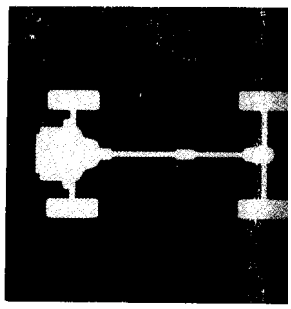
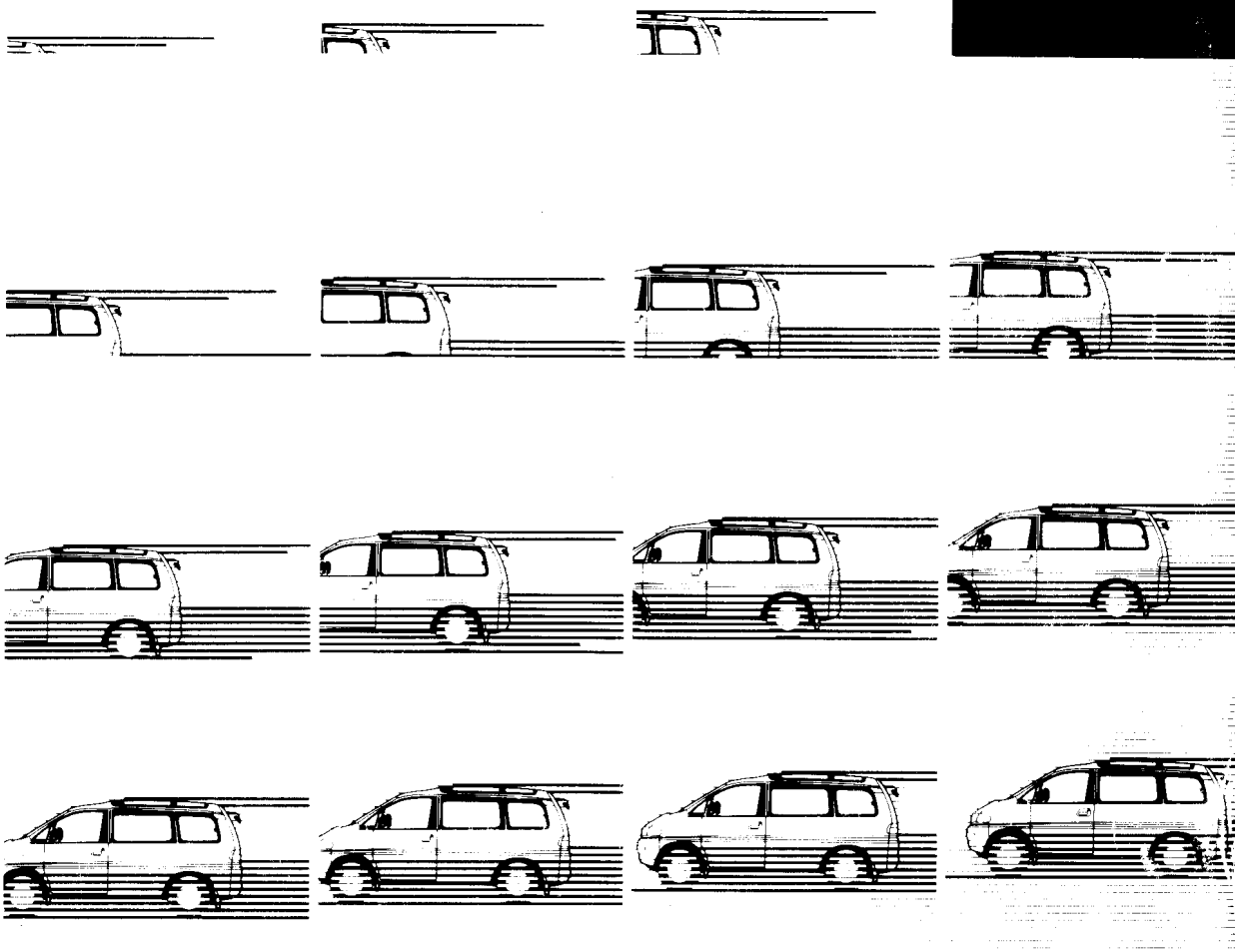
MITSUBISHI MOTORS

Workshop Manual

chassis

MITSUBISHI L400 '95





Pub. No. PWWE9410

120002190

MITSUBISHI L400

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	PYWE9410
WORKSHOP MANUAL	
ENGINE GROUP	PWEE □□□□ (Looseleaf edition)
ELECTRICAL WIRING	PHWE9407
BODY REPAIR MANUAL	PBWE9404
PARTS CATALOGUE	B603A805A□

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

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WARNING!

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

(2) If it is possible that the SRS components are subjected to heat over 93°C in baking or in drying after painting, remove the SRS components (air bag module, SRS diagnosis unit, front impact sensors) beforehand.

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

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

NOTE

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

GENERAL

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HOW TO USE THIS MANUAL

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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 the separate manuals covering the engine and the transmission.

SERVICE ADJUSTMENT PROCEDURES

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

INSPECTION

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

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.
MPI :	Indicates the multi-point injection, or engines equipped with the multi-point injection.
DIESEL :	Indicates a diesel engine, or models equipped with such an engine.
2WD :	Indicates the rear wheel-drive vehicles.
4WD :	Indicates the 4 wheel-drive vehicles.

EXPLANATION OF MANUAL CONTENTS

120000612

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

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

Indicates (by symbols) where lubrication is necessary.

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

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

Classifications of Major Maintenance / Service Points

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

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

Symbols for Lubrication, Sealants and Adhesives

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

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

: Sealant or adhesive

: Brake fluid or automatic transmission fluid

: Engine oil, gear oil or air conditioner compressor oil

: Adhesive tape or butyl rubber tape

Indicates the group title.

Indicates the section title.

Indicates the group number.

Indicates the page number.

STEERING – Power Steering Oil Pump 37A-29

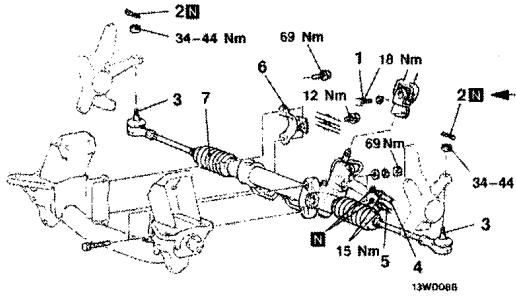
POWER STEERING GEAR BOX

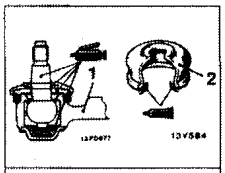
120000039

REMOVAL AND INSTALLATION

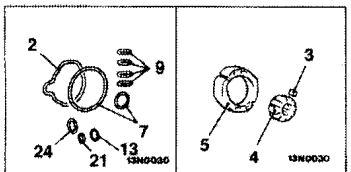
Pre-removal Operation
(1) Power Steering Fluid Draining (Refer to P. 37A-10.)
(2) Air Cleaner Assembly Removal
(3) Under Cover Removal (Refer to GROUP 42 – Under Cover.)

<2WD>





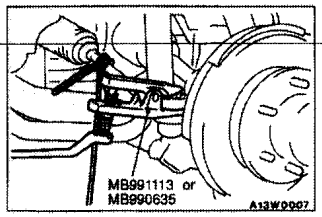
Sealant: 3M ATD Part No. 8661 or equivalent



Oil pump seal kit | Oil pump cartridge kit

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

◀A▶ ◀B▶



REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

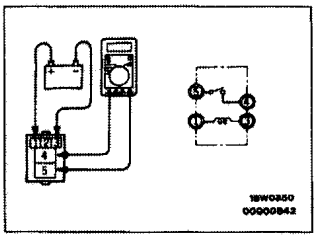
Caution
1. **Using the special tool, loosen the tie rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
2. **Support the special tool with a cord, etc. to prevent it from coming off.**

Denotes non-reusable part.

Denotes tightening torque.

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

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



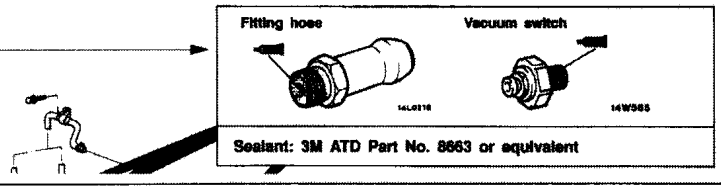
HEADLAMP RELAY CONTINUITY INSPECTION

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

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

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

Lubrication and sealing points



Sealant: 3M ATD Part No. 8663 or equivalent

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

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HOW TO USE TROUBLESHOOTING / INSPECTION SERVICE POINTS

120000613

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

TROUBLESHOOTING CONTENTS

1. STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

The main procedures for diagnostic troubleshooting are shown.

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. DIAGNOSTIC FUNCTION

The following diagnostic functions are shown.
- Method of reading diagnostic codes
- Method of erasing diagnostic codes
- Input inspection service points

4. INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

5. INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

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

6. INSPECTION CHART FOR TROUBLE SYMPTOMS

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

7. INSPECTION PROCEDURE FOR DIAGNOSTIC SYMPTOM

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

8. SERVICE DATA REFERENCE TABLE

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

9. CHECK AT ECU TERMINALS

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

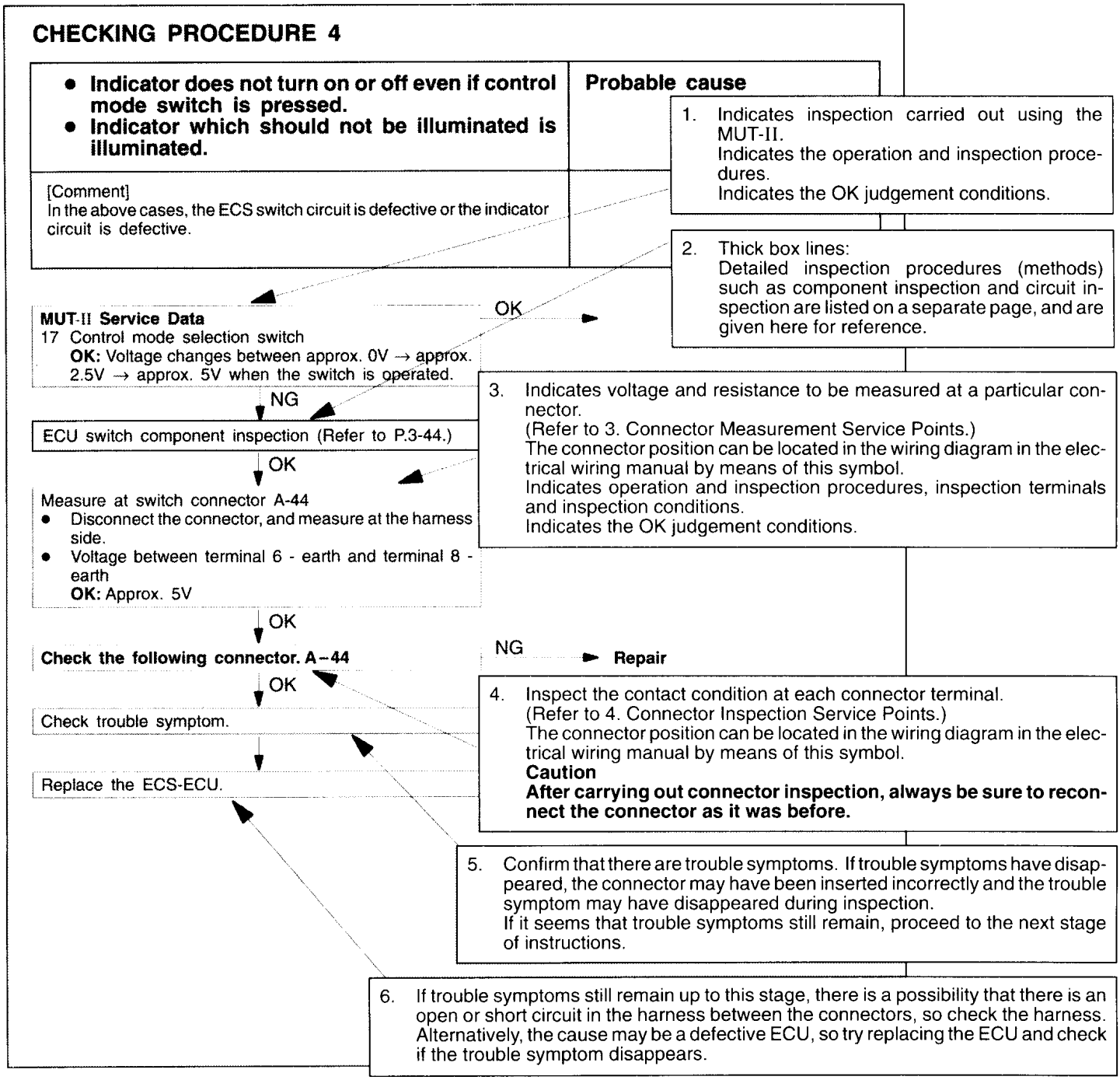
10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE

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

HOW TO USE THE INSPECTION PROCEDURES

120000614

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

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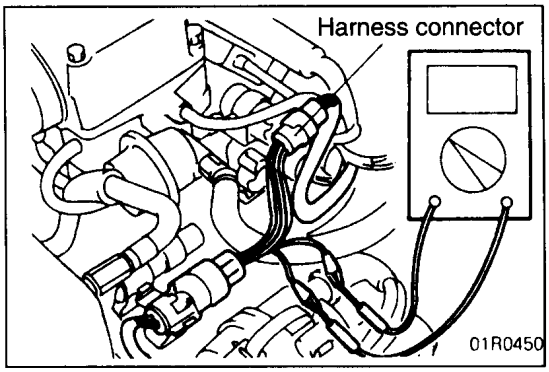
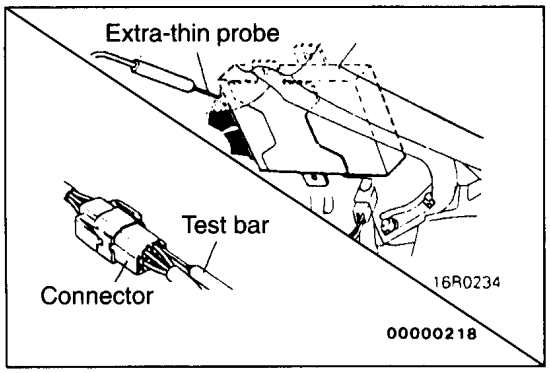
Turn the ignition switch to OFF when connecting and disconnecting the connectors, and turn the ignition switch to ON when measuring if there are no instructions to the contrary.



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

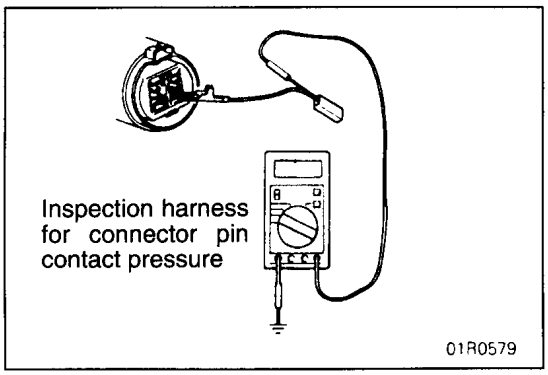
Waterproof Connectors

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



Ordinary (non-waterproof) Connectors

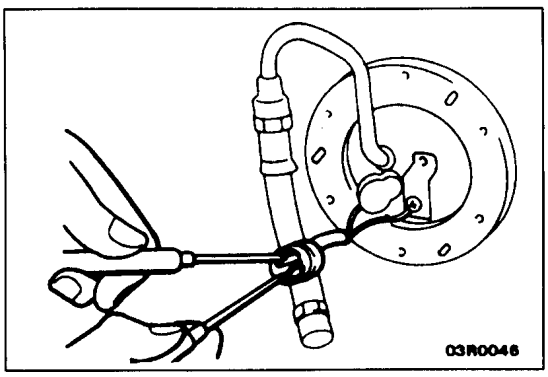
Check by inserting the test bar from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test bar, it should not be forced; use a special tool (the extra-thin probe in the harness set for checking) for this purpose.



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.

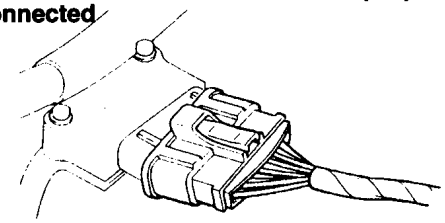


<When Inspecting a Male Pin>

Touch the pin directly with the test bar.

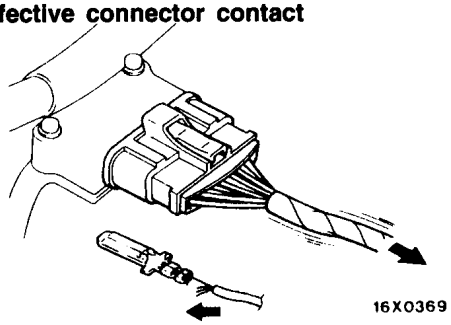
Caution
At this time, be careful not to short the connector pins with the test bars. To do so may damage the circuits inside the ECU.

Connector disconnected or improperly connected



16S0256

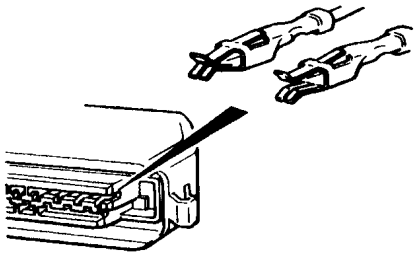
Defective connector contact



16X0369

Harness wire breakage at terminal section

Low contact pressure



16S0254
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CONNECTOR INSPECTION

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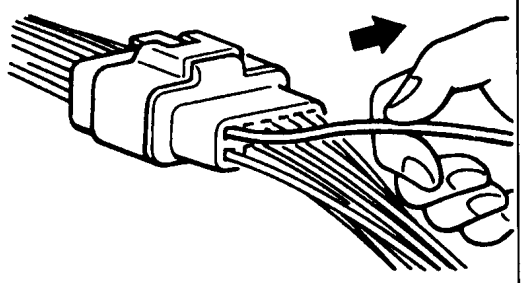
VISUAL INSPECTION

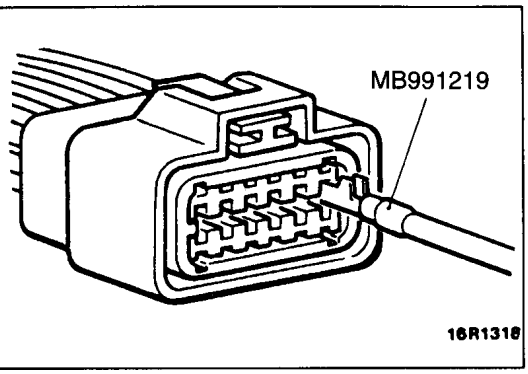
- Connector is disconnected or improperly connected
- Connector pins are pulled out
- Due to harness tension at terminal section
- Low contact pressure between male and female terminals
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals



16R1317

CONNECTOR PIN INSPECTION

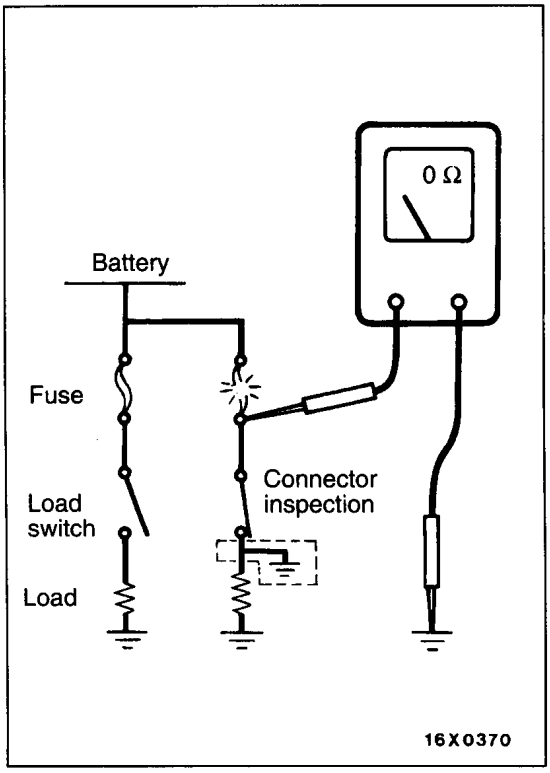
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even if the connector body is connected, and the pins may pull out of the reverse side of the connector. Therefore, gently pull the harnesses one by one to make sure that no pins pull out of the 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 female pins. (Pin drawing force : 1 N or more)

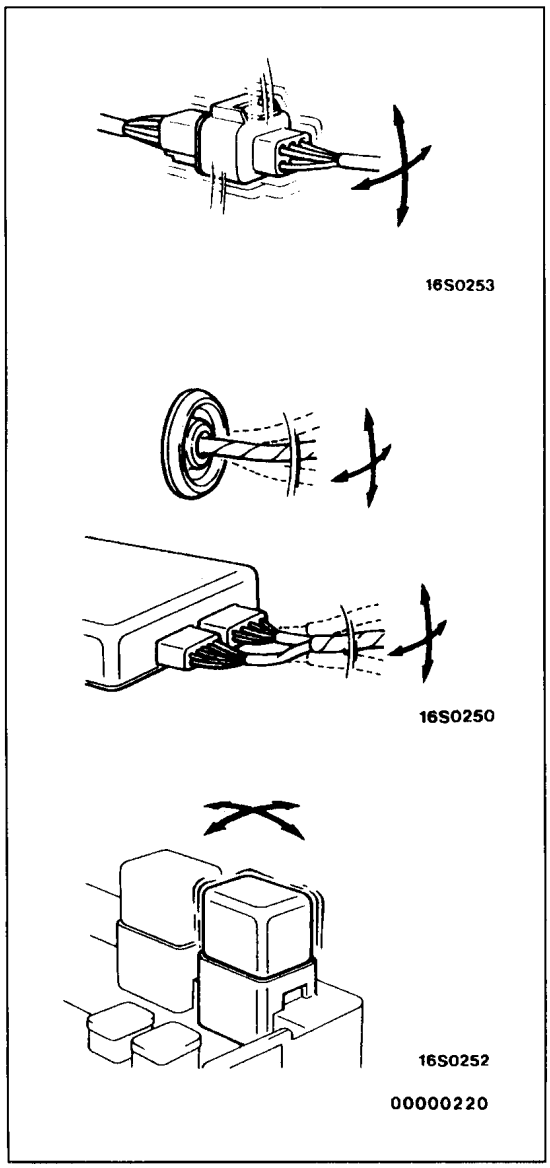


INSPECTION SERVICE POINTS FOR A BLOWN FUSE

120000617

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.)

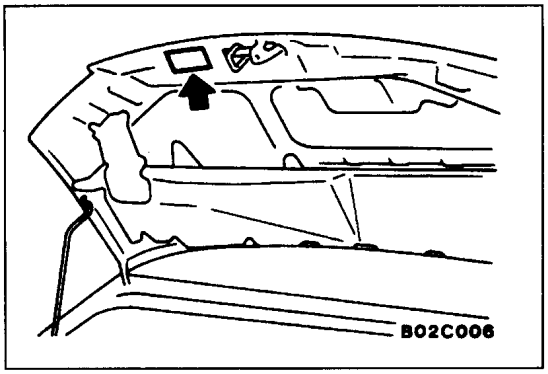


POINTS TO NOTE FOR INTERMITTENT MALFUNCTIONS

120000618

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 generate 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.



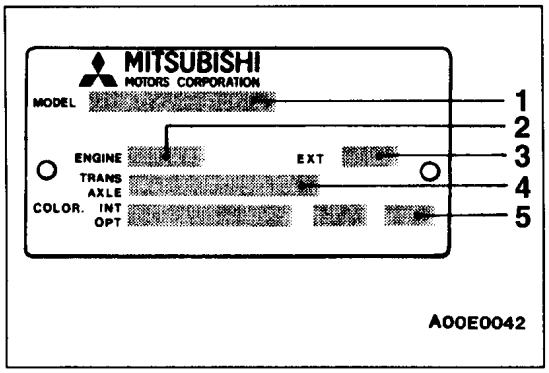
VEHICLE IDENTIFICATION

120002193

VEHICLE INFORMATION CODE PLATE

LOCATION

Vehicle information code plate is riveted on the front end of the hood.



CODE PLATE DESCRIPTION

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

No.	Item	Contents	
1	MODEL	PA5V GLZDTL6	PA5V: Vehicle model
			GLZDTL6: Model series
2	ENGINE	4D56	Engine model
3	EXT	B60B	Exterior code
4	TRANS AXLE	R5M21 4222	R5M21: Transaxle code
			4222: Rear differential reduction
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

120002194

<Standard wheelbase models>

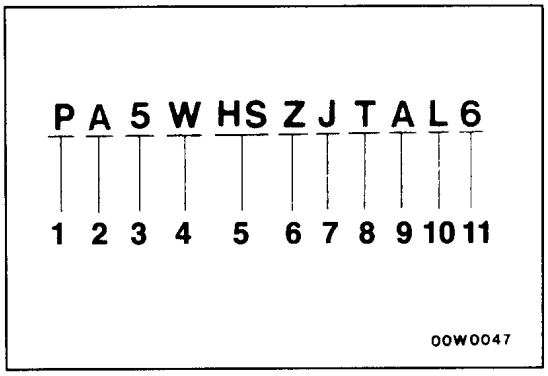
Model code		Engine model	Transmission model	Fuel supply system
PA3V	GLZDAL6	4G63 (1,997 mℓ)	R5M21 (2WD-5M/T)	Electronic controlled carburettor
	NLZDAL6			
	GLZDEL6			MPI
	GLZDER6			
	NLZDEL6			
	NLNUEL6			
PA5V	GLZDTL6	4D56 (2,476 mℓ) with turbocharger	R5M21 (2WD-5M/T)	Injection
	GLZDTR6			
	GLZDTAL6			
	NLZDTAL6			
PD4V	NLNDEL6	4G64 (2,350 mℓ)	V5M21 (4WD-5M/T)	MPI
PD5V	GLNDTL6	4D56 (2,476 mℓ) with turbocharger	V5M21 (4WD-5M/T)	Injection
	GLNDTAL6			
PA3W	NLZJEL6	4G63 (1,997 mℓ)	R5M21 (2WD-5M/T)	MPI
	NLZUEL6			
	NLNUEL6			
	NLEUEL6		R4AW2 (2WD-4A/T)	
PA4W	HSNHEL6	4G64 (2,350 mℓ)	R5M21 (2WD-5M/T)	MPI
	HSEHEL6		R4AW2 (2WD-4A/T)	
PA5W	NLZUFL6	4D56 (2,476 mℓ) with intercooler turbocharger	R5M31 (2WD-5M/T)	Injection
	NLZUFAL6			
PD4W	NLNUEL6	4G64 (2,350 mℓ)	V5M21 (4WD-5M/T)	MPI
PD5W	NLNUFL6	4D56 (2,476 mℓ) with intercooler turbocharger	V5M31 (4WD-5M/T)	Injection
	NLNUFAL6			

<Long wheelbase models>

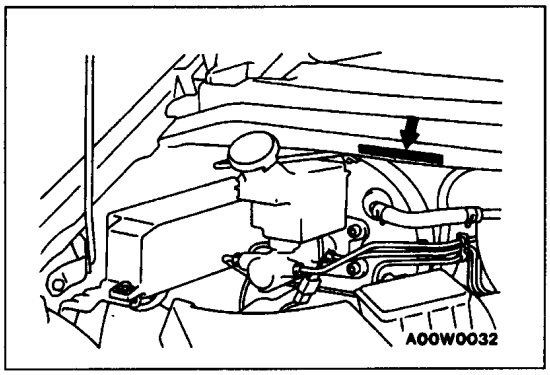
Model code		Engine model	Transmission model	Fuel supply system
PB3V	JLZDAL6	4G63 (1,997 mℓ)	R5M21 (2WD-5M/T)	Electronic controlled carburettor
	HLZDEL6			MPI
	JLZDEL6			
	JLZDER6			
PB5V	HLZDTL6	4D56 (2,476 mℓ) with turbocharger	R5M21 (2WD-5M/T)	Injection
	JLZDTL6			
	JLZDTR6			
	JLZDTAL6			

MODEL CODE

120002195



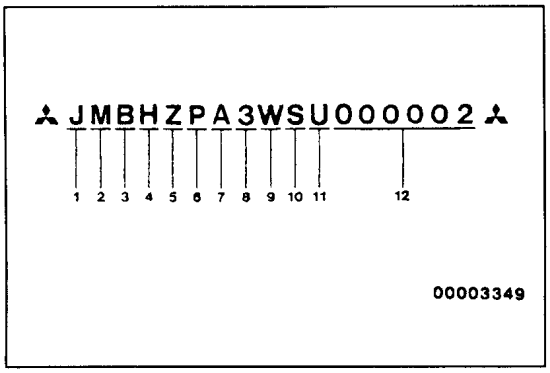
No.	Items		Contents
1	Sort	P	L400 VAN or SPACE GEAR
2	Chassis type	A	Standard wheelbase <2WD>
		B	Long wheelbase <2WD>
		D	Standard wheelbase <4WD>
3	Development order	3	1,997 mℓ, Petrol engine
		4	2,350 mℓ, Petrol engine
		5	2,476 mℓ, Diesel engine
4	Body type	V	Panel van or window van
		W	Wagon
5	Roof type	NL	Standard roof – 4-door with tailgate (Clear window)
		HS	High roof – 3-door with tailgate (Clear window)
		HL	High roof – 4-door with tailgate (Clear window)
		JL	High roof – 4-door with tailgate (Dark window)
		GL	Standard roof – 4-door with tailgate (Dark window)
6	Transmission type	Z	5-speed manual transmission (Column shift)
		N	5-speed manual transmission (Floor shift)
		E	4-speed automatic transmission (Column shift)
7	Trim code	D	GL
		H	GLS
		J	GL <Rear 5-link coil spring suspension>
		U	GLX
8	Specified engine feature	A	SOHC–Electronic controlled carburettor
		E	SOHC-MPI
		F	Turbocharger with intercooler
		T	Turbocharger
9	Exhaust emission specification	None	Without EGR system <Diesel-powered vehicles>
		A	With EGR system <Diesel-powered vehicles>
10	Steering wheel location	L	Left hand
		R	Right hand
11	Destination	6	For Europe



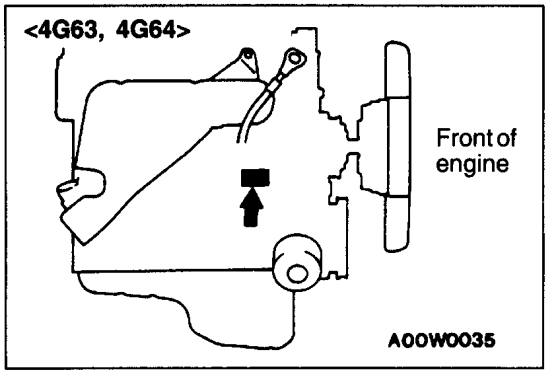
CHASSIS NUMBER

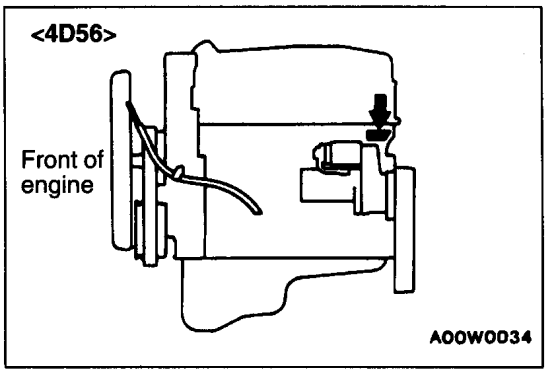
120002196

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



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	G	Standard roof (Dark window)
		H	High roof (Clear window)
		J	High roof (Dark window)
		N	Standard roof (Clear window)
5	Transmission type	E	4-speed automatic transmission (Column shift)
		N	5-speed manual transmission (Floor shift)
		Z	5-speed manual transmission (Column shift)
6	Vehicle line	P	L400 VAN or SPACE GEAR
7	Feature	A	Standard wheelbase <2WD>
		B	Long wheelbase <2WD>
		D	Standard wheelbase <4WD>
8	Development order	3	1,997 mℓ, Petrol engine
		4	2,350 mℓ, Petrol engine
		5	2,476 mℓ, Diesel engine
9	Body type	V	Panel van or window van
		W	Wagon
10	Model year	S	1995
11	Plant	U	Mizushima Motor Vehicle Works
12	Serial number	–	–





ENGINE MODEL NUMBER

120002197

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

Engine model	Engine displacement
4G63	1,997
4G64	2,350
4D56	2,476

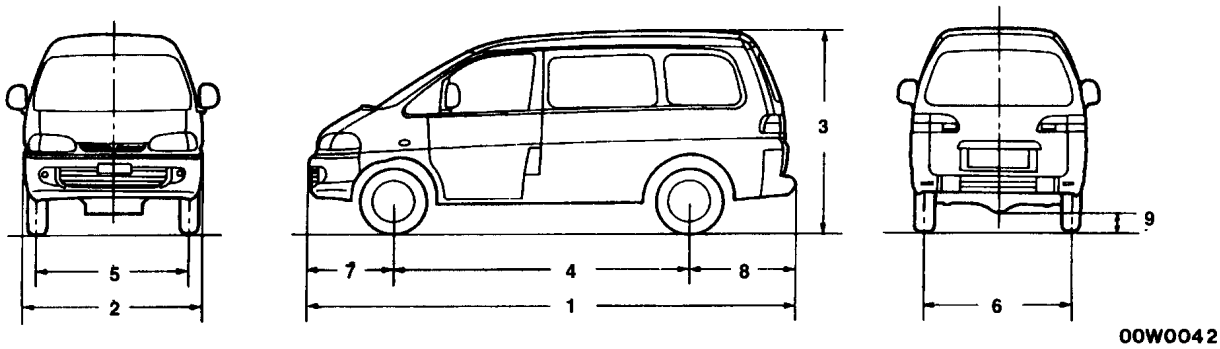
2. The engine serial number is stamped near the engine model number.

<4G63, 4G64, 4D56>

Engine serial number	AA0201 to YY9999

MAJOR SPECIFICATIONS

120002198



00W0042

Items			PA3VGLZDAL6 PA3VGLZDEL6 PA3VGLZDER6	PA3VNLZDAL6 PA3VNLZDEL6	PA3VNLNUEL6	PA5VGLZDTL6 PA5VGLZDTR6 PA5VGLZDTAL6 PA5VNLZDTAL6	PD4VNLNDEL6
Vehicle dimensions mm	Overall length	1	4,595	4,595	4,595	4,595	4,595
	Overall width	2	1,695	1,695	1,695	1,695	1,695
	Overall height (unladen)	3	1,855	1,855	1,855	1,855	1,965
	Wheelbase	4	2,800	2,800	2,800	2,800	2,800
	Tread–Front	5	1,445	1,445	1,445	1,445	1,440
	Tread–Rear	6	1,420	1,420	1,420	1,420	1,435
	Overhang–Front	7	795	795	795	795	795
	Overhang–Rear	8	1,000	1,000	1,000	1,000	1,000
	Ground clearance (unladen)	9	195	195	190	190	195
Vehicle weight kg	Kerb weight		1,445, 1,450*1	1,460, 1,470*2	1,515	1,525, 1,550*3	1,640
	Maximum vehicle weight		2,510	2,510	2,510	2,510	2,510
Seating capacity			3	6	6	3, 6*3	5
Engine	Model		4G63	4G63	4G63	4D56	4G64
	Total displacement mℓ		1,997	1,997	1,997	2,476	2,350
Transmission	Model		R5M21	R5M21	R5M21	R5M21	V5M21
	Type		5-speed manual	5-speed manual	5-speed manual	5-speed manual	5-speed manual

NOTE
*1: PA3VGLZDEL6, PA3VGLZDER6
*2: PA3VNLZDEL6
*3: PA5VNLZDTAL6

Items			PD5VGLNDTL6 PD5VGLNDTAL6	PA3WNLZJEL6 PA3WNLZUEL6 PA3WNLNUEL6	PA3WNLEUEL6	PA4WHSNHEL6	PA4WHSEHEL6
Vehicle dimensions mm	Overall length	1	4,595	4,595	4,595	4,595	4,595
	Overall width	2	1,695	1,695	1,695	1,695	1,695
	Overall height (unladen)	3	1,965	1,855	1,855	1,950	1,950
	Wheelbase	4	2,800	2,800	2,800	2,800	2,800
	Tread–Front	5	1,440	1,445	1,445	1,445	1,445
	Tread–Rear	6	1,435	1,420	1,420	1,420	1,420
	Overhang–Front	7	795	795	795	795	795
	Overhang–Rear	8	1,000	1,000	1,000	1,000	1,000
	Ground clearance (unladen)	9	195	195	195	190	190
Vehicle weight kg	Kerb weight		1,620	1,560, 1,570*1, 1,580*2	1,595	1,660	1,685
	Maximum vehicle weight		2,600	2,460, 2,440*2	2,440	2,835	2,410
Seating capacity			2	9, 8*2	8	7	7
Engine	Model		4D56	4G63	4G63	4G64	4G64
	Total displacement mℓ		2,476	1,997	1,997	2,350	2,350
Transmission	Model		V5M21	R5M21	R4AW2	R5M21	R4AW2
	Type		5-speed manual	5-speed manual	4-speed automatic	5-speed manual	4-speed automatic

NOTE
*1: PA3WNLZUEL6
*2: PA3WNLNUEL6

Items			PA5WNLZUFL6 PA5WNLZUFAL6	PD4WNLNUEL6	PD5WNLNUFL6 PD5WNLNUFAL6	PB3VHLZDEL6 PB3VJLZDAL6 PB3VJLZDEL6 PB3VJLZDER6	PB5VHLZDTL6 PB5VJLZDTL6 PB5VJLZDTR6 PB5VJLZDTAL6
Vehicle dimensions mm	Overall length	1	4,595	4,595	4,595	4,995	4,995
	Overall width	2	1,695	1,695	1,695	1,695	1,695
	Overall height (unladen)	3	1,855	1,965	1,965	1,960	1,960
	Wheelbase	4	2,800	2,800	2,800	3,000	3,000
	Tread–Front	5	1,445	1,440	1,440	1,445	1,445
	Tread–Rear	6	1,420	1,435	1,435	1,420	1,420
	Overhang–Front	7	795	795	795	795	795
	Overhang–Rear	8	1,000	1,000	1,000	1,200	1,200
	Ground clearance (unladen)	9	190	195	195	190	170
Vehicle weight kg	Kerb weight		1,650	1,735	1,835	1,475*1, 1,500*2, 1,480	1,630*3, 1,585
	Maximum vehicle weight		2,550	2,580	2,700	2,700	2,700
Seating capacity			9	8	8	3, 6*2	6*3, 3
Engine	Model		4D56	4G64	4D56	4G63	4D56
	Total displacement mℓ		2,476	2,350	2,476	1,997	2,476
Transmission	Model		R5M31	V5M21	V5M31	R5M21	R5M21
	Type		5-speed manual	5-speed manual	5-speed manual	5-speed manual	5-speed manual

NOTE
*1: PB3VJLZDAL6
*2: PB3VHLZDEL6
*3: PB5VHLZDTL6

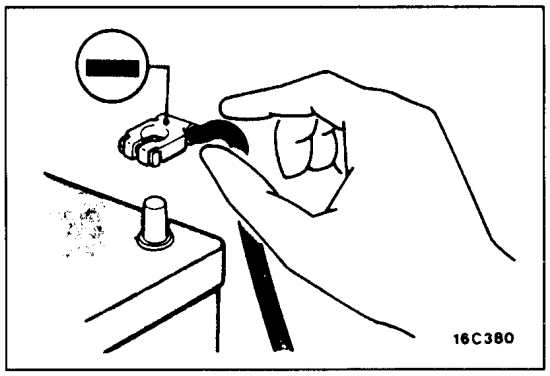
PRECAUTIONS BEFORE SERVICE

120000625

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

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

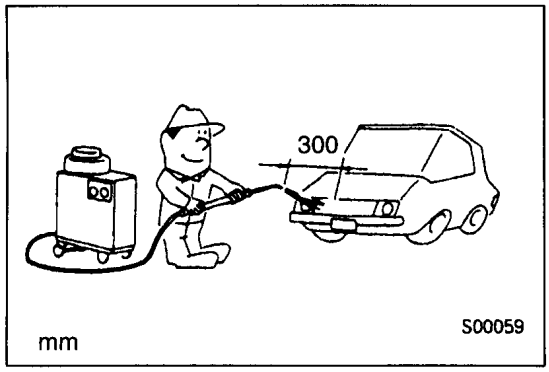
   (6) Store components removed from the SRS in a clean and dry place.
   The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward.
   Do not place anything on top of it.
   (7) Be sure to deploy the air bag before disposing of the air bag module or disposing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



SERVICING THE ELECTRICAL SYSTEM 120000626

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.

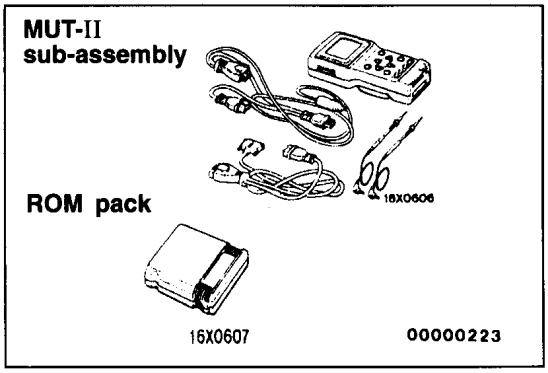
Caution
Before connecting or disconnecting the negative (–) cable, be sure to turn off the ignition switch and the lighting switch.
(If this is not done, there is the possibility of semiconductor parts being damaged.)



VEHICLE WASHING 120000627

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

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



MUT-II 120000628

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

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

120000629

"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

120000630

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

120000631

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)–AIR BAG

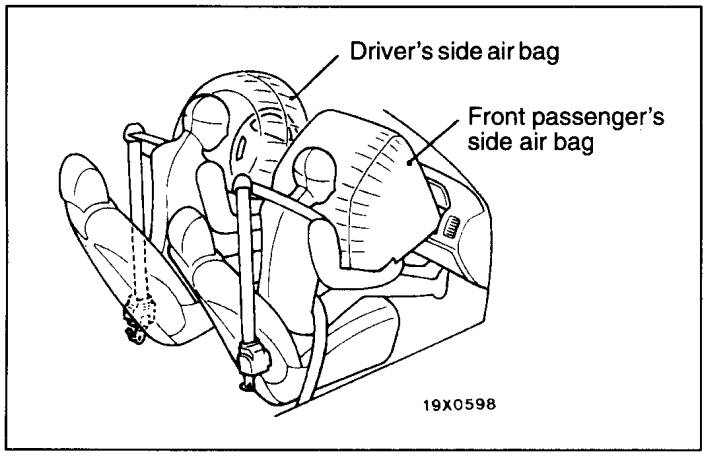
120002199

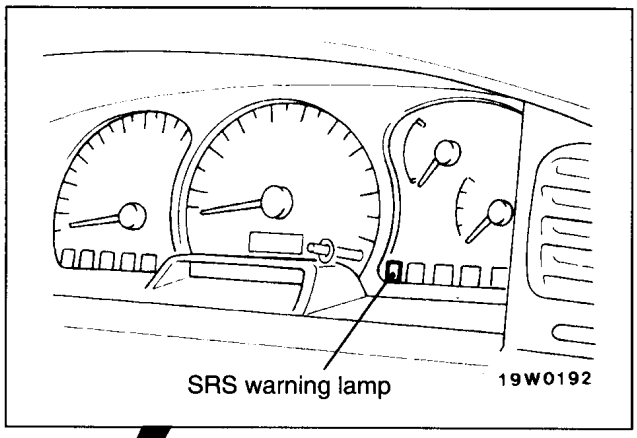
The Supplemental Restraint System (SRS) is designed to supplement the seat belt to help reduce the risk or severity of injury to the driver and front passenger* by activating and deploying driver's-side and front passenger's side* air bag in certain frontal collisions.

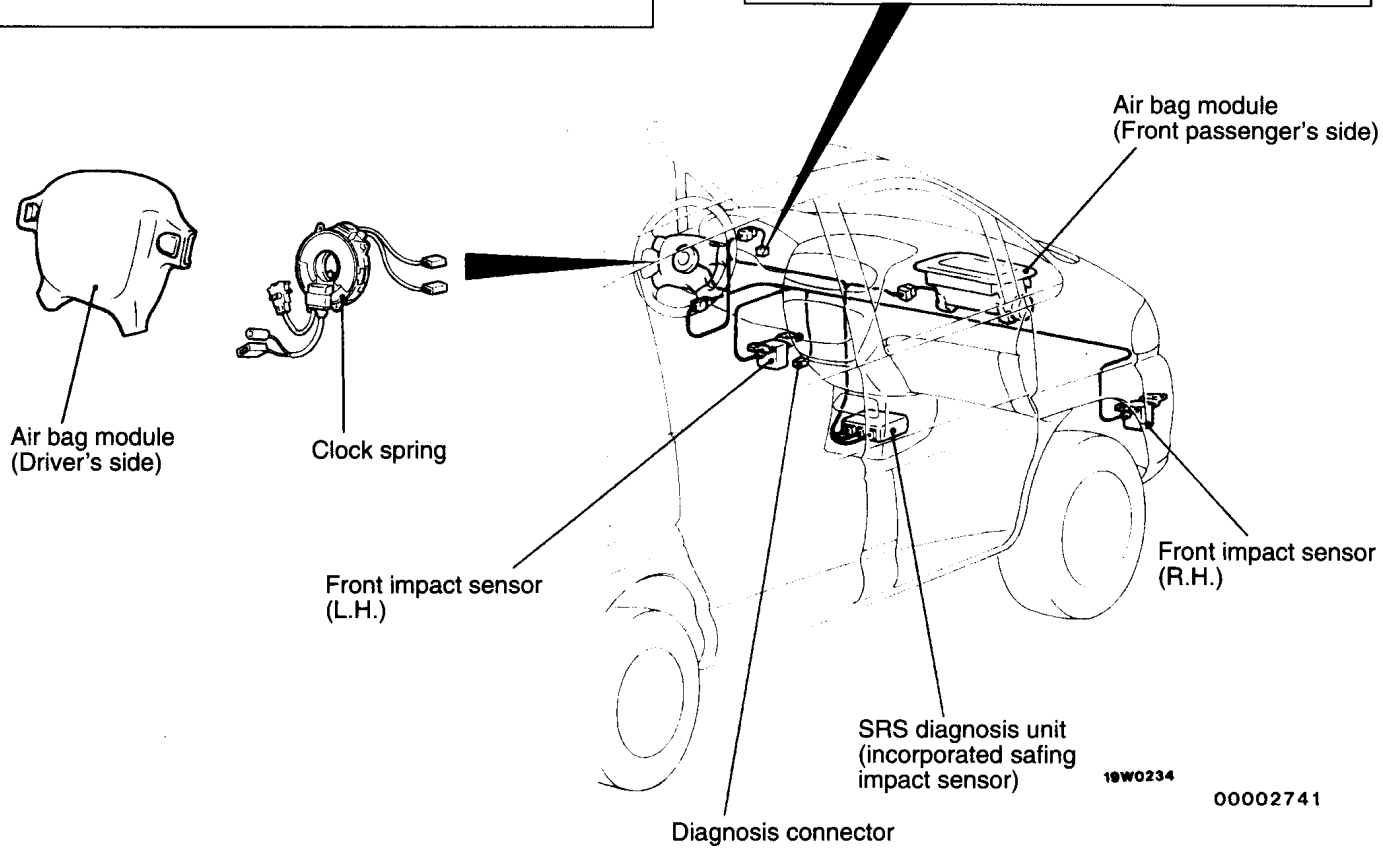
The SRS consists of : left front and right front impact sensors (located on the headlamp support corner panels); air bag modules for the driver's seat (located in the centre of steering wheel) and for the front passenger* seat (located above the glove box). Each module contains a folded air bag and an inflator unit. The SRS also contains: an SRS Diagnosis Unit with safing impact sensor (located under the computer cover which monitors the system): an SRS warning lamp to indicate the operational status of the SRS (located on the instrument panel): a clock spring interconnection (located within the steering column): system wiring and wiring connectors.

The SRS is designed so that the air bag will deploy when the safing sensor, plus either or both of the left front and right front impact sensors simultaneously activate while the ignition "ON" is switched. In addition, the SRS diagnosis unit (SDU) has the following functions.

- A backup function (charging condenser for the power supply) for cases when there is a malfunction of the power supply when the SRS air bag is deployed (during an impact).
- A voltage build-up function (DC/DC converter circuit) for cases when there is a drop in system voltage.
- A self-diagnosis function to further improve the degree of safety and reliability.







SRS SERVICE PRECAUTIONS

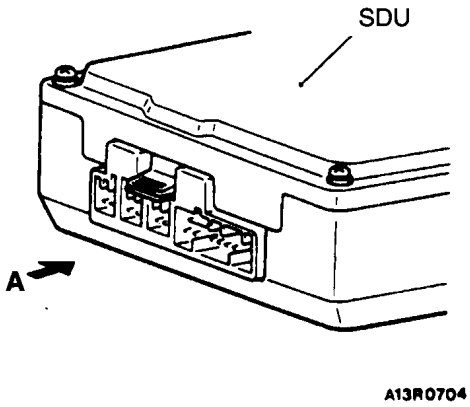
120002200

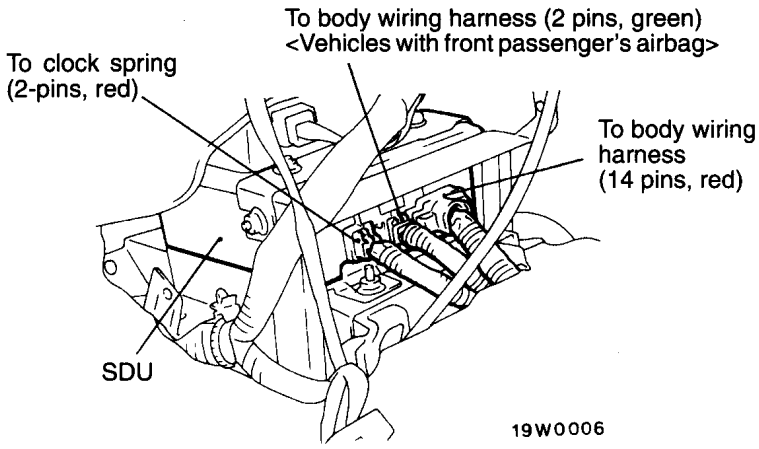
1. In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment on or near SRS components, except those specified on GROUP 52B – Special Tools and Test Equipment.
   Never use an analogue ohmmeter.
3. **Never Attempt to Repair the Following Components:**
   - Front Impact Sensors
   - SRS Diagnosis Unit (SDU)
   - Clock Spring
   - Air Bag Module (Driver's side or front passenger's side)

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

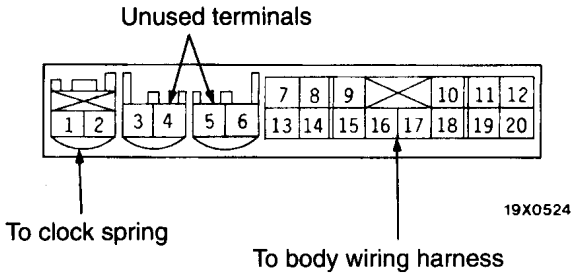
Harness connector (No. of terminals, colour)	SDU terminal No.	Destination of harness	Corrective action
2 pins, red	1, 2	Body wiring harness → Clock spring	Replace clock spring
2 pins, green	5*1, 6*1	Body wiring harness → Air bag module (Front passenger's side)	Correct or replace each wiring harness
14 pins, red	9	Body wiring harness → Diagnosis connector	Correct or replace each wiring harness
	10	Body wiring harness → Control wiring harness → Body wiring harness → Ignition switch (ST)	
	11	Body wiring harness → Instrument panel wiring harness → Junction block (fuse No. 4)	
	12	Body wiring harness → Junction block (fuse No. 8)	
	13, 14	Body wiring harness → Instrument panel wiring harness → Combination meter (SRS warning lamp)	
	15	Body wiring harness → Front wiring harness → Front impact sensor (+) (R.H.)	Sensor cable*2 installation procedures (Refer to GROUP 52B.)
	16	Body wiring harness → Front wiring harness → Front impact sensor (+) (L.H.)	
	17	Body wiring harness → Front wiring harness → Front impact sensor (–) (L.H.)	
	18	Body wiring harness → Front wiring harness → Front impact sensor (–) (R.H.)	
	19, 20	Body wiring harness → Earth	Correct or replace each wiring harness

NOTE
*1: Vehicles with front passenger's air bag
The sensor cable marked with*2 is available as service part.

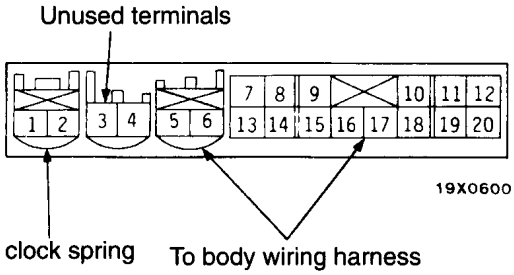


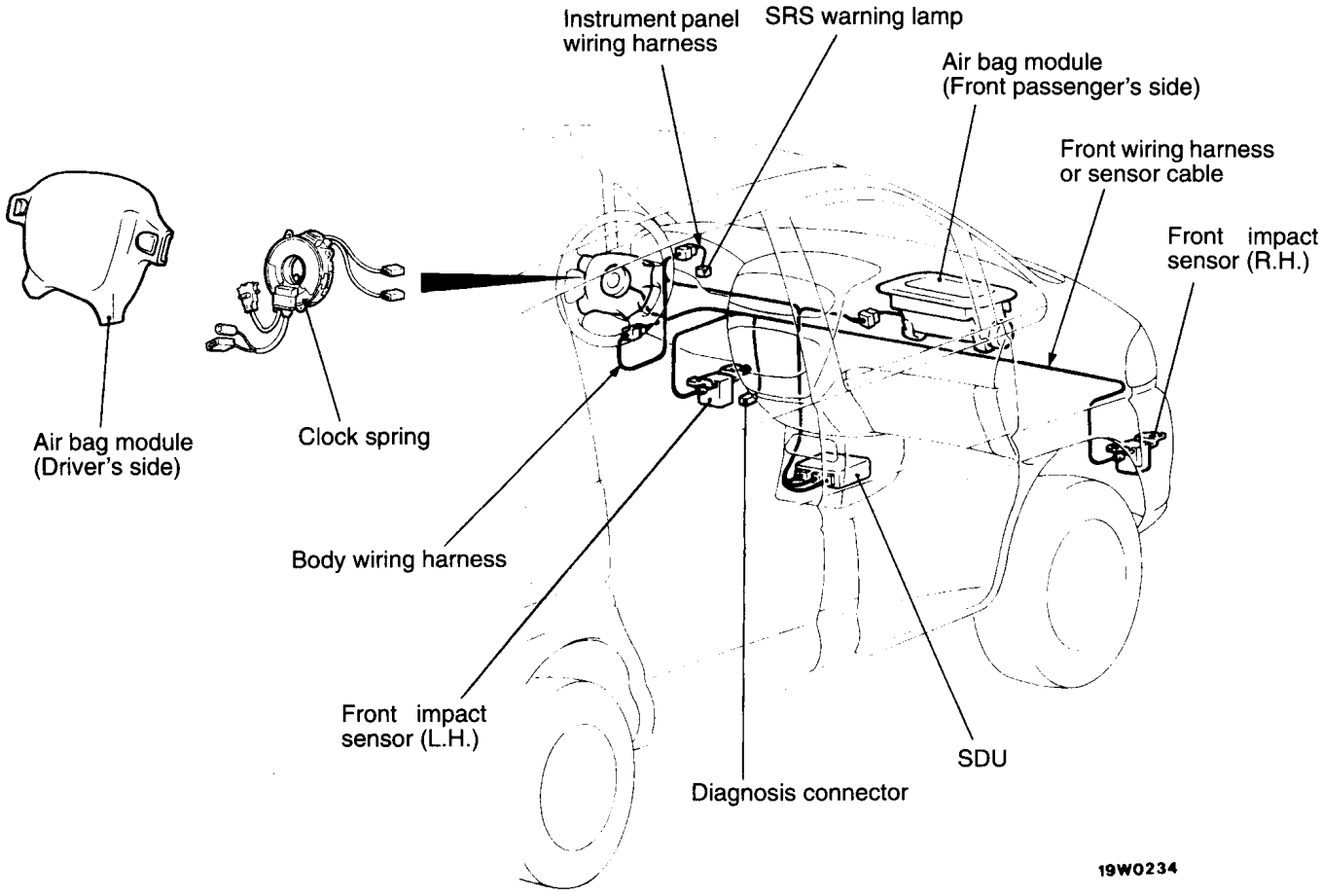


<Vehicles without front passenger's air bag> View A



<Vehicles with front passenger's air bag>





00002742

5. **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.**
6. SRS components should not be subjected to heat over 93°C, so remove the front impact sensors, SRS diagnosis unit, air bag module and clock spring before drying or baking the vehicle after painting.
7. Whenever you finish servicing the SRS, erase the diagnosis codes and check the SRS warning lamp operation to make sure that the system functions properly. (Refer to GROUP 52B – Troubleshooting.)
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.

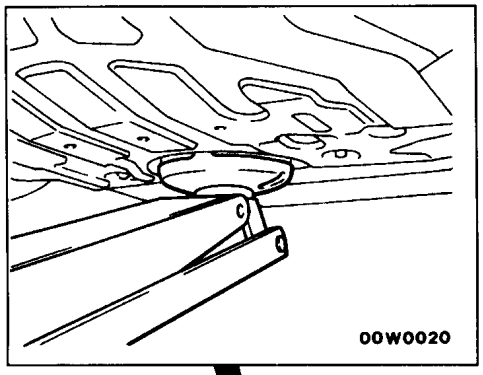
SUPPORT LOCATIONS FOR LIFTING AND JACKING

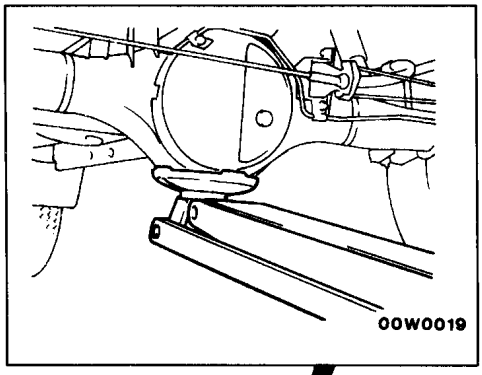
120000634

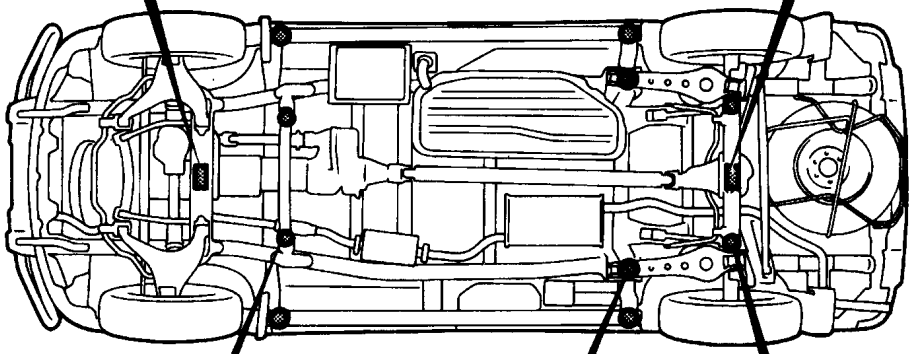
Caution
Do not support the vehicles at locations other than specified supporting points. If do so, this will cause damage, etc.

SUPPORT POSITIONS FOR A GARAGE JACK AND AXLE STANDS

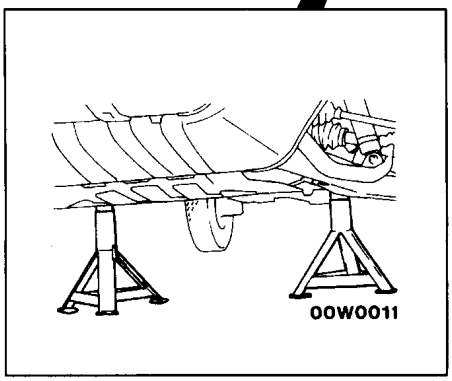
GARAGE JACK

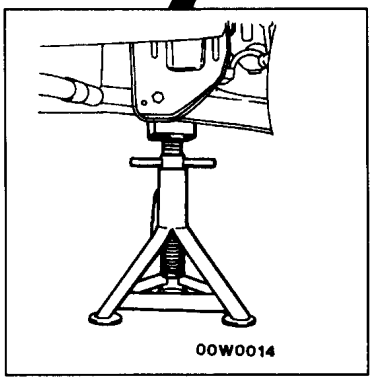


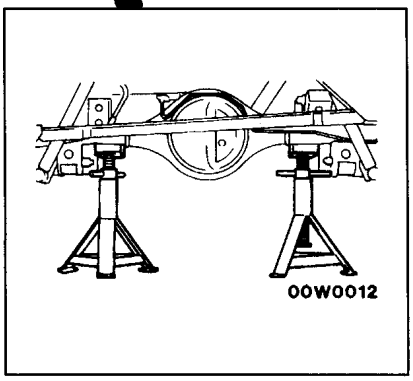




AXLE STANDS







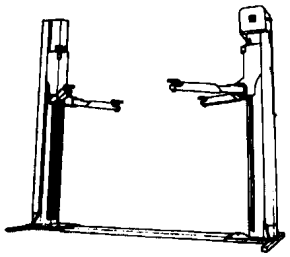
00000888

SUPPORT POSITIONS FOR A SINGLE-POST LIFT OR DOUBLE-POST LIFT AND H-BAR LIFT

120000635

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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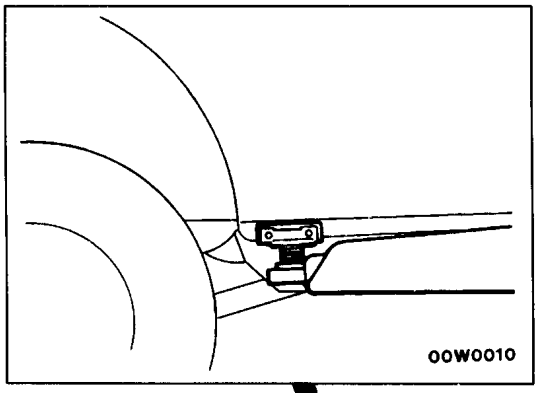

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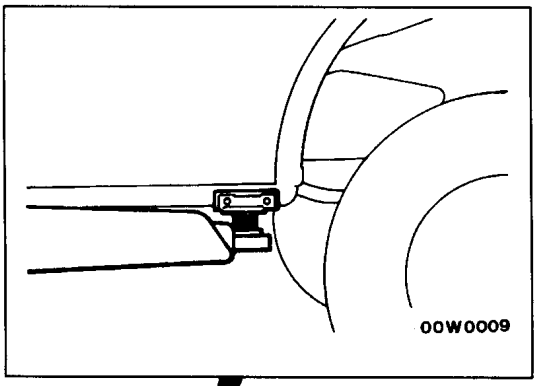
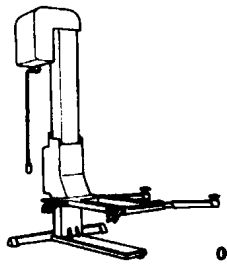


00W0009

SINGLE-POST LIFT



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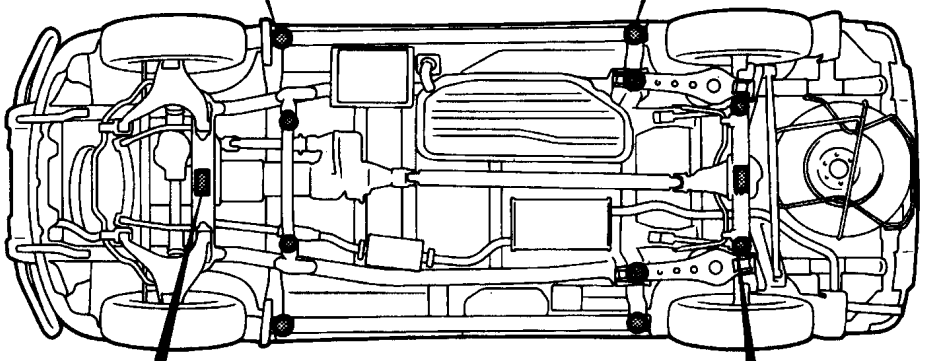
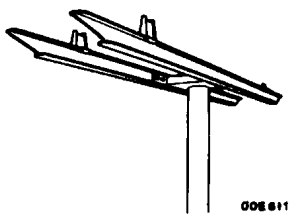


00W0024

H-BAR LIFT



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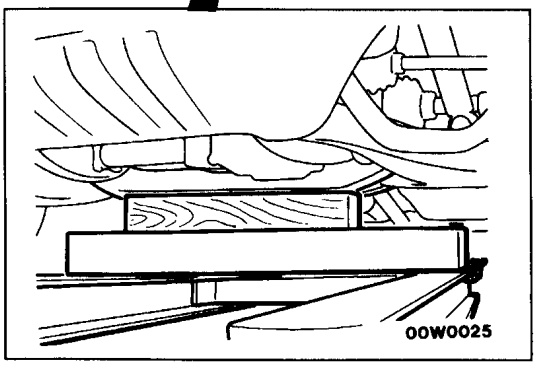

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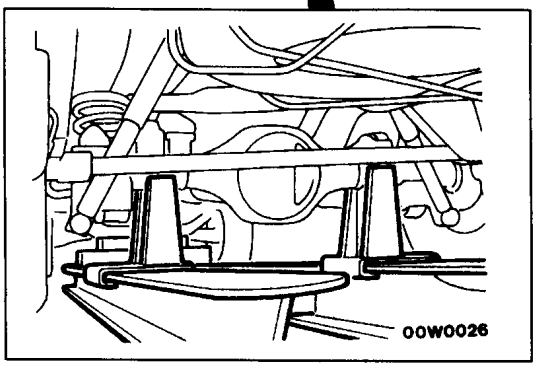

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STANDARD PARTS-TIGHTENING-TORQUE TABLE

120000636

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

MAIN SEALANT AND ADHESIVE TABLE

120000637

SEALANTS FOR ENGINE ACCESSORIES

Application	Recommended brand
Sealing between rocker cover and camshaft bearing cap (4G6 DOHC and 6G7 engines only)	3M ATD Part No. 8660 or equivalent
Sealing between semi-circular packing and rocker cover and between semi-circular packing and cylinder head	
Oil pressure switch	
Engine coolant temperature switch, engine coolant, temperature sensor, thermo valve, thermo switch, joints, engine coolant temperature gauge unit (large size)	3M Nut Locking Part No. 4171 or equivalent
Engine coolant temperature gauge unit (small size, MD091056 only)	3M ATD Part No. 8660 or equivalent
Oil pan (except 4G5 engine)	MITSUBISHI GENUINE Part No. MD970389 or equivalent
Water pump, thermostat case <4G9, 4G6, 6A1 engine only)	

SEALING BETWEEN GLASS AND WEATHERSTRIP

Application	Recommended brand
Sealing between tempered glass and weatherstrip	3M ATD Part No. 8513 or equivalent
Sealing between body flange and weatherstrip	3M ATD Part No. 8509 or equivalent
Sealing between laminated glass and weatherstrip	

ADHESION WITH RIBBON SEALER

Application	Recommended brand
Waterproof film for door	3M ATD Part No. 8625 or equivalent
Fender panel, splash shield, mud guard	
Rear combination lamp	

ADHESIVES FOR INTERIOR TRIM

Application	Recommended brand
Adhesion of polyvinyl chloride sheet	3M Part No. EC-1368 or equivalent
Adhesion of door weatherstrip to body	3M ATD Part No. 8001 or 3M ATD Part No. 8011 or equivalent
Sealing between grommet or packing and metal seal	3M ATD Part No. 8513 or equivalent
Adhesion of headlining and other interior trim materials	3M Part No. EC-1368 or 3M Part No. 8080 or equivalent
Adhesion of fuel tank to pad	

BODY SEALANT

Application	Recommended brand
Sealing of sheet metal, drip rail, floor, body side panel, trunk, front panel and the like joints	3M ATD Part No. 8513 or 3M ATD Part No. 8646 or equivalent
Sealing of tailgate hinges	

CHASSIS SEALANT

Application	Recommended brand
Sealing of flange surface and threaded portions (Fuel gauge unit packing)	3M ATD Part No. 8659 or equivalent
Sealing of flange surfaces, threaded portions, packing and dust cover (Differential carrier packing, dust covers for joint and linkage, steering gear box packing and shims, steering gear housing rack support cover and top cover, mating surface of knuckle arm flange)	3M ATD Part No. 8663 or equivalent
Sealing between accelerator arm bracket and toeboard	Drying sealant
Sealant for drum brake shoe hold-down pin and wheel cylinder	3M ATD Part No. 8513 or equivalent

FAST BONDING ADHESIVE

Application	Recommended brand
Adhesion of all materials except polyethylene, polypropylene, fluorocarbon resin or other materials with highly absorbent surface	3M ATD Part No. 8155 or equivalent

ANAEROBIC FAST BONDING ADHESIVES

Application	Recommended brand
Fixing of bolts and screws (Tightening of drive gear to differential case, bolts for coupling tilt steering upper column with lower column)	3M Stud locking Part No. 4170 or equivalent
Fixing of bearing, fan, pulley and gear connections	
Sealing of small recess or flange surface	

UNDERCOAT

Application	Recommended brand
Anti-corrosion treatment inside wheel housings and underneath the body	3M ATD Part No. 8864 or equivalent

ENGINE

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4G6 ..... 11D

4G9 ..... 11E

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3G8 ..... 11H

4D5 ..... 11I

4D6 ..... 11J

4A3 ..... 11K

420A 11L

4M4 ..... 11M

NOTE
THE GROUPS MARKED BY ARE NOT IN THIS MANUAL.

NOTES

4G6

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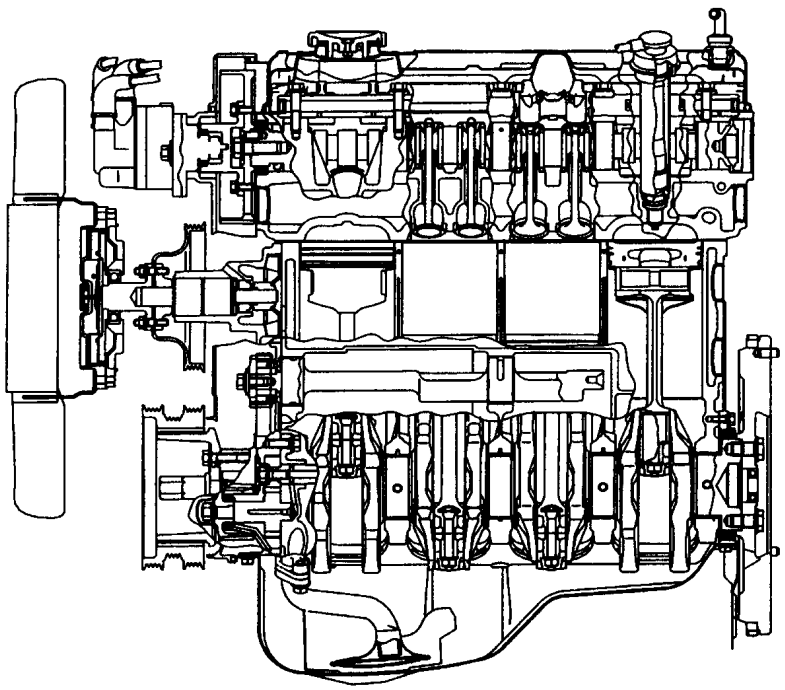
GENERAL INFORMATION

120002638

Items		4G63	4G64
Total displacement mℓ		1,997	2,351
Bore × Stroke mm		85.0×88.0	86.5×100.0
Compression ratio		9.5	9.5
Combustion chamber		Pentroof type	Pentroof type
Camshaft arrangement		SOHC	SOHC
Number of valve	Intake	8	8
	Exhaust	8	8
Valve timing	Intake	Opening BTDC 11°, Closing ABDC 53°	Opening BTDC 18°, Closing ABDC 58°
	Exhaust	Opening BBDC 63°, Closing ATDC 21°	Opening BBDC 58°, Closing ATDC 18°
Fuel system		Electronic controlled carburettor or electronic controlled multipoint fuel injection	Electronic controlled multipoint fuel injection
Rocker arm		Roller type	Roller type
Auto-lash adjuster		Equipped	Equipped
Oil level sensor		Equipped	Equipped

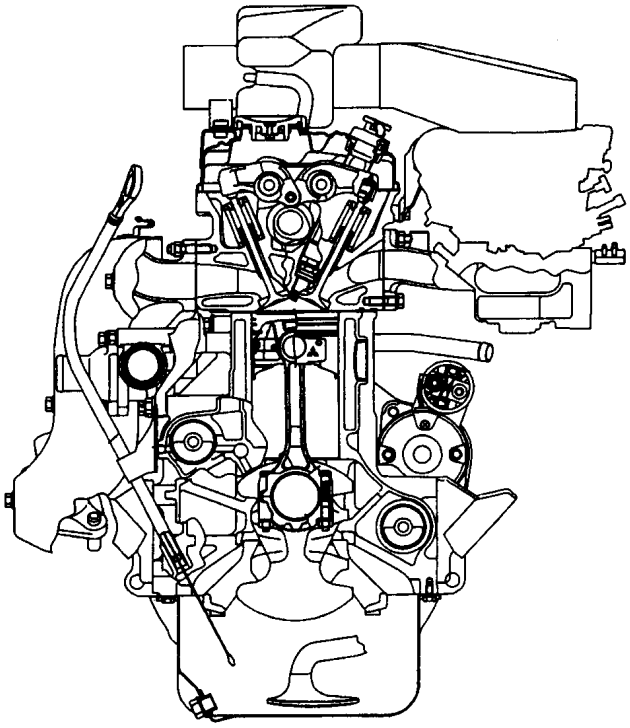
SECTIONAL VIEW

120000994



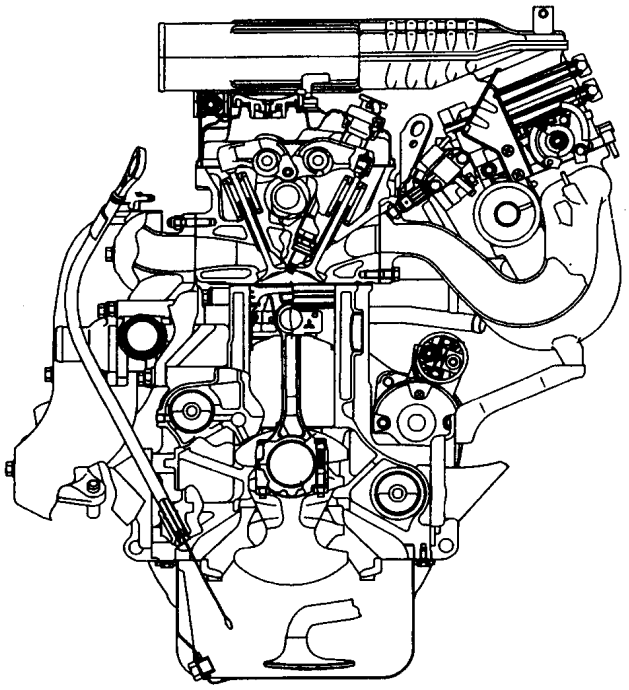
6EN1000

Electronic controlled carburettor



6EN1001

Electronic controlled multipoint fuel injection



6EN1002

SERVICE SPECIFICATIONS

120002639

Items			Standard value	Limit
Drive belt deflection mm	Alternator	When checked	7.0–9.0	–
		When a new belt is installed	5.5–7.5	–
		When a used belt is installed	7.5–8.5	–
	Power steering oil pump	When checked	5.5–7.5	–
		When a new belt is installed	4.0–6.0	–
		When a used belt is installed	6.0–7.0	–
	A/C compressor	When checked	4.5–6.5	–
		When a new belt is installed	3.5–4.5	–
		When a used belt is installed	5.0–6.0	–
Basic ignition timing	Carburettor		0° BTDC±2°	–
	MPI		5° BTDC±2°	–
Ignition timing	MPI		Approx. 10° BTDC	–
Curb idle speed r/min	Carburettor		800±50	–
	MPI		750±100	–
CO contents %	MPI		0.5 or less	–
HC contents ppm	MPI		100 or less	–
Idle-up engine speed for ABS r/min			1600 $^{+50}_{-300}$	–
Compression pressure (at engine speed of 250–400 r/min.) kPa			1,320	Min. 1,000
Compression pressure difference of all cylinder kPa			–	Max. 100
Intake manifold vacuum kPa			–	Min. 60
Cylinder head bolt shank length mm			–	99.4
Timing belt tension torque Nm			3.5	–
Timing belt B tension mm			5–7	–
Push rod pushed-in amount			Within 1.0	
Auto tensioner rod protrusion amount (special tool screw-in amount) turns			2.5–3	–

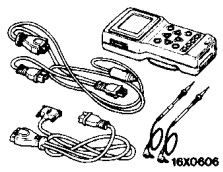
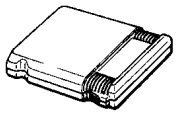
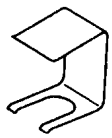
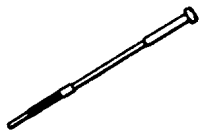
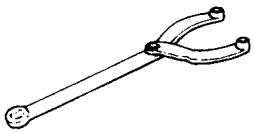
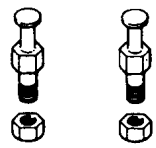
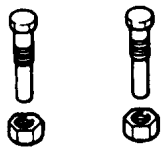
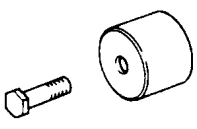
SEALANT

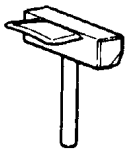
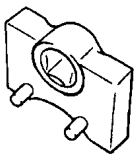
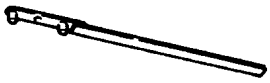
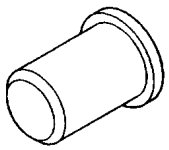
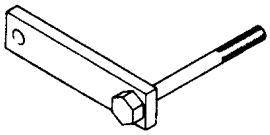
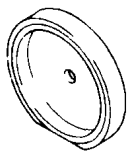
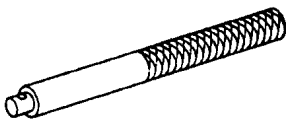
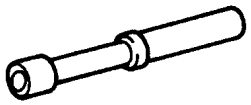
120002446

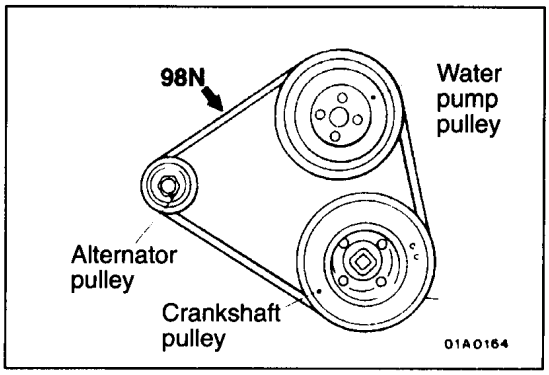
Items	Specified sealant	Remarks
Oil pan	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant

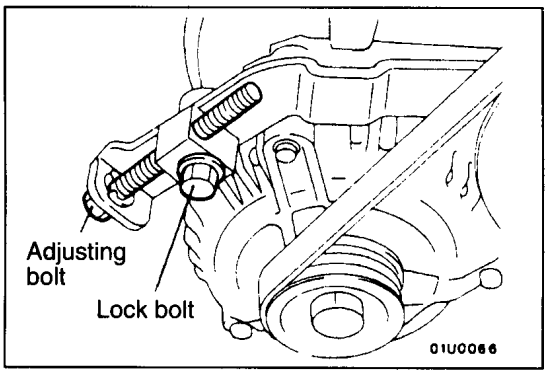
SPECIAL TOOLS

120002640

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Checking of the engine idle speed <MPI> • Erasure of diagnosis trouble code <MPI>
 16X0607	–	ROM pack	
	MD998443	Auto-lash adjuster holder	Supporting of auto-lash adjuster
	MD998738	Adjusting screw	• Holding of the auto tensioner • Timing belt tension adjustment
	MB990767	End yoke holder	Supporting of camshaft sprocket
	MD998719	Crankshaft pulley holder pin	
	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 the oil pan
	MD998767	Tensioner pulley socket wrench	Timing belt tension adjustment
	MD998747	Crankshaft pulley holder	Supporting of crankshaft sprocket
	MD998375	Crankshaft front oil seal installer	Press-fitting the crankshaft front oil seal
	MD998781	Fly wheel stopper	Securing the flywheel <M/T> or drive plate <A/T>
	MD998776	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal
	MB990938	Handle	
	MB991531	Engine hanger	Engine removal and installation
	MD998299	MAS screwdriver	Adjustment of mixture adjusting screw





SERVICE ADJUSTMENT PROCEDURES <CARBURETTOR>

120002641

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

ALTERNATOR DRIVE BELT TENSION INSPECTION

Pull or push at the center of the belt between the water pump pulley and the alternator pulley with a force of 98 N. Then measure the drive belt deflection.

Standard value: 7.0–9.0 mm

ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

120000995

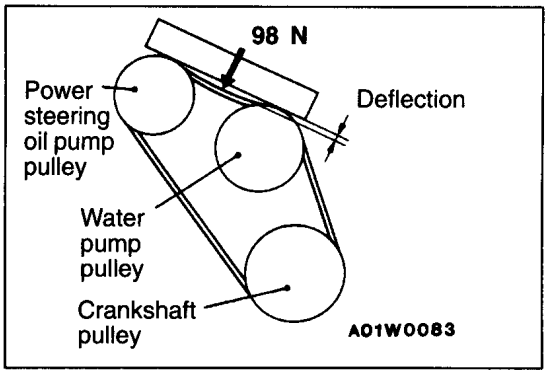
1. Loosen the nut of the alternator pivot bolt.
2. Loosen the lock bolt.
3. Turn the adjusting bolt to adjust the belt deflection to the standard value.

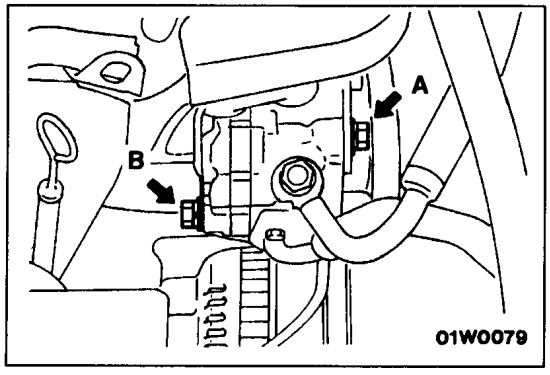
   Standard value:
   Used belt 7.5–8.5 mm
   New belt 5.5–7.5 mm
4. Tighten the nut of the alternator pivot bolt.

   Tightening torque: 22 Nm
5. Tighten the lock bolt.

   Tightening torque: 22 Nm
6. Tighten the adjusting bolt.

   Tightening torque: 9.8 Nm
7. Turn the crankshaft one or more turns clockwise, and then check the belt deflection or belt tension.





POWER STEERING OIL PUMP DRIVE BELT TENSION INSPECTION

120000996

Check the tension by pulling or pushing at the centre of the belt between pulleys with a force of 98 N as shown in the figure.
Measure drive belt deflection amount.

Standard value: 5.5–7.5 mm

POWER STEERING OIL PUMP DRIVE BELT TENSION ADJUSTMENT

120002447

1. Loosen power steering oil pump fixing bolt (A, B).
2. Move power steering oil pump, tension belt moderately and adjust tension.

   Standard value:

   If used belt (with correct tension) is used: 6.0–7.0 mm

   If a new belt is used: 4.0–6.0 mm
3. Tighten fixing bolt A.

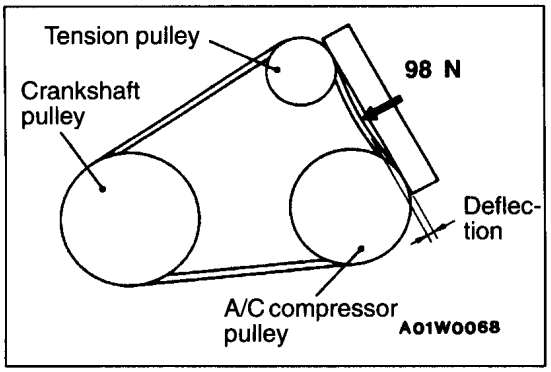
   Tightening torque: 39 Nm

4. Tighten the remaining fixing bolts B.

   Tightening torque: 24 Nm

5. Check the belt deflection amount and readjust if necessary.

   Caution
   Turn the crankshaft one or more turns in the clockwise direction and then check the belt tension.

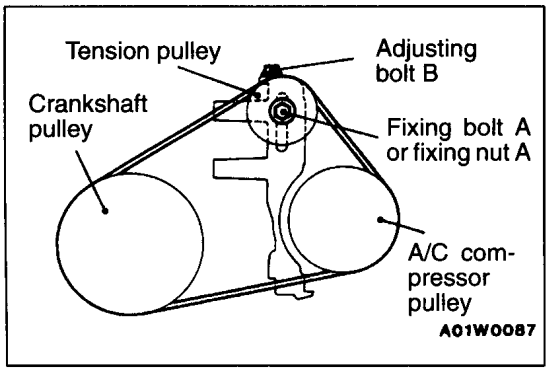


A/C COMPRESSOR DRIVE BELT TENSION INSPECTION

120000998

Check the tension by pulling or pushing at the centre of the belt between pulleys with a force of 98 N as shown in the figure.
Measure drive belt deflection amount.

Standard value: 4.5 – 6.5 mm



A/C COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

120002448

1. Loosen tension pulley fixing bolt A <Dual A/C> or fixing nut A <Single A/C>.
2. Adjust belt tension with adjusting bolt B.

   Standard value:

   If used belt (with correct tension) is used: 5.0–6.0 mm

   If a new belt is used: 3.5–4.5 mm

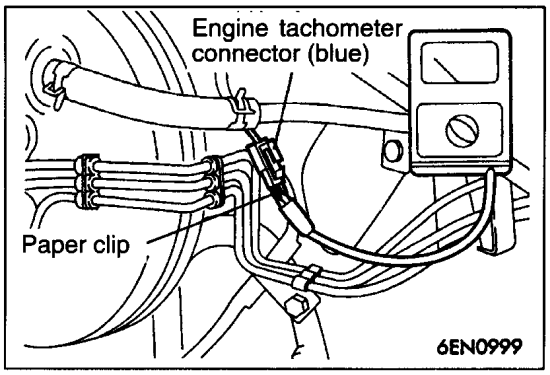
3. Tighten fixing bolt A <Dual A/C> or fixing nut A <Single A/C>.
4. Check the belt deflection amount and readjust if necessary.

   Caution
   Turn the crankshaft one or more turns in the clockwise direction and then check the belt tension

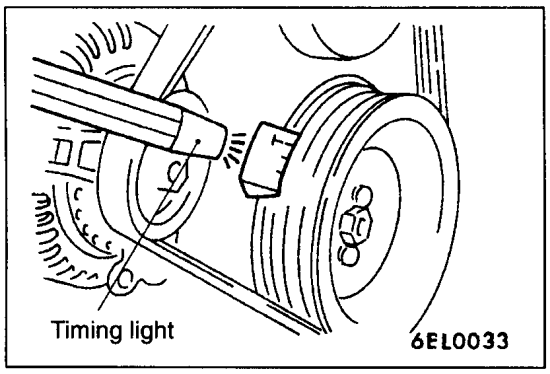
IGNITION TIMING INSPECTION AND ADJUSTMENT

120002642

1. Before inspection and adjustment, set vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral

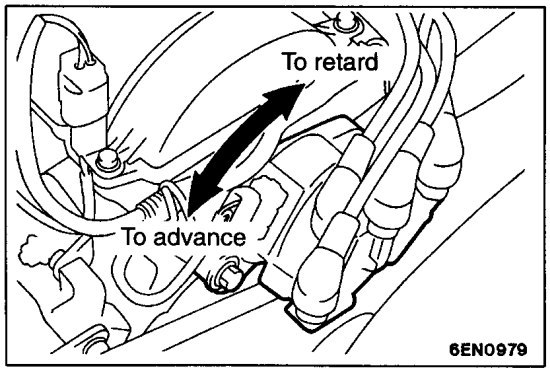


2. Insert a paper clip from the harness side into the 1-pin connector (blue) as shown in the illustration at left.
3. Connect a primary-voltage-detection type of tachometer to the paper clip.
4. Set up a timing light.
5. Start the engine and run at idle.
6. Check that the engine speed is at 600 – 900 r/min.



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

   Standard value: 0° BTDC±2°



8. If not within the standard value, loosen distributor fixing bolts and adjust by rotating distributor body.
9. Tighten the mounting bolts after adjusting.

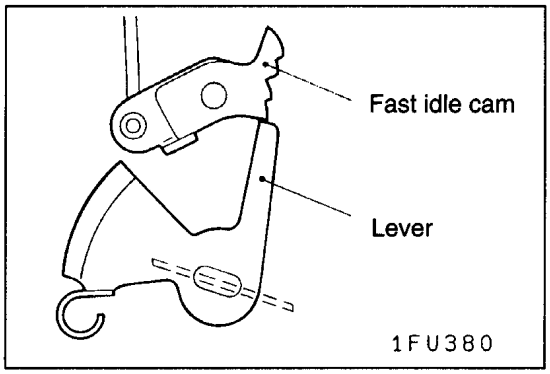
   Tightening torque: 12 Nm

IDLE SPEED INSPECTION AND ADJUSTMENT

120002643

Caution
The improper setting (throttle value opening) will increase exhaust gas temperature at deceleration, reducing catalyst life greatly and deteriorating exhaust gas cleaning performance. It also has effect on fuel consumption and engine braking.

1. Set the vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral
2. Set up a timing light and tachometer.
   For information regarding the tachometer installation method, refer to P. 11D-9.



3. Depress accelerator pedal once to release the fast idle.

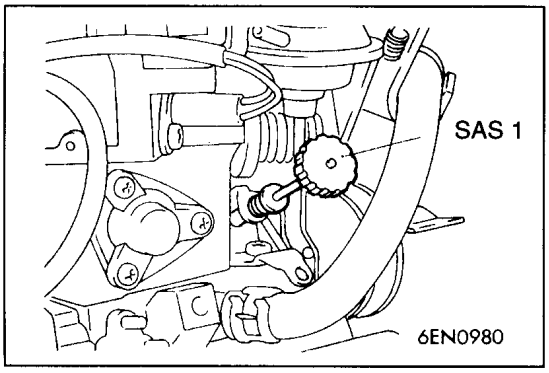
   NOTE
   Depressing the accelerator pedal separates the lever from the fast idle cam.

4. Start the engine and run at idle.
5. Check the ignition timing. Adjust if necessary.

   Standard value: 0°BTDC±2°

6. Race the engine 2–3 times up to 2,000–3,000 r/min.
7. Check the idle speed.

   Curb idle speed: 800±50 r/min



8. If the idle speed is outside the standard value, turn speed adjusting screw 1 (SAS 1) to adjust the idle speed.

IDLE FEEDBACK CHECK

120002644

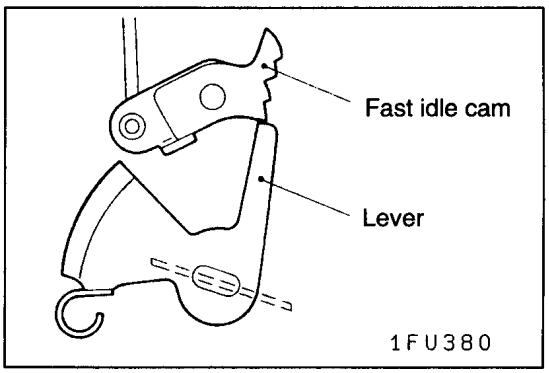
In case an idle condition check is required for some reason (for example when overhauling carburettor), the following procedure should be followed.

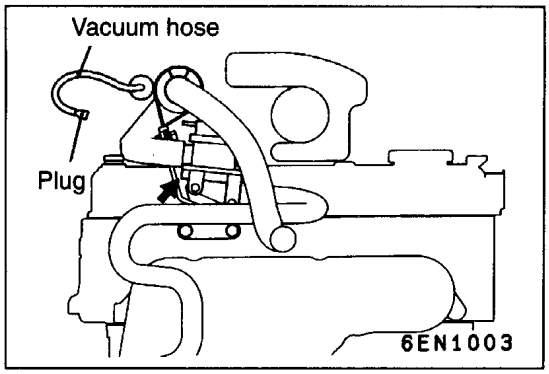
1. Set the vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral
2. Set up a timing light and tachometer.
   For information regarding the tachometer installation method, refer to P. 11D-9.
3. Depress accelerator pedal once to release the fast idle.

   NOTE
   Depressing the accelerator pedal separates the lever from the fast idle cam.

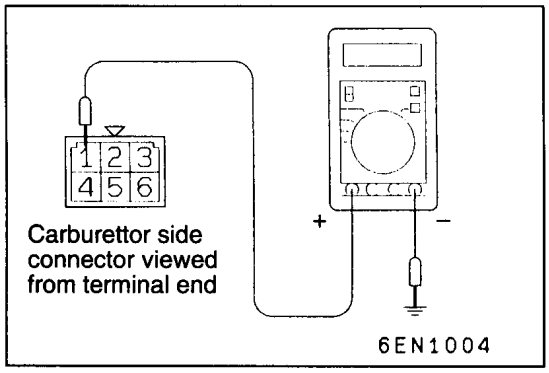
4. Start the engine and run at idle.
5. Check the ignition timing. Adjust if necessary.

   Standard value: 0°BTDC±2°





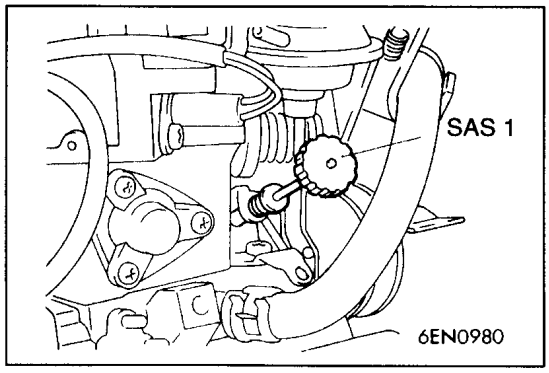
6. Disconnect the vacuum hose from the secondary air control valve, and plug the end of the hose.



7. Connect the positive terminal of an analogue type voltmeter to the negative terminal of the feedback solenoid valve (FBSV) while connecting the negative terminal of the voltmeter to the vehicle body as the earth.

   Caution
   The feedback solenoid valve connector must not be disconnected.

8. Race the engine at a speed of 2,000–3,000 r/min for 10 seconds or more.



9. Immediately after racing the engine (step 8. above), check the movement of the voltmeter pointer while the engine is running at idle. If the pointer is swinging between 2 and 12 volts, the system is operating normally.

   NOTE
   If necessary, turn the idle speed adjusting screw 1 (SAS 1) to adjust the curb idle speed.

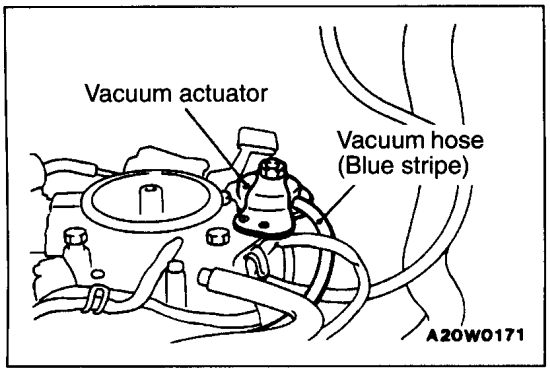
10. If the pointer is not swinging between 2 and 12 volts, check each part of the fuel system.
    (a) If there is a malfunction, repair or replace the part and repeat steps 8 and 9.
    (b) If there is no malfunction, clean the jets of the carburettor and repeat steps 8 and 9.
11. If the system is not working correctly, replace the throttle body of carburettor and repeat steps 8 and 9.
12. If the system is not working correctly even after replacing the throttle body, replace the carburettor assembly.
13. Remove the plug from the end of the vacuum hose, and then connect the vacuum hose to the secondary air control valve.

IDLE-UP MECHANISM INSPECTION AND ADJUSTMENT – FOR ABS

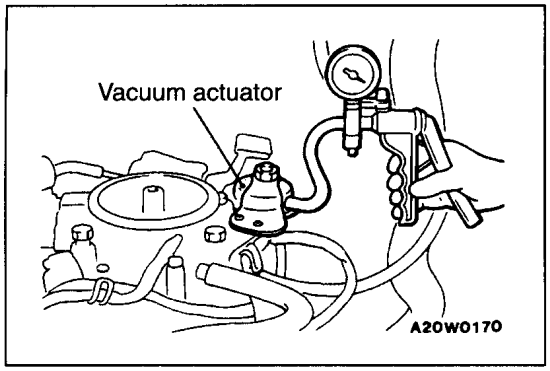
120002645

(1) Set the vehicles in the following condition.
- Engine coolant temperature: 80–95°C
- Lamps and all accessories: OFF
- Transmission: Neutral

(2) Inspect and adjust the idle speed. (Refer to P. 11D-9.)

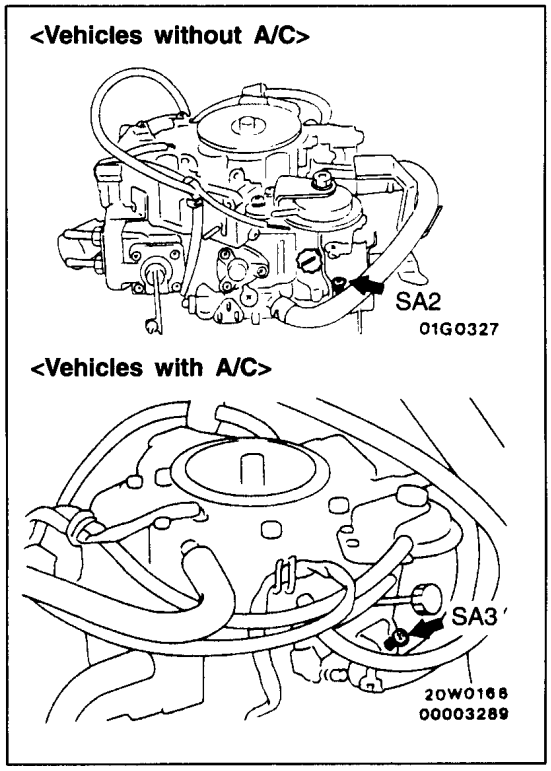


(3) Remove the vacuum hose (for anti-skid brake: blue) from the vacuum actuator.



(4) Connect a hand vacuum pump to the nipple of the removed vacuum hose.
(5) Set up a tachometer. (Refer to P. 11D-9.)
(6) Start the engine and run at idle.
(7) Apply the negative pressure of 87kPa and check the engine speed.

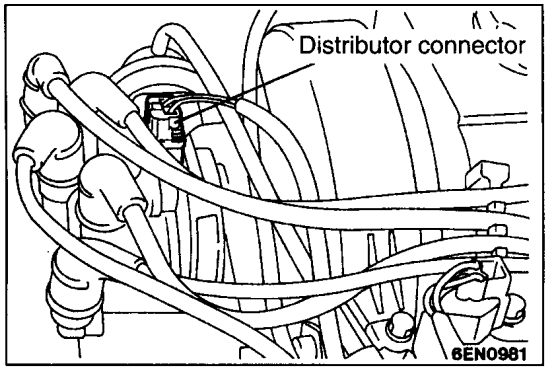
Standard value: 1,600 $^{+50}_{-300}$ r/min



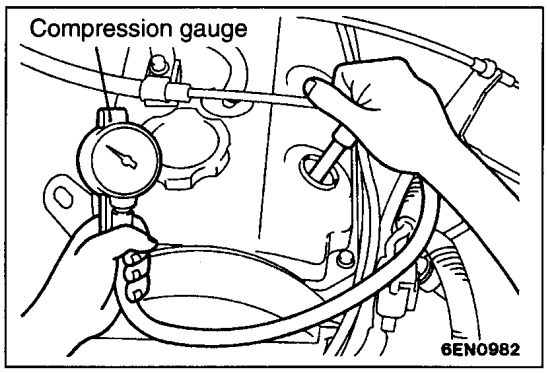
(8) If the engine speed is outside the standard value, adjust by turning the speed adjusting screw (SA2 <Vehicles without A/C> or SA3 <Vehicles with A/C>).

COMPRESSION PRESSURE INSPECTION 120001610

1. Check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the distributor connector.
5. Cover the spark plug hole with a rag etc., and after the engine has been cranked, check that no foreign material is adhering to the rag.



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:
1,320 kPa (at engine speed of 250–400 r/min)

Limit:
Min. 1,000 kPa (at engine speed of 250–400 r/min)

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.

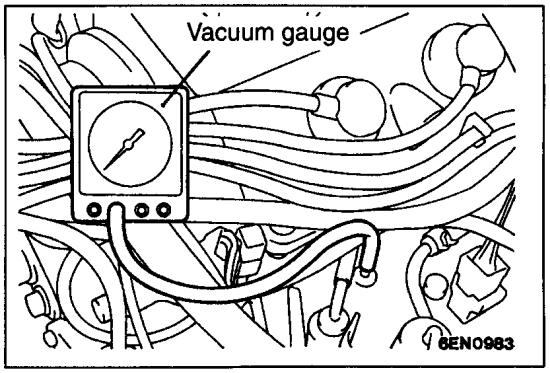
    Tightening torque: 25 Nm

12. Install the spark plug cables.

INTAKE MANIFOLD VACUUM INSPECTION

120002646

1. Set the vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral
2. Set up a timing light and tachometer.
   For information regarding the tachometer installation method, refer to P. 11D-9.

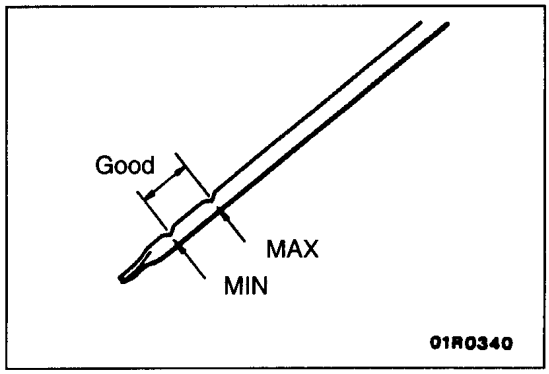


3. Set the vacuum gauge at illustrated position on the intake manifold.
4. Check that the idle speed is at the standard value.

   Standard value: 800±50 r/min

5. Check the manifold vacuum.

   Limit: Min. 60 kPa

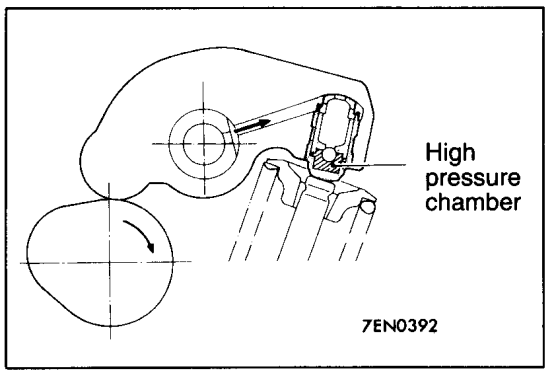


LASH ADJUSTER CHECK 120002008

NOTE
If an abnormal noise (rattling noise) probably caused by the lash adjusters is heard and the noise does not stop, check as follows.

1. Check the engine oil, and if required, refill or change it.

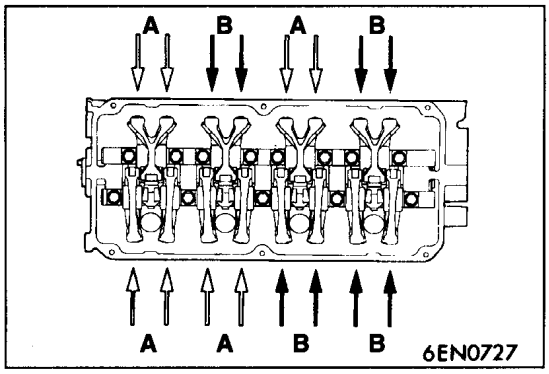
   NOTE
   - If the amount of the engine oil is insufficient, air will be sucked in from the oil strainer and mix in the oil passage.
   - If the amount of the engine oil is more than the specified amount, it will be stirred by the crank to make a lot of air mix in the oil.
   - If the oil is deteriorated, it will not easily separate from air and the amount of air mixed in the oil will increase.



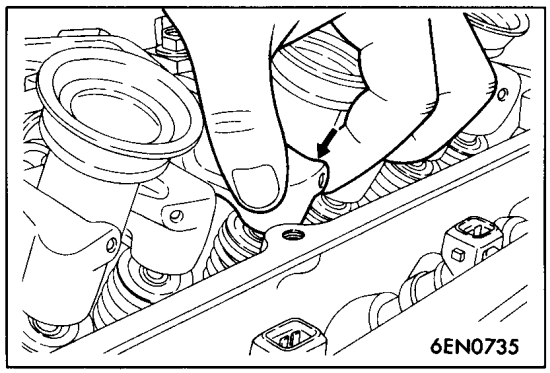
If the air which has mixed in the oil due to the above causes enters the high pressure chamber in the lash adjusters, the air in the high pressure chamber will be pressurized during opening of the valve, which causes the lash adjusters to shrink excessively, and an abnormal noise will be generated when the valve is closed. This is the same phenomenon as the one when the valve clearance has been excessively adjusted by mistake.
In this case, if the air which has entered the lash adjusters is bled, things will be normalized.

2. Start the engine and perform gentle racing * several times. (less than 10 times.)
   If the abnormal noise stops by racing, the air is bled from the high pressure chamber of the lash adjusters and the function of the lash adjusters is normalized.
   * After raising the engine speed from idling to 3,000 r/min. gradually (in 30 seconds), drop the speed gradually (in 30 seconds) to idling.

   NOTE
   - If the vehicle is parked on a slope for a long time, the oil in the lash adjusters will be decreased and air may enter the high pressure chamber when the vehicle is started.
   - After the vehicle is parked for a long time, air may enter the high pressure chamber because the oil in the oil passage will be gone and it will take a time before the oil is supplied to the lash adjusters.



3. If an abnormal noise does not stop by racing, check the lash adjusters according to the following procedures.
   (1) Stop the engine.
   (2) Set the No. 1 cylinder of the engine to the compression top dead centre.
   (3) Push the rocker arm indicated by the arrow mark "A" as shown in the illustration at left and check whether or not the arm lock goes down.
   (4) Turn slowly the crank shaft 360° clockwise.
   (5) Check the rocker arm indicated by the arrow mark "B" as shown in the illustration at left same as above (3).



(6) If the rocker arm can be lowered easily when the part of the rocker arm which is directly above the top of the lash adjuster is pressed, the lash adjuster is defective and should be replaced with a new part. Furthermore, when replacing the lash adjuster, bleed all of the air from the lash adjuster and then install. After this, check to be sure that there is no abnormality by carrying out the inspection in steps (1) to (5).

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

Furthermore, if the rocker arm feels extremely stiff and cannot be lowered when it is pressed, the lash adjuster is normal, so investigate for some other cause of the abnormality.

SERVICE ADJUSTMENT PROCEDURES <MPI>

120002647

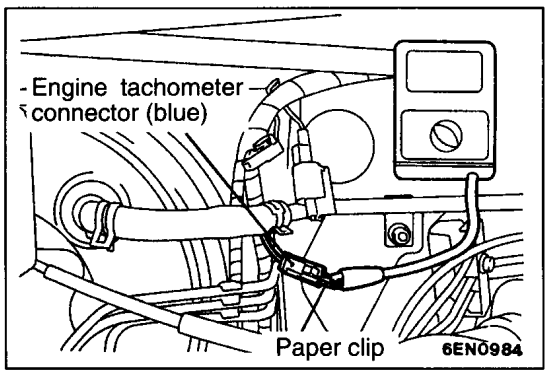
DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

Refer to P. 11D-7.

IGNITION TIMING INSPECTION AND ADJUSTMENT

120002648

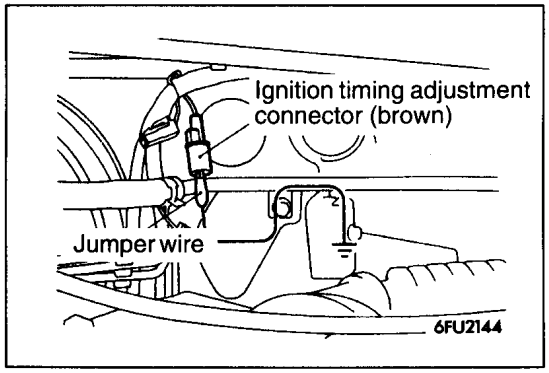
1. Before inspection and adjustment, set vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral (P range on vehicles with A/T)



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

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

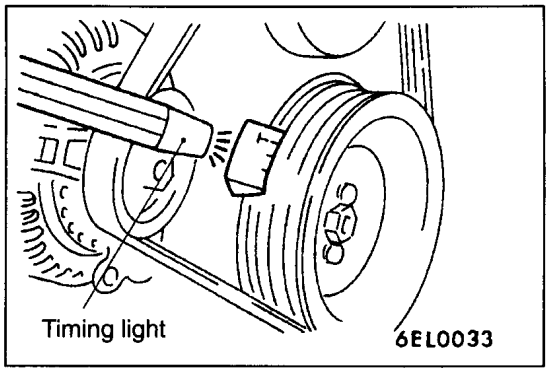
4. Set up a timing light.
5. Start the engine and run at idle.
6. Check that the idle speed is approximately 750 r/min.
7. Turn the ignition switch to OFF.
8. Remove the waterproof connector from the ignition timing adjustment connector (brown).
9. Connect the jumper wire with the clip to the ignition timing adjustment terminal, and earth this to the body as illustrated.

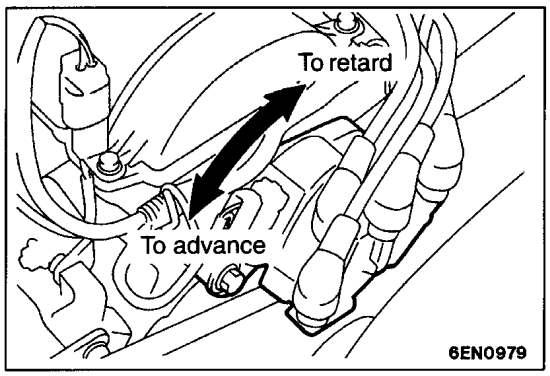


   NOTE
   Earthing this terminal sets the engine to the basic ignition timing.

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 fixing bolts and adjust by rotating distributor body.
13. Tighten mounting bolts 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 operation.
    2. And it is automatically further advanced by about 5° from 10° BTDC at higher altitudes.

16. Attach a sealing tape to the fitting nut only for vehicles for Switzerland.

    NOTE
    Sealing tape is attached to all new vehicles.

IDLE SPEED INSPECTION

120002649

1. Set vehicles in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral (P range on vehicles with A/T)
2. Check the basic ignition timing. Adjust if necessary.

   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.
5. Run it at idle for 2 minutes.
6. Check the curb idle speed.

   Standard value: 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 INSPECTION 120002650

1. Set vehicles in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral (P range on vehicles with A/T)
2. Check that the basic ignition timing is within the standard value.

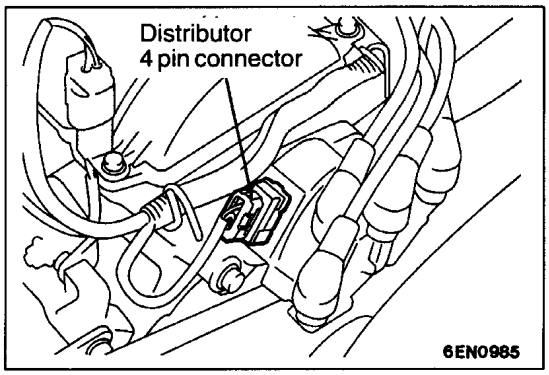
   Standard value: 5° BTDC ±2°
3. Turn the ignition switch to OFF and connect the MUT-II to the diagnosis connector.
4. Start the engine and run it at 2,500 r/min for 2 minutes.
5. Set the CO, HC tester.
6. Check the CO contents and the HC contents at idle.

   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 INSPECTION 120002651

1. Check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral (P range on vehicles with A/T)
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.

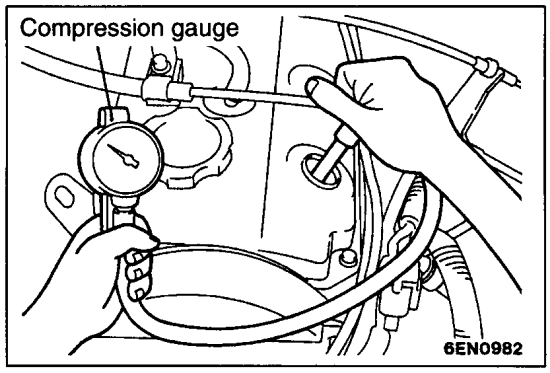


4. Disconnect the distributor 4 pin connector.

   NOTE
   Doing this prevent the engine control unit to carry 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:
   1,320 kPa (at engine speed of 250–400 r/min)
   Limit:
   Min. 1,000 kPa (at engine speed of 250–400 r/min)

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 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.

    Tightening torque: 25 Nm

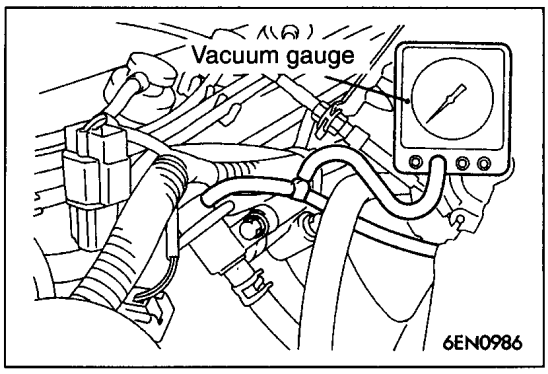
12. Install the spark plug cables.
13. Use the MUT-II to erase the diagnosis codes.

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

INTAKE MANIFOLD VACUUM INSPECTION

120002652

1. Set the vehicles in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral (P range on vehicles with A/T)
2. Turn the ignition switch to OFF and connect the MUT-II to the diagnosis connector.



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 the standard value.

   Standard value: 750±100 r/min
5. Check the manifold vacuum.

   Limit: Min. 60 kPa

LASH ADJUSTER CHECK

120002653

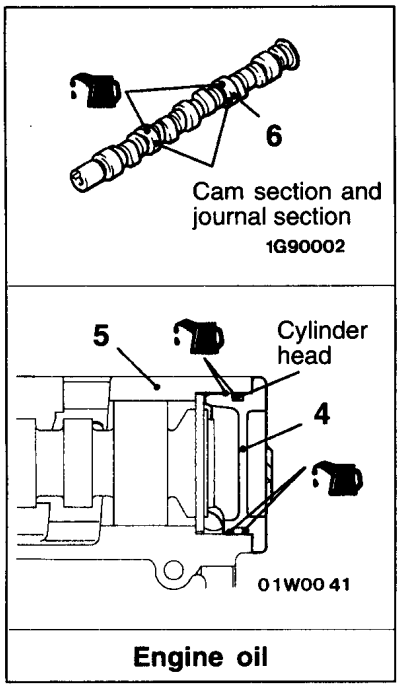
Refer to P. 11D-15.

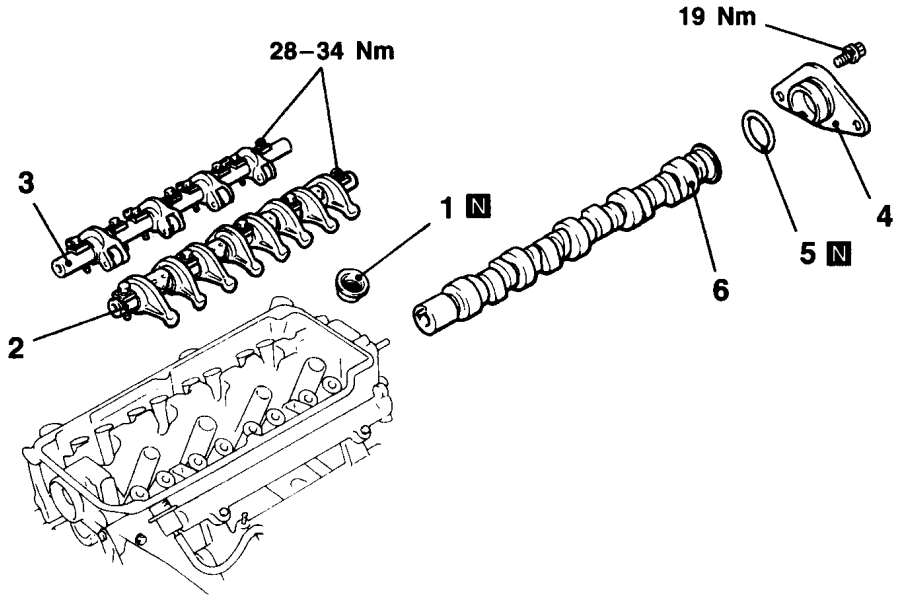
CAMSHAFT

120002449

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Cylinder Head Assembly Removal and Installation (Refer to P.11D-29.)



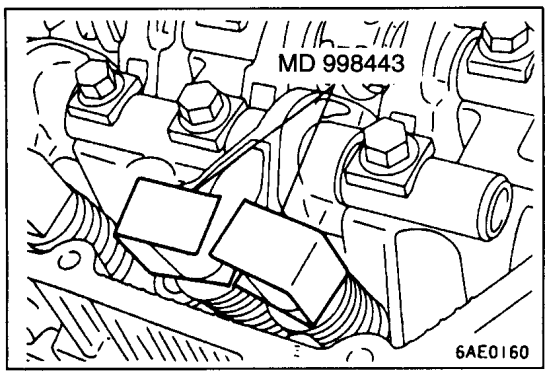


01W0039

00000850

Removal steps

1. Oil seal
◀A▶ ▶A◀ 2. Rocker arm and shaft assembly (Intake side)
◀A▶ ▶A◀ 3. Rocker arm and shaft assembly (Exhaust side)
4. Thrust case
5. O-ring
6. Camshaft

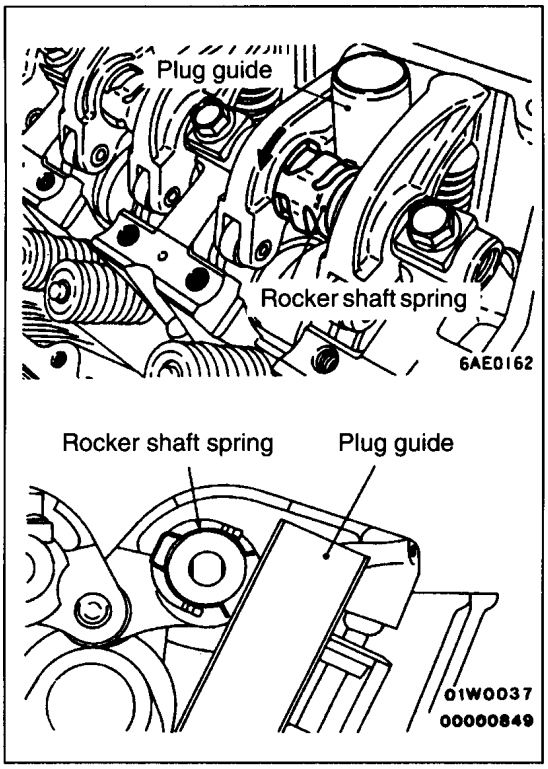


REMOVAL SERVICE POINT

◀A▶ ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

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

Caution
Never disassemble the rocker arm and shaft assembly.



INSTALLATION SERVICE POINT

▶A◀ ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

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

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

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

Tightening torque: 28–34 Nm

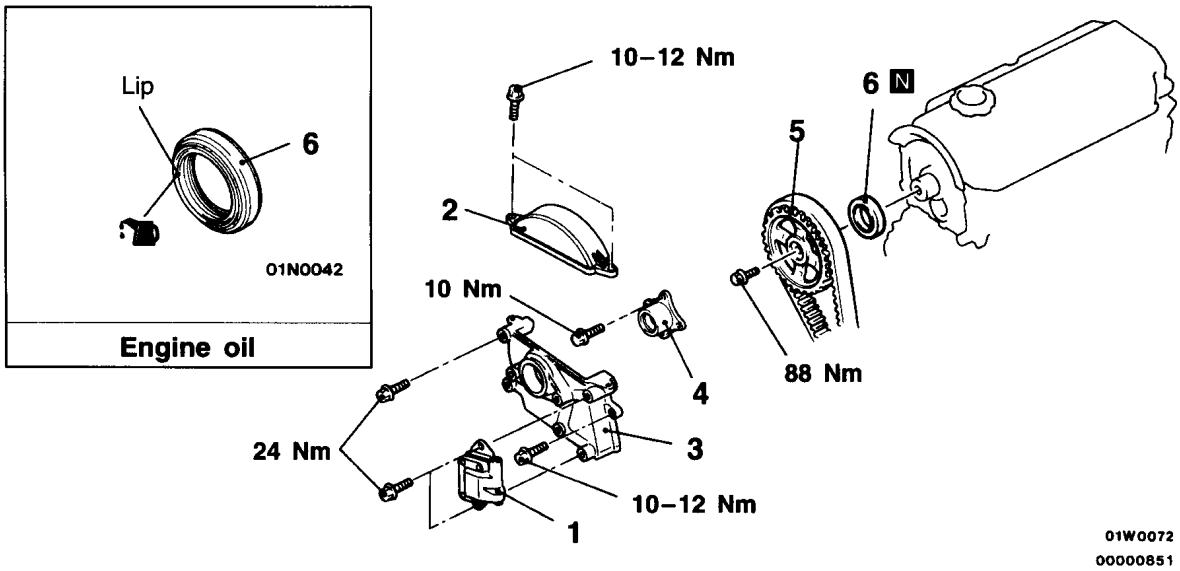
(4) Remove the special tool for fixing the lash adjuster.

CAMSHAFT OIL SEAL

120000227

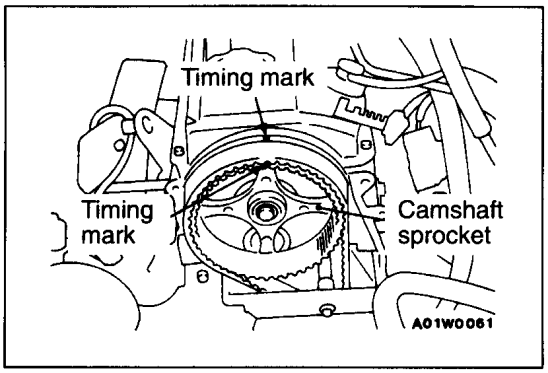
REMOVAL AND INSTALLATION

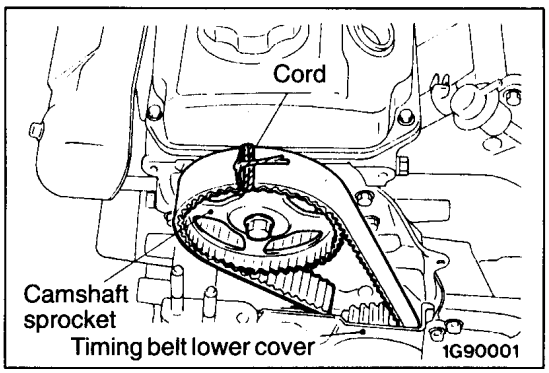
Pre-removal and Post-installation Operation
- Distributor Removal and Installation



Removal steps

1. Ignition coil
2. Timing belt upper cover assembly
3. Distributor bracket
▶C◀ 4. Camshaft sprocket spacer
◀A▶ ▶B◀ 5. Camshaft sprocket
◀B▶ ▶A◀ 6. Camshaft oil seal





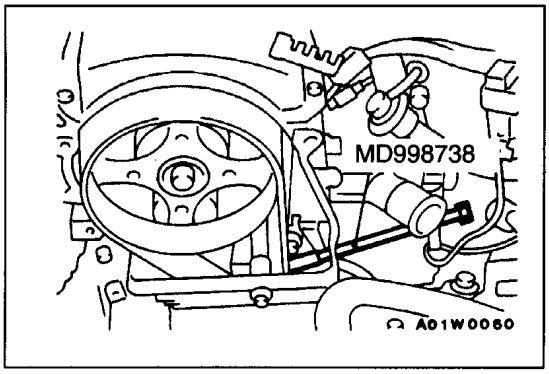
REMOVAL SERVICE POINTS

◀A▶ CAMSHAFT SPROCKET REMOVAL

(1) Rotate the crankshaft in the forward (right) direction and align the timing mark.

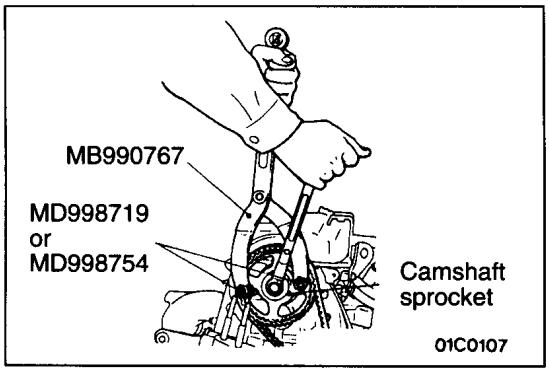
Caution
The crankshaft must always be rotated in the forward direction only.

(2) Tie the camshaft sprocket and timing belt with a cord so that the position of the camshaft sprocket will not move with respect to the timing belt.



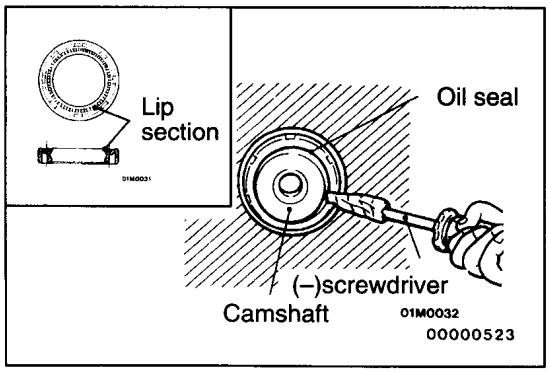
(3) Insert the special tool into the rubber plug hole in the timing belt cover assembly rear and turn it gently. Stop turning the special tool when it can no longer be turned gently.

NOTE
This work will make the end of the special tool touch the tensioner arm. So the auto tensioner will stop and the timing belt tension will not vary.



(4) Use the special tool to remove the camshaft sprocket with the timing belt attached.

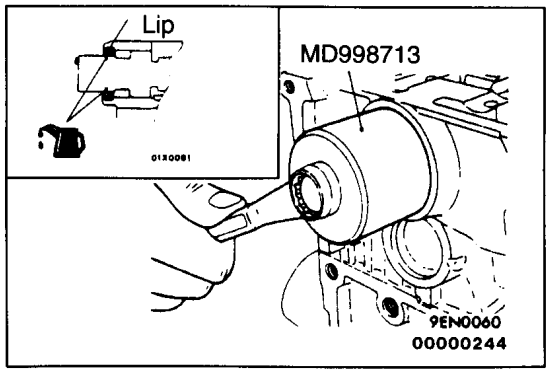
Caution
After removing the camshaft sprocket, be sure not to rotate the crankshaft.



◀B▶ CAMSHAFT OIL SEAL REMOVAL

(1) Make a notch in the oil seal lip section with a knife, etc.
(2) Cover the end of a (–) screwdriver with a rag and insert into the notched section of the oil seal, and lever out the oil seal to remove it.

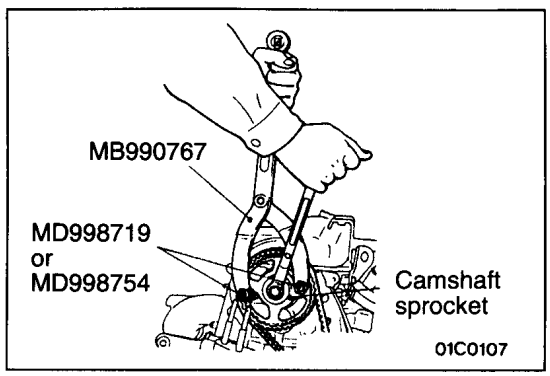
Caution
Be careful not to damage the camshaft and the cylinder head.



INSTALLATION SERVICE POINTS

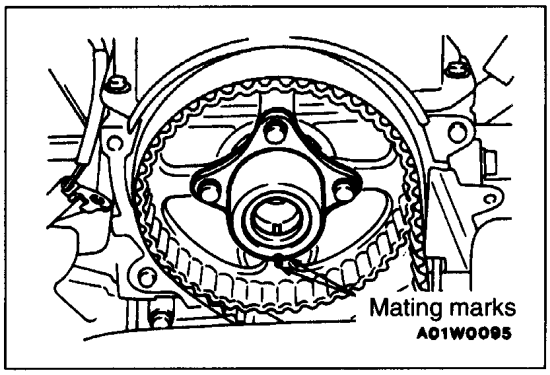
▶A◀ CAMSHAFT OIL SEAL INSTALLATION

(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

(1) Use the special tool to stop the camshaft sprocket from turning, and then install the camshaft sprocket bolt.
(2) Remove the special tool from the rubber plug hole.
(3) Remove the cord which binds the camshaft sprocket and timing belt.



▶C◀ CAMSHAFT SPROCKET SPACER INSTALLATION

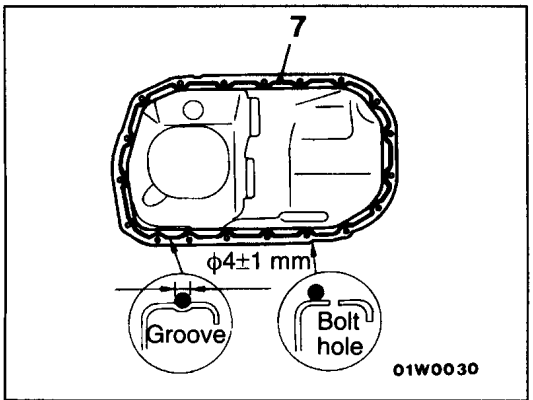
Align the mating marks on the camshaft sprocket and the camshaft sprocket spacer (groove), and then install them.

OIL PAN, OIL SCREEN

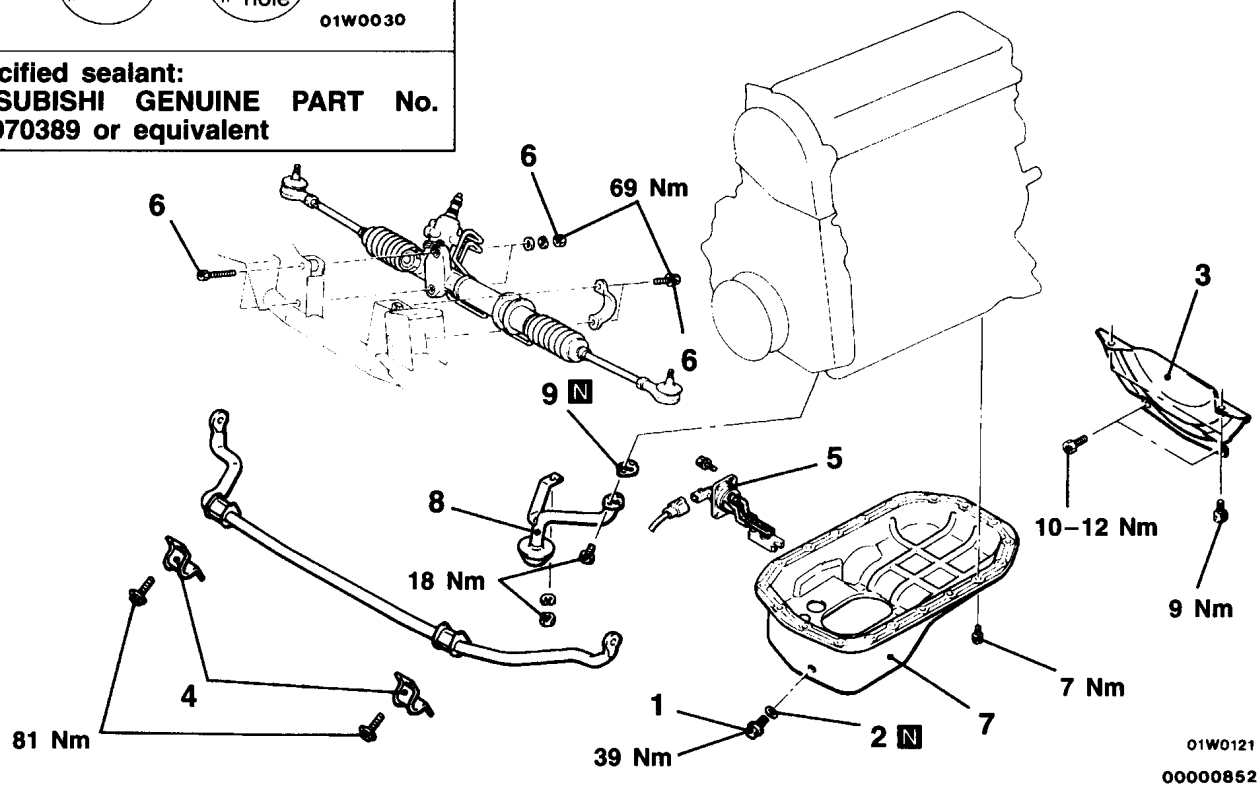
120002450

REMOVAL AND INSTALLATION

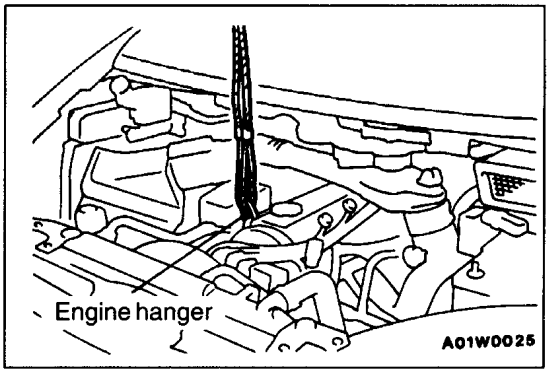
Pre-removal and Post-installation Operation
(1)Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)
(2)Engine Oil Draining and Refilling (Refer to GROUP 12 – Service Adjustment Procedures.)
(3)Hood Removal and Installation <4WD> (Refer to GROUP 42 – Hood.)



Specified sealant:
MITSUBISHI GENUINE PART No. MD970389 or equivalent



Removal steps
1. Drain plug
▶C◀ 2. Gasket
3. Bell housing cover
▶B◀ 4. Clamp
5. Engine oil level sensor
6. Steering gear and linkage mounting bolts and nuts <2WD>
◀A▶ • Suspend the engine assembly. <4WD>
◀B▶ ▶A◀ 7. Oil pan
8. Oil screen
9. Gasket

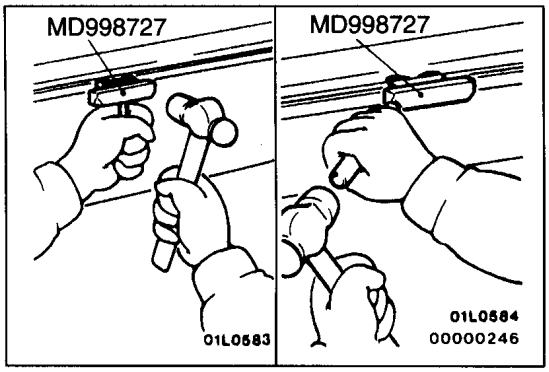


REMOVAL SERVICE POINTS

◀A▶ SUSPEND THE ENGINE ASSEMBLY <4WD>

Hook a chain onto the engine hanger and then use a chain block to raise the engine until there is no load on the engine mount insulators.

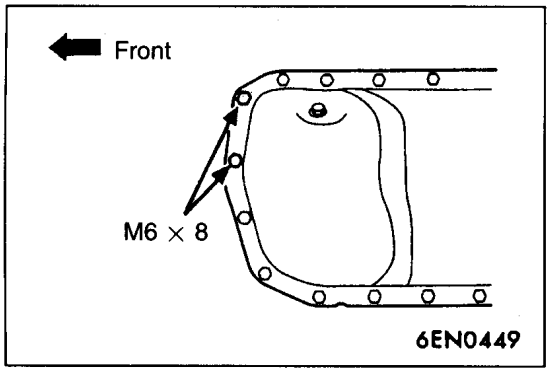
Caution
Be careful not to damage the engine mount insulators.



◀B▶ OIL PAN REMOVAL

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

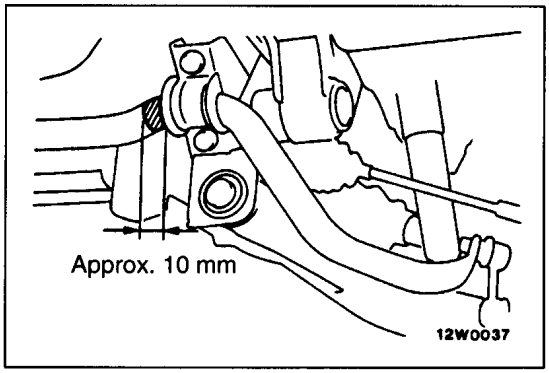
Caution
Perform this slowly to avoid deformation of the oil pan flange.



INSTALLATION SERVICE POINTS

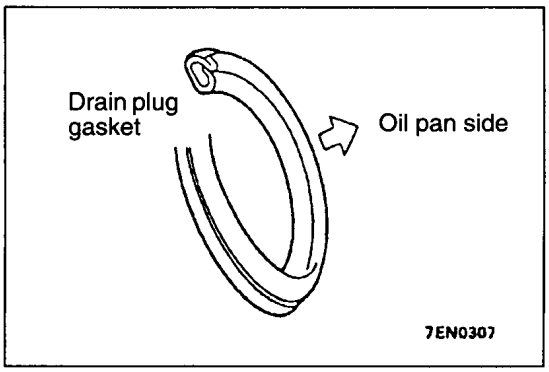
▶A◀ OIL PAN INSTALLATION

Be careful when installing, as the bolts indicated in the illustration have different lengths from the other bolts.



▶B◀ CLAMP INSTALLATION

Install the clamp so that the coloured part on the stabilizer bar meets the indicated distance.



▶C◀ GASKET INSTALLATION

Replace the gasket with a new gasket, and install it in the direction shown in the illustration.

CYLINDER HEAD GASKET

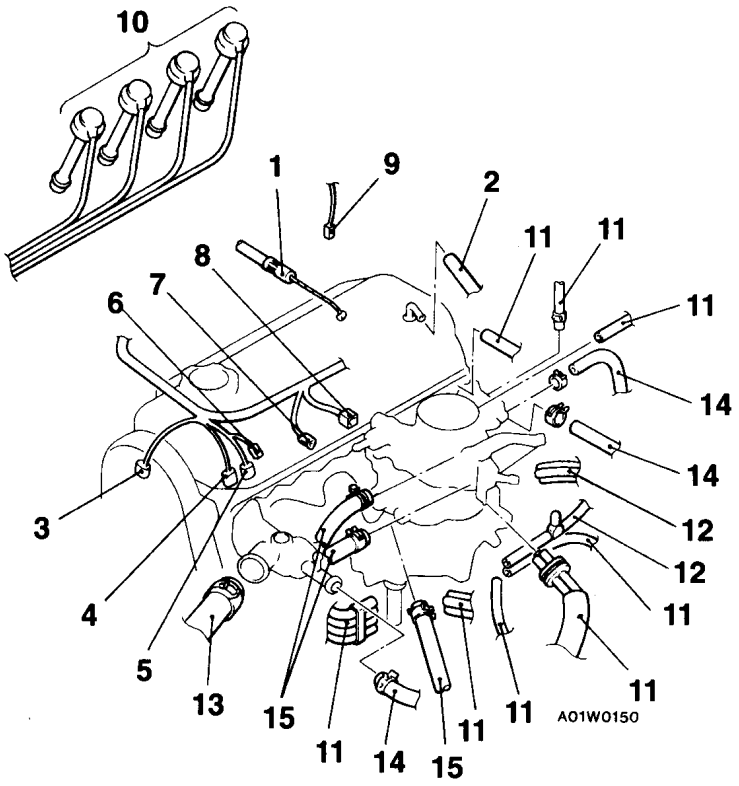
120002451

REMOVAL AND INSTALLATION

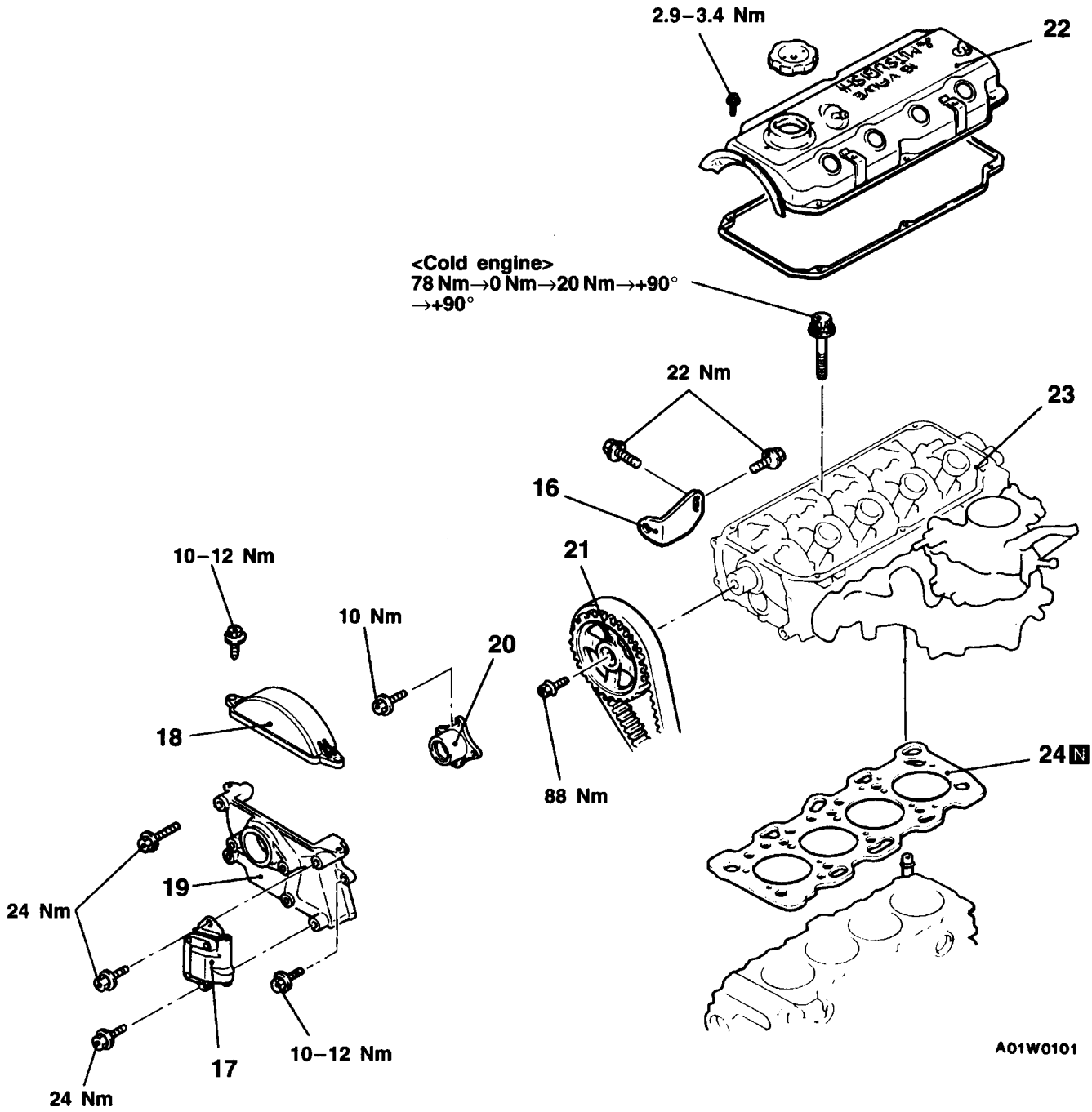
<Electronic controlled carburettor>

Pre-removal Operation
(1)Engine Coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)
(2)Battery and Battery Tray Removal
(3)Air Cleaner Assembly Removal (Refer to GROUP 15 – Air Cleaner.)
(4)Distributor Removal
(5)Exhaust Manifold Removal (Refer to GROUP 15 – Exhaust Manifold.)

Post-installation Operation
(1)Exhaust Manifold Installation (Refer to GROUP 15 – Exhaust Manifold.)
(2)Distributor Installation
(3)Air Cleaner Assembly Installation (Refer to GROUP 15 – Air Cleaner.)
(4)Battery and Battery Tray Installation
(5)Engine Coolant Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(6)Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
(7)Throttle Cable Adjustment (Refer to GROUP 23 – Service Adjustment Procedures.)



Removal steps
1. Accelerator cable connection
2. PCV hose connection
3. Ignition coil connector
4. Engine coolant temperature sensor connector
5. Engine coolant temperature switch connector (for A/C)
6. Noise capacitor connector
7. Throttle position sensor connector
8. Solenoid valve connector
9. Engine coolant temperature gauge connector
10. Spark plug cable
11. Vacuum hose connection
12. VRV hose
13. Radiator upper hose connection
14. Water hose connection
15. Fuel hose connection

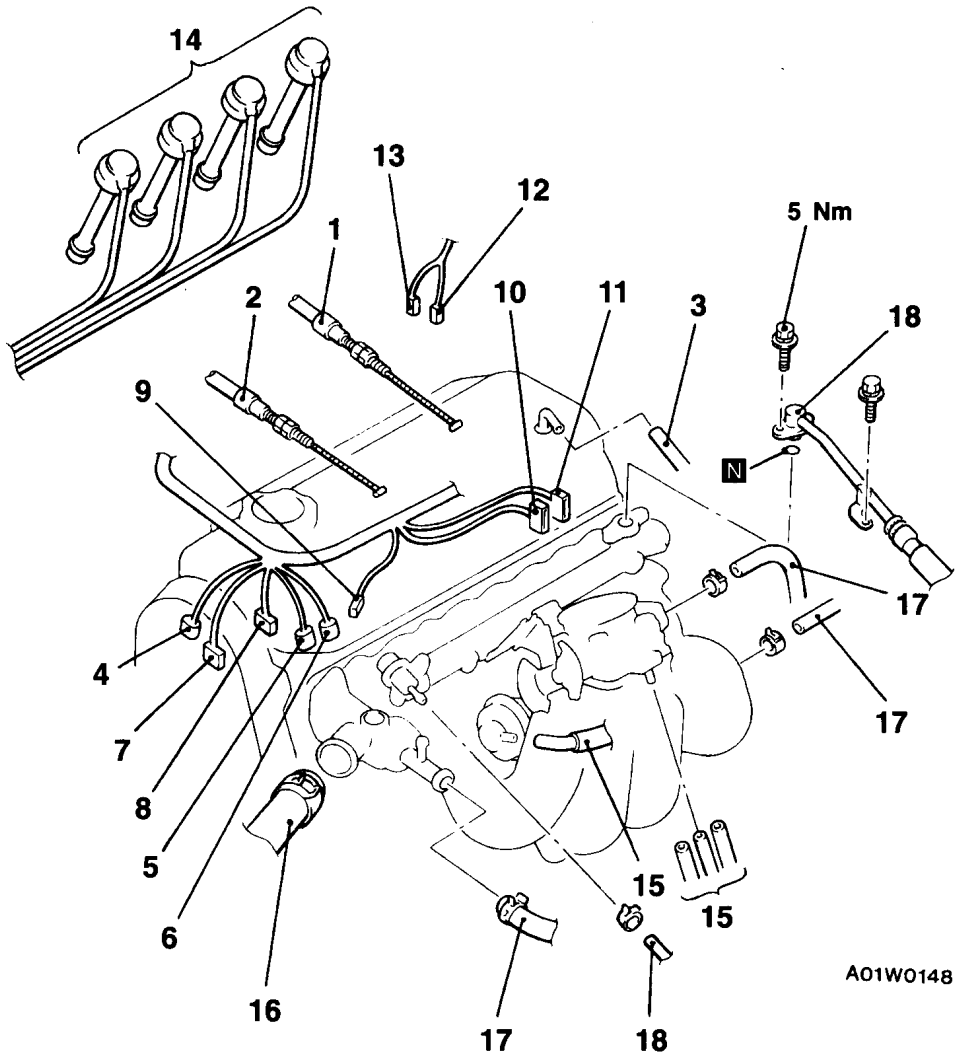


16. Power steering pump mount bracket
17. Ignition coil
18. Timing belt upper cover assembly
19. Distributor bracket
▶D◀ 20. Camshaft sprocket spacer
◀A▶ ▶C◀ 21. Camshaft sprocket
22. Rocker cover
◀B▶ ▶B◀ 23. Cylinder head assembly
▶A◀ 24. Cylinder head gasket

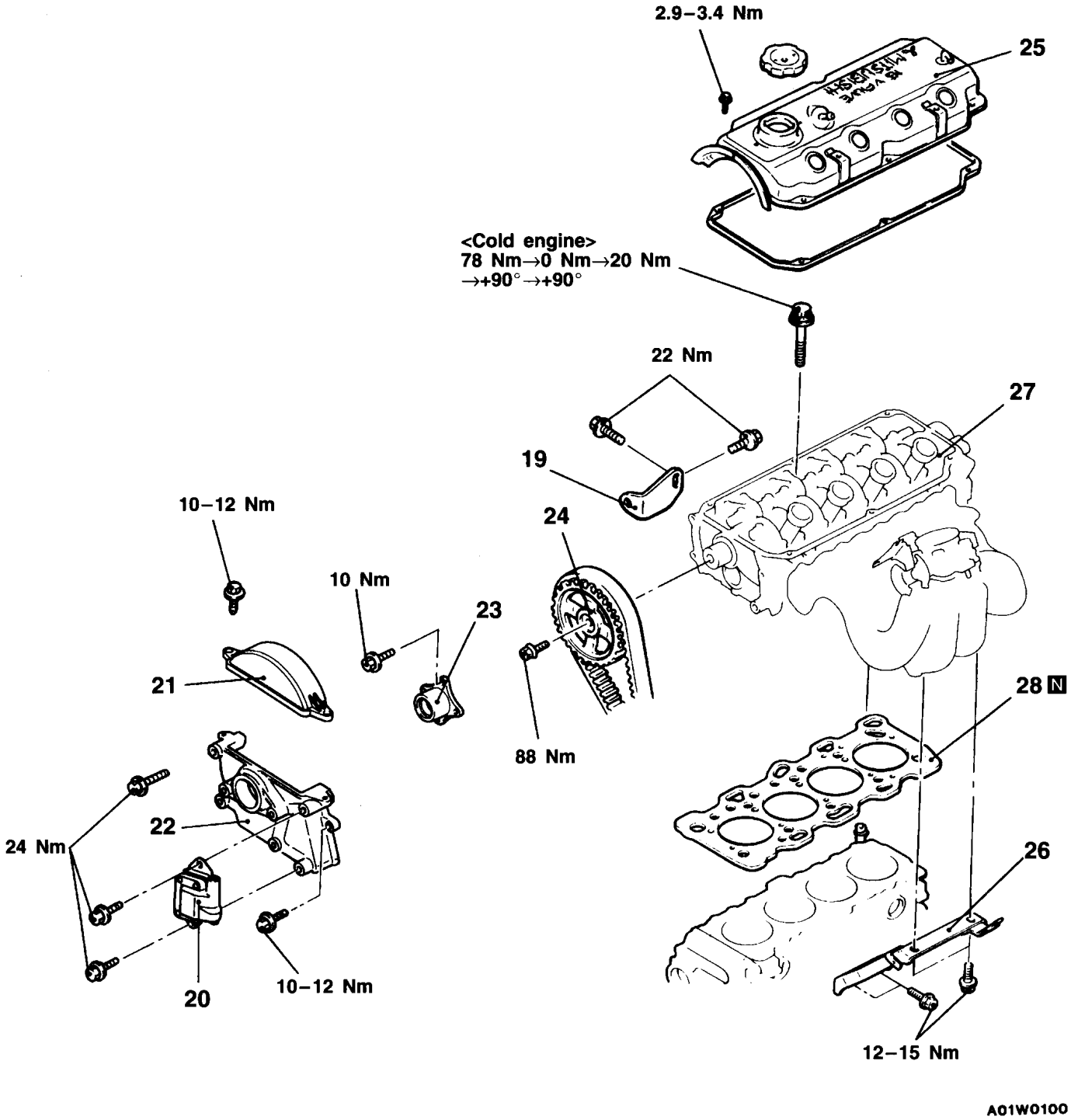
<MPI>

Pre-removal Operation
(1)Engine Coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)
(2)Fuel Line Pressure Releasing (Refer to GROUP 13A – Service Adjustment Procedures.)
(3)Battery and Battery Tray Removal
(4)Air Cleaner Assembly Removal (Refer to GROUP 15 – Air Cleaner.)
(5)Distributor Removal
(6)Exhaust Manifold Removal (Refer to GROUP 15 – Exhaust Manifold.)

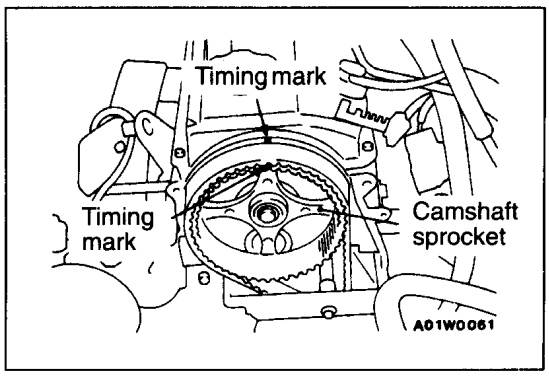
Post-installation Operation
(1)Exhaust Manifold Installation (Refer to GROUP 15 – Exhaust Manifold.)
(2)Distributor Installation
(3)Air Cleaner Assembly Installation (Refer to GROUP 15 – Air Cleaner.)
(4)Battery and Battery Tray Installation
(5)Engine Coolant Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(6)Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
(7)Throttle Cable Adjustment (Refer to GROUP 23 – Service Adjustment Procedures.)



Removal steps
1. Accelerator cable connection
2. Throttle cable connection <A/T>
3. PCV hose connection
4. Ignition coil connector
5. Engine coolant temperature sensor connector
6. Engine coolant temperature switch connector (for A/C)
7. Power transistor connector
8. Engine harness connector
9. Noise capacitor connector
10. Throttle position sensor connector
11. Idle speed control servo motor connector
12. Engine coolant temperature gauge connector
13. Engine coolant temperature switch connector (for A/T)
14. Spark plug cable
15. Vacuum hose connection
16. Radiator upper hose connection
17. Water hose connection
18. Fuel hose connection



19. Power steering pump mount bracket
20. Ignition coil
21. Timing belt upper cover assembly
22. Distributor bracket
▶D◀ 23. Camshaft sprocket spacer
◀A▶ ▶C◀ 24. Camshaft sprocket
25. Rocker cover
26. Intake manifold stay
◀B▶ ▶B◀ 27. Cylinder head assembly
▶A◀ 28. Cylinder head gasket

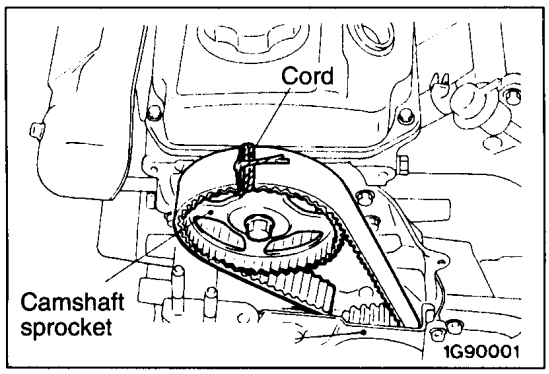


REMOVAL SERVICE POINTS

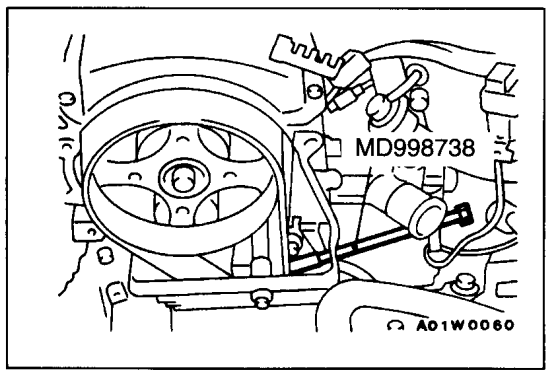
◀A▶ CAMSHAFT SPROCKET REMOVAL

(1) Rotate the crankshaft in the forward (right) direction and align the timing mark.

Caution
The crankshaft must always be rotated in the forward direction only.

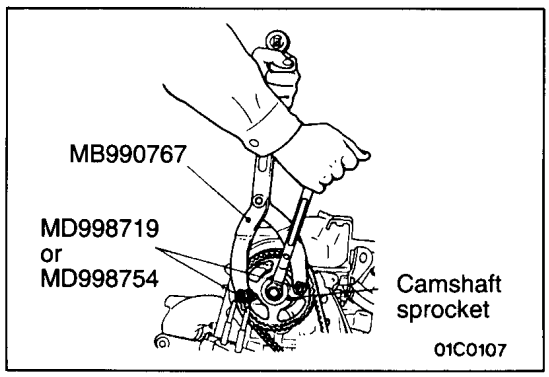


(2) Tie the camshaft sprocket and timing belt with a cord so that the position of the camshaft sprocket will not move with respect to the timing belt.



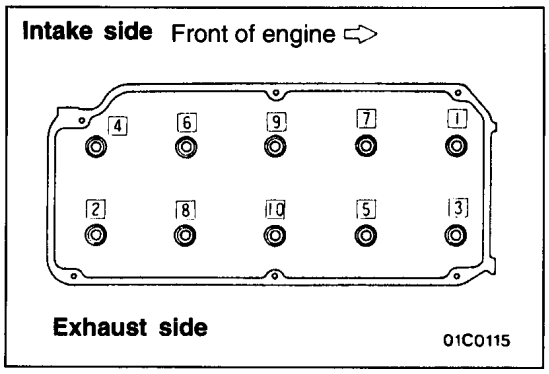
(3) Insert the special tool into the rubber plug hole in the timing belt cover assembly rear and turn it gently. Stop turning the special tool when it can no longer be turned gently.

NOTE
This work will make the end of the special tool touch the tensioner arm. So the auto tensioner will stop and the timing belt tension will not vary.



(4) Use the special tool to remove the camshaft sprocket with the timing belt attached.

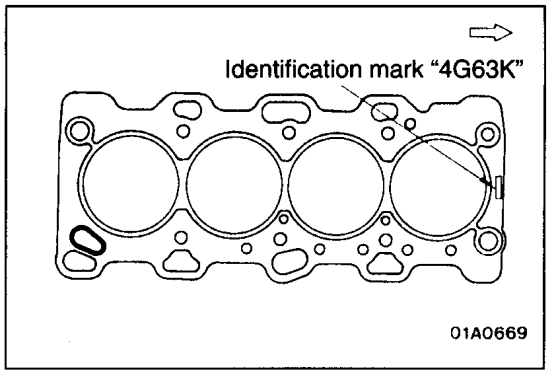
Caution
After removing the camshaft sprocket, be sure not to rotate the crankshaft.



◀B▶ CYLINDER HEAD ASSEMBLY REMOVAL

Loosen the bolts in the order shown in the illustration (in 2 or 3 cycles), remove them and then remove the cylinder head assembly.

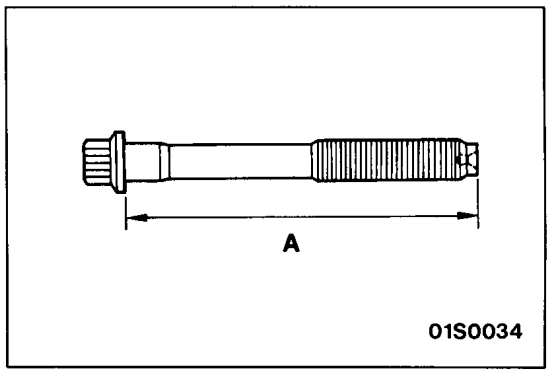
Caution
Because the plug guides cannot be replaced by themselves, be careful not to damage or deform the plug guides when removing the cylinder head bolts.



INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

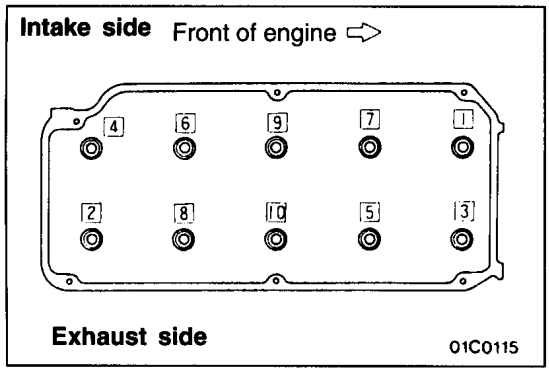
(1) Wipe off all oil and grease from the gasket mounting surface.
(2) Install the gasket to the cylinder block with the identification mark facing upwards.



