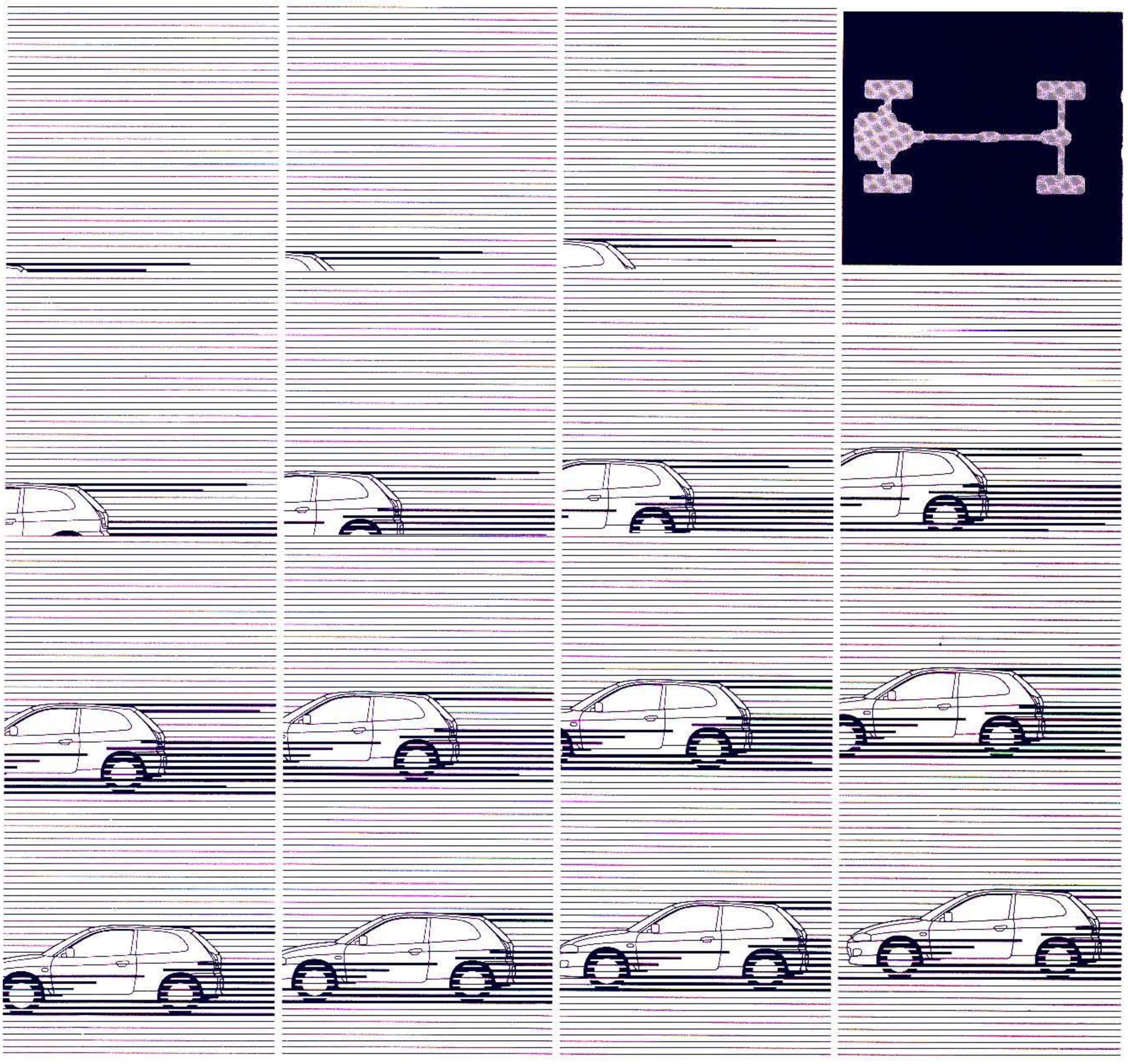
MITSUBISHI MOTORS

Workshop Manual

chassis

Workshop Manual

COLT/LANCER



MITSUBISHI COLT/LANCER

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	PYME9501
WORKSHOP MANUAL	
ENGINE GROUP	PWEE□□□□ (Looseleaf edition)
ELECTRICAL WIRING	PHME9511
BODY REPAIR MANUAL	PBME9501
PARTS CATALOGUE	B606F006A□

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 MOTORS CORPORATION

 Nov. 1995

GENERAL

CONTENTS

00109000348

HOW TO USE THIS MANUAL

00100010180

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.
MVV:	Indicates the Mitsubishi Vertical Vortex engine, or models equipped with that 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

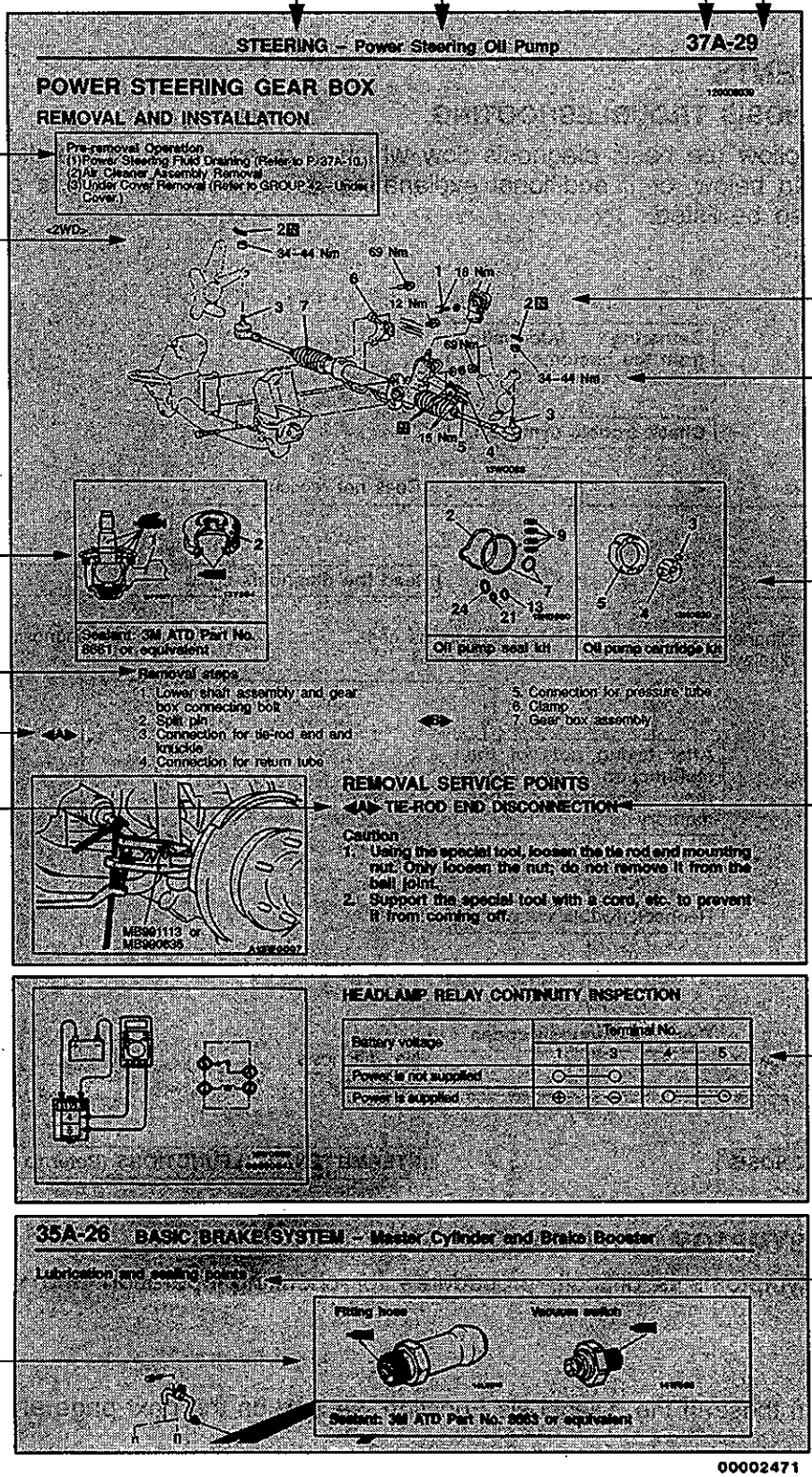
 : Adhesive tape or butyl rubber tape

Indicates the group title.

Indicates the section title.

Indicates the group number.

Indicates the page number.



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".

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

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

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

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

HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

00100020084

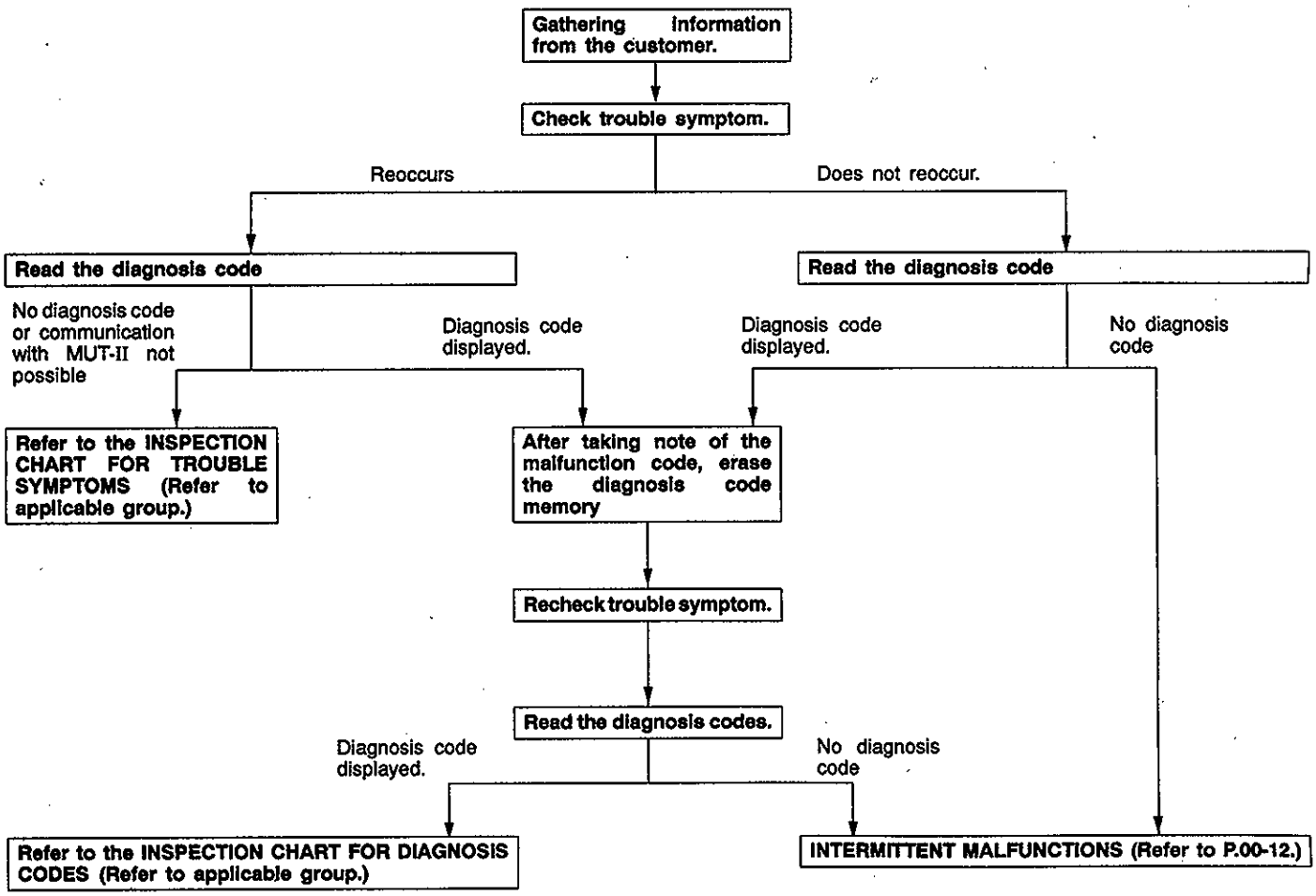
Troubleshooting of electronic control systems for which the MUT-II can be used follows the basic outline described below. Furthermore, even in systems for which the MUT-II cannot be used, part of these systems still follow this outline.

TROUBLESHOOTING CONTENTS

1. STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING

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

Diagnosis method



2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

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

3. DIAGNOSIS FUNCTION

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

4. INSPECTION CHART FOR DIAGNOSIS CODES

5. INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Indicates the inspection procedures corresponding to each diagnosis code. (Refer to P.00-9 for how to read the inspection procedures.)

6. INSPECTION CHART FOR TROUBLE SYMPTOMS

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

7. INSPECTION PROCEDURE FOR TROUBLE SYMPTOM

Indicates the inspection procedures corresponding to each trouble symptoms classified in the Inspection Chart for Trouble Symptoms. (Refer to P.00-9 for how to read the inspection procedures.)

8. SERVICE DATA REFERENCE TABLE

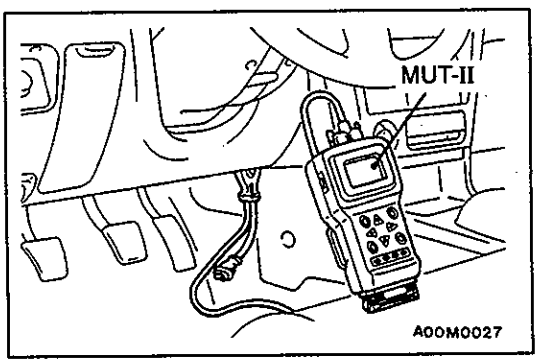
Inspection items and normal judgement values have been provided in this chart as reference information.

9. CHECK AT ECU TERMINALS

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

10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE

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



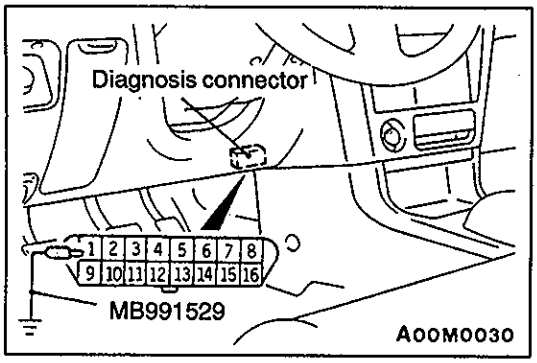
DIAGNOSIS FUNCTION

METHOD OF READING DIAGNOSIS CODES

WHEN USING THE MUT-II

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

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



WHEN USING THE WARNING LAMP

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

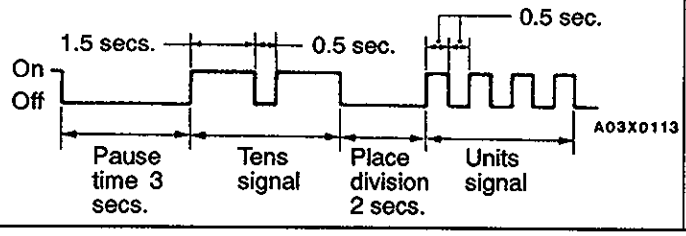
   NOTE
   That is because the valve relay is off and the warning lamp remains illuminated if there is a fault in the ABS system.
3. Turn off the ignition switch.
4. Read out a diagnosis code by observing how the warning lamp flashes.

Applicable systems

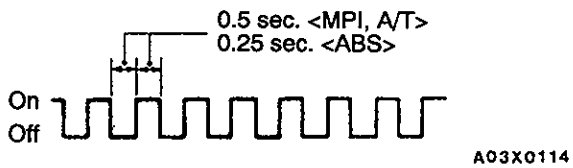
System name	Warning lamp name
MPI	Engine warning lamp
A/T	Neutral position indicator lamp
ABS	ABS warning lamp

Indication of diagnosis code by warning lamp

When the diagnosis code No.24 is output



When no diagnosis code is output*



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

METHOD OF ERASING DIAGNOSIS CODES

WHEN USING THE MUT-II

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

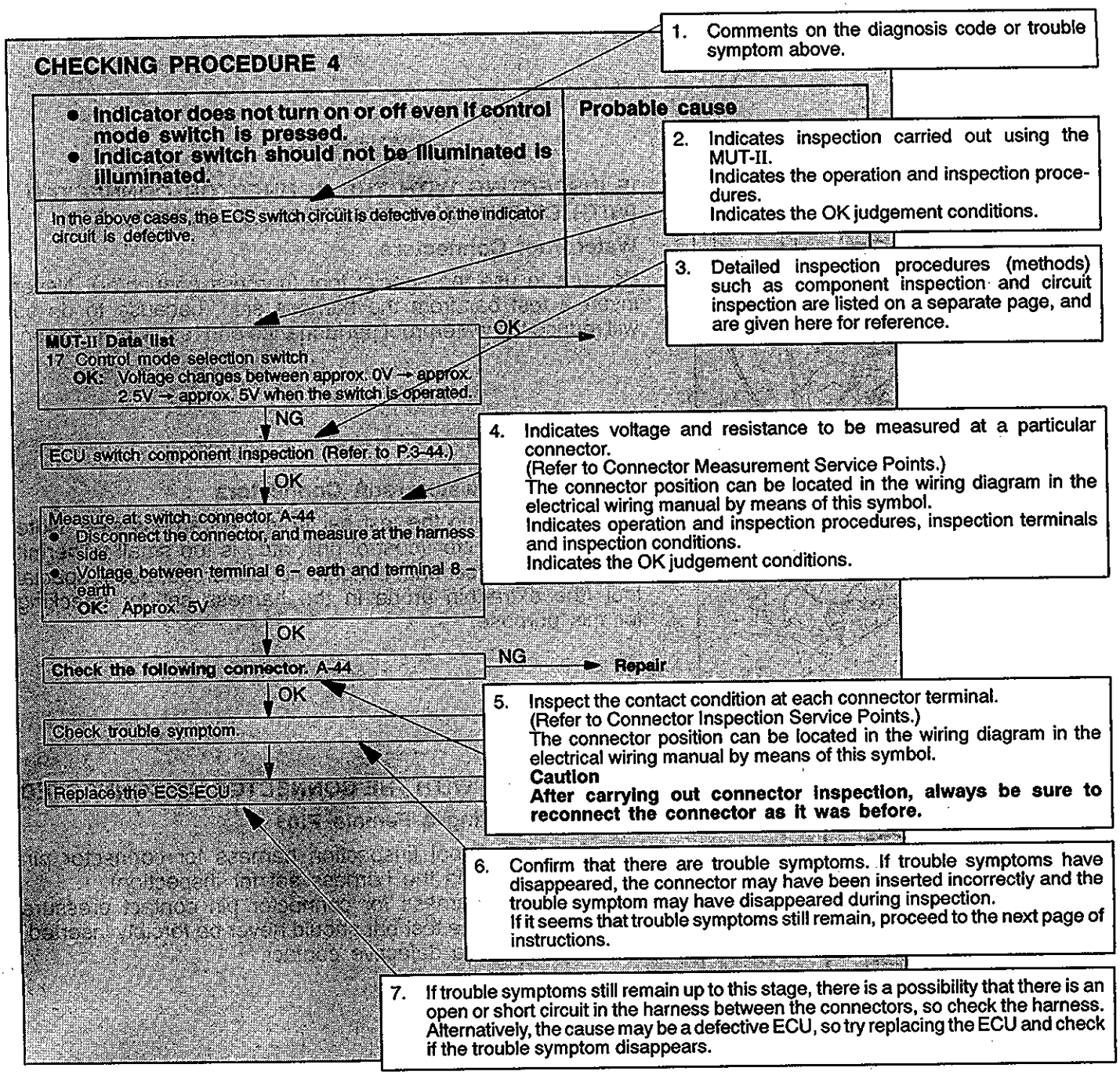
Caution
Turn off the ignition switch before connecting or disconnecting the MUT-II.

WHEN NOT USING THE MUT-II

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

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

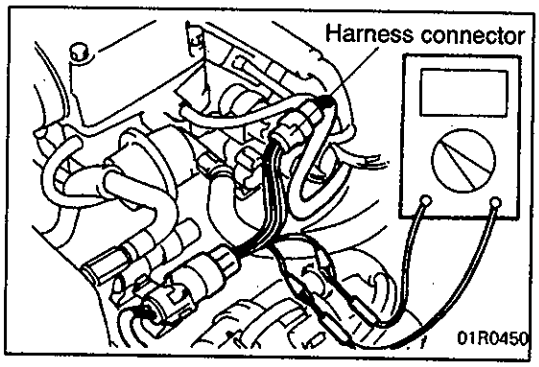
Check for an open or short circuit in the harness between the terminals which were defective according to the connector measurements. Carry out this inspection while referring to the electrical wiring manual. Here, "Check harness between power supply and terminal xx" also includes checking for blown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

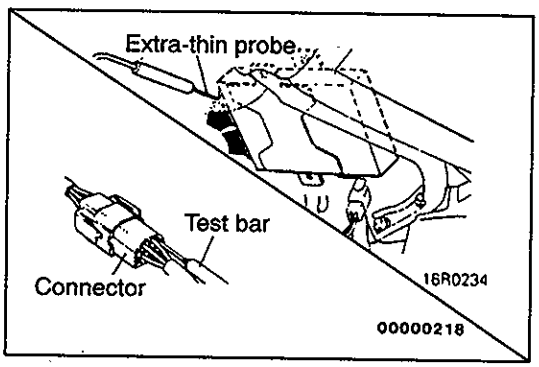
Turn the ignition switch to OFF when connecting disconnecting the connectors, and turn the ignition switch to ON when measuring if there are no instructions to be contrary.



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

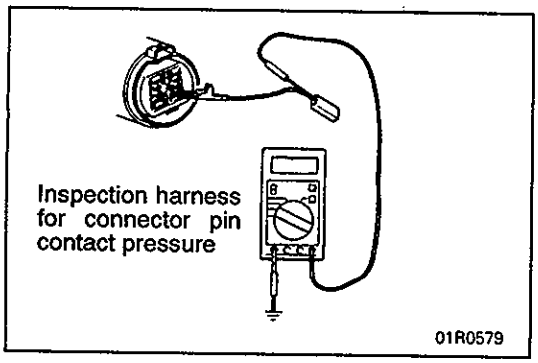
Waterproof Connectors

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

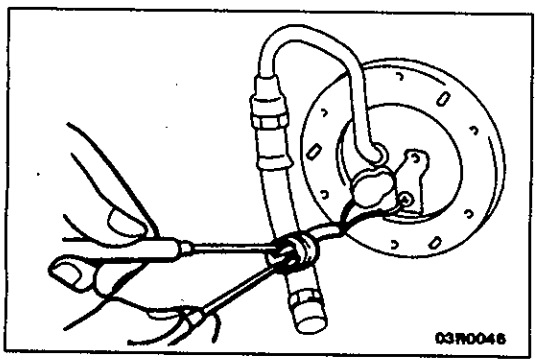
Check by inserting the test bar from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test bar, it should not be forced; use a special tool (the extra-thin probe in the harness set for checking for this purpose.



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.



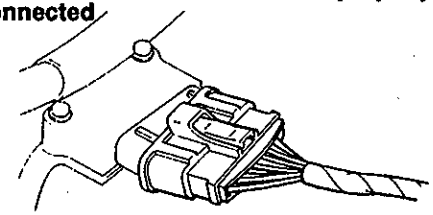
<When Inspecting a Male Pin>

Touch the pin directly with the test bar.

Caution

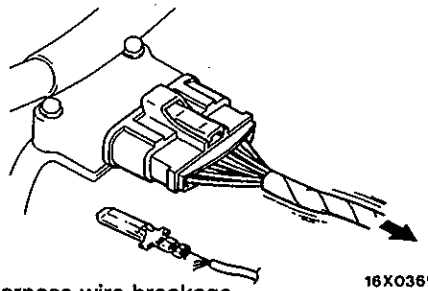
At this time, be careful not to short the connector pins with the test bars. To do so may damage the circuits inside the ECU.

Connector disconnected or improperly connected



16S0256

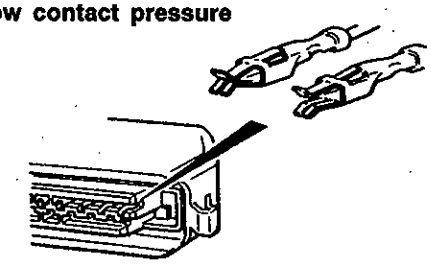
Defective connector contact



16X0369

Harness wire breakage at terminal section

Low contact pressure

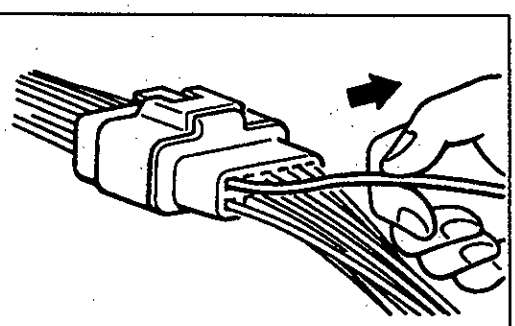


16S0254
00000219

CONNECTOR INSPECTION

VISUAL INSPECTION

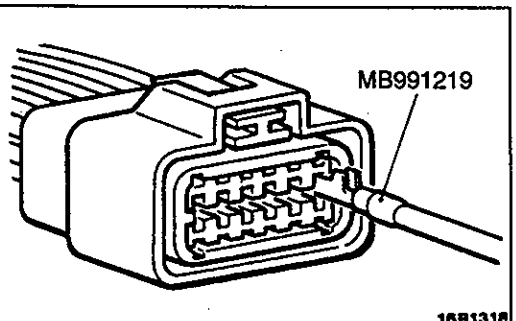
- Connector is disconnected or improperly connected
- Connector pins are pulled out
- Due to harness tension at terminal section
- Low contact pressure between male and female terminals
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals



16R1317

CONNECTOR PIN INSPECTION

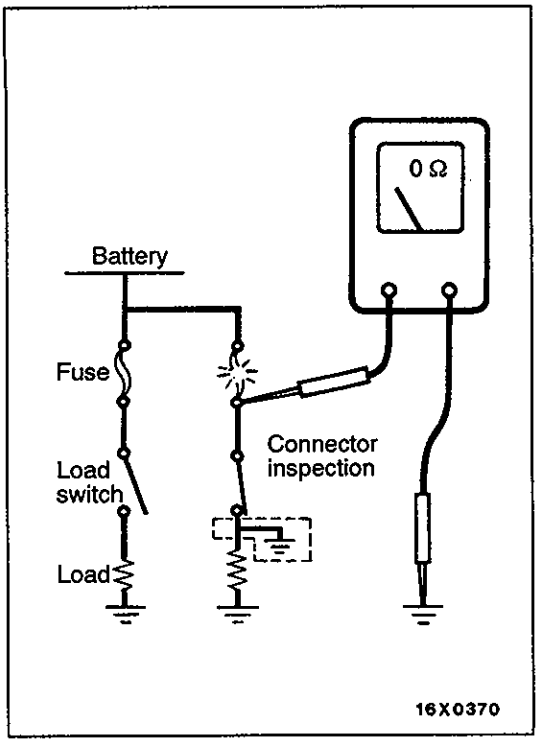
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even if the connector body is connected, and the pins may pull out of the reverse side of the connector. Therefore, gently pull the harnesses one by one to make sure that no pins pull out of the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



16R1318

CONNECTOR ENGAGEMENT INSPECTION

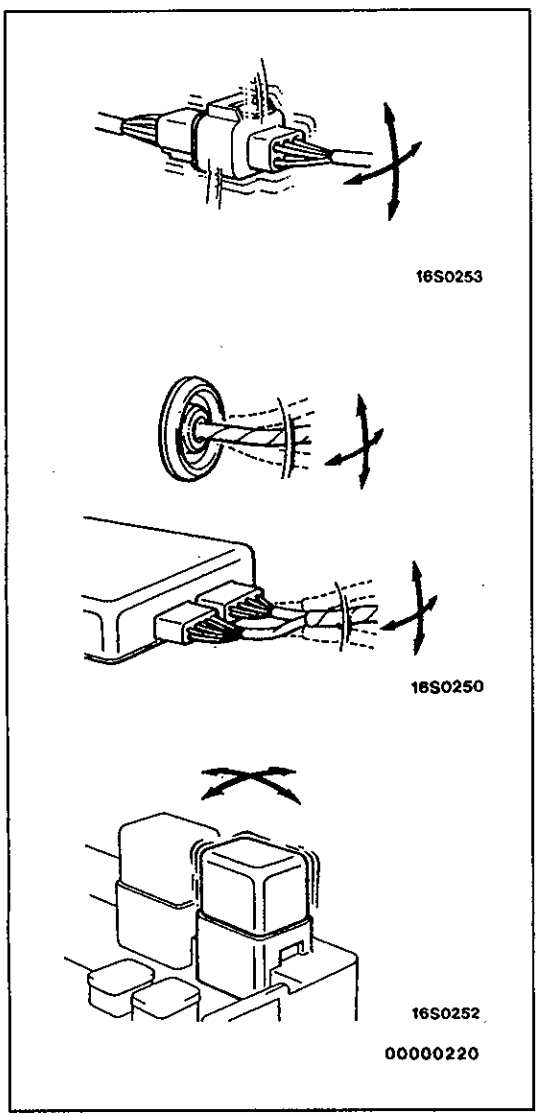
Use the special tool (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and females pins. (Pin drawing force : 1 N or more)



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.

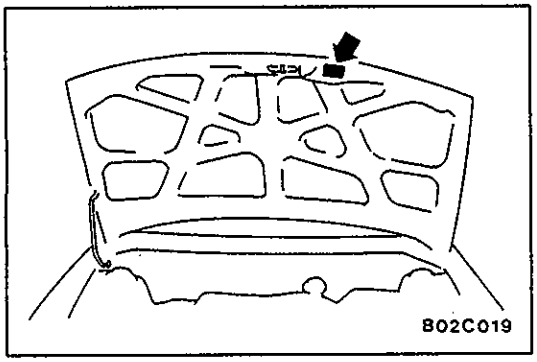
The main causes of a short circuit are the following.
- Harness being clamped by the vehicle body
- Damage to the outer casing of the harness due to wear or heat
- Water getting into the connector or circuitry
- Human error (mistakenly shorting a circuit, etc.)



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.



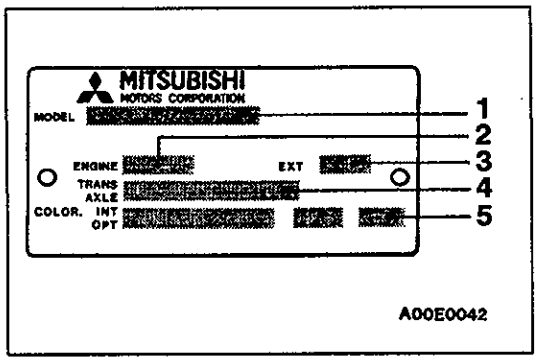
VEHICLE IDENTIFICATION

00100540047

VEHICLE INFORMATION CODE PLATE

LOCATION

Vehicle information code plate is riveted on the ~~toeboard~~ hood 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	CJ1A MNJEL6	CJ1A: Vehicle model
			MNJEL6: Model series
2	ENGINE	4G13	Engine model
3	EXT	B60B	Exterior code
4	TRANS AXLE	F5M41	Transmission code
5	COLOR INT OPT	B60 41H 03V	B60: Body colour code
			41H: Interior code
			03V: Equipment 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

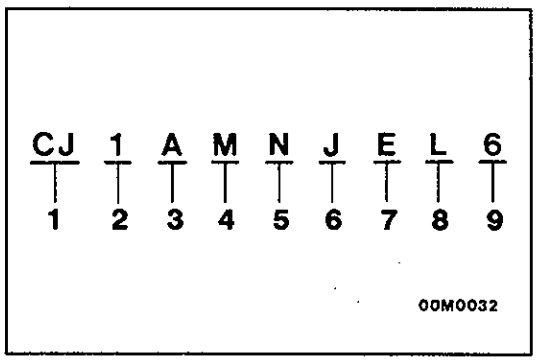
00100550040

<Hatchback>

Model code		Engine model	Transmission model	Fuel supply system
CJ1A	MNDEL6	4G13-SOHC (1,299 mℓ)	F5M41 (2WD-5M/T)	MPI
	MNDER6			
	MNJEL6			
	MNJER6			
	MRJEL6		F4A41 (2WD-4A/T)	
	MRJER6			
CJ4A	MNJEL6	4G92-SOHC (1,597 mℓ)	F5M41 (2WD-5M/T)	
	MNJER6			
	MRJEL6		F4A41 (2WD-4A/T)	
	MRJER6			
	MNDAL6		F5M41 (2WD-5M/T)	MPI (MVV)
	MNDAR6			

<Sedan>

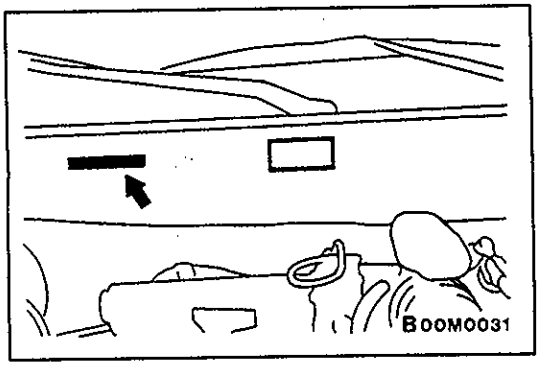
Model code		Engine model	Transmission model	Fuel supply system
CK1A	SNDEL6	4G13-SOHC (1,299 mℓ)	F5M41 (2WD-5M/T)	MPI
	SNDER6			
	SNJEL6			
	SNJER6			
	SRJEL6		F4A41 (2WD-4A/T)	
	SRJER6			
CK4A	SNJEL6	4G92-SOHC (1,597 mℓ)	F5M41 (2WD-5M/T)	
	SNJER6			
	SRJEL6		F4A41 (2WD-4A/T)	
	SRJER6			



MODEL CODE

00100040110

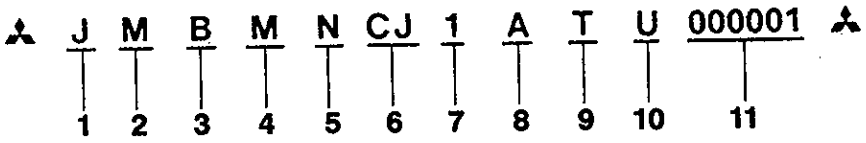
No.	Items	Contents
1	Development	CJ: MITSUBISHI COLT
		CK: MITSUBISHI LANCER
2	Engine type	1: 1,299 mℓ petrol engine
		4: 1,597 mℓ petrol engine
3	Sort	A: Passenger car
4	Body style	M: 2-door hatchback
		S: 4-door sedan
5	Transmission type	N: 5-speed manual transmission
		R: 4-speed automatic transmission
6	Trim level	D: GL
		J: GLX
7	Specified engine feature	E: MPI-SOHC
		A: MPI-SOHC-MVV
8	Steering wheel location	L: Left hand
		R: Right hand
9	Destination	6: For Europe



CHASSIS NUMBER

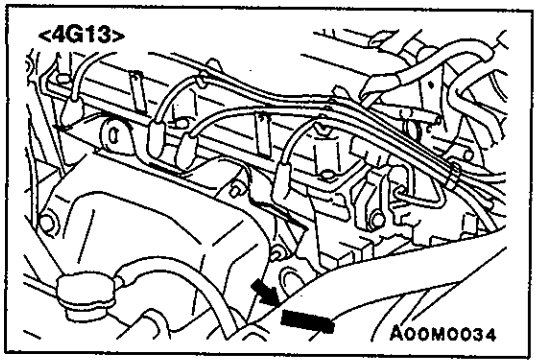
00100560043

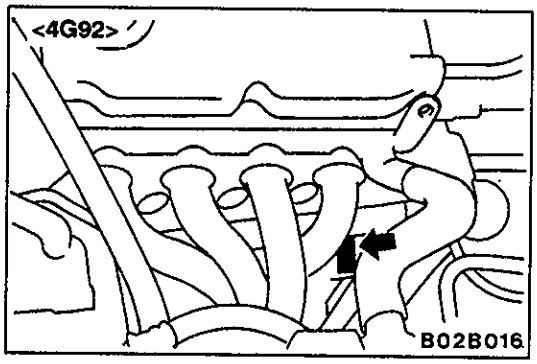
The chassis number is stamped on the toeboard inside the engine compartment.



00M0033

No.	Items		Contents
1	Fixed figure	J	Asia
2	Distribution channel	M	Japan channel
3	Destination	A	For Europe, right hand drive
		B	For Europe, left hand drive
4	Body style	M	2-door hatchback
		S	4-door sedan
5	Transmission type	N	5-speed manual transmission
		R	4-speed automatic transmission
6	Development order	CJ	COLT
		CK	LANCER
7	Engine	1	4G13: 1,299 mℓ petrol engine
		4	4G92: 1,597 mℓ petrol engine
8	Sort	A	Passenger car
9	Model year	T	1996
10	Plant	U	Mizushima Motor Vehicle Works
11	Serial number	–	–





ENGINE MODEL NUMBER

00100570046

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

Engine model	Engine displacement mℓ
4G13	1,299
4G92	1,597

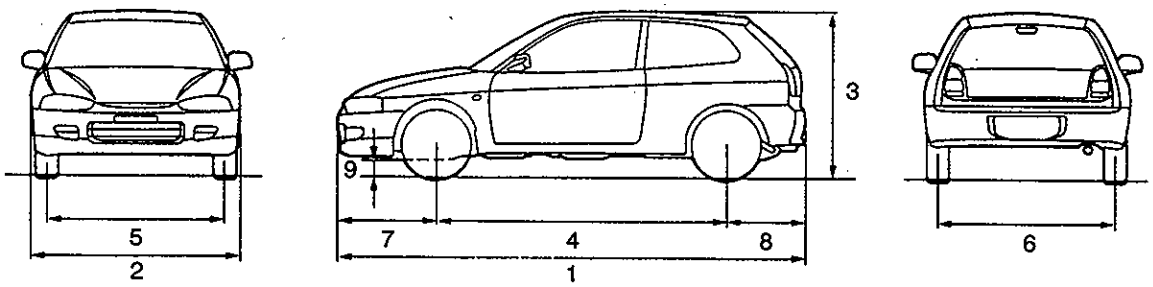
2. The engine serial number is stamped near the engine model number.

Engine serial number	AA0201 to YY9999

MAJOR SPECIFICATIONS

00100090122

<HATCHBACK>

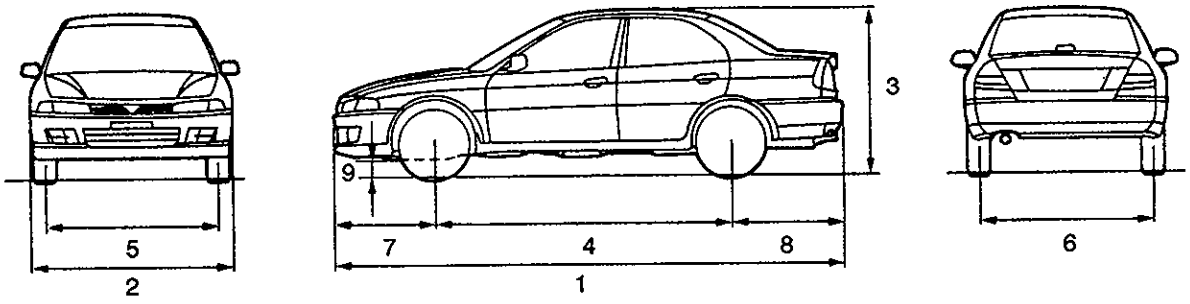


00M0035

Items			CJ1A MNDEL6, MNDER6	CJ1A MNJEL6, MNJER6	CJ1A MRJEL6, MRJER6	CJ4A MNJEL6, MNJER6	CJ4A MRJEL6, MRJER6	CJ4A MNDEL6, MNDER6
Vehicle dimensions mm	Overall length	1	3,880	3,880	3,880	3,880	3,880	3,880
	Overall width	2	1,680	1,680	1,680	1,680	1,680	1,680
	Overall height (unladen)	3	1,365, 1,385*1	1,365, 1,385*1	1,365, 1,385*1	1,365, 1,385*1	1,365, 1,385*1	1,365, 1,385*1
	Wheelbase	4	2,415	2,415	2,415	2,415	2,415	2,415
	Track-front	5	1,450	1,450	1,450	1,450	1,450	1,450
	Track-rear	6	1,460	1,460	1,460	1,460	1,460	1,460
	Overhang-front	7	805	805	805	805	805	805
	Overhang-rear	8	660	660	660	660	660	660
	Ground clearance (unladen)	9	150	150	150	150	150	150
Vehicle weight kg	Kerb weight		945	950	970	975	995	975
	Max. gross vehicle weight rating		1,445, 1,495*2	1,445, 1,495*2	1,465, 1,515*2	1,470, 1,520*2	1,480, 1,530*2	1,470, 1,520*2
	Max. axle weight rating-front		810	810	810	810	810	810
	Max. axle weight rating-rear		705, 770*2	705, 770*2	705, 770*2	705, 770*2	705, 770*2	705, 770*2
Seating capacity			5					
Engine	Model No.		4G13			4G92		
	Total displacement mℓ		1,299			1,597		
Transmission	Model No.		F5M41		F4A41	F5M41	F4A41	F5M41
	Type		5-speed manual		4-speed automatic	5-speed manual	4-speed automatic	5-speed manual
Fuel system	Fuel supply system		Electronic controlled multipoint fuel injection					

NOTE
*1: Vehicles with roof spoiler
*2: In case of towing

<SEDAN>



00M0036

Items			CK1A SNDEL6, SNDER6	CK1A SNJEL6, SNJER6	CK1A SRJEL6, SRJER6	CK4A SNJEL6, SNJER6	CK4A SRJEL6, SRJER6
Vehicle dimensions mm	Overall length	1	4,295	4,295	4,295	4,295	4,295
	Overall width	2	1,690	1,690	1,690	1,690	1,690
	Overall height (unladen)	3	1,395	1,395	1,395	1,395	1,395
	Wheelbase	4	2,500	2,500	2,500	2,500	2,500
	Track-front	5	1,450	1,450	1,450	1,450	1,450
	Track-rear	6	1,460	1,460	1,460	1,460	1,460
	Overhang-front	7	845	845	845	845	845
	Overhang-rear	8	950	950	950	950	950
	Ground clearance (unladen)	9	150	150	150	150	150
Vehicle weight kg	Kerb weight		995	1,000	1,020	1,025	1,045
	Max. gross vehicle weight rating		1,485, 1,535*	1,485, 1,535*	1,500, 1,550*	1,505, 1,555*	1,525, 1,575*
	Max. axle weight rating-front		820	820	820	820	820
	Max. axle weight rating-rear		720, 790*	720, 790*	720, 790*	720, 790*	720, 790*
Seating capacity			5				
Engine	Model No.		4G13			4G92	
	Total displacement mℓ		1,299			1,597	
Transmission	Model No.		F5M41		F4A41	F5M41	F4A41
	Type		5-speed manual		4-speed automatic	5-speed manual	4-speed automatic
Fuel system	Fuel supply system		Electronic controlled multipoint fuel injection				

NOTE
*: In case of towing

PRECAUTIONS BEFORE SERVICE

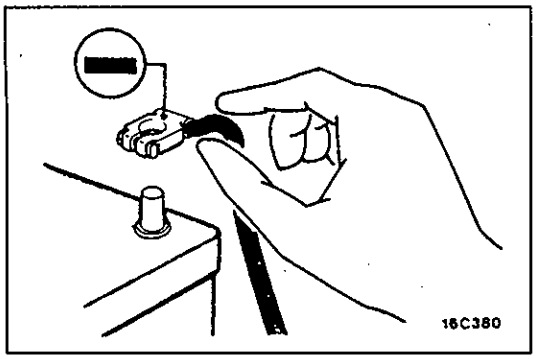
00100050120

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 and Seat Belt Pre-tensioner 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.)

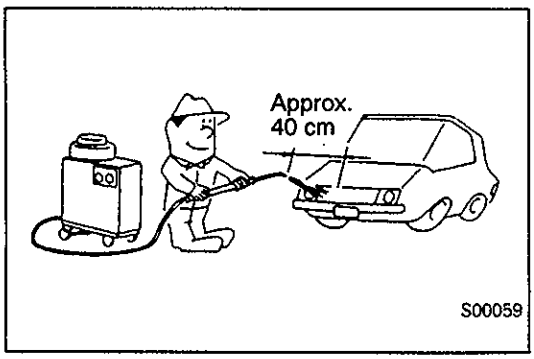
APPLICATION OF ANTI-CORROSION AGENTS AND UNDERCOATS

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.

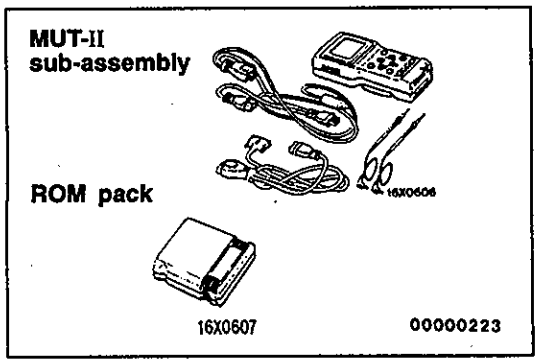
- Engine coolant temperature: 80–90°C
- Lamps, electric cooling fan and all accessories: OFF
- M/T: Neutral
- A/T: P range



VEHICLE WASHING

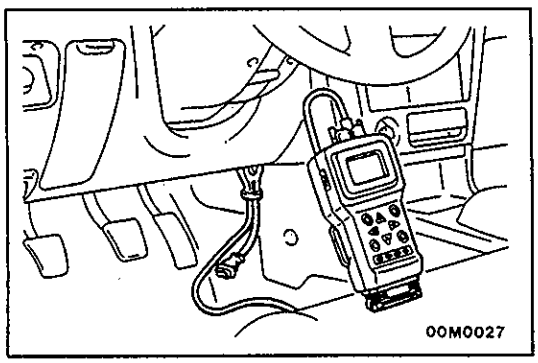
If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to note the following information in order to avoid damage to plastic components, etc.

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



MUT-II

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



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

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

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

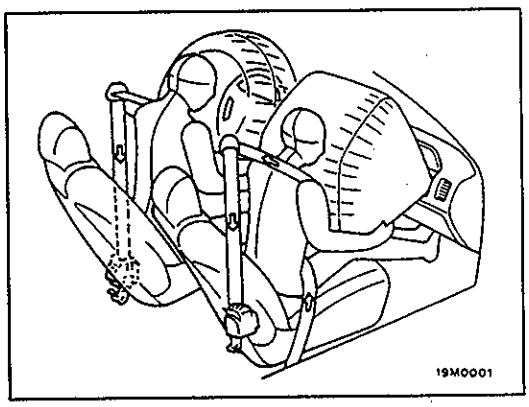
00100590042

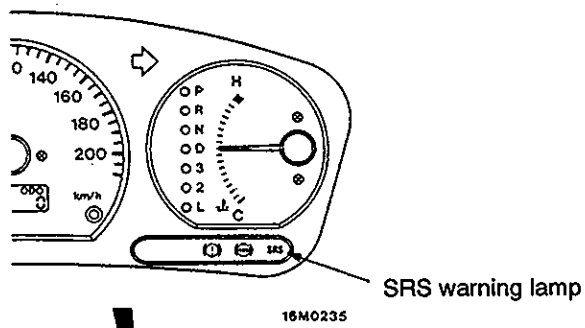
GENERAL INFORMATION

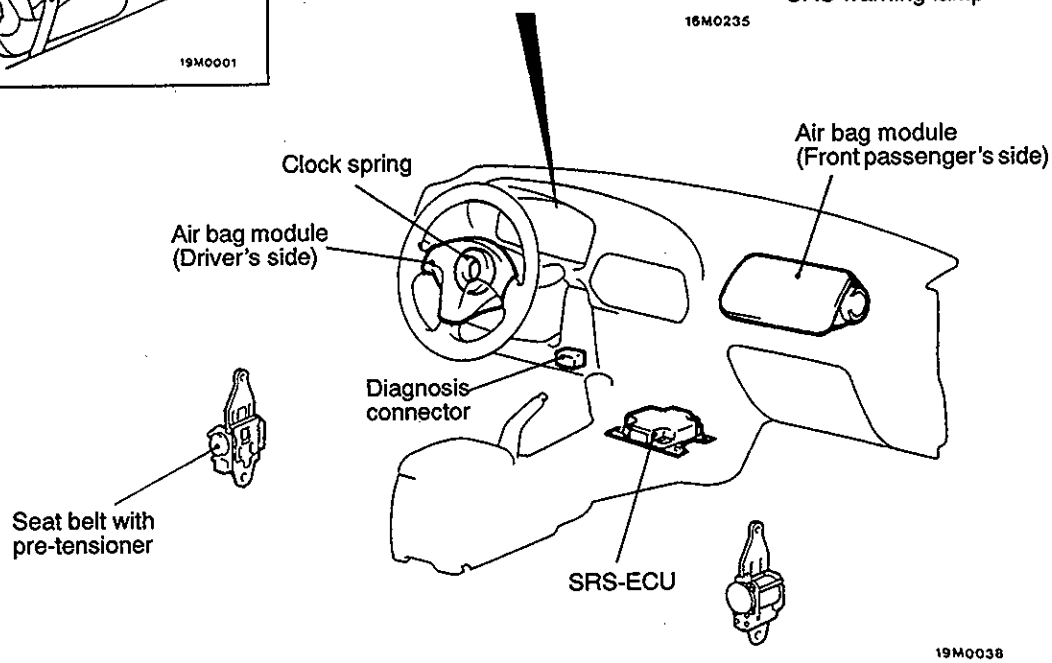
To improve safety, the SRS and seat belts with pre-tensioner are available as optional parts. These systems enhance collision safety by restraining the front passengers in case of an accident. The SRS works with the pre-tensioner simultaneously when a collision is detected.

The SRS consists of two air bag modules, SRS air bag control unit (SRS-ECU), SRS warning lamp and clock spring. One air bag is located in the centre of the steering wheel and another above the glove box. Each air bag has a folded air bag and an inflator unit. The control unit under the floor console monitors the system and has a safing G sensor and an analog G sensor. The warning lamp on the instrument panel indicates the operational status of the SRS. The clock spring is installed in the steering column.

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. The seat belt pre-tensioner is built into the front seat belt retractor. Only authorized service personnel should do work on or around the SRS components and seat belt with pre-tensioner. 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 inadvertent operation of the seat belt with pre-tensioner or inadvertent operation of the seat belt with pre-tensioner) or the driver (by rendering the SRS or the seat belt with pre-tensioner inoperative).



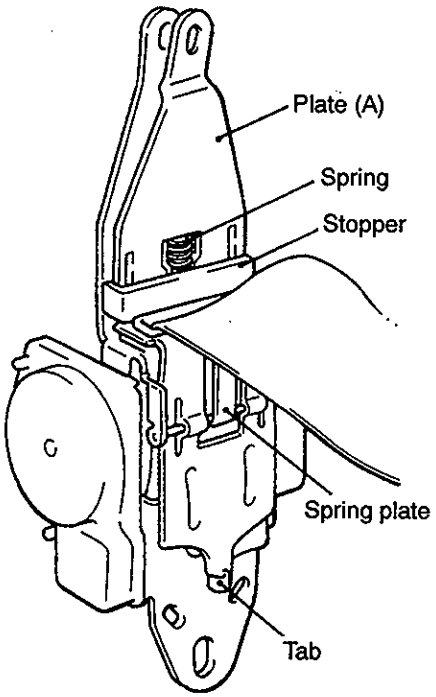




SEAT BELT WITH PRE-TENSIONER

The seat belt with pre-tensioner has a pre-tensioner operating mechanism and a G-sensor which detects the force from an impact built into the seat belt retractor.
The G-sensor is a mechanical-type sensor which includes components such as a weight which moves as a result of the impact from a collision, and a spike which strikes a charge and causes it to detonate.
Thus the pre-tensioner is equipped with a safety mechanism to prevent mis-operation during maintenance operations such as removal and installation of the seat belt.

The safety mechanism operates automatically when the retractor top mounting screw is removed during removal of the seat belt.
When the retractor top mounting screw is removed, the force of the spring plate causes the tab at the lower edge of plate (A) to push in the pin of the G-sensor, which prevents the weight inside the G-sensor from moving.
At the same time, the retractor bracket and the top of plate (A) become separated. A stopper is inserted into the gap thus formed by the force from a spring to prevent the tab from being removed from the pin if an outside force is applied to plate (A).



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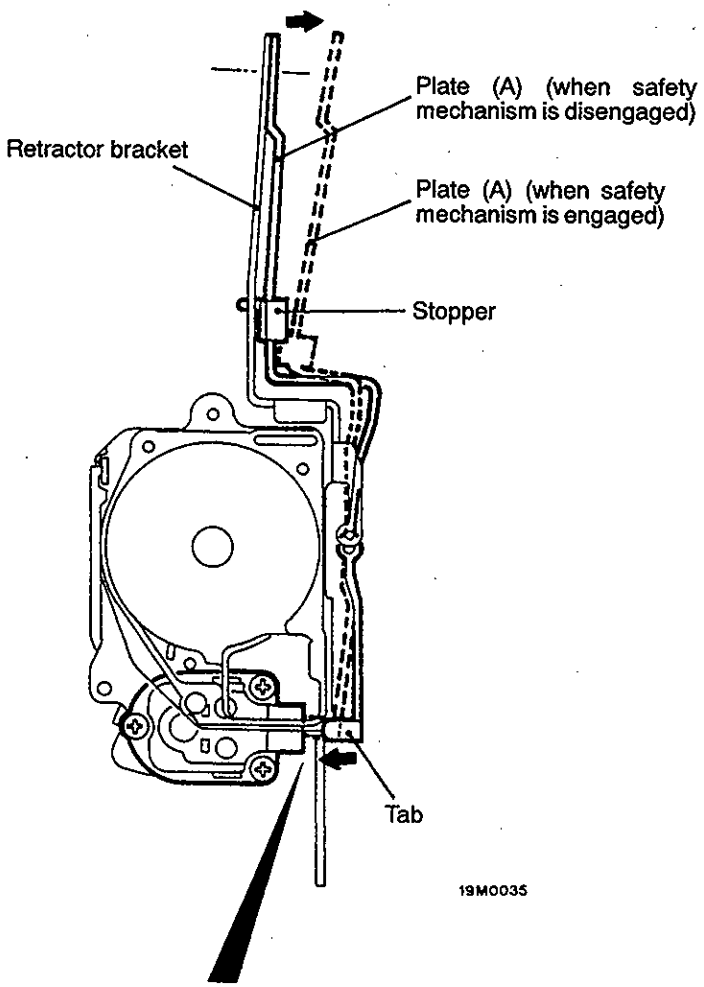

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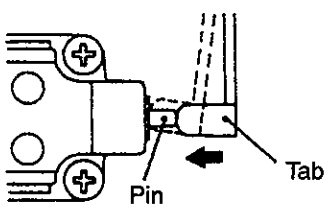
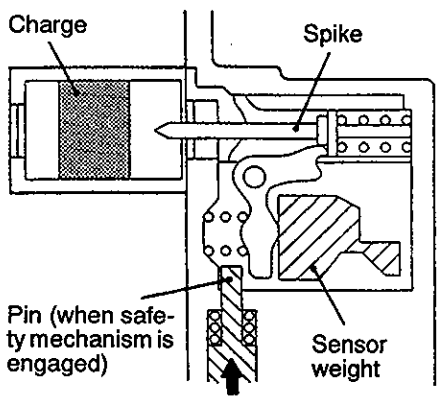


19M0036

G-sensor structure



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SRS SERVICE PRECAUTIONS

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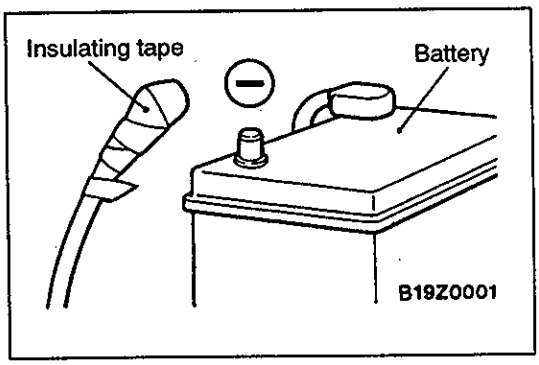
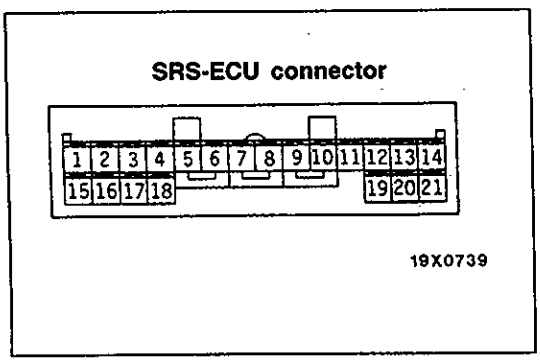
1. In order to avoid injury to yourself or others from accidental deployment of the air bag and accidental operation of the seat belt with pre-tensioner during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment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



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



5. Do not attempt to repair the wiring harness connectors of the SRS. If any of the connectors are diagnosed as faulty, replace the wiring harness. If the wires are diagnosed as faulty, replace or repair the wiring harness according to the following table.

SRS-ECU terminal No.	Harness connector (No. of terminals, colour)	Destination of harness	Corrective action
1 to 4	21 pins, yellow	–	–
5		Body wiring harness → Clock spring → Air bag module (Driver's side)	Correct or replace each wiring harness. Replace clock spring.
6			
7*		Body wiring harness → Air bag module (Front passenger's side)	Correct or replace each wiring harness.
8*			
9,10		–	–
11		Body wiring harness → Diagnosis connector	Correct or replace each wiring harness.
12		–	–
13		Body wiring harness → Junction block (fuse No.2)	Correct or replace each wiring harness.
14		Body wiring harness → Junction block (fuse No.4)	
15		Body wiring harness → SRS warning lamp	
16 to 19		–	–
20		Body wiring harness → Earth	Correct or replace body wiring harness.
21			

NOTE
*: Vehicles with front passenger's air bag

6. 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
7. Whenever you finish servicing the SRS, check warning lamp operation to make sure that the system functions properly. (Refer to GROUP 52B – SRS Maintenance.)
8. Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.
9. If you have any questions about the SRS, please contact your local distributor.

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

SUPPORT LOCATIONS FOR LIFTING AND JACKING

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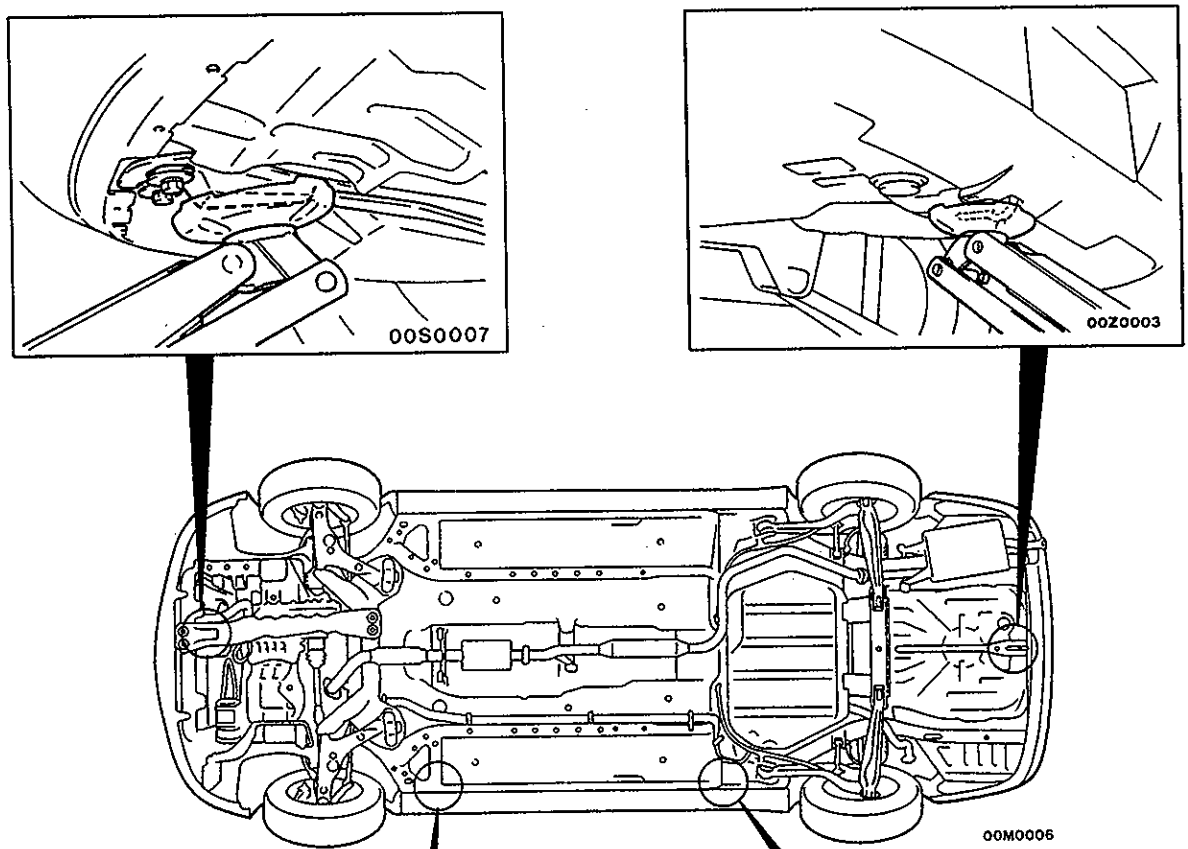
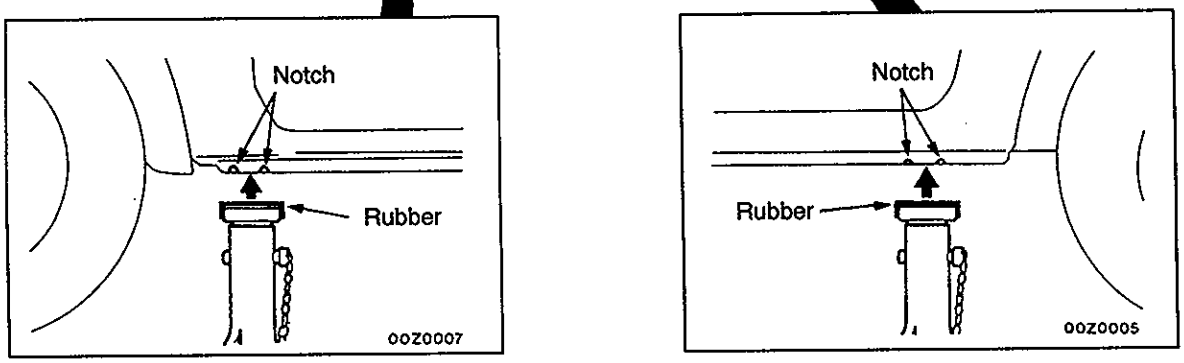
Caution
Do not support the vehicles at locations other than specified supporting points. If do so, this will cause damage, etc.

SUPPORT POSITIONS FOR A GARAGE JACK AND AXLE STANDS

GARAGE JACK



AXLE STANDS



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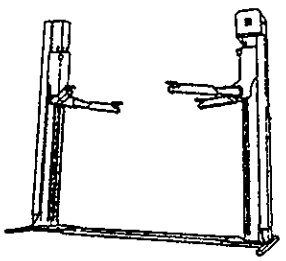
SUPPORT POSITIONS FOR A SINGLE-POST LIFT OR DOUBLE-POST LIFT

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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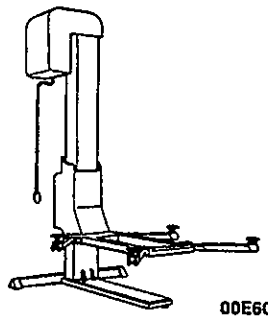
SINGLE-POST LIFT



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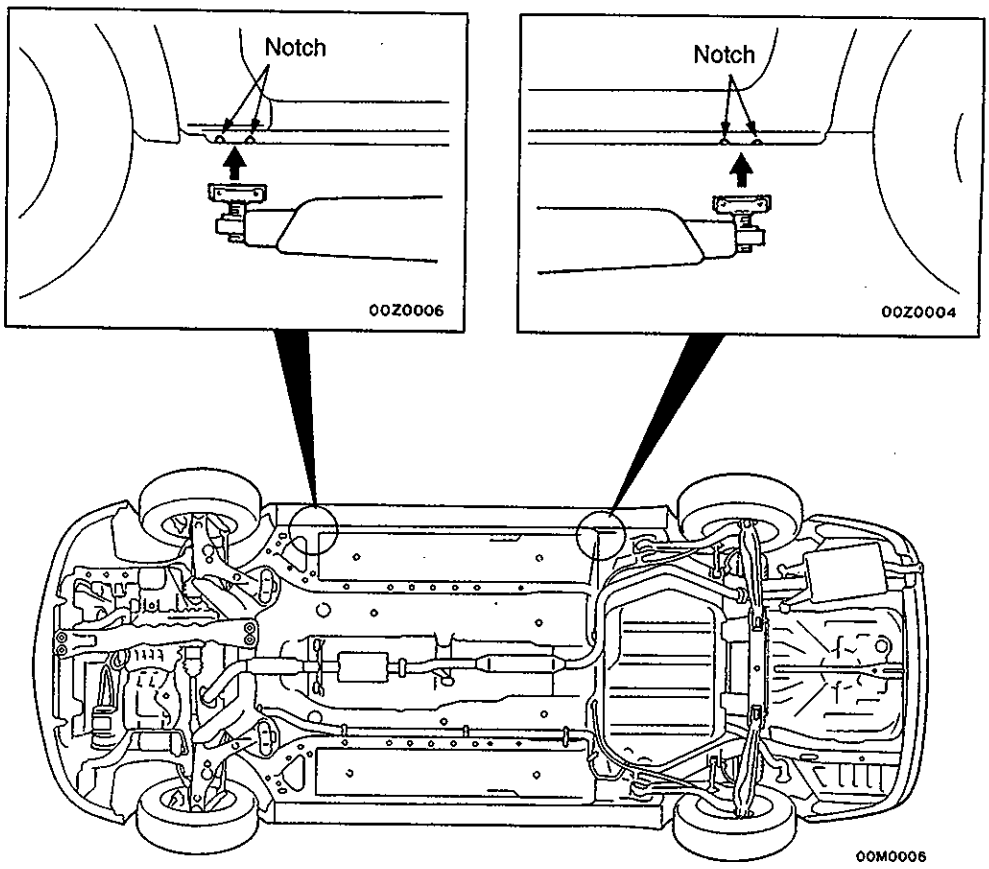

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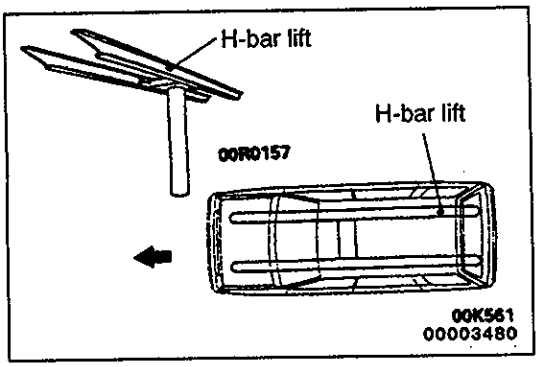
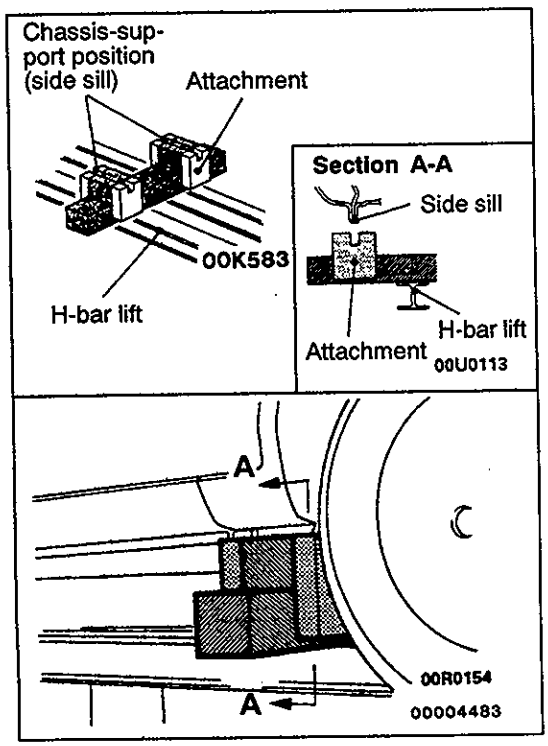


SUPPORT POSITIONS AND SUPPORT METHOD FOR AN H-BAR LIFT

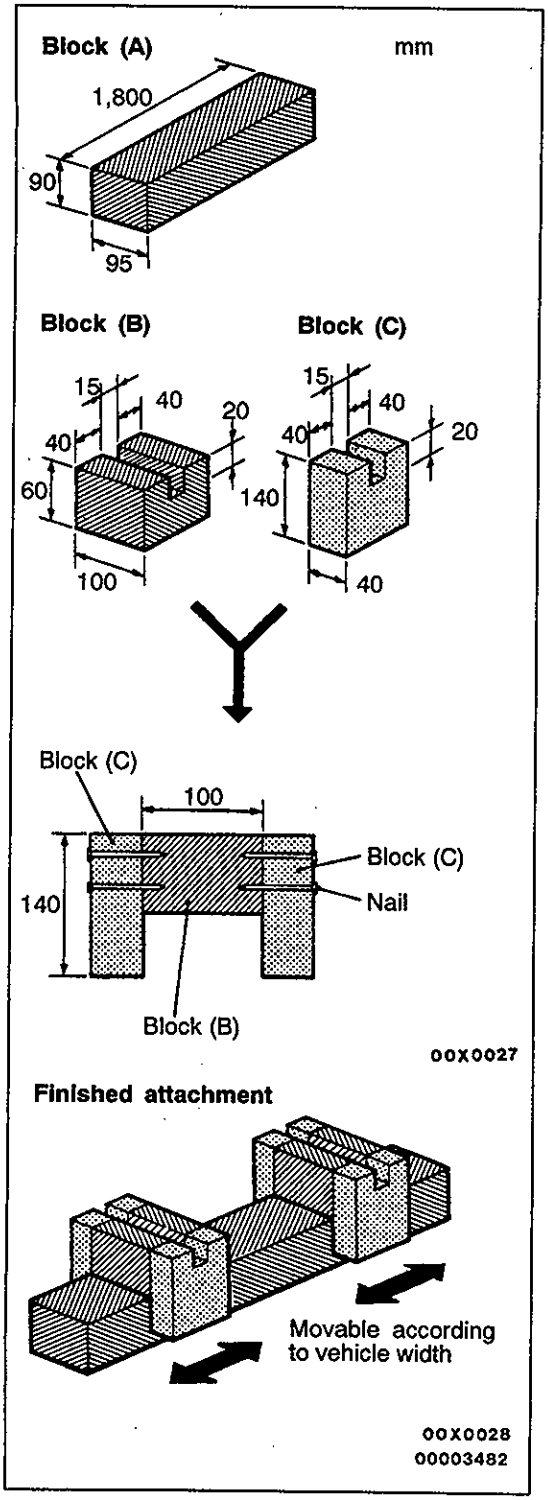
Caution
When service procedures require removing rear suspension, fuel tank, spare tyre and rear bumper, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping of centre of gravity changes.

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 PART/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

NOTES

ENGINE

CONTENTS

11109000276

ENGINE <4G1>

CONTENTS

11109000283

GENERAL INFORMATION

11100010186

Items			4G13
Total displacement mℓ			1,299
Bore × Stroke mm			71×82
Compression ratio			9.5
Combustion chamber			Semi spherical type
Camshaft arrangement			SOHC
Number of valve	Intake		8
	Exhaust		4
Valve timing	Intake	Opening	BTDC 19°
		Closing	ABDC 43°
	Exhaust	Opening	BBDC 60°
		Closing	ATDC 8°
Fuel system			Electronically controlled multipoint fuel injection
Rocker arm			Roller type
Auto-lash adjuster			Not equipped

SERVICE SPECIFICATIONS

11100030236

Items			Standard value	Limit
Alternator 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	8.7 – 11.4	–
		When a used belt is installed	9.2 – 10.6	–
		When a new belt is installed	6.6 – 8.3	–
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	9.6 – 12.4	–
		When a used belt is installed	10.2 – 11.6	–
		When a new belt is installed	7.2 – 9.0	–
Valve clearance (at hot) mm		Intake valve	0.20	–
		Exhaust valve	0.25	–

Items	Standard value	Limit
Basic ignition timing	5° BTDC±2°	–
Idle speed r/min	750±100	–
CO contents %	0.5 or less	–
HC contents ppm	100 or less	–
Compression pressure (250–400 r/min) kPa	1226	min. 863
Compression pressure difference of all cylinder kPa	–	max. 100
Intake manifold vacuum kPa	min. 60	–
Cylinder head bolt shank length mm	–	103.2

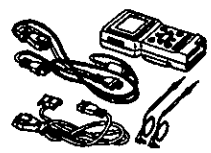
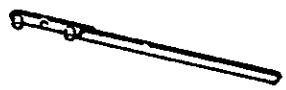
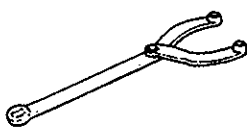
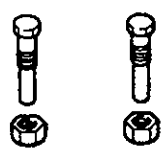
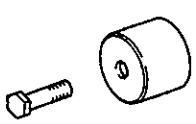
SEALANT

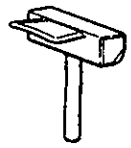
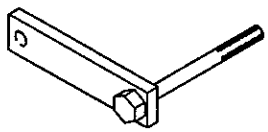
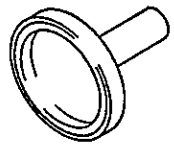
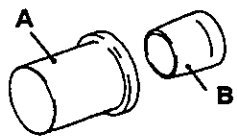
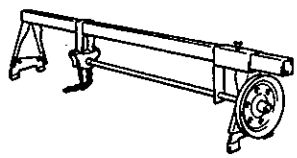
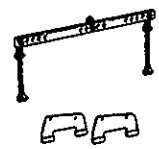
11100050218

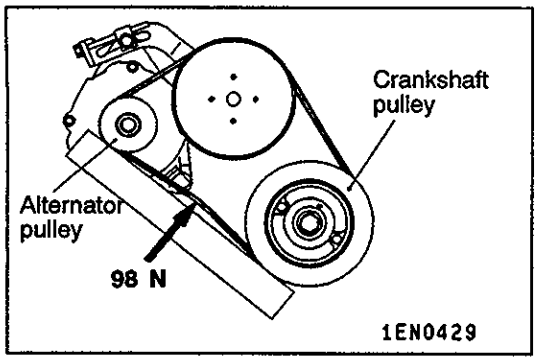
Item	Specified sealant	Remark
Oil pan	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant

SPECIAL TOOLS

11100060228

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	Checking the idle speed
	MD998747	Crankshaft pulley holder	Holding the crankshaft pulley
	MB990767	End yoke holder	Holding the camshaft sprocket
	MD998719 or MD998754	Crankshaft pulley holder pin	
	MD998713	Camshaft oil seal installer	Press-in of the camshaft oil seal

Tool	Number	Name	Use
	MD998727	Oil pan remover	Removal of oil pan
	MD998781	Flywheel stopper	Securing the flywheel <M/T> or drive plate <A/T>
	MD998718	Crankshaft rear oil seal installer	Press-in of the crankshaft rear oil seal
	A: MD998304 B: MD998305	A: Crankshaft front oil seal installer B: Crankshaft front oil seal guide	Press-in of the crankshaft front oil seal
	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
	MB991453	Engine hanger assembly	



ON-VEHICLE SERVICE

11100090258

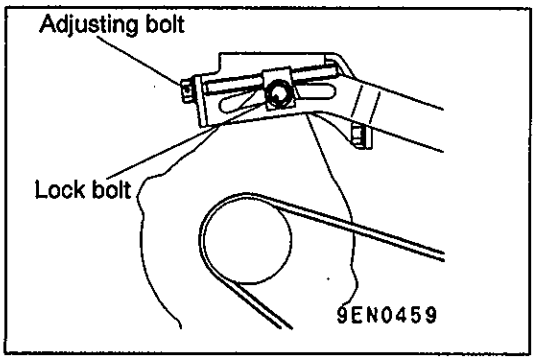
DRIVE BELT TENSION CHECK AND ADJUSTMENT

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	392 – 588
Deflection (Reference value) mm	8.7 – 11.4



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	441 – 539	637 – 833
Deflection (Reference value) mm	9.2 – 10.6	6.6 – 8.3

4. Tighten the lock bolt.

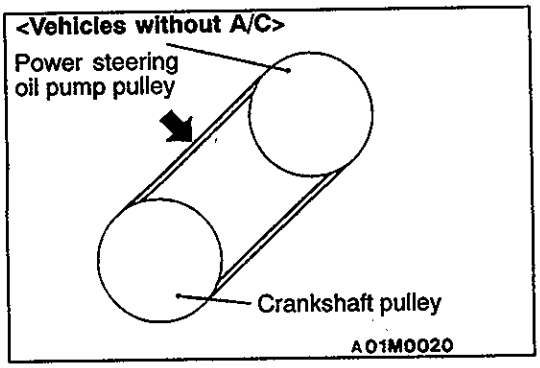
   Tightening torque: 23 Nm

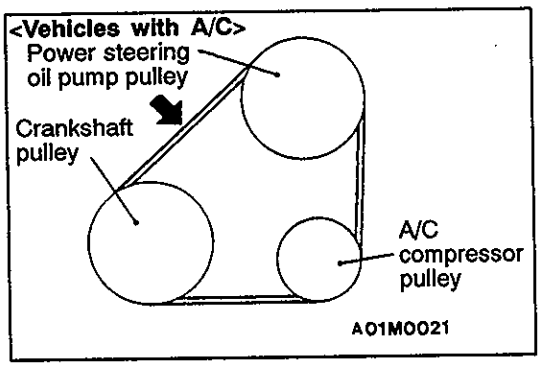
5. Tighten the nut of the alternator pivot bolt.

   Tightening torque: 44 Nm

6. Tighten the adjusting bolt.

   Tightening torque: 9.8 Nm





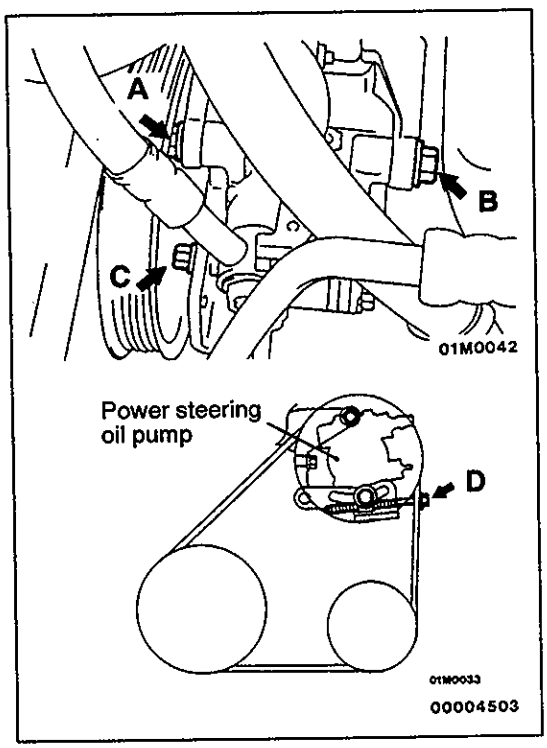
POWER STEERING OIL PUMP AND AIR CONDITIONER COMPRESSOR DRIVE BELT TENSION CHECK AND ADJUSTMENT

11100130066

1. Use a belt tention 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:

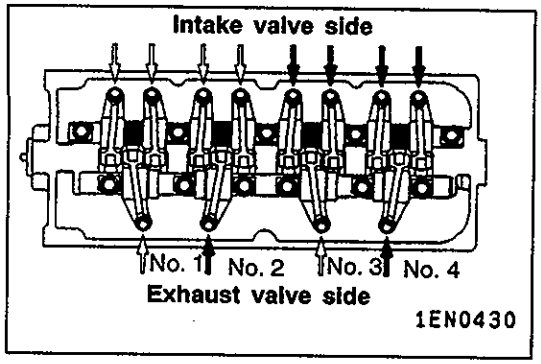
Items	When checked	When a used belt is intalled	When a new belt is installed
Tension N	392 – 588	441 – 539	637 – 833
Deflection (Reference value) mm	9.6 – 12.4	10.2 – 11.6	7.2 – 9.0



2. If the tension or deflection is outside the standard value, adjust by the following procedure.
   (1) Loosen power steering oil pump fixing bolts A, B and C.
   (2) Adjust the amount of belt deflection using adjusting bolt D.
   (3) Tighten fixing bolts A, B and C.

   Tightening torque:
   Bolts A and B: 39 Nm
   Bolt C: 49 Nm
   (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

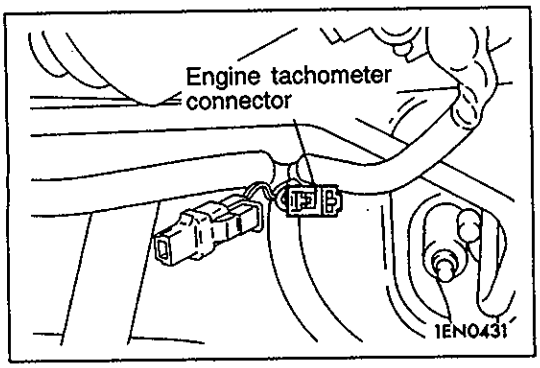
11100150055

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: 0.25 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: 15 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



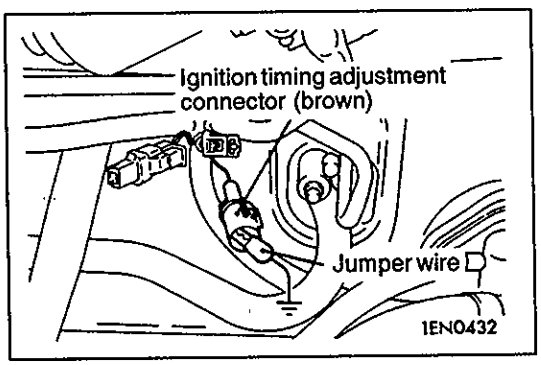
IGNITION TIMING CHECK AND ADJUSTMENT

11100160126

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.
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 it at idle.
6. Check that engine idle speed is within the standard value.

   Standard value: 750±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: 12 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.

IDLE SPEED CHECK

11100190200

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

   Standard value: 5° BTDC±2°

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: 750±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

11100210173

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: 5° BTDC±2°

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.

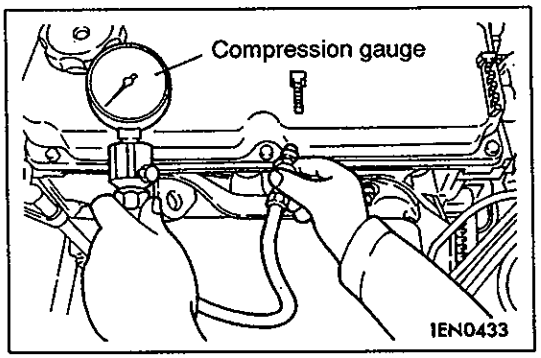
COMPRESSION PRESSURE CHECK 11100260208

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 7-pin connector.

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

5. Cover the spark plug hole with a shop towel 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): 1226 kPa

   Limit (at engine speed of 250–400 r/min): min. 863 kPa

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

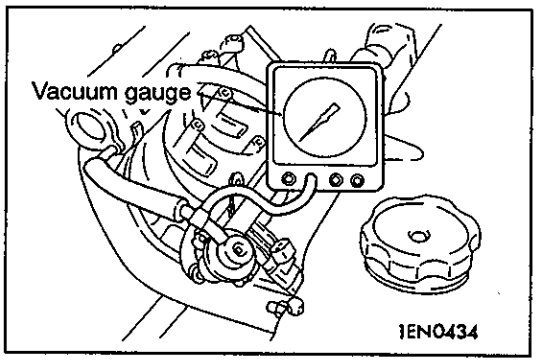
   Limit: max. 100 kPa

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 increses 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.

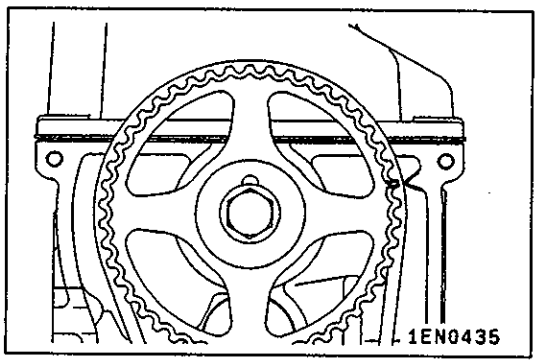
NOTE
This will erase the diagnosis code resulting from the distributor connector being disconnected.



MANIFOLD VACUUM CHECK 11100270201

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



TIMING BELT TENSION ADJUSTMENT 11100280068

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 90°–180°.
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.

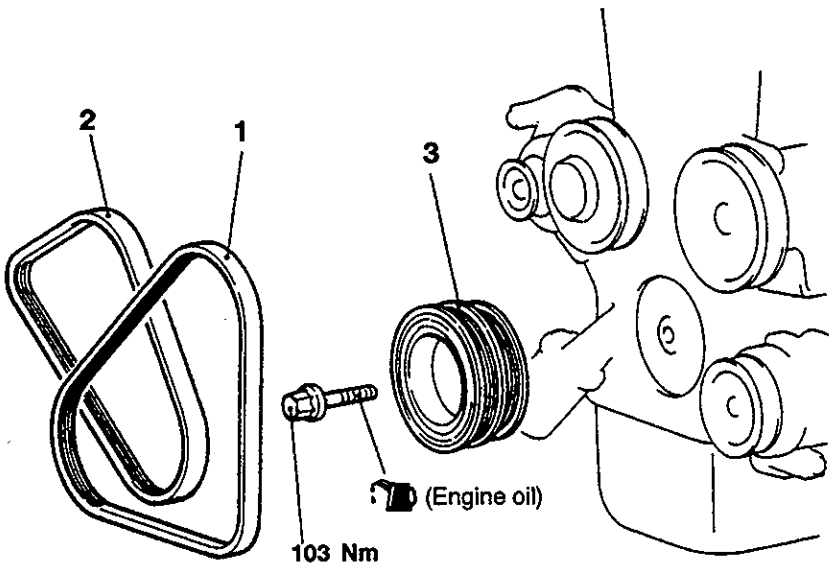
CRANKSHAFT PULLEY

11200160174

REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Cover Removal

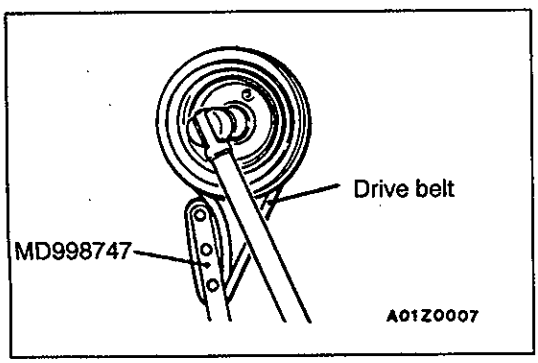
Post-installation Operation
- Drive Belt Tension Adjustment (Refer to P.11A-6.)
- Under Cover Installation



A01M0022

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

◀A▶ ▶A◀ 3. Crankshaft pulley



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY REMOVAL

Caution
1. **This drive belt will get damaged. Do not use the engine's drive belt.**
2. **Never use a damaged drive belt.**

INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT PULLEY INSTALLATION

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

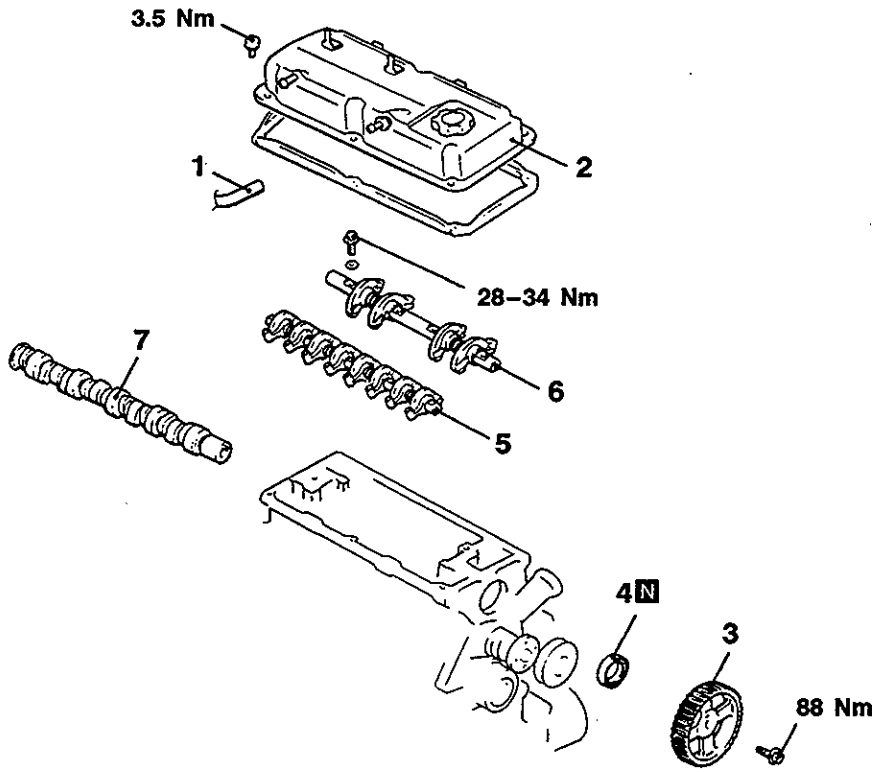
Caution
1. **This drive belt will get damaged. Do not use the engine's drive belt.**
2. **Never use a damaged drive belt.**

CAMSHAFT AND CAMSHAFT OIL SEAL

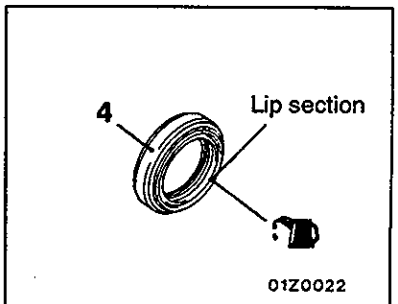
11200190197

REMOVAL AND INSTALLATION

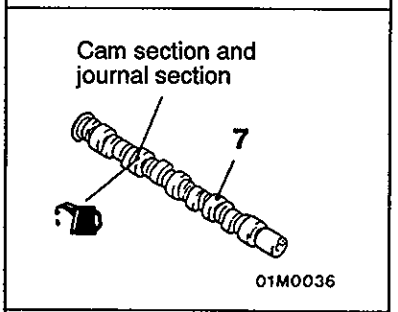
Pre-removal and Post-installation Operation
- Air Cleaner Removal and Installation
- Distributor Removal and Installation (Refer to GROUP 16.)
- Timing Belt Removal and Installation (Refer to P.11A-23.)



01M0043



01Z0022



01M0036

Engine oil

00004505

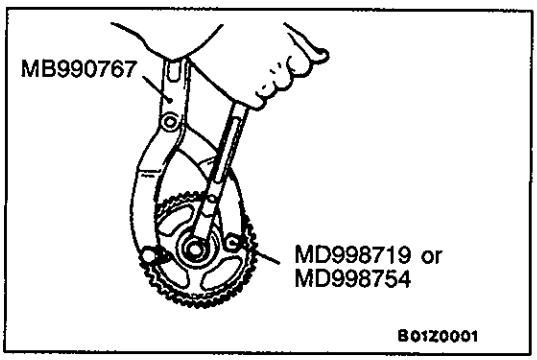
Removal steps

1. PCV hose connection
2. Rocker cover
   - Valve clearance adjustment (Refer to P.11A-8.)

◀A▶ ▶B◀ 3. Camshaft sprocket

▶A◀ 4. Camshaft oil seal

5. Rocker arm and shaft assembly (intake side)
6. Rocker arm and shaft assembly (exhaust side)
7. Camshaft



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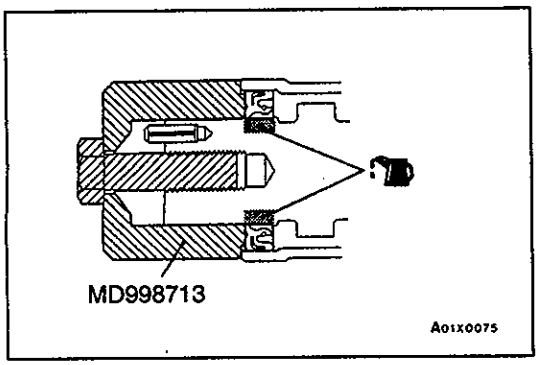
REMOVAL SERVICE POINT

◀A▶ CAMSHAFT SPROCKET REMOVAL



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

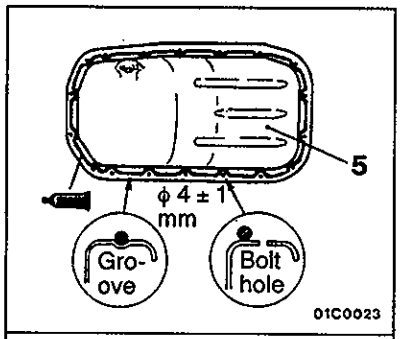
Use the special tool to stop the camshaft sprocket from turning in the same way as was done during removal, and then tighten the bolts to the specified torque.

OIL PAN

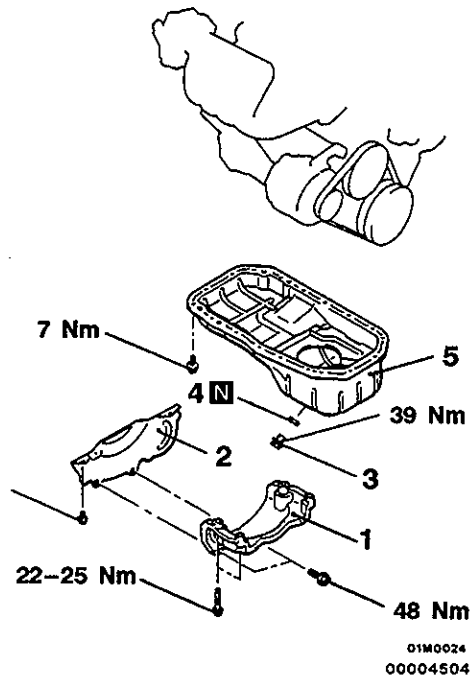
11200280108

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
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15.)

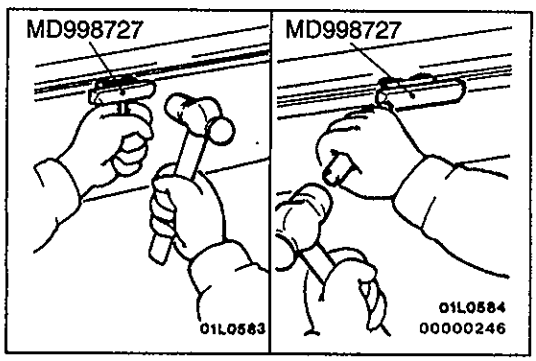


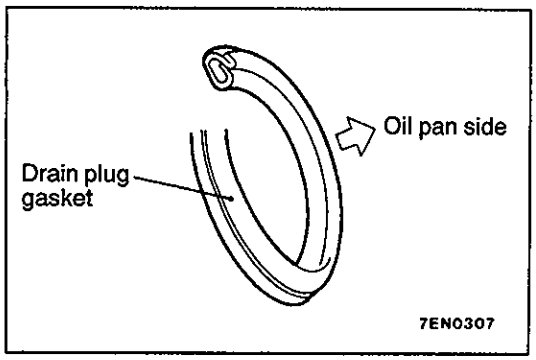
Sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent



Removal steps
1. Transmission stay
2. Bell housing cover
3. Drain plug

◀A▶ ▶A◀ 4. Drain plug gasket
5. Oil pan





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

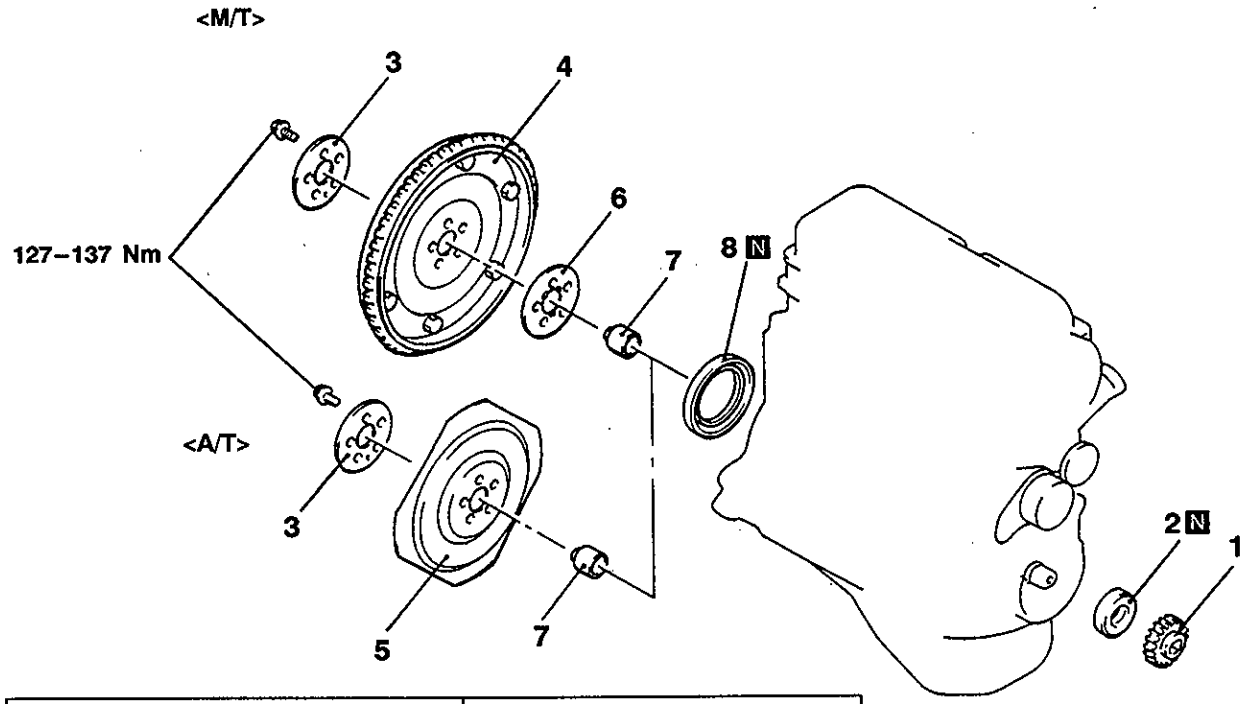
▶A◀ DRAIN PLUG GASKET INSTALLATION

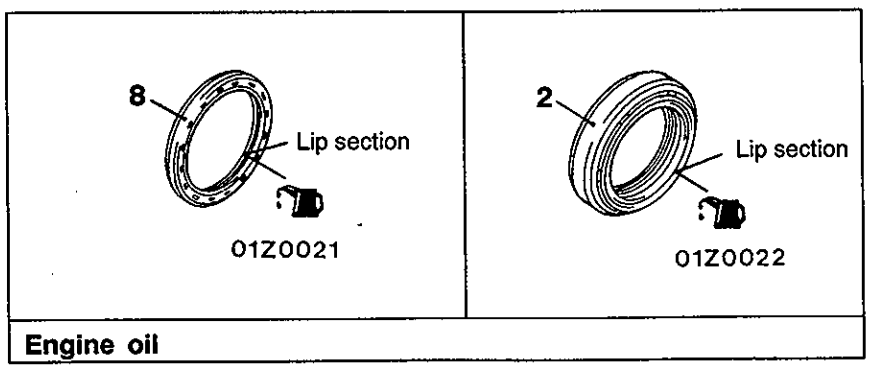
Install the drain plug gasket in the direction so that it faces as shown in the illustration.

CRANKSHAFT OIL SEAL

11200310043

REMOVAL AND INSTALLATION





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00004506

Crankshaft front oil seal removal steps

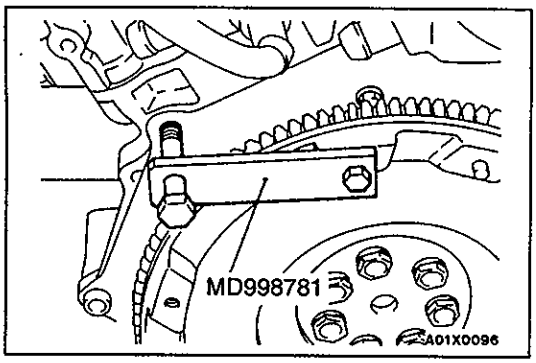
- Timing belt (Refer to P.11A-23.)

1. Crankshaft sprocket
▶C◀ 2. Crankshaft front oil seal

Crankshaft rear oil seal removal steps

- Transmission assembly (M/T: Refer to GROUP 22.) (A/T: Refer to GROUP 23.)
- Clutch cover and disc <M/T>

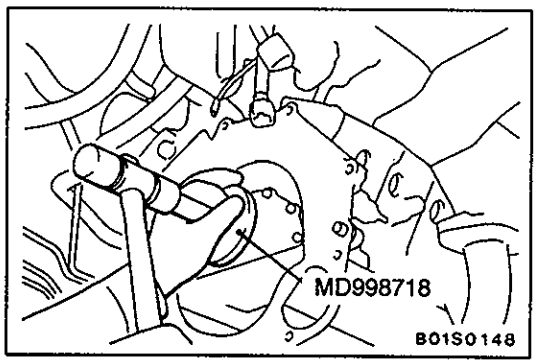
◀A▶ ▶B◀ 3. Adapter plate
◀A▶ ▶B◀ 4. Flywheel <M/T>
◀A▶ ▶B◀ 5. Drive plate <A/T>
◀A▶ ▶B◀ 6. Adapter plate <M/T>
7. Crankshaft bushing
▶A◀ 8. Crankshaft rear oil seal



REMOVAL SERVICE POINT

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

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



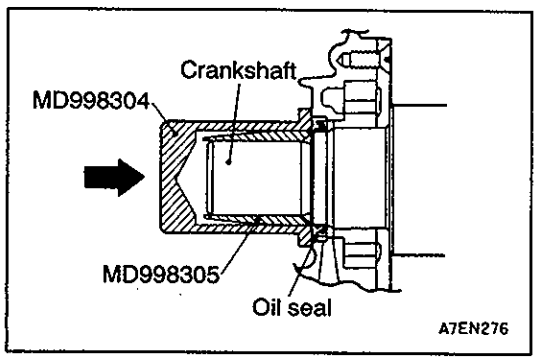
INSTALLATION SERVICE POINTS

▶A◀ CRANKSHAFT REAR OIL SEAL INSTALLATION

1. Apply a small mount of engine oil to the entire circumference of the oil seal lip.
2. Tap in the oil seal as show in the illustration.

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

Use the special tool to hold the flywheel or drive plate in the same manner as removal, and install the bolt.



▶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.

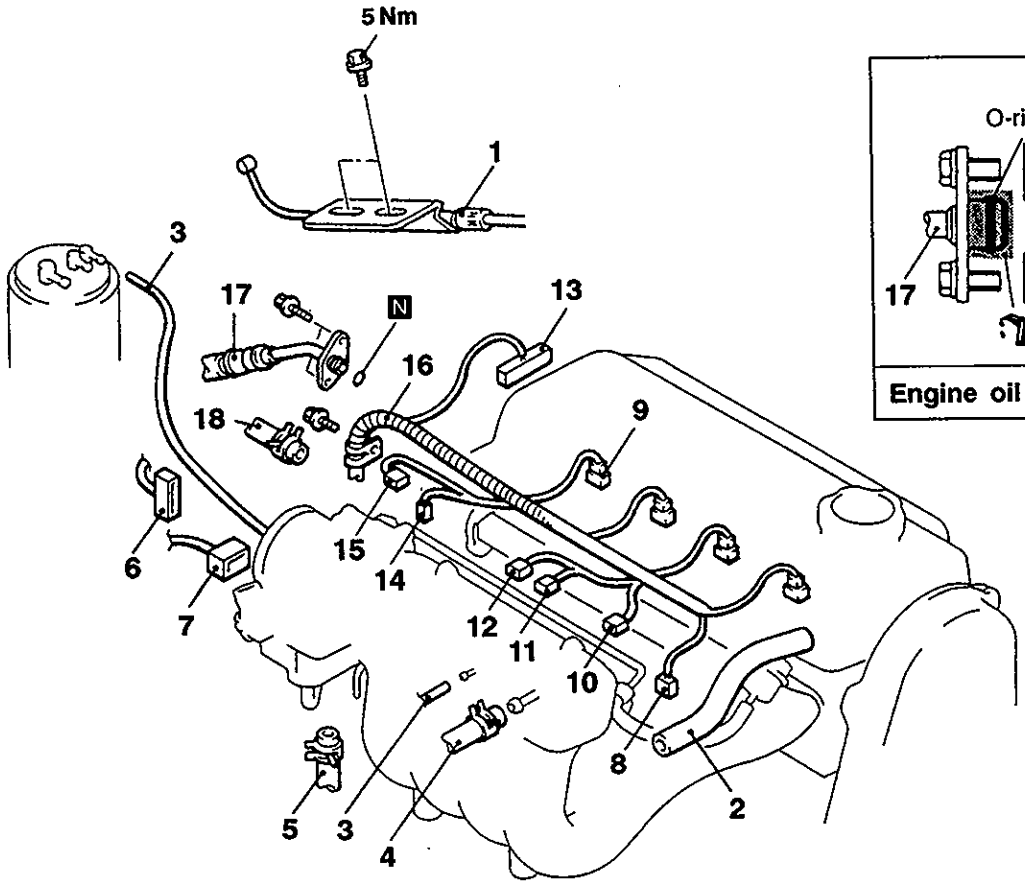
CYLINDER HEAD GASKET

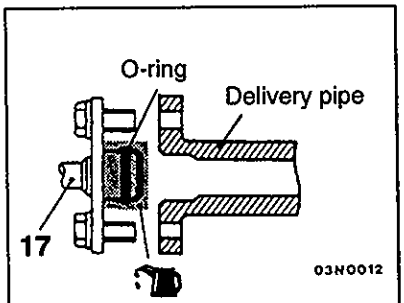
11200400269

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to GROUP 13A – On-vehicle Service.)
- Engine Oil Draining (Refer to GROUP 12 – On-vehicle Service.)
- Thermostat Case Assembly Removal (Refer to GROUP 14 – Water Hose and Water Pipe.)

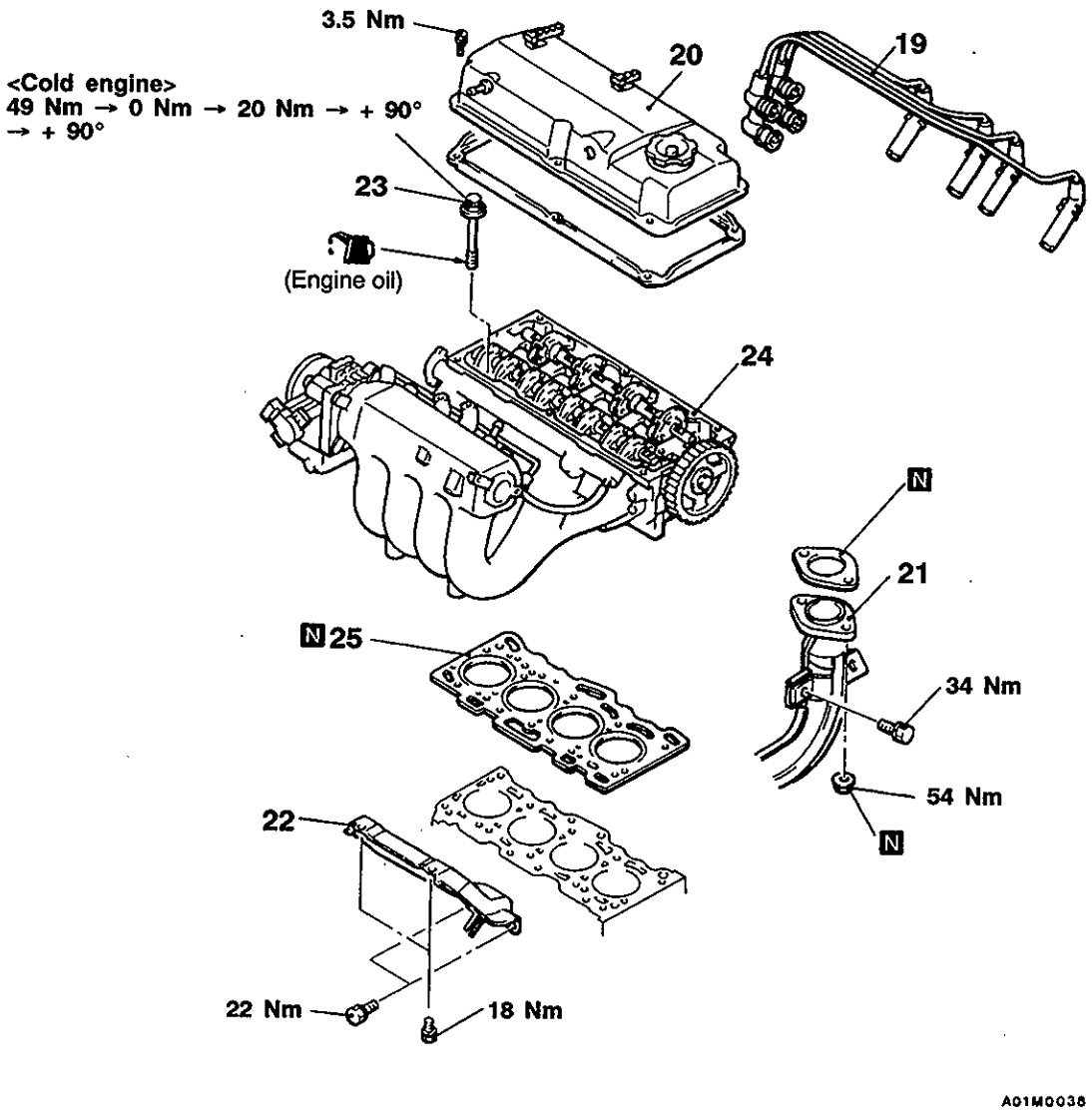
Post-installation Operation
- Thermostat Case Assembly Installation (Refer to GROUP 14 – Water Hose and Water Pipe.)
- Engine Oil Supplying (Refer to GROUP 12 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)



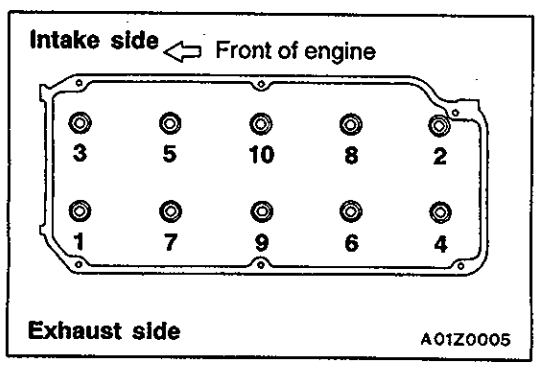


Engine oil

Removal steps
1. Accelerator cable connection
2. PCV hose
3. Vacuum hose connection
4. Brake booster vacuum hose connection
5. Water hose connection
6. Throttle position sensor connector
7. Idle speed control connector
8. Oxygen sensor connector
9. Injector connector
10. Intake air temperature sensor connector
11. Purge control solenoid valve connector
12. EGR solenoid valve connector
13. Distributor connector
14. Engine coolant temperature gauge unit connector
15. Engine coolant temperature sensor connector
16. Control wiring harness
▶C◀ 17. High-pressure fuel hose connection
18. Fuel return hose connection



19. Spark plug cables
20. Rocker cover
    - Timing belt (Refer to P.11A-23.)
21. Front exhaust pipe connection
22. Intake manifold stay
◀A▶ ▶B◀ 23. Cylinder head bolts
24. Cylinder head
▶A◀ 25. Cylinder head gasket



REMOVAL SERVICE POINT

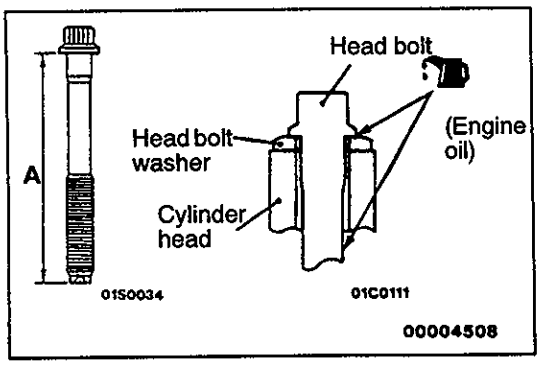
◀A▶ CYLINDER HEAD BOLT REMOVAL

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 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.

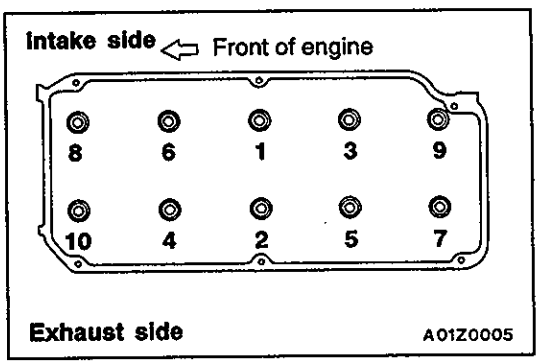


▶B◀ CYLINDER HEAD BOLT INSTALLATION

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.

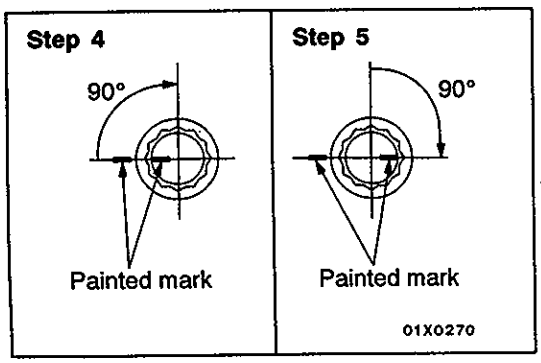
   Limit (A): 103.2 mm

2. The head bolt washer should be installed with the burred side caused by tapping out facing upwards.



3. Tighten the bolts by the following procedure.

Step	Operation	Remarks
1	Tighten to 49 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◀ HIGH-PRESSURE FUEL 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.

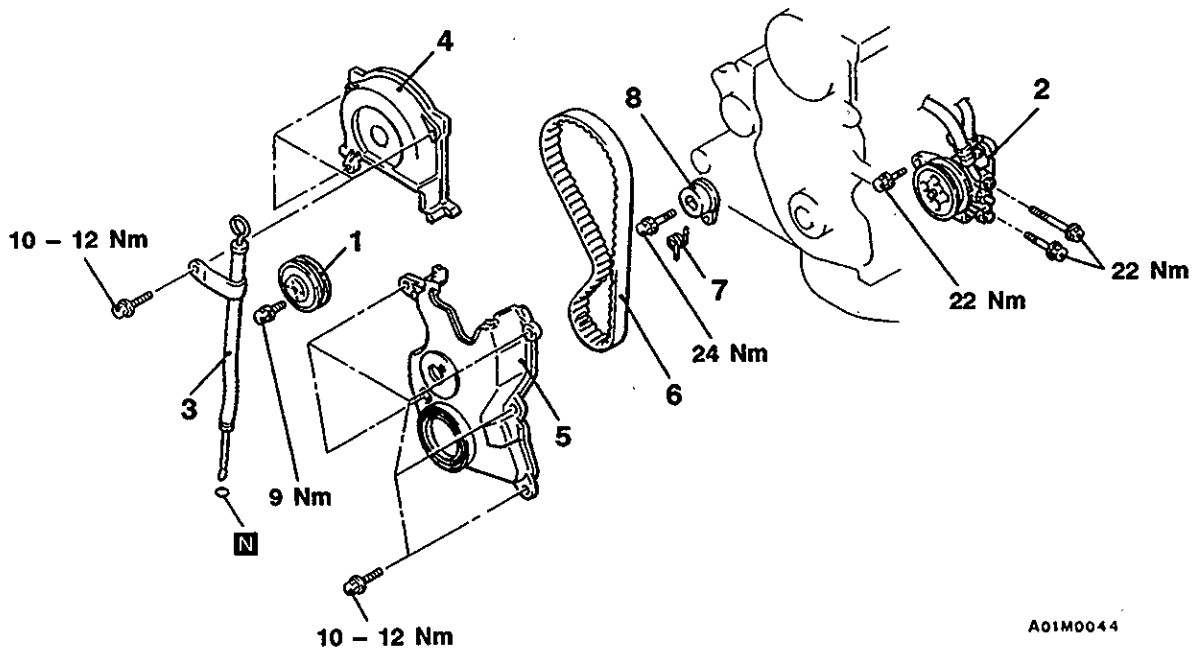
2. While turning the high-pressure fuel hose to the right and left, install delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the O-ring is probably being clamped. Disconnect the high-pressure fuel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

TIMING BELT

11200430251

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Crankshaft Pulley Removal and Installation (Refer to P.11A-13.)
- Engine Mount Bracket Removal and Installation (Refer to GROUP 32 – Engine Mounting.)



Removal steps

◀A▶
1. Water pump pulley
2. Power steering oil pump and bracket assembly
3. Oil level gauge guide assembly
4. Timing belt upper cover

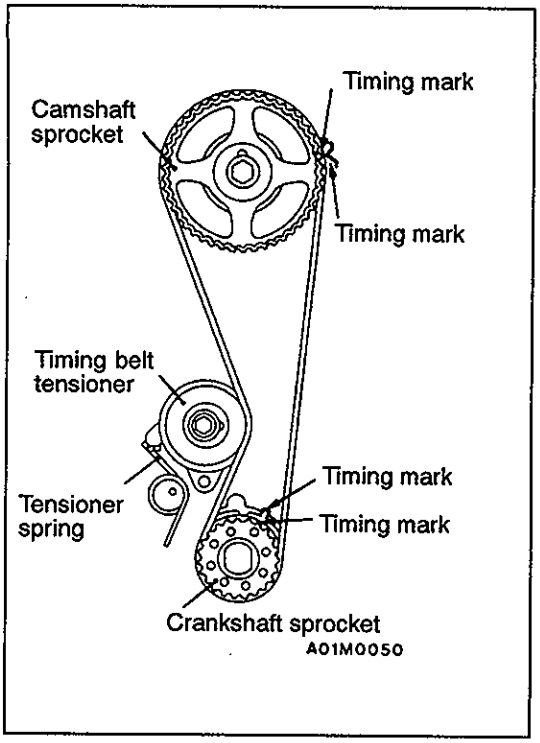
◀B▶
5. Timing belt lower cover
▶B◀ • Timing belt tension adjustment
▶A◀ 6. Timing belt
▶A◀ 7. Tensioner spring
▶A◀ 8. Timing belt tensioner

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.

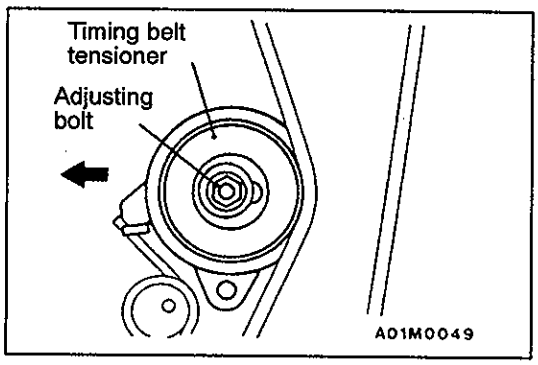
NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the timing belt, and tie it with a cord.



◀B▶ TIMING BELT REMOVAL

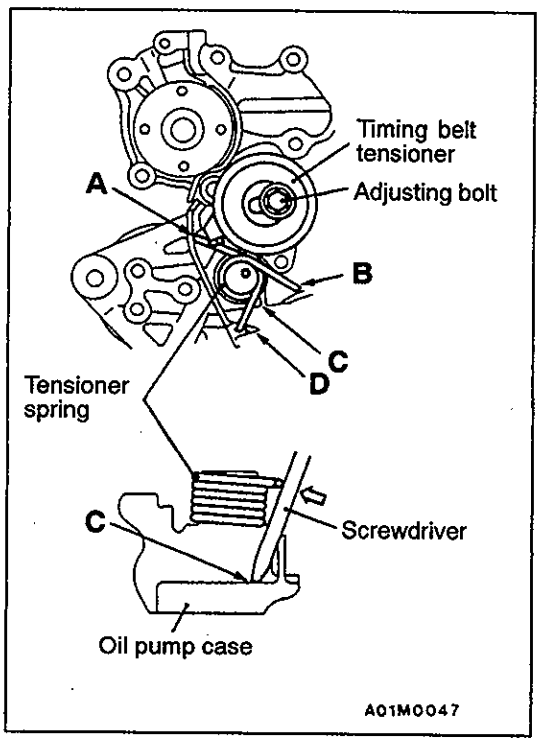
1. Turn the crankshaft clockwise (right turn) to align each timing mark and to set the No. 1 cylinder at compression top dead centre.

Caution
The crankshaft should always be turned only clockwise.



2. Loosen the adjusting bolt.
3. Move the timing belt tensioner to the water pump side and temporarily tighten the adjusting bolt so that the tensioner does not return.
4. Remove the timing belt.

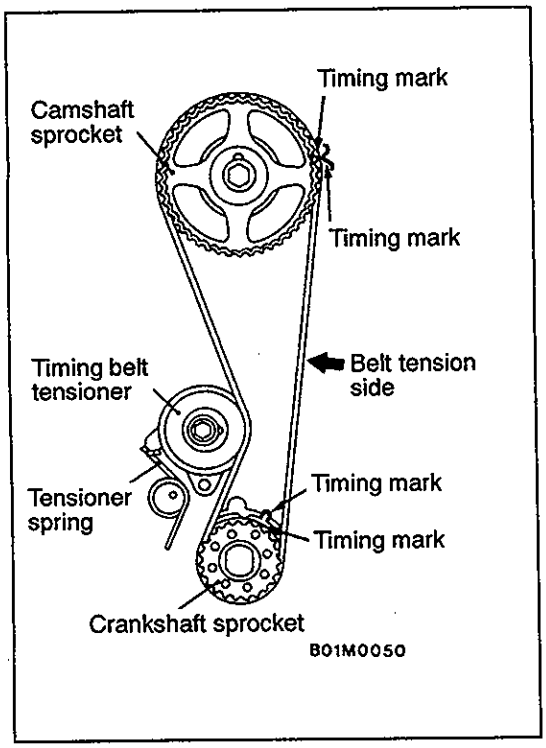
Caution
If the timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (rigth turn).



INSTALLATION SERVICE POINTS

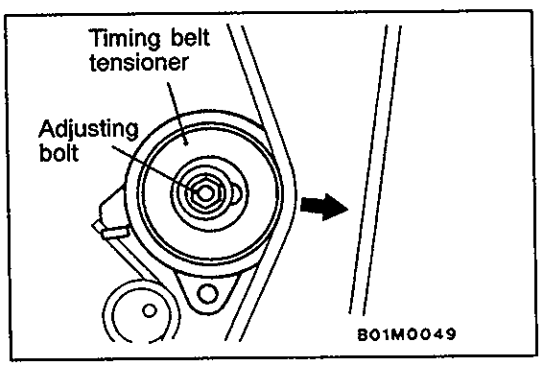
▶A◀ TIMING BELT TENSIONER/TENSIONER SPRING/TIMING BELT INSTALLATION

1. Put the protrusion of the timing belt tensioner on the end (A) of the tensioner spring as shown.
2. Move the timing belt tensioner close to the water pump, and temporarily tighten the adjusting bolt.
3. Put a screwdriver in (C), push the protrusion (B) of the tensioner spring in the shown direction, and place it on the stopper (D) of the oil pump case.



4. Align each of the camshaft sprocket and the crankshaft sprocket timing marks.
5. 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) Camshaft sprocket
   (3) Tensioner pulley

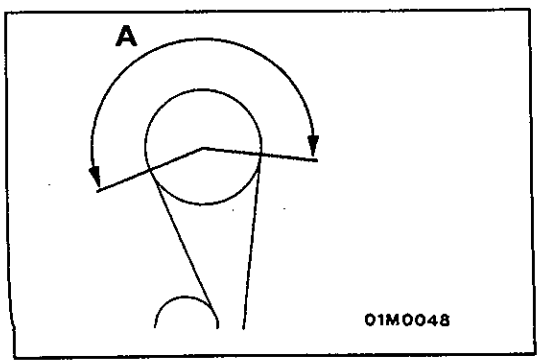
Caution
After installing the timing belt, apply force to turn the camshaft sprocket in the reverse direction, and recheck to be sure that the belt is fully tensioned and that each timing mark is in the proper position.



▶B◀ TIMING BELT TENSION ADJUSTMENT

1. Initially loosen the adjusting bolt of the timing belt tensioner fixed to the water pump 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.

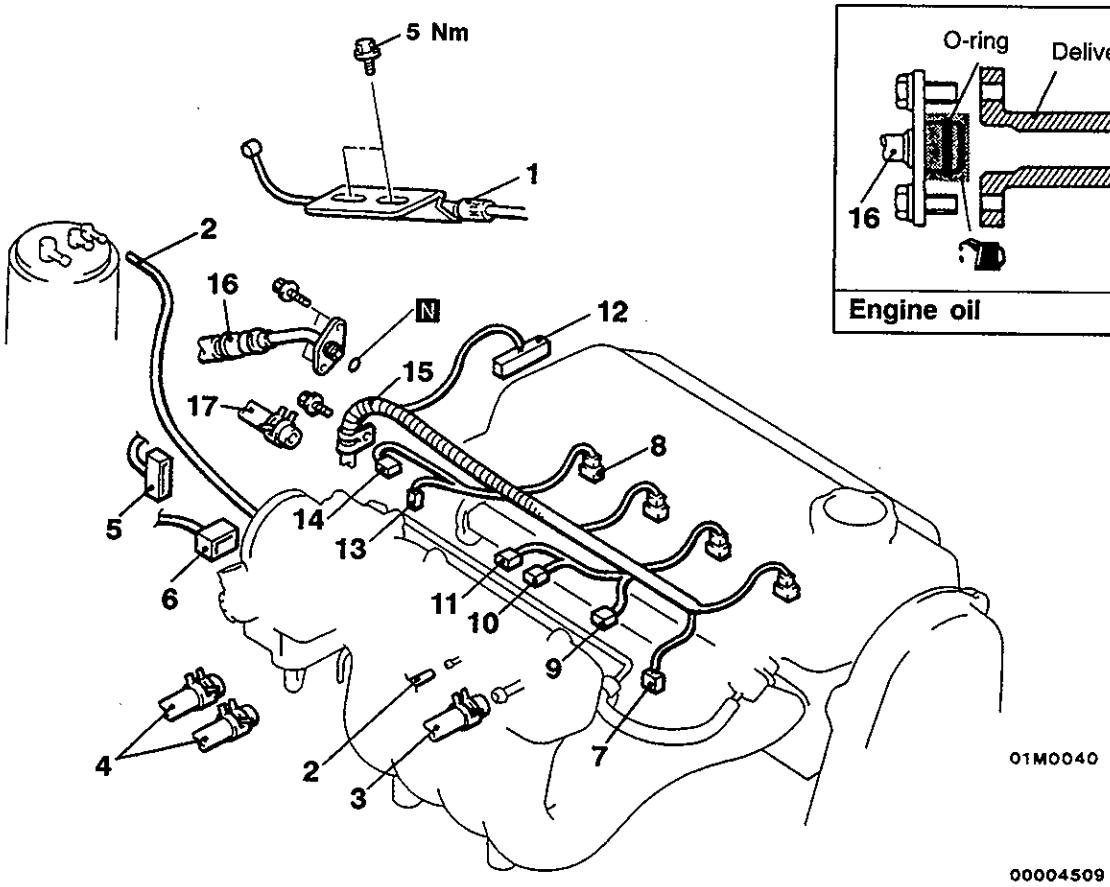
ENGINE ASSEMBLY

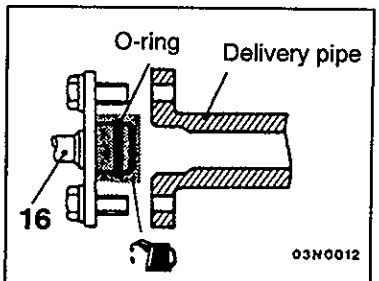
11200100268

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to GROUP 13A – On-vehicle Service.)
- Under Cover Removal
- Hood Removal (Refer to GROUP 42.)
- Air Cleaner Removal
- Radiator Removal (Refer to GROUP 14.)
- Front Exhaust Pipe Removal (Refer to GROUP 15.)

Post-installation Operation
- Front Exhaust Pipe Installation (Refer to GROUP 15.)
- Radiator Installation (Refer to GROUP 14.)
- Air Cleaner Installation
- Hood Installation (Refer to GROUP 42.)
- Under Cover Installation
- Drive Belt Tension Adjustment (Refer to P.11A-6.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)





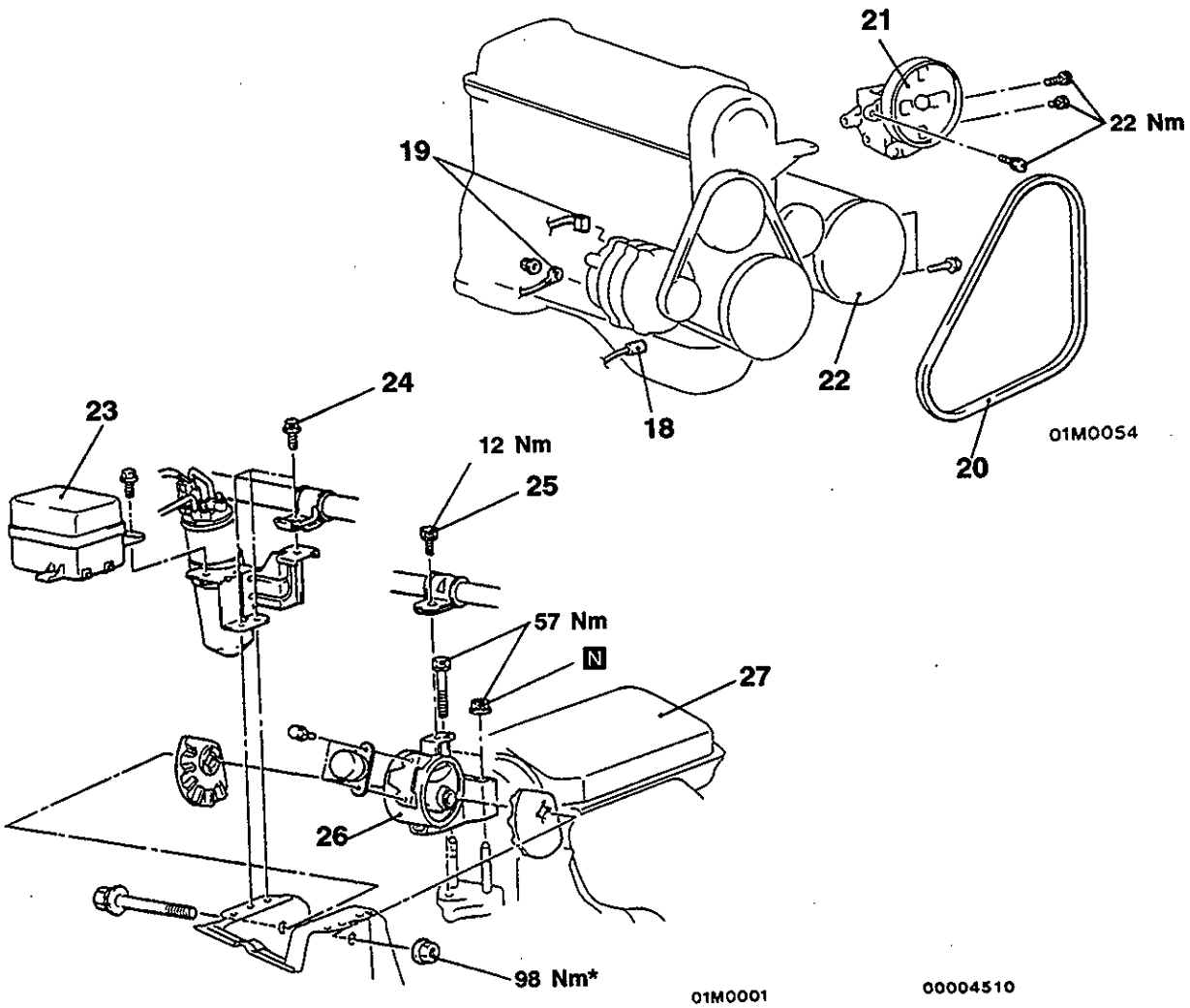
Engine oil

Removal steps

1. Accelerator cable connection
2. Vacuum hose connection
3. Brake booster vacuum hose connection
4. Heater hose connection
5. Throttle position sensor connector
6. Idle speed control connector
7. Oxygen sensor connector
8. Injector connector
9. Intake air temperature sensor connector
10. Purge control solenoid valve connector
11. EGR solenoid valve connector
12. Distributor connector
13. Engine coolant temperature gauge unit connector
14. Engine coolant temperature sensor connector
15. Control wiring harness

▶C◀ 16. High-pressure fuel hose connection

17. Fuel return hose connection



18. Oil pressure switch connector
19. Alternator connector
20. Drive belt (Power steering and A/C)

◀A▶ 21. Power steering oil pump and bracket assembly

◀B▶ 22. Air conditioner compressor
- Transmission assembly
(M/T: Refer to GROUP 22)
(A/T: Refer to GROUP 23)

23. Air conditioner relay box
24. Air conditioner receiver bracket mounting bolts
25. Power steering hose mounting bolt

◀C▶ ▶B◀ 26. Engine mount bracket

◀D▶ ▶A◀ 27. Engine assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

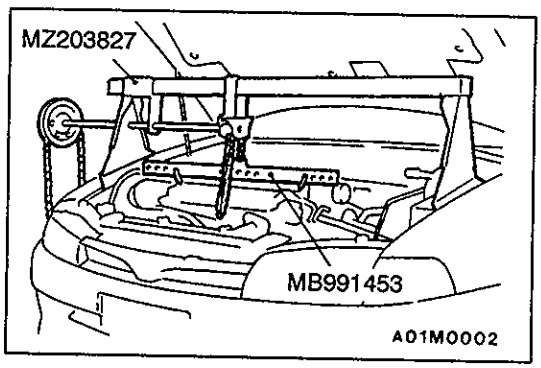
Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the 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 special 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.

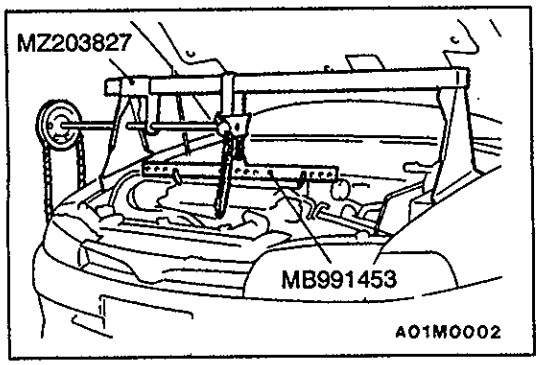
◀D▶ ENGINE ASSEMBLY REMOVAL

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 special tool.

▶C◀ HIGH-PRESSURE FUEL 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 it to 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 high-pressure fuel hose and check the O-ring for damage. After this, re-insert the delivery pipe and check that the hose turns smoothly.

NOTES

ENGINE <4G9>

CONTENTS

11109000290

GENERAL INFORMATION

11100010193

Items			4G92
Total displacement mℓ			1,597
Bore × Stroke mm			81.0 ×77.5
Compression ratio			10.0
Combustion chamber			Pentroof type
Camshaft arrangement			SOHC
Number of valve	Intake		8
	Exhaust		8
Valve timing	Intake	Opening	BTDC 20°
		Closing	ABDC 42°
	Exhaust	Opening	BBDC 54°
		Closing	ATDC 2°
Fuel system			Electronically controlled multipoint fuel injection
Rocker arm			Roller type
Auto-lash adjuster			Not equipped

SERVICE SPECIFICATIONS

11100030243

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	–
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		Intake valve	0.20	–
		Exhaust valve	0.30	–

Items		Standard value	Limit
Basic ignition timing		5° BTDC±3°	–
Idle speed r/min	Except MVV	750 ± 100	–
	MVV	700 ± 100	–
CO contents %		0.5 or less	–
HC contents ppm		100 or less	–
Compression pressure (250–400 r/min) kPa		1422	min. 1084
Compression pressure difference of all cylinder kPa		–	max. 100
Intake manifold vacuum kPa		min. 60	–
Cylinder head bolt shank length mm		–	96.4

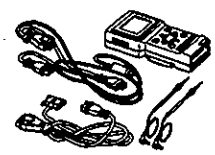
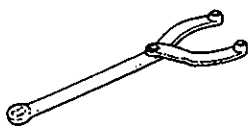
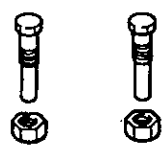
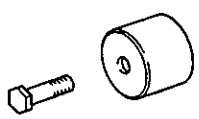
SEALANTS

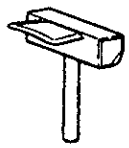
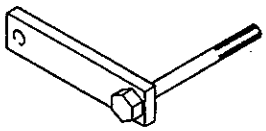
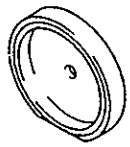
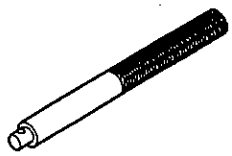
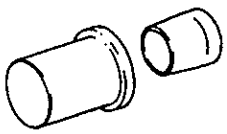
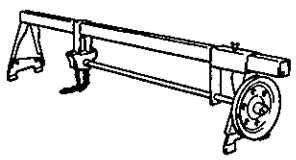
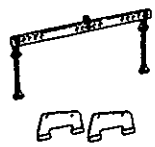
11100050225

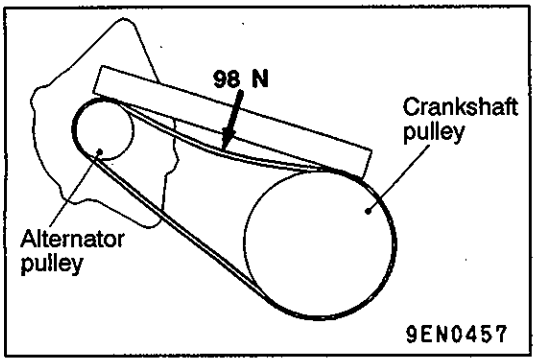
Items	Specified sealants	Remarks
Oil pan Camshaft position sensor support	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant
Flywheel bolt <M/T> or drive plate bolt <A/T>	3M Stud Locking 4170 or equivalent	–

SPECIAL TOOLS

11100060235

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	Checking the idle speed
	MB990767	End yoke holder	• Holding the camshaft sprocket • Holding the crankshaft pulley
	MD998719 or MD998754	Crankshaft pulley holder pin	
	MD998713	Camshaft oil seal installer	Press-in of the camshaft oil seal

Tool	Number	Name	Use
	MD998727	Oil pan remover	Removal of oil pan
	MD998781	Flywheel stopper	Securing the flywheel <M/T> or drive plate <A/T>
	MD998776	Crankshaft rear oil seal installer	Press-in of the crankshaft rear oil seal
	MB990938	Handle	
	MD998717	Crankshaft front oil seal installer	Press-in of the crankshaft front oil seal
	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
	MB991453	Engine hanger assembly	



ON-VEHICLE SERVICE

11100090265

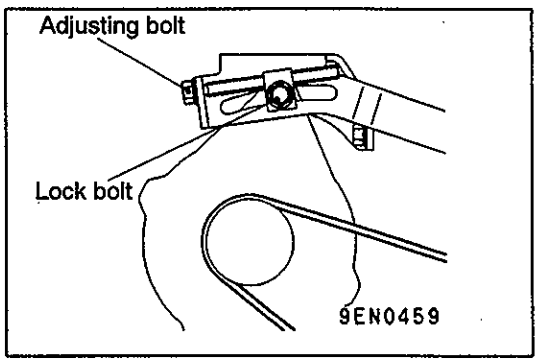
DRIVE BELT TENSION CHECK AND ADJUSTMENT

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:

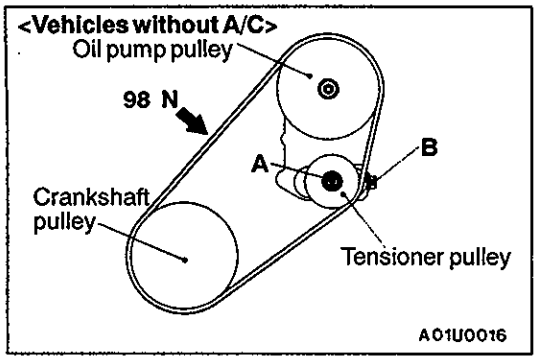
Items	When a used belt is installed	When a new belt is installed
Tension N	343–441	490–686
Deflection (Reference value) mm	8.5–10.0	7.0–8.0

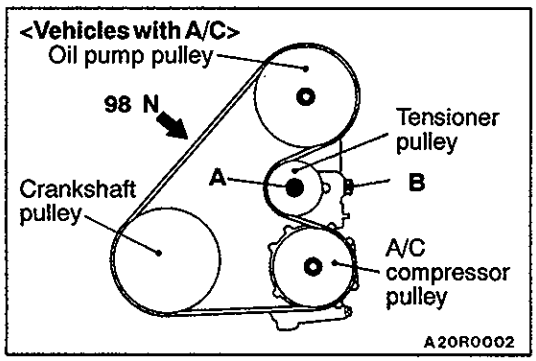
4. Tighten the lock bolt.

   Tightening torque: 23 Nm
5. Tighten the nut of the alternator pivot bolt.

   Tightening torque: 44 Nm
6. Tighten the adjusting bolt.

   Tightening torque: 9.8 Nm





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

11100130073

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 (Reference value) 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 tensioner pulley fixing nut A.
   (2) Adjust the amount of belt deflection using adjusting bolt B.
   (3) Tighten fixing nut A.

   Tightening torque: 25 Nm

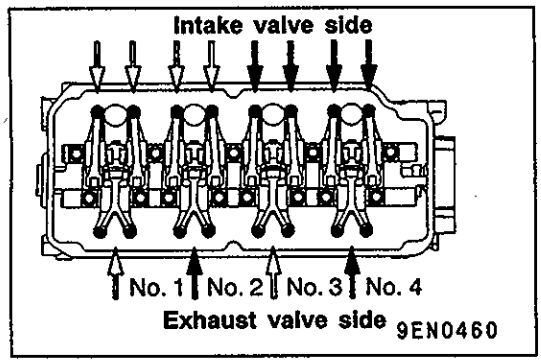
   (4) Check the belt deflection amount and tension, and readjust if necessary.

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

VALVE CLEARANCE CHECK AND ADJUSTMENT

11100150062

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 11100170105

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

   Standard value:
   Except MVV: 750 ± 100 r/min
   MVV: 700 ± 100 r/min
6. Select No.17 of the MUT-II ACTUATOR TEST.
7. Check that basic ignition timing is within the standard value.

   Standard value: 5° BTDC±3°
8. If the basic ignition timing is outside the standard value, inspect the MPI system while referring to GROUP 13A – Troubleshooting.

9. Press the MUT-II clear key (Select a forced driving cancel mode) to release the ACTUATOR TEST.

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

    Standard value:
    Except MVV: approx. 10°BTDC
    MVV: approx. 12°BTDC

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

IDLE SPEED CHECK

11100190217

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

   Standard value: 5° BTDC±3°
4. Run the engine at idle for 2 minutes.
5. Check the idle speed. Select item No. 22 and take a reading of the idle speed.

   Curb idle speed:
   Except MVV: 750 ± 100 r/min
   MVV: 700 ± 100 r/min

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

IDLE MIXTURE CHECK

11100210180

1. Before inspection, set the vehicle to the pre-inspection condition.
2. Turn the ignition switch to OFF and connect the MUT-II to the diagnosis connector.
3. Check that the basic ignition timing is within the standard value.

   Standard value: 5° BTDC±3°
4. Run the engine 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.

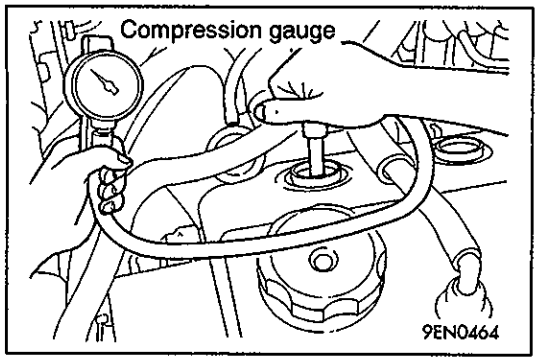
COMPRESSION PRESSURE CHECK 11100260215

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 crank angle sensor connector.

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

5. Cover the spark plug hole with a shop towel 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): 1422 kPa

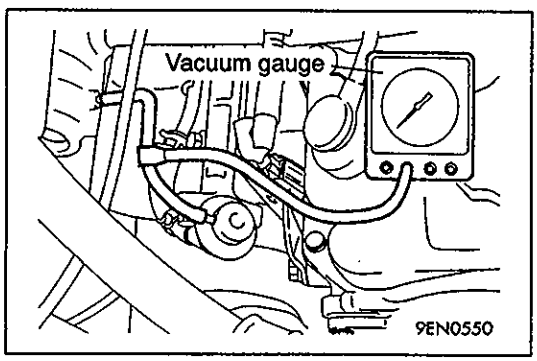
   Limit (at engine speed of 250–400 r/min): min. 1084 kPa

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 diagnosis code resulting from the distributor connector being disconnected.

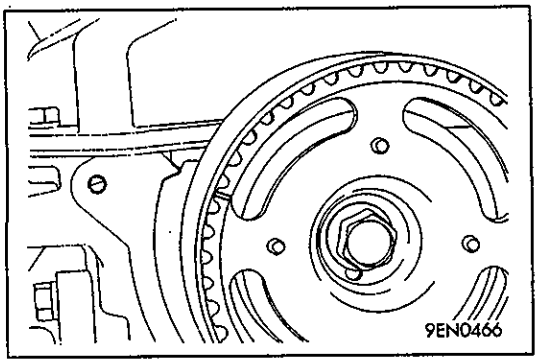


MANIFOLD VACUUM CHECK

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



TIMING BELT TENSION ADJUSTMENT 11100280075

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 90°–180°.
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.

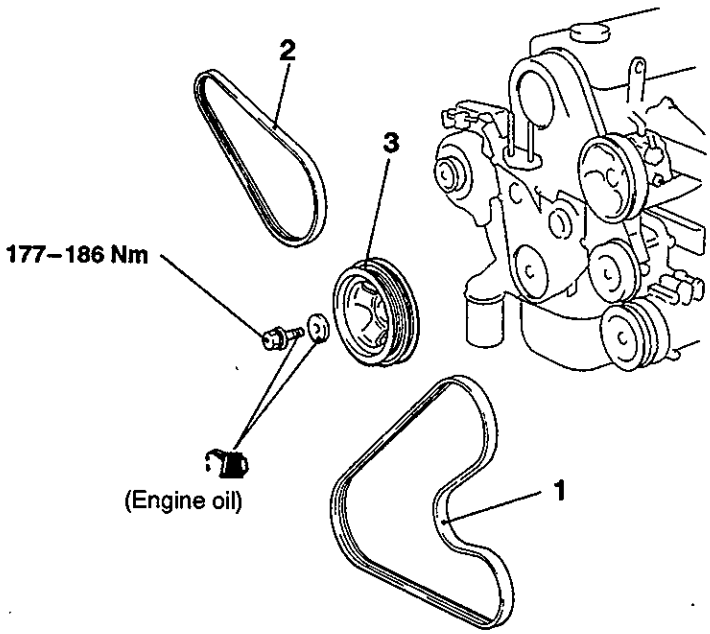
CRANKSHAFT PULLEY

11200160181

REMOVAL AND INSTALLATION

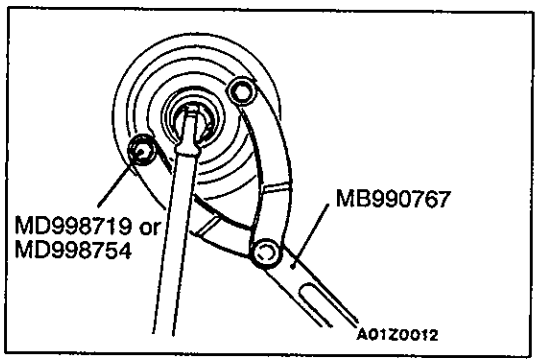
Pre-removal Operation
- Under Cover Removal

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



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

◀A▶ ▶A◀ 3. Crankshaft pulley



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY REMOVAL

INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT PULLEY INSTALLATION

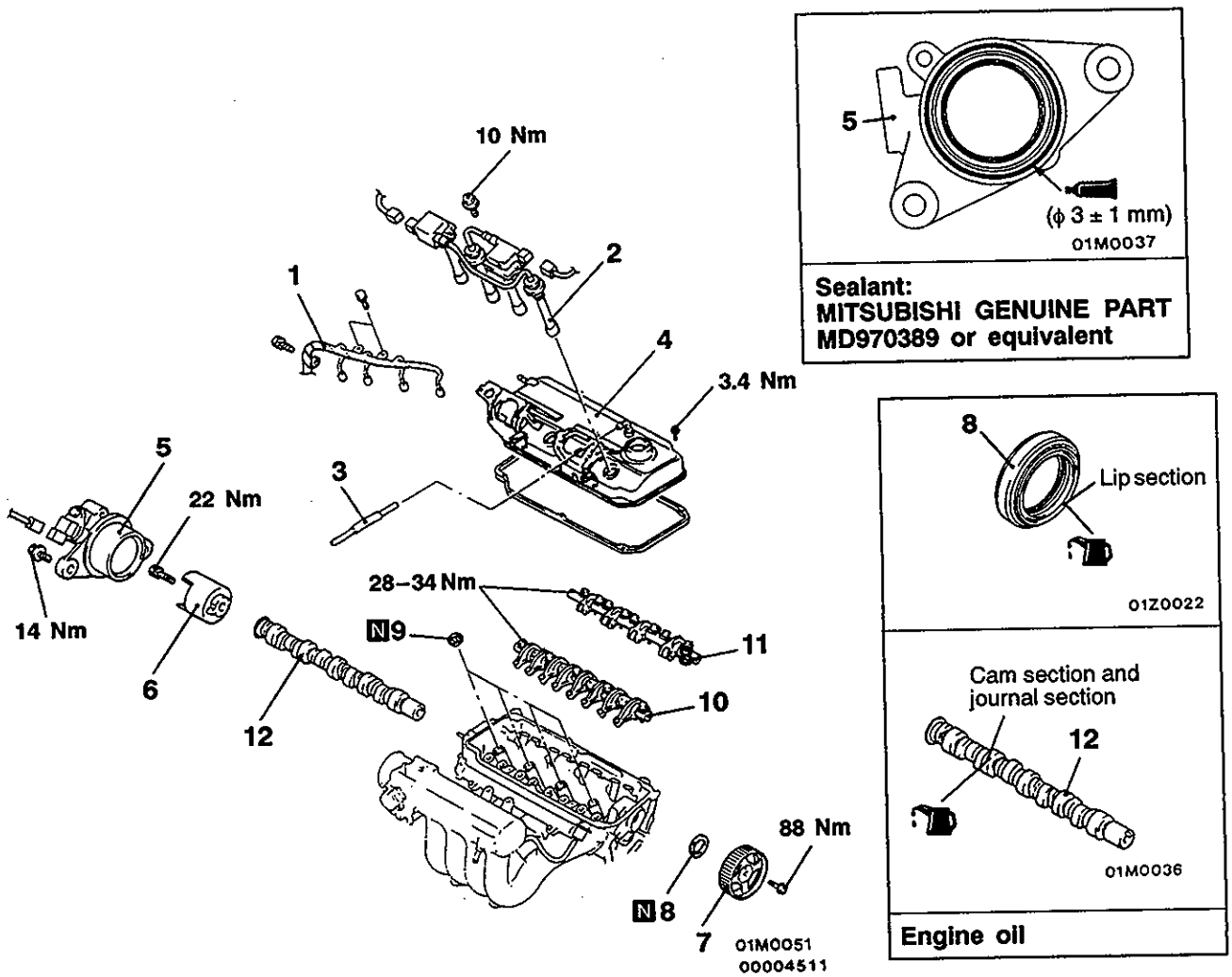
When installing the crankshaft bolt, apply the minimum amount of engine oil to the bearing surface and thread of the bolt.

CAMSHAFT AND CAMSHAFT OIL SEAL

11200190203

REMOVAL AND INSTALLATION

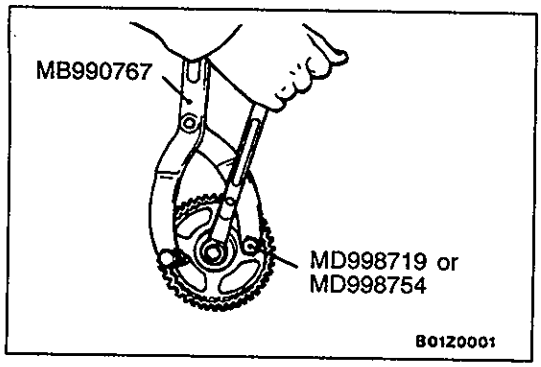
Pre-removal and Post-installation Operation
- Air Cleaner Removal and Installation
- Timing Belt Removal and Installation (Refer to P.11B-22.)



Removal steps
1. Control harness connection
2. Spark plug cable
3. PCV hose connection
4. Rocker cover
- Valve clearance adjustment (Refer to P.11B-6.)

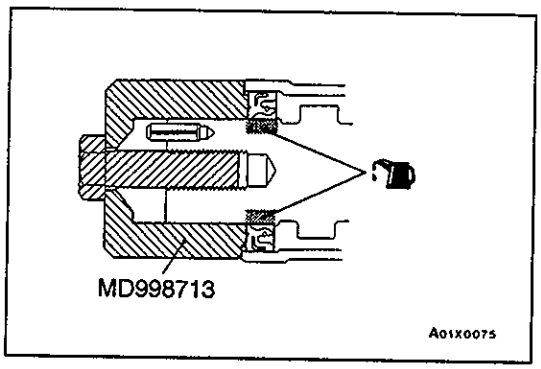
5. Camshaft position sensor support
6. Camshaft position sensing cylinder

◀A▶ ▶B◀ ▶A◀
7. Camshaft sprocket
8. Camshaft oil seal
9. Spark plug guide oil seal
10. Rocker arm and shaft assembly (intake side)
11. Rocker arm and shaft assembly (exhaust side)
12. Camshaft



REMOVAL SERVICE POINT

◀A▶ CAMSHAFT SPROCKET REMOVAL



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

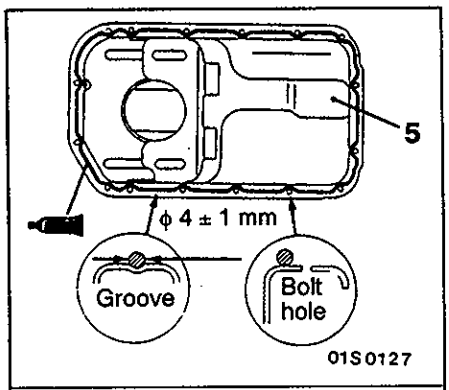
Use the special tool to stop the camshaft sprocket from turning in the same way as was done during removal, and then tighten the bolts to the specified torque.

OIL PAN

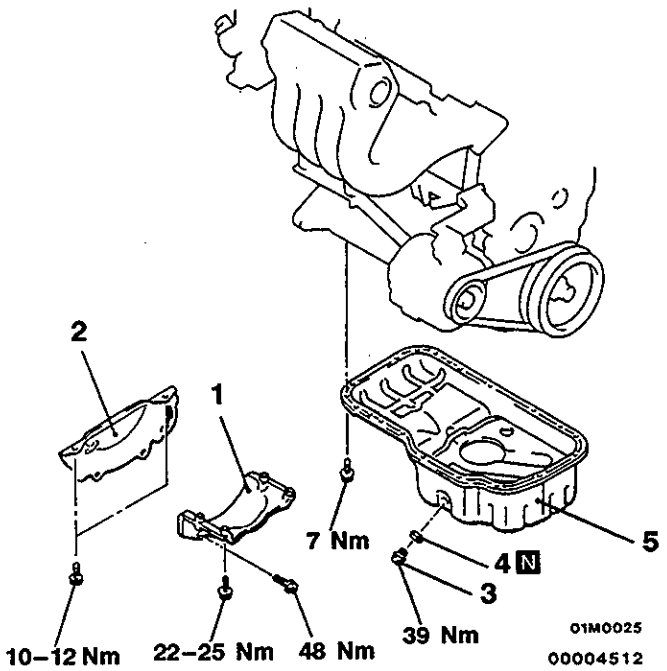
11200280115

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
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15.)

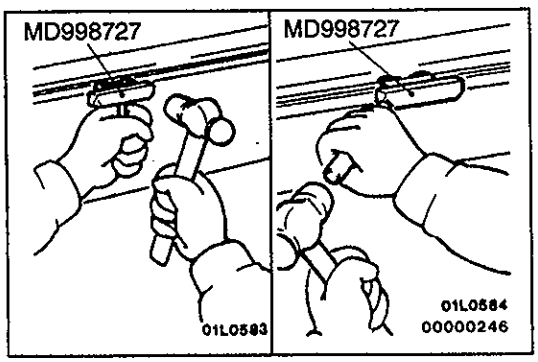


Sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent



Removal steps
1. Transmission stay
2. Bell housing cover
3. Drain plug
4. Drain plug gasket
5. Oil pan

◀A▶ ▶A◀

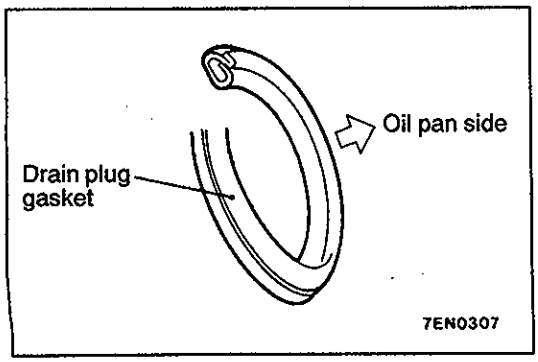


REMOVAL SERVICE POINT

◀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

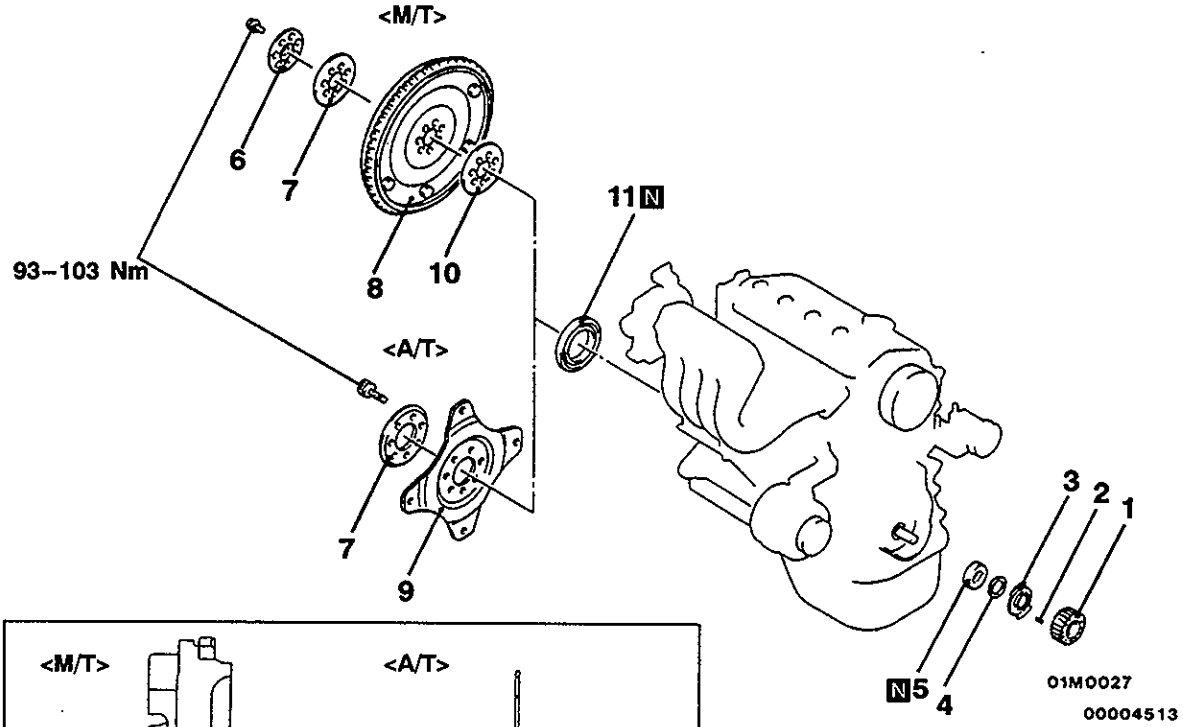
▶A◀ DRAIN PLUG GASKET INSTALLATION

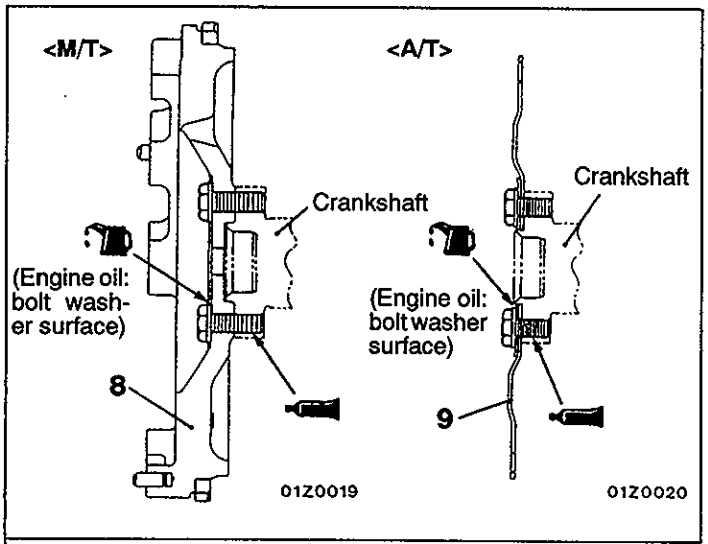
Install the drain plug gasket in the direction so that it faces as shown in the illustration.

CRANKSHAFT OIL SEAL

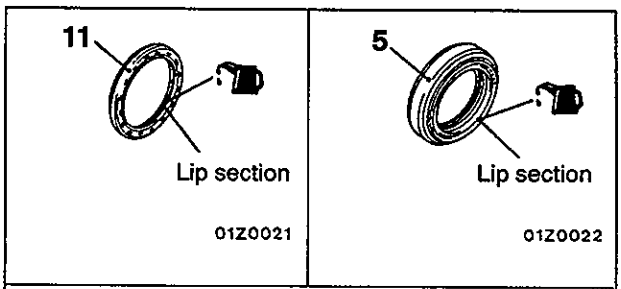
11200310050

REMOVAL AND INSTALLATION





Sealant: 3M Stud locking 4170 or equivalent



Engine oil

Crankshaft front oil seal removal steps

- Timing belt (Refer to P.11B-22.)
- Crank angle sensor (Refer to GROUP 16.)

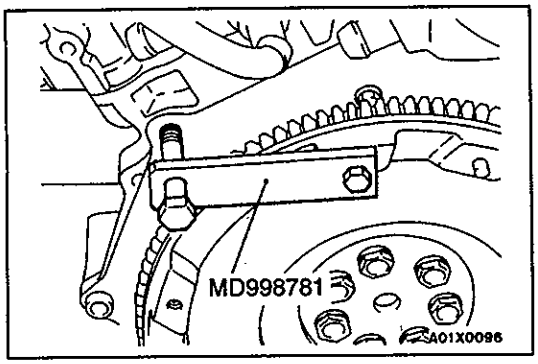
1. Crankshaft sprocket
2. Key
3. Crankshaft sensing blade
4. Crankshaft spacer

▶C◀ 5. Crankshaft front oil seal

Crankshaft rear oil seal removal steps

- Oil pan (Refer to P.11B-15.)
- Transmission assembly (M/T: Refer to GROUP 22.) (A/T: Refer to GROUP 23.)
- Clutch cover and disc <M/T>

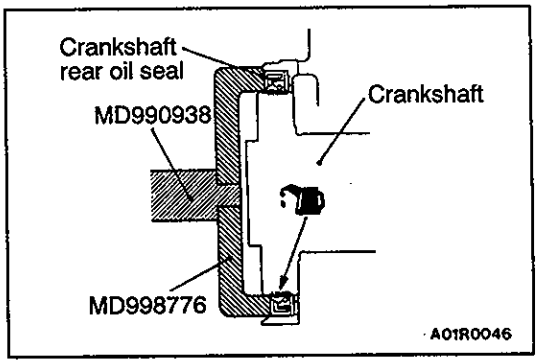
◀A▶ ▶B◀ 6. Plate <M/T>
◀A▶ ▶B◀ 7. Adapter plate
◀A▶ ▶B◀ 8. Flywheel <M/T>
◀A▶ ▶B◀ 9. Drive plate <A/T>
◀A▶ ▶B◀ 10. Adapter plate <M/T>
▶A◀ 11. Crankshaft rear oil seal



REMOVAL SERVICE POINT

◀A▶ PLATE <M/T>/ADAPTER PLATE/FLYWHEEL <M/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

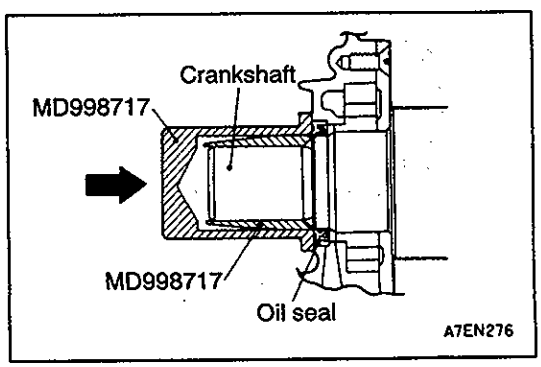
1. Apply a small mount of engine oil to the entire circumference of the oil seal lip.
2. Install the oil seal by tapping it as far as the chamfered position of the oil seal case as shown in the illustration.

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

1. Clean off all sealant, oil and other substances which are adhering to the threaded bolts, crankshaft thread holes and the flywheel or drive plate.
2. Apply oil to the bearing surface of the flywheel or drive plate 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 hold the flywheel or drive plate in the same manner as removal, and install the bolt.



▶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.

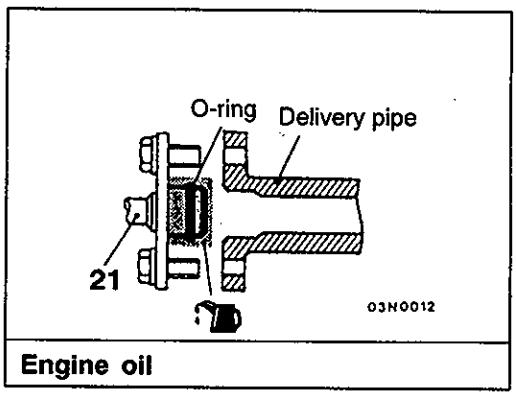
CYLINDER HEAD GASKET

11200400276

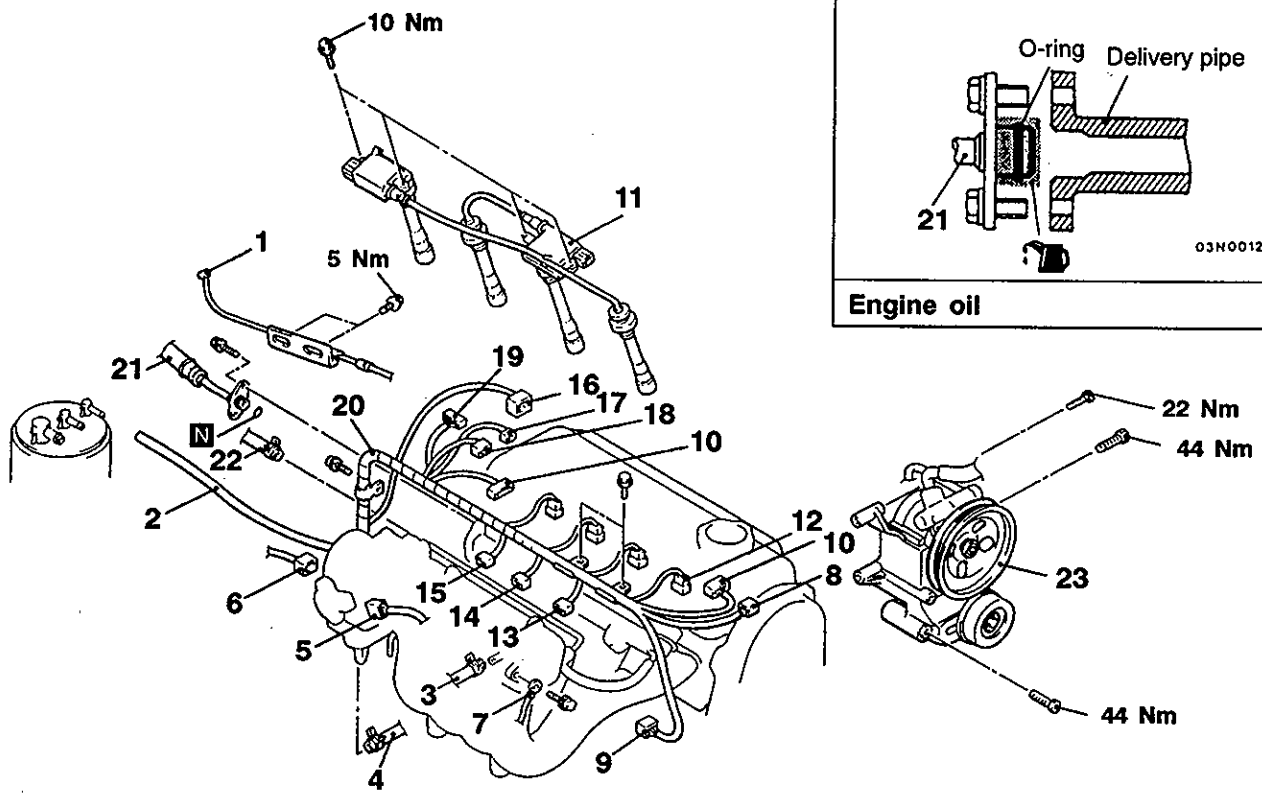
REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to GROUP 13A – On-vehicle Service.)
- Engine Oil Draining (Refer to GROUP 12 – On-vehicle Service.)
- Thermostat Case Assembly Removal (Refer to GROUP 14 – Water Hose and Water Pipe.)

Post-installation Operation
- Thermostat Case Assembly Installation (Refer to GROUP 14 – Water Hose and Water Pipe.)
- Engine Oil Supplying (Refer to GROUP 12 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)



Engine oil

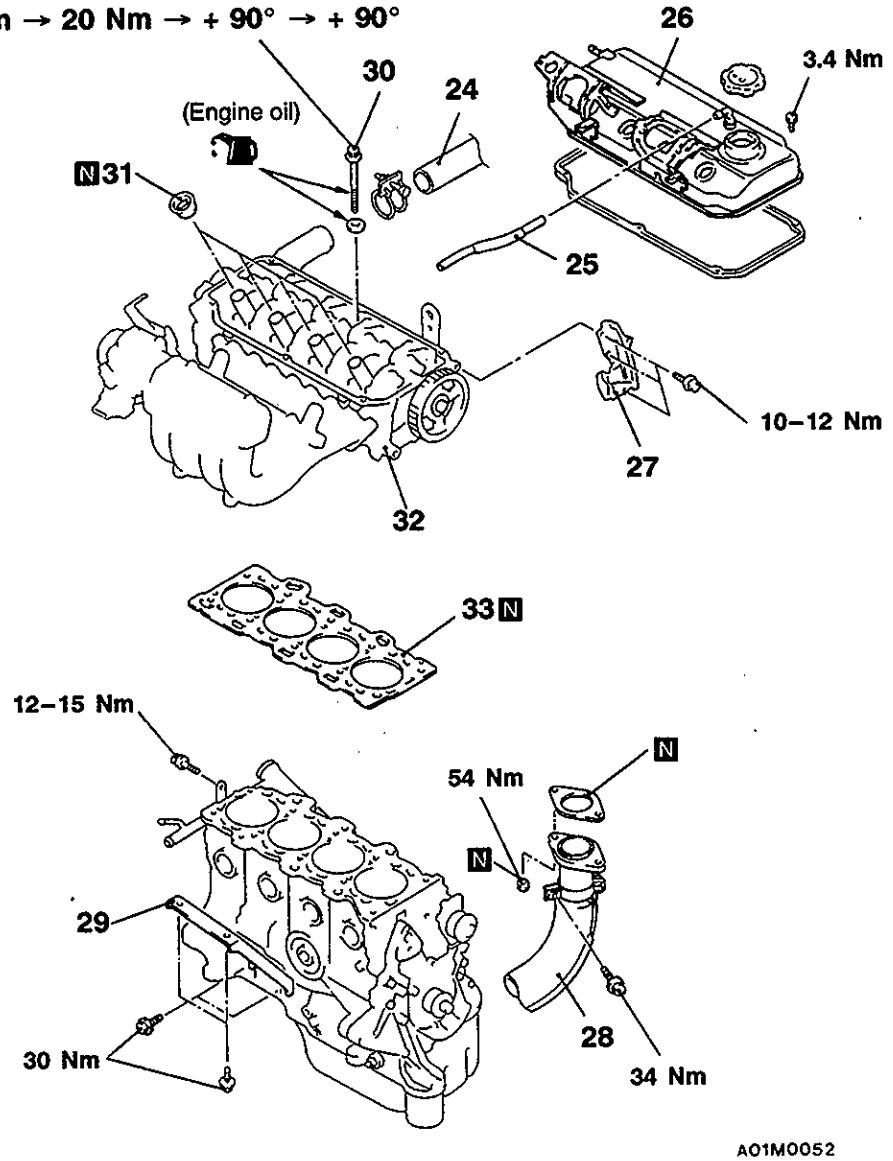


01M0046
00004514

Removal steps

1. Accelerator cable connection
2. Vacuum hose connection
3. Brake booster vacuum hose connection
4. Water hose connection
5. Throttle position sensor connector
6. Idle speed control connector
7. Earth cable connection
8. Crank angle sensor connector
9. Oxygen sensor connector <Except MVV>
10. Ignition coil connector
11. Ignition coil assembly
12. Injector connector
13. Purge control solenoid valve connector
14. EGR solenoid valve connector
15. Air by-pass solenoid valve connector <MVV>
16. Oxygen sensor connector <MVV>
17. Engine coolant temperature gauge unit connector
18. Engine coolant temperature sensor connector
19. Camshaft position sensor connector
20. Control wiring harness
- ▶C◀ 21. High-pressure fuel hose connection
22. Fuel return hose connection
- ◀A▶ 23. Power steering oil pump and bracket assembly

<Cold engine>
74 Nm → 0 Nm → 20 Nm → + 90° → + 90°



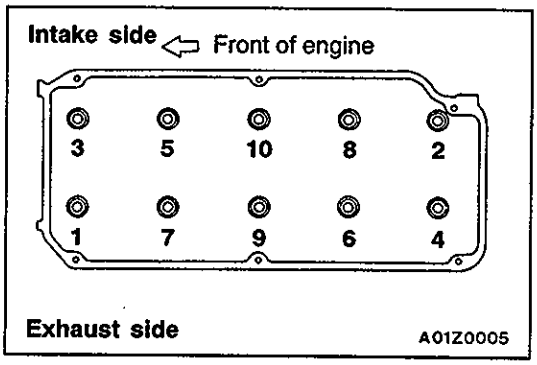
24. Radiator upper hose connection
25. PCV hose
26. Rocker cover
    - Timing belt (Refer to P.11B-22.)
27. Timing belt rear cover
28. Front exhaust pipe connection
29. Intake manifold stay
◀B▶ ▶B◀ 30. Cylinder head bolt
31. Spark plug guide oil seal
32. Cylinder head assembly
▶A◀ 33. Cylinder head gasket

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▶ CYLINDER HEAD BOLT REMOVAL

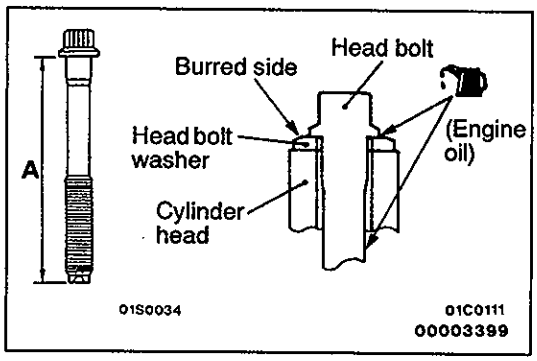
Loosen the bolts in 2 or 3 steps in order of the numbers shown in the illustration, and remove the cylinder head assembly.

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

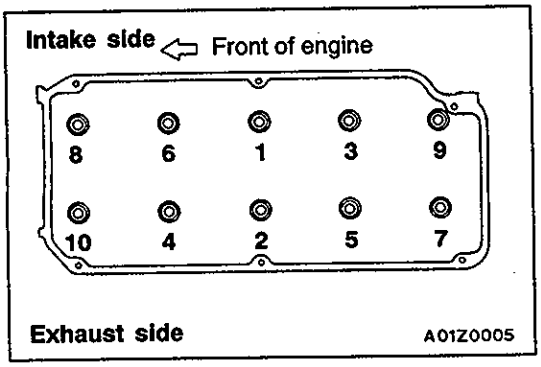
▶A◀ CYLINDER HEAD GASKET INSTALLATION

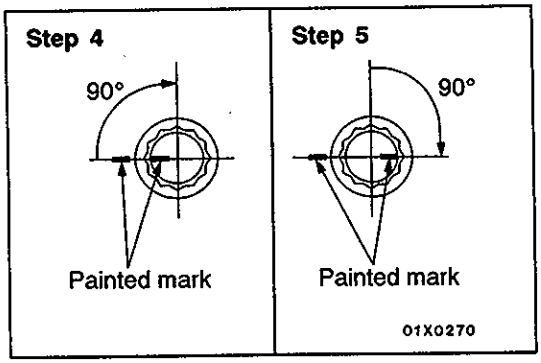
1. Wipe off all oil and grease from the gasket mounting surface.
2. Install so that the shapes of the cylinder head holes match the shapes of the respective cylinder head gasket holes.



▶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 74 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◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

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

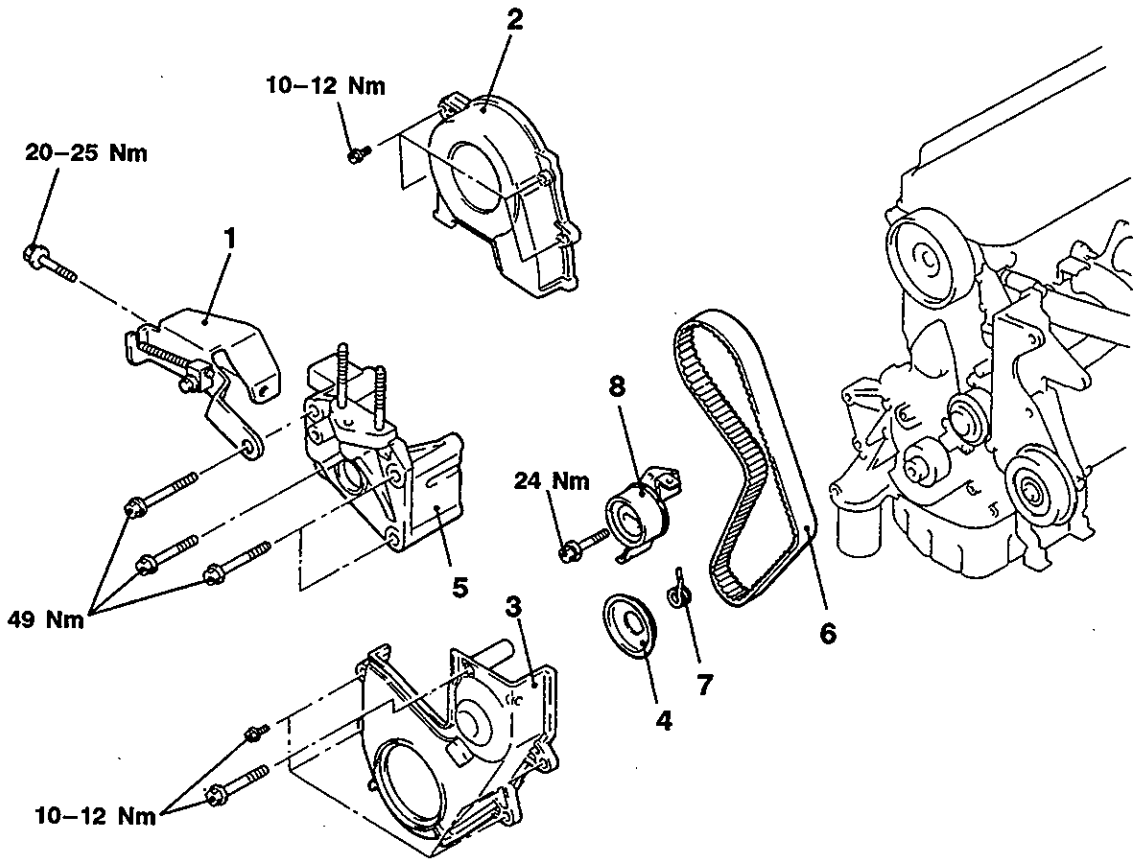
   Caution
   Do not let any engine oil get into the delivery pipe.
2. While turning the high-pressure fuel hose to the right and left, install the delivery pipe, while being careful not to damage the O-ring. After installing, check that the hose turns smoothly.
3. If the hose does not turn smoothly, the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

TIMING BELT

11200430268

REMOVAL AND INSTALLATION

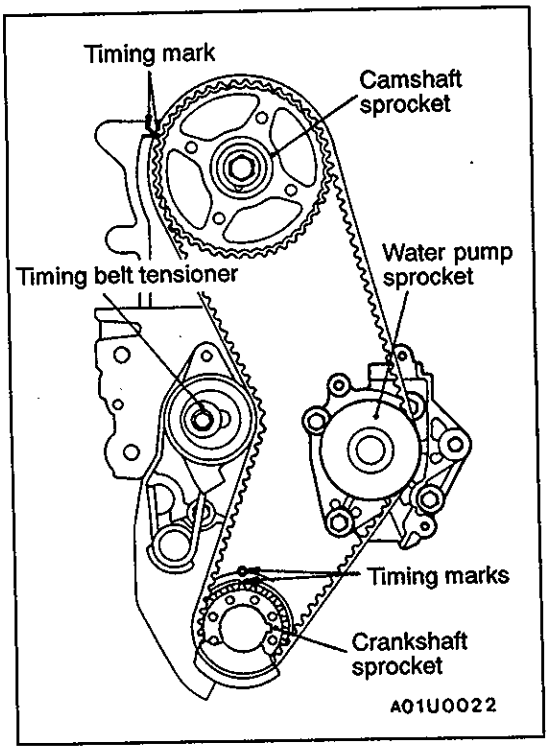
Pre-removal and Post-installation Operation
- Crankshaft Pulley Removal and Installation (Refer to P.11B-12.)
- Engine Mount Bracket Removal and Installation (Refer to GROUP 32 – Engine Mounting.)



A01M0039

Removal steps

1. Alternator brace
2. Timing belt upper cover
3. Timing belt lower cover
- ▶C◀ 4. Flange
5. Engine support bracket
- ▶B◀ ● Timing belt tension adjustment
- ◀A▶ ▶A◀ 6. Timing belt
7. Tensioner spring
8. Timing belt tensioner

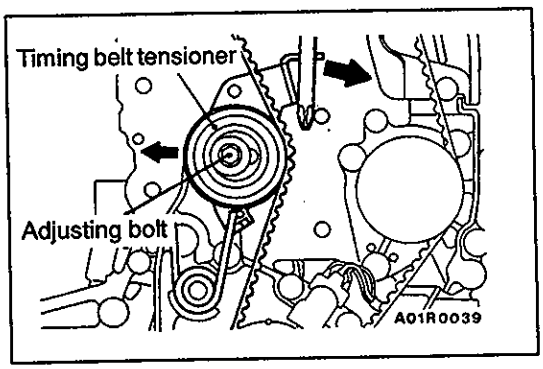


REMOVAL SERVICE POINT

◀A▶ TIMING BELT REMOVAL

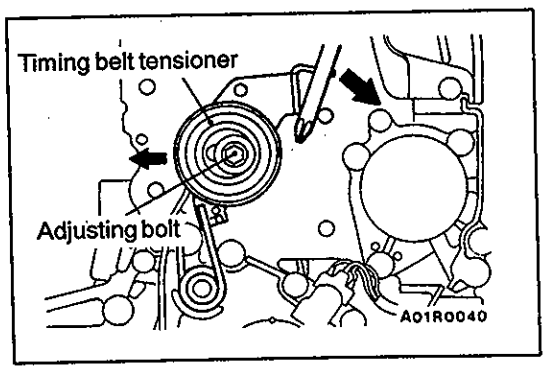
1. Turn the crankshaft clockwise (right turn) to align each timing mark and to set the No. 1 cylinder at compression top dead centre.

Caution
The crankshaft should always be turned only clockwise.



2. Loosen the adjusting 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 adjusting bolt.
5. Remove the timing belt.

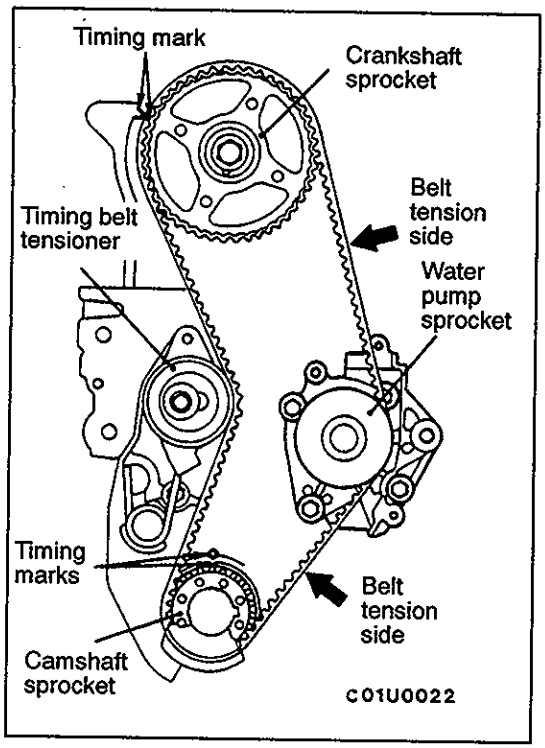
Caution
If the timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (right turn).



INSTALLATION SERVICE POINTS

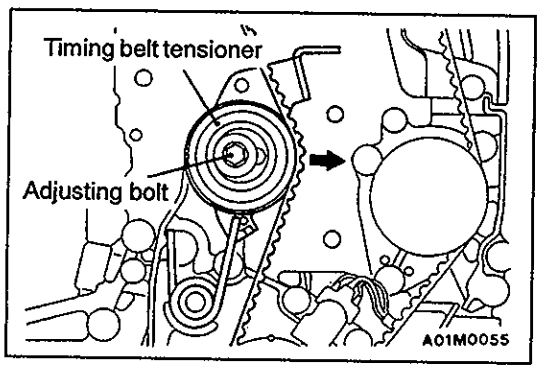
▶A◀ TIMING BELT INSTALLATION

1. Set a screwdriver to the timing belt tensioner and press it fully back in the direction of the arrow.
2. Provisionally tighten the adjusting bolt.



3. Align each of the camshaft sprocket and the crankshaft sprocket timing marks.
4. 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

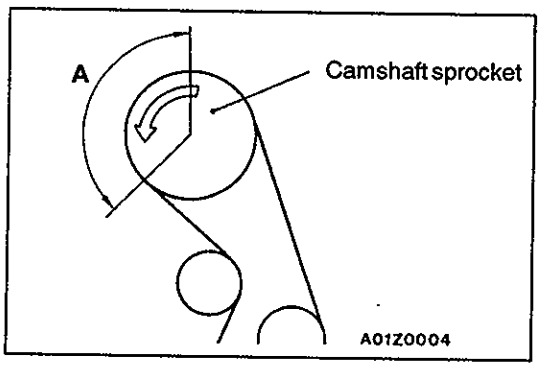
Caution
After installing the timing belt, apply force to turn the camshaft sprocket in the reverse direction, and recheck to be sure that the belt is fully tensioned and that each timing mark is in the proper position.



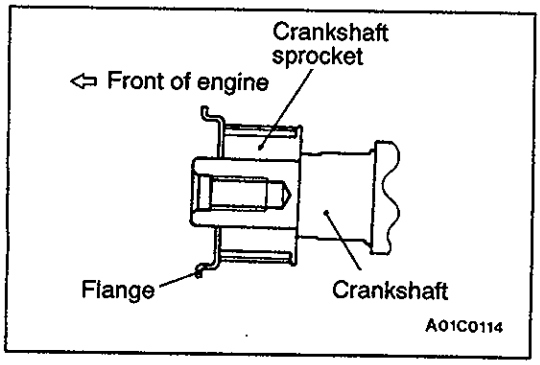
▶B◀ TIMING BELT TENSION ADJUSTMENT

1. Loosen the adjusting bolt of the temporarily secured timing belt tensioner by 1/4 – 1/2 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.

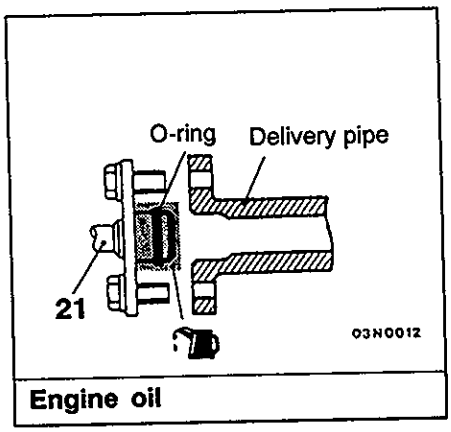
ENGINE ASSEMBLY

11200100275

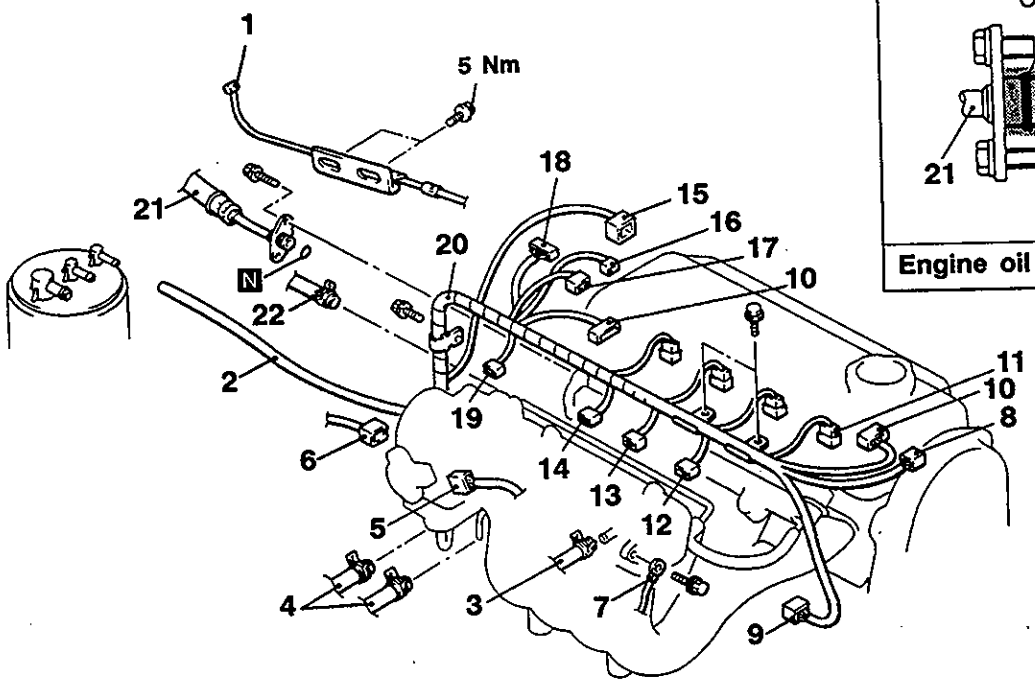
REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to GROUP 13A – On-vehicle Service.)
- Under Cover Removal
- Hood Removal (Refer to GROUP 42.)
- Air Cleaner Removal
- Radiator Removal (Refer to GROUP 14.)
- Front Exhaust Pipe Removal (Refer to GROUP 15.)

Post-installation Operation
- Front Exhaust Pipe Installation (Refer to GROUP 15.)
- Radiator Installation (Refer to GROUP 14.)
- Air Cleaner Installation
- Hood Installation (Refer to GROUP 42.)
- Under Cover Installation
- Drive Belt Tension Adjustment (Refer to P.11B-5.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)



Engine oil



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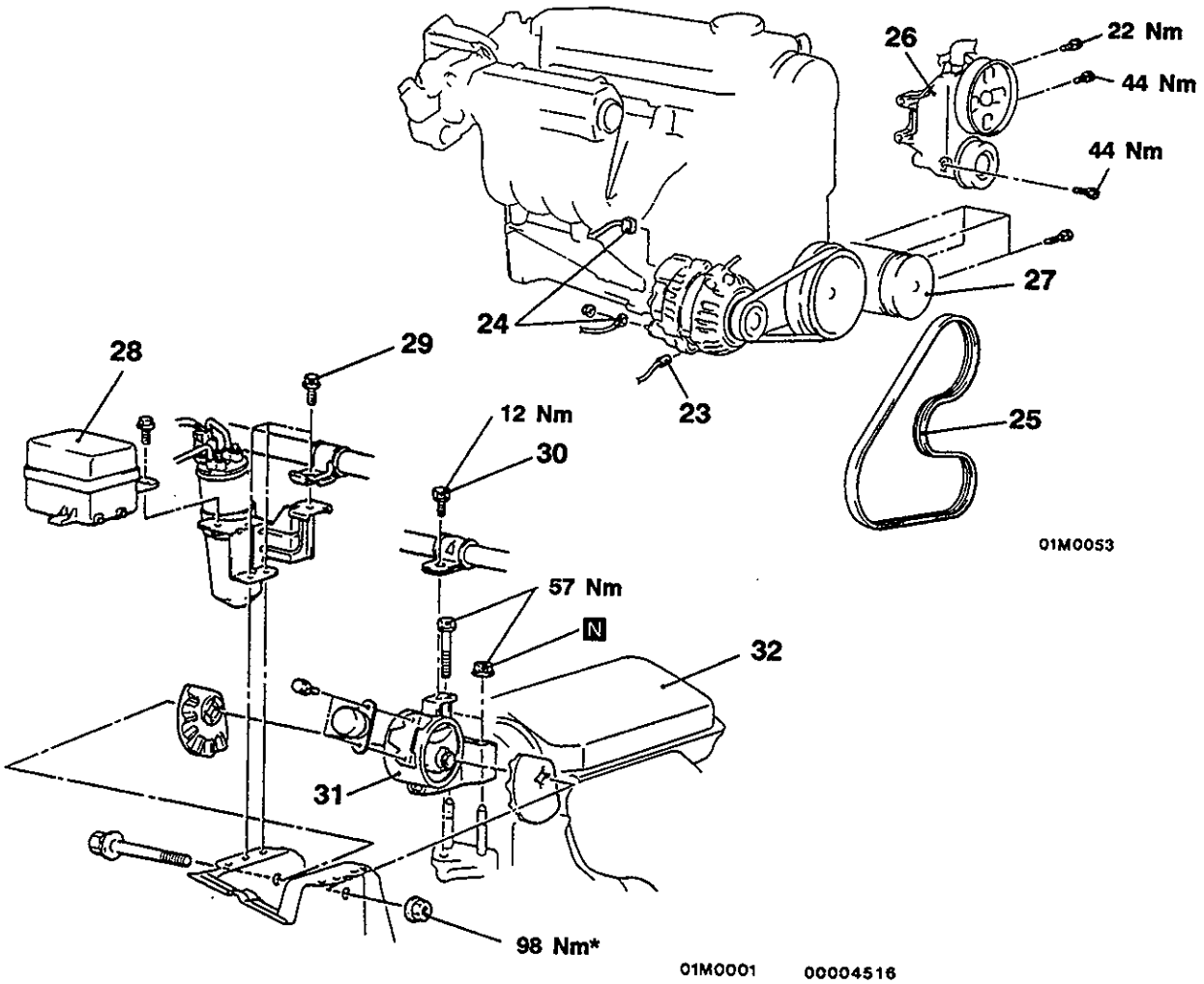
Removal steps
1. Accelerator cable connection
2. Vacuum hose connection
3. Brake booster vacuum hose connection
4. Heater hose connection
5. Throttle position sensor connector
6. Idle speed control connector
7. Earth cable connection
8. Crank angle sensor connector
9. Oxygen sensor connector <Except MVV>
10. Ignition coil connector
11. Injector connector
12. Purge control solenoid valve connector
13. EGR solenoid valve connector
14. Air by-pass solenoid valve connector <MVV>
15. Oxygen sensor connector <MVV>
16. Engine coolant temperature gauge unit connector
17. Engine coolant temperature sensor connector
18. Camshaft position sensor connector
19. Detonation sensor connector
20. Control wiring harness
- ▶C◀ 21. High-pressure fuel hose connection
22. Fuel return hose connection



23. Oil pressure switch connector
24. Alternator connector
25. Drive belt (Power steering and A/C)
◀A▶ 26. Power steering oil pump and bracket assembly
◀B▶ 27. Air conditioner compressor
- Transmission assembly (M/T: Refer to GROUP 22) (A/T: Refer to GROUP 23)

28. Air conditioner relay box
29. Air conditioner receiver bracket mounting bolts
30. Power steering hose mounting bolt
◀C▶ ▶B◀ ◀D▶ ▶A◀ 31. Engine mount bracket
32. Engine assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP AND BRACKET ASSEMBLY REMOVAL

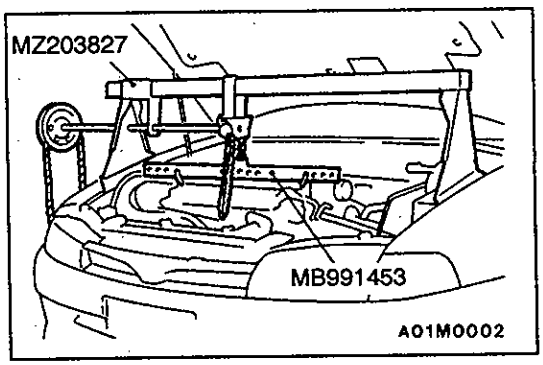
Remove the power steering oil pump and bracket assembly from the engine with the hose attached.

NOTE
Place the removed power steering oil pump in a place where it will not be a hindrance when removing and installing the 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 special 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.

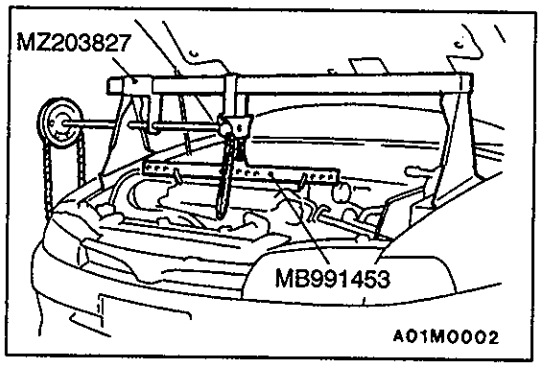
◀D▶ ENGINE ASSEMBLY REMOVAL

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 special tool.

▶C◀ HIGH-PRESSURE FUEL 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 high-pressure fuel hose to the right and left, install it to 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 high-pressure fuel hose and check the O-ring for damage. After this, re-insert the delivery pipe and check that the hose turns smoothly.

ENGINE LUBRICATION

CONTENTS

12109000020

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

12100040045

Items		Engine oil (API classification)	Quantity ℓ
Oil filter		SG or higher	0.3
Total quantity	4G13		3.3
	4G92		3.8

SPECIAL TOOL

12100060041

Tool	Number	Name	Use
	MB991396	Oil filter wrench	Removal and installation of engine oil filter (When using the oil filter of MD135737)

ON-VEHICLE SERVICE

12100090026

ENGINE OIL INSPECTION

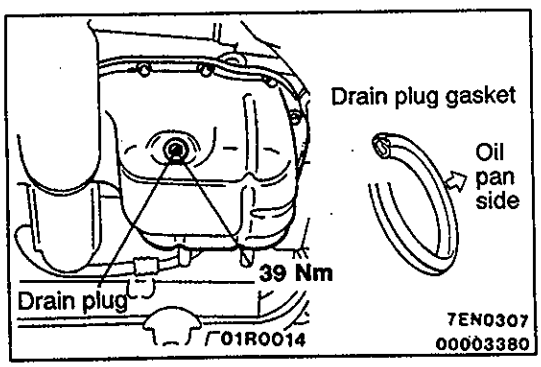
1. Pull out the level gauge slowly and check that the oil level is in the illustrated range.
2. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it has sufficient viscosity.

ENGINE OIL REPLACEMENT

12100100040

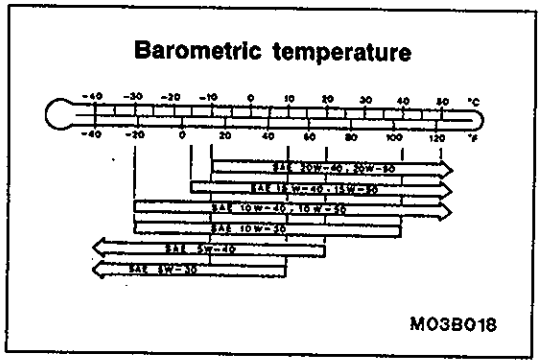
1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80°C to 90°C.
2. Remove the engine oil filler cap.
3. Remove the drain plug to drain oil.

Caution
Use care as oil could be hot.



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

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



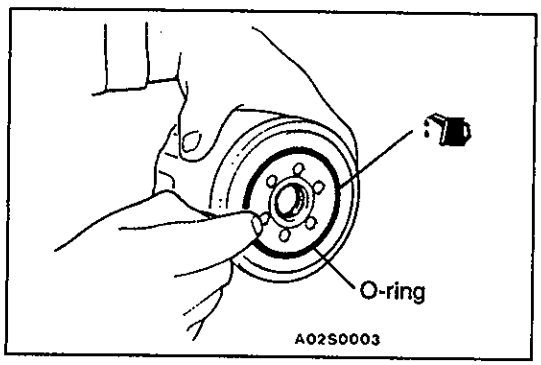
5. Refill with specified quantity of oil.
   Specified Engine Oil (API classification): SG or higher
   Total quantity (includes volume inside oil filter):
   <4G13> 3.3 ℓ
   <4G92> 3.8 ℓ
6. Install the engine oil filler cap.
7. Check oil level.

OIL FILTER REPLACEMENT

12100110043

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. Use the following tools to remove the engine oil filter from the underside of the vehicle.
   - MB991396 or equivalent (When using the oil filter of MD135737)
   - Commercial tool (When using the oil filter of MD332687)
5. Clean the filter bracket side mounting surface.



6. Apply a small amount of engine oil to the O-ring of the new oil filter.
7. Install the engine oil filter.

   NOTE
   Tightening torque:
   When using the oil filter of MD135737: 14 Nm
   When using the oil filter of MD332687: 16 Nm
8. Install the drain plug and refill engine oil. (Refer to Engine Oil Replacement on P.12-3.)
9. Race the engine 2–3 times, and check to be sure that no engine oil leaks from installation section of the oil filter.

FUEL

CONTENTS

13109000195

NOTE
THE GROUPS MARKED BY ▬ ARE NOT IN THIS MANUAL

MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

13109000201

CONTINUED ON NEXT PAGE

MULTIPOINT FUEL INJECTION (MPI) <4G1>

13100010142

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. Purge Control Solenoid Valve Control
   Refer to GROUP 17.
5. EGR Control Solenoid Valve Control
   Refer to GROUP 17.

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm	46
	Throttle position sensor	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	Rotary contact type, within throttle position sensor
Engine-ECU	Identification model No.	E2T65774 <Vehicles without immobilizer system> E2T65775 <Vehicles with immobilizer system>
Sensors	Vacuum sensor (Manifold absolute 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
	Crank angle sensor	Hall element type
	Power steering fluid pressure switch	Contact switch type
Actuators	Control relay type	Contact switch type
	Fuel pump relay type	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH116
	EGR control solenoid valve	ON/OFF type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	329

MULTI-POINT FUEL INJECTION SYSTEM DIAGRAM

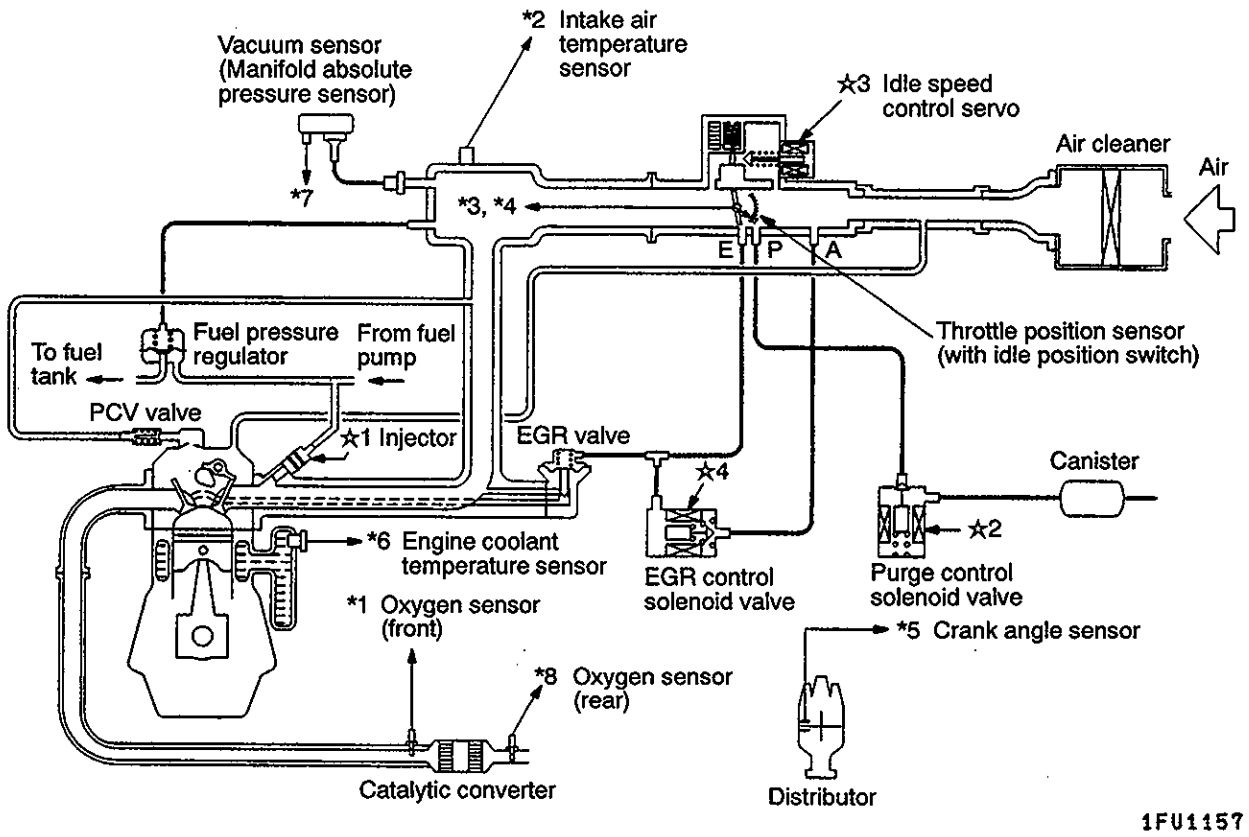
*1 Oxygen sensor (front)
*2 Intake air temperature sensor
*3 Throttle position sensor
*4 Idle position switch
*5 Crank angle sensor
*6 Engine coolant temperature sensor
*7 Vacuum sensor
*8 Oxygen sensor (rear)

- Power supply voltage
- Vehicle speed sensor
- A/C switch
- Inhibitor switch
- Power steering fluid pressure switch
- Ignition switch – ST
- Ignition switch – IG
- Alternator FR terminal

⇨ Engine-ECU ⇨

☆1 Injector
☆2 Purge control solenoid valve
☆3 Idle speed control servo
☆4 EGR control solenoid valve

- Fuel pump relay
- Control relay
- A/C power relay
- Engine warning lamp
- Diagnosis signal
- Ignition coil, power transistor
- Fan motor relay
- Alternator G terminal



SERVICE SPECIFICATIONS

13100030131

Items		Specifications
Basic idle speed r/min		750±50
Idle speed when A/C is ON r/min		850 at neutral position
Throttle position sensor adjusting voltage mV		400–1,000
Throttle 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)

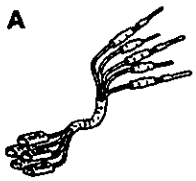
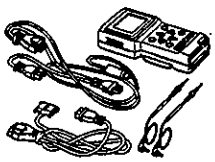
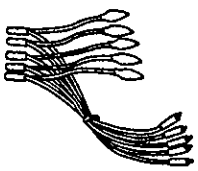
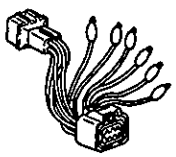
SEALANT

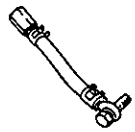
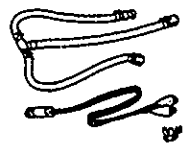
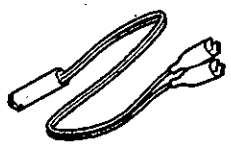
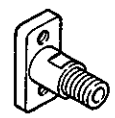
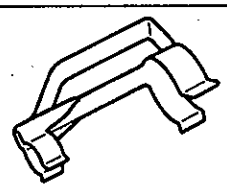
13100050038

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

SPECIAL TOOLS

13100060123

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 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
	MB991519	Alternator harness connector	Measurement of voltage during troubleshooting
	MD998463	Test harness (6-pin, square)	• Inspection of idle speed control servo • Inspection using an analyzer
	MD998464	Test harness (4-pin, triangle)	Inspection of oxygen sensor

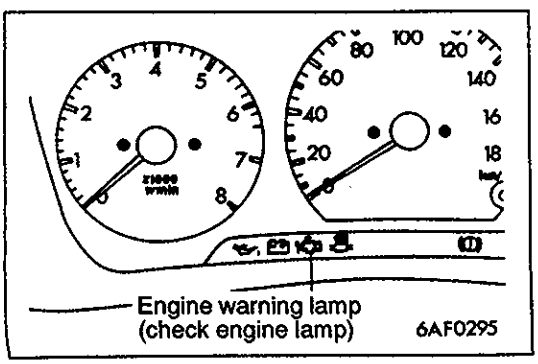
Tool	Number	Name	Use
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	Measurement of fuel pressure
	MD998706	Injector test set	Checking the spray condition of injectors
 MB991607	MB991607	Injector test harness	
 MD998741	MD998741	Injector test adaptor	
	MB991608	Clip	

TROUBLESHOOTING

13100850034

DIAGNOSIS TROUBLESHOOTING FLOW

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



DIAGNOSIS FUNCTION

13100860129

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
Vacuum sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Ignition timing adjustment signal
Injector
Immobilizer system

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 DATA LIST AND ACTUATOR TESTING

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

FAIL-SAFE FUNCTION REFERENCE TABLE

13100910121

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

Malfunctioning item	Control contents during malfunction
Vacuum sensor	1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take reading of the basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 45°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.
Oxygen sensor (front)	Air/fuel ratio feedback control (closed loop control) is not performed.
Oxygen sensor (rear)	Performs the feedback control (closed loop control) of the air/fuel ratio by using only the signal of the oxygen sensor (front) installed on the front of the catalytic converter.
Communication wire with transmission control unit <A/T>	Ignition timing is not retarded during transmission gear shifting (overall engine and transmission control).
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)

INSPECTION CHART FOR DIAGNOSIS CODES

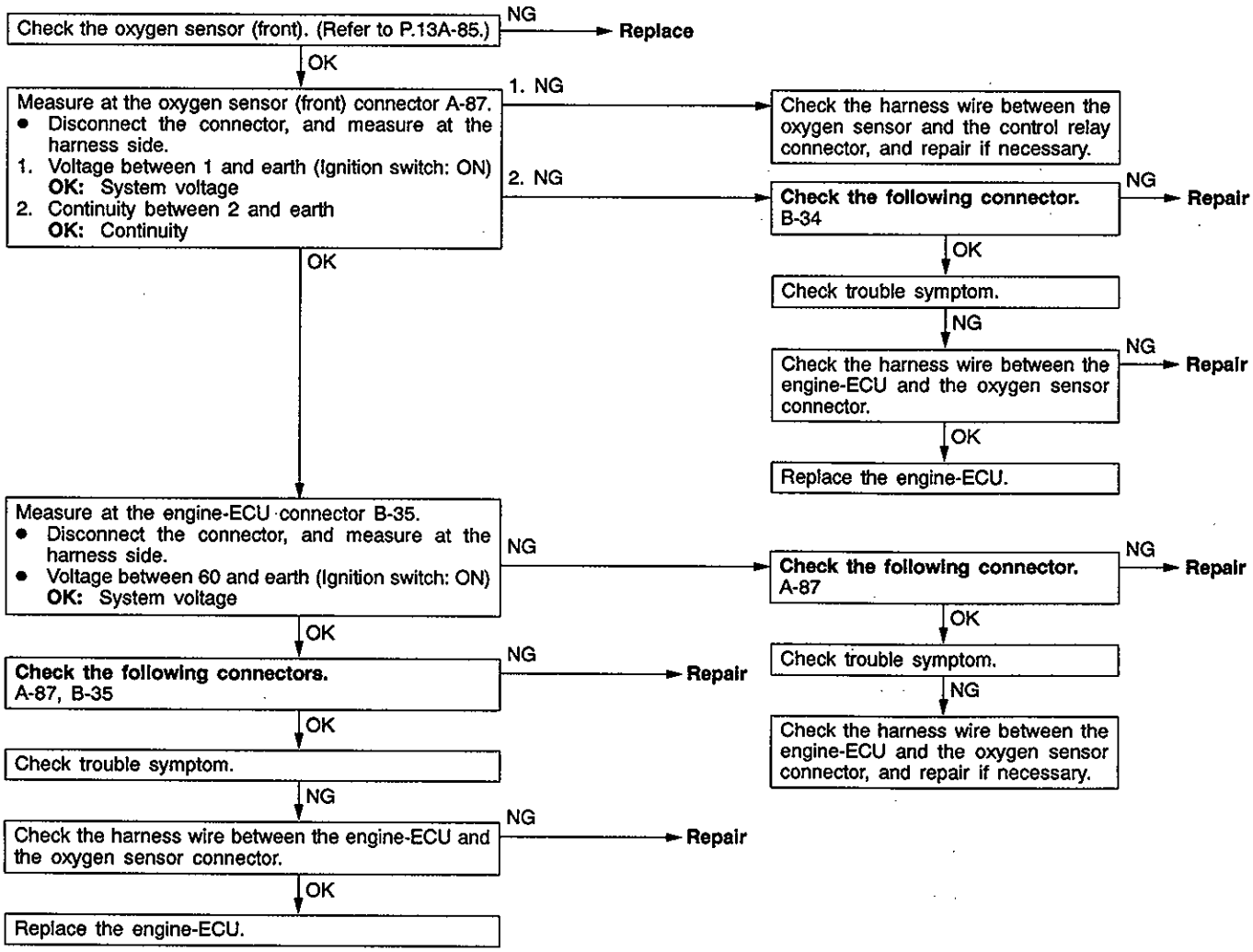
13100870122

Code No.	Diagnosis item	Reference page
11	Oxygen sensor (front) system	13A-12
13	Intake air temperature sensor system	13A-13
14	Throttle position sensor system	13A-14
21	Engine coolant temperature sensor system	13A-15
22	Crank angle sensor system	13A-16
24	Vehicle speed sensor system	13A-17
32	Vacuum sensor system	13A-18
36*	Ignition timing adjustment signal system	13A-19
41	Injector system	13A-19
54	Immobilizer system	13A-20
59	Oxygen sensor (rear) system	13A-21
61	Communication wire with A/T-ECU system <A/T>	13A-22
64	Alternator FR terminal system	13A-22

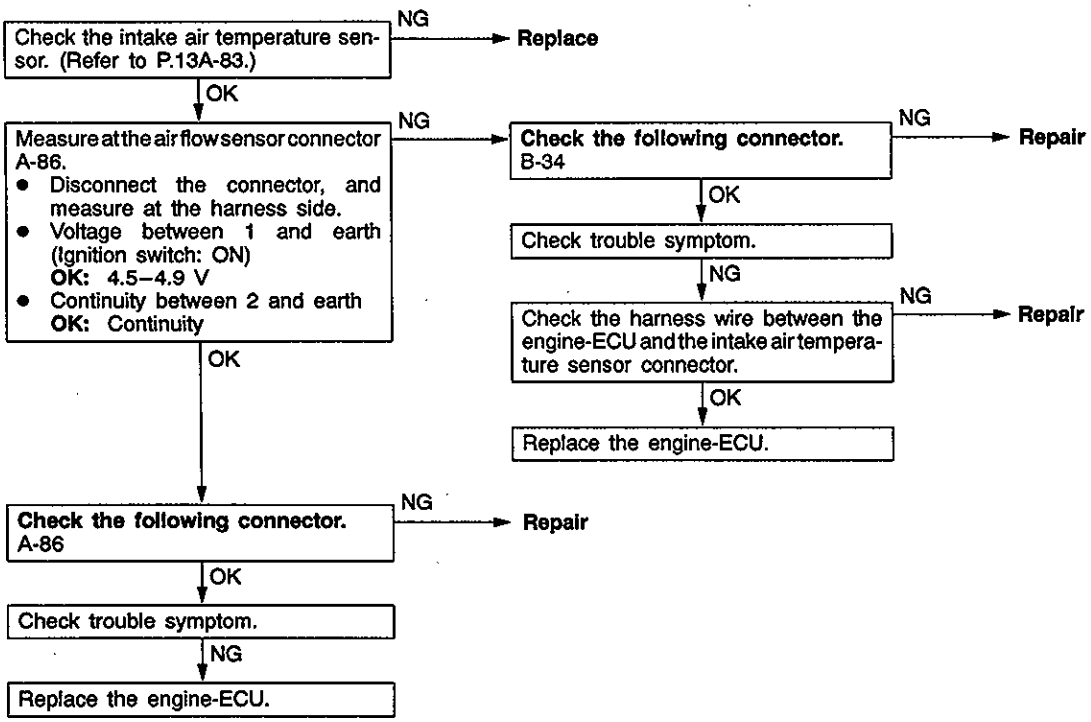
NOTE
*: Malfunction code No. 36 is not memorized.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

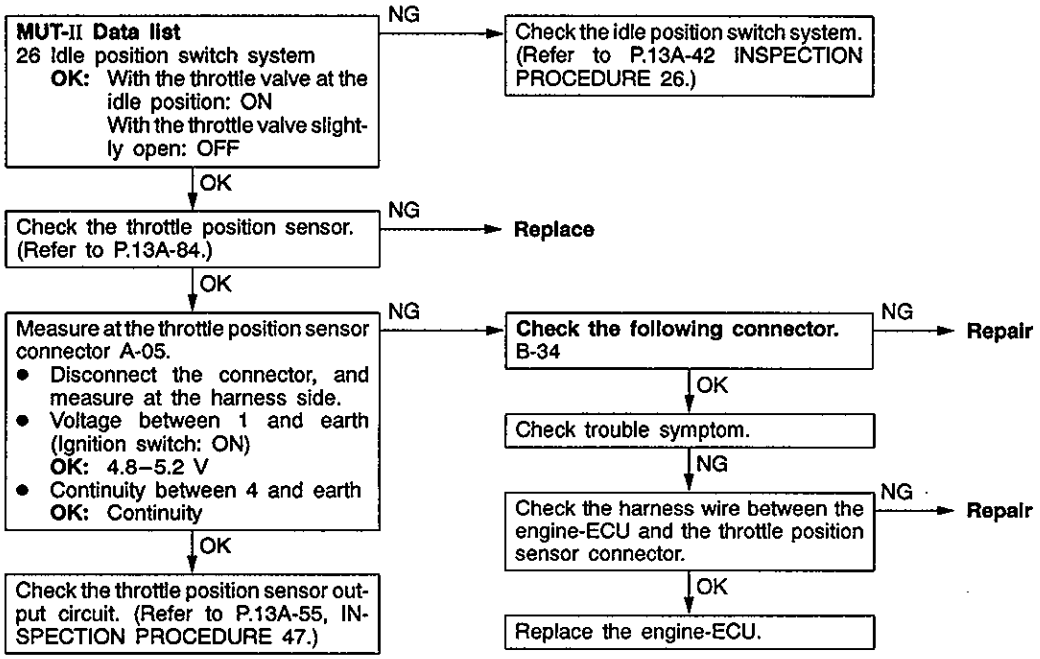
Code No. 11 Oxygen sensor (front) system	Probable cause
Range of Check • 3 minutes have passed after engine was started. • Engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20–50°C. • Engine speed is approx. 2,000–3,000 r/min • Vehicle is moving at constant speed on a flat, level road surface Set conditions • The oxygen sensor (front) 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 (front) • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



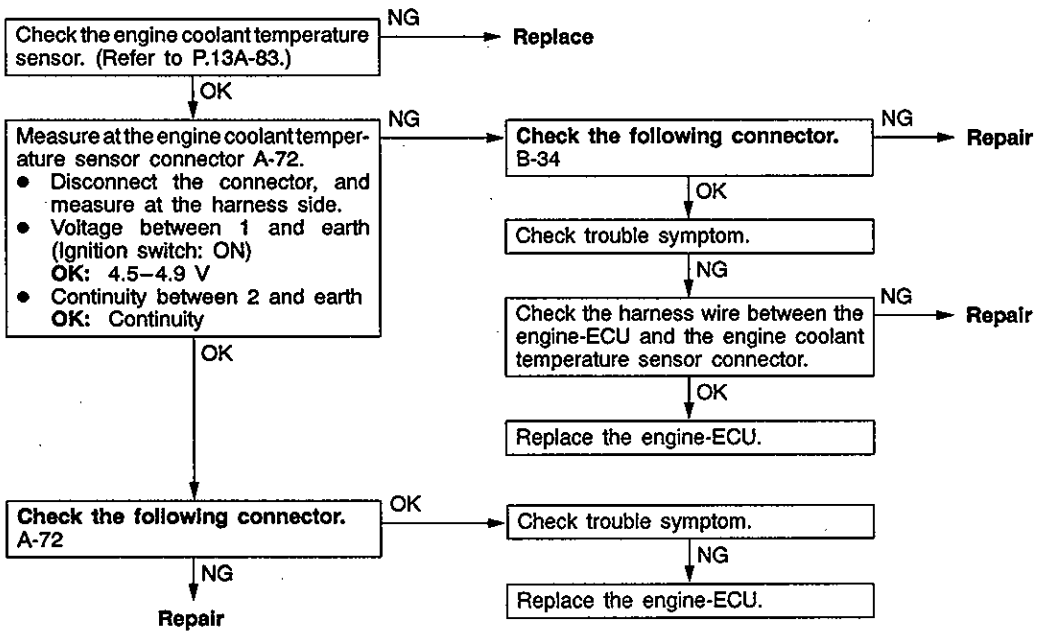
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature 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



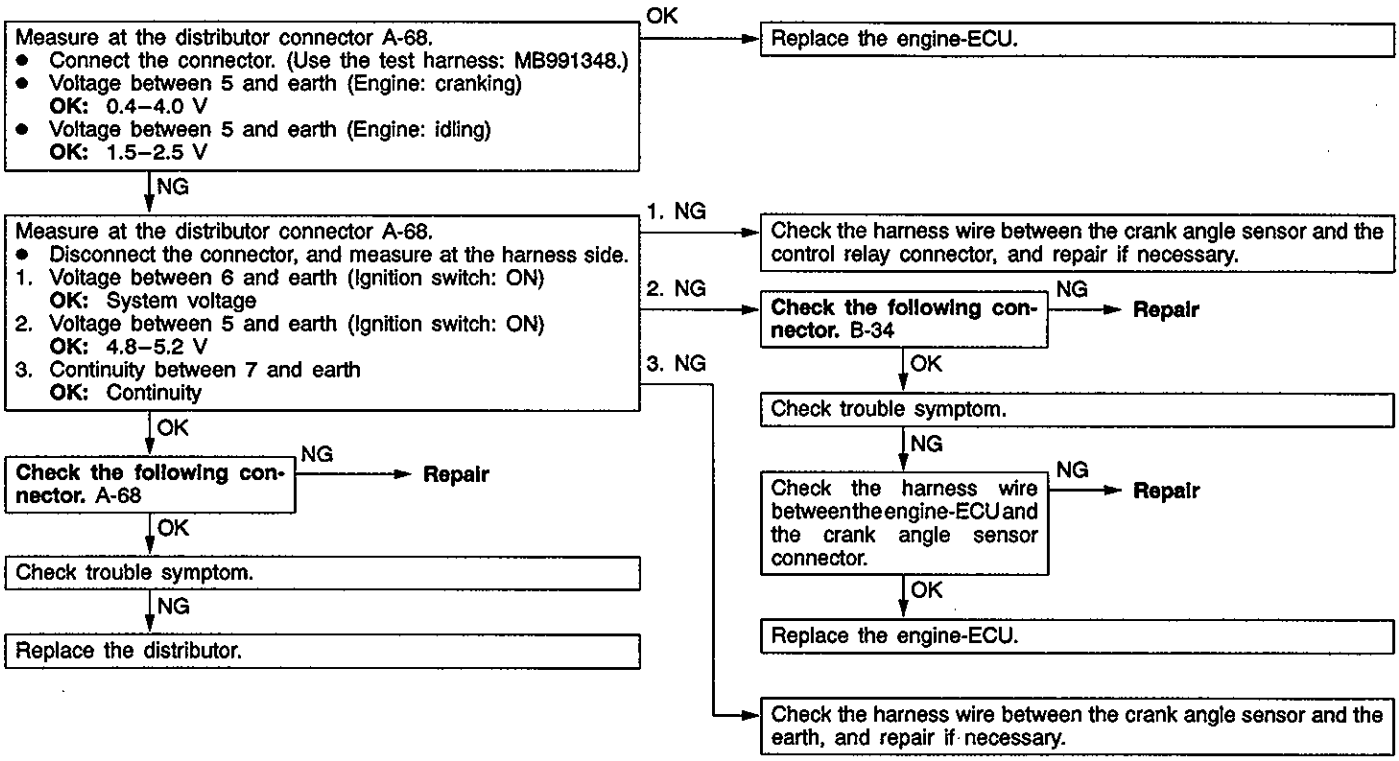
Code No. 14 Throttle position sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 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



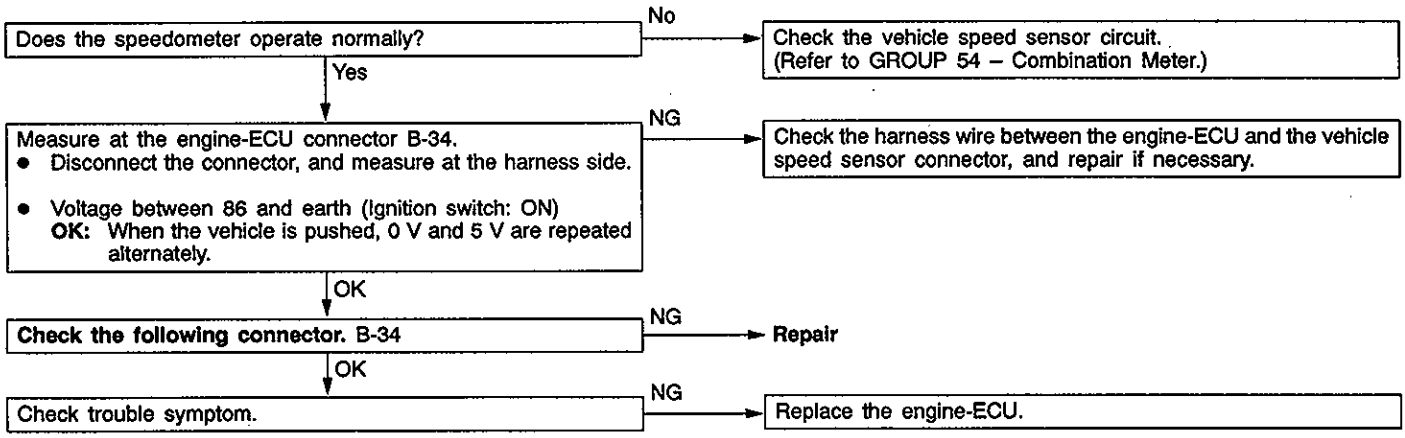
Code No. 21 Engine coolant temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an engine coolant 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.	



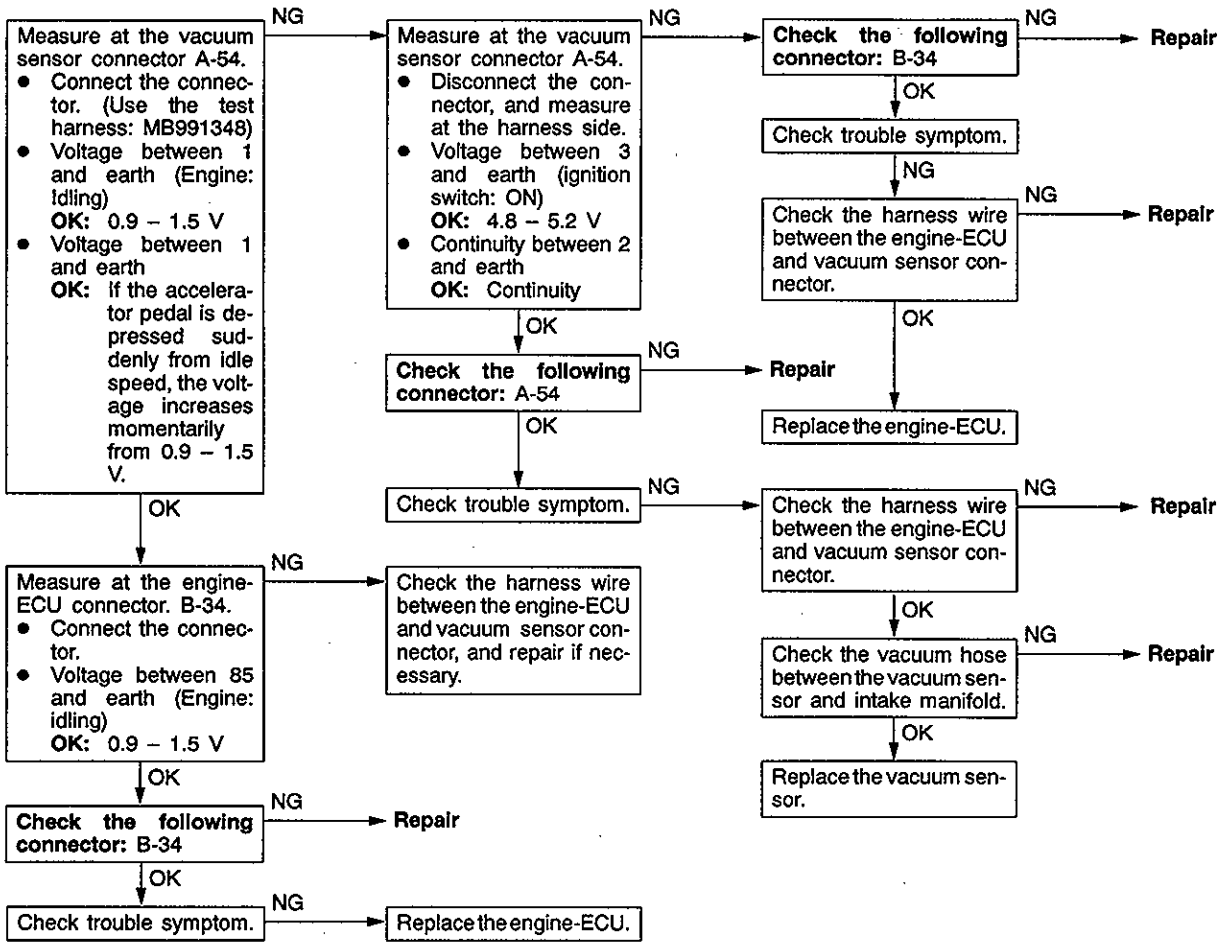
Code No. 22 Crank angle sensor system	Probable cause
Range of Check • Engine is cranking. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness wire of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



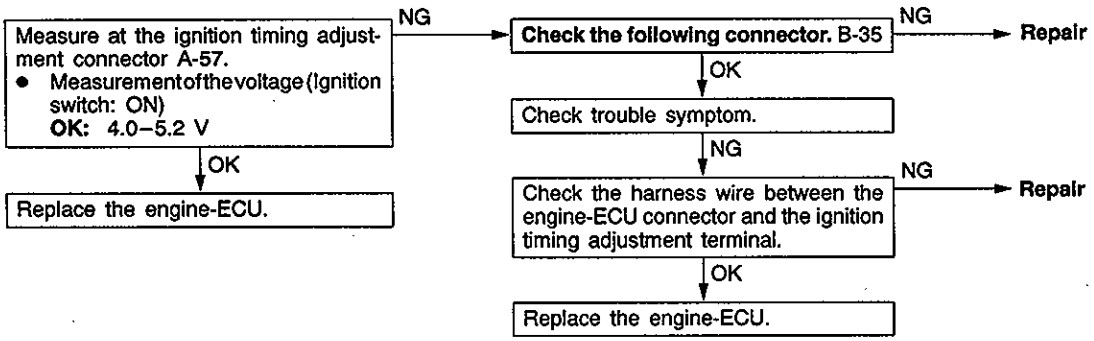
Code No. 24 Vehicles speed sensor system	Probable cause
Range of check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Idle position switch: OFF • Engine speed is 3,000 r/min or more. • Driving under high engine load conditions.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



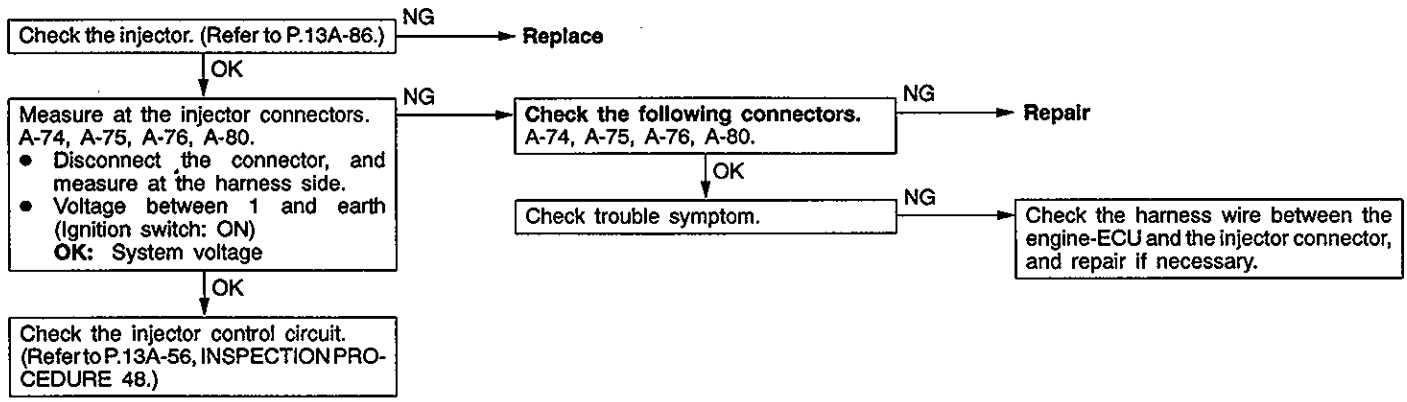
Code No.32 Vacuum sensor system	Range of Check
Range of Check • Ignition switch: ON Set Conditions • The output voltage of the vacuum sensor is 4.5 V or more for 4 seconds. (This corresponds to the absolute manifold pressure of 115 kPa or more.)	• 12Malfunction of the vacuum sensor • Improper connector contact, open circuit or short-circuited harness • Malfunction of the engine-ECU
Range of Check • The output voltage of the throttle position sensor is 1.25 V or more. or • The vehicle is stationary. Set Conditions • The output voltage of the vacuum sensor is 0.2 V or less for 4 seconds. (This corresponds to the absolute manifold pressure of 4.9 kPa or less.)	



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

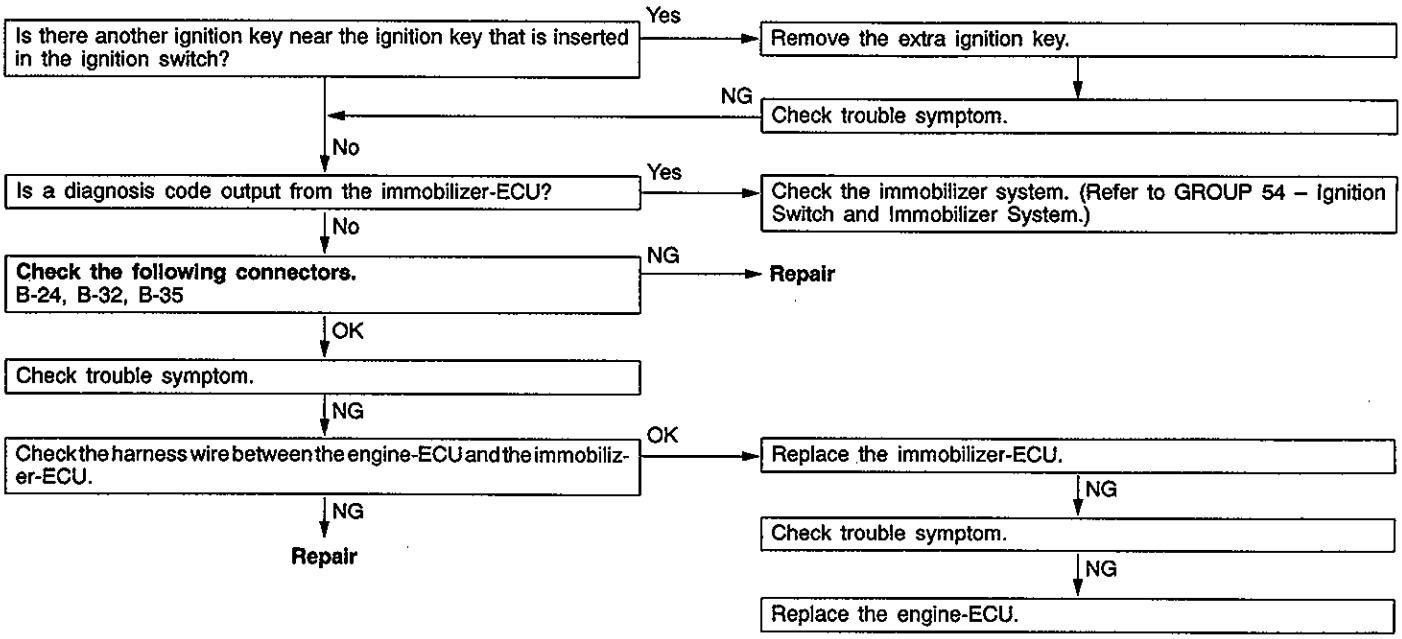


Code No. 41 Injector system	Probable cause
Range of Check • Engine speed is approx. 50–1,000 r/min • The throttle position sensor output voltage is 1.15 V or less. • Actuator test by MUT-II is not carried out. Set conditions • Surge voltage of injector coil is not detected for 4 seconds.	• Malfunction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

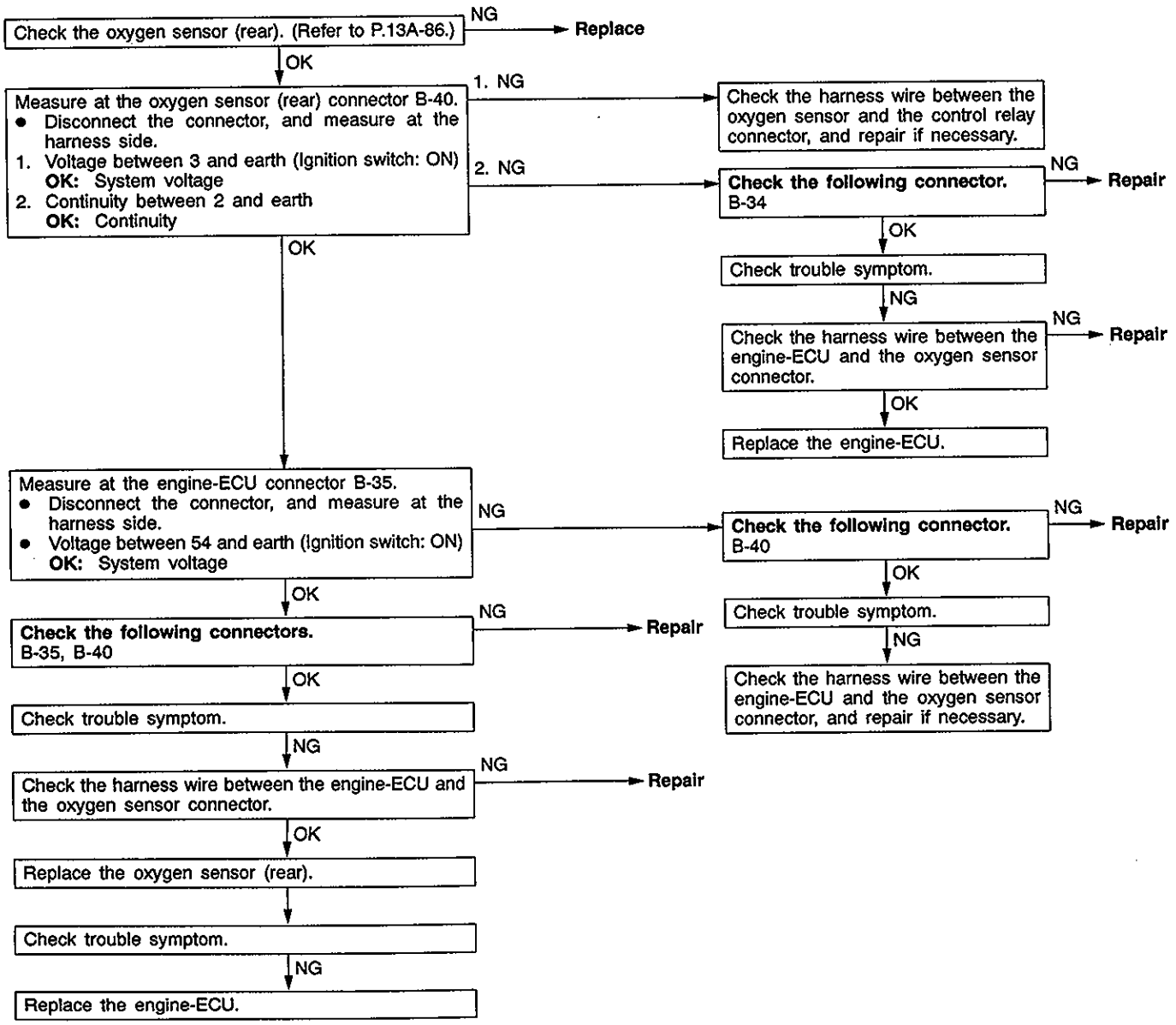


Code No.54 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU and immobilizer-ECU	• Radio interference of ID codes • Incorrect ID code • Malfunction of harness or connector • Malfunction of immobilizer-ECU • Malfunction of engine-ECU

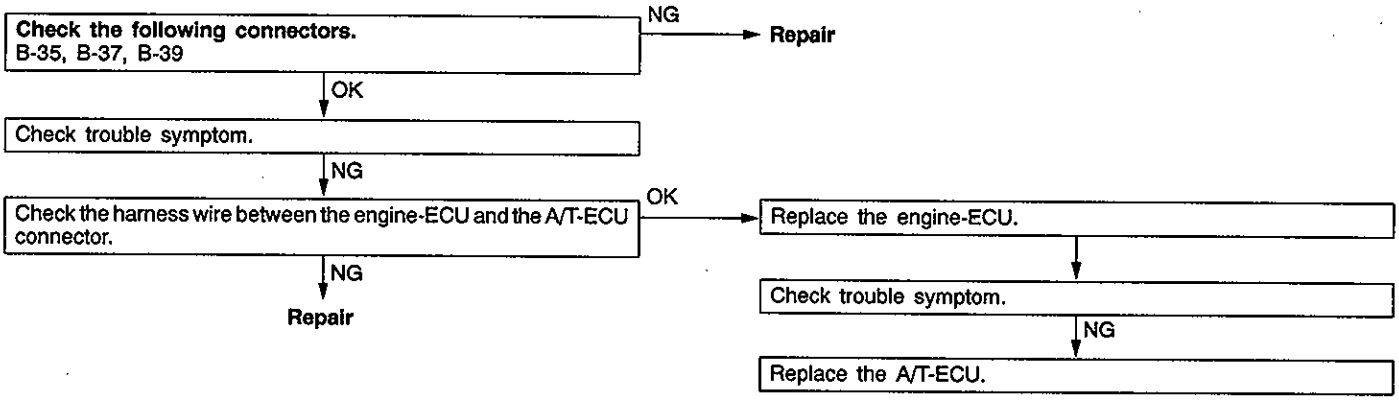
NOTE
(1) If the ignition switches are close each other when starting the engine, radio interference may cause this code to be displayed.
(2) This code may be displayed when registering the key ID code.



