At the centre of tyre tread mm	0 ± 2
	Toe-angle (per wheel)	0°00' ± 06'
Toe-out angle on turns (inner wheel when outer wheel at 20°)		21°39'

NOTE
*: difference between right and left wheels: less than 30'

<Added>

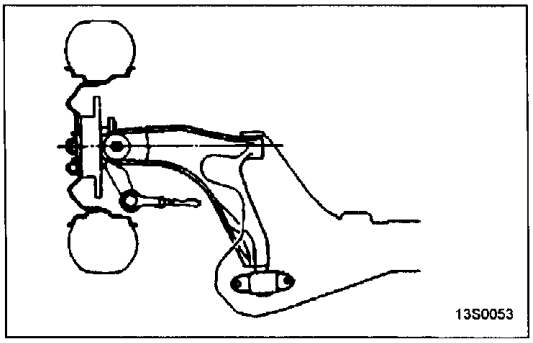
LOWER ARM

A compression type lower arm is fitted, giving the following advantages.

- Prevents fore/aft compliance steering by optimizing the lower arm pivot axis.
- Box-type cross-sectional construction for superior strength and light weight.
- Lower arm rear bushing with non-symmetrical spring characteristics in the vehicle lateral direction for steering stability and riding comfort.
- Front supporting point (lower arm front bushing section) positioned near the front wheel axis line to provide higher literal rigidity and reduce lateral force steering.
- Lower arm ball joint using polyacetal resin bearing which changes the rotating torque according to applied vibration frequency.

LOWER ARM FRONT BUSHING

Lower arm front bushing has "hard" characteristics in the vehicle left/right direction and "soft" characteristics in both fore/aft and twisting directions, which means that it functions to provide both steering stability and riding comfort.



Also the lower arm front bushing is installed at a point almost on the same line as the front wheel axis line to provide increased lateral rigidity and reduced lateral force steering.

SERVICE SPECIFICATIONS

Items		Standard value
Toe-in	At the centre of tyre tread mm	0 ± 2
	Toe-angle (per wheel)	0° 00' ± 06'
Toe-out angle on turns (inner wheel when outer wheel at 20°)		21°39'
Steering angle	Inner wheel	41°30'
	Outer wheel	34°00'
Camber		0° 40' ± 30' <Added>
Caster		2° 54' ± 30'* <Added>
Kingping inclination		13° 36'
Lower arm ball joint starting torque Nm		1.0 – 6.4
Lower arm ball joint turning torque Nm		1.0 – 2.5
Protruding lenght of stabilizer bar mounting bolt mm		22

NOTE
*: difference between right and left wheels: less than 30'

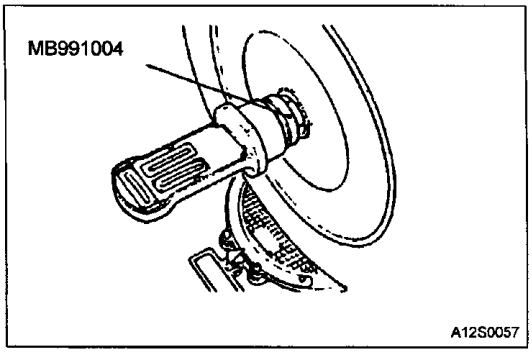
<Added>

STEERING ANGLE

Standard value:
Inner wheel 41°30'
Outer wheel 34°00'

<Added>

(difference between right and left wheels: less than 30'.)



CAMBER, CASTER AND KINGPIN INCLINATION

Standard value:
Camber 0°40' ± 30'
Caster 2°54'
Kingpin inclination 13°36'

<Added>

± 30' (difference between right and left wheels: less than 30'.)

NOTE
4. Camber and caster are preset at the factory and cannot be adjusted.
5. If camber is not within the standard value, check and replace bent or damaged parts.
6. For vehicles with aluminium type wheels, attach the camber/caster/kingpin gauge to drive shaft by using the special tool. Tighten the special tool to the same torque 216-255 Nm as the drive shaft nut.

Caution
Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosended.

BALL JOINT DUST COVER CHECK

33200660076

1. Check the dust cover for cracks or damage by pushing it with finger.
2. If the dust cover is cracks or damaged, replace the lower arm assembly.

NOTE
Cracks or damage of dust cover may cause damage of the ball joint.