▶B◀ CYLINDER HEAD ASSEMBLY INSTALLATION

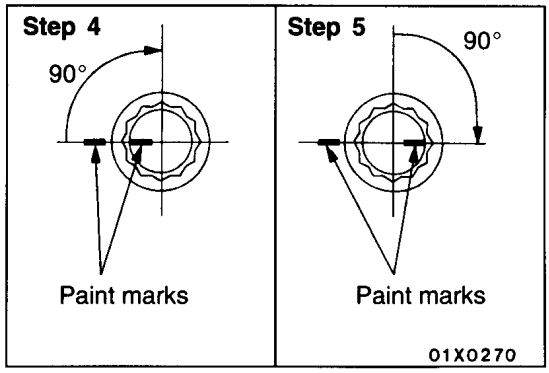
(1) When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

Limit (A):Within 99.4 mm



(2) Tighten the bolts by the following procedure.

Step	Operation	Remarks
1	Tighten to 78 Nm.	Carry out in the order shown in the illustration.
2	Fully loosen.	Carry out in the reverse order of that shown in the illustration.
3	Tighten to 20 Nm.	Carry out in the order shown in the illustration.
4	Tighten by 90°	Carry out in the order shown in the illustration.
5	Tighten by 90°	Carry out in the order shown in the illustration.

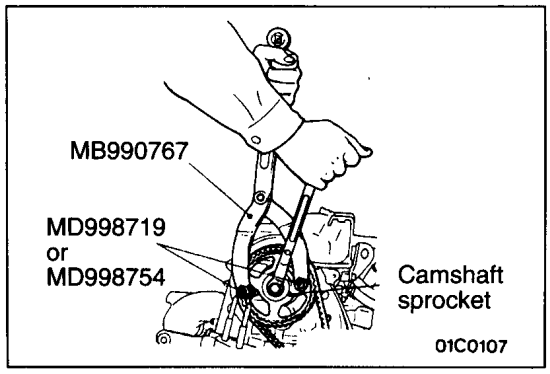


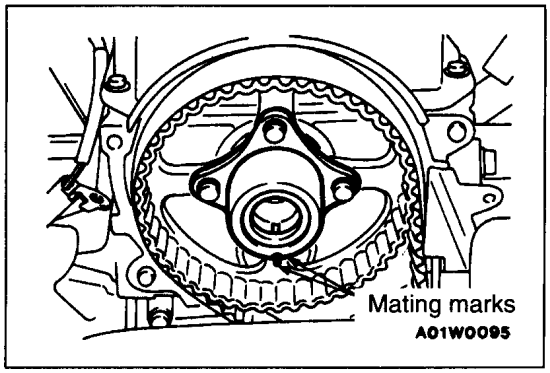
Caution

1. **It is possible that the tightening angle less than 90° doesn't assure enough tightness. Be careful about the tightening angle.**
2. **If the angle is not within the specified value, remove the bolt and redo by step 1.**

▶C◀ CAMSHAFT SPROCKET INSTALLATION

(1) Use the special tool to stop the camshaft sprocket from turning, and then install the camshaft sprocket bolt.
(2) Remove the special tool from the rubber plug hole.
(3) Remove the cord which binds the camshaft sprocket and timing belt.





▶D◀ CAMSHAFT SPROCKET SPACER INSTALLATION

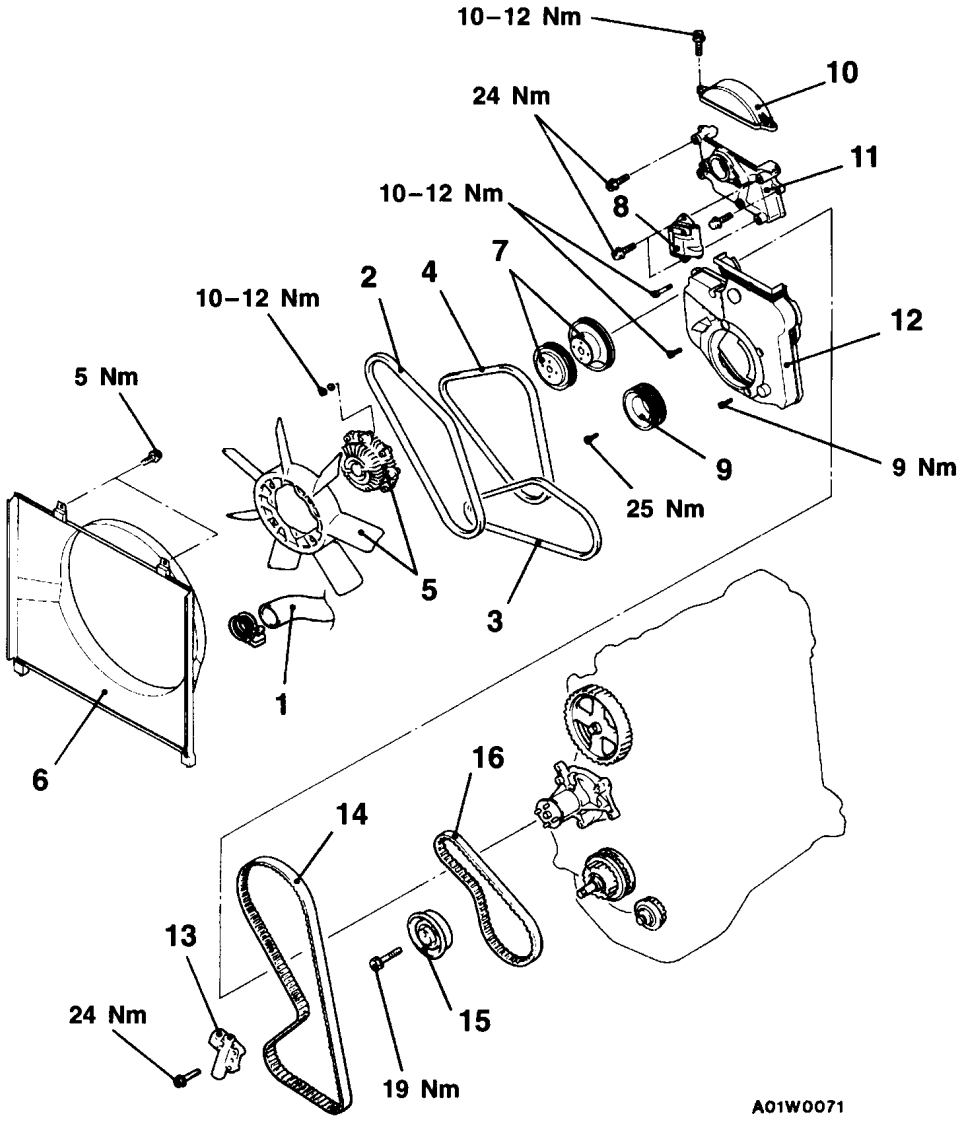
Align the mating marks on the camshaft sprocket and the camshaft sprocket spacer (groove), and then install them.

TIMING BELT, TIMING BELT B

120002452

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Engine Coolant Draining and Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(2)Distributor Removal and Installation



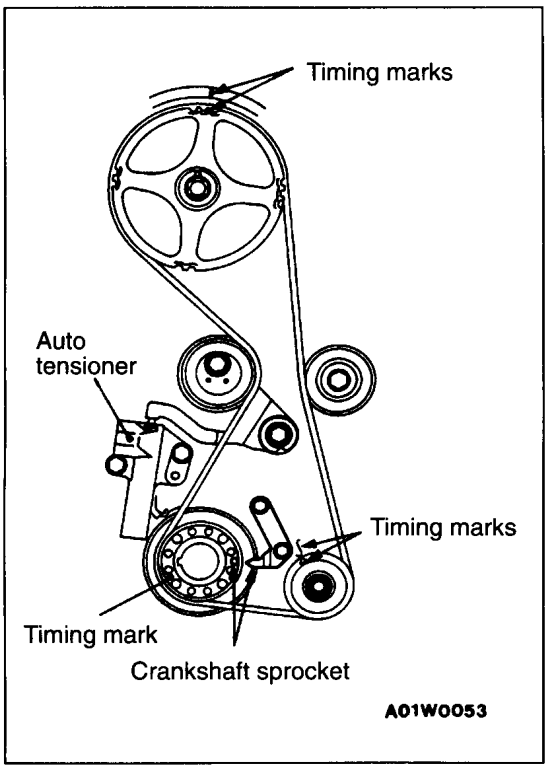
Removal steps

1. Connection for radiator upper hose
2. Drive belt (Power steering oil pump)
3. Drive belt (A/C compressor)
4. Drive belts (Alternator)
◀A▶ 5. Cooling fan and clutch assembly
◀A▶ 6. Radiator shroud assembly
7. Water pump pulley
8. Ignition coil
9. Crankshaft pulley
10. Timing belt upper cover assembly
11. Distributor bracket
12. Timing belt lower cover assembly
▶E◀ • Timing belt tension adjustment
◀B▶ ▶D◀ 13. Auto tensioner
◀C▶ ▶C◀ 14. Timing belt
▶B◀ • Timing belt B tension adjustment
15. Timing belt B tensioner
◀C▶ ▶A◀ 16. Timing belt B

REMOVAL SERVICE POINTS

◀A▶ COOLING FAN AND CLUTCH ASSEMBLY/RADIATOR SHROUD ASSEMBLY REMOVAL

Remove the mounting nuts and bolts, and then remove the cooling fan and clutch assembly and the radiator shroud assembly as a set.

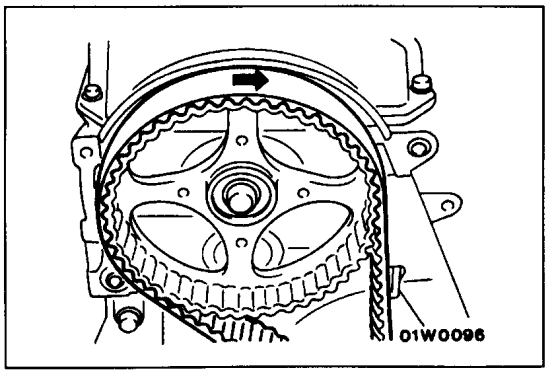


◀B▶ AUTO TENSIONER REMOVAL

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

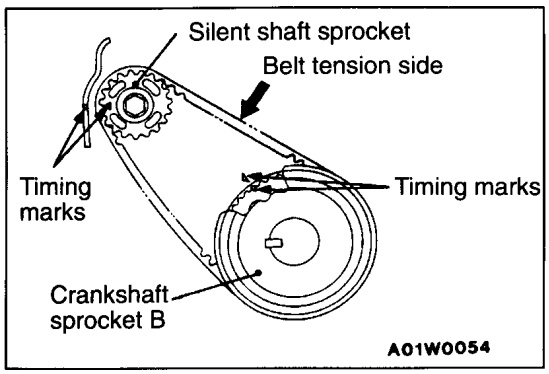
Caution
Never turn the crankshaft anticlockwise.

(2) Remove the auto tensioner.



◀C▶ TIMING BELT/TIMING BELT B REMOVAL

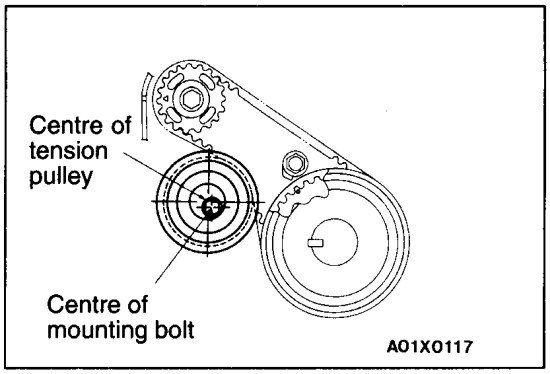
Caution
If the belt is to be re-used, chalk the belt with an arrow indicating the clockwise direction of rotation.



INSTALLATION SERVICE POINTS

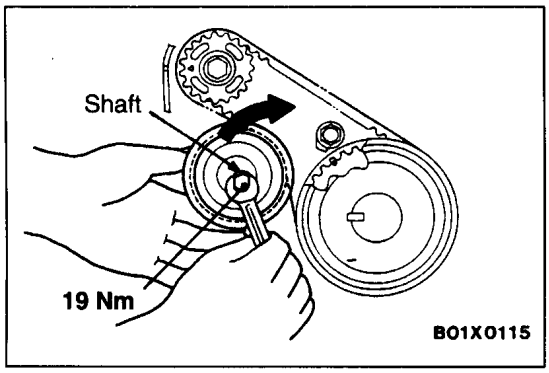
▶A◀ TIMING BELT B INSTALLATION

(1) Ensure that crankshaft sprocket "B" timing marks and the silent shaft sprocket timing marks are aligned.
(2) Fit timing belt "B" over crankshaft sprocket B and the silent shaft sprocket. Ensure that there is no slack in the belt.



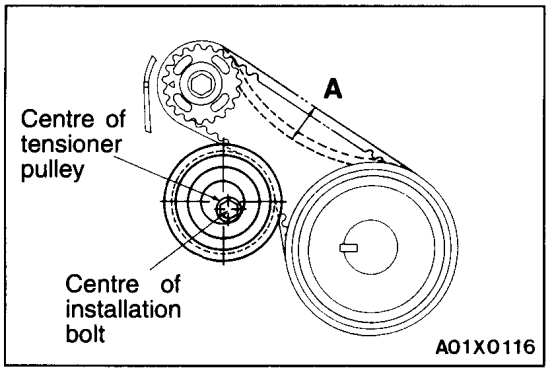
▶B◀ TIMING BELT B TENSION ADJUSTMENT

(1) Temporarily fix the timing belt "B" tensioner such that the centre of the tensioner pulley is to the left and above the centre of the installation bolt, and temporarily attach the tensioner pulley so that the flange is toward the front of the engine.



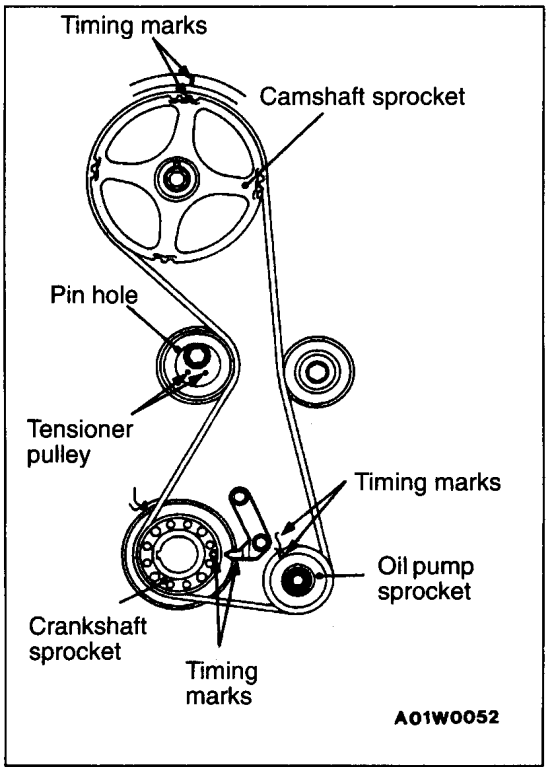
(2) Holding the timing belt "B" tensioner up with your finger in the direction of the arrow, apply pressure on the timing belt so that the tension side of the belt is taut. Now tighten the bolt to fix the tensioner.

Caution
When tightening the bolt, ensure that the tensioner pulley shaft does not rotate with the bolt. Allowing it to rotate with the bolt can cause excessive tension of the belt.



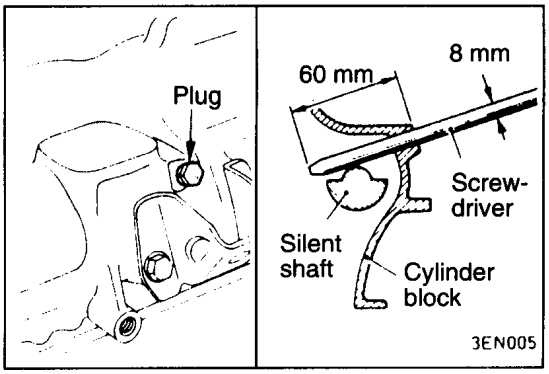
(3) To ensure that the tension is correct, depress the belt (point A) with a finger. Adjust the belt tension if it is incorrect.

Standard value:5–7 mm

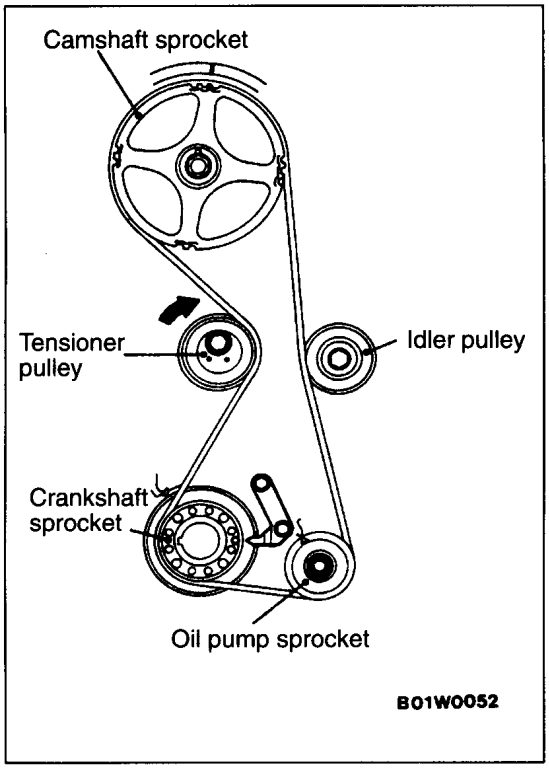


▶C◀ TIMING BELT INSTALLATION

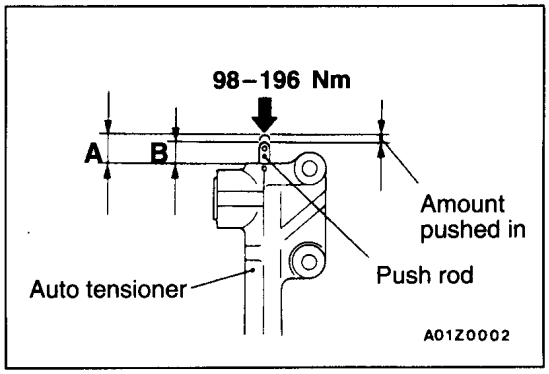
(1) Check that the timing marks of the camshaft sprocket, crankshaft sprocket and oil pump sprocket are all aligned. Also, temporarily tighten the tensioner pulley so that the pin holes are to the left of the bolt as shown in the illustration.



(2) After aligning the timing marks on the oil pump sprocket, remove the cylinder block plug and insert a Philips screwdriver with a diameter of 8 mm, and check to be sure that the screwdriver goes in 60 mm or more. If the screwdriver will only go in 20–25 mm before striking the silent shaft, turn the sprocket once, realign the timing mark and check that the screwdriver goes in 60 mm or more. The screwdriver should not be taken out until the timing belt is installed.



(3) Install the timing belt by the following procedure.
   (a) Place the timing belt onto the tensioner pulley and crankshaft sprocket, and hold it with your left hand so that it doesn't slip.
   (b) While pulling the timing belt with your right hand, place it onto the oil pump sprocket.
   (c) Place the timing belt onto the idler pulley and camshaft sprocket.
   (d) Push the tensioner pulley in the direction shown by the arrow to apply tension to the timing belt, and then tighten the tensioner pulley fixing bolt.

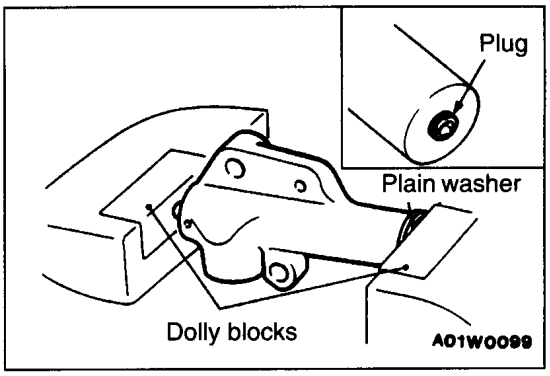


▶D◀ AUTO TENSIONER INSTALLATION

(1) While holding the auto-tensioner by hand, press the end of the rod against a metal surface (such as the cylinder block) with a force of 98–196 Nm and measure how far the rod is pushed in.

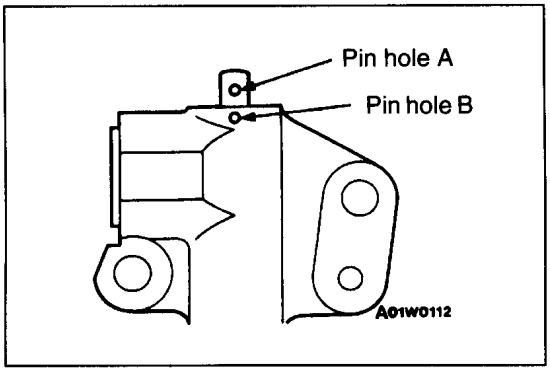
Standard value: Within 1mm
A: Length when no force is applied
B: Length when force is applied
A-B: Amount pushed in

(2) If it is not within the standard value, replace the auto tensioner.



(3) Place two dolly blocks in a vice as shown in the illustration, and then place the auto tensioner in the vice.

Caution
(1) Place the auto tensionner perpendicular to the jaws of the vice.
(2) If there is a plug at the base of the auto tensioner, insert a plain washer onto the end of the auto tensioner to protect the plug.

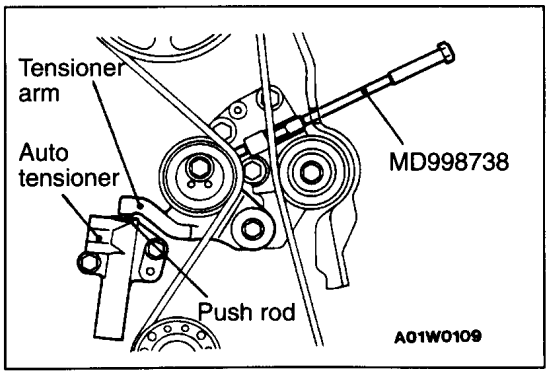


(4) Slowly compress the push rod of the auto tensioner until pin hole A in the push rod is aligned with pin hole B in the cylinder.

Caution
Never compress the push rod too fast, or the push rod may be damaged.

(5) Insert the setting pin into the pin holes once they are aligned.

NOTE
If replacing the auto tensioner, the pin will already be inserted into the pin holes.

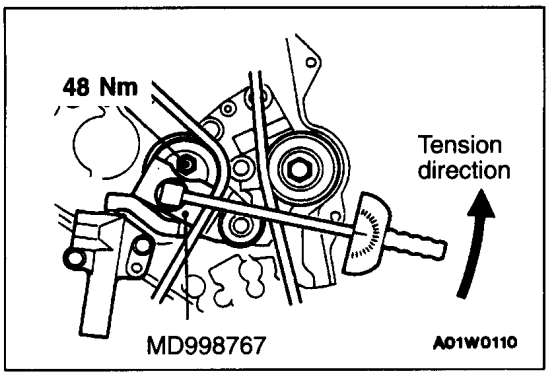


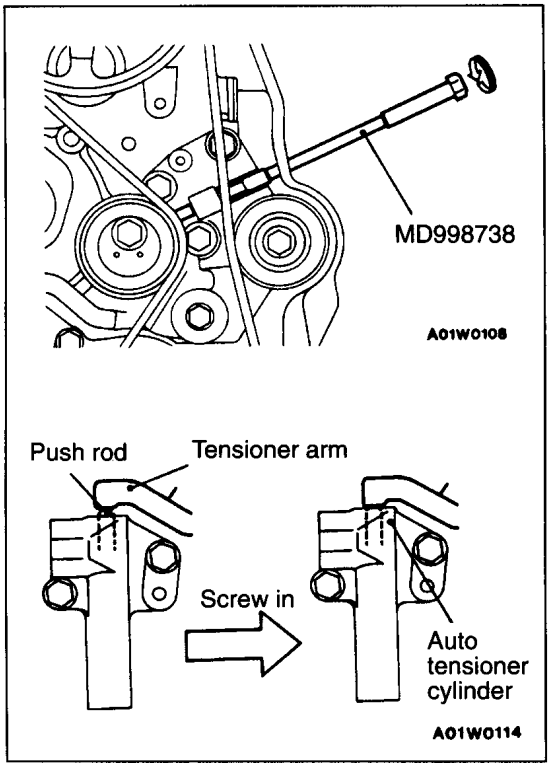
(6) Install the auto tensioner to the engine.

Caution
Do not remove the setting pin from the auto tensionner.

(7) Remove the rubber plug from the timing belt cover assembly rear. Then screw in the special tool by hand until the tensioner arm is touching the auto tensioner push rod.

Caution
Do not use a spannner or the like to turn the special tool, otherwise the auto tensionner setting pin may be broken. Turn the special tool by hand only.





▶E◀ TIMING BELT TENSION ADJUSTMENT

(1) After turning the crankshaft 1/4 of a revolution in the anticlockwise direction, turn it in the clockwise direction until the timing marks are aligned.

(2) Loosen the tension pulley fixing bolt, and then use the special tool and a torque wrench to tighten the fixing bolt to the specified torque while applying tension to the timing belt.

Standard value:3.5 Nm <Timing belt tension torque>

Caution
When tightening the fixing bolt, make sure that the tension pulley does not turn with the bolt.

(3) Remove the setting pin that has been inserted into the auto tensioner, and then remove the special tool.

(4) Turn the crankshaft two turns clockwise, and wait for approximately 15 minutes.

(5) Insert the special tool again and turn it by hand until the end of the special tool touches the tensioner arm.

(6) Once the end touches, keep turning the special tool until the auto tensioner push rod retracts and the tensioner arm contacts the auto tensioner cylinder.

Caution
Turn the special tool slowly 1/4 of a turn at a time.

(7) Check that the amount by which the special tool has been screwed in is within the standard value range.

Standard value:2.5–3 turns

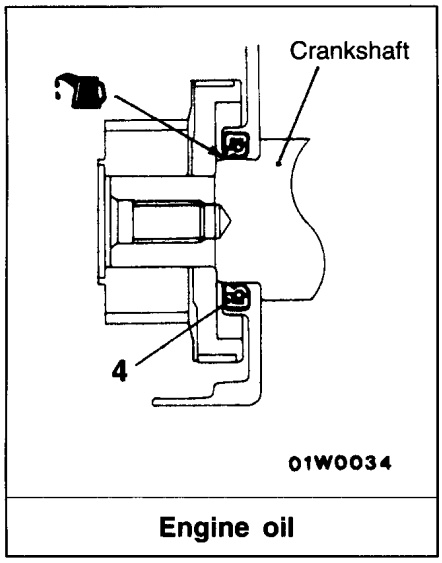
(8) Remove the special tool and install the rubber plug.

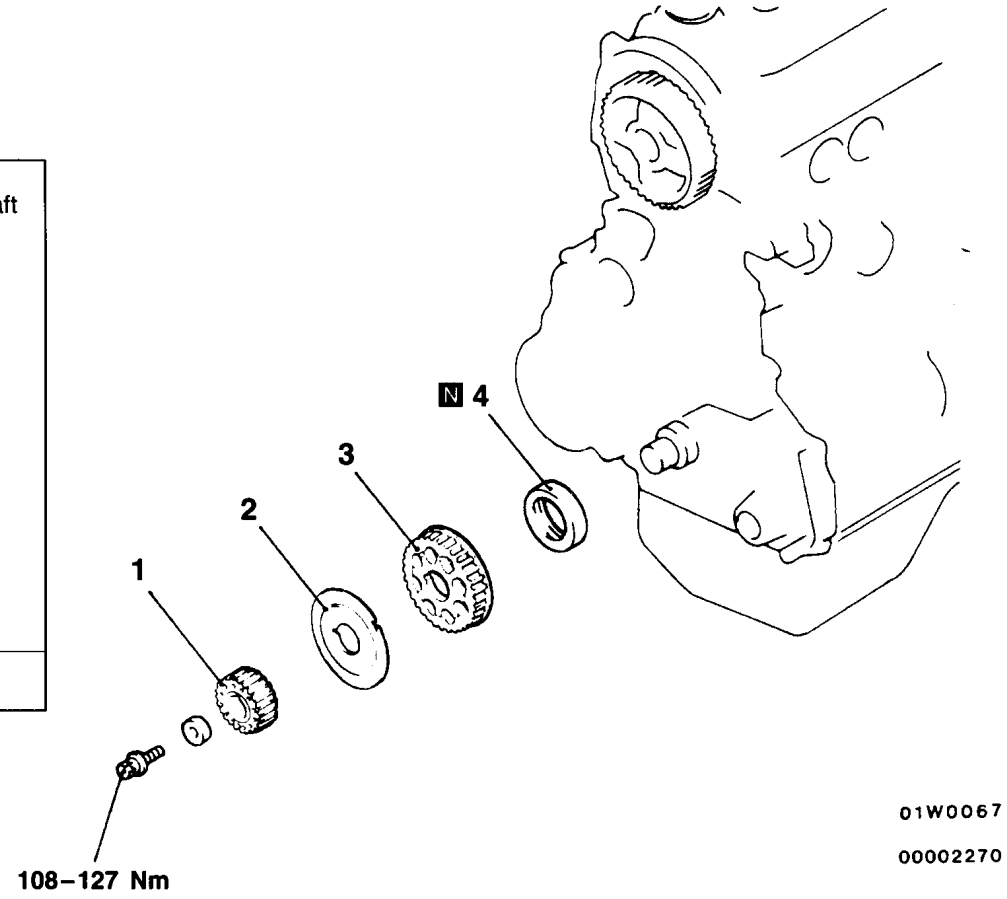
CRANKSHAFT FRONT OIL SEAL

120002453

REMOVAL AND INSTALLATION

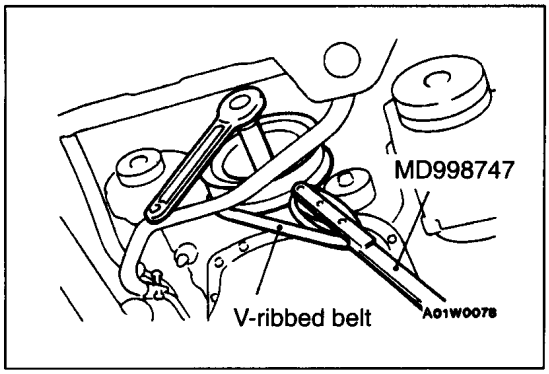
Pre-removal and Post-installation Operation
- Timing Belt, Timing Belt B Removal and Installation (Refer to P.11D-36.)





Removal steps

◀A▶ ▶B◀ 1. Crankshaft sprocket
▶B◀ 2. Flange
▶B◀ 3. Crankshaft sprocket B
▶A◀ 4. Crankshaft front oil seal



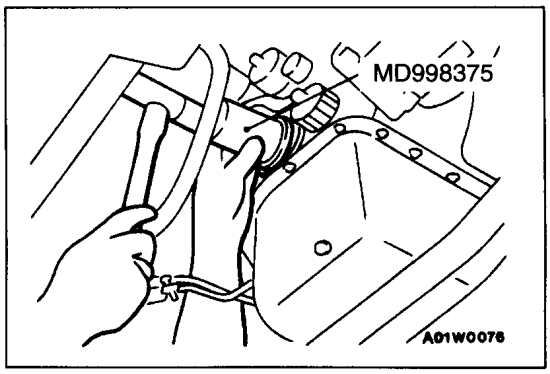
REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT SPROCKET REMOVAL

(1) Temporarily install the crankshaft pulley, and then use the V-ribbed belt and the special tool to stop the crankshaft pulley from turning.

Caution
(1) Do not use the vehicle's V-ribbed belt, or the belt may be damaged.
(2) Do not use a damaged V-ribbed belt.

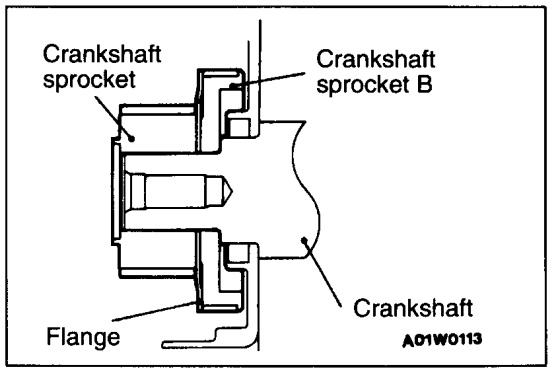
(2) Loosen the crankshaft sprocket bolt, and then remove the sprocket.



INSTALLATION SERVICE POINTS

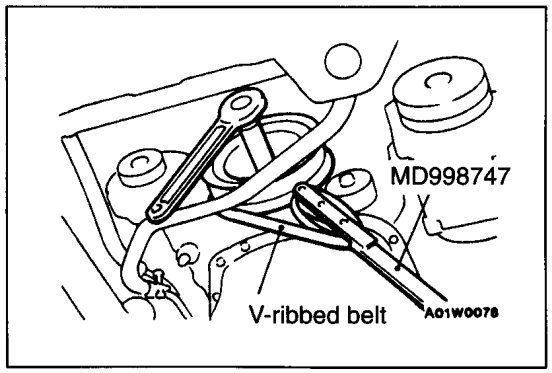
▶A◀ CRANKSHAFT FRONT OIL SEAL INSTALLATION

(1) Apply engine oil to the entire circumference of the oil seal lip.
(2) Press-fit the oil seal until it is flush with the front case.



▶B◀ CRANKSHAFT SPROCKET B/FLANGE/CRANKSHAFT SPROCKET INSTALLATION

(1) Install the crankshaft sprocket B, flange and the crankshaft sprocket so that they face as shown in the illustration.



(2) Temporarily install the crankshaft pulley, and then use the V-ribbed belt and the special tool to stop the crankshaft pulley from turning.

Caution
(1) Do not use the vehicle's V-ribbed belt, or the belt may be damaged.
(2) Do not use a damaged V-ribbed belt.

(3) Tighten the crankshaft sprocket bolt to the specified torque.

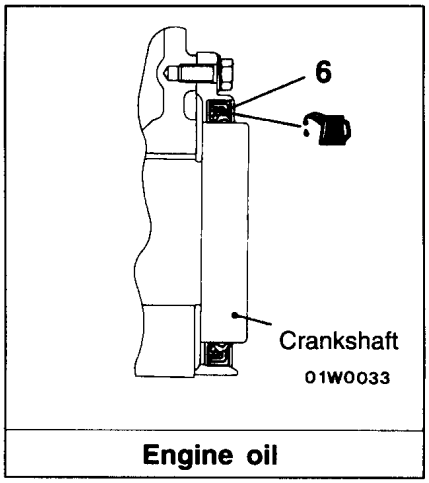
Specified torque:108–127 Nm

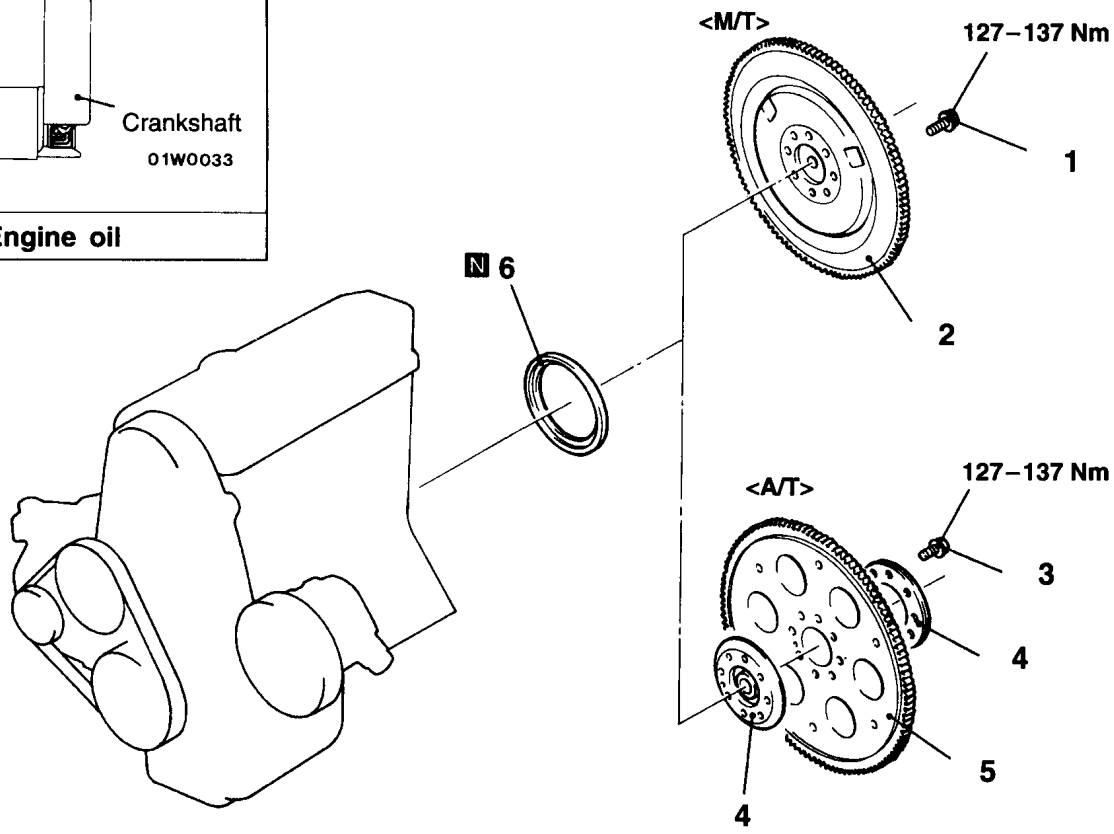
CRANKSHAFT REAR OIL SEAL

120000232

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Transmission Assembly Removal and Installation
  (M/T: Refer to GROUP 22 – Transmission assembly.)
  (A/T: Refer to GROUP 23 – Transmission assembly.)



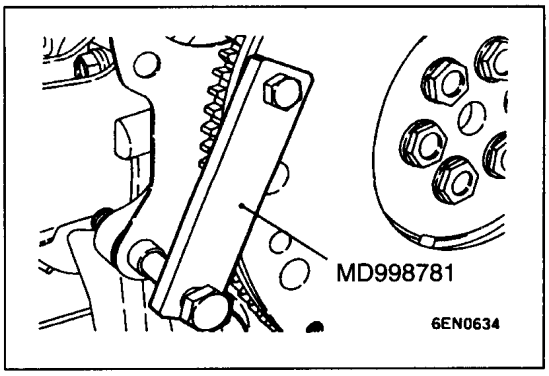


Removal steps

<M/T>
- Clutch cover and clutch disc

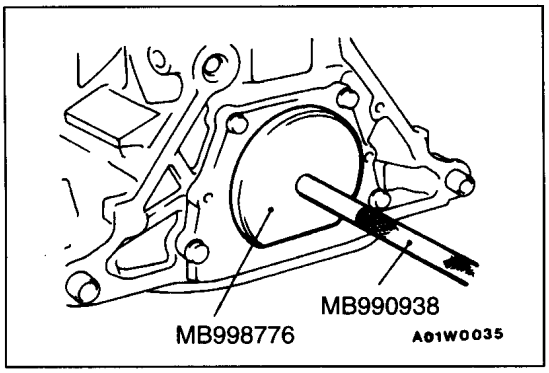
◀A▶ ▶B◀ 1. Flywheel bolt
2. Flywheel
▶A◀ 6. Crankshaft rear oil seal

<A/T>
◀A▶ ▶B◀ 3. Drive plate bolt
4. Adaptor plate
5. Drive plate
▶A◀ 6. Crankshaft rear oil seal



REMOVAL SERVICE POINT

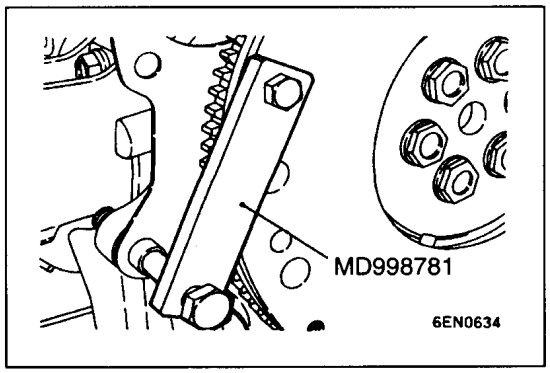
◀A▶ FLYWHEEL BOLT <M/T>/DRIVE PLATE BOLT <A/T> REMOVAL



INSTALLATION SERVICE POINTS

▶A◀ CRANKSHAFT REAR OIL SEAL INSTALLATION

(1) Apply a small amount of engine oil to the entire circumference of the oil seal lip.
(2) Tap in the oil seal as shown in the illustration.



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

ENGINE ASSEMBLY

120002454

REMOVAL AND INSTALLATION

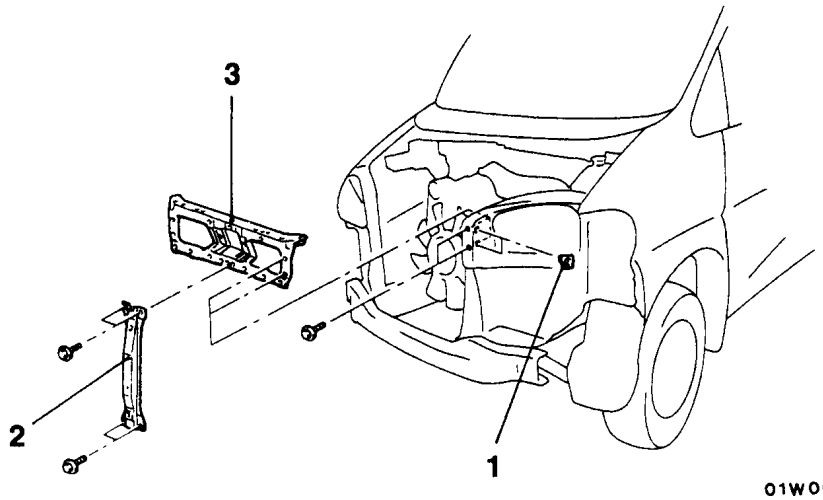
Pre-removal Operation

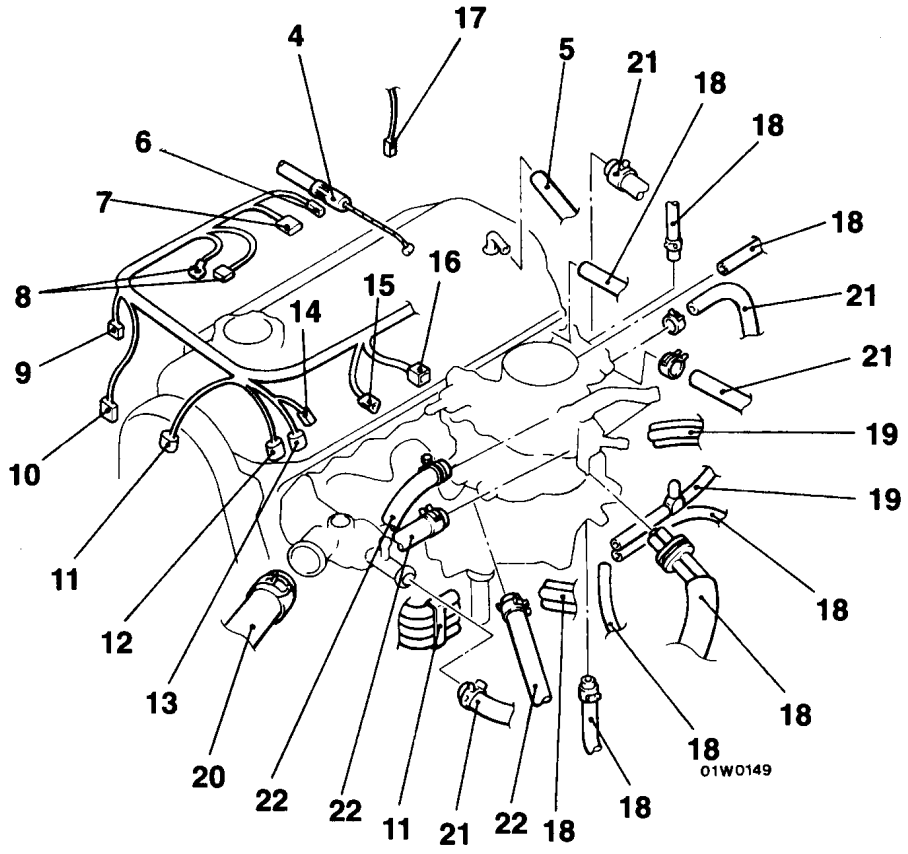
(1) Hood, Hood Latch Removal
(Refer to GROUP 42 – Hood.)
(2) Under Cover Removal
(Refer to GROUP 42 – Under Cover.)
(3) Fuel Line Pressure Releasing <4G64>
(Refer to GROUP 13F – Service Adjustment Procedures.)
(4) Engine Coolant Draining
(Refer to GROUP 14 – Service Adjustment Procedures.)
(5) Engine Oil Draining
(Refer to GROUP 12 – Service Adjustment Procedures.)
(6) Air Cleaner Assembly Removal
(Refer to GROUP 15 – Air Cleaner.)
(7) Reed Valve Assembly Removal
<Vehicles with electronic controlled carburettor>
(Refer to GROUP 15 – Exhaust Manifold.)
(8) Battery and Battery Tray Removal
(9) Transmission Assembly Removal
(M/T: Refer to GROUP 22 – Transmission Assembly.)
(A/T: Refer to GROUP 23 – Transmission Assembly.)
(10) Wiper Motor and Linkage Removal
(Refer to GROUP 51 – Windshield Wiper and Washer.)
(11) Front Bumper Removal
(Refer to GROUP 51 – Front Bumper.)
(12) Front Condenser and Condenser Fan Motor Assembly Removal
(Refer to GROUP 55 – Front Condenser and Condenser Fan Motor Assembly.)
(13) Radiator Removal
(Refer to GROUP 14 – Radiator.)
(14) Headlamp (L.H.) Removal
(Refer to GROUP 54 – Headlamp.)
(15) A/C Compressor Removal
(Refer to GROUP 55 – A/C Compressor.)

Post-Installation Operation

(1) A/C Compressor Installation
(Refer to GROUP 55 – A/C Compressor.)
(2) Headlamp (L.H.) Installation
(Refer to GROUP 54 – Headlamp.)
(3) Radiator Installation
(Refer to GROUP 14 – Radiator.)
(4) Front Condenser and Condenser Fan Motor Assembly Installation
(Refer to GROUP 55 – Front Condenser and Condenser Fan Motor Assembly.)
(5) Front Bumper Installation
(Refer to GROUP 51 – Front Bumper.)
(6) Wiper Motor and Linkage Installation
(Refer to GROUP 51 – Windshield Wiper and Washer.)
(7) Transmission Assembly Installation
(M/T: Refer to GROUP 22 – Transmission Assembly.)
(A/T: Refer to GROUP 23 – Transmission Assembly.)
(8) Reed Valve Assembly Installation
<Vehicles with electronic controlled carburettor>
(Refer to GROUP 15 – Exhaust Manifold.)
(9) Air Cleaner Assembly Installation
(Refer to GROUP 15 – Air Cleaner.)
(10) Battery and Battery Tray Installation
(11) Engine Oil Refilling
(Refer to GROUP 12 – Service Adjustment Procedures.)
(12) Engine Coolant Refilling
(Refer to GROUP 14 – Service Adjustment Procedures.)
(13) Drive Belt Tension Adjustment
(Refer to P.11I-7.)
(14) Throttle Cable Adjustment <A/T>
(Refer to GROUP 23 – Service Adjustment Procedures.)
(15) Accelerator Cable Adjustment
(Refer to GROUP 13F – Service Adjustment Procedures.)
(16) Under Cover Installation
(Refer to GROUP 42 – Under Cover.)
(17) Hood, Hood Latch Installation
(Refer to GROUP 42 – Hood.)

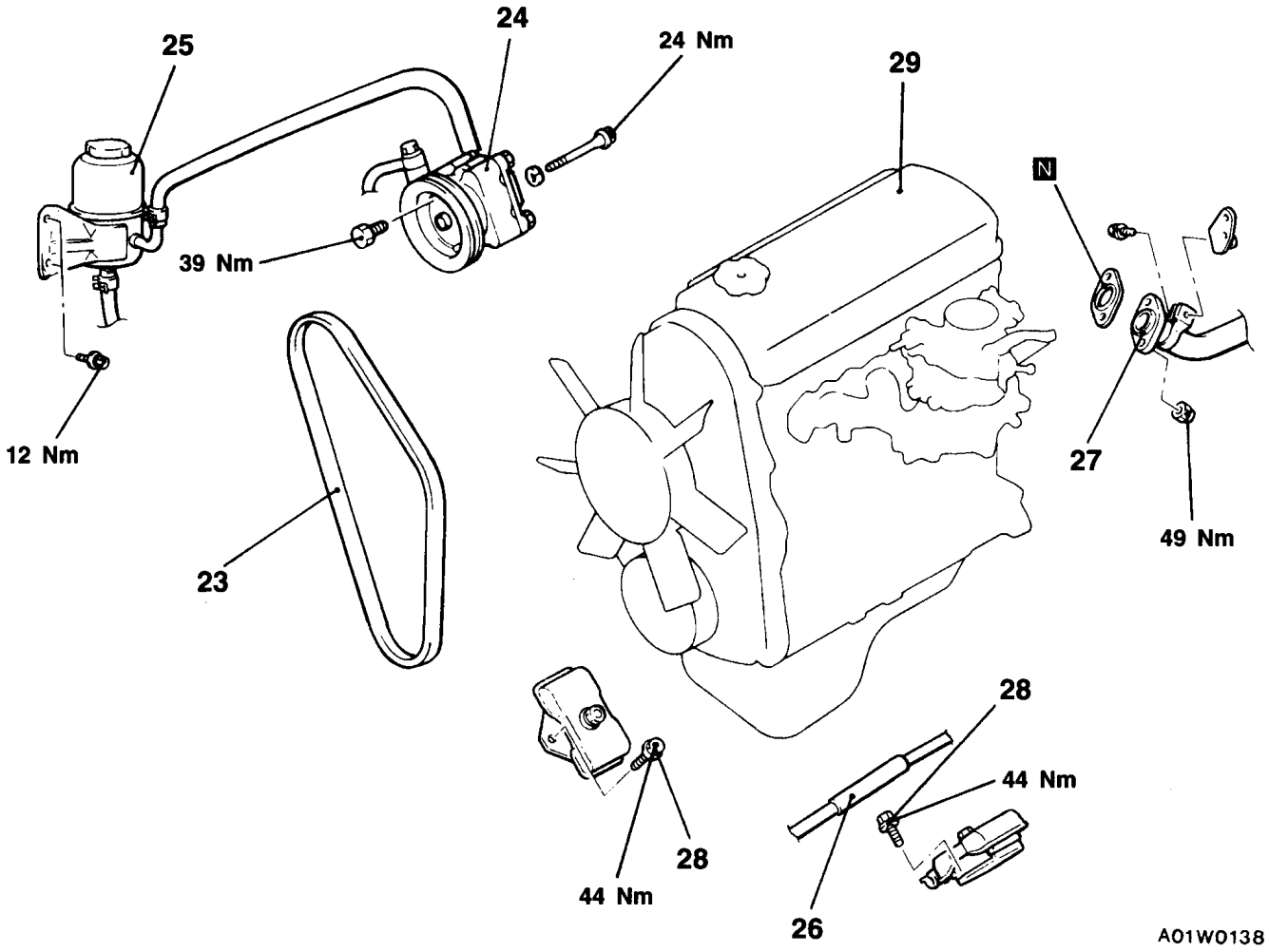
<Electronic controlled carburettor>





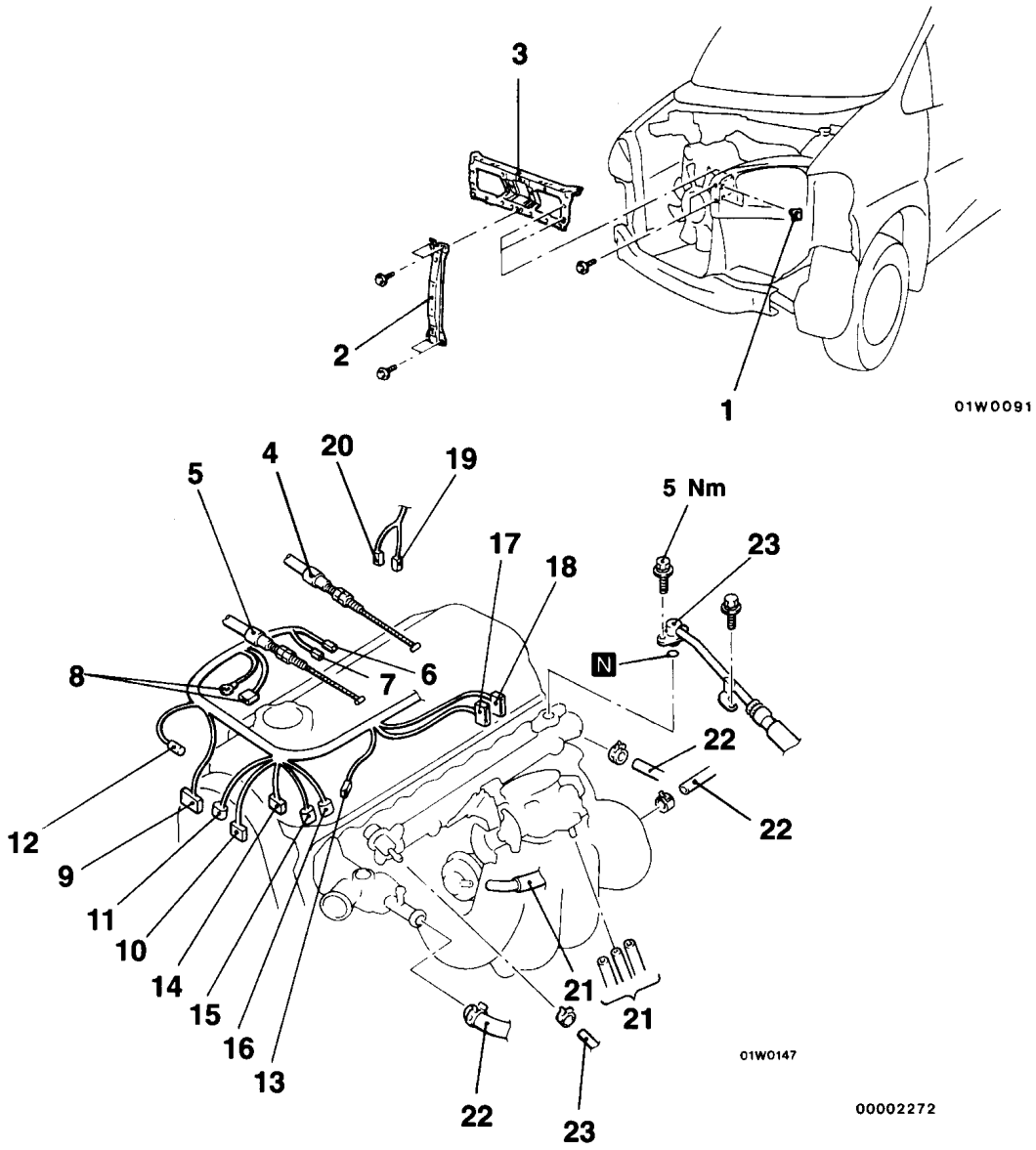
Removal steps

1. Grommet
2. Hood lock stay
3. Front end upper bar centre
4. Accelerator cable connection
5. PCV hose connection
6. Engine oil pressure switch connector
7. Engine oil level sensor connector
8. Alternator connector
9. Oxygen sensor connector
10. Distributor connector
11. Ignition coil connector
12. Engine coolant temperature sensor connector
13. Engine coolant temperature switch connector (for A/C)
14. Noise capacitor connector
15. Throttle position sensor connector
16. Solenoid valve connector
17. Engine coolant temperature gauge connector
18. Vacuum hose connection
19. VRV hose
22. Radiator upper hose connection
21. Water hose connection
22. Fuel hose connection



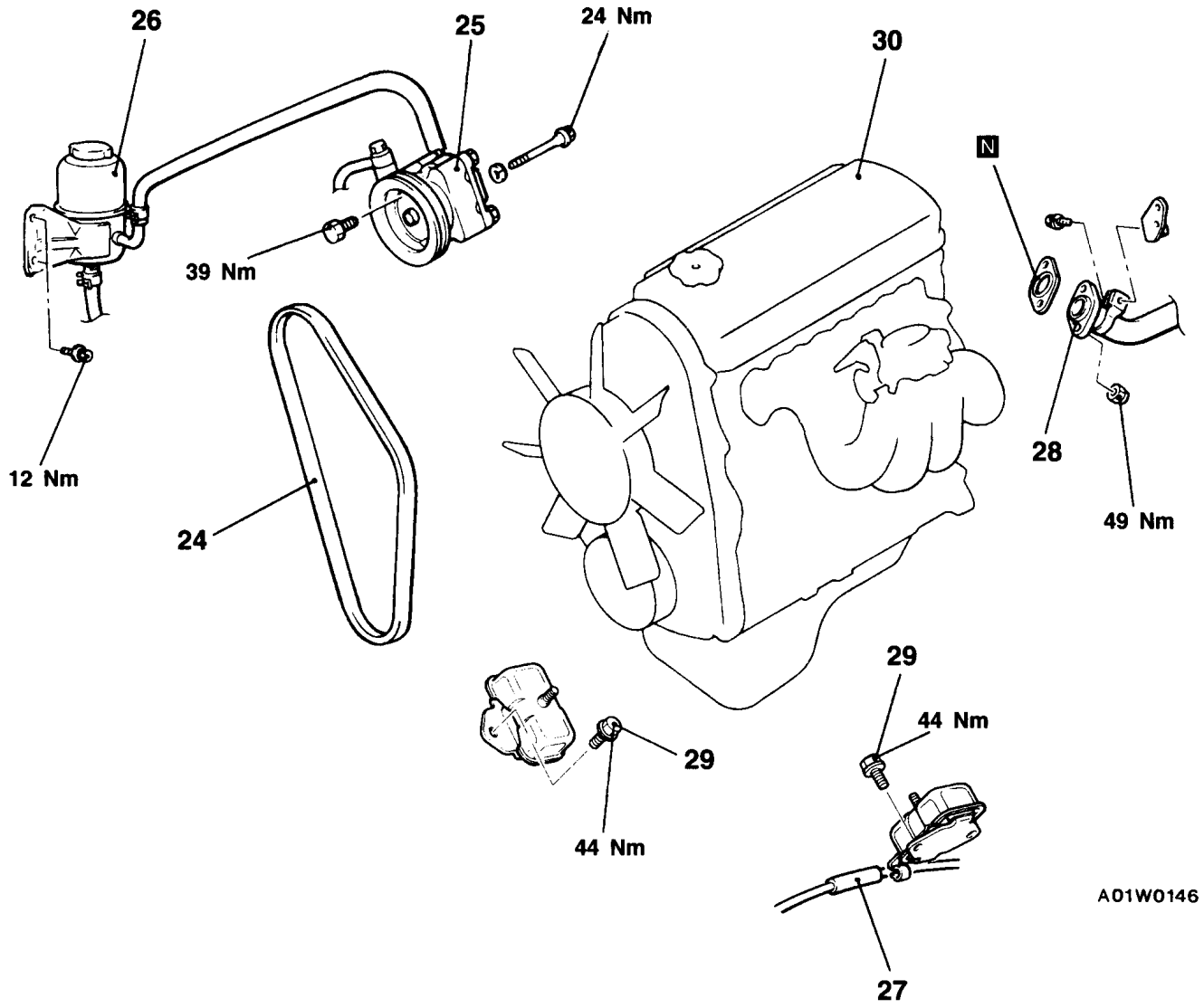
23. Drive belt (Power steering)
◀A▶ 24. Power steering oil pump assembly
◀A▶ 25. Power steering oil reservoir assembly
26. Clutch cable connection
27. Exhaust pipe connection
28. Engine support front insulator bolts
◀B▶ ▶A◀ 29. Engine assembly

<MPI>



Removal steps

1. Grommet
2. Hood lock stay
3. Front end upper bar centre
4. Accelerator cable connection
5. Throttle cable connection <A/T>
6. Engine oil pressure switch connector
7. Engine oil level sensor connector
8. Alternator connector
9. Distributor connector
10. Power transistor connector
11. Ignition coil connector
12. Power steering oil pressure switch connector
13. Noise capacitor connector
14. Engine harness connector
15. Engine coolant temperature sensor connector
16. Engine coolant temperature switch connector (for A/C)
17. Throttle position sensor connector
18. Idle speed control servo motor
19. Engine coolant temperature gauge connector
20. Engine coolant temperature switch connector (for A/T)
21. Vacuum hose connection
22. Water hose connection
23. Fuel hose connection



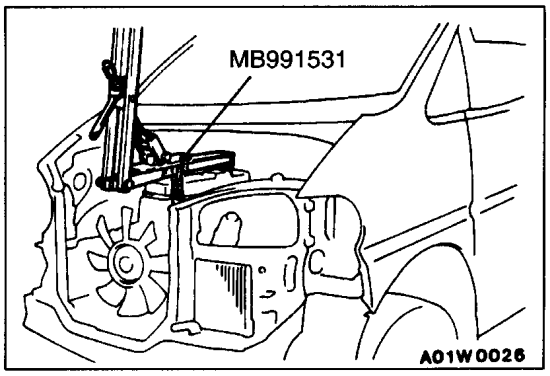
24. Drive belt (Power steering)
◀A▶ 25. Power steering oil pump assembly
◀A▶ 26. Power steering oil reservoir assembly
27. Clutch cable connection
28. Exhaust pipe connection
29. Engine support front insulator bolts
◀B▶ ▶A◀ 30. Engine assembly

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP ASSEMBLY/POWER STEERING OIL RESERVOIR ASSEMBLY REMOVAL

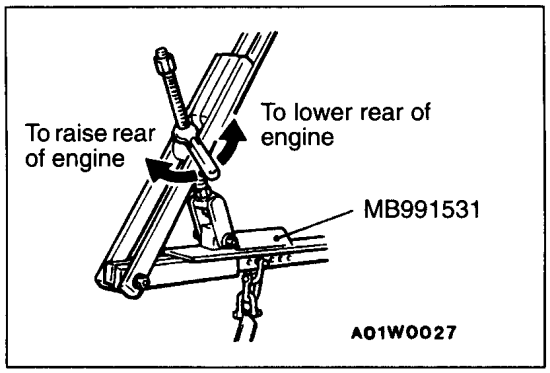
Remove the power steering oil pump assembly and power steering oil reservoir assembly from the bracket with the hose attached.

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



◀B▶ ENGINE ASSEMBLY REMOVAL

(1) Check that all cables, hoses and harness connectors have been disconnected from the engine.
(2) Hang the special tool on a chain block or similar tool, and then attach the special tool to the engine hanger.



(3) Turn the wrench on the special tool to tilt the engine assembly. Then raise the engine assembly slowly to remove from the front engine compartment.

INSTALLATION SERVICE POINT

▶A◀ ENGINE ASSEMBLY INSTALLATION

Install the engine assembly while checking to be sure that the cables, hoses, and harness connectors are not clamped.

4D5

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120002654

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CRANKSHAFT REAR OIL SEAL 31

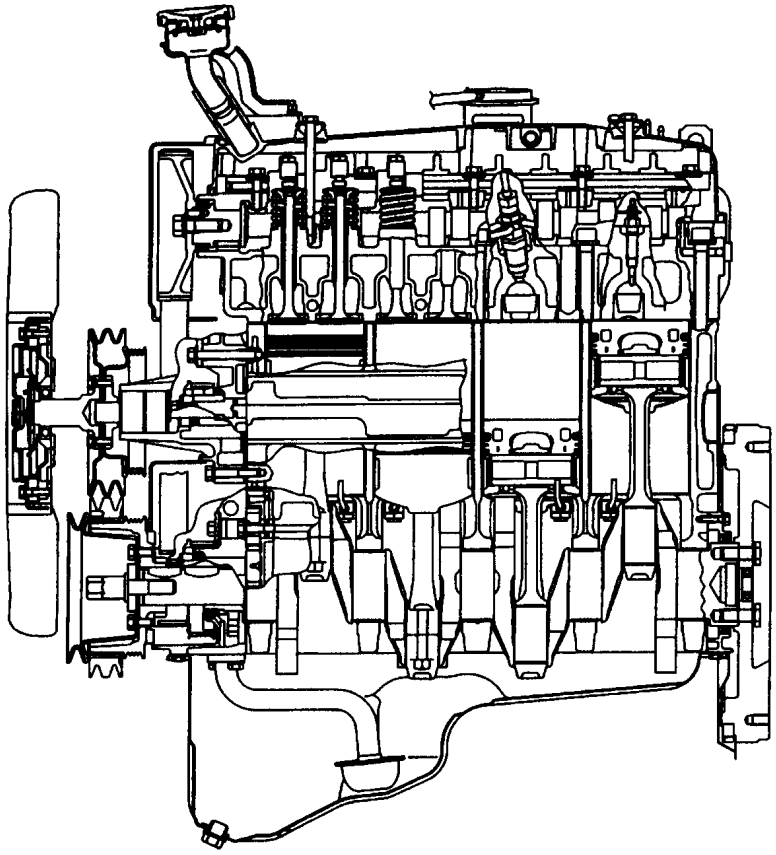
ENGINE ASSEMBLY 33

GENERAL INFORMATION

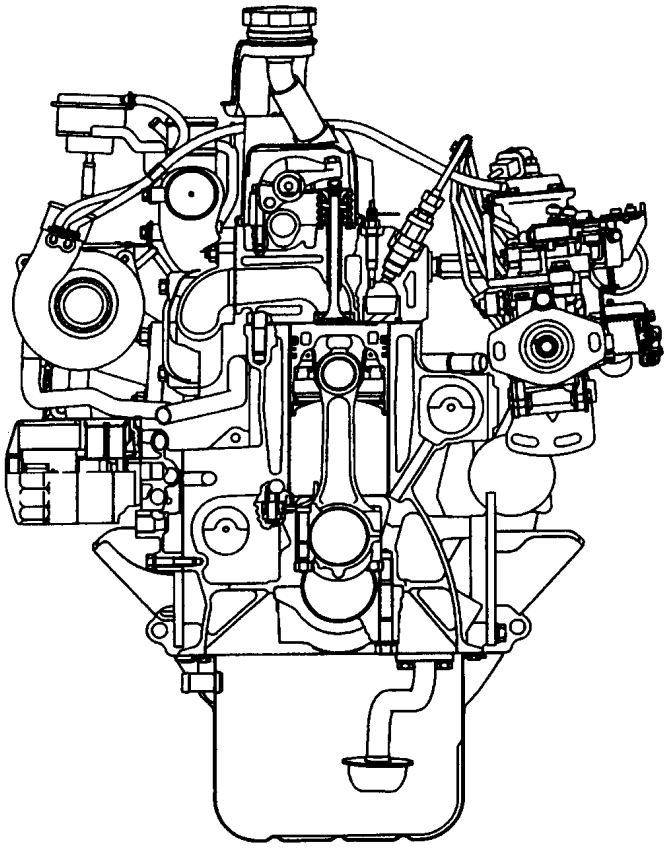
120000335

Items		4D56
Total displacement mℓ		2,476
Bore × Stroke mm		91.1×95.0
Compression ratio		21
Combustion chamber		Vortex chamber type
Camshaft arrangement		SOHC
Number of valve	Intake	4
	Exhaust	4
Valve timing	Intake	Opening BTDC20°, Closing ABDC49°
	Exhaust	Opening BBDC55°, Closing ATDC22°
Fuel system		Distribution type injection pump
Rocker arm		Roller type
Adjusting screw		Elephant foot type

SECTIONAL VIEW



DEN0110



DEN0111

SERVICE SPECIFICATIONS

120002655

Items			Standard value	Limit
Drive belt deflection mm	Alternator	Deflection (for each belt)	13–16	–
	Power steering oil pump	When checked	8.0–12.0	–
		When a new belt is installed	6.0–8.0	–
		When a used belt is installed	9.0–11.0	–
	A/C compressor	When checked	5.5–7.5	–
		When a new belt is installed	4.0–5.0	–
		When a used belt is installed	6.0–7.0	–
Valve clearance (at hot) mm			0.25	–
Injection timing (Value indicated on dial gauge mm)			9°ATDC (1±0.03)	–
Idle speed r/min			750±100	–
Idle up engine speed for ABS r/min			1,900±100	–
Compression pressure kPa			3,040	Min. 2,200
Compression pressure difference of all cylinder (at engine speed of 280 r/min) kPa			–	Max. 300
Timing belt tension mm			4–5	–
Timing belt B tension mm			4–5	–

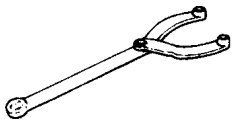
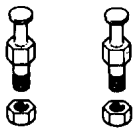
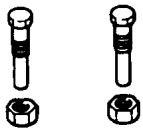
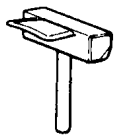
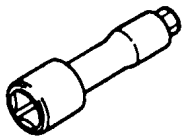
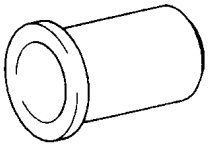
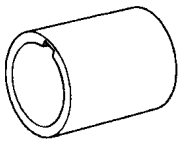
SEALANTS

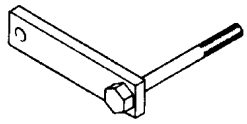
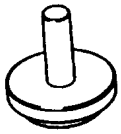
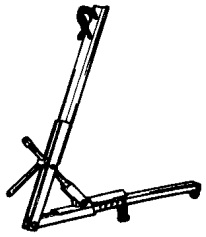
120002455

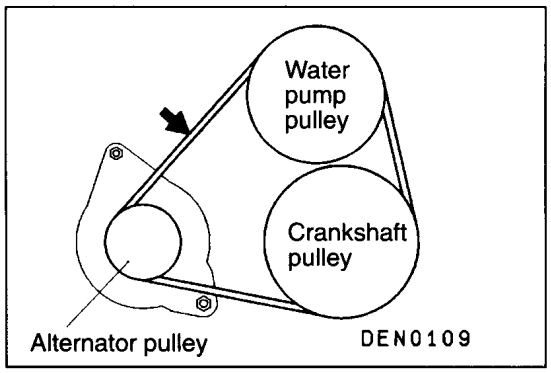
Items	Specified sealant	Remarks
Oil pan	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant
Semi-circular packing and rocker cover seal, and cylinder head seal	3M ATD Part No. 8660 or equivalent	

SPECIAL TOOLS

120000338

Tool	Number	Name	Use
	MD998384	Prestroke measuring adapter	Adjustment of the injection timing
	MD998721	Crankshaft pulley holder	Holding the crankshaft pulley
	MB990767	End yoke holder	Holding the camshaft sprocket
	MD998719	Crankshaft pulley holder pin	
	MD998754	Crankshaft pulley holder pin	
	MD998381	Camshaft oil seal installer	Installing the camshaft oil seal
	MD998727	Oil pan remover	Removal of oil pan
	MD998051	Cylinder head bolt wrench	Removal and installation of the cylinder head bolt
	MD998382	Crankshaft front oil seal installer	Installing the crankshaft front oil seal
	MD998383	Crankshaft front oil seal guide	

Tool	Number	Name	Use
	MD998781	Flywheel stopper	Securing the flywheel <M/T> or drive plate <A/T>
	MD998376	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal
	MB991531	Engine hanger	Engine removal and installation



SERVICE ADJUSTMENT PROCEDURES

120000339

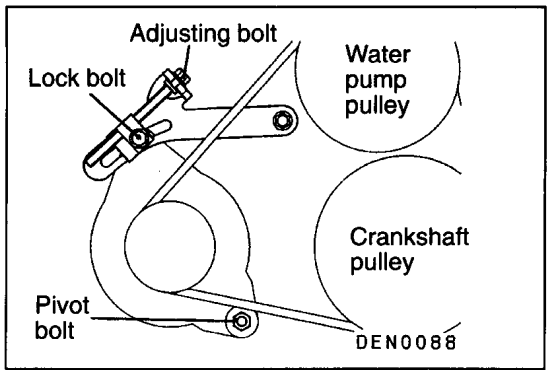
DRIVE BELTS TENSION INSPECTION AND ADJUSTMENT

ALTERNATOR DRIVE BELT TENSION INSPECTION

1. Check the tension by pushing at the centre of the belt between pulleys with a force of 98 N as shown in the figure. Measure drive belt deflection.

   Standard value:
   Alternator 13–16 mm (for each belt)

2. If the tension is not within the standard value range, adjust the belt tension.



ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

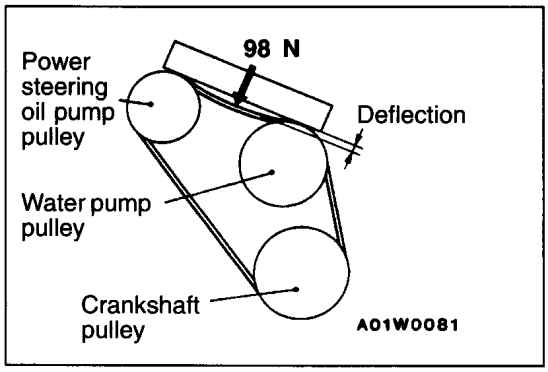
120002029

1. Loosen the nut on the alternator pivot bolt.
2. Loosen the lock bolt.
3. Turn the adjusting bolt to adjust the belt so that the amount of deflexion is at the standard value.
4. Tighten the lock nut.

   Tightening torque: 13 Nm
5. Tighten the nut on the alternator pivot bolt.

   Tightening torque: 22 Nm
6. Turn the crankshaft one or more turns in the clockwise direction, and then check the belt tension.

   Caution
   Always replace the two V-belts together as a set, and do not apply any oil to the belts.

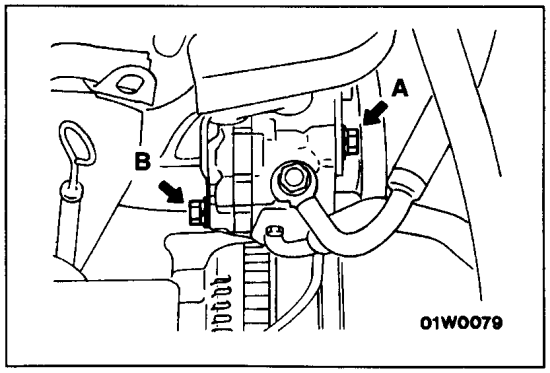


POWER STEERING OIL PUMP BELT TENSION INSPECTION

120002030

Check the tension by pulling or pushing at the centre of the belt between pulleys with a force of 98 N as shown in the figure.
Measure drive belt deflection amount.

Standard value: 8.0–12.0 mm



POWER STEERING OIL PUMP BELT TENSION ADJUSTMENT

120002456

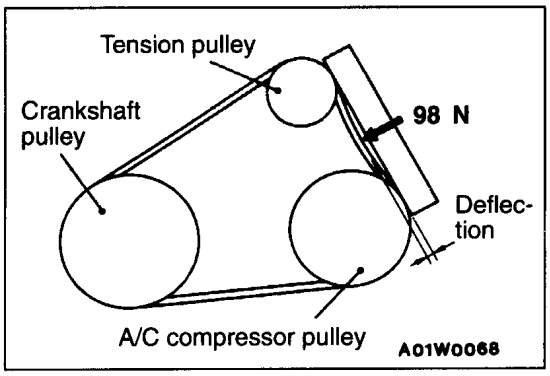
1. Loosen power steering oil pump fixing bolt.
2. Move power steering oil pump, tension belt moderately and adjust tension.

   Standard value:
   If used belt (with correct tension) is used;
   9.0–11.0 mm
   If a new belt is used;
   6.0–8.0 mm
3. Tighten fixing bolt A.

   Tightening torque: 39 Nm
4. Tighten the remaining fixing bolt B.

   Tightening torque: 24 Nm
5. Check the amount of belt deflection and readjust if necessary.

   Caution
   Turn the crankshaft one or more turns in the clockwise direction, and then check the belt tension.

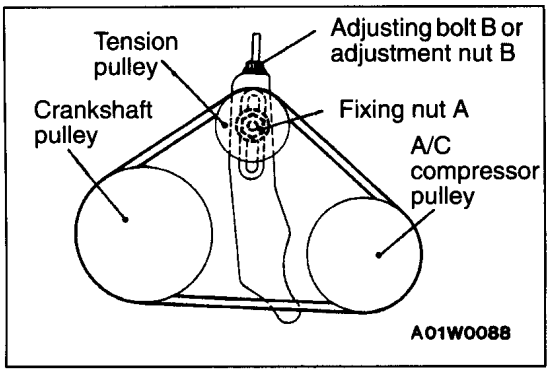


A/C COMPRESSOR BELT TENSION INSPECTION

120002457

Check the tension by pulling or pushing at the centre of the belt between pulleys with a force of 98 N as shown in the figure.
Measure drive belt deflection amount.

Standard value: 5.5–7.5 mm



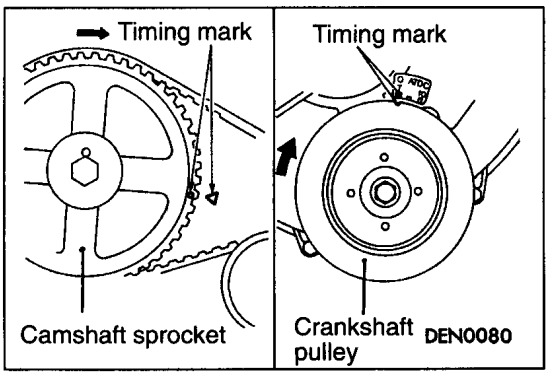
A/C COMPRESSOR BELT TENSION ADJUSTMENT

120002033

1. Loosen tension pulley fixing nut A.
2. Adjust belt tension with adjusting bolt B <single A/C> or adjusting nut B <Dual A/C>.

   Standard value:
   If used belt (with correct tension) is used;
   6.0–7.0 mm
   If a new belt is used;
   4.0–5.0 mm
3. Tighten fixing nut A.
4. Check the amount of belt deflection and readjust if necessary.

   Caution
   Turn the crankshaft one or more turns in the clockwise direction, and then check the belt tension.

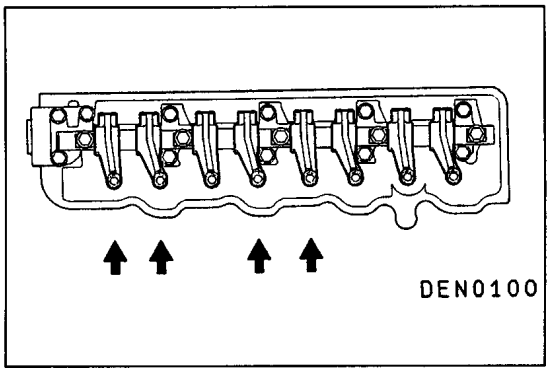


VALVE CLEARANCE INSPECTION AND ADJUSTMENT

120002034

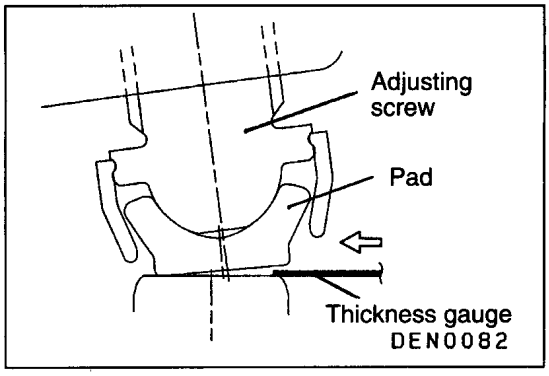
1. Start the engine and allow it to warm up until the engine coolant temperature reaches 80 to 90°C.
2. Remove the timing belt upper cover.
3. Remove the rocker cover.
4. Align the camshaft sprocket timing marks and set the No. 1 cylinder at top dead centre.

   Caution
   The crankshaft should always be turned in a clockwise direction.

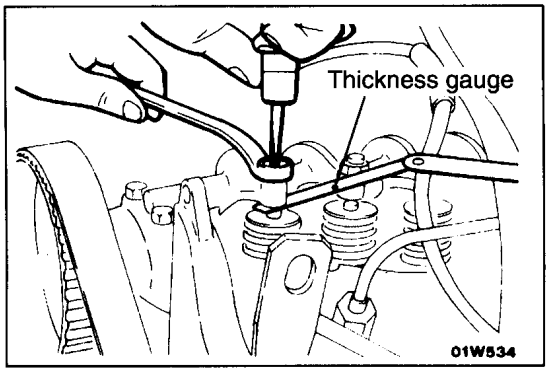


5. Measure the valve clearance at the places indicated by arrows in the illustration.

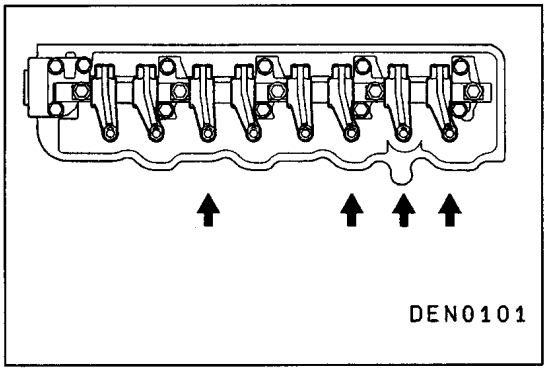
   Standard value: 0.25 mm



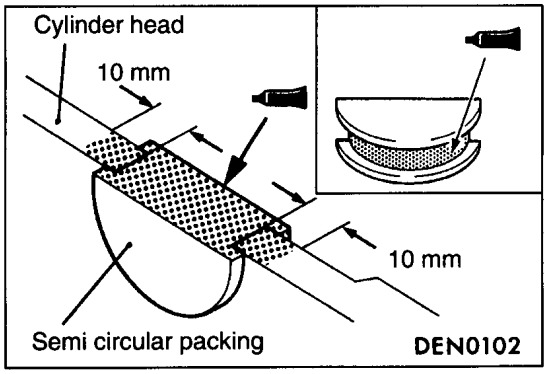
NOTE
Insert the thickness gauge from the centre of the cylinder head towards the outside so that it doesn't touch the pad.



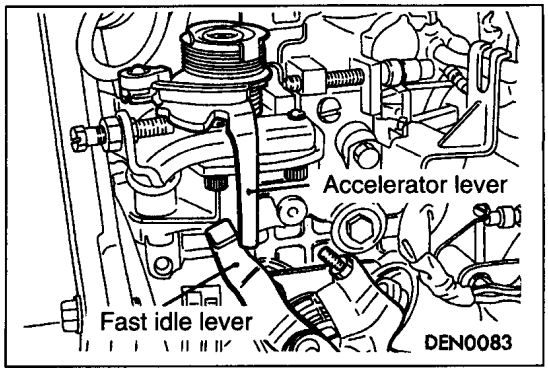
6. If the clearance is outside the standard value, loosen the lock nut of the rocker arm and adjust by turning the adjusting screw while using a thickness gauge to measure the clearance.
7. Tighten the lock nut while holding the adjusting screw with a screwdriver so that it doesn't turn.
8. Turn the crankshaft 360° clockwise to bring No. 4 cylinder to the top dead centre position.



9. Measure the valve clearances at the places indicated by arrows in the illustration. If the clearance is not within the standard value, repeat steps 7 and 8 above.

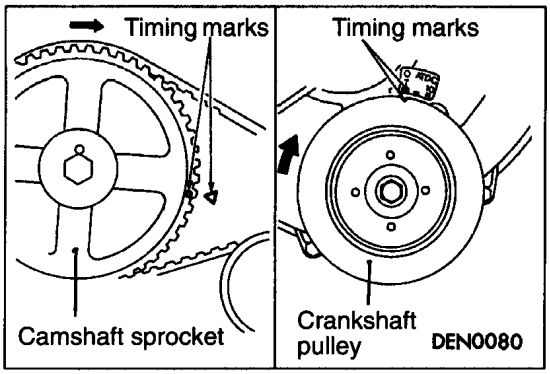


10. Apply specified sealant to the section of the semi-circular packing shown in the illustration.
    Specified sealant: 3M ATD Part No. 8660 or equivalent
11. Install the rocker cover.
12. Install the timing belt upper cover.

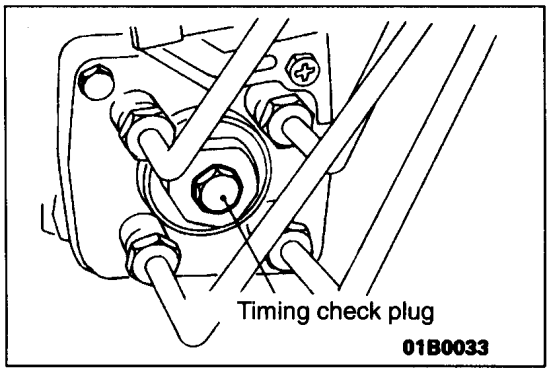


INJECTION TIMING INSPECTION AND ADJUSTMENT 120002035

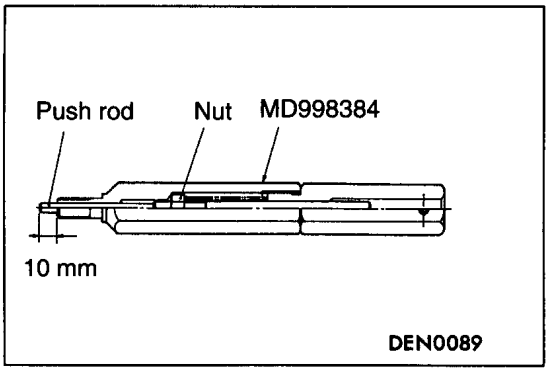
1. Warm up the engine and then check to be sure that the fast idle lever is separated from the throttle lever.
2. Remove all of the glow plugs.
3. Remove the timing belt upper cover.



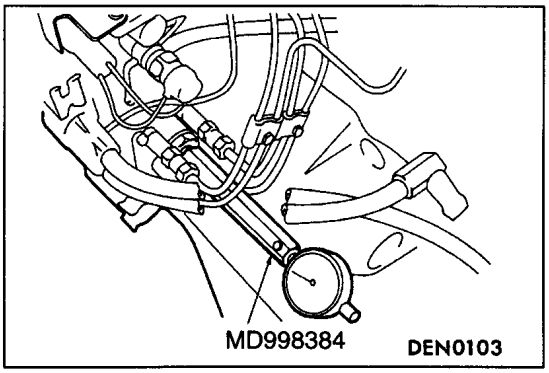
4. Align the timing marks of the camshaft sprocket and set the No. 1 cylinder to the top dead centre position.



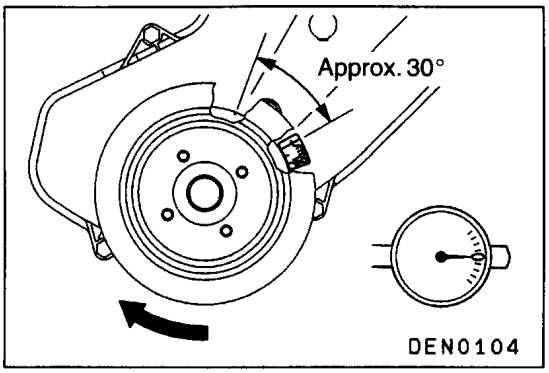
5. Remove the timing check plug at the rear of the injection pump.



6. Before installation of special tool, make sure that push rod is protruding by 10 mm. Protrusion of push rod can be adjusted with an inner nut.
7. Connect the dial gauge to the special tool.

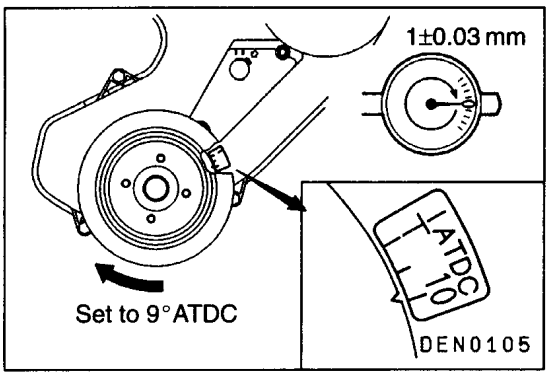


8. Install the special tool to the check plug at the rear of the injection pump.



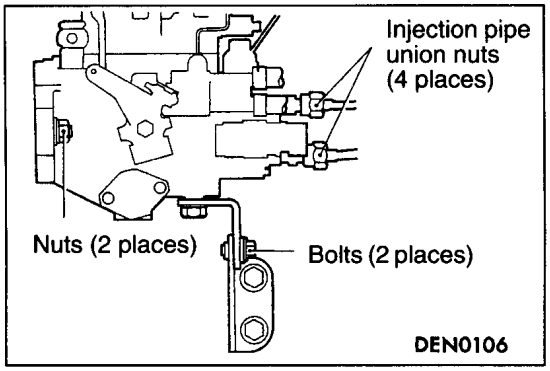
9. Turn the crankshaft clockwise to move the No. 1 cylinder approximately 30° before compression top dead centre.
10. Set the needle of the dial gauge to 0.
11. Check that the needle doesn't move even if the crankshaft is turned slightly (2–3°) in both clockwise and anti-clockwise direction.

NOTE
If the needle moves, the notch is not positioned properly, so once again move the No. 1 cylinder approximately 30° before compression top dead centre.



12. Turn the crankshaft clockwise to align the No. 1 cylinder to 9°ATDC.
13. Check that the value indicated on the dial gauge is at the standard value.

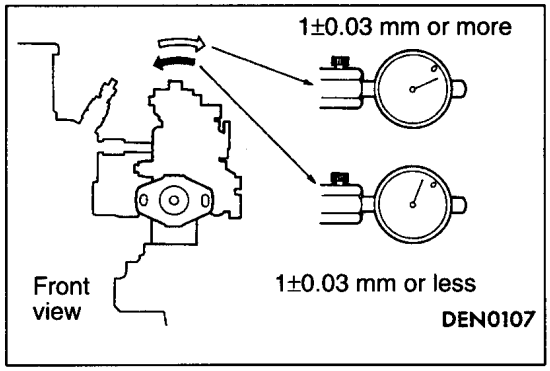
    Standard value: 1±0.03 mm

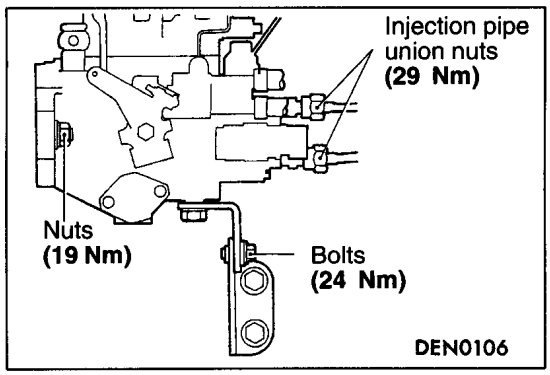


14. If the needle is outside the standard value, adjust the injection timing by the following procedure.
    (1) Loosen the injection pipe union nuts (4 places) on the injection pump. (Do not remove the union nuts.)

    Caution
    When loosening the nuts, hold the delivery valve holders with a spanner so that they don't turn at the same time.

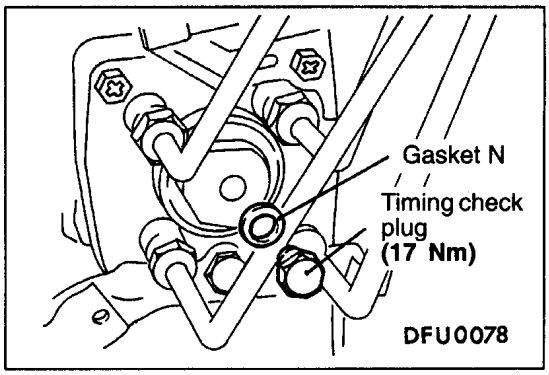
    (2) Loosen the upper mounting nuts and the lower mounting bolts of the injection pump. (Do not remove the nut and bolt.)
    (3) Tilt the injection pump to the left and right and adjust the needle on the dial gauge so that the display value is uniform.
    (4) Provisionally tighten the mounting nut and bolt of the injection pump.
    (5) Repeat steps 9–13 to check if the adjustment has been made correctly.





(6) Tighten the mounting nuts and bolts to the specified torque.
(7) Tighten the injection pump union nuts to the specified torque.

Caution
When tightening the nuts, hold the delivery valve holders with a spanner so that they don't turn at the same time.



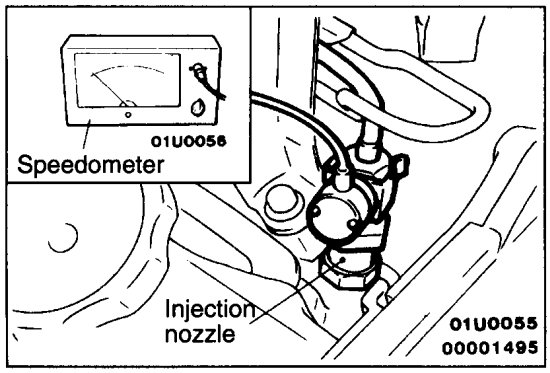
15. Remove the special tool.
16. Install a new gasket to the timing check plug.
17. Tighten the timing check plug to the specified torque.

IDLE SPEED INSPECTION AND ADJUSTMENT

120002036

NOTE
Check that the injection timing is normal.

1. Set the vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral

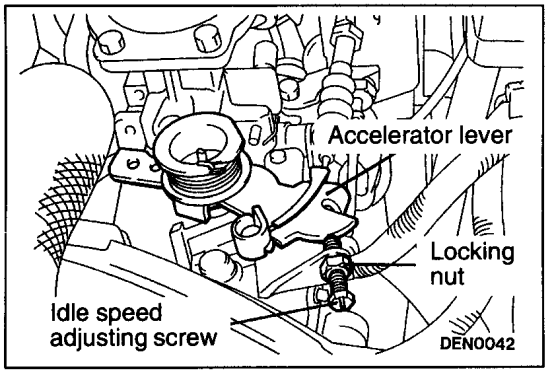


2. Connect the speedometer to the injection nozzle or the injection pipe.

   Caution
   When the speedometer is connected to the injection pipe, the pipe mounting clamps should all be removed.

3. Start the engine and run it at idle.
4. Check the idle speed.

   Standard value: 750±100 r/min



5. If not within the standard value, loosen idle adjusting screw lock nut and adjust the idle speed by rotating adjusting screw. And tighten locking nut.

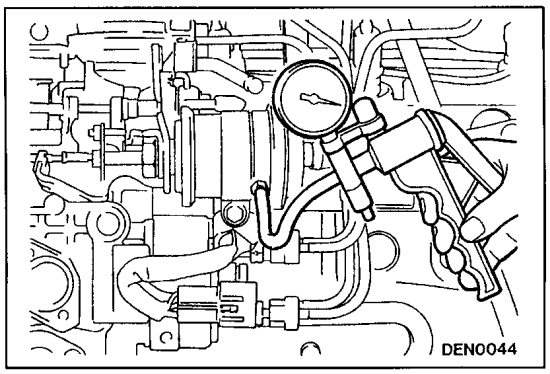
IDLE-UP MECHANISM INSPECTION AND ADJUSTMENT – FOR A/C

120002037

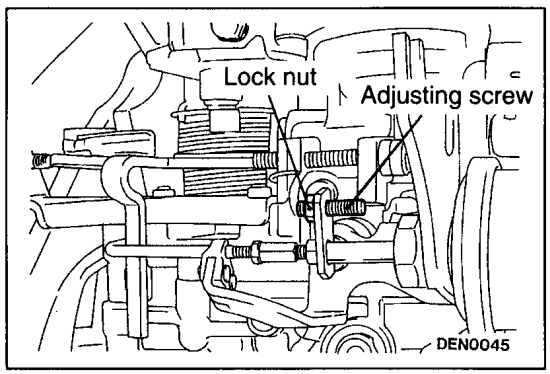
Refer to GROUP 55 – Service Adjustment Procedures.

IDLE-UP MECHANISM INSPECTION AND ADJUSTMENT – FOR ABS 120001565

1. Set the vehicles in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral



2. Inspect and adjust the idle speed.
3. Disconnect the vacuum hose (for anti-skid brakes: blue stripe) from the idle-up actuator.
4. Connect a hand vacuum pump to the nipple of the removed vacuum hose.
5. Connect the speedometer.
6. Start the engine and run it at idle.



7. Check the engine speed when a negative pressure of 87 kPa is applied.

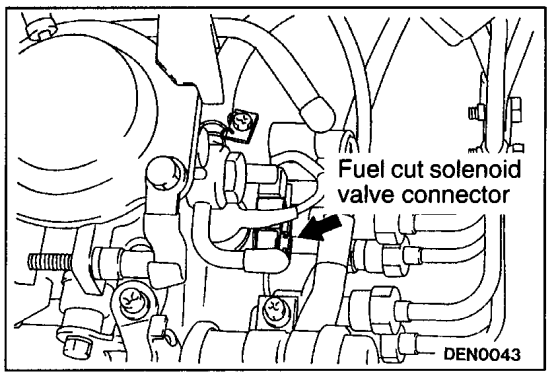
   Standard value: 1, 900±100 r/min

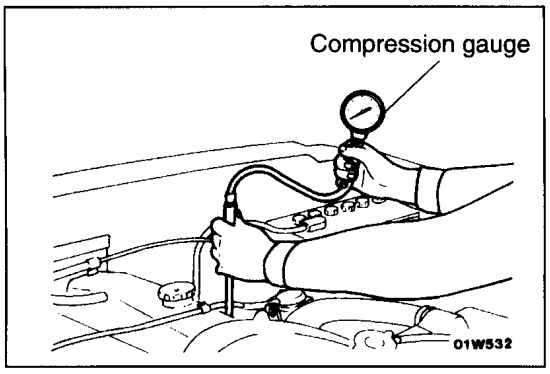
8. If the engine speed is outside the standard value, loosen the lock nut on the actuator rod and adjust by turning the adjusting screw.
9. Tighten the lock nut while making sure that the adjusting screw doesn't turn.

COMPRESSION PRESSURE INSPECTION 120002038

1. Check that the engine oil, starter and battery are normal. Also, set the vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories: OFF
   - Transmission: Neutral
2. Remove all of the glow plugs.

   Caution
   Be careful not to subject the glow plugs to any shock.





3. Disconnect the fuel cut solenoid valve connector.

   NOTE
   Doing this will stop carrying out fuel injection.
4. Cover the glow plug holes with a rag etc., and after the engine has been cranked, check that no foreign material is adhering to the rag.

   Caution
   1. **Keep away from the glow plug holes when cranking.**
   2. **If compression is measured while water, oil, fuel, etc., that has come from cracks is inside the cylinder, these materials will become heated and will gush out from the glow plug hole, which is dangerous.**
5. Set the compression gauge to one of the glow plug holes.
6. Crank the engine and measure the compression pressure.

   Standard value:
   3,040 kPa (at engine speed of 280 r/min)

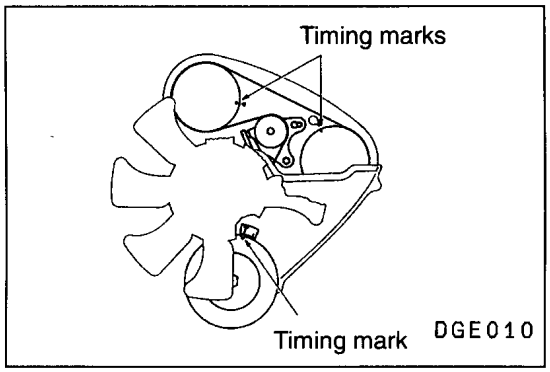
   Limit:
   Min. 2,200 kPa (at engine speed of 280 r/min)
7. Measure the compression for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

   Limit: Max. 300 kPa
8. 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 glow plug hole, and repeat the operations in steps 6 and 7.
   (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 or pressure is leaking from the gasket.
9. Connect the fuel cut solenoid valve connector.
10. Install the glow plugs.

    Tightening torque: 18 Nm

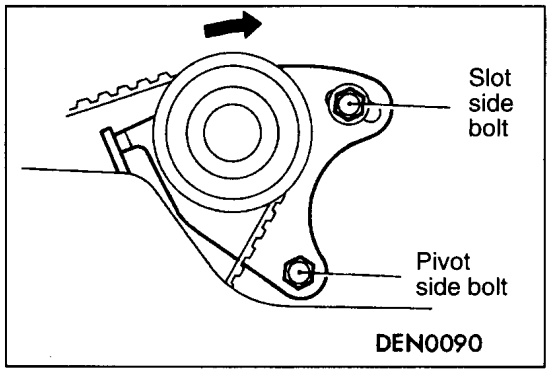
TIMING BELT TENSION ADJUSTMENT 120002039

1. Remove timing belt upper cover.
2. Turn the crankshaft in the clockwise direction and check the timing belt around its entire circumference for abnormalities.

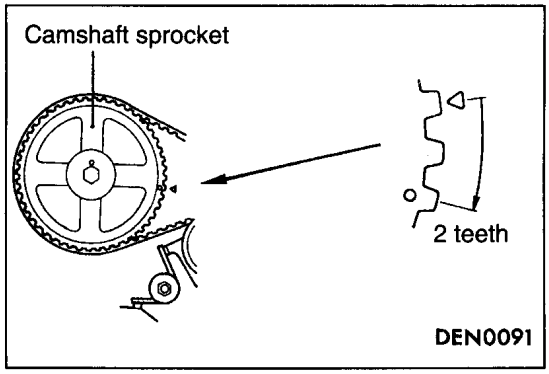


3. Align the timing mark on the sprockets with the timing mark on the front upper case.

Caution
When aligning the timing mark, be sure not to turn the crankshaft in the counterclockwise direction as this can cause improper belt tension.

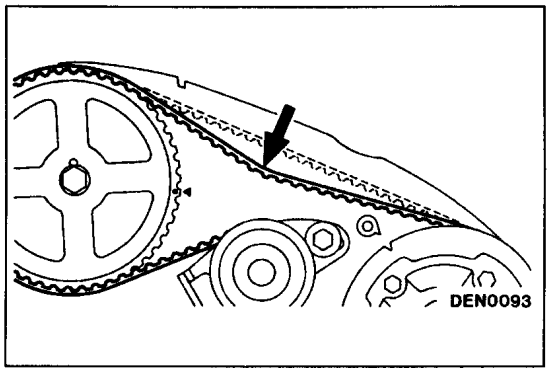


4. Loosen the tensioner pivot side bolt 1 turn and slot side bolt 1 or 2 turns.



5. Turn the crankshaft clockwise and stop at the second lobe of the camshaft sprocket.
6. First tighten tensioner slot side bolt, and then tighten pivot side bolt to the specified torque.

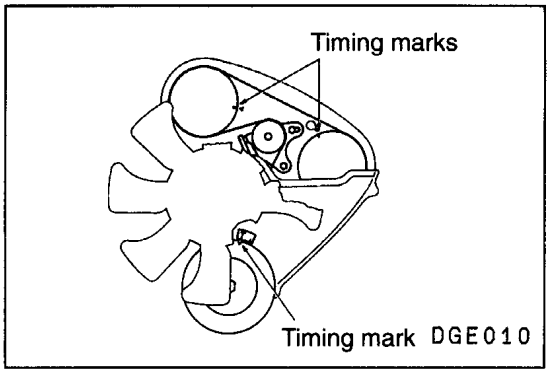
Tightening torque: 26 Nm



7. Turn the crankshaft anti-clockwise to align the timing marks.
8. Push down belt at a point halfway with a forefinger to check that tension of belt is up to standard value.

Specified value: 4–5 mm

9. Mount the timing belt upper cover.



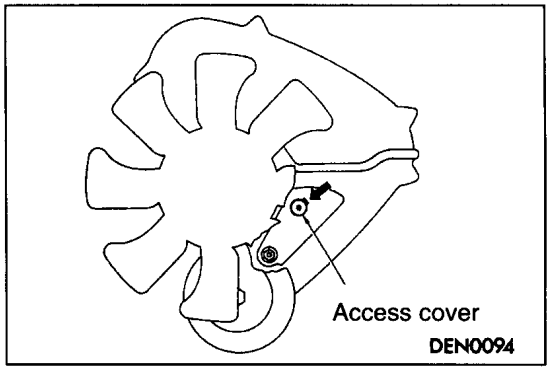
TIMING BELT "B" TENSION ADJUSTMENT

120002040

1. Remove timing belt upper cover.
2. Turn the crankshaft in the clockwise direction and check the timing belt around its entire circumference for abnormalities.
3. Align the timing marks on the sprockets with the timing mark on the front upper case.

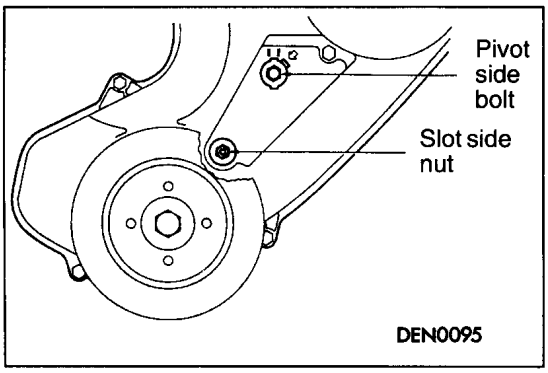
Caution
When aligning the timing mark, be sure not to turn the crankshaft in the counterclockwise direction as this can cause improper belt tension.

4. Remove the access cover.

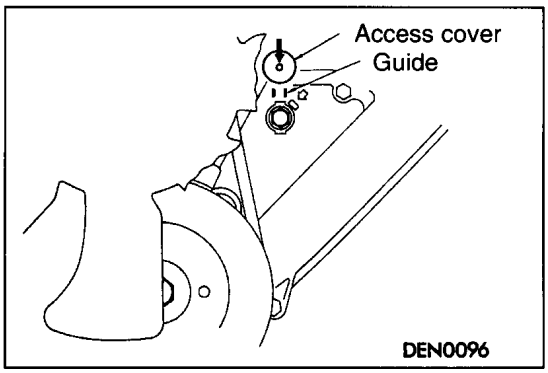


5. Loosen the tensioner pivot side bolt 1 turn and slot side nut 1 or 2 turns.
6. First tighten tensioner slot side nut, and then tighten pivot side bolt to the specified torque.

Tightening torque:
Pivot side bolt 24 Nm
Slot side nut 26 Nm



7. Install the access cover while sliding the front lower cover down along the two guides.
8. Install the timing belt upper cover.



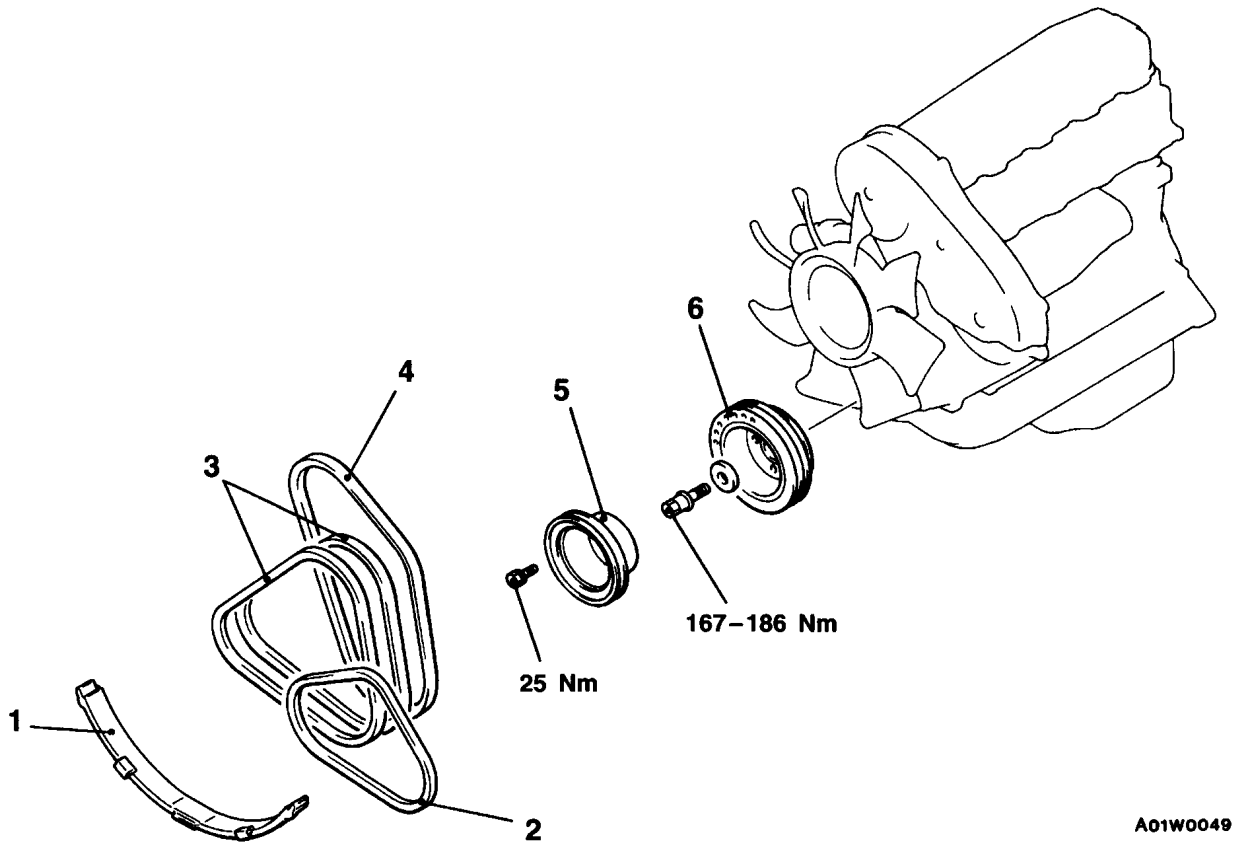
CRANKSHAFT PULLEY

120000340

REMOVAL AND INSTALLATION

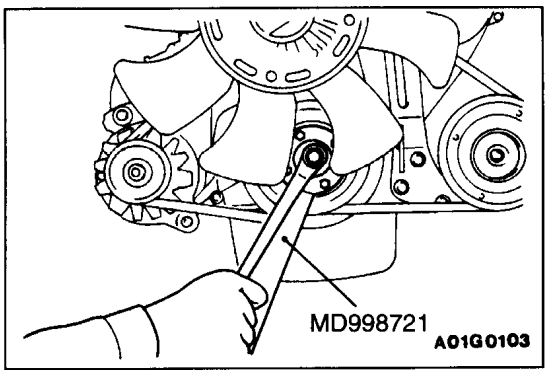
Pre-removal Operation
- Under Cover Removal (Refer to GROUP 42– Under Cover.)

Post-Installation Operations
(1)Drive Belt Tension Adjustment (Refer to P.11I-6.)
(2)Under Cover Installation (Refer to GROUP 42– Under Cover.)



Removal steps
1. Radiator shroud cover
2. Drive belt (A/C compressor)
3. Drive belt (Alternator)
4. Drive belt (Power steering oil pump)

◀A▶ ▶A◀ 5. Crankshaft pulley
6. Crankshaft pulley (A/C compressor)



REMOVAL AND INSTALLATION SERVICE POINT

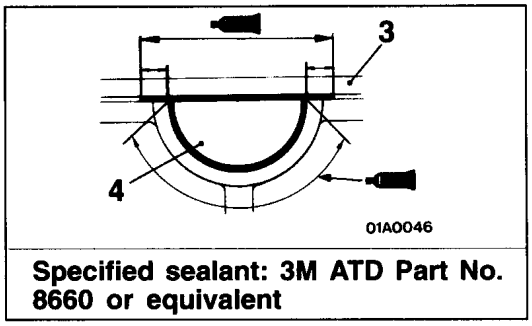
◀A▶▶A◀ **CRANKSHAFT PULLEY REMOVAL AND INSTALLATION**

CAMSHAFT, CAMSHAFT OIL SEAL

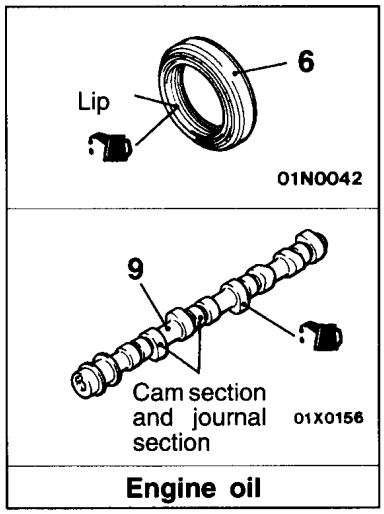
120002458

REMOVAL AND INSTALLATION

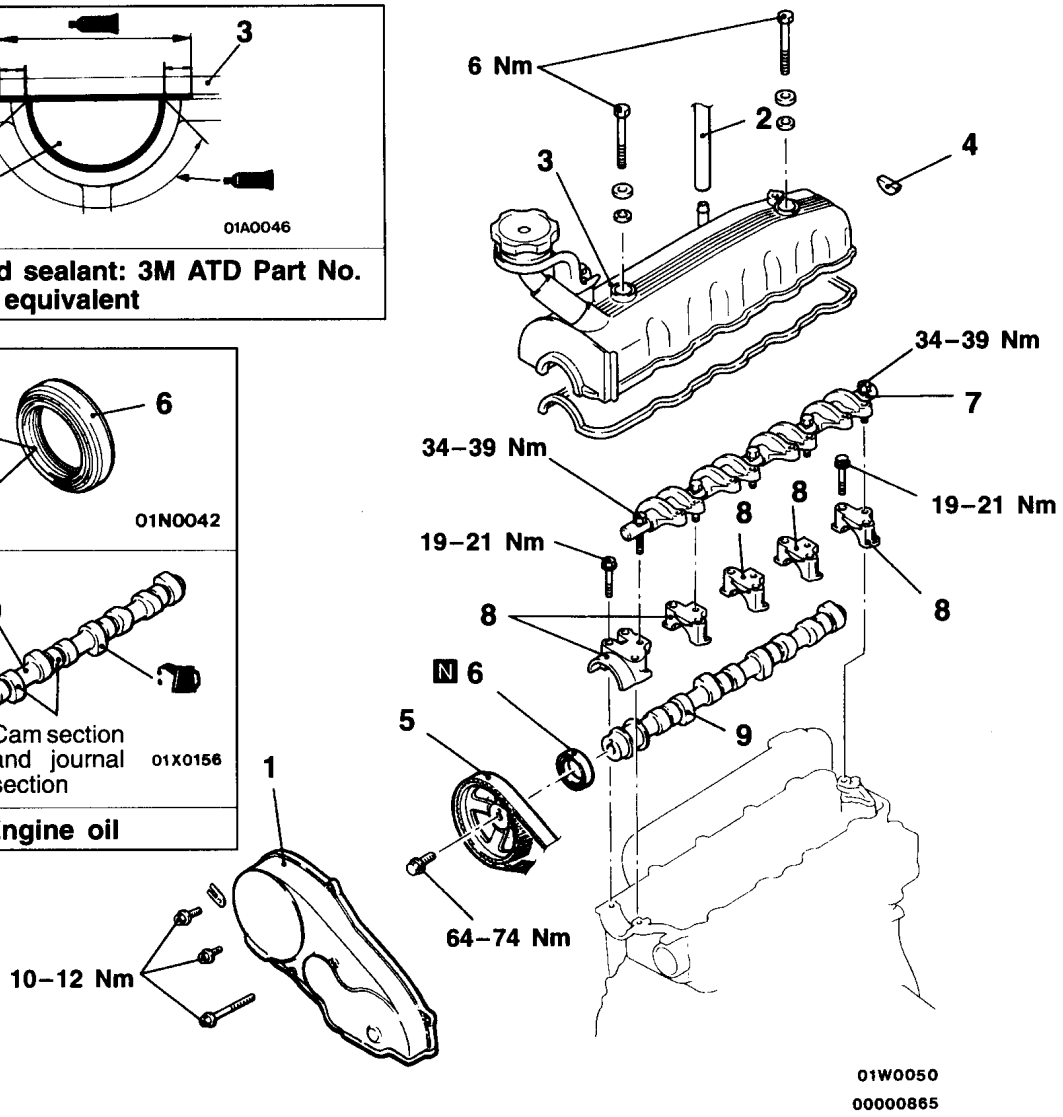
Pre-removal and Post-installation Operation
- Intercooler Removal and Installation (Refer to GROUP 15 – Intercooler.)



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



Engine oil

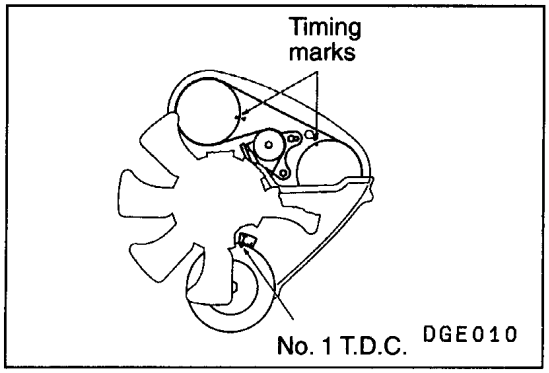


Camshaft removal steps

1. Timing belt upper cover assembly
2. Breather hose connection
3. Rocker cover
4. Semi-circular packing
5. Camshaft sprocket
6. Camshaft oil seal
7. Rocker arm and shaft assembly
8. Camshaft bearing cap
9. Camshaft

Camshaft oil seal removal steps

1. Timing belt upper cover assembly
5. Camshaft sprocket
6. Camshaft oil seal

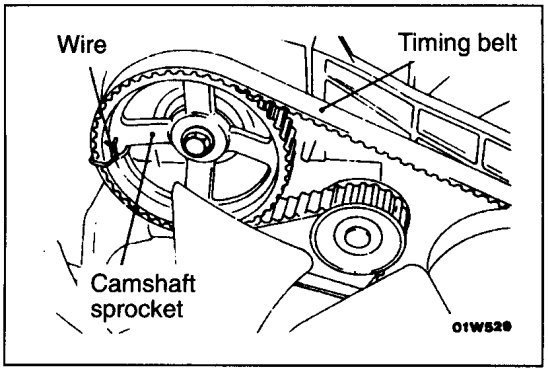


REMOVAL SERVICE POINTS

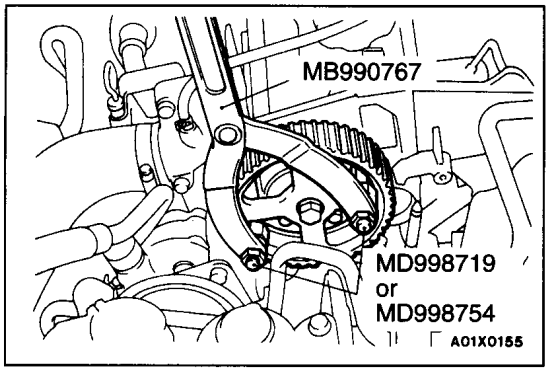
◀A▶ CAMSHAFT SPROCKET REMOVAL

(1) Rotate crankshaft clockwise (to the right) and align timing marks.

Caution
Never turn the crankshaft anticlockwise.

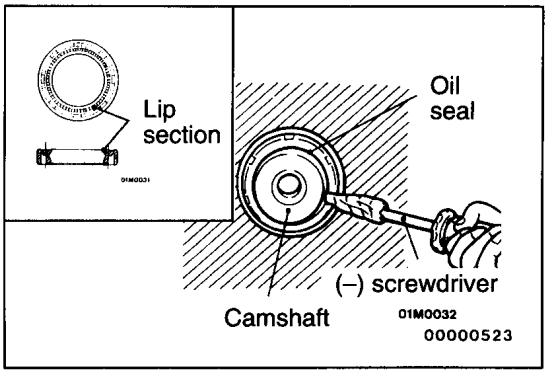


(2) Tie the camshaft sprocket and timing belt together with wire so that timing mark is not maladjusted.



(3) Use the special tool to stop the camshaft sprocket from turning, and then remove the camshaft sprocket with the timing belt still attached.

Caution
Do not rotate crankshaft after removing camshaft sprocket.



◀B▶ CAMSHAFT OIL SEAL REMOVAL

(1) Make a notch on the oil seal lip section with a knife, etc.

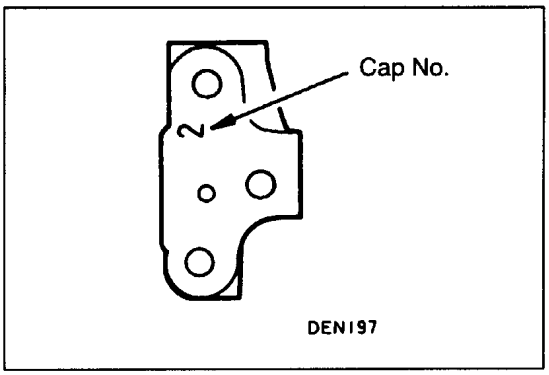
(2) Cover the end of a (–) screwdriver with a rag and insert it into the notched section of the oil seal, and lever out the oil seal to remove it.

Caution
Be careful not to damage the camshaft and the cylinder head.

◀C▶ ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

Loosen the rocker arm and shaft assembly mounting bolt, and then remove the rocker arm and shaft assembly with the bolt still attached.

Caution
Never disassemble the rocker arm and shaft assembly.



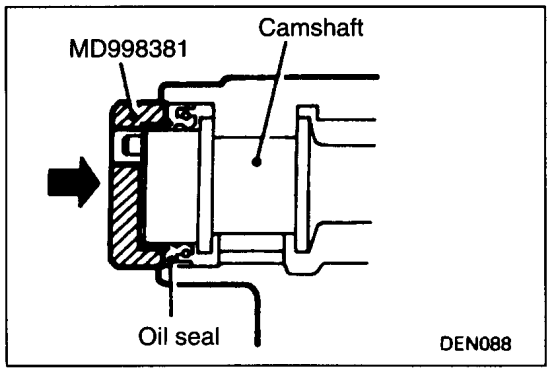
INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT BEARING CAP INSTALLATION

The cap numbers are embossed on the top surface of the bearing caps, so install in the order of the numbers. However, no numbers are embossed on bearing caps 1 and 5.

▶B◀ ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

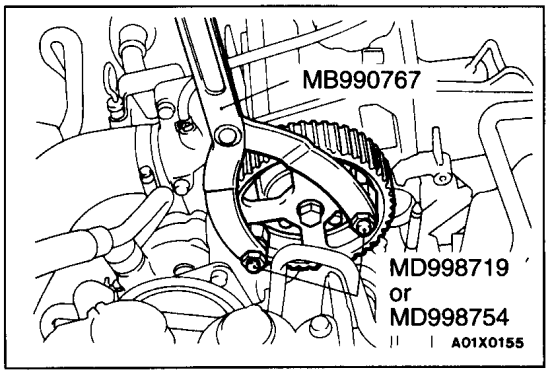
(1) Install the rocker arm and shaft assembly to the bearing caps.
(2) Check the valve clearance and adjust if necessary. (Refer to P.11I-8.)



▶C◀ CAMSHAFT OIL SEAL INSTALLATION

(1) Apply a small amount of engine oil to the entire circumference of the oil seal lip and camshaft.
(2) Use the special tool to tap in the oil seal.

NOTE
The oil seal should be tapped in until the distance from the end of the camshaft to the end of the oil seal is as shown in the illustration.



▶D◀ CAMSHAFT SPROCKET INSTALLATION

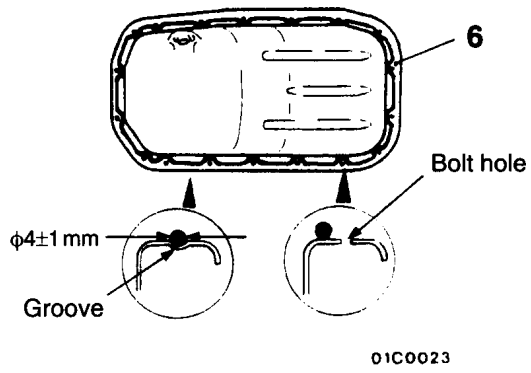
(1) Use the special tool to stop the camshaft sprocket from turning, and then install the camshaft sprocket bolt.
(2) Remove the cord which binds the camshaft sprocket and timing belt.

OIL PAN, OIL SCREEN

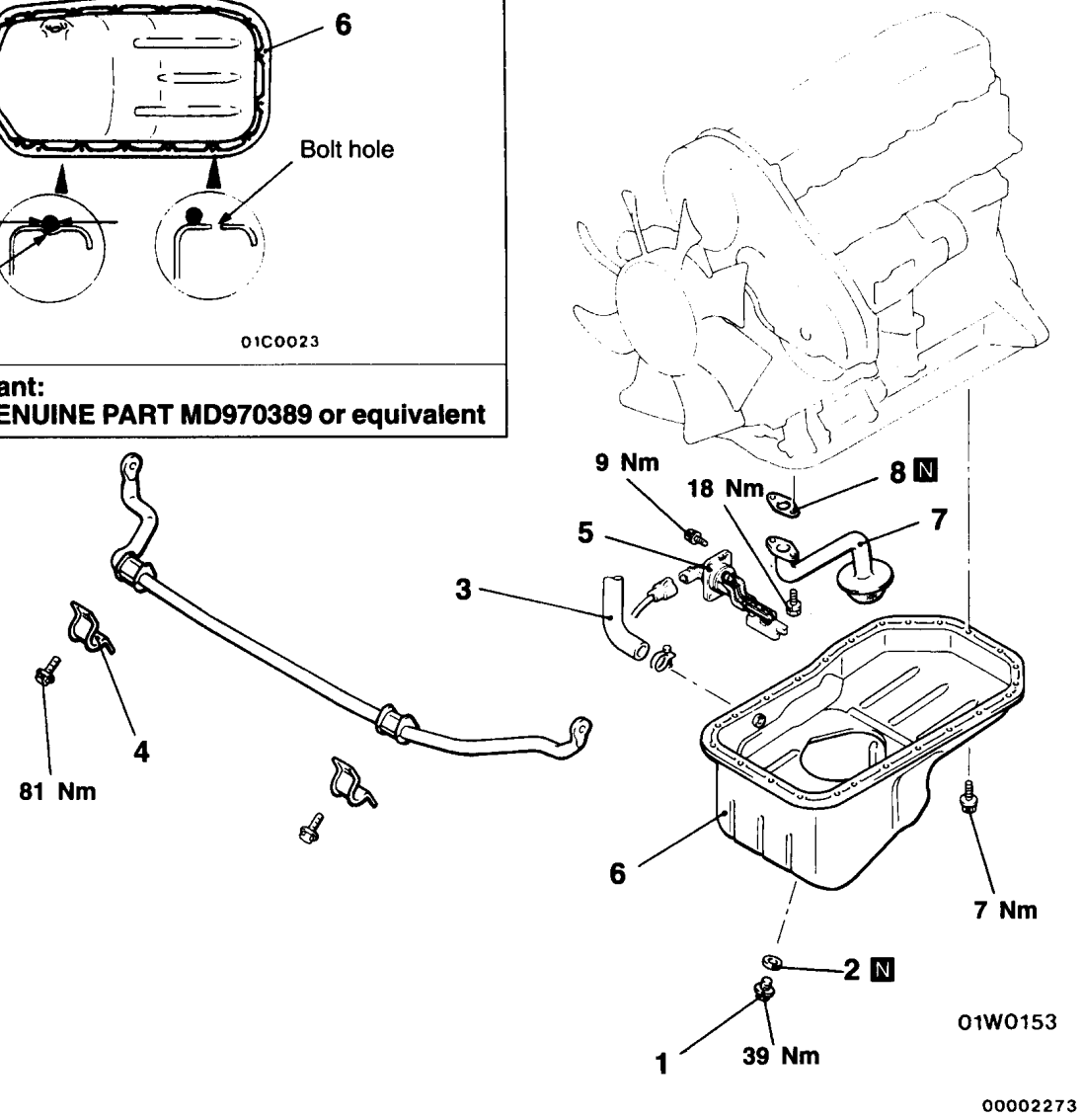
120002459

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Under Cover Removal and Installation (Refer to GROUP 42– Under Cover.)
(2)Engine Oil Draining and Supplying (Refer to GROUP 12 – Service Adjustment Procedures.)

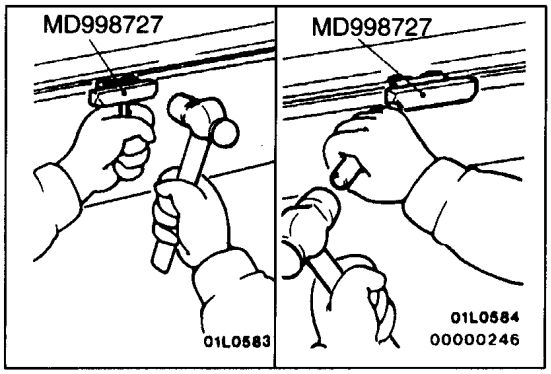


Specified sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent



Removal steps

1. Drain plug
▶B◀ 2. Gasket
3. Oil hose connection
▶A◀ 4. Clamp
5. Oil level sensor assembly
◀A▶ 6. Oil pan
7. Oil screen
8. Gasket

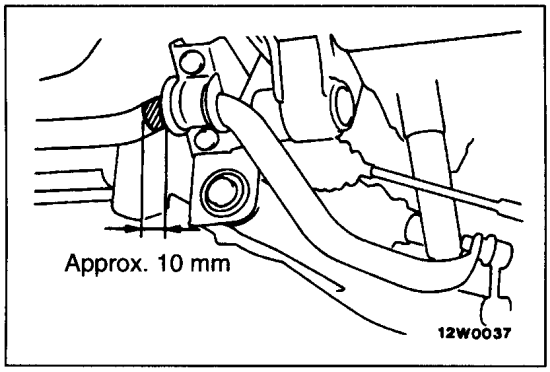


REMOVAL SERVICE POINT

◀A▶ OIL PAN REMOVAL

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

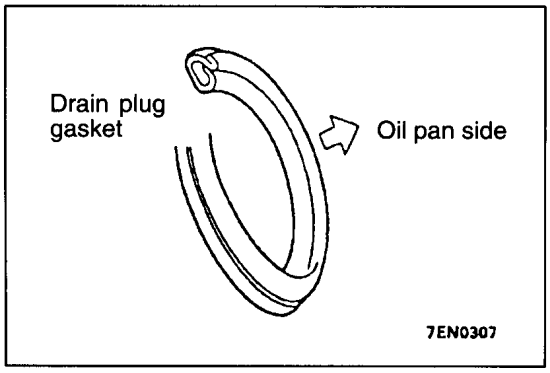
Caution
Perform this slowly to avoid deformation of the oil pan flange.



INSTALLATION SERVICE POINTS

▶A◀ CLAMP INSTALLATION

Install the clamp so that the coloured part on the stabilizer bar meets the indicated distance.



▶B◀ GASKET INSTALLATION

Replace the gasket with a new gasket, and install it in the direction shown in the illustration.

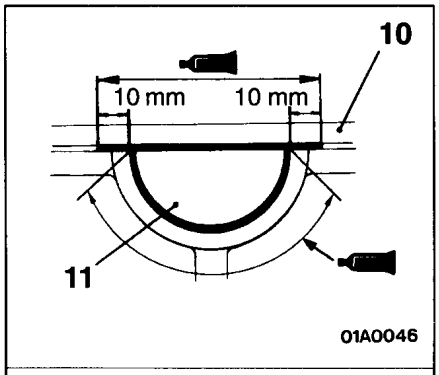
CYLINDER HEAD GASKET

120002460

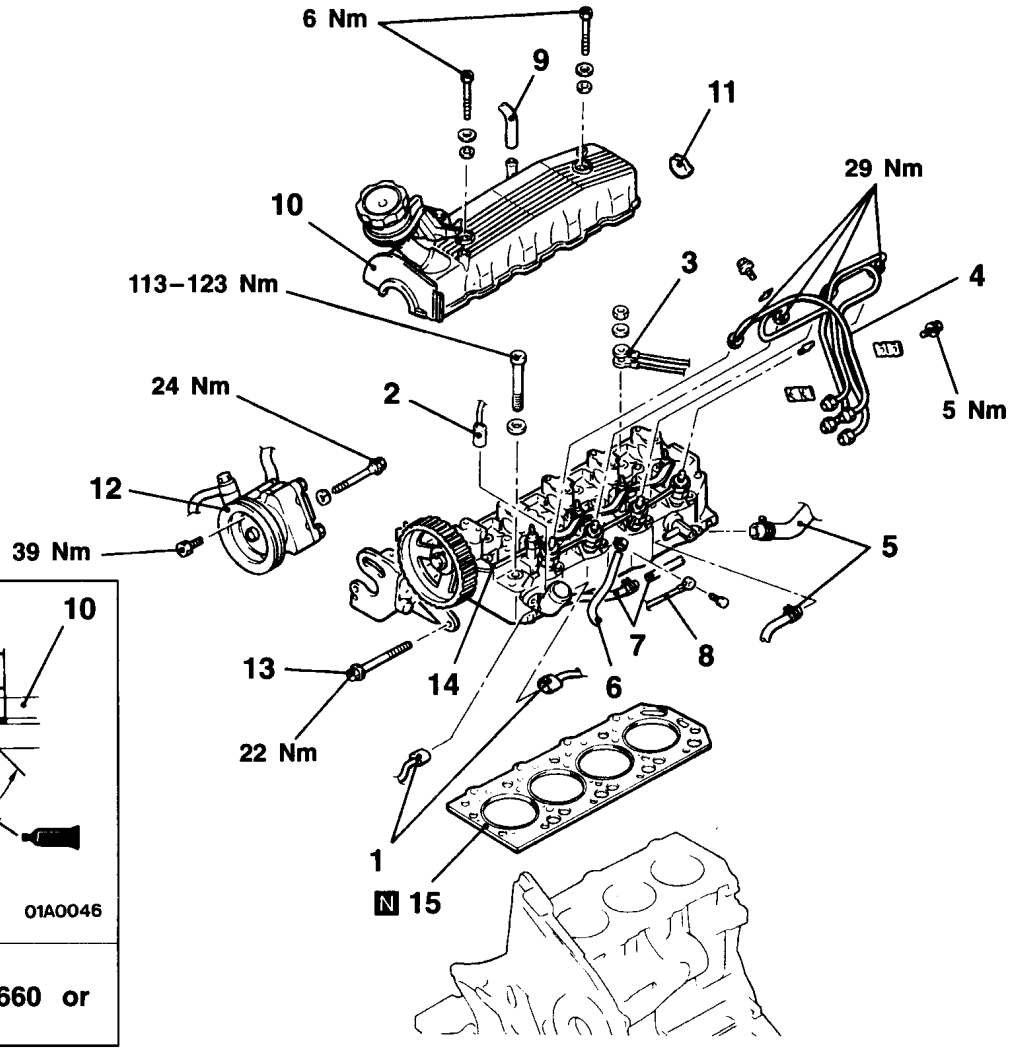
REMOVAL AND INSTALLATION

Pre-removal Operation
(1)Intake and Exhaust Manifold, Turbocharger Removal (Refer to GROUP 15 – Intake and Exhaust Manifold, Turbocharger.)
(2)Timing Belt Removal (Refer to P.11I-26.)

Post-installation Operation
(1)Timing Belt Installation (Refer to P.11I-26.)
(2)Intake and Exhaust Manifold, Turbocharger Installation (Refer to GROUP 15 – Intake and Exhaust Manifold, Turbocharger.)
(3)Evacuation of Air from Fuel Line (Refer to GROUP 13E – Service Adjustment Procedures.)

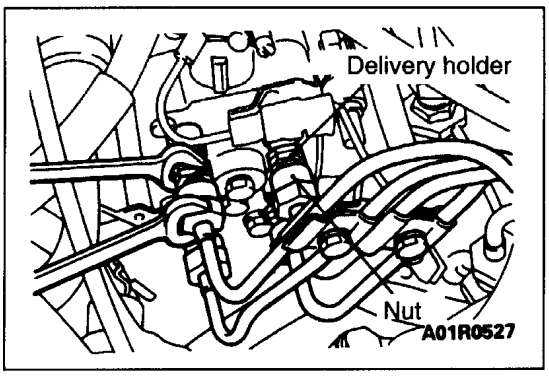


Specified sealant:
3M ATD Part No. 8660 or equivalent



Removal steps

1. Engine coolant temperature switch connector (for A/C)
2. Engine coolant temperature gauge connector
3. Glow plug connector
◀A▶ ▶C◀ 4. Fuel injection pipe
5. Heater hose connection
6. Fuel hose connection
7. Water hose connection
8. Earth cable connection
9. Breather hose connection
10. Rocker cover
11. Semi-circular packing
◀B▶ 12. Power steering oil pump assembly
13. Power steering oil pump bracket bolt
◀C▶ ▶B◀ 14. Cylinder head assembly
▶A◀ 15. Cylinder head gasket



REMOVAL SERVICE POINTS

◀A▶ FUEL INJECTION PIPE REMOVAL

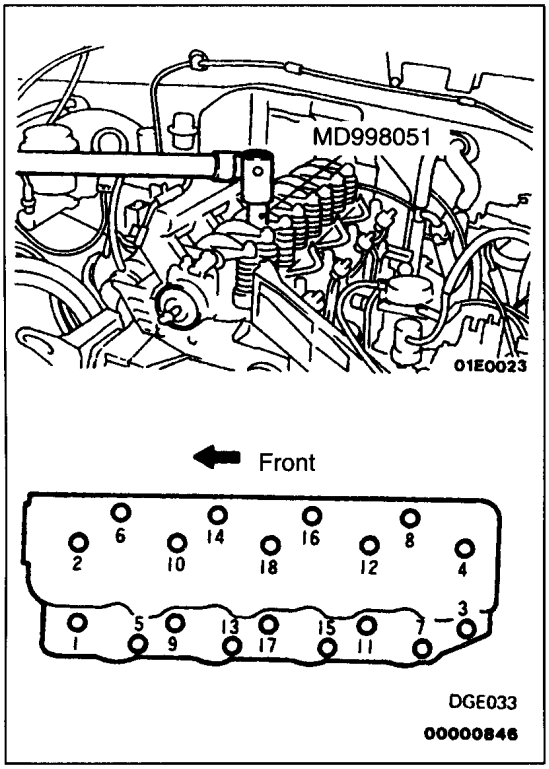
When loosening nuts at both ends of injection pipe, hold the other side (pump side-delivery holder, nozzle side-nozzle holder) with wrench and loosen nut.

Caution
After disconnecting the injection pipe, plug the opening so that no foreign particles get inside the pump or into the injection nozzle.

◀B▶ POWER STEERING OIL PUMP REMOVAL

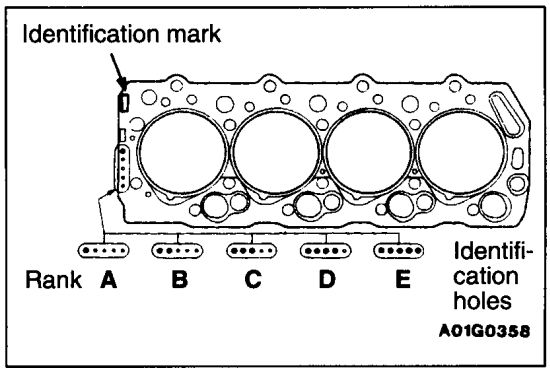
Remove the power steering oil pump from the bracket with the hose attached.

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



◀C▶ CYLINDER HEAD REMOVAL

Use the special tool to tighten each bolt 2 – 3 times in the order shown in the illustration.



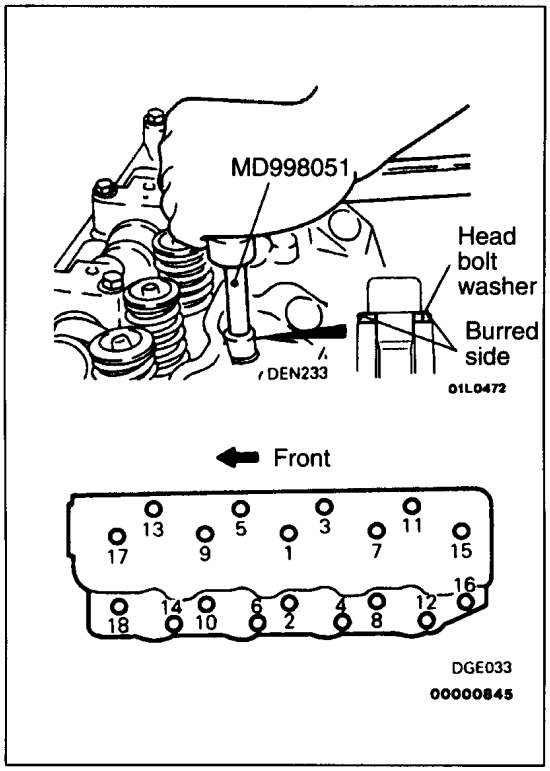
INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

(1) Wipe off any oil or grease from the gasket mounting surface.
(2) Check the rank from the number of identification holes on the cylinder head gasket that was removed, and select a cylinder head gasket of the same rank.

NOTE
The ranks are listed in the parts catalogue.

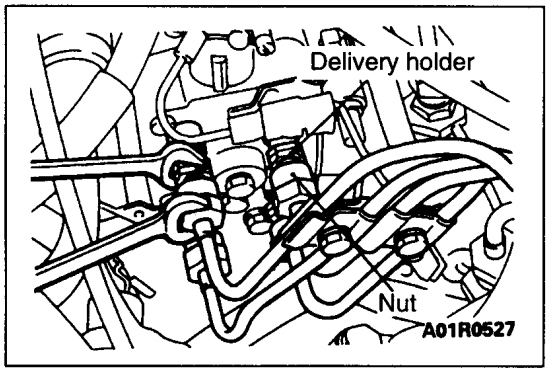
(3) Place the cylinder head gasket on top of the cylinder block so that the identification mark is facing upwards as in the illustration.



▶B◀ CYLINDER HEAD INSTALLATION

Use the special tool to tighten each bolt 2 – 3 times in the order shown in the illustration.

Caution
The head bolt washer should be installed so that the burred side is facing upwards.



▶C◀ FUEL INJECTION PIPE INSTALLATION

When tightening the nuts at both ends of the fuel injection pipe, hold the other side (pump-side delivery holder, nozzle-side nozzle holder) with a wrench, and tighten the nuts to the specified torque.

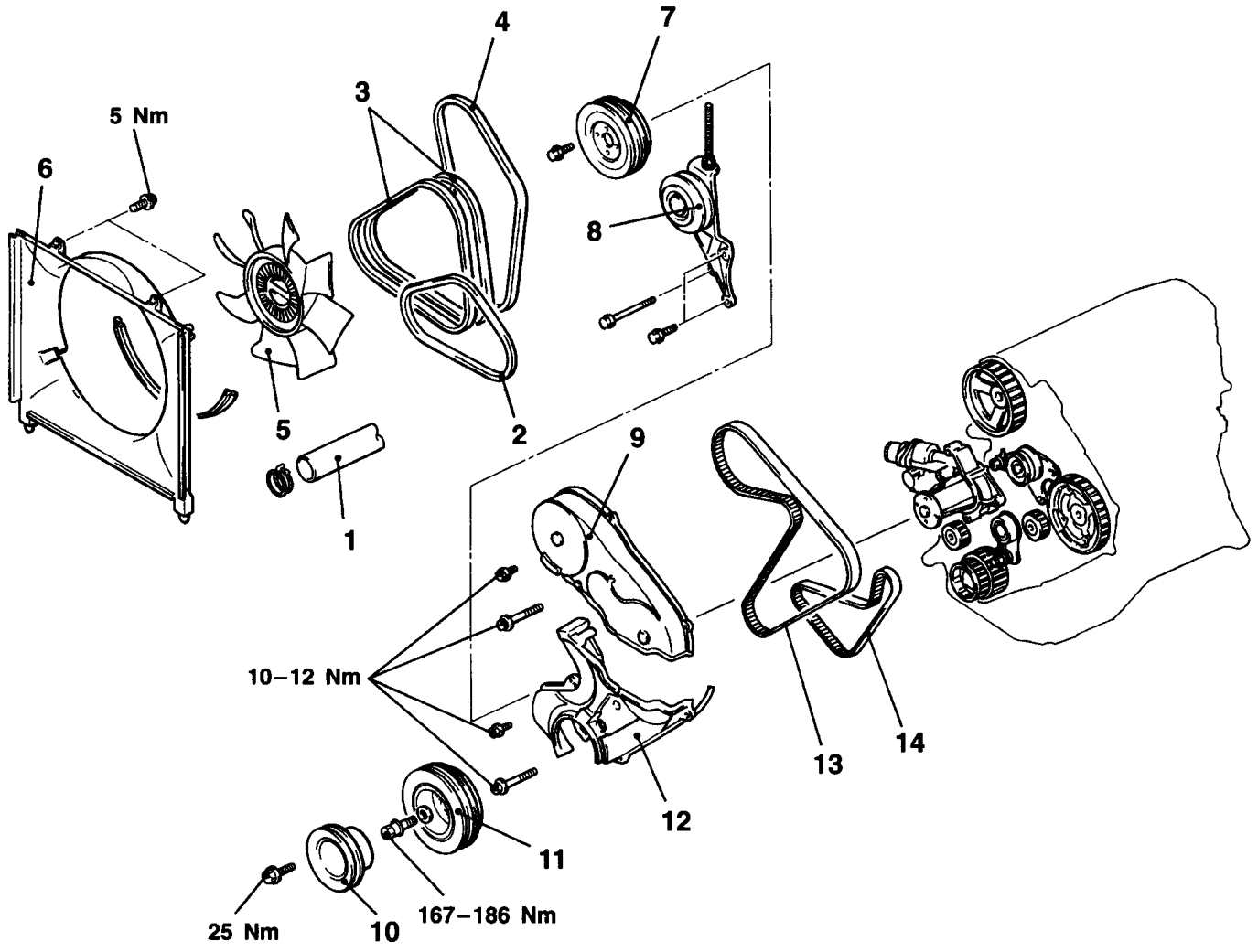
Tightening torque: 29 Nm

TIMING BELT/TIMING BELT B

120002461

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
(1) Engine Coolant Draining (Refer to GROUP 12 – Service Adjustment Procedures.)
(2) Intercooler Removal and Installation (Refer to GROUP 15 – Intercooler.)



A01W0065

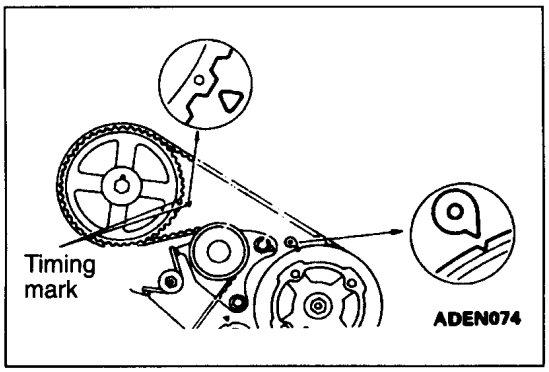
Removal steps

1. Radiator upper hose connection
2. Drive belt (A/C compressor)
3. Drive belts (Alternator)
4. Drive belt (Power steering oil pump)
◀A▶ 5. Cooling fan and clutch assembly
◀A▶ 6. Radiator shroud assembly
7. Water pump pulley
8. A/C tensioner pulley assembly (Refer to GROUP 55 – Compressor and Tension Pulley.)
9. Timing belt upper cover assembly
10. Crankshaft pulley (A/C compressor)
◀B▶ ▶C◀ 11. Crankshaft pulley
12. Timing belt lower cover assembly
◀C▶ ▶B◀ 13. Timing belt
◀D▶ ▶A◀ 14. Timing belt B

REMOVAL SERVICE POINTS

◀A▶ COOLING FAN AND CLUTCH ASSEMBLY/ RADIATOR SHROUD ASSEMBLY REMOVAL

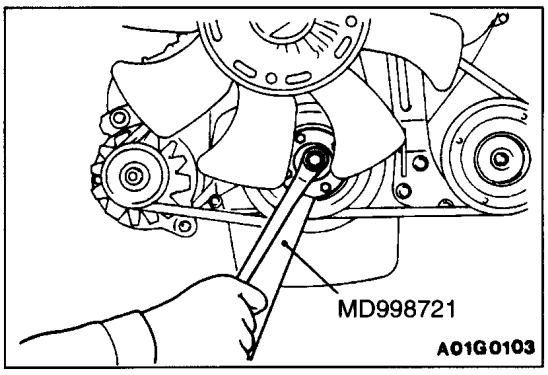
Remove the mounting nuts and bolts, and then remove the cooling fan and clutch assembly and the radiator shroud assembly as a set.



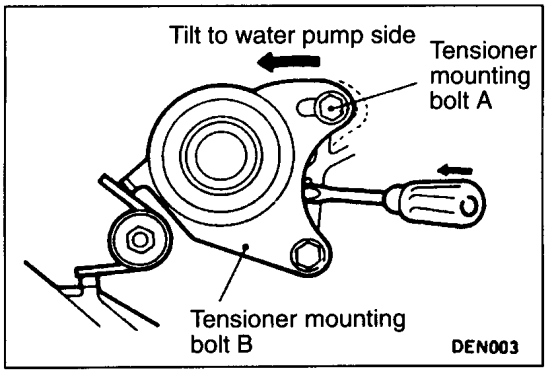
◀B▶ CRANKSHAFT PULLEY REMOVAL

(1) Position the No. 1 cylinder at compression TDC and remove the crankshaft pulley.

NOTE
The No. 1 cylinder is at compression TDC when the marks are aligned as shown in the figure.

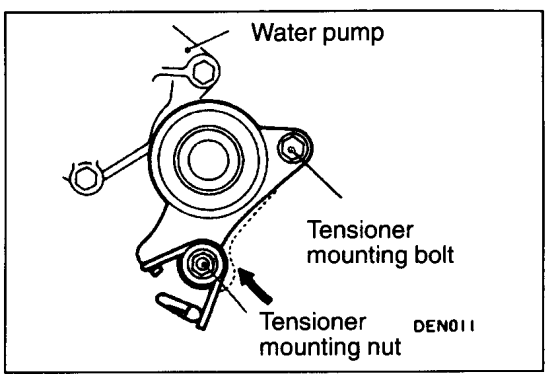


(2) Use the special tool to keep crankshaft from turning and remove the bolts.



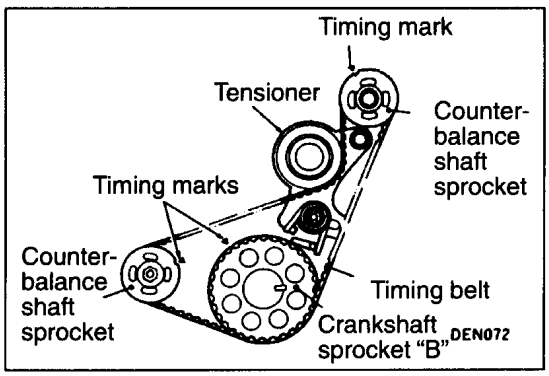
◀C▶ TIMING BELT REMOVAL

(1) When reinstalling timing belt, mark an arrow at the belt to show rotation direction.
(2) Loosen the tensioner mounting bolt A and B.
(3) Push timing belt tensioner to water pump side and tighten the tensioner mounting bolt A and B. Secure so that tensioner will not move back.



◀D▶ TIMING BELT B REMOVAL

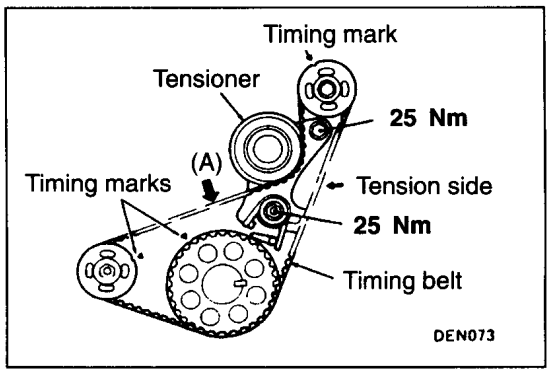
(1) When reinstalling timing belt B, mark an arrow at the belt to show rotation direction.
(2) Loosen the tensioner mounting bolt and nut.
(3) Push timing belt tensioner to water pump side and tighten the tensioner mounting bolt and nut. Secure so that tensioner will not move back.



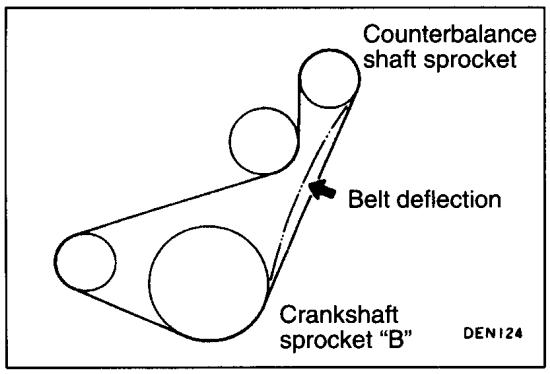
INSTALLATION SERVICE POINTS

▶A◀ TIMING BELT B INSTALLATION

(1) Align the timing marks of the 3 sprockets.
(2) When reusing timing belt B, make sure the arrow mark is pointing in the same direction as when the belt was removed.

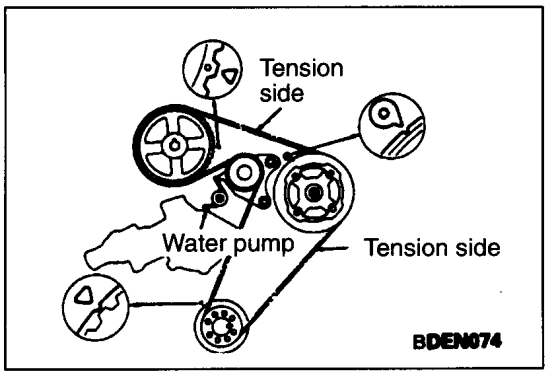


(3) Install timing belt B and make sure there is no deflection on the tension side.
(4) Press the deflection side of timing belt B (indicated by arrow (A)) a finger hand and fully stretch the tensioner side.
(5) Make sure that the timing marks are aligned.
(6) Loosen the tensioner mounting bolt and nut so that only the pressure of the spring is applied to timing belt B.
(7) Tighten the tensioner mounting nut and then tighten the bolt. If the bolt is tightened first, the tensioner will move and tension the belt.



(8) Press in the direction of the arrow in the figure with a finger to check the amount of deflection.

Standard value: 4–5 mm

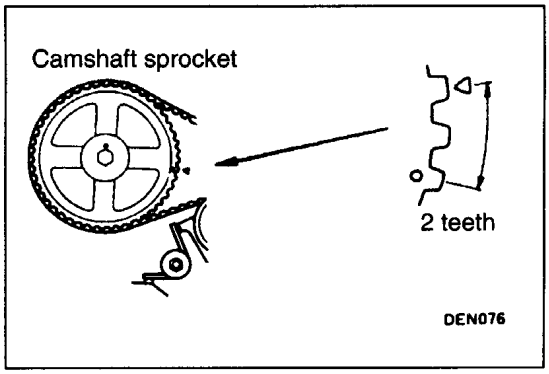


▶B◀ TIMING BELT INSTALLATION

(1) Align the timing marks of the 3 sprockets.
(2) When reusing timing belt, make sure the arrow mark is pointing in the same direction as when the belt was removed.
(3) Install the timing belt to the crankshaft sprocket, to injection pump sprocket, to tensioner and to camshaft sprocket in that order, using care not to allow defection on the tension side of the timing belt.

Caution
1. **Engage the belt on the various sprockets while maintaining tension on the belt of tension side.**
2. **Align the injection pump sprocket with the timing mark, hold the sprocket so that it does not turn and engage the belt.**

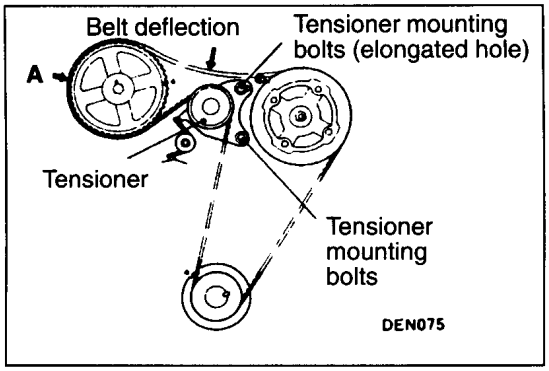
(4) Loosen the tensioner mounting bolts and apply tension with the spring.



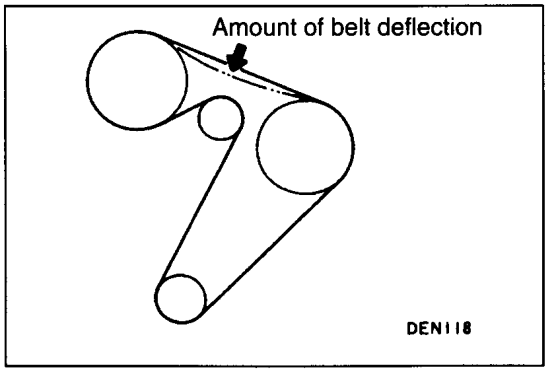
(5) Turn the crankshaft clockwise and stop at the second lobe of the camshaft sprocket.

Caution

1. **When turning the crankshaft, strictly observe the specified amount of rotation (2 teeth on the camshaft sprocket) in order to apply a constant force to the tension side of the belt.**
2. **Do not turn the crankshaft counterclockwise.**
3. **Do not touch the belt during adjustment.**

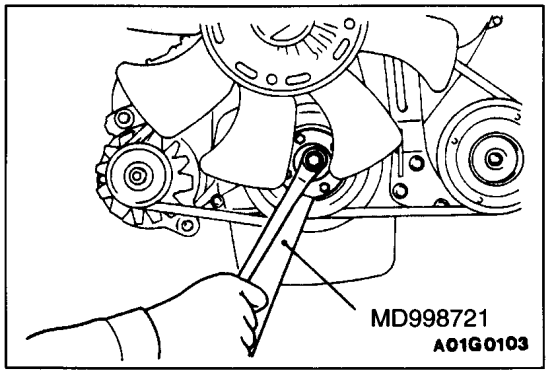


(6) Inspect to make sure that the part indicated by arrow A does not float upward.
(7) Tighten the tensioner mounting bolts, starting with the bolt in the elongated hole. If the lower bolt is tightened first, belt tension will become too tight.



(8) Turn the crankshaft anticlockwise and align the timing mark. And make sure that the timing marks of all sprockets are aligned.
(9) Press on the centre of the belt with an index finger to check the amount of deflection.

Standard value: 4–5 mm



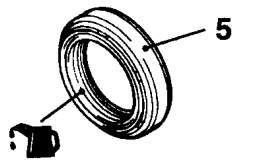
▶C◀ CRANKSHAFT PULLEY INSTALLATION

CRANKSHAFT FRONT OIL SEAL

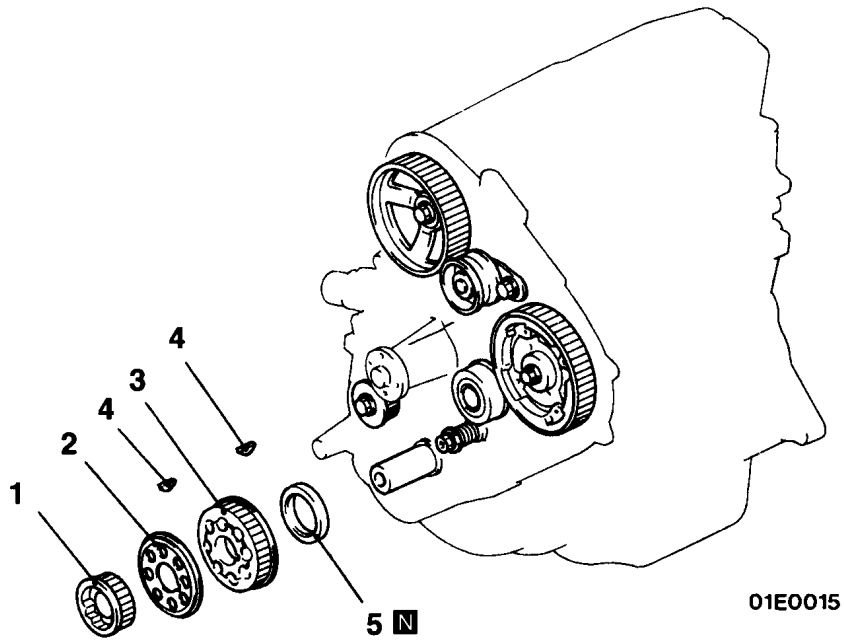
120000345

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
- Timing Belt and Timing Belt "B" Removal and Installation (Refer to p.11I-26.)



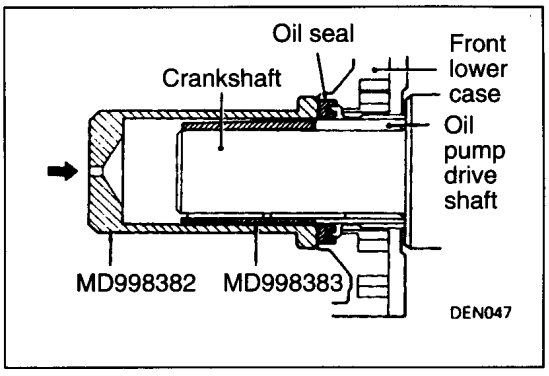
Engine oil



00000868

Removal steps
1. Crankshaft sprocket
2. Flange
3. Crankshaft sprocket B
4. Key

▶A◀ 5. Crankshaft front oil seal



INSTALLATION SERVICE POINT

▶A◀ CRANKSHAFT FRONT OIL SEAL INSTALLATION

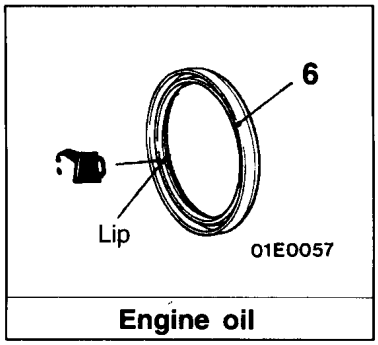
Apply engine oil to the entire circumference of the oil seal lip, and then tap in the oil seal until it is flush with the front lower case.