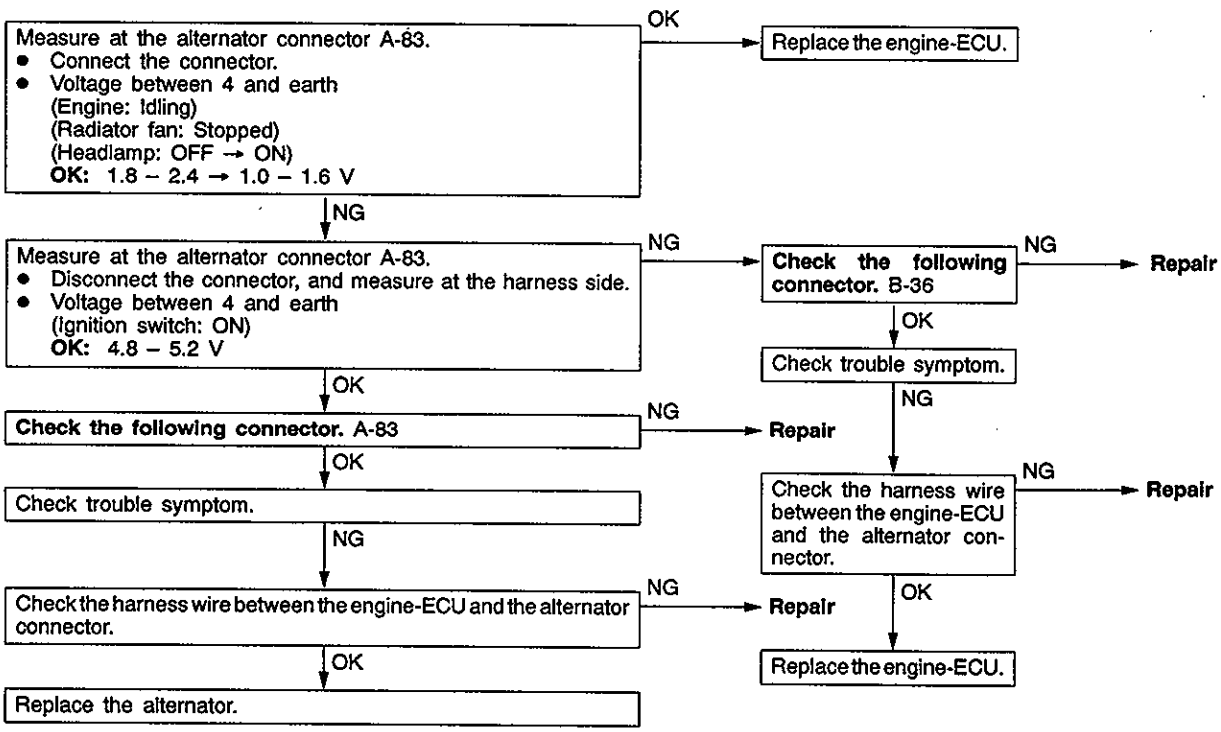
Code No. 59 Oxygen sensor (rear) system	Probable cause
Range of Check • 3 minutes have passed after engine was started. • Engine coolant temperature is approx. 80°C or more. • Idle position switch: OFF • The throttle position sensor output voltage is 4.1 V or more. • Open loop control in operation • 20 seconds have passed after deceleration finished. Set conditions • The oxygen sensor (rear) output voltage is 0.1 V or less. • The difference in the maximum and minimum values for the oxygen sensor (rear) output voltage is 0.08 V or less. • The oxygen sensor (rear) output voltage is 0.5 V or more. • The above conditions continue for a continuous period of 5 seconds.	• Malfunction of the oxygen sensor (rear) • Improper connector contact, open circuit or short-circuited harness wire • 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



Code No. 64 Alternator FR Terminal System	Probable cause
Range of Check, Set Conditions • The alternator FR terminal signal voltage remains high for approximately 20 seconds while the engine is running.	• Open circuit in alternator FR terminal circuit • Malfunction of the engine-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880125

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-25
	Communication with engine-ECU only is not possible.	2	13A-26
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-27
	The engine warning lamp remains illuminating and never goes out.	4	13A-27
Starting	No initial combustion (starting impossible)	5	13A-28
	Initial combustion but no complete combustion (starting impossible)	6	13A-29
	Long time to start (improper starting)	7	13A-30
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-31
	Idling speed is high. (Improper idling speed)	9	13A-32
	Idling speed is low. (Improper idling speed)	10	13A-33
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-34
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-35
	The engine stalls when starting the car. (Pass out)	13	13A-36
	The engine stalls when decelerating.	14	13A-36
Driving	Hesitation, sag or stumble	15	13A-37
	The feeling of impact or vibration when accelerating	16	13A-37
	The feeling of impact or vibration when decelerating	17	13A-38
	Poor acceleration	18	13A-38
	Surge	19	13A-39
	Knocking	20	13A-39
Dieseling		21	13A-39
Too high CO and HC concentration when idling		22	13A-40
Low alternator output voltage (approx. 12.3 V)		23	13A-41

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

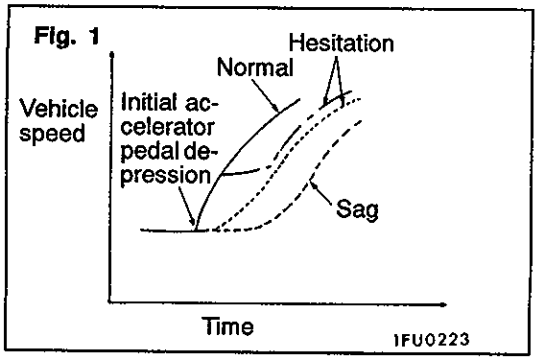
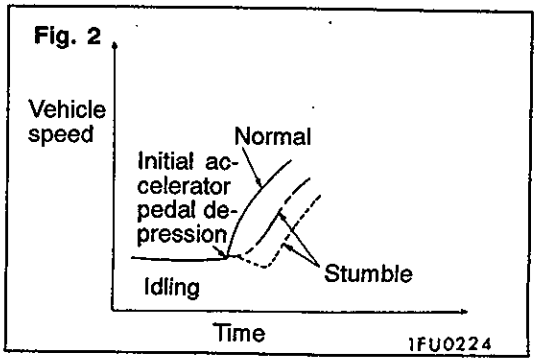


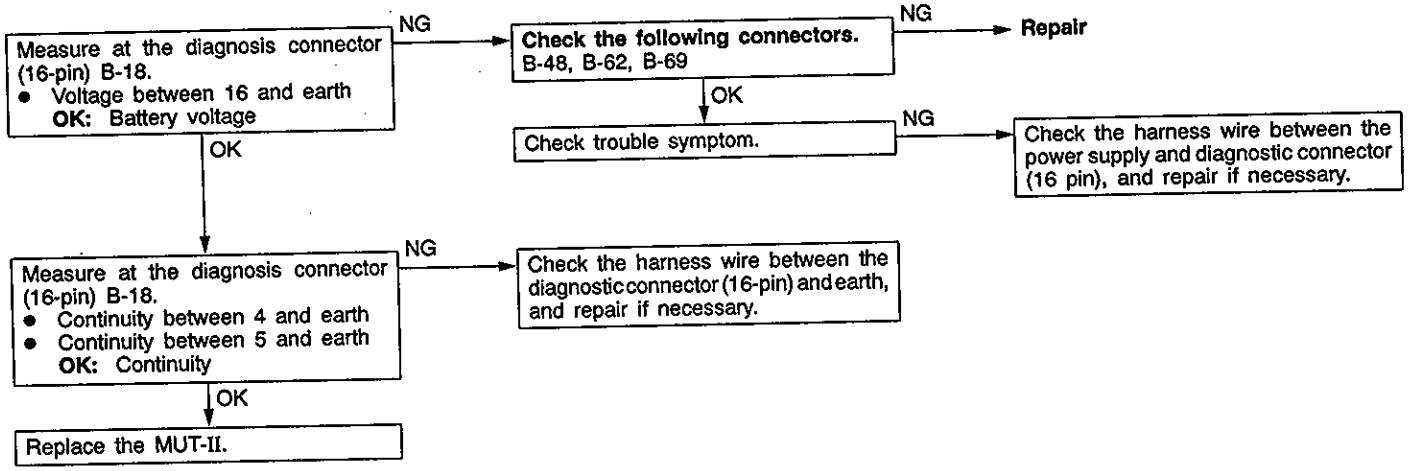
Fig. 2



INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

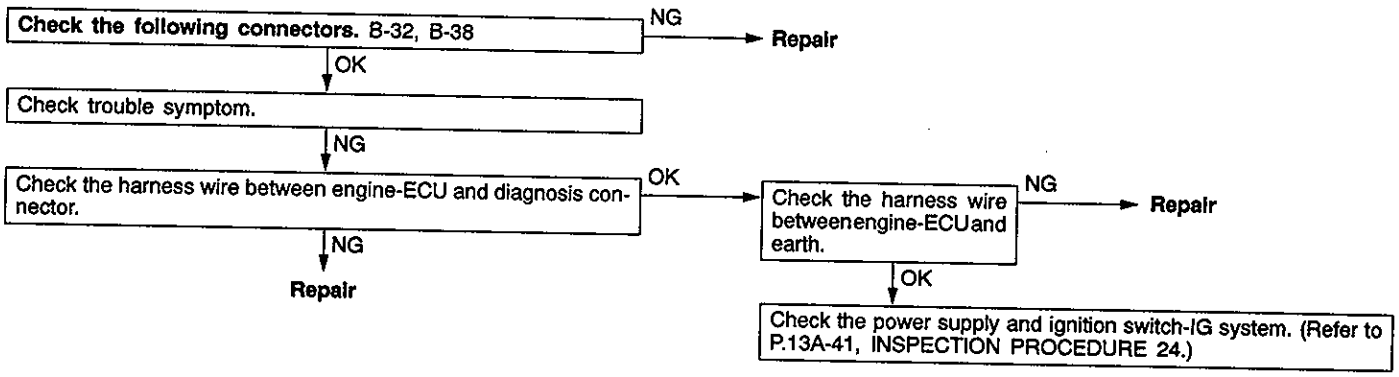
Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



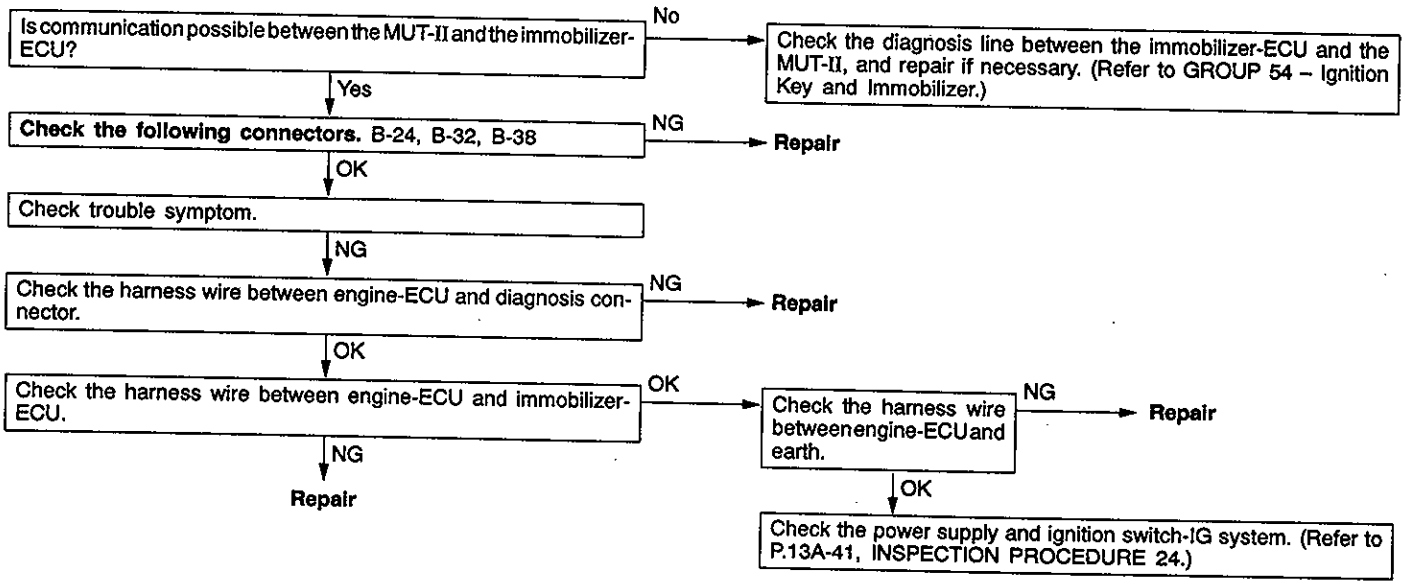
INSPECTION PROCEDURE 2

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	<Vehicles without immobilizer system> • Malfunction of engine-ECU power supply circuit • Malfunction of engine-ECU • Open circuit between engine-ECU and diagnosis connector <Vehicles with immobilizer system> • Malfunction of engine-ECU power supply circuit • Malfunction of engine-ECU • Malfunction of immobilizer-ECU • Open circuit between immobilizer-ECU and diagnosis connector • Open circuit between engine-ECU and immobilizer-ECU

<Vehicles without immobilizer system>

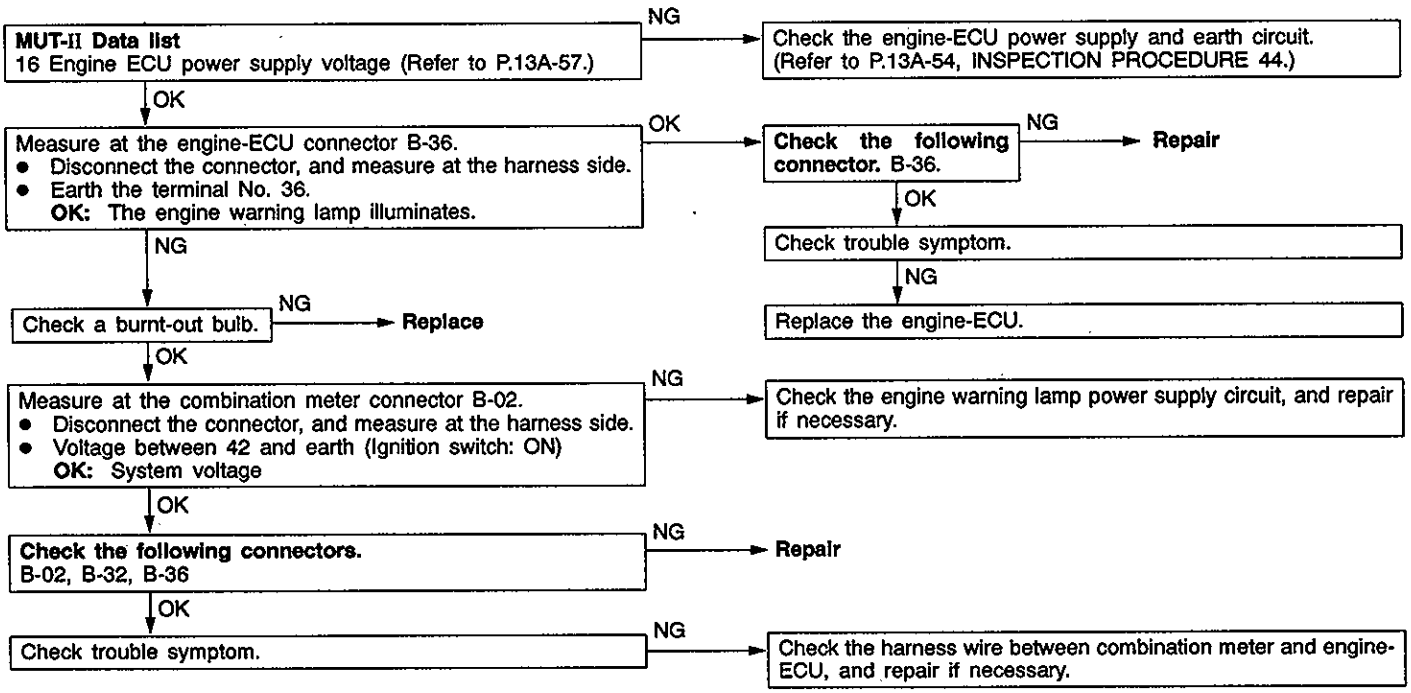


<Vehicles with immobilizer system>



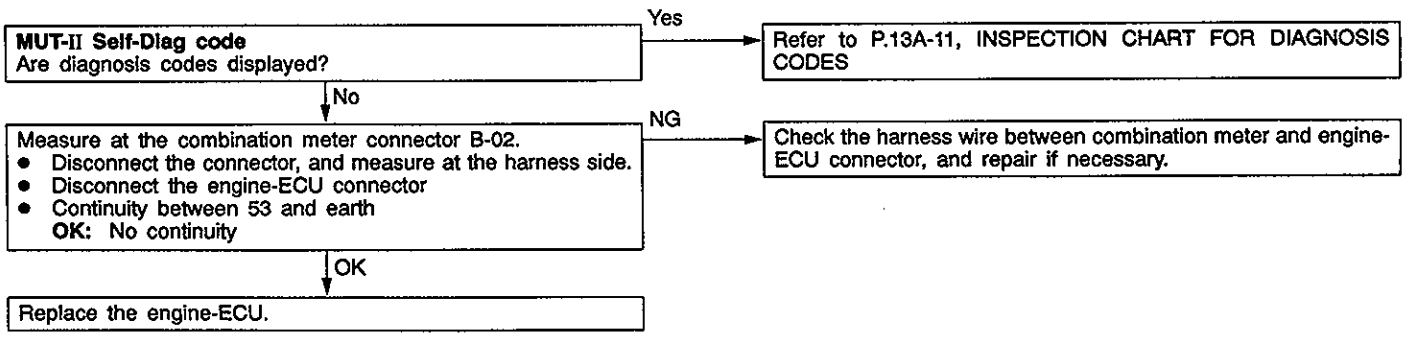
INSPECTION PROCEDURE 3

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



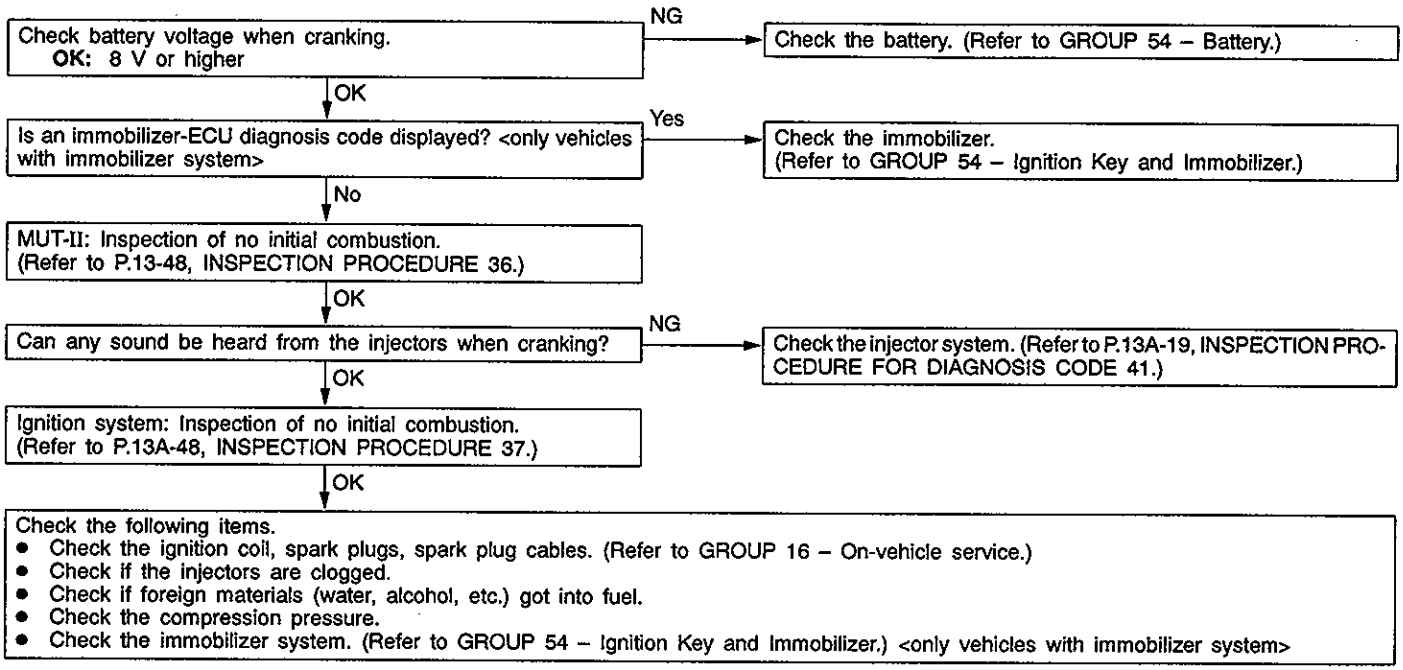
INSPECTION PROCEDURE 4

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



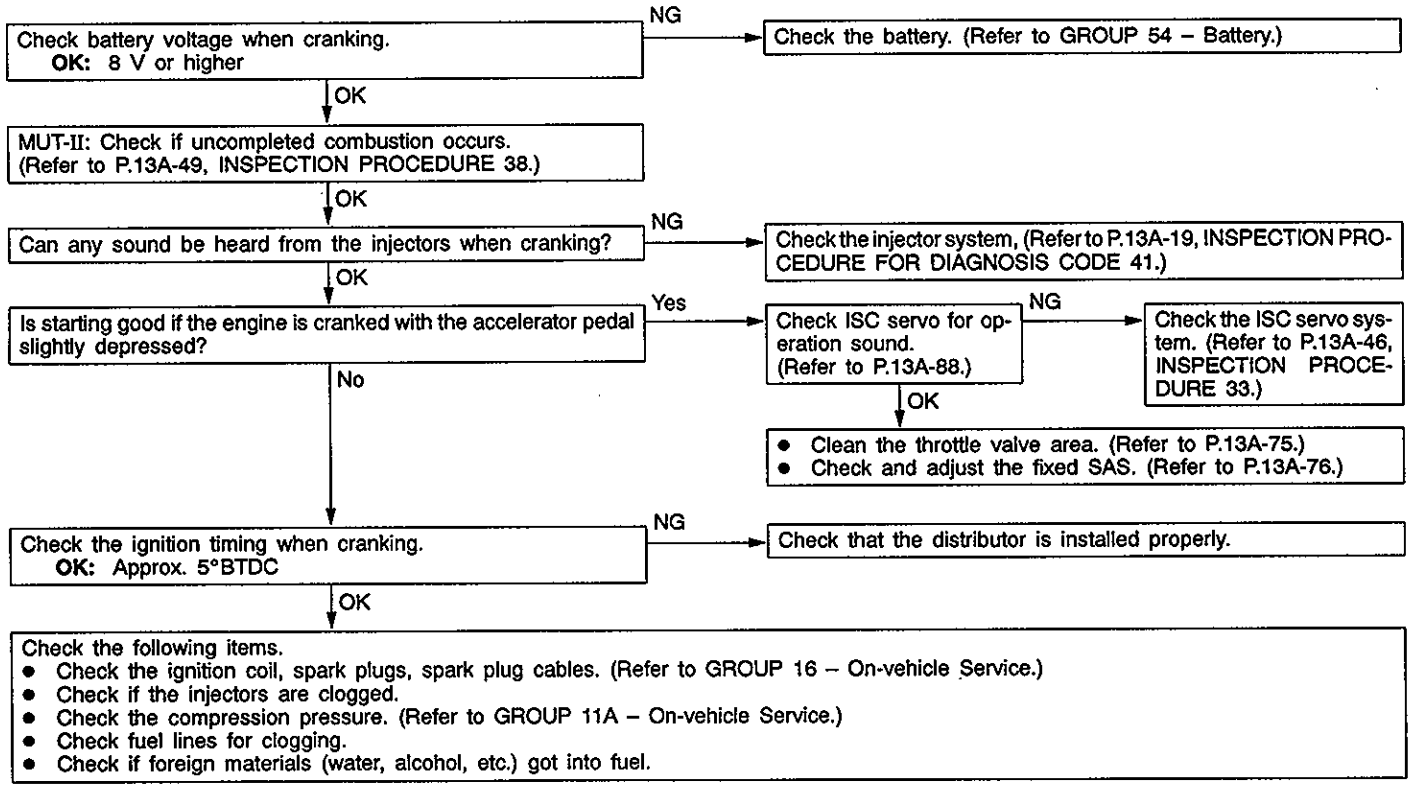
INSPECTION PROCEDURE 5

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 <only vehicles with immobilizer system> • Foreign materials in fuel



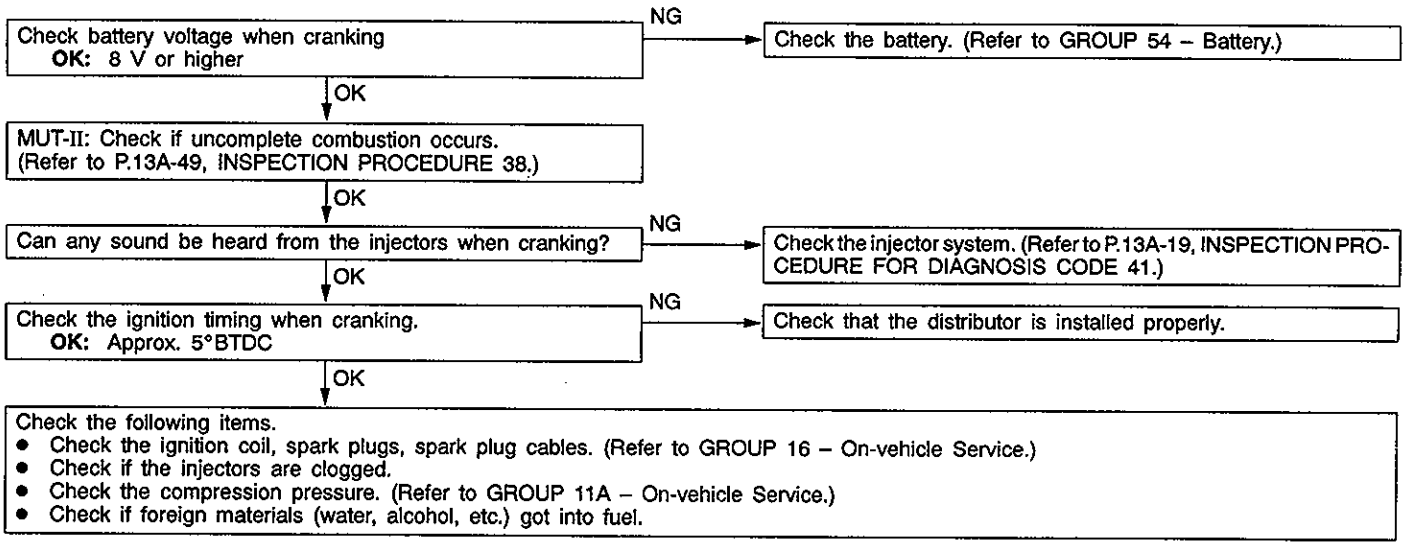
INSPECTION PROCEDURE 6

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



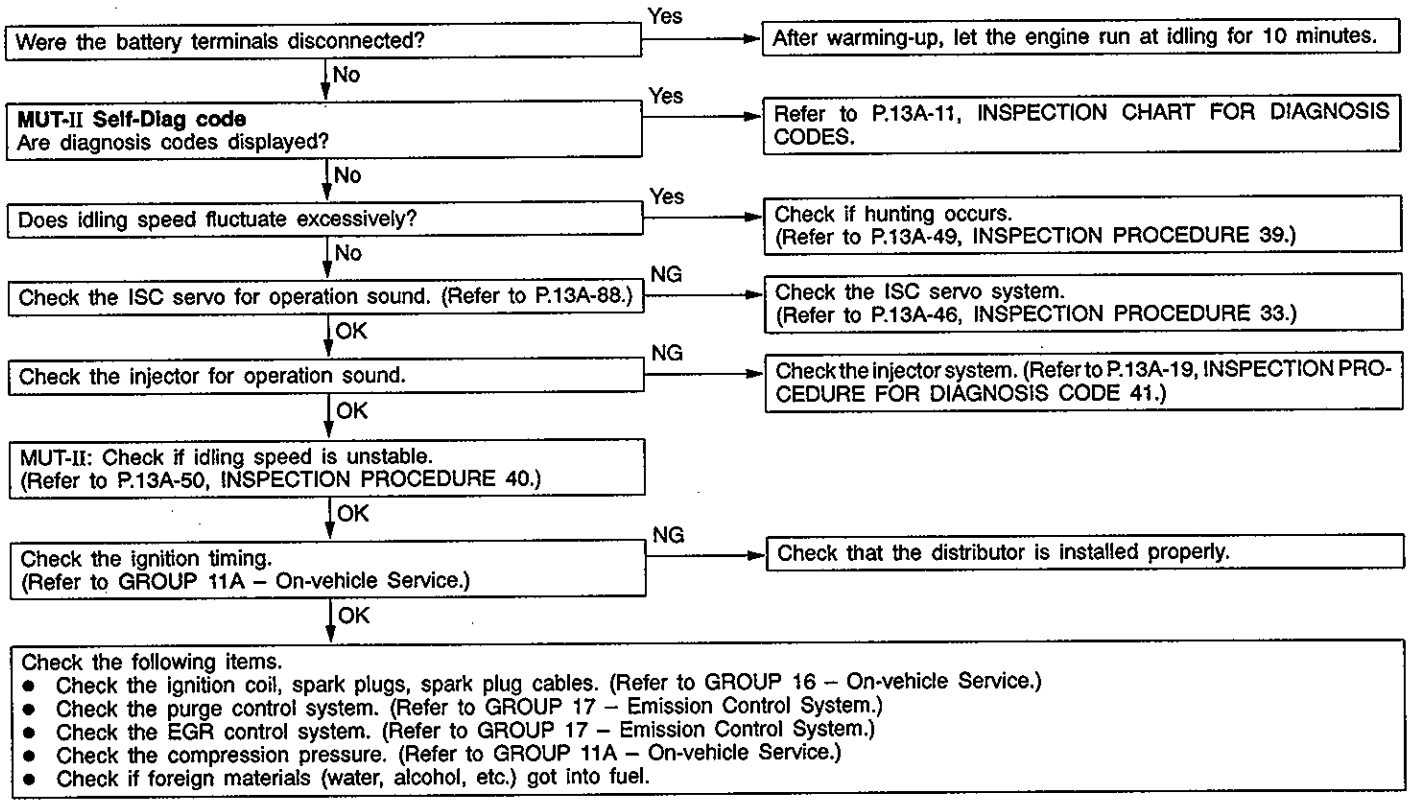
INSPECTION PROCEDURE 7

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



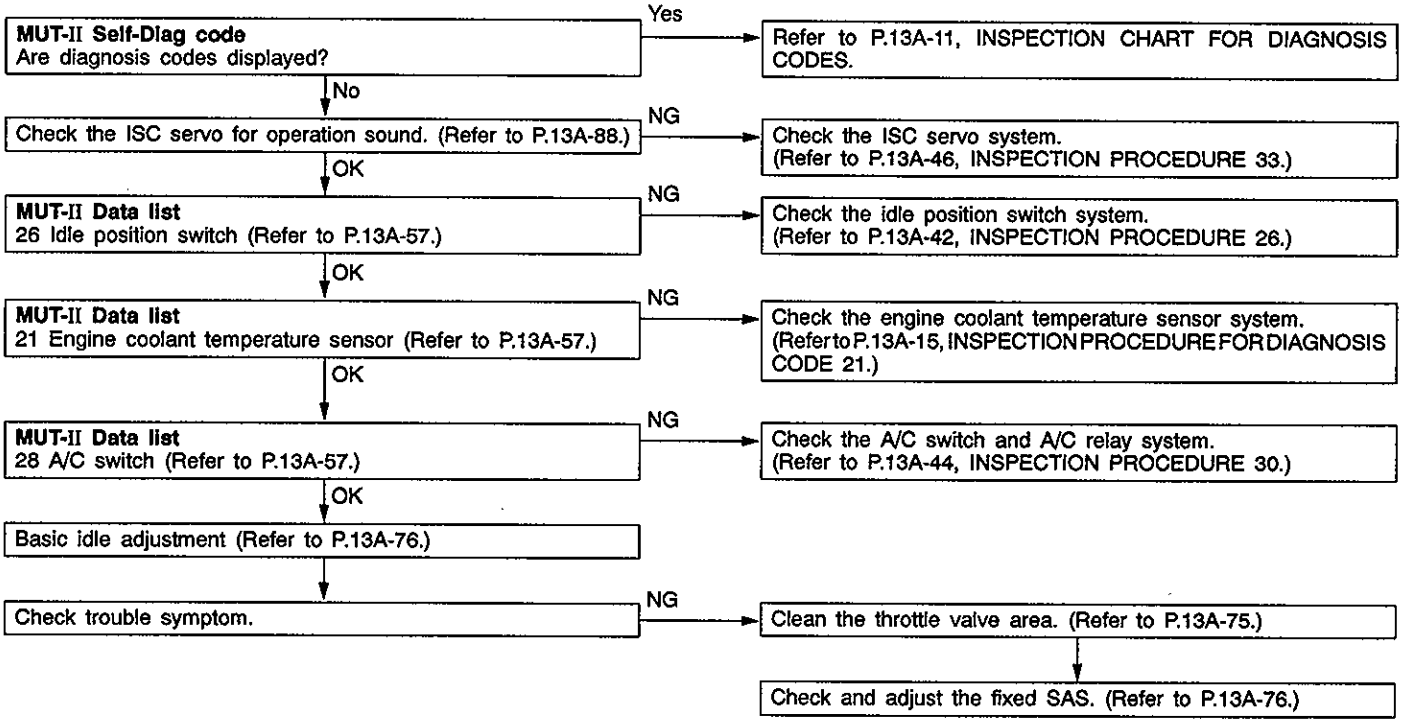
INSPECTION PROCEDURE 8

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 • Malfunction of the EGR solenoid valve system • Poor compression • Drawing air into exhaust system



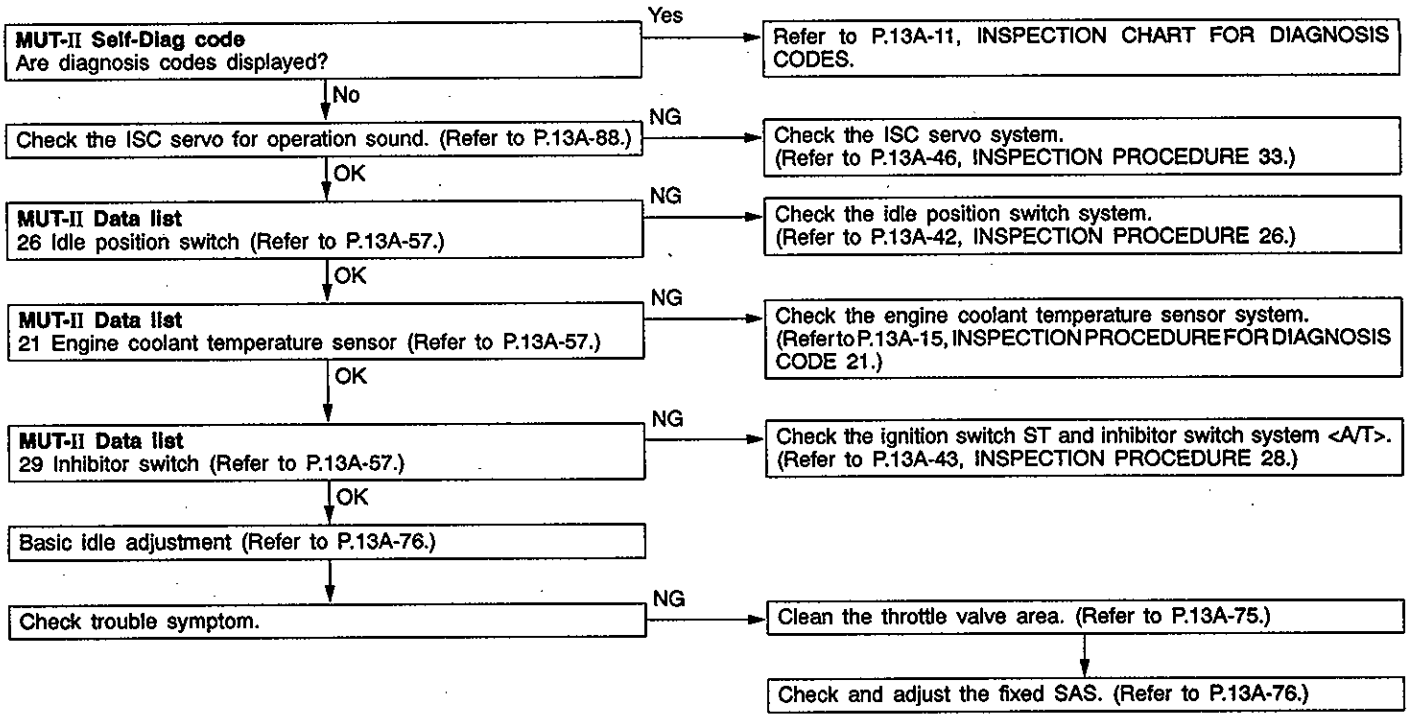
INSPECTION PROCEDURE 9

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



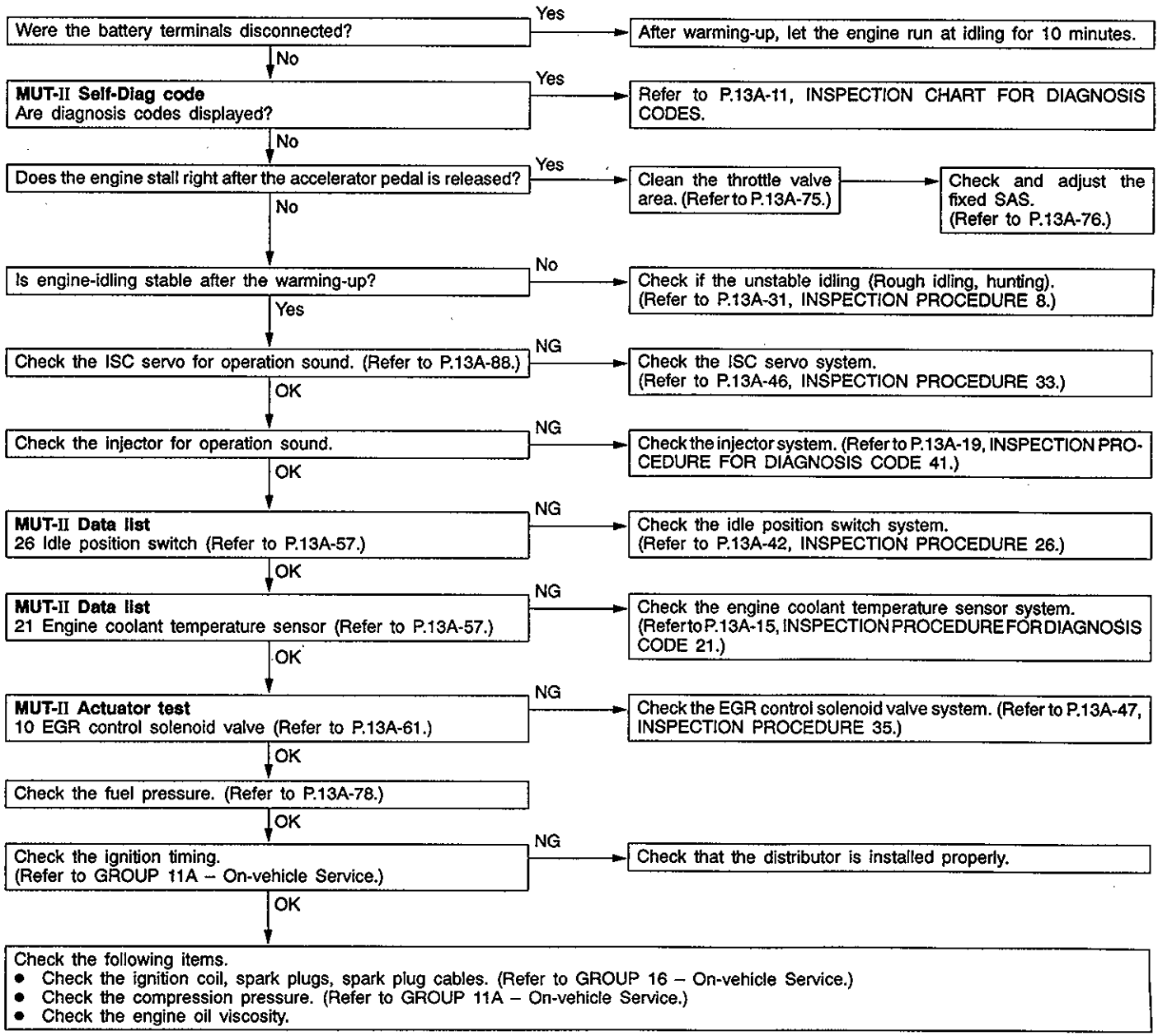
INSPECTION PROCEDURE 10

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



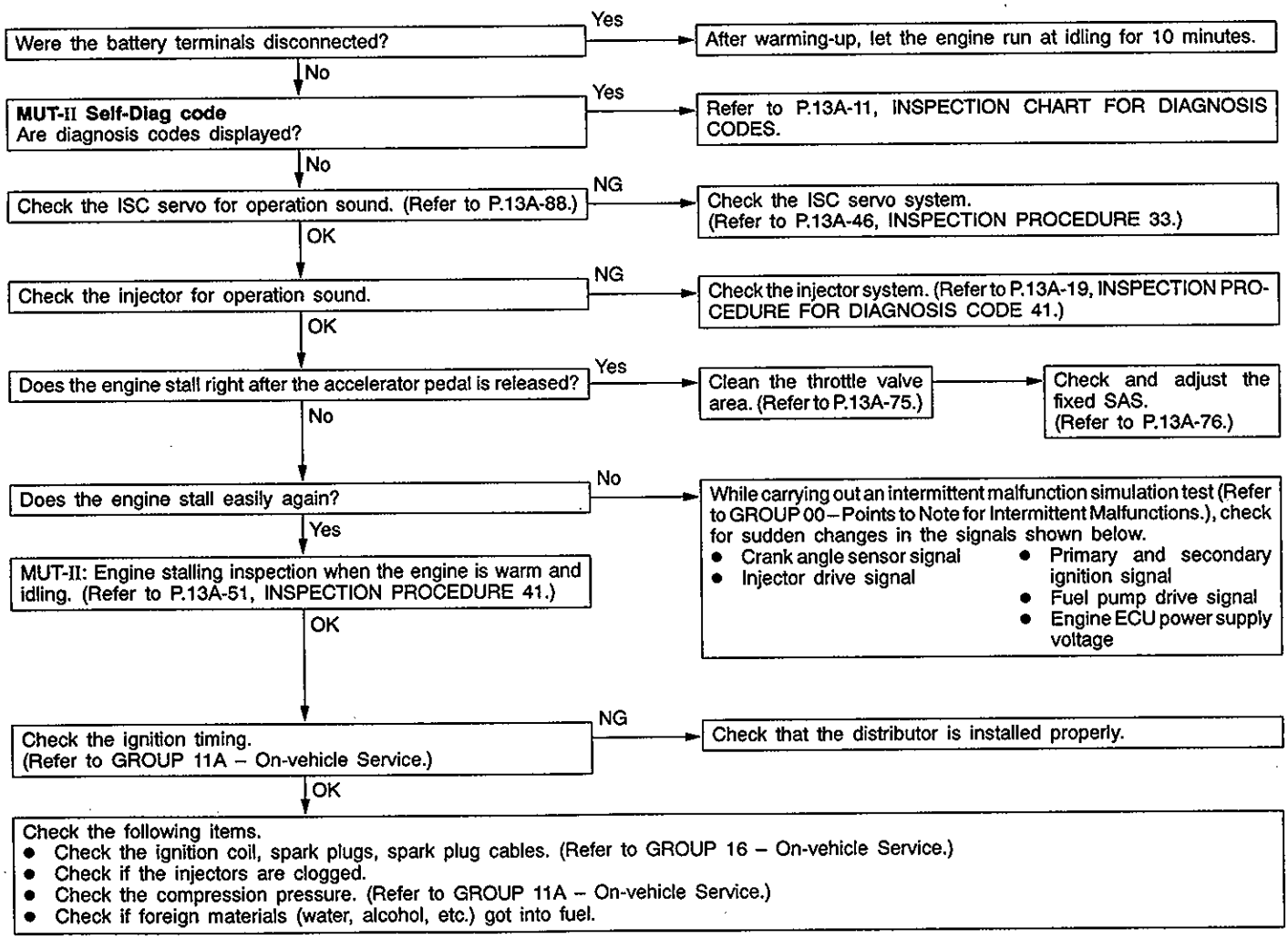
INSPECTION PROCEDURE 11

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



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 displayed?
- Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-61.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13A-47, INSPECTION PROCEDURE 35.)
- OK ↓

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 displayed?
- Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-57.)
- NG → Check the idle position switch system. (Refer to P.13A-42, INSPECTION PROCEDURE 26.)
- OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-57.)
- NG → Check the throttle position sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

MUT-II Data list
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-17, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 24.)
  - No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-61.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13A-47, INSPECTION PROCEDURE 35.)
- OK ↓

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.
- Check and adjust the fixed SAS.

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 displayed?
Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur.
(Refer to P.13A-52, INSPECTION PROCEDURE 42.)
OK ↓

Check the fuel pressure. (Refer to P.13A-78.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control 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 displayed?
Yes → Refer to P.13A-11, 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 displayed?
Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ISC servo for operation sound. (Refer to P.13A-88.)
NG → Check the ISC servo system. (Refer to P.13A-46, INSPECTION PROCEDURE 33.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-57.)
NG → Check the throttle position sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-57.)
NG → Check the idle position switch system. (Refer to P.13A-42, INSPECTION PROCEDURE 26.)
OK ↓

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

INSPECTION PROCEDURE 18

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing. (Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur. (Refer to P.13A-52, INSPECTION PROCEDURE 42.)
OK ↓

Check the fuel pressure. (Refer to P.13A-78.)
OK ↓

Check the following items.
- 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 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 displayed?
Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II: Check if surge occurs.
(Refer to P.13-53, INSPECTION PROCEDURE 43.)
OK ↓

Check the fuel pressure. (Refer to P.13A-78.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control 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.	• Inappropriate heat value of the spark plug

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 displayed?
Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ignition timing.
(Refer to GROUP 11A – On-vehicle Service.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor. (Refer to P.13A-57.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-57.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-57.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front) (Refer to P.13A-57.)
OK: 600 – 1000 mV when racing suddenly
NG → Check the oxygen sensor (front) system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front) (Refer to P.13A-57.)
OK: Repeat 0 – 400 mV and 600 – 1,000 mV alternately when idling.
OK → Replace the oxygen sensor.
Check trouble symptom.
NG ↓
NG ↓

Check the fuel pressure. (Refer to P.13A-78.)
OK ↓

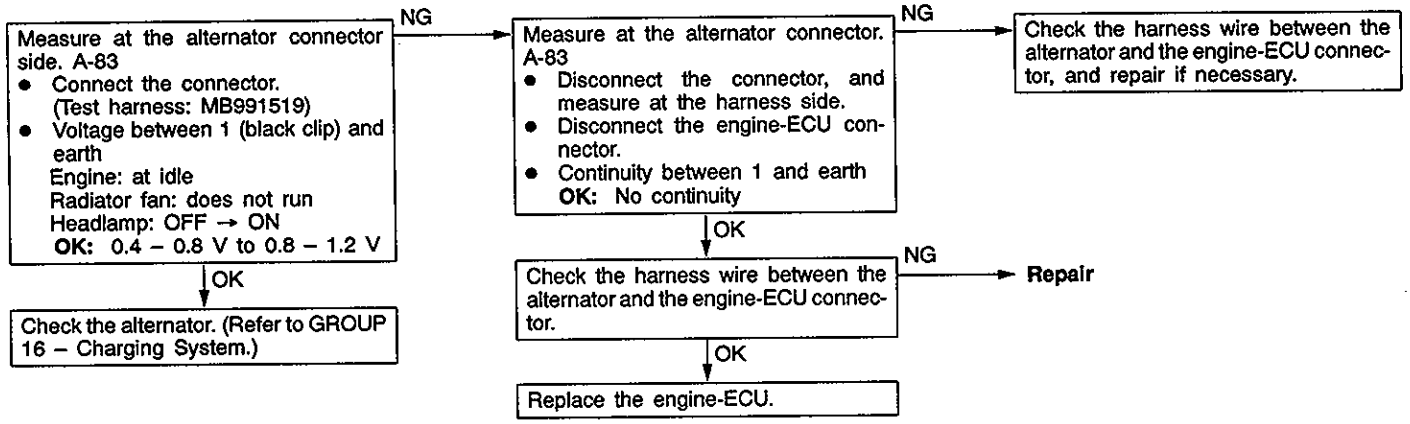
Check the following items.
- Check the injectors for operation sound.
- Check the injectors for fuel leakage.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11A – On-vehicle Service.)
- Check the positive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

Check the trouble symptom.
NG ↓

Replace the catalytic converter.

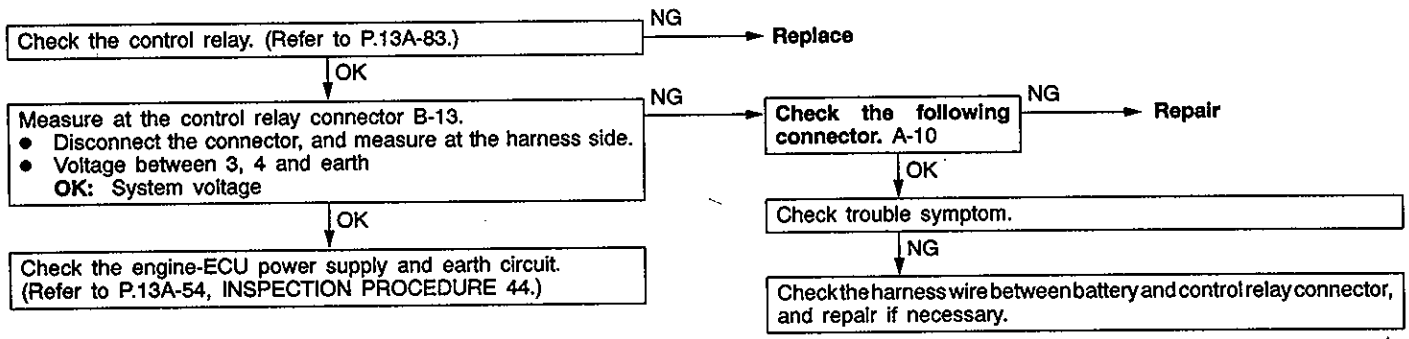
INSPECTION PROCEDURE 23

Low alternator output voltage (approx. 12.3 V)	Probable cause
The alternator may be defective, or malfunctions, which are listed in the right column, may be suspected.	• Malfunction of charging system (Refer to GROUP 16 – Charging System.) • Short circuit in harness between alternator G terminal and engine-ECU • Malfunction of engine-ECU



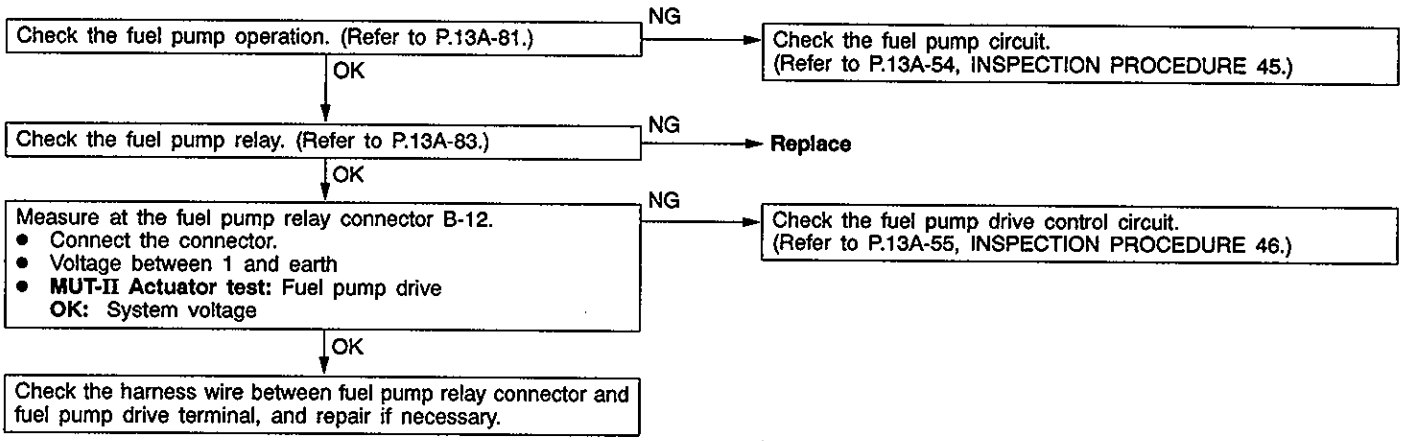
INSPECTION PROCEDURE 24

Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes 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



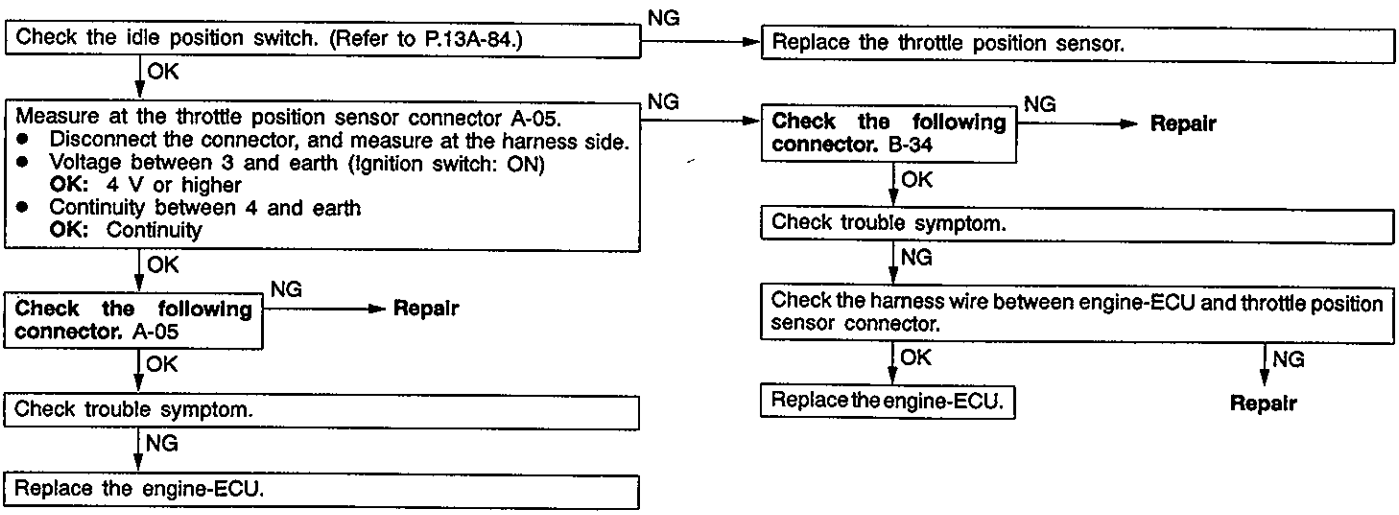
INSPECTION PROCEDURE 25

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



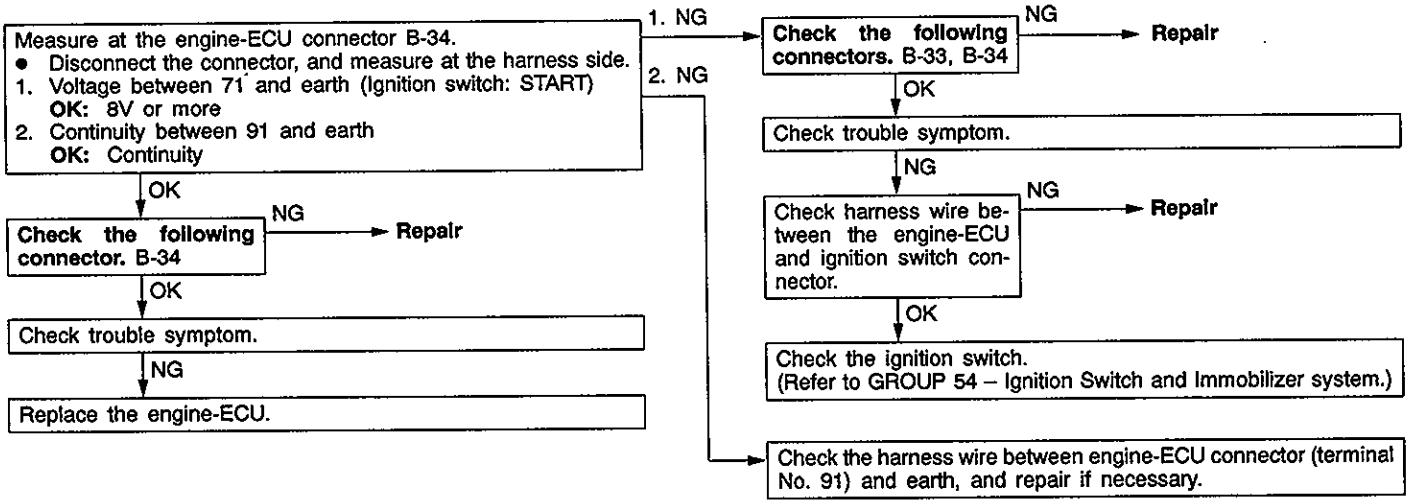
INSPECTION PROCEDURE 26

Idle position switch system	Probable cause
The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo-based on this input.	• 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



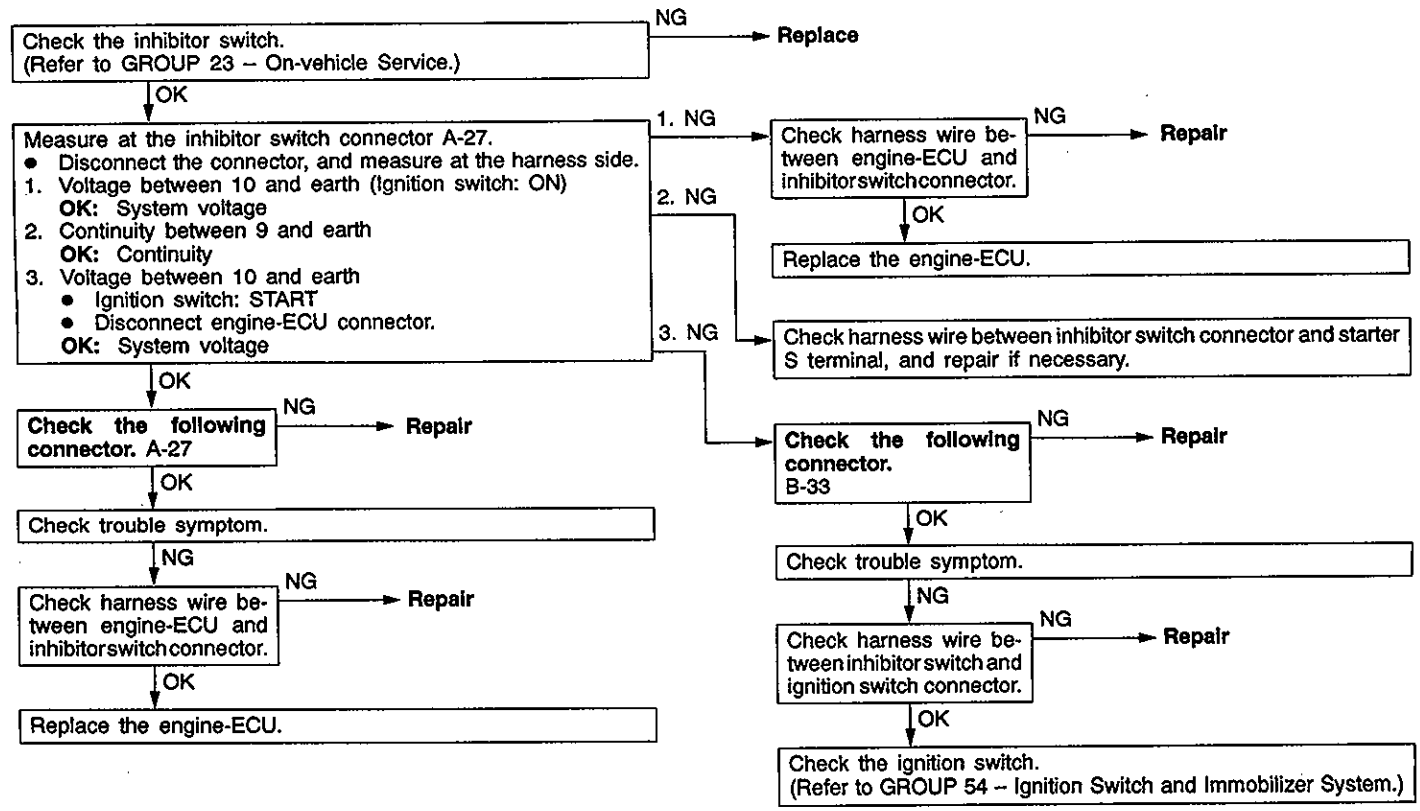
INSPECTION PROCEDURE 27

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



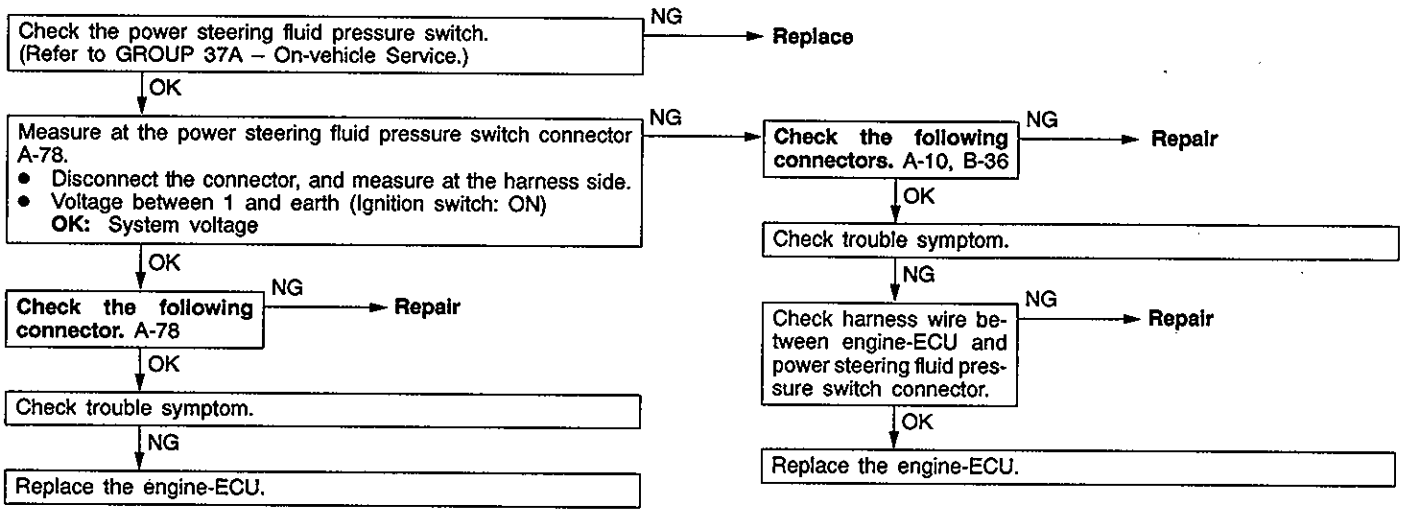
INSPECTION PROCEDURE 28

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.



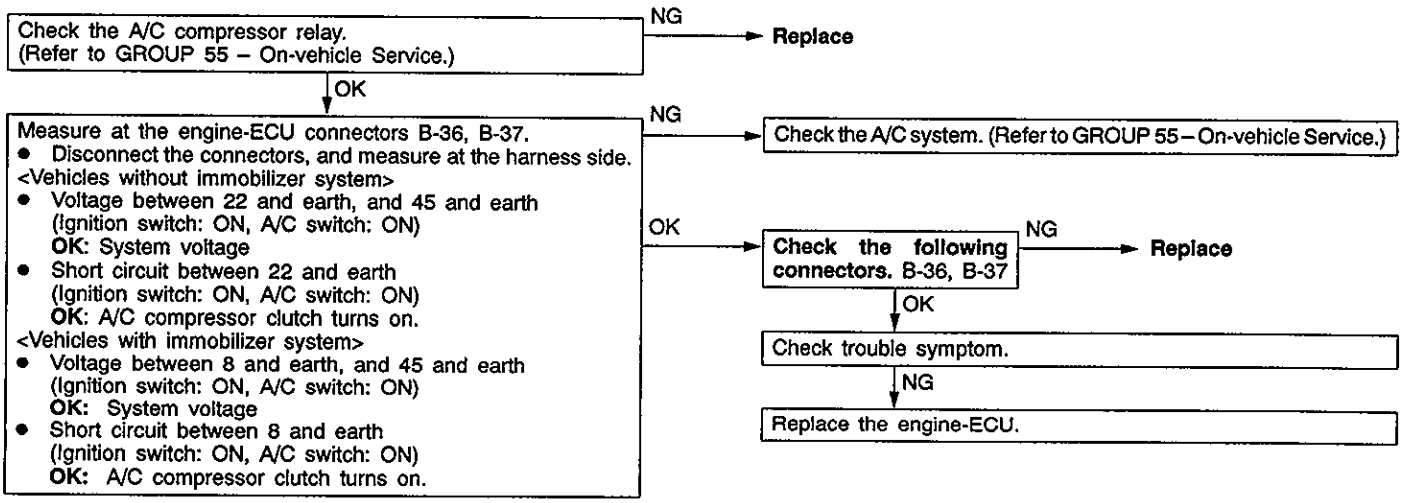
INSPECTION PROCEDURE 29

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



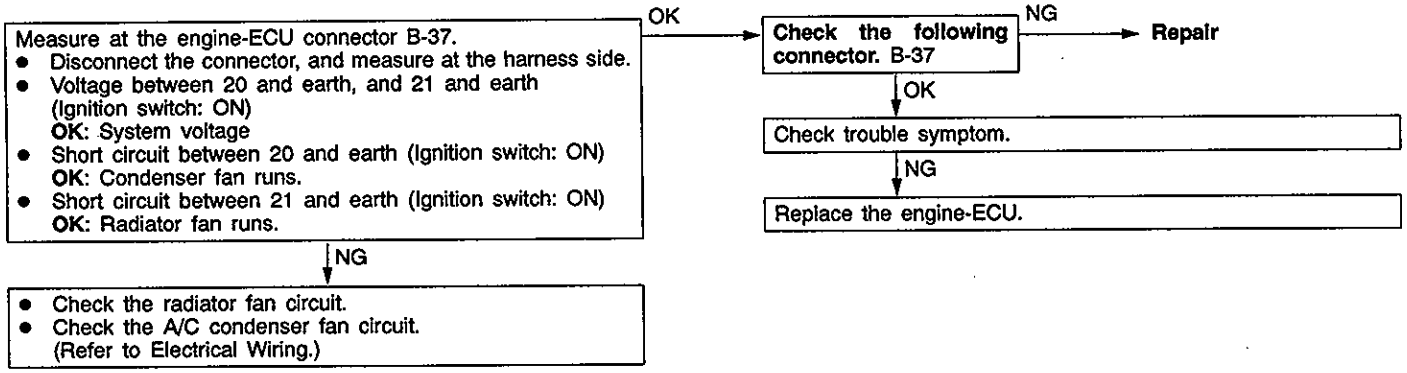
INSPECTION PROCEDURE 30

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



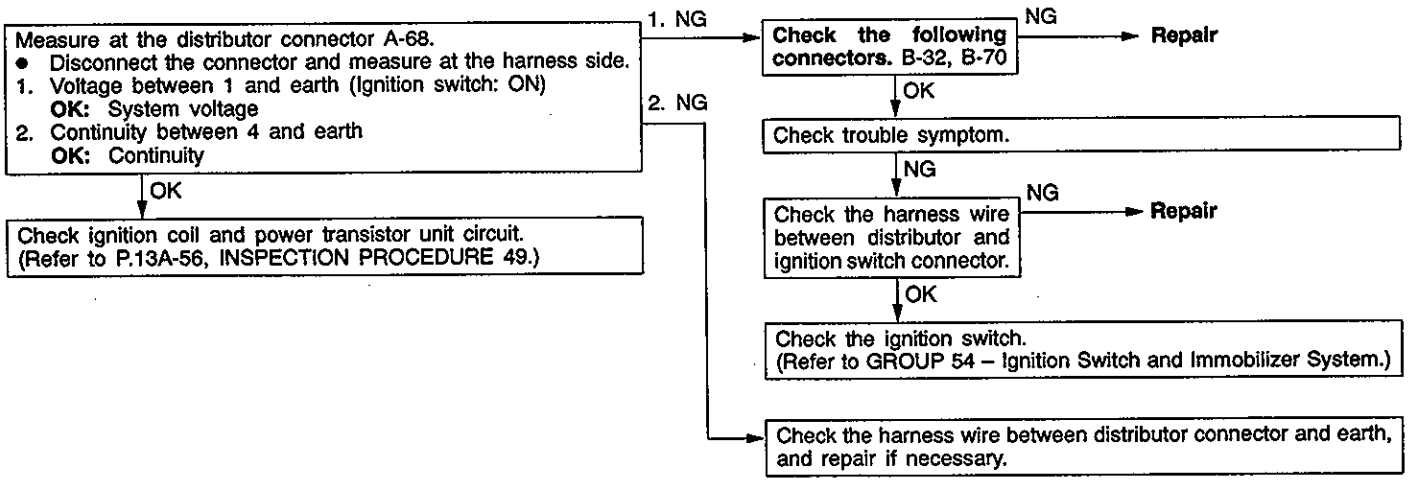
INSPECTION PROCEDURE 31

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



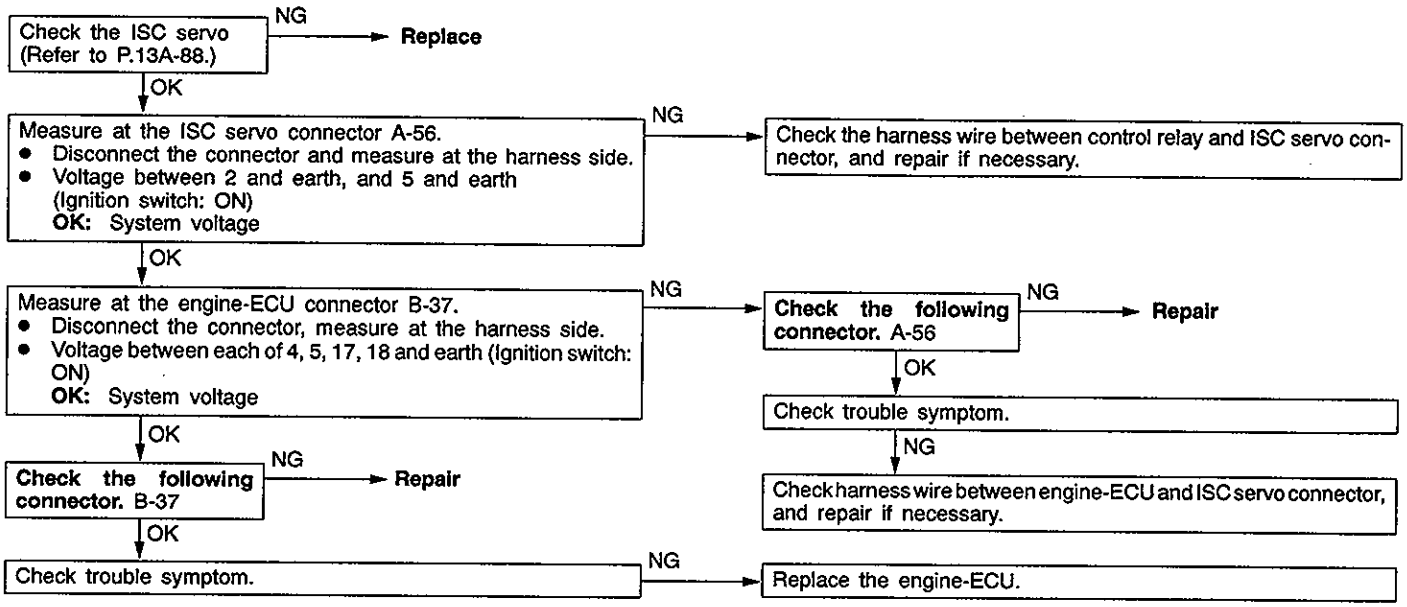
INSPECTION PROCEDURE 32

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



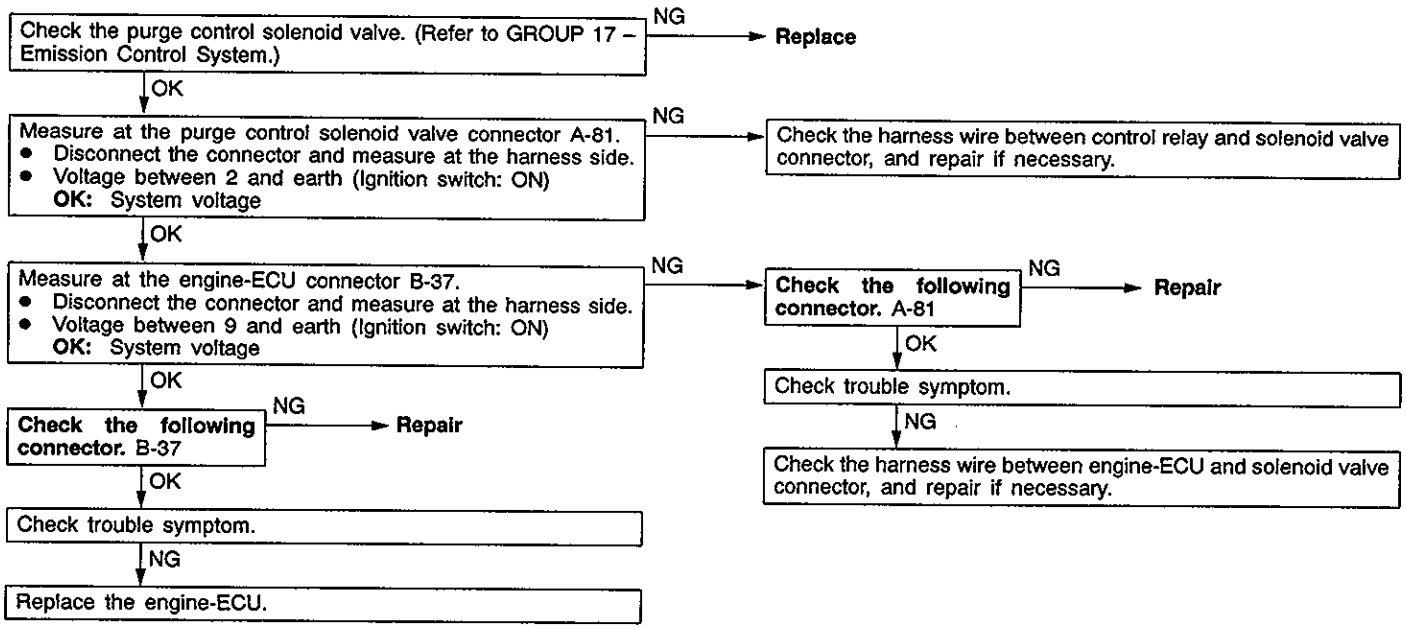
INSPECTION PROCEDURE 33

Idle speed control (ISC) servo (Stepper motor) system	Probable cause
The engine-ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	• Malfunction of ISC servo • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



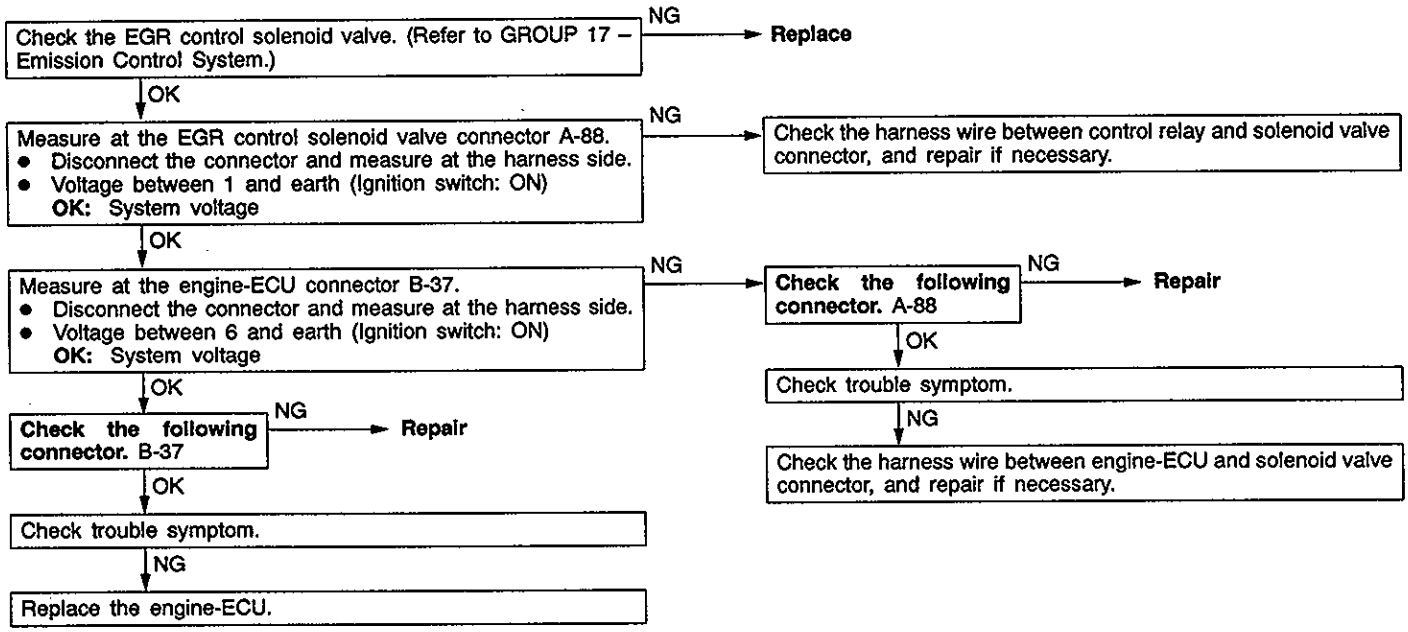
INSPECTION PROCEDURE 34

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 35

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 36

MUT-II: Inspection of no initial combustion

MUT-II Data list
16 Voltage of engine-ECU power source (Refer to P.13A-57.)
- NG → Check the power supply and ignition switch-IG system. (Refer to P.13A-41, INSPECTION PROCEDURE 24.)
- OK ↓

Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)
- No → Check timing belt for breakage.
- Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.
- No → Check the crank angle sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 22.)
- OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-61.)
- NG → Check the fuel pump system. (Refer to P.13A-42, INSPECTION PROCEDURE 25.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-57.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

INSPECTION PROCEDURE 37

Ignition system: Inspection of no initial combustion.

Does the engine tachometer display the cranking speed?
- Set the tachometer of primary voltage detection type.
- NG → Check the ignition circuit system (Refer to P.13A-45, INSPECTION PROCEDURE 32.)
- OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC
- NG → Check that the distributor is installed properly.

INSPECTION PROCEDURE 38

MUT-II: Check if uncomplete combustion occurs.

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-11, INSPECTION CHART FOR DIAGNOSIS CODE
- No ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-61.)
- NG → Check the fuel pump system. (Refer to P.13A-42, INSPECTION PROCEDURE 25.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-57.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-15, INSPECTION PROCEDURES FOR DIAGNOSIS CODE 21.)
- OK ↓

MUT-II Data list
18 Ignition switch-ST (Refer to P.13A-57.)
- NG → Check the ignition switch-ST system <M/T>. (Refer to P.13A-43, INSPECTION PROCEDURE 27.) Check the ignition switch-ST and inhibitor switch system <A/T>. (Refer to P.13A-43, INSPECTION PROCEDURE 28.)

INSPECTION PROCEDURE 39

Check if hunting occurs.

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

↓

Check and adjust the fixed SAS. (Refer to P.13A-76.)

↓

Check trouble symptom.

NG

Inspect the intake of air into the air intake system
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate.

INSPECTION PROCEDURE 40

MUT-II: Check if idling speed is unstable.

MUT-II Data list
26 Idle position switch (Refer to P.13A-57.)
NG → Check the idle position switch system. (Refer to P.13A-42, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-57.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-57.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13A-61.)
NG → Check the purge control solenoid valve system (Refer to P.13A-46, INSPECTION PROCEDURE 34.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-61.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-47, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-57.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: 600–1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-78.)
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.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-57.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-44, INSPECTION PROCEDURE 29.)
OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-57.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-44. INSPECTION PROCEDURE 30.)
OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-57.)
NG → Check the ignition switch-ST and inhibitor switch system. <A/T> (Refer to P.13A-43, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II Data list
45 ISC Servo position (Refer to P.13A-57.)
NG → Adjust the basic idle speed. (Refer to P.13A-76.)

INSPECTION PROCEDURE 41

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-57.)
NG → Check the idle position switch system. (Refer to P.13A-42, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-57.)
NG → Check the intake air sensor system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-57.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-61.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-47, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-57.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-78.)
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.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-57.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-44, INSPECTION PROCEDURE 29.)
OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-57.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-44, INSPECTION PROCEDURE 30.)
OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-57.)
NG → Check the ignition switch-ST and inhibitor switch system. <A/T> (Refer to P.13A-43, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II Data list
45 ISC servo position (Refer to P.13A-57.)
NG → Adjust the basic idle speed. (Refer to P.13A-76.)

INSPECTION PROCEDURE 42

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-57.)
NG → Check the idle position switch system. (Refer to P.13A-42, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-57.)
NG → Check the intake air sensor system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-57.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE 21.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-57.)
NG → Check the throttle position sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-61.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-47, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-57.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-78.)
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 43

MUT-II Check if surge occurs.

MUT-II Data list
26 Idle position switch (Refer to P.13A-57.)
NG → Check the idle position switch system. (Refer to P.13A-42, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-57.)
NG → Check the intake air sensor system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-57.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-57.)
NG → Check the throttle position sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-61.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-47, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Data list
59 Oxygen sensor (rear) (Refer to P.13A-57.)
- Transmission: 2nd gear <M/T>, L range <A/T>
- Driving with throttle widely open

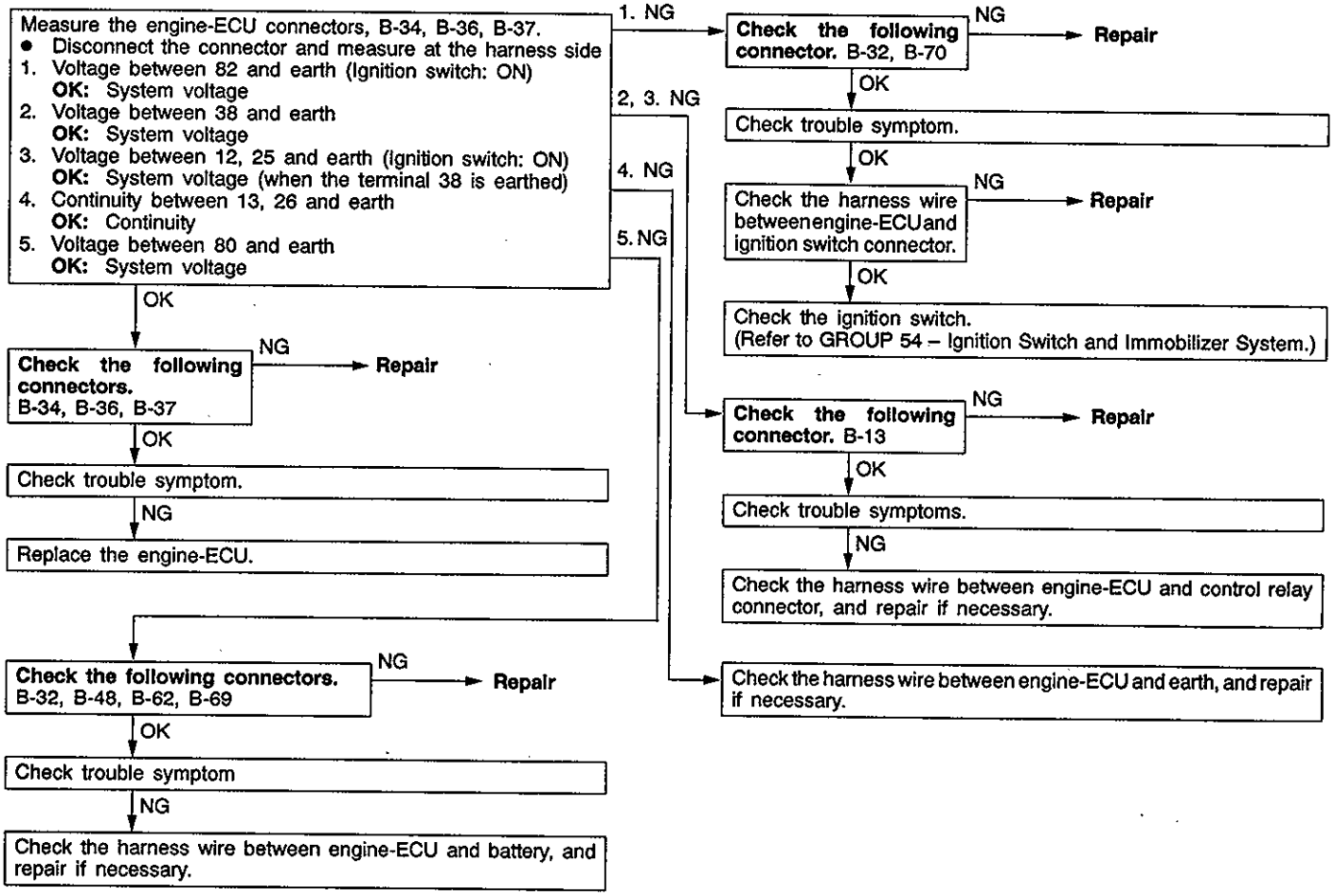
OK: 600 – 1,000 mV
NG → Check the oxygen sensor (rear) system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 59.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the oxygen sensor (front) system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor (front)
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-78.)
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.

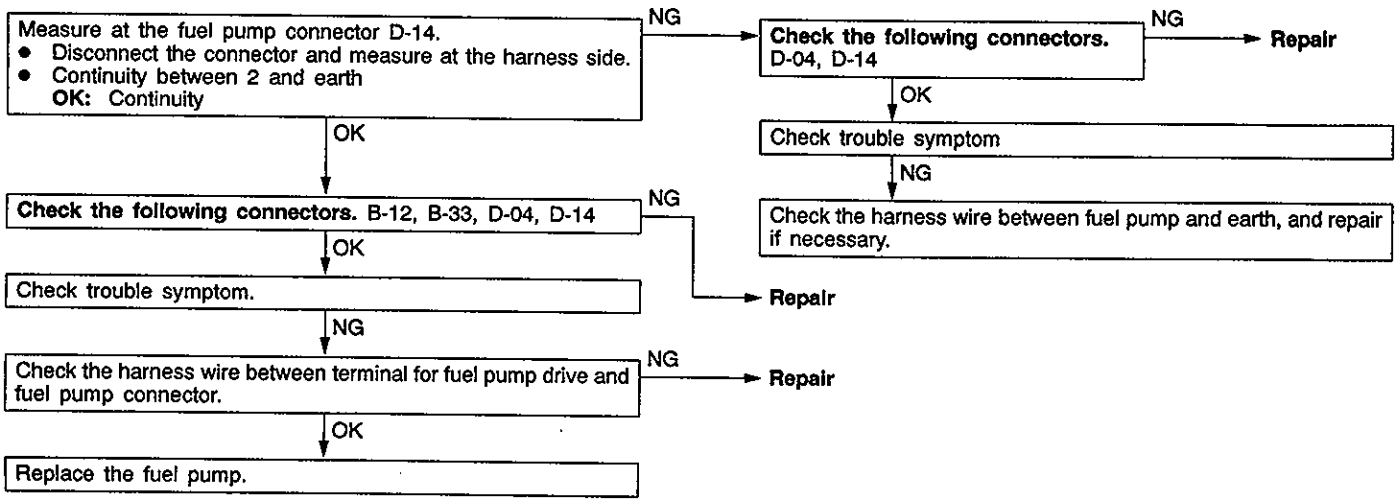
INSPECTION PROCEDURE 44

Check the engine-ECU power supply and earth circuit.



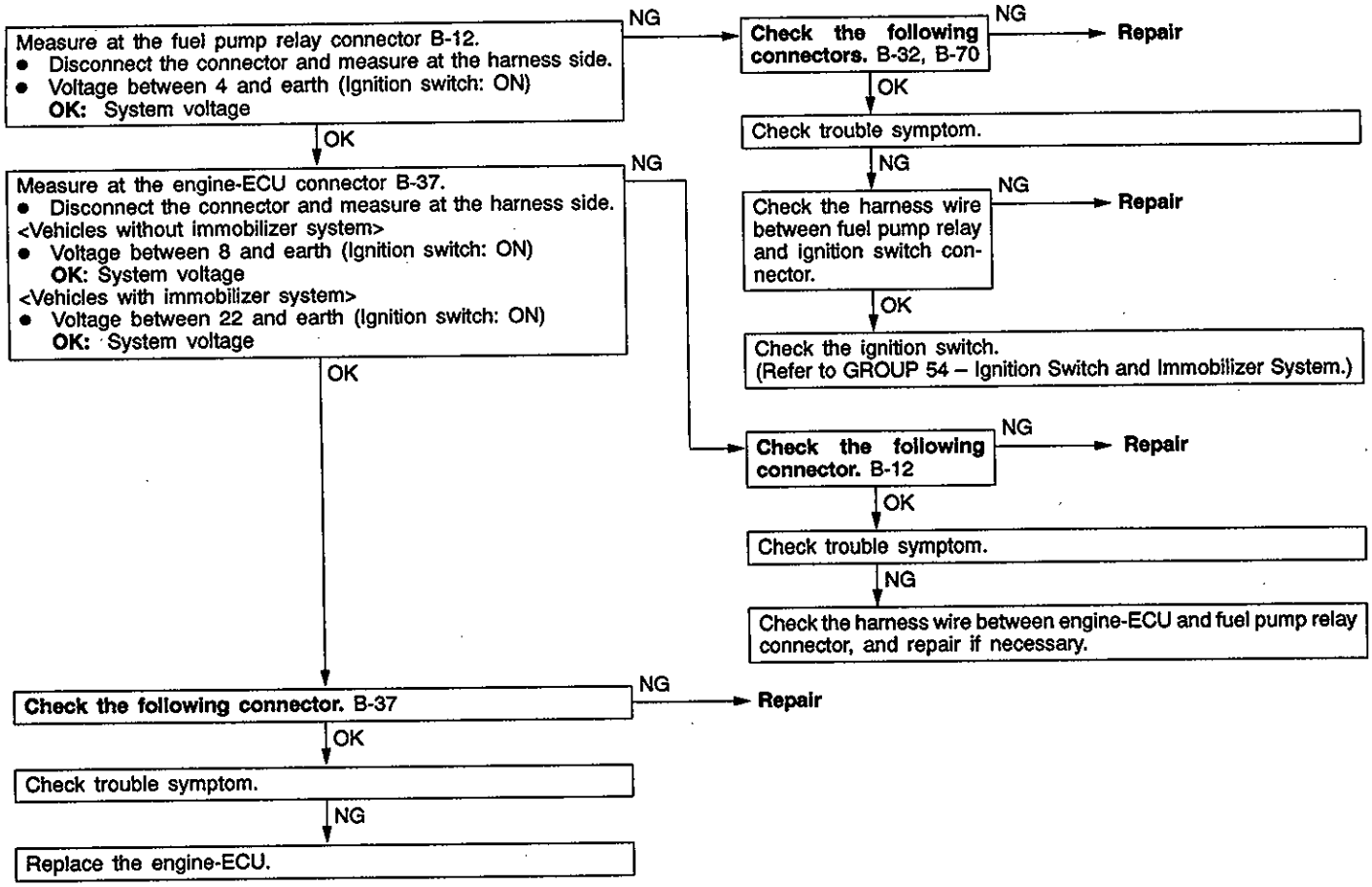
INSPECTION PROCEDURE 45

Check fuel pump circuit.



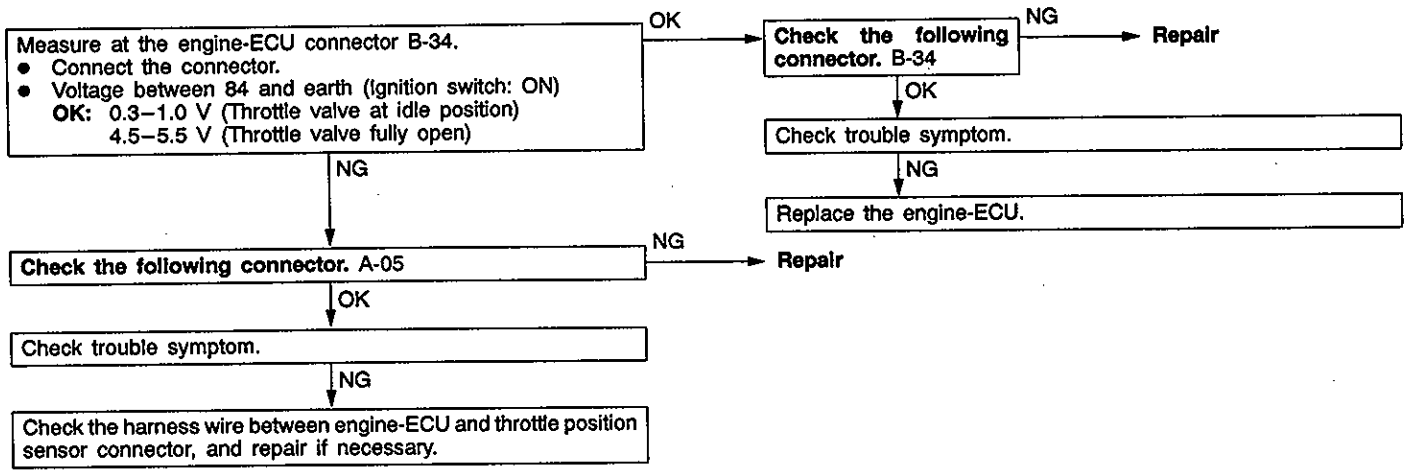
INSPECTION PROCEDURE 46

Check the fuel pump drive control circuit.



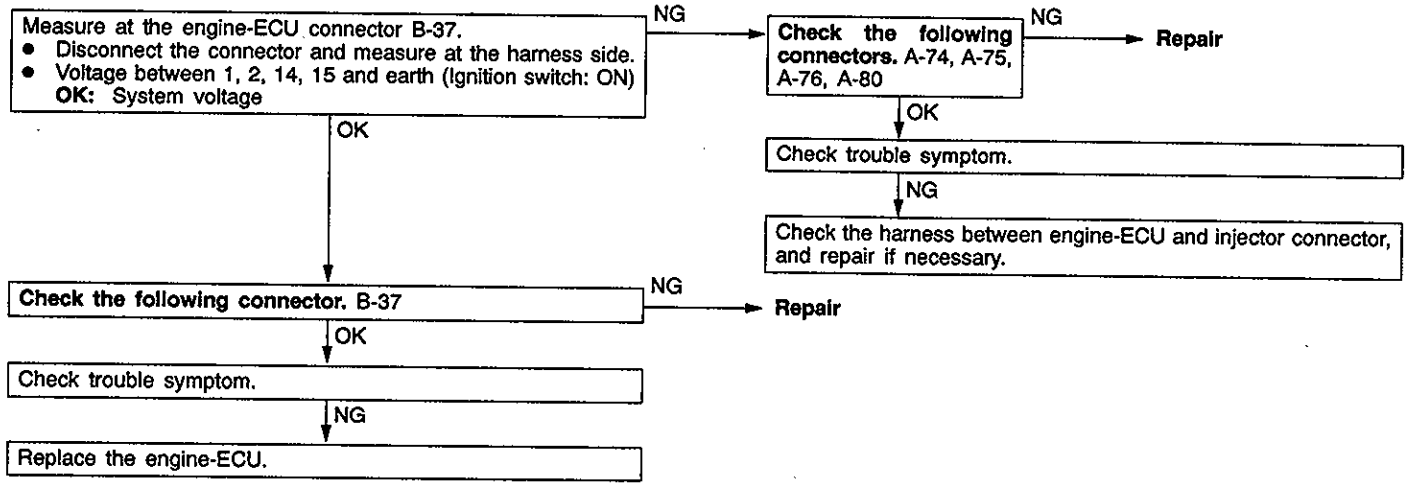
INSPECTION PROCEDURE 47

Check throttle position sensor (TPS) output circuit.



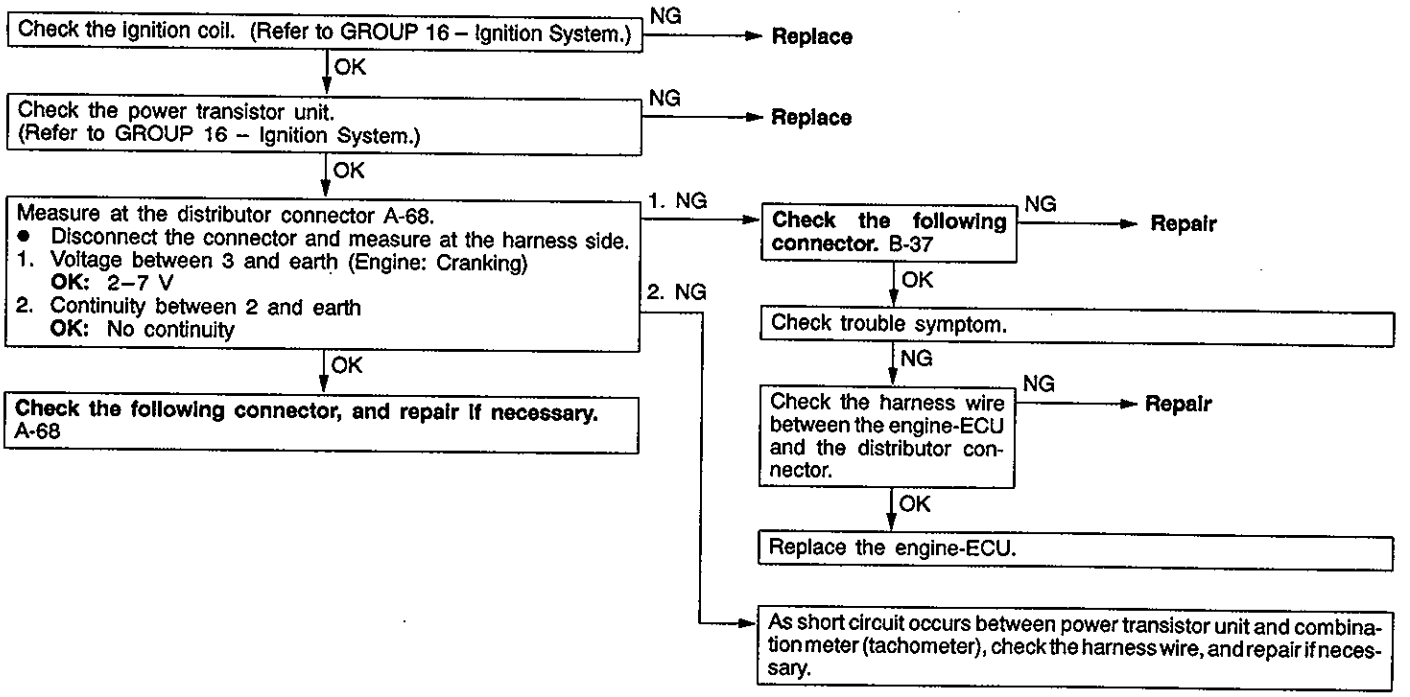
INSPECTION PROCEDURE 48

Check injector control circuit



INSPECTION PROCEDURE 49

Check ignition coil and power transistor unit circuit.



DATA LIST REFERENCE TABLE

13100890098

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

NOTE
*1. 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.
*2: In a new vehicle [driven approximately 500 km or less], the air intake plenum pressure is sometimes 10% higher than the standard pressure.
*3. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
*4. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
*5. 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.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor (front)	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-12
			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) 600–1,000 mV		
			2,500 r/min			
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-13
			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-14
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 24	13A-41
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27 <M/T> Procedure No. 28 <A/T>	13A-43 <M/T> 13A-43 <A/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13A-15
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected	Compare the engine speed readings on the tachometer and the MUT-II.	Accord	Code No. 22	13A-16
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,475–1,675 rpm		
			When engine coolant temperature is 0°C	1,345–1,545 rpm		
			When engine coolant temperature is 20°C	1,300–1,500 rpm		
			When engine coolant temperature is 40°C	1,160–1,360 rpm		
			When engine coolant temperature is 80°C	650–850 rpm		

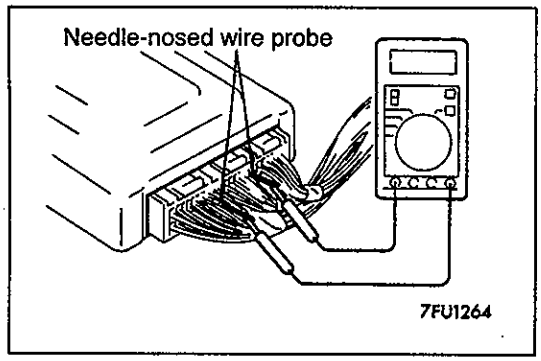
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 26	13A-42
			Throttle valve: Slightly open	OFF*1		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 29	13A-44
			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-44
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 28	13A-43
			D, 2, L or R	D, 2, L or R		
32	Vacuum sensor*2	• Engine coolant temperature: 80 – 95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (P range for A/T) • Ignition switch: ON	Engine: Stopped (At altitude of 0 m)	101 kPa	Code No. 32	13A-18
			Engine: Stopped (At altitude of 600 m)	95 kPa		
			Engine: Stopped (At altitude of 1,200 m)	88 kPa		
			Engine: Stopped (At altitude of 1,800 m)	81 kPa		
			Engine: Idling	24.3 – 37.7 kPa		
			When engine is suddenly raced	Increases		
36	Ignition timing adjustment mode	Engine: Idling	Ignition timing adjustment terminal is earthed	ON	Code No. 36	13A-19
			Ignition timing adjustment terminal is disconnected from earth	OFF		
41	Injectors *3	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	19–29 ms	–	–
			When engine coolant temperature is 20°C	39–59 ms		
			When engine coolant temperature is 80°C	8.8–13.2 ms		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Injectors*4	• Engine coolant temperature: 80–95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	1.7–2.9 ms	–	–
			2,500 r/min	1.4–2.6 ms		
			When engine is suddenly raced	Increases		
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	–	–
			2,500 r/min	25–45 °BTDC		
45	ISC (stepper) motor position *5	• Engine coolant temperature: 80–95°C • Lamps, electric cooling fan 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-44
			A/C switch: ON	ON (Compressor clutch is operating)		
59	Oxygen sensor (rear)	• Transmission: 2nd gear <M/T>, L range <A/T> • Drive with throttle widely open	3,500 r/min	600 – 1,000 mV	Code No. 59	13A-21

ACTUATOR TEST REFERENCE TABLE

13100900128

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-19
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. 25	13A-42
				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. 34	13A-46
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. 35	13A-47
20	Condenser fan	Drive the fan motors (condenser)	• Ignition switch: ON • A/C switch: ON		Fan motor runs	Procedure No. 31	13A-45
21	Radiator fan	Drive the fan motors (radiator)	• Ignition switch: ON		Fan motor runs	Procedure No. 31	13A-45



CHECK AT THE ENGINE-ECU TERMINALS

13100920094

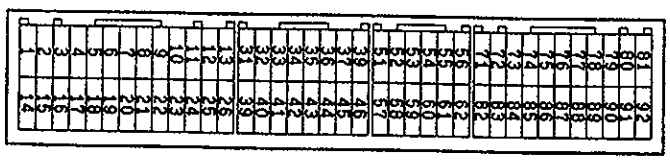
TERMINAL VOLTAGE CHECK CHART

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

NOTE
*: Vehicles with immobilizer system

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
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	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8 or 22*	Fuel pump relay	Ignition switch: ON	System voltage
		Engine: Idle speed	0–3V
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
12	Power supply	Ignition switch: ON	System voltage
25			
20	Condenser fan motor relay	Condenser fan is not operating (Engine coolant temperature is 90°C or less)	System voltage
		Condenser fan is operating (Engine coolant temperature is 105°C or more)	0 – 3 V
21	Radiator fan motor relay	Radiator fan is not operating (Engine coolant temperature is 90°C or less)	System voltage
		Radiator fan is operating (Engine coolant temperature is 90 – 105°C)	0 – 3 V
22 or 8*	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor runs)	System voltage or momentarily 6V or more → 0–3V
33	Alternator G terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF → ON • Rear defogger switch: OFF → ON	0.4 – 0.8 V to 0.8 – 1.2 V
41	Alternator FR terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF → ON • Rear defogger switch: OFF → ON	1.8 – 2.4 V to 1.0 – 1.6 V
36	Engine warning lamp	Ignition switch: OFF → ON	0–3V → 9–13V (After several seconds have elapsed)

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
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
38	Control relay (Power supply)	Ignition switch: OFF		System voltage
		Ignition switch: ON		0–3V
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	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
54	Oxygen sensor heater (rear)	Engine: Idling after warming up		0 – 3 V
		Engine r/min: 5,000 r/min		System voltage
60	Oxygen sensor heater (front)	Engine: Idling after warming up		0–3V
		Engine r/min: 5,000r/min.		System voltage
71	Ignition switch – ST	Engine: Cranking		8V or more
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
75	Oxygen sensor (rear)	• Transmission: 2nd gear <M/T>, L range <A/T> • Engine r/min: 3,500 r/min or more • Driving with the throttle valve widely open		0.6 – 1.0 V
76	Oxygen sensor (front)	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF		System voltage
81	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
82	Ignition switch – IG	Ignition switch: ON		System voltage

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
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	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	Vacuum sensor (Manifold absolute pressure sensor)	Ignition switch: ON (when altitude is 0 m)		3.7 – 4.3 V
		Ignition switch: ON (when altitude is 1,200 m)		3.2 – 3.8 V
		Engine: Idle speed		0.9 – 1.5 V
		While engine is idling after having warmed up, suddenly depress the accelerator pedal		From 0.9 – 1.5 V, momentarily increases
86	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5V (Changes repeatedly)
87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
			Slightly open throttle valve	4V or more
89	Crank angle sensor	Engine: Cranking		0.4–4.0V
		Engine: Idle speed		1.5–2.5V
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

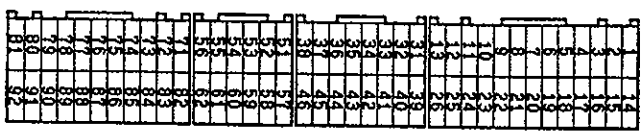
CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

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



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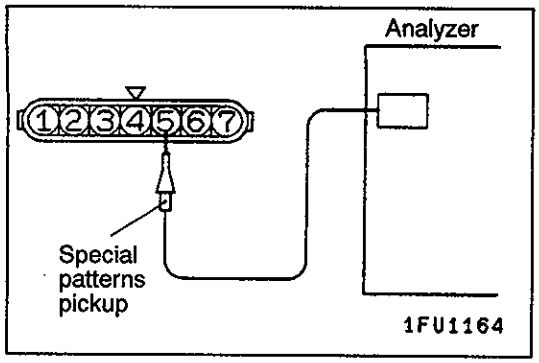
Terminal No.	Inspection item	Normal condition (Check condition)
1–12	No. 1 injector	13–16 Ω (At 20°C)
14–12	No. 2 injector	
2–12	No. 3 injector	
15–12	No. 4 injector	

Terminal No.	Inspection item	Normal condition (Check condition)
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	36–44 Ω (At 20°C)
9–12	Purge control solenoid valve	36–44 Ω (At 20°C)
13–Body earth	ENGINE-ECU earth	Continuity (0Ω)
26–Body earth	ENGINE-ECU earth	
54–12	Oxygen sensor heater (rear)	7 – 40 Ω (At 20°C)
60–12	Oxygen sensor heater (front)	7 – 40 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

13100930097

CRANK ANGLE SENSOR

Measurement Method

1. Disconnect the distributor (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 connector terminal 5.

Alternate Method (Test harness not available)

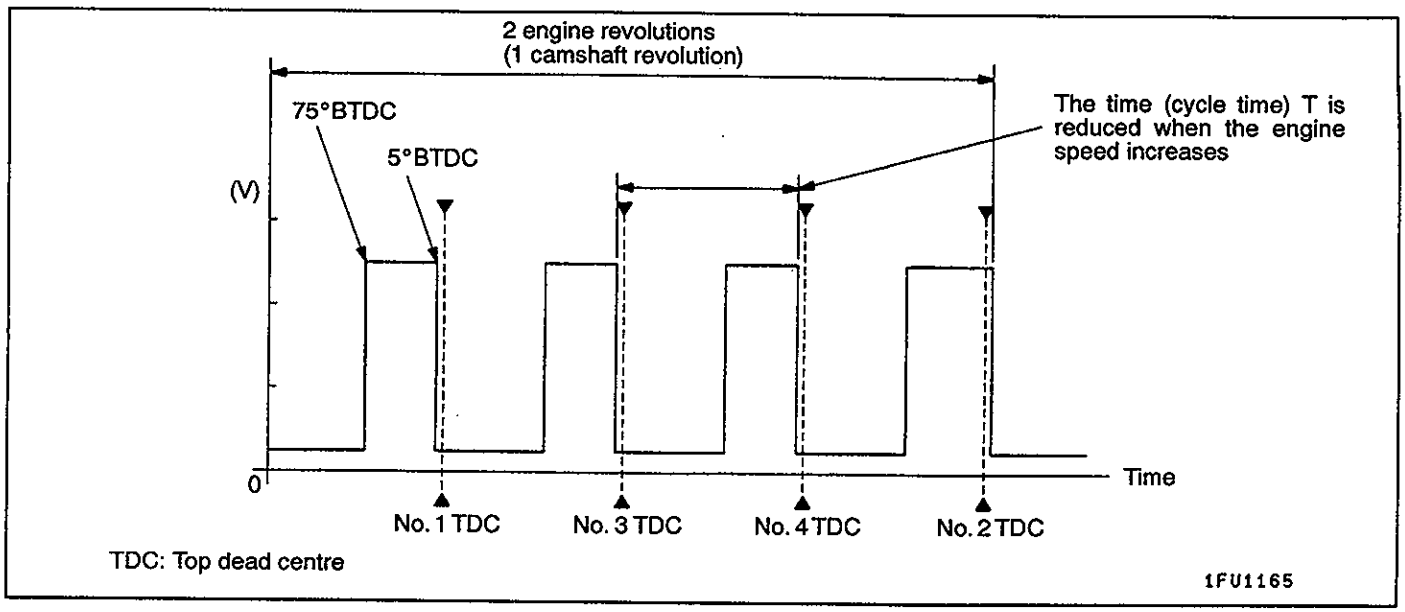
1. Connect the analyzer special patterns pickup to engine-ECU terminal 89.

Standard Wave Pattern

Observation conditions

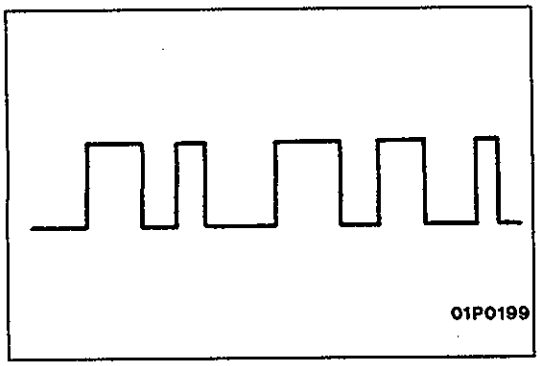
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

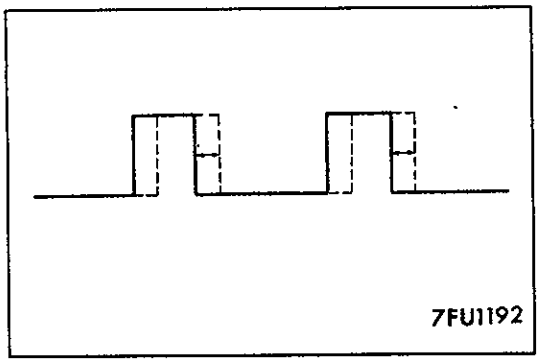
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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



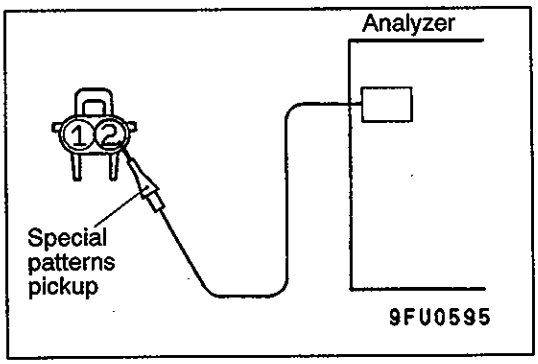
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



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)

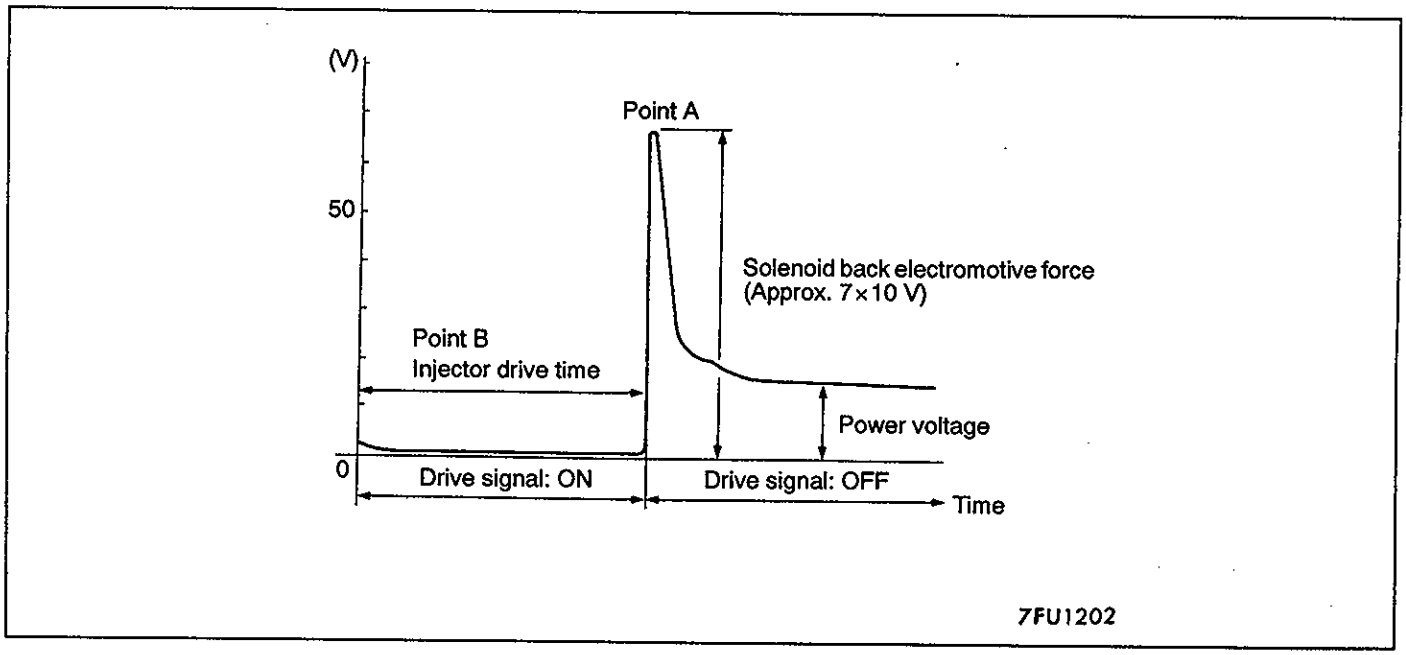
1. Connect the analyzer special patterns pickup to engine-ECU terminal 1. (When checking the No. 1 cylinder.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 14. (When checking the No. 2 cylinder.)
3. Connect the analyzer special patterns pickup to engine-ECU terminal 2. (When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

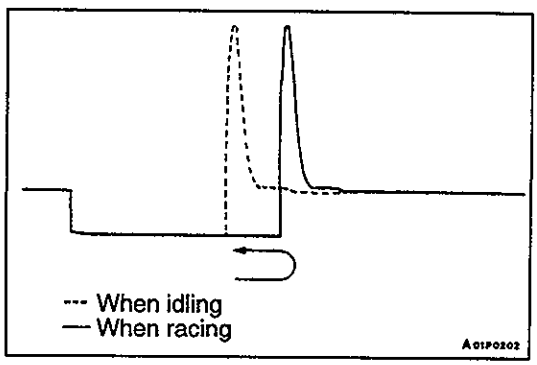


Wave Pattern Observation Points

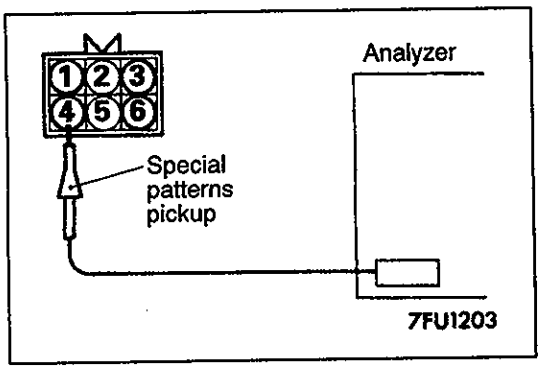
Point A: Height of solenoid back electromotive force

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)

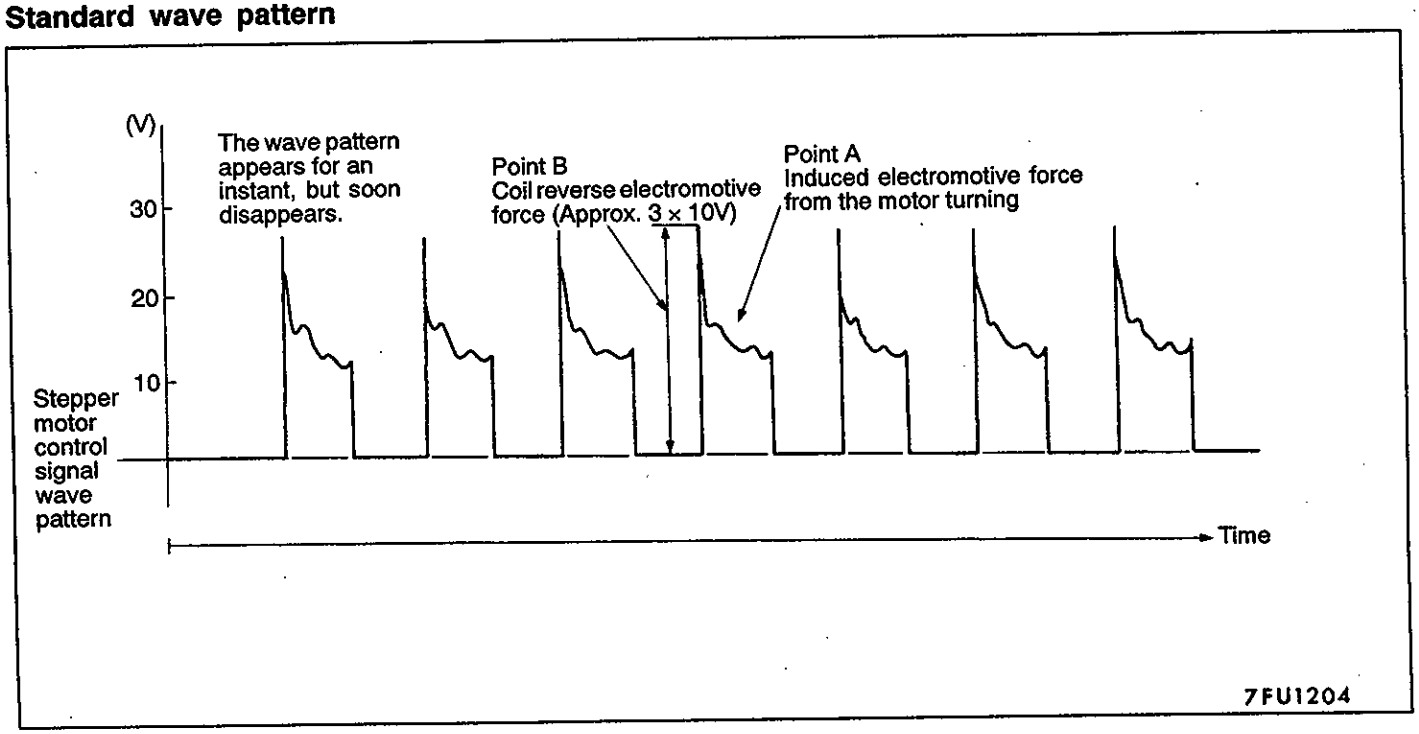
1. Connect the analyzer special patterns pickup to engine-ECU terminal 4, connection terminal 5, connection terminal 17, and connection terminal 18 respectively.

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



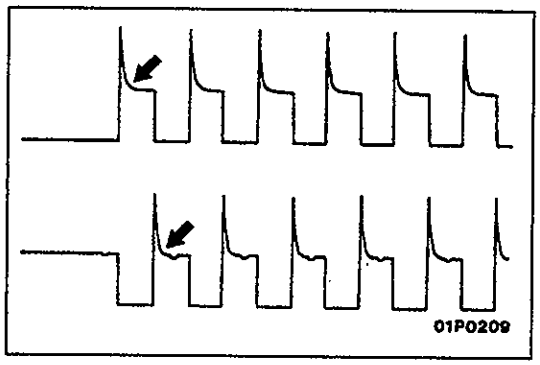
Wave Pattern Observation Points

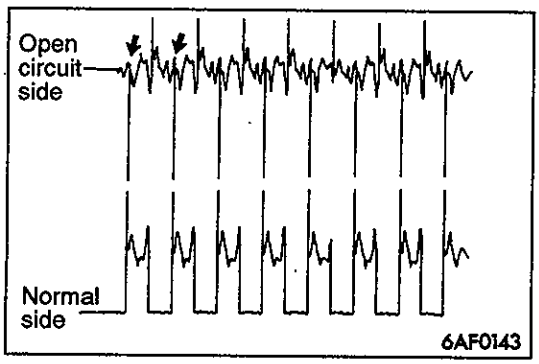
Check that the standard wave pattern appears when the stepper motor is operating.
Point A: Presence or absence of induced electromotive force from the motor turning. (Refer to the abnormal wave pattern.)

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.

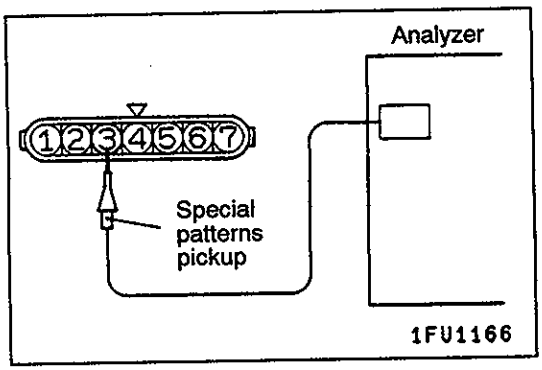
- Example 2

  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

- 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 3.

Alternate Method (Test harness not available)

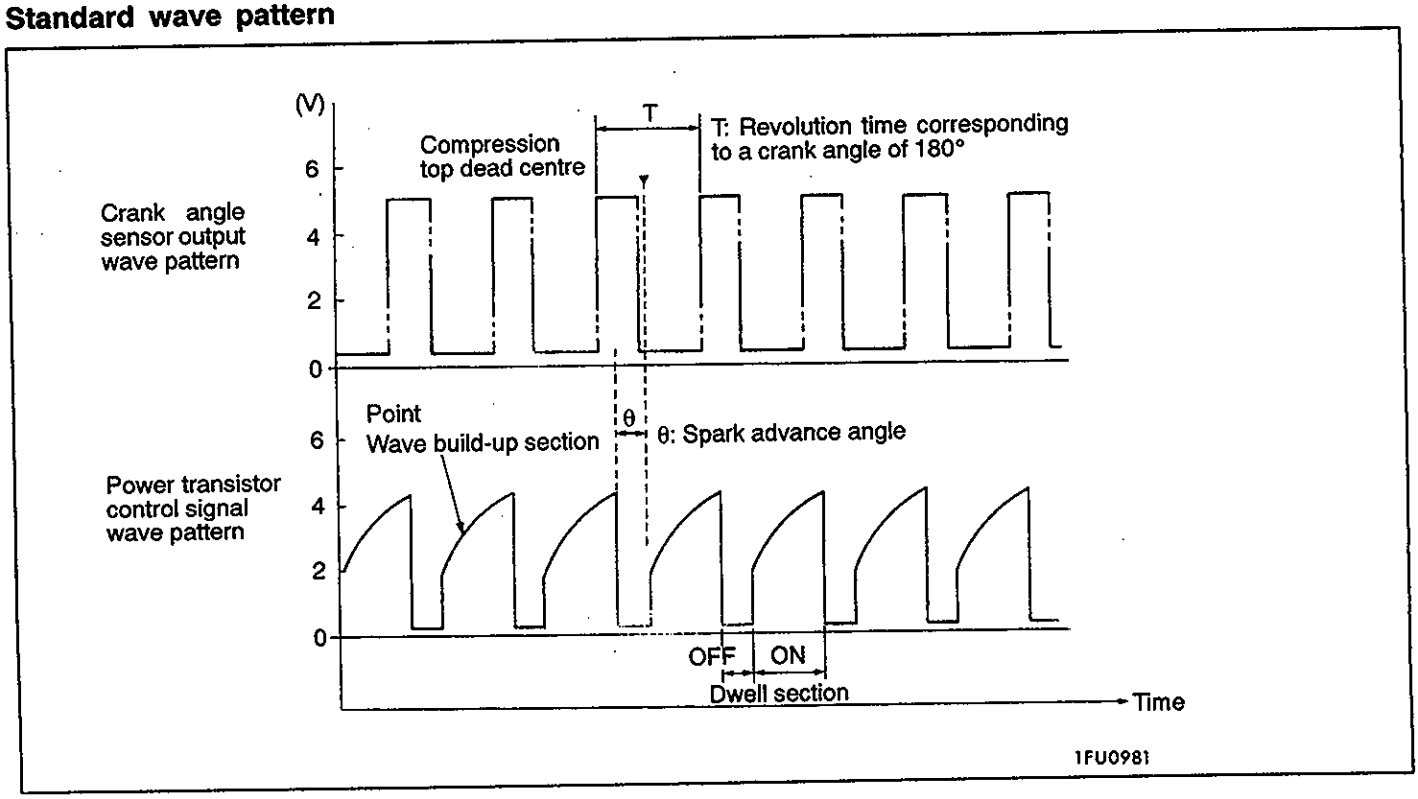
1. Connect the analyzer special patterns pickup to engine-ECU terminal 10.

Standard Wave Pattern

Observation condition

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

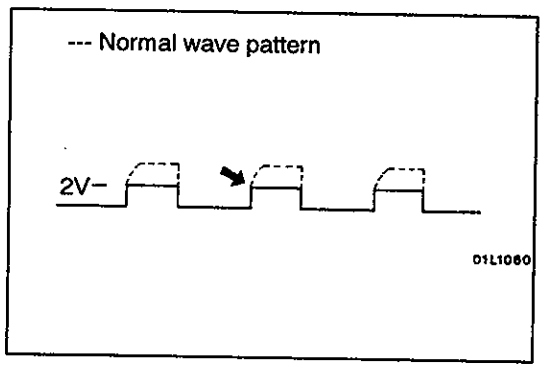
Standard wave pattern

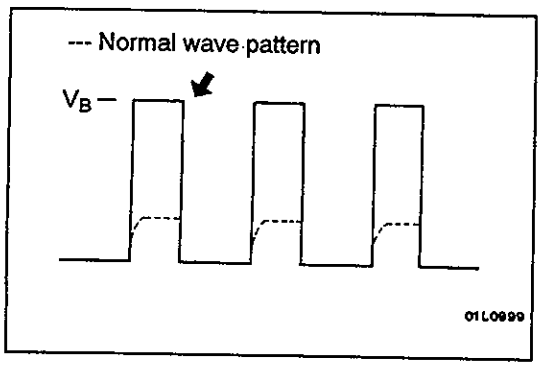


Wave Pattern Observation Points

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

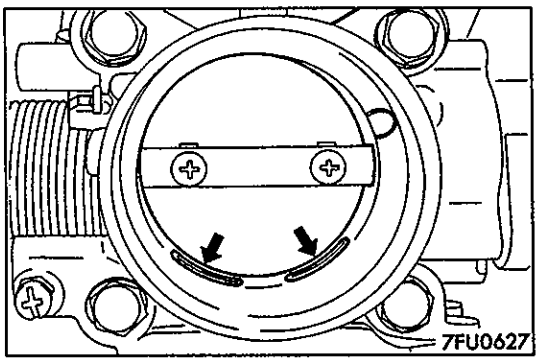
  Wave pattern characteristics

  Power voltage results when the power transistor is ON.

ON-VEHICLE SERVICE 13100100115

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.



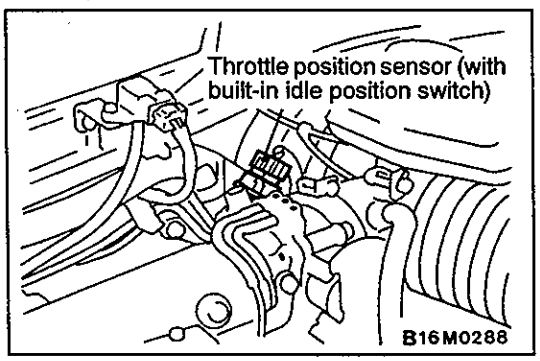
3. Plug the bypass passage inlet of the throttle body.

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

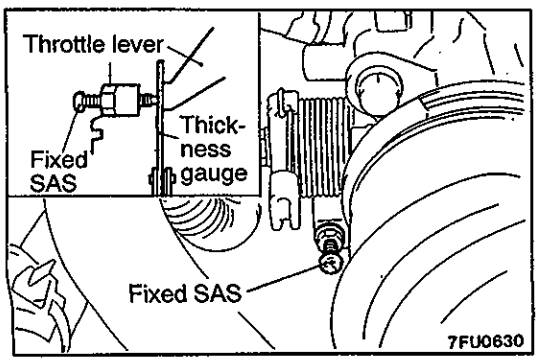
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly 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-76.)

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.

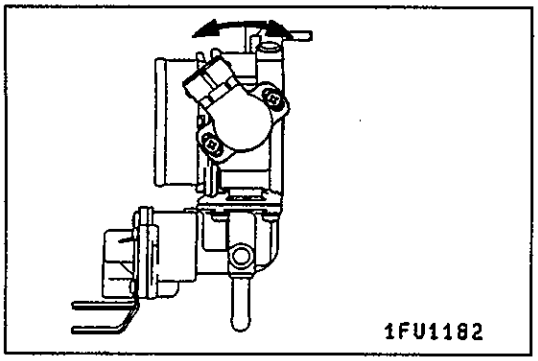
IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT 13100130107



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



2. Insert a thickness gauge with a thickness of 0.45 mm between the fixed SAS and the throttle lever.
3. Turn the ignition switch to ON (but do not start the engine).

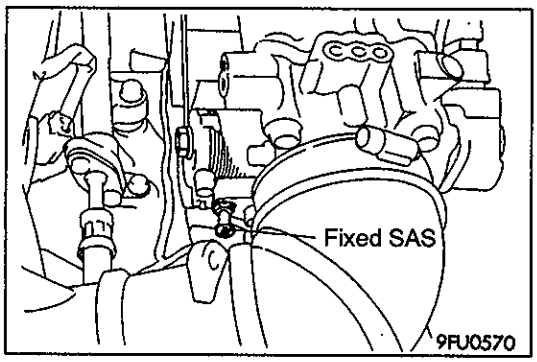


4. Loosen the throttle position sensor mounting bolt, and then turn the throttle position sensor anti-clockwise as far as it will go.
5. Check that the idle position switch is on at this position.
6. Slowly turn the throttle position sensor clockwise and find the point where the idle position switch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



FIXED SAS ADJUSTMENT 13100150110

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. Adjust the idle position switch and the throttle position sensor (P.13A-75).

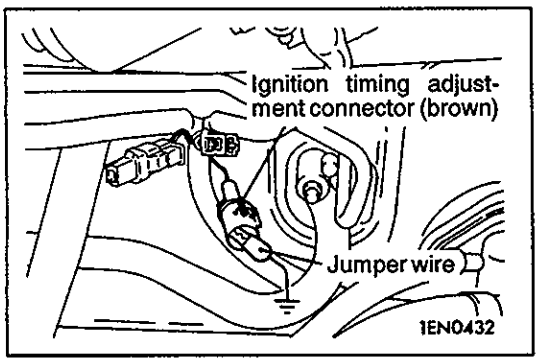
BASIC IDLE SPEED ADJUSTMENT 13100180119

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.

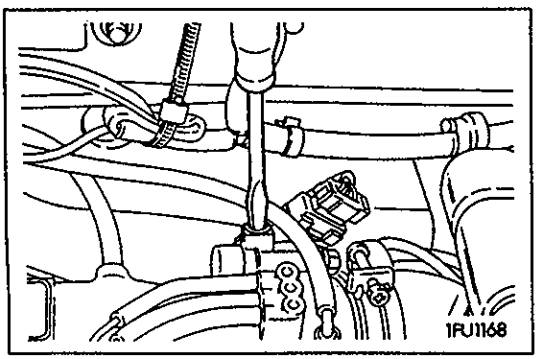


3. Remove the waterproof female connector from the ignition timing adjustment connector.
4. Use a jumper wire to earth the ignition timing adjustment terminal.

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

Standard value: 750 ± 50 r/min

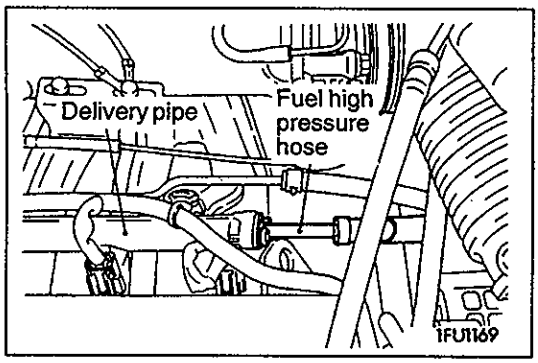
NOTE
1. The engine speed may be 20 to 100 r/min lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
2. If the engine stalls or the engine speed is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-75.)



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. Disconnect the MUT-II.
11. Start the engine again and let it run at idle speed for about 10 minutes; check that the idling condition is normal.

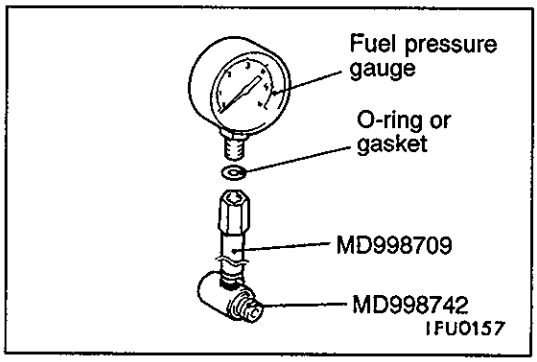


FUEL PRESSURE TEST

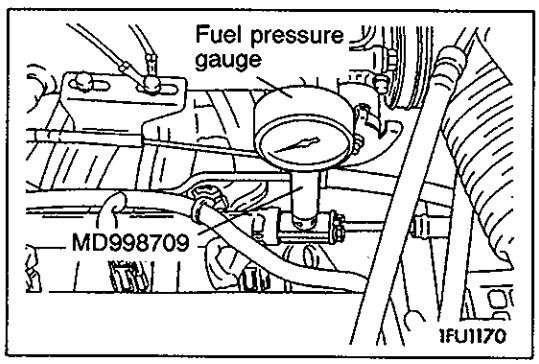
13100190112

1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-81.)
2. Disconnect the fuel high pressure hose at the delivery pipe side.

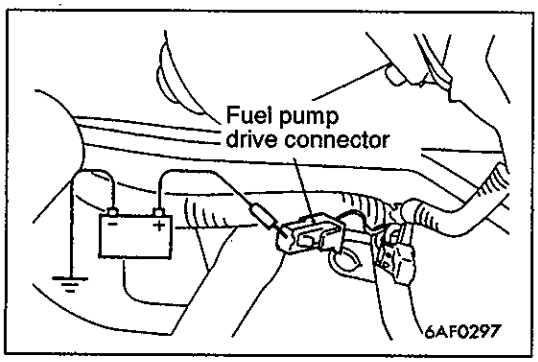
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



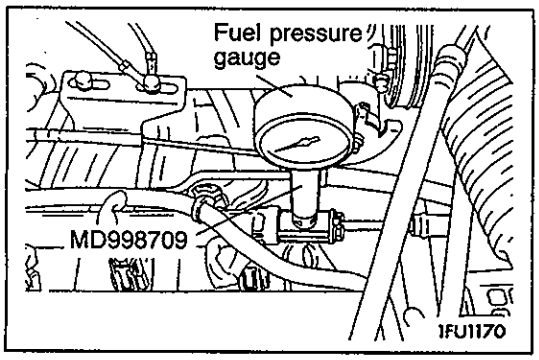
3. Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.
4. Install a fuel pressure gauge on the adapter hose that was set up in step 3.
   Use a suitable O-ring or gasket between the fuel pressure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

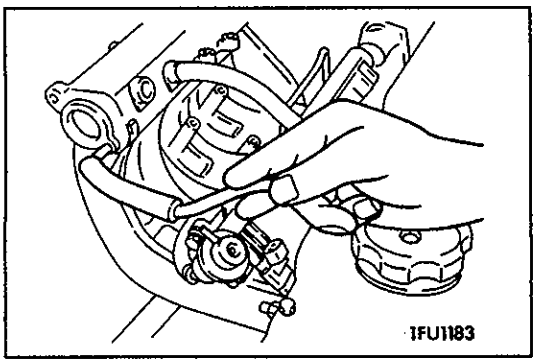


6. Connect the fuel pump drive connector with the battery (+) terminal using a jumper wire and drive the fuel pump. Under fuel pressure, check the fuel pressure gauge and special tool connections for leaks.
7. Disconnect the jumper wire from the fuel pump drive terminal to stop the fuel pump.
8. Start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

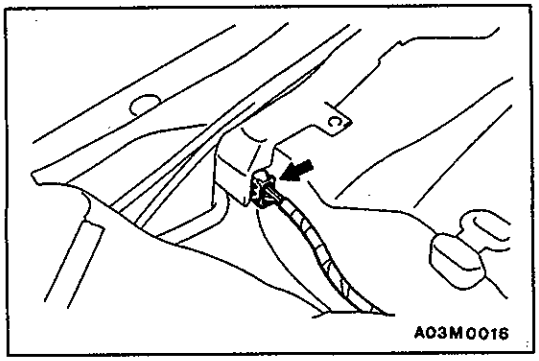
15. Release residual pressure from the fuel pipe line. (Refer to P.13A-81.)
16. Remove the fuel pressure gauge and special tool from the delivery pipe.

    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.

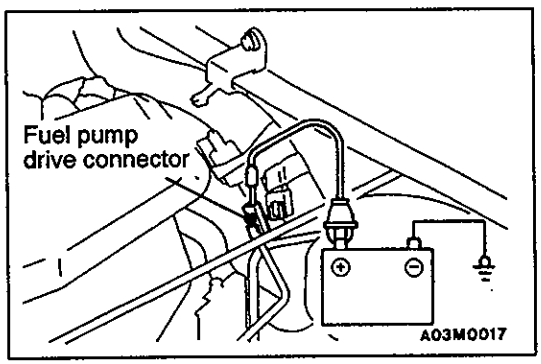


FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

13100090146

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) Disconnect the body wiring harness and fuel wiring harness under the floor carpet.
(3) After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
(4) Connect the fuel wiring harness and body wiring harness.
(5) Install the rear seat cushion.



FUEL PUMP OPERATION CHECK

13100200105

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.

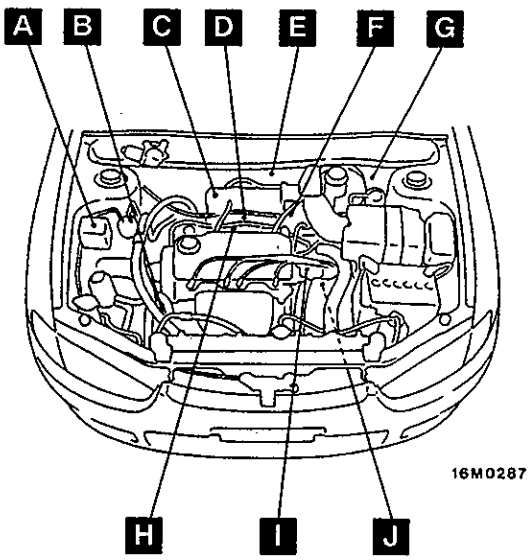
   NOTE
   As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel filler cap and check from the tank inlet.

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

COMPONENT LOCATION

13100210153

Name	Symbol	Name	Symbol
A/C relay	A	Ignition timing adjustment terminal	G
A/C switch	M	Inhibitor switch <A/T>	J
Control relay and fuel pump relay	N	Injectors	H
Diagnosis connector	L	Intake air temperature sensor	C
Distributor (with ignition coil and crank angle sensor)	I	Oxygen sensor (front)	Q
		Oxygen sensor (rear)	P
EGR control solenoid valve	D	Power steering fluid pressure switch	B
Engine coolant temperature sensor	I	Purge control solenoid valve	D
Engine-ECU	O	Throttle position sensor (with idle position switch)	F
Engine warning lamp (check engine lamp)	K		
Fuel pump check terminal	G	Vacuum sensor	E
Idle speed control servo	F	Vehicle speed sensor	J



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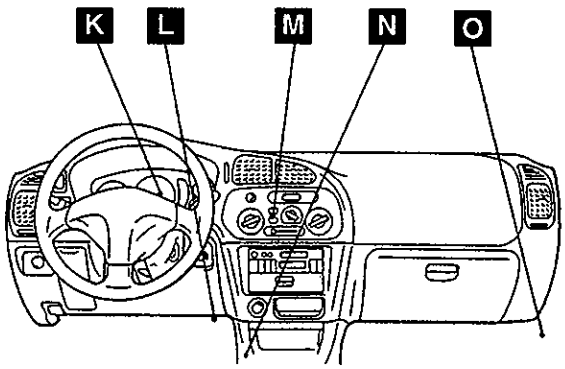

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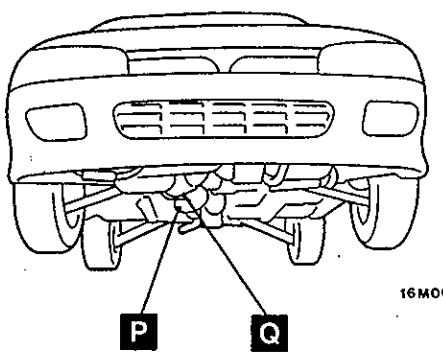

16M0043

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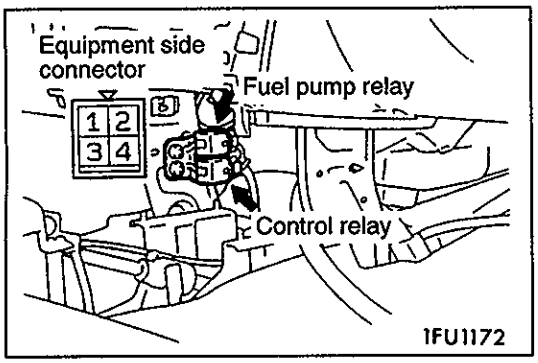
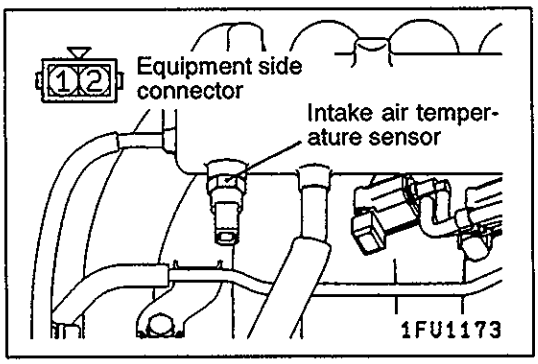


CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990057

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



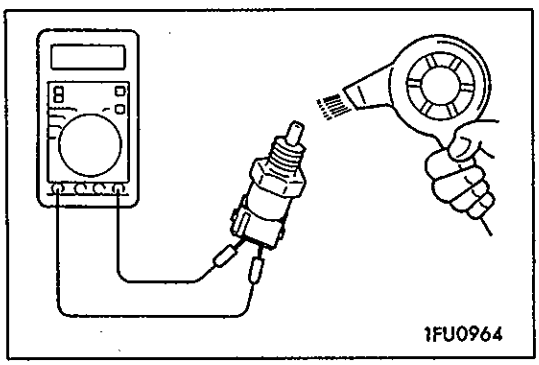
INTAKE AIR TEMPERATURE SENSOR CHECK

13100280109

1. Disconnect the intake air temperature sensor connector.
2. Measure resistance between terminals 1 and 2.

   Standard value:
   2.3 – 3.0 kΩ (at 20°C)
   0.30 – 0.42 kΩ (at 80°C)

3. Remove the intake air temperature sensor.



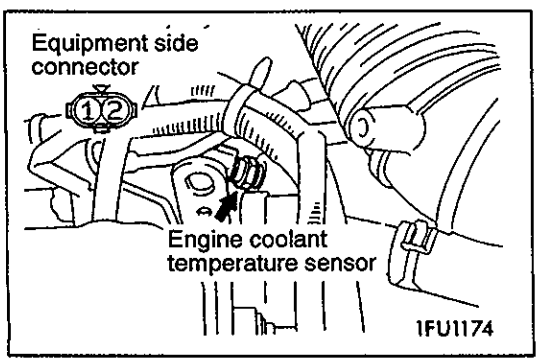
4. Measure resistance while heating the sensor using a hair drier.

   Normal condition:

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

5. If the value deviates from the standard value or the resistance remains unchanged, replace the intake air temperature sensor.
6. Install the intake air temperature sensor and tighten it to the specified torque.

   Tightening torque: 12 – 15 Nm

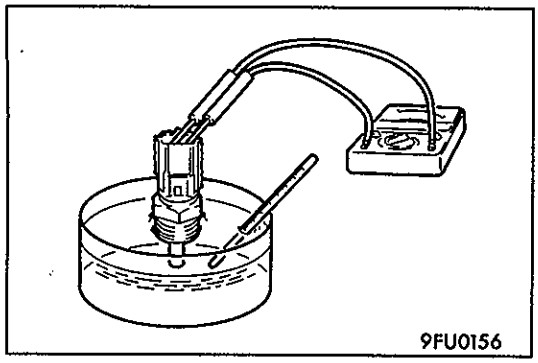


ENGINE COOLANT TEMPERATURE SENSOR CHECK

13100310105

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

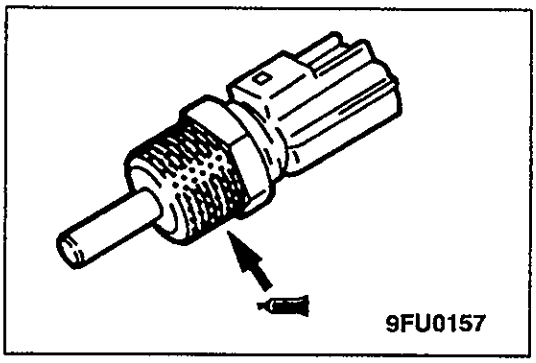
1. Remove the engine coolant temperature sensor.



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.

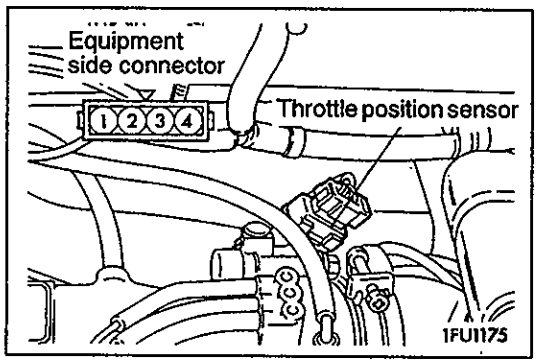


4. Apply sealant to threaded portion.

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

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

   Tightening torque: 29 Nm



THROTTLE POSITION SENSOR CHECK 13100320108

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

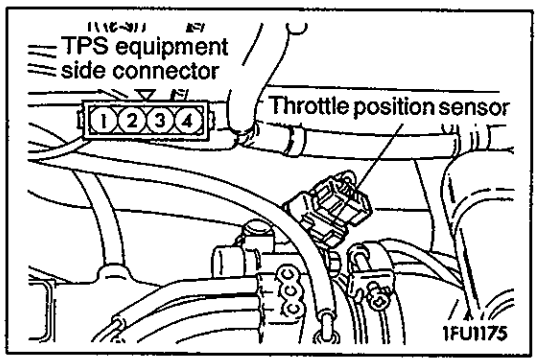
3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

   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-75.



IDLE POSITION SWITCH CHECK 13100330118

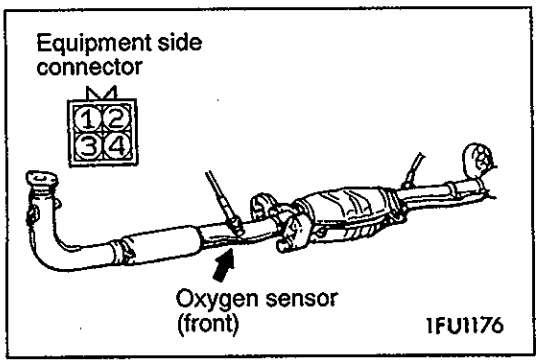
1. Disconnect the throttle position sensor connector.
2. Check the continuity between the throttle position sensor connector side terminal 3 and terminal 4.

   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-75.)

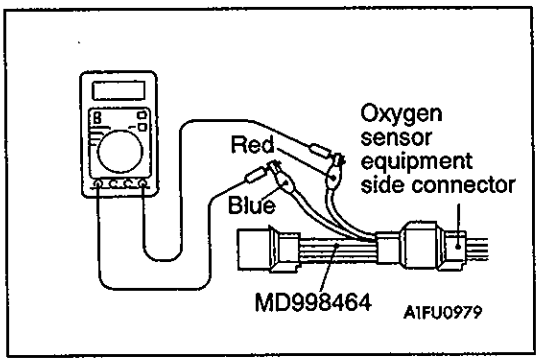


OXYGEN SENSOR CHECK

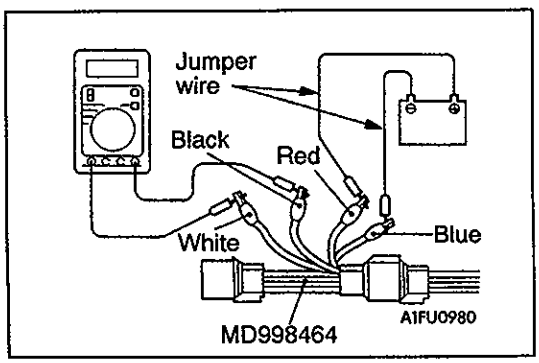
13100510048

<Oxygen sensor (front)>

1. Disconnect the oxygen sensor connector and connect the special tool (test harness) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (7 – 40 Ω at 20°C) between terminal 1 (red clip of special tool) and terminal 3 (blue clip of special tool) 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 wire to connect terminal 1 (red clip) of the oxygen sensor connector to the battery (+) terminal and terminal 3 (blue clip) to the battery (–) terminal.

Caution
Be very careful when connecting the jumper wire; incorrect connection can damage the oxygen sensor.

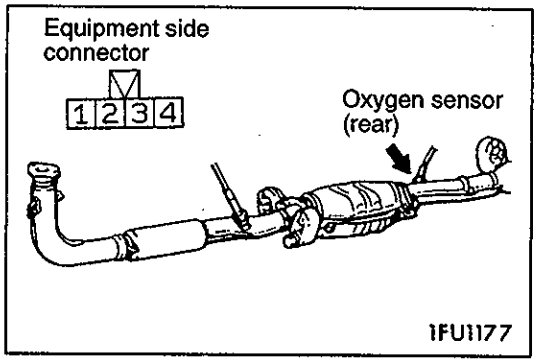
6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

Standard value:

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

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

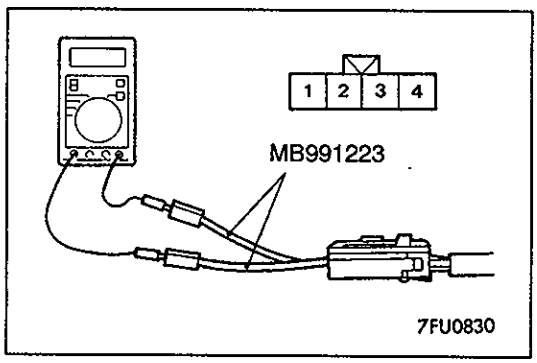
NOTE
For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.

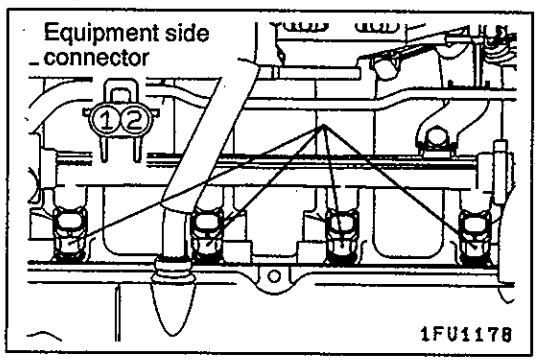


<Oxygen sensor (rear)>

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.

NOTE
1. If the MUT-II does not display the standard value although no abnormality is found by the above mentioned continuity test and harness check, replace the oxygen sensor (rear).
2. For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Pipe and Main Muffler.





INJECTOR CHECK

13100520102

Measurement of Resistance between Terminals

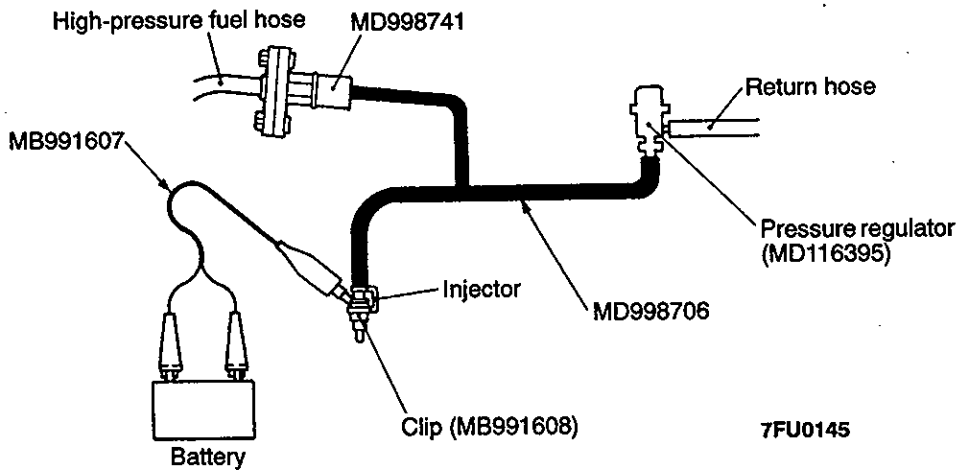
1. Remove the injector connector.
2. Measure the resistance between terminals.

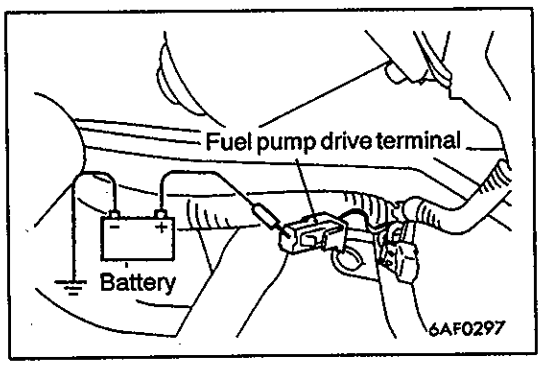
   Standard value: 13–16 Ω (at 20°C)
3. Install the injector connector.

Checking the Injection Condition

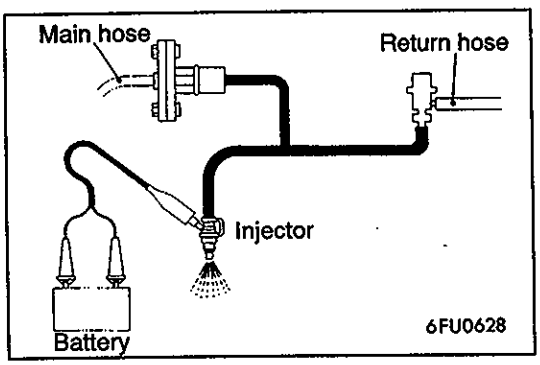
1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13-81.)
2. Remove the injector.

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

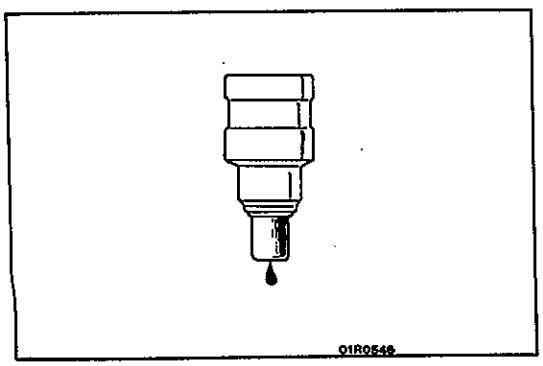




4. Apply battery voltage to the fuel pump drive terminal (black) and activate the fuel pump.



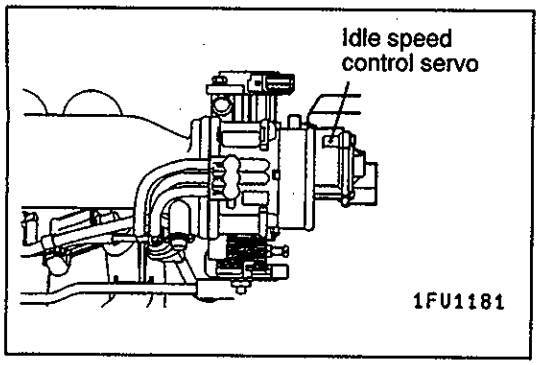
5. Activate the injector and check the atomized spray condition of the fuel.
   The condition can be considered satisfactory unless it is extremely poor.

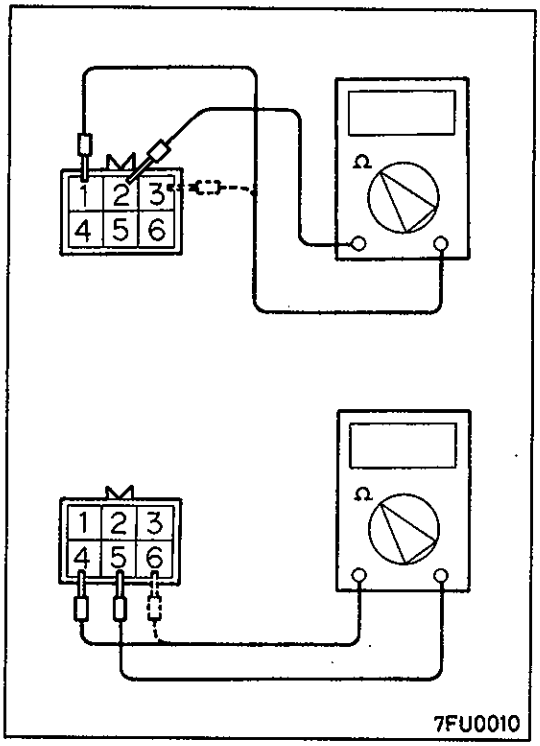


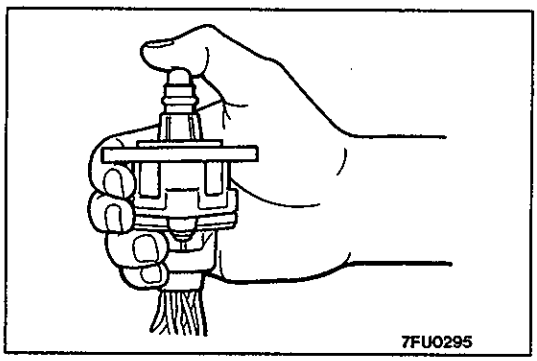
6. Stop the actuation of the injector, and check for leakage from the injector's nozzle.

   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

13100540146

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

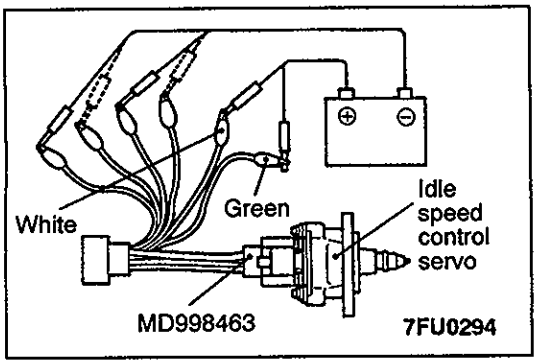
1. Disconnect the idle speed control servo connector and connect the special tool (test harness).
2. Measure the resistance between terminal 2 (white clip of the special tool) and either terminal 1 (red clip) or terminal 3 (blue clip) of the connector at the idle speed control servo side.

   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)

Operation Check

1. Remove the throttle body.
2. Remove the stepper motor.



3. Connect the special tool (test harness) to the idle speed control servo connector.
4. Connect the positive (+) terminal of a power supply (approx. 6 V) to the white clip and the green clip.
5. With the idle speed control servo as shown in the illustration, connect the negative (–) terminal of the power supply to each clip as described in the following steps, and check whether or not a vibrating feeling (a feeling of very slight vibration of the stepper motor) is generated as a result of the activation of the stepper motor.
   (1) Connect the negative (–) terminal of the power supply to the red and black clip.
   (2) Connect the negative (–) terminal of the power supply to the blue and black clip.
   (3) Connect the negative (–) terminal of the power supply to the blue and yellow clip.
   (4) Connect the negative (–) terminal of the power supply to the red and yellow clip.
   (5) Connect the negative (–) terminal of the power supply to the red and black clip.
   (6) Repeat the tests in sequence from (5) to (1).
6. If, as a result of these tests, vibration is detected, the stepper motor can be considered to be normal.

PURGE CONTROL SOLENOID VALVE CHECK

13100560111

Refer to GROUP 17 – Emission Control System.

EGR CONTROL SOLENOID VALVE CHECK

13100570107

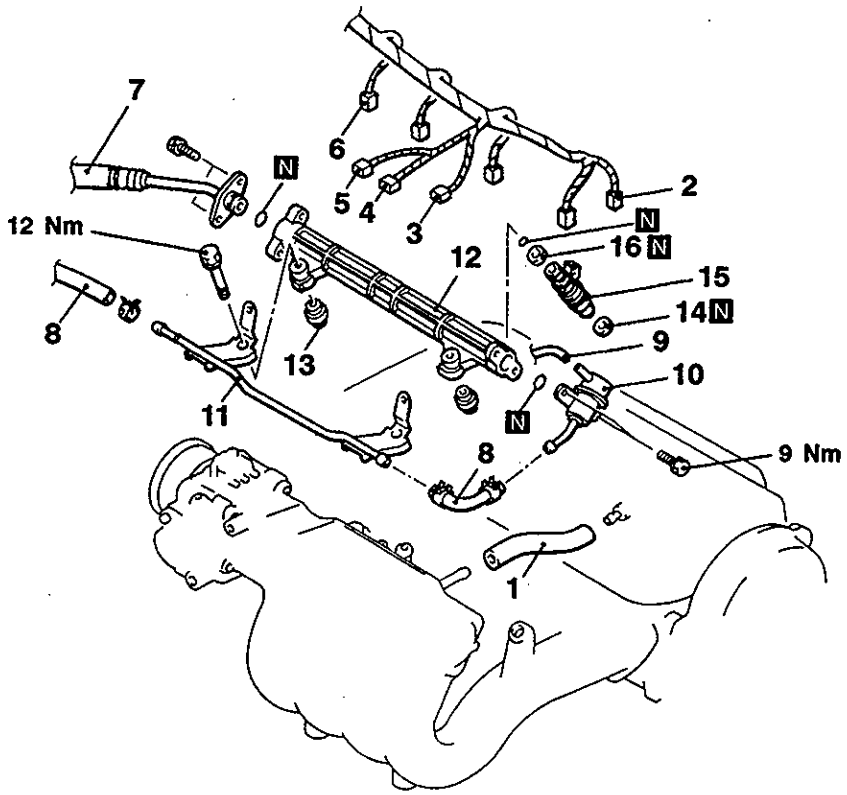
Refer to GROUP 17 – Emission Control System.

INJECTOR

13100710141

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-81.)



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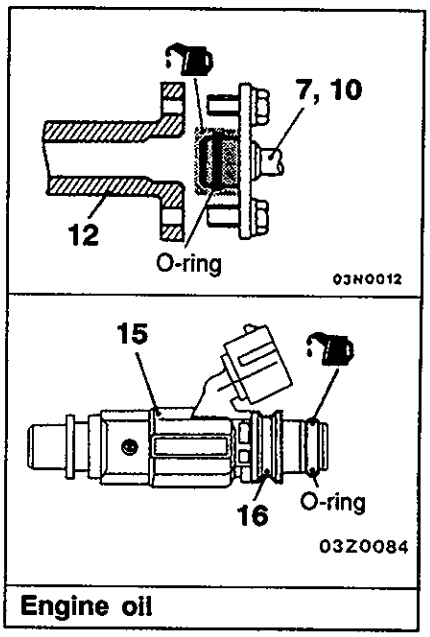


Removal steps

1. PCV hose
2. Oxygen sensor connector
3. Intake air temperature sensor connector
4. Purge control solenoid valve connector
5. EGR solenoid valve connector
6. Injector connector
▶A◀ 7. High-pressure fuel hose connection
8. Fuel return hose connection
9. Vacuum hose connection
▶A◀ 10. Fuel pressure regulator
11. Fuel return pipe
◀A▶ 12. Delivery pipe
13. Insulators
14. Insulators
◀A▶ ▶A◀ 15. Injectors
16. Grommets

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/ HIGH-PRESSURE FUEL HOSE INSTALLATION

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

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

(2) While turning the injector, high-pressure fuel 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 high-pressure fuel hose to the standard torque, and tighten the fuel pressure regulator to the specified torque.

Tightening torque:
9 Nm (Fuel pressure regulator)

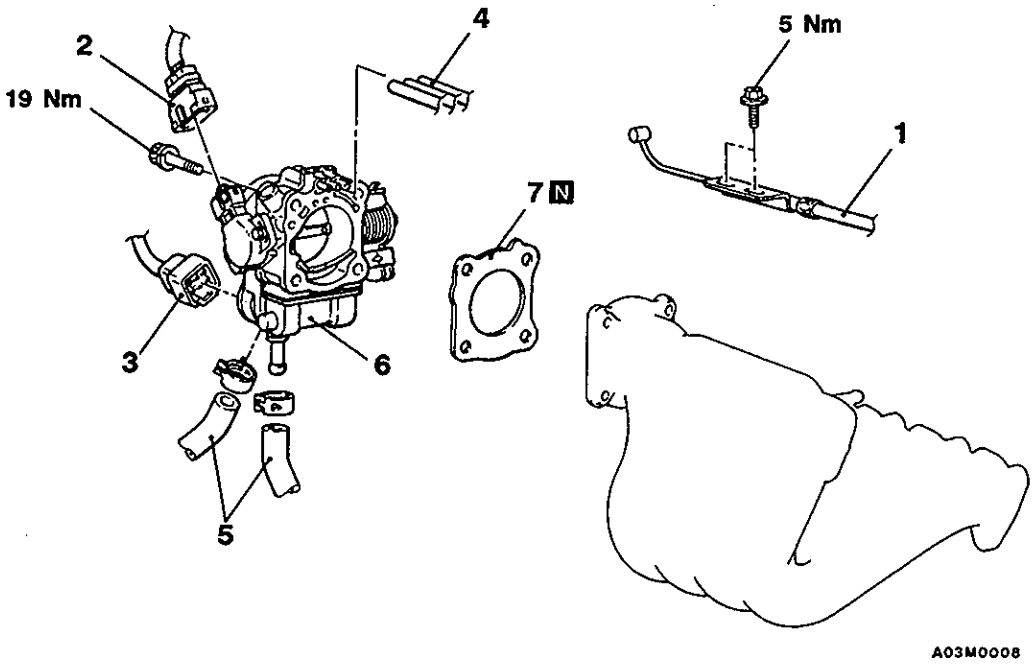
THROTTLE BODY

13100770125

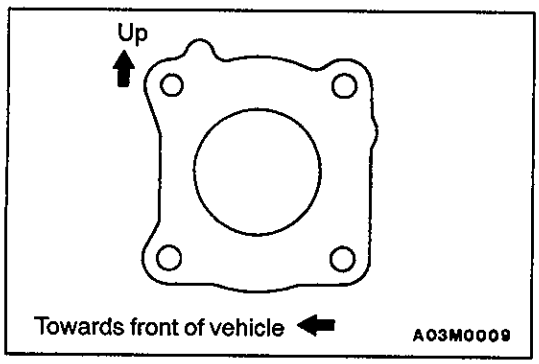
REMOVAL AND INSTALLATION

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

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



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



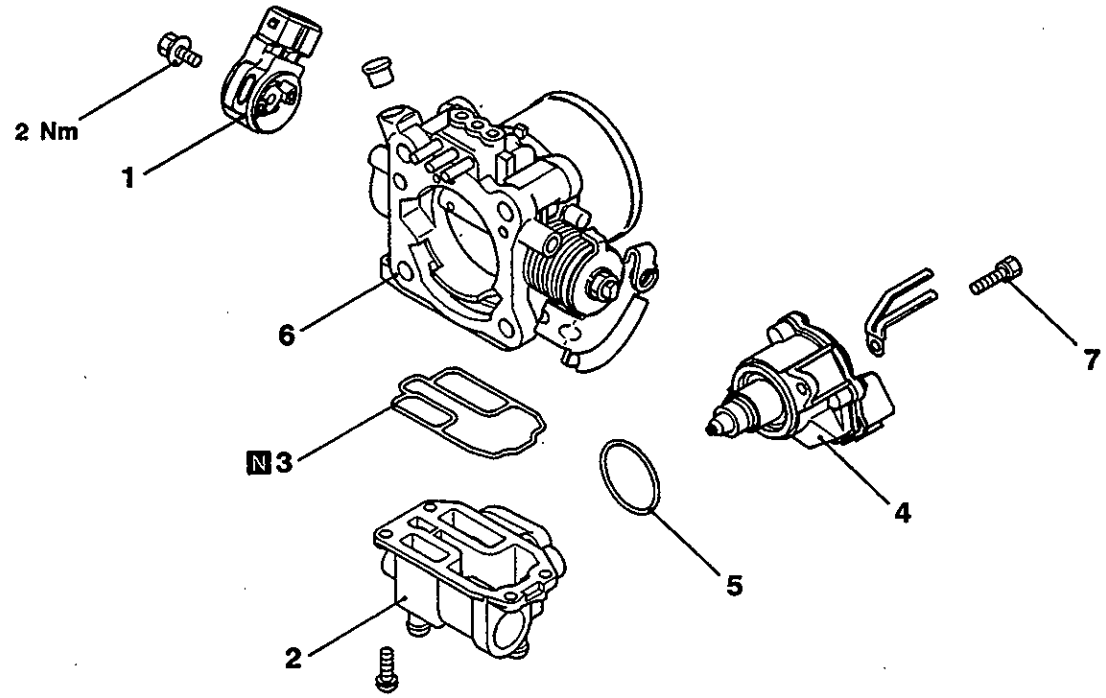
INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

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

DISASSEMBLY AND REASSEMBLY

13100970105



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Disassembly steps

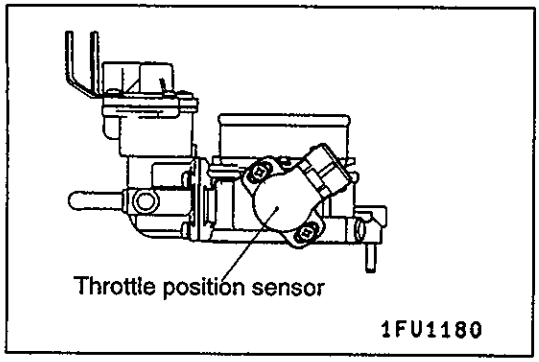
▶A◀ 1. Throttle position sensor
2. Idle speed control body assembly
3. O-ring
4. Idle speed control servo
5. O-ring
6. Throttle body
7. Fixed SAS

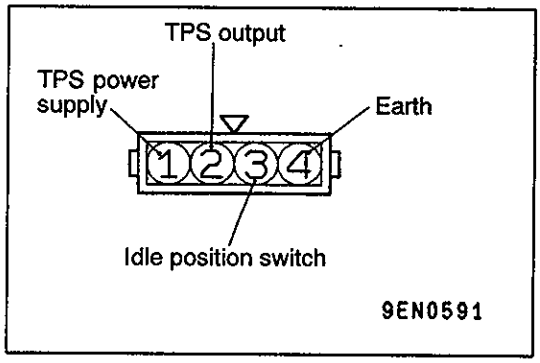
NOTE
1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A-76.)

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 POINT

▶A◀ 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. 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.

MULTIPOINT FUEL INJECTION (MPI) <4G9>

13100010159

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.

<Except MVV>

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.

<MVV>

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, engine-ECU makes an air/fuel mixture most efficient in fuel consumption by carrying out a lean air/fuel mixture ratio compensation (closed-loop control) when the engine is operating under normal conditions. The engine-ECU carries out a theoretical air/fuel mixture ratio compensation (closed-loop control) when the engine is being warmed up or under other conditions.

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. Air By-pass Control Solenoid Valve Control <MVV>
   Supplies air without passing through the throttle valve, based on signal from the engine-ECU, when the engine is operating under a lean mixture.
5. Purge Control Solenoid Valve Control
   Refer to GROUP 17.
6. EGR Control Solenoid Valve Control
   Refer to GROUP 17.

GENERAL SPECIFICATIONS

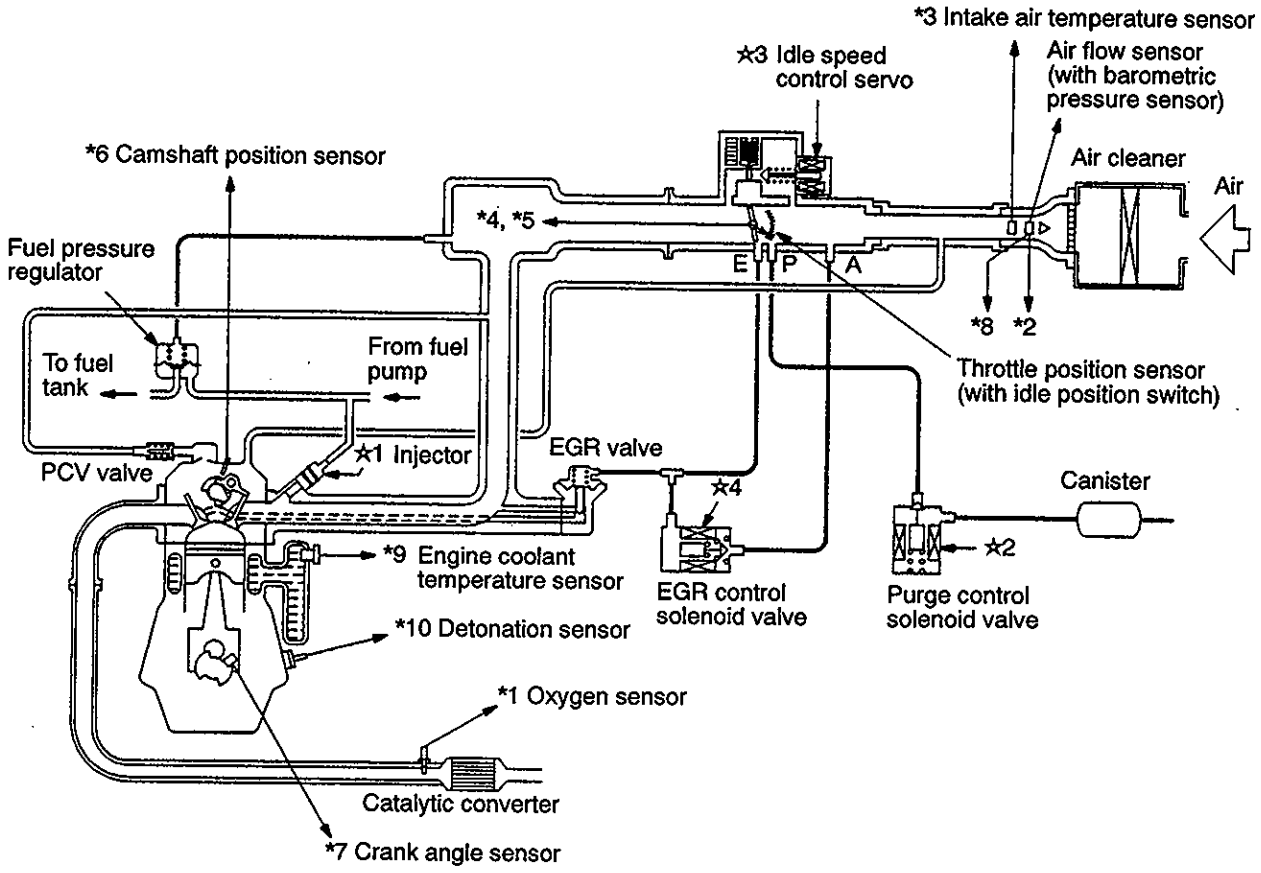
Items		Specifications
Throttle body	Throttle bore mm	46 <MVV> 50 <Except MVV>
	Throttle position sensor	Variable resistor type
	Idle speed control servo	Stepper motor type (Stepper motor type by-pass air control system with the air volume limiter)
	Idle position switch	Rotary contact type, within throttle position sensor

Items		Specifications
Engine-ECU	Identification model No.	E2T65679 <MVV (Vehicles without immobilizer system)> E2T65681 <MVV (Vehicles with immobilizer system)> E2T65678 <Except MVV (Vehicles without immobilizer system)> E2T65680 <Except MVV (Vehicles with immobilizer system)>
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
	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
	Fuel pump relay type	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH210 <Except MVV> CDH210N <MVV>
	EGR control solenoid valve	Duty cycle type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
	Air by-pass control solenoid valve	ON/OFF type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	329

MULTIPOINT FUEL INJECTION SYSTEM DIAGRAM

<Except MVV>

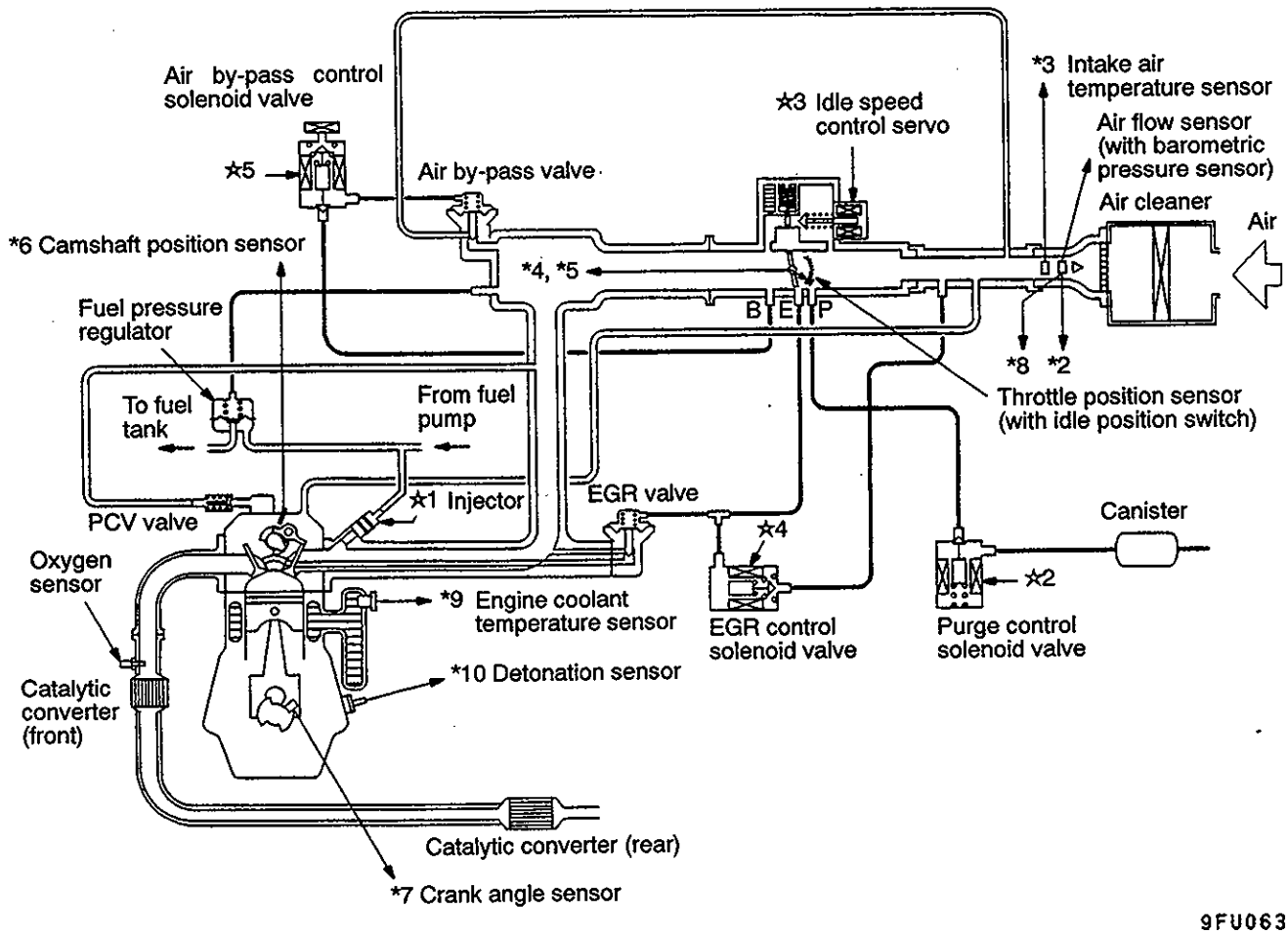
*1 Oxygen sensor *2 Air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Idle position switch *6 Camshaft position sensor *7 Crank angle sensor *8 Barometric pressure sensor *9 Engine coolant temperature sensor *10 Detonation sensor --- ● Power supply voltage ● Vehicle speed sensor ● A/C switch ● Inhibitor switch ● Power steering fluid pressure switch ● Ignition switch – ST ● Ignition switch – IG ● Alternator FR terminal	⇨ Engine-ECU ⇨	☆1 Injector ☆2 Purge control solenoid valve ☆3 Idle speed control servo ☆4 EGR control solenoid valve --- ● Fuel pump relay ● Control relay ● A/C power relay ● Engine warning lamp ● Diagnosis signal ● Ignition coil, power transistor ● Fan motor relay ● Alternator G terminal



9FU0635

<MVV>

*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 voltage ● Vehicle speed sensor ● A/C switch ● Inhibitor switch ● Power steering fluid pressure switch ● Ignition switch – ST ● Ignition switch – IG ● Alternator FR terminal	⇨ Engine-ECU ⇨	☆1 Injector ☆2 Purge control solenoid valve ☆3 Idle speed control servo ☆4 EGR control solenoid valve --- ● Fuel pump relay ● Control relay ● A/C power relay ● Engine warning lamp ● Diagnosis signal ● Ignition coil, power transistor ● Fan motor relay ● Alternator G terminal



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SERVICE SPECIFICATIONS

13100030148

Items		Specifications
Basic idle speed r/min	Except MVV	750±50
	MVV	700±50
Idle speed when A/C is ON r/min		850 at neutral position
Throttle position sensor adjusting voltage mV		400–1,000
Throttle 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)
Air by-pass control solenoid valve coil resistance <MVV> Ω		36–44 (at 20°C)

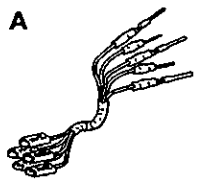
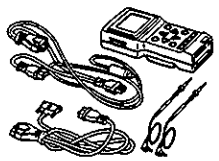
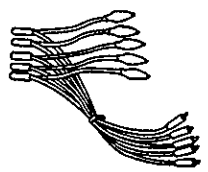
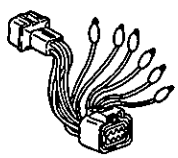
SEALANT

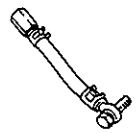
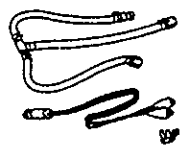
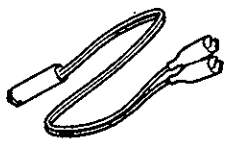
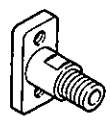
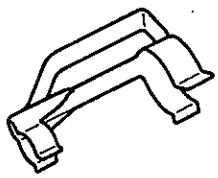
13100050038

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

SPECIAL TOOLS

13100060130

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 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
	MB991519	Alternator harness connector	Measurement of voltage during troubleshooting
	MD998463	Test harness (6-pin, square)	• Inspection of idle speed control servo • Inspection using an analyzer
	MD998464	Test harness (4-pin, square)	Inspection of oxygen sensor
	MD998478	Test harness (3-pin, triangle)	Inspection using an analyzer

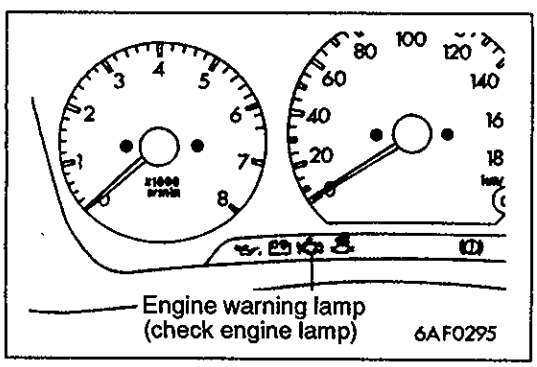
Tool	Number	Name	Use
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	
	MD998706	Injector test set	Checking the spray condition of injectors
 MB991607	MB991607	Injector test harness	
 MD998741	MD998741	Injector test adaptor	
	MB991608	Clip	

TROUBLESHOOTING

13100850034

DIAGNOSIS TROUBLESHOOTING FLOW

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



DIAGNOSIS FUNCTION

13100860136

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
Barometric pressure sensor
Detonation sensor
Injector
Ignition coil, power transister
Immobilizer system

METHOD OF READING AND ERASING DIAGNOSIS CODES

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

INSPECTION USING MUT-II DATA LIST AND ACTUATOR TESTING

Refer to P.13A-9.

FAIL-SAFE FUNCTION REFERENCE TABLE

13100910138

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 reading of the basic injector drive time and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor	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	Cuts off the fuel supply to cylinders with an abnormal ignition.
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).
Alternator FR terminal	Does not control the output of the alternator according to an electrical load. (works as a normal alternator)

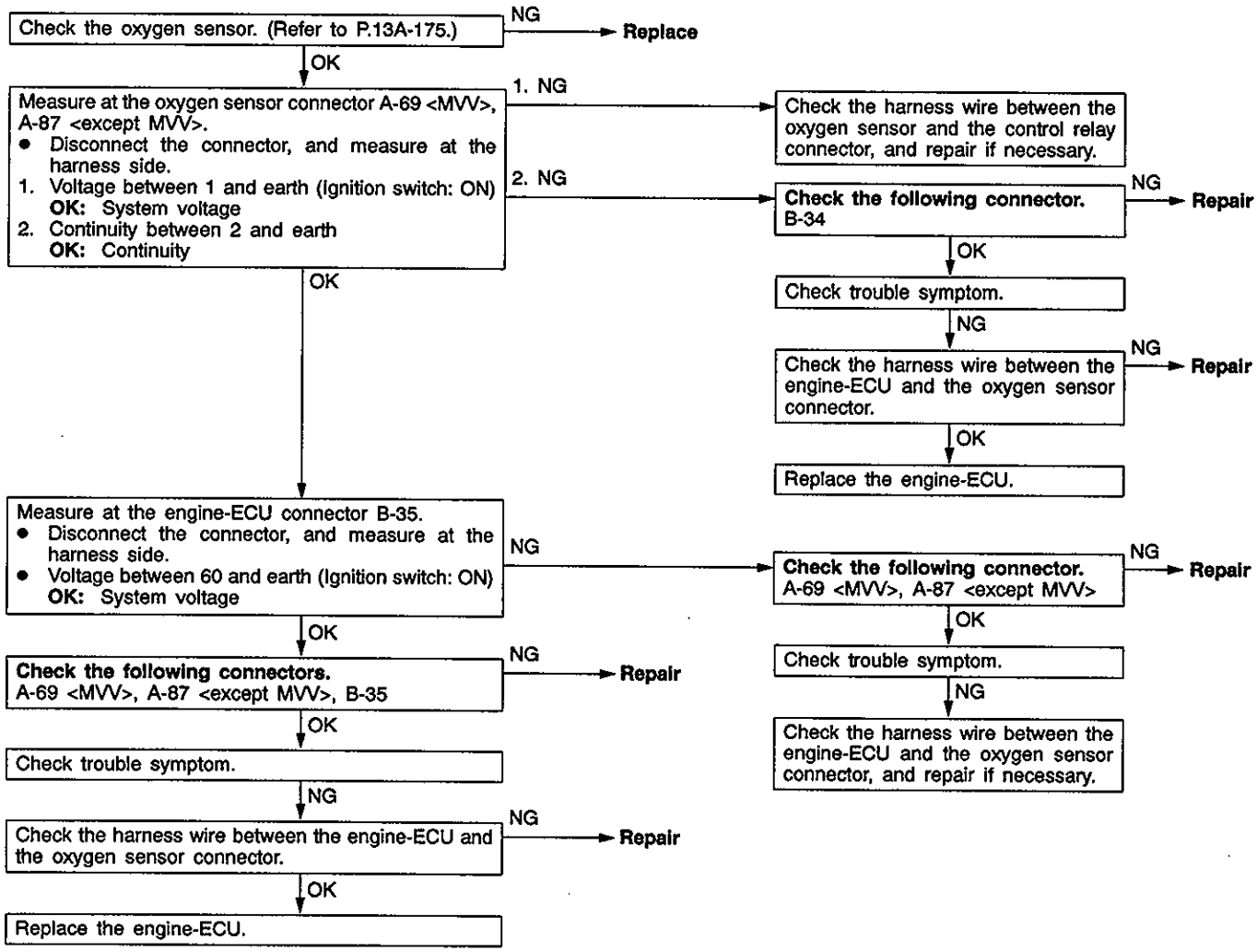
INSPECTION CHART FOR DIAGNOSIS CODES

13100870139

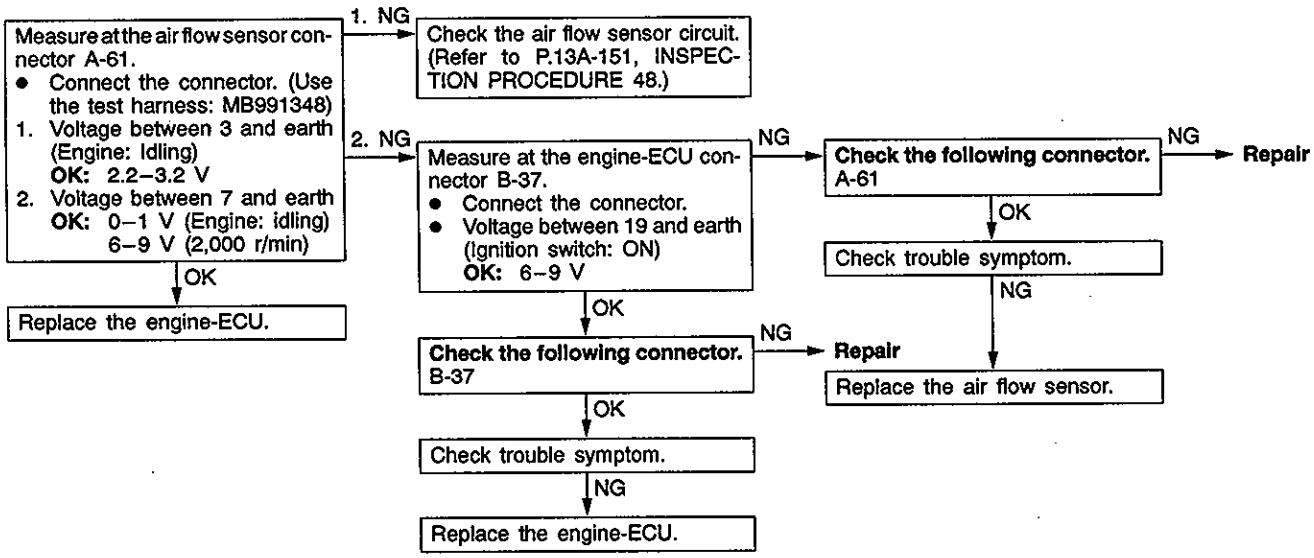
Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13A-106
12	Air flow sensor system	13A-107
13	Intake air temperature sensor system	13A-107
14	Throttle position sensor system	13A-108
21	Engine coolant temperature sensor system	13A-109
22	Crank angle sensor system	13A-110
23	Camshaft position sensor	13A-111
24	Vehicle speed sensor system	13A-112
25	Barometric pressure sensor system	13A-113
31	Detonation sensor system	13A-114
41	Injector system	13A-114
44	Ignition coil and power transistor unit system	13A-115
54	Immobilizer system	13A-116
61	Communication wire with A/T-ECU system <A/T>	13A-116
64	Alternator FR terminal system	13A-117

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

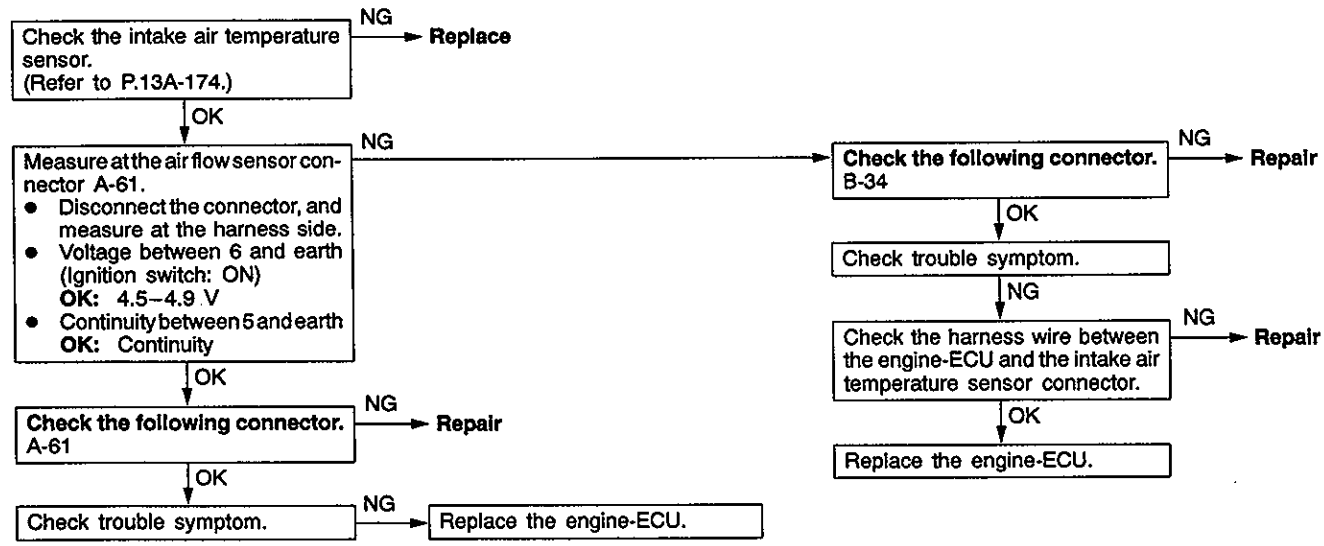
Code No. 11 Oxygen sensor system	Probable cause
Range of Check • 3 minutes have passed after engine was started. • Engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20–50°C. • Engine speed is approx. 2,000–3,000 r/min • Vehicle is moving at constant speed on a flat, level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



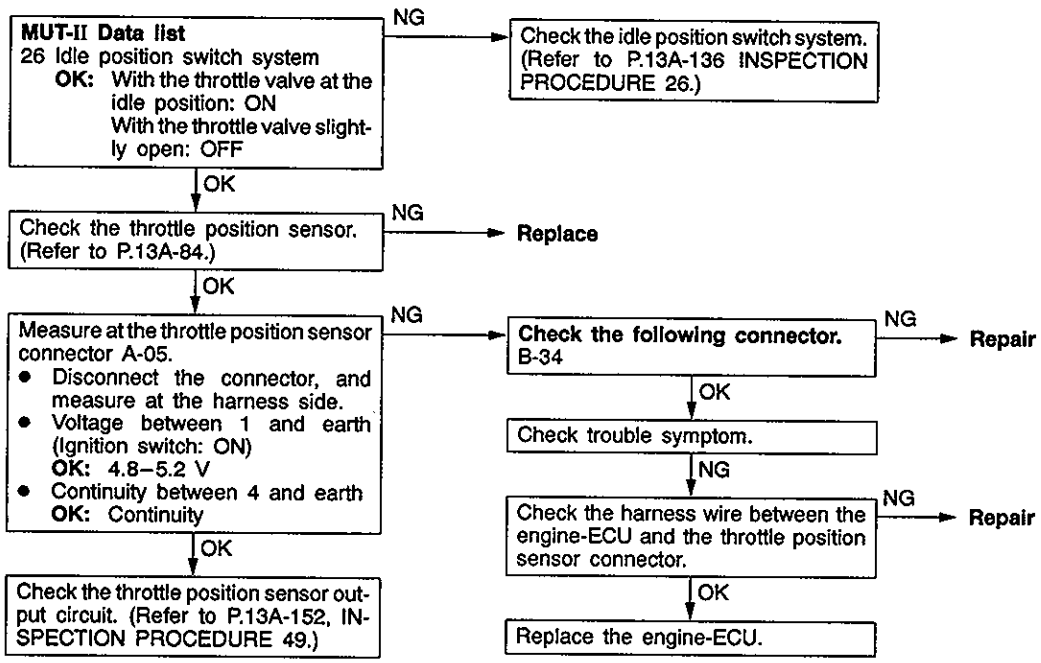
Code No. 12 Air flow sensor system	Probable cause
Range of Check • Engine speed is 500 r/min or more. Set conditions • Sensor output frequency is 3 Hz or less for 4 seconds.	• Malfunction of the air flow sensor • Improper connector contact, open circuit or short-circuited harness wire of the air flow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



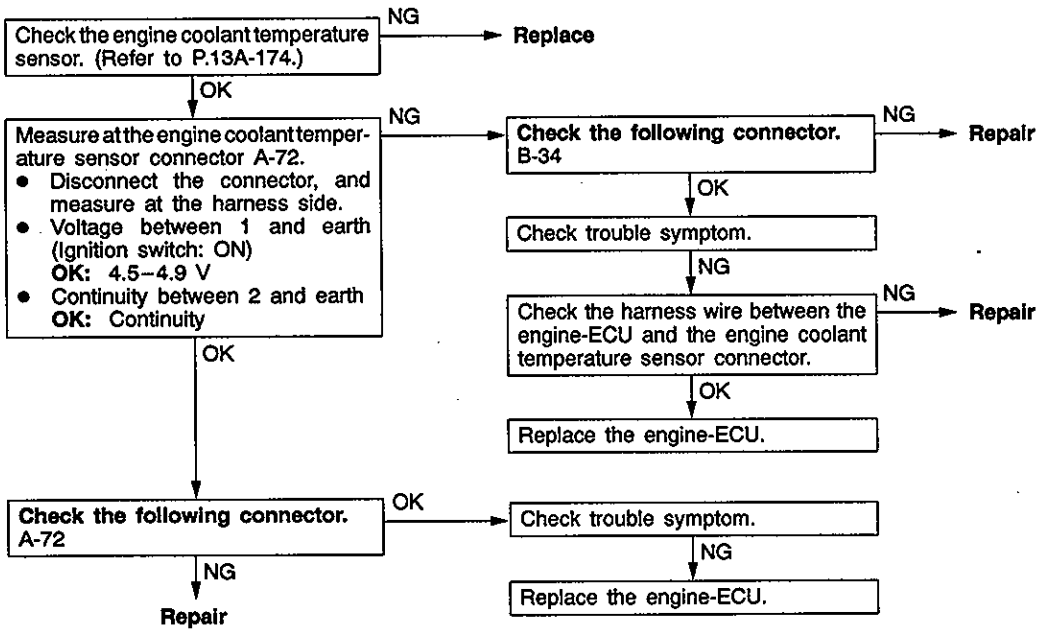
Code No. 13 Intake air temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature 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



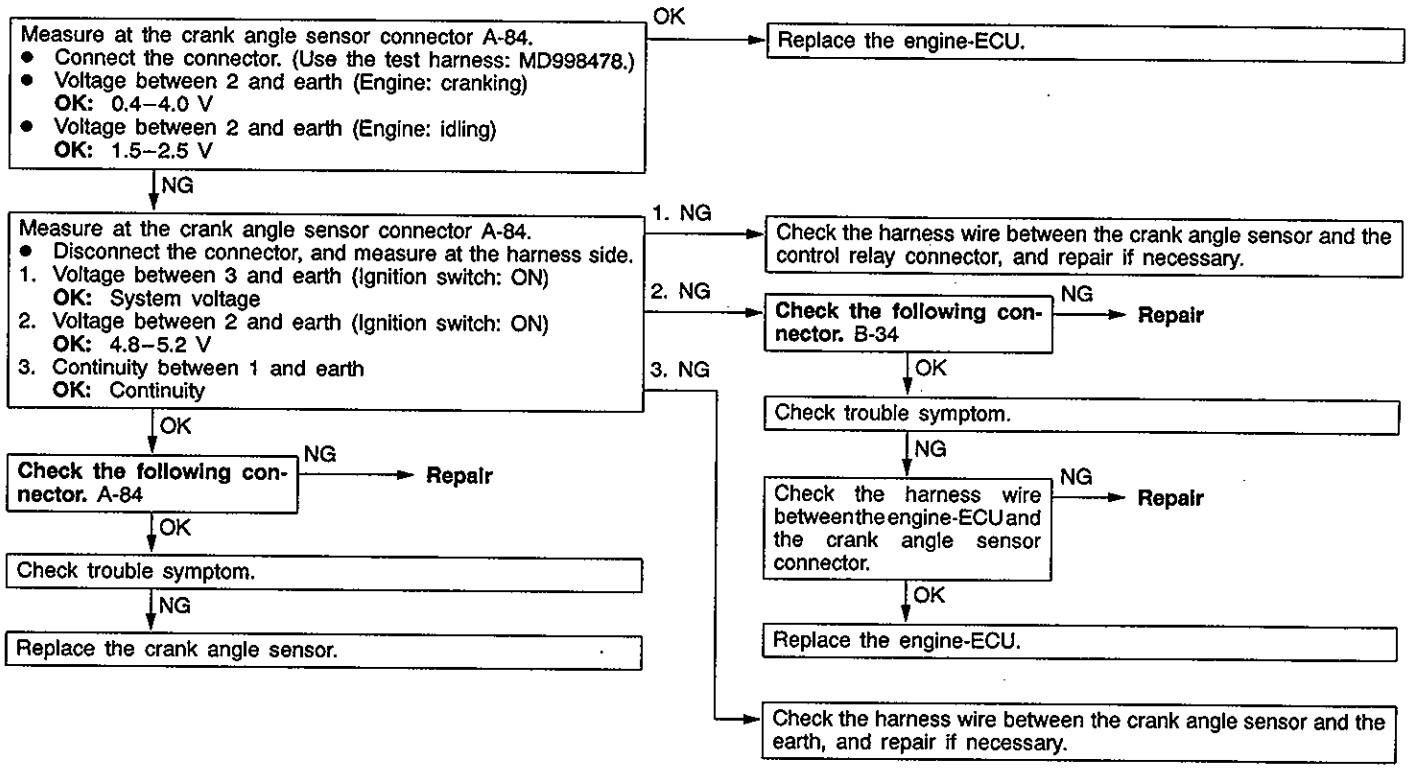
Code No. 14 Throttle position sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • When the idle position switch is ON, the sensor output voltage is 2 V or more for 4 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



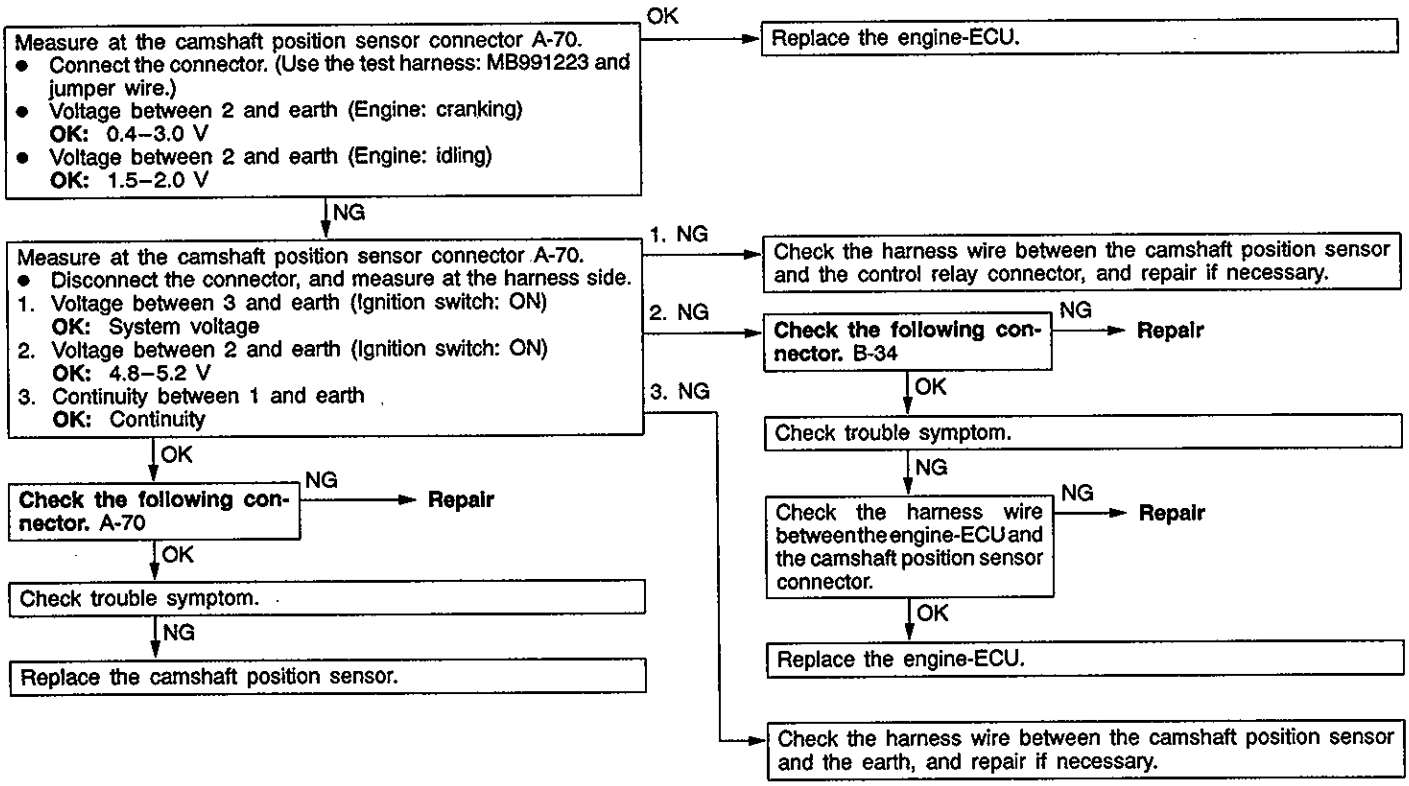
Code No. 21 Engine coolant temperature sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an engine coolant 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.	



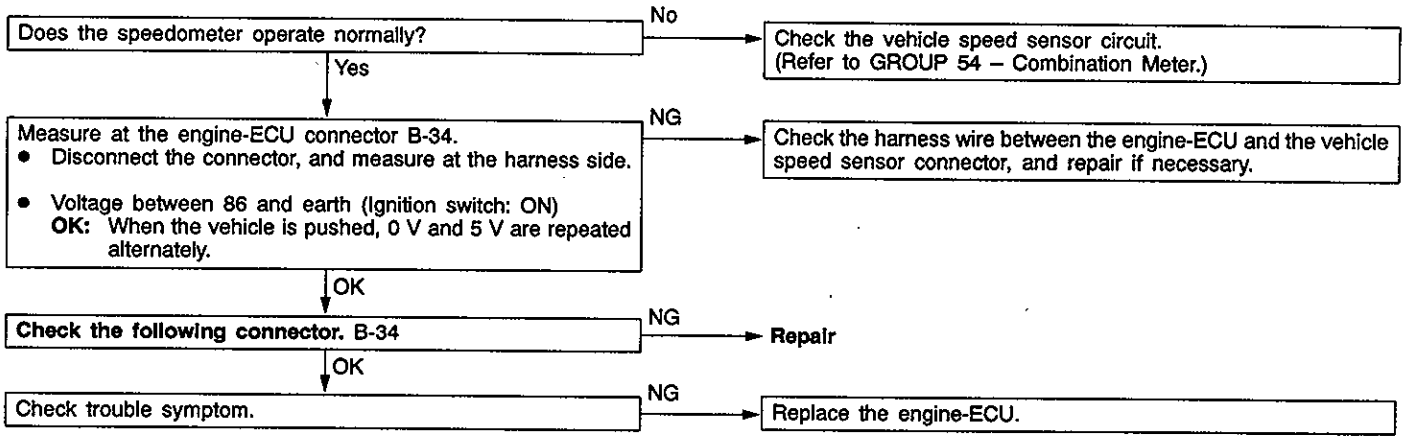
Code No. 22 Crank angle sensor system	Probable cause
Range of Check • Engine is cranking. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness wire of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



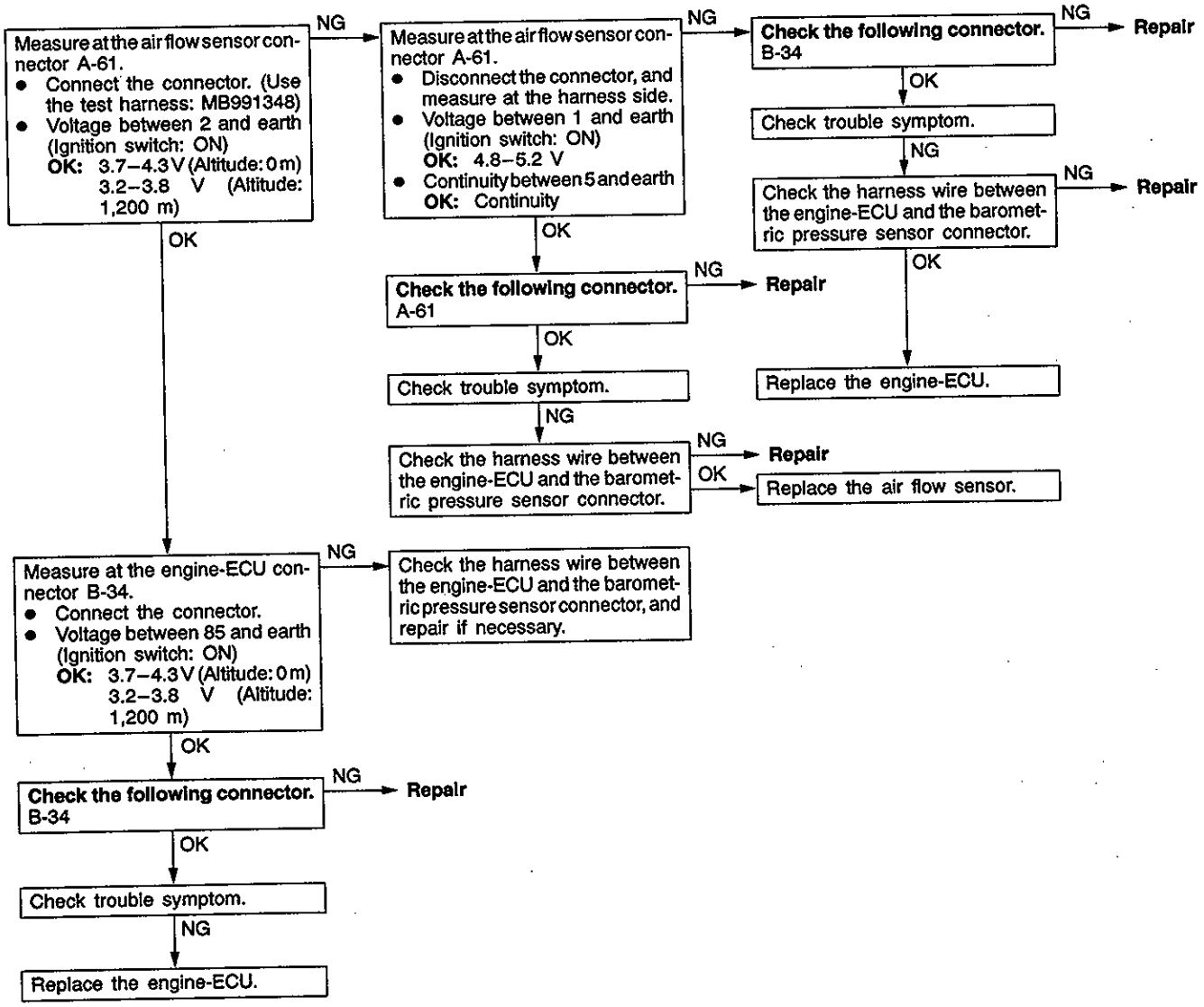
Code No. 23 Camshaft position sensor system	Probable cause
Range of Check • Ignition switch: ON • Engine speed is approx. 50 r/min or more. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the camshaft position sensor • Improper connector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



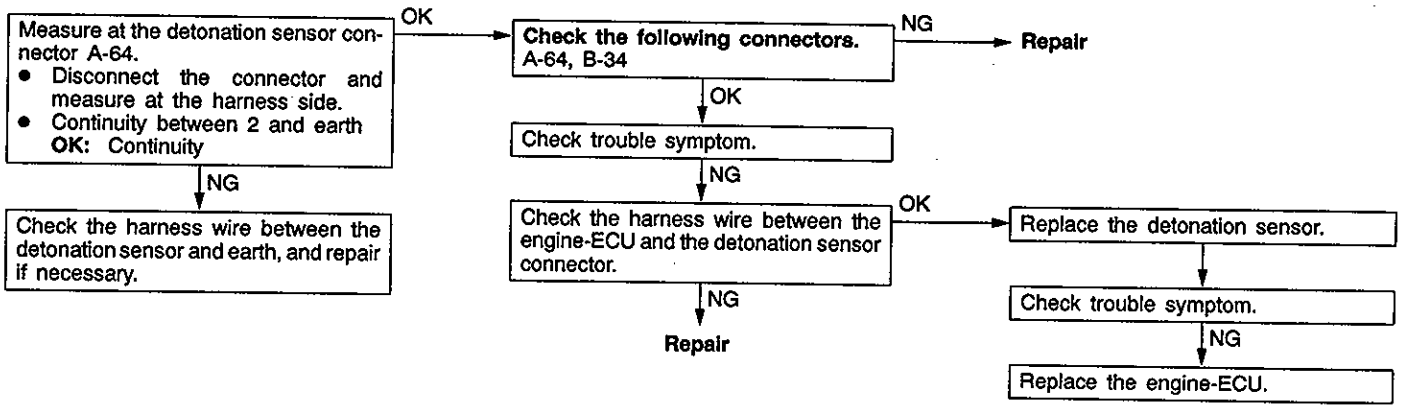
Code No. 24 Vehicles speed sensor system	Probable cause
Range of check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Idle position switch: OFF • Engine speed is 3,000 r/min or more. • Driving under high engine load conditions.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



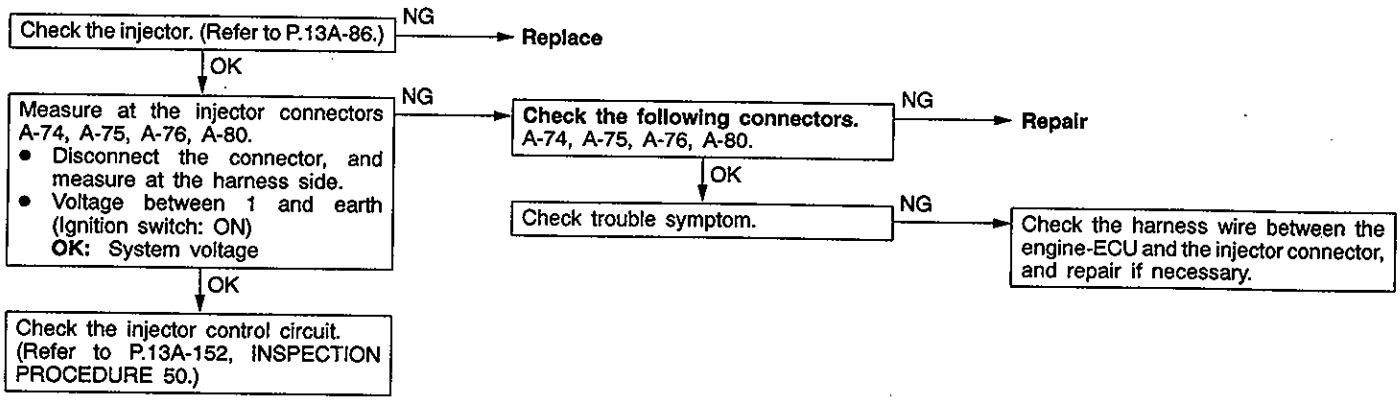
Code No. 25 Barometric pressure sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Battery voltage is 8 V or more. Set conditions • Sensor output voltage is 4.5 V or more (corresponding 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



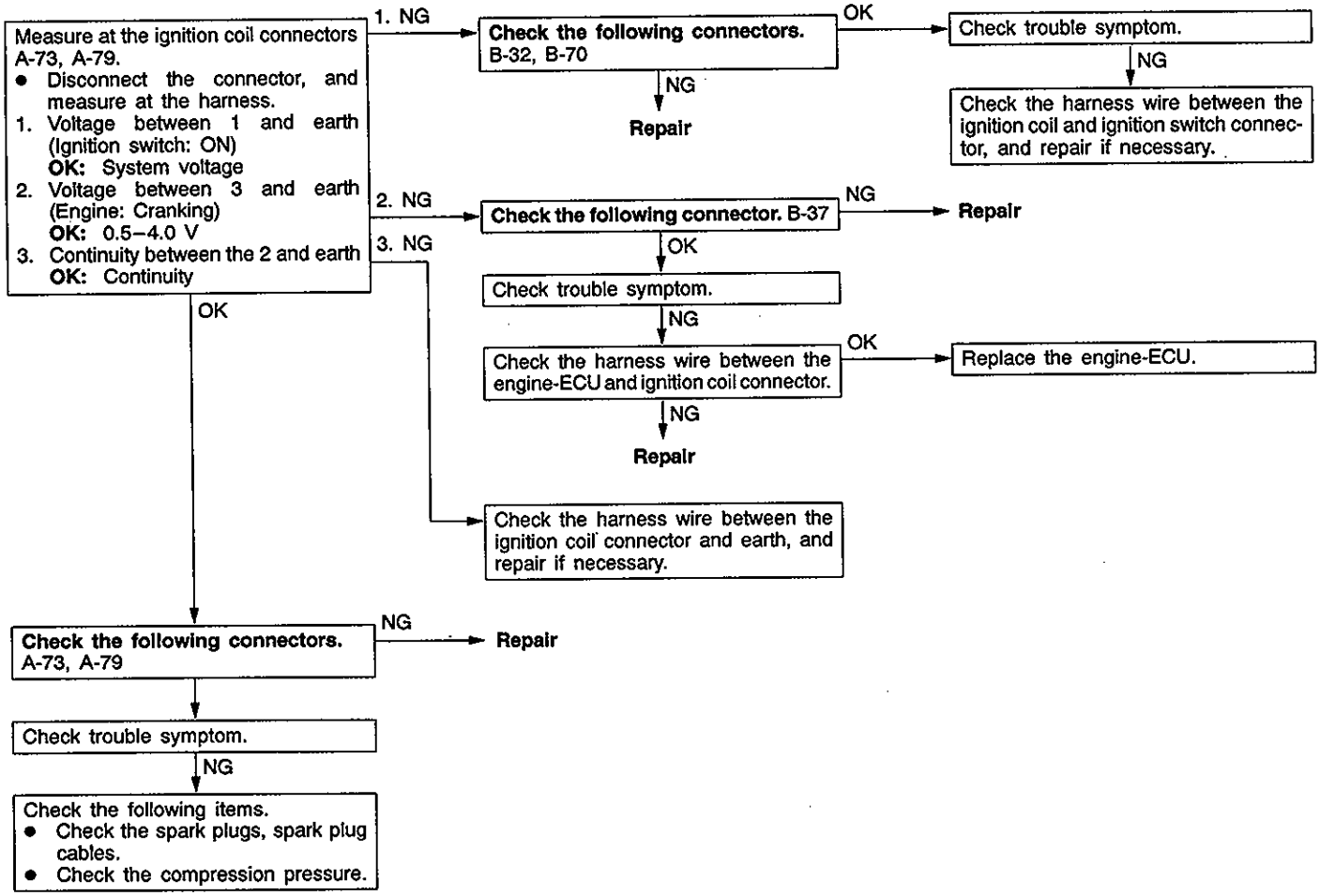
Code No. 31 Detonation sensor system	Probable cause
Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Engine speed is approx. 5,000 r/min or more Set conditions The change in the detonation sensor output voltage (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. 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

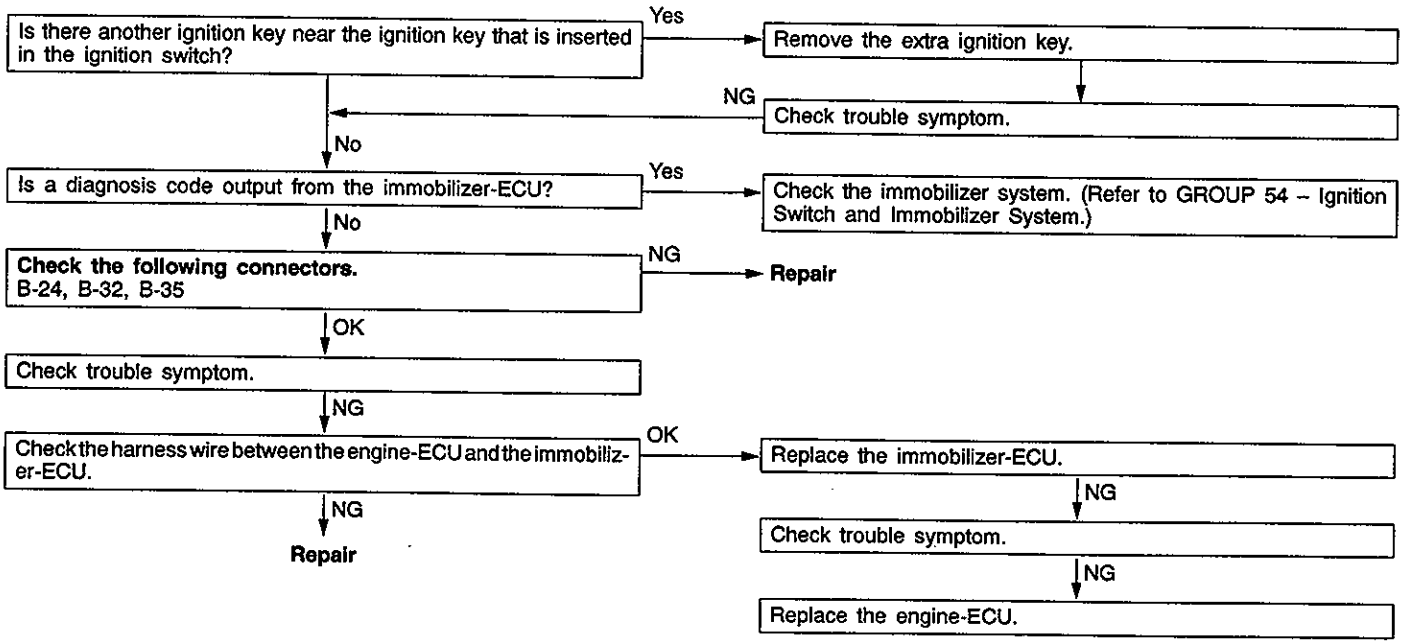


Code No. 44 Ignition coil and power transistor unit system	Probable cause
Range of Check • Engine speed is approx. 50–4,000 r/min • Engine is not cranking. Set conditions • The crank angle sensor detects an abnormal engine speed caused by misfire (one of the two coils fails).	• Malfunction of the ignition coil • Improper connector contact, open circuit or short-circuited harness wire of the ignition primary circuit • Malfunction of the engine-ECU

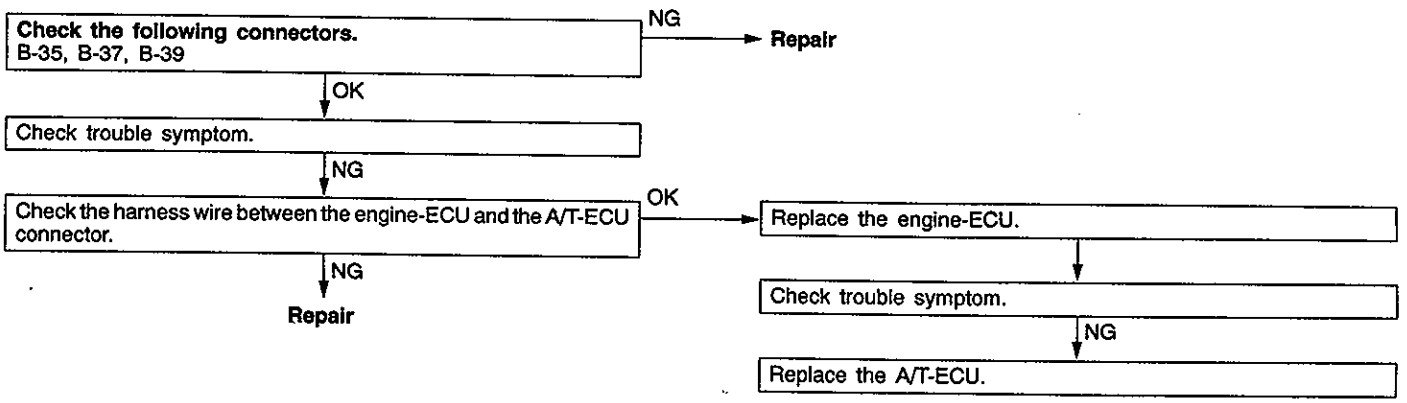


Code No.54 Immobilizer system	Probable cause
Range of Check • Ignition switch: ON Set Conditions • Improper communication between the engine-ECU and immobilizer-ECU	• Radio interference of ID codes • Incorrect ID code • Malfunction of harness or connector • Malfunction of immobilizer-ECU • Malfunction of engine-ECU

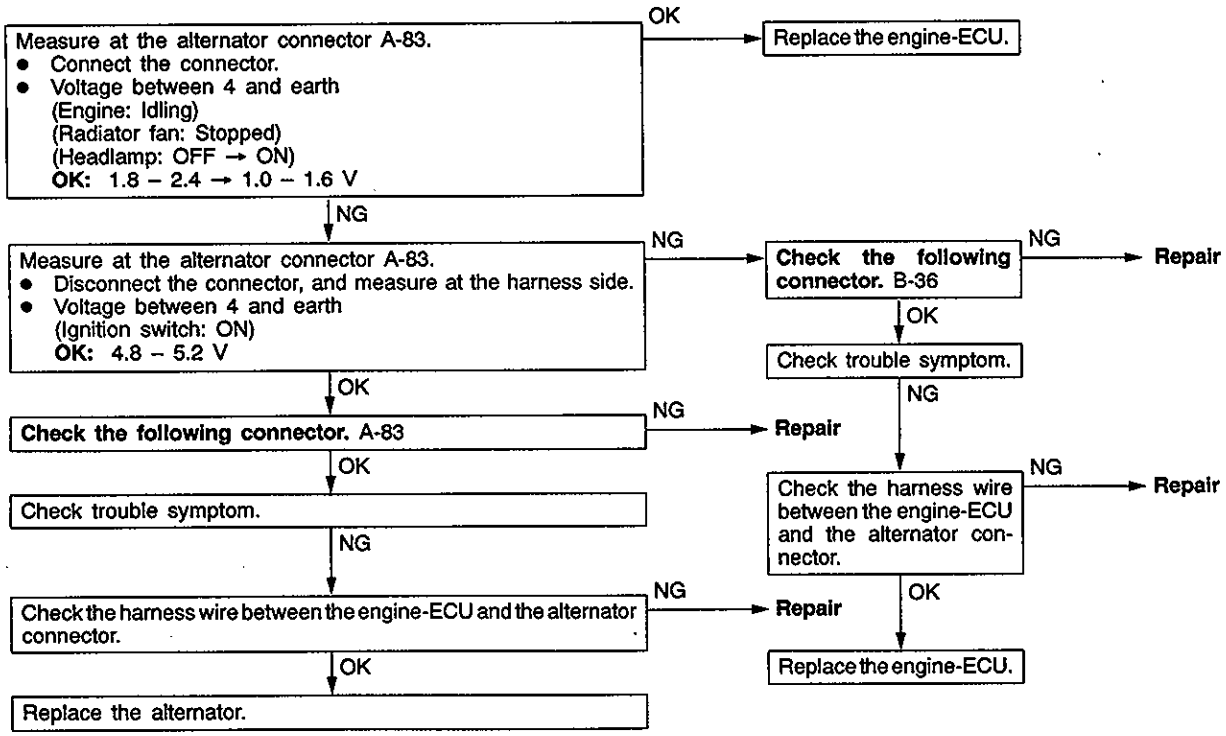
NOTE
(1) If the ignition switches are close each other when starting the engine, radio interference may cause this code to be displayed.
(2) This code may be displayed when registering the key ID code.



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



Code No. 64 Alternator FR Terminal System	Probable cause
Range of Check, Set Conditions • The alternator FR terminal signal voltage remains high for approximately 20 seconds while the engine is running.	• Open circuit in alternator FR terminal circuit • Malfunction of the engine-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

13100880132

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-119
	Communication with engine-ECU only is not possible.	2	13A-120
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-121
	The engine warning lamp remains illuminating and never goes out.	4	13A-121
Starting	No initial combustion (starting impossible)	5	13A-122
	Initial combustion but no complete combustion (starting impossible)	6	13A-123
	Long time to start (improper starting)	7	13A-124
Idling stability (Improper idling)	Unstable idling (Rough idling, hunting)	8	13A-125
	Idling speed is high. (Improper idling speed)	9	13A-126
	Idling speed is low. (Improper idling speed)	10	13A-127
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-128
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-129
	The engine stalls when starting the car. (Pass out)	13	13A-130
	The engine stalls when decelerating.	14	13A-130
Driving	Hesitation, sag or stumble	15	13A-131
	The feeling of impact or vibration when accelerating	16	13A-131
	The feeling of impact or vibration when decelerating	17	13A-132
	Poor acceleration	18	13A-132
	Surge	19	13A-133
	Knocking	20	13A-133
Dieseling		21	13A-133
Too high CO and HC concentration when idling		22	13A-134
Low alternator output voltage (approx. 12.3 V)		23	13A-135

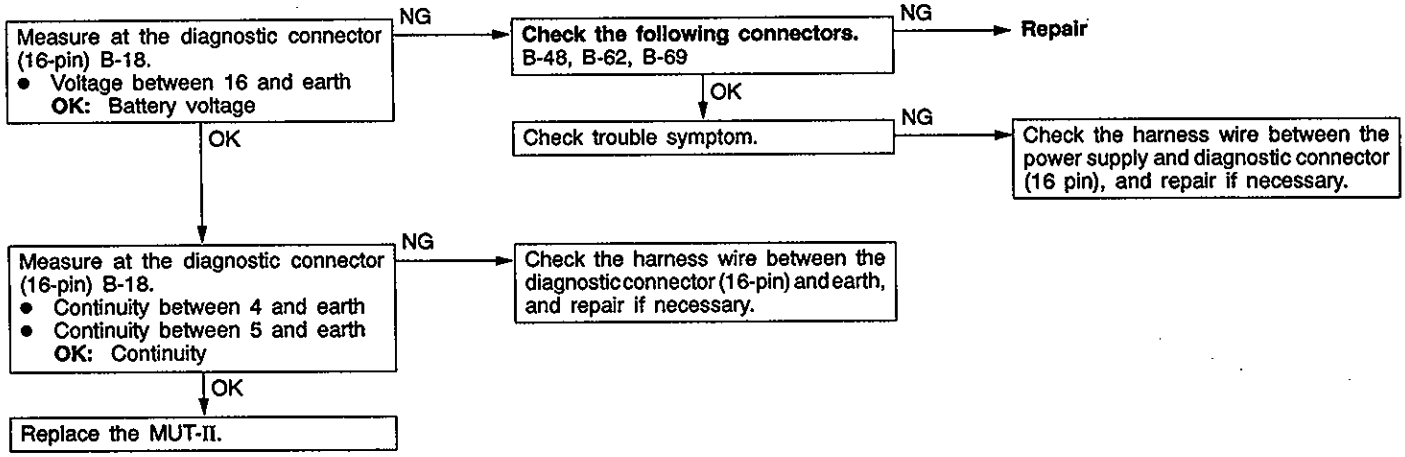
PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

Refer to P.13A-24.

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

INSPECTION PROCEDURE 1

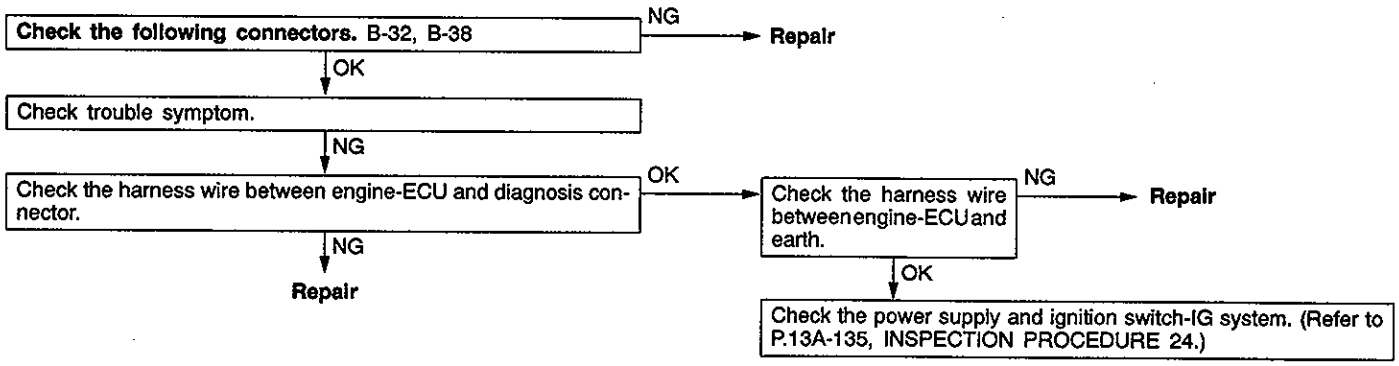
Communication with MUT-II is not possible. (Communication with all systems is not possible.)	Probable cause
The cause is probably a defect in the power supply system (including earth) for the diagnosis line.	• Malfunction of the connector • Malfunction of the harness wire



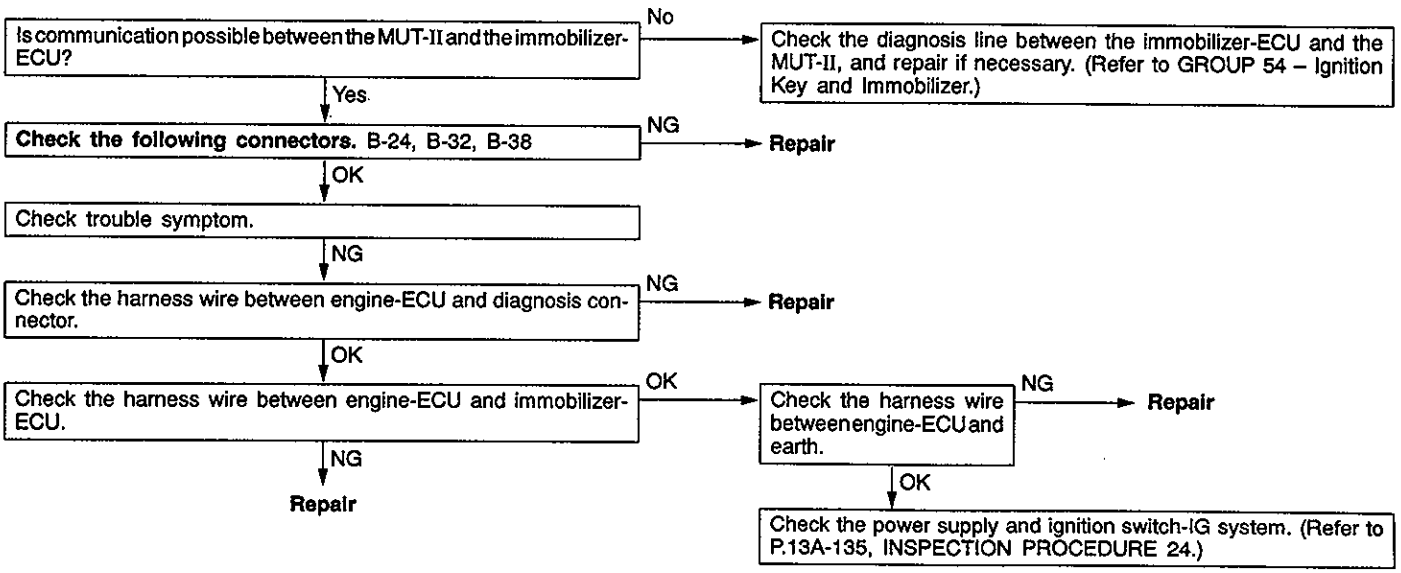
INSPECTION PROCEDURE 2

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	<Vehicles without immobilizer system> • Malfunction of engine-ECU power supply circuit • Malfunction of engine-ECU • Open circuit between engine-ECU and diagnosis connector <Vehicles with immobilizer system> • Malfunction of engine-ECU power supply circuit • Malfunction of engine-ECU • Malfunction of immobilizer-ECU • Open circuit between immobilizer-ECU and diagnosis connector • Open circuit between engine-ECU and immobilizer-ECU

<Vehicles without immobilizer system>

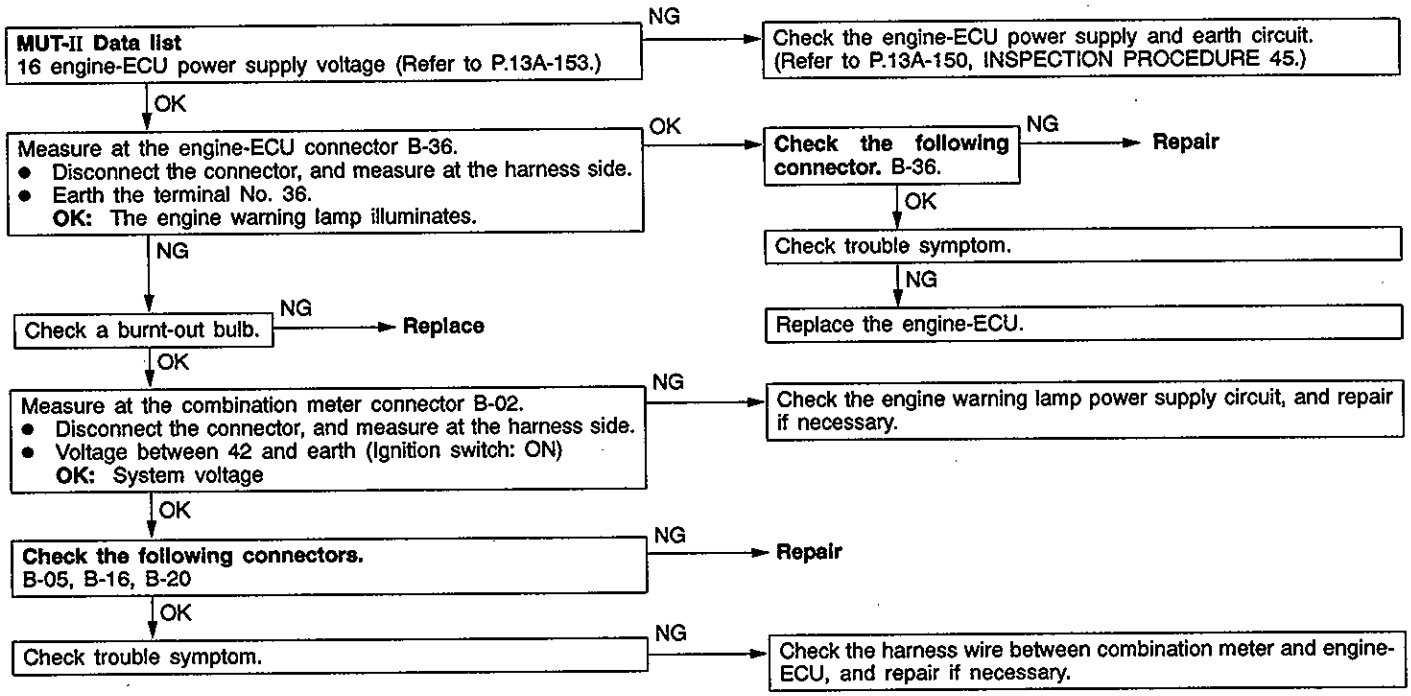


<Vehicles with immobilizer system>



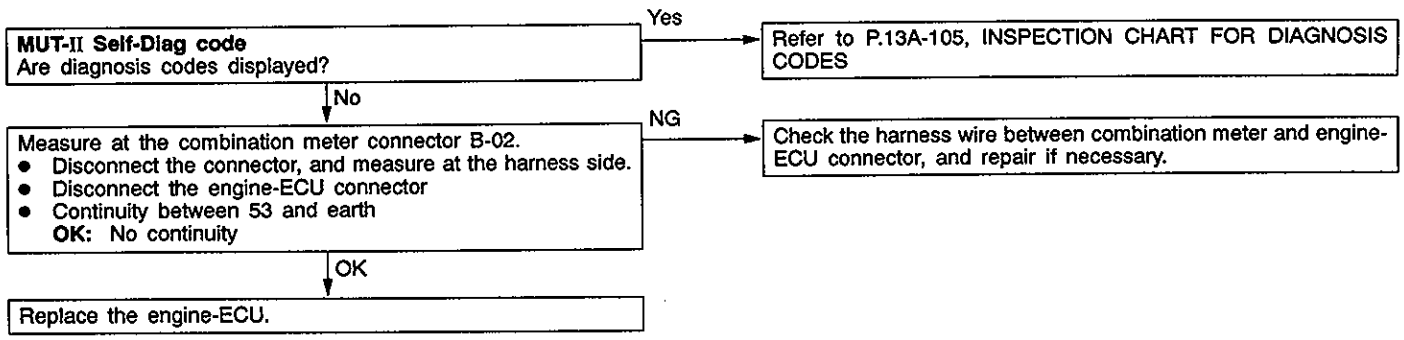
INSPECTION PROCEDURE 3

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



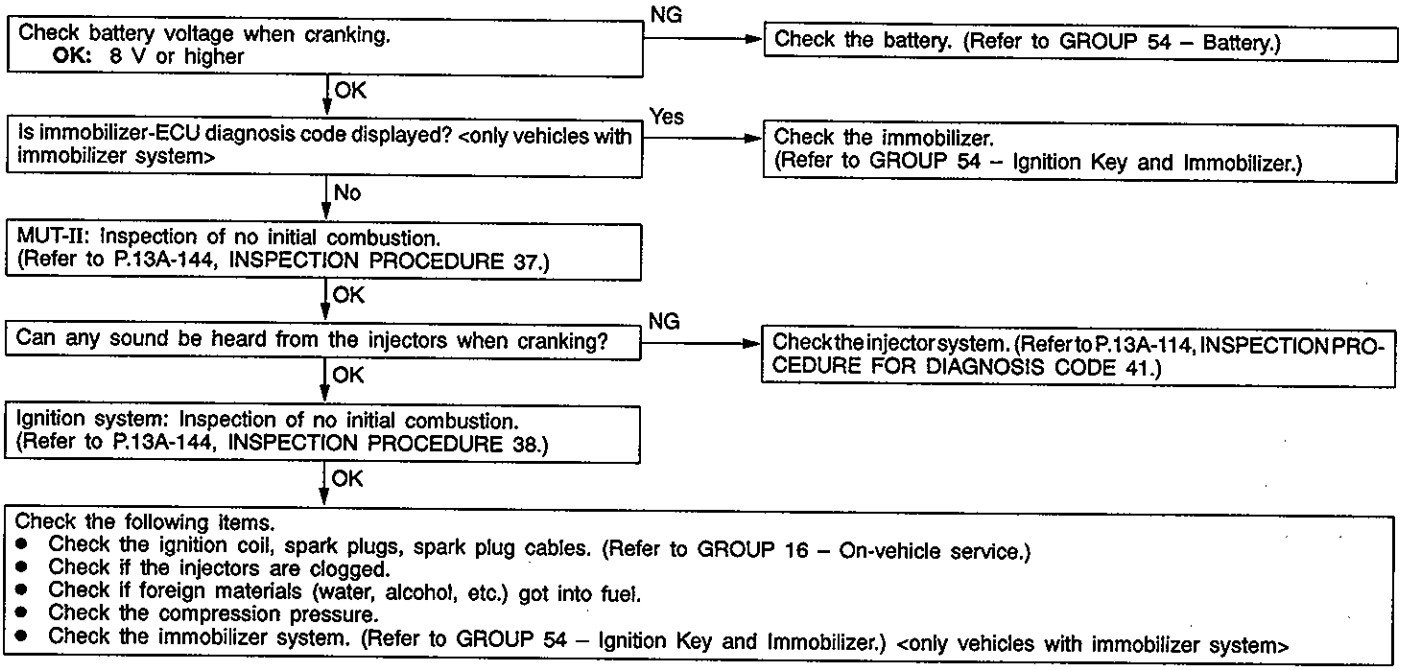
INSPECTION PROCEDURE 4

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



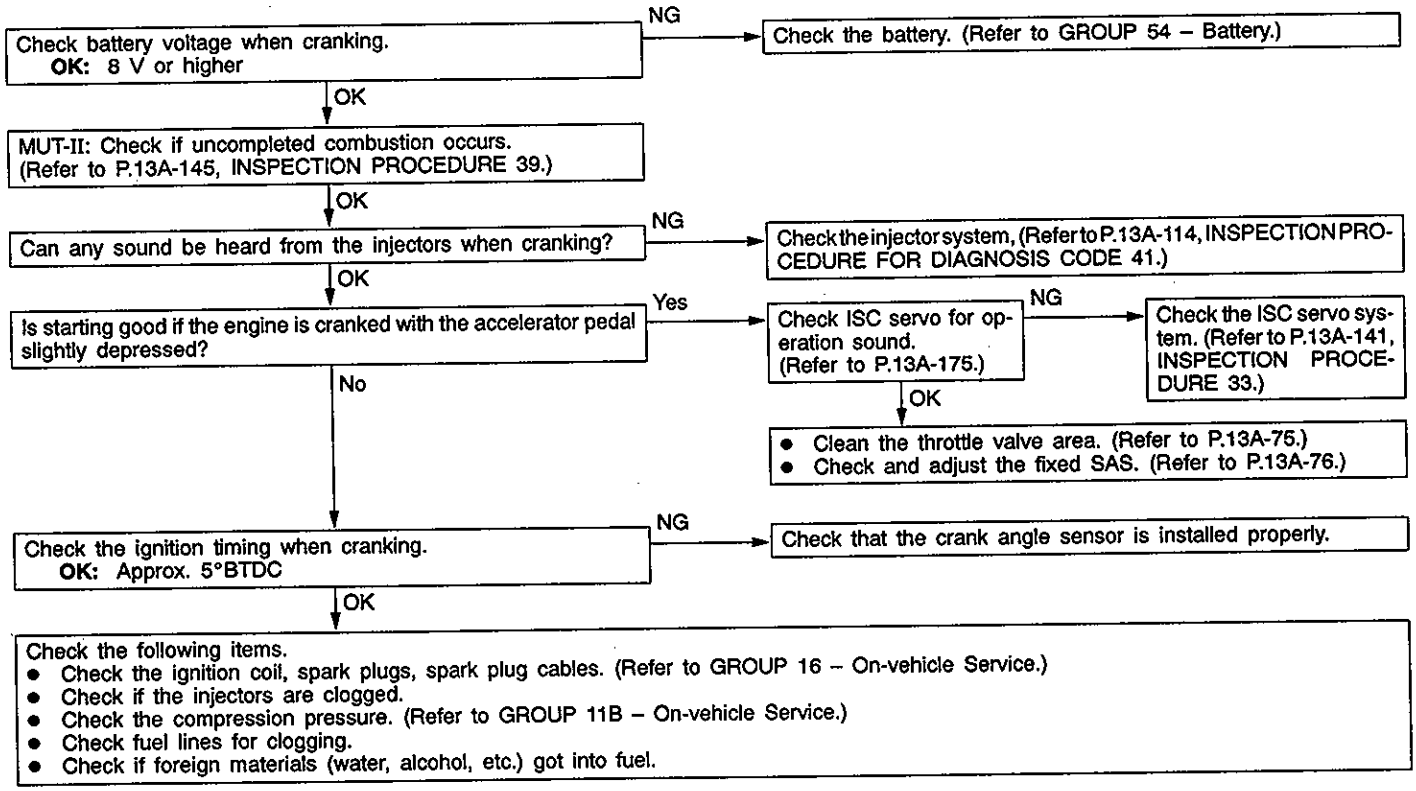
INSPECTION PROCEDURE 5

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 <only vehicles with immobilizer system> • Foreign materials in fuel



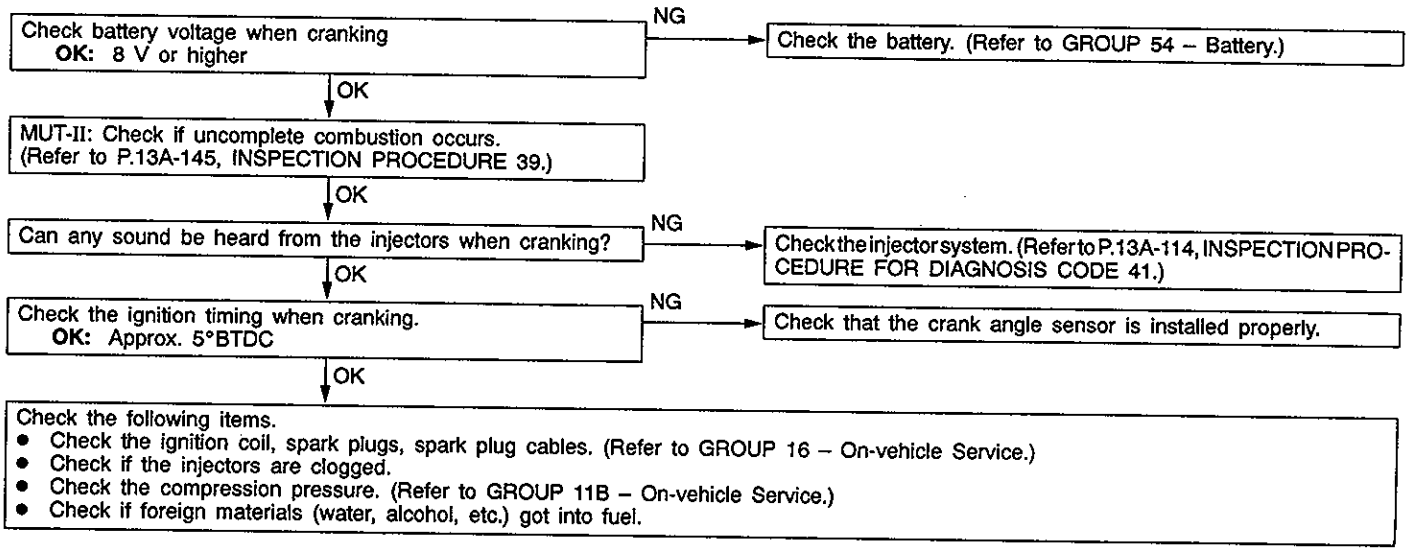
INSPECTION PROCEDURE 6

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



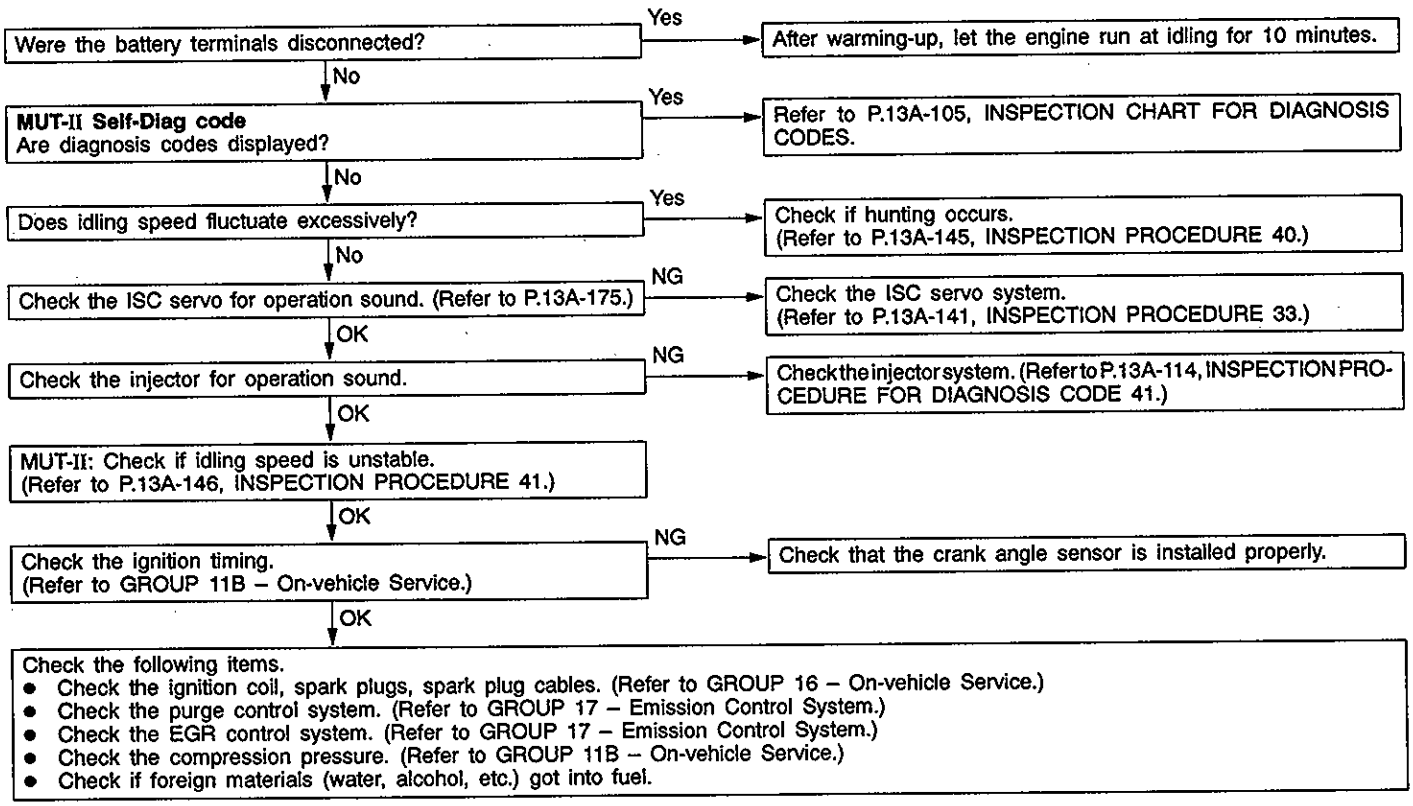
INSPECTION PROCEDURE 7

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



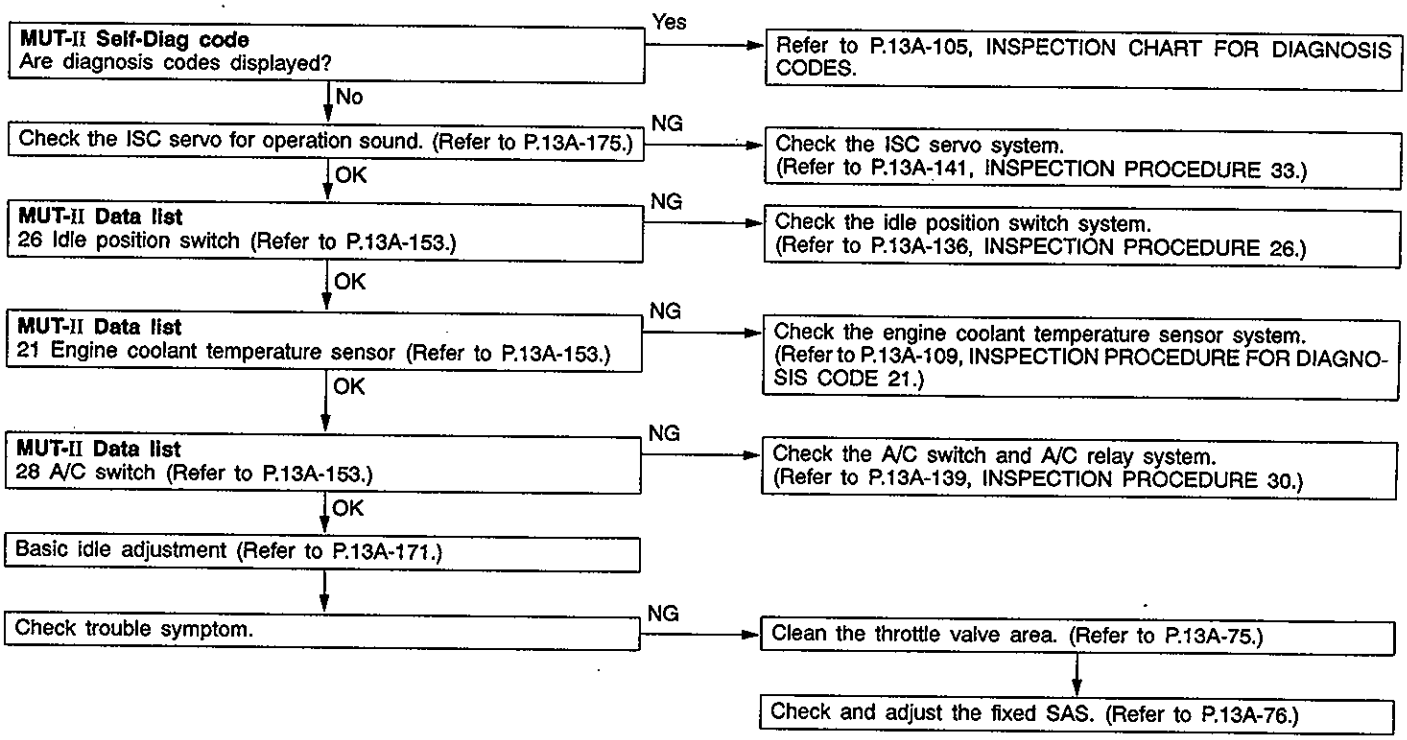
INSPECTION PROCEDURE 8

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 • Malfunction of the EGR solenoid valve system • Poor compression • Drawing air into exhaust system



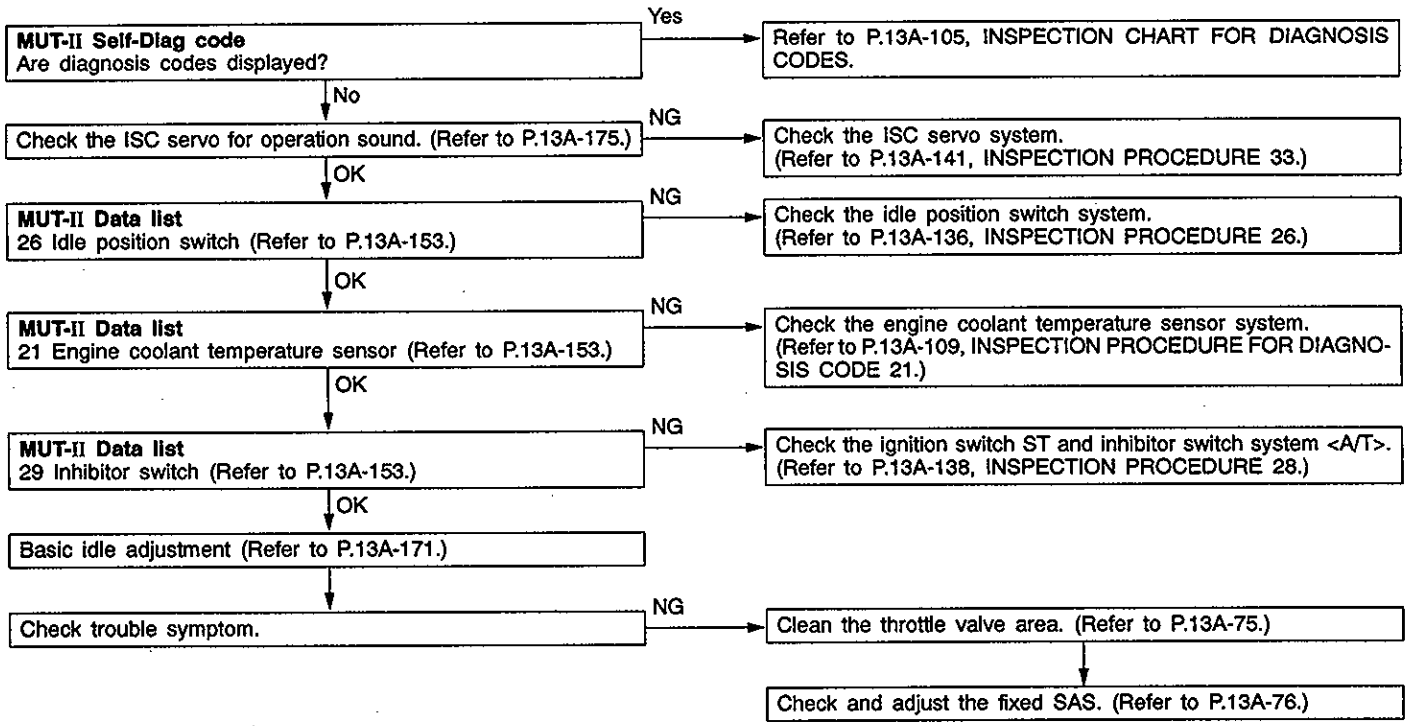
INSPECTION PROCEDURE 9

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



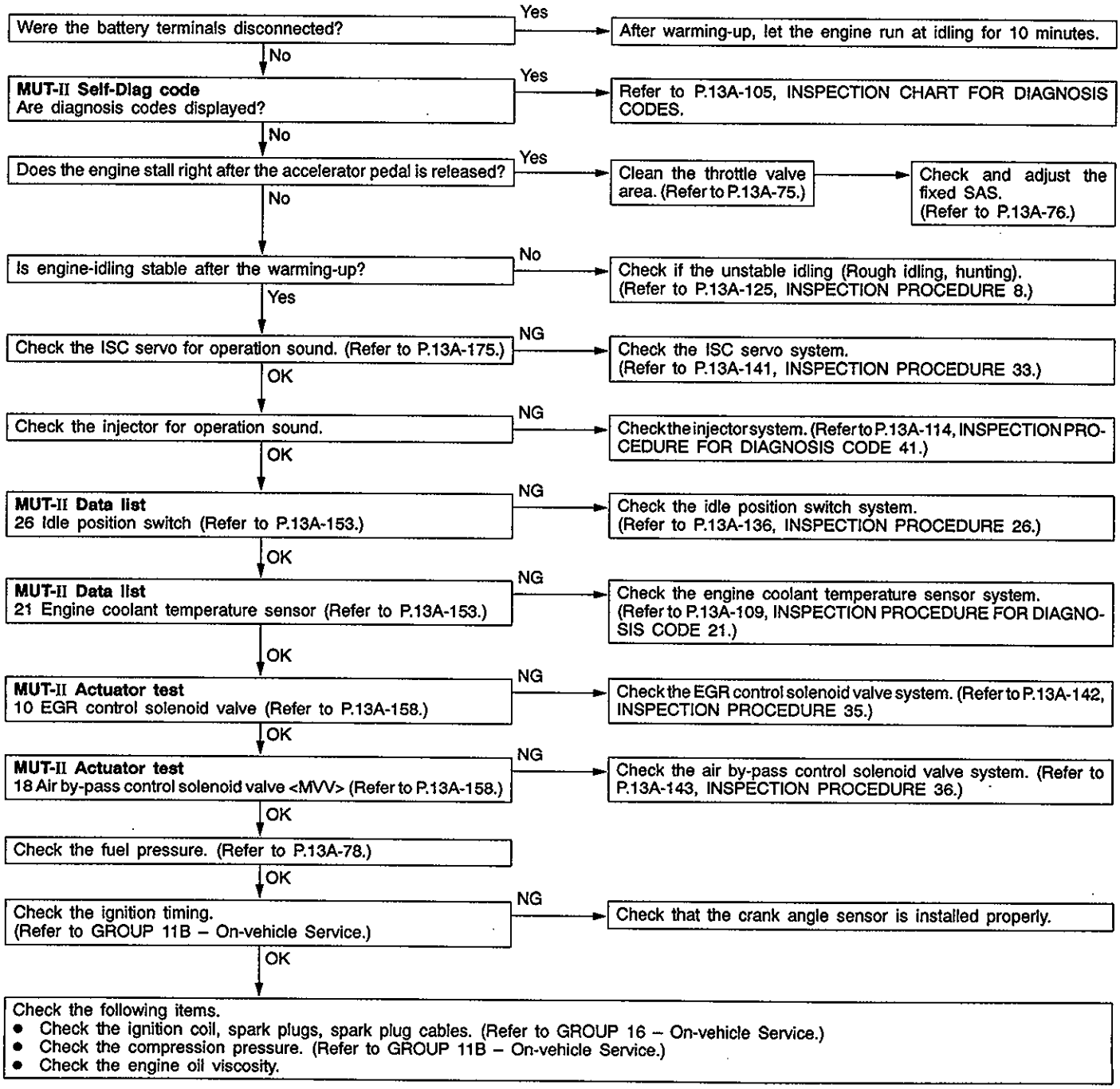
INSPECTION PROCEDURE 10

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



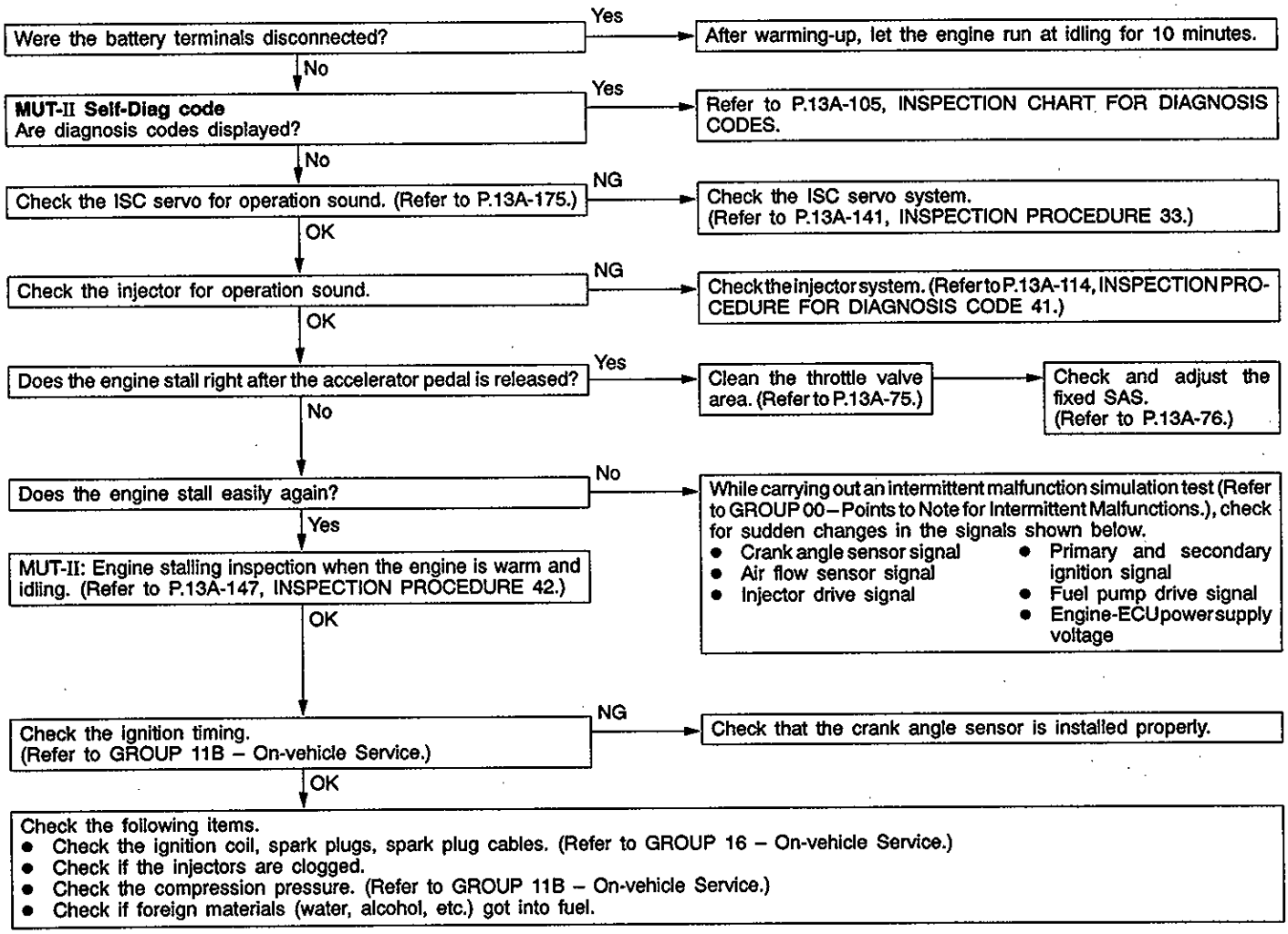
INSPECTION PROCEDURE 11

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



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 displayed?
- Yes → Refer to P.13A-105, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-158.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13A-142, INSPECTION PROCEDURE 35.)
- OK ↓

MUT-II Actuator test
18 Air by-pass control solenoid valve <MVV> (Refer to P.13A-158.)
- NG → Check the air by-pass control solenoid valve system. (Refer to P.13A-143, INSPECTION PROCEDURE 36.)
- OK ↓

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 displayed?
- Yes → Refer to P.13A-105, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-153.)
- NG → Check the idle position switch system. (Refer to P.13A-136, INSPECTION PROCEDURE 26.)
- OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-153.)
- NG → Check the throttle position sensor system. (Refer to P.13A-108, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
- OK ↓

MUT-II Data list
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-112, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 24.)
  - No ↓

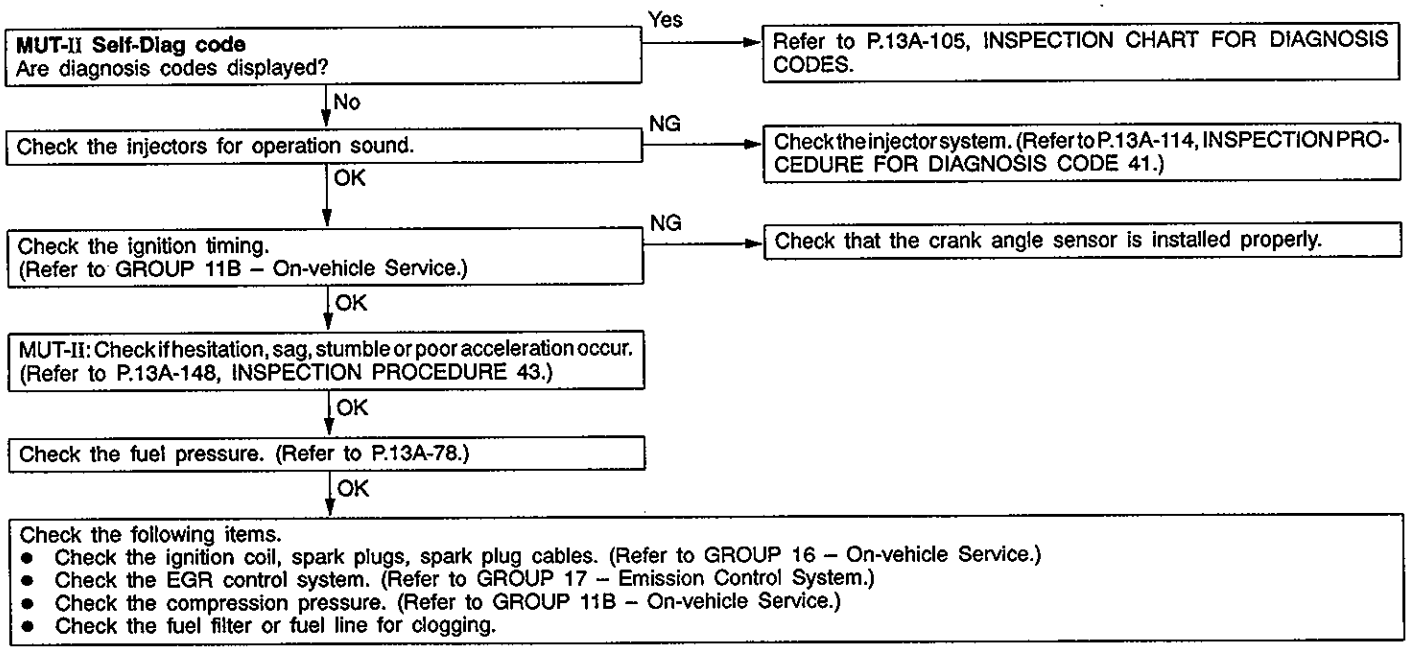
MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-158.)
- NG → Check the EGR control solenoid valve system. (Refer to P.13A-142, INSPECTION PROCEDURE 35.)
- OK ↓

MUT-II Actuator test
18 Air by-pass control solenoid valve <MVV> (Refer to P.13A-158.)
- NG → Check the air by-pass control solenoid valve system. (Refer to P.13A-143, INSPECTION PROCEDURE 36.)
- OK ↓

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.
- Check and adjust the fixed SAS.

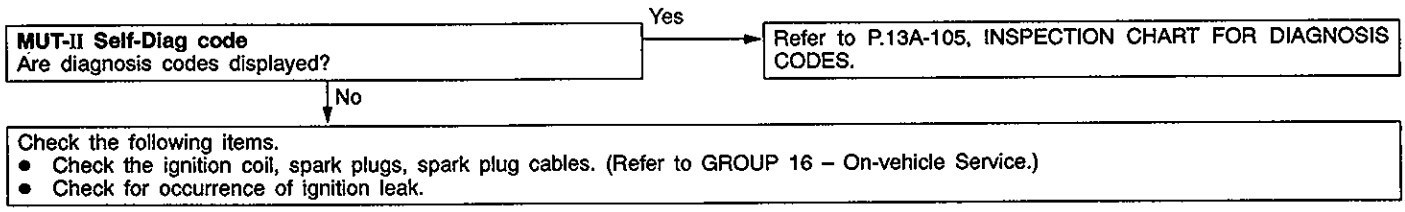
INSPECTION PROCEDURE 15

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



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



INSPECTION PROCEDURE 17

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-105, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ISC servo for operation sound. (Refer to P.13A-175.)
NG → Check the ISC servo system. (Refer to P.13A-141, INSPECTION PROCEDURE 33.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-153.)
NG → Check the throttle position sensor system. (Refer to P.13A-108, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Data list
26 Idle position switch (Refer to P.13A-153.)
NG → Check the idle position switch system. (Refer to P.13A-136, INSPECTION PROCEDURE 26.)
OK ↓

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

INSPECTION PROCEDURE 18

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

MUT-II Self-Diag code
Are diagnosis codes displayed?
Yes → Refer to P.13A-105, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13A-114, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing. (Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the crank angle sensor is installed properly.
OK ↓

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur. (Refer to P.13A-148, INSPECTION PROCEDURE 43.)
OK ↓

Check the fuel pressure. (Refer to P.13A-78.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11B – 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 displayed?
Yes → Refer to P.13A-105, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13A-114, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 41.)
OK ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the crank angle sensor is installed properly.
OK ↓

MUT-II: Check if surge occurs.
(Refer to P.13-149, INSPECTION PROCEDURE 44.)
OK ↓

Check the fuel pressure. (Refer to P.13A-78.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the EGR control system. (Refer to GROUP 17 – Emission Control 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 displayed?
Yes → Refer to P.13A-105, 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-114, 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 displayed?
Yes → Refer to P.13A-105, INSPECTION CHART FOR DIAGNOSIS CODES.
No ↓

Check the ignition timing.
(Refer to GROUP 11B – On-vehicle Service.)
NG → Check that the crank angle sensor is installed properly.
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor. (Refer to P.13A-153.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-109, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-153.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-107, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-153.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
11 Oxygen sensor
OK: 600–1,000 mV when racing suddenly (Refer to P.13A-153.)
NG → Check the oxygen sensor system. (Refer to P.13A-106, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
11 Oxygen sensor
OK: Repeat 0–400 mV and 600–1,000 mV alternately when idling. (Refer to P.13A-153.)
OK → Replace the oxygen sensor.
NG ↓

Check the fuel pressure. (Refer to P.13A-78.)
OK ↓

Check trouble symptom.
NG ↓

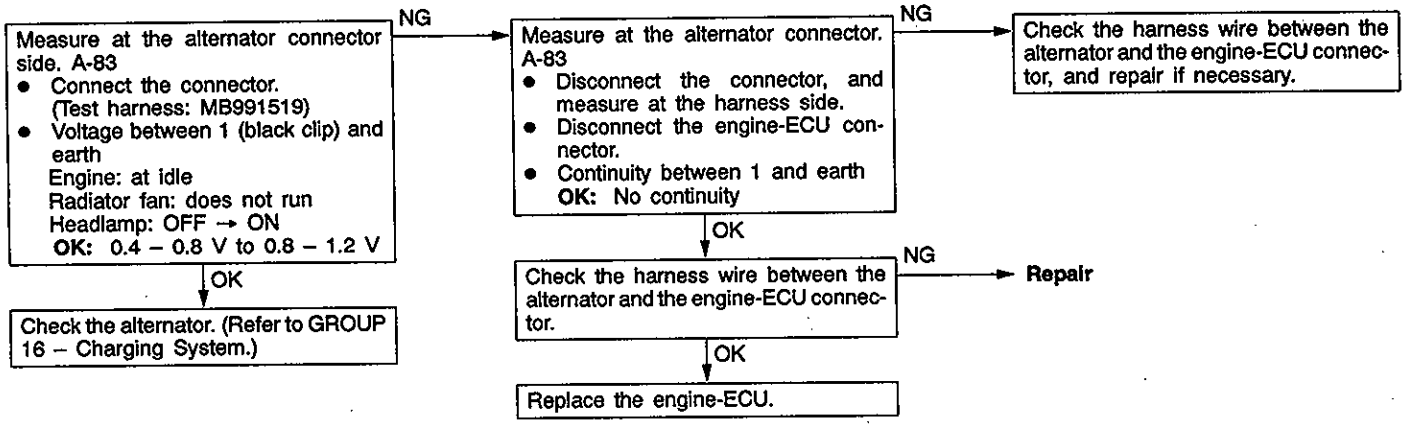
Check the following items.
- Check the injectors for operation sound.
- Check the injectors for fuel leakage.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – On-vehicle Service.)
- Check the compression pressure. (Refer to GROUP 11B – On-vehicle Service.)
- Check the positive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

Check the trouble symptom.
NG ↓

Replace the catalytic converter.

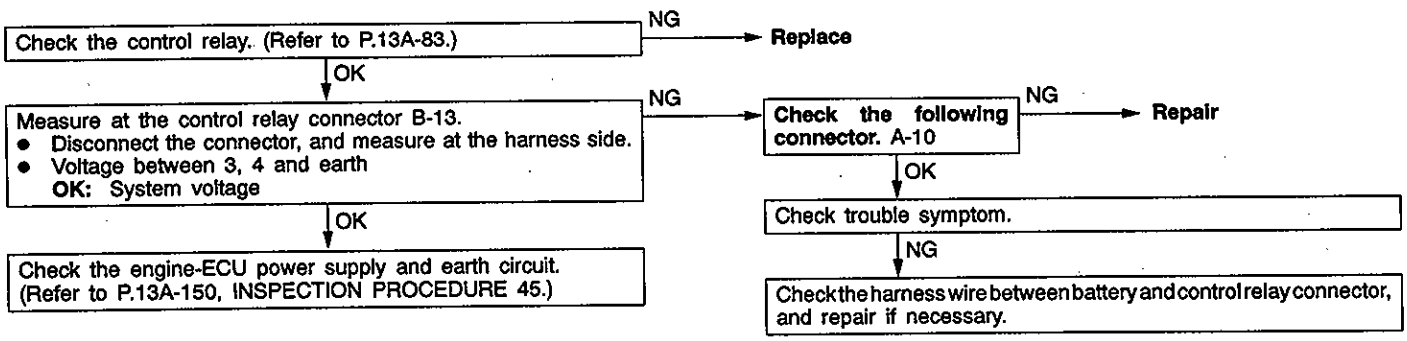
INSPECTION PROCEDURE 23

Low alternator output voltage (approx. 12.3 V)	Probable cause
The alternator may be defective, or malfunctions, which are listed in the right column, may be suspected.	• Malfunction of charging system (Refer to GROUP 16 – Charging System.) • Short circuit in harness between alternator G terminal and engine-ECU • Malfunction of engine-ECU



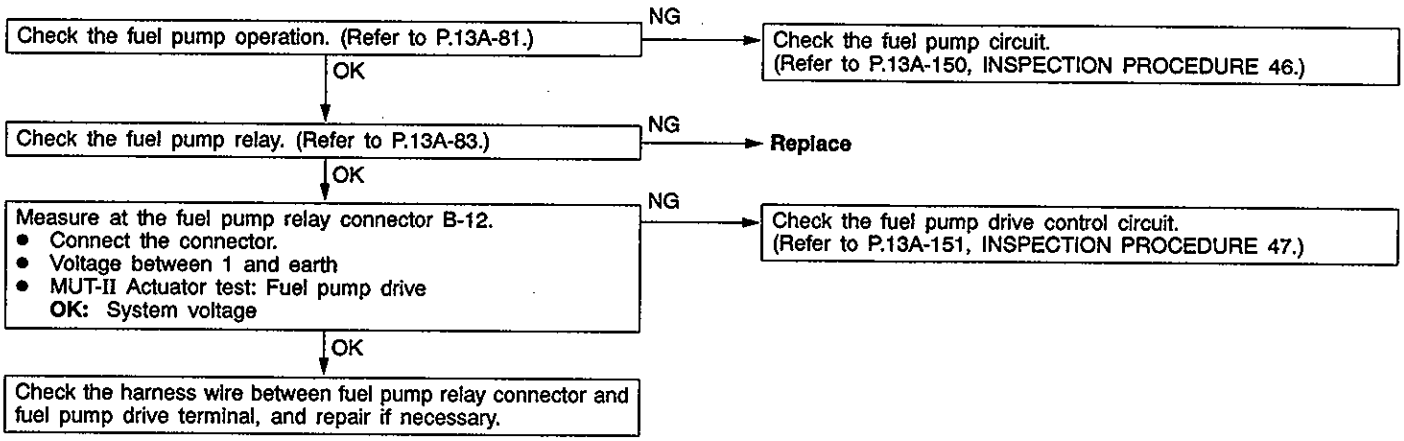
INSPECTION PROCEDURE 24

Power supply system and ignition switch-IG system	Probable cause
When an ignition switch ON signal is input to the engine-ECU, the engine-ECU turns the control relay ON. This causes 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



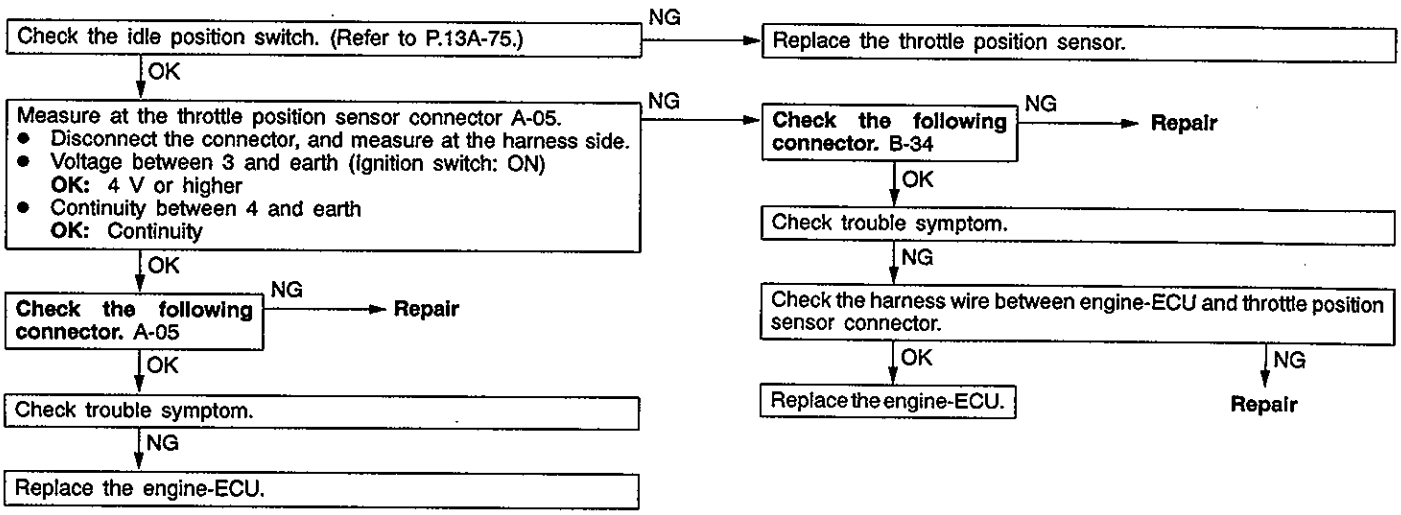
INSPECTION PROCEDURE 25

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 fuel pump relay • Malfunction of the fuel pump • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



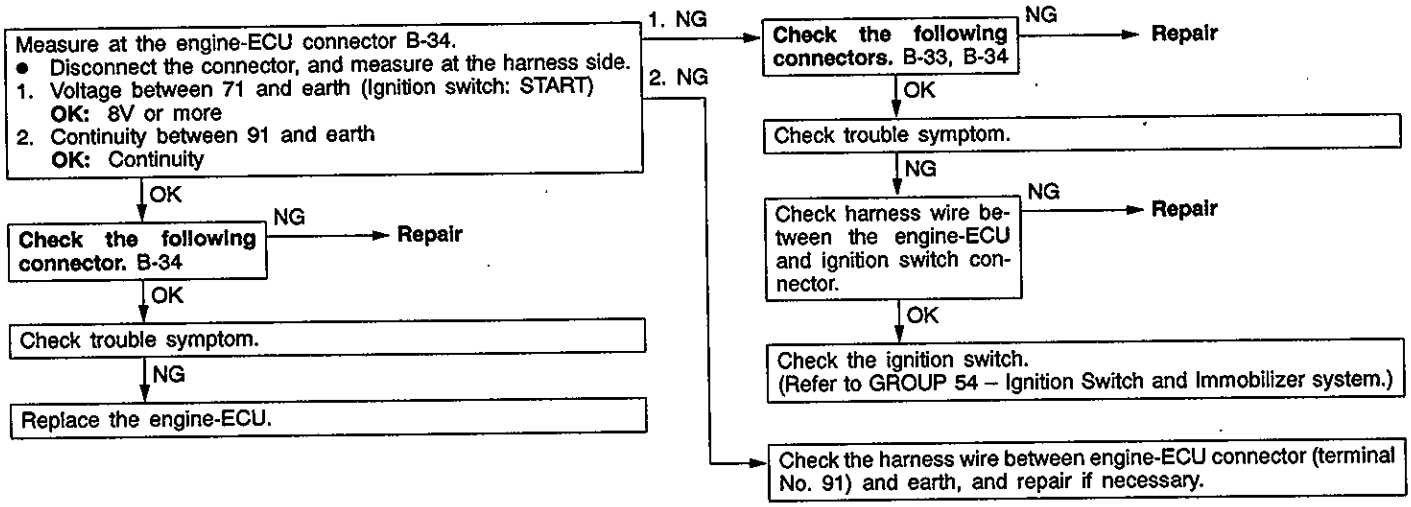
INSPECTION PROCEDURE 26

Idle position switch system	Probable cause
The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine-ECU. The engine-ECU controls the idle speed control servo based on this input.	• 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



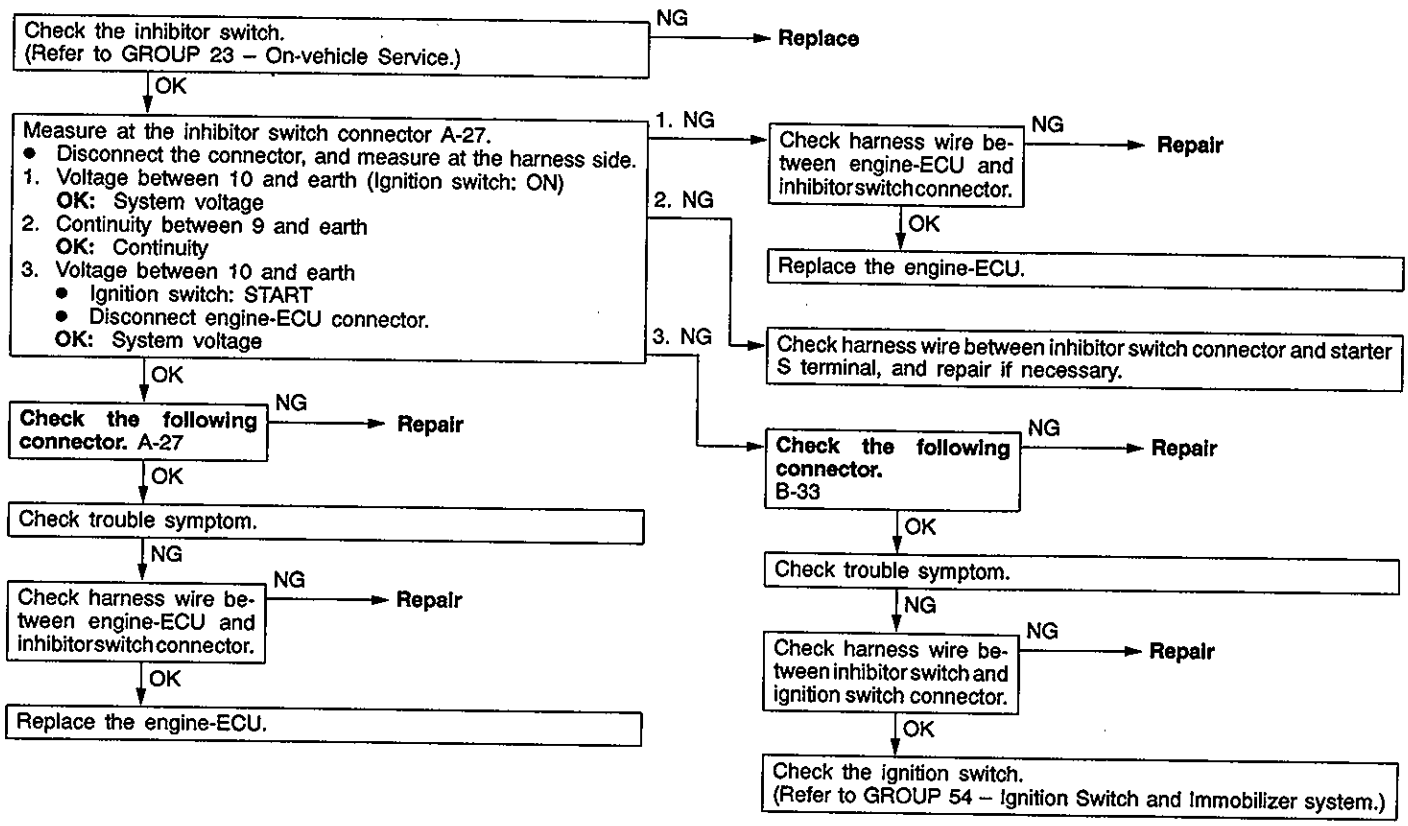
INSPECTION PROCEDURE 27

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



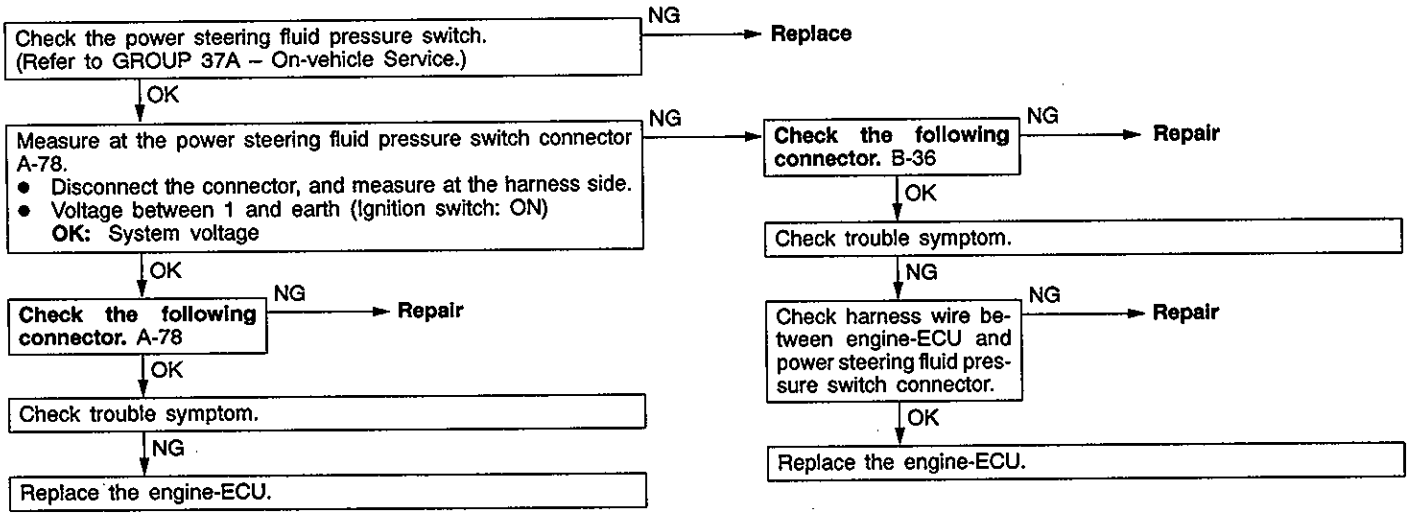
INSPECTION PROCEDURE 28

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.