MITSUBISHI MOTORS

SERVICE BULLETIN

PUBLICATION GROUP, AFTER SALES SERVICE DEP.
MITSUBISHI MOTOR SALES EUROPE BV

SERVICE BULLETIN	No.: ESB-99E35-001	
	Date: 1999-08-31	<Model> <M/Y>
Subject: CHANGE TO LIMIT OF FRONT BRAKE DISC THICKNESS		(EC) CARISMA 96-10
Group: SERVICE BRAKE		
CORRECTION	O Kai — E V P & G.M After Sales Service Dept	

1. Description:

On the 1.8-liter engine equipped car, limit of the front brake disc thickness has been changed. (The standard value remains unchanged.)

2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
'96 CARISMA Workshop Manual Chassis	PWDE9502	(English)	35A-4, 35A-12
	PWDS9503	(Spanish)	
	PWDF9504	(French)	
	PWDG9505	(German)	
	PWDD9506	(Dutch)	
	PWDW9507	(Swedish)	
	PWDI96E1	(Italian)	

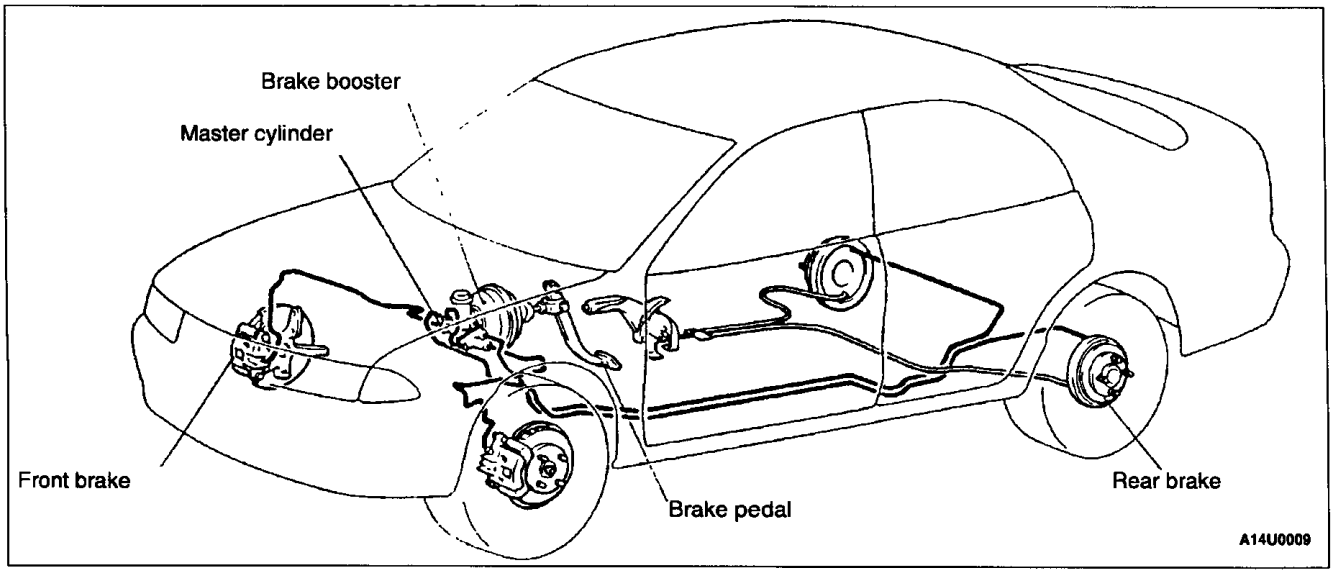
3. Interchangebility:

Not interchangeable

4. Effective Date:

From February 12, 1996
(Chassis No.: XMCLNDA2ATF024244 and up)

CONSTRUCTION DIAGRAM



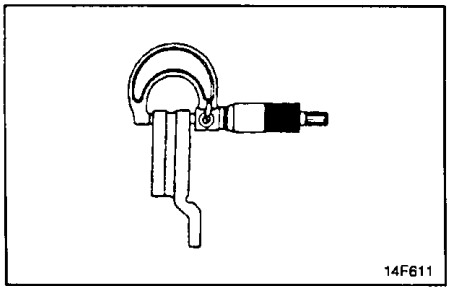
SERVICE SPECIFICATIONS

35100030058

Items			Standard value	Limit
Brake pedal height mm	L.H. drive vehicles		163.5 -166.5	—
	R.H. drive vehicles		162.5 - 165.5	—
Brake pedal free play mm			3 - 8	—
Brake pedal to floor board clearance mm			80	—
Proportioning valve	Split point Mpa	1600	3.43 ± 0.25	—
		1800	3.92 ± 0.25	—
	Output fluid pressure (input fluid pressure) Mpa	1600	5.03 ± 0.4 (9.81)	—
		1800	5.39 ± 0.4 (9.81)	—
	Output fluid pressure difference between left and right Mpa		—	0.8
Brake booster push rod to master cylinder piston clearance mm			0.6 - 0.8	—
Front disc brake	Pad thickness mm		10.0	2.0
	Disc thickness mm	1600	18.0	16.4
		1800	24.0	22.4
	Disc runout mm		—	0.07
	Drag force (tangential force of wheel mounting bolts) N		40 or less	—