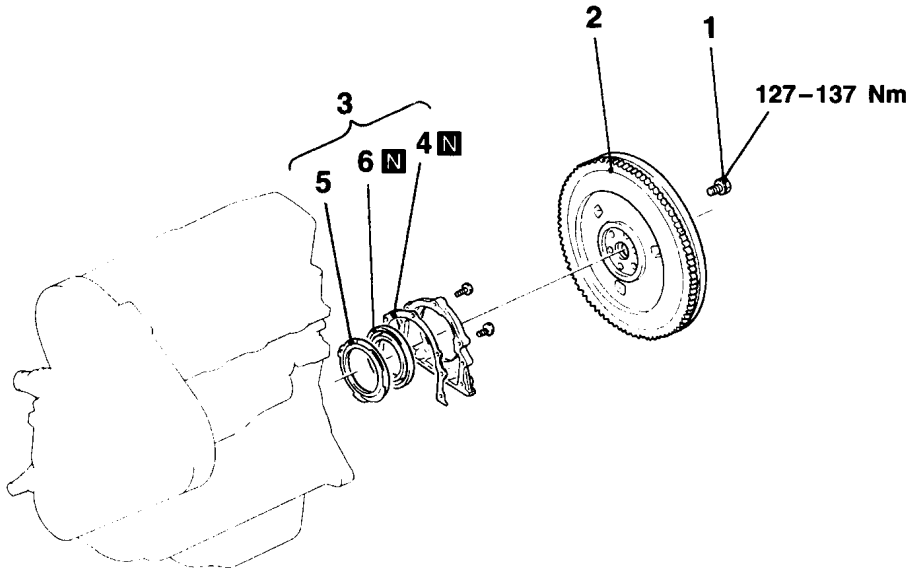
CRANKSHAFT REAR OIL SEAL

120002462

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
- Transmission Assembly Removal and Installation (Refer to GROUP 22 – Transmission Assembly.)

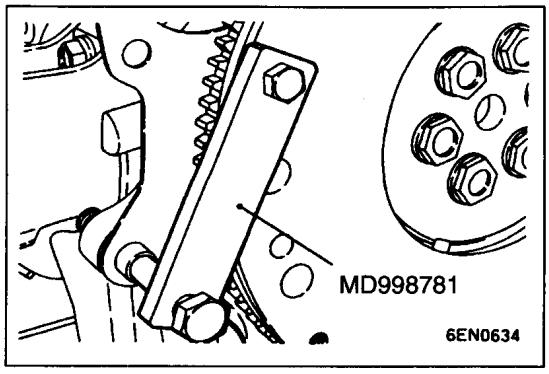




00002274

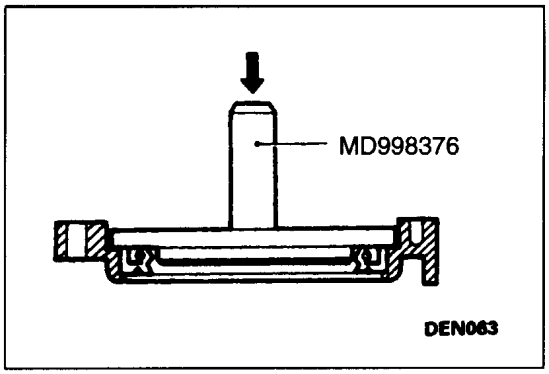
Removal steps

◀A▶ ▶C◀ 1. Flywheel bolt
2. Flywheel
3. Oil seal case assembly
4. Gasket
▶B◀ 5. Oil separator
▶A◀ 6. Crankshaft rear oil seal



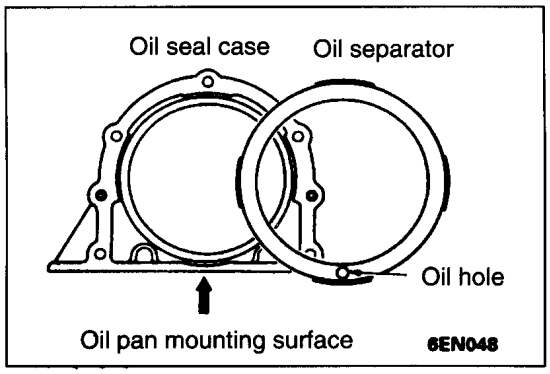
REMOVAL SERVICE POINT

◀A▶ FLYWHEEL BOLT REMOVAL



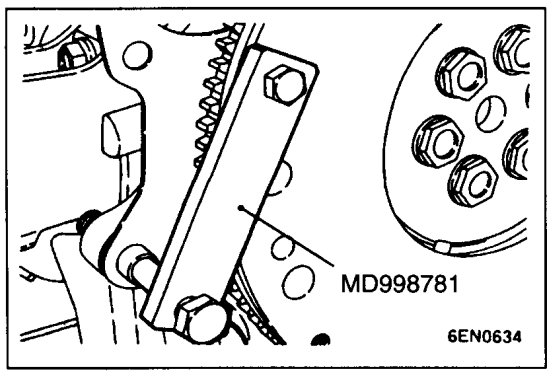
INSTALLATION SERVICE POINTS

▶A◀ CRANKSHAFT REAR OIL SEAL INSTALLATION



▶B◀ OIL SEPARATOR INSTALLATION

Install the oil separator so that its oil hole come at the case bottom (indicated by an arrow in illustration).



▶C◀ FLYWHEEL BOLT INSTALLATION

ENGINE ASSEMBLY

120002463

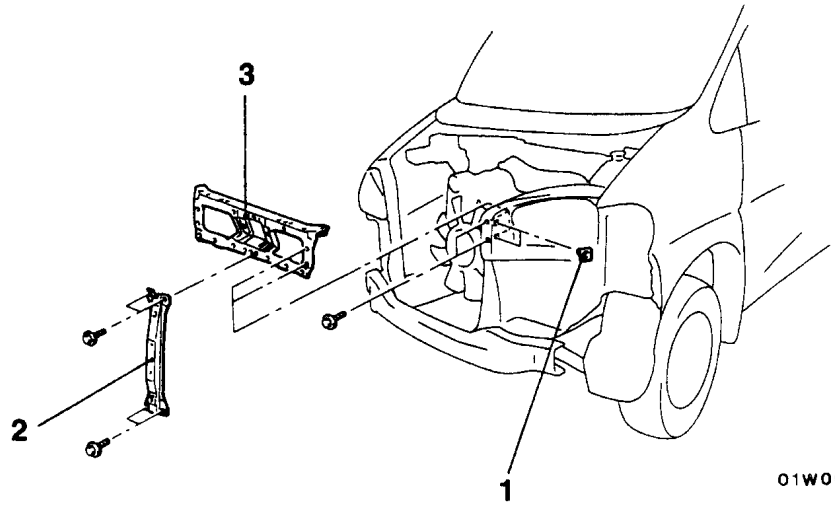
REMOVAL AND INSTALLATION

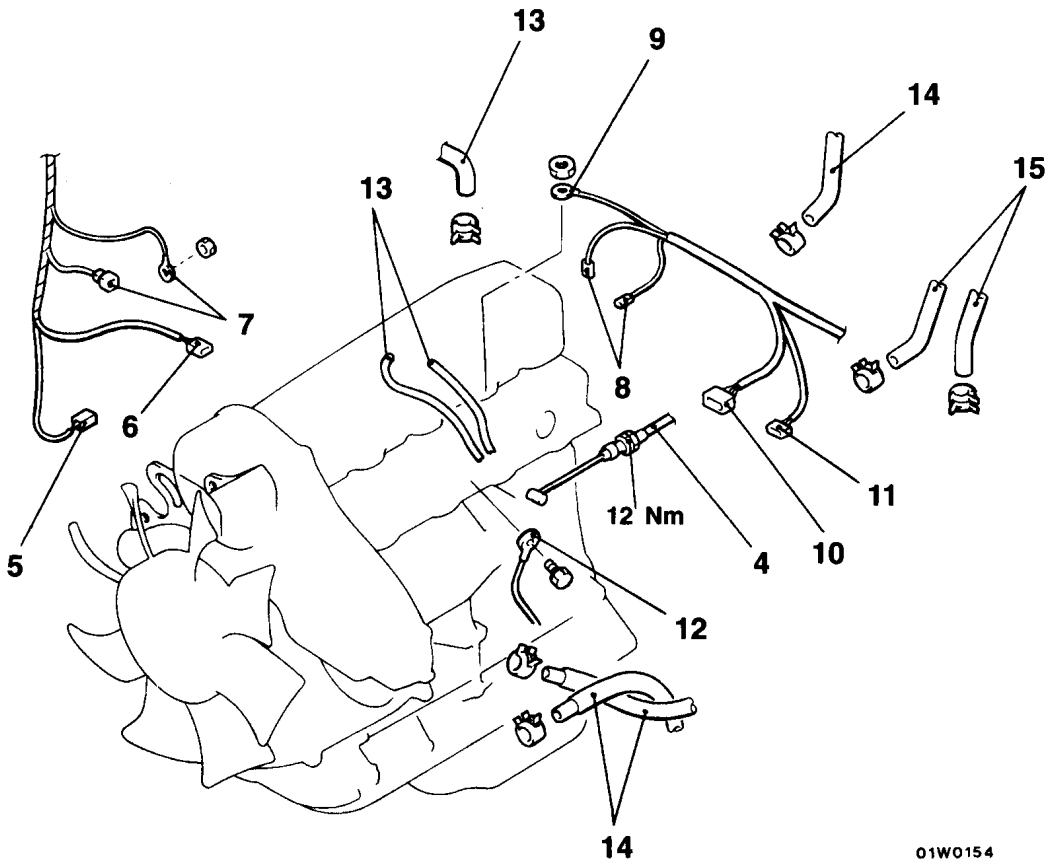
Pre-removal Operation

(1) Hood, Hood Latch Removal
(Refer to GROUP 42– Hood.)
(2) Under Cover Removal
(Refer to GROUP 42– Under Cover.)
(3) Engine Coolant Draining
(Refer to GROUP 14 – Service Adjustment Procedures.)
(4) Engine Oil Draining
(Refer to GROUP 12 – Service Adjustment Procedures.)
(5) Intercooler Removal
(Refer to GROUP 15 – Intercooler.)
(6) Air Cleaner Assembly Removal
(Refer to GROUP 15 – Air Cleaner.)
(7) Battery and Battery Tray Removal
(8) Transmission Assembly Removal
(M/T: Refer to GROUP 22 – Transmission Assembly.)
(A/T: Refer to GROUP 23 – Transmission Assembly.)
(9) Wiper Motor and Linkage Removal
(Refer to GROUP 51 – Windshield Wiper and Washer.)
(10) Front Bumper Removal
(Refer to GROUP 51 – Front Bumper.)
(11) Front Condenser and Condenser Fan Motor Assembly Removal
(Refer to GROUP 55 – Front Condenser and Condenser Fan Motor Assembly.)
(12) Radiator Removal
(Refer to GROUP 14 – Radiator.)
(13) Headlamp (L. H.) Removal
(Refer to GROUP 54 – Headlamp.)
(14) A/C Compressor Removal
(Refer to GROUP 55 – A/C Compressor.)

Post-Installation Operation

(1) A/C Compressor Installation
(Refer to GROUP 55 – A/C Compressor.)
(2) Headlamp (L. H.) Installation
(Refer to GROUP 54 – Headlamp.)
(3) Radiator Installation
(Refer to GROUP 14 – Radiator.)
(4) Front Condenser and Condenser Fan Motor Assembly Installation
(Refer to GROUP 55 – Front Condenser and Condenser Fan Motor Assembly.)
(5) Front Bumper Installation
(Refer to GROUP 51 – Front Bumper.)
(6) Wiper Motor and Linkage Installation
(Refer to GROUP 51 – Windshield Wiper and Washer.)
(7) Transmission Assembly Installation
(Refer to GROUP 22 – Transmission Assembly.)
(8) Air Cleaner Assembly Installation
(Refer to GROUP 15 – Air Cleaner.)
(9) Intercooler Installation
(Refer to GROUP 15 – Intercooler)
(10) Engine Oil Refilling
(Refer to GROUP 12 – Service Adjustment Procedures.)
(11) Engine Coolant Refilling
(Refer to GROUP 14 – Service Adjustment Procedures.)
(12) Drive Belt Tension Adjustment
(Refer P.11I-6.)
(13) Accelerator Cable Adjustment
(Refer to GROUP 13F – Service Adjustment Procedures.)
(14) Evacuation of Air from Fuel Line
(Refer to GROUP 13E – Service Adjustment Procedures.)
(15) Battery and Battery Tray Installation
(16) Under Cover Installation
(Refer to GROUP 42– Under Cover.)
(17) Hood, Hood Latch Installation
(Refer to GROUP 42– Hood.)

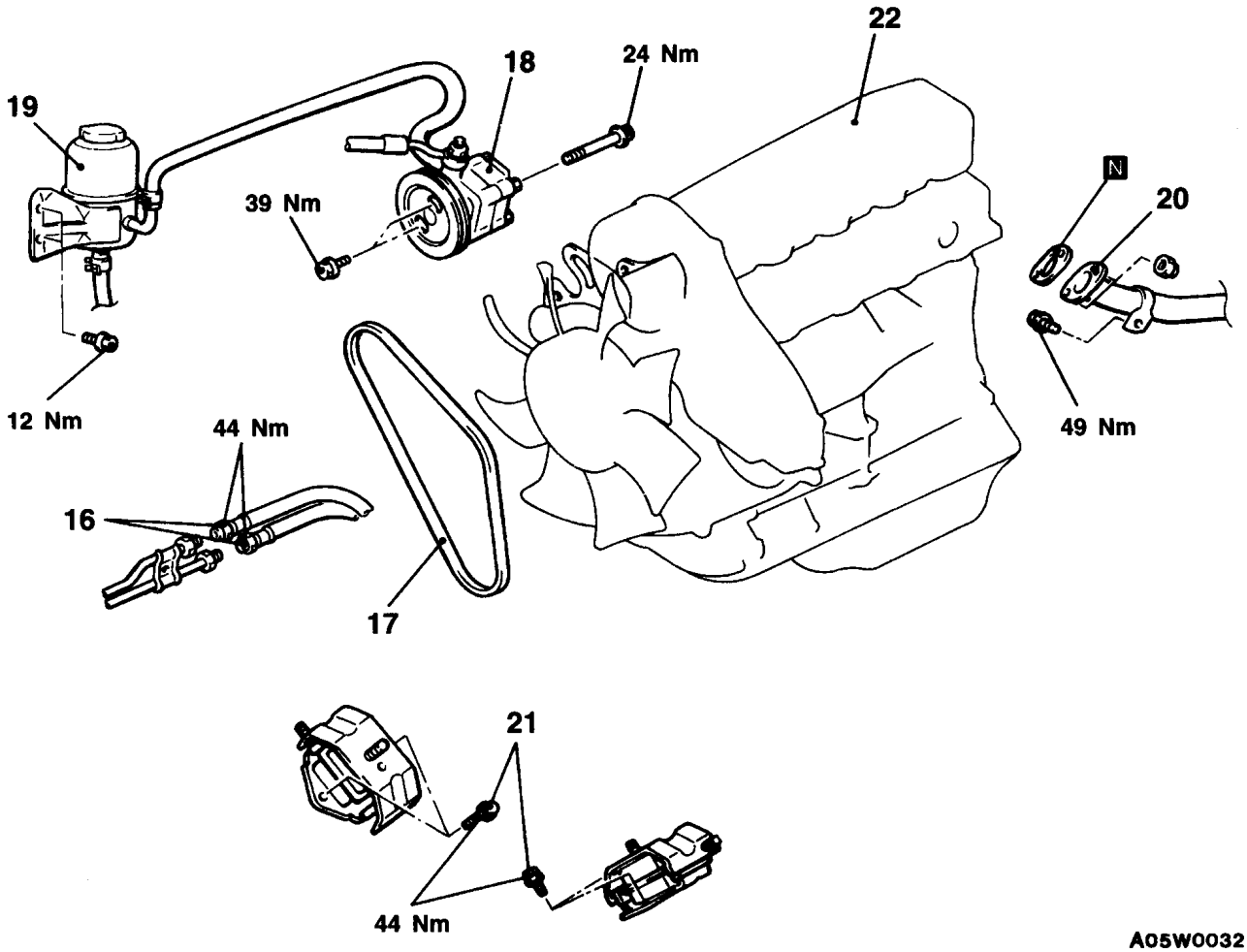




00002275

Removal steps

1. Grommet
2. Hood lock stay
3. Front end upper bar center
4. Accelerator cable
5. Engine oil level sensor connector
6. Engine oil pressure switch connector
7. Alternator connector
8. Engine coolant temperature switch connector (for A/C)
9. Glow plug connector
10. Lever position sensor connector
11. Sensor connector
12. Earth cable connection
13. Vacuum hose connection
14. Water hose connection
15. Fuel hose connection



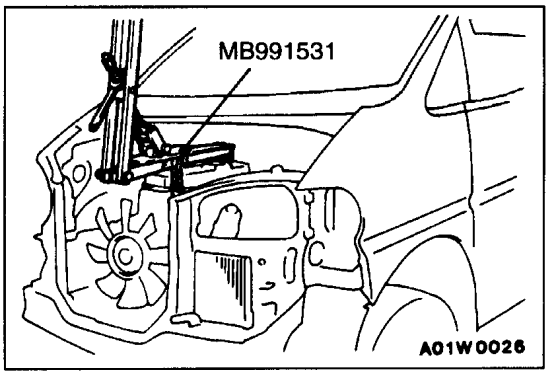
16. Engine oil cooler hose connection
17. Drive belt (Power steering)
◀A▶ 18. Power steering oil pump assembly
◀A▶ 19. Power steering oil reservoir assembly
20. Exhaust pipe connection
21. Engine support front insulator bolt
▶B◀ ▶A◀ 22. Engine assembly

REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP ASSEMBLY/POWER STEERING OIL RESERVOIR ASSEMBLY REMOVAL

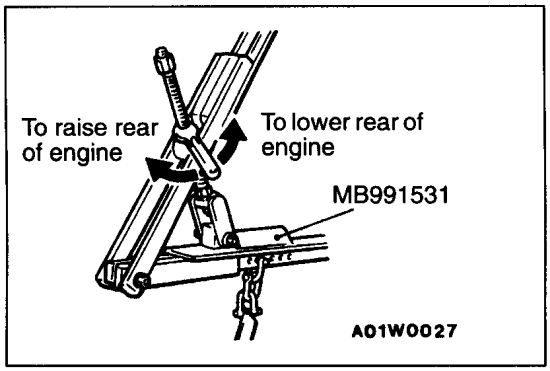
Remove the power steering oil pump assembly and power steering oil reservoir assembly from the bracket with the hose attached.

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



◀B▶ ENGINE ASSEMBLY REMOVAL

(1) Check that all cables, hoses and harness connectors have been disconnected from the engine.
(2) Hang the special tool on a chain block or similar tool, and then attach the special tool to the engine hanger.



(3) Turn the wrench on the special tool to tilt the engine assembly. Then raise the engine assembly slowly to remove from the front engine compartment.

INSTALLATION SERVICE POINT

▶A◀ ENGINE ASSEMBLY INSTALLATION

Install the engine assembly while checking to be sure that the cables, hoses, and harness connectors are not clamped.

LUBRICATION

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120002658

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Engine Oil Replacement 3

Oil Filter Replacement 5

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GENERAL INFORMATION

120002135

The lubrication method is a fully force-fed, full-flow filtration type. The oil pump is a gear type which is driven by the crankshaft via the timing belt.
Furthermore, the oil level sensor is located in the oil pan, and a system is equipped whereby an indicator gives a warning when the oil level drops.

ENGINE OILS

Health Warning

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

Recommended Precautions

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

Other precautions:

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

120002136

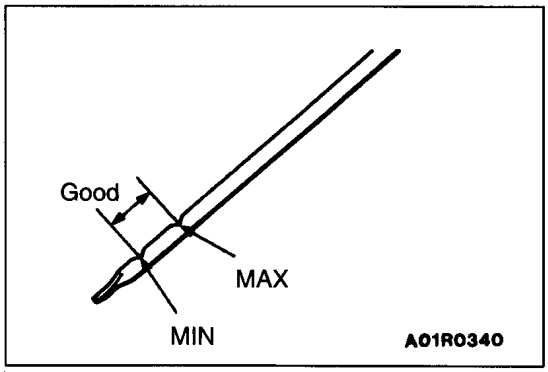
Items		4G63, 4G64	4D56
Engine oil (API Classification)		SG or higher	CD or higher
Quantity dm^3	Oil filter	0.3	0.8
	Oil cooler	–	0.6
	Total quantity	4.3	6.9

SERVICE ADJUSTMENT PROCEDURES

120002137

ENGINE OIL INSPECTION

1. Pull out the oil level gauge and remove oil adhered to the level gauge, wiping with clean cloth.
2. Insert the level gauge into the oil level gauge guide.



3. Pull out the level gauge slowly and check that the oil level is in the illustrated range.

   NOTE
   1. For this inspection, place the vehicle on a level surface.
   2. Check while the engine is stationary. If the engine has been started, stop it and allow for some time before inspection.
4. If below the minimum level, supply with specified oil.

   Specified oil: (API classification)
   <4G63, 4G64>: SG or higher
   <4D56>: CD or higher

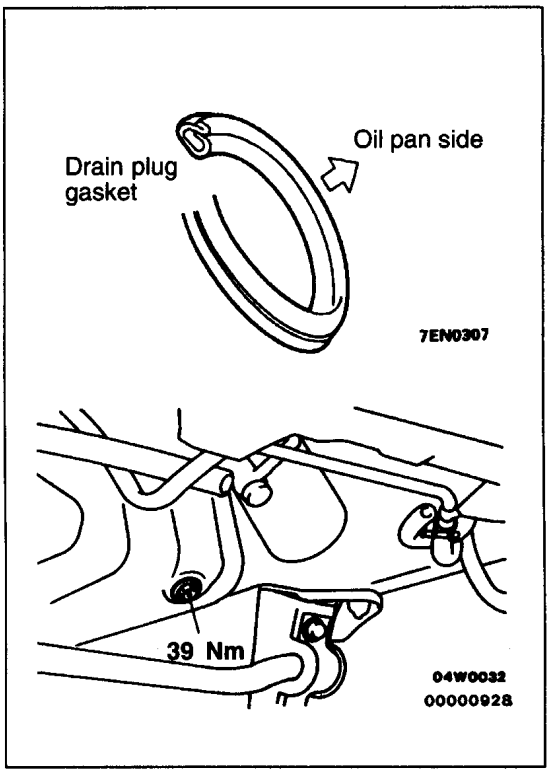
   Caution
   Refilling beyond the maximum level has adverse effect on engine performance.
5. Run the engine at idle and stop. Then allow some time and check oil level again to make sure it is within the specified range.
6. Check that the oil is not excessively dirty, that there is no coolant or gasoline mixed in, and that it has sufficient viscosity.

ENGINE OIL REPLACEMENT

120002138

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.

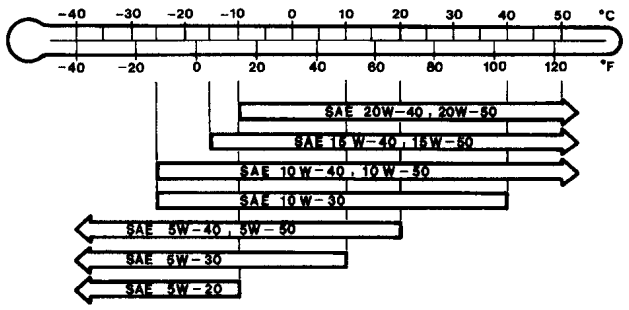


4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.

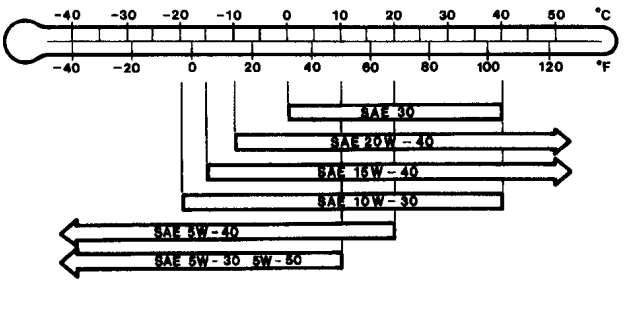
5. Refill with specified quantity of oil.

Items	Specified oil (API classification)	Total quantity (Includes volume inside oil filter and oil cooler) dm^3
4G63, 4G64	SG or higher	4.3
4D56	CD or higher	6.9

PETROL-POWERED VEHICLES
Barometric temperature



DIESEL-POWERED VEHICLES
Barometric temperature



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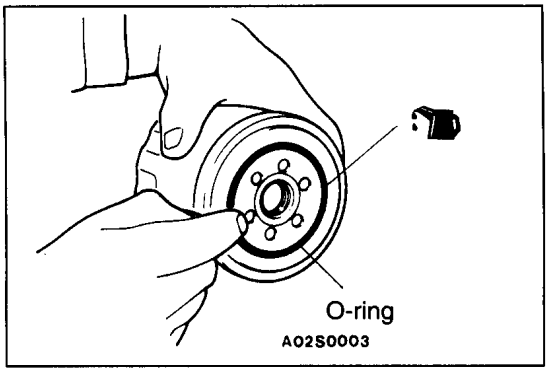
6. Install the engine oil filler cap.
7. Check oil level. (Refer to P.12-3.)

OIL FILTER REPLACEMENT

120002139

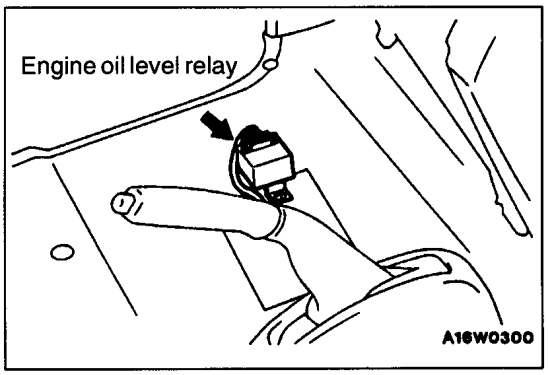
1. Warm up the engine, and then stop the engine to remove the oil filler cap.
2. Remove the under cover. (Refer to GROUP 42 – Under Cover.)
3. Remove the drain plug to drain the engine oil.
4. Remove the air cleaner, and cover the alternator with a rag so that oil will not get on the alternator <4D56 only>.
5. Use an oil filter wrench to remove the engine oil filter.

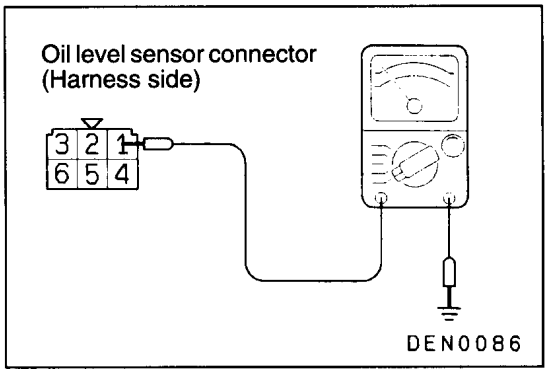


6. Clean the filter bracket side mounting surface.
7. Apply a small amount of engine oil to the O-ring of the new oil filter.
8. Screw in the oil filter by hand, and use a filter wrench after the O-ring starts to touch the flange.

Items	Specified torque	Remarks
4G63 4G64	1 turn [approx. 14 Nm]	MD135737
	3/4 turn [approx. 14 Nm]	MD136466
4D56	5/8 turn [approx. 20 Nm]	

9. Install the air cleaner. <4D56 only>
10. Fill with engine oil.
11. Race the engine 2–3 times, and check to be sure that no engine oil leaks from installation section of the oil filter.





OIL LEVEL WARNING SYSTEM INSPECTION

120002028

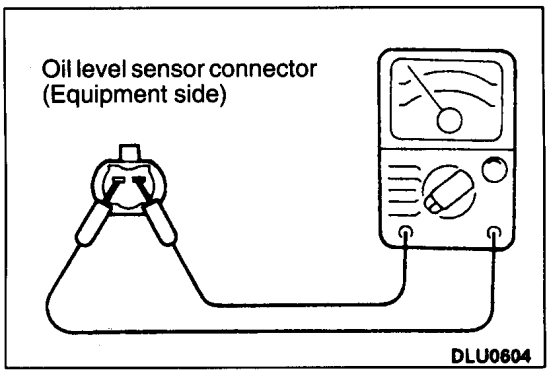
1. Check that the proper amount of oil has been filled.
2. When the ignition switch is turned to ON (do not start the engine), check that the oil level warning lamp illuminates.

   NOTE
   If the oil level warning lamp does not illuminate, the cause is probably a blown lamp, or a malfunction in the relay.
3. When the engine is started, check that the oil level warning lamp turns off.
   If the oil level warning lamp will not go out, disconnect the connector of the oil level relay and measure the voltage of the No. 1 terminal on the harness side of the connector while idling the engine in order to confirm that it is the same as the battery voltage.

   NOTE
   (1) If the voltage at the connector is the same as the battery voltage, the problem is probably a malfunction of either the oil level relay or the oil level sensor.

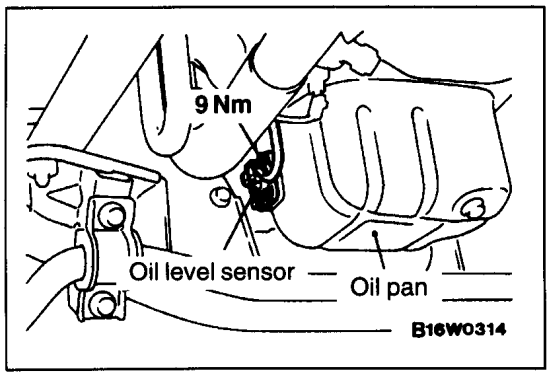
(2) If the voltage at the connector is lower than the battery voltage, the problem is probably a malfunction of either the alternator or the wiring harness.

4. Disconnect the oil level sensor connector. Check that the oil level warning lamp illuminates after approximately 20 seconds.
If the oil level warning lamp does not illuminate, replace the oil level relay.



5. Check the continuity between the oil level sensor terminals.

Engine oil temperature	Oil level	Continuity
At 40°C or lower	Normal (proper volume)	Continuity
	Low (drained)	Continuity
At 70°C or higher	Normal (proper volume)	Continuity
	Low (drained)	No continuity



6. If there is a defect, replace the oil level sensor.

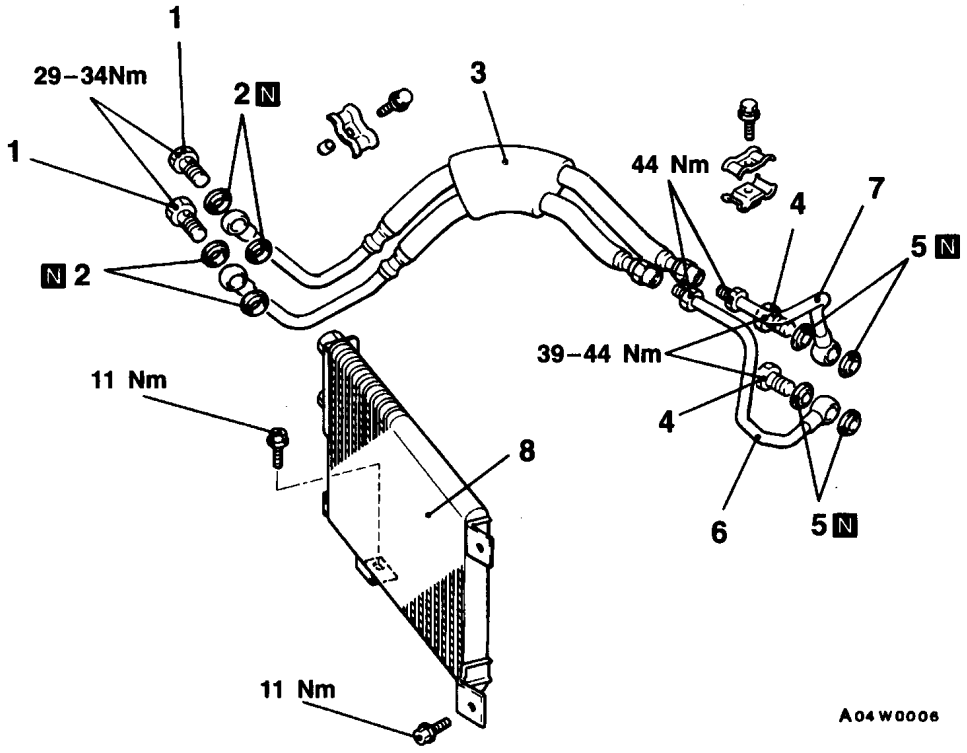
ENGINE OIL COOLER <4D56>

120000205

REMOVAL AND INSTALLATION

Pre-removal Operation
1. Front Bumper Removal
   (Refer to GROUP 51 – Front Bumper.)
2. Air Cleaner Removal
   (Refer to GROUP 15 – Air Cleaner.)

Post-installation Operation
1. Air Cleaner Installation
   (Refer to GROUP 15 – Air Cleaner.)
2. Front Bumper Installation
   (Refer to GROUP 51 – Front Bumper.)
3. Oil Checking and Supplying



Removal steps
1. Eye bolt
2. Gasket
3. Engine oil cooler hose assembly
4. Eye bolt
5. Gasket
6. Return tube assembly
7. Feed tube assembly
8. Oil cooler assembly

FUEL

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120002541

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AUTO-CRUISE CONTROL SYSTEM 13G

FUZZY TRACTION CONTROL SYSTEM 13H

NOTE
THE GROUPS MARKED BY ARE NOT IN THIS MANUAL.

NOTES

MULTIPOINT FUEL INJECTION (MPI)

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120002248

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GENERAL INFORMATION

120002542

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 2-cylinder group for every two rotations of the crankshaft. This is called group 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

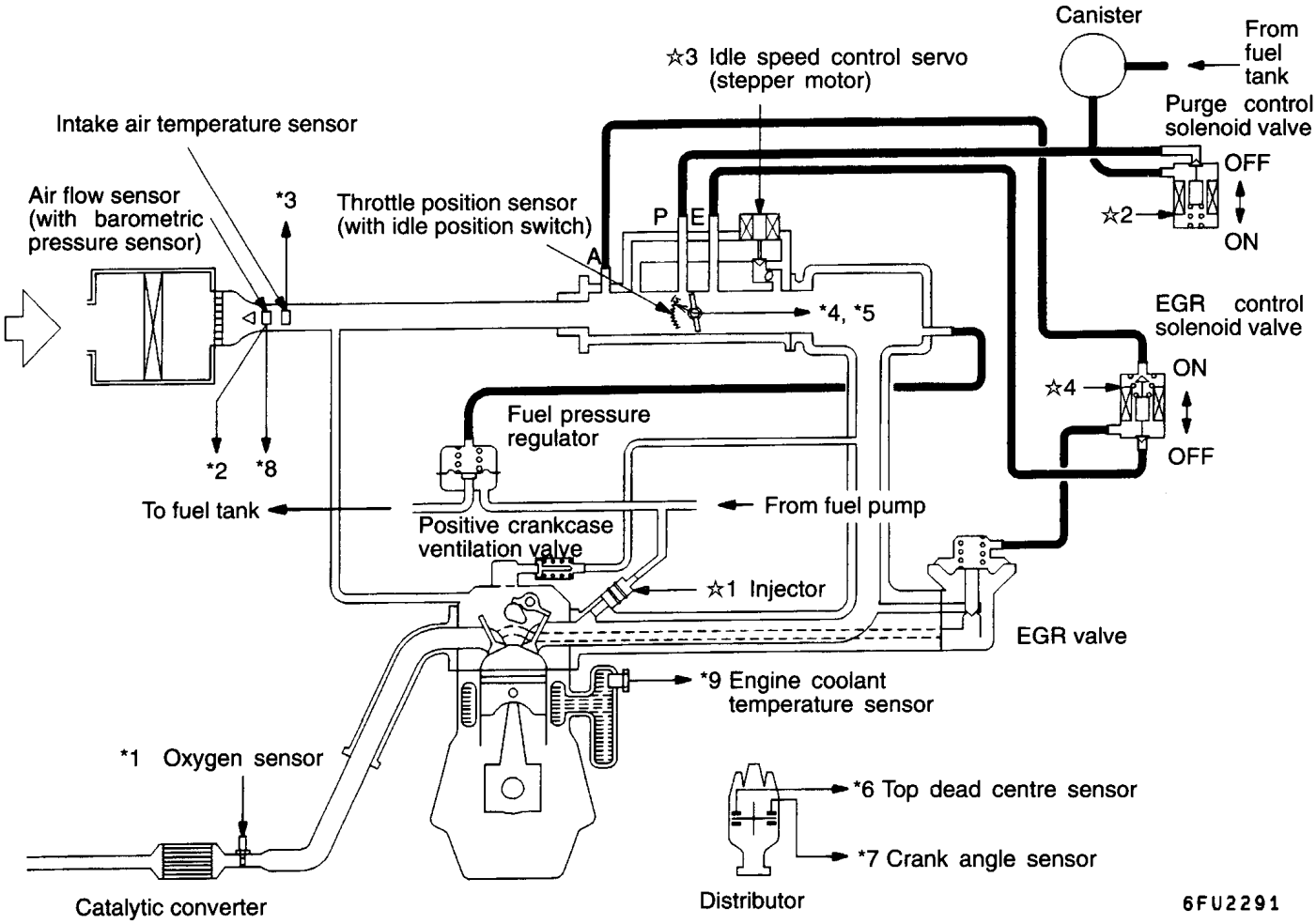
1. Fuel Pump Control
   Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Relay Control
   Turns the compressor clutch of the A/C ON and OFF.
3. Purge Control Solenoid Valve Control
   Refer to GROUP 17.
4. EGR Control Solenoid Valve Control
   Refer to GROUP 17.

Items		Specifications
Throttle body	Throttle bore mm	54
	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.	E2T63173 <4G63 – Wagon> E2T63176 <4G63 – Panel van and window van> E2T63172 <4G64>
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
	Top dead centre sensor	Hall element type
	Crank angle sensor	Hall element type
	Power steering fluid pressure switch	Contact switch type
Actuators	Control relay type	Contact switch type
	Injector type and number	Electromagnetic type, 4
	Injector identification mark	CDH275
	EGR control solenoid valve	Duty cycle type solenoid valve
	Purge control solenoid valve	ON/OFF type solenoid valve
Fuel pressure regulator	Regulator pressure kPa	328

MULTI POINT FUEL INJECTION SYSTEM DIAGRAM

120002543

*1.Oxygen sensor *2.Air flow sensor *3.Intake air temperature sensor *4.Throttle position sensor *5.Idle position switch *6.Top dead centre sensor *7.Crank angle sensor *8.Barometric pressure sensor *9.Engine coolant temperature switch	• Power supply • Vehicle speed sensor • A/C switch • Inhibitor switch • Power steering fluid pressure switch • Ignition switch–ST • Ignition switch–IG	⇨ 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



SERVICE SPECIFICATIONS

120002544

Items		Standard value
Basic idle speed r/min.		750±50
Idle speed when A/C is ON r/min.		900 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	At 20°C	2.3–3.0
	At 80°C	0.30–0.42
Engine coolant temperature sensor resistance kΩ	At 20°C	2.1–2.7
	At 80°C	0.26–0.36
Oxygen sensor output voltage V		0.6–1.0
Fuel pressure kPa	Vacuum hose disconnected	324–343 at curb idle
	Vacuum hose connected	Approx. 265 at curb idle
Injector coil resistance Ω		6.5–8.0 (at 20°C)

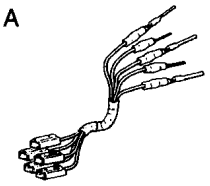
SEALANT

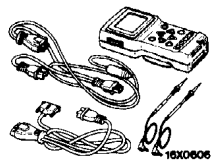
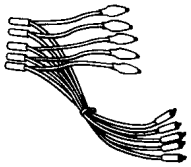
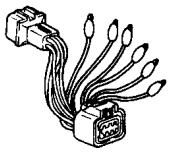
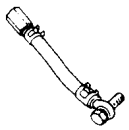
120000986

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

SPECIAL TOOLS

120002545

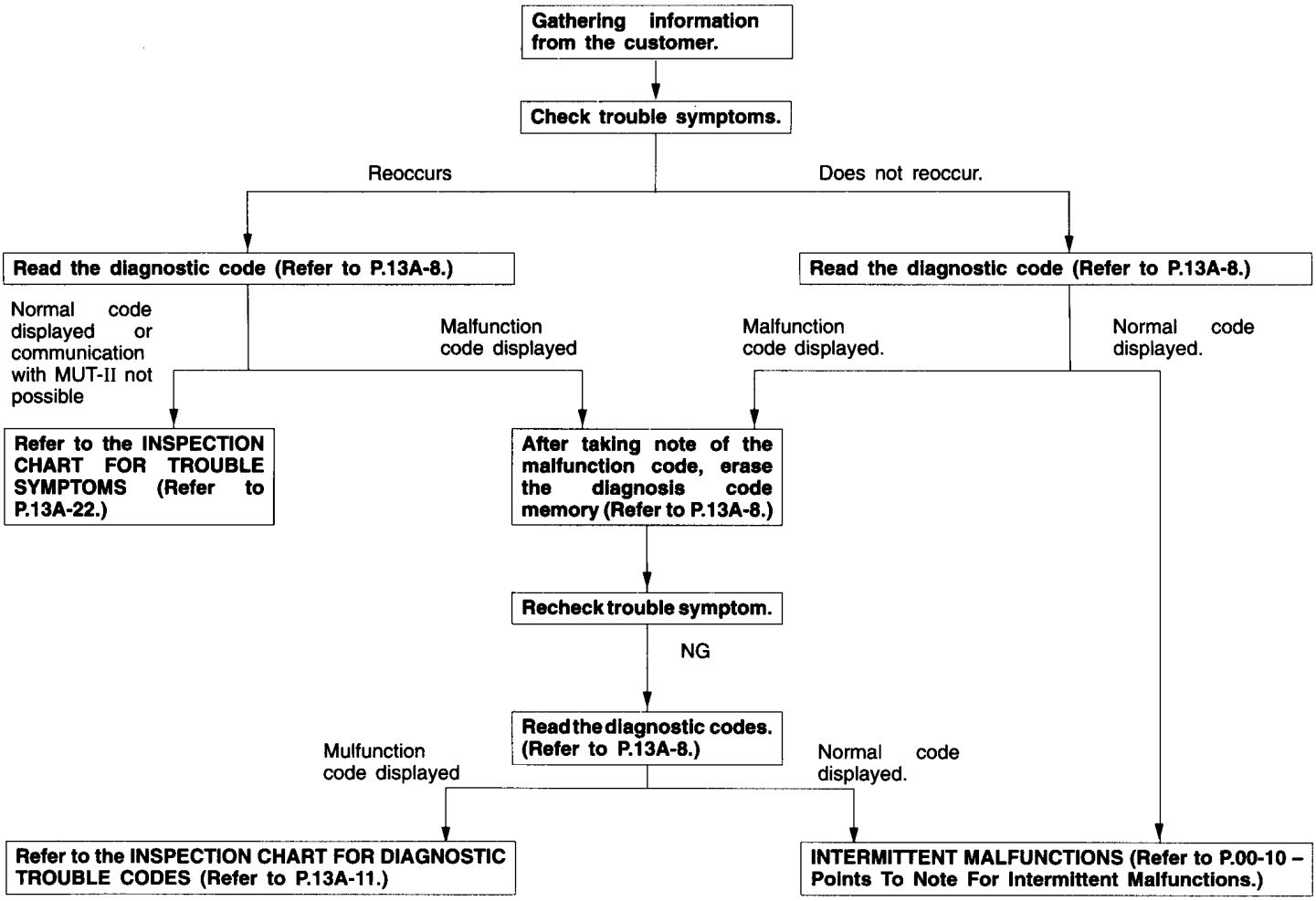
Tool	Number	Name	Use
A  B C D 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B,C: Power circuit inspection D: Commercial tester connection

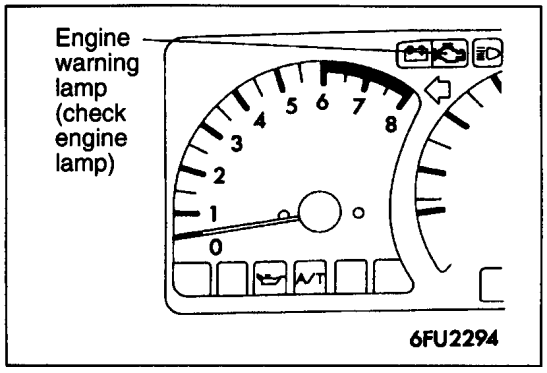
Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Reading diagnosis code • MPI system inspection
16X0607	–	ROM pack	
	MB991348	Test harness set	• Adjustment of idle position switch and throttle position sensor • Inspection using an analyzer
	MD998463	Test harness (6 pin, square)	• Inspection of idle speed control servo • Inspection using an analyzer
	MD998464	Test harness (4 pin, square)	Inspection of oxygen sensor
	MD998709	Adaptor hose	Measurement of fuel pressure

TROUBLESHOOTING

120002546

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING





DIAGNOSIS FUNCTION

120002547

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

If an abnormality occurs in any of the following items related to the Multi Point 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.

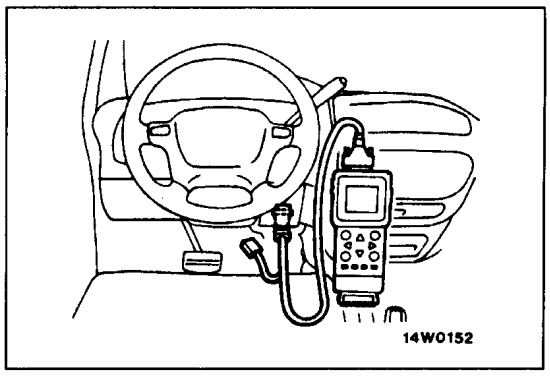
Engine warning lamp inspection items

Engine ECU
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Top dead centre sensor
Barometric pressure sensor
Ignition timing adjustment signal
Injector

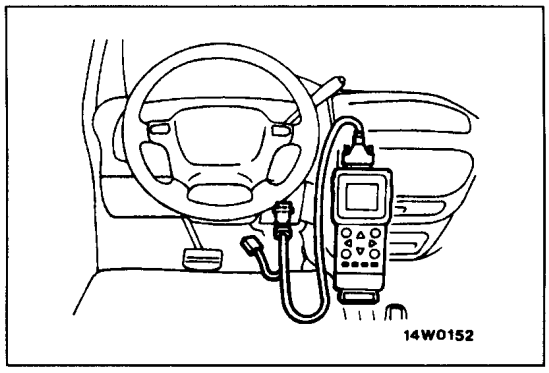
Caution
Engine warning lamp will come on even when terminal for ignition timing adjustment is short-circuited. Therefore, it is not abnormal that the lamp comes on even when terminal for ignition timing adjustment is short-circuited at the time of ignition timing adjustment.

METHOD OF READING AND ERASING DIAGNOSIS CODES

Caution
1. **If battery voltage is low, diagnosis codes will not be output. Accordingly, be sure to check the battery before carrying out inspection.**
2. **If the battery is disconnected or if the ENGINE ECU connector is disconnected, the diagnosis code memory will be erased.**
   Accordingly, the battery should not be disconnected until reading of the diagnosis codes has been completed.
3. **Connection and disconnection of the MUT-II should always be carried out with the ignition switch in the OFF position.**



1. Connect the MUT-II to the diagnosis connector (16-pin), and take a reading of the diagnosis codes.
2. Repair the malfunction location while referring to the INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
3. Turn the ignition switch to OFF and then back to ON again.
4. Erase the diagnosis codes using the MUT-II.
5. Check to be sure that the diagnosis code is normal.



INSPECTION USING MUT-II SERVICE DATA AND ACTUATOR TESTING

1. Carry out inspection by means of the data list and the actuator test function.
   If there is an abnormality, check and repair the chassis harnesses and components.
2. After repairing, re-check using the MUT-II and check to be sure 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/BACKUP FUNCTION TABLE

120002548

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

Malfunctioning item	Control contents during malfunction
Air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take readings of the basic injector drive timing and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle speed control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Top dead centre sensor	Injects fuel to all cylinders simultaneously.(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.
Oxygen sensor	Air/fuel ratio feedback control (closed loop control) is not performed.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

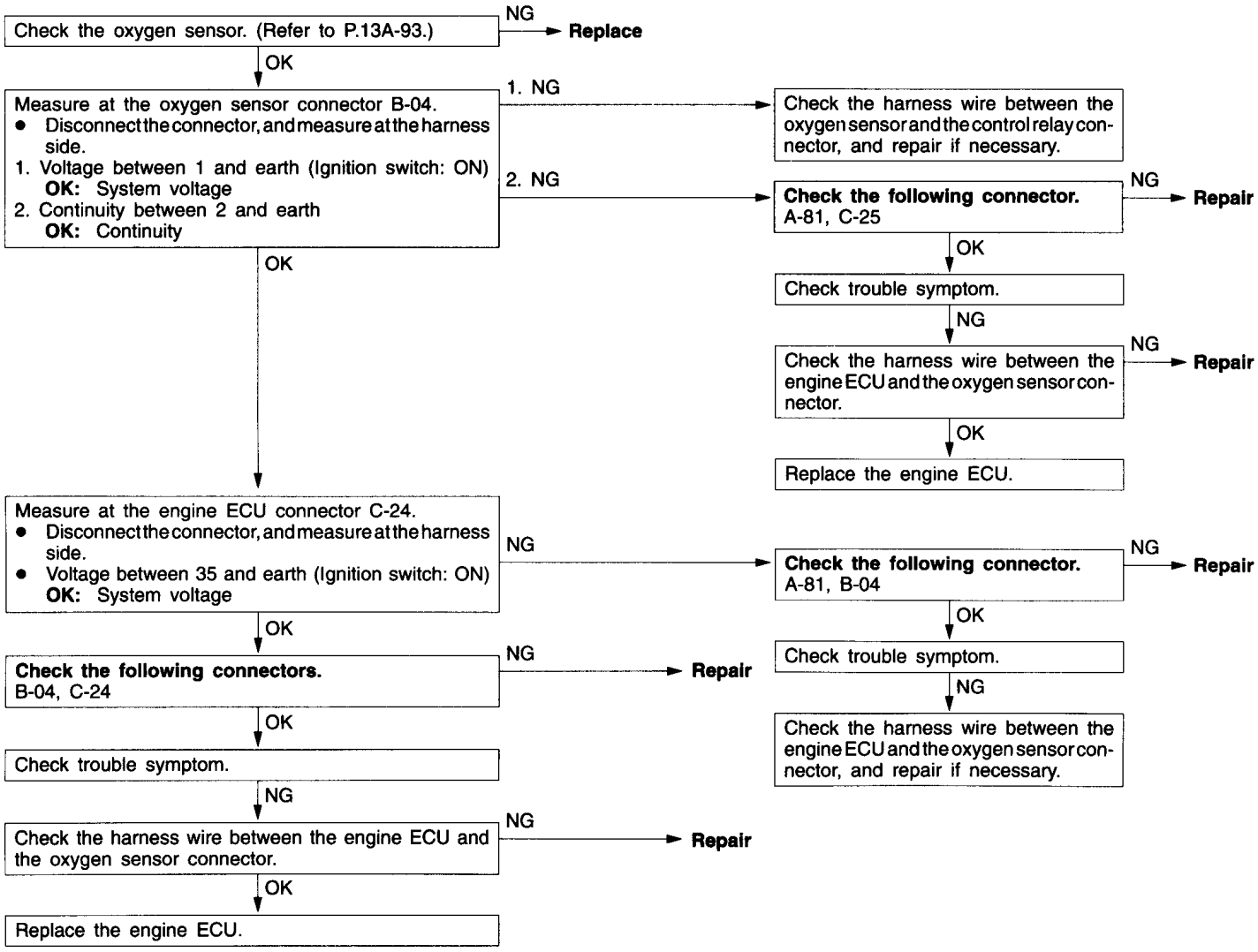
120002549

Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	13A-12
12	Air flow sensor system	13A-13
13	Intake air temperature sensor system	13A-14
14	Throttle position sensor system	13A-15
21	Engine coolant temperature sensor system	13A-16
22	Crank angle sensor system	13A-17
23	Top dead centre sensor system	13A-18
24	Vehicle speed sensor system	13A-19
25	Barometic pressure sensor system	13A-20
36*	Ignition timing adjustment signal system	13A-21
41	Injector system	13A-21

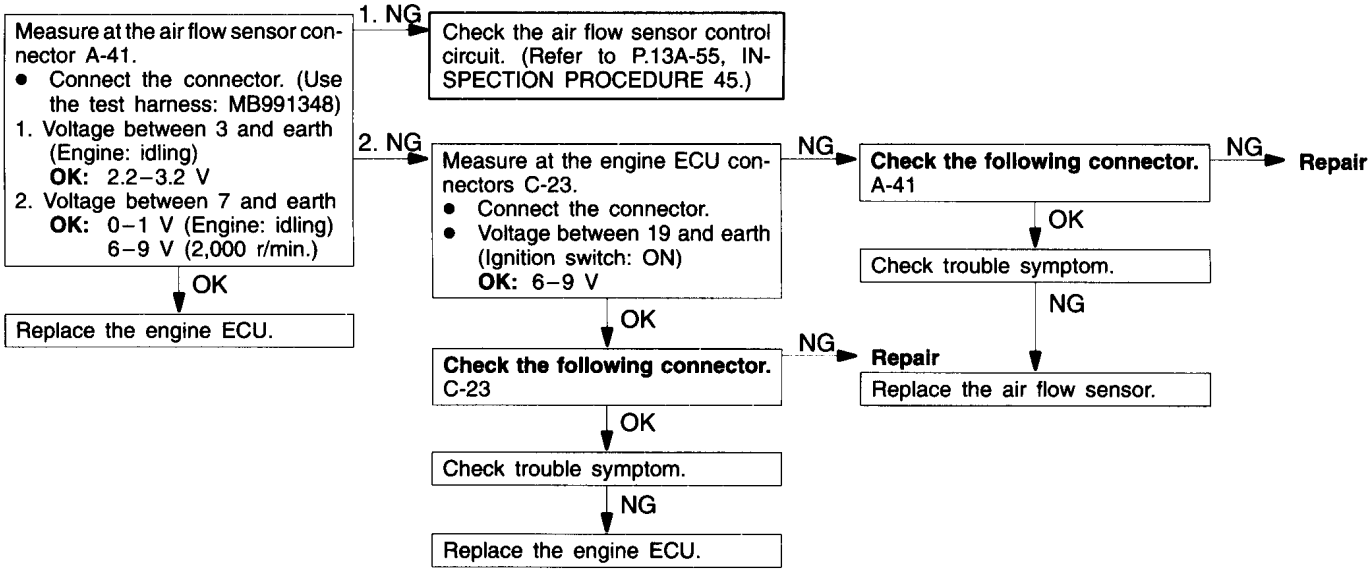
NOTE
*: Malfunction code No. 36 is not memorized.

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

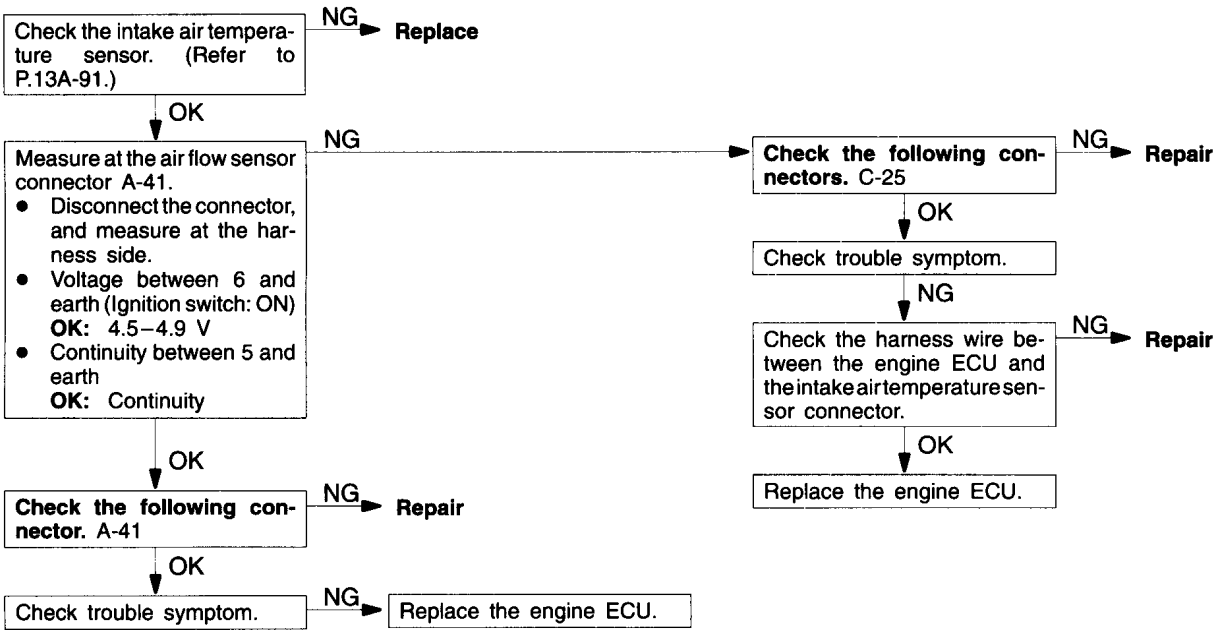
Code No. 11 Oxygen sensor system	Probable cause
[Comment] Range of Check • 3 minutes have passed after engine was started. • Engine coolant temperature is approx. 80°C or more. • Intake air temperature is 20–50 °C. • Engine speed is approx. 2,000–3,000 r/min. • Vehicle is moving at constant speed on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



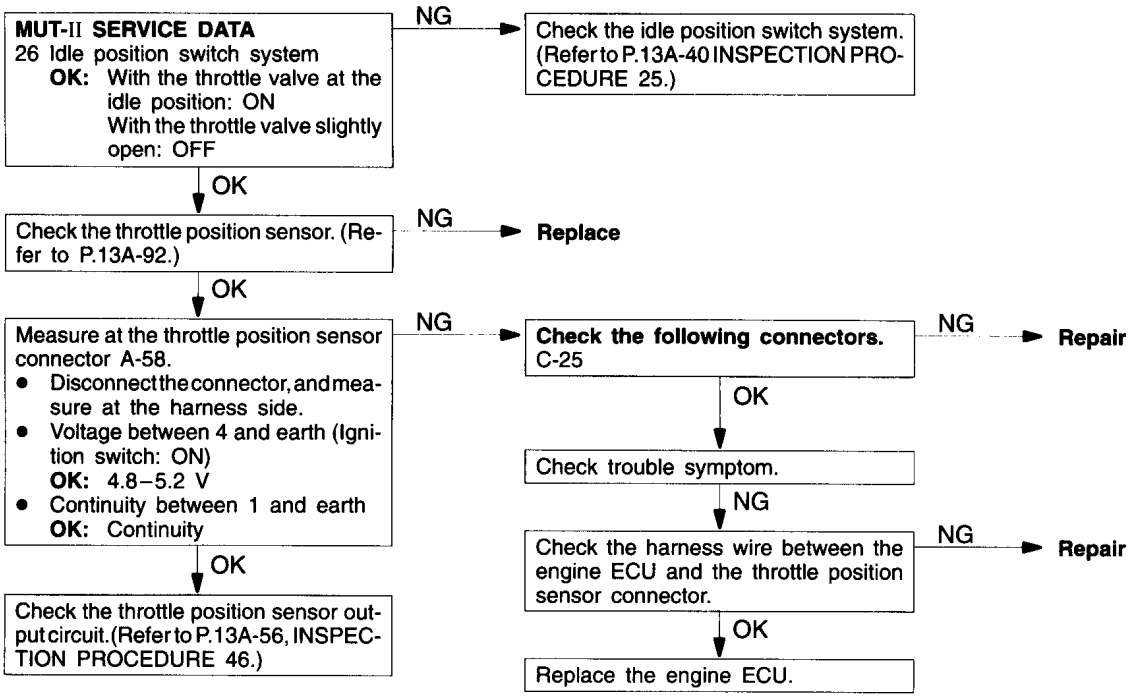
Code No. 12 Air flow sensor system	Probable cause
[Comment] Range of Check • Engine speed is 500 r/min or more. Set conditions • Sensor output frequency is 3 Hz or less for 4 seconds.	• Malfunction of the air flow sensor • Improper connector contact, open circuit or short-circuited harness wire of the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



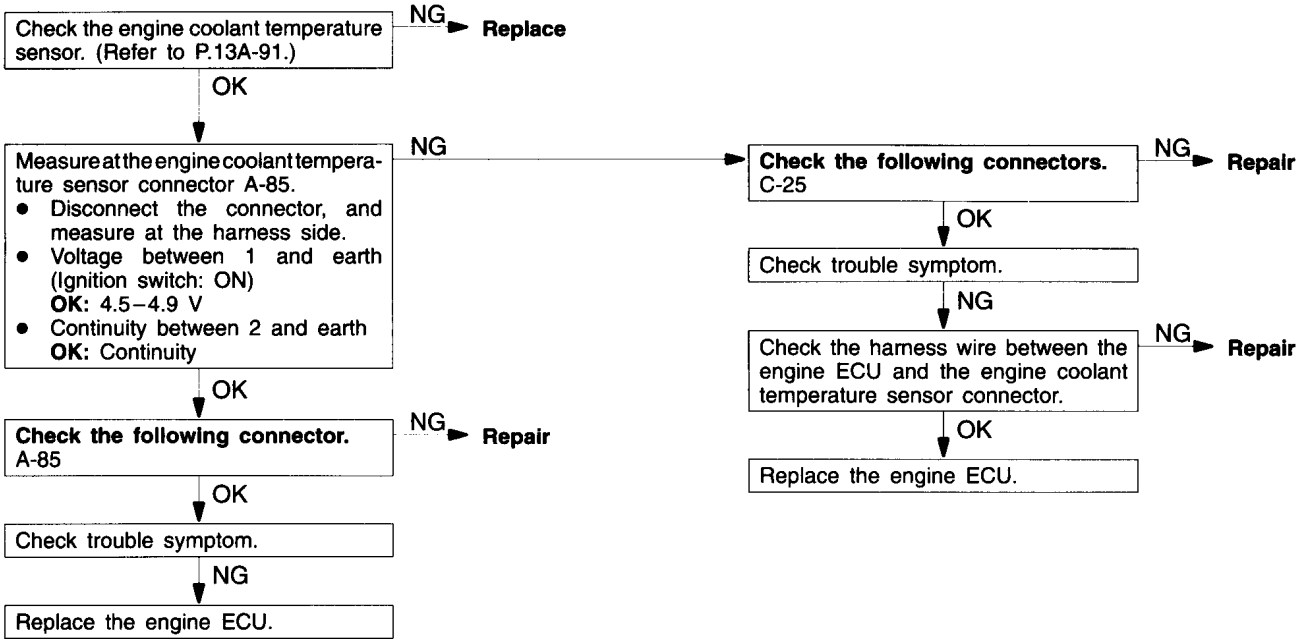
Code No. 13 Intake air temperature sensor system	Probable cause
[Comment] Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature of –45°C or less) for 4 seconds. or • Sensor output voltage is 0.2 V 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



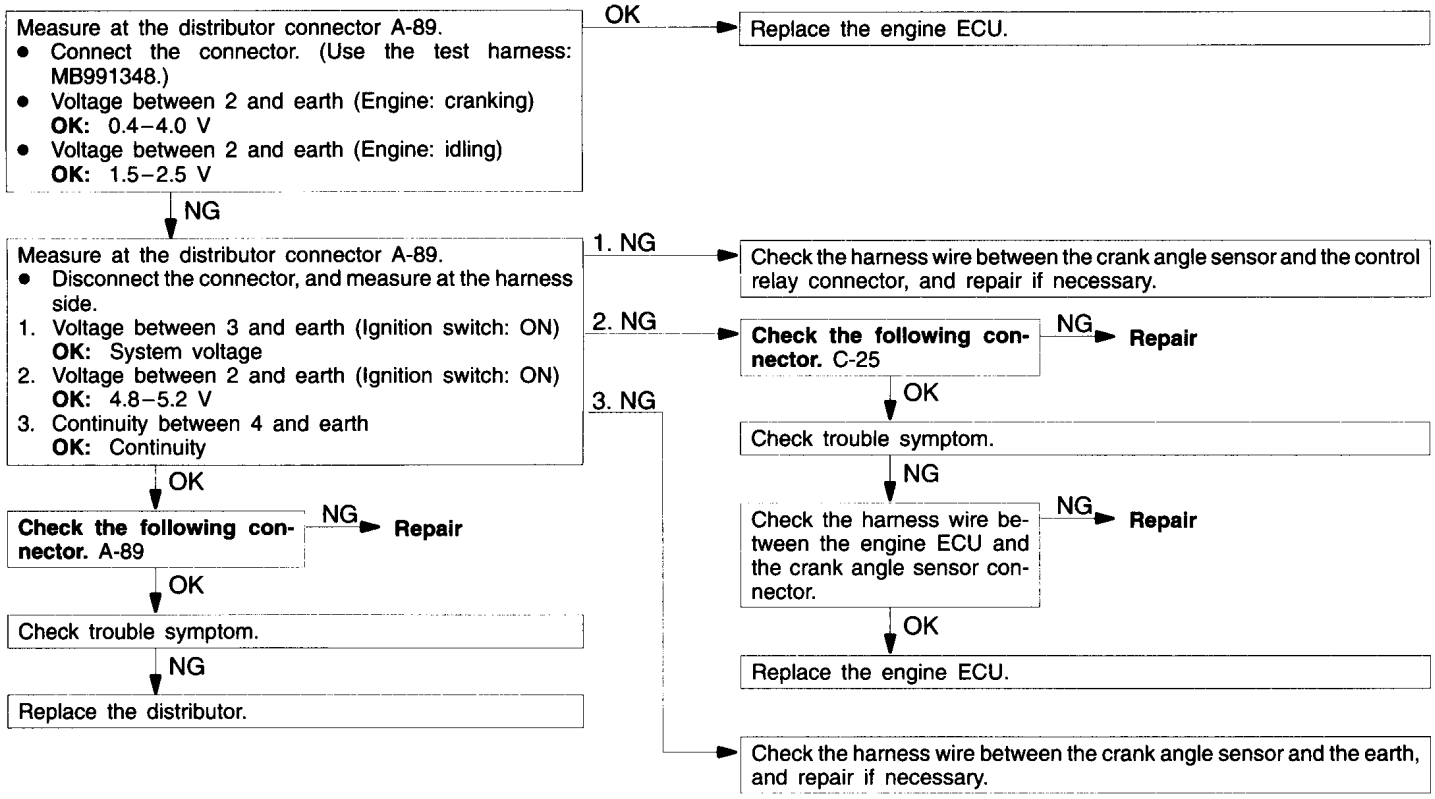
Code No. 14 Throttle position sensor system	Probable cause
[Comment] Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • When the idle position switch is ON, the sensor output voltage is 2 V or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



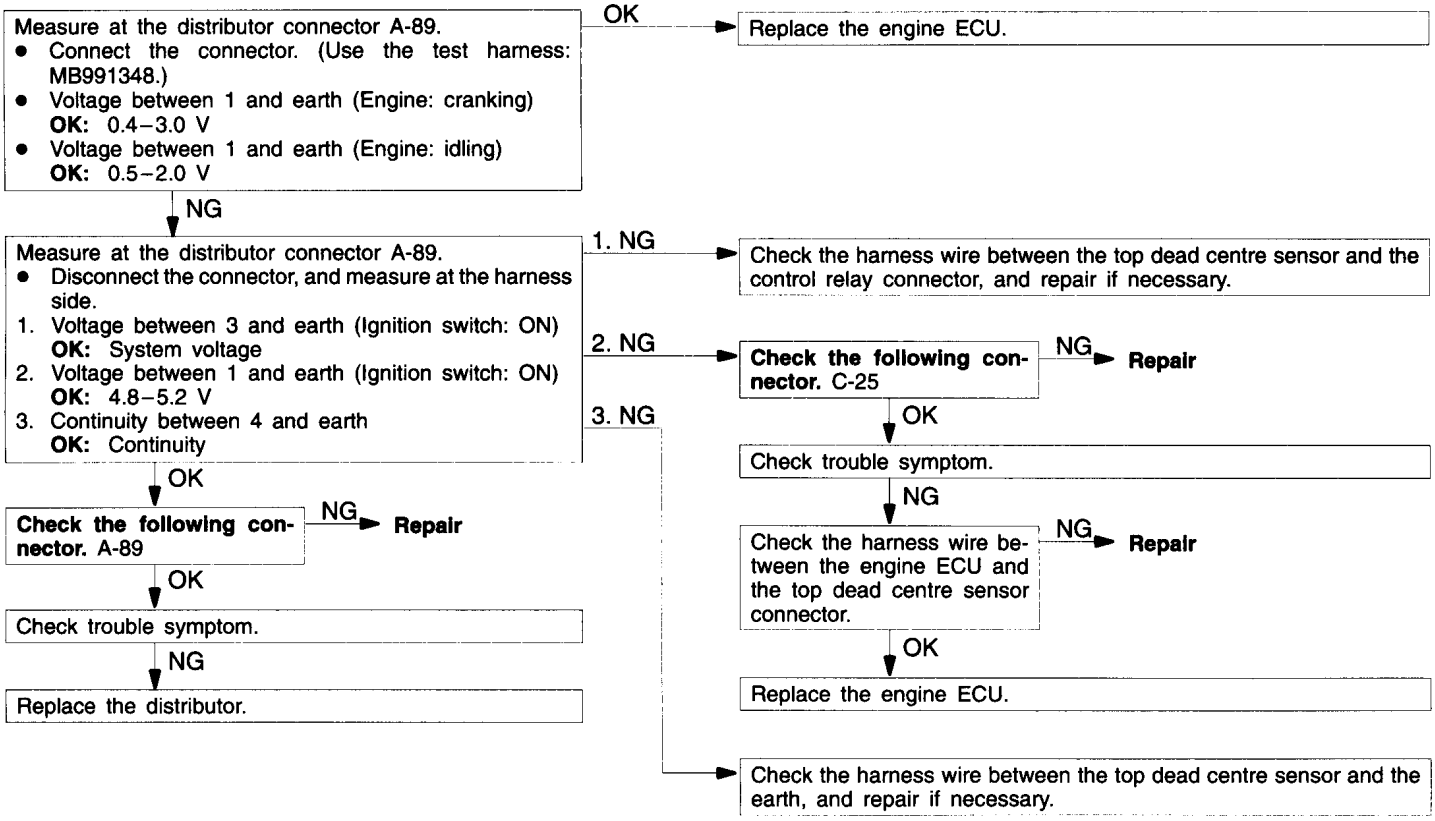
Code No. 21 Engine coolant temperature sensor system	Probable cause
[Comment] Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. Set conditions • Sensor output voltage is 4.6 V or more (corresponding to an engine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



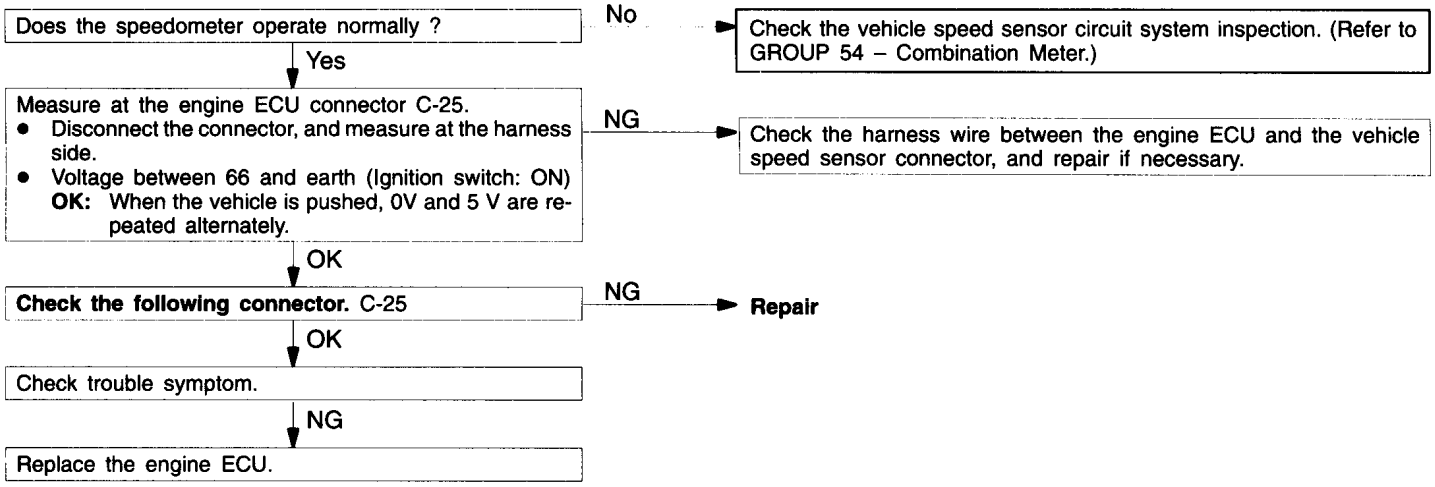
Code No. 22 Crank angle sensor system	Probable cause
[Comment] Range of Check • Engine is cranking. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input.)	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness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



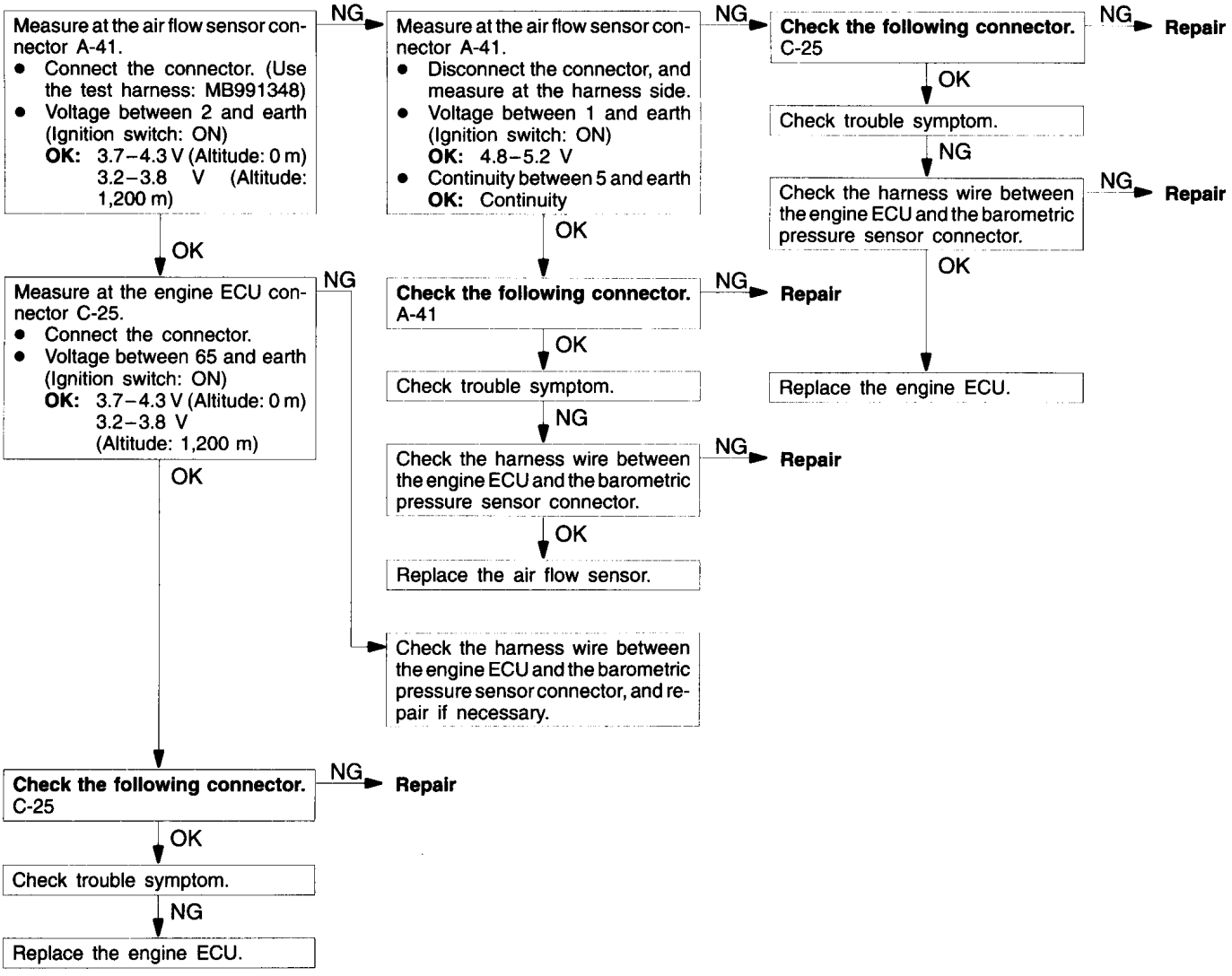
Code No. 23 Top dead centre sensor system	Probable cause
[Comment] Range of Check • Ignition switch: ON • Engine speed is approx. 50 r/min or more. Set conditions • Sensor output voltage does not change for 4 seconds (no pulse signal input).	• Malfunction of the top dead centre sensor • Improper connector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



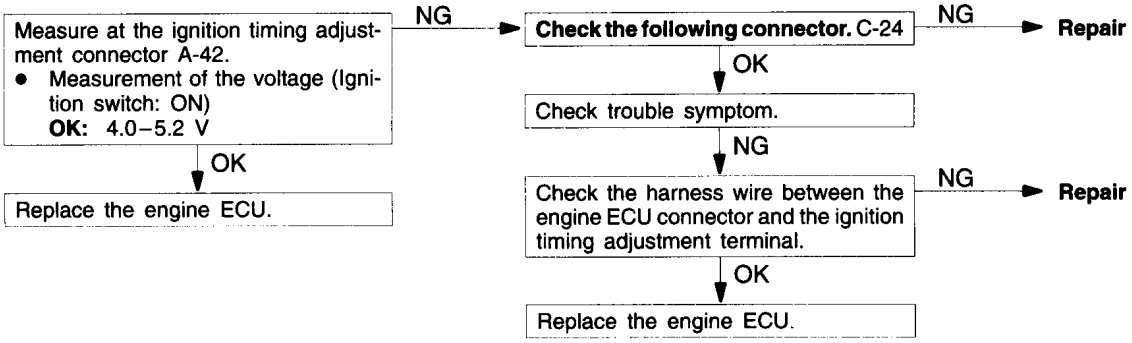
Code No. 24 Vehicles speed sensor system	Probable cause
[Comment] Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Idle position switch: OFF • Engine speed is 3000 r/min or more. • Driving under high engine 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



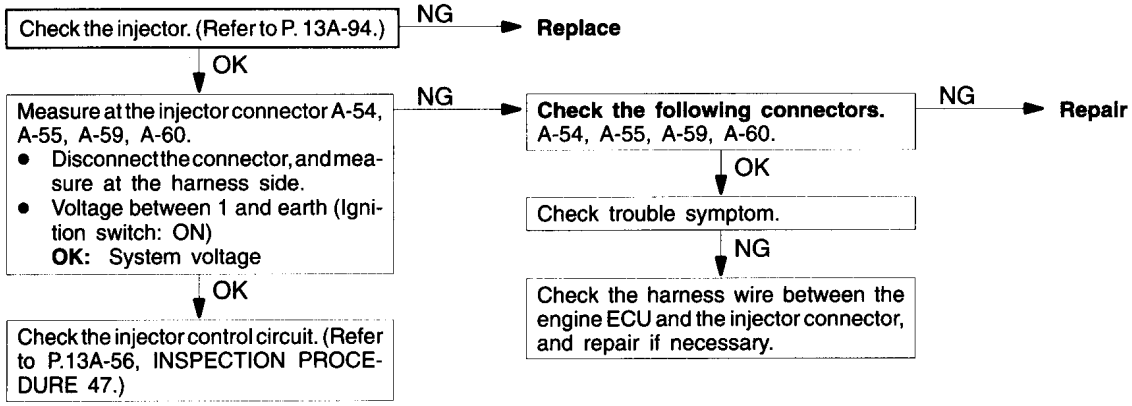
Code No. 25 Barometric pressure sensor system	Probable cause
[Comment] Range of Check • Ignition switch: ON • Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. • Battery voltage is 8 V or more. Set conditions • Sensor output voltage is 4.5 V or more (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. 36 Ignition timing adjustment signal system	Probable cause
[Comment] 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
[Comment] 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



INSPECTION CHART FOR TROUBLE SYMPTOMS

120002550

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-24
	Communication with engine ECU only is not possible.	2	13A-24
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-25
	The engine warning lamp remains illuminating and never goes out.	4	13A-26
Starting	No initial combustion (starting impossible)	5	13A-26
	Initial combustion but no complete combustion (starting impossible)	6	13A-27
	Long time to start (improper starting)	7	13A-28
Idling stability (Improper idling)	Unstable idling(Rough idling, hunting)	8	13A-29
	Idling speed is high. (Improper idling speed)	9	13A-30
	Idling speed is low. (Improper idling speed)	10	13A-31
Idling stability (Engine stalls)	When the engine is cold, it stalls at idling. (Die out)	11	13A-32
	When the engine becomes hot, it stalls at idling. (Die out)	12	13A-33
	The engine stalls when starting the car. (Pass out)	13	13A-34
	The engine stalls when decelerating.	14	13A-34
Driving	Hesitation, sag or stumble	15	13A-35
	The feeling of impact or vibration when accelerating	16	13A-35
	The feeling of impact or vibration when decelerating	17	13A-36
	Poor acceleration	18	13A-36
	Surge	19	13A-37
	Knocking	20	13A-37
Dieseling		21	13A-37
Too high CO and HC concentration when idling		22	13A-38

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

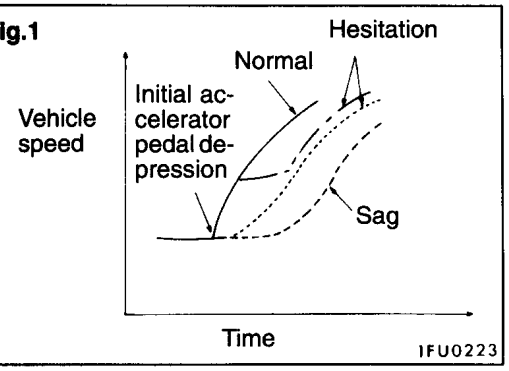
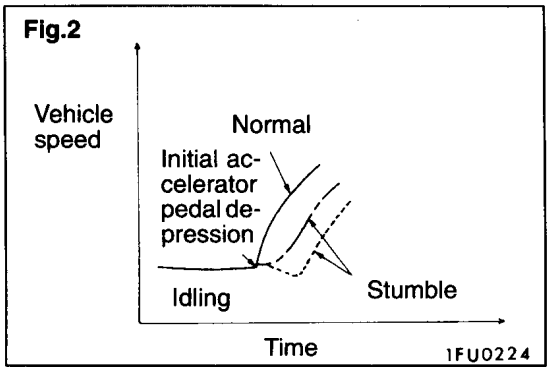


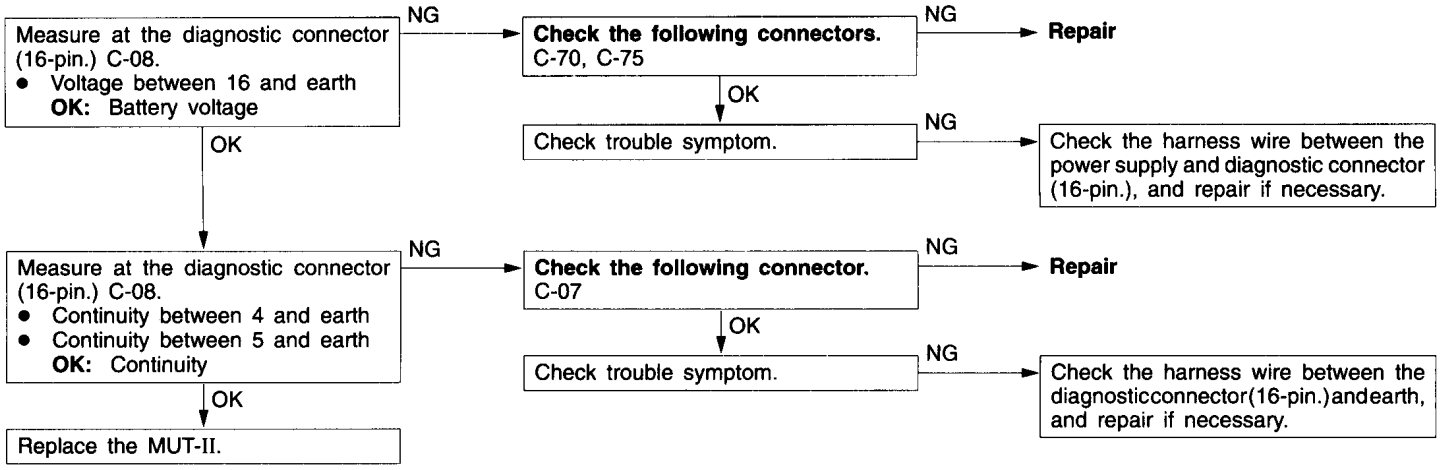
Fig.2



INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

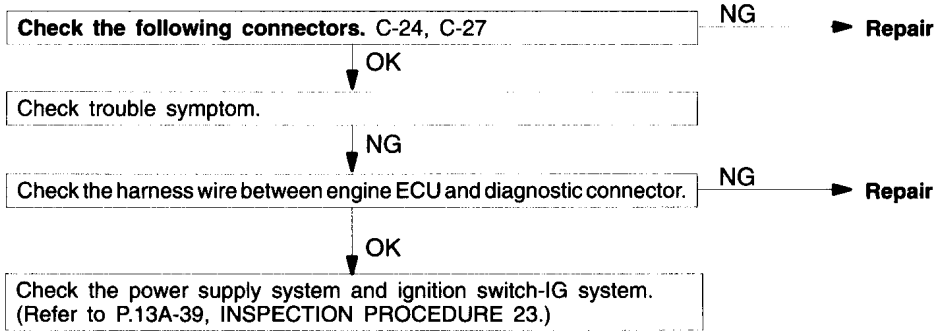
INSPECTION PROCEDURE 1

Communication with MUT-II is not possible. (Communication with all systems is not possible.)	**Probable cause**
[Comment] 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



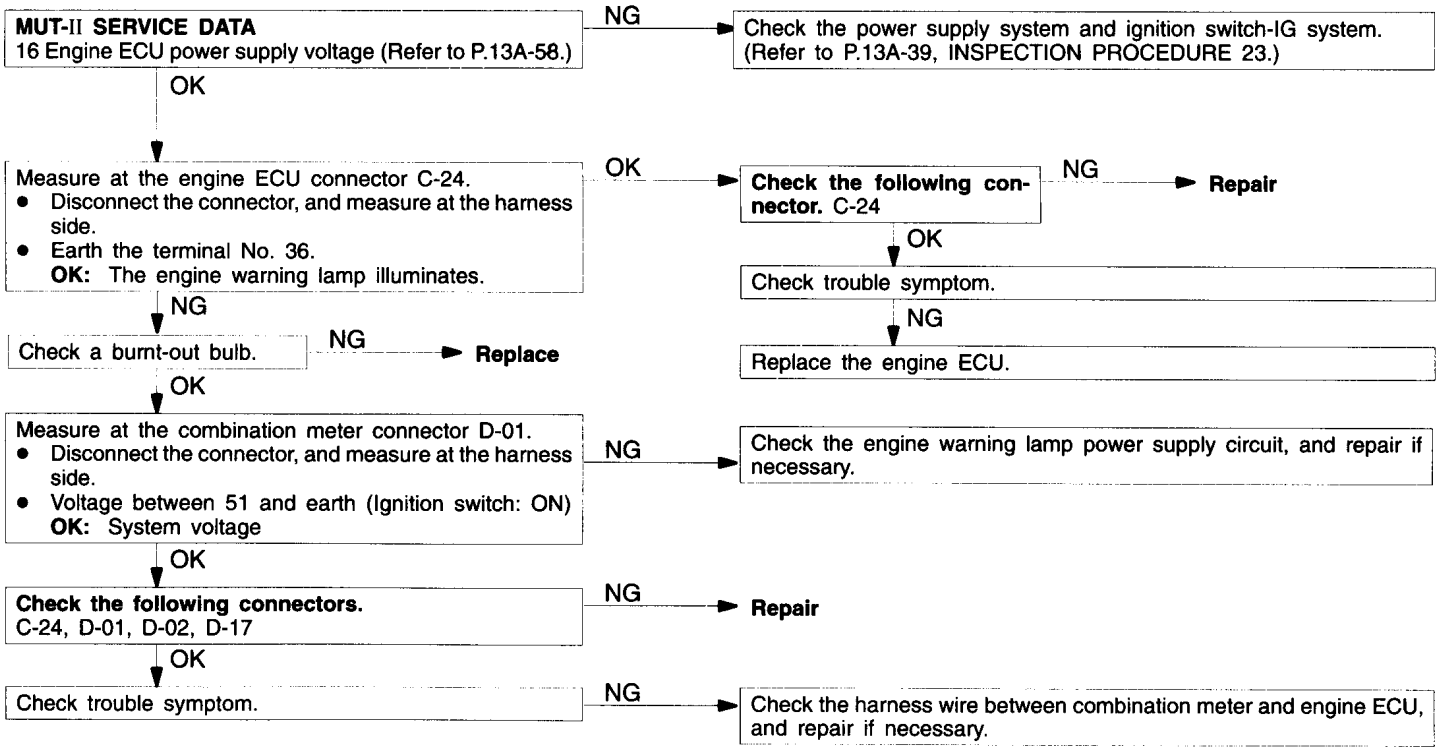
INSPECTION PROCEDURE 2

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



INSPECTION PROCEDURE 3

The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	Probable cause
[Comment] The engine ECU causes the engine warning lamp to illuminate for five seconds immediately after the ignition switch is turned to ON for detection of a burnt-out bulb. 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
[Comment] 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

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output?
- Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES
- No ↓

Measure at the combination meter connector D-02.
- Disconnect the connector, and measure at the harness side.
- Disconnect the engine ECU connector.
- Continuity between 31 and earth
  OK: No continuity

NG → Check the harness wire between combination meter and engine ECU connector, and repair if necessary.

OK ↓

Replace the engine ECU.

INSPECTION PROCEDURE 5

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

Check battery voltage when cranking.
OK: 8 V or higher

NG → Check the battery. (Refer to GROUP 54-Battery.)

OK ↓

MUT-II: Inspection of no initial combustion. (Refer to P.13A-48, INSPECTION PROCEDURE 34.)

OK ↓

Can any sound be heard from the injectors when cranking?

NG → Check the injector system.(Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES 41.)

OK ↓

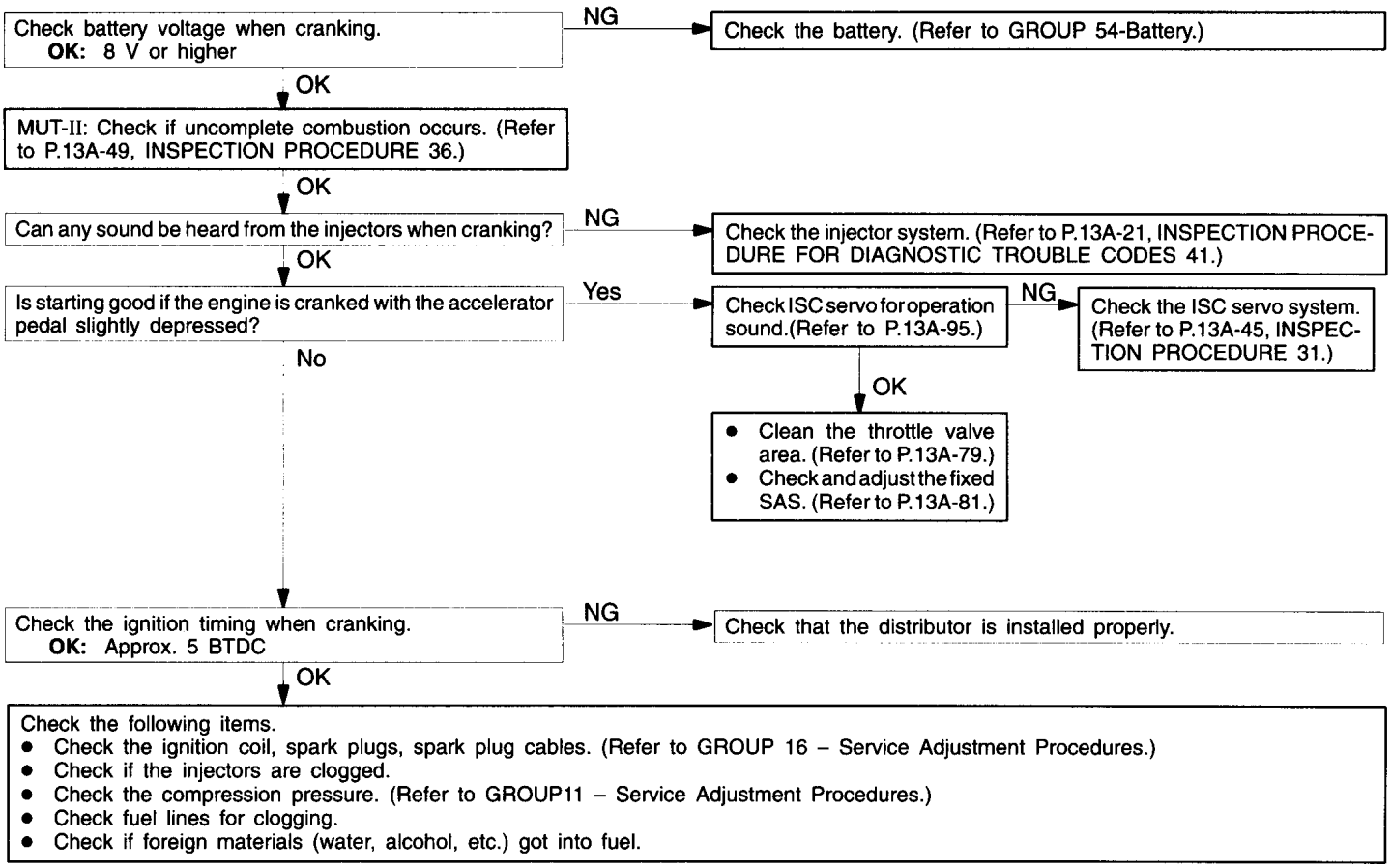
Ignition system: Inspection of no initial combustion. (Refer to P.13A-48, INSPECTION PROCEDURE 35.)

OK ↓

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

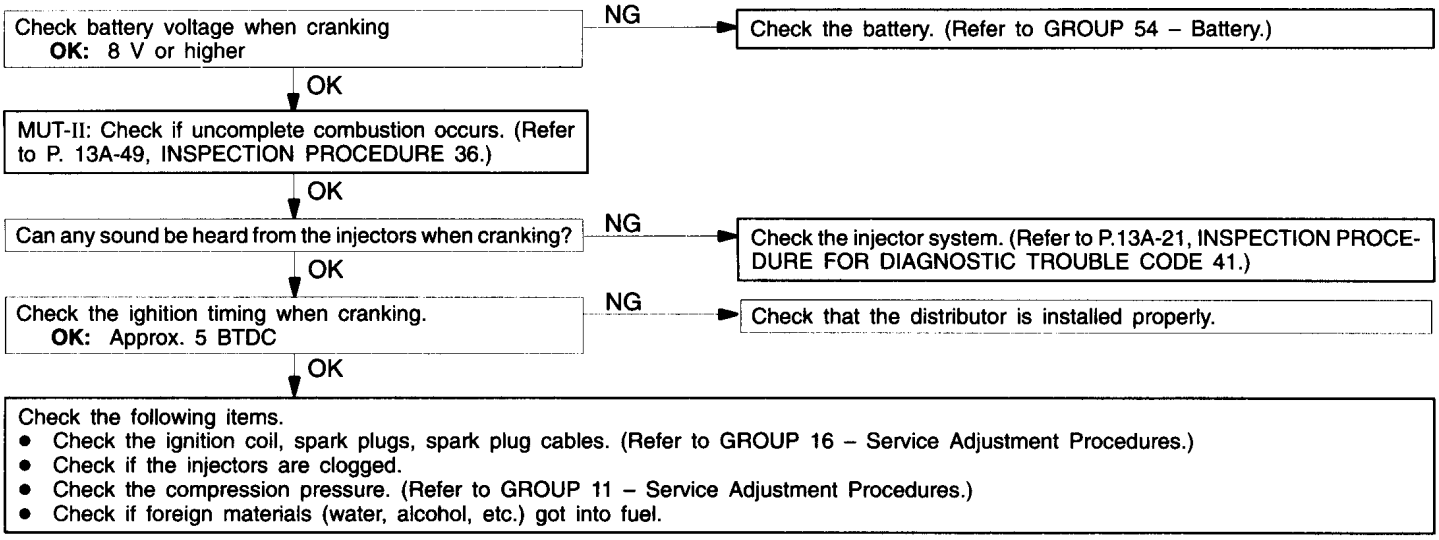
INSPECTION PROCEDURE 6

Initial combustion but no complete combustion (starting impossible)	Probable cause
[Comment] 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



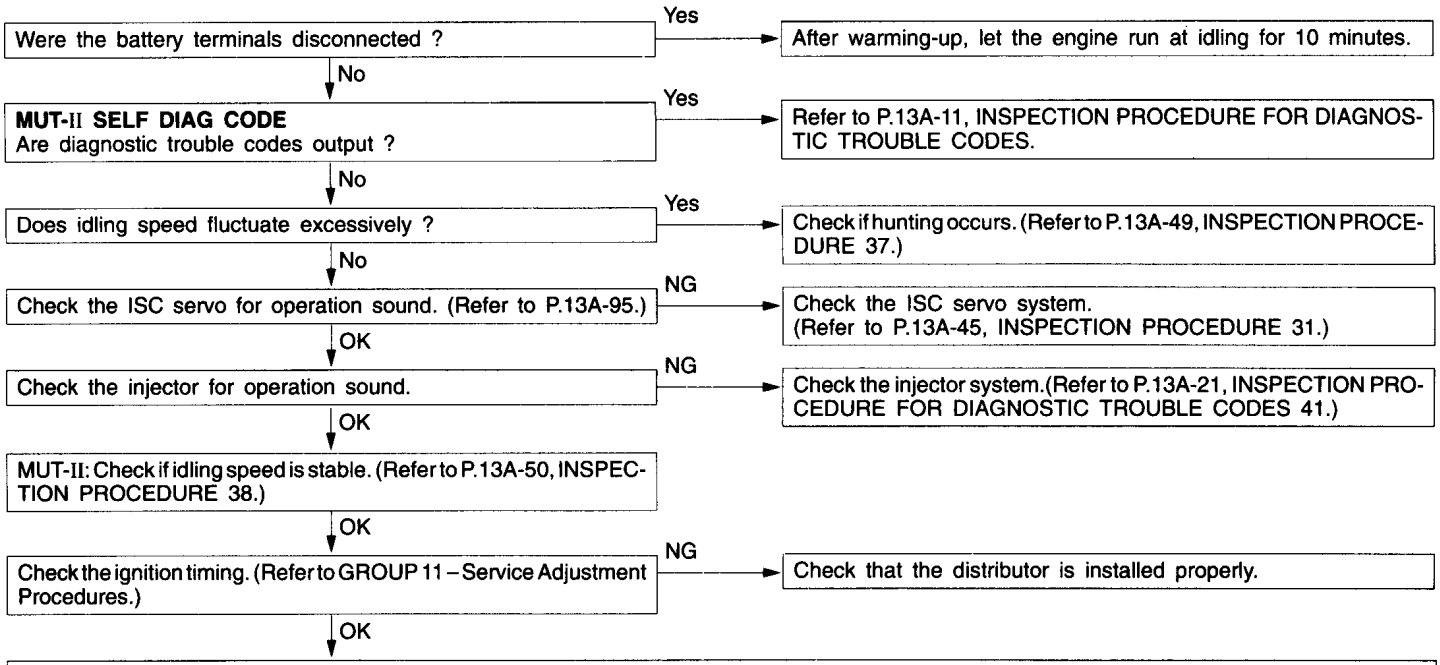
INSPECTION PROCEDURE 7

It takes too long time to start. (Incorrect starting)	Probable cause
[Comment] 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



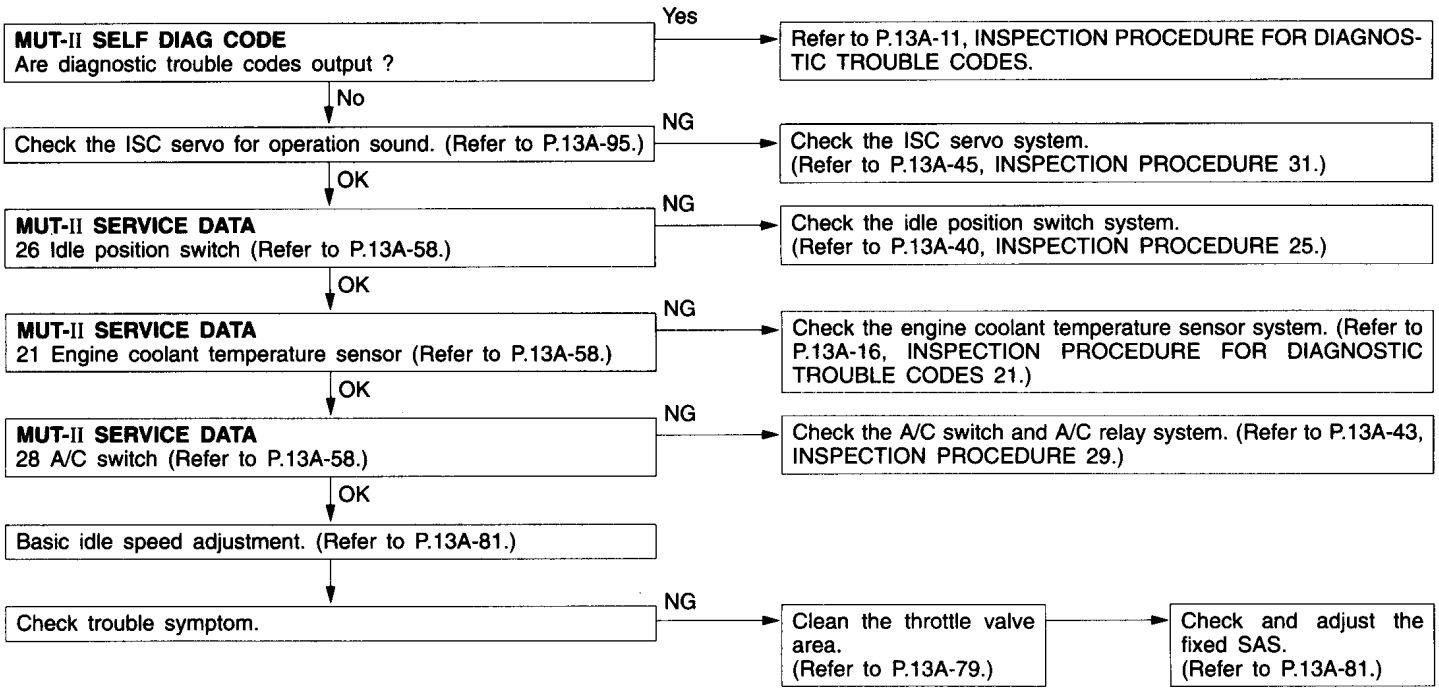
INSPECTION PROCEDURE 8

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



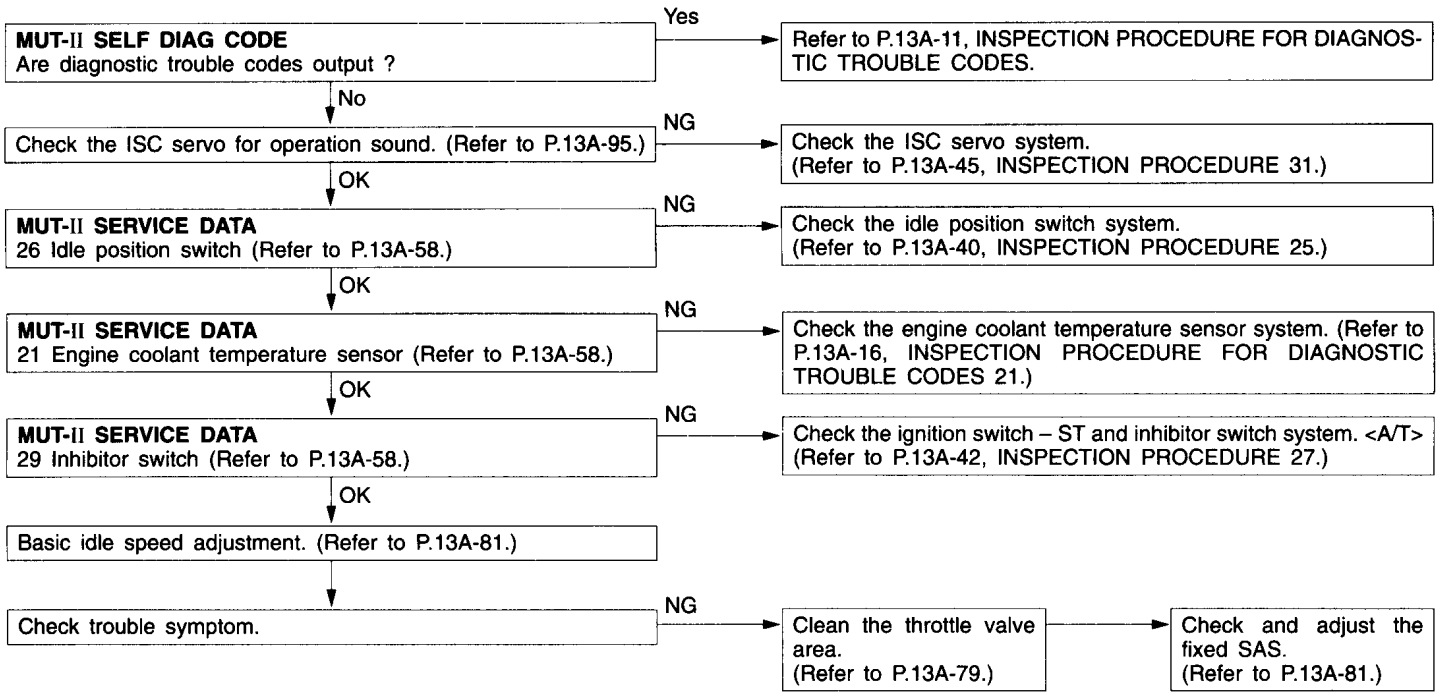
INSPECTION PROCEDURE 9

Idling speed is high. (Improper idling speed)	Probable cause
[Comment] 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
[Comment] 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
[Comment] 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

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 diagnostic trouble codes output?
- Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
- No ↓

Does the engine stall right after the accelerator pedal is released ?
- Yes → Clean the throttle valve area. (Refer to P.13A-79.) → Check and adjust the fixed SAS. (Refer to P.13A-81.)
- No ↓

Is engine-idling stable after the warming-up ?
- No → Check the unstable idling (Rough idling, hunting). (Refer to P.13A-29, INSPECTION PROCEDURE 8.)
- Yes ↓

Check the ISC servo for operation sound. (Refer to P.13A-95.)
- NG → Check the ISC servo system. (Refer to P.13A-45, INSPECTION PROCEDURE 31.)
- OK ↓

Check the injector for operation sound.
- NG → Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 41.)
- OK ↓

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-58.)
- NG → Check the idle position switch system. (Refer to P.13A-40, INSPECTION PROCEDURE 25.)
- OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-58.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 21.)
- OK ↓

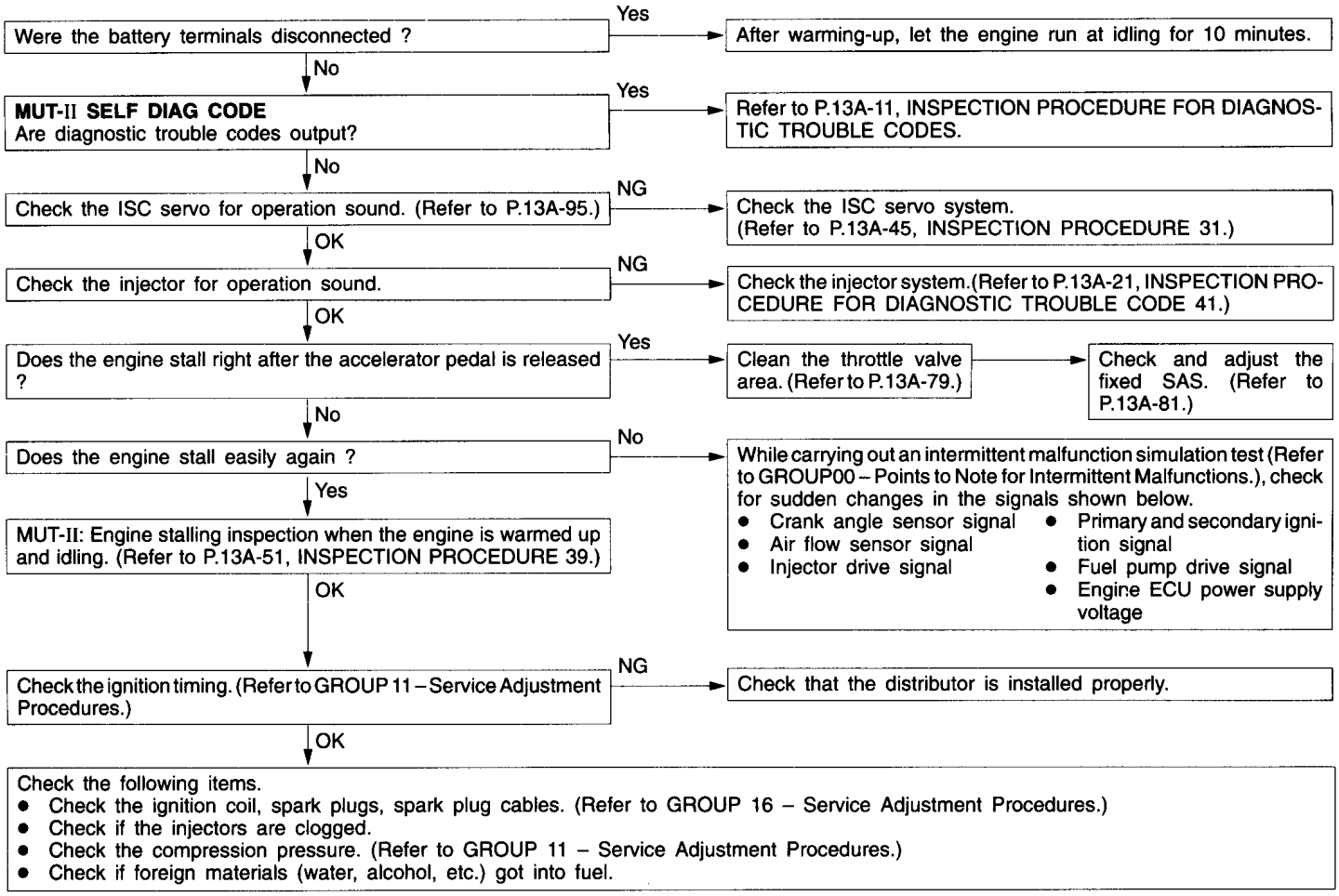
Check the fuel pressure. (Refer to P.13A-83.)
- OK ↓

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

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – Service Adjustment Procedures.)
- Check the compression pressure. (Refer to GROUP 11 – Service Adjustment Procedures.)
- Check the engine oil viscosity.

INSPECTION PROCEDURE 12

When the engine is hot, it stalls at idling. (Die out)	Probable cause
[Comment] In cases such 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
[Comment] 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 diagnostic trouble codes output ?
Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
↓ No

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – Service Adjustment Procedures.)
- 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
[Comment] 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 diagnostic trouble codes output?
Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
↓ No

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-58.)
NG → Check the idle position switch system. (Refer to P.13A-40, INSPECTION PROCEDURE 25.)
↓ OK

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-58.)
NG → Check the throttle position sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 14.
↓ OK

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

Yes → Check the vehicle speed sensor system. (Refer to P.13A-19, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 24.)
↓ No

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – Service Adjustment Procedures.)
- Clean the throttle valve area. (Refer to P.13A-79.)
- Check and adjust the fixed SAS. (Refer to P.13A-81.)

INSPECTION PROCEDURE 15

Hesitation, sag or stumble	Probable cause
[Comment] 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 diagnostic trouble codes output ?
Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 41.)
OK ↓

Check the ignition timing. (Refer to GROUP 11 – Service Adjustment Procedures.)
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 40.)
OK ↓

Check the fuel pressure. (Refer to P.13A-83.)
OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – Service Adjustment Procedures.)
- Check the EGR system. (Refer to GROUP 17 – EGR System.)
- Check the compression pressure.(Refer to GROUP 11 – Service Adjustment Procedures.)
- Check the fuel filter or fuel line for clogging.

INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating	Probable cause
[Comment] 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 diagnostic trouble codes output ?
Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
No ↓

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

INSPECTION PROCEDURE 17

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

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output ?
→ Yes: Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
↓ No

Check the ISC servo for operation sound. (Refer to P.13A-95.)
→ NG: Check the ISC servo system. (Refer to P.13A-45, INSPECTION PROCEDURE 31.)
↓ OK

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-58.)
→ NG: Check the throttle position sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 14.)
↓ OK

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-58.)
→ NG: Check the idle position switch system. (Refer to P.13A-40, INSPECTION PROCEDURE 25.)
↓ OK

Clean the throttle valve area. (Refer to P.13A-79.)

INSPECTION PROCEDURE 18

Poor acceleration	Probable cause
[Comment] 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 acceleration • Clogged exhaust system

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output ?
→ Yes: Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES .
↓ No

Check the injectors for operation sound.
→ NG: Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES 41.)
↓ OK

Check the ignition timing. (Refer to GROUP 11 – Service Adjustment Procedures.)
→ 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 40.)
↓ OK

Check the fuel pressure. (Refer to P.13A-83.)
↓ OK

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16 – Service Adjustment Procedures.)
- Check the compression pressure. (Refer to GROUP 11 – Service Adjustment Procedures.)
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner
- Clogged exhaust system

INSPECTION PROCEDURE 19

Surge	Probable cause
[Comment] 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 diagnostic trouble codes output ?
Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
No ↓

Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 41.)
OK ↓

Check the ignition timing. (Refer to GROUP 11 – Service Adjustment Procedures.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II: Check if surge occurs.(Refer to P.13-53, INSPECTION PROCEDURE 41.)
OK ↓

Check the fuel pressure. (Refer to P.13A-83.)
OK ↓

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

INSPECTION PROCEDURE 20

Knocking	Probable cause
[Comment] In cases such as the above, the cause is probably that 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
[Comment] 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
[Comment] Abnormal air-fuel ratio is suspected.	• Malfunction of the air-fuel ratio control system. • Deteriorated catalyst

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output?
Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
No ↓

Check the ignition timing. (Refer to GROUP 11 – Service Adjustment Procedures.)
NG → Check that the distributor is installed properly.
OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor. (Refer to P.13A-58.)
NG → Check the engine coolant temperature sensor. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 21.)
OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-58.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-58.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: 600 – 1,000 mV when racing suddenly (Refer to P.13A-58.)
NG → Check the oxygen sensor system. (Refer to P.13A-12, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 11.)
OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Repeat 0 – 400 mV and 600 – 1,000 mV alternately when idling. (Refer to P.13A-58.)
OK → Replace the oxygen sensor. ↓ Check trouble symptom. NG ↓
NG ↓

Check the fuel pressure. (Refer to P.13A-83.)
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 – Service Adjustment Procedures.)
- Check the compression pressure. (Refer to GROUP 11 – Service Adjustment Procedures.)
- Check the positive crankcase ventilation system. (Refer to GROUP 17 – Crankcase Emission Control System.)
- Check the purge control system. (Refer to GROUP 17 – Evaporative Emission Control System.)
- Check the EGR control system. (Refer to GROUP 17 – EGR System.)

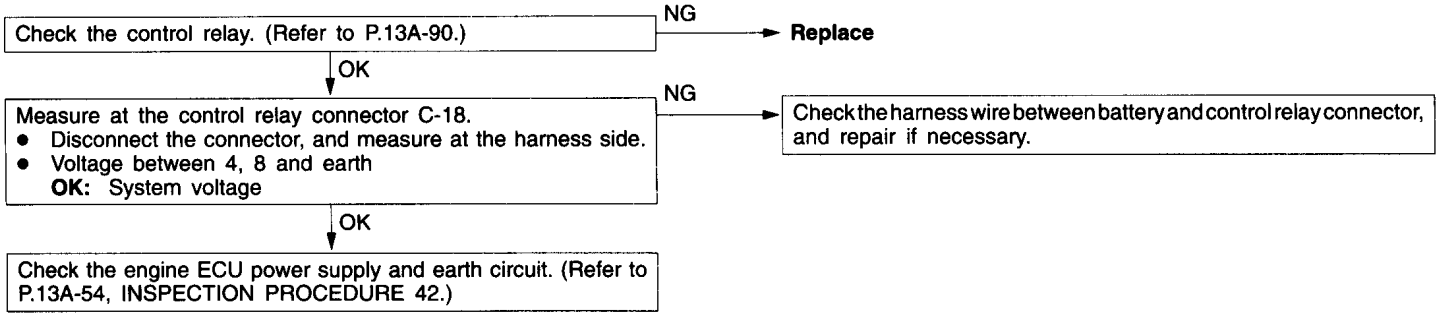
↓

Check trouble symptom.
NG ↓

Replace the catalytic converter.

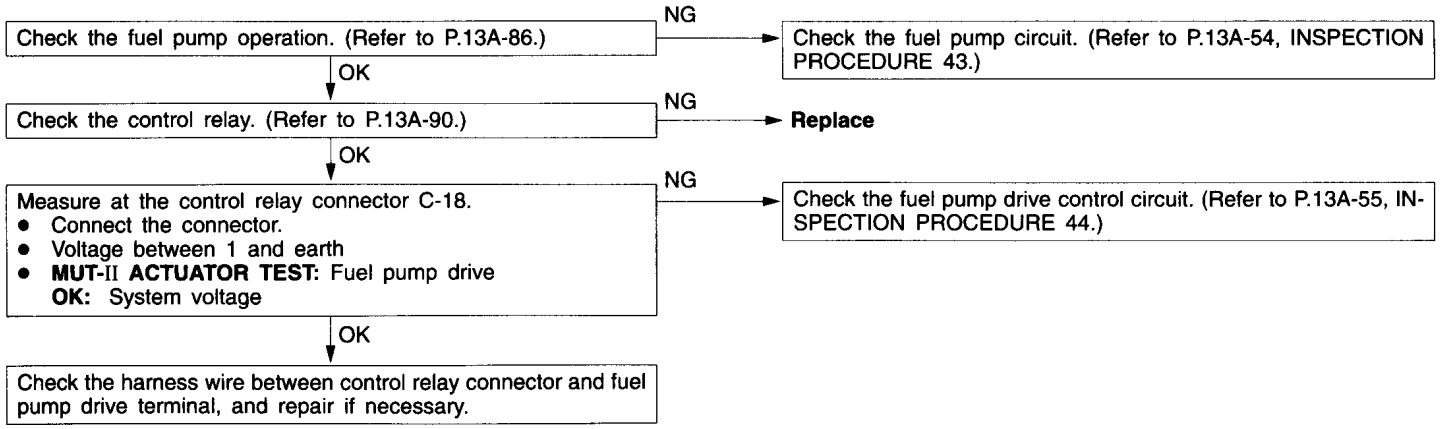
INSPECTION PROCEDURE 23

Power supply system and ignition switch – IG system	Probable cause
[Comment] When an ignition switch ON signal is input to the engine ECU, the engine ECU turns the control relay ON. This causes battery voltage to be supplied to the engine ECU, injectors and air flow sensor.	• Malfunction of the ignition switch • Malfunction of the control relay • Improper connector contact, open circuit or short-circuited harness wire • Disconnected engine ECU earth wire • Malfunction of the engine ECU



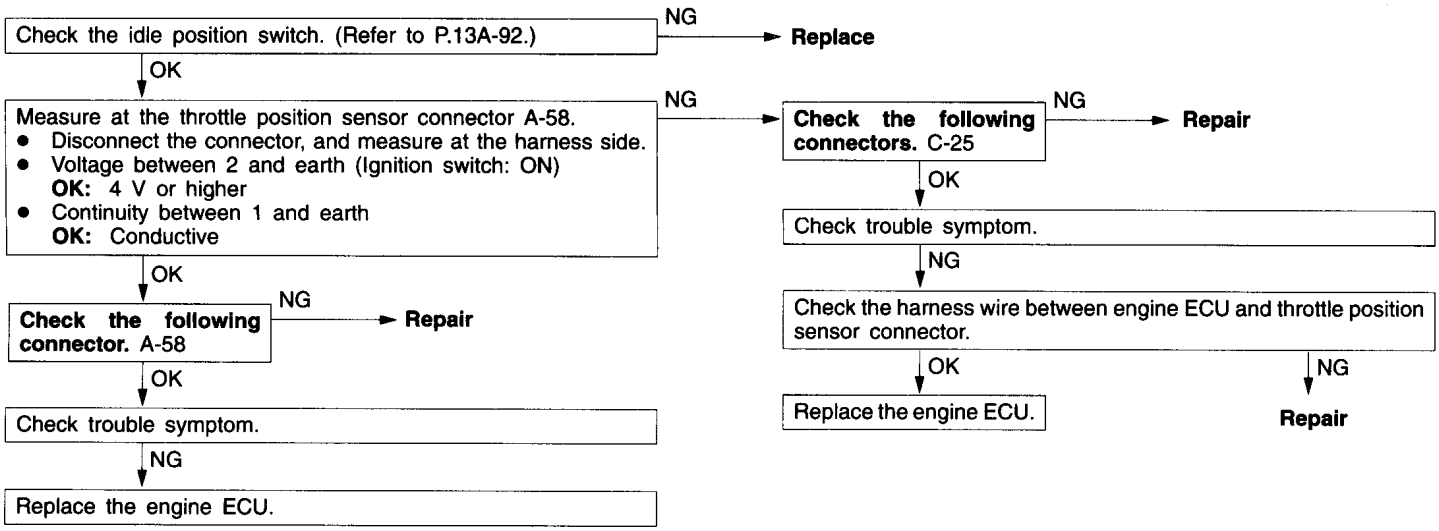
INSPECTION PROCEDURE 24

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



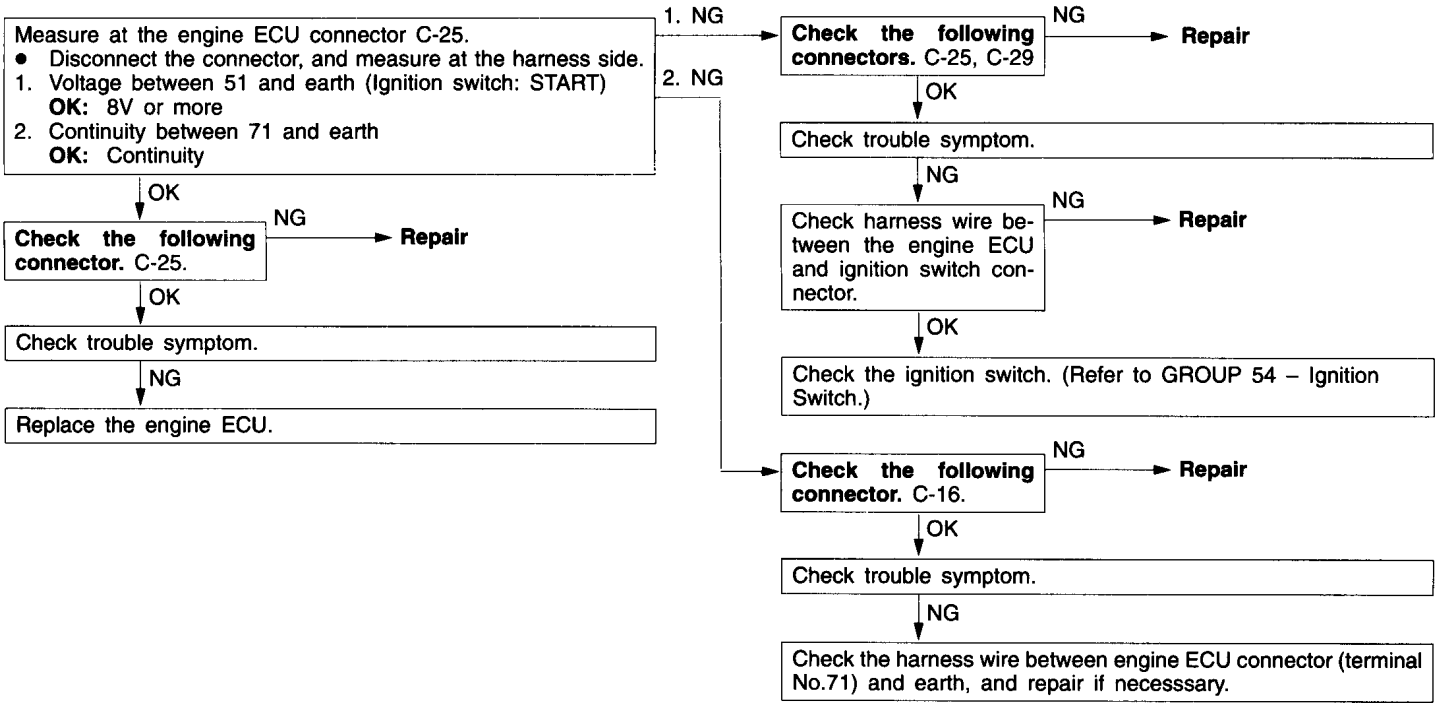
INSPECTION PROCEDURE 25

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



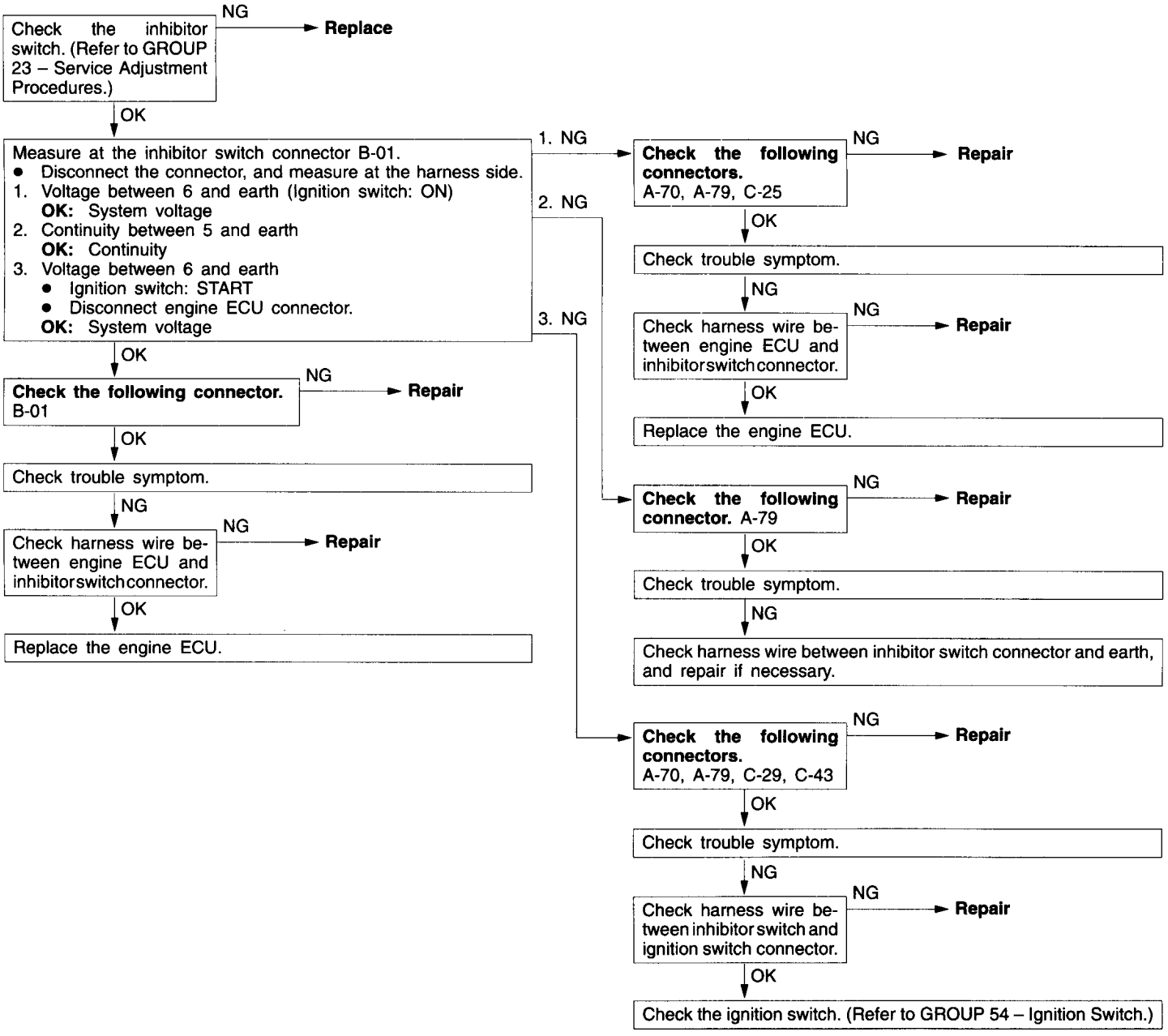
INSPECTION PROCEDURE 26

Ignition switch – ST system <M/T>	Probable cause
[Comment] 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



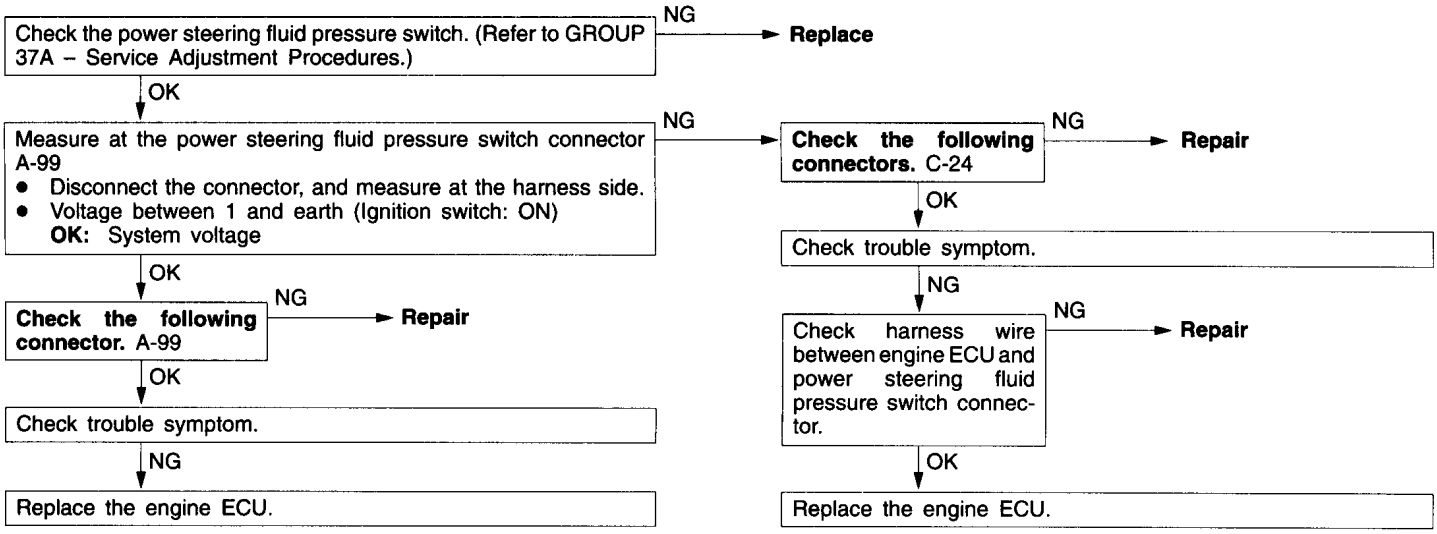
INSPECTION PROCEDURE 27

Ignition switch – ST and inhibitor switch system <A/T>	Probable cause
[Comment] • 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.



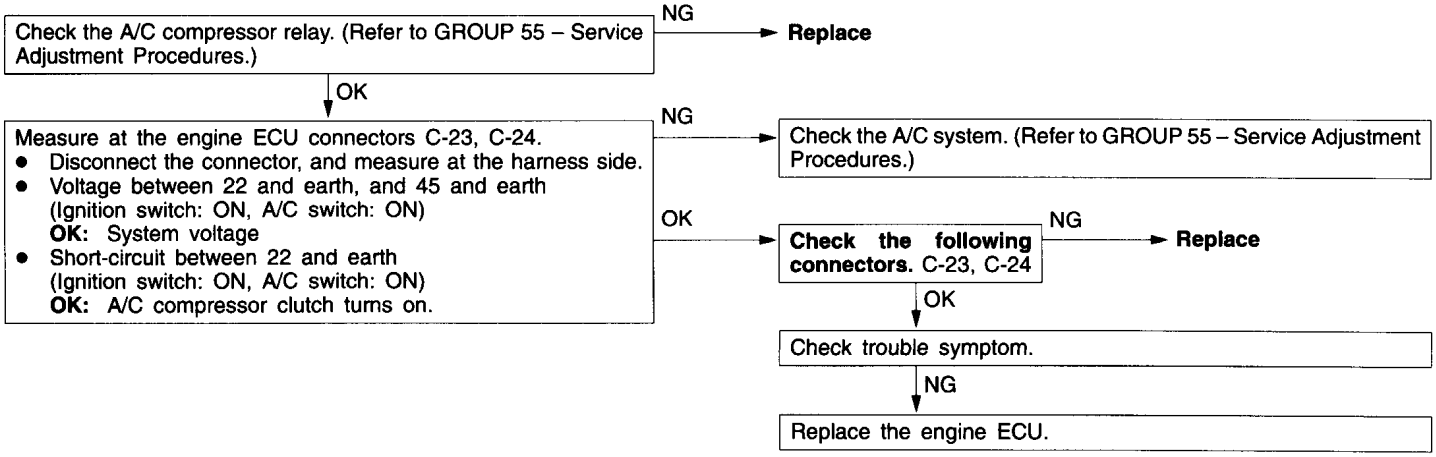
INSPECTION PROCEDURE 28

Power steering fluid pressure switch system	Probable cause
[Comment] 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



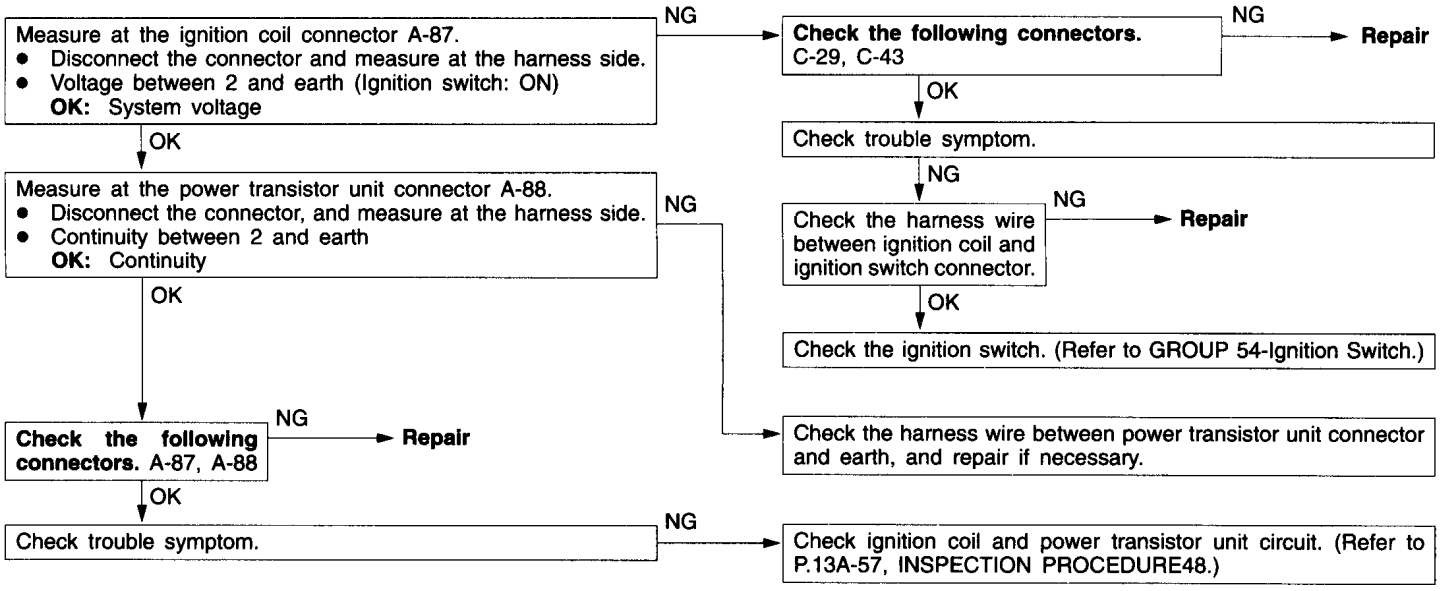
INSPECTION PROCEDURE 29

A/C switch and A/C relay system	Probable cause
[Comment] 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



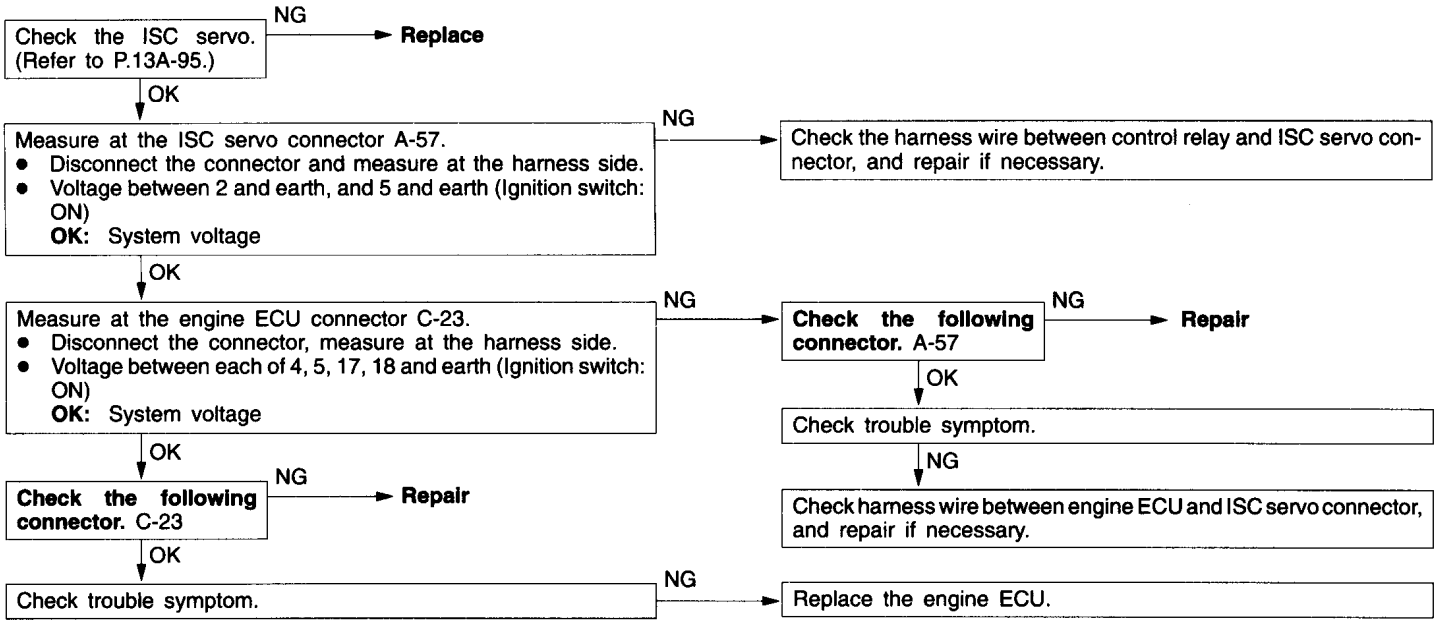
INSPECTION PROCEDURE 30

Ignition circuit system	Probable cause
[Comment] 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 • Malfunction of power transistor unit • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine ECU



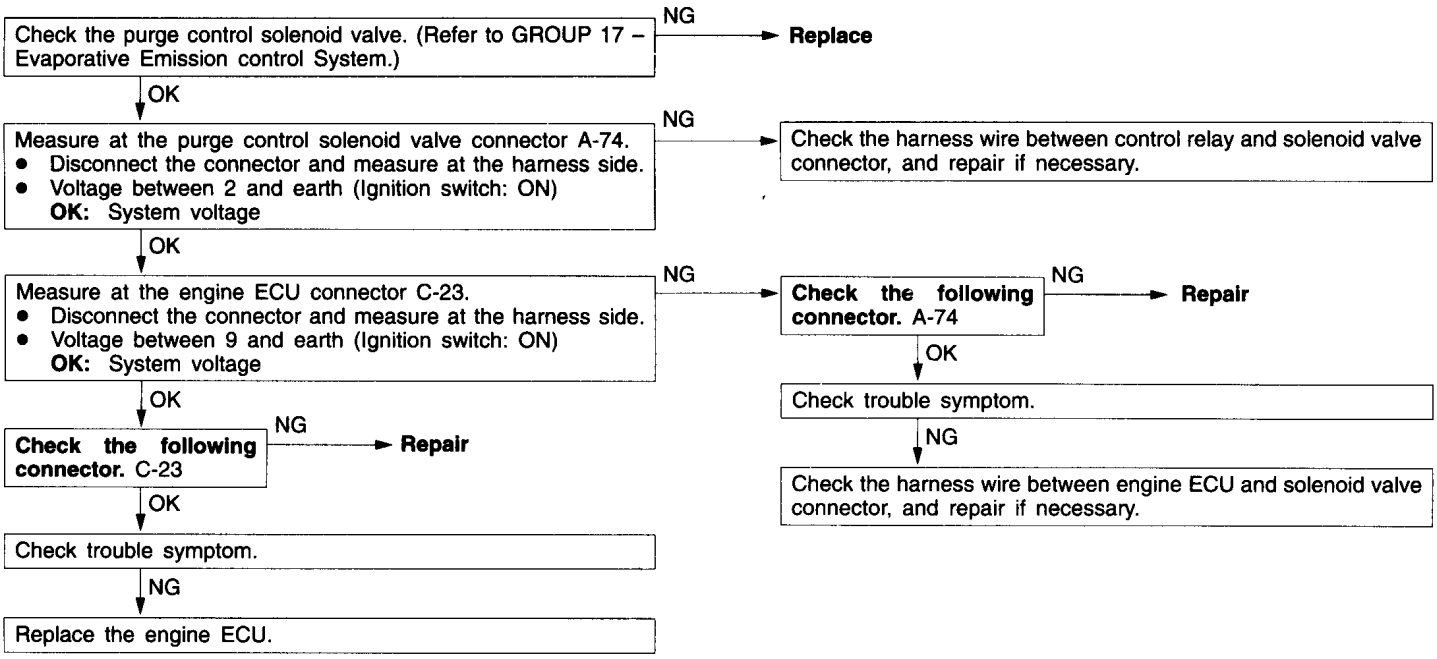
INSPECTION PROCEDURE 31

Idle speed control (ISC) servo (Stepper motor) system	Probable cause
[Comment] 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



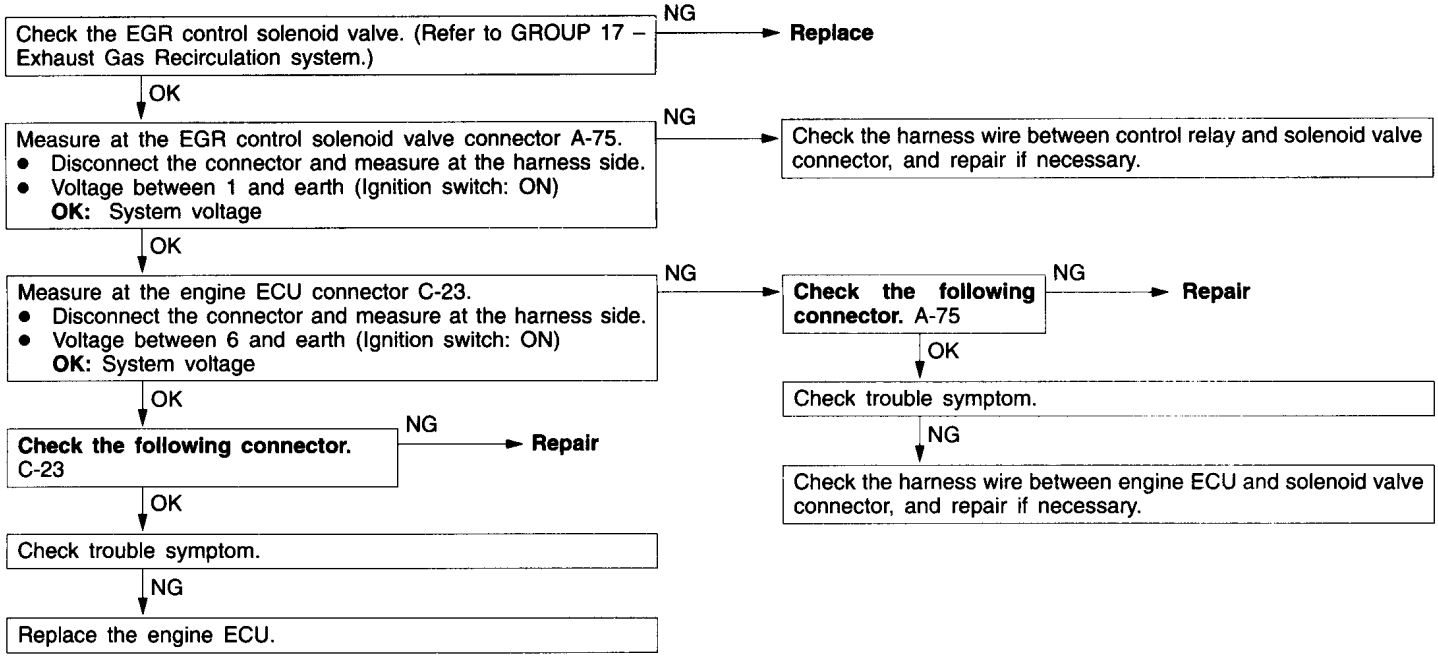
INSPECTION PROCEDURE 32

Purge control solenoid valve system	Probable cause
[Comment] 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 33

EGR control solenoid valve system	Probable cause
[Comment] 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, short-circuited harness wire • Malfunction of the engine ECU



INSPECTION PROCEDURE 34

MUT-II: Inspection of no initial combustion

MUT-II SERVICE DATA
16 voltage of engine ECU power source (Refer to P.13A-58.)
→ NG → Check the power supply and ignition switch – IG system. (Refer to P.13A-39, INSPECTION PROCEDURE 23.)
↓ 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
Is the diagnostic trouble code output?
→ Yes → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
↓ No

MUT-II SERVICE DATA
22 crank angle sensor
OK: Cranking speed is displayed.
→ NG → Check the crank angle sensor system. (Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES 22.)
↓ OK

MUT-II ACTUATOR TEST
07 Fuel pump (Refer to P.13A-63.)
→ NG → Check the fuel pump system. (Refer to P.13A-39, INSPECTION PROCEDURE 24.)
↓ OK

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-58.)
→ NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES 21.)

INSPECTION PROCEDURE 35

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-44, INSPECTION PROCEDURE 30.)
↓ OK

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

INSPECTION PROCEDURE 36

MUT-II: Check if uncomplete combustion occurs.

MUT-II SELF DIAG CODE
Is the diagnostic trouble code output ?
YES → Refer to P.13A-11, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE
NO ↓

MUT-II ACTUATOR TEST
07 Fuel pump (Refer to P.13A-63.)
NG → Check the fuel pump system. (Refer to P.13A-39, INSPECTION PROCEDURE 24.)
OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-58.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODE 21.)
OK ↓

MUT-II SERVICE DATA
Ignition switch – ST (Refer to P.13A-58.)
NG → Check the ignition switch – ST system. <M/T> (Refer to P.13A-41, INSPECTION PROCEDURE 26.)

INSPECTION PROCEDURE 37

Check if hunting occurs.

Clean the throttle body. (Refer to P.13A-79.)
↓
Check and adjust the fixed SAS (Refer to P.13A-81.)
↓
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 38

MUT-II: Check if idling speed is unstable.

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-58.)
NG → Check the idle position switch system. (Refer to P.13A-40, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-58.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-58.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-58.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 21.)
OK ↓

MUT-II ACTUATOR TEST
08 Purge control solenoid valve (Refer to P.13A-63.)
NG → Purge control solenoid valve system (Refer to P.13A-46, INSPECTION PROCEDURE 32.)
OK ↓

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

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0–400 mV and 600–1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-83.)
OK → 1. Inspect the intake of air into the air intake system.
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve dose not operate.
- Broken air intake hose

2. Check the injector for clog.

OK ↓

MUT-II SERVICE DATA
27 Power steering fluid pressure switch (Refer to P.13A-58.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-43, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II SERVICE DATA
28 A/C switch (Refer to P.13A-58.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-43. INSPECTION PROCEDURE 29.
OK ↓

MUT-II SERVICE DATA
29 Inhibitor switch (Refer to P.13A-58.)
NG → Check the ignition switch – ST and inhibitor switch system. <A/T> (Refer to P.13A-42, INSPECTION PROCEDURE 27.)
OK ↓

MUT-II SERVICE DATA
45 ISC Servo position (Refer to P.13A-58.)
NG → Adjust the basic idle speed. (Refer to P.13A-81.)

INSPECTION PROCEDURE 39

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

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-58.)
NG → Check the idle position switch system. (Refer to P.13A-40, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-58.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-58.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-58.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE 21.)
OK ↓

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

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-83.)
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 SERVICE DATA
27 Power steering fluid pressure switch (Refer to P.13A-58.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-43, INSPECTION PROCEDURE 28.)
OK ↓

MUT-II SERVICE DATA
28 A/C switch (Refer to P.13A-58.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-43, INSPECTION PROCEDURE 29.)
OK ↓

MUT-II SERVICE DATA
29 Inhibitor switch (Refer to P.13A-58.)
NG → Check the ignition switch – ST and inhibitor switch system. <A/T> (Refer to P.13A-42, INSPECTION PROCEDURE 27.)
OK ↓

MUT-II SERVICE DATA
34 Air flow sensor reset signal (Refer to P.13A-58.)
NG → Check the air flow sensor system. (Refer to P.13A-13, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 12.)
OK ↓

MUT-II SERVICE DATA
45 ISC servo position (Refer to P.13A-58.)
NG → Adjust the basic idle speed. (Refer to P.13A-81.)

INSPECTION PROCEDURE 40

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

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-58.)
NG → Check the idle position switch system. (Refer to P.13A-40, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-58.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-58.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-58.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 21.)
OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-58.)
NG → Check the throttle position sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 14.)
OK ↓

MUT-II ACTUATOR TEST
10 EGR control solenoid valve (Refer to P.13A-63.)
NG → Check the EGR control solenoid valve system. (Refer to P.13A-47, INSPECTION PROCEDURE 33.)
OK ↓

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

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-83.)
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 41

MUT-II: Check if surge occurs.

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-58.)
- NG → Check the idle position switch system. (Refer to P.13A-40, INSPECTION PROCEDURE 25.)
- OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-58.)
- NG → Check the intake air temperature sensor system. (Refer to P.13A-14, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
- OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-58.)
- NG → Check the barometric pressure sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
- OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-58.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-16, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 21.)
- OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-58.)
- NG → Check the throttle position sensor system. (Refer to P.13A-15, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 14.)
- OK ↓

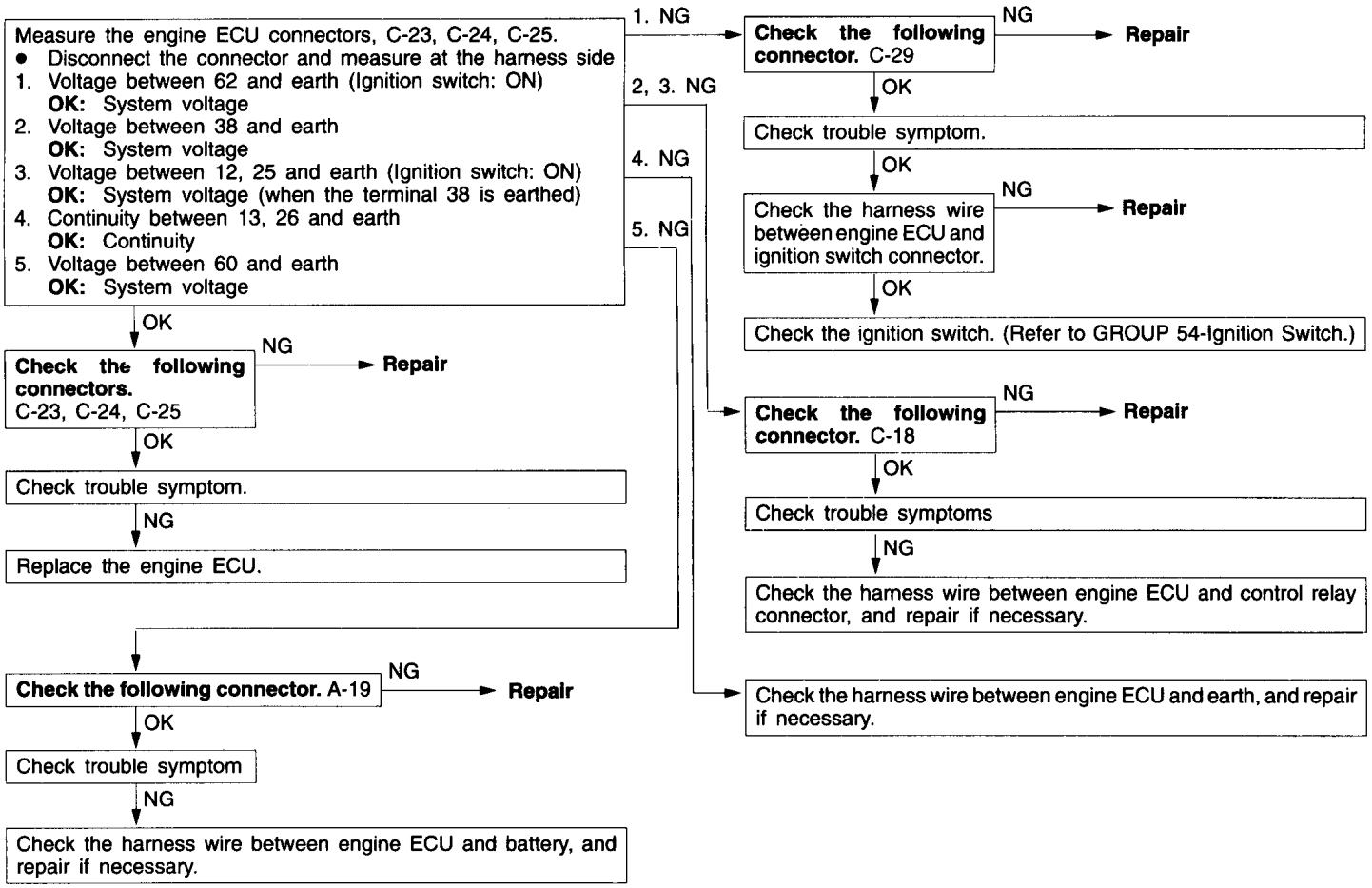
MUT-II ACTUATOR TEST
10 EGR control solenoid valve (Refer to P.13A-63.)
- NG → Check the EGR control solenoid valve. (Refer to P.13A-47, INSPECTION PROCEDURE 33.)
- OK ↓

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

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
- NG → Check the fuel pressure. (Refer to P.13A-83.)
- 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.

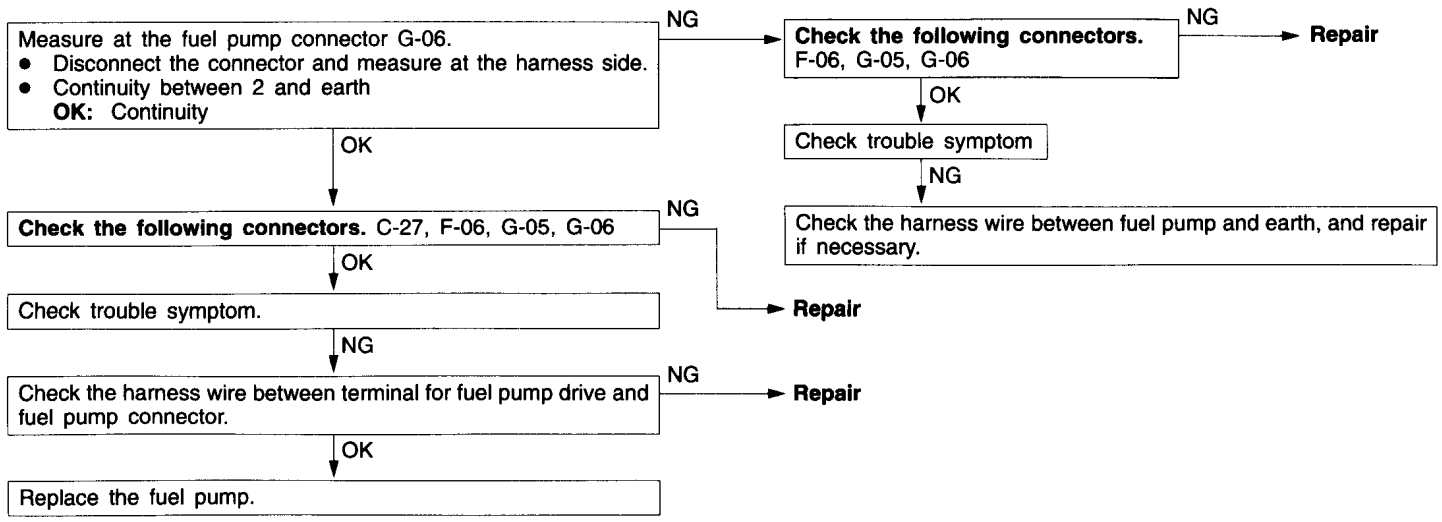
INSPECTION PROCEDURE 42

Check the engine ECU power supply and earth circuit.



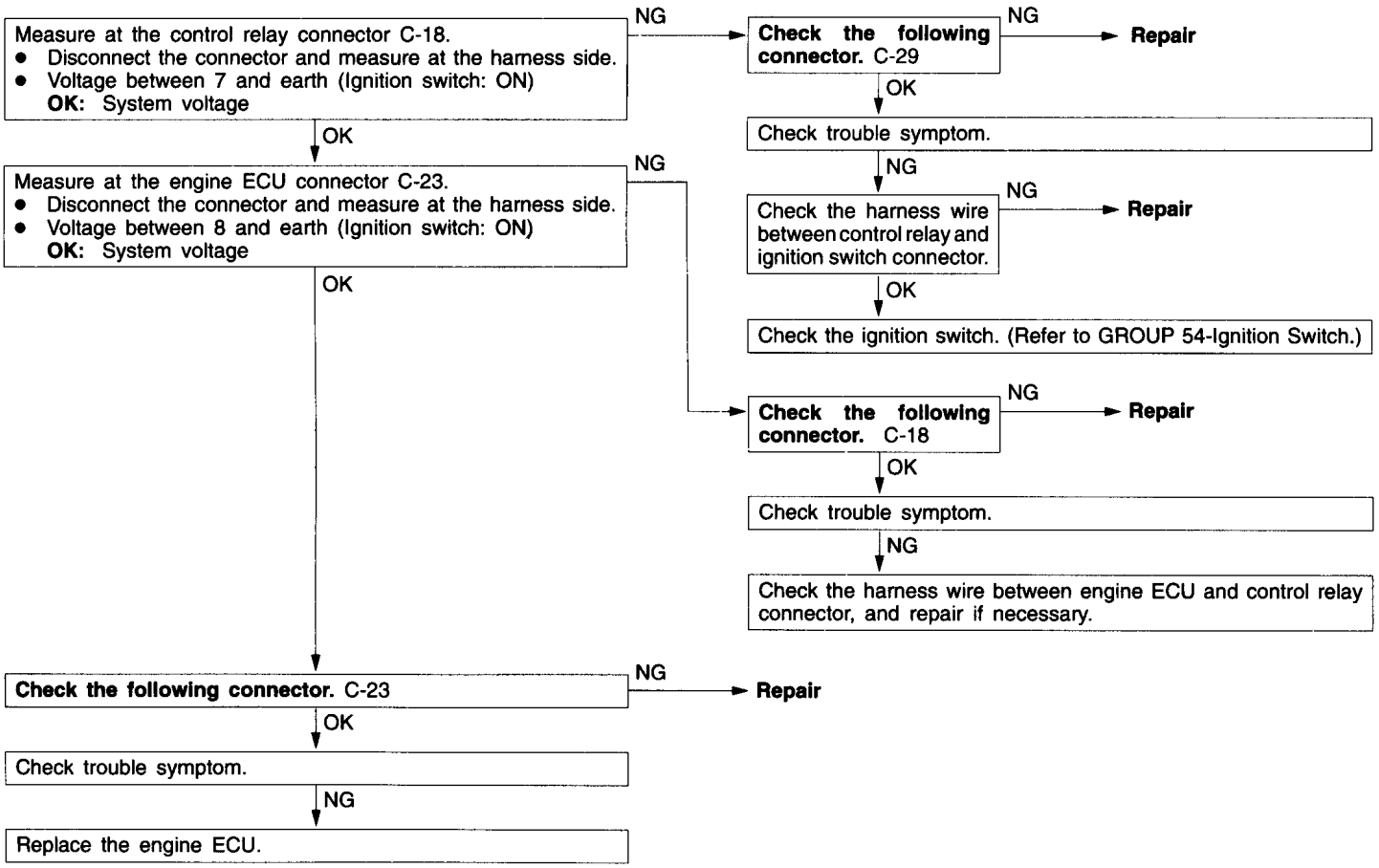
INSPECTION PROCEDURE 43

Check fuel pump circuit.