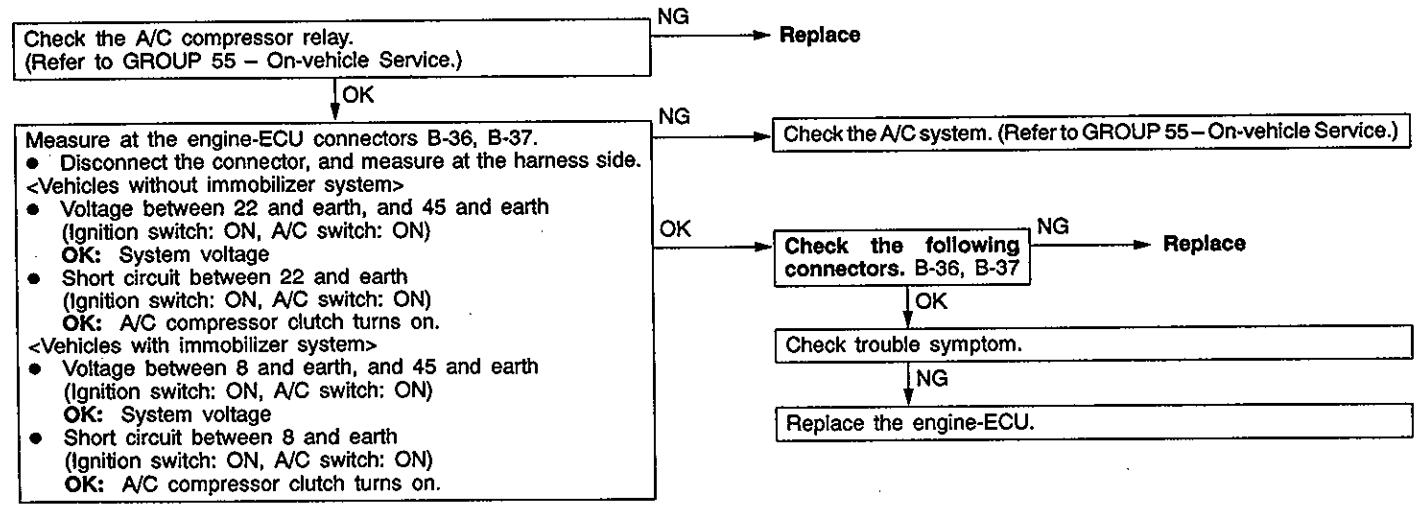
INSPECTION PROCEDURE 29

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



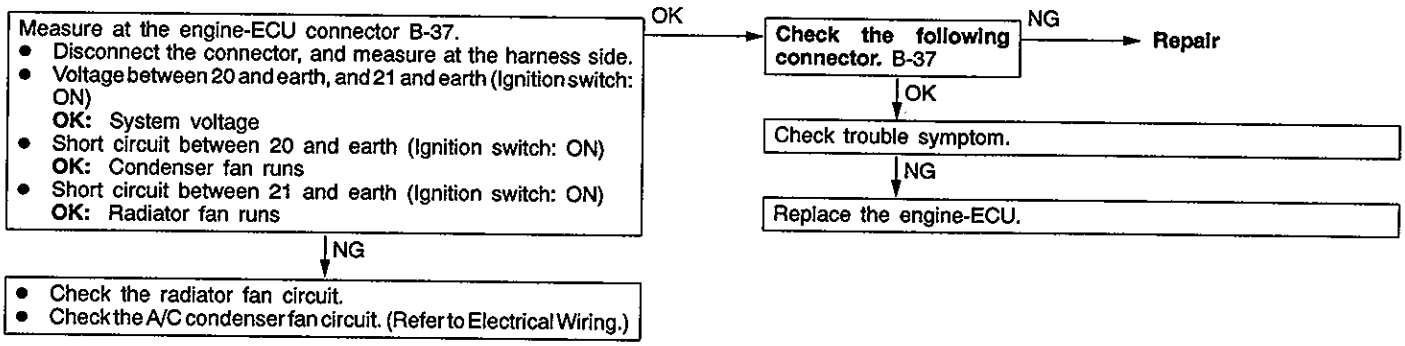
INSPECTION PROCEDURE 30

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



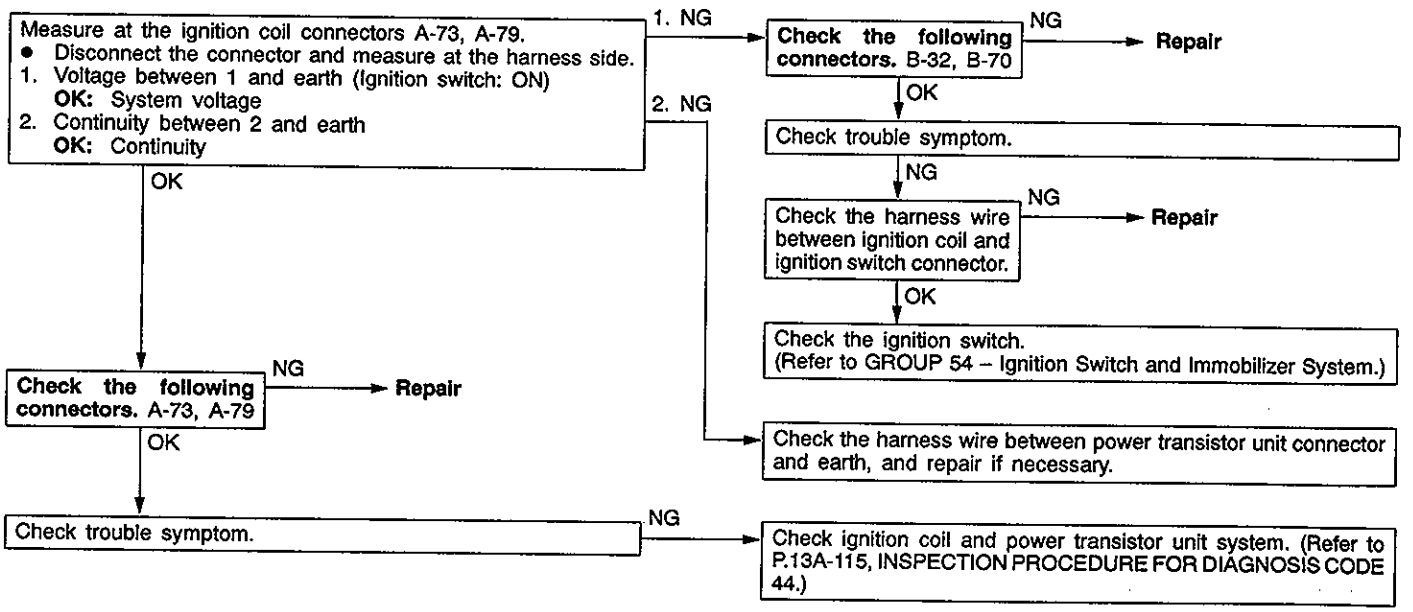
INSPECTION PROCEDURE 31

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



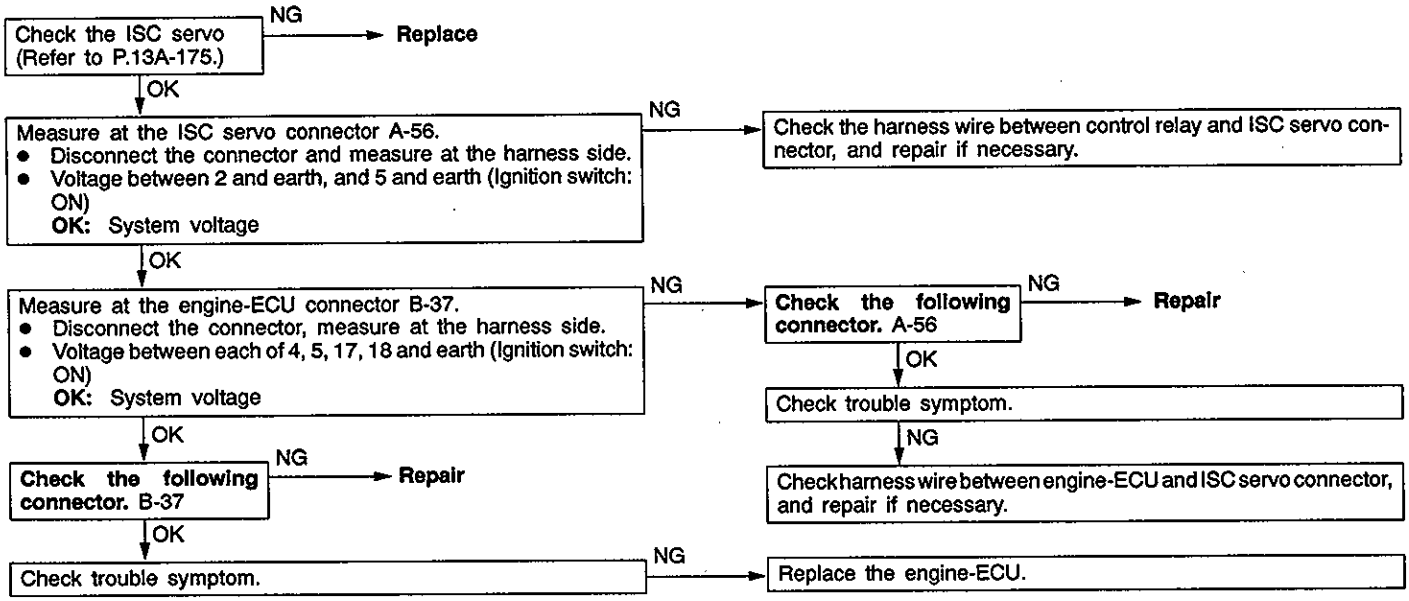
INSPECTION PROCEDURE 32

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



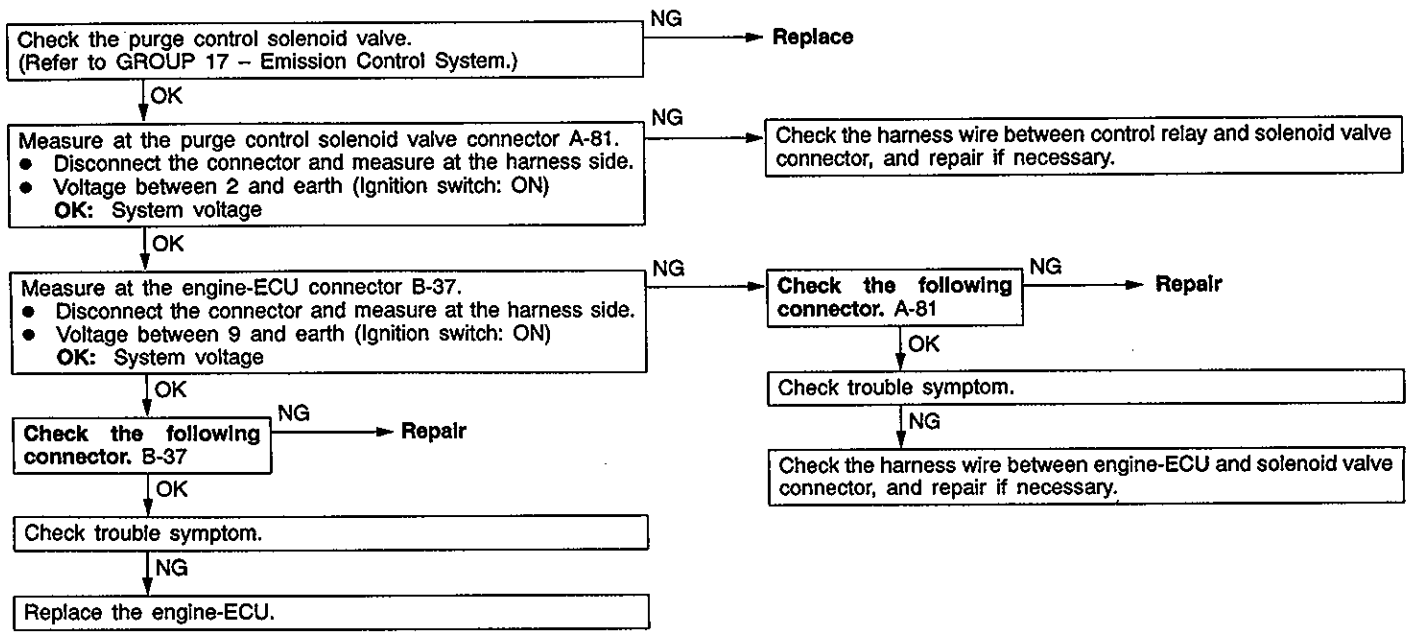
INSPECTION PROCEDURE 33

Idle speed control (ISC) servo (Stepper motor) system	Probable cause
The engine-ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	• Malfunction of ISC servo • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine-ECU



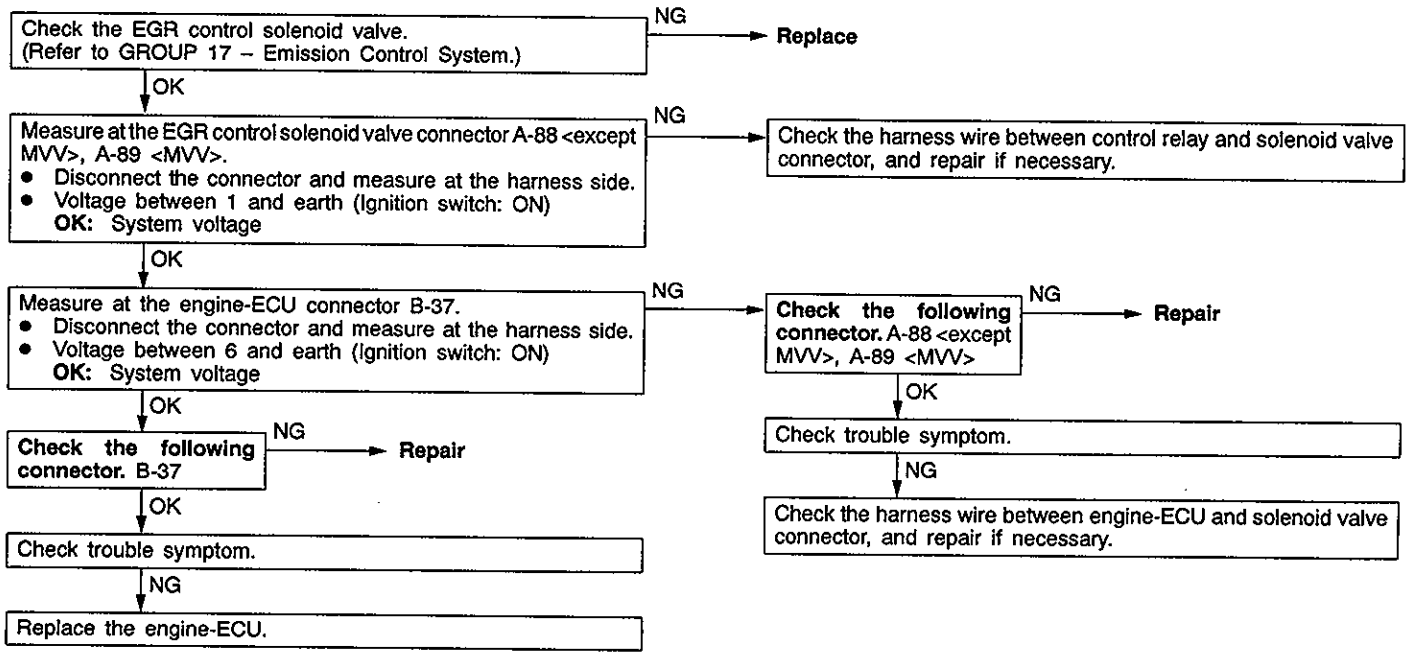
INSPECTION PROCEDURE 34

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



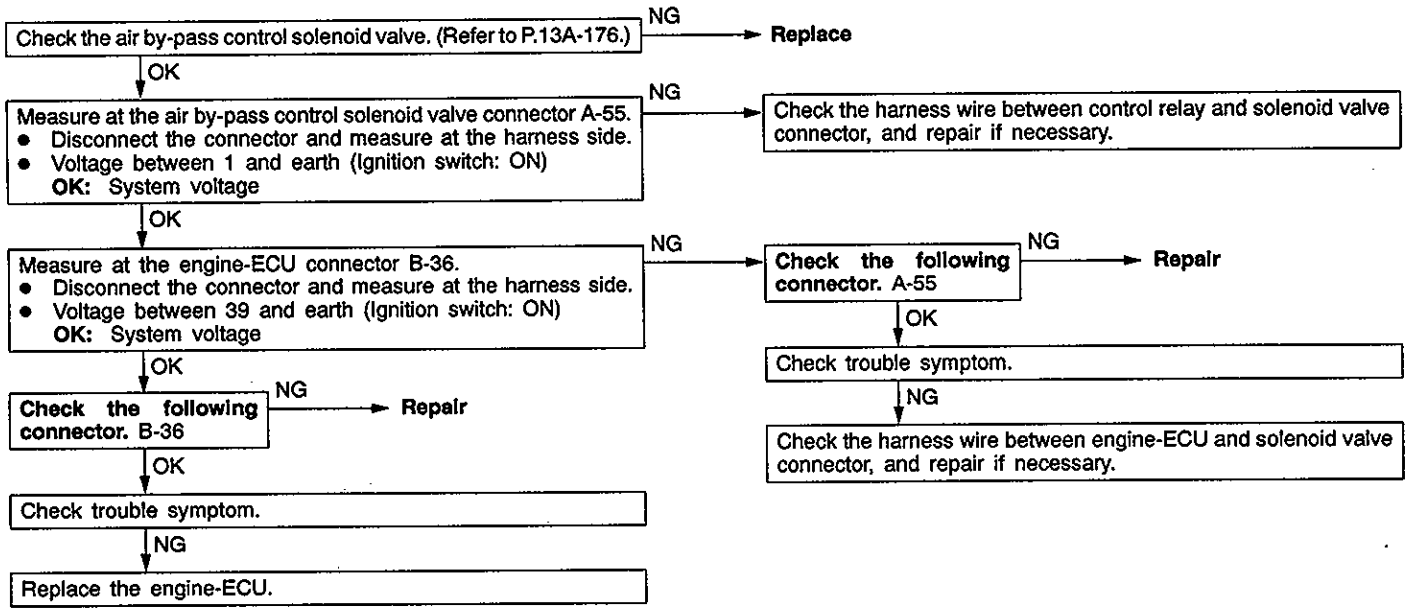
INSPECTION PROCEDURE 35

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 36

Air by-pass control solenoid valve system	Probable cause
The engine-ECU controls the air by-pass control solenoid valve to control its operating vacuum.	• Malfunction of solenoid valve • Improper connector contact, open circuit or short-circuited harness wire. • Malfunction of the engine-ECU



INSPECTION PROCEDURE 37

MUT-II: Inspection of no initial combustion

MUT-II Data list
16 Voltage of engine-ECU power source (Refer to P.13A-153.)
- NG → Check the power supply and ignition switch-IG system. (Refer to P.13A-135, INSPECTION PROCEDURE 24.)
- OK ↓

Does the camshaft rotate at the engine cranking? (When oil filler cap is removed.)
- No → Check timing belt for breakage.
- Yes ↓

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-105, INSPECTION CHART FOR DIAGNOSIS CODES.
- No ↓

MUT-II Data list
22 Crank angle sensor
OK: Cranking speed is displayed.
- No → Check the crank angle sensor system. (Refer to P.13A-110, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 22.)
- OK ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-158.)
- NG → Check the fuel pump system. (Refer to P.13A-136, INSPECTION PROCEDURE 25.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-153.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-109, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)

INSPECTION PROCEDURE 38

Ignition system: Inspection of no initial combustion.

Measure at the ignition coil connectors A-73, A-79.
- Connect the connector. (Use test harness: MB991348)
- Connect a primary voltage detection-type tachometer to terminal (1) of each connector in turn.

OK: Each terminal displays a speed on the engine tachometer that is 1/2 of the cranking speed.
- NG → Check ignition circuit system. (Refer to P.13A-140, INSPECTION PROCEDURE 32.)
- OK ↓

Check the ignition timing when cranking.
OK: Approx. 5°BTDC
- NG → Check that the crank angle sensor is installed properly.

INSPECTION PROCEDURE 39

MUT-II: Check if uncomplete combustion occurs.

MUT-II Self-Diag code
Are diagnosis codes displayed?
- Yes → Refer to P.13A-105, INSPECTION CHART FOR DIAGNOSIS CODE
- No ↓

MUT-II Actuator test
07 Fuel pump (Refer to P.13A-158.)
- NG → Check the fuel pump system. (Refer to P.13A-136, INSPECTION PROCEDURE 25.)
- OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-153.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-109, INSPECTION PROCEDURES FOR DIAGNOSIS CODE 21.)
- OK ↓

MUT-II Data list
18 Ignition switch-ST (Refer to P.13A-153.)
- NG → Check the ignition switch-ST system <M/T>. (Refer to P.13A-137, INSPECTION PROCEDURE 27.) Check the ignition switch-ST and inhibitor switch system <A/T>. (Refer to P.13A-138, INSPECTION PROCEDURE 28.)

INSPECTION PROCEDURE 40

Check if hunting occurs.

Clean the throttle body. (Refer to P.13A-75.)
↓
Check and adjust the fixed SAS. (Refer to P.13A-76.)
↓
Check trouble symptom.
- NG ↓

Inspect the intake of air into the air intake system
- Broken intake manifold gasket
- Broken air intake hose
- Broken vacuum hose
- Positive crankcase ventilation valve does not operate.

INSPECTION PROCEDURE 41

MUT-II: Check if idling speed is unstable.

MUT-II Data list
26 Idle position switch (Refer to P.13A-153.)
NG → Check the idle position switch system. (Refer to P.13A-136, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-153.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-107, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-153.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-153.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-109, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Actuator test
08 Purge control solenoid valve (Refer to P.13A-158.)
NG → Check the purge control solenoid valve system (Refer to P.13A-141, INSPECTION PROCEDURE 34.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-158.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-142, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Actuator test
18 Air by-pass control solenoid valve <MVV> (Refer to P.13A-158.)
NG → Check the air by-pass control solenoid valve system. (Refer to P.13A-143, INSPECTION PROCEDURE 36.)
OK ↓

MUT-II Data list
11 Oxygen sensor
OK: 600–1,000 mV during sudden racing
NG → Check the oxygen sensor system. (Refer to P.13A-106, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
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-78.)
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.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-153.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-139, INSPECTION PROCEDURE 29.)
OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-153.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-139. INSPECTION PROCEDURE 30.)
OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-153.)
NG → Check the ignition switch-ST and inhibitor switch system. <A/T> (Refer to P.13A-138, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II Data list
45 ISC Servo position (Refer to P.13A-153.)
NG → Adjust the basic idle speed. (Refer to P.13A-171.)

INSPECTION PROCEDURE 42

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-153.)
NG → Check the idle position switch system. (Refer to P.13A-136, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-153.)
NG → Check the intake air sensor system. (Refer to P.13A-107, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-153.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-153.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-109, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-158.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-142, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Actuator test
18 Air by-pass control solenoid valve <MVV> (Refer to P.13A-158.)
NG → Check the air by-pass control solenoid valve system. (Refer to P.13A-143, INSPECTION PROCEDURE 36.)
OK ↓

MUT-II Data list
11 Oxygen sensor
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the oxygen sensor system. (Refer to P.13A-106, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
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-78.)
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.

OK ↓

MUT-II Data list
27 Power steering fluid pressure switch (Refer to P.13A-153.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-139, INSPECTION PROCEDURE 29.)
OK ↓

MUT-II Data list
28 A/C switch (Refer to P.13A-153.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-139, INSPECTION PROCEDURE 30.)
OK ↓

MUT-II Data list
29 Inhibitor switch (Refer to P.13A-153.)
NG → Check the ignition switch-ST and inhibitor switch system. <A/T> (Refer to P.13A-138, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II Data list
45 ISC servo position (Refer to P.13A-153.)
NG → Adjust the basic idle speed. (Refer to P.13A-171.)

INSPECTION PROCEDURE 43

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

MUT-II Data list
26 Idle position switch (Refer to P.13A-153.)
NG → Check the idle position switch system. (Refer to P.13A-136, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-153.)
NG → Check the intake air sensor system. (Refer to P.13A-107, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-153.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-153.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-109, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE 21.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-153.)
NG → Check the throttle position sensor system. (Refer to P.13A-108, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-158.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-142, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Actuator test
18 Air by-pass control solenoid valve <MVV> (Refer to P.13A-158.)
NG → Check the air by-pass control solenoid valve system. (Refer to P.13A-143, INSPECTION PROCEDURE 36.)
OK ↓

MUT-II Data list
11 Oxygen sensor
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the oxygen sensor system. (Refer to P.13A-106, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
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-78.)
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 44

MUT-II: Check if surge occurs.

MUT-II Data list
26 Idle position switch (Refer to P.13A-153.)
NG → Check the idle position switch system. (Refer to P.13A-136, INSPECTION PROCEDURE 26.)
OK ↓

MUT-II Data list
13 Intake air temperature sensor (Refer to P.13A-153.)
NG → Check the intake air sensor system. (Refer to P.13A-107, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 13.)
OK ↓

MUT-II Data list
25 Barometric pressure sensor (Refer to P.13A-153.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-113, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 25.)
OK ↓

MUT-II Data list
21 Engine coolant temperature sensor (Refer to P.13A-153.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-109, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 21.)
OK ↓

MUT-II Data list
14 Throttle position sensor (Refer to P.13A-153.)
NG → Check the throttle position sensor system. (Refer to P.13A-108, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 14.)
OK ↓

MUT-II Actuator test
10 EGR control solenoid valve (Refer to P.13A-158.)
NG → Check the EGR control solenoid valve system. (Refer to P.s13A-142, INSPECTION PROCEDURE 35.)
OK ↓

MUT-II Actuator test
18 Air by-pass control solenoid valve <MVV> (Refer to P.13A-158.)
NG → Check the air by-pass control solenoid valve system. (Refer to P.13A-143, INSPECTION PROCEDURE 36.)
OK ↓

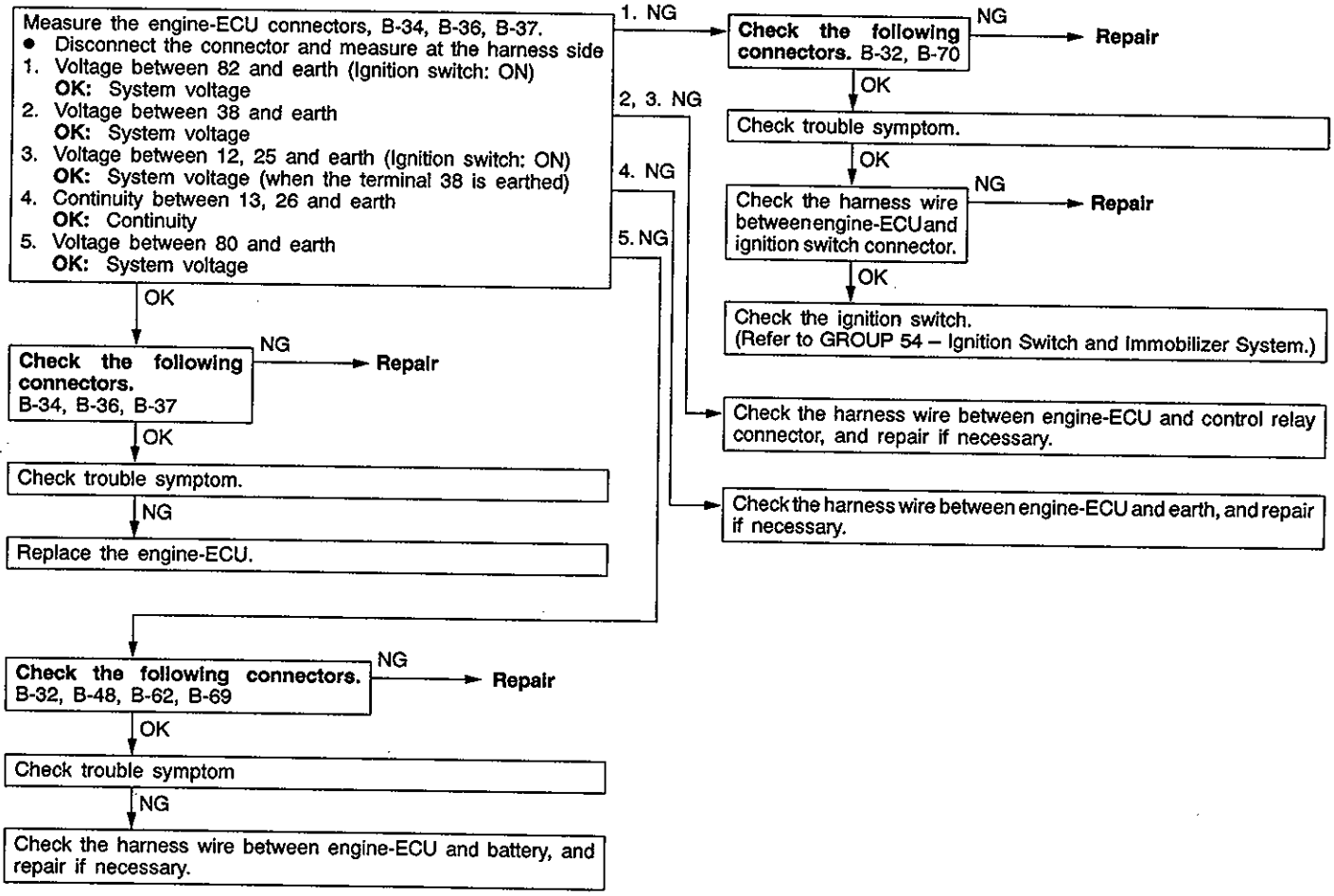
MUT-II Data list
11 Oxygen sensor
OK: Changes between 600–1,000 mV during sudden racing
NG → Check the oxygen sensor system. (Refer to P.13A-106, INSPECTION PROCEDURE FOR DIAGNOSIS CODE 11.)
OK ↓

MUT-II Data list
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-78.)
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.

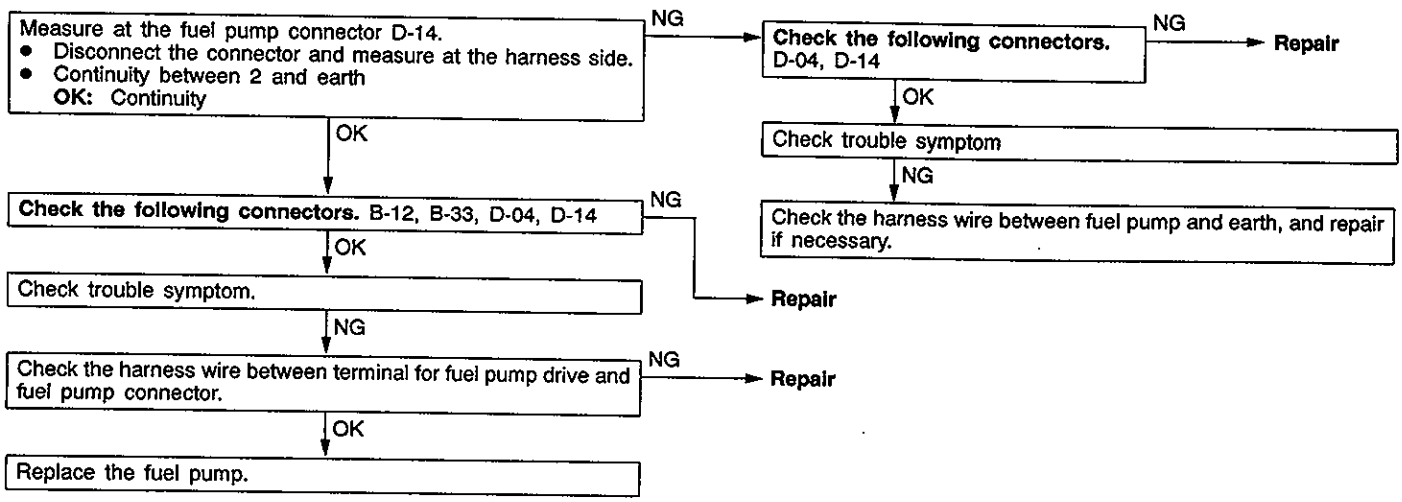
INSPECTION PROCEDURE 45

Check the engine-ECU power supply and earth circuit.



INSPECTION PROCEDURE 46

Check fuel pump circuit.



INSPECTION PROCEDURE 47

Check the fuel pump drive control circuit.

Measure at the fuel pump relay connector B-12.
- Disconnect the connector and measure at the harness side.
- Voltage between 4 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connectors.** B-32, B-70 → NG → **Repair**
OK → Check trouble symptom.
NG → Check the harness wire between fuel pump relay and ignition switch connector. → NG → **Repair**
OK → Check the ignition switch. (Refer to GROUP 54 – Ignition Switch and Immobilizer System.)

OK →

Measure at the engine-ECU connector B-37.
- Disconnect the connector and measure at the harness side.

<Vehicles without immobilizer system>
- Voltage between 8 and earth (Ignition switch: ON)
  OK: System voltage

<Vehicles with immobilizer system>
- Voltage between 22 and earth (Ignition switch: ON)
  OK: System voltage

NG → **Check the following connector.** B-12 → NG → **Repair**
OK → Check trouble symptom.
NG → Check the harness wire between engine-ECU and fuel pump relay connector, and repair if necessary.

OK →

Check the following connector. B-37 → NG → **Repair**
OK → Check trouble symptom.
NG → Replace the engine-ECU.

INSPECTION PROCEDURE 48

Check air flow sensor (AFS) control circuit.

Measure at the air flow sensor connector A-61.
- Disconnect the connector and measure at the harness side.

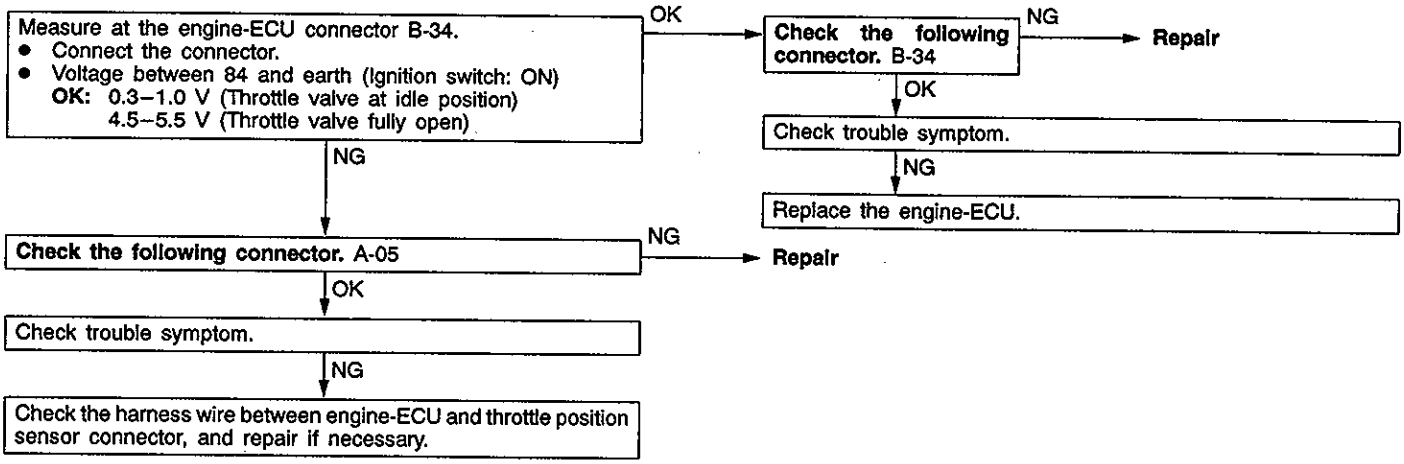
1. Voltage between 4 and earth (Ignition switch: ON)
   OK: System voltage
2. Voltage between 3 and earth (Ignition switch: ON)
   OK: 4.8–5.2 V
3. Continuity between 5 and earth
   OK: Continuity

1. NG → Check the harness wire between the air flow sensor and control relay connector, and repair if necessary.
2, 3. NG → **Check the following connector.** B-34 → NG → **Repair**
OK → Check trouble symptom.
NG → Check the harness wire between the engine-ECU and air flow sensor connector. → NG → **Repair**
OK → Replace the engine-ECU.

OK → **Check the following connector.** A-61 → NG → **Repair**
OK → Check trouble symptom.
NG → Replace the air flow sensor.

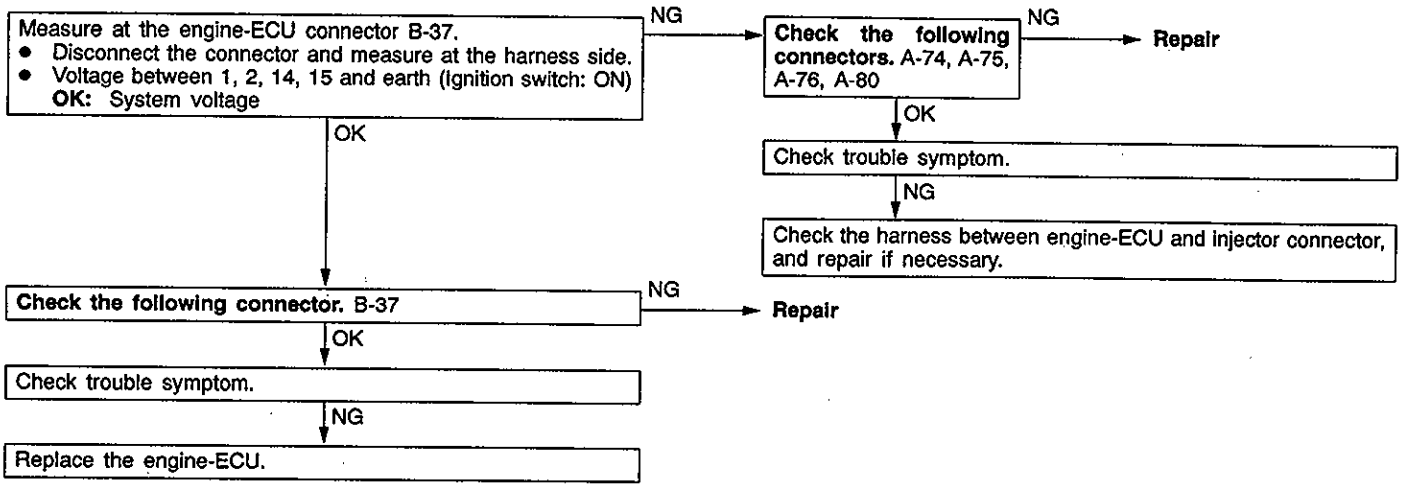
INSPECTION PROCEDURE 49

Check throttle position sensor (TPS) output circuit.



INSPECTION PROCEDURE 50

Check injector control circuit



DATA LIST REFERENCE TABLE

13100890104

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 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.
*3. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
*4. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
*5. 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.

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-106
			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) 600–1,000 mV		
			2,500 r/min			
12	Air flow sensor*1	• Engine coolant temperature: 80–95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	25–51 Hz	–	–
			2,500 r/min	80–120 Hz		
			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-107
			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-108
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 24	13A-135
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 27 <M/T> Procedure No. 28 <A/T>	13A-137 <M/T> 13A-138 <M/T>
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13A-109
			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-110
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,400–1,600 rpm <except MVV> 1,500–1,700 rpm <MVV>		
			When engine coolant temperature is 0°C	1,350–1,550 rpm		
			When engine coolant temperature is 20°C	1,300–1,500 rpm		
			When engine coolant temperature is 40°C	1,100–1,300 rpm		
			When engine coolant temperature is 80°C	650–850 rpm <except MVV> 600–800 rpm <MVV>		
25	Barometric pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-113
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 26	13A-136
			Throttle valve: Slightly open	OFF*2		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 29	13A-139
			Steering wheel turning	ON		

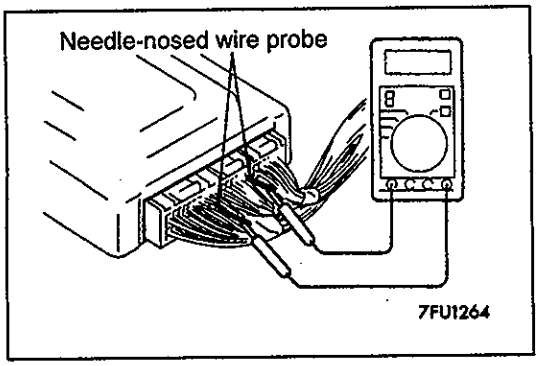
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 30	13A-139
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 28	13A-138
			D, 2, L or R	D, 2, L or R		
41	Injectors *3	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	13–19 ms <except MVV> 15–23 ms <MVV>	–	–
			When engine coolant temperature is 20°C	27–40 ms <except MVV> 30–44 ms <MVV>		
			When engine coolant temperature is 80°C	5.9–8.9 ms <except MVV> 7.0–10.6 ms <MVV>		
	Injectors*4	• Engine coolant temperature: 80–95°C • Lamps, electric cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	1.7–2.9 ms <except MVV> 1.6–2.8 ms <MVV>		
			2,500 r/min	1.4–2.6 ms		
			When engine is suddenly raced	Increases		
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 <except MVV> 4–20°BTDC <MVV>	–	–
			2,500 r/min	30–50°BTDC <except MVV> 25–45°BTDC <MVV>		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC (stepper) motor position *5	• Engine coolant temperature: 80–95°C • Lamps, electric cooling fan 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-139
			A/C switch: ON	ON (Compressor clutch is operating)		

ACTUATOR TEST REFERENCE TABLE

13100900135

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-114
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. 25	13A-136
				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. 34	13A-141
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. 35	13A-142
17	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idling Timing light is set		5°BTDC	–	–
18	Air by-pass control solenoid valve <MVV>	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-143
20	Condenser fan	Drive the fan motors (condenser)	• Ignition switch: ON • A/C switch: ON		Fan motor operates	Procedure No. 31	13A-140
21	Radiator fan	Drive the fan motors (radiator)	• Ignition switch: ON		Fan motor operates	Procedure No. 31	13A-140



CHECK AT THE ENGINE-ECU TERMINALS

13100920100

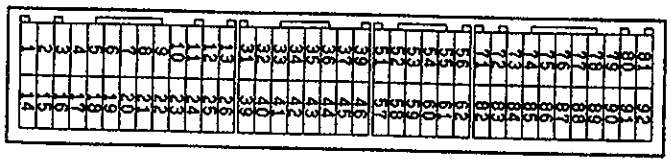
TERMINAL VOLTAGE CHECK CHART

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



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NOTE
*: Vehicles with immobilizer system

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
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	No. 2 injector		
2	No. 3 injector		
15	No. 4 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	System voltage ↔ 0 V (Changes repeatedly)
17	Stepper motor coil <A2>		
5	Stepper motor coil <B1>		
18	Stepper motor coil <B2>		
6	EGR control solenoid valve	Ignition switch: ON	System Voltage
		While engine is idling, suddenly depress the accelerator pedal.	From system voltage, momentarily drops
8 or 22*	Fuel pump relay	Ignition switch: ON	System voltage
		Engine: Idle speed	0–3V
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	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)		
12	Power supply	Ignition switch: ON	System voltage
25			
19	Air flow sensor reset signal	Engine: Idle speed	0–1V
		Engine r/min: 3,000 r/min	6–9V
20	Condenser fan motor relay	Condenser fan is not operating (Engine coolant temperature is 90°C or less)	System voltage
		Condenser fan is operating (Engine coolant temperature is 105°C or more)	0 – 3 V

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
21	Radiator fan motor relay	Radiator fan is not operating (Engine coolant temperature is 90°C or less)		System voltage
		Radiator fan is operating (Engine coolant temperature is 90 – 105°C)		0 – 3 V
22 or 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
33	Alternator G terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch: OFF to ON		0.4 – 0.8 V to 0.8 – 1.2 V
41	Alternator FR terminal	• Engine: Warm, idle (radiator fan: OFF) • Headlamp: OFF to ON • Rear defogger switch: OFF to ON		1.8 – 2.4 V to 1.0 – 1.6 V
36	Engine warning lamp	Ignition switch: OFF → ON		0–3V → 9–13V (After several seconds have elapsed)
37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	System voltage
			When steering wheel is turned	0–3V
38	Control relay (Power supply)	Ignition switch: OFF		System voltage
		Ignition switch: ON		0–3V
39	Air by-pass control solenoid valve <MVV>	Engine: Idling after warming up		0 – 3 V
		Engine r/min: 1,000 r/min		System voltage
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
58	Tachometer signal	Engine r/min: 3,000 r/min		0.3–3.0V
60	Oxygen sensor heater	Engine: Idling after warming up		0–3V
		Engine r/min: 5,000r/min.		System voltage
71	Ignition switch – ST	Engine: Cranking		8V or more

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
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	Oxygen sensor	Engine: Running at 2,500 r/min after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
80	Backup power supply	Ignition switch: OFF		System voltage
81	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
82	Ignition switch – IG	Ignition switch: ON		System voltage
83	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2–3.8V
			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

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
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	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7–4.3V
			When altitude is 1,200m	3.2–3.8V
86	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5V (Changes repeatedly)
87	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
			Slightly open throttle valve	4V or more
88	Camshaft position sensor	Engine: Cranking		0.4–3.0V
		Engine: Idle speed		0.5–2.0V
89	Crank angle sensor	Engine: Cranking		0.4–4.0V
		Engine: Idle speed		1.5–2.5V
90	Air flow sensor	Engine: Idle speed		2.2–3.2V
		Engine r/min: 2,500r/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

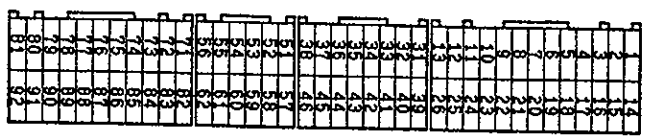
CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

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



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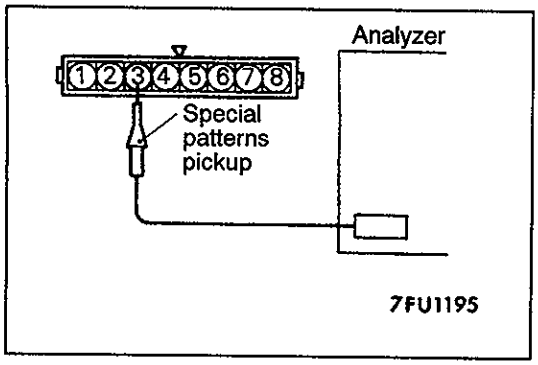
Terminal No.	Inspection item	Normal condition (Check condition)
1–12	No. 1 injector	13–16 Ω (At 20°C)
14–12	No. 2 injector	
2–12	No. 3 injector	
15–12	No. 4 injector	

Terminal No.	Inspection item	Normal condition (Check condition)
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	36–44 Ω (At 20°C)
9–12	Purge control solenoid valve	36–44 Ω (At 20°C)
13–Body earth	ENGINE-ECU earth	Continuity (0Ω)
26–Body earth	ENGINE-ECU earth	
39–12	Air by-pass control solenoid valve	36 – 44 Ω (At 20°C)
60–12	Oxygen sensor heater	7–40 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

13100930103

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)

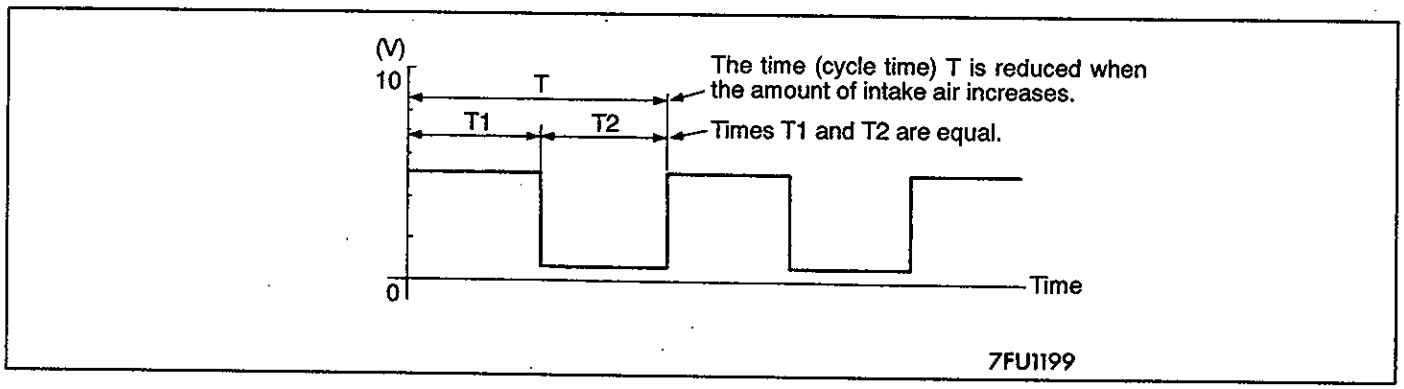
1. Connect the analyzer special patterns pickup to engine-ECU terminal 90.

Standard Wave Pattern

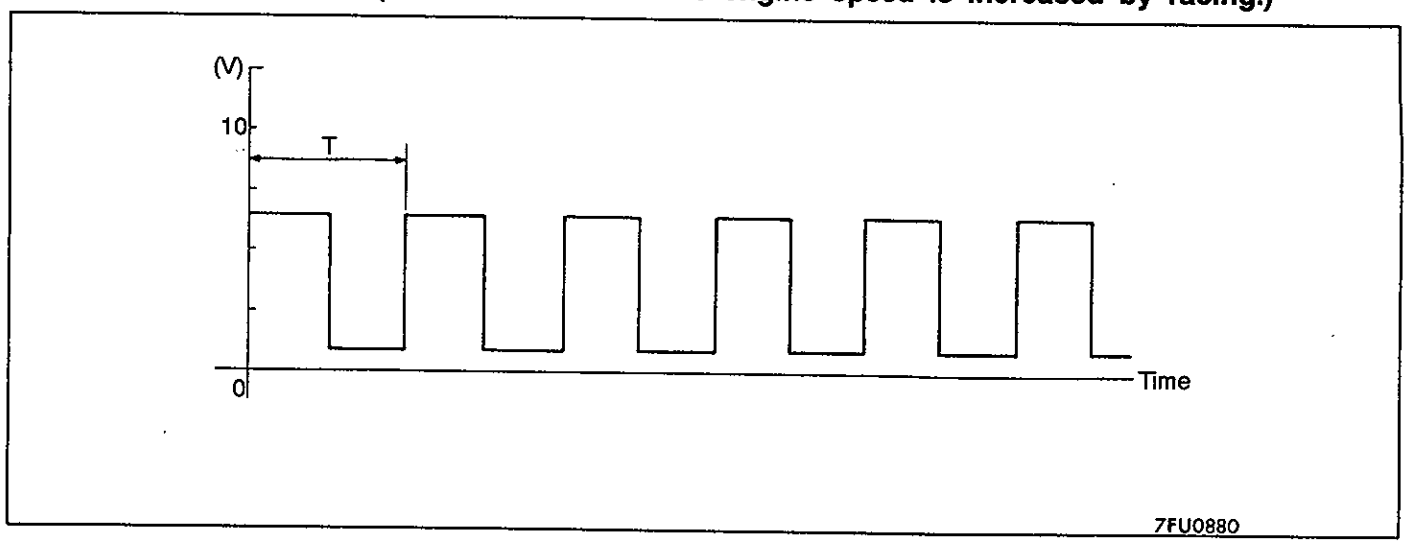
Observation conditions

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

Standard wave pattern

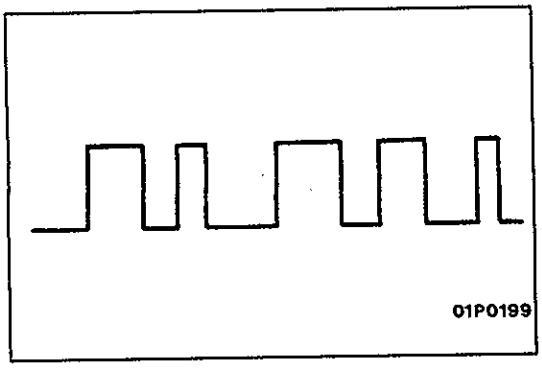


Observation conditions (from conditions above engine speed is increased by racing.)



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.

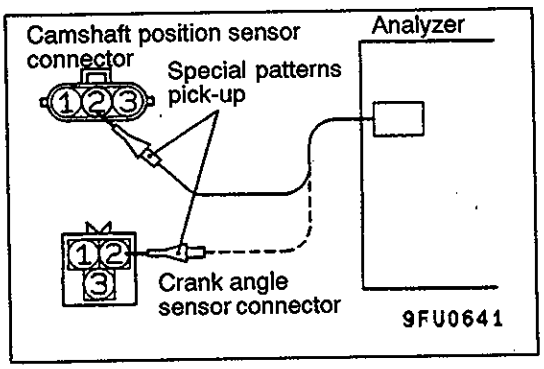
- Example 2

  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.



CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR

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)

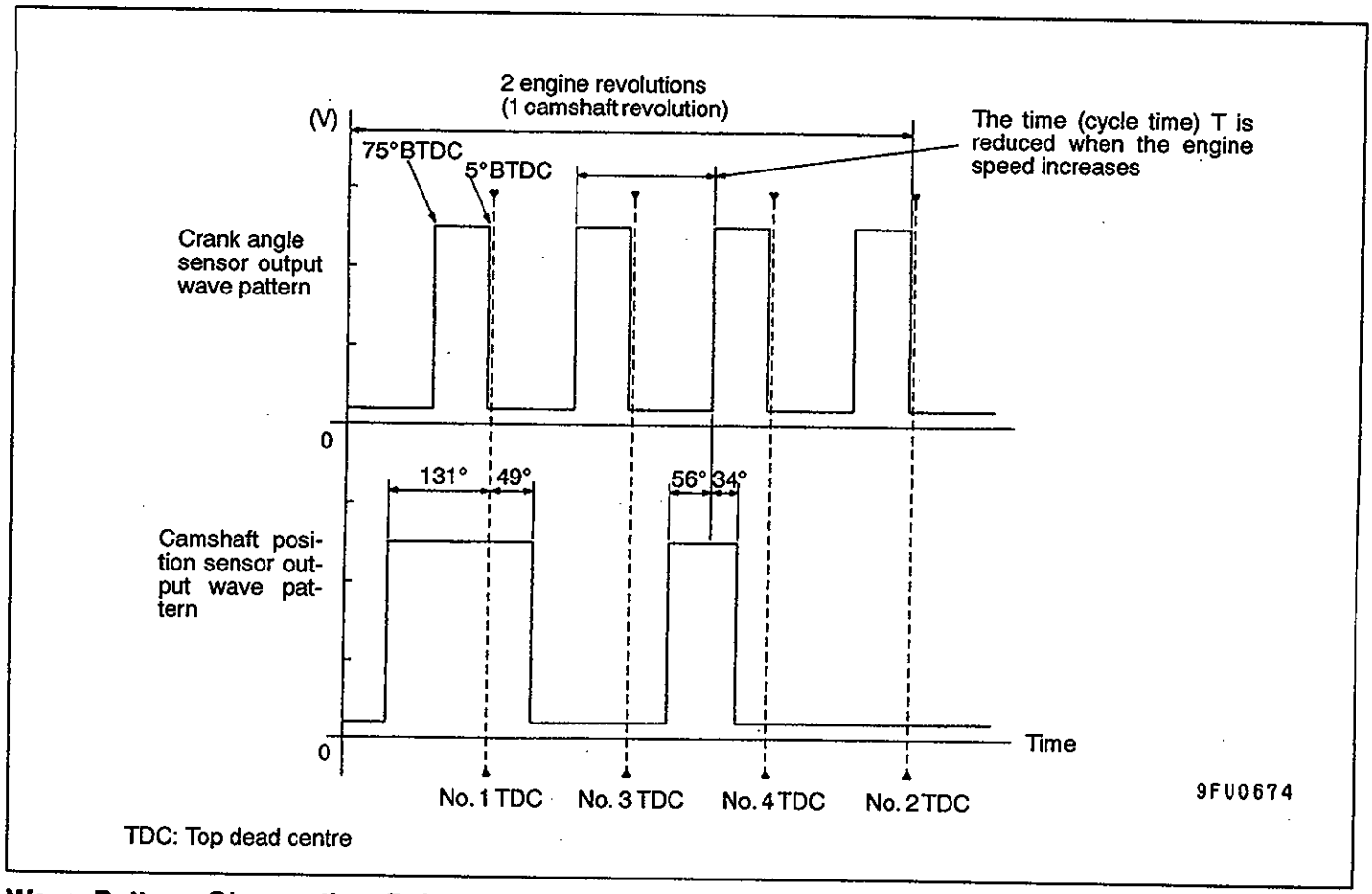
1. Connect the analyzer special patterns pickup to engine-ECU terminal 88. (When checking the camshaft position sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine-ECU terminal 89. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

Observation conditions

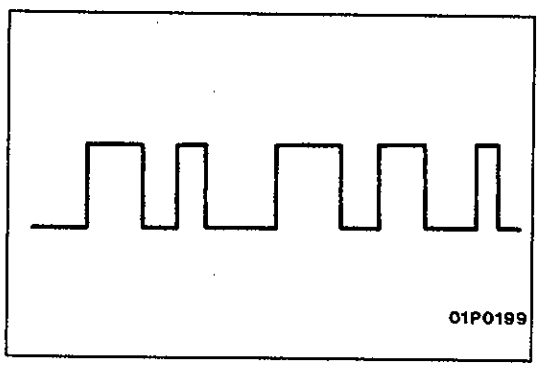
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min	Idle speed

Standard wave pattern



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

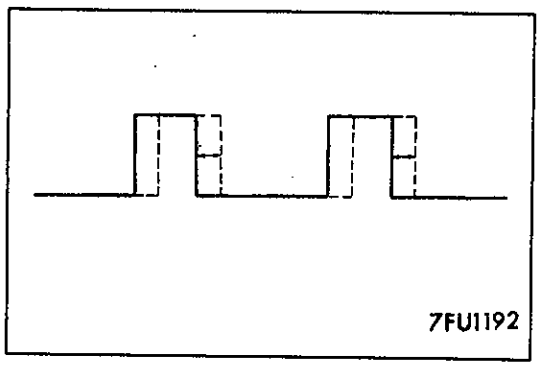
- Example 1

  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

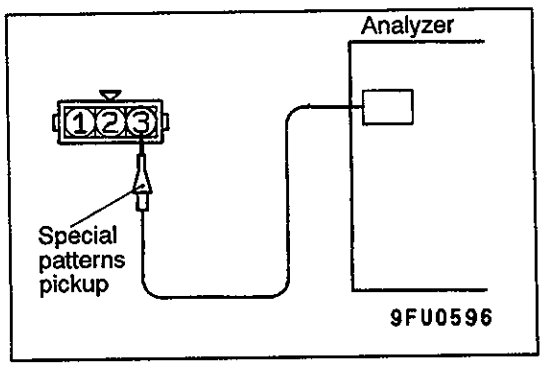
  Wave pattern is displaced to the left or right.

INJECTOR

Refer to P.13A-69.

STEPPER MOTOR

Refer to P.13A-71.



IGNITION COIL AND POWER TRANSISTOR

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)

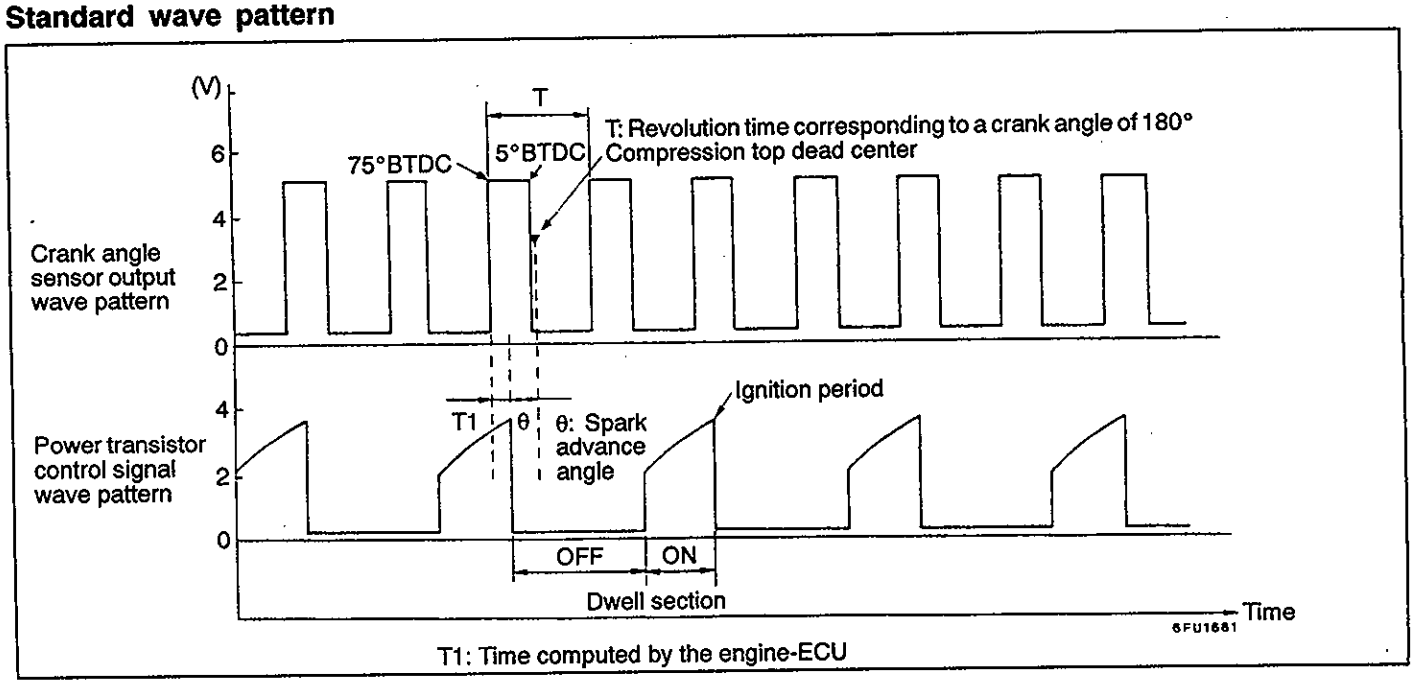
1. Connect the analyzer special patterns pickup to engine-ECU terminal 10 (No. 1 – No. 4), terminal 23 (No. 2 – No. 3) respectively.

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

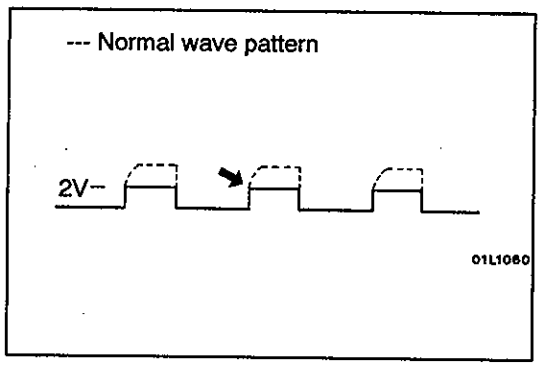


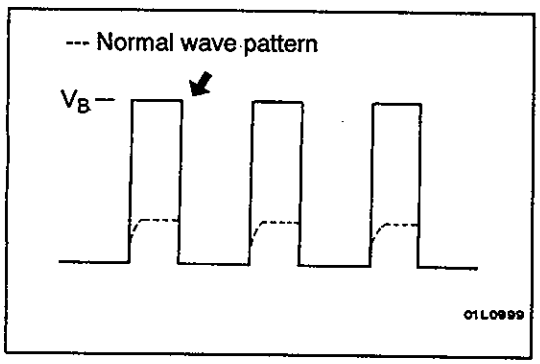
T1: Time computed by the engine-ECU

Wave Pattern Observation Points

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.

ON-VEHICLE SERVICE 13100100122

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

Refer to P.13A-75.

IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT 13100130114

Refer to P.13A-75.

FIXED SAS ADJUSTMENT 13100150127

Refer to P.13A-76.

BASIC IDLE SPEED ADJUSTMENT 13100180126

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.

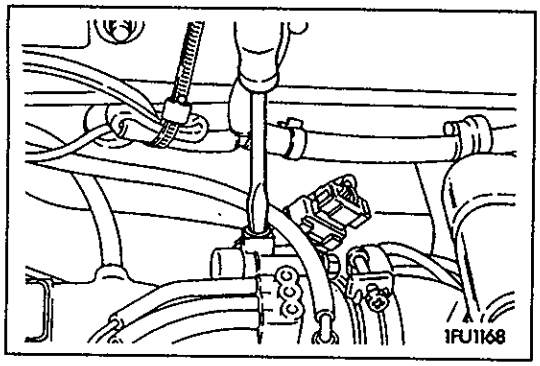
3. Start the engine and run at idle.
4. Select the item No.30 of the MUT-II ACTUATOR TEST.

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

5. Check the idle speed.

   Standard value:
   750 ± 50 r/min <except MVV>
   700 ± 50 r/min <MVV>

   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-75.)



6. 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.

7. Press the MUT-II clear key, and release the ISC servo from the ACTUATOR TEST mode.

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

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

FUEL PRESSURE TEST

13100190129

Refer to P.13A-78.

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

13100090153

Refer to P.13A-81.

FUEL PUMP OPERATION CHECK

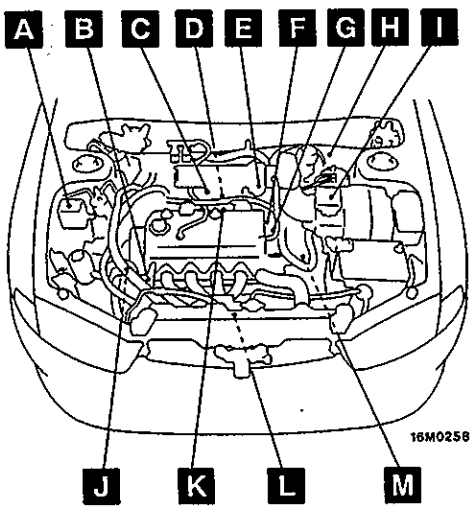
13100200112

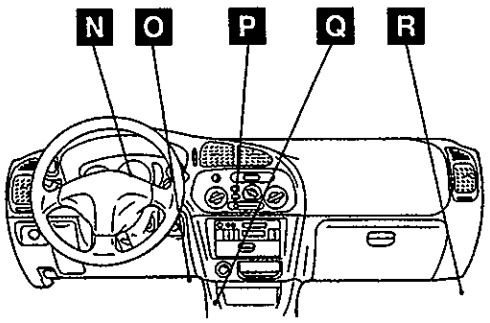
Refer to P.13A-81.

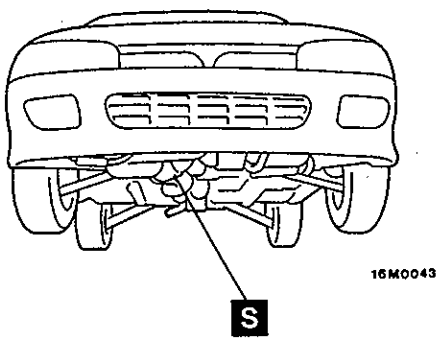
COMPONENT LOCATION

13100210160

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





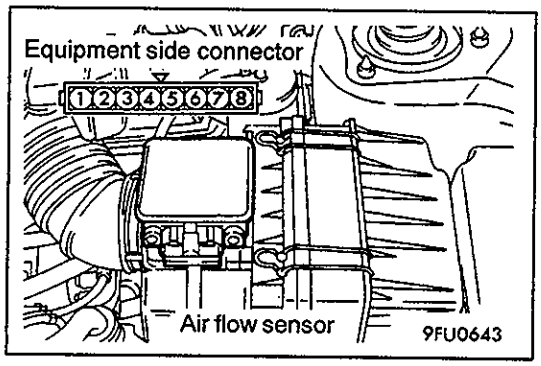


9FU0642

CONTROL RELAY AND FUEL PUMP RELAY CONTINUITY CHECK

13100990064

Refer to P.13A-83.



INTAKE AIR TEMPERATURE SENSOR CHECK

13100280116

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

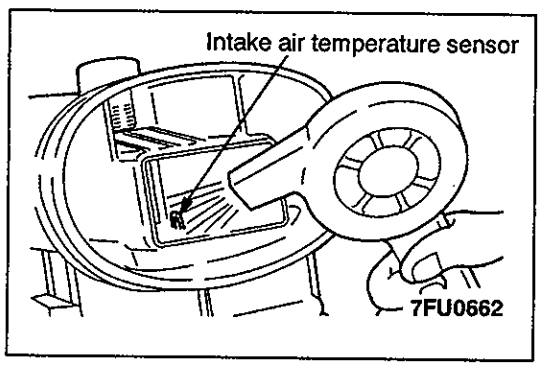
   Standard value:
   2.3–3.0 kΩ (at 20°C)
   0.30–0.42 kΩ (at 80°C)

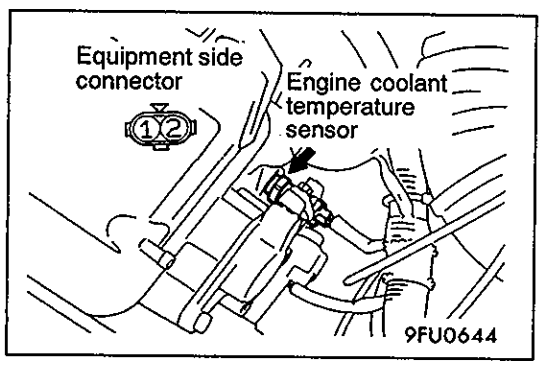
3. Measure resistance while heating the sensor using a hair drier.

   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

13100310112

Refer to P.13A-83.

THROTTLE POSITION SENSOR CHECK

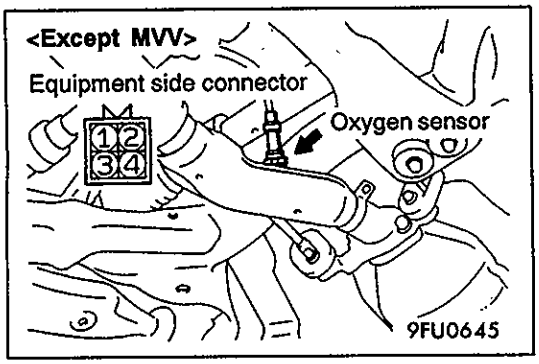
13100320115

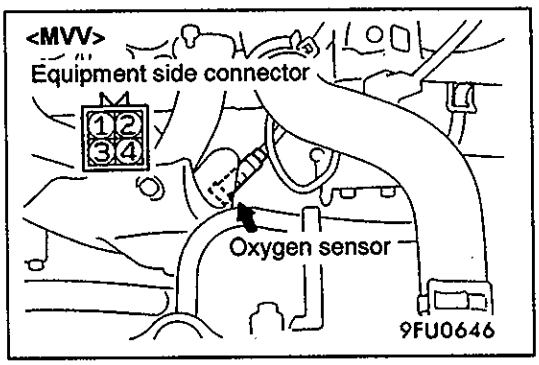
Refer to P.13A-84.

IDLE POSITION SWITCH CHECK

13100330125

Refer to P.13A-84.





OXYGEN SENSOR CHECK

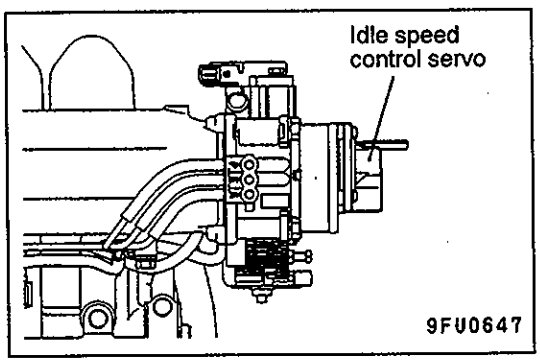
13100510055

Refer to P.13A-85. (Oxygen sensor <front>)

INJECTOR CHECK

13100520119

Refer to P.13A-86.



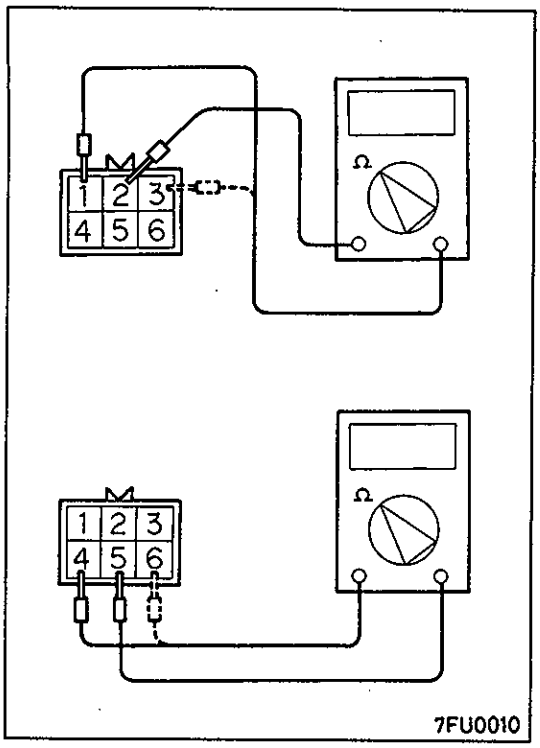
IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR) CHECK

13100540153

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

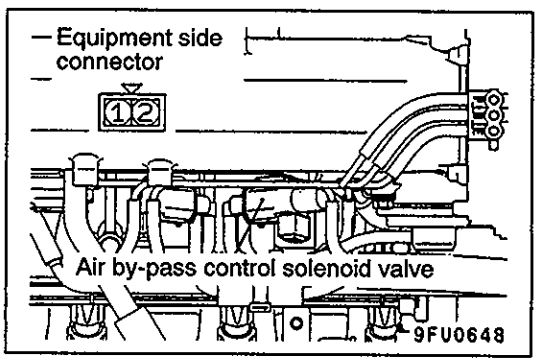
13100560128

Refer to GROUP 17 – Emission Control System.

EGR CONTROL SOLENOID VALVE CHECK

13100570114

Refer to GROUP 17 – Emission Control System.

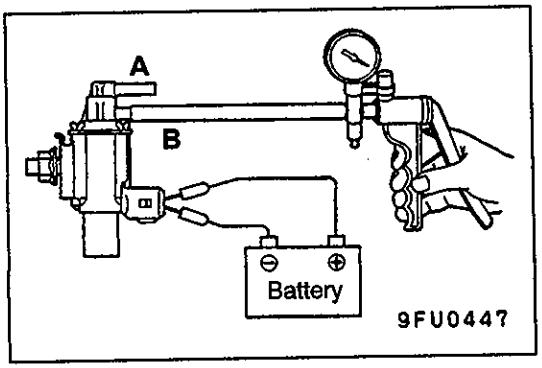


AIR BY-PASS CONTROL SOLENOID VALVE CHECK <MVV>

13101080012

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

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



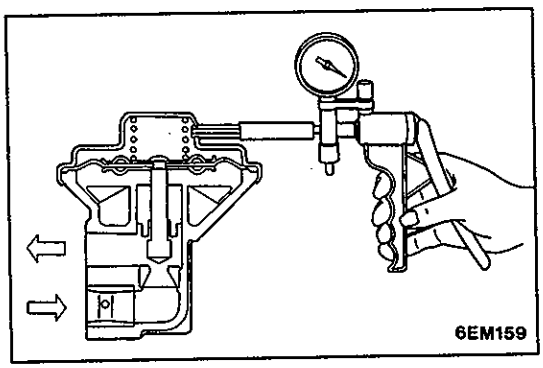
3. Connect a hand vacuum pump to nipple B of the solenoid valve.
4. Use jumper wires to connect the terminals of the solenoid valve and the battery.
5. Check the air-tightness when negative pressure is applied while the jumper wire is connected to the battery (–) terminal and while it is disconnected.

Normal condition:

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

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

Standard value: 36–44 Ω (at 20°C)



AIR BY-PASS VALVE CHECK <MVV> 13101090015

1. Remove the air by-pass valve.
2. Connect a hand vacuum pump to the air by-pass 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 air by-pass valve.

Normal condition:

Vacuum	Passage of air
2.0 kPa or less	Air is not blown out
11 kPa or more	Air is blown out

5. Replace the gasket, and tighten to the specified torque.

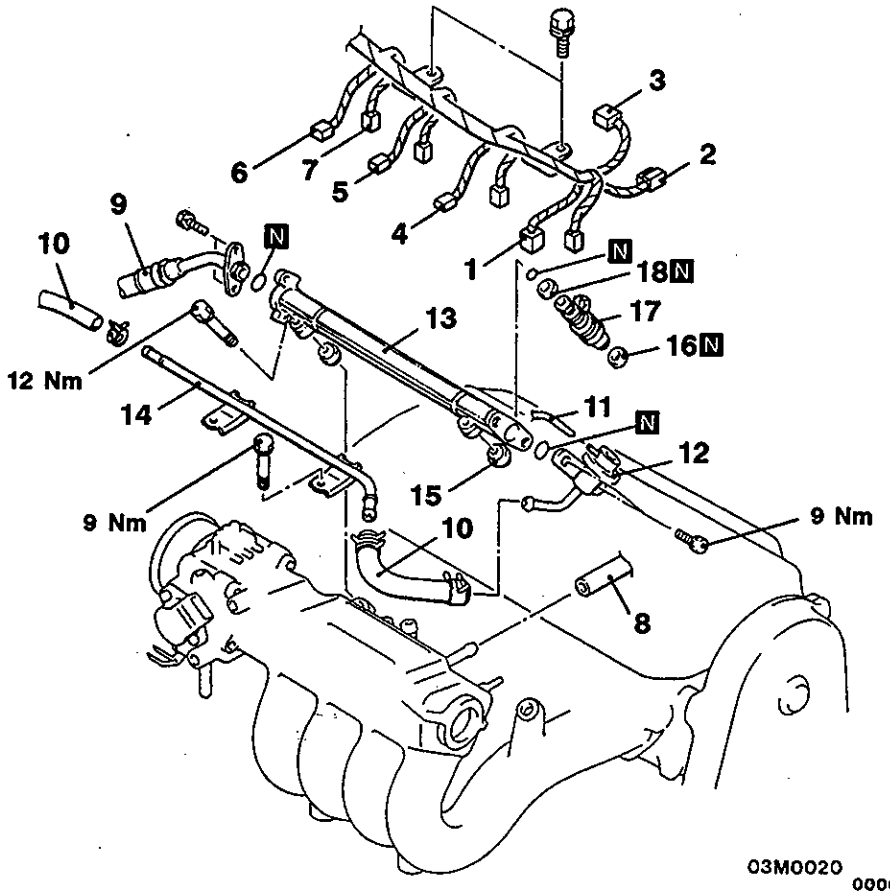
Tightening torque: 22 Nm

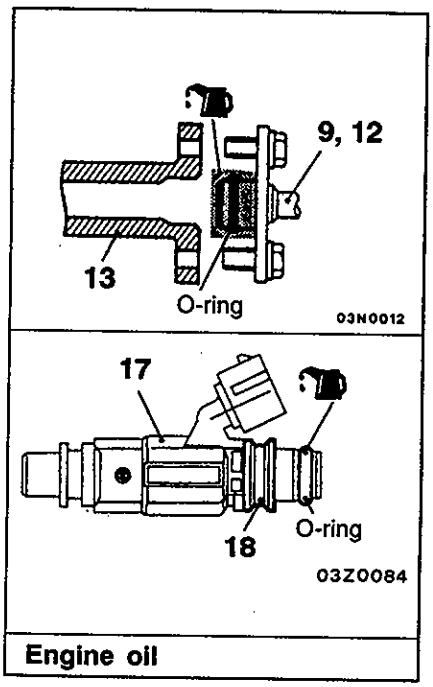
INJECTOR

13100710158

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-172.)





Removal steps

1. Oxygen sensor connector <except MVV>
2. Crank angle sensor connector
3. Ignition coil connector
4. Purge control solenoid valve connector
5. EGR solenoid valve connector
6. Air by-pass solenoid valve connector <MVV>
7. Injector connector
8. PCV hose

▶A◀ 9. High-pressure fuel hose connection
10. Fuel return hose connection
11. Vacuum hose connection
▶A◀ 12. Fuel pressure regulator
◀A▶ 13. Delivery pipe
14. Fuel return pipe
15. Insulators
16. Insulators
◀A▶ ▶A◀ 17. Injectors
18. Grommets

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/ HIGH-PRESSURE FUEL 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, high-pressure fuel 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 high-pressure fuel hose to the standard torque, and tighten the fuel pressure regulator to the specified torque.

Tightening torque:
9 Nm (Fuel pressure regulator)

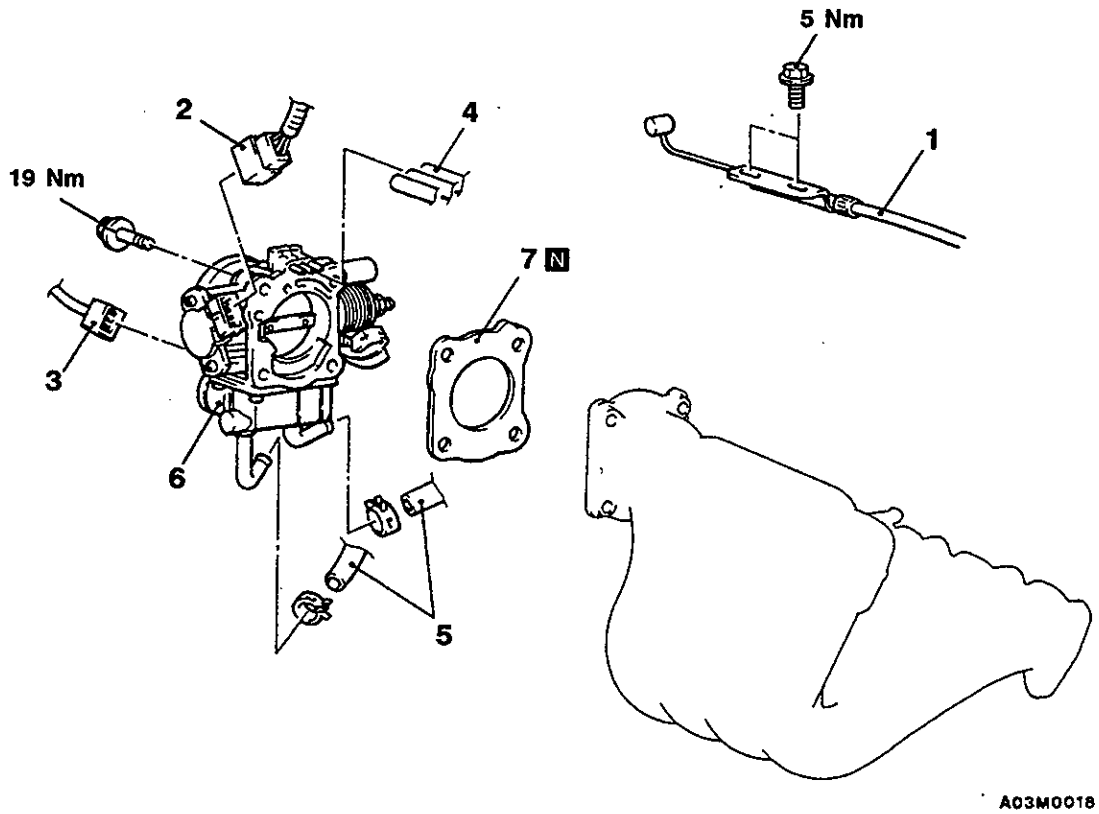
THROTTLE BODY

13100770132

REMOVAL AND INSTALLATION

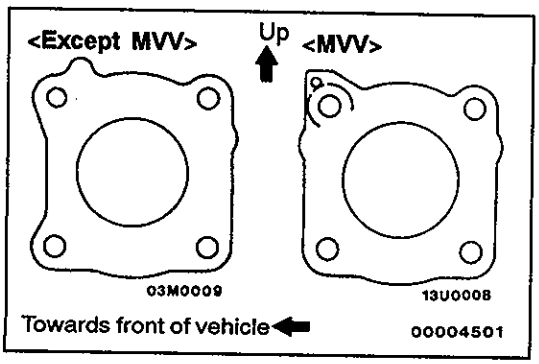
Pre-removal Operation
- Engine Coolant Draining (Refer to GROUP 14 – On-vehicle Service.)
- Air Cleaner Removal

Post-installation Operation
- Air Cleaner Installation
- Engine Coolant Supplying (Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)



Removal steps

1. Accelerator cable connection
2. Throttle position sensor connector
3. Idle speed control servo connector
4. Vacuum hose connection
5. Water hose connection
6. Throttle body
▶A◀ 7. Throttle body gasket



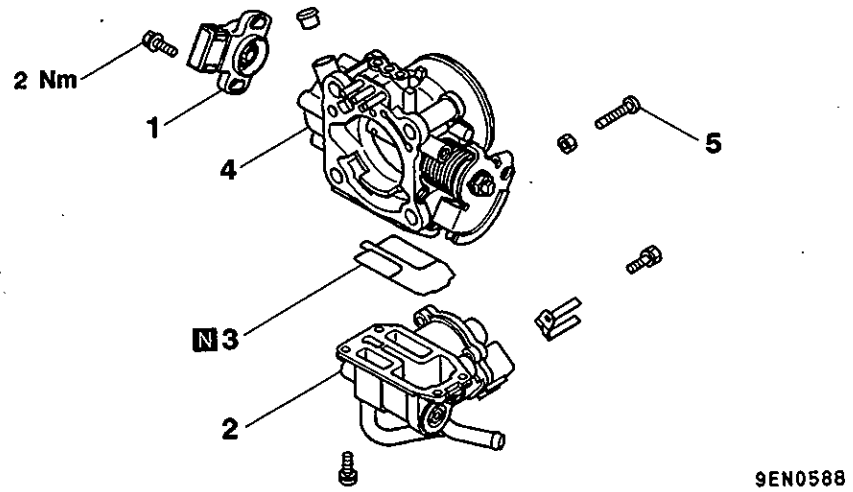
INSTALLATION SERVICE POINT

▶A◀ THROTTLE BODY GASKET INSTALLATION

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

DISASSEMBLY AND REASSEMBLY

13100970112



Disassembly steps

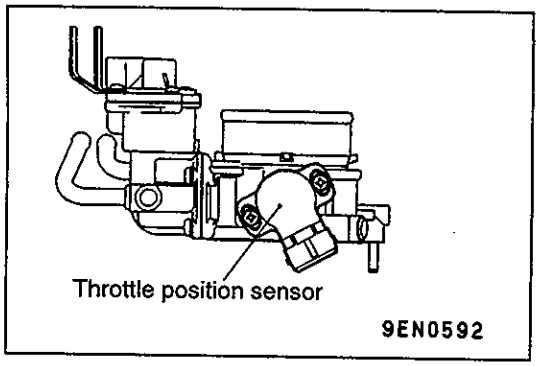
▶A◀ 1. Throttle position sensor
2. Idle speed control body assembly
3. O-ring
4. Throttle body
5. Fixed SAS

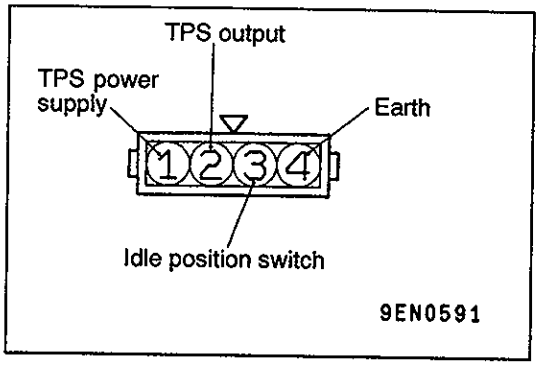
NOTE
1. The fixed SAS is correctly adjusted at the factory and should not be removed.
2. If the fixed SAS should happen to have been removed, carry out fixed SAS adjustment. (Refer to page 13A-76.)

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 POINT

▶A◀ 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. 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

13509000098

GENERAL INFORMATION

13500010038

(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.

SEALANT

13500050023

Item	Specified sealant
Plug and floor pan	3M 8513 Grommeted windshield sealer (Black)

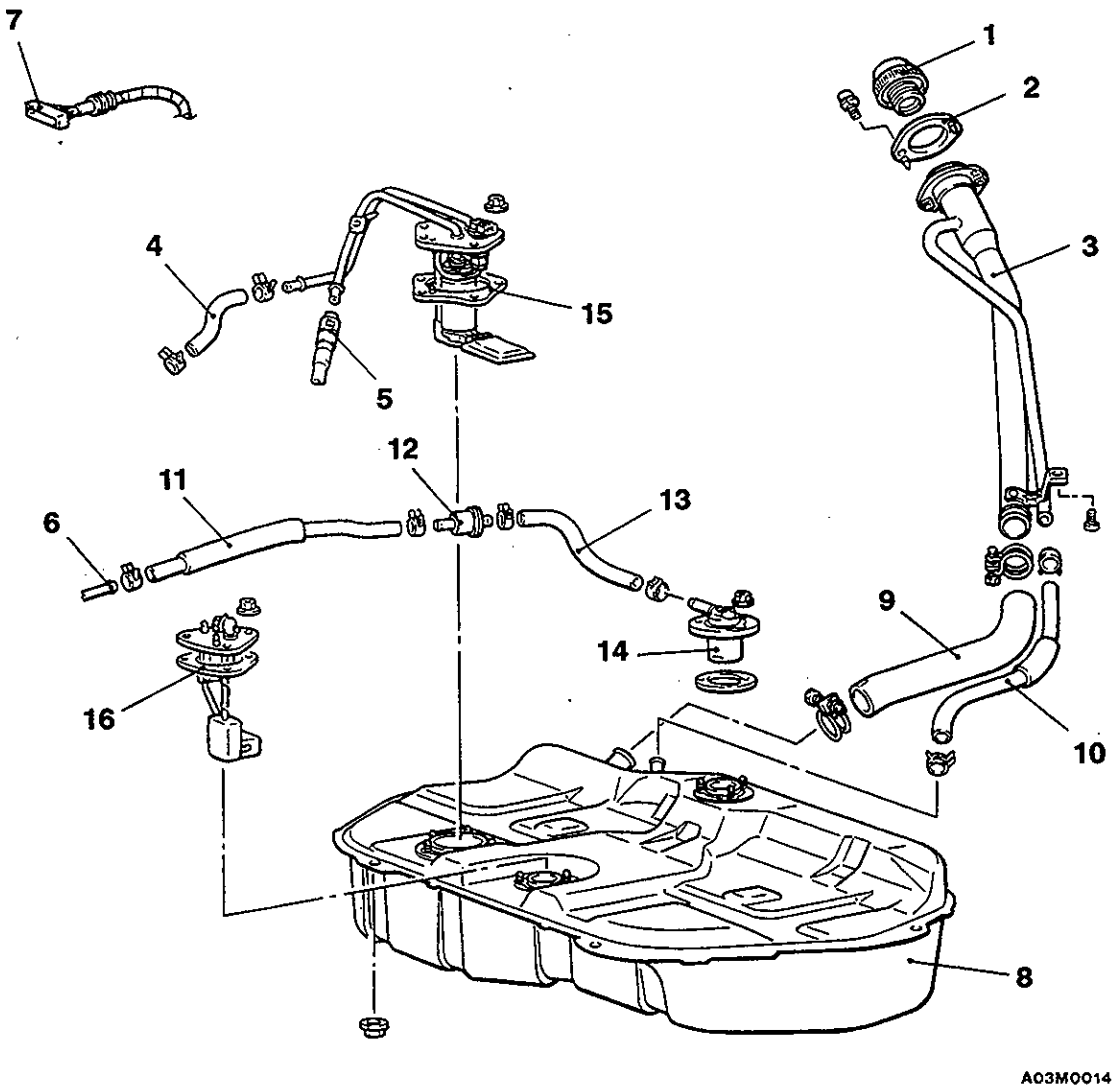
FUEL TANK

13500190121

REMOVAL AND INSTALLATION

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

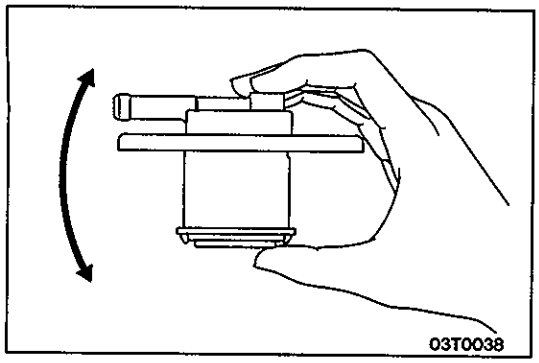
Post-installation Operation
(1) Refilling Fuel.
(2) Checking for Fuel Leaks



A03M0014

Removal steps

1. Fuel filler cap
2. Packing
3. Fuel filler neck assembly
4. Return hose
5. High-pressure fuel hose
6. Hose connection
   ● Rear seat cushion (Refer to GROUP 52A – Rear Seat).
7. Harness connector
8. Fuel tank
9. Filler hose
10. Leveling hose
11. Vapour hose
12. Tow-way valve(Refer to GROUP17 – Canister And Two-way Valve.)
13. Vapour hose
14. Fuel cut-off valve
15. Fuel pump
16. Fuel gauge unit assembly



INSPECTION

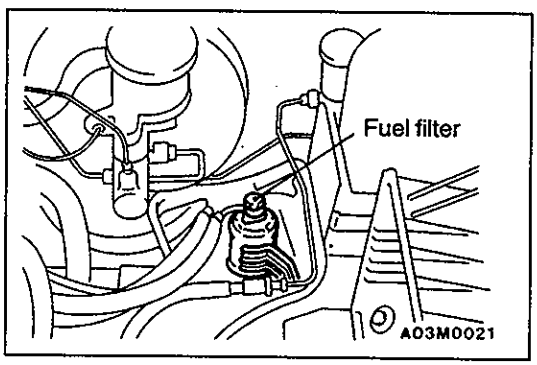
13500300067

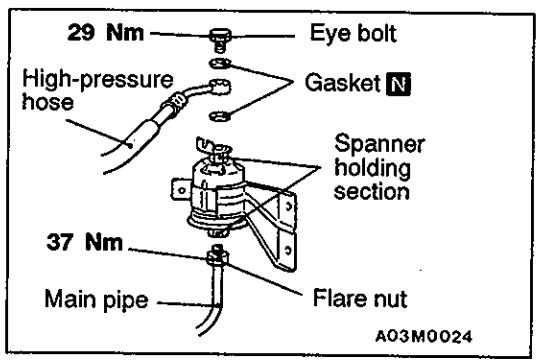
FUEL CUT-OFF VALVE CHECK

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

FUEL GAUGE UNIT CHECK

Refer to GROUP 54 – Combination Meter.





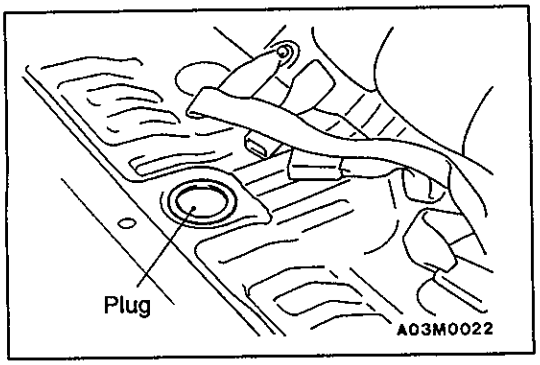
FUEL FILTER REPLACEMENT

13500130055

1. Bleed the residual pressure from inside the fuel line. (Refer to GROUP 13A – On-vehicle Service.)
2. Remove the air intake hose and canister.
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.

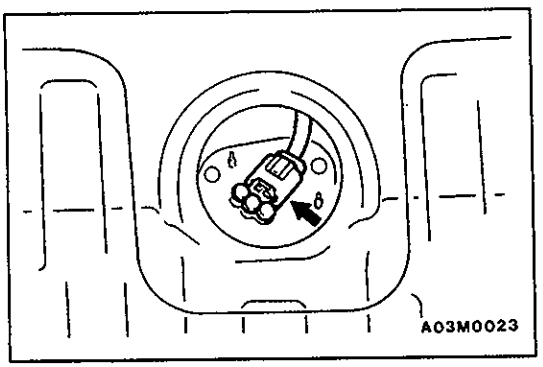
4. Hold the fuel filter with a spanner and loosen the flare nut. Then disconnect the main pipe connection.
5. Remove the fuel filter.
6. When installing the fuel filter, use a new gasket, and tighten the flare nut of the high-pressure hose and the main pipe to the specified torque.
7. After installation, 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.



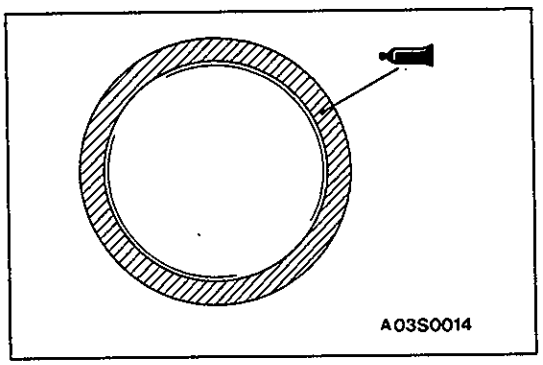
FUEL GAUGE UNIT REPLACEMENT

13500160092

1. Remove the rear seat cushion.
   (Refer to GROUP 52A – Rear Seat.)
2. Remove the plug.



3. Disconnect the fuel gauge unit connector and remove the fuel gauge unit.



4. Apply the specified sealant to the contact surfaces of the plug and the floor pan, and install the plug.

   Specified sealant:
   3M 8513 Grommeted Windshield Sealer (Black)
5. Install the rear seat cushion
   (Refer to GROUP 52A – Rear Seat).

NOTES

ENGINE COOLING

CONTENTS

14109000109

GENERAL INFORMATION

14100010095

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	4G1	M/T	132,700
			A/T	172,000
		4G9	M/T	164,900
			A/T	172,000
Automatic transmission oil cooler	Performance kJ/h			5,651

SERVICE SPECIFICATIONS

14100030091

Items		Standard value	Limit
High pressure valve opening pressure of radiator cap kPa		74–103	64
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	8.5 or more	–

LUBRICANT

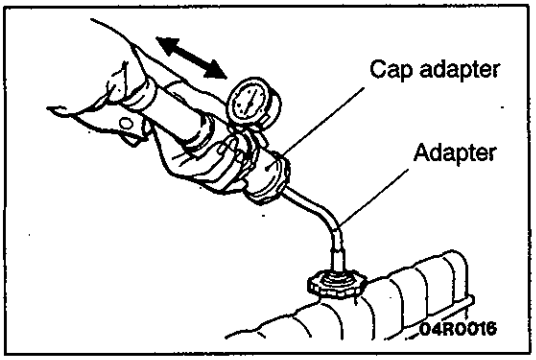
14100040087

Items		Quantity ℓ
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	4G1	5
	4G9	6

SEALANTS

14100050097

Items	Specified sealant	Remarks
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent	Drying sealant
Water pump, Thermostat case <4G9>	Mitsubishi Genuine Parts No. MD970389 or equivalent	Semi-drying sealant



ON-VEHICLE SERVICE

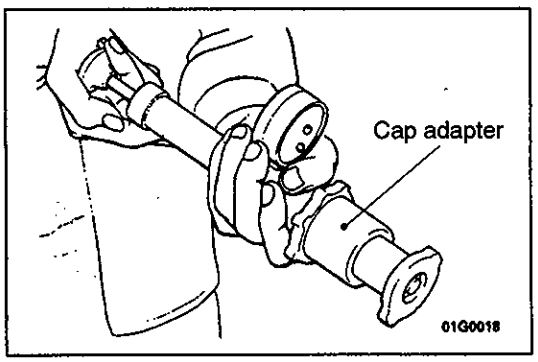
14100100082

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

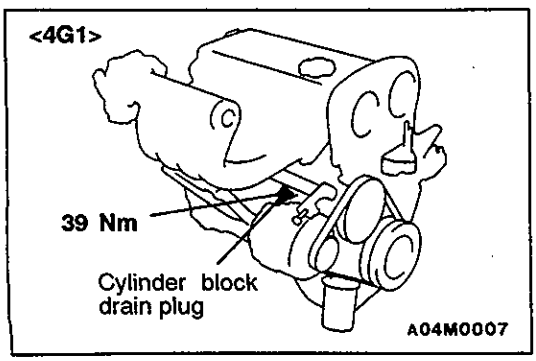
14100130098

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: 64 kPa
   Standard value: 74–103 kPa

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

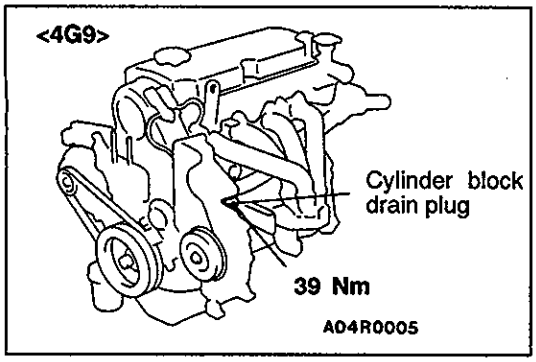
   NOTE
   Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.

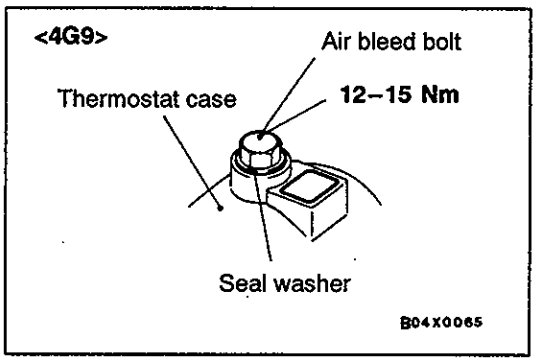


ENGINE COOLANT REPLACEMENT

14100120125

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.





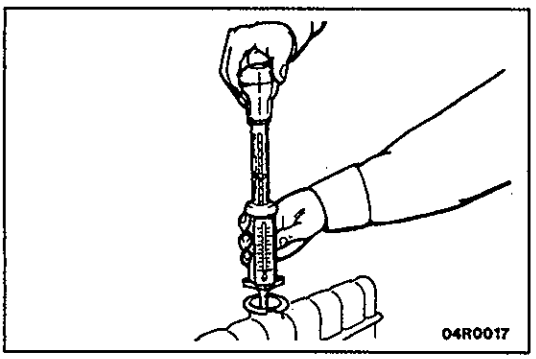
5. Coat the thread of the cylinder block drain plug with the specified sealant and tighten to the specified torque.

   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:
    <4G1> 5 ℓ
    <4G9> 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 14100110122

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

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

RECOMMENDED ANTIFREEZE

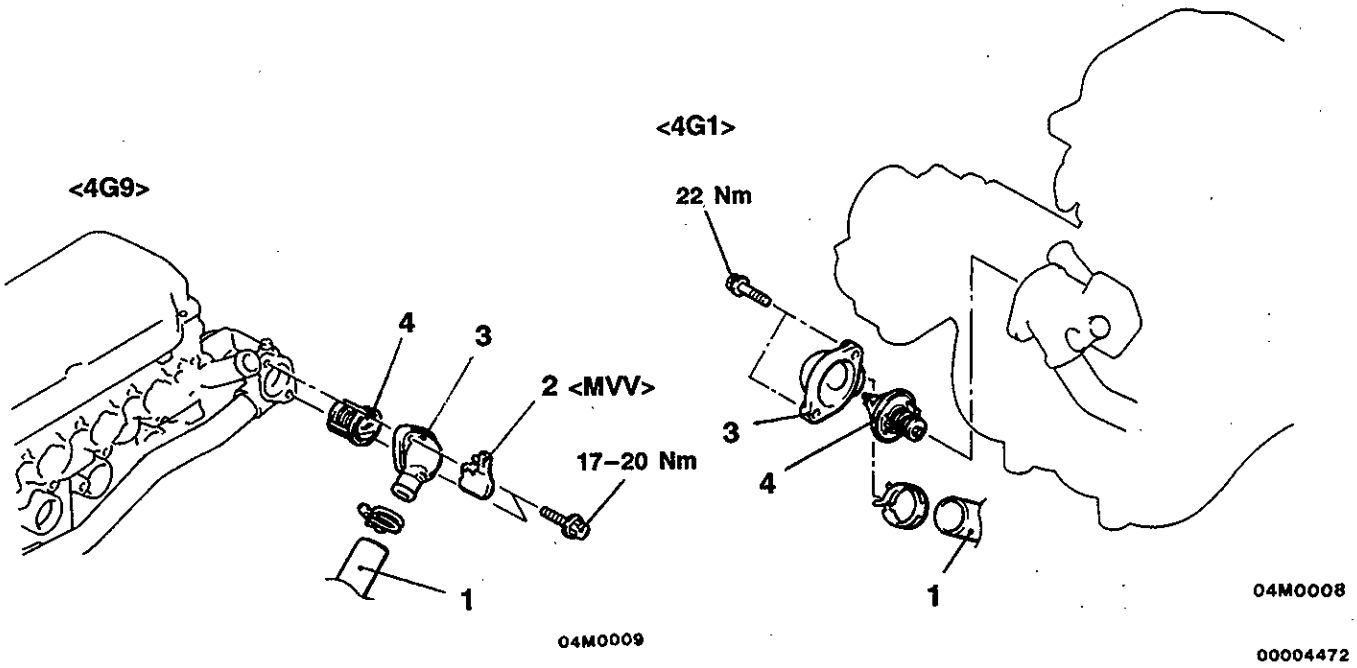
Antifreeze	Allowable concentration
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	30–60%

THERMOSTAT

14100240128

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-3.)
- Air Cleaner Removal and Installation <4G1>



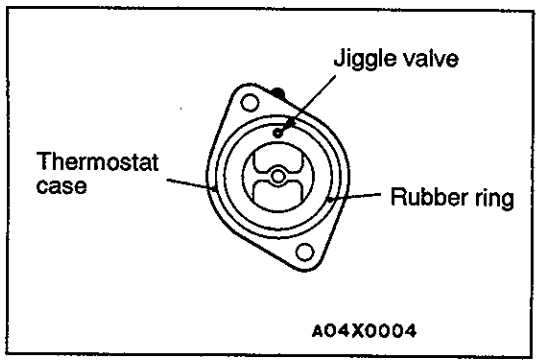
Removal steps

◀A▶ ▶B◀ 1. Radiator lower hose connection
2. Connector bracket <MVV>
3. Water inlet fitting
▶A◀ 4. Thermostat

REMOVAL SERVICE POINT

◀A▶ RADIATOR LOWER HOSE DISCONNECTION

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



INSTALLATION SERVICE POINTS

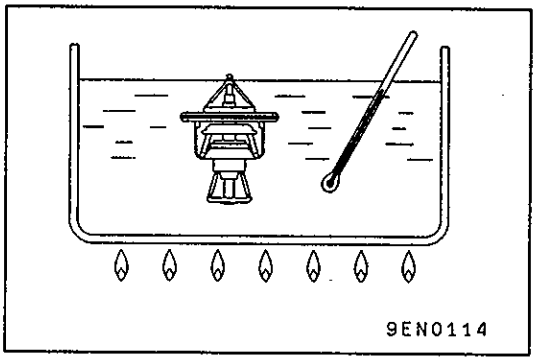
▶A◀ THERMOSTAT INSTALLATION

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

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

▶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

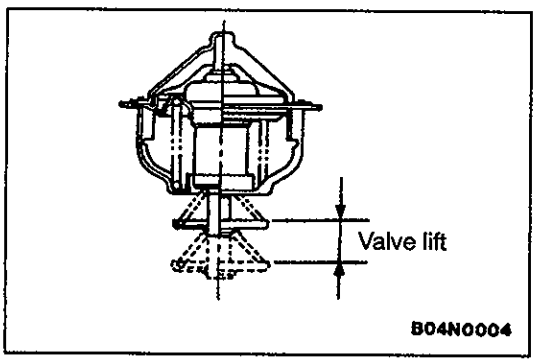
14100250138

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	8.5 or more

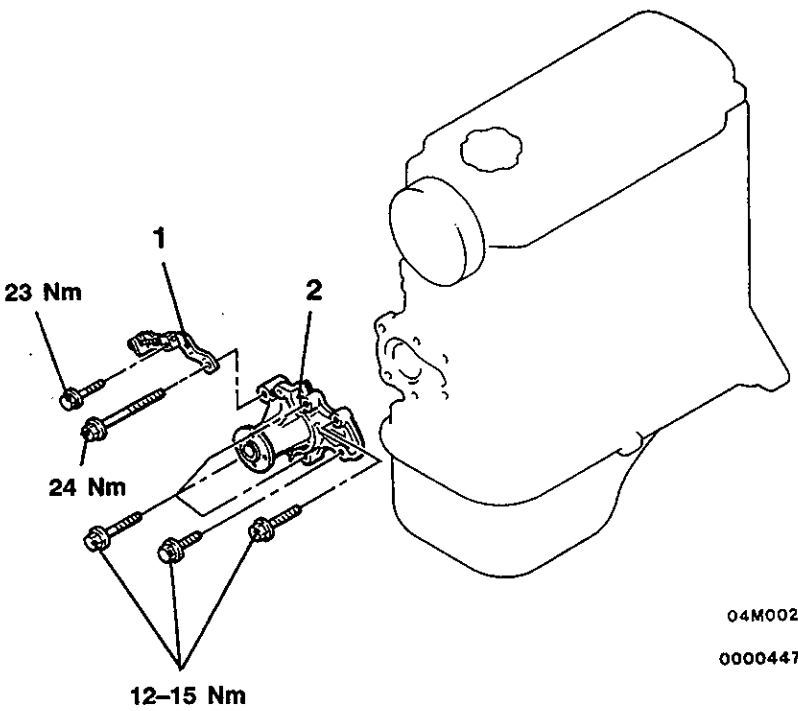
NOTE
Measure the valve height when the thermostat is fully closed, and use this measurement to calculate the valve height when the thermostat is fully open.

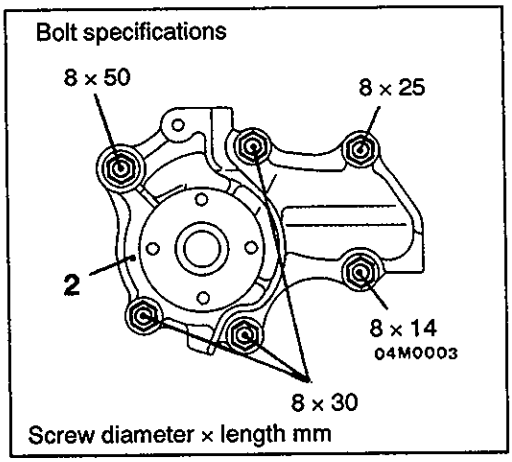
WATER PUMP <4G1>

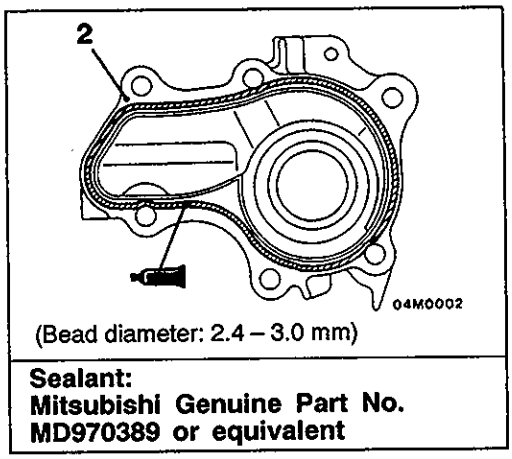
14100270219

REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operation
- Engine Coolant Draining and Supplying (Refer to P.4-3.)
- Timing Belt Removal and Installation (Refer to GROUP 11A.)







Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

Removal steps
1. Alternator brase
▶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.

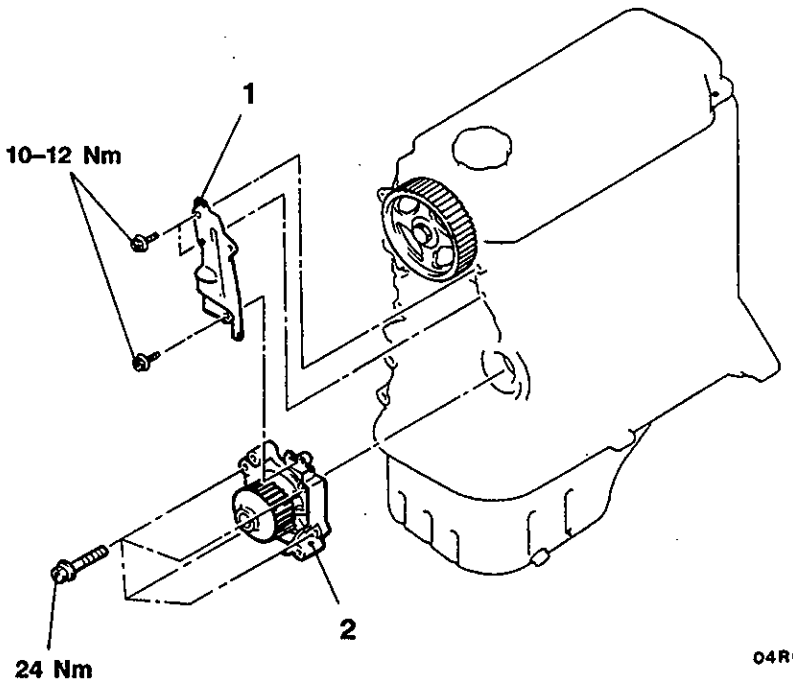
Specified Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

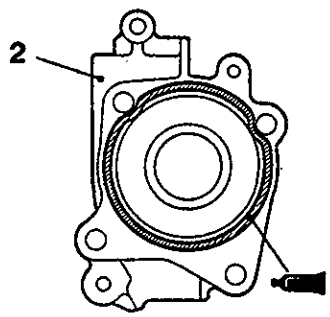
WATER PUMP <4G9>

14100270226

REMOVAL AND INSTALLATION

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





(Bead diameter: 2.4 – 3.0 mm)

Sealant:
Mitsubishi Genuine Part 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.

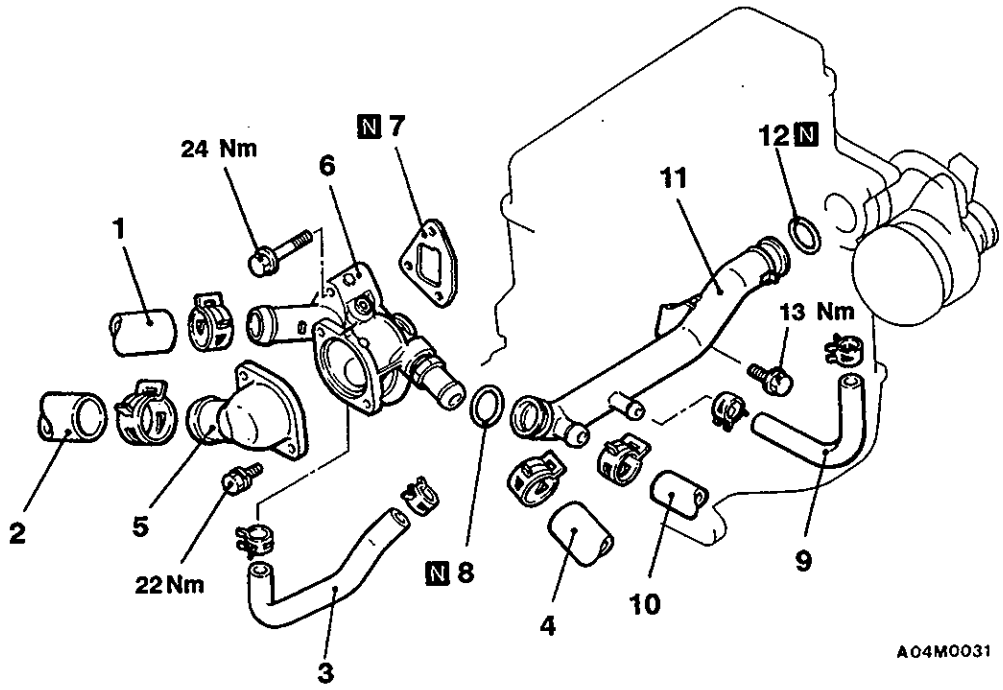
Specified Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

WATER HOSE AND WATER PIPE <4G1>

14100330160

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Suppling (Refer to P.14-3.)
- Air Cleaner Removal and Installation



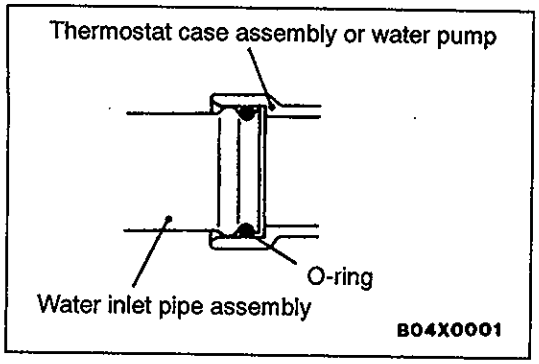
Removal steps

◀A▶ ▶B◀ 1. Radiator upper hose connection
◀A▶ ▶B◀ 2. Radiator lower hose connection
3. Water hose
4. Heater hose connection
5. Water inlet fitting
6. Thermostat case assembly
7. Gasket
▶A◀ 8. O-ring
9. Water hose
10. Heater hose connection
11. Water inlet pipe assembly
▶A◀ 12. O-ring

REMOVAL SERVICE POINT

◀A▶ RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

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



INSTALLATION SERVICE POINTS

▶A◀ O-RING INSTALLATION

Insert the O-ring to the water inlet pipe 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◀ RADIATOR UPPER HOSE/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

14100340101

WATER PIPE AND HOSE CHECK

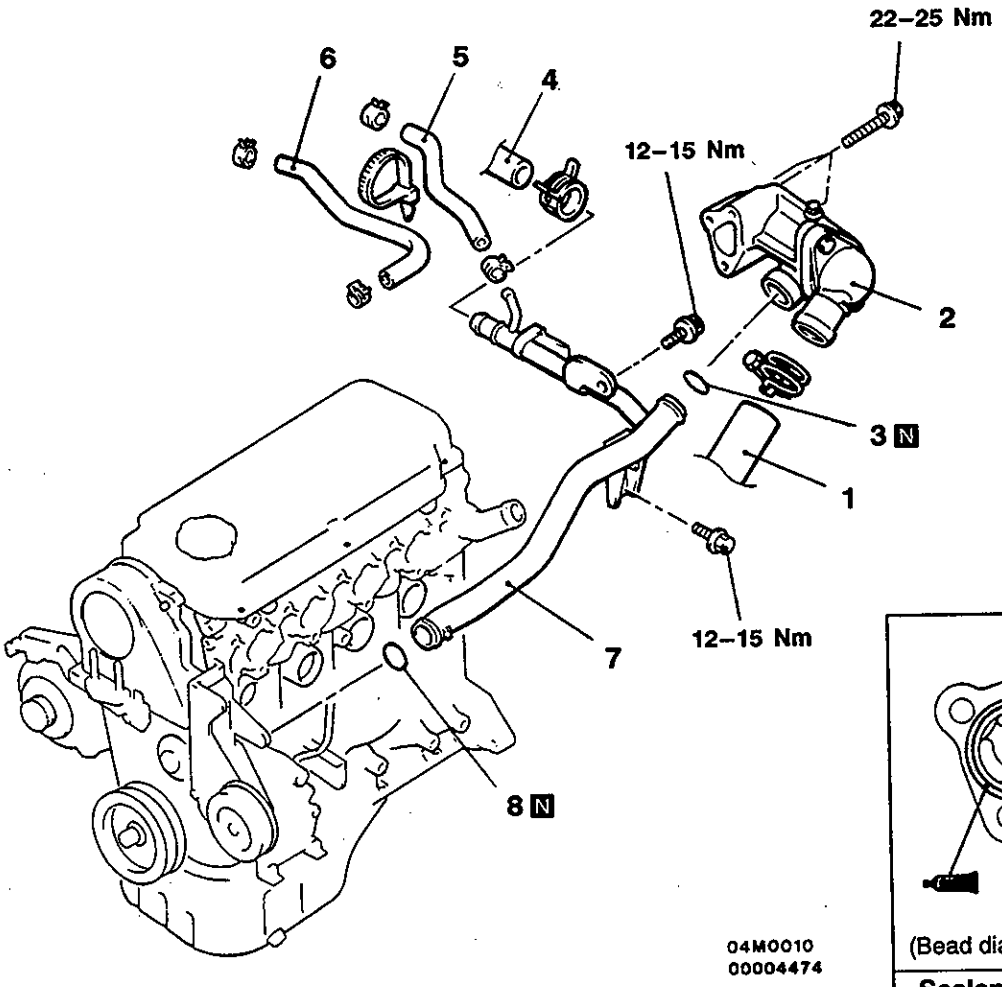
Check the water pipe and hose for cracks, damage, clog and replace them if necessary.

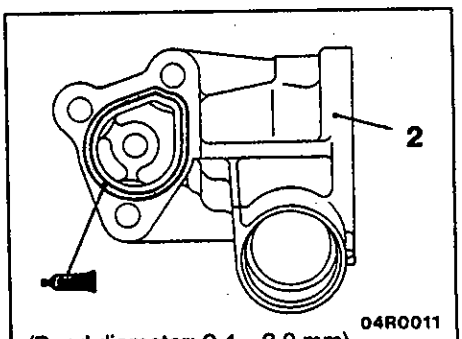
WATER HOSE AND WATER PIPE <4G9>

14100330177

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-3.)
- Air Cleaner Removal and Installation
- Distributor Removal and Installation (Refer to GROUP 16.)





(Bead diameter: 2.4 – 3.0 mm)

Sealant:
Mitsubishi Genuine Part No. MD970389 or equivalent

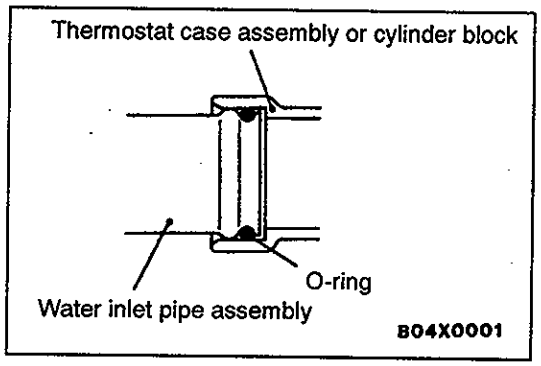
Removal steps

◀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

14100340118

WATER PIPE AND HOSE CHECK

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

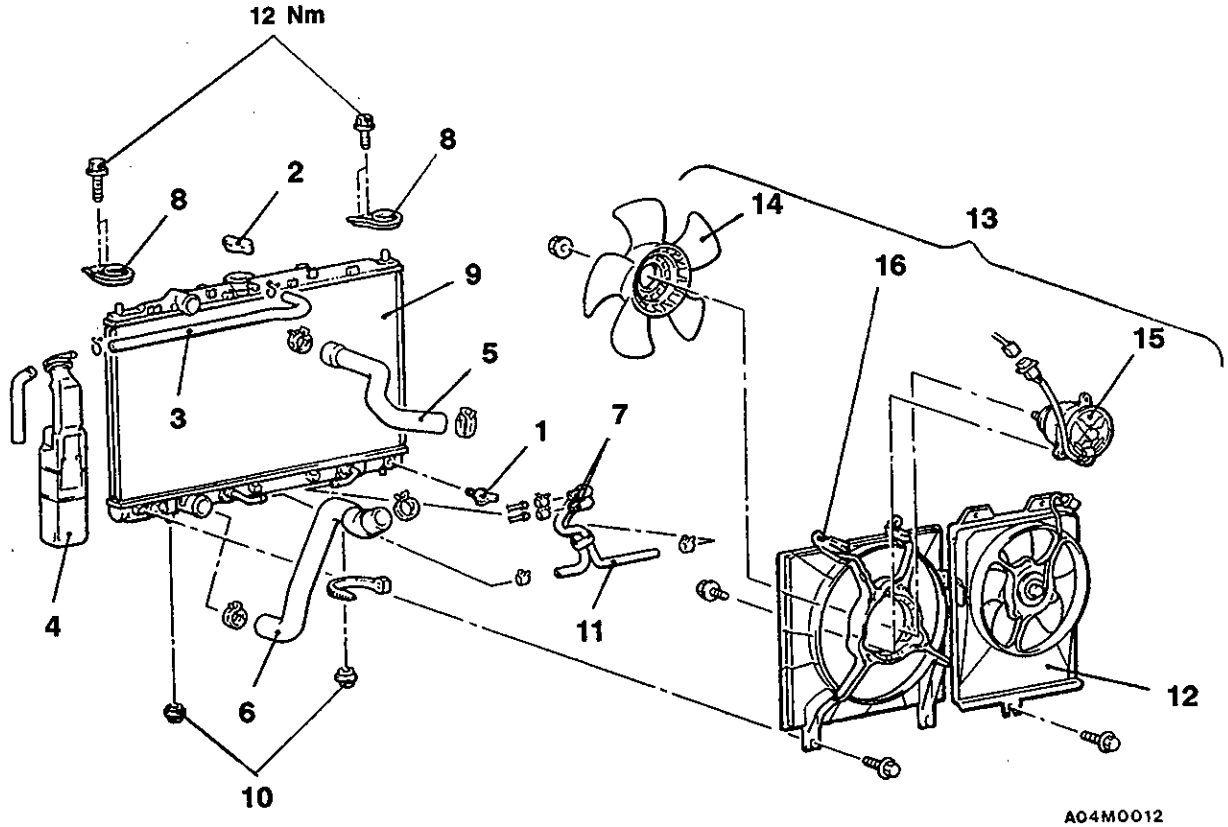
RADIATOR

14100150124

REMOVAL AND INSTALLATION

Pre-removal operation
- Engine Coolant Draining (Refer to P.14-3.)
- Air Cleaner Removal <4G1>

Post-installation Operation
- Engine Coolant Supplying (Refer to P.14-3.)
- A/T Fluid Supplying and Checking (Refer to GROUP 23 – On-vehicle Service.)
- Air Cleaner Installation <4G1>



Radiator removal steps
1. Drain plug
2. Radiator cap
3. Overflow hose
4. Reserve tank
5. Radiator upper hose
6. Radiator lower hose
7. Transmission fluid cooler hose connection
8. Upper insulator
9. Radiator assembly
10. Lower insulator
11. Transmission fluid cooler hose assembly
12. Condenser fan motor assembly <Vehicle with A/C>
13. Radiator fan motor assembly

Radiator fan motor removal steps
1. Drain plug
2. Radiator cap
3. Overflow hose
5. Radiator upper hose
12. Condenser fan motor assembly <Vehicles with A/C>
14. Fan
15. Radiator fan motor
16. Shroud

REMOVAL SERVICE POINTS

◀A▶ RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

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

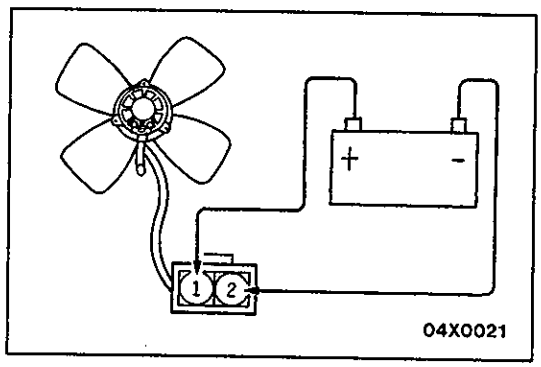
◀B▶ TRANSMISSION FLUID COOLER HOSE REMOVAL

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

INSTALLATION SERVICE POINT

▶A◀ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION

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

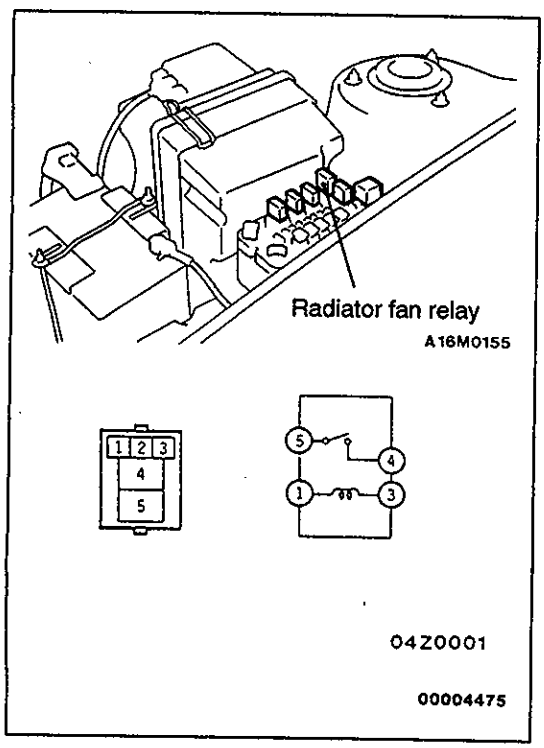


INSPECTION

14100190096

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

14100440092

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

INTAKE AND EXHAUST

CONTENTS

15109000106

GENERAL INFORMATION

15100010078

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

For 4G92 engine, the exhaust manifold is made of a stainless steel. The exhaust pipe is divided into four parts for MVV and three parts for the other models, respectively.

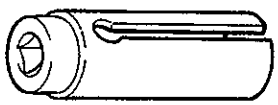
SERVICE SPECIFICATION

15100030081

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

SPECIAL TOOL

15100060073

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

ON-VEHICLE SERVICE

15100180106

INTAKE MANIFOLD VACUUM CHECK

Refer to GROUP 11A, B – On-vehicle Service.

INTAKE MANIFOLD

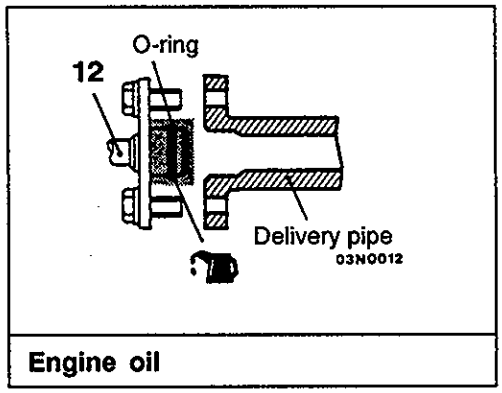
15100300199

REMOVAL AND INSTALLATION

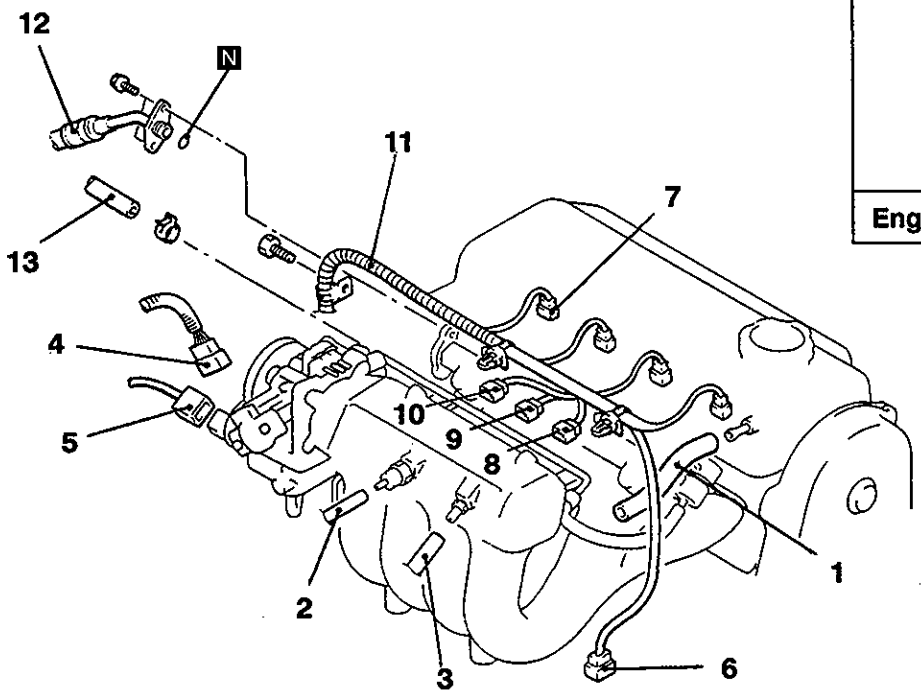
<4G1>

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

Post-Installation Operation
- Engine Coolant Supplying (Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)
- Thermostat Case Assembly Installation (Refer to GROUP 14)
- Throttle Body Installation (Refer to GROUP 13A)
- Air Cleaner Installation



Engine oil



05M0033

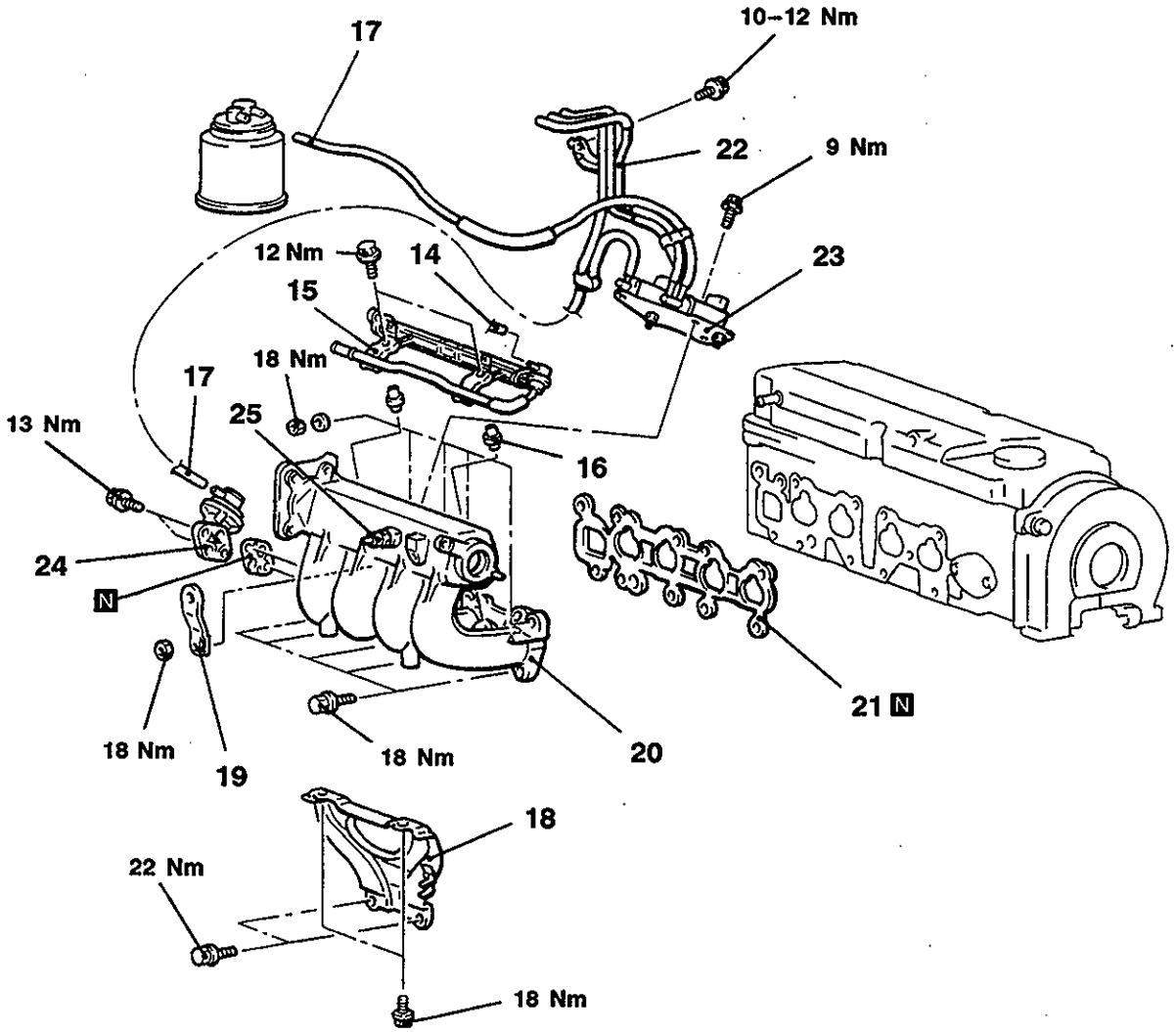
00004476

Removal steps

1. PCV hose
2. Vacuum hose connection
3. Brake booster vacuum hose
4. TPS connector
5. ISC connector
6. Oxygen sensor connector
7. Injector connector
8. Intake air temperature sensor connector
9. Purge control solenoid valve connector
10. EGR solenoid valve connector
11. Control wiring harness

▶A◀ 12. High-pressure fuel hose connection

13. Fuel return hose connection



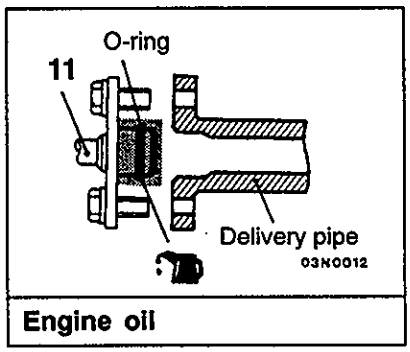
14. Vacuum hose connection
15. Delivery pipe, injector and pressure regulator assembly
16. Insulator
17. Vacuum hose connection
18. Intake manifold stay
19. Engine hanger
20. Intake manifold
21. Intake manifold gasket
22. Vacuum pipe and hose assembly
23. Solenoid valve assembly
24. EGR value
25. Gas filter

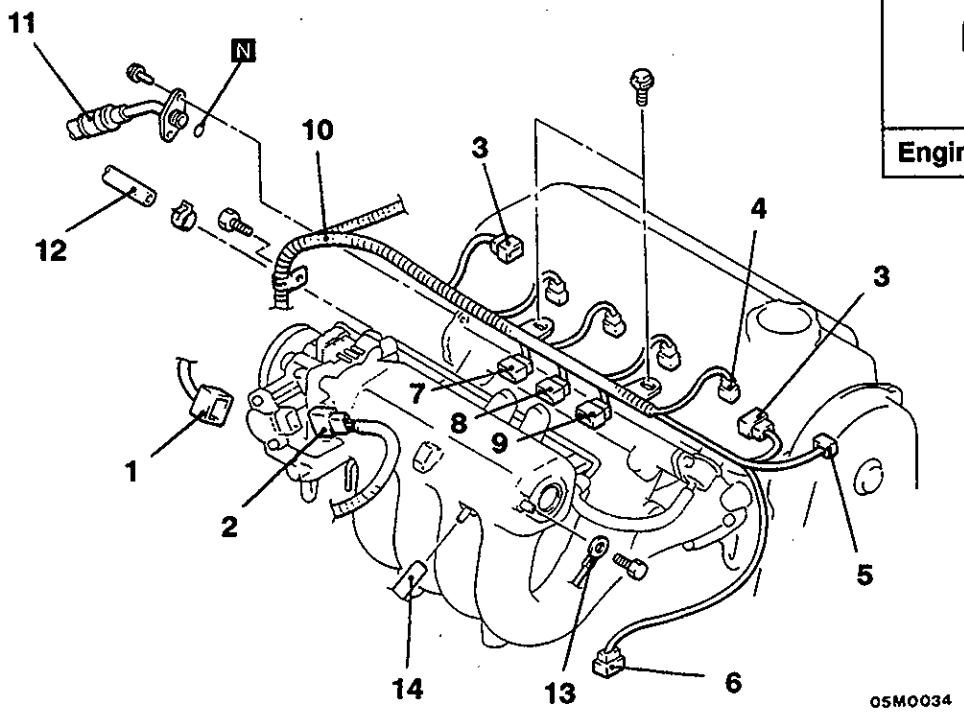
◀A▶

<4G9>

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

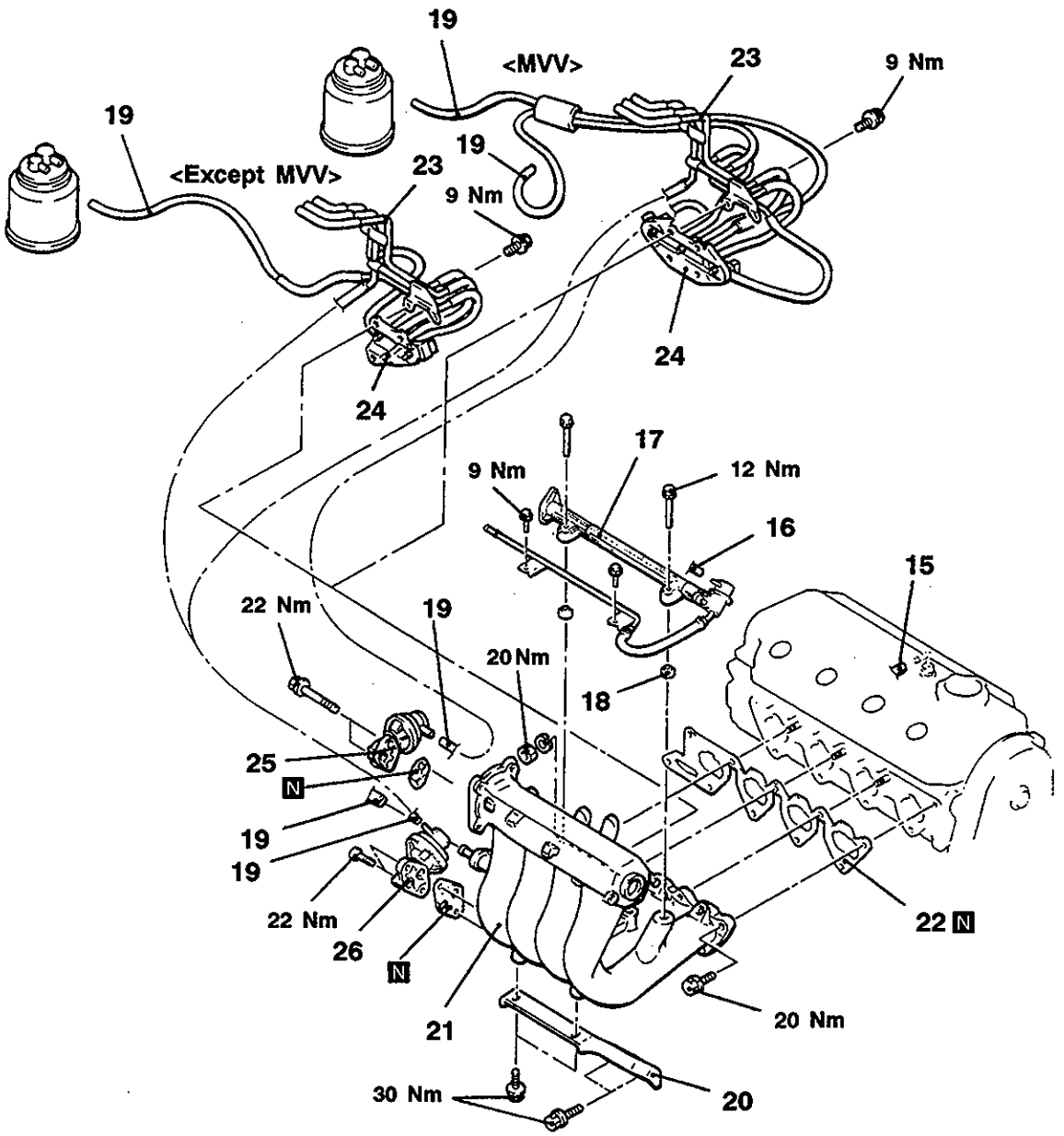
Post-Installation Operation
- Engine Coolant Supplying (Refer to GROUP 14 – On-vehicle Service.)
- Accelerator Cable Adjustment (Refer to GROUP 17 – On-vehicle Service.)
- Throttle Body Installation (Refer to GROUP 13A)
- Air Cleaner Installation





00004477

Removal steps
1. ISC connector
2. TPS connector
3. Ignition coil connector
4. Injector connector
5. Crank angle sensor connector
6. Oxygen sensor <except MVV>
7. Air bypass solenoid valve connector <MVV>
8. Purge control solenoid valve connector
9. EGR solenoid valve connector
10. Control wiring harness
▶A◀ 11. High-pressure fuel hose connection
12. Fuel return hose connection
13. Earth wire
14. Brake booster vacuum hose



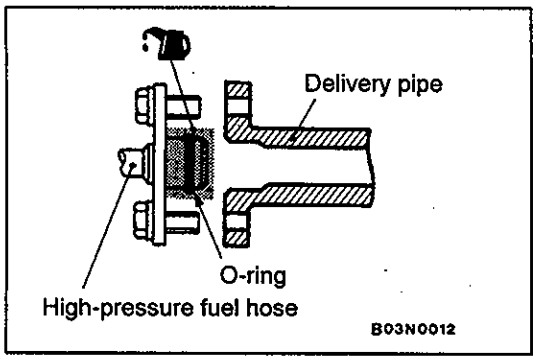
15. PCV hose
16. Vacuum hose connection
◀A▶ 17. Delivery pipe injector and pressure regulator assembly
18. Insulator
19. Vacuum hose connection
20. Intake manifold stay
21. Intake manifold
22. Intake manifold gasket
23. Vacuum pipe and hose assembly
24. Solenoid valve assembly
25. Air bypass solenoid valve <MVV>
26. 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◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

1. When connecting the high-pressure fuel hose to the delivery pipe, apply a small amount of new engine oil to the O-ring and then insert the high-pressure fuel 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 high-pressure fuel 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 high-pressure fuel hose and then re-insert it into the delivery pipe and check once again.

INSPECTION 15100310161

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

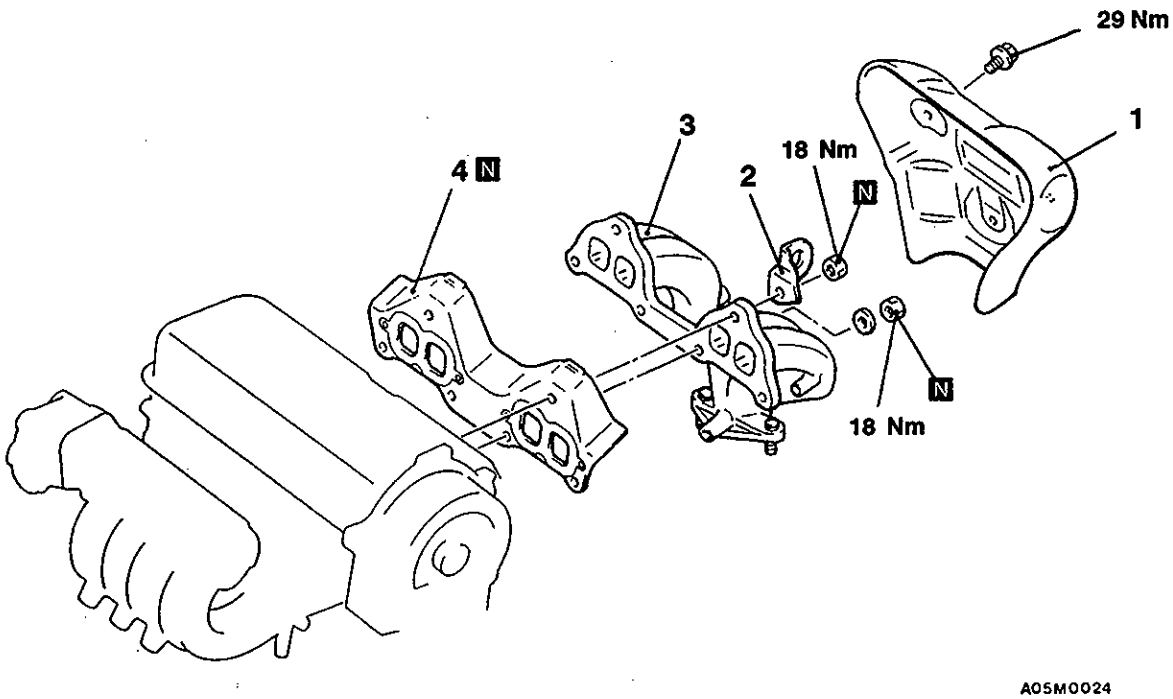
EXHAUST MANIFOLD

15100330228

REMOVAL AND INSTALLATION

<4G1>

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to P.15-10.)

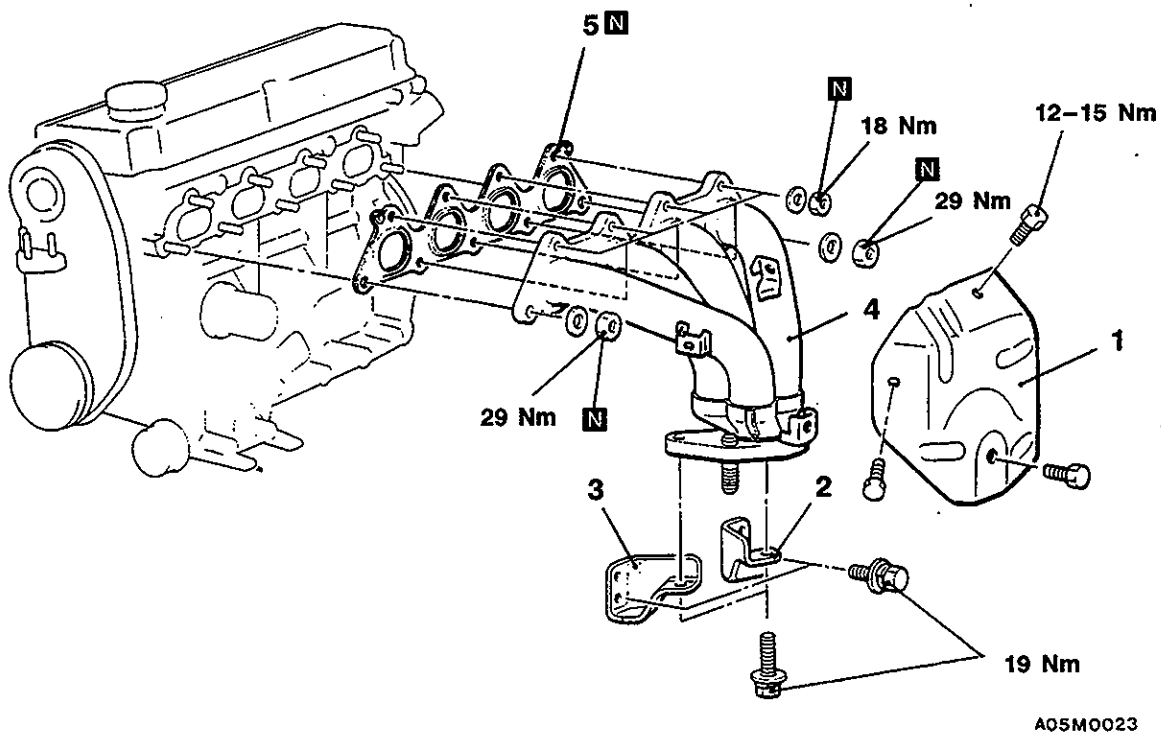


A05M0024

Removal steps
1. Exhaust manifold cover
2. Engine hanger
3. Exhaust manifold
4. Exhaust manifold gasket

<4G9>

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to P.15-10.)



Removal steps
1. Exhaust manifold cover
2. Exhaust manifold bracket (A)
3. Exhaust manifold bracket (B)
4. Exhaust manifold
5. Exhaust manifold gasket

INSPECTION

15100340061

EXHAUST MANIFOLD CHECK

1. Check for damage or cracking of any part.
2. Using a straight edge and thickness gauge, check for distortion of the cylinder head installation surface.

   Standard value: 0.15 mm or less

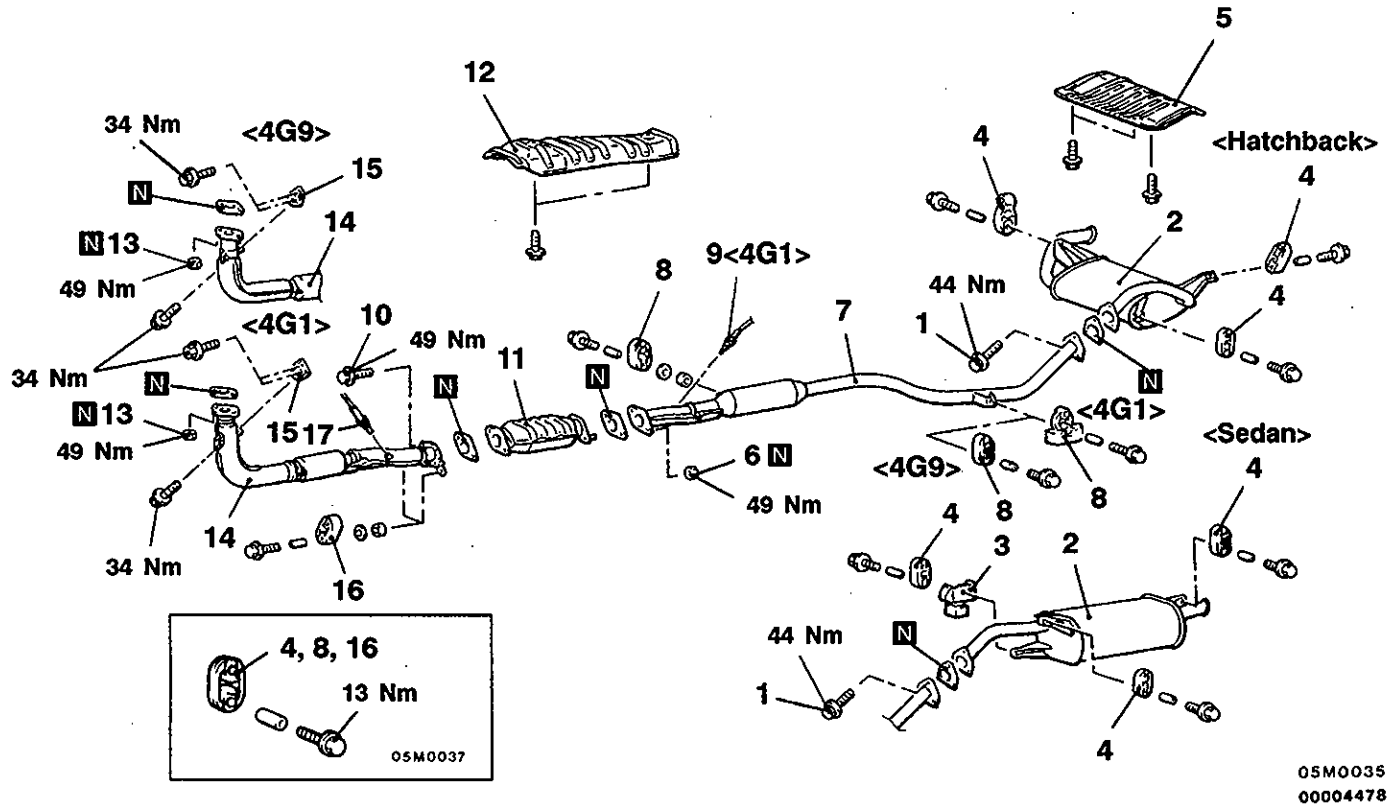
   Limit: 0.20 mm

EXHAUST PIPE AND MAIN MUFFLER

15100540157

REMOVAL AND INSTALLATION

<Except MVV>



Main muffler removal steps

1. Bolt
2. Main muffler
3. Dynamic damper <Sedan>
4. Hanger
5. Rear floor heat protector panel <Hatchback>

Center exhaust pipe removal steps

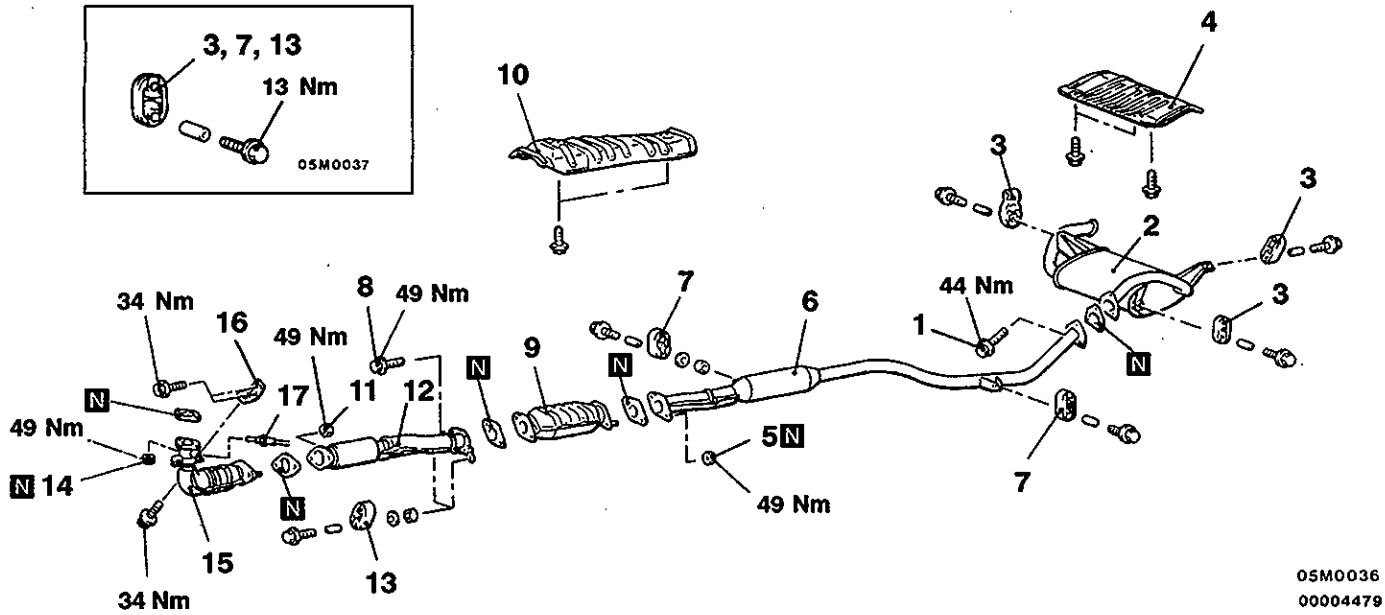
1. Bolt
6. Self locking nuts
7. Center exhaust pipe
8. Hanger
9. Oxygen sensor <4G1>
10. Bolt
11. Catalytic converter
12. Front floor heat protector panel

Front exhaust pipe removal steps

10. Bolt
13. Self locking nuts
14. Front exhaust pipe
15. Front exhaust pipe bracket
16. Hanger

◀A▶ ▶A◀ 17. Oxygen sensor

<MVV>



Main muffler removal steps

1. Bolt
2. Main muffler
3. Hanger
4. Rear floor heat protector panel

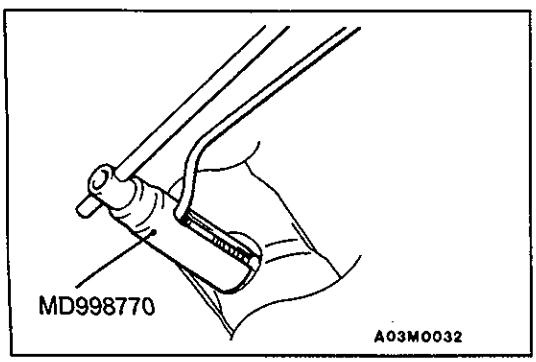
Center exhaust pipe removal steps

1. Bolt
5. Self locking nuts
6. Center exhaust pipe
7. Hanger
8. Bolt
9. Catalytic converter
10. Front floor heat protector panel

Front exhaust pipe removal steps

8. Bolt
11. Self locking nuts
12. Front exhaust pipe
13. Hanger
14. Self locking nuts
15. Front catalytic converter
16. Front exhaust pipe bracket

◀A▶ ▶A◀ 17. Oxygen sensor



REMOVAL SERVICE POINT

◀A▶ OXYGEN SENSOR REMOVAL

INSTALLATION SERVICE POINT

▶A◀ OXYGEN SENSOR INSTALLATION

NOTES

ENGINE ELECTRICAL

CONTENTS

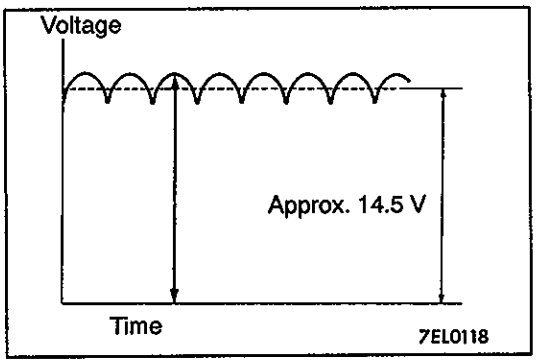
16109000103

CHARGING SYSTEM

16100010143

GENERAL INFORMATION

The charging system uses the alternator output to keep the battery charged at a constant level under various electrical loads.

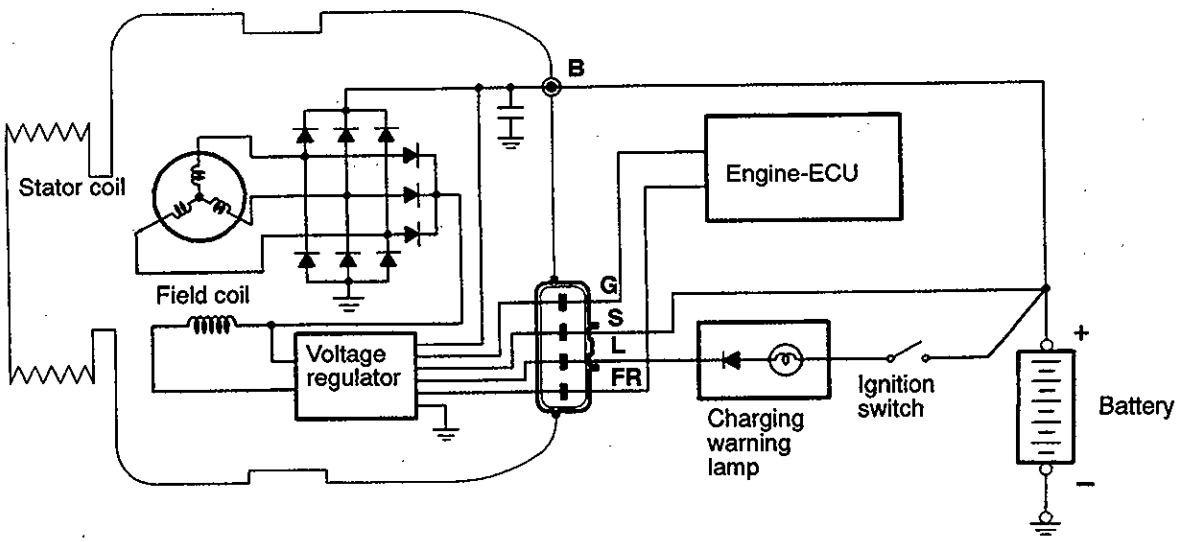


OPERATION

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.
When the stator coil begins to generate power after the engine is started, the field coil is excited by the output current of the stator coil.
The alternator output voltage rises as the field current increases and it falls as the field current decreases. When the battery voltage (alternator S terminal voltage) reaches a regulated voltage of approx. 14.4 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	4G1	4G9
Type	Battery voltage sensing	Battery voltage sensing
Rated output V/A	12/80, 12/90*	12/80, 12/90*
Voltage regulator	Electronic built-in type	Electronic built-in type

NOTE
*: A/T – vehicles for cold climate

SERVICE SPECIFICATIONS

16100030101

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 Ω		Approx. 2–5	–

SPECIAL TOOL

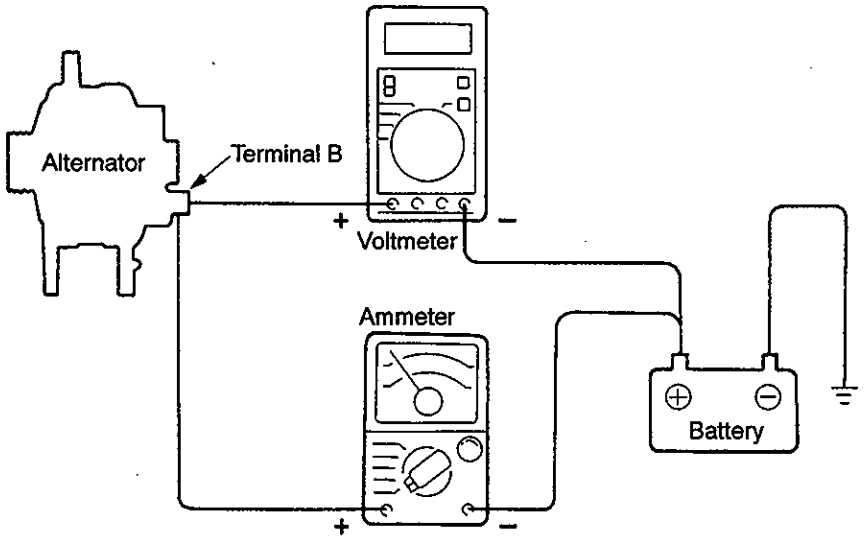
16100060056

Tool	Number	Name	Use
	MB991519	Alternator harness connector	Checking the alternator (S terminal voltage)

ON-VEHICLE SERVICE

16100090147

ALTERNATOR OUTPUT LINE VOLTAGE DROP TEST



5EL0015

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 11 – 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) Reconnect the negative battery cable.
(7) Connect a tachometer or the MUT-II. (Refer to GROUP 11 – On-vehicle Service.)
(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.

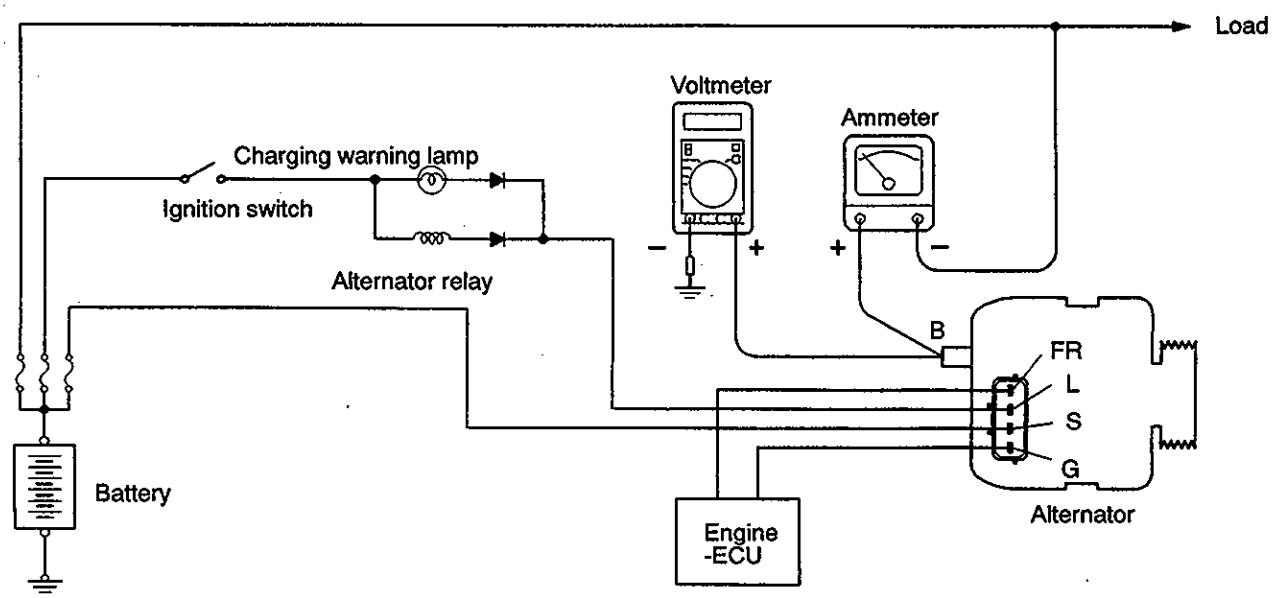
Limit: max. 0.3 V

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. When the value range is 40 A, the limit is max. 0.4 V.

(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 off all lamps and the ignition switch.
(14) Remove the tachometer or the MUT-II.
(15) Disconnect the negative batter cable.
(16) Disconnect the ammeter and voltmeter.
(17) Connect the alternator output wire to the alternator "B" terminal.
(18) Connect the negative battery cable.

OUTPUT CURRENT TEST

16100100147



6EN1162

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 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 11 – 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 the negative battery cable.
(7) Connect a tachometer or the MUT-II. (Refer to GROUP 11 – On-vehicle Service.)
(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.

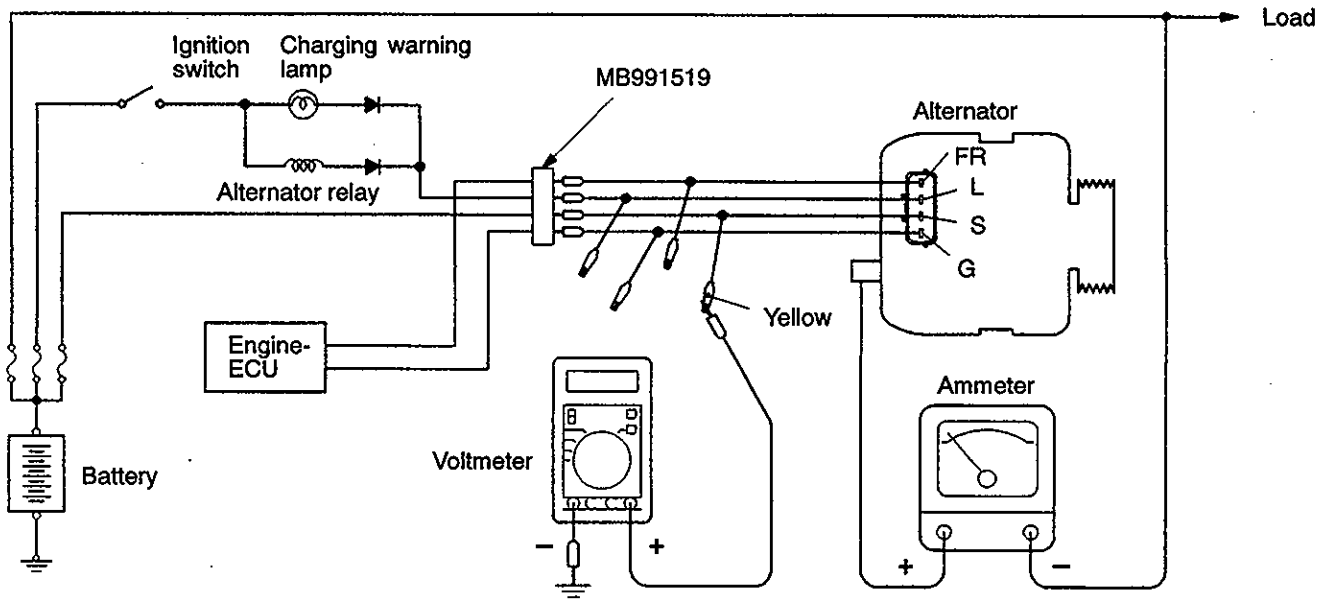
Limit: 70% of normal current output

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) Remove the tachometer or the MUT-II.
(16) Disconnect the negative battery cable.
(17) Disconnect the ammeter and voltmeter.
(18) Connect the alternator output wire to the alternator "B" terminal.
(19) Connect the negative battery cable.

REGULATED VOLTAGE TEST

16100110140



6EN1163

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 11 – On-vehicle Service.)
- Fusible link
- Abnormal noise from the alternator while the engine is running

(2) Turn the ignition switch to the OFF position.
(3) Disconnect the negative battery cable.
(4) Use the special tool (Alternator test harness: MB991519) to connect a digital voltmeter between the alternator S terminal and earth. (Connect the (+) lead of the voltmeter to the "S" terminal, and then connect the (–) lead of the voltmeter to a secure earth 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) Reconnect the negative battery cable.
(8) Connect a tachometer or the MUT-II. (Refer to GROUP 11 – On-vehicle Service.)
(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.

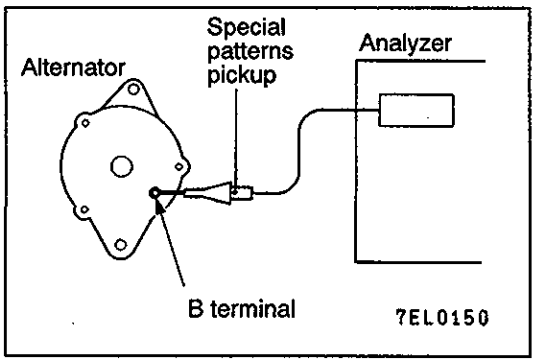
(10) Turn all lamps and accessories off.
(11) Start the engine.
(12) Increase the engine speed to 2,500 r/min.
(13) Read the value displayed on the voltmeter when the alternator output current alternator becomes 10 A or less.

(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)Remove the tachometer or the MUT-II.
(18)Disconnect the negative battery cable.
(19)Disconnect the ammeter and voltmeter.
(20)Connect the alternator output wire to the alternator "B" terminal.
(21)Remove the special tool, and return the connector to the original condition.
(22)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

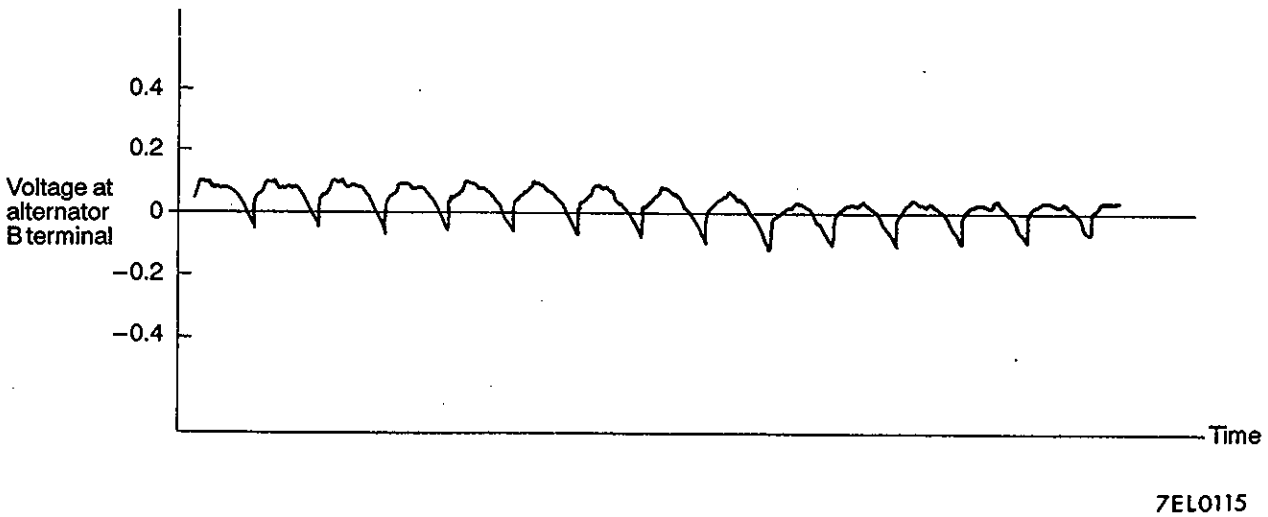
MEASUREMENT METHOD

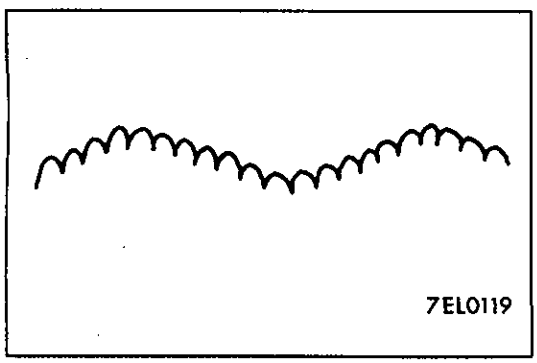
Connect the analyzer special patterns pick-up to the alternator B terminal.

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

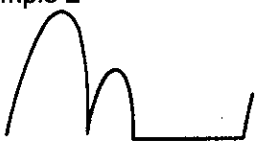


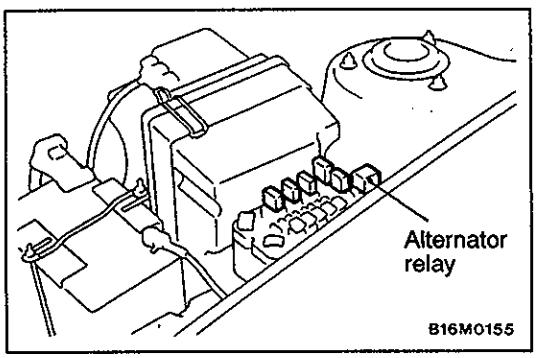


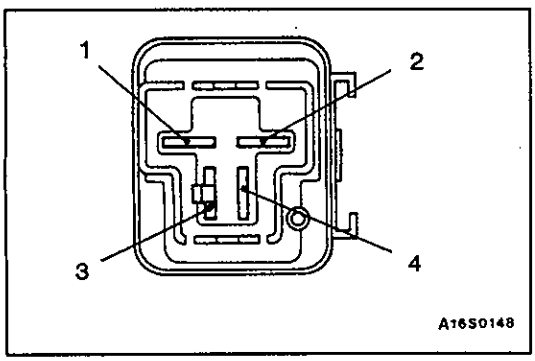
NOTE
The voltage waveform of the alternator B terminal can undulate as shown at left. This waveform is produced when the regulator operates according to fluctuations in the alternator load (current), and is normal for the alternator.

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 RELAY CONTINUITY CHECK

16100190014

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

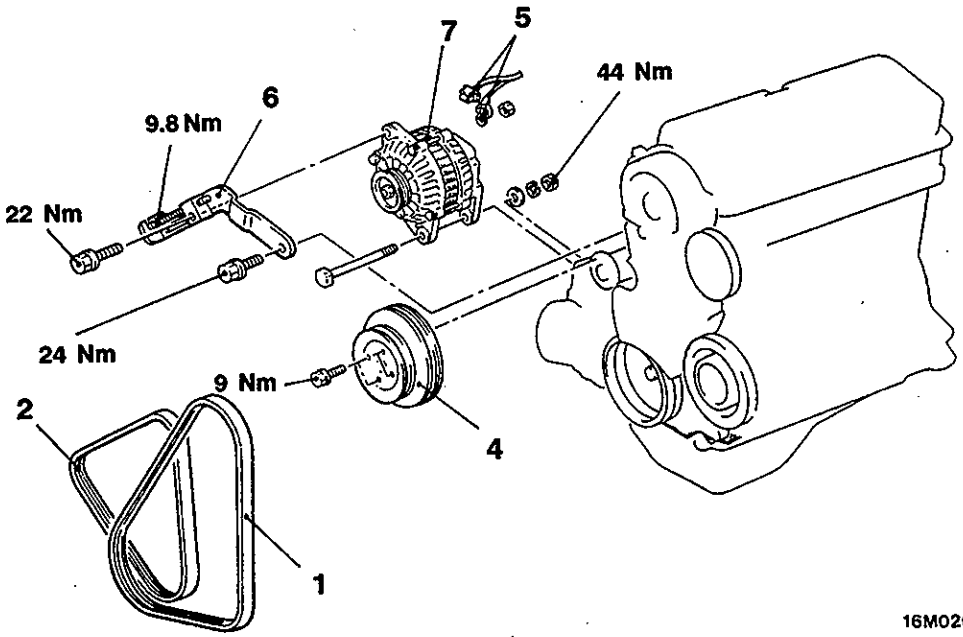
ALTERNATOR

16100140163

REMOVAL AND INSTALLATION

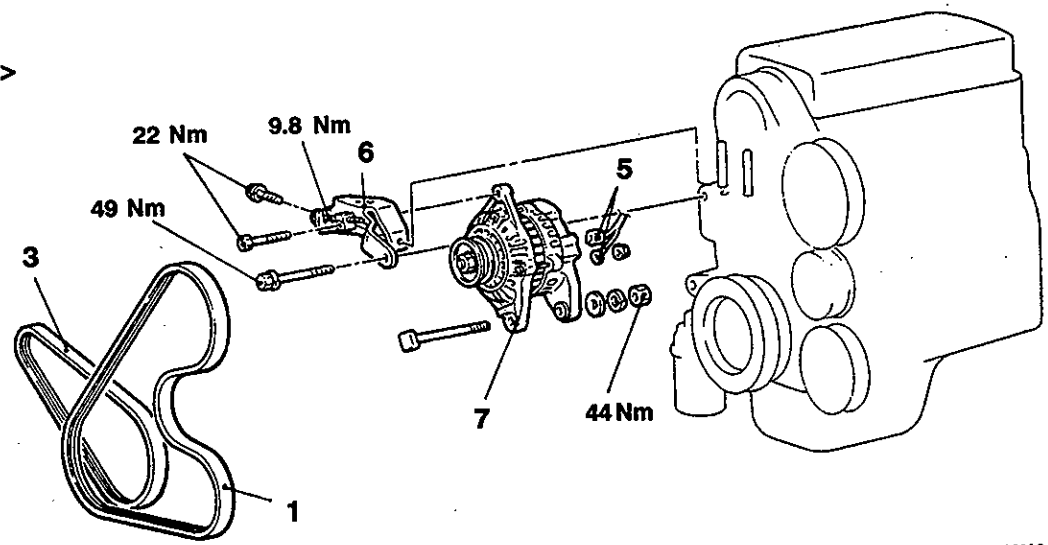
Post-installation Operation
- Adjustment of Drive Belt Tension (Refer to GROUP 11 – On-vehicle Service.)

<4G1>



16M0204

<4G9>

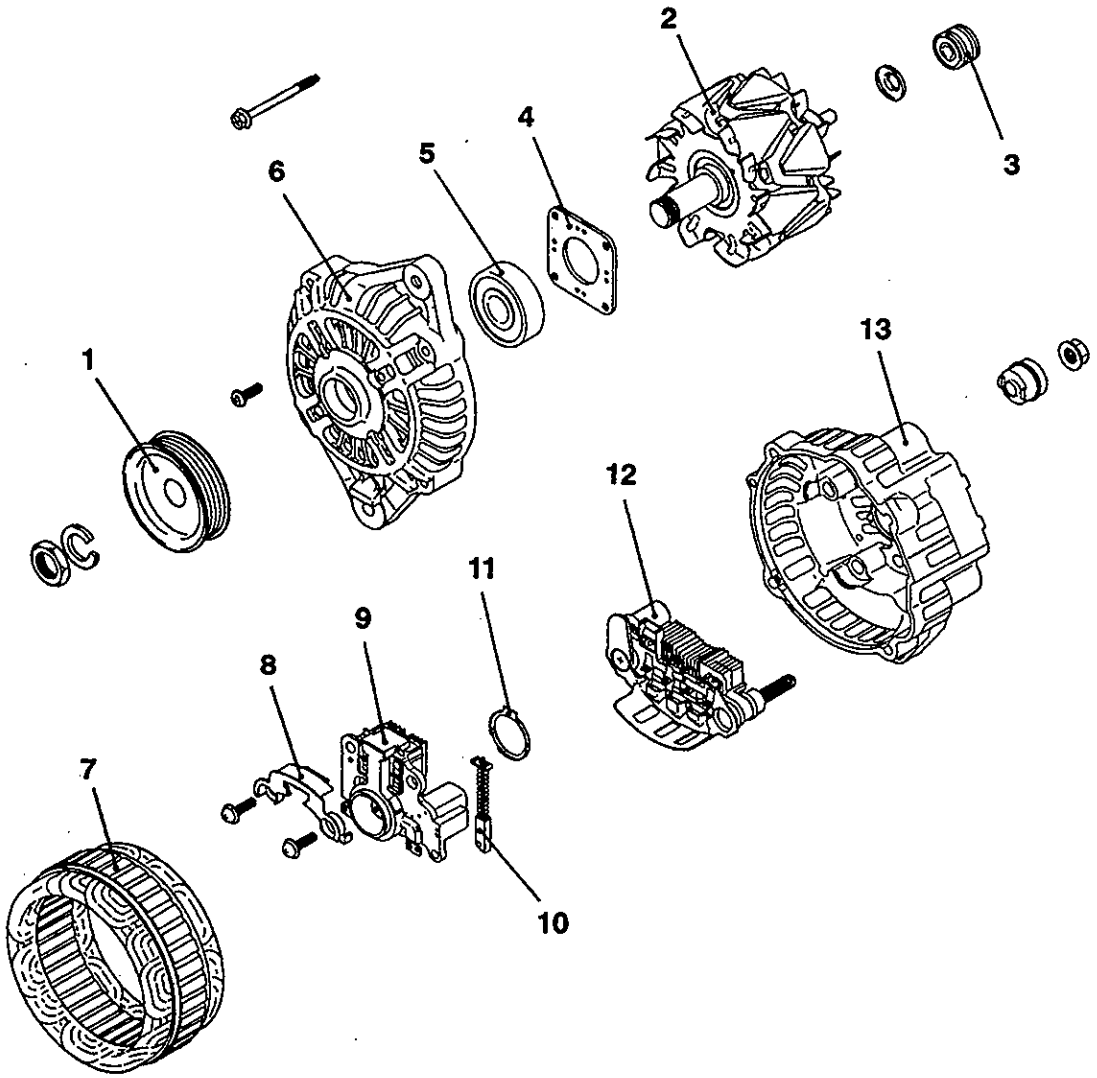


16M0205
00004497

Removal steps
1. Drive belt (Air conditioner and power steering)
2. Drive belt (Alternator and water pump) <4G1>
3. Drive belt (Alternator) <4G9>
4. Water pump pulley <4G1>
5. Alternator connector
6. Alternator brace
7. Alternator

DISASSEMBLY AND REASSEMBLY

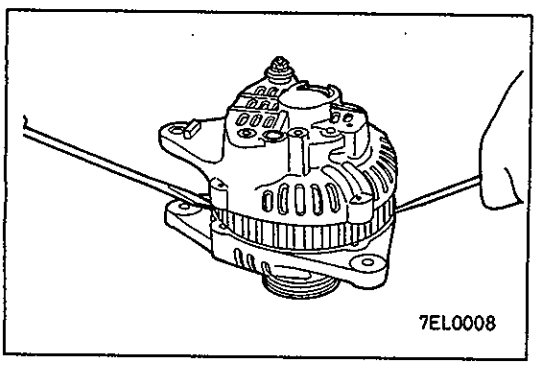
16100160121



Z6EN0878

Disassembly steps

◀A▶ 1. Alternator pulley
▶A◀ 2. Rotor assembly
3. Rear bearing
4. Bearing retainer
5. Front bearing
6. Front bracket
◀B▶ 7. Stator
8. Plate
9. Regulator and brush holder
10. Brush
11. Slinger
12. Rectifier
13. Rear bracket

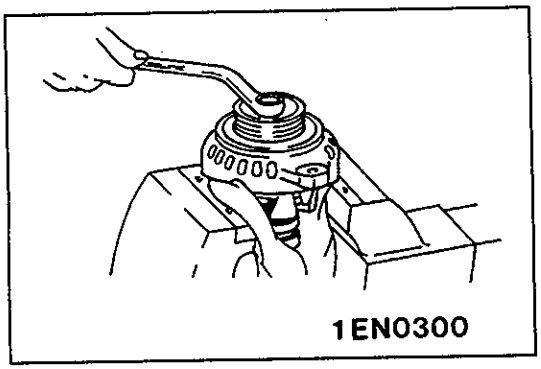


DISASSEMBLY SERVICE POINTS

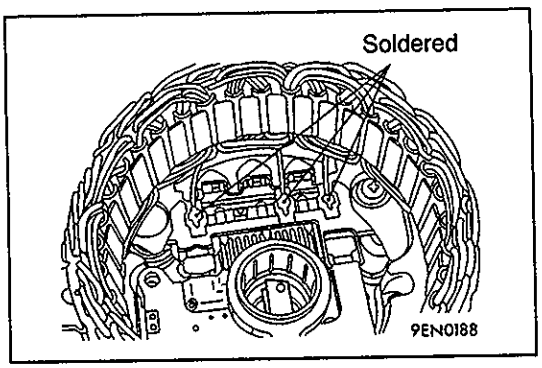
◀A▶ ALTERNATOR PULLEY REMOVAL

(1) Remove the bolts.
(2) Insert a flat-tipped screwdriver between front bracket and stator core and pry downwards.

Caution
Do not insert a screwdriver too deep, as the stator coil will be damaged.



(3) Clamp the rotor in a vice with soft jaws.
(4) After removing the nut, remove the pulley and front bracket from the rotor.

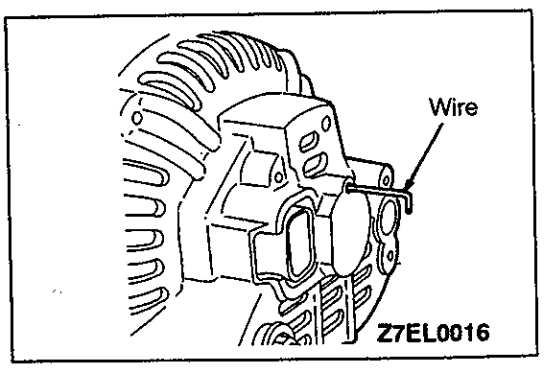


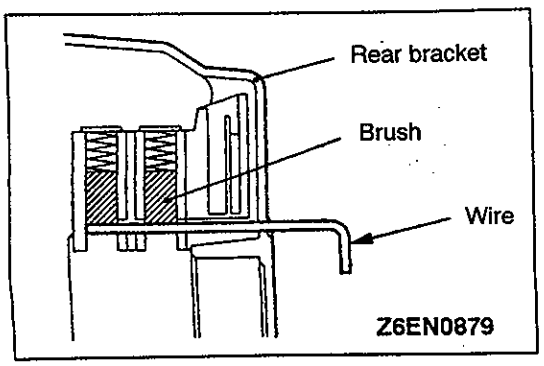
◀B▶ STATOR REMOVAL

(1) When removing stator, unsolder three stator leads soldered to main diodes on rectifier.
(2) When removing rectifier from brush holder, unsolder two soldered points to rectifier.

Caution

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

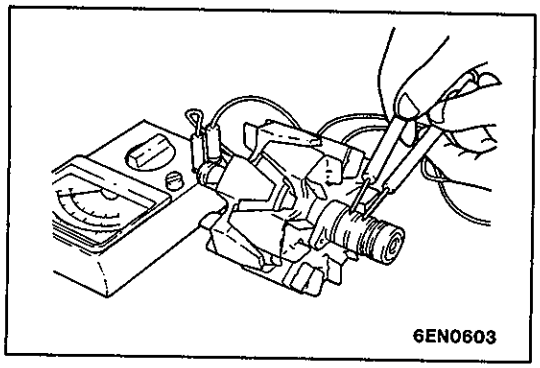


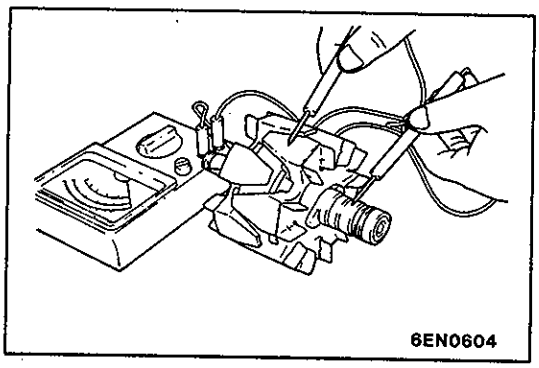


REASSEMBLY SERVICE POINT

▶A◀ ROTOR ASSEMBLY INSTALLATION

Before rotor is attached to rear bracket, insert wire through small hole made in rear bracket to lift brush. After rotor has been installed, remove the wire.


6EN0603


6EN0604

INSPECTION

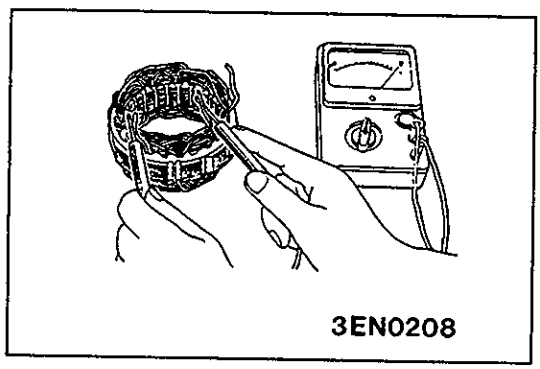
16100170124

ROTOR

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

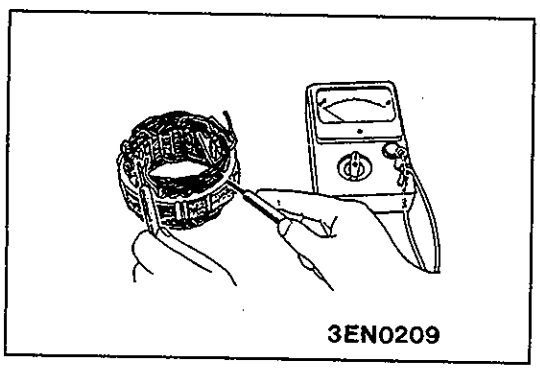
Resistance value: Approx. 2 – 5 Ω

(2) Check rotor coil for earthing. Check that there is no continuity between slip ring and core. If there is continuity, replace rotor assembly.

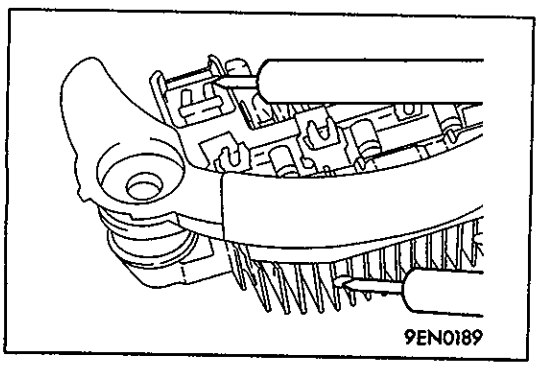

3EN0208

STATOR

(1) Make continuity test on stator coil. Check that there is continuity between coil leads. If there is no continuity, replace stator assembly.


3EN0209

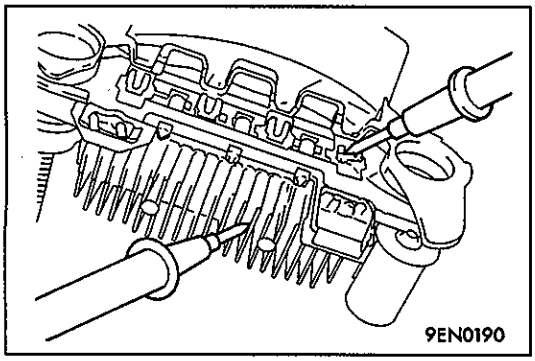
(2) Check coil for earthing. Check that there is no continuity between coil and core. If there is continuity, replace stator assembly.


9EN0189

RECTIFIERS

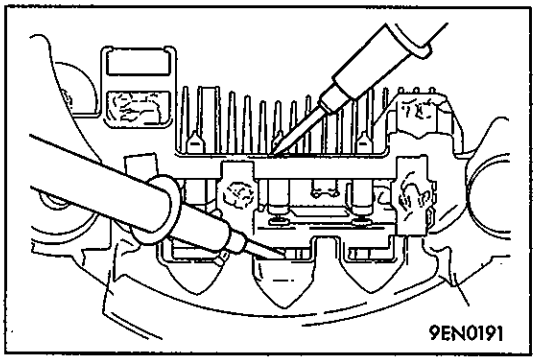
(1) Positive Rectifier Test

Check for continuity between positive rectifier and stator coil lead connection terminal with an ohmmeter. If there is continuity in both directions, diode is shorted. Replace rectifier assembly.



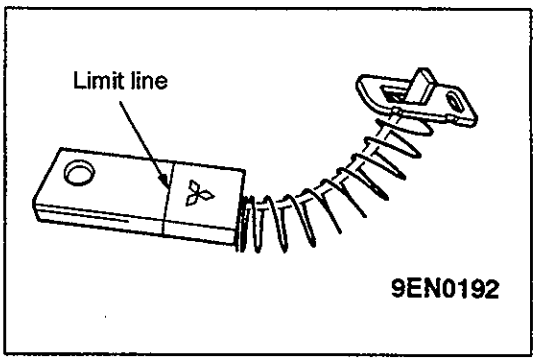
(2) Negative Rectifier Test

Check for continuity between negative rectifier and stator coil lead connection terminal. If there is continuity in both directions, diode is shorted, and rectifier assembly must be replaced.



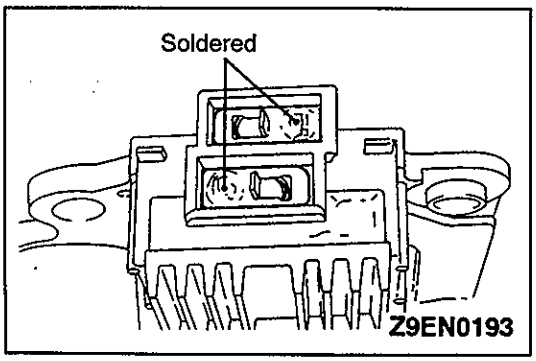
(3) Diode Trio Test

Check three diodes for continuity by connecting an ammeter to both ends of each diode. If there is no continuity in both directions, diode is faulty and heatsink assembly must be replaced.

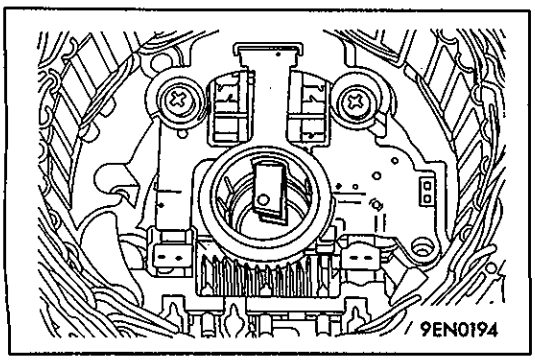


BRUSH REPLACEMENT

(1) Replace brush by the following procedures if it has been worn to limit line.



(2) Unsolder pigtail and remove old brush and spring.



(3) When installing a new brush, push the brush in the brush holder as shown in the illustration, and solder the lead wire.

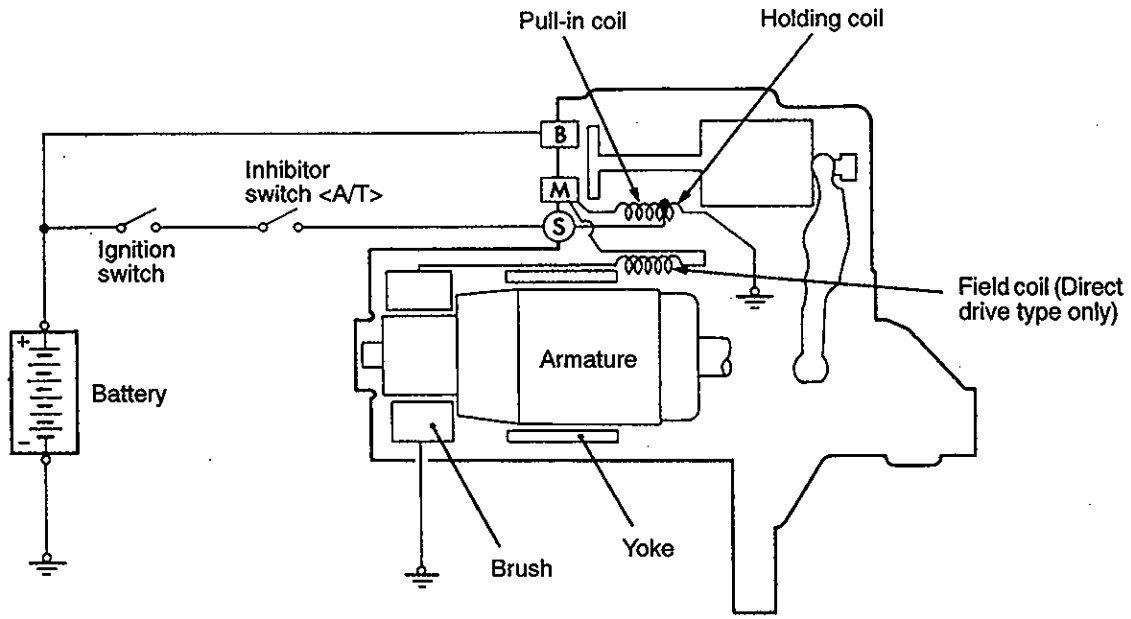
STARTING SYSTEM

16200010122

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

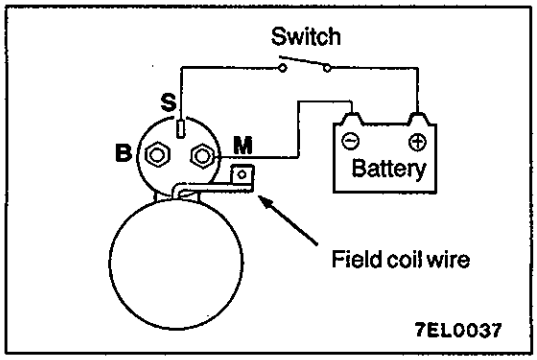
STARTER MOTOR SPECIFICATIONS

Items	4G1 – M/T – standard models	4G1 – M/T – models for cold climate, 4G1 – A/T, 4G9 – M/T, 4G9 – A/T – standard models	4G9 – A/T – models for cold climate
Type	Direct drive	Direct drive	Reduction drive with planetary gear
Rated output kW/V	0.7/12	0.9/12	1.0/12
No. of pinion teeth	8	8	8

SERVICE SPECIFICATIONS

16200030081

Items		Standard value	Limit
Pinion gap mm		0.5–2.0	–
Commutator outer diameter mm	Direct drive type	32.0	31.4
	Reduction drive type	29.4	28.8
Commutator runout mm		–	0.05
Commutator undercut mm		0.5	0.2



STARTER MOTOR

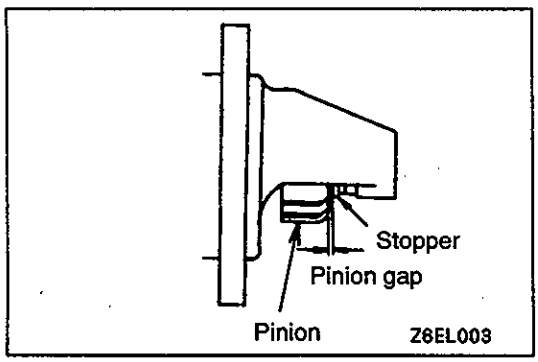
16200110112

INSPECTION

PINION GAP ADJUSTMENT

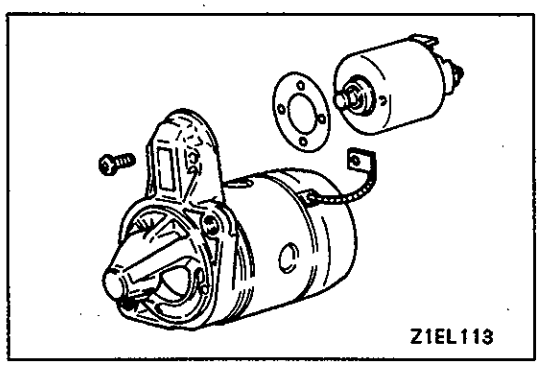
1. Disconnect field coil wire from M-terminal of magnetic switch.
2. Connect a 12V battery between S-terminal and M-terminal.
3. Set switch to "ON", and pinion will move out.

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

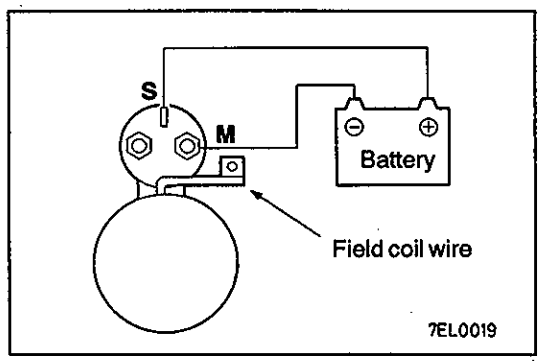


4. Check pinion to stopper clearance (pinion gap) with a thickness gauge.

   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.

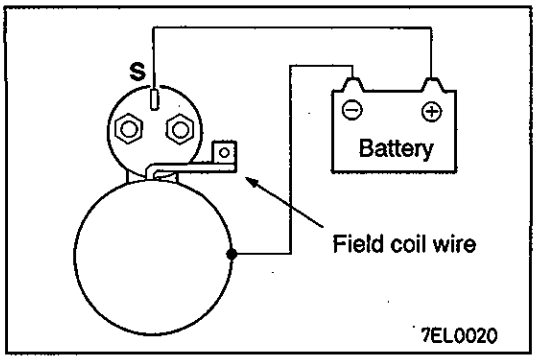


MAGNETIC SWITCH PULL-IN TEST

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.

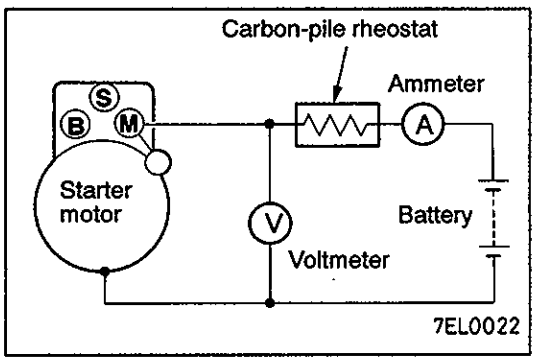
3. If pinion moves out, then pull-in coil is good. If it doesn't, replace magnetic switch.



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.

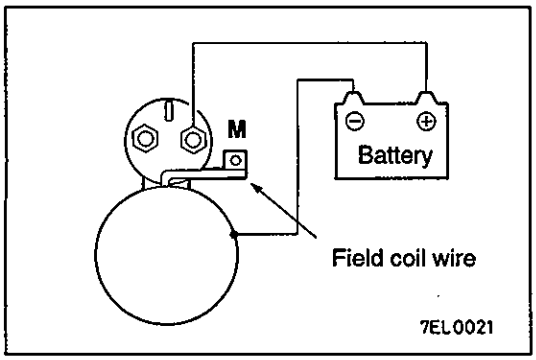
   Caution
   This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.
3. Manually pull out the pinion as far as the pinion stopper position.
4. If pinion remains out, everything is in order. If pinion moves in, hold-in circuit is open. Replace magnetic switch.



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 11.5 V (for the direct drive type) or 11 V (for reduction drive type).
7. Confirm that the maximum amperage is within the specifications and that the starter motor turns smoothly and freely.

   Current:
   max. 60 Amps (Direct drive type)
   max. 90 Amps (Reduction drive type)



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.

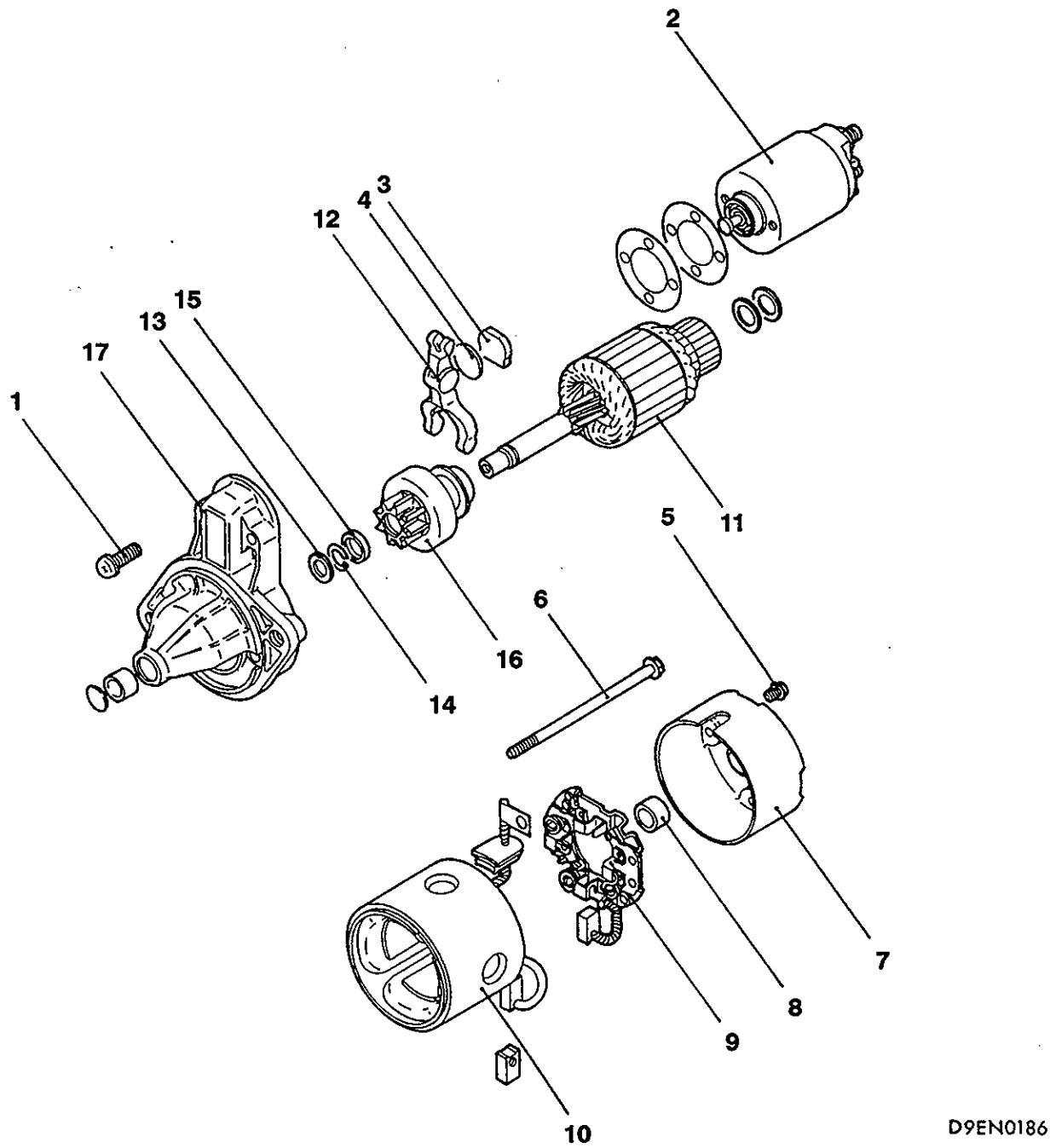
   Caution
   This test must be performed quickly (in less than 10 seconds) to prevent coil from burning.

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.

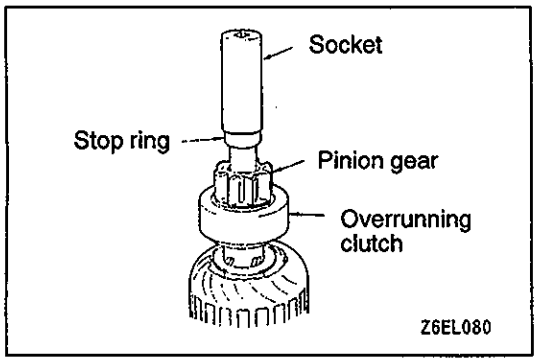
DISASSEMBLY AND REASSEMBLY <DIRECT DRIVE TYPE>

16200120085



Disassembly steps

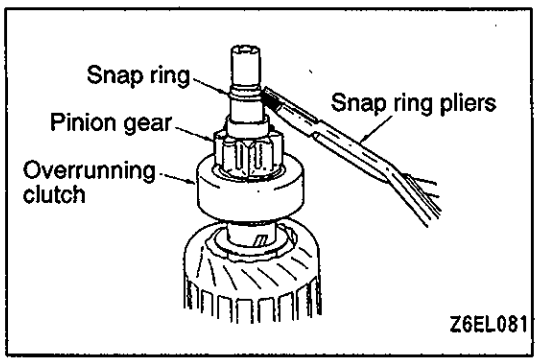
1. Screw
2. Magnetic switch
3. Packing
4. Plate
5. Screw
6. Through bolt
7. Rear bracket
8. Rear bearing
9. Brush holder assembly
10. Yoke assembly
11. Armature
12. Lever
13. Washer
14. Snap ring ◀A▶ ▶A◀
15. Stop ring ◀A▶ ▶A◀
16. Overrunning clutch
17. Front bracket



DISASSEMBLY SERVICE POINTS

◀A▶ SNAP RING/STOP RING REMOVAL

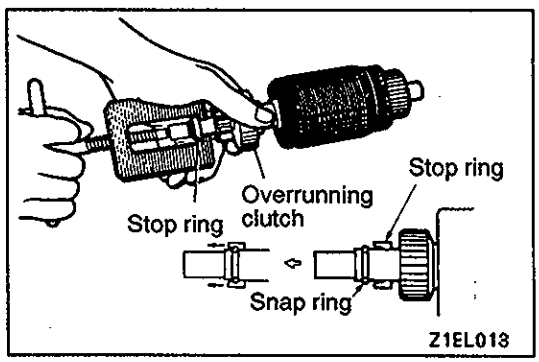
1. Press stop ring off snap ring with a suitable socket.



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

STARTER MOTOR PARTS CLEANING

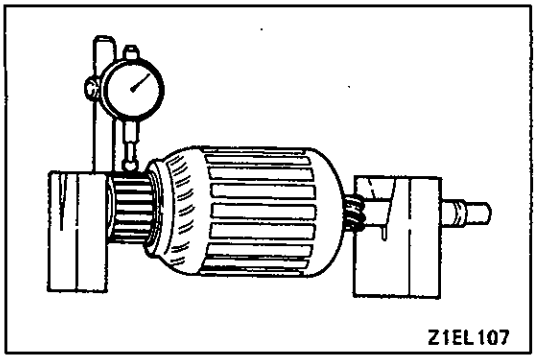
1. Do not immerse parts in cleaning solvent. Immersing the yoke and field coil assembly and/or armature will damage insulation. Wipe these parts with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from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

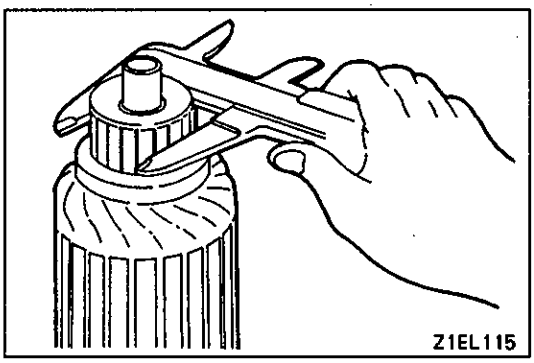

Z1EL107

INSPECTION

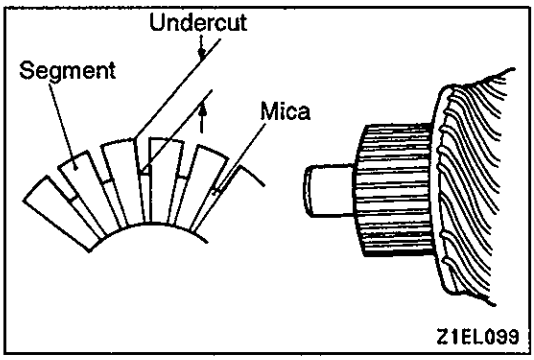
16200130088

COMMUTATOR

1. Place the armature in a pair of "V" blocks and check the runout with a dial indicator.
   Limit: 0.05 mm

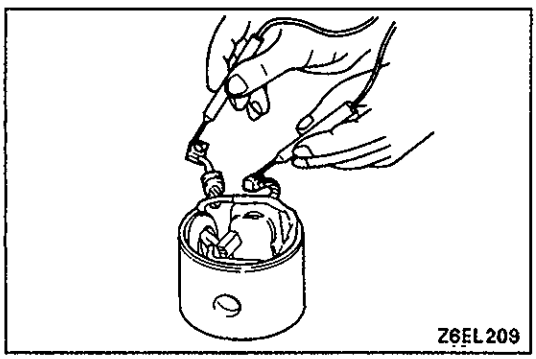

Z1EL115

2. Measure the commutator outer diameter.
   Standard value: 32.0 mm
   Limit: 31.4 mm



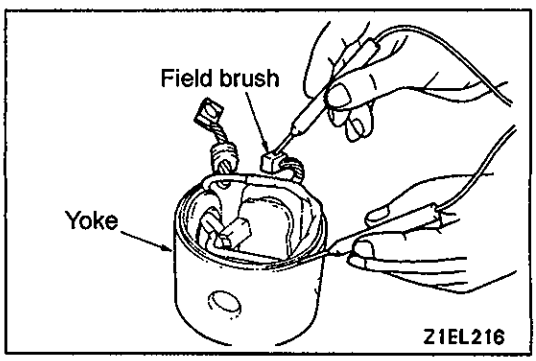
Z1EL099

3. Check the undercut depth between segments.
   Standard value: 0.5 mm
   Limit: 0.2 mm


Z6EL209

FIELD COIL OPEN-CIRCUIT TEST

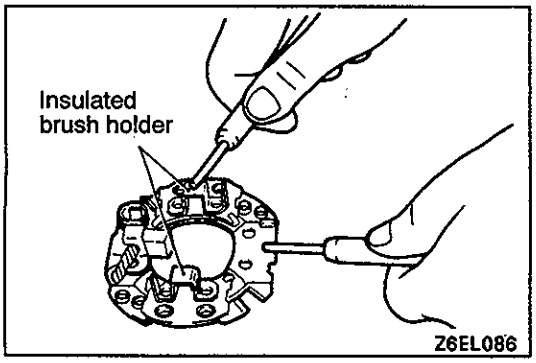
Check the continuity between field brushes. If there is continuity, the field coil is in order.



Z1EL216

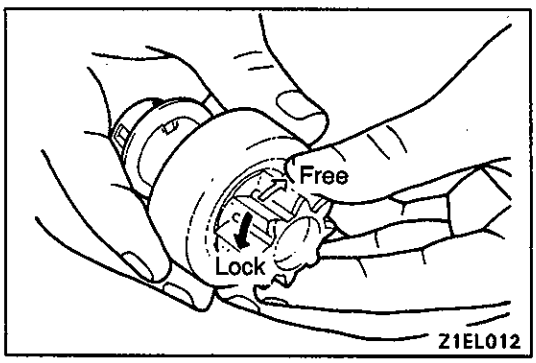
FIELD COIL GROUND TEST

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.

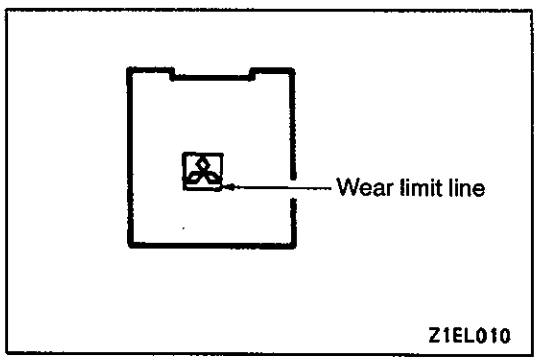


OVERRUNING CLUTCH

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.

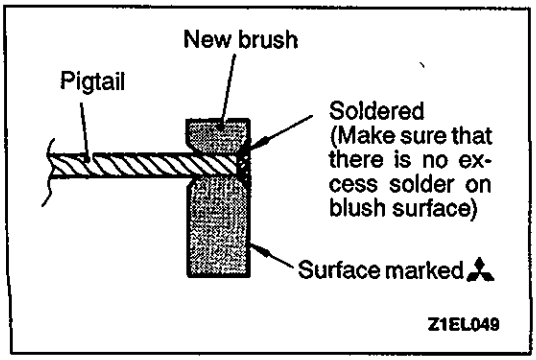
FRONT AND REAR BRACKET BUSHING

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

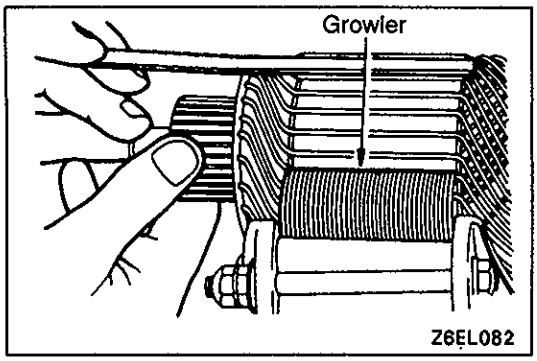


BRUSH AND SPRING REPLACEMENT

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.



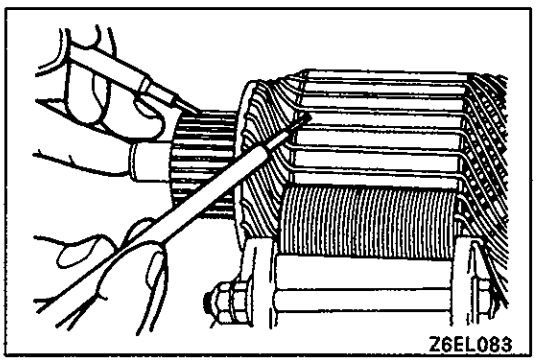
3. Sand pigtail end with sandpaper to ensure good soldering.
4. Insert pigtail into hole provided in new brush and solder it.
   Make sure that pigtail and excess solder do not come out onto brush surface.
5. When replacing ground brush, slide the brush from brush holder by prying retainer spring back.



ARMATURE TEST

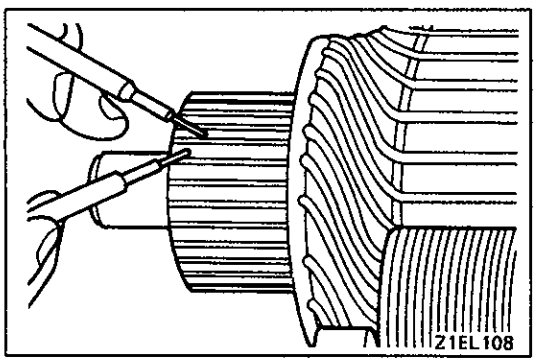
ARMATURE SHORT-CIRCUIT TEST

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.

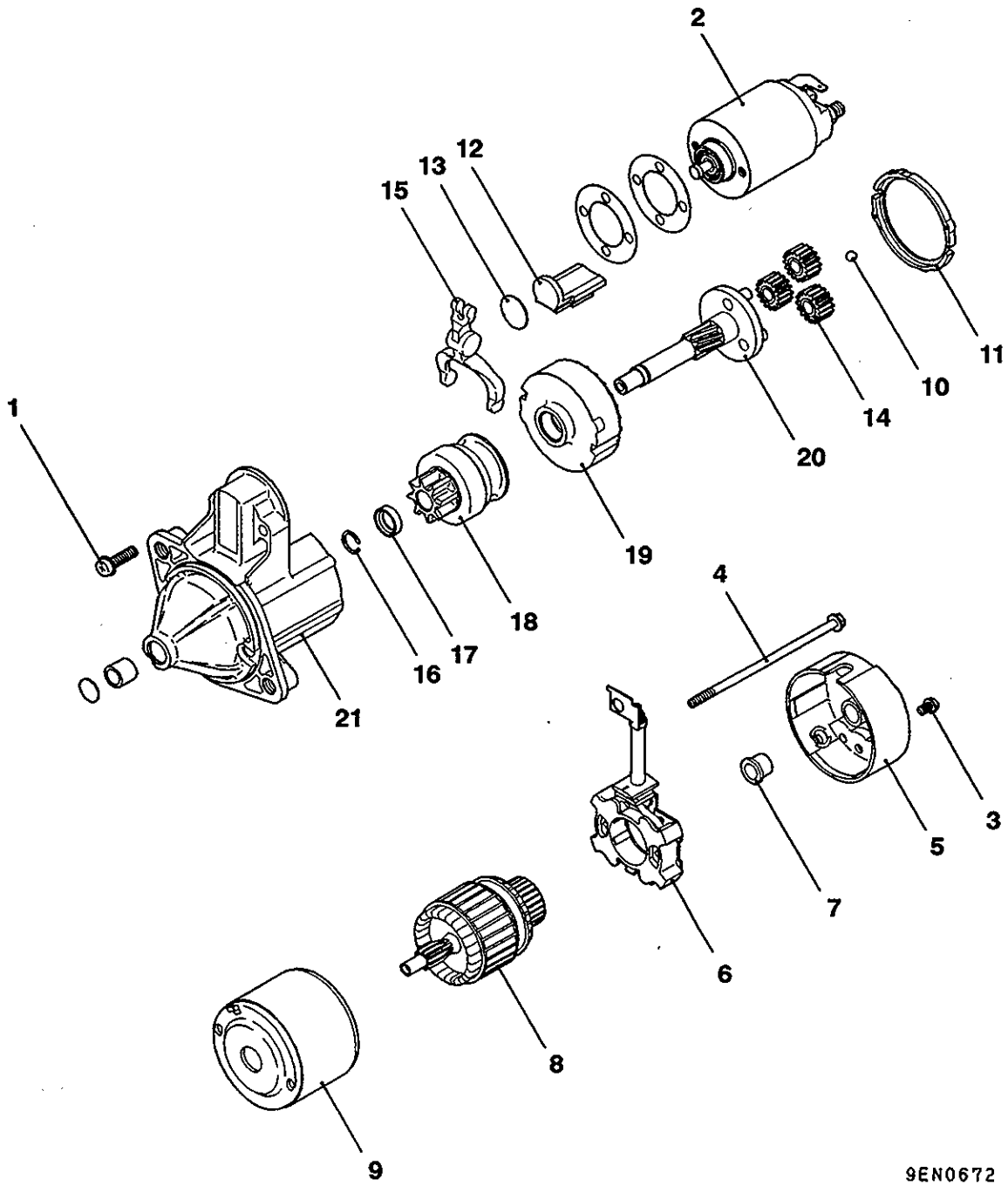


ARMATURE COIL OPEN-CIRCUIT INSPECTION

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

DISASSEMBLY AND REASSEMBLY <REDUCTION DRIVE TYPE>

16200120153



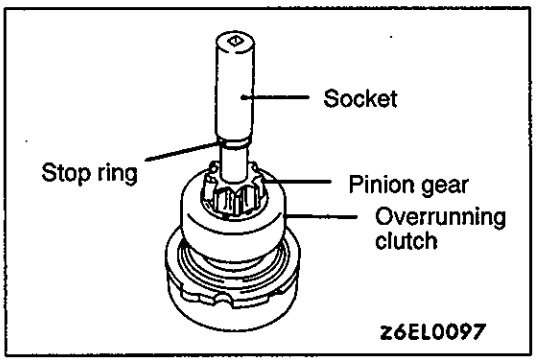
Disassembly steps

1. Screw
2. Magnetic switch
3. Screw
4. Screw
5. Rear bracket
6. Brush set
7. Rear bearing
◀A▶ 8. Armature
9. Yoke assembly
◀A▶ 10. Ball
11. Packing A
12. Packing B
13. Plate
14. Planetary gear
15. Lever
◀B▶ ▶A◀ 16. Snap ring
◀B▶ ▶A◀ 17. Stop ring
18. Overrunning clutch
19. Internal gear
20. Planetary gear holder
21. Front bracket

DISASSEMBLY SERVICE POINTS

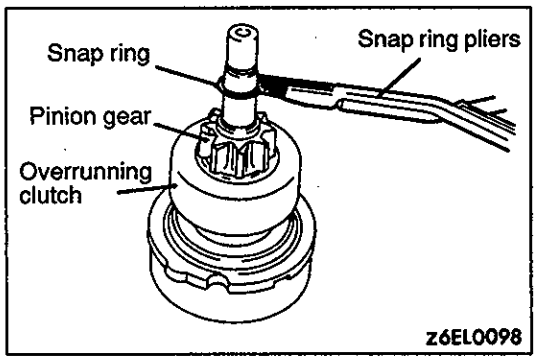
◀A▶ ARMATURE/BALL REMOVAL

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



◀B▶ SNAP RING/STOP RING REMOVAL

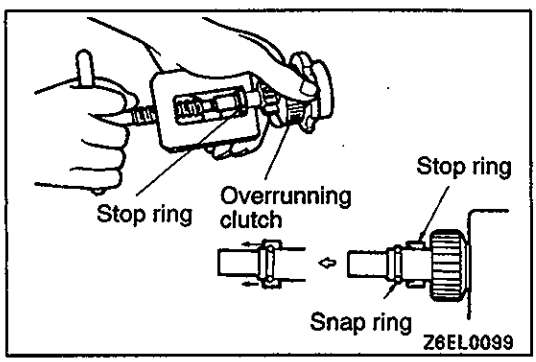
1. Press stop ring off snap ring with a suitable socket.



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

STARTER MOTOR PARTS CLEANING

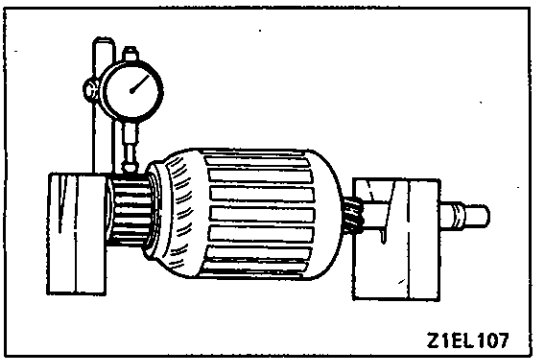
1. Do not immerse parts in cleaning solvent. Immersing the motor assembly will damage insulation. Wipe motor assembly with a cloth only.
2. Do not immerse drive unit in cleaning solvent. Overrunning clutch is pre-lubricated at the factory and solvent will wash lubrication from clutch.
3. The drive unit 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.

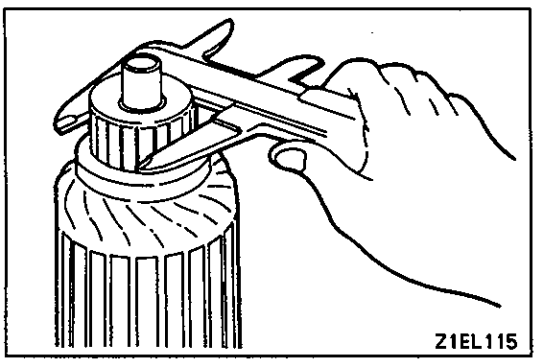

Z1EL107

INSPECTION

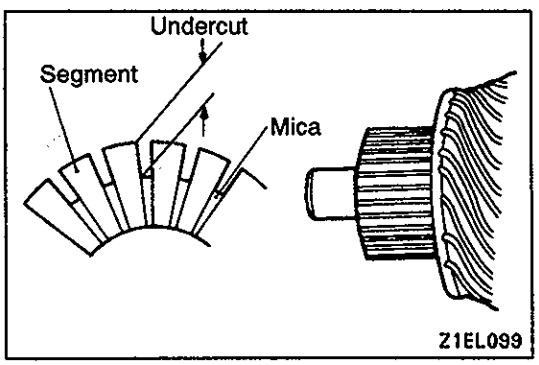
16200130156

COMMUTATOR

1. Place the armature in a pair of "V" blocks and check the runout with a dial indicator.
   Limit: 0.05 mm

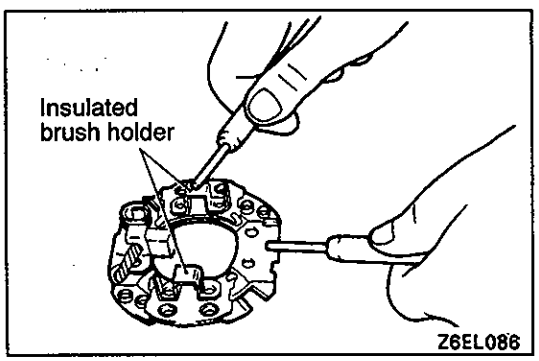

Z1EL115

2. Measure the commutator outer diameter.
   Standard value: 29.4 mm
   Limit: 28.8 mm



Z1EL099

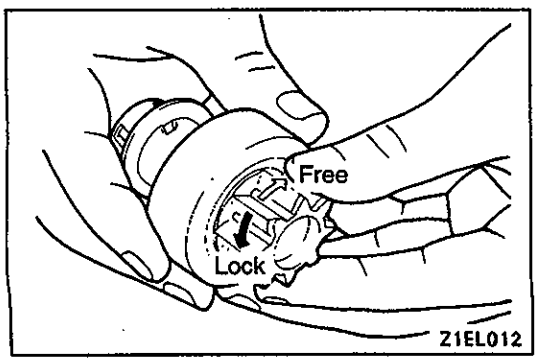
3. Check the undercut depth between segments.
   Standard value: 0.5 mm
   Limit: 0.2 mm



Z6EL086

BRUSH HOLDER

Check the continuity between brush holder plate and brush holder.
If there is no continuity, the brush holder is in order.



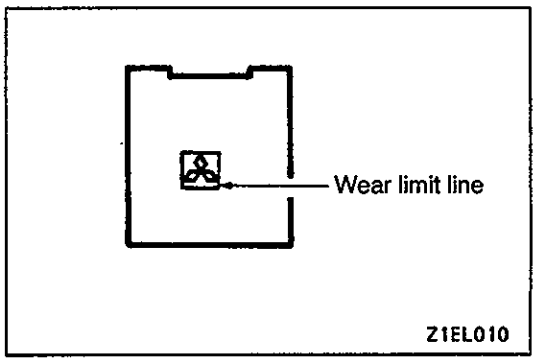
Z1EL012

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.

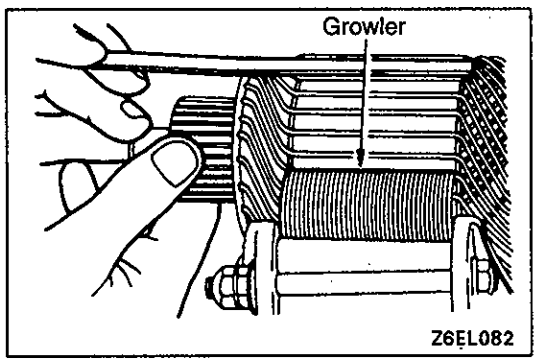
FRONT AND REAR BRACKET BUSHING

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



BRUSH SET REPLACEMENT

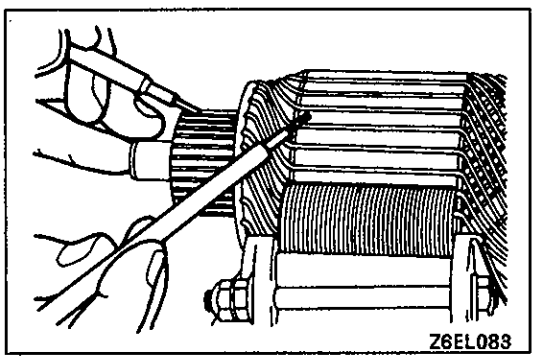
Brushes that are worn beyond wear limit line, or are oil-soaked, should be replaced.



ARMATURE TEST

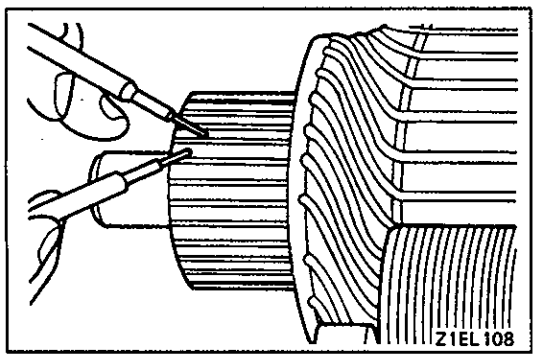
ARMATURE SHORT-CIRCUIT TEST

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.

IGNITION SYSTEM

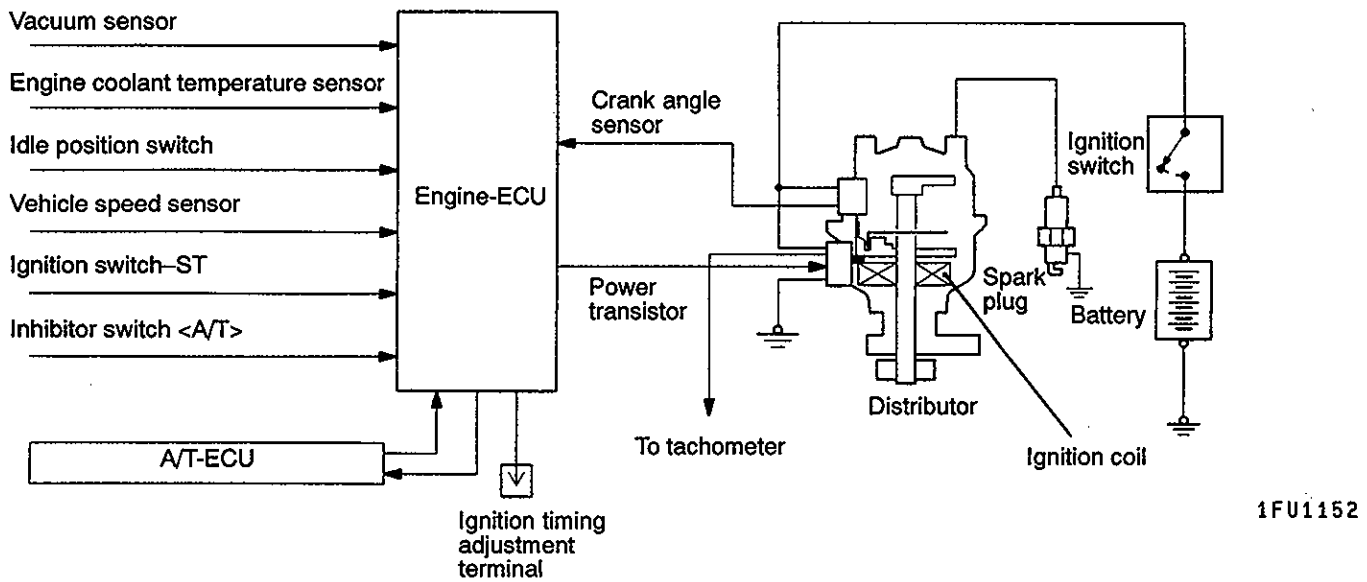
16300010118

GENERAL INFORMATION

<4G1>

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 crank angle 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.

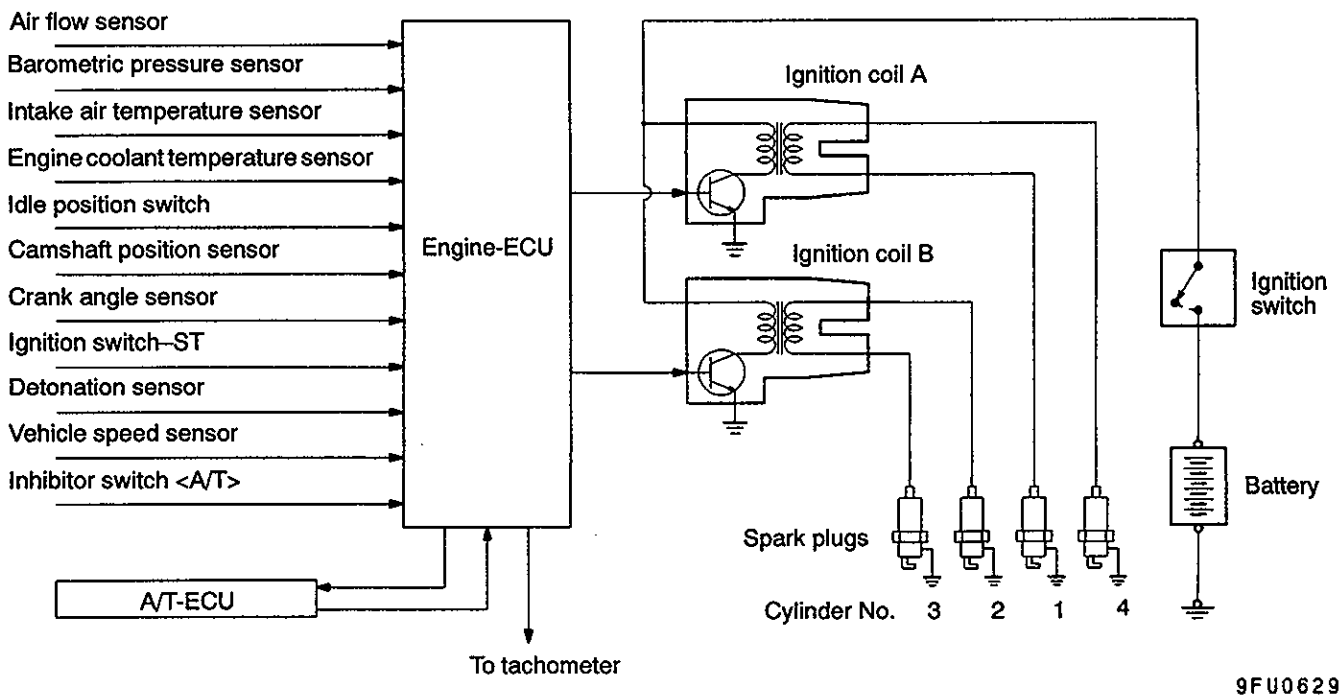
SYSTEM DIAGRAM



<4G9>

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 crank angle 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. 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



DISTRIBUTOR SPECIFICATIONS

Items	4G1
Type	Contact pointless with built-in ignition coil
Advance mechanism	Electronic
Firing order	1–3–4–2

IGNITION COIL SPECIFICATIONS

Items	4G1	4G9
Type	Molded single-coil with a built-in distributor	Molded 2-coil

SPARK PLUG SPECIFICATIONS

Items	4G1	4G9 – except MVV	4G9-MVV
NGK	BPR5ES-11	BKR6E-11	BKR5E-11
NIPPON DENSO	W16EPR11	K20PR-U11	K16PR-U11
CHAMPION	RN11YC4	RC9YC4	RC12YC4

SERVICE SPECIFICATIONS

16300030121

IGNITION COIL

Items	4G1	4G9 – except MVV	4G9-MVV
Primary coil resistance Ω	0.5–0.7	–	–
Secondary coil resistance kΩ	15–22	14–21	20–30

SPARK PLUG

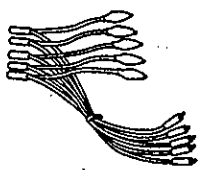
Items	4G1, 4G9
Spark plug gap mm	1.0–1.1

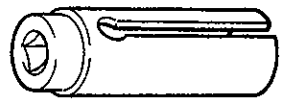
RESISTIVE CORD

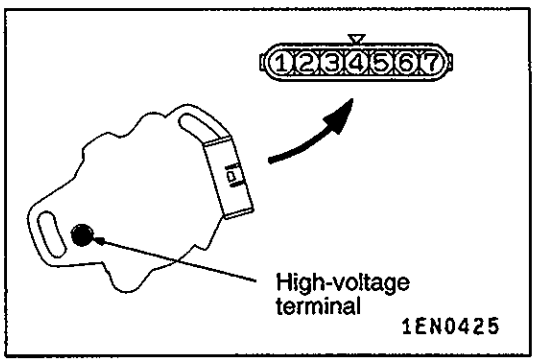
Items	4G1, 4G9
Resistance kΩ	max. 22

SPECIAL TOOL

16300060070

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

Tool	Number	Name	Use
	MD998770	Oxygen sensor wrench	Detonation sensor removal and installation

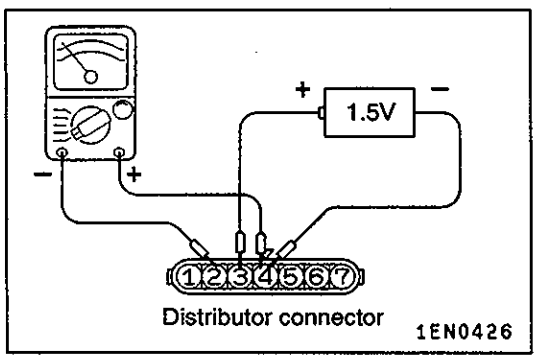


ON-VEHICLE SERVICE

16300120149

IGNITION COIL CHECK <4G1>

1. Measurement of the primary coil resistance
   Measure the resistance between connector terminal 1 and 2 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 1.
   Standard value: 15–22 kΩ



POWER TRANSISTOR CONTINUITY CHECK <4G1>

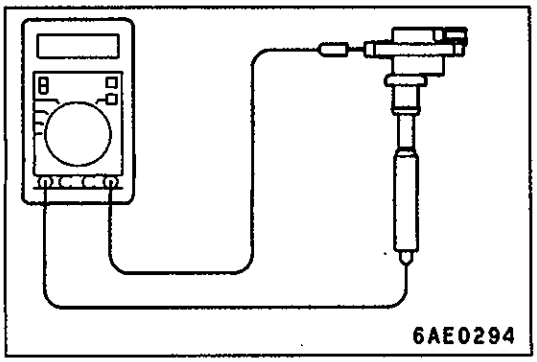
16300130104

NOTE
1. An analogue-type circuit tester should be used.
2. Connect the negative (–) prove of the circuit tester to terminal 2.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning and power transistor from breakage.

Voltage: 1.5V	Terminal No.		
	2	3	4
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 <4G9>

16300120156

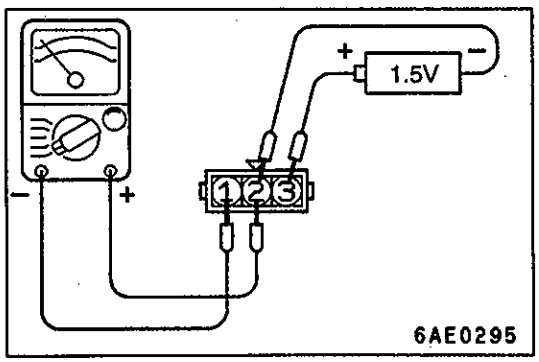
Check by the following procedure, and replace if there is a malfunction.

SECONDARY COIL RESISTANCE CHECK

Measure the resistance between the high-voltage terminals of the ignition coil.

Standard value:

14 – 21 kΩ <except MVV>
20 – 30 kΩ <MVV>

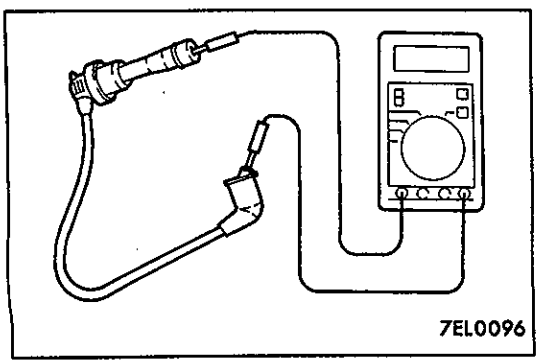


PRIMARY COIL AND POWER TRANSISTOR CONTINUITY CHECK

NOTE
1. An analogue-type circuit tester should be used.
2. Connect the negative (–) prove of the circuit tester to terminal 1.

Caution
This test must be performed quickly (in less than 10 seconds) to prevent coil from burning and power transistor from breaking.

Voltage: 1.5V	Terminal No.		
	1	2	3
When current is flowing	○	⊖	⊕
		○	
When current is not flowing			



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 <4G9> 16300180062

Check the detonation sensor circuit if self-diagnosis code, No. 31 is shown.

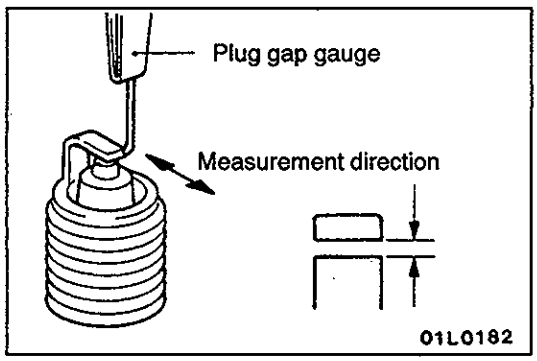
NOTE
For information concerning the self-diagnosis codes, after to GROUP 13A – Troubleshooting.

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 <4G1>, CAMSHAFT POSITION SENSOR, CRANK ANGLE SENSOR <4G9> CHECK

16300260223

Refer to GROUP 13A – Troubleshooting.

WAVEFORM CHECK USING AN ANALYZER

16300170199

Ignition Secondary Voltage Check

<4G1>

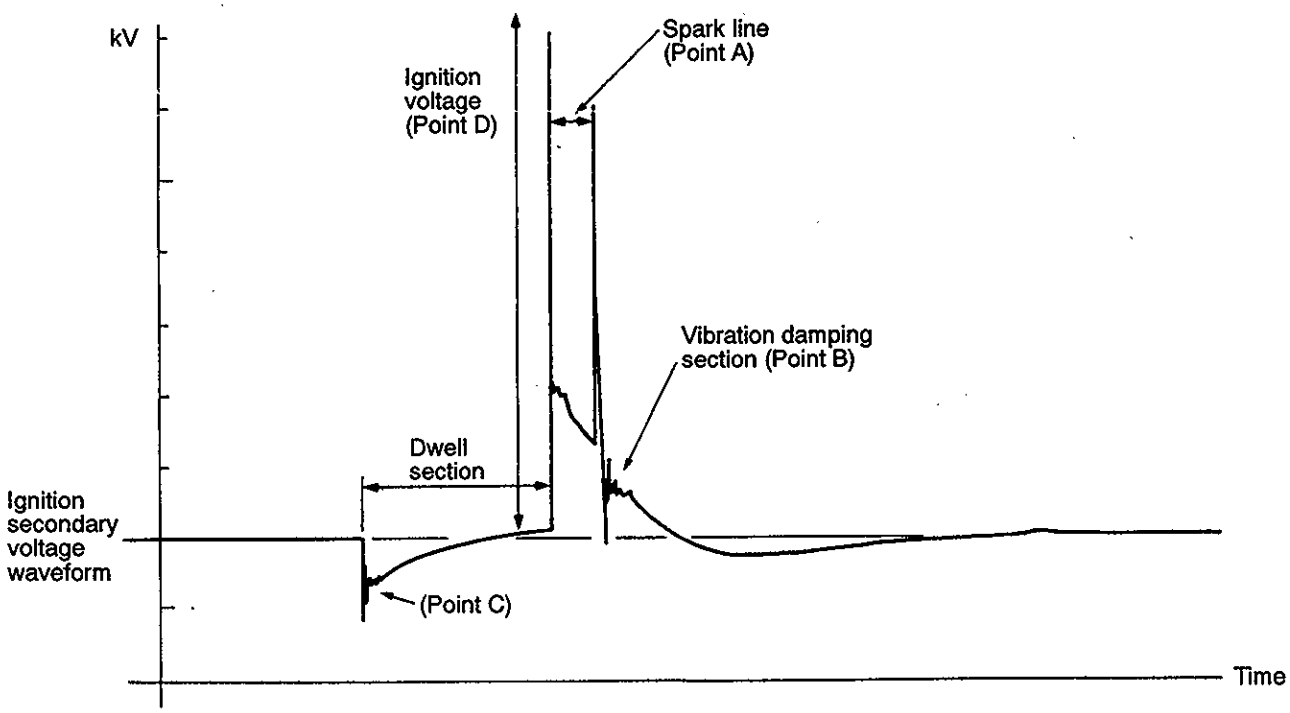
MEASUREMENT METHOD

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

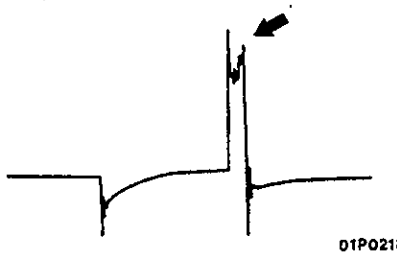
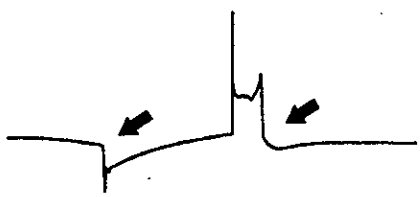
Point C: Number of vibrations at beginning of dwell section (Refer to abnormal waveform example 5)

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.	Layer short in ignition coil

<4G9>

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.

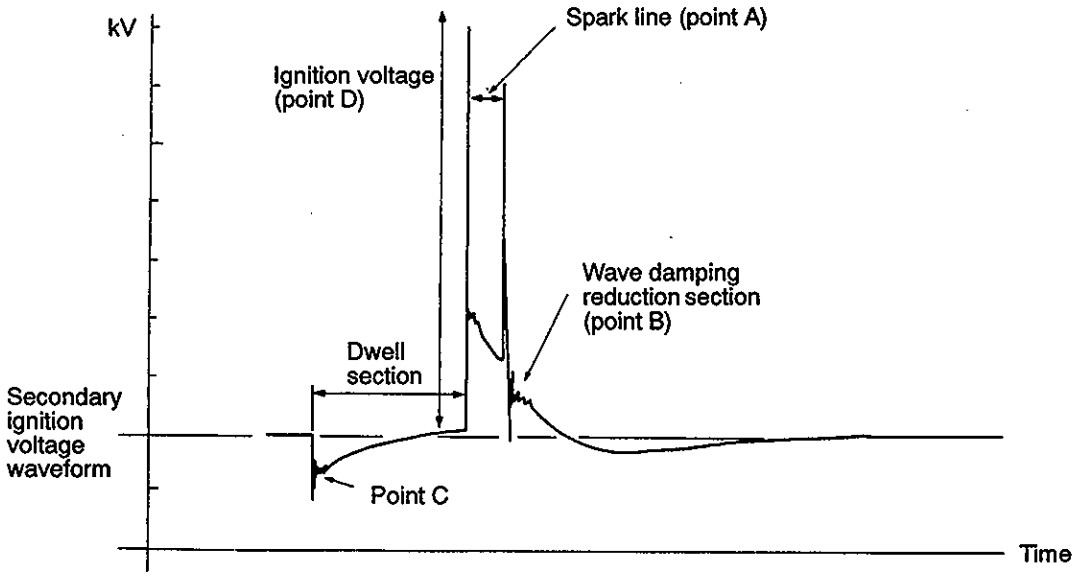
2. Clamp the spark plug cable with the trigger pickup.

   NOTE
   Clamp the trigger pickup to the same spark plug cable clamped by the secondary pickup.

STANDARD WAVEFORM

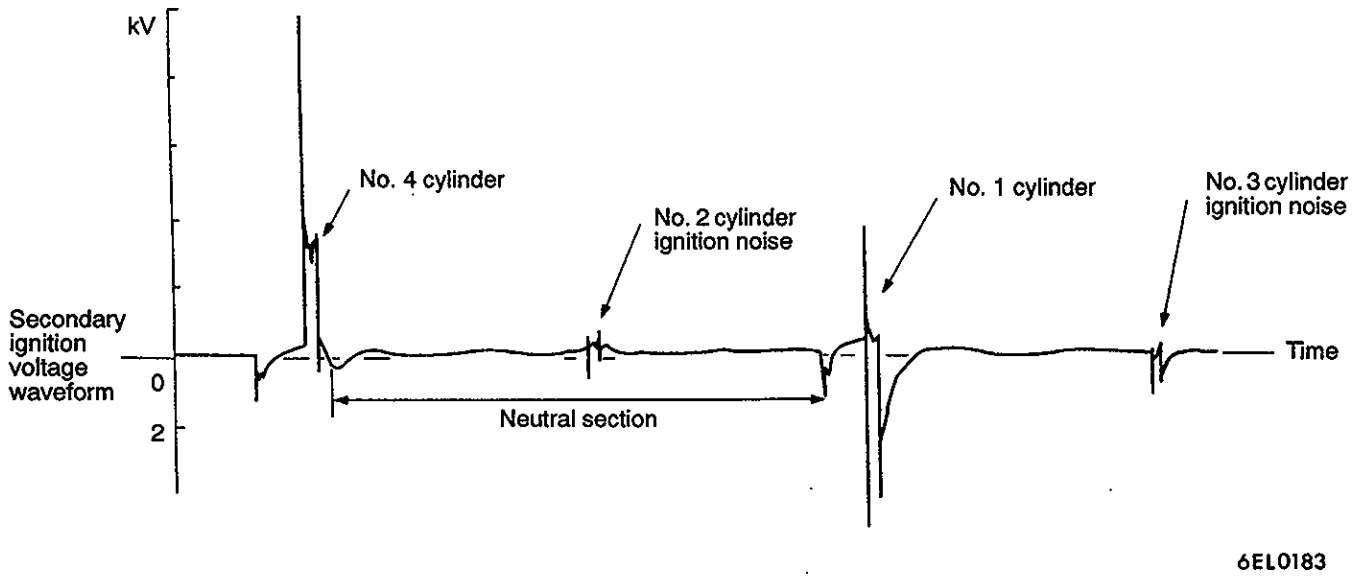
Observation Conditions

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.16-36.

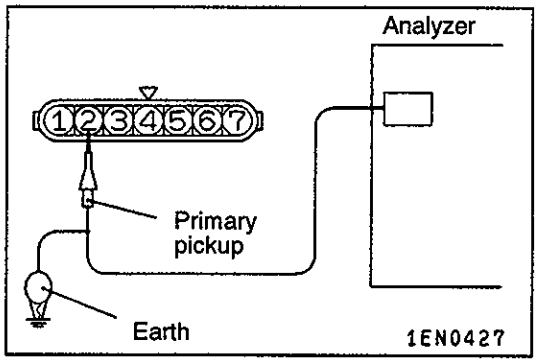
EXAMPLES OF ABNORMAL WAVEFORMS

For examples of abnormal waveforms, refer to P.16-37.

Ignition Primary Voltage Waveform Check <4G1>

MEASUREMENT METHOD

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



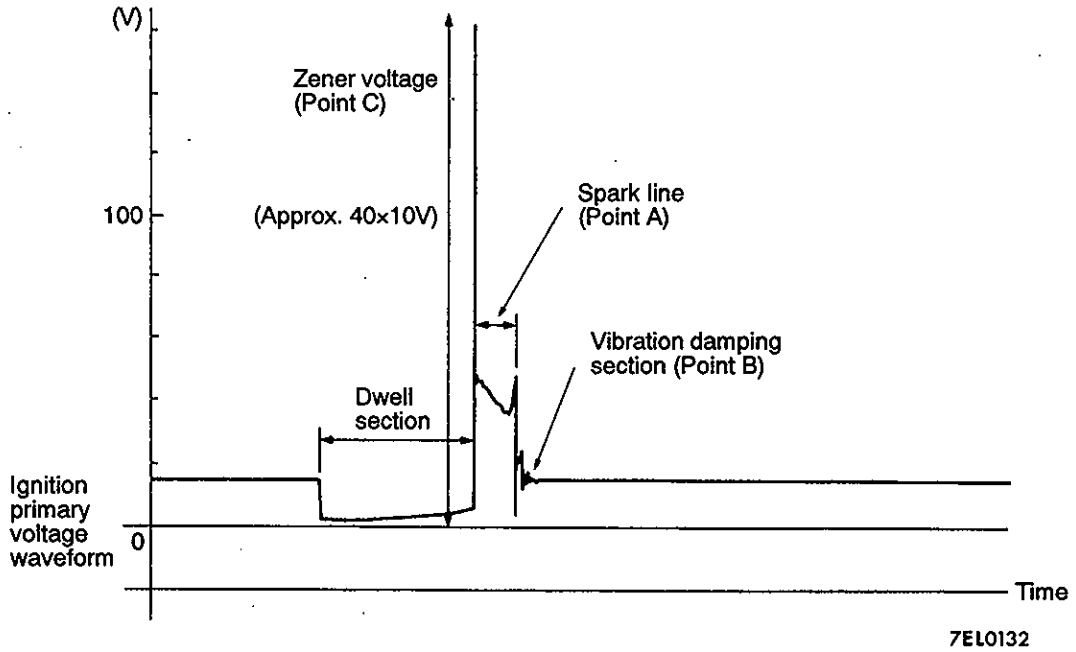
2. Connect the analyzer primary pickup to the distributor connector terminal 2.
3. Connect the primary pickup earth terminal.
4. Clamp the spark plug cable with the trigger pickup.

NOTE
The waveform of the cylinder clamped to the trigger pickup will appear at the left edge of the screen.

STANDARD WAVEFORM

Observation conditions

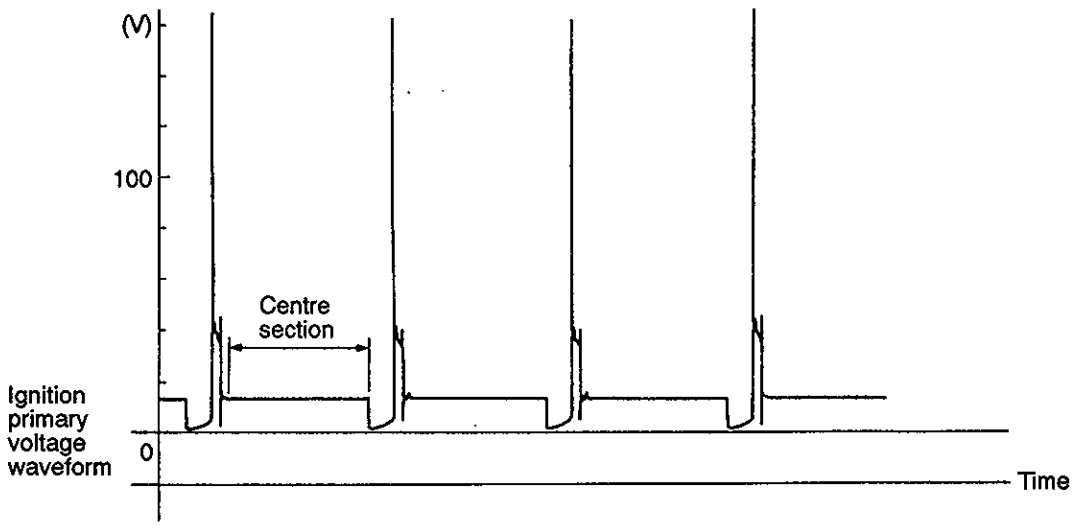
FUNCTION	SECONDARY
PATTERN HEIGHT	HIGH (or LOW)
PATTERN SELECTOR	RASTER
Engine Speed	Curb idle speed



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	–	–	–	–

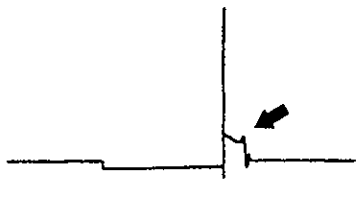
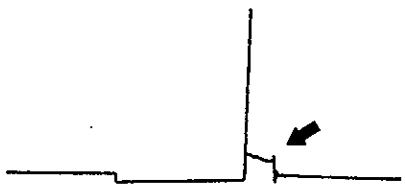
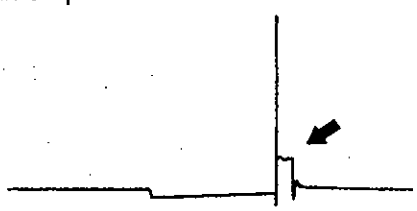
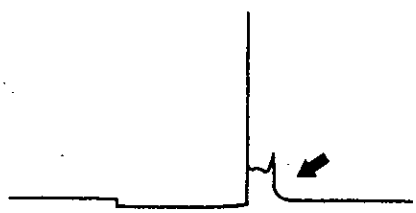
Point B: Number of vibration in reduction vibration section (Refer to abnormal waveform example 5)

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

Point C: Height of Zener voltage

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

EXAMPLES OF ABNORMAL WAVEFORMS

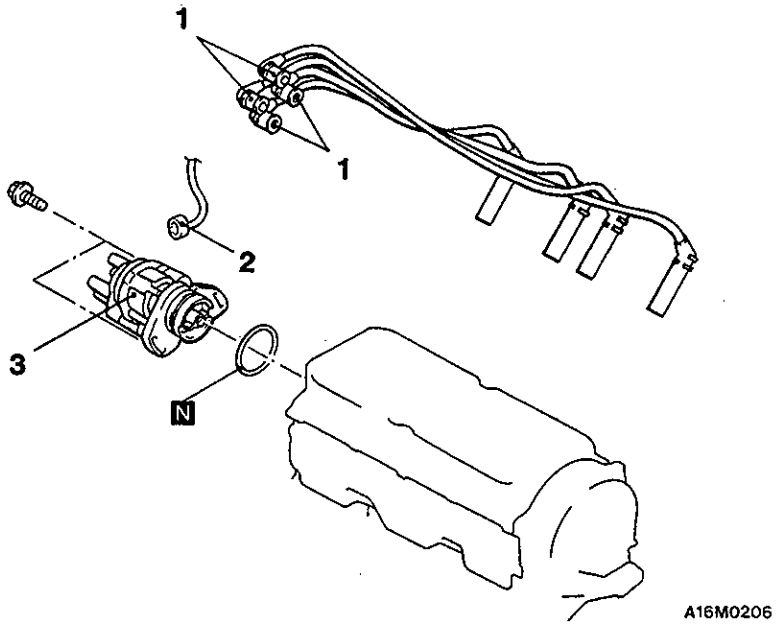
Abnormal waveform	Wave characteristics	Cause of problem
Example 1  01P0210	Spark line is high and short.	Spark plug gap is too large.
Example 2  01P0211	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.	Spark plug gap 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	Layer short in ignition coil

DISTRIBUTOR <4G1>

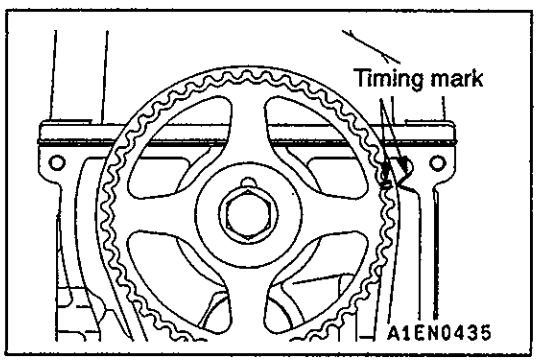
16300200096

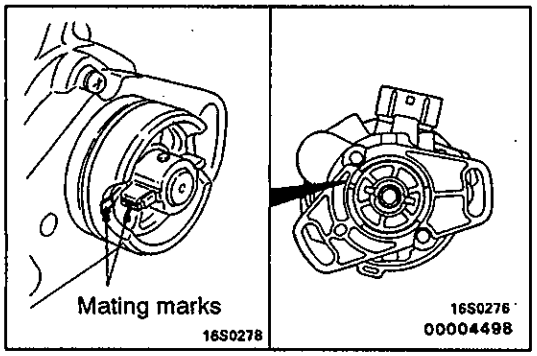
REMOVAL AND INSTALLATION

Post-Installation Operation
- Engine Adjustment
  (Refer to GROUP 11 – On-vehicle Service.)