<New>
<From February 12, 1996> → 21.5

<Old>
<Up to February 11, 1996>



BRAKE DISC THICKNESS CHECK

35100160047

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

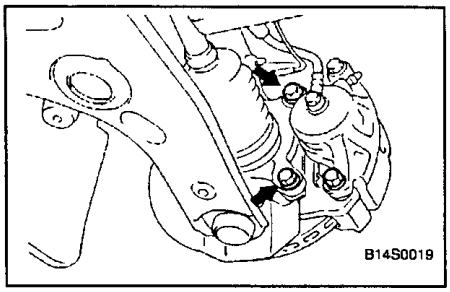
Standard value:
<1600> 18.0 mm
<1800> 24.0 mm

Limit:
<1600> 16.4 mm **<Old>**
<1800> 22.5 mm **<Up to february 11, 1996>**

<New>
21.5 mm
<From February 12, 1996>

Thickness variation (at least 8 positions)
The difference between any thickness measurements should not be more than 0.015 mm.

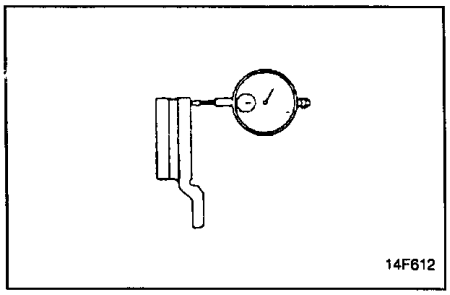
2. If the disc is beyond the limits for thickness, remove it and install a new one. If thickness variation exceeds the specifications, replace the brake disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).



BRAKE DISC RUN-OUT CHECK

35100170040

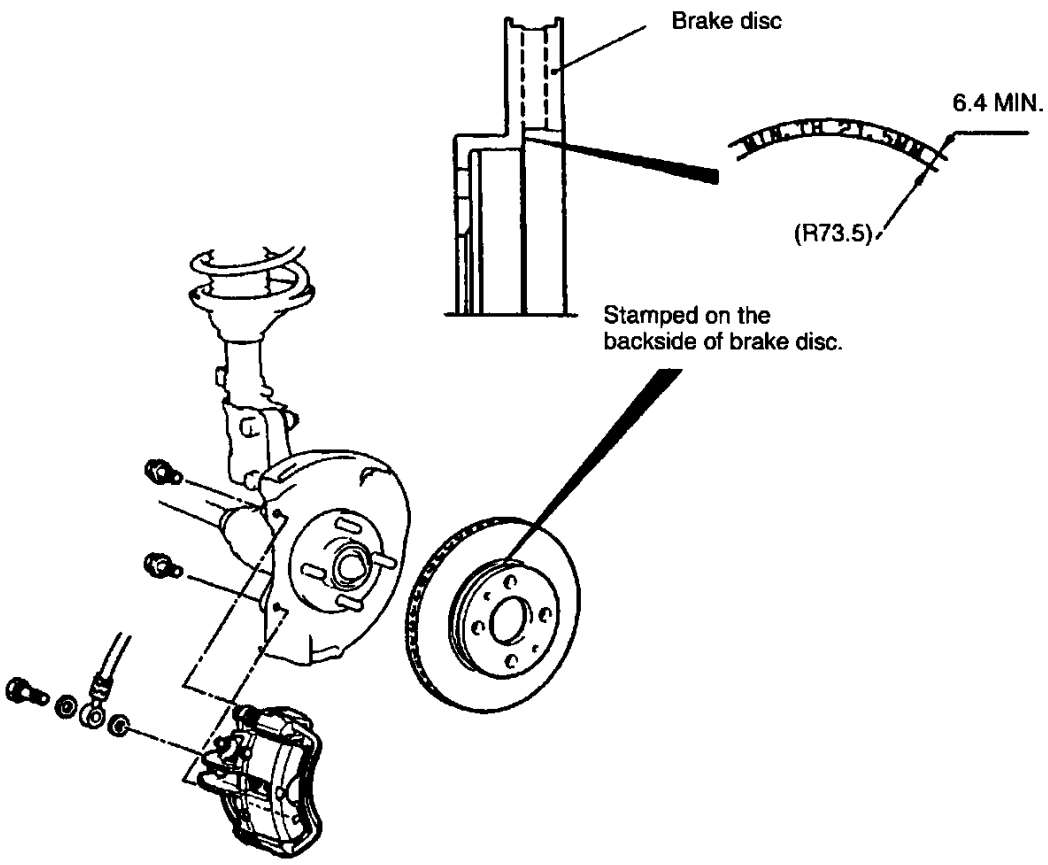
1. Remove the caliper support: then raise the caliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.



3. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the run-out of the disc.

Limit: 0.07 mm or less

NOTE
Tighten the nuts in order to secure the disc to the hub.


Brake disc
6.4 MIN.
(R73.5)
Stamped on the
backside of brake disc.

MITSUBISHI MOTORS

SERVICE BULLETIN

PUBLICATION GROUP, AFTER SALES SERVICE DEP.
MITSUBISHI MOTOR SALES EUROPE BV

SERVICE BULLETIN	No.: ESB-99E51-001	
	Date: 1999-12-15	<Model> <M/Y>
Subject: ADDITION OF WASHER MOTOR REMOVAL		(EC,EXP) CARISMA 96-10
Group: EXTERIOR		
INFORMATION	O Kai - E.V.P. & G.M. After Sales Service Dept.	

1. Description:

The washer motor removal procedure has been added.

2. Applicable Manuals:

Manual	Pub. No.	Language	Page(s)
'96 CARISMA Workshop Manual	PWDE9502	(English)	51-9, 10
	PWDS9503	(Spanish)	
	PWDF9504	(French)	
	PWDG9505	(German)	
	PWDD9506	(Dutch)	
	PWDW9507	(Swedish)	
	PWDI96E1	(Italian)	

3. Details:

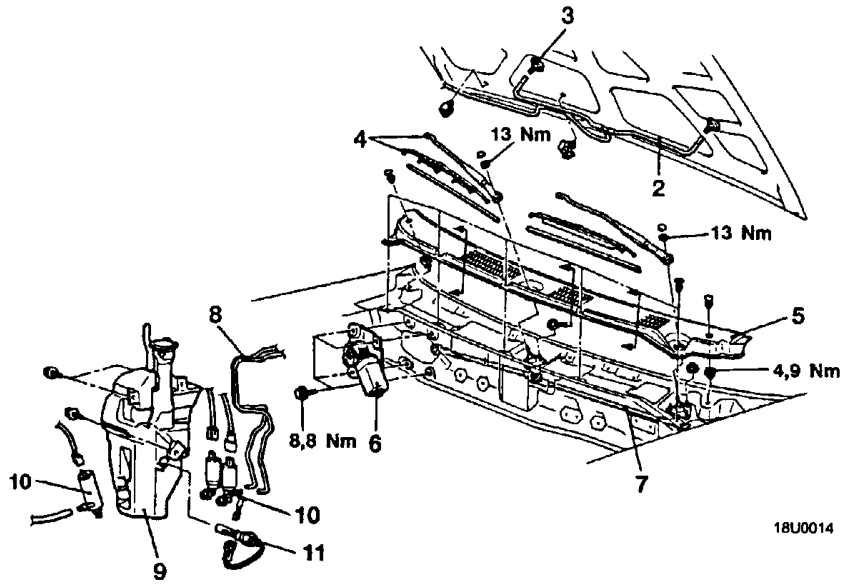
WINDWHIELD WIPER AND WASHER

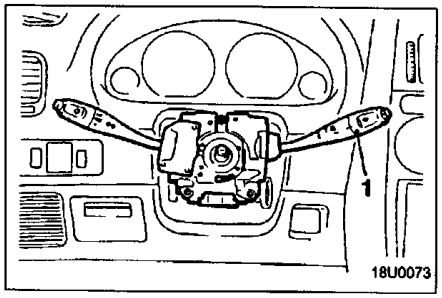
51100760032

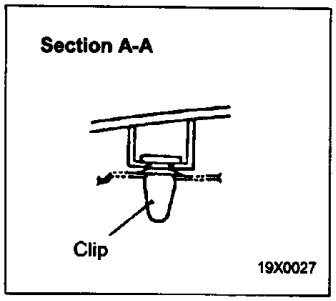
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Relay Box Removal and installation <R.H. drive vehicles>