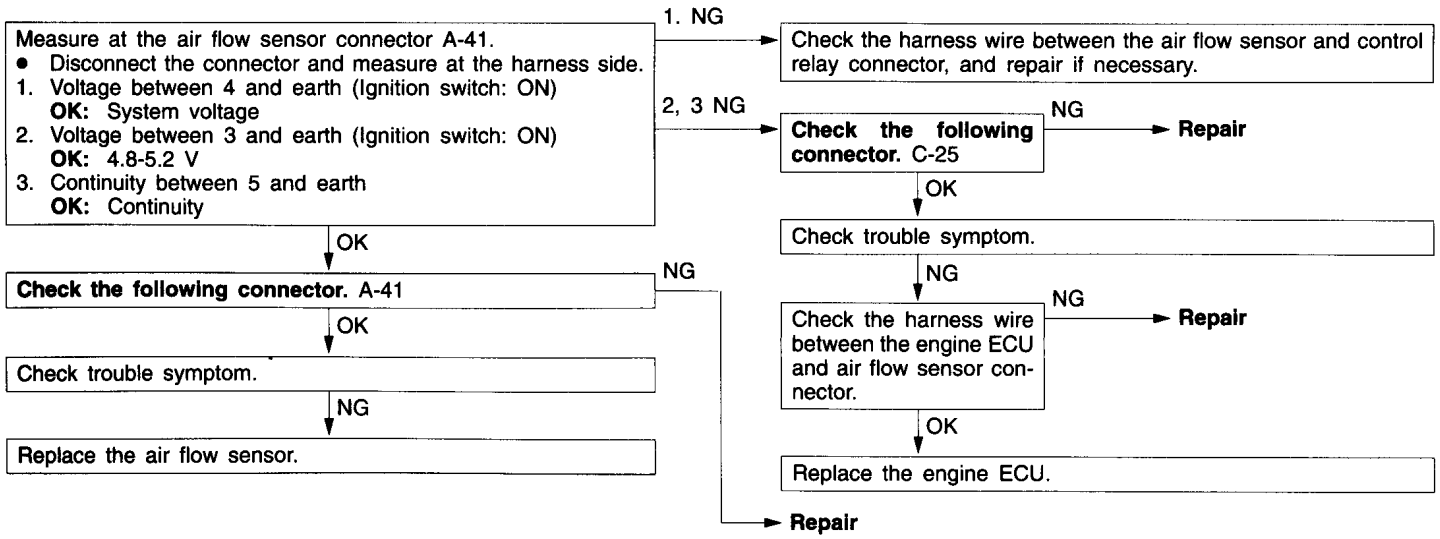
INSPECTION PROCEDURE 44

Check the fuel pump drive control circuit.



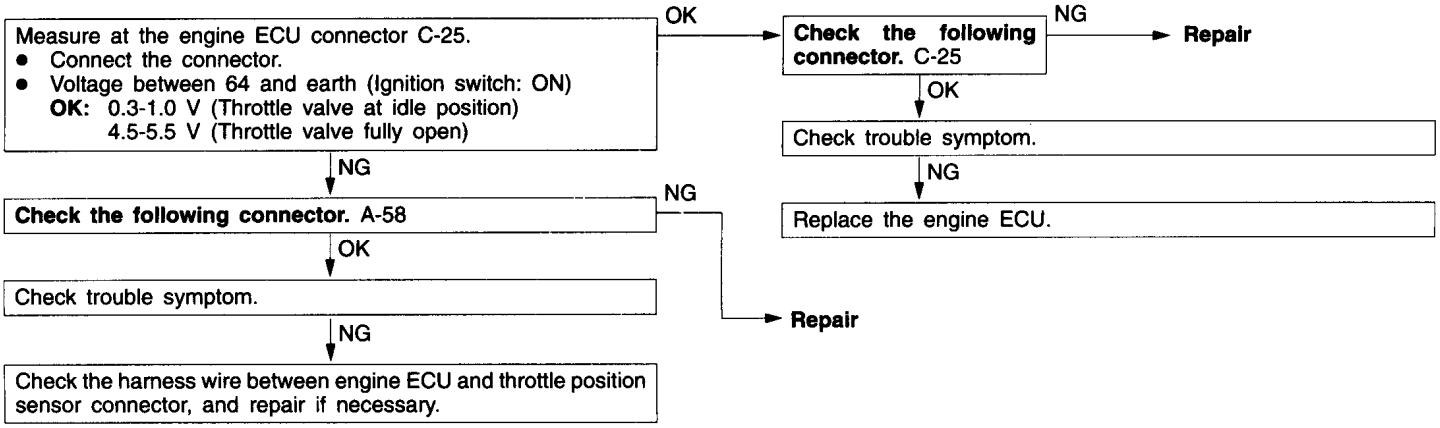
INSPECTION PROCEDURE 45

Check air flow sensor(AFS) control circuit.



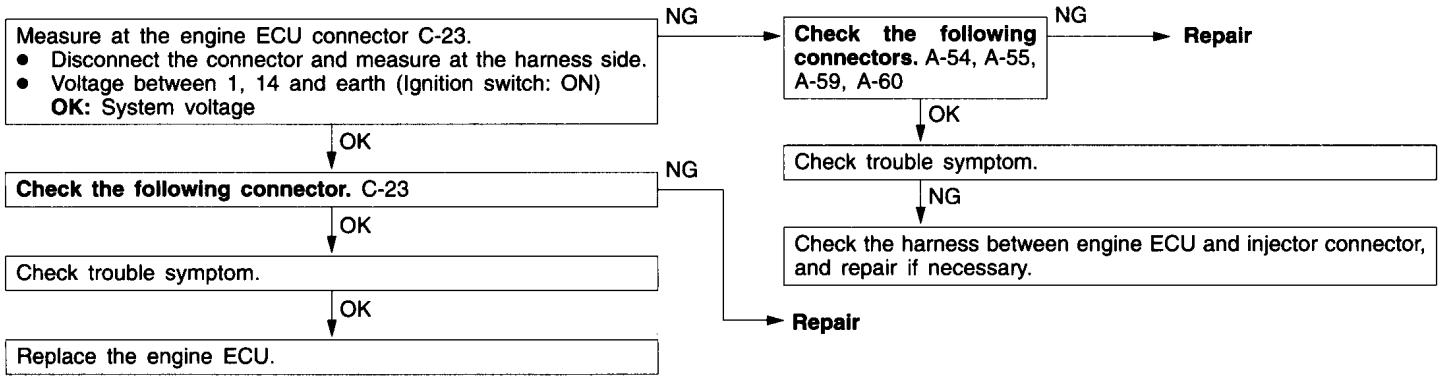
INSPECTION PROCEDURE 46

Check throttle position sensor(TPS) output circuit.



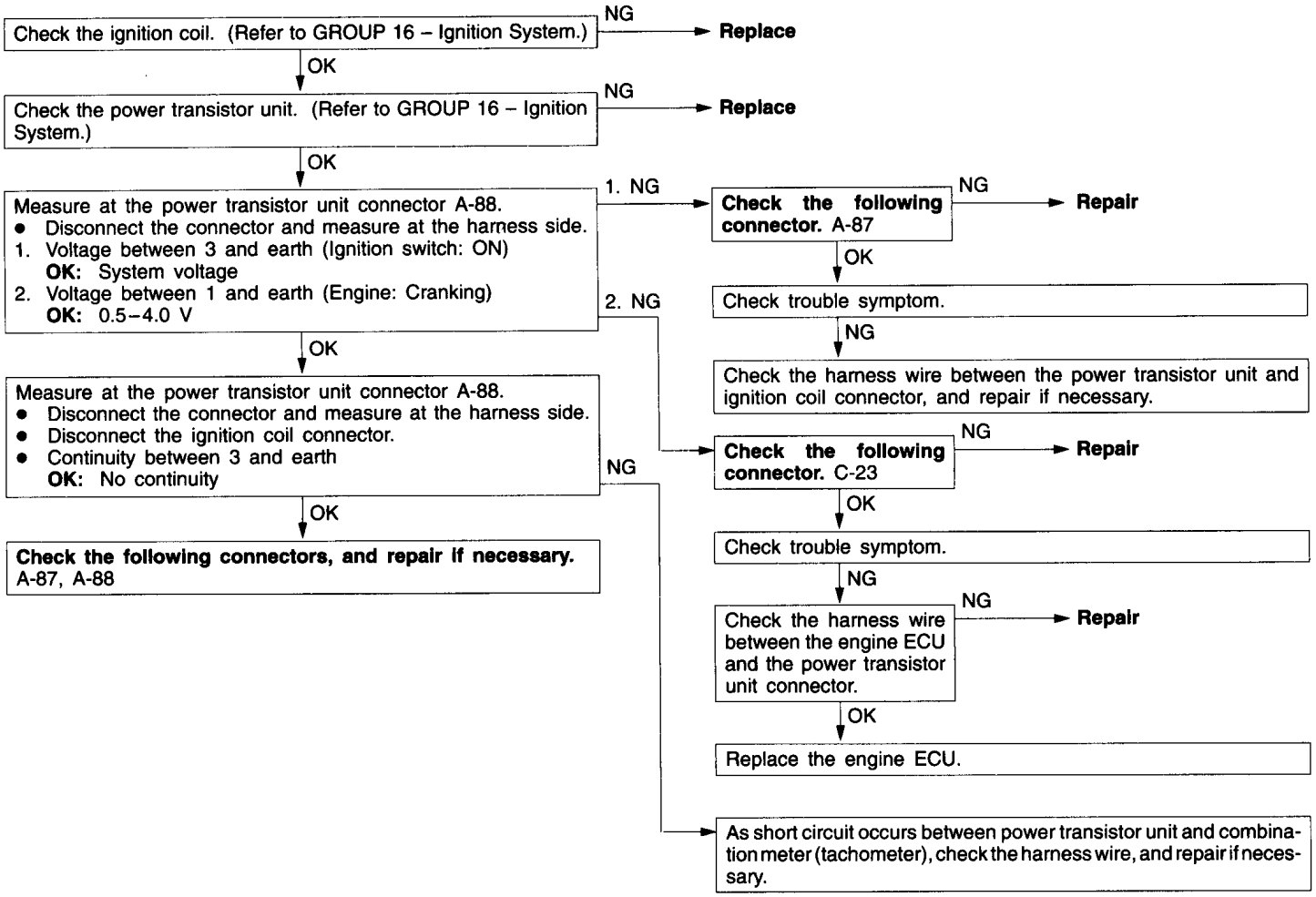
INSPECTION PROCEDURE 47

Check injector control circuit



INSPECTION PROCEDURE 48

Check ignition coil and power transistor unit circuit.



SERVICE DATA REFERENCE TABLE

120002551

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

NOTE
*1. In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10% higher than the standard frequency.
*2. The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
*3. In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
*4. In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.
*5. The idle position switch normally turns off when the voltage of the throttle position sensor is 50–100 mV higher than the voltage at the idle position. If the throttle position switch turns back on after the throttle position sensor voltage has risen by 100 mV and the throttle valve has opened, the throttle position switch and the throttle position sensor need to be adjusted.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine: After having warmed up Air/fuel mixture is made leaner when decelerating, and is made richer when racing.	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	13A-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)		
			2,500 r/min.	600–1,000 mV		
12	Air flow sensor *1	• Engine coolant temperature: 80–95°C • Lights and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	22–48 Hz <4G63> 19–45 Hz <4G64>	–	–
			2,500 r/min.	80–120 Hz <4G63> 67–107 Hz <4G64>		
			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-14
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor	Ignition switch: ON	Set to idle position	300–1,000 mV	Code No. 14	13A-15
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV		
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 23	13A-39
18	Cranking signal (ignition switch – ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 26 <M/T> Procedure No. 27 <A/T>	13A-41 13A-42
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	13A-16
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		

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-17
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,275–1,475 r/min		
			When engine coolant temperature is 0°C	1,225–1,425 r/min		
			When engine coolant temperature is 20°C	1,100–1,300 r/min		
			When engine coolant temperature is 40°C	950–1,150 r/min		
			When engine coolant temperature is 80°C	650–850 r/min		
25	Barometic pressure sensor	Ignition switch: ON	At altitude of 0 m	101 kPa	Code No. 25	13A-20
			At altitude of 600 m	95 kPa		
			At altitude of 1,200 m	88 kPa		
			At altitude of 1,800 m	81 kPa		
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 25	13A-40
			Throttle valve: Slightly open	OFF*5		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 28	13A-43
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (when A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 29	13A-43
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 27	13A-42
			D, 2, L or R	D, 2, L or R		

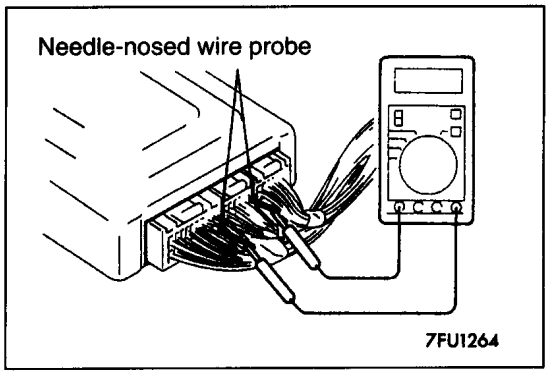
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Injectors *2	Engine: Cranking	When engine coolant temperature is 0°C	51–76 ms <4G63> 60–90 ms <4G64>	–	–
			When engine coolant temperature is 20°C	26–38 ms <4G63> 30–45 ms <4G64>		
			When engine coolant temperature is 80°C	5.7–8.5 ms <4G63> 6.7–10.1 ms <4G64>		
	Injectors *3	• Engine coolant temperature: 80–95°C • Lights and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	1.9–3.1 ms <4G63> 2.2–3.4 ms <4G64>		
			2,500 r/min.	1.8–3.0 ms <4G63> 1.9–3.1 ms <4G64>		
			When engine is suddenly raced	Increases		
44	Ignition coils and power transistors	• Engine: After having warmed up • Timing light is set. (The timing light is set in order to check actual ignition timing.)	Engine is idling	2–18 °BTDC	–	–
		• Engine: After having warmed up • Timing light is set. (The timing light is set in order to check actual ignition timing.)	2,500 r/min.	23–43 °BTDC <4G63> 27–47 °BTDC <4G64>		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
45	ISC(stepper) motor position *4	• Engine coolant temperature: 80–95°C • Lights 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. 29	13A-43
			A/C switch: ON	ON (Compressor clutch is operating)		

ACTUATOR TEST REFERENCE TABLE

120002552

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1, No. 3 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-21
02		Cut fuel to No. 2, No. 4 injector.					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Forced driving Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 24	13A-39
				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. 32	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. 33	13A-47



CHECK AT THE ENGINE ECU TERMINALS

120002553

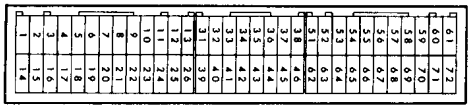
TERMINAL VOLTAGE CHECK CHART

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



9FU0101

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
1	No. 1, No. 3 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11–14 V, momentarily drops slightly
14	No. 2, No. 4 injector		
4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started	SV ↔ 0–3V (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	SV
		While engine is idling, suddenly depress the accelerator pedal.	From SV, momentarily drops
8	Control relay (Fuel pump)	Ignition switch: ON	SV
		Engine: Idle speed	0–3V
9	Purge control solenoid valve	Ignition switch: ON	SV
		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	SV
19	Air flow sensor reset signal	Engine: Idle speed	0–1V
		Engine r/min.: 3,000 r/min.	6–9V
22	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)	SV or momentarily 6V or more → 0–3V
25	Power supply	Ignition switch: ON	SV

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
34	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
35	Oxygen sensor heater	Engine: Idling after warming up		0–3V
		Engine r/min.: 5,000r/min.		SV
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	SV
			When steering wheel is turned	0–3V
38	Control relay (Power supply)	Ignition switch: OFF		SV
		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)	SV
51	Ignition switch – ST	Engine: Cranking		8V or more
52	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
56	Oxygen sensor	Engine: Running at 2,000 r/min. after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
60	Backup power supply	Ignition switch: OFF		SV
61	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
62	Ignition switch – IG	Ignition switch: ON		SV

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
63	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
64	Throttle position sensor	Ignition switch: ON	Set throttle valve to idle position	0.3–1.0V
			Fully open throttle valve	4.5–5.5V
65	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7–4.3V
			When altitude is 1,200m	3.2–3.8V
66	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5V (Changes repeatedly)
67	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
			Slightly open throttle valve	4V or more
68	Top dead centre sensor	Engine: Cranking		0.4–3.0V
		Engine: Idle speed		0.5–2.0V
69	Crank angle sensor	Engine: Cranking		0.4–4.0V
		Engine: Idle speed		1.5–2.5V
70	Air flow sensor	Engine: Idle speed		2.2–3.2V
		Engine r/min.: 2000r/min.		
71	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0–3V
			Set selector lever to D, 2, L or R	8–14V

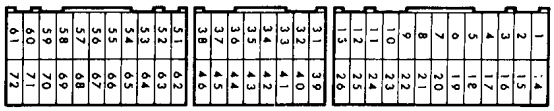
CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

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

   NOTE
   1. When measuring resistance and checking continuity, a harness for checking contact pin pressure should be used instead of inserting a test probe.
   2. 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.

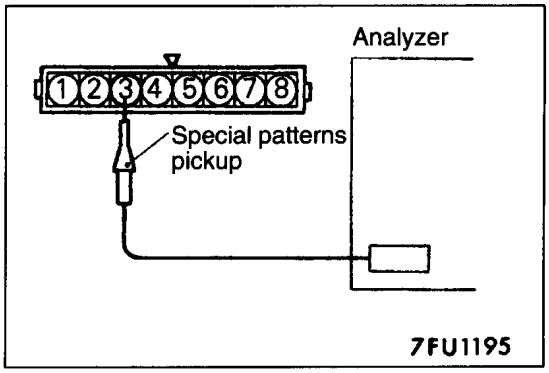
Engine ECU Harness Side Connector Terminal Arrangement



6AF0144

Terminal No.	Inspection item	Normal condition (Check condition)
1–12	No. 1, No. 3 injector	6.5–8.0 Ω (At 20°C)
14–12	No. 2, No. 4 injector	
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)	

Terminal No.	Inspection item	Normal condition (Check condition)
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	
35–12	Oygen sensor heater	Approx. 12 Ω (At 20°C)
52–72	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)
63–72	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)
67–72	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
71–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

120002050

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)

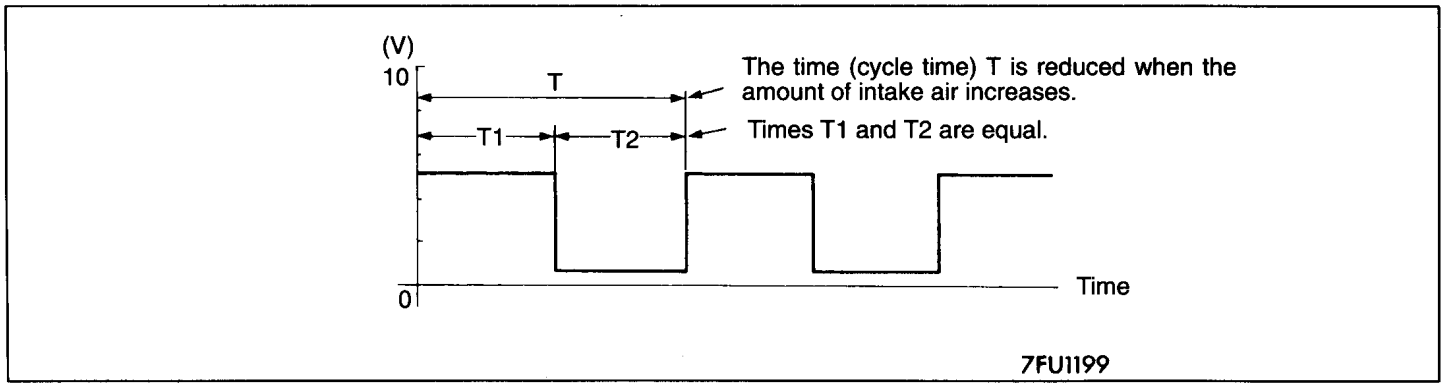
1. Connect the analyzer special patterns pickup to engine ECU terminal 70.

Standard Wave Pattern

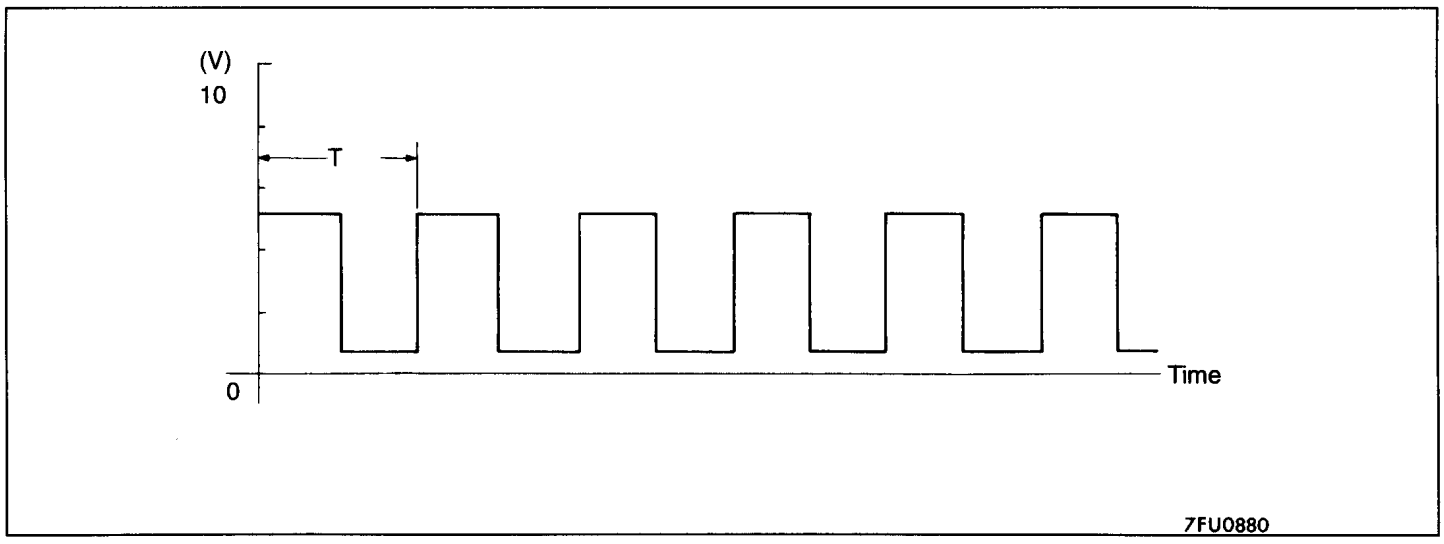
Observation conditions

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

Standard wave pattern

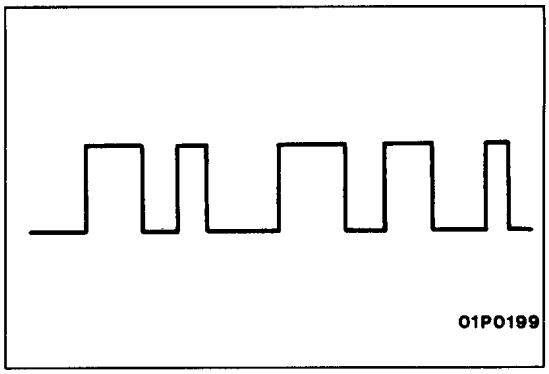


Observation conditions (from conditions above engine speed is increased by racing.)



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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

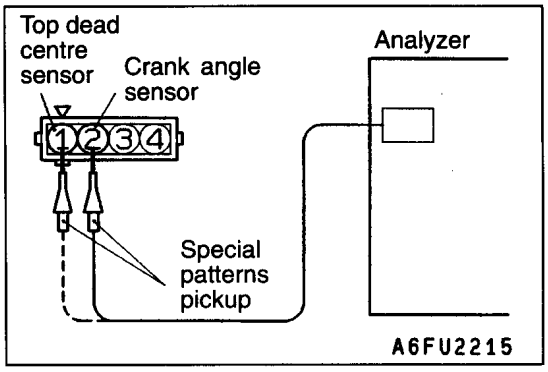
- Example 2

  Cause of problem

  Damaged rectifier or vortex generation column

  Wave pattern characteristics

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



TOP DEAD CENTRE SENSOR AND CRANK ANGLE SENSOR

120002554

Measurement Method

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

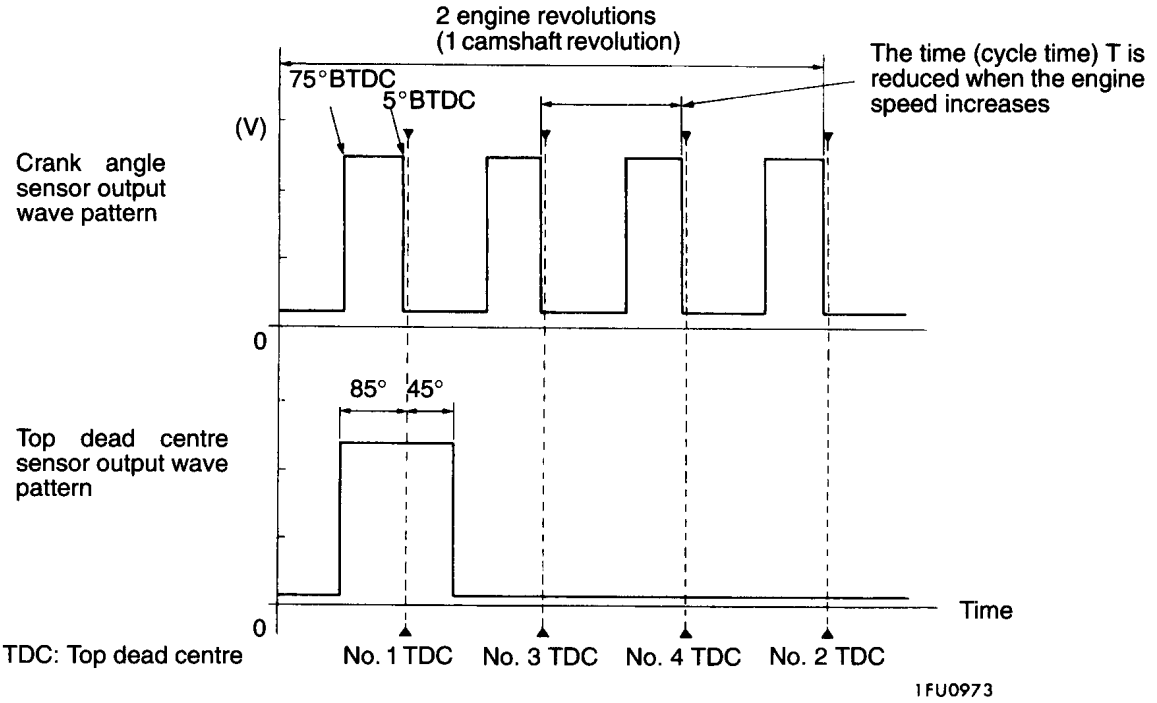
Alternate Method (Test harness not available)

1. Connect the analyzer special patterns pickup to engine ECU terminal 68. (When checking the top dead centre sensor signal wave pattern.)
2. Connect the analyzer special patterns pickup to engine ECU terminal 69. (When checking the crank angle sensor signal wave pattern.)

Standard Wave Pattern

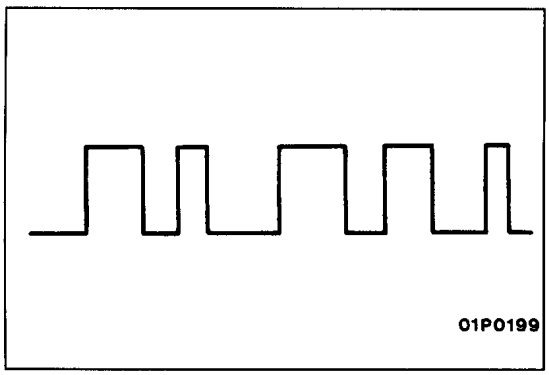
Observation conditions

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



Wave Pattern Observation Points

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



Examples of Abnormal Wave Patterns

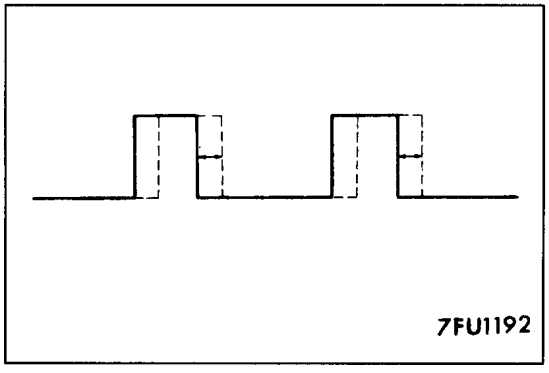
- Example 1

Cause of problem

Sensor interface malfunction

Wave pattern characteristics

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



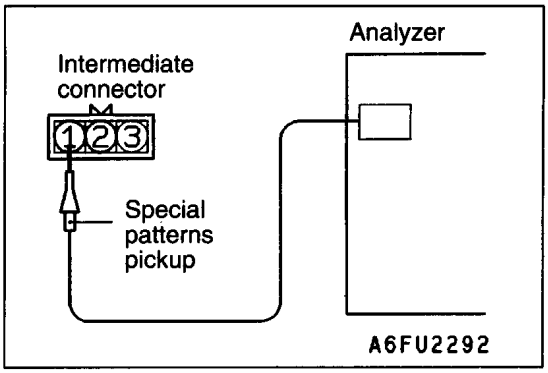
- Example 2

Cause of problem

Loose timing belt
Abnormality in sensor disk

Wave pattern characteristics

Wave pattern is displaced to the left or right.



INJECTOR

120002555

Measurement Method

1. Disconnect the injector intermediate harness connector, and use the special tool (test harness set: MB991223) and jumper wires to connect the connectors. (All terminals should be connected.)
2. To measure cylinder No. 1 and No. 3, connect the analyzer special patterns pickup to terminal 2. For cylinder No. 2 and No. 4, connect to terminal 1.

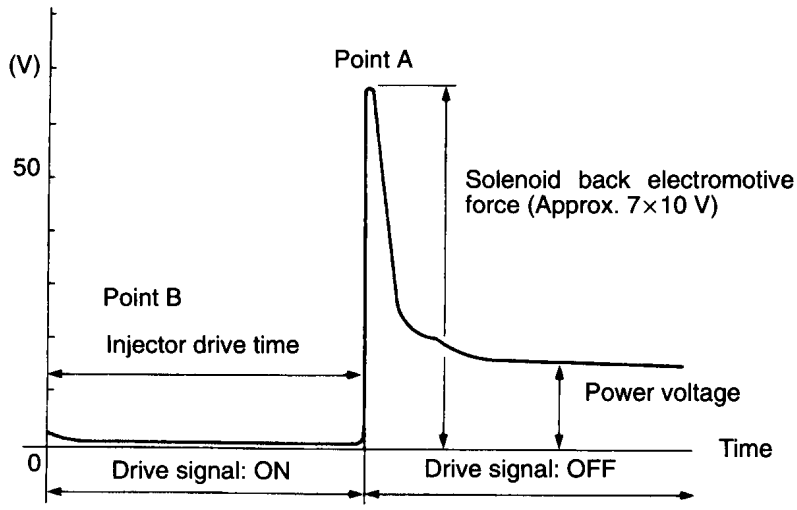
Alternate Method (Test harness not available)

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



7FU1202

Wave Pattern Observation Points

Explanation of Wave Pattern

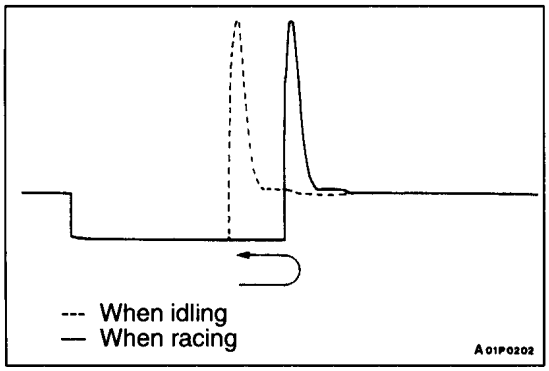
NOTE

- Because the fuel injection method is a group injection method (injection with injectors grouped together in sets of two), if there is an abnormality in the drive circuit of one of the injectors in a group, the drive circuit of the other injector may still be normal, and in this case a normal wave pattern will be output.
- If there is an abnormality in the engine control unit power transistor that drives the injectors, an abnormal wave pattern will be output.

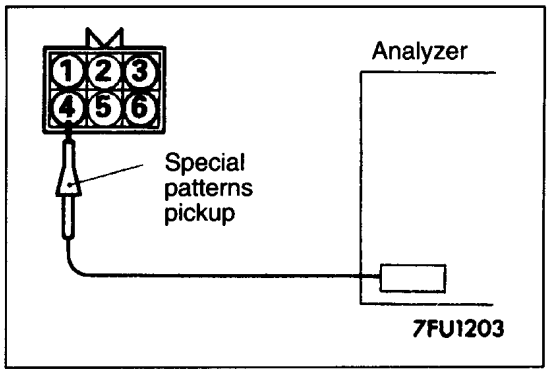
Point A: Height of solenoid back electromotive force

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

120002054

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.

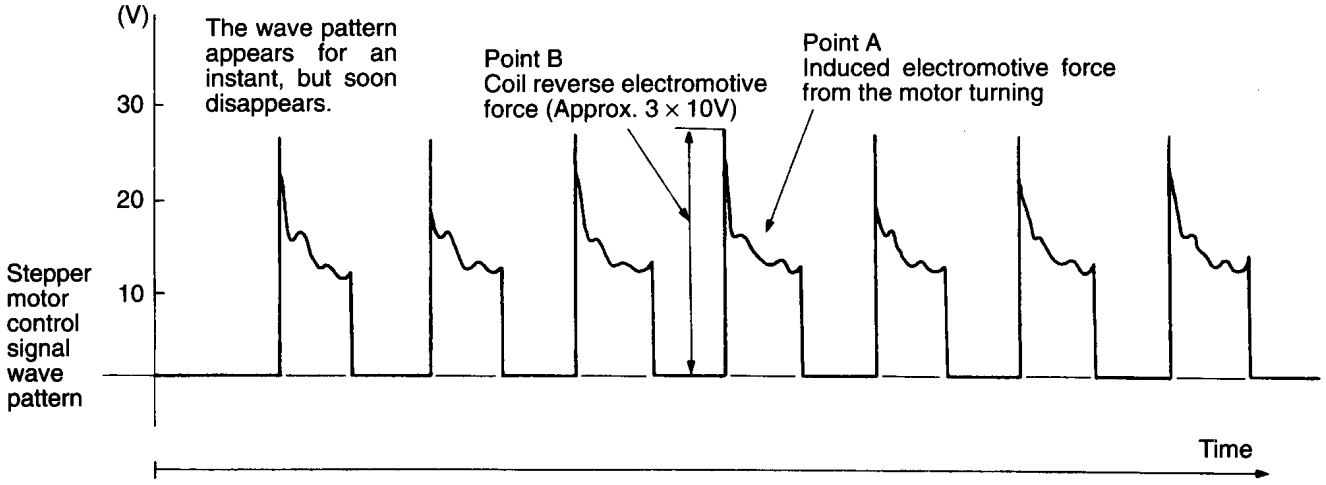
Alternate Method (Test harness not available)

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

Standard Wave Pattern

Observation conditions

Function	Special patterns
Pattern height	High
Pattern selector	Display
Engine condition	When the engine coolant temperature is 20°C or below, turn the ignition switch from OFF to ON (without starting the engine).
	While the engine is idling, turn the A/C switch to ON.
	Immediately after starting the warm engine (approx. 1 minute).



7FU1204

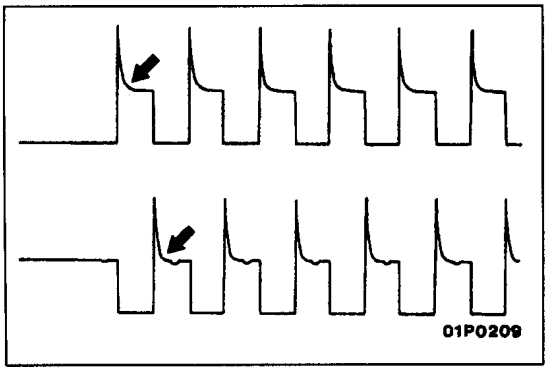
Wave Pattern Observation Points

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



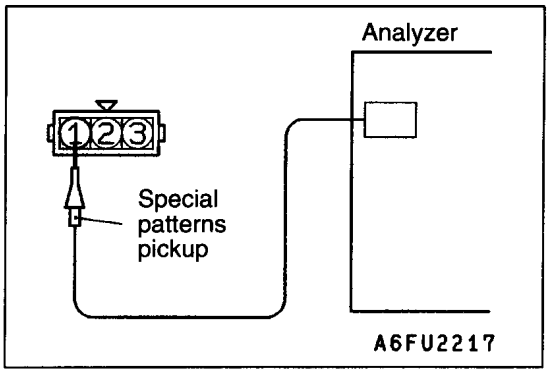
Examples of Abnormal Wave Pattern

Cause of problem

Motor is malfunctioning. (Motor is not operating.)

Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.



IGNITION COIL AND POWER TRANSISTOR 120002556

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

Measurement Method

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

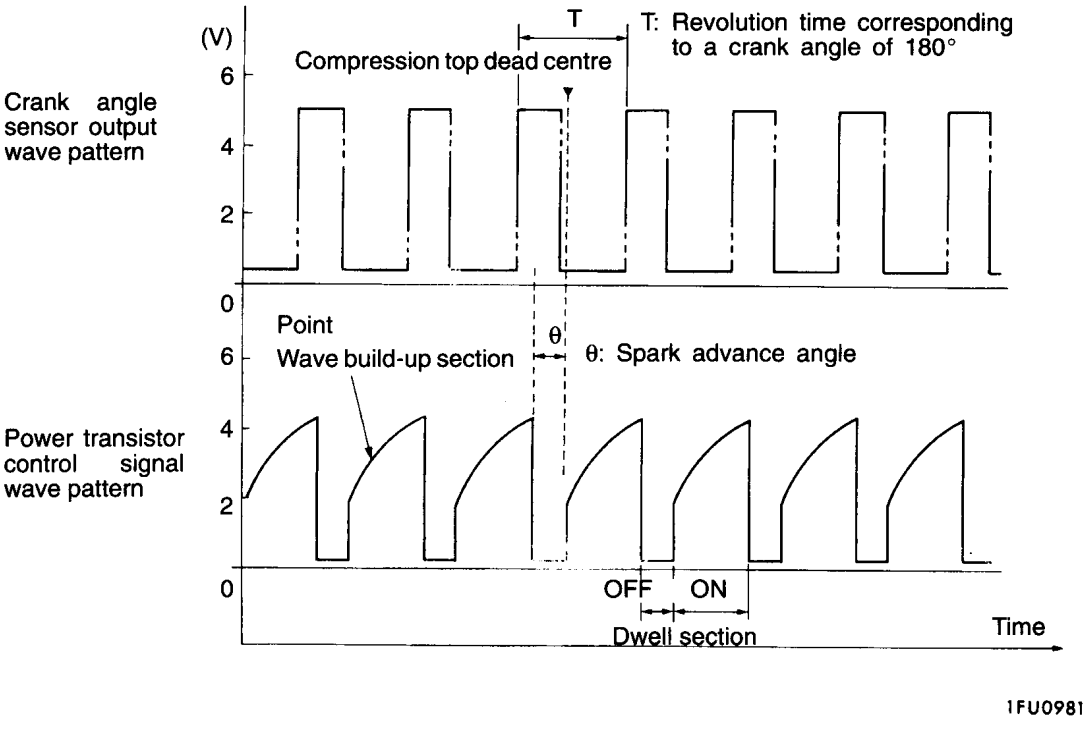
Alternate Method (Test harness not available)

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

Standard wave pattern

Observation condition

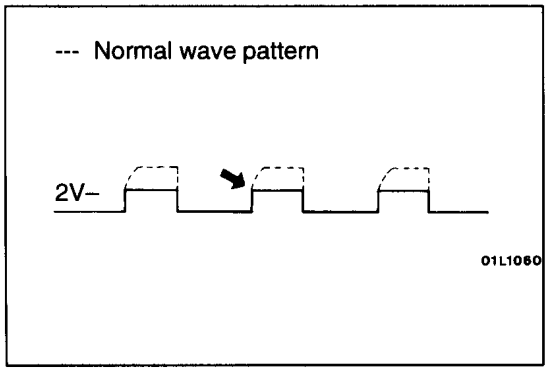
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min.	Approx. 1,200 r/min.

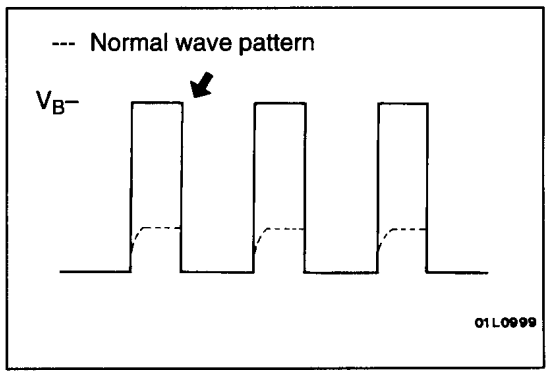


Wave Pattern Observation Points

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

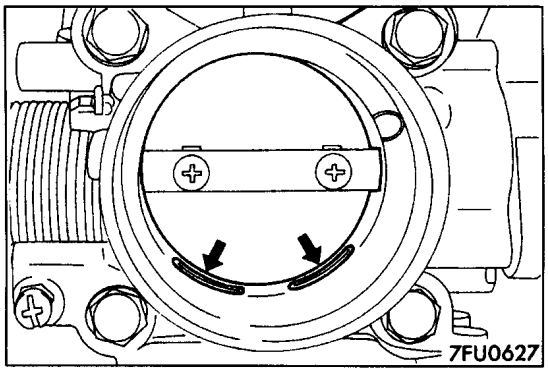
  Power voltage results when the power transistor is ON.

SERVICE ADJUSTMENT PROCEDURES

120002557

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.

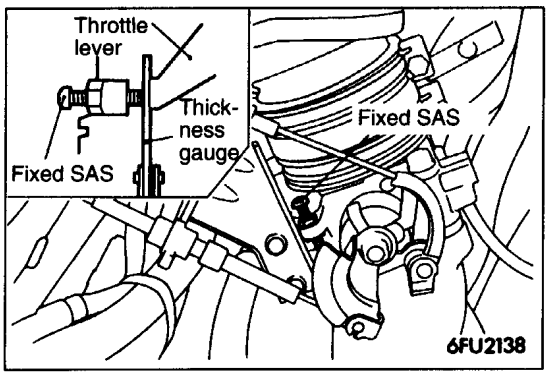
4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly 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-81.)

    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

120002596

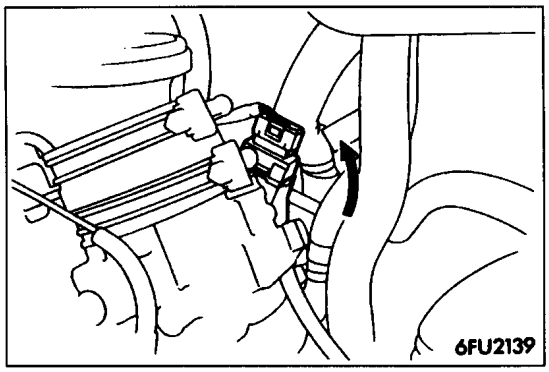
1. Connect the MUT-II to the diagnosis connector (16-pin).



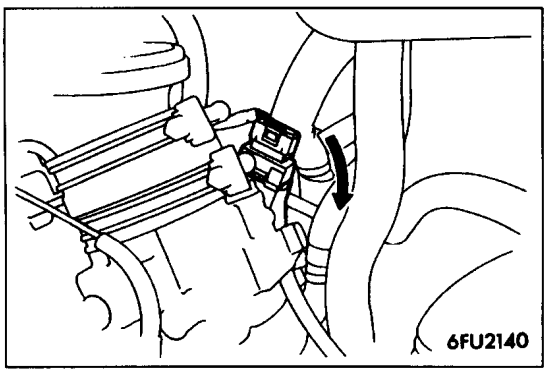
2. Insert a thickness gauge with the thickness indicated below between the fixed SAS and the throttle lever.

   Thickness gauge thickness: 0.45 mm

3. Turn the ignition switch to ON (without starting the engine).
4. Use a 4-mm Allen key to loosen the throttle position sensor mounting bolt.



5. Turn the throttle position sensor anticlockwise as far as it will go.
6. Check that the service data output for the idle position switch is ON.

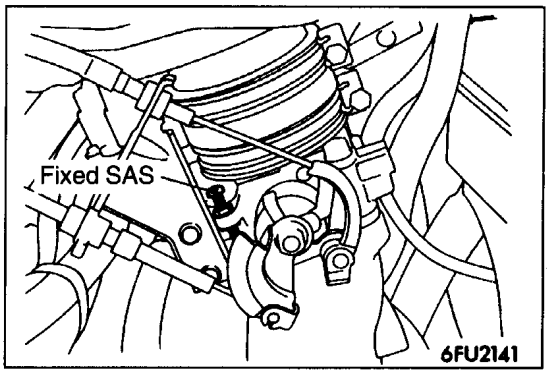


7. Slowly turn the throttle position sensor clockwise. Then find the point where the service data output for the idle position switch switches from ON to OFF.
   Use the 4-mm Allen key to tighten the throttle position sensor mounting bolt at this point.

8. Check the throttle position sensor output voltage.

   Standard value: 400–1,000 mV

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



FIXED SAS ADJUSTMENT 120002558

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

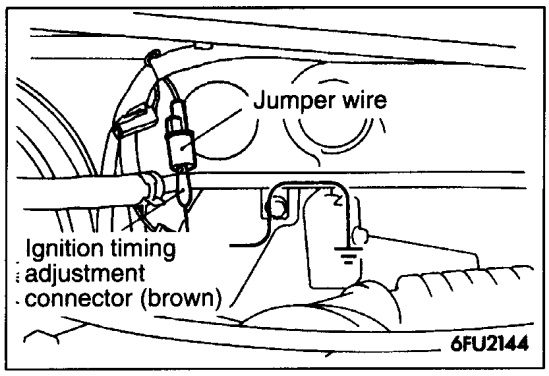
1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the fixed SAS lock nut.
3. Turn the fixed SAS counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point 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-79).

BASIC IDLE SPEED ADJUSTMENT 120002559

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. 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. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80–95°C
   - Lamps and accessories: OFF
   - Transmission: Neutral (A/T for P range)
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.

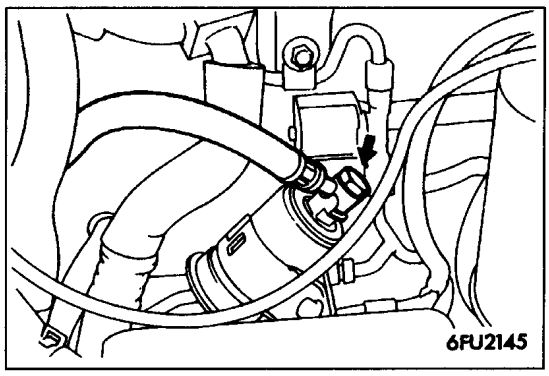
   Standard value: 750±50 r/min.

   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 rpm is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-79.)

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.

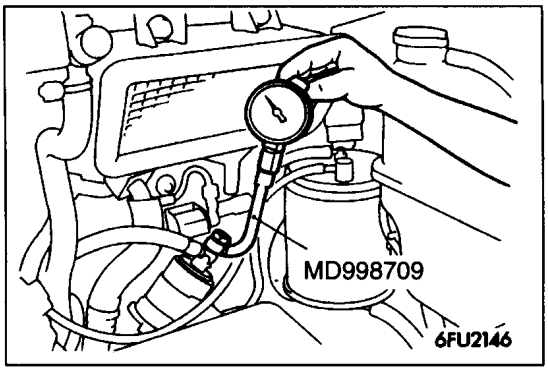
8. Turn the ignition switch to OFF.
9. Disconnect the jumper wire from the ignition timing adjustment terminal and return the connector to its original condition.
10. Start the engine again and let it run at idle speed for about 10 minutes; check to be sure that the idling condition is normal.



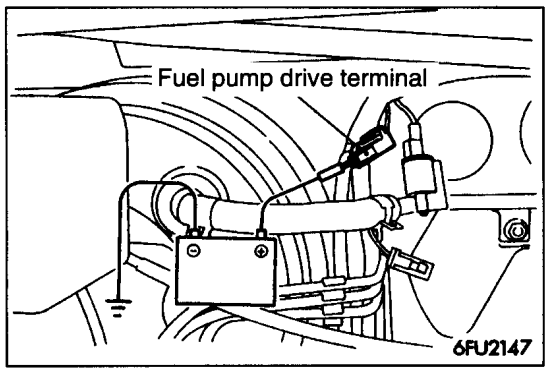
FUEL PRESSURE TEST 120002560

1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-86.)
2. While holding the fuel filter with a spanner, disconnect the high-pressure fuel hose and remove the eye bolt.

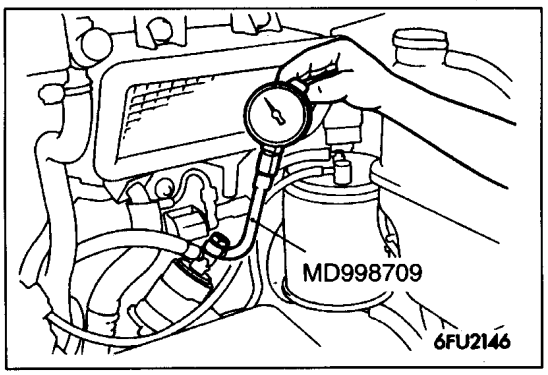
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



3. Install a fuel pressure gauge to the special tool. 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.
4. Connect the special tool which was installed in step 3. between the fuel filter and the high-pressure fuel hose.

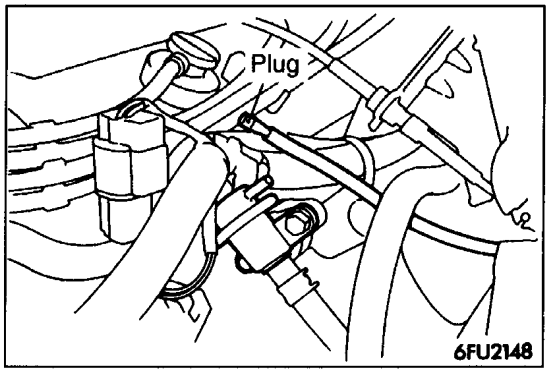


5. Connect the fuel pump drive terminal with the battery (+) terminal using a jumper wire and drive the fuel pump. Under fuel pressure, check the fuel pressure gauge and special tool connections for leaks.
6. Disconnect the jumper wire from the fuel pump drive terminal to stop the fuel pump.
7. Start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



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

Standard value:
Approx. 265 kPa at curb idle



9. Disconnect the vacuum hose (blue stripe) from the fuel pressure regulator and then measure the fuel pressure.

   NOTE
   Plug the vacuum hose or the air intake plenum nipple to prevent air from being drawn into the intake manifold.

   Standard value:
   Approx. 324–343 kPa at curb idle

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

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

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

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

13. Stop the engine and 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

14. Release residual pressure from the fuel pipe line. (Refer to P.13A-86.)
15. Remove the fuel pressure gauge and the special tool from the fuel filter.

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

16. Replace the gasket with a new one, connect the high-pressure fuel hose to the fuel filter, and then tighten the bolt to the specified torque.

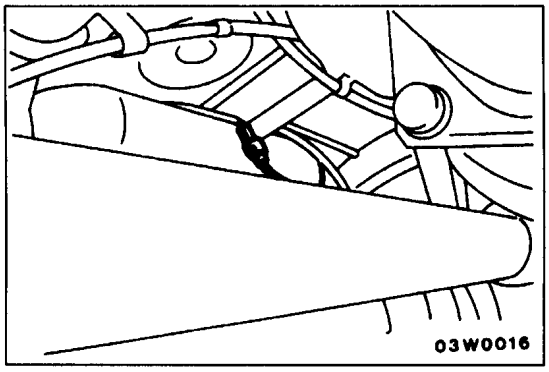
    Tightening torque: 29.4 Nm

17. 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.

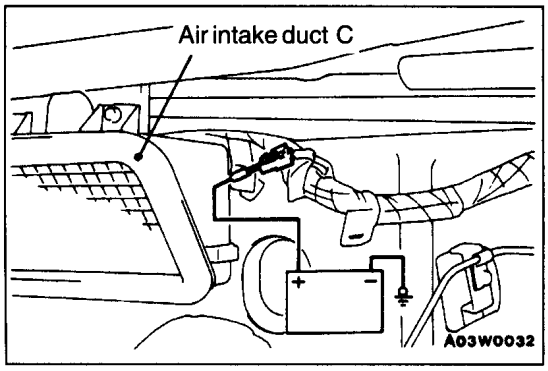
FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

120002062

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. Disconnect the fuel pump connector.
2. After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
3. Connect the fuel pump connector.



FUEL PUMP OPERATION CHECK

120002063

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 checking 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.

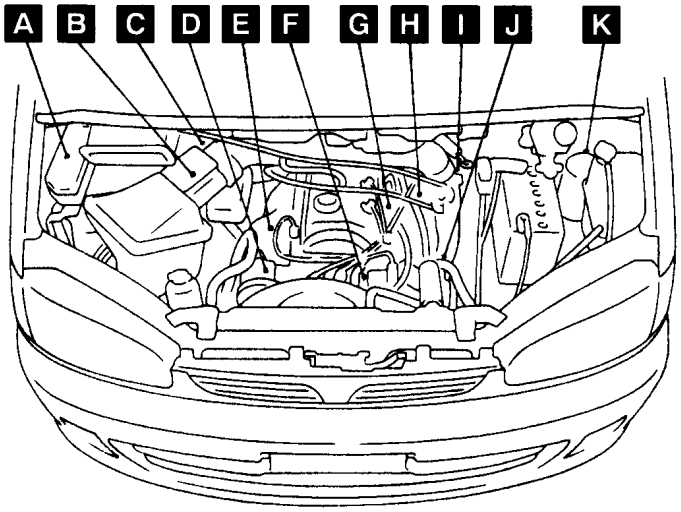
   (3) Check the fuel pressure by pinching the fuel hose with the fingertips.

ON-VEHICLE INSPECTION OF MPI COMPONENTS

120002561

COMPONENT LOCATION

Name	Symbol	Name	Symbol
A/C relay	A	Engine warning lamp (check engine lamp)	L
A/C switch	N	Idle speed control (ISC) servo	H
Air flow sensor (with incorporated intake air temperature sensor and barometric pressure sensor)	B	Ignition coil and power transistor unit	F
		Ignition timing adjustment connector	C
		Inhibitor switch	Q
Control relay	O	Injector	G
Diagnosis connector	M	Oxygen sensor	E
Distributor (with incorporated crank angle sensor and top dead centre sensor)	F	Power steering fluid pressure switch	D
		Purge control solenoid valve	K
EGR control solenoid valve	K	Throttle position sensor (with idle position switch)	I
Engine coolant temperature sensor	J		
Engine ECU	P	Vehicle speed sensor	R



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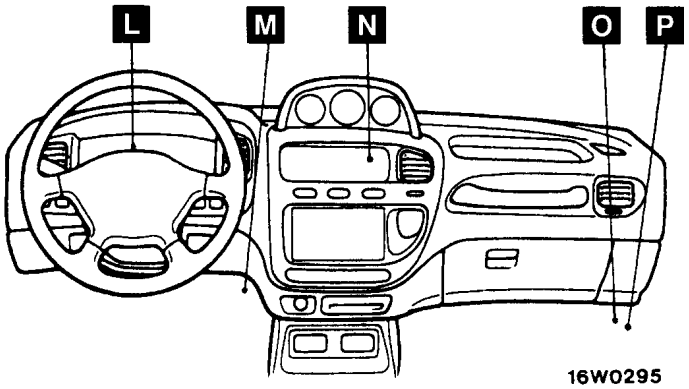

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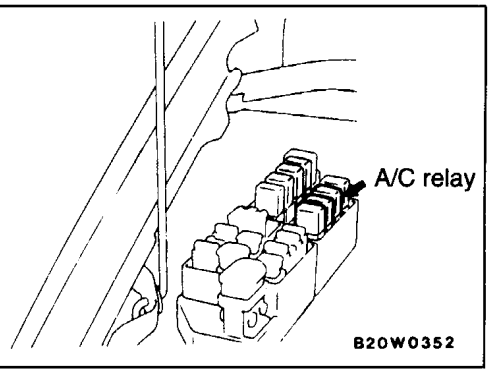
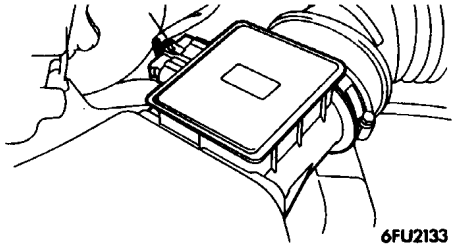


B

Air flow sensor (with incorporated intake air temperature sensor and barometric pressure sensor)



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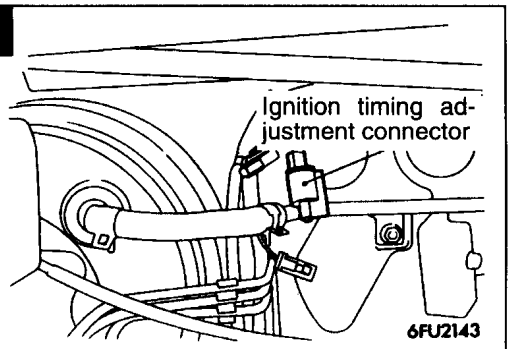

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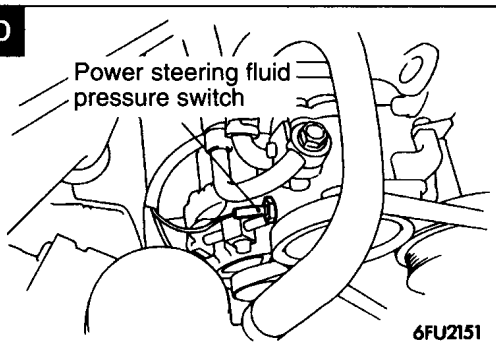

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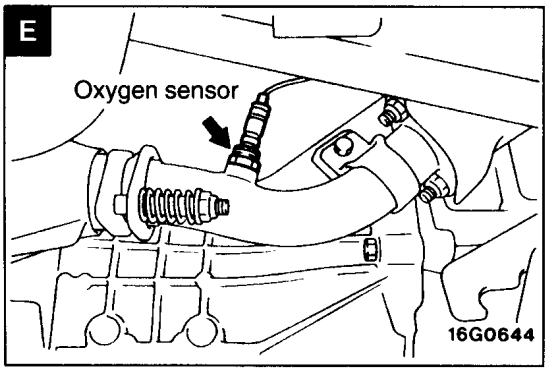

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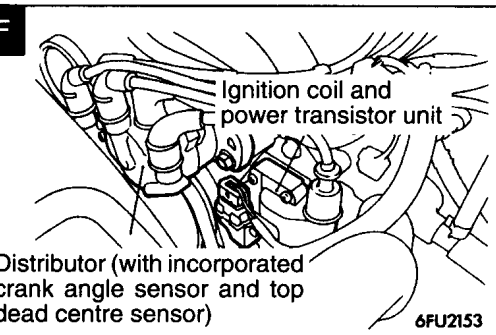

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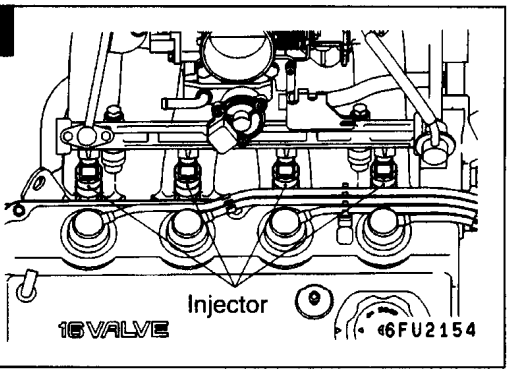

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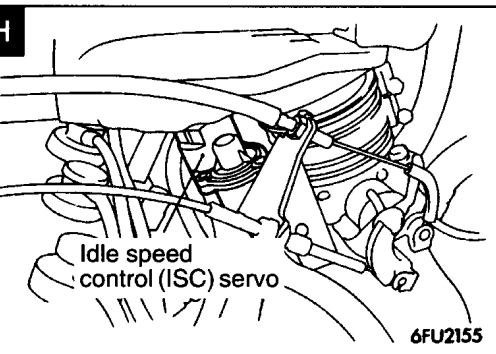

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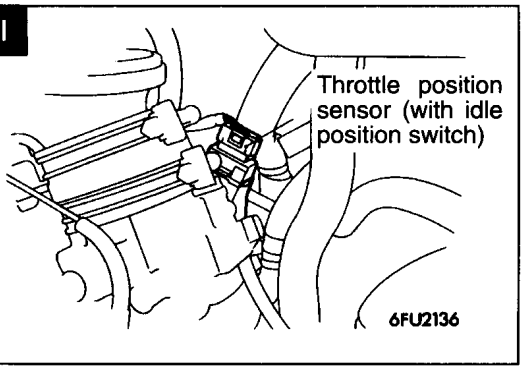

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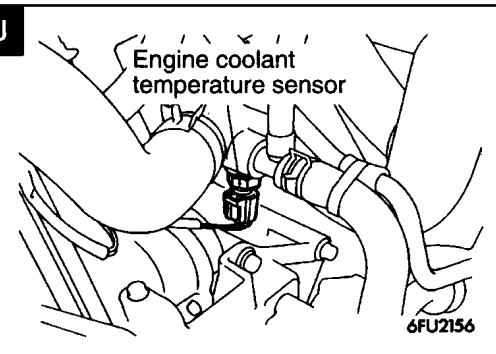

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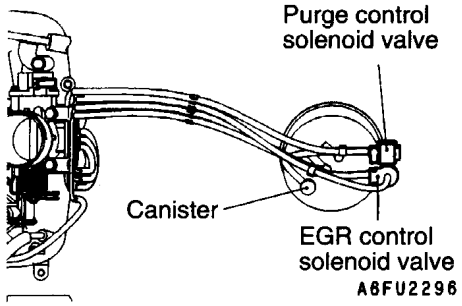

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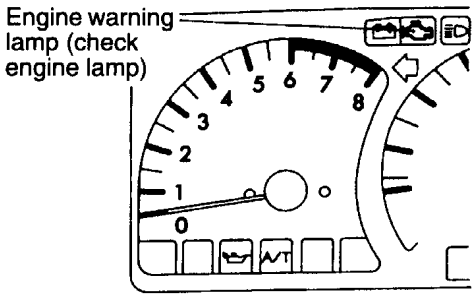

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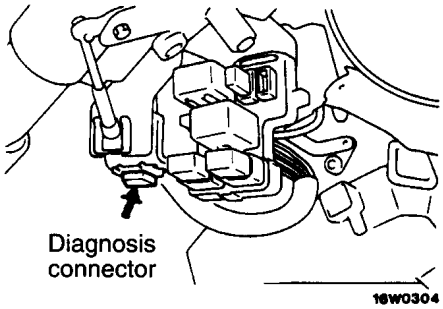

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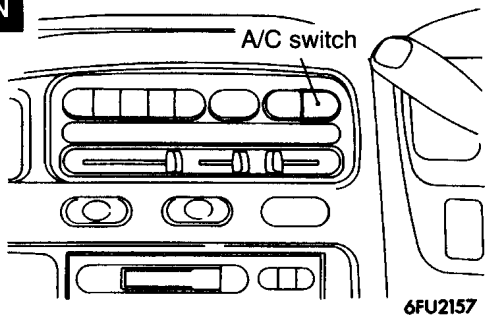

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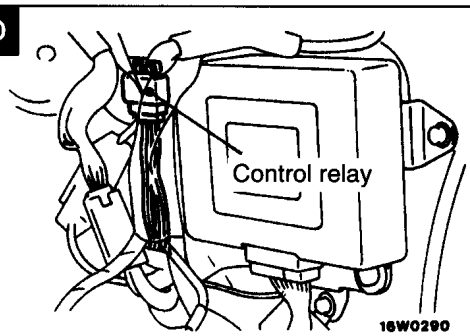

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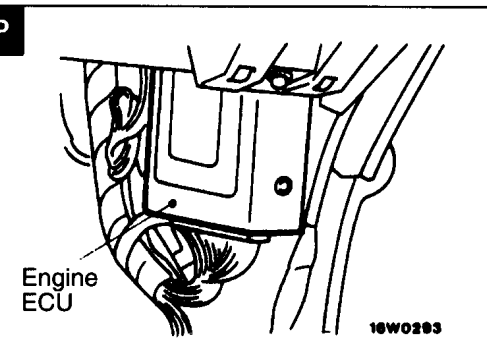

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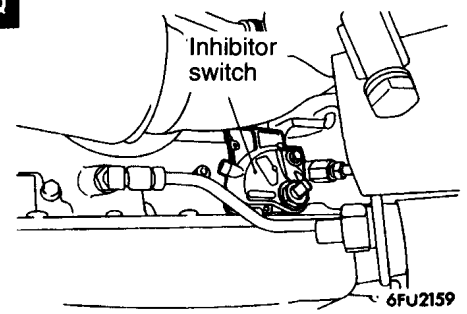

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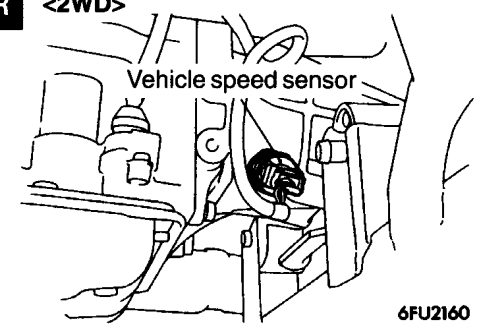

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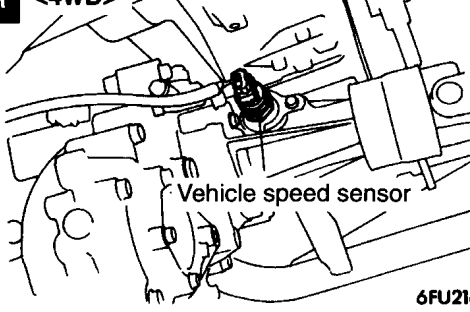
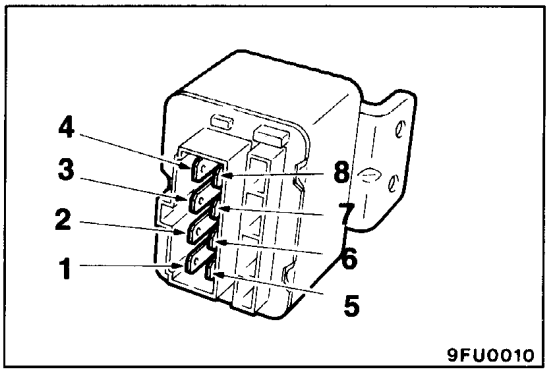
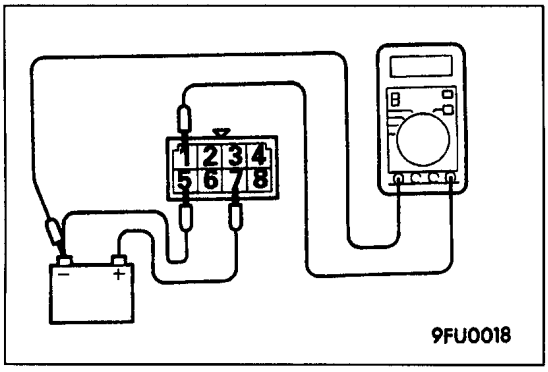




CONTROL RELAY INSPECTION 120002065

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

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

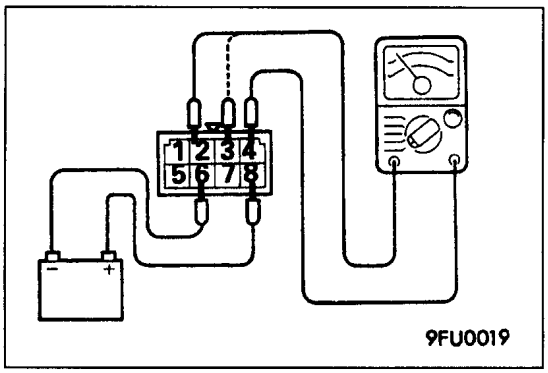


3. Use jumper leads to connect control relay terminal 7 to the battery (+) terminal and terminal 5 to the battery (–) terminal.

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

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

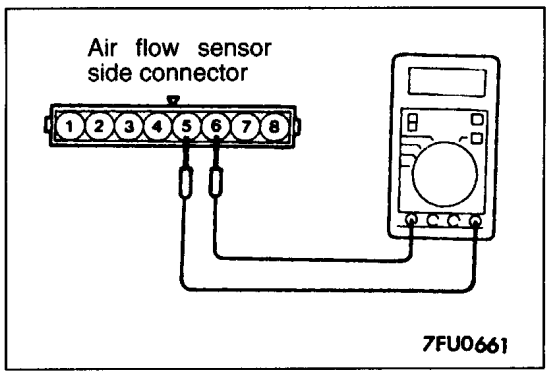
Jumper lead	Voltage at terminal 1
Connected	S V
Disconnected	0 V



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

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

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

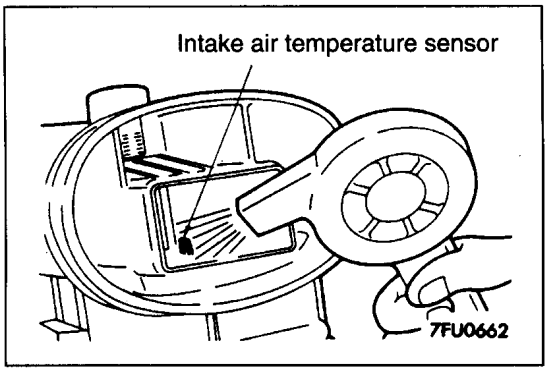


INTAKE AIR TEMPERATURE SENSOR INSPECTION

120002066

1. Disconnect the air flow sensor connectors.
2. Measure resistance between terminals 4 and 6.

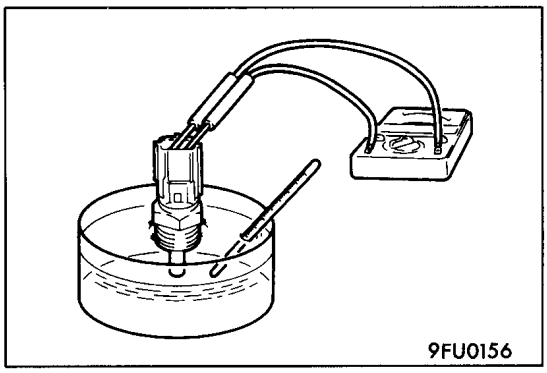
   Standard value: 2.3–3.0 kΩ <at 20°C>
   0.30–0.42 kΩ <at 80°C>



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

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 INSPECTION

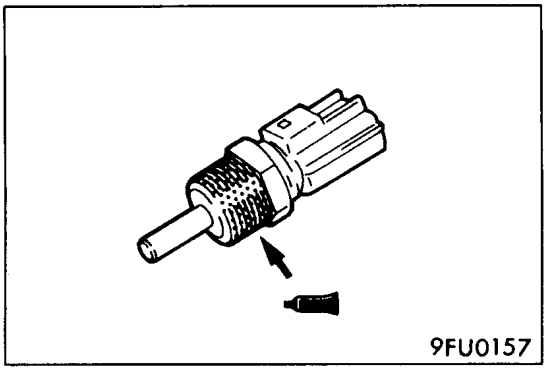
120002562

Caution
Don't touch the connector (resin section) with the tool when removing and installing.

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

   Standard value: 2.1–2.7 kΩ <at 20°C>
   0.26–0.36 kΩ <at 80°C>

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



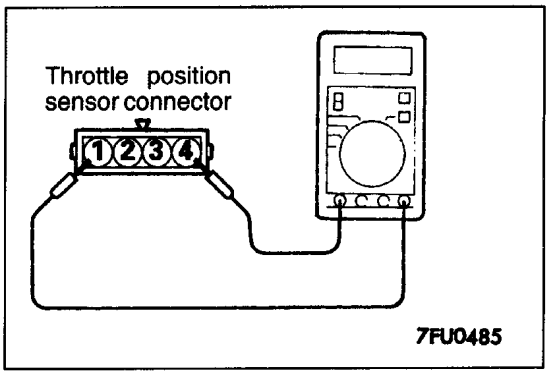
4. Apply sealant to threaded portion.

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

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

   Sensor tightening torque: 30 Nm

6. Fasten harness connectors securely.

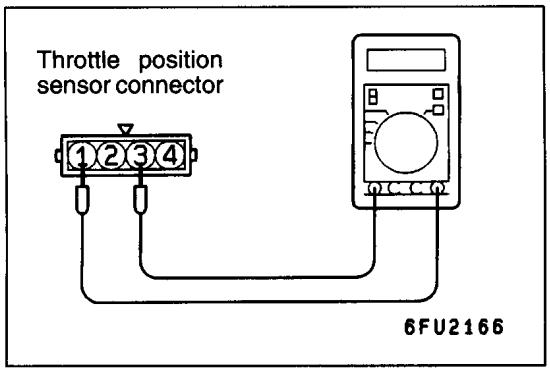


THROTTLE POSITION SENSOR INSPECTION

120002563

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

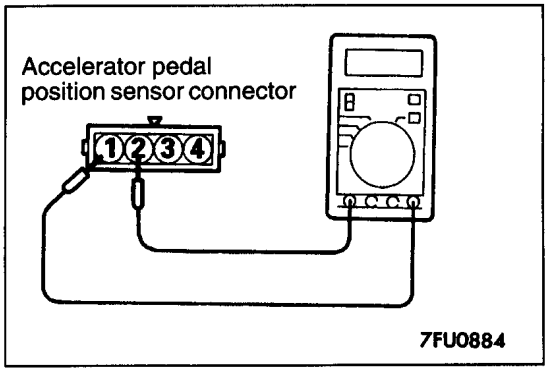


3. Measure the resistance between the throttle position sensor side connector terminal 1 and terminal 3.

Throttle valve slowly open until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

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

   NOTE
   For the throttle position sensor adjustment procedure, refer to P.13A-79.



IDLE POSITION SWITCH INSPECTION

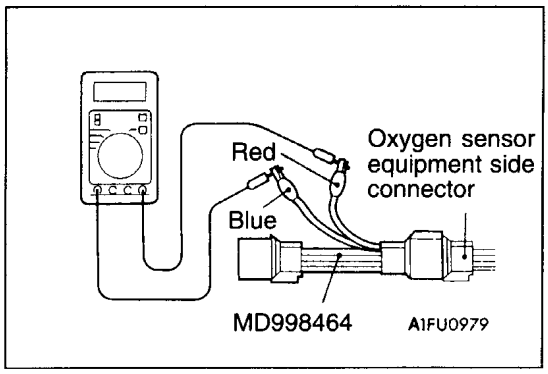
120002564

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

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

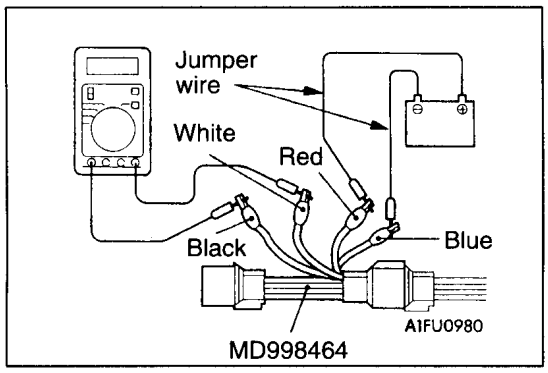
3. If out of specification, replace the throttle position sensor.

   NOTE
   After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P.13A-79.)



OXYGEN SENSOR INSPECTION 120002565

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 wires 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 wires; incorrect connection can damage the oxygen sensor.

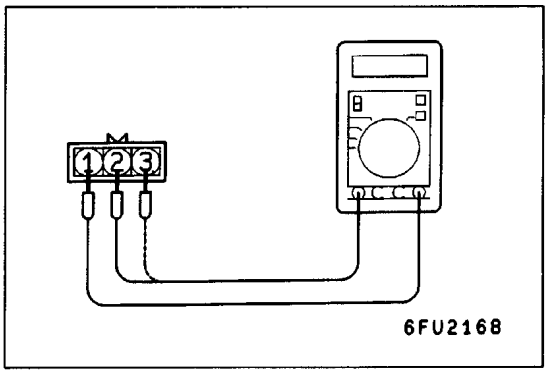
6. Connect a digital voltage meter between terminal 2 (black clip) and terminal 4 (white clip).
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

   Standard value:

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

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

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



INJECTOR INSPECTION

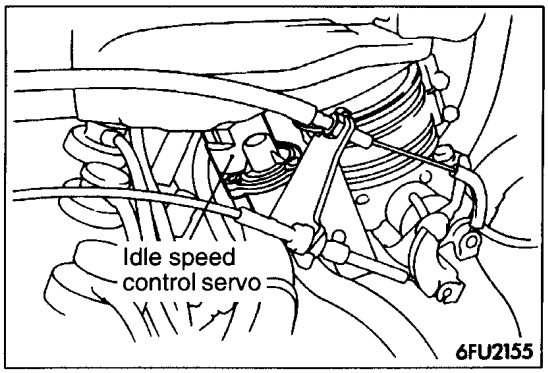
120002566

Measurement of Resistance Between Terminals

1. Disconnect the injector intermediate harness connectors.
2. Measure the resistance between terminals.

Standard value: 6.5–8.0 Ω (at 20°C)

Injector	Measurement terminal
No. 1 cylinder and No. 3 cylinder	1–2
No. 2 cylinder and No. 4 cylinder	1–3

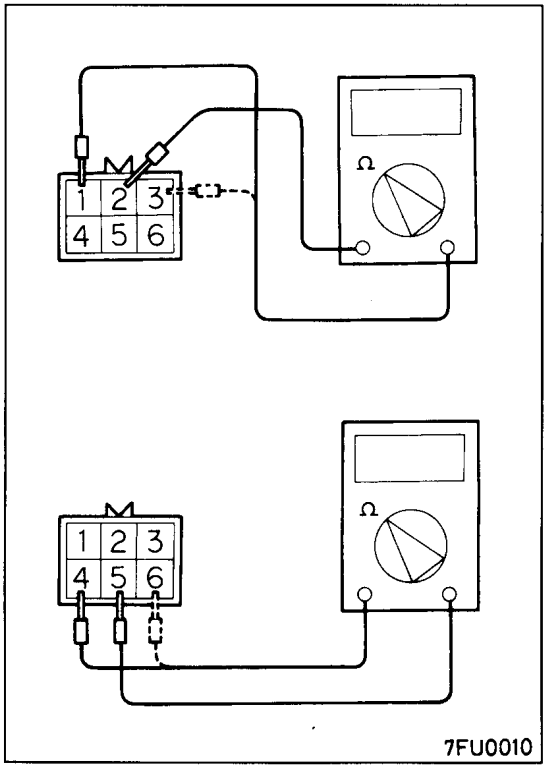


IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR) INSPECTION 120002567

Checking the Operation Sound

1. Check to be sure 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 INSPECTION 120002568

Refer to GROUP 17 – Evaporative Emission Control System.

EGR CONTROL SOLENOID VALVE INSPECTION 120002569

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

INJECTOR

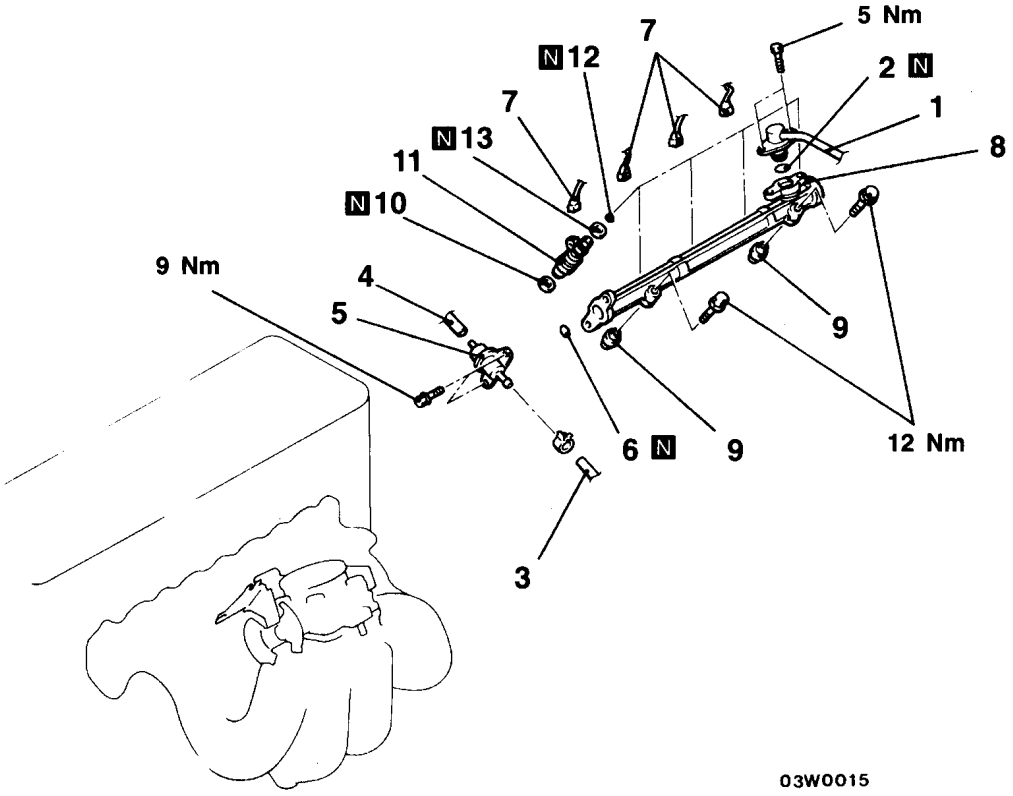
120002249

REMOVAL AND INSTALLATION

<4G64>

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-86.)

Post-installation Operation
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
- Fuel Leakage Inspection



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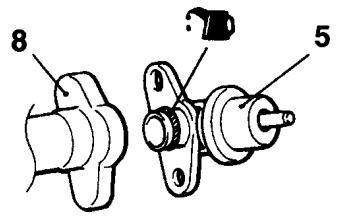

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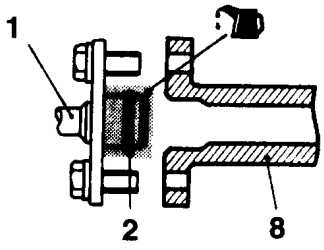

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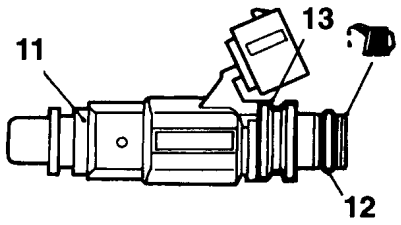


03W0026

Engine oil

Removal steps

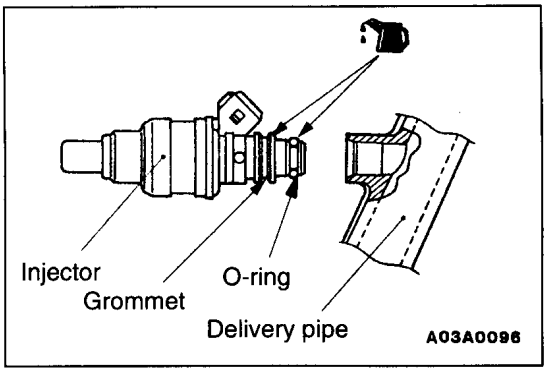
1. Fuel pressure hose connection
2. O-ring
3. Fuel return hose connection
4. Vacuum hose connection
▶B◀ 5. Fuel pressure regulator
6. O-ring
◀A▶ 7. Injector connectors
8. Delivery pipe
9. Insulators
10. Insulators
▶A◀ 11. Injectors
12. O-rings
13. Grommets

REMOVAL SERVICE POINT

◀A▶ DELIVERY PIPE 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.



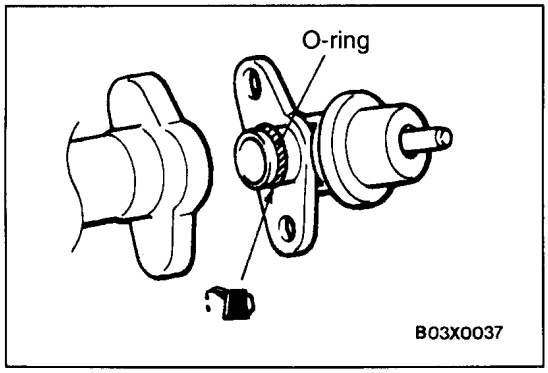
INSTALLATION SERVICE POINTS

▶A◀ INJECTOR INSTALLATION

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

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

(2) While turning the injector 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 injector and then re-insert it into the delivery pipe and check once again.



▶B◀ FUEL PRESSURE REGULATOR INSTALLATION

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

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

(2) Check to be sure that the fuel pressure regulator turns smoothly.
If it does not turn smoothly, the O-ring may be trapped, remove the fuel pressure regulator and then re-insert it into the delivery pipe and check once again.
(3) Tighten the bolts to the specified torque.

Specified tightening torque : 9 Nm

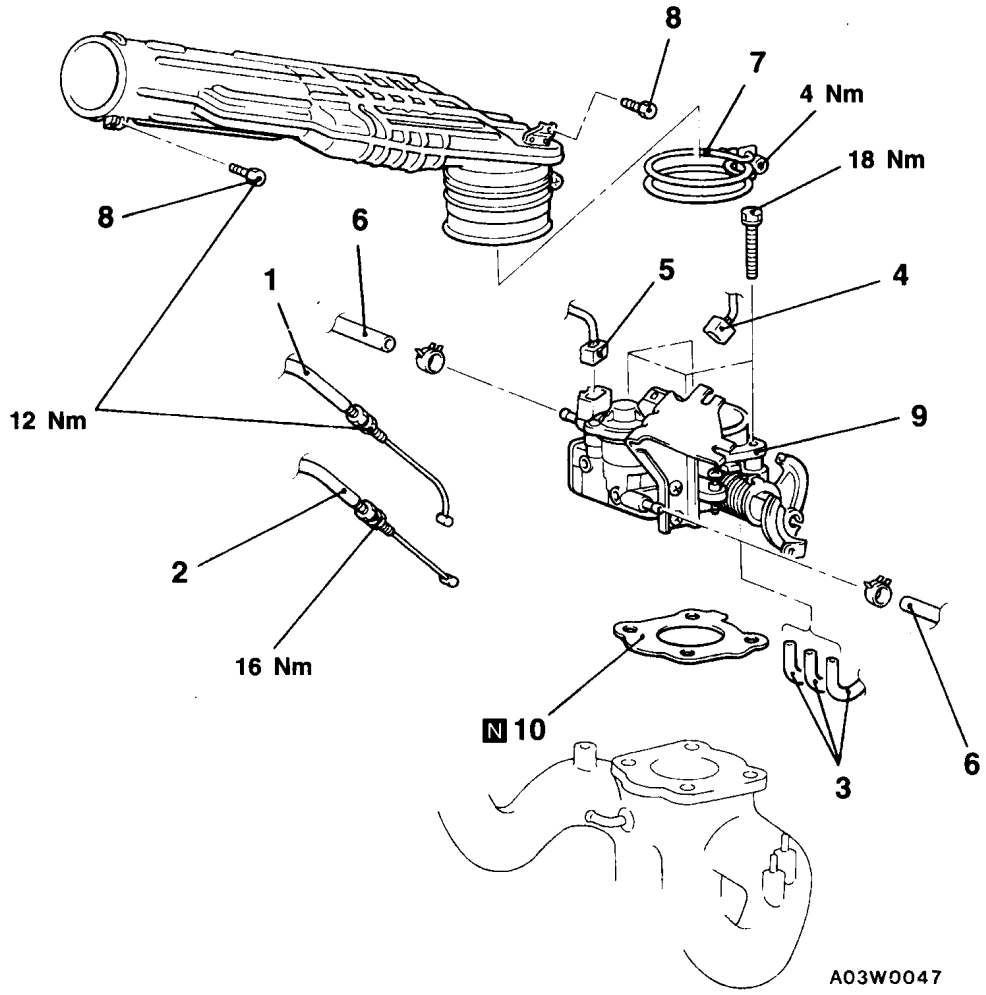
THROTTLE BODY

120002250

REMOVAL AND INSTALLATION

Pre-removal Operation
- Engine Coolant Draining

Post-installation Operation
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
- Throttle Cable Adjustment (Refer to GROUP 23 – Service Adjustment Procedures.)
- Engine Coolant Supplying



Removal steps

1. Accelerator cable connection
2. Throttle cable connection <A/T>
3. Vacuum hose connection
4. Throttle position sensor connector
5. Idle speed control motor connector
6. Water hose connection
7. Hose clamp
8. Resonance tank mounting bolts
9. Throttle body
10. Gasket

ELECTRONIC CONTROLLED CARBURETTOR

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120002573

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CARBURETTOR 23

GENERAL INFORMATION

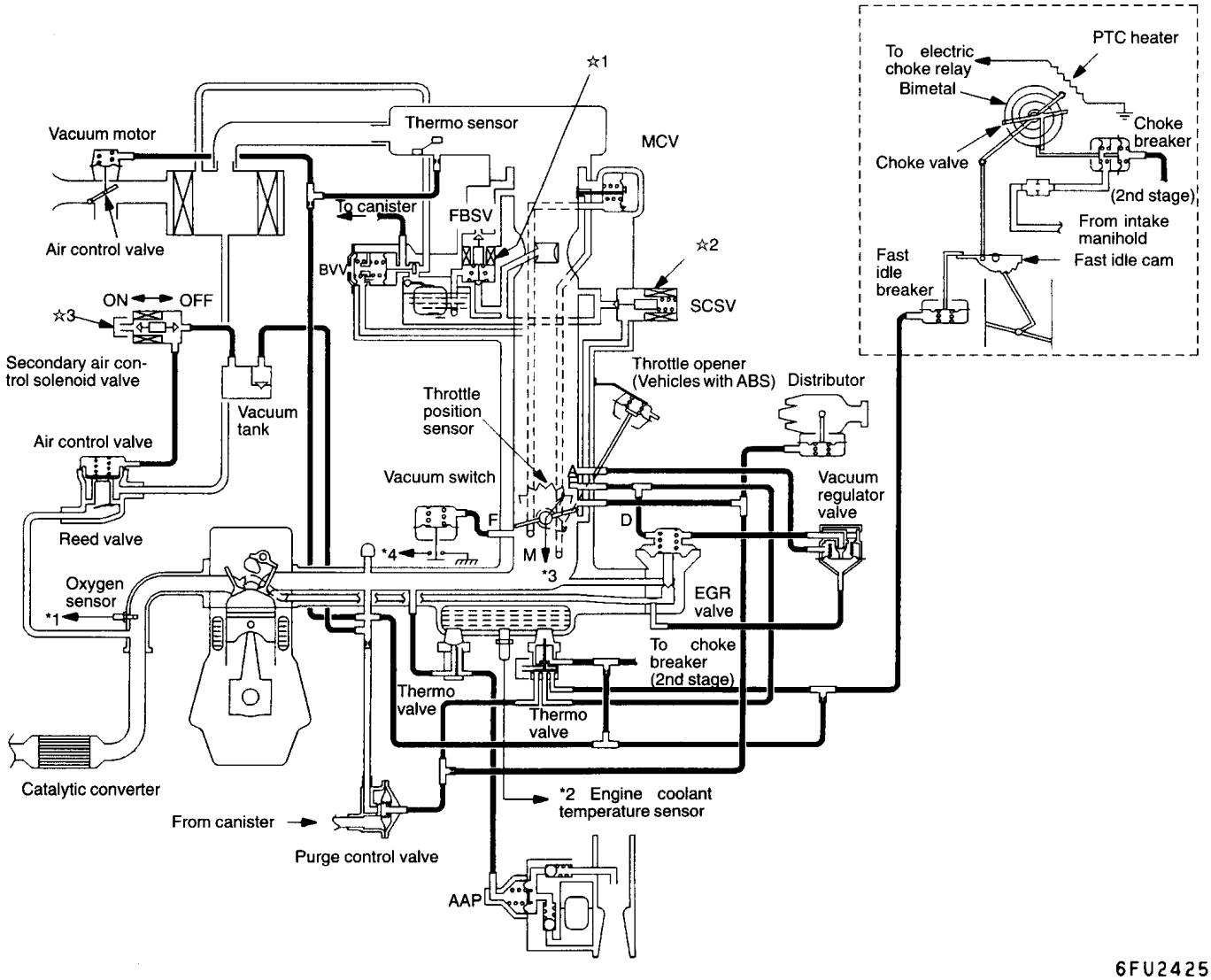
120001282

The fuel system consists of components such as an electronically-controlled 2-barrel down-draft carburettor, an electric fuel pump and a fuel vapour separator tank. After the fuel is drawn out of the fuel tank and filtered by the fuel filter, it is sent to the carburettor. In addition, surplus fuel is returned to the fuel tank via the accelerator pump of the carburettor.

SYSTEM DIAGRAM

120002574

*1 Oxygen sensor *2 Engine coolant temperature sensor *3 Throttle position sensor *4 Vacuum switch	• Power supply • Engine speed sensor	⇨	Engine ECU	⇨	☆1Feedback solenoid valve (FBSV) ☆2Slow cut solenoid valve (SCSV) ☆3Secondary air control solenoid valve	• Electric choke relay



6FU2425

NOTE
AAP: Auxiliary accelerator pump
ABS: Anti-skid braking system
BVV: Bowl vent valve
MCV: Mixture control valve
PTC heater: Positive temperature coefficent heater

GENERAL SPECIFICATIONS

120002575

Items		Specifications
Carburettor	Type	Down-draft, 2-barrel, feedback type
	Choke type	Automatic (electric type)
	Choke breaker	Equipped (2-stage)
	Fast idle breaker	Equipped
	Electric choke heater	PTC heater
	Throttle bore (primary/secondary) mm	32/35
	Feedback solenoid valve (FBSV)	Duty cycle solenoid
	Slow cut solenoid valve (SCSV)	Duty cycle solenoid
	Throttle position sensor (TPS)	Variable resistor type
	Bowl vent valve (BVV)	Vacuum type
	Mixture control valve (MCV)	Vacuum type
Engine ECU	Identification model No.	E2T57771
Input sensor	Engine coolant temperature sensor	Thermistor type
	Oxygen sensor	Zirconia sensor
	Vacuum switch	Contact type switch
Output actuator	Secondary air control solenoid valve	ON-OFF type solenoid valve

SERVICE SPECIFICATIONS

120001285

Items		Standard value
Throttle position sensor adjusting voltage mV		230–270
Throttle position sensor resistance kΩ		3.5–6.5
Electric choke heater		Should be conductive (approx. 6Ω at 20°C)
Choke breaker opening mm	1st stage	1.9–2.1
	2nd stage	2.9–3.1
Fast idle (at no load, after warm up, 2nd stage) r/min.		2,300–2,700
Feedback solenoid valve coil resistance Ω		54–66 (at 20°C)
Slow cut solenoid valve coil resistance Ω		48–60 (at 20°C)
Engine coolant temperature sensor resistance kΩ	at 20°C	2.1–2.7
	at 80°C	0.26–0.36
Oxygen sensor output voltage V		0.6–1.0

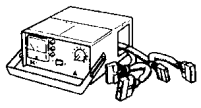
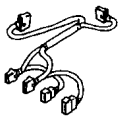
SEALANT

120001286

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

SPECIAL TOOLS

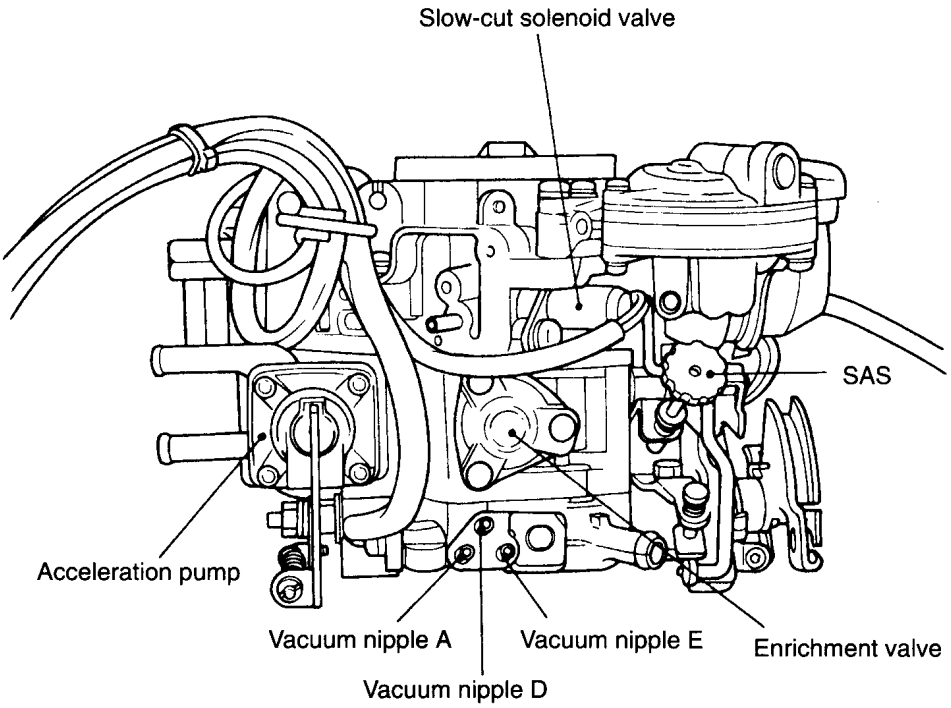
120001287

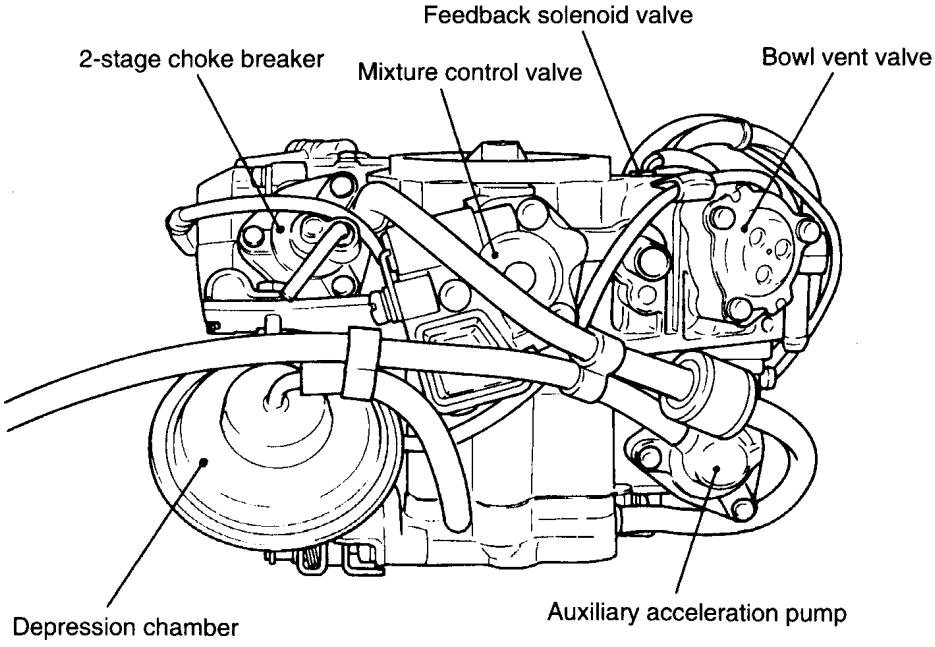
Tool	Number	Name	Use
	MD998404	ECI checker	Electronic controlled carburettor system inspection
	MD998475	Test harness	
	MD998478	Test harness (3P, triangle)	Adjustment of throttle position sensor

SERVICE ADJUSTMENT PROCEDURES

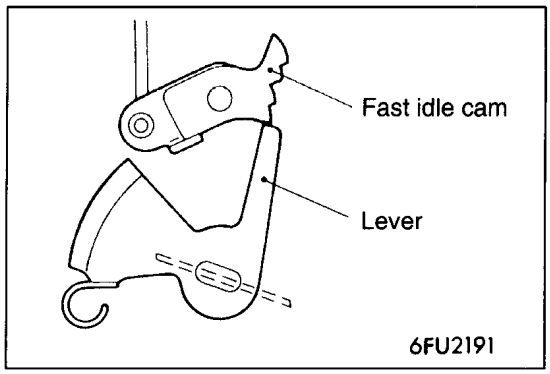
120002576

CARBURETTOR APPEARANCE





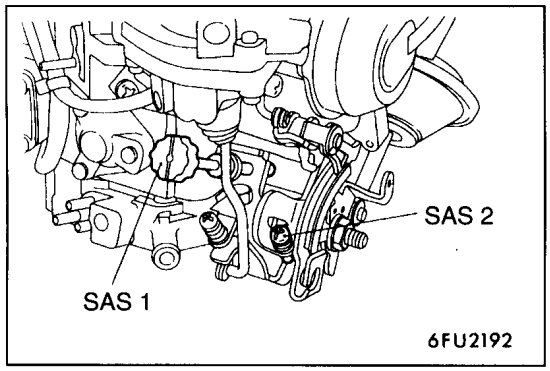
6FU2426



THROTTLE POSITION SENSOR (TPS) ADJUSTMENT

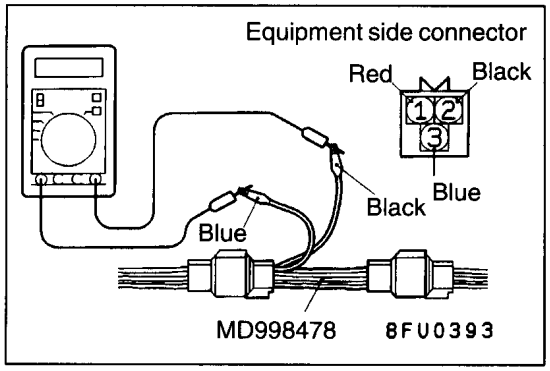
120001289

1. Check that the fast idle has been released. (Set so that the fast idle lever is not resting on the fast idle cam.)
2. Remove the air horn.
3. Loosen the accelerator cable tension sufficiently.



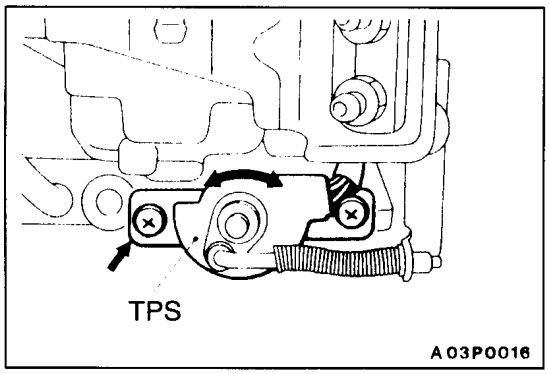
4. After backing out the speed adjusting screw 1 (SAS 1) sufficiently, check that the throttle valve is fully closed.
5. If the throttle valve is not fully closed, back out the speed adjusting screw 2 (SAS 2) sufficiently to securely set the throttle valve to the fully closed position.

   NOTE
   At this time, make a note of how many turns the screws were backed out.

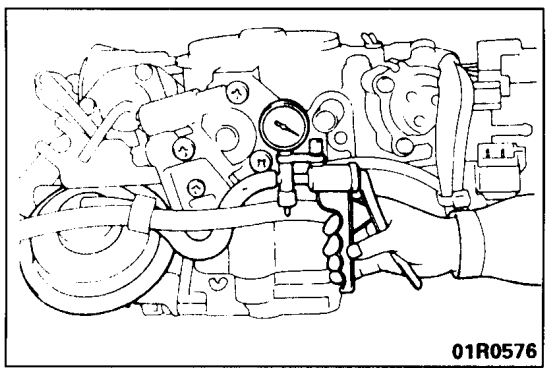


6. Disconnect the throttle position sensor connector and connect the special tool (test harness) between the disconnected connector.
7. Connect a digital type voltmeter between the throttle position sensor terminal 3 (blue clip: sensor output) and terminal 2 (black clip: sensor earth).
8. Turn the ignition switch to "ON". (Do not start the engine.)
9. Inspect the throttle position sensor output voltage.

   Standard value: 230–270 mV



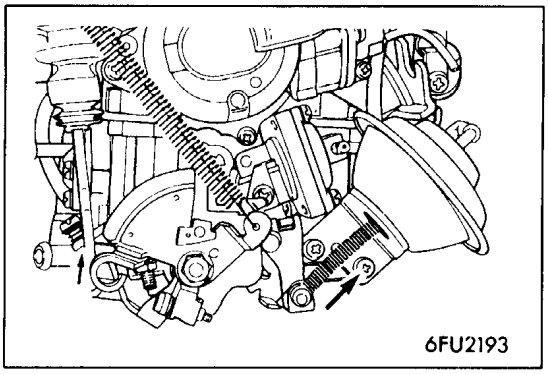
10. If the voltage is outside the standard value, adjust by loosening the throttle position sensor mounting screws and turning the throttle position sensor body. After adjusting, securely tighten the screws.
11. Turn the ignition switch to "OFF".
12. Turn in the screws that were backed out in step 5 until they are at their original positions.
13. Adjust the accelerator cable tension.
14. Adjust the idle speed.



CARBURETTOR SECONDARY VALVE OPERATION INSPECTION

120001290

1. Disconnect the vacuum hose from the depression chamber and connect a hand vacuum pump to the depression chamber.

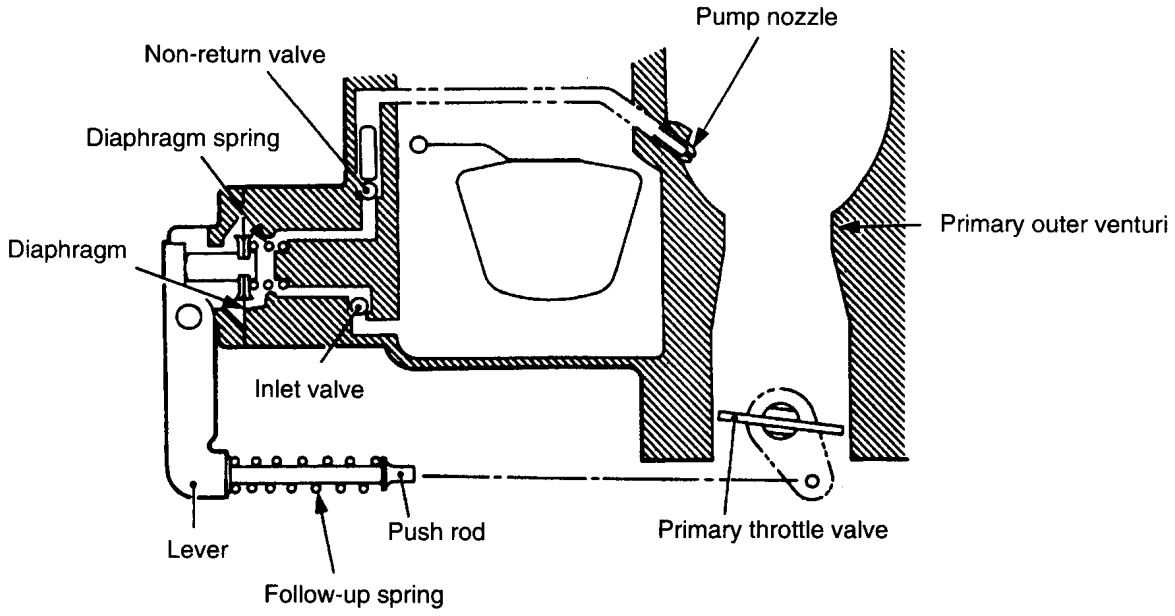


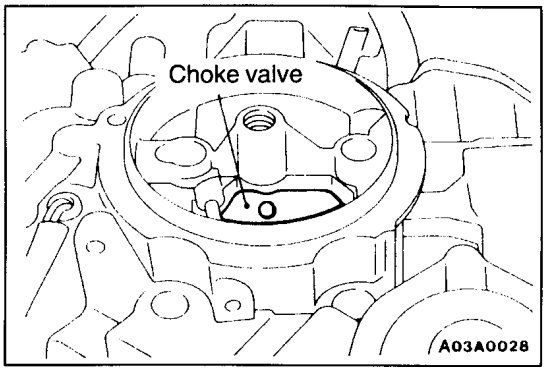
2. Apply 13 kPa of vacuum, and check to be sure that the vacuum is maintained.
3. When the primary throttle valve is fully opened with the vacuum applied, check to be sure that the secondary throttle valve fully opens.
4. If the secondary throttle valve does not fully open, clean surroundings of the secondary throttle valve.

CARBURETTOR ACCELERATION PUMP INSPECTION

120001291

1. Remove the air horn.
2. With the choke valve in the fully open position, check to be sure that fuel is injected strongly from the pump nozzle when the throttle valve is quickly opened.
3. If the fuel injection is weak, clean the fuel passage of the carburettor.
   NOTE
   If the acceleration pump is defective, this will cause acceleration to be defective.





CHOKE VALVE INSPECTION

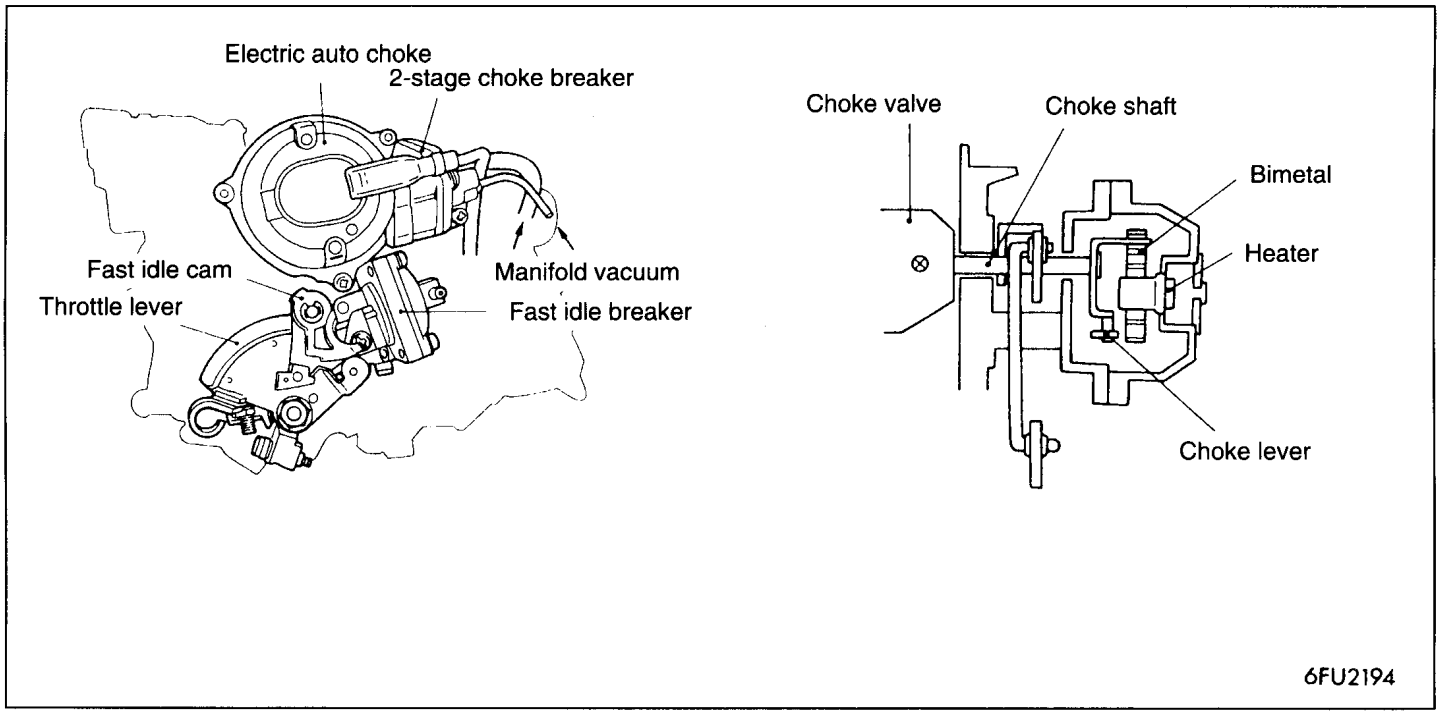
120001292

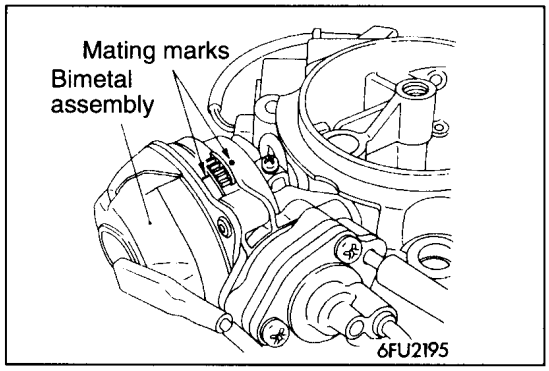
1. Remove the air horn.
2. Move the choke valve with a finger to check that the valve moves smoothly without excessive looseness.

If the valve is excessively loose.	Replace the float chamber cover assembly.
If the valve is stuck.	Clean the choke valve and the area around it, and apply a small amount of oil to the choke shaft.

ELECTRIC AUTO CHOKE INSPECTION

120001293





1. Check the mating marks on the electric auto choke body and bimetal assembly to make sure they are matched. If they are not matched, match them.

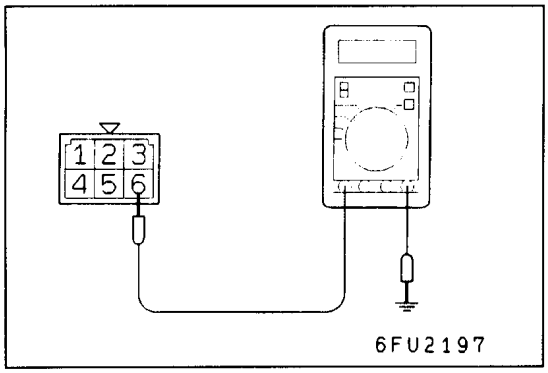
   NOTE
   1. For information concerning the disassembly and reassembly of the bimetal assembly, refer to the Engine Workshop Manual.
   2. Likely symptoms of mating mark deviation.

Mating mark	Symptom
Deviates to the right (clockwise)	Startability is good but plugs become sooty easily
Deviates to the left (counterclockwise)	Startability is poor and the engine stalls easily

2. Check if the engine coolant temperature is 30°C or lower.
3. After starting the engine, check the operation of the choke valve and the fast idle cam while holding onto the electric auto choke body.

Electric auto choke body	Gets hot gradually after the engine is started.
Choke valve	Opens as the temperature of the bimetal assembly rises
Fast idle cam	The fast idle breaker operates when the engine coolant becomes hot, cancelling fast idle

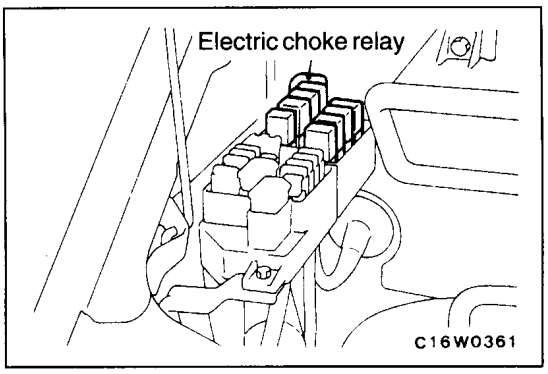
4. If the electric auto choke body does not become hot after the engine is started, check the electric choke.



ELECTRIC CHOKE HEATER INSPECTION 120001294

1. Disconnect the solenoid valve connector.
2. Check that there is continuity between terminal (6) (heater power supply) of the electric choke heater connector and the carburettor float chamber cover (earth).

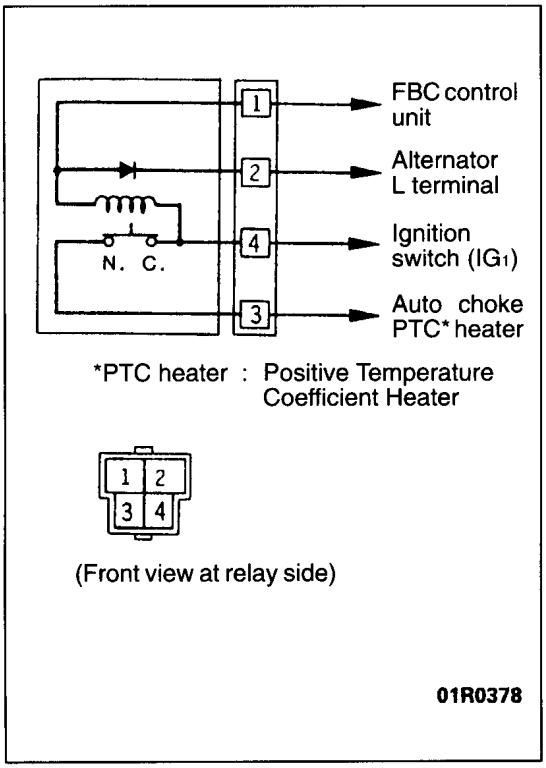
   Normal state: Should be conductive (approx. 6Ω at 20°C)
3. If the heater is not conductive, replace the electric choke body (bimetal assembly).



ELECTRIC CHOKE RELAY INSPECTION 120002577

1. Remove the electric choke relay.
2. Check the continuity between the terminals when current is flowing through the relay coil and when current is not flowing.

Item	Measurement terminals	Continuity
When current is not flowing	Between (1) – (2)	Continuity (0 Ω)
	Between (1) – (2)	No continuity (∞ Ω)
	Between (1) – (4)	Continuity (Approx. 100 Ω)
	Between (3) – (4)	Continuity (0 Ω)
When current is flowing	Between (3) – (4)	No continuity (∞ Ω)



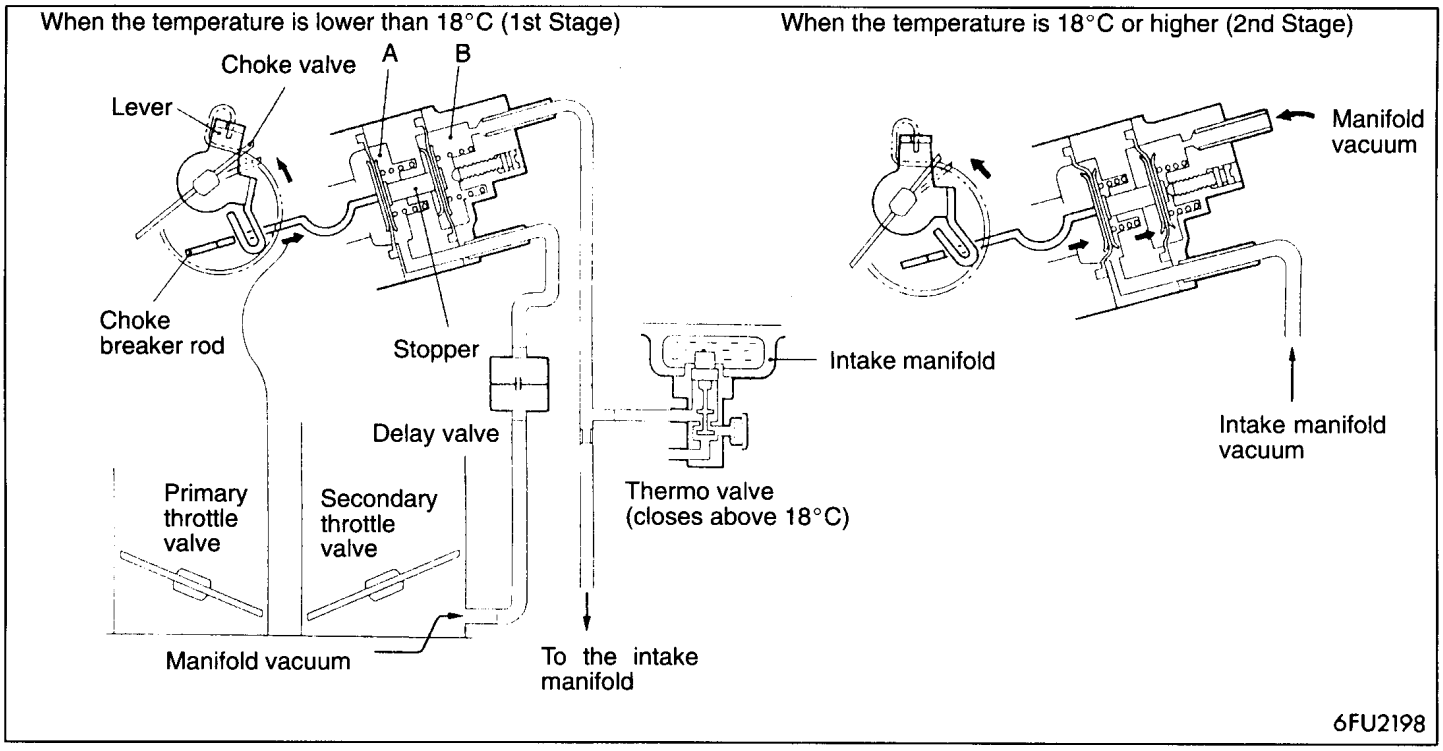
NOTE
1. → indicates the direction of current flow.
2. Make sure that the polarity of the ohmmeter is correct. To energize the relay coil, apply battery voltage directly between terminals (1) and (4).

   Caution
   When applying voltage from the battery, be careful not to apply to the wrong terminals, otherwise the relay will be damaged.
3. If there is a malfunction, replace the electric choke relay.

NOTE
If the body of the automatic choke does not become warm after starting the engine even though the automatic choke heater (PTC heater) and the electric choke relay are normal, check the body harness circuit.

CHOKE BREAKER SYSTEM INSPECTION

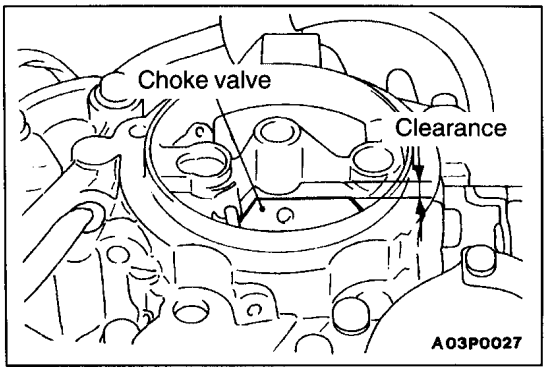
120001296



1. Remove the air horn.
2. Check conditions of the choke valve according to the procedures given the table below.

Procedure	Inspection conditions	Normal choke valve condition	Probable cause of abnormality
1	• Before starting the engine • Engine coolant temperature: Lower than 10°C	Fully closed	• Malfunction of bimetal assembly • Malfunction of link
2	• After starting the engine • Engine coolant temperature: Lower than 10°C	Slightly open (clearance approx. 2.0 mm)	• Blocked delay valve • Broken diaphragm (chamber A)
3	• Engine: Idling • Vacuum hose (red stripe) disconnected from choke breaker • Engine coolant temperature: Lower than 10°C	Not operating	• Malfunction of thermo valve
4	• Engine: Idling • Vacuum hose (red stripe) connected to choke breaker • Engine coolant temperature: Higher than 25°C	When the choke valve is lightly closed with a finger, the valve is opened further from the position in procedure 2 (clearance approx. 3.0 mm)	• Malfunction of thermo valve • Broken diaphragm (chamber A)

NOTE
For the inspection of thermo valve, refer to GROUP 17 – Service Adjustment Procedures.

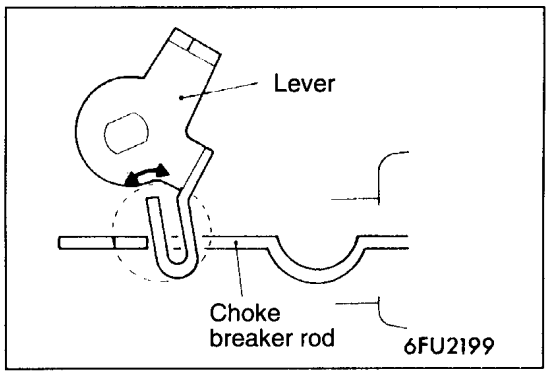


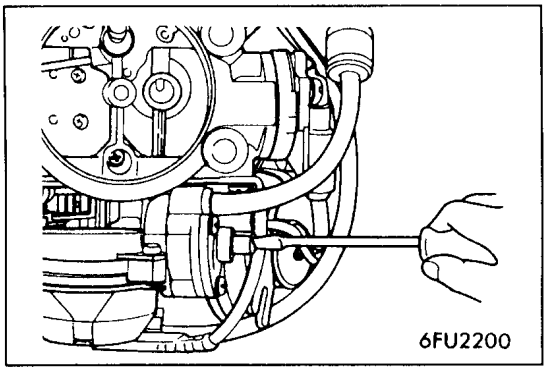
CHOKE BREAKER OPENING INSPECTION AND ADJUSTMENT

120001297

NOTE
After inspection of the choke breaker system.

1. Disconnect the vacuum hose (red stripe) from the choke breaker.
2. With the engine idling, close the choke valve lightly with a finger until the choke valve stops. Then, measure the choke valve to choke bore clearance.
   Standard value: 1.9–2.1 mm





3. If the clearance is not as specified, stop the engine, remove the bimetal assembly and adjust the rod end opening for standard clearance.

   Caution
   When removing the bimetal assembly, put a mark on the electric choke body.

   NOTE
   For information concerning the disassembly and reassembly of the bimetal assembly, refer to the Engine Workshop Manual.

4. Connect the vacuum hose (red stripe) which was disconnected in step 1. above.
5. Measure the clearance between the choke valve and the choke bore by the same procedure as in step 2.

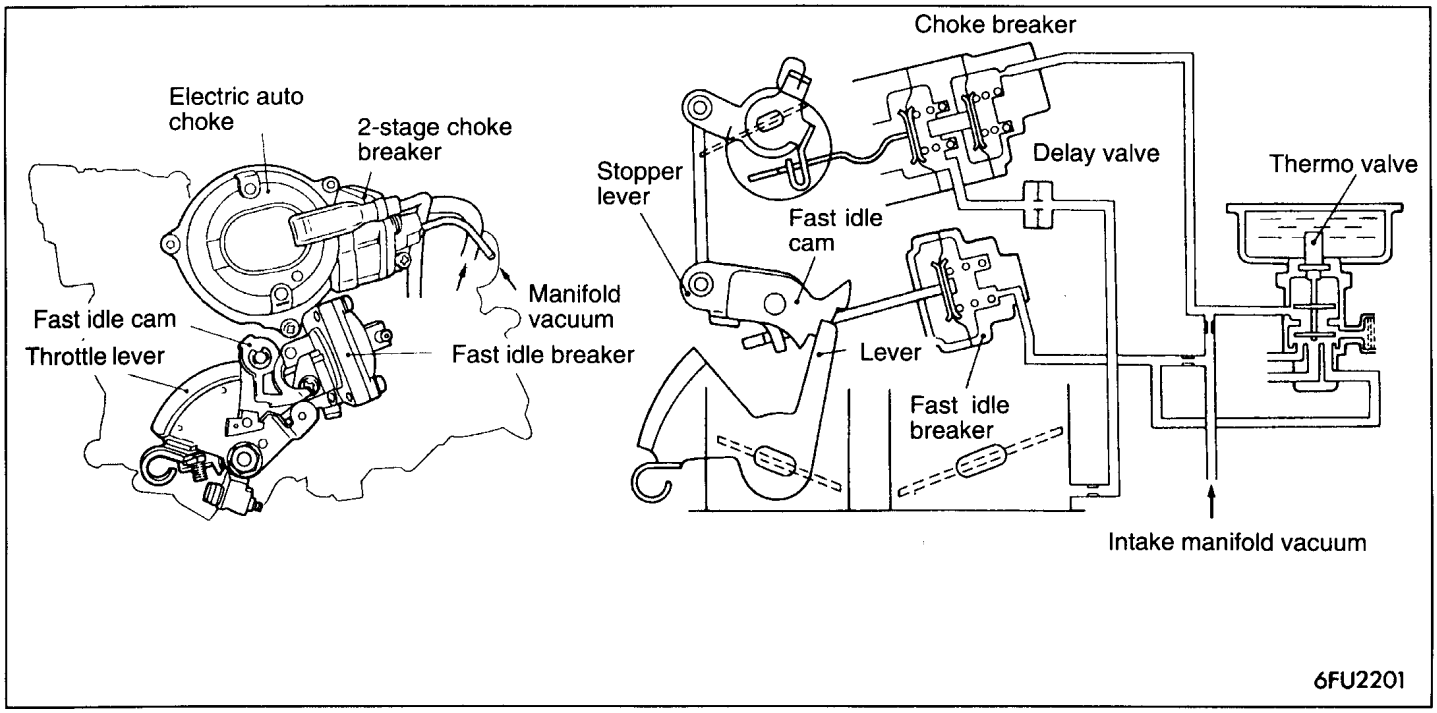
   Standard value: 2.9–3.1 mm

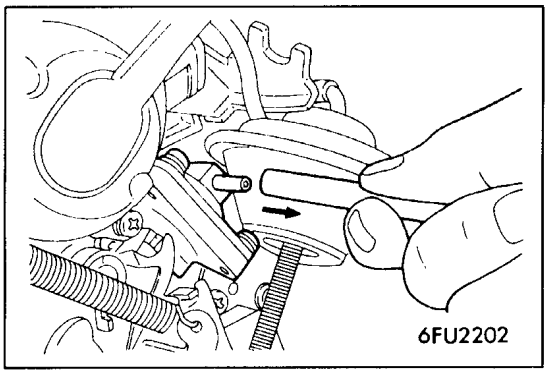
6. If the clearance is outside the standard value, stop the engine and turn the adjusting screw to adjust the clearance.

Adjusting screw	Valve clearance	NOTE
Turned in clockwise direction	Becomes smaller	Plug becomes fouled easily
Turned in anticlockwise direction	Becomes larger	Starting performance deteriorates and engine stalls more easily

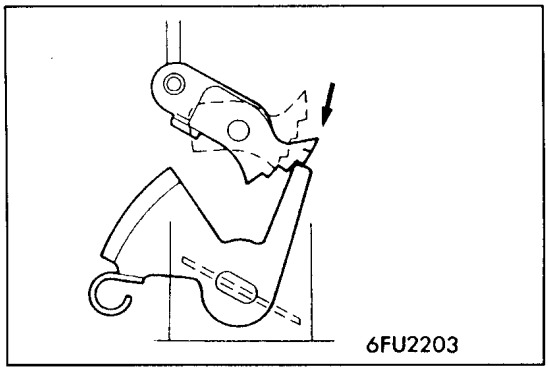
FAST IDLE INSPECTION AND ADJUSTMENT

120001298



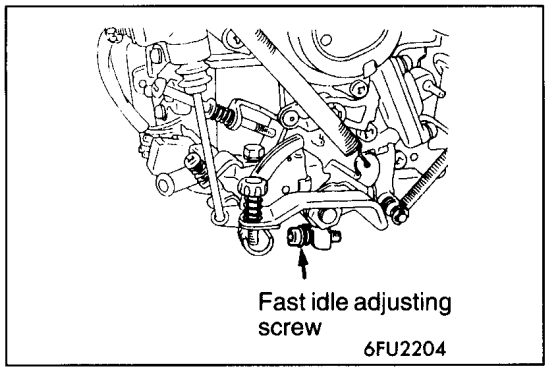

6FU2202

1. Before inspection and adjustment, set vehicle in the following condition:
   - Engine coolant temperature: 80–95°C
   - Lamps and all accessories : OFF
   - Transmission : Neutral
2. Connect a tachometer.
3. Disconnect the vacuum hose (white stripe) from the fast idle breaker.


6FU2203

4. Set the lever on the second highest detent of fast idle cam.
5. Start the engine and check the fast idle speed.

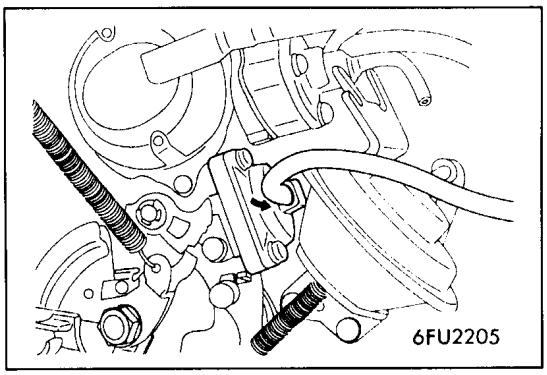
   Standard value : 2,300–2,700 r/min.


Fast idle adjusting screw
6FU2204

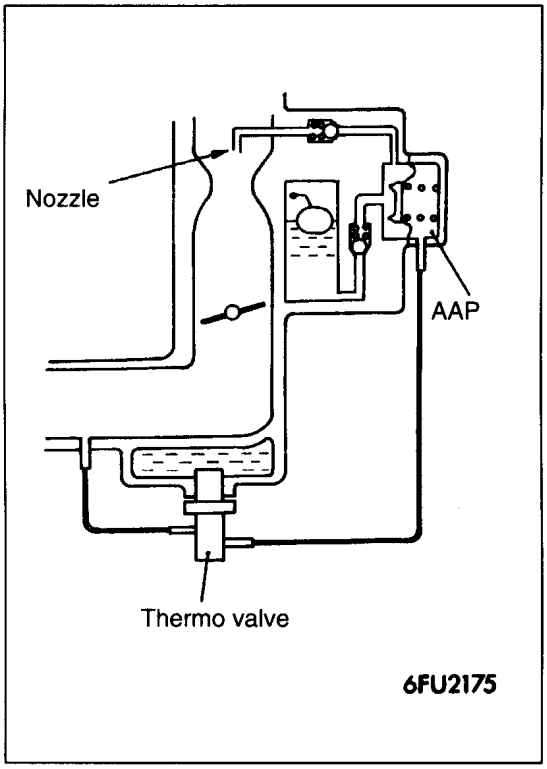
6. If the fast idle speed is outside the standard value, adjust by turning the fast idle adjusting screw.

Adjusting screw	Fast idle speed
Turned to clockwise direction	Becomes higher
Turned to anticlockwise direction	Becomes lower

NOTE
A torx screw (M4) is used as the fast idle adjusting screw.


6FU2205

7. Check that the fast idle breaker releases the fast idle when the vacuum hose (white stripe) which was disconnected in step 3. above is connected again.



AUXILIARY ACCELERATOR PUMP (AAP) INSPECTION

120001299

1. Start the engine and run at idle.
2. Disconnect the vacuum hose (black stripe) from the auxiliary accelerator pump. Place a finger against the end of the hose and check if negative pressure can be felt.

Engine coolant temperature	Negative pressure
35°C or below	Negative pressure can be felt
55°C or above	Negative pressure cannot be felt

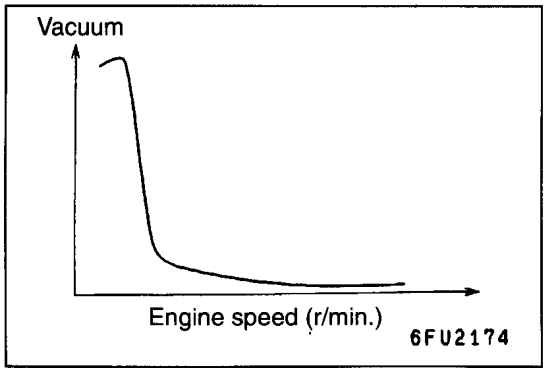
3. Stop the engine.
4. Disconnect the air horn.
5. Connect a hand vacuum pump to the auxiliary accelerator pump nipple.
6. Apply 53 kPa of negative pressure and check that the negative pressure is maintained.
7. Check whether fuel is injected strongly from the pump nozzle when the negative pressure is 0 kPa.

VACUUM SWITCH CONTROL VACUUM INSPECTION

120001300

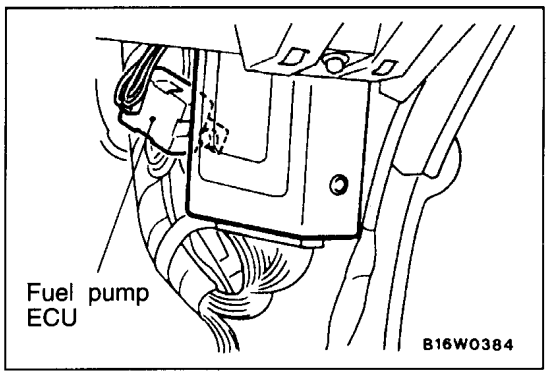
Check condition
Engine coolant temperature : 80–95°C

1. Disconnect the vacuum hose (blue stripe) from the carburettor vacuum switch control vacuum nipple and connect a hand vacuum pump to the nipple.



2. Check that the vacuum switch control vacuum drops rapidly when the engine speed is increased gradually from the idle speed.

   NOTE
   If abnormality is found in the change of the vacuum, clean the vacuum passage of the carburettor.

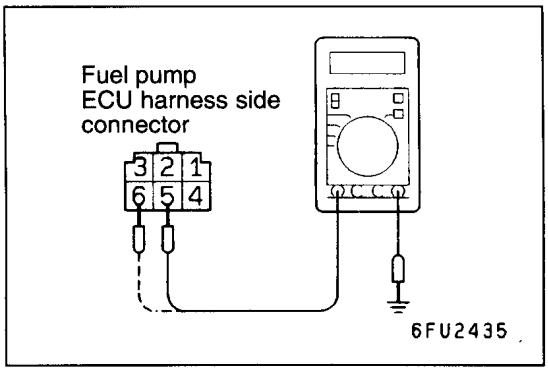


FUEL PUMP CONTROL SYSTEM INSPECTION

120002609

1. Check whether the sound of the fuel pump operating can be heard when the engine is turning over and when it is idling.

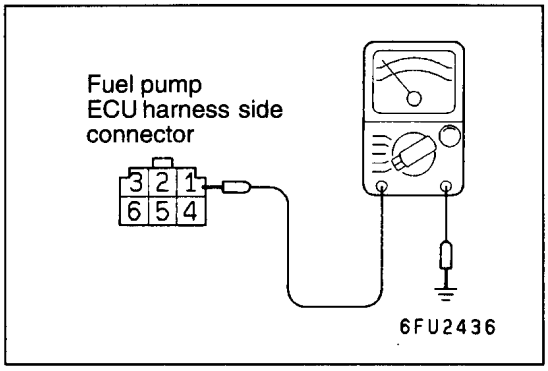
   NOTE
   As the fuel pump is an in-tank type, the fuel pump sound is hard to hear, so remove the fuel filler cap and check from the tank inlet.



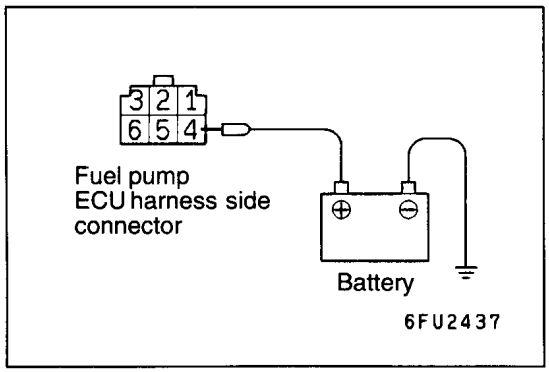
2. If the sound of the fuel pump operating cannot be heard, check by the following procedure.
   (1) Disconnect the fuel pump ECU connector.
   (2) Measure the voltage at the terminals of the fuel pump ECU connector.

   Standard value:

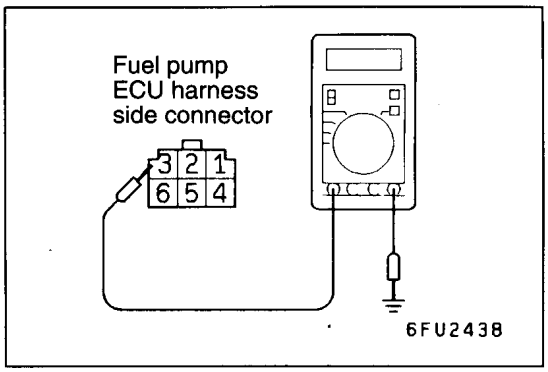
Terminal No.	Ignition switch	Voltage
5	ON	System voltage
6	START	8V or more



   (3) Check whether there is continuity between terminal (1) of the fuel pump ECU connector at the harness side and the earth.



   (4) Apply battery voltage to terminal (4) of the fuel pump ECU connector at the harness side, and check that the fuel pump operates.



   (5) Measure the voltage at terminal (3) of the fuel pump ECU connector at the harness side.

   Standard value:

Ignition switch	Voltage
ON	System voltage

   (6) If the results of all of the checks in steps (1) – (5) are normal, replace the fuel pump ECU.

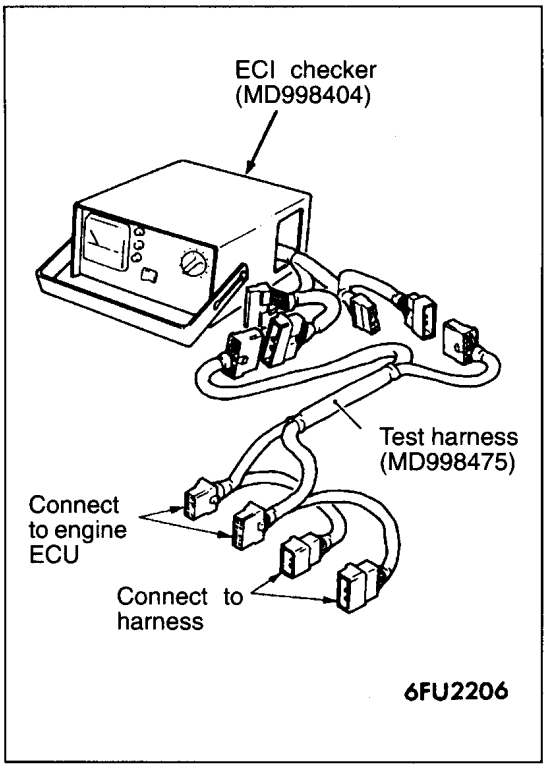
INSPECTION PROCEDURES USING THE ECI CHECKER

120002578

PRECAUTIONS FOR OPERATION

When ECI checker is used, pay attention to the following:

- Avoid rough operation of switches.
- Do not subject ECI checker to shock and other external forces, heat, etc.
- Keep the checker away from water and oil.
- Store ECI checker in a moisture- and dust-free place and take steps to protect the checker from heat and vibration.

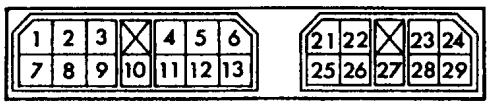


INSPECTION PROCEDURES

1. Turn ignition switch to LOCK.
2. Disconnect the large harness connector and small harness connector from the engine ECU.
3. Set check switch of the ECI checker to OFF.
4. Set select switch of the ECI checker to A.
5. Connect the special tool (test harness) to the connectors of the ECI checker, and then connect the special tool (test harness) to the engine ECU and body side harness connectors.
6. Set the select switch and check switch to check item.
7. Check the input and output signals of the engine ECU.
8. If checker shows any variance from specifications, check the corresponding sensor and related electrical wiring, then repair or replace.
9. After repair or replacement, recheck with the ECI checker to confirm that the repair has corrected the problem.
10. Set check switch of the ECI checker to OFF.
11. Set ignition switch to LOCK.
12. Disconnect connectors of the ECI checker and the special tool (test harness) from the engine ECU and the body side harness connectors.
13. Connect the body side harness connectors to the engine ECU.
14. After completion of the above test make certain that the trouble has been eliminated on the road test.

ELECTRONIC CONTROLLED CARBURETTOR SYSTEM CHECK PROCEDURE CHART

Engine ECU connector



1FU0852

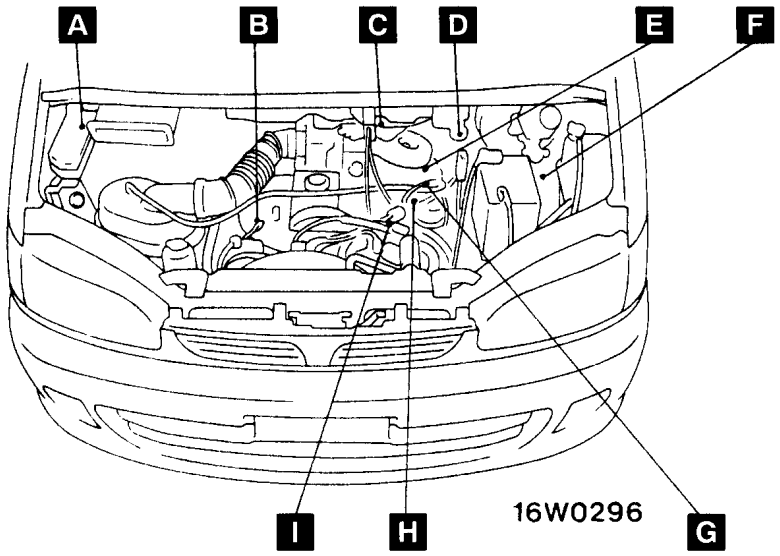
ECI checker select switch	ECI checker check switch	Check item	Engine ECU terminal No.	Check condition		Normal condition
A	1	Power supply	12	Ignition switch: ON		SV
A	2	Engine speed sensor	5	Engine: Idling		4–10V
A	3	Throttle position sensor	2	Ignition switch: ON	Set throttle valve to idle position	0.2–0.7V
					Fully open throttle valve	4.5–5.5V
A	4	Vacuum switch	10	Engine: Idling	Set throttle valve to idle position	0–1V
					Slightly open throttle valve	SV
A	5	Electric choke relay	29	Ignition switch: ON		0–1V
				Engine: Idling		SV
B	2	Idle up control solenoid valve	27	A/C switch: ON (A/C compressor is operating)	Engine: Idling	0–1V
					Engine: 2,000 r/min.	SV
B	4	A/C power relay	24	Engine: Idling A/C switch: ON	Set throttle valve to idle position	0–1V
					Fully open throttle valve	SV (after approx. 5 seconds → 0–1V
B	5	Engine coolant temperature sensor	3	Ignition switch: ON	When engine coolant temperature is 20°C	2.3–2.9V
					When engine coolant temperature is 80°C	0.3–0.9V
B	6	Feedback solenoid valve	22	Ignition switch: ON		SV
				Engine: Idling after warming up		2–12V
B	7	Slow cut solenoid valve	26	Engine: Idling after warming up		0–1V
				Decrease the engine speed from 4,000 r/min. to the idle speed		Momentarily SV
B	8	Oxygen sensor	1	Engine: Run at 2,000 r/min. after warming up (5 minutes or more after engine is started)		0–1V ← (Changes repeatedly) →2–3V
B	9	Secondary air control solenoid valve	28	Engine: Idling, 70 seconds after start of warm engine		0–1V → SV
				Decrease the engine speed from 2,000 r/min. to the idle speed		Momentarily drop
B	10	Sensor impressed voltage	8	Ignition switch: ON		4.5–5.5V

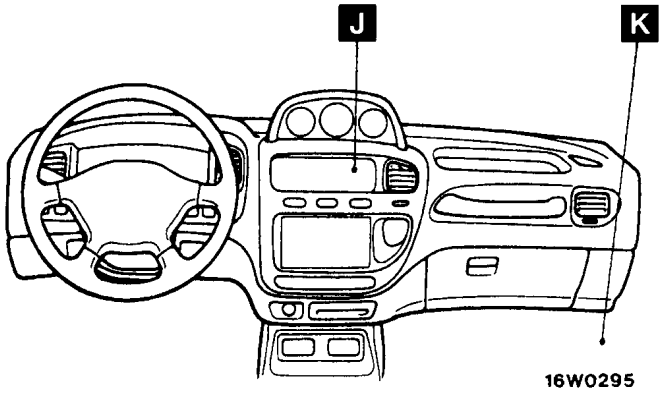
NOTE
(1) SV: System voltage

COMPONENT LOCATION

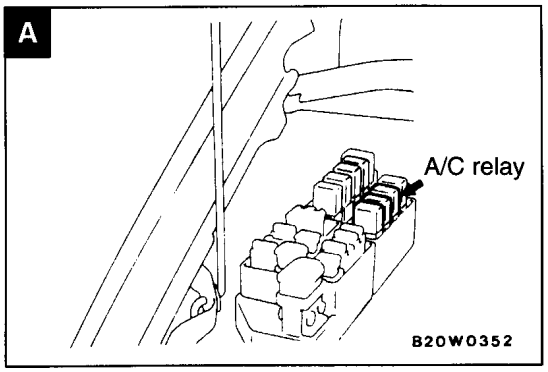
120002579

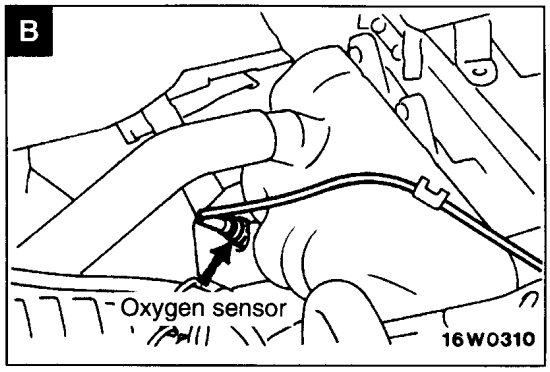
Name	Symbol	Name	Symbol
A/C idle up solenoid valve	C	Oxygen sensor	B
A/C relay	A	Secondary air control solenoid valve	F
A/C switch	J	Slow cut solenoid valve	G
Engine coolant temperature sensor	I	Throttle position sensor	H
Engine ECU	K	Vacuum switch	D
Feedback solenoid valve	E	–	–



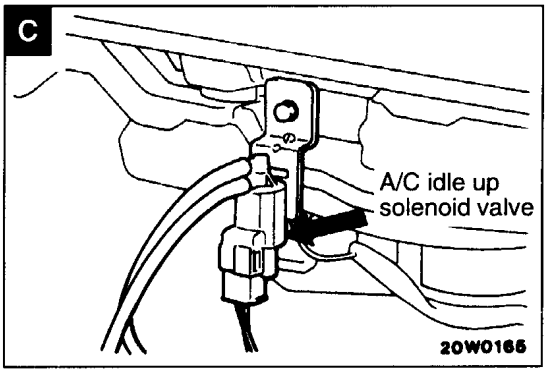


6FU2428

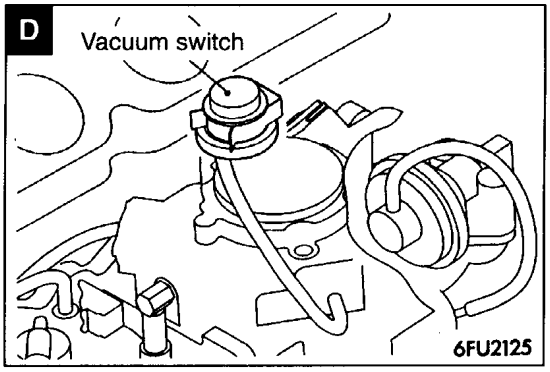




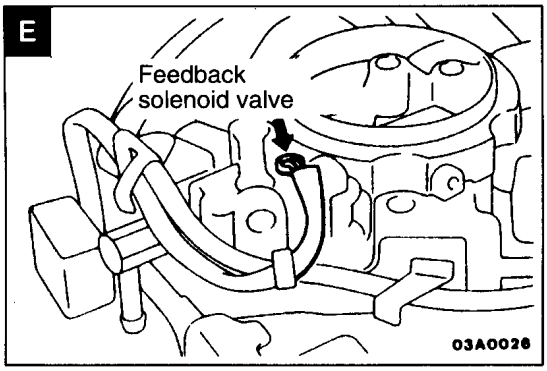
C


A/C idle up
solenoid valve
20W0166

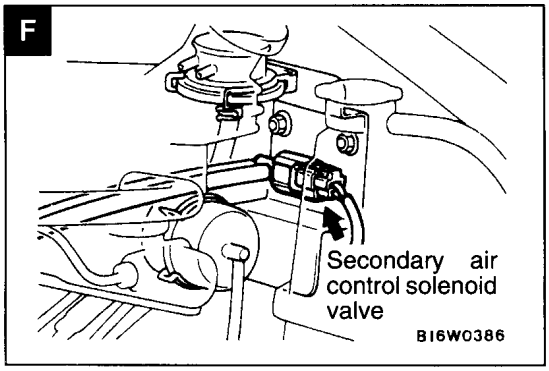
D


Vacuum switch
6FU2125

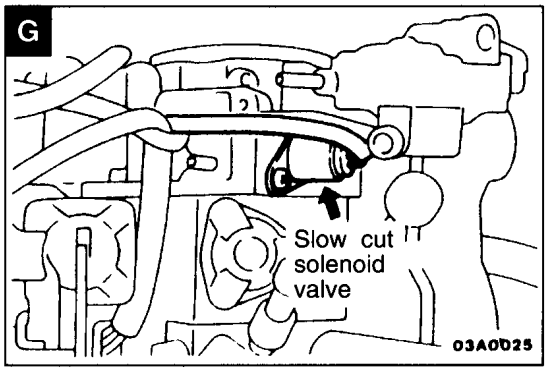
E


Feedback
solenoid valve
03A0026

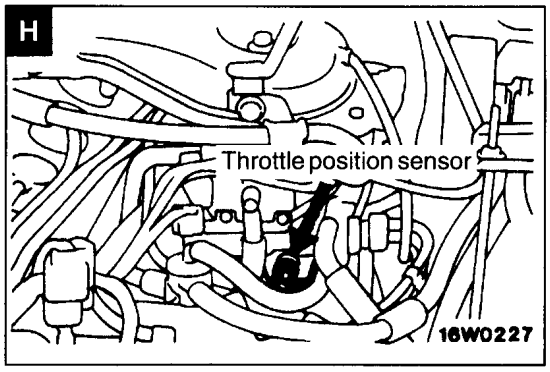
F


Secondary air
control solenoid
valve
B16W0386

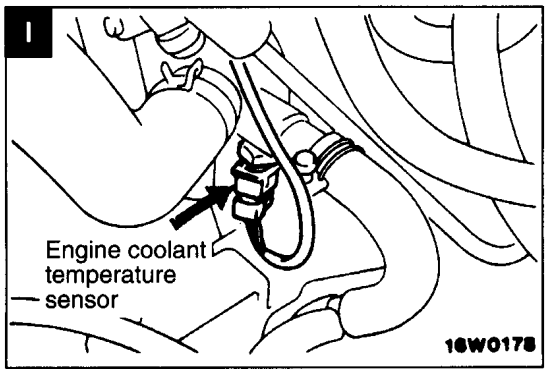
G


Slow cut
solenoid
valve
03A0025

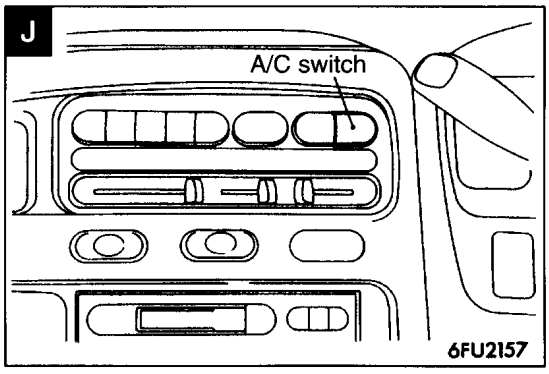
H


Throttle position sensor
16W0227

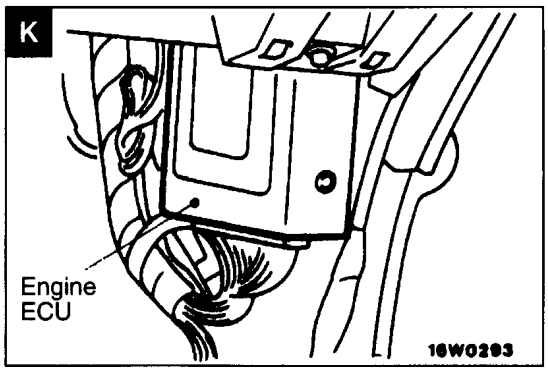
I


Engine coolant
temperature
sensor
16W0178

J


A/C switch
6FU2157

K

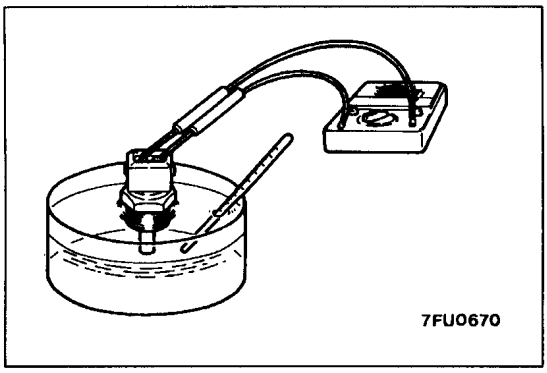

Engine
ECU
16W0293

ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

120001303

Caution
Don't touch the connector (resin section) with the tool when removing and installing.

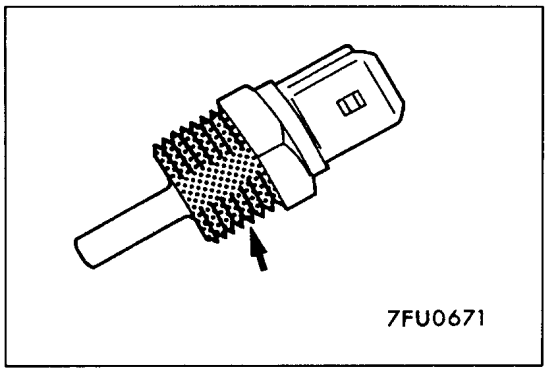
1. Remove engine coolant temperature sensor.



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

   Standard value :
   2.1–2.7kΩ (at 20°C)
   0.26–0.36kΩ (at 80°C)

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

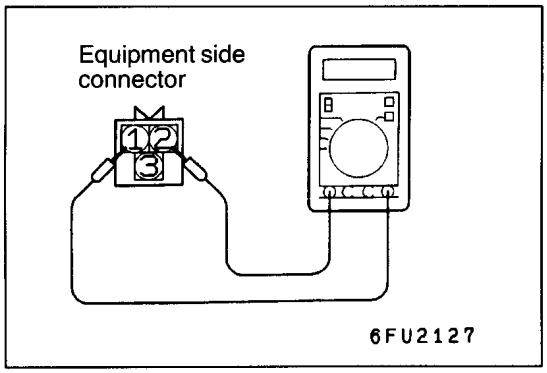


4. Apply sealant to the threaded portion.

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

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

   Sensor tightening torque: 30 Nm

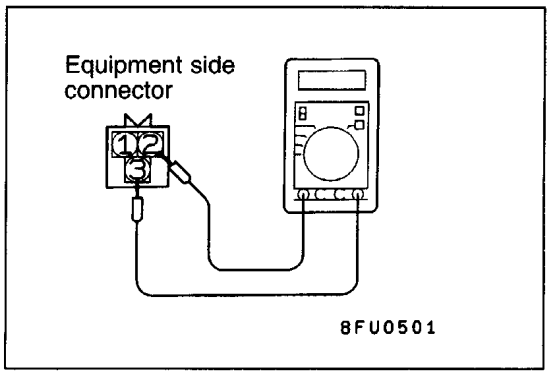


THROTTLE POSITION SENSOR (TPS) INSPECTION

120001304

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

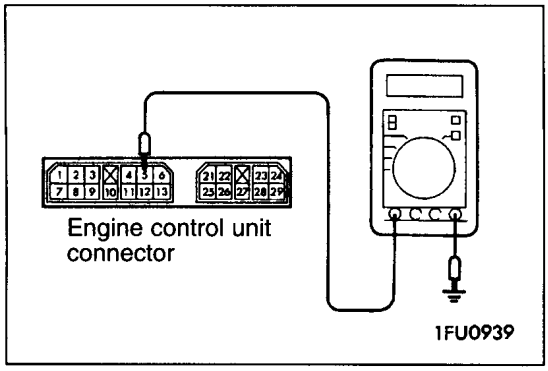
   Standard value: 3.5–6.5 kΩ



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

Throttle valve slowly opens until fully open from the idle position	Changes smoothly in proportion to the opening angle of the throttle valve

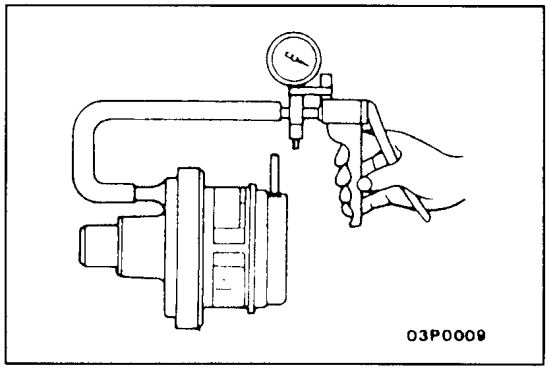
4. If the resistance is outside the standard value, or if it doesn't change smoothly, replace the throttle position sensor.