Removal steps
1. Spark plug cable connection
2. Distributor connector
▶A◀ 3. Distributor





INSTALLATION SERVICE POINT

▶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.
4. Install the distributor to the engine.

INSPECTION

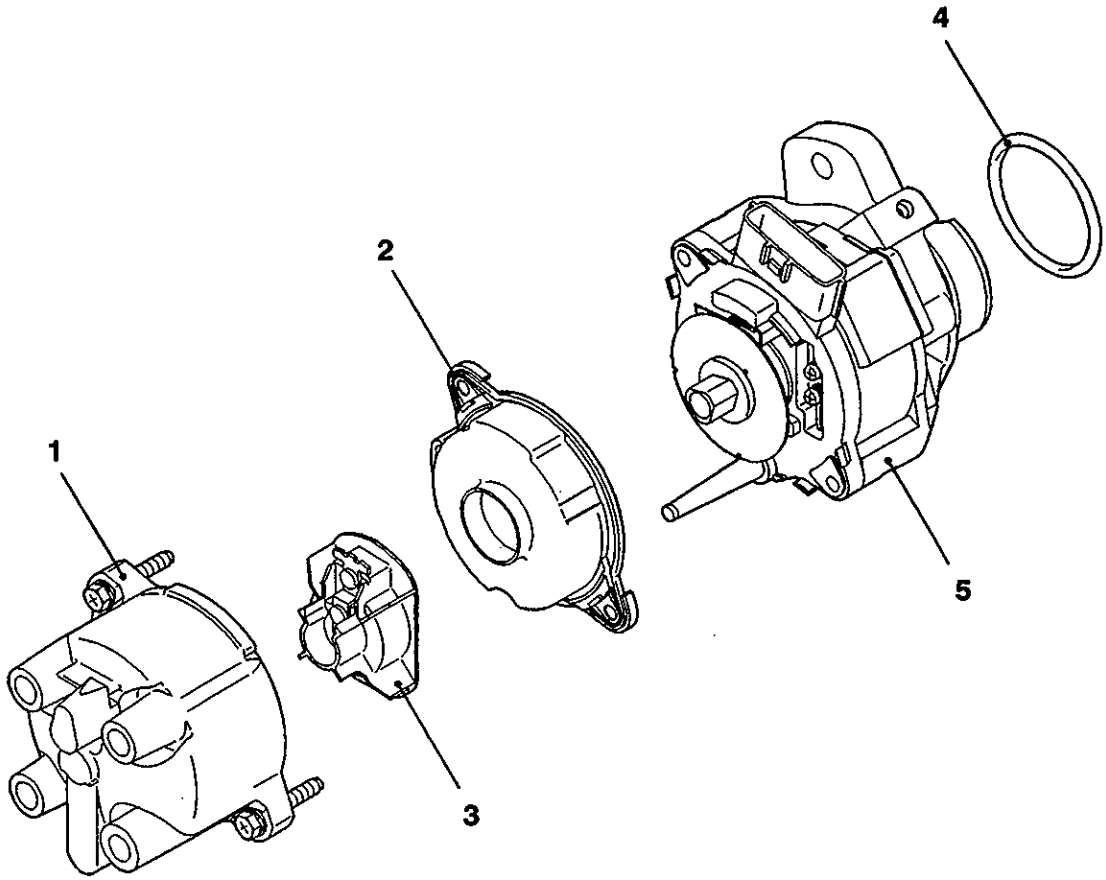
16300260254

CAMSHAFT POSITION SENSOR, CRANKSHAFT POSITION SENSOR CHECK

Refer to GROUP 13A – Troubleshooting.

DISASSEMBLY AND REASSEMBLY

16300220078



1EN0428

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.

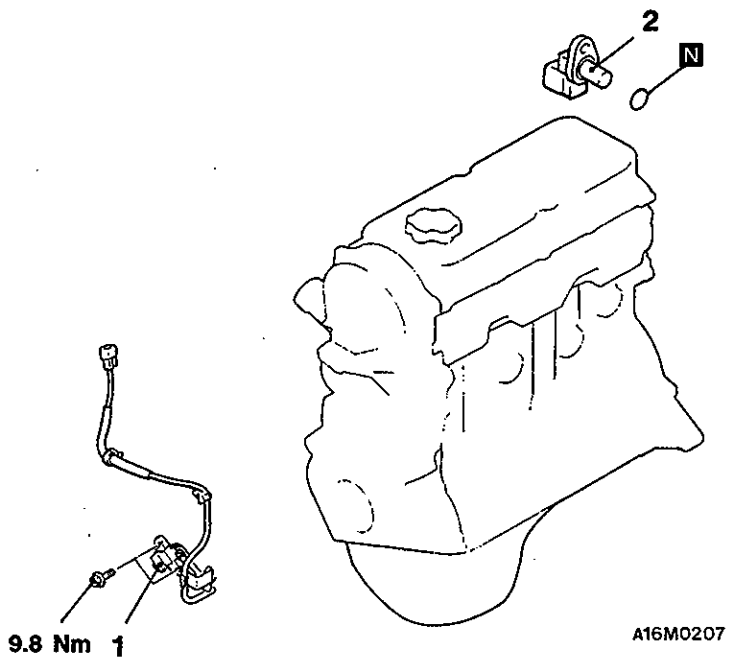
CAP, ROTOR

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

CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR <4G9>

16300250121

REMOVAL AND INSTALLATION



1. Crank angle sensor
2. Camshaft position sensor

INSPECTION

16300260247

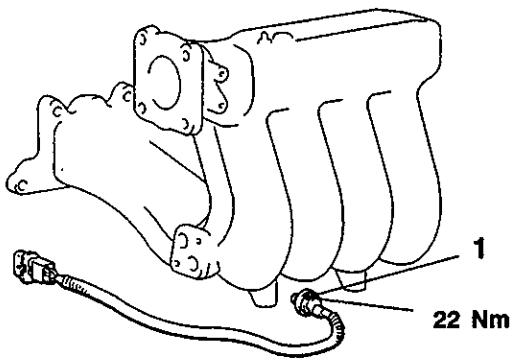
CAMSHAFT POSITION SENSOR, CRANK ANGLE SENSOR CHECK

Refer to GROUP 13A – Troubleshooting.

DETONATION SENSOR <4G9>

16300280113

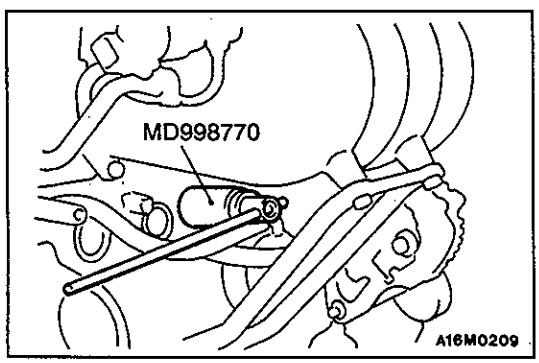
REMOVAL AND INSTALLATION



A16M0208

◀A▶ 1. Detonation sensor

Caution
Do not subject the detonation sensor to any shocks.



A16M0209

REMOVAL SERVICE POINT

◀A▶ DETONATION SENSOR REMOVAL

INSPECTION

16300290048

DETONATION SENSOR CHECK

Refer to GROUP 13A – Troubleshooting.

NOTES

ENGINE AND EMISSION CONTROL

CONTENTS

17109000063

CONTINUED ON NEXT PAGE

ENGINE CONTROL SYSTEM

17100010027

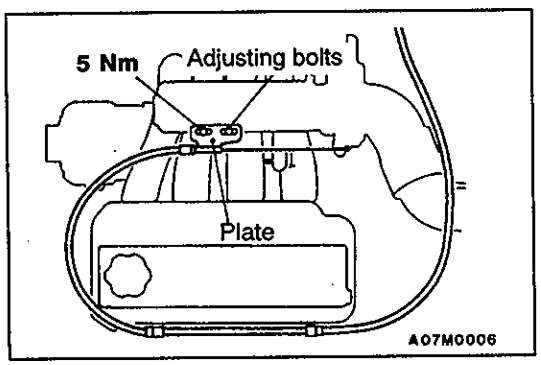
GENERAL INFORMATION

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

SERVICE SPECIFICATIONS

17100030078

Items		Standard value
Accelerator cable play mm		1–2
Engine idle speed r/min	4G1	750 ± 100
	4G9 <except MVV>	800 ± 100
	4G9 <MVV>	700 ± 100



ON-VEHICLE SERVICE

17100090137

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:
   <4G1> 750 ± 100 r/min
   <4G9 (except MVV)> 800 ± 100 r/min
   <4G9 (MVV)> 700 ± 100 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

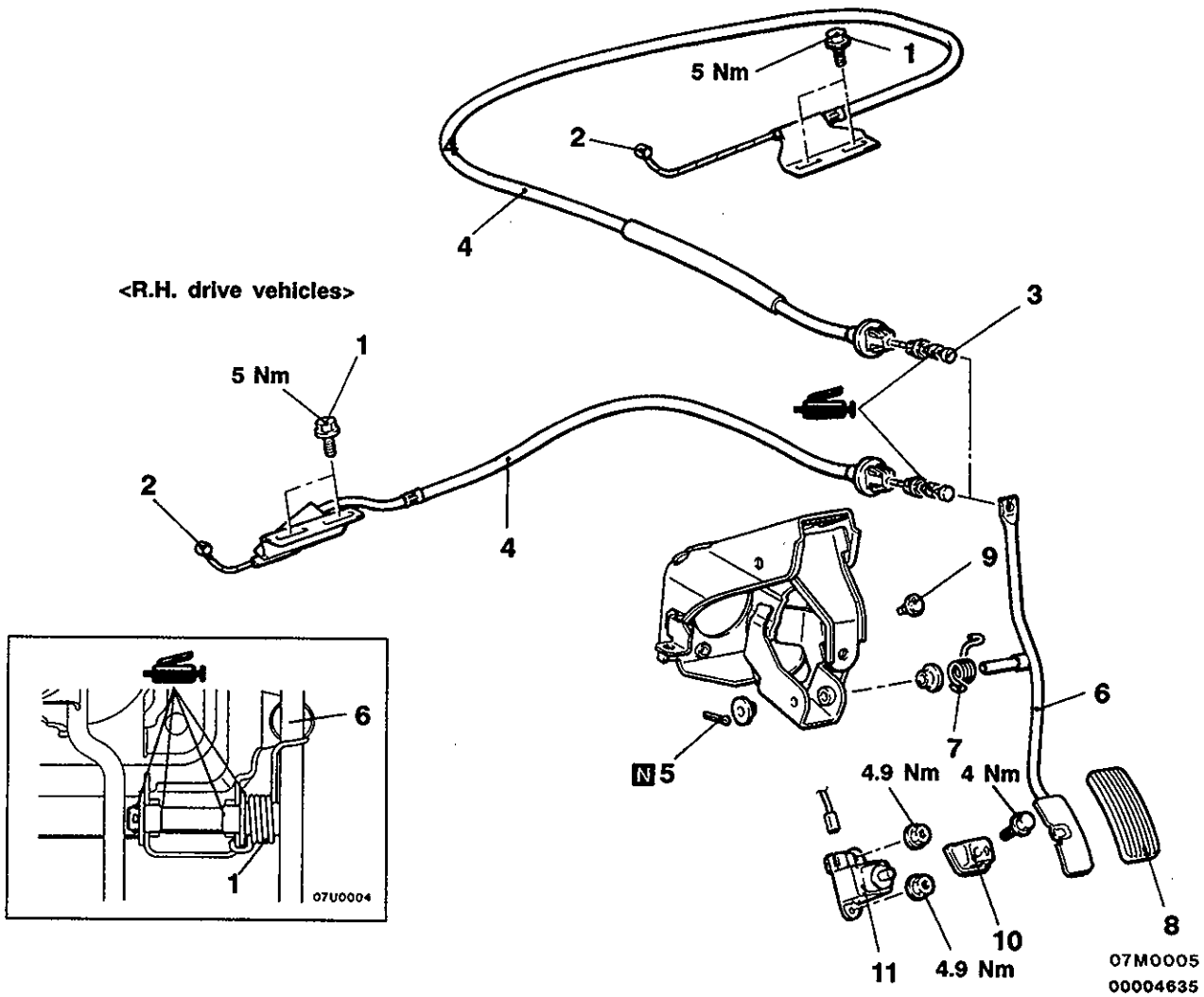
17100120133

REMOVAL AND INSTALLATION

Post-installation Operation
- Adjusting the Accelerator Cable (Refer to P.17-3.)

<L.H. drive vehicles>

<R.H. drive vehicles>



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. Wide open throttle switch <A/T>

EMISSION CONTROL SYSTEM

17300010122

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 ON/OFF type solenoid valve <4G1> Duty cycle type solenoid valve <4G9> (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	×					17-11
Purge control solenoid valve		×				17-14
MPI system component		×	×			GROUP 13A
Catalytic converter				×		17-20
EGR valve					×	17-17
EGR control solenoid valve					×	17-18

SERVICE SPECIFICATIONS

17300030135

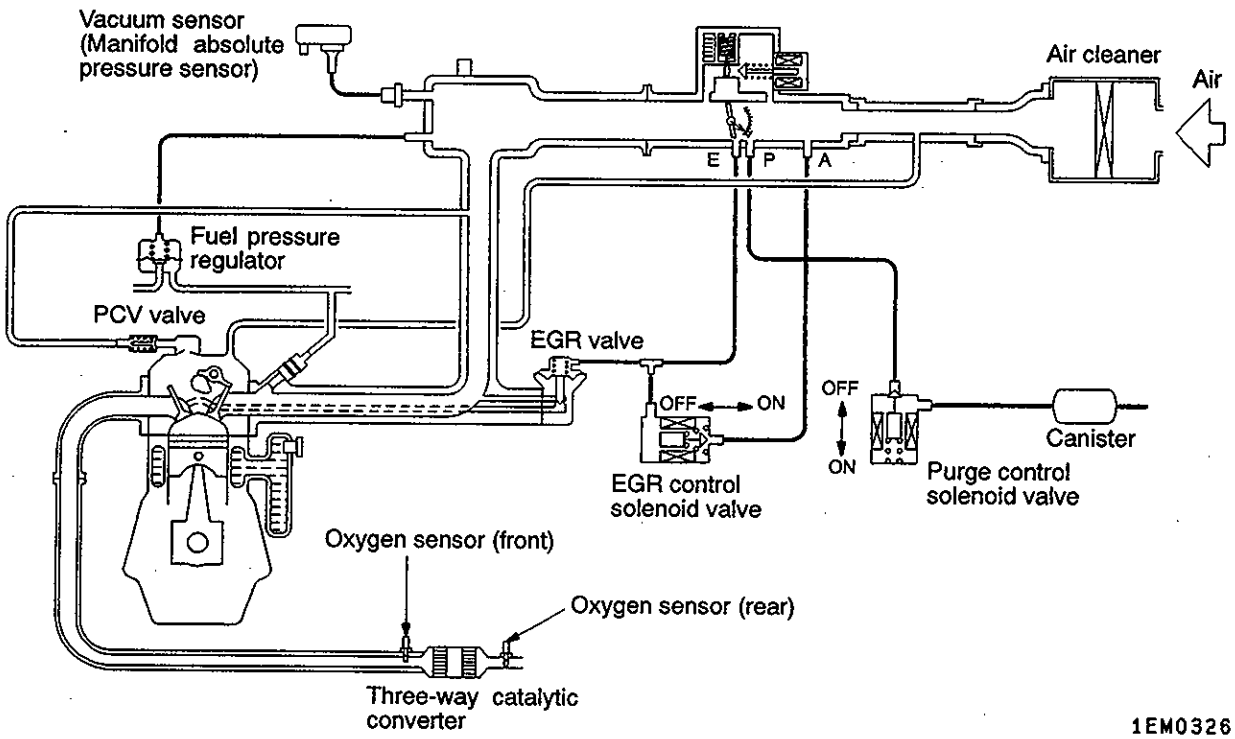
Items	Standard value
Purge control solenoid valve coil resistance (at 20°C) Ω	36 – 44
EGR control solenoid valve coil resistance (at 20°C) Ω	36 – 44

VACUUM HOSE

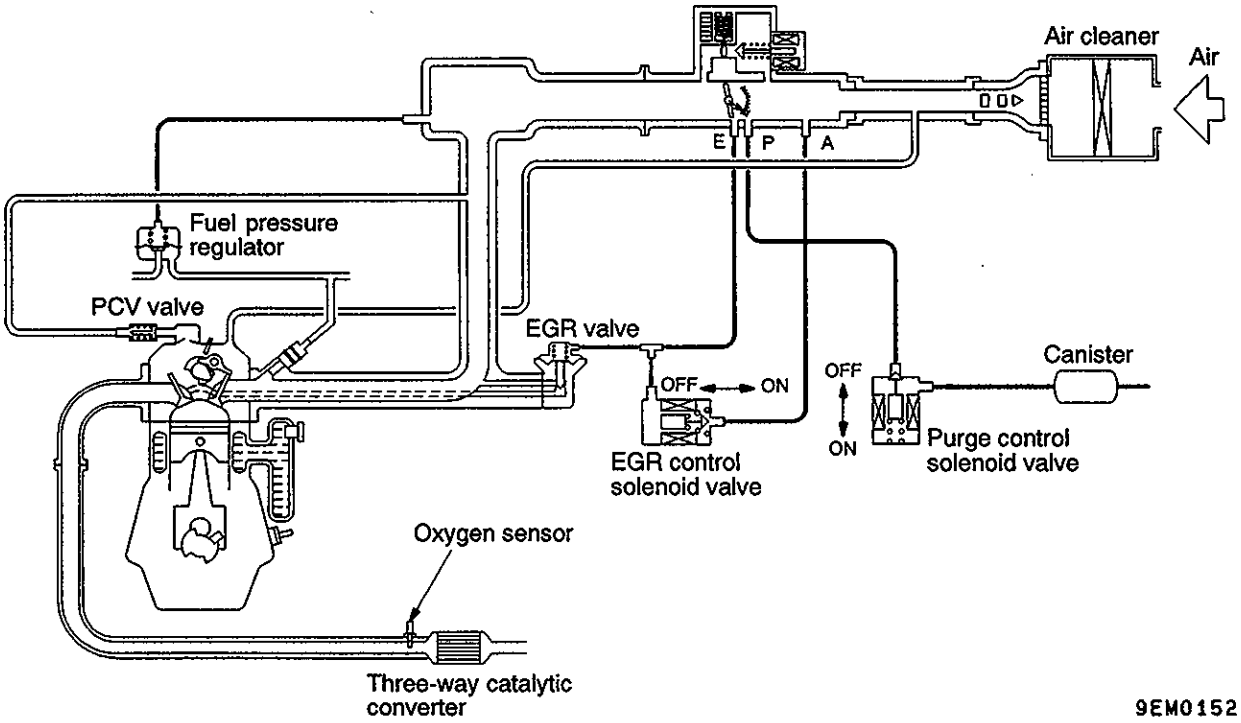
17300090140

VACUUM HOSE PIPING DIAGRAM

<4G1>



<4G9–except MVV>



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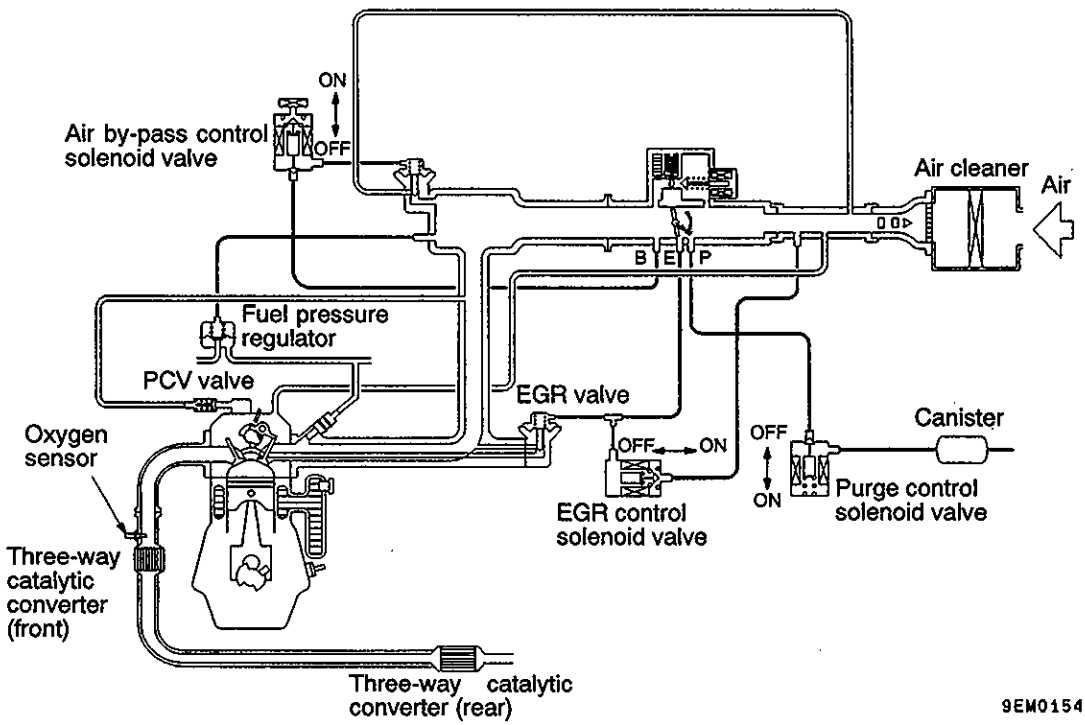
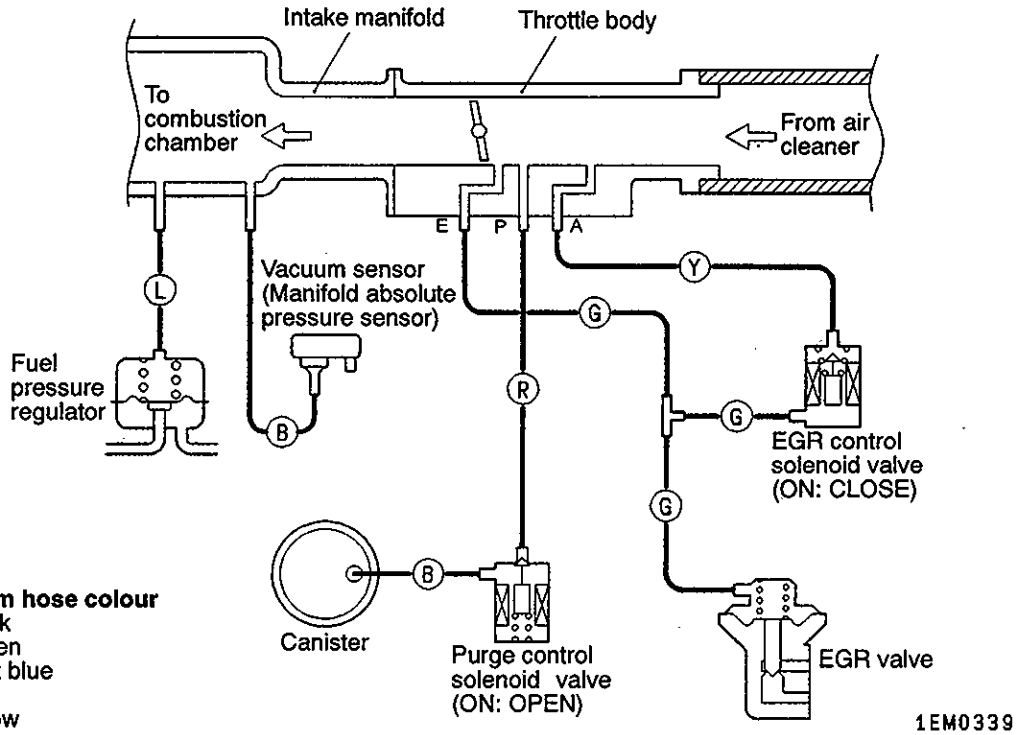


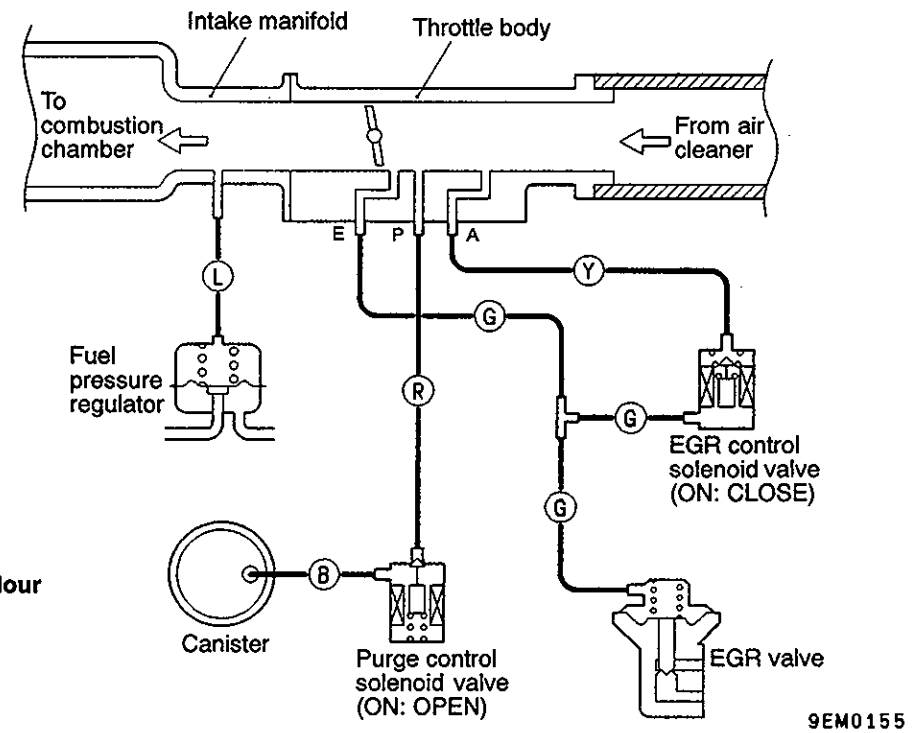
VACUUM CIRCUIT DIAGRAM

<4G1>



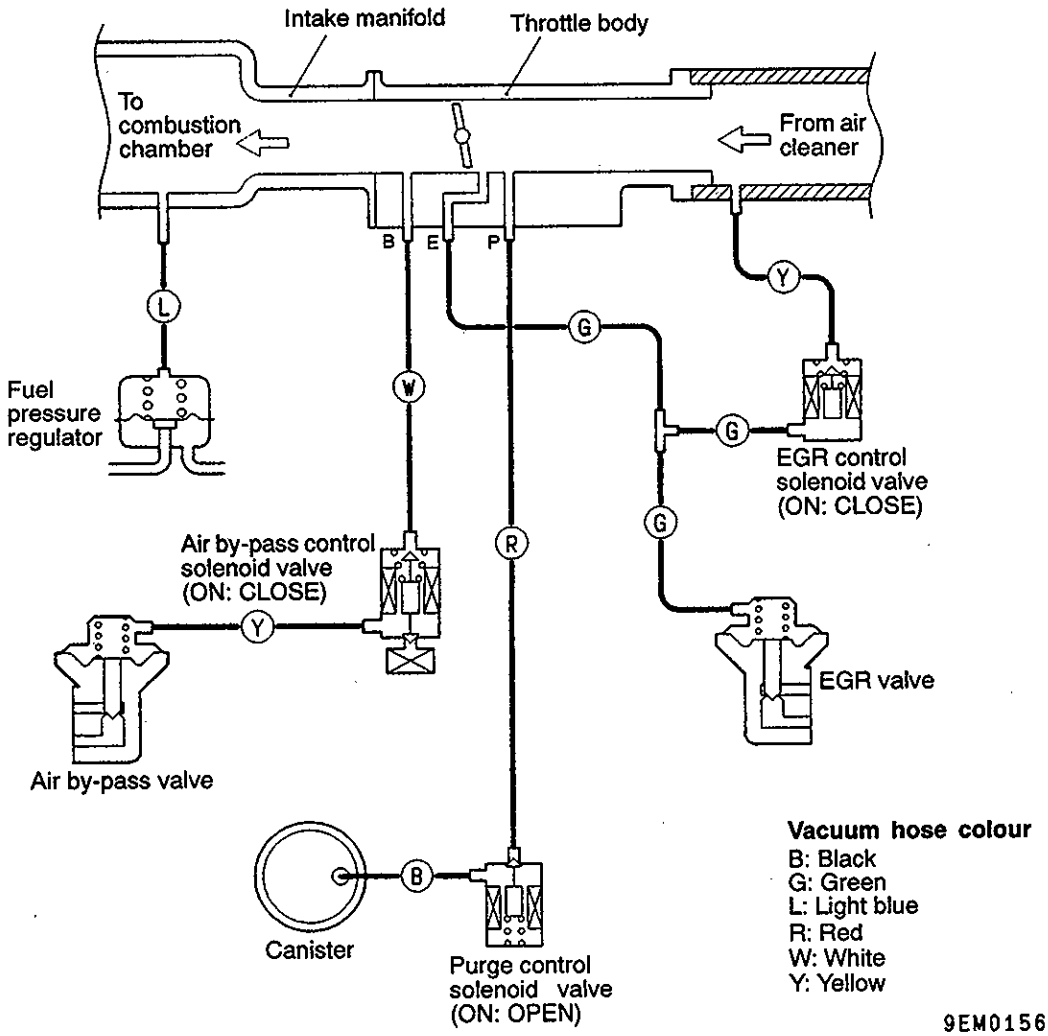
Vacuum hose colour
B: Black
G: Green
L: Light blue
R: Red
Y: Yellow

<4G9–EXCEPT MVV>



Vacuum hose colour
B: Black
G: Green
L: Light blue
R: Red
Y: Yellow

<4G9-MVV>



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

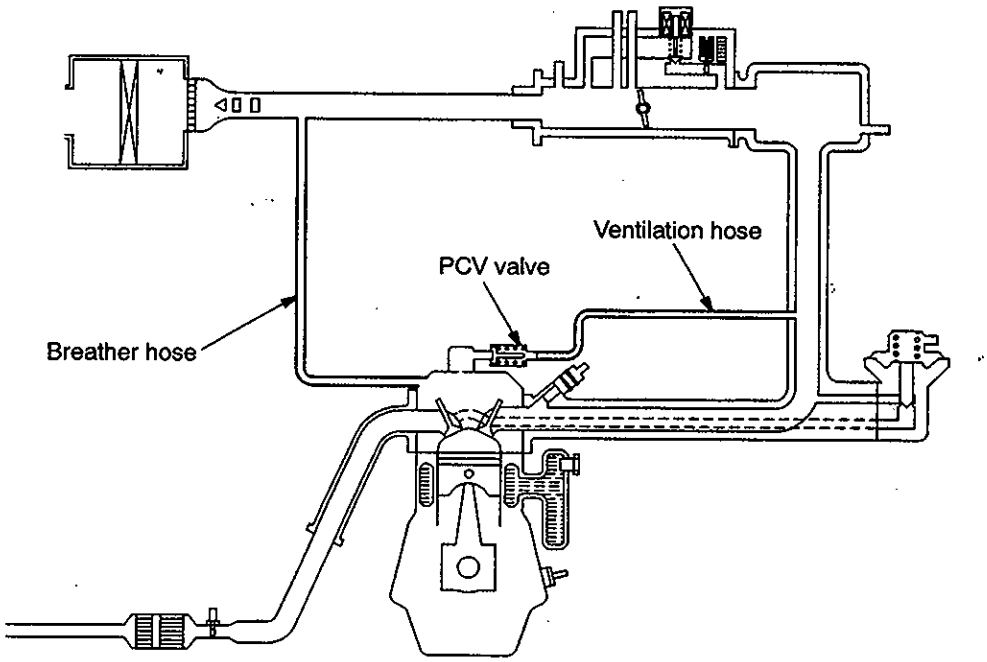
17300500124

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 (PCV) valve.

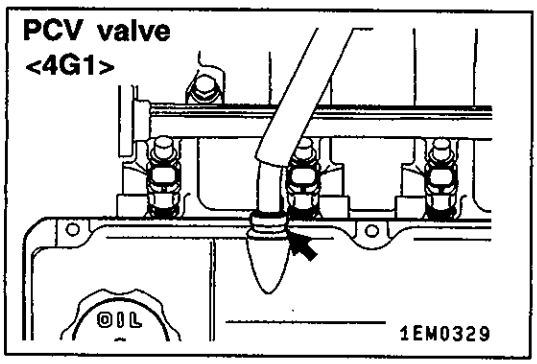
The PCV valve lifts the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly. In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

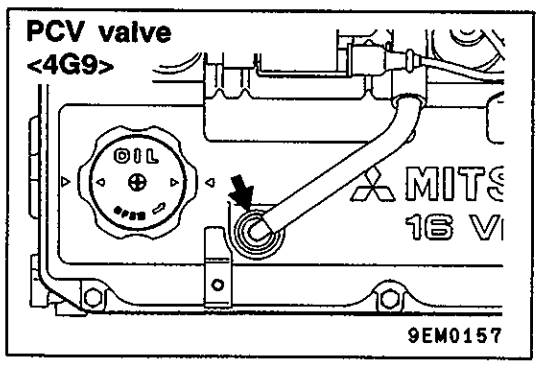
SYSTEM DIAGRAM



9EM0133

COMPONENT LOCATION

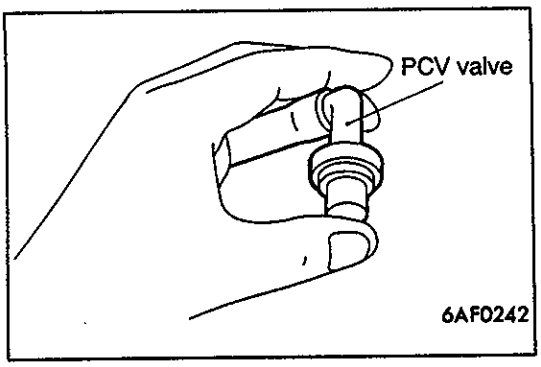




POSITIVE CRANKCASE VENTILATION SYSTEM CHECK

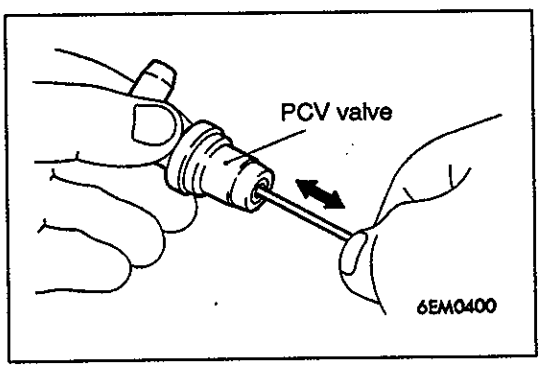
17300110136

1. Remove the ventilation hose from the PCV valve.
2. Remove the PCV valve from the rocker cover.
3. Reinstall the PCV valve at the ventilation hose.
4. Start the engine and run at idle.



5. Place a finger at the opening of the PCV valve and check that vacuum of the intake manifold is felt.

   NOTE
   At this moment, the plunger in the PCV valve moves back and forth.
6. If vacuum is not felt, clean the PCV valve or replace it.



PCV VALVE CHECK

17300120122

1. Insert a thin rod into the PCV 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 clogging in the PCV valve. In this case, clean or replace the PCV valve.

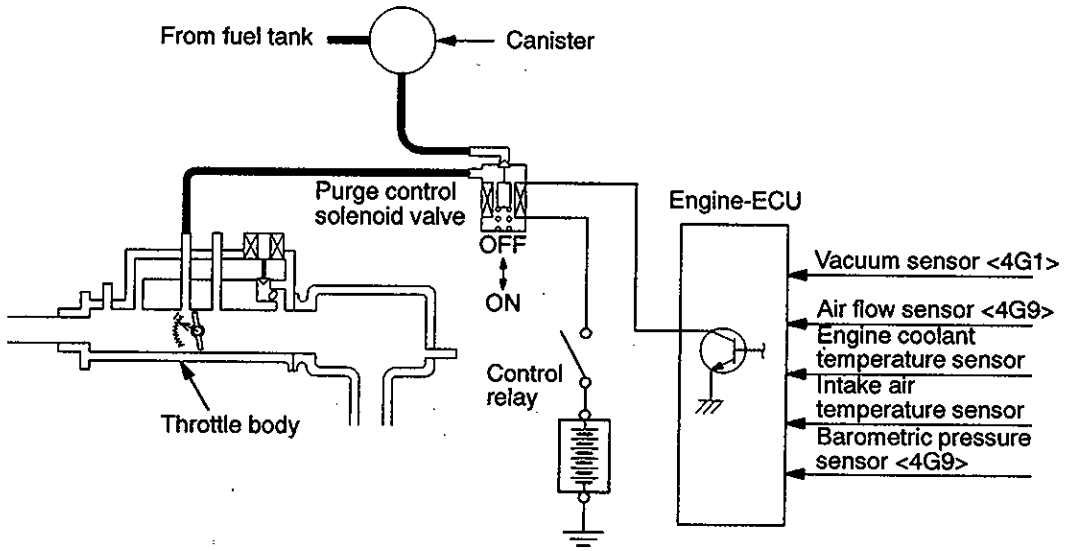
EVAPORATIVE EMISSION CONTROL SYSTEM

17300510189

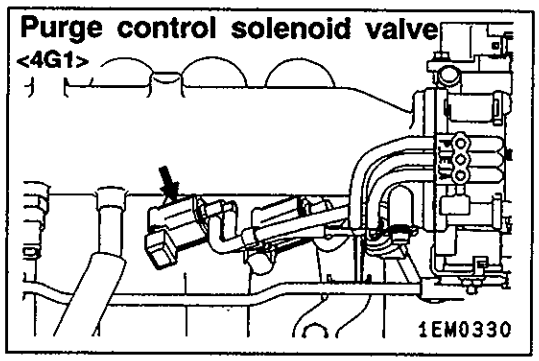
GENERAL INFORMATION

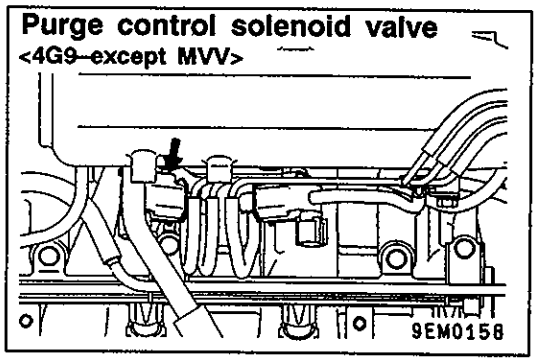
The evaporative emission control system prevents fuel vapours generated in the fuel tank from escaping into the atmosphere.
Fuel vapours from the fuel tank flow through the fuel tank pressure control valve and vapour pipe/hose to be stored temporarily in the canister. When driving the vehicle, fuel vapours 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.

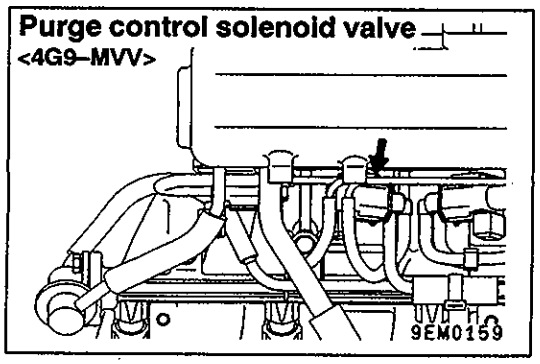
SYSTEM DIAGRAM

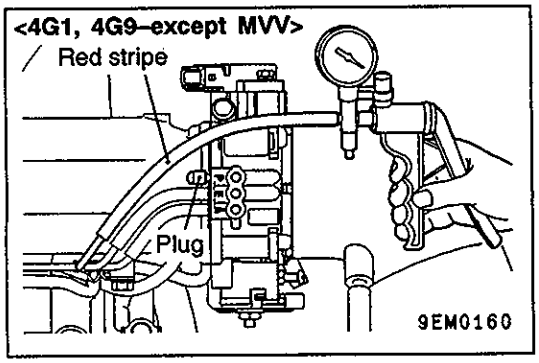


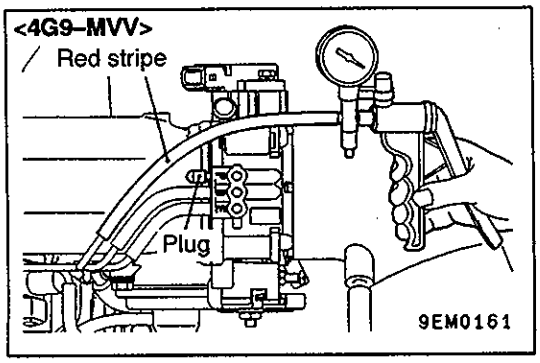
COMPONENT LOCATION











PURGE CONTROL SYSTEM CHECK 17300140166

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.

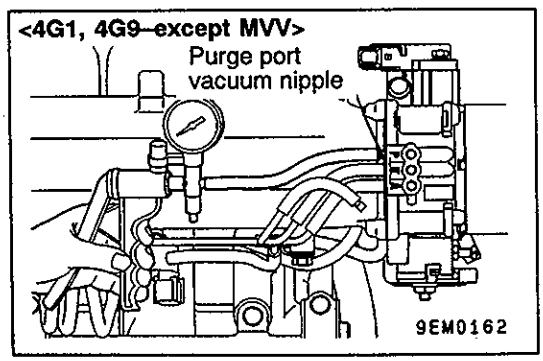
When engine is cold
(Engine coolant temperature: 40°C or less)

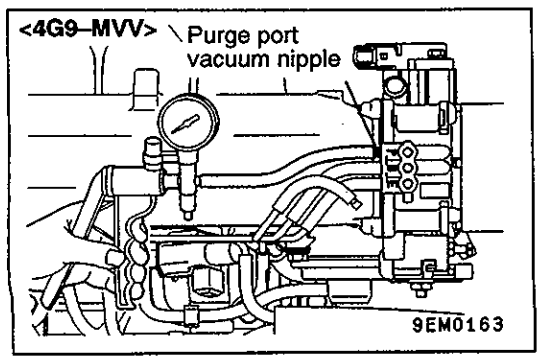
Vacuum	Engine condition	Normal condition
53 kPa	3,000 r/min	Vacuum is maintained

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.*

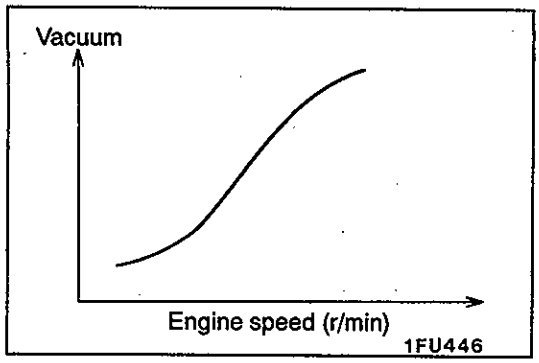
NOTE
*: The vacuum will leak continuously if the atmospheric pressure is approximately 77 kPa or less, or the temperature of the intake air is approximately 50°C or higher.





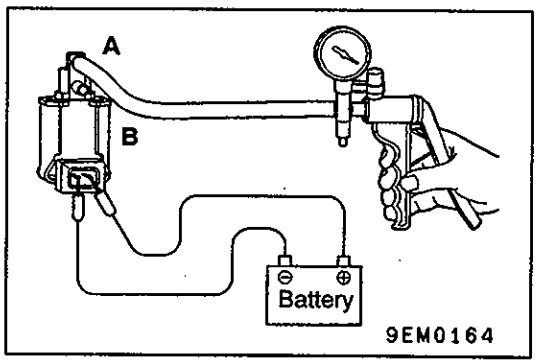
PURGE PORT VACUUM CHECK 17300150138

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.



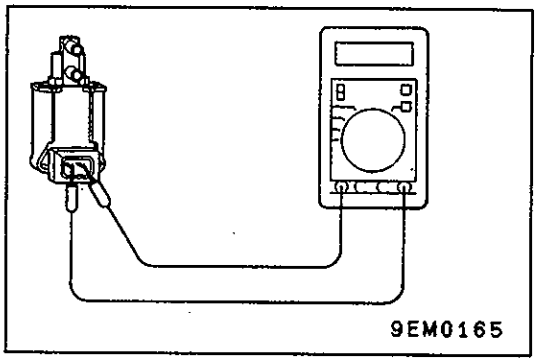
PURGE CONTROL SOLENOID VALVE CHECK

17300170127

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: 36–44 Ω (at 20°C)

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

17300520137

GENERAL INFORMATION

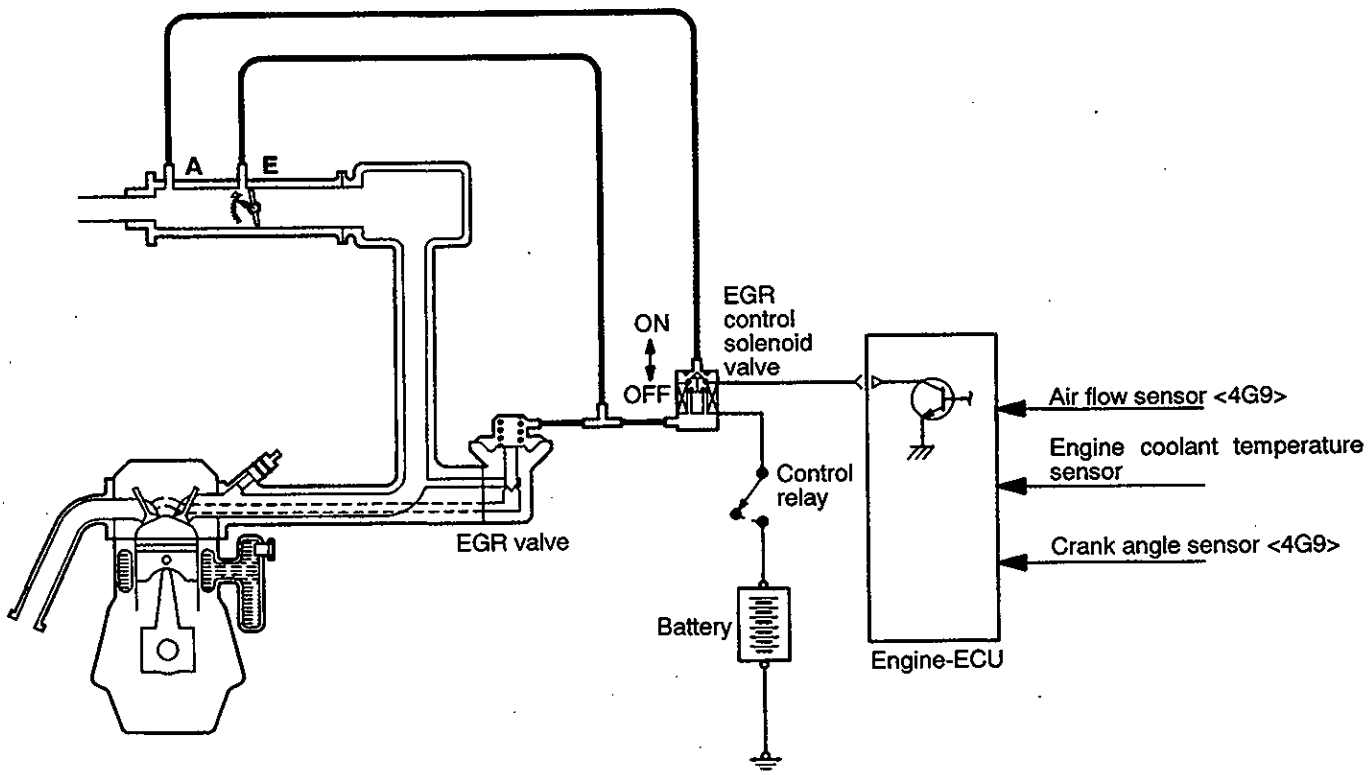
The exhaust gas recirculation (EGR) system lowers the nitrogen oxide (NOx) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of nitrogen oxides (NOx) is generated in the combustion chamber. Therefore, this system recirculates part of emission gas from the exhaust 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.

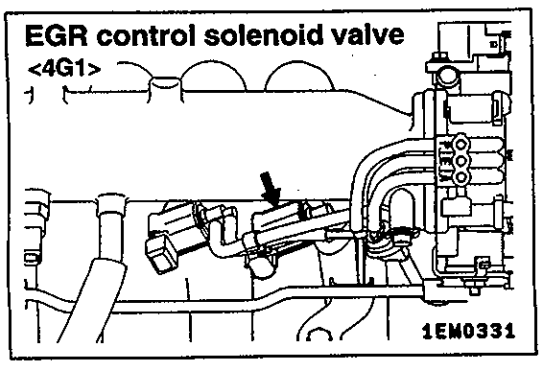
- The engine coolant temperature is low.
- The engine is at idle.
- The throttle valve is widely opened.

SYSTEM DIAGRAM

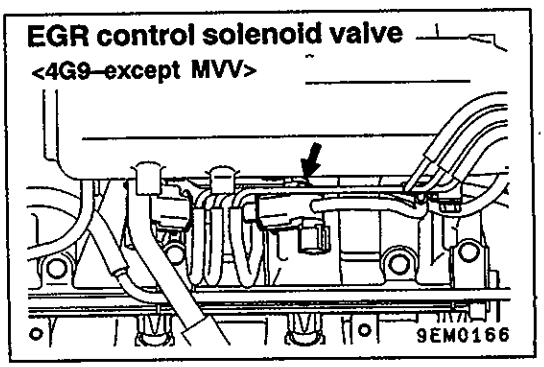


9EM0130

COMPONENT LOCATION



1EM0331



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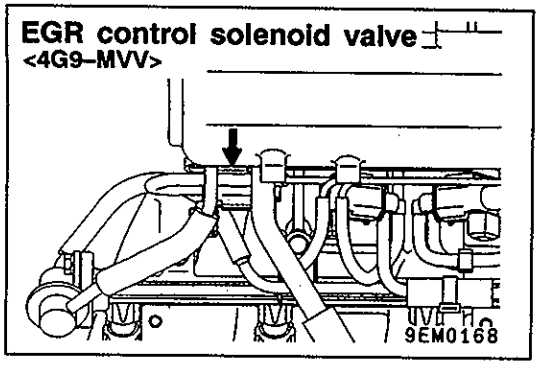
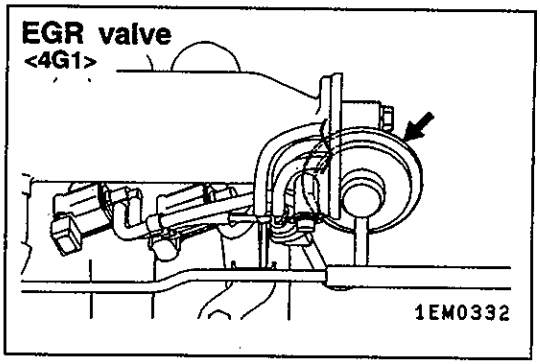
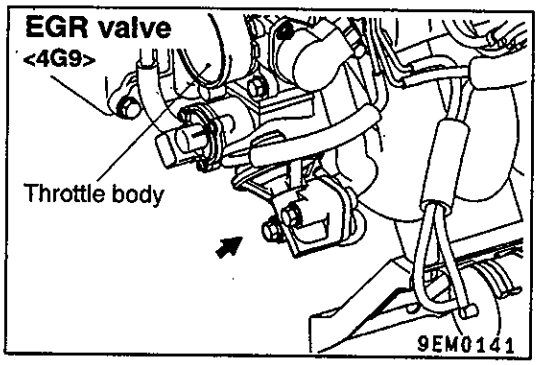
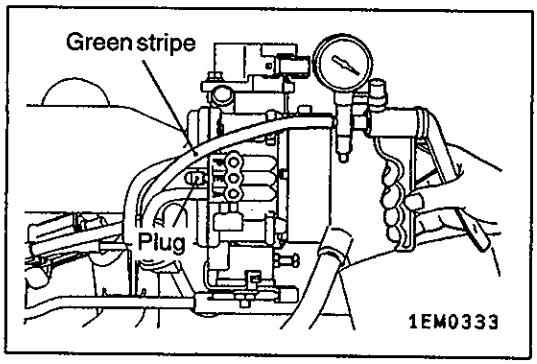








EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM CHECK <4G1> 17300260152

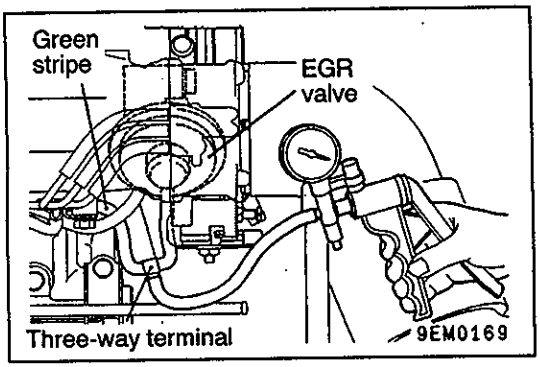
1. Disconnect the vacuum hose (green stripe) from the throttle body, and connect a hand vacuum pump to the vacuum hose.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold and hot, apply a vacuum while the engine is idling, and check the condition of the engine and the vacuum.

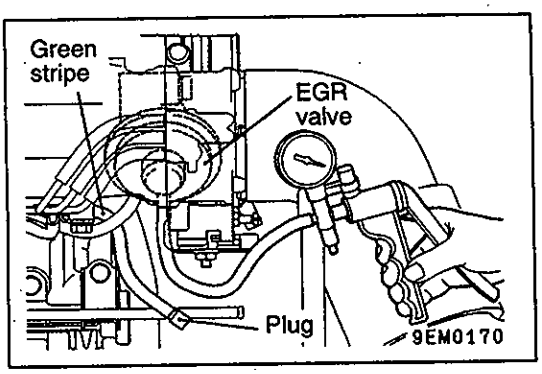
When engine is cold (Engine coolant temperature: 40°C or less)

Hand vacuum pump	Normal engine condition	Normal vacuum condition
Vacuum is applied	No change	Vacuum leaks

When engine is hot (Engine coolant temperature: 80°C or higher)

Hand vacuum pump	Normal engine condition	Normal vacuum condition
5.3 kPa	No change	Vacuum is maintained
27 kPa	Idling becomes slightly unstable or engine stalls.	Vacuum is maintained





EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM CHECK <4G9> 17300260145

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.)

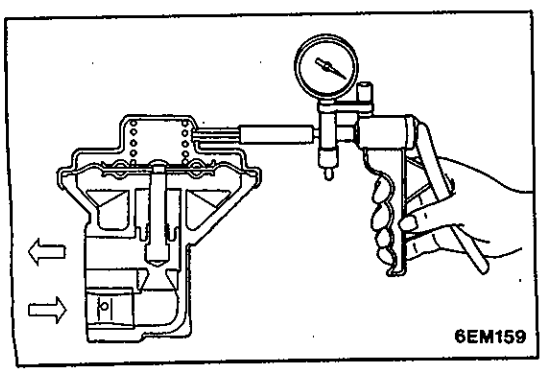
When engine is hot
(Engine coolant temperature: 80°C or higher)

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 17300280110

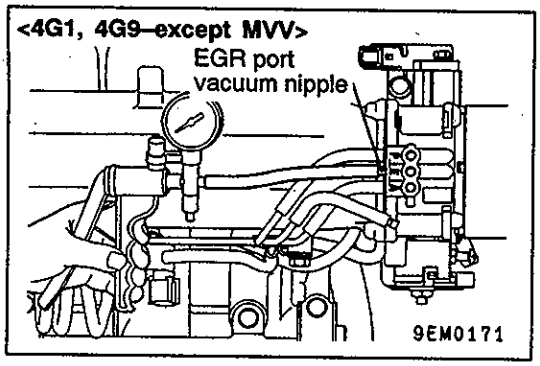
1. Remove the EGR valve and inspect for sticking, carbon deposits, etc. If found, clean with a suitable solvent so that the valve seats correctly.
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67 kPa of vacuum, and check that the vacuum is maintained.

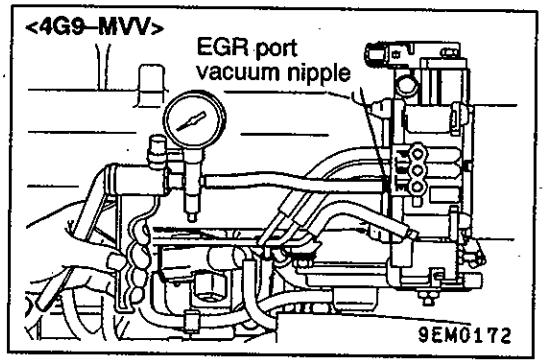


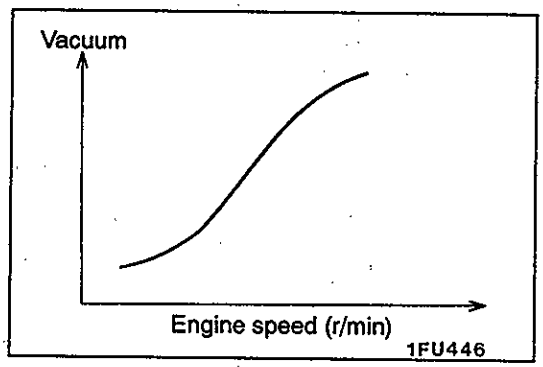
4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

Vacuum	Passage of air
5.3 kPa or less	Air is not blown out
27 kPa or more	Air is blown out

5. Replace the gasket, and tighten to the specified torque.
Specified torque: 22 Nm







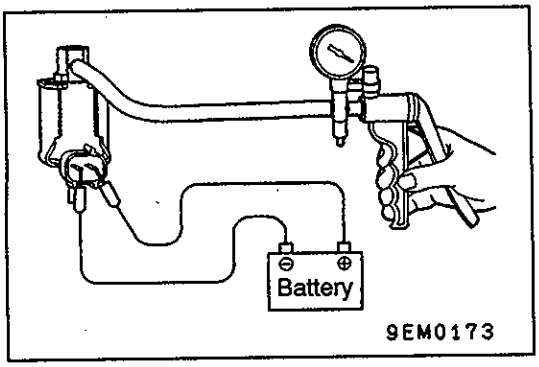
EGR PORT VACUUM CHECK

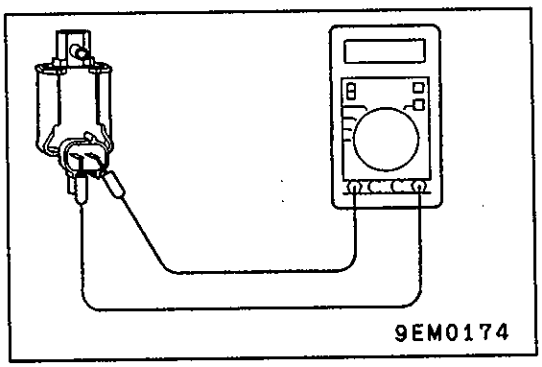
17300290106

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

17300310123

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

1. Disconnect the vacuum hose (yellow stripe, green stripe) from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Not applied	Vacuum leaks
Applied	Vacuum maintained

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

   Standard value: 36–44Ω (at 20°C)

CATALYTIC CONVERTER

17300530055

GENERAL INFORMATION

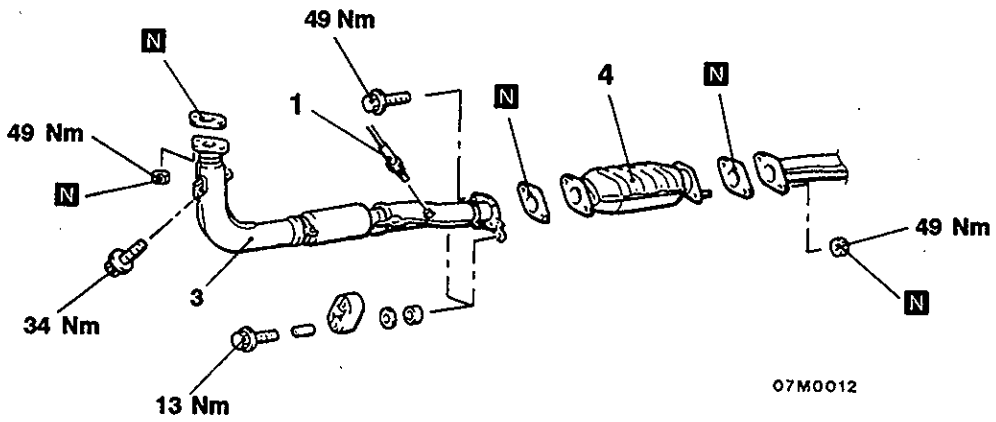
The three-way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC) and reduces nitrogen oxides (NOx).

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.

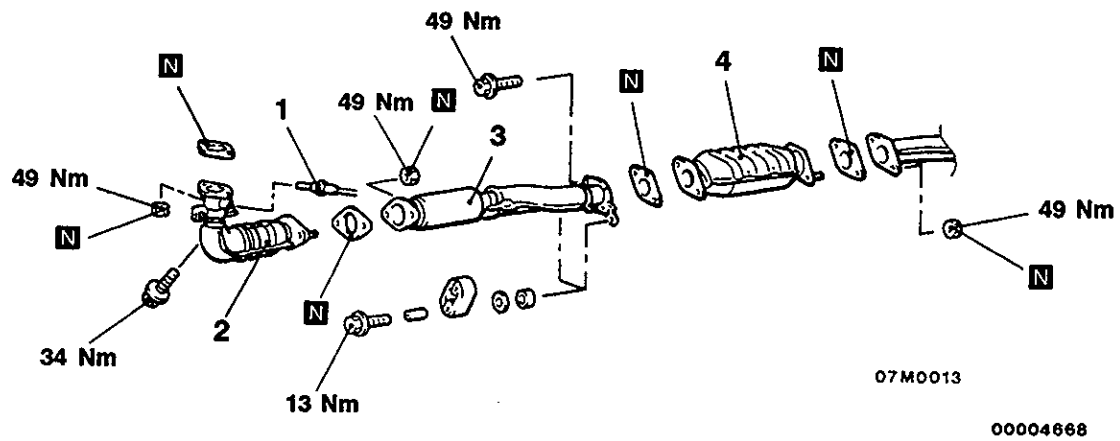
REMOVAL AND INSTALLATION

17300390110

<Except 4G9-MVV>



<4G9-MVV>



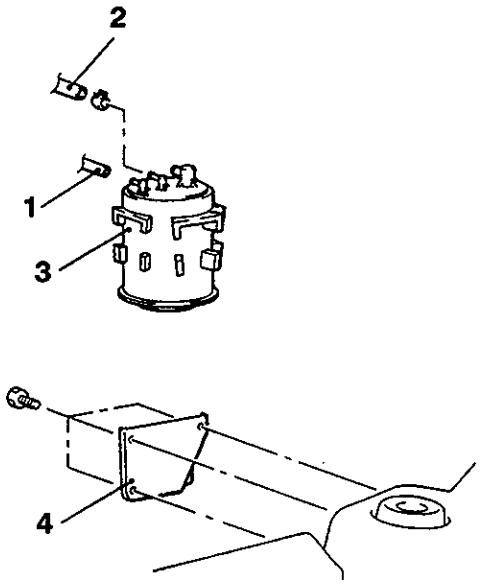
Removal steps

1. Oxygen sensor (Refer to GROUP 15 – Exhaust Pipe and Main Muffler.)
2. Catalytic converter (front) <4G9–MVV>
3. Front exhaust pipe
4. Catalytic converter <except 4G9–MVV> *or* catalytic converter (rear) <4G9–MVV>

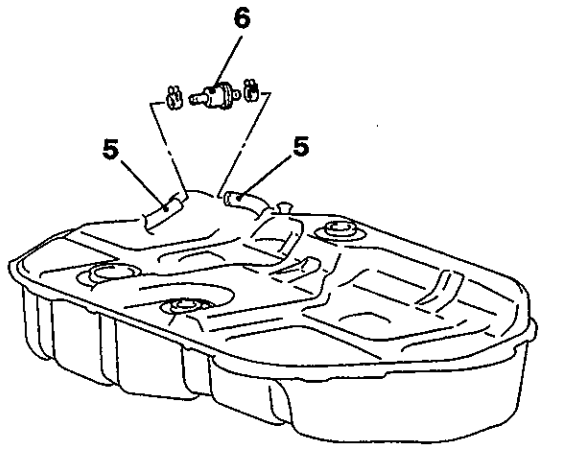
CANISTER AND TWO-WAY VALVE

17300480107

REMOVAL AND INSTALLATION



03M0013



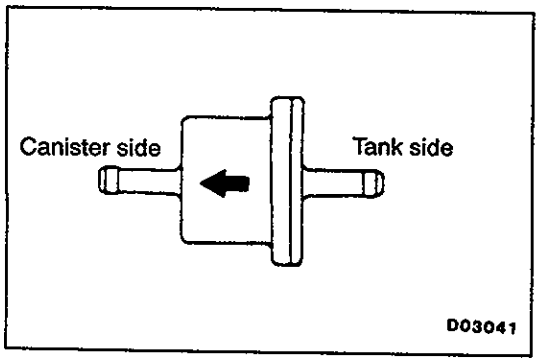
03M0015

00004634

Canister removal steps
1. Vapour hose
2. Purge hose
3. Canister
4. Canister bracket

Two-way valve removal steps
- Fuel tank
  (Refer to GROUP 13F – Fuel tank.)

5. Vapour hose
▶A◀ 6. Two-way valve



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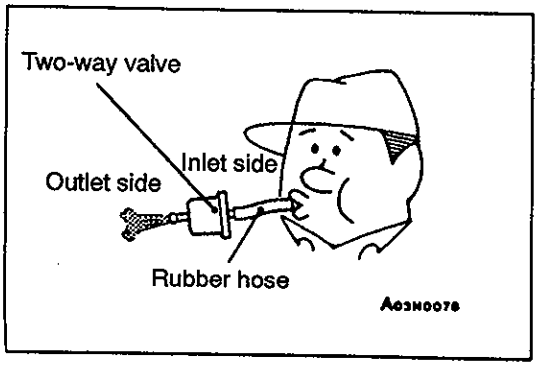


A03M0078

INSTALLATION SERVICE POINT

▶A◀ TWO-WAY VALVE INSTALLATION

Be careful about the installation direction of the two-way valve.

INSPECTION

17300490049

TWO-WAY VALVE SIMPLE CHECK

Attach a clean hose and check the operation of the two-way valve.

Lightly blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance.
Lightly blow from outlet side.	Air passes through.

NOTES

CLUTCH

CONTENTS

21109000114

GENERAL INFORMATION

21100010093

The clutch is a dry single-disc, diaphragm type; hydraulic pressure is used for the clutch control.

SERVICE SPECIFICATIONS

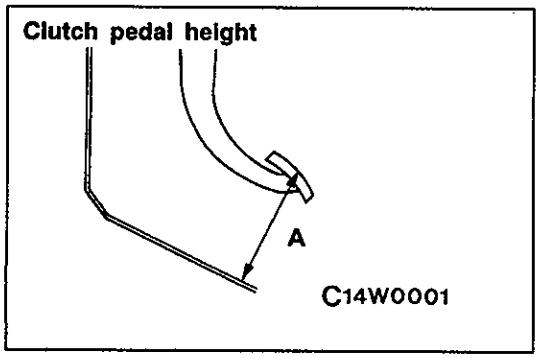
21100030099

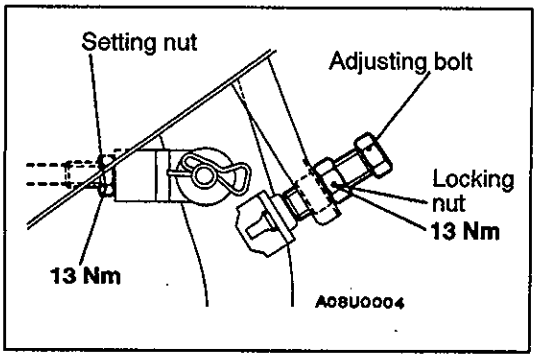
Items	Standard value
Clutch pedal height mm	162–165
Clutch pedal clevis pin play mm	1–3
Clutch pedal free play mm	6–13
Distance between the clutch pedal and the toeboard when the clutch is disengaged mm	85 or more

LUBRICANTS

21100040078

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	





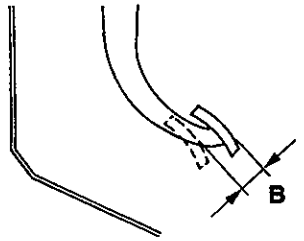
ON-VEHICLE SERVICE

21100090103

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

1. Turn up the carpet, etc. under the clutch pedal.
2. Measure the clutch pedal height.
   Standard value (A): 162 – 165 mm
3. If the height of the clutch pedal is outside the standard value, loosen the lock nut and adjust the pedal height to the standard value using the adjusting bolt or push rod.

Clutch pedal clevis pin play



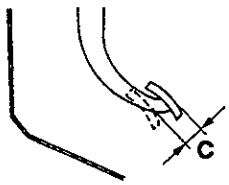
A14W0002

4. Measure the clutch pedal play.

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

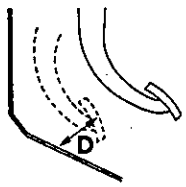
   Caution
   Do not push in the master cylinder push rod at this time.

Clutch pedal free play



14W0002

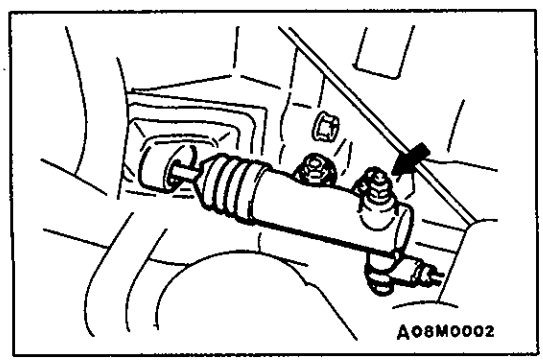
Distance between the clutch pedal and the toeboard when the clutch is disengaged



14W0003
00003373

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

   Standard value (C): 6–13 mm
   Standard value (D): 85 mm or more
7. If the clutch pedal free play and the distance between the clutch pedal and the toeboard when the clutch is disengaged do not agree with the standard values, it is probably the result of either air in the hydraulic system or a faulty master cylinder or clutch. Bleed the air, or disassembly and inspect the master cylinder or clutch.
8. Turn back the carpet, etc.



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BLEEDING

21100140099

Specified fluid: Brake fluid DOT 3 or DOT 4

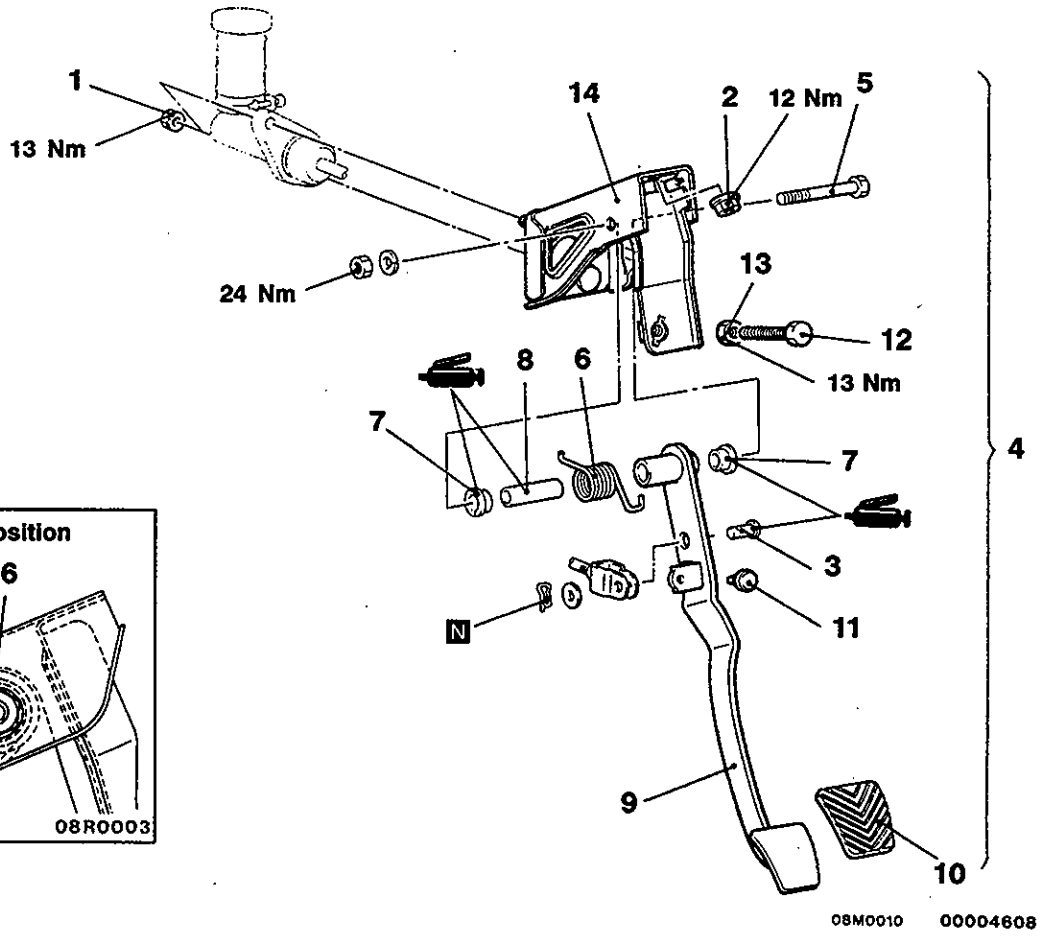
Caution
Use the specified brake fluid. Avoid using a mixture of the specified fluid and other fluid.

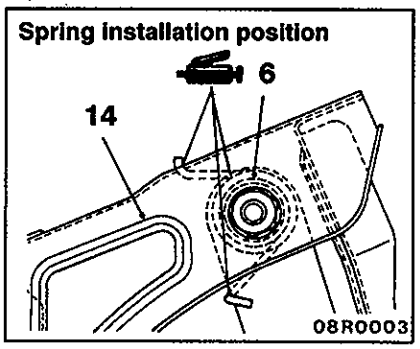
CLUTCH PEDAL

21100160132

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 bracket installation nut
3. Clevis pin
4. Pedal support member and clutch pedal assembly
5. Bolt
6. Return spring
7. Bushing
8. Pipe
9. Clutch pedal
10. Pedal pad
11. Stopper
12. Adjusting bolt
13. Locking nut
14. Pedal support member

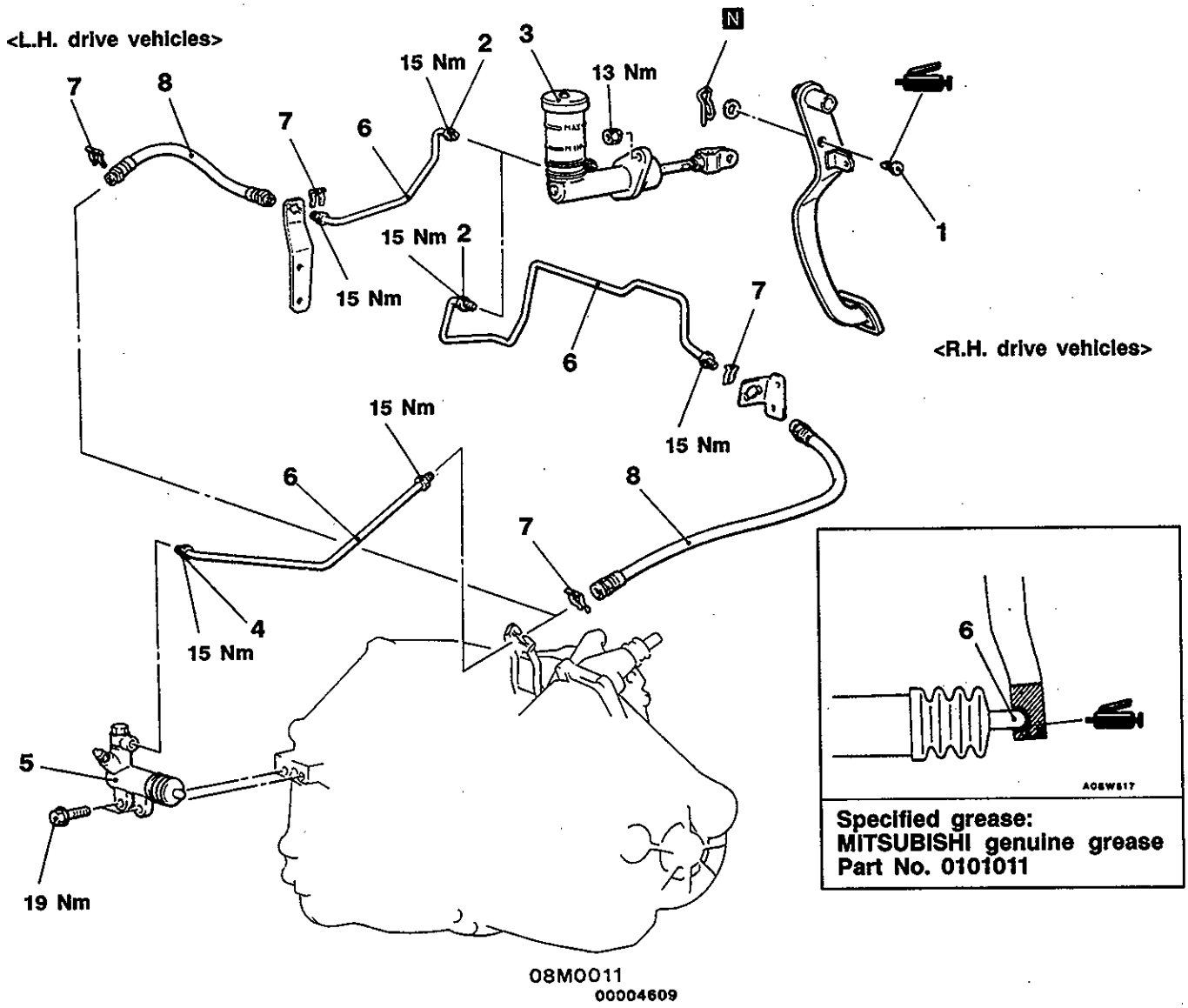
CLUTCH CONTROL

21100190124

REMOVAL AND INSTALLATION

Pre-removal Operation
- Clutch Fluid Draining
- Air Cleaner Removal

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



Specified grease:
MITSUBISHI genuine grease
Part No. 0101011

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

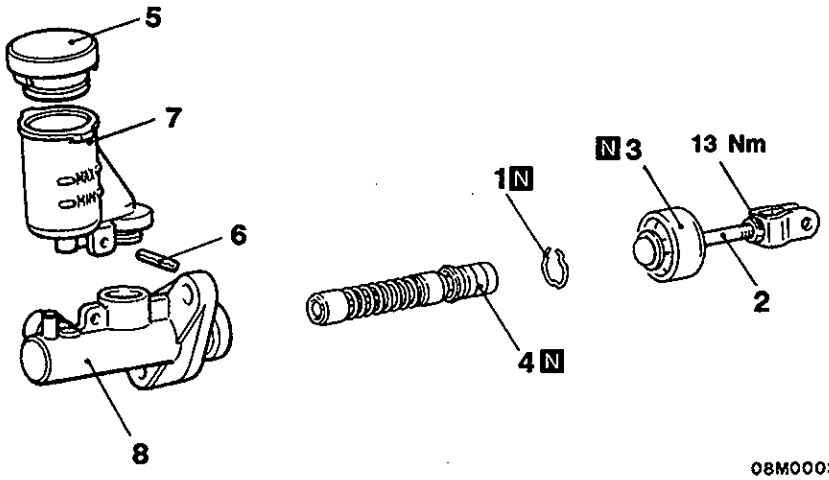
Clutch release cylinder removal steps
4. Clutch pipe connection
5. Clutch release cylinder

Clutch line removal steps
6. Clutch pipe
7. Hose clip
8. Clutch hose

DISASSEMBLY AND REASSEMBLY

21100210103

CLUTCH MASTER CYLINDER



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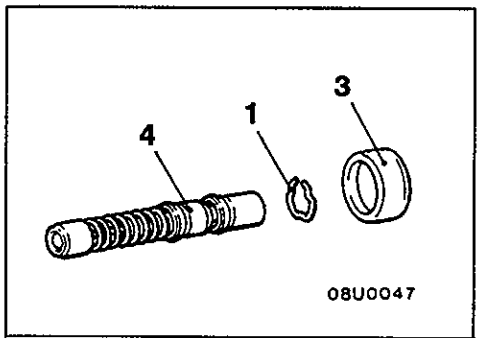
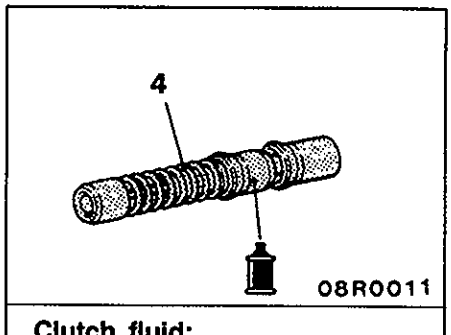
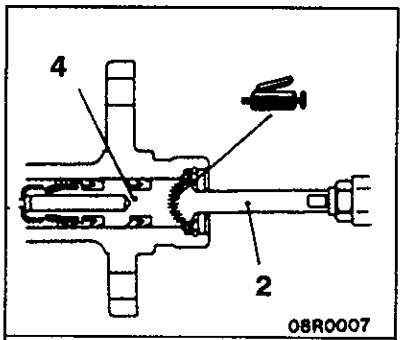


Piston repair kit



Clutch fluid:
Brake fluid DOT3 or DOT4

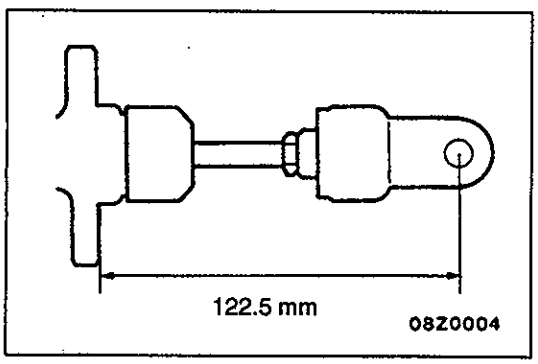


Grease: Rubber grease

Disassembly steps

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

Caution
Do not disassemble piston assembly.



INSTALLATION SERVICE POINT

◀A▶ PUSH ROD ASSEMBLY INSTALLATION

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

MANUAL TRANSMISSION

CONTENTS

22109000166

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 (*).

SERVICE SPECIFICATION

22100030027

Item	Standard value
Protruding length of stabilizer bar mounting bolt mm	22

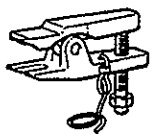
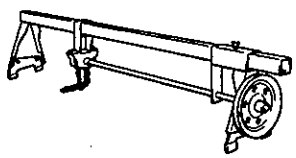
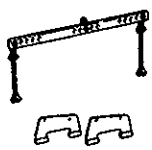
LUBRICANT

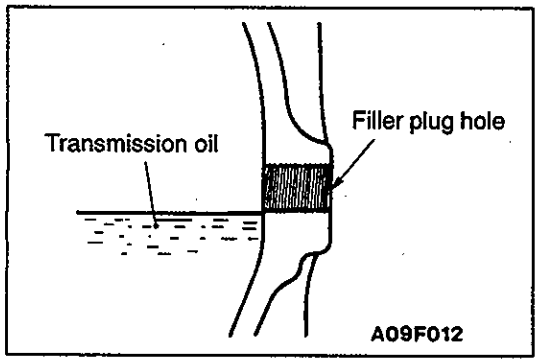
22100040099

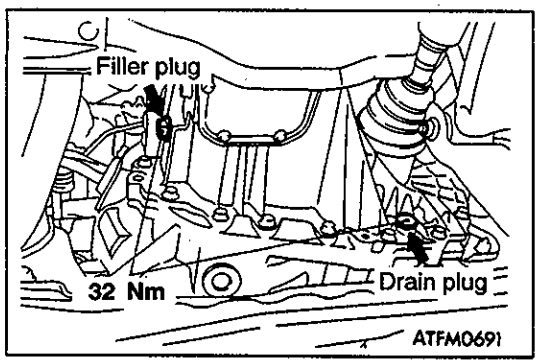
Item	Specified lubricant	Quantity ℓ
Transmission oil	Hypoid gear oil SAE 75W – 90 or 75W – 85W conforming to API GL-4	2.1

SPECIAL TOOLS

22100060095

Tool	Number	Name	Use
	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 22100090124

TRANSMISSION OIL CHECK

(1) Remove the oil filler plug.
(2) Oil level should be at the lower portion of the filler plug hole.
(3) Check that the transmission oil is not noticeably dirty, and that it has a suitable viscosity.

Tighten the filler plug to the specified torque.

Tightening torque: 32 Nm

TRANSMISSION OIL REPLACEMENT 22100100100

(1) Remove the drain plug to drain oil.
(2) Tighten the drain plug to the specified torque.
(3) Remove the filler plug and fill with specified oil till the level comes to the lower portion of filler plug hole.

Transmission oil

Specified oil:
Hypoid gear oil SAE 75W – 90 or 75W – 85W conforming to API GL-4

Quantity: 2.1 ℓ

(4) Tighten the filler plug to the specified torque.

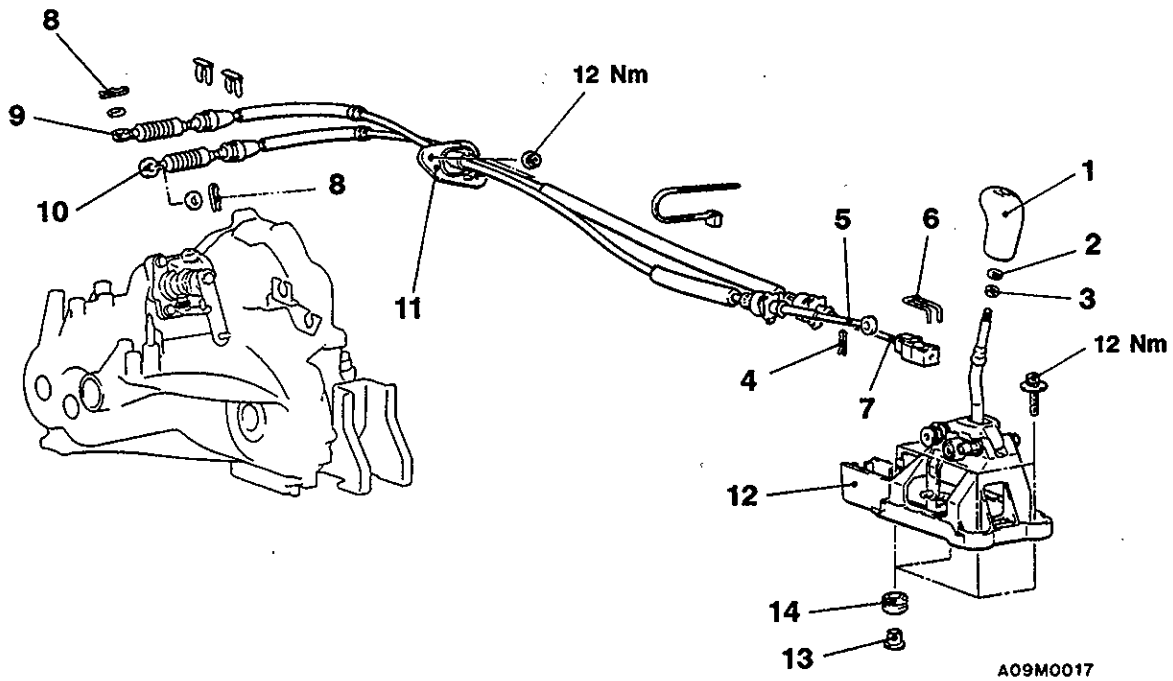
TRANSMISSION CONTROL

22100380115

REMOVAL AND INSTALLATION

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

Caution: SRS
Be careful not to subject the SRS-ECU to any shocks during removal and installation of the shift cable and select cable assembly.



Shift cable and select cable assembly removal steps

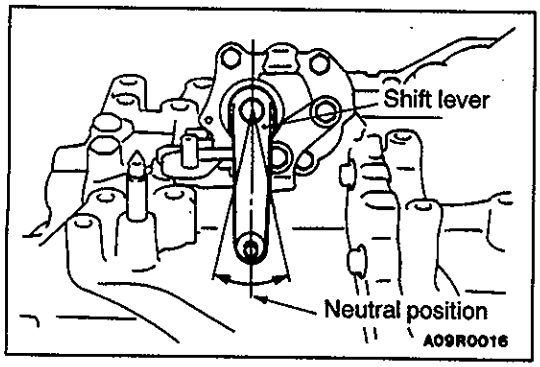
▶B◀ 1. Shift knob
▶B◀ 2. Spring washer
▶B◀ 3. Nut
- Front floor console (Refer to GROUP 52A.)

4. Snap pin
5. Select cable connection (Shift lever side)
6. Clip
7. Shift cable connection (Shift lever side)
8. Snap pin
▶A◀ 9. Select cable connection (Transmission side)
▶A◀ 10. Shift cable connection (Transmission side)
▶A◀ 11. Shift cable and select cable assembly

Shift lever assembly removal steps

▶B◀ 1. Shift knob
▶B◀ 2. Spring washer
▶B◀ 3. Nut
- Front floor console (Refer to GROUP 52A.)

4. Snap pin
5. Select cable connection (Shift lever side)
6. Clip
7. Shift cable connection (Shift lever side)
12. Shift lever assembly
13. Distance piece
14. Bushing



INSTALLATION SERVICE POINTS

▶A◀ SHIFT CABLE AND SELECT CABLE ASSEMBLY/ SHIFT CABLE CONNECTION/SELECT CABLE CONNECTION

(1) Set the transmission side shift lever and the passenger compartment side shift lever to the neutral position.

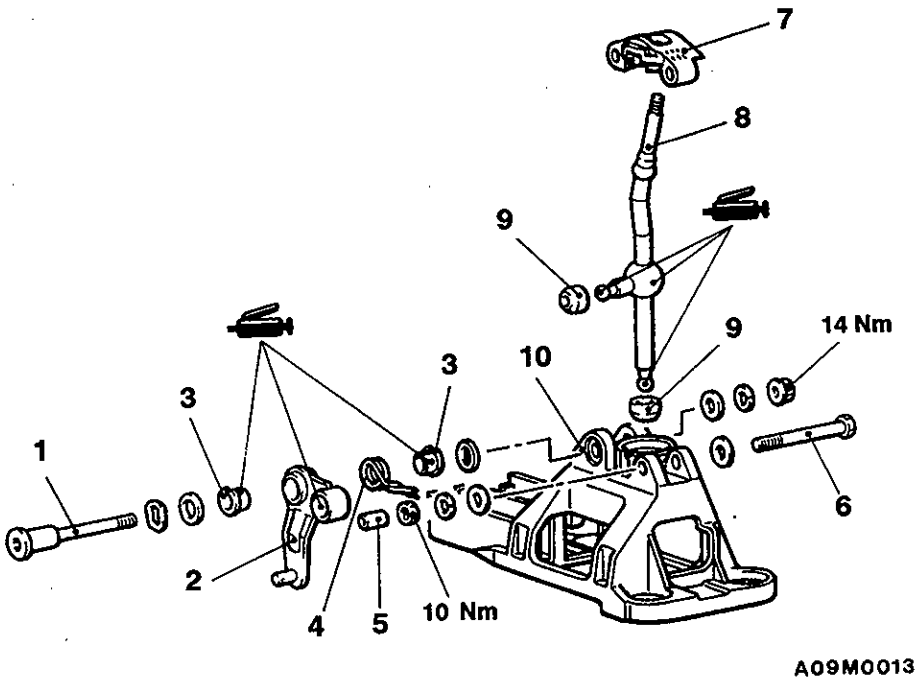
(2) For the transmission side, the white and yellow paint marks on the shift and select cable ends should face the snap pins.
(3) Move the shift lever to all positions and check that the operation is smooth.

▶B◀ NUT/SPRING WASHER/SHIFT KNOB INSTALLATION

(1) Screw in the nut all the way by hand, turn back half a turn, and then insert the spring washer.
(2) Screw in the shift knob until it touches the spring washer, and make one more turn. Then turn more to adjust the shift pattern on the shift knob.
(3) If the above steps are impossible, you can turn back the shift knob by one turn at most after screwing in all the way to adjust the shift pattern.

SHIFT LEVER ASSEMBLY
DISASSEMBLY AND REASSEMBLY

22100400071



Disassembly steps

1. Bolt
2. Select lever
3. Bushing
4. Return spring
5. Collar
6. Bolt
7. Cap
8. Shift lever
9. Shift lever bushing
10. Base block

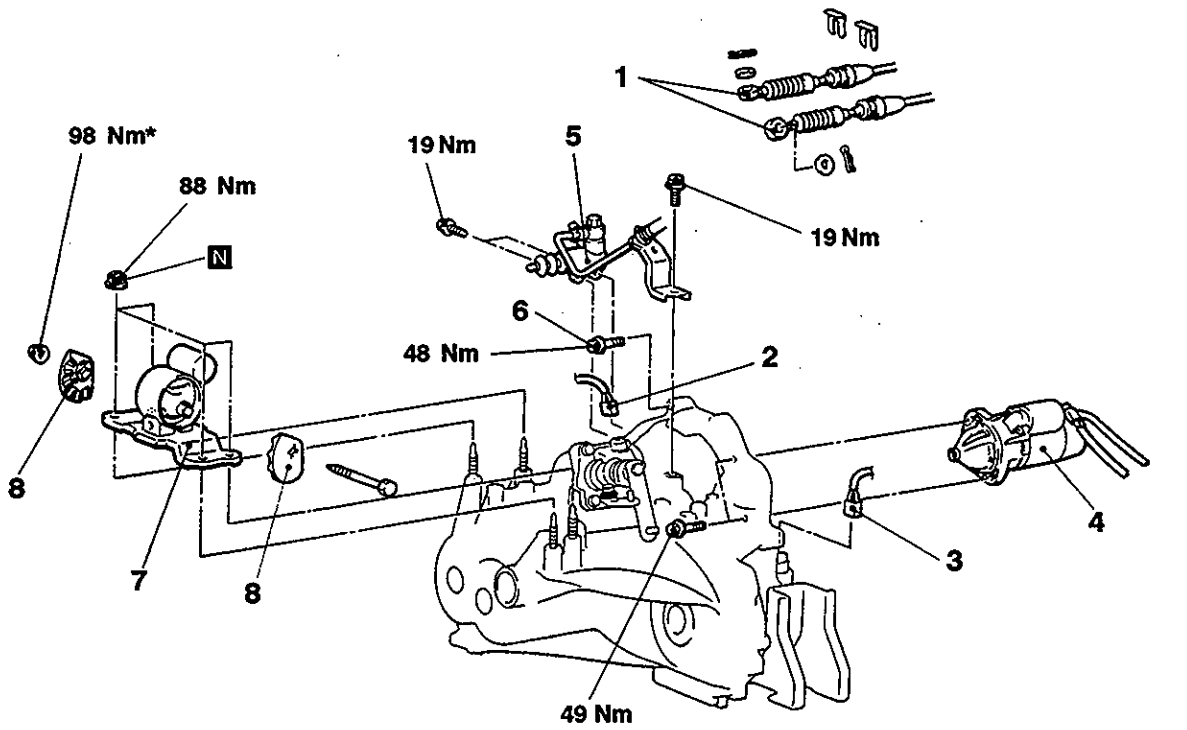
TRANSMISSION ASSEMBLY

22100270153

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Transmission Oil Draining (Refer to P.22-3.)
(2) Under Cover Removal
(3) Battery and Battery Tray Removal
(4) Air Cleaner Assembly Removal

Post-installation Operation
(1) Air Cleaner Assembly Installation
(2) Battery and Battery Tray Installation
(3) Under Cover Installation
(4) Transmission Oil Supplying (Refer to P.22-3.)
(5) Shift Lever Operation Check
(6) Speedometer Operation Check



A09M0033

Removal steps

1. Shift cable and select cable connection (Refer to P.22-4.)
2. Backup lamp switch connector
3. Vehicle speed sensor connector

◀A▶ 4. Starter motor

◀B▶ 5. Clutch release cylinder connection

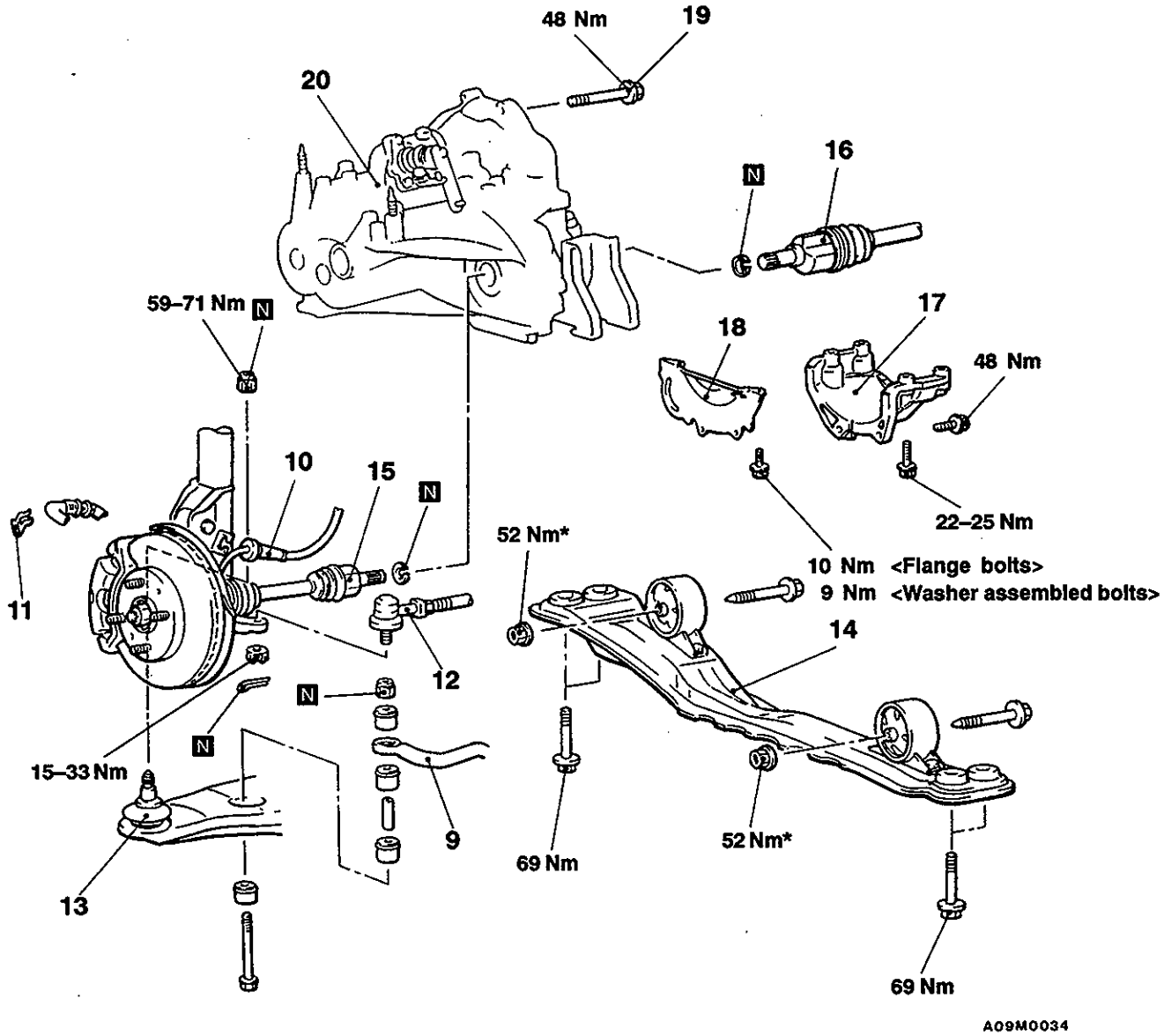
6. Transmission assembly upper part coupling bolts

◀C▶ 7. Transmission mount bracket

▶B◀ 8. Transmission mount stopper

◀D▶ • Engine assembly supporting

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.



Lifting up of the vehicle

▶A◀ 9. Stabilizer bar connection
10. Wheel speed sensor cable connection <Vehicles with ABS>
11. Brake hose clamp
◀E▶ 12. Tie rod end connection
◀E▶ 13. Lower arm ball joint connection
14. Centermember assembly
◀F▶ 15. Drive shaft <LH> connection
◀F▶ 16. Drive shaft <RH> connection
17. Transmission stay <4G13>
18. Bell housing cover
19. Transmission assembly lower part coupling bolts
20. Transmission assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

REMOVAL SERVICE POINTS

◀A▶ STARTER MOTOR REMOVAL

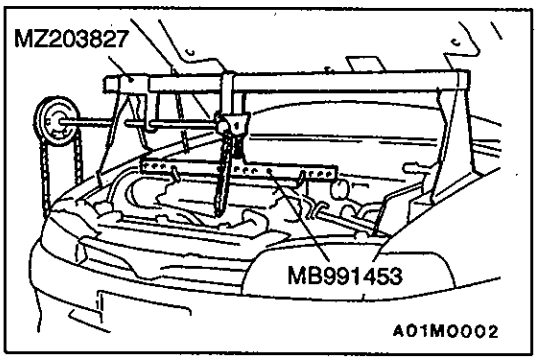
Remove the starter motor with the starter motor harness still connected and secure it inside the engine compartment.

◀B▶ CLUTCH RELEASE CYLINDER REMOVAL

Remove the clutch release cylinder without disconnecting the oil line connection, and fix it to the vehicle chassis.

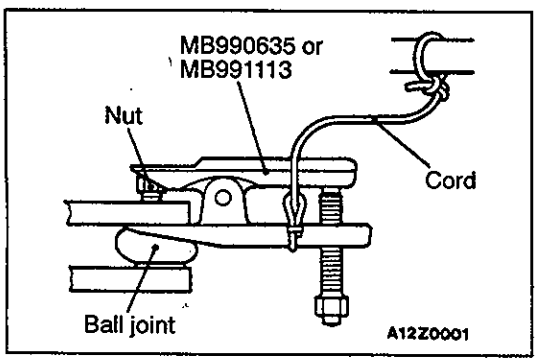
◀C▶ TRANSMISSION MOUNT BRACKET REMOVAL

Jack up the transmission assembly gently with a garage jack, and then remove the transmission mount bracket.



◀D▶ ENGINE ASSEMBLY SUPPORTING

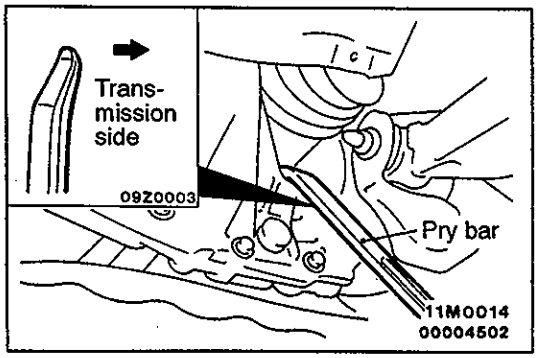
Set the special tool to the vehicle to support the engine assembly.



◀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 <LH>/DRIVE SHAFT <RH> DISCONNECTION

(1) Insert a pry bar between the transmission case and the drive shaft as shown to remove the drive shaft.

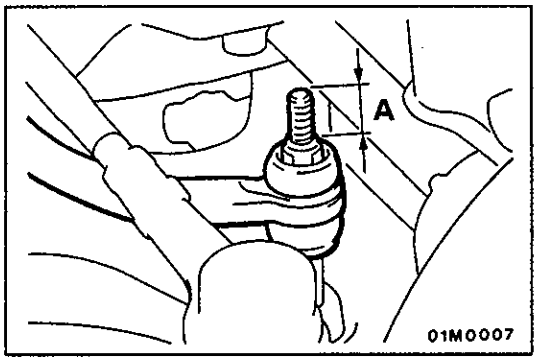
NOTE

Do not remove the hub and knuckle from the drive shaft.

Caution

Always use a pry bar, or the TJ will be damaged.

(2) Suspend the removed drive shaft with a wire so that there are no sharp bends in any of the joints.
(3) Use a shop towel to cover the transmission case not to let foreign material get into it.

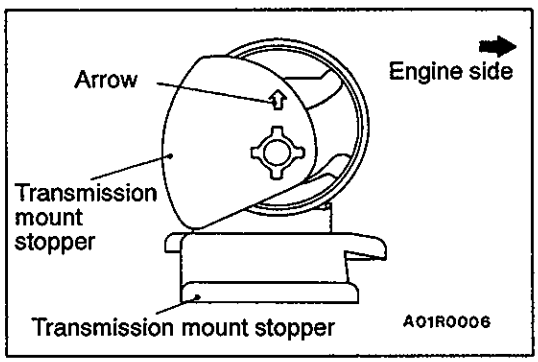


INSTALLATION SERVICE POINTS

▶A◀ STABILIZER BAR INSTALLATION

Tighten the self-locking nut so that the stabilizer bar mounting bolt protrudes as shown.

Standard value (A): 22 mm



▶B◀ TRANSMISSION MOUNT STOPPER INSTALLATION

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

AUTOMATIC TRANSMISSION

CONTENTS

23109000156

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 (*).

SERVICE SPECIFICATIONS

23100030079

Items		Standard value
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		2.7–3.4
Resistance of Low-Reverse solenoid valve coil (at 20°C) Ω		2.7–3.4
Resistance of second solenoid valve coil (at 20°C) Ω		2.7–3.4
Resistance of underdrive solenoid valve coil (at 20°C) Ω		2.7–3.4
Resistance of overdrive solenoid valve coil (at 20°C) Ω		2.7–3.4
Stall speed r/min		2,100 – 2,600
Protruding length of stabilizer bar mounting bolt mm		22

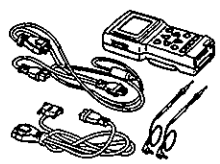
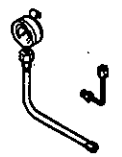
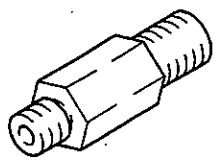
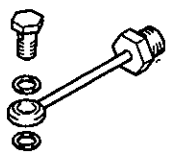
LUBRICANTS

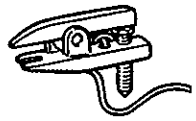
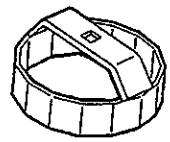
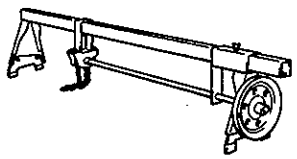
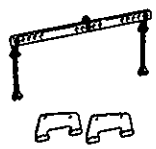
23100040034

Items	Specified lubricant	Quantity ℓ
Transmission fluid	DIA QUEEN ATF SPII or equivalent	7.8

SPECIAL TOOLS

23100060085

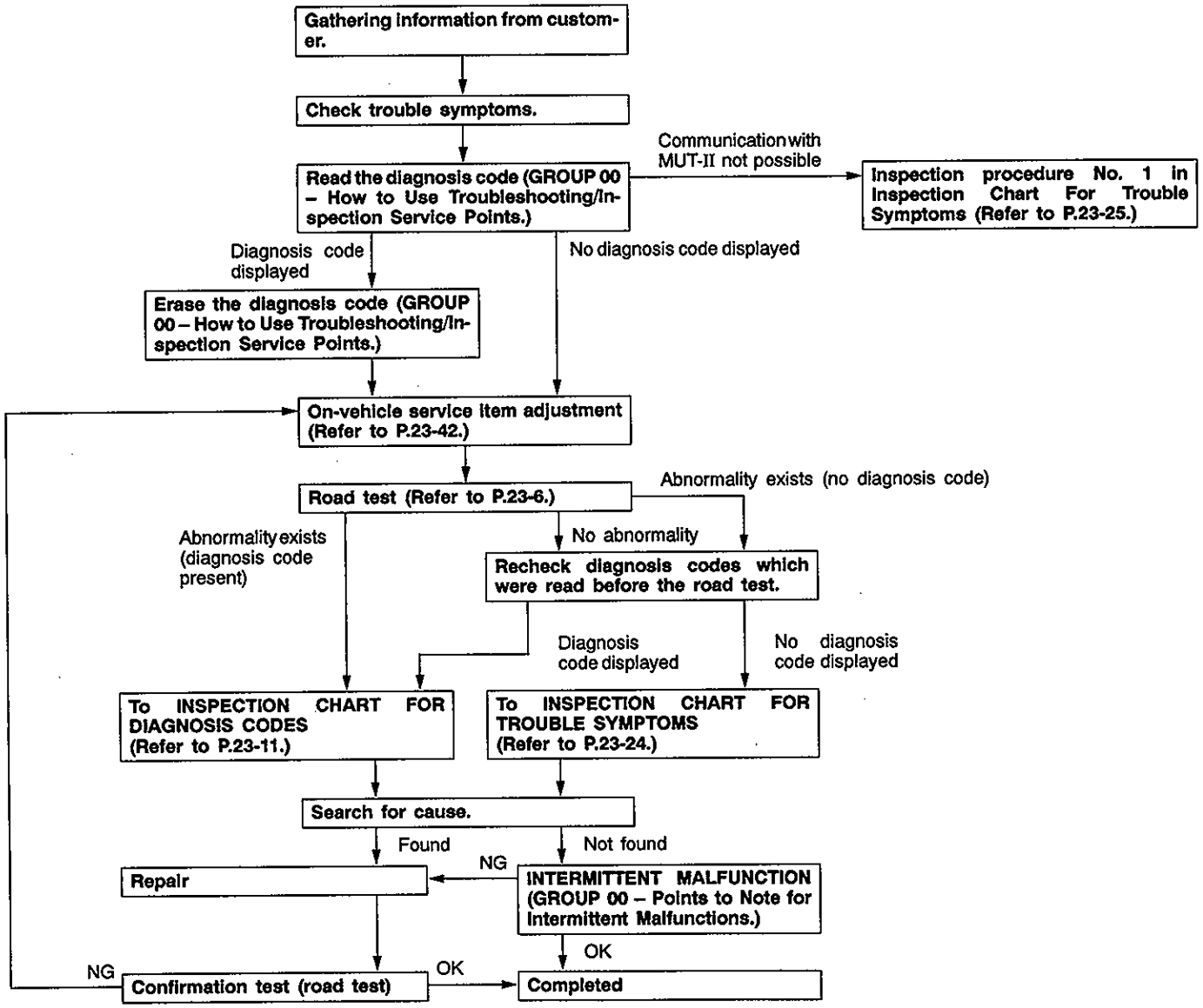
Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	Checking of the diagnosis code
	MD998330 (including MD998331)	Oil pressure gauge (2,942 kPa)	Measurement of oil pressure
	MD998332	Adapter	
	MD998900	Adapter	

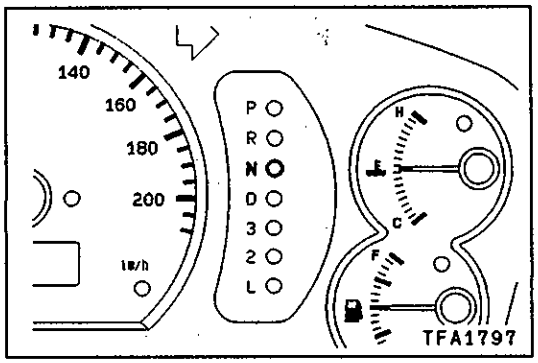
Tool	Number	Name	Use
	MB990635 or MB991113	Steering linkage puller	Removal of the tie rod end and the lower arm
	MB991610	Oil filter wrench	Removal and installation of automatic transmission oil filter
	GENERAL SERVICE TOOL MZ203827	Engine lifter	Supporting the engine assembly during removal and installation of the transmission
	MB991453	Engine hanger assembly	Supporting the engine assembly during removal and installation of the transmission

TROUBLESHOOTING

23100760104

STANDARD FLOW OF DIAGNOSIS TROUBLESHOOTING





DIAGNOSIS FUNCTION

23100770070

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

23100780103

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 (23-23)
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 (23-34)
		Accelerator pedal (1) Released (2) Half depressed (3) Depressed	Data list No. 11 (1) 400 – 1,000 mV (2) Gradually rises from (1) (3) 4,500 – 5,000 mV	Throttle position sensor	11 12 14	Throttle position sensor system (23-12)
			Data list No. 25 (1) OFF (2) ON	Wide open throttle switch	25	Wide open throttle switch system (23-16)
		Brake pedal (1) Depressed (2) Released	Data list No. 26 (1) ON (2) OFF	Stop lamp switch	26	Stop lamp switch system (23-16)
3	Ignition switch: ST Engine: Stopped	Starting test with lever P or N range	Starting should be possible	Starting possible or impossible	–	Starting impossible (23-26)
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 (23-13)

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 (23-16)
		A/C switch (1) ON (2) OFF	Data list No. 65 (1) ON (2) OFF	Dual pressure switch	–	Dual pressure switch system (23-35)
		Accelerator pedal (1) Released (2) Half depressed	Data list No. 64 (1) ON (2) OFF	Idle position switch	–	Idle position switch system (23-34)
			Data list No. 21 (1) 650 – 900 rpm Gradually rises from (1)	Crank angle sensor	21	Crank angle sensor system (23-13)
			Data list No. 57 (2) Data changes	Communication with engine-ECU	51	Serial communication system (23-23)
		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 (23-28)
					–	Shocks when changing from N to D and large time lag (23-28)
					–	Shocks when changing from N to R and large time lag (23-29)
					–	Shocks when changing from N to D,N to R and large time lag (23-30)
				Driving impossible	–	Does not move forward (23-26)
					–	Does not reverse (23-27)
					–	Does not move (forward or reverse) (23-27)

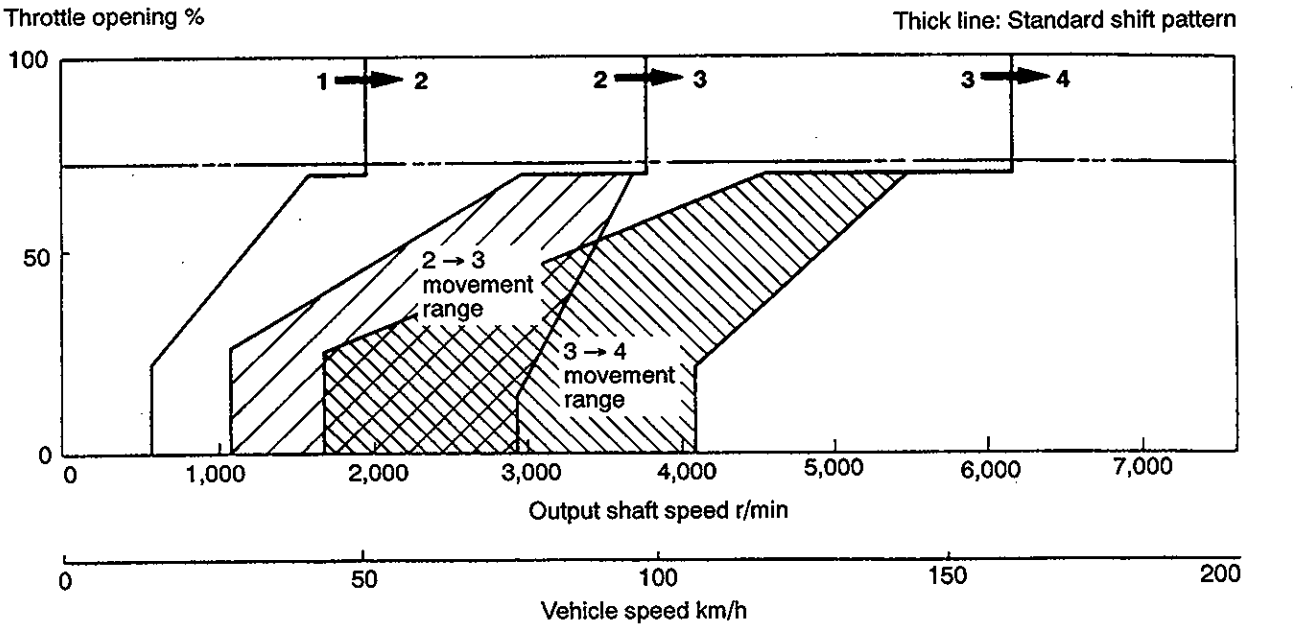
No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
6	Selector lever position: N (Carry out on a flat and straight road.)	Selector lever position and vehicle speed (1) Idling in L range (Vehicle stopped) (2) Driving at constant speed of 10 km/h in L position (3) Driving at constant speed of 30 km/h in 2 position (4) Driving at 50 km/h in 3 position with accelerator fully closed (5) Driving at constant speed of 50 km/h in D position (Each condition should be maintained for 10 seconds or more.)	Data list No. 63 (2) 1st, (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 (23-17)
			Data list No. 32 (2) 0 %, (4) 0 %, (3) 0 %, (6) 100 %	Underdrive solenoid valve	32	Underdrive solenoid valve system (23-17)
			Data list No. 33 (2)100 %, (4) 100 %, (3) 0 %, (6) 0 %	Second solenoid valve	33	Second solenoid valve system (23-17)
			Data list No. 34 (2) 100 %, (4) 0 %, (3) 100 %, (6) 0 %	Overdrive solenoid valve	34	Overdrive solenoid valve system (23-17)
			Data list No. 29 (1) 0 km/h (4) 50 km/h	Vehicle speed sensor	–	Vehicle speed sensor system (23-35)
			Data list No. 22 (4) 1,800 – 2,100 rpm	Input shaft speed sensor	22	Input shaft speed sensor system (23-14)
			Data list No. 23 (4) 1,800 – 2,100 rpm	Output shaft speed sensor	23	Output shaft speed sensor system (23-15)
7	Selector lever position: 3 (Carry out on a flat and straight road.)	Selector lever position and vehicle speed (1) Release the accelerator pedal fully while driving at 50 km/h in 3rd gear. (2) Driving at constant speed of 50 km/h in 3rd gear.	Data list No. 36 (3) 0 % (5) Approx. 70 – 90 %	Damper clutch control solenoid valve	36 52	Damper clutch control solenoid valve system (23-17)
			Data list No. 52 (3) Approx. 100 – 300 rpm (5) Approx. 0 – 10 rpm			

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
8	Use the MUT-II to stop the INVECS-II function. Selector lever position: D (Carry out on a flat and straight road.)	Monitor data list No. 11, 23, and 63 with the MUT-II. (1) Accelerate to 4th gear at a throttle position sensor output of 1.5V (accelerator opening angle of 30 %). (2) Gently decelerate to a standstill. (3) Accelerate to 4th gear at a throttle position sensor output of 2.5 V (accelerator opening angle of 50%). (4) While driving at 60 km/h in 4th gear, shift down to 3 range. (5) While driving at 40 km/h in 3rd gear, shift down to 2 range. (6) While driving at 20 km/h in 2nd gear, shift down to L range.	For (1), (2) and (3), the reading should be the same as the specified output shaft 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 (23-30)
				Displaced shifting points	–	All points (23-31)
					–	Some points (23-32)
				Does not shift	–	No diagnosis code (23-32)
					22	Input shaft speed sensor system (23-14)
					23	Output shaft speed sensor system (23-15)
				Does not shift from 1 to 2 or 2 to 1	31	Low and reverse solenoid valve system (23-17)
					33	Second solenoid valve system (23-17)
					41	1st gear ratio is not specified (23-18)
					42	2nd gear ratio is not specified (23-19)
				Does not shift from 2 to 3 or 3 to 2	33	Second solenoid valve system (23-17)
					34	Overdrive solenoid valve system (23-17)
					42	2nd gear ratio is not specified (23-19)
					43	3rd gear ratio is not specified (23-20)
				Does not shift from 3 to 4 or 4 to 3	32	Underdrive solenoid valve system (23-17)
					33	Second solenoid valve system (23-17)
					43	3rd gear ratio is not specified (23-20)
					44	4th gear ratio is not specified (23-21)

No.	Condition	Operation	Judgement value	Check item	Code No.	Inspection procedure page if there is an abnormality
9	Selector lever position: N (Carry out on a flat and straight road.)	Monitor data list No. 22 and No. 23 with the MUT-II. (1) Move selector lever to R range, drive at constant speed of 10 km/h.	The ratio between data list No. 22 and No. 23 should be the same as the gear ratio when reversing.	Does not shift	22	Input shaft speed sensor system (23-14)
					23	Output shaft speed sensor system (23-16)
					46	Reverse gear ratio is not specified (23-22)

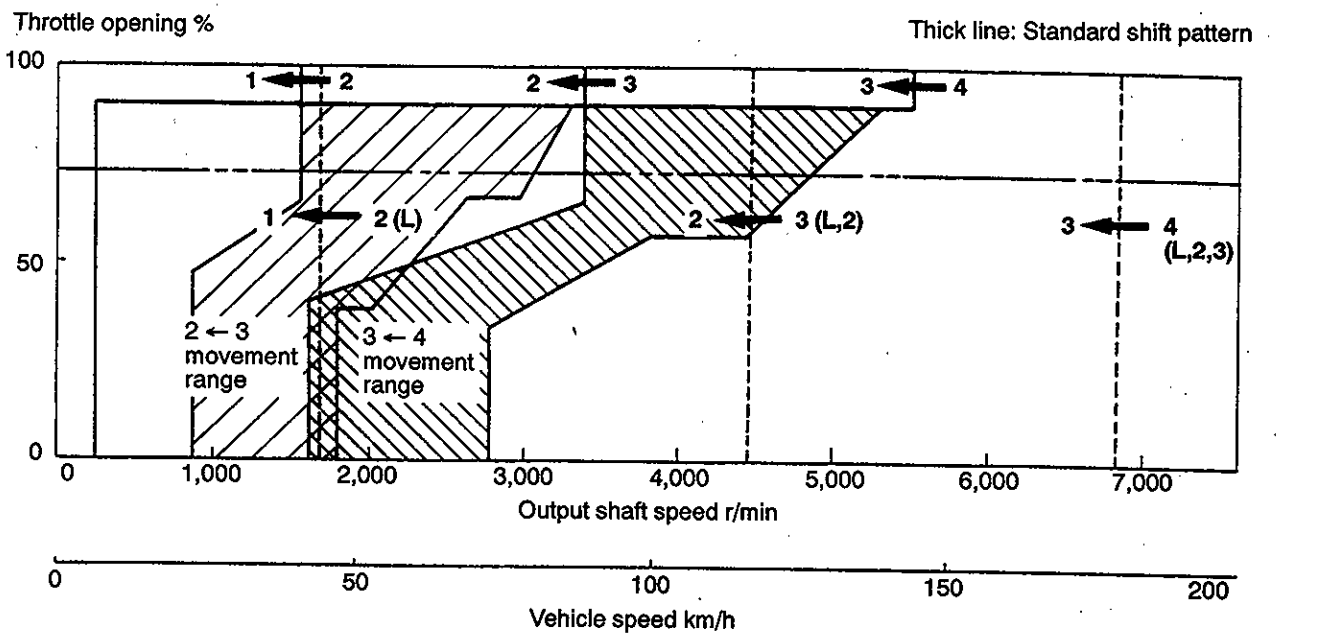
SHIFT PATTERN

UPSHIFT PATTERN



TFA1793

DOWNSHIFT PATTERN



TFA1794

INSPECTION CHART FOR DIAGNOSIS CODE

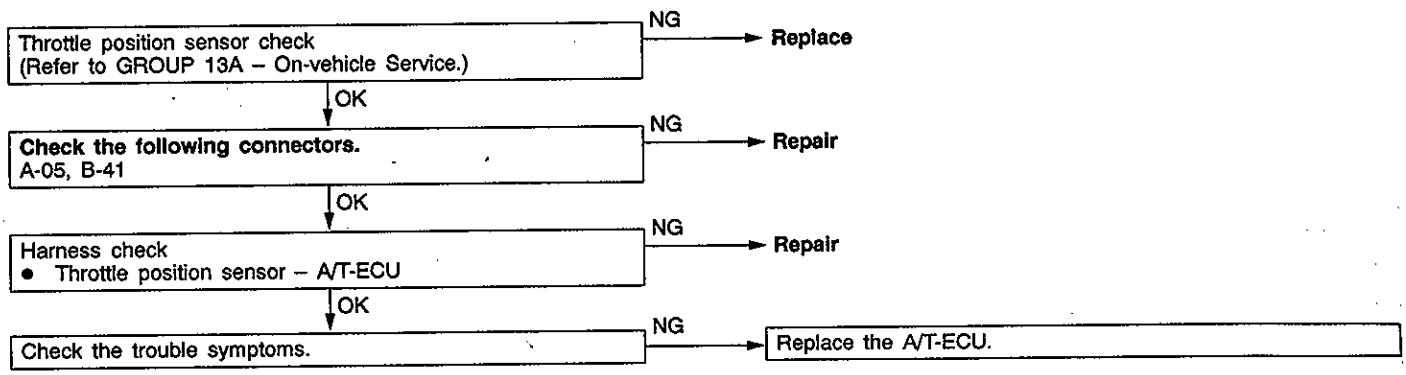
23100790106

Code	Diagnosis item		Reference page
11	Throttle position sensor system	Short circuit	23-12
12		Open circuit	23-12
14		Sensor maladjustment	23-12
15	Oil temperature sensor system	Open circuit	23-13
21	Crank angle sensor system	Open circuit	23-13
22	Input shaft speed sensor system	Short circuit/open circuit	23-14
23	Output shaft speed sensor system	Short circuit/open circuit	23-15
25	Wide open throttle switch system	Short circuit	23-16
26	Stop lamp switch system	Short circuit/open circuit	23-16
31	Low and reverse solenoid valve system	Short circuit/open circuit	23-17
32	Underdrive solenoid valve system	Short circuit/open circuit	23-17
33	Second solenoid valve system	Short circuit/open circuit	23-17

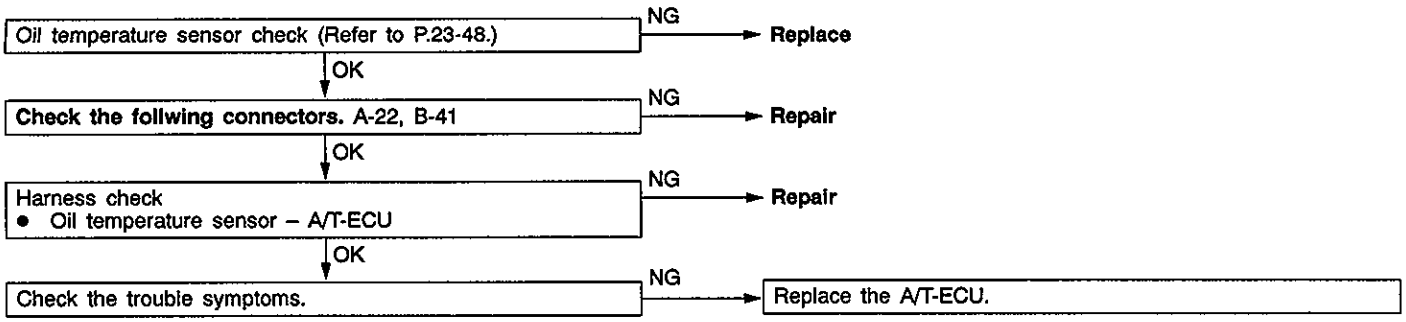
Code	Diagnosis item		Reference page
34	Overdrive solenoid valve system	Short circuit/open circuit	23-17
36	Damper control clutch solenoid valve system	Short circuit/open circuit	23-17
41	1st gear ratio does not meet the specification		23-18
42	2st gear ratio does not meet the specification		23-19
43	3rd gear ratio does not meet the specification		23-20
44	4th gear ratio does not meet the specification		23-21
46	Reverse gear ratio does not meet the specification		23-22
51	Abnormal communication with engine-ECU		23-23
52	Damper control clutch solenoid valve system	Defective system	23-17
54	A/T Control relay system	Short circuit to earth/ open circuit	23-23
56	N range lamp system	Short circuit to earth	23-24
71	Malfunction of A/T-ECU		23-24

INSPECTION PROCEDURES FOR DIAGNOSIS CODES

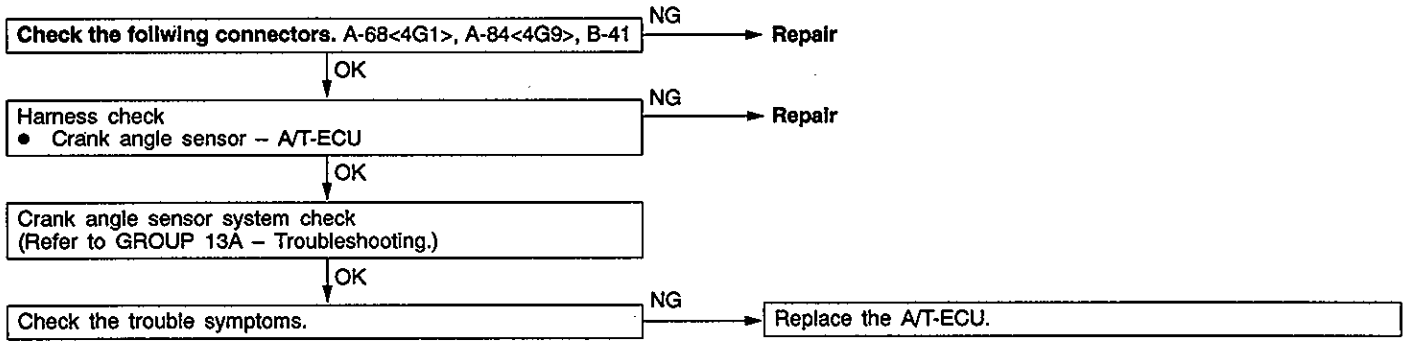
Code No. 11, 12, 14 Throttle position sensor system	Probable cause
If the TPS output voltage is 4.8 V or higher when the engine is idling, the output is judged to be too high and diagnosis code No. 11 is output. If the TPS output voltage is 0.2 V or lower at times other than when the engine is idling, the output is judged to be too low and diagnosis code No. 12 is output. If the TPS output voltage is 0.2 V or lower or if it is 1.2 V or higher when the engine is idling, the TPS adjustment is judged to be incorrect and diagnosis code No. 14 is output.	• Malfunction of the throttle position sensor • Malfunction of connector • Malfunction of the A/T-ECU



Code No. 15 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

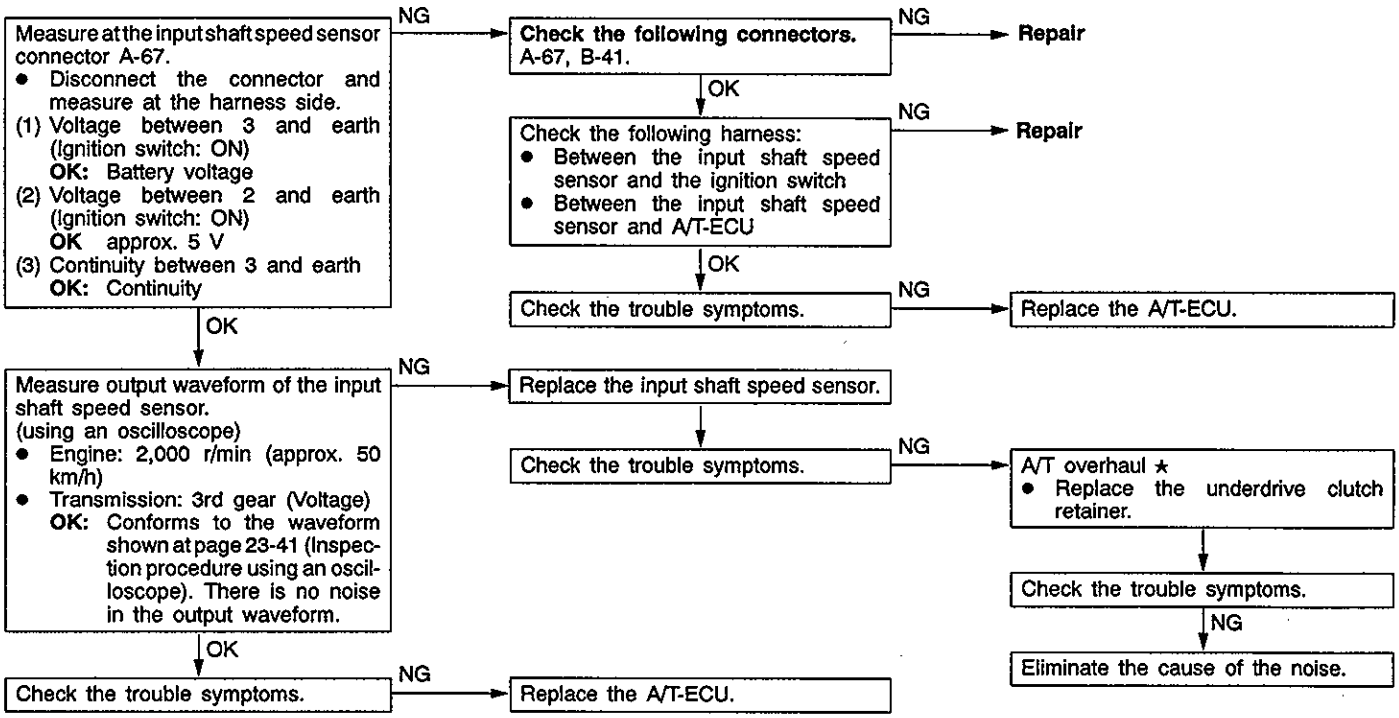


Code No. 21 Crank angle sensor system	Probable cause
If no output pulse is detected from the crank angle sensor for 5 seconds or more while driving at 25 km/h or more, it is judged that there is an open circuit in the crank angle sensor and diagnosis code No. 21 is output.	• Malfunction of the crank angle sensor • Malfunction of connector • Malfunction of the A/T-ECU



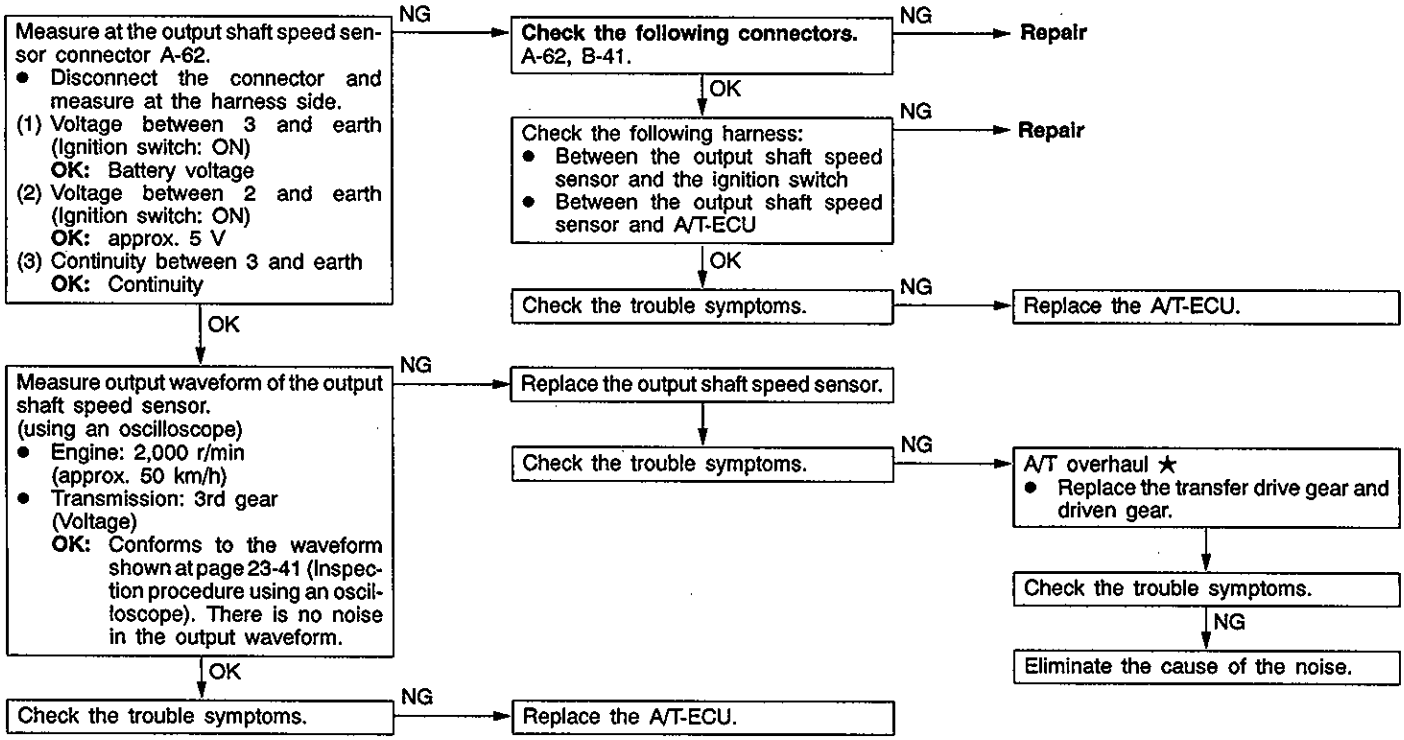
Code No. 22 Input shaft speed sensor system	Probable cause
If no output pulse is detected from the input shaft speed sensor for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more, there is judged to be an open circuit or short-circuit in the input shaft speed sensor and diagnosis code No. 22 is output. If diagnosis code No. 22 is output four times, the transmission is locked into 3rd gear (D range) 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 A/T-ECU

★: Refer to the Transmission Workshop Manual.

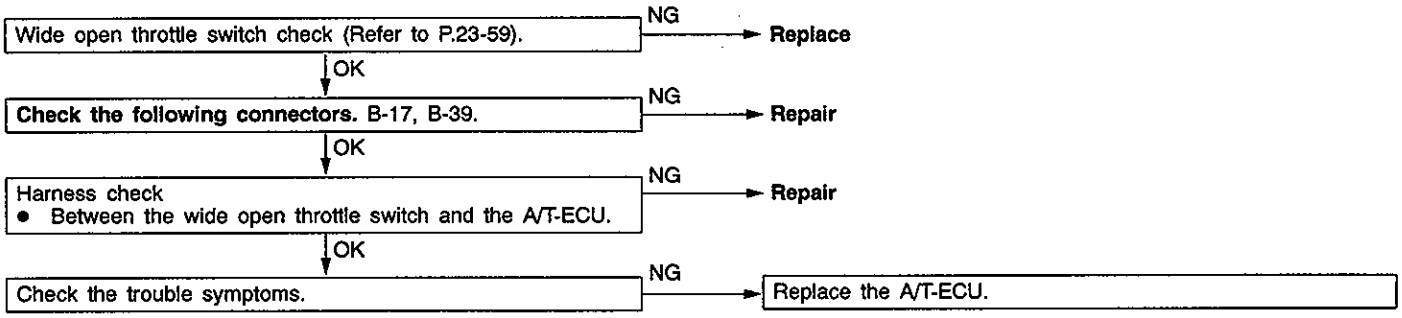


Code No. 23 Output shaft speed sensor system	Probable cause
If the output from the output shaft speed sensor is continuously 50% lower than the vehicle speed for 1 second or more while driving in 3rd or 4th gear at a speed of 30 km/h or more, there is judged to be an open circuit or short-circuit in 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 (D range) 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

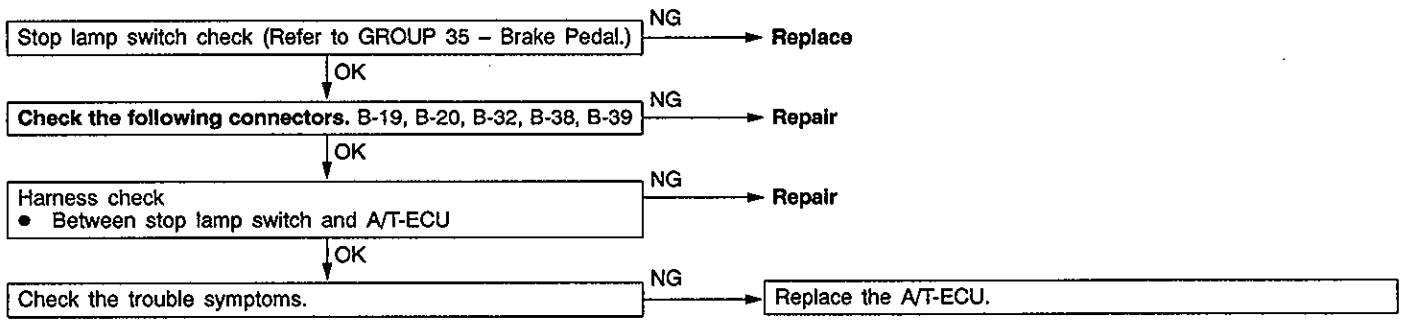
★: Refer to the Transmission Workshop Manual.



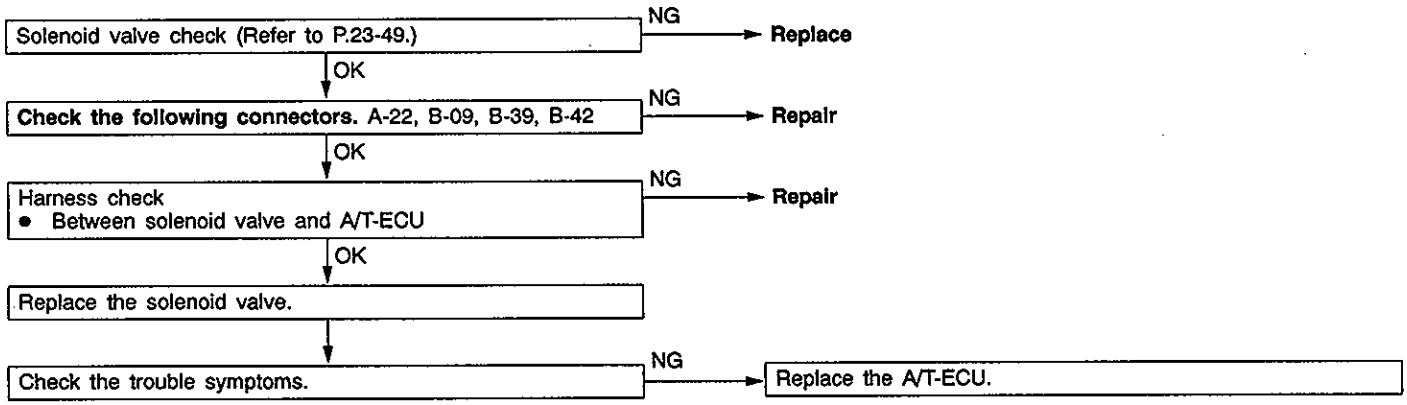
Code No. 25 Wide open throttle switch system	Probable cause
If the wide open throttle switch is on for 1 second or more with the throttle valve opening angle at 70% or less, it is judged that there is a short circuit in the wide open throttle switch and diagnosis code No. 25 is output.	• Malfunction of the wide open throttle switch • Malfunction of connector • Malfunction of A/T-ECU



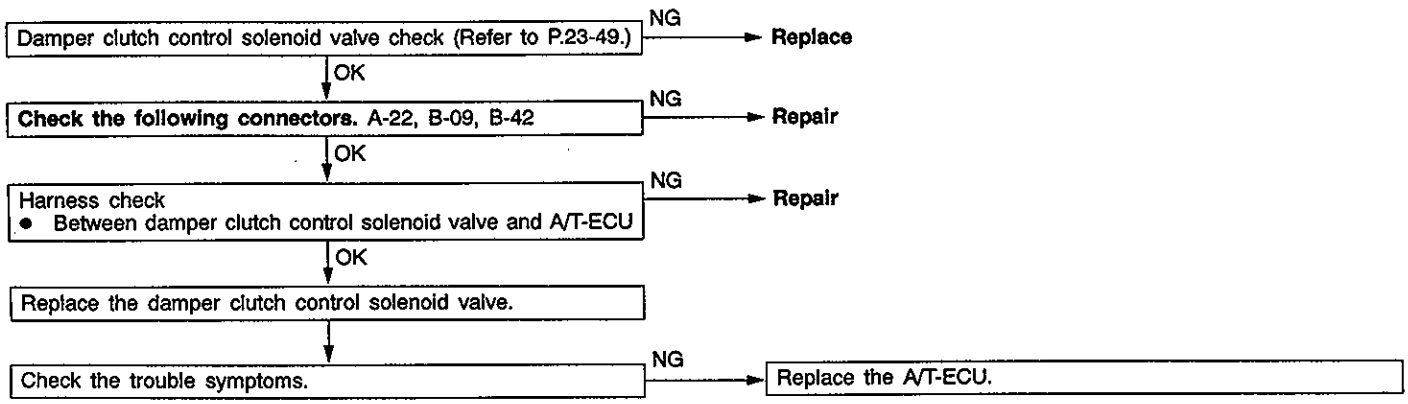
Code No. 26 Stop lamp switch system	Probable cause
If the stop lamp switch is on for 5 minutes or more while driving, it is judged that there is a short circuit in the stop lamp switch and diagnosis code No. 26 is output.	• Malfunction of the stop lamp switch • Malfunction of connector • Malfunction 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 does not meet the specification	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.

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

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

Measure output waveform from the input shaft speed sensor. (using an oscilloscope)
- Connect the connector B-41 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.23-41 (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-41 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.23-41 (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 ★
- Underdrive clutch system check (No. 42, No. 43, or no diagnosis code is output).
- Low and reverse brake system check (No. 46 or no diagnosis code is output).

Code No. 42 2nd gear ratio does not meet the specification	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.

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

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

Measure output waveform from the input shaft speed sensor. (using an oscilloscope)
- Connect the connector B-41 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.23-41 (Inspection Procedure Using an Oscilloscope) is output (flalshing 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-41 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.23-41 (Inspection Procedure Using an Oscilloscope) is output (flalshing 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 ★
- Underdrive clutch system check (No. 41, No. 43, or no diagnosis code is output).
- Second brake system check (No. 44 or no diagnosis code is output).

Code No. 43 3rd gear ratio does not meet the specification	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.

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

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

Measure output waveform from the input shaft speed sensor. (using an oscilloscope)
- Connect the connector B-41 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.23-41 (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-41 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.23-41 (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 ★
- Underdrive clutch system check (No. 41, No. 42, or no diagnosis code is output).
- Overdrive clutch system check (No. 44 or no diagnosis code is output).

Code No. 44 4th gear ratio does not meet the specification	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.23-14.)
No ↓

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

Measure output waveform from the input shaft speed sensor. (using an oscilloscope)
- Connect the connector B-41 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.23-41 (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-41 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.23-41 (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 (No. 42 or no diagnosis code is output).
- Overdrive clutch system check (No. 43 or no diagnosis code is output).

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

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

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

Measure output waveform from the input shaft speed sensor. (using an oscilloscope)
- Connect the connector B-41 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.23-41 (Inspection Procedure Using an Oscilloscope) is output (flalshing 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-41 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.23-41 (Inspection Procedure Using an Oscilloscope) is output (flalshing between 0 ←→ 5V) and there is no noise appearing in the waveform.

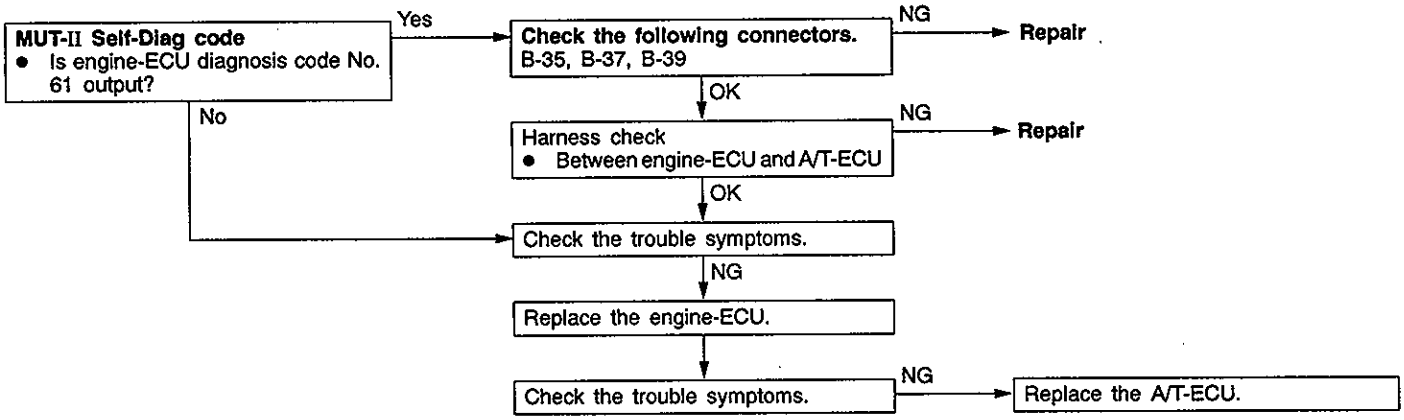
NG → Replace the output shaft speed sensor.
↓
Check the trouble symptoms.
NG ↓
A/T overhaul ★
- Replace the transfer drive gear and driven gear.

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

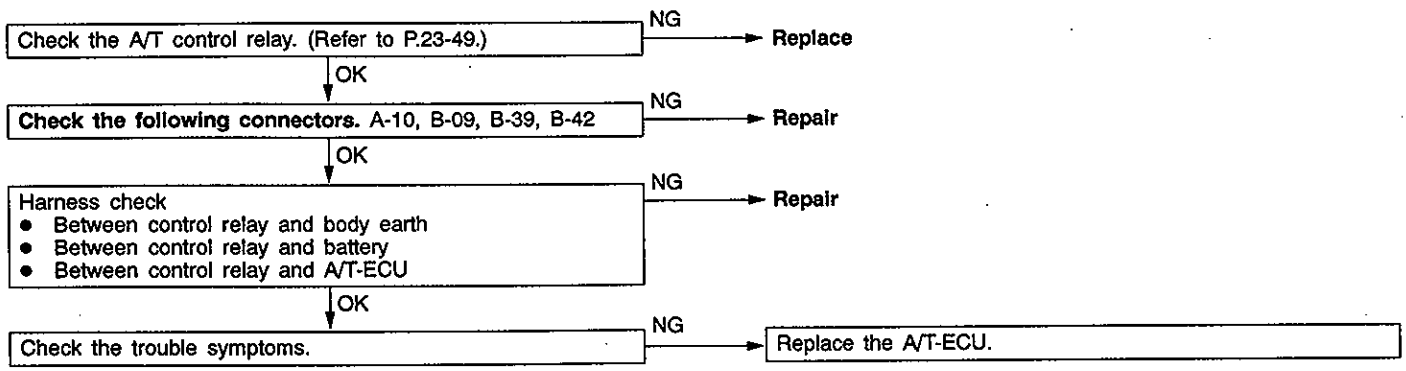
OK ↓

A/T overhaul ★
- Low and reverse brake system check (No. 41 or no diagnosis code is output).
- Reverse clutch system check (No diagnosis code is output).

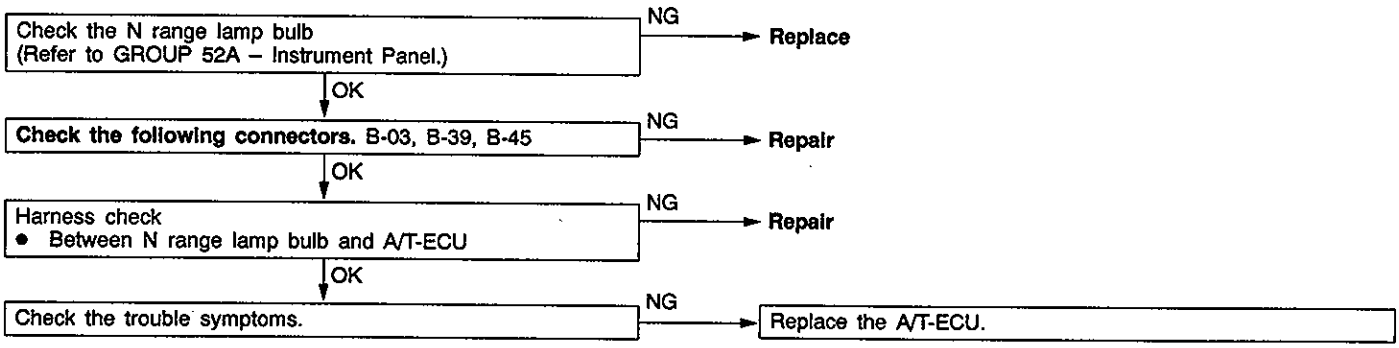
Code No. 51 Abnormal communication with engine-ECU	Probable cause
If normal communication is not possible for a continuous period of 1 second or more when the ignition switch is at the ON position, the battery voltage is 10 V or more and the engine speed is 450 r/min or more, diagnosis code No. 51 is 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 • Malfunction of the A/T-ECU



Code No. 54 A/T control relay system	Probable cause
If the A/T control relay voltage is less than 7 V after the ignition switch has been turned 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. Then 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

23100800106

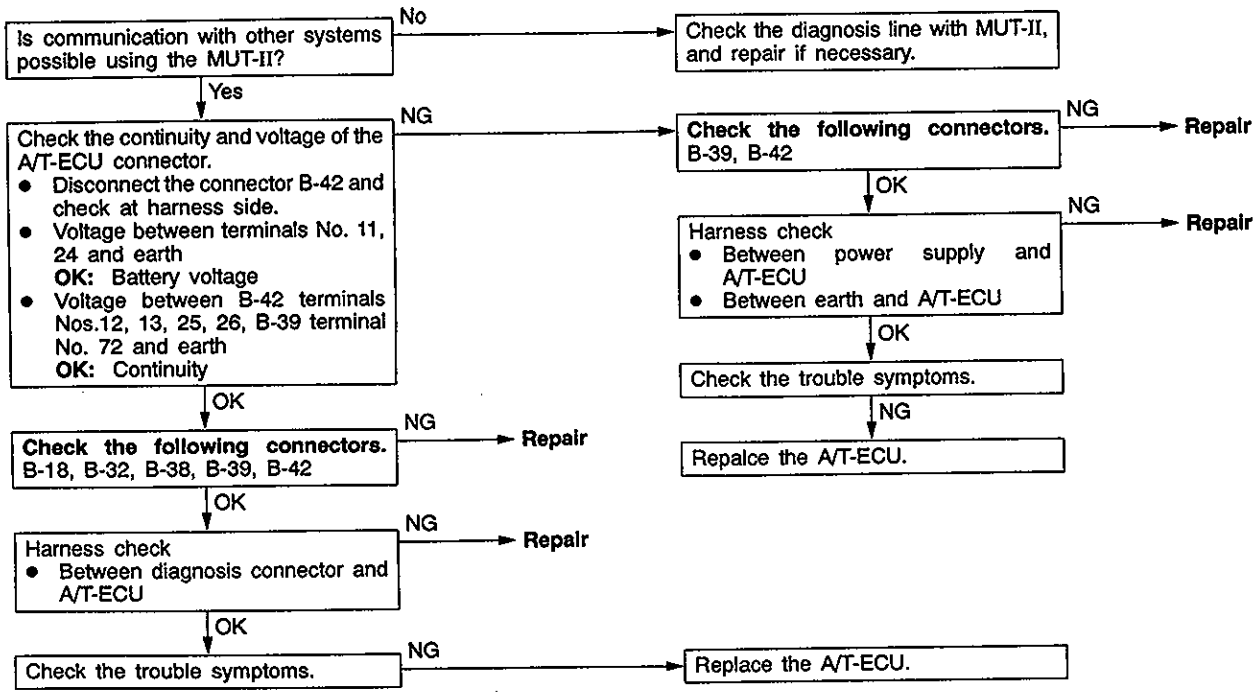
Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible		1	23-25
Driving impossible	Starting impossible	2	23-26
	Does not move forward	3	23-26
	Does not reverse	4	23-27
	Does not move (forward or reverse)	5	23-27
Malfunction when starting	Engine stalling when shifting	6	23-28
	Shocks when changing from N to D and large time lag	7	23-28
	Shocks when changing from N to R and large time lag	8	23-29
	Shocks when changing from N to D, N to R and large time lag	9	23-30
Malfunction when shifting	shocks and running up	10	23-30

Trouble symptom		Inspection procedure No.	Reference page
Displaced shifting points	All points	11	23-31
	Some points	12	23-32
Does not shift	No diagnosis codes	13	23-32
Malfunction while driving	Poor acceleration	14	23-33
	Vibration	15	23-33
Inhibitor switch system		16	23-34
Idle position switch system		17	23-34
Dual pressure switch system		18	23-35
Vehicle speed sensor system		19	23-35

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.

Check the engine system.
- Control system, ignition system, fuel system, main engine system

NG → **Repair, replace**

OK ↓

Torque converter check
- Check for incorrect installation (inserted at an angle, etc.) and for damaged splines.

NG → Repair if possible. If the splines are damaged and repairs are not possible, replace the torque converter assembly.

OK ↓

Repalce the oil pump assembly. ★
(The oil pump cannot be disassembled.)

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.

MUT-II Actuator test
- No. 2 Underdrive solenoid valve
  OK: Sound of operation can be heard.

NG → Replace the solenoid valve. ★

OK ↓

Hydraulic pressure test (Refer to P.23-51.)
- Measure the hydraulic pressure for each element when in L range.
  Standard value: Refer to P.23-51.

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 ↓

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.

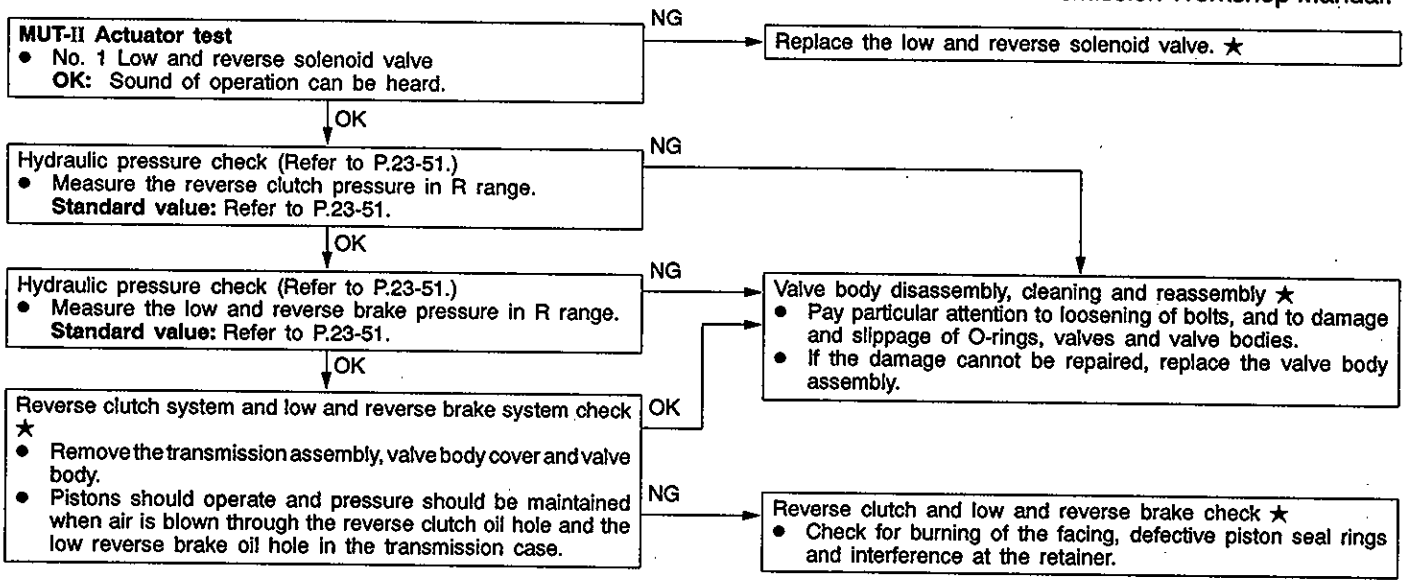
OK → (Valve body disassembly, cleaning and reassembly ★)

NG → Underdrive clutch check ★
- Check for burning of the facing, defective piston seal rings and interference at the retainer.

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

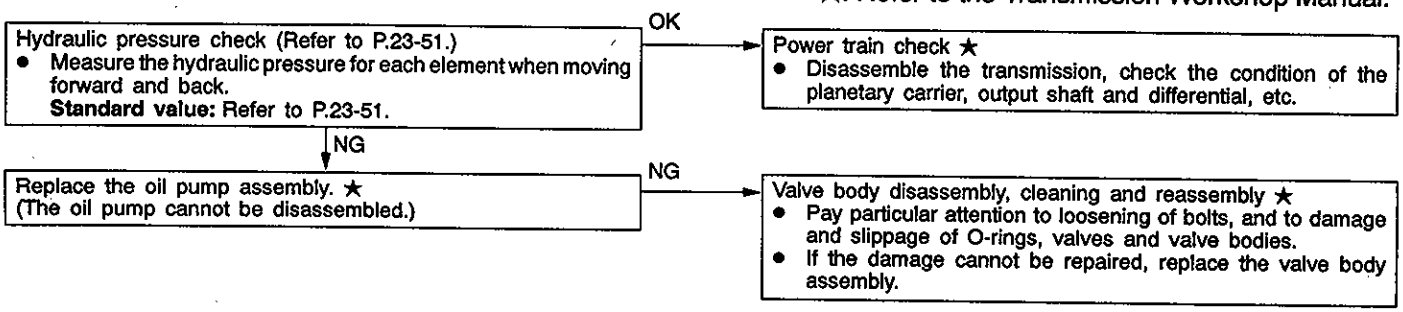
★: Refer to the Transmission Workshop Manual.



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

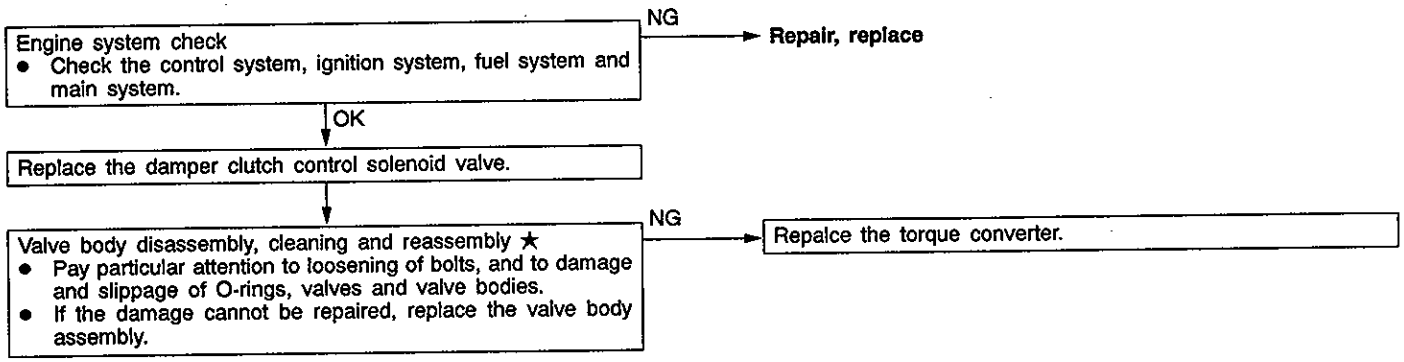
★: Refer to the Transmission Workshop Manual.



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)

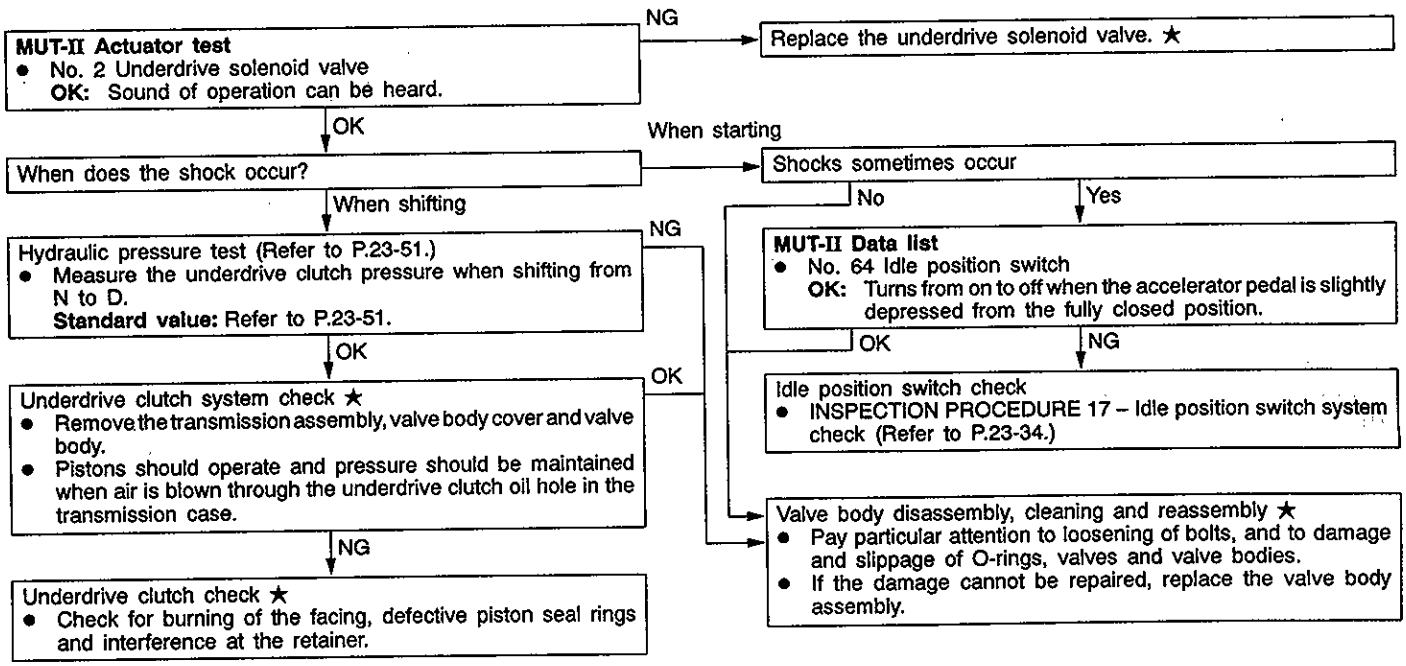
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 7

Shocks when changing from N to D and large time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range while the engine is idling, the cause is probably abnormal underdrive clutch pressure or a malfunction of the underdrive clutch, valve body or idle position switch.	• Abnormal underdrive clutch pressure • Malfunction of the underdrive solenoid valve • Malfunction of the underdrive clutch • Malfunction of the valve body • Malfunction of the idle position switch

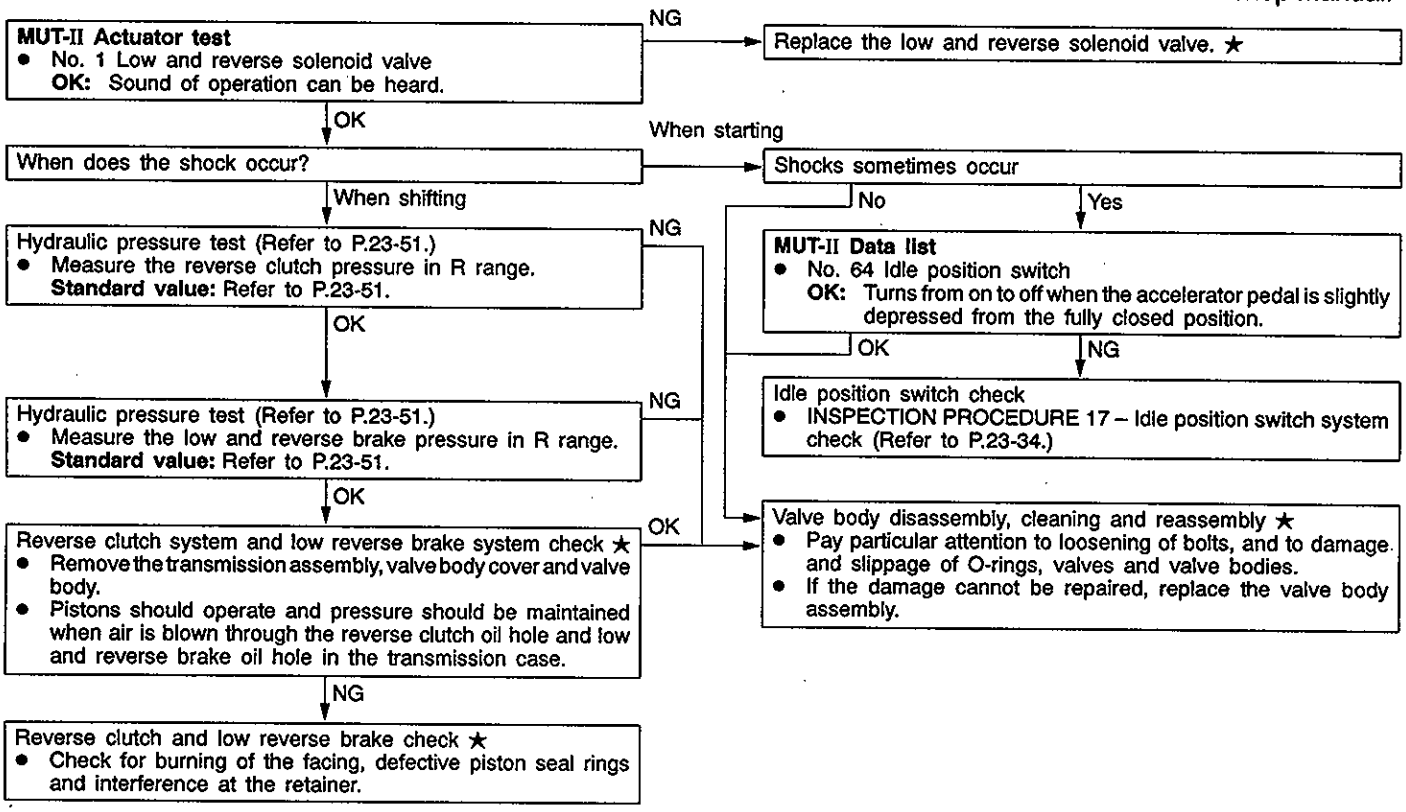
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 8

Shocks when changing from N to R and large time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occurs when the selector lever is shifted from N to R range while the engine is idling, the cause is probably abnormal reverse clutch pressure or low and reverse brake pressure, or a malfunction of the reverse clutch, low and reverse brake, valve body or idle position switch.	• Abnormal reverse clutch pressure • Abnormal low and reverse brake pressure • Malfunction of the low and reverse solenoid valve • Malfunction of the reverse clutch • Malfunction of the low and reverse brake • Malfunction of the valve body • Malfunction of the idle position switch

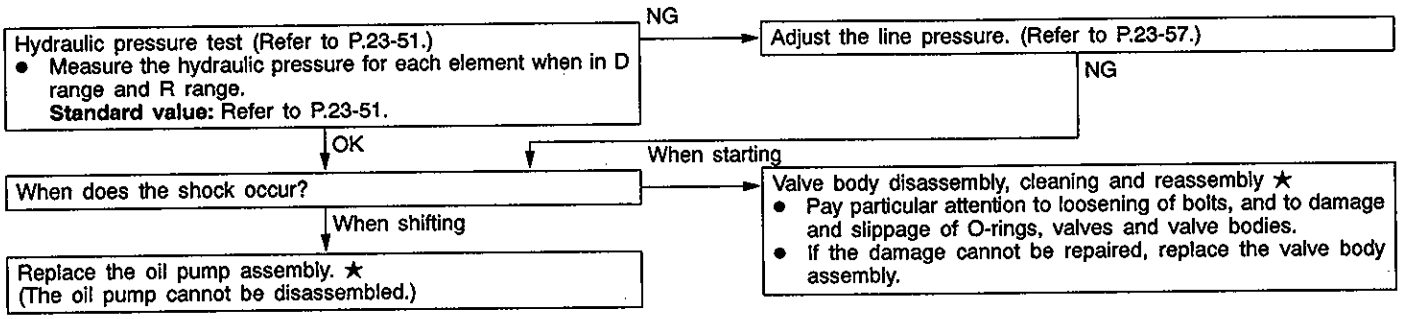
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 9

Shocks when changing from N to D, N to R and large time lag	Probable cause
If abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range and from N to R range while the engine is idling, the cause is probably abnormal line pressure or a malfunction of the oil pump or valve body.	• Abnormal line pressure • Malfunction of the oil pump • Malfunction of the valve body

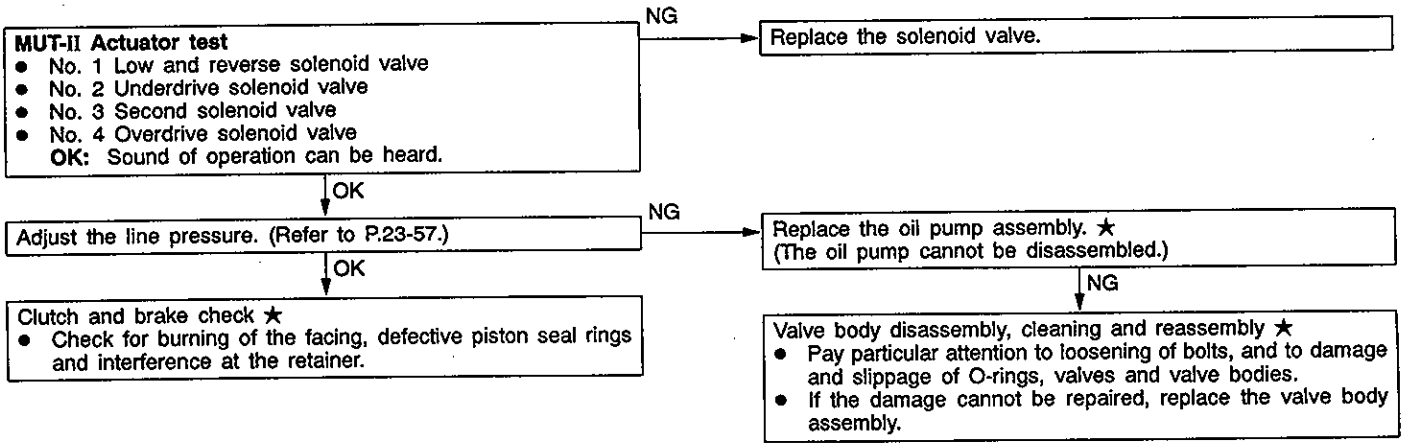
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 10

Shocks and running up	Probable cause
If shocks occur when driving due to upshifting or downshifting and the transmission speed becomes higher than the engine speed, the cause is probably abnormal line pressure or a malfunction of a solenoid valve, oil pump, valve body or of a brake or clutch.	• Abnormal line pressure • Malfunction of each solenoid valve • Malfunction of the oil pump • Malfunction of the valve body • Malfunction of each brake or each clutch

★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 11

All points (Displaced shifting points)	Probable cause
If all shift points are displaced while driving, the cause is probably a malfunction of the output shaft speed sensor, TPS or of a solenoid valve.	• Malfunction of the output shaft speed sensor • Malfunction of the throttle position sensor • Malfunction of each solenoid valve • Abnormal line pressure • Malfunction of the valve body • Malfunction of the A/T-ECU

★: Refer to the Transmission Workshop Manual.

MUT-II Data list
- No. 23 Output shaft speed sensor
  OK: Increases in proportion to vehicle speed.

NG → Code No. 23 – Output shaft speed sensor system (Refer to P.23-15.)

OK ↓

MUT-II Data list
- No. 11 TPS
  OK: Increases in proportion to accelerator pedal opening angle

NG → Code No. 11, 12, 14 TPS system check (Refer to P.23-12.)

OK ↓

MUT-II Data list
- No. 31 Low and reverse solenoid valve duty %
- No. 32 Underdrive solenoid valve duty %
- No. 33 Second solenoid valve duty %
- No. 34 Overdrive solenoid valve duty %
  OK: Refer to the table below.

NG → Replace the solenoid valve. ★

NG ↓ Repalce the A/T-ECU.

OK ↓

Adjust the line pressure. (Refer to P.23-57.)

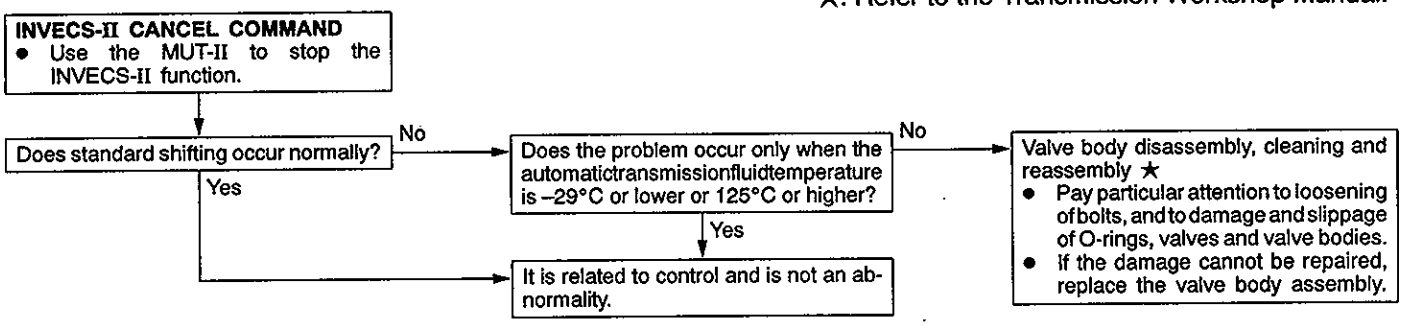
NG → Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies.
- If the damage cannot be repaired, replace the valve body assembly.

	No. 31	No. 32	No. 33	No. 34
Driving at constant speed in 1st gear	0 %	0 %	100 %	100 %
Driving at constant speed in 2nd gear	100 %	0 %	0 %	100 %
Driving at constant speed in 3rd gear	100 %	0 %	100 %	0 %
Driving at constant speed in 4th gear	100 %	100 %	0 %	0 %

INSPECTION PROCEDURE 12

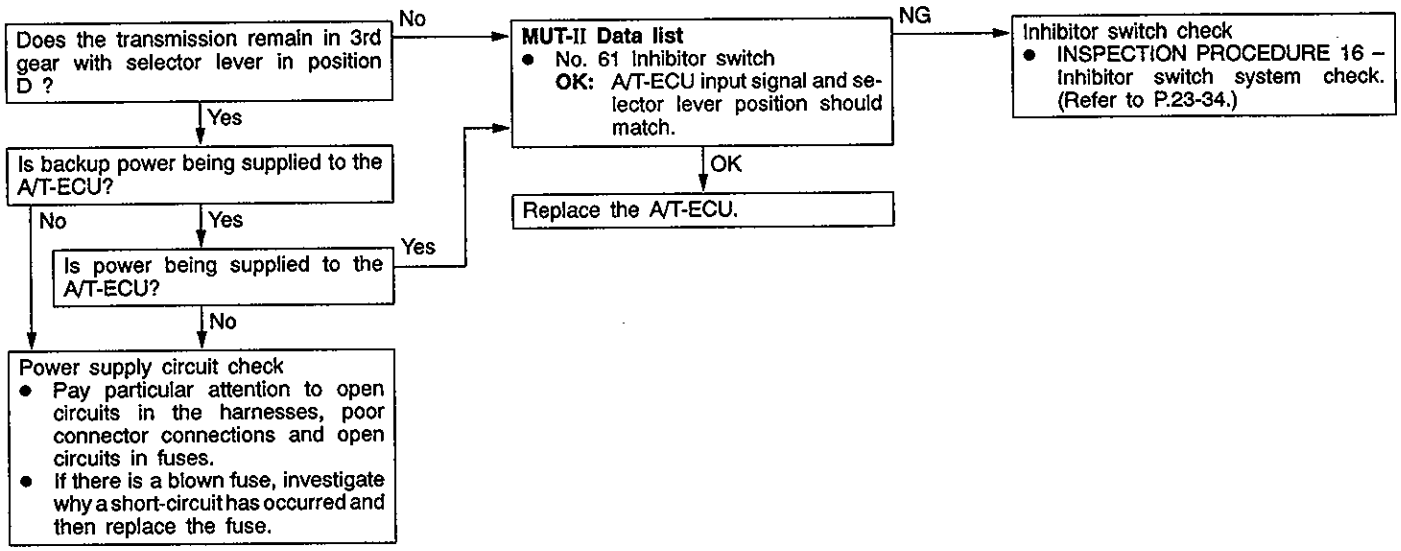
Some points (Displaced shifting points)	Probable cause
If some of the shift points are displaced while driving, the cause is probably a malfunction of the valve body, or it is related to control and is not an abnormality.	• Malfunction of the valve body

★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 13

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



INSPECTION PROCEDURE 14

Poor acceleration	Probable cause
If acceleration is poor even if downshifting occurs while driving, the cause is probably a malfunction of the engine system or of a brake or clutch.	• Malfunction of the engine system • Malfunction of the brake or clutch

★: Refer to the Transmission Workshop Manual.

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 and deceleration 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.23-51.)
- Measure the damper clutch pressure.
  Standard value: Refer to P.23-51.

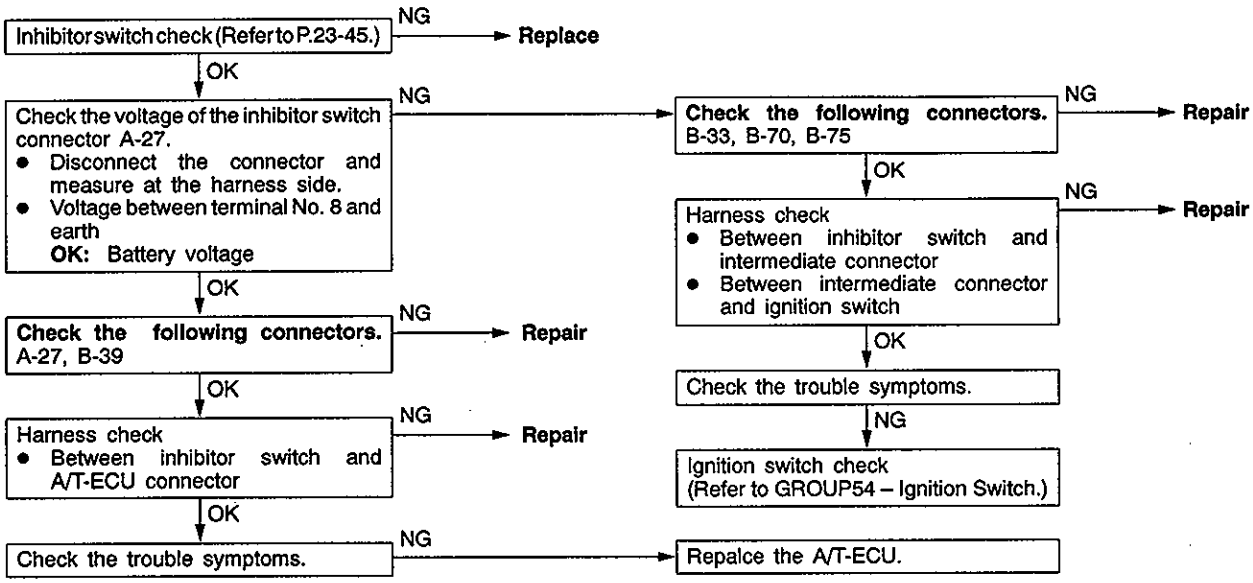
NG → Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage and slippage of O-rings, valves and valve bodies.
- If the damage cannot be repaired, replace the valve body assembly.

OK ↓

Replace the torque converter assembly.

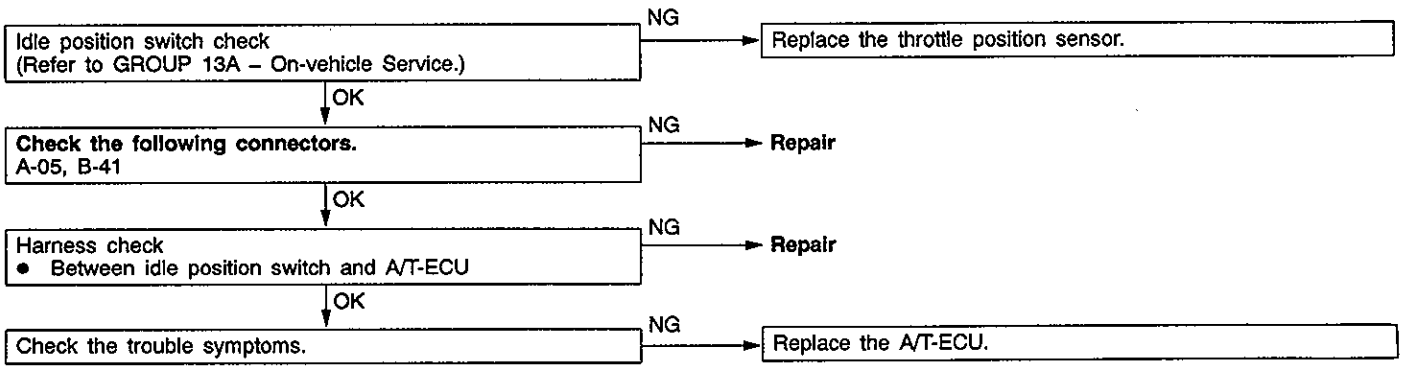
INSPECTION PROCEDURE 16

Inhibitor switch system	Probable cause
The cause is probably a malfunction of the inhibitor switch circuit, ignition switch circuit or a defective A/T-ECU.	• Malfunction of the inhibitor switch • Malfunction of the ignition switch • Malfunction of connector • Malfunction of the A/T-ECU



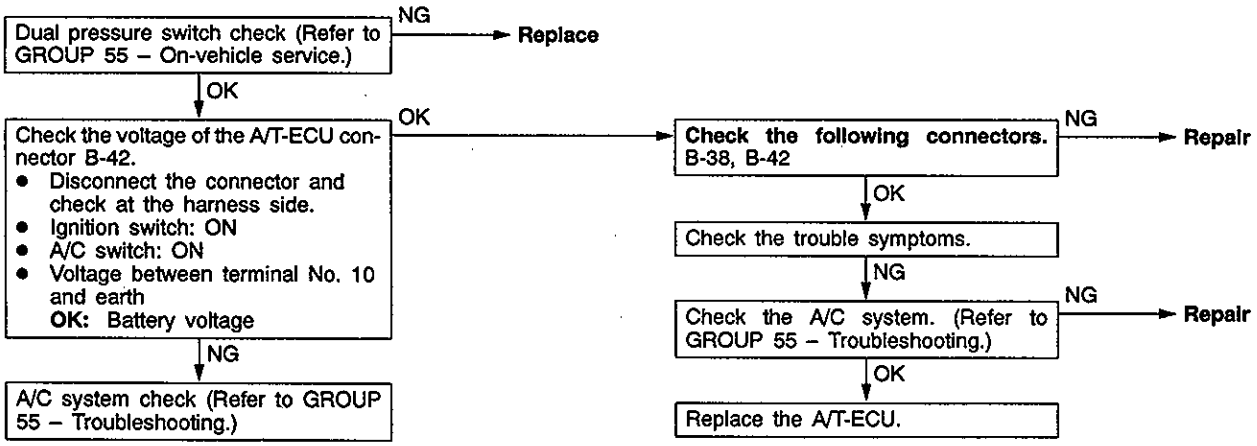
INSPECTION PROCEDURE 17

Idle position switch system	Probable cause
The cause is probably a defective idle position switch circuit or a defective A/T-ECU.	• Malfunction of the idle position switch • Malfunction of connector • Malfunction of the A/T-ECU



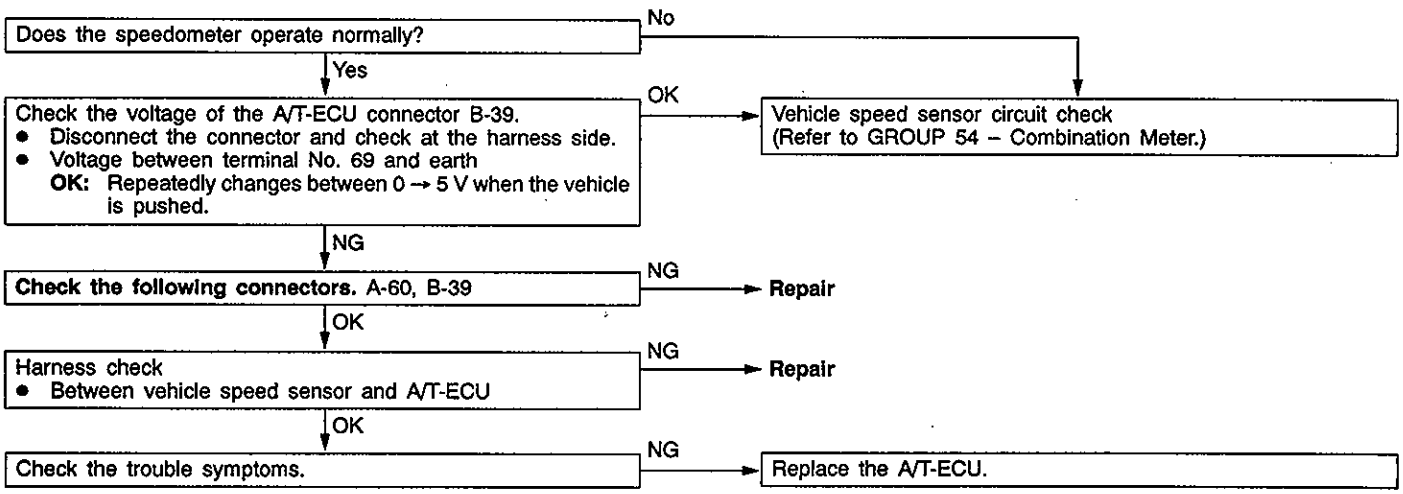
INSPECTION PROCEDURE 18

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 19

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



SERVICE DATA REFERENCE TABLE

23100810086

Item No.	Check item	Check requirement		Normal value
11	Throttle position sensor	Engine: Stopped Selector lever position: P	Accelerator pedal: Released	400 – 1,000 mV
			Accelerator pedal: Halfly depressed	Gradually rises from the above value
			Accelerator pedal: Depressed	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: Released	600 – 900 rpm
			Accelerator pedal: Halfly 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	1,800 – 2,100 rpm
23	Output shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear	1,800 – 2,100 rpm
25	Wide open throttle switch	Accelerator pedal position	Released	OFF
			Depressed	ON
26	Stop lamp switch	Ignition switch: ON Engine: Stopped	Brake pedal: Depressed	ON
			Brake pedal: Released	OFF
29	Vehicle speed sensor	Selector lever position: 3	Idling with 1st gear (Vehicle stopped)	0 km/h
			Driving at constant speed of 50 km/h in 3rd gear	50 km/h
31	Low and reverse solenoid valve duty %	Selector lever position: L, 2, 3, D	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%

Item No.	Check item	Check requirement		Normal value
36	Damper clutch control solenoid valve duty %	Selector lever position: 3	Driving at 50 km/h in 3rd gear with accelerator released	0 %
			Driving at constant speed of 70 km/h in 3rd gear	Approx. 70 – 90 %
52	Amount of damper clutch slippage	Selector lever position: 3	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 : OFF	Ignition switch: ON → OFF	Battery voltage (mV) → 0 mV
57	Engine volumetric efficiency	Selector lever position: N	N range with accelerator pedal released → depressed.	Data changes
61	Inhibitor switch	Ignition switch: ON Engine: Stopped	Selector lever position: P	P
			Selector lever position: R	R
			Selector lever position: N	N
			Selector lever position: D	D
			Selector lever position: 3	3
			Selector lever position: 2	2
			Selector lever position: L	L
63	Shift position	Selector lever position: L, 2, 3, D	Driving at constant speed of 10 km/h in 1st gear	1st
			Driving at constant speed of 30 km/h in 2nd gear	2nd
			Driving at constant speed of 50 km/h in 3rd gear	3rd
			Driving at constant speed of 70 km/h in 4th gear	4th
64	Idle position switch	Engine: Idling Selector lever position: N	Accelerator pedal: Released	ON
			Accelerator pedal: Halfly depressed	OFF
65	Dual pressure switch	Engine: Idling Selector lever position: N	A/C switch: ON	ON
			A/C switch: OFF	OFF

NOTE
*: The damper clutch is released when the accelerator is fully closed (Idle position switch: ON).

ACTUATOR TEST JUDGEMENT VALUE

23100820065

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	A/T control relay	Control relay is OFF for 3 seconds.		Data list No. 54 (1) During test: 0 mV (2) Normal: Battery voltage [mV]

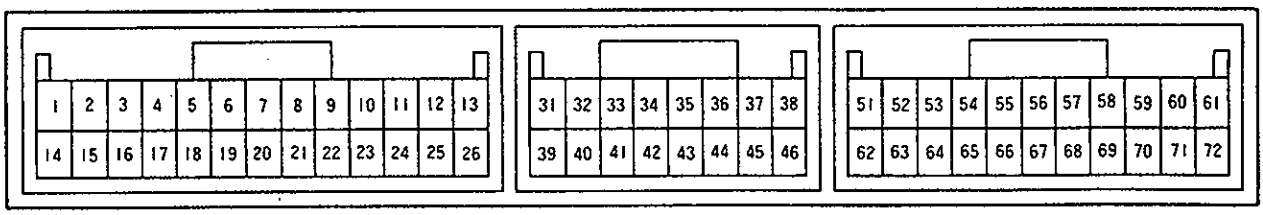
INVECS-II CANCEL COMMAND

23100950023

Item No.	Item	Content	Remarks
14	INVECS-II	Stop the INVECS-II control and change gears according to the standard shift pattern.	Use this function when carrying out procedure 8 in the road tests.

CHECK AT A/T-ECU TERMINALS

23100840092



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Terminal No.	Check item	Check requirement	Standard value
1	Underdrive solenoid valve	Selector lever position: D (1st gear)	Battery voltage
		Selector lever position: P	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
10	A/C compressor load signal	A/C switch: OFF	0 V
		A/C switch: ON	Battery voltage

Terminal No.	Check item	Check requirement	Standard value
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: P	Approx. 7 – 9 V
15	Damper clutch control solenoid valve	Selector lever position: L (1st gear)	Battery voltage
		Selector lever position: 3 (50 km/h in 3rd gear)	Other than battery voltage
16	Second solenoid valve	Selector lever position: 2 (2nd gear)	Battery voltage
		Selector lever position: P	Approx. 7 – 9 V
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.23-41, 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.23-41, 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
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 position sensor (TPS)	Accelerator pedal: Released (Engine stopped)	0.5 – 1.0 V
		Accelerator pedal: Depressed (Engine stopped)	4.5 – 5.0 V
53	Communication with engine-ECU	Engine: Idling Selector lever position: D	Other than 0 V

Terminal No.	Check item	Check requirement	Standard value
54	Communication with engine-ECU	Engine: Idling Selector lever position: D	Other than 0 V
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
63	Diagnosis output	Normal (No diagnosis code output)	0 → 5 V flashing
65	Wide open throttle switch	Accelerator pedal: Released	4.5 – 5.5 V
		Accelerator pedal: Depressed	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
69	Vehicle speed sensor	When stopped	0 V
		Move forward slowly	0 → 5 V flashing
71	A/T control relay	Ignition switch: OFF	0 V
		Ignition switch: ON	Battery voltage
72	Earth	Ignition switch: ON	0 V

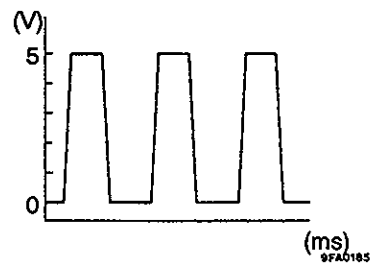
OSCILLOSCOPE INSPECTION PROCEDURE

23100850064

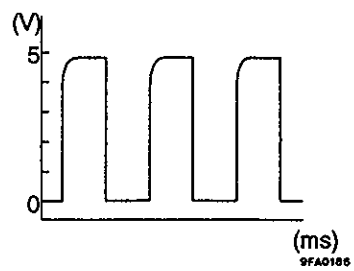
Check item	Check requirement		Normal condition (Waveform sample)
Crank angle sensor	Selector lever position: N	Idling (Vehicle stopped)	Waveform A
Input shaft speed sensor	Selector lever position: 3	Driving at constant speed of 50 km/h in 3rd gear (Engine: 1,800 – 2,100 r/min)	Waveform B
Output shaft speed sensor			
Vehicle speed sensor			
Low reverse solenoid valve	Ignition switch: ON Selector lever position: P Engine: 0 r/min Vehicle speed: 0 km/h (Vehicle stopped) Throttle (Accelerator) opening angle: Less than 1 V 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

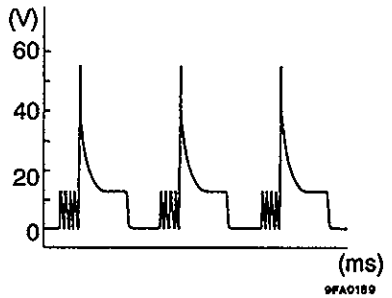
Waveform A

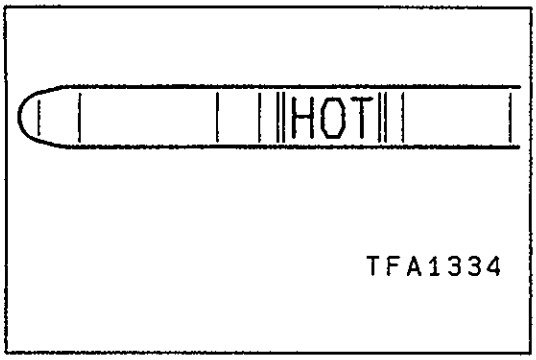


Waveform B



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.

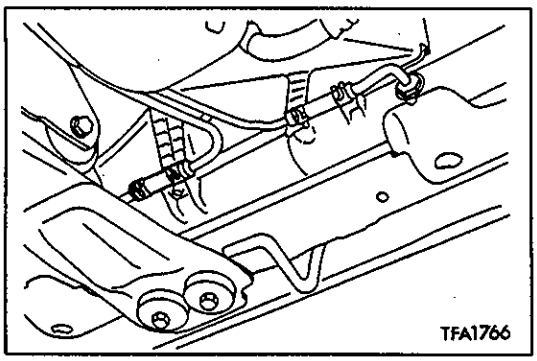
(5) Check that the fluid level is at the HOT mark on the oil level gauge. If the fluid level is lower than this, pour in more fluid until the level reaches the HOT mark.

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.


TFA1766

AUTOMATIC TRANSMISSION FLUID REPLACEMENT

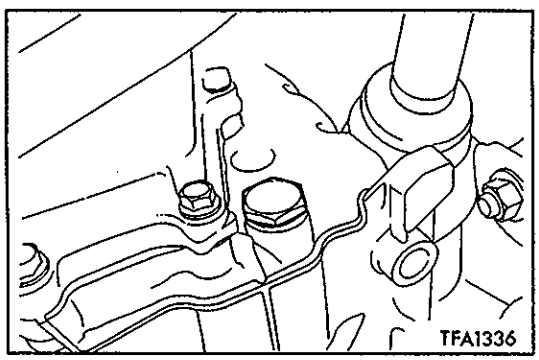
23100100107

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.23-44.)
(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

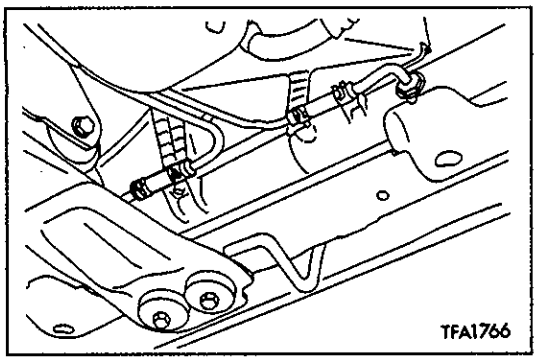
Caution
Stop pouring if the full volume of fluid cannot be poured in.

(7) Repeat the procedure in step (2).

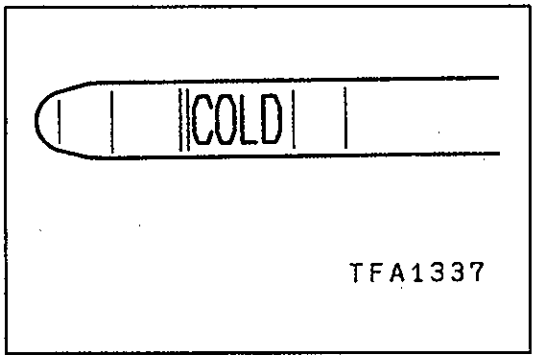
NOTE
Check the old fluid for contamination. If it has been contaminated, repeat the steps (6) and (7).

(8) Pour the new fluid in through the oil filler tube.

Adding volume: Approx. 3.5 ℓ


TFA1766

(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.

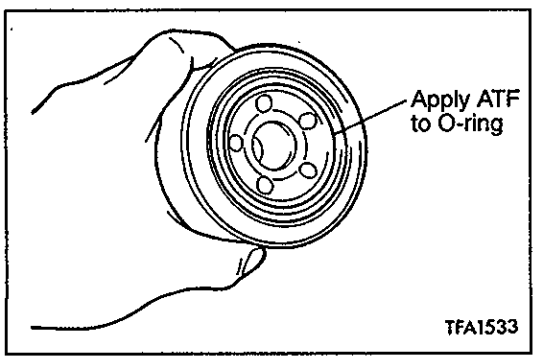


TFA1337

(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 must 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.



TFA1533

OIL FILTER REPLACEMENT 23101050029

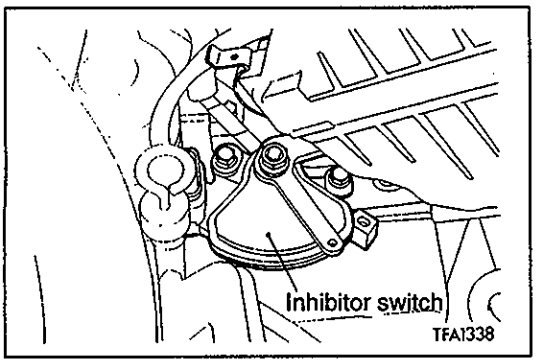
1. Use the special tool (MB991610) to remove the automatic transmission oil filter.
2. Clean the filter bracket side mounting surface.
3. Apply a small amount of automatic transmission fluid to the O-ring of the new oil filter.
4. Use the special tool (MB991610) to install the automatic transmission oil filter.

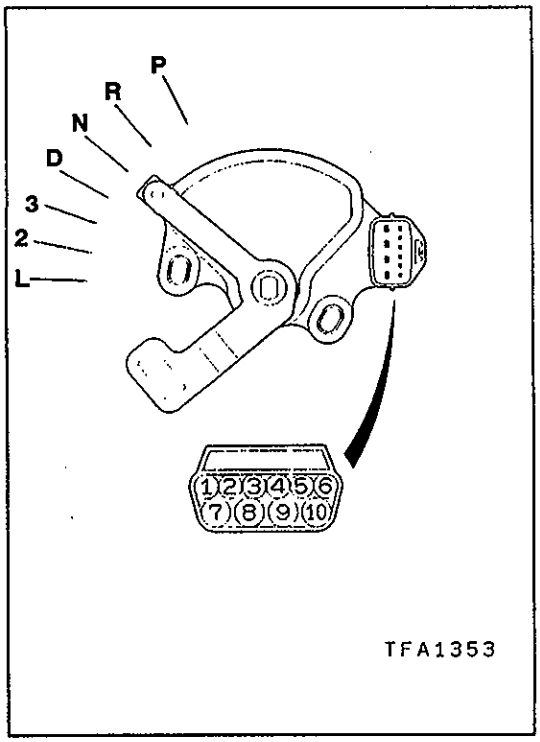
   NOTE
   Tightening torque: 12 Nm

5. Check the quantity of the automatic transmission fluid. (Refer to P.23-42.)

THROTTLE POSITION SENSOR ADJUSTMENT 23100190036

Refer to GROUP 13A – On-vehicle Service.

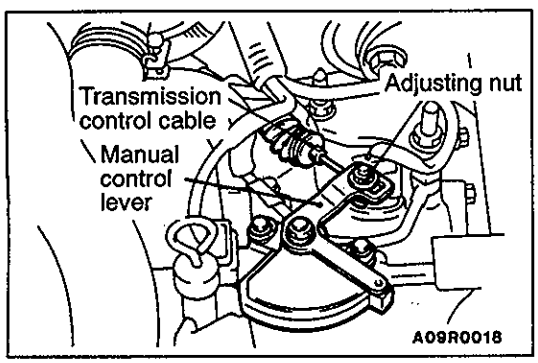




INHIBITOR SWITCH CONTINUITY CHECK

23100140055

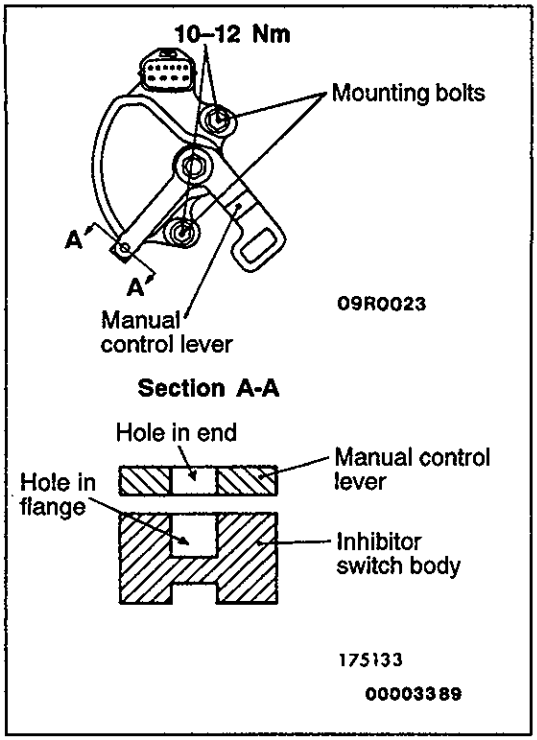
Items	Terminal No.									
	1	2	3	4	5	6	7	8	9	10
P			○					○	○	○
R							○	○		
N				○				○	○	○
D	○							○		
3					○			○		
2		○						○		
L						○		○		



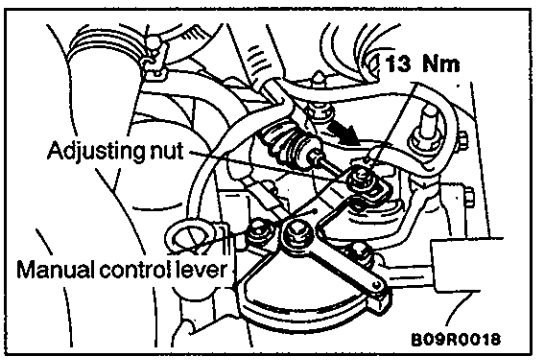
INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT

23100150096

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.

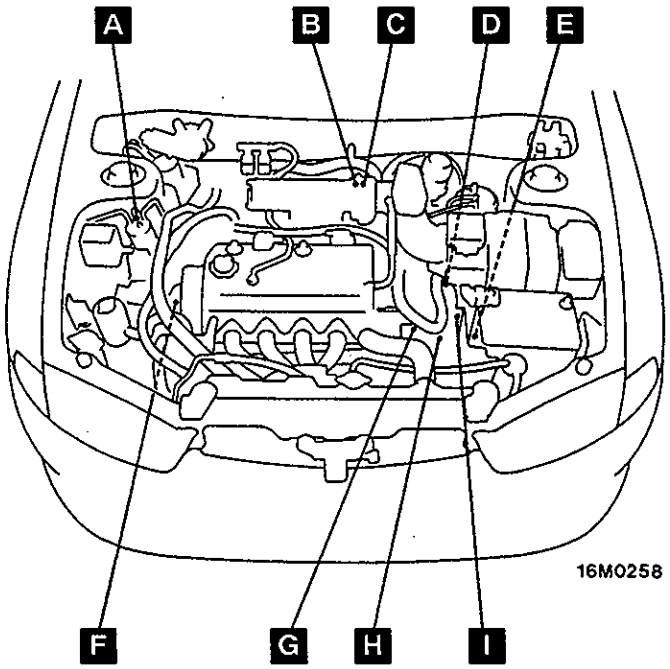


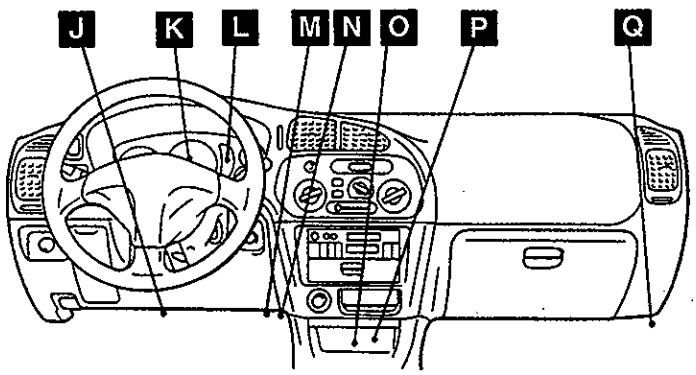
6. Gently pull the transmission control cable in the direction of the arrow, and then tighten the adjusting nut.
7. Check that the selector lever is in the "N" position.
8. Check that each range on the transmission side operates and functions correctly for each position of the selector lever.

A/T CONTROL COMPONENT LOCATION

23100860081

Name	Symbol	Name	Symbol
A/T control relay	P	Oil temperature sensor	H
A/T-ECU	Q	Output shaft speed sensor	D
Crank angle sensor	F	Shift indicator lamp	L
Diagnosis connector	N	Solenoid valve	E
Dual pressure switch	A	Stop lamp switch	J
Engine-ECU	Q	Throttle position sensor	B
Idle position switch	C	Vehicle speed sensor	K
Inhibitor switch	I	Wide open throttle switch	M
Input shaft speed sensor	G		





TFA1795

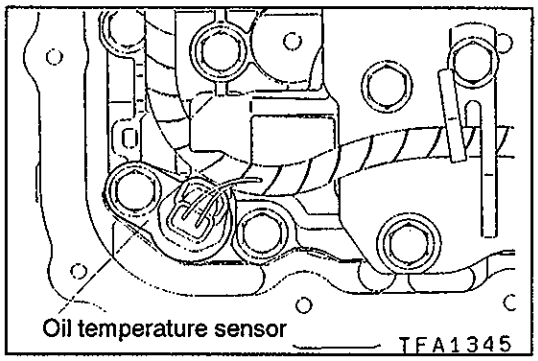
A/T CONTROL COMPONENT CHECK 23100900011

1. CRANK ANGLE SENSOR CHECK

Refer to GROUP 13A – Troubleshooting.

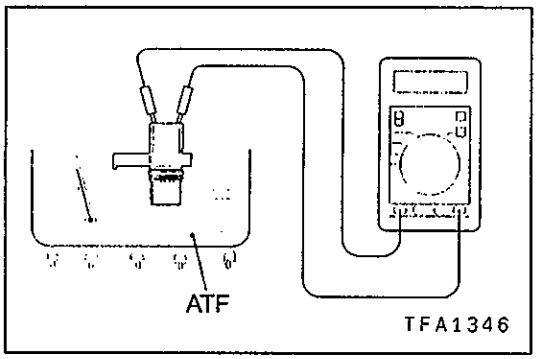
2. THROTTLE POSITION SENSOR CHECK 23100390092

Refer to GROUP 13A – On-vehicle Service.



3. OIL TEMPERATURE SENSOR CHECK 23100450073

(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

4. INHIBITOR SWITCH CHECK 23100140147

Refer to P.23-45.

5. STOP LAMP SWITCH CHECK 23100910021

Refer to GROUP 35 – On-vehicle Service.

6. VEHICLE SPEED SENSOR CHECK 23100460106

Refer to GROUP 54 – On-vehicle Service.

7. DUAL POSITION PRESSURE SWITCH CHECK 23100470086

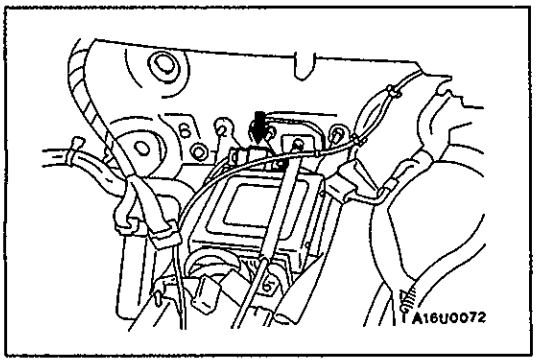
Refer to GROUP 55 – On-vehicle Service.

8. IDLE POSITION SWITCH CHECK 23100410088

Refer to GROUP 13A – On-vehicle Service.

9. WIDE OPEN THROTTLE SWITCH CHECK 23100890059

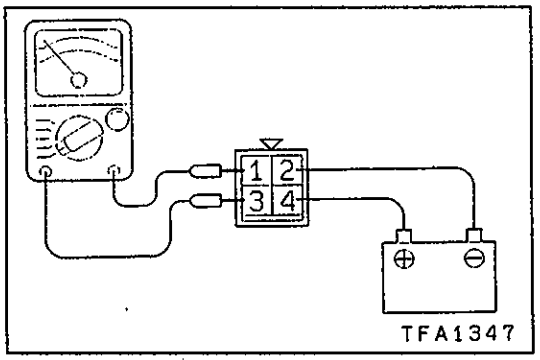
Refer to P.23-59.



10. A/T CONTROL RELAY CHECK

23100930027

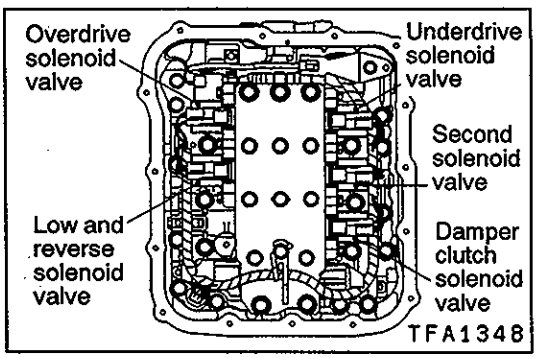
(1) Remove the A/T control relay.



(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

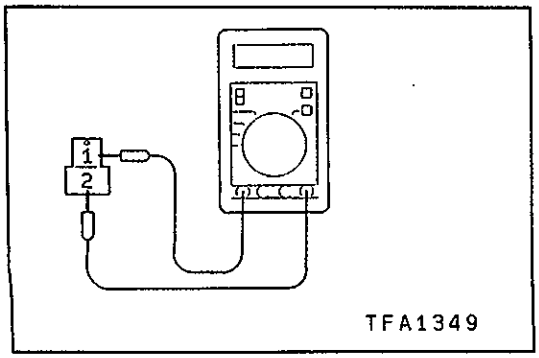
(4) If there is a problem, replace the A/T control relay.



11. SOLENOID VALVE CHECK

23100940020

(1) Remove the valve body cover.
(2) Disconnect the connectors of each solenoid valve.

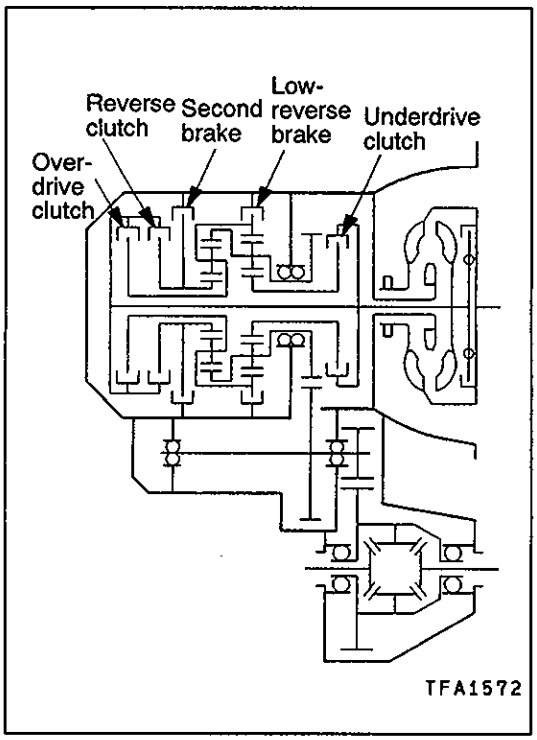


(3) Measure the resistance between terminals 1 and 2 of each solenoid valve.

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 23100540084

This test measures the maximum engine speed when the selector lever is at the D or R position and the torque converter stalls to test the operation of the torque converter, starter motor and one-way clutch operation and the holding performance of the clutches and brakes in the transmission.

Caution
Do not let anybody stand in front of or behind the vehicle while this test is being carried out.

(1) Check the automatic transmission fluid level and temperature and the engine coolant temperature.
- Fluid level: At the HOT mark on the oil level gauge
- Fluid temperature: 80–100°C
- Engine coolant temperature: 80–100°C

(2) Chock both rear wheels (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

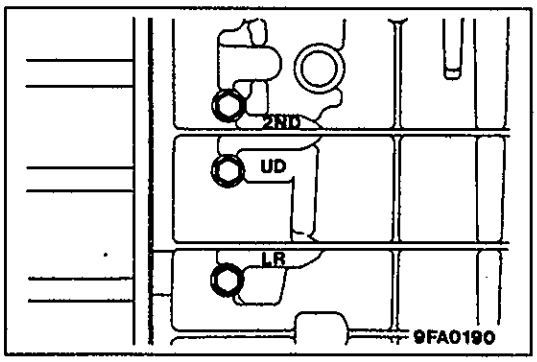
TORQUE CONVERTER STALL TEST JUDGEMENT RESULTS

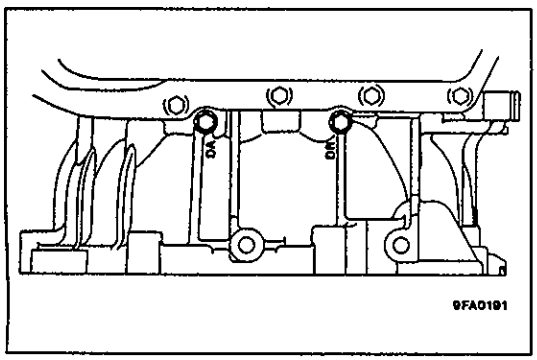
a. Stall speed is too high in both D and R ranges
   - Low line pressure
   - Low & reverse brake slippage

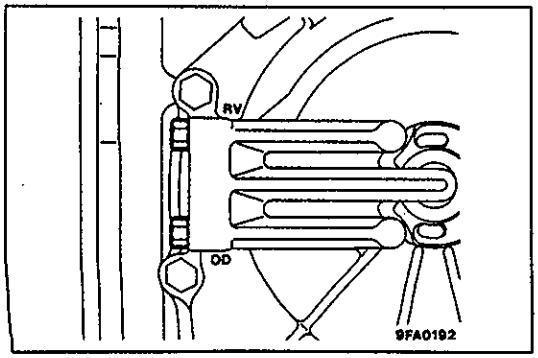
b. Stall speed is too high in D range only
   - Underdrive clutch slippage

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 23100550094

(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	–	–	–	1,010–1,050	500–700
	3rd gear	2,500	590–690	–	590–690	–	–	450–650
	4th gear	2,500	–	–	590–690	–	590–690	450–650

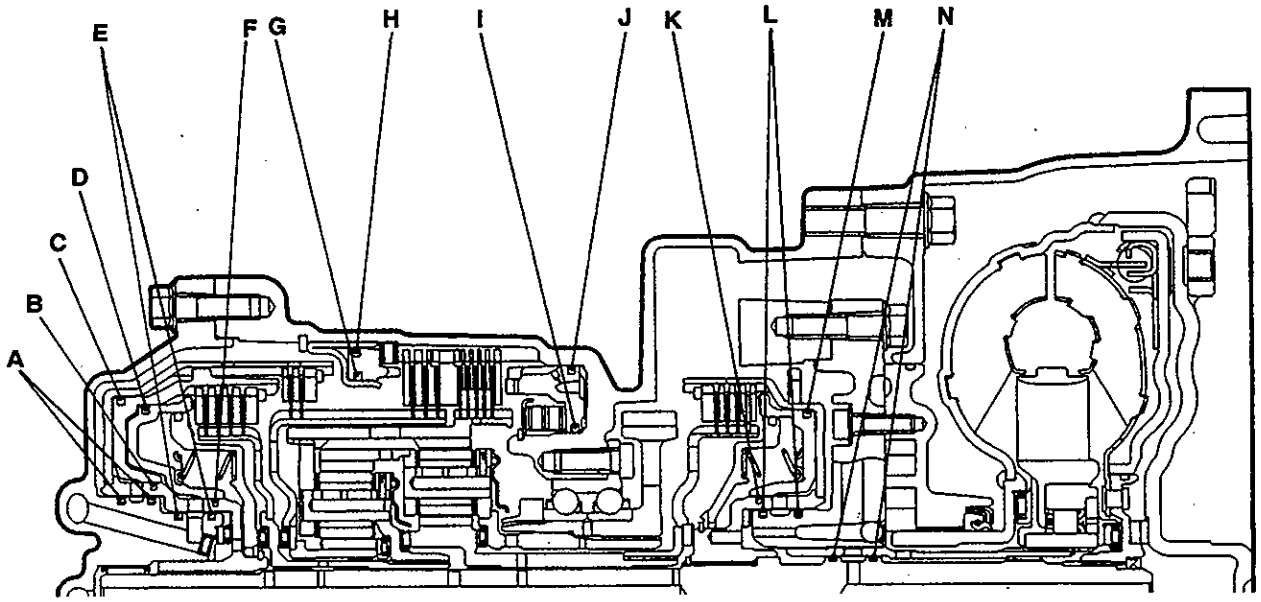
HYDRAULIC PRESSURE TEST DIAGNOSIS TABLE

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
Hydraulic pressure is abnormal in "R" range only.	Malfunction of the regulator valve
	Clogged orifice
	Incorrect valve body installation
Hydraulic pressure is abnormal in "3" or "4" range only.	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction of the regulator valve
	Malfunction of the switch valve
	Clogged orifice
	Incorrect valve body installation

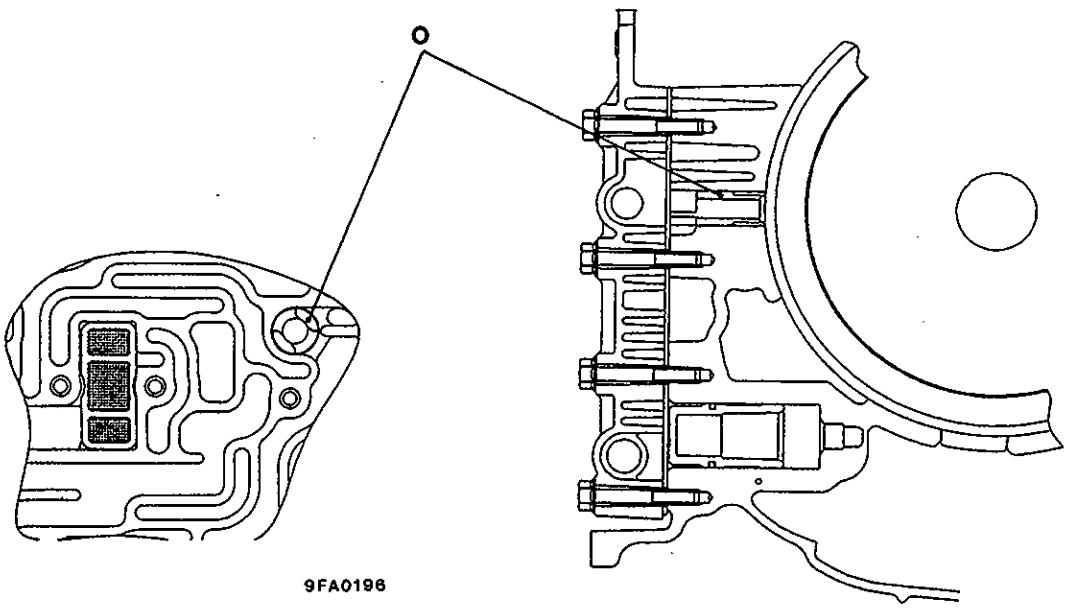
Trouble symptom	Probable cause
Only underdrive hydraulic pressure is abnormal.	Malfunction of the oil seal K
	Malfunction of the oil seal L
	Malfunction of the oil seal M
	Malfunction of the underdrive solenoid valve
	Malfunction of the underdrive pressure control valve
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation
Only reverse clutch hydraulic pressure is abnormal.	Malfunction of the oil seal A
	Malfunction of the oil seal B
	Malfunction of the oil seal C
	Clogged orifice
	Incorrect valve body installation
Only overdrive hydraulic pressure is abnormal.	Malfunction of the oil seal D
	Malfunction of the oil seal E
	Malfunction of the oil seal F
	Malfunction of the overdrive solenoid valve
	Malfunction of the overdrive pressure control valve
	Malfunction check ball
	Clogged orifice
	Incorrect valve body installation
Only low and reverse hydraulic pressure is abnormal.	Malfunction of the oil seal I
	Malfunction of the oil seal J
	Malfunction of the low and reverse solenoid valve
	Malfunction of the low and reverse pressure control valve
	Malfunction of the switch valve
	Malfunction of the fail safe valve A
	Malfunction of check ball
	Clogged orifice
	Incorrect valve body installation

Trouble symptom	Probable cause
Only second hydraulic pressure is abnormal.	Malfunction of the oil seal G
	Malfunction of the oil seal H
	Malfunction of the oil seal O
	Malfunction of the second solenoid valve
	Malfunction of the second pressure control valve
	Malfunction of the fail safe valve B
	Clogged orifice
	Incorrect valve body installation
Only torque converter pressure is abnormal.	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



9FA0281



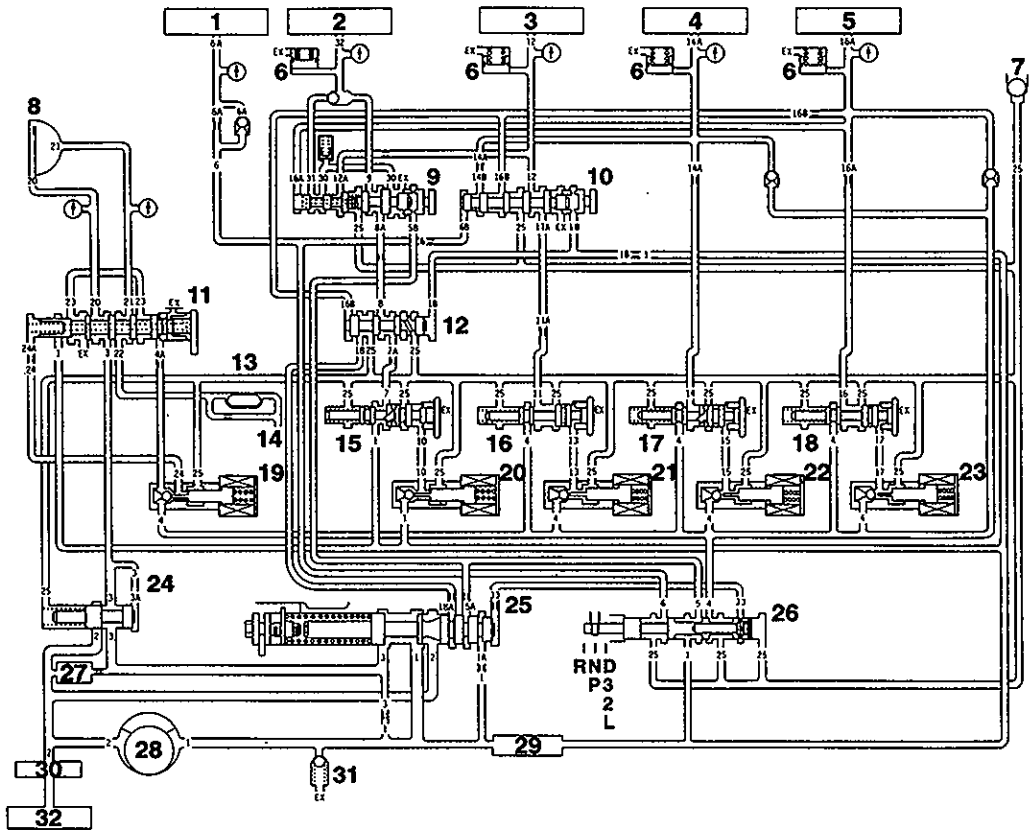
9FA0196

9FA0203
00003693

HYDRAULIC CIRCUIT

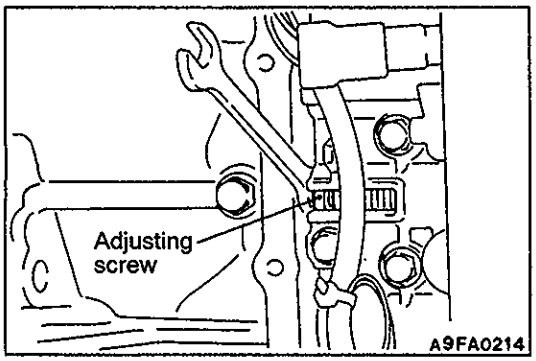
23100880070

PARKING AND NEUTRAL



TFA1598

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

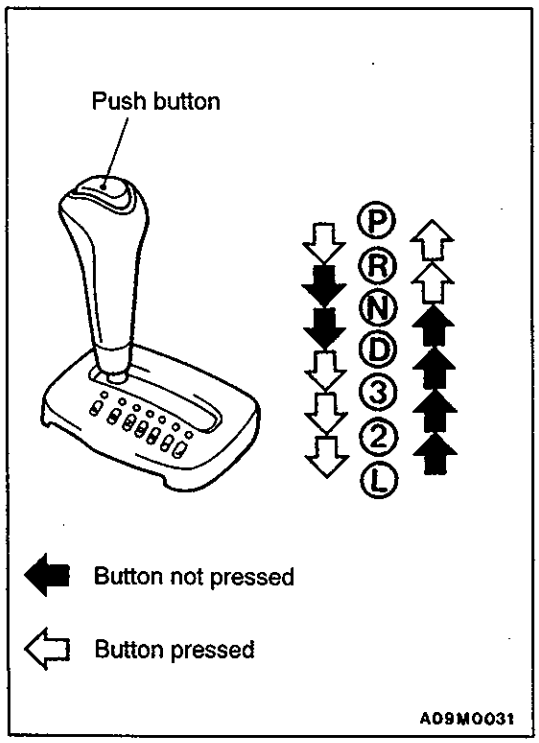
23100170078

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.23-51.) Readjust the line pressure if necessary.



SELECTOR LEVER OPERATION CHECK

23100130090

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.

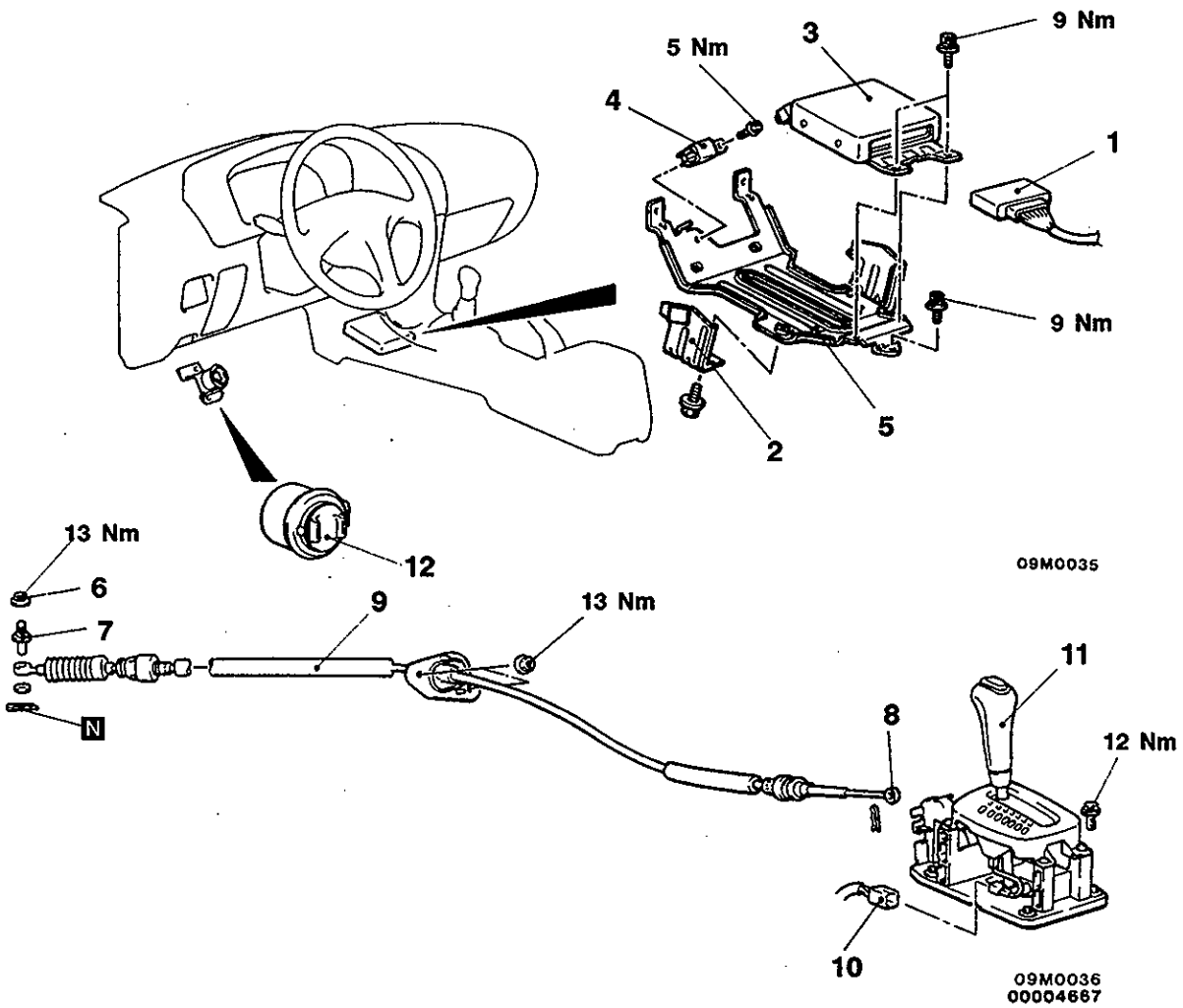
TRANSMISSION CONTROL

23100660131

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Air Cleaner Assembly Removal and Installation
(2) Front Floor Console Removal and Installation (Refer to GROUP 52A)

Caution: SRS
Be careful not to subject the SRS-ECU to any shocks during removal and installation of the transmission control cable and selector lever assembly.

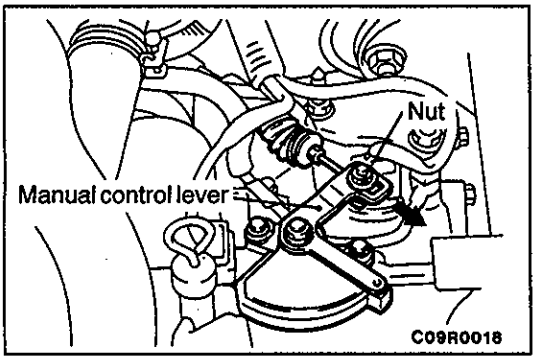


Transmission control cable assembly removal steps
1. Wiring harness connector
2. Arm (L.H.)
3. A/T-ECU
▶A◀ 6. Nut
7. Adjuster
8. Transmission control cable connection
9. Transmission control cable assembly

Selector lever assembly removal steps
8. Transmission control cable connection
10. Wiring harness connector
11. Selector lever assembly

A/T-ECU and carpet bracket removal steps
1. Wiring harness connector
2. Arm (L.H.)
3. A/T-ECU
4. Control relay
● Heater unit (Refer to GROUP 55.)
5. Carpet bracket

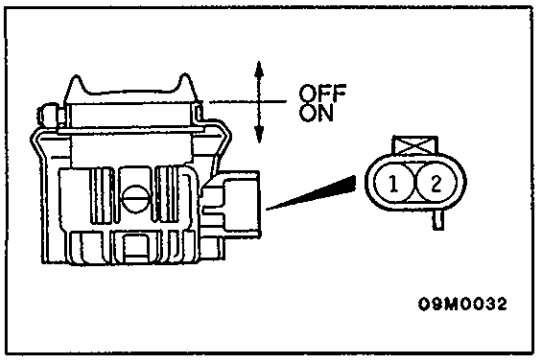
Wide open throttle switch removal
12. Wide open throttle switch



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

23100890066

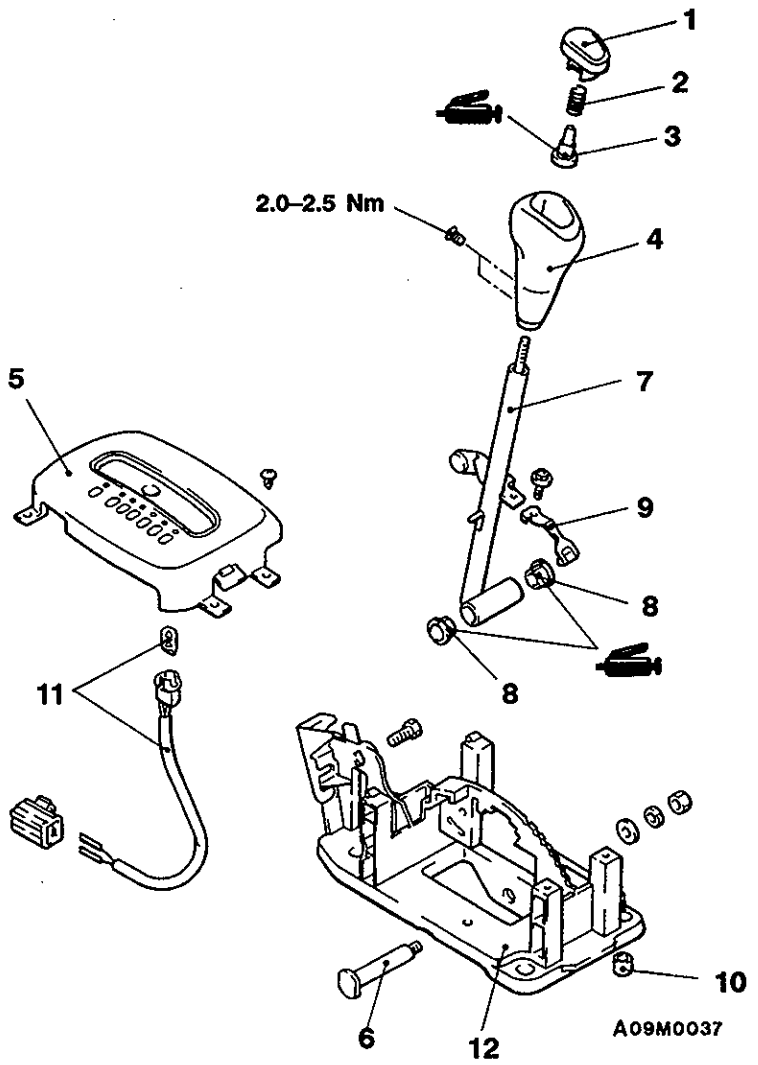
WIDE OPEN THROTTLE SWITCH CHECK

Switch position	Terminal No.	
	1	2
OFF		
ON	○	○

SELECTOR LEVER ASSEMBLY

23100680083

DISASSEMBLY AND REASSEMBLY



Disassembly steps

1. Push button
2. Spring
3. Adjuster
4. Shift knob
5. Indicator panel assembly
6. Bolt
7. Shift lever assembly
8. Bushing
9. Detent spring
10. Collar
11. Position indicator lamp assembly
12. Bracket assembly

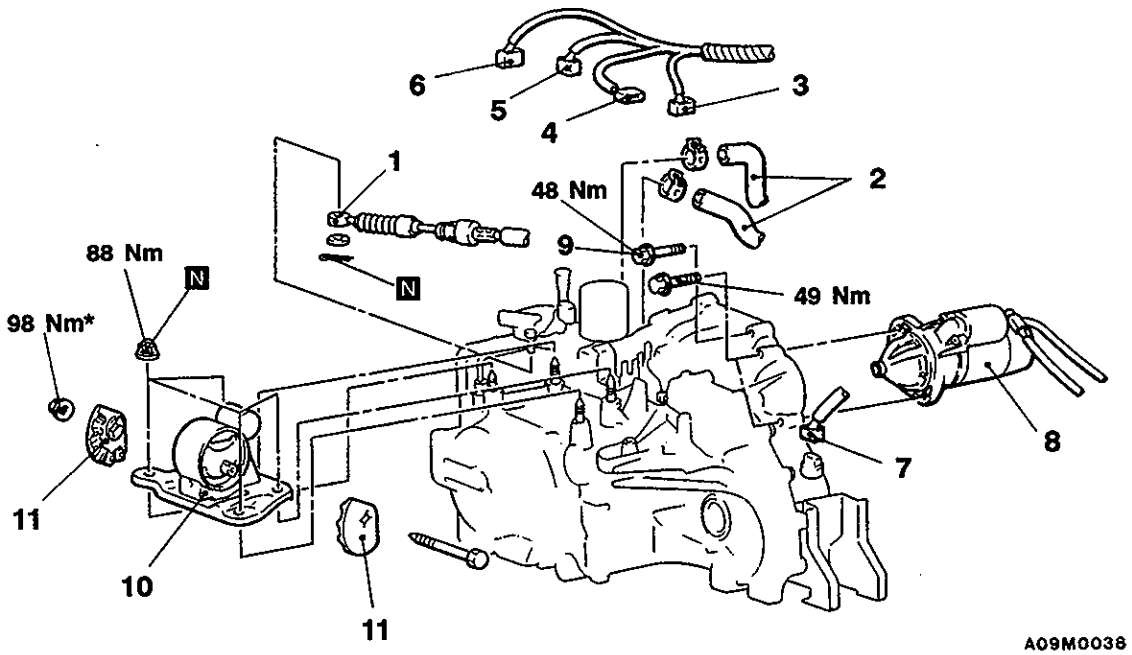
TRANSMISSION ASSEMBLY

23100570137

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Transmission Fluid Draining (Refer to P.23-43.)
(2) Under Cover Removal
(3) Battery and Battery Tray Removal
(4) Air Cleaner Assembly Removal

Post-installation Operation
(1) Air Cleaner Assembly Installation
(2) Battery and Battery Tray Installation
(3) Under Cover Installation
(4) Transmission Fluid Supplying (Refer to P.23-43.)
(5) Selector Lever Operation Check
(6) Speedometer Operation Check



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 assembly connector
7. Vehicle speed sensor connector
8. Starter motor

◀A▶

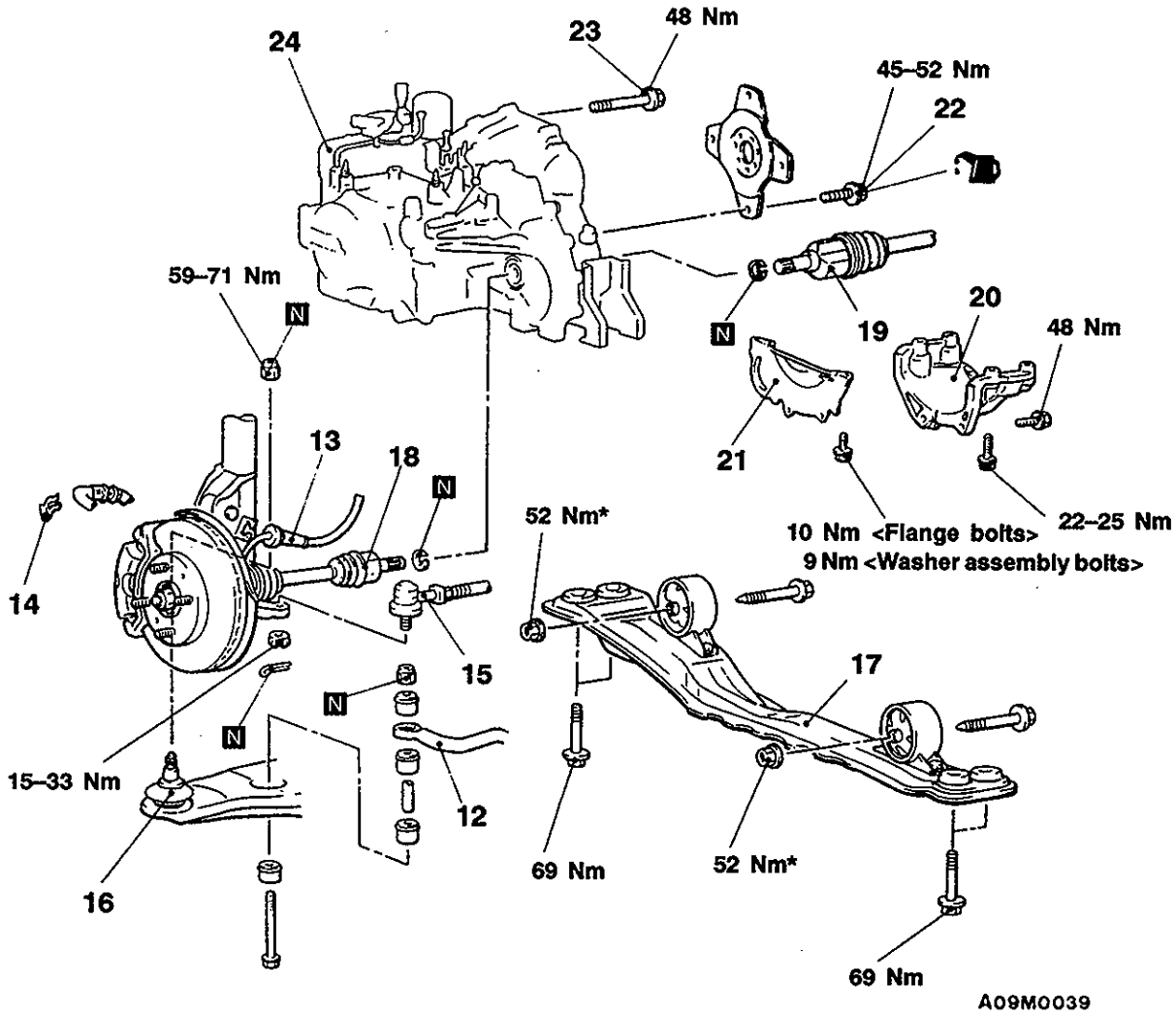
9. Transmission assembly upper part coupling bolts

◀B▶ 10. Transmission mount bracket

▶C◀ 11. Transmission mount stopper

◀C▶ • Engine assembly supporting

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.



Lifting up of the vehicle

- ▶B◀ 12. Stabilizer bar connection
- 13. Speed sensor cable connection <Vehicles with ABS>
- 14. Brake hose clamp
- ◀D▶ 15. Tie rod end connection
- ◀D▶ 16. Lower arm ball joint connection
- 17. Centermember assembly
- ◀E▶ 18. Drive shaft <L.H.> connection
- ◀E▶ 19. Drive shaft <R.H.> connection
- 20. Transmission stay <4G13>
- 21. Bell housing cover
- ◀F▶ 22. Drive plate bolts
- ◀F▶ 23. Transmission assembly lower part coupling bolts
- ◀F▶ ▶A◀ 24. Transmission assembly

Caution
Mounting locations marked by * should be provisionally tightened, and then fully tightened when the body is supporting the full weight of the engine.

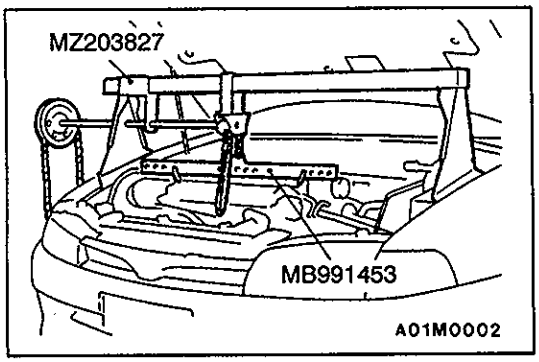
REMOVAL SERVICE POINTS

◀A▶ STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harness still connected, and secure it inside the engine compartment.

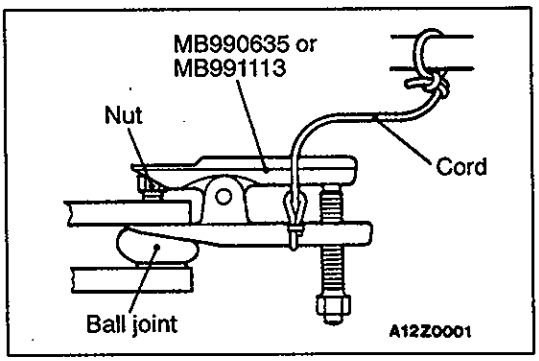
◀B▶ TRANSMISSION MOUNT BRACKET REMOVAL

Jack up the transmission assembly gently with a garage jack, and then remove the transmission mounting.



◀C▶ ENGINE ASSEMBLY SUPPORTING

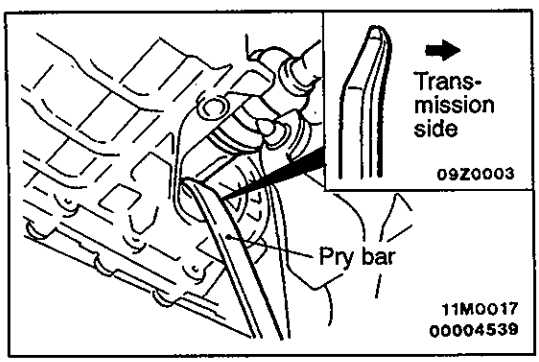
Set the special tool to the vehicle to support the engine assembly.



◀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.**

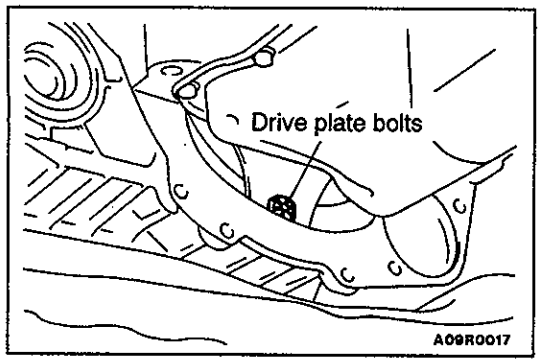


◀E▶ DRIVE SHAFT <L.H.>/DRIVE SHAFT <R.H.> DISCONNECTION

1. Insert a pry bar between the transmission case and the drive shaft as shown to remove the drive shaft.

   NOTE
   Do not remove the hub and knuckle from the drive shaft.

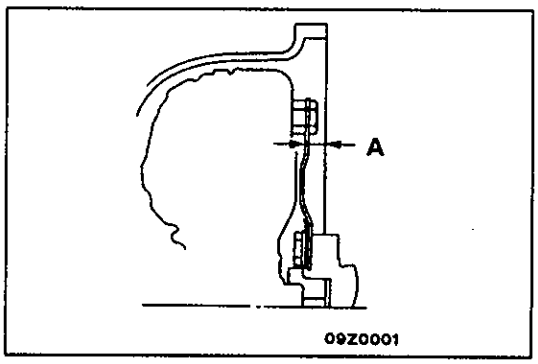
   Caution
   Always use a pry bar, or the TJ will be damaged.
2. Suspend the removed drive shaft with a wire so that there are no sharp bends in any of the joints.
3. Use a shop towel to cover the transmission case not to let foreign material get into it.



◀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.

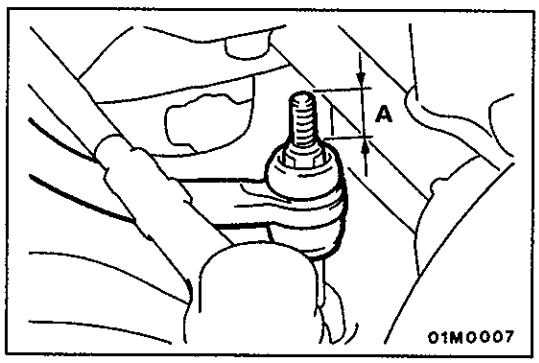
INSTALLATION SERVICE POINTS



▶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.

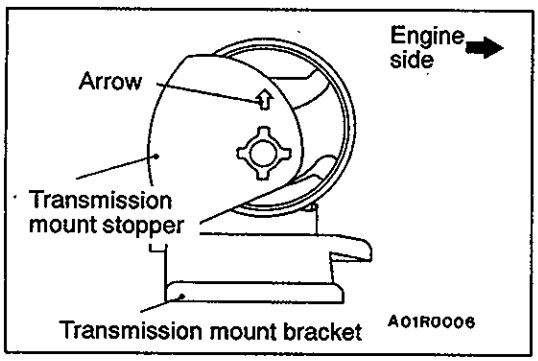
Reference value (A): Approx. 12.2 mm



▶B◀ STABILIZER BAR INSTALLATION

Tighten the self-locking nut so that the stabilizer mounting bat protrudes 22 mm as shown.

Standard value (A): 22 mm



▶C◀ TRANSMISSION MOUNT STOPPER INSTALLATION

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

FRONT AXLE

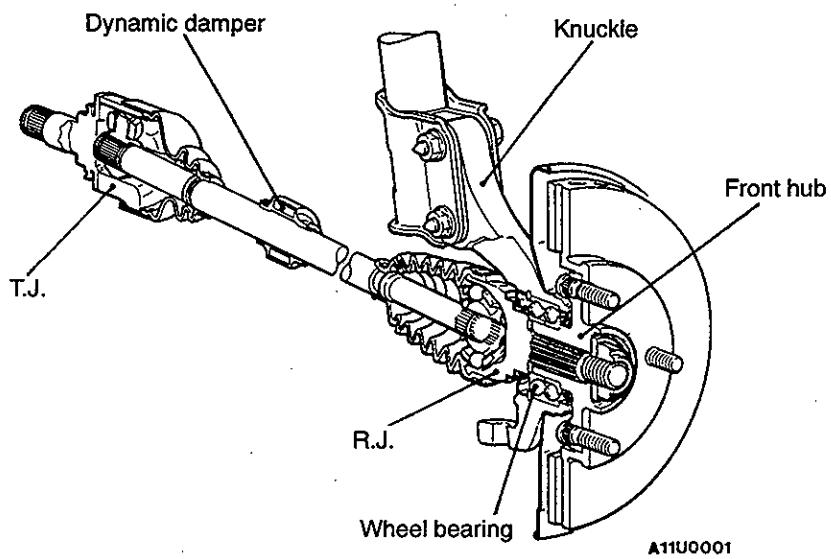
CONTENTS

26109000089

GENERAL INFORMATION

26100010081

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 R.J. – T.J.-type constant velocity joints to improve power transmission efficiency and to reduce vibration or noise.



NOTE
R.J.: Rzeppa Joint
T.J.: Tripod Joint

SERVICE SPECIFICATIONS

26100030100

Items		Standard value	Limit
Hub axial play mm		–	0.05
Wheel bearing starting torque Nm		–	1.8 or less
Setting of T.J. boot length mm		85±3	–
Opening dimension of the special tool (MB991561) mm	When the R.J. boot band (small) is crimped	2.9	–
	When the R.J. boot band (large) is crimped	3.2	–
Crimped width of the R.J. boot band mm		2.4 – 2.8	–
Clearance between the R.J. boot (large diameter side) and the stepped phase of the R.J. housing mm		0.1 – 1.55	–

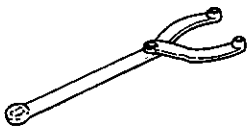
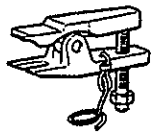
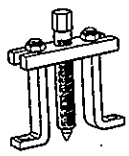
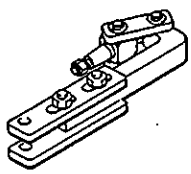
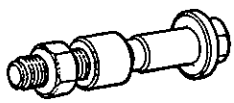
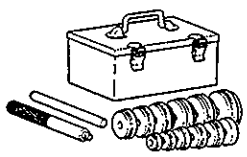
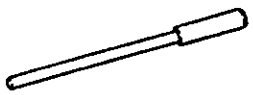
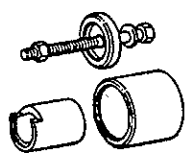
LUBRICANTS

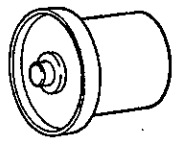
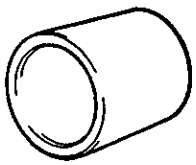
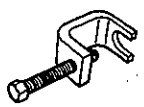
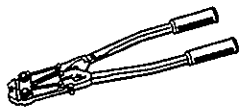
26100040110

Items	Specified lubricant	Quantity g
T.J. boot grease	Repair kit grease	100
R.J. boot grease	Repair kit grease	125

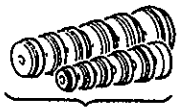
SPECIAL TOOLS

26100060109

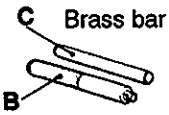
Tool	Number	Name	Use
	MB990767	End yoke holder	Fixing of the hub
	MB991113 or MB990635	Steering linkage puller	• Removal of the lower arm ball joint and knuckle • Removal of the knuckle and tie rod end ball joint
	MB990241	Axle shaft puller	Removal of the drive shaft
	MB991056 or MB991355	Knuckle arm 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
 A	MB991045 A: MB991050	Bushing remover and installer	Press-fitting of wheel bearing Use together with MB990883

Tool	Number	Name	Use
	MB991387	Bushing remover and installer	Press-fitting of the outer oil seal
	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
 11H0072	MB991618	Hub bolt remover	Removal of the hub bolt
	MB991561	Boot band clipping tool	Resin boot band installation

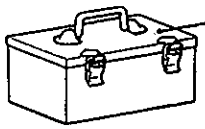
MB990925



A
Installer adapter

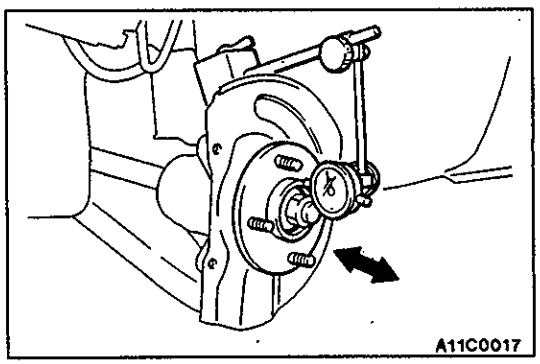


Bar (snap-in type)



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

26100090054

HUB AXIAL PLAY CHECK

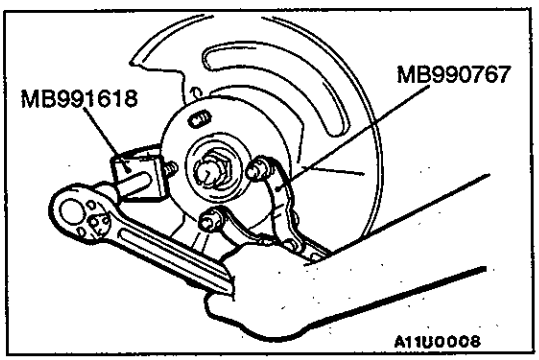
1. Remove the disc brake caliper and suspend it with a wire.
2. Remove the brake disc from the front hub.
3. Attach a dial gauge as shown in the illustration, and then measure the axial play while moving the hub in the axial direction.

   Limit: 0.05 mm
4. If axial play exceeds the limit, disassemble and check parts.

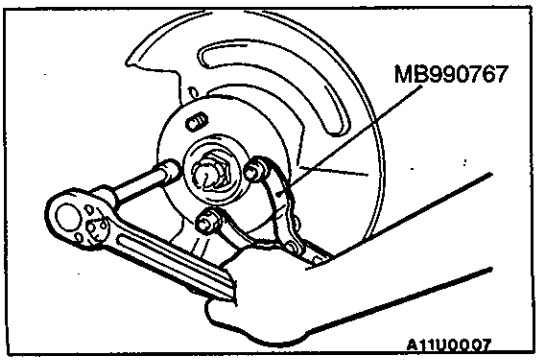
HUB BOLT REPLACEMENT

26100100054

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



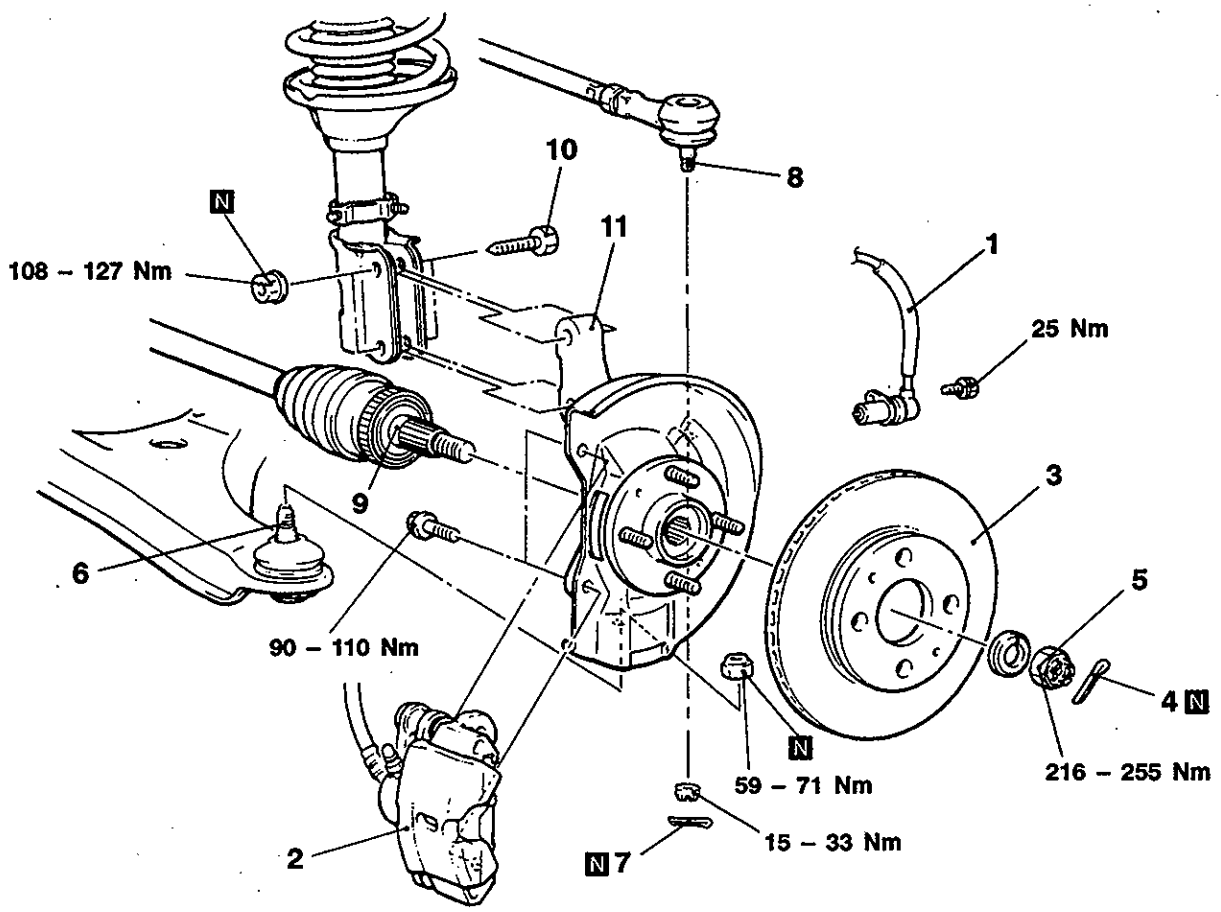
A11U0007

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

26100170093

REMOVAL AND INSTALLATION



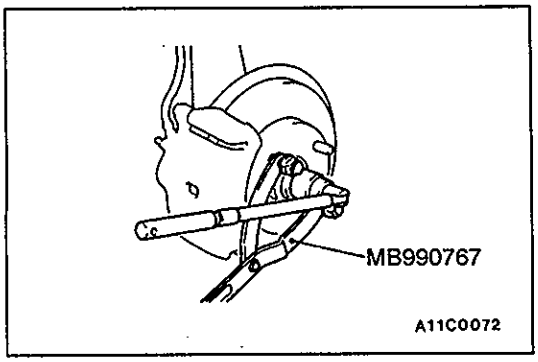
A11M0024

Removal steps

1. Front speed sensor <Vehicles with ABS>
◀A▶ 2. Caliper assembly
3. Brake disc
4. Split pin
◀B▶ ▶A◀ 5. Drive shaft nut
● Lower arm and stabilizer bar connection (Refer to GROUP 33A – Stabilizer Bar.)
◀C▶ 6. Connection for lower arm ball joint
7. Split pin
◀C▶ 8. Connection for tie rod end
9. Drive shaft
10. Front strut mounting bolt and nut
11. Hub and knuckle

Caution

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

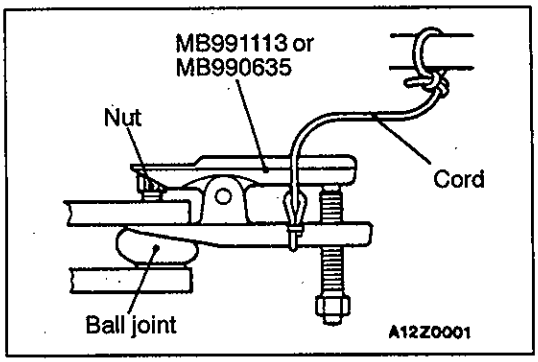


REMOVAL SERVICE POINTS

◀A▶ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire, etc.

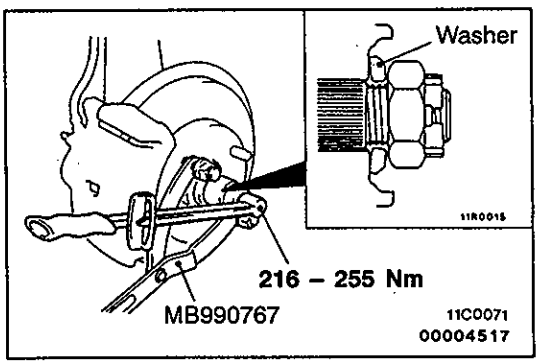
◀B▶ DRIVE SHAFT NUT REMOVAL



◀C▶ LOWER ARM BALL JOINT/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.**



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

26100180089

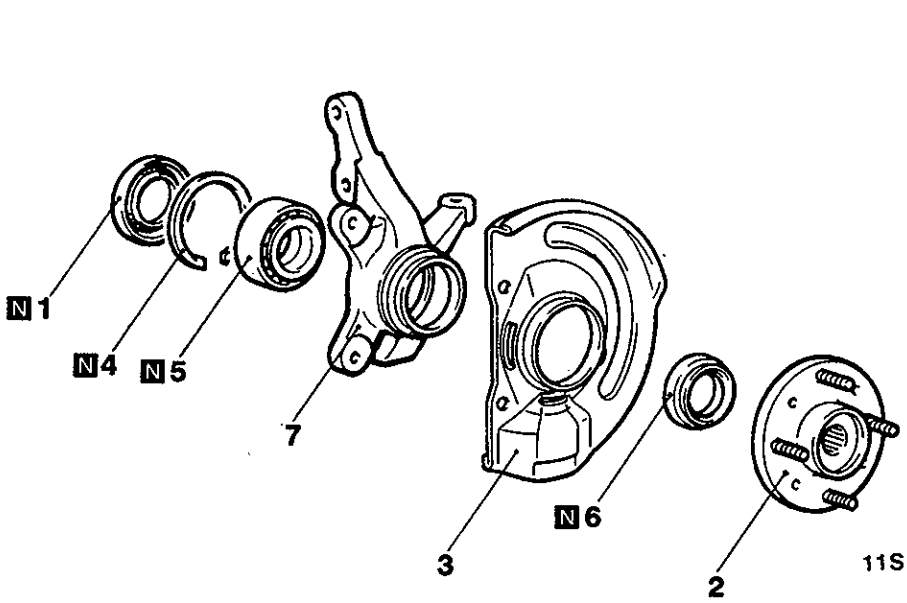
- Check the front hub and brake disc mounting surfaces for galling and contamination.
- Check the hub for cracks and spline for wear.
- Check the oil seal for damage.
- Check the knuckle for cracks.
- Check for defective bearing.