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







00003366

1. Column switch assembly (with built-in wiper and washer switch, and wiper relay) (Refer to GROUP 37A - Steering wheel and shaft.)
2. Washer hose
3. Washer nozzle

Wiper motor an linkage removal steps

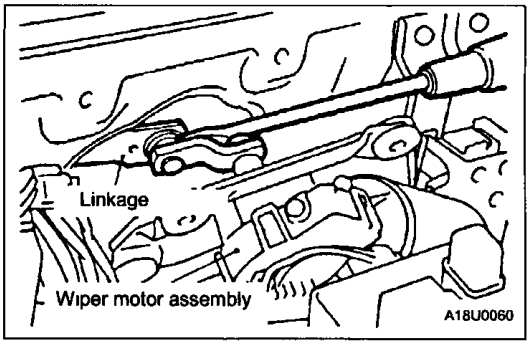
▶A◀ 4. Wiper arm and blade assembly
5. Front deck garnish
◀A▶ 6. Wiper motor
7. Linkage

Washer tank removal steps
- Draining of washer fluid
- Front bumper (Refer to P.51-3.)

8. Washer hose
9. Washer tank
10. Washer motor
11. Washer fluid level switch

<Added>

Washer motor removal
◀B▶ 10. Washer motor



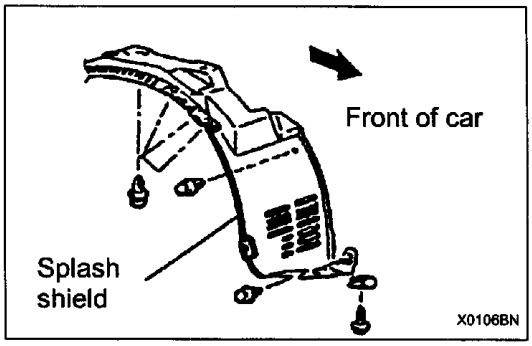
REMOVAL SERVICE POINT

《A》 WIPER MOTOR REMOVAL

Loosen the wiper motor assembly mounting bolts, and then remove the wiper motor assembly. Disconnect the linkage and the motor assembly, and then remove the linkage.

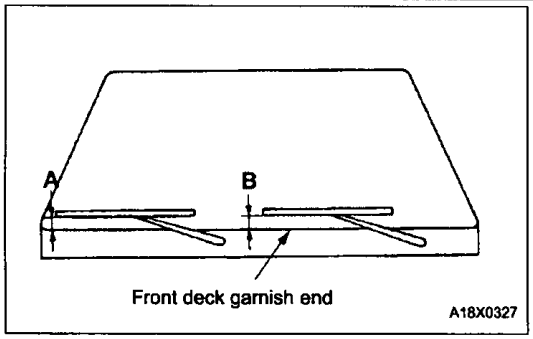
Caution
Because the installation angle of the crank arm and the motor has been set, do not remove them unless it is necessary to do so. If they must be removed, remove them only after marking their mounting positions.

<Added>



《B》 WASHER MOTOR REMOVAL

1. Remove the front under cover panel.
2. Partially remove the splash shield as shown.
3. Replace each washer motor.

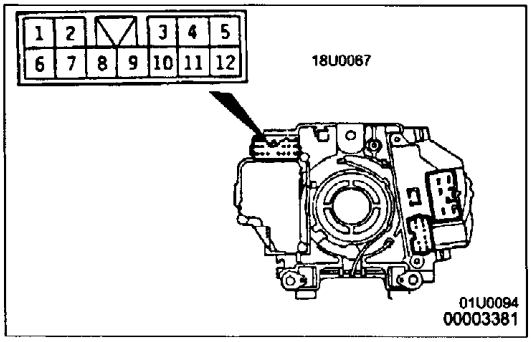


INSTALLATION SERVICE POINT

》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:
Passenger's side (A): 20 ± 5 mm
Driver's side (B): 25 ± 5 mm



INSPECTION

51100770035

COLUMN SWITCH CHECK

Wiper and Washer Switch

Switch position		Terminal No.				
		6	7	8	9	10
Wiper switch	OFF		○	○		
	INT		○	○		
	1 (LO)			○		○
	2 (HI)				○	○
Washer switch	ON	○				○

Intermittent Wiper Relay (Intermittent Operation Inspection)

(1) Connect the column switch connector.
(2) Turn the ignition switch to ACC.