ENGINE SPEED SENSOR (IGNITION COIL (–) TERMINAL) INSPECTION 120001305

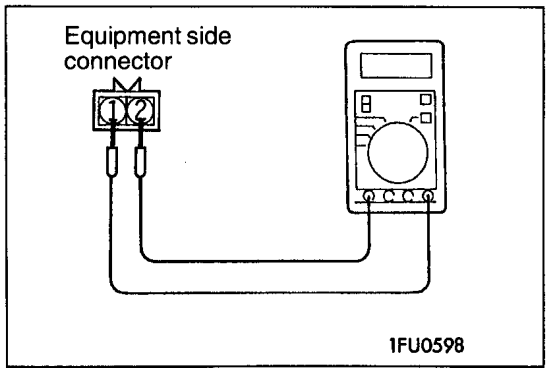
Check that there is continuity between the ignition coil (–) terminal and the engine control unit terminal No. 5.

NOTE
Shake the harness connector to check for a lurking open circuit.



VACUUM SWITCH INSPECTION 120001306

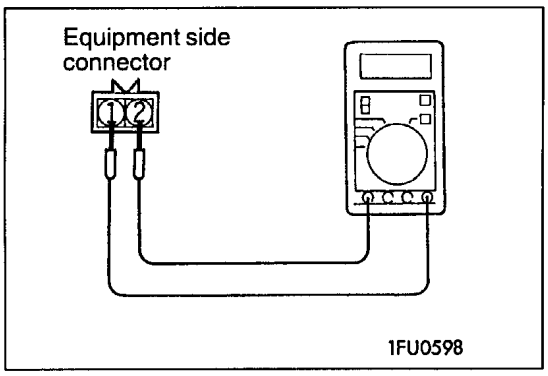
1. Disconnect the vacuum switch connector.
2. Connect a hand vacuum pump to the nipple of vacuum switch.
3. Apply a vacuum of 67 kPa and check that vacuum is maintained.



4. Check continuity between the vacuum switch terminals.

Vacuum	Continuity
27 kPa or less	No continuity
47 kPa or more	Continuity

5. If defective, replace the vacuum switch.



OXYGEN SENSOR INSPECTION 120001307

1. Warm the engine and check to be sure that the engine coolant temperature is 80–95°C.
2. Disconnect the oxygen sensor connector and connect a digital voltmeter.

   Caution
   When disconnecting the oxygen sensor connector, do not pull the connector or lead wire too strongly.

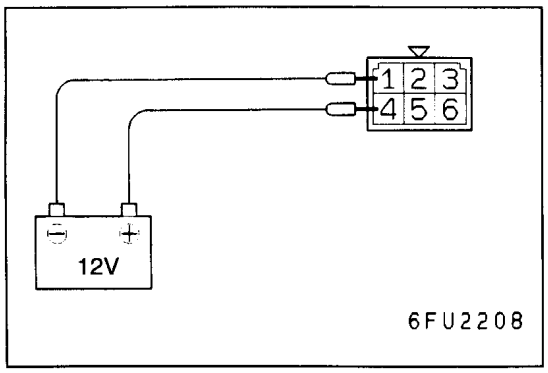
3. Race the engine repeatedly and measure the oxygen sensor output voltage.

   Standard value:

Engine	Sensor output voltage	Remark
When racing the engine	0.6–1.0V	When the air/fuel mixture ratio is enriched by racing the engine repeatedly, a normal oxygen sensor will output a voltage of 0.6–1.0V.

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

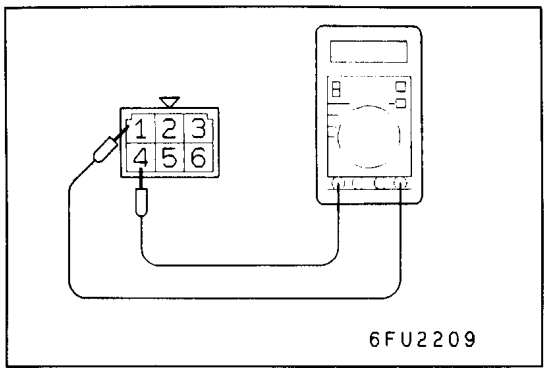
   NOTE
   For removal and installation of the oxygen sensor, refer to GROUP 15 – Exhaust Manifold.



FEEDBACK SOLENOID VALVE (FBSV) INSPECTION 120001308

OPERATION INSPECTION

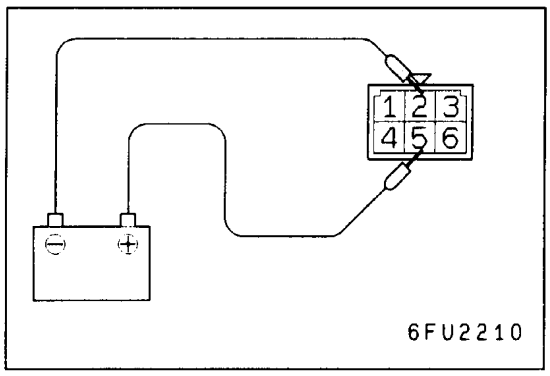
1. Disconnect the solenoid valve connector.
2. Check that a operation sound (click) is heard when a battery voltage is applied between the feedback solenoid valve terminal 1 (to battery (–) terminal) and terminal 4 (to battery (+) terminal).



INSPECTION OF COIL RESISTANCE

Measure the resistance of the feedback solenoid valve coil.

Standard value: 54–66Ω (at 20°C)

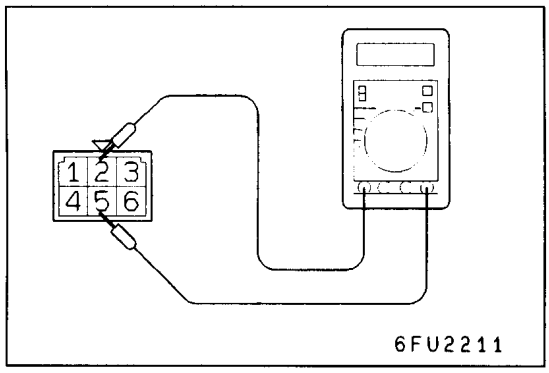


SLOW CUT SOLENOID VALVE (SCSV) INSPECTION

120001309

OPERATION INSPECTION

1. Disconnect the solenoid valve connector.
2. Check that a operation sound (click) is heard when a battery voltage is applied between the slow cut solenoid valve terminal 2 (to battery (–) terminal) and terminal 5 (to battery (+) terminal).



INSPECTION OF COIL RESISTANCE

Measure the resistance of the slow cut solenoid valve coil.

Standard value: 48–60Ω (at 20°C)

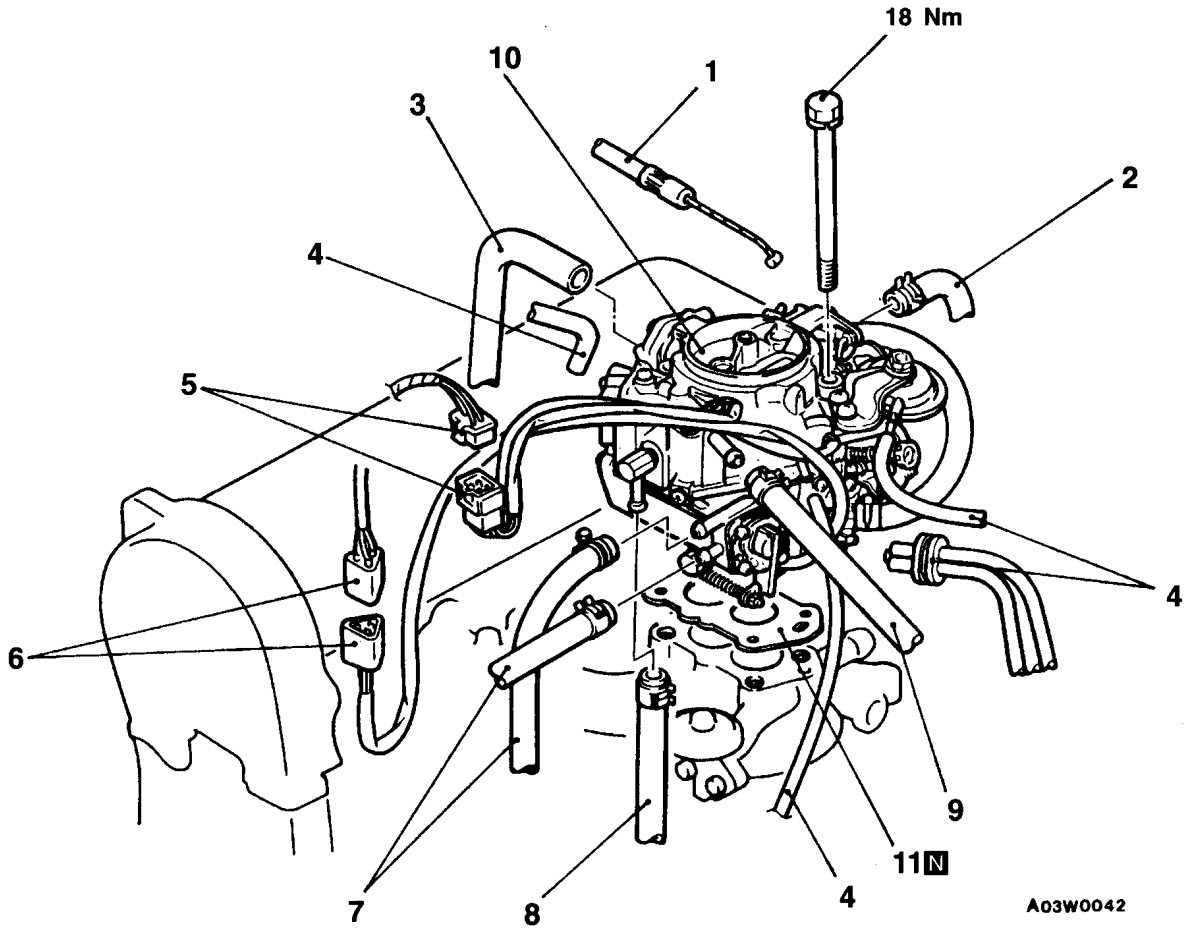
CARBURETTOR

120000819

REMOVAL AND INSTALLATION

Pre-removal Operation
- Air Horn Assembly Removal (Refer to GROUP 15 – Air Cleaner.)
- Engine Coolant Draining

Post-installation Operation
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
- Air Horn Assembly Installation (Refer to GROUP 15 – Air Cleaner.)
- Engine Coolant Supplying



Removal steps

1. Accelerator cable connection
2. Water hose connection
3. Fuel vapor hose connection
4. Vacuum hose connection
5. Solenoid valve connector
6. Throttle position sensor connector
7. Fuel return hose connection
8. Fuel main hose connection
9. Inner bend hose connection
10. Carburettor
11. Gasket

DIESEL FUEL

CONTENTS

120000820

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SERVICE SPECIFICATIONS 2

SPECIAL TOOL 2

SERVICE ADJUSTMENT PROCEDURES 2

- Fuel Injection Timing Inspection and Adjustment 2
- Engine Idling Speed Inspection and Adjustment 2
- Fuel Discharge Prevention 2
- Evacuation of Water from Fuel Filter 3
- Evacuation of Air from Fuel Line 3
- Fuel Filter Cartridge Replacement 3
- Fuel Injection Pump Inspection 4
- Boost Compensator Inspection 4
- Injection Nozzle Inspection and Adjustment 4

INJECTION NOZZLE 6

INJECTION PUMP 8

GENERAL INFORMATION

120000821

The fuel is drawn out of the fuel tank by means of the feed pump which is built into the fuel injection pump. It then passes through the fuel filter and is fed to the injection pump.
The fuel is pressurized by the feed pump, and this fuel pressure is controlled by the regulating valve which is built into the pump. Then, the fuel is compressed by the plunger and injected from the nozzles at high pressure in accordance with the injection sequence.
Engine speed (fuel injection amount) control is carried out by means of a centrifugal-type governor using a flyweight.
Fuel injection timing control is carried out by a hydraulic timer. The hydraulic timer operates by the fuel pressure inside the pump chamber. This pressure is controlled by the regulating valve.

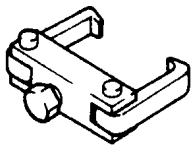
SERVICE SPECIFICATIONS

120000822

Items	Standard value
Fuel cut solenoid valve coil resistance Ω	8–10
Fuel injection initial pressure kPa	14,710–15,690

SPECIAL TOOL

120000823

Tool	Number	Name	Use
	MD998388	Injection pump sprocket puller	Removal of sprocket from drive shaft of injection pump

SERVICE ADJUSTMENT PROCEDURES

120000824

FUEL INJECTION TIMING INSPECTION AND ADJUSTMENT

Refer to GROUP 11I – Service Adjustment Procedures.

ENGINE IDLING SPEED INSPECTION AND ADJUSTMENT

120000825

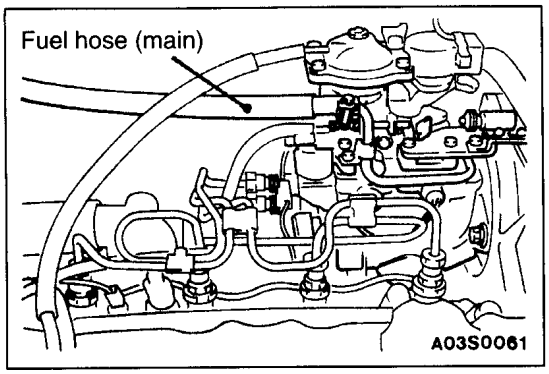
Refer to GROUP 11I – Service Adjustment Procedures.

FUEL DISCHARGE PREVENTION

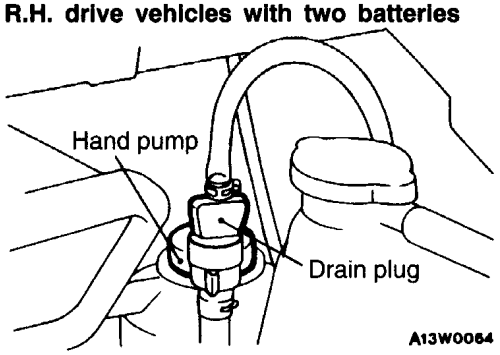
120000826

1. Remove the connection between the fuel hose (main) and the fuel injection pump.

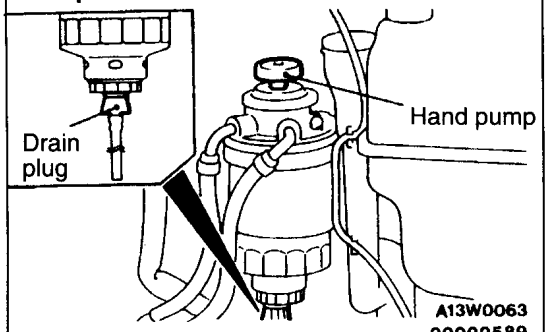
   NOTE
   The fuel hose should be plugged.
2. Start the engine and let it run until it stops by itself.



R.H. drive vehicles with two batteries



Except R.H. drive vehicles with two batteries

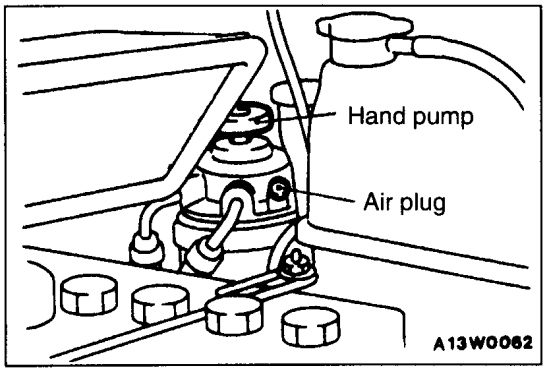


EVACUATION OF WATER FROM FUEL FILTER

120002253

Water is in the filter when fuel filter warning lamp lights. Evacuate water by the following procedures.

1. Loosen drain plug.
2. Drain water with hand pump. Finger-tighten drain plug.



EVACUATION OF AIR FROM FUEL LINE 120000828

Bleed the air from the fuel line after refilling the fuel:

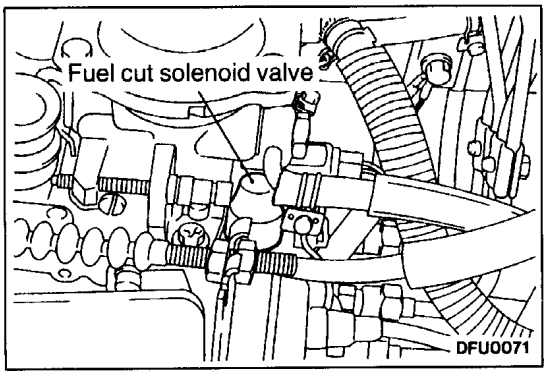
- When fuel is drained for service.
- When fuel filter is replaced.
- When main fuel line is removed.

1. Loosen fuel filter air plug.
2. Place rags around air plug hole. Operate hand pump repeatedly until no bubbles come from plug hole. Tighten air plug.
3. Repeat until hand pump operation becomes stiff.

FUEL FILTER CARTRIDGE REPLACEMENT

120000829

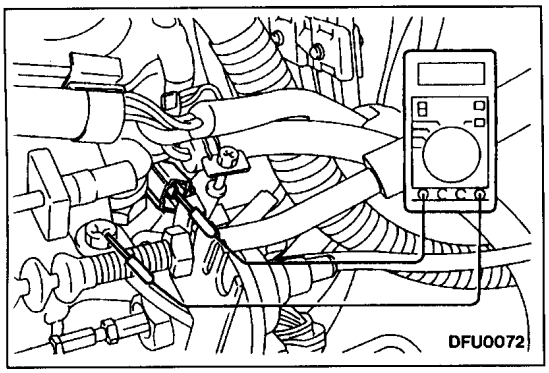
Refer to GROUP 13F – Service Adjustment Procedures.



FUEL INJECTION PUMP INSPECTION 120000830

INSPECTION OF FUEL CUT SOLENOID VALVE OPERATION

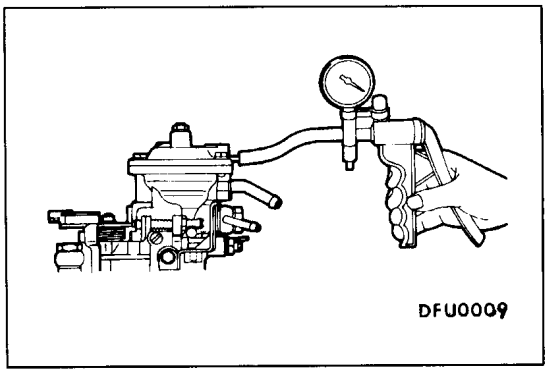
When a sound scope is held against the fuel cut solenoid valve and the ignition switch is turned to "ON", check that the sound of the valve operating can be heard.



INSPECTION OF FUEL CUT SOLENOID VALVE COIL RESISTANCE

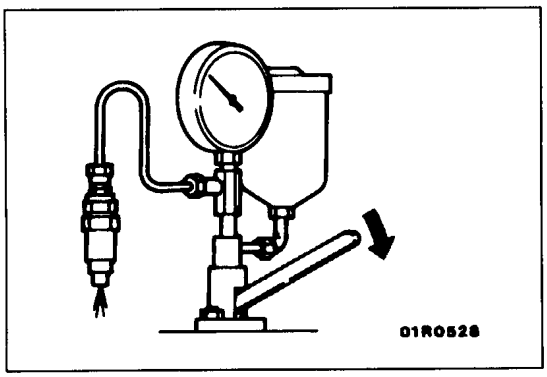
Measure the resistance between the fuel cut solenoid valve terminal and the ignition pump body.

Standard value: 8–10 Ω



BOOST COMPENSATOR INSPECTION 120000831

1. Connect a hand pump (pressurization type) to the nipple of the boost compensator.
2. Apply 30 kPa of pressure and check to be sure that the pressure is maintained.



INJECTION NOZZLE INSPECTION AND ADJUSTMENT 120002572

Caution
Never touch the injection spray that is injected from the nozzle.

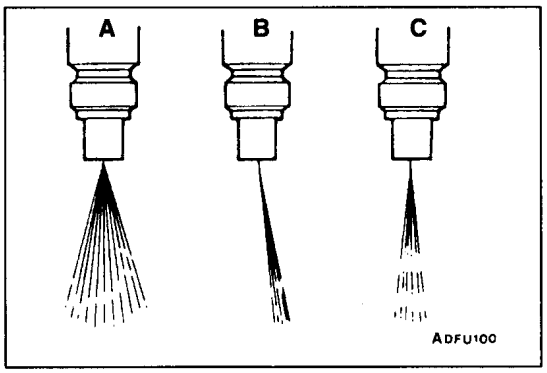
FUEL INJECTION INITIAL PRESSURE INSPECTION

1. Install the injection nozzle to a nozzle tester.
2. Move the lever of the nozzle tester 2–3 times to inject fuel and to bleed the air.
3. Gently press down the lever of the nozzle tester, and take a reading of the indication value on the pressure gauge at the point where the needle slowly rises and then suddenly drops.

   Standard value (Fuel injection initial pressure): 14,710–15,690 kPa

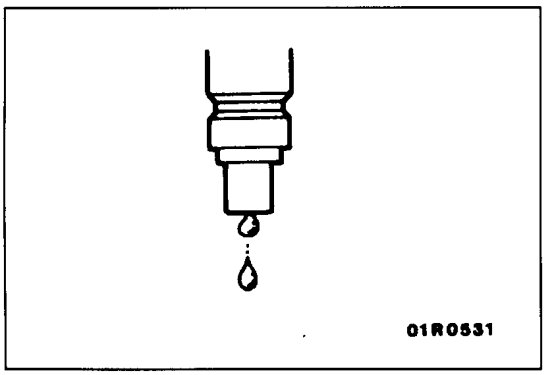
4. If the fuel injection initial pressure is outside the standard value, disassemble the nozzle holder to clean it, and then change the thickness of the shim to adjust the fuel injection initial pressure.

   NOTE
   1. For disassembly, reassembly and adjustment of the nozzle holder, refer to the Engine Workshop Manual.
   2. There are 10 shims for adjustment, with thicknesses in the range of 0.10–0.80 mm.
   3. When the shim thickness is increased by 0.1 mm, the fuel injection initial pressure increases by 2,350 kPa.

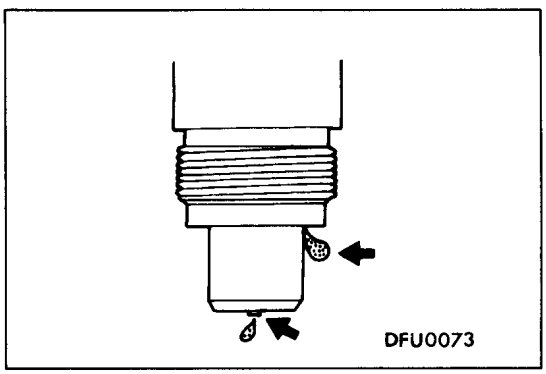


INJECTION SPRAY CONDITION INSPECTION

1. Move the lever of the nozzle tester rapidly (4–6 times per second) to eject the fuel continuously. Check to be sure that the injection spray comes out evenly in a cone shape (injection spray angle is 10°). The injection spray patterns shown in the illustration at left are wrong.
   A. Injection angle is tool large
   B. Bias
   C. Intermittent fuel injection



2. Check to be sure that no fuel drips after injection is completed.
3. If there are any drips, disassemble the nozzle, clean it and reinspect, or replace the nozzle.



NOZZLE FUEL-TIGHT INSPECTION

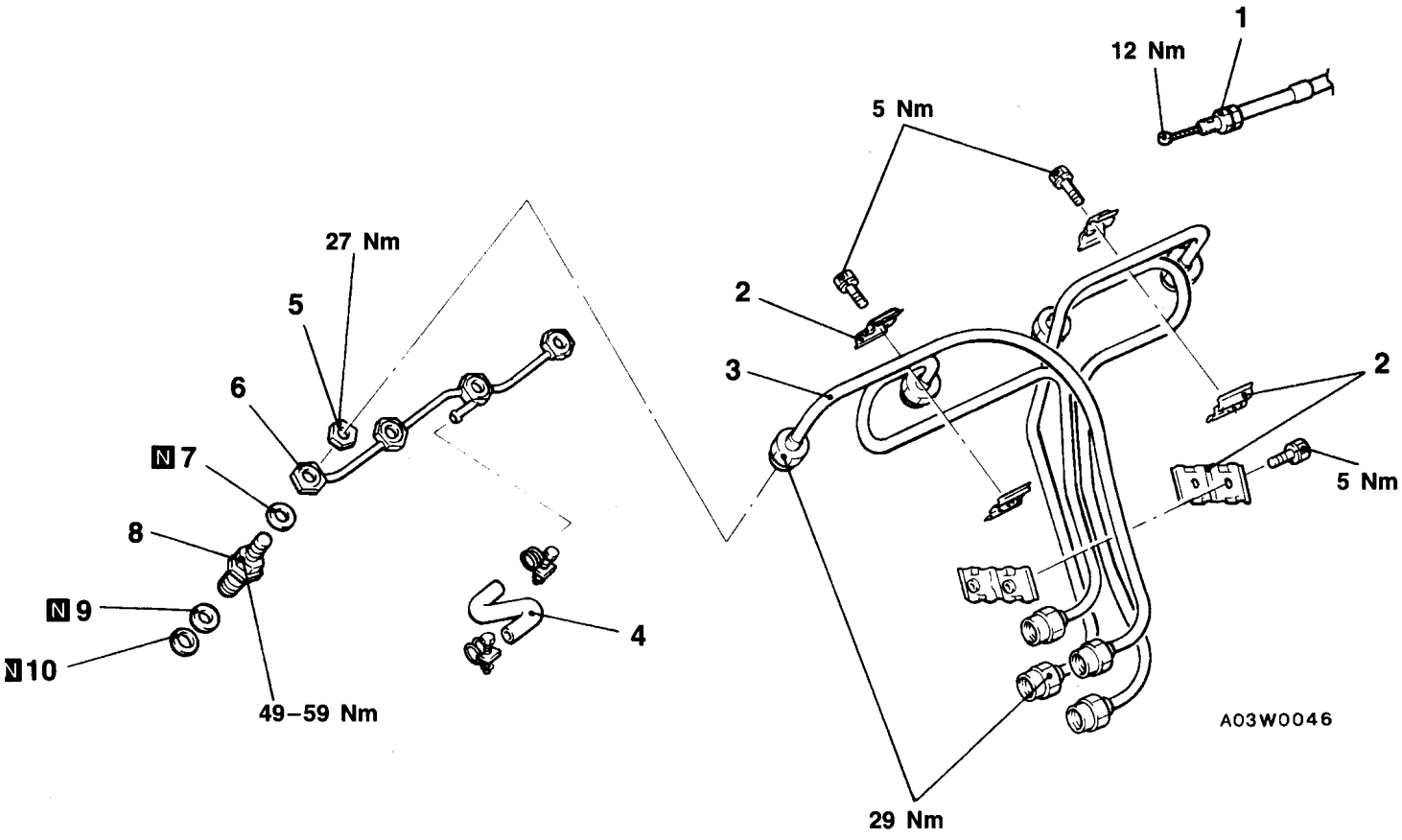
1. Gently raise the lever of the nozzle tester until the pressure inside the nozzle (value displayed on pressure gauge) becomes 12,750–13,730 kPa, and after holding this pressure for approximately 10 seconds, check to be sure that there are no fuel leaks from the nozzle.
2. If there are any leaks, disassemble the injection nozzle, clean it and re-inspect, or replace the nozzle.

INJECTION NOZZLE

120002251

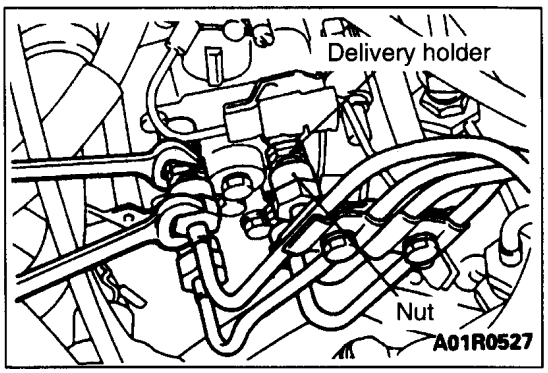
REMOVAL AND INSTALLATION

Post-installation Operation
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)



Removal steps

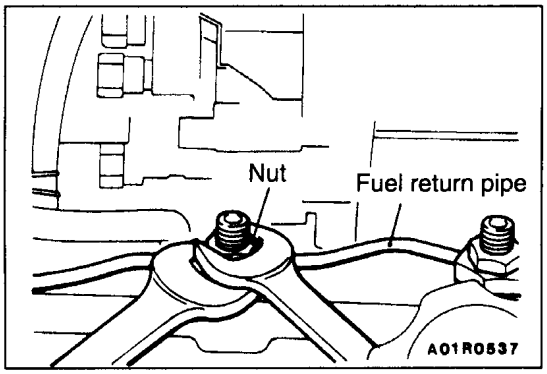
1. Accelerator cable connection
2. Injection pipe clamp
◀A▶ 3. Injection pipe
4. Fuel return hose
◀B▶ 5. Nut
◀B▶ 6. Fuel return pipe
7. Fuel return pipe gasket
◀C▶ 8. Nozzle holder
▶A◀ 9. Holder gasket
▶A◀ 10. Nozzle gasket



REMOVAL SERVICE POINTS

◀A▶ DISCONNECTION OF INJECTION PIPE

When loosening nuts at both ends of injection pipe, hold the other side (pump side-delivery holder, nozzle side-nozzle holder) with wrench and loosen nut.

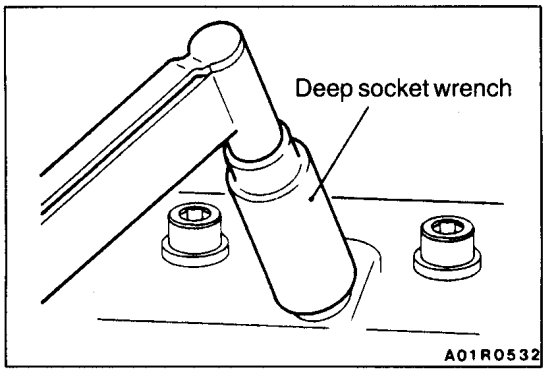


◀B▶ NUT / FUEL RETURN PIPE REMOVAL

(1) While using a spanner or similar tool to hold the hexagonal nut of the fuel return pipe, remove the nut.

Caution
If an attempt is made to loosen the nut without first holding the fuel return pipe, the pipe may be broken or otherwise damaged.

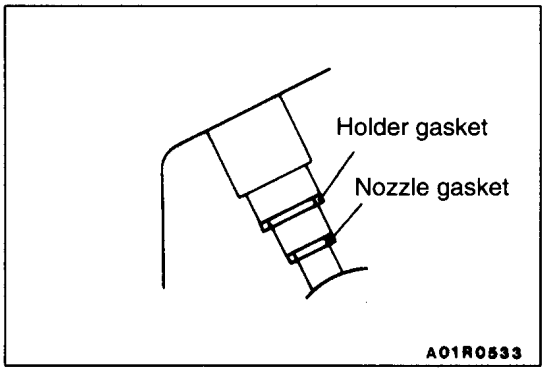
(2) Disconnect the fuel return pipe.



◀C▶ INJECTION NOZZLE HOLDER REMOVAL

Using a deep socket wrench, remove the injection nozzle holder.

Caution
1. **Make a marking on the removed injection nozzle holder (the cylinder No.).**
2. **Use a cap to prevent foreign material, etc. from entering the injection nozzle hole.**



INSTALLATION SERVICE POINT

▶A◀ NOZZLE GASKET / HOLDER GASKET INSTALLATION

Clean the cylinder head's injection nozzle hole, and insert a new gasket.

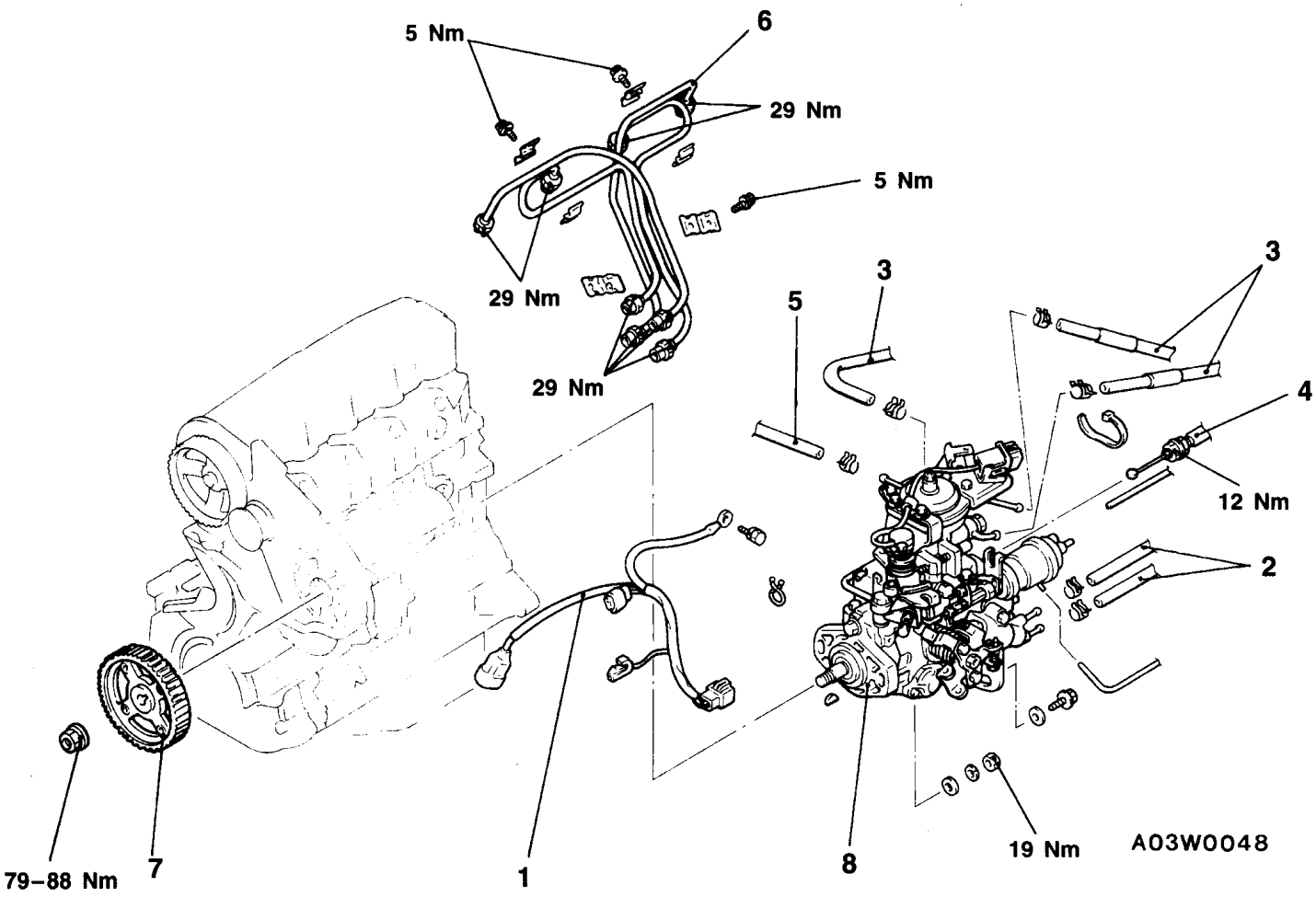
INJECTION PUMP

120002252

REMOVAL AND INSTALLATION

Pre-removal Operation
- Engine Coolant Draining
- Timing Belt Removal (Refer to GROUP 11I – Timing Belt.)

Post-installation Operation
- Timing Belt Installation (Refer to GROUP 11I – Timing Belt.)
- Engine Coolant Supplying
- Injection Timing Adjustment (Refer to GROUP 11I – Service Adjustment Procedures.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)

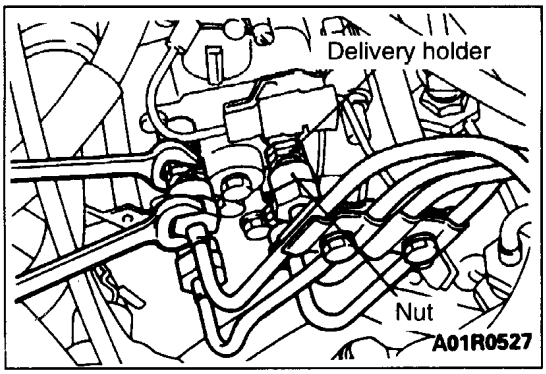


Removal steps

1. Fuel injection pump wiring harness
2. Water hose connection <Vehicles with CSD>
3. Fuel hoses
4. Accelerator cable connection

◀A▶ ◀B▶

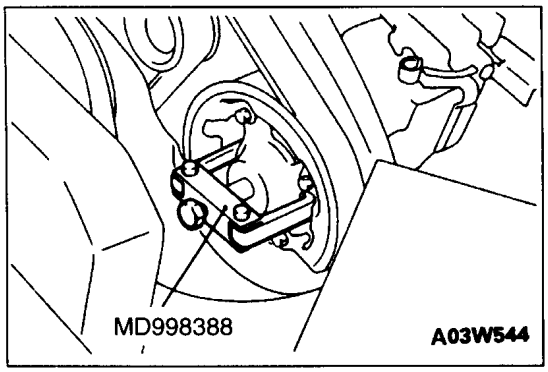
5. Boost hose connection
6. Fuel injection pipe
7. Fuel injection pump sprocket
8. Fuel injection pump



REMOVAL SERVICE POINTS

◀A▶ INJECTION PIPE REMOVAL

Loosen the nuts at the end of the injection pipe with the corresponding holders (delivery holder for pump side and nozzle holder for nozzle side) retained by a spanner, etc.



◀B▶ FUEL INJECTION PUMP SPROCKET REMOVAL

Remove the sprocket installing nut and remove sprocket from pump drive shaft with special tool.

Caution

1. **Do not hit pump drive shaft with hammer, etc.**
2. **When holding injection pump, do not allow to dangle by holding accelerator lever or fast idle lever. Do not remove these levers. Removal will cause injection pump malfunction.**

FUEL SUPPLY AND ENGINE CONTROL

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120002464

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Fuel Filter Cartridge Replacement <Diesel-powered Vehicles> 3

Power Relay Check <Diesel-powered Vehicles> 3

FUEL TANK 4

ACCELERATOR CABLE AND PEDAL 7

FUEL FILTER <PETROL-POWERED VEHICLES> 9

FUEL FILTER <DIESEL-POWERED VEHICLES> 10

GENERAL INFORMATION

120000602

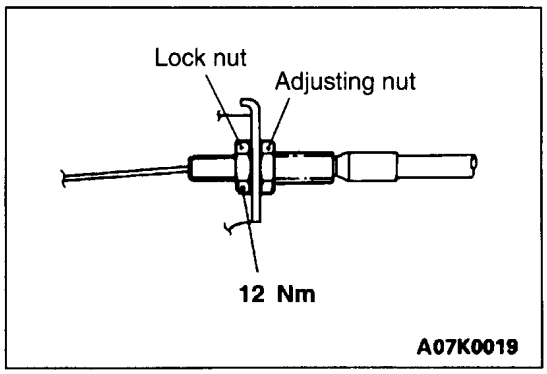
A cable-type accelerator mechanism and a suspended-type pedal have been adopted.
The fuel tank is equipped with a valve assembly (roll-over valve). It prevents fuel from leaking out of the fuel tank if the vehicle rolls over.
The fuel tank is equipped with a fuel shut-off valve. It prevents fuel from leaking out of the fuel tank when the fuel filler cap is opened and when fuel is being supplied.

SERVICE ADJUSTMENT PROCEDURES

120000603

ACCELERATOR CABLE INSPECTION AND ADJUSTMENT

1. Turn the A/C and all lamps OFF so that there is no electrical load when inspecting.
2. Warm the engine until the engine idling speed becomes stable.
3. Check that the engine idling speed is at the specified value.
4. Stop the engine and turn the ignition switch to OFF.
5. Check that there are no sharp bends in the accelerator cable.
6. Check the amount of play in the inner cable.
7. If there is excessive play in the inner cable, adjust play by the following procedures.
   (1) Turn the ignition switch to the ON position (without starting the engine) and leave in that condition for approximately 15 seconds in order to initialize the ISC motor. <MPI>



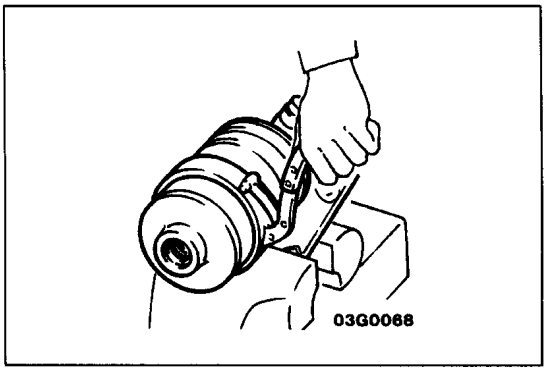
   (2) Loosen the adjusting nut and fully close the throttle lever.
   (3) Tighten the adjusting nut until immediately before the throttle lever starts to move.
   (4) Loosen the adjusting nut one turn.
   (5) Fix the adjusting nut with the lock nut.
   (6) After adjusting, check that the throttle lever is touching the stopper.

FUEL FILTER CARTRIDGE REPLACEMENT <Diesel-powered vehicles>

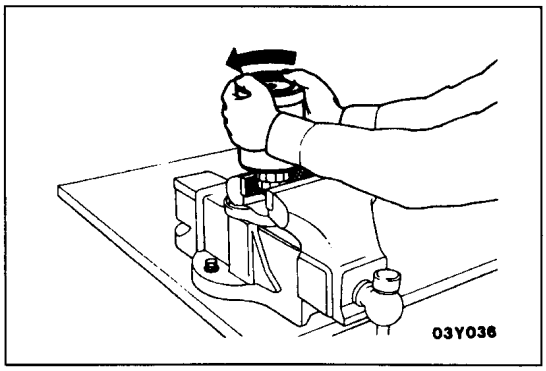
120002656

(1) Remove the fuel filler cap to release the pressure inside the fuel tank.
(2) Disconnect the water level sensor connector.
(3) Remove the fuel filter. (Refer to P.13F–10.)

Caution
Cover with a rag to prevent fuel from spraying out.



(4) Secure the fuel filter pump in a vise, and use an oil filter wrench to remove the fuel filter cartridge.

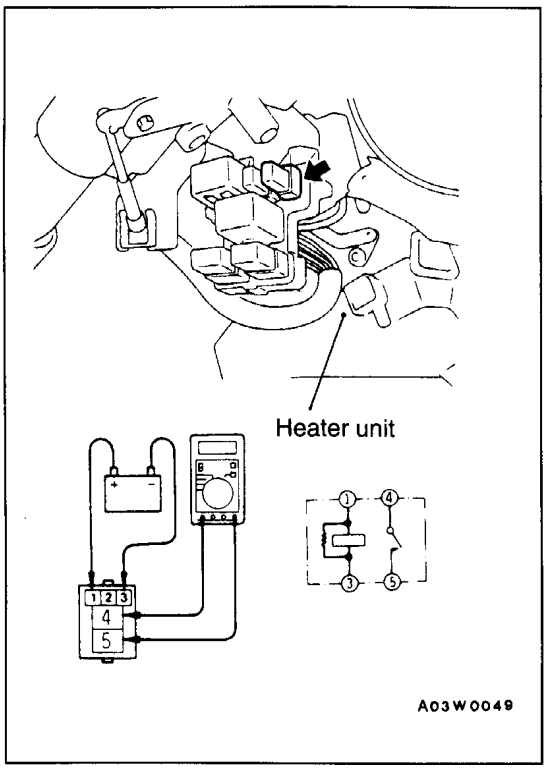


(5) Secure the water level sensor in a vise and turn the fuel filter cartridge with both hands to remove the water filter sensor.
(6) After installing a new filter, bleed all air from the fuel line.
(7) Start the engine, and check that there are no fuel leakages.

POWER RELAY CHECK <Diesel-powered vehicles>

120002469

FUEL LINE HEATER RELAY CONTINUITY INSPECTION



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

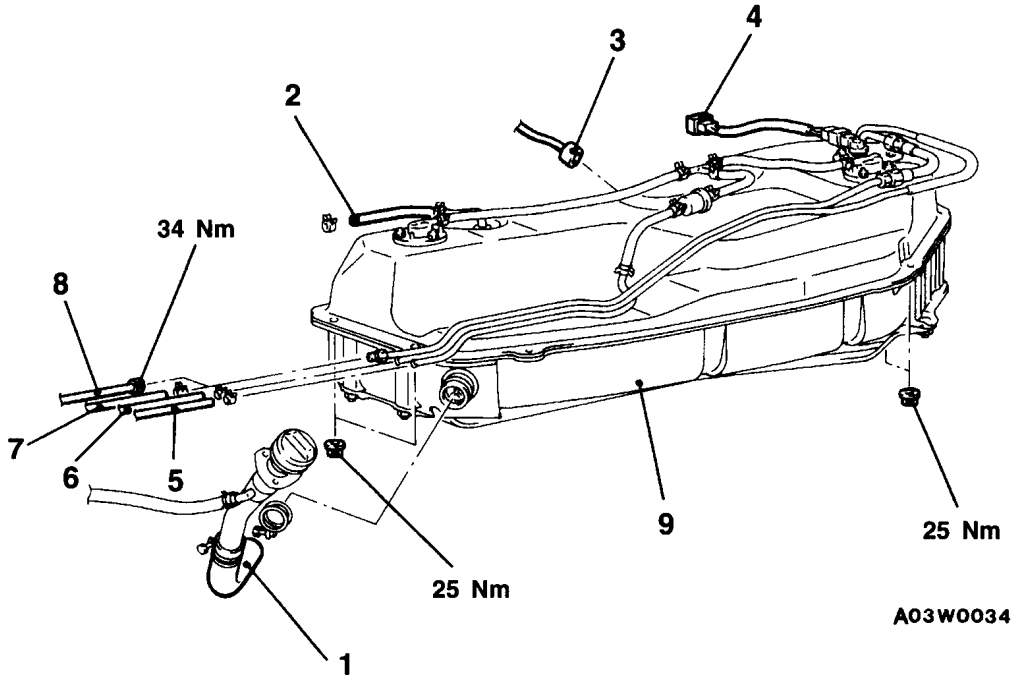
FUEL TANK

120002465

REMOVAL AND INSTALLATION

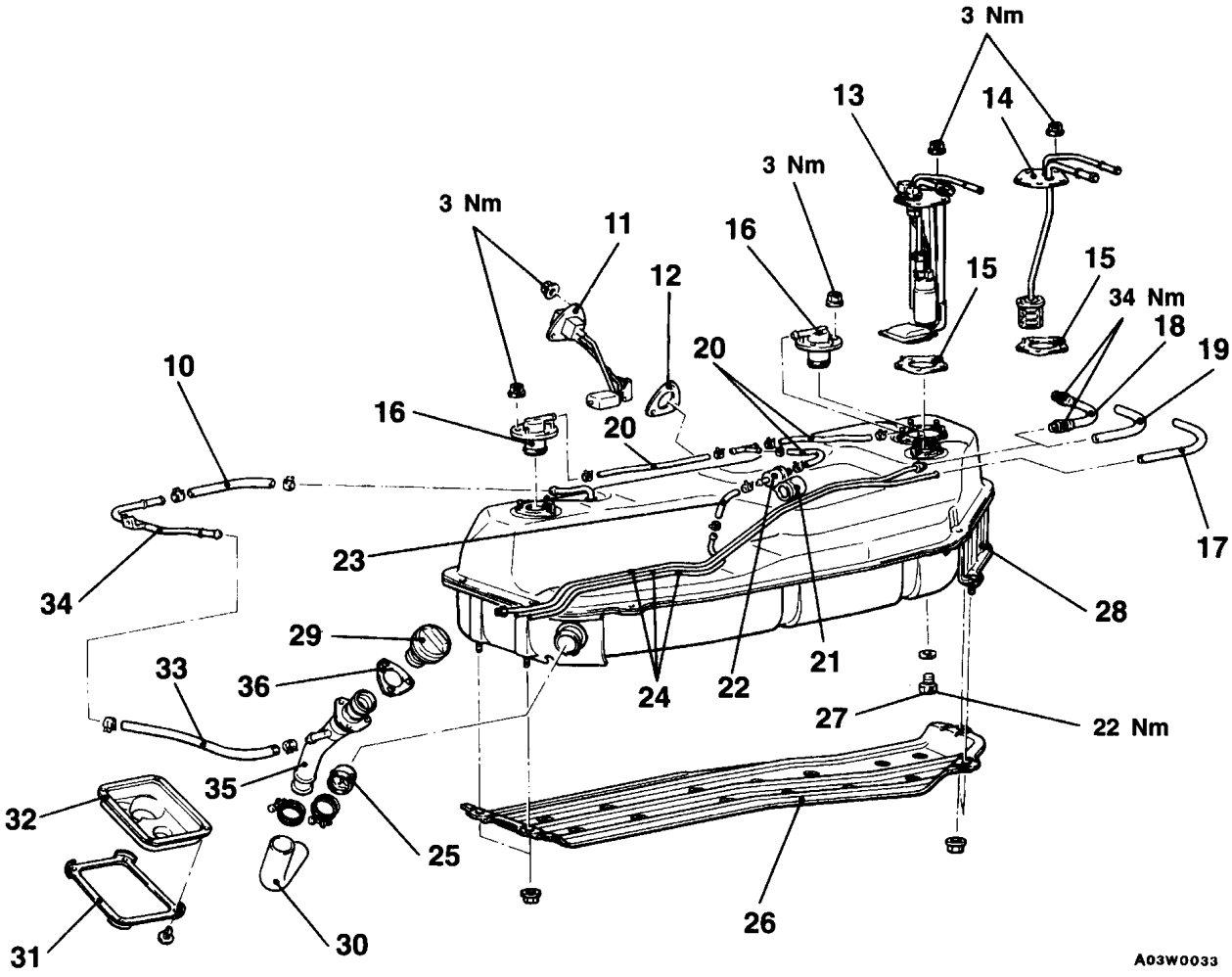
Pre-removal Operation
- Fuel Draining
- Fuel Discharge Prevention <MPI> (Refer to GROUP 13A – Service Adjustment Procedures.)

Post-Installation Operation
- Fuel Refilling
- Fuel Leakage Inspection



Fuel tank removal steps

1. Filler hose connection
2. Leveling hose connection
3. Fuel gauge unit connector
4. Fuel pump connector <Petrol-powered vehicles>
5. Vapour hose connection <Vehicles with MPI and vehicles with carburettor>
6. Return hose connection
7. High-pressure fuel hose connection <MPI>
8. Main hose connection <Diesel-powered vehicles and Carburettor>
9. Fuel tank



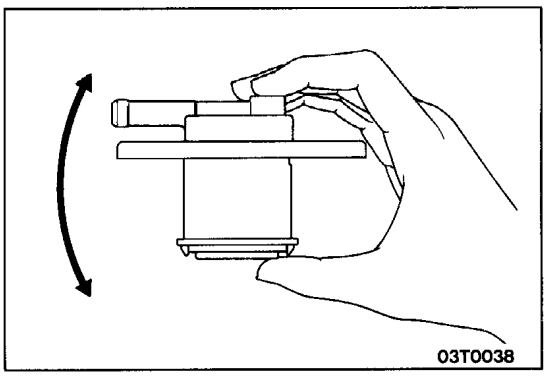
10. Leveling hose
11. Fuel gauge unit
12. Packing
13. Fuel pump
14. Fuel filter assembly
15. Packing
16. Valve assembly
17. Return hose
18. High-pressure fuel hose <MPI>
19. Main hose <Diesel-powered vehicles and Carburettor>
20. Vapour hose
21. Breather case <Diesel-powered vehicles>
22. 2-way valve
23. Vapour hose <Petrol-powered vehicles>
24. Fuel pipe
25. Fuel shut-off valve
26. Fuel tank under cover <4WD>
27. Drain bolt
28. Fuel tank

Fuel filler neck removal steps

29. Fuel filler cap
30. Filler hose
31. Dust plate
32. Dust cover
33. Leveling hose
34. Connector pipe
35. Filler neck
36. Packing

Fuel gauge unit removal steps

3. Fuel gauge unit connector
11. Fuel gauge unit
12. Packing



INSPECTION

VALVE ASSEMBLY

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

Refer to GROUP 54 – Combination Meter.

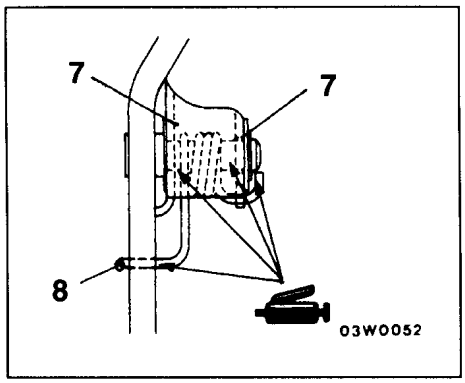
ACCELERATOR CABLE AND PEDAL

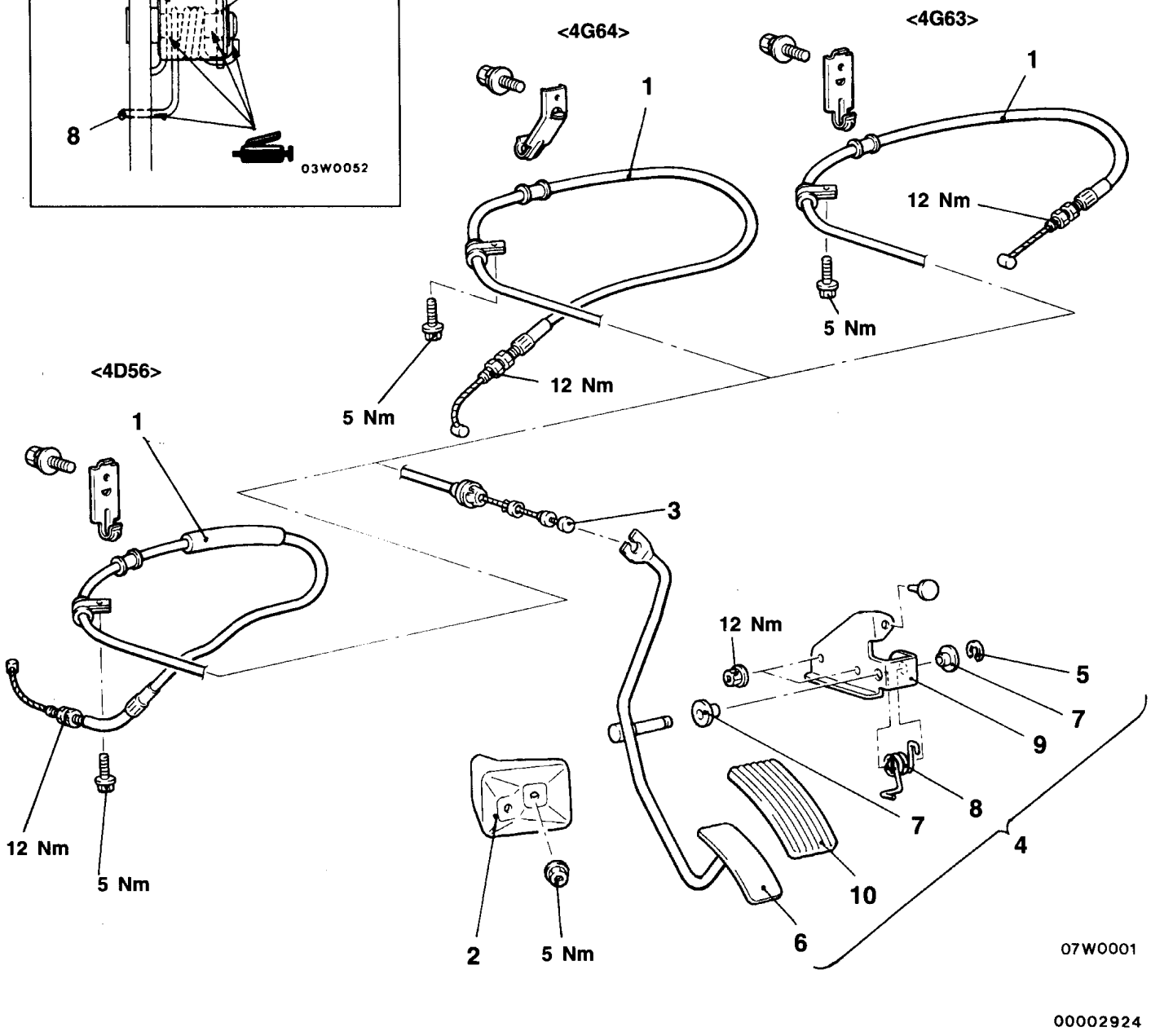
120002466

REMOVAL AND INSTALLATION

<L.H. DRIVE VEHICLES>

Post-installation Operation
- Accelerator Cable Adjustment (Refer to P. 13F-2.)





00002924

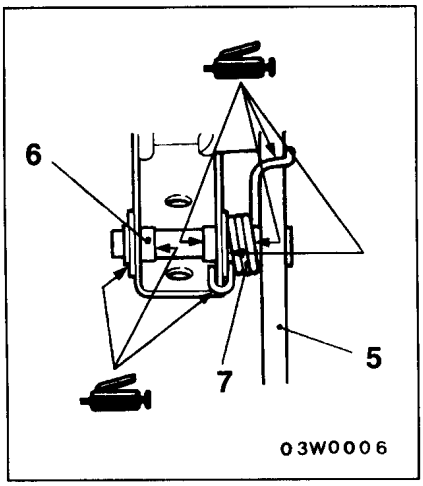
1. Accelerator cable
2. Accelerator pedal stopper

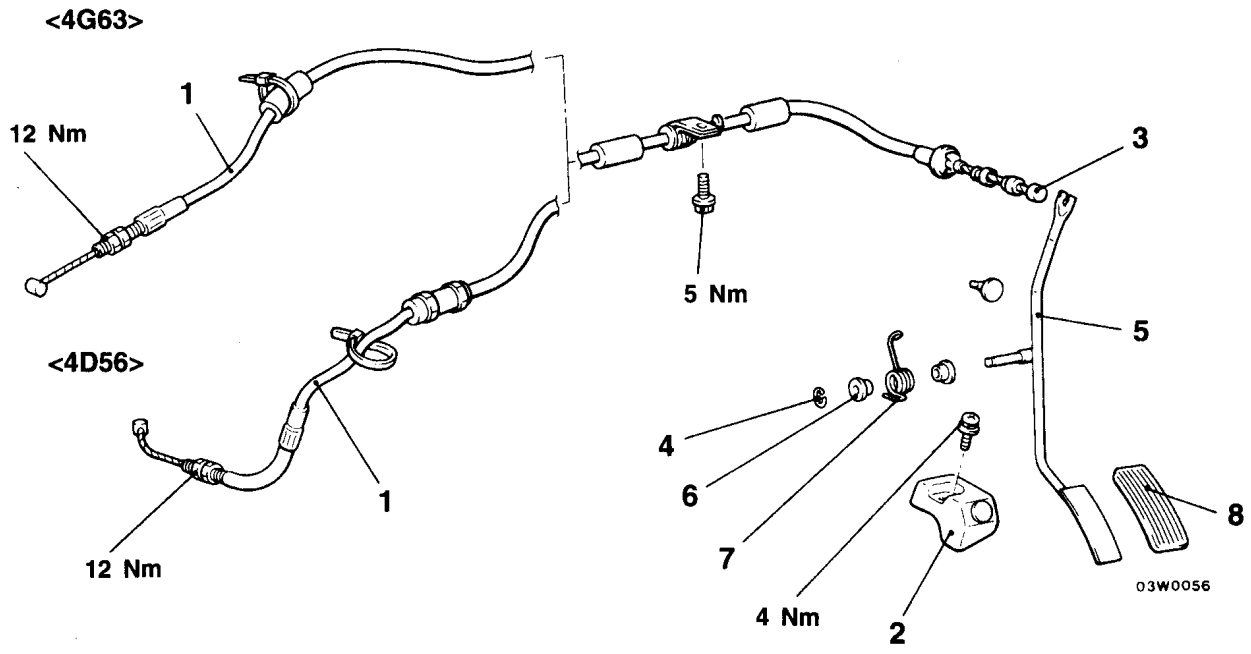
Accelerator pedal removal steps

3. Accelerator cable connection
4. Accelerator pedal assembly
5. Snap ring
6. Accelerator pedal arm
7. Bushing
8. Spring
9. Accelerator pedal bracket
10. Pedal pad

<R.H. DRIVE VEHICLES>

Post-installation Operation
- Accelerator Cable Adjustment (Refer to P. 13F-2.)





00002925

1. Accelerator cable
2. Accelerator pedal stopper

Accelerator pedal removal steps

3. Accelerator cable connection
4. Snap ring
5. Accelerator pedal arm
6. Bushing
7. Spring
8. Pedal pad

FUEL FILTER <PETROL-POWERED VEHICLES>

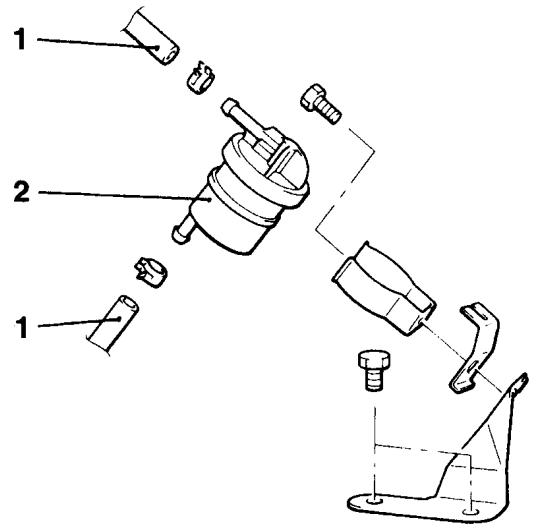
120002467

REMOVAL AND INSTALLATION

Pre-removal Operation
- Fuel Discharge Prevention <MPI> (Refer to GROUP 13A – Service Adjustment Procedures.)
- Battery Removal

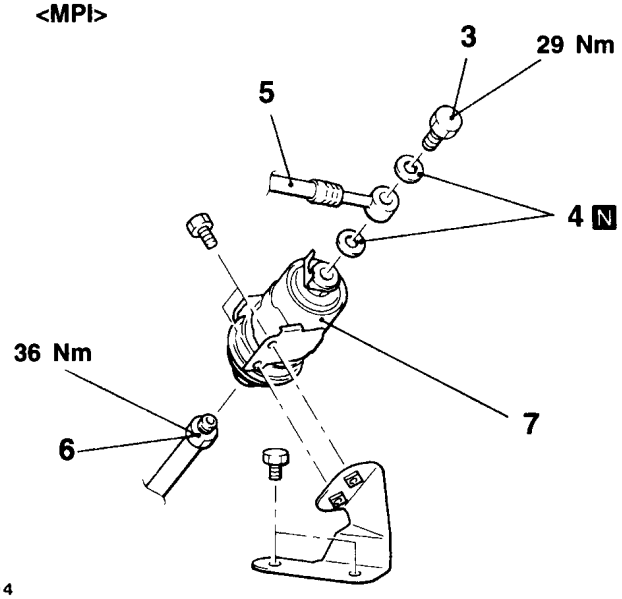
Post-installation Operation
- Battery Installation
- Fuel Leakage Inspection

<Carburettor>



13W0104

<MPI>



13W0070

00002852

Removal steps

<Carburettor>

◀A▶ 1. Fuel hose connection
◀A▶ 2. Fuel filter

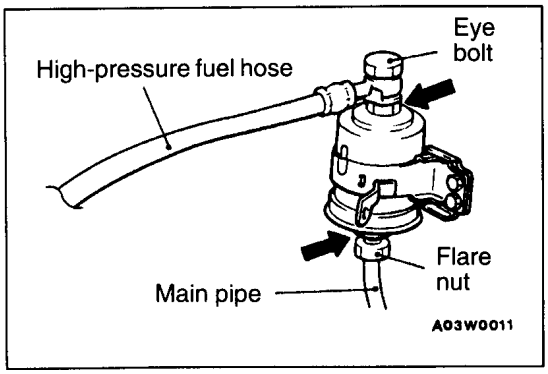
<MPI>

◀B▶ 3. Eye bolt
◀B▶ 4. Gasket
◀B▶ 5. High-pressure fuel hose connection
◀B▶ 6. Main pipe connection
7. Fuel filter

REMOVAL SERVICE POINTS

◀A▶ FUEL HOSE/FUEL FILTER REMOVAL

Caution
Cover with a rag to prevent fuel from spraying out.



◀B▶ EYE BOLT/GASKET/HIGH-PRESSURE FUEL HOSE/ MAIN PIPE REMOVAL

1. Hold the fuel filter with a spanner and remove the eye bolt. Then remove the high-pressure fuel 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.

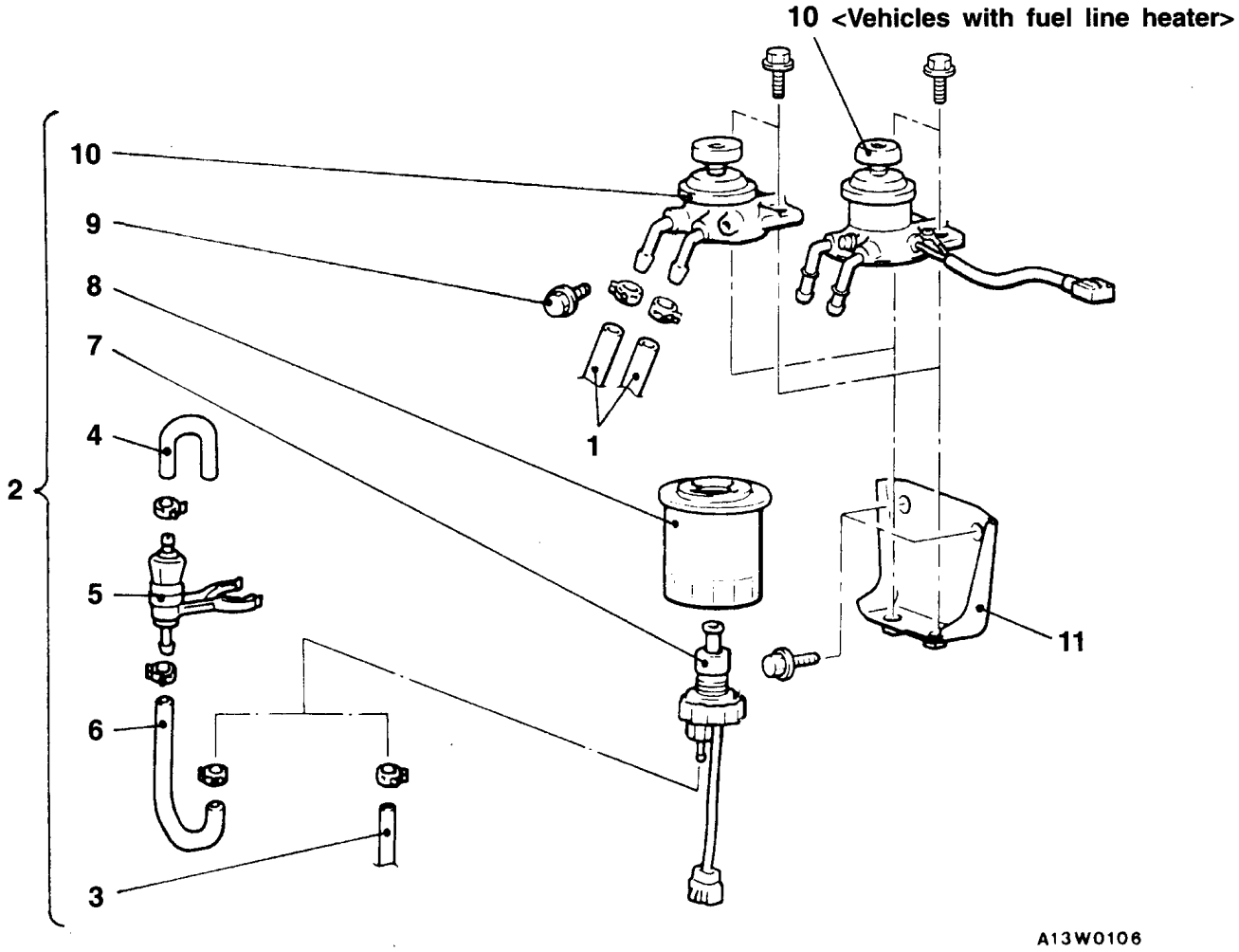
2. Hold the fuel filter with a spanner and loosen the flare nut. Then disconnect the main pipe connection.

FUEL FILTER <DIESEL-POWERED VEHICLES>

120002468

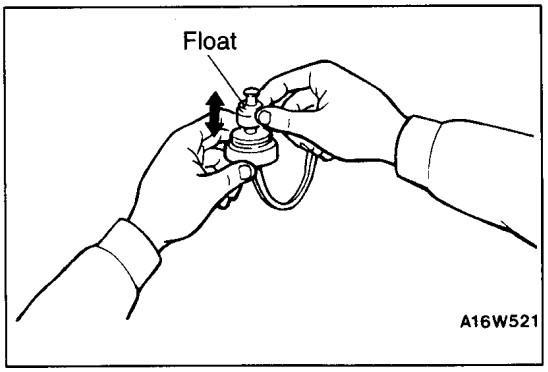
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Battery Removal and Installation



Removal steps

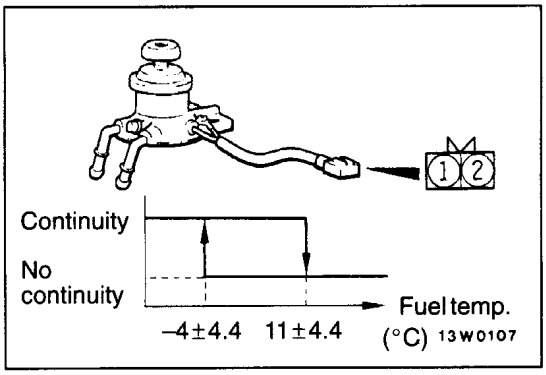
▶A◀ 1. Main hose connection
2. Fuel filter
3. Tube <Except R.H. drive vehicles with 2 batteries>
4. Tube <R.H. drive vehicles with 2 batteries>
5. Drain plug assembly <R.H. drive vehicles with 2 batteries>
6. Drain hose <R.H. drive vehicles with 2 batteries>
7. Water level sensor
8. Fuel filter cartridge
9. Breather screw
10. Fuel filter pump
11. Fuel filter bracket



INSPECTION

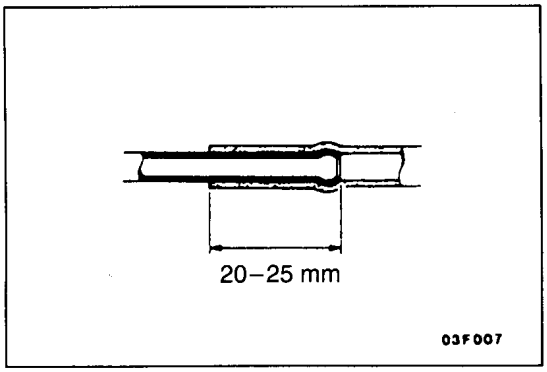
WATER LEVEL SENSOR

Connect the circuit tester to the water level sensor connector. The water level sensor is operating correctly if there is continuity when the float is raised and no continuity when it is lowered.



FUEL LINE HEATER CONTINUITY INSPECTION

There should be continuity between the terminals when the fuel filter pump is cooled to –4°C or below and continuity should disappear when the pump is gradually heated. If this is true, then the heater is working properly.



INSTALLATION SERVICE POINT

◀A▶ FUEL MAIN HOSE INSTALLATION

If the pipe has a stepped part, connect securely up to the stepped part. If the pipe has no stepped part, insert so that the inserted portion is 20–25 mm long.

COOLING

CONTENTS

120002145

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Concentration Measurement 5

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WATER HOSE AND WATER PIPE 13

RADIATOR 16

GENERAL INFORMATION

120002146

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.

Items			Specifications
Radiator	Performance kJ/h	4G63	167,442
		4G64	184,186
		4D56	221,861
Automatic transmission oil cooler	Performance kJ/h		5,233

SERVICE SPECIFICATIONS

120002147

Items	Standard value	Limit
High pressure valve opening pressure of radiator cap kPa	75–105	65
Range of coolant antifreeze concentration of radiator %	30–60	–
Valve opening temperature of thermostat °C	82 <4G63, 4G64> 76.5 < 4D56>	–
Full-opening temperature of thermostat °C	95 <4G63, 4G64> 90 <4D56>	–
Amount of thermostat valve lift mm	8.5 or more <4G63,4G64, 4D56–Wagon>	–
	8 or more <4D56 – Panel van and window van>	–

LUBRICANT

120002148

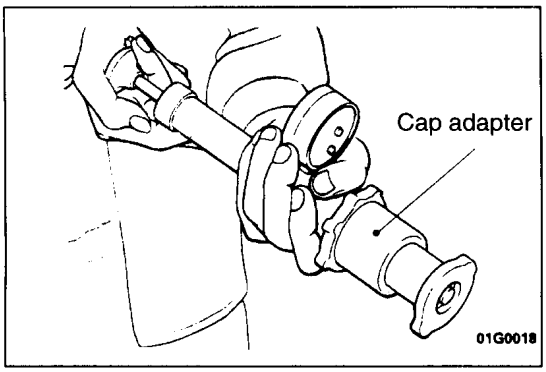
Item		Quantity dm^3
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	4G63, 4G64	8 (9)
	4D56	9 (10)

NOTE
( ) indicates figure witn rear heater.

SEALANTS

120000210

Items	Specified sealant	Remarks
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent	Drying sealant
Water by-pass fitting <4G63, 4G64>	Mitsubishi Genuine Parts No. MD970389 or equivalent	Semi-Drying sealant



SERVICE ADJUSTMENT PROCEDURES

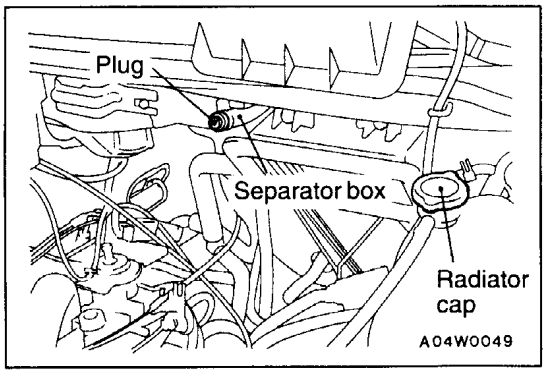
120000211

RADIATOR CAP VALVE OPENING PRESSURE

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

   Limit: 65 kPa
   Standard value: 75–105 kPa
3. Replace the radiator cap if the reading does not remain at or above the limit.

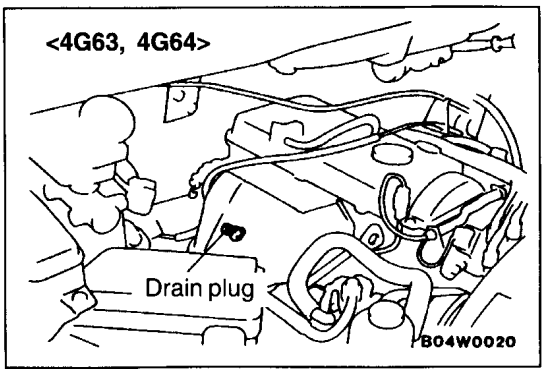
   NOTE
   Be sure that the cap is clean before testing, since rust or other foreign material on the cap seal will cause an improper indication.



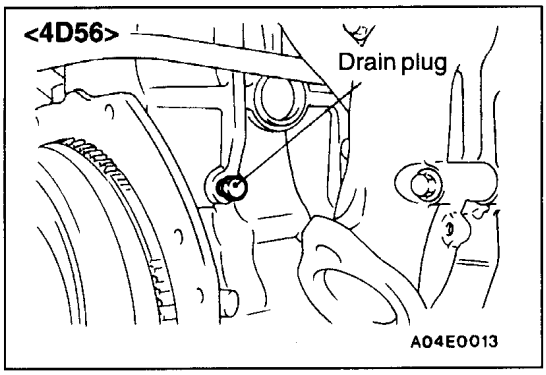
ENGINE COOLANT REPLACEMENT

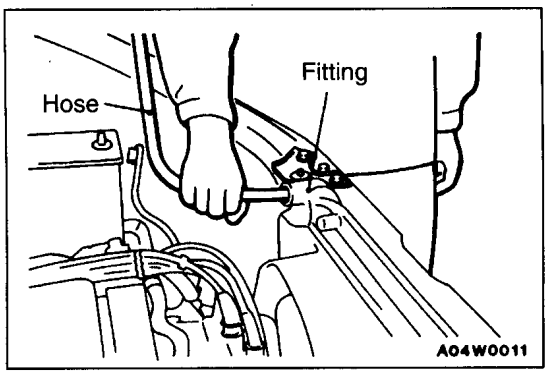
120002149

1. Remove the drain plug to drain the coolant from inside the radiator.
2. Remove the separator box plug, radiator cap. Then drain the coolant from inside the heater and engine reserve tank.

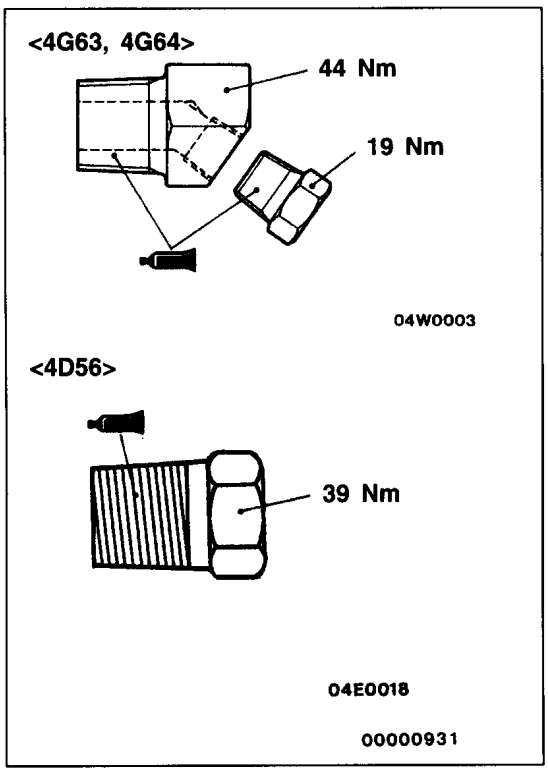


3. Remove the drain plug from the cylinder block to drain the engine coolant.





4. Disconnect the hose from the radiator and pour water in through the fitting 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

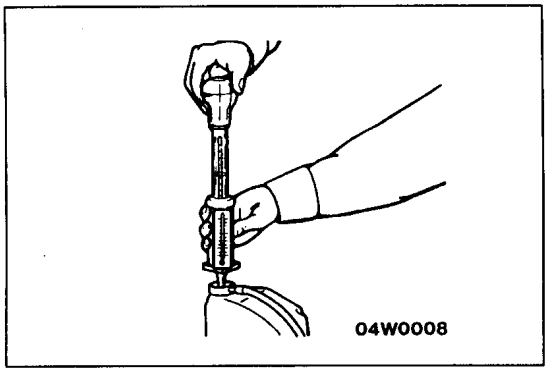
6. Securely tighten the radiator drain plug.
7. Slowly pour coolant into the reserve tank until it overflows from the separator box plug hole without any bubbles. Then install the plug.
8. Pour engine coolant into the reserve tank until the level reaches the FULL line.

   Recommended antifreeze: HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT

Items	Quantity dm^3
4G63, 4G64	8 (9)
4D56	9 (10)

NOTE
( ) indicates figure with rear heater.

9. Install the radiator cap securely.
10. Start the engine and warm the engine until the thermostat opens. (Touch the radiator hose with your fingers to check that warm water is flowing.)
11. After the thermostat opens, race the engine several times, and then stop the engine.
12. 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 9.



CONCENTRATION MEASUREMENT 120000213

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

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

RECOMMENDED ANTIFREEZE

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

Caution

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

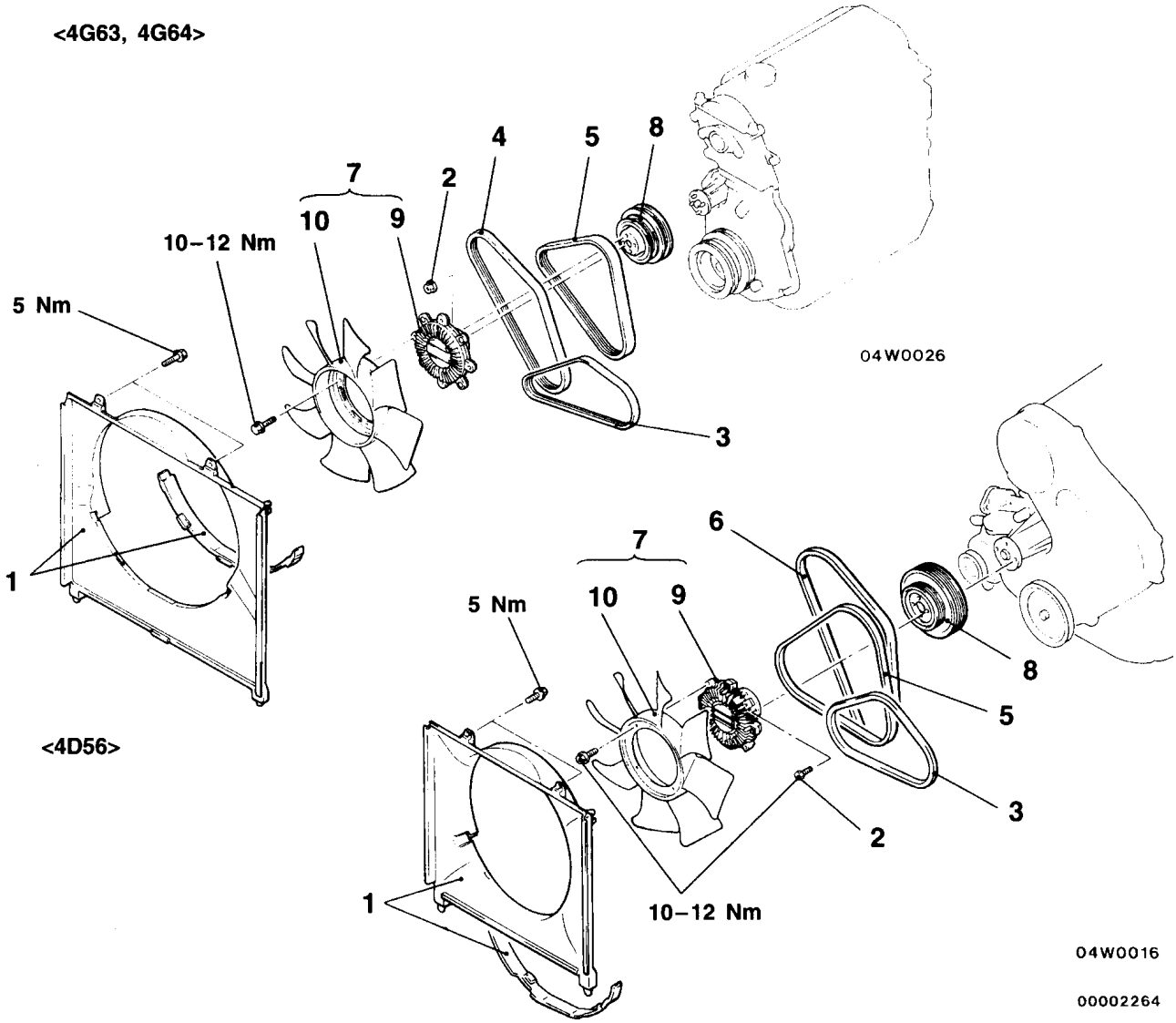
COOLING FAN

120000214

REMOVAL AND INSTALLATION

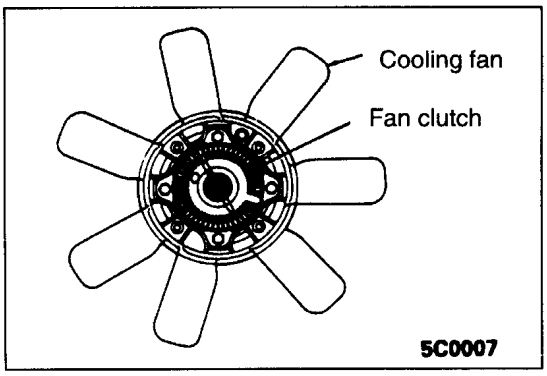
Pre-removal and Post-installation Operation
1. Engine Coolant Draining and Supplying (Refer to P.14-3.)
2. Radiator Upper Hose Removal and Installation (Refer to P.14-16.)

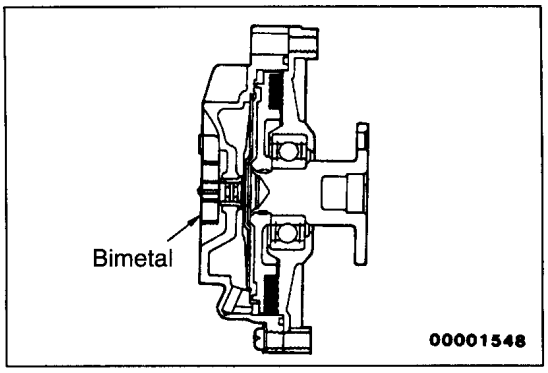
<4G63, 4G64>



<4D56>

Removal steps
1. Shroud assembly
2. Bolt or nut
3. Drive belt (A/C)
4. Drive belt (Power steering) <4G63, 4G64>
5. Drive belt (Alternator)
6. Drive belt (Power steering) <4D56>
7. Cooling fan and fan clutch assembly
8. Pulley
9. Fan clutch
10. Cooling fan





INSPECTION

COOLING FAN

- Check blades for damage and cracks.
- Check for cracks and damage around bolt holes in fan hub.
- If any portion of fan is damaged or cracked, replace cooling fan.

FAN CLUTCH

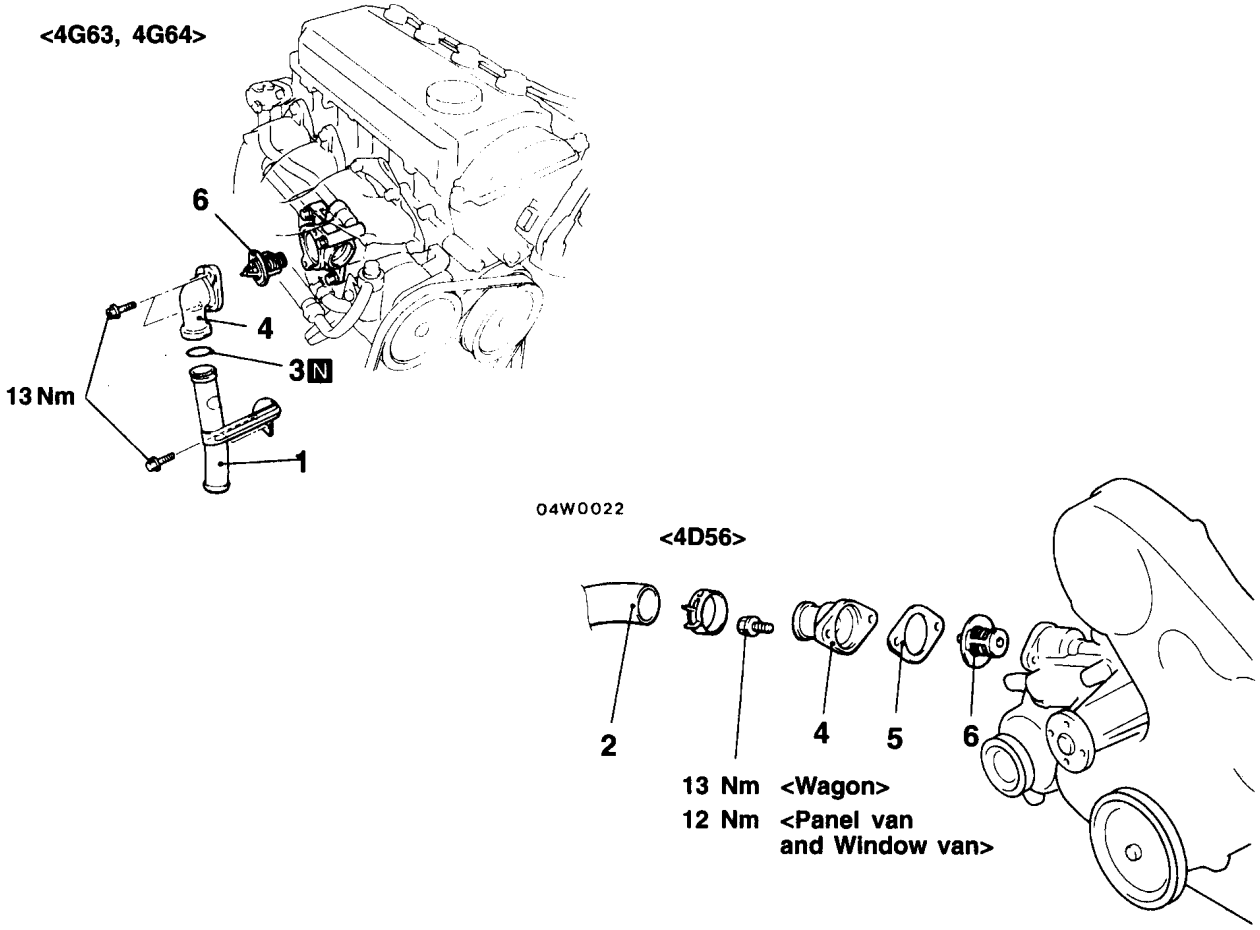
- Check to ensure that fluid in fan clutch is not leaking at case joint and seals. If fluid quantity decreases due to leakage, fan speed will decrease and engine overheating might result.
- When a fan attached to an engine is turned by hand, it should give a sense of some resistance. If fan turns lightly, it is faulty.
- Check bimetal strip for damage.

THERMOSTAT

120002151

REMOVAL AND INSTALLATION

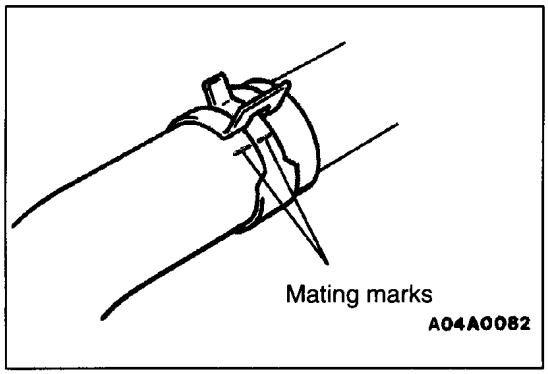
Pre-removal and Post-installation Operation
1. Engine Coolant Draining and Supplying (Refer to P.14-3.)
2. Air Intake Hose Removal and Installation <4G63, 4G64> (Refer to GROUP 15 – Air Cleaner.)



04W0007
00002265

Removal steps

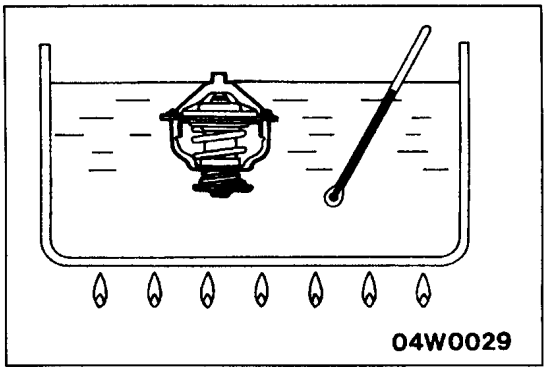
1. Radiator lower pipe assembly <4G63, 4G64>
◀A▶ ▶C◀ 2. Radiator lower hose connection <4D56>
▶B◀ 3. O-ring <4G63, 4G64>
4. Water inlet fitting
5. Water inlet fitting gasket <4D56>
▶A◀ 6. Thermostat



REMOVAL SERVICE POINT

◀A▶ RADIATOR LOWER HOSE DISCONNECTION

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



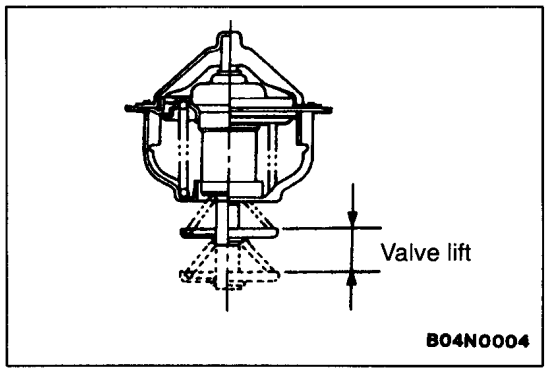
INSPECTION

THERMOSTAT INSPECTION

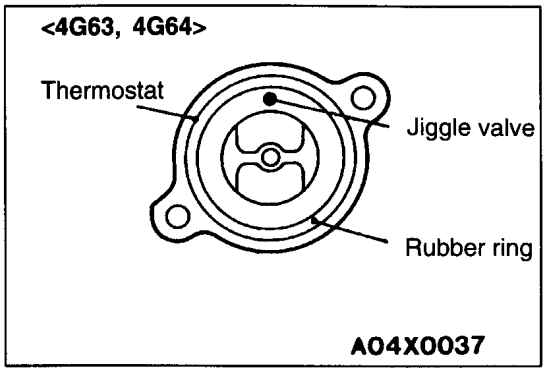
Immerse the thermostat in water, and heat the water while stirring. Check that the thermostat valve opening and fully open temperatures.

Standard value:

Items	4G63, 4G64	4D56
Valve opening temperature °C	82	76.5
Full-opening temperature °C	95	90
Amount of valve lift mm	8.5 or more	8 or more <Panel van and Window van> 8.5 or more <Wagon>



1. Measure valve height when fully closed. Calculate lift by measuring the height when fully open.
2. If valve opens even a little at normal temperature, the thermostat should be replaced.
3. If there is any serious warping, visible damage or breakage, the thermostat should be replaced.
4. Remove any rust or deposits if present.



INSTALLATION SERVICE POINTS

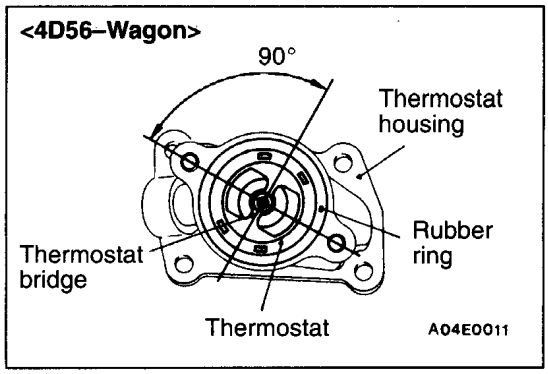
▶A◀ THERMOSTAT INSTALLATION

<4G63, 4G64>

Install the thermostat so that the jiggle valve is facing straight up, while being careful not to fold over or scratch the rubber ring.

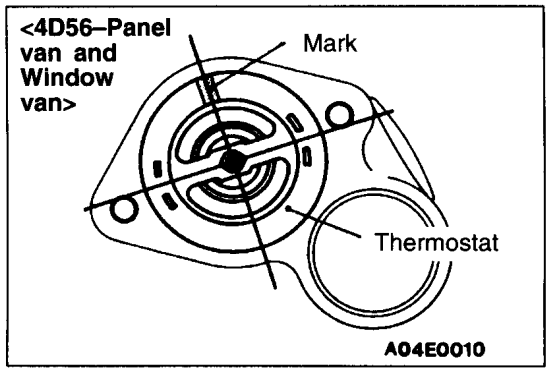
Caution

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.

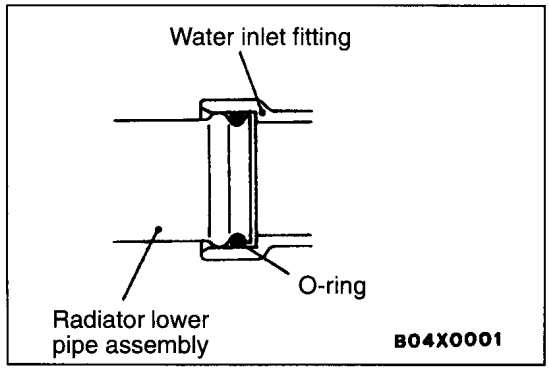


<4D56–Wagon>
Hold the thermostat at the angle shown in the illustration, and install it while being careful not to wrinkle or damage the rubber ring.

Caution
- **Do not apply any oil or grease to the rubber ring of the thermostat under any circumstances.**



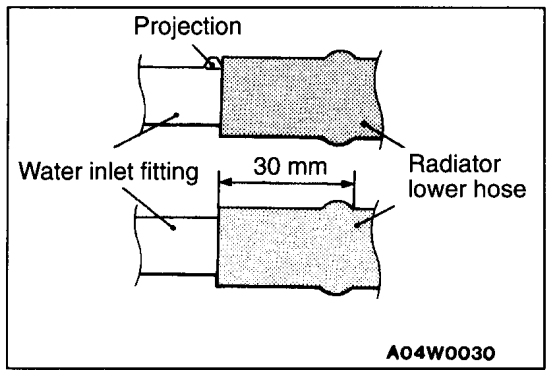
<4D56–Panel van and Window van>
Install the thermostat so that the mark is facing straight up.



▶B◀ O-RING INSTALLATION

Insert the O-ring into the groove in the radiator lower pipe assembly, and then apply water to the outer inside diameter of the O-ring.

Caution
1. **Do not apply oil and grease to water pipe O-ring.**
2. **Keep the water pipe connections free of sand, dust, etc.**



▶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.

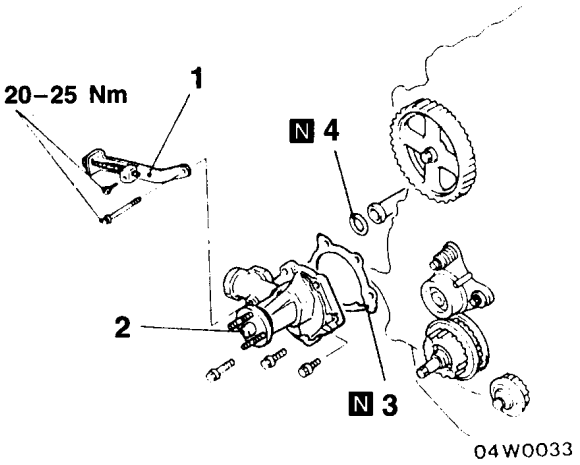
WATER PUMP

120002152

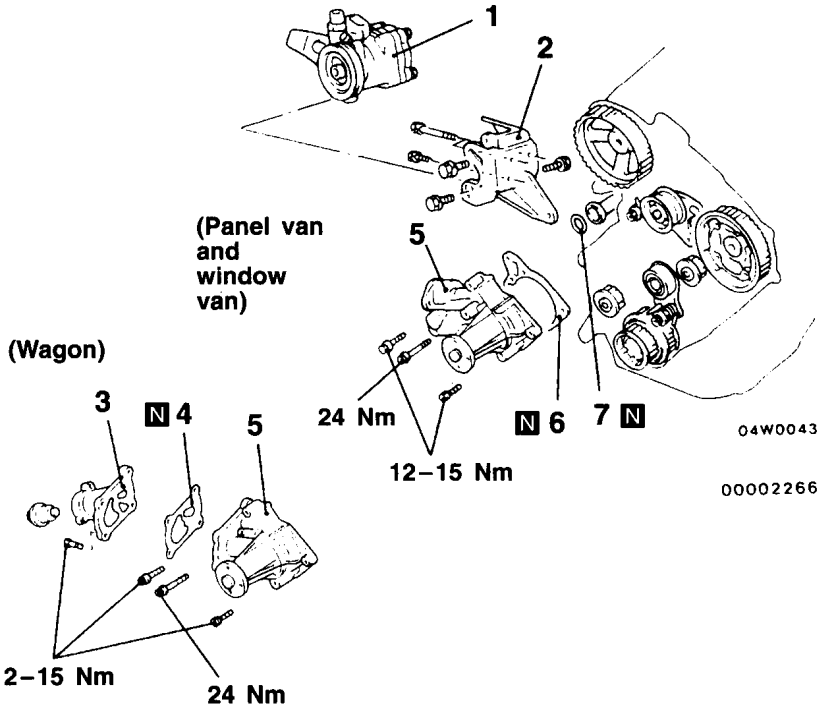
REMOVAL AND INSTALLATION

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

<4G63, 4G64>



<4D56>



Removal steps

<4G63, 4G64>

1. Alternator brace
▶B◀ 2. Water pump assembly
3. Water pump gasket
▶A◀ 4. O-ring

◀A▶

<4D56>

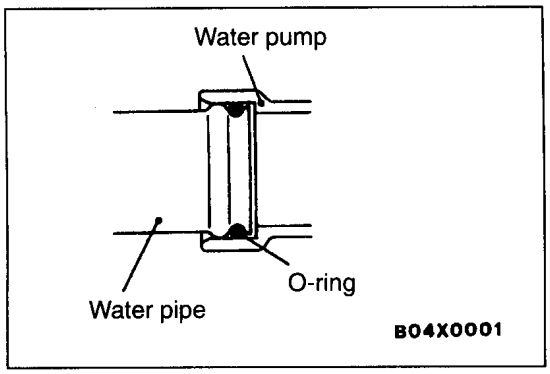
- Air intake hose (Refer to GROUP 15 – Air Cleaner)
- Thermostat (Refer to P.14-8.)

1. Power steering oil pump
2. Power steering oil pump bracket
3. Thermostat housing <Wagon>
4. Thermostat housing gasket <Wagon>

▶B◀ 5. Water pump assembly
6. Gasket
▶A◀ 7. O-ring

◀A▶ POWER STEERING OIL PUMP REMOVAL

(1) Remove the power steering oil pump from the bracket with the hose still attached.
(2) Place the power steering oil pump somewhere where it will not be a hindrance to working, being careful not to put too much strain on the hose.



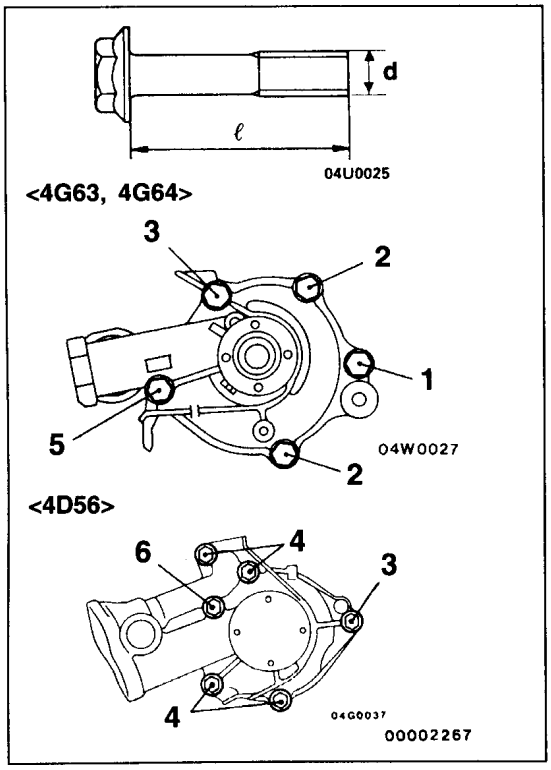
INSTALLATION SERVICE POINTS

▶A◀ O-RING INSTALLATION

Rinse the mounting location of the O-ring and water pipe with water, and install the O-ring and water pipe.

Caution

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



▶B◀ WATER PUMP ASSEMBLY INSTALLATION

No.	Hardness category (Head mark)	d × ℓ mm
1	4T	8×14
2		8×22
3		8×25
4		8×40
5	7T	8×65
6		8×70

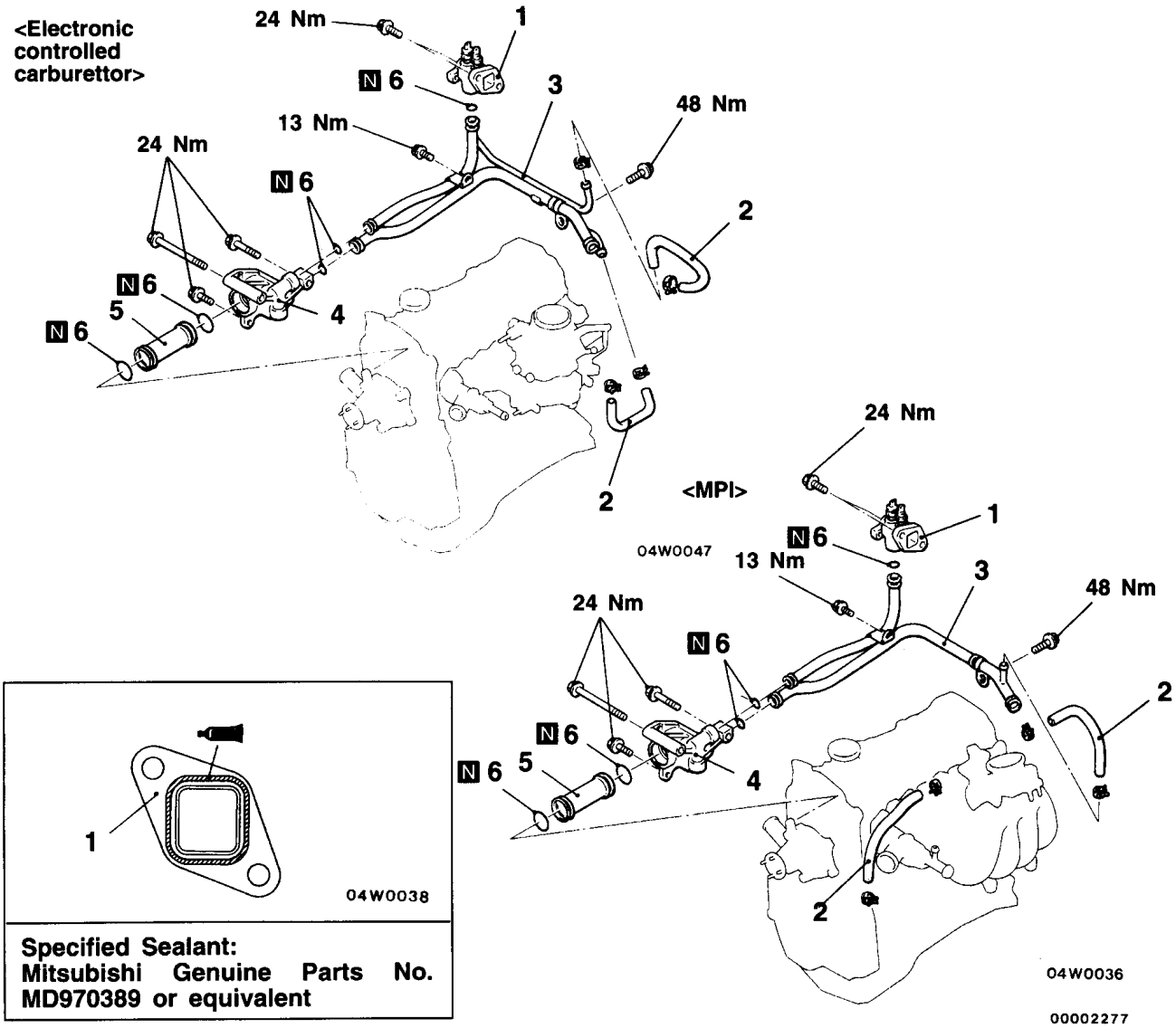
WATER HOSE AND WATER PIPE

120002153

REMOVAL AND INSTALLATION

<4G63, 4G64>

Pre-removal and Post-installation Operation
1. Engine Coolant Draining and Supplying (Refer to P.14-3.)
2. Thermostat Removal and Installation (Refer to P.14-8.)
3. Exhaust Manifold Removal and Installation (Refer to GROUP 15 – Exhaust Manifold.)

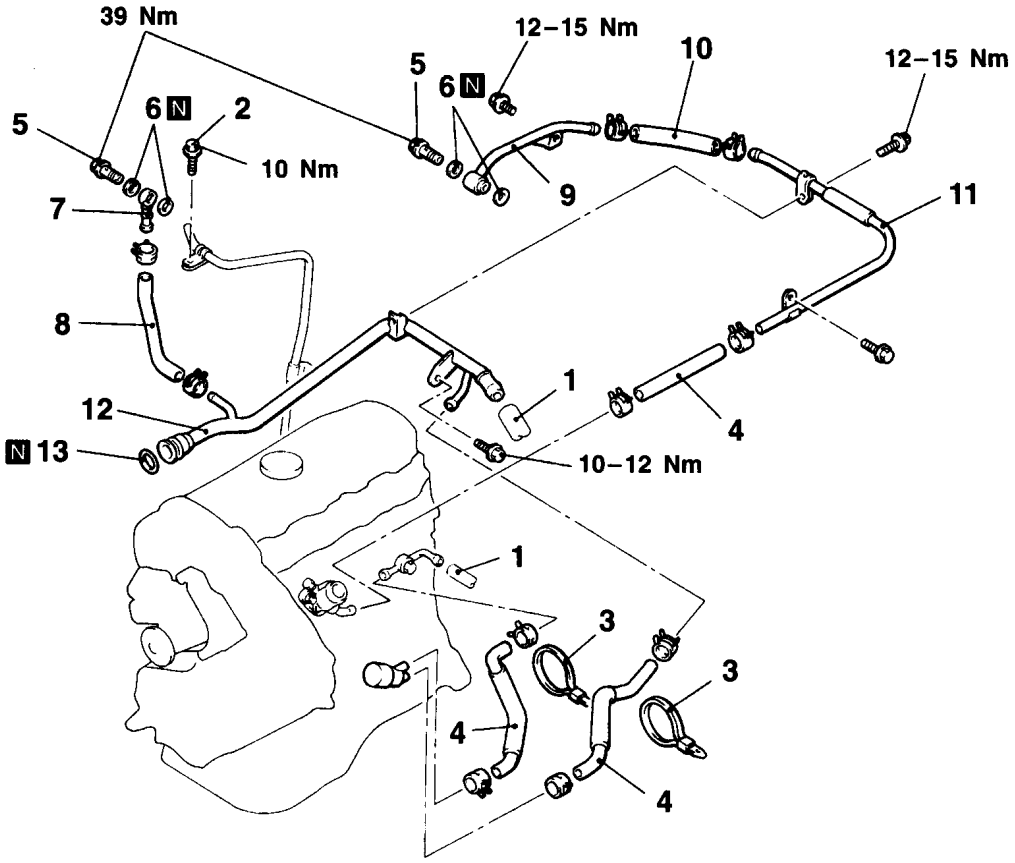


Specified Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent

Removal steps
1. Water bypass fitting
◀A▶ ▶B◀ 2. Water hose
3. Water pipe assembly
4. Thermostat housing assembly
5. Water inlet pipe
▶A◀ 6. O-ring

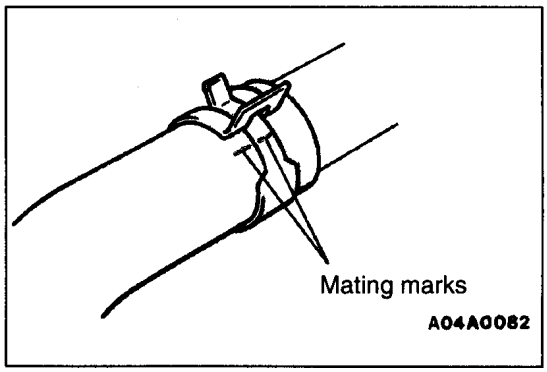
<4D56>

Pre-removal and Post-Installation Operation
1. Engine Coolant Draining and Supplying (Refer to P.14-3.)
2. Injection Pipe Removal and Installation (Refer to GROUP 13E – Injection Nozzle.)
3. Intake, Exhaust Manifold Removal and Installation (Refer to GROUP 15 – Intake Exhaust Manifold, Turbocharger.)



Removal steps

1. Heater hose connection (Refer to GROUP 55 – Heater Hose.)
2. Vacuum pipe installation bolt
3. Cable band
◀A▶ ▶B◀ 4. Water hose
5. Eye bolt
6. Gasket
7. Water pipe assembly A
◀A▶ ▶B◀ 8. Water hose
9. Water pipe assembly B
10. Water hose
11. Water pipe assembly C
12. Water pipe assembly
▶A◀ 13. O-ring



REMOVAL SERVICE POINT

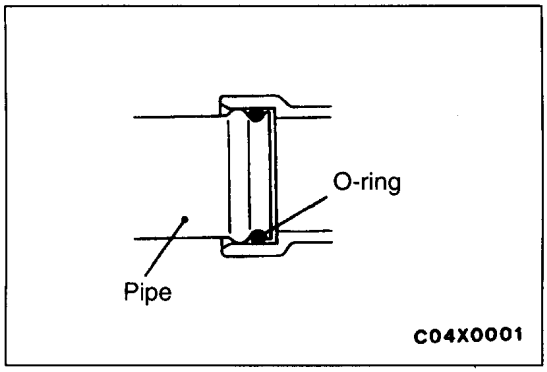
◀A▶ WATER HOSE DISCONNECTION

To reuse the hose, make a mating marks on the hose and the hose clamp and then disconnect the hose.

INSPECTION

WATER PIPE AND HOSE INSPECTION

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



INSTALLATION SERVICE POINTS

▶A◀ O-RING INSTALLATION

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

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

▶B◀ WATER HOSE CONNECTION

To reuse the water hose, align the mating marks that were made during removal, and then install the hose clamp.

RADIATOR

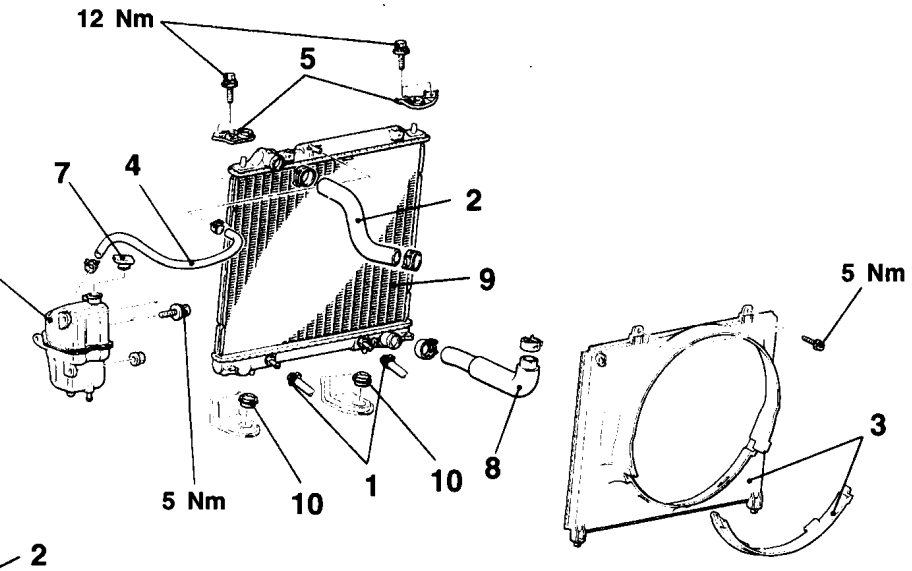
120002154

REMOVAL AND INSTALLATION

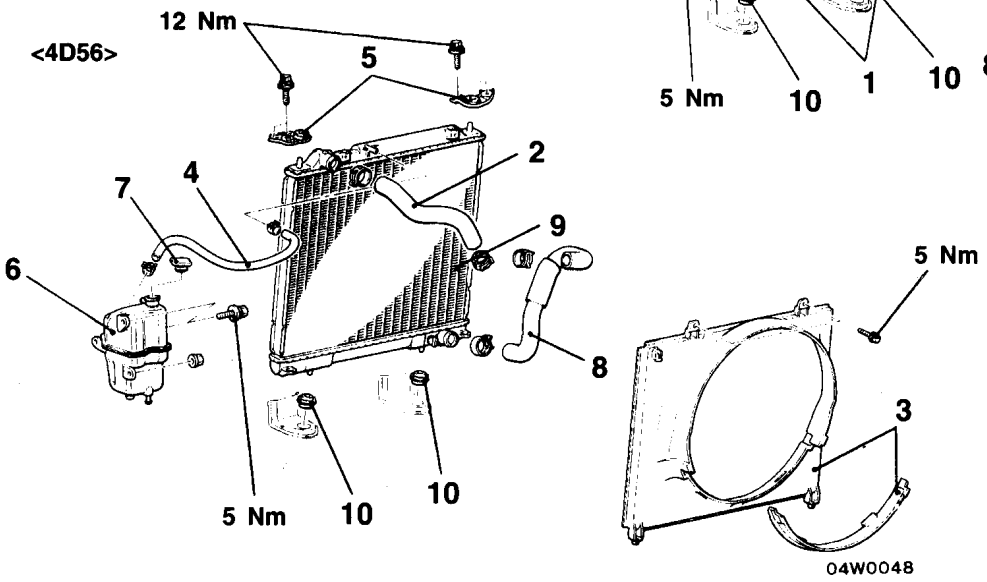
Pre-removal Operation
1. Under Cover Removal (Refer to GROUP 42 – Under Cover.)
2. Engine Coolant Draining (Refer to P.14-3.)

Post-installation Operation
1. Engine Coolant Supplying and Checking (Refer to P.14-3.)
2. Under Cover Installation (Refer to GROUP 42 – Under Cover.)
3. A/T Fluid Supplying and Checking <A/T> (Refer to GROUP 23 – Service Adjustment Procedures.)

<4G63, 4G64>



<4D56>



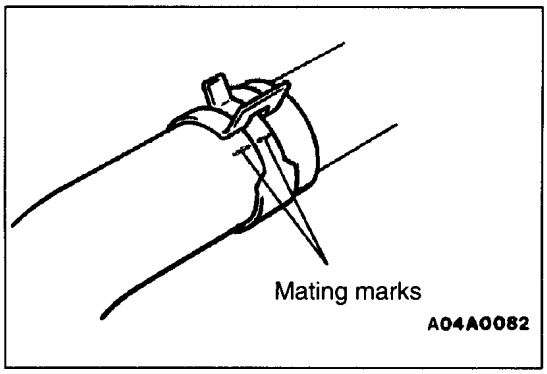
04W0039

04W0048

00002268

Removal steps

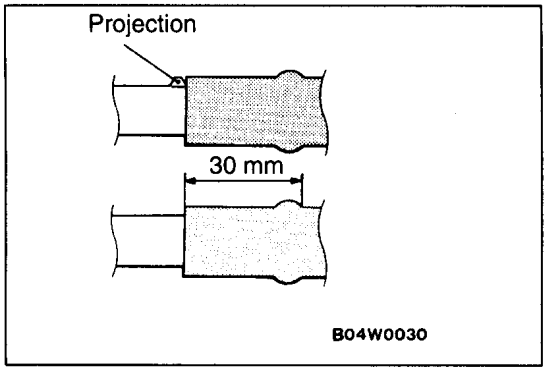
1. Transmission fluid cooler hose <A/T>
◀A▶ ▶A◀ 2. Radiator upper hose
3. Shroud
4. Rubber hose
5. Radiator support assembly
6. Reserve tank assembly
7. Radiator cap
◀A▶ ▶A◀ 8. Radiator lower hose
9. Radiator assembly
10. Lower insulator



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 POINT

▶A◀ RADIATOR UPPER HOSE/RADIATOR LOWER HOSE CONNECTION

(1) Insert the hose as far as the projections on both the radiator side and engine side. If there is no projection, insert by the amount shown in the illustration.
(2) Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

INTAKE AND EXHAUST

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120002519

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- Turbocharger Supercharging Inspection 3
- Waste Gate Actuator Inspection 3
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- Power Relay Check 4

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EXHAUST MANIFOLD <4G63, 4G64> 15

EXHAUST PIPE AND MAIN MUFFLER 16

CATALYTIC CONVERTER
..... Refer to GROUP 17

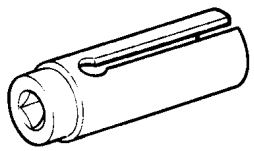
SERVICE SPECIFICATIONS

120002308

Items		Standard value	Limit
Waste gate actuator activation pressure kPa	Panel van and window van	Approx. 83	–
	Wagon	Approx. 92	–
Air temperature switch °C <Vehicles with intercooler turbocharger>	OFF → ON	57 or more	–
	ON → OFF	45 or less	–
Manifold distortion of the installation surface mm		0.15 or less	0.20

SPECIAL TOOL

120000099

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

SEALANT

120002309

Item	Specified sealant	Remark
Thermo valve <4G63 (Carburettor)>	3M Nut Locking Part No. 4171 or equivalent	Drying sealant
Water outlet fitting <4G63, 4G64>	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant

SERVICE ADJUSTMENT PROCEDURES

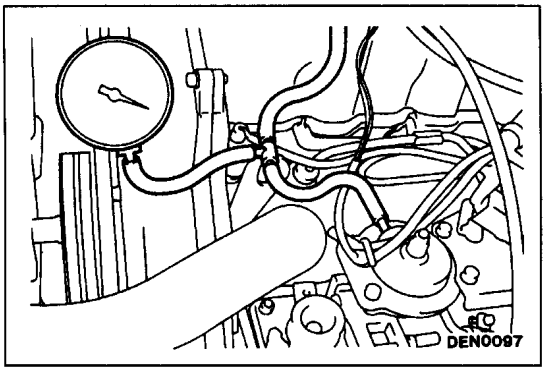
INTAKE MANIFOLD VACUUM INSPECTION <4G6>

120002658

Refer to GROUP 11D–Service Adjustment Procedures.

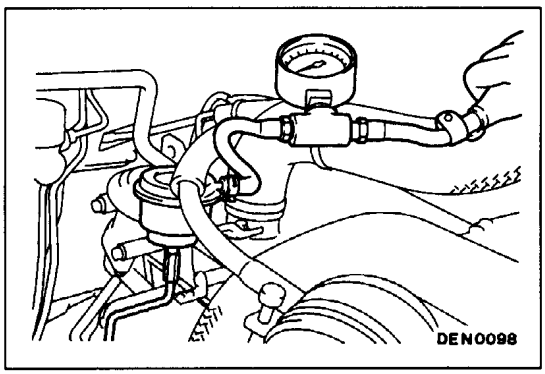
TURBOCHARGER SUPERCHARGING INSPECTION <4D56>

120002310



Caution
Conduct the driving test in a location where driving at full acceleration can be done with safety. Two persons should be in the vehicle when the test is conducted; the person in the passenger seat should read the indications shown by the pressure meter.

1. Remove the boost compensator hose from the fuel injection pump, and install a pressure gauge as shown in the illustration.
2. Drive at full-throttle acceleration in second gear and then measure the supercharging when the engine speed in about 3,000 r/min.
3. When the indicated supercharging does not become positive pressure, check the following items.
   - Malfunction of the waste gate actuator.
   - Leakage of supercharging pressure.
   - Malfunction of the turbocharger.
4. When the indicated supercharging is 84 kPa or more, supercharging control may be faulty, therefore check the followings.
   - Disconnection or cracks of the waste gate actuator rubber hose.
   - Malfunction of the waste gate actuator.
   - Malfunction of the waste gate valve.



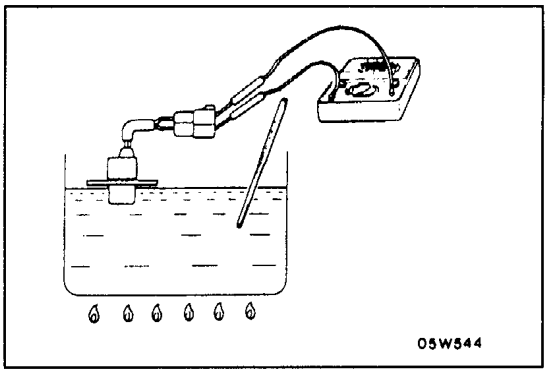
WASTE GATE ACTUATOR INSPECTION <4D56>

120002311

1. Connect a manual pump (pressure-application type) to nipple A.
2. While gradually applying pressure, check the pressure that begins to activate (approx. 1 mm stroke) the waste gate actuator rod.

   Standard value: Approx. 83 kPa <Panel van and window van>
   Approx. 92 kPa <Wagon>

   Caution
   In order to avoid damage to the diaphragm, do not apply a pressure of 91 kPa or higher <Panel van and window van>, 106 kPa or higher <Wagon>.
3. If there is a significant deviation from the standard value, check the actuator or the waste gate valve: replace if necessary.



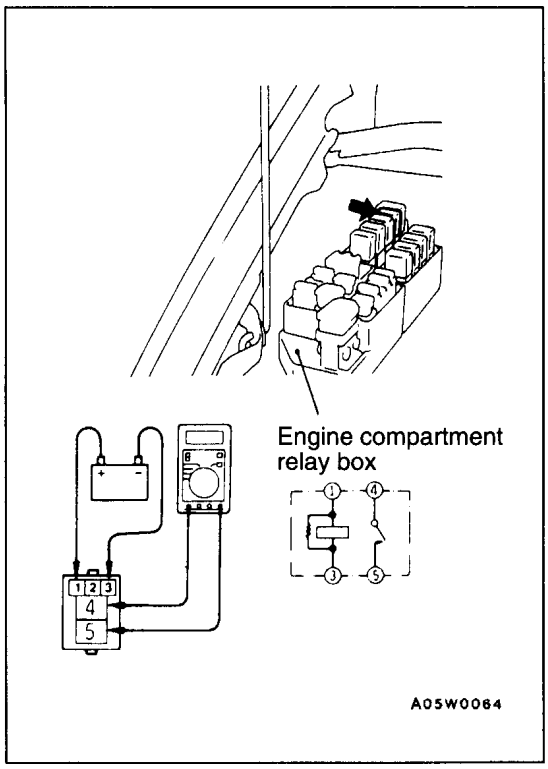
AIR TEMPERATURE SWITCH INSPECTION <Vehicles with intercooler turbocharger>

120002312

1. Immerse the air temperature switch into warm water as shown in the illustration.
2. Check the continuity with a circuit tester as the temperature of the liquid changes, and the condition is normal if it is within the standard value.

Standard value:

Items	Temperature
OFF → ON	57 or more
ON → OFF	45 or less



POWER RELAY CHECK <Vehicles with intercooler turbocharger>

120002313

INTERCOOLER FAN MOTOR RELAY CONTINUITY INSPECTION

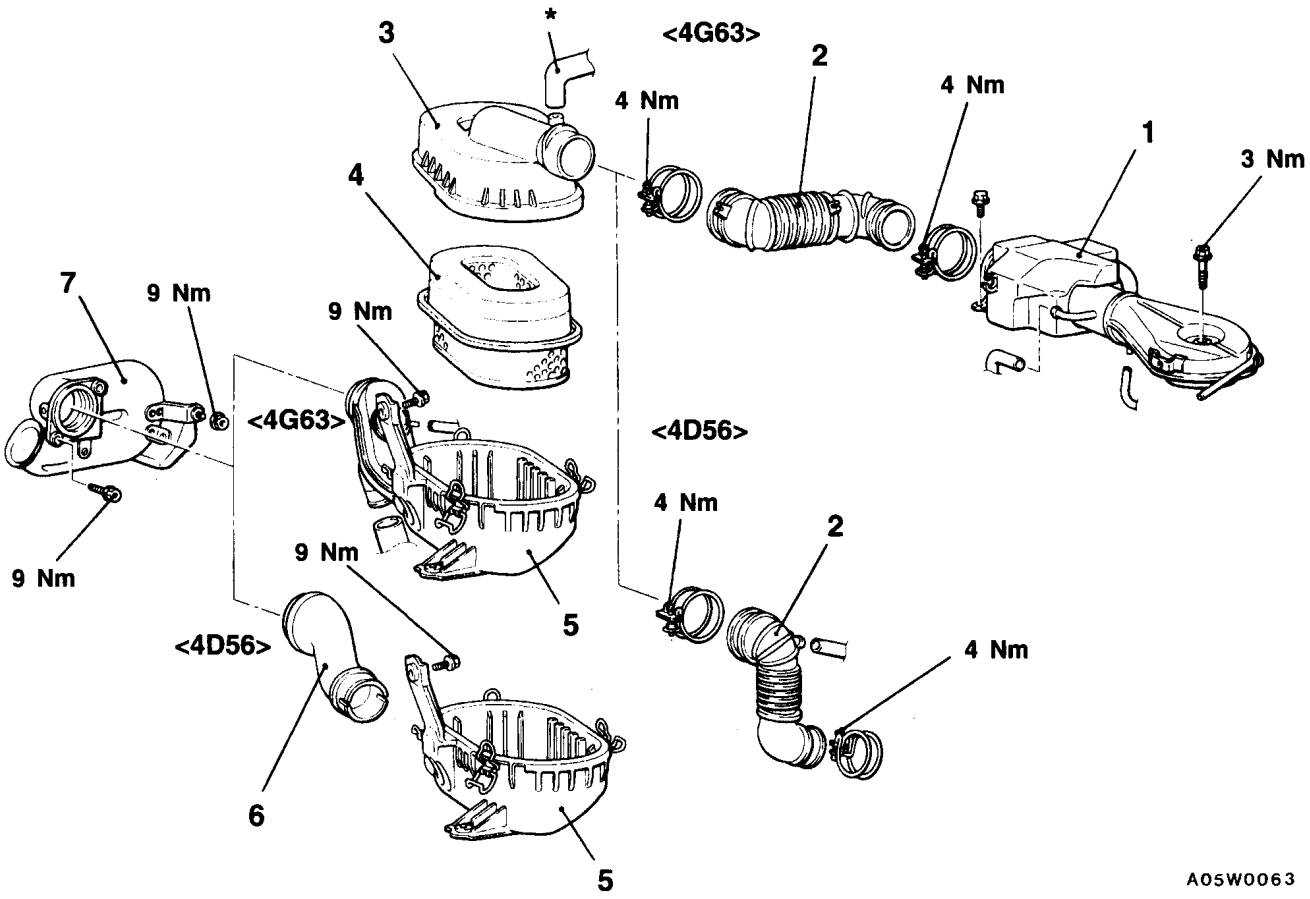
Battery voltage	Terminal No.			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○

AIR CLEANER

120002314

REMOVAL AND INSTALLATION

<4G63 (Carburettor), 4D56 – Normal type>

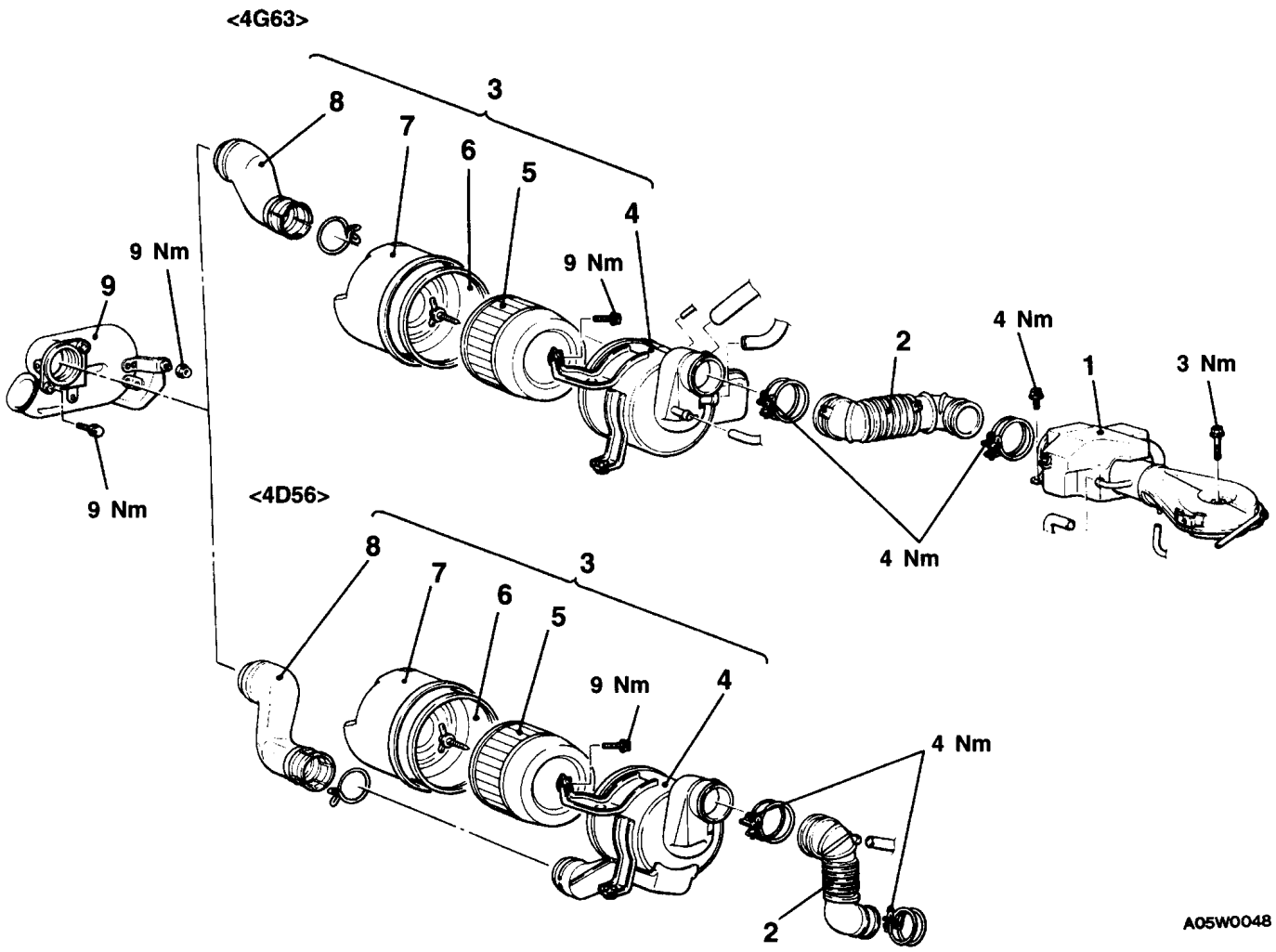


NOTE
*: 4G63

Removal steps

1. Air horn assembly
2. Air intake hose
3. Air cleaner cover
4. Air cleaner element
5. Air cleaner body
6. Air duct B
- Splash shield <R.H.>
  (Refer to GROUP 42 – Fender.)
7. Air duct A

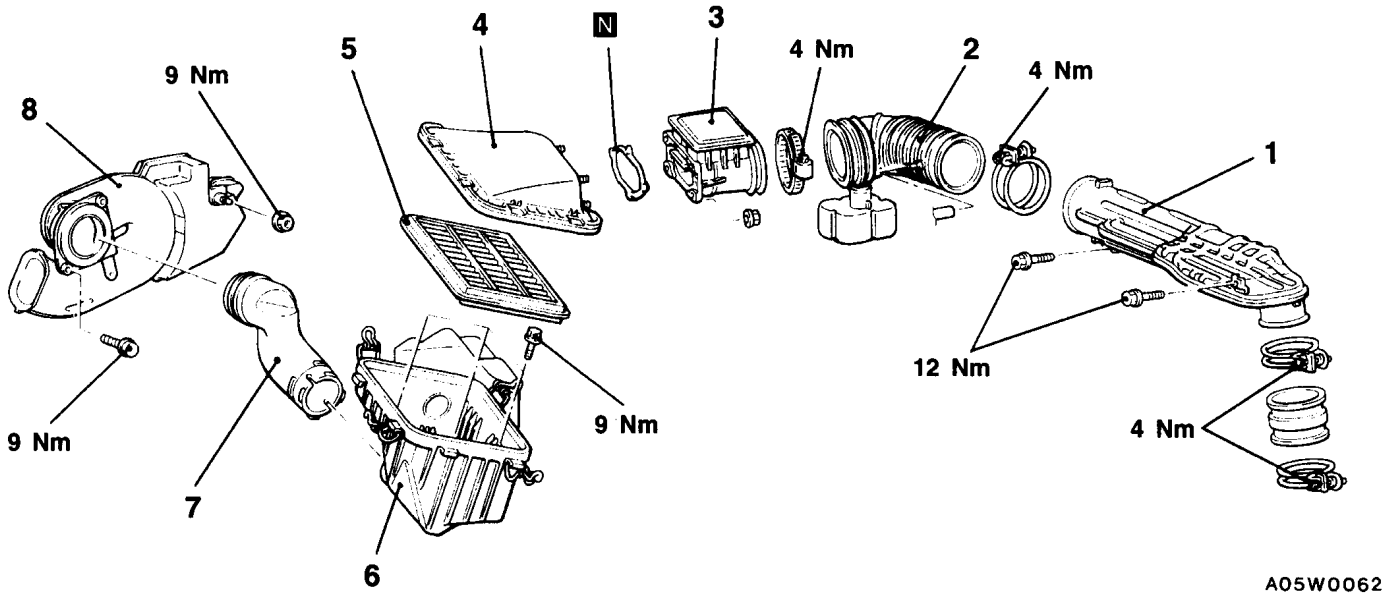
<4G63 (Carburettor), 4D56 – Cyclone type>



Removal steps

1. Air horn assembly <4G63>
2. Air intake hose
3. Air cleaner assembly
4. Air cleaner cover
5. Air cleaner element
6. Buffle assembly
7. Air cleaner body
8. Air duct B
   - Splash shield <R.H.> (Refer to GROUP 42 – Fender.)
9. Air duct A

<4G63 (MPI), 4G64>



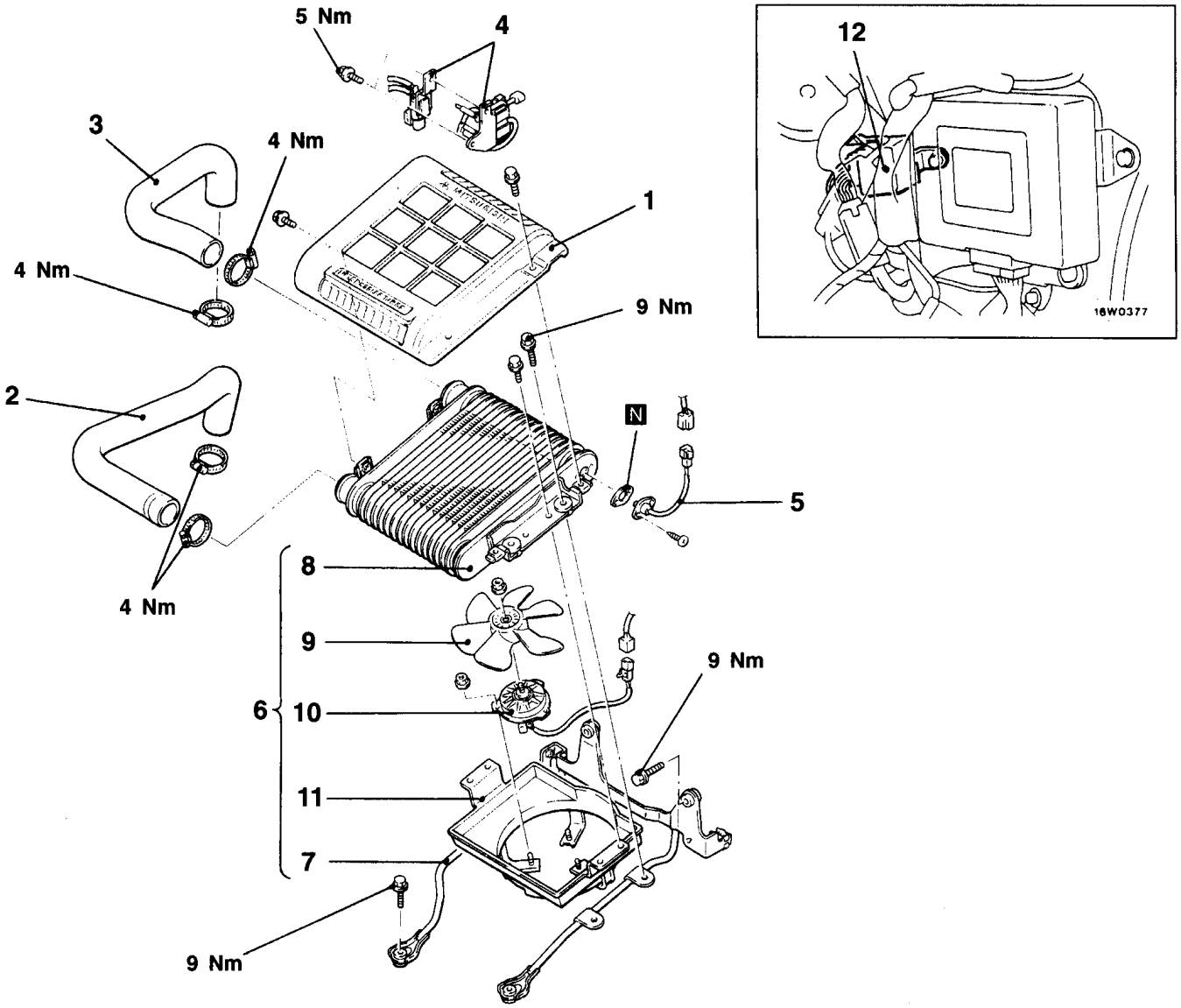
Removal steps

1. Resonance tank <4G64>
2. Air intake hose
3. Air flow sensor
4. Air cleaner cover
5. Air cleaner element
6. Air cleaner body
7. Air duct B or pre-cleaner assembly
   - Splash shield <R.H.>
     (Refer to GROUP 42 – Fender.)
8. Air duct A

INTERCOOLER AND INTERCOOLER FAN – ECU

120002315

REMOVAL AND INSTALLATION



00002857

Intercooler removal steps

1. Intercooler cover
2. Air hose A
3. Air hose B
4. Solenoid valve bracket connection
5. Air temperature switch
6. Intercooler bracket assembly
7. Intercooler bracket
8. Intercooler
9. Fan
10. Fan motor
11. Fan shroud

Intercooler fan – ECU removal steps

- Cowl side trim L.H.
  (Refer to GROUP 52A – Trim.)

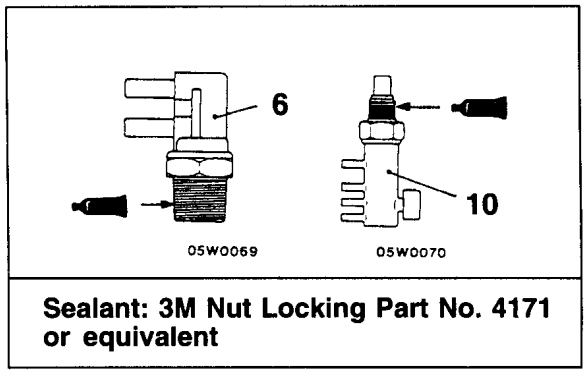
12. Intercooler fan – ECU

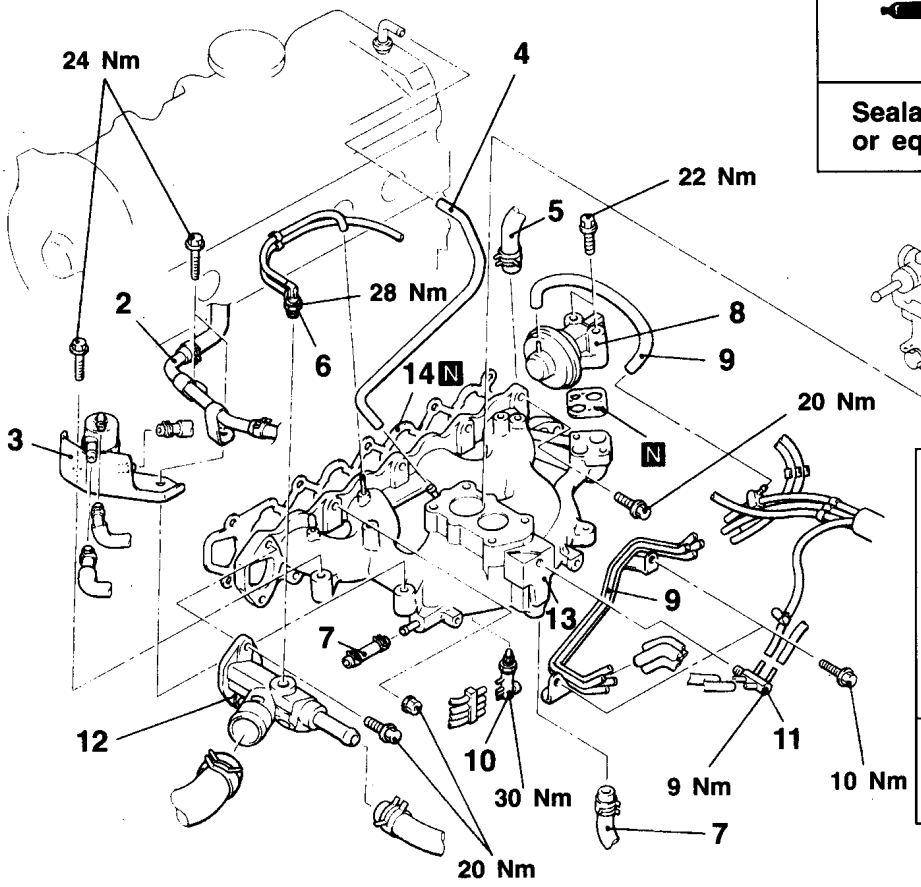
INTAKE MANIFOLD <4G63 (Carburettor)>

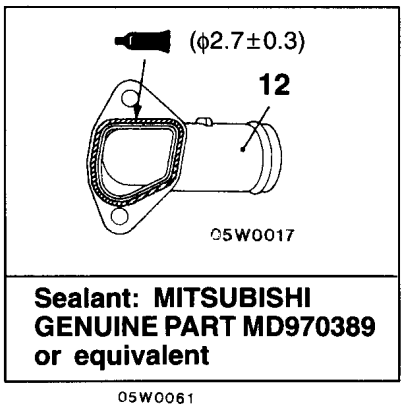
120002316

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Engine Coolant Draining and Supplying
(2)Air Cleaner Removal and Installation (Refer to P.15-5, 6.)
(3)Battery and Battery Tray Removal and Installation







00002858

Removal steps

1. Carburettor (Refer to GROUP 13 – Carburettor.)
2. Vapour pipe connection
3. Fuel vapour separator
4. PCV hose
5. Brake booster vacuum hose connection
6. Thermo valve
7. Water hose
8. EGR valve
9. Vacuum hose and pipe assembly
10. Thermo valve
11. Vacuum connector joint
12. Water outlet fitting
13. Intake manifold
14. Intake manifold gasket

INSPECTION

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

INTAKE MANIFOLD

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 a thickness gauge, check for distortion of the cylinder head installation surface.

   Standard value: 0.15 mm or less

   Limit: 0.20 mm

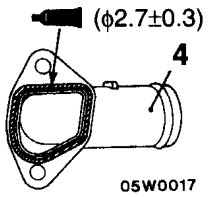
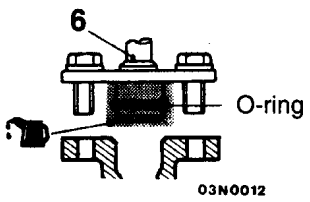
INTAKE MANIFOLD <4G63 (MPI), 4G64>

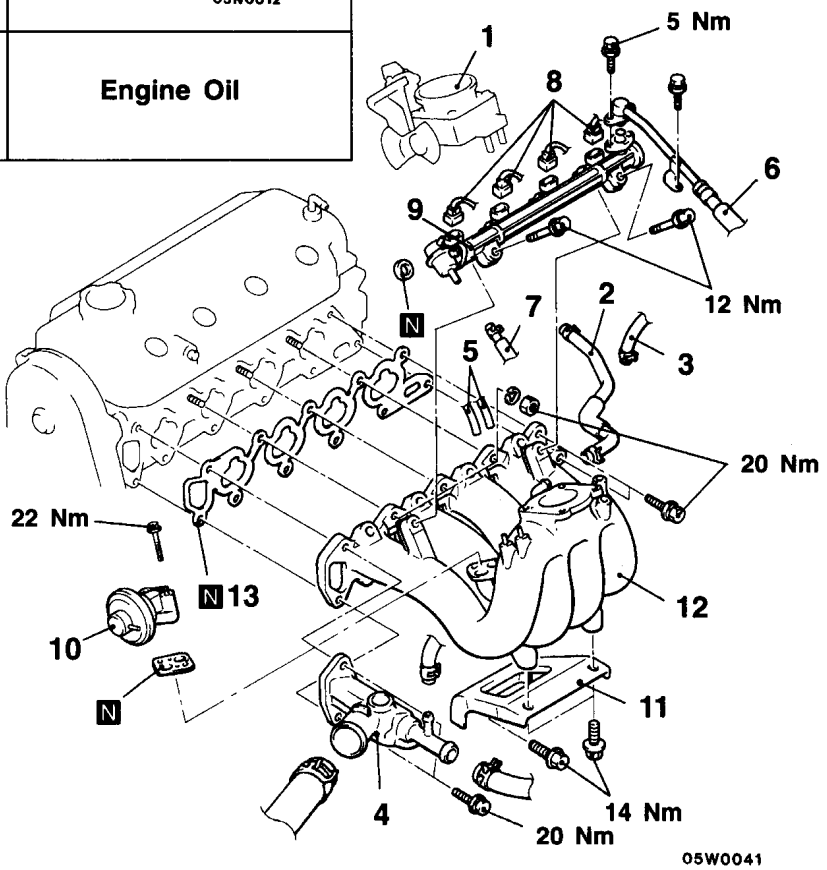
120002317

REMOVAL AND INSTALLATION

Pre-removal Operation
(1)Fuel Discharge Prevention (Refer to GROUP 13A – Service Adjustment Procedures.)
(2)Engine Coolant Draining
(3)Air Cleaner Removal (Refer to P.15-7.)
(4)Battery and Battery Tray Removal

Post-installation Operation
(1)Engine Coolant Supplying
(2)Battery and Battery Tray Installation
(3)Air Cleaner Installation (Refer to P.15-7.)

 05W0017	 03N0012
Sealant: MITSUBISHI GENUINE PART MD970389 or equivalent	**Engine Oil**



05W0041

00000966

Removal steps

1. Throttle body (Refer to GROUP 13A – Throttle Body.)
2. PCV hose
3. Brake booster vacuum hose connection
4. Water outlet fitting
5. Vacuum hose connection

▶A◀ 6. Fuel high pressure hose connection

7. Fuel return hose connection
8. Injector connector

◀A▶

9. Injector and delivery pipe assembly
10. EGR valve
11. Intake manifold stay
12. Intake manifold
13. Intake manifold gasket

REMOVAL SERVICE POINT

◀A▶ INJECTOR AND DELIVERY PIPE ASSEMBLY 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.

INSPECTION

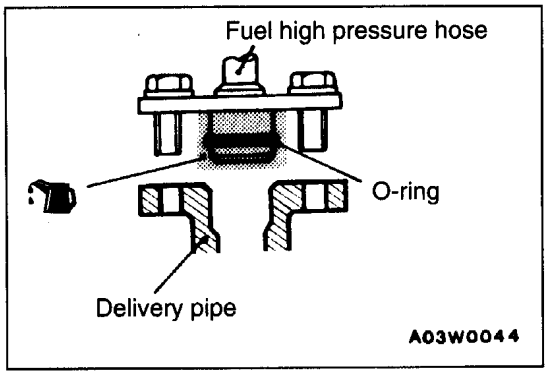
Check the following points; replace the part if a problem is found.

INTAKE MANIFOLD

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 a thickness gauge, check for distortion of the cylinder head installation surface.

   Standard value: 0.15 mm or less

   Limit: 0.20 mm



INSTALLATION SERVICE POINT

▶A◀ FUEL HIGH PRESSURE HOSE INSTALLATION

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

Caution
Be careful not to let any engine oil get into the delivery pipe.

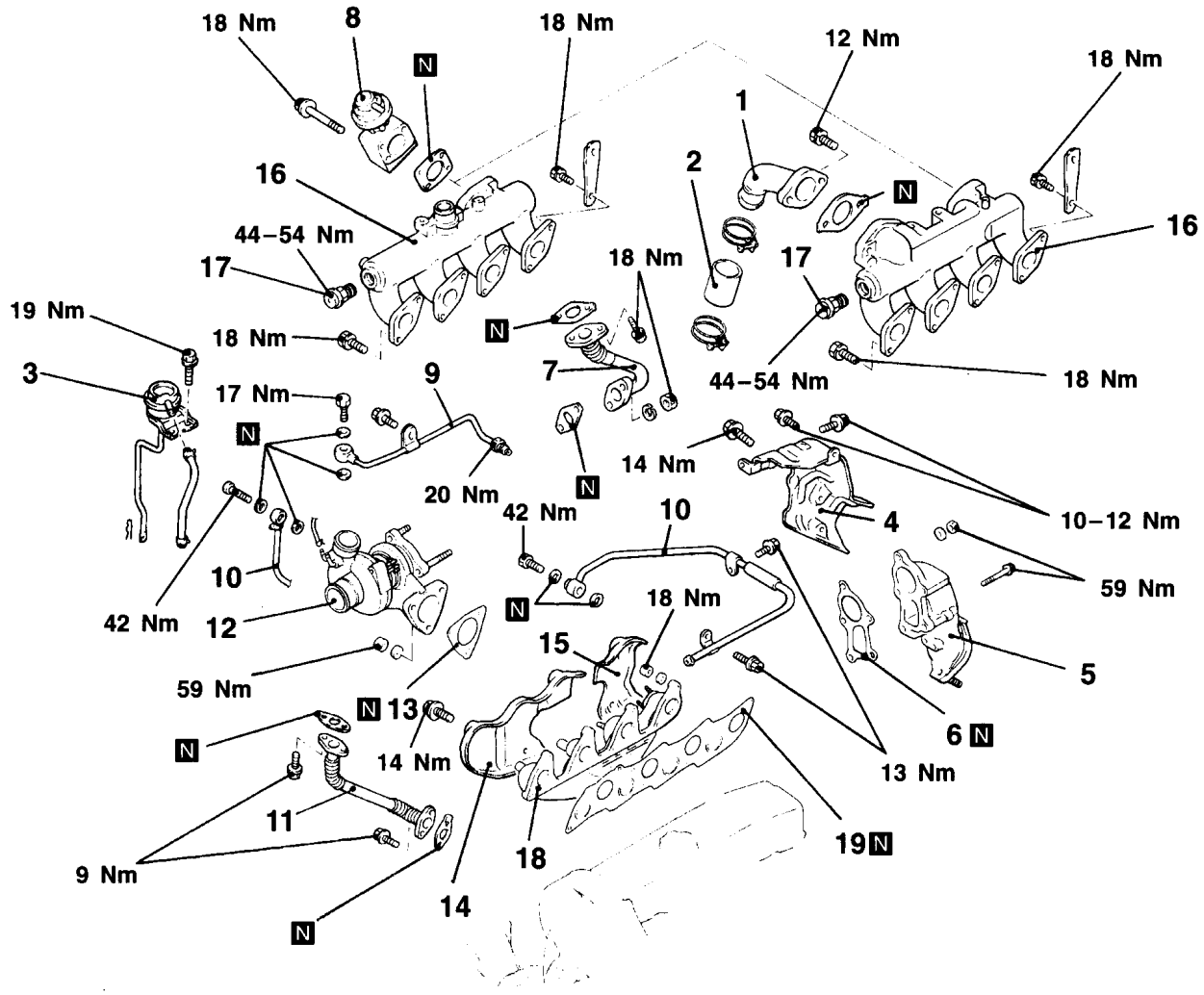
INTAKE AND EXHAUST MANIFOLD, TURBOCHARGER <4D56>

120002318

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Engine Coolant Draining and Supplying
(2)Engine Oil Draining and Supplying
(3)Air Cleaner Removal and Installation (Refer to P.15-5, 6.)
(4)Intercooler Removal and Installation (Refer to P.15-8.)
(5)Front Exhaust Pipe and Front Heat Protector Removal and Installation (Refer to P.15-18.)
(6)Heat Protector B Removal and Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)

<Vehicles with intercooler turbocharger> **<Vehicles without intercooler turbocharger>**



Removal steps

1. Air inlet fitting <Vehicles without intercooler turbocharger>
2. Air hose <Vehicles without intercooler turbocharger>
3. Waste gate actuator
4. Heat protector
5. Exhaust fitting
6. Gasket B
7. EGR valve pipe
8. EGR valve
9. Oil pipe
10. Water pipe connection
11. Oil return pipe
▶A◀ 12. Turbocharger assembly
13. Gasket A
14. Heat protector front
15. Heat protector rear
16. Intake manifold
17. Relief valve
18. Exhaust manifold
19. Intake and exhaust manifold gasket

INSPECTION

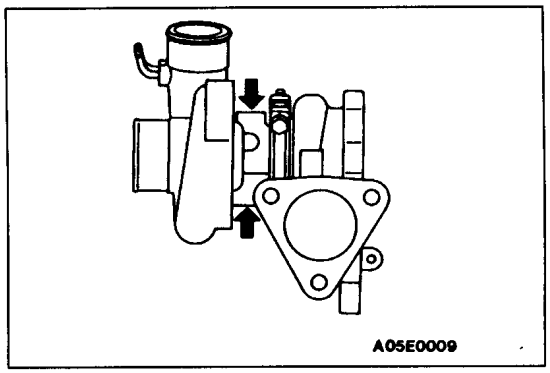
Check the following points; replace the part if a problem is found.

INTAKE MANIFOLD, EXHAUST MANIFOLD

1. Check for damage or cracking of any part.
2. Check deflection of installation surface with straight edge and thickness gauge.

   Standard value: 0.15 mm or less

   Limit: 0.20 mm



INSTALLATION SERVICE POINT

▶A◀ TURBOCHARGER ASSEMBLY INSTALLATION

(1) Clean the connection surfaces of the oil pipe, oil return pipe and water pipe.
(2) Add new engine oil from the oil pipe mounting hole of the turbocharger.

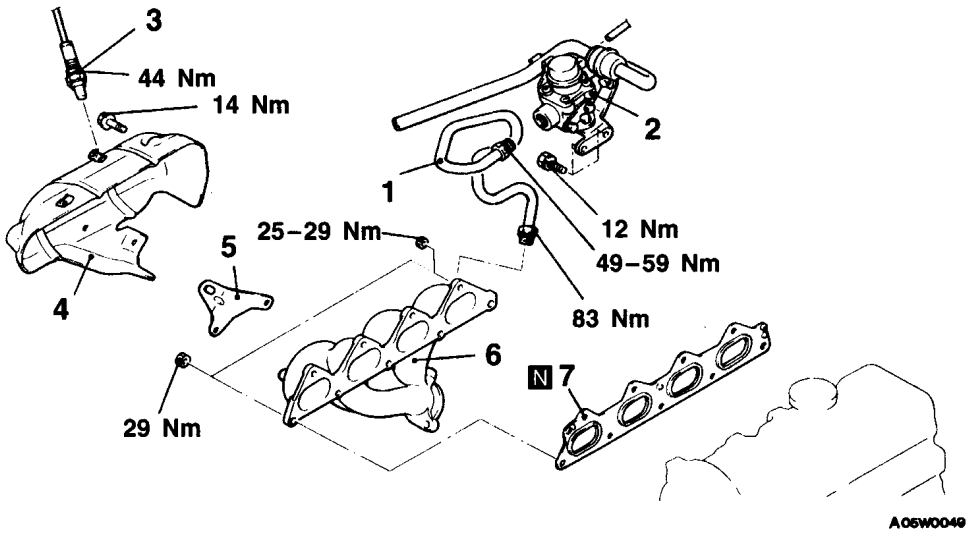
Caution
Be careful that no foreign particles get into the turbocharger.