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

26100190051



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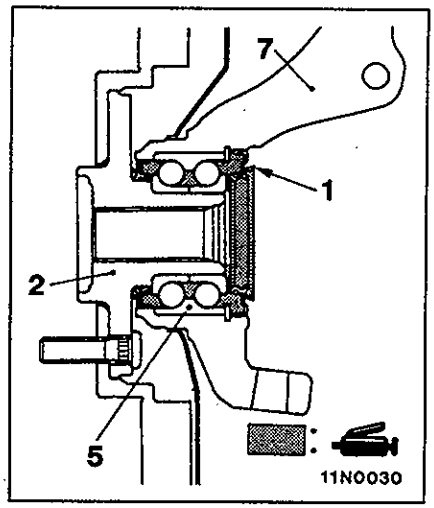


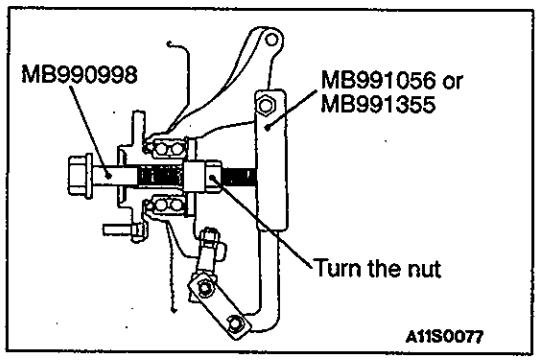
00003386

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

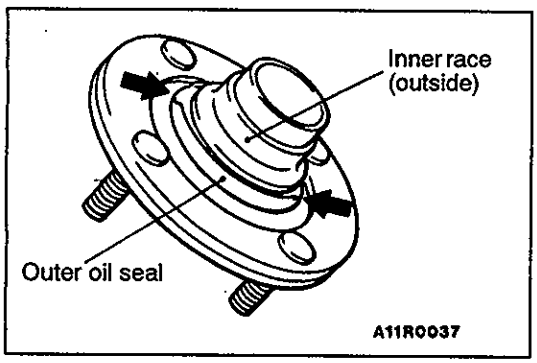
7. Knuckle
▶A◀ 5. Wheel bearing
4. Snap ring
▶B◀ 6. Outer oil seal
3. Dust cover
2. Hub
▶C◀ • Wheel bearing starting torque check
▶C◀ • Hub axial play check
▶D◀ 1. Inner oil seal



DISASSEMBLY SERVICE POINTS

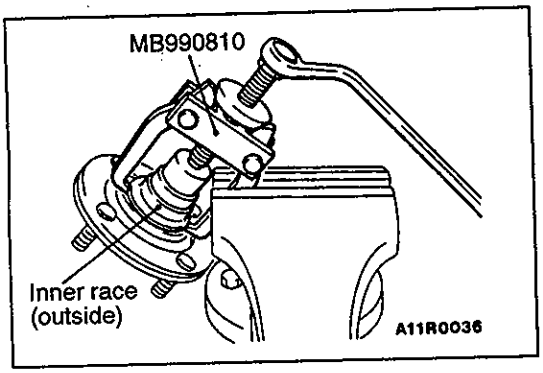
◀A▶ HUB REMOVAL

Caution
When removing the hub, always replace the wheel bearing with a new part.



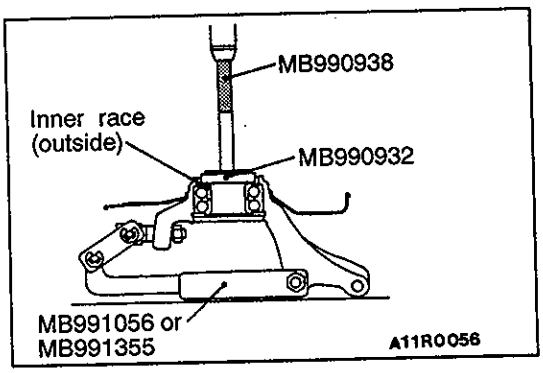
◀B▶ WHEEL BEARING REMOVAL

(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).

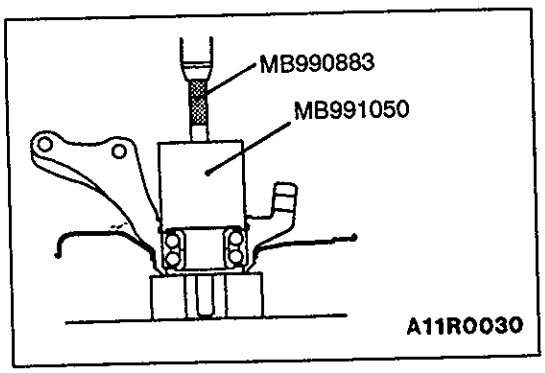


(2) Remove the wheel bearing inner race (outside) from the front hub by using the special tool.

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.

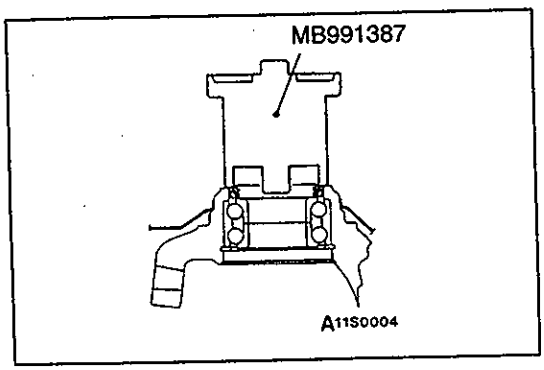


REASSEMBLY SERVICE POINTS

▶A◀ WHEEL BEARING INSTALLATION

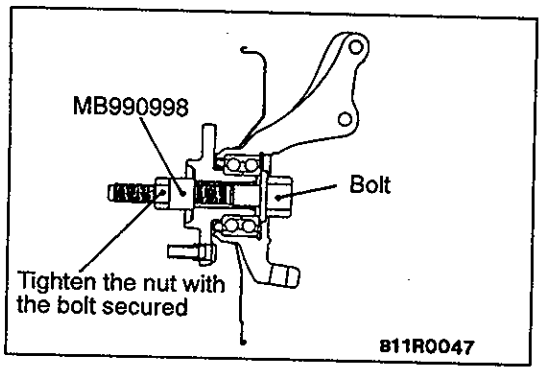
(1) Fill the wheel bearing with multipurpose grease.
(2) Apply a thin coating of multipurpose grease to the knuckle and bearing contact surfaces.
(3) Press-in the bearing by using the special tools.

Caution
Press the outer race when pressing-in the wheel bearing.



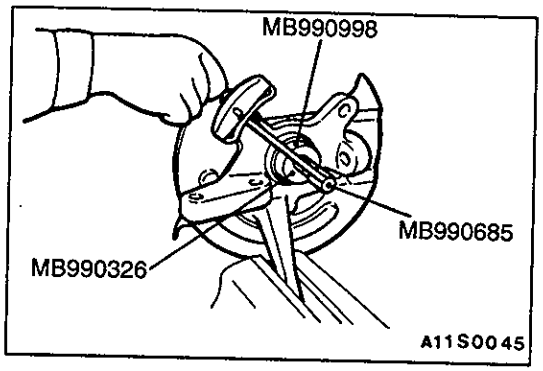
▶B◀ OUTER OIL SEAL INSTALLATION

(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.

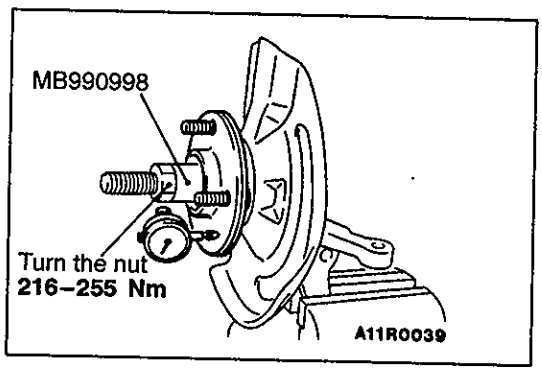


▶C◀ WHEEL BEARING STARTING TORQUE CHECK/HUB AXIAL PLAY CHECK

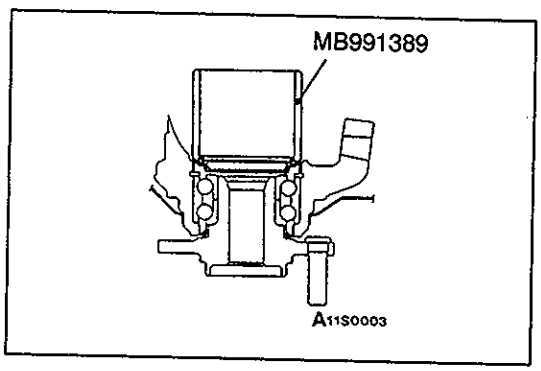
(1) Use the special tool to mount the hub onto the knuckle.
(2) Tighten the nut of the special tool to 216–255 Nm.
(3) Rotate the hub in order to seat the bearing.



(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.



(6) Measure to determine whether the axial play of the hub is within the specified limit or not.
Limit: 0.05 mm
(7) 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.



▶D◀ 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

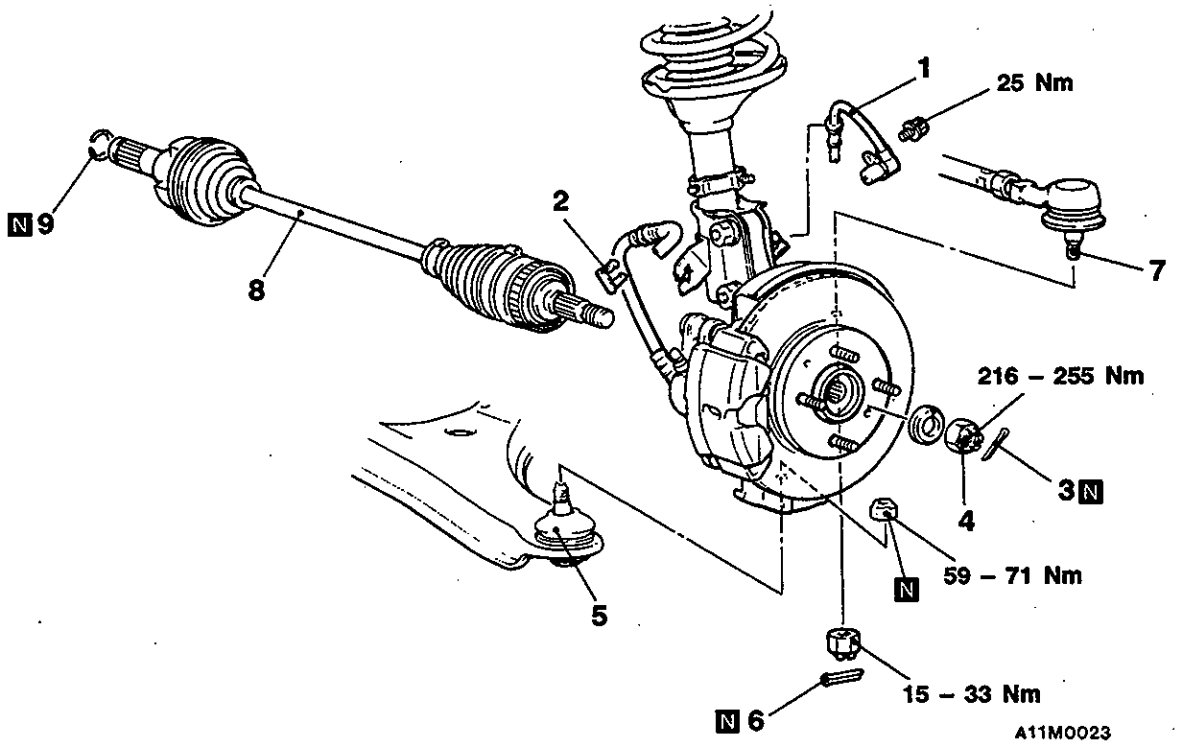
26100200037

Check the knuckle inner surface for galling and cracks.

DRIVE SHAFT

26100350121

REMOVAL AND INSTALLATION



Removal steps

1. Speed sensor cable connection <vehicles with ABS>
2. Brake hose clip
3. Split pin

◀A▶ ▶A◀ 4. Drive shaft nut
- Lower arm and stabilizer bar connection (Refer to GROUP 33A – Stabilizer Bar.)

◀B▶ 5. Connection for lower arm ball joint

6. Split pin

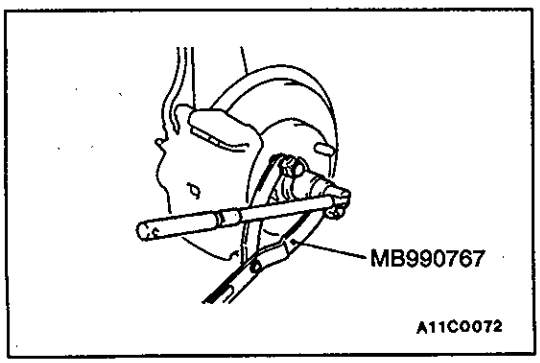
◀B▶ 7. Connection for tie rod end

◀C▶ 8. Drive shaft

9. Circlip

Caution

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

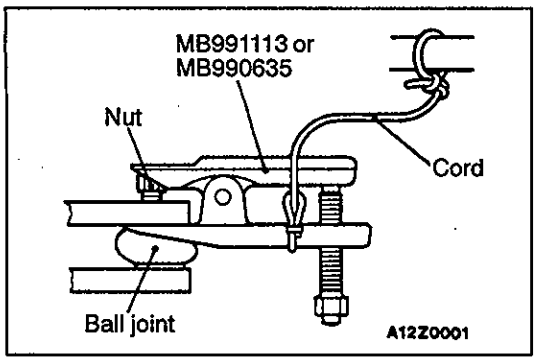


REMOVAL SERVICE POINTS

◀A▶ DRIVE SHAFT NUT REMOVAL

Caution

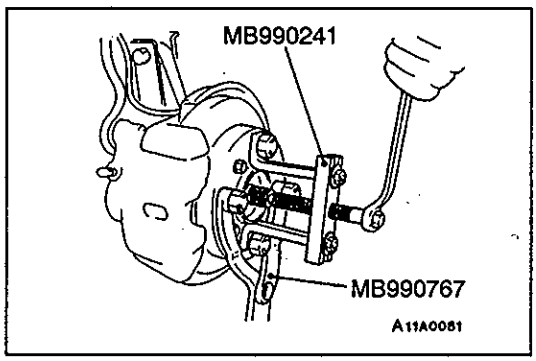
Do not apply the vehicle weight to the wheel bearing while loosening the drive shaft nut.



◀B▶ LOWER ARM BALL JOINT/TIE ROD END DISCONNECTION

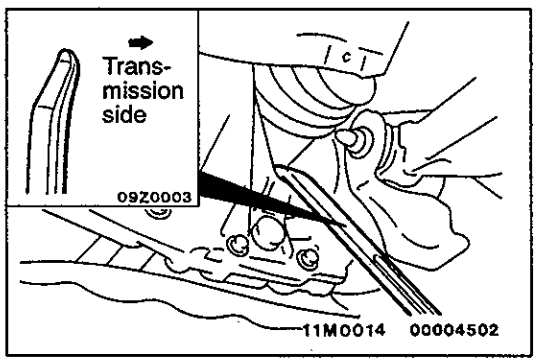
Caution

1. **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.**



◀C▶ DRIVE SHAFT REMOVAL

(1) Use the special tools to push out the drive shaft from the hub.

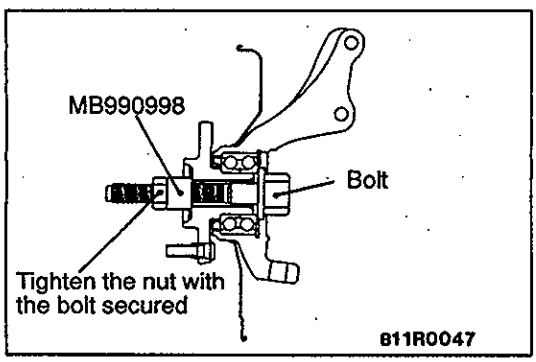


(2) Insert a pry bar between the transmission case and the drive shaft as shown to remove the drive shaft.

Caution

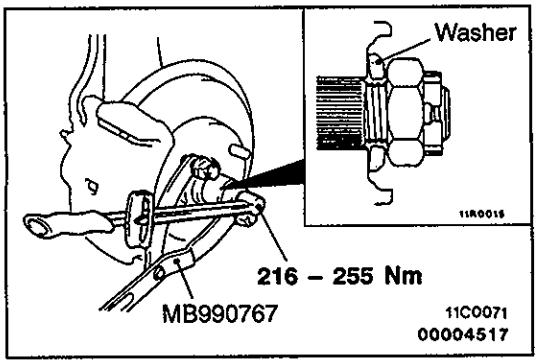
1. **Do not pull on the drive shaft; doing so will damage the T.J.; be sure to use the pry bar.**
2. **Do not insert the pry bar so deep as to damage the oil seal.**

(3) Use a shop towel to cover the transmission case not to let foreign material get into it.



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 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.

(3) If the position of the split pin holes does not match, tighten the nut up to 255 Nm in maximum.
(4) Install the split pin in the first matching holes and bend it securely.

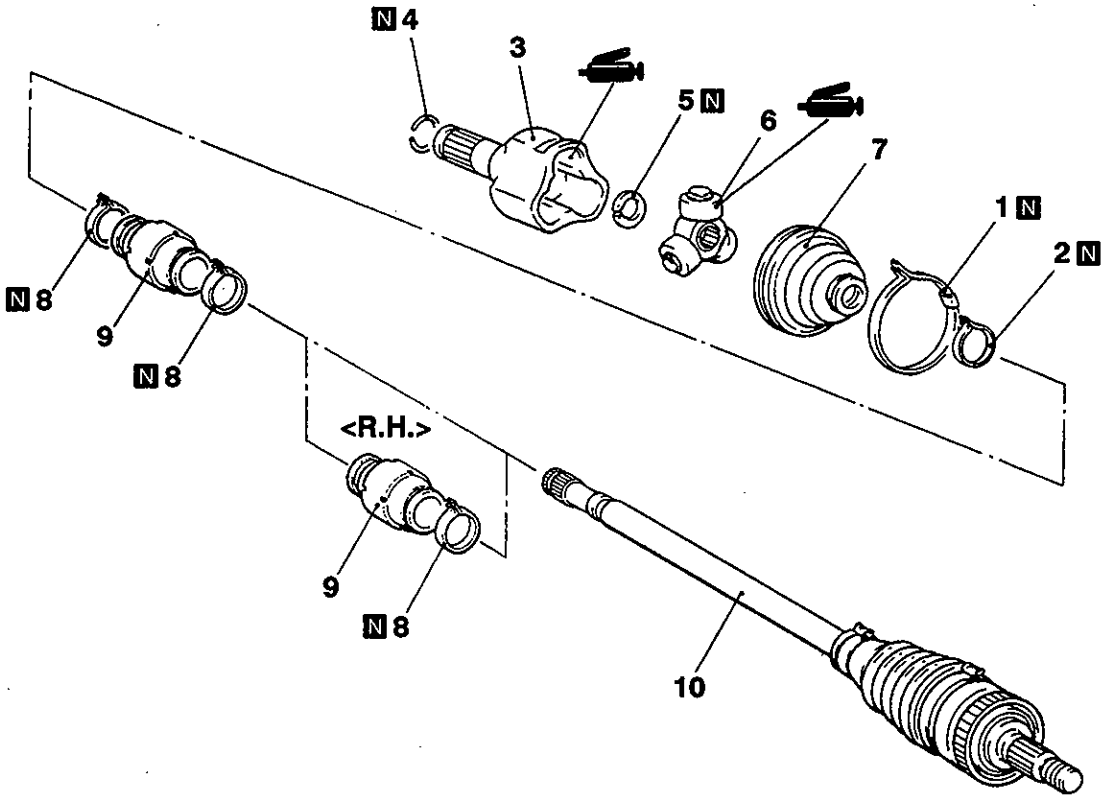
INSPECTION

26100360063

- Check the drive shaft boot for damage or deterioration.
- Check the ball joints for excessive play or operating condition.
- Check the spline part for wear or damage.

DISASSEMBLY AND REASSEMBLY

26100370134



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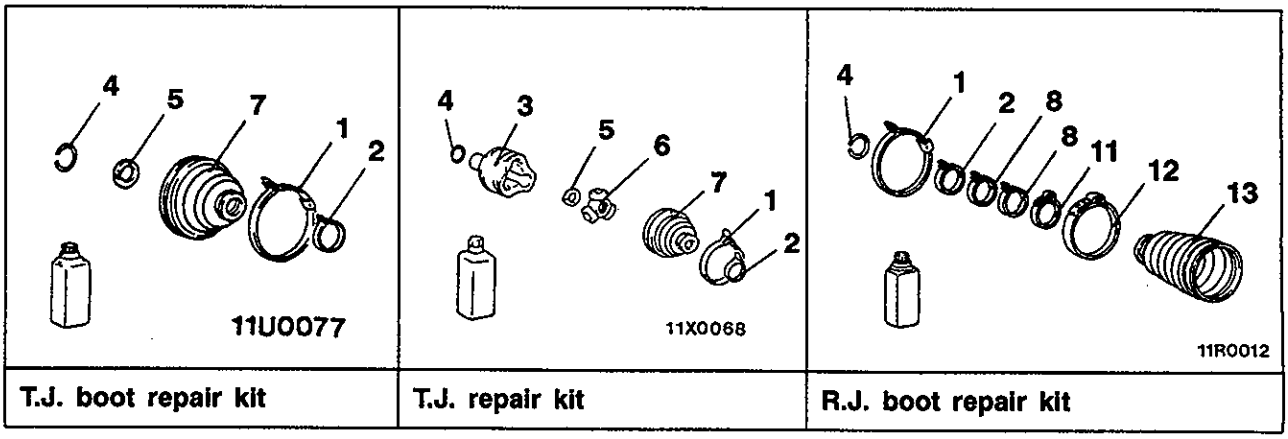


T.J. boot repair kit	T.J. repair kit	R.J. boot repair kit

Disassembly steps

	▶C◀	1. T.J. boot band (large)
	▶C◀	2. T.J. boot band (small)
◀A▶	▶B◀	3. T.J. case
		4. Circlip
		5. Snap ring
◀A▶	▶B◀	6. Spider assembly
◀B▶	▶A◀	7. T.J. boot
	▶A◀	8. Damper band
	▶A◀	9. Dynamic damper
		10. R.J. assembly
		11. R.J. boot band (small)
		12. R.J. boot band (large)
		13. R.J. boot

Caution

1. **Never disassemble the R.J. assembly except when replacing the R.J. boot.**
2. **On vehicles with ABS, be sure not to damage the rotor attached to the R.J. outer race.**

DISASSEMBLY SERVICE POINTS

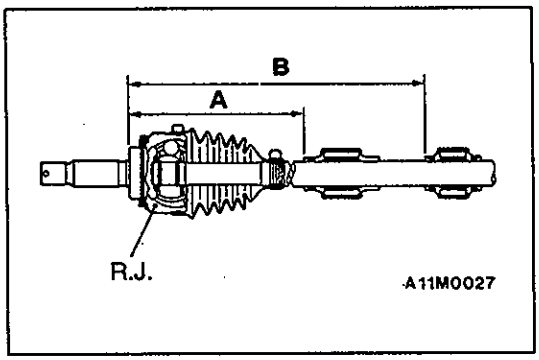
◀A▶ T.J. CASE/SPIDER ASSEMBLY REMOVAL

(1) Wipe off grease from the spider assembly and the inside of the T.J. case.
(2) Always clean the spider assembly when the grease contains water or foreign material.

Caution
1. Do not disassemble the spider assembly.
2. Use care in handling so as not to damage the drive shaft.

◀B▶ T.J. BOOT REMOVAL

(1) Wipe off grease from the shaft spline.
(2) When reusing the T.J. boot, wrap plastic tape around the shaft spline to avoid damaging the boot.

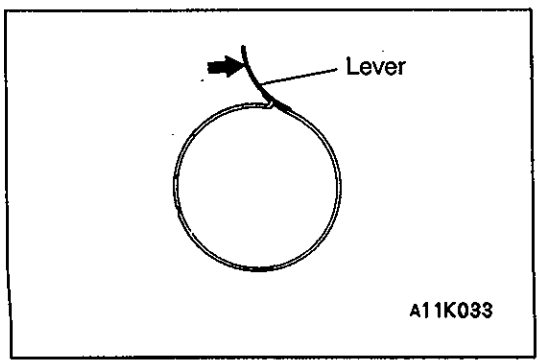


REASSEMBLY SERVICE POINTS

▶A◀ DYNAMIC DAMPER/DAMPER BAND/T.J. BOOT INSTALLATION

Install the dynamic damper in the position shown in the illustration.

Items	A	B
1300 (L.H.)	200±3	–
1300 (R.H.)	441±3	536±3
1600 (L.H.)	201.4±3	–
1600 (R.H.)	381±3	481±3

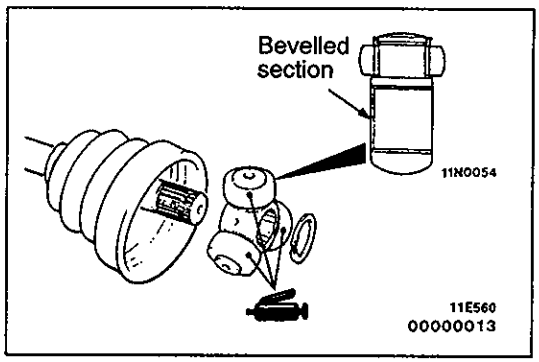


(2) Secure the damper bands.

Caution
1. There should be no grease adhered to the rubber part of the dynamic damper.
2. The damper band and T.J. boot band are identified by the identification number stamped on the lever. Take good care to install the correct one.

Items	Identification number
Damper band	31.3
T.J. boot band	33

(3) Wrap plastic tape around the shaft spline, and then install the T.J. boot band (small) and T.J. boot.

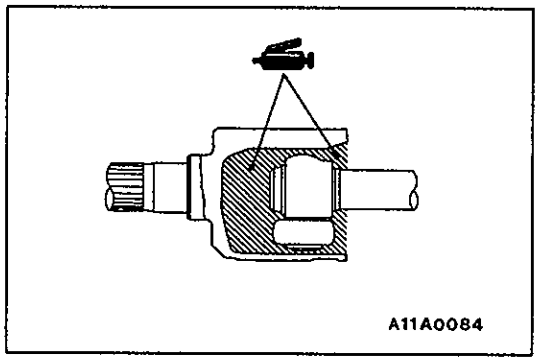


▶B◀ SPIDER ASSEMBLY/T.J. CASE INSTALLATION

(1) Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.

Specified grease: Repair kit grease

Caution
1. **The drive shaft joint uses special grease. Do not mix old and new or different types of grease.**
2. **If the spider assembly has been cleaned, take special care to apply the specified grease.**



(2) Install the spider assembly to the shaft from the direction of the spline bevelled section.

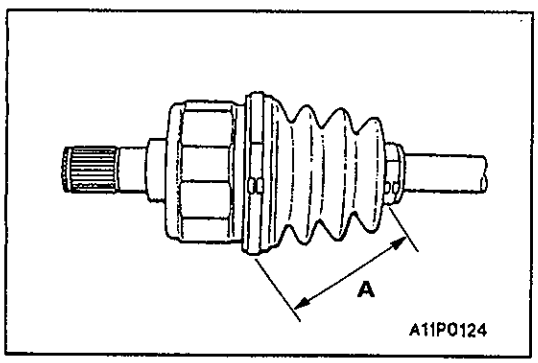
(3) After applying the specified grease to the T.J. case, insert the drive shaft and apply grease one more time.

Specified grease: Repair kit grease

Amount to use: 100 g

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.



▶C◀ T.J. BOOT BAND (SMALL)/T.J. BOOT BAND (LARGE) INSTALLATION

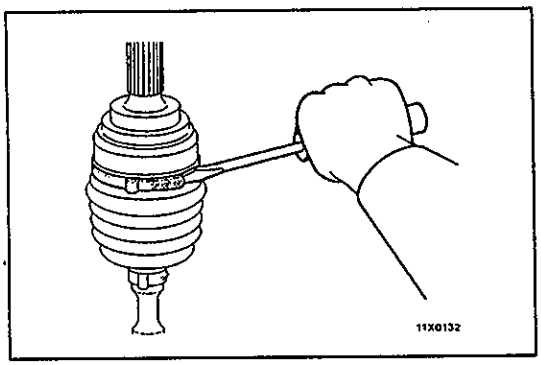
Set the T.J. boot bands at the specified distance in order to adjust the amount of air inside the T.J. boot, and then tighten the T.J. boot bands securely.

Standard value (A): 85 ± 3 mm

INSPECTION

26100380083

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft spline part for wear or damage.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear or corrosion.
- Check the dynamic damper for damage or cracking.
- Check the boots for deterioration, damage or cracking.



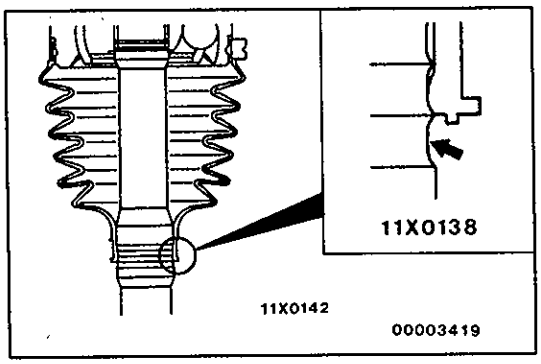
R.J. BOOT (RESIN BOOT) REPLACEMENT

26100520034

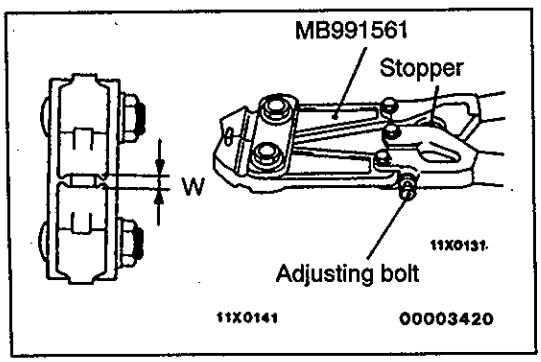
(1) Remove the R.J. boot bands (large and small).

NOTE
The R.J. boot bands cannot be re-used.

(2) Remove the R.J. boot.



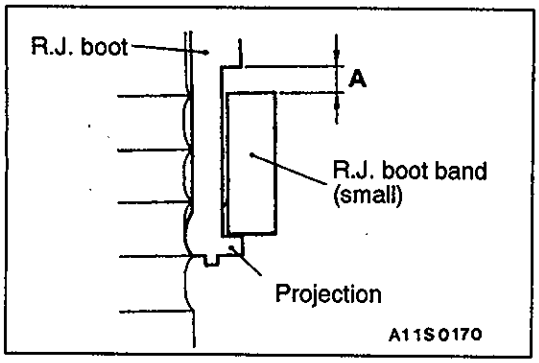
(3) Install the R.J. boot with the part with the smallest diameter in a position such that the shaft groove can be seen.



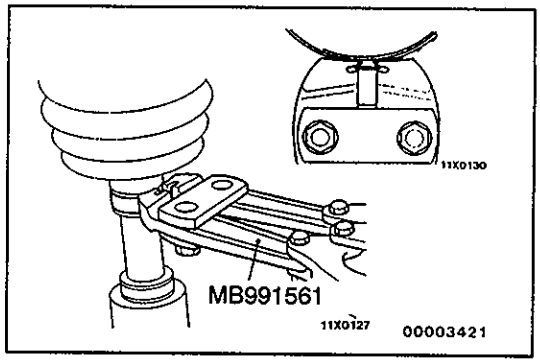
(4) Turn the adjusting bolt on the special tool so that the size of the opening (W) is at the standard value.

Standard value (W): 1.6 mm
<If it is larger than 1.6 mm>
Tighten the adjusting bolt.
<If it is smaller than 1.6 mm>
Loosen the adjusting bolt.

NOTE
(1) The value of W will change by approximately 0.7 mm for each turn of the adjusting bolt.
(2) The adjusting bolt should not be turned more than once.



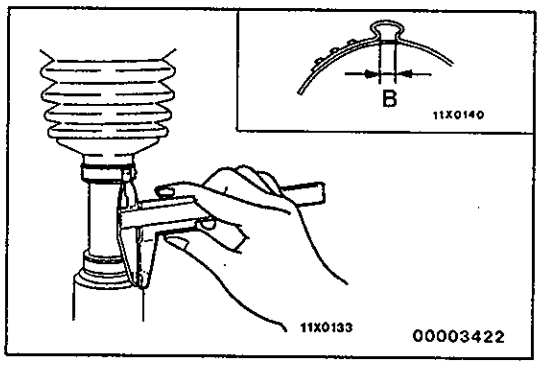
(5) Place the R.J. boot band (small) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (A) in the illustration.



(6) Use the special tool to crimp the R.J. boot band (small).

Caution

1. **Secure the drive shaft in an upright position and clamp the part of the R.J. boot band to be crimped securely in the jaws of the special tool.**
2. **Crimp the R.J. boot band until the special tool touches the stopper.**



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

Standard value (B): 1.0 – 1.5 mm

<If the crimping amount is larger than 1.5 mm>
Readjust the value of (W) in step (4) according to the following formula, and then repeat the operation in step (6).
W = 3.0 mm – B
Example: If B = 1.6 mm, then W = 1.4 mm.

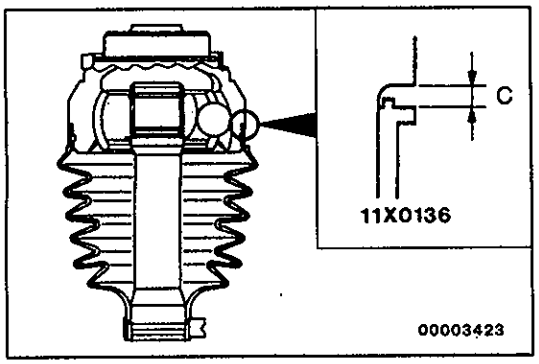
<If the crimping amount is smaller than 1.0 mm>
Remove the R.J. boot band, readjust the value of (W) in step (4) according to the following formula, and then repeat the operations in steps (5) and (6) using a new R.J. boot band.
W = 3.0 mm – B
Example: If B = 0.9 mm, then W = 2.1 mm.

(8) Check that the R.J. boot band is not sticking out past the place where it has been installed.
If the R.J. boot band is sticking out, remove it and then repeat the operations in steps (5) to (7) using a new R.J. boot band.

(9) Fill the inside of the R.J. boot with the specified amount of the specified grease.

Specified grease: Repair kit grease

Amount to use: 125 g

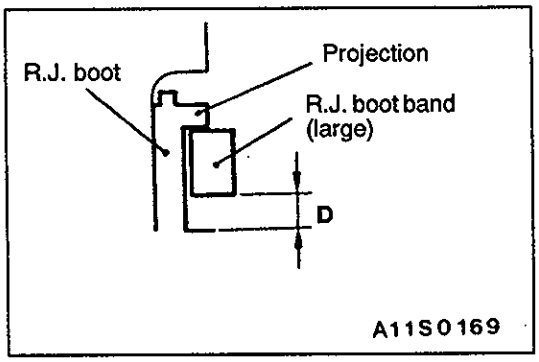


(10) Install the R.J. boot band (large) so that there is the clearance (C) between it and the R.J. housing is at the standard value.

Standard value (C): 0.1 – 1.55 mm

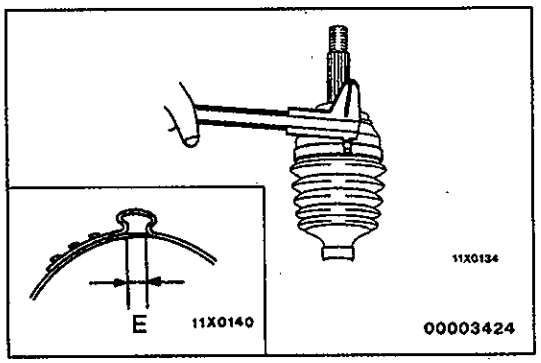
(11) Follow the same procedure as in step (4) to adjust the size of the opening (W) on the special tool so that it is at the standard value.

Standard value (W): 3.2 mm



(12) Place the R.J. boot band (large) against the projection at the edge of the boot, and then secure it so that there is a clearance left as shown by (D) in the illustration.

(13) Use the special tool to crimp the R.J. boot band (large) in the same way as in step (6).



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

Standard value (e): 1.0 – 1.5 mm

<If the crimping amount is larger than 1.5 mm>
Readjust the value of (W) in step (11) according to the following formula, and then repeat the operation in step (13).
W = 3.7 mm – E
Example: If E = 1.6 mm, then W = 2.1 mm.

<If the crimping amount is smaller than 1.0 mm>
Remove the R.J. boot band, readjust the value of (W) in step (11) according to the following formula, and then repeat the operations in steps (12) and (13) using a new R.J. boot band.
W = 3.7 mm – E
Example: If E = 0.9 mm, then W = 2.8 mm.

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

NOTES

REAR AXLE

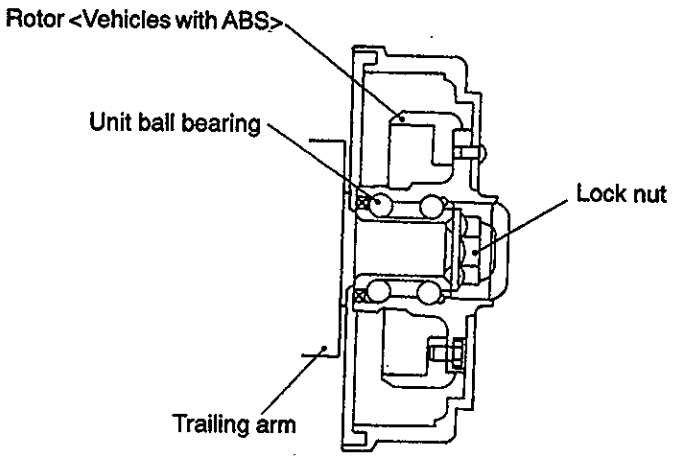
CONTENTS

27109000086

GENERAL INFORMATION

27100010095

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.



A11M0001

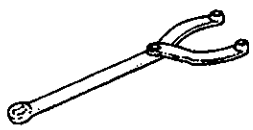
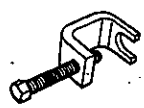
SERVICE SPECIFICATIONS

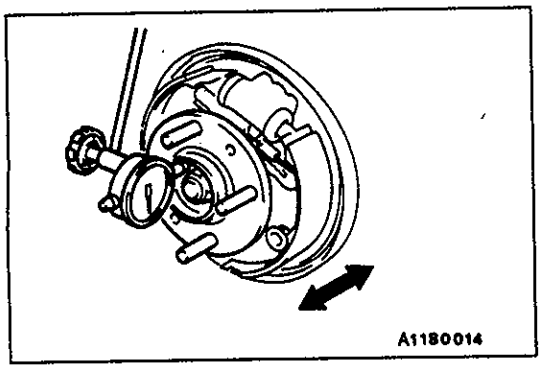
27100030107

Items	Standard value	Limit
Clearance of the rear speed sensor's pole piece and rotor <Vehicles with ABS> mm	0.1 – 2.0	–
Wheel bearing axial play mm	–	0.05
Wheel bearing rotary-sliding resistance N	–	19 or less

SPECIAL TOOLS

27100060090

Tool	Number	Name	Use
	MB990767	End yoke holder	Fixing of the hub
 11H0072	MB991618	Hub bolt remover	Removal of the hub bolt



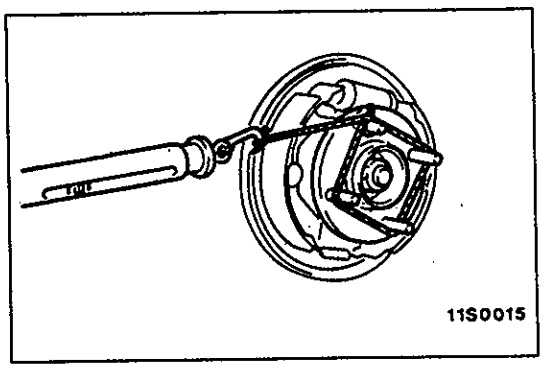
ON-VEHICLE SERVICE

27100090082

WHEEL BEARING AXIAL PLAY CHECK

1. Remove the brake drum.
2. 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
3. If the axial play exceeds the limit, the flange nut should be tightened to the specified torque (172 Nm) and check the axial play again.
4. Replace the rear hub assembly if an adjustment cannot be made to within the limit.

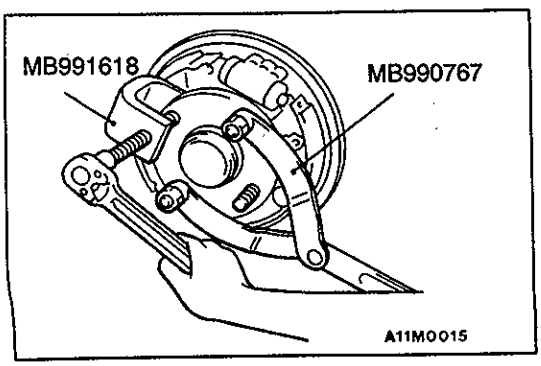


REAR HUB ROTARY-SLIDING RESISTANCE CHECK

27100110085

1. Remove the brake drum.
2. 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
3. If the limit value is exceeded, loosen the flange nut and then tighten it to the specified torque (172 Nm) and check the rear hub rotary sliding resistance again.
4. Replace the rear hub assembly if an adjustment cannot be made to within the limit.

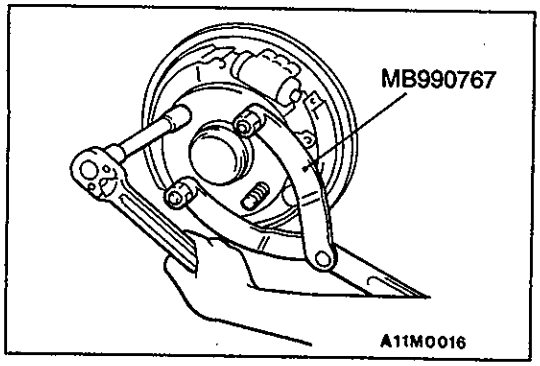


HUB BOLT REPLACEMENT

27100100082

<VEHICLES WITHOUT ABS>

1. Remove the brake drum.
2. Use the special tools to remove the hub bolts.

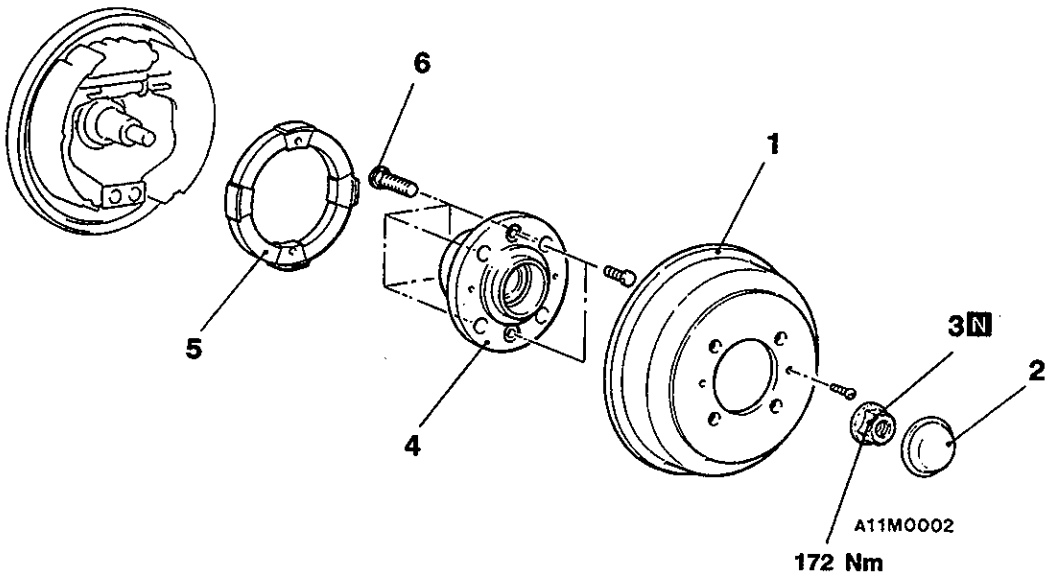


3. Use the wheel nuts to securely install the new hub bolts, while being careful of the hub bolts and hub.

REAR AXLE HUB

27100200126

REMOVAL AND INSTALLATION



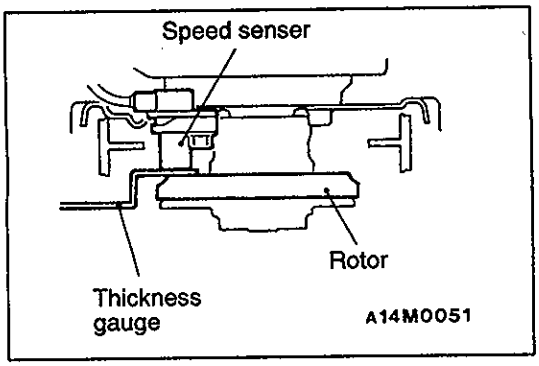
Removal steps

1. Brake drum
2. Hub cap
3. Flange nut
- ▶A◀ 4. Rear hub assembly
5. Rotor <Vehicles with ABS>
6. Hub bolt

Caution

(1) The rear hub unit bearing should not be dismantled.
When removing the rear hub assembly, the wheel bearing inner race may be left at the spindle side.
In this case, always replace the rear hub assembly, otherwise the hub will damage the oil seal, causing oil leaks or excessive play.

(2) 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.



INSTALLATION SERVICE POINT

▶A◀ REAR HUB ASSEMBLY INSTALLATION <VEHICLES WITH ABS>

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: 0.1 – 2.0 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.

NOTES

WHEEL AND TYRE

CONTENTS

31109000038

GENERAL INFORMATION

31100010092

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		L.H. drive vehicles	R.H. drive vehicles
Wheel	Type	Steel type Aluminium type*	Steel type Aluminium type*
	Size	13 × 5.00B 13 × 5JJ*	13 × 5.00B 13 × 5JJ*
	Amount of wheel offset mm	46	46
	Pitch circle diameter (P.C.D.) mm	100	100
Tyre	Size	175/70 R13 82H	175/70 R13 82H
Spare wheel	Type	Steel type	Steel type
	Size	14 × 4.0T 13 × 5.00B*	13 × 5.00B
	Amount of wheel offset mm	46	46
	Pitch circle diameter (P.C.D.) mm	100	100
Spare tyre	Size	T105/70 D14 (High pressure) 175/70 R13 82H*	175/70 R13 82H

NOTE
*: Optional items

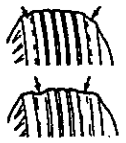
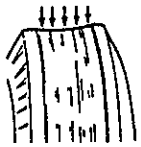
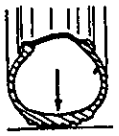
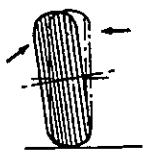
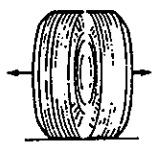
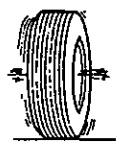
SERVICE SPECIFICATIONS

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

31100070083

Symptom		Probable cause		Remedy	Reference page
Rapid wear at shoulders	 11X0109	Under-inflation or lack of rotation	 11X0116	Adjust the tyre pressure.	31-4.
Rapid wear at centre	 11X0110	Over-inflation or lack of rotation	 11X0117		
Cracked treads	 11X0111	Under-inflation		Adjust the tyre pressure.	31-4.
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 check the front suspension alignment.	Refer to GROUP 33A – On-vehicle Service.

ON-VEHICLE SERVICE

31100090089

TYRE INFLATION PRESSURE CHECK

NOTE
For information on tyre inflation pressure, refer to the label attached at the driver's side to the centre pillar.

TYRE WEAR CHECK

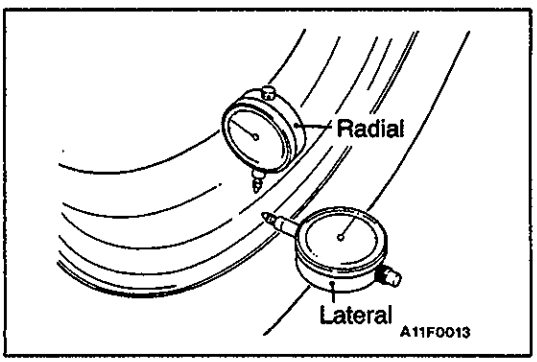
31100100034

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

31100130071

INSTALLATION SERVICE POINT

Tighten the wheel nut to the specified torque.

Tightening torque: 98 Nm

POWER PLANT MOUNT

CONTENTS

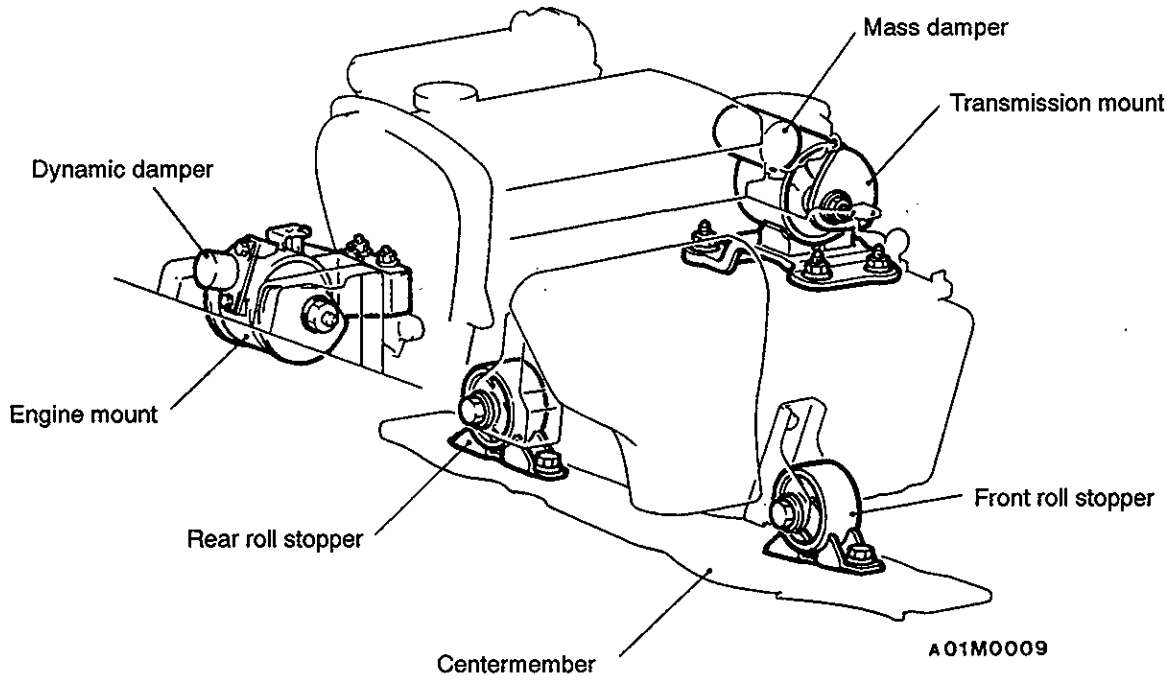
32109000080

GENERAL INFORMATION

32100010099

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.

CONSTRUCTION DIAGRAM



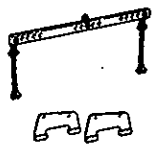
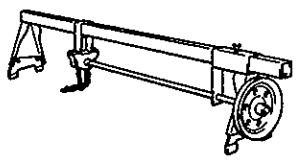
SERVICE SPECIFICATION

32100030064

Item	Standard value
Protruding length of stabilizer bar mounting bolt mm	22

SPECIAL TOOLS

32100060087

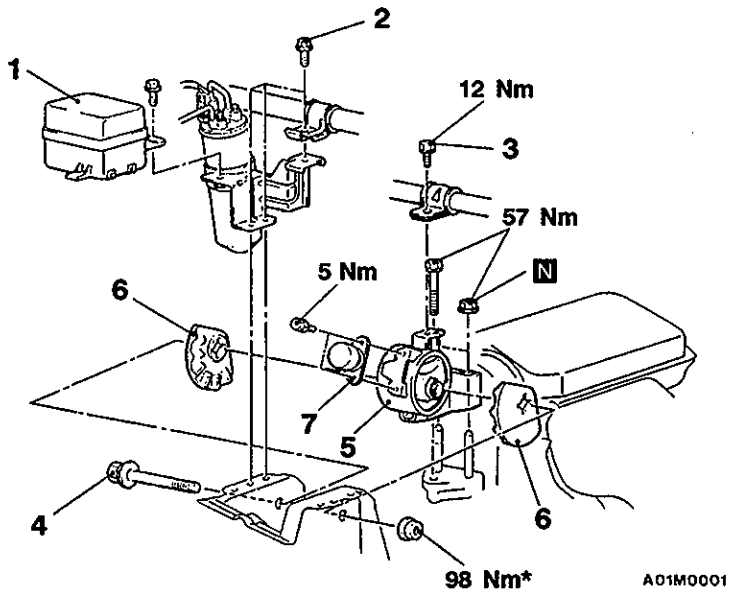
Tool	Number	Name	Use
	MB991453	Engine hanger	To support the engine assembly during removal and installation of the transmission mount
	GENERAL SERVICE TOOL MZ203827	Engine lifter	

ENGINE MOUNTING

32100110119

REMOVAL AND INSTALLATION

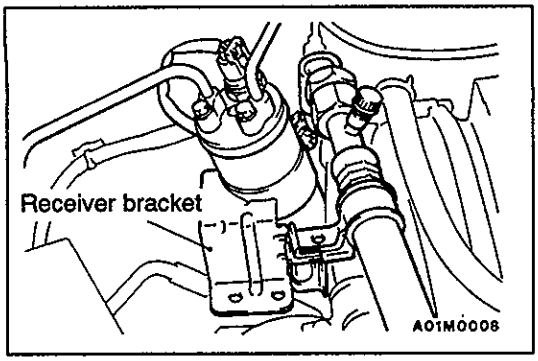
Pre-removal Operation
- Jack Up the Engine and Transmission Assembly Until There is no Weight on the Engine Mount Bracket Insulator.

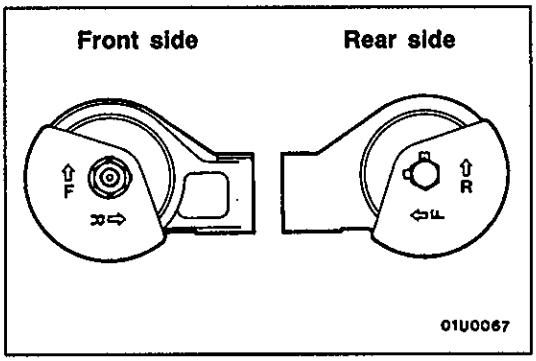


Removal steps

1. Air conditioner relay box
◀A▶ 2. Air conditioner receiver bracket mounting bolts
3. Power steering hose mounting bolt
◀A▶ 4. Engine mount insulator mounting bolt
5. Engine mount bracket
▶A◀ 6. Engine mount stopper
7. Engine mount dynamic damper

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▶ ENGINE MOUNT INSULATOR MOUNTING BOLT / AIR CONDITIONER RECEIVER BRACKET MOUNTING BOLT REMOVAL

(1) To make it easier to remove the engine mount insulator mounting bolt in vehicles with air-conditioner, remove the air-conditioner receiver bracket and support the receiver so that there are no bends in the pipe.
(2) Remove the engine mount insulator mounting bolt.

INSTALLATION SERVICE POINT

▶A◀ ENGINE MOUNT STOPPER INSTALLATION

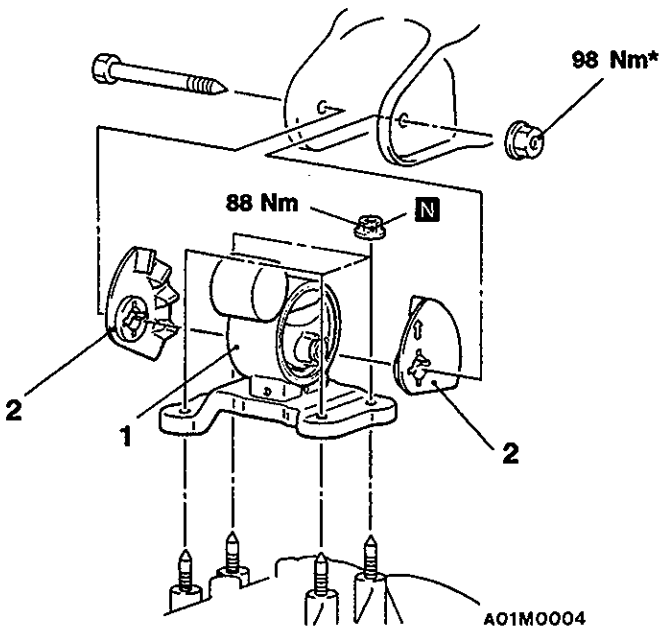
(1) At the front, install so that the arrow with the "F" mark is facing upwards.
(2) At the rear, install so that the arrow with the "R" mark is facing upwards.

TRANSMISSION MOUNTING

32100140095

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Air Cleaner Assembly Installation and Removal
- Battery and Battery Tray Removal and Installation



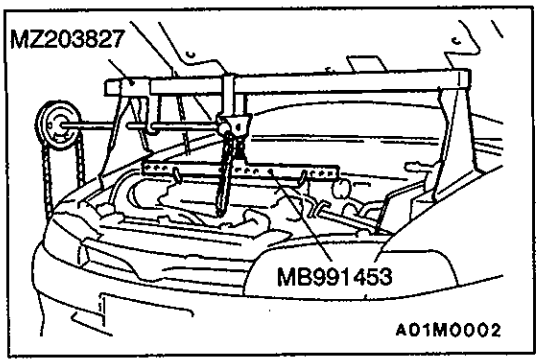
Removal steps

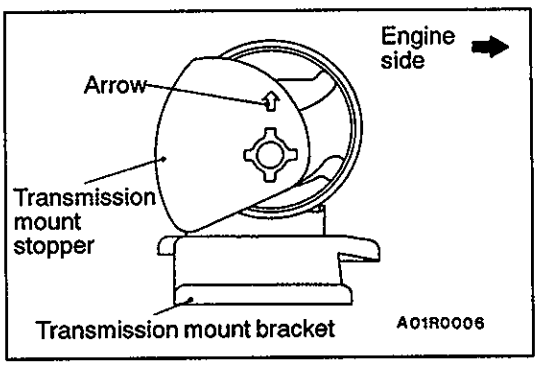
- Centermember mounting bolt (Refer to P.32-7.)

◀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

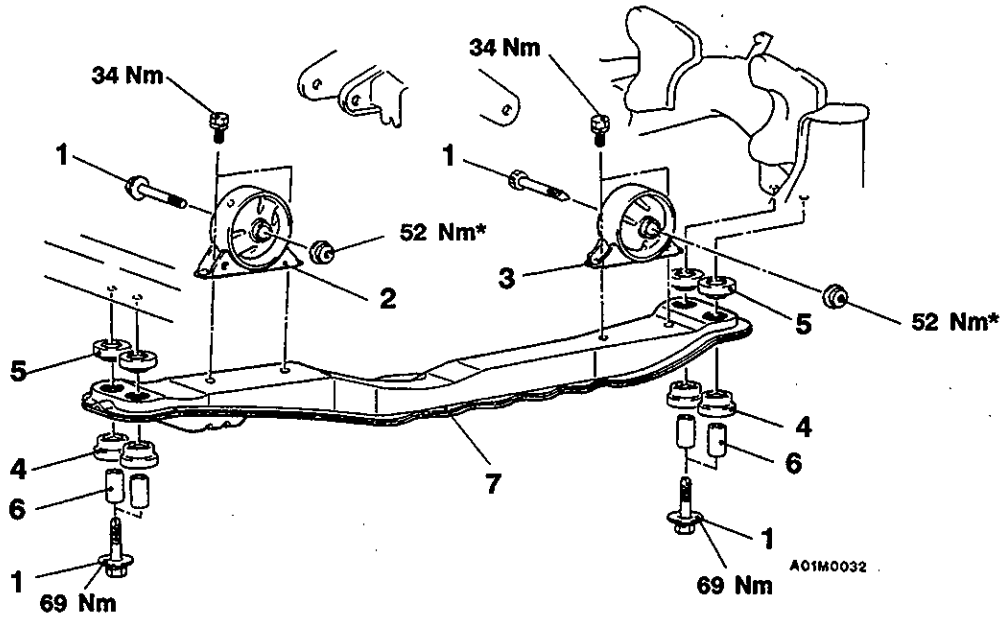
▶A◀ TRANSMISSION MOUNT STOPPER INSTALLATION

Clamp the transmission mount stopper so that the arrow points in the direction as shown in the diagram.

ENGINE ROLL STOPPER, CENTERMEMBER

32100200083

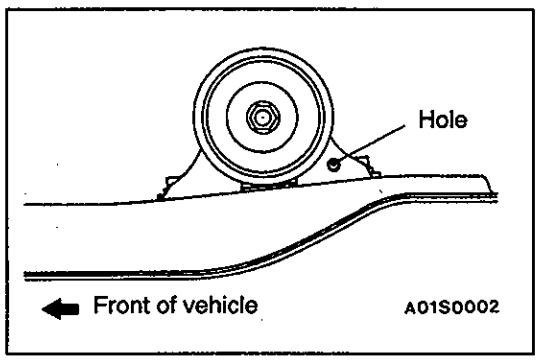
REMOVAL AND INSTALLATION

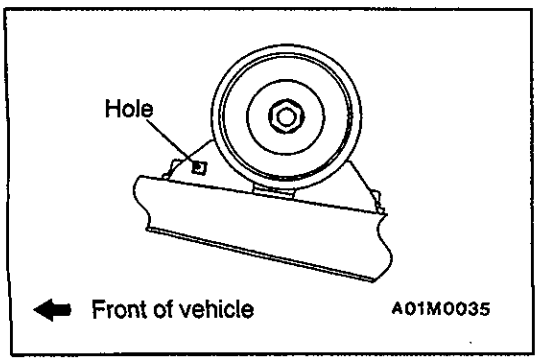


Removal steps

1. Bolts
▶B◀ 2. Front roll stopper bracket assembly
▶A◀ 3. Rear roll stopper bracket assembly
4. Bushing (lower)
5. Bushing (upper)
6. Collar
7. 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

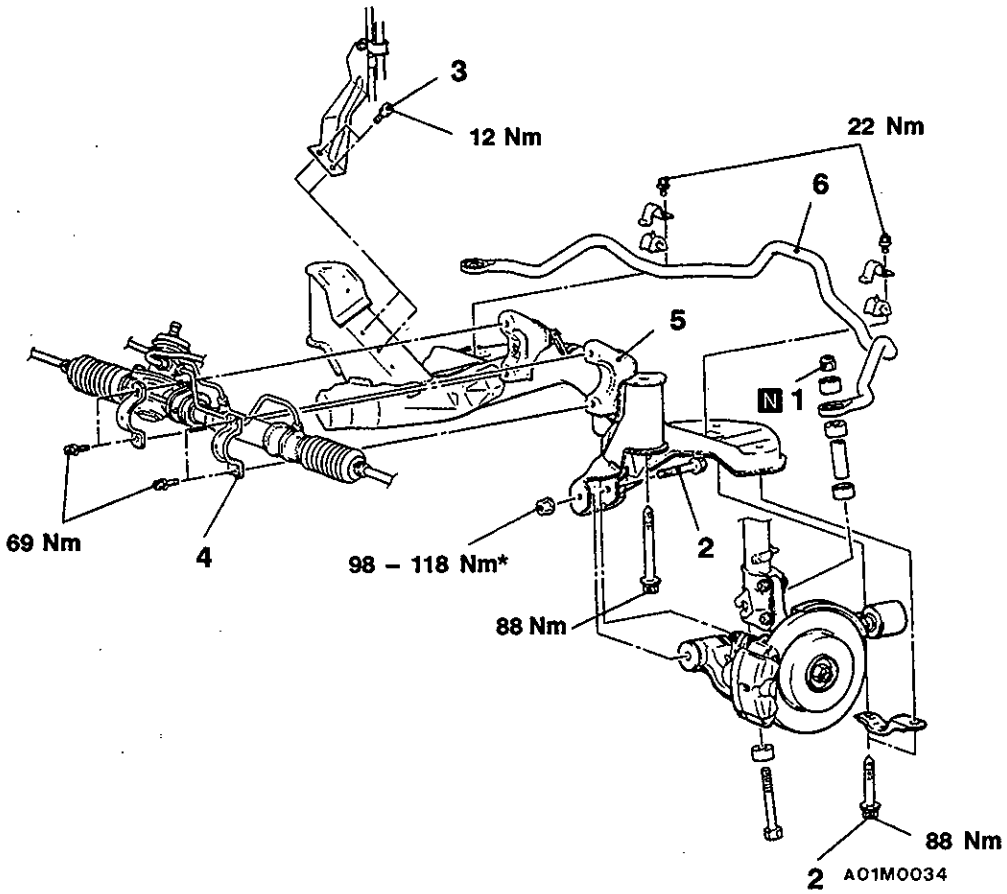
Install so that the hole in the front roll stopper bracket is facing towards the front of the vehicle.

CROSSMEMBER

32100320086

REMOVAL AND INSTALLATION

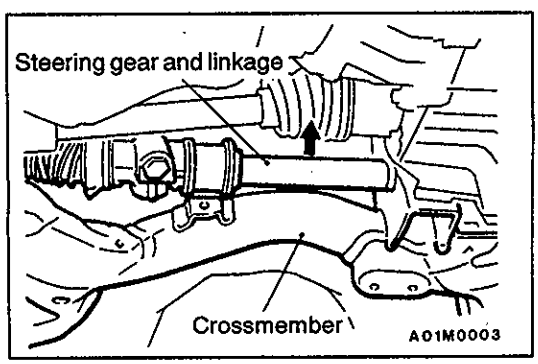
Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to GROUP 15.)
- Centermember Assembly Removal and Installation (Refer to P.32-7.)



Removal steps

▶A◀ 1. Self-locking nut
2. Lateral lower arm mounting bolts
3. Oil return pipe clamp mounting bolts
4. Steering gear and linkage clamp
◀A▶ 5. Crossmember assembly
▶B◀ 6. Stabilizer bar

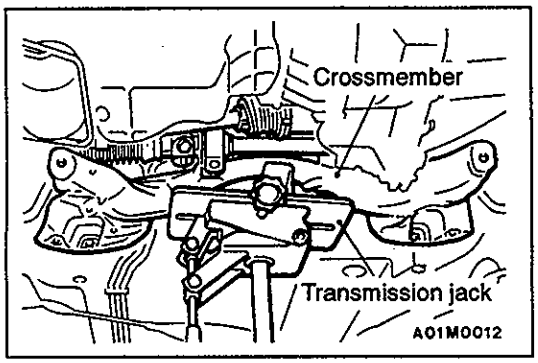
Caution
*: **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**



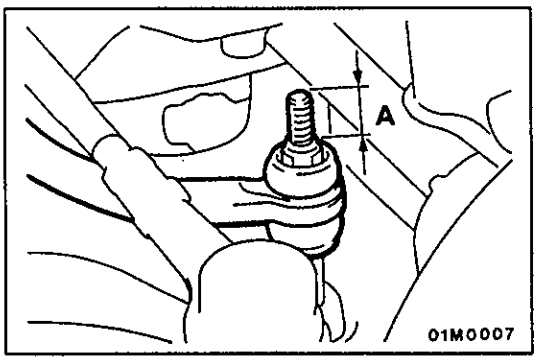
REMOVAL SERVICE POINT

◀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.

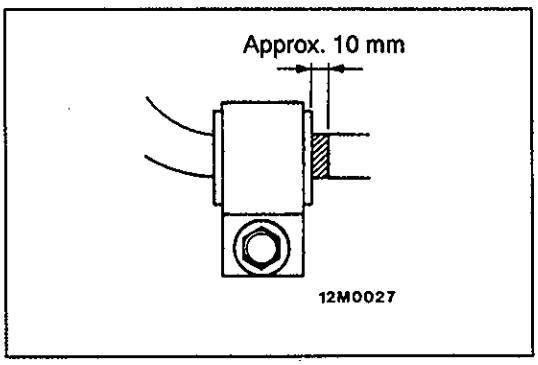


INSTALLATION SERVICE POINTS

▶A◀ SELF-LOCKING NUT INSTALLATION

Tighten the self-locking nut so that the amount of protrusion of the end of the stabilizer bar mounting bolts is at the standard value.

Standard value (A): 22 mm



▶B◀ STABILIZER BAR INSTALLATION

Place the identification mark of the stabilizer bar to the left, and install the bushing so that the identification mark protrudes approximately 10 mm from the edge of the inside of the bushing.

NOTES

FRONT SUSPENSION

CONTENTS

33109000049

GENERAL INFORMATION

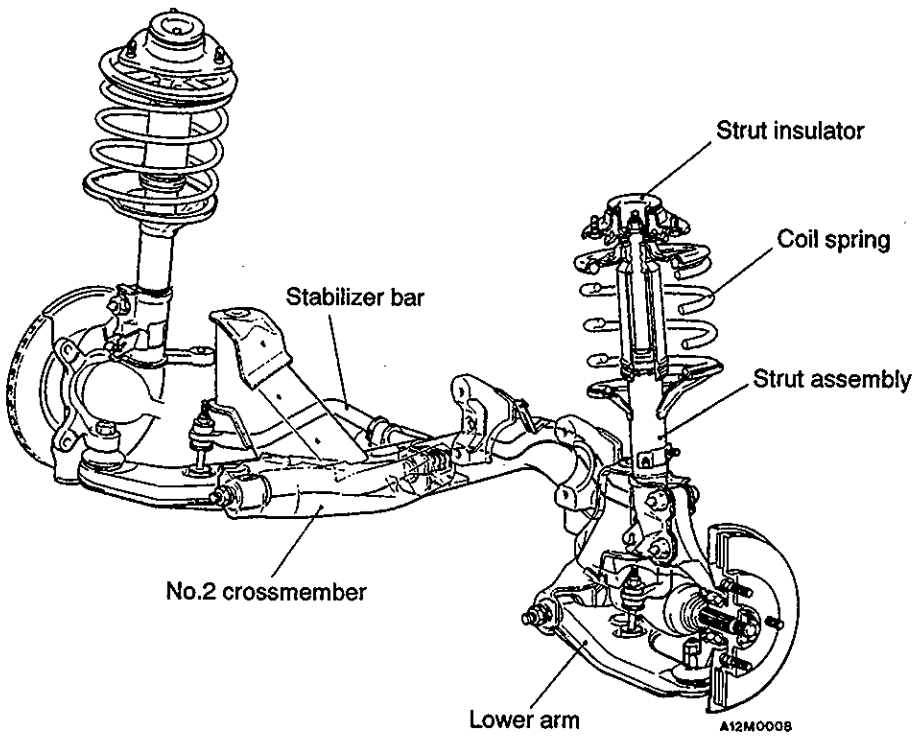
33100010027

The front suspension is a Mcpherson strut with coil spring. The shock absorber is hydraulic double-acting type.

COIL SPRING

Items	Hatchback (except 1600-A/T), Sedan (1300-M/T)	Hatchback (1600-A/T), Sedan (except 1300-M/T)
Wire diameter × average diameter × free length mm	12 × 138 × 340	12 × 138 × 350

CONSTRUCTION DIAGRAM



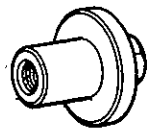
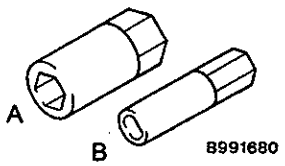
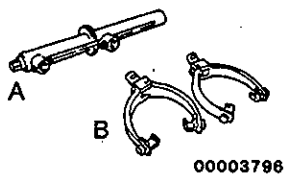
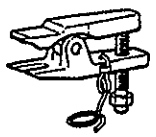
SERVICE SPECIFICATIONS

33100030047

Items		Standard value
Toe-in	At the centre of tyre tread mm	0 ± 3
	Toe-angle (per wheel)	0°00' ± 09'
Toe-out angle on turns (inner wheel when outer wheel at 20°)		21°48'
Steering angle	Inner wheel	38°00' ± 1°30'
	Outer wheel	31°00'
Camber		0°00' ± 30' (difference between right and left wheel: less than 30')
Caster		2°51' ± 30'(difference between right and left wheel: less than 30')
Kingpin inclination		12°52'
Lower arm ball joint starting torque Nm		1.0 – 6.4
Lower arm ball joint turning torque Nm		1.0–2.5
Protruding length of stabilizer bar mounting bolt mm		22

SPECIAL TOOLS

33100060039

Tools	Number	Name	Use
	MB991004	Wheel alignment gauge attachment	Measurement of the wheel alignment
	MB991680 A: MB991681 B: MB991682	Wrench set A: Wrench B: Socket	Disassembly/assembly of the strut assembly
	A: MB991237 B: MB991238	A: Spring compressor body B: Arm set	Compression of the front coil spring
	MB991113	Steering linkage puller	Removal of the ball joint
	MB990800	Ball joint remover and installer	Installation of the dust cover
	MB990326	Preload socket	Measurement of the ball joint rotation starting torque and turning torque
	MB990968	Torque wrench	

ON-VEHICLE SERVICE

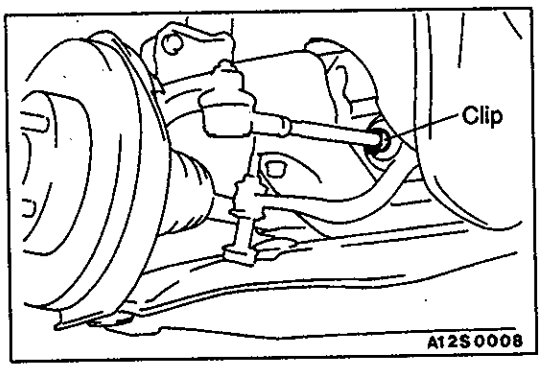
33100090090

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 0±3 mm
Toe angle (per wheel) 0°00'±09'



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. 1°05' (per wheel).

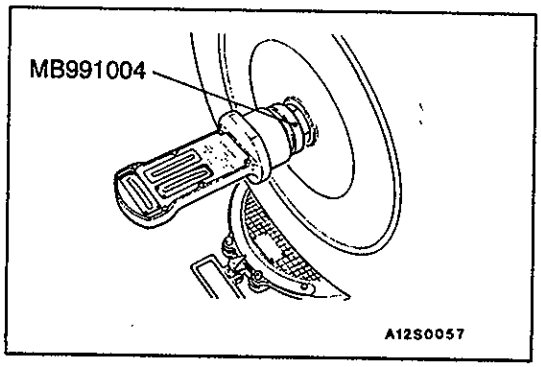
TOE-OUT ANGLE ON TURNS

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°48' (inner wheel when outer wheel at 20°)

STEERING ANGLE

Standard value:
Inner wheel 38°00'±1°30'
Outer wheel 31°00'



CAMBER, CASTER AND KINGPIN INCLINATION

Standard value:
Camber 0°00' ± 30'(difference between right and left wheel: less than 30')
Caster 2°51' ± 30'(difference between right and left wheel: less than 30')
Kingpin inclination 12°52'

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 216–255 Nm as the drive shaft nut.

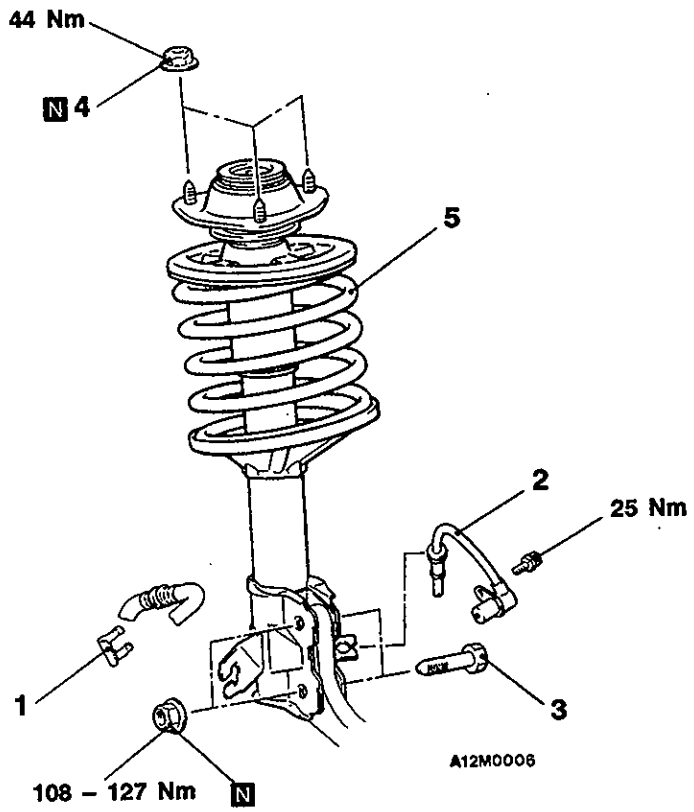
Caution
Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

STRUT ASSEMBLY

33200110034

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>
◀A▶ 3. Bolts
4. Self-locking nut
5. Strut assembly

Caution
For vehicles with ABS, be careful when handling the pole piece at the tip of the speed sensor so as not to damage it by striking against other parts.

REMOVAL SERVICE POINT

◀A▶ BOLTS REMOVAL

(1) Suspend the lower arm from the vehicle with wire.
(2) Remove the strut and knuckle connection.

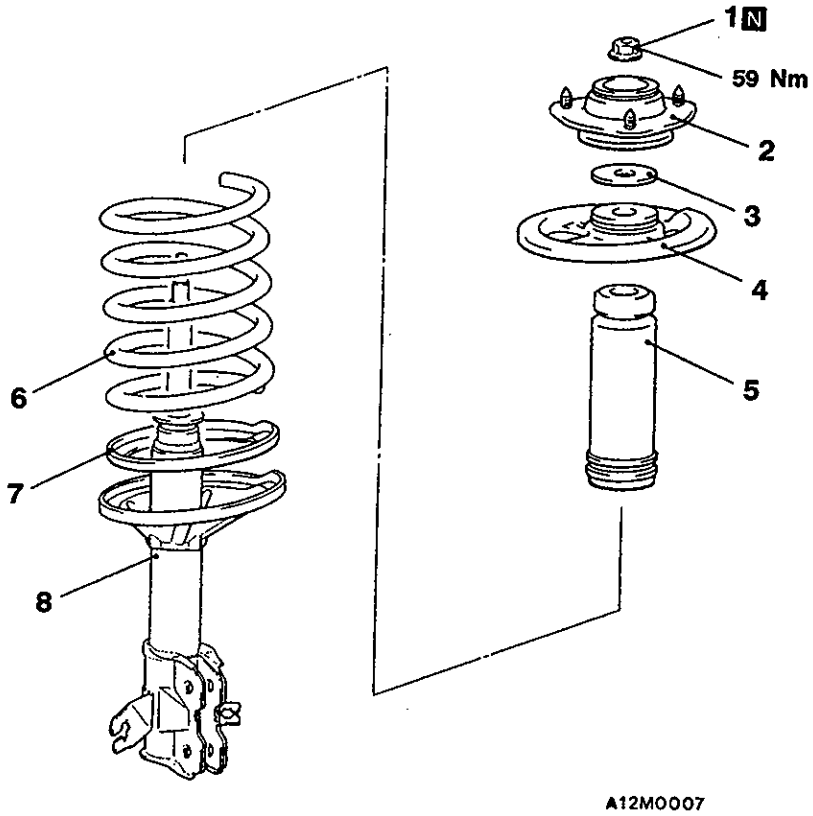
INSPECTION

33200120020

- Check for oil leaks from the strut assembly.
- Check the strut assembly for damage or deformation.

DISASSEMBLY AND REASSEMBLY

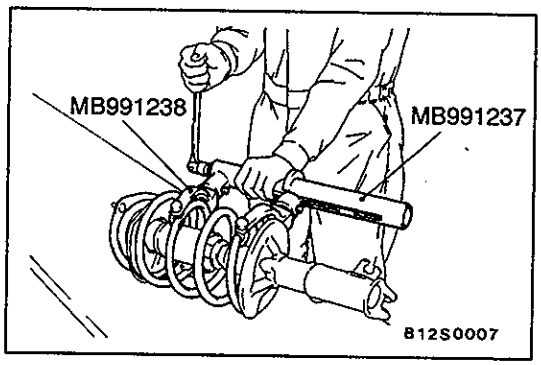
33200130047

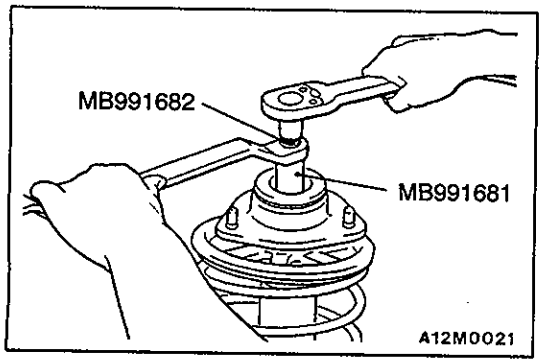


A12M0007

Disassembly steps

◀A▶ ▶A◀ 1. Self-locking nut
2. Strut insulator
3. Washer
4. Spring seat, upper
5. Bump rubber
6. Coil spring
7. Spring pad, lower
◀B▶ 8. Strut assembly





DISASSEMBLY SERVICE POINTS

◀A▶ SELF-LOCKING NUT REMOVAL

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

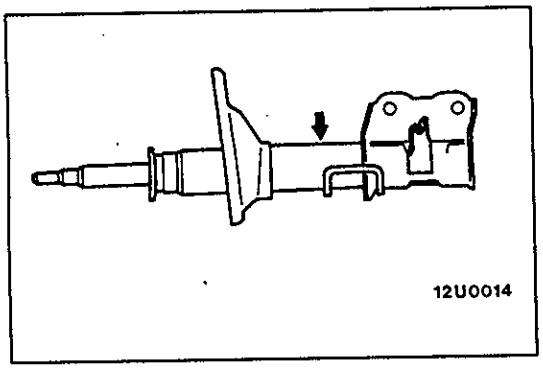
Caution

1. **Install the special tools evenly, and so that the maximum length will be attained within the installation range.**
2. **Do not use an impact wrench to tighten the special tool bolt.**

(2) Use the special tools to remove the self-locking nut.

Caution

Do not use an impact wrench.



▶B◀ STRUT ASSEMBLY REMOVAL <VEHICLES WITHOUT HIGH GROUND CLEARANCE SUSPENSION>

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.

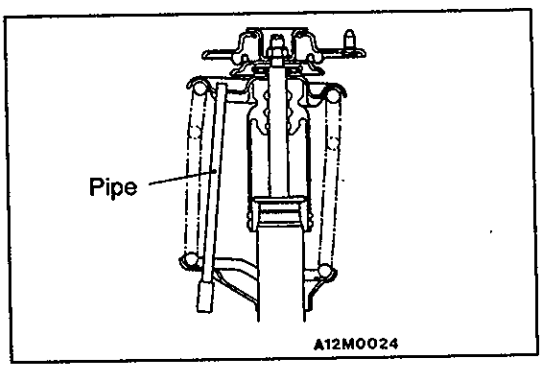
Caution
The gas itself is harmless but it may issue out of the hole together with chips generated by the drill. Therefore, be sure to wear goggles.

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.

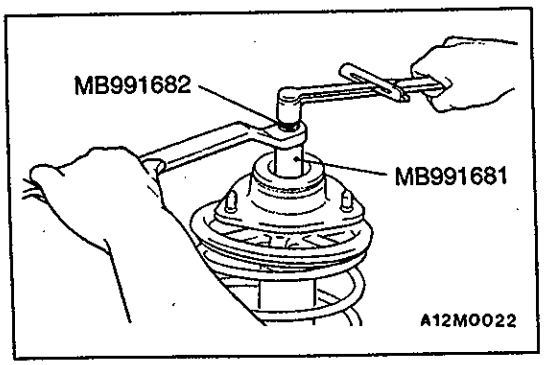
Caution
Do not use an impact wrench to tighten the special tool bolt.



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

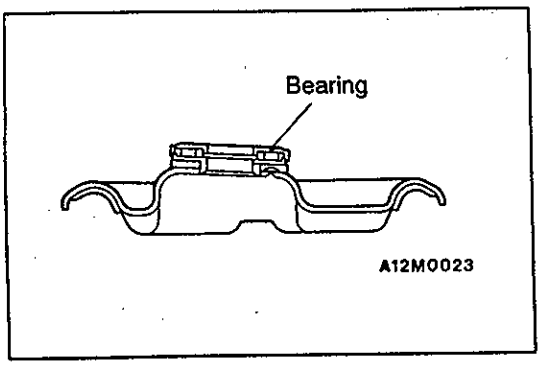
NOTE
The job is easily accomplished with a pipe.

(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.



INSPECTION

3320140033

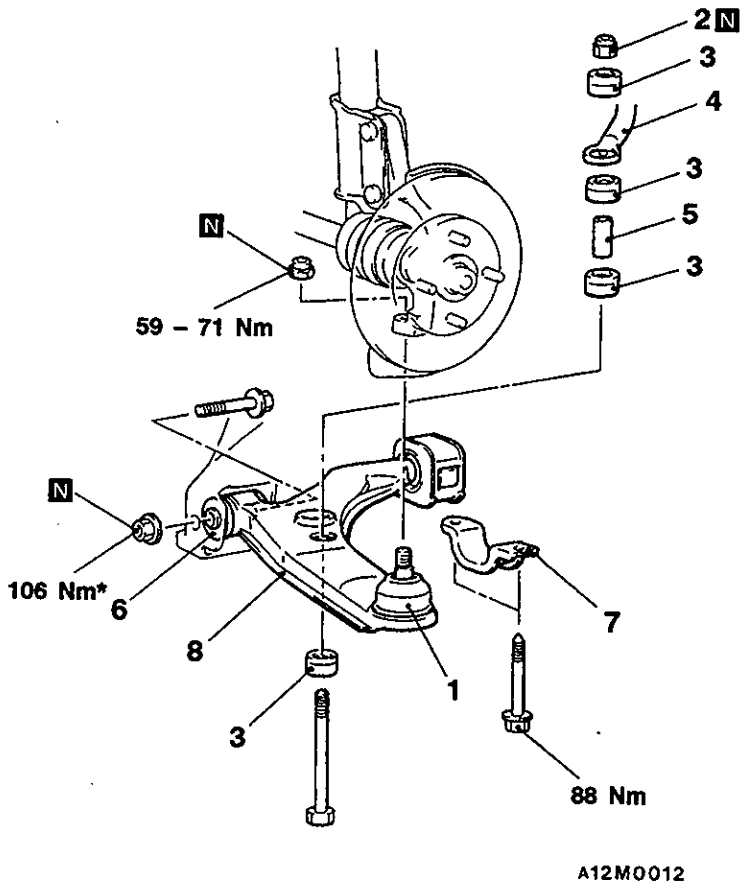
- Check the bearing for wear or rust.
- Check the rubber parts for damage or deterioration.
- Check the spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.

LOWER ARM

33200160039

REMOVAL AND INSTALLATION

Post-installation Operation
- Front Wheel Alignment Adjustment (Refer to P.33A-5.)

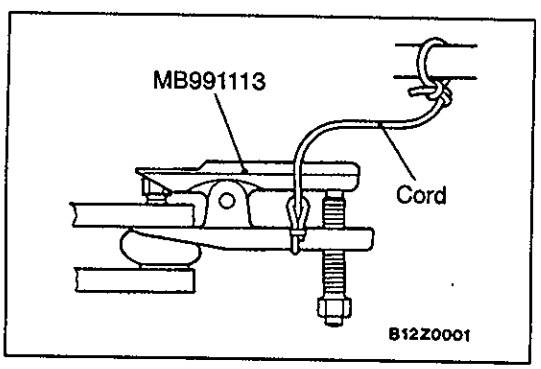


A12M0012

Removal steps

◀A▶ ▶A◀ 1. Lower arm ball joint connection
2. Self-locking nut
3. Stabilizer rubber
4. Stabilizer bar
5. Collar
6. Lower arm front bushing connection
7. Support bracket
8. Lower arm assembly

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

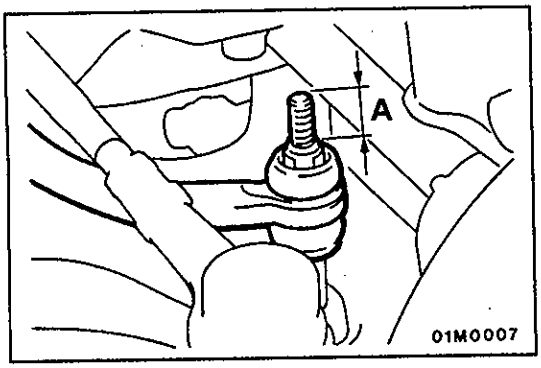


REMOVAL SERVICE POINT

◀A▶ LOWER ARM BALL JOINT DISCONNECTION

Use the special tool to disconnect the lower arm ball joint from the knuckle.

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.**



INSTALLATION SERVICE POINT

▶A◀ SELF-LOCKING NUT INSTALLATION

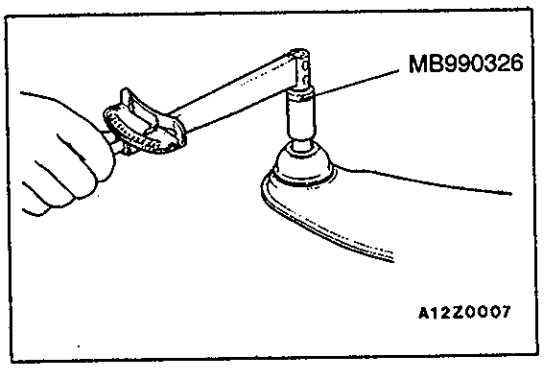
Tighten the self-locking nut so that the amount of protrusion of the end of the stabilizer bar mounting bolt is at the standard value.

Standard value (A): 22 mm

INSPECTION

33200170032

- 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.

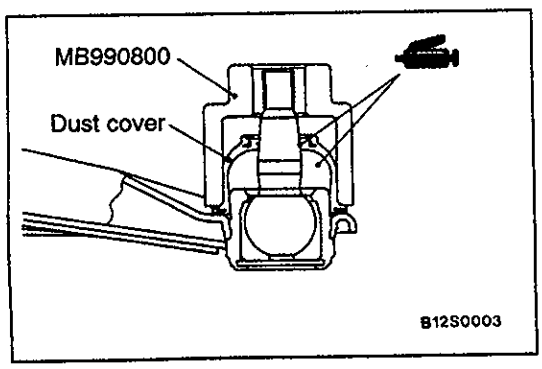


BALL JOINT STARTING TORQUE/TURNING TORQUE CHECK

(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.

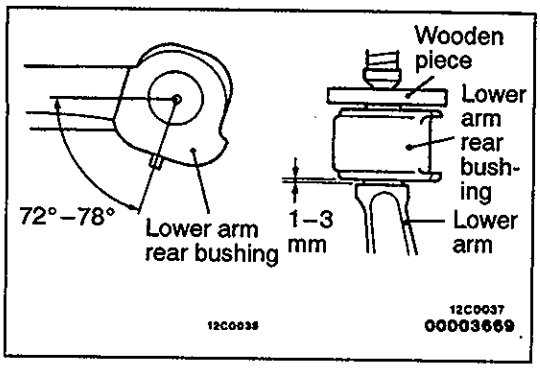
Standard value:
Starting torque 1.0–6.4 Nm
Turning torque 1.0–2.5 Nm

(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.



BALL JOINT DUST COVER REPLACEMENT

(1) Remove the dust cover.
(2) Apply multipurpose grease to the lip and inside of the dust cover.
(3) Drive in the dust cover with special tool until it is fully seated.



LOWER ARM REAR BUSHING REPLACEMENT

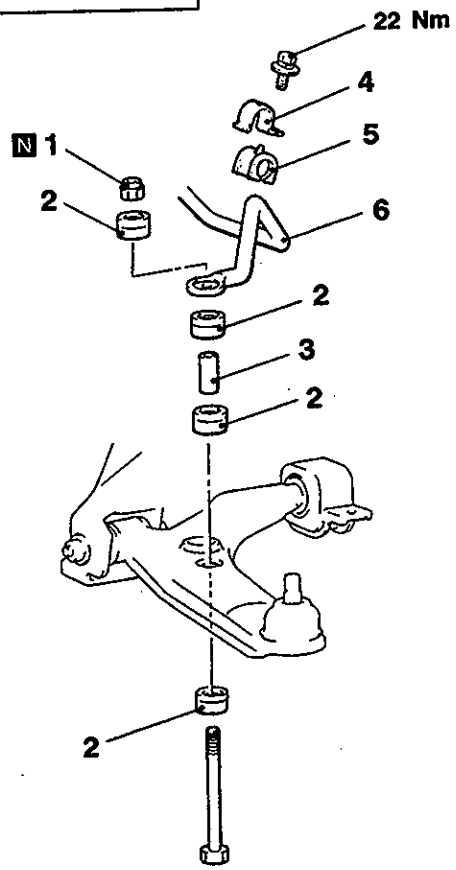
(1) Apply soapy water between the shaft and old bushing, and pry up bushing using a screwdriver.
(2) Apply soapy water to the shaft and new bushing and install new bushing into the shaft at the angle shown in the illustration.
(3) Press in the bushing as illustrated.

STABILIZER BAR

33200190021

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Crossmember Removal and Installation (Refer to GROUP 32 – Crossmember.)

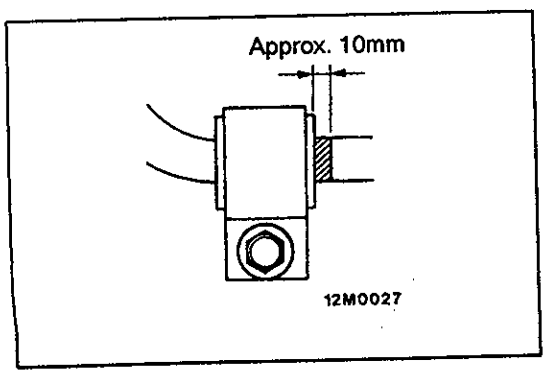


A12M0013

Removal steps

▶B◀ 1. Self-locking nut
2. Stabilizer rubber
3. Collar

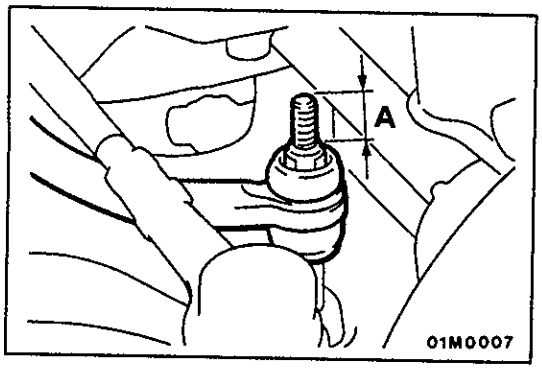
▶A◀ 4. Fixture
▶A◀ 5. Bushing
6. Stabilizer bar



INSTALLATION SERVICE POINT

▶A◀ BUSHING/FIXTURE INSTALLATION

Place the identification mark of the stabilizer bar to the left, and install the bushing so that the identification mark protrudes approximately 10 mm from the edge of the inside of the bushing.



▶B◀ SELF-LOCKING NUT INSTALLATION

Tighten the self-locking nut so that the amount of protrusion of the end of the stabilizer bar mounting bolt is at the standard value.

Standard value (A): 22 mm

INSPECTION

33200200021

- Check the bushing for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.

REAR SUSPENSION

CONTENTS

34109000084

GENERAL INFORMATION

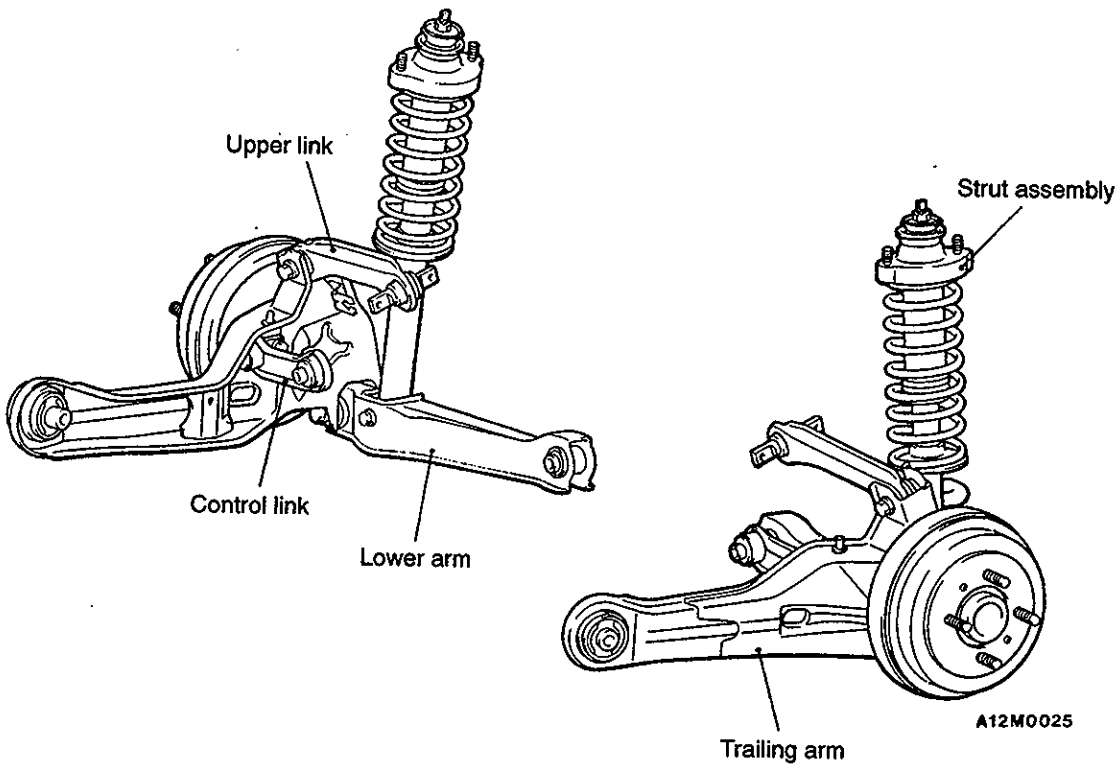
34100010093

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	Hatchback	Sedan
Wire diameter × average diameter × free length mm	9 × 86 × 369	9 × 86 × 379

CONSTRUCTION DIAGRAM



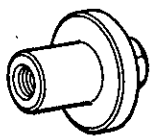
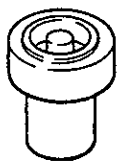
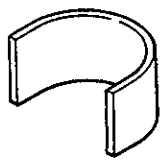
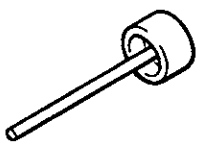
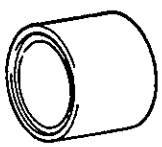
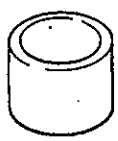
SERVICE SPECIFICATIONS

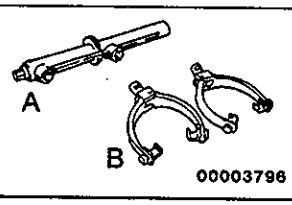
34100030105

Items		Specifications
Toe-in	At the centre of tyre tread mm	3 ±2
	Toe-angle (per wheel)	0°09'±06'
Camber		– 0°40'±30'
Clearance between rear speed sensor pole piece and rotor mm		0.1 – 2.0

SPECIAL TOOLS

34100060081

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
	A: MB991237 B: MB991239	A: Spring compressor body B: Arm set	Compression of the rear coil spring

ON-VEHICLE SERVICE

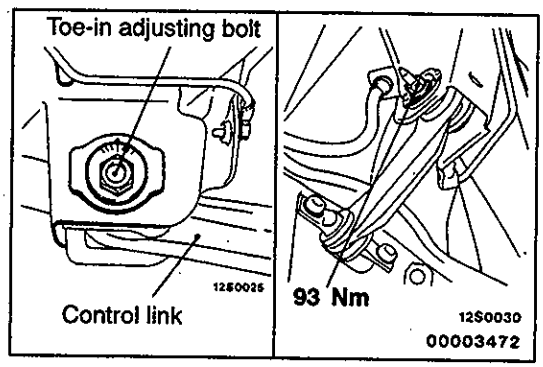
33100100090

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.

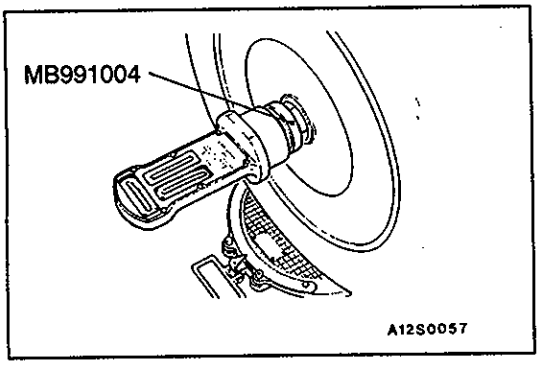
TOE-IN

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')

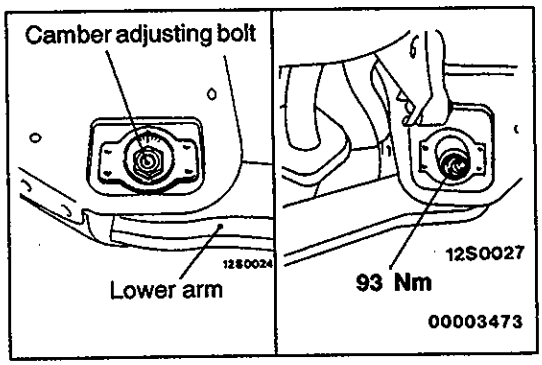


CAMBER

Standard value: – 0°40'±30'
(The difference between the left and right wheels should be 30' or less.)

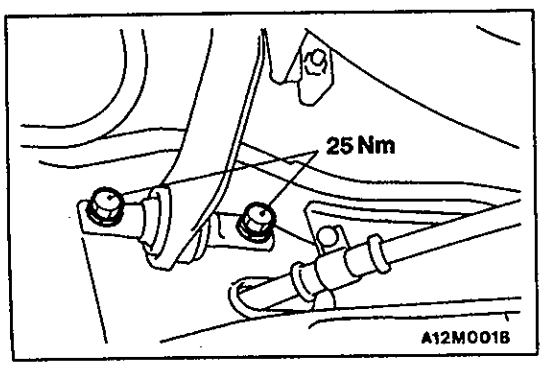
NOTE
For vehicles equipped with aluminium wheels, measure the camber after tightening the special tool (MB991004) to the specified torque 172 Nm.

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'



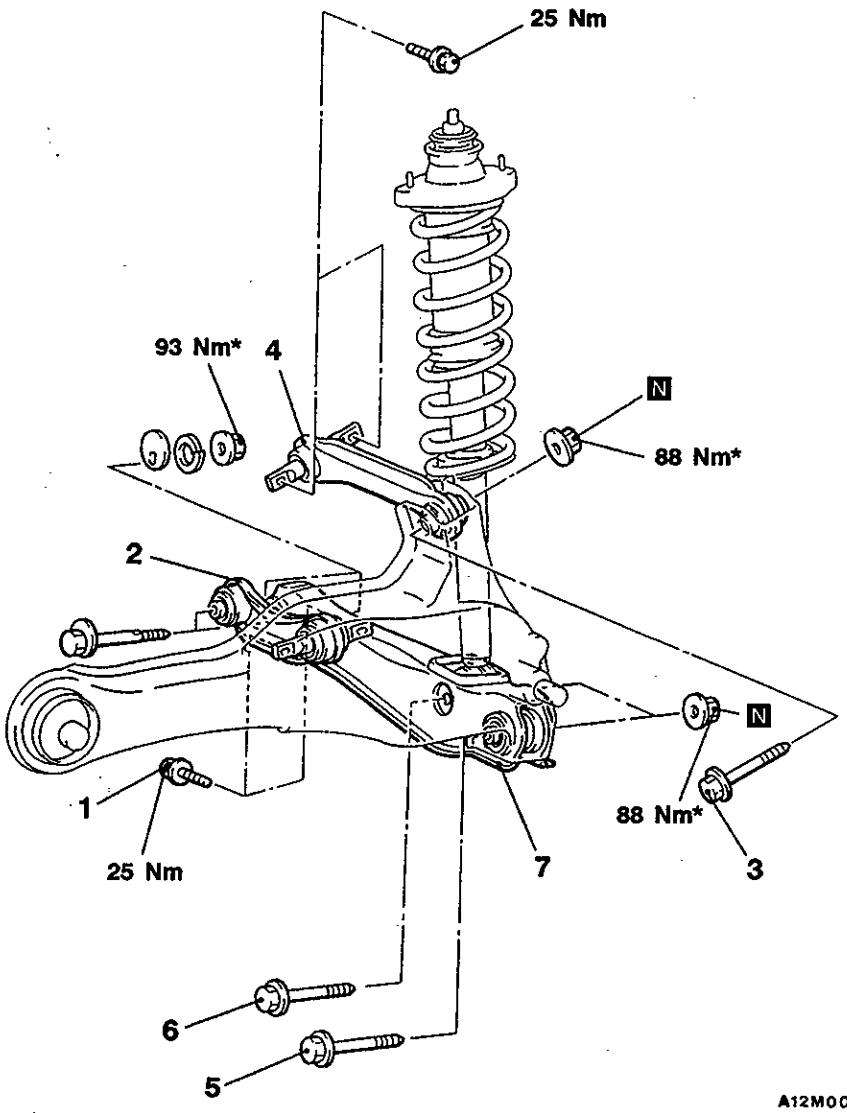
(3) Tighten the control link to the trailing arm at the specified torque.
(4) After adjusting the camber, be sure to adjust the toe-in.

CONTROL LINK, UPPER LINK AND LOWER ARM

34100480030

REMOVAL AND INSTALLATION

Post-Installation Operation
- Wheel Alignment Check (Refer to P.34-4.)

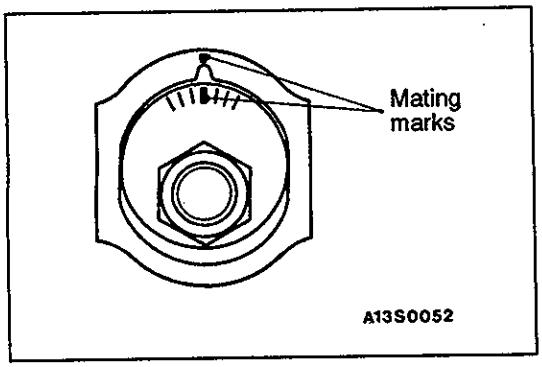


Control link removal steps
1. Control link and trailing arm connection
◀A▶ 2. Control link

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
◀B▶ 5. Lower arm and trailing arm connection
6. Shock absorber assembly and lower arm connection
◀A▶ 7. Lower arm

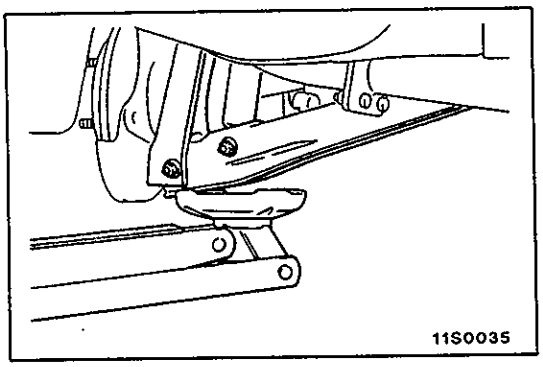
Caution
*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.**



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.



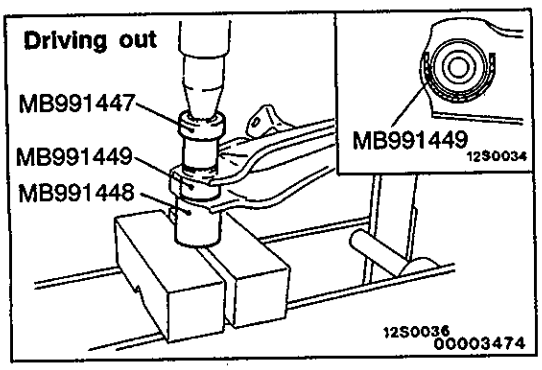
◀B▶ UPPER LINK AND TRAILING ARM / LOWER ARM AND TRAILING ARM DISCONNECTION

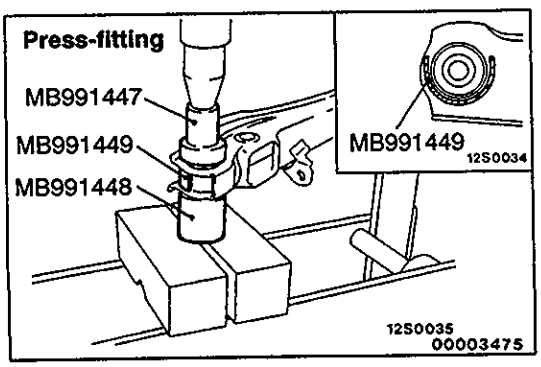
After supporting the lower arm with a jack, separate the connection.

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.

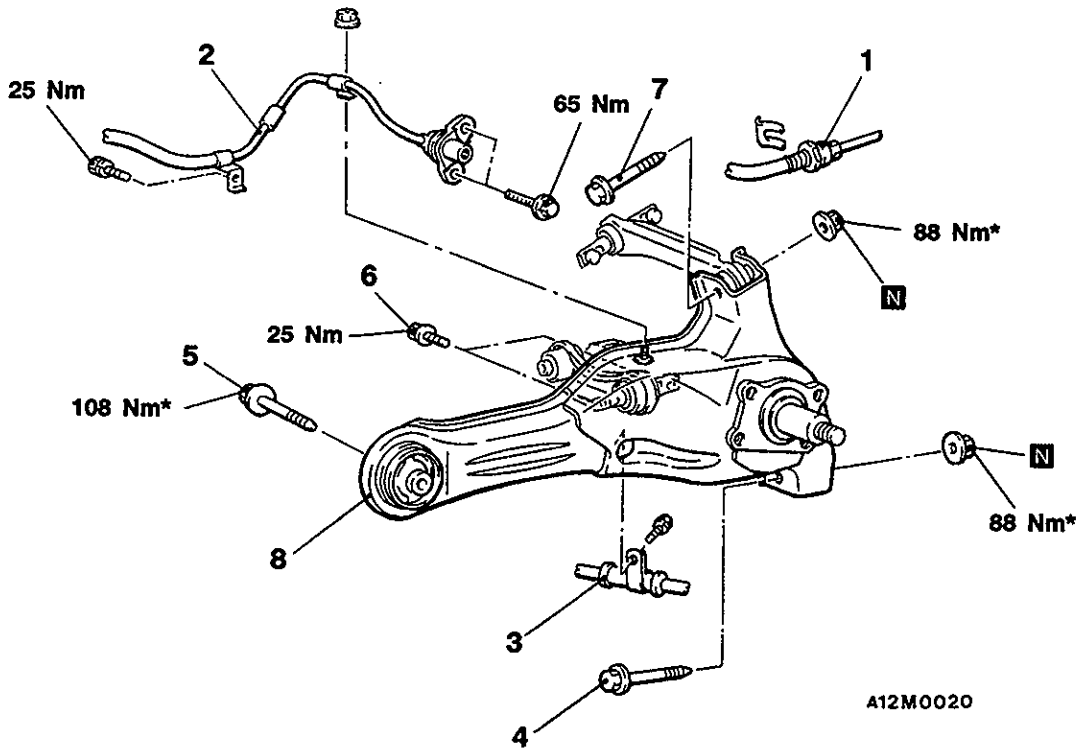
Caution
Because the outside diameter of both edges of the bushing are different, be careful not to mistake the direction when driving out and press-fitting.

TRAILING ARM

34100420094

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Rear Drum Brake Removal and Installation (Refer to GROUP 35A.)
- Rear Axle Hub Removal and Installation (Refer to GROUP 27.)

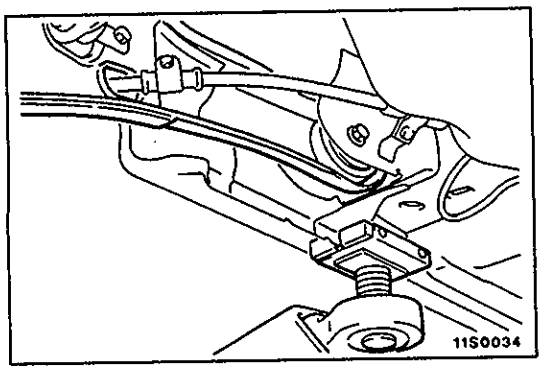


Removal steps

◀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

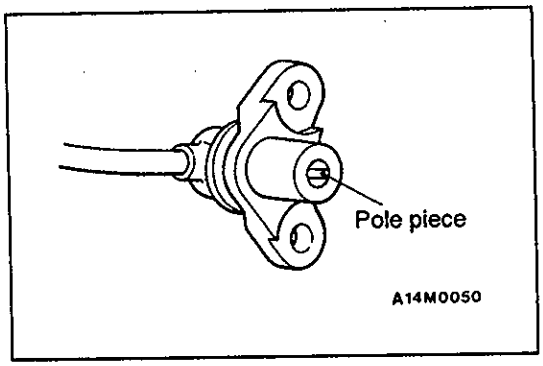
* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground *in the unladen condition*.**



REMOVAL SERVICE POINTS

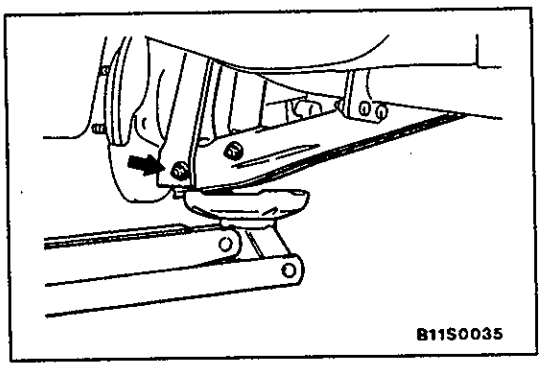
◀A▶ LIFTING POINT

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.



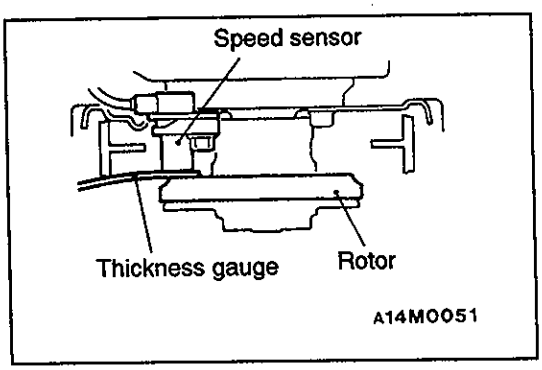
◀B▶ REAR SPEED SENSOR REMOVAL

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

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



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.

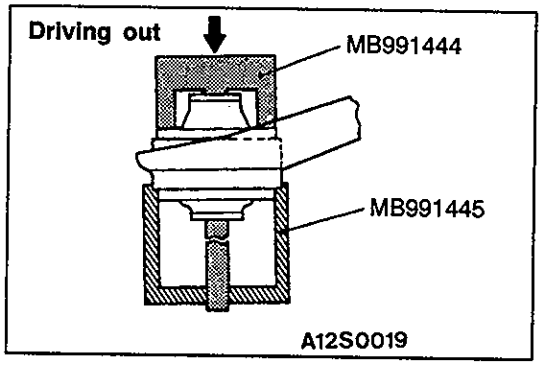
Insert a thickness gauge into the space between the speed sensor's pole piece and the rotor's toothed surface, and then tighten the speed sensor bracket at the position where the clearance is at the standard value all around.

Standard value: 0.1 – 2.0 mm

INSPECTION

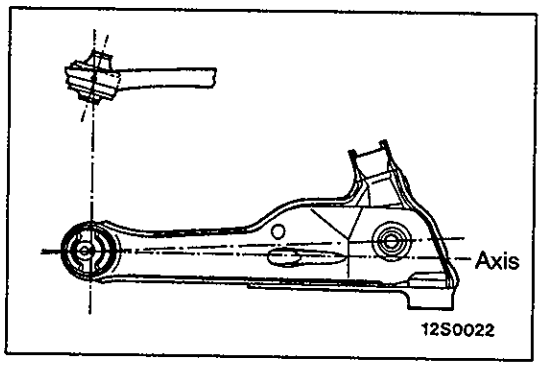
34100430035

- Check trailing arm for cracks and deformation.
- Check bushing for cracks, deterioration and wear.

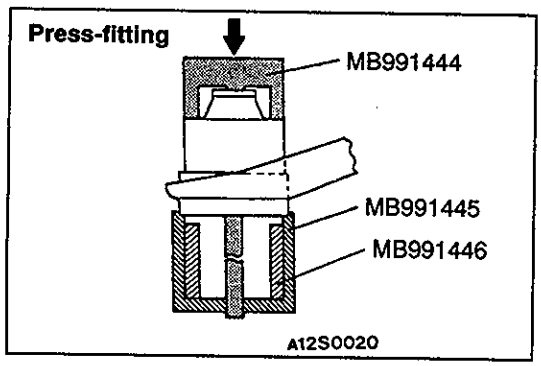


TRAILING ARM BUSHING REPLACEMENT

(1) Use the special tools to drive out the trailing arm bushing.



(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.



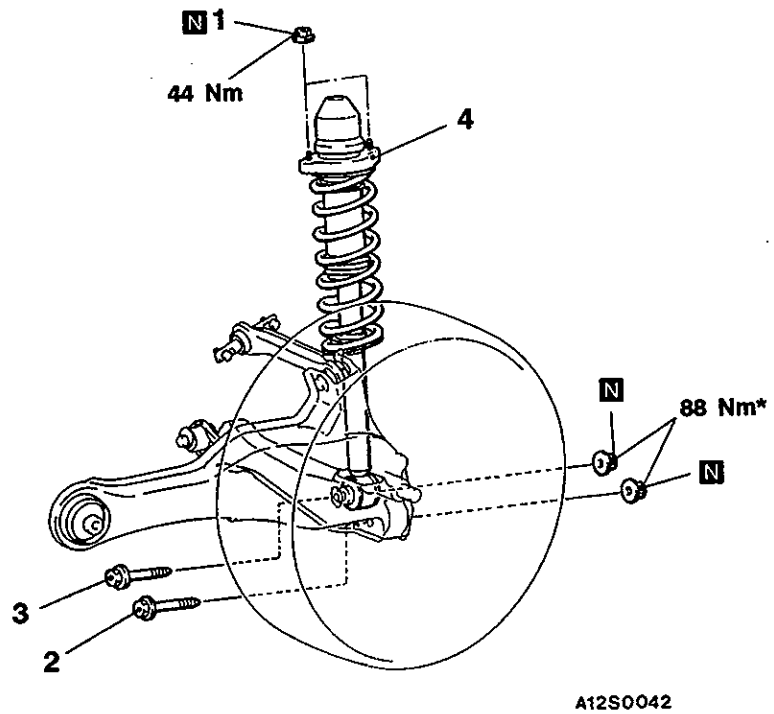
(3) Use the special tools to press-fit the trailing arm bushing.

STRUT ASSEMBLY

34100510098

REMOVAL AND INSTALLATION

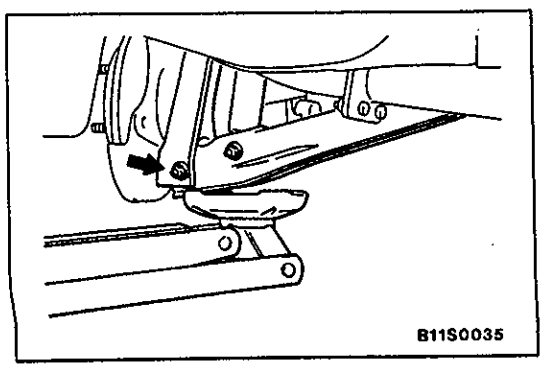
Pre-removal and Post-installation Operation
- Lower arm and trailing arm disconnection (Refer to P.34-8.)
- Quarter trim lid <Hatchback> (Refer to GROUP 52A – Trim.)



Removal steps

◀A▶ 1. Self-locking flange nut
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.

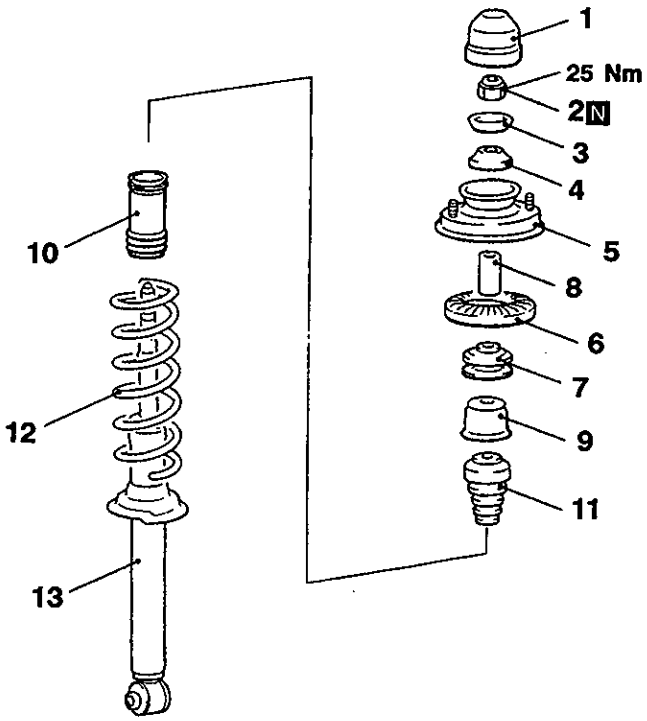
INSPECTION

34100520022

- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage or abnormal noise.

DISASSEMBLY AND REASSEMBLY

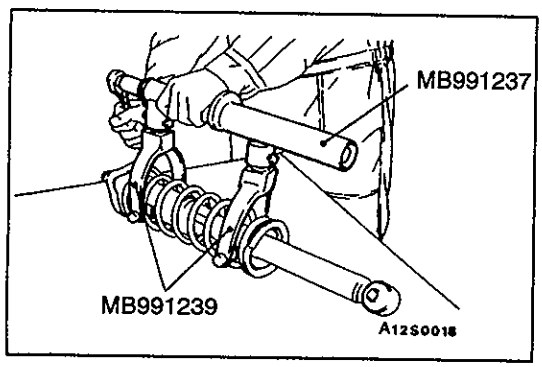
34100530070

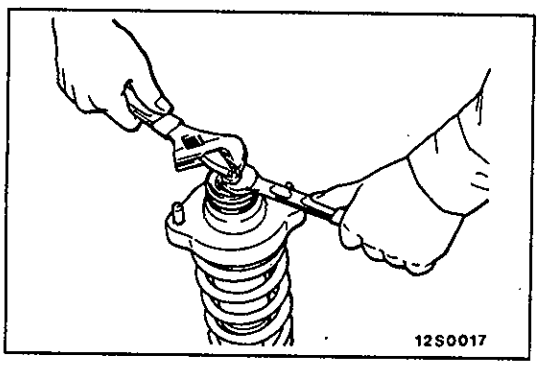


A12M0016

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
13. Shock absorber



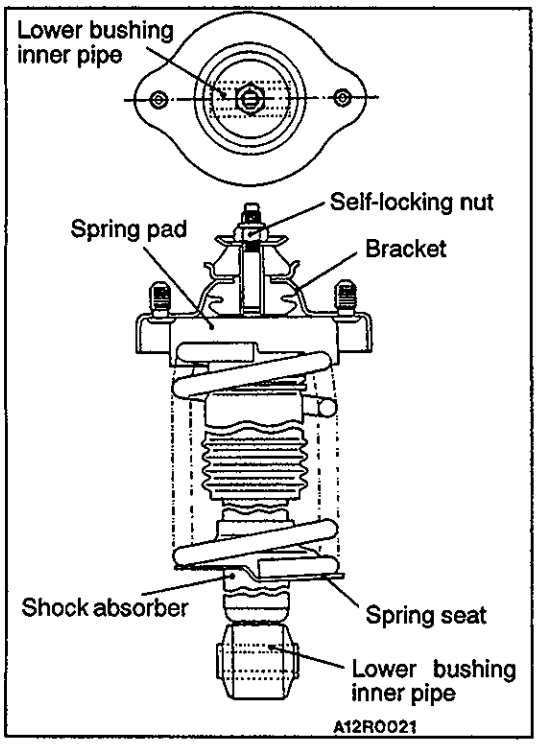


DISASSEMBLY SERVICE POINT

◀A▶ SELF-LOCKING NUT REMOVAL

(1) Use the special tools to compress the coil spring.
Caution
1. Install the special tools evenly, and so that the maximum length will be attained within the installation range.
2. 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.



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.

NOTES

SERVICE BRAKES

CONTENTS

35109000159

NOTE
THE GROUPS MARKED BY [redacted] ARE NOT IN THIS MANUAL

BASIC BRAKE SYSTEM

CONTENTS

35109000166

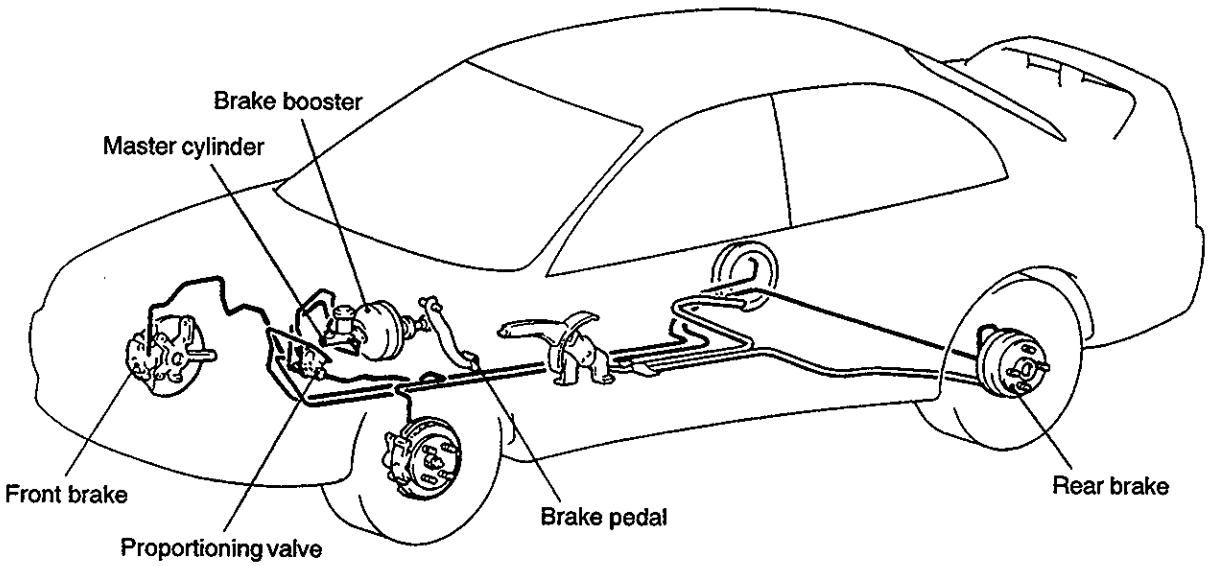
GENERAL INFORMATION

35100010090

The brake system offers high dependability and durability along with improved braking performance and brake sensitivity.

Items		Specifications
Master cylinder	Type	Tandem type (with level sensor)
	I.D. mm	22.2
Brake booster	Type	Vacuum type, single
	Effective dia. of power cylinder mm	230
	Boosting ratio	5.0
Proportioning valve	Type	Dual type
	Decompression ratio	0.25
Front brakes	Type	Floating caliper, 1-piston, ventilated disc
	Disc effective dia. × thickness mm	184 × 18
	Wheel cylinder I.D. mm	54.0
	Pad thickness mm	10.0
	Clearance adjustment	Automatic
Rear drum brakes	Type	Leading trailing
	Drum I.D. mm	180
	Wheel cylinder I.D. mm	19.0
	Lining thickness mm	4.3
	Clearance adjustment	Automatic
Brake fluid		DOT3 or DOT4

CONSTRUCTION DIAGRAM



A14M0061

SERVICE SPECIFICATIONS

35100030096

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 or more	–
Proportioning valve	Split point MPa	Hatchback	2.45 ± 0.25	–
		Sedan	2.94 ± 0.25	–
	Output fluid pressure (Input fluid pressure) MPa	Hatchback	4.30 ± 0.39 (9.81)	–
		Sedan	4.66 ± 0.39 (9.81)	–
	Output fluid pressure difference between left and right MPa		–	0.39
Brake booster push rod to master cylinder piston clearance mm			0.65–0.85	–
Front disc brake	Pad thickness mm		10.0	2.0
	Disc thickness mm		18.0	16.4
	Disc runout mm		–	0.06
	Drag force (tangential force of wheel mounting bolts) N		39 or less	–

Items		Standard value	Limit
Rear drum brake	Lining thickness mm	4.3	1.0
	Drum inside diameter mm	180	182

LUBRICANTS

35100040082

Items	Specified Lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease (orange)
Slide pin boot and slide pin bush inner surfaces	
Brake piston boot inner surfaces	
Piston boot mounting grooves	
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	

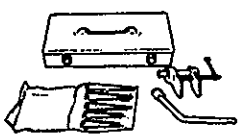
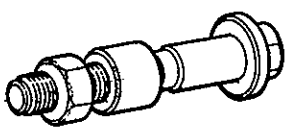
SEALANTS

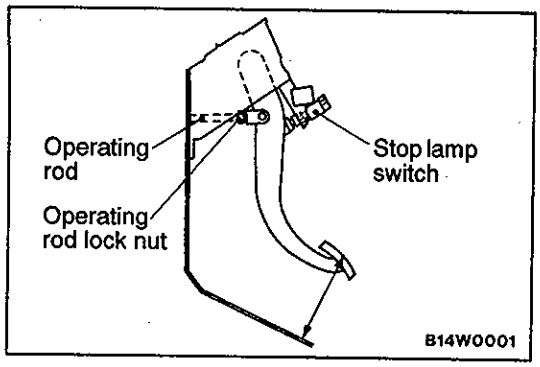
35100050085

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant

SPECIAL TOOLS

35100060071

Tool	Number	Name	Use
	MB990964 MB990520 MB990619	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



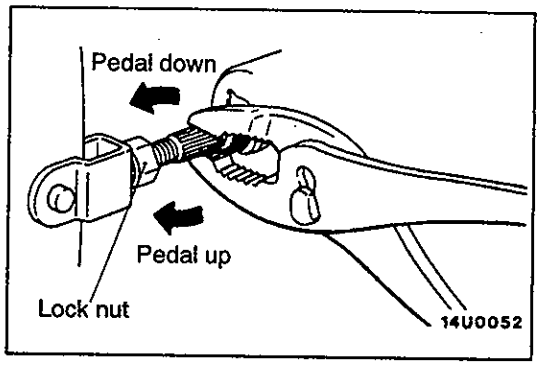
ON-VEHICLE SERVICE

35100090117

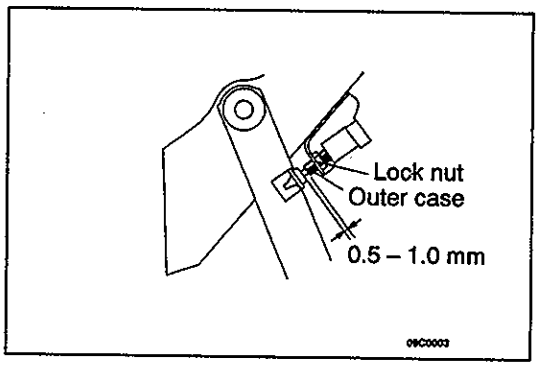
BRAKE PEDAL CHECK AND ADJUSTMENT

1. Turn up the carpet, etc under the brake pedal.
2. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, follow the procedure below.

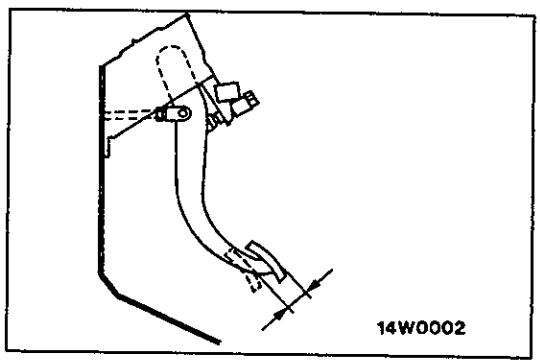
Standard value:
<L.H. drive vehicles> 163.5–166.5 mm
<R.H. drive vehicles> 162.5–165.5 mm



(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.
(3) Secure by tightening the lock nut of the operating rod.



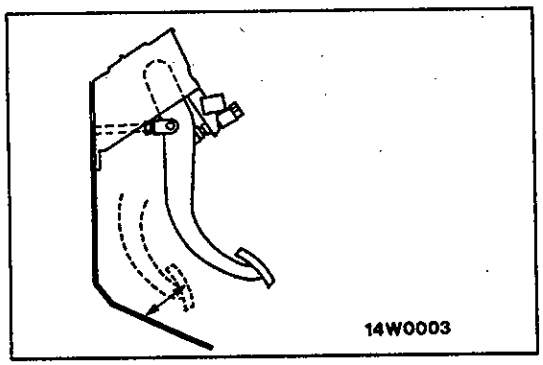
(4) Push the stop lamp switch in the direction of the pedal stroke until it stops. (The switch will slide if it is pushed firmly.)
(5) Lift up the pedal until the operating rod is fully extended, and then slide the stop lamp switch back to the required position. Adjust the position of the switch by turning it until the distance shown in the illustration is correct.
(6) Connect the connector of the stop lamp switch.
(7) Check that the stop lamp is not illuminated with the brake pedal unpressed.



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

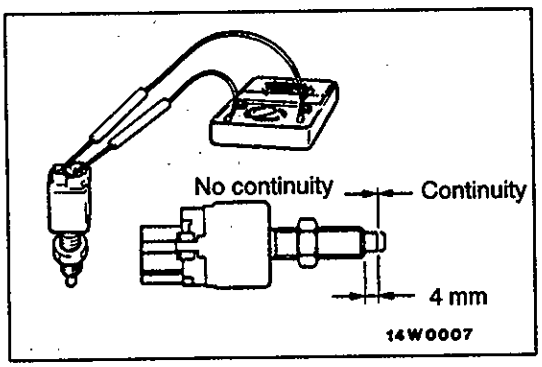
If the free play exceeds the standard value, it is probably due to excessive play between the retaining ring bolt and brake pedal arm.
Check for excessive clearance and replace faulty parts as required.



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.

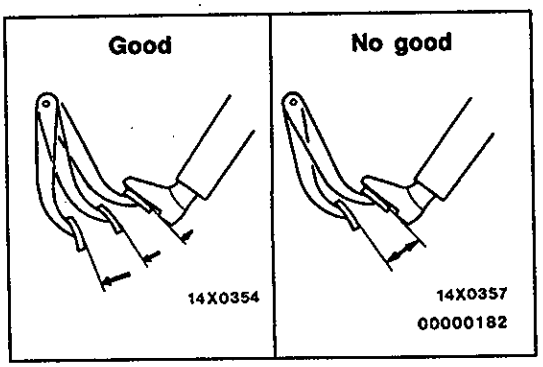
   Standard value: 80 mm or more

   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.
4. Turn back the carpet, etc.



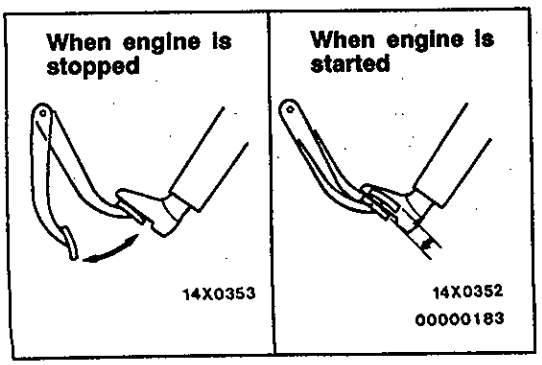
STOP LAMP SWITCH CHECK 35100890083

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.



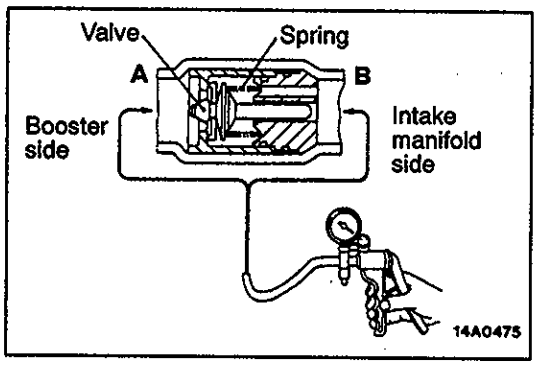
2. With the engine stopped, step on the brake pedal several times.
   Then step on the brake pedal and start the engine.
   If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.

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 35100900090

1. Remove the vacuum hose. (Refer to P.35A-17.)

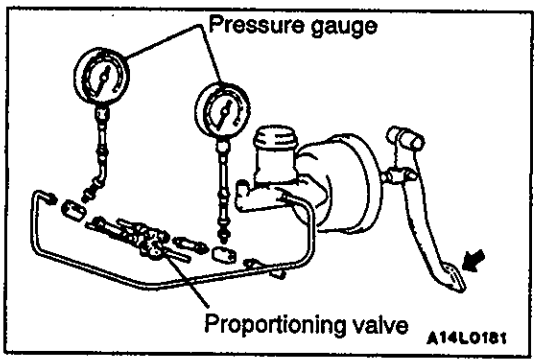
Caution
The check valve should not be removed from the vacuum hose.



2. Check the operation of the check valve by using a vacuum pump.

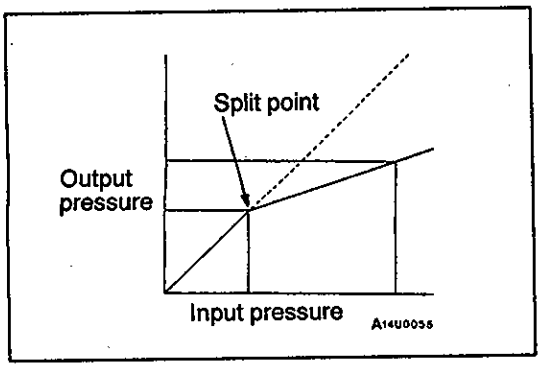
Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created.

Caution
If the check valve is defective, replace it as an assembly unit together with the vacuum hose.



PROPORTIONING VALVE FUNCTION TEST 35100110080

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

Hatchback	Sedan
2.45 ± 0.25	2.94 ± 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:

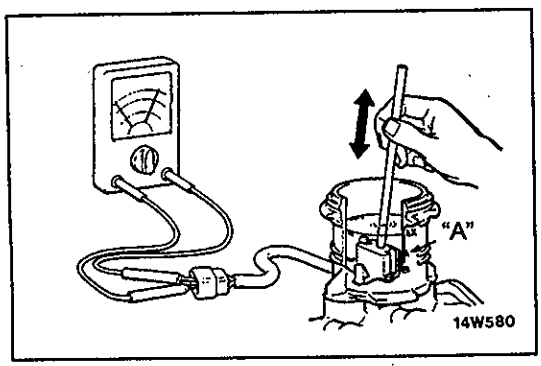
MPa

	Hatchback	Sedan
Output fluid pressure (Input fluid pressure)	4.30 ± 0.39 (9.81)	4.66 ± 0.39 (9.81)

(3) Output pressure difference between left and right brake lines.

Limit: 0.39 MPa

4. If the measured pressures are not within the permissible ranges, replace the proportioning valve.



BRAKE FLUID LEVEL SENSOR CHECK

35100910086

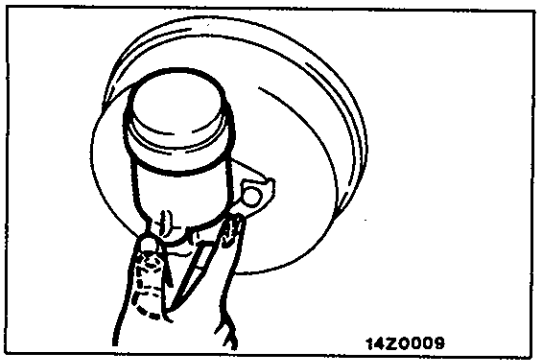
The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "A" and if there is continuity when the float surface is below "A".

BLEEDING

35100140089

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

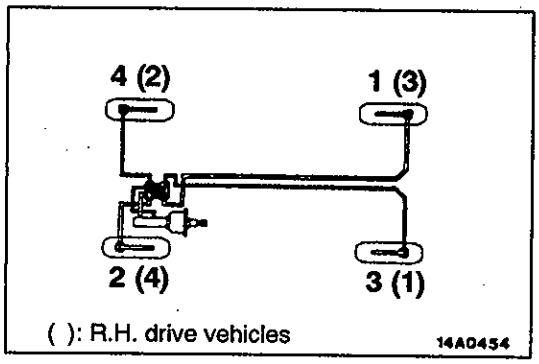
Specified brake fluid: DOT3 or DOT4



MASTER CYLINDER BLEEDING

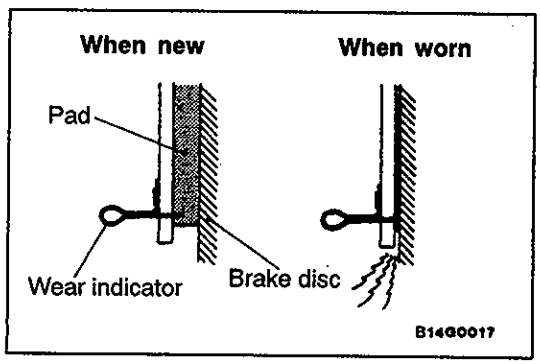
The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

(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

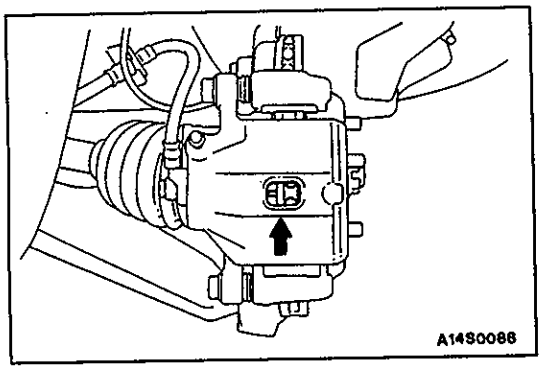
Bleed the air in the sequence shown in the figure.



FRONT DISC BRAKE PAD CHECK AND REPLACEMENT

35100150099

NOTE
The left side outer brake pad has a wear indicator.
The wear indicator contacts the brake disc when the brake pad thickness becomes 2 mm and emit a squealing sound to warn the driver.

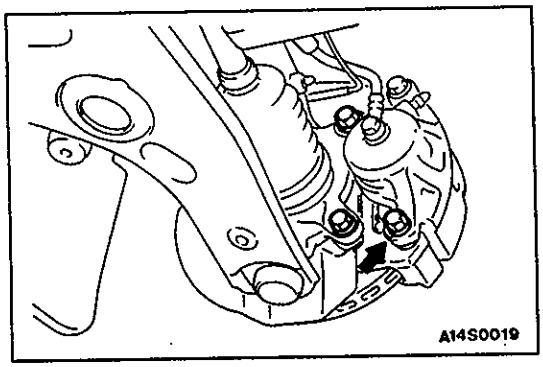


1. Check brake pad thickness through caliper body check port.

   Standard value: 10 mm

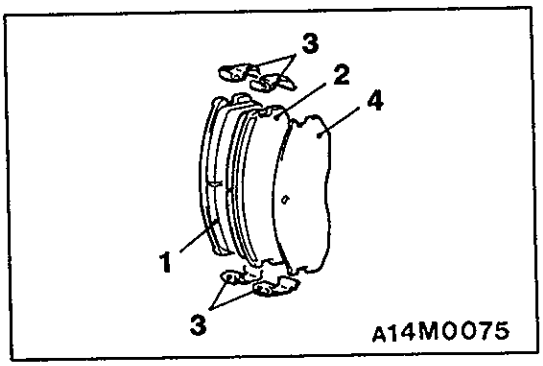
   Limit: 2.0 mm

   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 the slide pin (M14). Lift caliper assembly and retain with wires.

   Caution
   Do not wipe off the special grease that is on the slide pin or allow it to contaminate the slide pin.



3. Remove the following parts from caliper support.
   1. Pad and wear indicator assembly <L.H.>, and pad assembly <R.H.>
   2. Pad assembly
   3. Pad liner
   4. Outer shim

4. In order to measure the brake drag force after pad installation, measure the rotary-sliding resistance of the hub with the pads removed. (Refer to P.35A-20.)
5. Install the pads and the caliper assembly, and then check the brake drag force. (Refer to P.35A-20.)

FRONT DISC BRAKE ROTOR CHECK

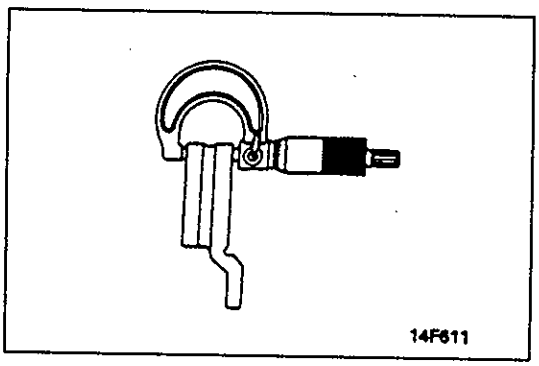
35100270061

CAUTION

When servicing disc brakes, it is necessary to exercise caution to keep the disc brakes within the allowable service values in order to maintain normal brake operation.

Before re-finishing or re-processing the brake disc surface, the following conditions should be checked.

Inspection items	Remarks
Scratches, rust, saturated lining materials and wear	• If the vehicle is not driven for a certain period, the sections of the discs that are not in contact with lining will become rusty, causing noise and shuddering. • If grooves resulting from excessive disc wear and scratches are not removed prior to installing a new pad assembly, there will momentarily be inappropriate contact between the disc and the lining (pad).
Run-out or drift	Excessive run-out or drift of the discs will increase the pedal depression resistance due to piston knock-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause inset or warping.



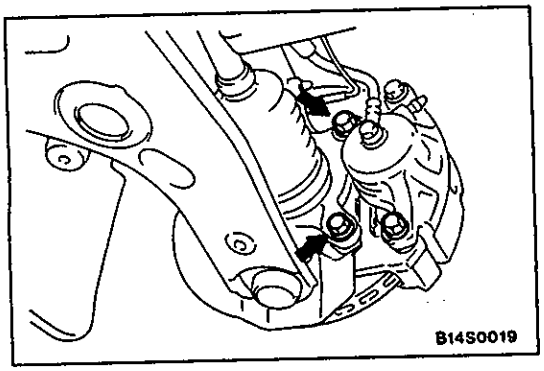
THICKNESS CHECK

35100160085

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: 18.0 mm
   Limit: 16.4 mm

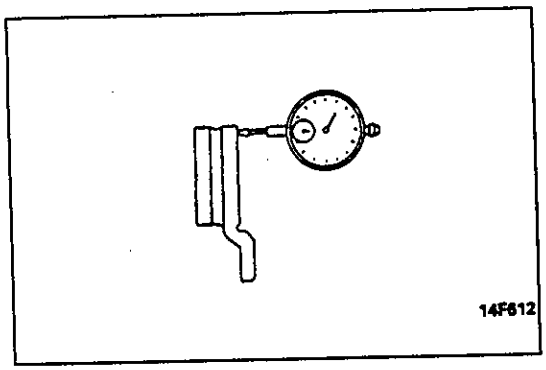
   Thickness variation (at least 8 positions)
   The difference between any thickness measurements should not be more than 0.015 mm.
2. If the disc is beyond the limits for thickness, remove it and install a new one. If thickness variation exceeds the specification, replace the brake disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).



RUN-OUT CHECK

35100170088

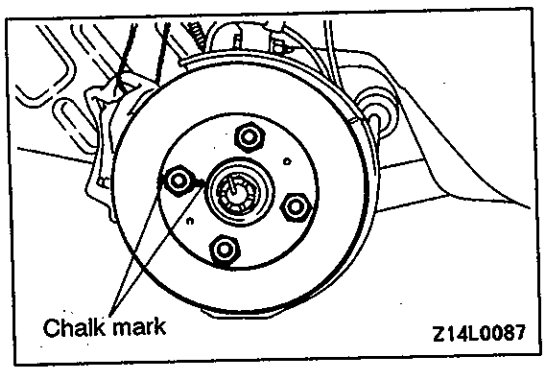
1. Remove the caliper support; then raise the caliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks and rust. Clean the disc thoroughly and remove all rust.



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: 0.06 mm or less

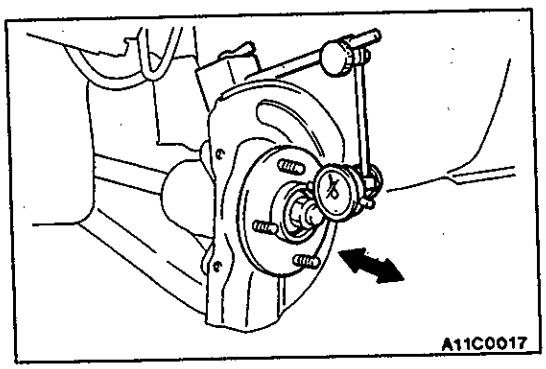
   NOTE
   Tighten the nuts in order to secure the disc to the hub.



RUN-OUT CORRECTION

35100180081

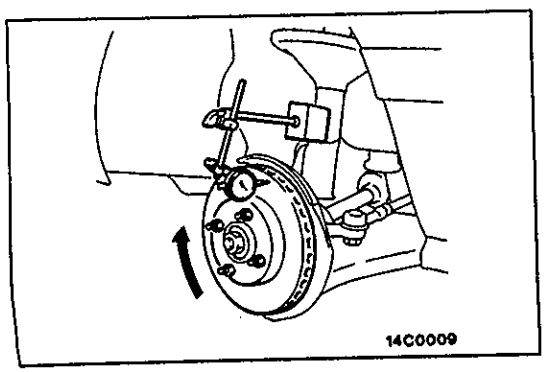
1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.
   (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.



   (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.

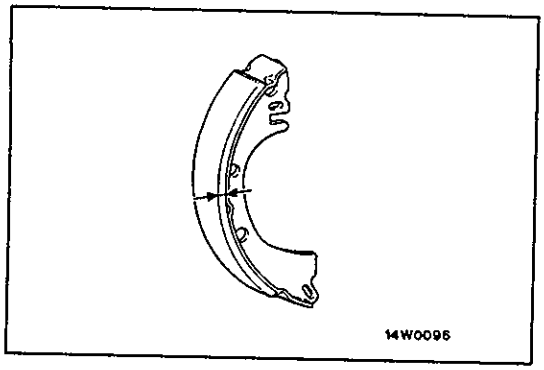
   Limit: 0.05 mm

   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

35100300104

1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

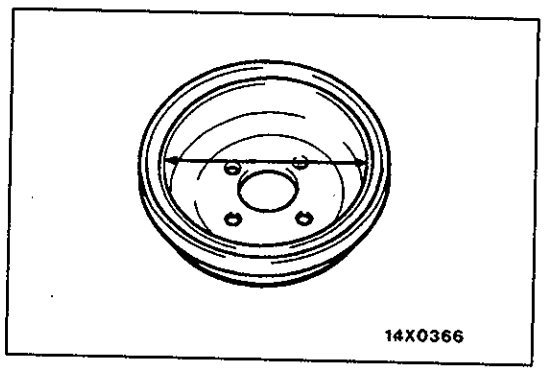
   Standard value: 4.3 mm

   Limit: 1.0 mm

   Replace the shoe and lining assembly if brake lining thickness is less than the limit or if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35A-25.

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

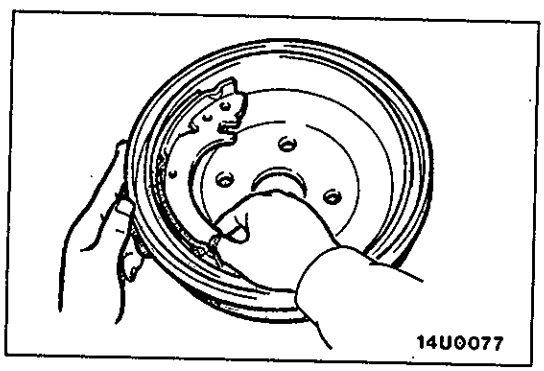
35100320094

1. Remove the brake drum.
2. Measure the inside diameter of the brake drum at two or more locations.

   Standard value: 180 mm

   Limit: 182 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

35100310091

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35A-25.)
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.

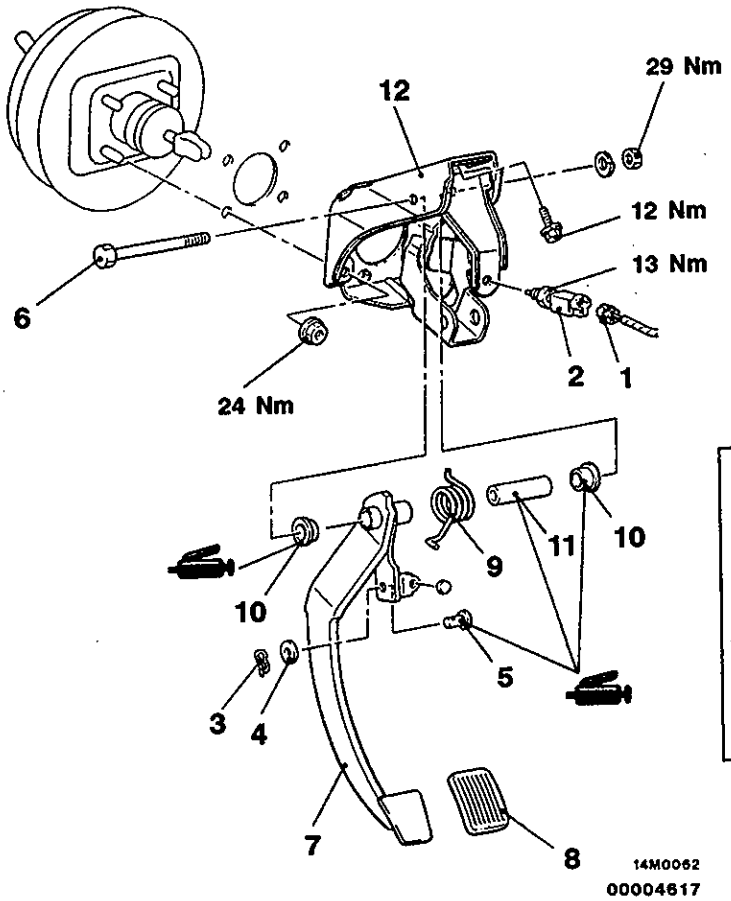
BRAKE PEDAL

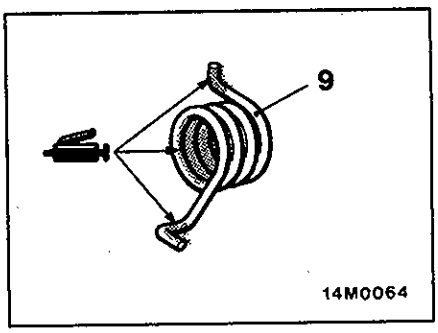
35100340151

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.)
- Accelerator Pedal Removal (Refer to GROUP 17.)

Post-installation Operation
- Accelerator Pedal Installation (Refer to GROUP 17.)
- 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.)





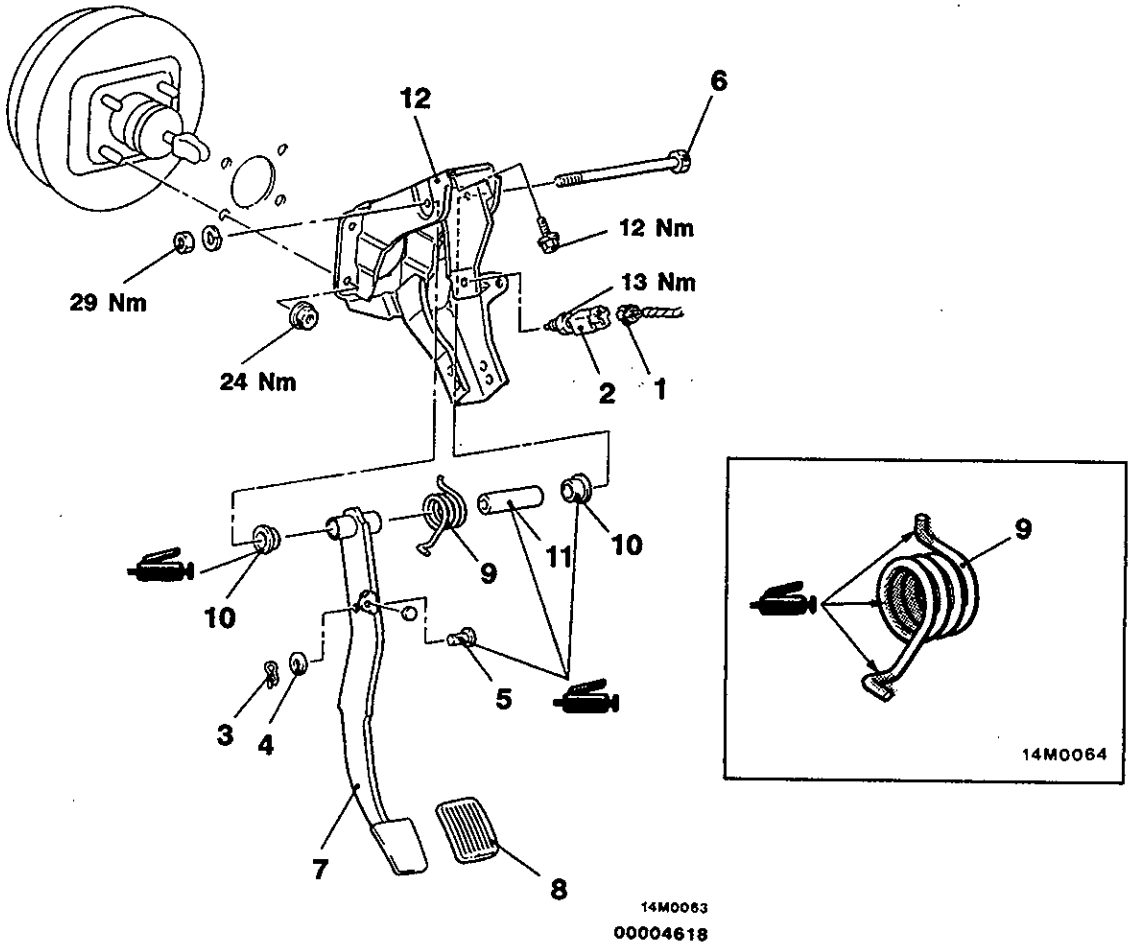
Removal steps

1. Stop lamp switch connector
2. Stop lamp switch
3. Snap pin
4. Washer
5. Clevis pin
6. Brake pedal shaft bolt
7. Brake pedal
8. Brake pedal pad
9. Brake pedal return spring
10. Bushing
11. Pipe
12. 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.)
- Accelerator Pedal Removal (Refer to GROUP 17.)

Post-installation Operation
- Accelerator Pedal Installation (Refer to GROUP 17.)
- 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.)



Removal steps

1. Stop lamp switch connector
2. Stop lamp switch
3. Snap pin
4. Washer
5. Clevis pin
6. Brake pedal shaft bolt
7. Brake pedal
8. Brake pedal pad
9. Brake pedal return spring
10. Bushing
11. Pipe
12. Pedal support member

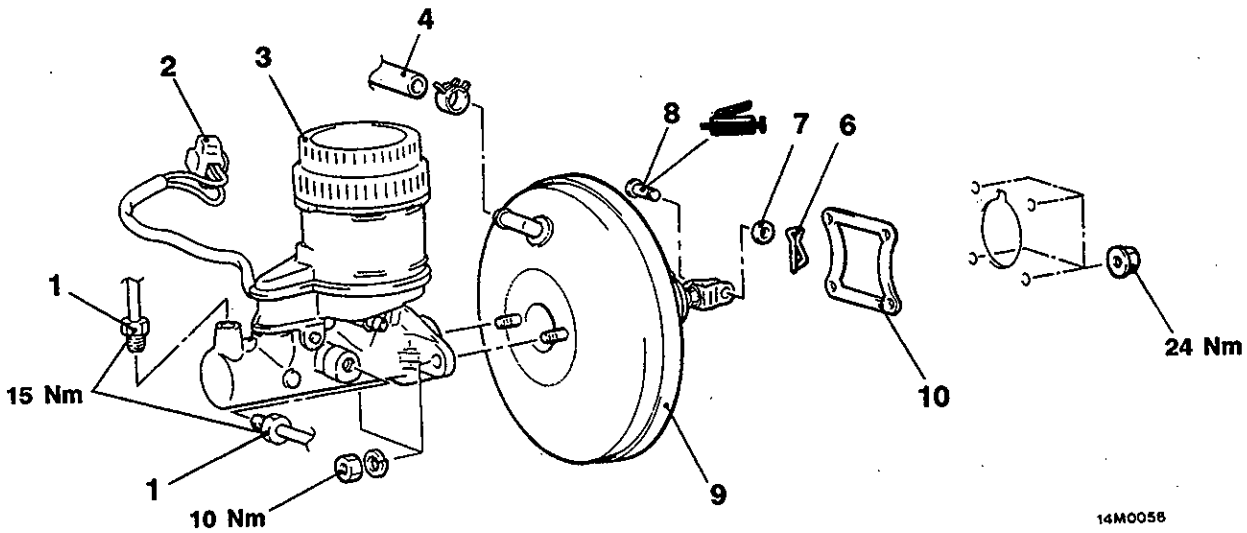
MASTER CYLINDER AND BRAKE BOOSTER

35100370136

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <L.H. drive vehicles>

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-9.)
- Brake Pedal Adjustment (Refer to P.35A-6.)
- Air Intake Hose Installation <L.H. drive vehicles>



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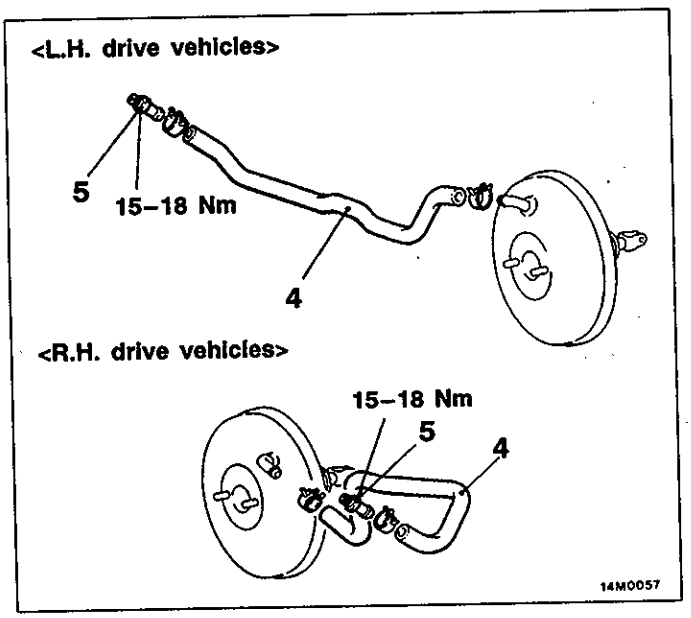

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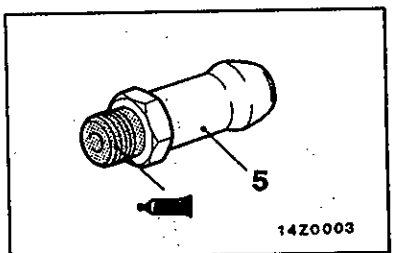


14Z0003

Sealant: 3M ATD Part No. 8661 or equivalent

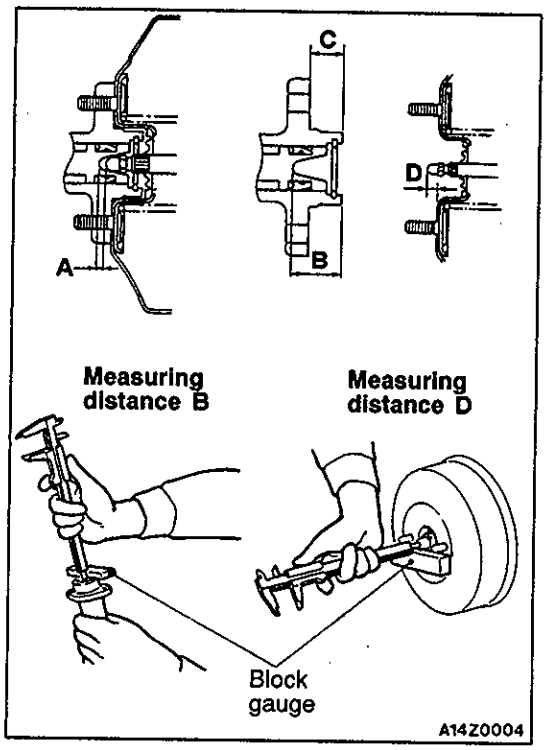
Removal steps

1. Brake pipe connection
2. Brake fluid level sensor connector
3. Master cylinder assembly
- ▶B◀ • Clearance adjustment between brake booster push rod and primary piston
- ▶A◀ 4. Vacuum hose (With built-in check valve)
5. Fitting
6. Snap pin
7. Washer
8. Clevis pin
9. Brake booster
10. Sealer

INSTALLATION SERVICE POINTS

▶A◀ VACUUM HOSE CONNECTION

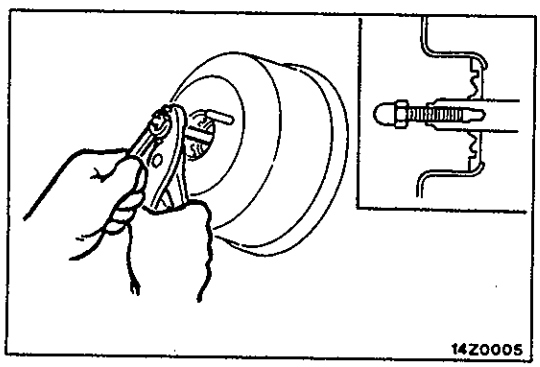
Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.



▶B◀ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

Calculate clearance A from the B, C and D measurements.
A = B – C – D

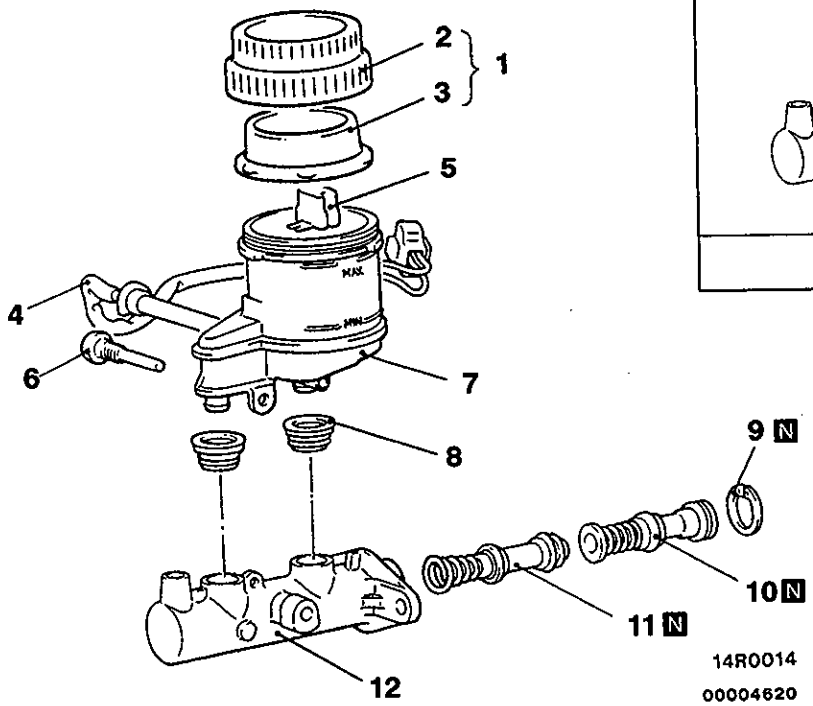
Standard value: 0.65–0.85 mm

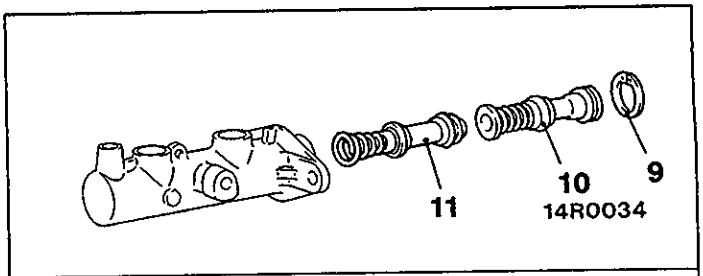


If the clearance is not within the standard value range, adjust by changing the push rod length by turning the screw of the push rod.

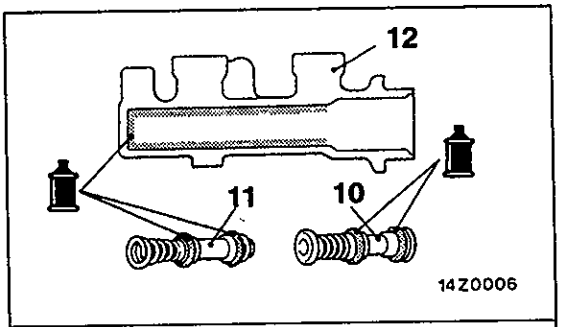
MASTER CYLINDER
DISASSEMBLY AND REASSEMBLY

35100420091





Master cylinder kit



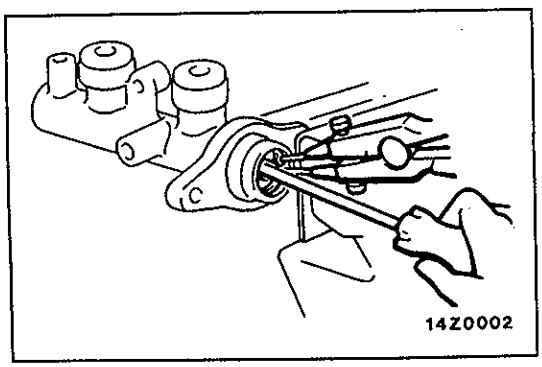
Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Brake fluid level sensor
5. Float
6. Reservoir stopper bolt

◀A▶

7. Reservoir tank
8. Reservoir seal
9. Piston stopper ring
10. Primary piston assembly
11. Secondary piston assembly
12. Master cylinder body



DISASSEMBLY SERVICE POINT

◀A▶ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

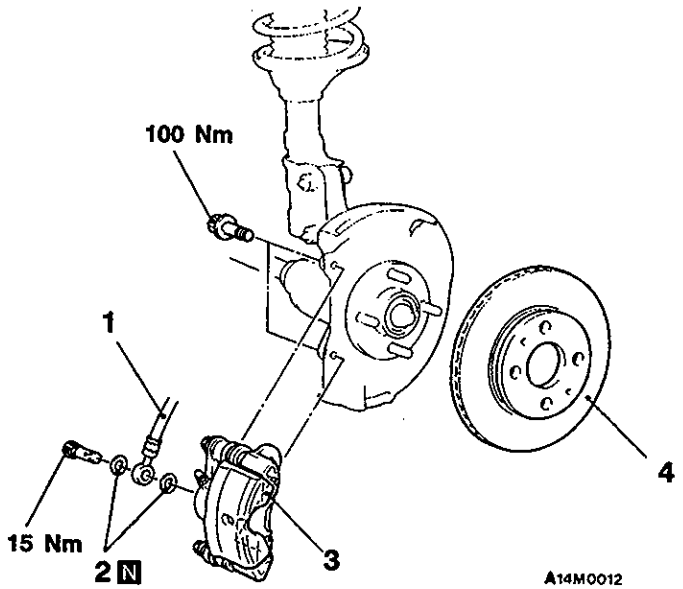
FRONT DISC BRAKE

35100600099

REMOVAL AND INSTALLATION

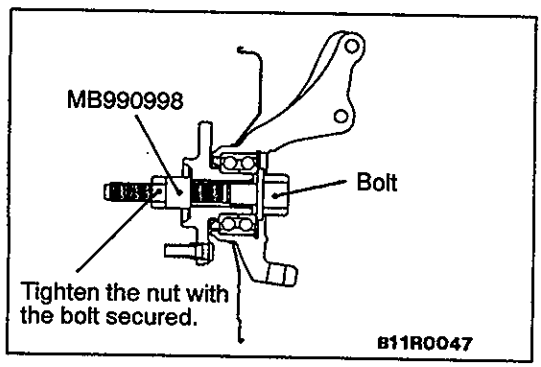
Pre-removal Operation
- Brake Fluid Draining

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

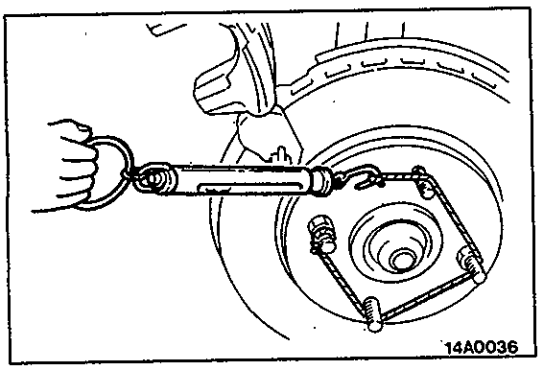


INSTALLATION SERVICE POINT

▶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 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.

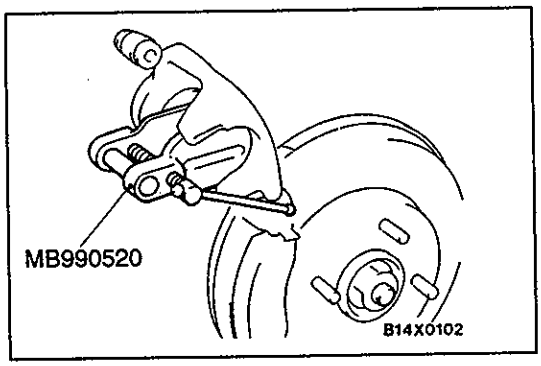
   Tightening torque: 196 – 255 Nm



(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.

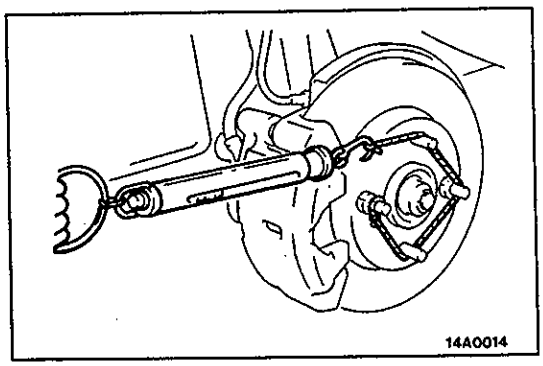
Caution
Do not let any oil, grease or other contamination get onto the friction surfaces of the pads and brake discs.



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 tighten the slide pin (M14) to the specified torque.

Tightening torque: 83 – 93 Nm

5. Start the engine and then depress the brake pedal 2–3 times.
6. Stop engine.
7. Turn brake disc forward 10 times.



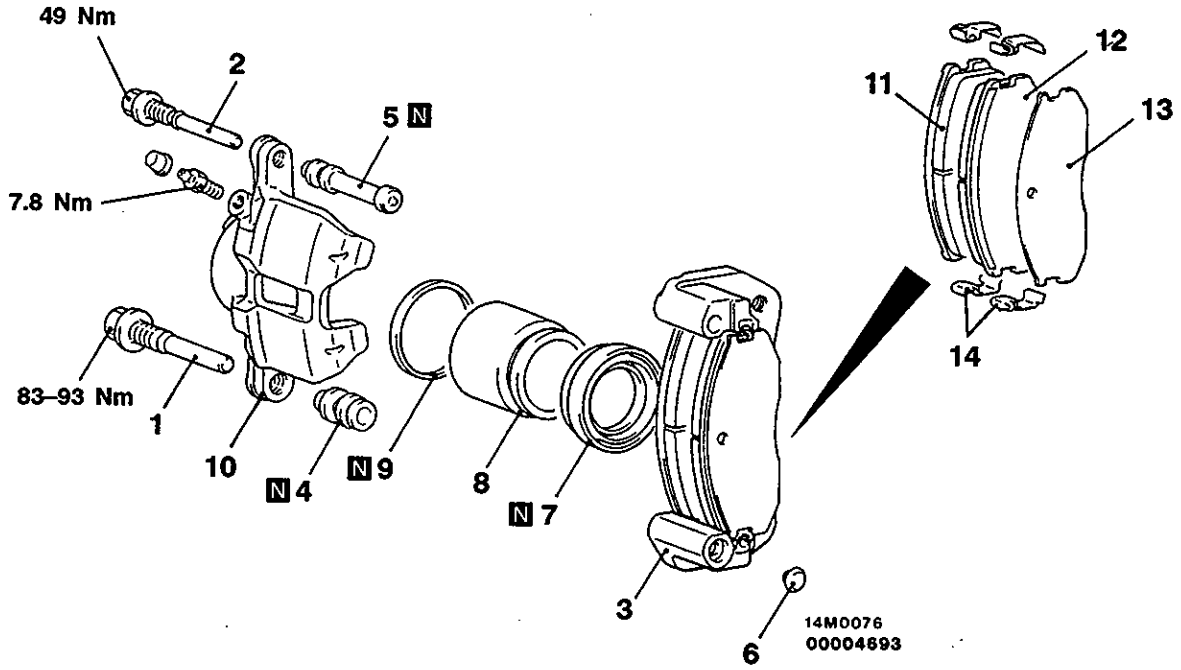
8. Use a spring balance to measure the rotation sliding resistance of the hub in the forward direction.
9. Calculate the drag force of the disc brake (difference between of values measured in item 8 and item 1.)

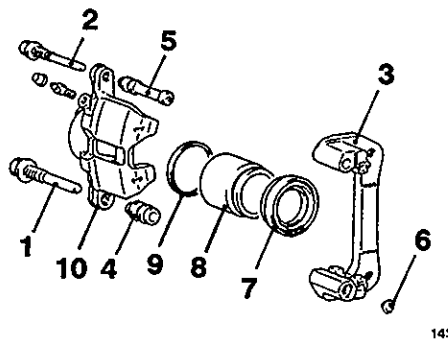
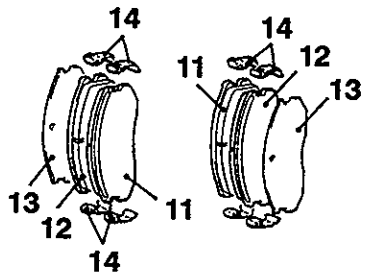
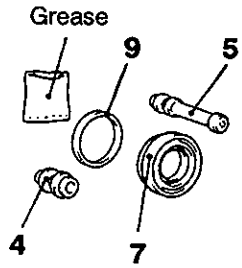
Standard value: 39 N or less

10. If the drag force of the disc brake exceeds the standard value, disassemble piston and clean piston. Check for corrosion or worn piston seal, and check the sliding condition of the slide pins.

DISASSEMBLY AND REASSEMBLY

35100620101



Brake caliper kit	Pad repair kit	Seal and boots repair kit
		
14S0082	14M0075	14A0557

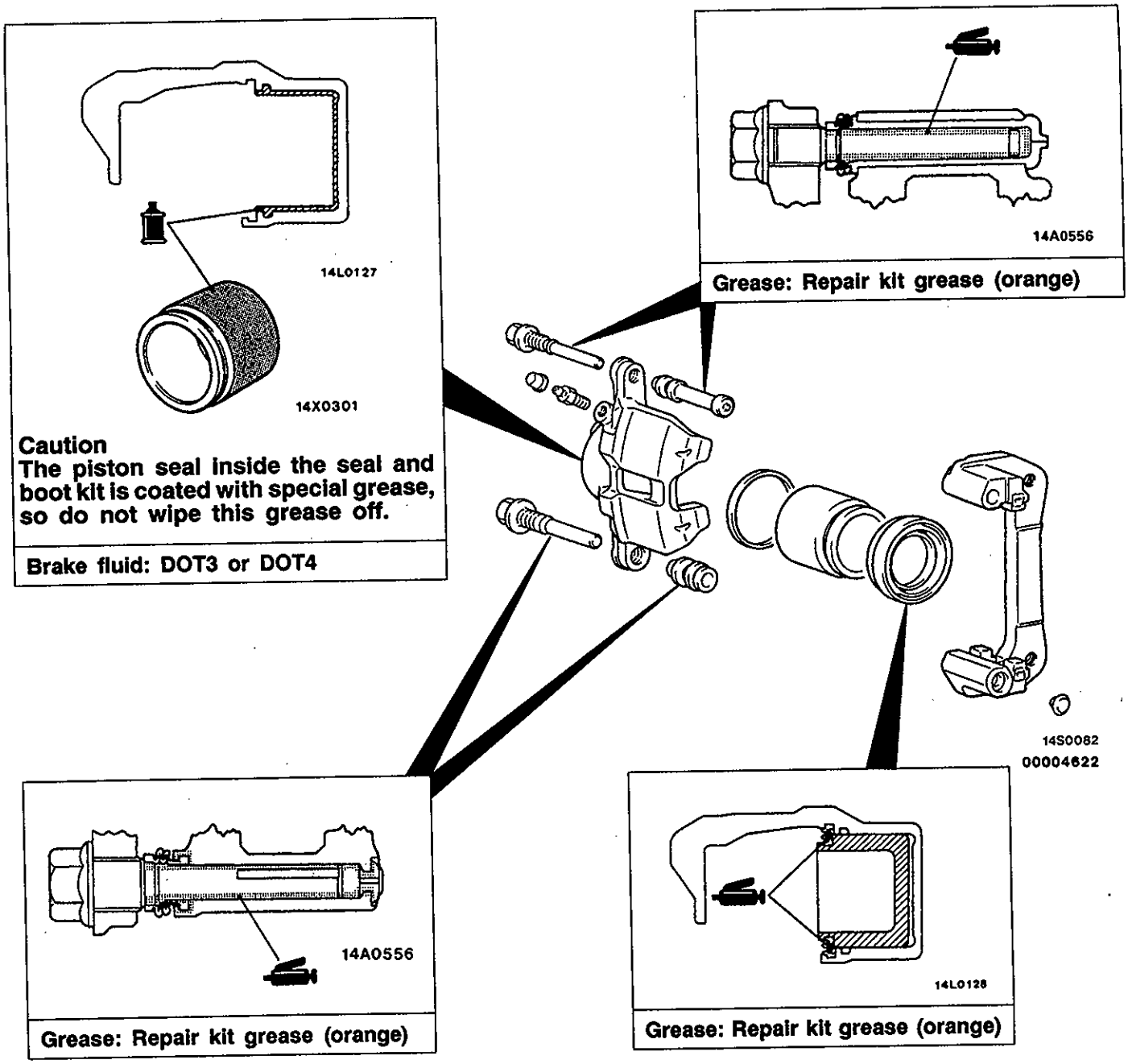
Caliper assembly disassembly steps

1. Slide pin (M14)
2. Slide pin (M10)
3. Torque member (pad, pad liner, shim)
4. Boot
5. Bush
6. Plug
7. Piston boot
8. Piston
9. Piston seal
10. Caliper body

Pad assembly disassembly steps

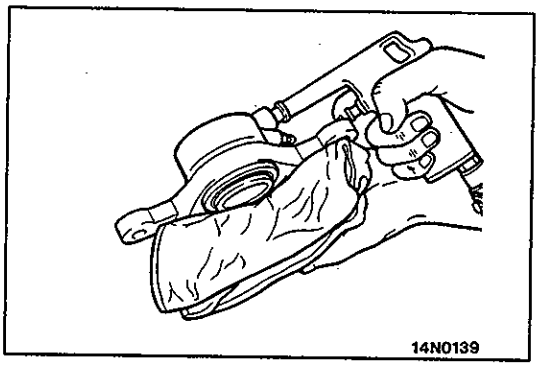
1. Slide pin (M14)
2. Slide pin (M10)
3. Torque member (pad, pad liner, shim)
11. Pad and wear indicator assembly <L.H.> or pad assembly <R.H.>
12. Pad assembly
13. Outer shim (coated with rubber)
14. Pad liner

LUBRICATION POINTS



DISASSEMBLY SERVICE POINTS

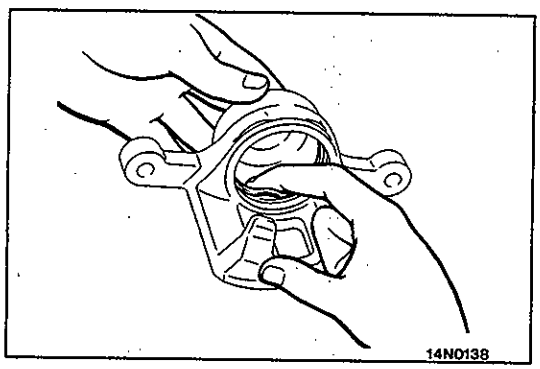
When disassembling the front disc brakes, disassemble both sides (left and right) as a set.



◀A▶ PISTON BOOT/PISTON REMOVAL

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow compressed air gently.



◀B▶ PISTON SEAL REMOVAL

(1) Remove piston seal with finger tip.

Caution
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION

35100630081

- 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.

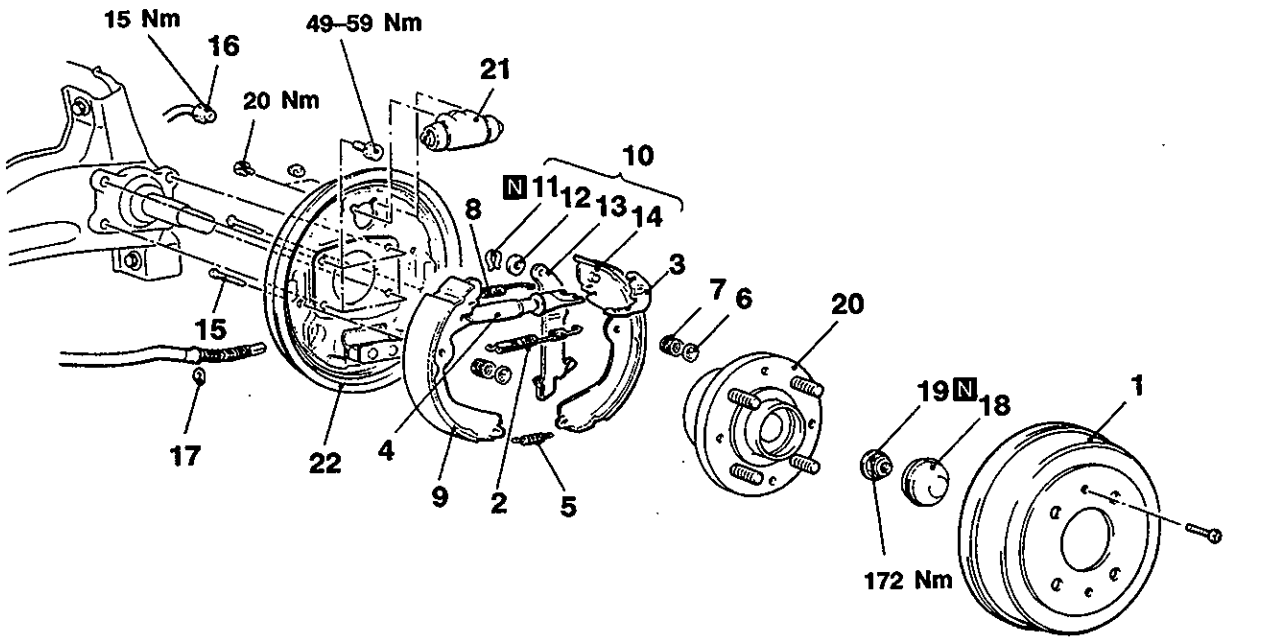
REAR DRUM BRAKE

35100750077

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.)



A14M0054

Rear drum brake removal steps

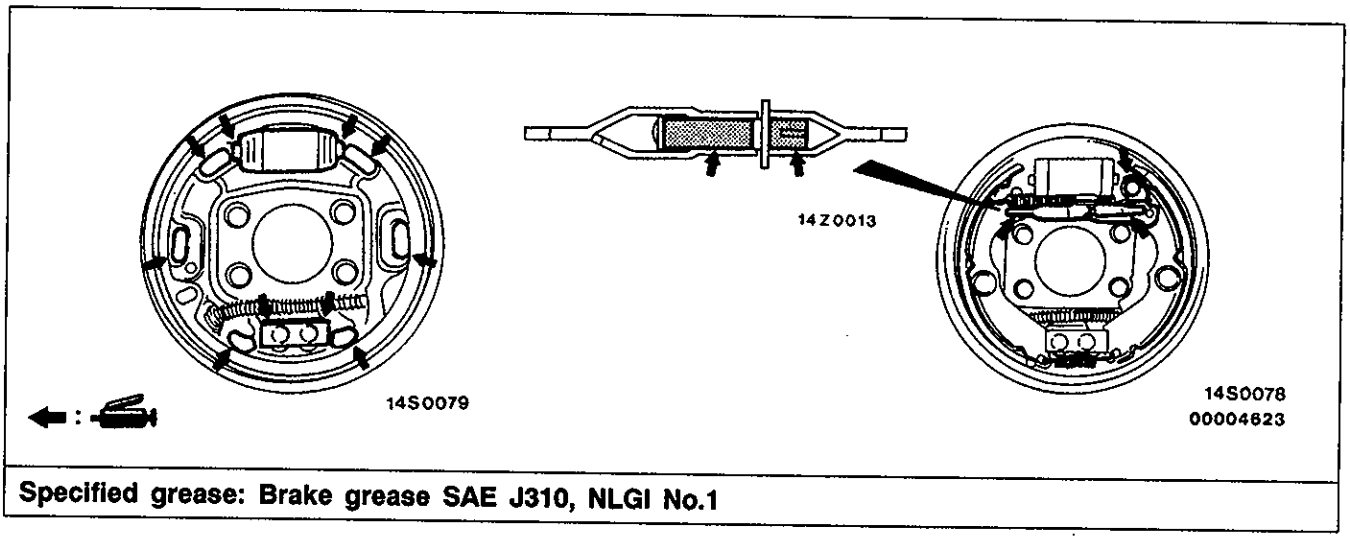
1. Brake drum
2. Shoe-to-lever spring
3. Adjuster lever
4. Auto adjuster assembly
5. Retainer spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe-to-shoe spring
9. Shoe and lining assembly
10. Shoe, lining and lever assembly
- ◀A▶ ▶B◀ 11. Retainer
- ▶A◀ 12. Wave washer
13. Parking lever
14. 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. Wheel cylinder
22. Backing plate

Wheel cylinder removal steps

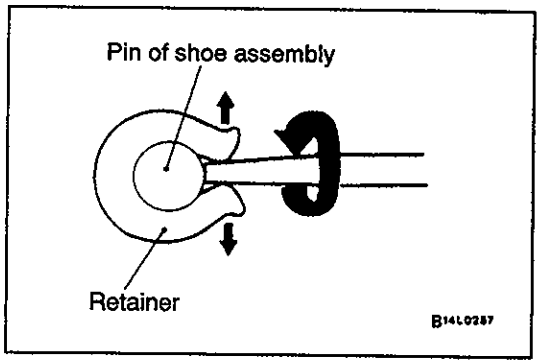
1. Brake drum
2. Shoe-to-lever spring
8. Shoe-to-shoe spring
16. Brake pipe connection
21. Wheel cylinder

Caution
When removing the rear hub assembly, the wheel bearing inner race may be left at the spindle side. In this case, always replace the rear hub assembly, otherwise the hub will damage the oil seal, causing oil leaks or excessive play.

LUBRICATION POINTS



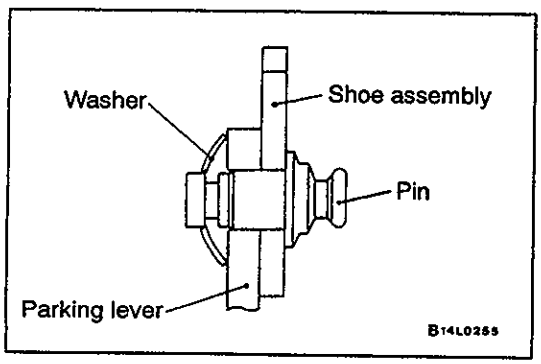
Specified grease: Brake grease SAE J310, NLGI No.1



REMOVAL SERVICE POINT

◀A▶ RETAINER REMOVAL

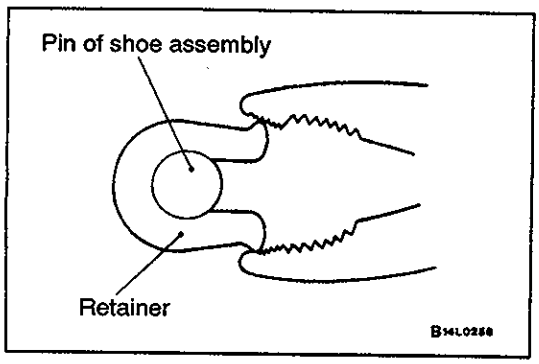
Use a flat-tipped screwdriver or the like to open up the retainer joint, and remove retainer.



INSTALLATION SERVICE POINTS

▶A◀ WAVE WASHER INSTALLATION

Install the washer in the direction shown in the illustration.

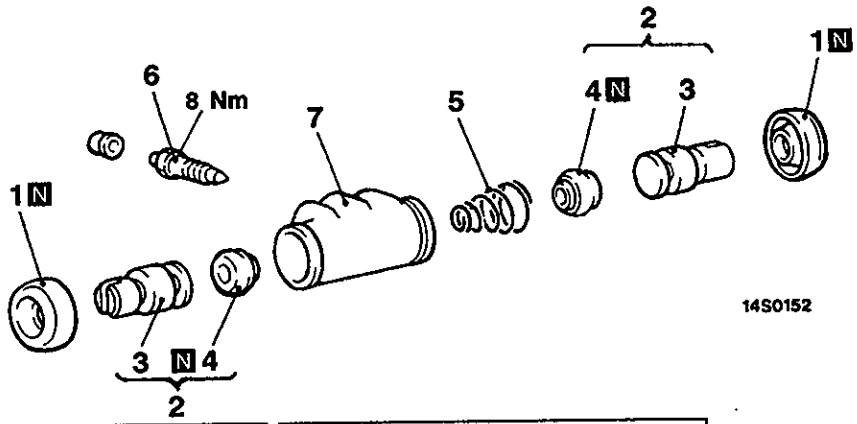


▶B◀ RETAINER INSTALLATION

Use pliers or the like to install the retainer or the pin positively.

WHEEL CYLINDER
DISASSEMBLY AND REASSEMBLY

35100770066



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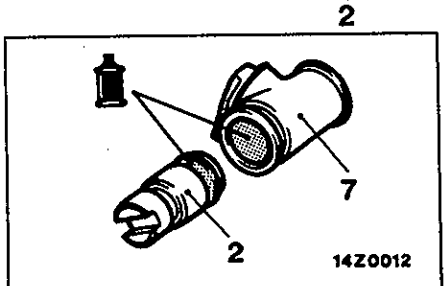
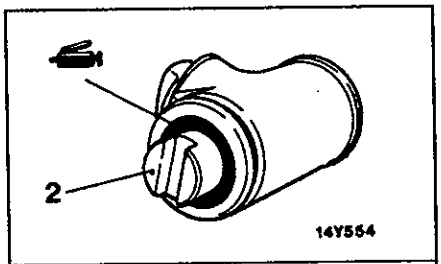
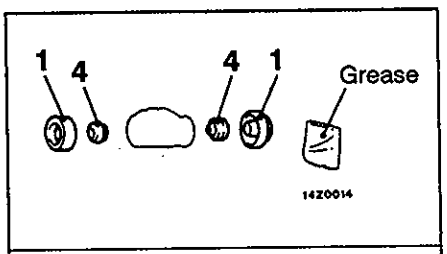


Brake fluid: DOT3 or DOT4



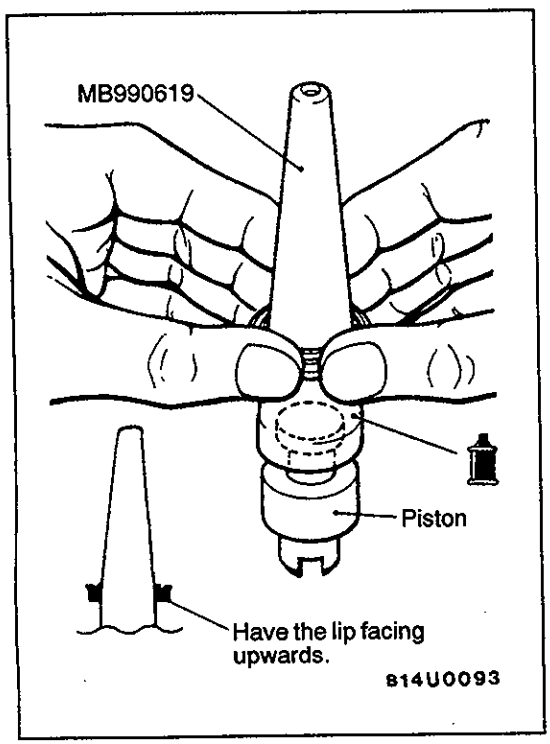
Grease: Repair kit grease



Wheel cylinder repair kit

Disassembly steps

1. Boots
2. Piston assembly
▶A◀ 3. Pistons
▶A◀ 4. 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

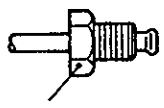
35100570093

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-9.)
- Air Intake Hose Installation

Flared brake line nuts



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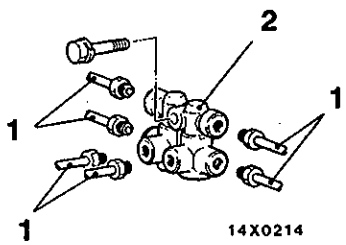

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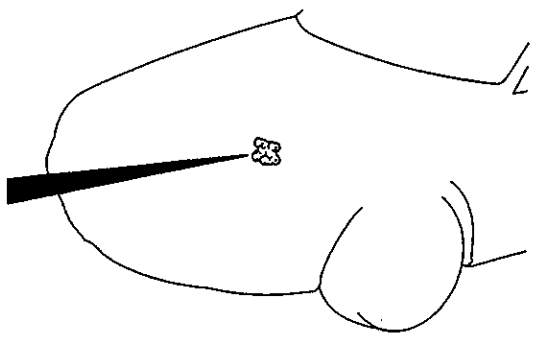

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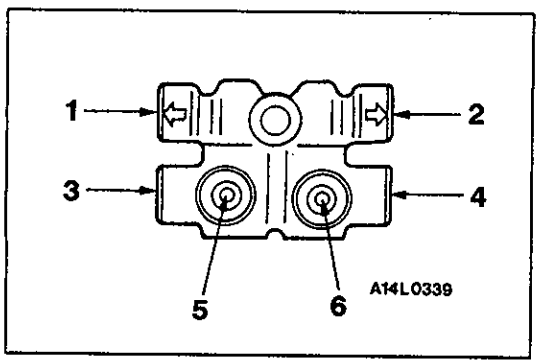
Removal steps

▶A◀ 1. Brake pipe
2. Proportioning valve
3. Bracket



INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – 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>

CONTENTS

35209000107

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 (*).

GENERAL INFORMATION

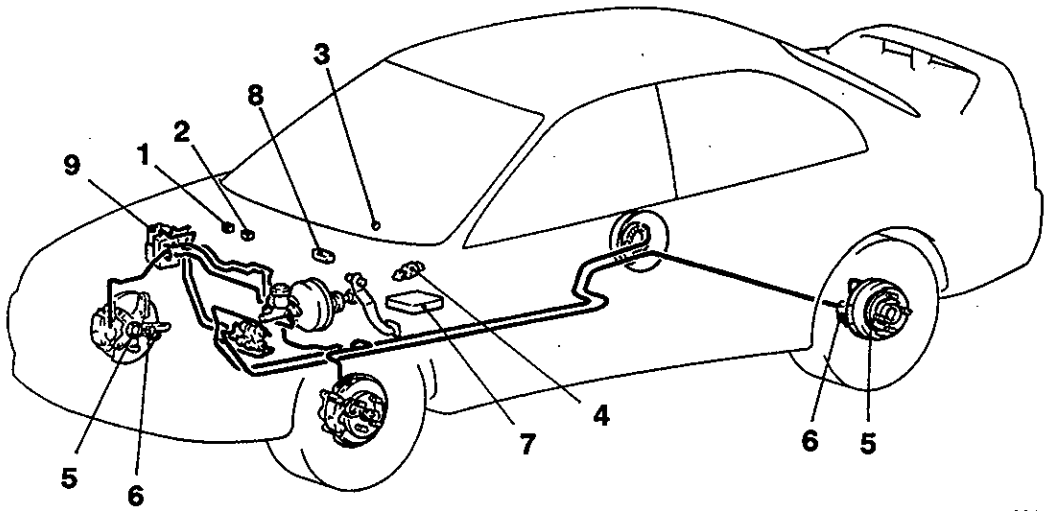
35200010109

The ABS consists of components such as the wheel speed sensors, stop lamp switch, hydraulic unit assembly, ABS control unit (ABS-ECU) and the ABS warning lamp. If a problem occurs in the system, the malfunctioning components 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.

Items		Specifications
Master cylinder	Type	Tandem type (with level sensor)
	I.D. mm	22.2
Brake booster	Type	Vacuum type, single
	Effective dia. of power cylinder mm	230
	Boosting ratio	5.0
Proportioning valve	Type	Dual type
	Decompression ratio	0.25
Front brakes	Type	Floating caliper, 1-piston, ventilated disc
	Disc effective dia. × thickness mm	184 × 18
	Wheel cylinder I.D. mm	54.0
	Pad thickness mm	10.0
	Clearance adjustment	Automatic
Rear drum brakes	Type	Leading trailing
	Drum I.D. mm	203
	Wheel cylinder I.D. mm	17.4
	Lining thickness mm	4.4
	Clearance adjustment	Automatic
Brake fluid		DOT3 or DOT4
ABS type		4-sensor, 4-channel method
Speed sensor		Magnet coil type on 4 wheels
Front rotor teeth		43
Rear rotor teeth		43

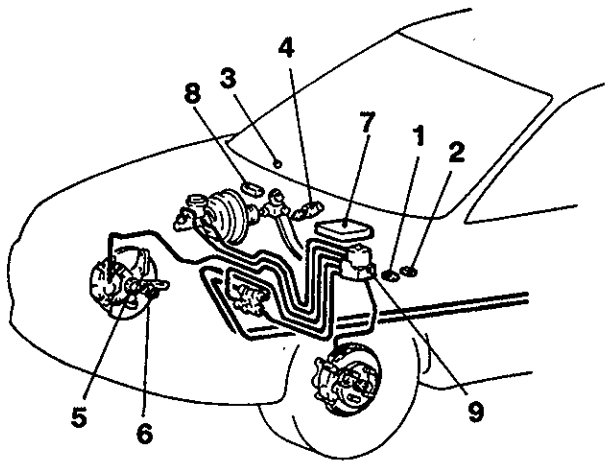
CONSTRUCTION DIAGRAM

<L.H. drive vehicles>



14M0060

<R.H. drive vehicles>



14M0039
00004484

1. ABS valve relay
2. ABS motor relay
3. ABS warning lamp
4. Stop lamp switch
5. Rotor
6. Wheel-speed sensor
7. ABS-ECU
8. Diagnosis connector
9. Hydraulic unit

SERVICE SPECIFICATIONS

35200030112

Items			Standard value	Limit
Rear drum brake	Lining thickness mm		4.4	1.0
	Drum inside diameter mm		203	205
Resistance between solenoid valve terminals Ω		IN	8.04 – 9.04	–
		OUT	4.04 – 4.54	–
Wheel speed sensor's internal resistance kΩ			1.4 – 1.8	–
Wheel speed sensor insulation resistance kΩ			100 or more	–

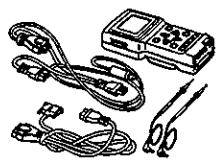
LUBRICANTS

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	

SPECIAL TOOLS

35200060111

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	For checking of ABS (Diagnosis code display when using the MUT-II)
	MB991529	Diagnosis code check harness	For checking of ABS (Diagnosis code display when using the ABS warning lamp)
	MB991008	Piston cup installer	Installation of drum brake wheel cylinder piston cup

TROUBLESHOOTING

35201110129

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

35201120108

DIAGNOSIS CODES CHECK

Read a diagnosis code by the MUT-II or ABS warning lamp. (Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)

ERASING DIAGNOSIS CODES

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

INSPECTION CHART FOR DIAGNOSIS CODES

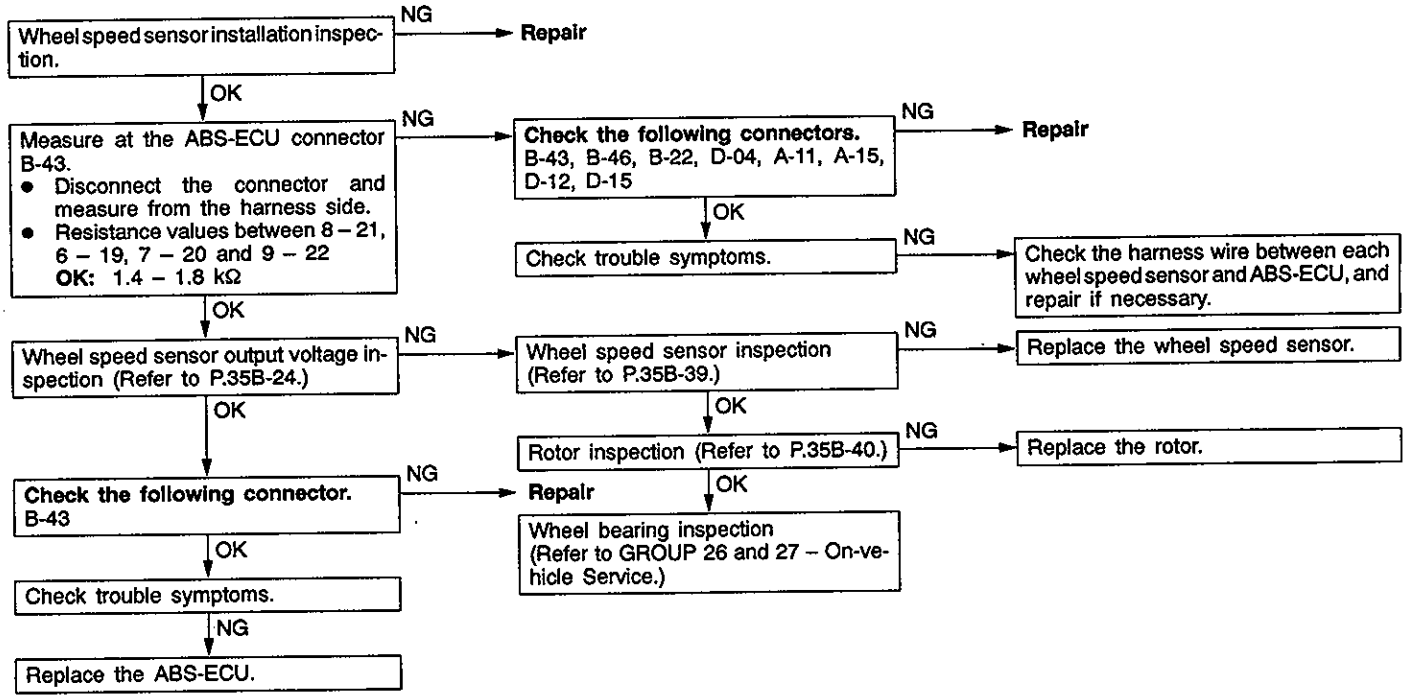
35201130132

Inspect according to the inspection chart that is appropriate for the malfunction code.

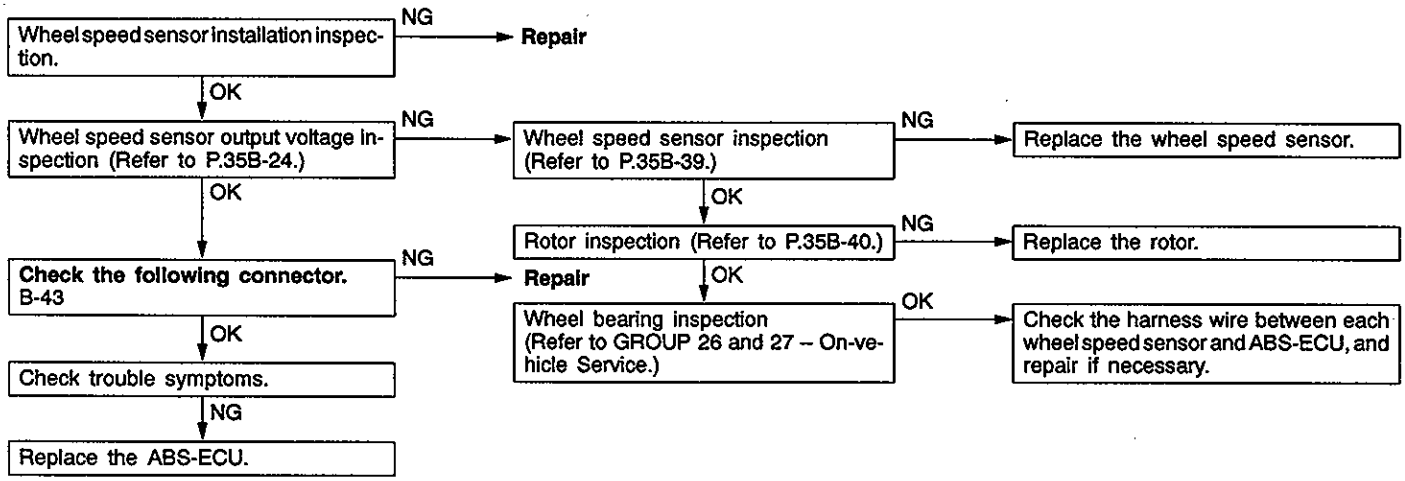
Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front right wheel speed sensor	Open circuit	35B-8
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	35B-9
16	Power supply system		35B-9
21	Front right wheel speed sensor	Short circuit	35B-8
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
33	Stop lamp switch system		35B-10
41	Front right solenoid valve		35B-11
42	Front left solenoid valve		
43	Rear right solenoid valve		
44	Rear left solenoid valve		
51	Valve relay		35B-12
53	Motor relay, motor		35B-13
63	ABS-ECU		35B-41 (Replace the ABS-ECU)

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

Code Nos. 11, 12, 13, 14 Wheel speed sensor open circuit Code Nos.21, 22, 23, 24 Wheel speed sensor short circuit	Probable cause
Code Nos.11, 12, 13, 14 are output when the ABS-ECU detects an open circuit in at least one of the four wheel-speed sensors.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU
Code Nos.21, 22, 23, 24 are output under the following cases: • When an open circuit cannot be found, but more than one wheel-speed sensor does not output any signal during driving at 8 km/h or higher. • When a chipped or plugged-up rotor tooth, etc. is detected during driving at 40 km/h or more.	• Malfunction of wheel-speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

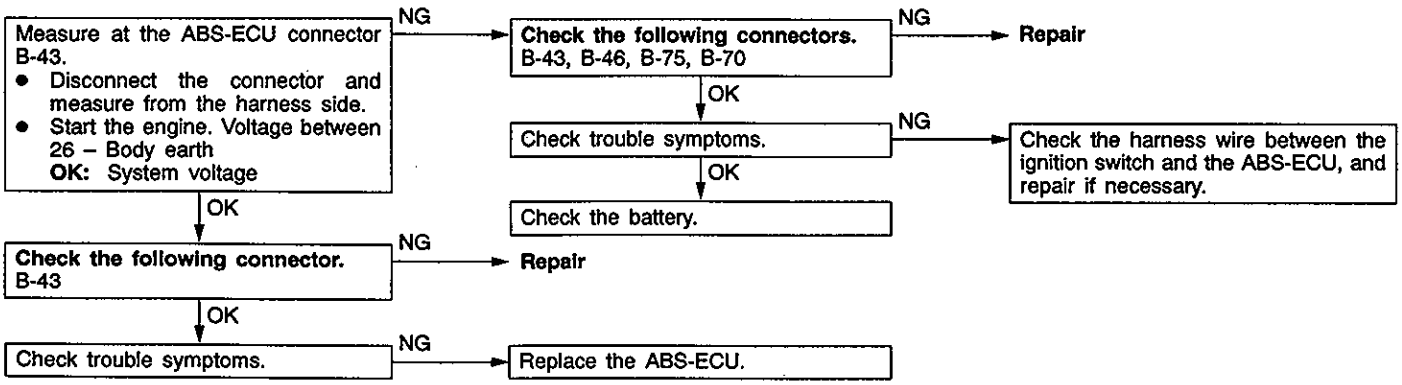


Code No. 15 Wheel speed sensor (Abnormal output signal)	Probable cause
A wheel speed sensor outputs an abnormal signal (other than an open or short-circuit).	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

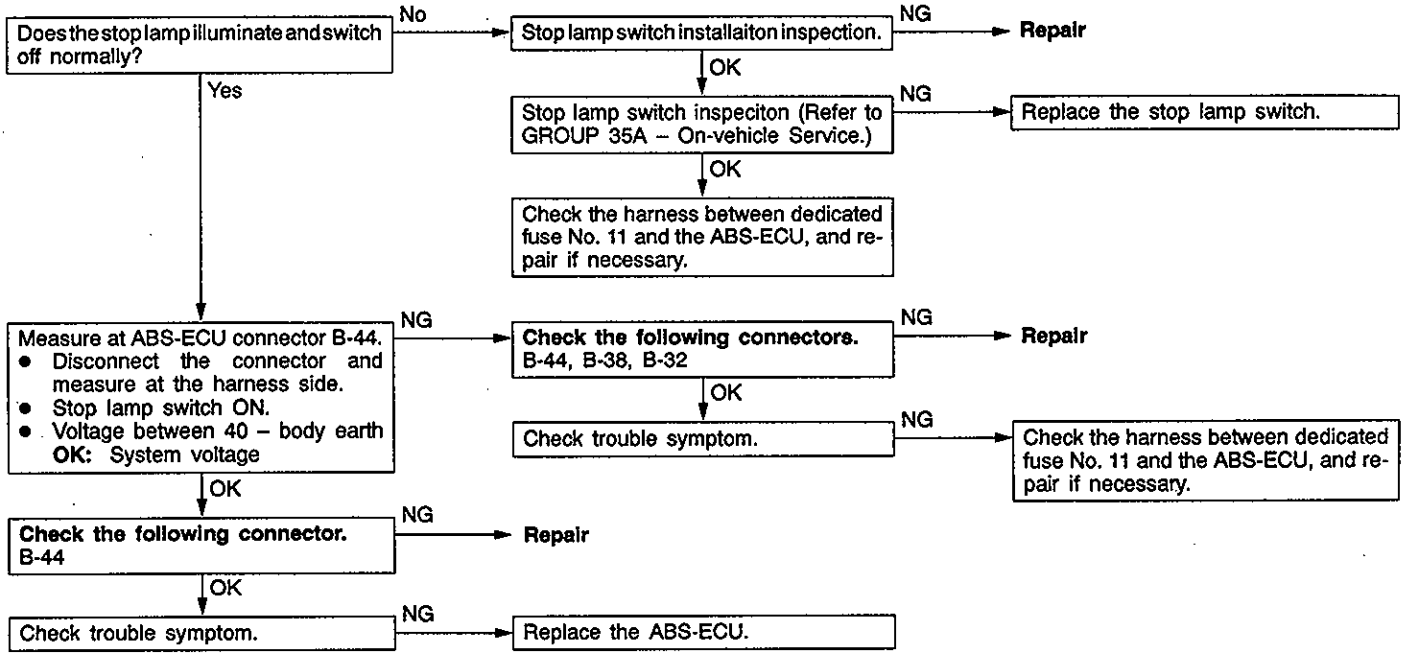


Code No. 16 Power supply system	Probable cause
The voltage of the ABS-ECU power supply drops lower or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector. • Malfunction of ABS-ECU

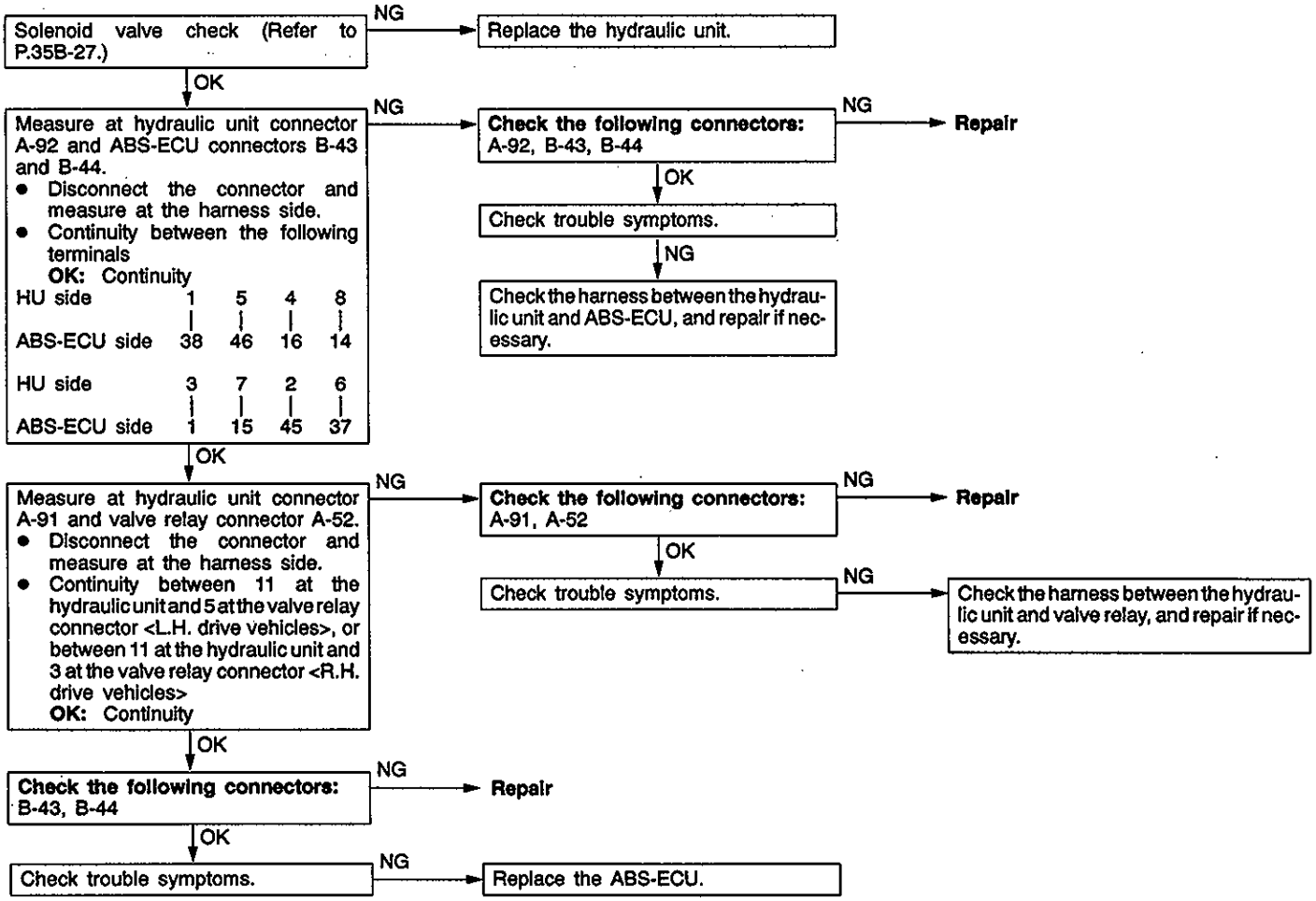
Caution
If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to standard value, this code is no longer output.
Before carrying out the following inspection, check the battery level, and refill it if necessary.



Code No. 33 Stop lamp switch system	Probable cause
This code is output 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).	• Malfunction of stop lamp switch • Malfunction of harness or connector • Malfunction of ABS-ECU

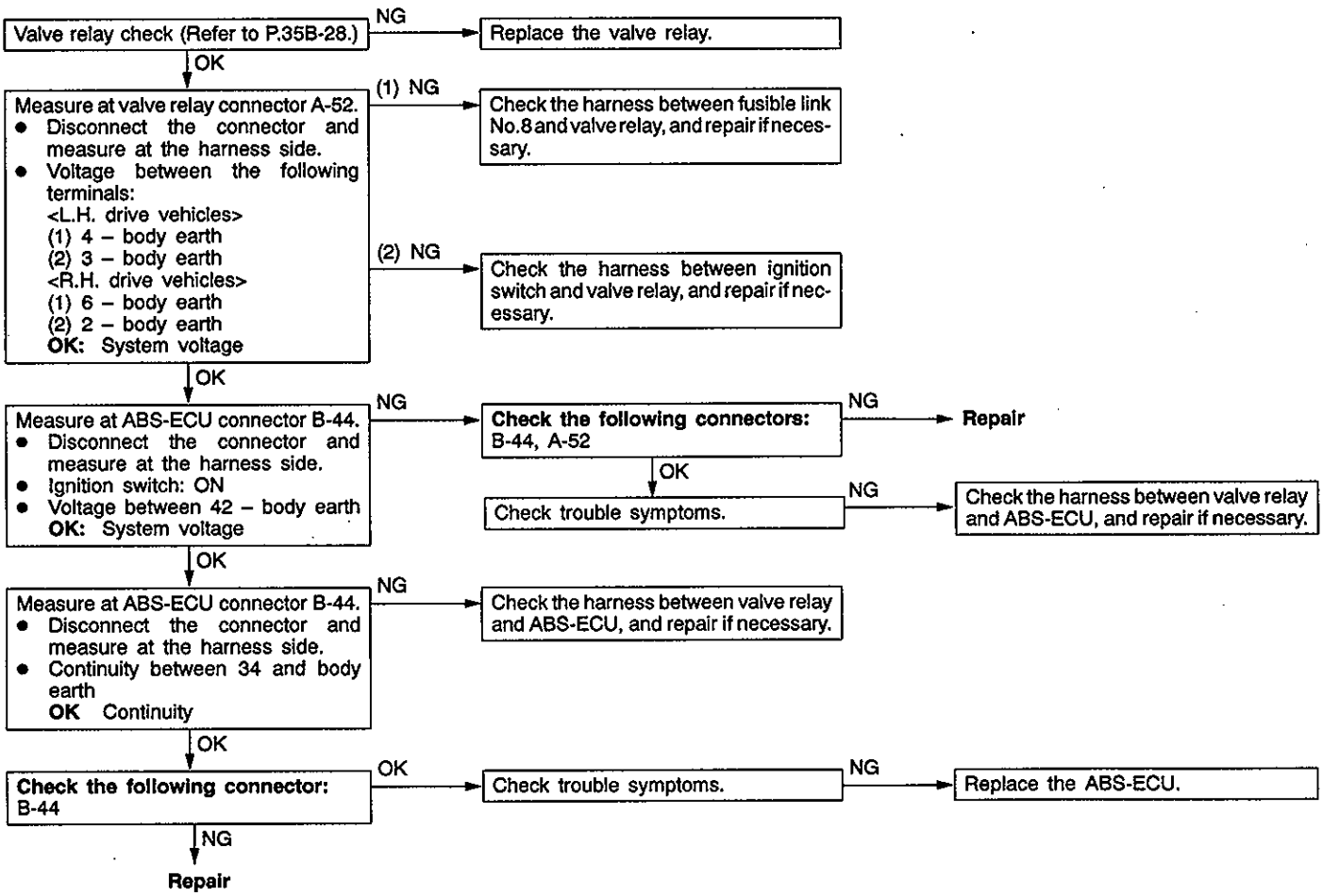


Code Nos.41, 42, 43, 44 Solenoid valve	Probable cause
The ABS-ECU always monitors the solenoid valve drive circuit. It determines that there is an open or short-circuit in the solenoid coil or in a harness. When no current flows in the solenoid even though the ABS-ECU turns on it, and vice versa.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU



Code No.51 Valve relay	Probable cause
When the ignition switch is turned to ON, the ABS-ECU switches the valve relay off and on during the initial check. In that way, the ABS-ECU compares the signals sent to the valve relay with the voltage in the valve relay monitor line. That is how to check if the valve relay is operating normally. The ABS-ECU always checks if current flows in the valve relay monitor line, too. It determines that there is an open circuit when no current flows. If no current flows in the valve relay monitor line, this diagnosis code is output.	• Malfunction of valve relay • Malfunction of wiring harness or connector • Malfunction of ABS-ECU • Malfunction of hydraulic unit

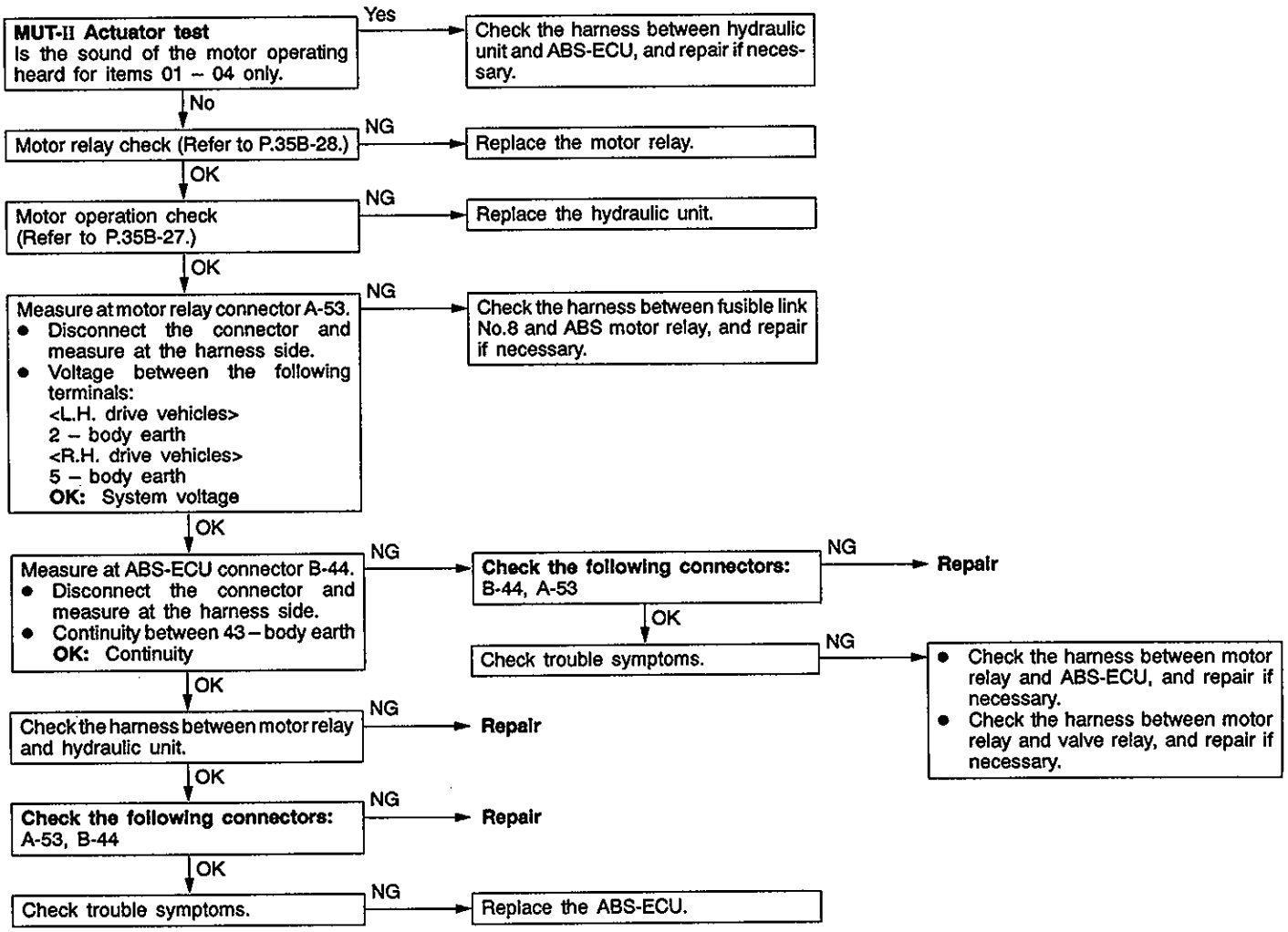
NOTE
Whenever reading the diagnosis codes using the ABS warning lamp (refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points), this diagnosis code will be output. That is not a malfunction but because the valve relay connector is disconnected. After repairing all other malfunctions, connect the valve relay connector again to check the valve relay. Then check that the ABS warning lamp does not illuminate. If it illuminates, the valve relay may be defective. So carry out the following procedure.



Code No.53 Motor relay, motor	Probable cause
This code is output at the following times: • When the motor relay is on but no signal is input to the motor monitor line (motor is not operating, etc.) • When the motor relay is off but a signal is input to the motor monitor line (motor continues operating, etc.)	• Malfunction of motor relay • Malfunction of wiring harness or connector • Malfunction of hydraulic unit • Malfunction of ABS-ECU

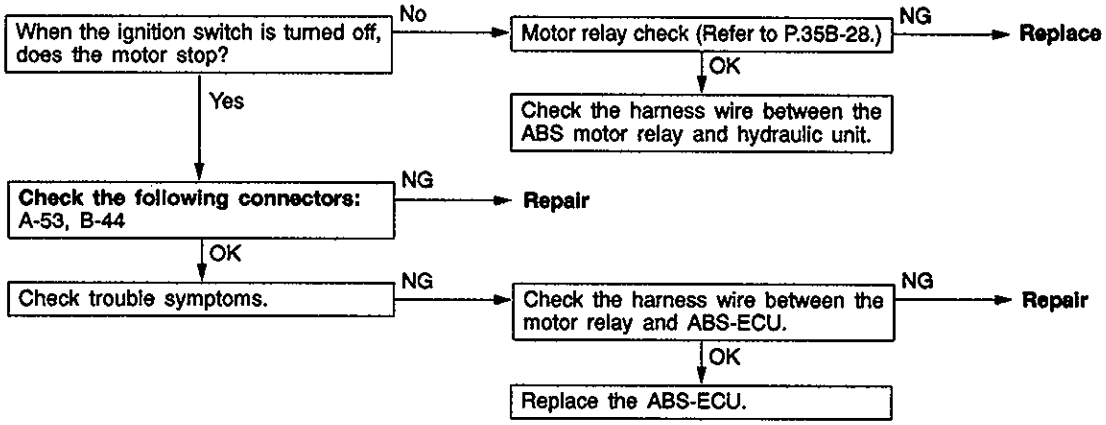
<When the motor does not run>

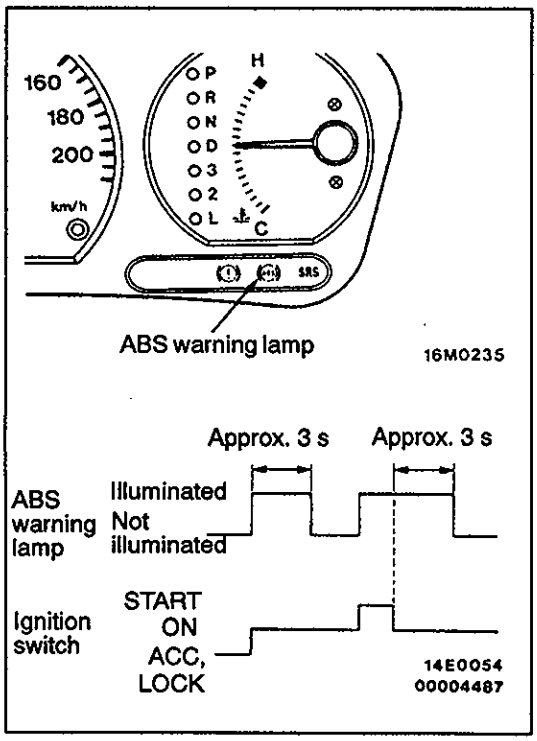
Caution
Because force-driving of the motor by means of the actuator test will drain the battery, the engine should be started and left to run for a while after testing is completed.



<When the motor keep running>

Caution
If there is a melted contact in the motor relay, the motor will keep running, even if the ignition switch is turned off. In this case, immediately remove the fusible link No.8, or disconnect the hydraulic unit connector A-91 or motor relay connector A-53. Excessive running of the motor will waste battery.





ABS WARNING LAMP INSPECTION 35201200055

Check that the ABS warning lamp illuminates as follows.

1. When the ignition key is turned to "ON", the ABS warning lamp illuminates for approximately 3 seconds and then switches off.
2. When the ignition key is turned to "START", the ABS warning lamp remains illuminated.
3. When the ignition key is turned from "START" back to "ON", the ABS warning lamp illuminates for approximately 3 seconds and then switches off.
4. If the illumination is other than the above, check the diagnosis codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

35201140128

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-16
	Communication with ABS only is not possible.	2	35B-16
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate.		3	35B-17
After the engine starts, the ABS warning lamp remains illuminated.		4	35B-17
When the ignition key is turned to "START", the ABS warning lamp does not illuminate.		5	35B-18
After the ignition key is turned to "ON", the ABS warning lamp blinks twice, and when turned to "START", it illuminates. When returned to "ON", the lamp flashes once, and then switches off.		6	35B-18
Faulty ABS operation	Unequal braking power on both sides	7	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

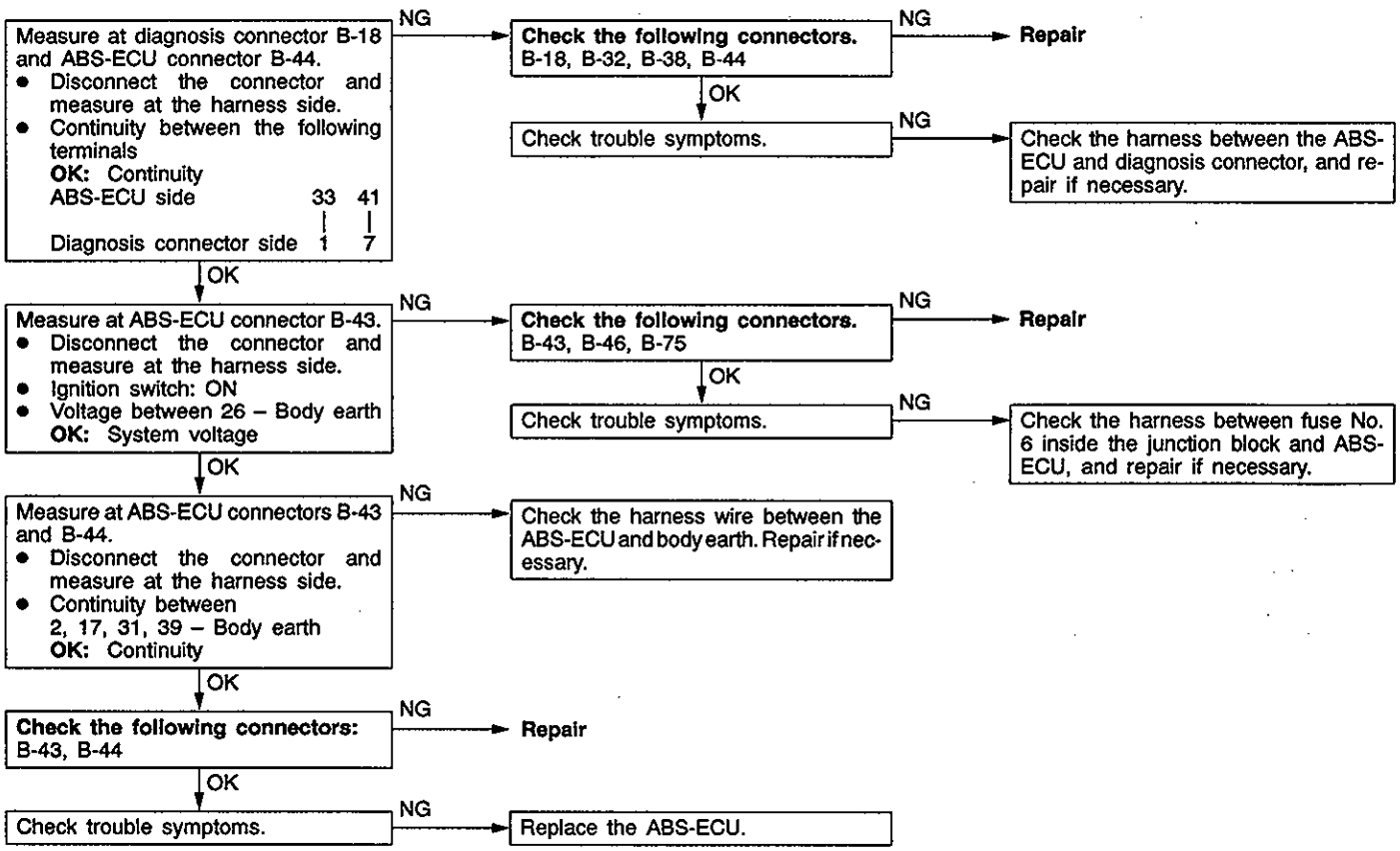
Inspection Procedure 1

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.

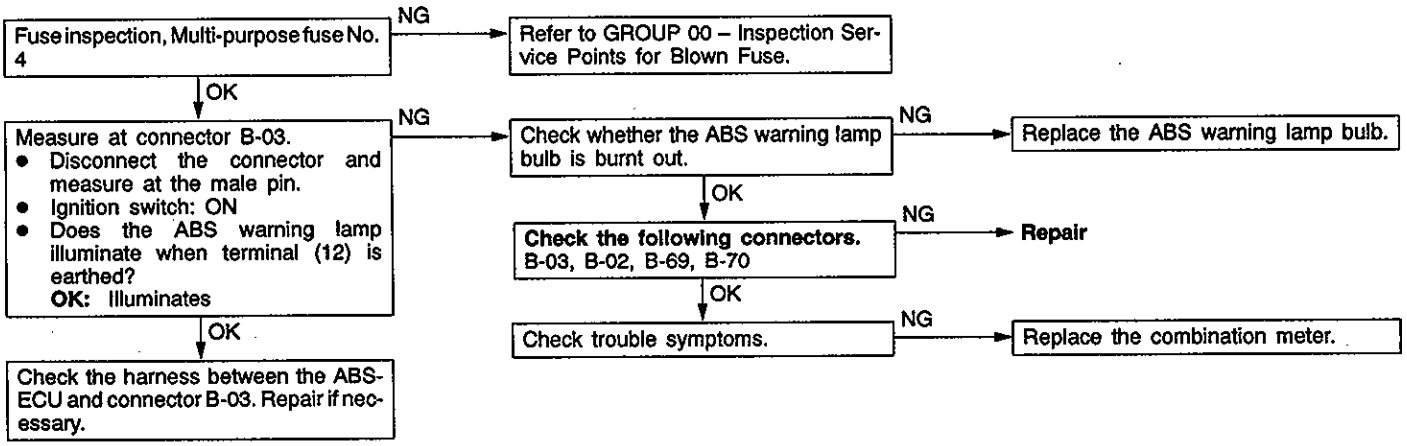
Inspection Procedure 2

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

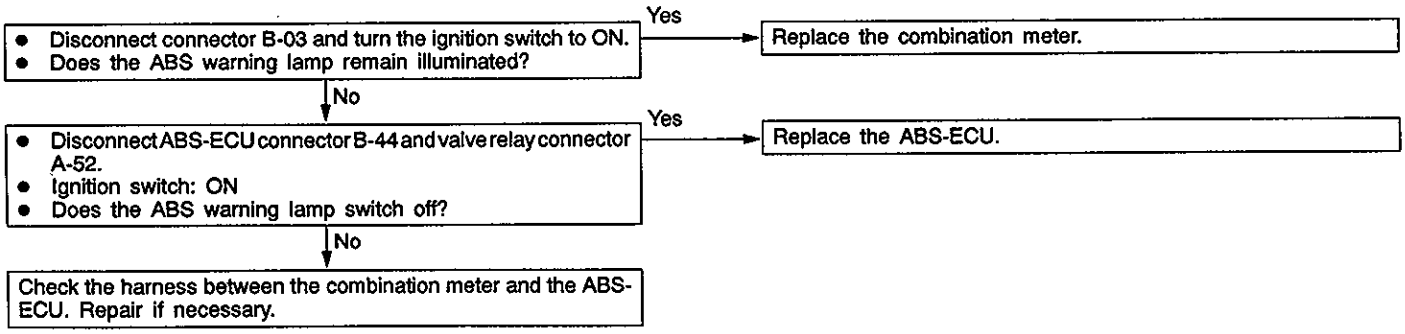
When ignition key is turned to "ON" (engine stopped), ABS warning lamp does not illuminate.	Probable cause
The cause may be: an open circuit in the lamp power supply circuit, a blown lamp bulb, an open circuit in both the circuit between the ABS warning lamp and the ABS-ECU.	• Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector



Inspection Procedure 4

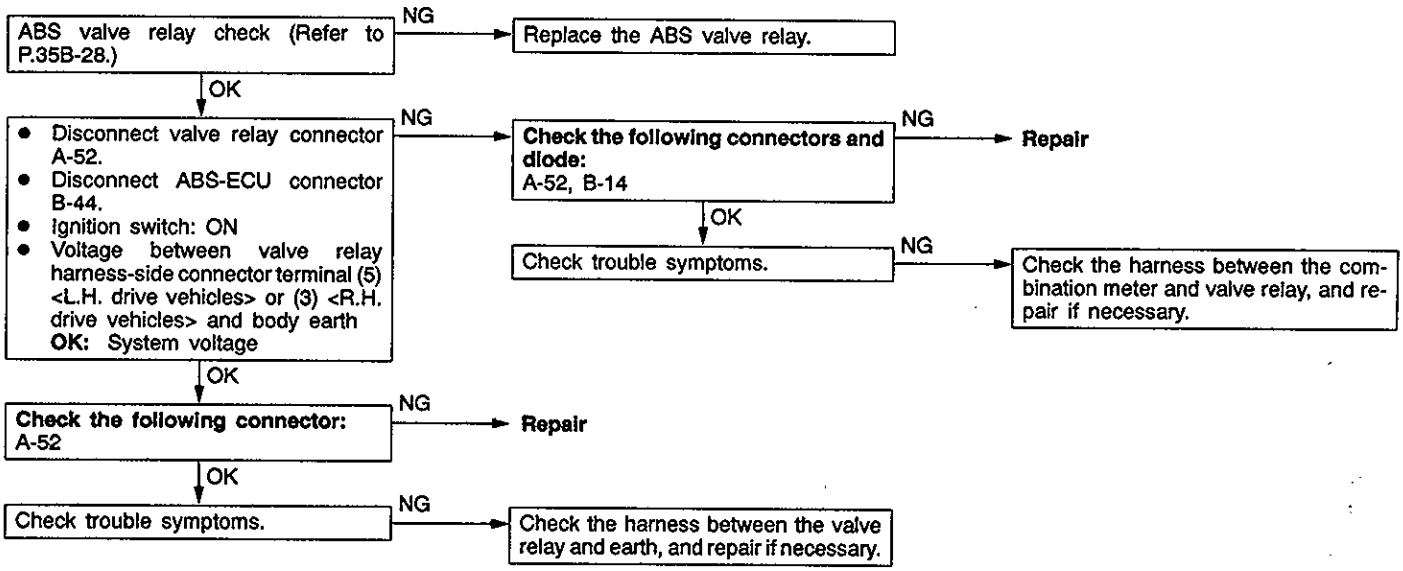
Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
The cause is probably a short-circuit in the ABS warning lamp illumination circuit.	• Malfunction of combination meter • Malfunction of ABS-ECU • Malfunction of wiring harness

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.



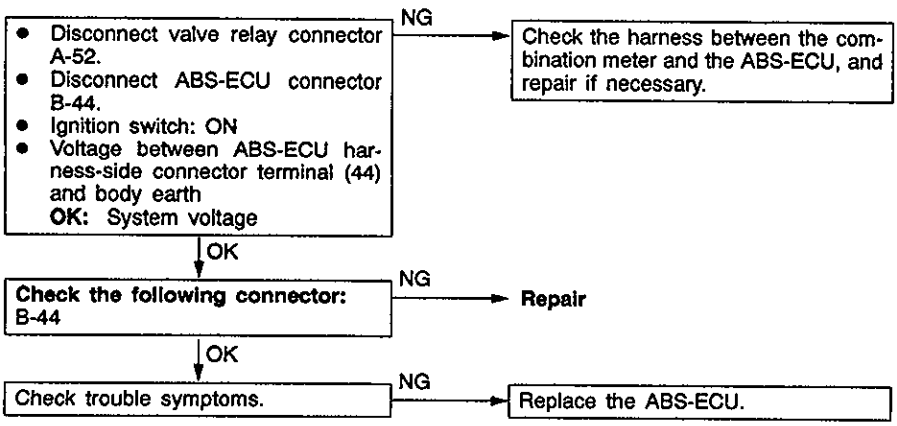
Inspection Procedure 5

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



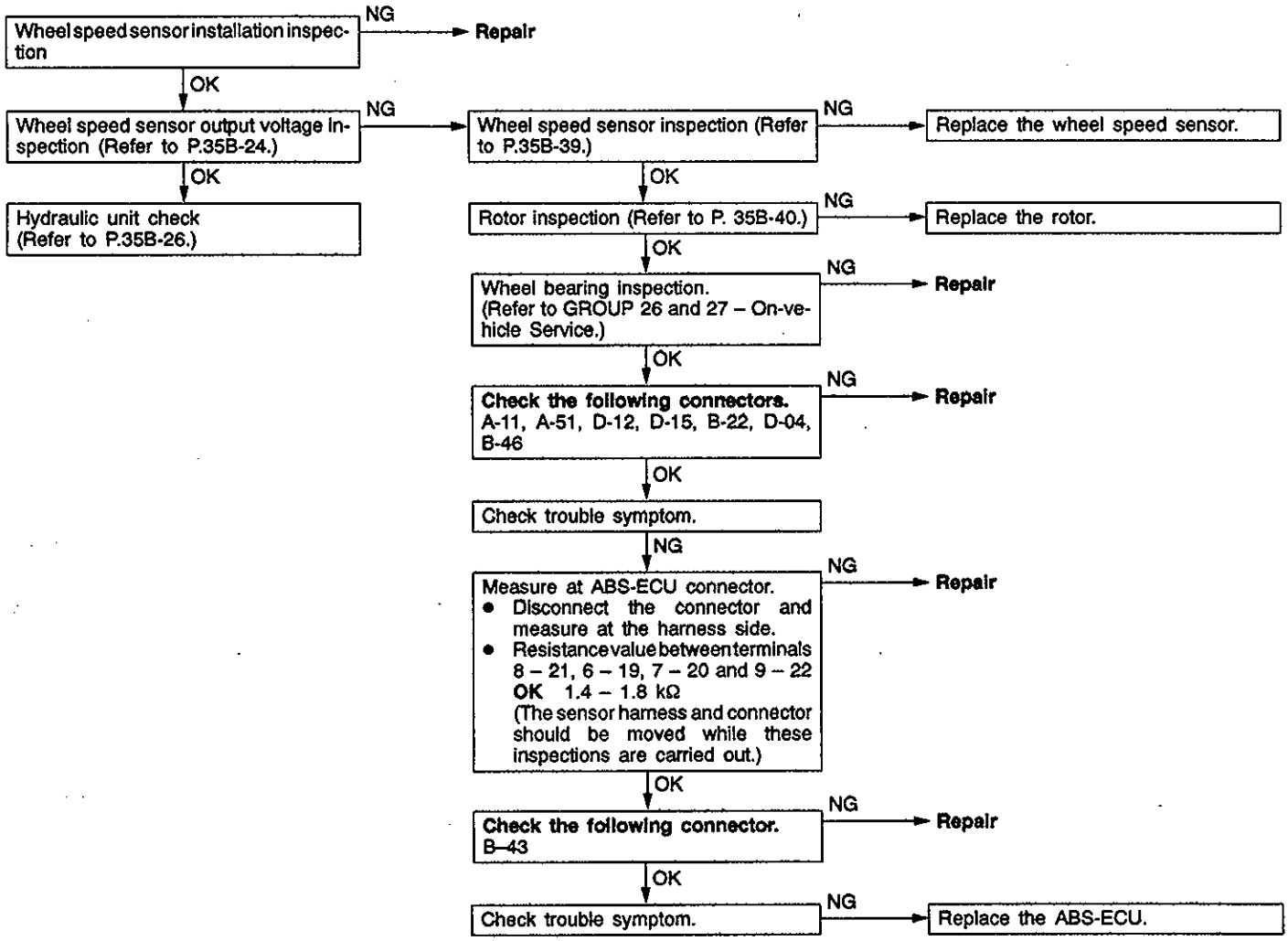
Inspection Procedure 6

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



Inspection Procedure 7

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



DATA LIST REFERENCE TABLE

35201150077

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
33	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.

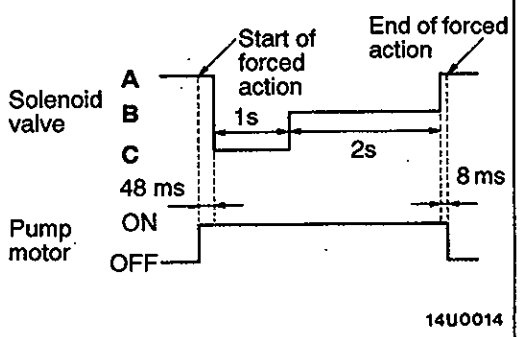
ACTUATOR TEST REFERENCE TABLE

35201160025

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.
3. During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.

Activation pattern



NOTE
A: Hydraulic pressure increase
B: Hydraulic pressure holds
C: Hydraulic pressure decrease

ACTUATOR TEST SPECIFICATIONS

No.	Item	
01	Solenoid valve for front-left wheel	Solenoid valves and pump motors in the hydraulic unit (simple inspection mode)
02	Solenoid valve for front-right wheel	
03	Solenoid valve for rear-left wheel	
04	Solenoid valve for rear-right wheel	

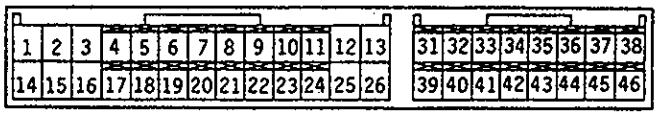
CHECK AT ABS-ECU

35201180106

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (15), (25) and (42) (earth terminals) and each respective terminal.

   NOTE
   Do not measure terminal voltage for approx. 3 seconds after the ignition switch is turned on. The ABS-ECU performs the initial check for that period.
2. The terminal layouts are shown in the illustrations below.



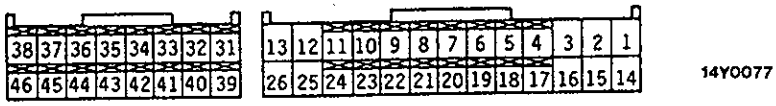
14Y0076

Connector terminal No.	Signal	Checking requirements		Normal condition
1	Output to rear-right solenoid valve (IN)	Ignition switch: ON (When solenoid valve is off)		System voltage
14	Output to front-left solenoid valve (OUT)			
15	Output to rear-right solenoid valve (OUT)			
16	Output to front-left solenoid valve (IN)			
25	Memory power supply	Always		System voltage
26	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
33	Input from diagnosis indication selection	Connect the MUT-II.		0 V
		Do not connect the MUT-II.		Approx. 12 V
34	Valve relay monitor	Ignition switch: ON		System voltage
35	Motor monitor	Ignition switch: ON	Motor is on.	System voltage
			Motor is off.	0.5V or less
37	Output to rear-left solenoid valve (OUT)	Ignition switch: ON (When solenoid valve is off)		System voltage
38	Output to front-right solenoid valve (IN)			
40	Input from stop lamp switch	Ignition switch: ON	Stop lamp switch ON	System voltage
			Stop lamp switch OFF	1 V or less

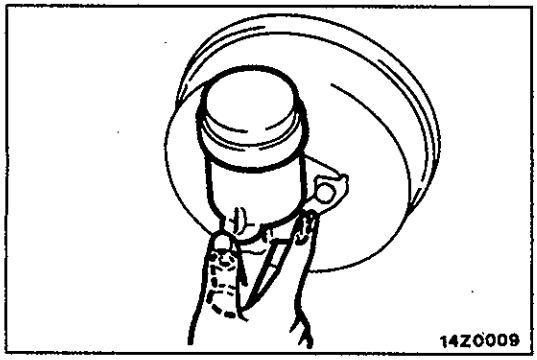
Connector terminal No.	Signal	Checking requirements			Normal condition
41	MUT-II	Connect the MUT-II.			Serial communication with MUT-II
		Do not connect the MUT-II.			1 V or less
42	Output to valve relay	Ignition switch; ON	The relay is on.		2 V or less
			The relay is off. The system runs down.		System voltage
43	Output to motor relay	Ignition switch: ON		Motor is on.	2 V or less
				Motor is off.	System voltage
44	Output to ABS warning lamp	Ignition switch: ON	The lamp is switched off.		System voltage
			The lamp is illuminated.		3 V or less
45	Output to rear-left solenoid valve (IN)	Ignition switch: ON (When solenoid valve is off)			System voltage
46	Output to front-right solenoid valve (OUT)				

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.



Connector terminal No.	Signal	Normal condition
2 – Body earth	ABS-ECU earth	Continuity
6-19	Front-left wheel speed sensor	1.4 – 1.8 kΩ
7-20	Rear-right wheel speed sensor	1.4 – 1.8 kΩ
8-21	Front-right wheel speed sensor	1.4 – 1.8 kΩ
9-22	Rear-left wheel speed sensor	1.4 – 1.8 kΩ
17 – Body earth	ABS-ECU earth	Continuity
31 – Body earth		
39 – Body earth		



ON-VEHICLE SERVICE

35200150085

BLEEDING

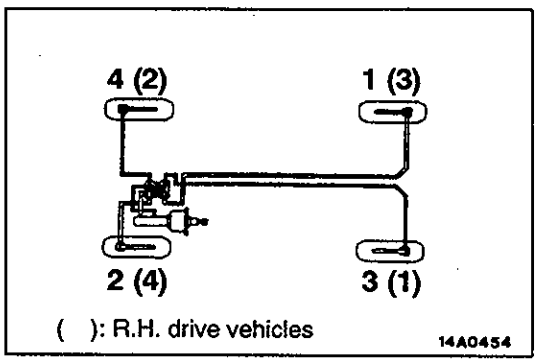
Caution
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING

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.)

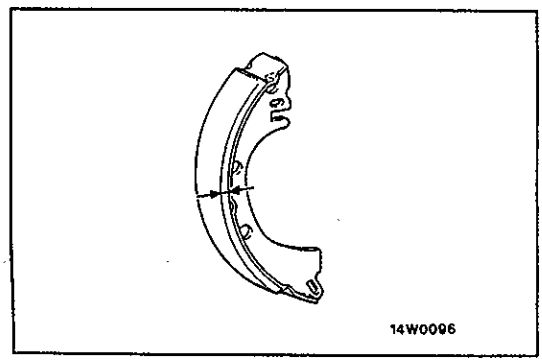
(1) Fill the reserve tank with brake fluid.
(2) Keep the brake pedal depressed.
(3) Have another person cover the master cylinder outlet with a finger.
(4) With the outlet still closed, release the brake pedal.
(5) Repeat steps (2) –(4) three or four times to fill the inside of the master cylinder with brake fluid.



BRAKE PIPE LINE BLEEDING

Start the engine and bleed the air in the sequence shown in the figure.

Caution
Be sure to install a filter to the master cylinder reservoir tank when supplying brake fluid.



BRAKE LINING THICKNESS CHECK

35100300050

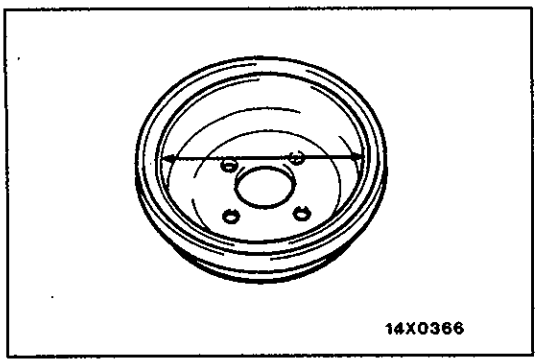
1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

   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.35B-32.

   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.**



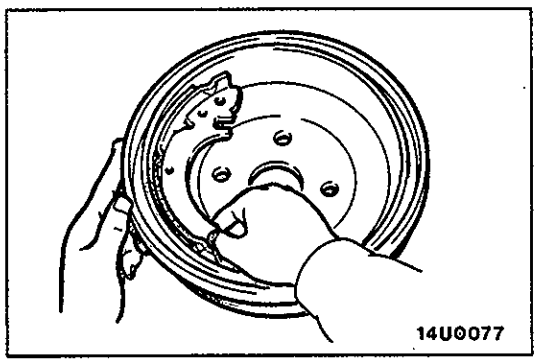
BRAKE DRUM INSIDE DIAMETER CHECK

35100320049

1. Remove the brake drum.
2. Measure the inside diameter of the brake drum at two or more locations.

   Standard value: 203 mm

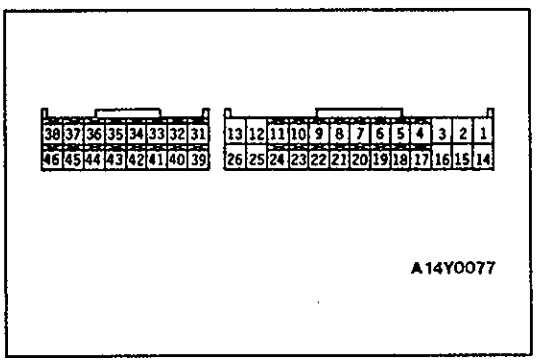
   Limit: 205 mm
3. Replace brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.



BRAKE LINING AND BRAKE DRUM CONNECTION CHECK

35100310107

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35B-32.)
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.



WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

35200160132

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.	6	8	9	7
	19	21	22	20

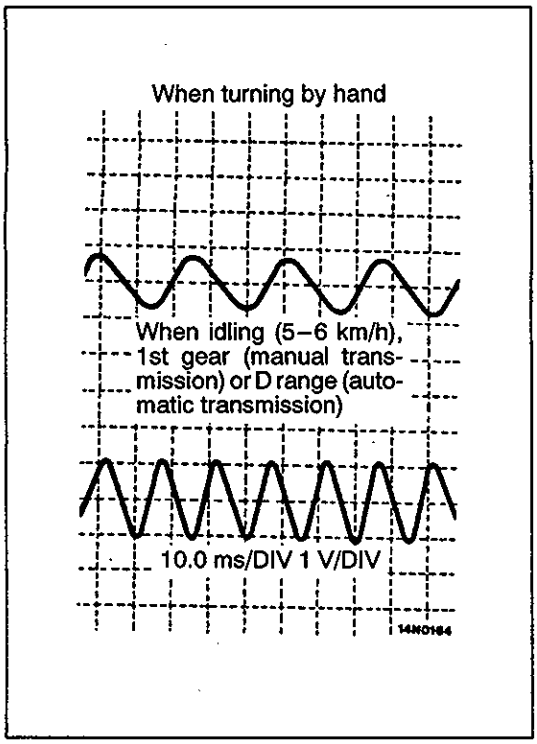
Output voltage

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

35200170142

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.

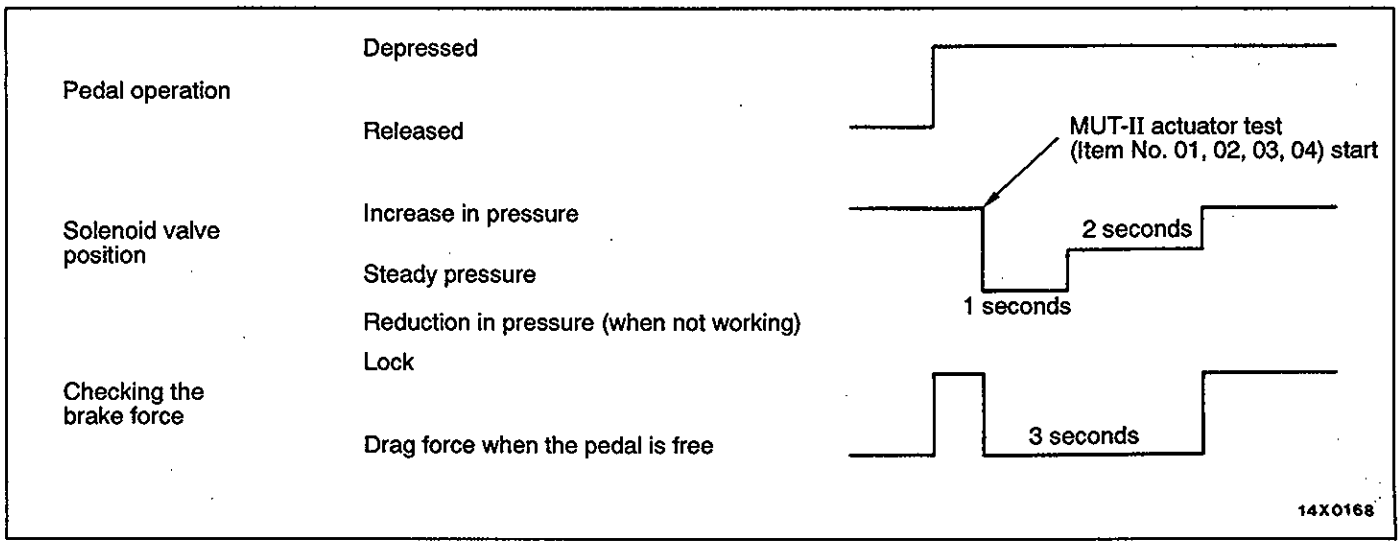
2. Release the parking brake, and feel the drag force (drag torque) on each road wheel.
   When using the braking force tester, take a reading of the brake drag force.
3. Turn the ignition key to the OFF position and set the MUT-II.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.
5. Use the MUT-II to force-drive the actuator.

   NOTE
   1. During the actuator test, the ABS warning lamp will illuminate and the anti-skid control will be cancelled.
   2. When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.

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 decreases when the actuator is force-driven.

Front wheel	785–981 N
Rear wheel	294–490 N

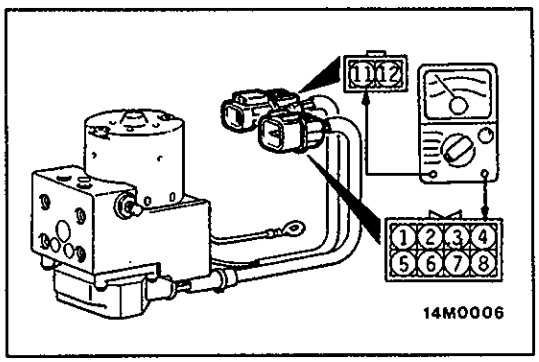
The result should be as shown in the following diagram.



7. If the result of inspection is abnormal, correct according to the "Diagnosis Table" (Refer to P.35B-27).
8. After inspection, disconnect the MUT-II immediately after turning the ignition switch to OFF.

Diagnosis Table

No.	Operation	Judgement – Normal	Judgement – Abnormal	Probable cause	Remedy
01	(1) Depress brake pedal to lock wheel. (2) Using the MUT-II, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel manually to check the change of brake force.	Brake force released for 3 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than HU	Check and clean brake line
02				Clogged hydraulic circuit in HU	Replace HU assembly
03			Brake force is not released	Incorrect HU brake tube connection	Connect correctly
04				HU solenoid valve not functioning correctly	Replace HU assembly



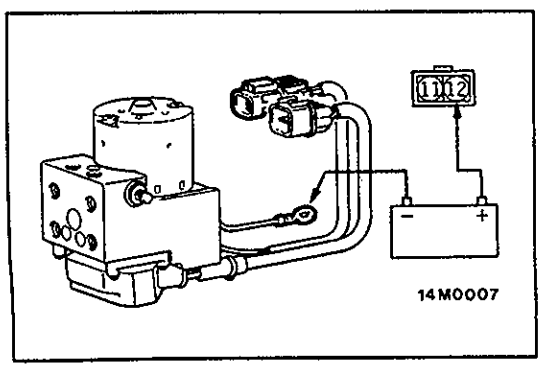
SOLENOID VALVE CHECK

35201070113

Measure the resistance between terminals.

Standard value:

Solenoid valve	Measurement terminals	Resistance between terminals.
Front IN (right side)	1–11	8.04 – 9.04 Ω
Front IN (left side)	4–11	
Rear IN (right side)	3–11	
Rear IN (left side)	2–11	
Front OUT (right side)	5–11	4.04 – 4.54 Ω
Front OUT (left side)	8–11	
Rear OUT (right side)	7–11	
Rear OUT (left side)	6–11	



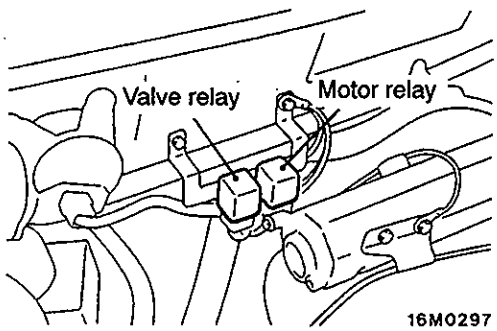
MOTOR OPERATION CHECK

35200180114

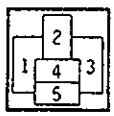
Connect the battery and check to be sure that the sound of the hydraulic unit motor operating can be heard.

Caution
The battery power should not be applied for more than 1 second.

<L.H. drive vehicles>

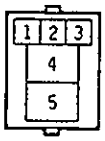


Motor relay connector



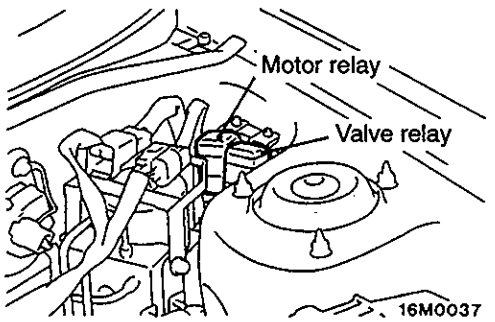
20Z0004

Valve relay connector

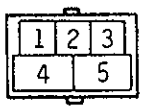


20Z0003
00004684

<R.H. drive vehicles>

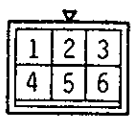


Motor relay connector



14X0104

Valve relay connector



14W0039
00004683

MOTOR RELAY AND VALVE RELAY CONTINUITY CHECK

35201090119

<L.H. drive vehicles>

Motor relay

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

Valve relay

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

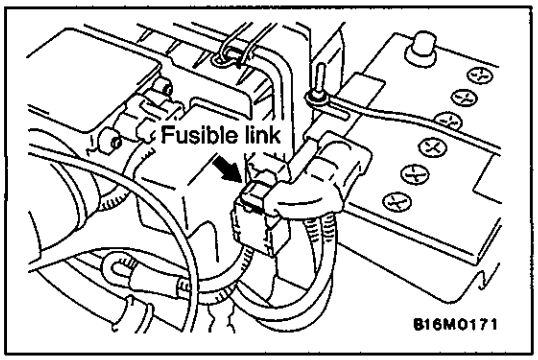
<R.H. drive vehicles>

Motor relay

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

Valve relay

Battery voltage	Terminal No.				
	1	2	3	5	6
Power is not supplied	○	○	○	○	
Power is supplied		⊕		⊖	○



REMEDY FOR A FLAT BATTERY 35200350102

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

35200400142

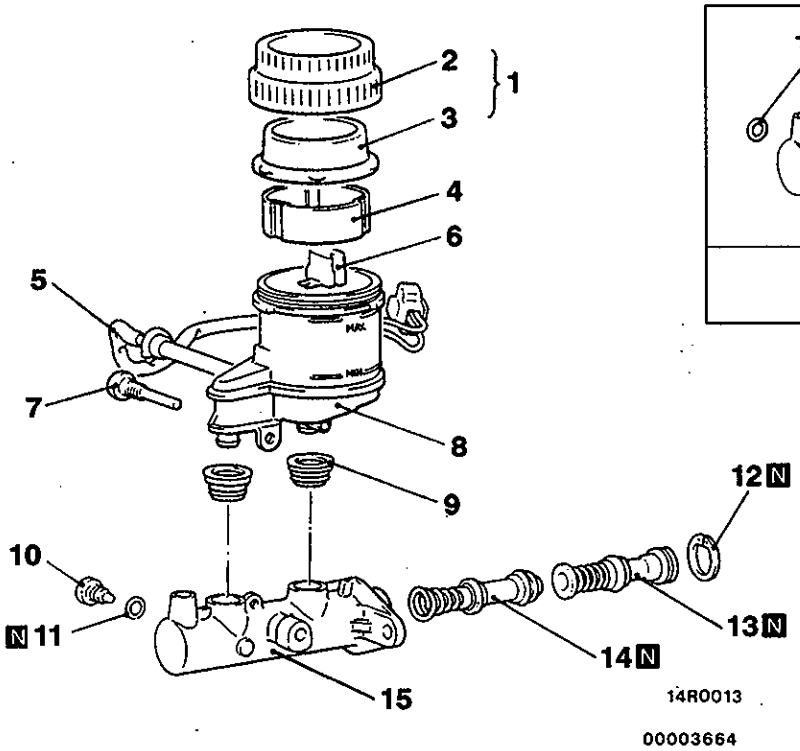
REMOVAL AND INSTALLATION

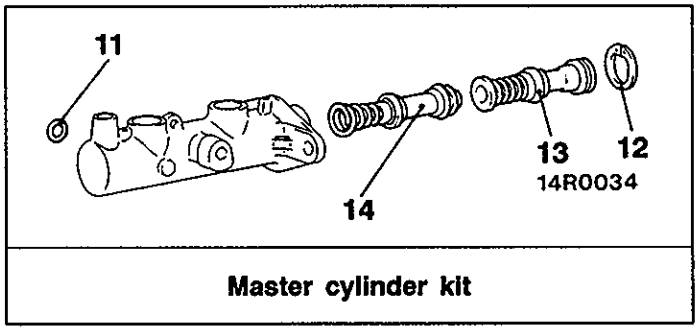
Refer to GROUP 35A.

MASTER CYLINDER

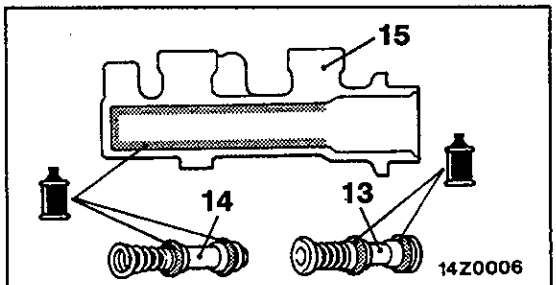
DISASSEMBLY AND REASSEMBLY

35200450062





Master cylinder kit



Brake fluid: DOT3 or DOT4

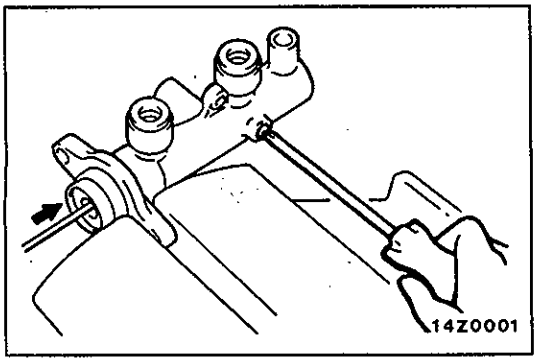
Disassembly steps

1. Reservoir cap assembly
2. Reservoir cap
3. Diaphragm
4. Filter
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt

◀A▶

◀B▶

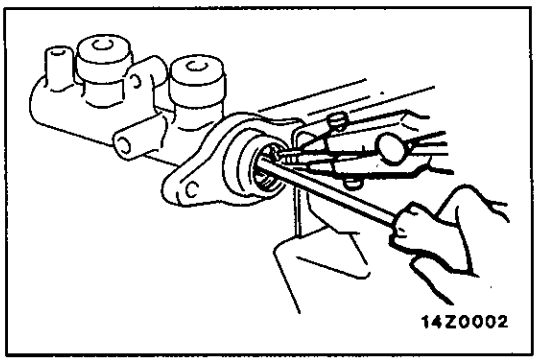
8. Reservoir tank
9. Reservoir seal
10. Piston stopper bolt
11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body



DISASSEMBLY SERVICE POINTS

◀A▶ PISTON STOPPER BOLT DISASSEMBLY

Remove the piston stopper bolt, while depressing the piston.



◀B▶ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION

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.

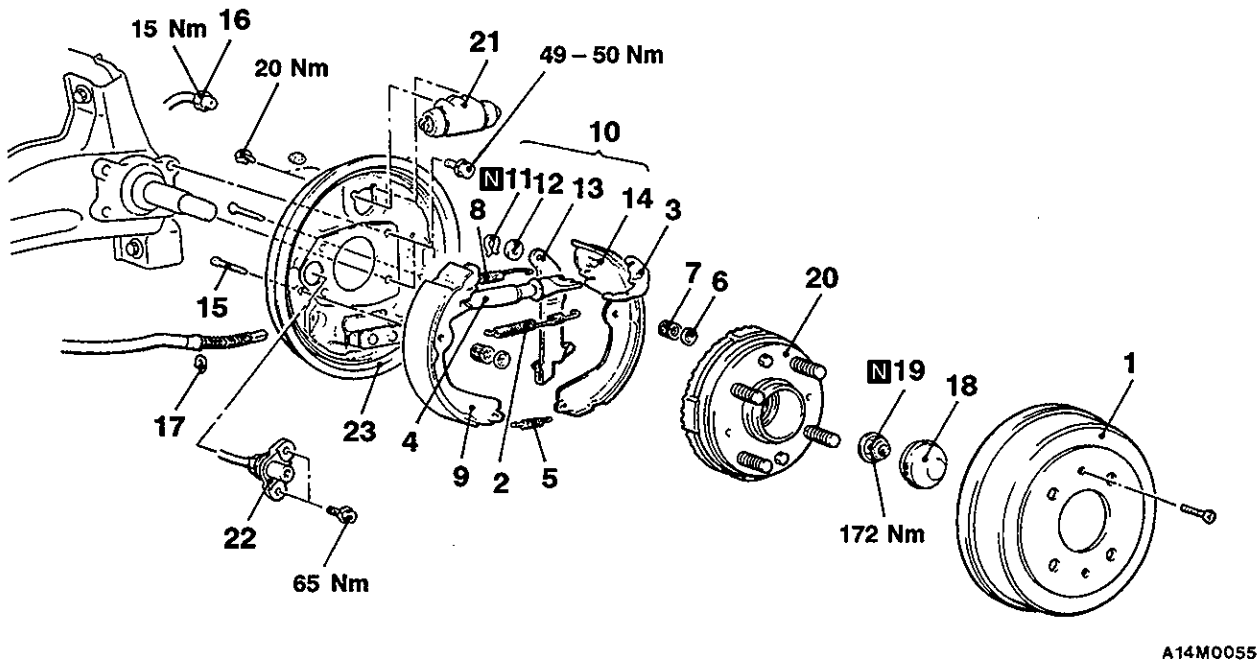
REAR DRUM BRAKE

35200700013

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.35B-23.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – On-vehicle Service.)



A14M0055

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 and rotor assembly
21. Wheel cylinder
22. Speed sensor
23. Backing plate

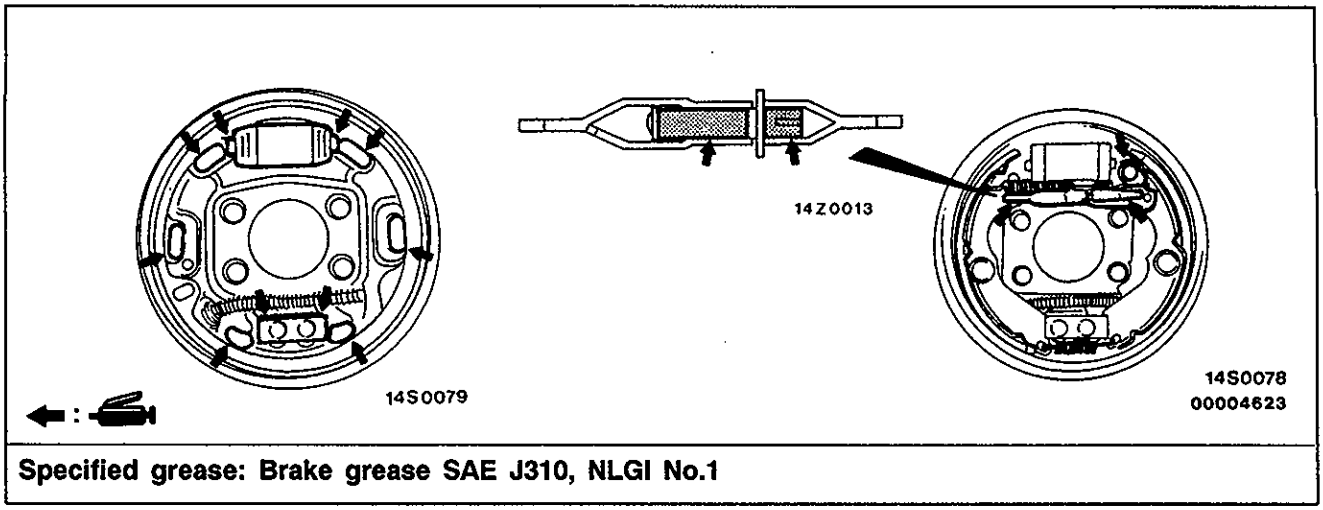
Wheel cylinder removal steps

1. Brake drum
2. Shoe-to-lever spring
8. Shoe-to-shoe spring
16. Brake pipe connection
21. Wheel cylinder

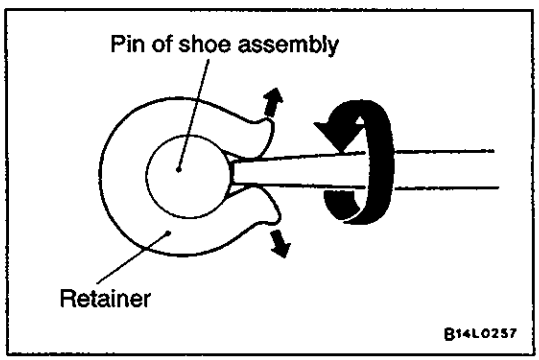
Caution

1. **Be careful when handling the pole piece at the tip of hte speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.**
2. **When removing the rear hub assembly, the wheel bearing inner race may be left at the spindle side. In this case, always replace the rear hub assembly, otherwise the hub will damage the oil seal, causing oil leaks or excessive play.**

LUBRICATION POINTS



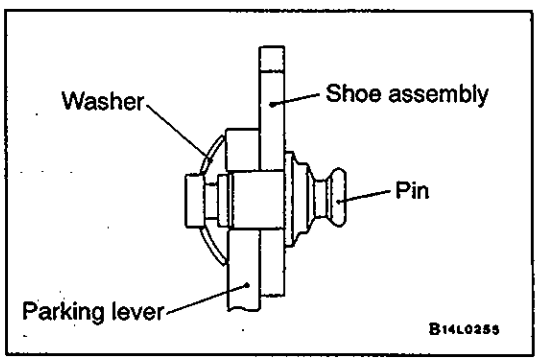
Specified grease: Brake grease SAE J310, NLGI No.1



REMOVAL SERVICE POINT

◀A▶ RETAINER REMOVAL

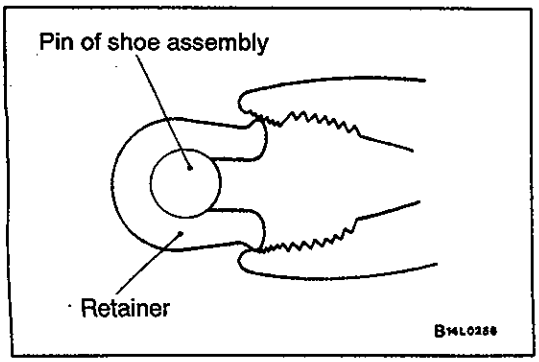
Use a flat-tipped screwdriver or the like to open up the retainer joint, and remove retainer.



INSTALLATION SERVICE POINTS

▶A◀ WAVE WASHER INSTALLATION

Install the washer in the direction shown in the illustration.



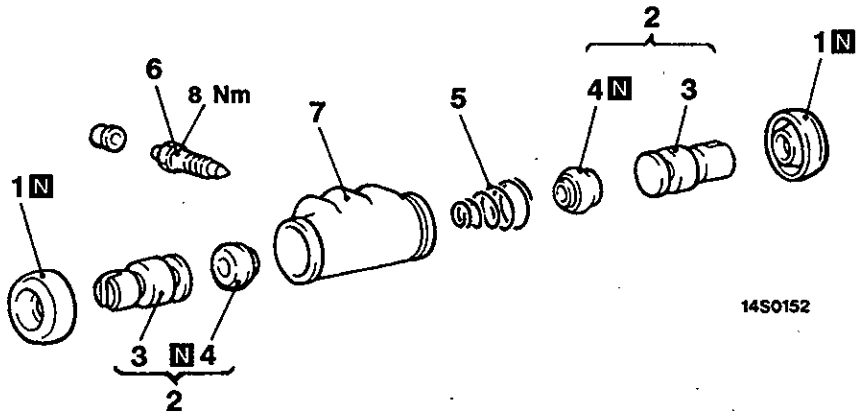
▶B◀ RETAINER INSTALLATION

Use pliers or the like to install the retainer or the pin positively.

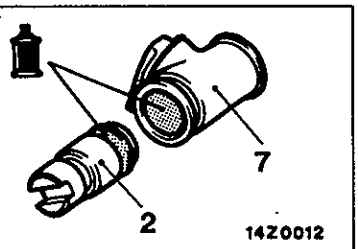
WHEEL CYLINDER

35200720019

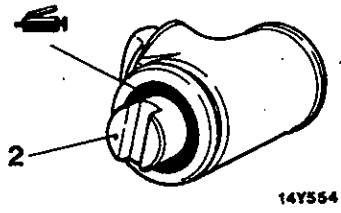
DISASSEMBLY AND REASSEMBLY



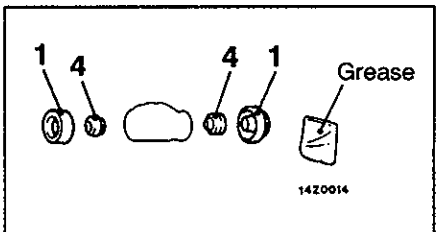
00003584



Brake fluid: DOT3 or DOT4



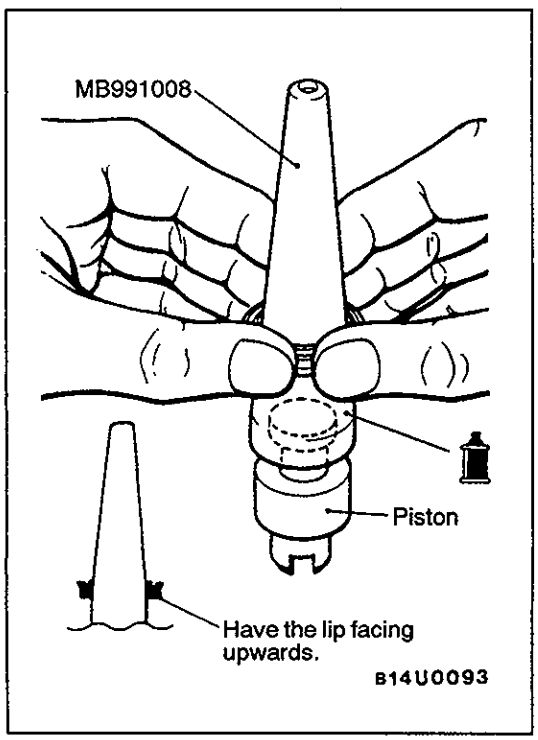
Grease: Repair kit grease



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

35200570089

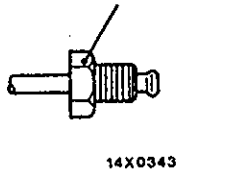
REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal

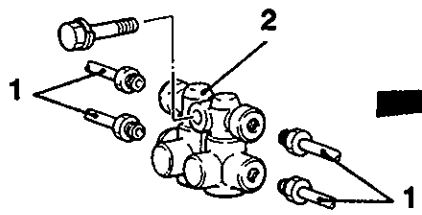
Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35B-23.)
- Air Intake Hose Installation

Flared brake line nuts

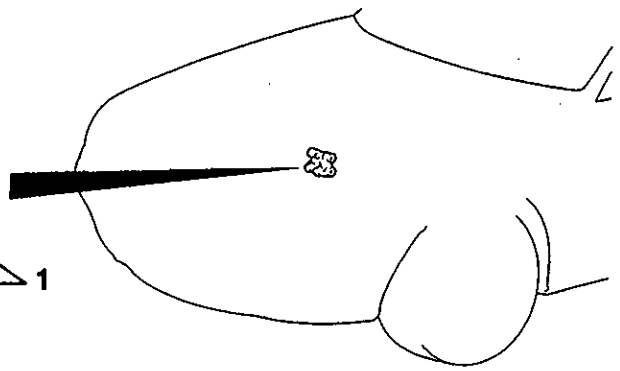
15 Nm



14X0343



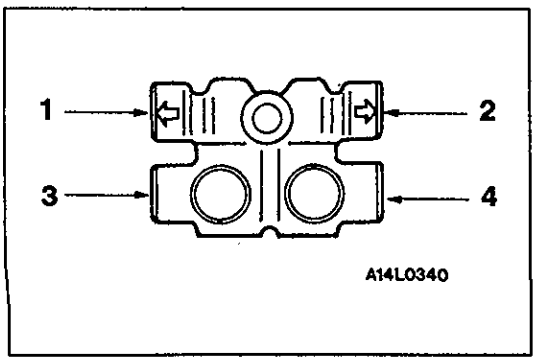
14X0214



14X0146
00004486

Removal steps

▶A◀ 1. Brake pipe
2. Proportioning valve
3. Bracket



A14L0340

INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.
1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – Hydraulic unit
4. Proportioning valve – Hydraulic unit

HYDRAULIC UNIT

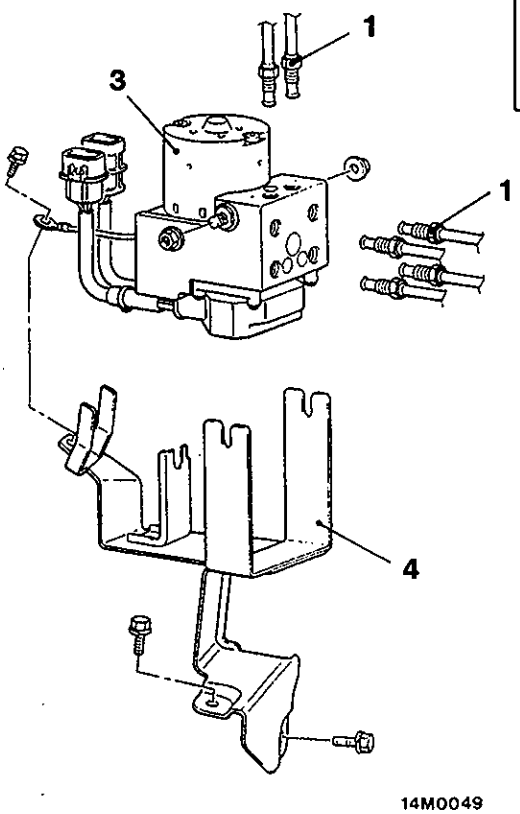
35200860155

REMOVAL AND INSTALLATION

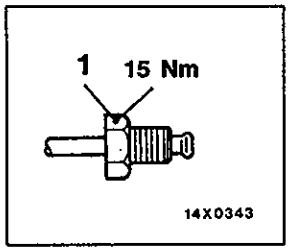
Pre-removal Operation
- Brake Fluid Draining
- Windshield Wiper Motor Removal <L.H. drive vehicles> (Refer to GROUP 51)

Post-installation Operation
- Windshield Wiper Motor Installation <L.H. drive vehicles> (Refer to GROUP 51)
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P35B-23.)
- Brake Pedal Adjustment (Refer to GROUP 35A – On-vehicle Service.)

<L.H. drive vehicles>

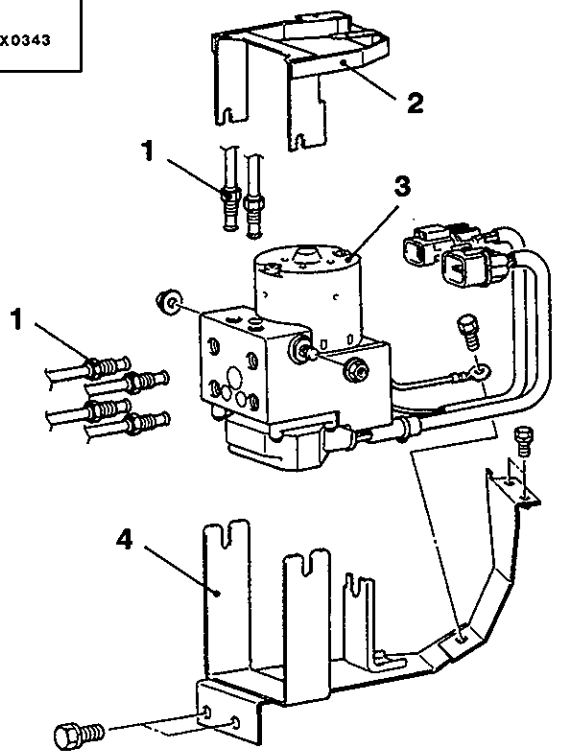


14M0049



14X0343

<R.H. drive vehicles>



14M0003
00004485

Removal steps

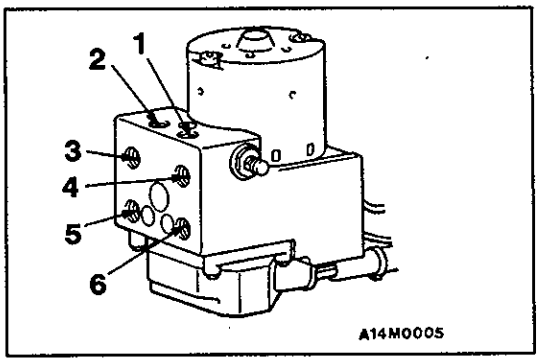
▶A◀ 1. Brake pipe connection
2. Connector bracket <R.H. drive vehicles>
◀A▶ 3. Hydraulic unit assembly
4. Hydraulic unit bracket

REMOVAL SERVICE POINT

◀A▶ HYDRAULIC UNIT ASSEMBLY REMOVAL

Caution

1. **The hydraulic unit assembly is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit assembly is not to be disassembled; its nuts and bolts should absolutely not be loosened.**
3. **The hydraulic unit assembly must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit assembly must not be turned upside down or laid on its side.**



INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit assembly as shown in the illustration.

1. To the proportioning valve (RH)
2. To the proportioning valve (LH)
3. From the master cylinder (Primary)
4. From the master cylinder (Secondary)
5. To the front brake (RH)
6. To the front brake (LH)

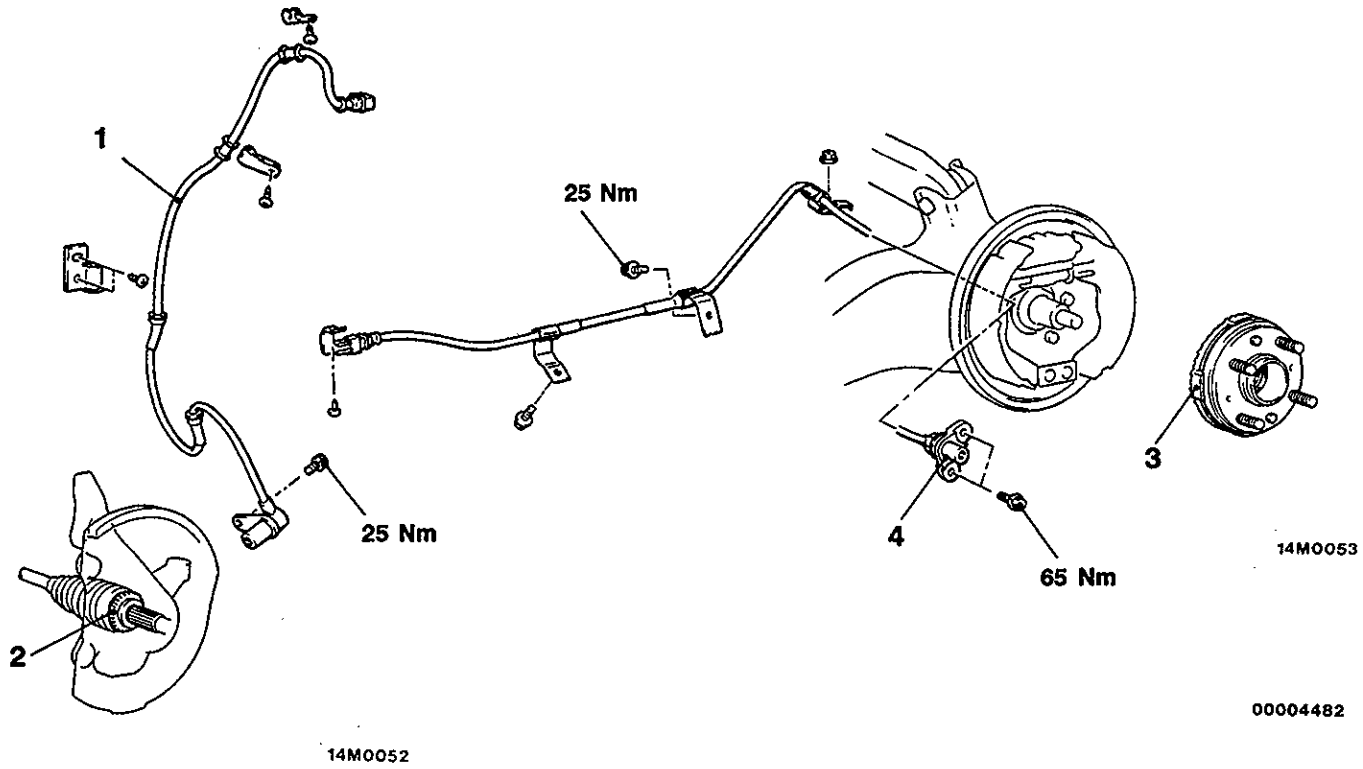
WHEEL SPEED SENSOR

35200830149

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Speed Sensor Output Voltage Check (Refer to P.35B-24.)

<Front> <Rear>



Front speed sensor removal steps

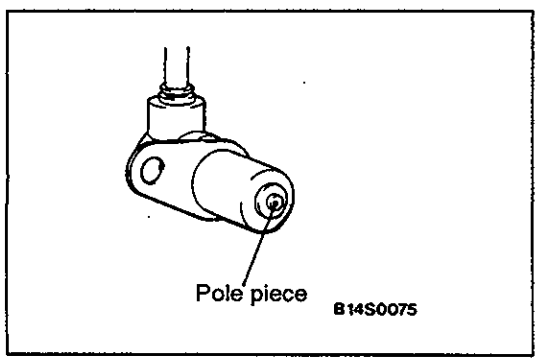
◀A▶ 1. Front speed sensor
2. Front rotor
(Refer to GROUP 26 – Drive shaft.)

NOTE
The front rotor is integrated with the drive shaft and is not disassembled.

Rear speed sensor removal steps

3. Rear rotor
(Refer to GROUP 27 – Rear Axle Hub.)

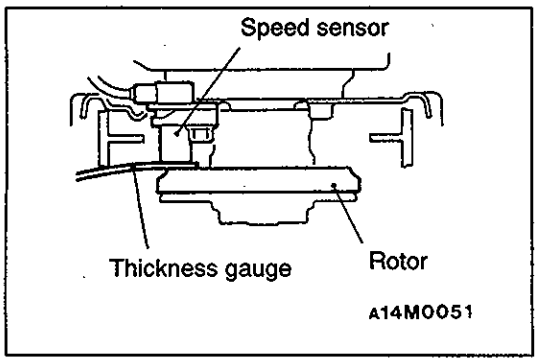
◀A▶ ▶A◀ 4. Rear speed sensor



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: 0.1 – 2.0 mm

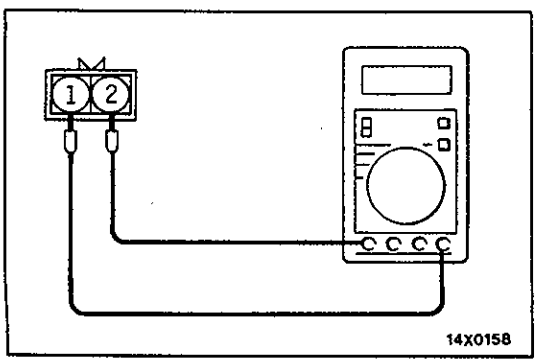
INSPECTION

35200840111

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.



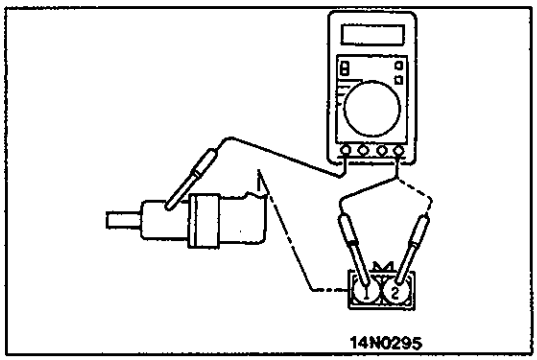
(2) Measure the resistance between the speed sensor terminals.

Standard value: 1.4 – 1.8 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.

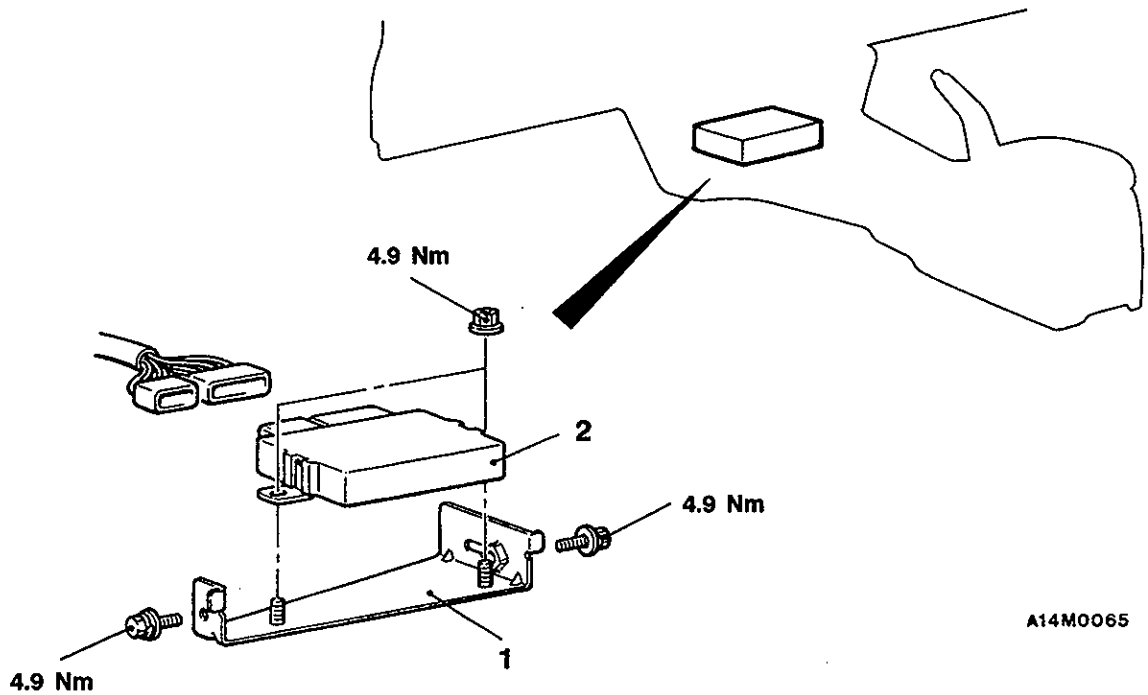
ABS-ECU

35200980127

REMOVAL AND INSTALLATION

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

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



Removal steps
1. ABS-ECU bracket
2. ABS-ECU

INSPECTION

35200990083

Refer to P.35B-21.

NOTES

PARKING BRAKES

CONTENTS

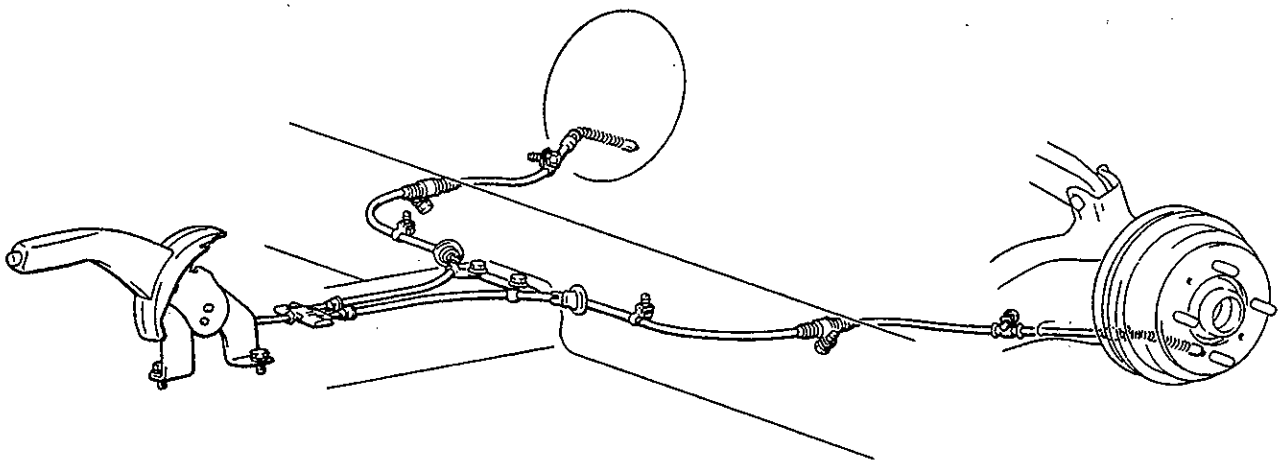
36109000101

GENERAL INFORMATION

36100010080

The parking brake is of a mechanical rear-wheel brake construction in all vehicles.

CONSTRUCTION DIAGRAM



14M0033

SERVICE SPECIFICATIONS

36100030093

Item	Standard value
Parking brake lever stroke [Operation force: Approx. 196N]	5–7 notches

LUBRICANTS

36100040089

Items	Specified Lubricant
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	

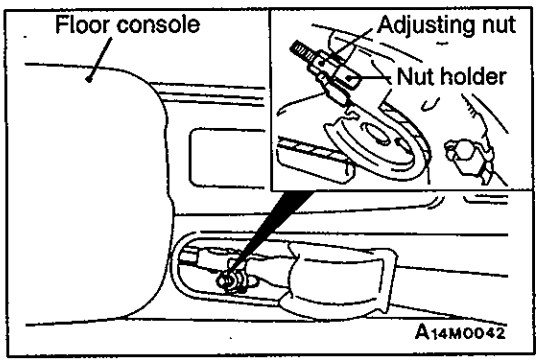
ON-VEHICLE SERVICE 36100090091

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.

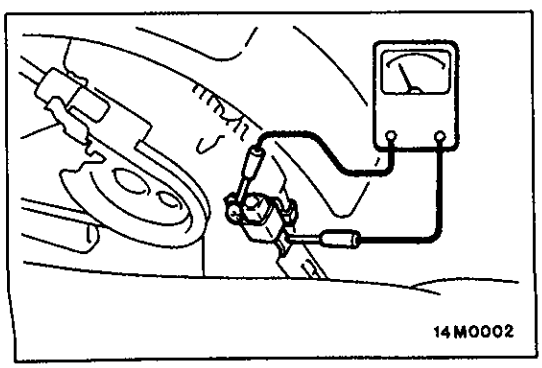
   NOTE
   If the pedal stroke stops changing, the automatic-adjustment mechanism is functioning normally, and the clearance between the shoe and drum is correct.

   (3) 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.

   (4) 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.



PARKING BRAKE SWITCH CHECK 36100330087

1. Remove the floor console. (Refer to GROUP 52A.)
2. 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

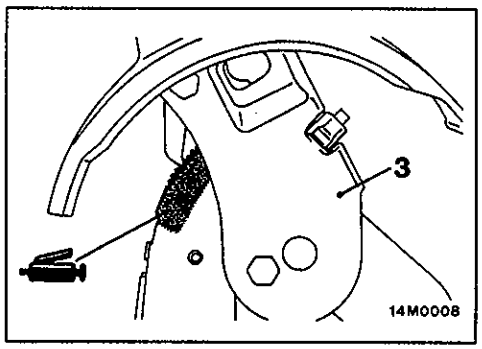
PARKING BRAKE LEVER

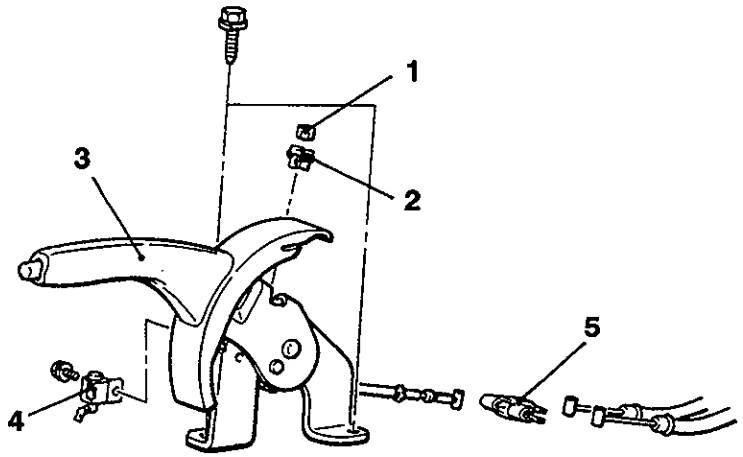
36100130106

REMOVAL AND INSTALLATION

Pre-removal Operation
- Floor Console Removal (Refer to GROUP 52A.)

Post-installation Operation
(1). Parking Brake Lever Stroke Adjustment (Refer to P.36-3.)
(2). Floor Console Installation (Refer to GROUP 52A.)





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Removal steps
1. Adjusting nut
2. Nut holder
3. Parking brake lever assembly
4. Parking brake switch
5. Cable equalizer

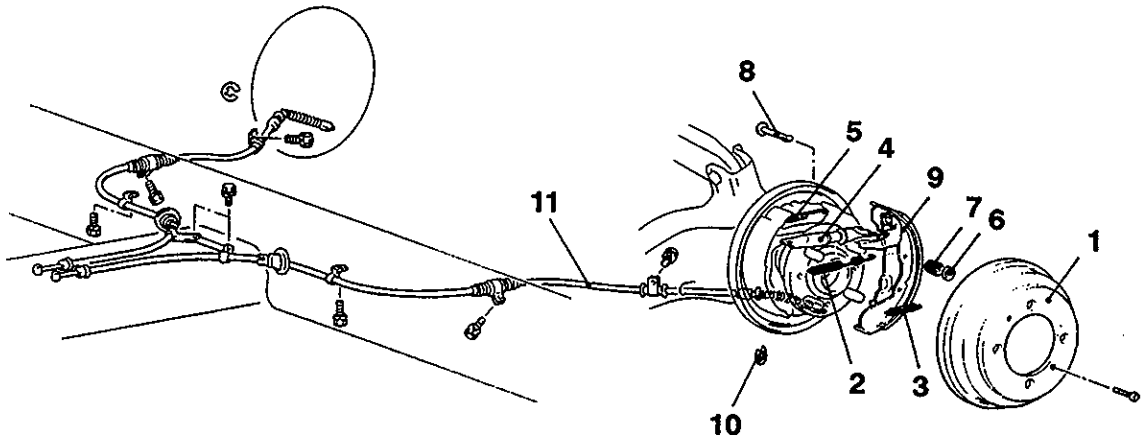
PARKING BRAKE CABLE

36100190142

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.36-3.)
(2) Floor Console Installation (Refer to GROUP 52A.)
(3) Rear Seat Installation (Refer to GROUP 52A.)



14M0010
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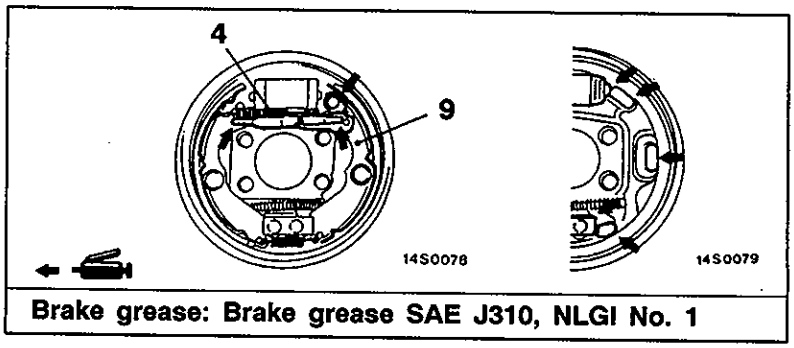


Brake grease: Brake grease SAE J310, NLGI No. 1

Removal steps

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
11. Parking brake cable

NOTES

STEERING

CONTENTS

37209000125

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 (*).

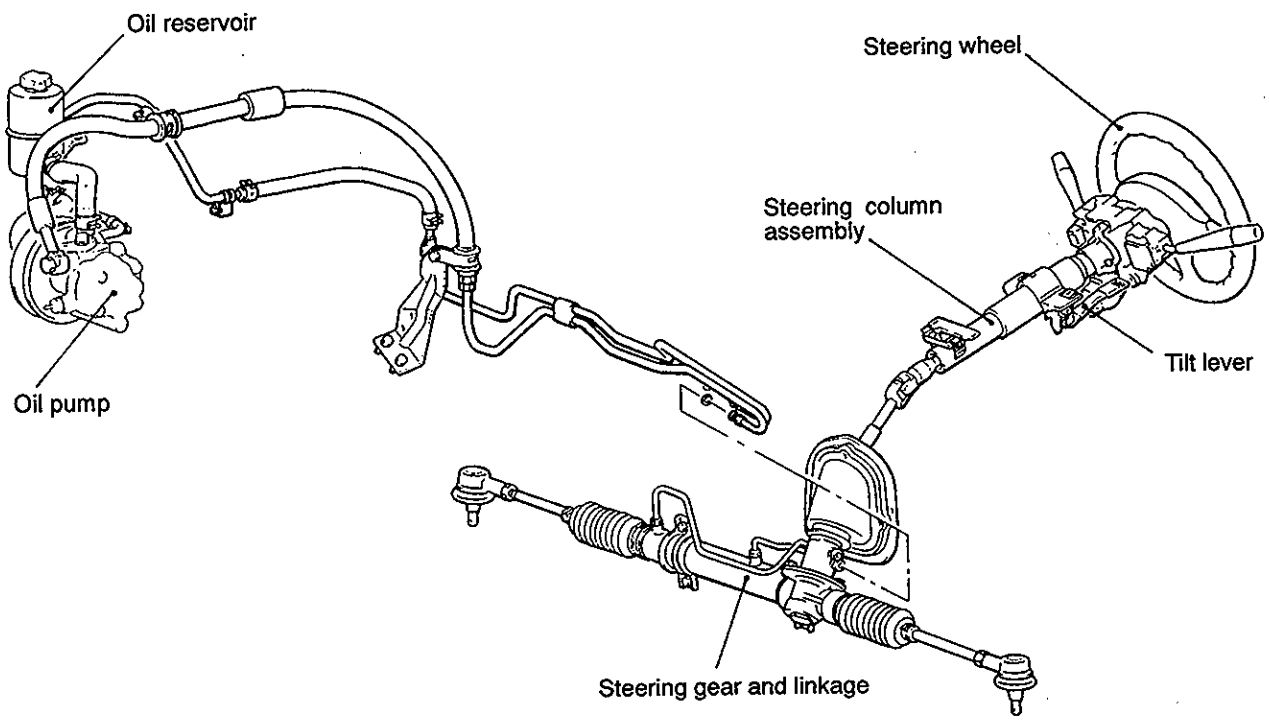
GENERAL INFORMATION

37200010103

The steering wheel is a 2-spoke type or 3-spoke type. In addition, the steering wheel including the air bag is a 3-spoke type. The steering column is equipped with both shock absorbing and tilt steering mechanisms.
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		L.H. drive vehicles	R.H. drive vehicles
Steering gear and linkage	Type	Integral type	Integral type
	Gear type	Rack and pinion	Rack and pinion
Oil pump	Type	Vane type	Vane type
	Displacement mℓ/rev.	5.9	7.2
	Relief set pressure MPa	9.8	8.8

CONSTRUCTION DIAGRAM



A13M0023

SERVICE SPECIFICATIONS

37200030093

Items			Standard value	Limit
Steering wheel free play mm	with engine stopped		10 or less	–
	when hydraulic operation		–	30
Steering angle	Inner wheel		38°00' ± 1°30'	–
	Outer wheel		31°00'	–
Tie rod end ball joint starting torque Nm			0.2–0.48	–
Stationary steering effort N (Fluctuation allowance)			29 or less (5.9 or less)	–
Oil pump pressure MPa	Oil pump relief pressure		<L.H. drive vehicles> 9.8 <R.H. drive vehicles> 8.8	–
	Pressure under no-load conditions		0.2–0.5	–
	Steering gear retention hydraulic pressure		<L.H. drive vehicles> 9.8 <R.H. drive vehicles> 8.8	–
Oil pressure switch operating pressure MPa		OFF→ON	1.5 – 2.0	–
		ON→OFF	0.7–2.0	–
Total pinion torque Nm (Change in torque: 0.4 Nm)			0.6 – 1.4	–
Tie-rod joint swing resistance N (Tie-rod joint swing torque Nm)			7–24 (1.5–4.9)	–

LUBRICANTS

37200040096

Items	Specified lubricant	Quantity
Power steering fluid	Automatic transmission fluid DEXRON or DEXRON II	As required
Bellows	Silicone grease	As required
Oil seal, pinion and valve assembly, ball bearing, needle roller bearing, special tool (MB991212)	Automatic transmission fluid DEXRON or DEXRON II	As required
Flow control valve, friction surface of rotor, vanes, cam ring, pump cover, O-ring		

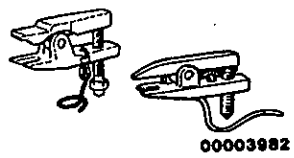
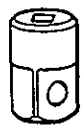
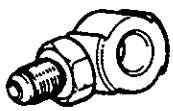
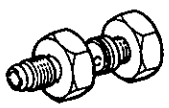
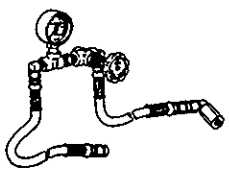
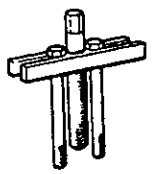
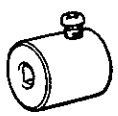
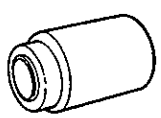
SEALANT

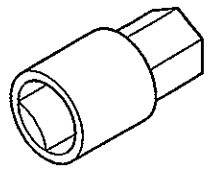
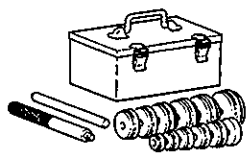
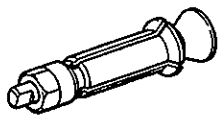
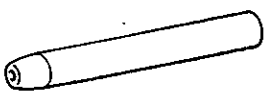
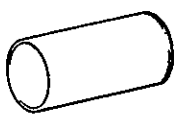
37200050082

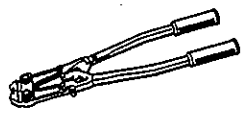
Items	Specified sealant	Remarks
Power steering rack support cover screw	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Dust cover lip for tie rod end ball joint		

SPECIAL TOOLS

37200060115

Tool	Number	Name	Use
 00003982	MB991113 or MB990635	Steering linkage puller	Disconnection of tie-rod end
	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

Tool	Number	Name	Use
	MB990607	Torque wrench socket	• Adjustment of rack support • Removal of rack support cover
	MB990925	Bearing and oil seal installer set	Installation of the oil seal and bearing
	MB991120	Needle bearing puller	Removal of rack housing needle bearing
	MB991197	Bar (long type)	To press in the oil seal for the rack
	MB991452	Oil seal installer	
	MB991202	Oil seal and bearing installer	Press fitting of rack housing bearing
	MB991212	Rack installer	Rack installation
	MB991203	Oil seal and bearing installer	To press in the valve housing oil seal and bearing
	MB991317	Seal ring installer	Compression of the seal rings after replacement of the pinion seal rings

Tool	Number	Name	Use
	MB991561	Boot band crimping tool	Installation of bellows band

ON-VEHICLE SERVICE

37200100084

STEERING WHEEL FREE PLAY CHECK

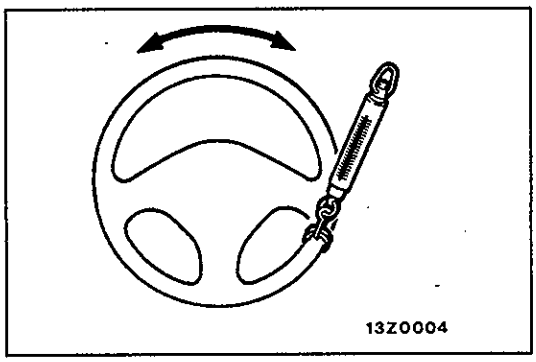
1. With engine running (hydraulic operation), set front wheels straight ahead.
2. Measure the play on steering wheel circumference before wheels start to move when slightly moving steering wheel in both directions.

   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.



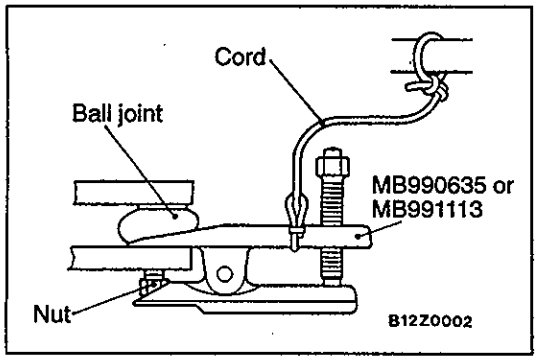
STEERING ANGLE CHECK

37200110100

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

   Standard value:
   Inner wheel 38°00'±1°30'
   Outer wheel 31°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.

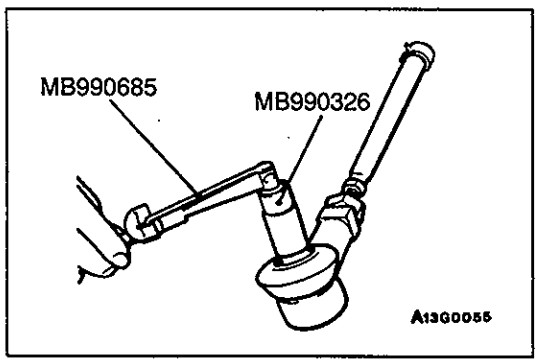


TIE ROD END BALL JOINT STARTING TORQUE CHECK

37200150058

1. Disconnect tie rod and knuckle with special tool.

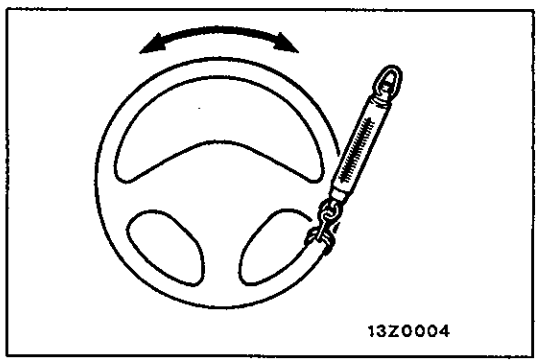
   Caution
   1. Using the special tool, loosen the tie rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.
   2. Support the special tool with a cord, etc. to prevent it from coming off.



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

   Standard value: 0.2–0.48 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

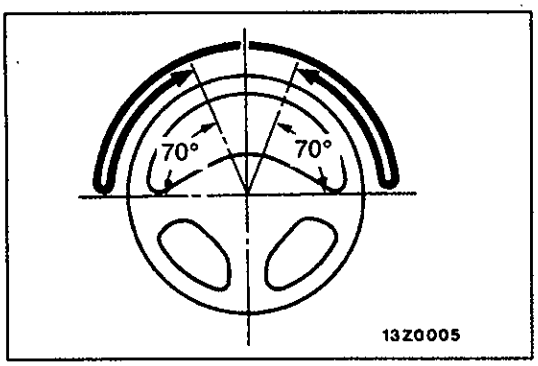
37200170092

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

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

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

   Standard value:
   Steering effort: 29N or less
   Fluctuation allowance: 5.9N or less



CHECKING STEERING WHEEL RETURN TO CENTRE

37200180095

To make this test, conduct a road test and check as follows.

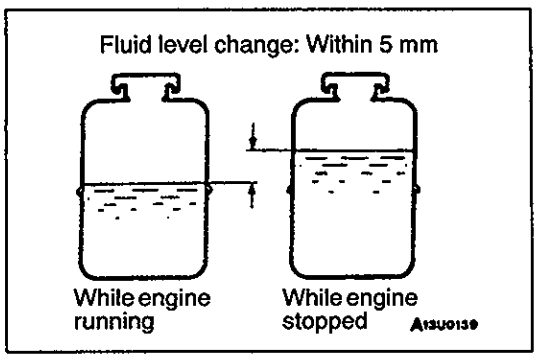
1. Make both gradual and sudden turns and check the steering "feeling" to be sure that there is not difference in the steering force required and the wheel return between left and right turns.
2. At a speed of 35 km/h, turn the steering wheel 90° and release the steering wheel after 1 or 2 seconds. If the steering wheel then returns 70° or more, the return can be judged to be satisfactory.

   NOTE
   There will be a momentary feeling or "heaviness" when the wheel is turned quickly, but this is not abnormal. (This is because the oil pump discharge amount is especially apt to be insufficient during idling.)

DRIVE BELT TENSION CHECK

37200190050

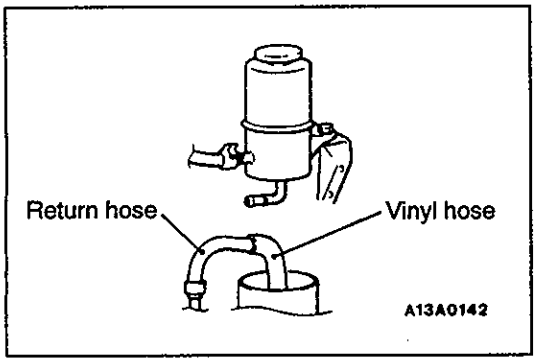
Refer to GROUP 11 – On-vehicle Service.



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

37200220087

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.

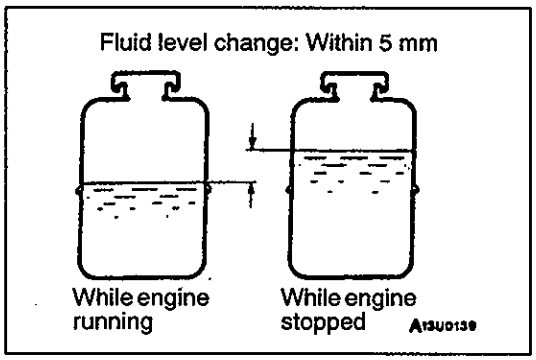
Caution
Be careful not to position the high-tension cable near the delivery pipe.

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.**

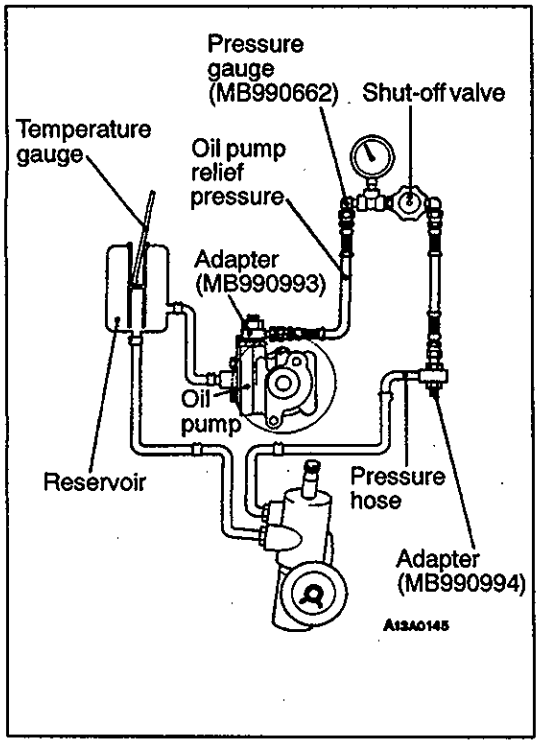
6. Connect the high-tension cable.
7. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
8. Confirm that the fluid is not milky, and that the level is up to the specified position on the level gauge.
9. Confirm that there is very little change in the fluid 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

37200230103

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:
   <L.H. drive vehicles> 9.8 MPa
   <R.H. drive vehicles> 8.8 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: 0.2–0.5 MPa

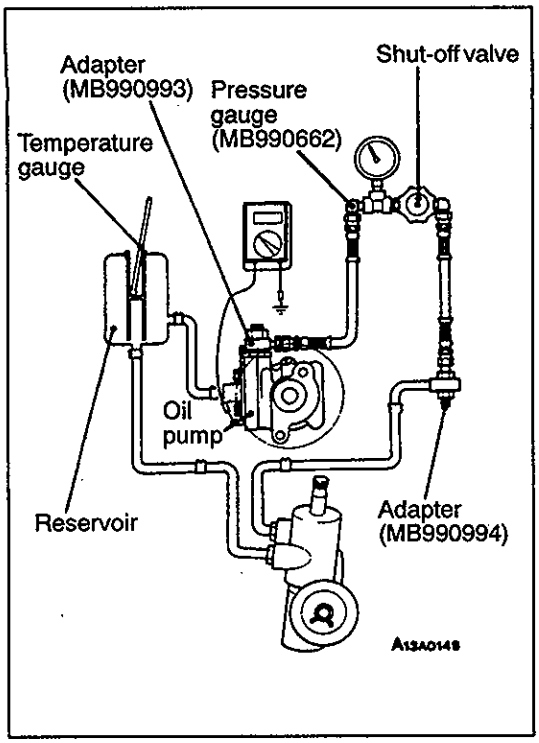
7. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
8. Fully open the shut-off valve of the pressure gauge.
9. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is the standard value.

   Standard value:
   <L.H. drive vehicles> 9.8 MPa
   <R.H. drive vehicles> 8.8 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: 17 Nm

12. Bleed the system.



POWER STEERING OIL PRESSURE SWITCH CHECK

37200720082

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: 1.5–2.0 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: 0.7–2.0 MPa
7. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 17 Nm
8. Bleed the system.

STEERING WHEEL AND SHAFT

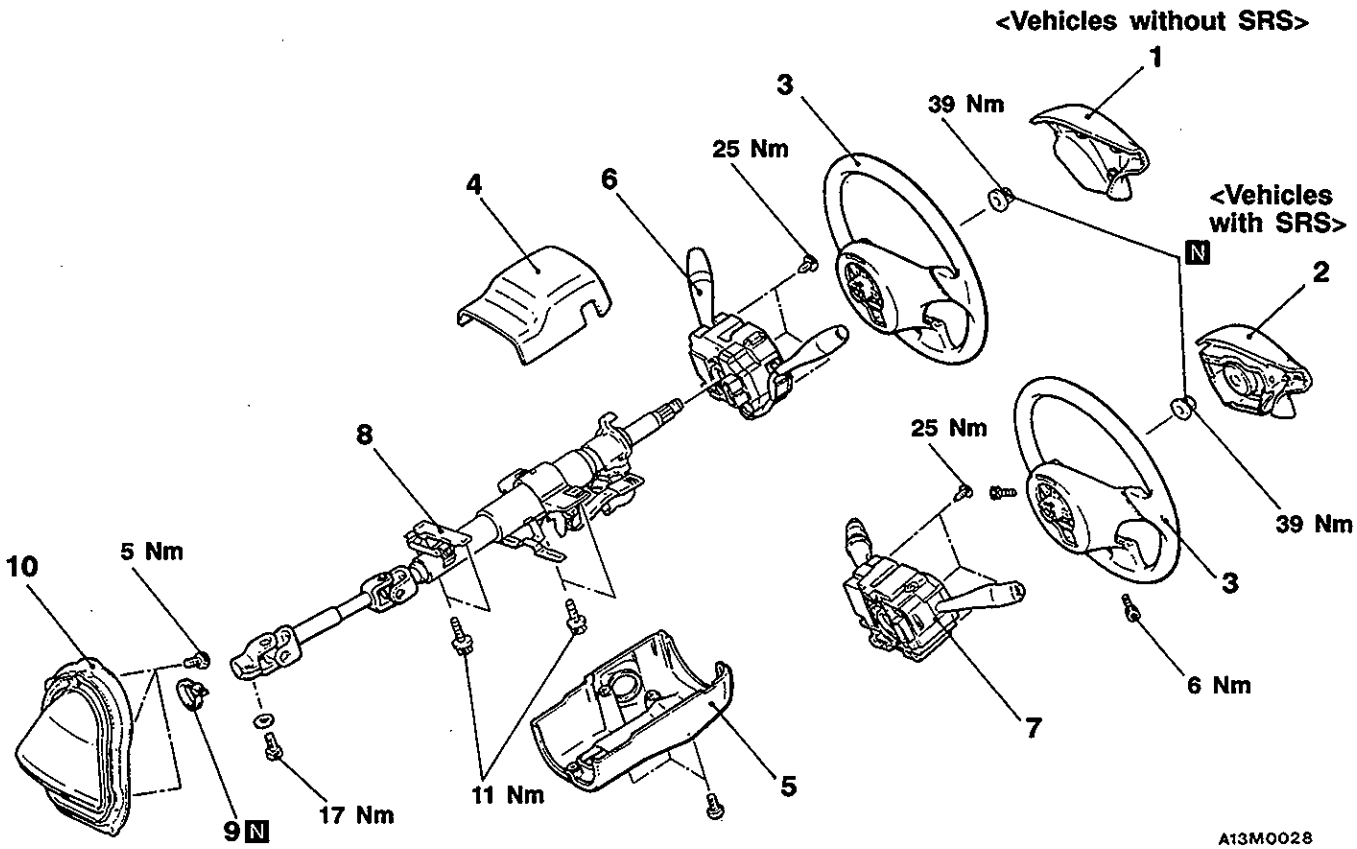
37200260126

REMOVAL AND INSTALLATION

CAUTION: SRS
For vehicles with SRS, before removal of air bag module, refer to GROUP 52B – Service Precautions and Air Bag Module and Clock Spring.

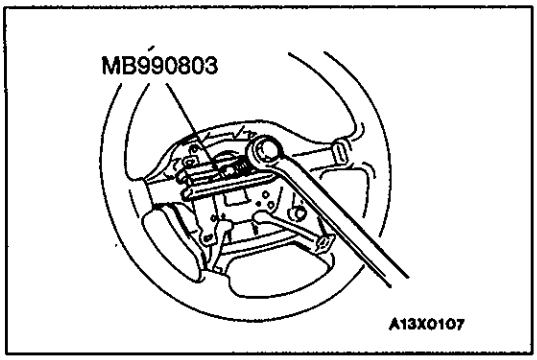
Pre-removal Operation
- Instrument Under Cover Removal (Refer to GROUP 52A – Instrument Panel.)

Post-installation Operation
(1) Instrument Under Cover Installation (Refer to GROUP 52A – Instrument Panel.)
(2) Checking Steering Wheel Position with Wheels Straight Ahead



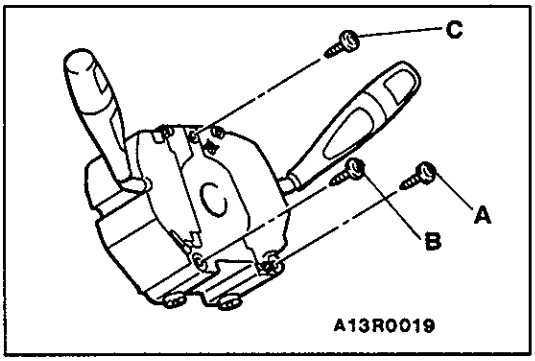
Removal steps

1. Horn pad <Vehicles without SRS>
2. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
◀A▶ 3. Steering wheel
4. Upper column cover
5. Lower column cover
▶A◀ 6. Column switch <Vehicles without SRS>
▶A◀ 7. Clock spring and column switch (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
8. Steering shaft assembly
9. Band
10. Steering cover assembly



REMOVAL SERVICE POINT

◀A▶ STEERING WHEEL REMOVAL



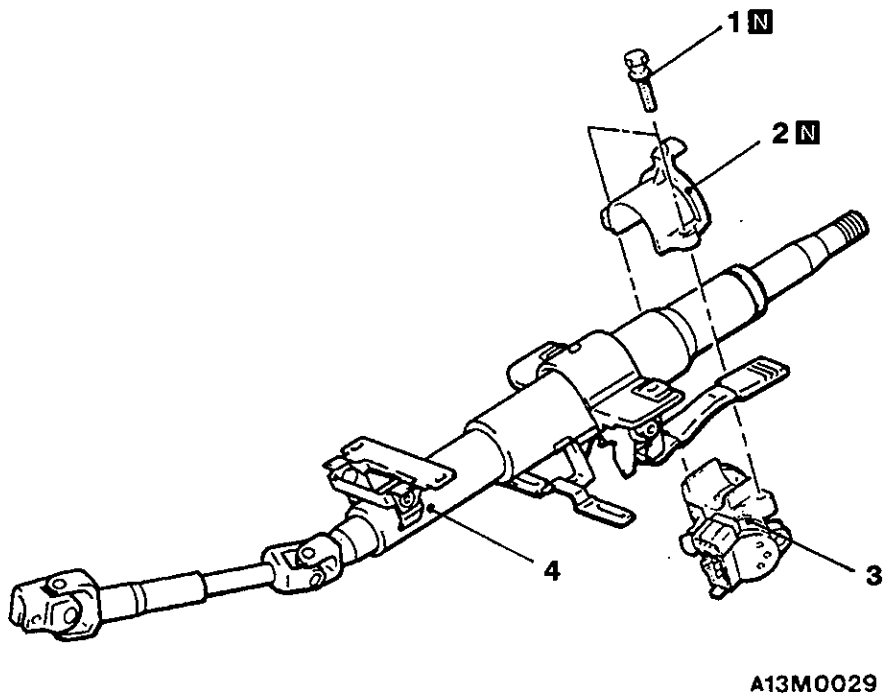
INSTALLATION SERVICE POINT

▶A◀ CLOCK SPRING AND COLUMN SWITCH/COLUMN SWITCH INSTALLATION

Tighten the screws in an alphabetical order.

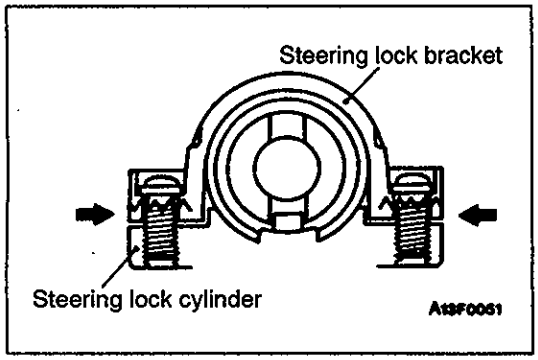
DISASSEMBLY AND REASSEMBLY

37200280108



Disassembly steps

◀A▶ ▶A◀ 1. Special bolt
▶A◀ 2. Steering lock bracket
▶A◀ 3. Steering lock cylinder
4. Steering shaft



DISASSEMBLY SERVICE POINT

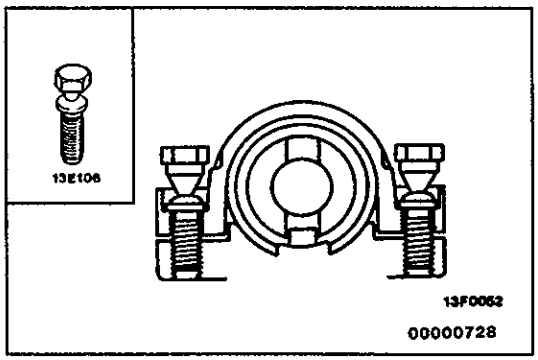
◀A▶ STEERING LOCK BRACKET/STEERING LOCK CYLINDER REMOVAL

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

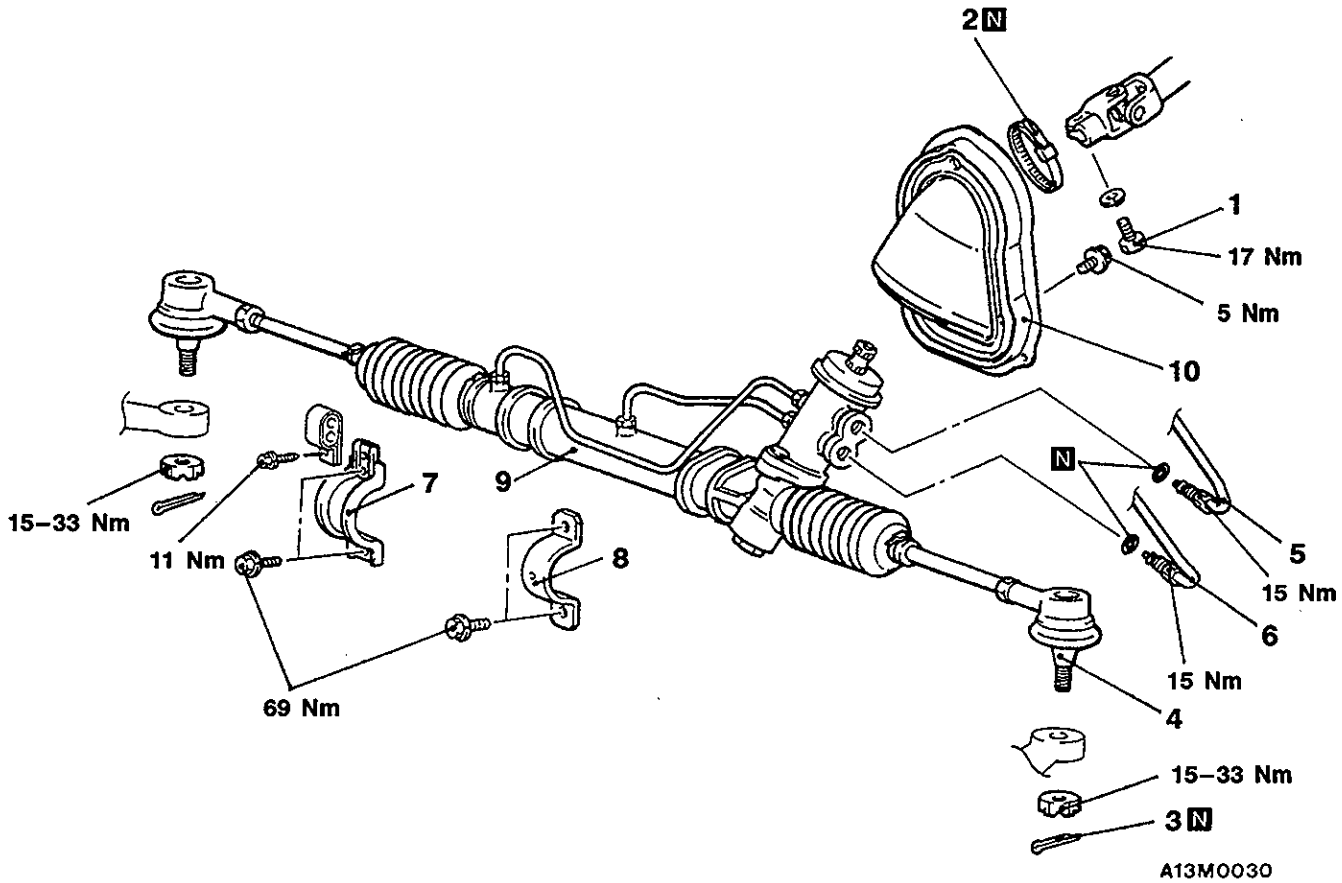
37200390108

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-9.)
(2) Center Member Removal (Refer to GROUP 32.)
(3) Front Exhaust Pipe Removal (Refer to GROUP 15.)

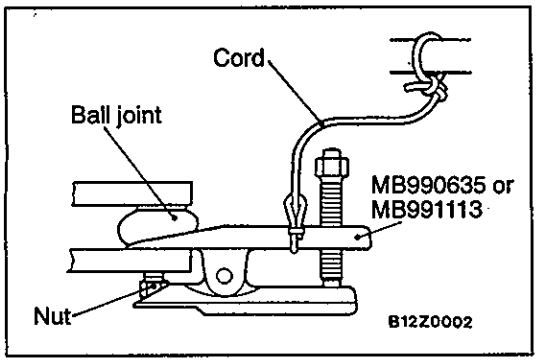
Post-installation Operation
(1) Front Exhaust Pipe Installation (Refer to GROUP 15.)
(2) Center Member Installation (Refer to GROUP 32.)
(3) Power Steering Fluid Supplying (Refer to P.37A-9.)
(4) Power Steering Fluid Line Bleeding (Refer to P.37A-9.)
(5) Checking Steering Wheel Position with Wheels Straight 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 tube connection
6. Pressure tube connection
7. Cylinder clamp
8. Gear housing clamp
9. Gear box assembly
10. Steering cover 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

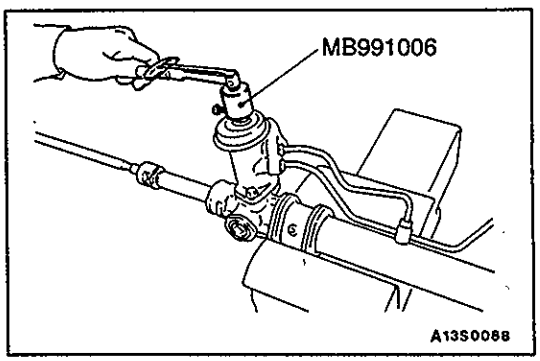
Caution

Be careful not to damage the bellows and the tie-rod end dust cover when removing the gear box assembly.

INSPECTION

37200400078

- 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 – 1.4 Nm
[Change in torque: 0.4 Nm]

Caution

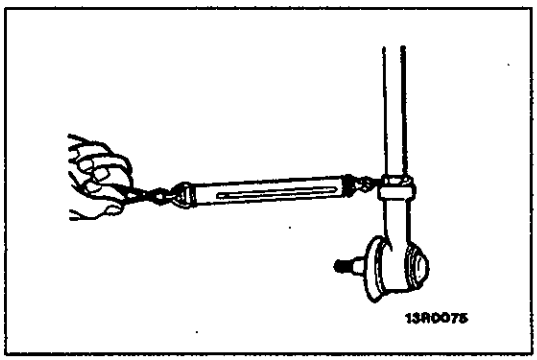
When holding the steering gear box assembly in a vice, secure its mounting positions. If it is secured in any other places, the gear housing may become deformed or damaged.

NOTE

When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.

If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion starting torque again.

If the total pinion starting torque cannot be adjusted to within the standard range by adjusting the rack support cover, check the rack support cover, rack support spring, rack support and replace any parts if necessary.



CHECK THE TIE ROD FOR SWING RESISTANCE

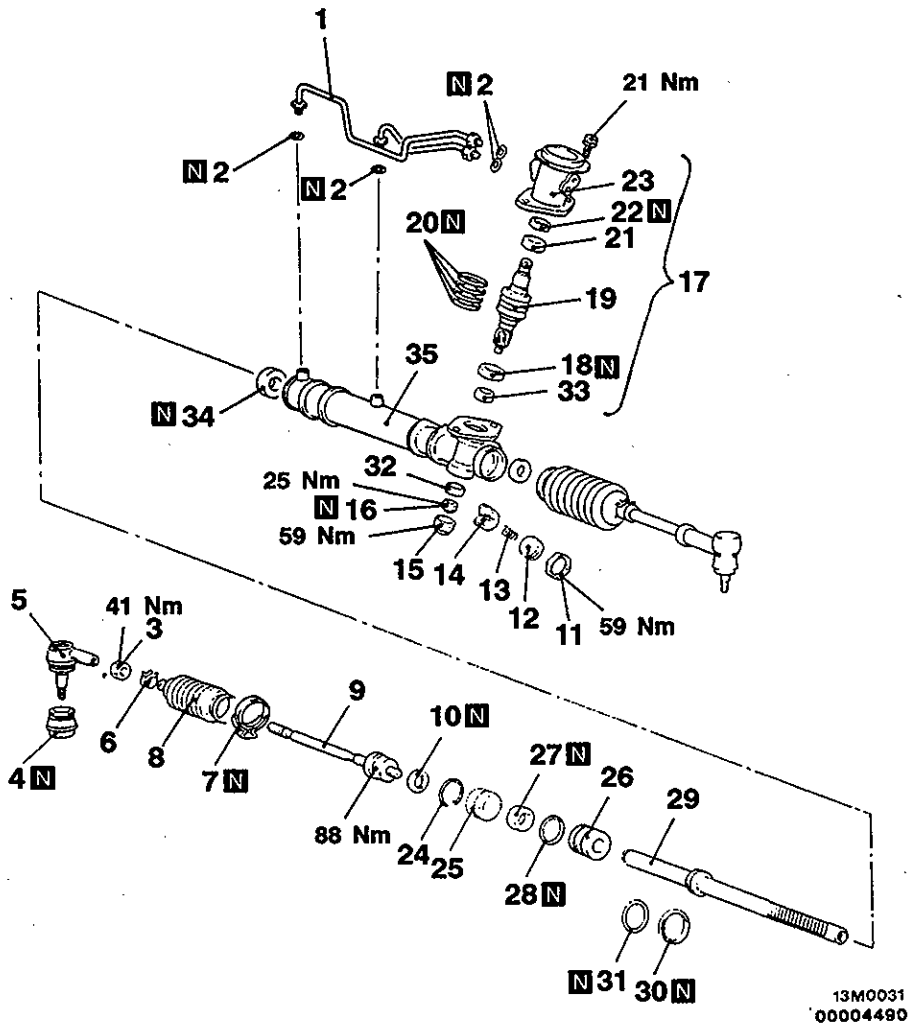
(1) Give 10 hard swings to the tie rod.
(2) Measure the tie rod swing resistance with a spring balance.

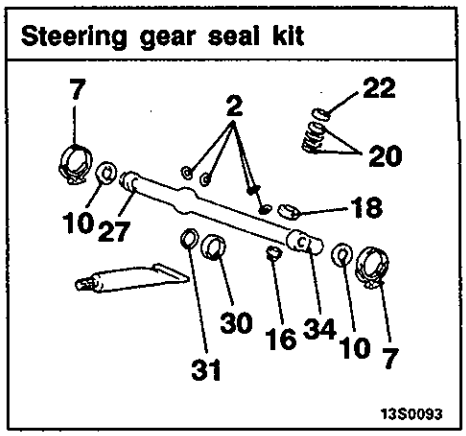
Standard value: 7–24 N [1.5–4.9 Nm]

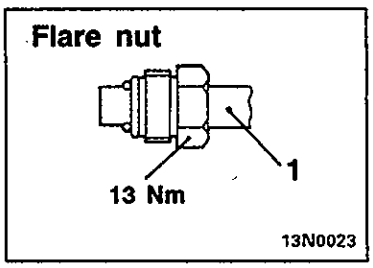
(3) If the measured value exceeds the standard value, replace tie rod.
(4) Even if the measured value is below the standard value, the tie rod which swings smoothly without excessive play may be used.

DISASSEMBLY AND REASSEMBLY

37200410088



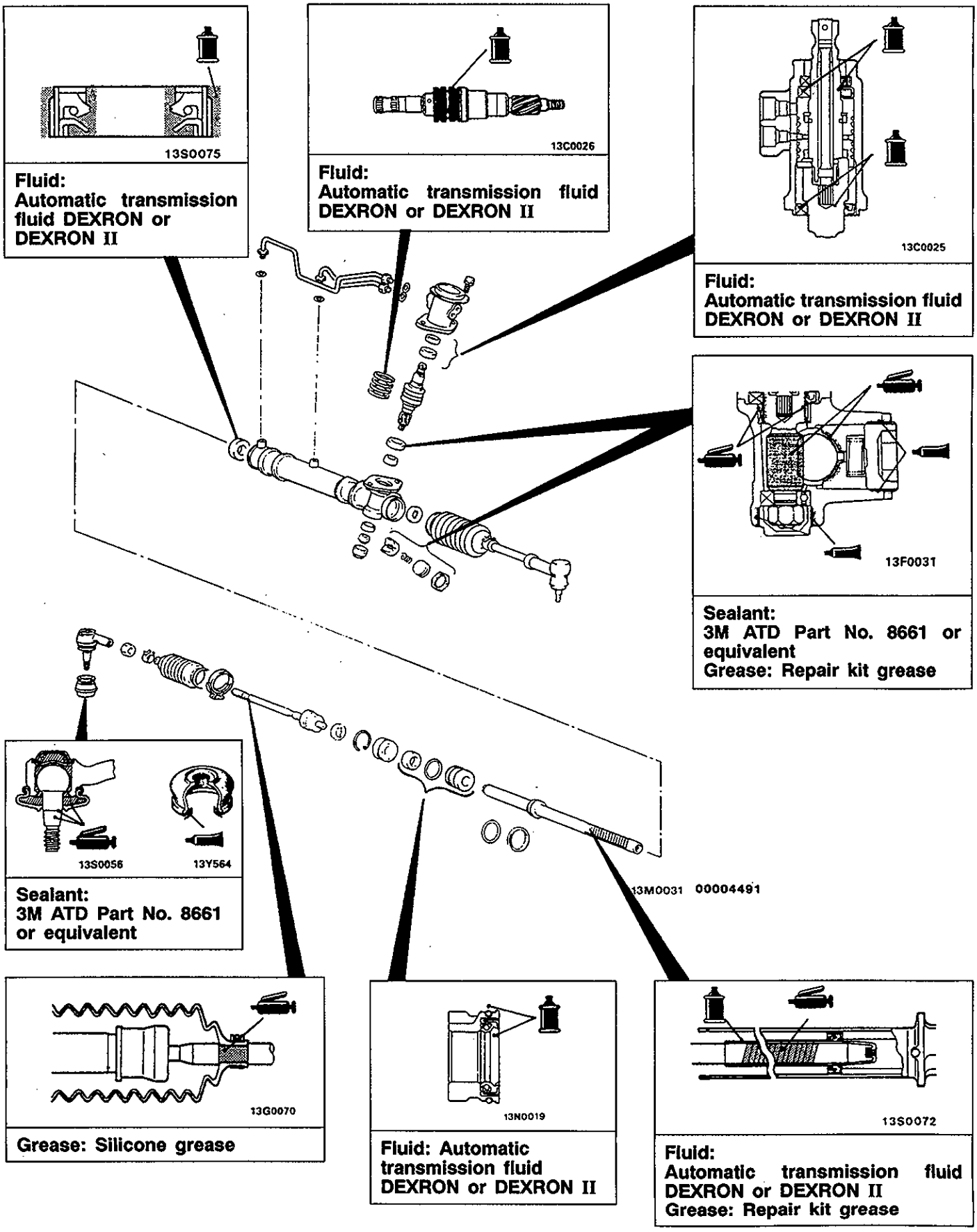


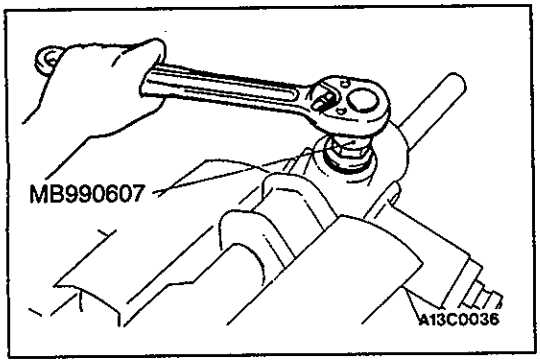


Disassembly steps

1. Feed pipe
2. O-ring
3. ▶N◀ Tie-rod end locking nut
4. ▶N◀ Tie-rod end
5. ▶M◀ Dust cover
6. Bellows clip
7. ▶L◀ Bellows band
8. Bellows
9. ▶K◀ Tie-rod
10. ▶K◀ Tab washer
- ▶J◀ • Total pinion torque adjustment
11. Locking nut
12. ◀A▶ Rack support cover
13. Rack support spring
14. Rack support
15. ▶I◀ End plug
16. Self-locking nut
17. Valve housing assembly
18. ◀B▶ ▶H◀ Oil seal
19. ◀B▶ Pinion and valve assembly
20. ◀C▶ ▶G◀ Seal ring
21. ◀D▶ ▶F◀ Ball bearing
22. ◀D▶ ▶F◀ Oil seal
23. Valve housing
24. ◀E▶ ▶E◀ Circlip
25. ◀F▶ Rack stopper
26. ◀F▶ ▶D◀ Rack bushing
27. ◀G▶ ▶D◀ Oil seal
28. O-ring
29. ◀F▶ ▶C◀ Rack
30. ◀C▶ Seal ring
31. O-ring
32. ◀H▶ ▶B◀ Ball bearing
33. ◀I▶ ▶B◀ Needle roller bearing
34. ◀J▶ ▶A◀ Oil seal
35. Rack housing

Lubrication and Sealing Points

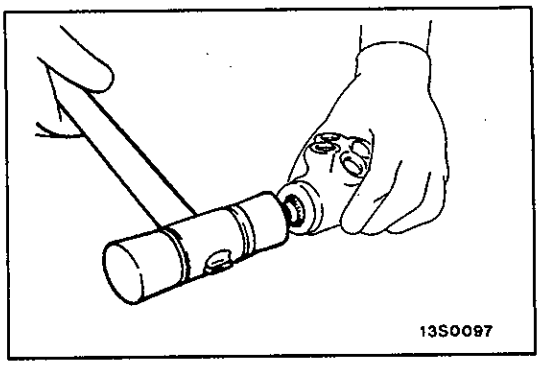




DISASSEMBLY SERVICE POINTS

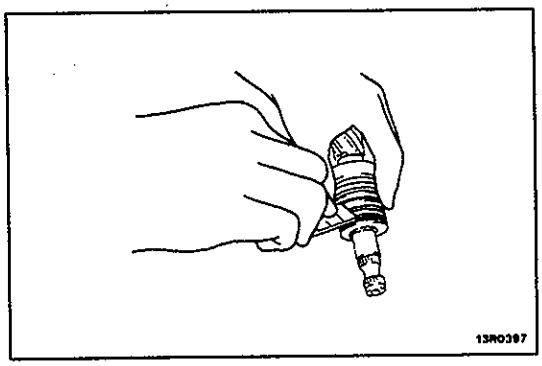
◀A▶ RACK SUPPORT COVER REMOVAL

Use the special tool to remove the rack support cover from the gear box.



◀B▶ OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL

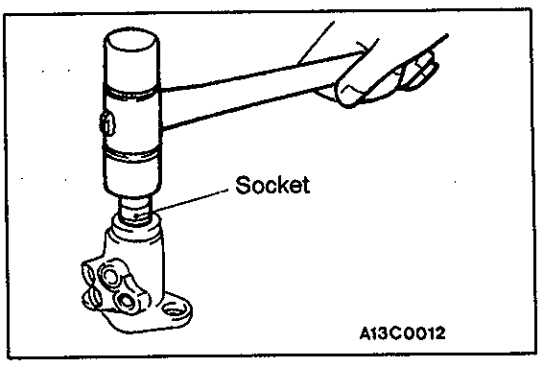
Using a plastic hammer, gently tap the pinion to remove it.



◀C▶ SEAL RING REMOVAL

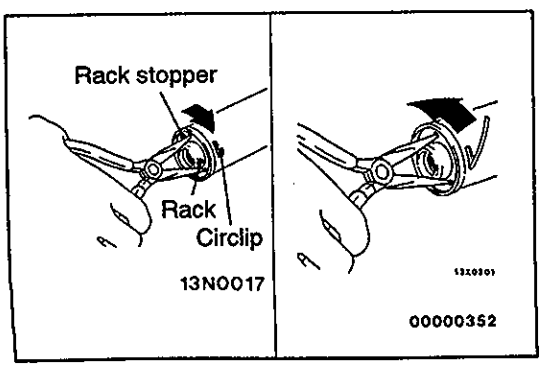
Cut the seal ring and remove it from the pinion and valve assembly and the rack.

Caution
When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.



◀D▶ BALL BEARING/OIL SEAL REMOVAL

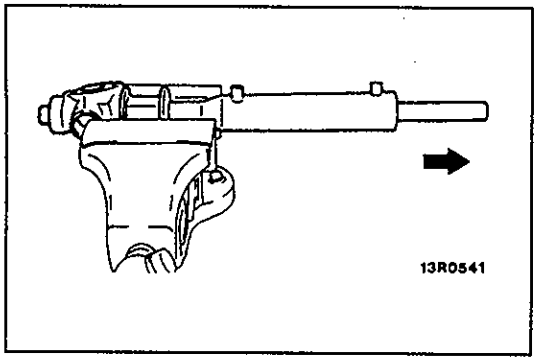
Use a socket, remove the oil seal and the ball bearing from the valve housing assembly simultaneously.



◀E▶ CIRCLIP REMOVAL

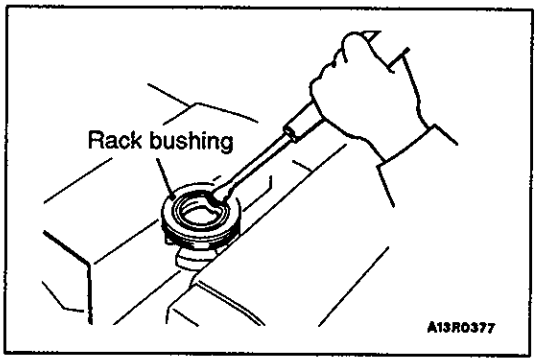
(1) Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the rack housing.
(2) Turn the rack stopper anticlockwise to remove the circlip.

Caution
Note that if the rack stopper is first turned anticlockwise, the circlip will get caught in the slot in the housing and the rack stopper will not turn.



◀F▶ RACK STOPPER/RACK BUSHING/RACK REMOVAL

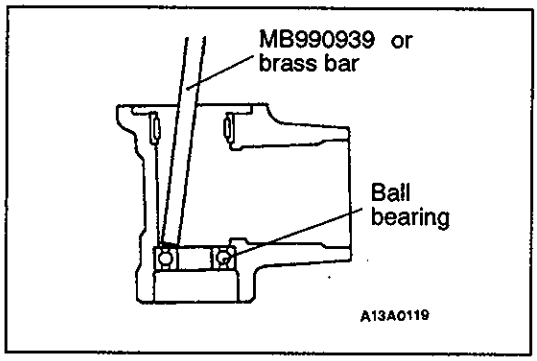
Pull out the rack assembly gently, and remove the rack stopper and rack bushing together.



◀G▶ OIL SEAL REMOVAL

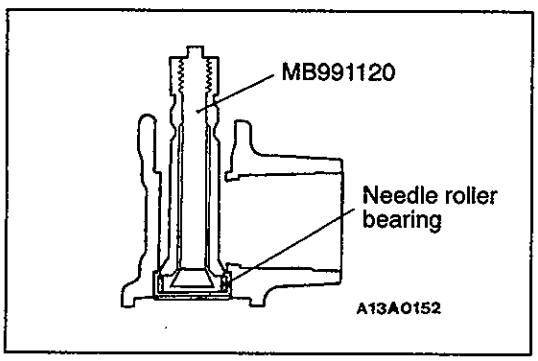
Partially bend the oil seal to remove from the rack bushing.

Caution
Do not damage the oil seal press fitting surface of the rack bushing.



◀H▶ BALL BEARING REMOVAL

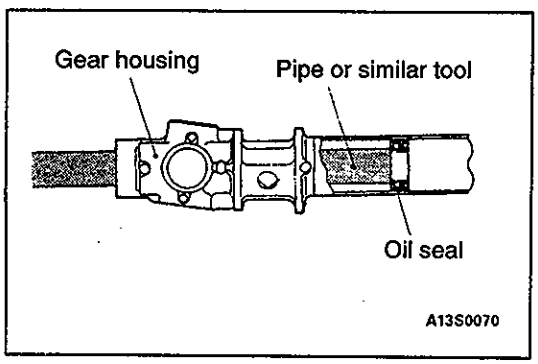
Use a brass bar or the special tool to remove the ball bearing from the gear housing.



◀I▶ NEEDLE ROLLER BEARING REMOVAL

Use the special tool to remove the needle roller bearing from the rack housing.

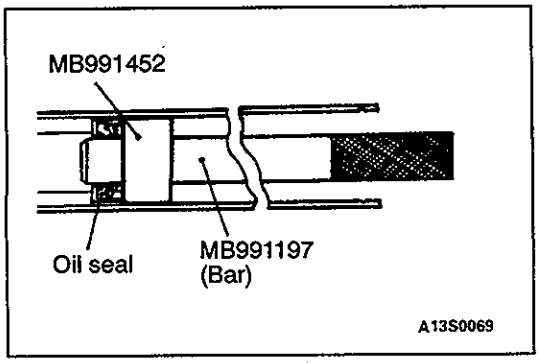
Caution
Do not open the special tool excessively to prevent damaging housing interior.



◀J▶ OIL SEAL REMOVAL

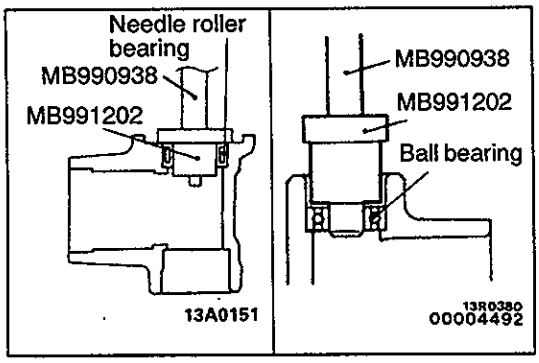
Use a piece of pipe or similar tool to remove the oil seal from the gear housing.

Caution
Be careful not to damage the inner surface of the rack cylinder of the gear housing.

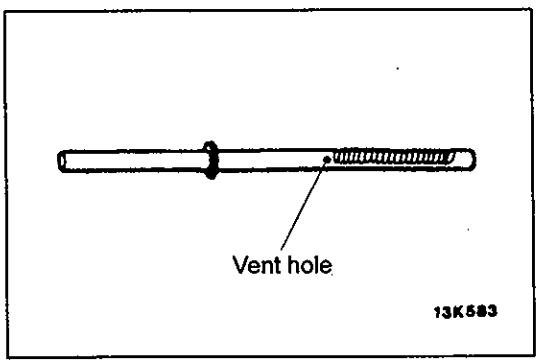


REASSEMBLY SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION



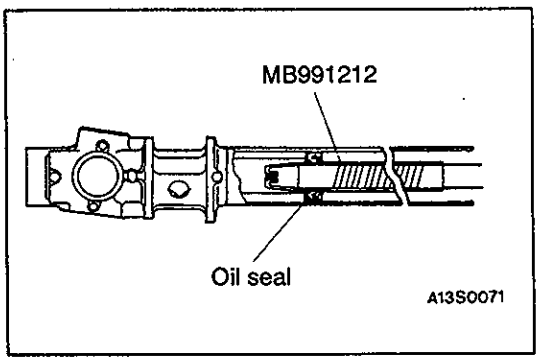
▶B◀ NEEDLE ROLLER BEARING/BALL BEARING INSTALLATION



▶C◀ RACK INSTALLATION

(1) Apply a coating of repair kit grease to the rack tooth face.

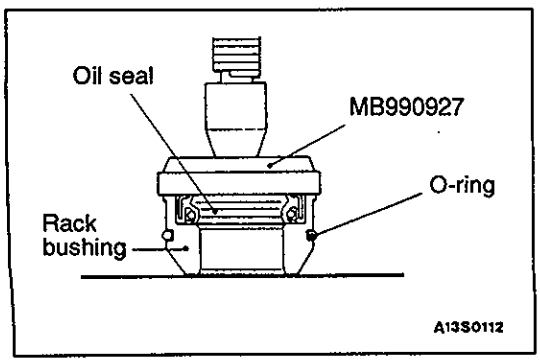
Caution
Do not close the vent hole in the rack with grease.



(2) Cover rack serrations with special tool.
(3) Apply the specified fluid on the special tool.

Specified fluid:
Automatic transmission fluid
DEXRON or DEXRON II

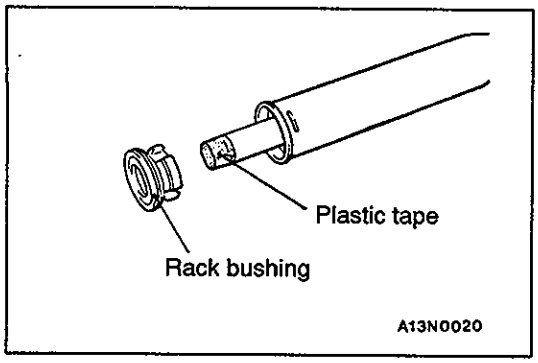
(4) Match the oil seal centre with rack to prevent retainer spring from slipping and slowly insert rack from power cylinder side.



▶D◀ OIL SEAL/RACK BUSHING INSTALLATION

(1) Apply the specified fluid to the outer surface of the oil seal. Press-fit the oil seal using the special tool until it is flush with the bushing end face.

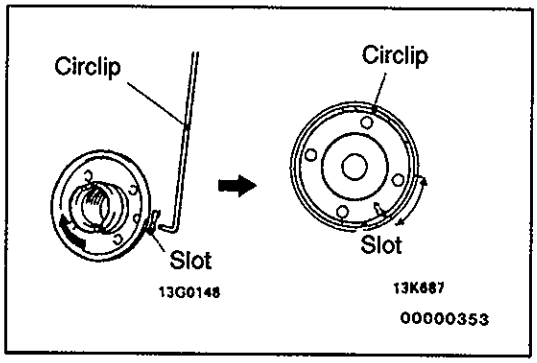
Specified fluid:
Automatic transmission fluid
DEXRON or DEXRON II



(2) Apply the specified fluid to the oil seal inner surface and the O-ring.

Specified fluid:
Automatic transmission fluid
DEXRON or DEXRON II

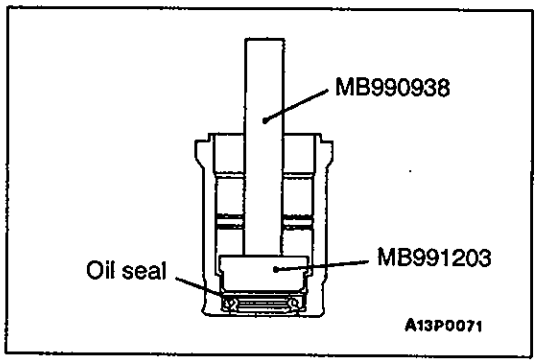
(3) Wrap the rack end with plastic tape, and push the rack bushing onto the rack.



▶E◀ CIRCLIP INSTALLATION

Insert the circlip to the rack stopper hole through the cylinder hole. Turn the rack stopper clockwise and insert the circlip firmly.

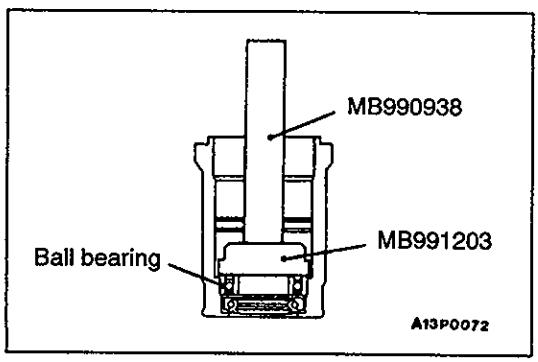
Caution
Insert the circlip to the rack stopper hole while turning the rack stopper clockwise.



▶F◀ OIL SEAL/BALL BEARING INSTALLATION

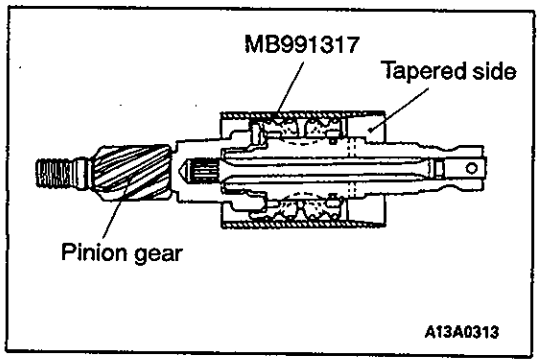
(1) Apply a coating of the specified fluid to the outside of the oil seal. Using the special tools, press the oil seal into the valve housing.

Specified fluid:
Automatic transmission fluid
DEXRON or DEXRON II



(2) Apply a coating of the specified fluid to the outside of the ball bearing. Using the special tools, press the ball bearing into the valve housing.

Specified fluid:
Automatic transmission fluid
DEXRON or DEXRON II

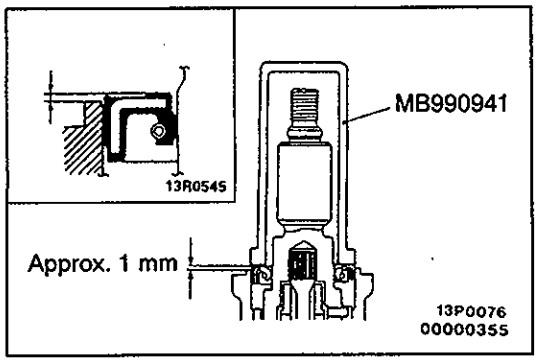


▶G◀ SEAL RING INSTALLATION

(1) Kneed the seal ring to soften it.
(2) Apply the specified fluid to the seal ring, and install to the rack groove.

Specified fluid:
Automatic transmission fluid
DEXRON or DEXRON II

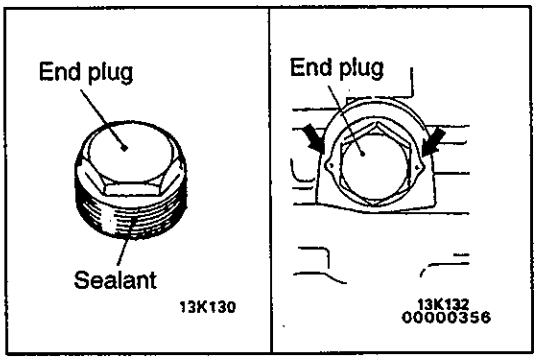
(3) Insert the tapered side of the special tool from the pinion gear side, and compress the seal ring.



▶H◀ OIL SEAL INSTALLATION

Use the special tool to press the oil seal into the valve housing. The upper surface of the oil seal should project outwards approx. 1 mm from the housing edge surface.

Caution
If the oil seal is flush with or lower than the housing edge, it will cause oil leaks and require reassembly.

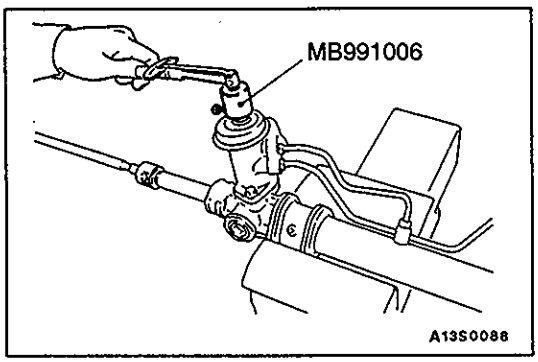


▶I◀ END PLUG INSTALLATION

(1) Apply the specified sealant to the threaded part of the end plug.

Specified sealant:
3M ATD Part No.8661 or equivalent

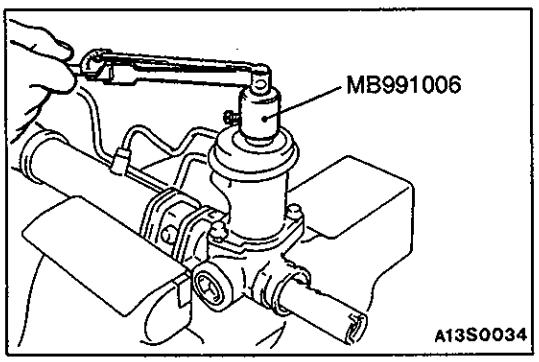
(2) Secure the threaded portion of the end plug at two places by using a punch.



▶J◀ TOTAL PINION TORQUE ADJUSTMENT

(1) Position the rack at its centre. Tighten the rack support cover to 15 Nm.

(2) In neutral position, rotate the pinion shaft clockwise one turn/4 – 6 seconds with the special tool. Return the rack support cover 30° – 60° and adjust torque to the standard value.



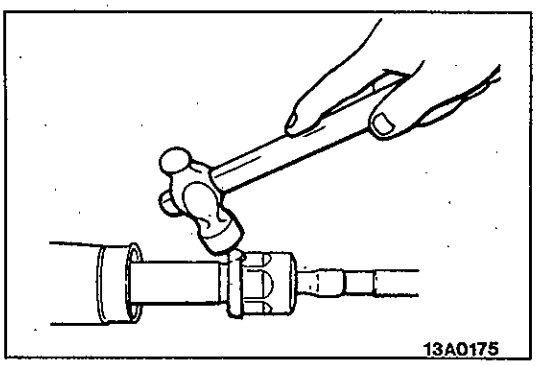
(3) Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value: 0.6 – 1.4 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 the rack towards the shaft direction.**

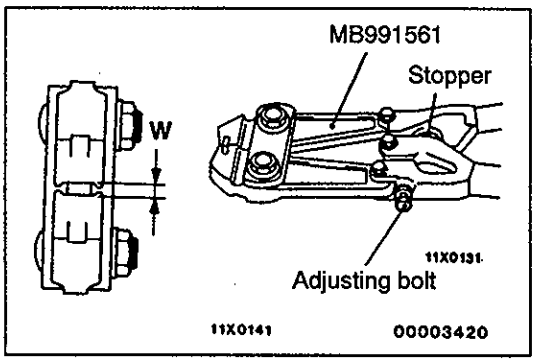
NOTE
When it cannot be adjusted within the specified return angle, check or replace the rack support cover components.

(4) After adjusting, lock the rack support cover with lock nut.



▶K◀ TAB WASHER/TIE-ROD INSTALLATION

After installing the tie-rod to the rack, fold the tab washer end (2 locations) to the tie-rod notch.

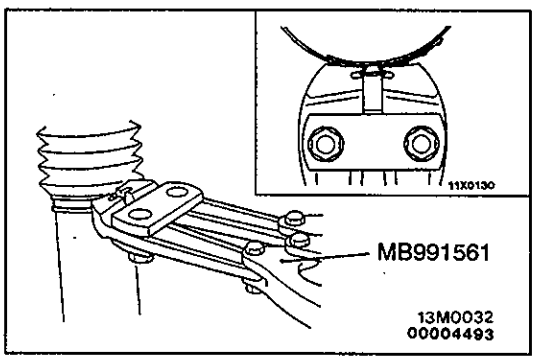


▶L◀ BELLOWS BAND INSTALLATION

(1) Turn the adjusting bolt of the special tool to adjust the opening dimension (W) to the standard value.

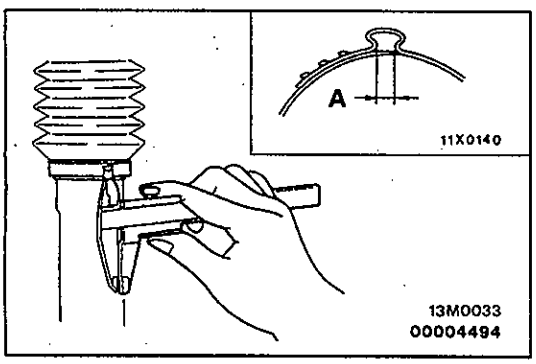
Standard value (W): 2.9 mm
<When more than 2.9 mm>
Screw in the adjusting bolt.
<When less than 2.9 mm>
Loosen the adjusting bolt.

NOTE
(1) The dimension (W) is adjusted by approx. 0.7 mm per one turn.
(2) Do not turn the adjusting bolt more than one turn.



(2) Use the special tool to crimp the bellows band.

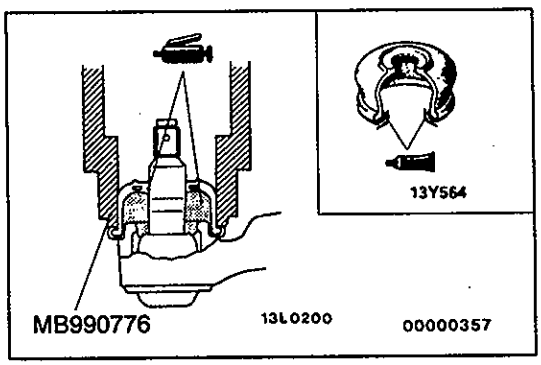
Caution
(1) Hold the rack housing, and use the special tool to crimp the bellows band securely.
(2) Crimp the bellows band until the special tool touches the stopper.



(3) Check that the crimped width (A) is within the standard value.

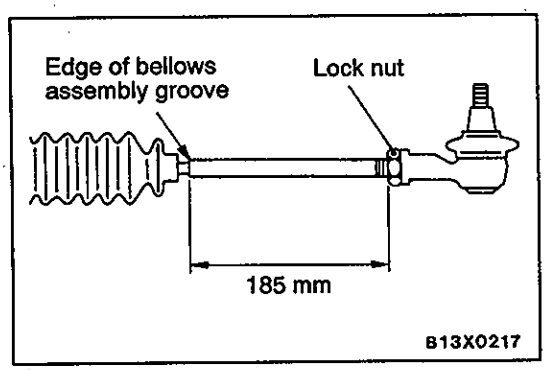
Standard value (A): 2.4 – 2.8 mm
<When more than 2.8 mm>
Readjust the dimension (W) of step (1) to the value calculated by the following equation, and repeat step (2).
W = 5.5 mm – A [Example: If (A) is 2.9 mm, (W) is 2.6 mm.]

<When less than 2.4 mm>
Remove the bellows band, readjust the dimension (W) of step (1) to the value calculated by the following equation, and use a new bellows band to repeat steps (2) to (3).
W = 5.5 mm – A [Example: If (A) is 2.3 mm, (W) is 3.2 mm.]



▶M◀DUST COVER INSTALLATION

(1) Pack the dust cover interior with multipurpose grease.
(2) Apply the specified sealant to the dust cover lip.
Specified sealant: 3M ATD Part No.8661 or equivalent
(3) Using the special tool, install the dust cover to the tie-rod end ball joint.



▶N◀TIE-ROD END/TIE-ROD END LOCKING NUT INSTALLATION

Screw in the tie-rod end to have its right and left length as illustrated. Lock with lock nut.

INSPECTION

37200440070

RACK CHECK

- Check the rack tooth surfaces for damage or wear.
- Check the oil seal contact surfaces for uneven wear.
- Check the rack for bends.

PINION AND VALVE ASSEMBLY CHECK

- Check the pinion gear tooth surfaces for damage or wear.
- Check for worn or defective seal ring.

BEARING CHECK

- Check for roughness or abnormal noise during bearing operation.
- Check the bearing for play.
- Check the needle roller bearing for roller slip-off.

OTHER CHECK

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

POWER STEERING OIL PUMP

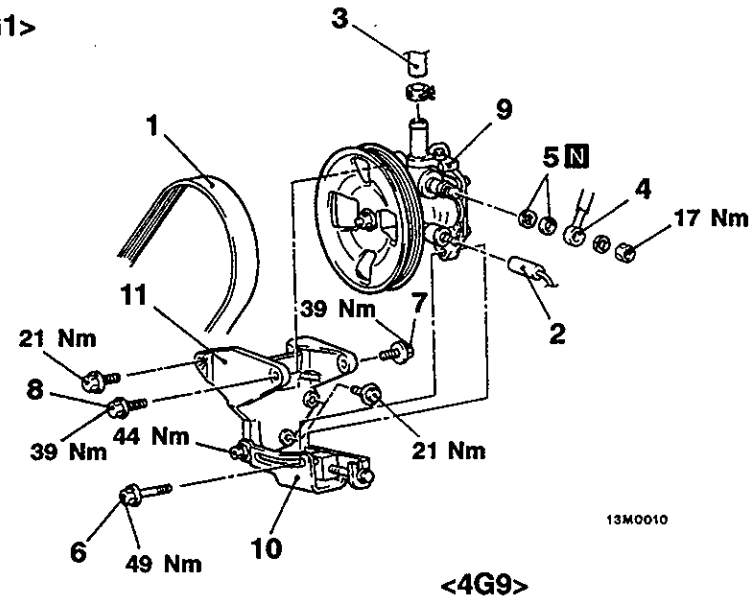
37200520132

REMOVAL AND INSTALLATION

Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-9.)

Post-installation Operation
- Power Steering Fluid Supplying (Refer to P.37A-9.)
- Drive Belt Tension Adjusting (Refer to GROUP 11 – On-vehicle Service.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-9.)
- Oil Pump Pressure Check (Refer to P.37A-11.)

<4G1>



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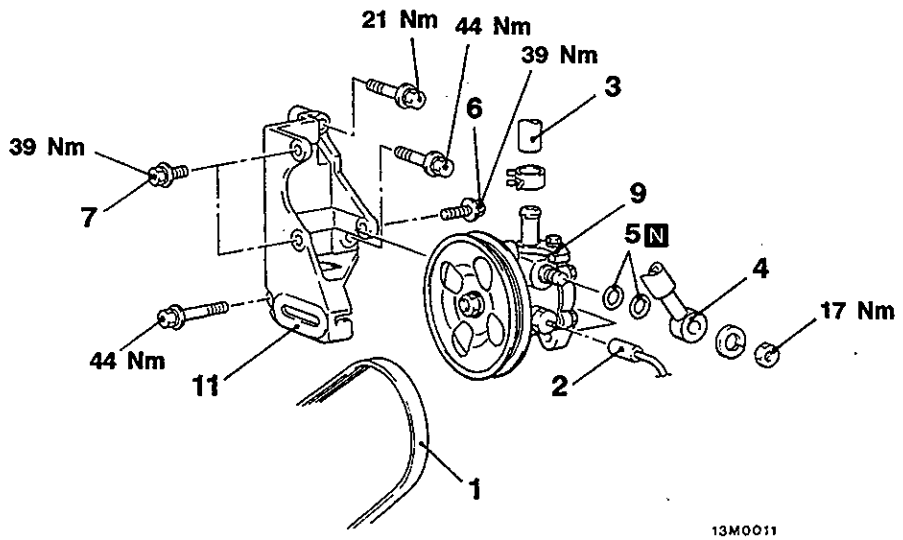
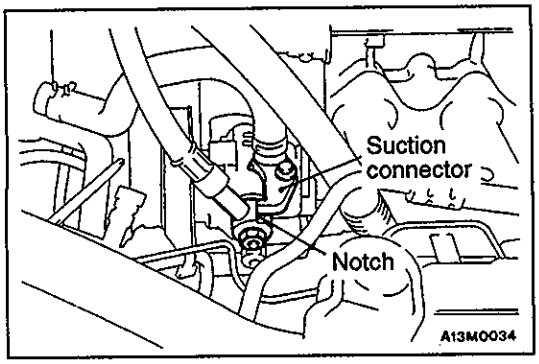


Removal steps

1. Drive belt
2. Pressure switch connector
3. Suction hose
▶A◀ 4. Pressure hose
5. O-ring
6. Bolt
7. Bolt
8. Bolt
9. Oil pump
10. Oil pump brace
11. Oil pump bracket



INSTALLATION SERVICE POINT

▶A◀ PRESSURE HOSE INSTALLATION

Connect the pressure hose so that its notch part contacts the suction connector.

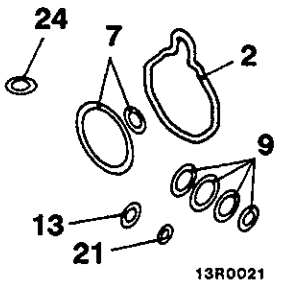
INSPECTION

37200530036

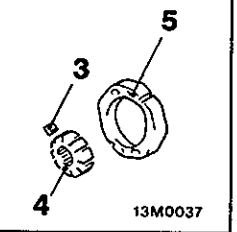
- Check the drive belt for cracks.
- Check the pulley assembly for uneven rotation.

DISASSEMBLY AND REASSEMBLY

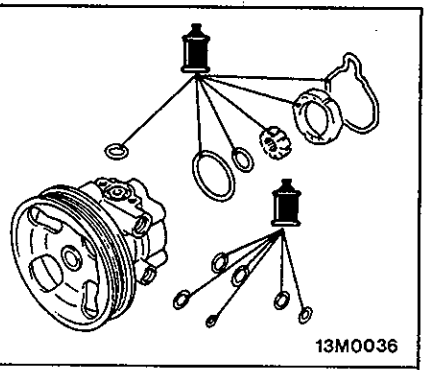
37200540107



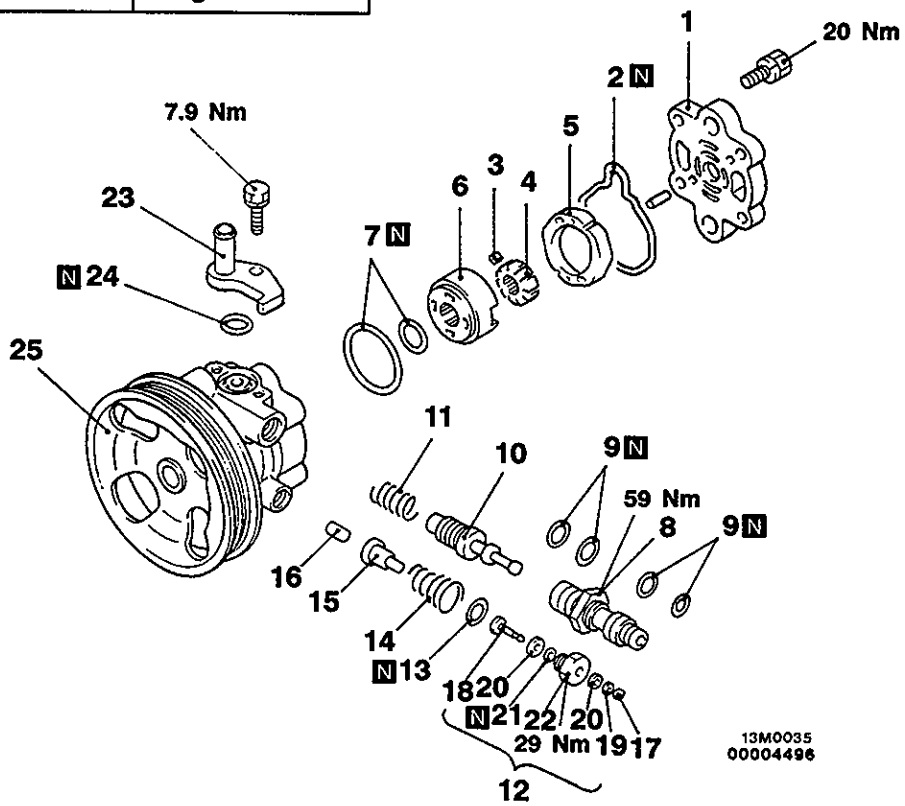
Oil pump seal kit



Oil pump cartridge kit



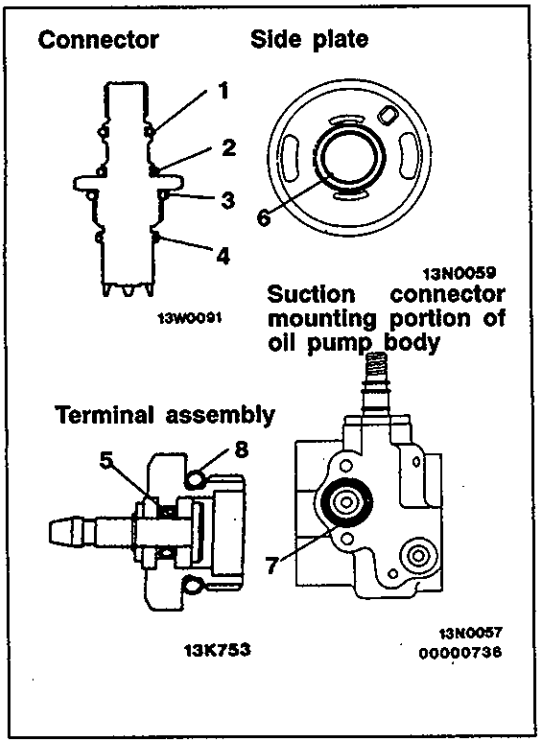
Fluid: Automatic transmission fluid DEXRON or DEXRON II



Disassembly steps

1. Pump cover
2. O-ring
3. ▶E◀ Vanes
4. Rotor
5. ▶D◀ Cam ring
6. ▶C◀ Side plate
7. ▶A◀ O-ring
8. Connector
9. ▶A◀ O-ring
10. Flow control valve
11. Flow control spring
12. Terminal assembly
13. ▶A◀ O-ring
14. ▶B◀ Spring
15. Plunger
16. Piston rod
17. Snap ring
18. Terminal
19. Washer
20. Insulator
21. ▶A◀ O-ring
22. Plug
23. Suction connector
24. ▶A◀ O-ring
25. Oil pump body and pulley assembly

Caution
Do not disassemble the flow control valve.

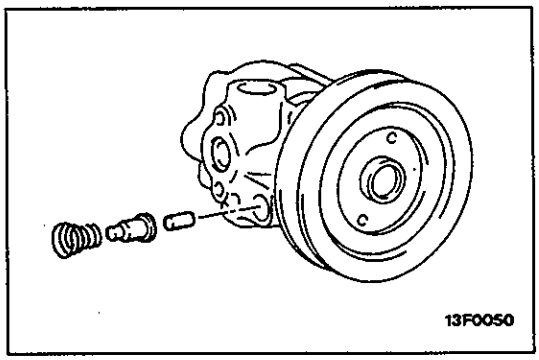


REASSEMBLY SERVICE POINTS

▶A◀ O-RINGS INSTALLATION

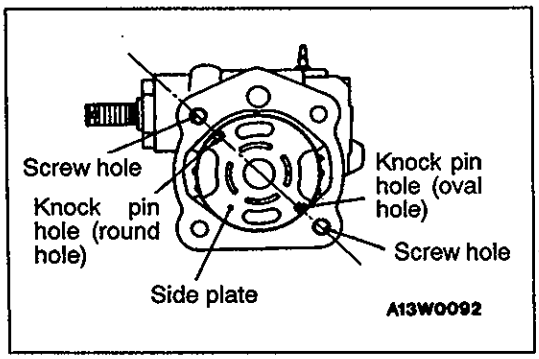
Apply the specified fluid on O-rings to install.

No.	I.D. × Width mm
1	11 × 1.9
2	13 × 1.9
3	17.8 × 2.4
4	13.5 × 1.5
5	3.8 × 1.9
6	16.8 × 2.4
7	17.8 × 2.4
8	13.0 × 1.9



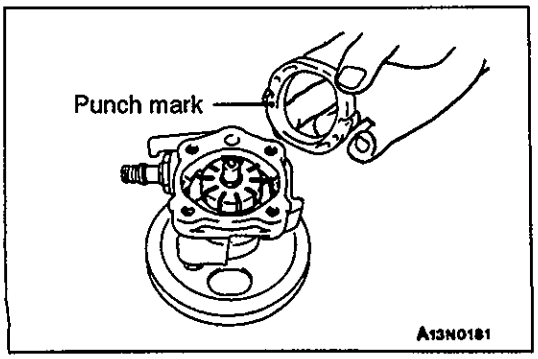
▶B◀ SPRING INSTALLATION

Fit the spring to the oil pump body with the larger diameter end at the terminal assembly side.



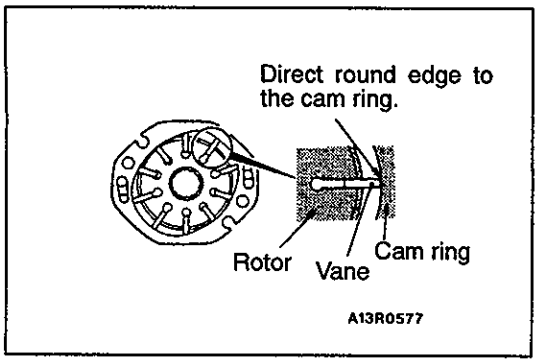
▶C◀ SIDE PLATE INSTALLATION

Install the side plate so that the screw hole in the oil pump body and the knock pin holes in the side plate are all in a straight line.



▶D◀ CAM RING INSTALLATION

Install the cam ring with the punch mark facing the side plate.



▶E◀ VANE INSTALLATION

Install the vanes on the rotor, paying close attention to the installation direction.

INSPECTION

37200550087

- Check the flow control valve for clogging.
- Check the pulley assembly for wear or damage.
- Check the groove of rotor and vanes for "stepped" wear.
- Check the contact surface of cam ring and vanes for "stepped" wear.
- Check the vanes for damage.

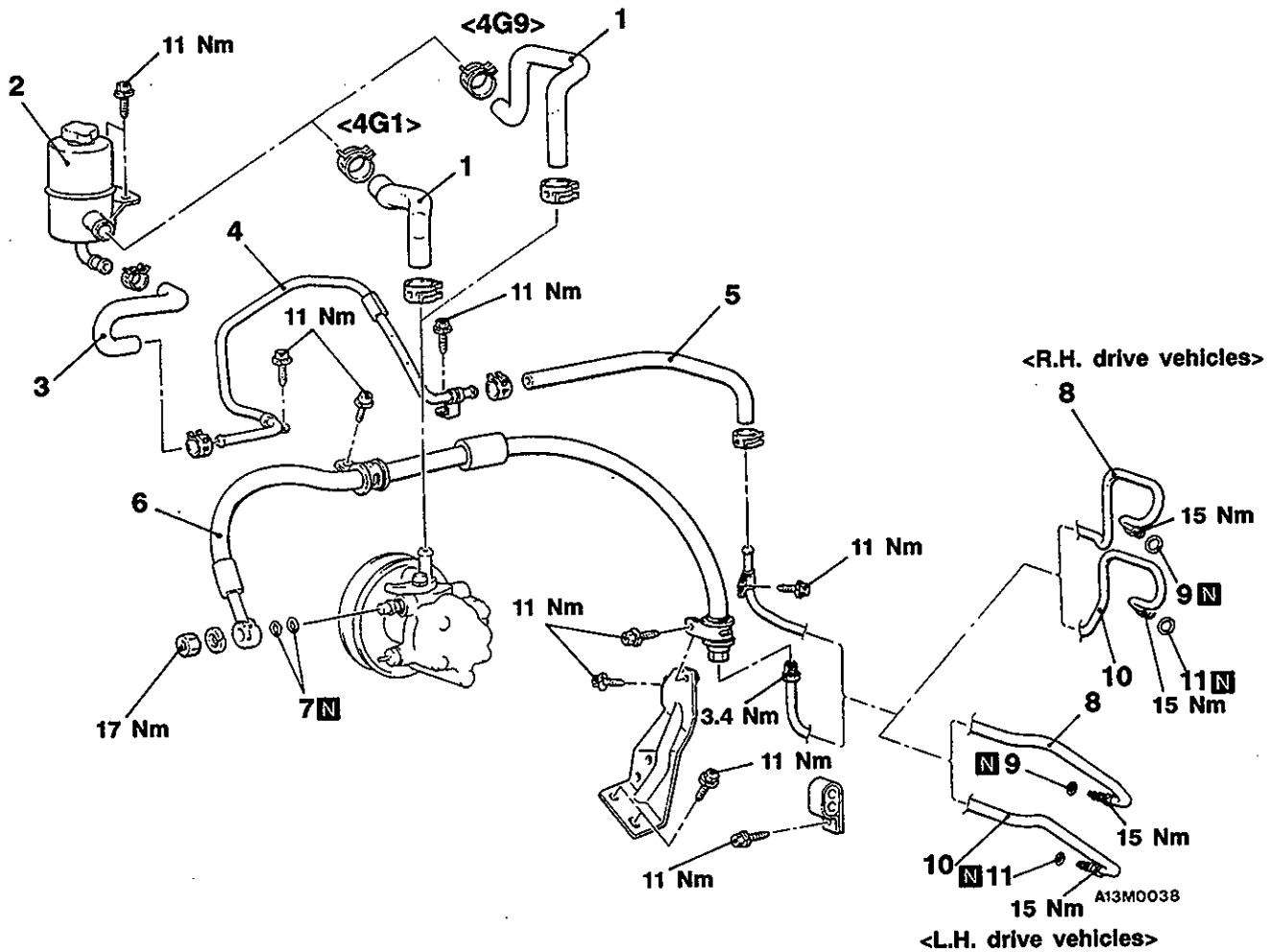
POWER STEERING HOSES

37200570137

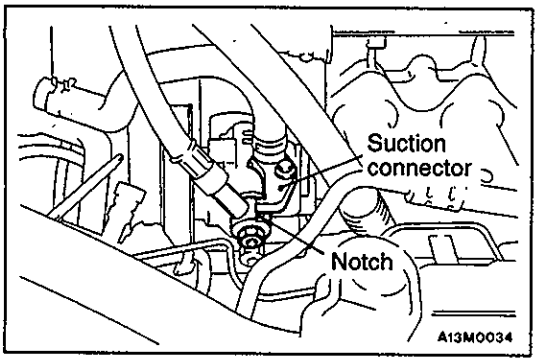
REMOVAL AND INSTALLATION

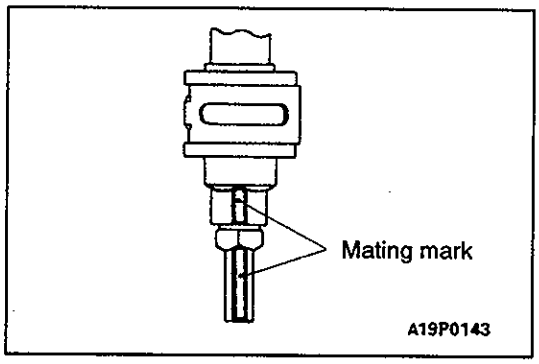
Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-9.)

Post-installation Operation
- Power Steering Fluid Supplying (Refer to P.37A-9.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-9.)



1. Suction hose
2. Oil reservoir
3. Return hose
4. Return tube
5. Return hose
▶A◀ 6. Pressure hose
7. O-ring
8. Return tube
9. O-ring
▶A◀ 10. Pressure tube
11. O-ring





INSTALLATION SERVICE POINT

▶A◀ PRESSURE HOSE/PRESSURE TUBE INSTALLATION

(1) Connect the pressure hose so that its notch part contacts the suction connector.

(2) Align the marks on the pressure hose and pressure tube, and install the pressure hose.

BODY

CONTENTS

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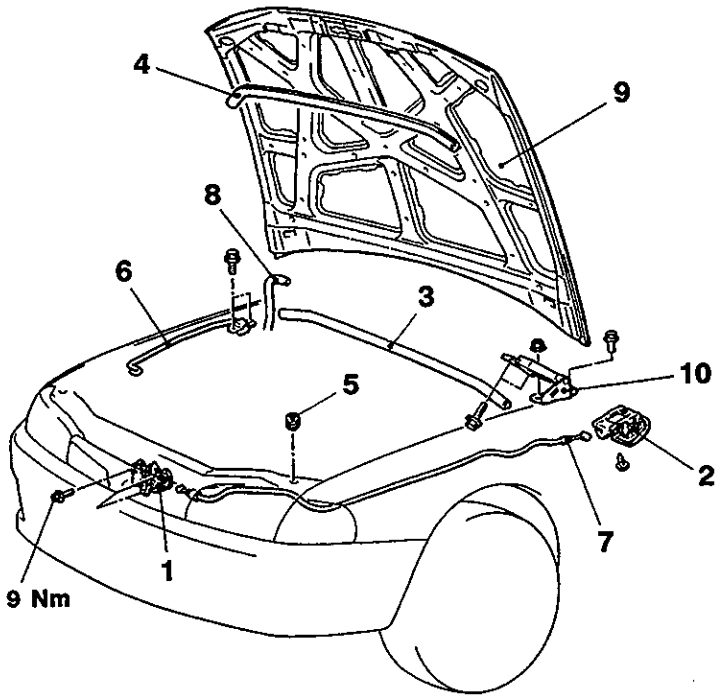
CONTINUED ON NEXT PAGE

HOOD

42100160113

REMOVAL AND INSTALLATION



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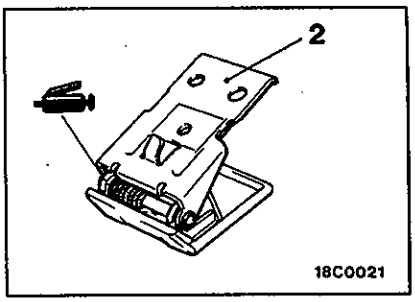
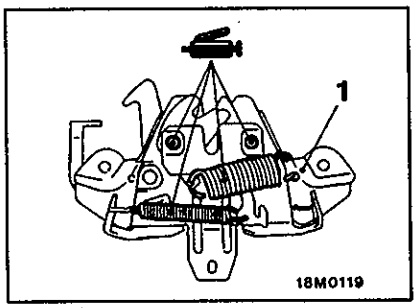
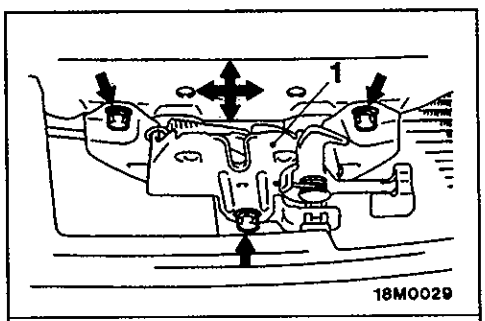
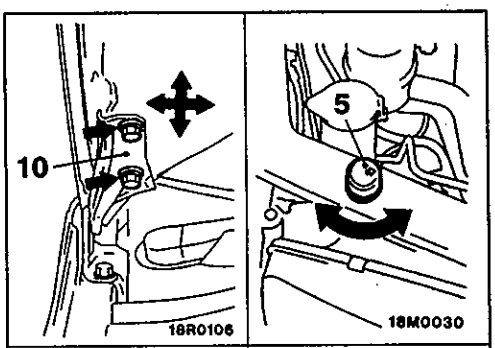






Adjustment of hood step and hood striker linkage



Adjustment of clearance and height around hood

1. Hood latch
2. Hood lock release handle
3. Hood weatherstrip
4. Hood weatherstrip
   <Vehicles with air conditioner>
5. Bumper
6. Hood support rod

Hood lock release cable removal steps

- Splash shield <Driver's side>
  (Refer to P.42-7.)

7. Hood lock release cable

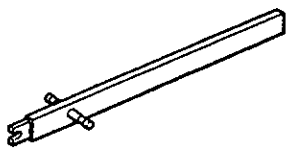
Hood and hood hinge removal steps

8. Washer hose connection
9. Hood
10. Hood hinge

TRUNK LID <Sedan>

42100060062

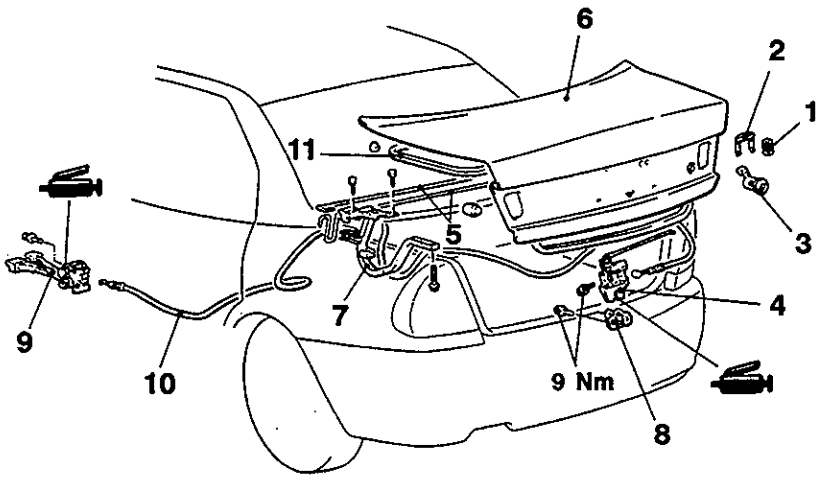
SPECIAL TOOL

Tool	Number	Name	Use
	MB991244	Torsion bar remover and installer	Removal and installation of trunk lid torsion bar

TRUNK LID

42100220057

REMOVAL AND INSTALLATION



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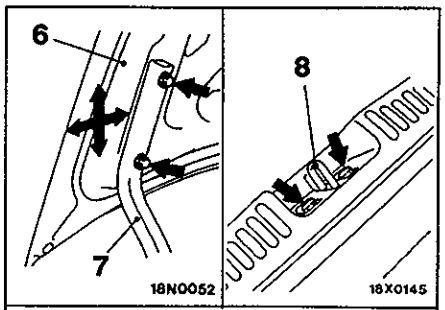


Adjustment of clearance around trunk lid and trunk lid striker linkage

Trunk lid panel removal steps

- Licence plate lamp
- Rear lid garnish

▶C◀ 1. Bumper
2. Cylinder lock retainer
3. Trunk lid lock cylinder
4. Trunk lid latch
◀A▶ ▶B◀ 5. Trunk lid torsion bar
6. Trunk lid panel

Trunk lid latch removal

4. Trunk lid latch

Trunk lid hinge removal steps

- Rear shelf trim (Refer to GROUP 52A.)

6. Trunk lid panel assembly
7. Trunk lid hinge

Trunk lid striker removal steps

- Rear end trim (Refer to GROUP 52A.)

8. Trunk lid striker

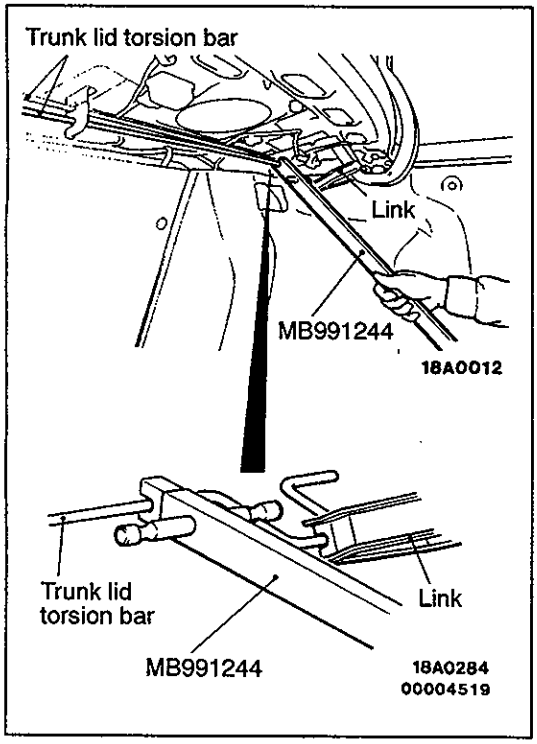
Trunk lid release handle and cable removal steps

- Front seat (driver's side) (Refer to GROUP 52A.)
- Rear seat (Refer to GROUP 52A.)
- Front scuff plate (driver's side) (Refer to GROUP 52A.)
- Rear scuff plate (driver's side) (Refer to GROUP 52A.)
- Trunk room side trim (driver's side) (Refer to GROUP 52A.)

4. Trunk lid latch
9. Trunk lid release handle
10. Trunk lid release cable

Trunk lid weatherstrip removal

▶A◀ 11. Trunk lid weatherstrip removal



REMOVAL SERVICE POINT

◀A▶ TRUNK LID TORSION BAR REMOVAL

1. Disconnect the body harness and the harness connector of the rear shelf lower panel.
2. Install the special tool as shown in the illustration, and then remove the torsion bar from the link while pushing the special tool downwards. Next, repeat the procedure from the other side.

Caution
Be sure to attach the special tool properly, as the body or parts could be damaged when the torsion bar is removed from the special tool.

INSTALLATION SERVICE POINTS

▶A◀ TRUNK LID WEATHER STRIP INSTALLATION

Install the trunk lid weatherstrip so that the marking and the joint are aligned with the body centre line.

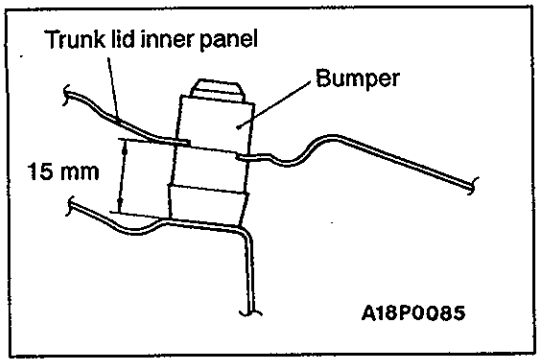
▶B◀ TRUNK LID TORSION BAR INSTALLATION

1. Check the colour of the identification mark at the middle of the torsion bars to make sure that the correct torsion bars are being used.

Torsion bar	Identification colour	
	Vehicles without rear spoiler	Vehicles with rear spoiler
L.H.	–	Green
R.H.	Red	Yellow

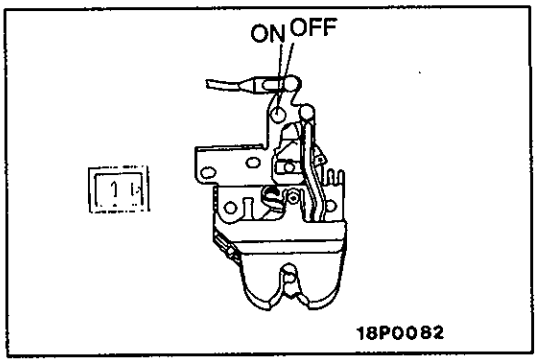
2. Insert the end of the torsion bar through the link side mating hole.
3. Install the special tool in the same way as when removing the torsion bar, and then twist the torsion bar while hooking it onto the link. After this, hook the torsion bar onto the holder.

Caution
Be sure to attach the special tool properly, as the body or parts could be damaged when the torsion bar is removed from the special tool.



▶C◀ BUMPER INSTALLATION

Install the bumper as shown in the figure.



INSPECTION

42100410027

TRUNK LID LATCH CONTINUITY CHECK

Switch position	Terminal No.1	Body earth
ON (Latch open)	○	○
OFF (Latch shut)		

FENDER

42100050045

SEALANT

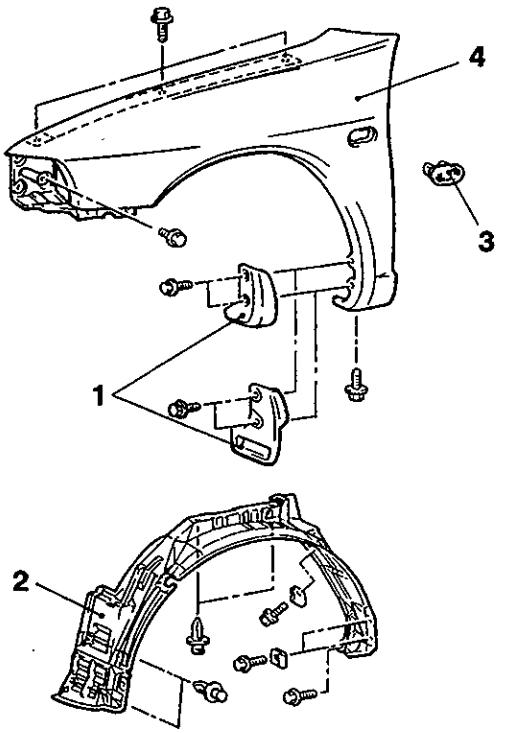
Item	Specified sealant	Remark
Splash shield	3M ATD Part No. 8625 or equivalent	Ribbon sealer

FENDER

42100190112

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Front Bumper Removal and Installation (Refer to GROUP 51.)
(2) Front Turn-signal Lamp Removal and Installation (Refer to GROUP 54.)
(3) Side Airdam Removal and Installation (Refer to GROUP 51 – Aero Parts.)



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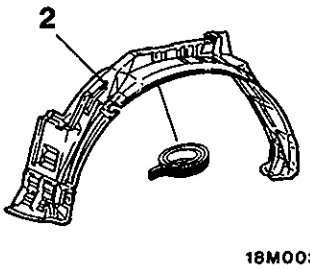
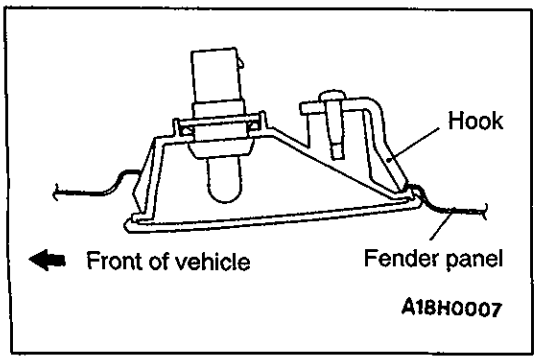


18M0035

Sealant: 3M ATD Part No. 8625 or equivalent

Removal steps
1. Stone guard or mud guard
2. Splash shield
▶A◀ 3. Side turn signal lamp
4. Fender



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INSTALLATION SERVICE POINT

▶A◀SIDE TURN-SIGNAL LAMP INSTALLATION

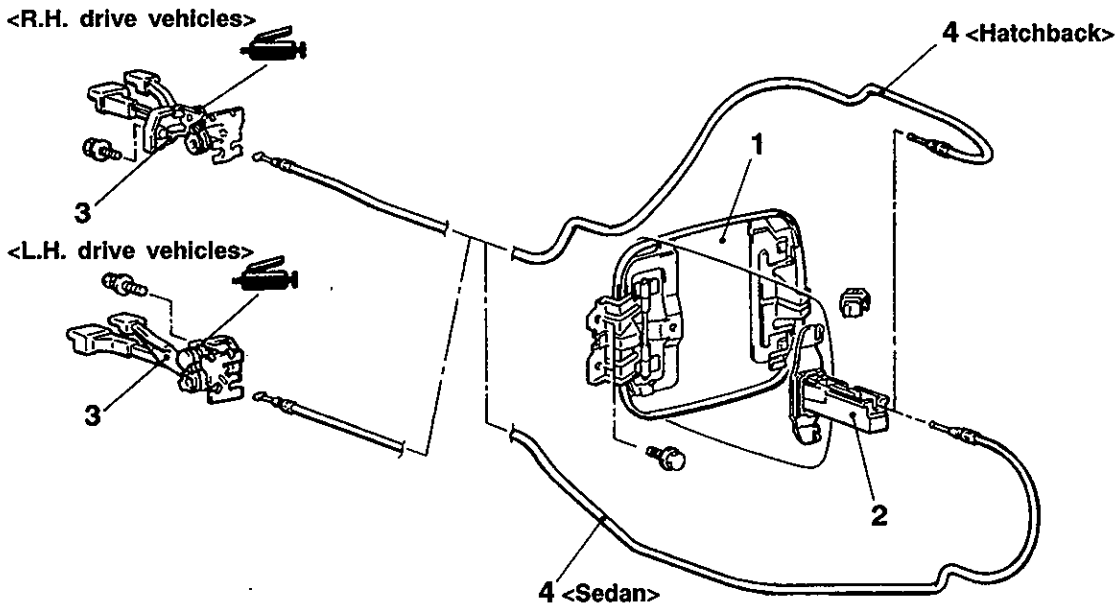
Insert the hook into the fender panel, and then install the side turn signal lamp.

FUEL FILLER DOOR

42100250117

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) Front Scuff Plate (driver's side), Rear Scuff Plate (driver's side), Center Pillar Lower Trim (driver's side), Quarter Trim (driver's side) <Hatchback>, Trunk Side Trim (driver's side) <Sedan> Removal and Installation (Refer to GROUP 52A.)



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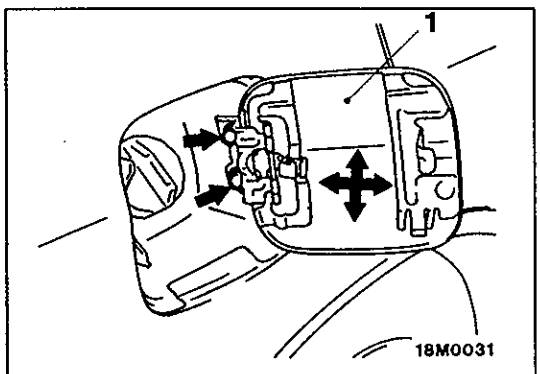
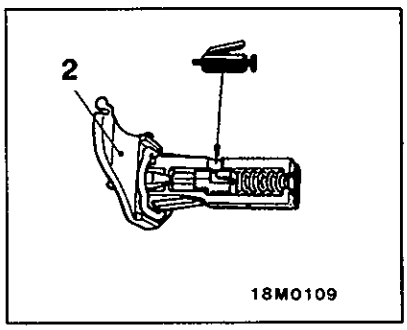


Fuel filler door height and clearance adjustment



Removal steps
1. Fuel filler door pannel assembly
2. Fuel filler door hook assembly
3. Lid lock release handle
4. Fuel filler door lock release cable

WINDOW GLASS

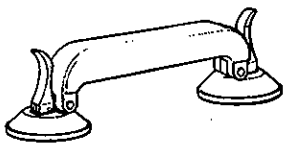
42200050062

ADHESIVES

Items	Specified adhesives
Windshield	3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealants or equivalent
Quarter window glass	
Tailgate window glass	
Rear window glass	

SPECIAL TOOLS

42200060065

Tool	Number	Name	Use
	MB990480	Glass holder	• Removal and installation of windshield • Removal and installation of tailgate window glass • Removal and installation of rear window glass
	MB990449	Window moulding remover	Removal of roof drip moulding

WINDOW REPAIR

42200560046

The following glass sections are installed by means of a liquid urethane adhesive method.

- Windshield
- Quarter window glass
- Tailgate window glass
- Rear 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.

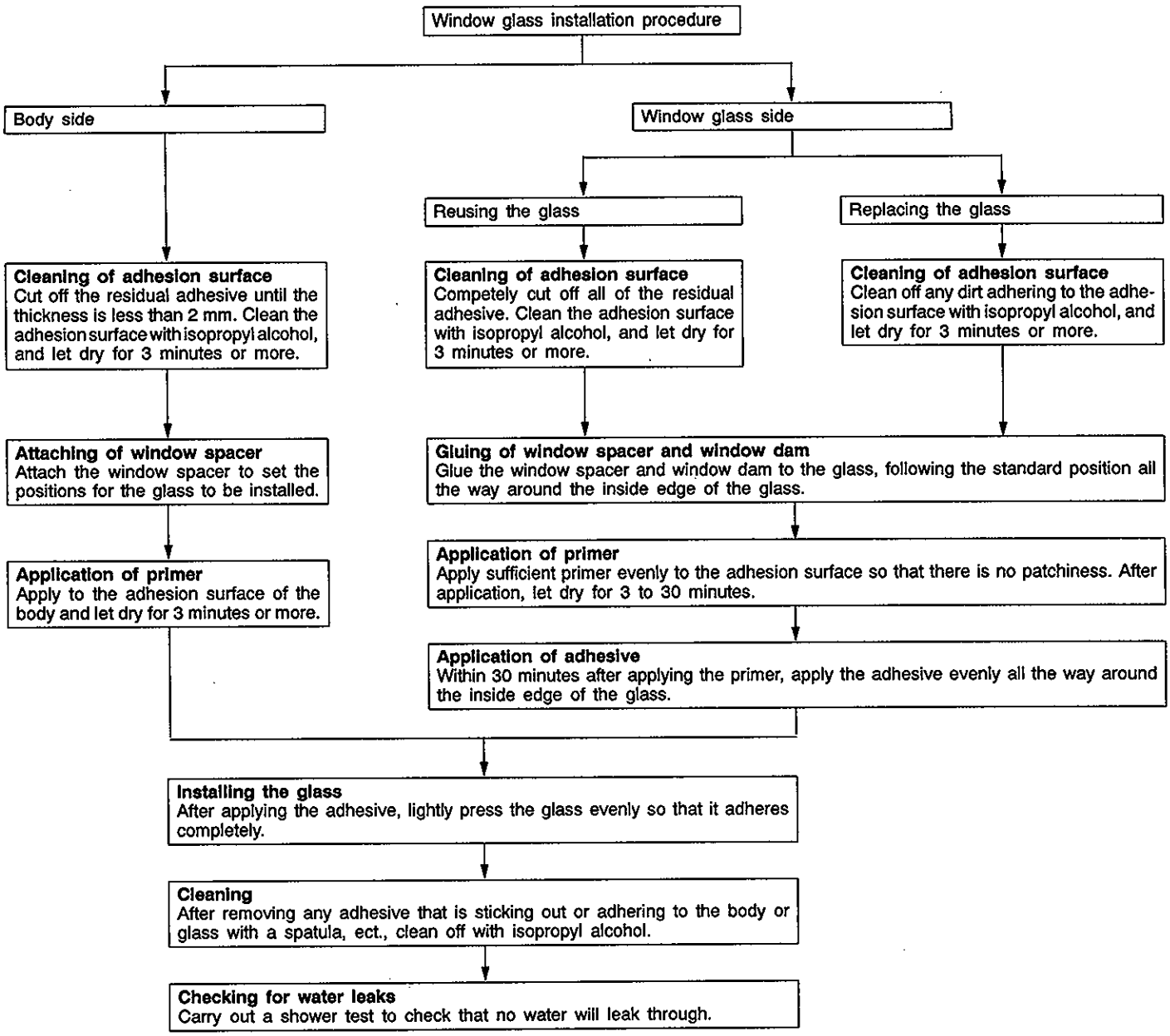
HANDLING OF AUTO WINDOW SEALER

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

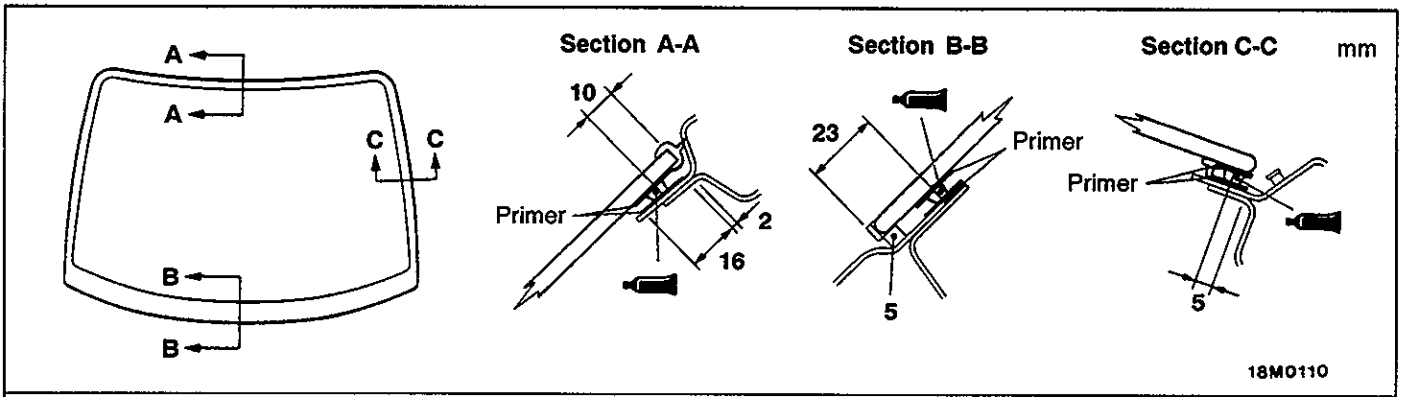


WINDSHIELD

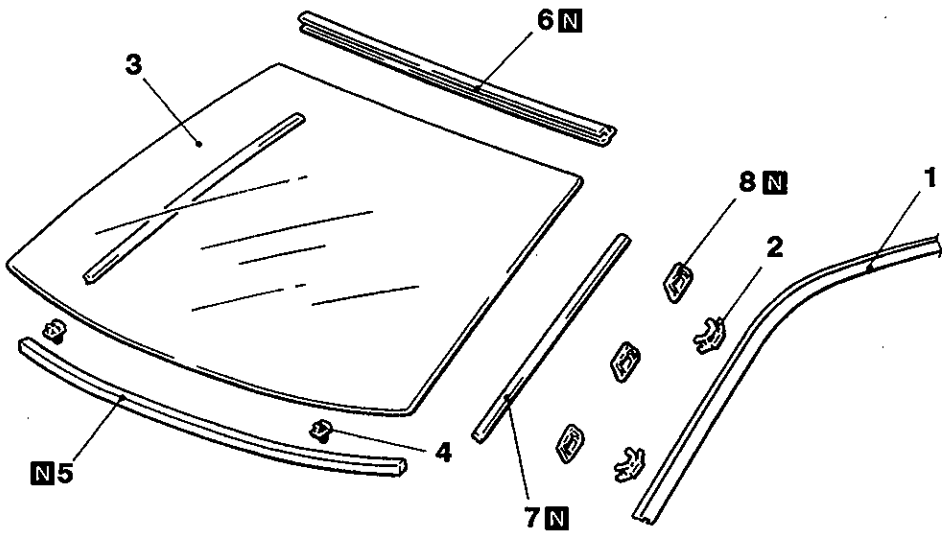
42200100118

REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operation
(1) Front Pillar Trim Removal and Installation (Refer to GROUP 52A.)
(2) Headlining Removal and Installation

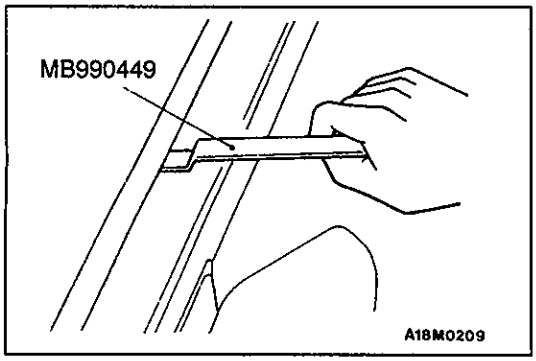


Adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent



Removal steps

◀A▶ 1. Roof drip moulding
2. Windshield clip
• Front deck garnish (Refer to GROUP 51 – Windshield Wiper and Washer.)
◀B▶ ▶A◀ 3. Windshield
4. Windshield spacer
▶A◀ 5. Window spacer
▶A◀ 6. Windshield upper moulding
▶A◀ 7. Window dam
▶A◀ 8. Clip

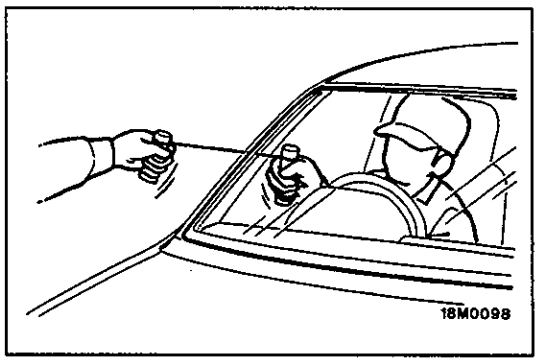


REMOVAL SERVICE POINTS

◀A▶ ROOF DRIP MOULDING REMOVAL

Use the special tool to lever out the moulding.

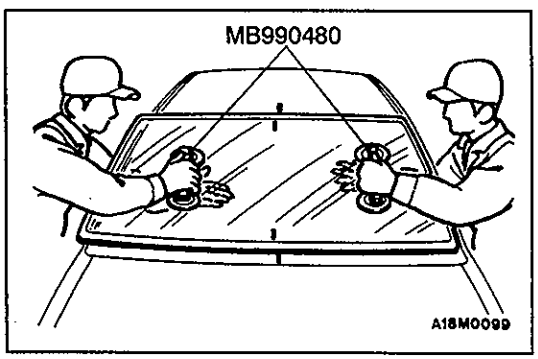
Caution
If the moulding has become warped, it should not be reused.



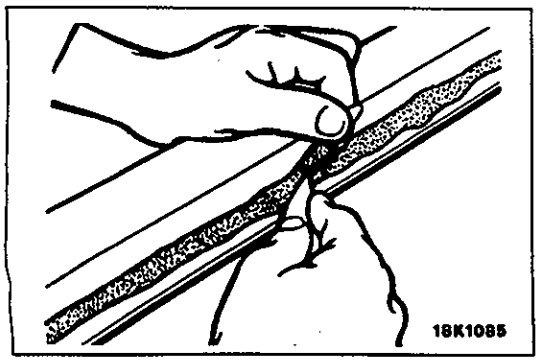
◀B▶ WINDSHIELD REMOVAL

1. In order to protect the body (paint surface), apply cloth tape to all body areas around the installed windshield glass.
2. Using a sharp-point drill, make hole in the windshield glass adhesive.
3. Pass the piano wire from the inside of the vehicle through the hole.
4. 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.
5. Make mating marks on the windshield glass and body.



6. Use the special tool to remove the windshield glass.



7. 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.

8. 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.

9. When reusing the glass, remove the adhesive still adhering to the glass, and clean with isopropyl alcohol.
10. Clean the body side in the same way.

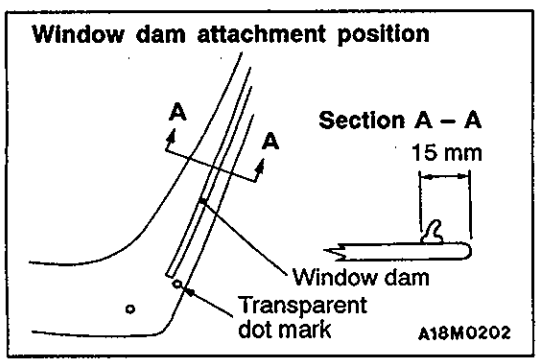
Caution
Let the cleaned places stand for 3 minutes or more, and carry out the next procedures after they have dried. Also, do not touch any surface that has been cleaned.

INSTALLATION SERVICE POINTS

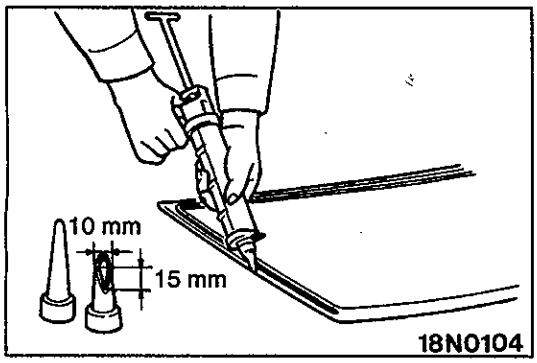
▶A◀ CLIP/WINDOW DAM/WINDOW SPACER/ WINDSHIELD UPPER MOULDING/WINDSHIELD INSTALLATION

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.

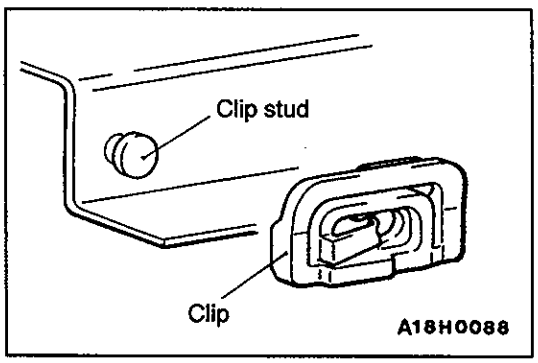


5. Attach the window dam in the specified positions so that there are no bends or lifts on the inside of the windshield.
6. Attach the window spacers so that the clearance at both left and right will be the same during installation.
7. Install the windshield upper moulding.



8. 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.



9. Place the clips onto the clip studs.

10. Align the mating marks on the glass and the body, and lightly press the windshield glass evenly so that it adheres completely.
11. Use a spatula or the like to remove any excessive adhesive. Then clean the surface with isopropyl alcohol. Install the roof drip moulding before the adhesive hardens. Try not to move the vehicle until the adhesive sets.
12. Wait 30 minutes or more, and then test for water leakage.

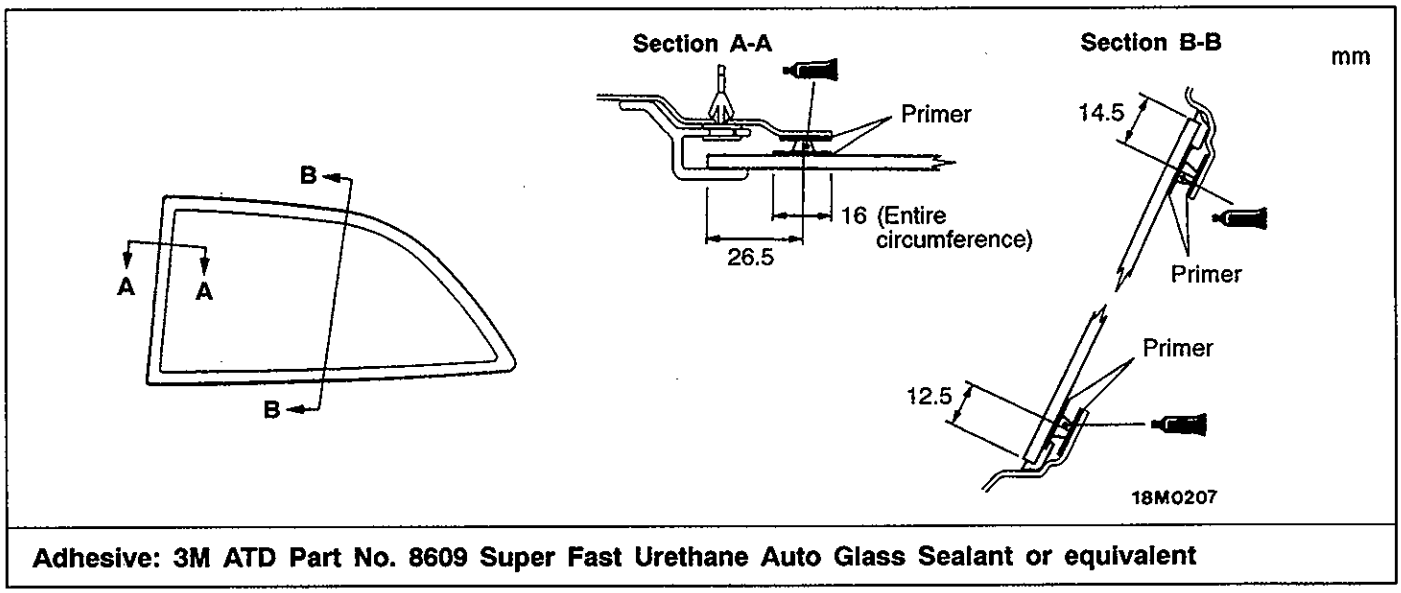
    Caution
    (1) Do not move the vehicle unless absolutely necessary.
    (2) When testing for water leakage, do not pinch the end of the hose to spray the water.

QUARTER WINDOW GLASS <Hatchback>

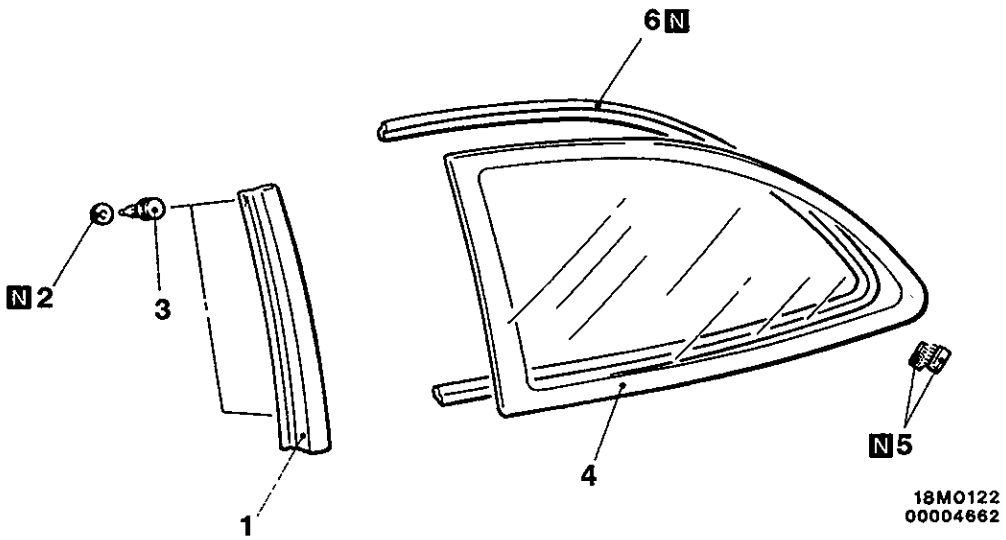
42200250073

REMOVAL AND INSTALLATION

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



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



Removal steps

1. Quarter window garnish
2. Packing
3. Clip
◀A▶ ▶A◀ 4. Quarter window glass
▶A◀ 5. Dual-lock fastener
▶A◀ 6. Window dam

REMOVAL SERVICE POINT

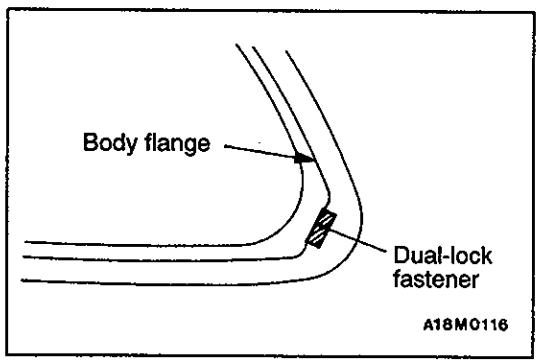
◀A▶ QUARTER WINDOW GLASS REMOVAL

Remove the quarter window glass by the same procedure as for the windshield. (Refer to P.42-13.)

INSTALLATION SERVICE POINTS

▶A◀ WINDOW DAM/DUAL-LOCK FASTENER/QUARTER WINDOW GLASS INSTALLATION

1. Use isopropyl alcohol to degrease the window dam and dual lock fastener mounting surfaces on both the glass and the body.
2. Attach the window dam.



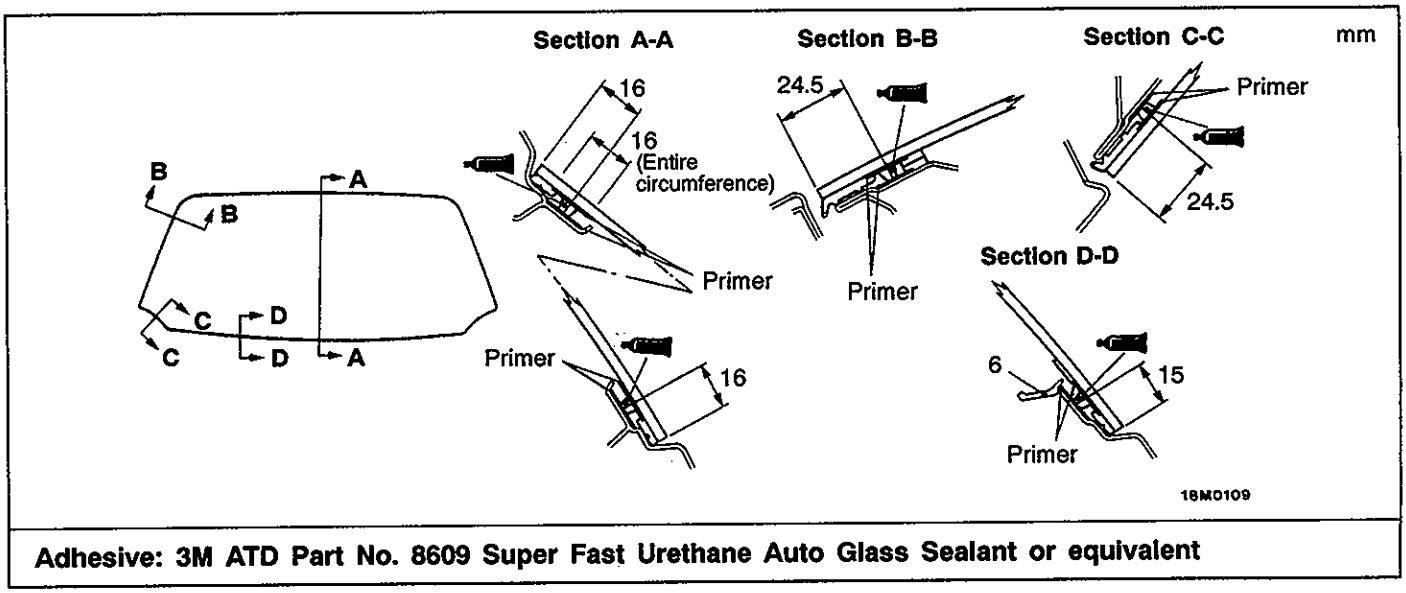
3. Install the dual lock fastener so that it is lined up with the body flange.
4. Apply primer and adhesive. (Refer to P.42-16.)
5. Install the glass in the same way as for the windshield. (Refer to P.42-14.)

TAILGATE WINDOW GLASS <Hatchback>

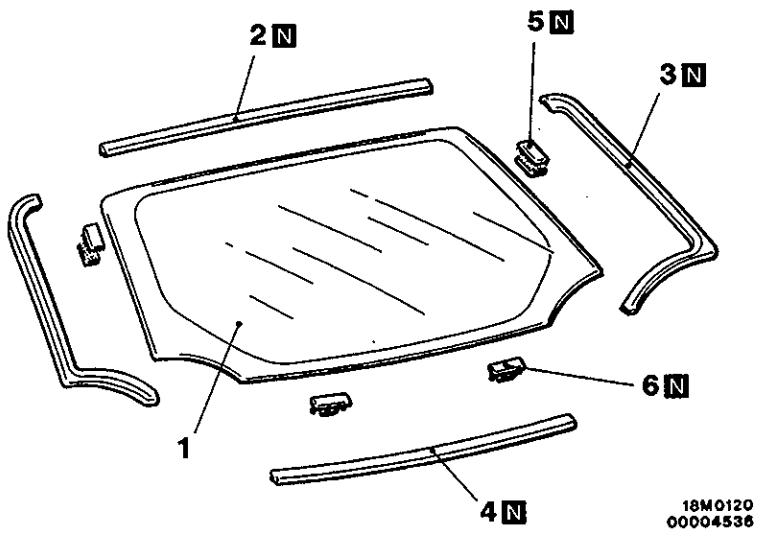
42200370069

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Tailgate Trim Removal and Installation (Refer to P.42-48.)
(2) Roof Spoiler Removal and Installation (Refer to GROUP 51 – Aero Parts.)



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



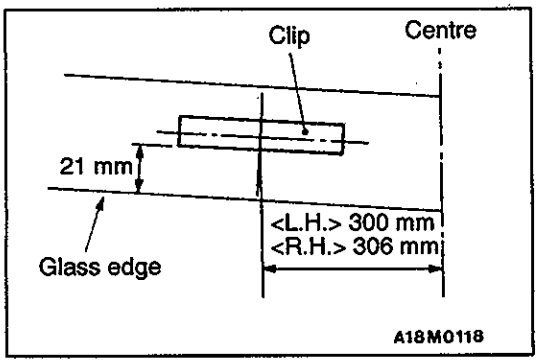
Removal steps

◀A▶ ▶A◀ 1. Tailgate window glass
▶A◀ 2. Tailgate glass upper dam
▶A◀ 3. Tailgate glass side dam
▶A◀ 4. Tailgate glass lower dam
▶A◀ 5. Dual-lock fastener
▶A◀ 6. Clip

REMOVAL SERVICE POINT

◀A▶ TAILGATE WINDOW GLASS REMOVAL

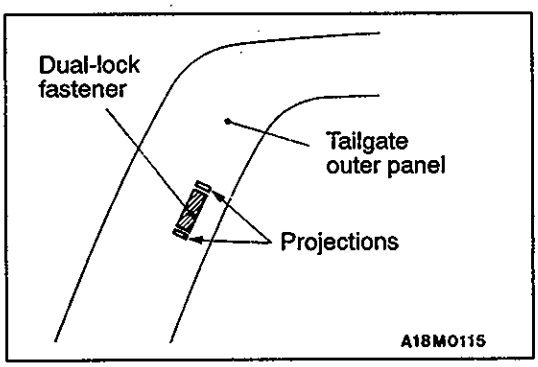
Remove the tailgate window glass by the same procedure as for the windshield. (Refer to P.42-13.)



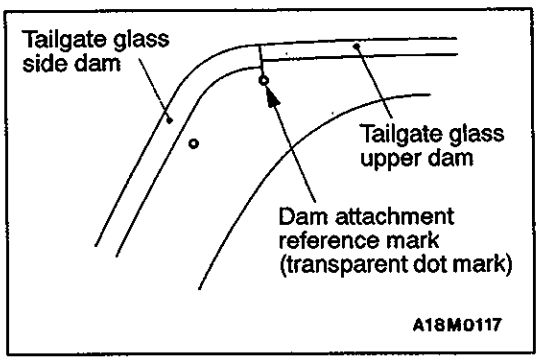
INSTALLATION SERVICE POINT

▶A◀ CLIP/DUAL-LOCK FASTENER/TAILGATE GLASS LOWER DAM/TAILGATE GLASS SIDE DAM/TAILGATE GLASS UPPER DAM/TAILGATE WINDOW GLASS INSTALLATION

1. Use isopropyl alcohol to degrease the inside and outside edges of the tailgate window glass and the surface of the body flange.
2. Attach the clips to the inside of the tailgate glass in the positions shown in the illustration.



3. Install the dual lock fasteners between the projections on the tailgate outer panel, and then install them in matching positions on the glass.



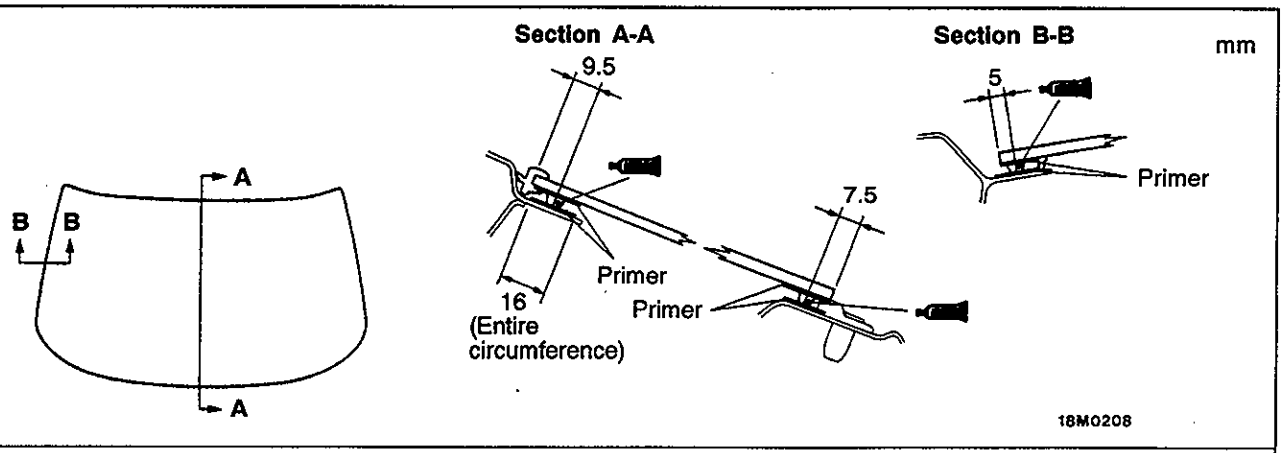
4. Attach the tailgate glass dams to the edge of the tailgate glass, starting from the dam attachment reference marks.
5. Apply primer and adhesive. (Refer to P.42-18.)
6. Install the glass in the same way as for the windshield. (Refer to P.42-14.)

REAR WINDOW GLASS <Sedan>

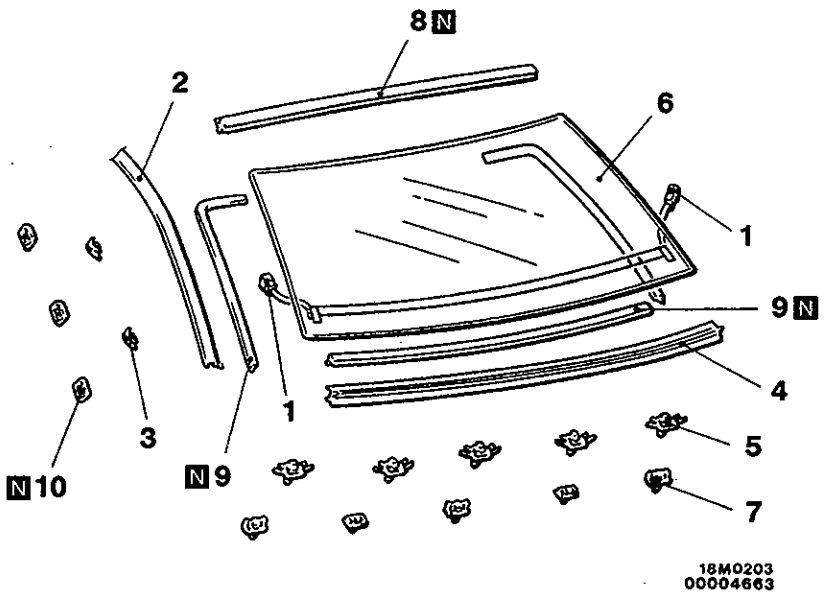
42200160055

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Rear Wiper Motor Removal and Installation (Refer to GROUP 51.)
(2) High Mounted Stop Lamp Removal and Installation (Refer to GROUP 54.)
(3) Rear Pillar Trim Removal and Installation (Refer to GROUP 52A.)
(4) Headlining Removal and Installation

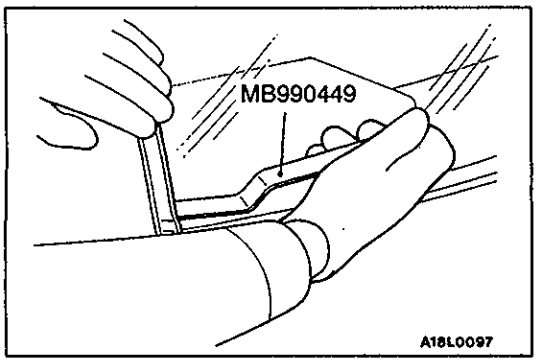


Adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent



Removal steps

1. Harness connector
◀A▶ 2. Roof drip moulding
3. Windshield clip
◀A▶ 4. Rear window lower moulding
5. Rear window moulding clip
◀B▶ ▶A◀ 6. Rear window glass
7. Clip
8. Rear window upper moulding
▶A◀ 9. Window dam
▶A◀ 10. Clip



REMOVAL SERVICE POINTS

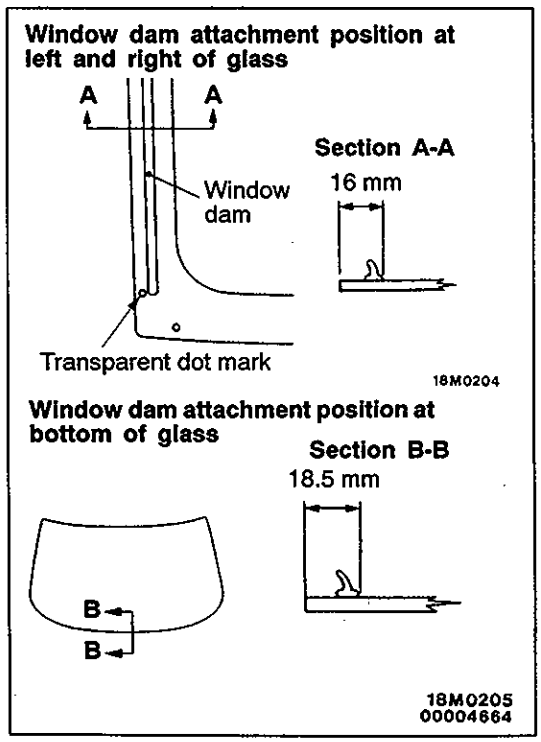
◀A▶ ROOF DRIP MOULDING/ REAR WINDOW LOWER MOULDING REMOVAL

Use the special tool to lever out the moulding.

Caution
If the moulding has become warped, it should not be reused.

◀B▶ REAR WINDOW GLASS REMOVAL

Remove the rear window glass by the same procedure as for the windshield. (Refer to P.42-13.)

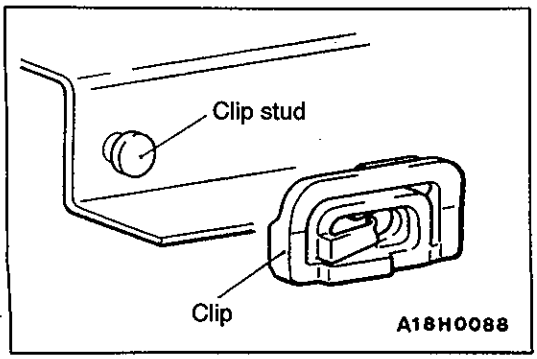


INSTALLATION SERVICE POINT

▶A◀ CLIP/WINDOW DAM/REAR WINDOW GLASS INSTALLATION

1. Use isopropyl alcohol to degrease the inside and outside edges of the rear window glass and the surface of the body flange.
2. Attach the window dam in the specified positions so that there are no bends or lifts on the inside of the rear window glass.

   NOTE
   Attach the dam at the bottom of the glass so that the clearance at both left and right will be the same during installation.



3. Place the clips onto the clip studs.
4. Apply primer and adhesive. (Refer to P.42-20.)
5. Install the glass in the same way as for the windshield. (Refer to P.42-14.)

DOOR

42300030052

SERVICE SPECIFICATIONS

Items	Standard value
Door outside handle play mm	3.6 or more
Power window operating current A	3–7 (for 14–15 V power supply at 25°C)
Door inside handle play mm	5.3 or more

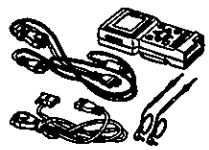
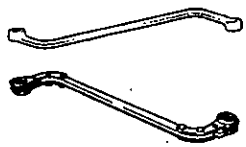
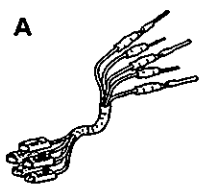
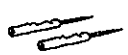
SEALANT

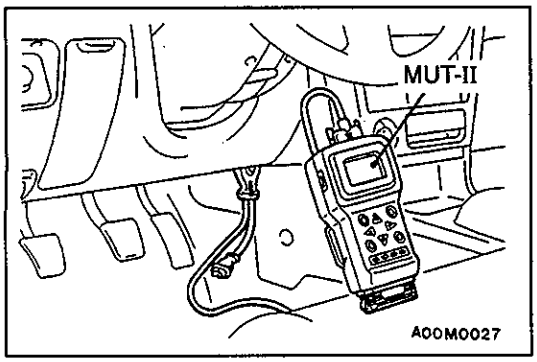
42300050034

Item	Specified sealant	Remark
Waterproof film	3M ATD Part No. 8625 or equivalent	Ribbon sealer

SPECIAL TOOLS

42300060051

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	ETACS-ECU input signal checking
	MB990784	Ornament remover	Removal of 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

42300070085

DIAGNOSIS FUNCTION

INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

1. Connect the MUT-II to the diagnosis connector.
2. If buzzer of the MUT-II sounds once when door lock actuator switch is operated (LOCK/UNLOCK), the ETACS-ECU input signal for that switch circuit system is normal.

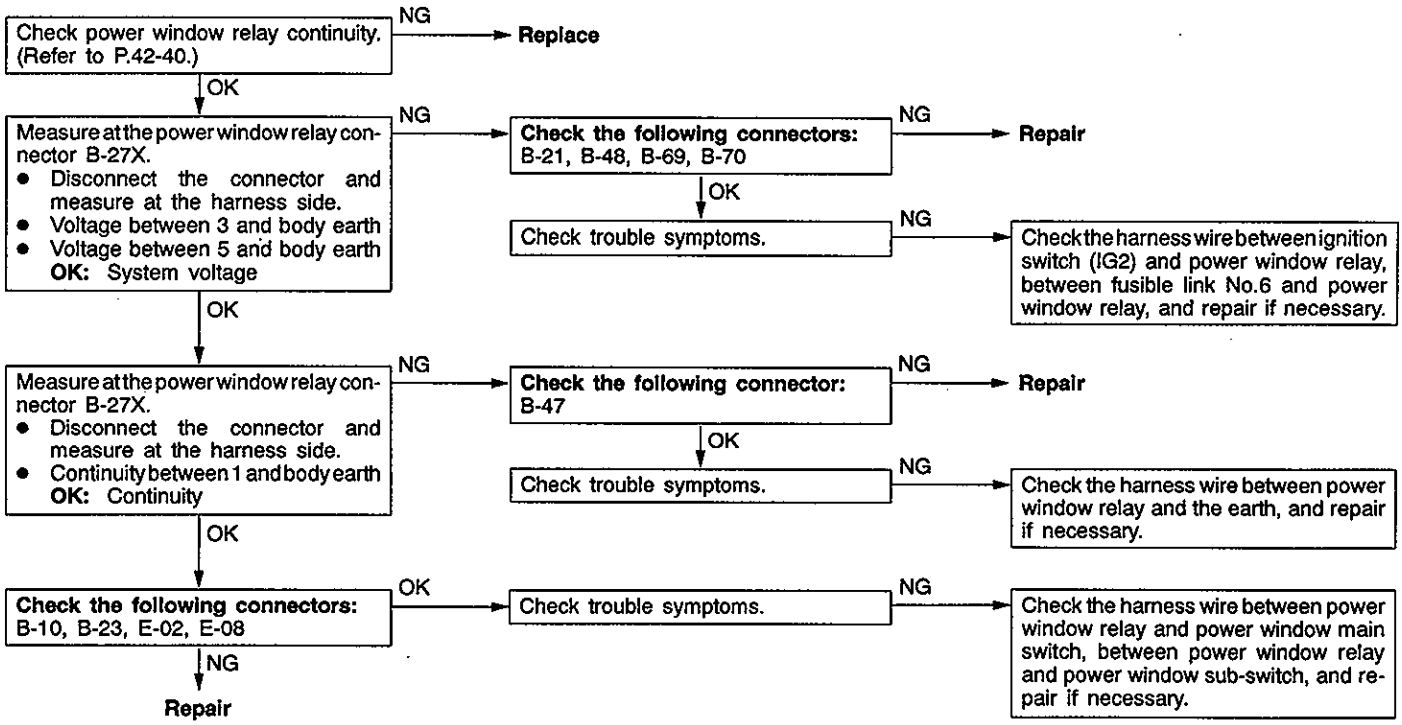
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure	Reference page
Power windows	The power windows cannot be operated by any of the power window switches.	1	42-24
	Driver's side power window cannot be operated by the power window main switch.	2	42-25
	Passenger's side and rear power windows cannot be operated by the power window main switch. (However, they can be operated by the power window sub-switches.)	3	42-26
	Passenger's side and rear power windows cannot be operated by the power window sub-switches. (However, they can be operated by the power window main switch.)	4	42-26
	Passenger's side and rear power windows cannot be operated by both the power window sub-switches and by the power window main switch.	5	42-27
	When the glass is raised, it then lowers automatically.	6	42-29
	The glass is not lowered when something is jammed in the window.	7	42-29
	When the glass is fully raised, it then lowers automatically.	8	42-30
Door locking mechanism	None of the door lock functions operate.	9	42-30
	None of the doors lock or unlock when the driver's side inside door locking knob is operated (including by means of the door key).	10	42-31
	Some doors do not lock or unlock.	11	42-31

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

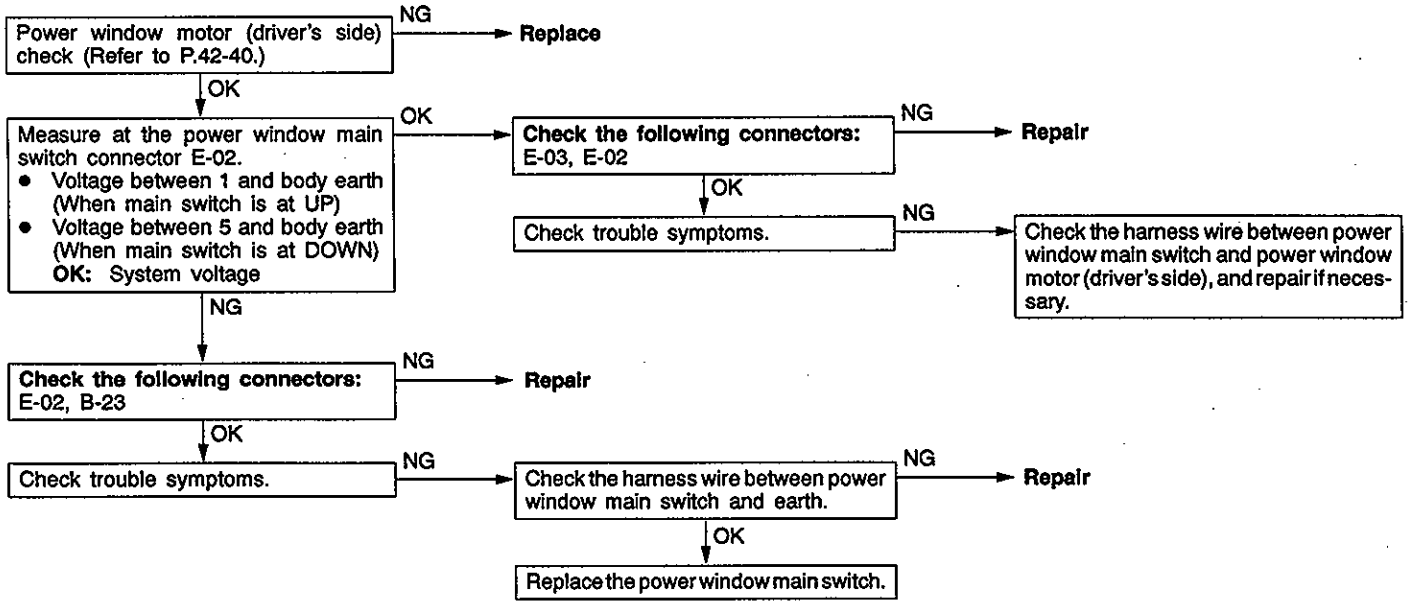
Inspection Procedure 1

The power windows cannot be operated by any of the power window switches.	Probable cause
The cause may be a malfunction of the power window relay and of the power window relay drive circuit.	• Malfunction of power window relay • Malfunction of wiring harness or connector



Inspection Procedure 2

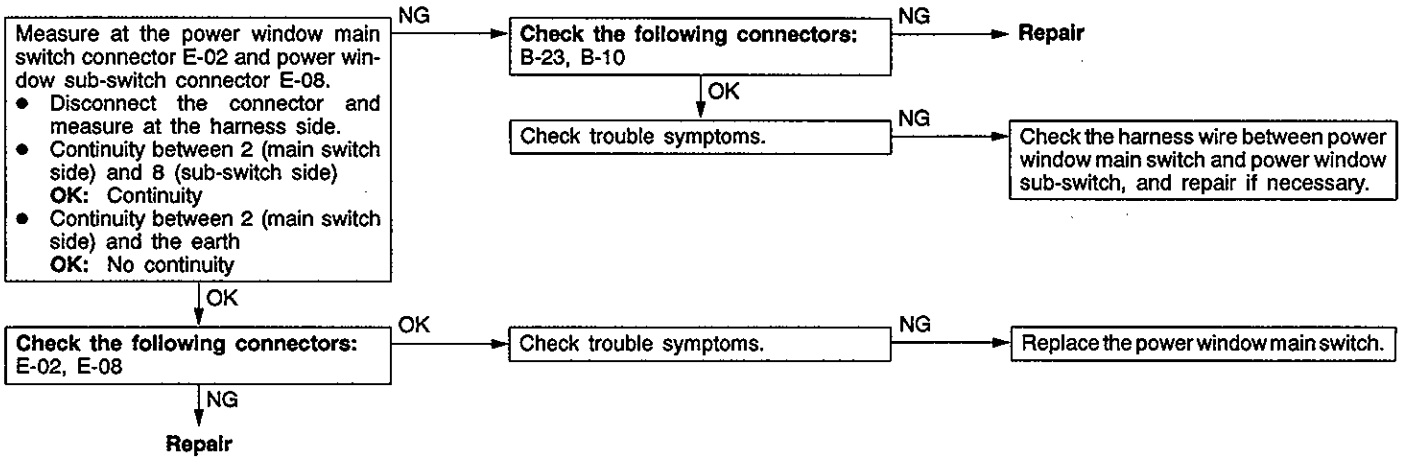
Driver's side power window cannot be operated by the power window main switch.	Probable cause
The cause may be a malfunction of the earth circuit in the power window main switch or of the power supply circuit for the power window motor. The cause may also be a malfunction of the control circuit inside the power window main switch.	• Malfunction of power window motor • Malfunction of power window main switch • Malfunction of wiring harness or connector



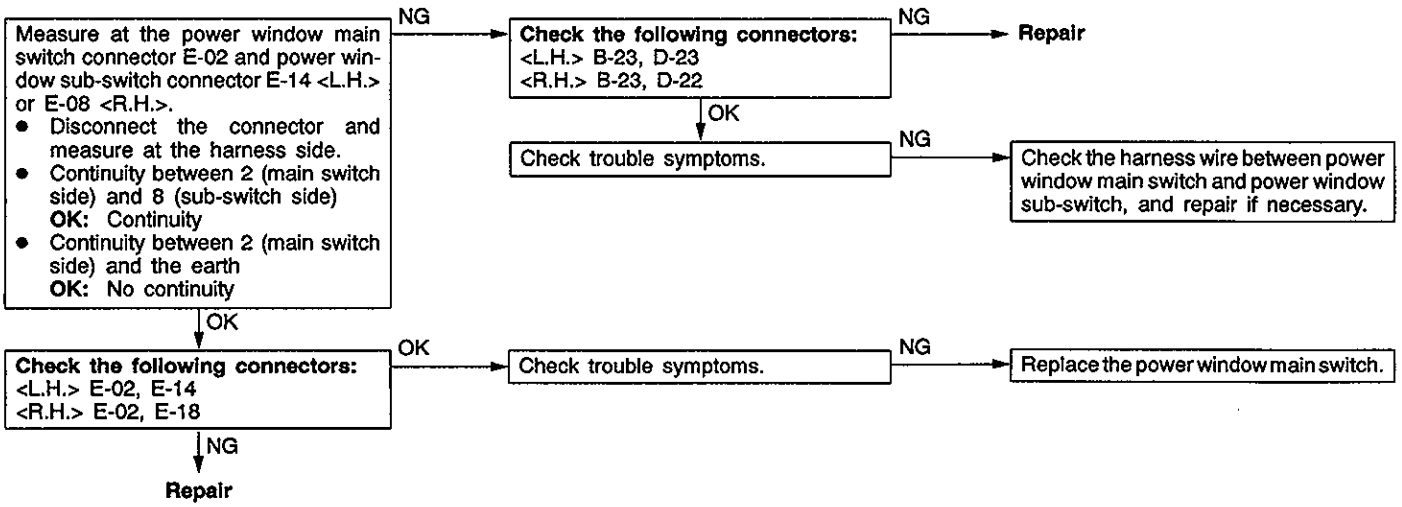
Inspection Procedure 3

Passenger's side and rear power windows cannot be operated by the power window main switch. (However, they can be operated by the power window sub-switches.)	Probable cause
The cause may be a malfunction of the power window main switch, or an open circuit or short-circuit in the communication line.	• Malfunction of power window main switch • Malfunction of wiring harness or connector

<If passenger's side power window does not operate>



<If a rear power window does not operate>



Inspection Procedure 4

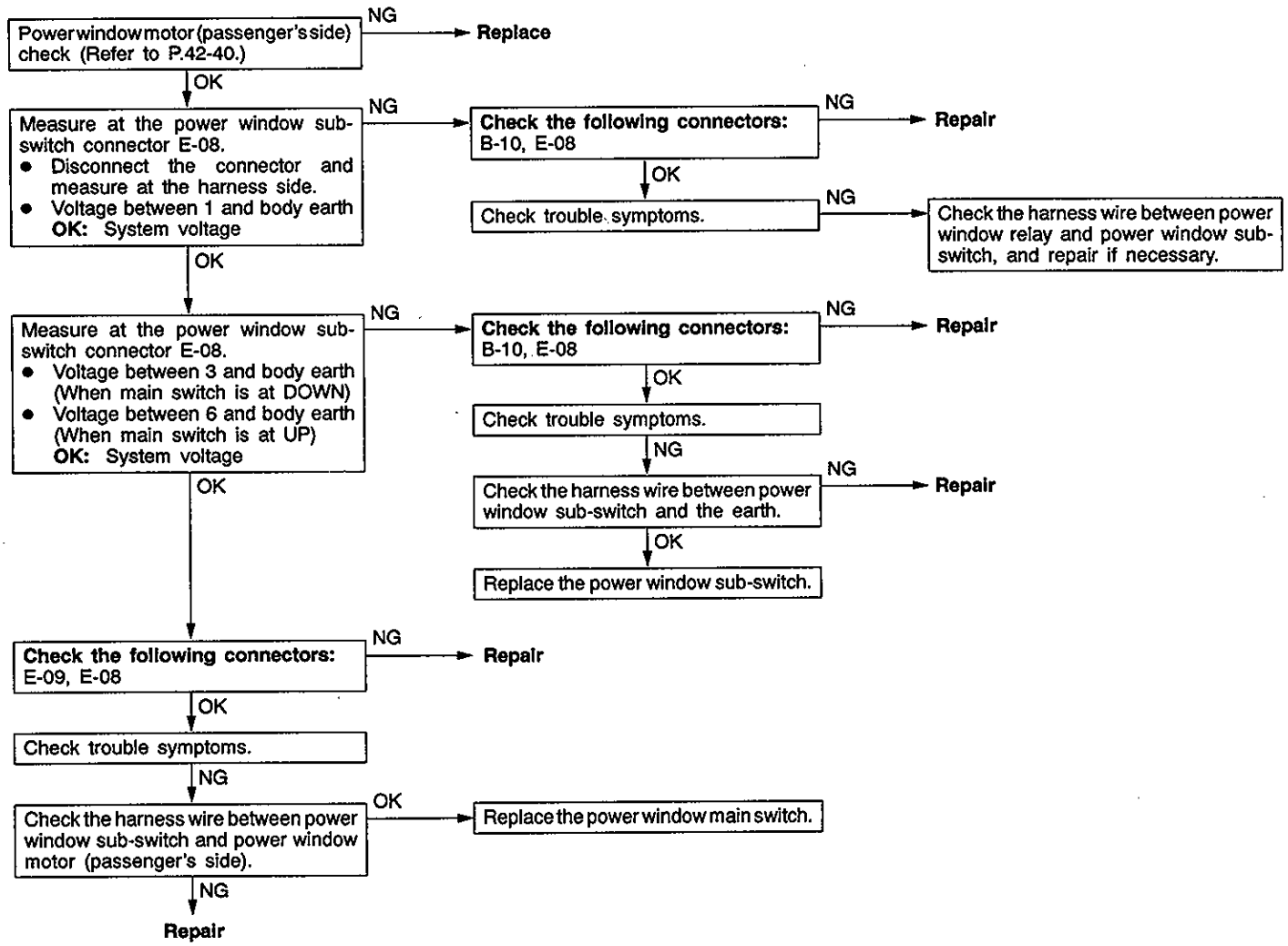
Passenger's side and rear power windows cannot be operated by the power window sub-switches. (However, they can be operated by the power window main switch.)	Probable cause
The cause may be a malfunction of the power window sub-switch.	• Malfunction of power window sub-switch

Replace the power window sub-switch

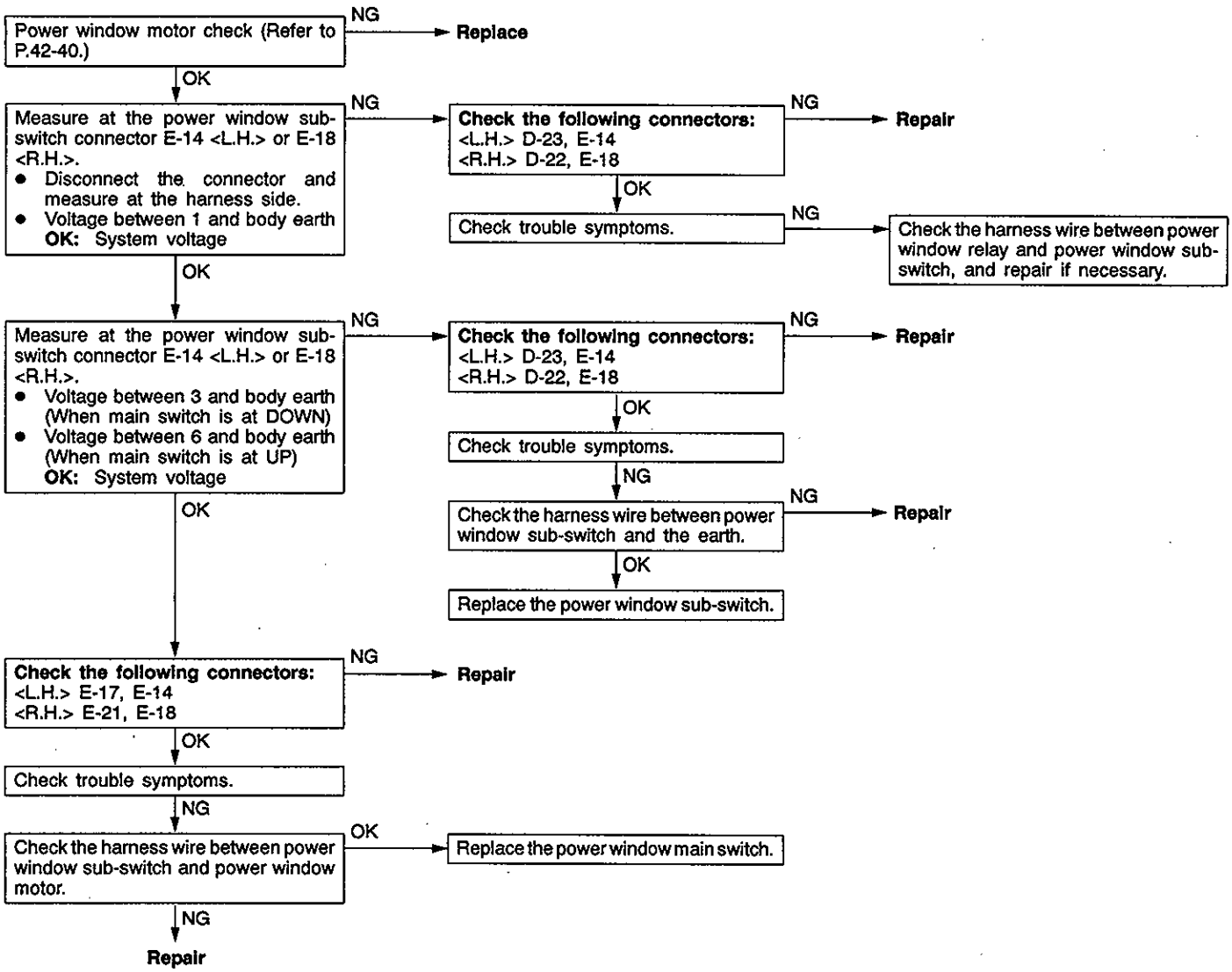
Inspection Procedure 5

Passenger's side and rear power windows cannot be operated by both the power window sub-switches and by the power window main switch.	Probable cause
One of the following items can be defective: • Power supply circuit of the power window sub-switch • Earth circuit • Power window motor • Lock switch • Power window main switch • Power window sub-switch	• Malfunction of power window main switch • Malfunction of power window sub-switch • Malfunction of power window motor • Malfunction of wiring harness or connector

<If passenger's side power window does not operate>



<If a rear power window does not operate>



Inspection Procedure 6

When the glass is raised, it then lowers automatically.	Probable cause
If the sliding resistance is too large when the glass is being raised, it is judged that something is jammed in the window, and the window is lowered by approximately 150 mm.	• Incorrect window glass adjustment • Glass slider is incorrectly installed or warped • Malfunction of power window main switch or sub-switch

Does the glass move in the opposite direction when the power window drive current is above the following value? (Refer to P.42-34.)
Drive current: 3–7 A
→ YES: Adjust the window glass. (Refer to P.42-32.) Adjust or replace the power window. (Refer to P.42-33.)
↓ NO
Driver's side: Replace the power window main switch.
Passenger's side: Replace the power window sub-switch.

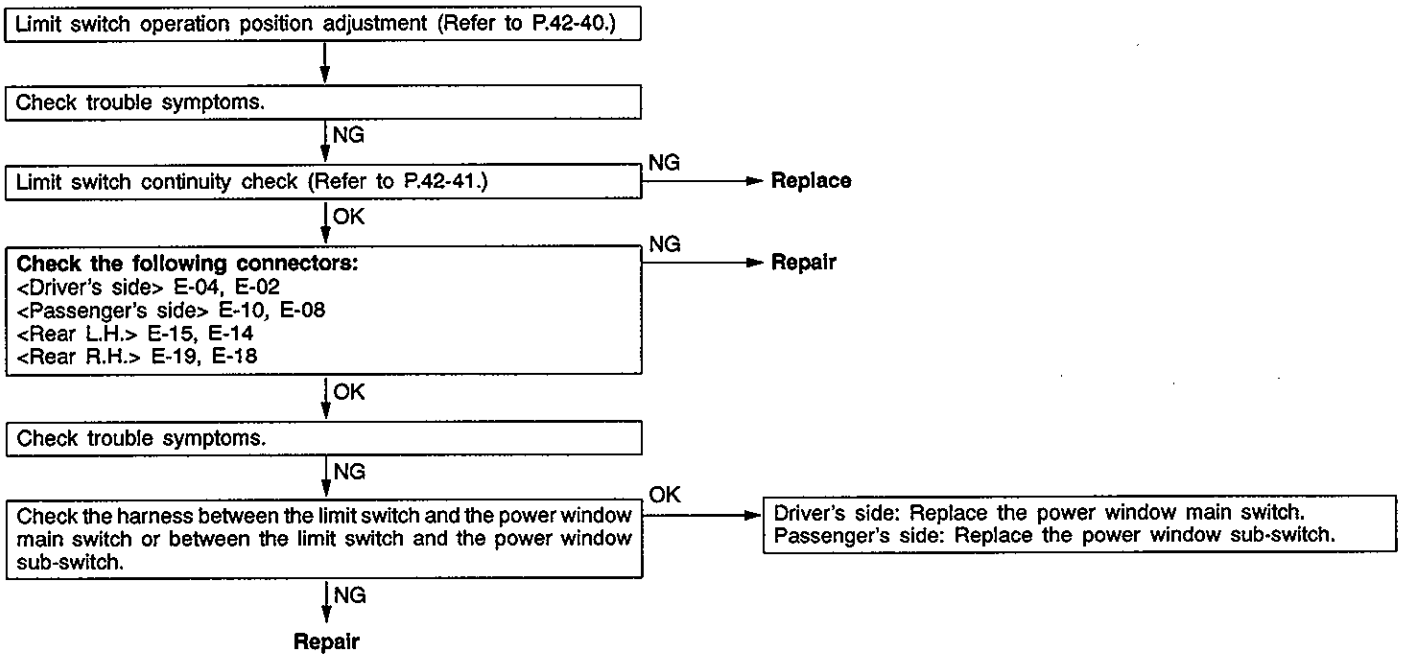
Inspection Procedure 7

The glass is not lowered when something is jammed in the window.	Probable cause
The safety mechanism is released under the following conditions, and the window will not be lowered even if something becomes jammed in it. • If the limit switch is always off • If there is an open circuit in the harness between the limit switch and the power window main switch or the power window sub-switch • If the limit switch turns off before the set value is reached • If the window is within 15 mm of being fully closed (normal setting to prevent the window from being lowered)	• Malfunction of limit switch • Malfunction of wiring harness • Malfunction of power window main switch or sub-switch • Incorrect limit switch operation position

Limit switch operation position adjustment (Refer to P.42-40.)
↓
Check trouble symptoms.
↓ NG
Limit switch continuity check (Refer to P.42-41.) → NG → **Replace**
↓ OK
Check the following connectors:
<Driver's side> B-23, E-04, E-02
<Passenger's side> B-10, E-10, E-08
<Rear L.H.> D-23, E-15, E-14
<Rear R.H.> D-22, E-19, E-18
→ NG → **Repair**
↓ OK
Check trouble symptoms.
↓ NG
Check the harness between the limit switch and the power window main switch and between the limit switch and the power window sub-switch, and between the limit switch and the earth.
→ OK: Driver's side: Replace the power window main switch.
Passenger's side: Replace the power window sub-switch.
↓ NG
Repair

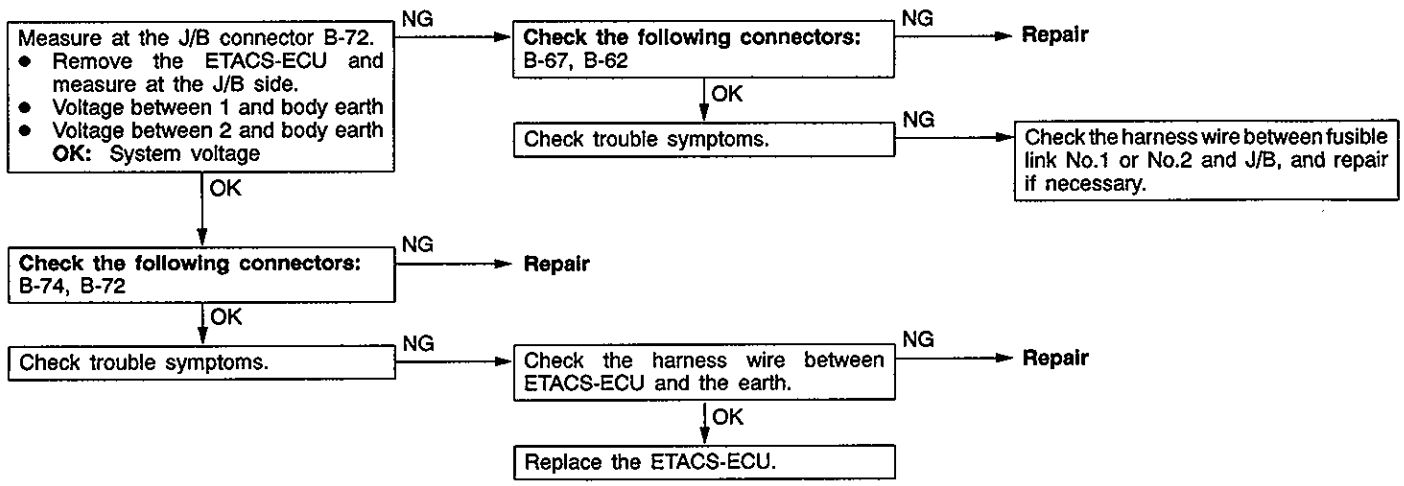
Inspection Procedure 8

When the glass is fully raised, it then lowers automatically.	Probable cause
When the window is within 15 mm of being fully closed, the limit switch turns off to prevent the window from being lowered. However, the above problem can occur if there is a malfunction of the limit switch or a short-circuit in a harness.	• Malfunction of limit switch • Malfunction of wiring harness or connector • Malfunction of power window main switch or sub-switch • Incorrect limit switch operation position



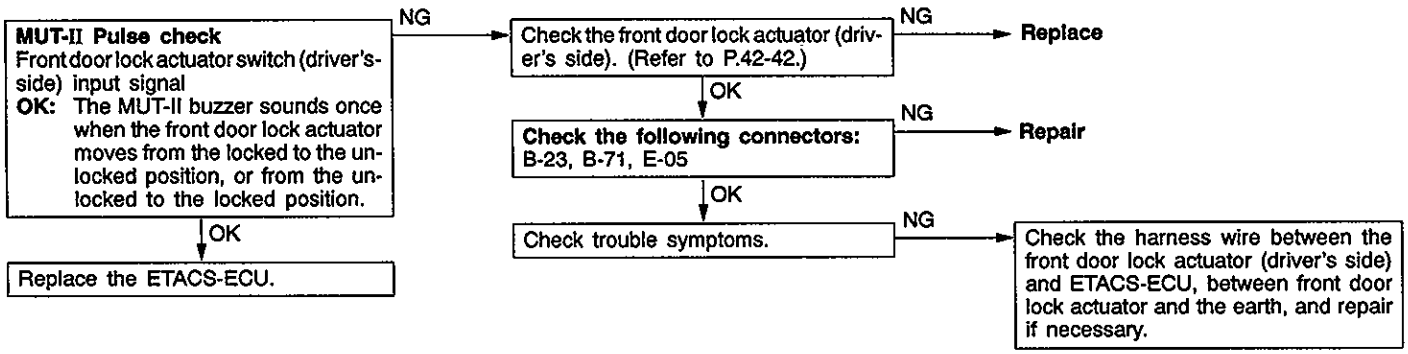
Inspection Procedure 9

None of the door lock functions operate.	Probable cause
The cause may be a malfunction of the ETACS-ECU power supply circuit system or of the earth circuit system.	• Malfunction of ETACS-ECU • Malfunction of wiring harness or connector



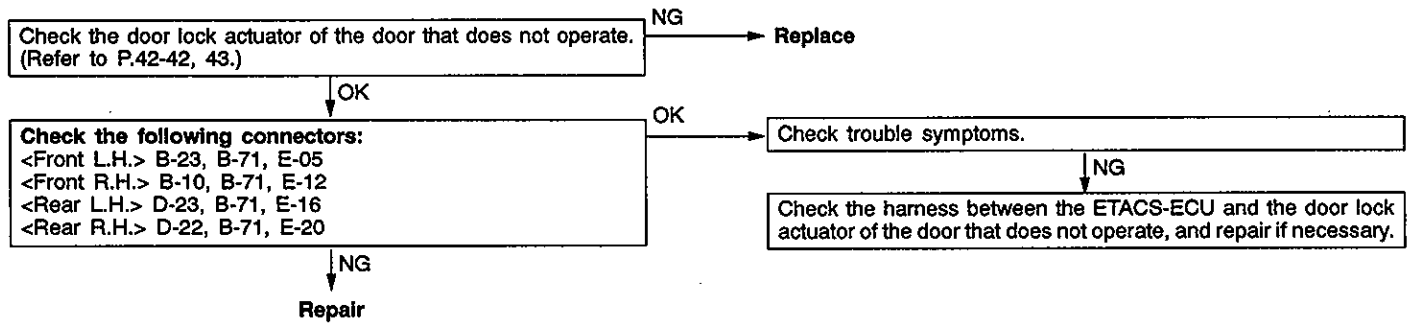
Inspection Procedure 10

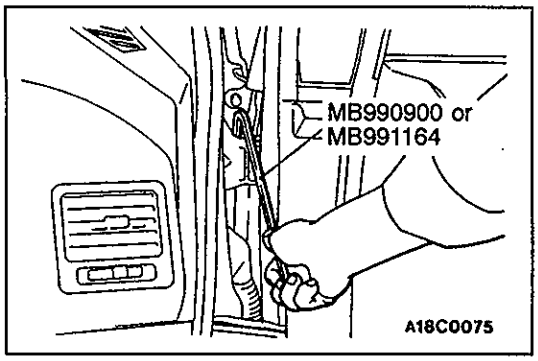
None of the doors lock or unlock when the driver's-side inside door locking knob is operated (including by means of the door key).	Probable cause
The cause may be a malfunction of the door lock actuator switch, the ETACS-ECU or of a wiring harness or connector.	• Malfunction of front door lock actuator (driver's side) • Malfunction of ETACS-ECU • Malfunction of wiring harness or connector



Inspection Procedure 11

Some doors do not lock or unlock.	Probable cause
The cause may be a malfunction of the door lock actuator or of a wiring harness or connector.	• Malfunction of door lock actuator • Malfunction of wiring harness or connector

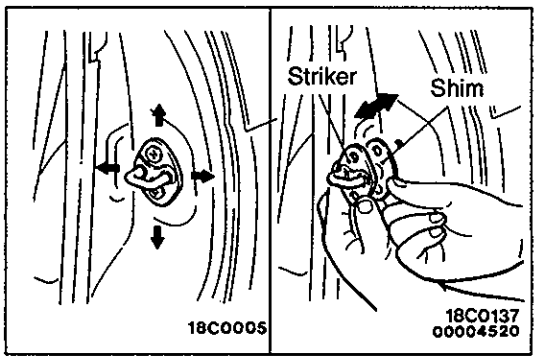




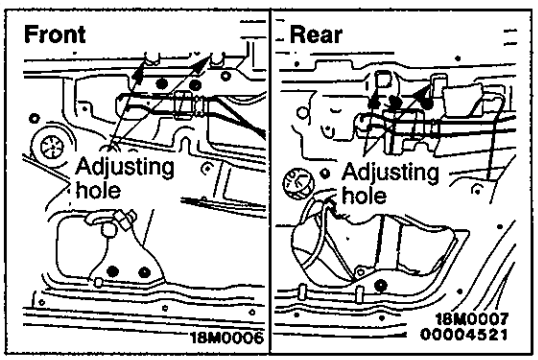
ON-VEHICLE SERVICE 42300090074

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.



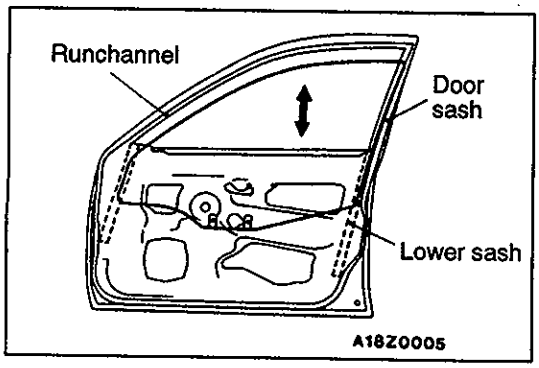
3. If the door opening and closing is heavy, adjust the meshing of the striker and the door latch (in the longitudinal direction) by adding shims to the striker and by moving the striker up and down or to the left and right.



DOOR WINDOW GLASS ADJUSTMENT 42300100104

Check that the door glass moves securely along the door glass runchannel when the window glass is fully raised and fully lowered. If the glass does not move correctly, adjust by the following procedure.

1. Remove the door trim and the waterproof film. (Refer to P.42-37.)
2. Loosen the mounting screw through the adjusting hole with the door window glass fully closed, and lower the door window glass slightly.
3. Close the door window glass fully again, and tighten the door glass mounting screw securely through the adjusting hole.



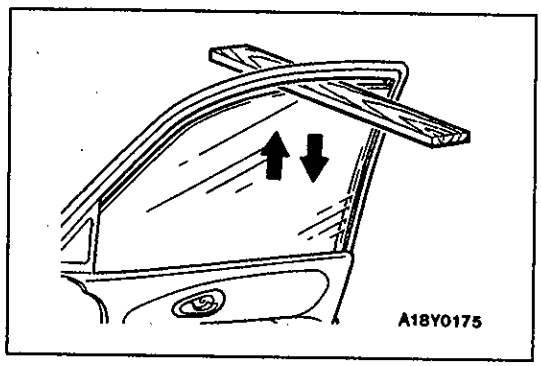
ADJUSTMENT AND REPLACEMENT WHEN THERE IS A MALFUNCTION OF THE POWER WINDOWS 42900190024

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.42-37.)
2. Remove the window regulator assembly from the door window glass, and then raise and lower the door window glass by hand to check the operation force.

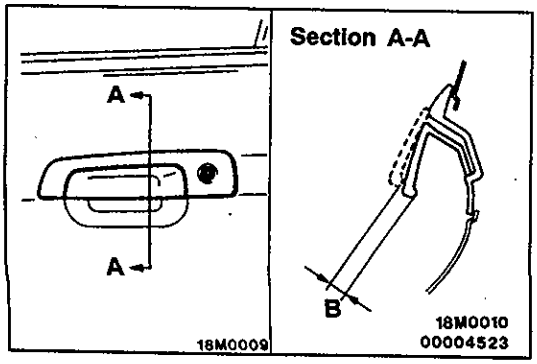
   NOTE
   Insert a cushion or similar object to prevent damage to the glass if it should happen to fall down.
3. If the door window glass does not move up and down smoothly, check or repair the following points.
   - Check the installation condition of the runchannel.
   - Repair the twisting in the door sash.
   - Check the installation condition of the lower sash or the center sash.

   NOTE
   The lower sash cannot normally be adjusted, but it may be possible to adjust the sash span slightly within the range allowed by manufacturing tolerances by pushing the lower sash outwards while re-installing it.
4. If repair or adjustment is not possible, replace the door assembly.



POWER WINDOW SAFETY MECHANISM CHECK 42900100041

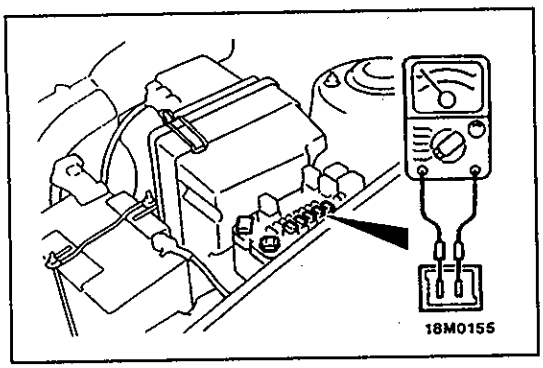
1. Place a wooden board with a thickness of approximately 10 mm as shown in the illustration, and then raise the window glass.
2. Check that the window lowers by a distance of approximately 150 mm when the window clamps the wooden board. If this doesn't happen, refer to "Troubleshooting" (P.42-23).



DOOR OUTSIDE HANDLE PLAY CHECK 42300160072

1. Check that the door outside handle play is within the standard value range.

   Standard value (B): 3.6 mm or more
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.



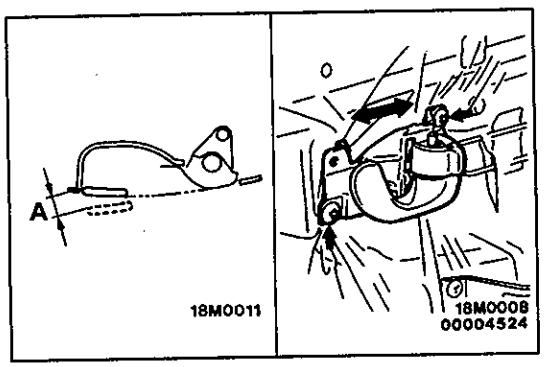
POWER WINDOW OPERATION CURRENT INSPECTION 42900110013

1. Remove the power window fuse and connect a circuit analyser as shown in the illustration.
2. When the power window switch is pressed to the UP position, a large amount of current flows at the time the window starts to close and when it is fully closed, so measure the operation current in the interval between these two points.

   Standard value: 3–7 A (for 14–15 V power supply voltage at 25°C)
3. If the operation current is outside the standard value, refer to "Troubleshooting" (P.42-23).

CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR) INSPECTION 42900170042

1. Press the power window switch to the UP position to fully close the window glass, and keep pressing the switch for a further 10 seconds.
2. Release the power window switch from the UP position and immediately press it to the DOWN position. The condition of the circuit breaker is good if the power window glass starts to move downwards within 60 seconds.



DOOR INSIDE HANDLE PLAY CHECK AND ADJUSTMENT 42300150109

1. Check that the door inside handle play is within the standard value range.

   Standard value (A): 5.3 mm or more
2. If the door inside handle play is outside the standard value range, remove the door trim. (Refer to P.42-37.)
3. Loosen the inside handle mounting screws, and then move the inside handle back and forth to adjust the play.

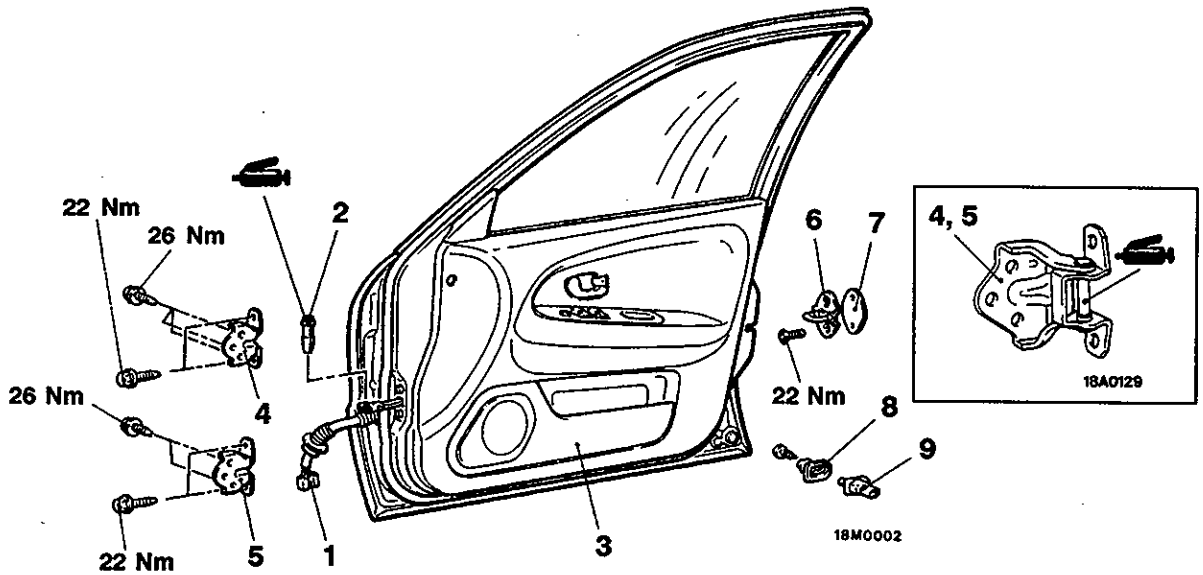
DOOR ASSEMBLY

42300220138

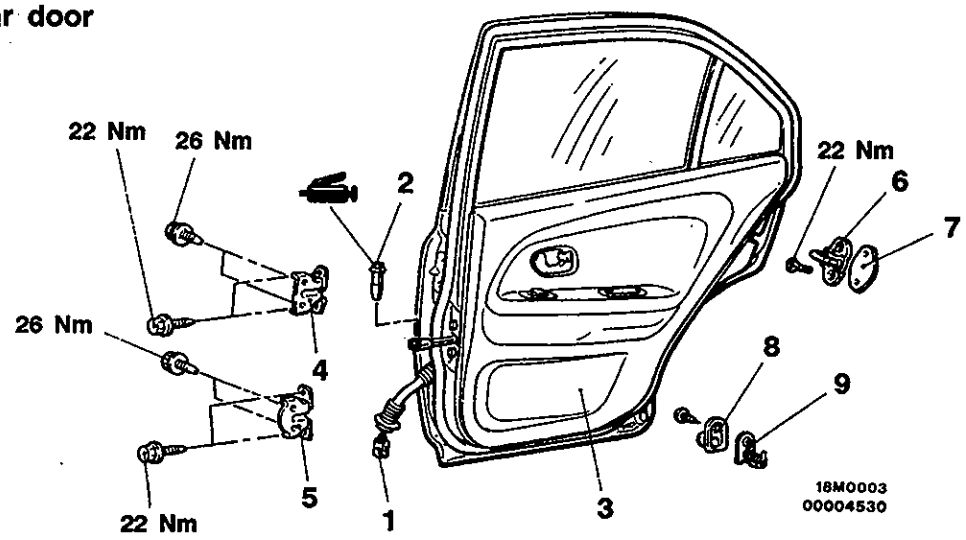
REMOVAL AND INSTALLATION

Post-installation Operation
- Door Adjustment (Refer to P.42-32.)

Front door



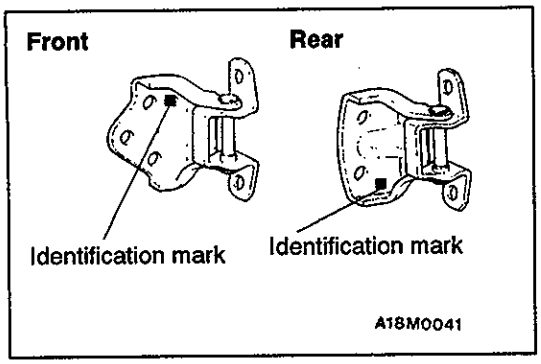
Rear door



Door assembly removal steps
1. Harness connector
2. Spring pin
3. Door assembly
▶A◀ 4. Door upper hinge
▶A◀ 5. Door lower hinge

Striker removal steps
6. Striker
7. Striker shim

Door switch removal steps
8. Door switch cap
9. Door switch

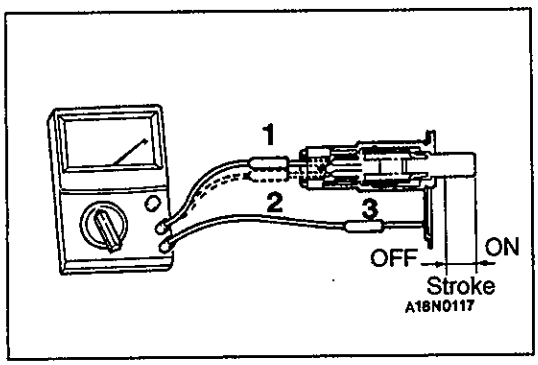


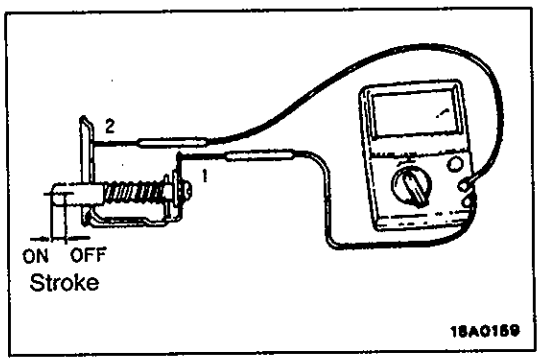
INSTALLATION SERVICE POINT

▶A◀ DOOR LOWER HINGE/DOOR UPPER HINGE INSTALLATION

The door hinges differ according to where they are used, so check the identification marks before installation.

Applicable location		Identification mark
Front left side door	Upper hinge	F1
	Lower hinge	E1
Front right side door	Upper hinge	E1
	Lower hinge	F1
Rear left side door	Upper hinge	A1
	Lower hinge	K1
Rear right side door	Upper hinge	B1
	Lower hinge	L1





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

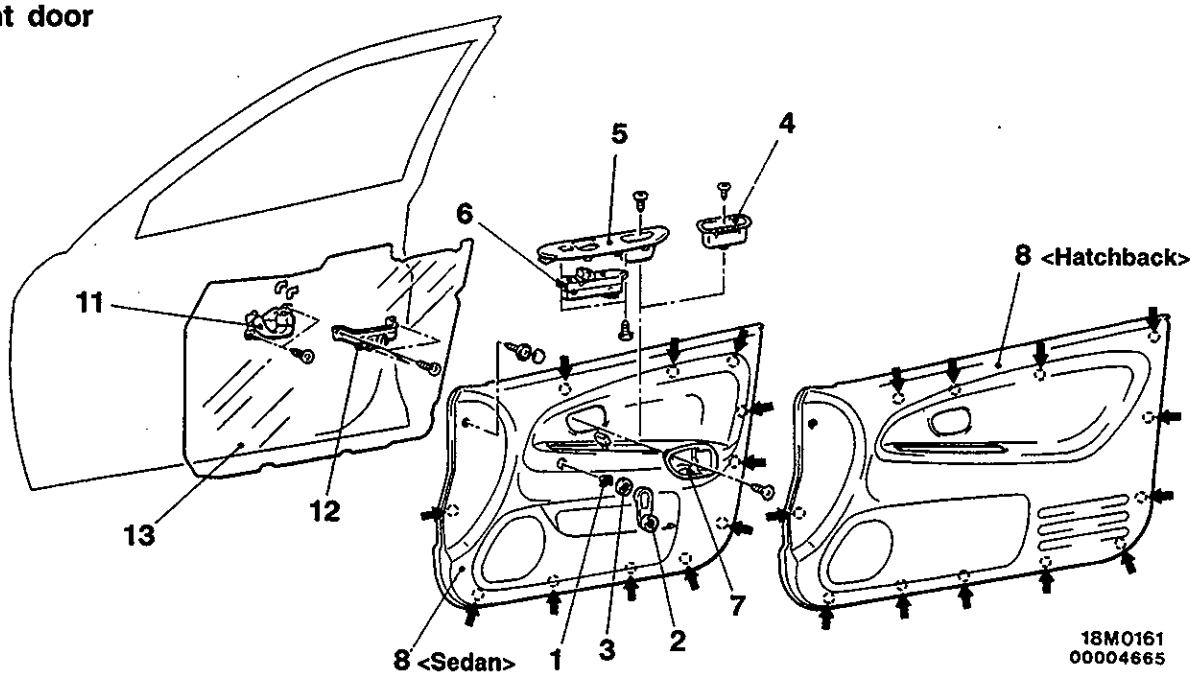
Switch position	Terminal No.	
	1	2
Open (ON)	○	○
Depressed (OFF)		

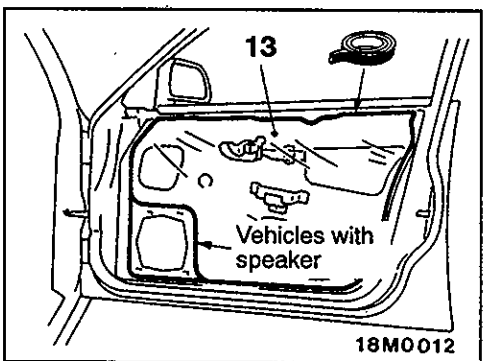
DOOR TRIM AND WATERPROOF FILM

42300430128

REMOVAL AND INSTALLATION

Front door





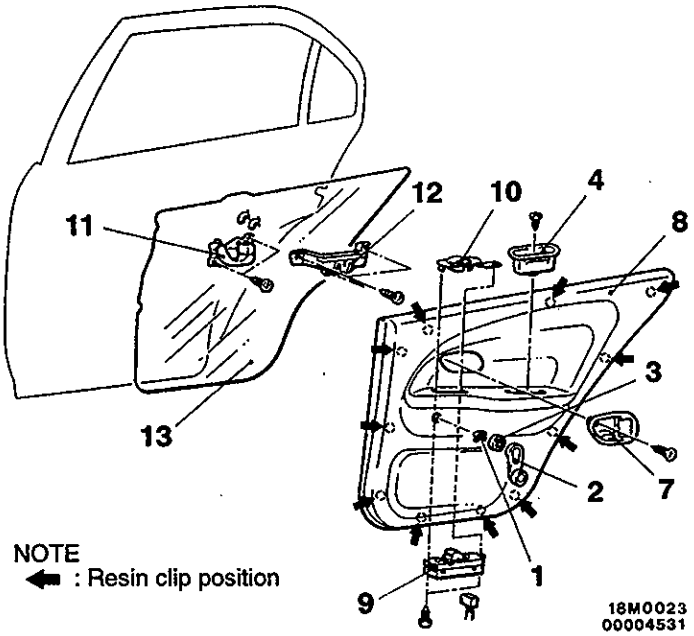
Sealant:
3M ATD Part. No. 8625 or equivalent

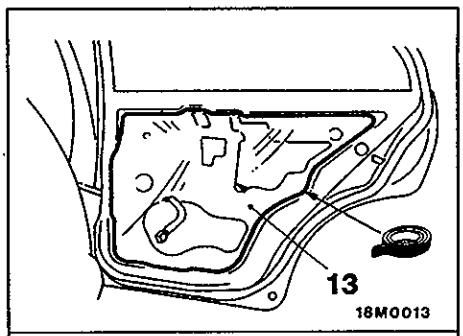
NOTE
⬅ : Resin clip position

Removal steps

◀A▶ ▶A◀ 1. Clip <Vehicles without power window>
▶A◀ 2. Regulator handle <Vehicles without power windows>
▶A◀ 3. Escutcheon <Vehicles without power windows>
4. Pull handle box <Vehicles without power windows>
5. Power window switch panel <Vehicles with power windows>
6. Power window switch <Vehicles with power windows>
7. Cover
8. Door trim
11. Door inside handle
12. Pull handle bracket
13. Waterproof film

Rear door

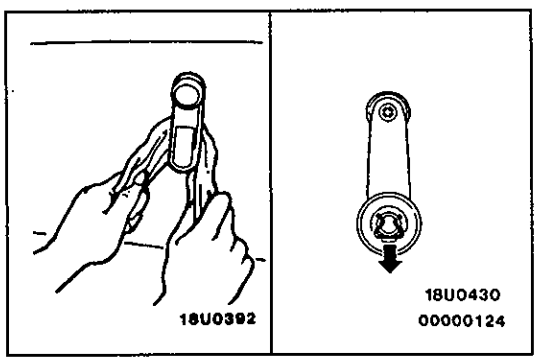




Sealant:
3M ATD Part. No. 8625 or equivalent

Removal steps

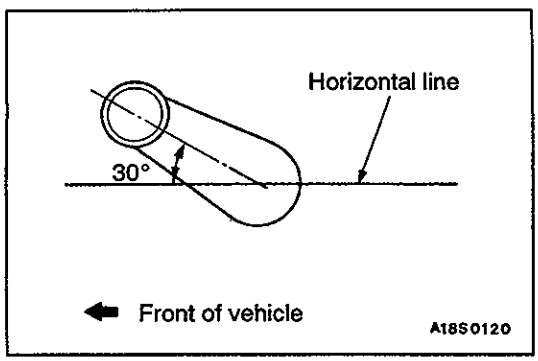
◀A▶ ▶A◀ 1. Clip <Vehicles without power windows>
▶A◀ 2. Regulator handle <Vehicles without power windows>
▶A◀ 3. Escutcheon <Vehicles without power windows>
4. Pull handle box <Vehicles without power windows>
7. Cover
8. Door trim
9. Power window switch <Vehicles with power windows>
10. Power window switch panel <Vehicles with power windows>
11. Door inside handle
12. Pull handle bracket
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◀ ESCUTCHEON/REGULATOR HANDLE/CLIP 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

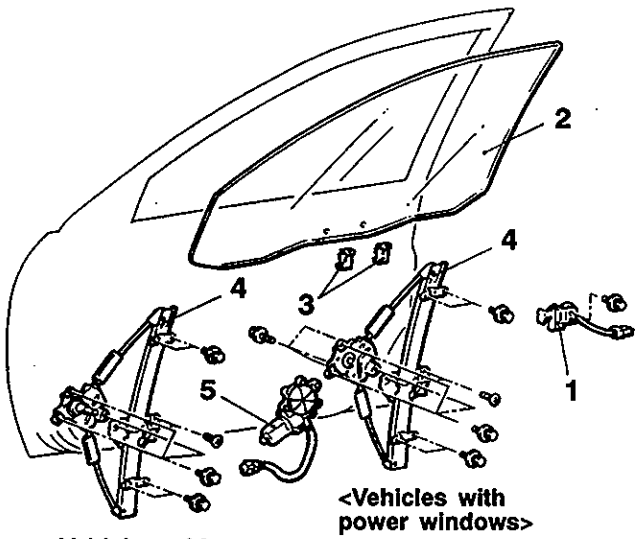
42900130125

REMOVAL AND INSTALLATION

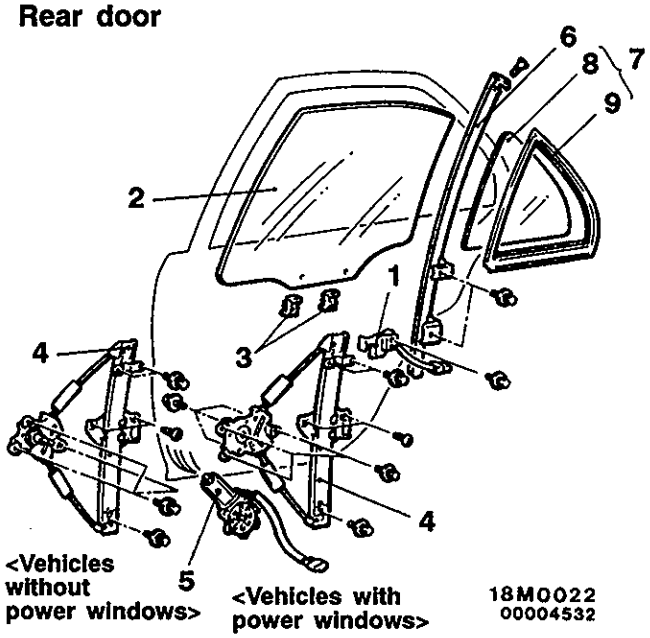
Pre-removal Operation
(1) Door Trim and Waterproof Film Removal (Refer to P.42-37.)
(2) Door Beltline Inner Weatherstrip Removal (Refer to P.42-44.)

Post-installation Operation
(1) Door Window Glass Adjustment (Refer to P.42-32.)
(2) Door Beltline Inner Weatherstrip Installation (Refer to P.42-44.)
(3) Door Trim and Waterproof Film Installation (Refer to P.42-37.)

Front door



Rear door



Front window regulator assembly removal steps

▶A◀ 1. Door limit switch
2. Door window glass
3. Door window glass holder
4. Window regulator assembly
5. Power window motor

Rear window regulator assembly removal steps

▶A◀ 1. Door limit switch
- Window glass runchannel (Refer to P.42-44.)

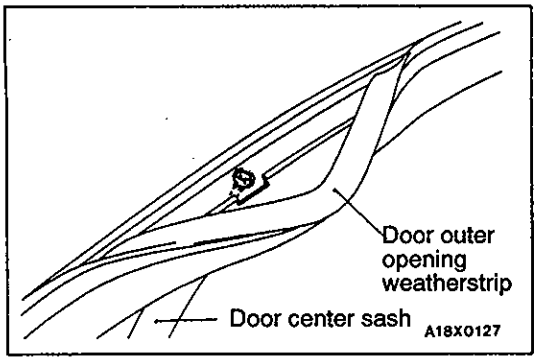
2. Door window glass
3. Door window glass holder
4. Window regulator assembly
5. Power window motor

◀A▶

Stationary window glass removal steps

- Window glass runchannel (Refer to P.42-44.)

2. Door window glass
6. Door center sash
7. Stationary window glass and weatherstrip assembly
8. Stationary window glass
9. Stationary window weatherstrip



REMOVAL SERVICE POINT

◀A▶ DOOR CENTER SASH REMOVAL

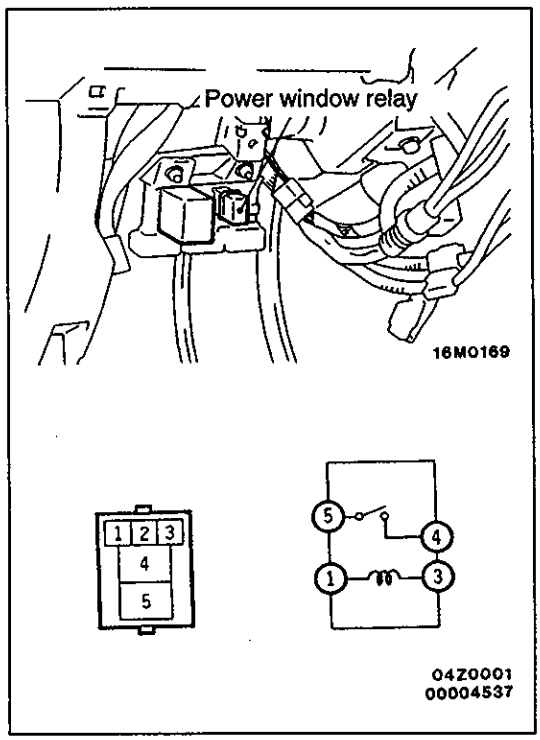
1. Remove the door outer opening weatherstrip from the door center sash only.
2. Remove the door center sash mounting screws, and then remove the door center sash from the door panel.

INSTALLATION SERVICE POINT

▶A◀ DOOR LIMIT SWITCH INSTALLATION

Install the door limit switch, and then fully raise the door window glass.

NOTE
Fully raising the door window glass will set the door limit switch to the correct position.



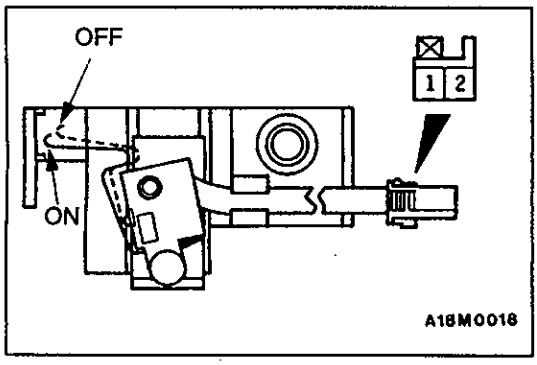
INSPECTION 42900180045

POWER WINDOW RELAY CONTINUITY CHECK

System voltage	Terminal No.			
	1	3	4	5
Not applied	○	○		
Applied	⊕	⊖	○	○

POWER WINDOW MOTOR CHECK 42900150053

1. Connect a battery directly to the motor terminals and check that the motor runs smoothly.
2. Check that the motor runs in the opposite direction when the battery is connected with the polarity reversed.



DOOR LIMIT SWITCH CONTINUITY CHECK 42900220013

Switch position	Terminal No.	
	1	2
ON	○	○
OFF		

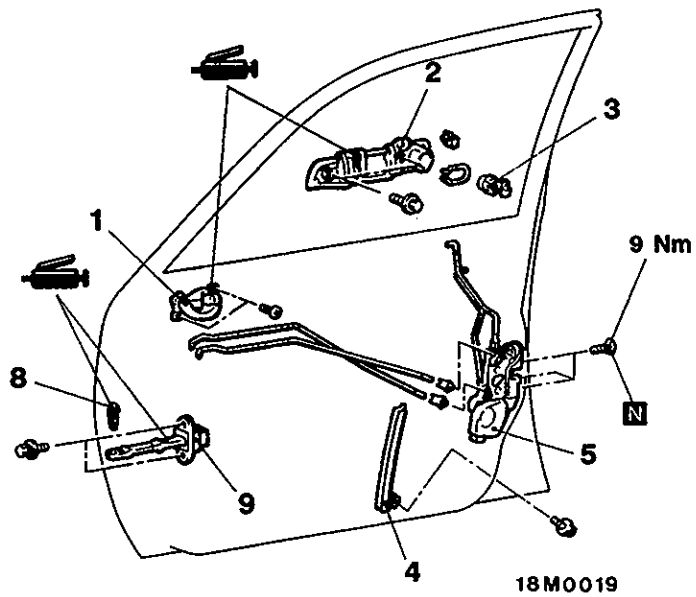
DOOR HANDLE AND LATCH 42300460110

REMOVAL AND INSTALLATION

Pre-removal Operation
- Door Trim Removal (Refer to P.42-37.)

Post-installation Operation
(1) Door Inside Handle Play Check (Refer to P.42-34.)
(2) Door Outside Handle Play Check (Refer to P.42-33.)
(3) Door Trim Installation (Refer to P.42-37.)

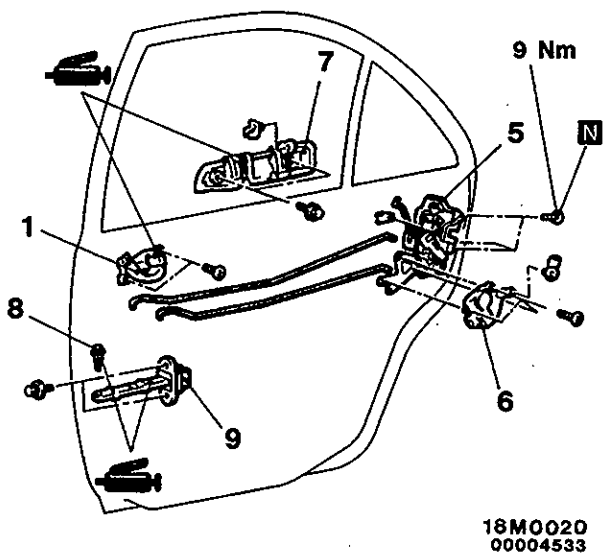
Front door



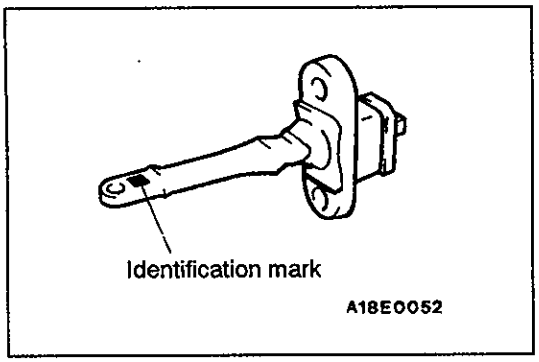
Front door handle and door latch assembly removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-37.)
2. Door outside handle
3. Door lock key cylinder
4. Rear lower sash
5. Door latch assembly

Rear door handle and door latch assembly removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-37.)
- Door center sash (Refer to P.42-39.)
5. Door latch assembly
6. Door lock actuator
7. Door outside handle

Rear door



Door check removal steps
1. Door inside handle
- Waterproof film (Refer to P.42-37.)
8. Spring pin
▶A◀ 9. Door check

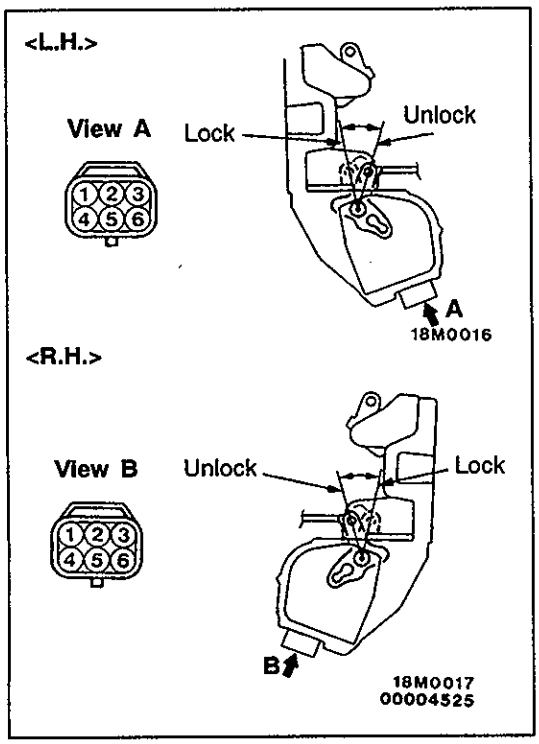


INSTALLATION SERVICE POINT

▶A◀ DOOR CHECK INSTALLATION

Install the door check so that the identification mark faces upwards.

Applicable location		Identification mark	
		Hatchback	Sedan
L.H.	Front door	YL	XL
	Rear door	–	16L
R.H.	Front door	YR	XR
	Rear door	–	16R



INSPECTION

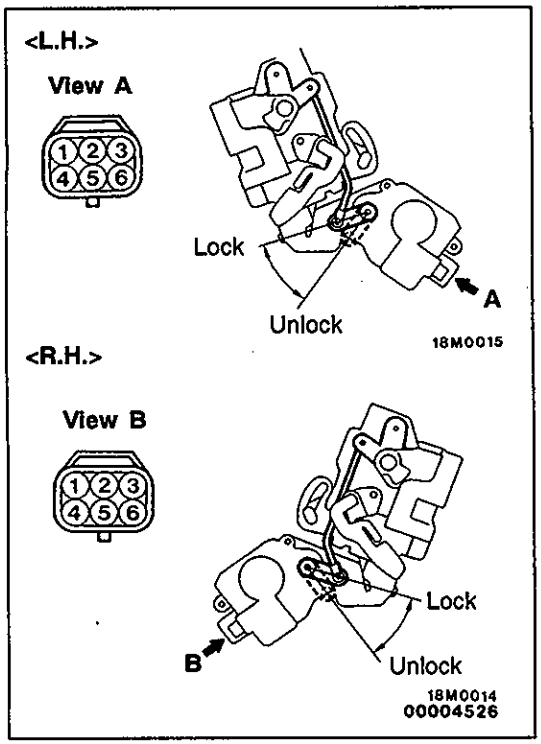
FRONT DOOR LOCK ACTUATOR CHECK 42300610065

<Driver's side>

Rod position	Terminal No.					Rod operation
	1	2	3	4	6	
LOCK				⊕	⊖	LOCK position → UNLOCK position
UNLOCK				⊖	⊕	UNLOCK position → LOCK position
LOCK	○		○			
UNLOCK	○	○				

<Passenger's side>

Rod position	Terminal No.		Rod operation
	4	6	
LOCK	⊖	⊕	LOCK position → UNLOCK position
UNLOCK	⊕	⊖	UNLOCK position → LOCK position



REAR DOOR LOCK ACTUATOR CHECK

42300620044

<L.H.>

Rod position	Terminal No.		Rod operation
	2	3	
LOCK	⊕ — ⊖		LOCK position → UNLOCK position
UNLOCK	⊖ — ⊕		UNLOCK position → LOCK position

<R.H.>

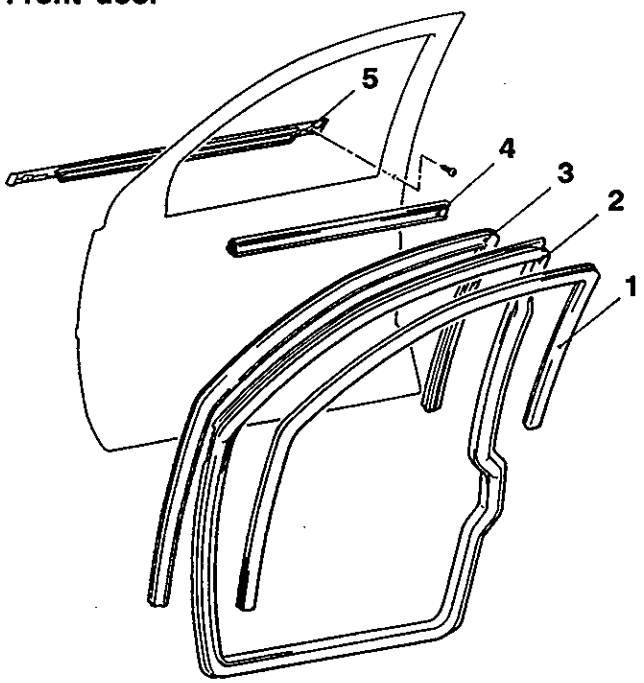
Rod position	Terminal No.		Rod operation
	2	3	
LOCK	⊖ — ⊕		LOCK position → UNLOCK position
UNLOCK	⊕ — ⊖		UNLOCK position → LOCK position

WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP

42300310095

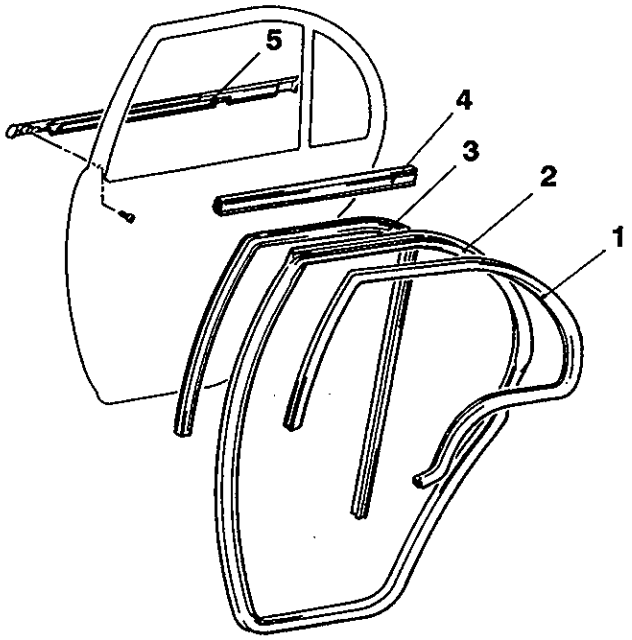
REMOVAL AND INSTALLATION

Front door



18M0032

Rear door



18M0033
00004527

Door inner opening weatherstrip removal steps

- Cowl side trim (Refer to GROUP 52A.)
- Quarter trim <Hatchback> (Refer to GROUP 52A.)
- Center pillar lower trim <Sedan> (Refer to GROUP 52A.)

1. Door inner opening weatherstrip

Door outer opening weatherstrip removal

◀A▶ ▶A◀ 2. Door outer opening weatherstrip

Door window glass runchannel removal

3. Door window glass runchannel

Door beltline inner weatherstrip removal steps

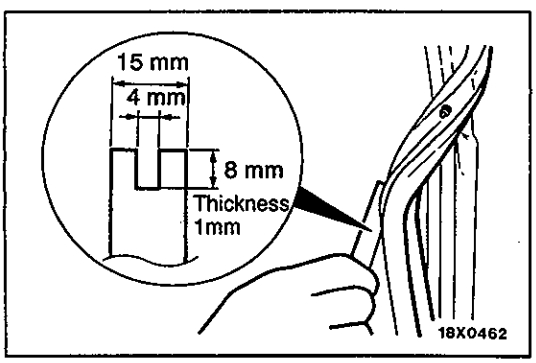
- Door trim (Refer to P.42-37.)

4. Door beltline inner weatherstrip

Door beltline moulding removal

- Door mirror (Refer to GROUP 51.)

5. Door beltline moulding



18X0462

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	Pink
Right door	Dark brown

TAILGATE <Hatchback>

42400060016

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of the tailgate trim

TROUBLESHOOTING

42400070040

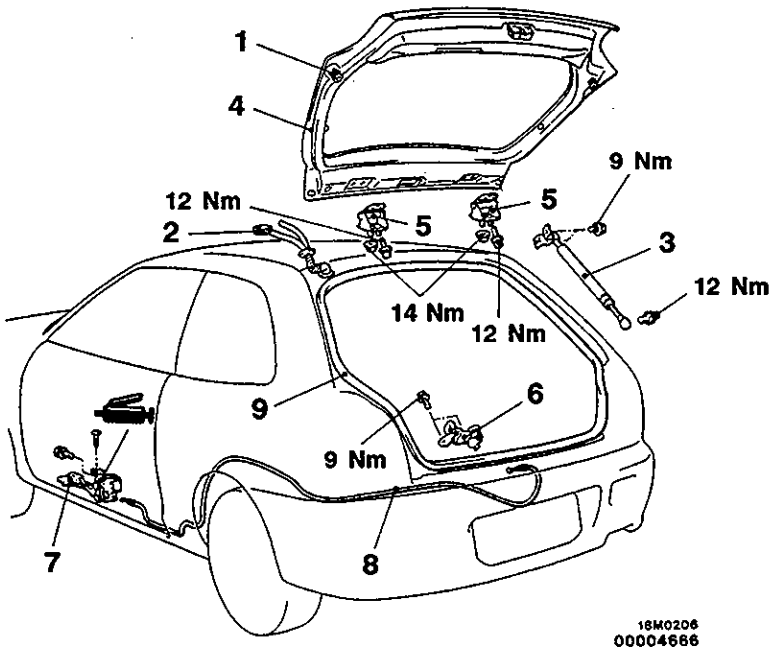
INSPECTION CHART FOR TROUBLE SYMPTOMS

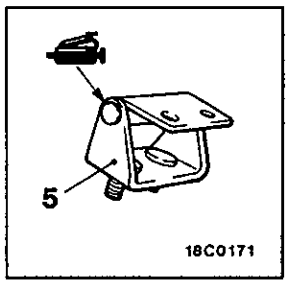
Trouble symptom	Reference page
Door lock mechanism does operate.	42-23.

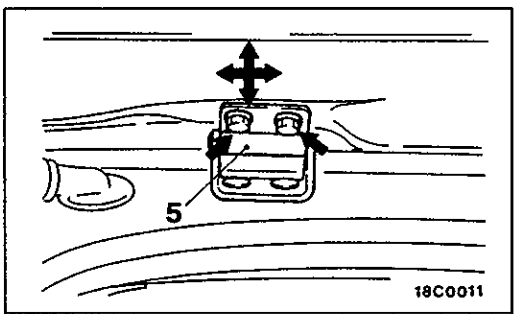
TAILGATE ASSEMBLY

42400110063

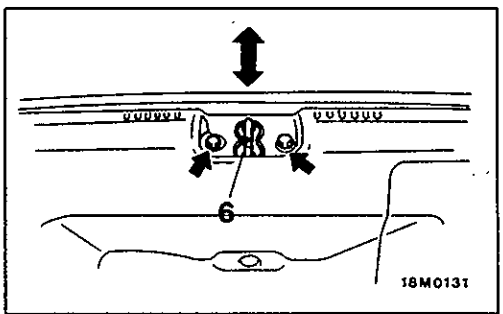
REMOVAL AND INSTALLATION







Adjustment of clearance around tailgate



Adjustment of tailgate step and tailgate striker linkage

Tailgate and tailgate hinge removal steps

▶B◀ 1. Bumper
2. Harness connector
◀A▶ 3. Tailgate gas spring
4. Tailgate assembly
- Headlining

5. Tailgate hinge

Tailgate striker removal steps

- Rear end trim (Refer to GROUP 52A.)

6. Tailgate striker

Tailgate lock release handle and cable removal steps

- Front seat (driver's side) (Refer to GROUP 52A.)
- Rear seat (Refer to GROUP 52A.)
- Scuff plate (driver's side) (Refer to GROUP 52A – Trims.)
- Rear end trim (Refer to GROUP 52A.)
- Quarter trim (driver's side) (Refer to GROUP 52A.)

7. Tailgate lock release handle
8. Tailgate lock release cable

Tailgate opening weatherstrip removal

▶A◀ 9. Tailgate opening weatherstrip

REMOVAL SERVICE POINT

◀A▶ TAILGATE GAS SPRING REMOVAL

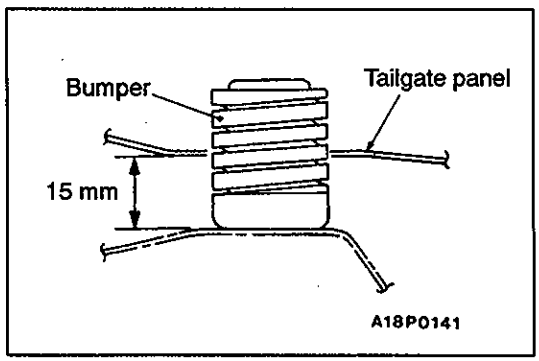
Caution

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 marked part is at the centre of the body.



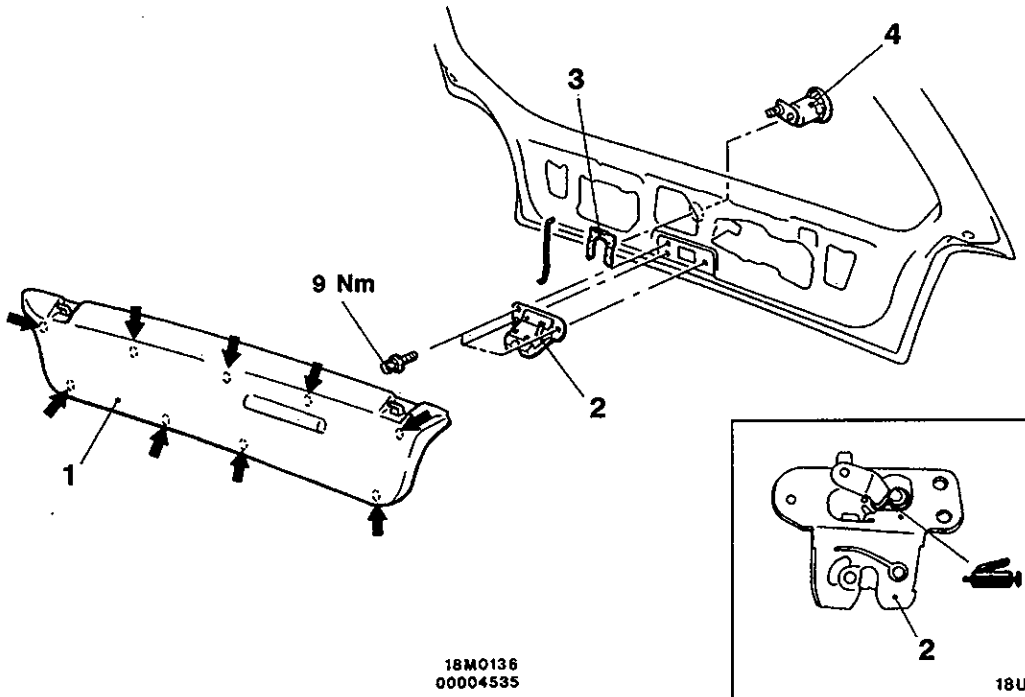
▶B◀ BUMPER INSTALLATION

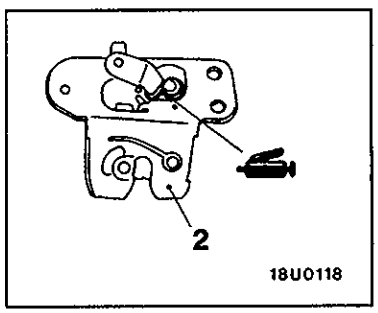
Install the bumper so that the amount of projection from the tailgate panel is as shown in the illustration.