EXHAUST MANIFOLD <4G63, 4G64>

120002319

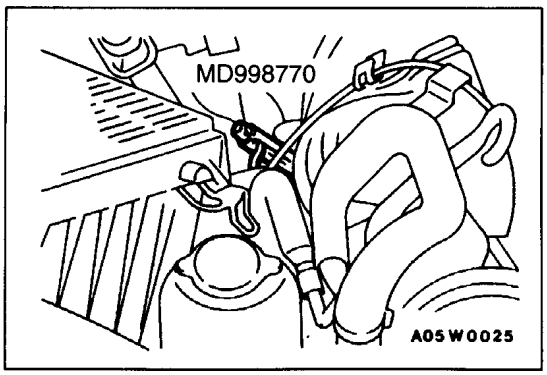
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Front Exhaust Pipe Removal and Installation (Refer to P.15-16, 17.)
(2)Air Cleaner Removal and Installation (Refer to P.15-5, 6, 7.)
(3)Engine Oil Level Gauge Guide Removal and Installation



Removal steps

1. Air pipe assembly <4G63 (Carburettor)>
2. Reed valve assembly <4G63 (Carburettor)>
◀A▶ 3. Oxygen sensor <4G63 (Carburettor)>
4. Heat protector
5. Engine hanger
6. Exhaust manifold
7. Exhaust manifold gasket



REMOVAL SERVICE POINT

◀A▶ OXYGEN SENSOR REMOVAL

INSPECTION

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

EXHAUST MANIFOLD

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

Standard value: 0.15 mm or less

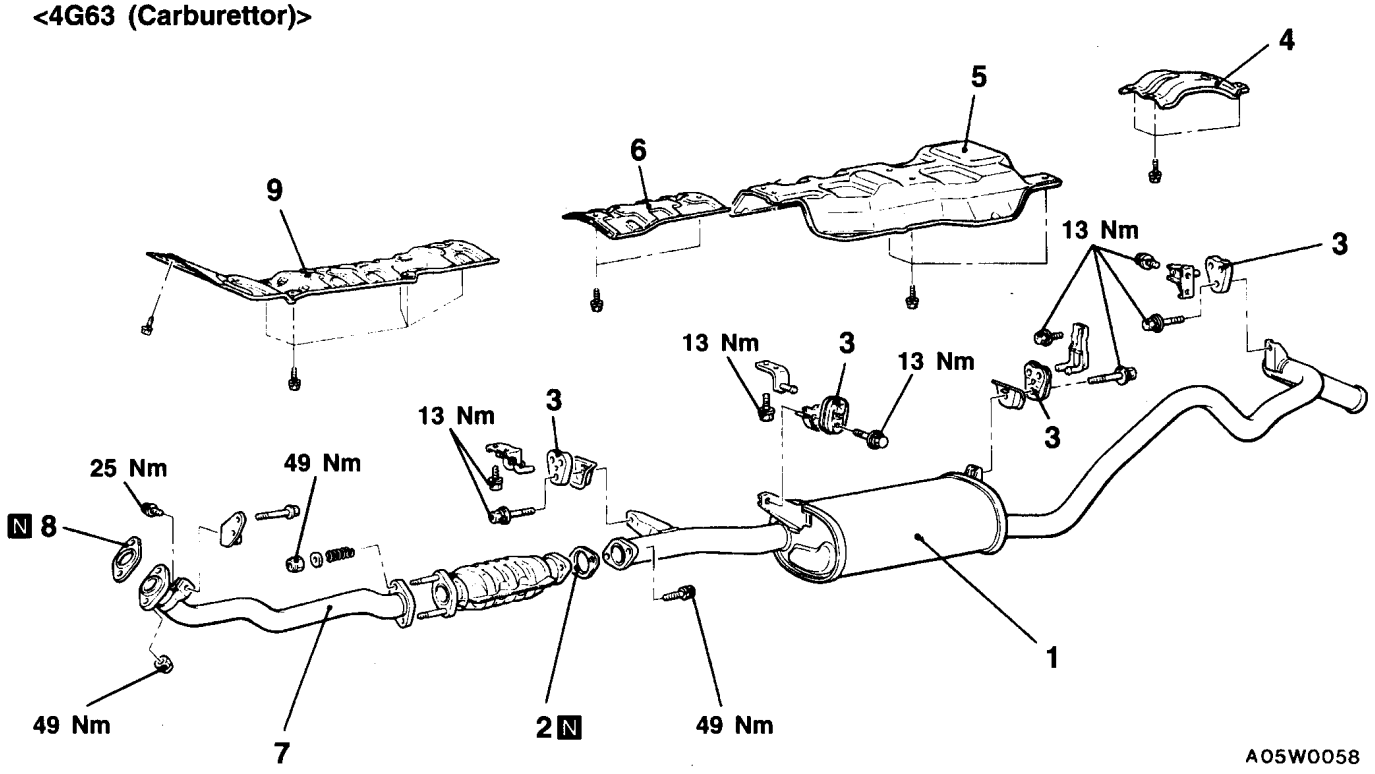
Limit: 0.20 mm

EXHAUST PIPE AND MAIN MUFFLER

120002320

REMOVAL AND INSTALLATION

<4G63 (Carburettor)>

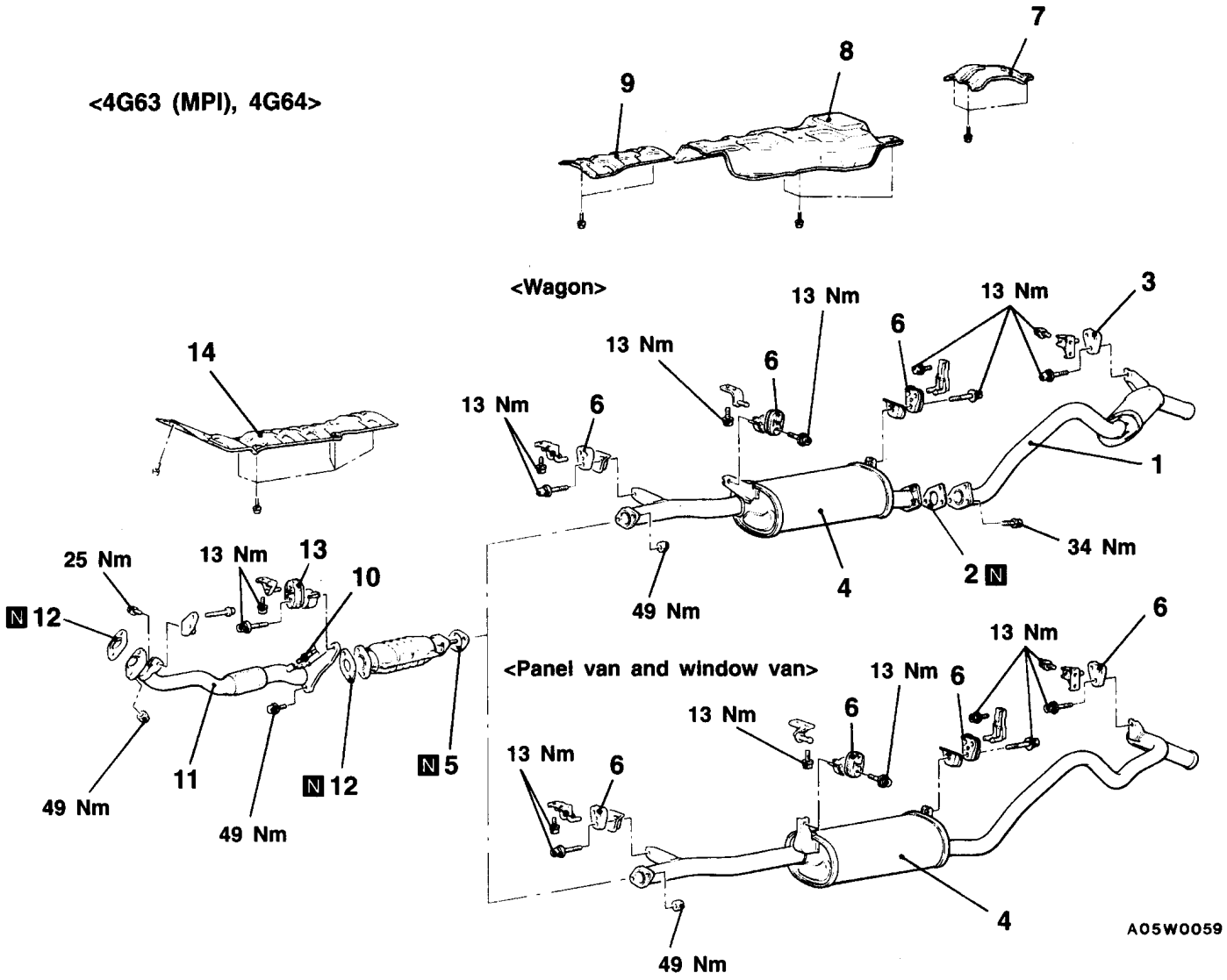


Main muffler assembly removal steps

1. Main muffler
2. Gasket
3. Hanger
4. Rear heat protector B
5. Rear heat protector A
6. Front heat protector B

Front exhaust pipe removal steps

7. Front exhaust pipe
8. Gasket
9. Front heat protector A



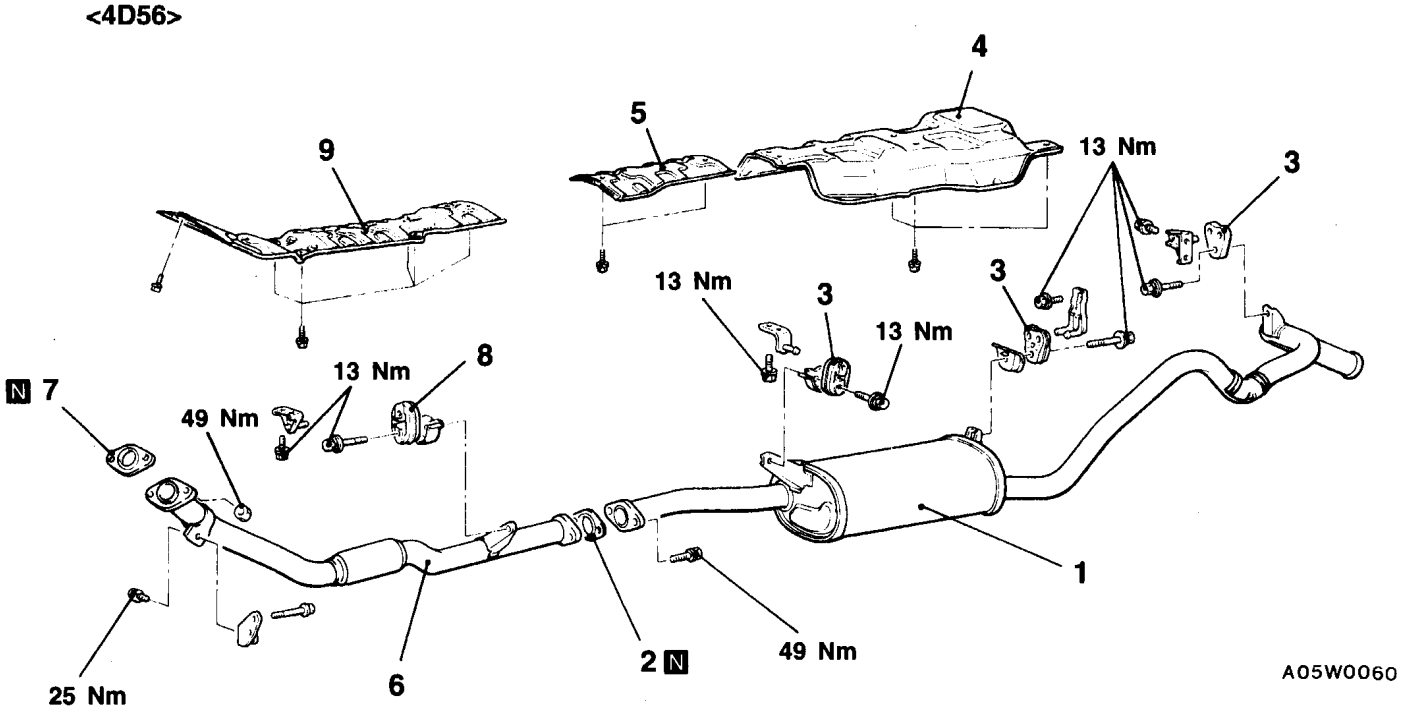
Main muffler assembly removal steps

1. Tail pipe <Wagon>
2. Gasket <Wagon>
3. Hanger <Wagon>
4. Main muffler
5. Gasket
6. Hanger
7. Rear heat protector B
8. Rear heat protector A
9. Front heat protector B

Front exhaust pipe removal steps

10. Oxygen sensor
11. Front exhaust pipe
12. Gasket
13. Hanger
14. Front heat protector A

<4D56>



Main muffler assembly removal steps

1. Main muffler
2. Gasket
3. Hanger
4. Rear heat protector A
5. Front heat protector B

Front exhaust pipe removal steps

6. Front exhaust pipe
7. Gasket
8. Hanger
9. Front heat protector A

ENGINE ELECTRICAL

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120002525

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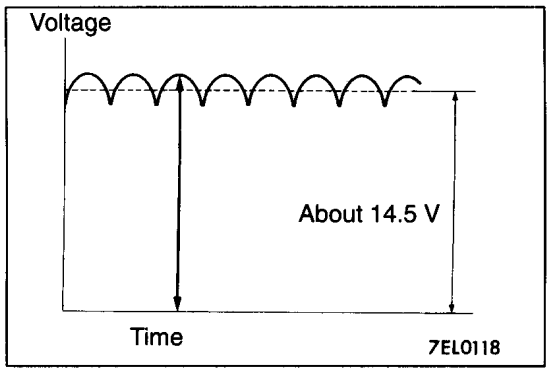
CHARGING SYSTEM

120002526

GENERAL INFORMATION

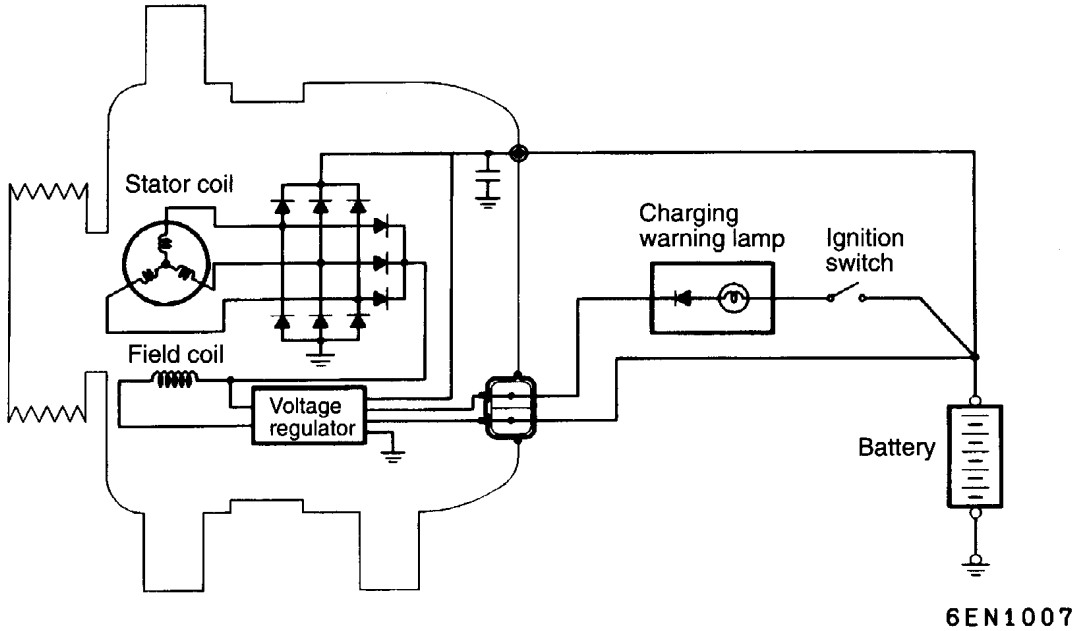
The charging system uses the alternator output to keep the battery charged at a constant level under various electrical loads.



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 wave-form 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.



ALTERNATOR SPECIFICATIONS

<4G63, 4G64>

Items	4G63 – Carburettor	4G63 – MPI	4G64
Type	Battery voltage sensing	Battery voltage sensing	Battery voltage sensing
Rated output V/A	12/70	12/75, 90*	12/90
Voltage regulator	Electronic built-in type	Electronic built-in type	Electronic built-in type

*: Vehicles for cold climate zone

<4D56>

Items	Panel van and window van	Wagon
Type	Battery voltage sensing	Battery voltage sensing
Rated output V/A	12/65, 75*	12/75, 90*
Voltage regulator	Electronic built-in type	Electronic built-in type

*: Vehicles for cold climate zone

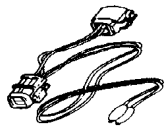
SERVICE SPECIFICATIONS

120000952

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

SPECIAL TOOL

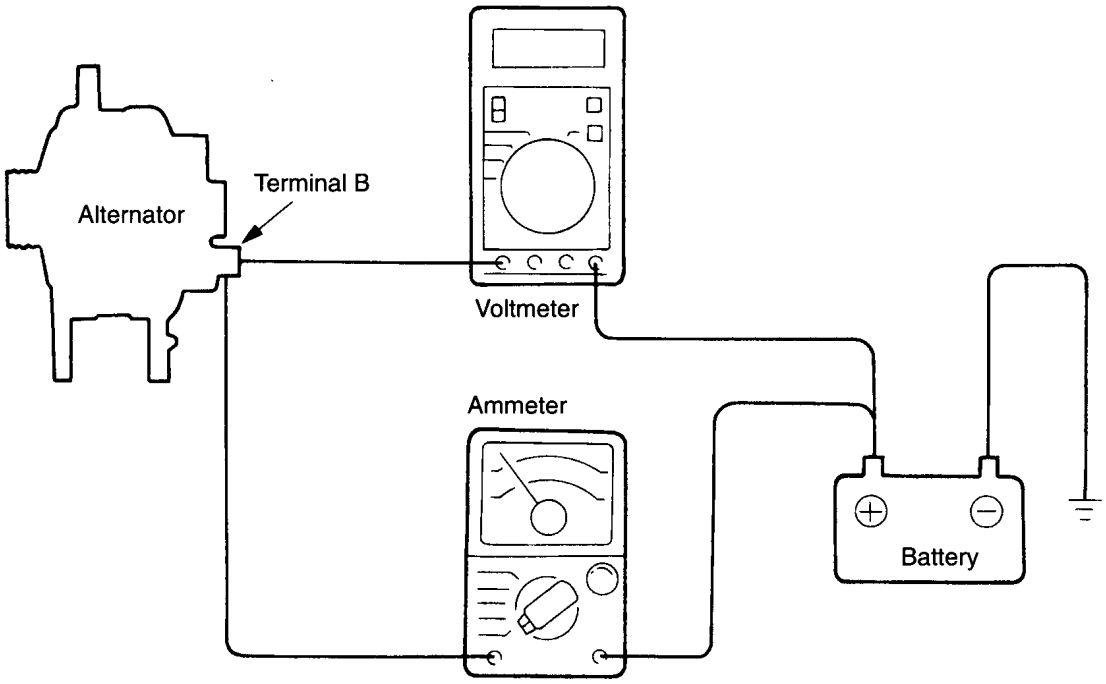
120000953

Tool	Number	Name	Use
	MD998467	Alternator harness connector	Checking the alternator (S terminal voltage)

SERVICE ADJUSTMENT PROCEDURES

120000954

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 link) is in a good condition or not.

(1) Always be sure to check the following before the test.
- Alternator installation
- Alternator drive belt tension (Refer to GROUP 11 – Service Adjustment Procedures.)
- 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 then connect the (–) lead of the voltmeter to the battery (+) cable.)

(6) Connect a tachometer. (For the procedure for connecting the tachometer, refer to GROUP 11 – Service Adjustment Procedures.)
(7) Reconnect the negative battery cable.
(8) Leave the hood open.
(9) Start the engine.
(10) With the engine running at 2,500 r/min., turn the headlamps and other lamps on and off to adjust the alternator load so that the value displayed on the ammeter is slightly above 30 A.
Adjust the engine speed by gradually decreasing it until the value displayed on the ammeter is 30 A. Take a reading of the value displayed on the voltmeter at this time.

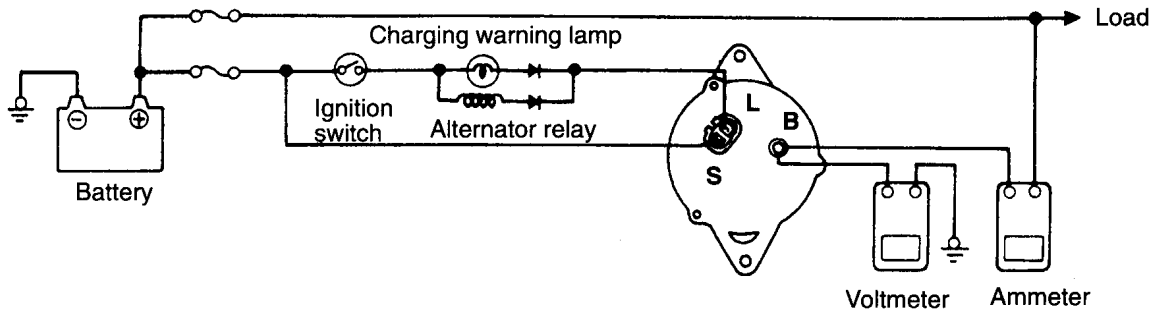
Limit: Max. 0.3 V

NOTE
When the alternator output is high and the value displayed on the ammeter does not decrease until 30 A, set the value to 40 A. Read the value displayed on the voltmeter at this time.

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

OUTPUT CURRENT TEST

120000955



16P0482

This test determines whether the alternator output current is normal.
(1) Before the test, always be sure to check the following.
- Alternator installation
- Battery (Refer to GROUP 54 – Battery.)

NOTE
The used battery should be slightly discharged. The load needed by a fully-charged battery is insufficient for an accurate test.

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

(2) Turn the ignition switch off.
(3) Disconnect the negative battery cable.
(4) Disconnect the alternator output wire from the alternator "B" terminal. Connect a DC test ammeter with a range of 0–100 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal. Connect the (–) lead of the ammeter to the disconnected output wire.)

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

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

(5) Connect a voltmeter with a range of 0–20 V between the alternator "B" terminal and the earth. (Connect the (+) lead of the voltmeter to the "B" terminal, and then connect the (–) lead of the voltmeter to the earth.)
(6) Connect a tachometer. (For the procedure for connecting the tachometer, refer to GROUP 11 – Service Adjustment Procedures.)
(7) Connect the negative battery cable.
(8) Leave the hood open.
(9) Check that the reading on the voltmeter is equal to the battery voltage.

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

(10) Turn the light switch on to turn on headlamps and then start the engine.
(11) Immediately after setting the headlamps to high beam and turning the heater blower switch to the high revolution position, increase the engine speed to 2,500 r/min. and read the maximum current output value displayed on the ammeter.

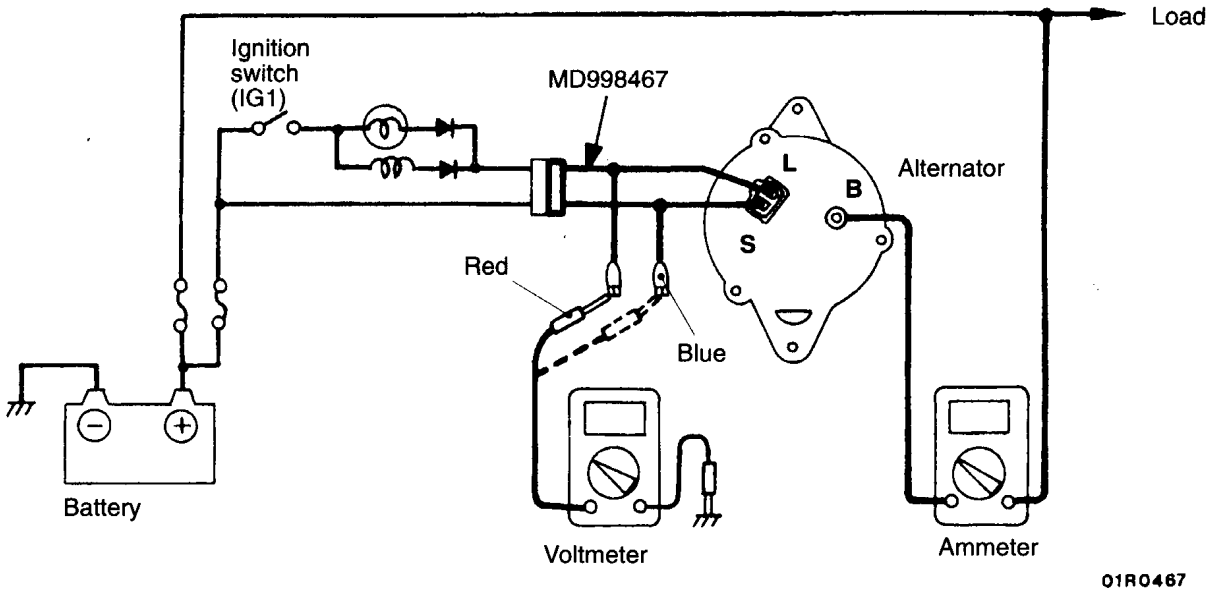
Limit: 70% of normal current output

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

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

REGULATED VOLTAGE TEST

120000956



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 – Service Adjustment Procedures.)
- Fusible link
- Abnormal noise from the alternator while the engine is running

(2) Turn the ignition switch to the OFF position.
(3) Disconnect the negative battery cable.
(4) Connect a digital-type voltmeter between the alternator "S" terminal and the earth. (Connect the (+) lead of the the voltmeter to the "S" terminal, and then connect the (–) lead of the voltmeter to a secure earth or to the battery (–) terminal.)
(5) Disconnect the alternator output wire from the alternator "B" terminal.
(6) Connect a DC test ammeter with a range of 0–100 A in series between the "B" terminal and the disconnected output wire. (Connect the (+) lead of the ammeter to the "B" terminal. Connect the (–) lead of the ammeter to the disconnected output wire.)
(7) Connect a tachometer. (Refer to GROUP 11 – Service Adjustment Procedures.)
(8) Reconnect the negative battery cable.
(9) Turn the ignition switch to the ON position and check that the reading on the voltmeter is equal to the battery voltage.

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

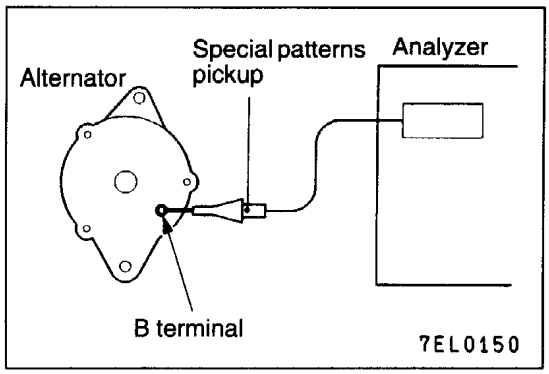
(10) Turn all lamps and accessories off.
(11) Start the engine.
(12) Increase the engine speed to 2,500 r/min.
(13) Read the value displayed on the voltmeter when the alternator output current becomes 10 A or less.

(14)If the voltage reading conforms to the value in the voltage regulation, then the voltage regulator is operating normally.
If the voltage is not within the standard value, there is a malfunction of the voltage regulator or of the alternator.
(15)After the test, lower the engine speed to the idle speed.
(16)Turn the ignition switch off.
(17)Disconnect the negative battery cable.
(18)Disconnect the ammeter, voltmeter and tachometer.
(19)Connect the alternator output wire to the alternator "B" terminal.
(20)Connect the negative battery cable.

Voltage Regulation Table

Standard value:

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



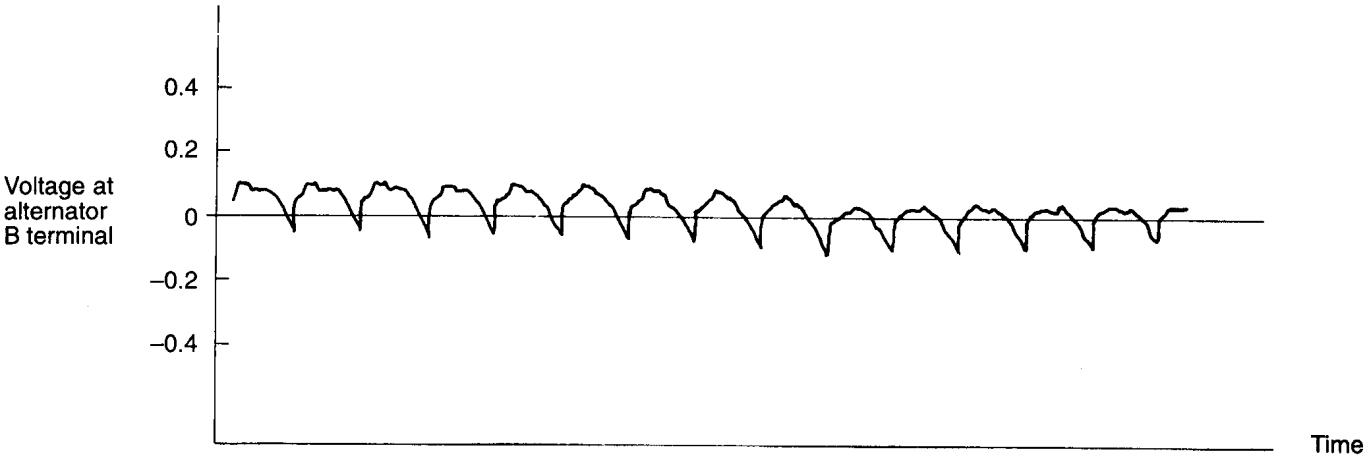
CHECKING WITH AN ANALYZER 120000957

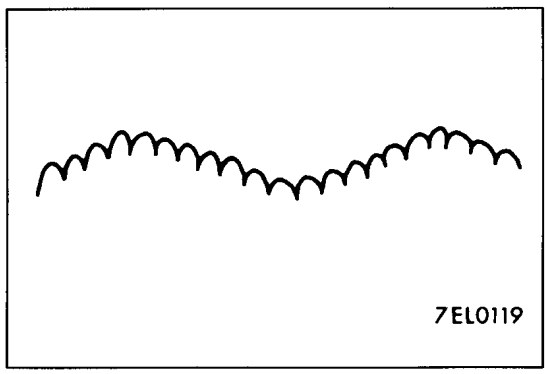
MEASUREMENT METHOD

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

STANDARD WAVE-FORM
Observation Conditions

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

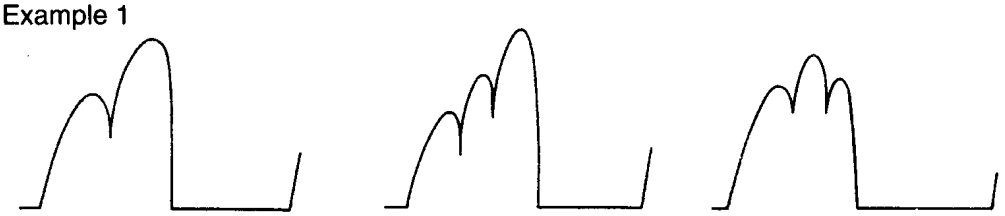
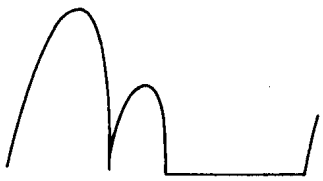




NOTE
The voltage wave-form of the alternator B terminal can undulate as shown at left. This wave-form is produced when the regulator operates according to fluctuations in the alternator load (current), and is normal for the alternator.

EXAMPLES OF ABNORMAL WAVE-FORMS

NOTE
1. The size of the wave-form patterns differs largely, depending on the adjustment of the variable knob on the analyzer.
2. Identification of abnormal wave-forms is easier when there is a large output current (regulator is not operating). (Wave-forms 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 wave-forms	Problem cause
Example 1  7EL0120	• Open diode
Example 2  7EL0121	• Short in diode
Example 3 7EL0122	• Broken wire in stator coil
Example 4 7EL0123	• Short in stator coil
Example 5 NOTE: At this time, the charging warning is illuminated. 7EL0124	• Open supplementary diode

ALTERNATOR

120002181

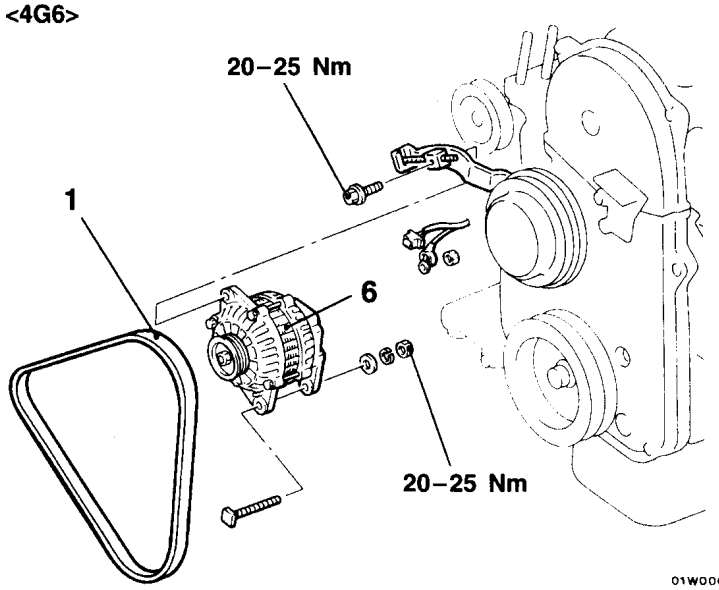
REMOVAL AND INSTALLATION

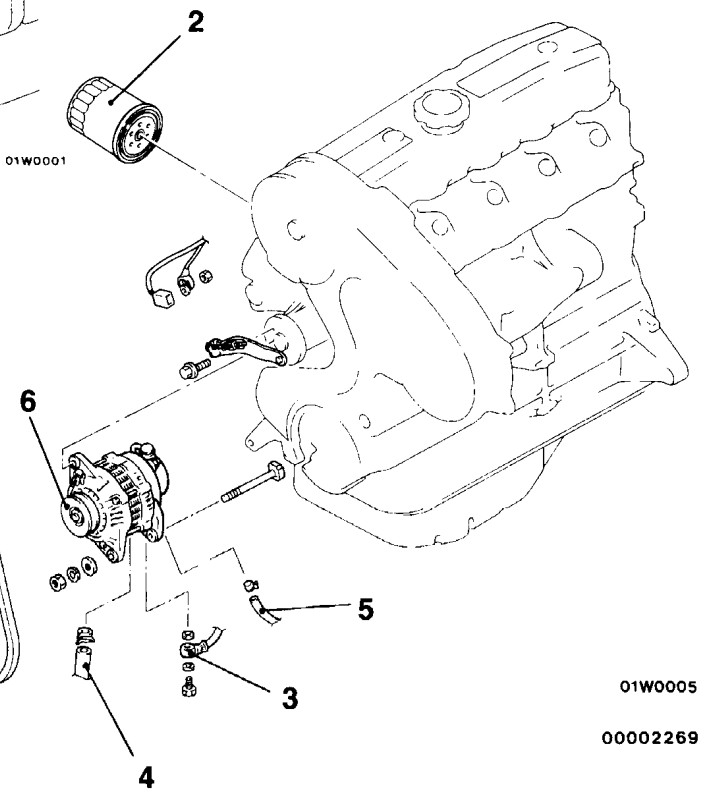
<4G6, 4D56>

Pre-removal Operation
- Under Cover Removal
  (Refer to GROUP 42 – Under Cover.)

Post-installation Operation
(1)Drive Belt Tension Adjustment (Refer to GROUP 11 – Service Adjustment Procedures.)
(2)Under Cover Installation
(Refer to GROUP 42 – Under Cover.)

<4G6>





Removal steps

1. Drive belt (Alternator)
2. Oil filter (Refer to GROUP 12 – Service Adjustment Procedures.)
3. Oil pipe connection
4. Oil return hose connection
5. Vacuum hose connection
6. Alternator

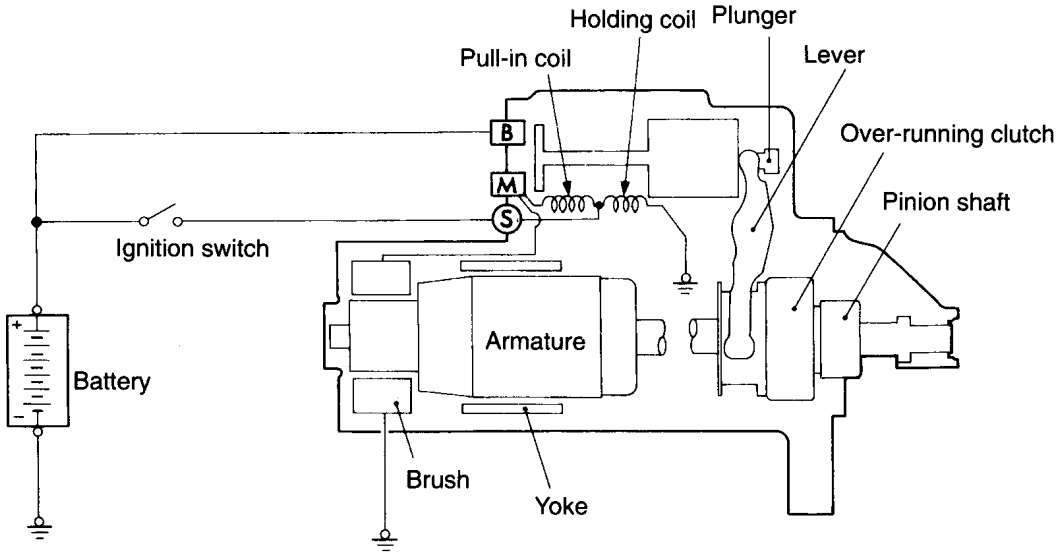
STARTING SYSTEM

120002527

GENERAL INFORMATION

If the ignition switch is turned to the "START" position, current flows in the Pull-in and Holding coils inside magnetic switch, attracting the plunger. When the plunger is attracted, the lever connected to the plunger engages 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 over-running clutch is provided between the pinion and the armature shaft, to prevent damage to the starter.



6EN0939

STARTER MOTOR SPECIFICATIONS

<4G63, 4G64>

Items	4G63 – Standard and M/T	4G63 – Cold climate zone and A/T, 4G64
Type	Direct drive	Reduction drive with planetary gear
Rated output kw/V	0.9/12	1.2/12
No. of pinion teeth	8	8

<4D56>

Items	Standard	Cold climate zone
Type	Reduction drive with planetary gear	Reduction drive with planetary gear
Rated output	2.0	2.2
No. of pinion teeth	10	10

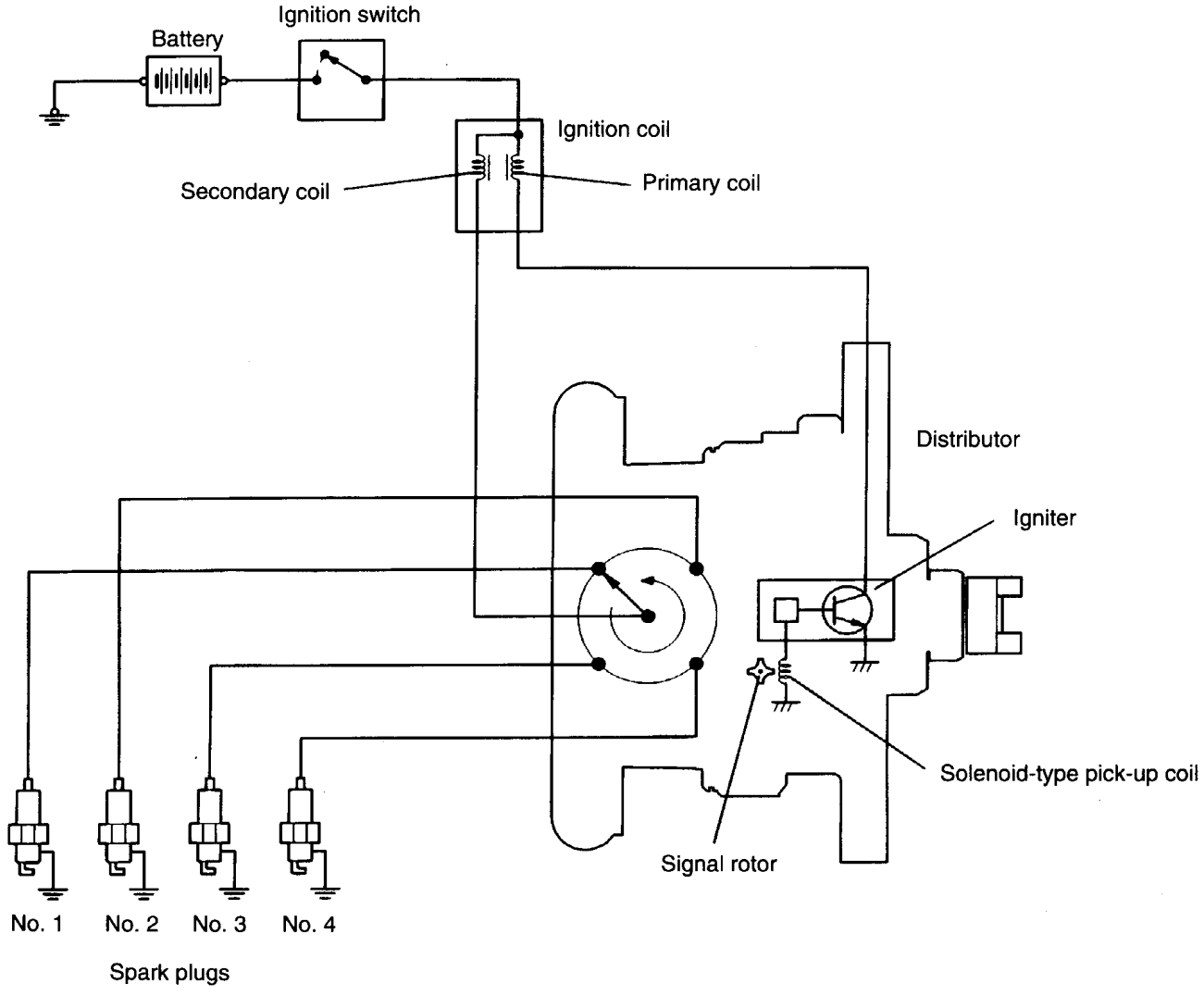
IGNITION SYSTEM

120002528

GENERAL INFORMATION

<CARBURETTOR>

When the primary current stops suddenly in the ignition coil, high voltage appears in the secondary side of the coil. The distributor supplies the high voltage to the applicable spark plug. The engine firing order is 1-3-4-2 cylinders.
The high voltage ignites the compressed air fuel mixture in the combustion chamber through the spark plugs.
A signal rotor is installed to the distributor shaft. When the distributor shaft (signal rotor) rotates, an electromotive force is generated in a solenoid-type pick-up coil in accordance with the rotation.
The igniter turns a power transistor built into the igniter ON and OFF in accordance with this electromotive force, thereby stops the ignition coil primary current suddenly.
The ignition timing is controlled by a centrifugal-type spark advance device and a load-type spark advance device in accordance with the engine speed and engine load condition.

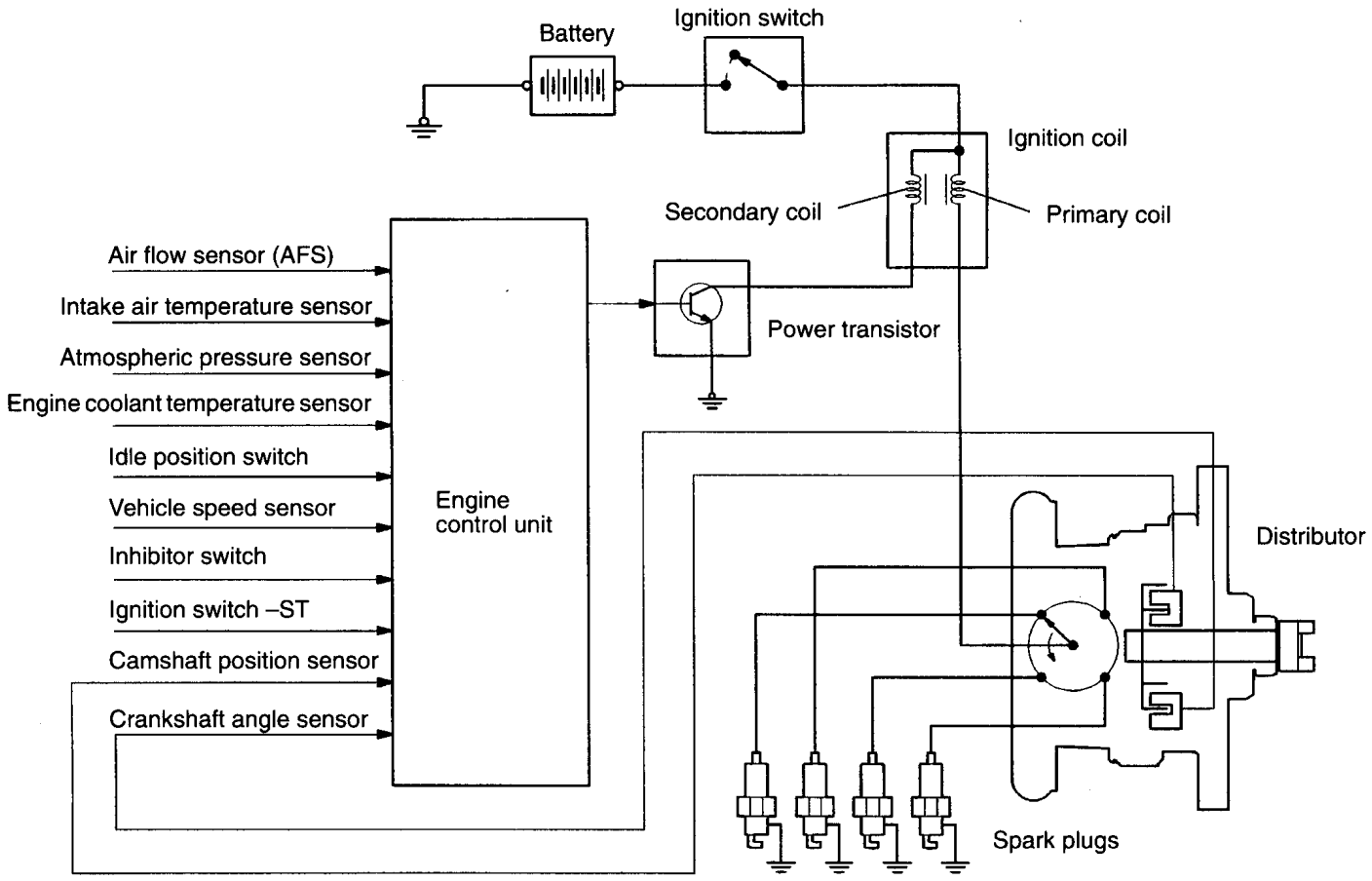


6EN1008

<MPI>

When the primary current stops suddenly in the ignition coil, high voltage appears in the secondary side of the coil. The distributor supplies the high voltage to the applicable spark plug. The engine firing order is 1-3-4-2 cylinders.
The high voltage ignites the compressed air fuel mixture in the combustion chamber through the spark plugs.
The engine control unit makes and breaks the primary current of the ignition coil to regulate the ignition timing.

The engine control unit detects the crankshaft position by the crankshaft position sensor incorporated in the distributor to ignite 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 for optimum performance.



6EN1009

DISTRIBUTOR SPECIFICATIONS

Items	Carburettor	MPI
Type	Contact pointless	Contact pointless
Advance mechanism	Centrifugal + Vacuum	Electronic
Firing order	1-3-4-2	1-3-4-2

IGNITION COIL SPECIFICATION

Items	Carburettor	MPI
Type	Moulded single-coil	Moulded single-coil
Identification No.	FA-0004	FA-0005

SPARK PLUG SPECIFICATION

Items		Specifications
Model	NGK	BKR5E-11
	NIPPON DENSO	K16PR-U11

SERVICE SPECIFICATIONS

120002529

Items			Standard value	Limit
Distributor <Caburettor>	Centrifugal advance (at 6,000 r/min)		26–35 °BTDC	–
	Vacuum advance (at 45 kPa)		15–26 °BTDC	–
Ignition coil	Primary coil resistance Ω	Carburettor	1.08–1.32	–
		MPI	0.67–0.81	–
	Secondary coil resistance kΩ	Carburettor	22.1–29.9	–
		MPI	11.3–15.3	–
Spark plug gap mm			1.0–1.1	–
Resistive cord resistance kΩ			–	Max. 22

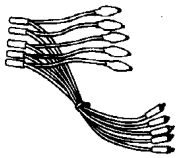
LUBRICANT

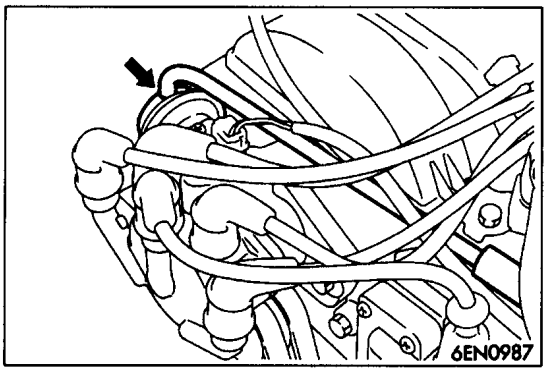
120002530

Items	Specified lubricant	Quantity
Distributor cupping	Multipurpose grease SAE J310, NLGI No. 3	2 g

SPECIAL TOOL

120000971

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



SERVICE ADJUSTMENT PROCEDURES

120002531

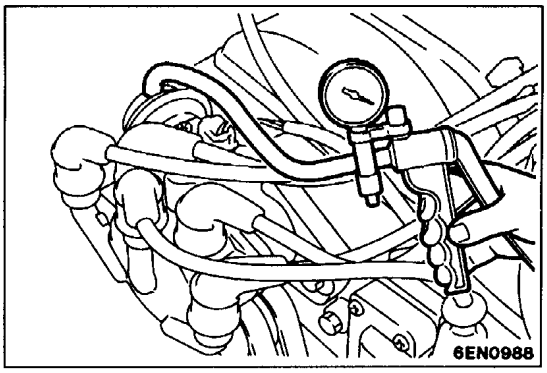
CENTRIFUGAL ADVANCE CONTROL DEVICE INSPECTION <Carburettor>

(1) Start the engine and run it at idle.
(2) Disconnect the vacuum hose from the vacuum controller. Plug the disconnected vacuum hose.
(3) Increase the engine speed gradually and check the ignition timing. At this time, check that the ignition timing advances smoothly as the engine speed increases.

Standard value: 26–35 °BTDC (at 6,000 r/min)

(4) If any of the following symptoms occur, disassemble the distributor and check it.

Symptom	Possible cause
Excessive advance	Worn or damaged governor spring
Start-up advance too sudden	Damaged spring
Inadequate advance or excessive hysteresis	Malfunction of governor weight or cam



VACUUM ADVANCE CONTROL DEVICE INSPECTION <Carburettor>

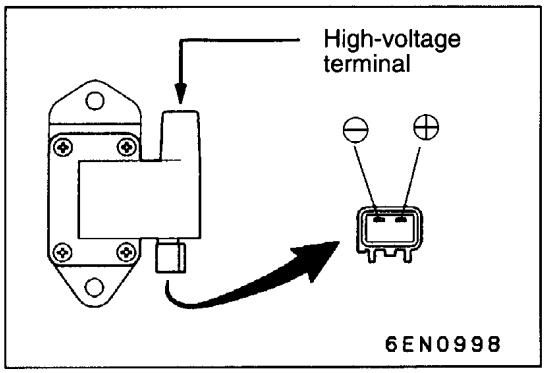
120002532

(1) Start the engine and run it at idle.
(2) Disconnect the vacuum hose from the vacuum controller. Plug the disconnected vacuum hose. Connect a vacuum pump to the nipple.
(3) Gradually increase the negative pressure with the hand vacuum pump, and check the ignition timing.
At this time, check that the ignition timing advances smoothly as the negative pressure increases.

Standard value: 15–26 °BTDC (at 45 kPa)

(4) If any of the following symptoms occur, disassemble the distributor and check it.

Symptom	Possible cause
Excessive advance	Worn or damaged vacuum controller spring
Start-up advance too sudden	Damaged spring
Inadequate advance or excessive hysteresis	Breaker base malfunction
Not advancing	Damaged diaphragm



IGNITION COIL INSPECTION

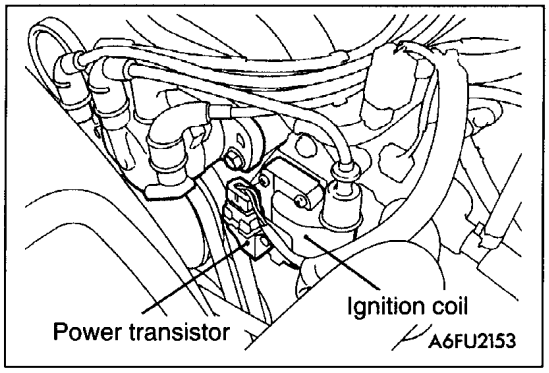
120002533

1. Measurement of the primary coil resistance
Measure the resistance between (+) terminal and (–) terminal

Standard value:
Carburettor 1.08–1.32 Ω
MPI 0.67–0.81 Ω

2. Measurement of the secondary coil resistance
Measure the resistance between the high-voltage terminal and (+) terminal.

Standard value:
Carburettor 22.1–29.9 kΩ
MPI 11.3–15.3 kΩ

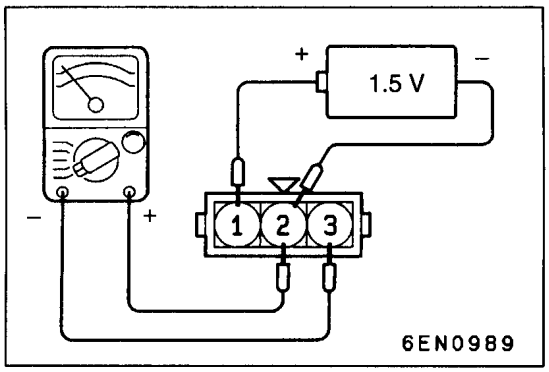


POWER TRANSISTOR INSPECTION <MPI>

120002534

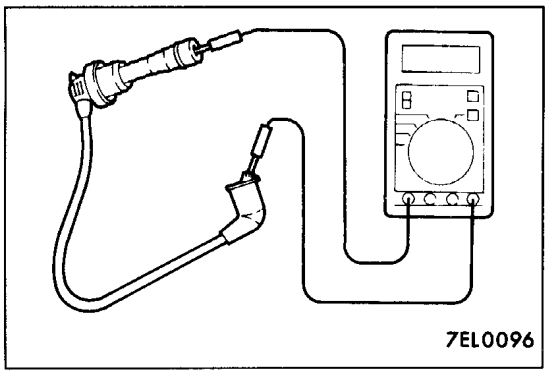
1. Disconnect the power transistor connector and check the continuity between terminals (2) and (3).

   NOTE
   An analog-type ohmmeter should be used.



1.5 V Voltage	Terminal No.		
	1	2	3
Applied	⊕ - - - -	- - - ⊖	○ ——— ○
Not applied			

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



RESISTIVE CODE INSPECTION 120000978

Measure the resistance of the all spark plug leads.

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

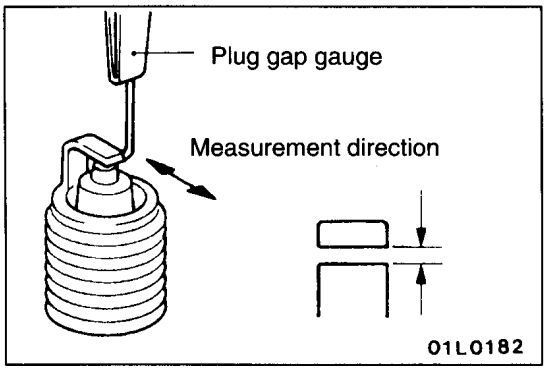
   Limit: Max. 22 kΩ

SPARK PLUG CHECK AND CLEANING 120002535

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
   Do not let foreign matter enter cylinders.

7. Install the spark plugs.

WAVE-FORM INSPECTION USING AN ANALYZER (Ignition Primary and Secondary Voltage wave-forms) 120002536

Ignition Secondary Voltage Inspection

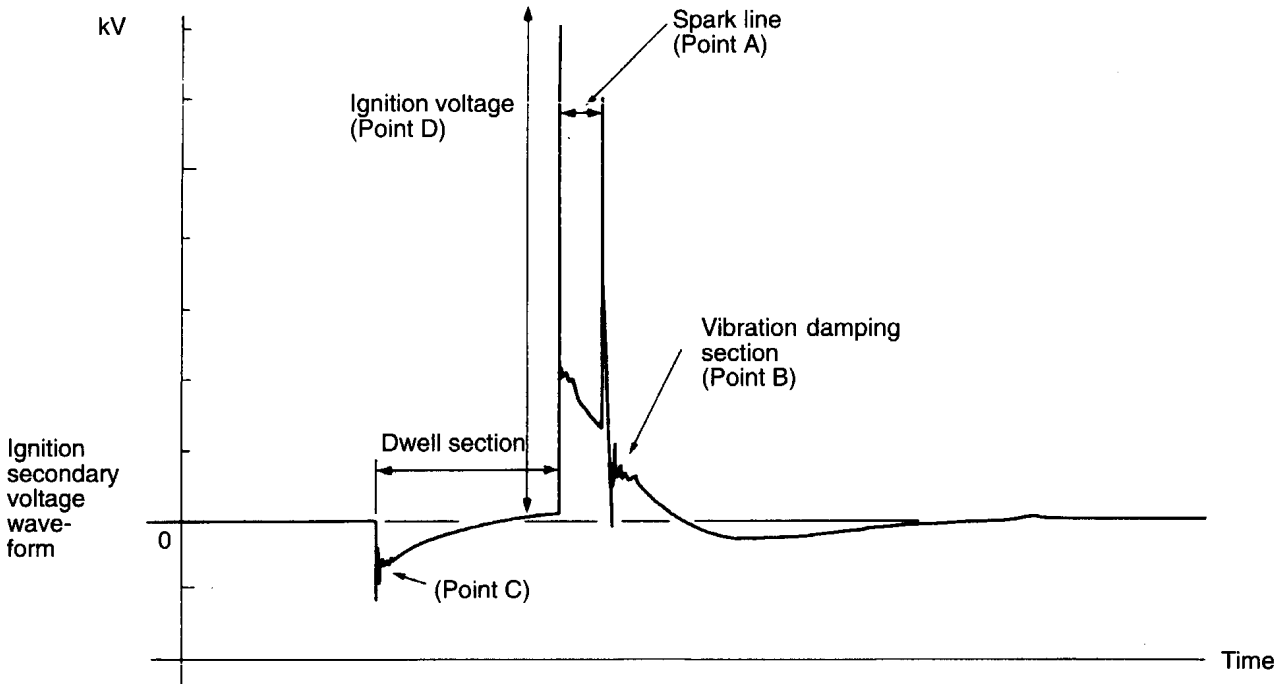
MEASUREMENT METHOD

1. Clamp the high-tension cable with the secondary pickup.
2. Clamp the spark plug cable with the trigger pickup. (Basically, clamp the spark plug cable of the No. 1 cylinder.)

NOTE
The wave-form of the cylinder clamped to the trigger pickup appears at the left edge of the screen.

STANDARD WAVE-FORM
Observation conditions

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



7EL0128

WAVE-FORM OBSERVATION POINTS

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

Spark line		Plug gap	Condition of electrode	Compression force	Concentration of air mixture	Ignition timing	Spark plug cable
Length	Long	Small	Normal	Low	Rich	Advanced	Leak
	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 wave-form Example 5.)

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

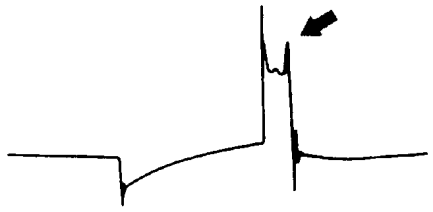
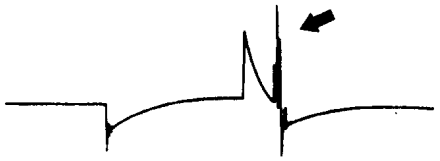
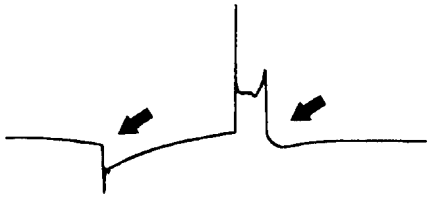
Point C: Number of vibrations at beginning of dwell section (Refer to abnormal wave-form Example 5.)

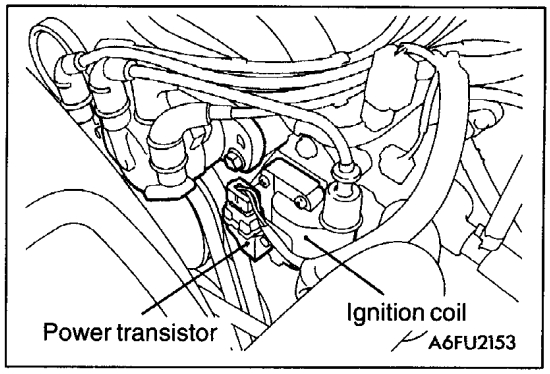
Number of vibrations	Coil
5 – 6 or higher	Normal
Except above	Abnormal

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 WAVE-FORMS

Abnormal wave-form	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 wave-form example 1.	Spark plug cable is nearly falling off. (Causing a dual ignition)
Example 5  01P0219	No waves in wave damping section	Short in ignition coil.

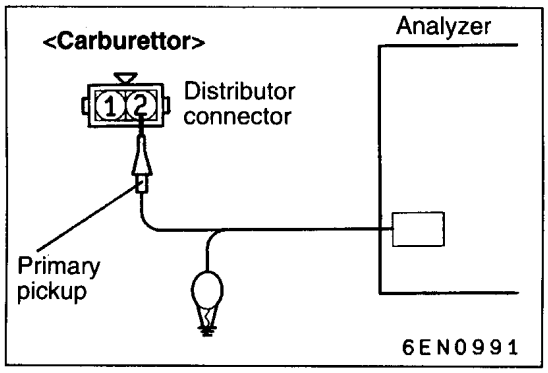


Ignition Primary Voltage Wave-form Check

120002537

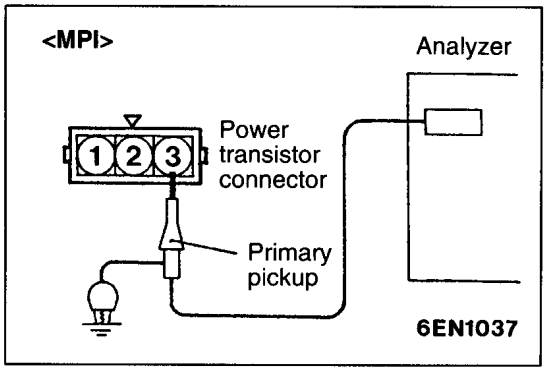
MEASUREMENT METHOD

1. Disconnect the distributor connector <Carburettor> or the power transistor connector <MPI>, and connect the special tool (test harness: MB991348) between the connector terminals. (All terminals should be connected.)



2. **<For Carburettor>**

   Connect the analyzer primary pickup to the distributor connector terminal 2.



<For MPI>

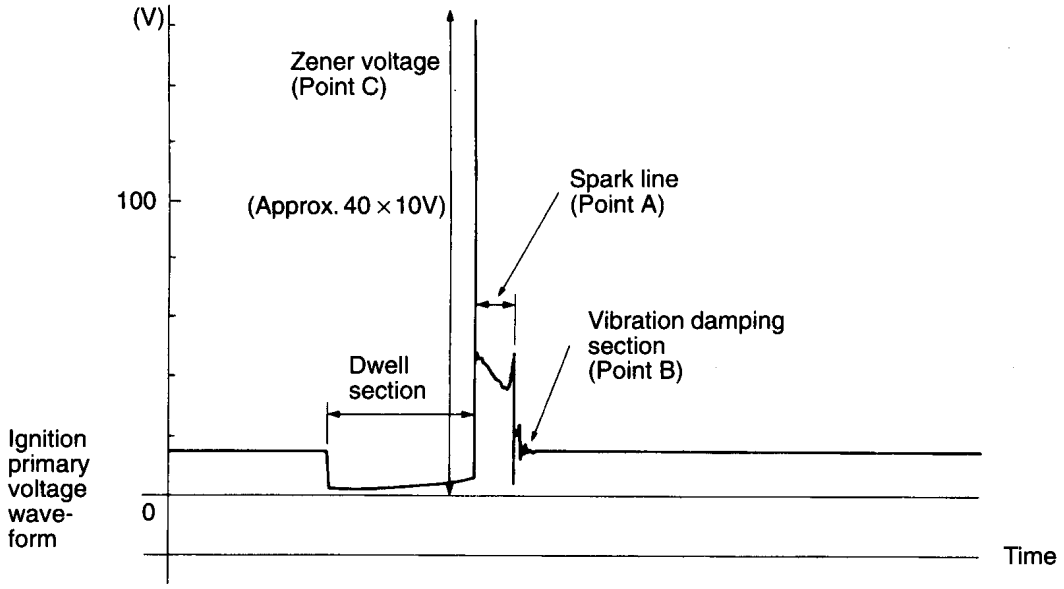
Connect the analyzer primary pickup to the power transistor connector terminal 3.

3. Connect the primary pickup earth terminal.
4. Clamp the spark plug cable with the trigger pickup.

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

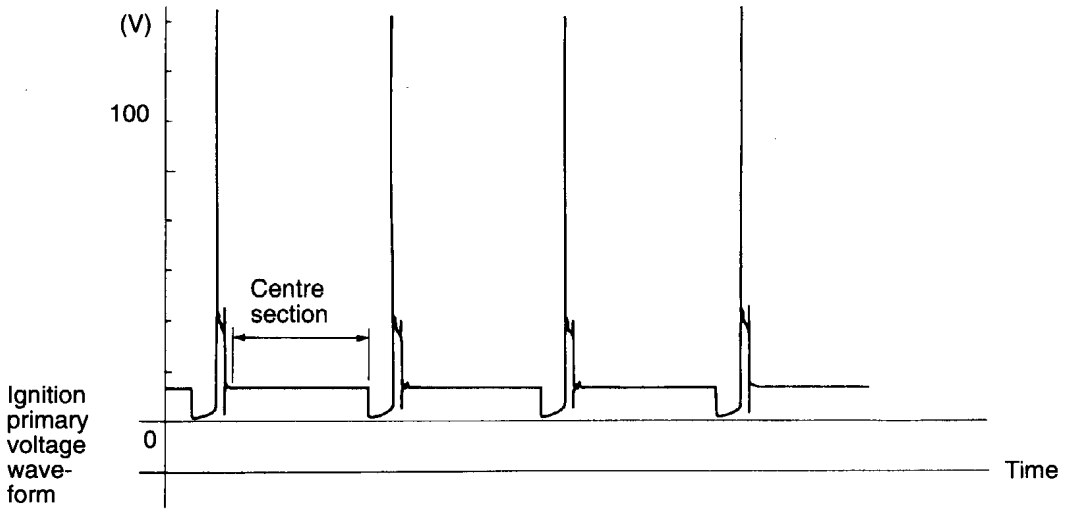
STANDARD WAVE-FORM
Observation conditions

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



WAVE-FORM OBSERVATION POINTS

Point A: The height, length and slope of the spark line (refer to abnormal wave-form 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 fouled	–	–	–	–

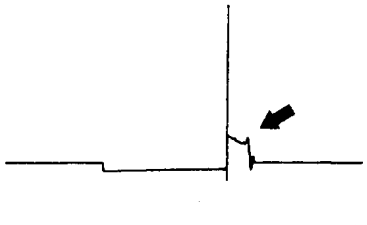
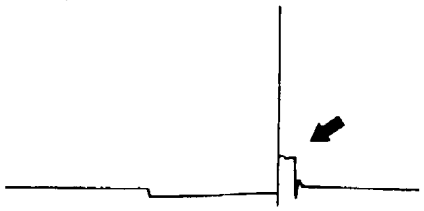
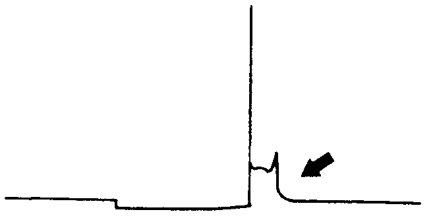
Point B: Number of vibration in reduction vibration section (Refer to abnormal wave-form Example 5.)

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

Point C: Height of Zener voltage

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

EXAMPLES OF ABNORMAL WAVE-FORMS

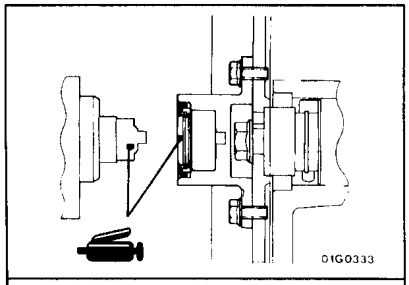
Abnormal wave-form	Wave characteristics	Cause of problem
Example 1  01P0210	Spark line is high and short.	Spark plug gap is too large.
Example 2 01P0211	Spark line is low and long, and is sloping. Also, the second half of the spark line is distorted. This could be a result of misfiring.	Spark plug gap 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	Short in ignition coil

DISTRIBUTOR

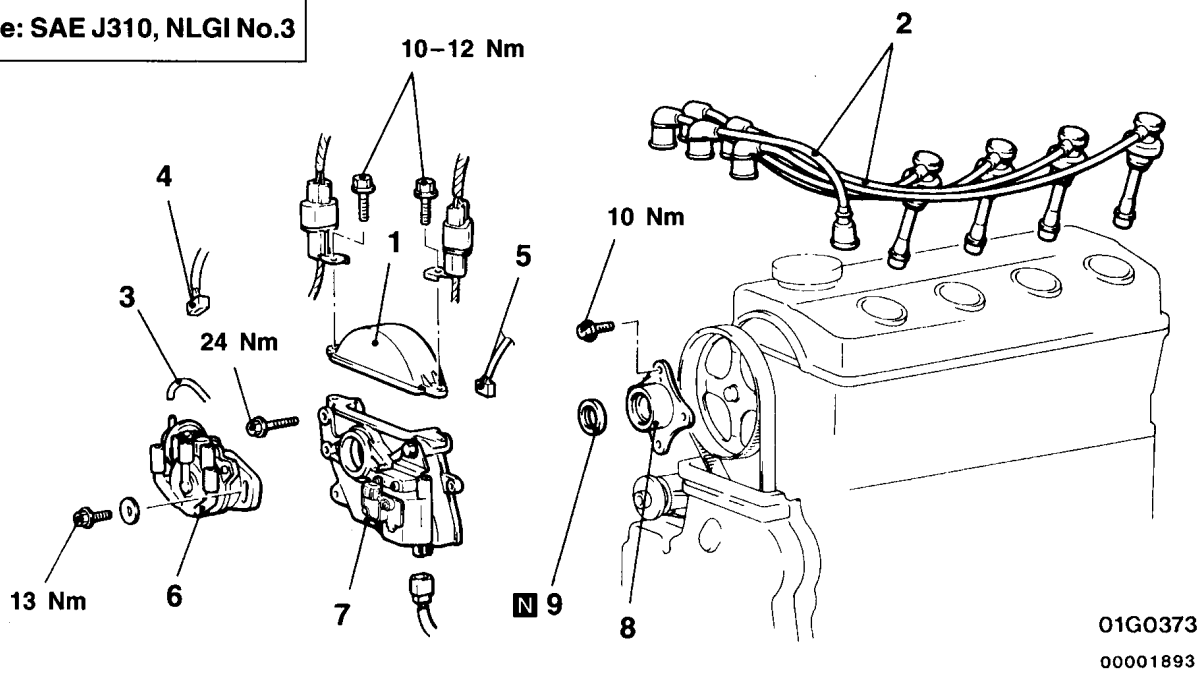
120002538

REMOVAL AND INSTALLATION

Post-installation Operation
- Engine Adjustment (Refer to GROUP 11D – Service Adjustment Procedures.)



Grease: SAE J310, NLGI No.3



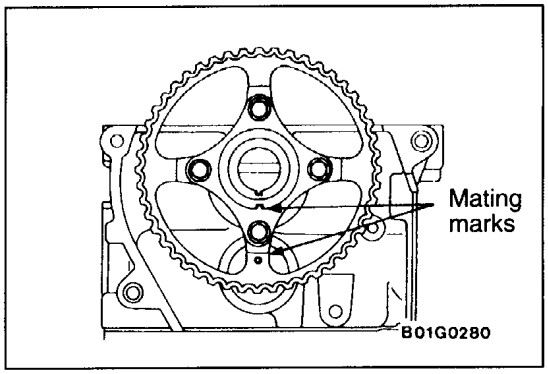
Removal Steps

1. Timing belt upper cover
2. Spark plug cable and high tension cable
3. Vacuum hose connection <Carburettor>
4. Distributor connector
5. Power transistor connector <MPI>
- ▶C◀ 6. Distributor assembly
7. Distributor bracket
- ▶B◀ 8. Camshaft sprocket spacer
- ▶A◀ 9. Oil seal

INSTALLATION SERVICE POINTS

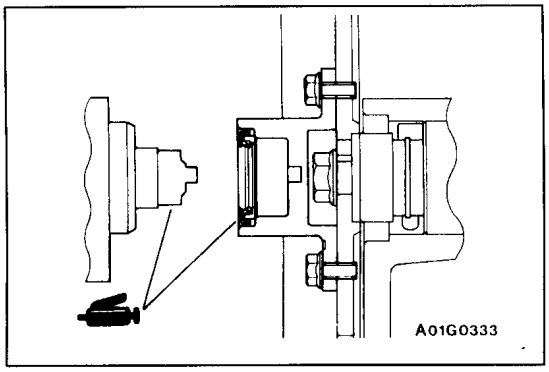
▶A◀ OIL SEAL INSTALLATION

Tap in the oil seal until it is flush with the camshaft sprocket spacer.



▶B◀ CAMSHAFT SPROCKET SPACER INSTALLATION

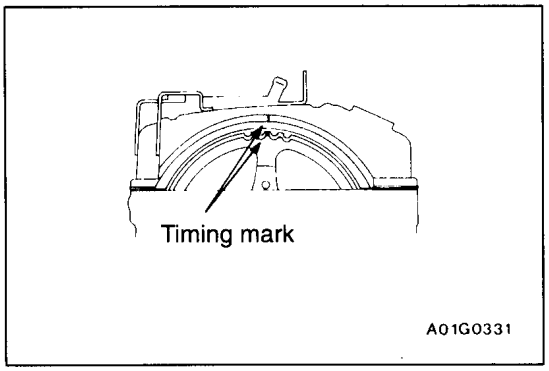
Install the camshaft sprocket spacer so that the mating marks on the camshaft sprocket spacer and the camshaft sprocket are aligned.



▶C◀ DISTRIBUTOR ASSEMBLY INSTALLATION

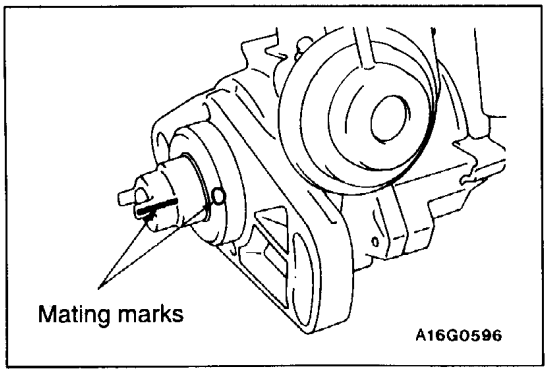
(1) Apply 2 grams of grease in the places shown in the illustration.

Specified grease: Multipurpose grease SAE J310, NLGI No. 3



(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 while aligning the distributor fixing bolt with the oblong hole on the distributor mounting flange.

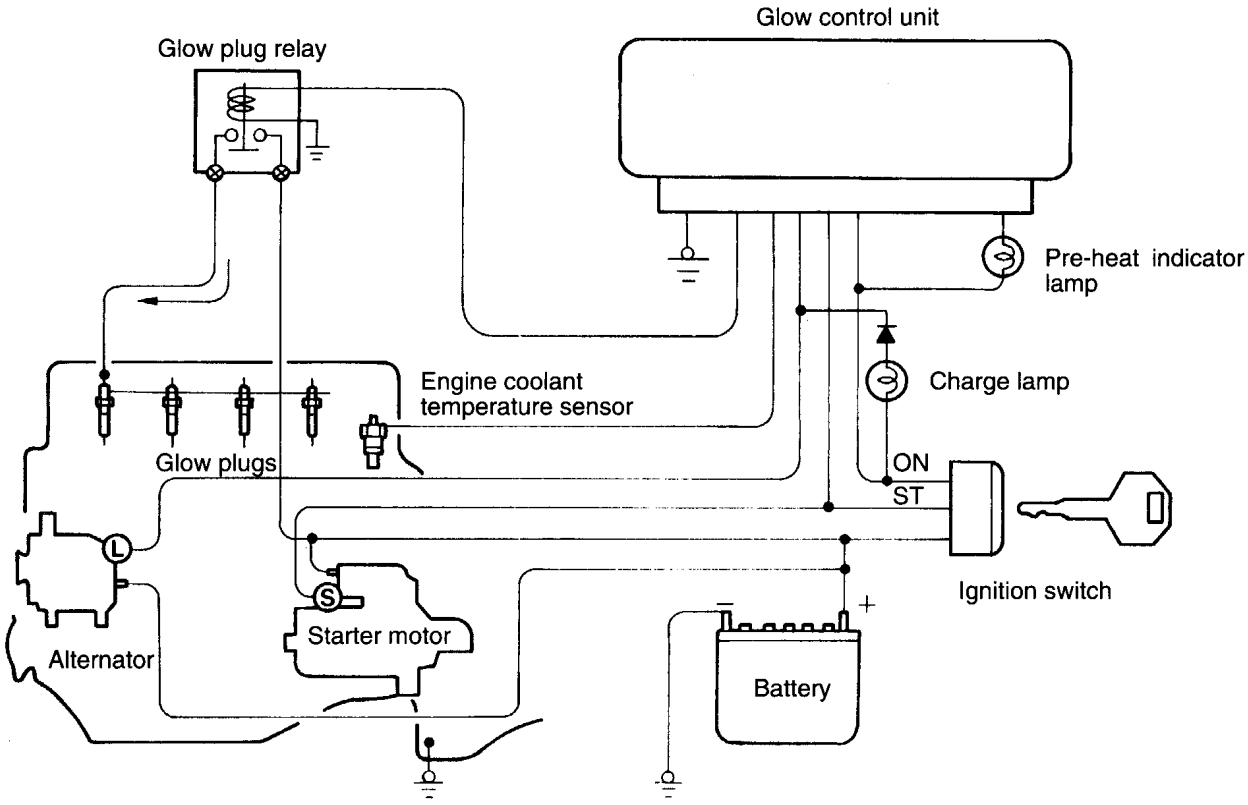
GLOW SYSTEM

120001412

GENERAL INFORMATION

SELF-REGULATING GLOW SYSTEM

The self-regulating glow system reduces the time required for starting at low temperatures to provide a degree of starting and operation that is identical to petrol-engine vehicles by preheating the glow plugs at super-quick speed.
The glow control unit controls both the time during which current is supplied to the glow plugs after the ignition switch is turned to the ON position and also the glow indicator lamp illumination time in accordance with the engine coolant temperature. The resistances of the heating coils which are built into the glow plugs increase as the glow plug temperatures become higher. As a result of this, the flow of current gradually decreases, thus stabilising the glow plug temperature at the specified temperature.



DEN0062

SERVICE SPECIFICATIONS

120001413

Item		Standard value
Resistance between glow plug plate and glow plug body (parallel resistance for 4 glow plugs) (at 20°) Ω		0.10–0.15
Voltage between glow plug plate and glow plug body V	Immediately after ignition switch is turned to ON (without starting the engine)	9–11 (Drops to 0 V after 4–8 seconds have passed)
	While engine is cranking	6 or more
	While engine is warming up	12–15 (Drops to 0 V when the engine coolant temperature increases to 60° or more or if 180 seconds have passed since the engine was started)
Glow plug resistance (at 20°) Ω		0.4–0.6

SEALANT

120001414

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

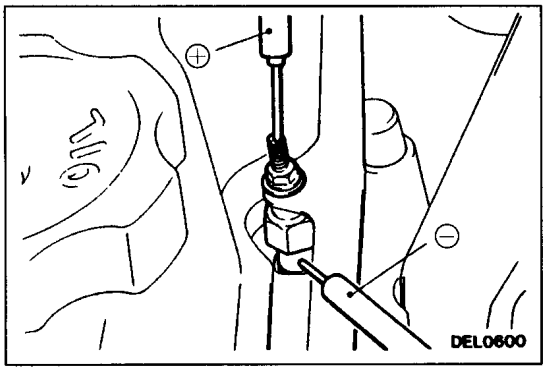
SERVICE ADJUSTMENT PROCEDURES

120001415

SELF-REGULATING GLOW SYSTEM INSPECTION

1. Check that the battery voltage is 11–13 V.
2. Check that the engine coolant temperature is 40°C or less.

   NOTE
   If the engine coolant temperature is too high, disconnect the engine coolant temperature sensor connector.



3. Measure the resistance between the glow plug plate and the glow plug body (earth).

   Standard value: 0.10–0.15 Ω (at 20°C)

   NOTE
   The resistance value is the parallel resistance value for the four glow plugs.
4. Connect a voltmeter between the glow plug plate and the glow plug body (earth).
5. Measure the voltage immediately after the ignition switch is turned to ON (without starting the engine).

   Standard value: 9–11 V (Drops to 0 V after 4–8 seconds have passed)

   In addition, check to be sure that the glow indicator lamp (red) illuminates immediately after the ignition switch is turned to ON.

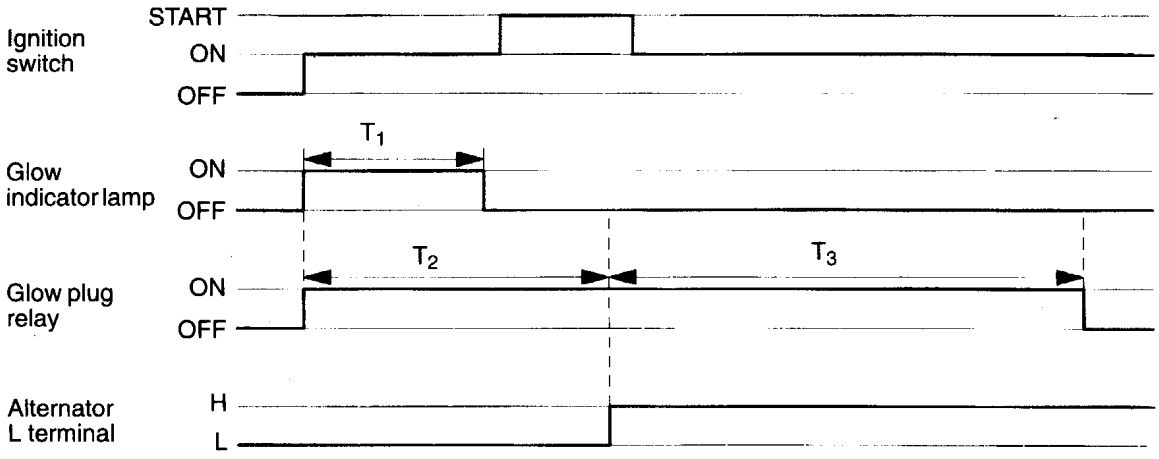
   NOTE
   The time during which the voltage appears (energizing time) will depend on the engine coolant temperature.
6. Measure the voltage while the engine is cranking.

   Standard value: 6 V or more
7. Start the engine and measure the voltage while the engine is warming up.
   However, if the engine coolant temperature rises above 60°C or when 180 seconds have passed since the engine was started, the voltage will always return to 0 V. (Refer to the Glow Plug Energization Timing Chart.)

   Standard value: 12–15 V

<Reference>

Glow Plug Energization Timing Chart



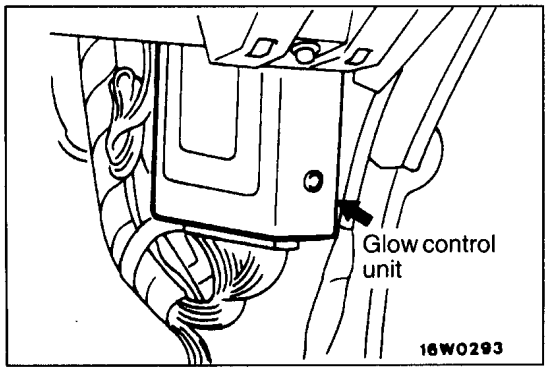
T_1: Glow indicator lamp
T_2: Glow plug relay drive time after ignition switch is turned ON
T_3: Glow plug relay drive time after engine starts (afterglow)

DEN0063

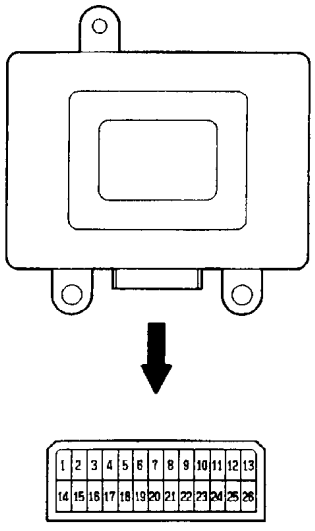
NOTE
After glow time T3 becomes longer as the engine coolant temperature drops.

GLOW CONTROL UNIT INSPECTION

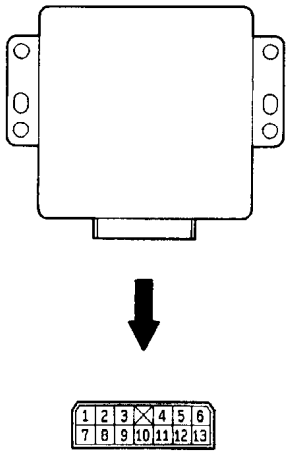
120002539



Vehicles with EGR



Vehicles without EGR



DEN0821
00003260

1. Measure the voltage at the control unit terminals.

   NOTE
   1. Inspect with the control unit connector connected.
   2. When measuring the voltage, connect the control unit terminal (26) (terminal (10) for vehicles without EGR) to the earth.

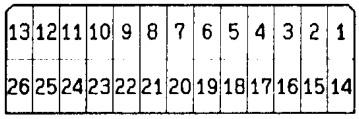
Terminal Voltage Reference Table

Inspection terminal	Inspection item	Inspection condition		Standard value
5 13*	Engine coolant temperature sensor (Engine coolant temperature detection)	Ignition switch "ON" → "OFF"	Engine coolant temperature: –20°C	4.3–4.5 V
			Engine coolant temperature: 0°C	3.7–3.9 V
			Engine coolant temperature: 20°C	2.8–3.0 V
			Engine coolant temperature: 40°C	1.9–2.1 V
			Engine coolant temperature: 80°C	0.5–0.7 V
12 2*	Ignition switch (power supply)	Ignition switch "OFF" → "START"		8 V or more
14 7*	Glow plug relay (glow time control)	Ignition switch "OFF" → "ON" Engine coolant temperature: 40°C (104°F) or less (Pre-glow function inspection)		9–12 V 0–0.5 V after approx. 8 sec. (when engine coolant temperature is 20°C)
17 3*	Glow indicator lamp	Ignition switch "OFF" → "ON" Engine coolant temperature: 40°C (104°F) or less		0–1 V 11–13 V after approx. 1 sec. (when engine coolant temperature is 20°C)
23 6*	Alternator charging signal ("L" terminal)	Ignition switch "OFF" → "ON"		1–4 V
		Engine is idling		11 V or more
26 10*	Earth	–		–

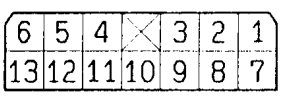
*: indicates vehicles without EGR

Glow control unit harness-side connector as seen from the terminal side

Vehicles with EGR



Vehicles without EGR

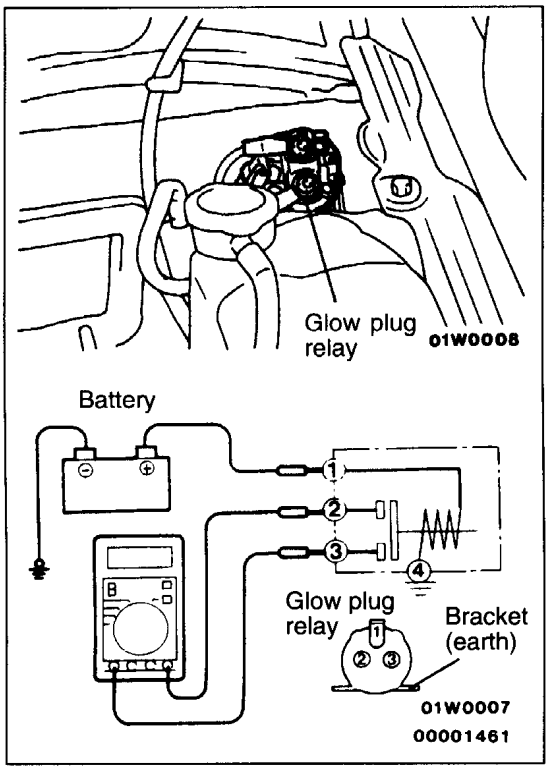


DEN0822

2. Remove the control unit connector and check the continuity between the harness-side connector terminals.

Inspection terminal	Inspection item	Continuity (resistance value)
14–26 7–10*	Glow plug relay	Continuity (approx. 3 Ω)

*: indicates vehicles without EGR

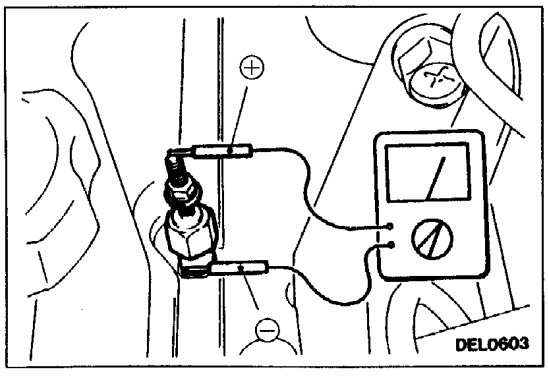


GLOW PLUG RELAY INSPECTION 120002540

1. Check to be sure that there is continuity (approx. 3 Ω) between glow plug relay terminal (1) and the bracket (earth).
2. Use jumper cables to connect terminal (1) of the glow plug relay to the battery (+) terminal and the bracket to the battery (–) terminal.

   Caution
   (1) Always be sure to disconnect the harnesses connected to glow plug relay terminals (2) and (3) before using the jumper cables.
   (2) The terminals of the disconnected harnesses must not be shorted to earth.
   (3) When connecting the jumper cables, be very careful not to make a mistake in connecting the terminals, as this will cause damage to the relay.
3. Check the continuity between glow plug relay terminals (2) and (3) while disconnecting and connecting the jumper cable at the battery (+) terminal.

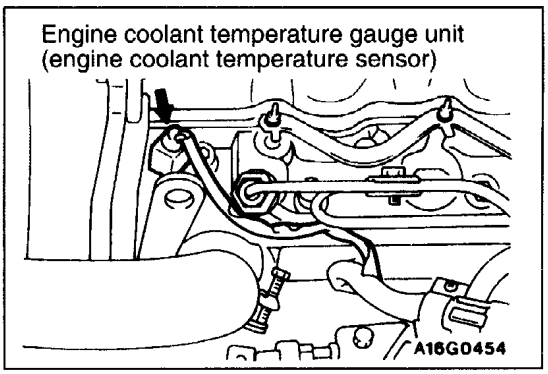
Jumper cable at battery (+) terminal	Continuity between terminals (2) – (3)
Connected	Continuity (0.01 Ω or less)
Disconnected	No continuity (∞ Ω)



GLOW PLUG INSPECTION 120001418

1. Remove the glow plug plate.
2. Measure the resistance between the glow plug terminals and the body.

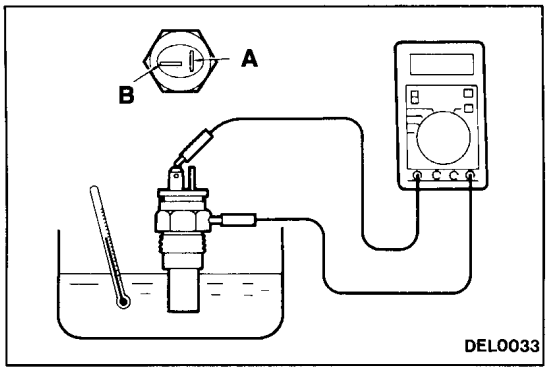
   Standard value: 0.4–0.6 Ω (at 20°C)



ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

120001419

1. Remove the engine coolant temperature sensor.



2. While the sensor section of the engine coolant temperature sensor is submerged, measure the resistance between (B) terminal and the body.

Temperature (°C)	Resistance value (kΩ)
0	8.6
20	3.25±0.33
40	1.5
80	0.3

3. After applying specified sealant to the threaded portion, tighten to the specified torque.

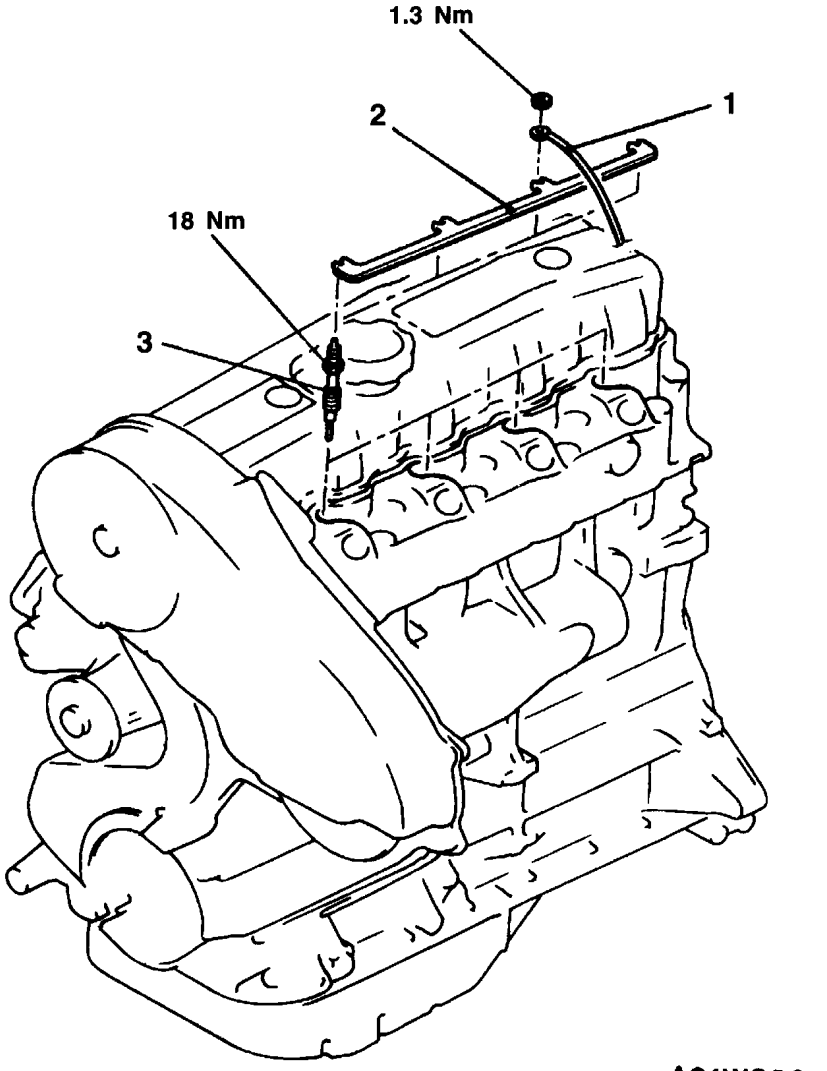
   Specified sealant: 3M Nut Locking Part No. 4171 or equivalent

   Tightening torque: 35 Nm

GLOW PLUG

120002182

REMOVAL AND INSTALLATION



Removal steps

1. Connector connection
2. Glow plug plate

◀A▶ 3. Glow plug

REMOVAL SERVICE POINT

◀A▶ GLOW PLUG REMOVAL

Remove glow plug by hand after loosening with tool as its ceramic part is fragile.

INSPECTION

- Check for rust on glow plug plate.
- Check glow plug for damage.

Caution
Do not use a plug that has been dropped from a height of 10 cm or more.

EMISSION CONTROL

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120002583

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EMISSION CONTROL <MPI>

120002584

GENERAL INFORMATION

The emission control system consists of the following sub-systems:
- Crankcase emission control system
- Evaporative emission control system
- Exhaust emission control system

Items	Name	Specification
Crankcase emission control system	Positive crankcase ventilation (PCV) valve	Variable flow type (Purpose: HC reduction)
Evaporative emission control system	Canister Purge control solenoid valve	Equipped ON/OFF type solenoid valve (Purpose: HC reduction)
Exhaust emission control system	Air-fuel ratio control device–MPI system	Oxygen sensor feedback type (Purpose: CO, HC, NOx reduction)
	Exhaust gas recirculation system • EGR valve • EGR control solenoid valve	Equipped Single type Duty cycle type solenoid valve (Purpose: NOx reduction)
	Catalytic converter	Monolith type (Purpose: CO, HC, NOx reduction)

EMISSION CONTROL DEVICE REFERENCE TABLE

120002585

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	×					17-7
Purge control solenoid valve		×				17-10
MPI system component		×	×			GROUP 13A
Catalytic converter				×		17-14
EGR valve					×	17-12
EGR control solenoid valve					×	17-13

SERVICE SPECIFICATIONS

120000838

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

SEALANT

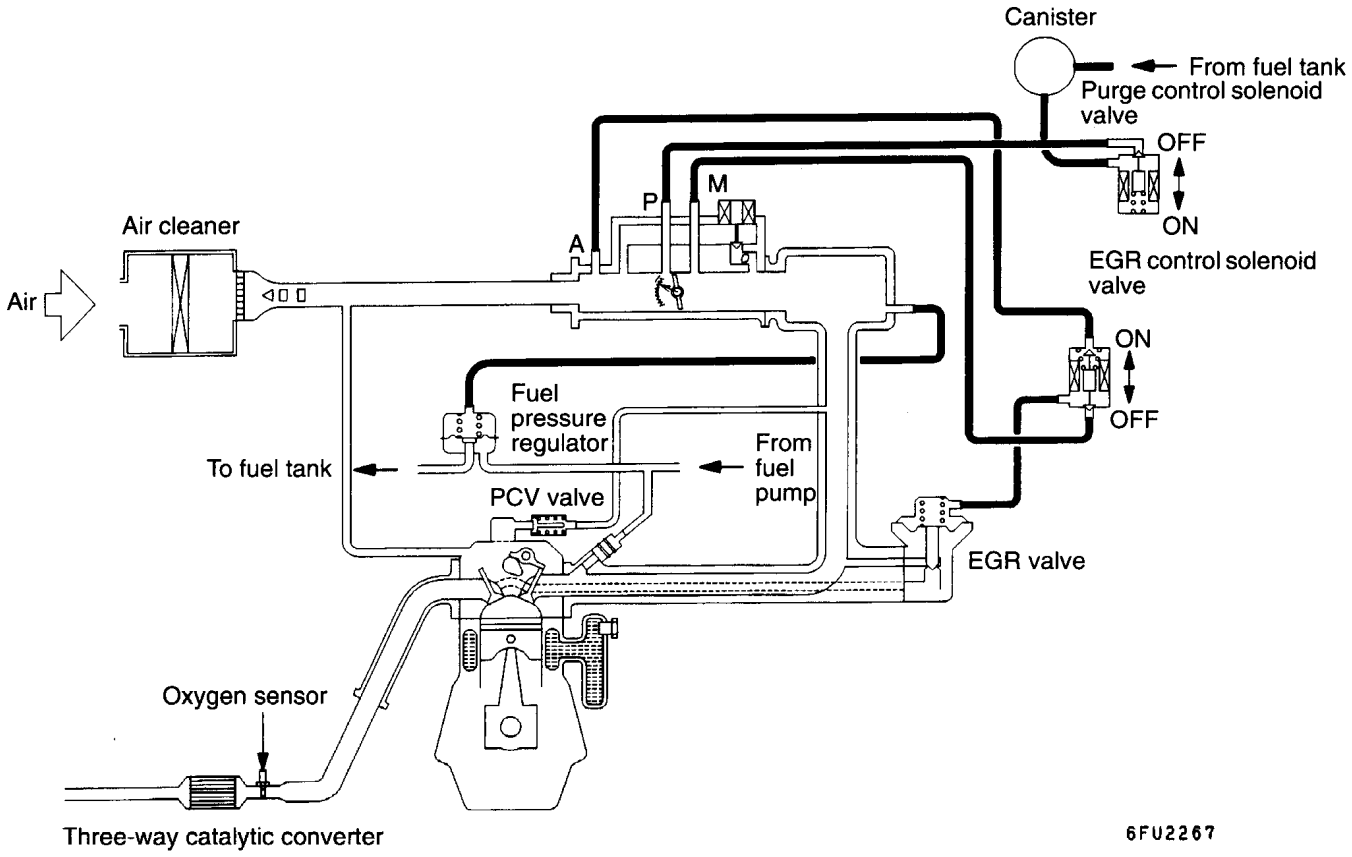
120000915

Item	Specified sealant	Remark
Thermo valve threaded portion	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

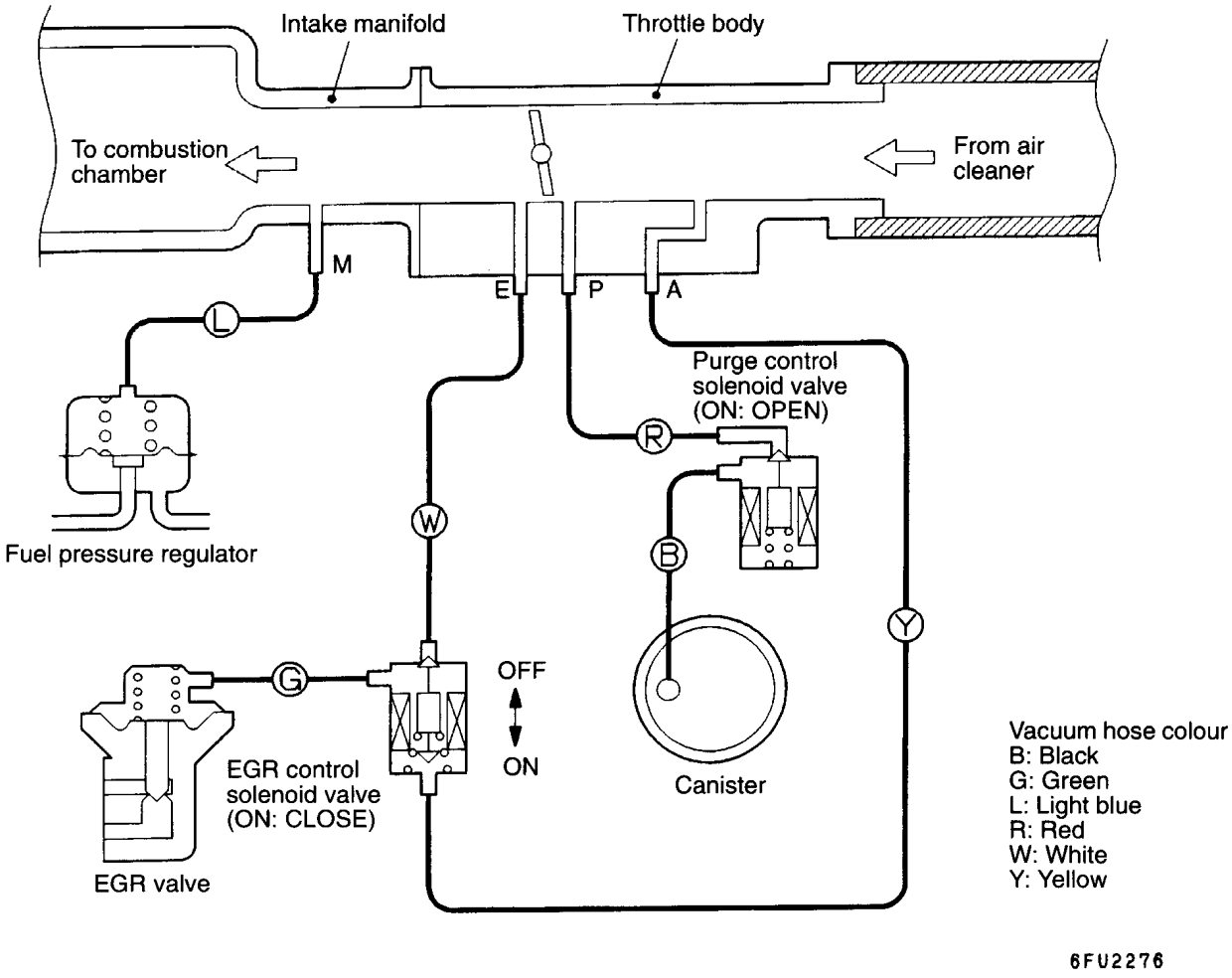
VACUUM HOSE

120002586

VACUUM HOSE PIPING DIAGRAM



VACUUM CIRCUIT DIAGRAM



VACUUM HOSE INSPECTION

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

120000840

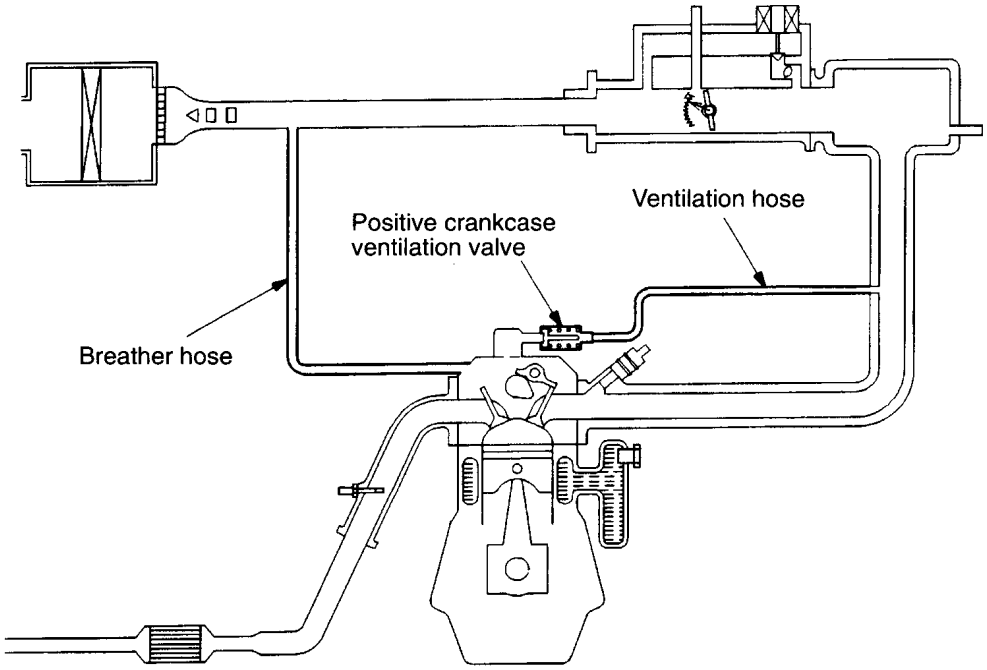
GENERAL INFORMATION

The crankcase emission control system prevents blow-by gases from escaping inside the crankcase into the atmosphere.
Fresh air is sent from the air cleaner into the crankcase through the breather hose. The air becomes mixed with the blow-by gases inside the crankcase.
The blow-by gas inside the crankcase is drawn into the intake manifold through the positive crankcase ventilation valve.

The positive crankcase ventilation valve lifts the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly. In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.

SYSTEM DIAGRAM

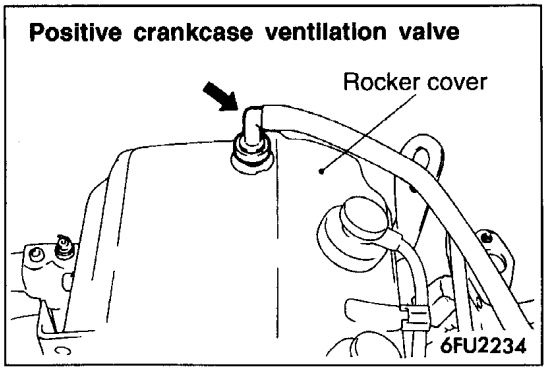
120000841



NOTE
The illustration shows the system for the 4G64 engine.

COMPONENT LOCATION

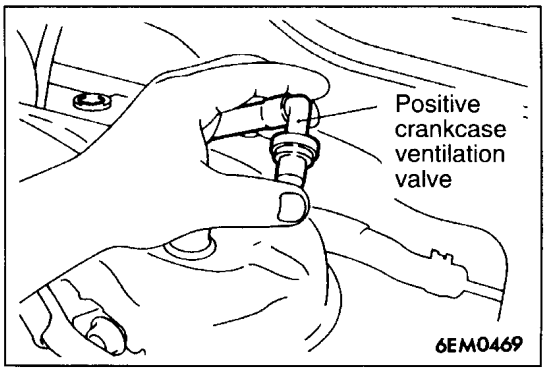
120002587



POSITIVE CRANKCASE VENTILATION SYSTEM INSPECTION

120000843

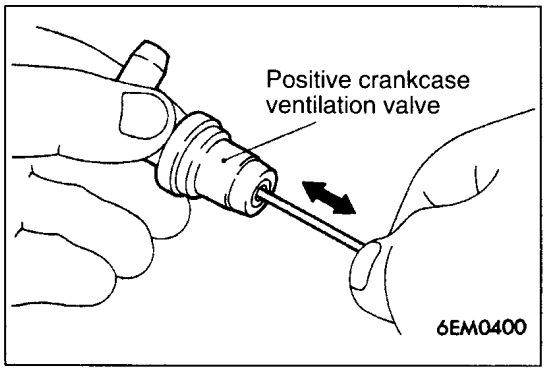
1. Remove the ventilation hose from the positive crankcase ventilation valve.
2. Remove the positive crankcase ventilation valve from the rocker cover.
3. Reinstall the positive crankcase ventilation valve at the ventilation hose.
4. Start the engine and run at idle.



5. Place a finger at the opening of the positive crankcase ventilation valve and check that vacuum of the intake manifold is felt.

   NOTE
   At this moment, the plunger in the positive crankcase ventilation valve moves back and forth.

6. If vacuum is not felt, clean the positive crankcase ventilation valve or replace it.



PCV VALVE INSPECTION

120000844

1. Insert a thin rod into the positive crankcase ventilation valve from the side shown in the illustration (rocker cover installation side), and move the rod back and forth to check that the plunger moves.
2. If the plunger does not move, there is a clogging in the positive crankcase ventilation valve. In this case, clean or replace the valve.

EVAPORATIVE EMISSION CONTROL SYSTEM

120002588

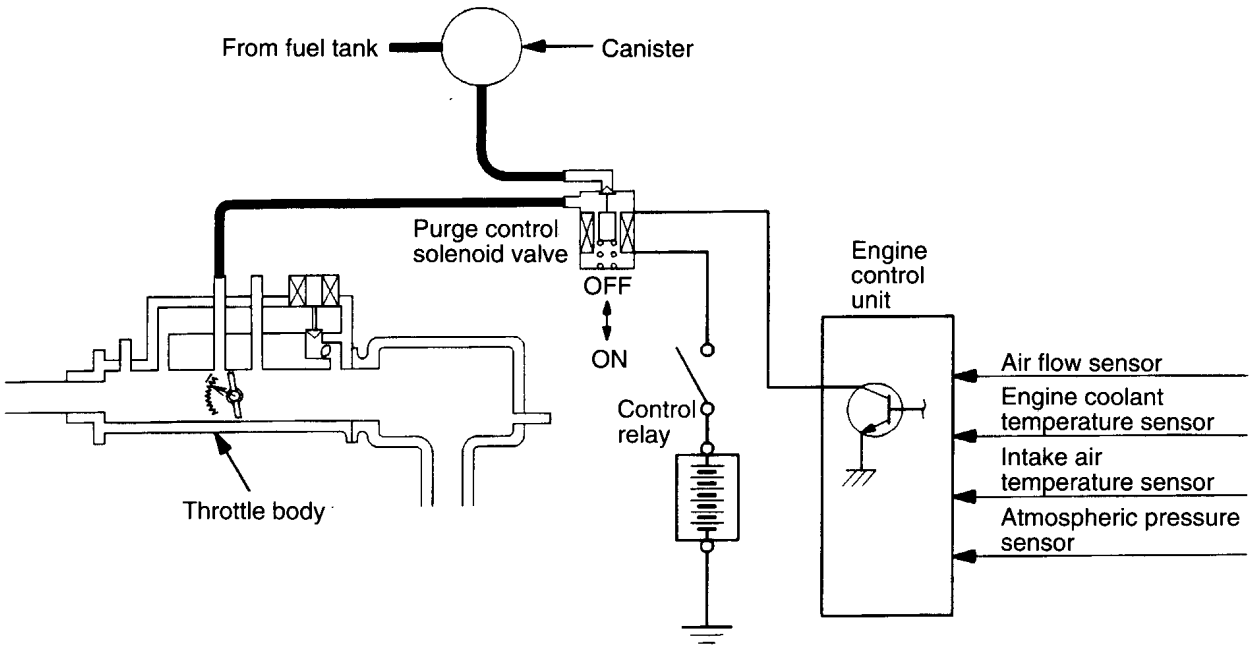
GENERAL INFORMATION

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.

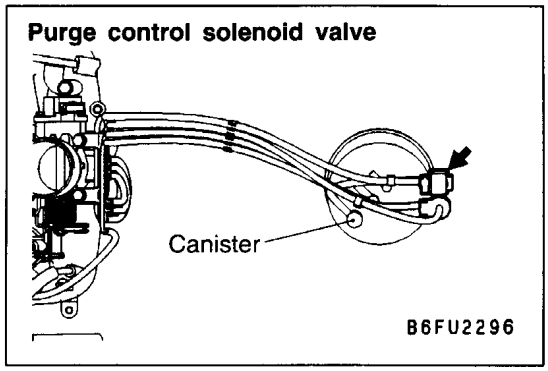
SYSTEM DIAGRAM

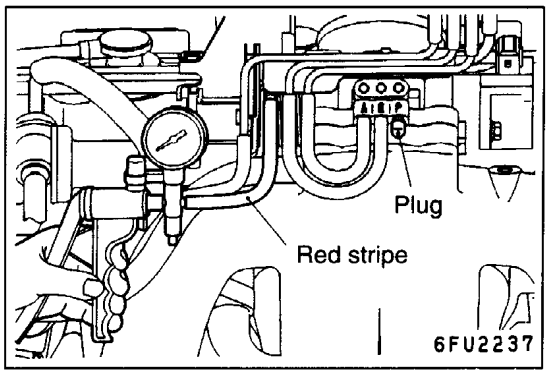
120000848



COMPONENT LOCATION

120000849





PURGE CONTROL SYSTEM INSPECTION

120000850

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.

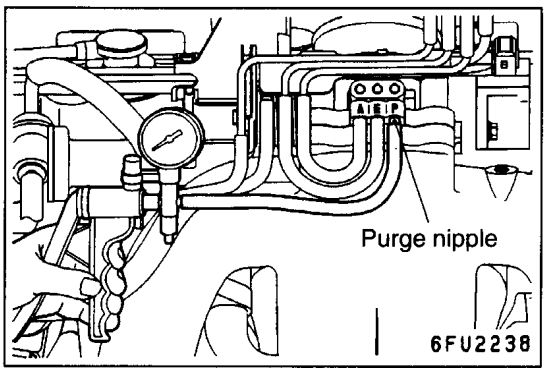
When engine is cold
(Engine coolant temperature: 40°C or less)

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.*

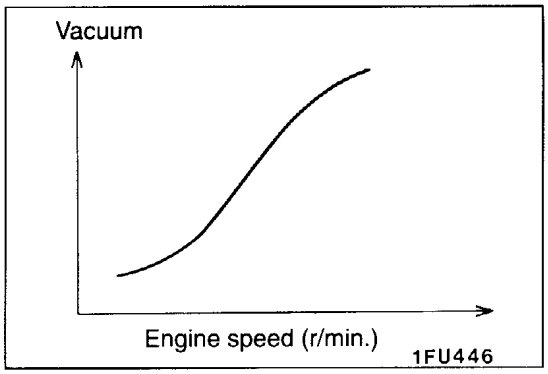
NOTE
* The vacuum will leak continuously if the atmospheric pressure is approximately 77 kPa or less, or the temperature of the intake air is approximately 50°C or higher.



PURGE PORT VACUUM INSPECTION

120000846

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.

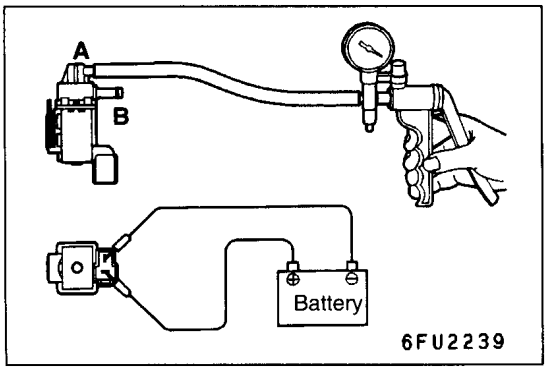
   NOTE
   If there is a problem with the change in vacuum, the throttle body purge port may be clogged and needs cleaning.

PURGE CONTROL SOLENOID VALVE INSPECTION

120000852

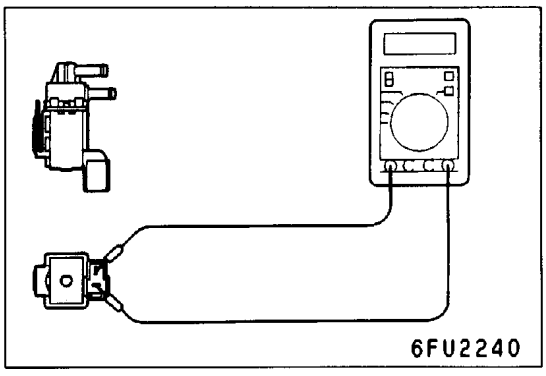
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

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 air-tightness 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

120002589

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.

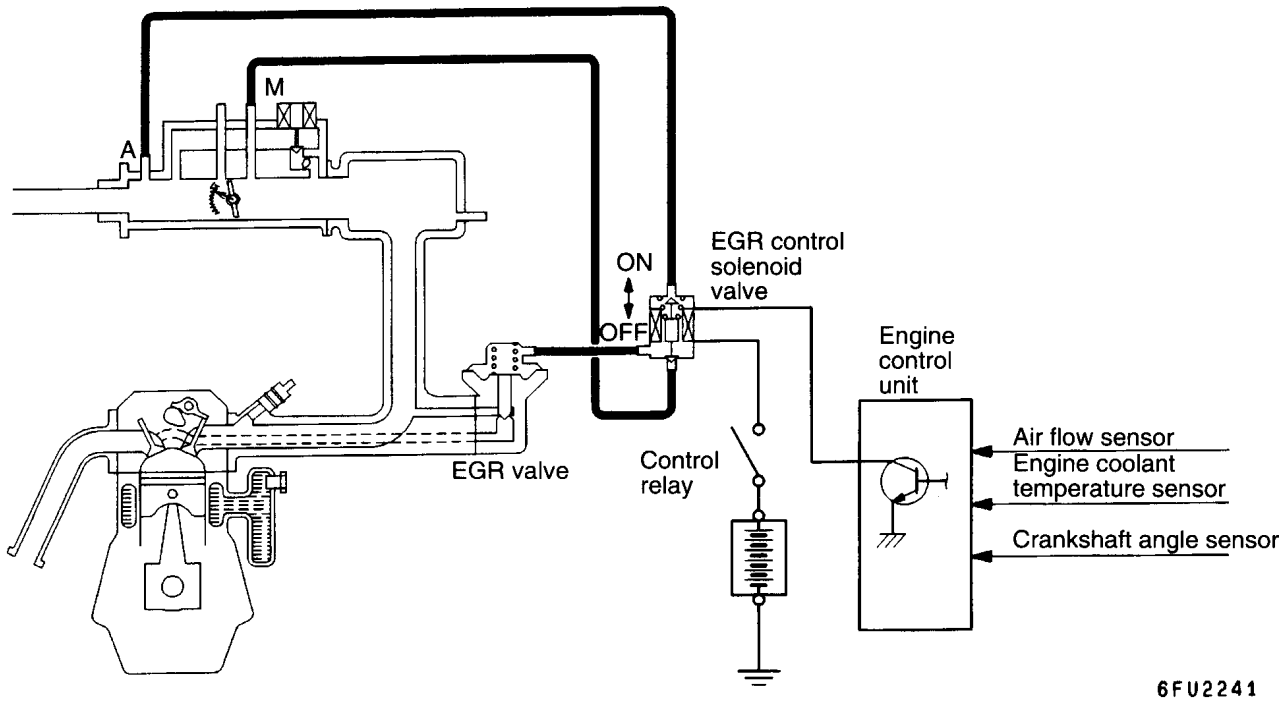
OPERATION

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.

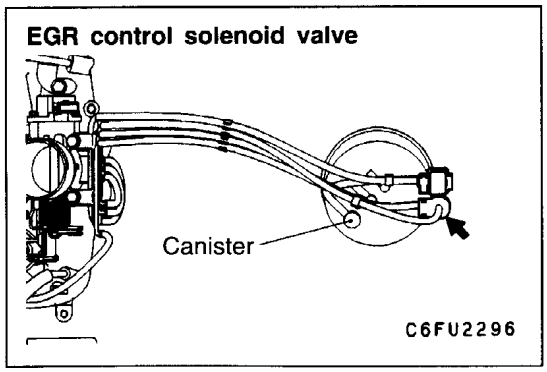
SYSTEM DIAGRAM

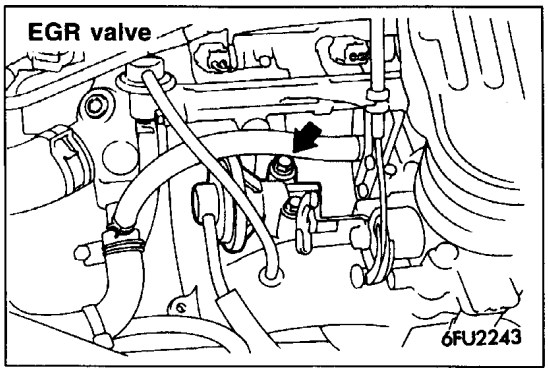
120000854

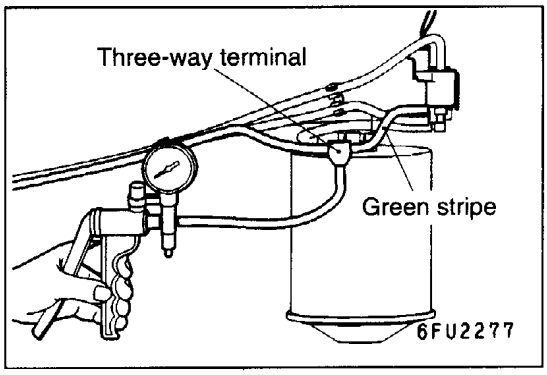


COMPONENT LOCATION

120002593





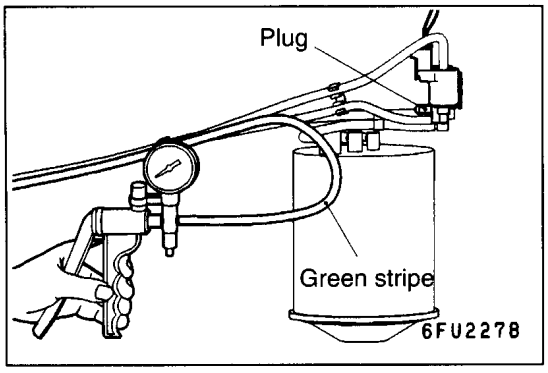


EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM INSPECTION 120000856

1. Disconnect the vacuum hose (green stripe) from the EGR control solenoid 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)

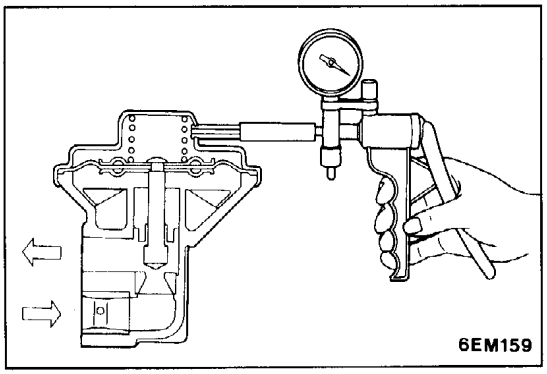
Throttle valve	Normal vacuum condition
Open quickly	No vacuum will generate (the same as barometric pressure.)



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 vacuum hose (green stripe).
5. Check whether the engine stalls or the idling is unstable when a vacuum of 30 kPa or higher is applied during idling.



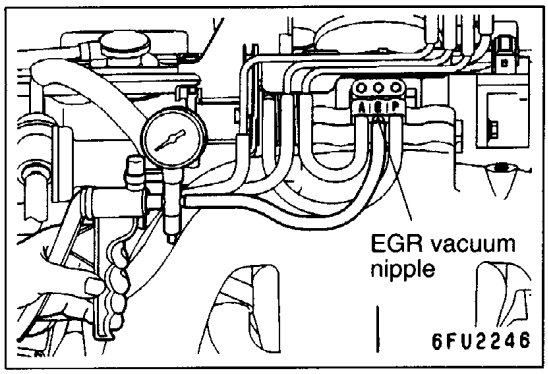
EGR VALVE INSPECTION 120000857

1. Remove the EGR valve and inspect for sticking, carbon deposits, etc. If found, clean with a suitable solvent so that the valve seats correctly.
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67 kPa of vacuum, and check that the vacuum is maintained.
4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

Vacuum	Passage of air
5.3 kPa or less	Air is not blown out
26 kPa or more	Air is blown out

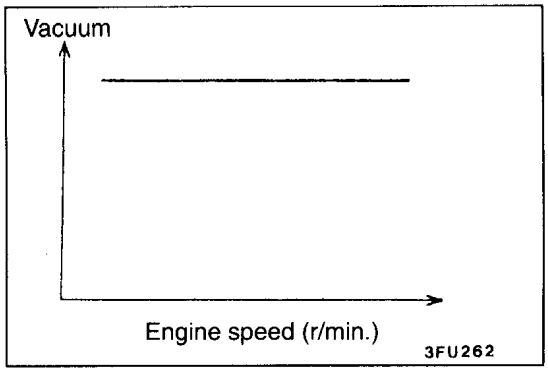
5. Replace the gasket, and tighten to the specified torque.

Specified torque: 22 Nm



EGR PORT VACUUM INSPECTION 120000858

1. Disconnect the vacuum hose (white stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.



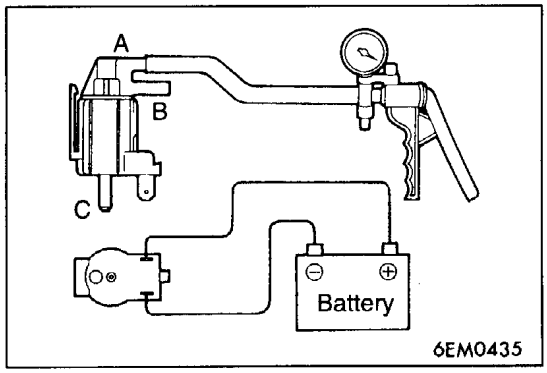
2. Start the engine and check vacuum remains fairly constant after racing the engine.

   NOTE
   If there is no vacuum created, it is possible that the throttle body EGR port may be clogged and needs cleaning.

EGR CONTROL SOLENOID VALVE INSPECTION 120000859

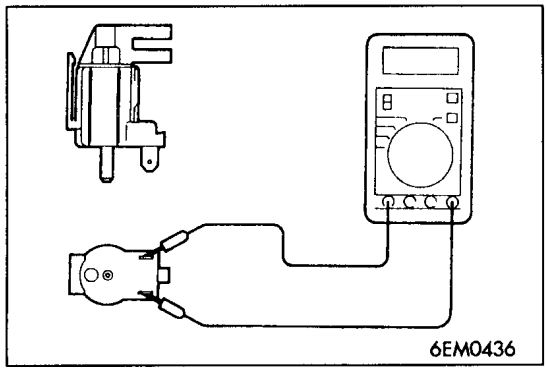
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

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



3. Connect a hand vacuum pump to the nipple to which the white-striped vacuum hose was connected.
4. Check air-tightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

Battery voltage	B Nipple condition	Normal condition
Not applied	Open	Vacuum maintained
Applied	Open	Vacuum leaks
	Closed	Vacuum maintained



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

   Standard value: 36–44 Ω (at 20°C)

CATALYTIC CONVERTER

120000004

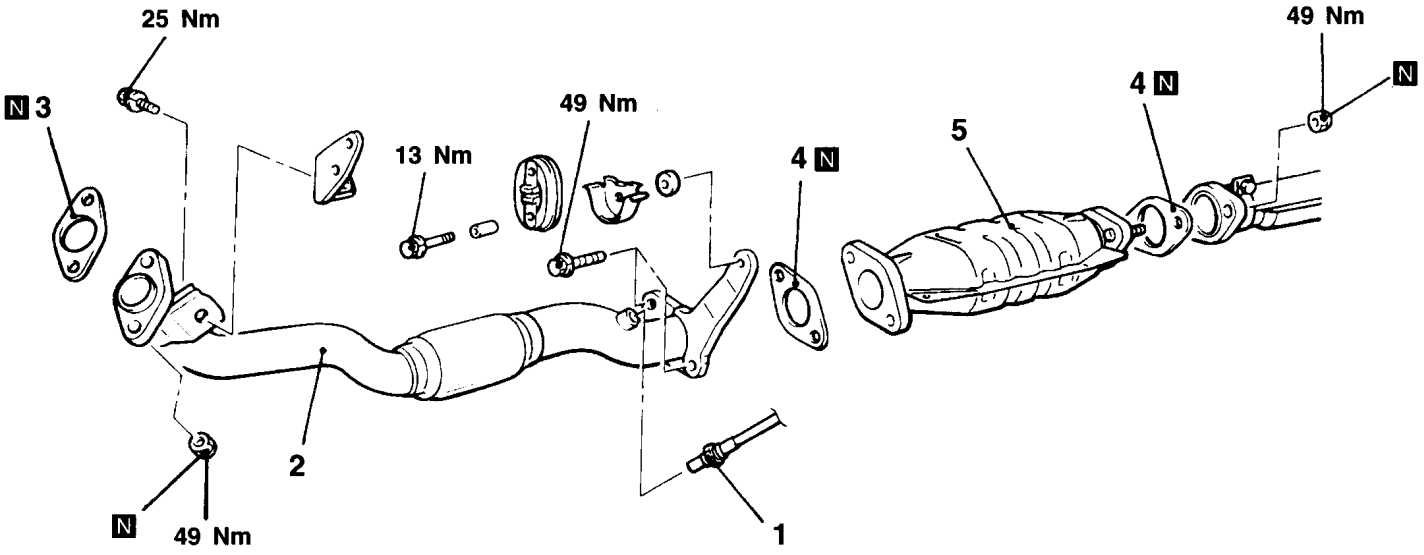
GENERAL INFORMATION

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

120002177



A05W0052

Removal steps

1. Oxygen sensor
2. Front exhaust pipe
3. Gasket
4. Gasket
5. Catalytic converter

INSPECTION

Inspect for damage, cracking or deterioration. Replace if faulty.

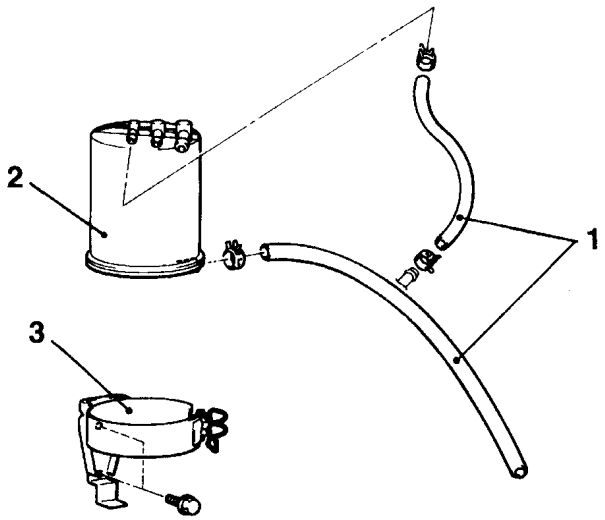
Caution

1. **Stop the engine immediately if engine misfiring occurs, otherwise an abnormally hot exhaust system will damage the catalytic converter or other under-body parts.**
2. **Correct and repair the ignition or fuel system if there are malfunctions, otherwise engine misfiring may occur which will damage the catalytic converter.**
3. **Observe manufacturer's specifications when doing service work.**

CANISTER

120000006

REMOVAL AND INSTALLATION



A03W0001

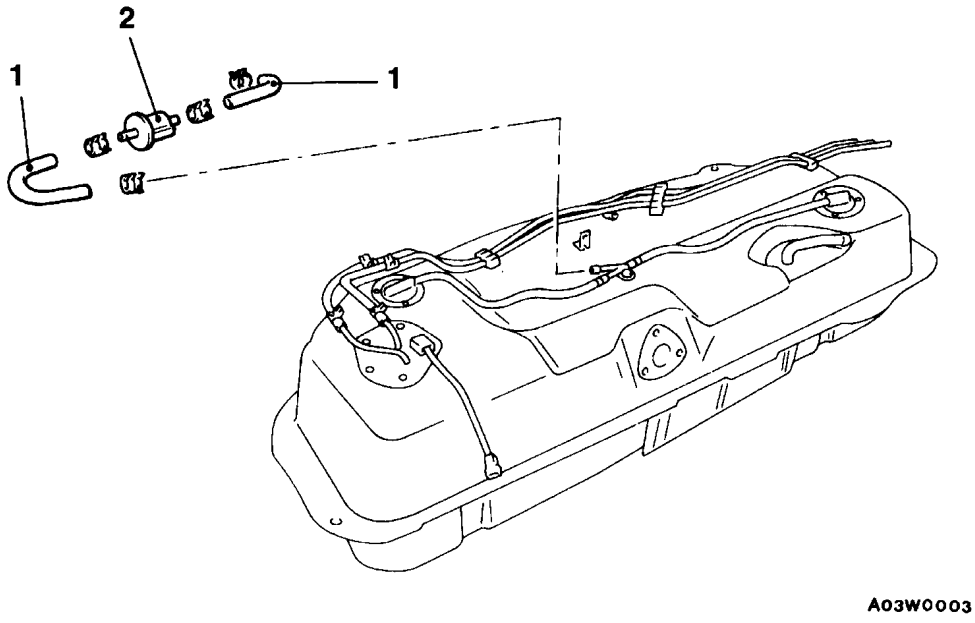
Removal steps

1. Vapour hose
2. Canister
3. Canister holder assembly

TWO-WAY VALVE

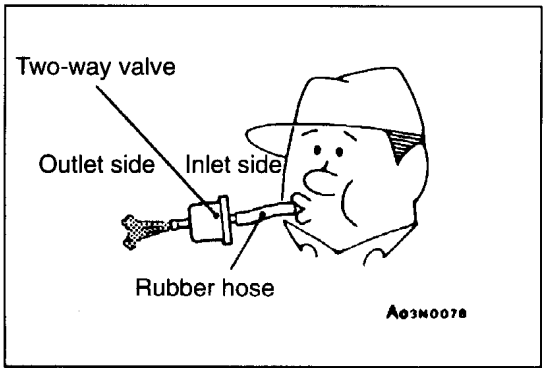
120000007

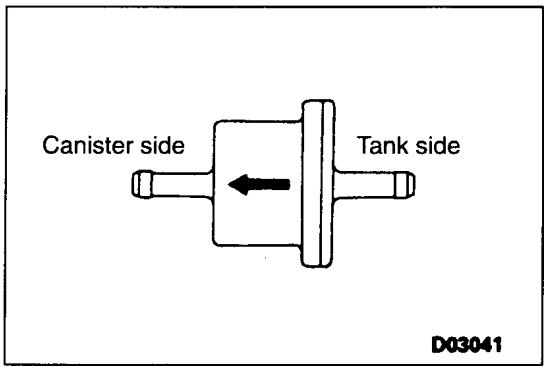
REMOVAL AND INSTALLATION



Removal steps

1. Vapour hose
▶A◀ 2. Two-way valve





INSPECTION

TWO-WAY VALVE SIMPLE CHECK

Attach a clean hose and check the operation of the two-way valve.

Inspection procedure	Normal condition
Lightly blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance.
Lightly blow from outlet side.	Air passes through.

INSTALLATION SERVICE POINT

▶A◀ TWO-WAY VALVE INSTALLATION

Be careful about the installation direction of the two-way valve.

EMISSION CONTROL <ELECTRONIC CONTROLLED CARBURETTOR>

120002590

GENERAL INFORMATION

The emission control system consists of the following sub-systems:
- Crankcase emission control system
- Evaporative emission control system
- Exhaust emission control system

Items	Name	Specifications
Crankcase emission control system	Positive crankcase ventilation valve	Variable flow type (Purpose: HC reduction)
Evaporative emission control system	Canister Purge control valve Bowl vent valve	Equipped Single diaphragm type Vacuum type (Purpose: HC reduction)
Exhaust emission control system	Air-fuel ratio control device – Electronic control carburettor system	Oxygen sensor feedback type (Purpose: CO, HC, NOx reduction)
	Catalytic converter	Monolith type (Purpose: CO, HC, NOx reduction)
	Secondary air supply system • Reed valve • Secondary air control solenoid valve	Equipped With air control valve ON-OFF solenoid valve (Purpose: CO, HC reduction)
	Exhaust gas recirculation system • EGR valve • Vacuum regulator valve • Thermo valve	Equipped Single type With vacuum control Wax type (Purpose: NOx reduction)
	Intake air temperature control system	Vacuum control type (Purpose: CO, HC reduction)
	Mixture control valve (MCV)	Pressure differential type valve (Purpose: CO, HC reduction)

EMISSION CONTROL DEVICE REFERENCE TABLE

120002591

Items	Emission control system								
Related parts	Crank-case emis-sion control system	Evapo-rative emis-sion control system	Air-fuel ratio control system	Cata-lytic con-verter	Sec-ondary air supply system	Ex-haust gas re-circula-tion system	Intake air tem-pera-ture control system	Decel-erator	Reference page for each part inspection
Positive crankcase ventilation valve	×								17-7
Bowl vent valve		×							17-23
Purge control valve		×							17-21
Thermo valve		×				×			17-21
Electronic control carburettor system component			×		×				GROUP 13B
Catalytic converter				×					17-33
Secondary air control valve (with reed valve)					×				17-28
Secondary air control solenoid valve					×				17-29
Vacuum tank					×				–
EGR valve						×			17-12
Vacuum regulator valve						×			17-25
Air control valve							×		17-31
Thermo sensor							×		17-31
Mixture control valve								×	17-32

SERVICE SPECIFICATION

120001448

Item	Standard value
Secondary air control solenoid valve coil resistance (at 20°C) Ω	36–44

SEALANT

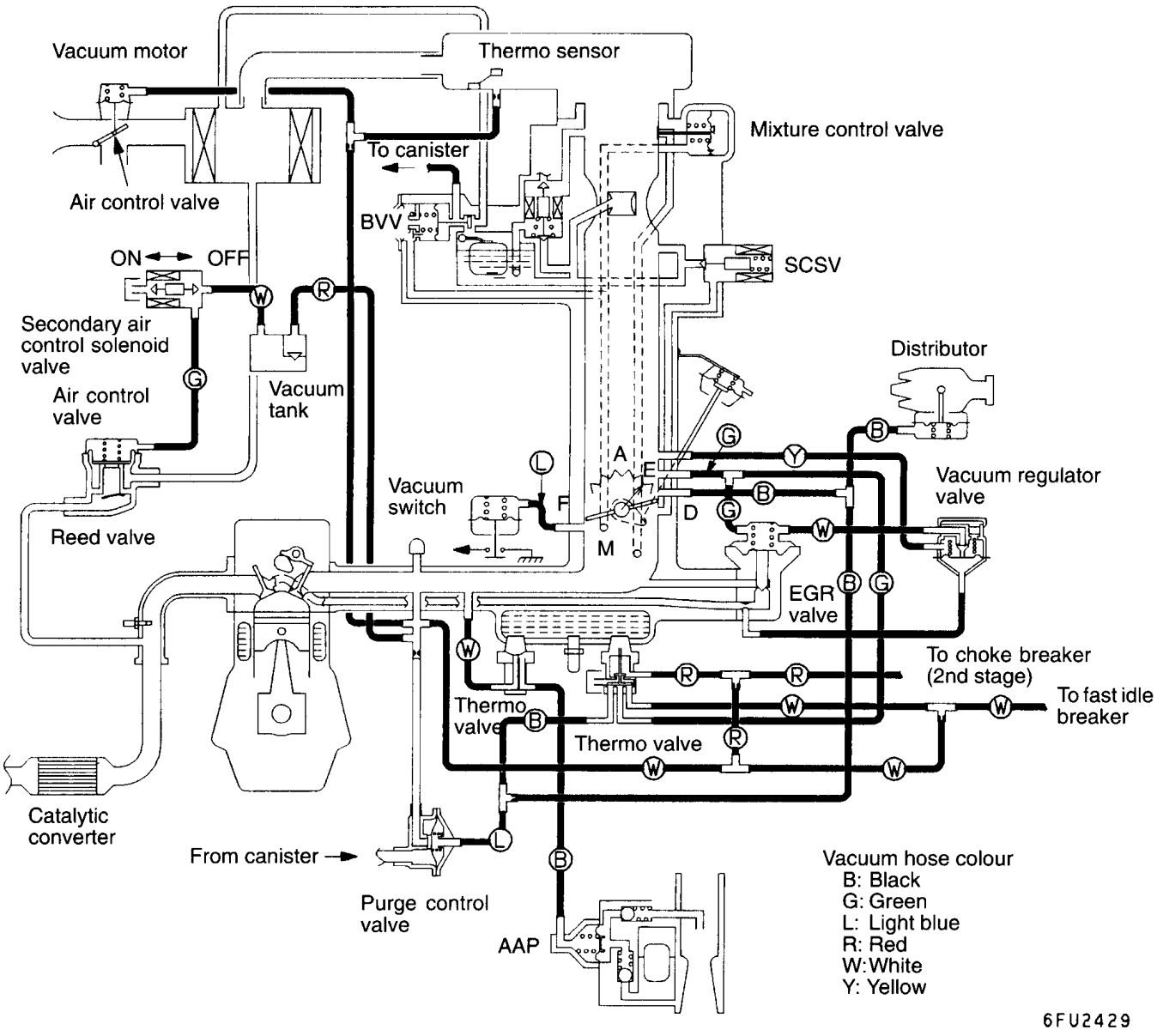
120001449

Item	Specified sealant	Remark
Thermo valve threaded portion	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

VACUUM HOSE

120002592

VACUUM HOSE PIPING DIAGRAM



VACUUM HOSE INSPECTION

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

120001451

Refer to P.17-6.

EVAPORATIVE EMISSION CONTROL SYSTEM

120001452

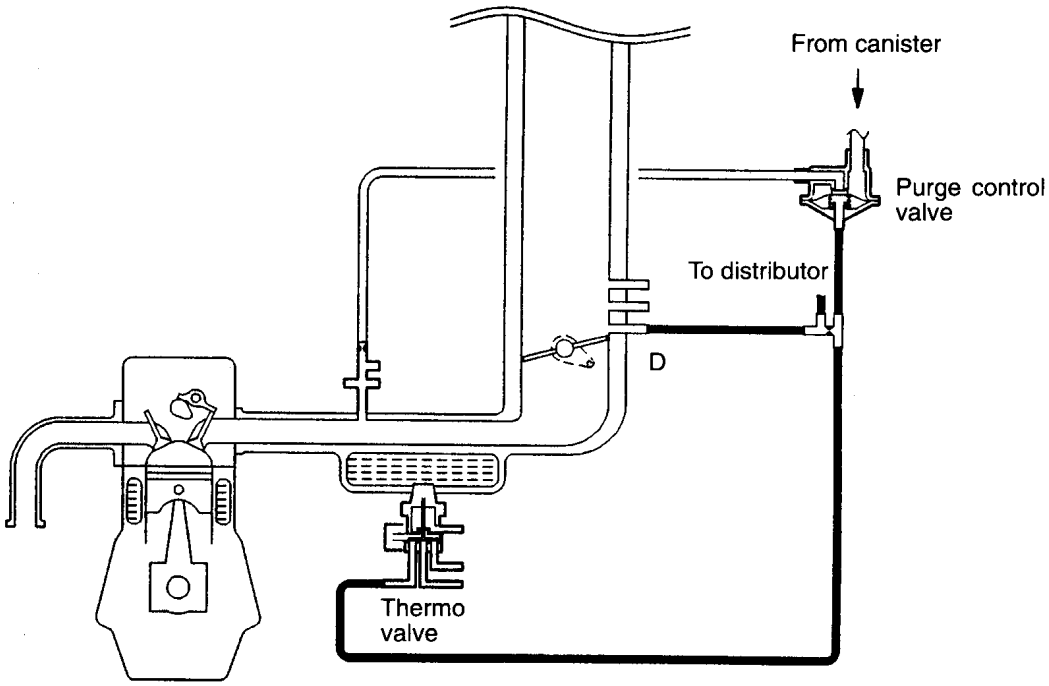
GENERAL INFORMATION

The evaporative emission control system prevents fuel vapors 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 the vehicle is in operation, fuel vapours stored in the canister flow through the purge control valve 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 air intake quantity is small (when the engine is at idle, for example), the purge control valve shuts 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 stabilities the emission level.
Furthermore, a bowl vent valve is installed to the carburettor to improve startability when the engine is warm.

SYSTEM DIAGRAM

120001453



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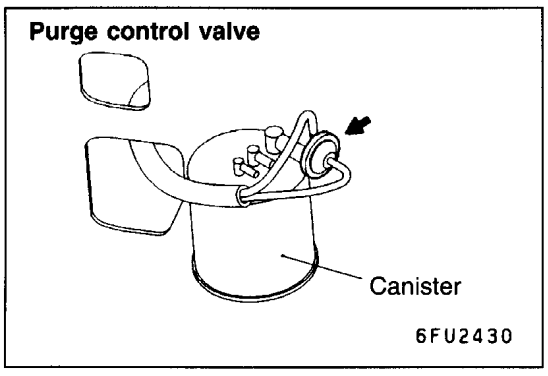
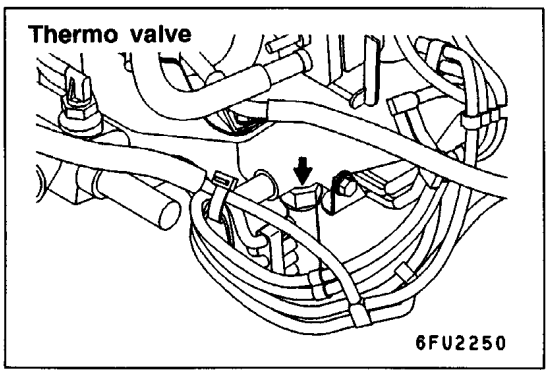
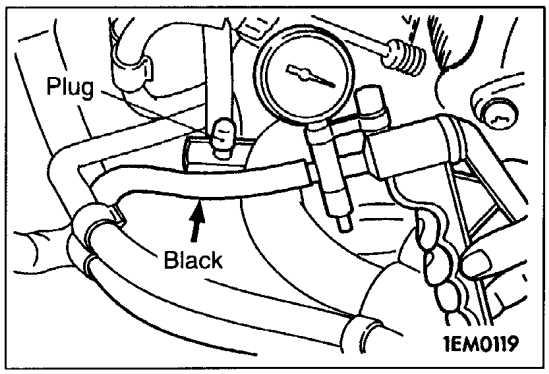
COMPONENT LOCATION

120002594







PURGE CONTROL SYSTEM INSPECTION 120001455

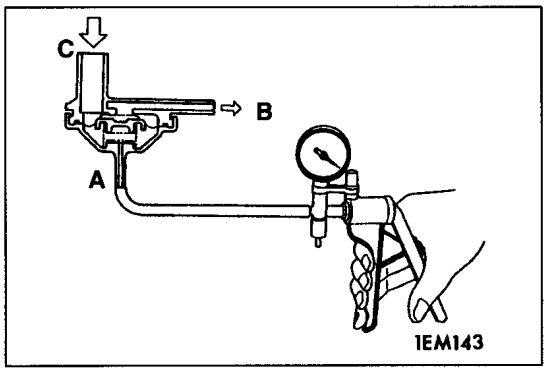
1. Disconnect the vacuum hose (Black) from the intake manifold and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold and hot, apply 53 kPa of vacuum, and check the condition of the vacuum.

When engine is cold
(Engine coolant temperature: 40°C or less)

Engine status	Normal condition
3,500 r/min.	Vacuum is maintained

When engine is hot
(Engine coolant temperature: 80°C or higher)

Engine status	Normal condition
Idling	Vacuum is maintained
3,500 r/min.	Vacuum leaks



PURGE CONTROL VALVE INSPECTION 120001456

1. Remove the purge control valve.
2. Connect a hand vacuum pump to the nipple A of the purge control valve.
3. Apply 53 kPa of vacuum, and check to be sure that the vacuum is maintained.
4. Blow the air from the nipple C and check the air passage.

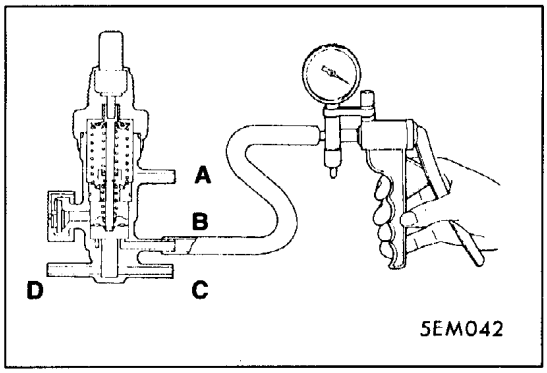
Vacuum	Passage of air
Not applied	Air is not blown out
5.3 kPa	Air is blown out

THERMO VALVE INSPECTION 120001457

NOTE
This thermo valve controls the choke breaker, EGR and fast idle breaker.

1. Remove the thermo valve.

Caution
1. **Do not apply spanners, etc. to the plastic parts of the thermo valve.**
2. **When disconnecting the vacuum hose, always make a mark so that the hose can be reconnected at its original position.**



2. Connect a hand vacuum pump to each of the nipples, apply a vacuum and check whether or not air passes through the thermo valve.

Caution
Plug all nipples except the one to which the vacuum pump is connected.

Nipple B, C, D

Engine coolant temperature	Normal condition
40°C or less	Vacuum leaks
80°C or more	Vacuum is maintained

Nipple A

Engine coolant temperature	Normal condition
10°C or less	Vacuum leaks
30°C or more	Vacuum is maintained

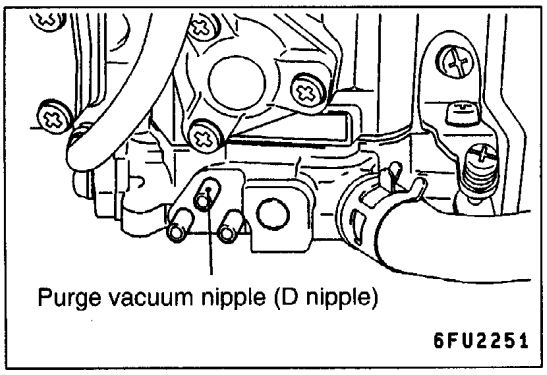
3. Apply sealant threaded portion.

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

4. Install thermo valve and tighten it to the specified torque.

Sensor tightening torque: 29 Nm

Caution
Do not apply spanners, etc. to the plastic parts of the thermo valve.



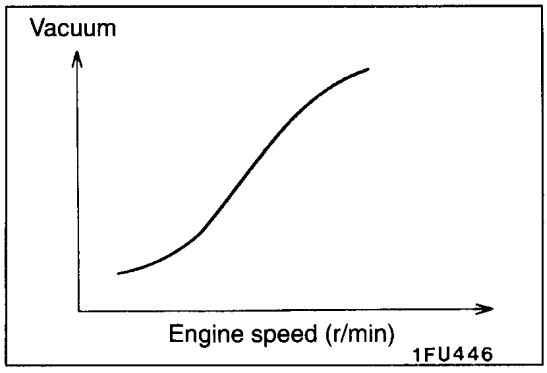
PURGE PORT (D NIPPLE) VACUUM INSPECTION

120001458

Check Condition

Engine coolant temperature: 80–95°C

1. Disconnect the vacuum hose (black) from the carburettor purge vacuum nipple (D nipple) and connect a hand vacuum pump to the nipple.

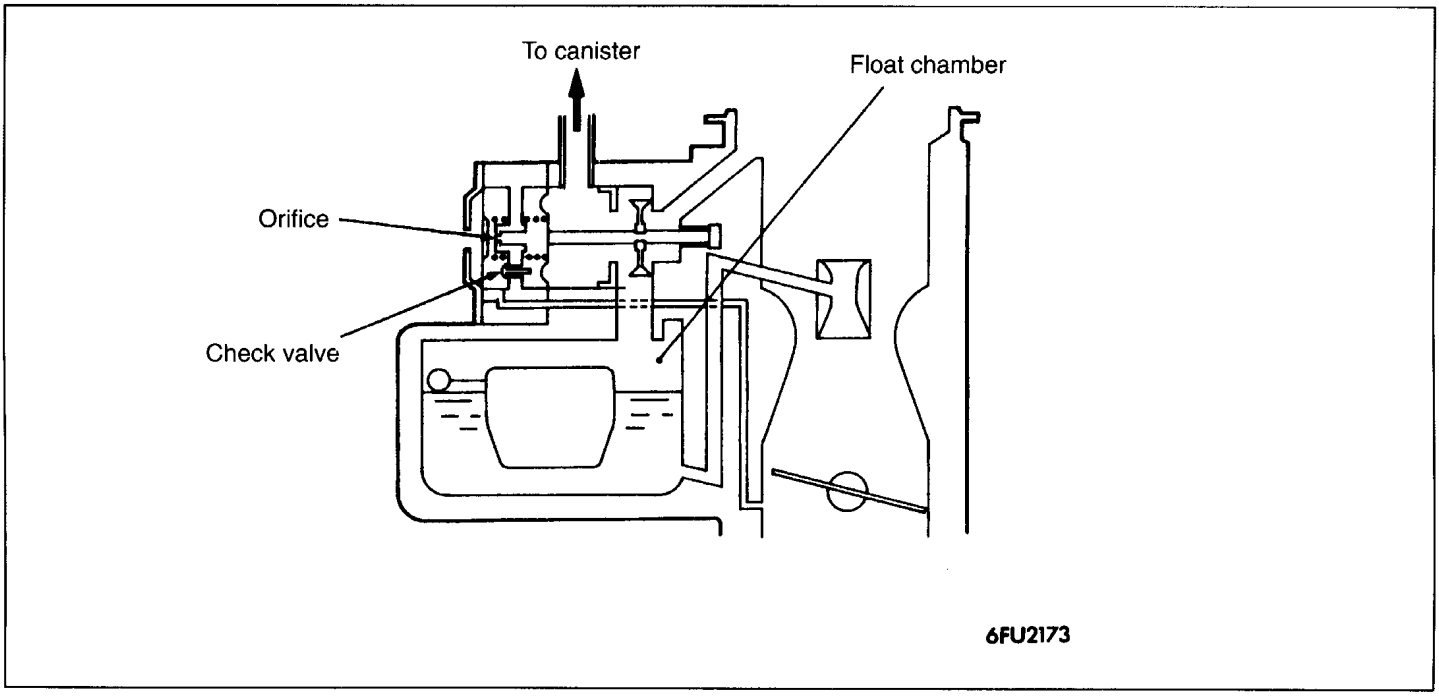


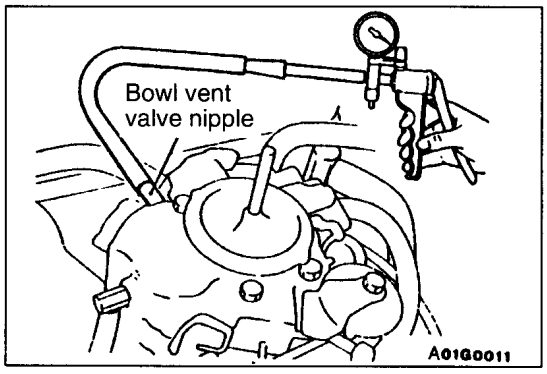
2. Start the engine and check to see that, after raising the engine speed by racing the engine, purge vacuum raises proportionally with the rise in engine speed.

NOTE
If there is a problem with the change in vacuum, it is possible that the carburettor purge port (D port) may be clogged and needs cleaning.

BOWL VENT VALVE INSPECTION

120001459





Caution
Inspect after the engine has cooled. Fuel may be discharged from the bowl vent valve nipple if the engine is still warm.

1. Disconnect the bowl vapour hose from the bowl vent valve nipple and connect a hand vacuum pump to the bowl vent valve nipple.
2. Apply a vacuum of 14 kPa to the bowl vent valve and inspect.

Engine status	Normal condition
STOP	Vacuum leaks
Idling	Vacuum is applied

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

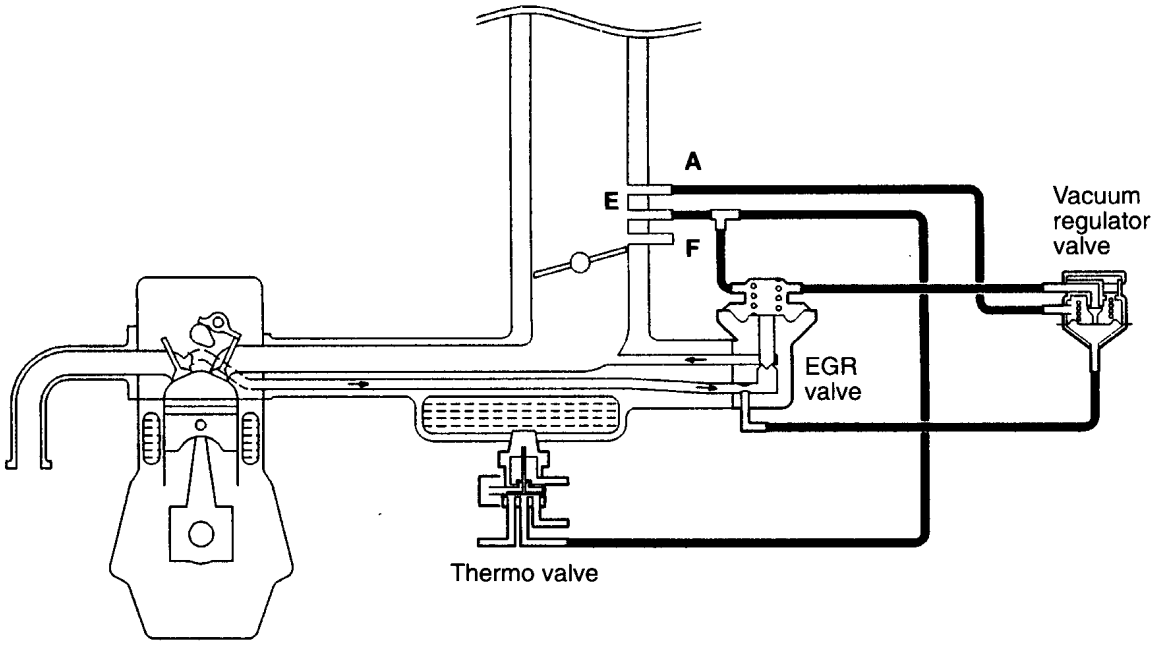
120002595

GENERAL INFORMATION

Refer to P.17-11.

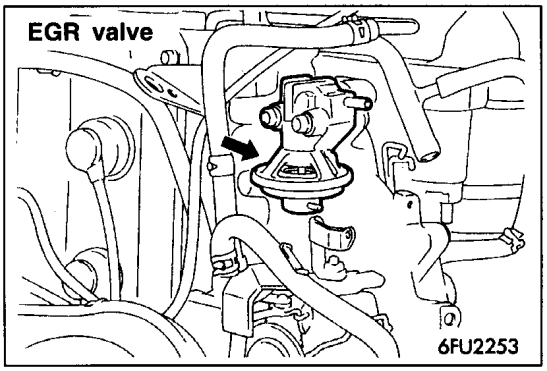
SYSTEM DIAGRAM

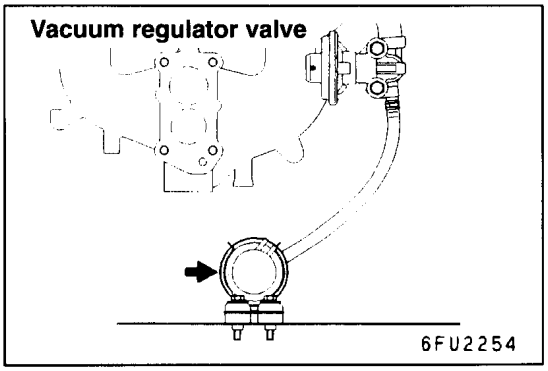
120001463

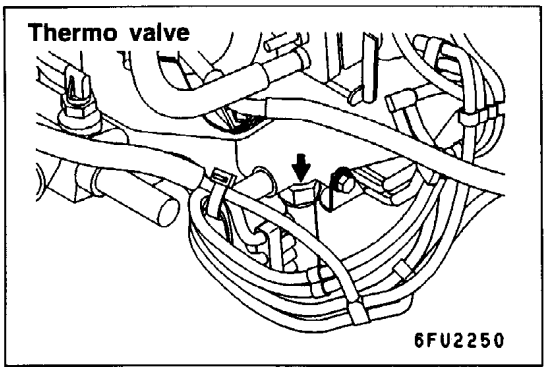


COMPONENT LOCATION

120001464







EXHAUST GAS RECIRCULATION (EGR) CONTRTOL SYSTEM INSPECTION

120001465

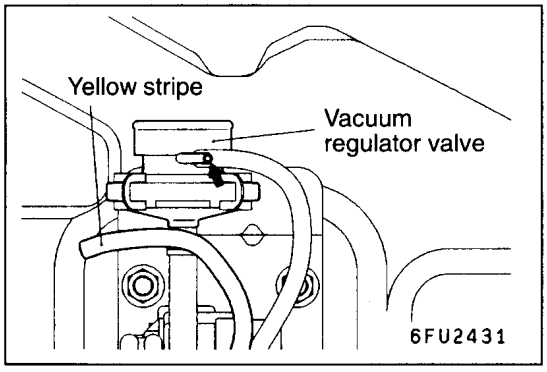
1. Disconnect the vacuum hose (green striped) from the carburettor throttle body and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold and hot, apply a vacuum, and check the condition of the vacuum.