TAILGATE LATCH

42400170023

REMOVAL AND INSTALLATION



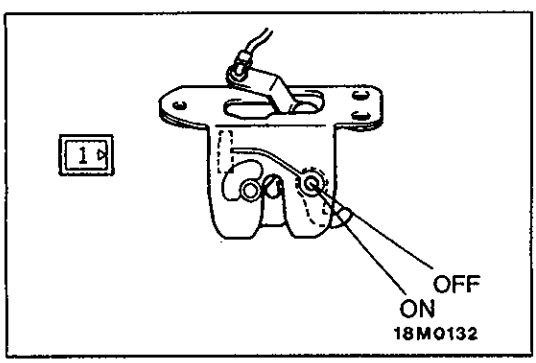


NOTE
⬅ : Resin clip position

1. Tailgate trim

Tailgate latch removal steps
1. Tailgate trim
2. Tailgate latch

Tailgate lock cylinder removal steps
1. Tailgate trim
3. Cylinder lock retainer
4. Tailgate lock cylinder



INSPECTION

42400180019

TAILGATE LATCH CONTINUITY CHECK

Switch position	Terminal No.1	Body earth
ON (Latch open)	○	○
OFF (Latch shut)		

SUNROOF

42600030037

SERVICE SPECIFICATIONS

Items	Standard value
Roof lid glass operating current A	7 or less (at 20°C)
Sunroof motor clutch slippage torque Nm	4.7 – 6.2

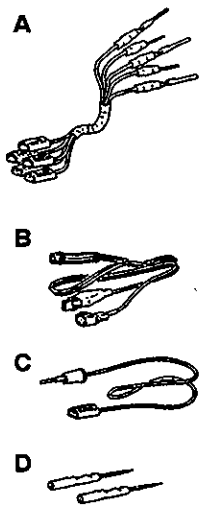
SEALANT

42600050057

Item	Specified sealant
Rail cover assembly	3M ATD Part No.8531 or 3M Part No.8646 or equivalent

SPECIAL TOOLS

42600060012

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	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection

TROUBLESHOOTING

42600200020

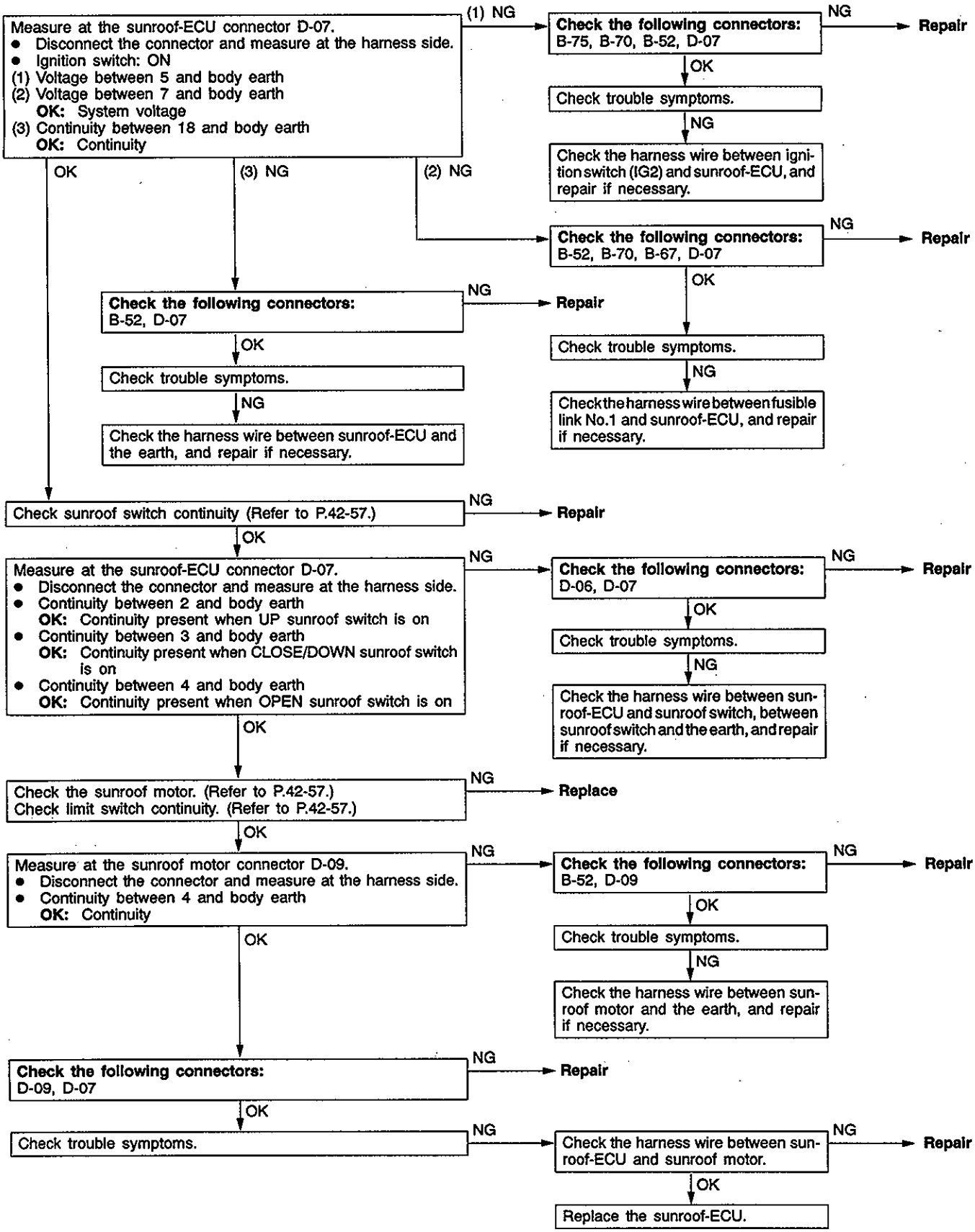
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
The sunroof does not operate when the ignition switch is turned to ON.	1	42-50
The motor does not reverse its direction when a load of 140 N or more is applied while the sunroof is closing.	2	42-52
The timer does not operate for 30 seconds after the ignition switch is turned to OFF.	3	42-52
Opening or closing of the sunroof is possible immediately after turning the ignition switch to OFF, but the timer function does not operate continuously for another 30 seconds if the driver's side door is opened within 30 seconds.	4	42-52

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1

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


Measure at the sunroof-ECU connector D-07.
• Disconnect the connector and measure at the harness side.
• Ignition switch: ON
(1) Voltage between 5 and body earth
(2) Voltage between 7 and body earth
OK: System voltage
(3) Continuity between 18 and body earth
OK: Continuity
(1) NG
Check the following connectors: B-75, B-70, B-52, D-07
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between ignition switch (IG2) and sunroof-ECU, and repair if necessary.
OK
(3) NG
(2) NG
Check the following connectors: B-52, D-07
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between sunroof-ECU and the earth, and repair if necessary.
Check the following connectors: B-52, B-70, B-67, D-07
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between fusible link No.1 and sunroof-ECU, and repair if necessary.
Check sunroof switch continuity (Refer to P.42-57.)
NG
Repair
OK
Measure at the sunroof-ECU connector D-07.
• Disconnect the connector and measure at the harness side.
• Continuity between 2 and body earth
OK: Continuity present when UP sunroof switch is on
• Continuity between 3 and body earth
OK: Continuity present when CLOSE/DOWN sunroof switch is on
• Continuity between 4 and body earth
OK: Continuity present when OPEN sunroof switch is on
NG
Check the following connectors: D-06, D-07
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between sunroof-ECU and sunroof switch, between sunroof switch and the earth, and repair if necessary.
OK
Check the sunroof motor. (Refer to P.42-57.)
Check limit switch continuity. (Refer to P.42-57.)
NG
Replace
OK
Measure at the sunroof motor connector D-09.
• Disconnect the connector and measure at the harness side.
• Continuity between 4 and body earth
OK: Continuity
NG
Check the following connectors: B-52, D-09
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between sunroof motor and the earth, and repair if necessary.
OK
Check the following connectors: D-09, D-07
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness wire between sunroof-ECU and sunroof motor.
NG
Repair
OK
Replace the sunroof-ECU.

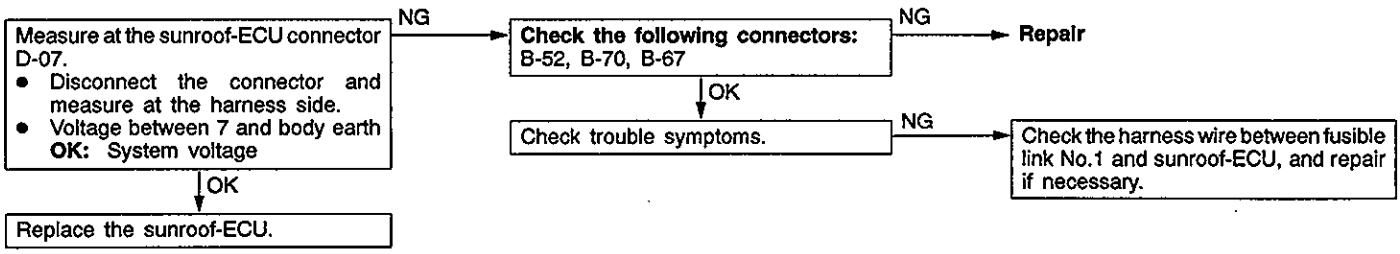
Inspection Procedure 2

The motor does not reverse its direction when a load of 140 N or more is applied while the sunroof is closing.	Probable cause
The sunroof-ECU monitors the load conditions from the amount of current flowing to the motor. If more than the constant amount of current is flowing, the direction of motor operation is reversed to prevent jamming. If the motor does not reverse direction even when an excessive load is being applied, the cause may be a malfunction of the sunroof-ECU.	• Malfunction of sunroof-ECU

Replace the sunroof-ECU.

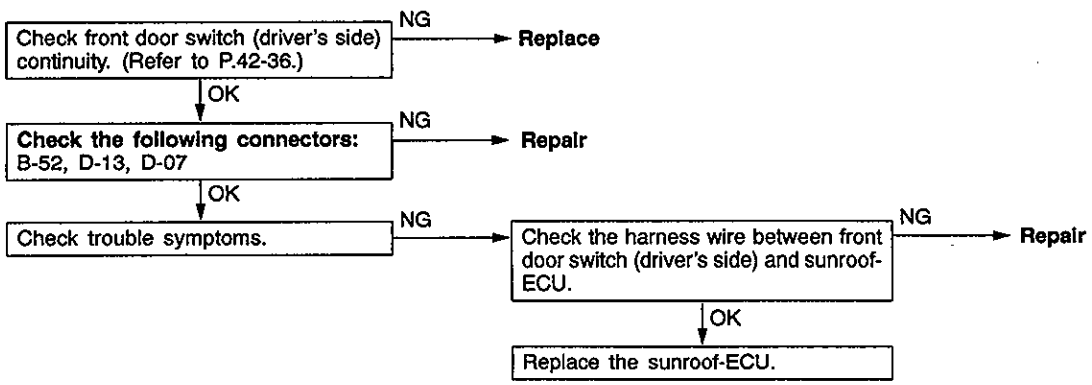
Inspection Procedure 3

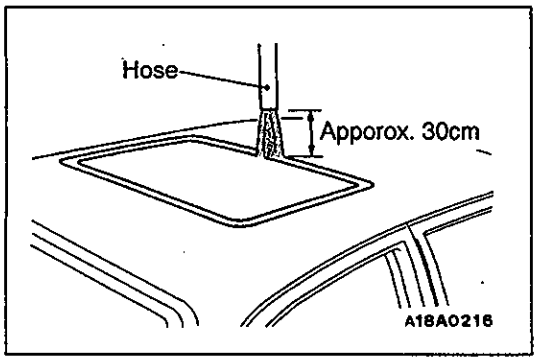
The timer does not operate for 30 seconds after the ignition switch is turned to OFF.	Probable cause
The sunroof-ECU has a timer function which operates for 30 seconds after the ignition switch is turned to OFF. If the timer does not operate, the cause may be a malfunction of the sunroof-ECU or of the wiring harness or connector.	• Malfunction of sunroof-ECU • Malfunction of wiring harness or connector



Inspection Procedure 4

Opening or closing of the sunroof is possible immediately after turning the ignition switch to OFF, but the timer function does not operate continuously for another 30 seconds if the driver's side door is opened within 30 seconds.	Probable cause
The operation period for the sunroof timer is extended when an on signal is output from the driver's-side door switch. Because of this, if the timer operation period is not extended, the cause may be a malfunction of the door switch input circuit.	• Malfunction of the front door switch (driver's side) • Malfunction of sunroof-ECU • Malfunction of wiring harness or connector





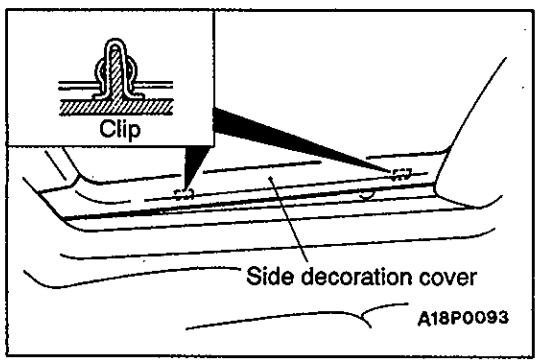
ON-VEHICLE SERVICE

42600090073

WATER TEST

Check if there are any leaks in the sunroof by the following procedure.

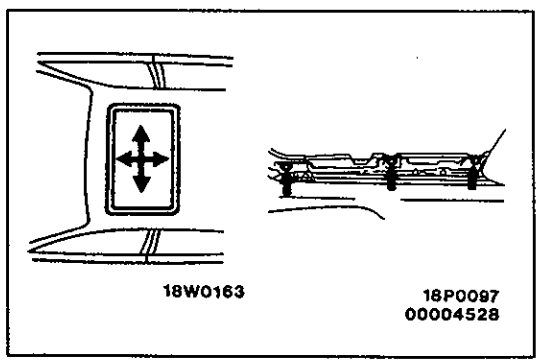
1. Fully close the roof lid glass.
2. Adjust the water pressure so that water comes out of the hose to a height of approximately 50 cm when the hose is held vertically facing upwards.
3. Hold the end of the hose approximatery 30 cm above the roof and let the water run onto the weatherstrip for 5 minutes 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

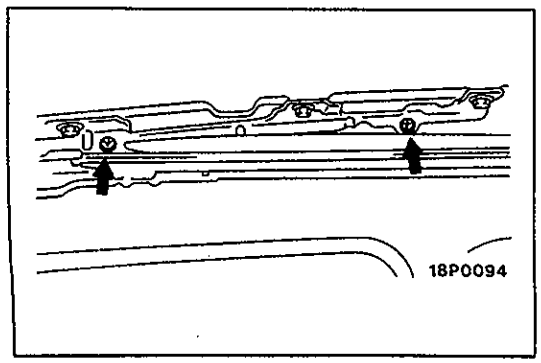
42600100073

1. Fully close the roof lid glass.
2. Fully open the sunshade.
3. Remove the side decoration cover.



4. To adjust the forward, backward and sideways position of the roof lid glass, loosen the six roof lid glass assembly mounting nuts and then adjust the glass forward, backward or sideways.

   NOTE
   If the adjustment cannot be made by loosening the adjustment nuts, the roof lid glass or the motor have not been fully closed, so they should be adjusted to the fully closed positions.



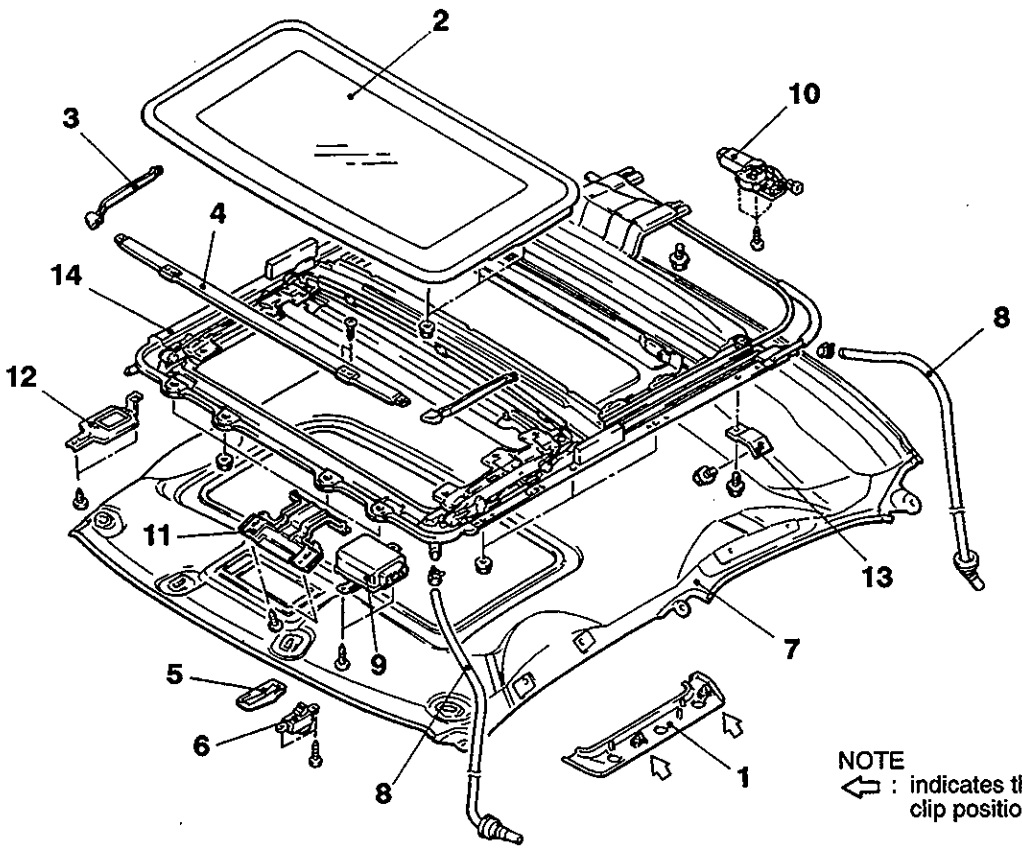
5. To adjust the height of the roof lid glass, loosen the four guide (A) assembly mounting screws and then move the roof lid glass assembly along the slot in the guide (A) assembly to adjust the height of the roof lid glass.
6. After adjustment, check to be sure that the sunroof operates smoothly.

SUNROOF

42600120093

REMOVAL AND INSTALLATION

Post-installation Operation
<Roof lid glass assembly, Sunroof assembly>
(1) Sunroof Water Test (Refer to P.42-53.)
(2) Sunroof Fit Adjustment (Refer to P.42-53.)



Roof lid glass assembly removal steps

◀A▶ 1. Side decoration cover
2. Roof lid glass assembly

Deflector assembly removal steps

3. Deflector link assembly <Hatchback>
4. Deflector assembly <Hatchback>

Sunroof switch removal steps

5. Sunroof switch cover
6. Sunroof switch

Drain hose removal steps

● Splash shield (Front drain hose)
7. Headlining
◀B▶ ▶B◀ 8. Drain hose

Sunroof-ECU removal steps

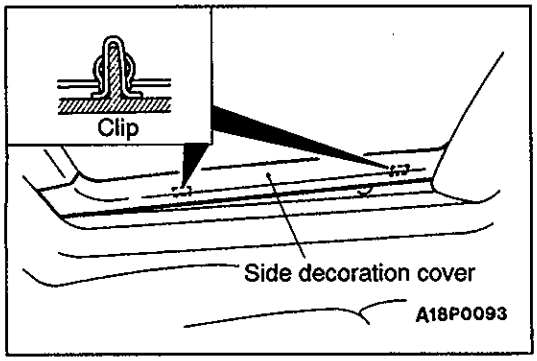
7. Headlining
9. Sunroof-ECU

Sunroof motor removal steps

7. Headlining
◀C▶ ▶A◀ 10. Sunroof motor

Sunroof assembly removal steps

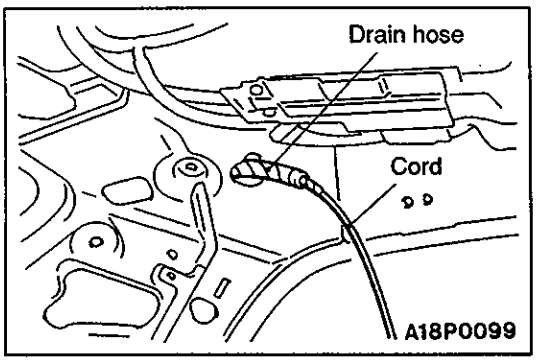
7. Headlining
8. Drain hose connection
11. Room lamp bracket
12. Sunroof switch bracket
13. Set bracket
14. Sunroof assembly



REMOVAL SERVICE POINTS

◀A▶ SIDE DECORATION COVER REMOVAL

Remove the clips, and then remove the side decoration cover.

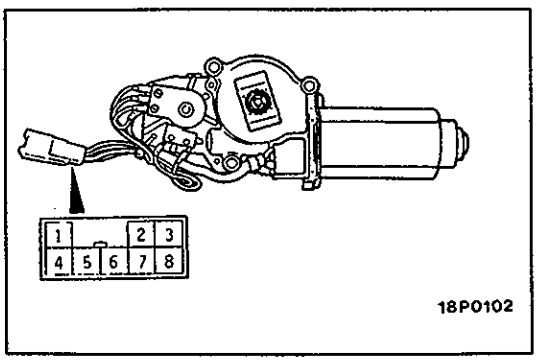


◀B▶ DRAIN HOSE REMOVAL

Tie a cord to the end of the drain hose, and wind tape around the tie until it is smooth. Then pull the drain hose out from the passenger compartment.

◀C▶ SUNROOF MOTOR REMOVAL

Caution
Always close the roof lid glass fully before removing the sunroof motor. If the fully-closed positions of the roof lid glass and the sunroof motor are not the same, the sunroof will not operate properly.

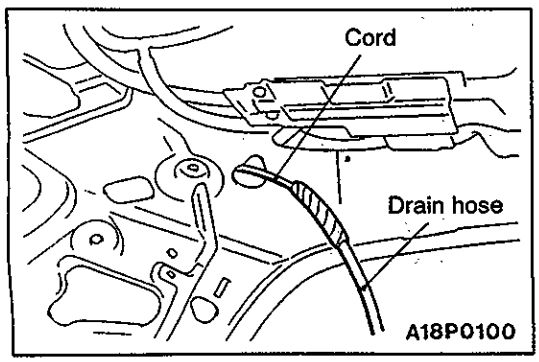


INSTALLATION SERVICE POINTS

▶A◀ SUNROOF MOTOR INSTALLATION

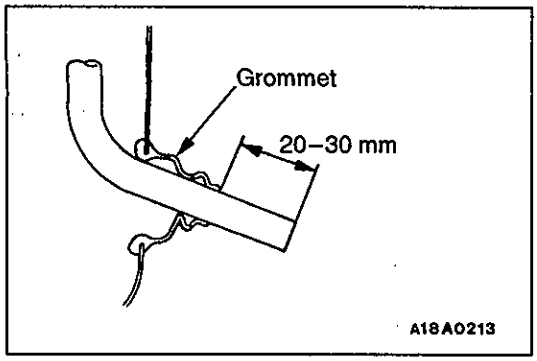
If the fully-closed position of the sunroof motor is incorrect, set the motor to the fully-closed position by the procedure given below before installing the motor.

1. Connect a circuit analyser between terminals (4) and (6) of the motor connector.
2. Operate the motor until the position is reached at which continuity switches from on to off or from off to on, and then install the motor.

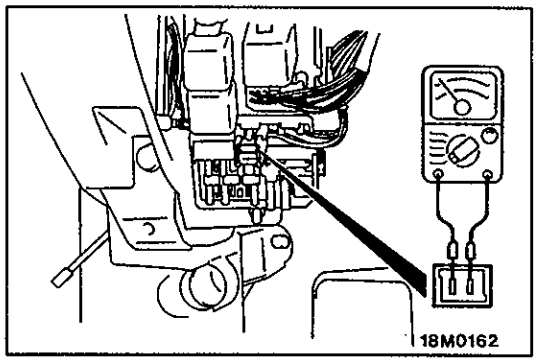


▶B◀ DRAIN HOSE INSTALLATION

1. Tie the cord that was used during removal to the end of the drain hose, and wind tape around it so that there is no unevenness.
2. Pull the cord to pull through the drain hose



3. Make the protrusion from the drain hose grommet as shown in the illustration.



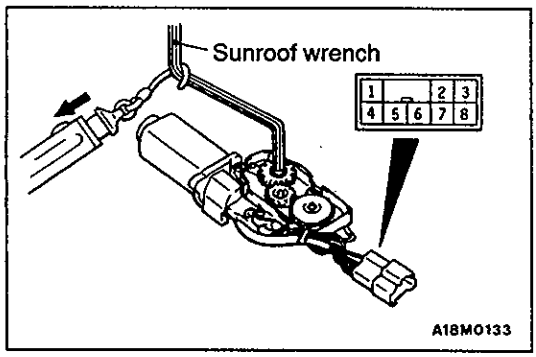
INSPECTION

42600130058

ROOF LID GLASS OPERATION CURRENT CHECK

1. Remove the sunroof fuse and connect a circuit analyser as shown in the illustration.
2. Press the sunroof switch to the ON position, and then measure the operation current in the intervals between the points when the sunroof starts to operate, when it is fully open, when it is fully closed and when it is fully tilted up.

   Standard value: 7 A or less (at 20°C)
3. If the operation current is outside the standard value, check the following points.
   - Installation condition, warping or jamming of sunroof assembly
   - Sticking of drive cable
   - Tilt of roof lid glass

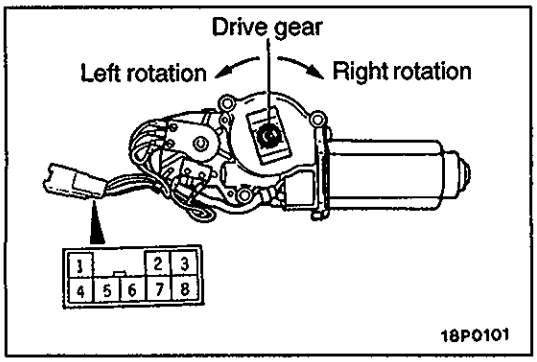


SUNROOF-MOTOR CLUTCH SLIDING TORQUE CHECK

1. Insert the sunroof wrench of the on-board tools into the hexagonal hole in the motor drive shaft, and hook a spring balance as shown in the illustration.
2. Apply battery voltage between terminals (1) and (2) of the sunroof motor connector to operate the motor.
3. Measure the load on the spring balance at the point where the rotation torque of the motor matches the spring force of the spring balance.

   Standard value: 4.7–6.2 Nm

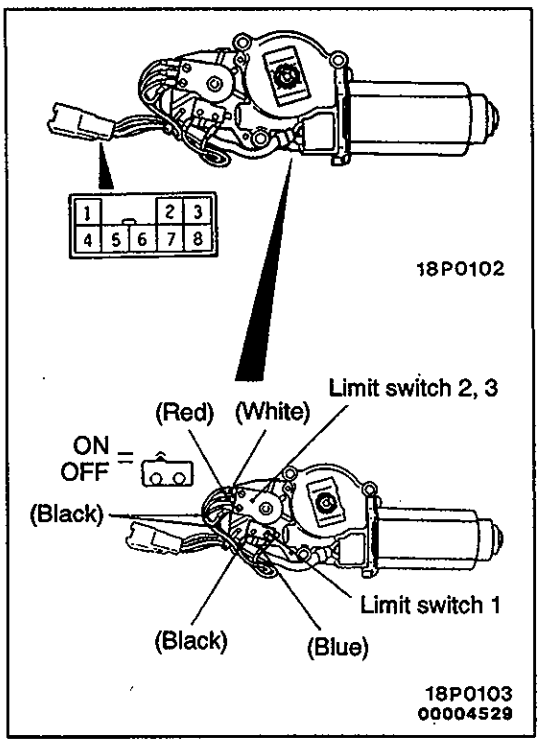
   Caution
   1. **The spring balance should be kept a right angle to the sunroof wrench.**
   2. **If a wrench other than that in the on-board tools is used, the value for the clutch sliding torque will be different, so only the on-board tool should be used.**
4. If the clutch sliding torque is outside the standard value, turn the motor adjuster to adjust it.



SUNROOF MOTOR CHECK

Check the direction of rotation of the drive gear when the battery is connected to the connector.

Battery connection terminal		Drive gear rotation direction
1	2	
⊖	⊕	Right
⊕	⊖	Left

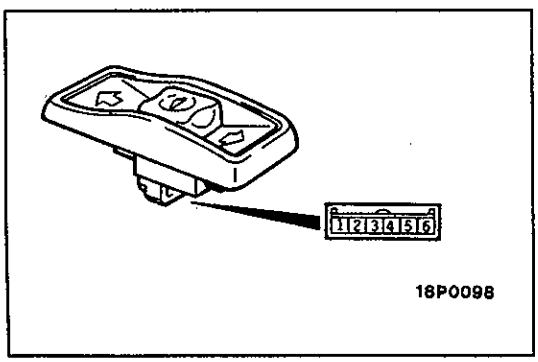


LIMIT SWITCH CONTINUITY CHECK

1. Remove the limit switches from the sunroof motor, and then check the operation of the limit switches.

Switch position		Terminal No.			
		4	5	6	7
Limit switch 1	ON	○	○		
	OFF				
Limit switch 2	ON	○		○	
	OFF				
Limit switch 3	ON	○			○
	OFF				

2. Check the identification colours. Then install the limit switches as shown in the illustration.

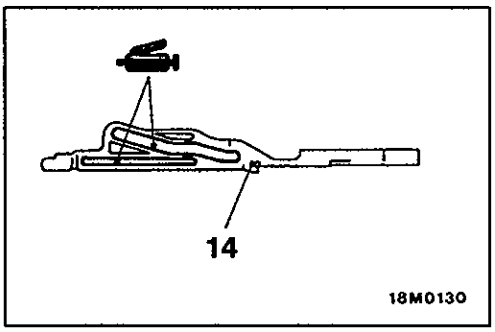


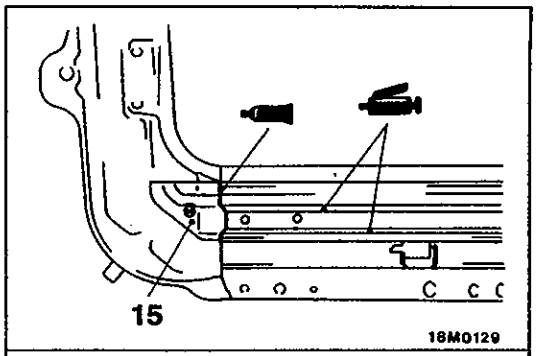
SUNROOF SWITCH CONTINUITY CHECK

Switch position	Terminal No.			
	3	4	5	6
Slide open		○	○	
Off				
Tilt up	○	○		
Slide close, Tilt down		○		○

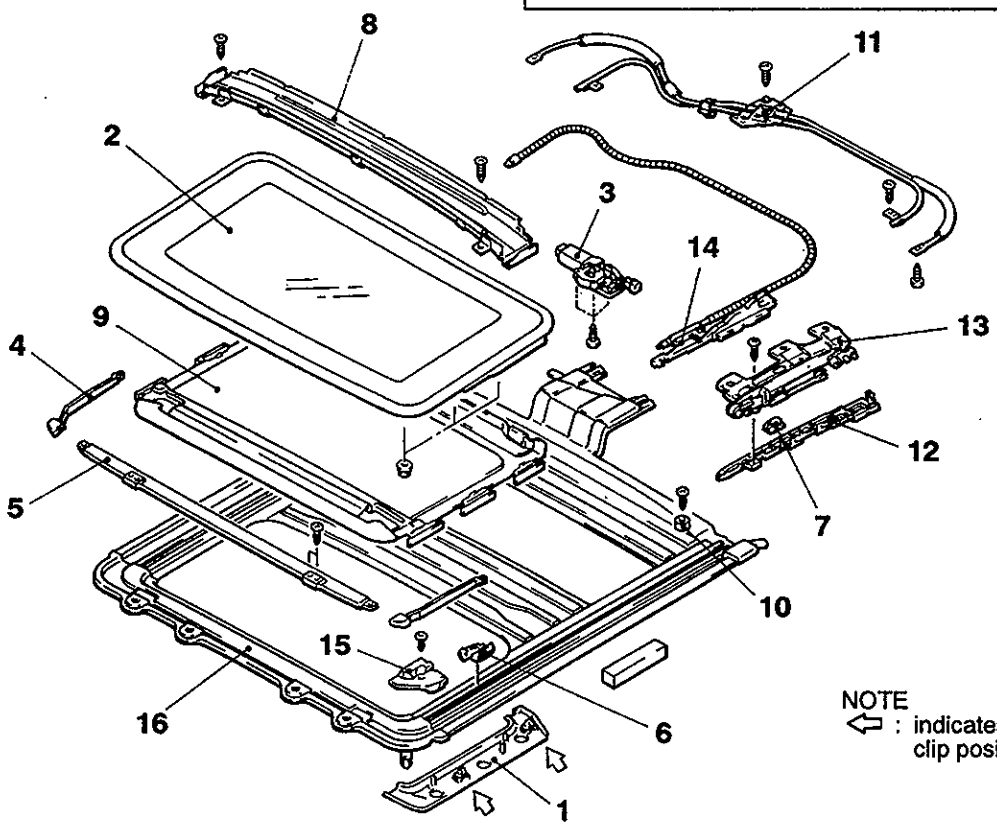
DISASSEMBLY AND REASSEMBLY

42600140051





Sealant:
3M ATD Part No.8531 or 3M Part No.8646, or equivalent



NOTE
⇦ : indicates the sheet metal clip position.

18M0139
00004534

Disassembly steps

1. Side decoration cover (Refer to P.42-55.)
2. Roof lid glass assembly
3. Sunroof motor
4. Deflector link assembly <Hatchback>
5. Deflector assembly <Hatchback>
6. Link connector <Hatchback>
7. Shoe (C) <Hatchback>
8. Drip rail assembly
9. Sunshade assembly
10. Cushion (B) assembly
11. Drive unit assembly
12. Decoration link
13. Guide (A) assembly
14. Slider assembly
15. Rail cover assembly
16. Frame sub assembly

EXTERIOR

CONTENTS

51109000104

SERVICE SPECIFICATIONS

51100030096

Items		Standard value
Windshield wiper blade installation position mm	Driver's side	20±5
	Passenger's side	20±5
Rear wiper blade installation position mm		77±5

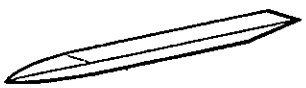
SEALANT AND ADHESIVE

51100050092

Items	Specified sealant and adhesive
Front airdam panel or rear spoiler <Hatchback> to body panel	Adhesive tape: double-sided tape [10 mm width and 1.2 mm thickness]
Side airdam to body panel	Adhesive tape: double-sided tape [5 mm width and 1.2 mm thickness]
Rear side airdam to body panel	Adhesive tape: double-sided tape [10 mm width and 0.8 mm thickness]

SPECIAL TOOLS

51100060071

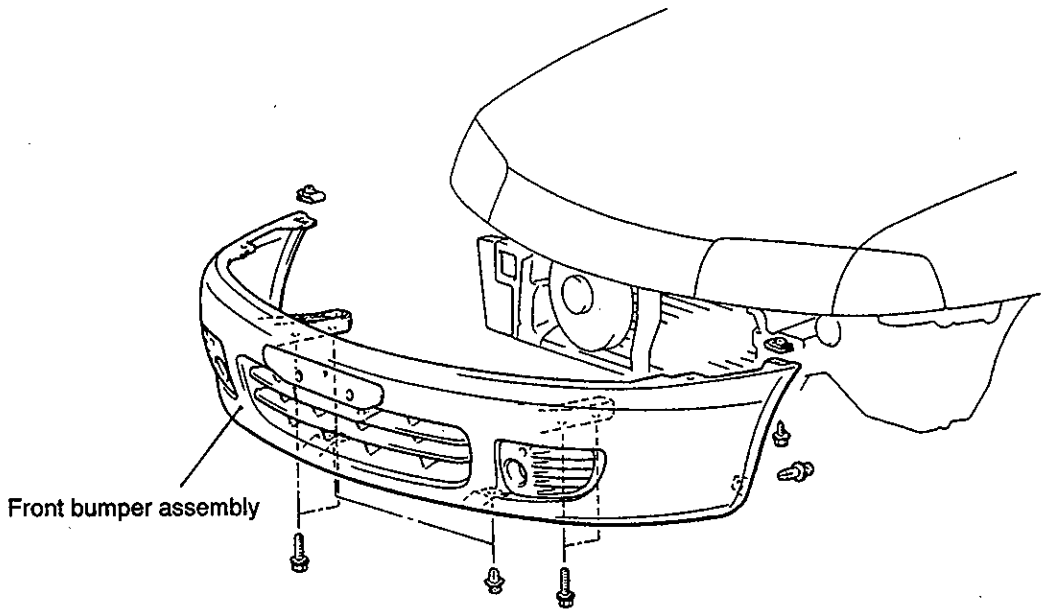
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of bumper mounting clips (front and rear) and door mirror control switch
	MB990449	Window moulding remover	Removal of roof drip moulding, etc.

FRONT BUMPER

51100140096

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Splash Shield Removal and Installation (Refer to GROUP 42 – Fender.)

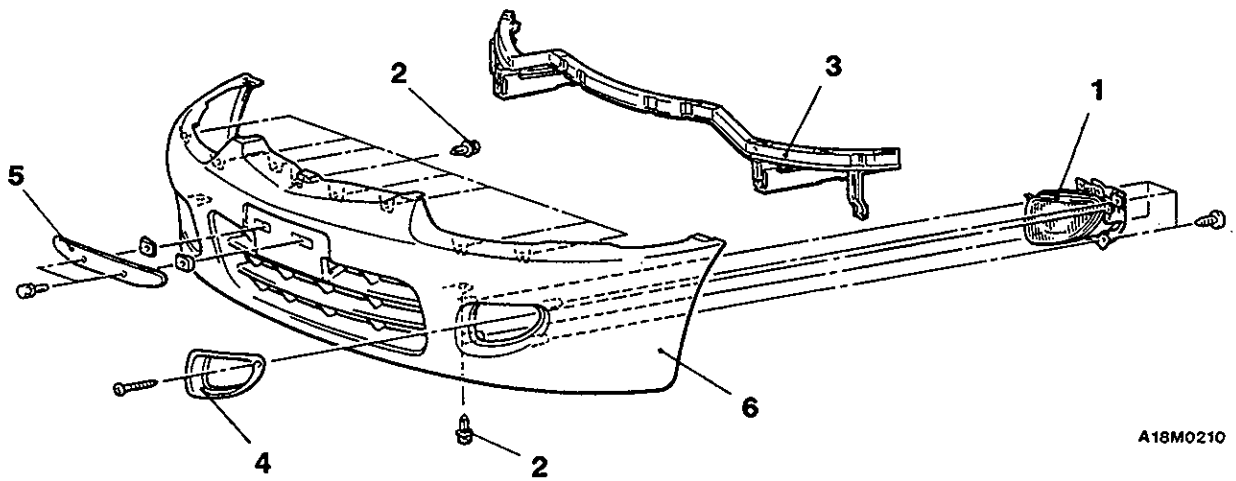


A18M0198

DISASSEMBLY AND REASSEMBLY

51100160108

<Hatchback>

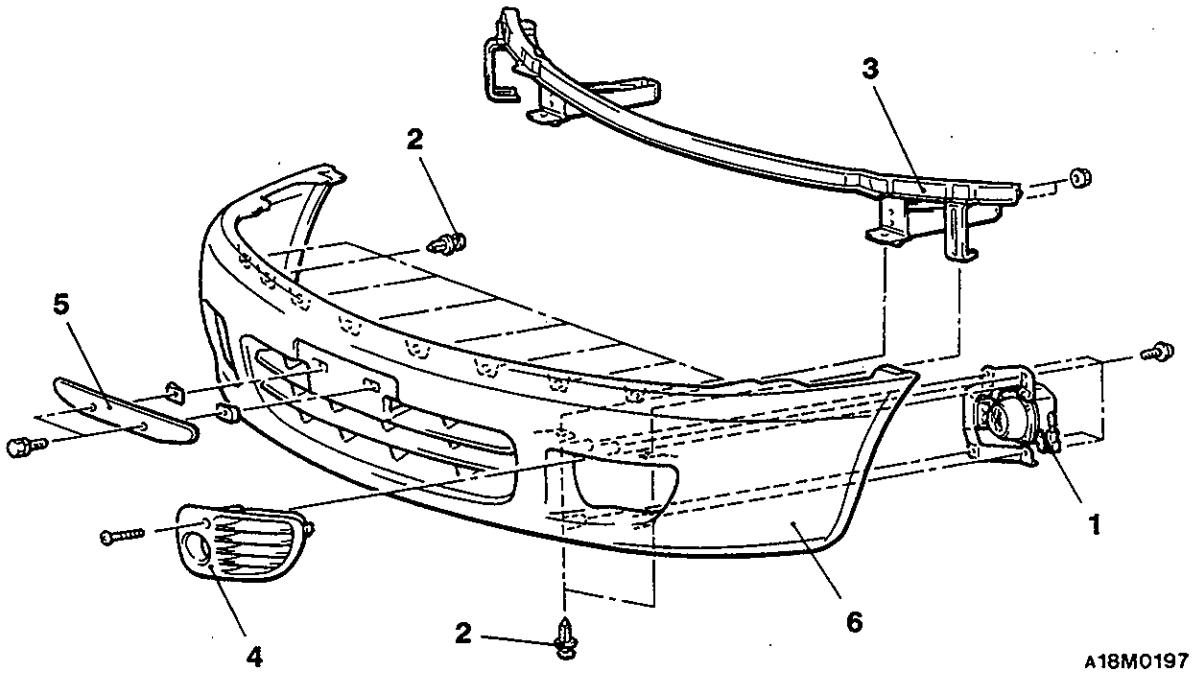


A18M0210

Disassembly steps

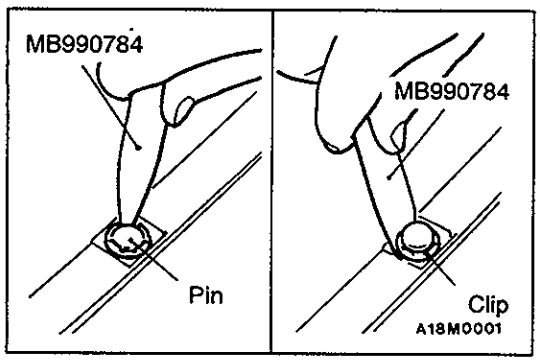
◀A▶ 1. Front fog lamp assembly
2. Clip
3. Front bumper reinforcement
4. Front fog lamp bezel
5. Licence plate bracket
6. Bumper face

<Sedan>



Disassembly steps

◀A▶ 1. Front fog lamp assembly
2. Clip
3. Front bumper reinforcement
4. Front fog lamp bezel
5. Licence plate bracket
6. Bumper face



DISASSEMBLY SERVICE POINT

◀A▶ CLIP REMOVAL

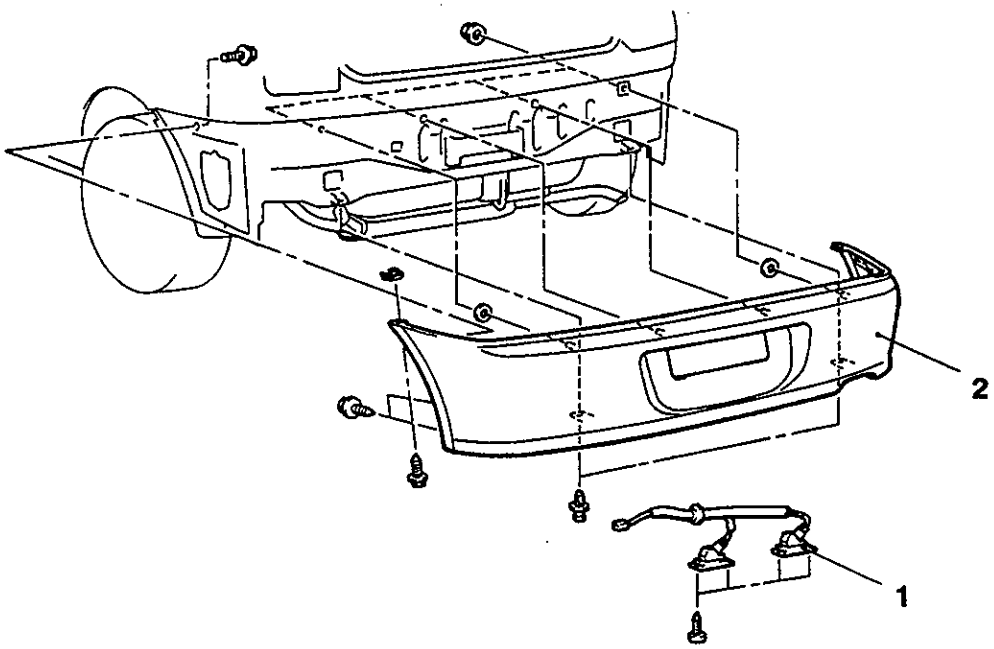
(1) Use the special tool to pull up the centre pin in the clip.
(2) Remove the clip.

REAR BUMPER

51100190114

REMOVAL AND INSTALLATION

<Hatchback>

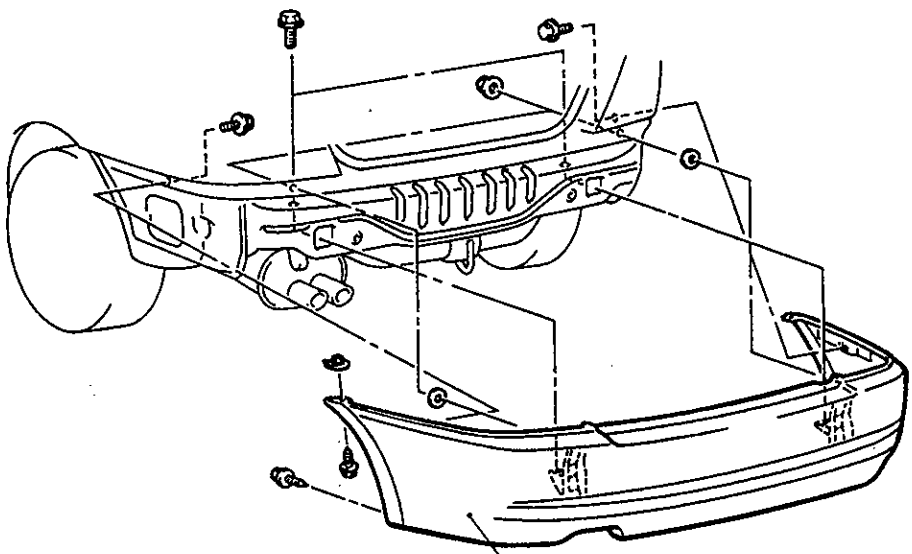


A18M0102

Removal steps

1. Licence plate lamp
2. Rear bumper assembly

<Sedan>



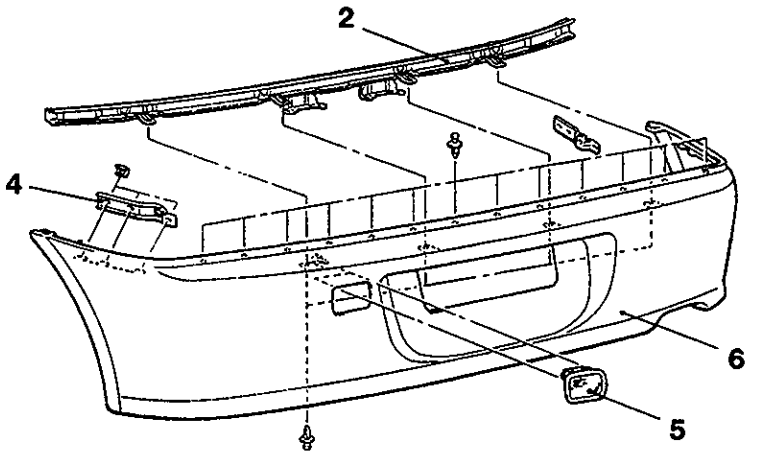
A18M0100

Rear bumper assembly

DISASSEMBLY AND REASSEMBLY

51100210094

<Hatchback>



18M0199

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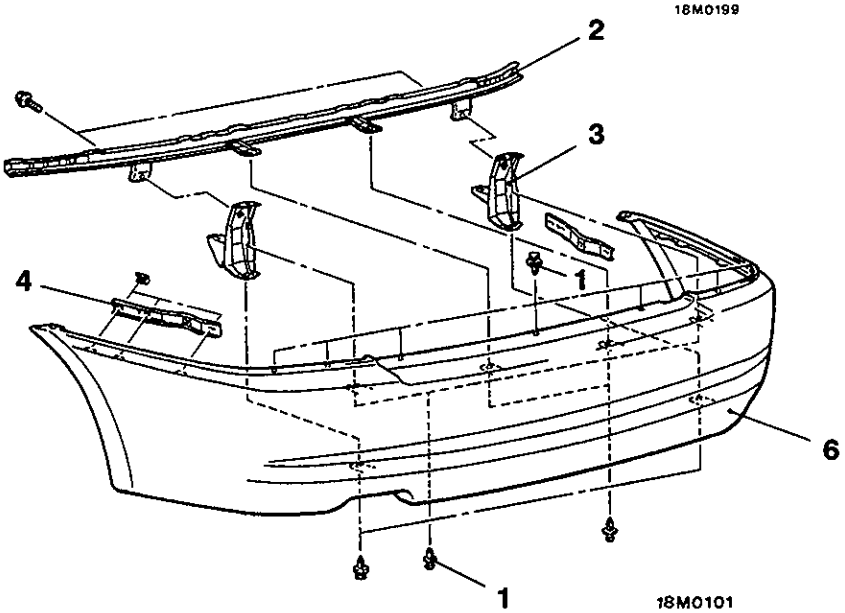
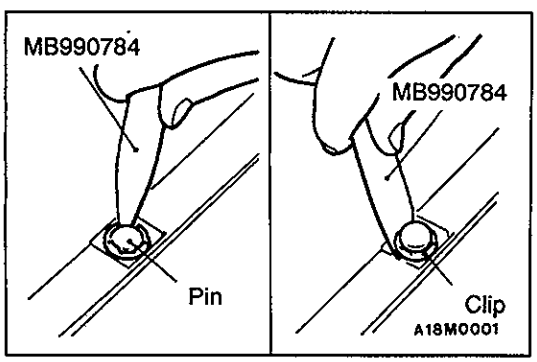


18M0101

00004552

Disassembly steps

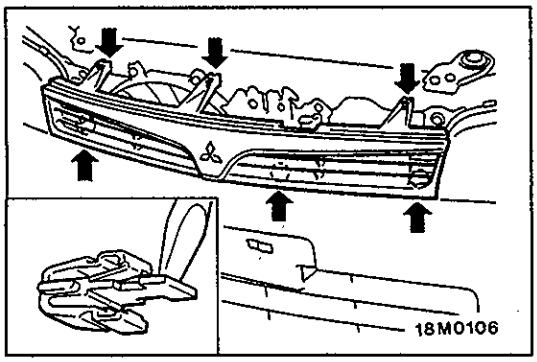
◀A▶ 1. Clip
2. Rear bumper reinforcement
3. Rear bumper bracket assembly
4. Side reinforcement
5. Rear fog lamp
6. Bumper face



DISASSEMBLY SERVICE POINT

◀A▶ CLIP REMOVAL

(1) Use the special tool to pull up the centre pin in the clip.
(2) Remove the clip.



RADIATOR GRILLE

51100280019

REMOVAL SERVICE POINT

RADIATOR GRILLE REMOVAL

Remove the radiator grille by pushing the tab of the radiator grille clips in the direction of the arrows with a flat-tipped screwdriver, while lightly pulling the radiator grille towards you.

MOULDINGS

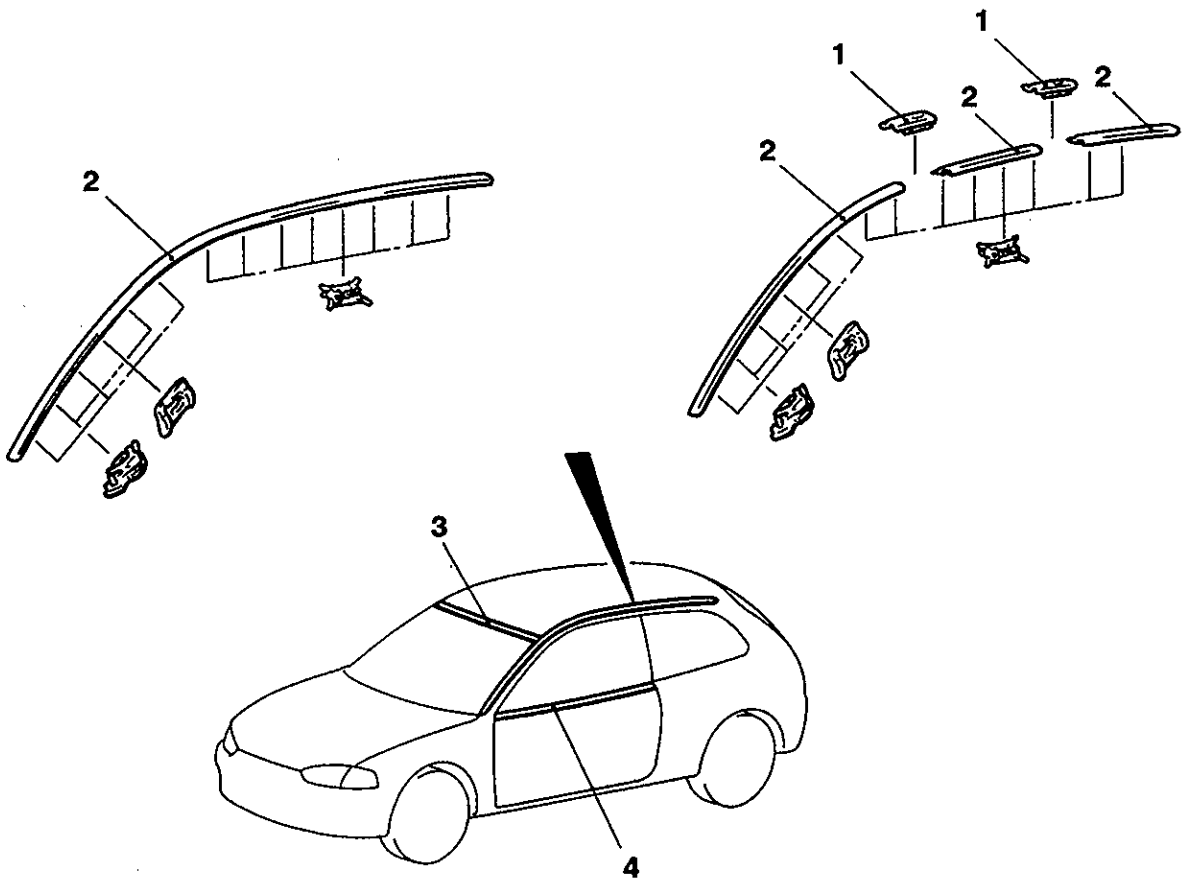
51100470089

REMOVAL AND INSTALLATION

<Hatchback>

<Vehicles without roof carrier cap>

<Vehicles with roof carrier cap>



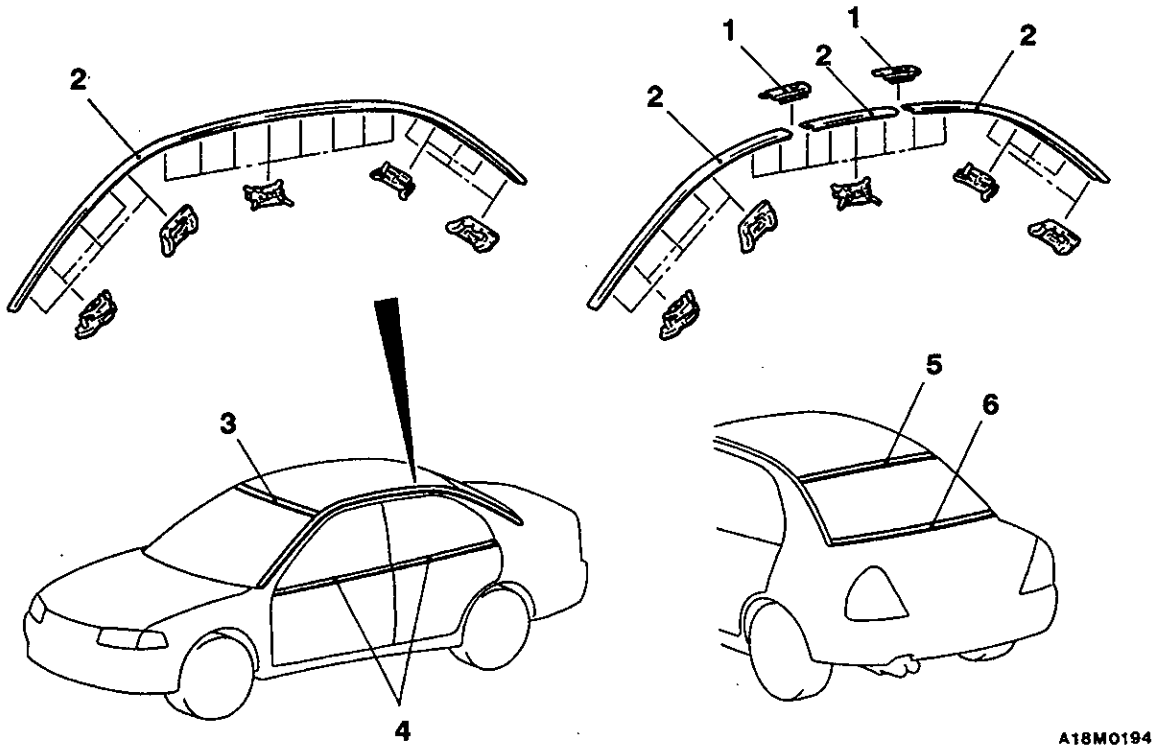
A18M0195

◀A▶ ▶A◀
1. Roof carrier caps
2. Roof drip moulding
3. Windshield upper moulding (Refer to GROUP 42 – Windshield.)
4. Belt line moulding (Refer to GROUP 42 – Window Glass Runchannel and Door Opening Weatherstrip.)

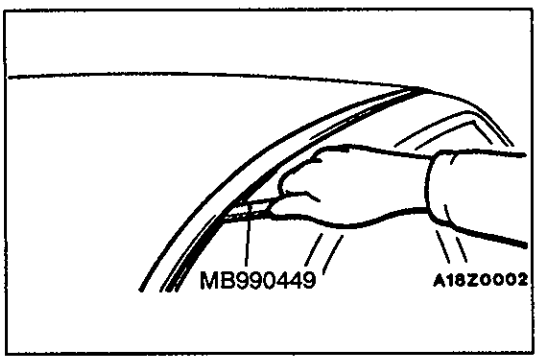
<Sedan>

<Vehicles without roof carrier cap>

<Vehicles with roof carrier cap>



◀A▶ ▶A◀
1. Roof carrier caps
2. Roof drip moulding
3. Windshield upper moulding (Refer to GROUP 42 – Windshield.)
4. Belt line moulding (Refer to GROUP 42 – Window Glass Runchannel and Door Opening Weatherstrip.)
5. Rear window moulding upper (Refer to GROUP 42 – Rear Window Glass.)
6. Rear window moulding lower (Refer to GROUP 42 – Rear 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

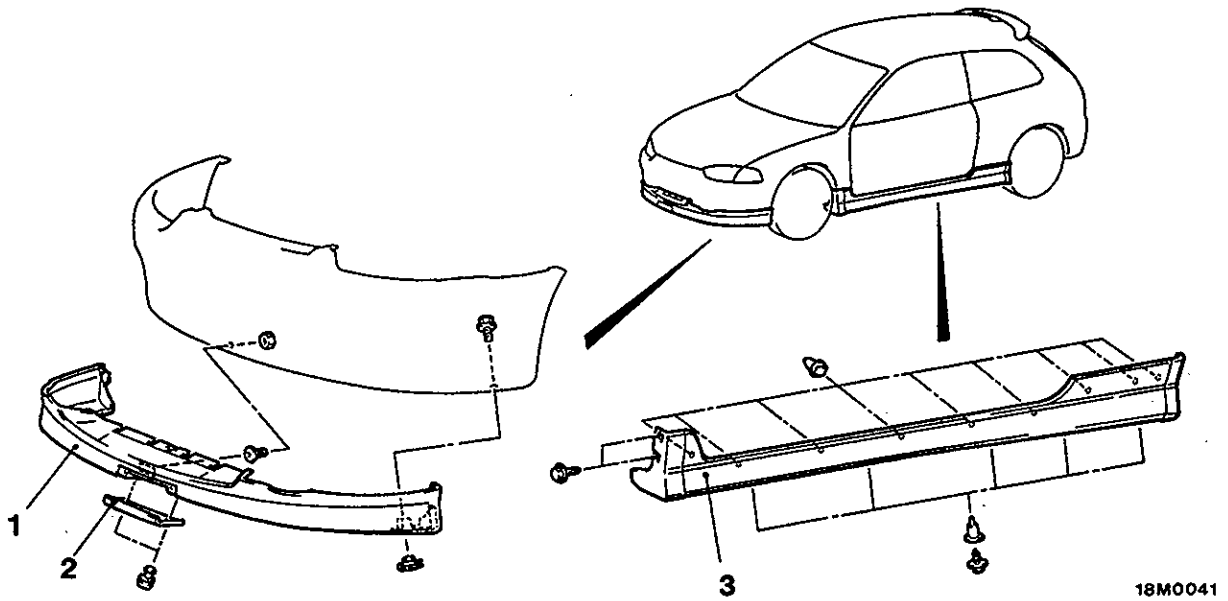
(1) Install the clips to the clip installation bosses on the roof.
(2) Install the roof moulding with the clips.

AERO PARTS

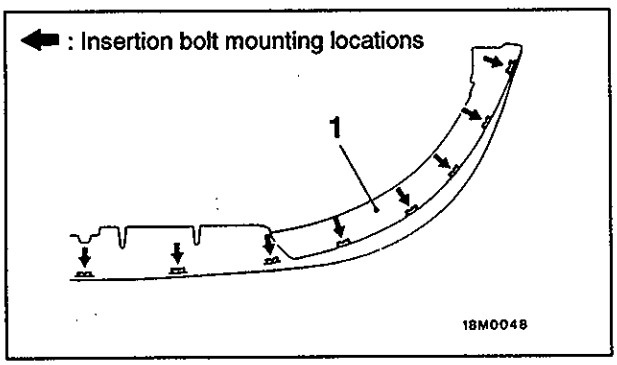
51100500085

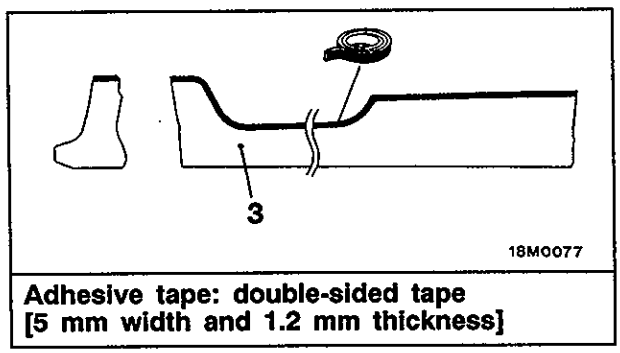
REMOVAL AND INSTALLATION

<Hatchback>

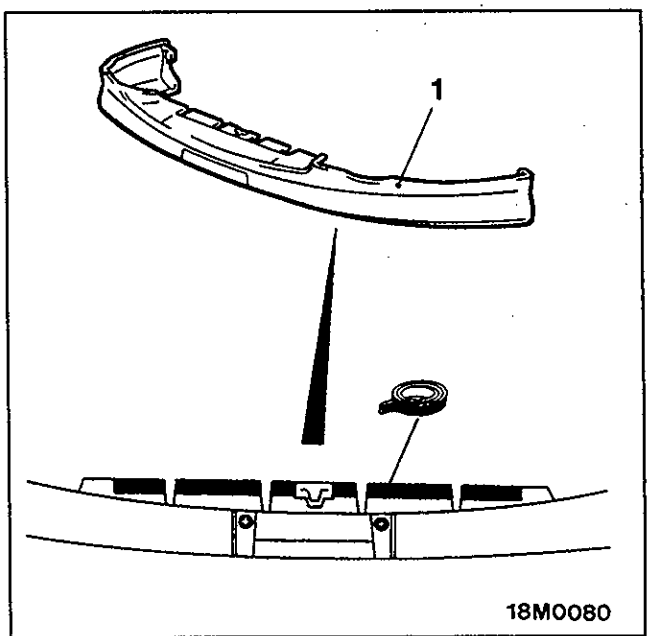


18M0041
00004553





Adhesive tape: double-sided tape [5 mm width and 1.2 mm thickness]



Adhesive tape: double-sided tape [10 mm width and 1.2 mm thickness]

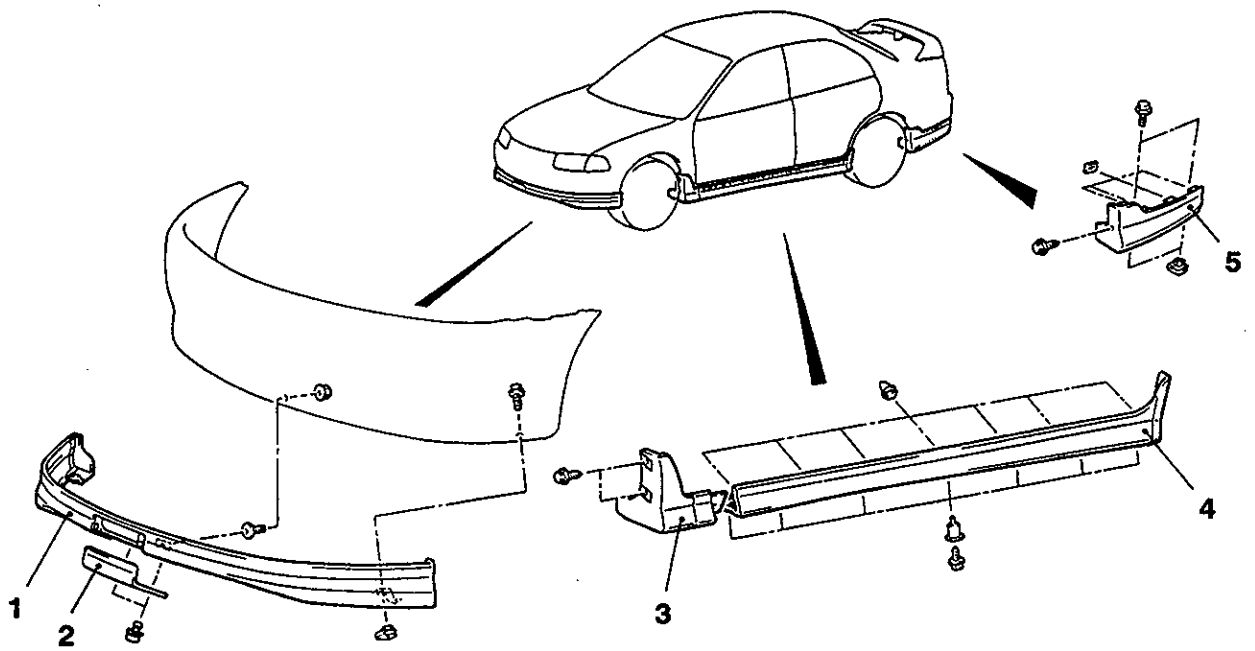
Front airdam panel removal steps

◀A▶ ▶A◀ 1. Front airdam panel
2. Center cover

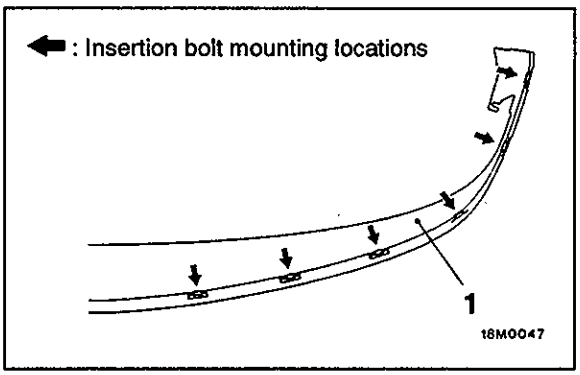
Side airdam removal

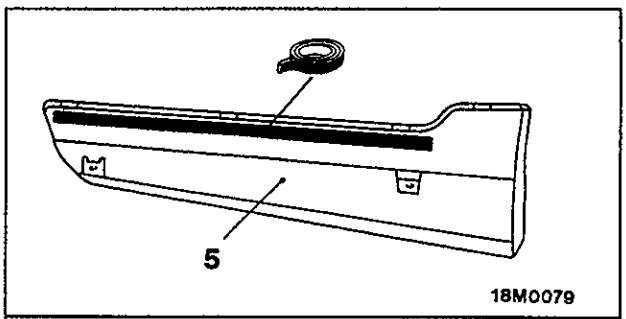
◀A▶ ▶A◀ 3. Side airdam

<Sedan>

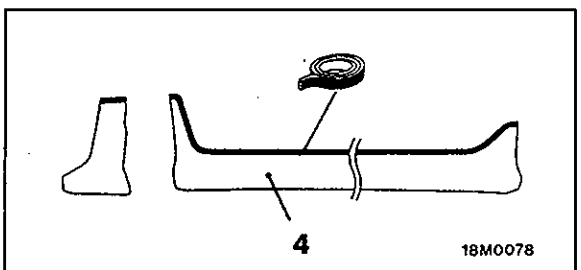


18M0044
00004554





Adhesive tape: double-sided tape [10 mm width and 0.8 mm thickness]



Adhesive tape: double-sided tape [5 mm width and 1.2 mm thickness]

Front airdam panel removal steps

◀A▶ ▶A◀ 1. Front airdam panel
2. Center cover

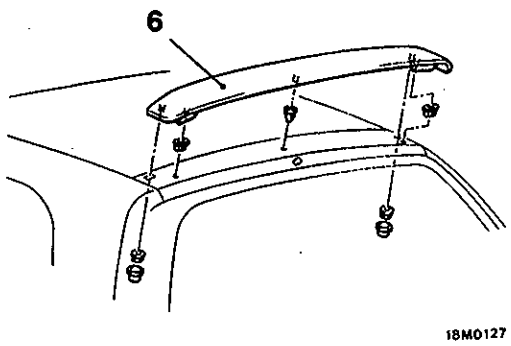
Side airdam removal steps

◀A▶ ▶A◀ 3. Side airdam front
◀A▶ ▶A◀ 4. Side airdam rear

Rear side airdam removal

◀A▶ ▶A◀ 5. Rear side airdam

<Hatchback>



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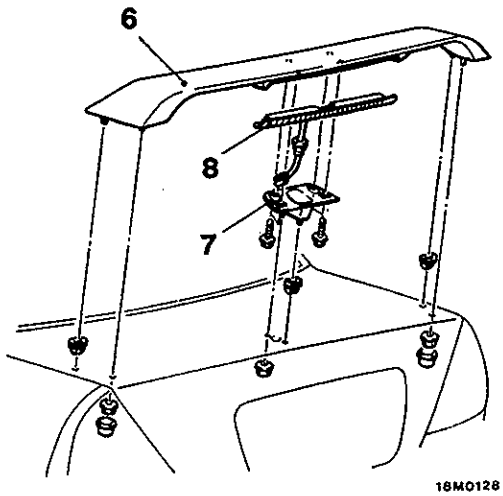

00004555

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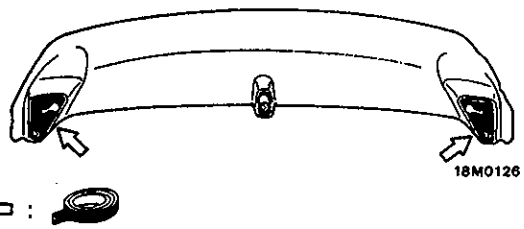
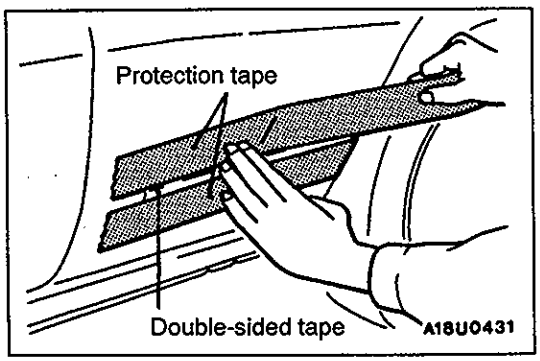
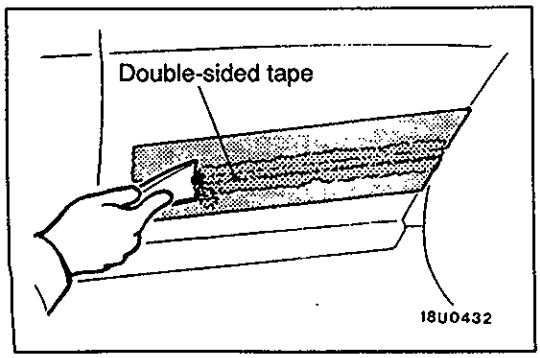


Adhesive tape: double-sided tape [10 mm width and 1.2 mm thickness]

Rear spoiler removal

6. Rear spoiler
7. Center stay
8. High-mounted stop lamp

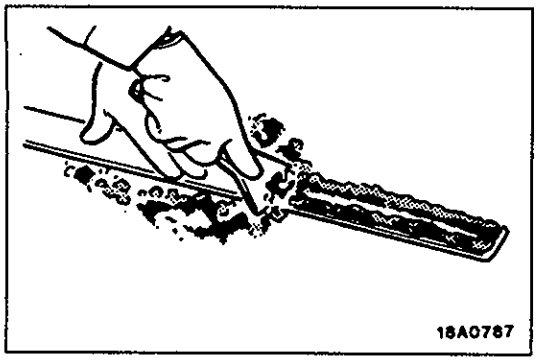




REMOVAL SERVICE POINT

◀A▶ FRONT AIRDAM PANEL/SIDE AIRDAM/REAR 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.



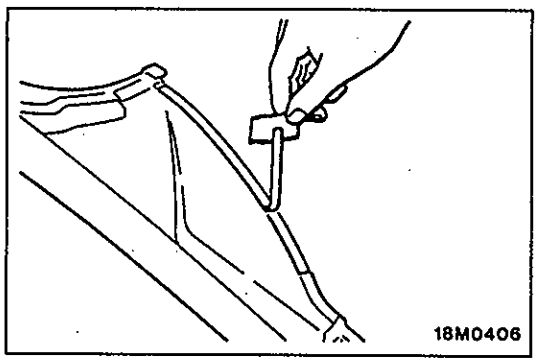
INSTALLATION SERVICE POINTS

▶A◀ FRONT AIRDAM PANEL/SIDE AIRDAM/REAR SIDE AIRDAM/REAR SPOILER INSTALLATION

Double-sided tape affixing to the front airdam panel, side airdam, rear 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
   Front airdam panel or rear spoiler: 10 mm width and 1.2 mm thickness
   Side airdam: 5 mm width and 1.2 mm thickness
   Rear side airdam: 10 mm width and 0.8 mm thickness



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 front airdam panel, side airdam, rear 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 front airdam panel, side airdam, rear side airdam or rear spoiler before affixing the tape.

   Body ..... 40–60°C

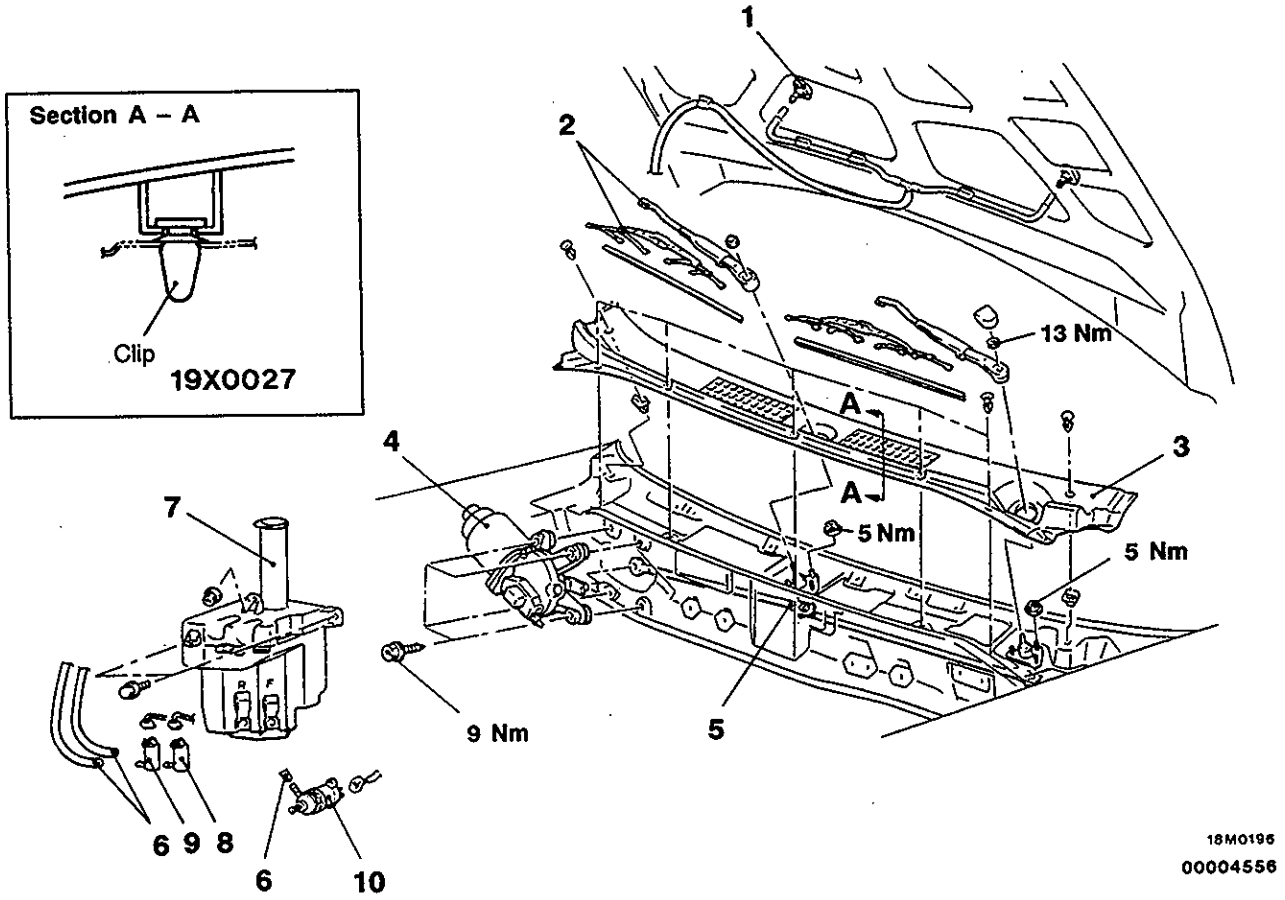
   Front airdam panel, side airdam, rear side airdam or rear spoiler ..... 20 – 30°C

   Apply pressure fully to the front airdam panel, side airdam, rear side airdam or rear spoiler.

WINDSHIELD WIPER AND WASHER

51100760117

REMOVAL AND INSTALLATION



1. Washer nozzle assembly

Wiper motor and linkage removal steps

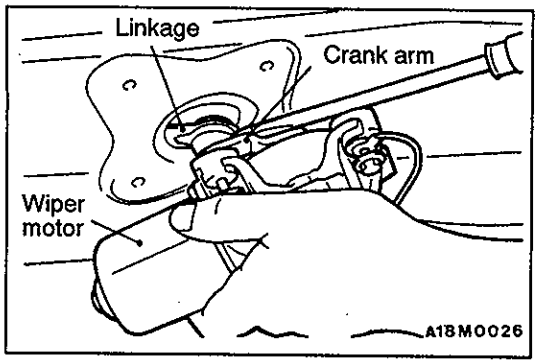
▶A◀ 2. Wiper arm and blade assembly
3. Front deck garnish
◀A▶ 4. Wiper motor
5. Linkage

Washer tank removal steps

- Draining of washer fluid
- Front bumper (Refer to P.51-3.)

6. Washer hose
7. Washer tank
8. Washer motor (Front)
9. Washer motor (Rear)
10. Washer motor <Vehicles with headlamp washer>

NOTE
For removal and installation of the column switch assembly (windshield wiper and washer switch), refer to GROUP 37A – Steering Wheel and Shaft.

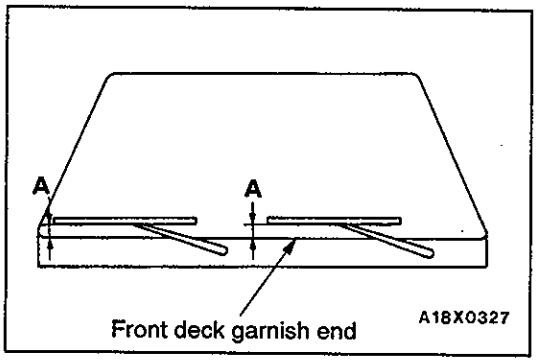


REMOVAL SERVICE POINT

◀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.

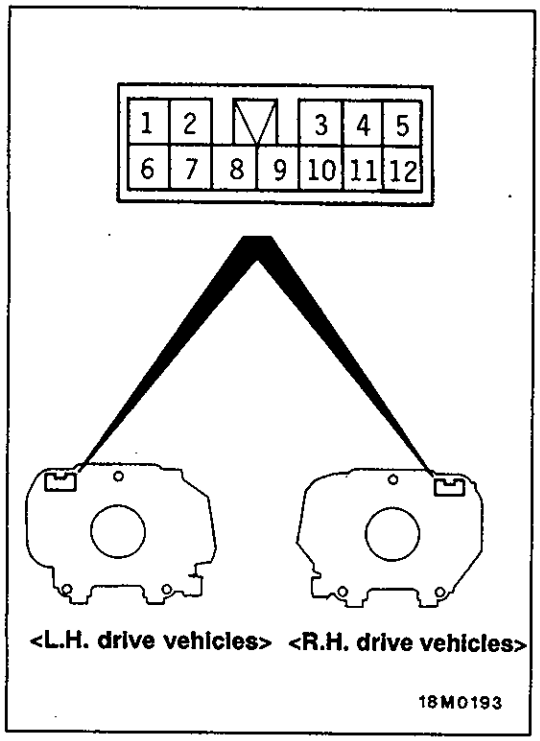


INSTALLATION SERVICE POINT

▶A◀ WIPER ARM AND BLADE ASSEMBLY INSTALLATION

Install the wiper blade in the specified position (standard value) as shown in the illustration.

Standard value (A): 20±5 mm



INSPECTION

51100770080

COLUMN SWITCH CHECK

Wiper and Washer Switch

<L.H. drive vehicles>

Switch position		Terminal No.				
		6	7	8	9	10
Wiper switch	OFF		○—○			
	INT		○—○			
	1 (LO)			○—	—○	
	2 (HI)				○—	—○
Washer switch	ON	○—	—	—	—	—○

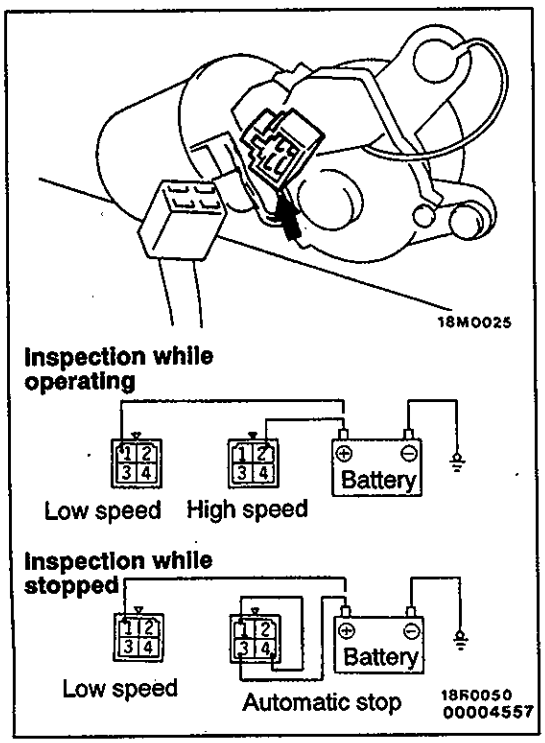
<R.H. drive vehicles>

Switch position		Terminal No.				
		8	9	10	11	12
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. 2 seconds
SLOW: Approx. 15 seconds



WIPER MOTOR CHECK 51101260043

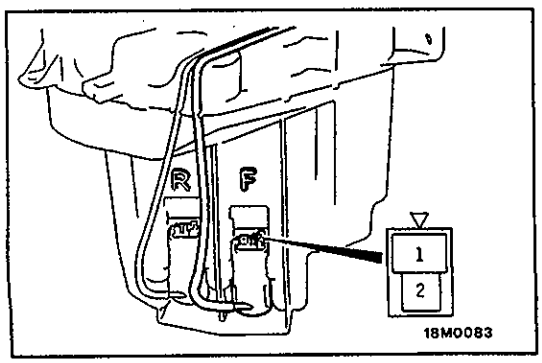
Check the wiper motor after disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

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 that after the motor starts turning at low speed, it stops at the automatic stop position.



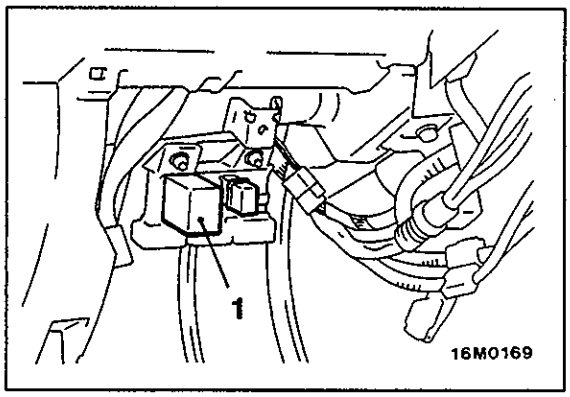
WASHER MOTOR CHECK 51101270046

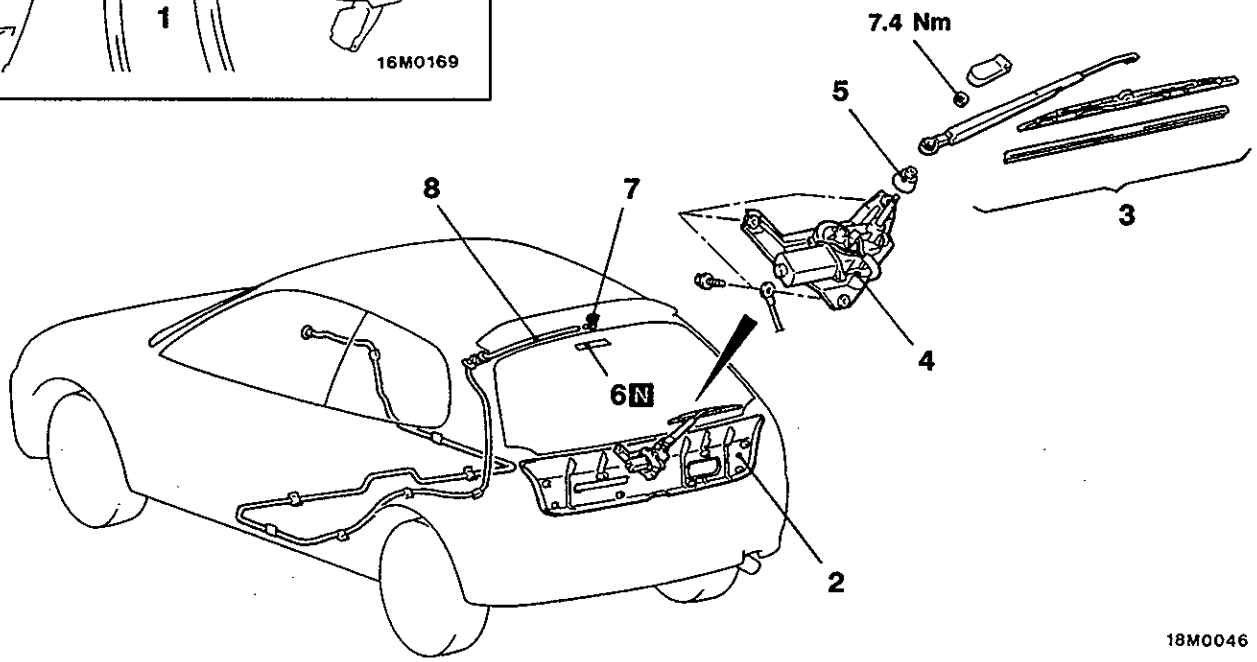
1. With the washer motor installed to the washer tank, fill the washer tank with water.
2. Check that the water squirts out strongly when battery voltage is applied to terminals (1) and (2).

REAR WIPER AND WASHER

51100850074

REMOVAL AND INSTALLATION





00004558

1. Rear intermittent wiper relay

Wiper motor removal steps

2. Tailgate trim
▶A◀ 3. Wiper arm and blade assembly
4. Motor and bracket assembly
5. Grommet

Washer hose removal steps

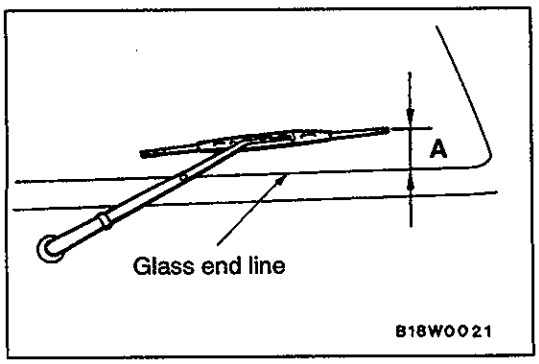
- Scuff plate, quarter trim and rear pillar trim (Refer to GROUP 52A – Trims.)
- Front seat (Refer to GROUP 52A – Front Seat.)
- Rear seat (Refer to GROUP 52A – Rear Seat.)

6. Tape
7. Washer nozzle
8. Washer hose

NOTE

(1) For removal and installation of the washer tank, refer to P.51-13.

(2) For removal and installation of the column switch assembly (windshield wiper and washer switch), refer to GROUP 37A – Steering Wheel and Shaft.

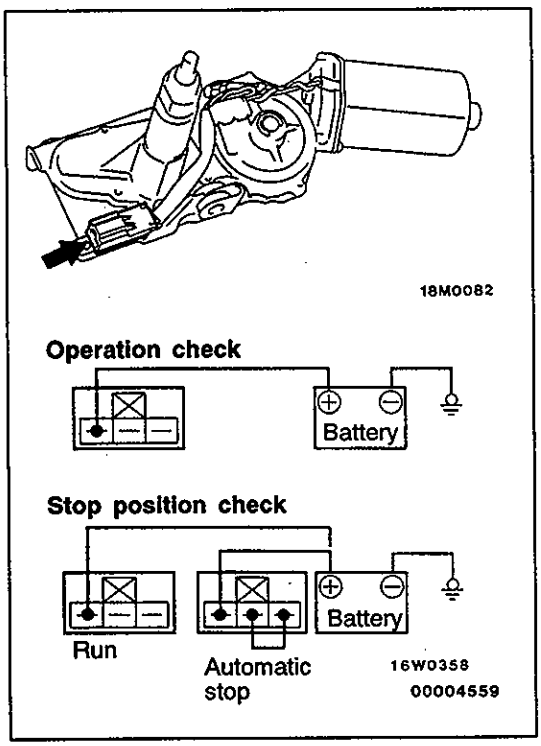


INSTALLATION SERVICE POINT

▶A◀ WIPER ARM AND BLADE 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): 77 ± 5 mm



INSPECTION

51101290042

WIPER MOTOR CHECK

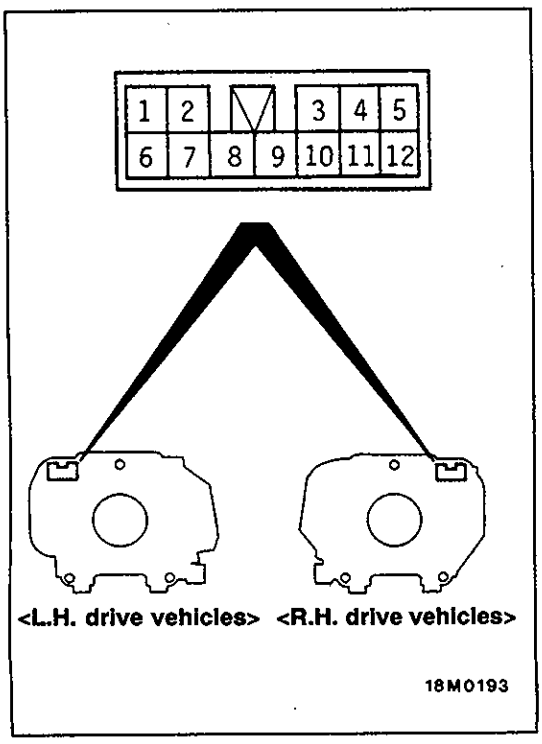
Check the wiper motor after first disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

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.

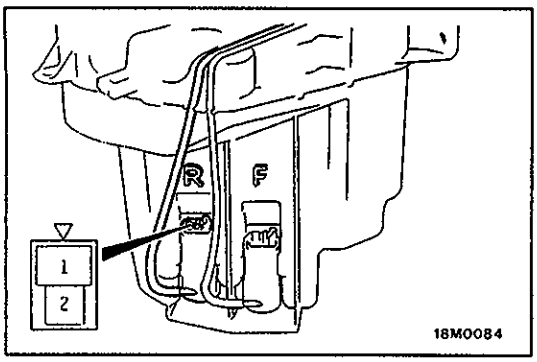


COLUMN SWITCH (WIPER AND WASHER) CHECK

51100950057

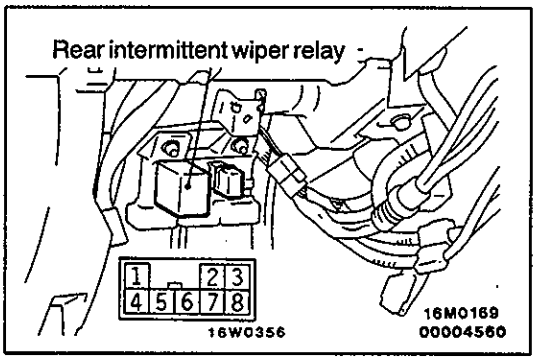
Switch position		Terminal No.			
		2	3	4	10, 8*
Wiper switch	INT		○		○
	ON			○	○
Washer switch	ON	○			○

NOTE
*: R.H. drive vehicles



WASHER MOTOR CHECK 51101310045

1. With the washer motor installed to the washer tank, fill the washer tank with water.
2. When the battery is connected as shown in the figure, check that the washer squirts out strongly.



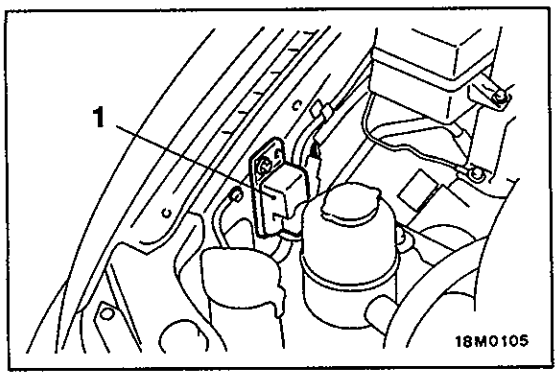
INTERMITTENT WIPER RELAY CHECK 51101300028

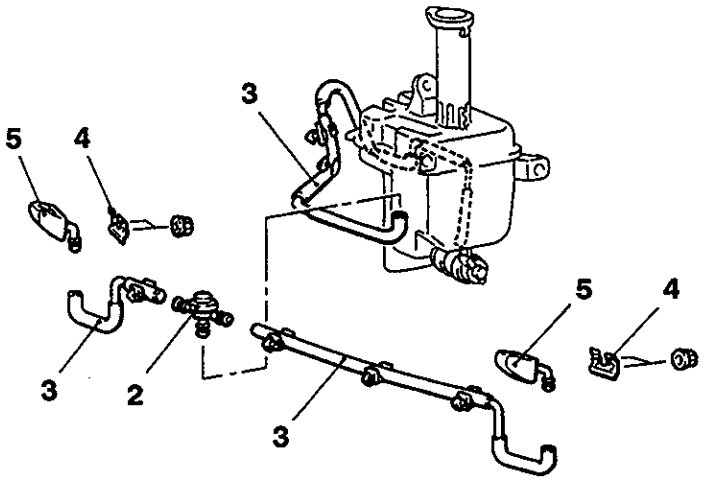
1. Check to be sure that there is continuity between terminals (1) and (2).
2. Connect terminal (4), (5) to the battery (+) terminal.
3. Check that there is battery voltage at terminal (2) for intermittent periods of 8 seconds when terminal (7) is connected to the battery (–) terminal.

HEADLAMP WASHER

51100970060

REMOVAL AND INSTALLATION





18M0192
00004561

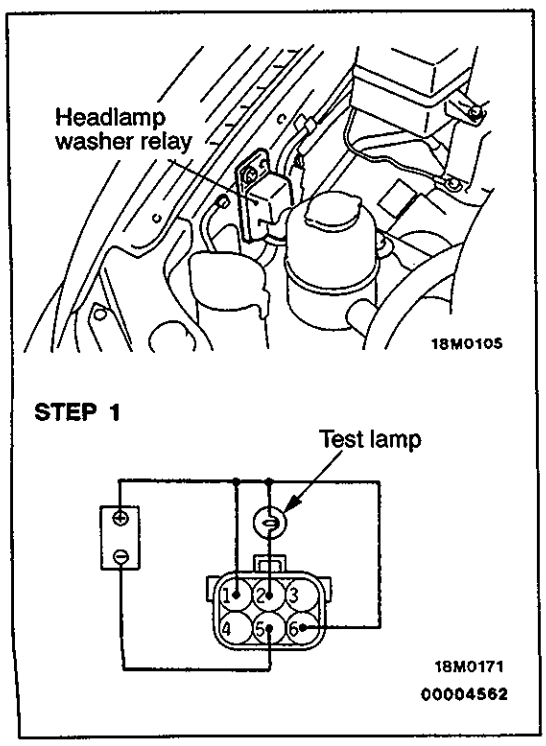
1. Headlamp washer relay

Nozzle and check valve removal steps

- Draining of washer fluid
- Front bumper (Refer to P.51-3.)

2. Check valve
3. Washer hose assembly
4. Bracket
5. Nozzle

NOTE
(1) For removal and installation of the column switch assembly (built-in headlamp washer switch), refer to GROUP 37A – Steering Wheel and Shaft.
(2) For removal and installation of the washer tank, refer to P.51-13.

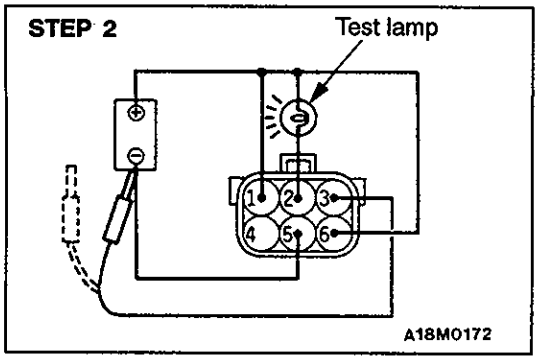


INSPECTION

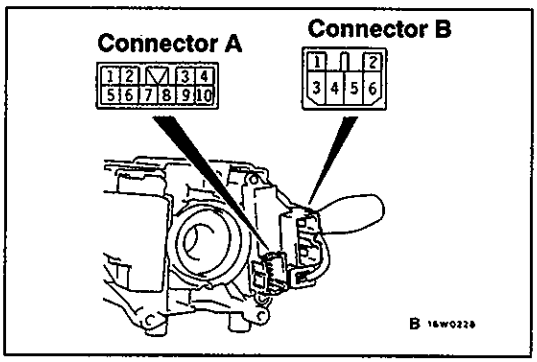
51101320031

HEADLAMP WASHER RELAY CHECK

1. Connect battery and test lamp to the relay as illustrated.



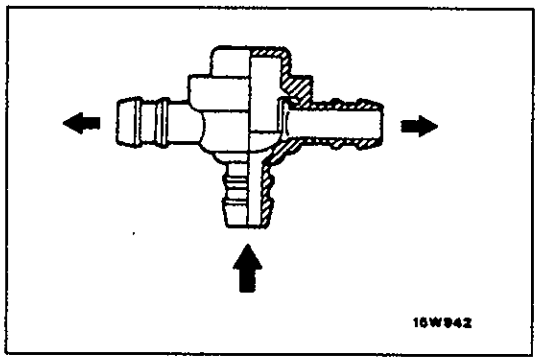
2. The relay is normal if the lamp lights for approximately 0.5 second upon connection of terminal (2) to battery (–).



COLUMN SWITCH (HEADLAMP WASHER SWITCH) CHECK

51100980063

Check the continuity between terminal 2 of connector A and terminal 1 of connector B with headlamp washer switch in ON position.

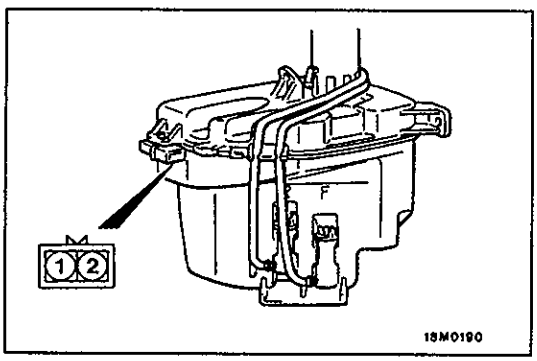


CHECK VALVE CHECK

51101330034

Apply pressure to the inlet of the check valve to check its opening pressure.

Opening pressure: 78 kPa



HEADLAMP WASHER MOTOR CHECK

51101340037

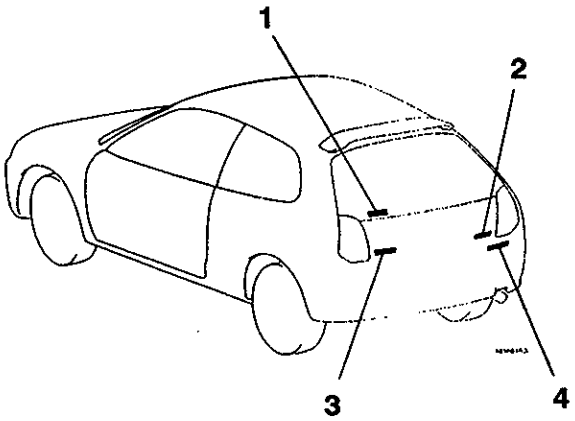
1. With the washer motor installed to the washer tank, fill the washer tank with water.
2. Connect battery (+) and (–) cables to terminals (2) and (1) respectively to see that the washer motor runs and water is injected.

MARKS

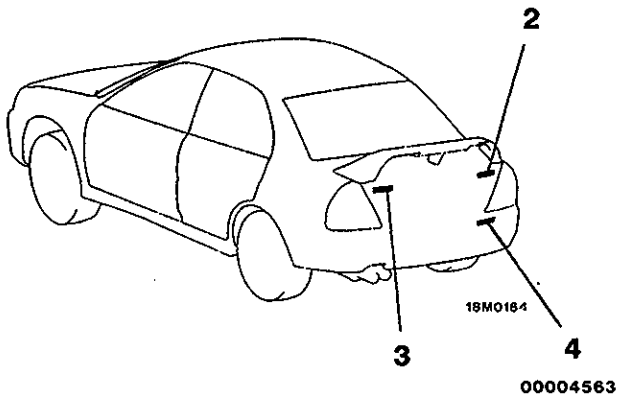
51101180035

REMOVAL AND INSTALLATION

<Hatchback>



<Sedan>



00004563

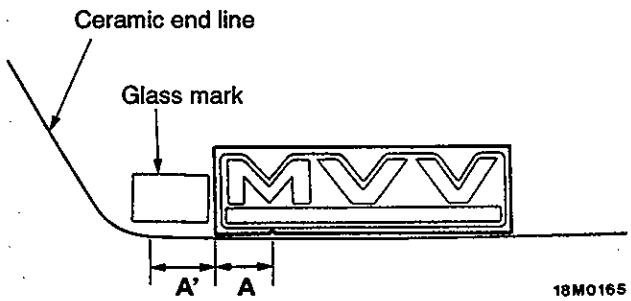
▶A◀ 1. MVV mark
▶A◀ 2. COLT or LANCER mark
▶A◀ 3. MITSUBISHI mark
▶A◀ 4. GRADE mark

INSTALLATION SERVICE POINT

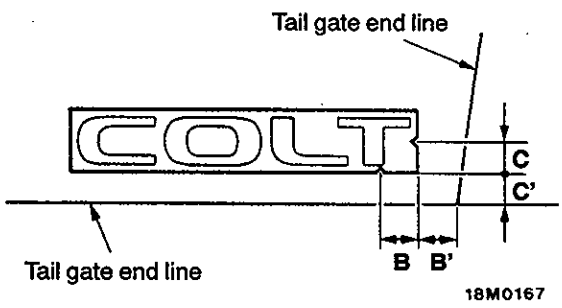
MARK INSTALLATION

Each dimension from the edge to the notch of the mark should be equal to each installation dimension. (i.e. A=A', B=B', C=C', D=D', E=E', F=F')

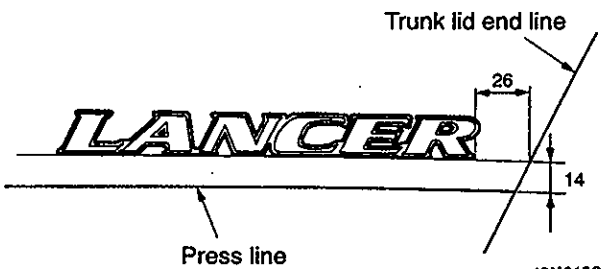
MVV MARK



COLT MARK



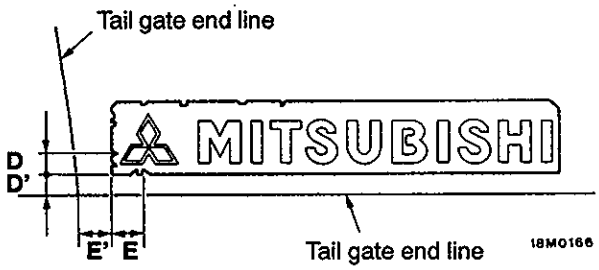
LANCER MARK



Unit: mm 00004564

MITSUBISHI MARK

<Hatchback>



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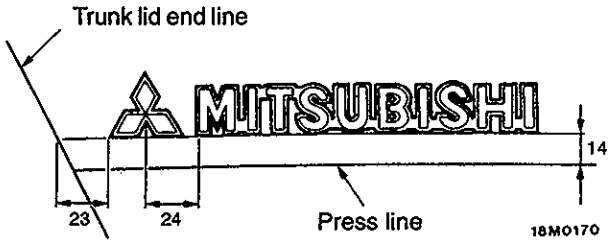
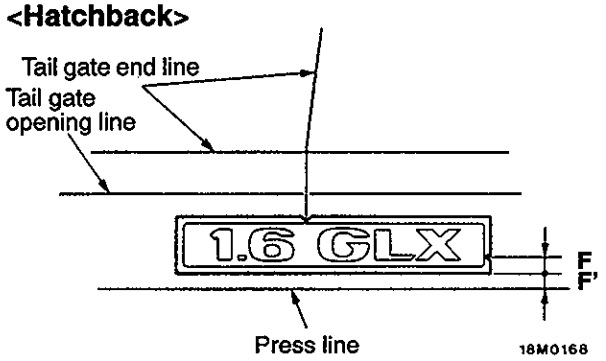


GRADE MARK

<Hatchback>



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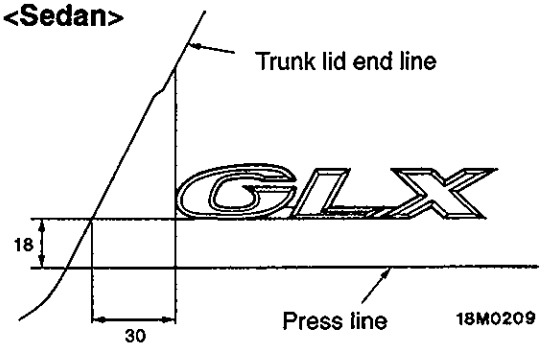


00004565

NOTE
The installation dimensions of 1.6 GL and GL are the same as 1.6 GLX.

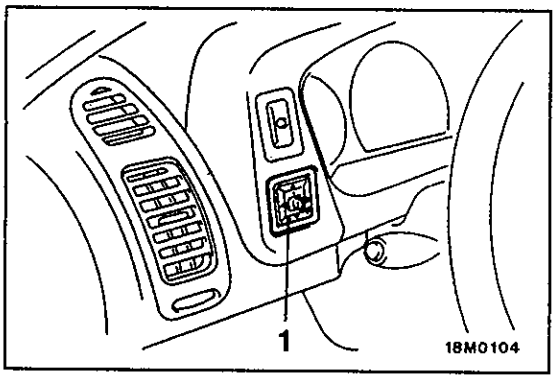
1. Clean the mark installation surfaces on the body with unleaded petrol.
2. Peel off the backing paper from the reverse side of the marks, and then attach the marks to the vehicle body so that they fit properly into position.

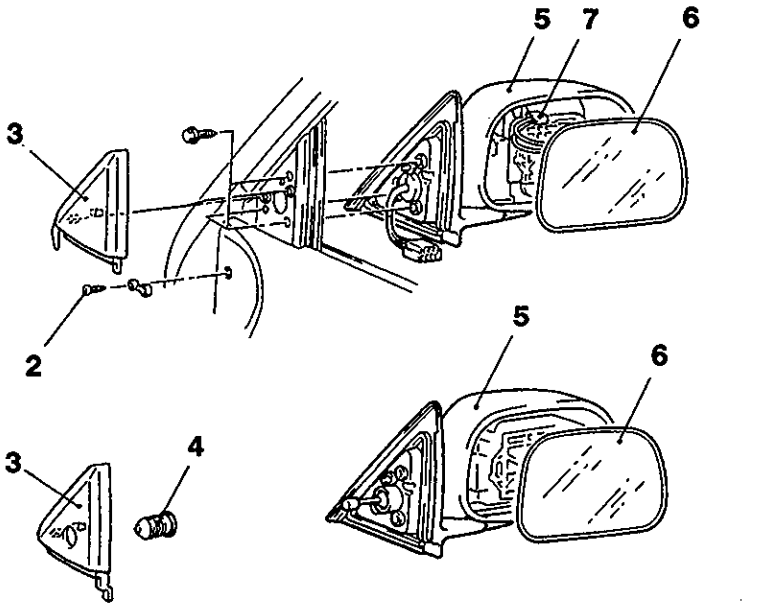
Caution
When attaching the marks, the surrounding temperature should be 20–38°C and the air should be completely free from dust.
If the surrounding temperature is lower than 20°C, the marks and the places on the body where the marks are to be attached should be heated to 20–38°C.

DOOR MIRROR

51100640039

REMOVAL AND INSTALLATION





00004566

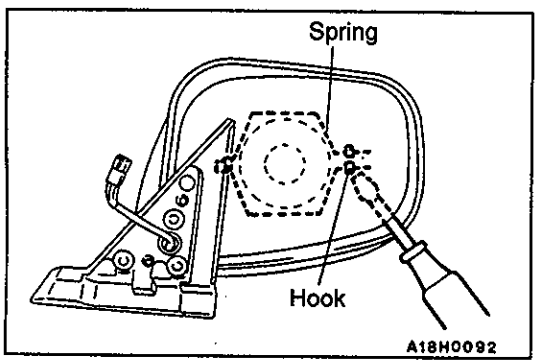
1. Door mirror control switch

Door mirror removal steps

2. Door trim attaching screw
3. Delta cover inner
4. Boot
5. Door mirror
6. Mirror

◀A▶

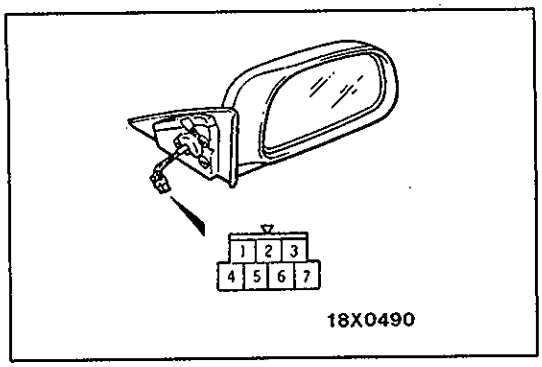
7. Harness connector



REMOVAL SERVICE POINT

◀A▶ MIRROR REMOVAL

Let the mirror face up, insert a flat-tipped screwdriver wound with masking tape, and remove the mirror by releasing the spring from the hook.



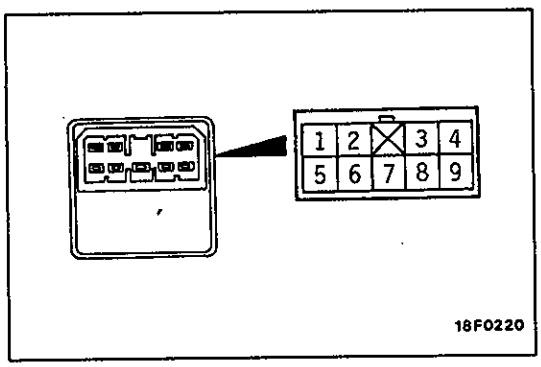
INSPECTION

51100650025

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
5	6	7	1	4	
⊖		⊕	Printed heating wire		UP
⊕		⊖			DOWN
⊕	⊖				RIGHT
⊖	⊕				LEFT



DOOR MIRROR CONTROL SWITCH CONTINUITY CHECK

51101350023

Switch position		Terminal No.						
		2	3	4	6	7	8	9
Left side	UP			○			○	
					○	○		
	DOWN			○		○		
					○		○	
	LEFT		○	○		○		
					○			
	RIGHT	○	○					
					○	○		
Right side	UP	○		○				
					○	○		
	DOWN	○		○		○		
				○	○			
	LEFT			○		○		
					○			○
	RIGHT			○				○
					○	○		

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

52109000187

INTERIOR

CONTENTS

52109000194

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

52100030031

Items		Standard value
Seatback heater resistance (between terminals) Ω		Approx. 8
Seat cushion heater resistance (between terminals) Ω	Between terminals 2 and 3	Approx. 8
	Between terminals 1 and 3	0

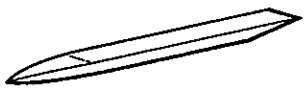
ADHESIVE

52100050037

Item	Specified adhesive
Roof pad <Vehicles without sunroof>	3M Part No.EC-1368 or equivalent

SPECIAL TOOL

52100060030

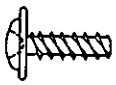
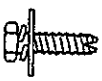
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch, trim, etc.

INSTRUMENT PANEL

52100170122

REMOVAL AND INSTALLATION

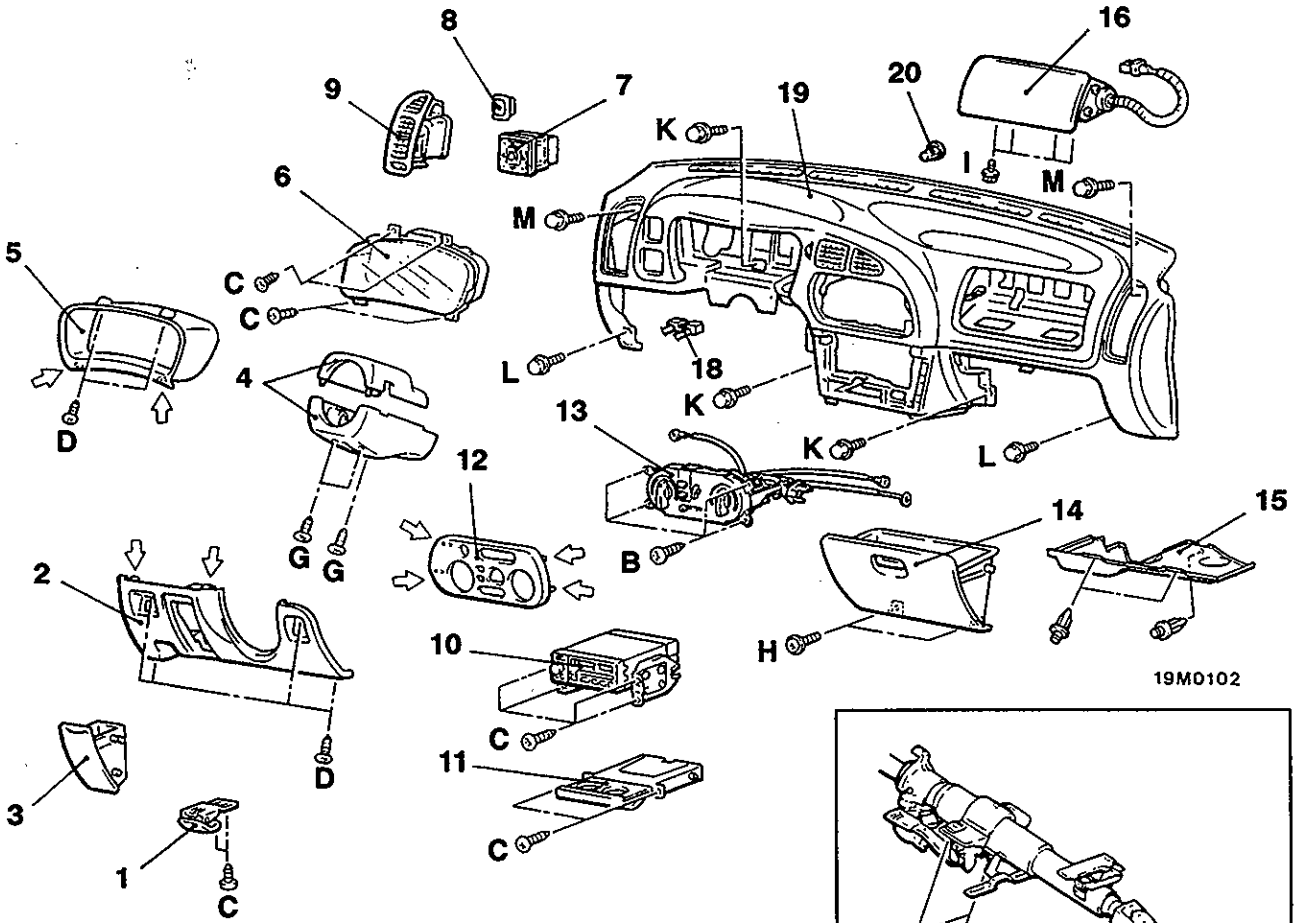
For installation of the instrument panel, the bolts and screws described below are used. They are indicated by symbols in the illustration.

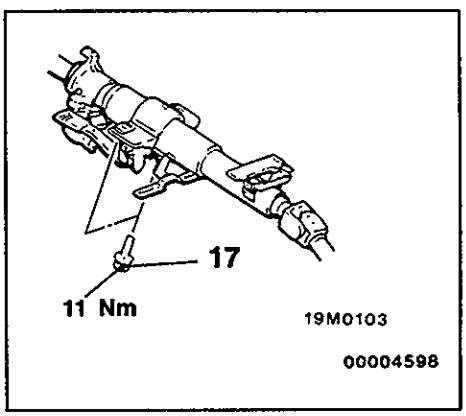
Name	Symbol	Size mm (D × L)	Colour	Shape
Tapping screw	A	5 × 12	–	 A00Z0010
	B	5 × 14	–	
	C	5 × 16	–	
	D	5 × 20	Black	
	E	5 × 12	–	 B00Z0010
	F	5 × 16	–	
	G	5 × 20	–	
Washer-assembled screw	H	5 × 16	–	 C00Z0010
Washer-assembled bolt	I	6 × 16	–	 D00Z0010
	J	6 × 20	–	
	K	6 × 16	–	 E00Z0010
	L	6 × 16	Black	
Gimlet bolt	M	6 × 16	–	 F00Z0010

D = Thread diameter
L = Effective thread length

CAUTION: SRS
- **When removing and installing the floor console (vehicles equipped with SRS), do not let it bump against the SRS-ECU.**
- **For the passenger side air bag module removal/installation, always observe the service procedures of GROUP 52B – Air Bag Module and Clock Spring.**

Pre-removal and Post-installation Operation
- Floor Console Assembly Removal and Installation (Refer to P.52A-7.)



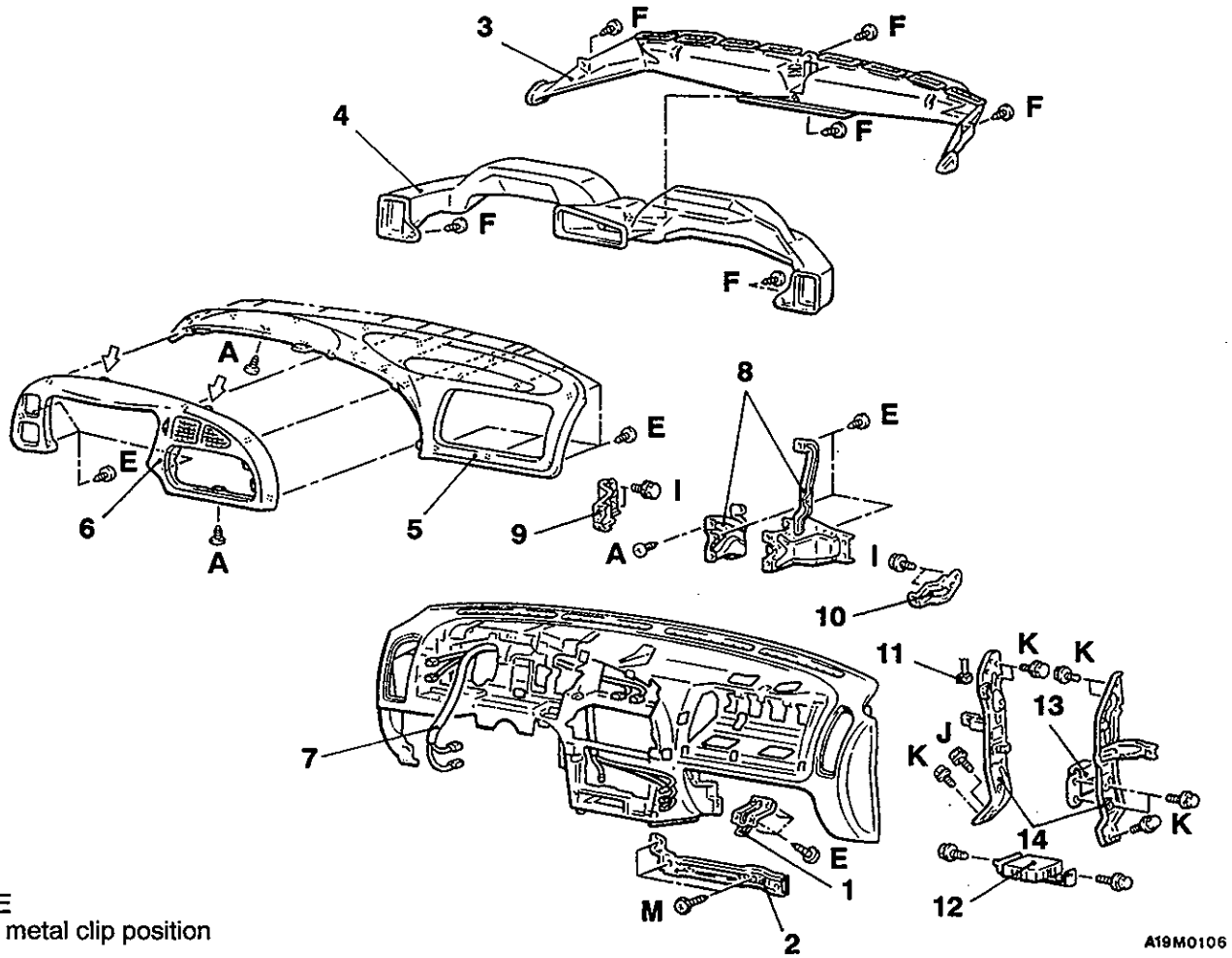


NOTE
⇦ : metal clip position

Removal steps
1. Hood lock release handle
2. Driver side lower cover
3. Personal pocket
4. Column cover
5. Meter bezel
6. Combination meter
7. Door mirror control switch or plug
8. Fog lamp switch
9. Side air outlet assembly
10. Radio and tape player or DIN bracket
11. Cup holder or plug
12. Heater control panel
13. Heater control assembly (Refer to GROUP 55.)
14. Glove box
15. Under cover
16. Front passenger's air bag module assembly
17. Steering column assembly installation bolt
18. Harness connector
19. Instrument panel assembly
20. Grommet

DISASSEMBLY AND REASSEMBLY

52100190128



NOTE
⇦ : metal clip position

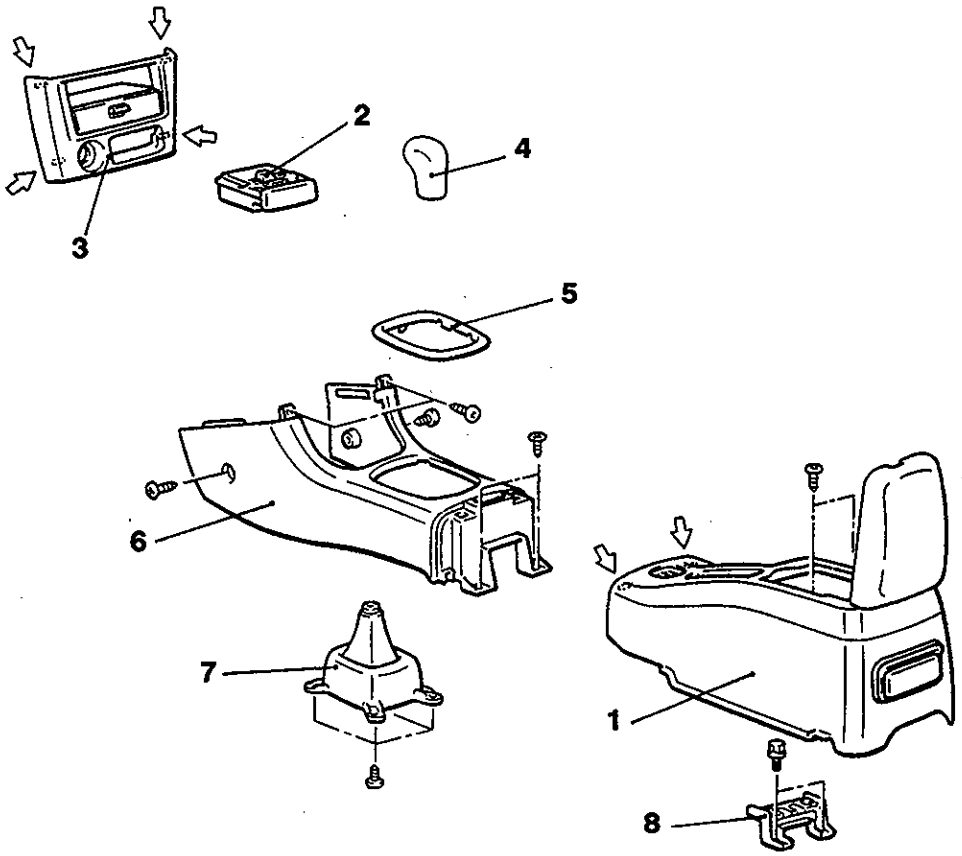
Disassembly steps

1. Glove box striker
2. Glove box frame
3. Defroster nozzle assembly
4. Distribution duct
5. Instrument pad
6. Cluster panel
7. Instrument panel wiring harness
8. Instrument panel reinforcement
9. Lower bracket (L.H.)
10. Lower bracket (R.H.)
11. Harness connector
12. ABS-ECU
13. Relay
14. Center reinforcement

FLOOR CONSOLE

52100220100

REMOVAL AND INSTALLATION



NOTE
⇦ : metal clip position

A19M0107

Removal steps

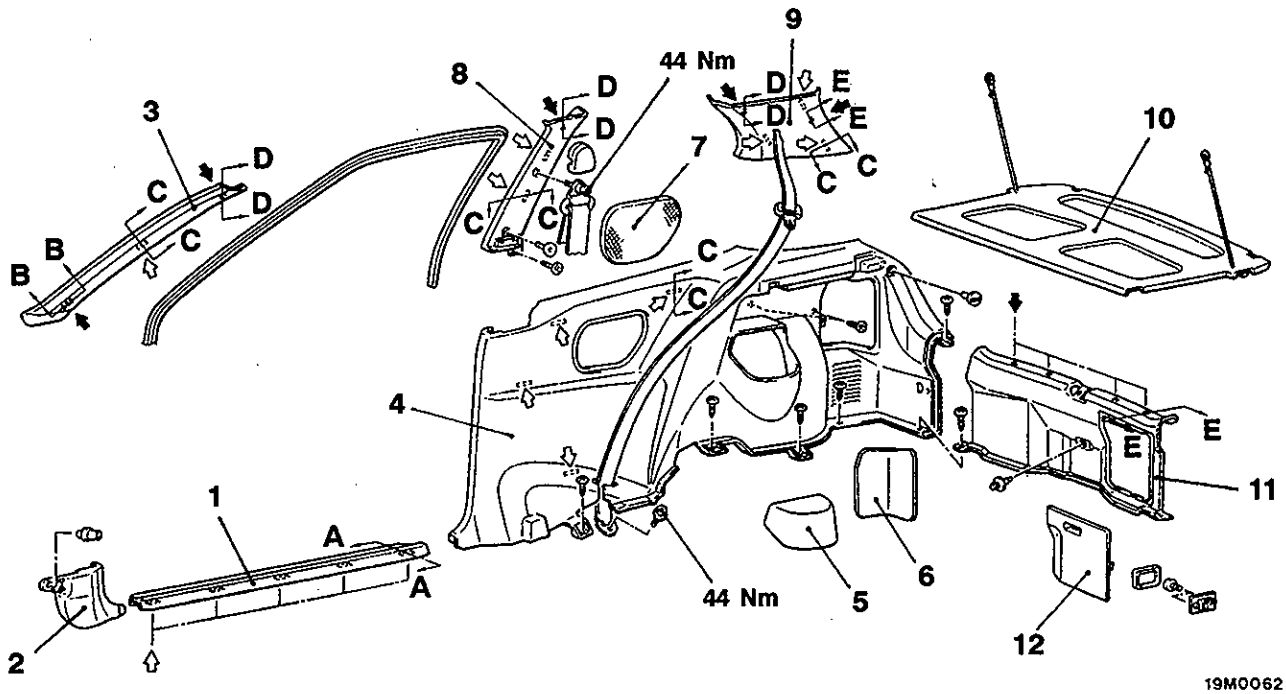
1. Rear floor console assembly
2. Ashtray
3. Audio panel
4. Shift lever knob <M/T>
5. A/T panel
6. Front floor console assembly
7. Shift lever cover <M/T>
8. Rear console bracket

TRIMS

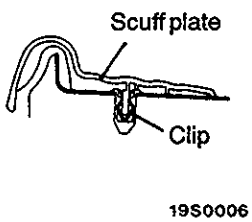
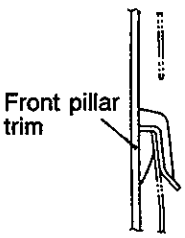
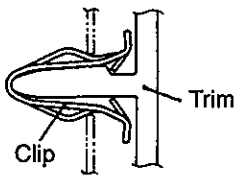
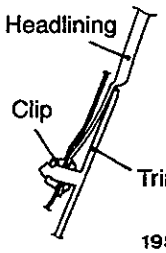
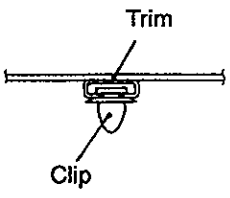
52100110124

REMOVAL AND INSTALLATION

<Hatchback>



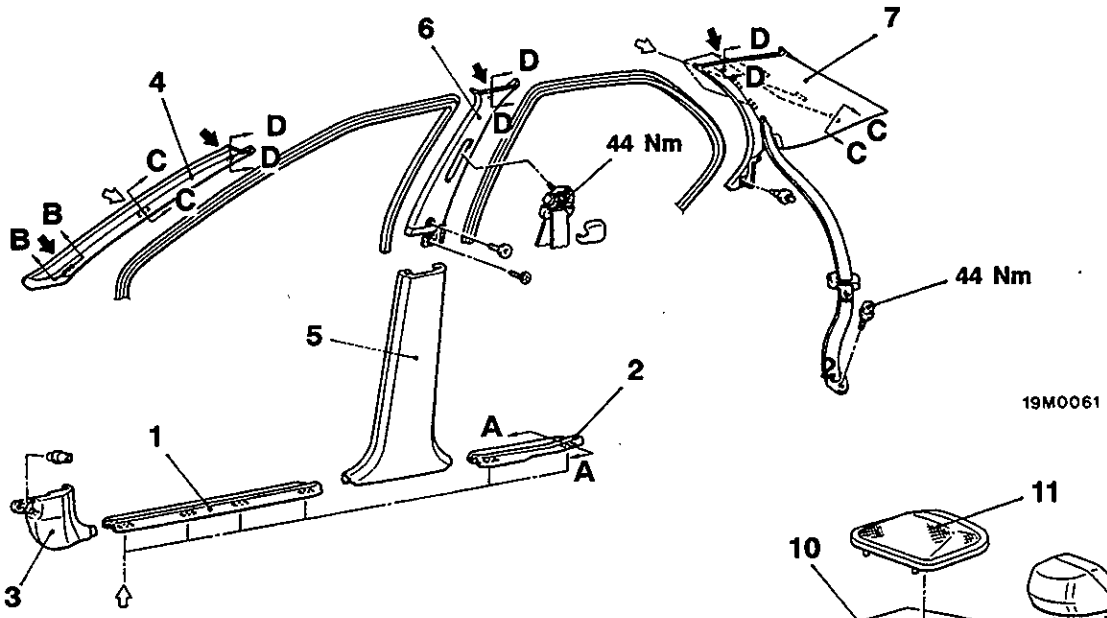
NOTE
⇦ : metal clip position
⬅ : resin clip position

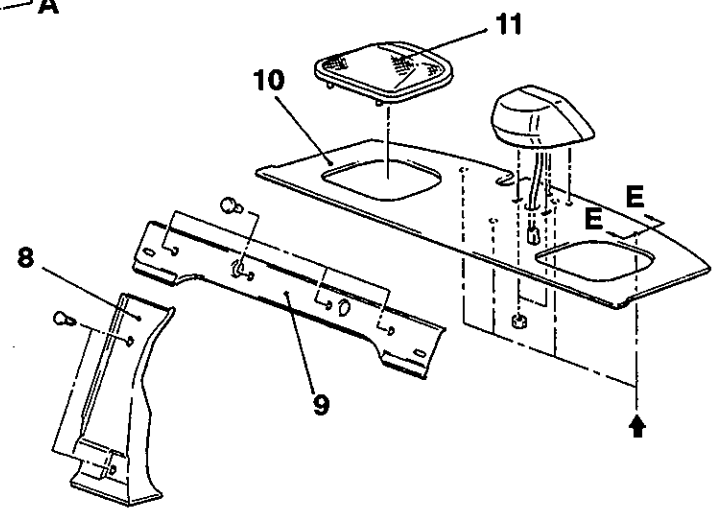
Section A-A	Section B-B	Section C-C	Section D-D	Section E-E
				

00004599

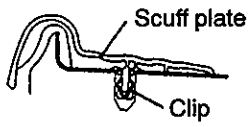
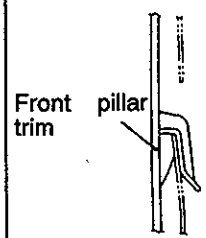
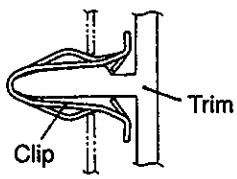
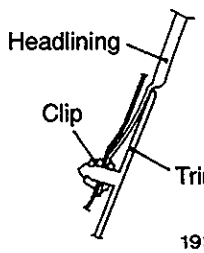
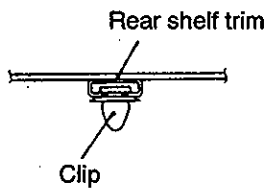
1. Scuff plate
2. Cowl side trim
3. Front pillar trim
4. Quarter trim
5. Quarter trim lid
6. Lamp lid
7. Rear speaker garnish
8. Center pillar trim
9. Rear pillar trim
10. Rear shelf
11. Rear end trim
12. Jack lid

<Sedan>



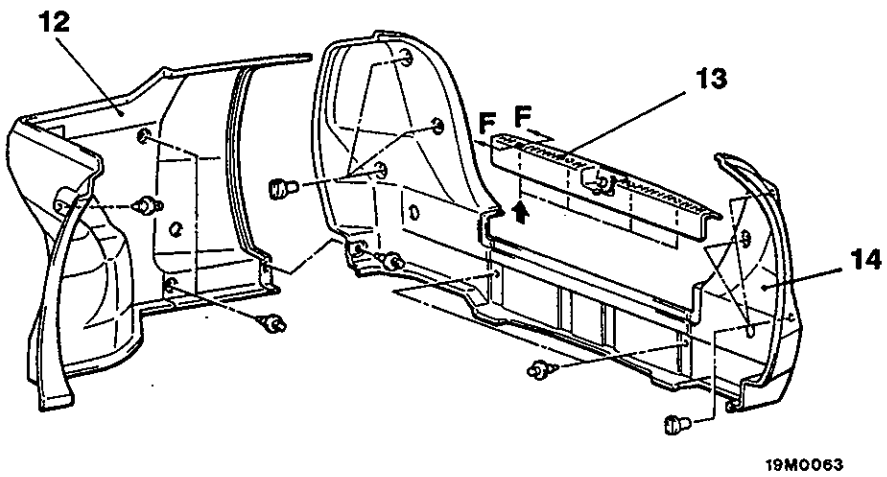


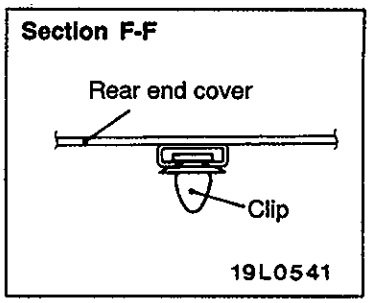
NOTE
⇦ : metal clip position
⬅ : resin clip position

Section A-A	Section B–B	Section C-C	Section D-D	Section E-E
				

00004600

1. Front scuff plate
2. Rear scuff plate
3. Cowl side trim
4. Front pillar trim
5. Center pillar trim lower
6. Center pillar trim upper
7. Rear pillar trim
8. Rear seatback brace trim
9. Rear seatback trim
10. Rear shelf trim
11. Rear speaker garnish

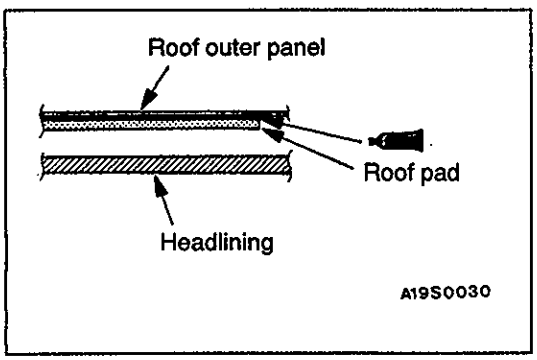




NOTE
◀ : resin clip position

00004601

12. Trunk side trim
13. Rear end cover
14. Rear end trim



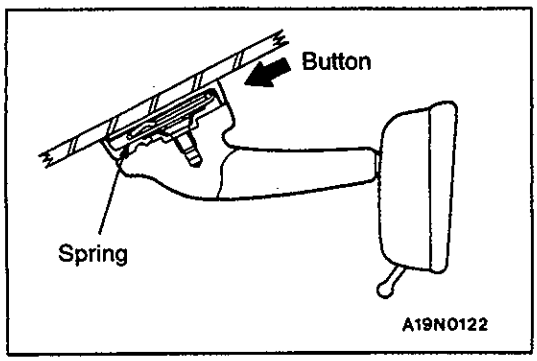
HEADLINING

52100140116

INSTALLATION SERVICE POINT

<Vehicles without sunroof>

Specified adhesive: 3M Part No.EC-1368 or equivalent



INSIDE REAR VIEW MIRROR

52100270051

REMOVAL SERVICE POINT

Remove by pushing in the direction of the arrow in the illustration.

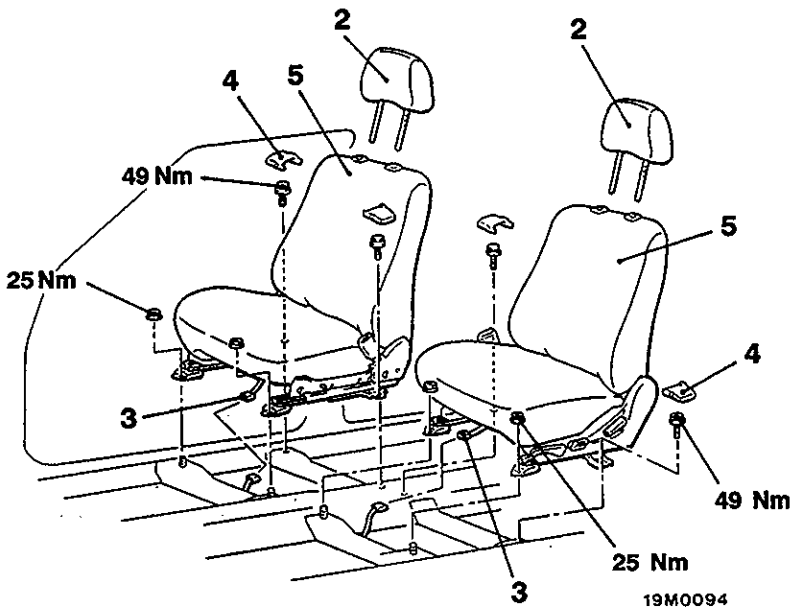
NOTE
1. The mirror spring fits firmly in the groove of the button that is attached to the glass.
2. The mirror breaking load is within 450 N.

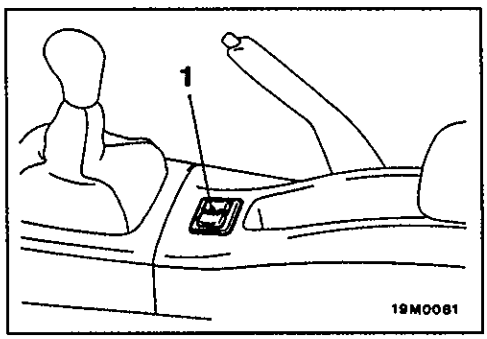
FRONT SEAT

52200130116

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Rear Floor Console Assembly Removal and Installation (Refer to P.52A-7).





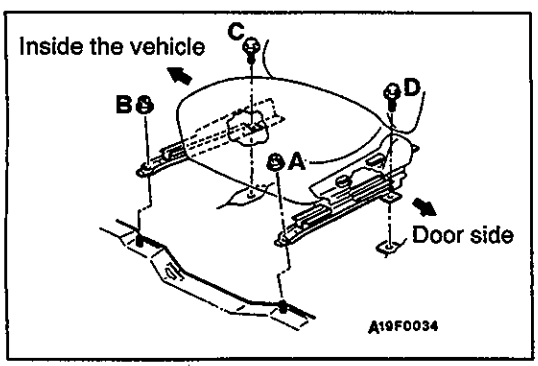
00004602

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

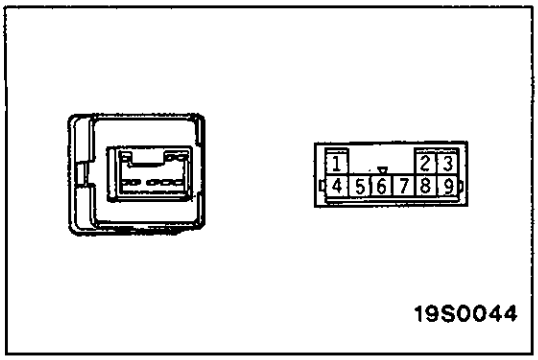
NOTE
After provisionally tightening the seat assembly mounting nuts and bolts in every installation location, fully tighten them to the specified torque.



INSTALLATION SERVICE POINT

▶A◀ FRONT SEAT ASSEMBLY INSTALLATION

Tighten the front seat mounting bolts in the order A, B, C, and D.



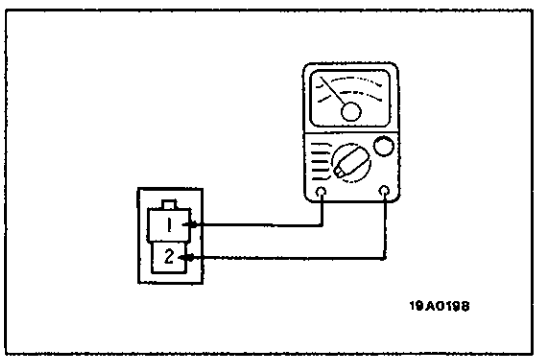
INSPECTION

52200390019

HEATED SEAT SWITCH CONTINUITY CHECK

Switch position		Terminal No.									
		1	3	4	5	–	8	9	2	–	6
Driver's seat switch	HI	○			○						
			○				○				
					⊖	▶	⊕				
	LO		○		○				○	⊖	○
					⊖	▶	⊕				
Passen-ger's seat switch	HI			○	○		○	○			
					⊖	▶	⊕				
	LO				○			○			
					⊖	▶	⊕				

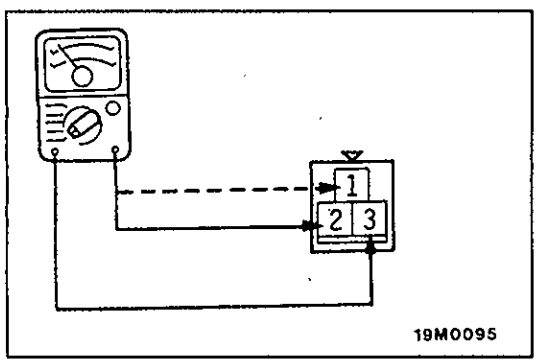
NOTE
To inspect the diode, match the polarity of the circuit tester with the (+) (–) polarities in the table.



SEATBACK HEATER CHECK

Measure the resistance between terminals.

Standard value: Approx. 8 Ω



SEAT CUSHION HEATER CHECK

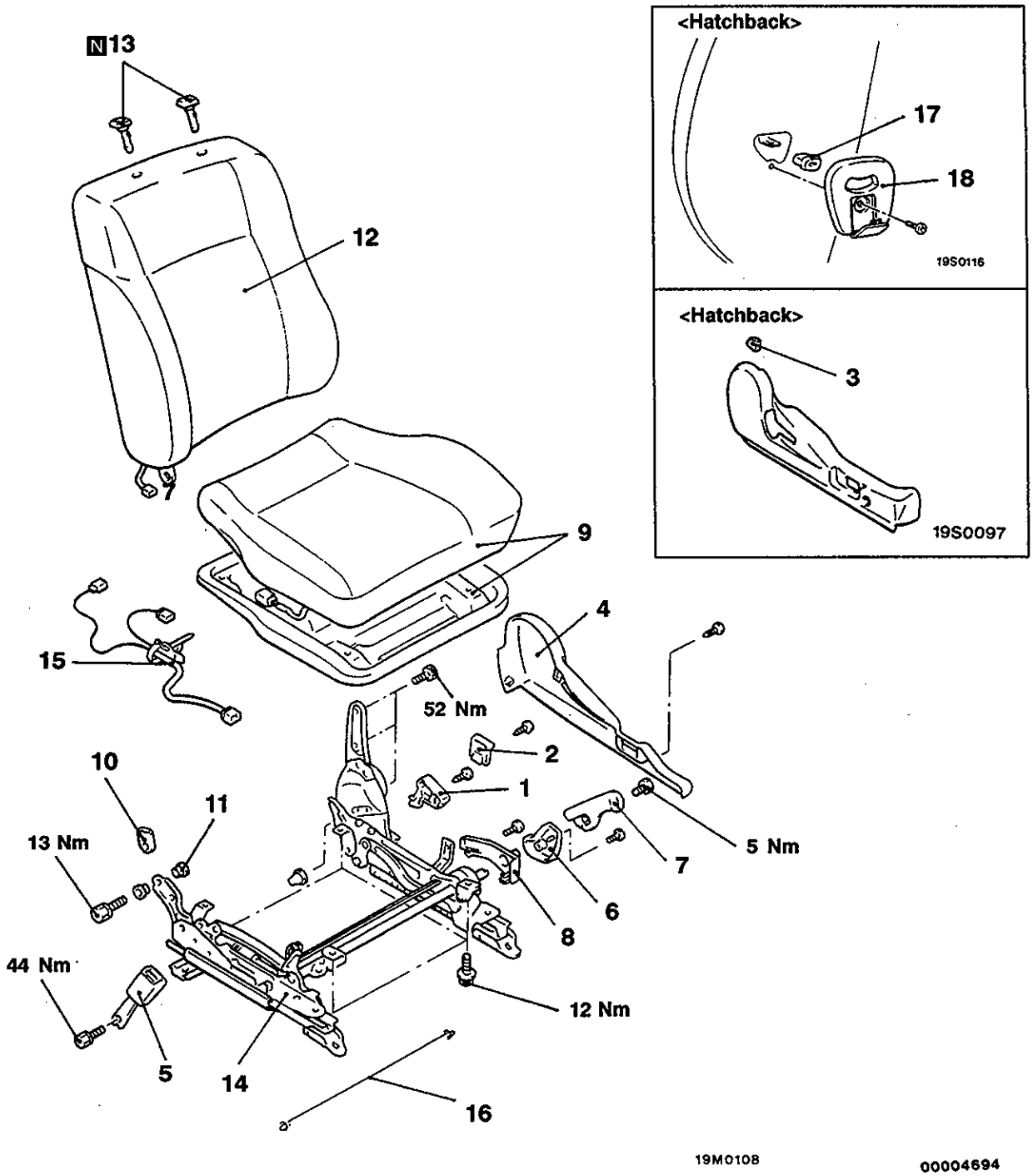
Measure the resistance between terminals.

Standard value:

Between terminals 2 and 3: Approx. 8 Ω
Between terminals 1 and 3: 0 Ω

DISASSEMBLY AND REASSEMBLY

52200150150



Disassembly steps

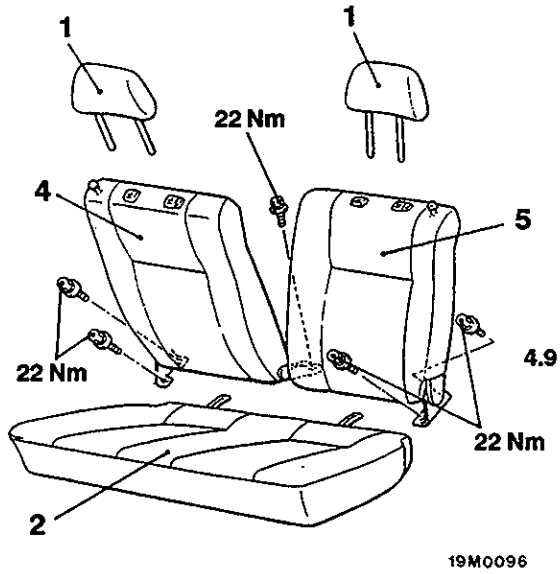
1. Reclining adjuster knob
2. Slide adjuster knob
3. Walk-in knob <Hatchback>
4. Front seat side shield cover
5. Inner seat belt
6. Height adjuster inner lever
7. Height adjuster lever
8. Inner cover
9. Seat cushion and seat cushion frame
10. Protector
11. Bushing
12. Seatback assembly
13. Headrestraint guide
14. Seat adjuster assembly
15. Seat heater wiring harness <Vehicles with heated seat>
16. Wire
17. Knob <Hatchback>
18. Cover <Hatchback>

REAR SEAT

52200180104

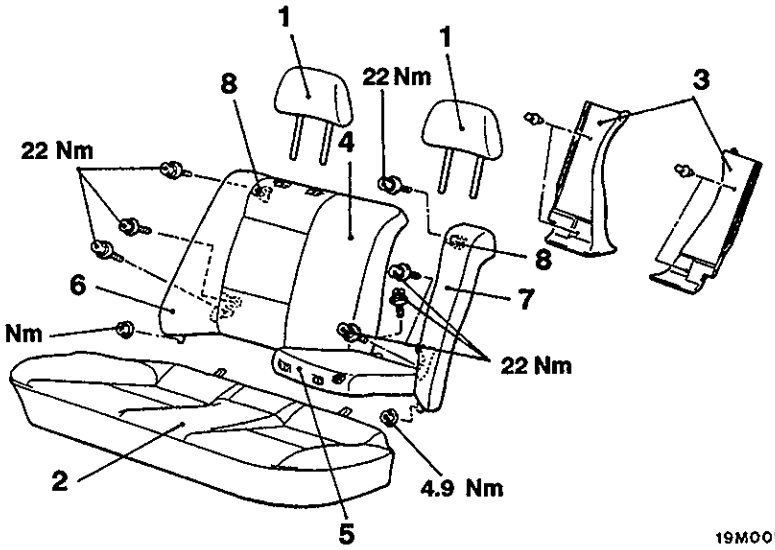
REMOVAL AND INSTALLATION

<Hatchback>



19M0096

<Sedan>

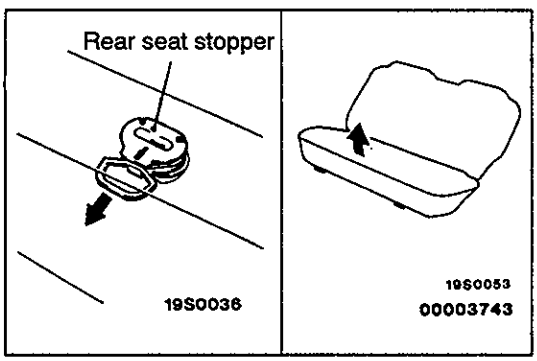


19M0097
00004603

Removal steps

1. Headrestraint
2. Seat cushion
3. Seatback trim
4. Seatback (R.H.)
5. Seatback (L.H.)
6. Side seatback (R.H.)
7. Side seatback (L.H.)
8. Seat striker

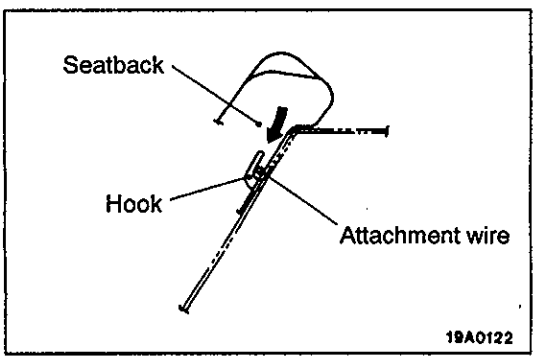
◀A▶ ▶C◀ ▶B◀ ▶B◀ ▶A◀ ▶A◀



REMOVAL SERVICE POINT

◀A▶ SEAT CUSHION REMOVAL

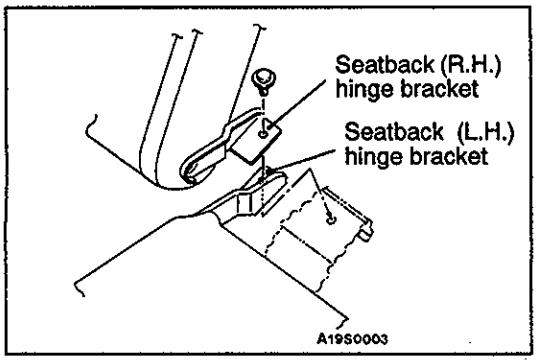
While keeping the rear seat stopper pulled, lift up the seat cushion to remove it.



INSTALLATION SERVICE POINTS

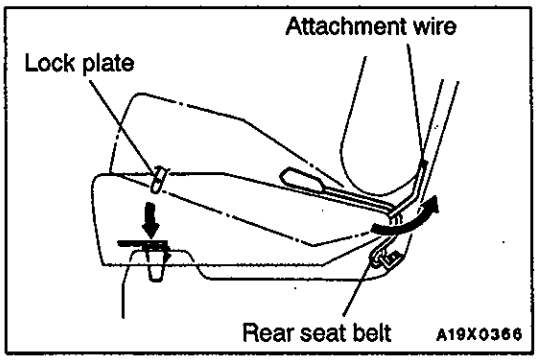
▶A◀ SIDE SEATBACK (L.H.)/SIDE SEATBACK (R.H.) INSTALLATION

Push the side seatback in the direction indicated in the illustration; then securely attach the attachment wire to the body side hook and install the side seatback.



▶B◀ SEATBACK (L.H.)/SEATBACK (R.H.) INSTALLATION

Place the seatback (L.H.) hinge bracket facing downwards and the seatback (R.H.) hinge bracket facing upwards, and then install the bolt.



▶C◀ SEAT CUSHION INSTALLATION

1. Pull the rear seat belt on top of the seat cushion.
2. Insert the seat cushion attachment wire securely below the seatback.
3. Insert the seat cushion lock plate securely into the floor holes.

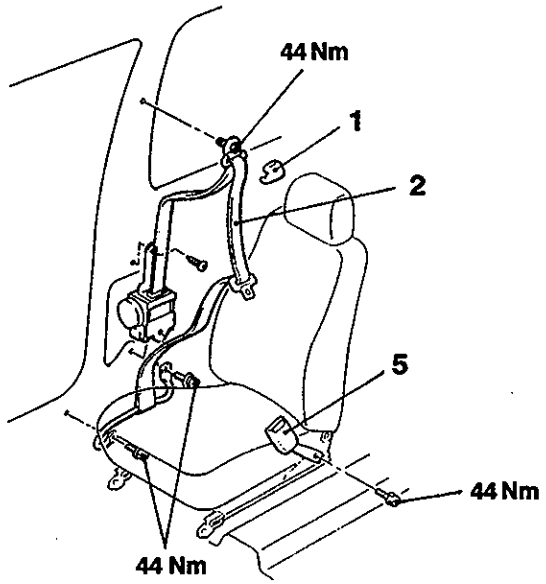
FRONT SEAT BELT

52300130089

For removal and installation procedures for the seat belt with pre-tensioner, refer to GROUP 52B – Seat Belt with Pre-tensioner.

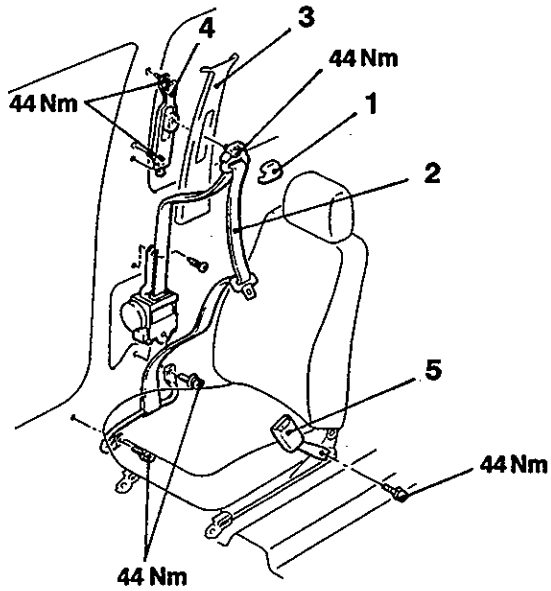
REMOVAL AND INSTALLATION

<Hatchback without adjustable seat belt anchor>



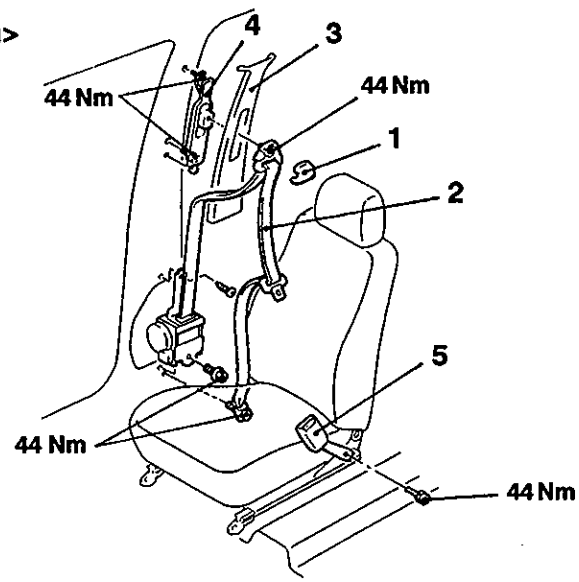
19M0098

<Hatchback with adjustable seat belt anchor>



19M0099

<Sedan>



19M0100

00004604

Outer seat belt removal steps

- Quarter trim <Hatchback> (Refer to P.52A-8.)
- Center pillar trim lower <Sedan> (Refer to P.52A-9.)

1. Sash guide cover
2. Outer seat belt
3. Center pillar trim upper (Refer to P.52A-8, 9.)
4. Adjustable seat belt anchor

Inner seat belt removal steps

- Front seat (Refer to P.52A-11.)

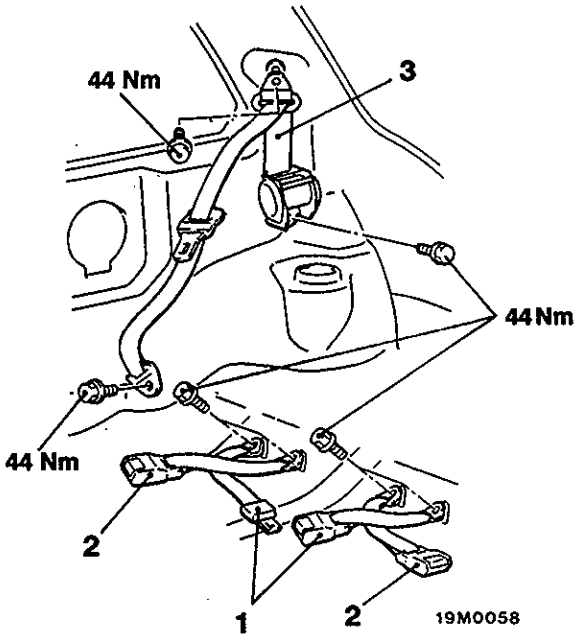
5. Inner seat belt

REAR SEAT BELT

52300160064

REMOVAL AND INSTALLATION

<Hatchback>



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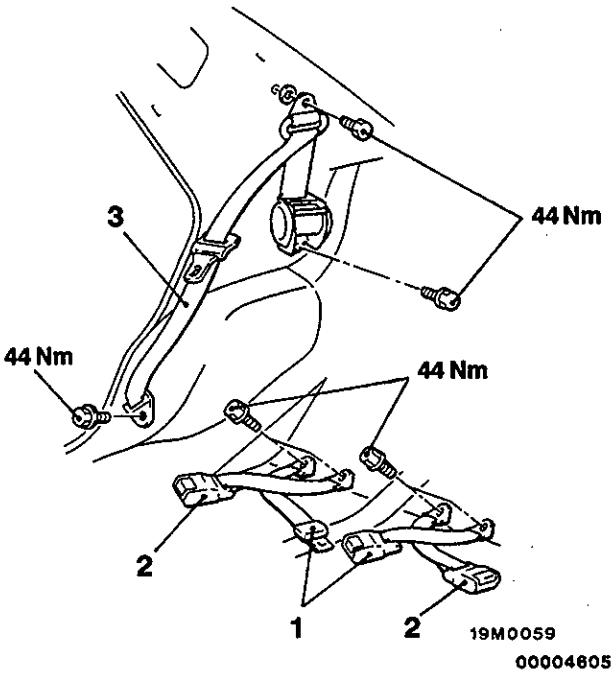


00004605

Removal steps

- Rear seat (Refer to P.52A-14.)

1. Inner, outer seat belt (center seat belt)
2. Inner seat belt

- Quarter trim <Hatchback> (Refer to P.52A-8.)
- Rear pillar trim (Refer to P.52A-8, 9.)

3. Outer seat belt

NOTES

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

52409000094

CAUTION

- **Carefully read and observe the information in the SERVICE PRECAUTIONS (P.52B-4.) prior to any service.**
- **For information concerning troubleshooting or maintenance, always observe the procedures in the Troubleshooting (P.52B-6.) section.**
- **If any SRS components are removed or replaced in connection with any service procedures, be sure to follow the procedures in the INDIVIDUAL COMPONENT SERVICE section (P.52B-22.) for the components involved.**
- **If you have any questions about the SRS, please contact your local distributor.**

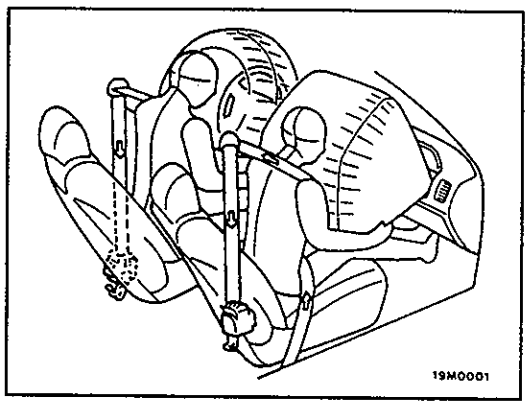
GENERAL INFORMATION

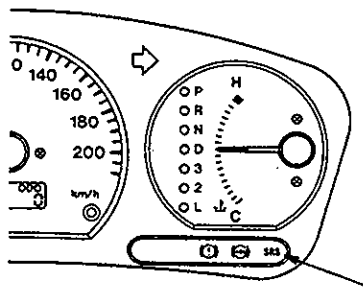
52400010126

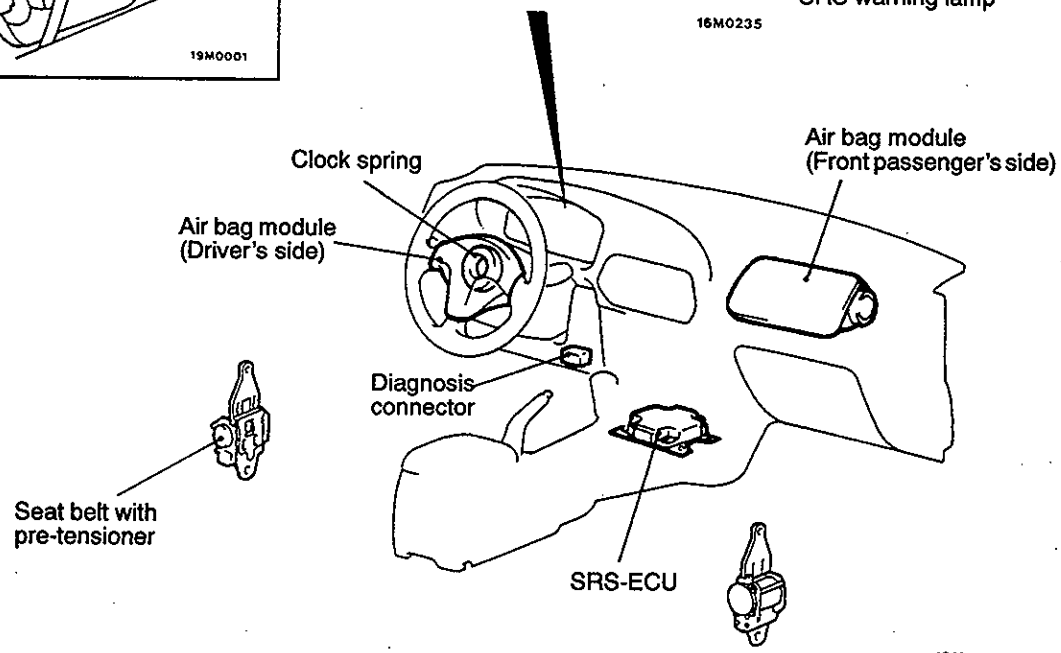
To improve safety, the SRS and seat belts with pre-tensioner are available as optional parts. These systems enhance collision safety by restraining the front passengers in case of an accident. The SRS works with the pre-tensioner simultaneously when a collision is detected.

The SRS consists of two air bag modules, SRS air bag control unit (SRS-ECU), SRS warning lamp and clock spring. One air bag is located in the centre of the steering wheel and another above the glove box. Each air bag has a folded air bag and an inflator unit. The control unit under the floor console monitors the system and has a safing G sensor and an analog G sensor. The warning lamp on the instrument panel indicates the operational status of the SRS. The clock spring is installed in the steering column.

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. The seat belt pre-tensioner is built into the front seat belt retractor. Only authorized service personnel should do work on or around the SRS components and seat belt with pre-tensioner. 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 inadvertent operation of the seat belt with pre-tensioner or inadvertent operation of the seat belt with pre-tensioner) or the driver (by rendering the SRS or the seat belt with pre-tensioner inoperative).



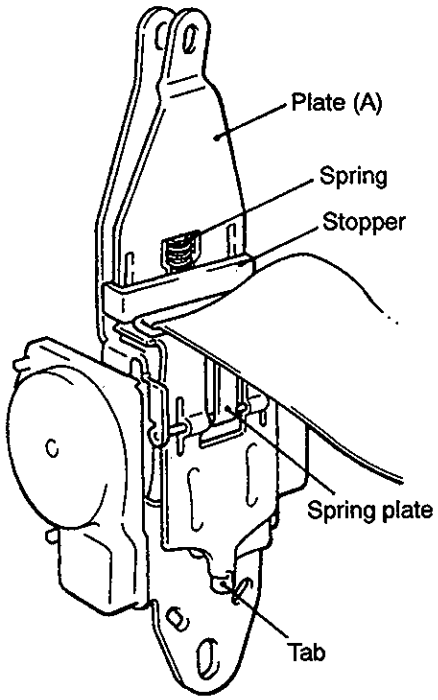




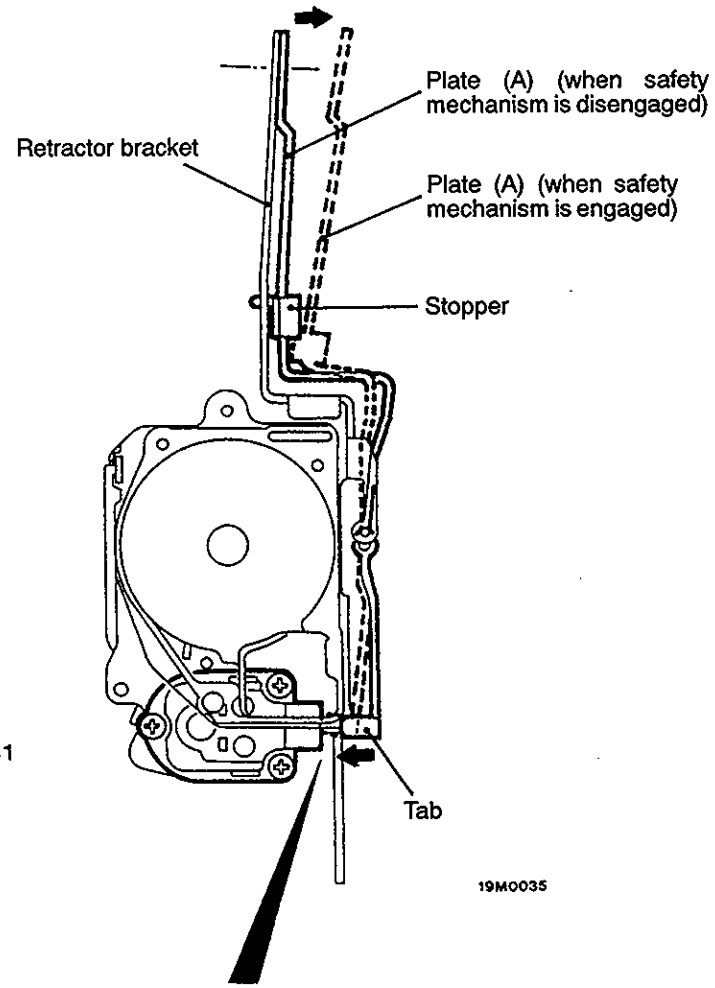
SEAT BELT WITH PRE-TENSIONER

The seat belt with pre-tensioner has a pre-tensioner operating mechanism and a G-sensor which detects the force from an impact built into the seat belt retractor.
The G-sensor is a mechanical-type sensor which includes components such as a weight which moves as a result of the impact from a collision, and a spike which strikes a charge and causes it to detonate.
Thus the pre-tensioner is equipped with a safety mechanism to prevent mis-operation during maintenance operations such as removal and installation of the seat belt.

The safety mechanism operates automatically when the retractor top mounting screw is removed during removal of the seat belt.
When the retractor top mounting screw is removed, the force of the spring plate causes the tab at the lower edge of plate (A) to push in the pin of the G-sensor, which prevents the weight inside the G-sensor from moving.
At the same time, the retractor bracket and the top of plate (A) become separated. A stopper is inserted into the gap thus formed by the force from a spring to prevent the tab from being removed from the pin if an outside force is applied to plate (A).

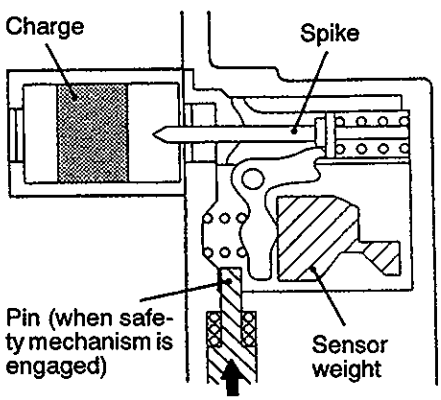


19M0031

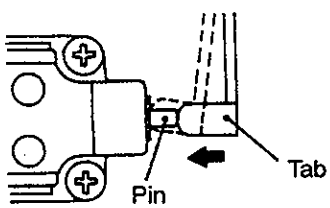


19M0035

G-sensor structure



19M0030



19M0036

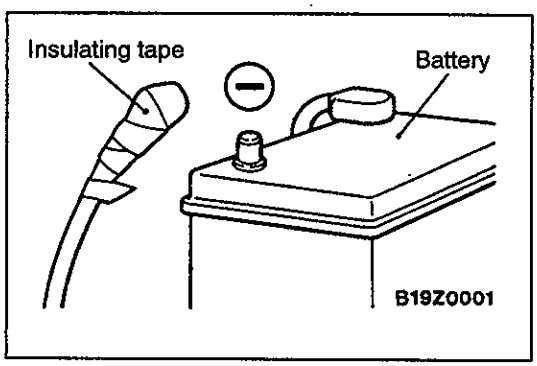
00004569

SRS SERVICE PRECAUTIONS

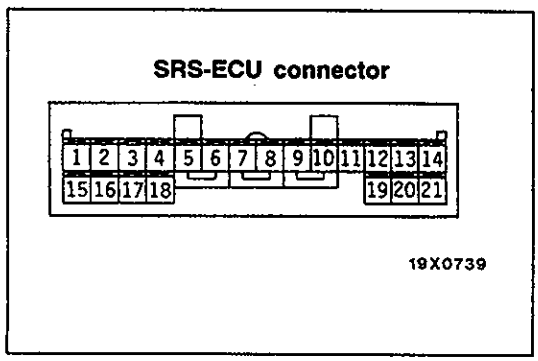
52400030122

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-6.
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-22.



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



5. Do not attempt to repair the wiring harness connectors of the SRS. If any of the connectors are diagnosed as faulty, replace the wiring harness. If the wires are diagnosed as faulty, replace or repair the wiring harness according to the following table.

SRS-ECU terminal No.	Harness connector (No. of terminals, colour)	Destination of harness	Corrective action
1 to 4	21 pins, yellow	–	–
5		Body wiring harness → Clock spring → Air bag module (Driver's side)	Correct or replace each wiring harness. Replace clock spring.
6			
7*		Body wiring harness → Air bag module (Front passenger's side)	Correct or replace each wiring harness.
8*			
9,10		–	–
11		Body wiring harness → Diagnosis connector	Correct or replace each wiring harness.
12		–	–
13		Body wiring harness → Junction block (fuse No.2)	Correct or replace each wiring harness.
14		Body wiring harness → Junction block (fuse No.4)	
15		Body wiring harness → SRS warning lamp	
16 to 19		–	–
20		Body wiring harness → Earth	Correct or replace body wiring harness.
21			

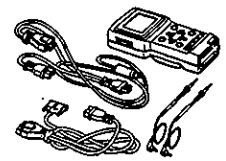
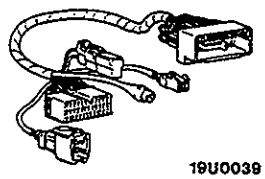
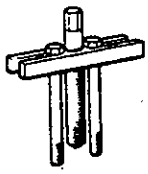
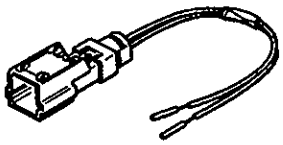
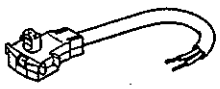
NOTE
*: Vehicles with front passenger's air bag

6. 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
7. Whenever you finish servicing the SRS, check warning lamp operation to make sure that the system functions properly. (Refer to P.52B-14.)
8. Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.
9. If you have any questions about the SRS, please contact your local distributor.

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

SPECIAL TOOLS

52400070117

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
	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
	MR203491 or MB628919	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

52400310097

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

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

DIAGNOSIS FUNCTION

52400320083

DIAGNOSIS CODES CHECK

Connect the MUT-II to the diagnosis connector (16-pin) under the instrument under cover, then check diagnosis codes.
(Refer to GROUP 00 – How to Use Troubleshooting/Inspection Service Points.)

ERASING DIAGNOSIS CODES

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

INSPECTION CHART FOR DIAGNOSIS CODES

52400330093

Inspect according to the inspection chart that is appropriate for the malfunction code.

Code No.	Diagnosis item		Reference page
14	Analog G-sensor system in the SRS-ECU		52B-7
15,16	Safing G-sensor system in the SRS-ECU		52B-8
21, 22, 61, 62	Driver's side air bag module (squib) system		52B-8
24, 25, 64, 65	Front passenger's side air bag module (squib) system		52B-9
31, 32	SRS-ECU capacitor system		52B-9
34*	Connector lock system		52B-9
35	SRS-ECU (deployed air bag) system		52B-10
41*	IG_1 (A) power circuit system		52B-10
42*	IG_1 (B) power circuit system		52B-11
43	SRS warning lamp drive circuit system	Lamp does not illuminate.*	52B-12
		Lamp does not switch off.	52B-13
44	SRS warning lamp drive circuit system		52B-13
45	SRS-ECU non-volatile memory (EEPROM) and A/D converter system		52B-13
51, 52	Driver's side air bag module (squib ignition drive circuit) system		52B-13
54, 55	Front passenger's side air bag module (squib ignition drive circuit) system		52B-13

NOTE
(1) *: If the vehicle condition returns to normal, the diagnosis code will be automatically erased, and the SRS warning lamp will return to normal.
(2) If the vehicle has a discharged battery it will store the fault codes 41 or 42. When these diagnosis codes are displayed, check the battery.

INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

Code No.14 Analog G-sensor system in the SRS-ECU	Probable cause
The SRS-ECU monitors the output of the analog G-sensor inside the SRS-ECU. It outputs this code when any of the following are detected. • When the analog G-sensor is not operating • When the characteristics of the analog G-sensor are abnormal • When the output from the analog G-sensor is abnormal	• Malfunction of SRS-ECU

Replace the SRS-ECU.

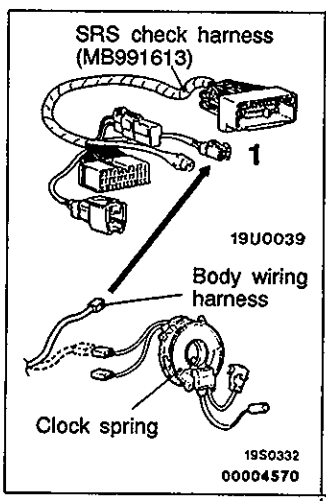
Code No.15 Safing G-sensor system in the SRS-ECU	Probable cause
This code is output if there is a short or open circuit between the terminals of the safing G-sensor inside the SRS-ECU. The trouble causes for each diagnosis code No. are as follows.	• Malfunction of SRS-ECU

Code No.	Trouble symptom
15	Short circuit in the safing G-sensor
16	Open circuit in the safing G-sensor

Replace the SRS-ECU.

Code No.21, 22, 61 or 62 Driver's side air bag module (squib) system	Probable cause
These diagnosis codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The trouble causes for each diagnosis code No. are as follows.	• Malfunction of clock spring • Malfunction of wiring harnesses or connectors • Malfunction of driver's side air bag module (squib) • Malfunction of SRS-ECU

Code No.	Trouble symptom
21	• Short in driver's side air bag module (squib) or harness short • Short in clock spring
22	• Open circuit in driver's side air bag module (squib) or open harness • Open circuit in clock spring • Malfunction of connector contact
61	• Short in driver's side air bag module (squib) harness leading to the power supply
62	• Short in driver's side air bag module (squib) harness leading to the earth



MUT-II Self-diag code
- Disconnect clock spring connector B-57.
- Connect SRS check harness connector (1).
- Erase diagnosis code memory.

Are code Nos.21, 22, 61 or 62 output?

Yes → **Check the following connectors:** B-57, B-15 — NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and clock spring. — NG → **Repair**

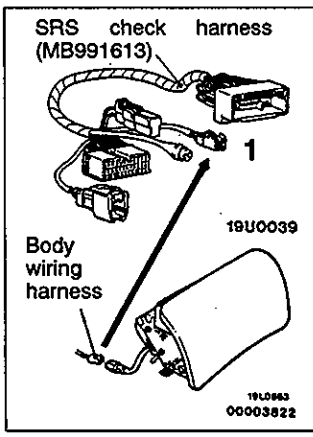
OK → Replace the SRS-ECU.

No → Check the clock spring. (Refer to P.52B-30.) — NG → **Repair**

OK → Replace the driver's side air bag module.

Code No.24, 25, 64 or 65 Front passenger's side air bag module (squib) system	Probable cause
These diagnosis codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib). The trouble causes for each diagnosis code No. are as follows.	• Malfunction of wiring harnesses or connectors • Malfunction of front passenger's side air bag module (squib) • Malfunction of SRS-ECU

Code No.	Trouble symptom
24	• Short in front passenger's side air bag module (squib) or harness short
25	• Open circuit in front passenger's side air bag module (squib) or open harness • Malfunction of connector contact
64	• Short in front passenger's side air bag module (squib) harness leading to the power supply
65	• Short in front passenger's side air bag module (squib) harness leading to the earth



MUT-II Self-diag code
- Disconnect front passenger's side air bag module connector B-07.
- Connect SRS check harness connector (1).
- Erase diagnosis code memory.

Are code Nos.24, 25, 64 or 65 output?

Yes → **Check the following connectors:** B-07, B-15
- NG → **Repair**
- OK → Check trouble symptoms.
  - NG → Check the harness wire between the front passenger's side air bag module (squib) and SRS-ECU.
    - NG → **Repair**
    - OK → Replace the SRS-ECU.

No → Replace the front passenger's side air bag module.

Code No.31 or 32 SRS-ECU capacitor system	Probable cause
Probable cause These diagnosis codes are output if there is abnormal resistance between the input terminals of the driver's side air bag module (squib).	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No.34 Connector lock system	Probable cause
This diagnosis code is output if a poor connection of the SRS-ECU is detected. However, if the vehicle condition returns to normal, diagnosis code No.34 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of connectors • Malfunction of SRS-ECU

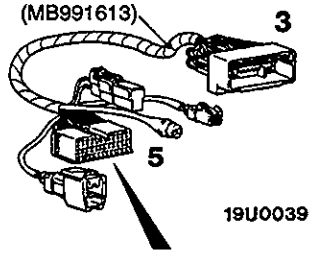
Check the following connector: B-15
- NG → **Repair**
- OK → Replace the SRS-ECU.

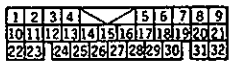
Code No.35 SRS-ECU (deployed air bag) system	Probable cause
This diagnosis code is output after the air bag deploys. If this code is output before the air bag has deployed, the cause is probably a malfunction inside the SRS-ECU.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

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

SRS check harness (MB991613)





19L0567
00003824

Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-15.
- Connect SRS check harness connector (3).
- Continuity between terminals (20) and (21)

OK: Continuity

NG → **Check the following connectors:** B-15, B-73, B-74 NG → **Repair**

OK → Check trouble symptoms.

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

OK

Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-15.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Voltage between terminal (14) and body earth

OK: 9 V or more

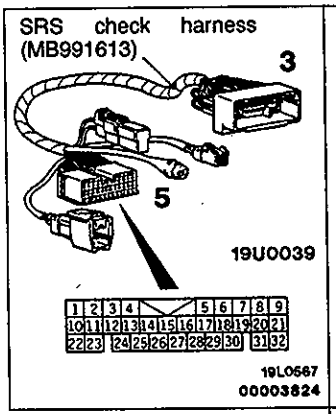
NG → **Check the following connectors:** B-15, B-73 NG → **Repair**

OK → Check trouble symptoms.

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

OK → Replace the SRS-ECU.

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



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-15.
- Connect SRS check harness connector (3).
- Continuity between terminals (20) and (21)

OK: Continuity

NG → **Check the following connectors:** B-15, B-73, B-74 → NG → **Repair**

OK → Check trouble symptoms.

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

OK → Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-15.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Voltage between terminal (13) and body earth

OK: 9 V or more

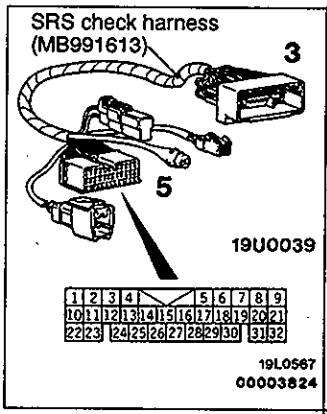
NG → **Check the following connectors:** B-15, B-73 → NG → **Repair**

OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ignition switch IG_1, 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 in monitoring the SRS warning lamp and the lamp is OFF (transistor OFF). However, if this code is output due to an open circuit, if the vehicle condition returns to normal, this diagnosis code No.43 will be automatically erased, and the SRS warning lamp will return to normal.	• Malfunction of wiring harnesses or connectors • Blown bulb • Malfunction of SRS-ECU • Malfunction of combination meter



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-15.
- Connect SRS check harness connector (3).
- Continuity between terminals (20) and (21)

OK: Continuity

NG → **Check the following connectors:** B-15, B-73, B-74 → NG → **Repair**

OK → Check trouble symptoms.

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

OK → Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-15.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Connect terminal (15) to the body earth.

OK: Lamp illuminates

NG → Blown bulb inspection → NG → **Repair**

OK → **Check the following connectors:** B-03, B-02, B-69 → NG → **Repair**

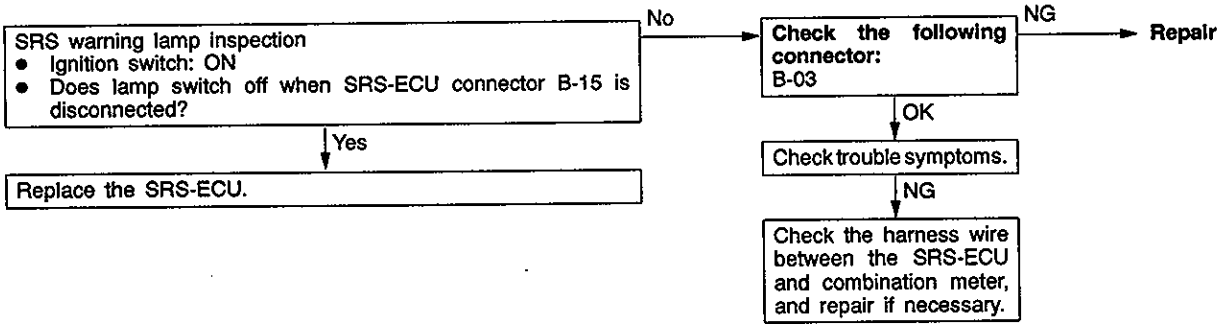
OK → Check trouble symptoms.

NG → Check the harness wire between the SRS-ECU and ignition switch (IG_1). → NG → **Repair**

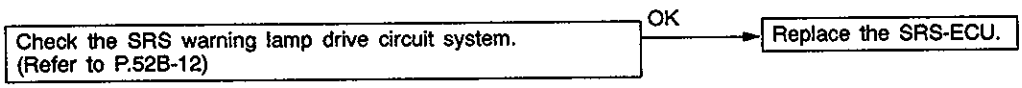
OK → Replace the combination meter.

OK → Replace the SRS-ECU.

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 SRS-ECU is monitoring the SRS warning lamp and the lamp is ON.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU • Malfunction of combination meter



Code No.44 SRS warning lamp drive circuit system	Probable cause
This diagnosis code is output when a short occurs in the lamp drive circuit or a malfunction of the output transistor inside the SRS-ECU is detected while the SRS-ECU is monitoring the SRS warning lamp drive circuit.	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU



Code No.45 SRS-ECU non-volatile memory (EEPROM) and A/D converter system	Probable cause
This diagnosis code is output if there is a malfunction in the SRS-ECU non-volatile memory (EEPROM) and A/D converter.	• Malfunction of SRS-ECU

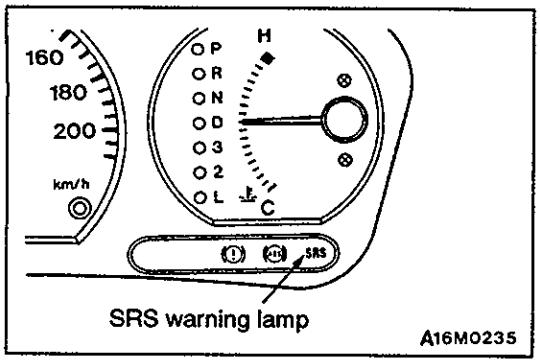
Replace the SRS-ECU.

Code No.51 or 52 Driver's side air bag module (squib ignition drive circuit) system	Probable cause
This diagnosis code is output if a short (No.51) or an open circuit (No.52) is detected in the circuit for the driver's seat.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No.54 or 55 Front passenger's side air bag module (squib ignition drive circuit) system	Probable cause
This diagnosis code is output if a short (No.54) or an open circuit (No.55) is detected in the circuit for the passenger's seat.	• Malfunction of SRS-ECU

Replace the SRS-ECU.



SRS WARNING LAMP INSPECTION

1. Check to be sure that the SRS warning lamp illuminates when the ignition switch is in the ON position.
2. Check to be sure that it illuminates for approximately 7 seconds and then switches off.
3. If the above is not the cause, inspect the diagnosis codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

52400340096

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	52B-14
	Communication is not possible with SRS only.	2	52B-14
When the ignition key is turned to "ON" (engine stopped), the SRS warning lamp does not illuminate.		Refer to diagnosis code No.43.	52B-12
After the ignition switch is turned to ON, the SRS warning lamp is still on after approximately 7 seconds have passed.		Refer to diagnosis code No.43.	52B-13

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

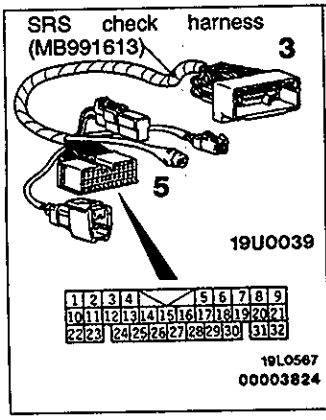
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting.

Inspection Procedure 2

Communication with MUT-II is not possible. (Communication is not possible with SRS only.)	**Probable cause**
If communication is not possible with the SRS only, the cause is probably an open circuit in the diagnosis output circuit of the SRS or in the power circuit (including earth circuit).	• Malfunction of wiring harnesses or connectors • Malfunction of SRS-ECU



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-15.
- Connect SRS check harness connector (3).
- Continuity between terminals (20) and (21)

OK: Continuity

NG → **Check the following connectors:** B-15, B-73, B-74 NG → **Repair**

OK → Check trouble symptoms.

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

OK

Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector B-15.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Voltage between terminal (13) and body earth
  OK: 9 V or more
- Voltage between terminal (14) and body earth
  OK: 9 V or more

NG → **Check the following connectors:** B-15, B-73 NG → **Repair**

OK → Check trouble symptoms.

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

OK

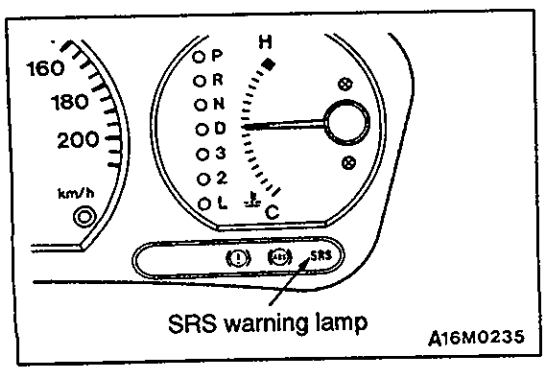
Check the harness wire between the SRS-ECU and diagnosis connector. NG → **Repair**

OK → Replace the SRS-ECU.

SRS MAINTENANCE

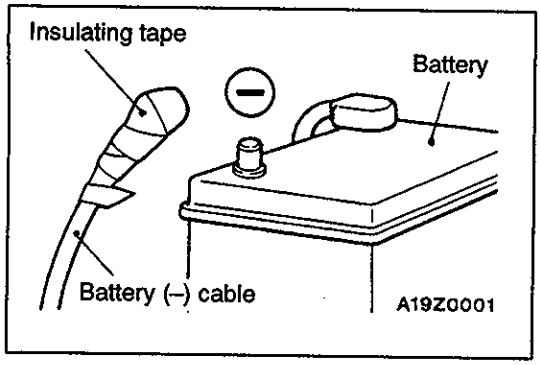
52400390084

The SRS must be inspected by an authorized dealer 10 years after the date of vehicle registration.



SRS WARNING LAMP CHECK

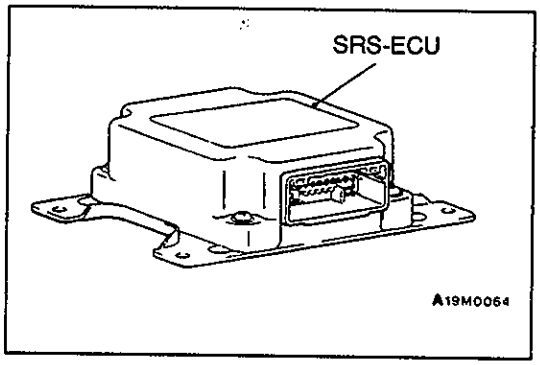
Turn the ignition key to the "ON" position. Does the SRS warning lamp illuminate for about 7 seconds, turn off and then remain extinguished for at least 5 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-6.



SRS COMPONENT VISUAL CHECK

Turn the ignition key to the "LOCK" 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-4.)

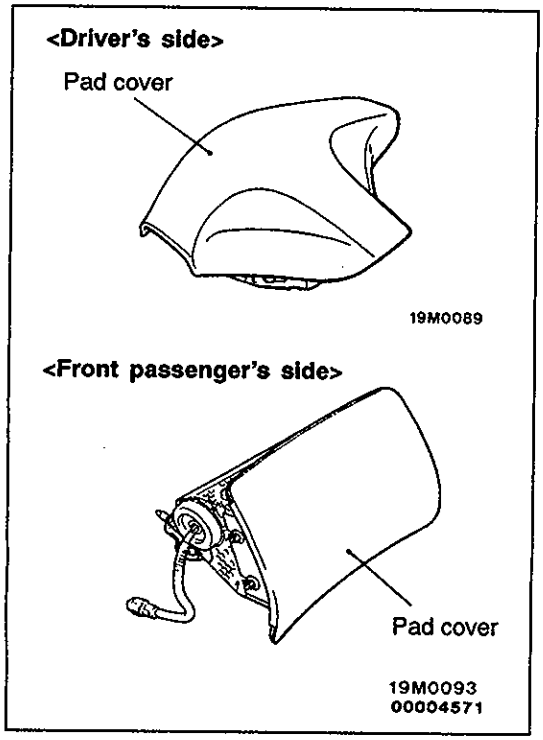


SRS CONTROL UNIT (SRS-ECU)

1. Check SRS-ECU case and brackets for dents, cracks, deformation or rust.

   Caution
   The SRS may not activate if the SRS-ECU is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.

2. Check connector for damage, and terminals for deformation or rust.
   Replace SRS-ECU if it fails visual check.
   (Refer to P.52B-24.)



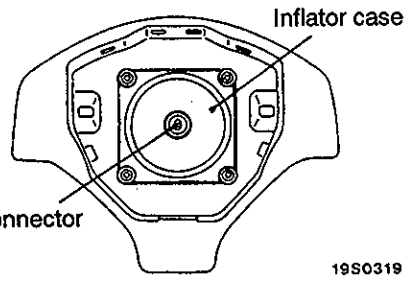
AIR BAG MODULES, STEERING WHEEL AND CLOCK SPRING

1. Remove the air bag modules, steering wheel and clock spring. (Refer to P.52B-25.)

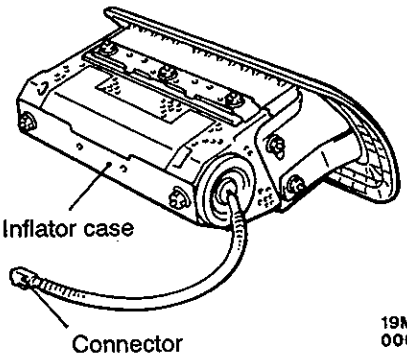
   Caution
   The removed air bag modules should be stored in a clean, dry place with the pad cover face up.

2. Check pad cover for dents, cracks or deformation.

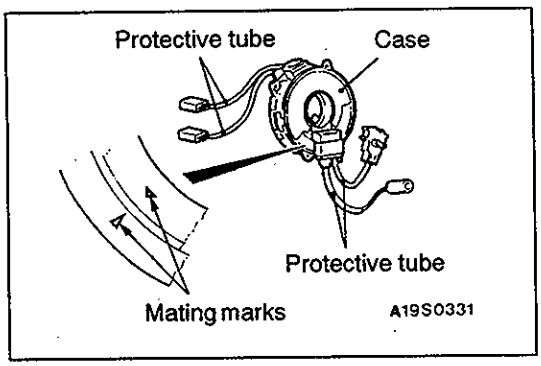
<Driver's side>



<Front passenger's side>



3. Check connector for damage, terminals deformities, and harness for binds.
4. Check air bag inflator case for dents, cracks or deformities.
5. Check harness and connectors for damage, and terminals for deformation.



6. Check clock spring connectors and protective tube for damage, and terminals for deformation.
7. Visually check the clock spring case for damage.
8. Align the mating marks of the clock spring and, after turning the vehicle's front wheels to straight-ahead position, install the clock spring to the column switch.

Mating Mark Alignment

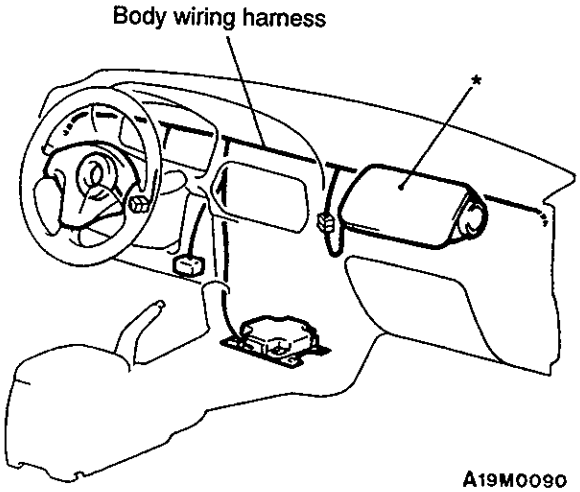
Turn the clock spring clockwise fully, and then turn back it approx. 3 4/5 turns counterclockwise to align the mating marks.

Caution
If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver or front passenger.

9. Install the steering column covers, steering wheel and the air bag module.
10. Check steering wheel for noise, binds of difficult operation.
11. Check steering wheel for excessive free play.
    REPLACE ANY VISUALLY INSPECTED PART IF IT FAILS THAT INSPECTION. (Refer to P.52B-25.)

Caution
The SRS may not activate if any of the above components is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.

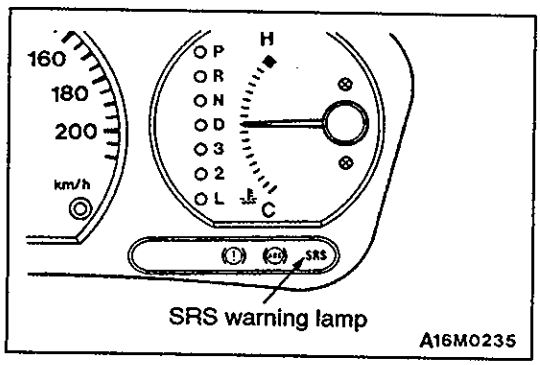
BODY WIRING HARNESS



NOTE
*: Vehicles with front passenger's air bag

1. Check connector for poor connection.
2. Check harnesses for binds, connectors for damage, and terminals for deformation.
   REPLACE ANY CONNECTORS OR HARNESS THAT FAIL THE VISUAL INSPECTION. (Refer to P.52B-4.)

Caution
The SRS may not activate if SRS harnesses or connectors are damaged or improperly connected, which could result in serious injury or death to the vehicle's driver or front passenger.



POST-INSTALLATION INSPECTION

Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the SRS warning lamp illuminate for about 7 seconds, turn off and then remain extinguished for at least 5 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-6.

POST-COLLISION DIAGNOSIS 52400110116

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-7.)

   NOTE
   If the battery power supply has been disconnected or disrupted by the collision, the MUT-II cannot communicate with the SRS-ECU. Inspect and, if necessary, repair the body wiring harness before proceeding further.

3. Read the data list (fault duration and how many times memories are erased) using the MUT-II.

Data list

No	Service Data Item	Applicability
92	Number indicating houw often the memory is cleared	Maximum time to be stored: 250
93	How long a problem has lasted (How long it takes from the occurrence of the problem till the firest igniting signal)	Maximum time to be stored: 99999 minutes (approximately 7 days)
94	How long a problem has lasted (How long it takes from the first igniting signal till now)	

4. Erase the diagnosis codes and after waiting 5 seconds or more read (and write down) all displayed diagnosis codes. (Refer to P.52B-7.)

REPAIR PROCEDURE

WHEN AIR BAG DEPLOYS OR SEAT BELT PRE-TENSIONER OPERATES IN A COLLISION.

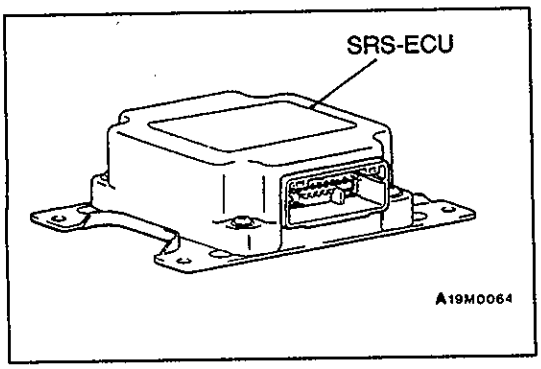
1. Replace the following parts with new ones.
   - SRS-ECU (Refer to P.52B-24.)
   - Air bag module (Refer to P.52B-25.)
   - Seat belt with pre-tensioner (Refer to P.52B-31.)

2. Check the following parts and replace if there are any malfunctions.
   - Clock spring (Refer to P.52B-25.)
   - Steering wheel, steering column and intermediate joint
     (1) Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
     (2) Install air bag module to check fit or alignment with steering wheel.
     (3) Check steering wheel for noise, binds or difficult operation and excessive free play.

3. Check harnesses for binding, connectors for damage, poor connections, and terminals for deformation. (Refer to P.52B-18.)

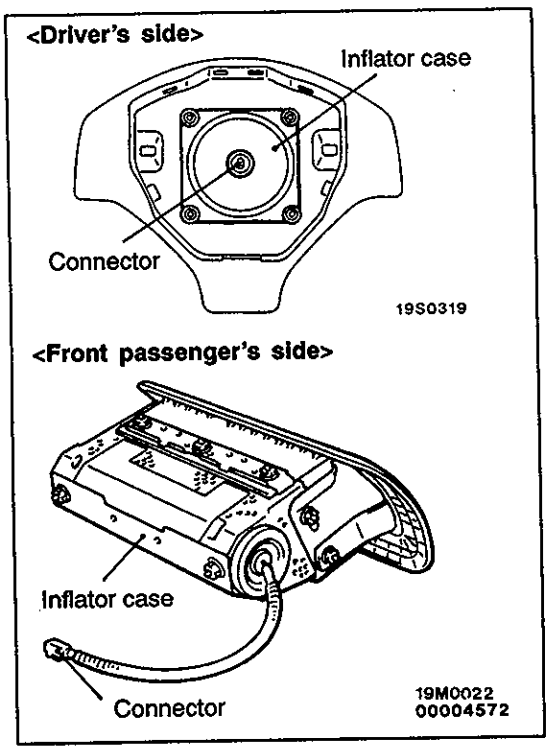
WHEN AIR BAG OR SEAT BELT PRE-TENSIONER DOES NOT DEPLOY IN LOW-SPEED COLLISION.

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-22.



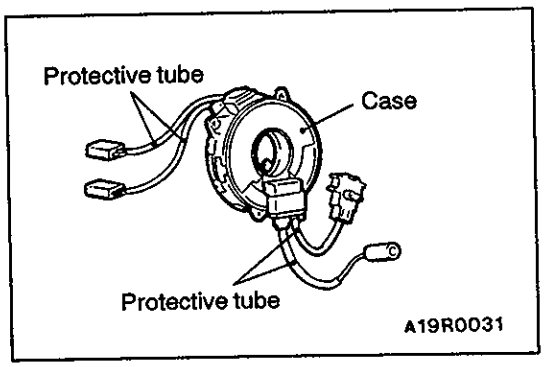
SRS-ECU

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



Air bag modules

1. Check pad cover for dents, cracks or deformation.
2. Check connector for damage, terminals deformities, and harness for binds.
3. Check air bag inflator case for dents, cracks or deformities.
4. Install air bag module to steering wheel to check fit or alignment with the wheel.



Clock spring

1. Check clock spring connectors and protective tube for damage, and terminals for deformation.
2. Visually check the case for damage.

Steering wheel, steering column and intermediate joint

1. Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
2. Install air bag module to check fit or alignment with steering wheel.
3. Check steering wheel for noise, binds or difficult operation and excessive free play.

Harness connector (body wiring harness)

Check harnesses for binding, connectors for damage, poor connection, and terminals for deformation. (Refer to P.52B-18.)

Seat belt with pre-tensioner

1. Check the seat belt for damage or deformation.
2. Check the pre-tensioner for cracks or deformation.
3. Check that the unit is installed correctly to the vehicle body.

INDIVIDUAL COMPONENT SERVICE

52400290100

If the SRS components and seat belt with pre-tensioner are to be removed or replaced as a result of maintenance, troubleshooting, etc., follow each procedure (P.52B-24 – P.52B-33.)

Caution

1. **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**

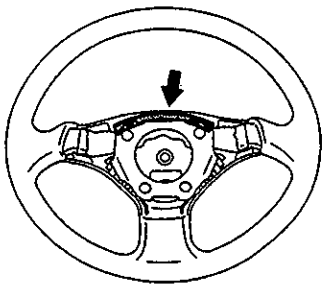
   Recheck SRS system operability after re-installing them.
2. **If the SRS components and seat belt with pre-tensioner are removed for the purpose of check, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.**

WARNING/CAUTION LABELS

52400300049

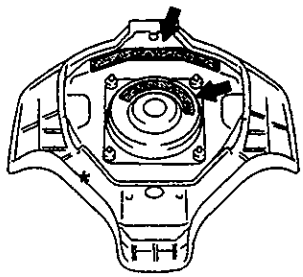
A number of caution labels relating to the SRS and seat belt with pre-tensioner are found in the vehicle, as shown in the following illustration. Follow label instructions when servicing SRS and seat belt pre-tensioner. If labels are dirty or damaged, replace them with new ones.

Steering wheel



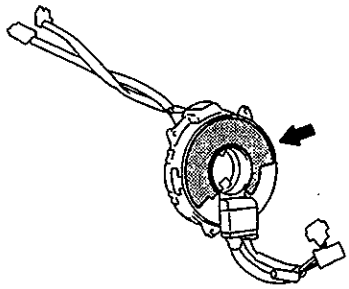
19M0033

Air bag module (driver's side)



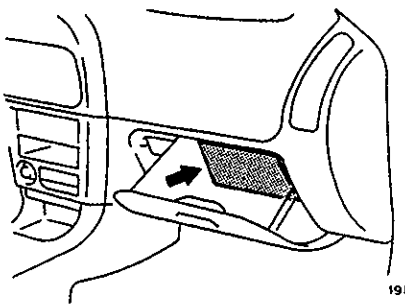
19M0020

Clock spring



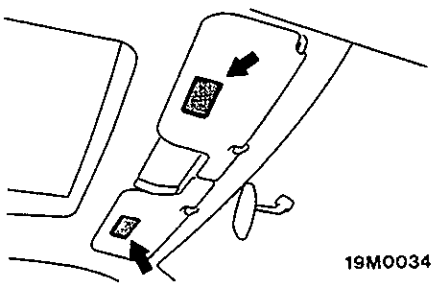
19X0015

Glove box



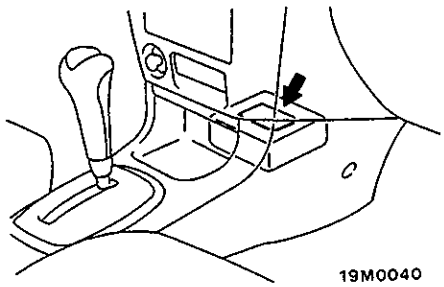
19M0039

Sun visor



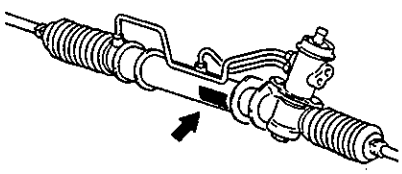
19M0034

SRS-ECU



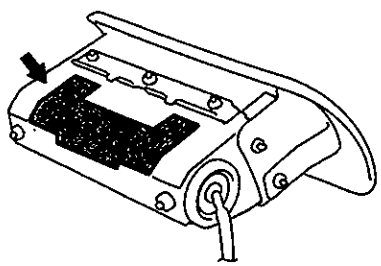
19M0040

Steering gear and linkage



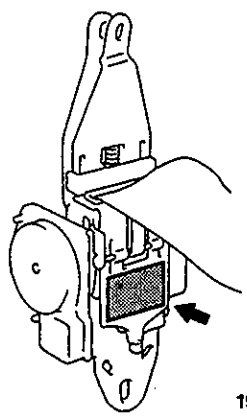
19S0223

Air bag module (front passenger's side)



19M0021

Seat belt pre-tensioner



19M0091

00004573

SRS AIR BAG CONTROL UNIT (SRS-ECU)

52400210083

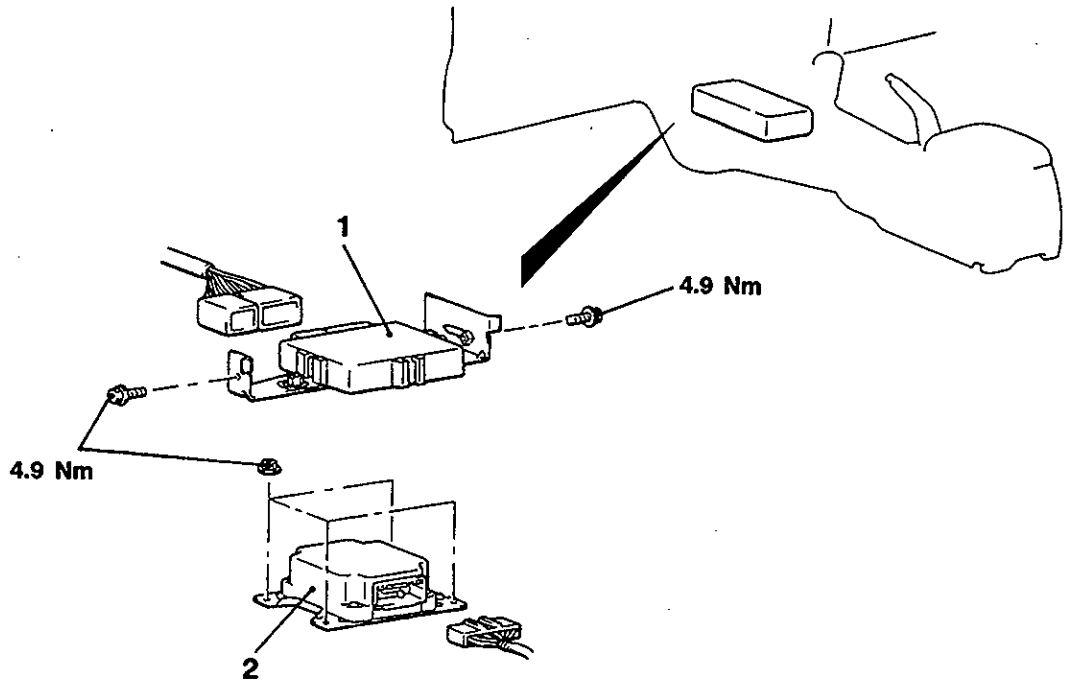
Caution

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-4.)**
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-6.**

REMOVAL AND INSTALLATION

Pre-removal Operation
- Turn the ignition key to the "LOCK" position.
- Floor Console Removal (Refer to GROUP 52A.)

Post-installation Operation
- Floor Console Installation (Refer to GROUP 52A.)



A19M0065

Removal steps

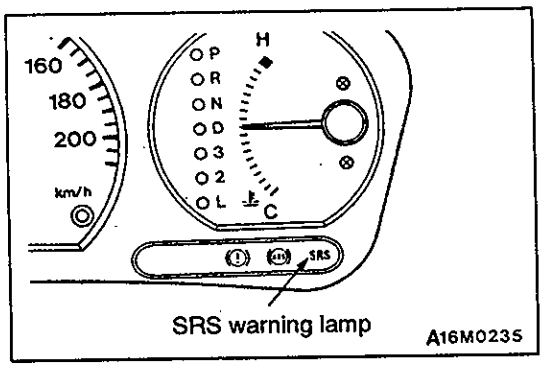
▶B◀ • Post-installation inspection
• Negative (–) battery cable connection
1. ABS-ECU <Vehicles with ABS>

▶A◀ 2. SRS-ECU

INSTALLATION SERVICE POINTS

▶A◀ SRS-ECU INSTALLATION

Caution
The SRS may not activate if SRS-ECU is not installed properly, which could result in serious injury or death to the vehicle's driver or front passenger.



▶B◀ POST-INSTALLATION INSPECTION

1. Reconnect the negative battery terminal.
2. Turn the ignition key to the "ON" position.
3. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 5 seconds after turning OFF?
4. If yes, SRS system is functioning properly.
   If no, consult page 52B-6.

INSPECTION 52400220062

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

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

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

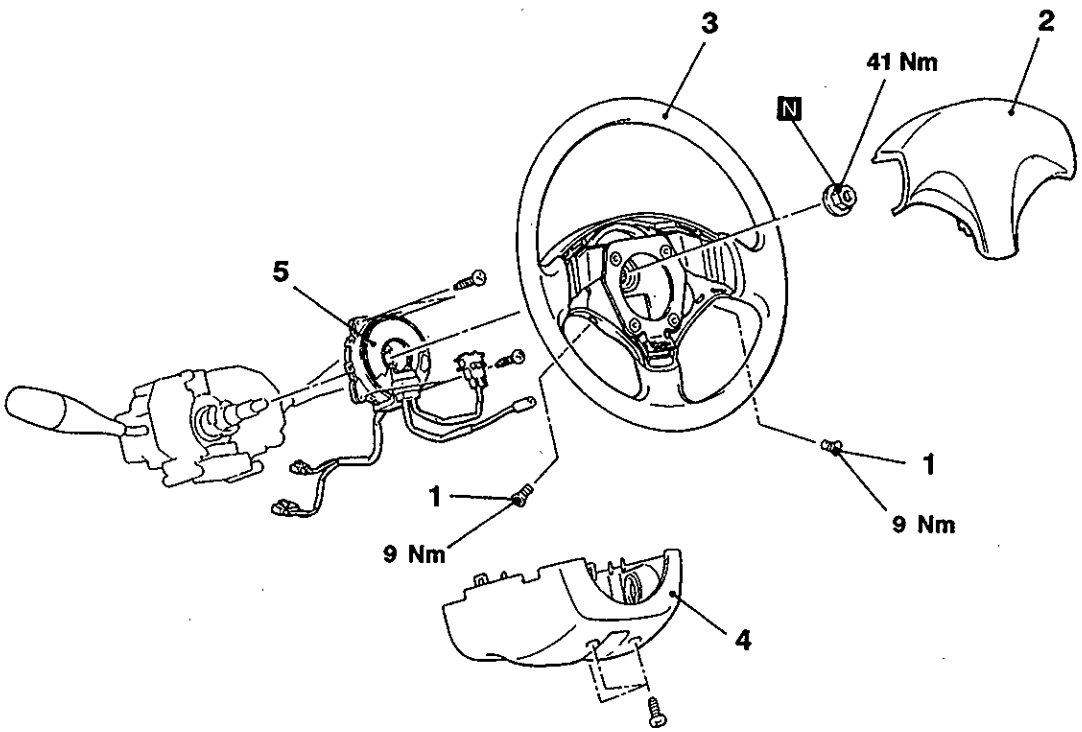
AIR BAG MODULES AND CLOCK SPRING 52400240112

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-4.)**
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-34.)**

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.



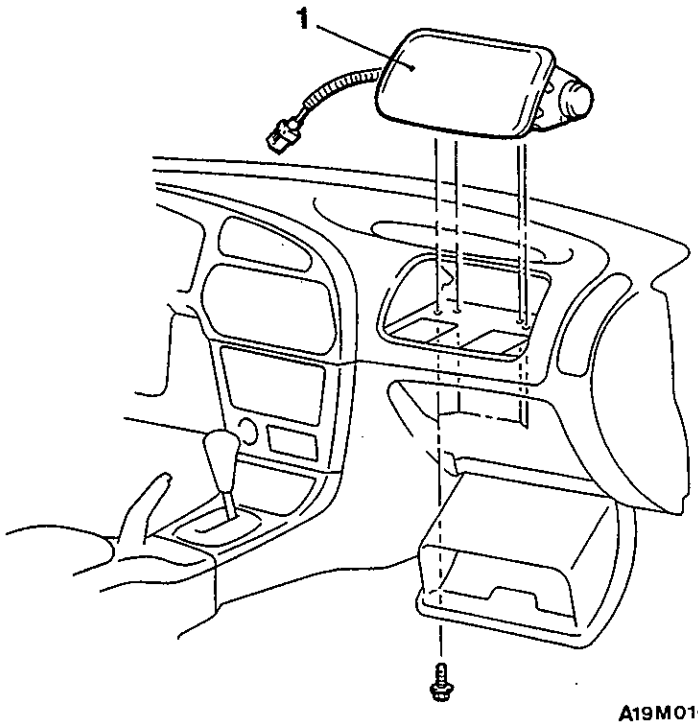
Air bag module removal steps

▶D◀ • Post-installation inspection
• Negative (–) battery cable connection
1. Air bag module mounting screw (Torx screw)
◀A▶ 2. Air bag module
▶A◀ • Pre-installation inspection

Clock spring removal steps

▶D◀ • Post-installation inspection
• Negative (–) battery cable connection
1. Air bag module mounting screw (Torx screw)
◀A▶ 2. Air bag module
◀B▶ ▶C◀ 3. Steering wheel
4. Column cover lower
◀C▶ ▶B◀ 5. Clock spring
▶A◀ • Pre-installation inspection

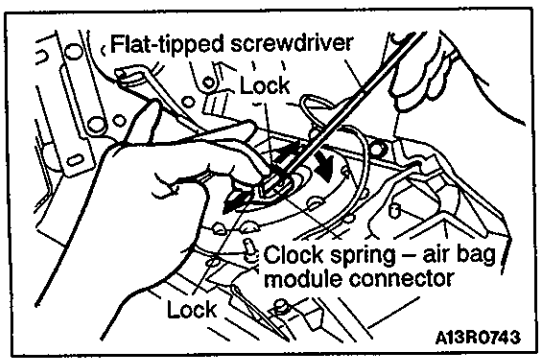
<Air bag module (front passenger's side>



Air bag module removal steps

▶D◀ • Post-installation inspection
• Negative (–) battery cable connection

◀D▶ 1. Air bag module
▶A◀ • Pre-installation inspection



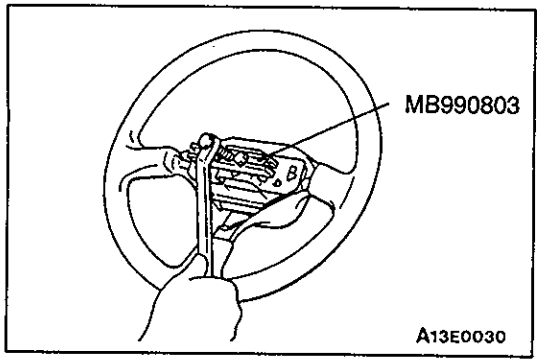
REMOVAL SERVICE POINTS

◀A▶ AIR BAG MODULE REMOVAL (DRIVER'S SIDE)

When disconnecting the connector of the clock spring from the air bag module, press the air bag's lock towards the outer side to spread it open. Use a flat-tipped screwdriver, as shown in the figure at the left, to pry so as to remove the connector gently.

Caution

1. **When disconnect the air bag module-clock spring connector, take care not to apply excessive force to it.**
2. **The removed air bag module should be stored in a clean, dry place with the pad cover face up.**



◀B▶ STEERING WHEEL REMOVAL

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".

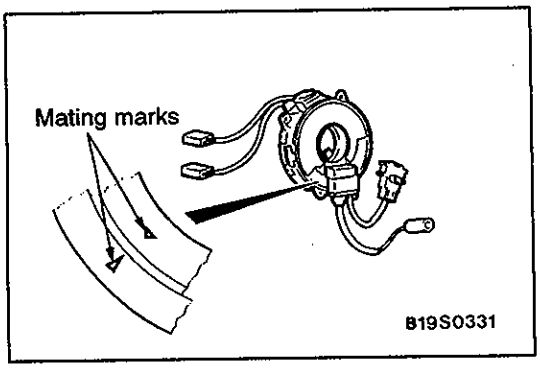
   Caution
   Dispose of air bag modules only according to the specified procedure. (Refer to P.52B-34.)

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-4.)



▶B◀ CLOCK SPRING INSTALLATION

Align the mating marks of the clock spring and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch.

Mating Mark Alignment

Turn the clock spring clockwise fully, and then turn back it approx. 3 4/5 turns counterclockwise to align the mating marks.

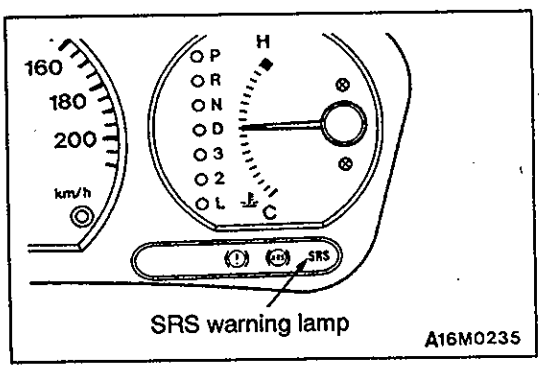
Caution
If the clock spring's mating marks are not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver.

▶C◀ STEERING WHEEL INSTALLATION

1. Before installation the steering wheel, be sure to first turn the vehicle's front wheels to the straight-ahead position and align the mating marks of the clock spring.

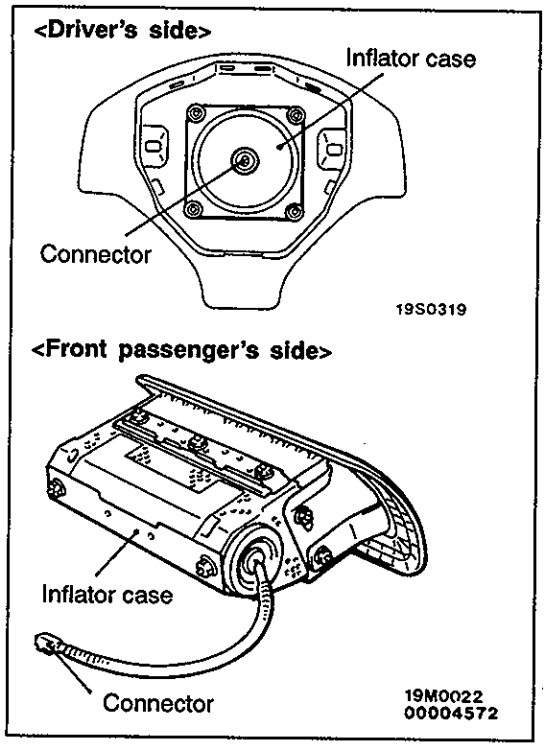
   Caution
   Be sure when installing the steering wheel, that the harness of the clock spring does not become caught or tangled.

2. After clamping, turn the steering wheel all the way in both directions to confirm that steering is normal.



▶D◀ POST-INSTALLATION INSPECTION

1. 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

52400250115

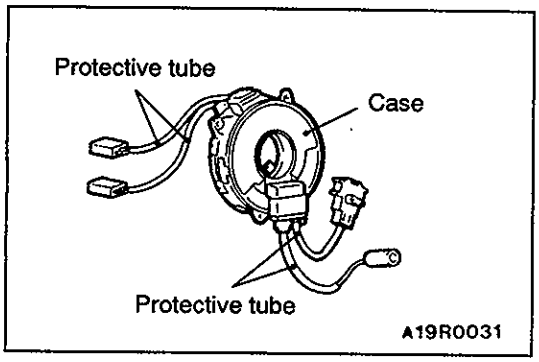
AIR BAG MODULE CHECK

If any improper part is found during the following inspection, replace the air bag modules with a new one.
Dispose the old one according to the specified procedure. (Refer to P.52B-34.)

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.

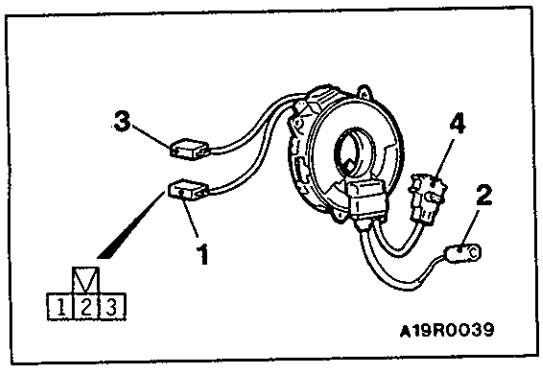
Caution
If dents, cracks, deformation, or rust are discovered in the air bag module, replace it with a new one.
Dispose of the old one according to the specified procedure. (Refer to P.52B-34.)



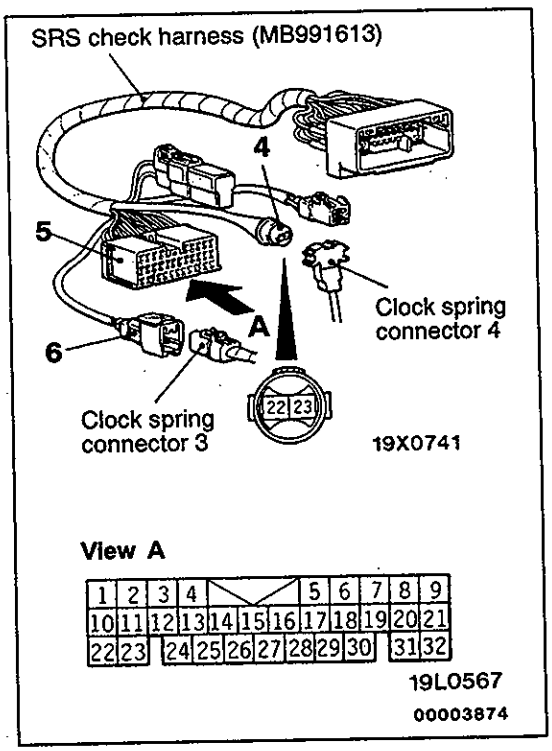
CLOCK SPRING CHECK

If, as result of following checks, even one abnormal point is discovered, replace the clock spring with a new one.

1. Check connectors and protective tube for damage, and terminals for deformation.
2. Visually check the case for damage.



3. Check that there is continuity between terminal (3) of the clock spring No.1 connector and the No. 2 connector.



4. Joint the No.3 connector and No.4 connector of the clock spring to connector No.6 and connector No.4 respectively, of the SRS check harness.

   NOTE
   When joining SRS check harness connector No.4 align its white paint with the hollow portion of the No.4 connector of the clock spring.

5. Check for continuity between terminal 22 and terminal 25, and terminal 23 and terminal 24, of SRS Check Harness connector No. 5 using a digital multi-meter.

SEAT BELT WITH PRE-TENSIONER

52400410025

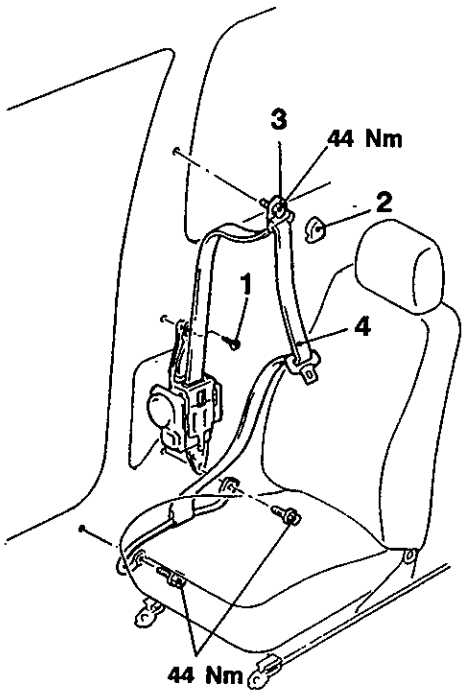
Caution

1. **Never attempt to disassemble or repair the seat belt with pre-tensioner. If faulty, replace it.**
2. **Be extremely careful when handling the seat belt with pre-tensioner. Do not subject it to shocks, drop it, bring it close to strong magnets or allow contact with water, grease or oil. Always replace it with a new part if any dents, cracks or deformation is found.**
3. **Do not place anything on top of the seat belt pre-tensioner.**
4. **Do not expose the seat belt with pre-tensioner to temperatures over 90°C.**
5. **After operating the seat belt pre-tensioner, replace the seat belt pre-tensioner with a new part.**
6. **Gloves and protective goggles should be worn when handling a pre-tensioner once it has been used.**
7. **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-34.)**

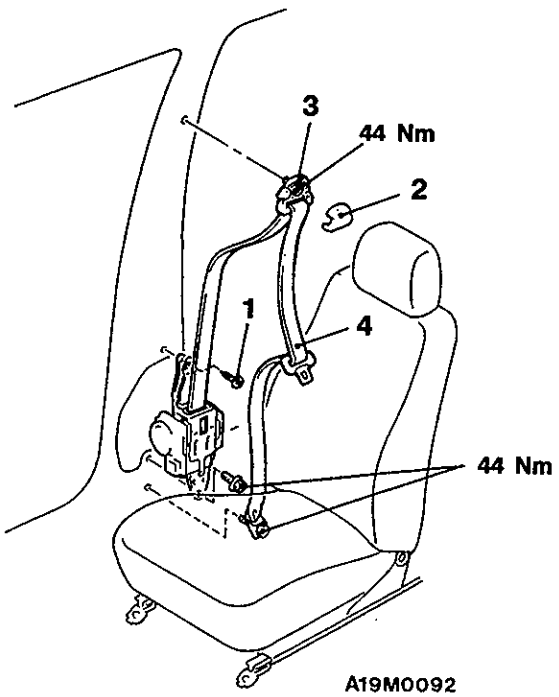
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Center Pillar Lower Trim Removal and Installation (Refer to GROUP 52A.)

<Hatchback>



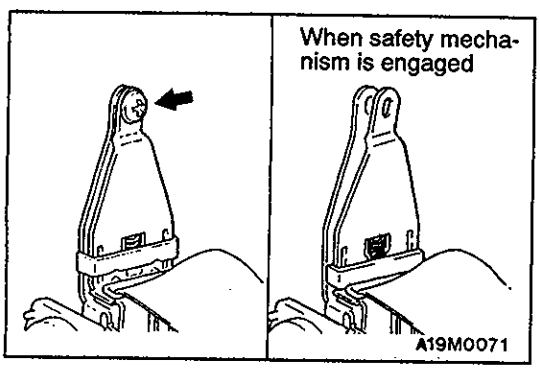
<Sedan>



Removal steps

◀A▶ ▶B◀ 1. Retractor top mounting screw (for engaging and disengaging safety mechanism)
2. Sash guide cover
3. Sash guide
4. Seat belt with pre-tensioner

▶A◀ • Pre-installation inspection



REMOVAL SERVICE POINT

◀A▶ RETRACTOR TOP MOUNTING SCREW REMOVAL (SAFETY MECHANISM ENGAGEMENT)

The safety mechanism which is equipped in the seat belt pre-tensioner will engage automatically when the retractor top mounting screw is removed.

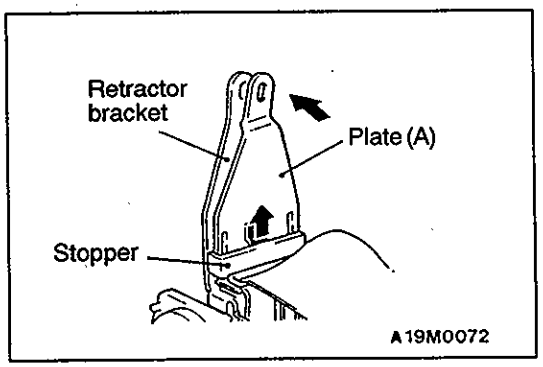
Caution
All of the following operations should be carried out while the safety mechanism is engaged to prevent mis-operation of the seat belt pre-tensioner. Furthermore, the safety mechanism should not be disengaged while the seat belt pre-tensioner is removed from the vehicle.

INSTALLATION SERVICE POINTS

▶A◀ PRE-INSTALLATION INSPECTION

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-34.)



▶B◀ RETRACTOR TOP MOUNTING SCREW INSTALLATION (SAFETY MECHANISM DISENGAGEMENT)

1. Lift up the stopper and then bring the retractor bracket and plate (A) together so that the stopper tab goes into the hole in the retractor bracket.
2. Screw the retractor bracket and plate (A) together with the retractor top mounting screw.
3. Check that the seat belt can be pulled out smoothly. If it does not move smoothly, the safety mechanism may not have been properly disengaged, so remove the retractor top mounting screw and repeat the installation procedure.

INSPECTION

52400420028

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-34.)

- Check seat belt pre-tensioner for dents, cracks or deformation.

AIR BAG MODULE AND SEAT BELT PRE-TENSIONER DISPOSAL PROCEDURES

52400120119

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 inside the vehicle, and operate the seat belt pre-tensioners outside 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.**

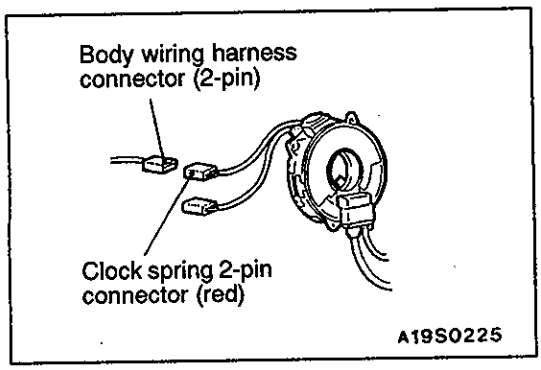
AIR BAG MODULE DEPLOYMENT

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.

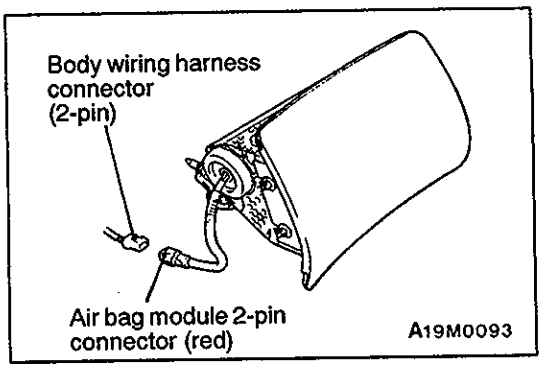
   Caution
   Wait at least 60 seconds after disconnecting the battery cables before doing any further work.
   (Refer to P.52B-4.)



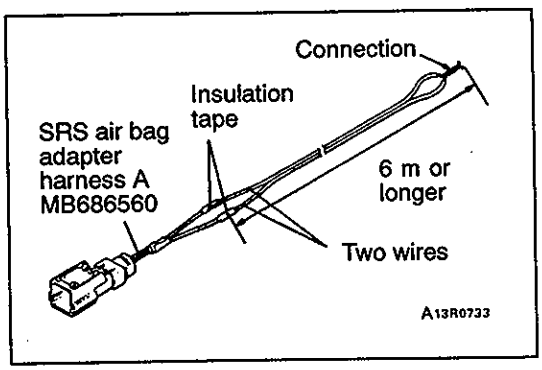
3. To deploy the air bag module (driver's side):
   (1) Remove the steering column cover lower.
   (2) Remove the connection between the clock spring 2-pin connector (red) and the body wiring harness connector.

   NOTE

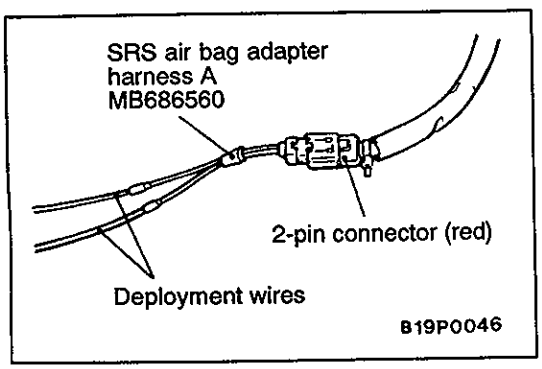
   If the clock spring connector is disconnected from the body wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.



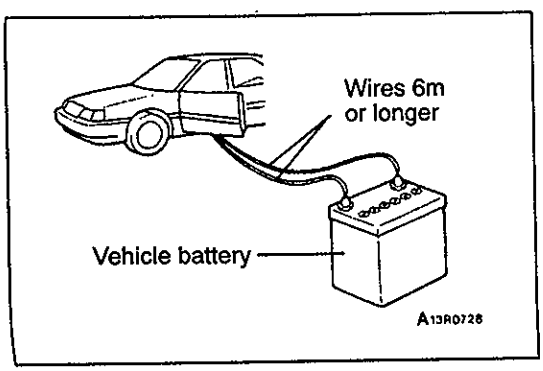
4. To deploy the air bag module (front passenger's side):
   (1) Remove the glove box. (Refer to P.52B-27.)
   (2) Remove the connection between the air bag module (front passenger's side) connector (red 2-pin) and the body wiring harness connector.



5. Connect two wires, each six 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.



6. Connect the clock spring or air bag module (front passenger's side) 2-pin connector (red) to SRS air bag adapter harness A and pass the deployment wires out of the vehicle.



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

Caution

1. **Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.**
2. **The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment.**
   See Deployed Air Bag Module or Operated Seat Belt Pre-tensioner Disposal Procedures (P.52B-41.) 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.**

8. After deployment, dispose of air bag module according to the Deployed Air Bag Module or Operated Seat Belt Pre-tensioner Disposal Procedures. (Refer to P.52B-41.)

Deployment Outside The Vehicle

Caution

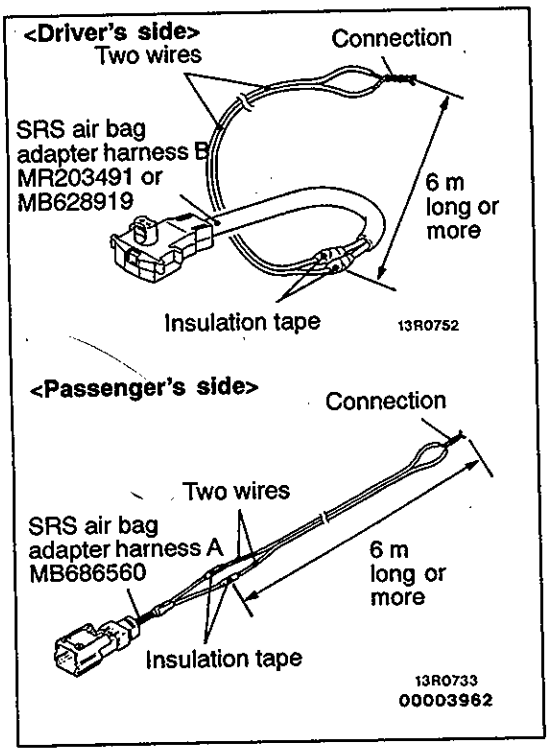
1. **This should be carried out in a wide, flat area at least 6 m away from obstacles and other people.**
2. **Do not perform deployment outside, if a strong wind is blowing, and if there is even a slight breeze, the air bag module should be placed and deployed downwind from the battery.**

1. Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

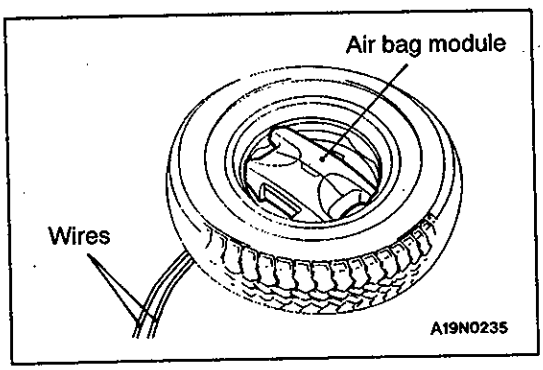
   Caution
   Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-4.).

2. Remove the air bag module from the vehicle. (Refer to P.52B-25.)

   Caution
   The air bag module should be stored on a flat surface and placed so that the pad cover face up. Do not place anything on top of it.



3. Connect two wires, each six meters or longer, to the two leads of SRS air bag adapter harness B <driver's side> or SRS air bag adapter harness A <front passenger's side>, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag module.



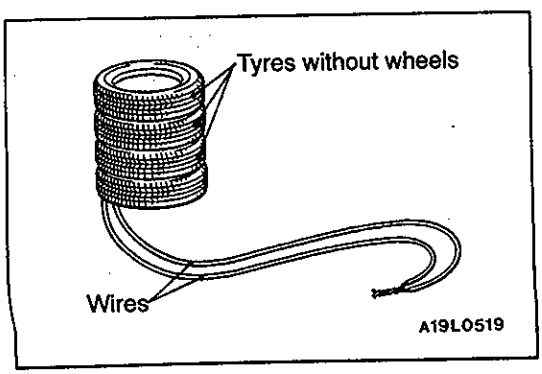
4. Set the air bag modules as follows:

<Air bag module (driver's side)>

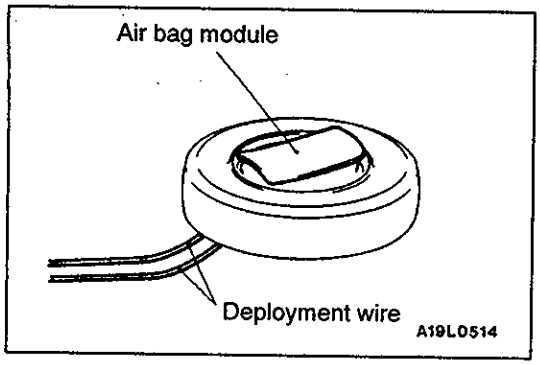
(1) Take the SRS air bag adapter harness B that is connected to the wires, pass it beneath the old tyre wheel assembly, and connect it to the air bag module.

(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.



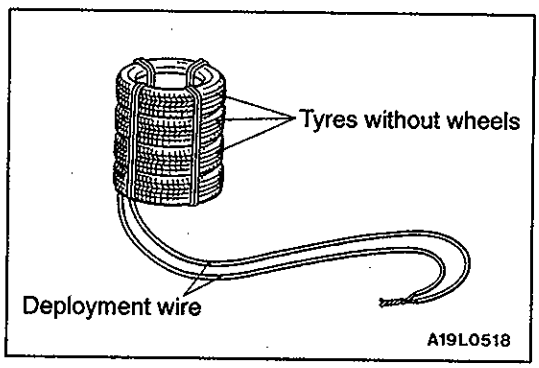
(3) Place three old tyres with no wheels on top of the tyre secured to the air bag module.



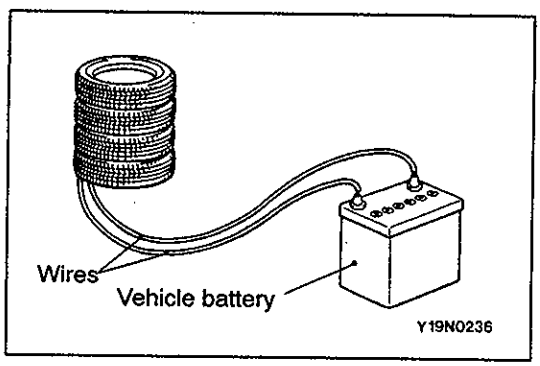
<Air bag module (front passenger's side)>

(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).



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

Caution
1. **Before deployment, check carefully to be sure that no one is nearby.**
2. **The inflator will be quite hot immediately following 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 or Operated Seat Belt Pre-tensioner Disposal Procedures (P.52B-41) for post-deployment handling instructions.**

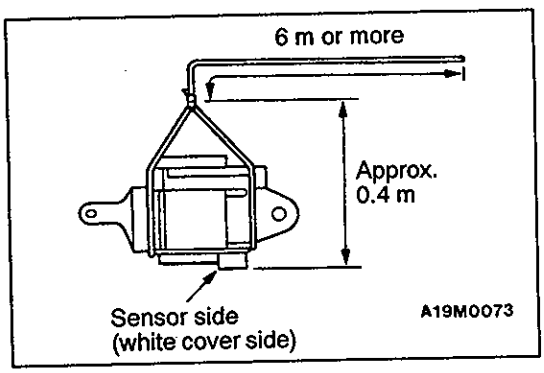
3. **If the air bag fails to deploy or seat belt pre-tensioner fails to operate when the procedures above are followed, do not go near the module. Contact your local distributor.**

6. After deployment, dispose of air bag module according to the Deployed Air Bag Module or Operated Seat Belt Pre-tensioner Disposal Procedures. (Refer to P.52B-41.)

SEAT BELT PRE-TENSIONER OPERATION

Operate the seat belt pre-tensioner by the following procedure after it has been removed from the vehicle.

Caution
Operation of the seat belt pre-tensioner should be carried out in a clear, open space at least 5 meters away from people and other objects.

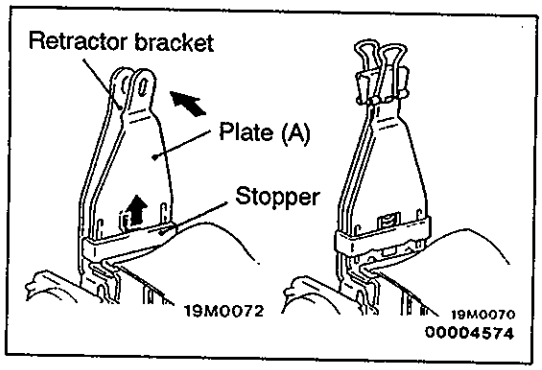


1. Remove the seat belt with pre-tensioner. (Refer to P.52B-31.)

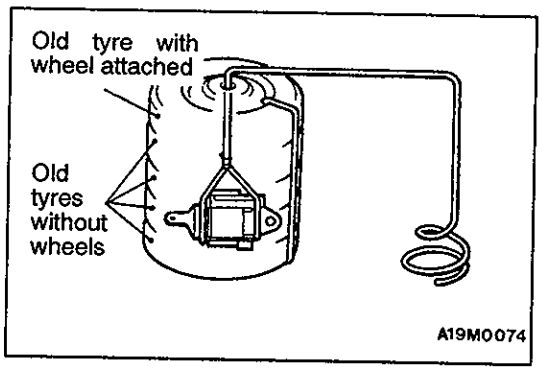
   Caution
   The pre-tensioner safety mechanism should be engaged to prevent accidental operation of the pre-tensioner.

2. Tie a rope which is 6 meters or more in length to the seat belt pre-tensioner so that the pre-tensioner is level and the sensor side (the side with the white cover) is at the bottom when the pre-tensioner is suspended.
3. Disengage the pre-tensioner safety mechanism by the following procedure.

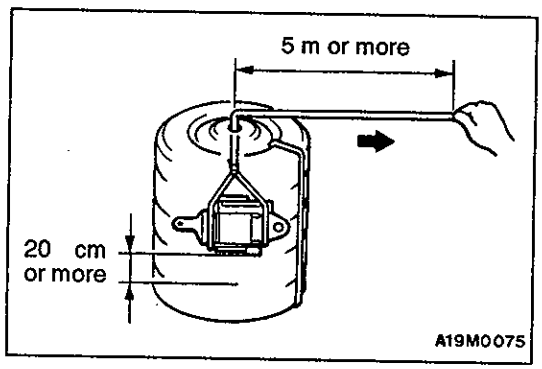
   Caution
   After disengaging the safety mechanism, the pre-tensioner can operate even if it is dropped by a distance of as little as 5 cm, so be extremely careful when handling the pre-tensioner in this condition.



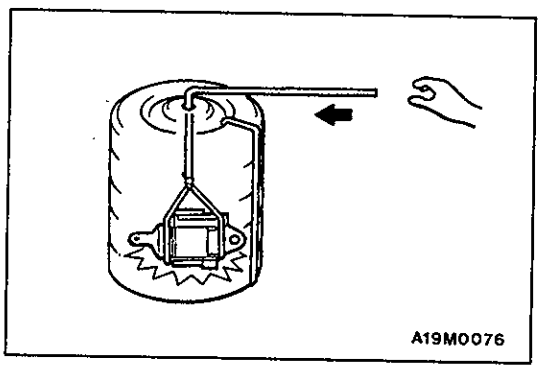
(1) Lift up the stopper and then bring the retractor bracket and plate (A) together so that the stopper tab goes into the hole in the retractor bracket. This will disengage the safety mechanism.
(2) Use a bulldog clip to secure the retractor bracket and plate (A) so that they do not become separated.



4. Place the pre-tensioner down gently onto a solid base such as a concrete floor, and stack four tyres without wheels around it. Then place one more tyre with the wheel still attached on top, and pass the rope through the hole in the middle of the wheel.
5. Tie the tyres together with rope so that they do not slip apart.



6. From a distance of 5 meters away, pull the rope to raise the seat belt pre-tensioner off the ground by 20 cm or more.



7. Release the rope so that the pre-tensioner drops down and operates from the force of the impact.

Caution

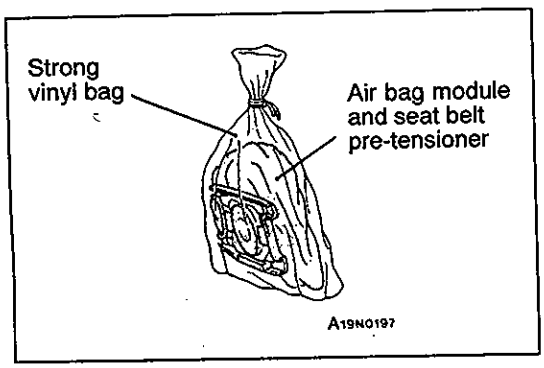
1. **Check that nobody is near the tyres before operating the pre-tensioner.**
2. **The seat belt pre-tensioner will be hot after it has operated, so leave it for 30 minutes or more to wait for it to cool down before handling it further.**
3. **If the safety mechanism has not been properly disengaged or if the cylinder is not at the bottom when the pre-tensioner is dropped, the pre-tensioner may not operate. In such cases, repeat the procedure from the beginning, while being careful to avoid applying shocks to the pre-tensioner.**

8. After the seat belt pre-tensioner has operated, dispose of it according to the proper disposal procedures. (Refer to P.52B-41)

DEPLOYED AIR BAG MODULE OR OPERATED SEAT BELT PRE-TENSIONER DISPOSAL PROCEDURES

After deployment or operation, 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.

NOTES

CHASSIS ELECTRICAL

CONTENTS

54109000099

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 (*).

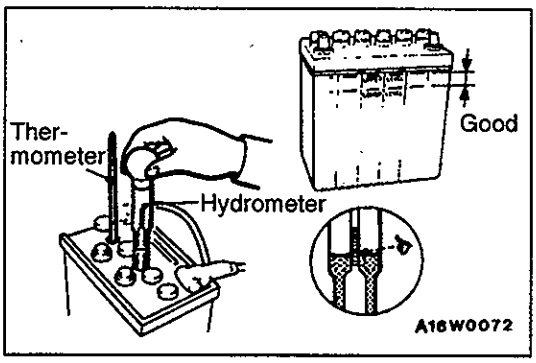
CONTINUED ON NEXT PAGE

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.

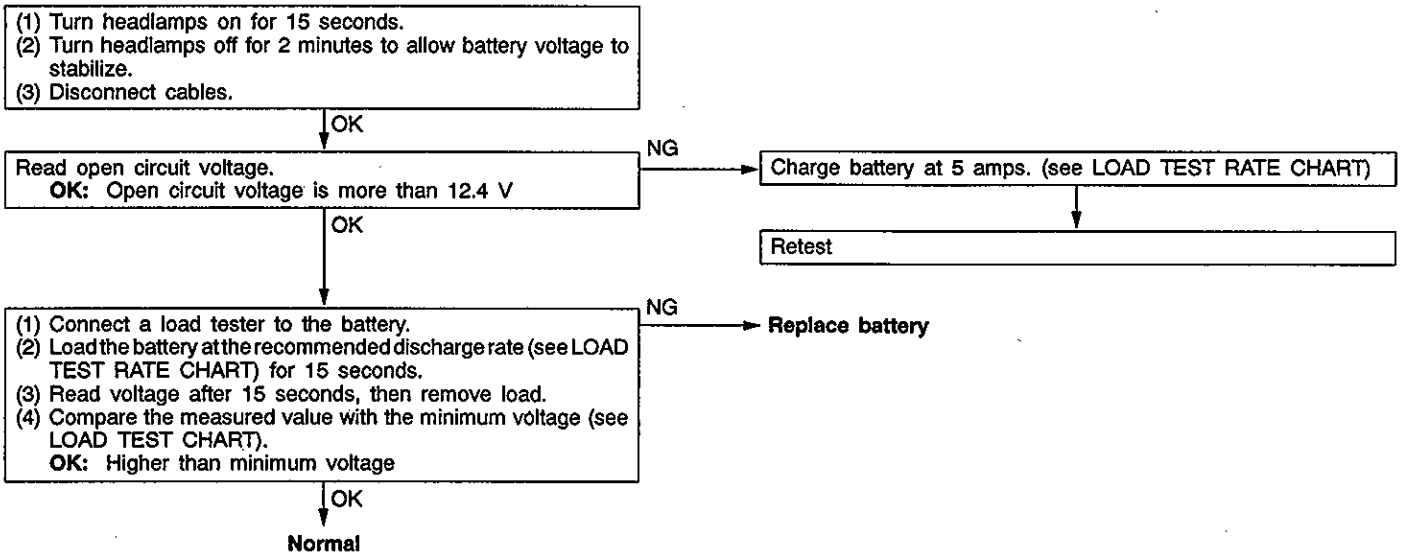
Caution

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

54100120077

TEST STEP



LOAD TEST RATE CHART

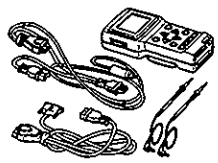
Battery type	55D23L	65D23L
Charging time when fully discharged h [5-amp rated current charging]	10	11
Load test (Amps)	178	210

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 54300690017

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 54300700079

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.

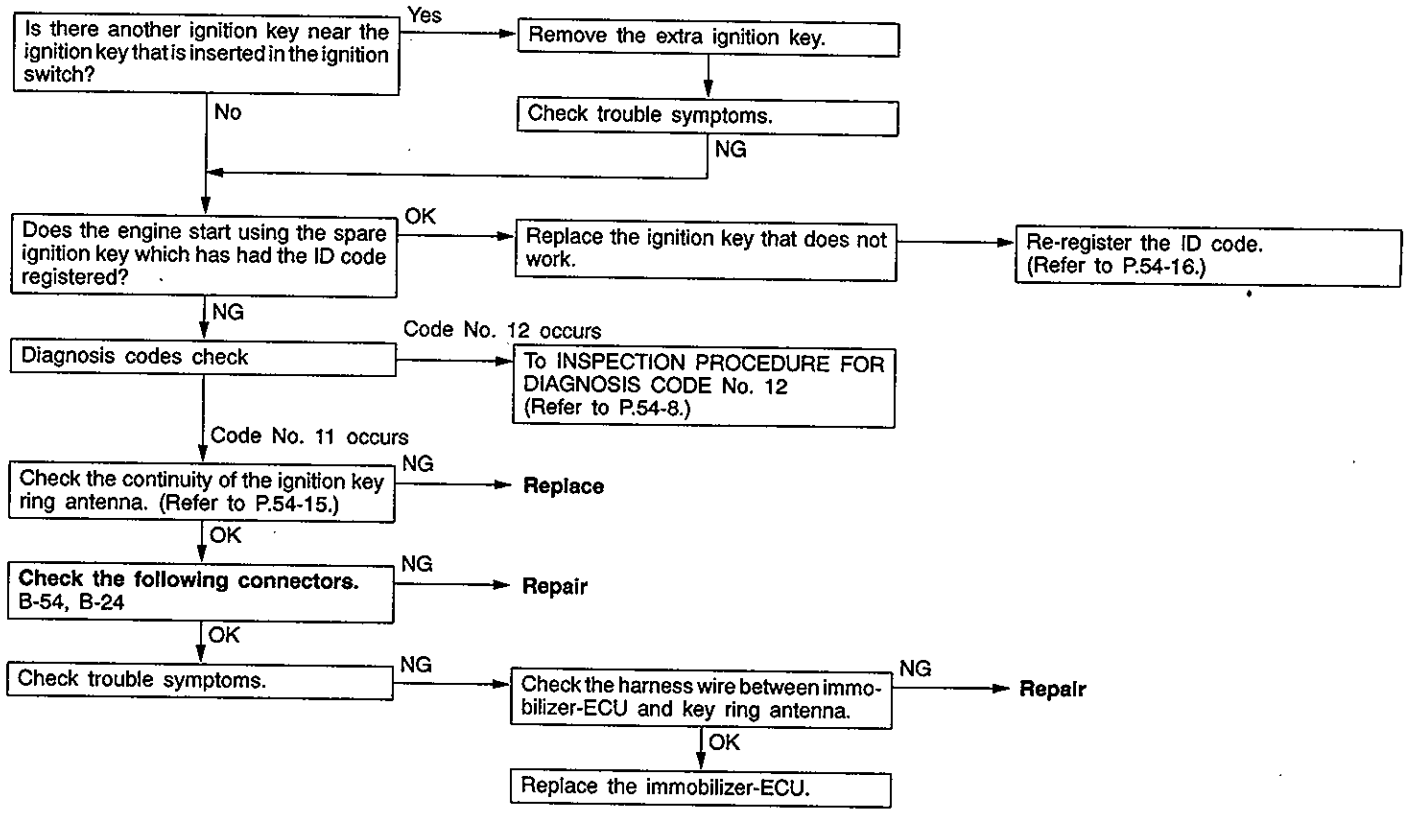
INSPECTION CHART FOR DIAGNOSIS CODES 54300710010

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

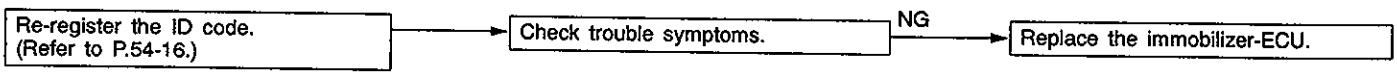
NOTE
*: Diagnosis code No. 12 is not recorded.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

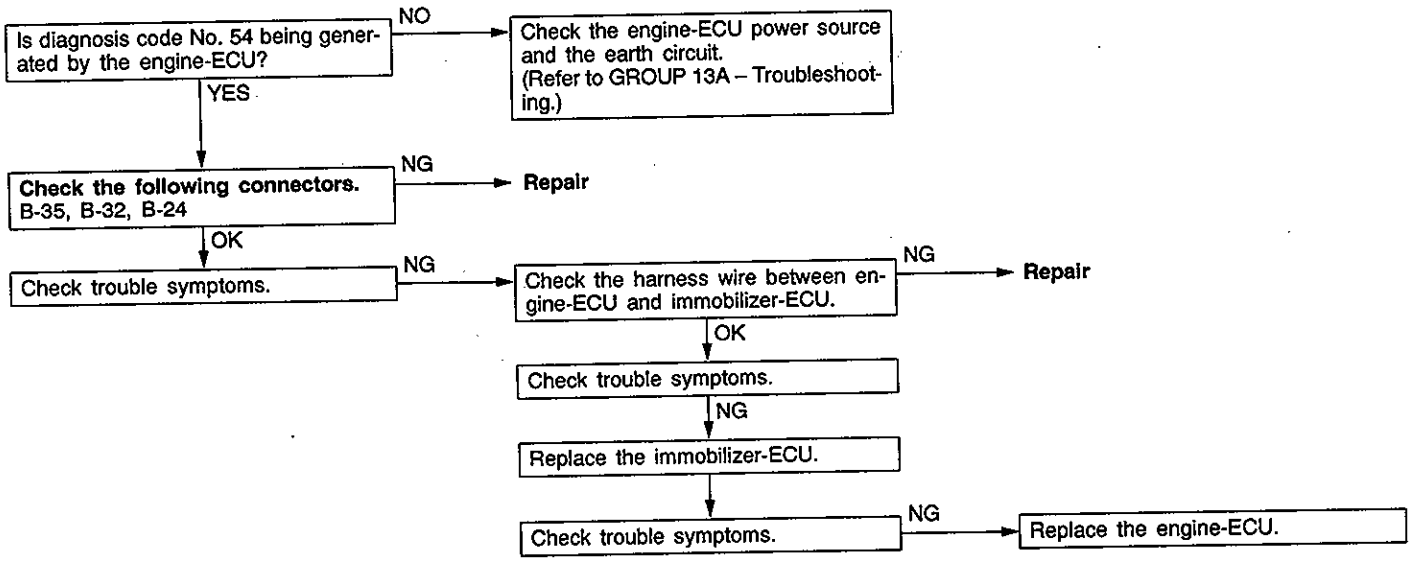
Code No. 11 Transponder communication system	Probable cause
• The ID code of the transponder is not sent to the immobilizer-ECU immediately after the ignition switch is turned to the ON position. • When starting the engine, one ignition key's ID code interferes with another ignition key's code.	• Radio interference of ID codes • Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



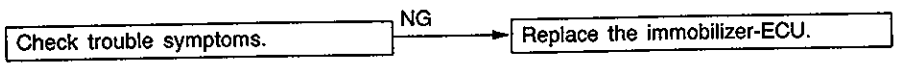
Code No. 12 ID code are not the same or are not registered	Probable cause
The ID code which is sent from the transponder is not the same as the ID code which is registered in the immobilizer-ECU.	• The ID code in the ignition key being used has not been properly registered. • Malfunction of the immobilizer-ECU



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



INSPECTION CHART FOR TROUBLE SYMPTOMS

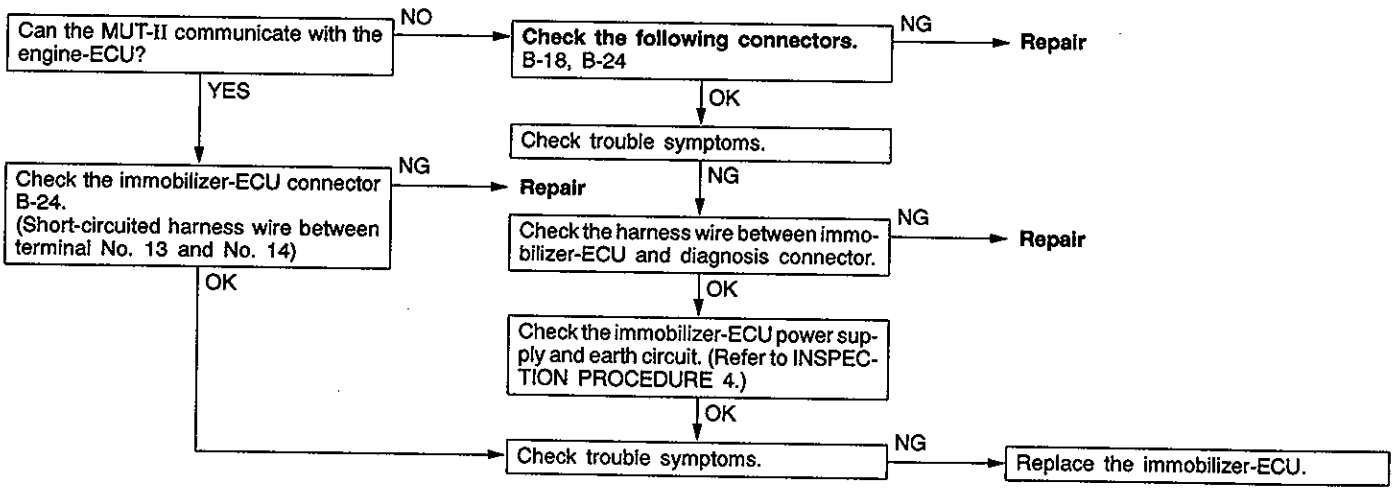
54300720174

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	1	54-10
ID code cannot be registered using the MUT-II.	2	54-11
Engine does not start (Cranking but no initial combustion).	3	54-11
Malfunction of the immobilizer-ECU power source and earth circuit	4	54-12

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

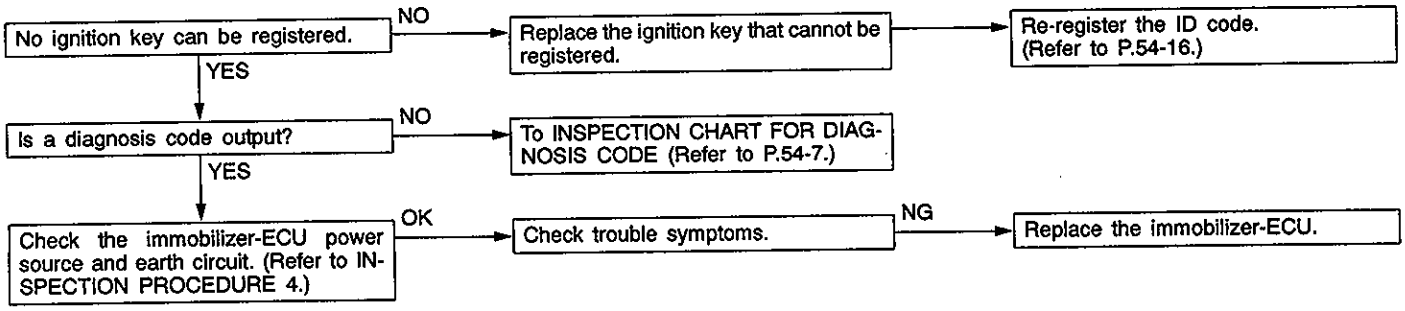
Inspection Procedure 1

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-ECU



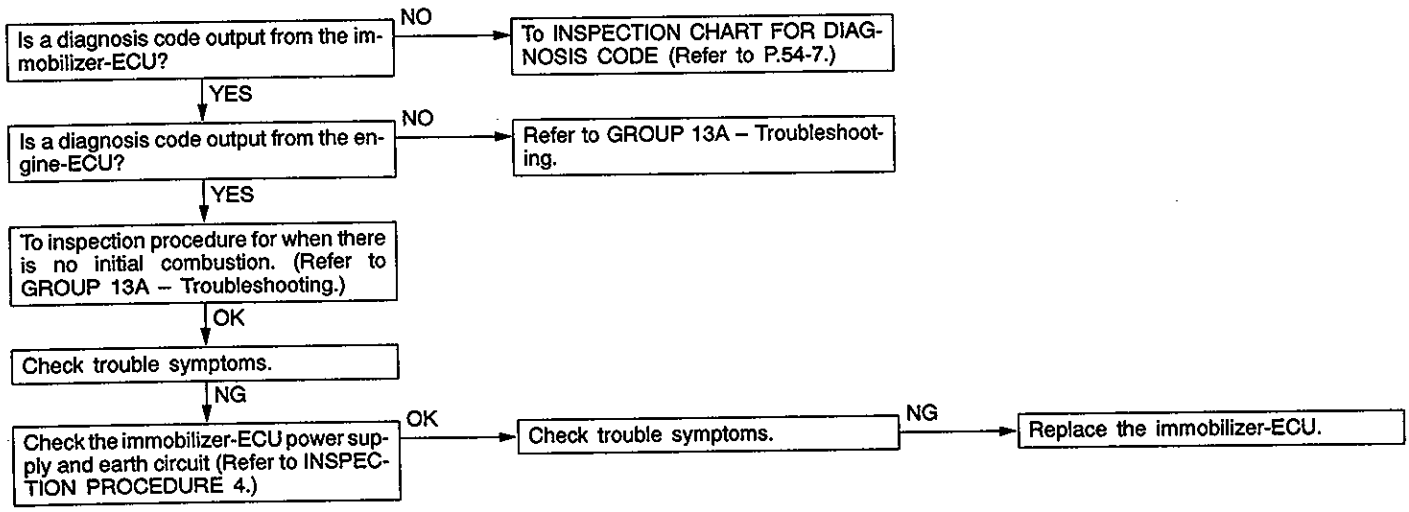
Inspection Procedure 2

ID code cannot be registered using the MUT-II.	Probable cause
The cause is probably that there is no ID code registered in the immobilizer-ECU, or there is a malfunction of the immobilizer-ECU.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



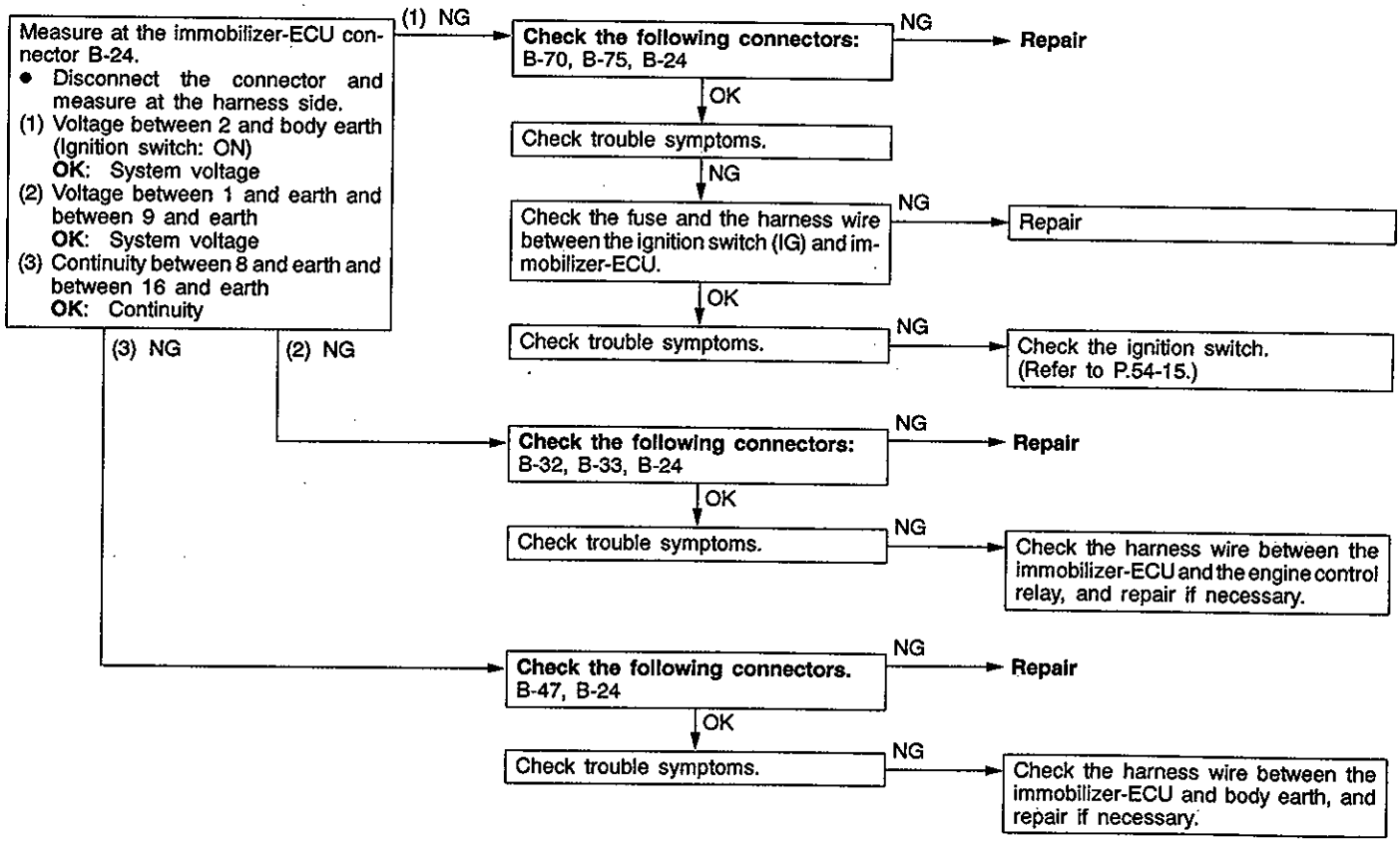
Inspection Procedure 3

Engine does not start (cranking but no initial combustion).	Probable cause
If the fuel injectors are not operating, there might be a problem with the MPI system in addition to a malfunction of the immobilizer system. It is normal for this to occur if an attempt is made to start the engine using a key that has not been properly registered.	• Malfunction of the MPI system • Malfunction of the immobilizer-ECU



Inspection Procedure 4

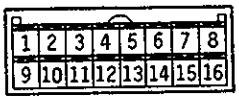
Malfunction of the immobilizer-ECU power supply and earth circuit



CHECK AT IMMOBILIZER-ECU

54300760015

TERMINAL VOLTAGE CHECK CHART



16W0390

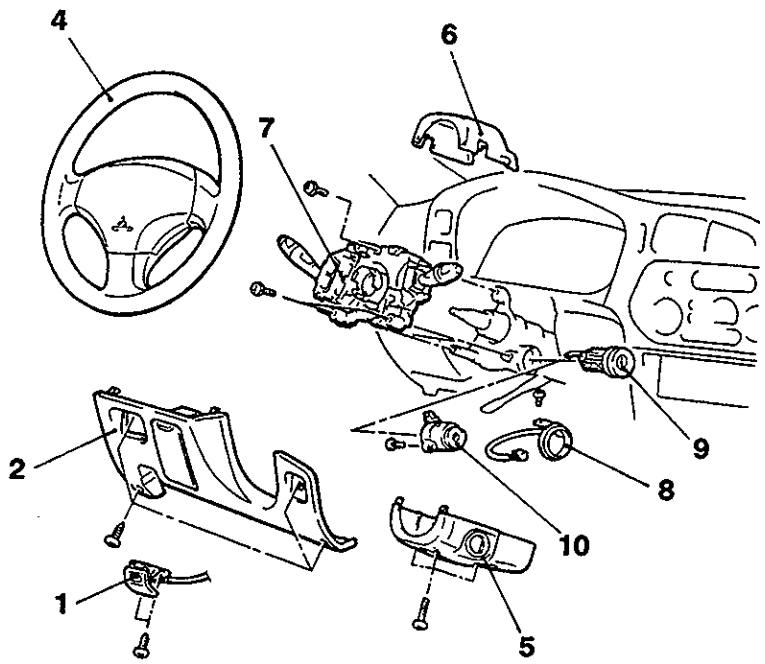
Terminal No.	Signal	Checking requirements	Terminal voltage
1	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
2	Ignition switch-IG	Ignition switch: OFF	0V
		Ignition switch: ON	System voltage
8	Immobilizer-ECU earth	Always	0V
9	Immobilizer-ECU power supply	Ignition switch: ON	System voltage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

IGNITION SWITCH AND IMMOBILIZER SYSTEM

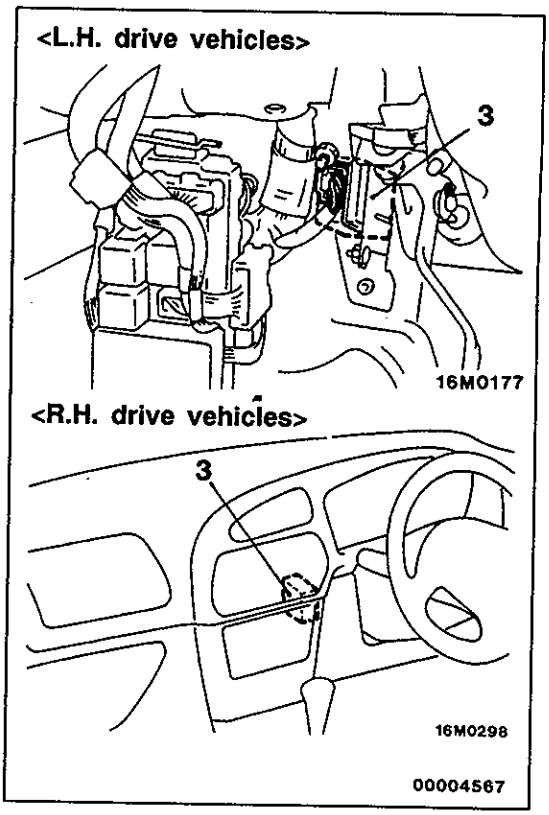
54300210107

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.