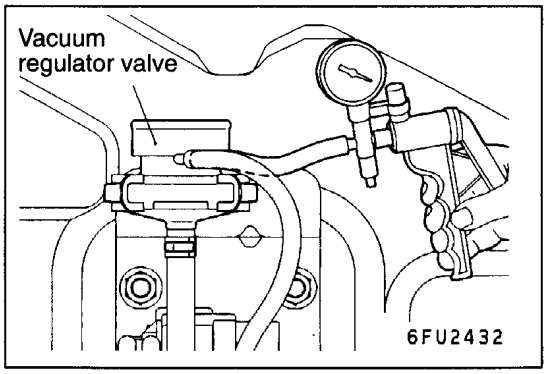
When engine is cold
(Engine coolant temperature: 40°C or less)

Engine status	Normal condition
3,500 r/min.	Vacuum leaks from the thermo valve

When engine is hot
(Engine coolant temperature: 80°C or higher)

Engine status	Normal condition
Idling	Vacuum leaks
3,500 r/min.	Vacuum leaks until it is approx. 11 kPa





VACUUM REGULATOR VALVE INSPECTION

120002597

1. Check whether air is escaping from the vacuum regulator valve nipple when the vacuum hose (yellow stripe) is disconnected from the vacuum regulator valve while the engine is idling.

   NOTE
   If no air is escaping from the vacuum regulator valve nipple, it is probable that the exhaust pressure hose is blocked or that the vacuum regulator valve diaphragm is broken.
2. Connect the vacuum hose in the correct position again.
3. Disconnect the vacuum hose (white stripe) from the vacuum regulator valve, and then connect a hand vacuum pump to the vacuum regulator valve.
4. Apply 53 kPa of negative pressure and check the airtightness.

Engine condition	Normal condition
Idling	Negative pressure leaks
3,500 r/min.	Negative pressure is maintained

EGR VALVE INSPECTION

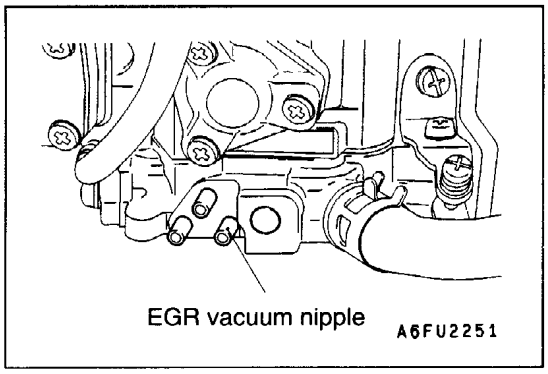
120002598

Refer to P.17-12.

THERMO VALVE INSPECTION

120001468

Refer to P.17-21.



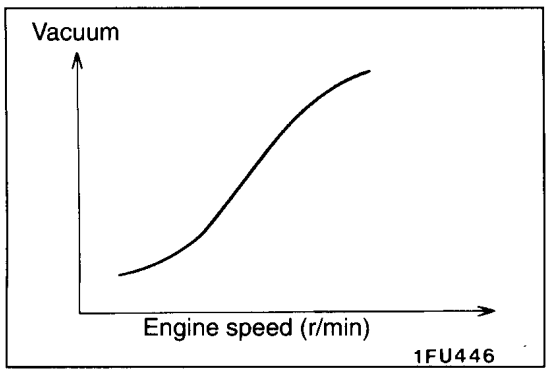
EGR PORT VACUUM INSPECTION

120001469

Check Condition

Engine coolant temperature: 80–95°C

1. Disconnect the vacuum hose (green stripe) from the carburettor 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 proportionally with the rise in engine speed.

   NOTE
   If there is a problem with the change in vacuum, it is possible that the carburettor EGR port may be clogged and needs cleaning.

SECONDARY AIR SUPPLY SYSTEM

120001471

GENERAL INFORMATION

The reed valve supplies secondary air into the exhaust manifold for the purpose of promoting oxidation of exhaust emissions. The reed valve is actuated by exhaust vacuum being generated from pulsation in the exhaust manifold, and additional air is supplied into the exhaust manifold through the secondary air control valve.

OPERATION

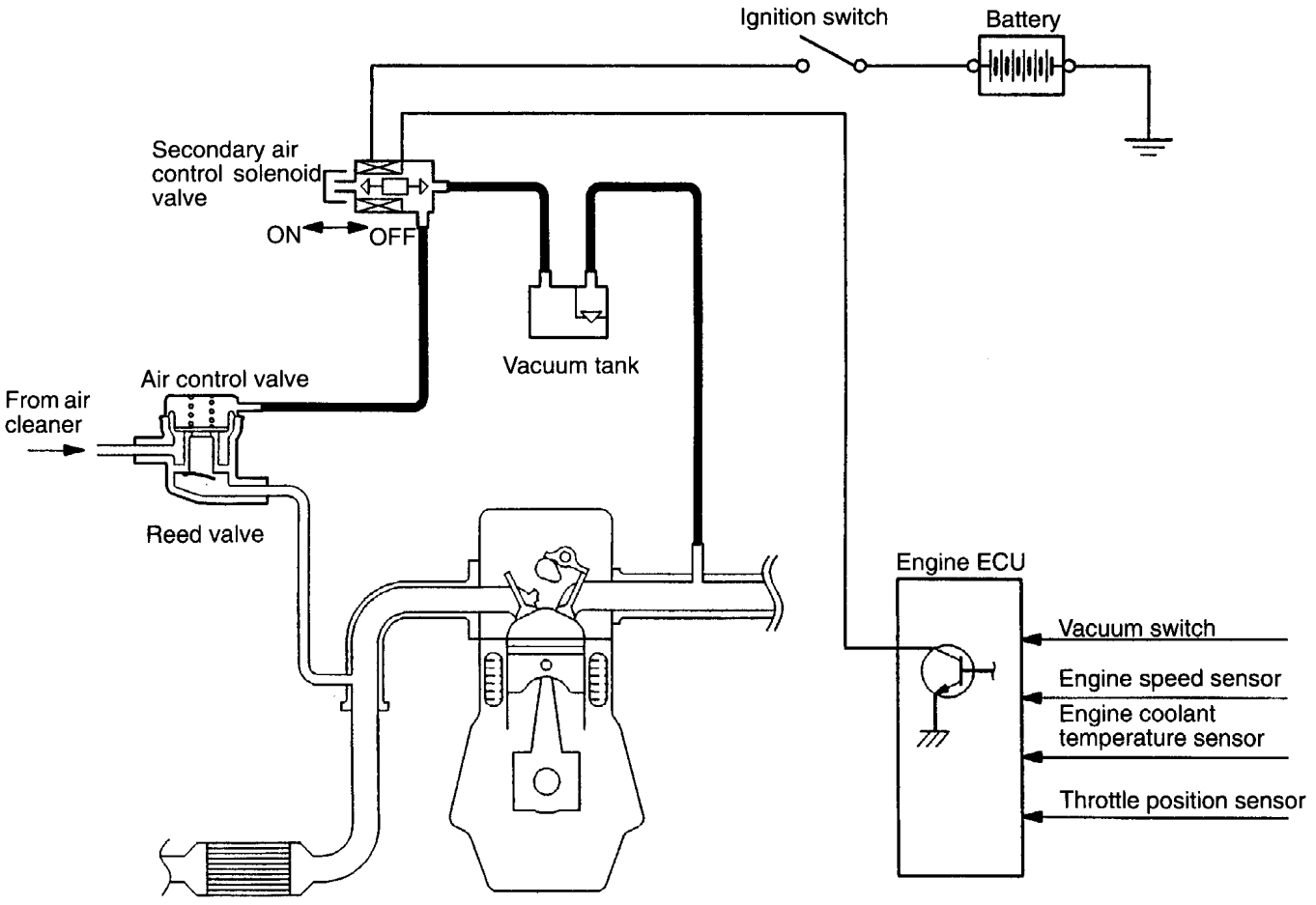
Current is caused to flow to the secondary air control solenoid valve as a result of the power transistor being switched ON by the engine ECU when, while the temperature of the coolant is 18°C (65°F) or higher, any of the following driving conditions is met.

- Deceleration (vacuum switch: ON; engine speed: 1,000 r/min. or higher)
- Cold engine (coolant temperature: 18–52°C)
- Engine: Idling
- Sudden acceleration
- For 1–3 minutes after the engine is started

As a result, the intake manifold negative pressure (vacuum) is introduced to the secondary air control valve, the valve opens, and the secondary air is supplied to the exhaust manifold.
Because negative pressure (vacuum) is stored in the vacuum tank, note that secondary air is supplied to the intake manifold even if the intake manifold negative pressure (vacuum) drops to about the level of atmospheric pressure when there is sudden acceleration.

SYSTEM DIAGRAM

120001472



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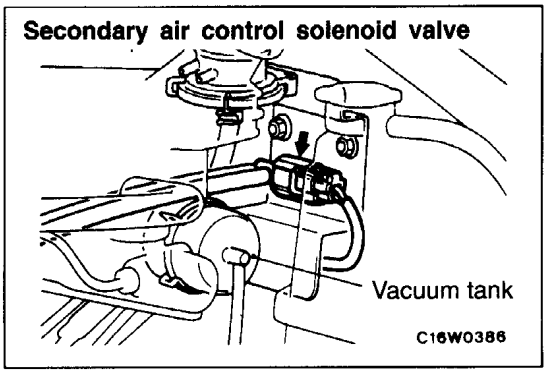
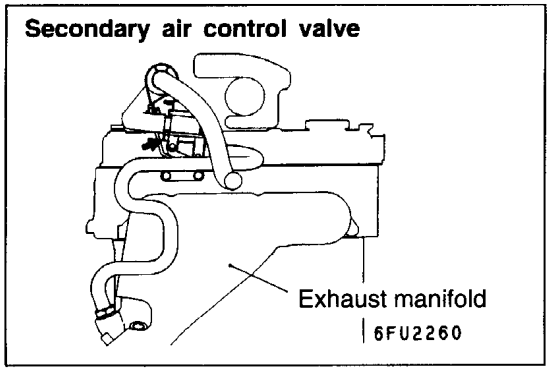
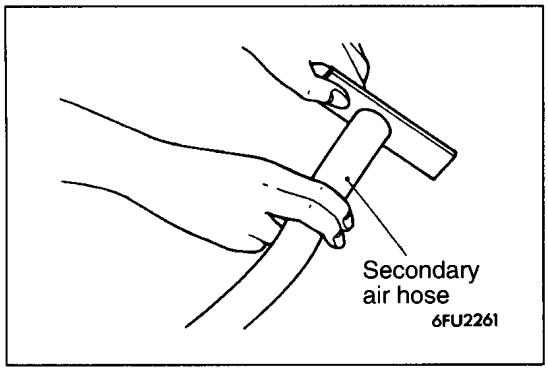
COMPONENT LOCATION

120002600







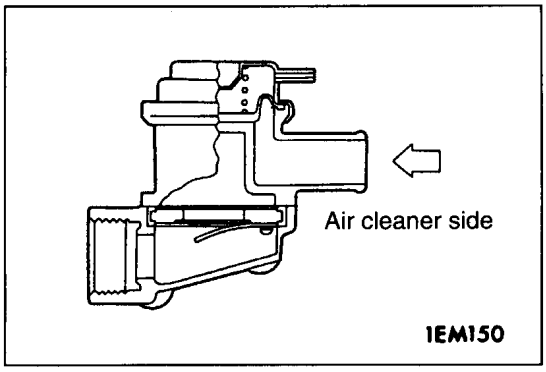
SECONDARY AIR SUPPLY SYSTEM INSPECTION

120001474

Caution
Note that exhaust blowback sometimes occurs if the secondary air control valve is faulty.

Disconnect the air supply hose from the air cleaner, place a small steel plate over the end of the hose and check the air intake.

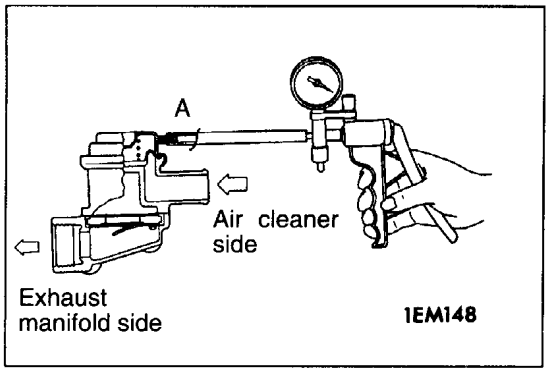
Engine coolant temperature	Engine status	Air suction
20–40°C	2,000 r/min.	Yes
70°C or higher	2,000 r/min.	Yes (within 70 sec. after starting the engine)
		No (70 sec. or more after starting the engine)
	Idling	Yes



SECONDARY AIR CONTROL VALVE INSPECTION

120001475

1. Remove the secondary air control valve.
2. Blow air from the air cleaner side and make sure that the air does not pass through.



3. Connect a hand vacuum pump to the nipple A of the secondary air control valve.
4. Apply a vacuum of 67 kPa and check that air-tightness is maintained.
5. Apply a vacuum of 15 kPa and check whether or not air passes through.

Direction of air	Normal condition
Air cleaner side → exhaust manifold side	Air passes through
Exhaust manifold side → air cleaner side	Air does not pass through

6. If inspection reveals any additional problems, replace the secondary air control valve.

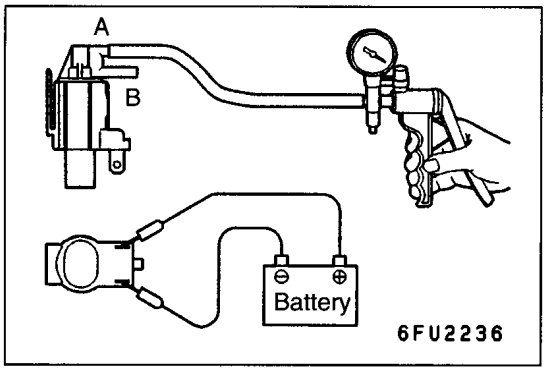
SECONDARY AIR CONTROL SOLENOID VALVE INSPECTION

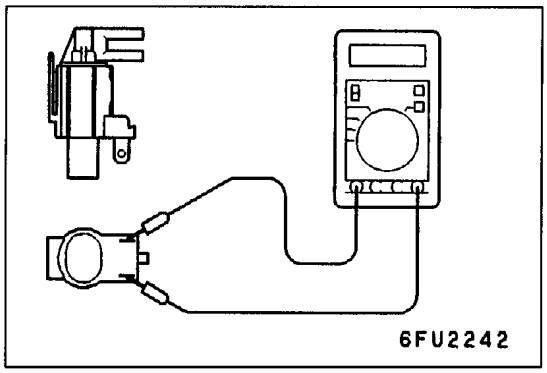
120001476

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, green stripe) from the solenoid valve.
2. Disconnect the harness connector.
3. Connect a hand vacuum pump to the nipple to which the white striped vacuum hose was connected.
4. Check air-tightness by applying a vacuum with voltage applied directly from the battery to the control solenoid valve and without applying voltage.

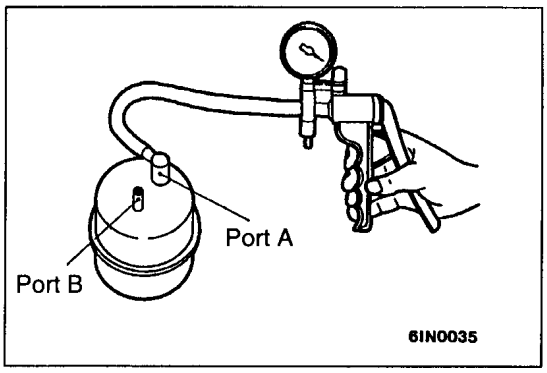
Battery voltage	B Nipple condition	Normal condition
Not applied	Open	Vacuum maintained
Applied	Open	Vacuum leaks
	Closed	Vacuum maintained





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

Standard value: 36–44Ω (at 20°C)



VACUUM TANK INSPECTION

120001477

1. Connect a hand vacuum pump to port A of the vacuum tank and apply a vacuum of 67 kPa. Make sure that the tank is completely air-tight with no vacuum leaks.
2. Connect a hand vacuum pump to port B and apply a vacuum. Make sure that the vacuum leaks.

INTAKE AIR TEMPERATURE CONTROL SYSTEM

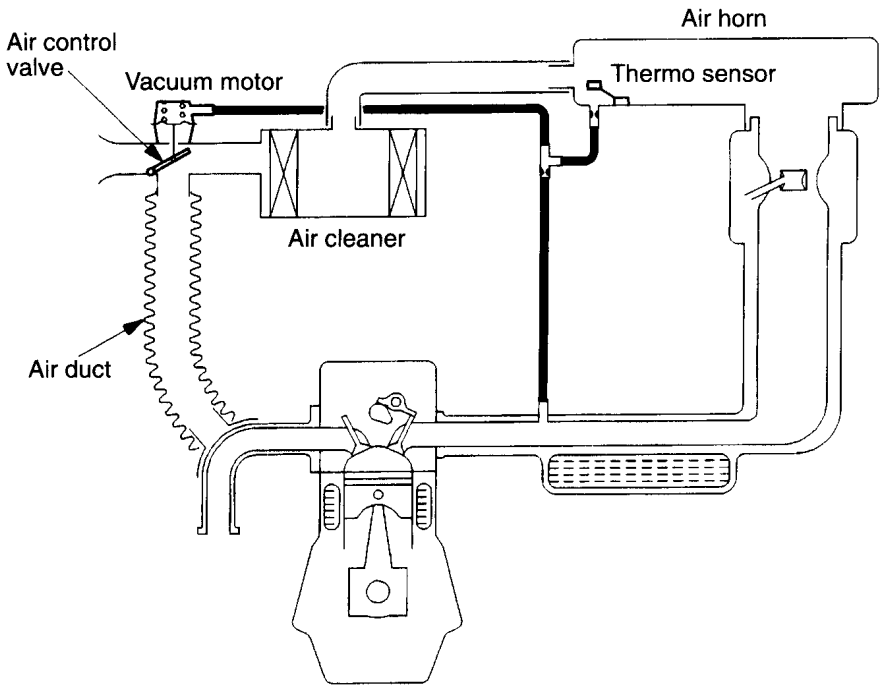
120000875

GENERAL INFORMATION

The air/fuel mixture ratio after being measured in the carburettor supplied to the engine is leaner when the air temperature is cold, because the density of the air is greater. Conversely, when the air temperature is warm, the air/fuel mixture ratio is richer because the density of the air is poorer. Thus, the intake air temperature control system maintains the temperature of the intake air at an almost constant level in order to provide a stable air/fuel mixture ratio. This provides improved stability of the exhaust gas level and also improves fuel consumption and driveability. In addition, the addition of warm air during cold weather prevents the carburettor from icing up.

SYSTEM DIAGRAM

120000876



6FU2255

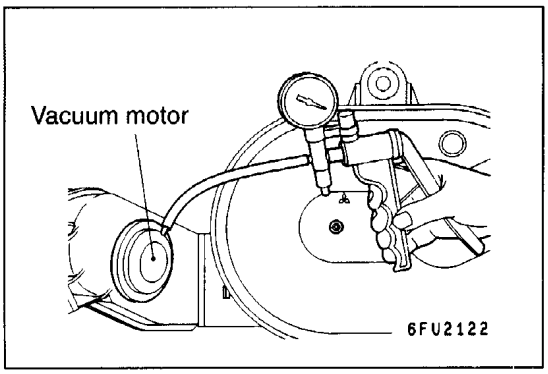
INTAKE AIR TEMPERATURE CONTROL SYSTEM INSPECTION

120000877

1. Start the engine.
2. Check the opening and closing of the air control valve while the engine is at idle.

Thermo sensor temperature	Normal condition
30°C or less	Cold air side inlet closes
45°C or more	Cold air side inlet opens

NOTE
If necessary, apply compressed air to cool or apply hot air using a hair dryer, etc. to heat.

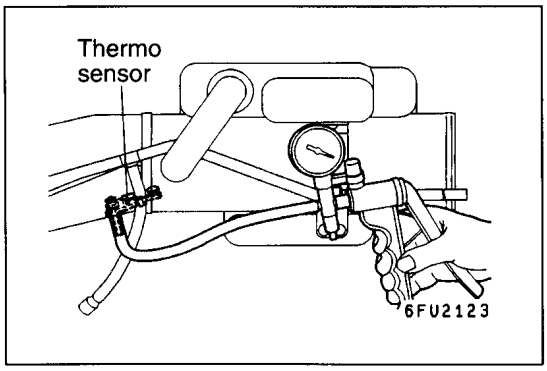


AIR CONTROL VALVE INSPECTION 120000878

1. Disconnect the vacuum hose from the vacuum motor and connect a hand vacuum pump to the valve nipple.
2. Apply a vacuum of 67 kPa and check air-tightness.
3. Check air control valve operation.

Vacuum	Normal condition
10 kPa or less	Cold air side inlet opens
33 kPa or more	Cold air side inlet closes

4. Connect the disconnected vacuum hose to the original position.



THERMO SENSOR INSPECTION 120000879

Connect a hand vacuum pump to the thermo sensor nipple and check air-tightness.

Thermo sensor temperature	Normal condition
30°C or less	Vacuum holds
45°C or more	Vacuum leaks

MIXTURE CONTROL VALVE (MCV)

120002601

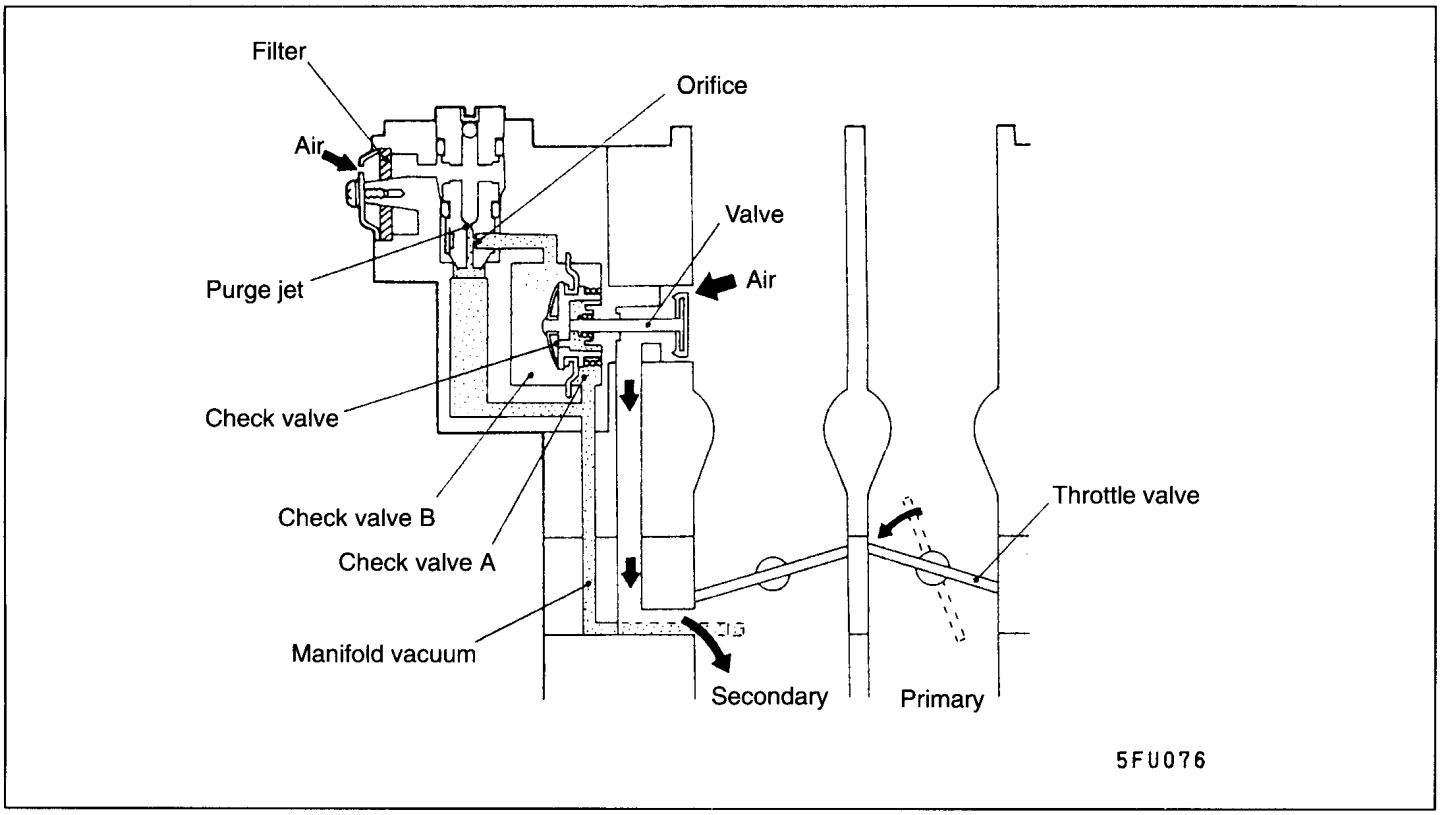
GENERAL INFORMATION

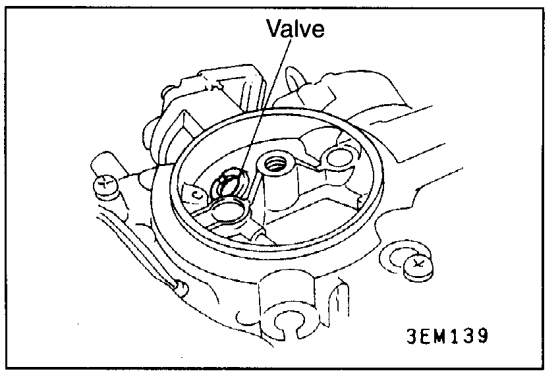
When the throttle is closed suddenly during deceleration or shifting, the fuel remaining in the inlet manifold causes an over-rich mixture temporarily.

In order to prevent this, air is supplied temporarily from another passage so as to keep correct air fuel ratio and reduce emission (HC).

MIXTURE CONTROL VALVE (MCV) INSPECTION

120002602





Caution

Inspect with the engine warm.

1. Remove the air horn.
2. Start the engine and check the operation of the MCV valve and sound of the intake air when the throttle valve is rapidly opened and closed.

Engine condition	Normal condition	
Throttle lever operated	Valve opens and quickly closes.	Intake air sound is audible.
Idling	Valve closes.	Intake air sound is not audible.

CATALYTIC CONVERTER

120000012

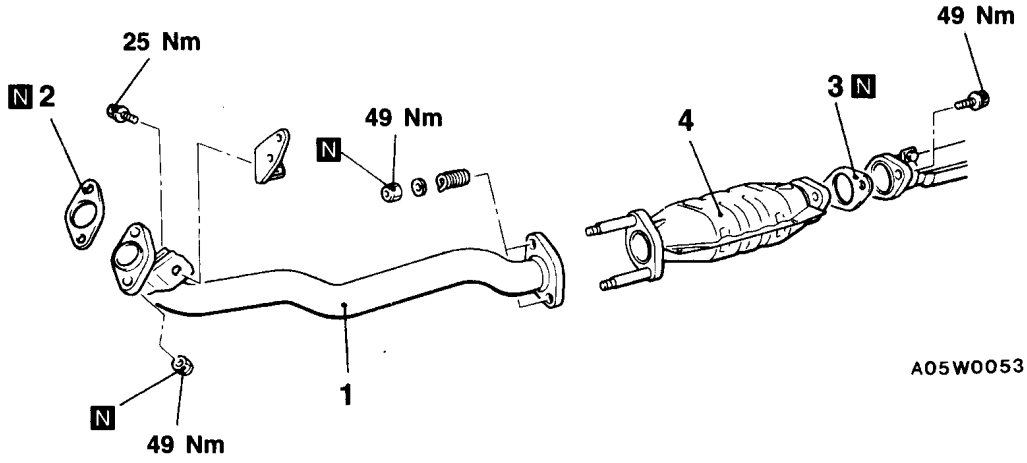
GENERAL INFORMATION

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

120002178



Removal steps

1. Front exhaust pipe
2. Gasket
3. Gasket
4. Catalytic converter

INSPECTION

Inspect for damage, cracking or deterioration. Replace if faulty.

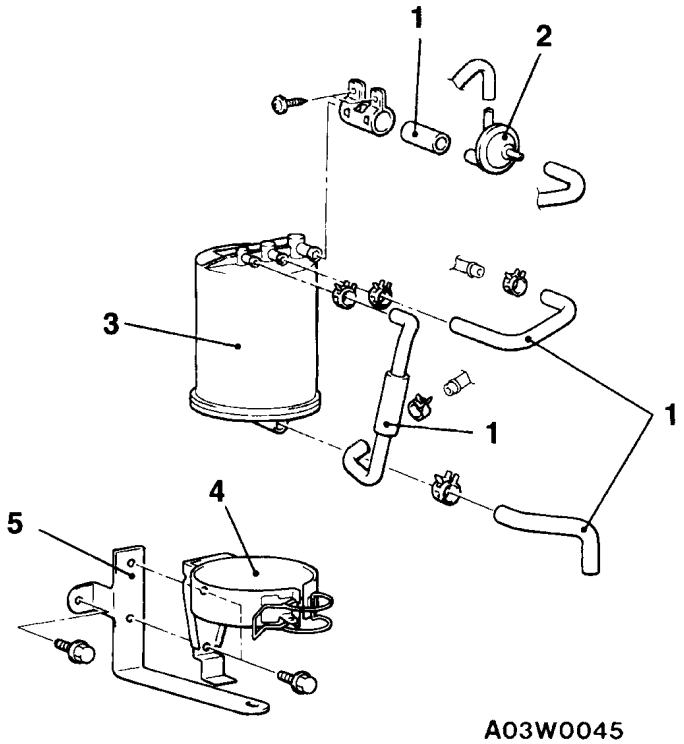
Caution

1. **Stop the engine immediately if engine misfiring occurs, otherwise an abnormally hot exhaust system will damage the catalytic converter or other under-body parts.**
2. **Correct and repair the ignition or fuel system if there are malfunctions, otherwise engine misfiring may occur which will damage the catalytic converter.**
3. **Observe manufacturer's specifications when doing service work.**

CANISTER

120002179

REMOVAL AND INSTALLATION



A03W0045

Removal steps

- Front bumper
  (Refer to GROUP 51 – Front Bumper.)

1. Vapour hose
2. Purge control valve
3. Canister
4. Canister holder assembly
5. Canister holder bracket

TWO-WAY VALVE

120002180

Refer to P.17-16.

EMISSION CONTROL <DIESEL>

120001483

GENERAL INFORMATION

The electronically-controlled EGR system and the fuel injection timing control system (load timer) reduce the level of exhaust gases (NOx).

Items	Name	Specification
Exhaust emission control system	Exhaust gas recirculation system • EGR valve • EGR solenoid valve No. 1 • EGR solenoid valve No. 2	Electronically-controlled EGR system Single type Duty cycle solenoid valve ON-OFF solenoid valve

SERVICE SPECIFICATIONS

120001484

Item		Standard value
EGR solenoid valve No.1/No. 2 resistance (at 20°C) Ω		36–44
Lever position sensor output voltage V	Idle position	0.8–1.0
	Fully open	3.5–5.0
Engine speed sensor resistance kΩ		1.3–1.9
Engine coolant temperature sensor resistance kΩ	At 20°C	2.9–3.6
	At 80°C	0.26–0.35

SEALANT

120002603

Item	Specified sealant	Remark
Engine coolant temperature gauge unit (built in engine coolant temperature sensor) threaded portion	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

SPECIAL TOOL

120001485

Tool	Number	Name	Use
	MD998478	Test harness (3P, square)	Inspection of lever position sensor

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

120001487

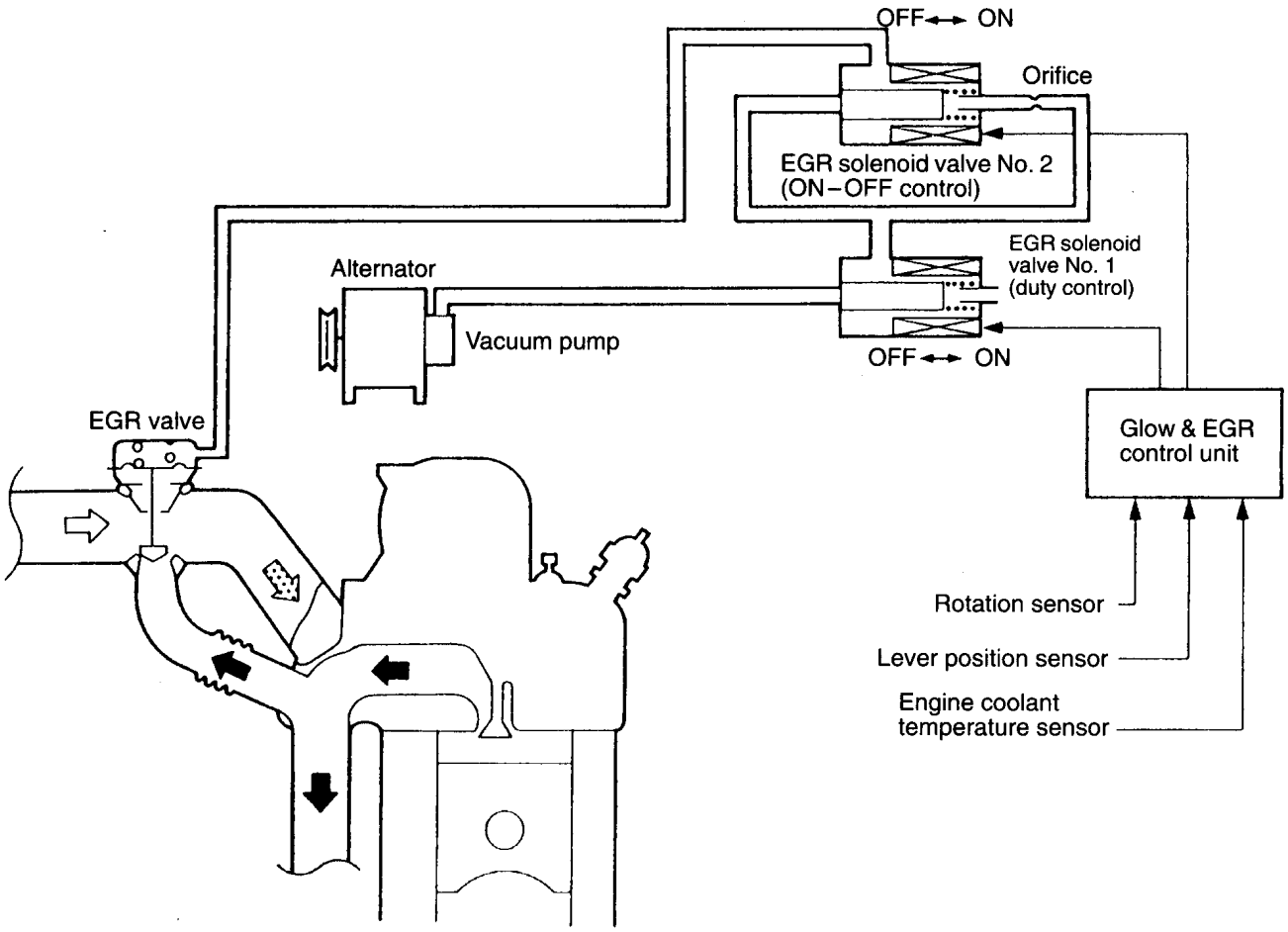
GENERAL INFORMATION

The electronically-controlled EGR system consists of an EGR valve, vacuum pump, EGR solenoid valves No. 1 and No. 2, glow & EGR control unit and various sensors.
The EGR valve is controlled by the negative pressure inside the valve, which is controlled by EGR solenoid valves No. 1 and No. 2.

The EGR solenoid valves No. 1 and No. 2 are optimally controlled by the glow & EGR control unit in response to the engine operation conditions, based on data input from each of the sensors. In this way, the EGR is controlled to reduce NOx emissions while maintaining good engine performance.

SYSTEM DIAGRAM

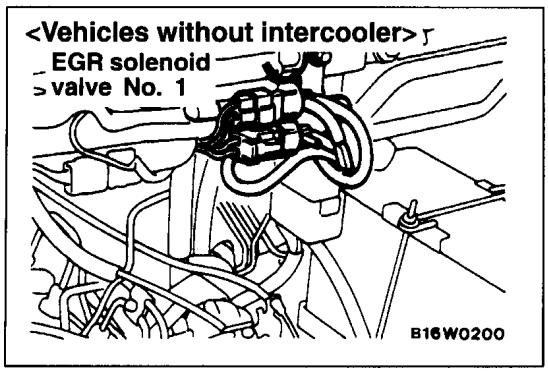
120002604

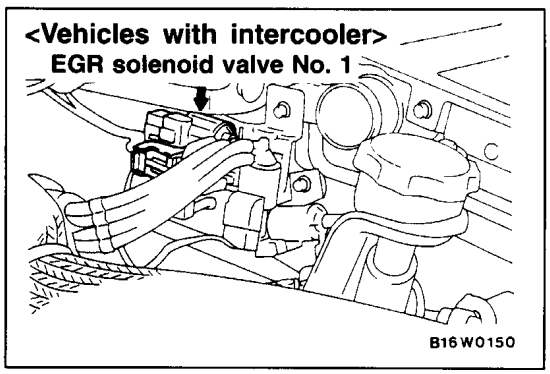


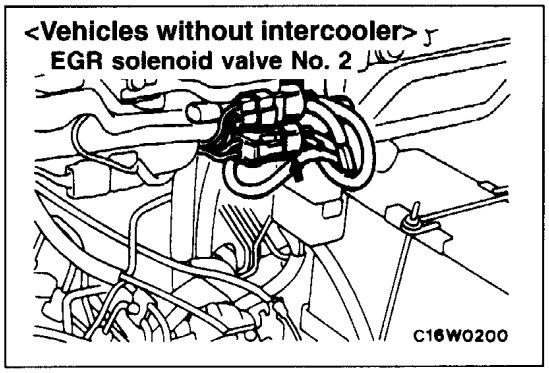
DEM0652

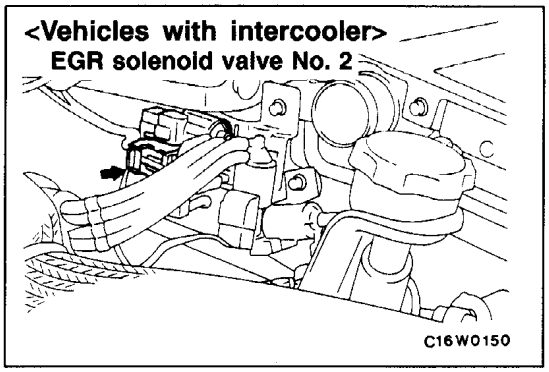
COMPONENT LOCATION

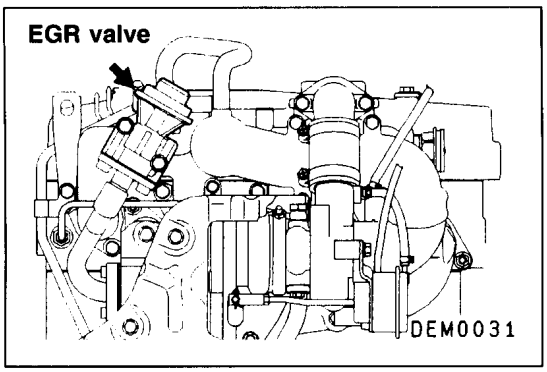
120002605

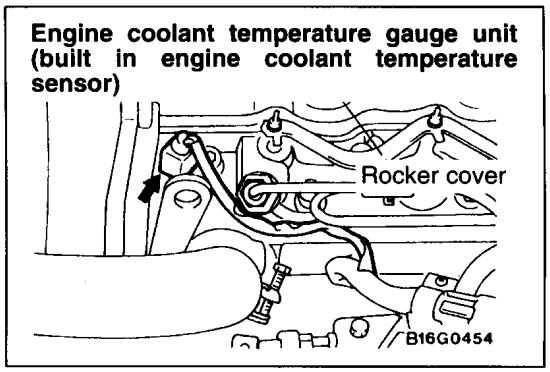


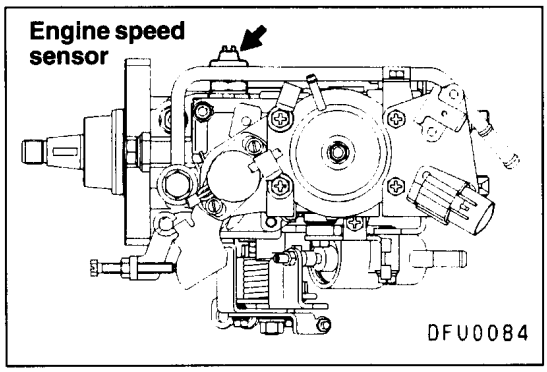


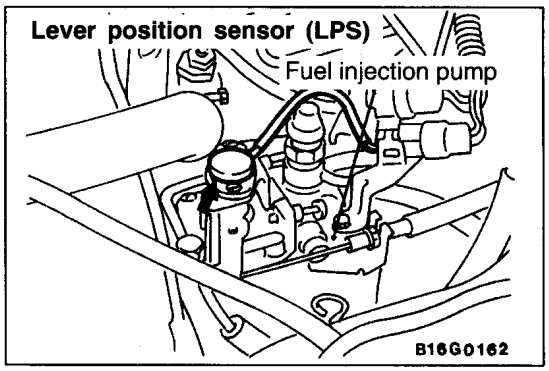


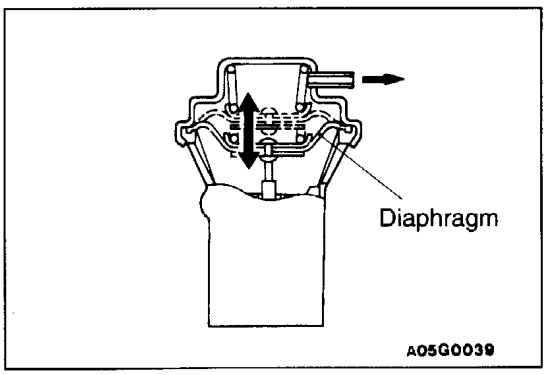












FUNCTION INSPECTION

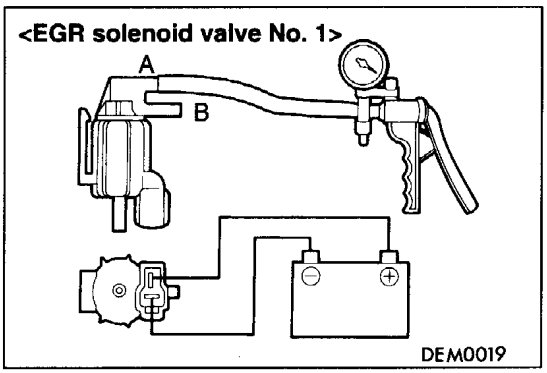
120001490

1. Start the engine and let it warm up until the engine coolant temperature is 65°C or above.
2. When the engine is raced by suddenly depressing the accelerator pedal, check to be sure that the diaphragm of the EGR valve lifts.

EGR SOLENOID VALVE OPERATION INSPECTION

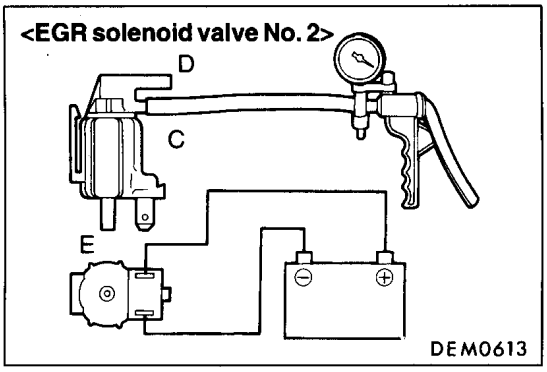
120001491

1. Remove the EGR solenoid valve No. 1/No. 2 connectors and vacuum hoses.
2. Attach a vacuum pump to each nipple of the EGR solenoid valve No. 1/No. 2 and apply negative pressure. Check that the valves are air-tight both when voltage is applied to each terminal of the EGR solenoid valves and when it is not applied.



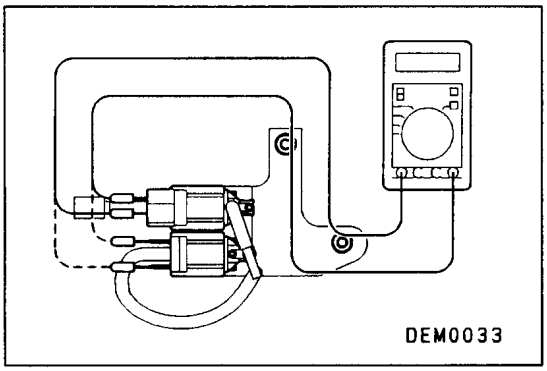
EGR solenoid valve No. 1

Battery voltage	Normal condition
When current is flowing	Vacuum leaks (Vacuum is maintained when nipple B is covered)
When current is not flowing	Vacuum is maintained



EGR solenoid valve No. 2

Battery voltage	Normal condition
When current is flowing	Vacuum leaks (Vacuum is maintained when nipple D is covered)
When current is not flowing	Vacuum leaks (Vacuum is maintained when nipple E is covered)

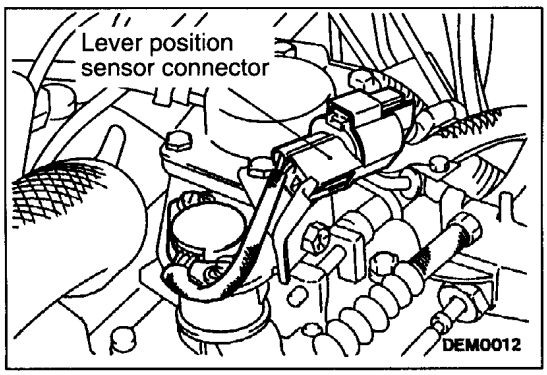


EGR SOLENOID VALVE RESISTANCE INSPECTION

120002606

Measure the coil resistances of the EGR solenoid valve No. 1/No. 2 with a circuit tester.

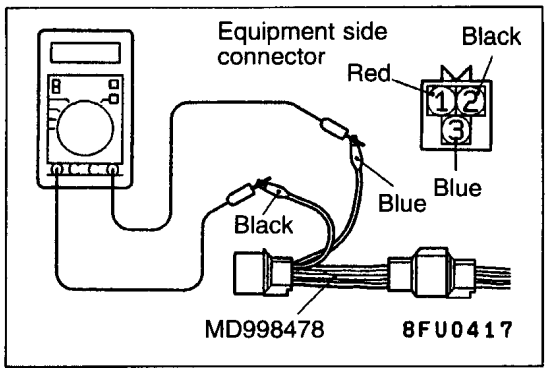
	Solenoid valve No. 1/No. 2 resistance Ω
Standard value (at 20°C)	36–44



LEVER POSITION SENSOR (LPS) ADJUSTMENT

120001493

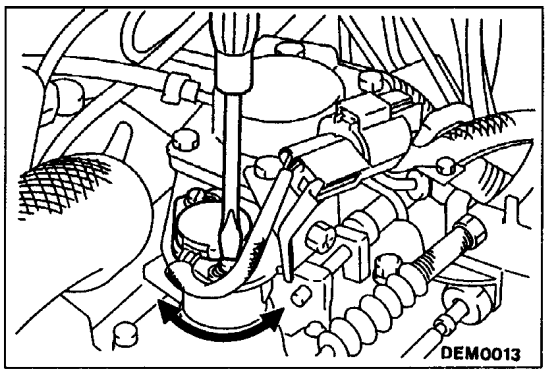
1. Run the engine until the engine coolant temperature rises to 80°C or above, and then release the fast idle.
2. Loosen the accelerator cable tension sufficiently.
3. Connect the special tool (test harness) to the lever position sensor connector shown in the illustration.



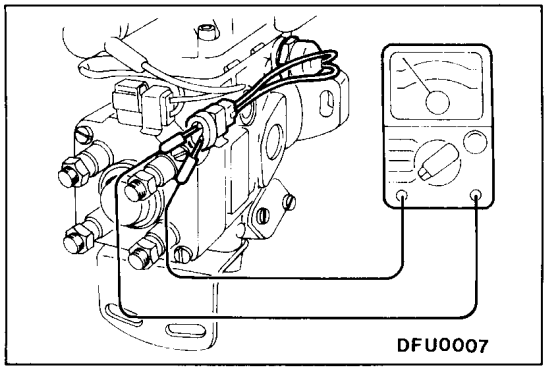
4. Connect a digital-type voltmeter between terminal 1 (red clip) and terminal 3 (blue clip) of the lever position sensor.
5. Turn the ignition switch to ON. (Do not start the engine.)
6. Measure the output voltage of the lever position sensor.

Standard value:

Lever condition	Voltage V
Idle position	0.8–1.0
Fully open	3.5–5.0



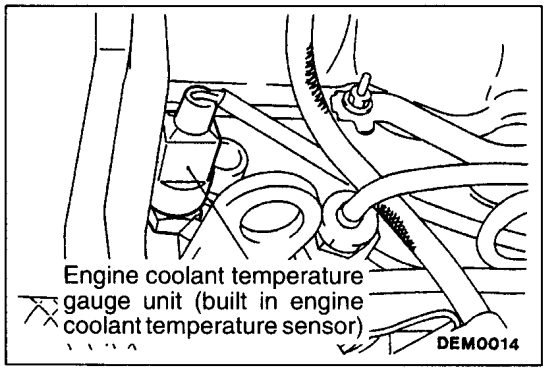
7. If the voltage is outside the standard value, adjust by loosening the lever position sensor mounting screw and turning the lever position sensor body. After adjustment, securely tighten the screw.
8. Turn the ignition switch to OFF.
9. Adjust the accelerator cable play.



ENGINE SPEED SENSOR INSPECTION 120001494

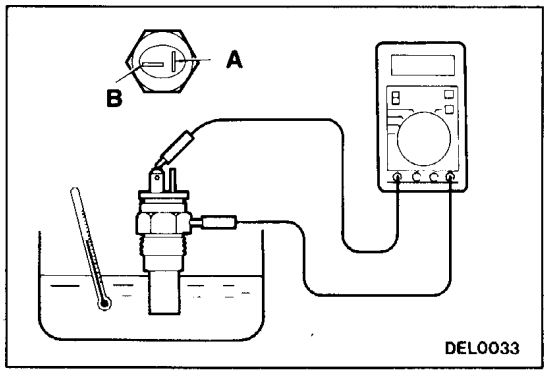
1. Disconnect the engine speed sensor connector.
2. Measure the resistance between the engine speed sensor terminals.

   Standard value: 1.3–1.9 kΩ



ENGINE COOLANT TEMPERATURE SENSOR INSPECTION 120002607

1. Remove the engine coolant temperature gauge unit.



2. Measure the resistance between terminal (B) and the body earth when the temperature sensing portion of the engine coolant temperature sensor is immersed in hot water.

Temperature (°C)	Resistance (kΩ)
0	7.7–9.5
20	2.9–3.6
40	1.3–1.7
80	0.26–0.35

3. If the resistance deviates from the standard value greatly, replace the sensor.
4. Apply sealant threaded portion.

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

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

   Sensor tightening torque: 35 Nm

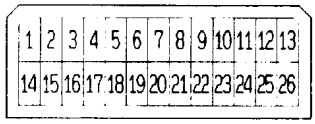
6. Connect the harness connectors securely.

CHECK AT THE GLOW AND EGR CONTROL UNIT

120001495

TERMINAL VOLTAGE CHECK CHART

Glow and EGR Control Unit Connector Terminal Arrangement

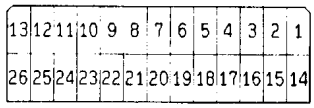


DEM0029

Terminal No.	Check item	Check condition (Engine condition)		Normal condition
3	EGR solenoid valve No. 1	Ignition switch: ON		SV
		While engine is idle after having warmed up, suddenly depress the accelerator pedal.		Momentarily increases
6	Lever position sensor	Ignition switch: ON	Set throttle lever to idle position	0.8–1.0V
			Fully open throttle lever	3.5–5.0V
7	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
16	EGR solenoid valve No. 2	Ignition switch: ON		SV
		While engine is idle after having warmed up, suddenly depress the accelerator pedal.		Momentarily decreases

HARNESS-SIDE CONNECTOR TERMINAL RESISTANCE AND CONTINUITY CHECK CHART

Glow and EGR Control Unit Harness Side Connector Terminal Arrangement



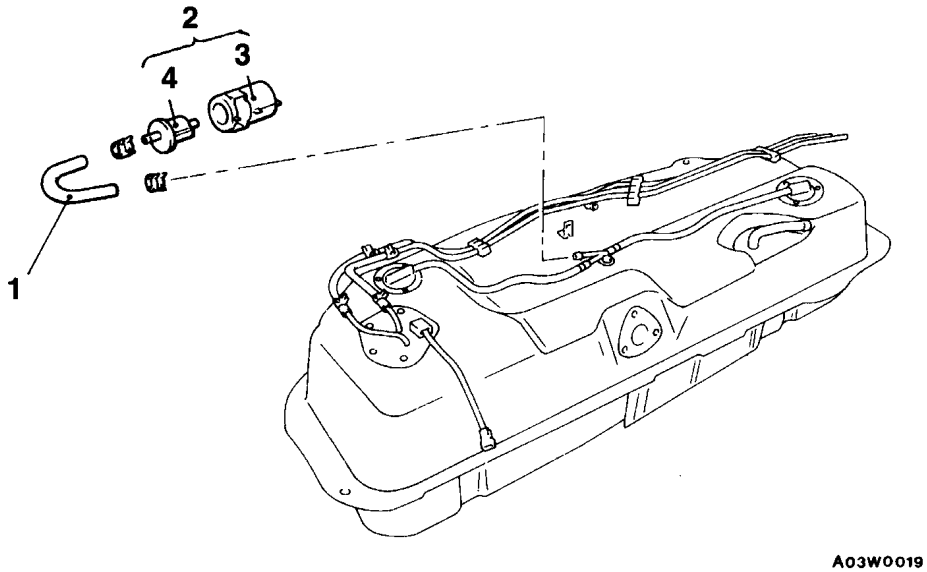
DEM0026

Terminal No.	Check item	Normal condition (Check condition)
3 – 1	EGR solenoid valve No. 1	36–44 Ω (At 20°C)
5–Body earth	Engine coolant temperature sensor	7.7–9.5 kΩ (When coolant temperature is 0°C)
		2.9–3.6 kΩ (When coolant temperature is 20°C)
		1.3–1.7 kΩ (When coolant temperature is 40°C)
		0.26–0.35 kΩ (When coolant temperature is 80°C)
11 – 24	Engine speed sensor	1.3–1.9 kΩ
16 – 1	EGR solenoid valve No. 2	36–44 Ω (At 20°C)

TWO-WAY VALVE

120002608

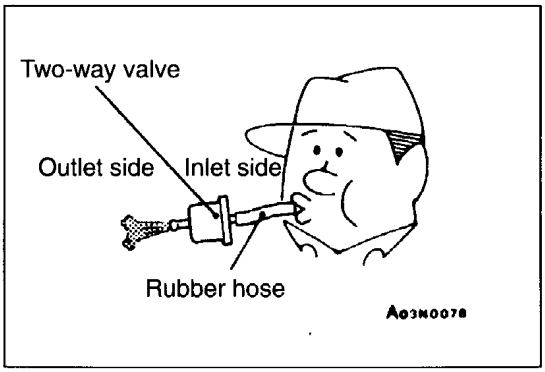
REMOVAL AND INSTALLATION



Removal steps

1. Vapour hose
2. Breather case and two-way valve assembly
3. Breather case

▶A◀ 4. Two-way valve

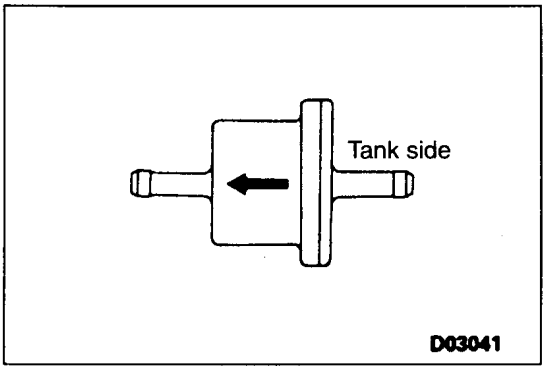


INSPECTION

TWO-WAY VALVE SIMPLE CHECK

Attach a clean hose and check the operation of the two-way valve.

Inspection procedure	Normal condition
Lightly blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance.
Lightly blow from outlet side.	Air passes through.



INSTALLATION SERVICE POINT

▶A◀ TWO-WAY VALVE INSTALLATION

Install so that the installation direction of the two-way valve is correct.

CLUTCH

CONTENTS

120002599

<Cable type>

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<Hydraulic type>

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CLUTCH <CABLE TYPE>

GENERAL INFORMATION

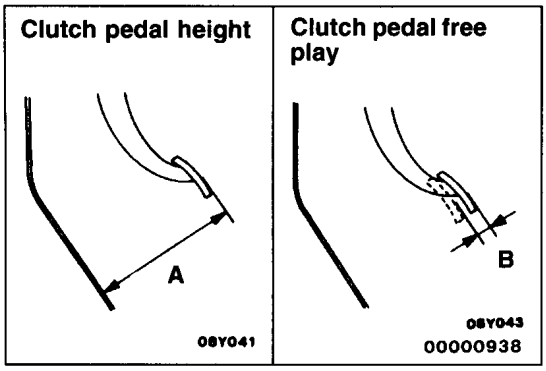
120000531

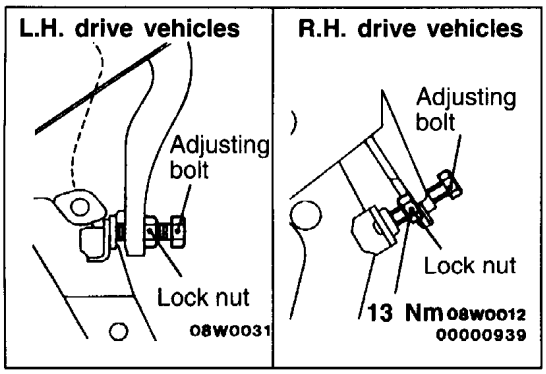
The clutch is a dry single-disc, diaphragm type; the clutch is controlled by means of a cable.

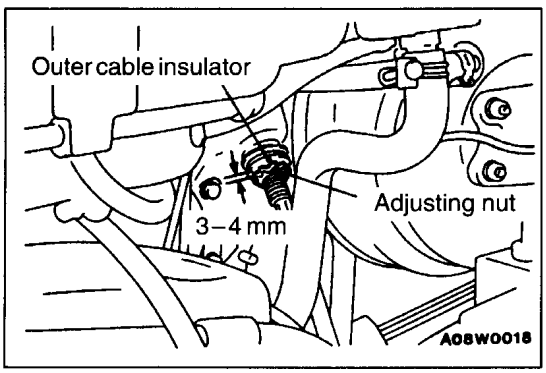
SERVICE SPECIFICATIONS

120000532

Items	Standard value
Clutch pedal height mm	162–167
Clutch pedal free play mm	15–20
Distance between the clutch pedal and the toeboard when the clutch is disengaged mm	85







SERVICE ADJUSTMENT PROCEDURES

120000533

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

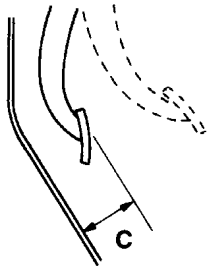
1. Measure the clutch pedal height and the clutch pedal free play.

   Standard value (A): 162–167 mm
   Standard value (B): 15–20 mm

2. If the height of the clutch pedal is outside the standard value, loosen the lock nut and adjust the pedal height to the standard value using the adjusting bolt.

3. If the clutch pedal play is outside the standard value, adjust by turning the adjusting nut so that the clearance between the adjusting nut and the outer cable insulator on the engine compartment side of the toeboard is at the standard dimension when the clutch cable is gently pulled.

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



08N0010

4. After completing the adjustments, 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): 85 mm or more

5. If the distance between the clutch pedal and the toeboard when the clutch is disengaged do not agree with the standard values, disassemble and inspect the clutch.

CLUTCH PEDAL

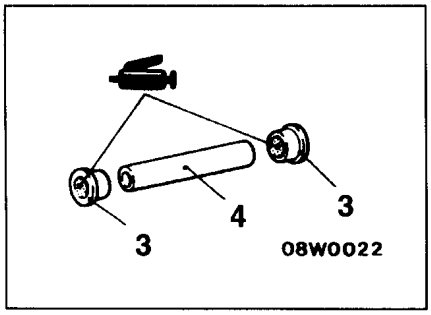
120002140

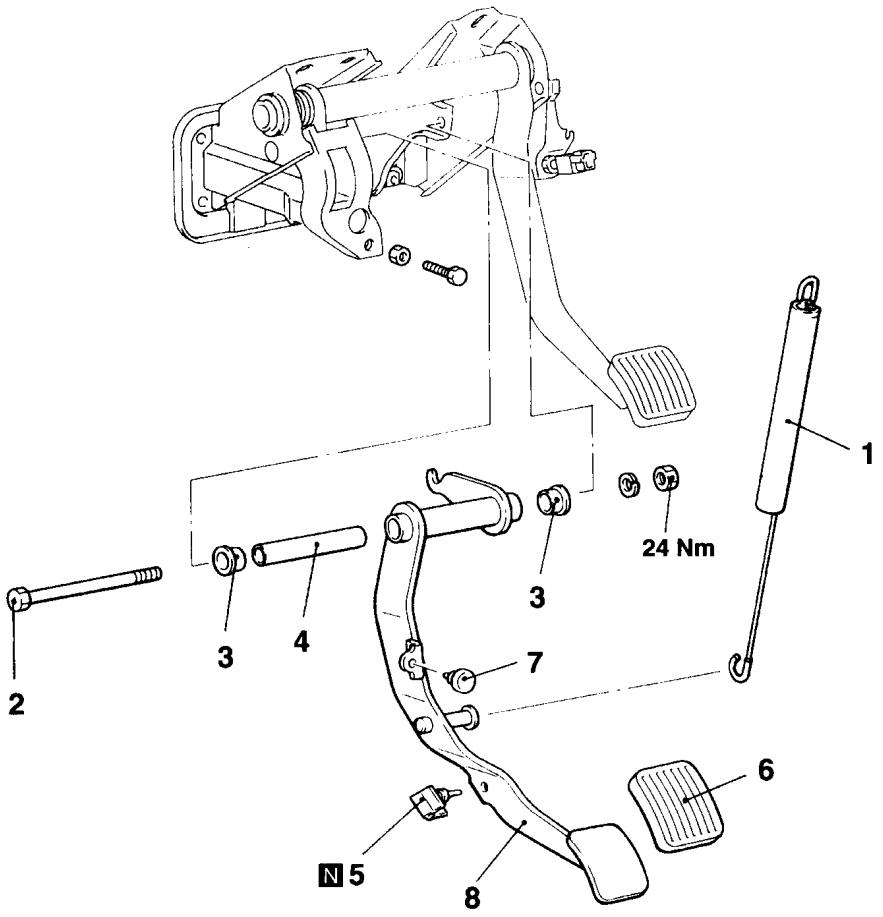
REMOVAL AND INSTALLATION

L.H. drive vehicles

Pre-removal Operation
- Brake and Clutch Pedal Assembly Removal (Refer to GROUP 35A – Brake Pedal.)

Post-installation Operation
1. Brake and Clutch Pedal Assembly Installation (Refer to GROUP 35A – Brake Pedal.)
2. Clutch Pedal Adjustment (Refer to P. 21-2.)





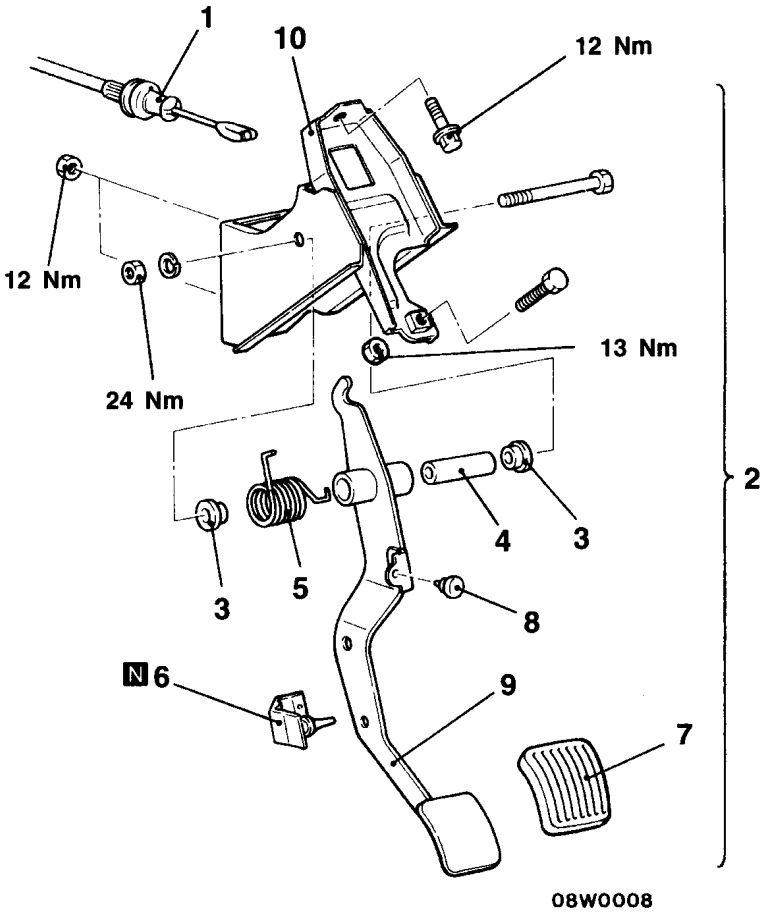
08W0021

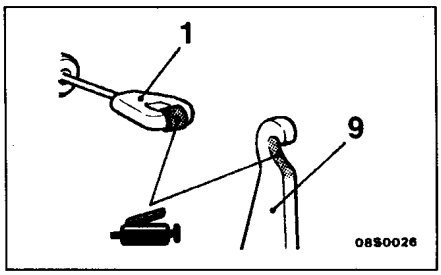
00002255

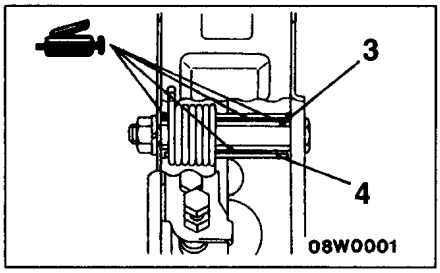
Removal steps
1. Return spring
2. Bolt
3. Bushing
4. Spacer
5. Stopper
6. Pedal pad
7. Stopper
8. Clutch pedal

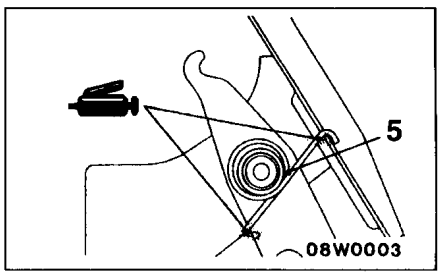
R.H. drive vehicles

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









00000941

Removal steps
1. Clutch cable connection
2. Clutch pedal assembly
3. Bushing
4. Spacer
5. Clutch return spring
6. Stopper
7. Pedal pad
8. Stopper
9. Clutch pedal
10. Pedal support member

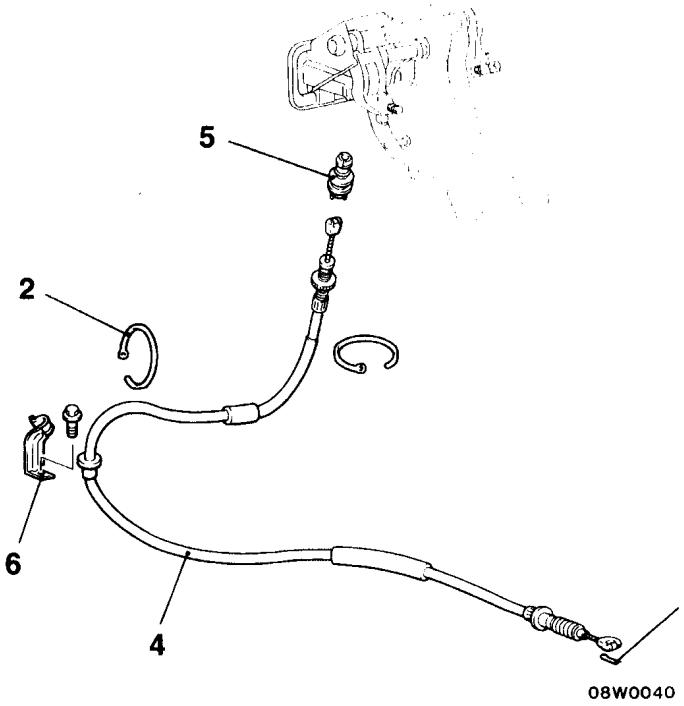
CLUTCH CONTROL

120002141

REMOVAL AND INSTALLATION

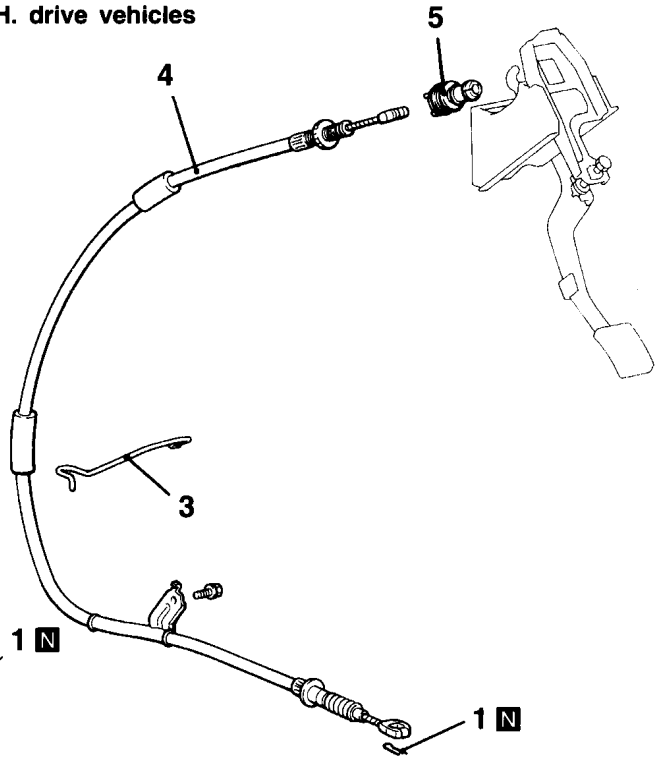
Post-installation Operation
- Clutch Pedal Adjustment (Refer to P. 21-2.)

L.H. drive vehicles

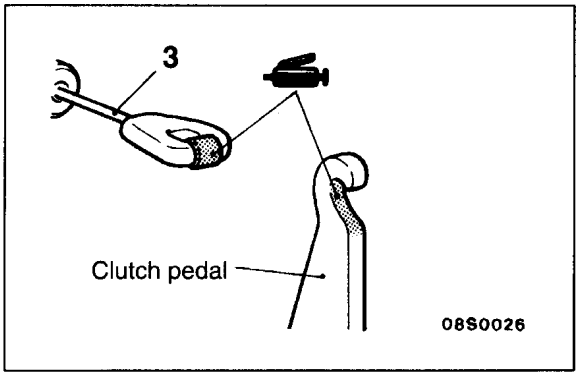


08W0040

R.H. drive vehicles



08W0035



08S0026

00002256

Removal steps

1. Split pin
2. Cable band
3. Spring
4. Clutch cable assembly
5. Outer cable insulator
6. Cable crip

CLUTCH <HYDRAULIC TYPE>

GENERAL INFORMATION

120000536

The clutch is a dry single-disc, diaphragm type; hydraulic pressure is used for the clutch control.

SERVICE SPECIFICATIONS

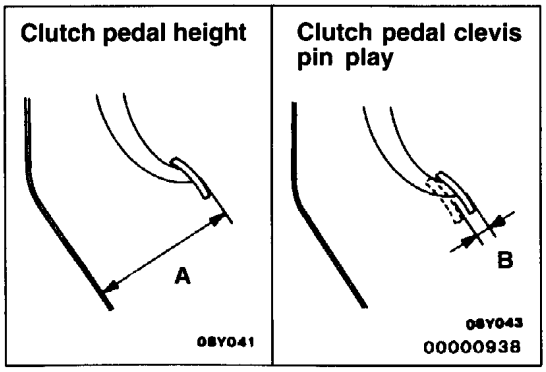
120000537

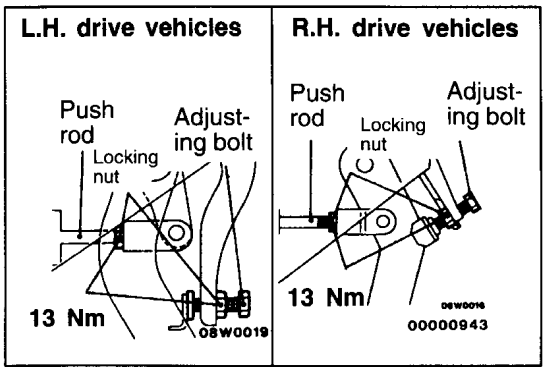
Items	Standard value
Clutch pedal height mm	162–167
Clutch pedal free play mm	6–13
Clutch pedal clevis pin play mm	1–3
Distance between the clutch pedal and the toeboard when the clutch is disengaged mm	85

LUBRICANTS

120000538

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





SERVICE ADJUSTMENT PROCEDURES

120000539

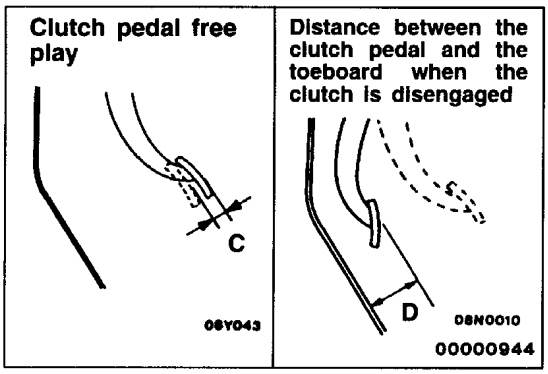
CLUTCH PEDAL INSPECTION AND ADJUSTMENT

1. Measure the clutch pedal height and the clutch pedal clevis pin play.

   Standard value (A): 162–167 mm
   Standard value (B): 1–3 mm

2. If the height of the clutch pedal is outside the standard value, loosen the lock nut and adjust the pedal height to the standard value using the adjusting bolt.
3. If the clutch pedal play is not within the standard value, loosen the locking nut and move the push rod to adjust.

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



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

   Standard value (C): 6–13 mm
   Standard value (D): 85 mm

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

BLEEDING

120000540

Specified brake fluid: DOT 3 or DOT 4

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

CLUTCH PEDAL

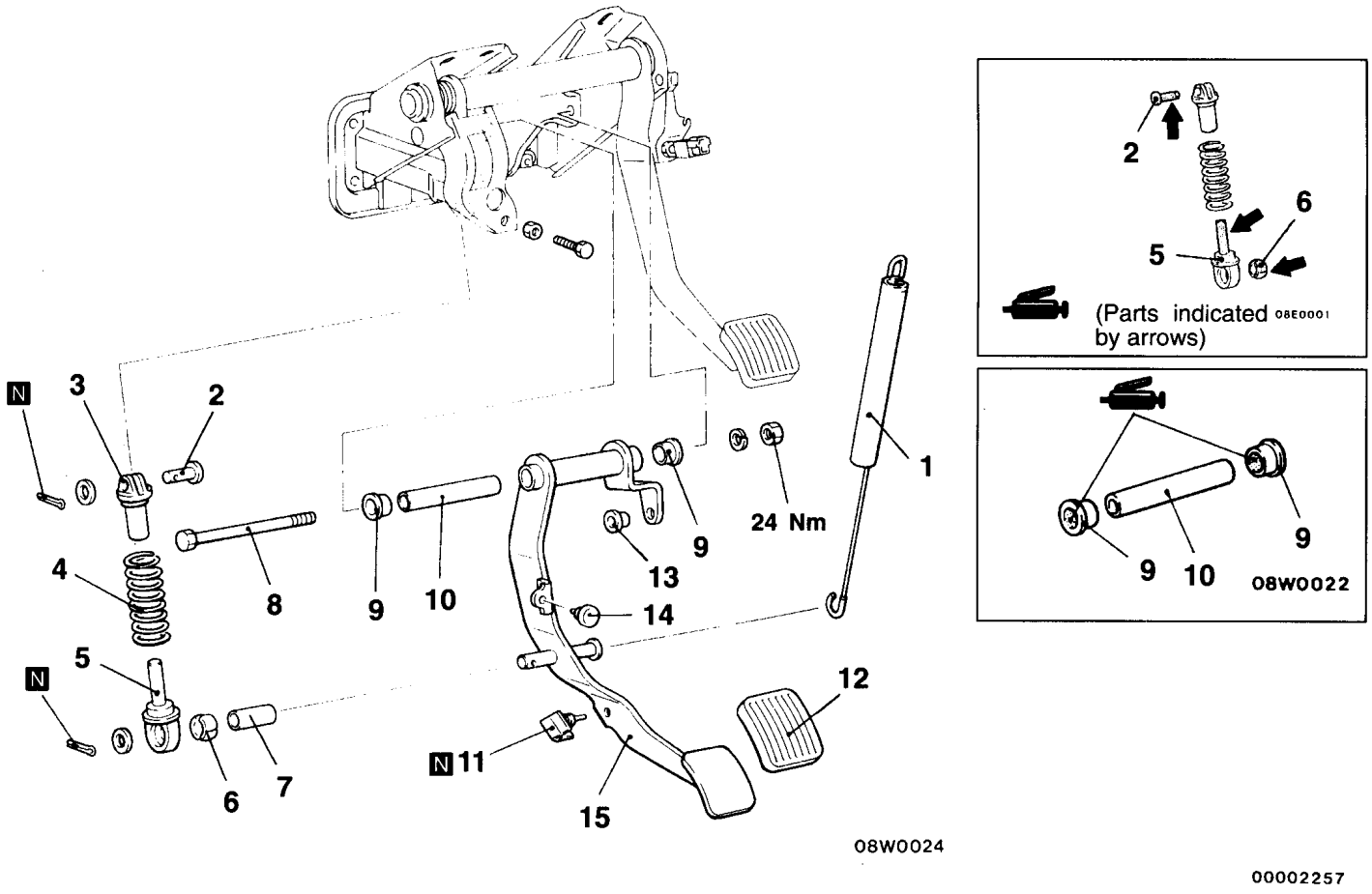
120002142

REMOVAL AND INSTALLATION

L.H. drive vehicles

Pre-removal Operation
- Brake and Clutch Pedal Assembly Removal (Refer to GROUP 35A – Brake Pedal.)

Post-installation Operation
1. Brake and Clutch Pedal Assembly Installation (Refer to GROUP 35A – Brake Pedal.)
2. Clutch Pedal Adjustment (Refer to P. 21-7.)



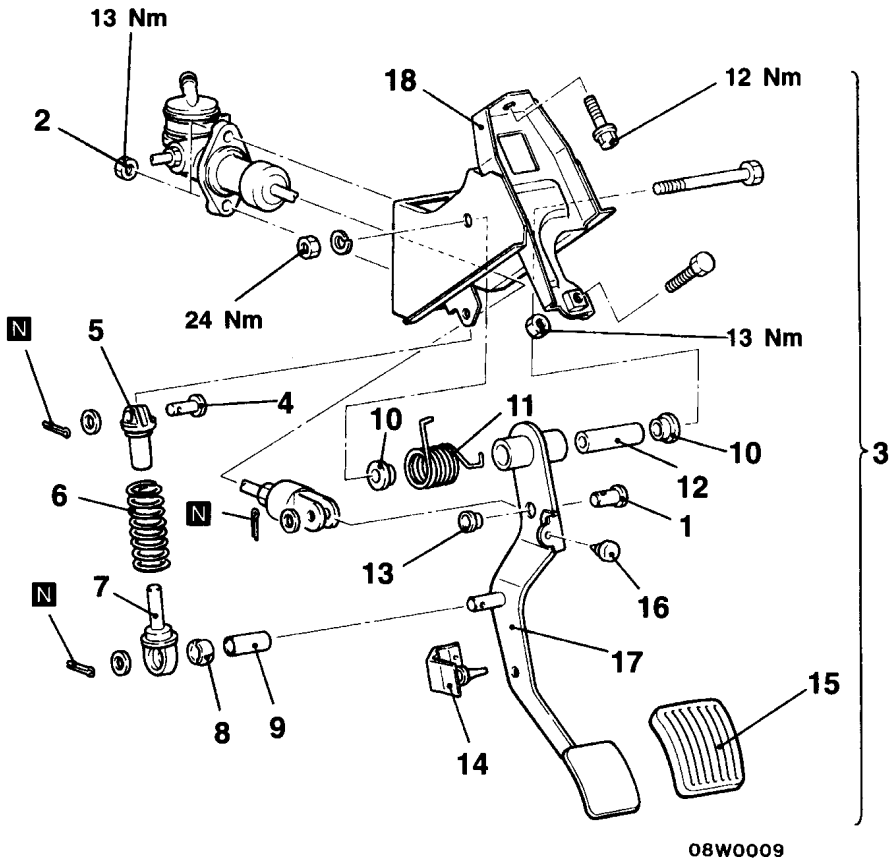
00002257

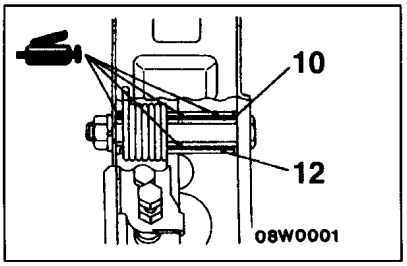
Removal steps

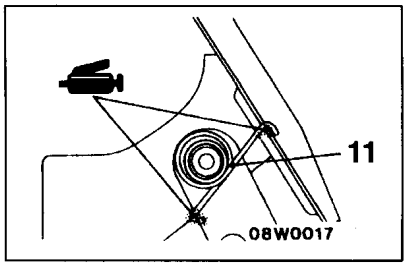
1. Return spring <Petrol-powered vehicles>
2. Clevis pin <Diesel-powered vehicles>
3. Rod A <Diesel-powered vehicles>
4. Turnover spring <Diesel-powered vehicles>
5. Rod B <Diesel-powered vehicles>
6. Bushing <Diesel-powered vehicles>
7. Pipe <Diesel-powered vehicles>
8. Bolt
9. Bushing
10. Pipe
11. Stopper
12. Pedal pad
13. Bushing
14. Stopper
15. Clutch pedal

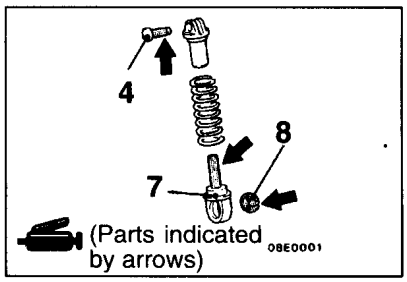
R.H. drive vehicles

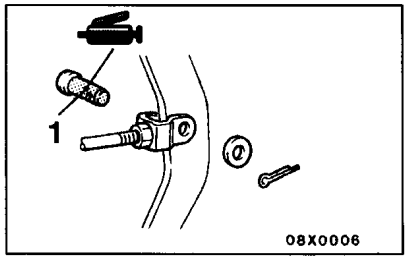
Post-Installation Operation
- Clutch Pedal Adjustment (Refer to P. 21-7.)











00000946

Removal steps

1. Clevis pin
2. Clutch master cylinder installation nut
3. Clutch pedal assembly
4. Clevis pin <Diesel-powered vehicles>
5. Rod A <Diesel-powered vehicles>
6. Turnover spring <Diesel-powered vehicles>
7. Rod B <Diesel-powered vehicles>
8. Bushing <Diesel-powered vehicles>
9. Pipe <Diesel-powered vehicles>
10. Bushing
11. Clutch pedal return spring <Petrol-powered vehicles>
12. Spacer
13. Bushing
14. Stopper
15. Pedal pad
16. Stopper
17. Clutch pedal
18. Pedal support member

CLUTCH CONTROL

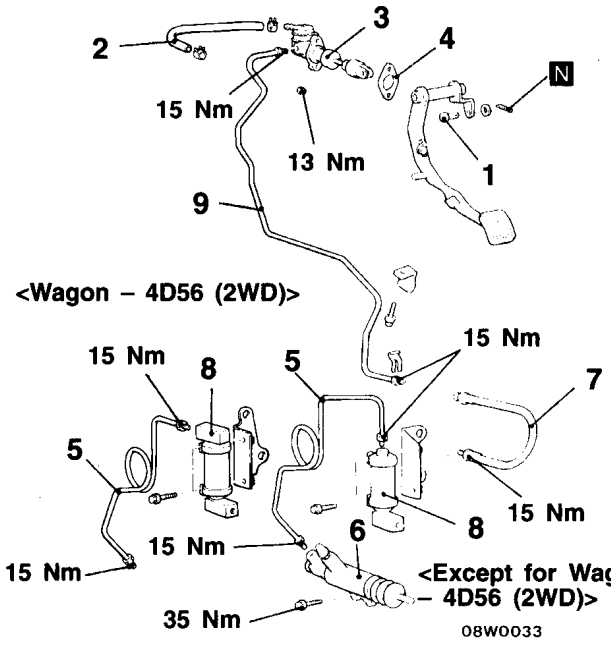
120002143

REMOVAL AND INSTALLATION

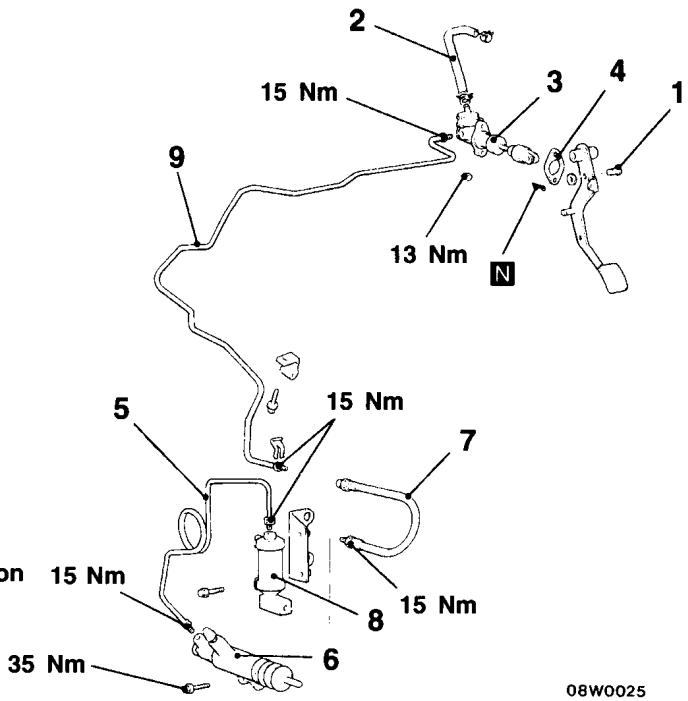
Pre-removal Operation
- Clutch Fluid Draining

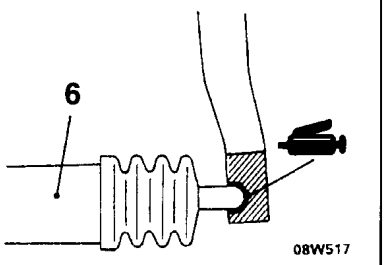
Post-installation Operation
1. Clutch Fluid Supplying
2. Clutch Line Bleeding (Refer to P. 21-8.)

L.H. drive vehicles



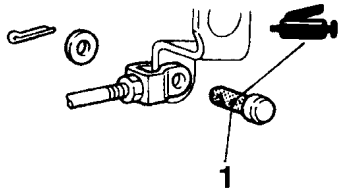
R.H. drive vehicles



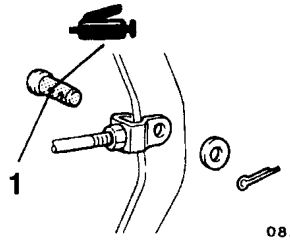


Specified grease:
MITSUBISHI genuine grease
Part No. 0101011

L.H. drive vehicles



R.H. drive vehicles



00002258

Clutch master cylinder removal steps
- Clutch pedal adjustment (Refer to P. 21-7.)

1. Clevis pin
2. Reservoir hose
3. Clutch master cylinder
4. Sealer

Clutch release cylinder removal steps

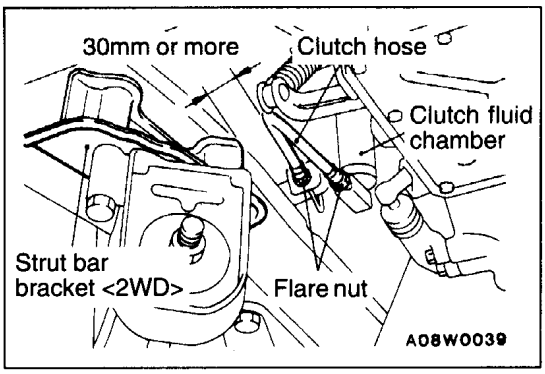
5. Clutch pipe connection
6. Clutch release cylinder

Clutch fluid chamber removal steps

5. Clutch pipe connection
▶A◀ 7. Clutch hose connection
8. Clutch fluid chamber

Clutch line removal steps

5. Clutch pipe
▶A◀ 7. Clutch hose
9. Clutch pipe



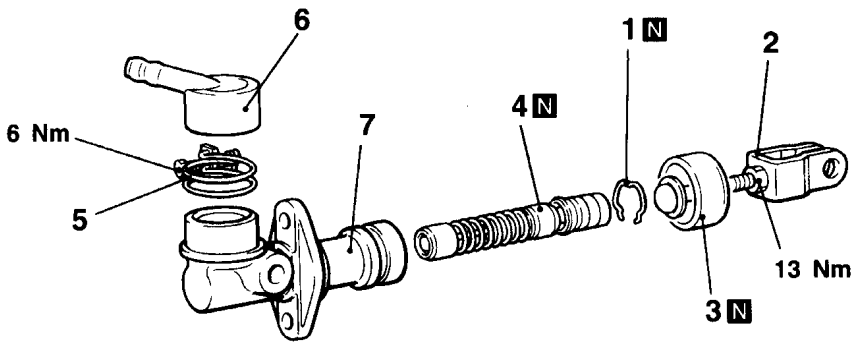
INSTALLATION SERVICE POINT

▶A◀ CLUTCH HOSE INSTALLATION <2WD>

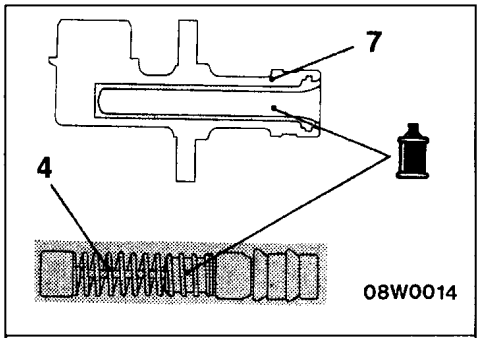
1. Tighten the flare nut at the clutch fluid chamber side.
2. Tighten the flare nut at the clutch pipe side so that the clearance between the strut bar bracket and the clutch hose can have the dimension shown in the illustration.

DISASSEMBLY AND REASSEMBLY 120002114

CLUTCH MASTER CYLINDER

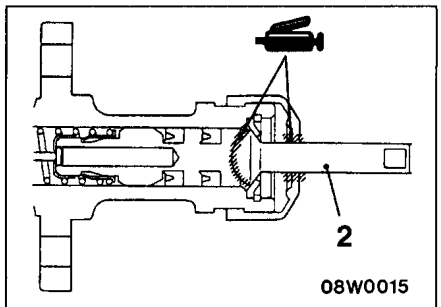


08W0010



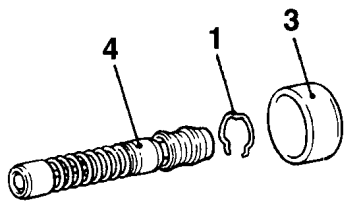
08W0014

Clutch fluid:
Brake fluid DOT 3 or DOT 4



08W0015

Grease: Rubber grease



08W0013

Piston repair kit

00000948

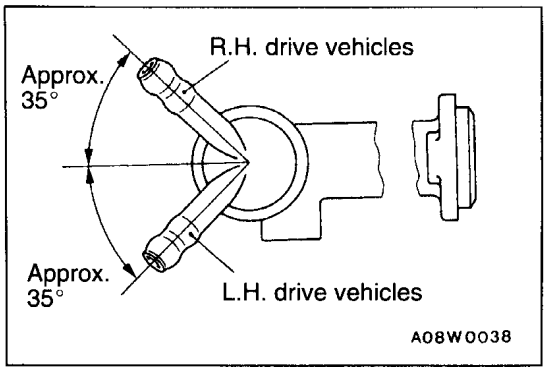
Disassembly steps

1. Piston stopper ring
2. Push rod assembly
3. Boot
4. Piston assembly
5. Reservoir band

▶A◀ 6. Nipple

7. Clutch master cylinder body

Caution
Do not disassemble piston assembly.



A08W0038

REASSEMBLY SERVICE POINT

▶A◀ NIPPLE INSTALLATION

Install the nipple as shown in the illustration.

MANUAL TRANSMISSION

CONTENTS

120002610

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SEALANTS 3

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4WD INDICATOR-ECU 18

GENERAL INFORMATION

120002611

Items		Vehicles with 4G63 or 4D56 engine	Vehicles with 4G63 or 4G64 engine	Vehicles with 4D56 engine
Transmission model		R5M21-7	R5M21-7	R5M31-7
Type		5-speed, column-shift	5-speed, floor-shift	5-speed, column-shift
Gear ratio	1st	3.967	3.967	3.952
	2nd	2.136	2.136	2.238
	3rd	1.360	1.360	1.398
	4th	1.000	1.000	1.000
	5th	0.856	0.856	0.760
	Reverse	3.578	3.578	3.553
Speedometer gear ratio (driven/drive)		26/8 ..... QF 30/8 ..... EJ, EJL	28/8 ..... GHDL 30/8 ..... EJDL	29/9

Items		Vehicles with 4G64 or 4D56 engine	Vehicles with 4D56 engine
Transmission model		V5M21-7	V5M31-7
Type		5-speed, floor-shift	5-speed, column-shift
Gear ratio	1st	3.967	3.952
	2nd	2.136	2.238
	3rd	1.360	1.398
	4th	1.000	1.000
	5th	0.856	0.760
	Reverse	3.578	3.553
Transfer type		2-speed	2-speed
Gear ratio	High	1.000	1.000
	Low	1.925	1.900
Speedometer gear ratio (driven/drive)		27/8	31/9

SERVICE SPECIFICATION

120000349

Item	Standard value
Clearance between shift lever guide and steering column mm	2.4–3.6

LUBRICANTS

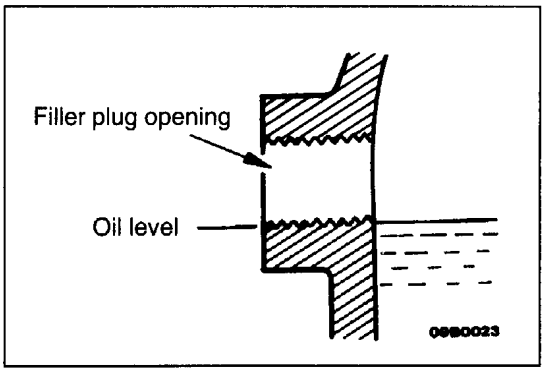
120002612

Items	Specified lubricants	Quantity ℓ
Transmission oil	Hypoid gear oil SAE 75W-90, 75W-85W or 80W conforming to API GL-4	2.3 <R5M21> 3.7 <R5M31> 2.2 <V5M21> 3.7 <V5M31>
Transfer oil	Hypoid gear oil SAE 75W-90, 75W-85W or 80W conforming to API GL-4	2.2 <V5M21> 2.5 <V5M31>

SEALANTS

120000351

Items	Specified sealant	Remarks
Control lever gasket	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Control lever assembly mounting bolt	3M Stud Locking No. 4170 or equivalent	Anaerobic sealant



SERVICE ADJUSTMENT PROCEDURES

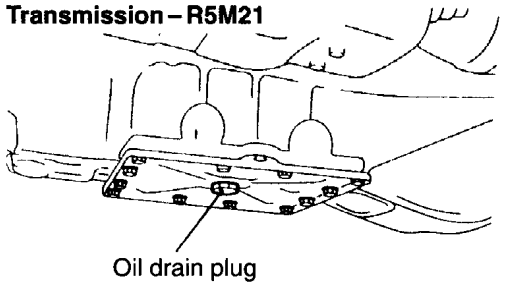
120000352

OIL LEVEL CHECK

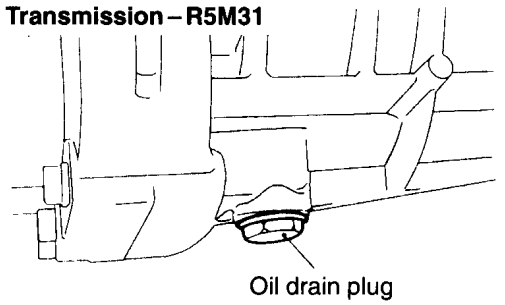
Inspect each component for evidence of leakage, and check the oil level by removing the filler plug. If the oil is contaminated, it is necessary to replace it with new oil.

1. Oil level should be at the lower portion of the filler plug hole.
2. Check that the transmission oil is not noticeably dirty, and that it has a suitable viscosity.

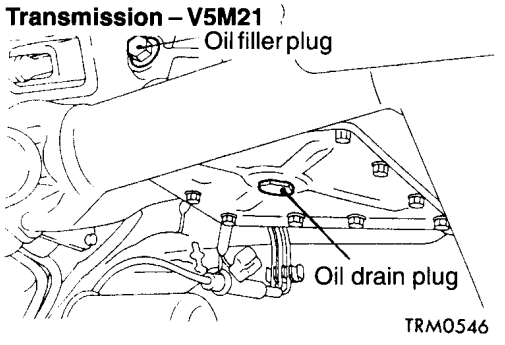
Transmission – R5M21



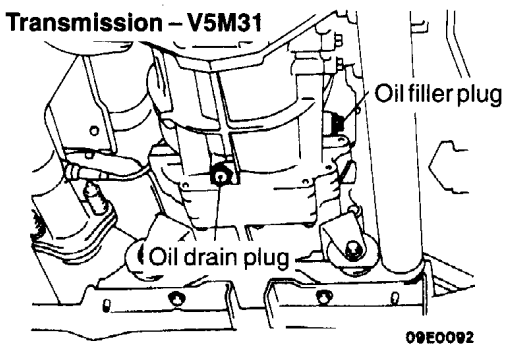
Transmission – R5M31



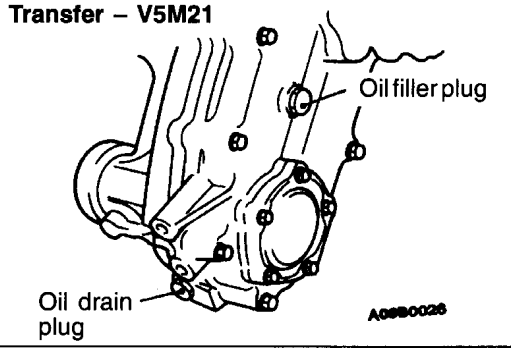
Transmission – V5M21



Transmission – V5M31



Transfer – V5M21



OIL REPLACEMENT

120002613

1. Remove oil filler plug and oil drain plug.
2. Drain oil.
3. Tighten the oil drain plug to the specified torque.

   Specified torque: 33 Nm

4. Fill with specified oil till the level comes to the lower portion of oil filler plug hole.

   Specified transmission oil:

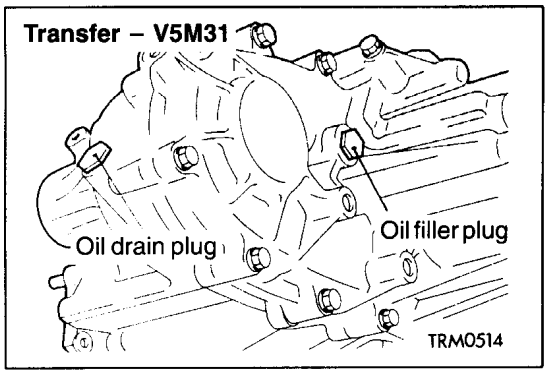
   Hypoid gear oil SAE 75W-90, 75W-85W or 80W conforming to API GL-4

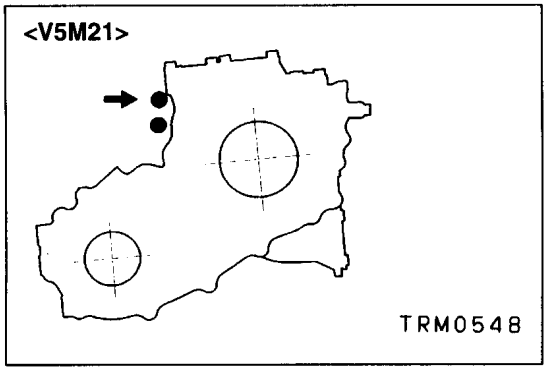
   Quantity:

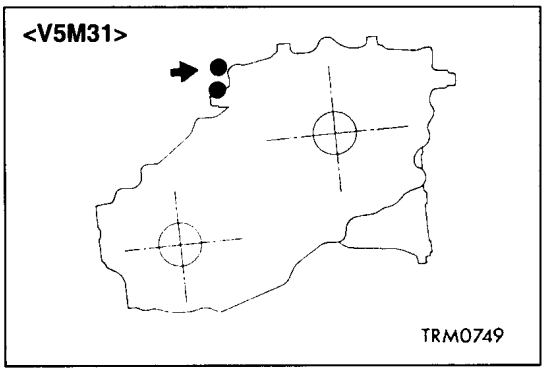
Transmission	**2.3ℓ <R5M21>**
	3.7ℓ <R5M31>
	2.2ℓ <V5M21>
	2.5ℓ <V5M31>
Transfer	**2.2ℓ <V5M21>**
	2.5ℓ <V5M31>

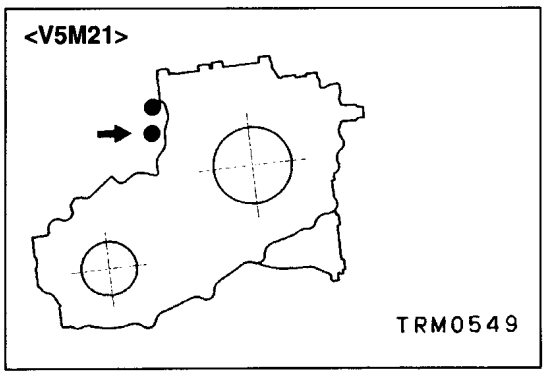
5. Tighten the oil filler plug to the specified torque.

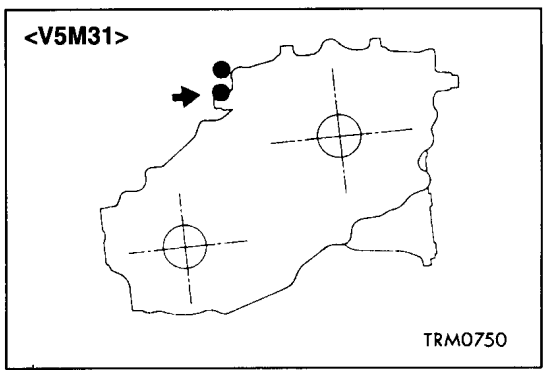
   Specified torque: 33 Nm











4WD DETECTION SWITCH CONTINUITY INSPECTION <4WD>

120002614

Check the continuity between terminals of the black connector indicated in the illustration.

Transfer lever position	Terminal No.	
	1	2
2H		
4H	○	○

HIGH/LOW DETECTION SWITCH CONTINUITY INSPECTION <4WD>

120002615

Check the continuity between terminals of the gray connector indicated in the illustration.

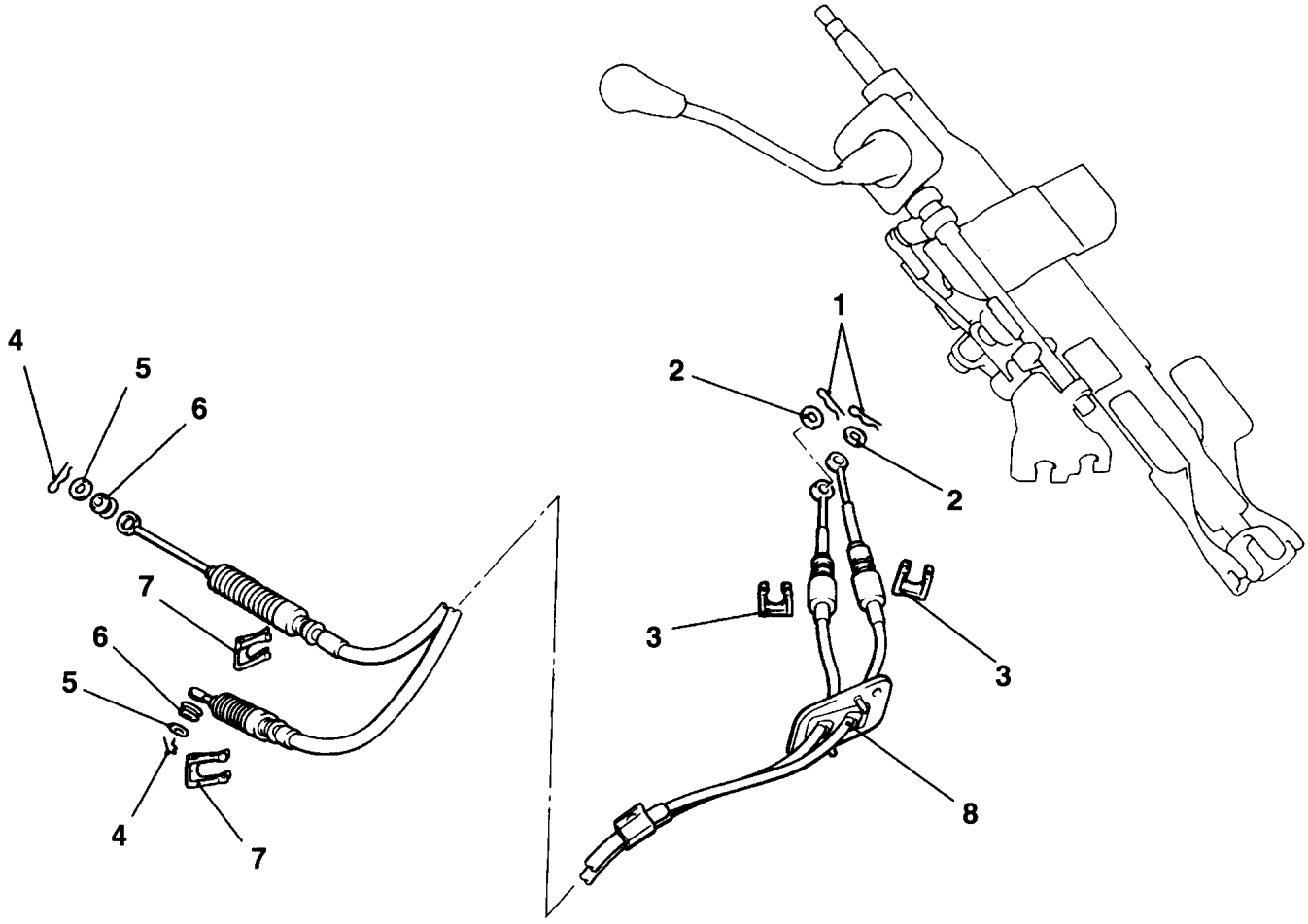
Transfer lever position	Terminal No.	
	1	2
4H	○	○
4L	○	○
4H–4L		

TRANSMISSION CONTROL <2WD-COLUMN SHIFT>

120000353

REMOVAL AND INSTALLATION

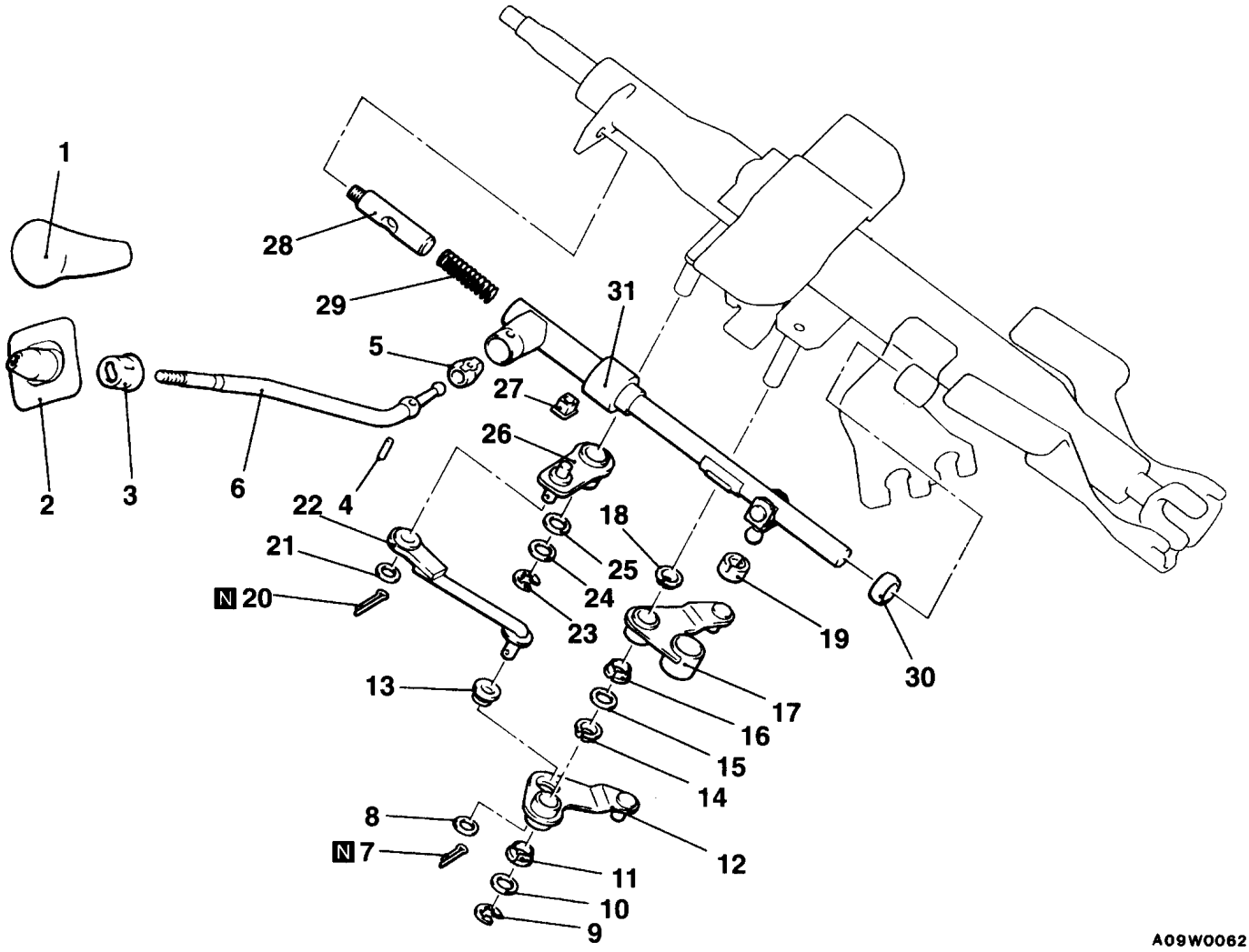
Pre-removal and Post-installation Operation
(1)Air Cleaner Removal and Installation <Petrol-powered vehicles> (Refer to GROUP 15 – Air Cleaner.)
(2)Column Cover Upper, Lower, Under Cover Removal and Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)



A09W0063

Transmission control cable assembly removal steps

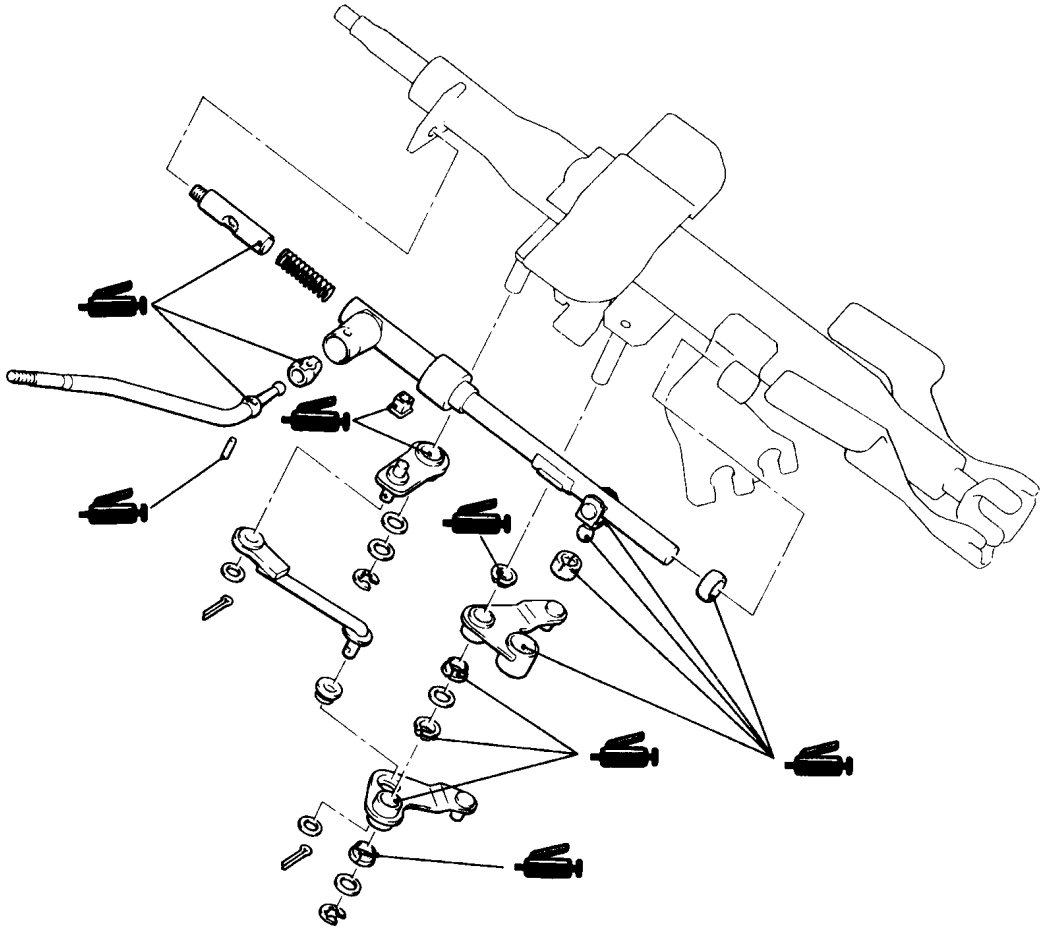
1. Snap pin
2. Washer
3. Clip
4. Snap pin
5. Washer
6. Bushing
7. Clip
8. Transmission control cable assembly



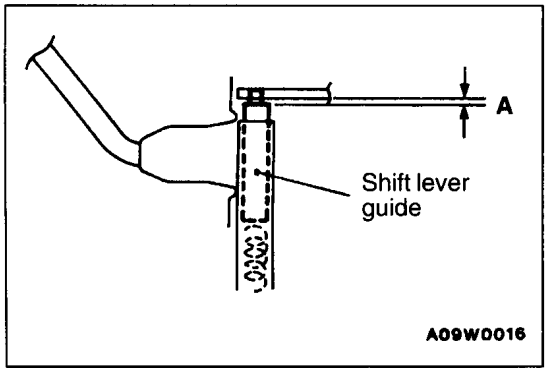
Control rod removal steps

1. Shift knob
2. Boot
3. Retainer
4. Pin
5. Shift lever support cover
6. Shift lever
7. Split pin
8. Plane washer
9. Snap ring
10. Washer
11. Bushing
12. Select link lever B
13. Bushing
14. Bushing
15. Washer
16. Bushing
17. Shift link lever B
18. Bushing
19. Bushing
20. Split pin
21. Plane washer
22. Select rod
23. Snap ring
24. Plane washer
25. Spring washer
26. Select link lever A
27. Bushing
▶A◀ 28. Shift lever guide
29. Spring
30. Bushing
31. Control rod

Lubrication points



A09W0066



A09W0016

INSTALLATION SERVICE POINT

▶A◀ SHIFT LEVER GUIDE INSTALLATION

Install so that the dimension shown in the illustration is at the standard value.

Standard value (A): 2.4–3.6 mm

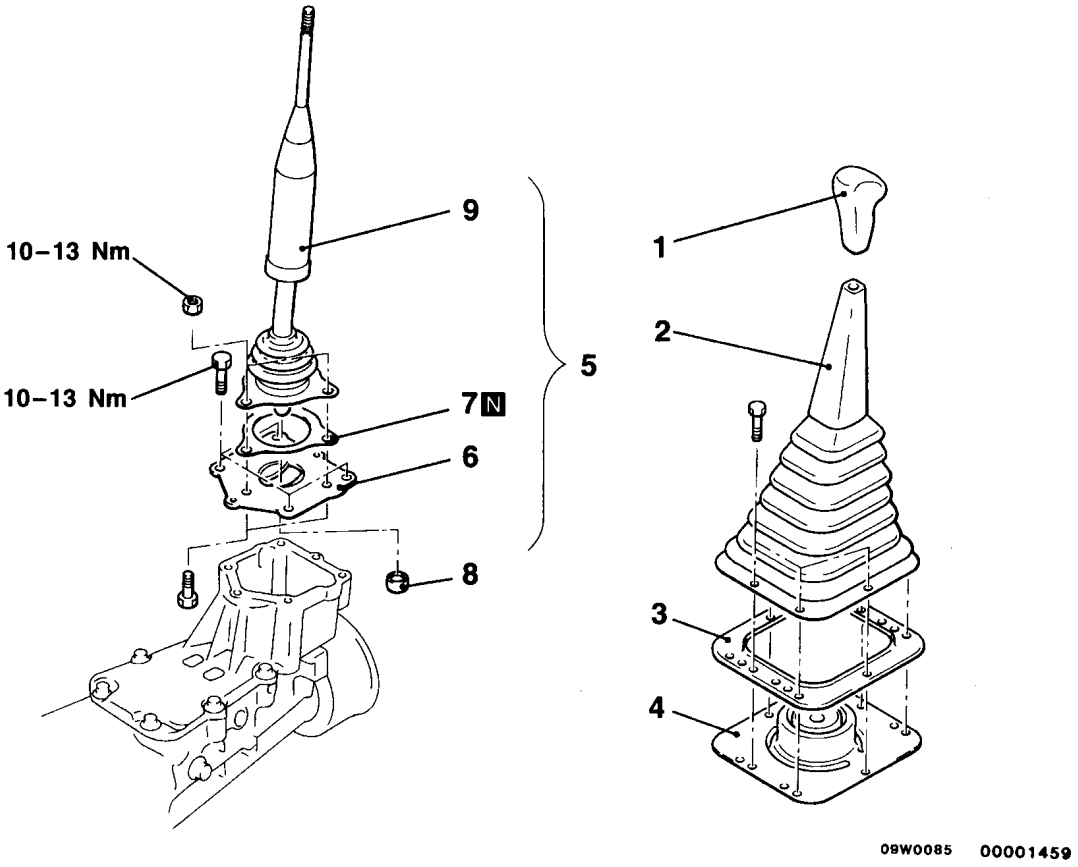
TRANSMISSION CONTROL <2WD-FLOOR SHIFT>

120000354

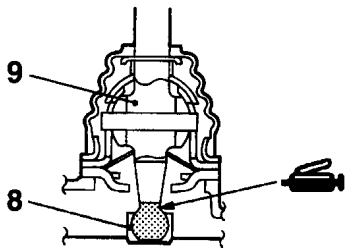
REMOVAL AND INSTALLATION

Pre-removal Operation
Shift the Transmission Control Lever to the N Position.

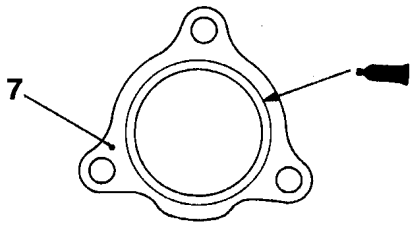
Post-installation Operation
Check the Operation of the Transmission Control Lever and the Movement in Each Lever Position



09W0085 00001459



09E0053



Apply the sealant to both sides of the gasket

Sealant: 3M ATD Part No. 8661 or equivalent

Removal steps

1. Transmission shift lever knob
2. Shift lever boot
3. Retainer
4. Control lever boot
5. Transmission control lever assembly
6. Stopper plate
7. Gasket
8. Control lever bushing
9. Transmission control lever

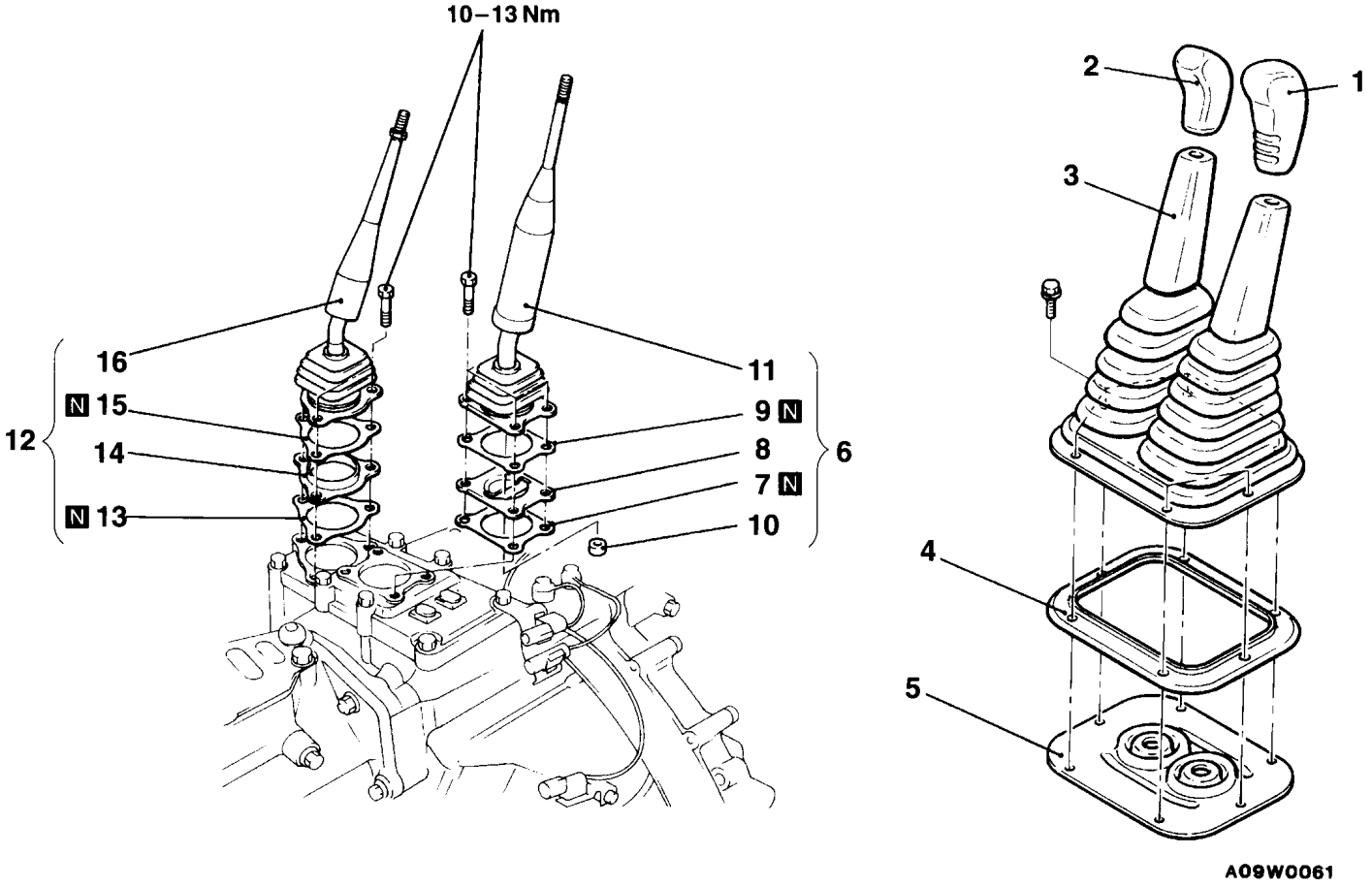
TRANSMISSION CONTROL <4WD-FLOOR SHIFT>

120002659

REMOVAL AND INSTALLATION

Pre-removal Operation
(1)Shift the Transmission Control Lever to the N Position.
(2)Shift the Transfer Control Lever to the 4H Position.

Post-installation Operation
- Check the Operation of the Transmission and Transfer Control Levers and the Movement in Each Lever Position.



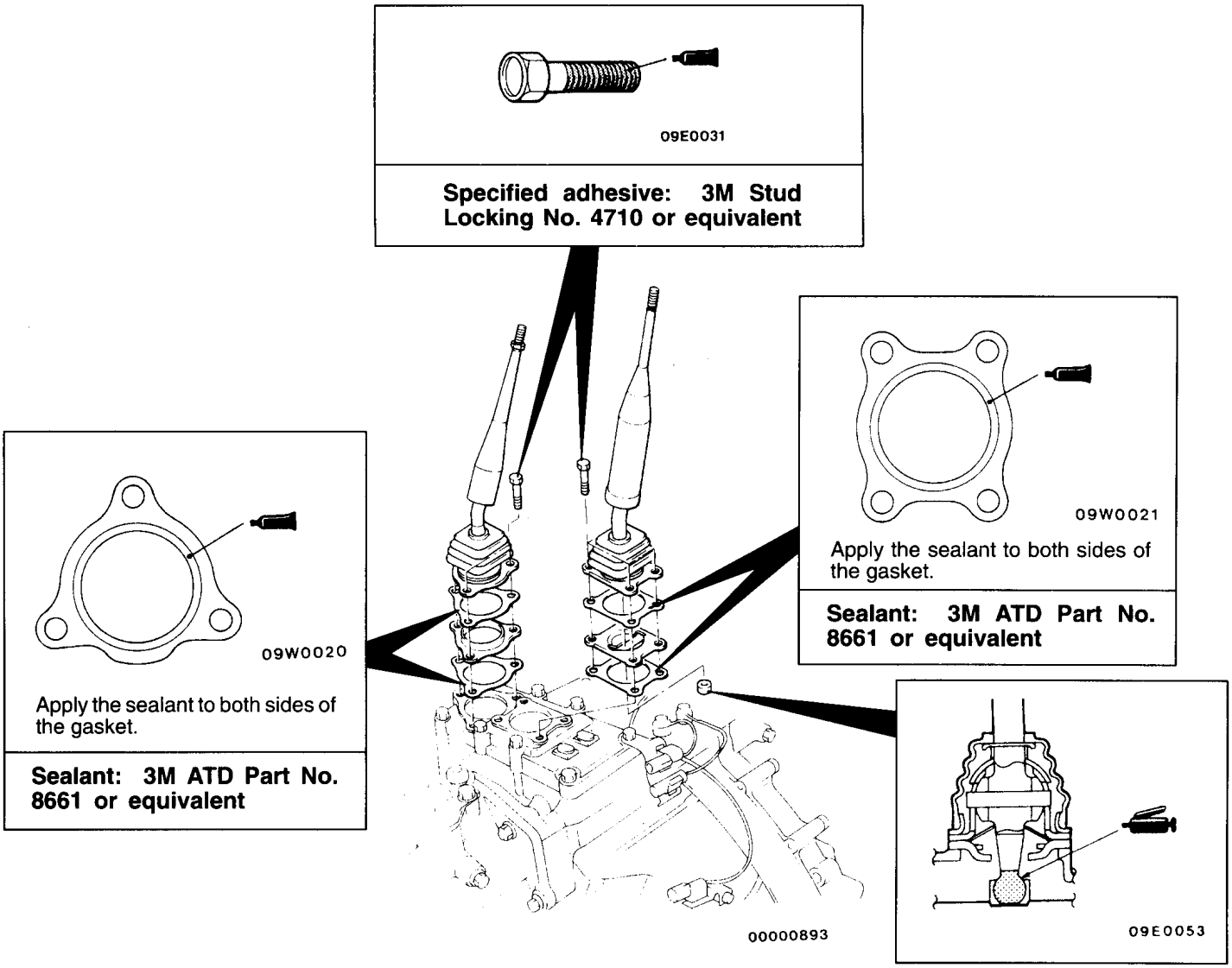
Transmission control lever assembly removal steps

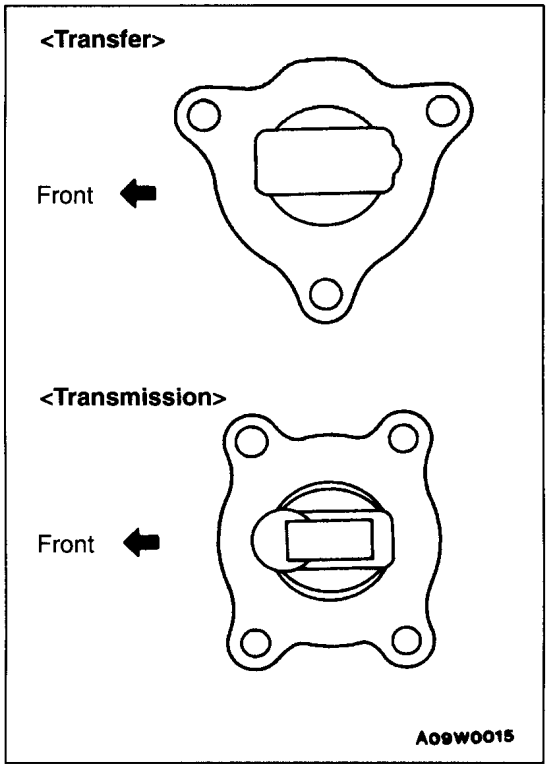
1. Transmission shift lever knob
2. Transfer shift lever knob
3. Shift lever boot
4. Retainer
5. Control lever boot
- ▶B◀ 6. Transmission control lever assembly
7. Gasket
- ▶A◀ 8. Stopper plate
9. Gasket
10. Control lever bushing
11. Transmission control lever

Transfer control lever assembly removal steps

1. Transmission shift lever knob
2. Transfer shift lever knob
3. Shift lever boot
4. Retainer
5. Control lever boot
- ▶B◀ 12. Transfer control lever assembly
13. Gasket
- ▶A◀ 14. Stopper plate
15. Gasket
16. Transfer control lever

Lubrication points

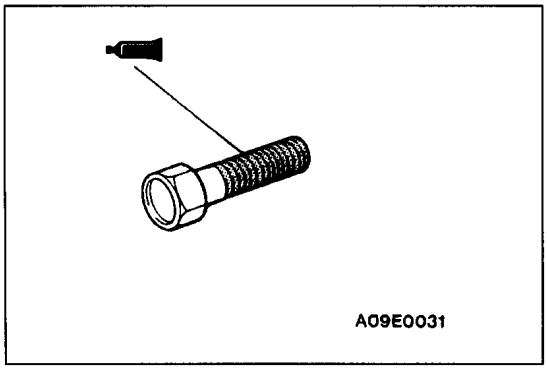




INSTALLATION SERVICE POINTS

◀A▶ STOPPER PLATE INSTALLATION

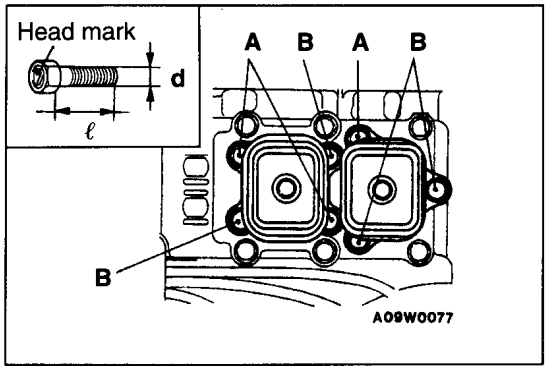
Install the stopper plates so that they face as shown in the illustration.



▶B◀ TRANSFER CONTROL LEVER ASSEMBLY/ TRANSMISSION CONTROL LEVER ASSEMBLY INSTALLATION

(1) Remove the adhesive sticking to the lever assembly mounting bolts.
(2) Use a tap (M8x1.25) to remove the adhesive sticking to the screw holes in the control housing, and clean it by blowing in air.
(3) Apply specified adhesive to the threads of the lever assembly mounting bolts.

Specified adhesive: 3M Stud Locking No. 4710 or equivalent



(4) The dimensions of the mounting bolts vary according to their mounting locations, so do not confuse them when installing.

Bolt	Head mark	d × ℓ mm
A	4T	8×22
B		8×23

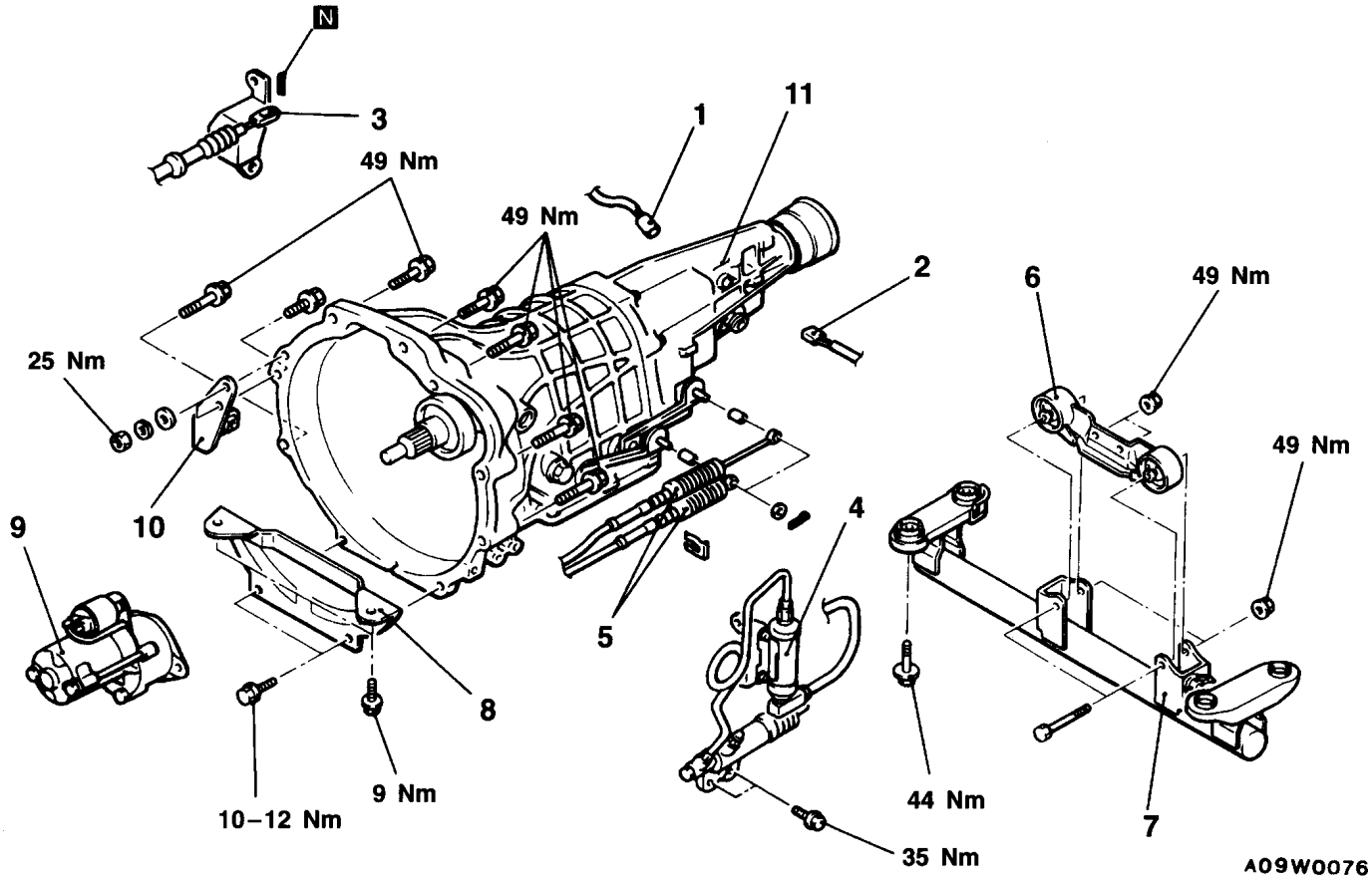
TRANSMISSION ASSEMBLY <2WD>

120002616

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Transmission Control Lever Assembly Removal and Installation <Floor Shift> (Refer to P. 22-9.)
(2) Propeller Shaft Removal and Installation (Refer to GROUP 25 – Propeller Shaft.)

<COLUMN SHIFT>



Removal steps

1. Back-up lamp switch connector
2. Vehicle speed sensor connector
3. Clutch cable connection <4G63>

◀A▶ 4. Clutch release cylinder, clutch fluid chamber <4D56, 4G64>

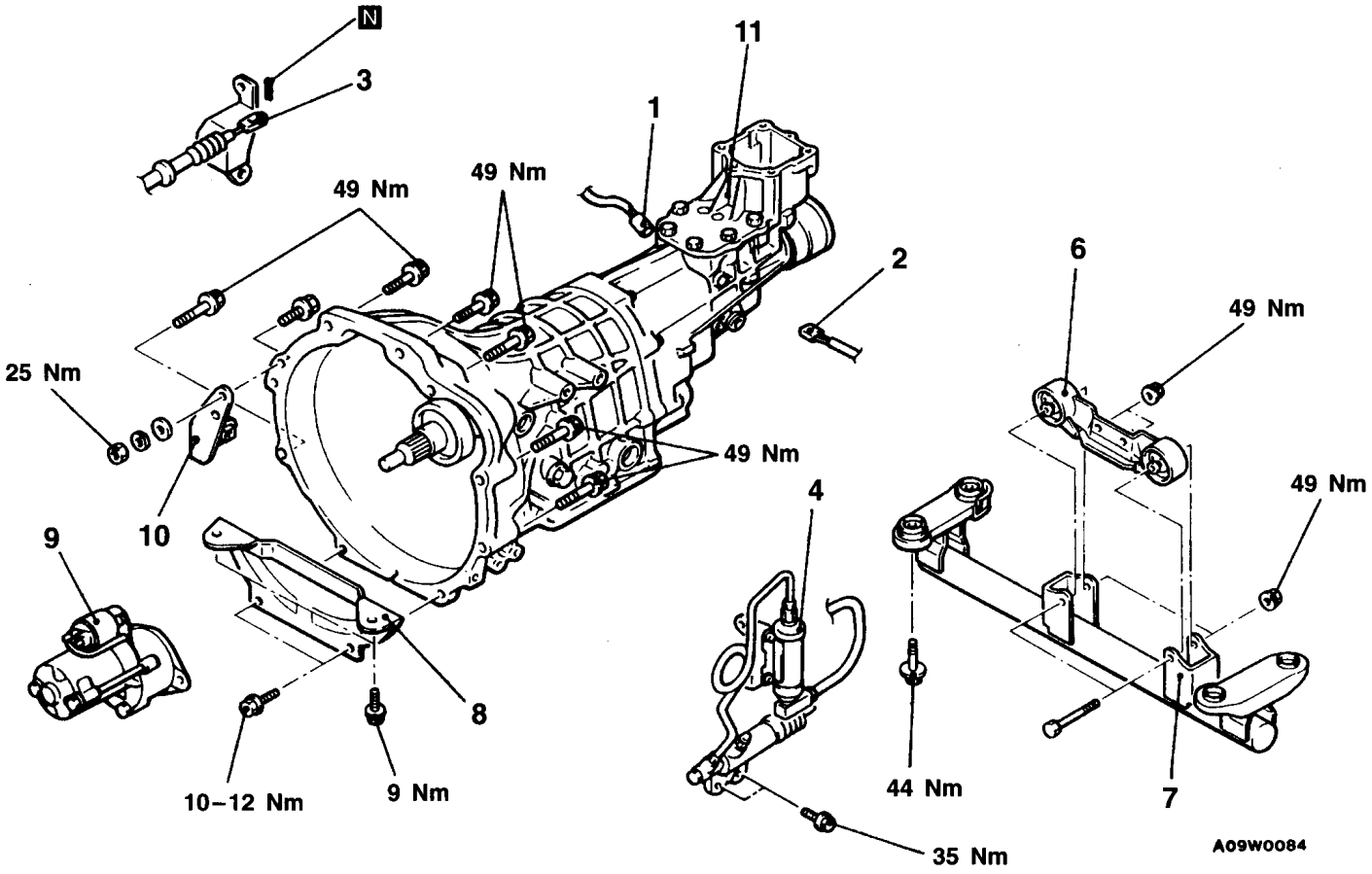
5. Shift select cable connection
   - Support the transmission with a transmission jack.
6. Transmission mount insulator assembly
7. Transmission mount crossmember assembly
8. Bell housing cover

◀B▶ 9. Starter motor

10. Transmission hanger bracket

◀C▶ ▶A◀ 11. Transmission assembly

<FLOOR SHIFT>



Removal steps

1. Back-up lamp switch connector
2. Vehicle speed sensor connector
3. Clutch cable connection <4G63>

◀A▶ 4. Clutch release cylinder, clutch fluid chamber <4G64>

- Support the transmission with a transmission jack.

6. Transmission mount insulator assembly
7. Transmission mount crossmember assembly
8. Bell housing cover

◀B▶ 9. Starter motor

10. Transmission hanger bracket

◀C▶ ▶A◀ 11. Transmission assembly

REMOVAL SERVICE POINTS

◀A▶ CLUTCH RELEASE CYLINDER, CLUTCH FLUID CHAMBER REMOVAL <4G64>

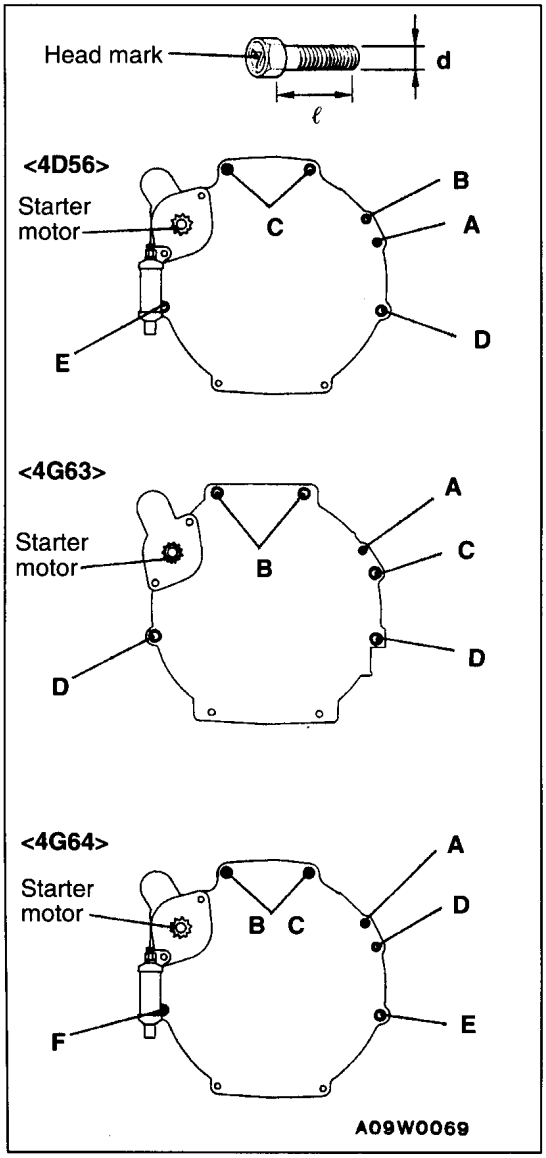
Remove the clutch release cylinder and clutch fluid chamber without disconnecting fluid line. Then suspend them with a cord.

◀B▶ STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harnesses still connected, and secure it inside the engine compartment.

◀C▶ TRANSMISSION ASSEMBLY REMOVAL

Caution
When removing the transmission assembly from the engine, care must be taken not to shake or rock with force, because to do so might cause damage to the end of the main drive gear, the pilot bearing, or the clutch disc, etc.



INSTALLATION SERVICE POINT

▶A◀ TRANSMISSION ASSEMBLY INSTALLATION

The sizes of the mounting bolts are different. So be sure not to confuse them.

<4D56>

Bolt	Head mark	d×ℓ mm
A	7T	8×35
B		8×55
C		10×40
D		10×65
E		10×70

<4G63>

Bolt	Head mark	d×ℓ mm
A	7T	8×35
B		10×40
C		10×60
D		10×65

<4G64>

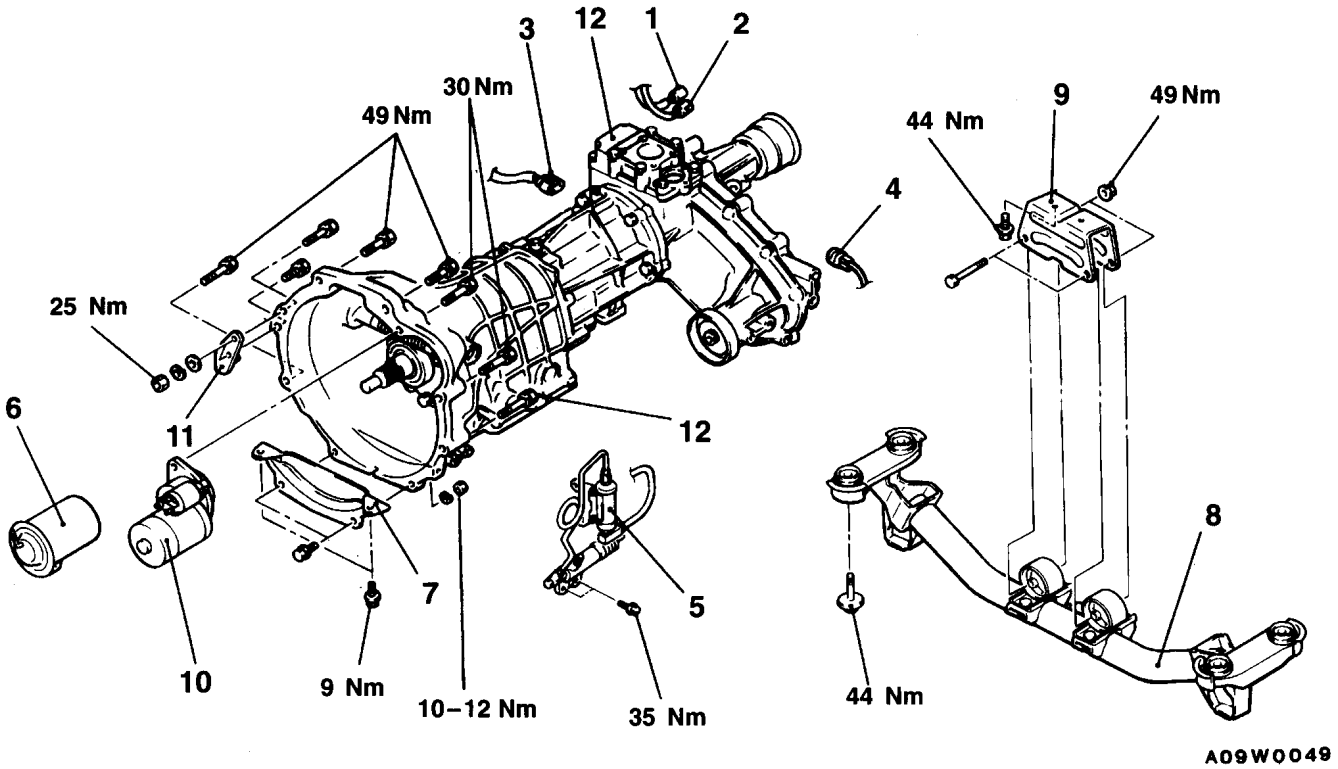
Bolt	Head mark	d×ℓ mm
A	7T	8×55
B		10×35
C		10×40
D		10×60
E		10×65
F		10×70

TRANSMISSION ASSEMBLY <4WD>

120002223

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Transmission and Transfer Control Lever Assembly Removal and Installation (Refer to 22-10.)
(2) Transmission Fluid and Transfer Fluid Draining and Supplying (Refer to 22-4.)
(3) Front and Rear Propeller Shaft Removal and Installation (Refer to GROUP 25 – Propeller Shaft.)



Removal steps

1. HI/LOW detection switch connector
2. 2WD/4WD detection switch connector
3. Back-up lamp switch connector
4. Vehicle speed sensor connector

◀A▶ 5. Clutch release cylinder, clutch fluid chamber <4D56, 4G64>

6. Vacuum tank
7. Bell housing cover
   - Support the transmission with a transmission jack.

8. Transmission mount crossmember assembly
9. Transmission mount bracket

◀B▶ 10. Starter motor

11. Transmission hanger bracket

◀C▶ ▶A◀ 12. Transmission assembly

REMOVAL SERVICE POINTS

◀A▶ CLUTCH RELEASE CYLINDER, CLUTCH FLUID CHAMBER REMOVAL <4D56, 4G64>

Remove the clutch release cylinder and clutch fluid chamber without disconnecting fluid line. Then suspend them with a cord.

◀B▶ STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harnesses still connected, and secure it inside the engine compartment.

◀C▶ TRANSMISSION ASSEMBLY REMOVAL

Caution
When removing the transmission assembly from the engine, care must be taken not to shake or rock with force, because to do so might cause damage to the end of the main drive gear, the pilot bearing, or the clutch disc, etc.

INSTALLATION SERVICE POINT

▶A◀ TRANSMISSION ASSEMBLY INSTALLATION

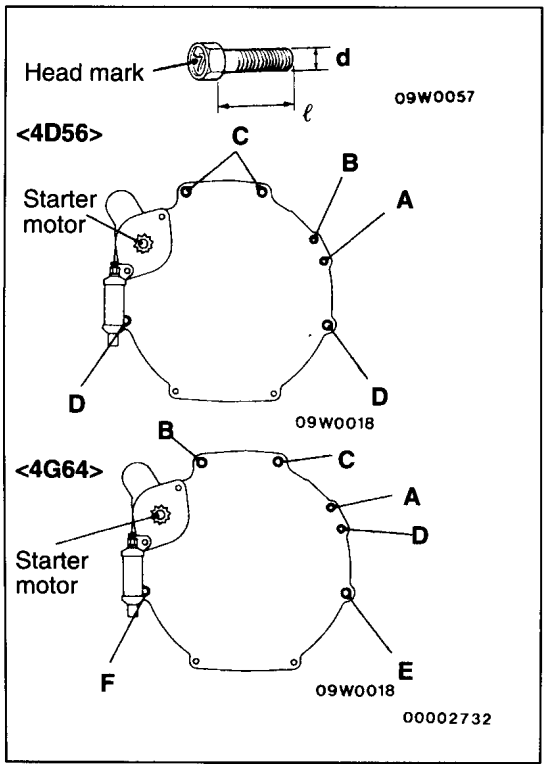
The sizes of the mounting bolts are different. So be sure not to confuse them.

<4D56>

Bolt	Head mark	d×ℓ mm
A	7T	8×35
B		8×55
C		10×40
D		10×65

<4G64>

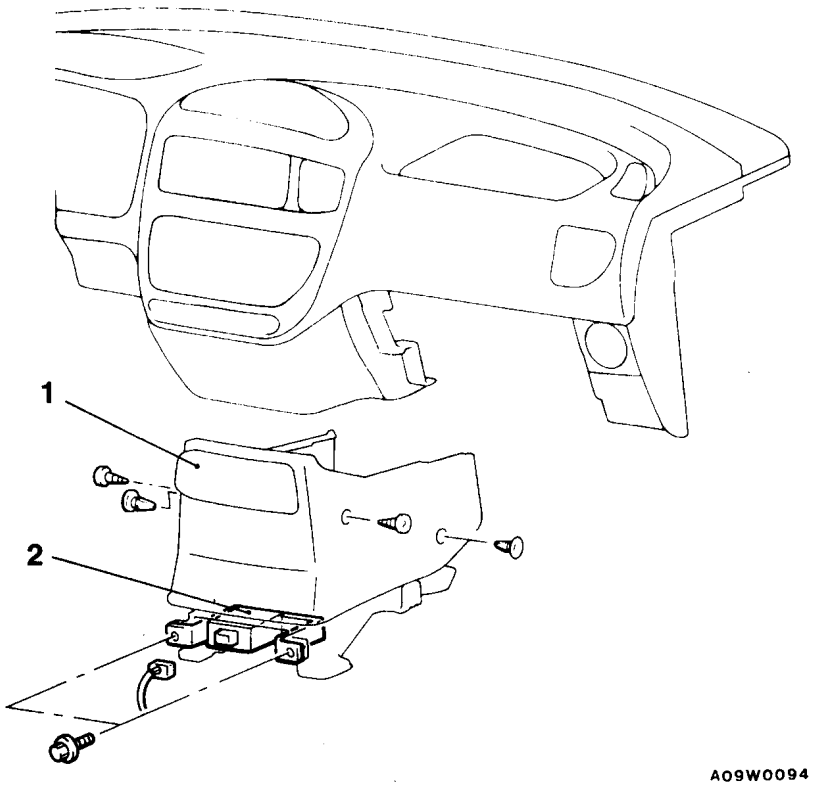
Bolt	Head mark	d×ℓ mm
A	7T	8×55
B		10×35
C		10×40
D		10×60
E		10×65
F		10×70



4WD INDICATOR-ECU

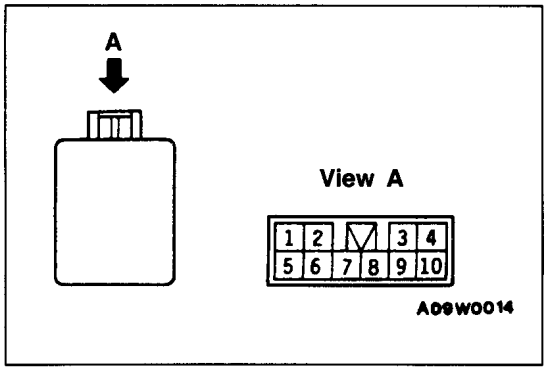
120002322

REMOVAL AND INSTALLATION



Removal steps

1. Computer cover
2. 4WD indicator-ECU



INSPECTION

4WD INDICATOR-ECU

(1) Measure the voltage with the control unit and harness still connected.
(2) Earth terminal (8) and then measure terminal voltage.

Terminal No.	Inspection item	Inspection condition 1: Ignition switch	Inspection condition 2: Transfer lever position	Terminal voltage
1	Free-wheel engage switch	ON	2H	System voltage
			4H*1	0V
2	4WD operation detection switch	ON	2H	System voltage
			4H, 4L	0V

Terminal No.	Inspection item		Inspection condition 1: Ignition switch	Inspection condition 2: Transfer lever position	Terminal voltage
3	Ignition switch (IG2)		OFF	–	0V
			ON	–	System voltage
5	Free-wheel differential indicator lamp		ON	2H	System voltage
				4H*1	0V
6	HI/LOW detection switch		ON	Shifting from 4H to 4L or vice versa	System voltage
				2H, 4H, 4L	0V
7	Free-wheeling clutch changeover solenoid valve		ON	4H, 4L	0V
				2H*2	System voltage
9	2WD/4WD indicator lamp	Rear wheel lamp	ON	Shifting from 4H to 4L or vice versa	0V
				2H, 4H, 4L	System voltage
10		Front wheel lamp	ON	2H	0V
				4H, 4L	System voltage

NOTE
*1: When vehicle has been moved once.
*2: Shift the lever from 4H to 2H, and then turn the ignition switch to OFF and then back to ON.

AUTOMATIC TRANSMISSION

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120002617

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GENERAL INFORMATION

120002618

Items		Vehicles with 4G63 engine	Vehicles with 4G64 engine
Transmission model		R4AW2-5	R4AW2-5
Type		4-speed full automatic	4-speed full automatic
Gear ratio	1st	2.826	2.826
	2nd	1.493	1.493
	3rd	1.000	1.000
	4th	0.730	0.730
	Reverse	2.703	2.703
Speedometer gear ratio (driven/drive)		22/6	21/6

SERVICE SPECIFICATIONS

120002619

Items			Standard value
Distance between inner cable stopper and end of dust cover mm			0–1
Lock-up solenoid valve coil resistance (at 20°) Ω			Approx. 13
Stall speed r/min.		4G63	2,100–2,400
		4G64	2,300–2,600
Governor pressure kPa		1,000 r/min.	137–166
		2,000 r/min.	245–284
		3,200 r/min.	402–460
Line pressure kPa	Idle speed	D range	509–588
		R range	774–892
	Stall speed	D range	1,078–1,274
		R range	1,569–1,961
Operation temperature of engine coolant temperature switch °C	On (continuity)		50±3
	Off (no continuity)		43
Clearance between shift lever guide and steering column mm			2.4–3.6

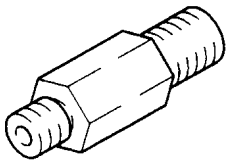
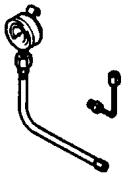
LUBRICANTS

120002620

Items	Specified lubricants	Quantity ℓ
Transmission fluid	DIA QUEEN ATF-SP or equivalent	Approx. 6.8
O-ring for oil filler pipe	DIA QUEEN ATF-SP or equivalent	As required

SPECIAL TOOLS

120002621

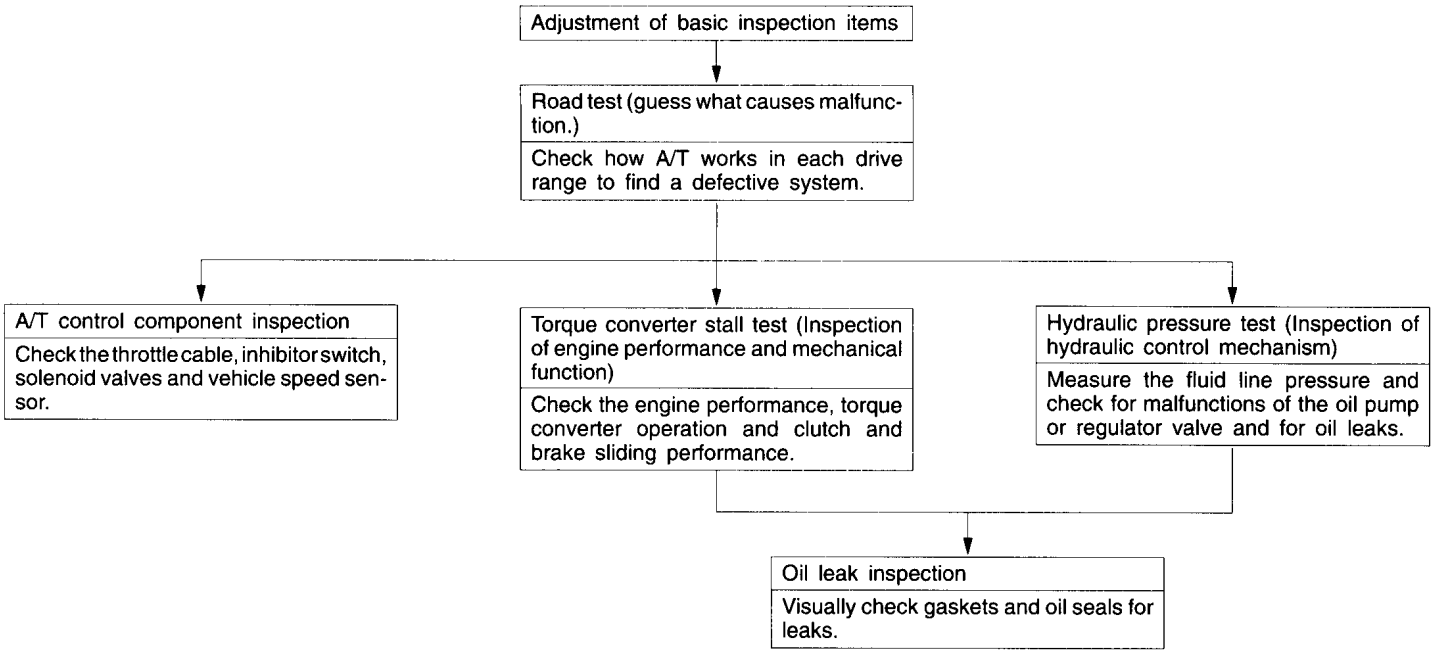
Tool	Number	Name	Use
	MD998330 (including MD998331)	Oil pressure gauge (2,942 kPa)	Measurement of oil pressure
	MD998920	Adapter	Connection of oil pressure gauge
	MD999563 (including MD998331)	Oil pressure gauge (980 kPa)	Measurement of oil pressure

TROUBLESHOOTING

120002622

Automatic transmission malfunctions may be caused by the following conditions.
(1) Improper maintenance and adjustment
(2) Mechanical malfunctions
(3) Hydraulic malfunctions
(4) Poor engine performance

Troubleshooting in the event of any such malfunctions should begin by checking fluid level, ATF condition, manual linkage adjustment, throttle control cable adjustment and other conditions whose deviation from standards can be readily known. Then, road test shall be performed to determine whether or not the problem has been corrected or more diagnosis is necessary. If the problem still persists after these tests and corrections, hydraulic tests should be performed for further troubleshooting.