16M0283



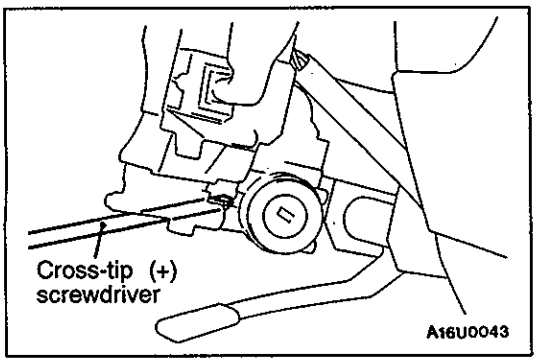
Immobilizer-ECU removal steps

1. Hood lock release handle
2. Driver's side lower cover
- Radio and tape player <R.H drive vehicles> (Refer to P.54-73.)
- Heater control assembly <R.H. drive vehicles> (Refer to GROUP 55.)
3. Immobilizer-ECU

◀A▶

Ignition switch and ignition key ring antenna removal steps

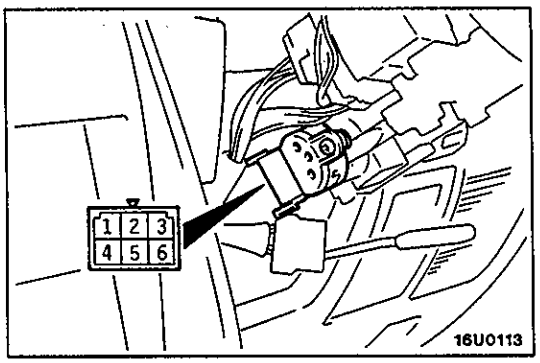
1. Hood lock release handle
2. Driver's side lower cover
4. Steering wheel (Refer to GROUP 37A.)
5. Column cover, lower
6. Column cover, upper
7. Column switch (Refer to GROUP 37A – Steering Wheel and Shaft.)
8. Ignition key ring antenna
9. Steering lock cylinder
10. Ignition switch



REMOVAL SERVICE POINTS

◀A▶ STEERING LOCK CYLINDER REMOVAL

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



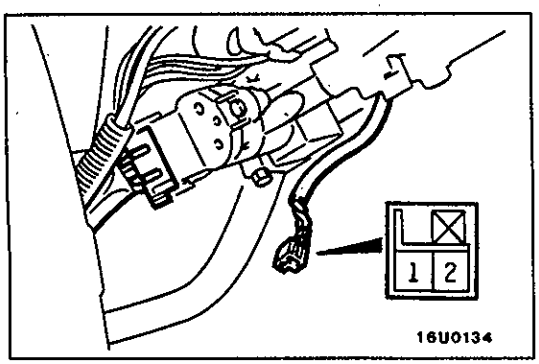
INSPECTION

54300220100

IGNITION SWITCH CONTINUITY CHECK

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

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



IGNITION KEY RING ANTENNA CONTINUITY CHECK

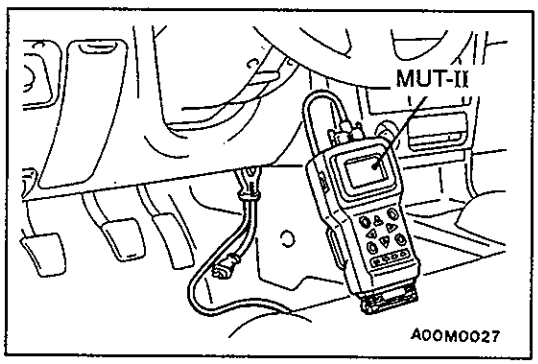
54300930010

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

ID CODE REGISTRATION METHOD 54300810031

If using an ignition key that has just been newly purchased, or if the immobilizer-ECU has been replaced, you will need to register the ID codes for each ignition key being used into the immobilizer-ECU. (A maximum of eight different ID codes can be registered.)
Moreover, when the immobilizer-ECU has been replaced, you will need to use the MUT-II to register the password that the user specifies into the immobilizer-ECU. (Refer to the MUT-II instruction manual for instructions on using the MUT-II.)

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



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

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

COMBINATION METERS

54300030093

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	700	±100
	3,000	±150
	5,000	±200
	6,000	±250
Fuel gauge unit resistance Ω	Float point F	0.9 – 5.1
	Float point E	102.3 – 117.7
Fuel gauge unit float height mm	A (Float point F)	17.4
	B (Float point E)	130.2
Fuel gauge resistance Ω	Power supply and earth	192±19.2
	Power supply and fuel gauge	89±8.9
	Fuel gauge and earth	103±10.3
Engine coolant temperature gauge resistance Ω	Power supply and earth	187±18.7
	Power supply and engine coolant temperature gauge	90±4.5
	Engine coolant temperature gauge and earth	247±24.7
Engine coolant temperature gauge unit resistance (at 70 °C) Ω		104 ± 13.5

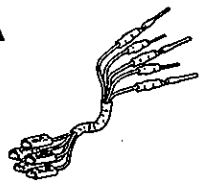
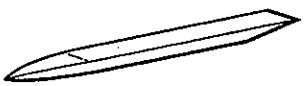
SEALANT

54300050037

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

SPECIAL TOOLS

54300060191

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 bezel

TROUBLESHOOTING

54300720181

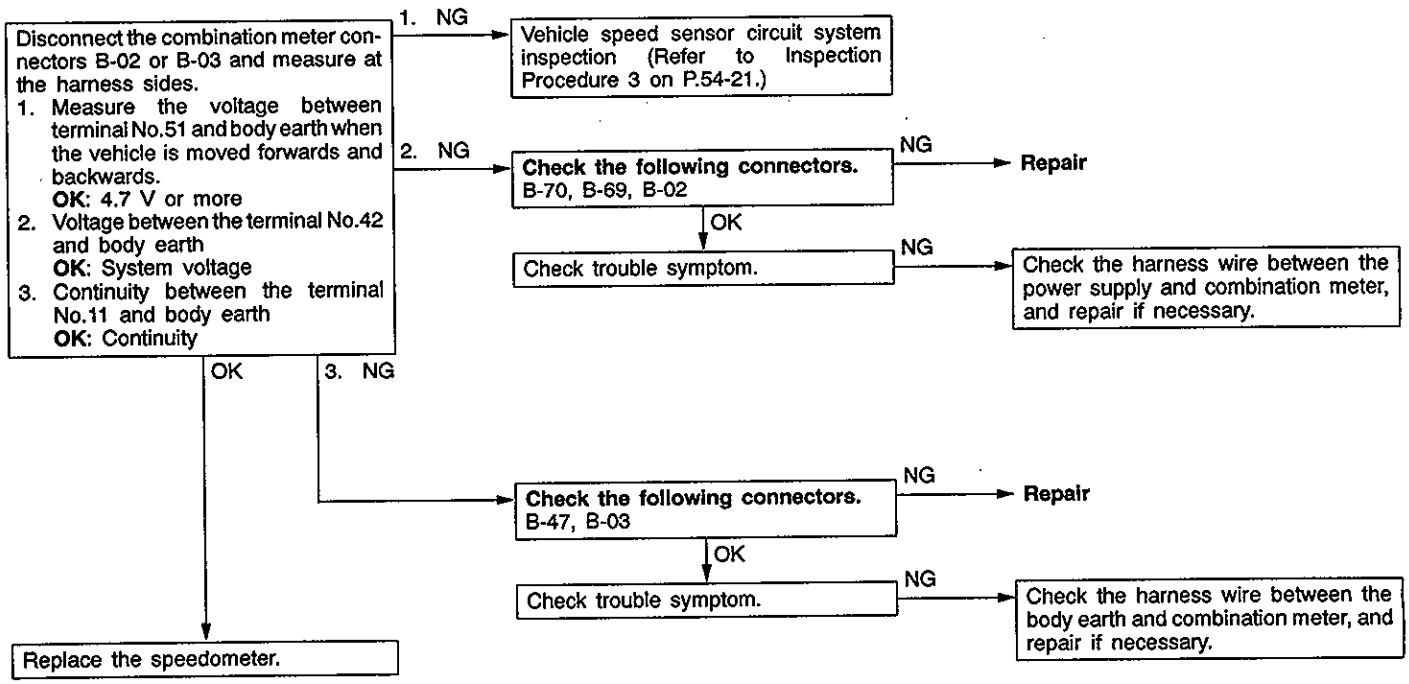
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Speedometer does not work.	1	54-19
Tachometer does not work.	2	54-20

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

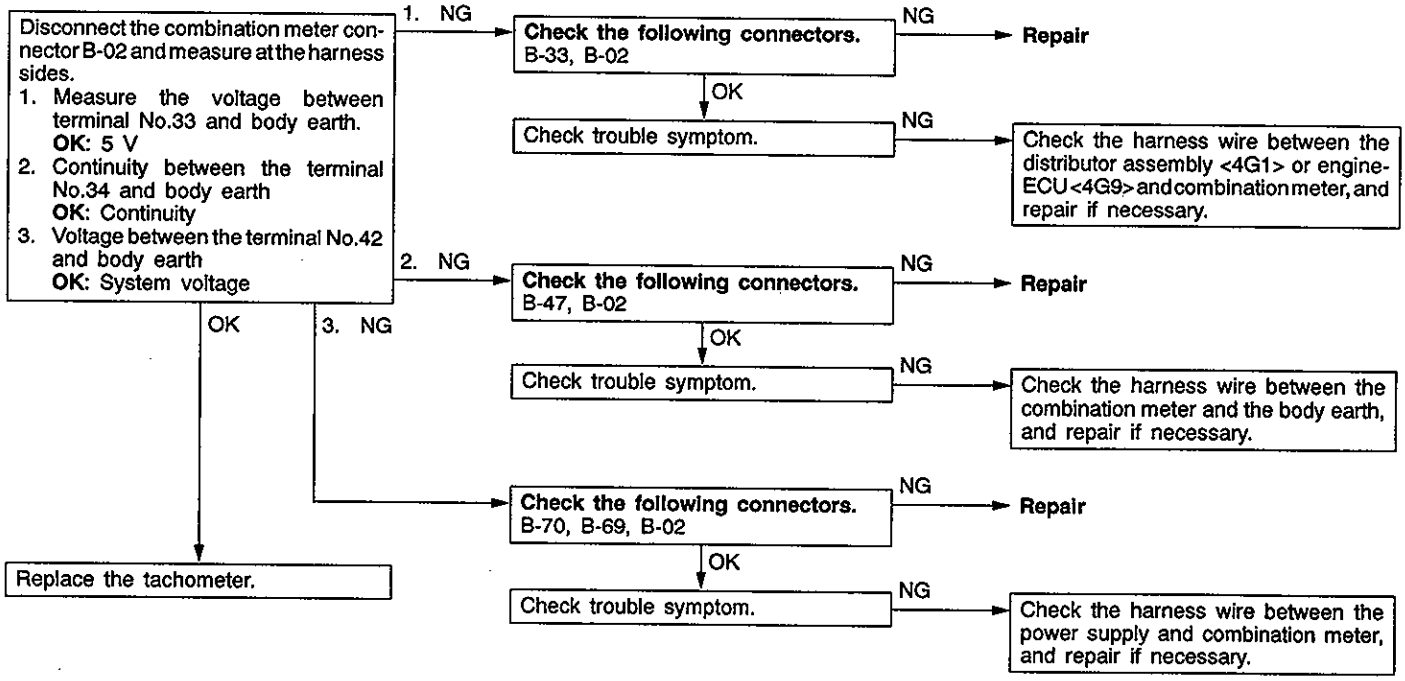
Inspection Procedure 1

Speedometer does not work.	Probable cause
The cause may be a defective vehicle speed sensor circuit system or a defective speedometer. Vehicle speed sensor is co-used among the engine-ECU and A/T-ECU.	• Malfunction of vehicle speed sensor • Malfunction of speedometer • Malfunction of harness or connector



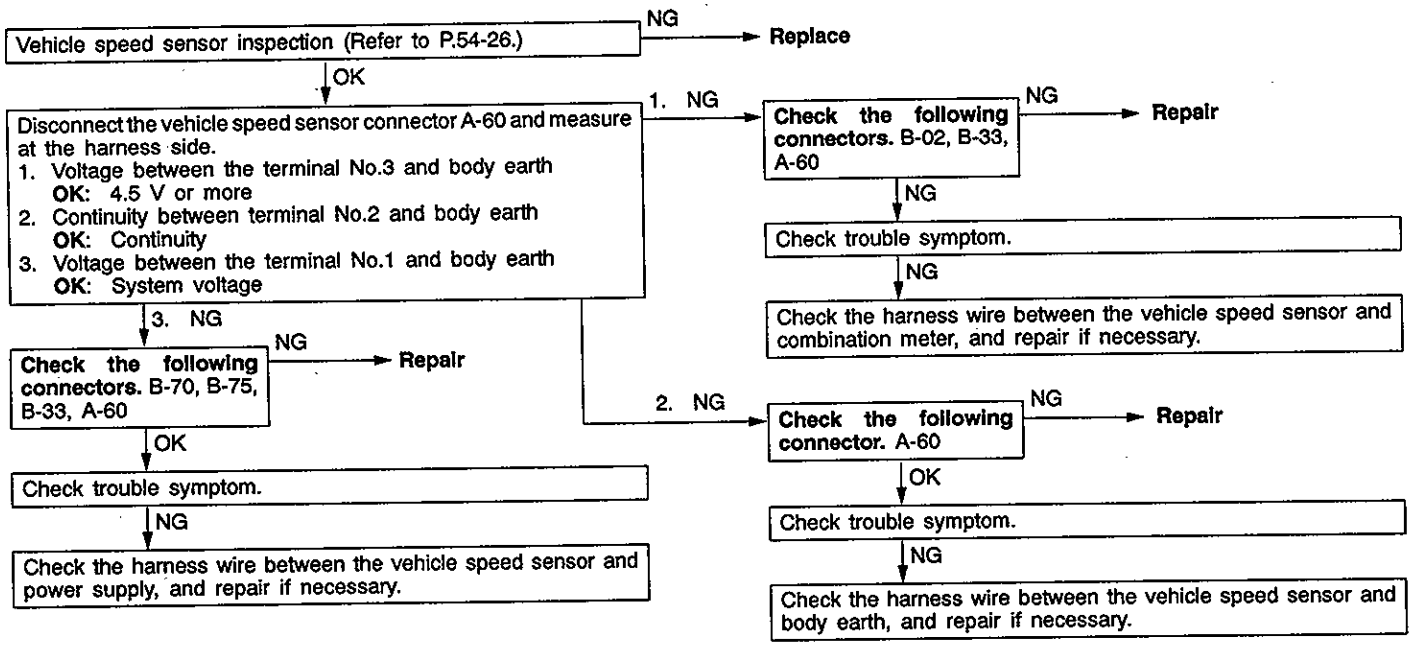
Inspection Procedure 2

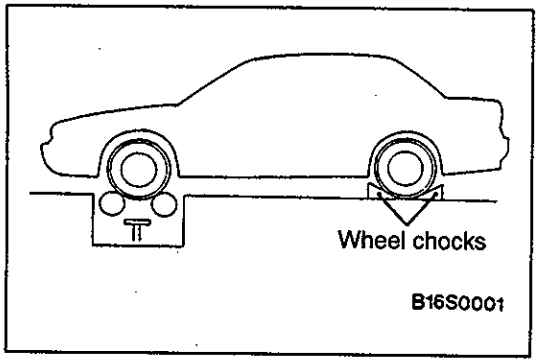
Tachometer does not work.	Probable cause
The ignition signal may not be input from the engine, or there may be a malfunction in the power supply or earth circuit.	• Malfunction of tachometer • Malfunction of harness or connector



Inspection Procedure 3

Vehicle speed sensor circuit system inspection



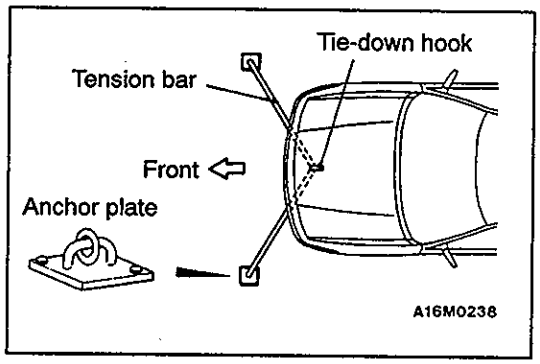


ON-VEHICLE SERVICE

54300090077

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.

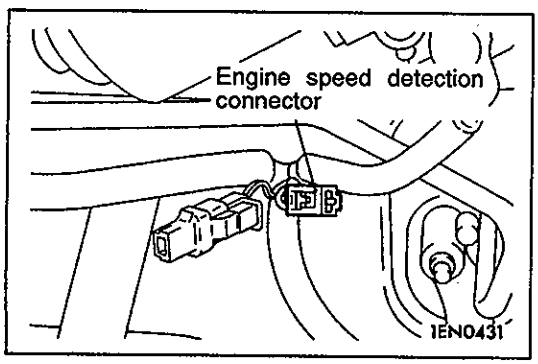


3. To prevent the front wheel from moving from side to side, attach tension bars to the tie-down hook, and secure both ends to anchor plates.
4. Toe prevent the vehicles from starting, attach a chain or wire to the rear retraction hook, and make sure the end of the chain or wire is secured firmly.
5. 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

54300100084

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach the engine speedometer.

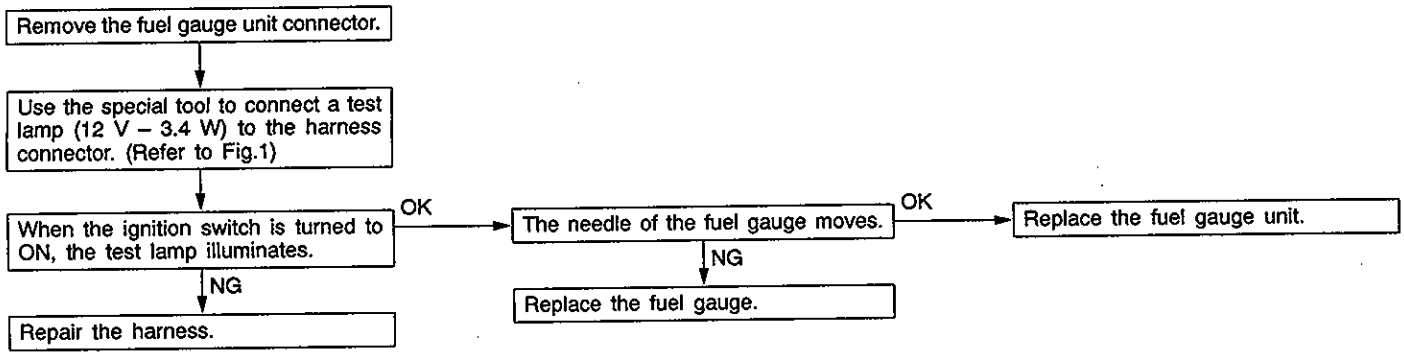
   NOTE
   For tachometer check, use of a fluxmeter-type engine speedometer is recommended. (Because a fluxmeter only needs to be clipped to the high tension cable.)

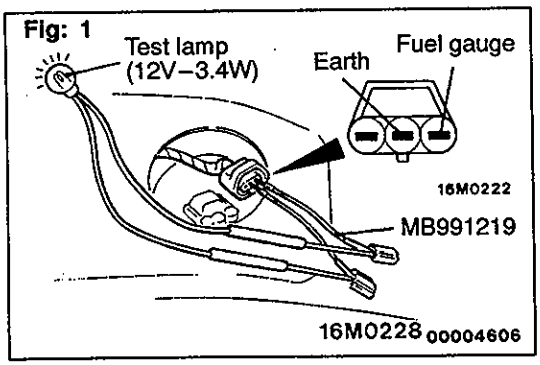
2. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variations are within the standard values.

   Standard values:
   700 r/min : ±100 r/min
   3,000 r/min : ±150 r/min
   5,000 r/min : ±250 r/min
   6,000 r/min : ±300 r/min

FUEL GAUGE SIMPLE CHECK

54300110094





FUEL GAUGE UNIT CHECK

54300120134

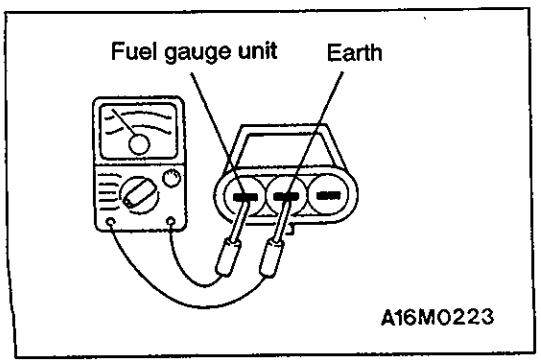
Remove the fuel gauge unit from the fuel tank. (Refer to GROUP 13F.)

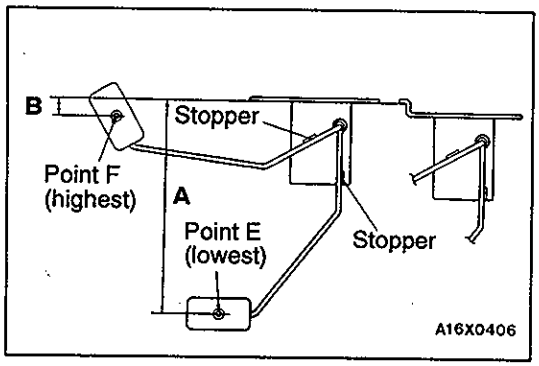
FUEL GAUGE UNIT RESISTANCE

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: 0.9 – 5.1 Ω
   Point E: 102.3 – 117.7 Ω

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

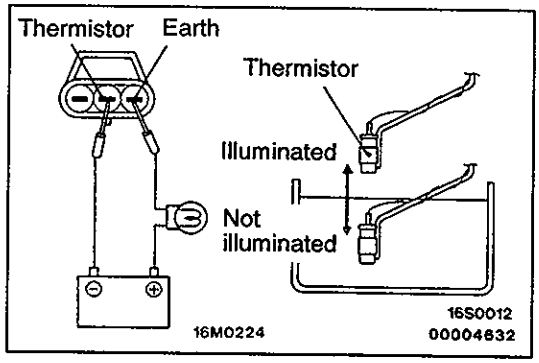




FUEL GAUGE UNIT FLOAT HEIGHT

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: 17.4 mm
B: 130.2 mm



THERMISTOR

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

Caution
After finishing this test, wipe the unit, dry and install it in the fuel tank.

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE CHECK

54300140109

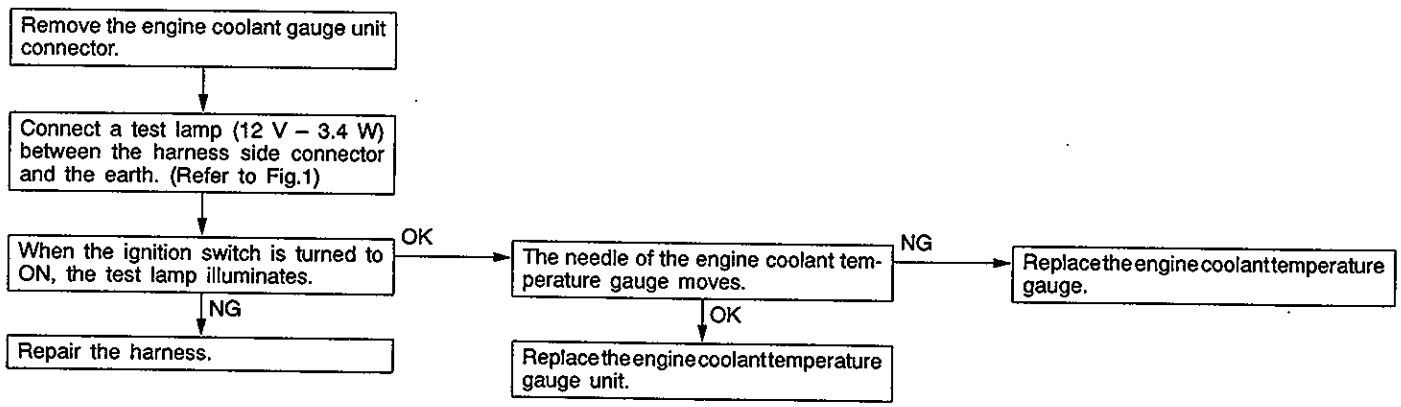
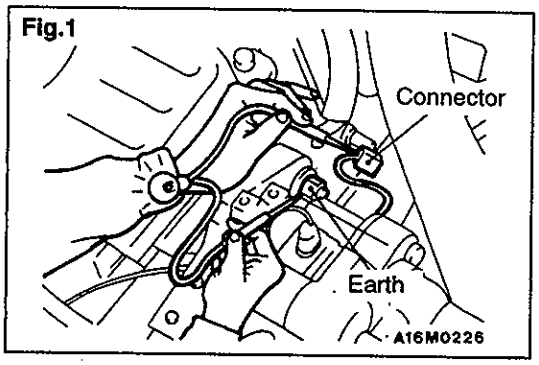
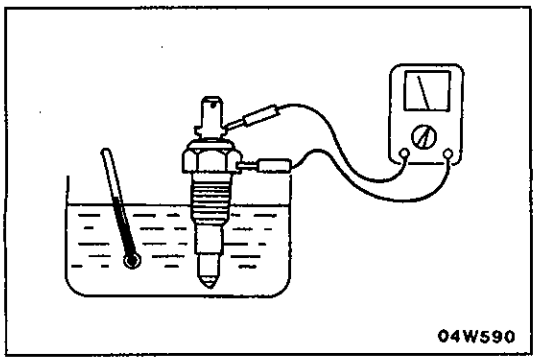


Fig.1



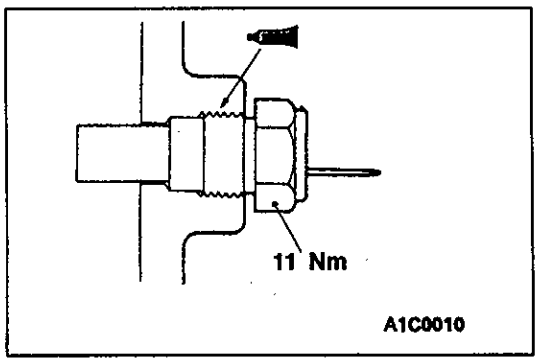


ENGINE COOLANT TEMPERATURE GAUGE UNIT CHECK

54300150133

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



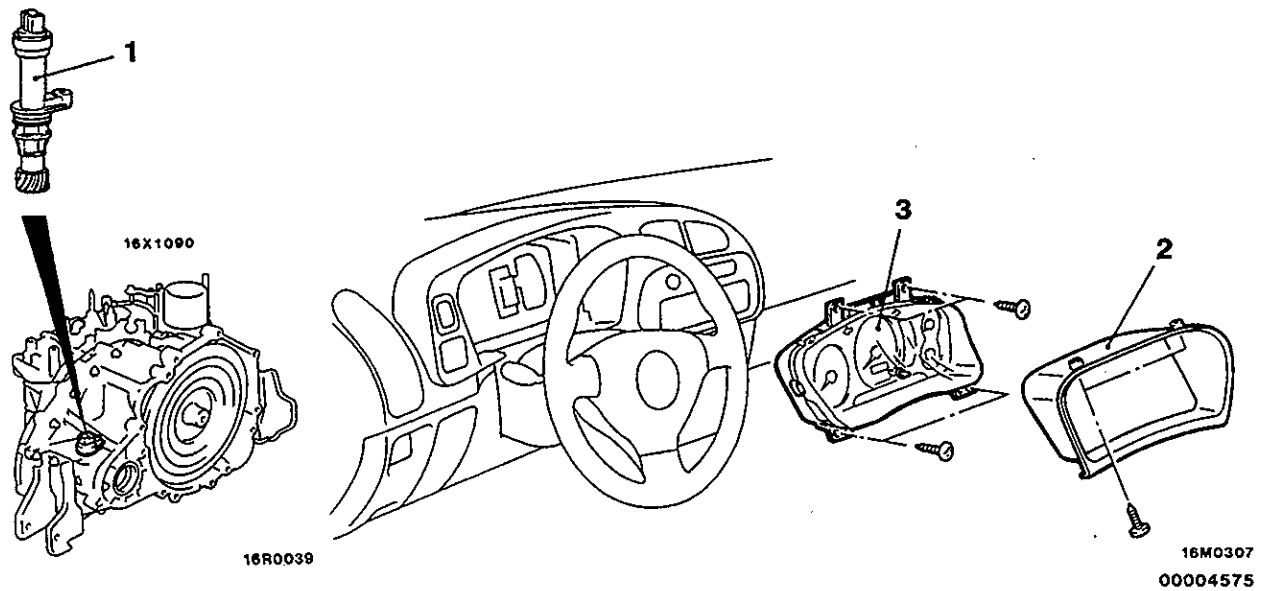
4. After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit.

   Specified sealant:
   3M Adhesive Nut Locking No. 4171 or equivalent
5. Add engine coolant. (Refer to GROUP 14 – On-vehicle Service.)

COMBINATION METERS

54300290101

REMOVAL AND INSTALLATION

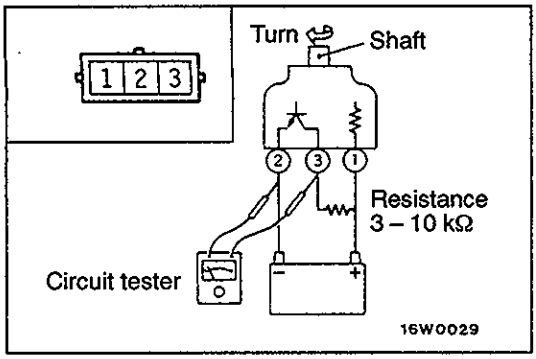


Vehicle speed sensor removal steps

- Air Cleaner, Air Intake Hose
1. Vehicle speed sensor

Combination meter removal steps

2. Meter bezel
3. Combination meter

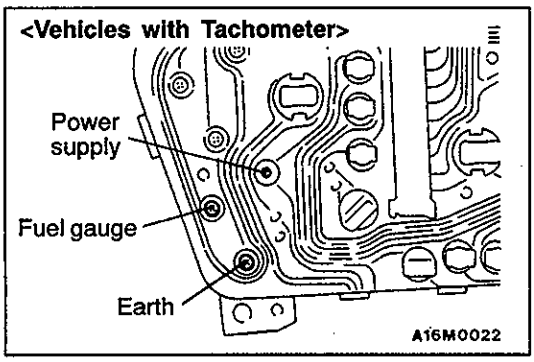


INSPECTION

54300640067

VEHICLE SPEED SENSOR CHECK

1. Remove the vehicle speed sensor and connect a 3 – 10 kΩ resistance as shown in the illustration.
2. Turn the shaft of the vehicle speed sensor and check that there is voltage between terminals 2 – 3. (1 turn = 4 pulses)



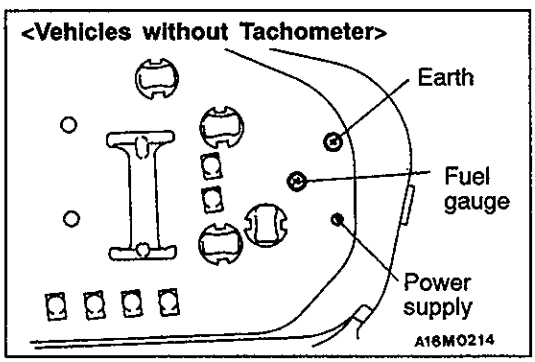
FUEL GAUGE RESISTANCE CHECK

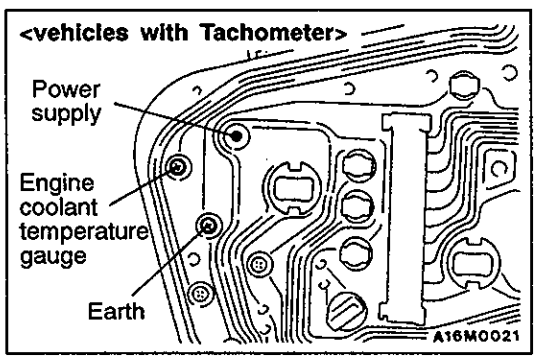
54300300071

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

Standard value:
Power supply – Earth: 192±19.2
Power supply – Fuel gauge: 89±8.9
Fuel gauge – Earth: 103±10.3

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



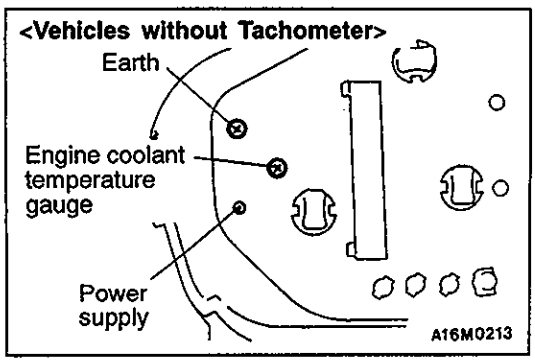


ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE CHECK

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

Standard value:
Power supply – Earth: 187±18.7
Power supply – Engine coolant temperature gauge: 90±4.5
Engine coolant temperature gauge – Earth: 247±24.7

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

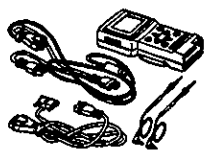
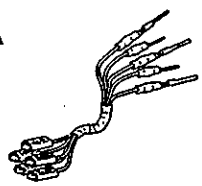


HEADLAMP AND FRONT TURN-SIGNAL LAMP 54200030052

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

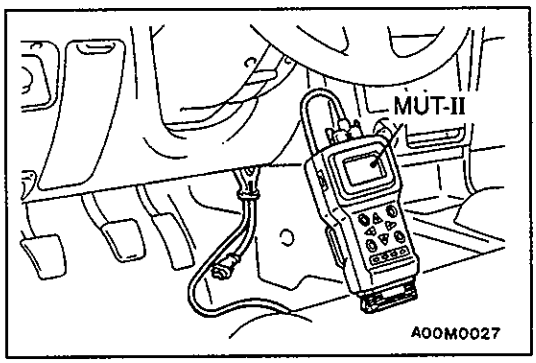
SPECIAL TOOLS 54200060204

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

54200900018

The special tool (MB991223) should always be used to measure voltages and resistances when carrying out troubleshooting.



DIAGNOSIS FUNCTION

INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

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

INSPECTION CHART FOR TROUBLE SYMPTOMS

54200910011

Trouble symptoms		Inspection procedure	Reference page
Communication with MUT-II is impossible. <Vehicles with ETACS-ECU>	Communication with all systems is impossible.	1	54-29
	Communication with one-shot pulse input signal only is impossible.	2	54-29
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.		3	54-29
Headlamp leveling does not occur when the headlamp leveling switch is operated.		5	54-31
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		6	54-33
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		7	54-34

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

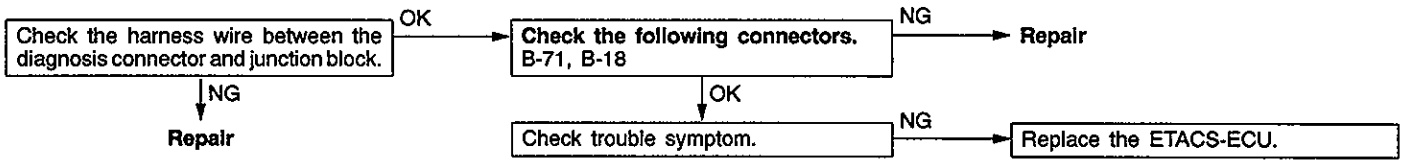
Inspection Procedure 1

Communication with MUT-II is impossible. (Communication with all systems is impossible.)	Probable cause
The cause is probably a defective power supply system (including earth) for the diagnosis line.	• Malfunction of connector • Malfunction of harness wire

Refer to GROUP 13A – Troubleshooting.

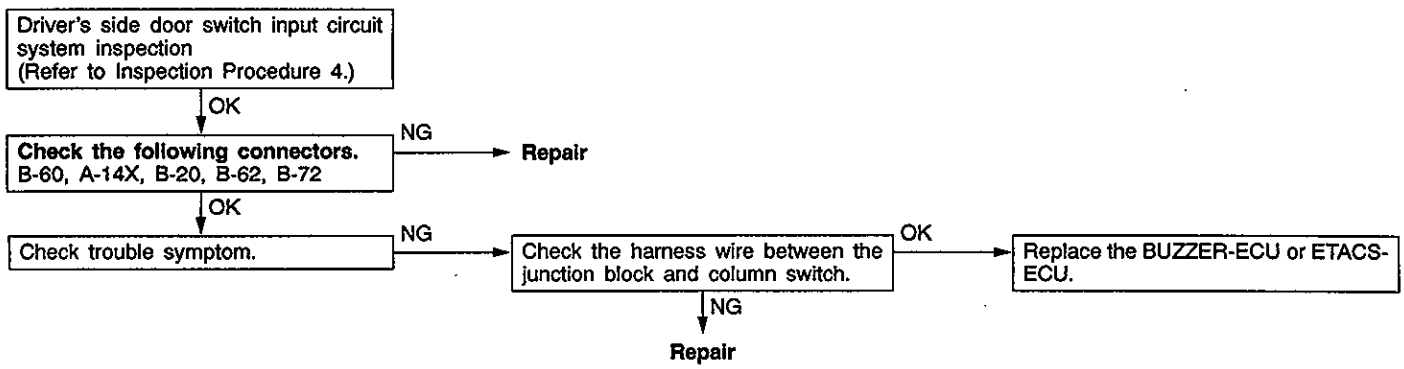
Inspection Procedure 2

Communication with MUT-II is impossible. (Communication with the one-shot pulse input signal only is impossible.)	Probable cause
The cause is probably a defective one-shot pulse input circuit system of the diagnosis line.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ETACS-ECU



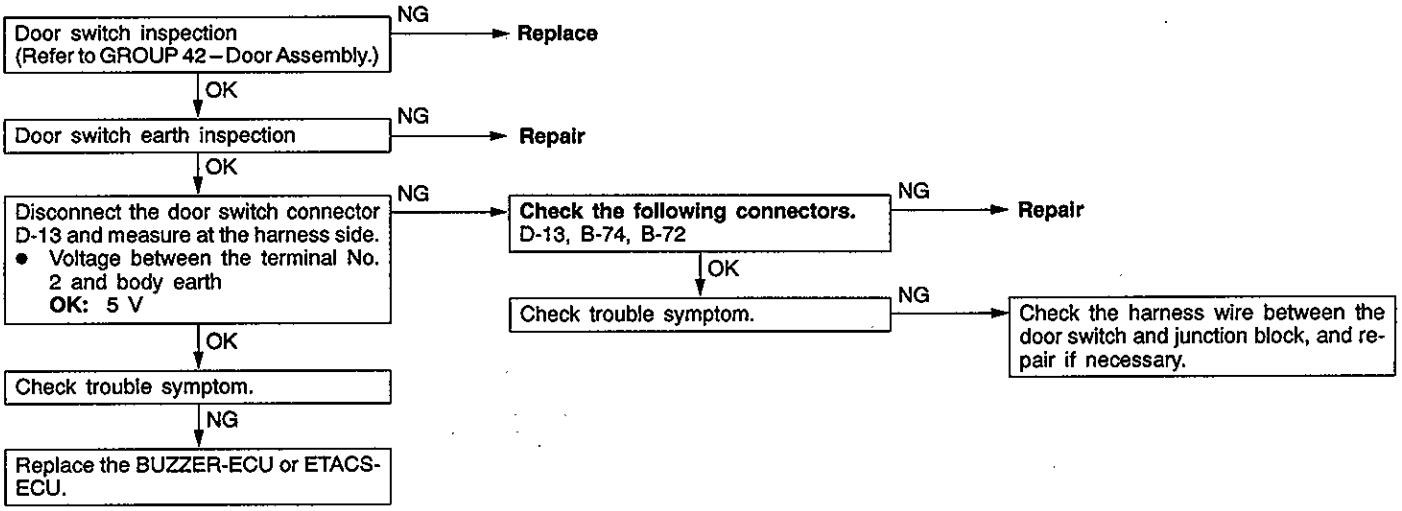
Inspection Procedure 3

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 or ETACS-ECU



Inspection Procedure 4

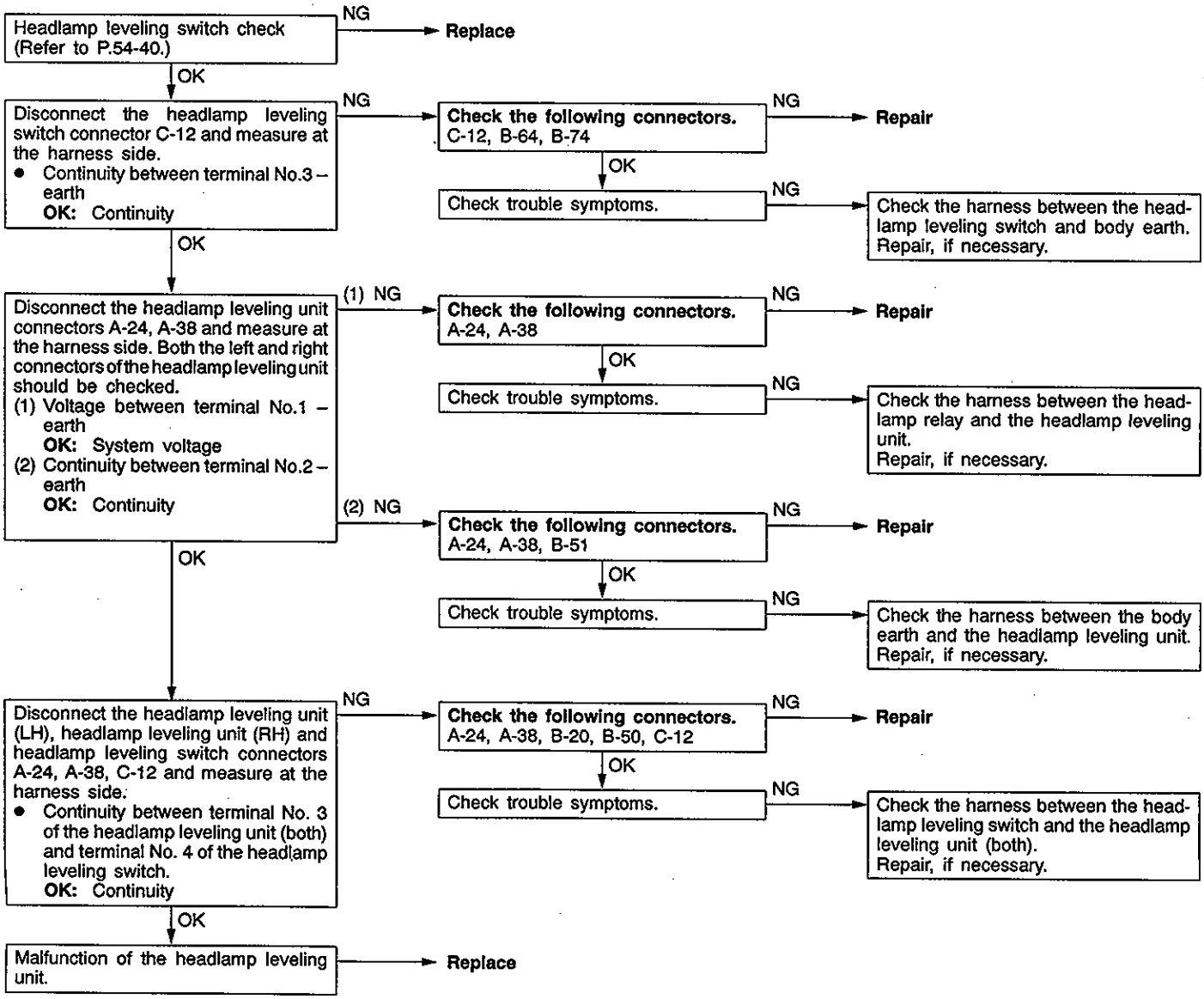
Driver's side door switch input circuit system inspection



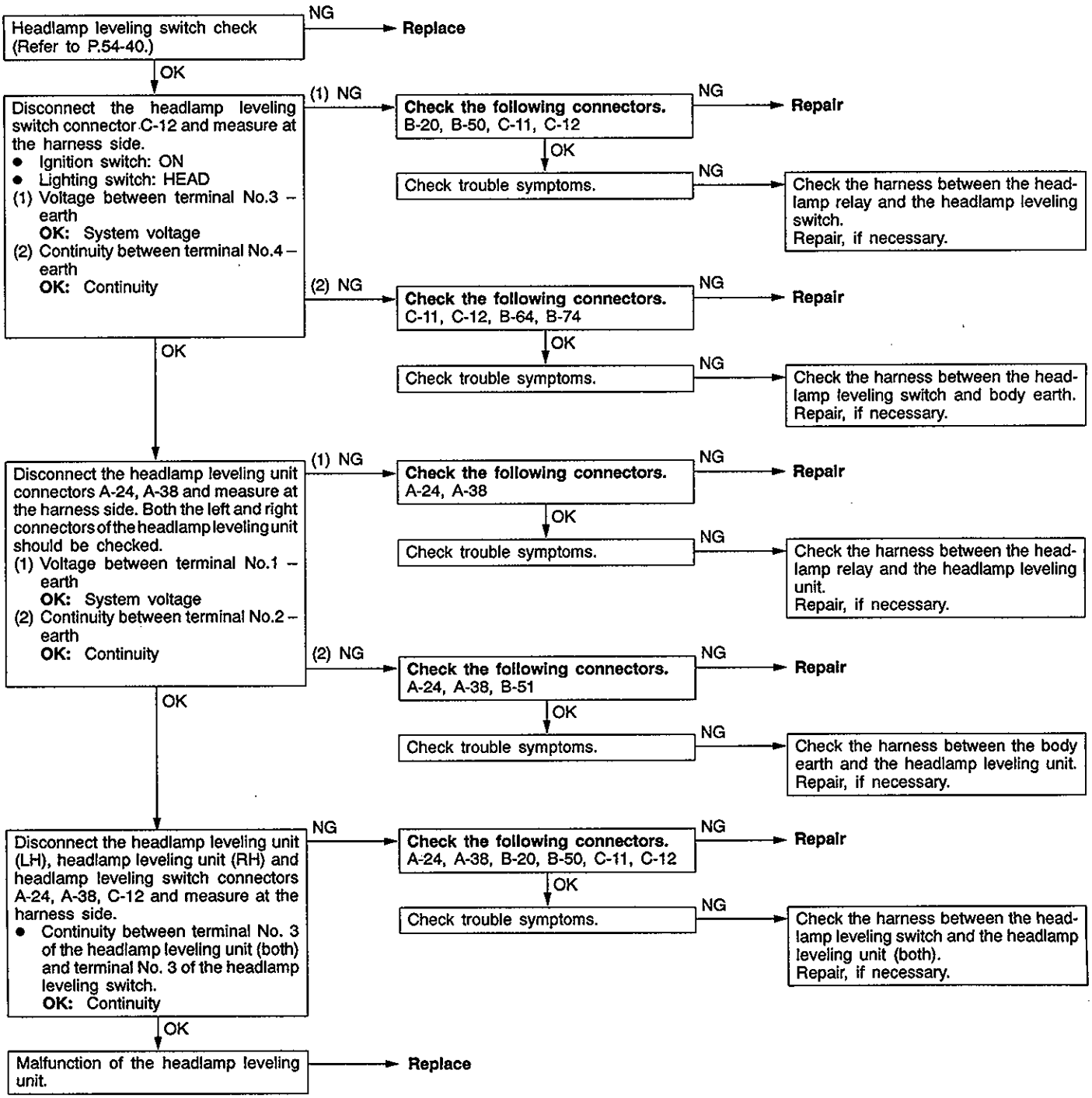
Inspection procedure 5

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

<Hatchback>

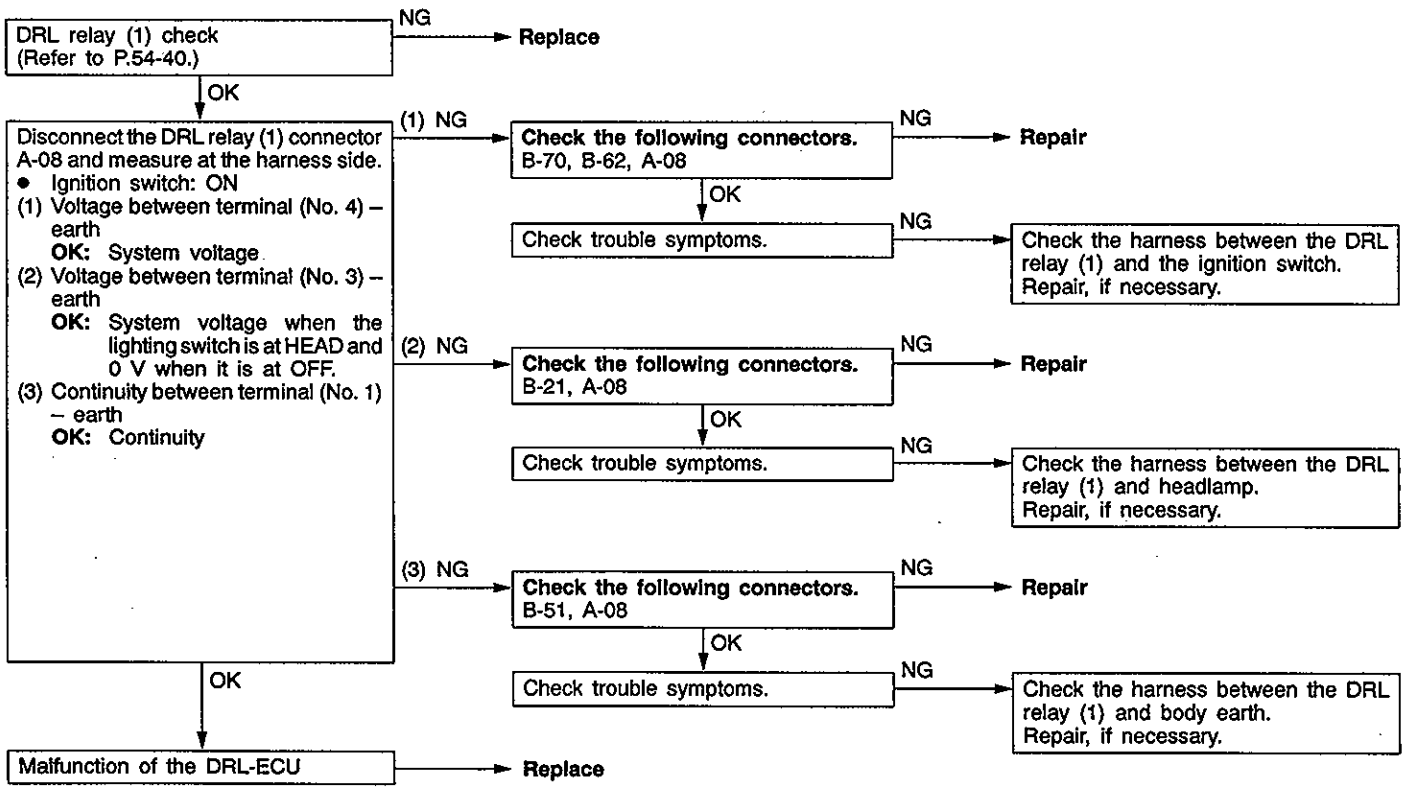


<Sedan>


Headlamp leveling switch check (Refer to P.54-40.)
NG
Replace
OK
Disconnect the headlamp leveling switch connector C-12 and measure at the harness side.
● Ignition switch: ON
● Lighting switch: HEAD
(1) Voltage between terminal No.3 – earth
OK: System voltage
(2) Continuity between terminal No.4 – earth
OK: Continuity
(1) NG
Check the following connectors.
B-20, B-50, C-11, C-12
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the headlamp relay and the headlamp leveling switch.
Repair, if necessary.
(2) NG
Check the following connectors.
C-11, C-12, B-64, B-74
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the headlamp leveling switch and body earth.
Repair, if necessary.
OK
Disconnect the headlamp leveling unit connectors A-24, A-38 and measure at the harness side. Both the left and right connectors of the headlamp leveling unit should be checked.
(1) Voltage between terminal No.1 – earth
OK: System voltage
(2) Continuity between terminal No.2 – earth
OK: Continuity
(1) NG
Check the following connectors.
A-24, A-38
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the headlamp relay and the headlamp leveling unit.
Repair, if necessary.
(2) NG
Check the following connectors.
A-24, A-38, B-51
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the body earth and the headlamp leveling unit.
Repair, if necessary.
OK
Disconnect the headlamp leveling unit (LH), headlamp leveling unit (RH) and headlamp leveling switch connectors A-24, A-38, C-12 and measure at the harness side.
● Continuity between terminal No. 3 of the headlamp leveling unit (both) and terminal No. 3 of the headlamp leveling switch.
OK: Continuity
NG
Check the following connectors.
A-24, A-38, B-20, B-50, C-11, C-12
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the headlamp leveling switch and the headlamp leveling unit (both).
Repair, if necessary.
OK
Malfunction of the headlamp leveling unit.
Replace

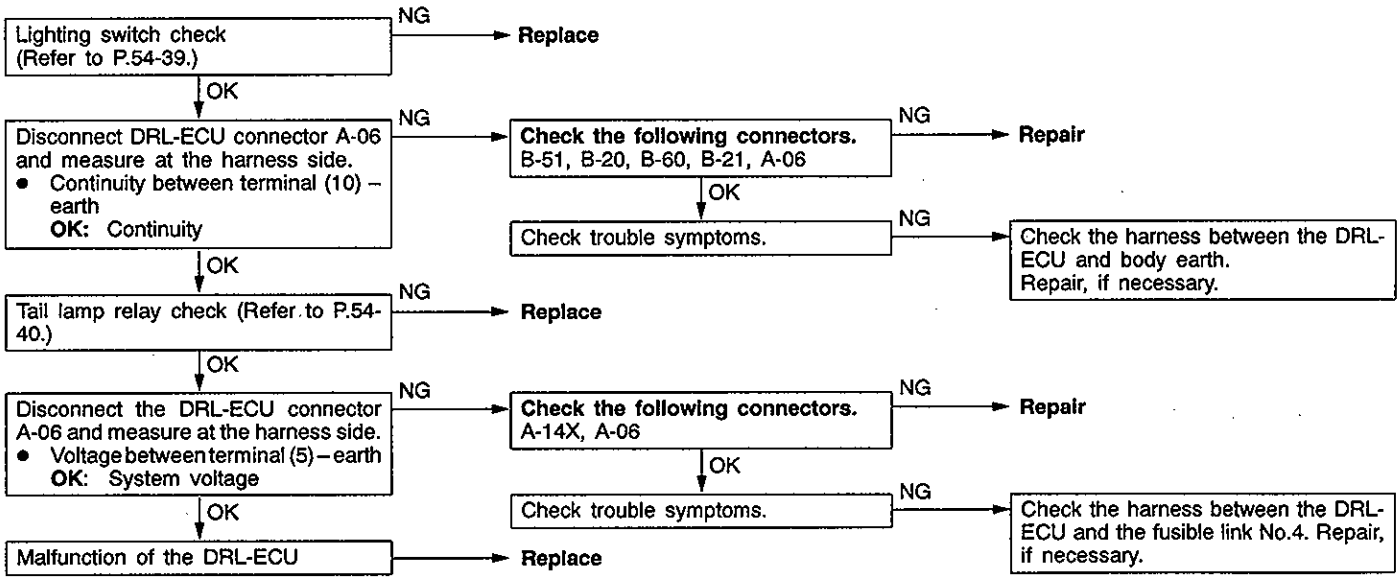
Inspection procedure 6

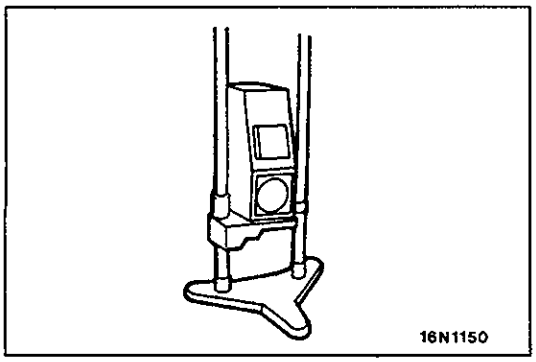
The headlamps do not illuminate when the vehicle is in the following condition and the ignition switch is moved to the ON position. However, they illuminate when the lighting switch is moved to the HEAD position. **<Vehicles with daytime running lamp>** • **Lighting switch: OFF** • **Passing switch: 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

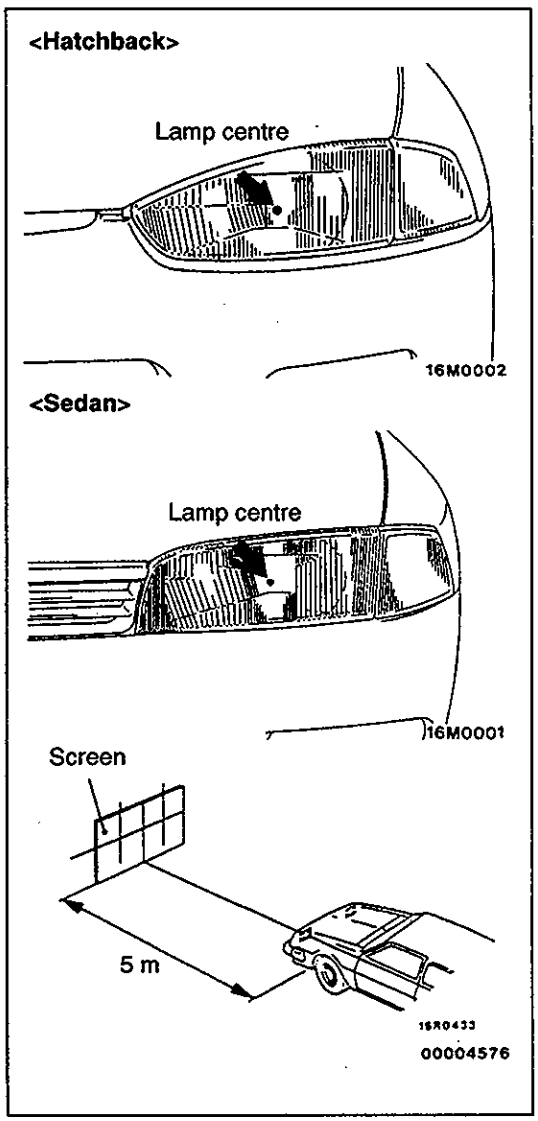


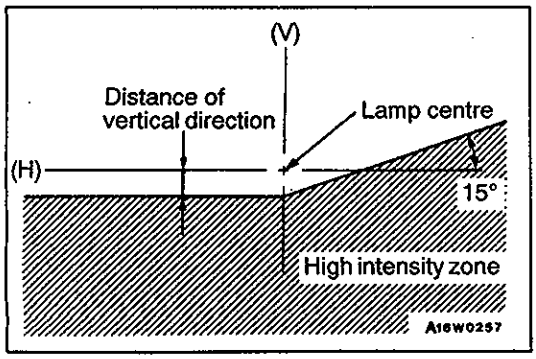
Inspection procedure 7

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

54200090081

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.

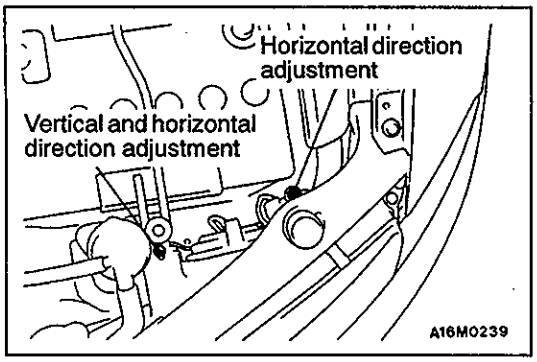
   NOTE
   If there are any regulations pertinent to the aiming of headlamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

2. Alternately turn the adjusting screw to adjust the headlamp aiming. (Refer to P.54-36.)

<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.

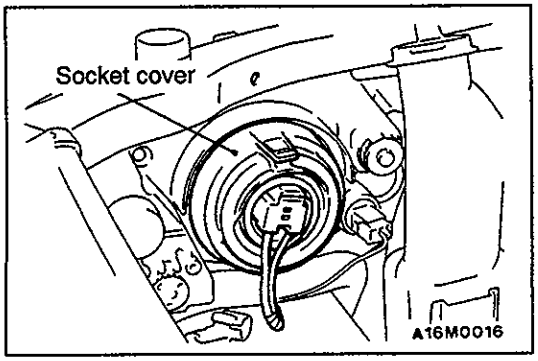
INTENSITY MEASUREMENT 54200100067

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

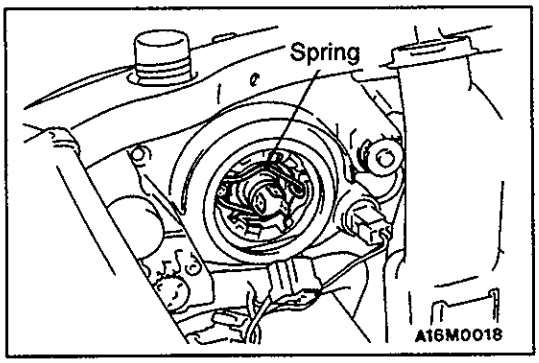


BULB REPLACEMENT

54200130103

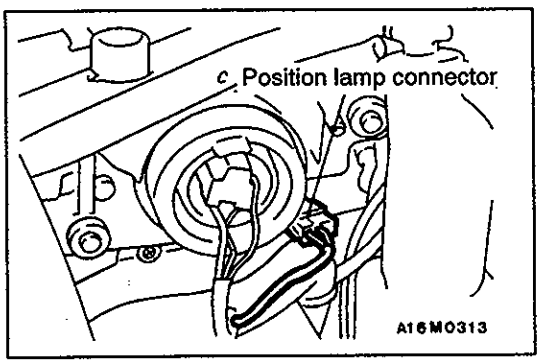
<Headlamp Bulb>

1. Disconnect the connector.
2. Remove the socket cover.



3. Unhook the spring which secures the bulb, and then remove the bulb.

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



<Position Lamp Bulb>

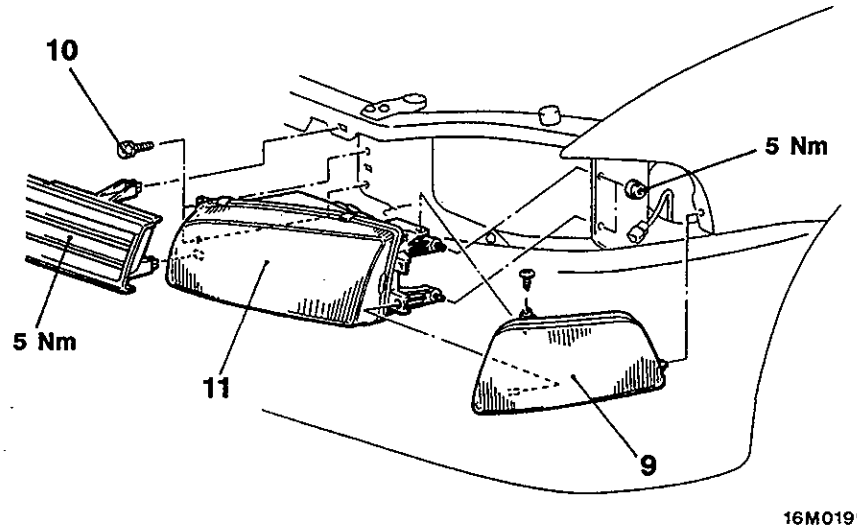
1. Disconnect the connector.
2. Remove the lamp socket by turning it anti-clockwise, then pull out the bulb from the socket.

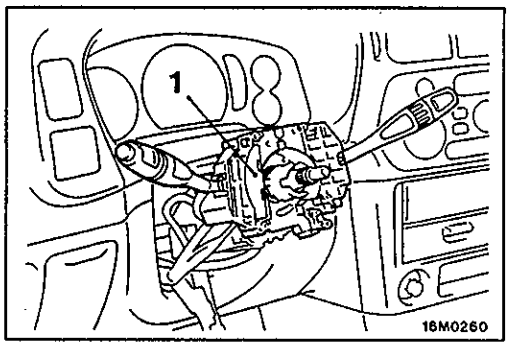
HEADLAMP AND FRONT TURN-SIGNAL LAMP

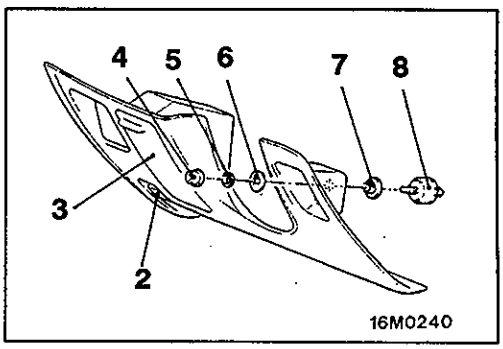
54200240073

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.







00004577

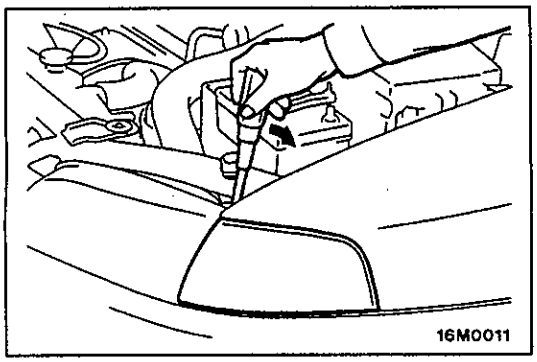
1. Column switch <Lighting switch and dimmer/passing switch> (Refer to GROUP 37A – Steering Wheel and Shaft.)

Headlamp leveling switch removal steps

2. Hood lock release handle
3. Driver's side lower trim
4. Knob
5. Nut
6. Plate
7. Spacer
8. Headlamp leveling switch

Headlamp removal steps

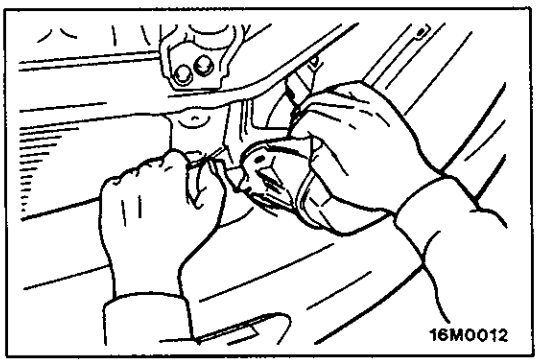
◀A▶ 9. Front turn-signal lamp
10. Radiator grille <Sedan> (Refer to GROUP 51.)
◀B▶ 11. Headlamp



REMOVAL SERVICE POINT

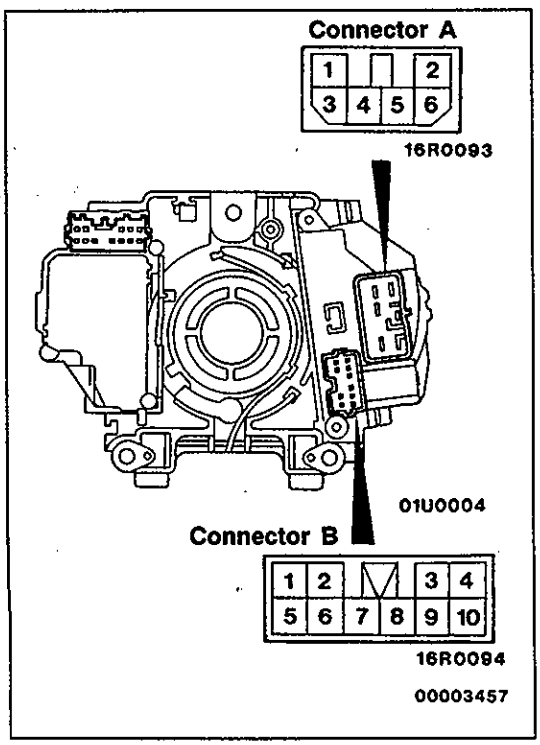
◀A▶ FRONT TURN-SIGNAL LAMP REMOVAL

Pry a screwdriver into the shown direction to remove the front turn-signal lamp forwards.



◀B▶ HEADLAMP REMOVAL <HATCHBACK>

After removing the inside of the headlamp while pulling the bumper towards you as shown in the illustration, remove the outside, and then remove the headlamp.



INSPECTION

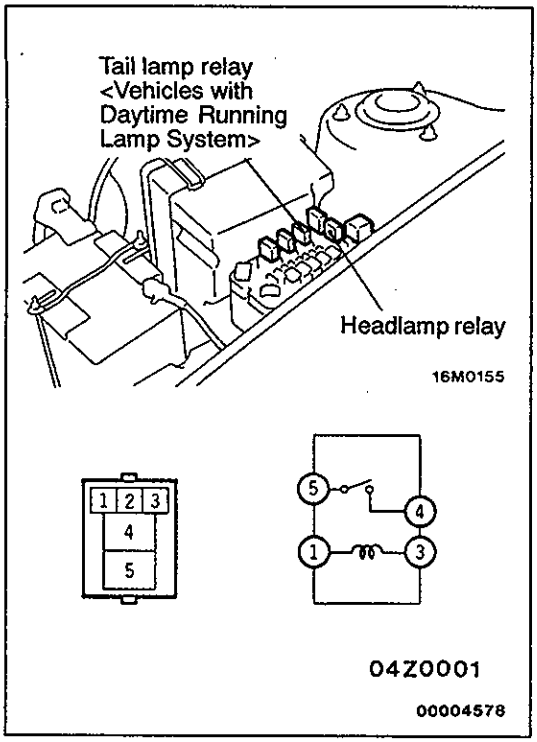
54200800042

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

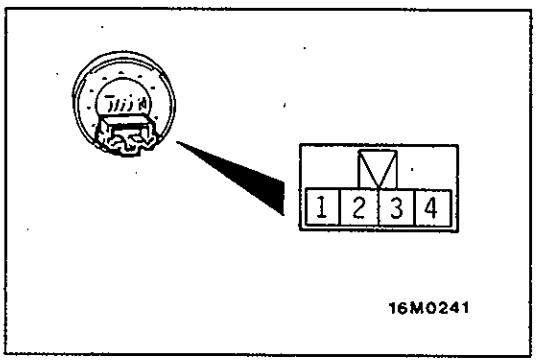
1. *1 indicates continuity when the dimmer switch in the lower beam position.
2. *2 indicates continuity when the dimmer switch in the upper beam position.



HEADLAMP RELAY AND TAIL LAMP RELAY CHECK

54200820086

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

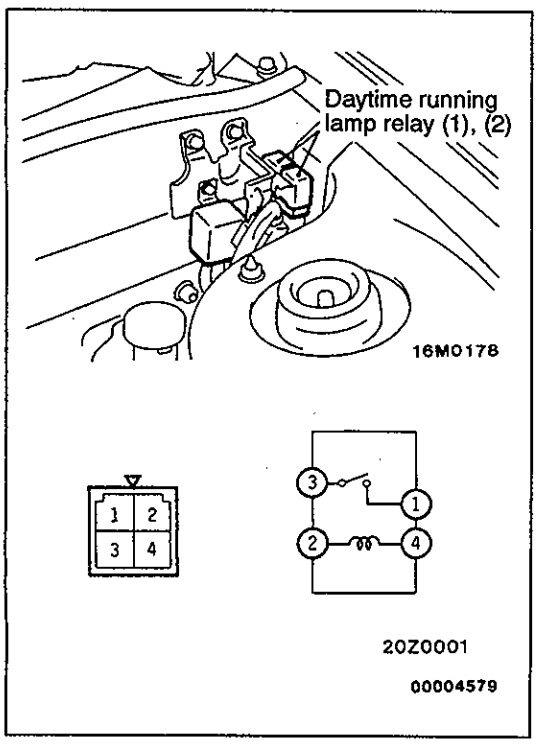


HEADLAMP LEVELING SWITCH CHECK

54200810021

Check the resistance between the terminals when the headlamp leveling switch is operated.

Switch position	0	1	2	3	4
Resistance measurement between terminal No.3 and 4 Ω	120	300	620	1,100	2,000



DAYTIME RUNNING LAMP RELAY (1) AND (2) CHECK

54200830027

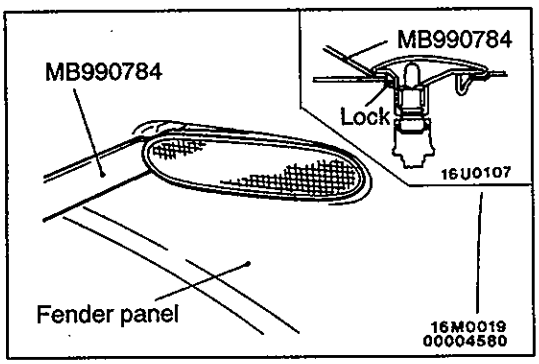
Battery voltage	Terminal No.			
	1	2	3	4
Supplied	○	⊕	○	⊖
Not supplied		○		○

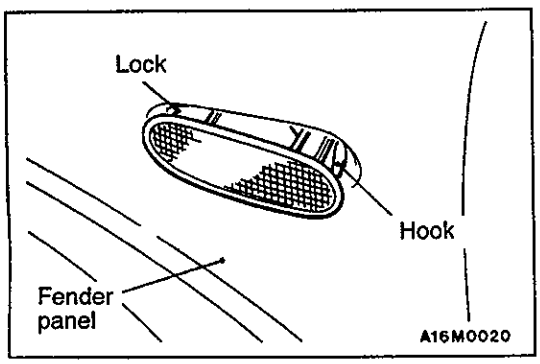
SIDE TURN-SIGNAL LAMP

54200060105

SPECIAL TOOL

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





SIDE TURN-SIGNAL LAMP

54200330046

REMOVAL

Use a special tool to remove the lock from the fender panel, and then remove the 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

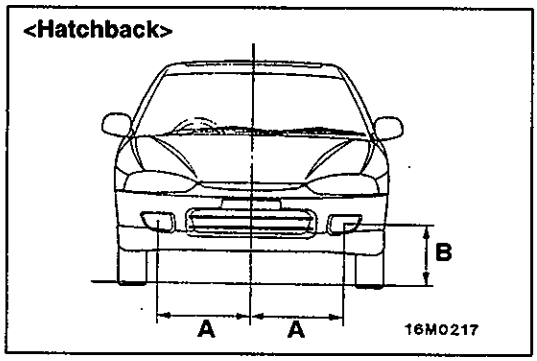
SERVICE SPECIFICATIONS

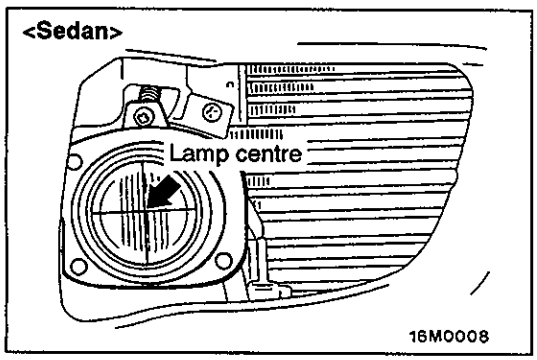
Items		Standard value
Front fog lamp aiming	Vertical direction	100 mm below horizontal (H)
	Horizontal direction	Parallel to direction of vehicle travel

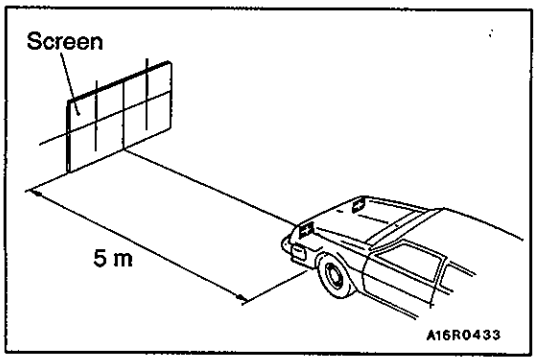
SPECIAL TOOL

54200060211

Tool	Number	Name	Use
	MB990784	Ornament remover	Fog lamp switch removal







ON-VEHICLE SERVICE

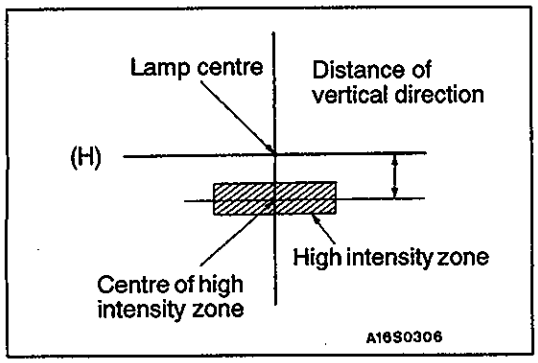
54200110060

FRONT FOG LAMP AIMING

1. Remove the fog lamp bezel.
2. Measure the centre of the fog lamps, as shown in the illustration.

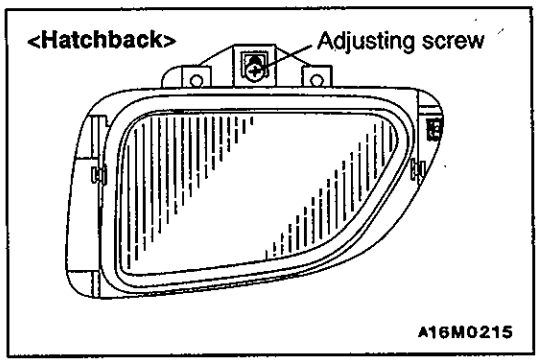
   NOTE
   Measure the centre of the fog lamp as shown.
   <Hatchback>
   A: 572.5 mm (from the centre of the vehicle body)
   B: 360 mm

3. Set the distance between the screen and the centre of the fog lamps as shown in the illustration.
4. 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.
5. With the engine running at 2,000 r/min, aim the fog lamp.



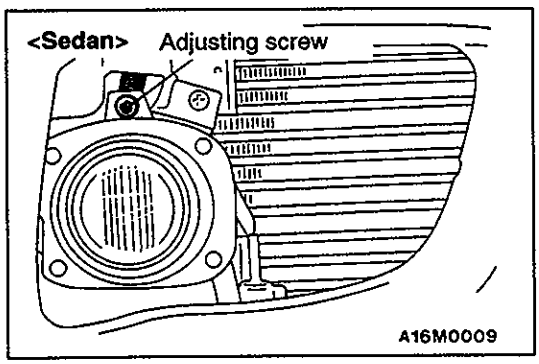
6. Check if the beam shining onto the screen is at the standard value.

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.



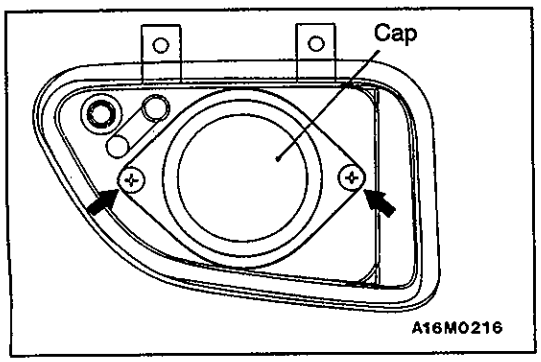
BULB REPLACEMENT

54200130110

<Hatchback>

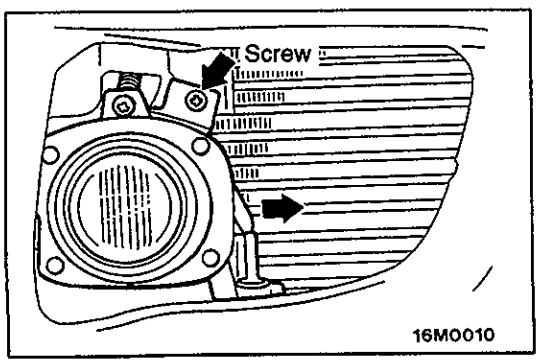
1. Remove the fog lamp. (Refer to P.54-45.)
2. Remove the cap and pull out the bulb.

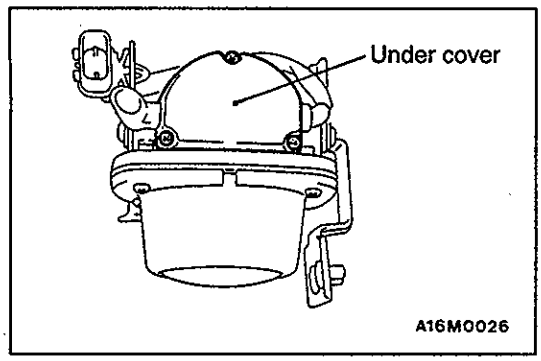
Caution
Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.



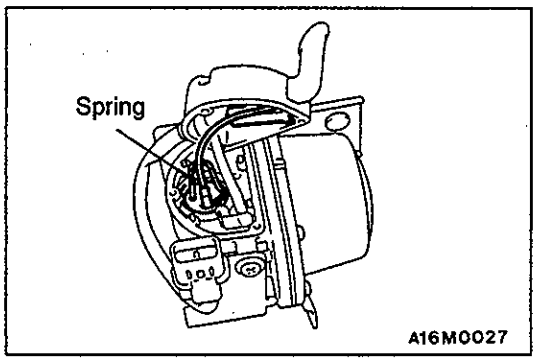
<Sedan>

1. Remove the fog lamp bezel.
2. Remove the fog lamp unit fixing screw, and push the lamp unit in the shown direction to remove it.





3. Remove the fog lamp under cover.



4. Unhook the spring which secures the bulb and then remove the bulb.

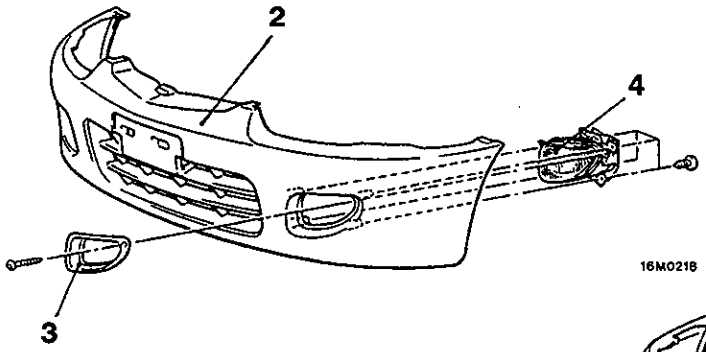
Caution
Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.

FRONT FOG LAMP

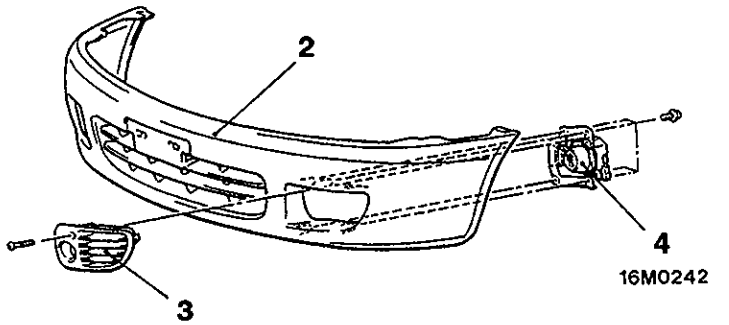
54200150079

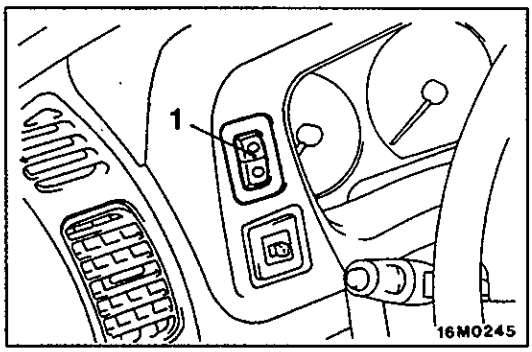
REMOVAL AND INSTALLATION

<Hatchback>



<Sedan>



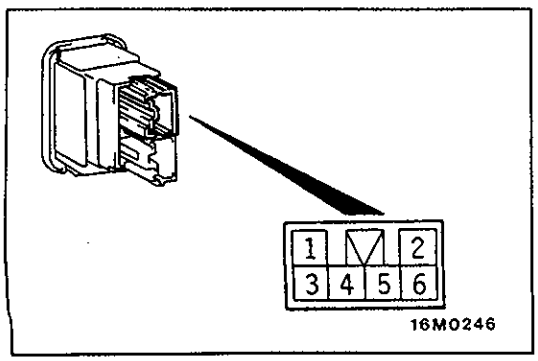


00004581

1. Front fog lamp switch

Front fog lamp removal steps

2. Front bumper (Refer to GROUP 51.)
3. Fog lamp bezel
4. Front fog lamp assembly



INSPECTION

54200740047

FRONT FOG LAMP SWITCH CONTINUITY CHECK

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

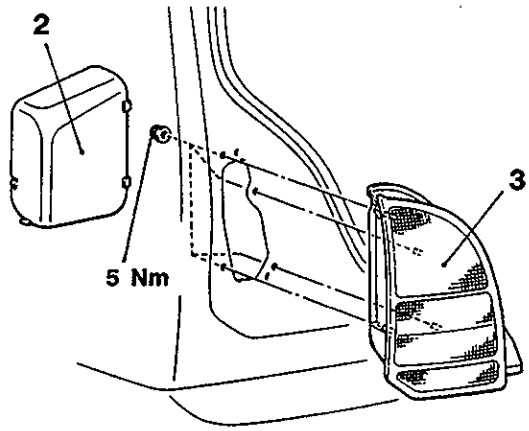
REAR COMBINATION LAMP

54200390051

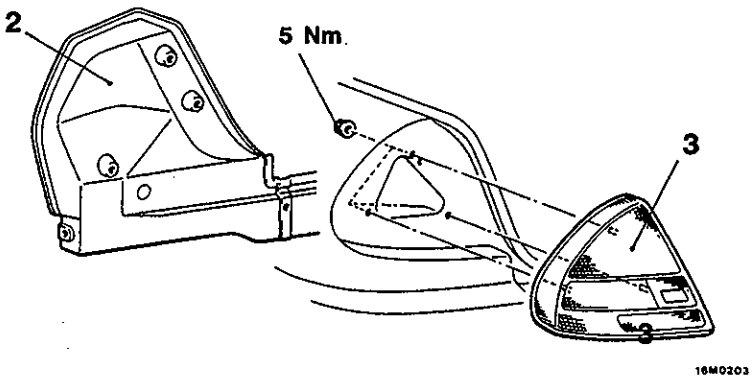
REMOVAL AND INSTALLATION

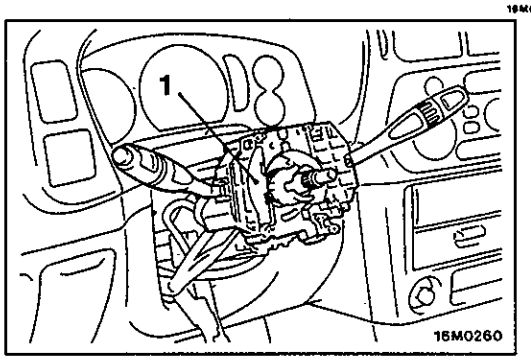
Caution: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

<Hatchback>



<Sedan>





00004582

1. Column switch <Lighting switch and turn-signal lamp switch>
   (Refer to GROUP 37A – Steering Wheel and Shaft.)

Rear combination lamp removal steps

2. Lamp lid <Hatchback> or Rear end trim <Sedan>
   (Refer to GROUP 52A – Trim.)
3. Rear combination lamp

INSPECTION

54200760050

LIGHTING SWITCH AND TURN-SIGNAL LAMP SWITCH CHECK

Refer to P.54-39.

TAIL LAMP RELAY CHECK <Vehicles with Daytime Running Lamp System>

54200780087

Refer to P.54-40.

REAR FOG LAMP

54200060228

SPECIAL TOOL

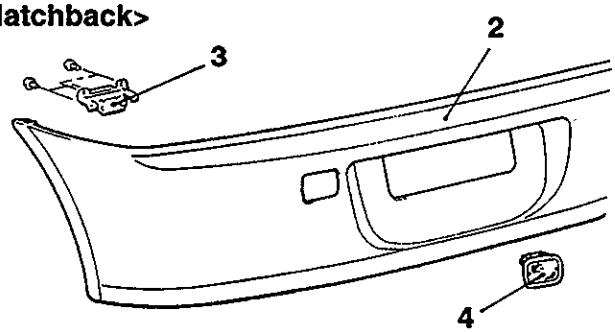
Tool	Number	Name	Use
	MB990784	Ornament remover	Fog lamp switch removal

REAR FOG LAMP

54200150086

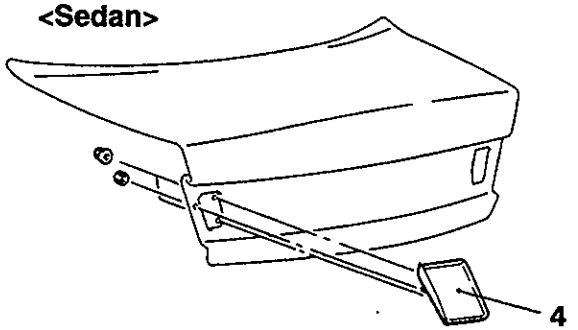
REMOVAL AND INSTALLATION

<Hatchback>

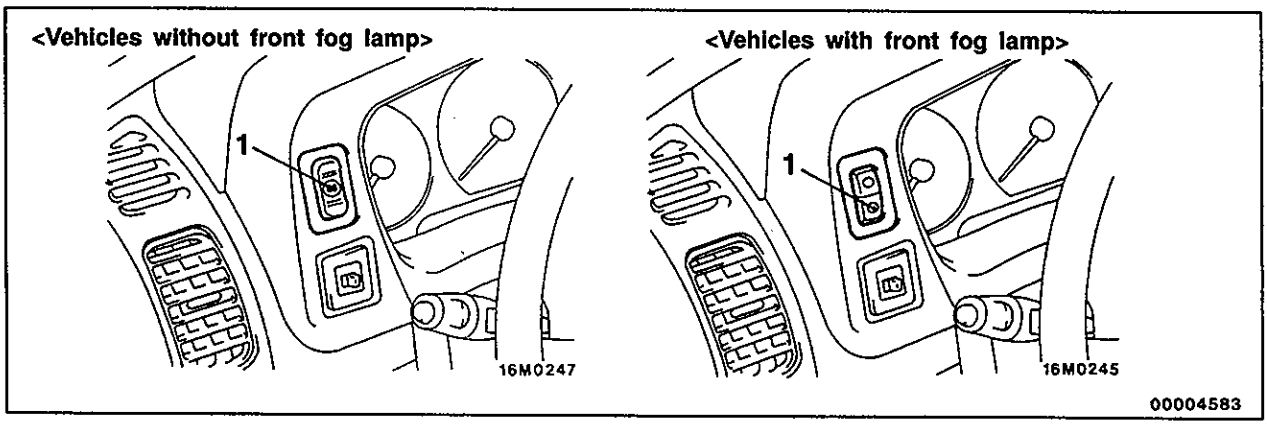


16M0256

<Sedan>



16M0257



1. Rear fog lamp switch

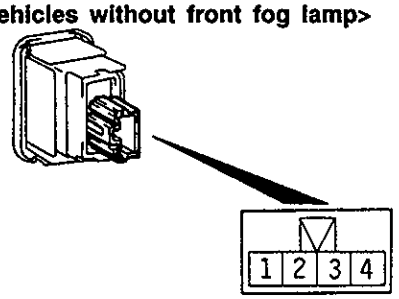
Rear fog lamp removal steps
<Hatchback>

2. Rear bumper (Refer to GROUP 51.)
3. Fog lamp bracket
4. Rear fog lamp

<Sedan>

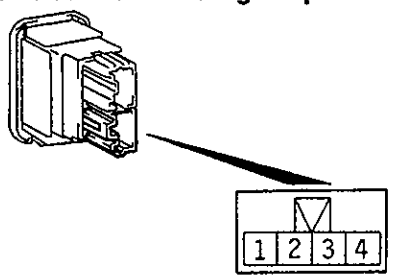
4. Rear fog lamp

<Vehicles without front fog lamp>

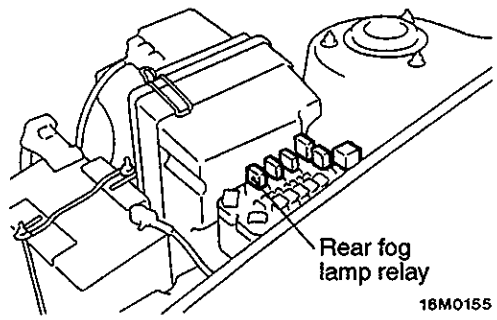


16M0248

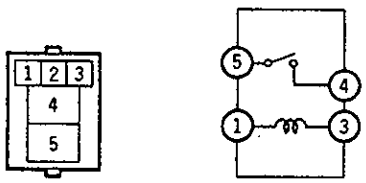
<Vehicles with front fog lamp>



16M0249



16M0155



04Z0001

00004584

INSPECTION

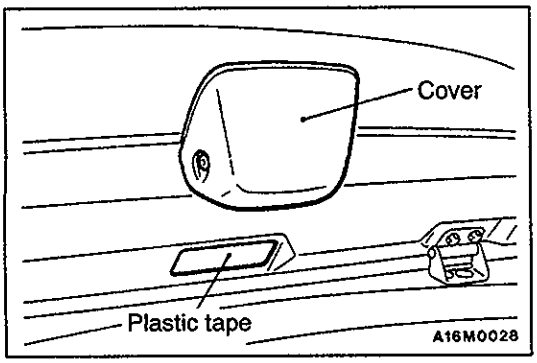
54200770022

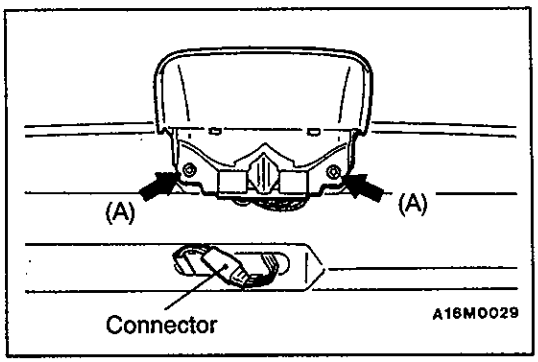
REAR FOG LAMP SWITCH CHECK

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	○	○		





HIGH-MOUNTED STOP LAMP

54200510099

REMOVAL SERVICE POINT

HIGH-MOUNTED STOP LAMP REMOVAL <Hatchback>

1. Remove the high-mounted stop lamp cover.
2. Remove the plastic tape.
3. Disconnect the high-mounted stop lamp connector.
4. Remove the two bolts (A) and then remove the high-mounted stop lamp.

RHEOSTAT

54200060235

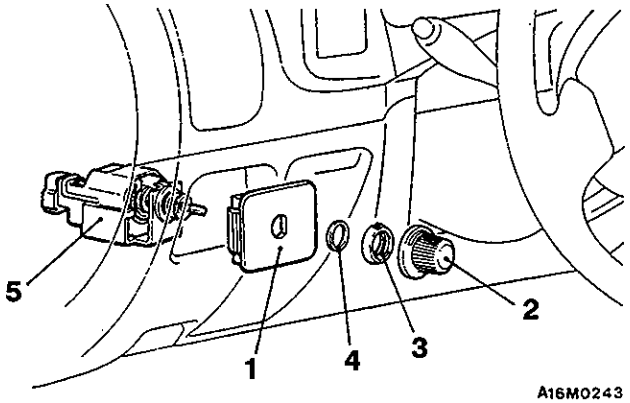
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch garnish

RHEOSTAT

54200600062

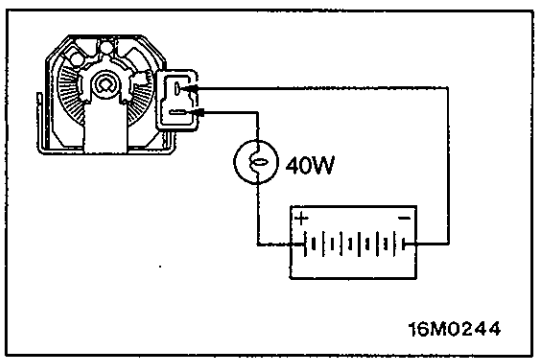
REMOVAL AND INSTALLATION



A16M0243

Removal steps

1. Switch garnish
2. Knob
3. Ring nut
4. Plate
5. Rheostat



16M0244

INSPECTION

54200610089

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

54200060242

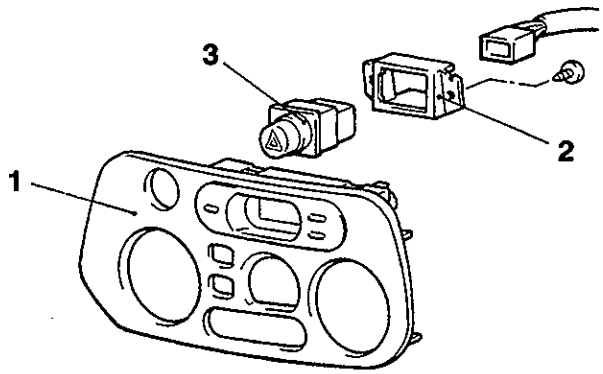
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Heater control panel removal

HAZARD WARNING LAMP SWITCH

54200660060

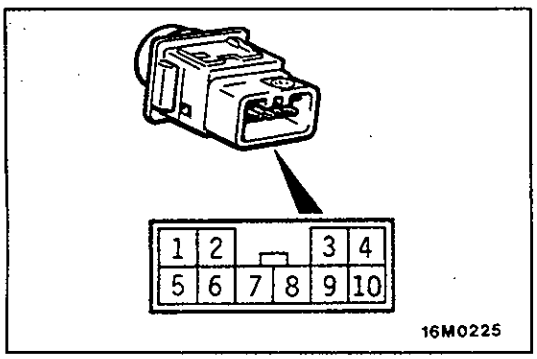
REMOVAL AND INSTALLATION



A16M0284

Removal steps

1. Heater control panel
2. Switch holder
3. Hazard warning lamp switch



16M0225

INSPECTION

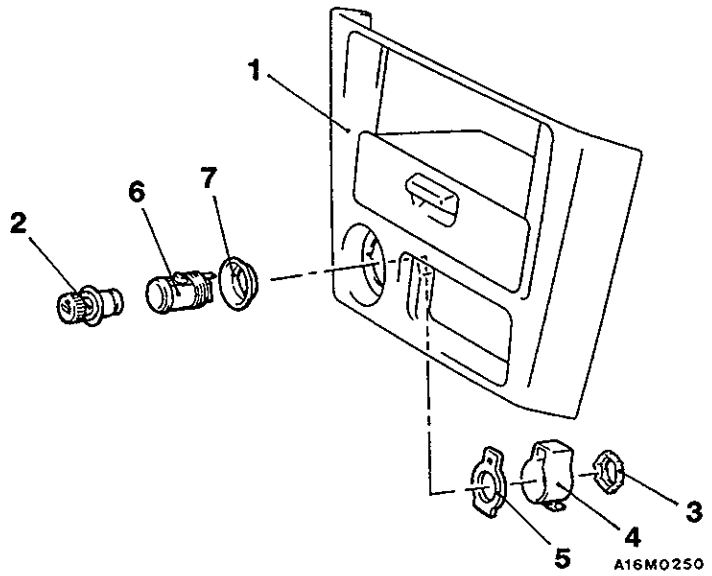
54200670087

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

CIGARETTE LIGHTER

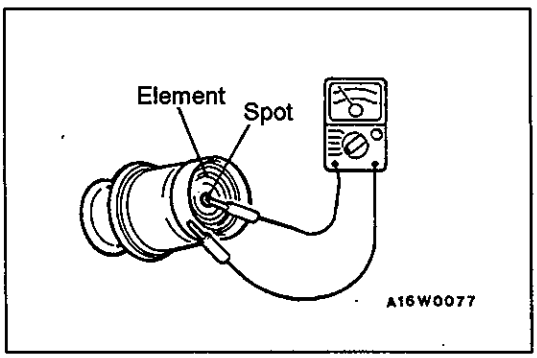
54300560073

REMOVAL AND INSTALLATION



Removal steps

1. Audio panel
2. Plug
3. Fixing ring
4. Socket case
5. Socket washer
6. Socket
7. Protector



INSPECTION

54300570083

- 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.

CLOCK

54300060184

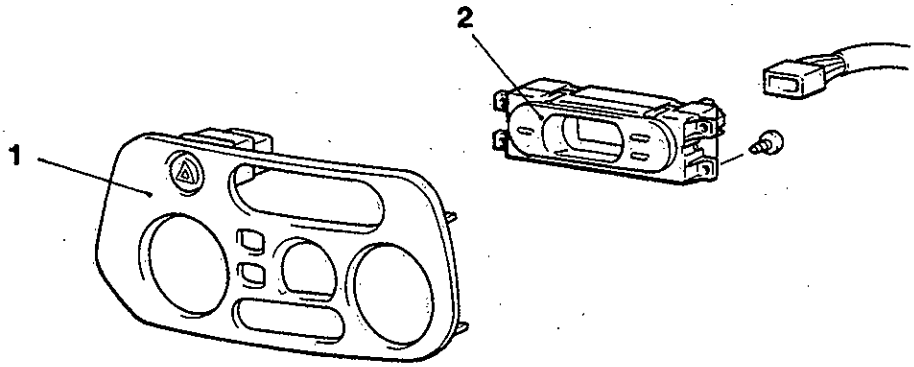
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Heater control panel removal

CLOCK

54300590041

REMOVAL AND INSTALLATION



A16M0285

Removal steps

1. Heater control panel
2. Clock

RADIO AND TAPE PLAYER

54400060033

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Audio panel removal

TROUBLESHOOTING

54400070128

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

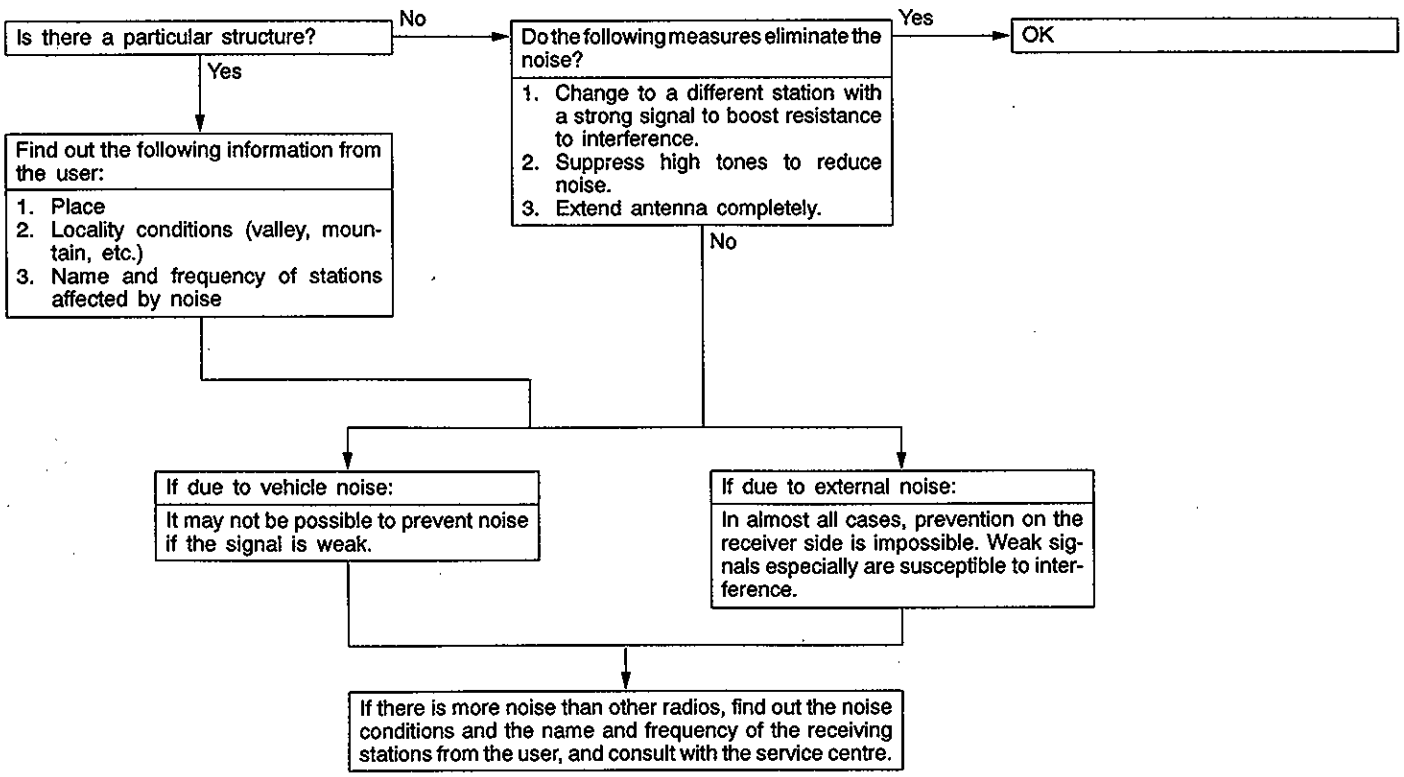
NOTE
Refer to problem symptoms of AM radio for MW radio.

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

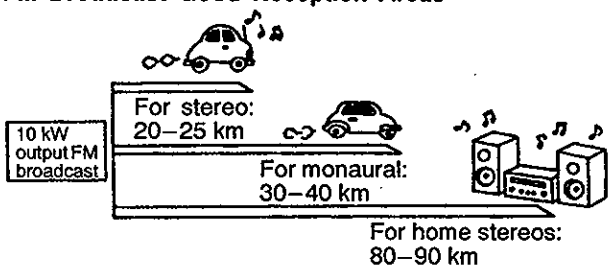
No ↓

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.

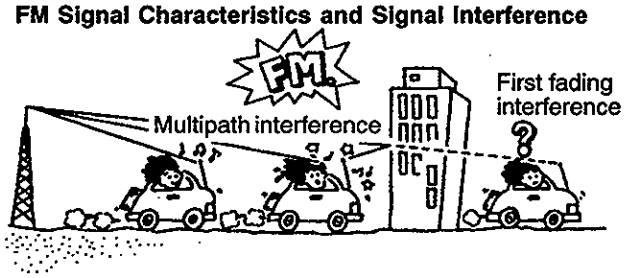
NOTE
About FM waves:
FM waves have the same properties as light, and can be deflected and blocked. Wave reception is not possible in the shadow of obstructions such as buildings or mountains.

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

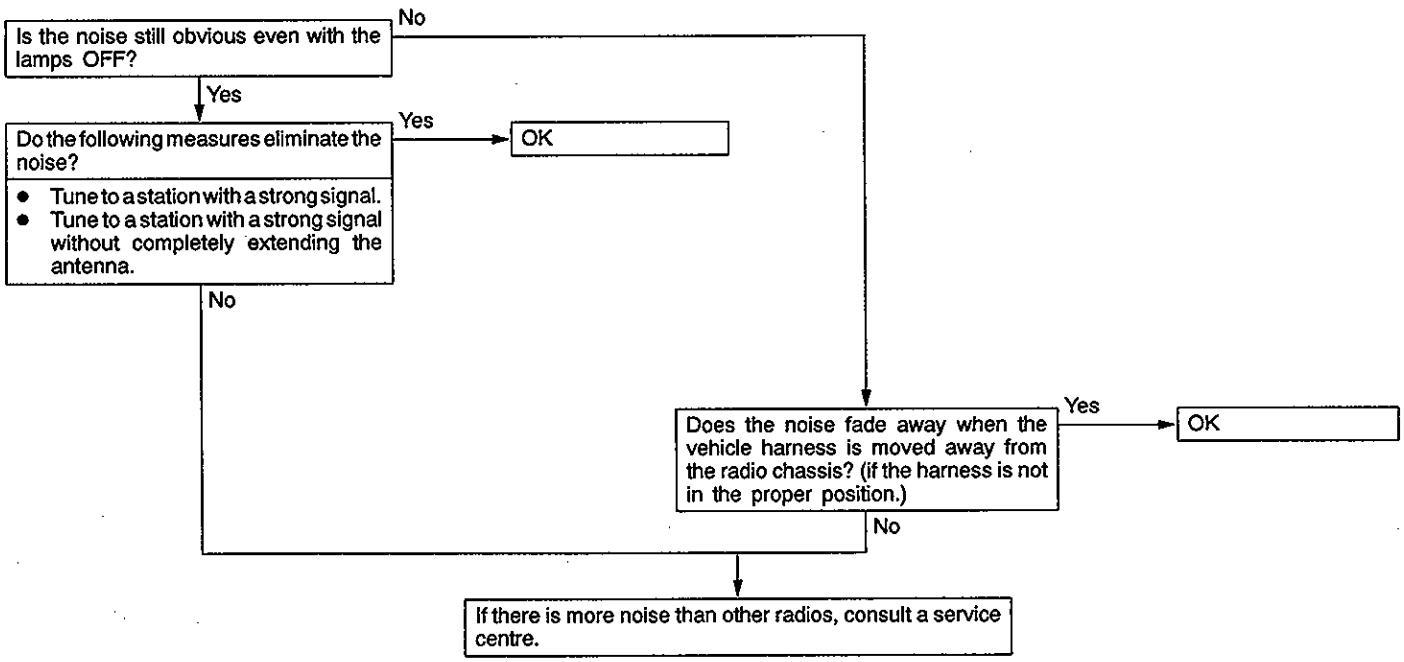


16W0268

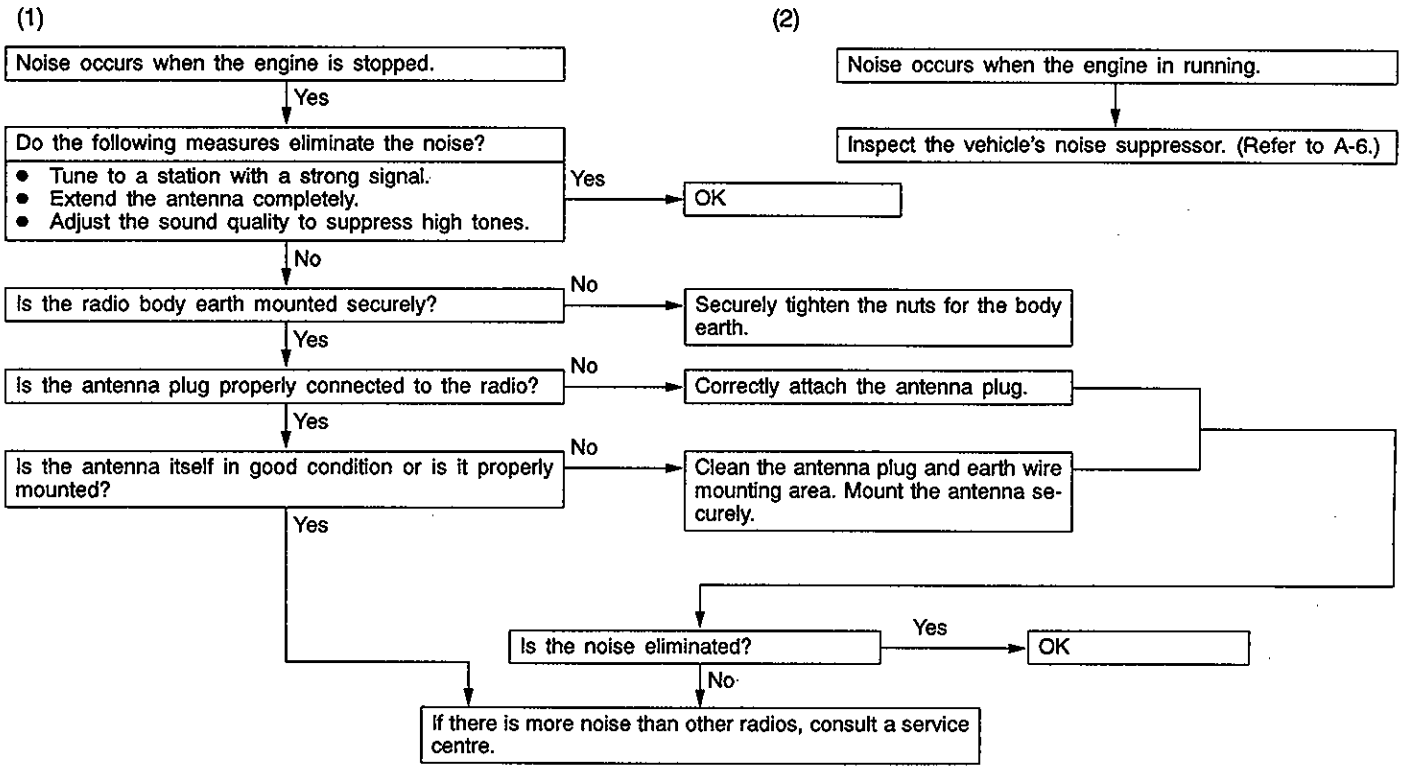
A–3 Mixed with noise, only at night (AM).

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.



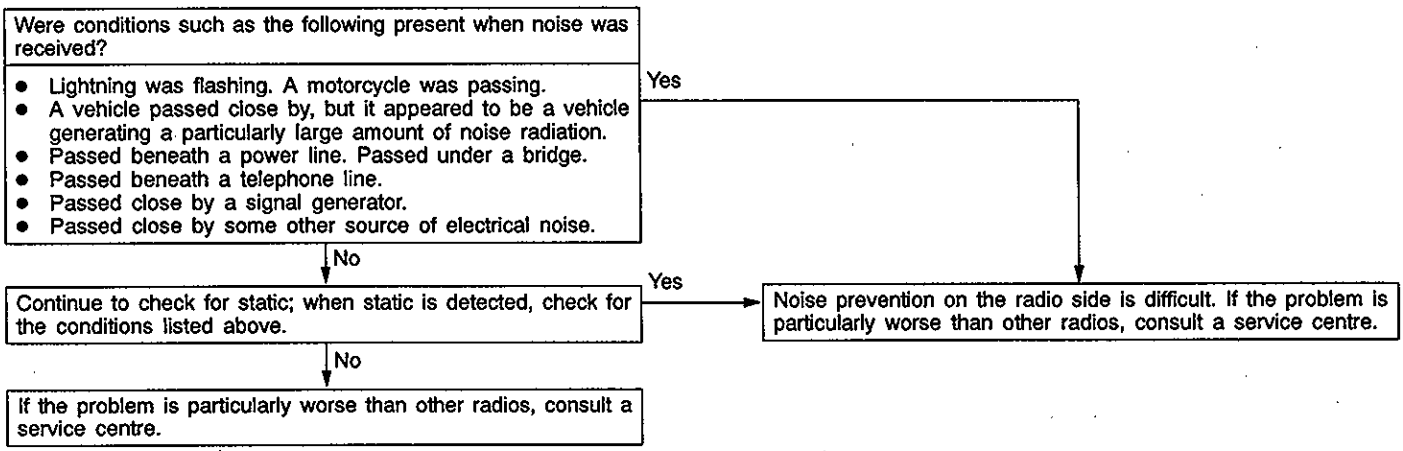
A-4 Broadcasts can be heard but both AM and FM have a lot of noise.



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.54-61.) • 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.

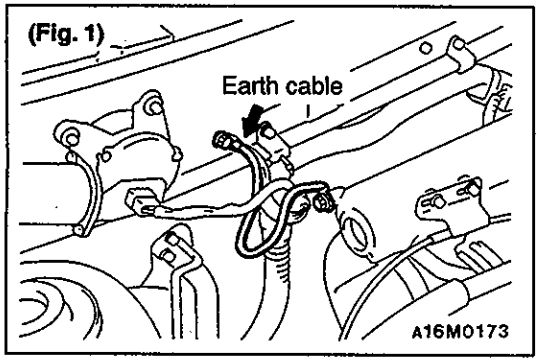
Caution

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.

(Fig. 1)



A–7 Some noise appears when there is vibration or shocks during travelling.

Are connectors properly connected?
- No → Ensure proper connection.
- Yes ↓

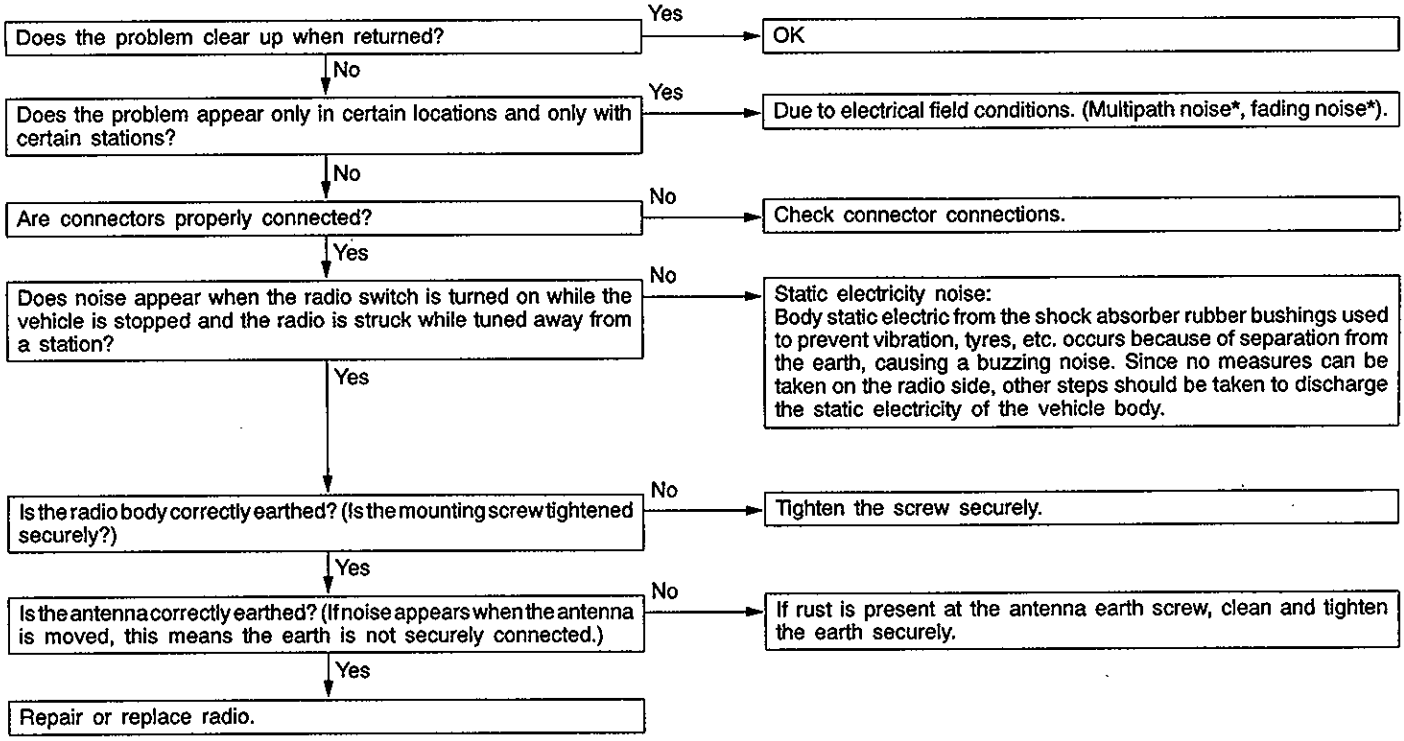
Does noise appear when the radio switch is turned on while the vehicle is stopped and the radio is struck while tuned away from a station?
- No → Static electricity noise: Body static electric from the shock absorber rubber bushings used to prevent vibration, tyres, etc. occurs because of separation 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.

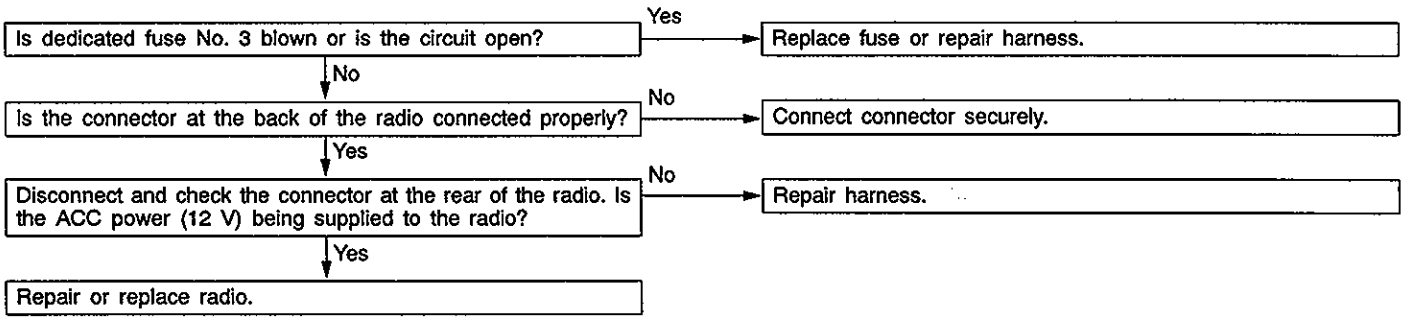
Noise is often created by the following factors, and often the radio is OK when it is checked individually.

- Travelling conditions of the vehicle
- Terrain of area travelled through
- Surrounding buildings
- Signal conditions
- Time period

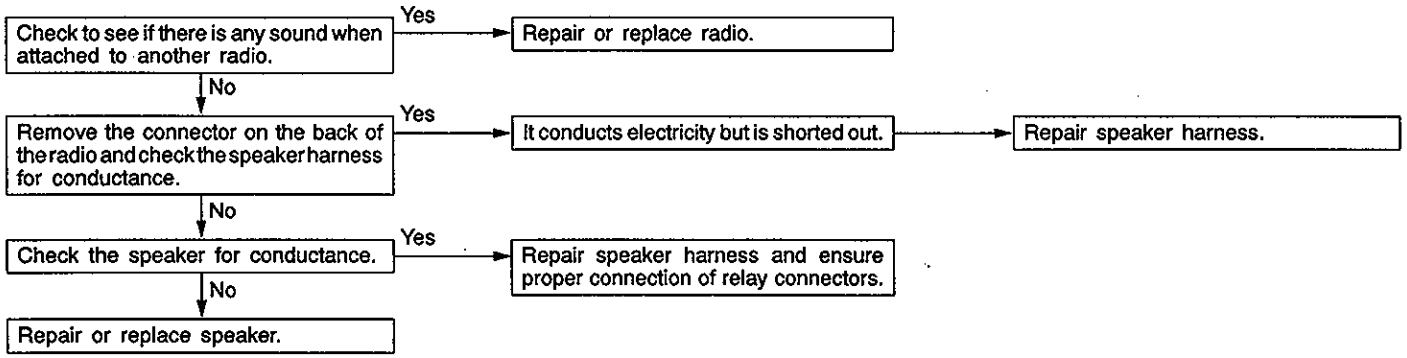
For this reason, if there are still problems with noise even after the measures described in steps A–1 to A–8 have been taken, get information on the factors listed above as well as determining whether the problem occurs with AM or FM, the station names, frequencies, etc., and contact a service centre.

B. RADIO

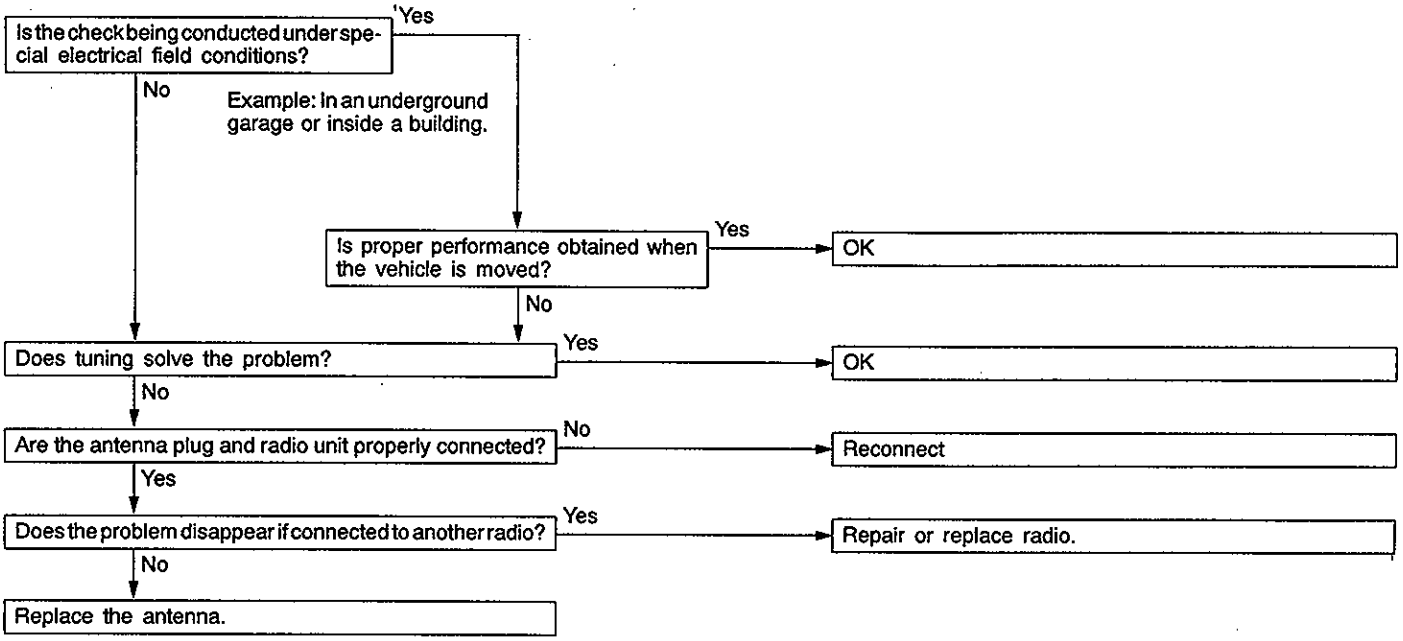
B–1 No power is supplied when the switch is set to ON.



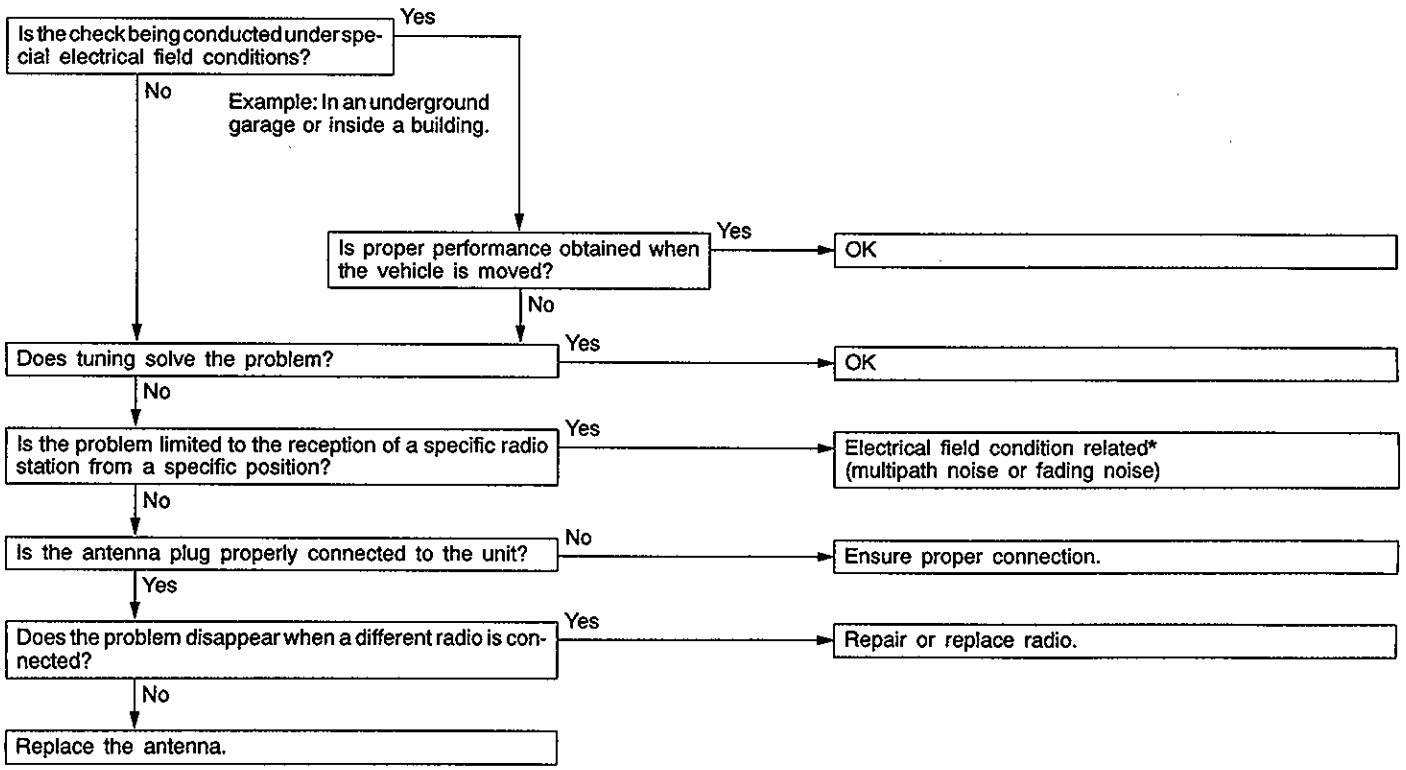
B–2 No sound from one speaker.



B–3 There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.

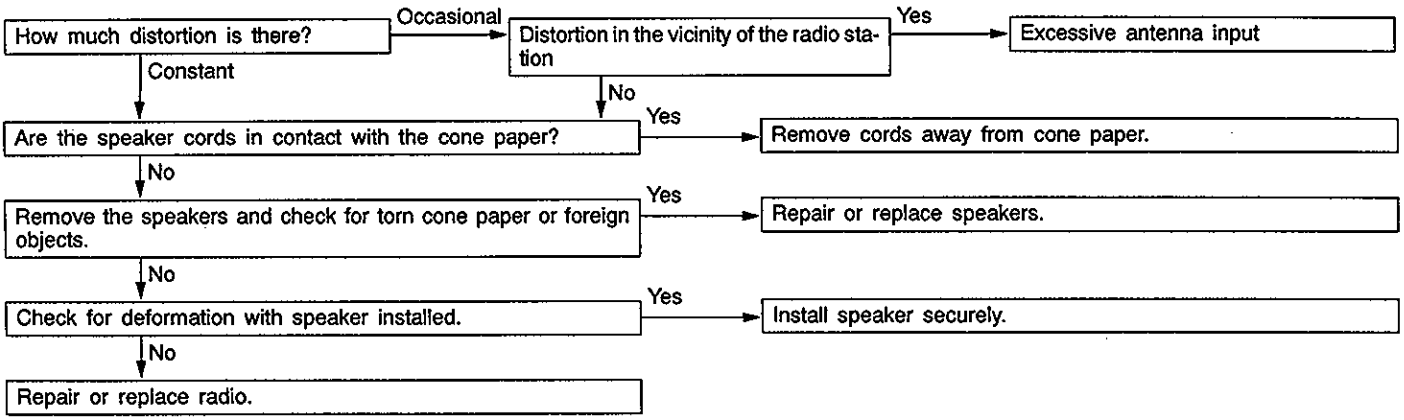


B–4 Insufficient sensitivity.

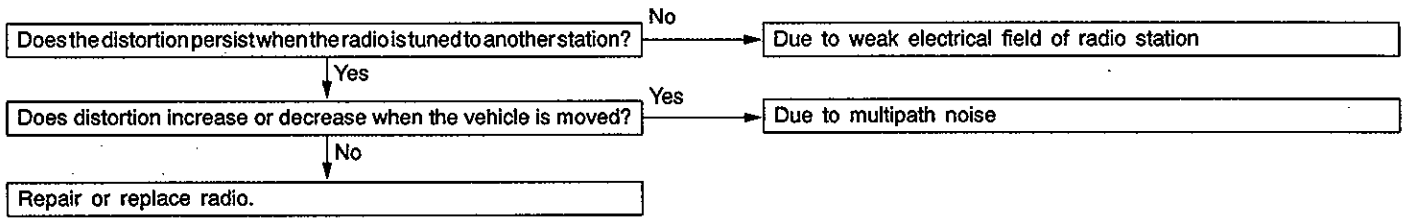


* For multipath noise and fading noise problems, refer to P. 54-55.

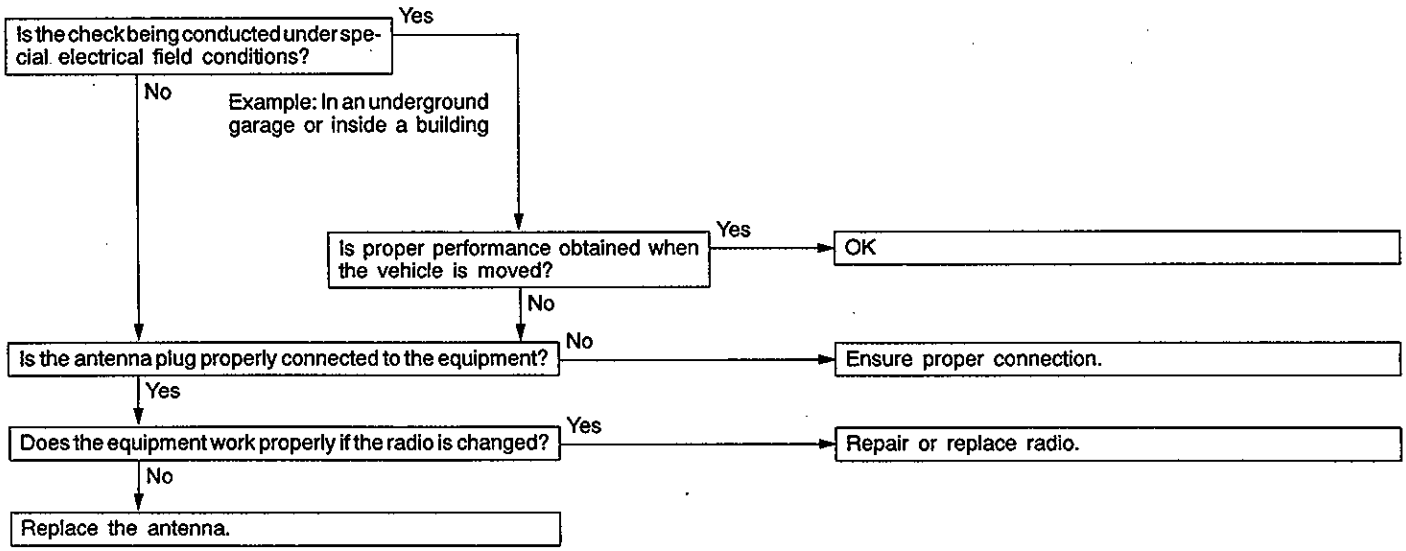
B–5 Distortion on AM or on both AM and FM.



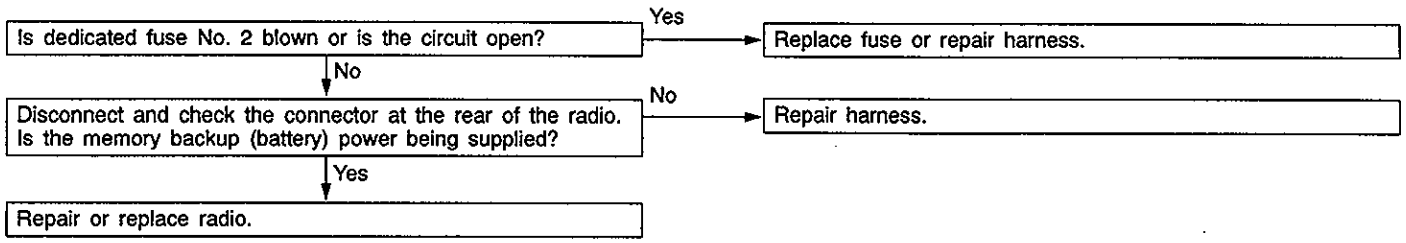
B–6 Distortion on FM only



B–7 Too few automatic select stations.

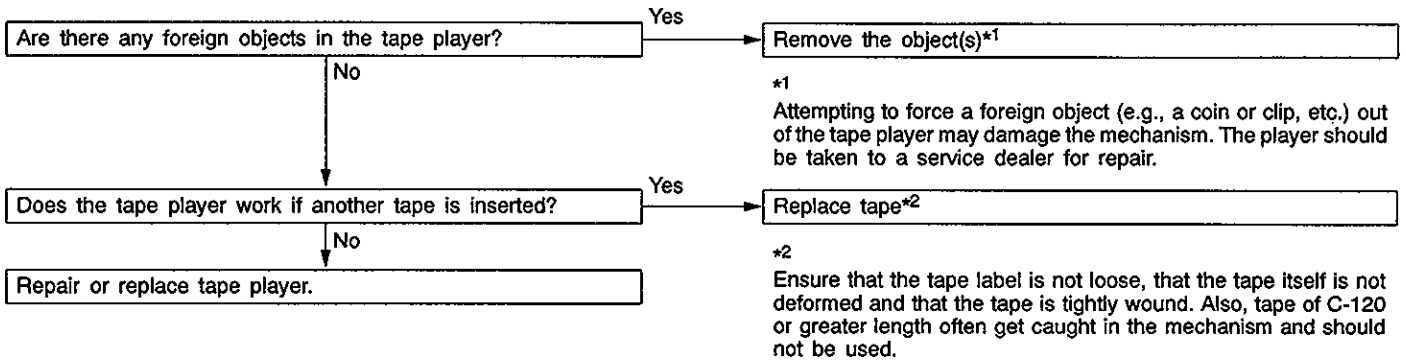


B–8 Insufficient memory (preset stations are erased).



C. TAPE PLAYER

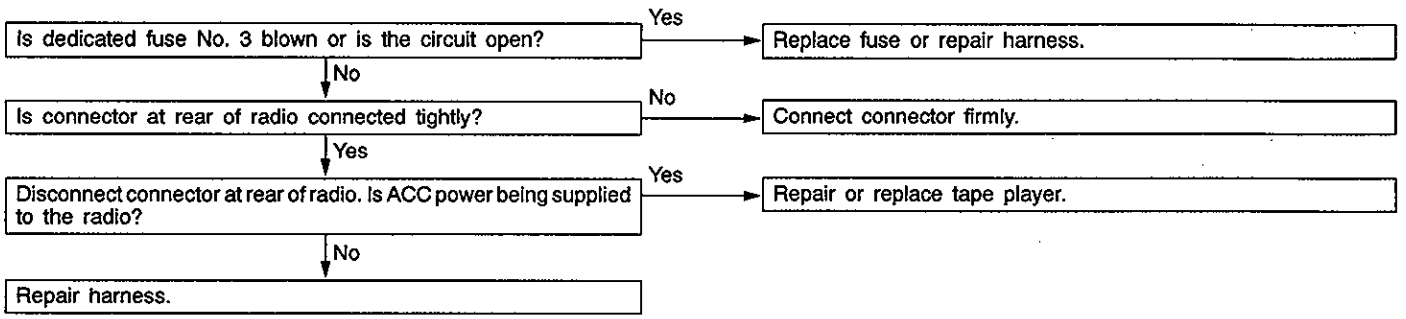
C–1 Cassette tape will not be inserted.



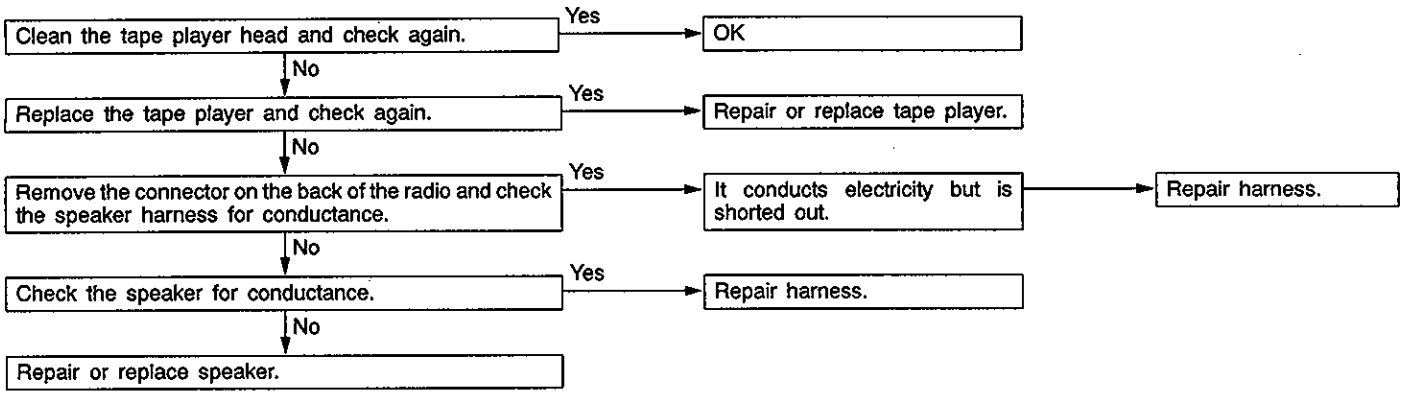
*1
Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the tape player may damage the mechanism. The player should be taken to a service dealer for repair.

*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.

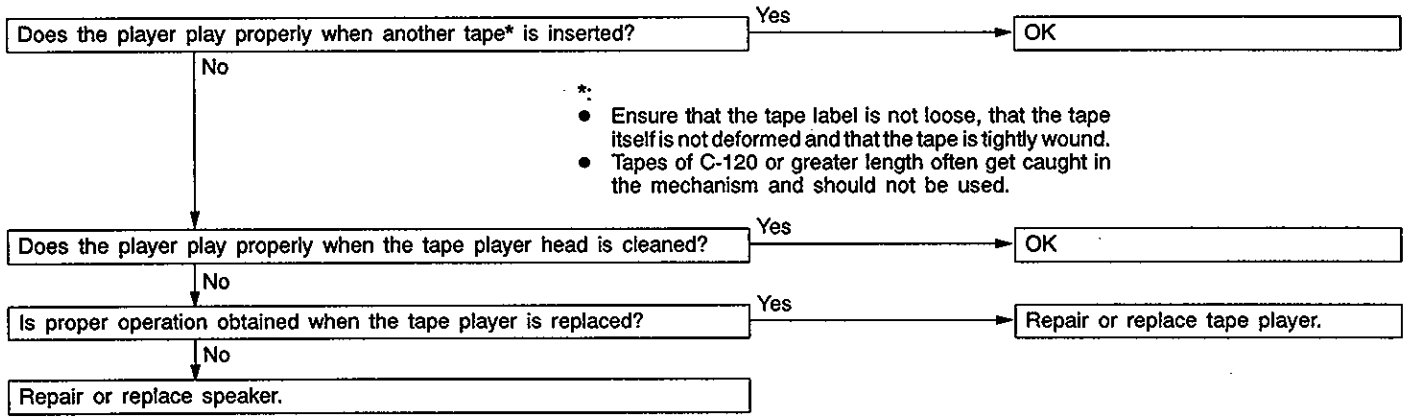
C–2 No sound (even after a tape has been inserted).



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

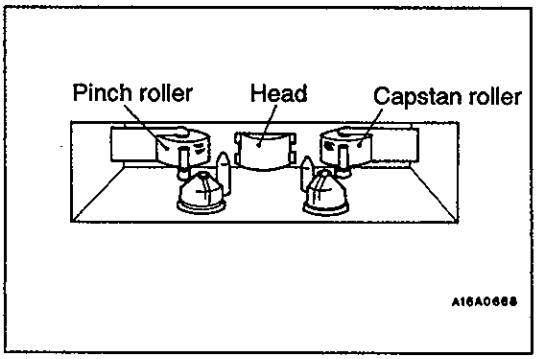
*1
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

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.

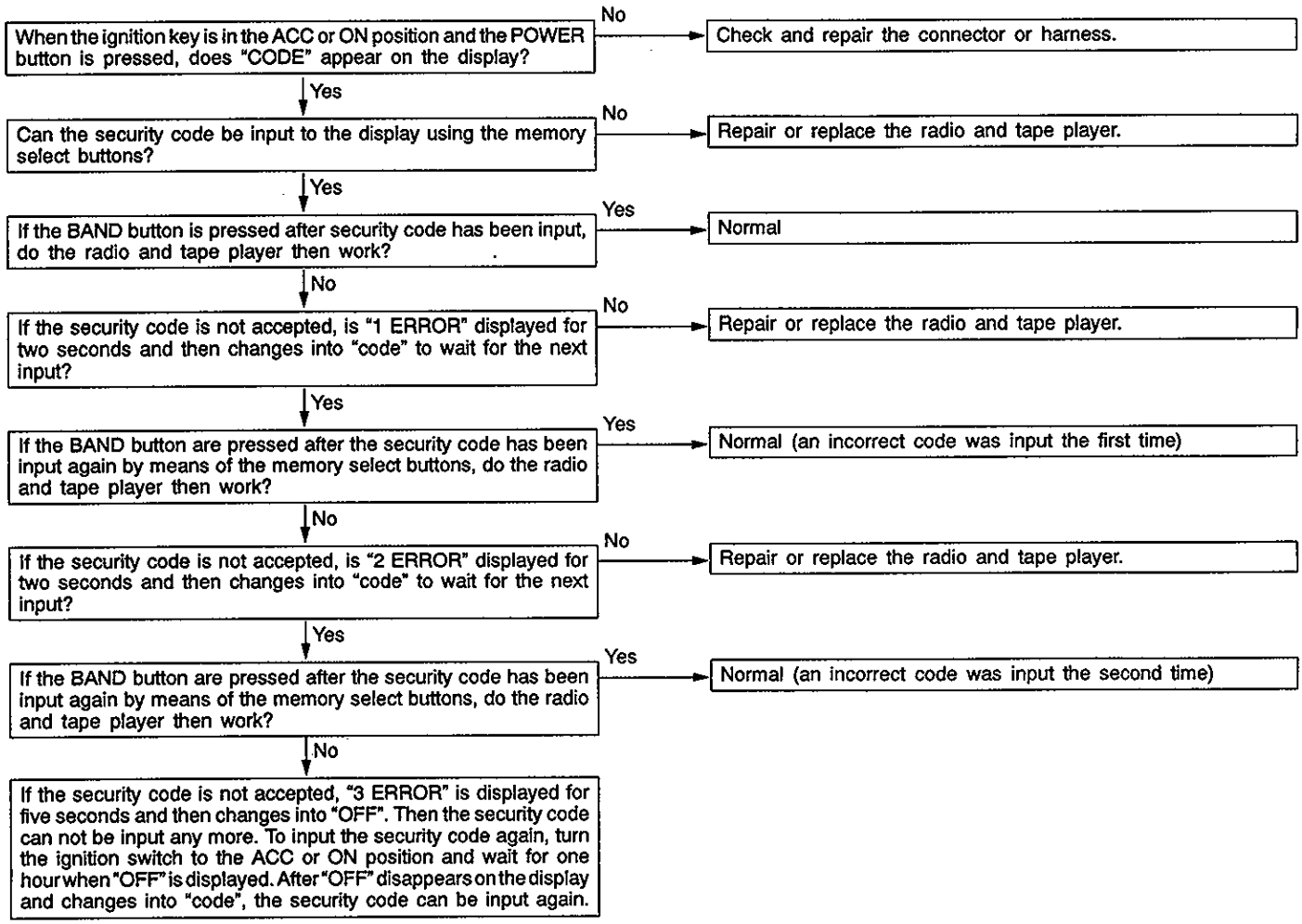
No → Repair or replace tape player.

*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.

RADIO AND TAPE PLAYER WITH ANTI-THEFT SYSTEM

54400430032

- After the power supply to the radio and tape player has been interrupted for an hour or more, the anti-theft system will prevent the radio and tape player from working, even if the power supply is restored. Problem with the anti-theft system can be found using the flow chart below.



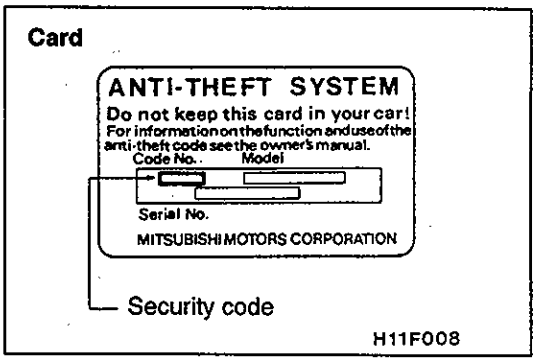
PROCEDURE FOR INPUT OF SECURITY CODE FOR RADIO AND TAPE PLAYER WITH ANTI-THEFT SYSTEM

54400440035

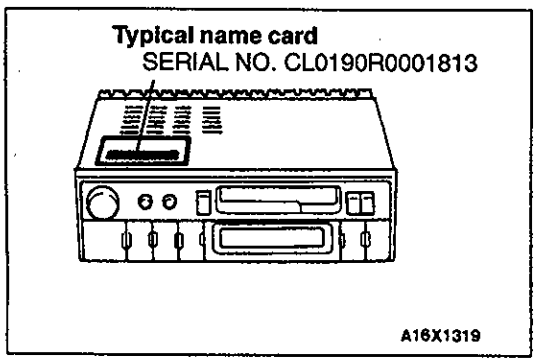
The radio and tape player does not work in the following states.

- Power supply to the radio and tape player has been suspended for more than an hour continuously by removing the cable from the battery terminal for disconnecting the harness connectors.
- The power supply to the radio and tape player has been suspended for more than an hour owing to blown fuse or discharged battery.
- The radio and tape player has been replaced.

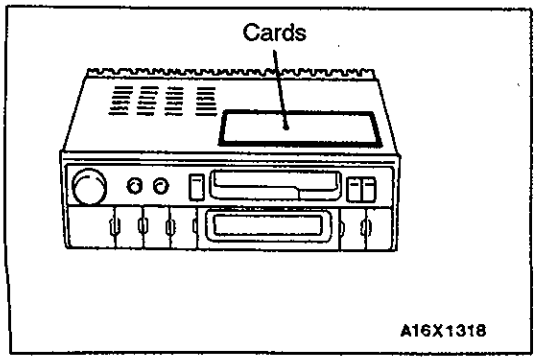
If the radio and tape player does not work for these causes, input the security code by the following procedure.



1. Using any of the following methods, confirm the security code.
   (1) Read the security code indicated on the cards retained by the car.

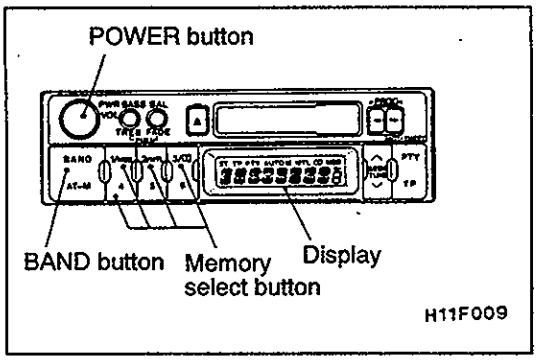


   (2) If the security code is unknown owing to the user's loss of the card:
      a. Remove the radio and tape player, referring to P.54-73.
      b. Read the serial No. stamped on the radio and tape player.
      c. Look up the security code (anti-theft code table) corresponding to the serial number, or ask the authorized Mitsubishi dealer.

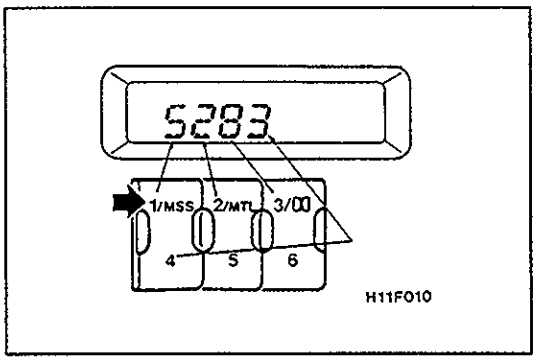


   (3) When the radio and tape player is replaced:
   Read the security code on the cards attached to the upper surface of the replacement radio and tape player.

NOTE
Deliver the two cards to the user.

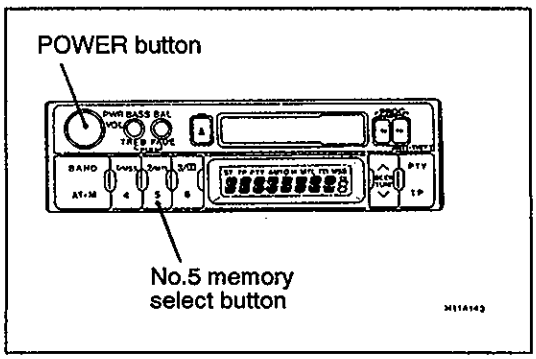


2. Return the power supply from the battery to the normal condition.
3. Turn the ignition key to the "ACC" or "ON" position.
4. Press the POWER button, and "CODE" will be displayed.



5. Press No.1 through No.4 memory select button to set the four-digit security code shown on the card.
   Every time each digit key is pressed, the figure changes as follows: 0→1→2.....9→0
6. Press the BAND button, and a beep will be heard and the radio and tape player will work.
7. If the security code is not accepted, "1 ERROR" is displayed. In a few minutes, it will change to "CODE". Then repeat the steps 5 and 6.

   NOTE
   (1) If an incorrect security code is input, the anti-theft system will allow three attempts at most to input the correct code.
   (2) The second error is displayed as "2 ERROR". When the third error is made, "3 ERROR" is displayed and then the display changes to "OFF". If this should occur, the unit will not work any more.
   (3) To input the security code again, turn the ignition switch to the ACC or ON position and wait for one hour when "OFF" is displayed. After "OFF" disappears on the display and changes into "CODE", the security code can be input again.



5-minute operation mode

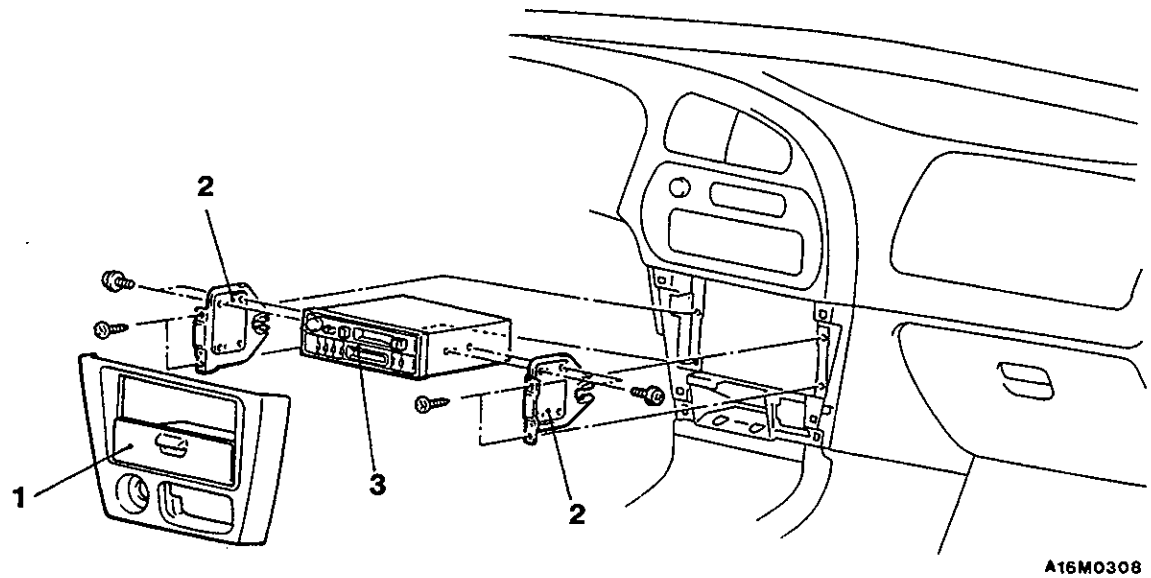
To facilitate replacement or check, the radio and tape player can be operated for five minutes without inputting the security code.

1. Press the POWER button and No.5 memory select button together to operate the radio and tape player.
2. In five minutes the unit will not be able to work, and "CODE" will be displayed to indicate that the security code can be input again.

RADIO AND TAPE PLAYER

54400140041

REMOVAL AND INSTALLATION



Removal steps

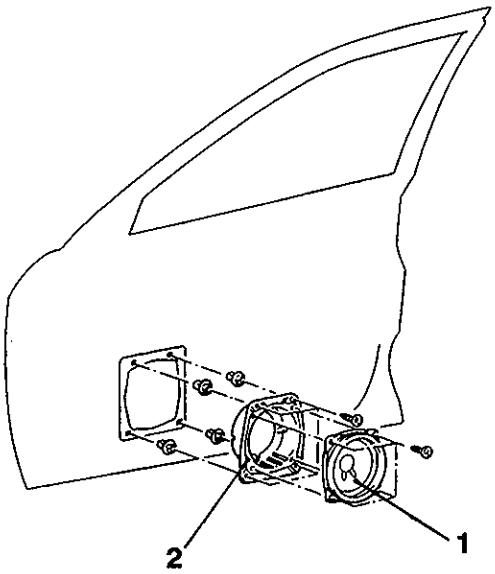
1. Audio panel
2. Radio bracket
3. Radio and tape player

SPEAKER

54400260143

REMOVAL AND INSTALLATION

<FRONT SPEAKER>



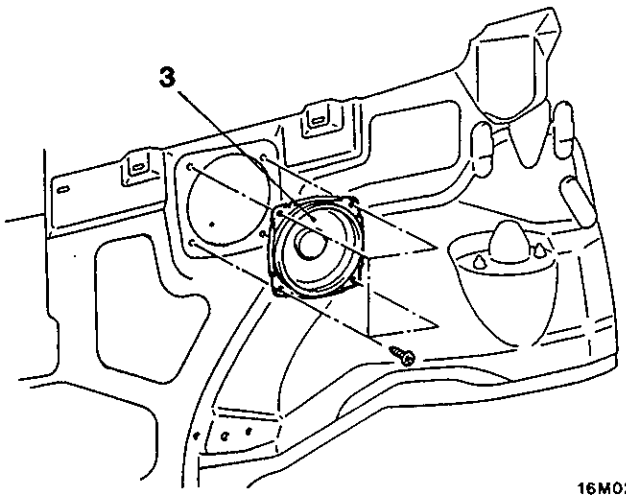
A16M0309

Removal steps

- Front door trim (Refer to GROUP 42.)

1. Front speaker
2. Speaker cover

<REAR SPEAKER – HATCHBACK>



16M0252

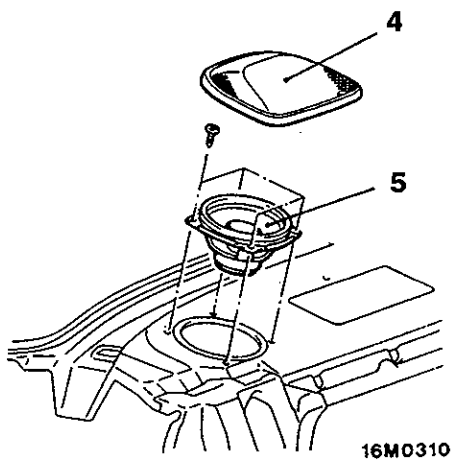
Removal steps

<Hatchback>

- Quarter trim (Refer to GROUP 52A – Trims.)

3. Rear speaker

<REAR SPEAKER – SEDAN>



16M0310
00004585

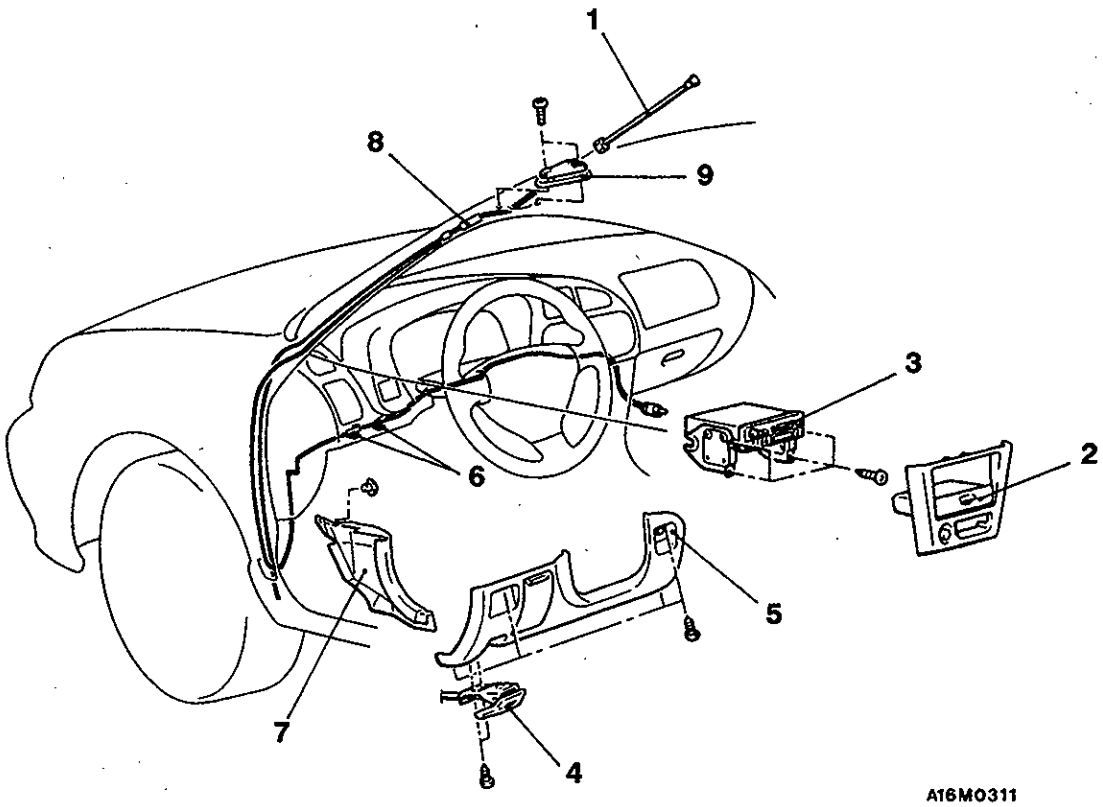
<Sedan>

4. Rear speaker garnish
5. Rear speaker

ANTENNA

54400290098

REMOVAL AND INSTALLATION

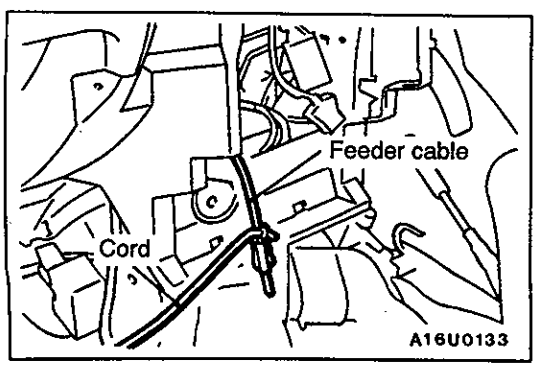


Removal steps

1. Antenna rod
2. Audio panel
3. Radio and tape player assembly
4. Hood lock release handle
5. Driver side lower cover
6. Clip
7. Cowl side trim

◀A▶ 8. Antenna assembly

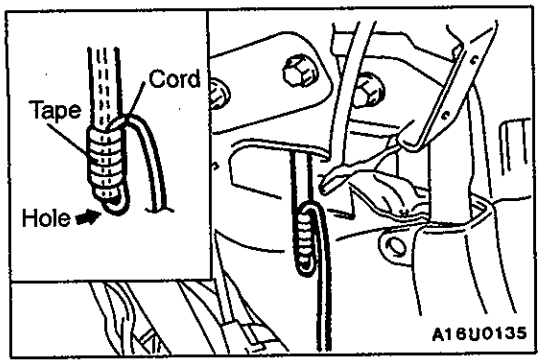
9. Antenna base gasket



REMOVAL SERVICE POINT

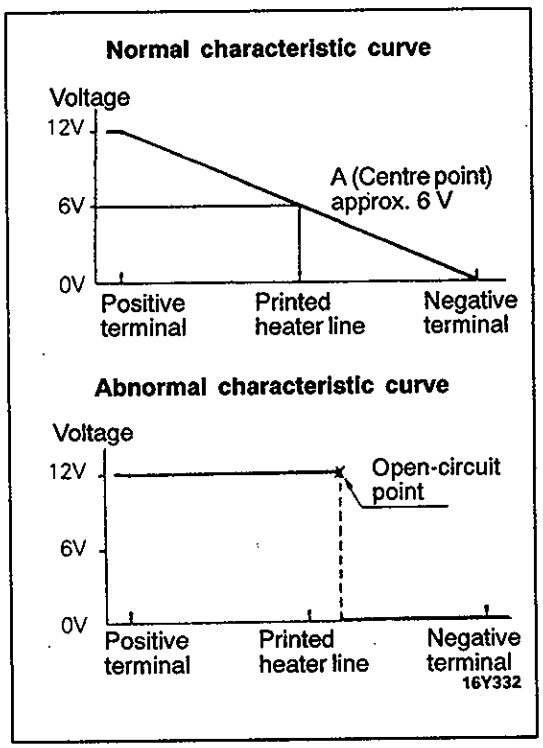
◀A▶ ANTENNA BASE REMOVAL

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.



REAR WINDOW DEFOGGER

54300180033

ON-VEHICLE SERVICE

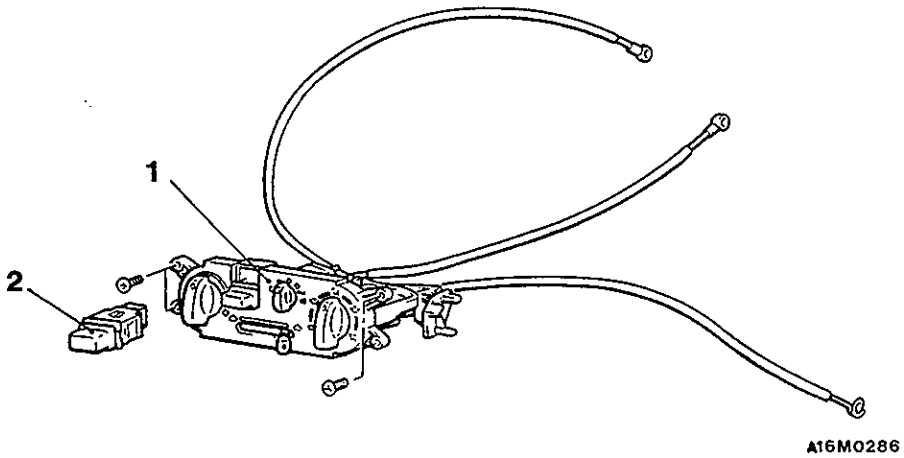
PRINTED-HEATER LINE CHECK

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

54300620061

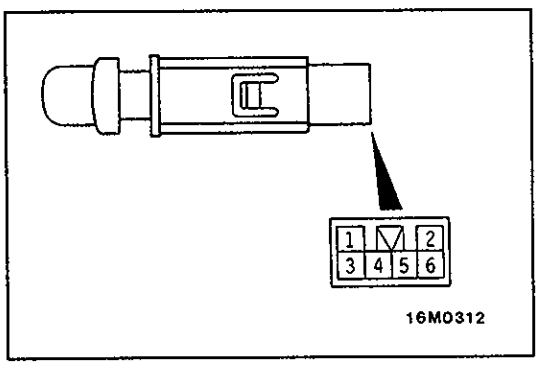
REMOVAL AND INSTALLATION



A16M0286

Removal steps

1. Heater control assembly (Refer to GROUP 55.)
2. Rear window defogger switch



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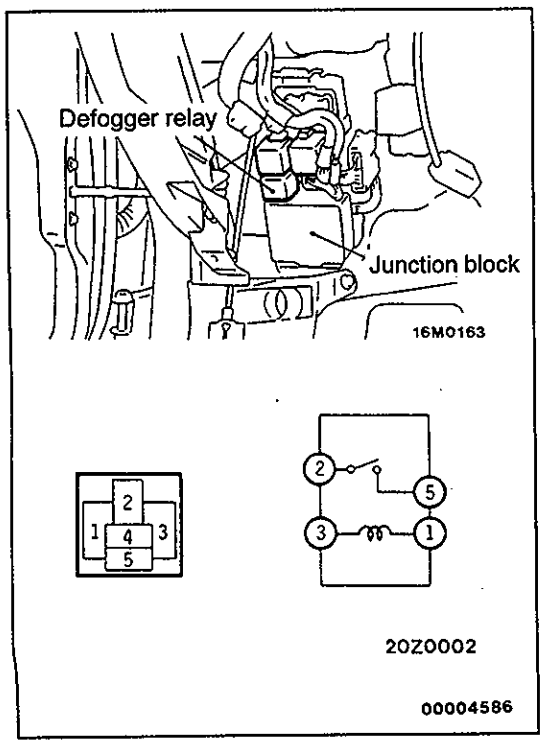


00004586

INSPECTION

54300670059

DEFOGGER SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1		3	2	4		5
OFF		ILL					
ON		ILL				IND	

REAR WINDOW DEFOGGER RELAY CONTINUITY CHECK

54300680076

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

NOTES

HEATER, AIR CONDITIONER AND VENTILATION

CONTENTS

55109000065

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 (*).

GENERAL INFORMATION

55200010107

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.

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: 3,138, OFF → ON: 2,550
	Low pressure switch	ON → OFF: 196, OFF → ON: 221
Refrigerant and quantity g		R-134a (HFC-134a), Approx. 555–595

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

55200030110

Items		Standard value
Idle speed r/min	4G1, 4G9 (except MVV)	750±100
	4G9 (MVV)	700±100
Idle up speed r/min		850±100
Resistor (for blower motor) <L.H. drive vehicles> Ω		LO: 2.21, ML: 0.97, MH: 0.35
Resistor (for blower motor) <R.H. drive vehicles> Ω		LO: 2.81, ML: 1.28, MH: 0.33
Air gap (Magnetic clutch)		0.40 – 0.65

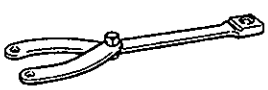
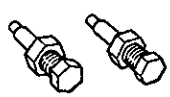
LUBRICANTS

55200040113

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

55200060096

Tool	Number	Name	Use
	MB991367	Special spanner	Removal and installation of armature mounting nut of compressor
	MB991386	Pin	Removal and installation of armature mounting nut of compressor

TROUBLESHOOTING

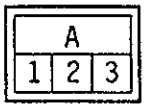
55200070112

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	55-17
	Magnetic clutch is defective	Replace the armature plate, rotor or clutch coil	55-30
	Refrigerant leak or overfilling of refrigerant	Replenish the refrigerant, repair the leak or take out some of the refrigerant	55-15
	Dual pressure switch is defective	Replace the dual pressure switch	55-32
	A/C switch is defective	Replace the A/C switch	55-18
	Blower switch is defective	Replace the blower switch	55-18
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-28
	Automatic compressor-ECU is defective	Replace the automatic compressor-ECU	55-25
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	55-15
	Dual pressure switch is defective	Replace the dual pressure switch	55-32
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	55-28
	Automatic compressor ECU is defective	Replace the automatic compressor-ECU	55-25
Blower fan and motor doesn't turn	Blower relay is defective	Replace the blower relay	55-16
	Blower fan and motor is defective	Replace the blower fan and motor	55-22, 26
	Resistor (for blower motor) is defective	Replace the resistor	55-22, 26
	Blower switch is defective	Replace the blower switch	55-18
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	55-18
	Blower relay is defective	Replace the blower relay	55-16
When the A/C is operating condenser fan does not turn.	Condenser fan motor is defective	Replace the condenser fan motor	55-35
	Condenser fan relay is defective	Replace the condenser fan relay	55-17
	Dual pressure switch is defective	Replace the dual pressure switch	55-32

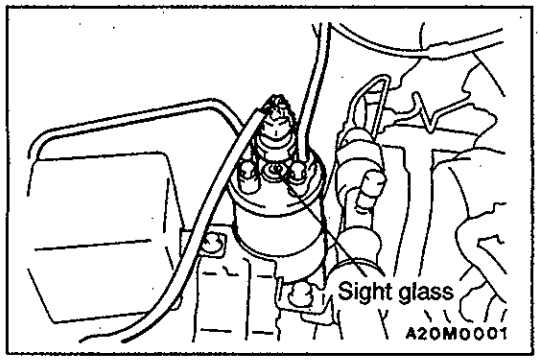
INSPECTION AT THE AUTOMATIC COMPRESSOR-ECU TERMINAL

55201030010



20M0065

Terminal No.	Check item	Checking requirements	Normal condition
1	Output from ECU to A/C compressor relay	A/C compressor relay: OFF	Battery voltage
		A/C compressor relay: ON	0 V
2	Input from A/C switch to ECU	A/C switch: OFF	0 V
		A/C switch: ON	Battery voltage
3	Earth	Always	0V

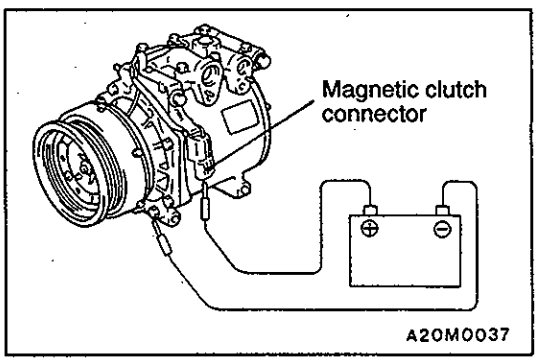


ON-VEHICLE SERVICE 55200840089

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.

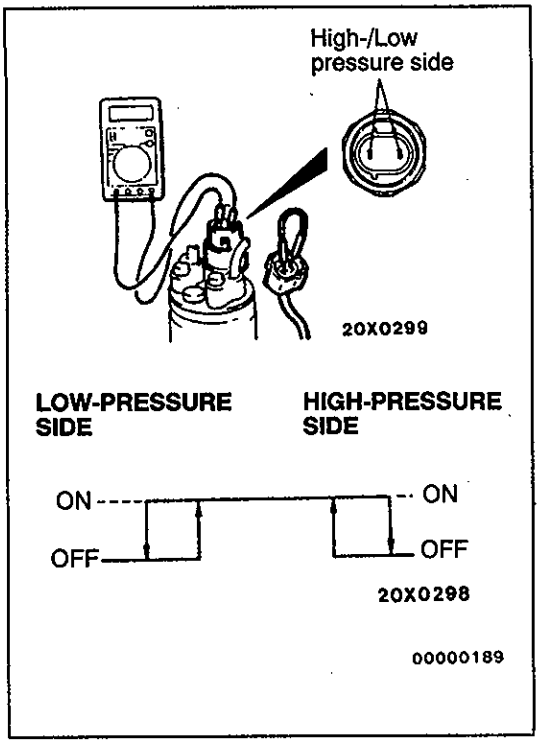


MAGNETIC CLUTCH TEST 55200850044

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

55201040105

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.

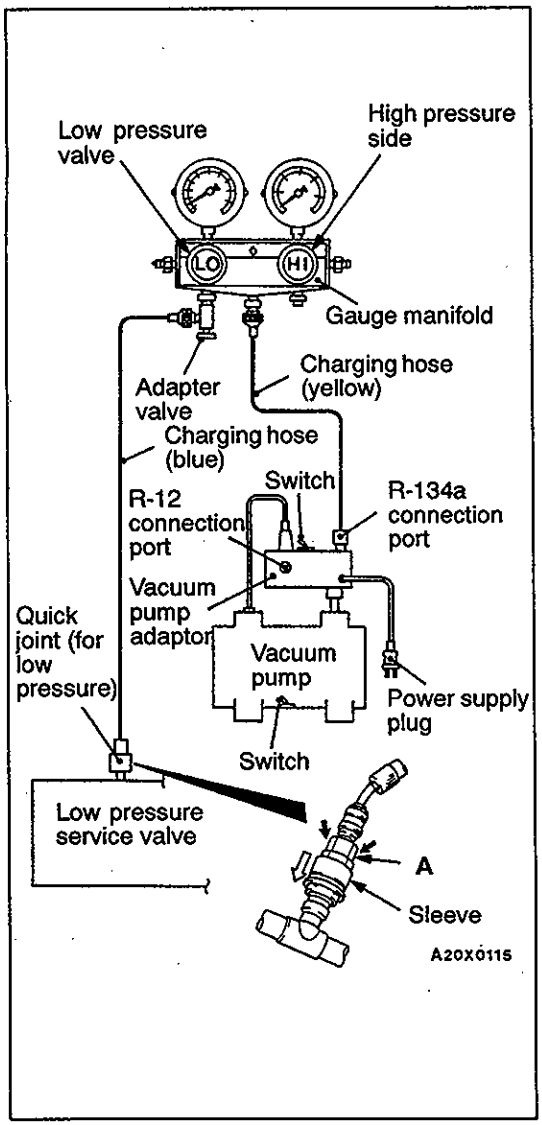
Unit: kPa

Items	Switch position	
	OFF → ON	ON → OFF
Low-pressure side	221	196
High-pressure side	2,550	3,138

COMPRESSOR DRIVE BELT ADJUSTMENT

55200100101

Refer to GROUP 11 – On-vehicle Service.



CHARGING

55200120046

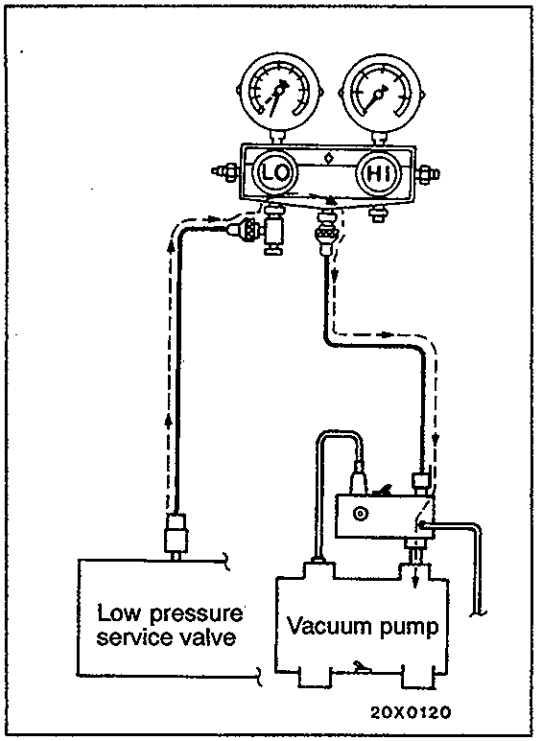
1. With the handles turned back all the way (valve closed), install the adaptor valve to the low-pressure side of the gauge manifold.
2. Connect the charging hose (blue) to the adaptor valve.
3. Connect the quick joint (for low pressure) to the charging hose (blue).
4. Connect the quick joint (for low 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.

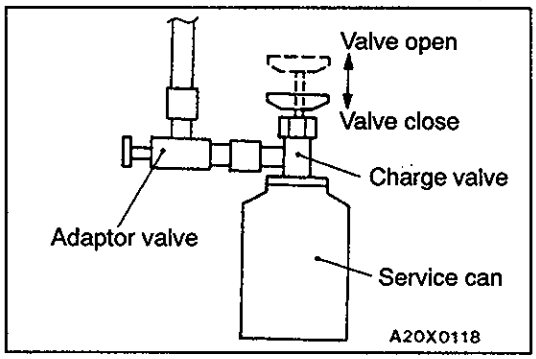
    Caution
    Do not operate the compressor for evacuation.

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.

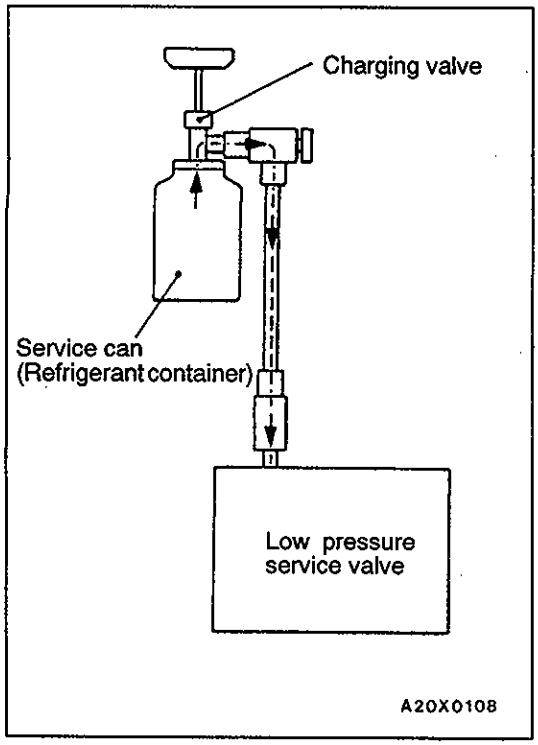
    Caution
    Do not operate the compressor in the vacuum condition; damage may occur.

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).

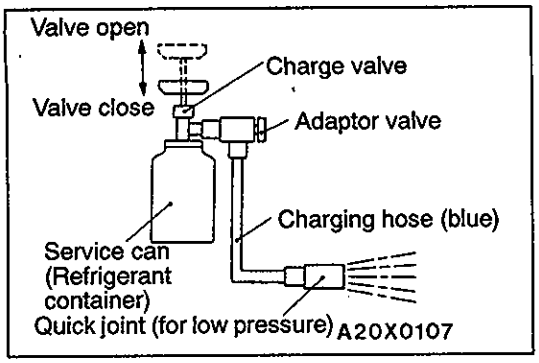
    Caution
    The leak detector for R-134a should be used.

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.

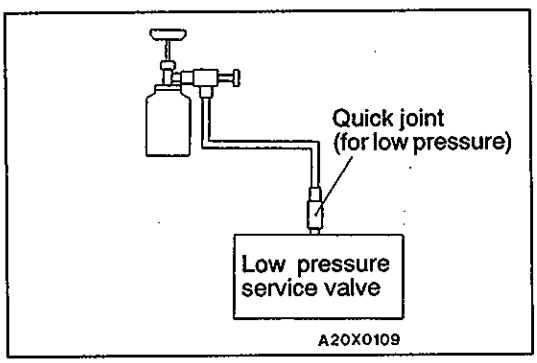
26. After charging with refrigerant, turn the handle of the adaptor valve back all the way (valve closed).
27. Tighten the charging valve handle (valve closed).
    Remove the quick joint (for low pressure) from the low-pressure service valve.

    NOTE
    If the service can is not emptied completely, keep the handles of the charging valve and adaptor valve closed for the next charging.



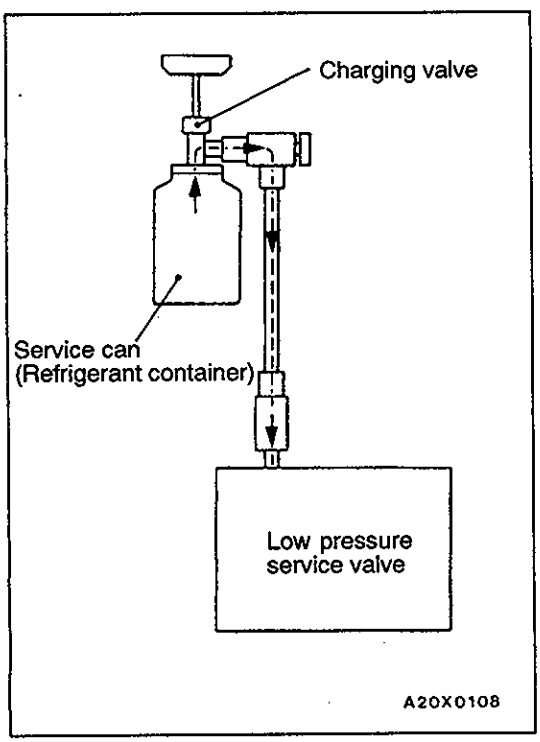
CORRECTING LOW REFRIGERANT LEVEL IN CASE THE SERVICE CAN IS USED.

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.

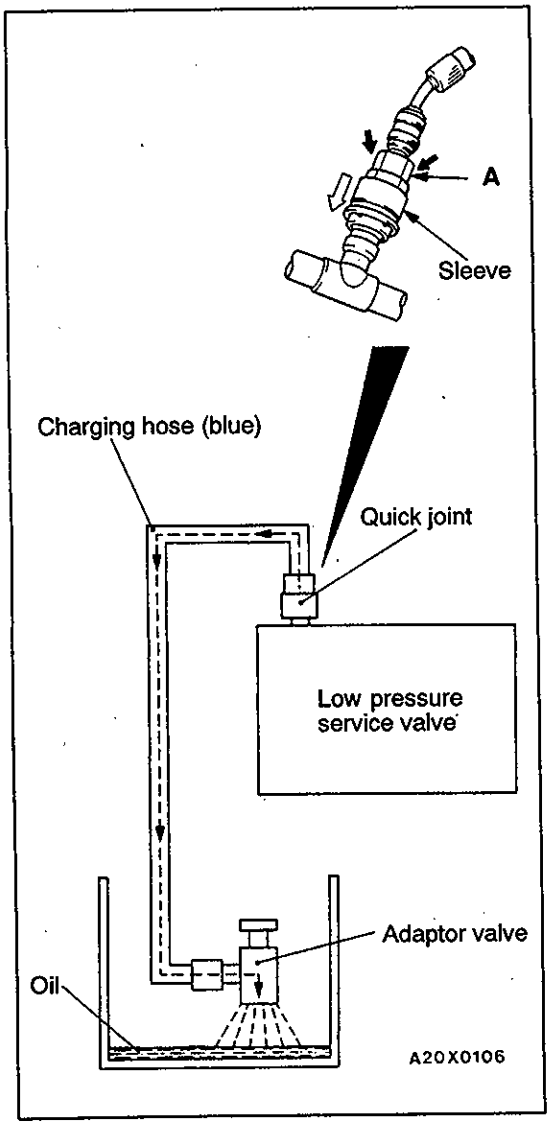


8. Start the engine.
9. Operate the air conditioner and set at the lowest temperature (MAX. COOL).
10. Fix the engine speed at 1,500 r/min.
11. Tighten the handle of the adaptor valve (valve open), and replenish refrigerant while checking the quantity through the sight glass.

    Caution
    If the service can is inverted, liquid refrigerant may be drawn 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.

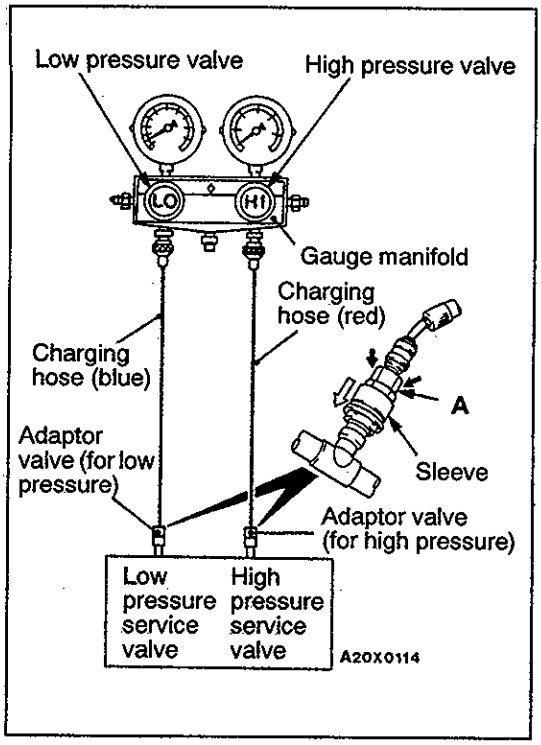
   NOTE
   Any oil remaining in the container should be returned to the A/C system.

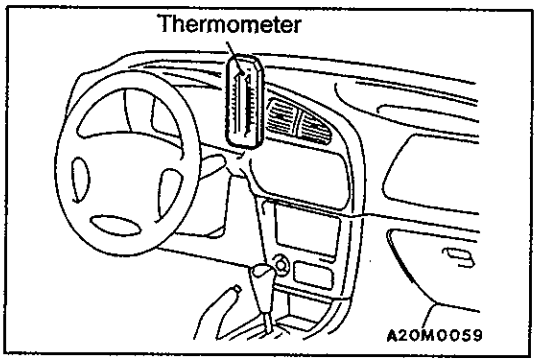
REFILLING OF OIL IN THE A/C SYSTEM

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

55200140103

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.

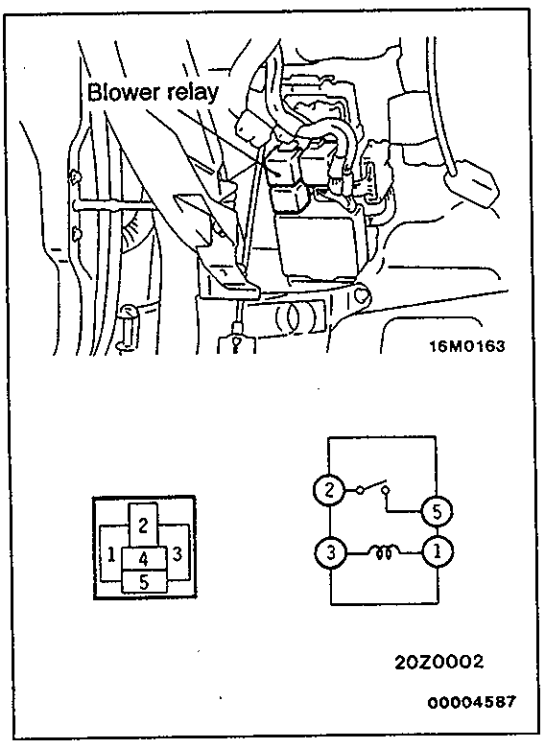
Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering or alternator).

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.

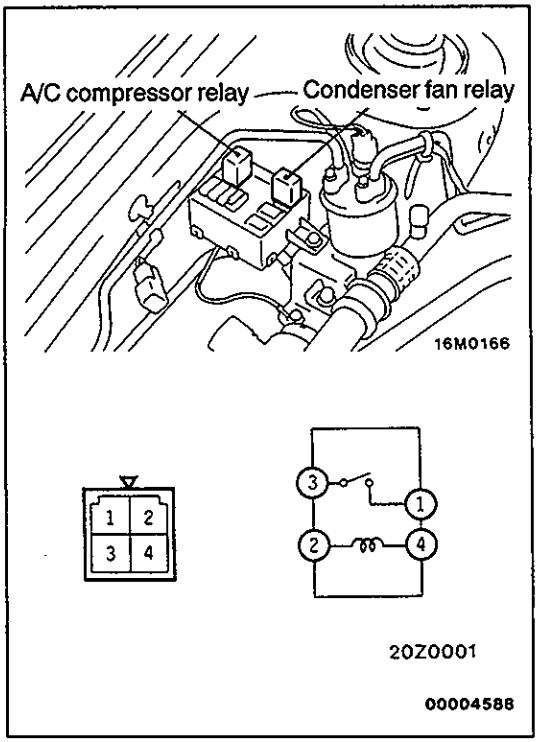


POWER RELAY CHECK

55200880111

BLOWER RELAY

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



A/C COMPRESSOR RELAY, CONDENSER FAN RELAY

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

IDLE-UP OPERATION CHECK 55200160116

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:
   <4G1, 4G9 (except MVV)> 750 ± 100 r/min
   <4G9 (MVV)> 700 ± 100 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 to be sure that the idle speed is at the standard value.

   Standard value: 850 ± 50 r/min

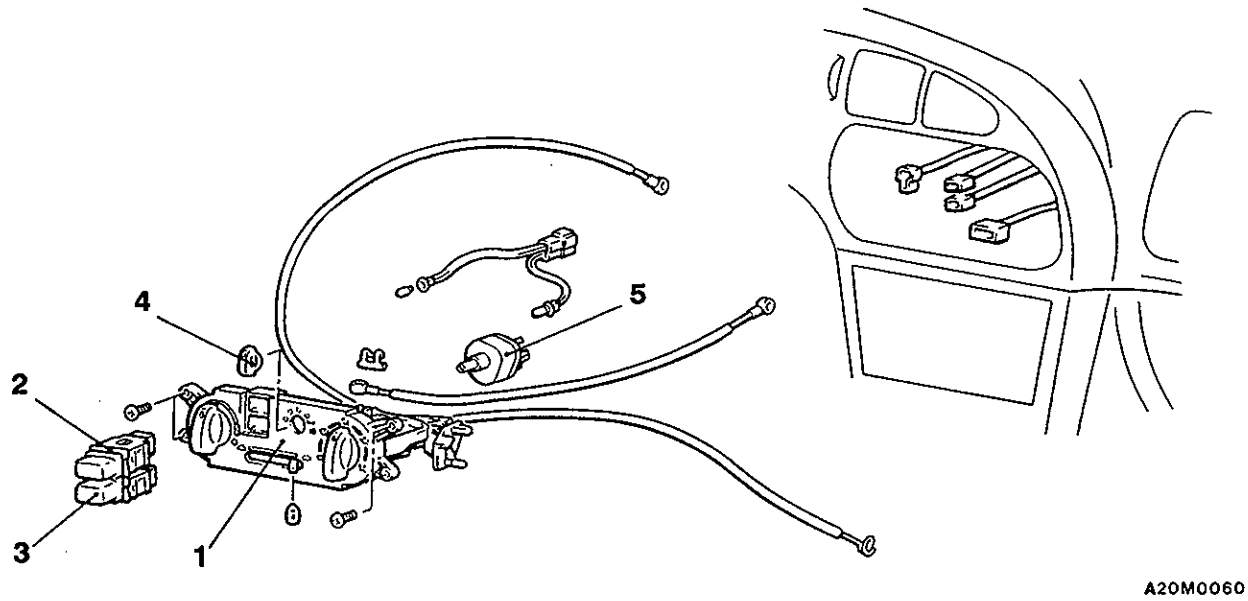
   NOTE
   There is no necessity to make an adjustment, because the idling speed is automatically adjusted by the ISC system. If, however, there occurs a deviation from the standard value for some reason, check the ISC system. (Refer to GROUP 13A – On-vehicle Service.)

HEATER CONTROL ASSEMBLY AND A/C SWITCH

55200240025

REMOVAL AND INSTALLATION

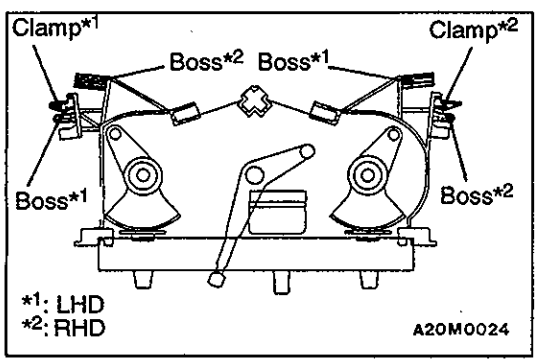
Pre-removal and Post-installation Operation
- Driver's side Lower Cover and Heater Control Panel Removal and Installation
- Floor Console Assembly Removal and Installation (Refer to GROUP 52A.)
- Foot Distribution Duct Removal and Installation (Refer to P.55-37.)



A20M0060

Removal steps

◀A▶ ▶A◀ 1. Heater control assembly
2. Rear window defogger switch
3. A/C switch
4. Knob
5. Blower switch

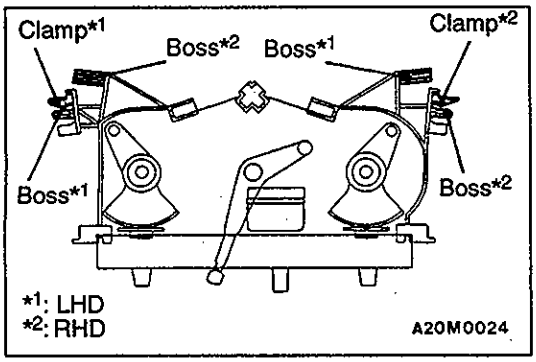


A20M0024

REMOVAL SERVICE POINT

◀A▶ HEATER CONTROL ASSEMBLY REMOVAL

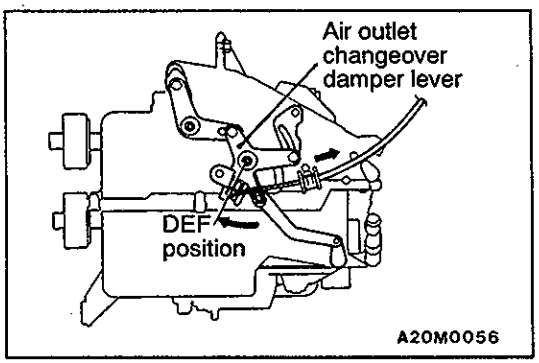
1. Remove the heater control assembly mounting screws.
2. Bend the two clamps and the four bosses, which are inserted into the centre reinforcement.
3. Remove the heater control assembly.



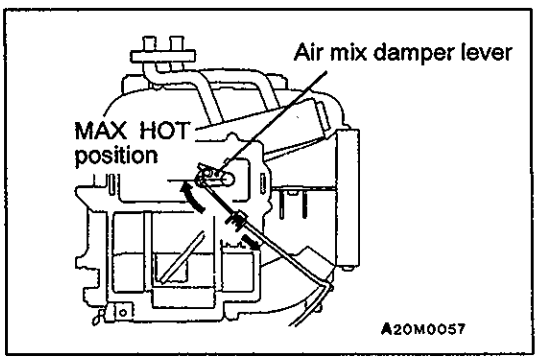
INSTALLATION SERVICE POINT

▶A◀ HEATER CONTROL ASSEMBLY INSTALLATION

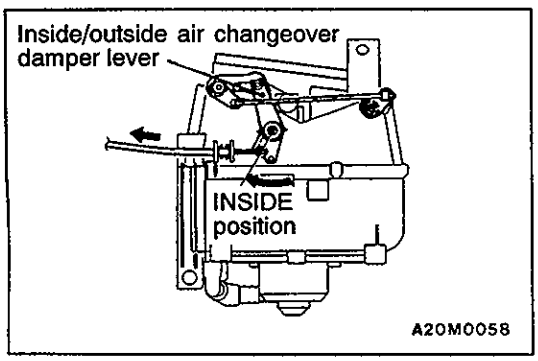
1. Cut off the bosses and clips shown before installing a new heater control assembly.
2. Install the heater control assembly mounting screws.



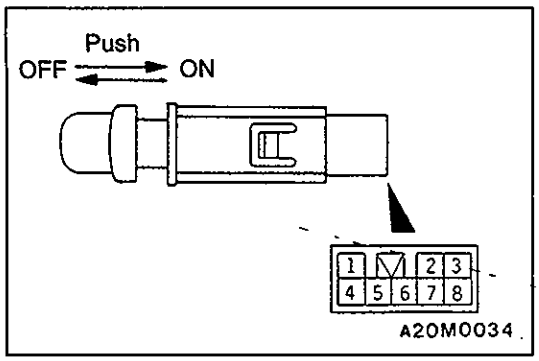
3. Follow the steps below to install the air outlet changeover damper lever cable.
   (1) Set the air outlet changeover control knob on the heater control assembly to the DEF position.
   (2) Set the air outlet changeover damper lever of the heater unit to the DEF position as shown in the illustration, 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 clip.

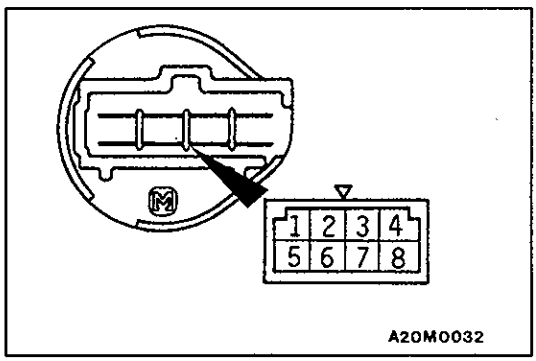


4. Follow the steps below to install the air mix damper lever cable.
   (1) Set the temperature control knob on the heater control assembly to the MAX HOT position.
   (2) Set the air mix damper lever of the heater unit to the MAX HOT position as shown in the illustration, and then connect the cable 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 clip.



5. Follow the steps below to install the inside/outside air changeover damper lever cable.
   (1) Set the inside/outside air changeover control knob on the heater control assembly to the INSIDE position.
   (2) Set the inside/outside air changeover damper lever of the heater unit to the INSIDE 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 clip.
6. After installation, ensure that each damper operates smoothly by operating the heater control assembly knob.





INSPECTION

55200250028

A/C SWITCH CONTINUITY CHECK

Switch position	Terminal No.						
	1	ILL	2	IND	4	5	7
OFF	○	⊘			○		
ON	○	⊘			○		
			○	⊘		○	○

BLOWER SWITCH CONTINUITY CHECK

55200900046

Switch position	Terminal No.						
	1	2	3	5	6	7	8
OFF							
● (LO)	○		○	○			○
● (ML)	○			○	○		○
● (MH)	○	○		○			○
● (HI)	○			○		○	○

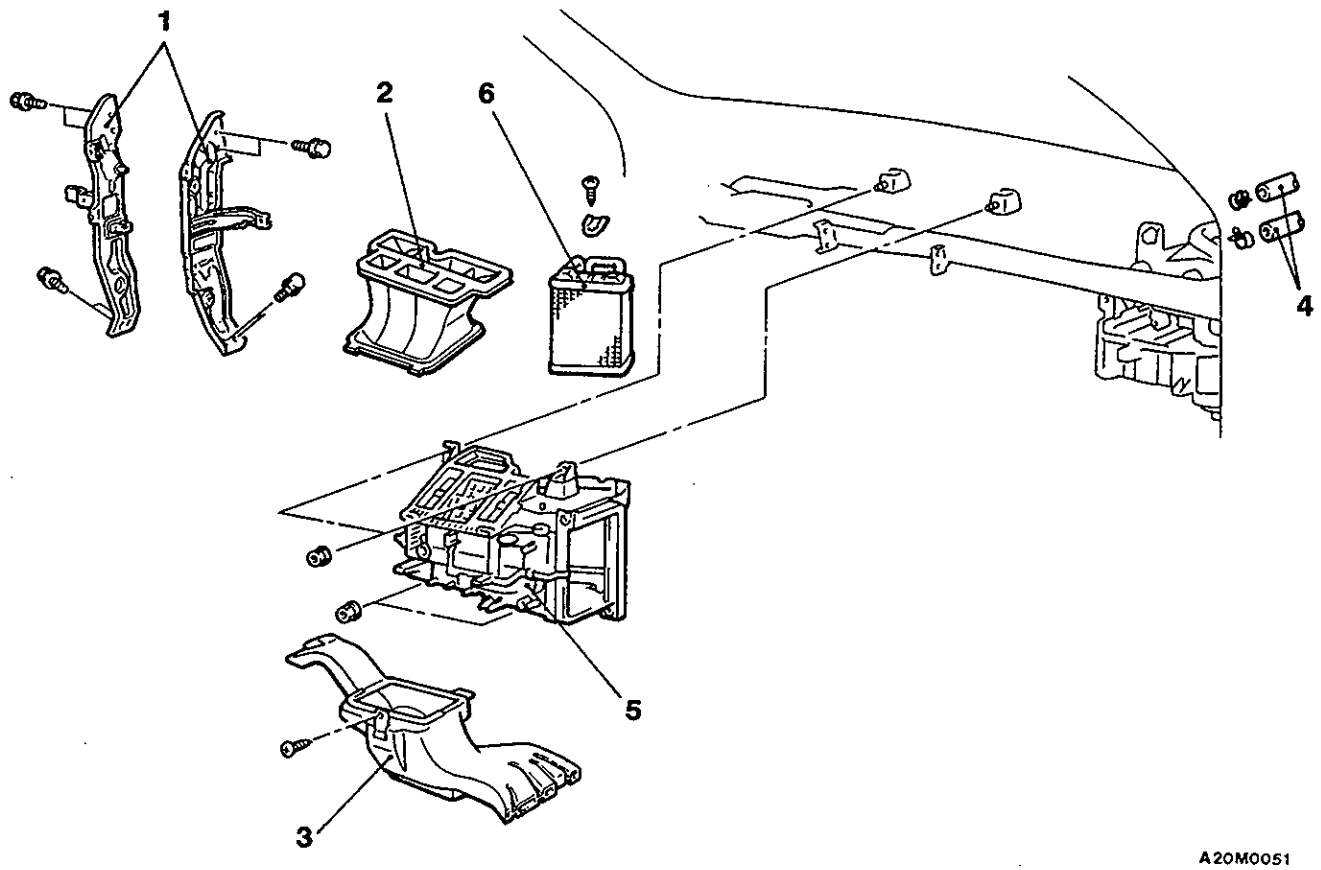
HEATER UNIT AND HEATER CORE

55100190112

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Draining and Refilling Engine Coolant (Refer to GROUP 14 – On-vehicle Service.)
- Air Cleaner Cover and Air Intake Hose Removal and Installation
- Instrument Panel Removal and Installation (Refer to GROUP 52A.)
- Joint Duct Removal and Installation <Vehicles without A/C> (Refer to P.55-22.)
- Evaporator Removal and Installation <L.H. drive vehicles with A/C> (Refer to P.55-24.)
- Evaporator and Blower Unit Removal and Installation <R.H. drive vehicles with A/C> (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.



A20M0051

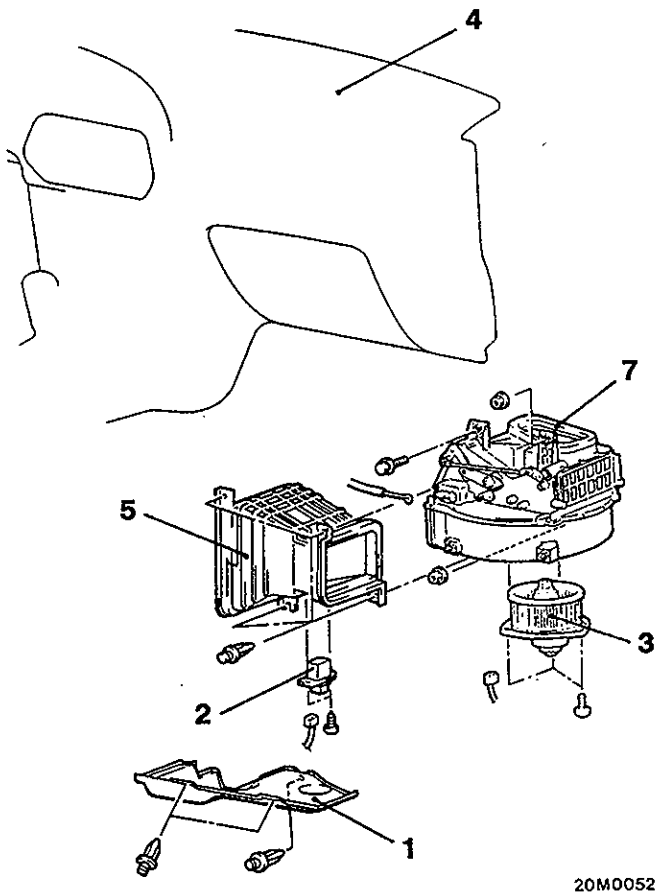
Removal steps
1. Center reinforcement
2. Center ventilation duct
3. Foot distribution duct
4. Heater hose connection
5. Heater unit
6. Heater core

BLOWER ASSEMBLY AND RESISTOR <EXCEPT R.H. DRIVE VEHICLES WITH A/C>

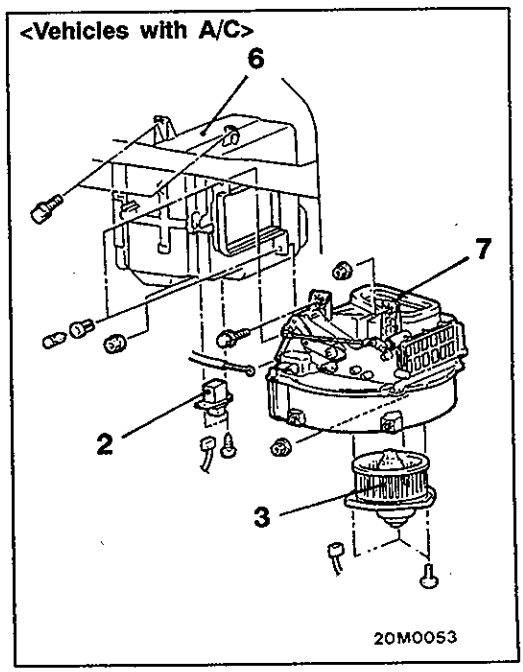
55100280116

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.



20M0052



00004633

Resistor removal steps

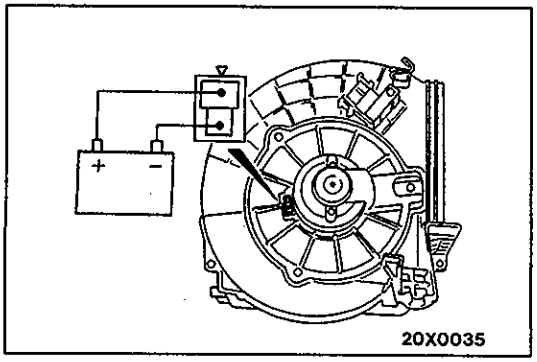
1. Under cover
2. Resistor

Blower fan and motor removal steps

1. Under cover
3. Blower fan and motor

Blower unit removal steps

4. Instrument panel (Refer to GROUP 52A.)
5. Joint duct <Vehicles without A/C>
6. Evaporator <Vehicles with A/C> (Refer to P.55-24.)
7. Blower unit assembly

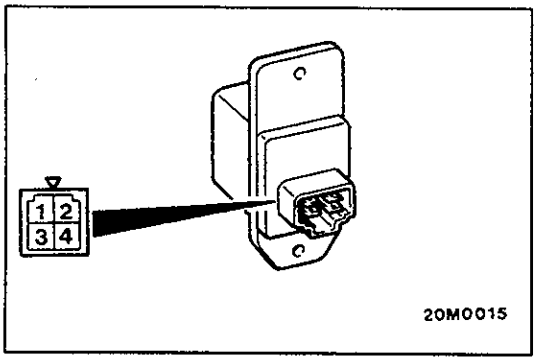


INSPECTION

55100290065

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:
<L.H. drive vehicles>

Measurement terminal	Standard value Ω
Between terminals 3 and 2 (LO)	2.21
Between terminals 3 and 4 (ML)	0.97
Between terminals 3 and 1 (MH)	0.35

<R.H. drive vehicles>

Measurement terminal	Standard value Ω
Between terminals 3 and 2 (LO)	2.81
Between terminals 3 and 4 (ML)	1.28
Between terminals 3 and 1 (MH)	0.33

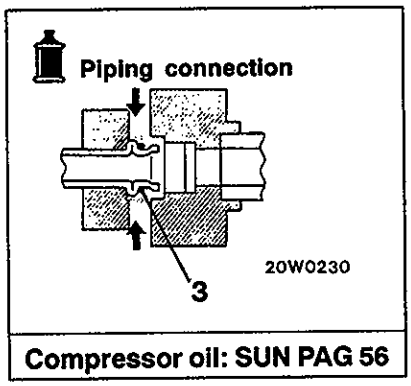
EVAPORATOR <L.H. DRIVE VEHICLES WITH A/C>

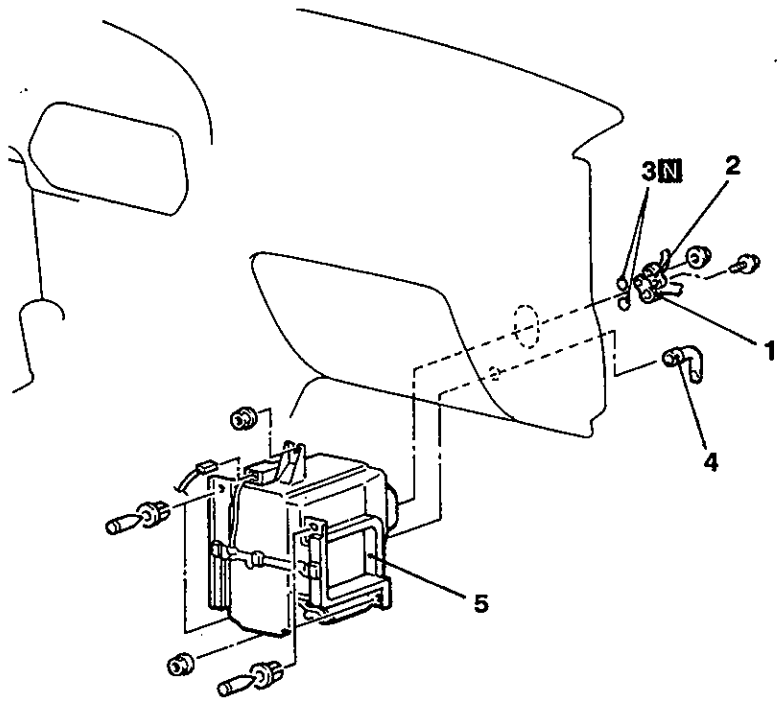
55200360080

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Discharging and Charging of Refrigerant (Refer to P.55-9.)
- Under Cover, Glove Box and Glove Box Frame Removal and Installation (Refer to GROUP 52A – Instrument Panel.)

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.





00004589

Removal steps

◀A▶ 1. Suction hose connection
◀A▶ 2. Discharge pipe connection
3. O-ring
4. Drain hose
▶A◀ 5. Evaporator

REMOVAL SERVICE POINT

◀A▶ SUCTION HOSE, DISCHARGE PIPE DISCONNECTION

Plug the disconnected hose and the evaporator 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.

INSTALLATION SERVICE POINT

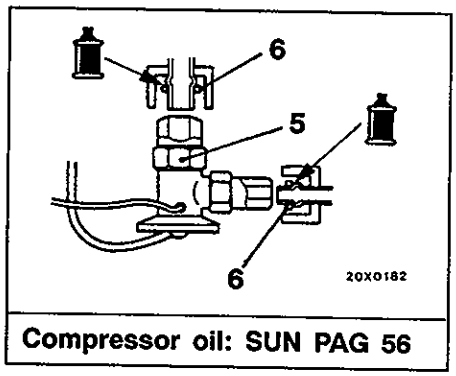
▶A◀ EVAPORATOR INSTALLATION

When replacing the evaporator, refill it with a specified amount of compressor oil and install it (to the vehicle).

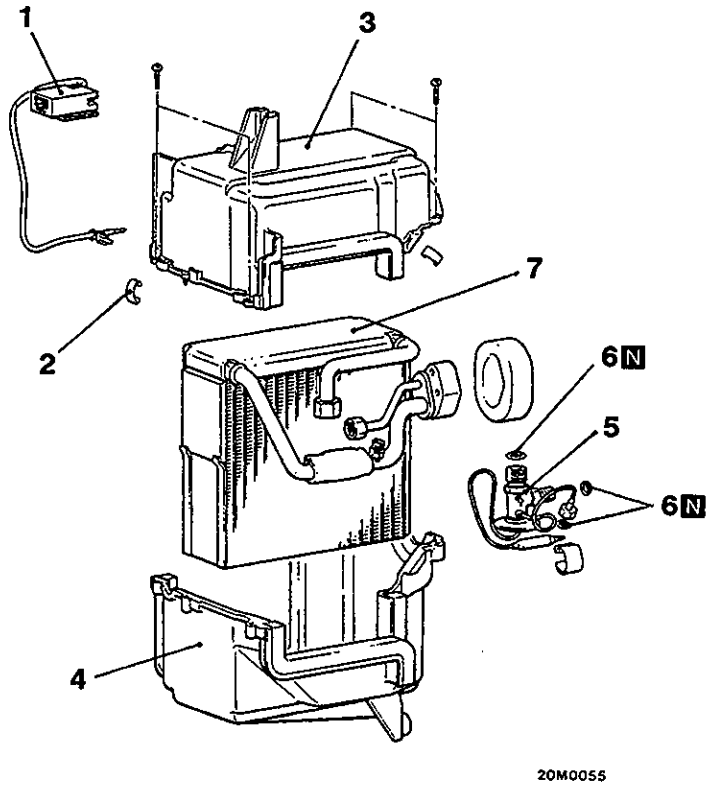
Compressor oil: SUN PAG 56
Quantity: 60 mℓ

DISASSEMBLY AND REASSEMBLY

55200380086



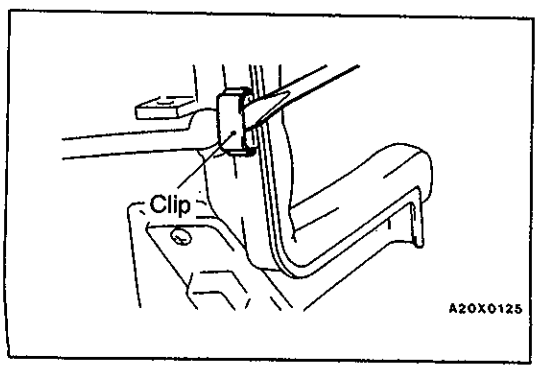
Compressor oil: SUN PAG 56



00004590

Disassembly steps

◀A▶
1. Clip
2. Evaporator cover (upper)
3. Thermostat (Automatic compressor ECU)
4. Evaporator cover (lower)
5. Expansion valve
6. O-ring
7. Evaporator



DISASSEMBLY SERVICE POINT

◀A▶ CLIP REMOVAL

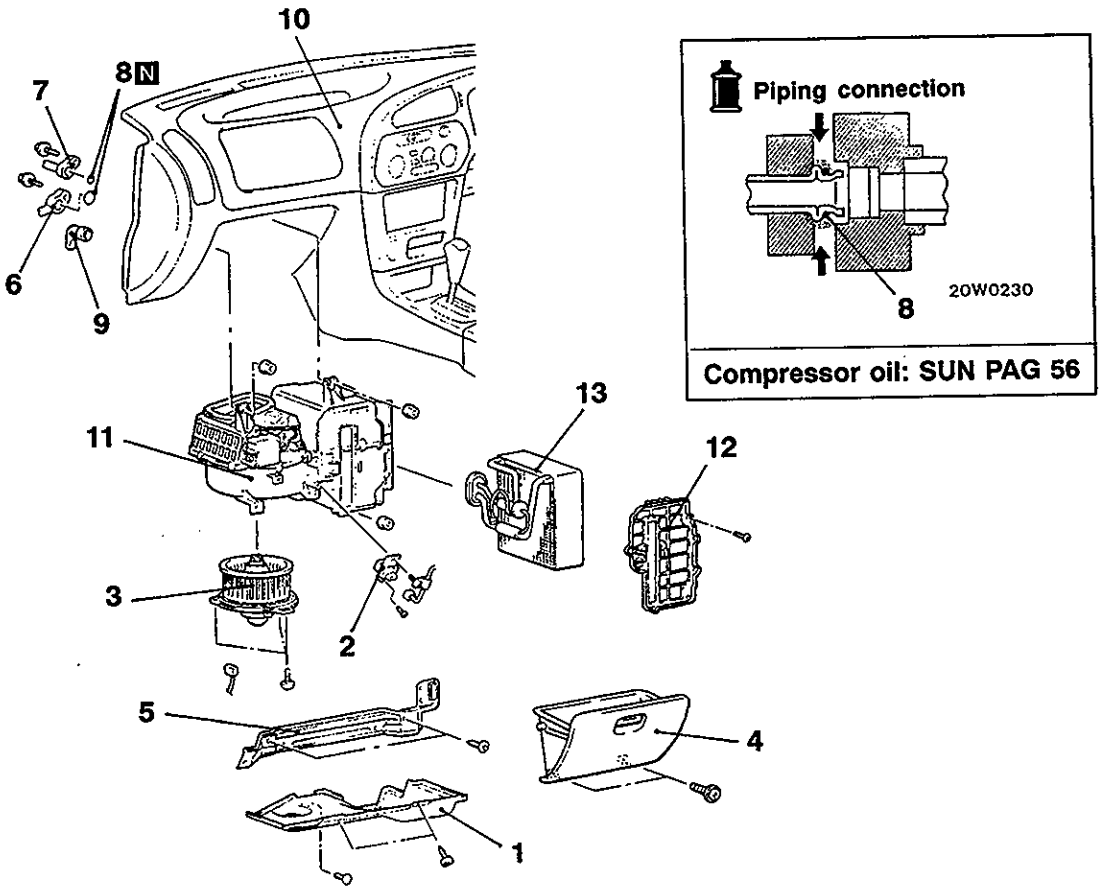
Remove the clips with a flat-tipped screwdriver covered with a shop towel to prevent damage to case surfaces.

EVAPORATOR, BLOWER UNIT AND RESISTOR <R.H. DRIVE VEHICLES WITH A/C>

55200360097

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.



Resistor removal steps
1. Under cover
2. Resistor

Blower fan and motor removal steps
1. Under cover
3. Blower fan and motor

Evaporator and blower unit removal steps
1. Under cover
4. Glove box
5. Glove box frame
- Discharging and charging of refrigerant (Refer to P.55-9.)
- Air cleaner cover and air intake hose

◀A▶ 6. Suction hose connection
◀A▶ 7. Discharge pipe connection
8. O-ring
9. Drain hose
10. Instrument panel (Refer to GROUP 52A.)
11. Evaporator and blower unit

Evaporator removal steps
1. Under cover
4. Glove box
5. Glove box frame
- Discharging and charging of refrigerant (Refer to P.55-9.)
- Air cleaner cover and air intake hose

◀A▶ 6. Suction hose connection
◀A▶ 7. Discharge pipe connection
8. O-ring
◀B▶ 12. Case cover
◀B▶ ▶A◀ 13. Evaporator

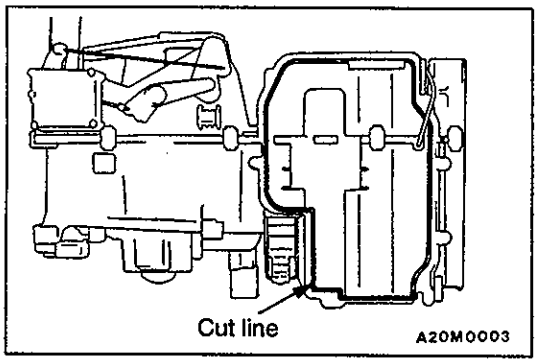
REMOVAL SERVICE POINTS

◀A▶ SUCTION HOSE, DISCHARGE PIPE DISCONNECTION

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

Caution

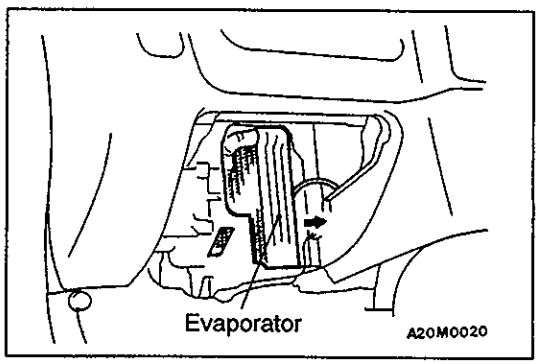
Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapour easily.



▶B◀ CASE COVER, EVAPORATOR REMOVAL

The evaporator, which has been installed in a factory, has no case cover. Follow the steps below to remove that evaporator.

1. Cut the case along the shown line to remove the cooling and blower unit.



2. Remove the air thermo sensor from the evaporator, and then remove the evaporator towards you, being careful not to damage its core.

INSTALLATION SERVICE POINT

▶B◀ 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

INSPECTION

55200370021

BLOWER FAN AND MOTOR CHECK

Refer to P.55-23.

RESISTOR CHECK

Refer to P.55-23.

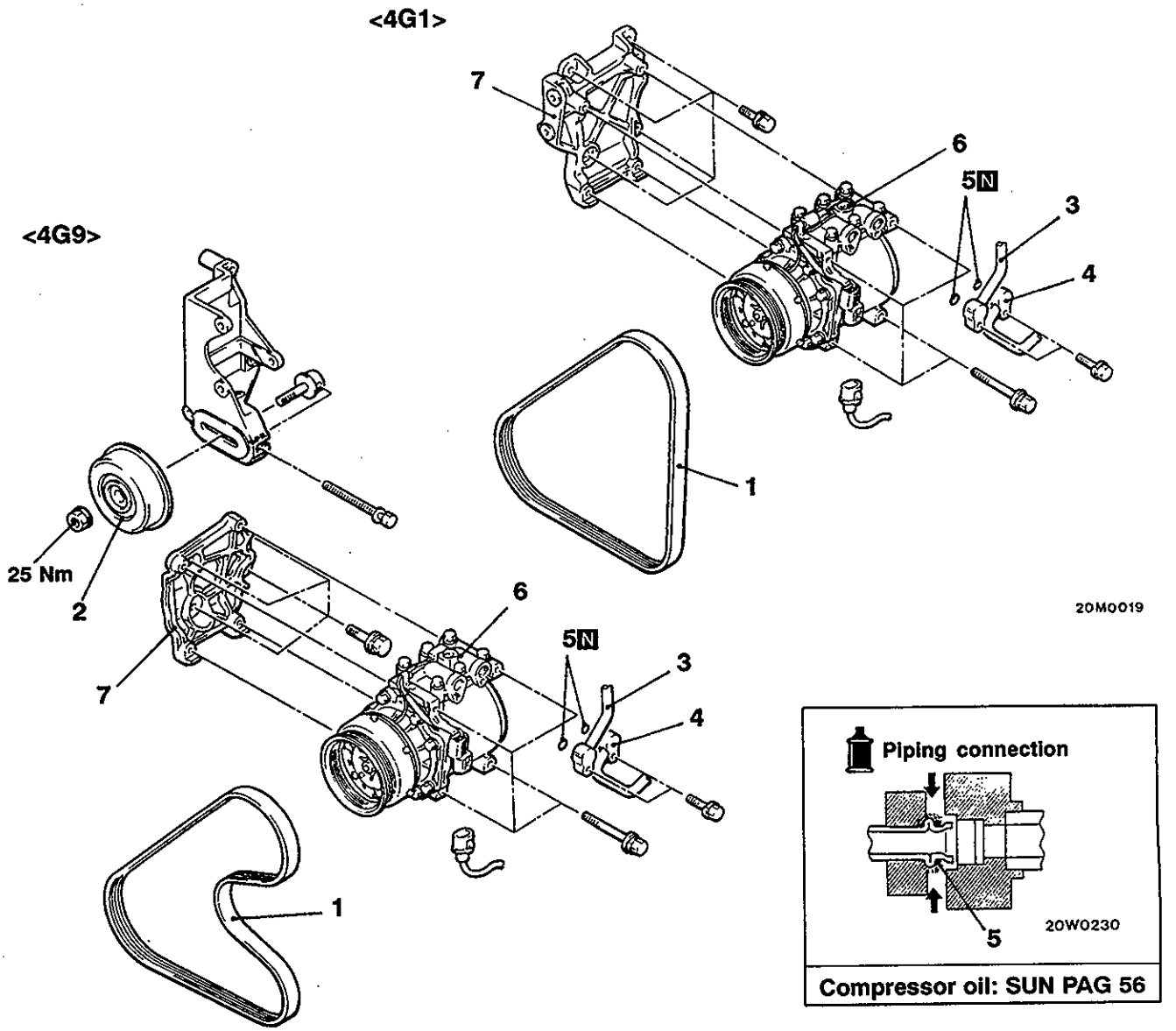
COMPRESSOR AND TENSION PULLEY

55200410150

REMOVAL AND INSTALLATION

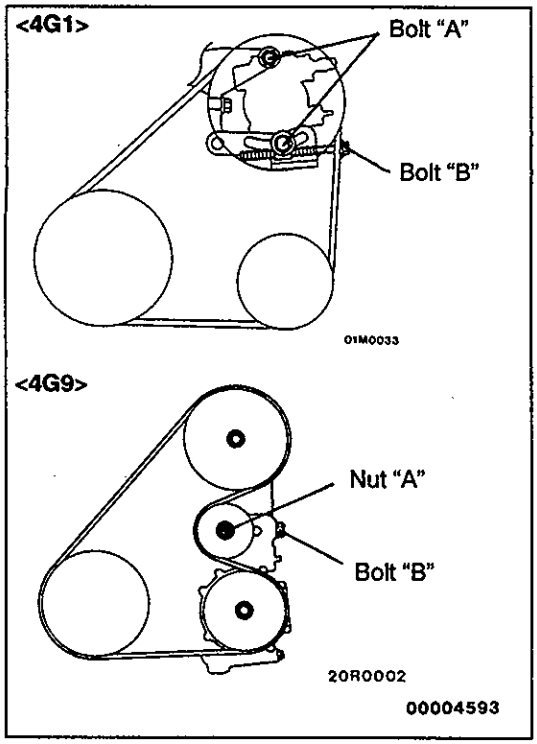
Pre-removal Operation
- Discharging of Refrigerant (Refer to P.55-9.)

Post-installation Operation
- Drive Belt Tension Adjustment (Refer to GROUP 11 – On-vehicle Service.)
- Charging of Refrigerant (Refer to P.55-9.)



Removal steps

◀A▶ 1. Drive belt
2. Tension pulley <4G9>
◀B▶ 3. Suction hose connection
◀B▶ 4. Discharge hose connection
5. O-ring
◀C▶ ▶A◀ 6. Compressor
7. Compressor bracket



REMOVAL SERVICE POINTS

◀A▶ DRIVE BELT REMOVAL

1. Loosen the bolts "A" <4G1> or nut "A" <4G9> for holding.
2. Loosen the bolt "B" for adjustment.
3. Remove the drive belt.

◀B▶ SUCTION HOSE, DISCHARGE HOSE DISCONNECTION

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

Caution
Seal the hoses completely, otherwise the compressor oil and receiver will absorb water vapour easily.

◀C▶ COMPRESSOR REMOVAL

When doing this work, be careful not to spill the compressor oil.

INSTALLATION SERVICE POINT

▶A◀ COMPRESSOR INSTALLATION

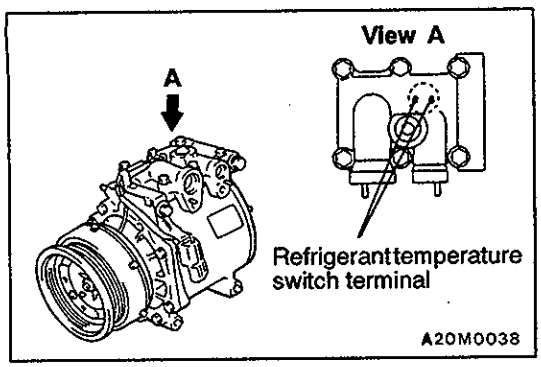
If a new compressor is installed, first adjust the amount of oil according to the procedures described below, and then install the compressor.

(1) Measure the amount (X mℓ) of oil within the removed compressor.
(2) Drain (from the new compressor) the amount of oil calculated according to the following formula, and then install the new compressor.
New compressor oil amount

120 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

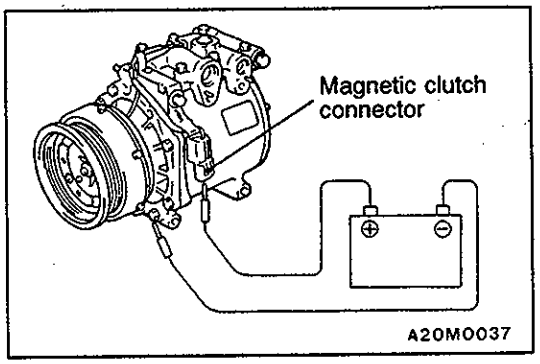


INSPECTION

55200930052

REFRIGERANT-TEMPERATURE SWITCH SIMPLE CHECK

When the A/C is off, check that there is continuity between the refrigerant-temperature switch terminals. If no, replace the compressor assembly.



COMPRESSOR MAGNETIC CLUTCH OPERATION INSPECTION

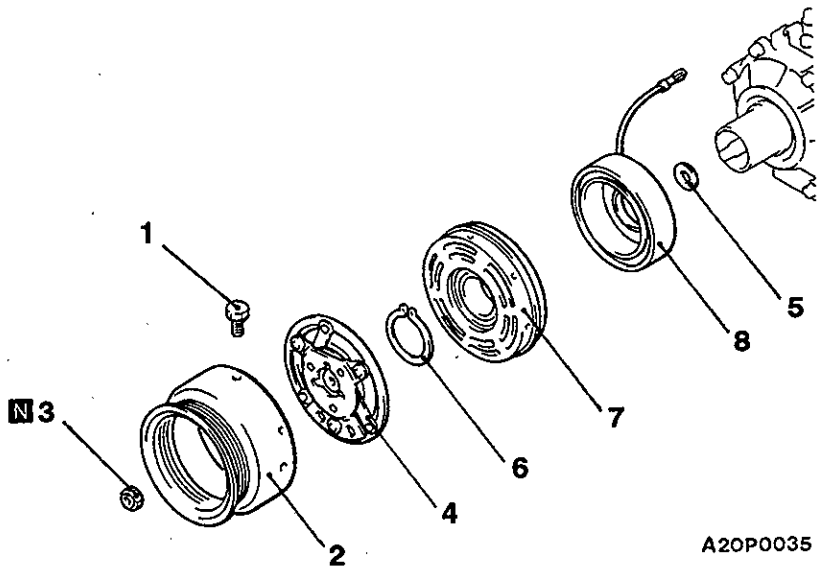
55200850075

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

55200460117

DISASSEMBLY AND REASSEMBLY

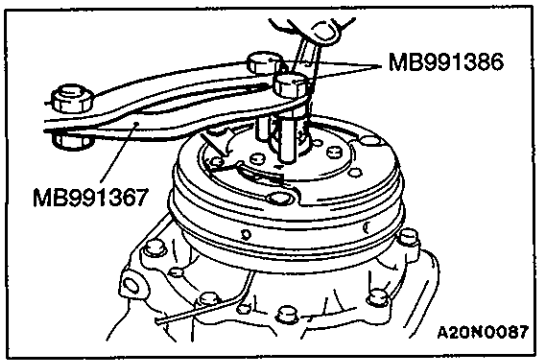


Disassembly steps

◀A▶ ▶E◀ ▶D◀ ▶C◀
1. Bolt
2. Pulley
● Air gap adjustment
3. Nut
4. Armature plate

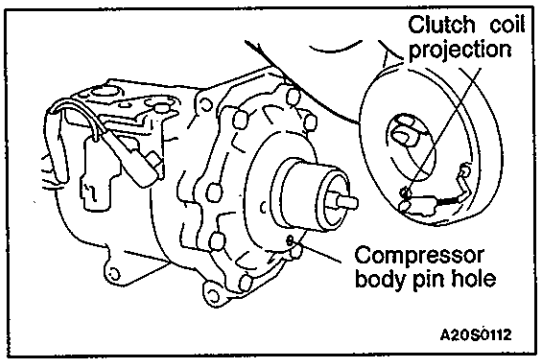
▶B◀
5. Shims
6. Snap ring
7. Rotor

▶A◀
8. Clutch coil



DISASSEMBLY SERVICE POINT

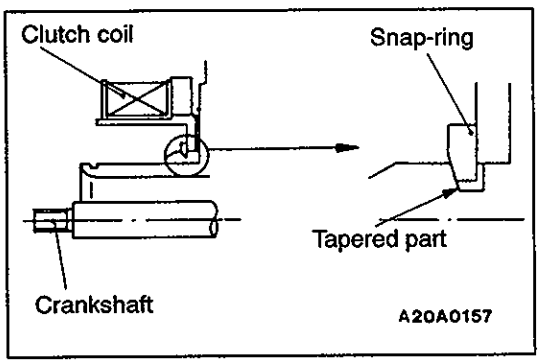
◀A▶ NUT REMOVAL



REASSEMBLY SERVICE POINTS

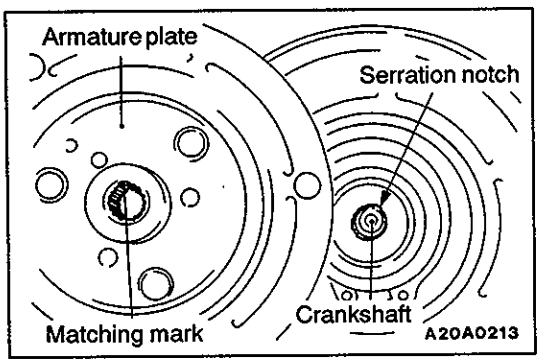
▶A◀ CLUTCH COIL INSTALLATION

When installing the clutch coil to the A/C compressor body, install so that the pin hole of the A/C compressor body and the clutch coil projection are aligned.



▶B◀ SNAP RING INSTALLATION

Install the snap ring so that the tapered surface is at the outer side.

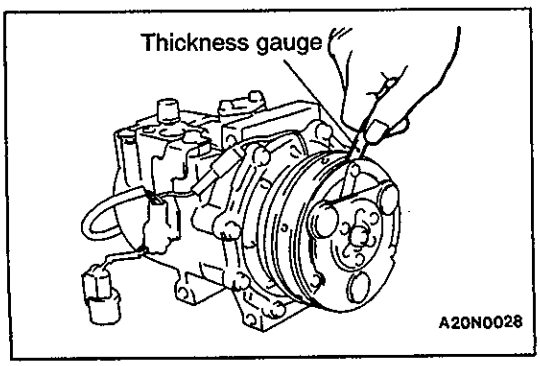


▶C◀ ARMATURE PLATE INSTALLATION

Align the mating mark of the crankshaft spline and the mating mark of the armature plate, and then fit them together.

▶D◀ NUT INSTALLATION

Use the special tool to hold the magnet clutch, and tighten the nut in the same manner as removal.



▶E◀ AIR GAP ADJUSTMENT

Check whether or not the air gap of the clutch is within the standard value.

Standard value: 0.40–0.65 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.

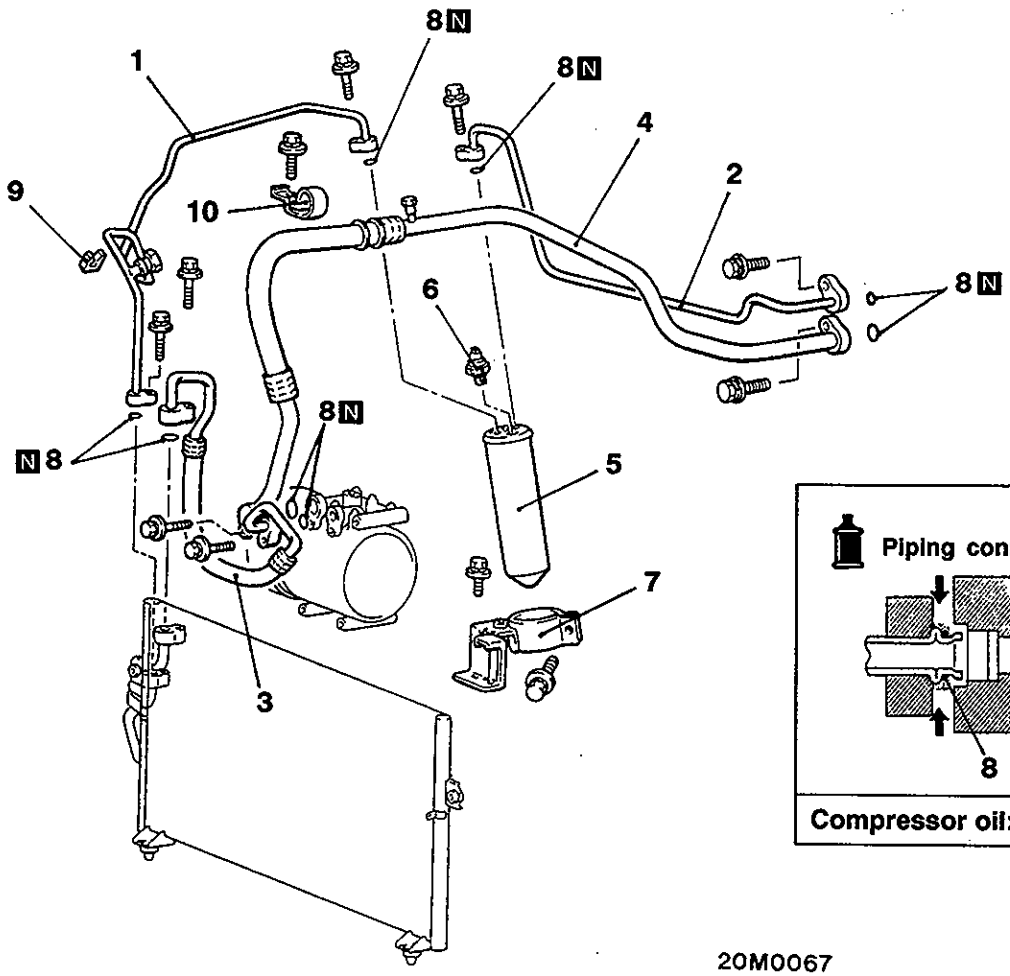
REFRIGERANT LINE

55200640122

REMOVAL AND INSTALLATION

<L.H. DRIVE VEHICLES>

Pre-removal and Post-installation Operation
- Discharging and Charging of Refrigerant (Refer to P.55-9.)



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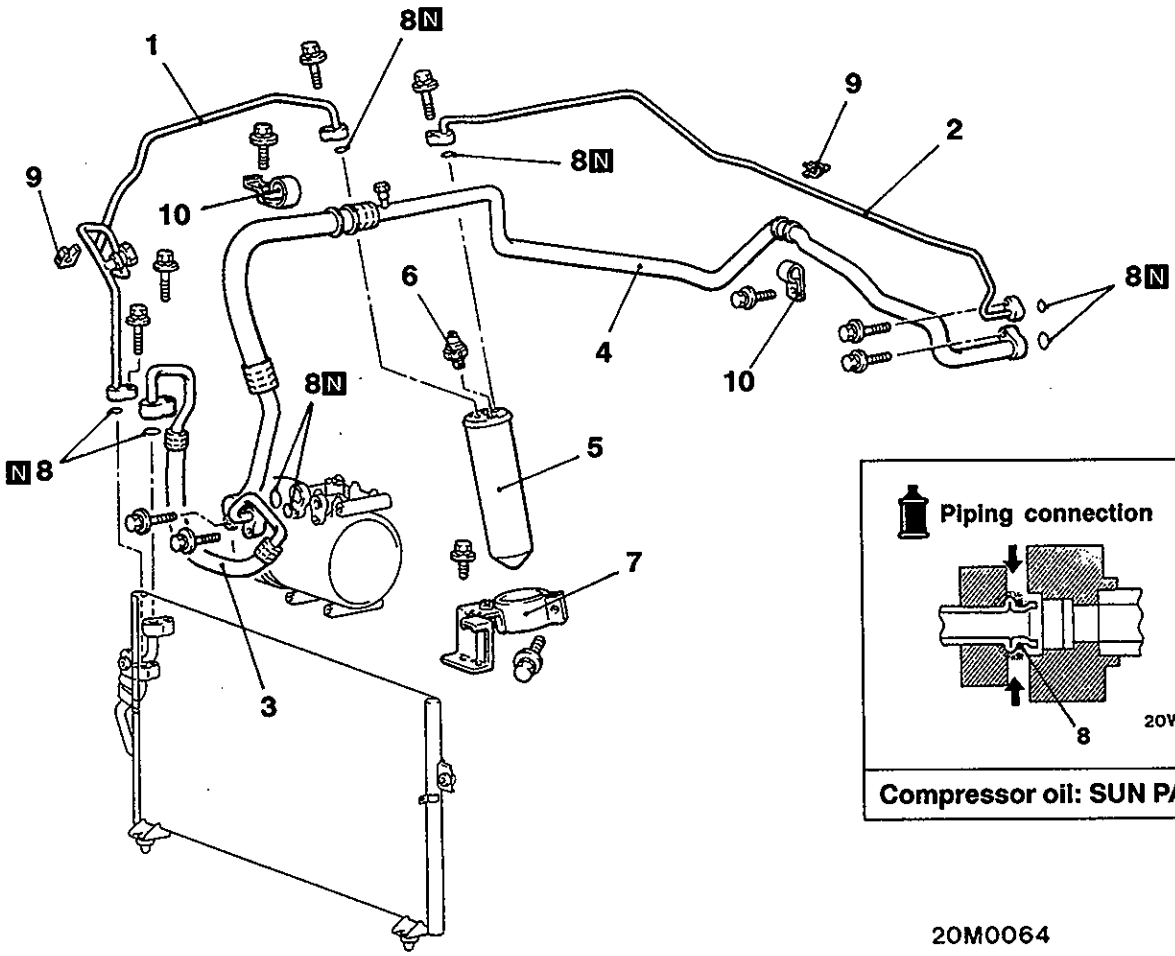
◀A▶ 1. Discharge pipe A
◀A▶ 2. Discharge pipe B
◀A▶ 3. Discharge hose
◀A▶ 4. Suction hose
◀A▶ ▶A◀ 5. Receiver assembly
6. Dual pressure switch
7. Receiver bracket
8. O-ring
9. Clip
10. Clamp

<R.H. DRIVE VEHICLES>

Pre-removal and Post-installation Operation
- Discharging and Charging of Refrigerant (Refer to P.55-9.)
- Air Cleaner Cover and Air Intake Hose Removal and Installation



◀A▶ 1. Discharge pipe A
◀A▶ 2. Discharge pipe B
◀A▶ 3. Discharge hose
◀A▶ 4. Suction hose
◀A▶ ▶A◀ 5. Receiver assembly
6. Dual pressure switch
7. Receiver bracket
8. O-ring
9. Clip
10. Clamp

REMOVAL SERVICE POINT

◀A▶ HOSE/PIPE/RECEIVER ASSEMBLY DISCONNECTION

Plug the disconnected hose, the receiver, the evaporator 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.

INSTALLATION SERVICE POINT

▶A◀ SUCTION HOSE/RECEIVER ASSEMBLY INSTALLATION

When replacing the suction hose or receiver assembly, refill them with a specified amount of compressor oil, and then install them.

Compressor oil: SUN PAG 56

Quantity:
Suction hose: 10 mℓ
Receiver assembly: 10 mℓ

CONDENSER AND CONDENSER FAN MOTOR

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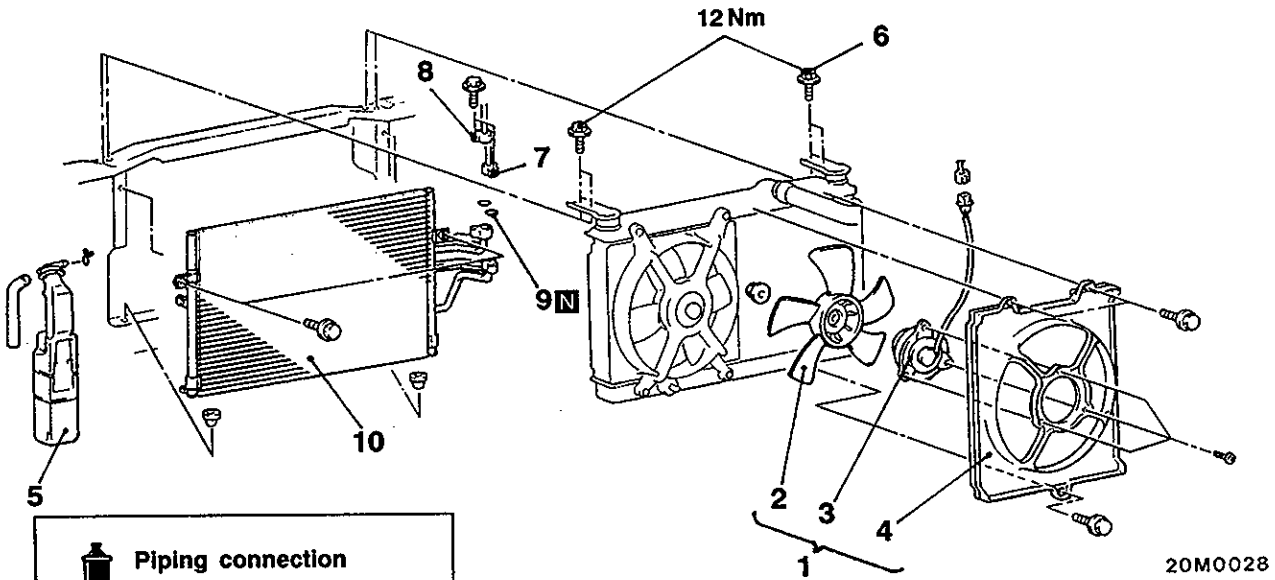
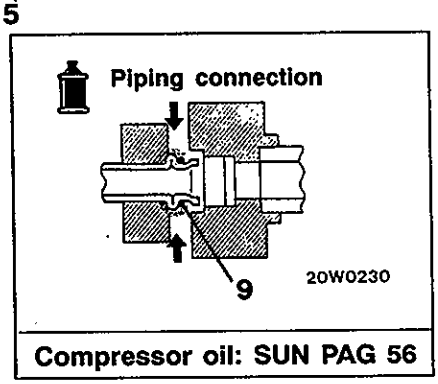
REMOVAL AND INSTALLATION





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Condenser fan motor removal steps

1. Condenser fan motor and shroud assembly
2. Condenser fan
3. Condenser fan motor
4. Shroud

Condenser removal steps

- Discharging and charging of refrigerant (Refer to P.55-9.)

5. Reserve tank
6. Upper insulator installation bolt
7. Discharge pipe A connection
8. Discharge hose connection
9. O-ring
10. Condenser

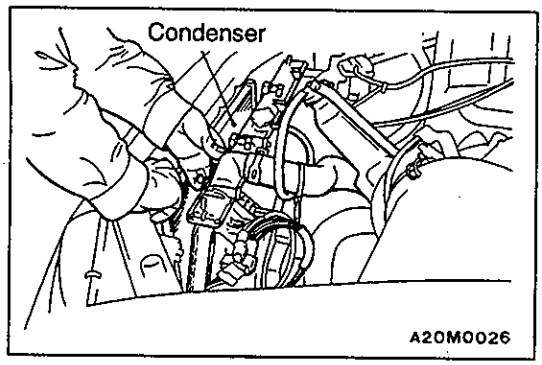
◀A▶ ◀A▶ ◀B▶ ▶A◀

REMOVAL SERVICE POINTS

◀A▶ DISCHARGE PIPE "A" /DISCHARGE HOSE DISCONNECTION

Plug the disconnected pipe, hose and the condenser 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.



◀B▶ CONDENSER REMOVAL

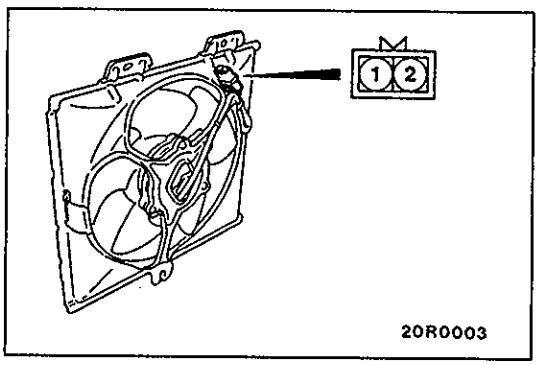
Move the radiator to the engine side and then lift up the condenser to remove it.

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

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CONDENSER FAN MOTOR CHECK

Check to be sure that the condenser fan motor operates when battery voltage is applied to terminal 1 and terminal 2 earthed.

VENTILATORS

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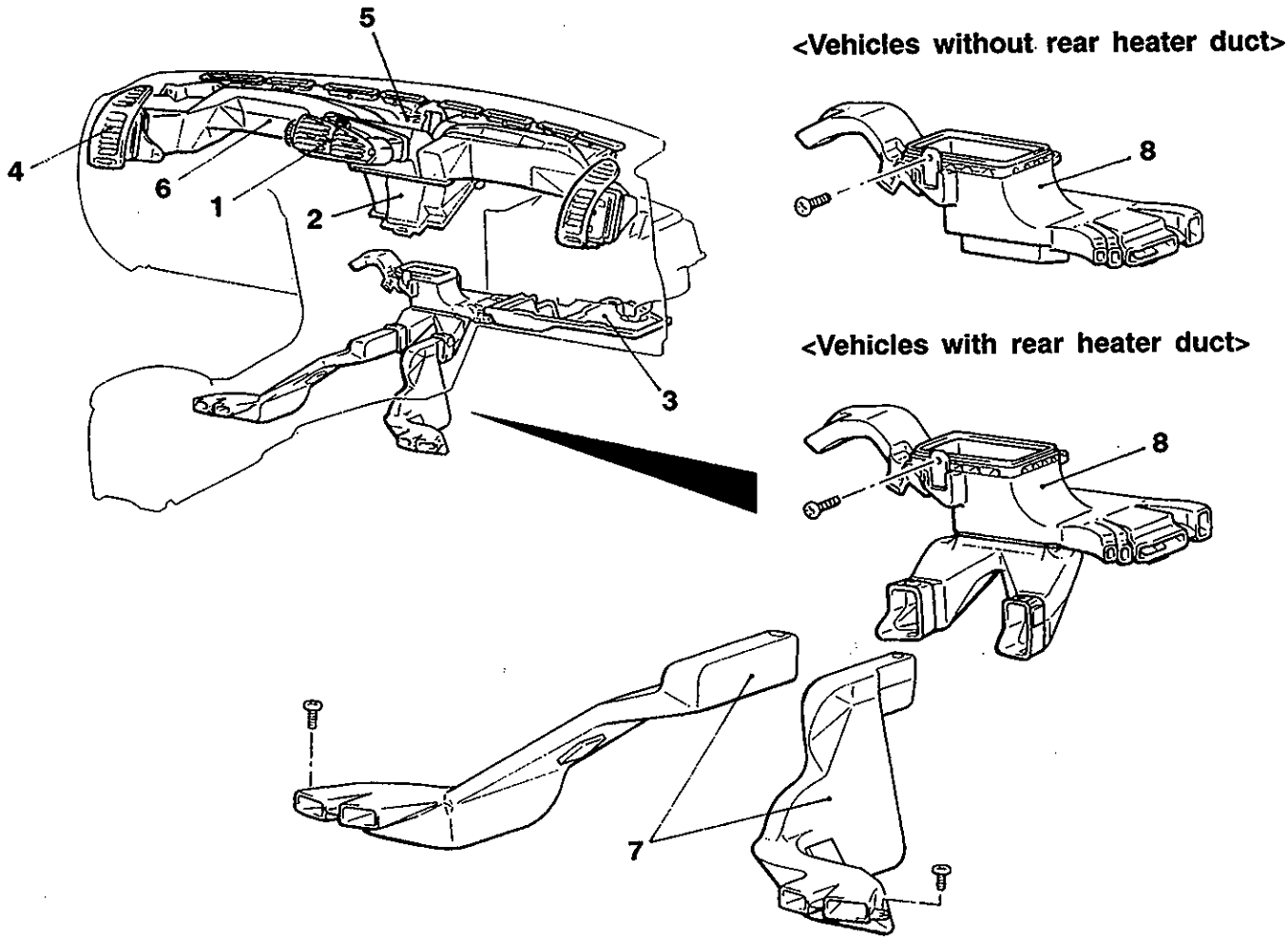
REMOVAL AND INSTALLATION

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.



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1. Center air outlet assembly (Refer to GROUP 52A – Instrument Panel.)
2. Center ventilation duct (Refer to P.55-21.)
3. Under cover
4. Side air outlet assembly (Refer to GROUP 52A – Instrument Panel.)
5. Defroster nozzle (Refer to GROUP 52A – Instrument Panel.)
6. Distribution duct (Refer to GROUP 52A – Instrument Panel.)

Rear heater duct removal steps

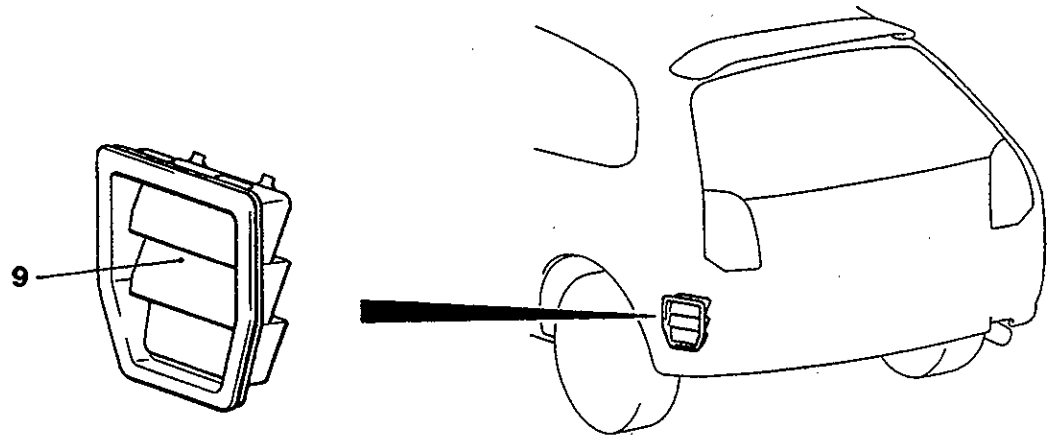
- Front seat assembly (Refer to GROUP 52A.)
- Floor console assembly (Refer to GROUP 52A.)

7. Rear heater duct

- Radio and tape player (Refer to GROUP 54.)

8. Foot distribution duct

<Hatchback>



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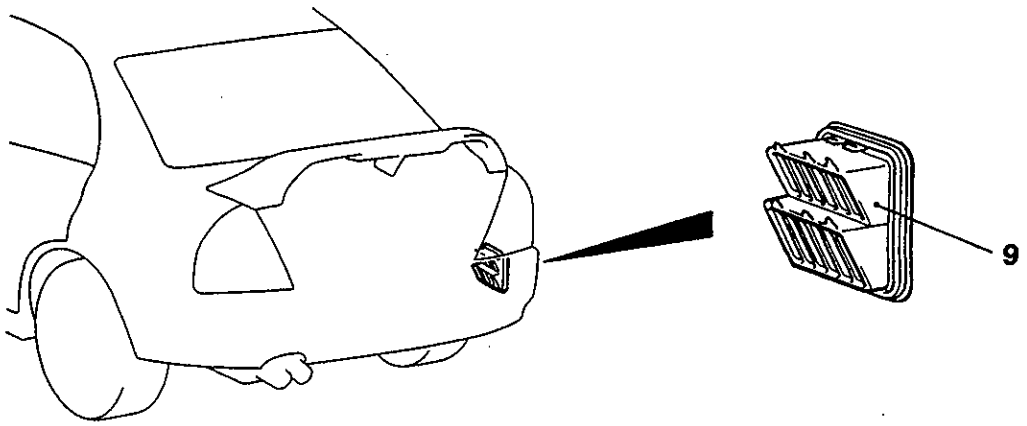
<Sedan>



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Rear ventilation duct removal steps

- Rear bumper (Refer to GROUP 51.)
- Quarter trim <Hatchback> (Refer to GROUP 52A.)
- Trunk side trim <Sedan> (Refer to GROUP 52A.)

9. Rear ventilation duct

NOTE
A rear ventilation duct for Hatchback is equipped on the right side also.

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