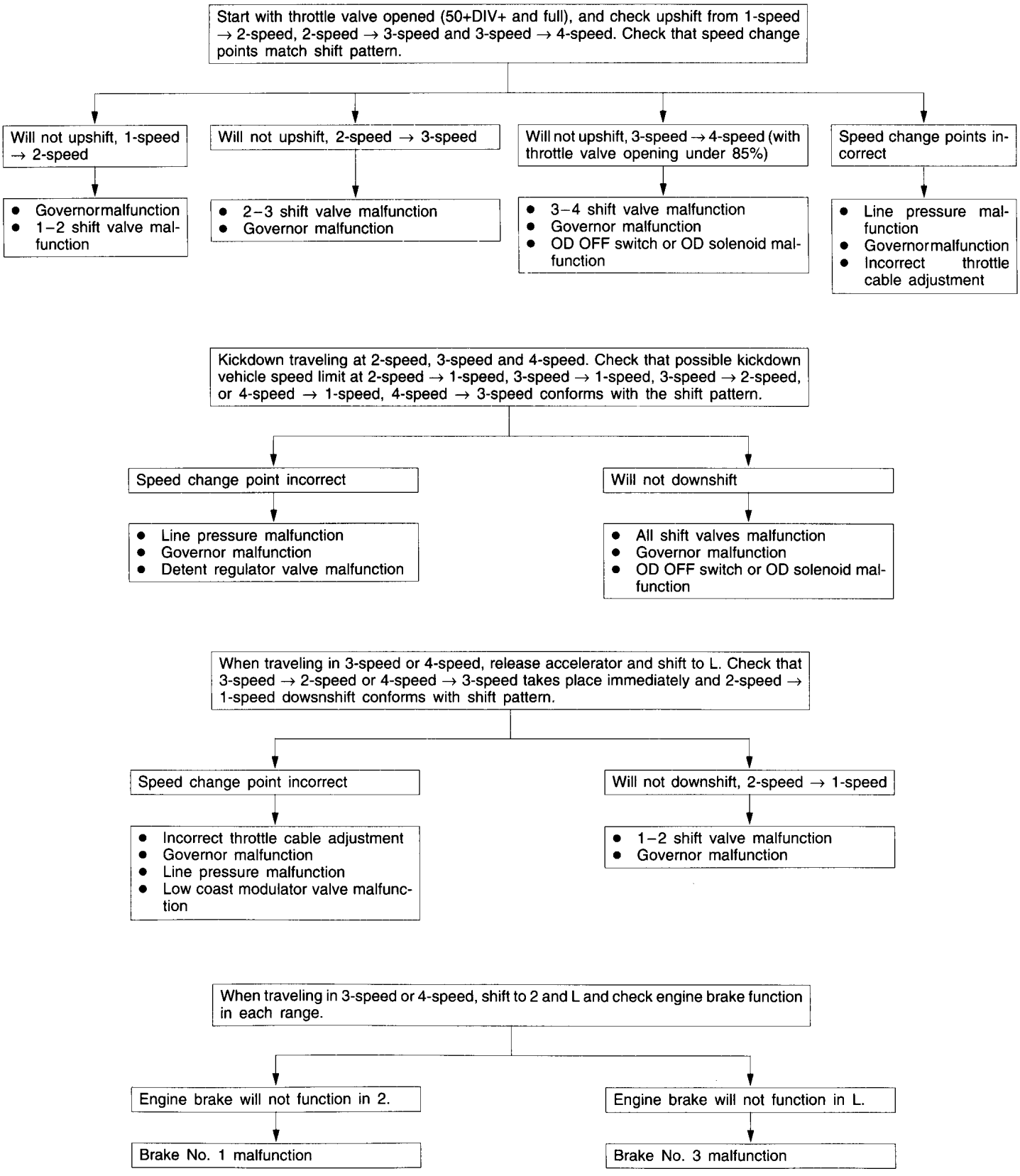
ROAD TEST

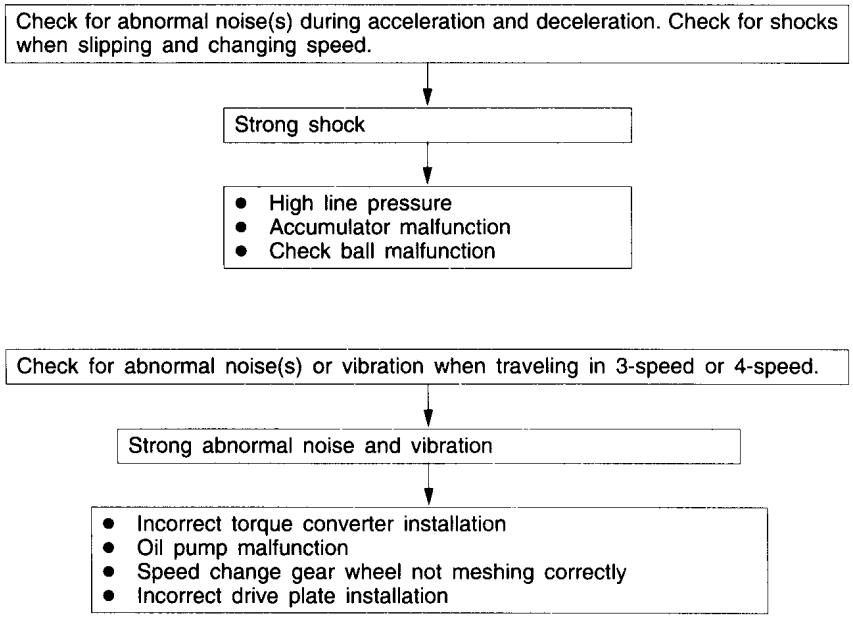
120000552

Prior to performing road test, be sure to make basic checks including check and adjustment of fluid level and condition and adjustment of the throttle cable. For road test, the transfer must be placed in the 2H (2WD-high) position. In road test, various changes such as slips in transmission and shifting conditions are checked and the transmission operation at each shift position must be checked.

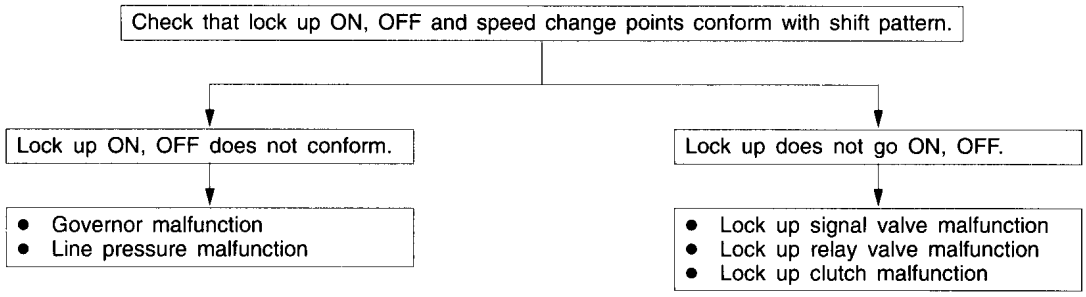
D RANGE TEST

120000553





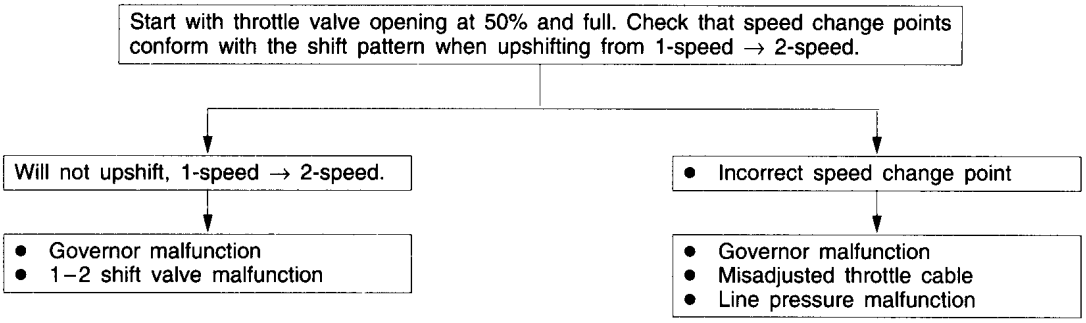
NOTE
Abnormal noises and vibrations are often caused by an unbalanced propeller shaft, differential, tyre, torque converter, engine, etc. Extremely thorough inspection is therefore required.

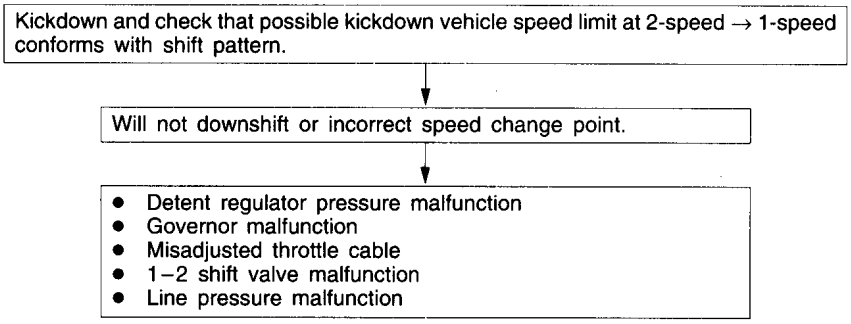


NOTE
(1) Determine the moment when lock up turns ON by decreased engine r/min. or by a slight shock back and forth.
(2) Determine the moment when lock up turns OFF by increased engine r/min.
(3) Check lock up condition by pumping the accelerator slightly. If engine r/min. rises in accordance with throttle valve opening size, determine that the lock up is OFF, if not, determine it ON.
(When lock up is OFF, drive power is transferred through the fluid in the torque converter and therefore, when the accelerator pedal is depressed, slipping occurs inside the torque converter with a resulting large increase in engine r/min.)

2 RANGE TEST

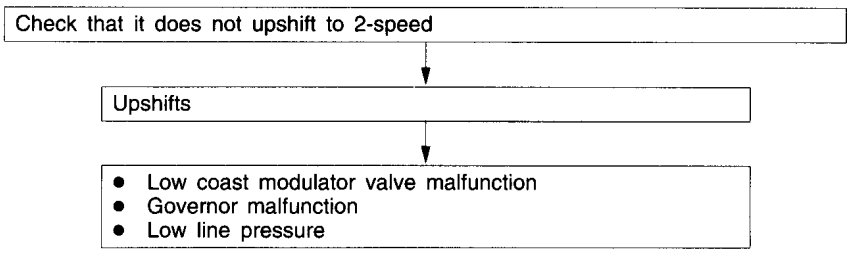
120000554





L RANGE TEST

120000555



R RANGE TEST

120000556

Start with full throttle and check for slippage

↓

Slippage

↓

- Brake No. 3 malfunction
- OD clutch or direct clutch malfunction
- OD one-way clutch malfunction
- Low line pressure

P RANGE TEST

120000557

Park vehicle on an incline (more than 5°). Release parking and service brakes and check that the vehicle does not move.

↓

Vehicle moves

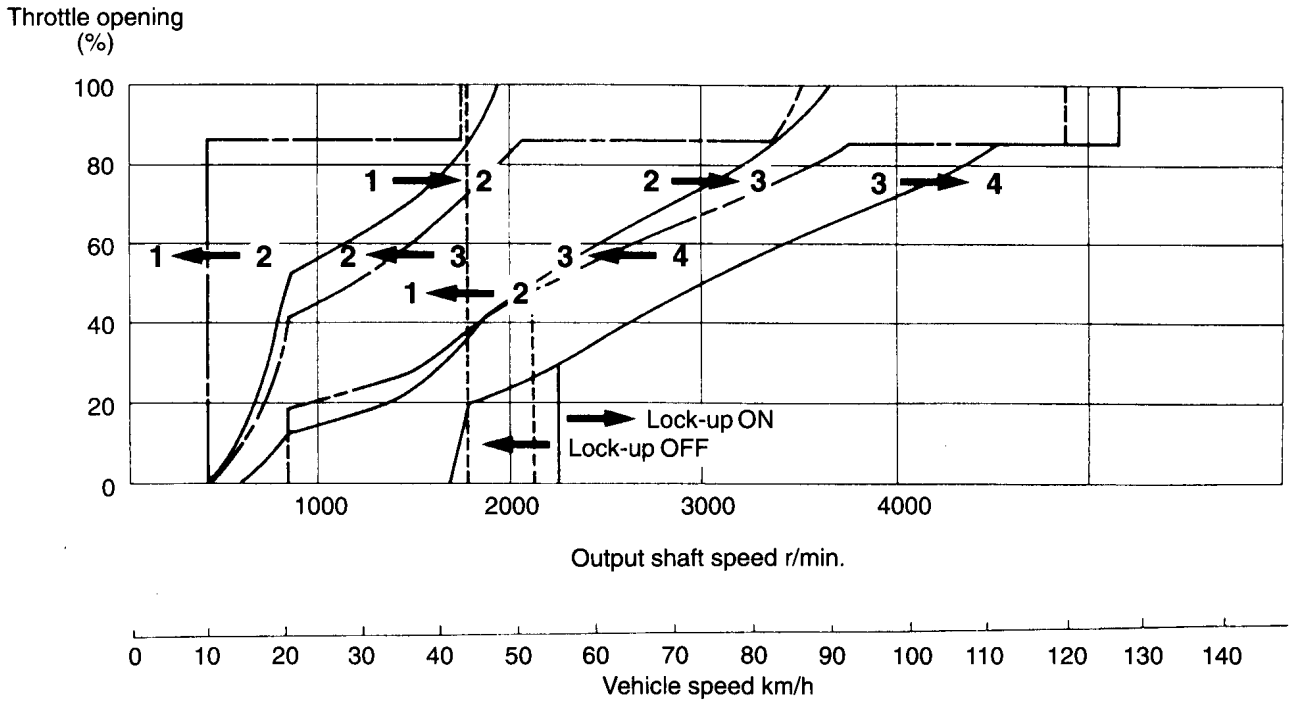
↓

- Park mechanism malfunction
- Misadjusted shift lever

SHIFT PATTERN

120002623

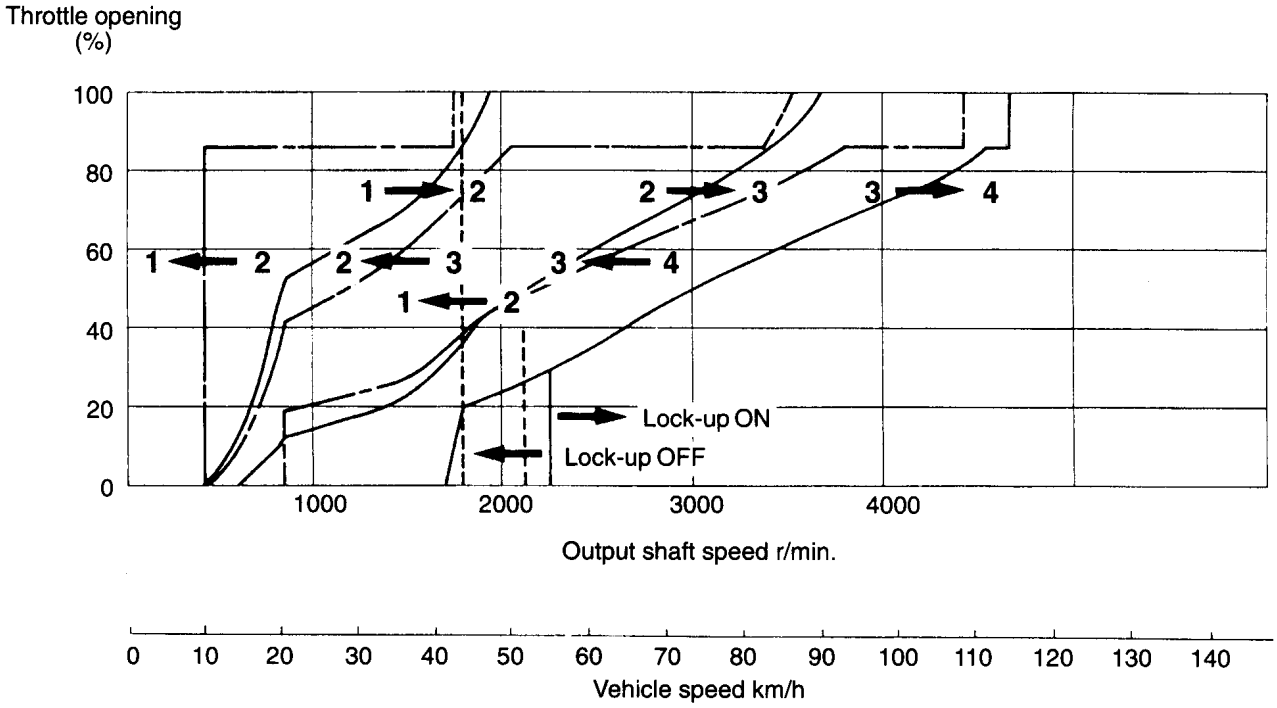
<4G63 engine>



TRA0911

<4G64 engine>

120002624

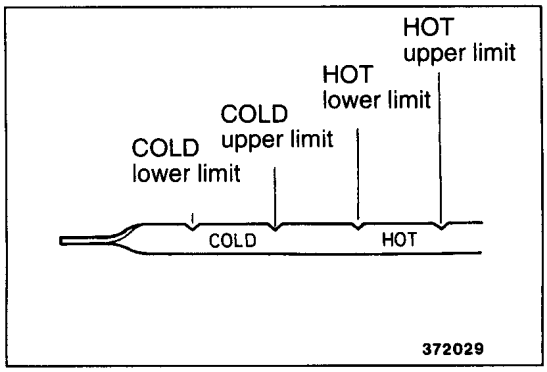


TRA0912

SERVICE ADJUSTMENT PROCEDURES

120002625

AUTOMATIC TRANSMISSION FLUID INSPECTION



(1) Place the vehicle on a level surface.
(2) Before removing the dipstick, wipe all dirt from area around the dipstick.
(3) With the selector lever in the "P" position and the parking brake applied, start the engine.
(4) The engine should be running at idle and the transmission should be warmed up sufficiently. (fluid temperature 70–80°C)
(5) Move the selector lever through all positions to fill the torque converter and hydraulic circuit with fluid. Then place the lever in the "N" position.
(6) Check that fluid is at "HOT" level on the oil level gauge. If fluid level is low, add fluid to "HOT" level.

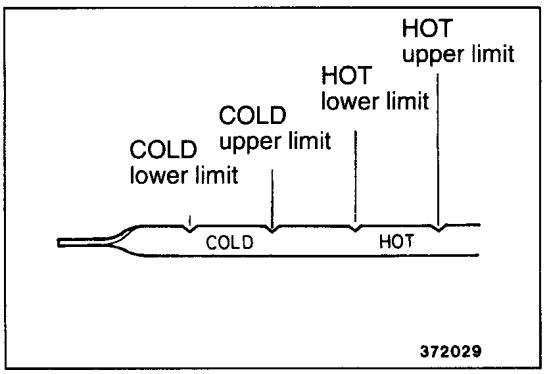
Transmission fluid: DIA QUEEN ATF-SP or equivalent

NOTE
Low fluid level can allow the oil pump to take in air together with fluid, leading to various troubles. Air trapped in hydraulic circuit forms bubbles which make the fluid spongy. This lowers pressure and shows down pressure buildup. If the transmission has too much fluid, gears churn up foam and cause same conditions as when the fluid level is low, resulting in premature deterioration of ATF. In either case, air bubbles can cause overheating and fluid oxidation and varnishing, which can interfere with normal valve, clutch and servo operation. Foaming can also result in fluid escaping from the transmission vent where it may be mistaken for a fluid leak.

(7) Check fluid condition.

NOTE
When fluid smells burned, metal bushing or friction material particles are contaminated and a complete overhaul of the transmission is needed. Be sure to examine fluid on the dipstick closely.

(8) After fluid has been checked, insert the dipstick until it is seated fully to seal out water and dirt.

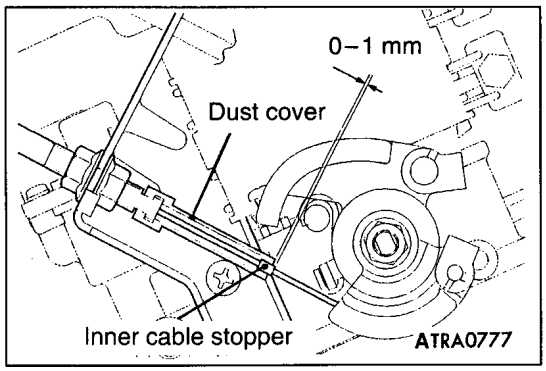


AUTOMATIC TRANSMISSION FLUID CHANGE

120002626

Caution
If ATF change is required due to damage to the transmission, be sure to clean the cooler system.

(1) Raise the vehicle on hoist. Place a drain container with large opening under the drain plug (located in bottom of the oil pan).
(2) Remove the drain plug to let ATF drain.
(3) Install the drain plug and new gasket and tighten to 20 Nm.
(4) Refill ATF through the oil level gauge hole until ATF reaches at COLD lower limit of the level gauge.
(5) Start the engine and allow it to run idle for at least two minutes. Then, with the parking brake and service brake applied, move the selector lever through all positions and finally place in the "N" or "P" position.
(6) After the transmission is warmed up to the normal operating temperature, recheck the fluid level, which must be between the HOT upper limit and HOT lower limit marks.
(7) Insert the dipstick fully to prevent dirt from entering the transmission.



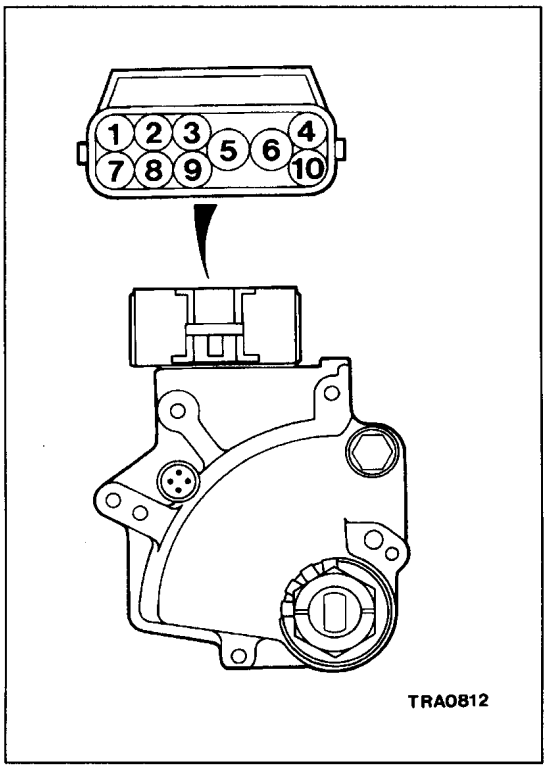
THROTTLE CABLE CHECK AND ADJUSTMENT

120002627

(1) Check the throttle lever and the bracket for deformation.
(2) Measure the distance between the inner cable stopper and the end of the dust cover when the throttle lever is fully opened.

Standard value: 0–1 mm

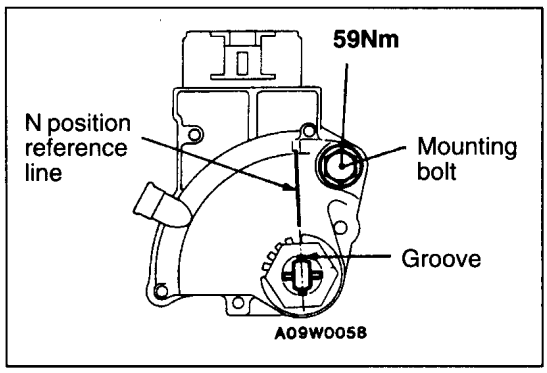
(3) If the distance is not within the standard value, turn the adjusting nut.



INHIBITOR SWITCH CONTINUITY INSPECTION

120002628

Position	Terminal No.									
	1	2	3	4	5	6	7	8	9	10
P	○				○	○				○
R	○								○	
N	○				○	○	○			
D	○							○		
2	○		○							
L	○	○								



INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT

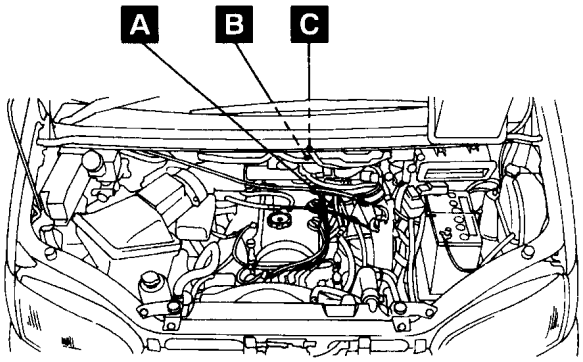
120000578

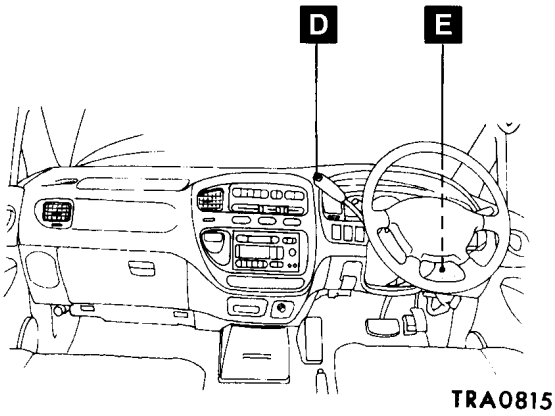
(1) Shift the manual control lever to the N position.
(2) Loosen the inhibitor switch mounting bolt.
(3) Turn the inhibitor switch to align the N position reference line on the inhibitor switch with the groove.
(4) Tighten the mounting bolt to the specified torque.

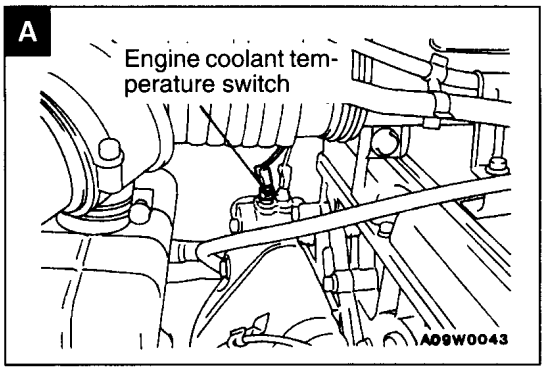
A/T CONTROL COMPONENT LOCATION

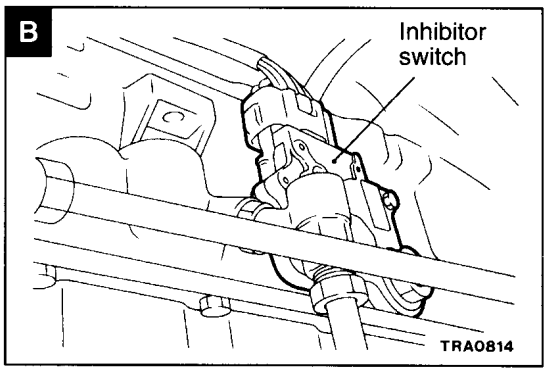
120002629

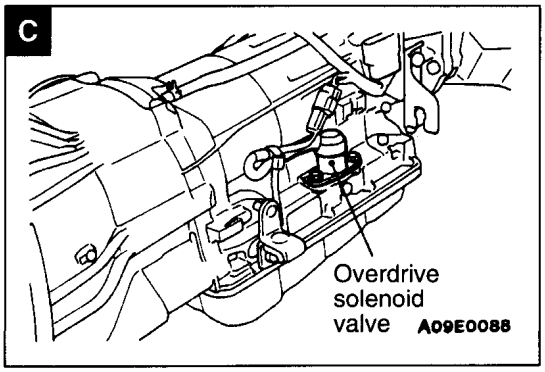
Name	Symbol	Name	Symbol
Overdrive switch	D	Inhibitor switch	B
Overdrive solenoid valve	C	Engine coolant temperature switch	A
Overdrive relay	E	–	–

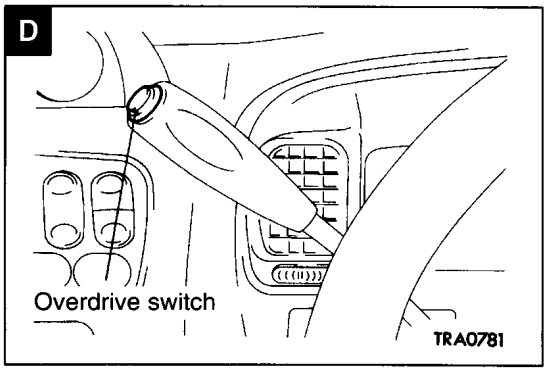


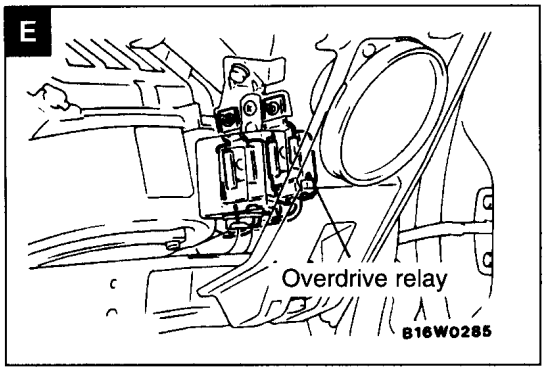












A/T CONTROL COMPONENT INSPECTION

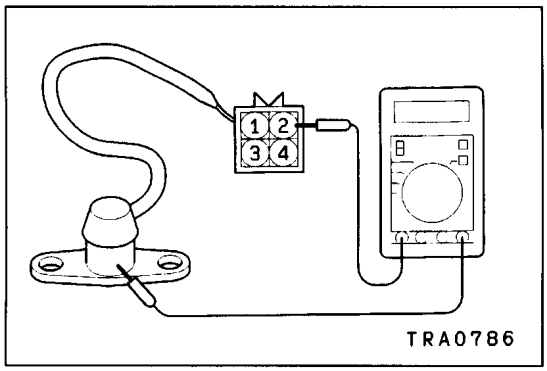
120002630

INHIBITOR SWITCH

Refer to P.23-12.

THROTTLE POSITION SENSOR 120000582

Refer to GROUP 13 – Service Adjustment Procedures.

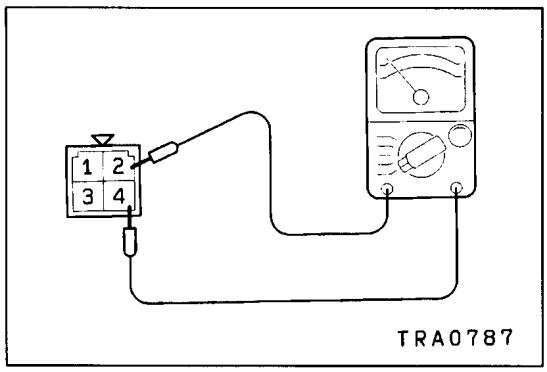


OVERDRIVE SOLENOID VALVE 120000583

(1) Disconnect the overdrive solenoid valve connector.
(2) Measure the resistance between terminal (2) of the overdrive solenoid valve connector and the body earth.

Standard value: Approx. 13Ω

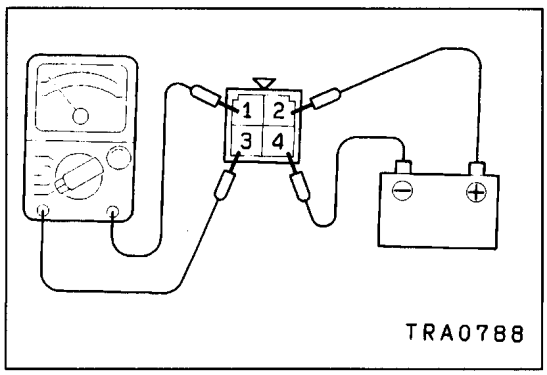
(3) If the resistance is not within the standard value, replace the overdrive solenoid valve.



OVERDRIVE RELAY CONTINUITY 120002631

(1) Remove the overdrive relay.
(2) Check the continuity between the terminals of the overdrive relay.

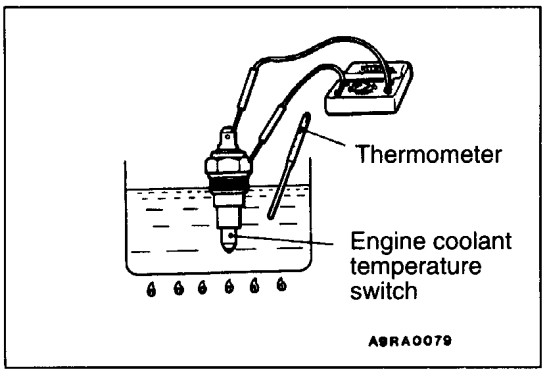
Item	Terminal No.	
	2	4
Overdrive relay	○	○



(3) Use jumper wires to connect terminal (2) of the overdrive relay to the battery (+) terminal and terminal (4) to the battery (–) terminal.
(4) Connect and disconnect the jumper wire from the battery (–) terminal. Check the continuity between the terminals of the overdrive relay at this time.

Item	Terminal No.	
	1	3
When connected	○	○
When disconnected		

(5) Replace the overdrive relay if necessary.



ENGINE COOLANT TEMPERATURE SWITCH CONTINUITY

120002632

(1) Disconnect the engine coolant temperature switch connector.
(2) Check the continuity between the switch connector terminal and the switch body.

Standard value

Item	Temperature
On (continuity)	50±3°C
Off (no continuity)	43°C

(3) Replace the engine coolant temperature switch if necessary.

CONVERTER STALL TEST 120002633

In this test, the engine maximum speed when the torque converter stalls with the shift lever in the "D" or "R" range is measured to check operation of the torque converter, starter and one-way clutch and check holding performance of the transmission clutch (including brake).

Caution
Do not stand in front or at rear of the vehicle during this test.

(1) Check the transmission fluid level. The fluid temperature should be at the level after normal operation (70–80°C). The engine coolant temperature should also be at the level after normal operation (80–90°C).
(2) Apply chocks to the rear wheels (right and left).
(3) Mount an engine tachometer.
(4) Apply the parking and service brakes fully.
(5) Start the engine.
(6) With the selector lever in the "D" range, fully depress the accelerator pedal and read off the engine maximum speed.

Standard value: 2,100–2,400 r/min. <4G63>
2,300–2,600 r/min. <4G64>

NOTE
When doing so, do not keep the engine running with throttle full open for more than necessary duration (5 seconds or more). If two or more stall tests are needed, place the selector lever in the "N" position and run the engine at about 1,000 r/min. to allow the transmission fluid to cool before another stall test.

(7) Place the selector lever in the "R" range and perform the test as above.

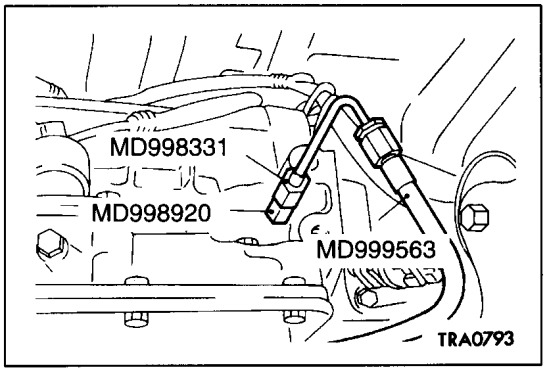
JUDGEMENT OF STALL TEST RESULTS

Stall speed in "D" and "R" range is equal to each other but lower than the nominal value.	(1) Engine output is low. (2) Starter one-way clutch is faulty. (Faulty torque converter is suspected if it is lower than nominal by more than 600 r/min.)
Stall speed in "D" range is higher than nominal.	(1) O.D. clutch slipping (2) O.D. one-way clutch faulty (3) Forward clutch slipping (4) One-way clutch No. 2 faulty (5) Low line pressure
Stall speed in "R" range is higher than nominal.	(1) O.D. clutch slipping (2) O.D. one-way clutch faulty (3) Direct clutch slipping (4) Brake No. 3 slipping (5) Low line pressure

HYDRAULIC PRESSURE TEST 120000596

The hydraulic pressure tests (governor pressure and line pressure tests) are important in determining the causes of transmission failures. Before conducting these tests, fluid level and condition and throttle cable adjustment, etc. must be checked for defects or abnormalities. When conducting the tests, the engine and transmission should be at correct operating temperatures. (engine coolant 80–90°C, transmission fluid 70–80°C.)

GOVERNOR PRESSURE TEST 120002634



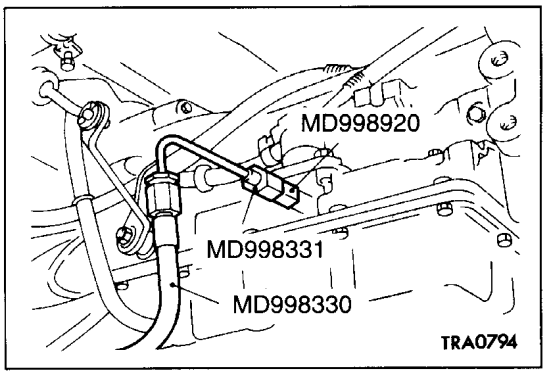
(1) Place vehicle on a chassis dynamometer.
(2) Remove plug from governor pressure take off port.
(3) Install the special tools as shown in figure and place the meter inside vehicle.
(4) Apply parking brake.
(5) Start engine.
(6) Release parking brakes.
(7) Shift to D and measure governor pressure at each output shaft r/min.

Standard value:

Output shaft speed (r/min.)	Governor pressure kPa
1,000	137–166
2,000	245–284
3,200	402–460

JUDGEMENT BY GOVERNOR PRESSURE

Governor pressure is not within the standard value	• Line pressure malfunction • Oil leak in governor circuit • Governor malfunction



LINE PRESSURE TEST

120002635

(1) Place the vehicle on a chassis dynamometer.
(2) Remove the plug from the line pressure take off port.
(3) Install special tool as shown in the figure and place the meter inside vehicle.
(4) Apply the parking brake.
(5) Start the engine.
(6) Place the selector lever in the "D" range.
(7) Depress the brake pedal firmly by the left foot and operate the accelerator pedal by the right foot to measure the line pressure at each engine rpm. If the measured pressure is not nominal, check adjustment of the throttle cable and readjust if necessary before conducting the test again.
(8) Place the selector lever in the "R" range and test as above. When measuring the hydraulic pressure for reverse, change the oil-pressure gauge to 3,000 kPa.

Standard value:

Items	Line pressure kPa	
	"D" range	"R" range
At idle	509–588	774–892
At stall	1,078–1,274	1,569–1,961

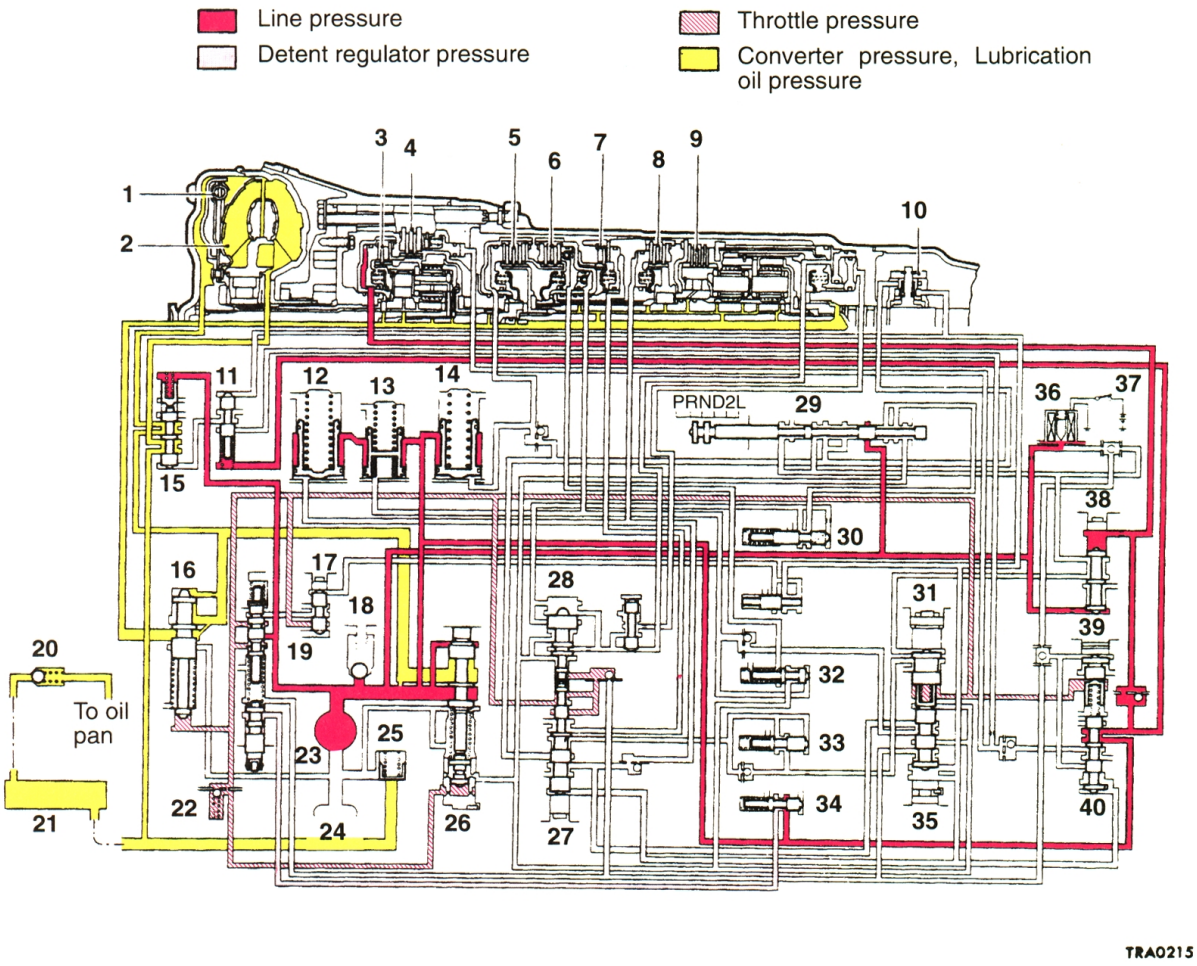
JUDGEMENT BY LINE PRESSURE

Hydraulic pressure higher than nominal in all ranges	(1) Regulator valve faulty (2) Throttle valve faulty (3) Throttle control cable incorrectly adjusted
Hydraulic pressure lower than nominal in all ranges	(1) Oil pump faulty (2) Regulator valve faulty (3) Throttle valve faulty (4) Throttle control cable incorrectly adjusted (5) O.D. clutch faulty
Hydraulic pressure lower than nominal in "D" range	(1) Large fluid leaks in "D" range hydraulic circuit (2) Forward clutch faulty (3) O.D. clutch faulty
Hydraulic pressure lower than nominal in "R" range	(1) Large fluid leaks in "R" range hydraulic circuit (2) Brake No. 3 faulty (3) Direct clutch faulty (4) O.D. clutch faulty

HYDRAULIC CIRCUIT

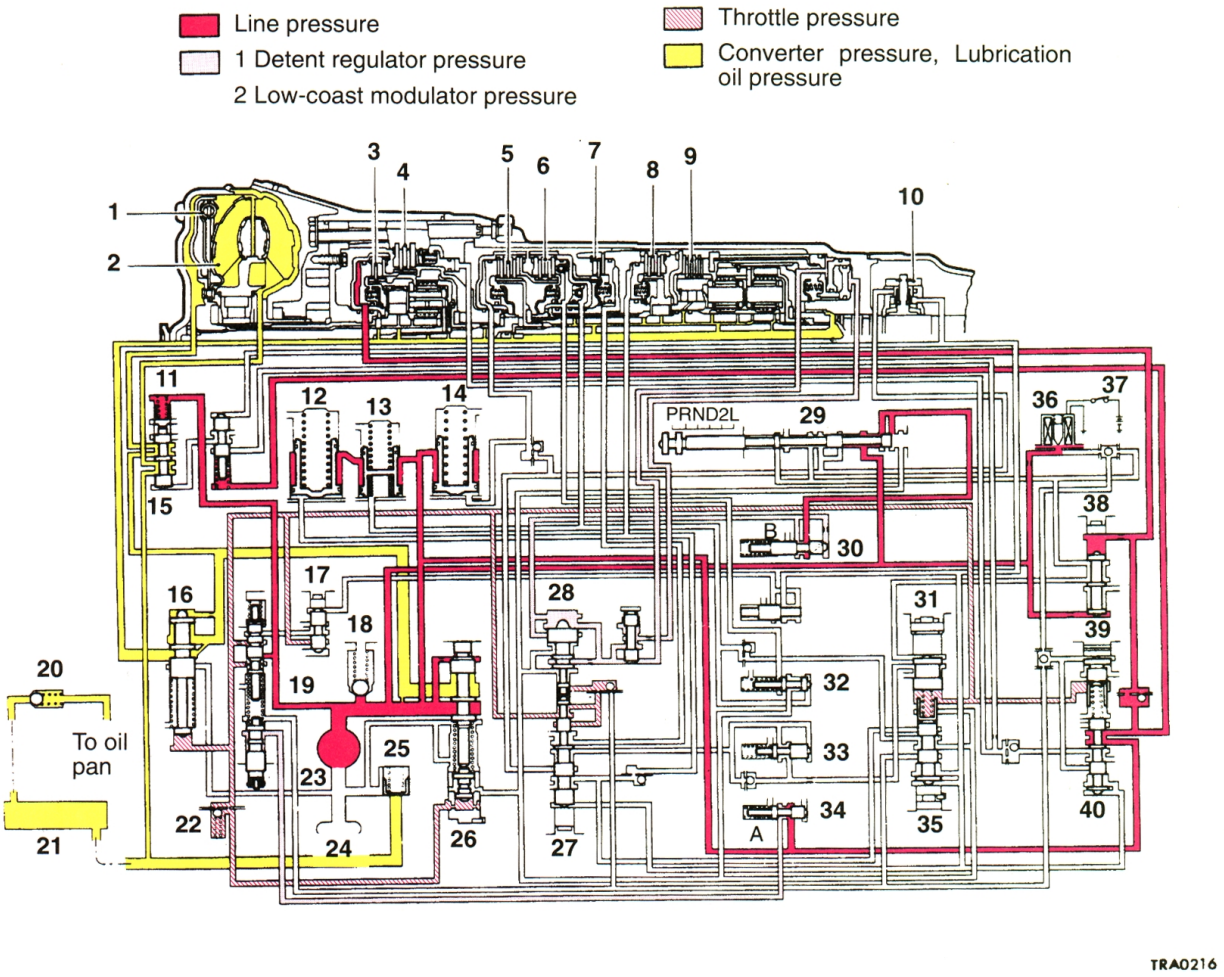
120002636

N (NEUTRAL)



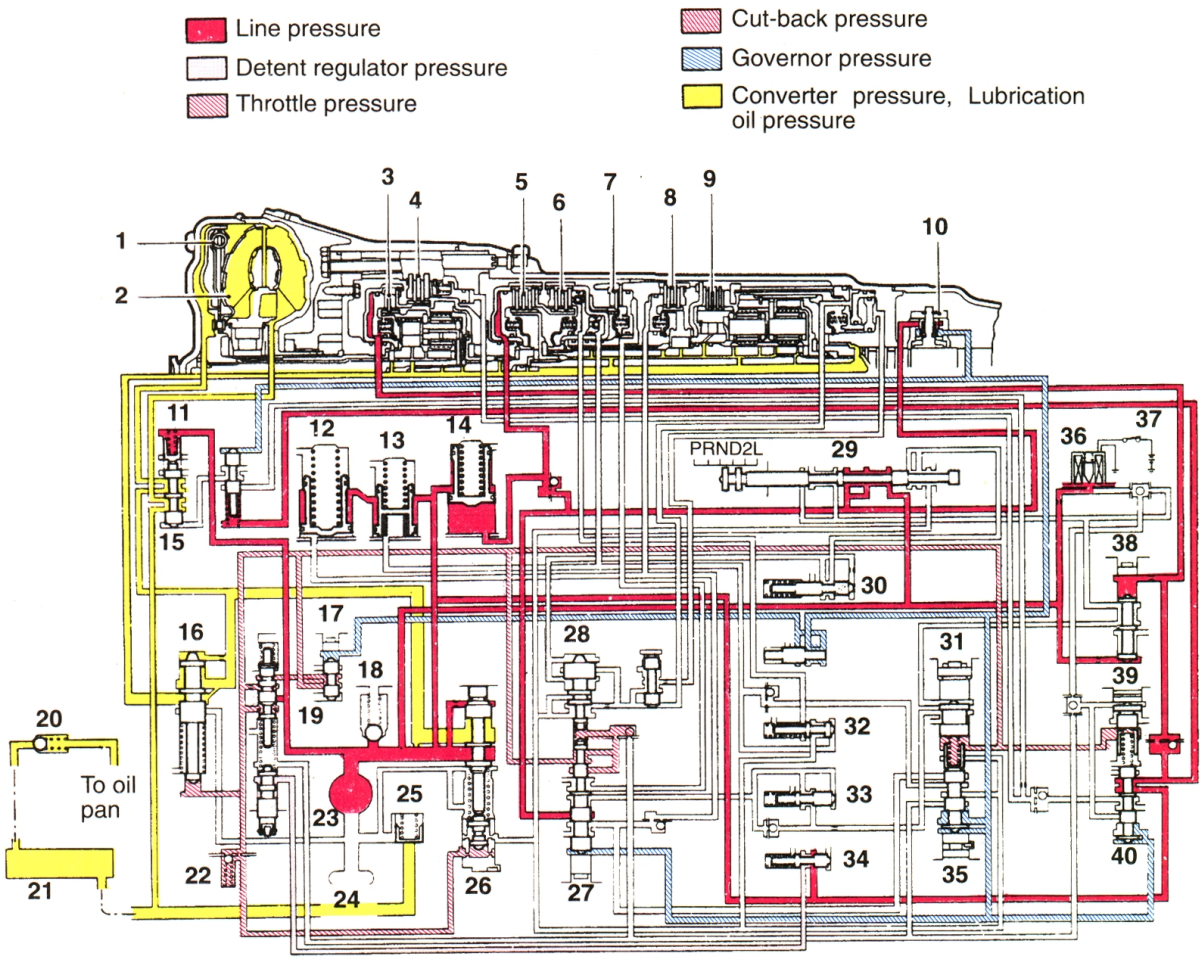
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

P (PARKING)



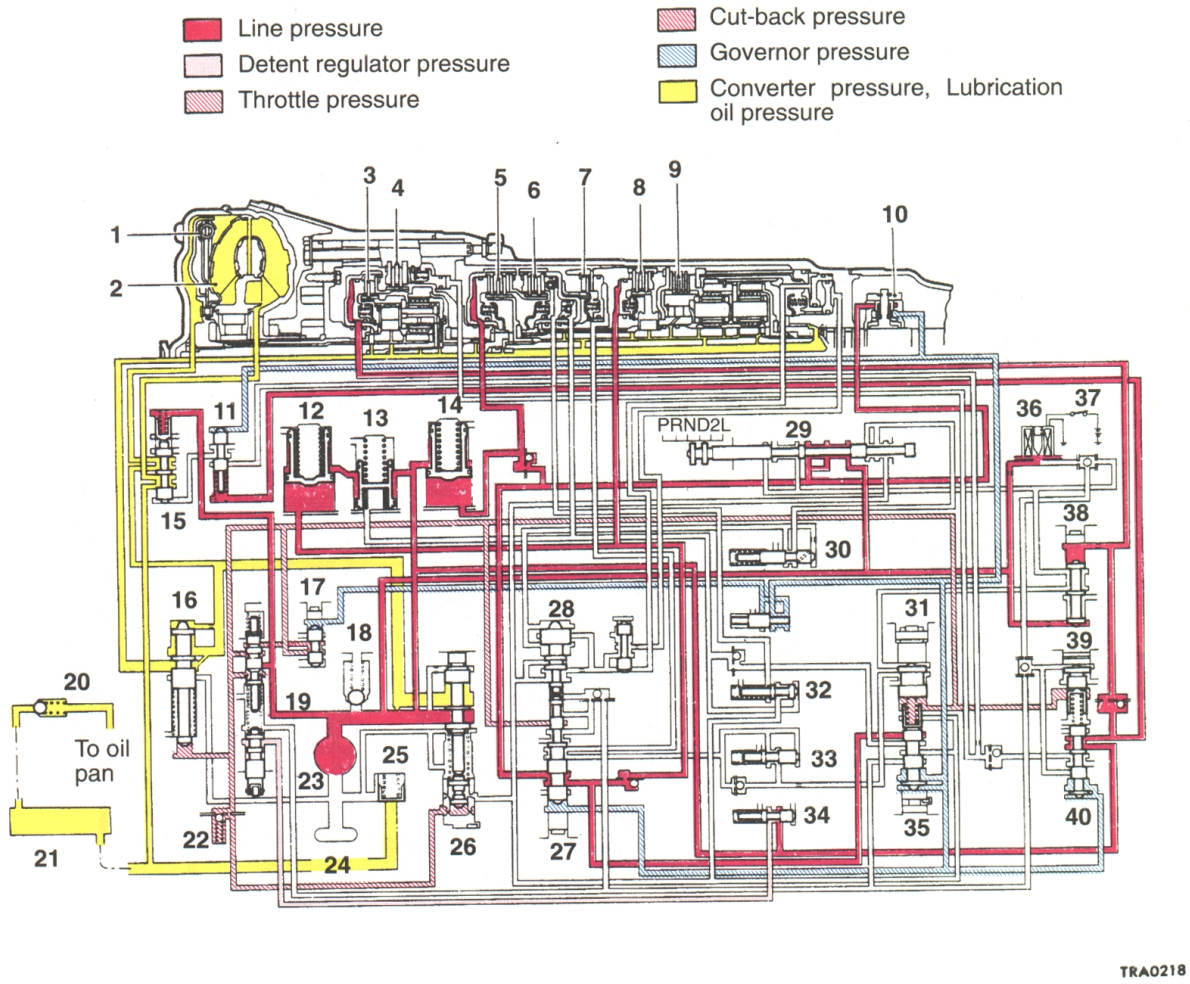
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

D-1 (DRIVE 1ST)



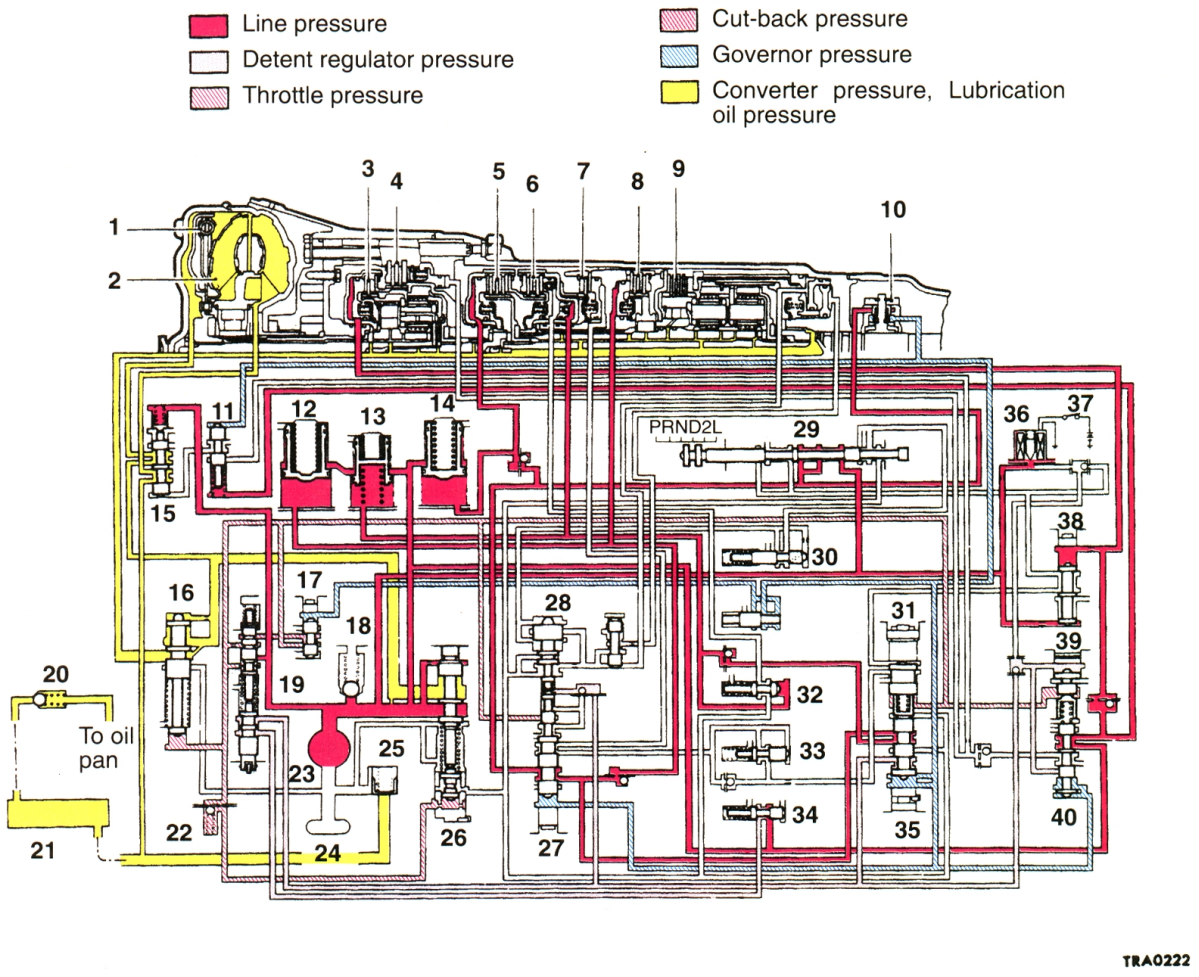
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

D-2 (DRIVE 2ND)



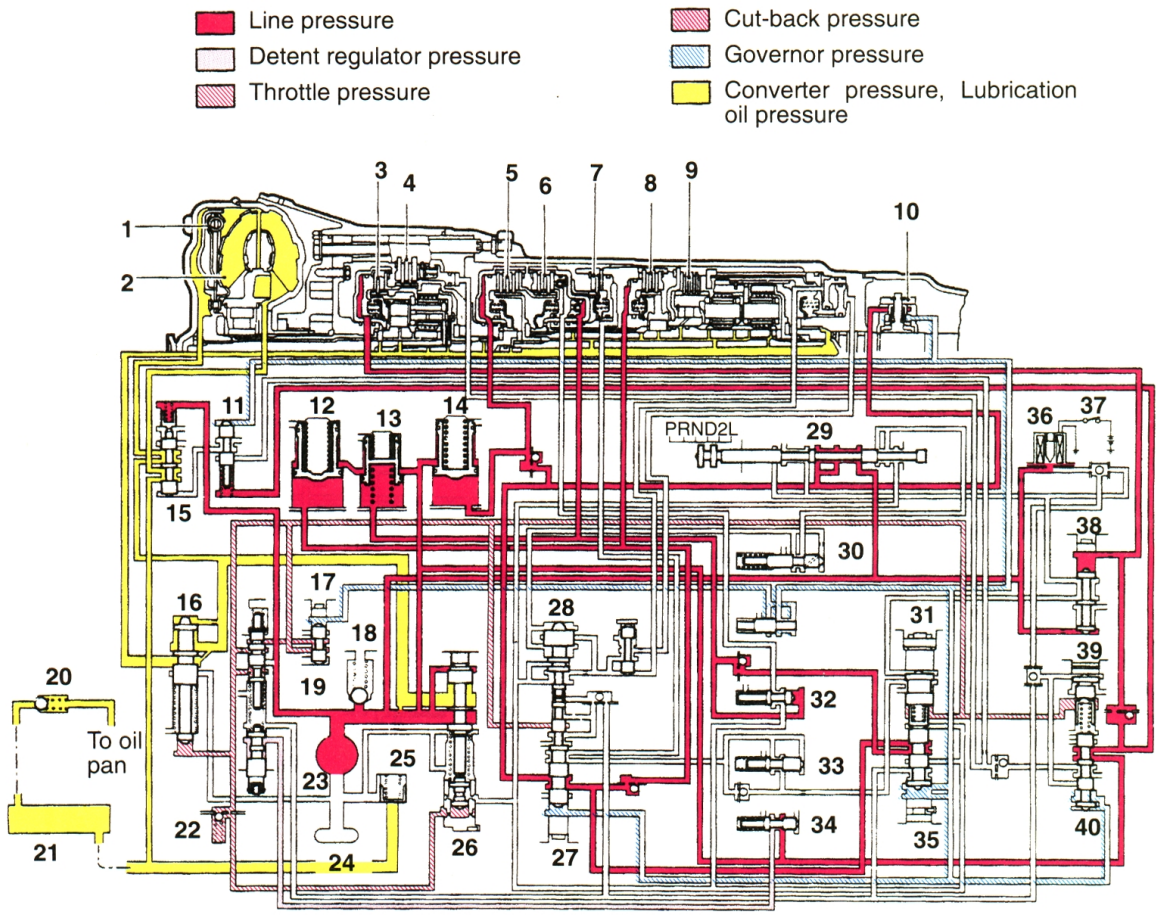
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

D-3 (DRIVE 3RD)



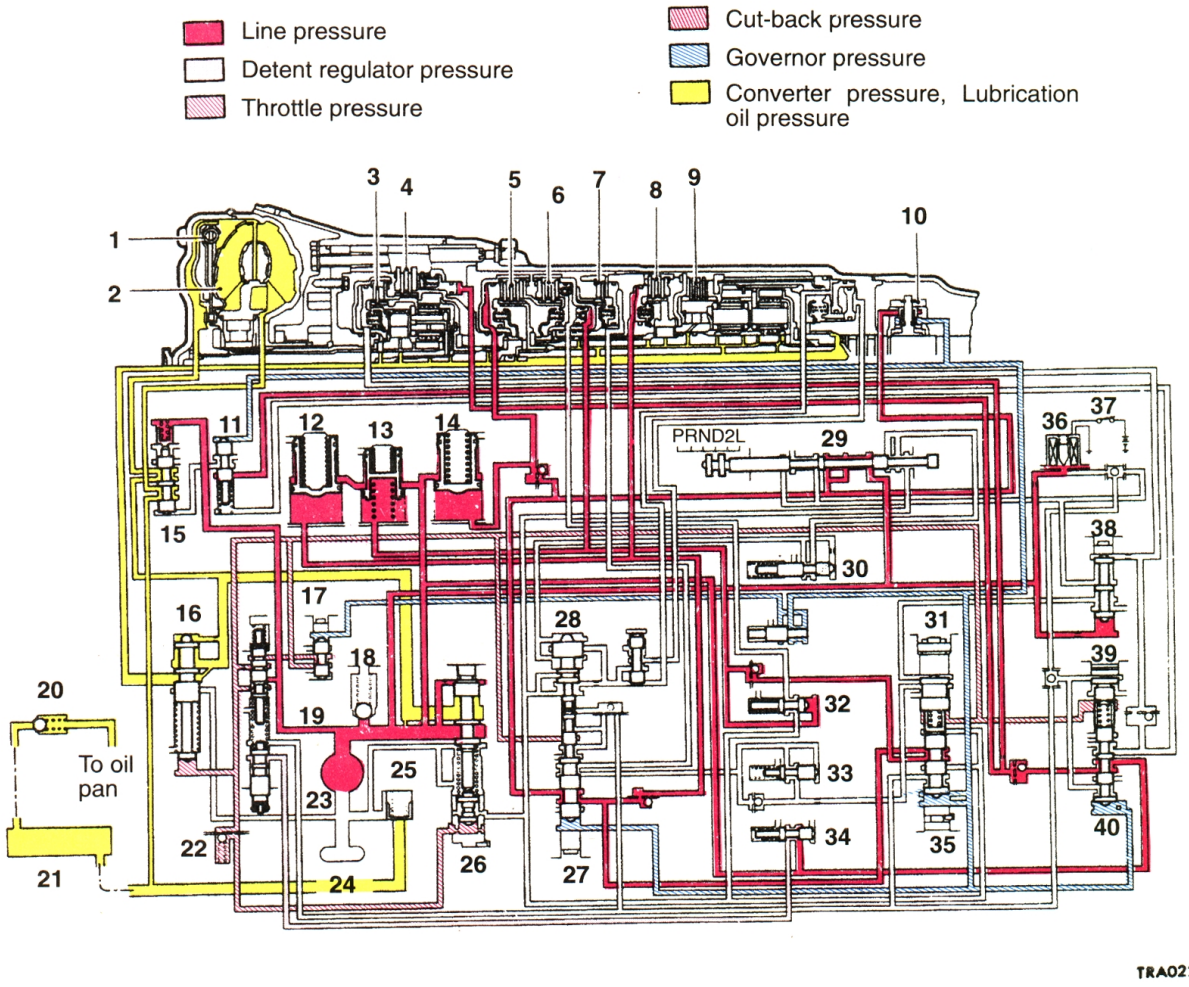
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

D-4 (DRIVE 4TH)
LOCK-UP CLUTCH: OFF



1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

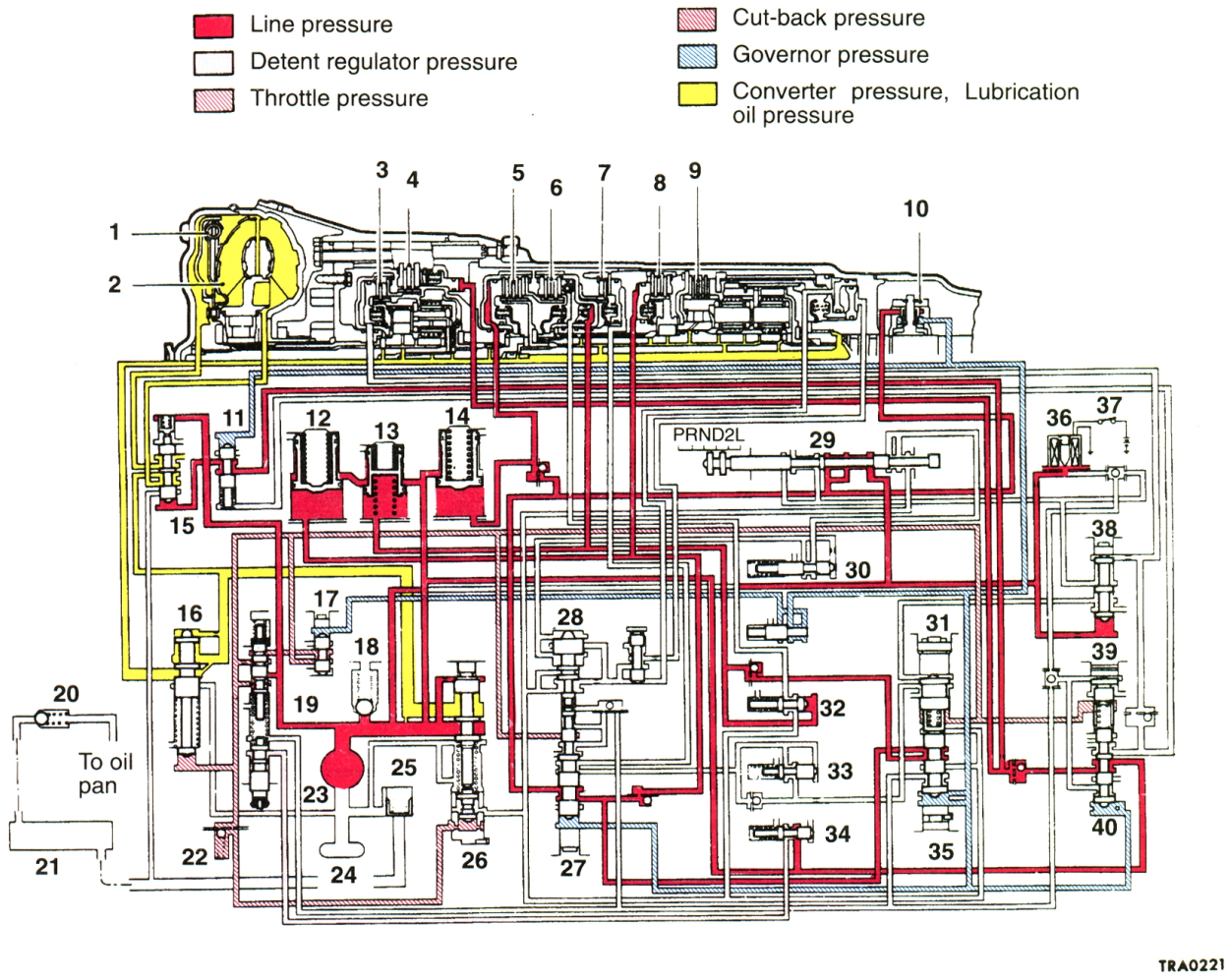
D-4 (DRIVE 4TH)
LOCK-UP CLUTCH: ON



1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

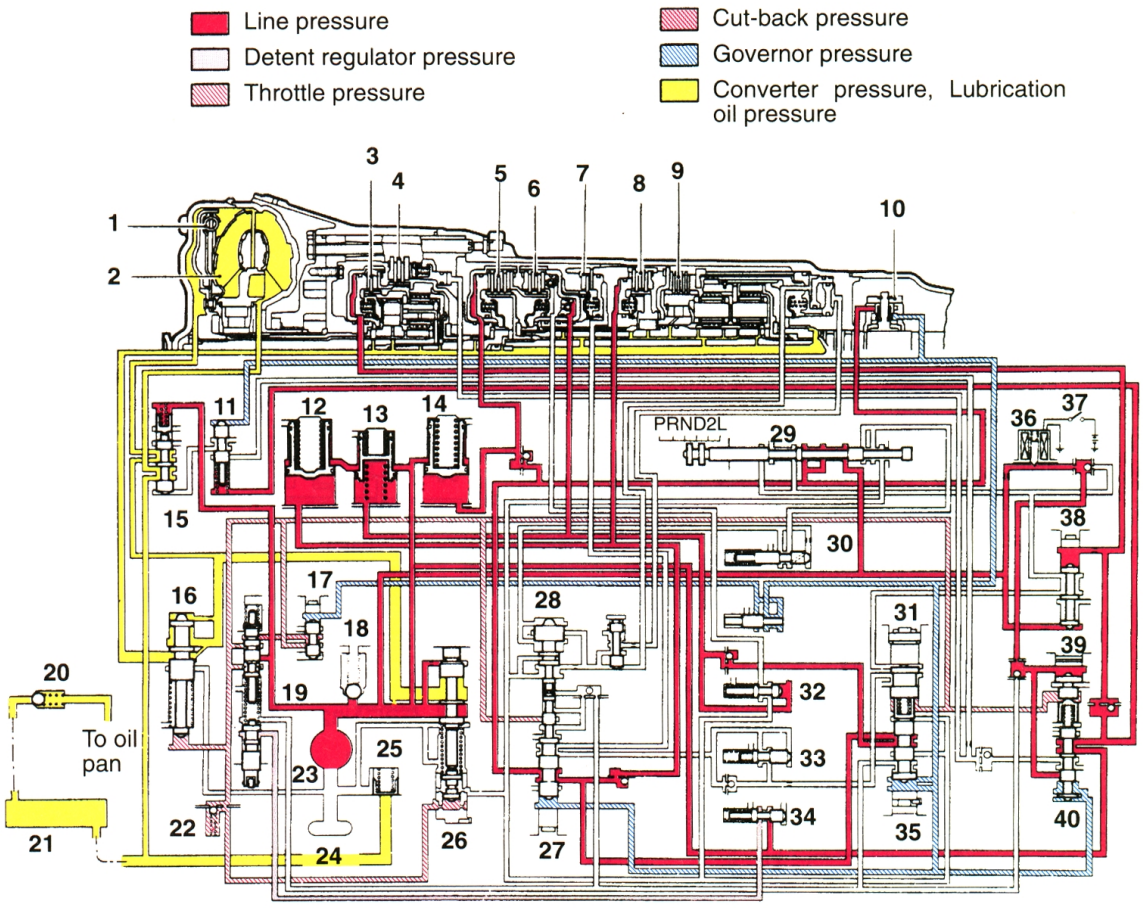
D-K/D (DRIVE KICK DOWN)

4TH➧ 3RD



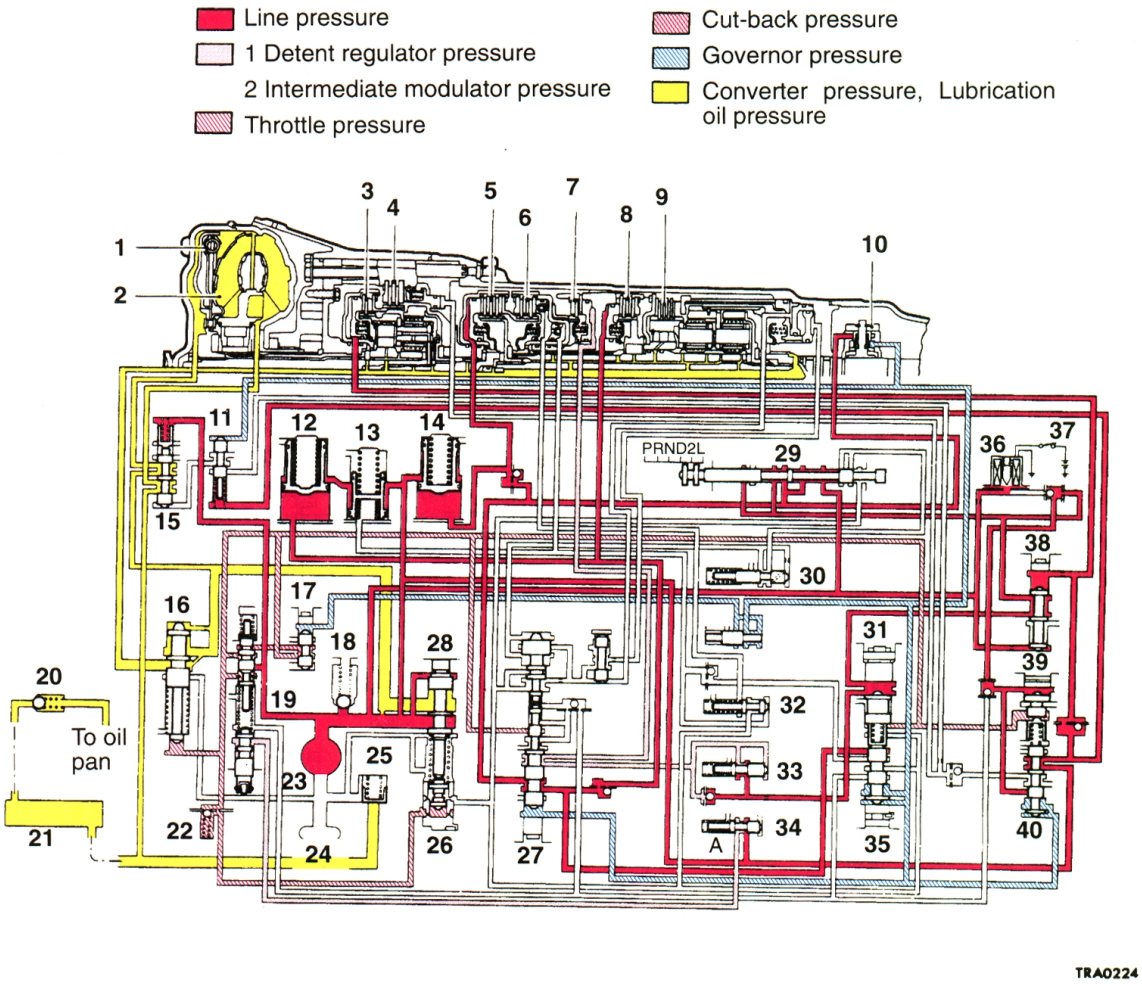
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

D-3 (DRIVE 3RD)
OVERDRIVE SWITCH: OFF



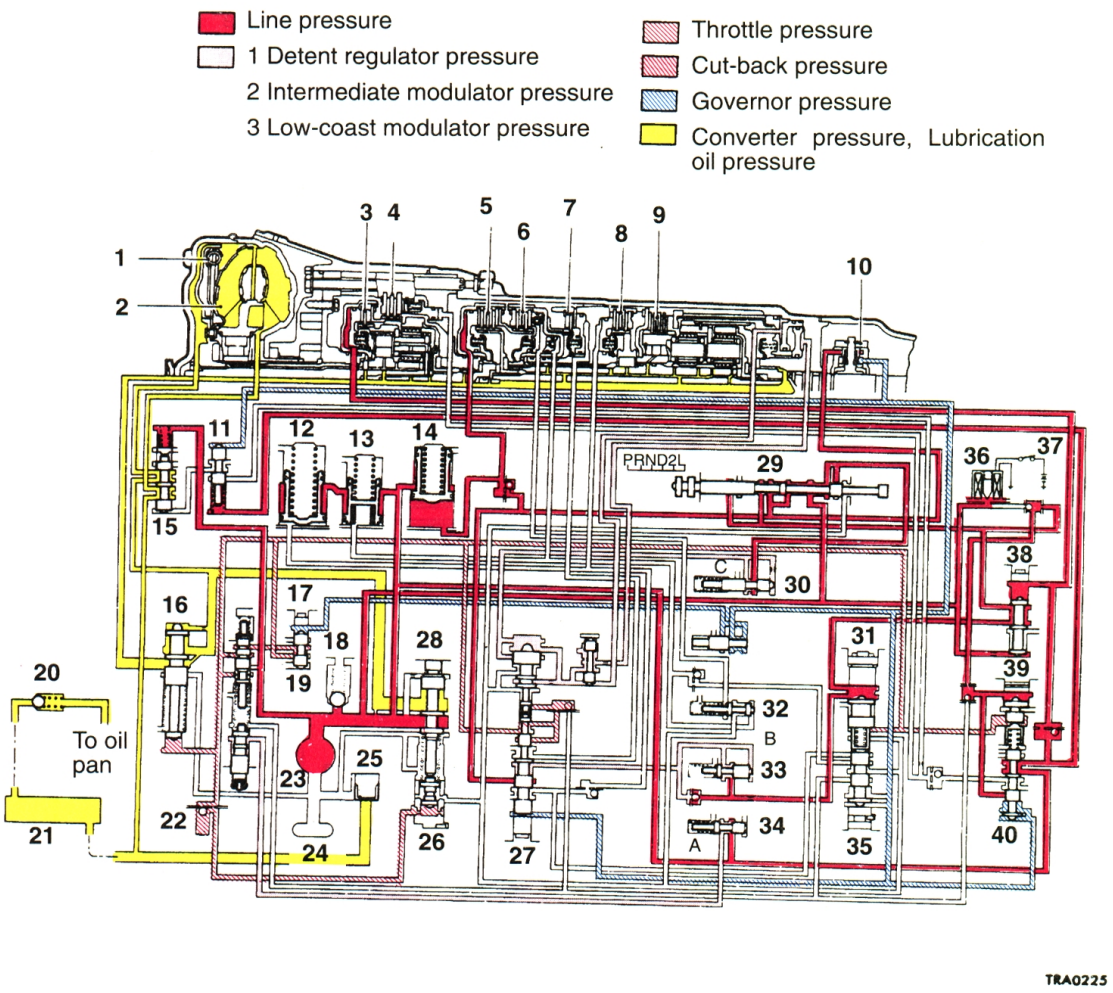
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

2-2 (SECOND 2ND)



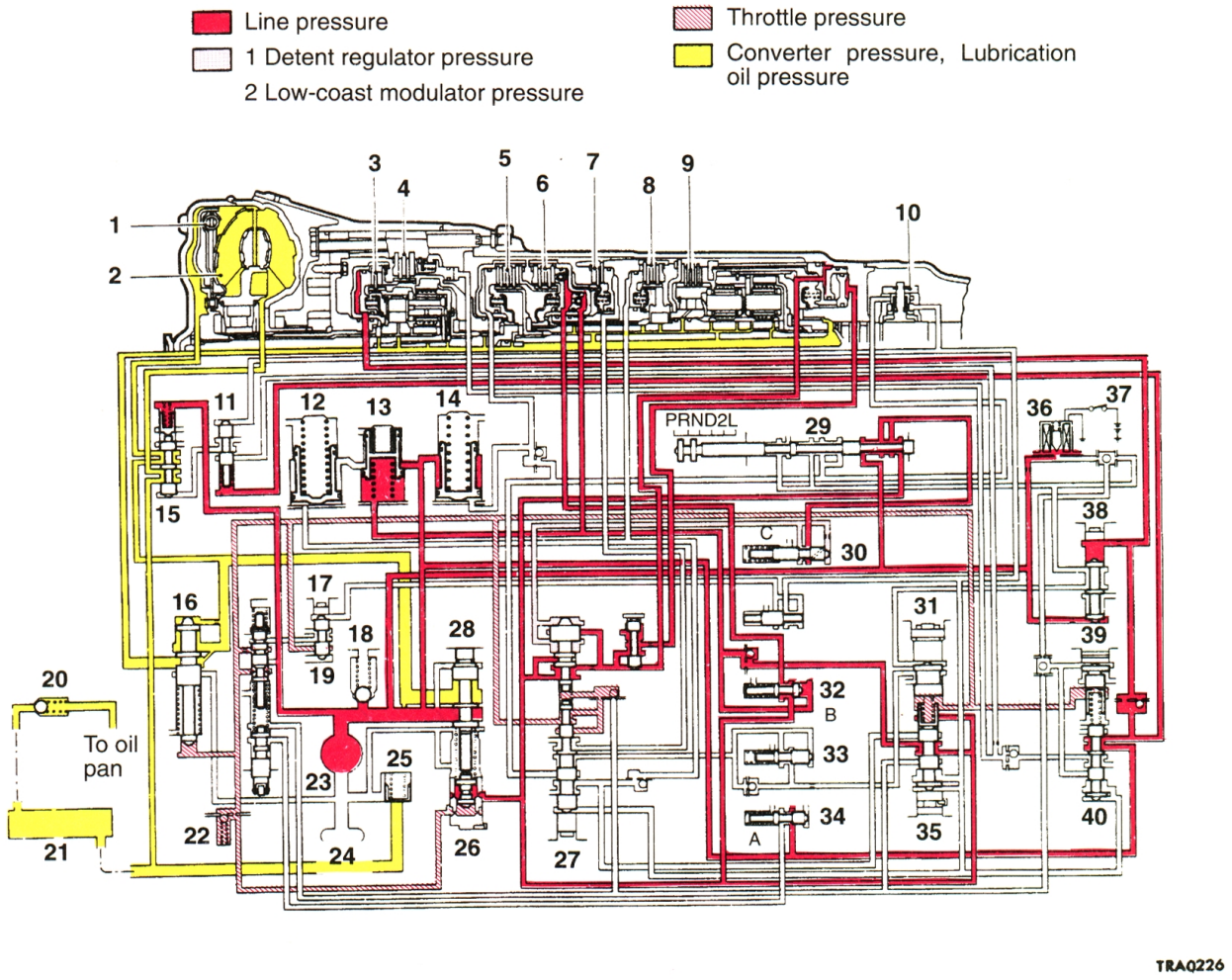
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

L (LOCK UP)



1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

R (REVERSE)



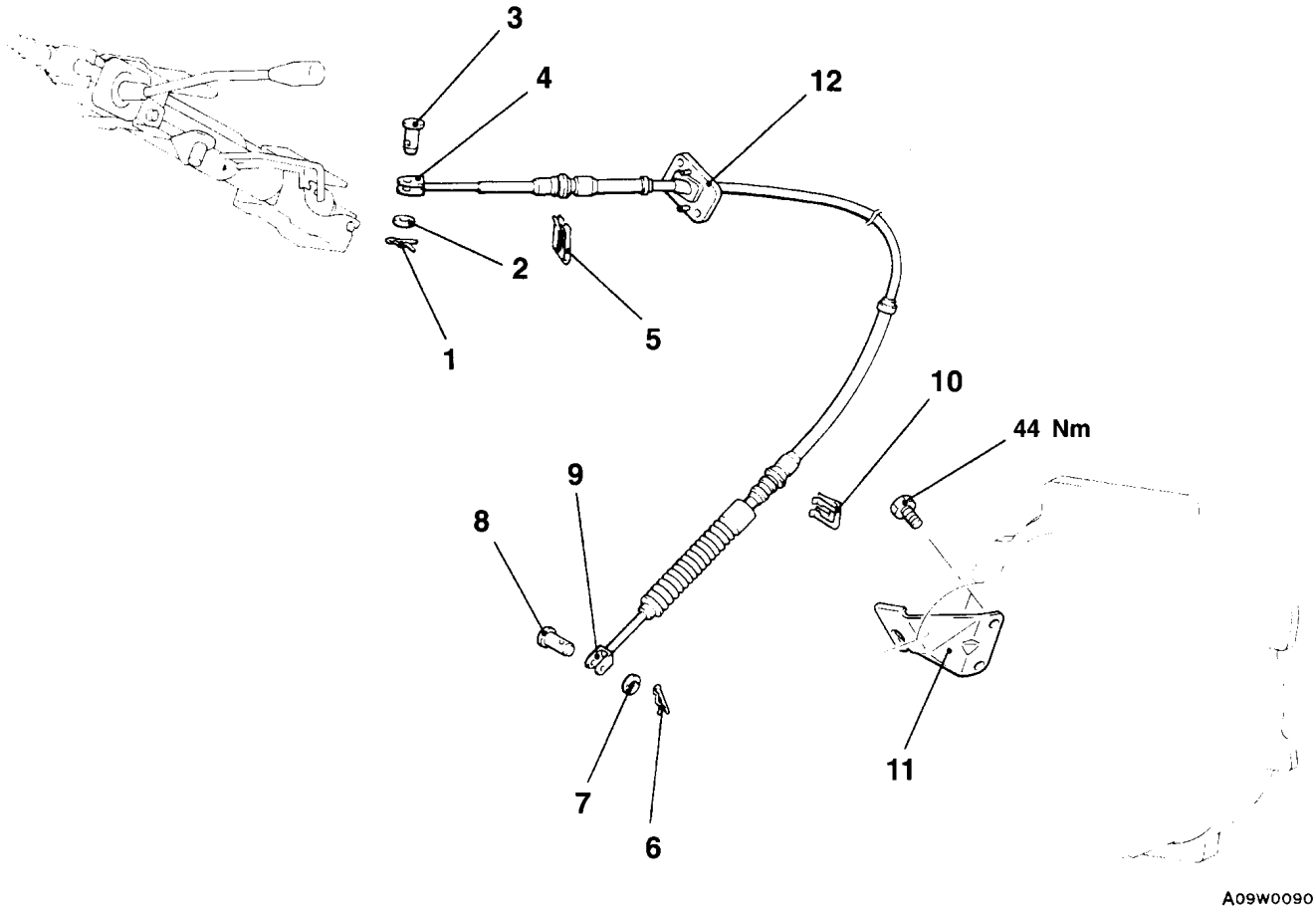
1. Lock-up clutch
2. Torque converter
3. Overdrive clutch
4. Overdrive brake
5. Forward clutch
6. Direct clutch
7. Brake No. 1
8. Brake No. 2
9. Brake No. 3
10. Governor
11. Lock-up signal valve
12. Accumulator B2
13. Accumulator C2
14. Accumulator C3
15. Lock-up relay valve
16. Secondary regulator valve
17. Cut-back valve
18. Relief valve
19. Throttle valve
20. Check valve
21. Oil cooler
22. Damping check valve
23. Oil pump
24. Strainer
25. Cooler bypass valve
26. Primary regulator valve
27. 1-2 shift valve
28. Low-coast shift valve
29. Manual valve
30. Low coast modulator valve
31. Intermediate shift valve
32. Reverse clutch sequence valve
33. Intermediate modulator valve
34. Detent regulator valve
35. 2-3 shift valve
36. Overdrive solenoid valve
37. Overdrive switch
38. D-2 down timing valve
39. 3rd-coast shift valve
40. 3-4 shift valve

TRANSMISSION CONTROL

120002225

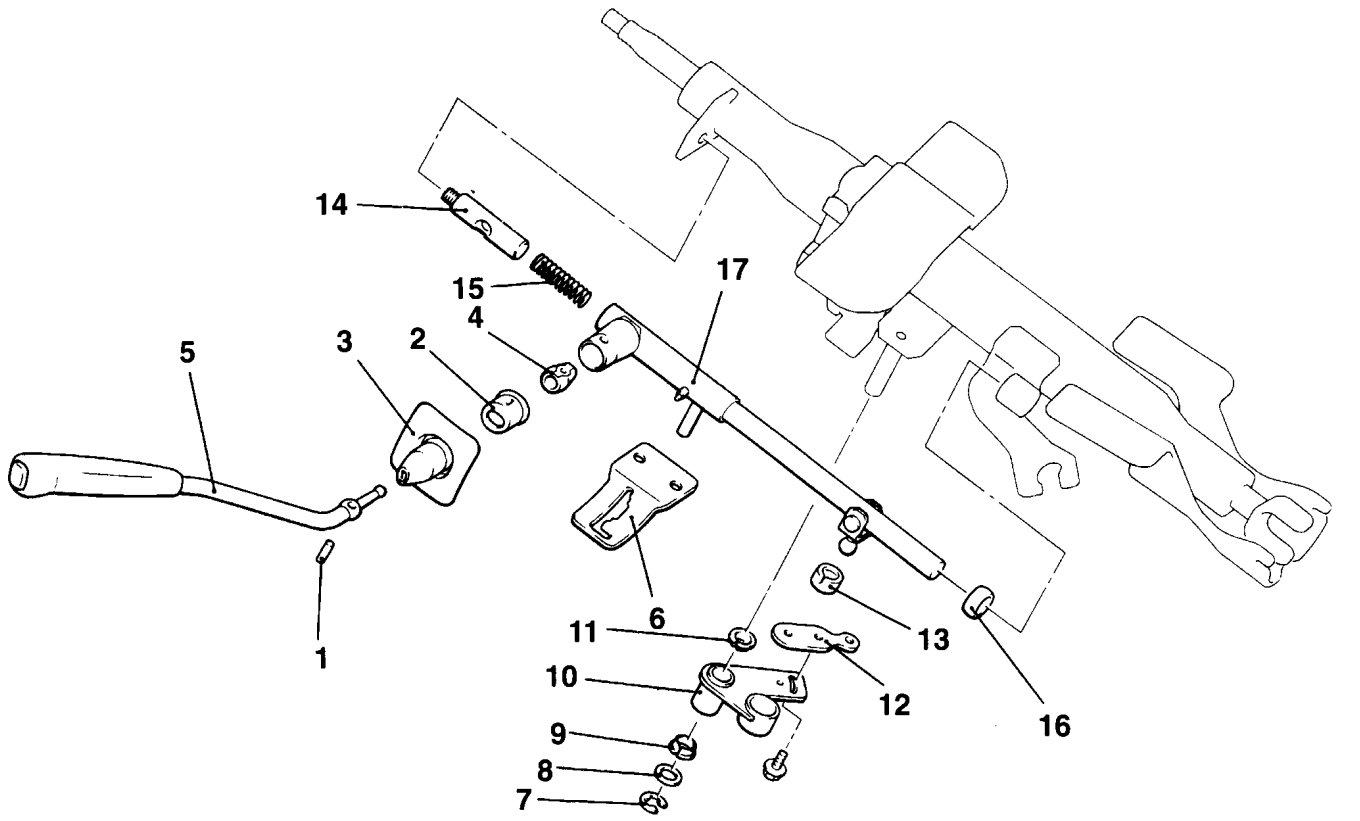
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Air Cleaner Removal and Installation <Petrol-powered vehicles> (Refer to GROUP 15 – Air Cleaner.)
(2)Column Cover Upper, Lower, Under Cover Removal and Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)



Transmission control cable assembly removal steps

1. Snap pin
2. Washer
3. Clevis pin
▶B◀ 4. Transmission control cable connection (selector lever side)
5. Clip
6. Snap pin
7. Washer
8. Clevis pin
9. Transmission control cable connection (transmission side)
10. Clip
11. Shift control bracket
12. Transmission control cable assembly

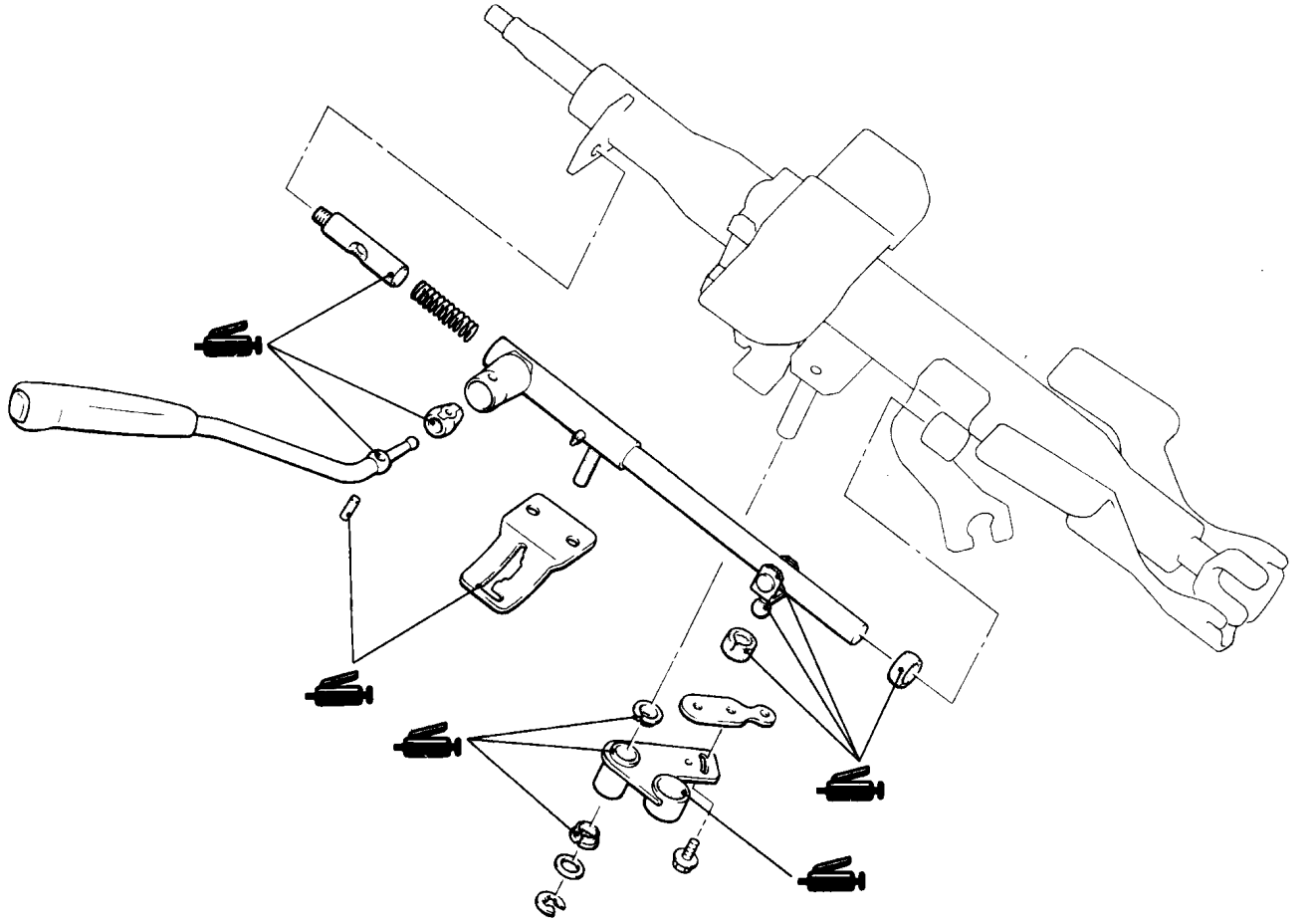


A09W0065

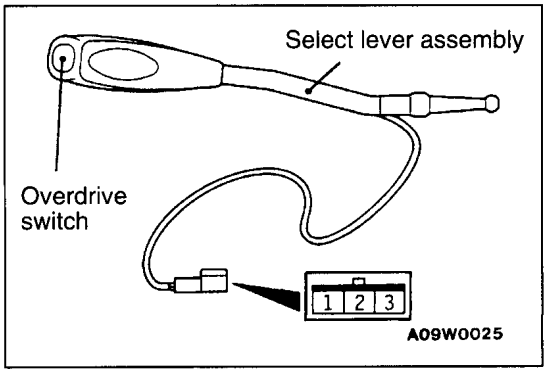
Control rod removal steps

1. Pin
2. Retainer
3. Boot
4. Selector lever support cover
5. Selector lever assembly
6. Detent plate
7. Snap ring
8. Washer
9. Bushing
10. Shift link lever
11. Bushing
12. Lever
13. Bushing
▶A◀ 14. Shift lever guide
15. Spring
16. Bushing
17. Control rod

Lubricant points



A09W0064

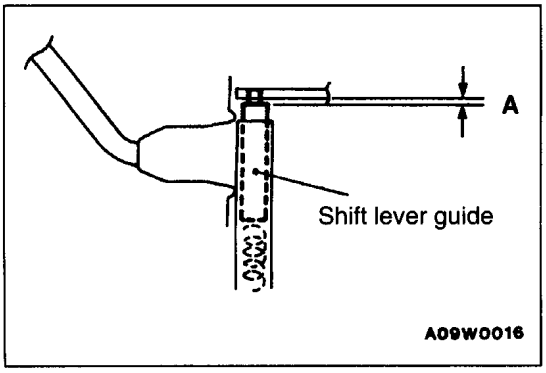


A09W0025

INSPECTION

OVERDRIVE SWITCH CONTINUITY INSPECTION

Switch position	Terminal No.		
	1	2	3
OFF	○		○
ON	○	○	

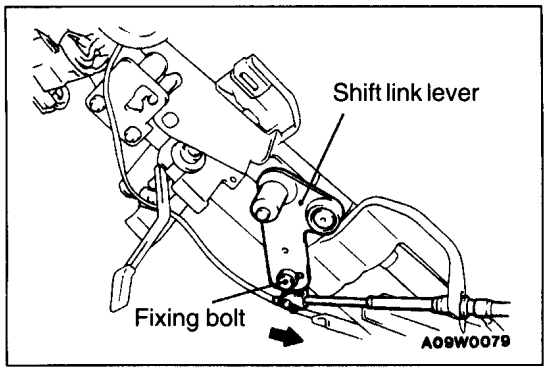


INSTALLATION SERVICE POINTS

▶A◀ SHIFT LEVER GUIDE INSTALLATION

Install so that the distance shown in the illustration is at the standard value.

Standard value (A): 2.4–3.6 mm



▶B◀ TRANSMISSION CONTROL CABLE (SELECTOR LEVER SIDE) INSTALLATION

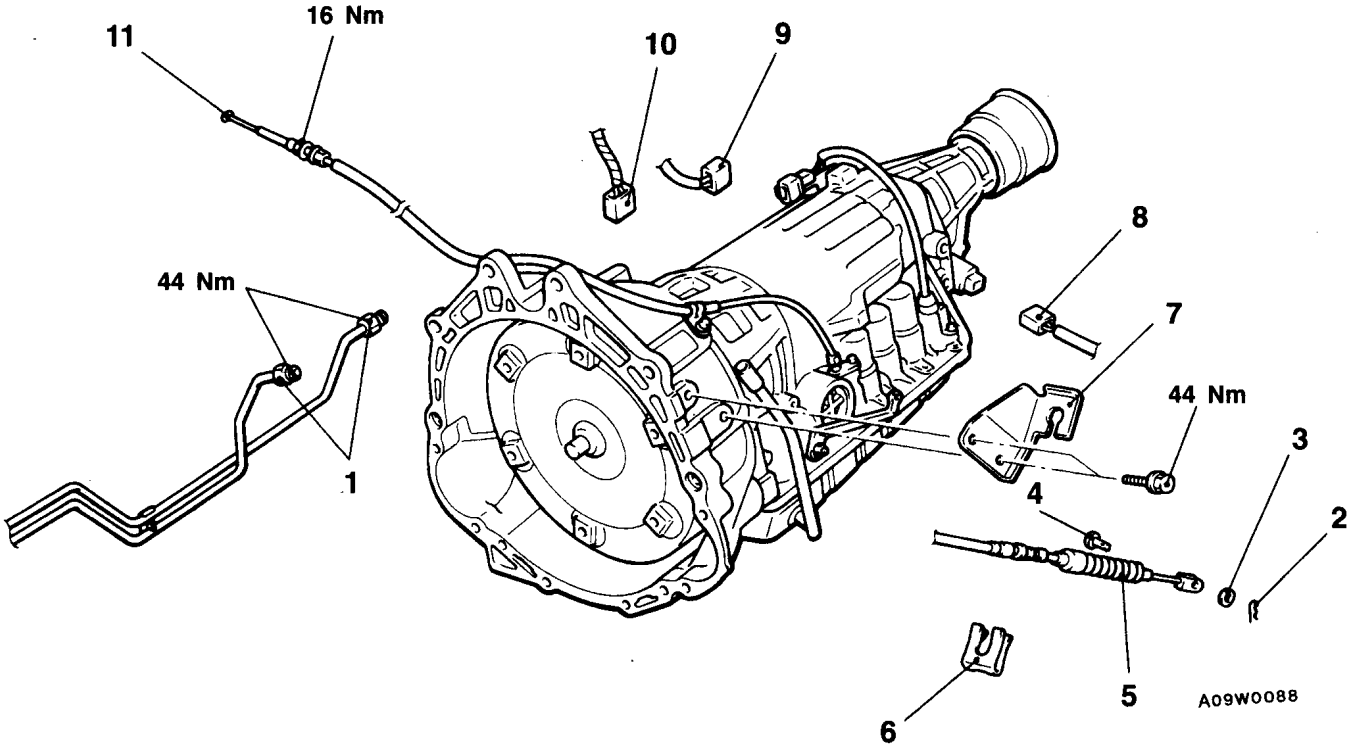
(1) Shift the selector lever to the N position.
(2) Tighten the fixing bolt while gently pushing the shift link lever in the direction of the arrow in the illustration.

TRANSMISSION ASSEMBLY

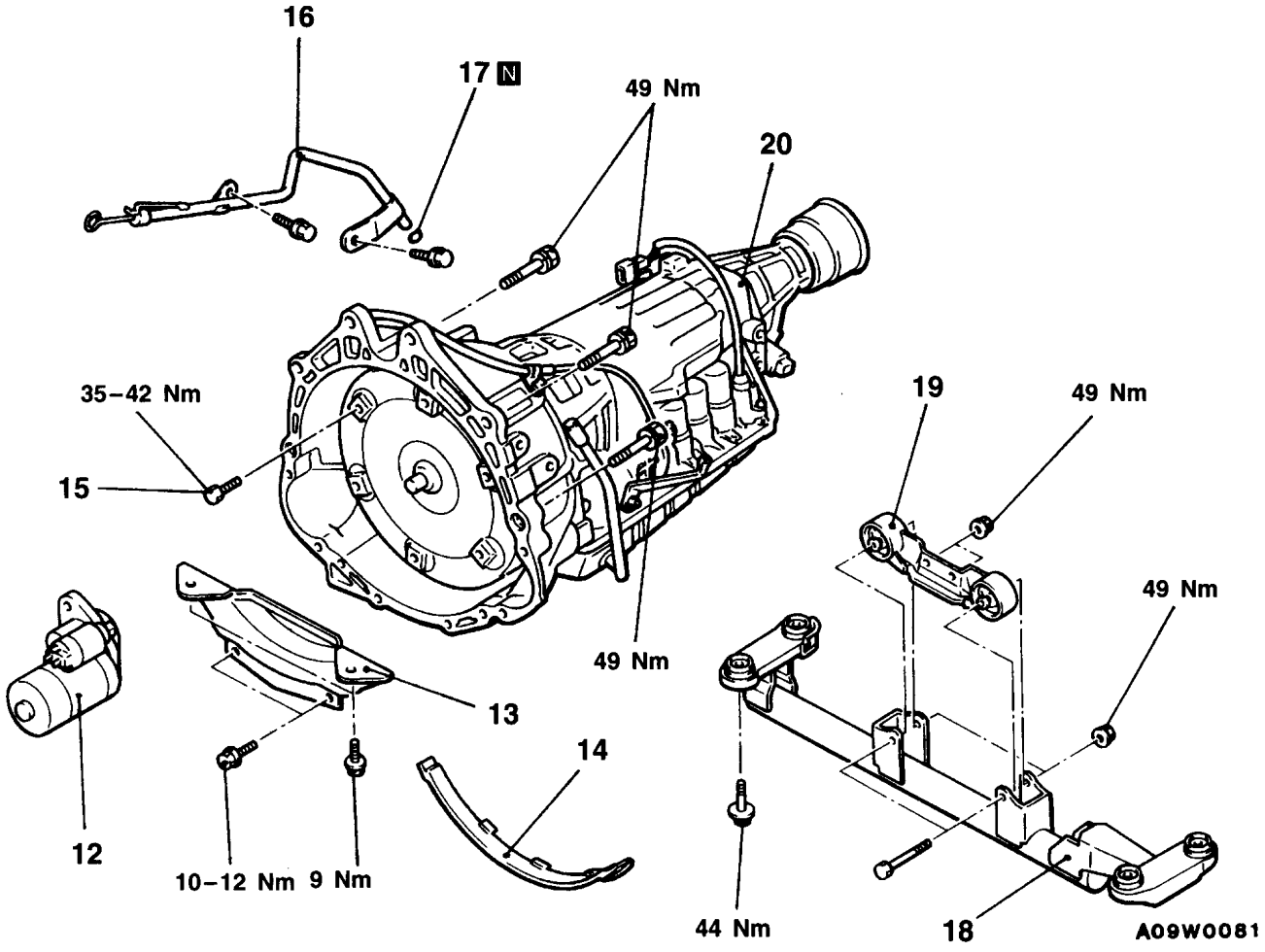
120002226

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Transmission Fluid Draining and Supplying (Refer to P. 23-11.)
(2)Under Cover Side Panel, Under Cover Panel Removal and Installation (Refer to GROUP 42 – Under Cover.)
(3)Propeller Shaft Removal and Installation (Refer to GROUP 25 – Propeller Shaft.)
(4)Front Exhaust Pipe (L.H), (R.H) Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(5)Battery, Battery Tray Removal and Installation



Removal steps
1. Oil cooler tube connection
2. Snap pin
3. Washer
4. Pin
5. Transmission control cable connection
6. Clip
7. Shift control bracket
8. Vehicle speed sensor connector
9. Solenoid valve connector
10. Inhibitor switch connector
▶B◀ 11. Throttle cable connection



◀A▶ 12. Starter motor
13. Bell housing cover
14. Fan shroud
◀B▶ 15. Torque converter and drive plate connection bolts
16. Oil level gauge assembly
17. O-ring
• Support the transmission with a transmission jack.
18. Transmission mount crossmember assembly
19. Transmission mount insulator assembly
▶A◀ 20. Transmission assembly

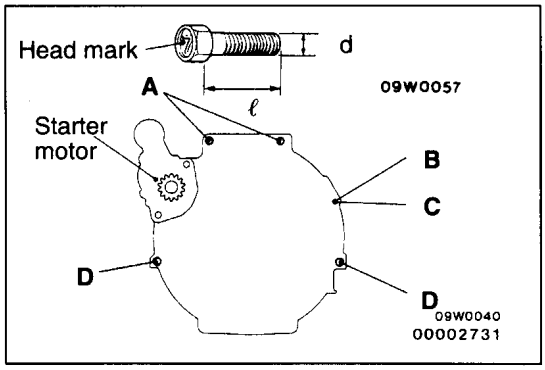
REMOVAL SERVICE POINTS

◀A▶ STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harnesses still connected, and secure it inside the engine compartment.

◀B▶ TORQUE CONVERTER AND DRIVE PLATE CONNECTION BOLTS REMOVAL

(1) Remove the connection bolts (6 places) while turning the crankshaft.
(2) Press in the torque converter to the transmission side so the torque converter does not remain on the engine side.

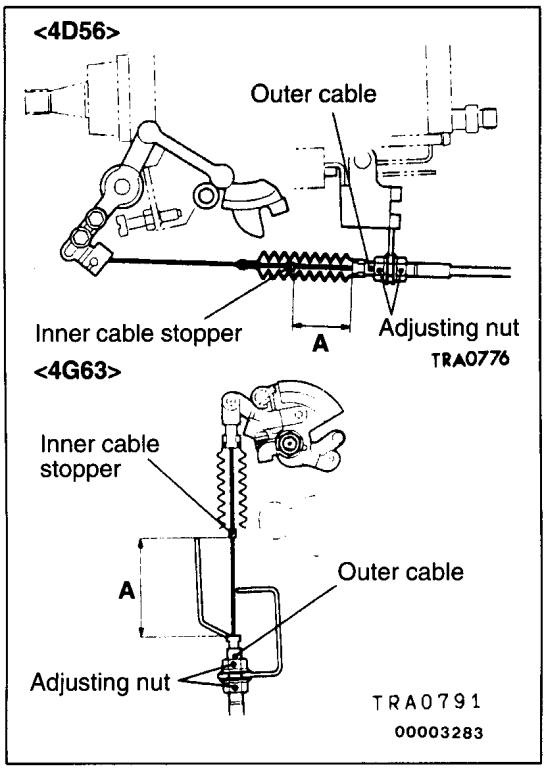


INSTALLATION SERVICE POINTS

▶A◀ TRANSMISSION ASSEMBLY INSTALLATION

The sizes of the mounting bolts are different. So be sure not to confuse them.

Bolt	Head mark	d×ℓ mm
A	7T	10×40
B <4D56>		10×55
C <4G63, 4G64>		10×60
D		10×65



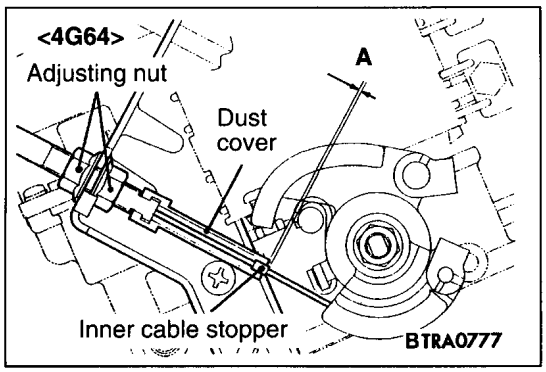
▶B◀ THROTTLE CABLE INSTALLATION

After installing the throttle cable, adjust it by the following procedure.

<4D56, 4G63>

(1) Remove the cable from the boot outer cable side until the inner cable stopper can be seen.
(2) Open the throttle lever completely and adjust the cable with the adjusting nut so that the distance between the inner dable stopper and the outer cable end is at the standard value.

Standard value (A): 34–35 mm <4D56>
54–55 mm <4G63>



<4G64>

Open the throttle lever completely and adjust the cable with the adjusting nut so that the distance between the inner cable stopper and the dust cover end is at the standard value.

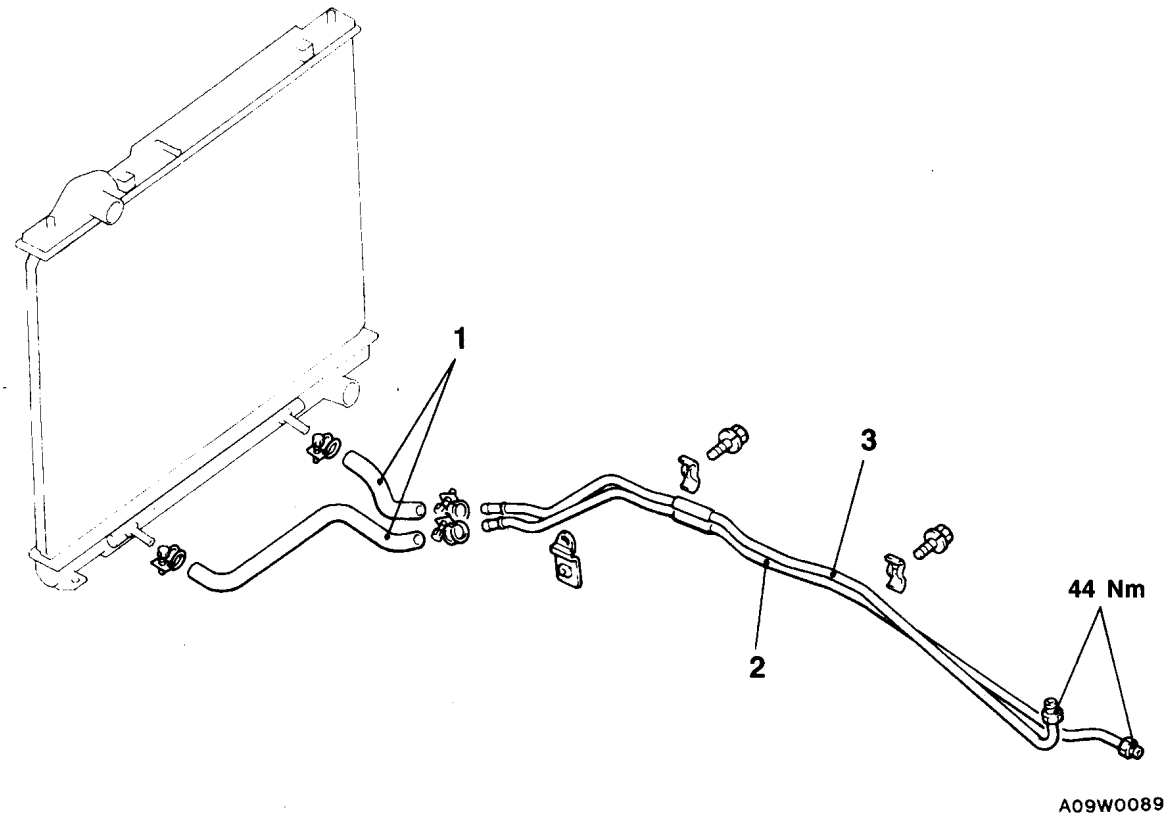
Standard value (A): 0–1 mm

TRANSMISSION OIL COOLER

120002227

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Transmission Fluid Draining and Supplying
(Refer to P. 23-11.)
(2)Front Bumper Removal and Installation
(Refer to GROUP 51 – Front Bumper.)



Removal steps

1. Hose
2. Oil return tube
3. Oil feed tube

PROPELLER SHAFT

CONTENTS

120000377

GENERAL INFORMATION 2
SERVICE SPECIFICATIONS 3
LUBRICANT 3
SPECIAL TOOLS 3
PROPELLER SHAFT 4

GENERAL INFORMATION

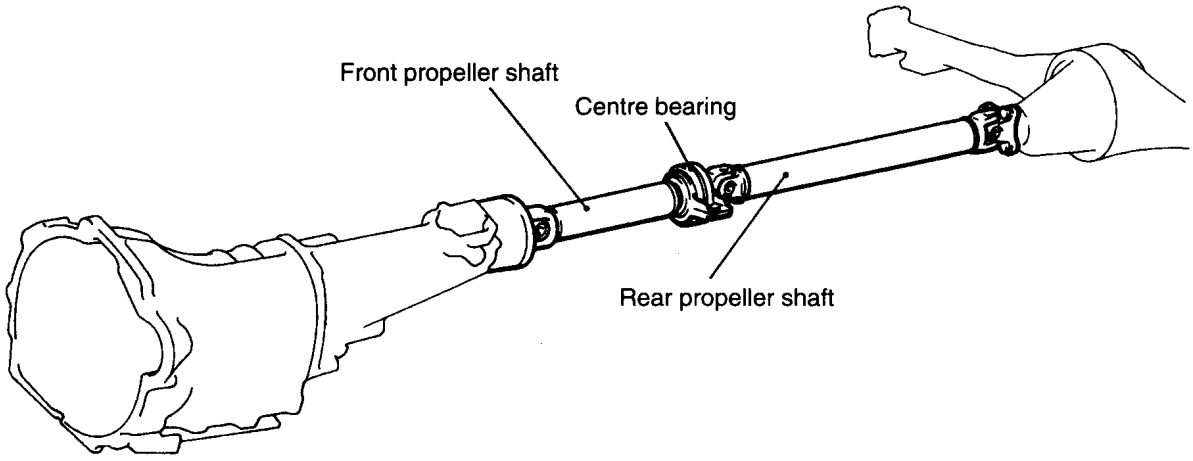
120000378

2WD vehicles have a double-construction 3-joint-type propeller shaft with a centre bearing. 4WD vehicles have a front and rear two-joint propeller shafts. The front propeller shaft has a B.J.-type joint on the transfer side.

CONSTRUCTION DIAGRAM

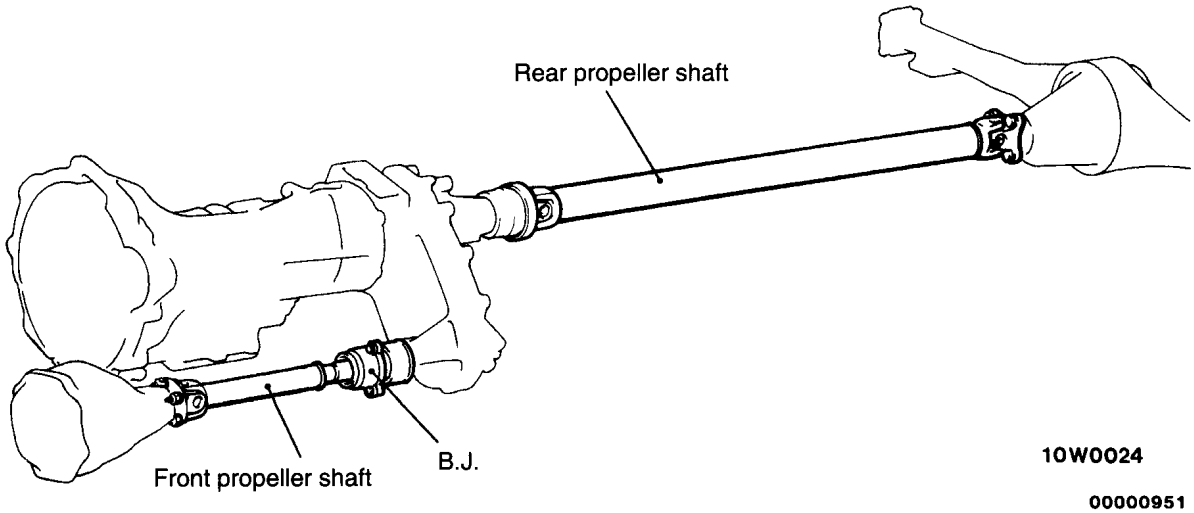
120000379

<2WD>



10W0023

<4WD>



10W0024

00000951

SERVICE SPECIFICATIONS

120000380

Items	Standard value	Limit
Clearance between snap ring and groove wall of yoke mm	0.03 or less	–
Front propeller shaft runout mm	–	0.6
Rear propeller shaft runout mm	–	0.6

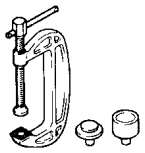
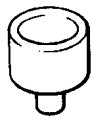
LUBRICANT

120000382

Item	Specified lubricant	Quantity
Sleeve yoke	Hypoid gear oil SAE 75W-85W conforming to API GL-4 or higher	As required

SPECIAL TOOLS

120000381

Tool	Number	Name	Use
	MB990840	Universal joint remover and installer	Disassembly and reassembly of the universal joint
	MB991410	Collar	

PROPELLER SHAFT

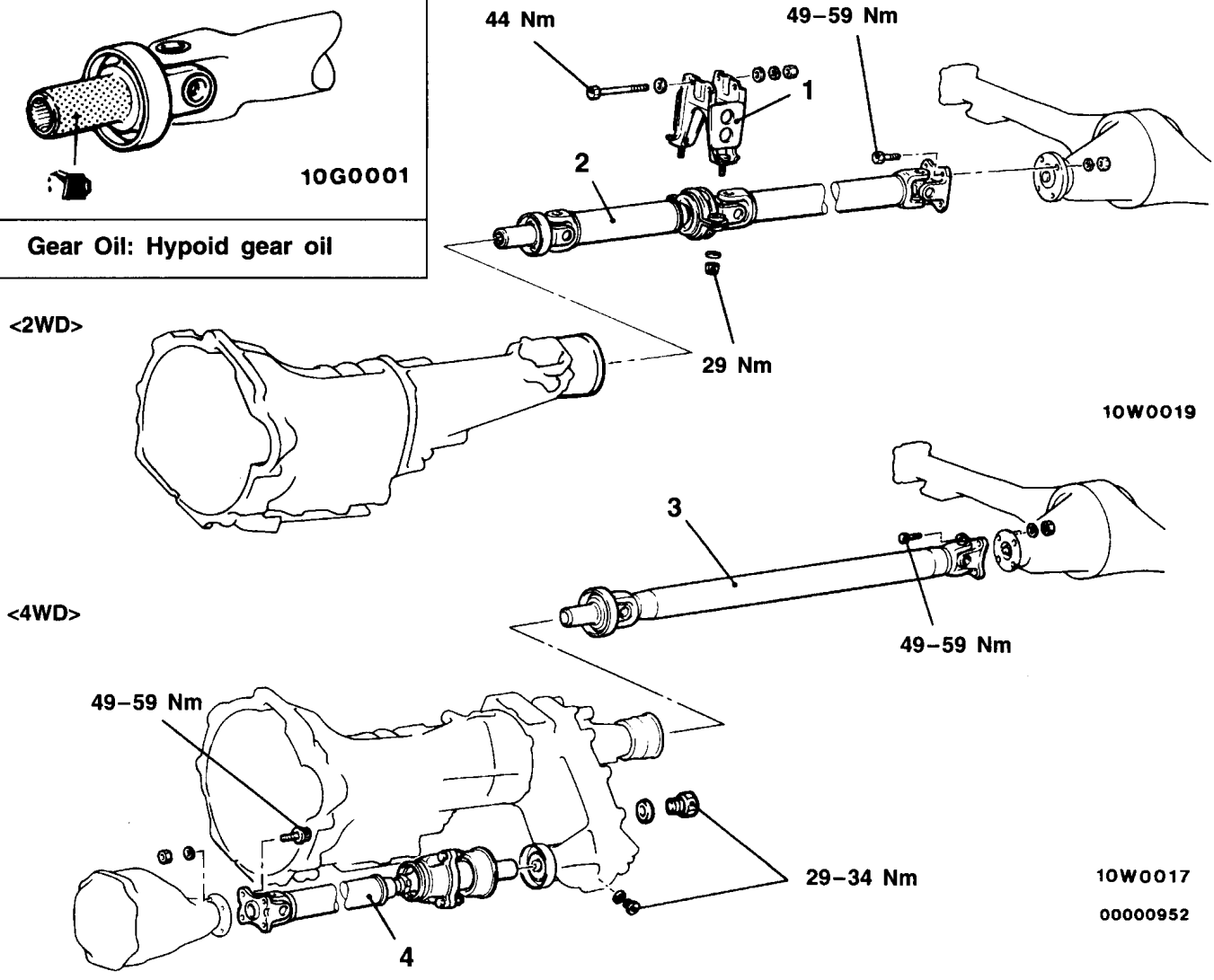
120000383

REMOVAL AND INSTALLATION

Pre-removal Operation <4WD>
1. Set the Transfer Shift Lever to "2H"
2. Draining of the Transfer Gear Oil
   (M/T: Refer to GROUP 22 – Service Adjustment Procedures.)
   (A/T: Refer to GROUP 23 – Service Adjustment Procedures.)

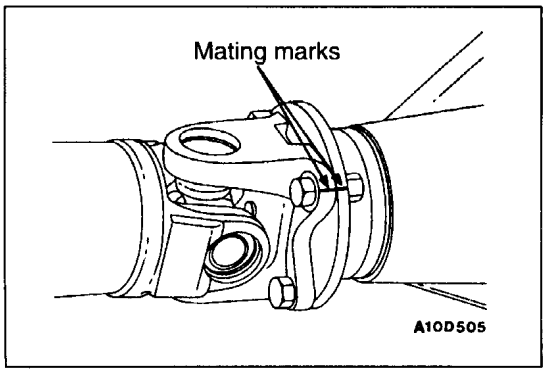
Post-installation Operation <4WD>
- Supplying of the Transfer Gear Oil
  (M/T: Refer to GROUP 22 – Service Adjustment Procedures.)
  (A/T: Refer to GROUP 23 – Service Adjustment Procedures.)

Gear Oil: Hypoid gear oil



Removal steps

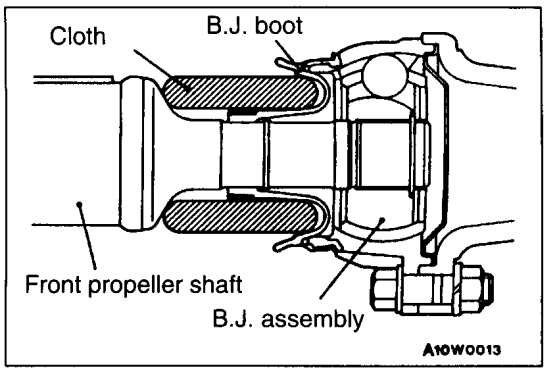
1. Centre bearing bracket
◀A▶ ▶A◀ 2. Propeller shaft assembly
◀A▶ ▶A◀ 3. Rear propeller shaft assembly
◀A▶ ▶A◀ 4. Front propeller shaft assembly



REMOVAL SERVICE POINT

◀A▶ PROPELLER SHAFT ASSEMBLY/REAR PROPELLER SHAFT ASSEMBLY/FRONT PROPELLER SHAFT ASSEMBLY REMOVAL

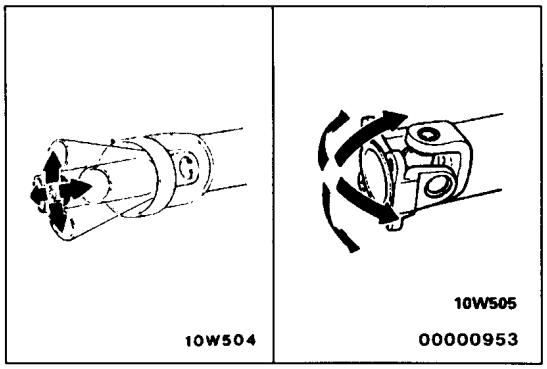
(1) Make mating marks on the differential companion flange and flange yoke and remove the propeller shaft.



Caution
Remove the front propeller shaft assembly <4WD> in a straight and level manner so as to ensure that the boot is not damaged through pinching.

Damage to the boot can be avoided, and the work will be easier, if a piece of cloth or similar material is inserted in the boot.

(2) Use the plug as a cover so that no foreign material gets into the transmission or transfer.

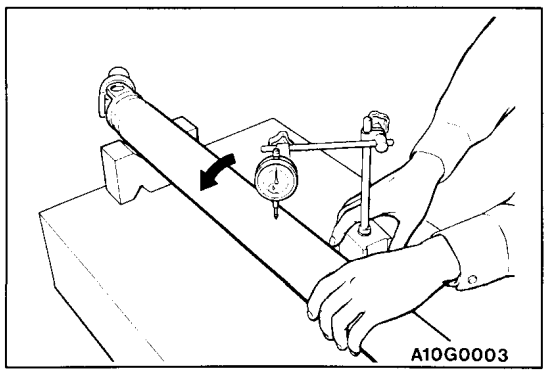


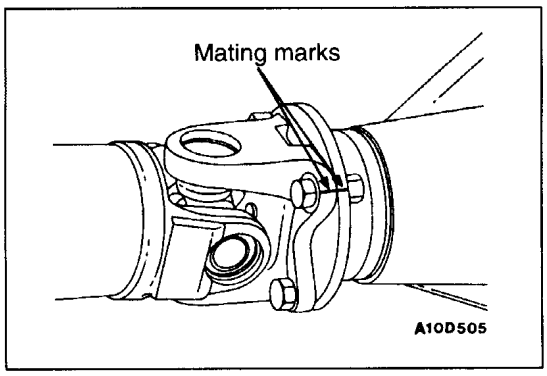
INSPECTION

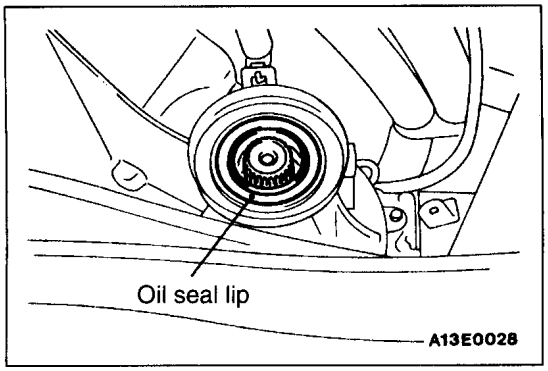
- Check the sleeve yoke, centre yoke and flange yoke for wear, damage or cracks.
- Check the propeller shaft yokes for wear, damage or cracks.
- Check the propeller shaft for bends, twisting or damage.
- Check the universal joints for smooth operation in all directions.
- Check the centre bearing for smooth movement.
- Check the centre bearing mounting rubber for damage or deterioration.

PROPELLER SHAFT RUNOUT

Limit: 0.6 mm







INSTALLATION SERVICE POINT

▶A◀ PROPELLER SHAFT ASSEMBLY/FRONT PROPELLER SHAFT ASSEMBLY/REAR PROPELLER SHAFT ASSEMBLY INSTALLATION

To reuse the propeller shaft, align the mating marks that were made during removal, and then install the propeller shaft assembly to the companion flange.

Caution

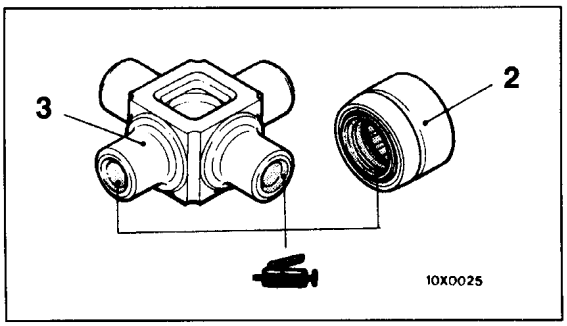
(1) Tighten installation bolts after removing oil and grease from threads to prevent them from loosening due to lubrication.

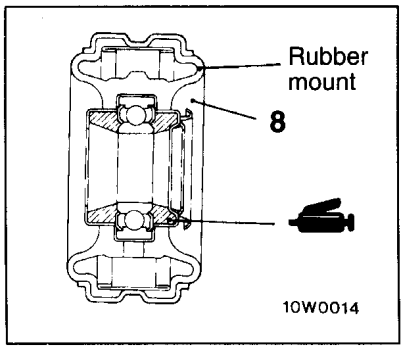
(2) Be careful not to damage the lip section of the transfer case oil seal when installing the propeller shaft.

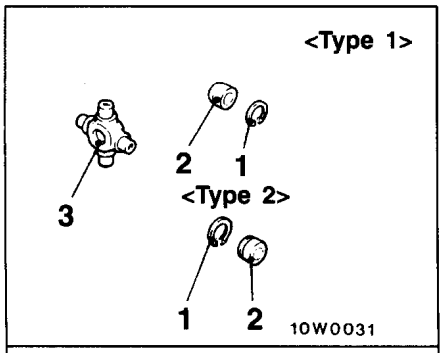
DISASSEMBLY AND REASSEMBLY

120002155

<2WD>

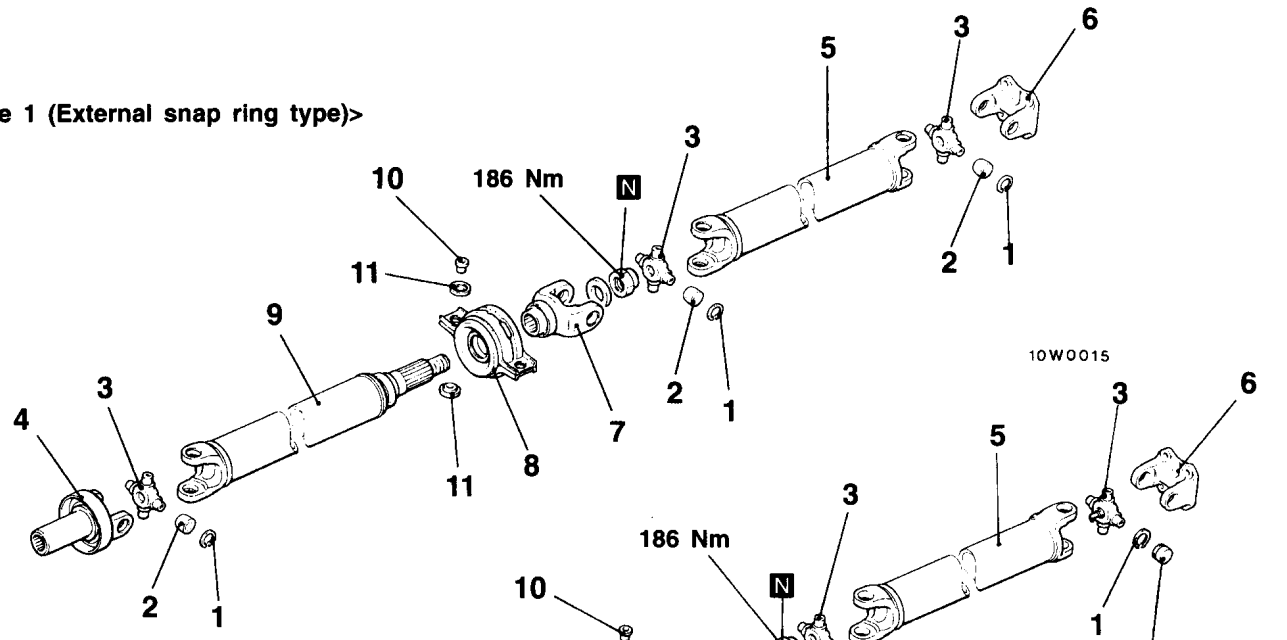




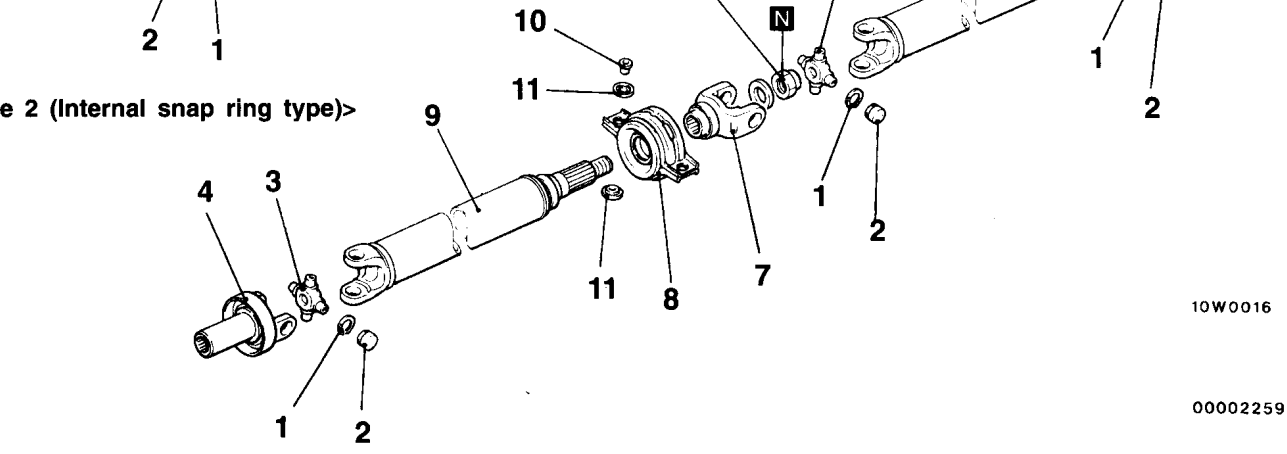


Universal joint repair kit

<Type 1 (External snap ring type)>



<Type 2 (Internal snap ring type)>



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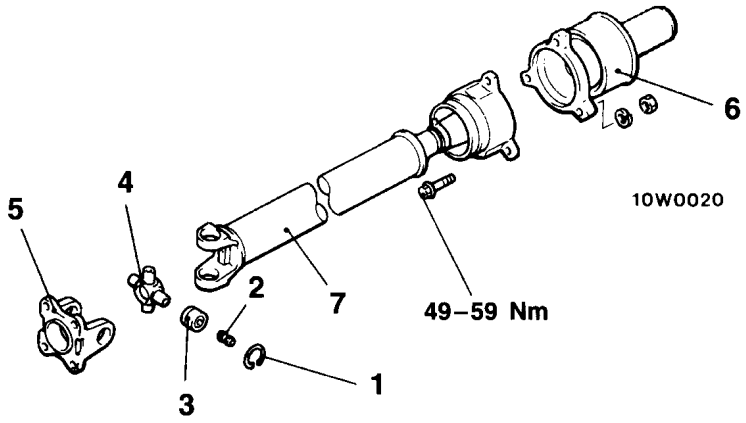
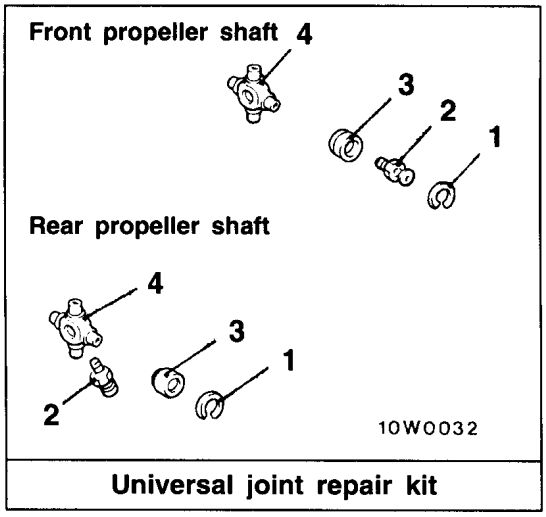
Disassembly steps

◀A▶ ▶D◀ 1. Snap ring
◀B▶ ▶C◀ 2. Journal bearing
3. Journal
4. Sleeve yoke
5. Propeller shaft (rear)
6. Flange yoke
◀C▶ ▶B◀ 7. Centre yoke
◀D▶ ▶B◀ 8. Centre bearing assembly
9. Propeller shaft (front)
▶A◀ 10. Spacer
11. Insulator

<4WD>

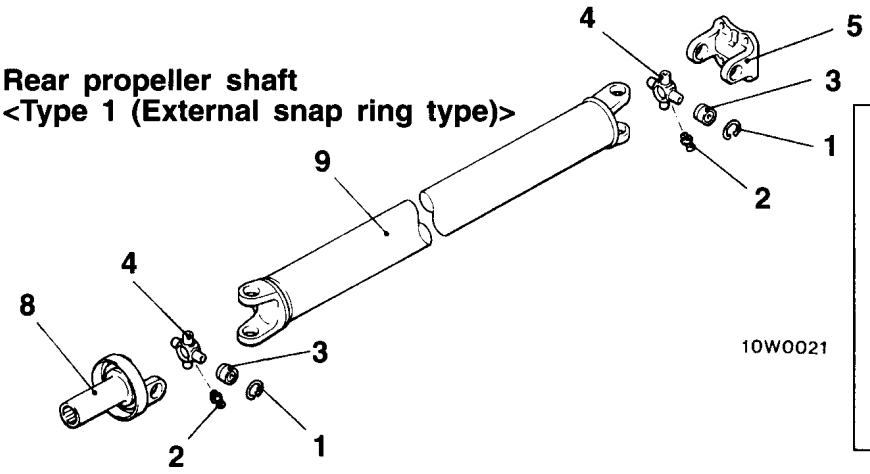
Front propeller shaft
<Type 1 (External snap ring type)>

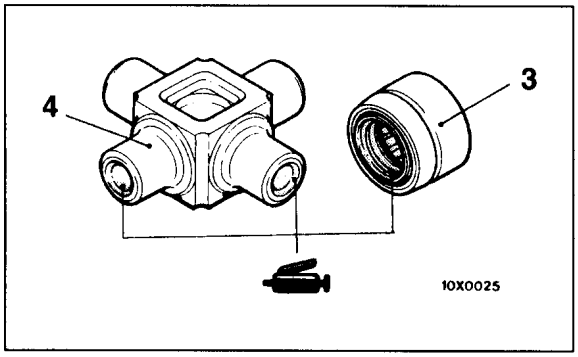




Universal joint repair kit

Rear propeller shaft
<Type 1 (External snap ring type)>

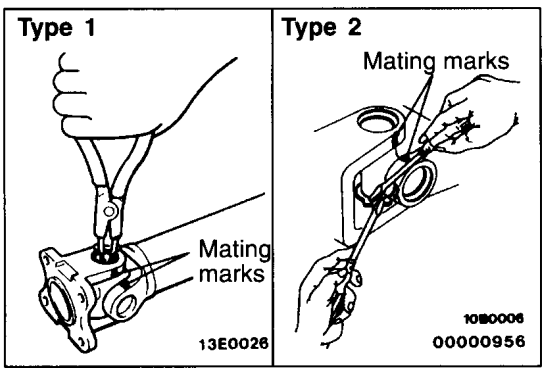




00002260

Disassembly steps

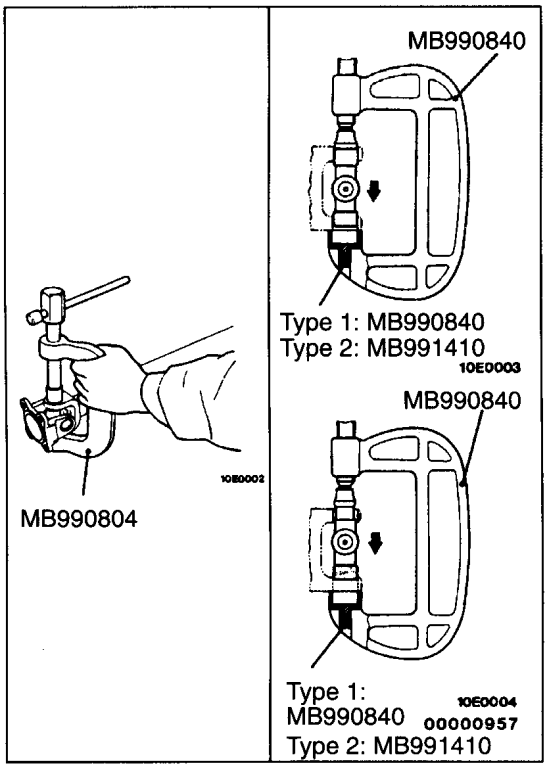
◀A▶ ▶D◀ 1. Snap ring
2. Grease fitting
◀B▶ ▶C◀ 3. Journal bearing
4. Journal
5. Flange yoke
◀E▶ 6. Sleeve flange
7. Front propeller shaft assembly
8. Sleeve yoke
9. Rear propeller shaft



DISASSEMBLY SERVICE POINTS

◀A▶ SNAP RING REMOVAL

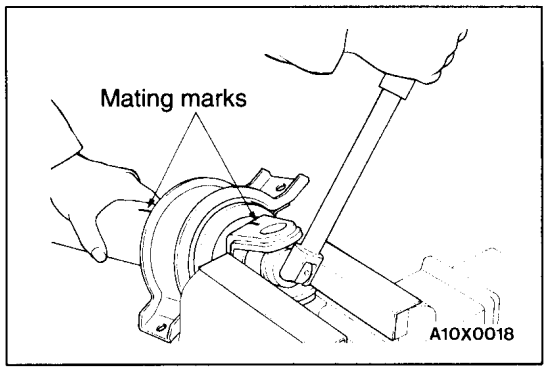
Make mating marks on the yokes of the universal joint that is to be disassembled.



◀B▶ JOURNAL BEARING REMOVAL

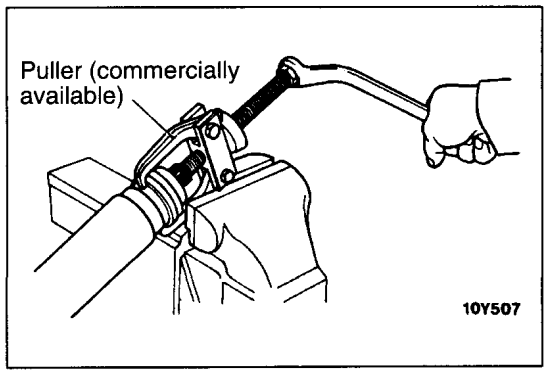
(1) Use the special tool to press in the journal bearing on one side, and take out the journal bearing on the opposite side.
(2) Insert the special tool in the other side and press the journal to remove the first journal bearing that was pushed.

Caution
Do not tap the journal bearings to remove them, as this will upset the balance of the propeller shaft.



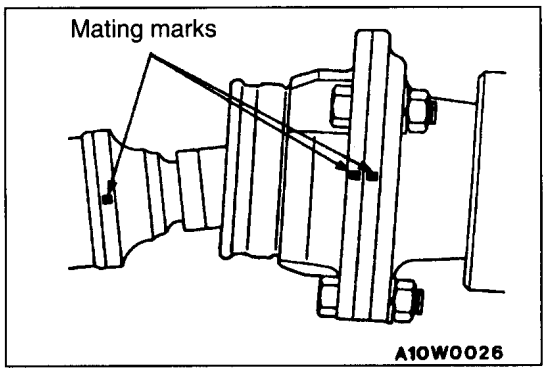
◀C▶ CENTRE YOKE REMOVAL

Make mating marks on the centre yoke and front propeller shaft, and then remove the centre yoke.



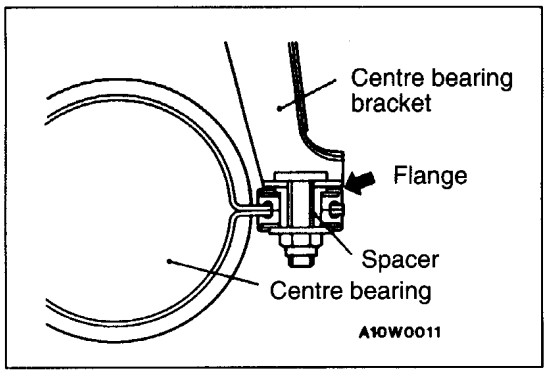
◀D▶ CENTRE BEARING ASSEMBLY REMOVAL

After removing the rubber mount, use a commercially available puller to remove the centre bearing.



◀E▶ SLEEVE FLANGE REMOVAL

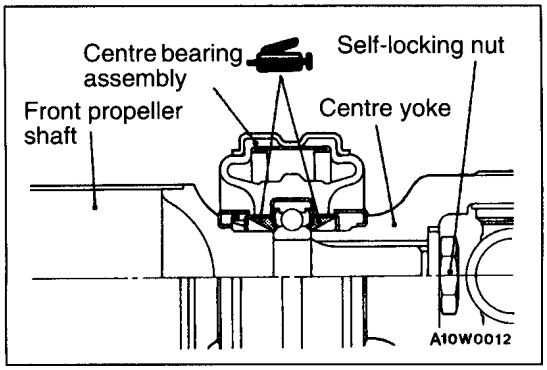
Make mating marks on the sleeve flange and front propeller shaft assembly, and then remove the sleeve flange.



REASSEMBLY SERVICE POINTS

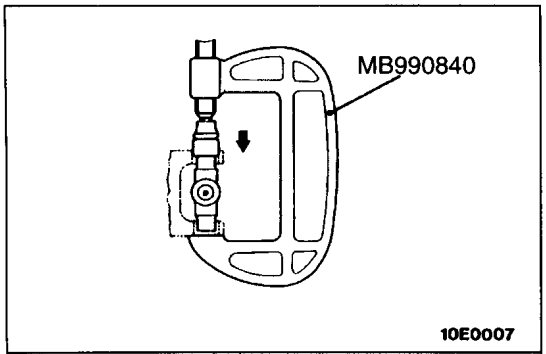
▶A◀ SPACER INSTALLATION

Install the spacer so that the flange faces upwards as shown in the illustration.



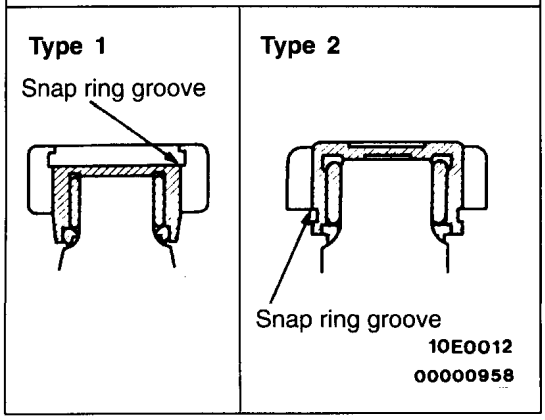
▶B◀ CENTRE BEARING ASSEMBLY / CENTRE YOKE INSTALLATION

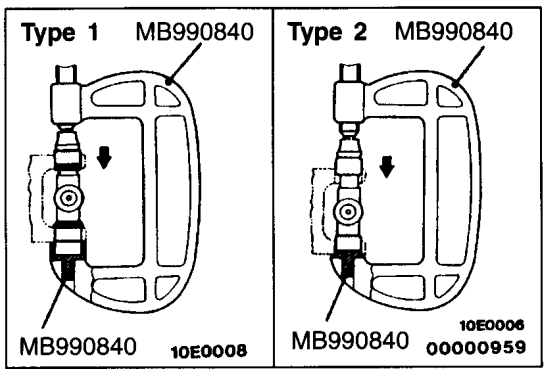
(1) Install the centre bearing assembly to the front propeller shaft as shown in the illustration.
(2) Align the mating marks on the centre yoke and front propeller shaft.
(3) Press-fit the center bearing assembly with the centre yoke while tightening the self-locking nut.



▶C◀ JOURNAL BEARING INSTALLATION

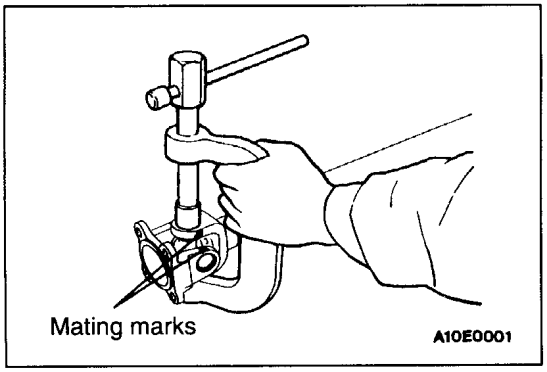
(1) Use the special tool to press the journal bearing into the yoke until the snap ring groove is fully visible.



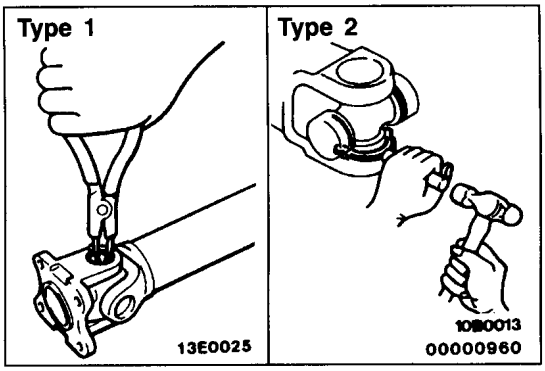


(2) Use the special tool to press the opposite side journal bearing into the yoke.

Caution
Be careful when pressing the journal bearings, if they are pressed at an angle, the inside of the journal bearings will be damaged by the journal.

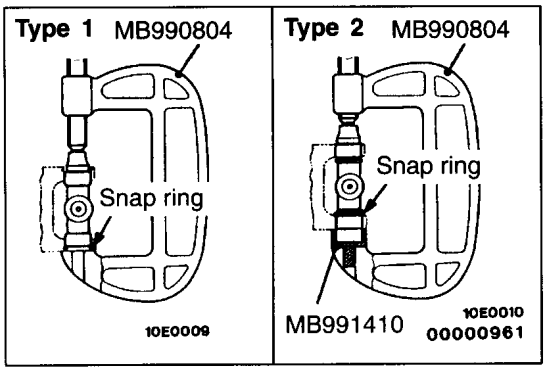


(3) Align the mating marks on the yoke and propeller shaft, and install the propeller shaft journal bearings in the method described in (1) and (2) above.

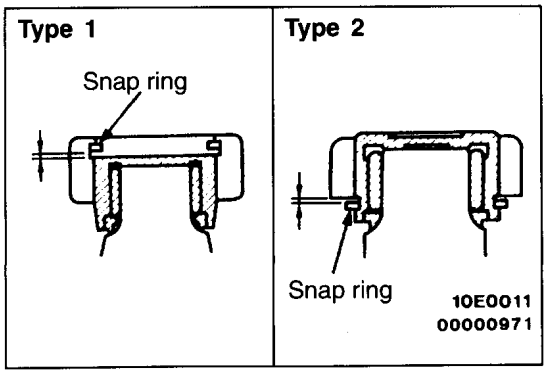


▶D◀ SNAP RING INSTALLATION

(1) Install a snap ring to one side of the journal.



(2) Use the special tool at the opposite side of the installed snap ring to press in the journal bearing towards the snap ring.



(3) Install the snap ring on the opposite side, and measure the clearance of the snap ring groove with a thickness gauge.

Standard value: 0.03 mm or less

Caution
Always use snap rings of equal thicknesses on both sides.

(4) If the clearance exceeds the standard value, adjust by changing the thickness of the snap ring.

Thickness mm Type 1	Thickness mm Type 2	Identification colour
1.28	1.50	–
1.31	1.55	Yellow
1.34	1.60	Blue
1.37	1.65	Purple

FRONT AXLE

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120002201

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GENERAL INFORMATION

120002202

2WD

The front hub assembly which uses a double taper roller bearing is mounted on the knuckle spindle. For vehicles with ABS, a rotor for detecting the wheel speed is press-fitted into the front hub.

4WD

The front axle consists of the hub assembly, drive shaft, inner shaft, front differential, free-wheeling clutch assembly and actuator. The features are:

- The wheel bearing uses a double taper roller bearing. For vehicles with ABS, a rotor for detecting the wheel speed is bolted to the brake disc.
- Drive shafts of almost identical length reduce torque steer. In addition, a D.O.J.-B.J.-type constant velocity ball joint has high power transmission efficiency and reduces vibration and noise.
- A vacuum-type free-wheeling clutch has been adopted in the free-wheeling mechanism. Its solenoid valve and actuator switch powertrain between 2WD and 4WD.

2WD

Item		Specifications
Wheel bearing	Type	Double taper roller bearing
	Inner bearing (O.D.×I.D.) mm	65×35
	Outer bearing (O.D.×I.D.) mm	50×18

4WD

Item		Specifications
Wheel bearing	Type	Double taper roller bearing
	Inner bearing (O.D.×I.D.) mm	80×50
	Outer bearing (O.D.×I.D.) mm	73×45
Drive shaft	Joint type	Outer-B.J. Inner-D.O.J.
	Shaft length (joint to joint) mm	Right–310 Left–302
Inner shaft	O.D.×Length mm	31.5×304.2
	Bearing (O.D.×I.D.) mm	62×35

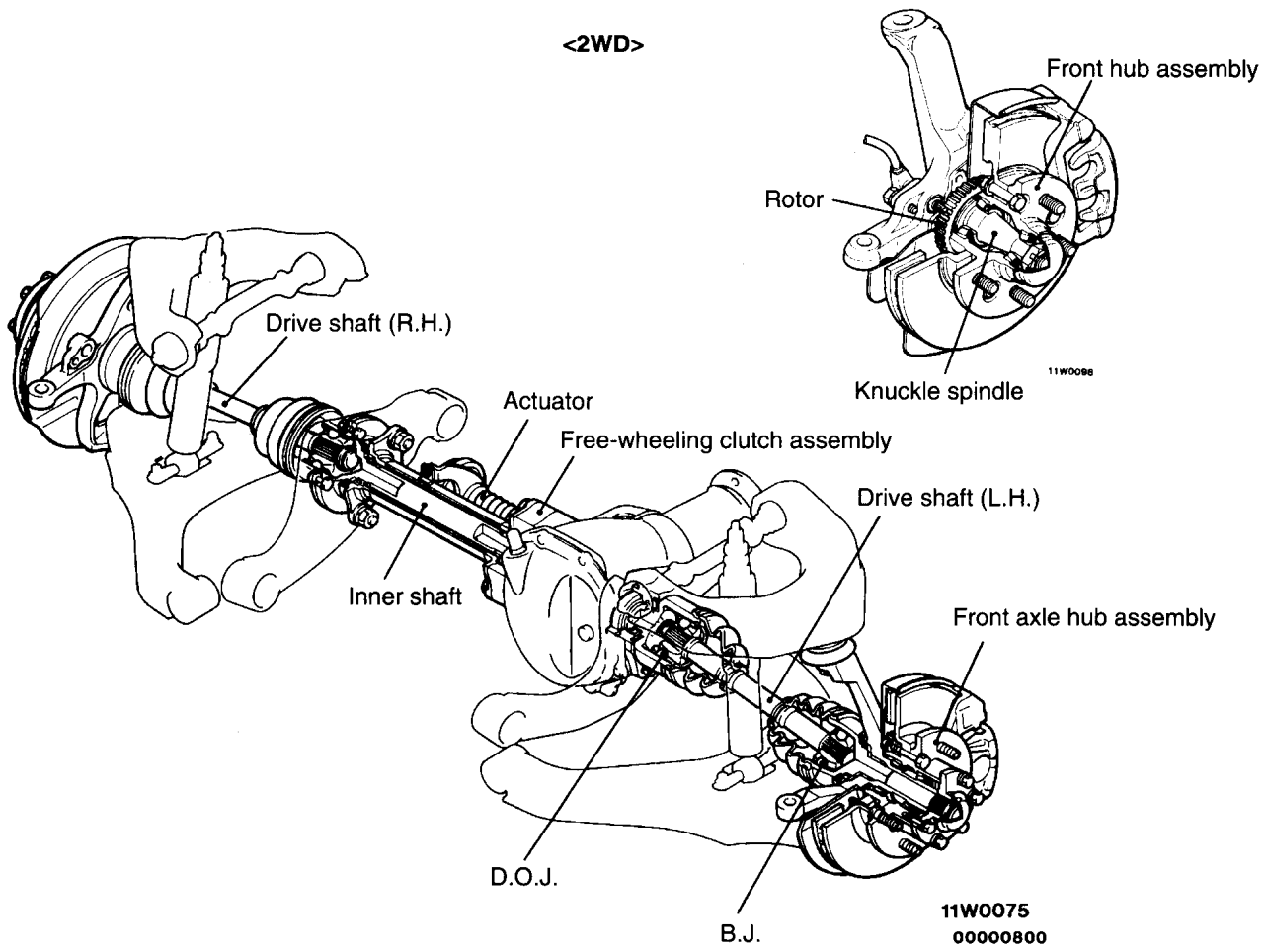
Item			4D56 – Wagon	Except 4D56 – Wagon
Reduction gear type			Hypoid gear type	Hypoid gear type
Reduction ratio			4.875	4.875
Differential	Differential gear type (type×piece)	Side gear	Straight bevel gear×2	Straight bevel gear×2
		Pinion gear	Straight bevel gear×2	Straight bevel gear×4
	Number of teeth	Drive gear	39	39
		Drive pinion	8	8
		Side gear	14	14
		Pinion gear	10	10
	Bearing (O.D.×I.D.) mm	Side	80.0×45.2	80.0×45.2
		Front	64.3×30.2	64.3×30.2
		Rear	76.2×36.5	76.2×36.5

CONSTRUCTION DIAGRAM

120000169

<4WD>

<2WD>



SERVICE SPECIFICATIONS

120000170

Item		Standard value	Limit
Drive shaft axial play mm		0.4–0.7	–
Solenoid valve resistance Ω		36–46	–
Hub rotary sliding resistance N		7–26	–
(Hub rotation starting torque) Nm		0.5–1.8	–
Amount of movement of wheel bearing in an axial direction mm		0.05 or less	–
Setting of D.O.J. boot length mm		80±3	–
Clutch gear play (bearing axial play) mm		0.05–0.30	–
Drive gear backlash mm		0.11–0.16	–
Differential gear backlash mm	2-pinion differential	0–0.076	–
	4-pinion differential	0.01–0.25	–
Drive pinion rotation torque Nm	Without oil seal	When replacing (with anti-rust agent) 0.3–0.5	–
		When replacing or reusing (with gear oil applied) 0.15–0.25	–
	With oil seal	When replacing (with anti-rust agent) 0.5–0.7	–
		When replacing or reusing (with gear oil applied) 0.3–0.4	–
Drive gear runout mm		–	0.05
Differential gear backlash <2 pinion differential> mm		–	0.2

LUBRICANTS

120000171

Items	Specified lubricants	Quantity
Front differential gear oil	Hypoid gear oil API classification GL-5 or higher SAE viscosity No.90, 80W	0.9 ℓ
D.O.J. boot grease	Repair kit grease	100 g

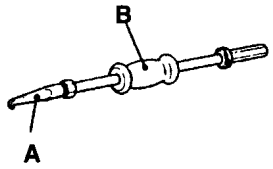
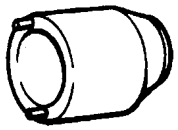
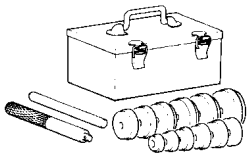
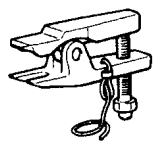
SEALANTS

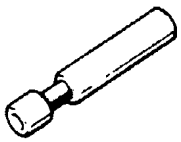
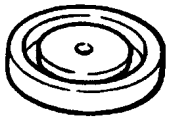
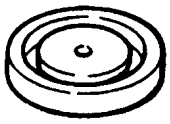
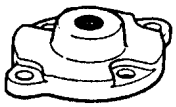
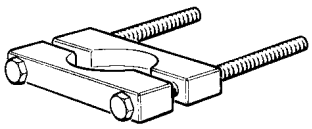
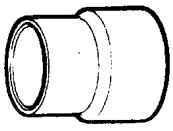
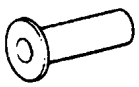
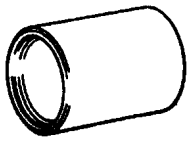
120000172

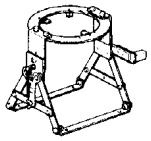
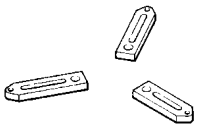
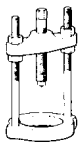
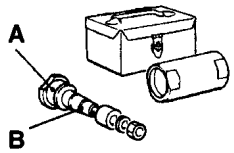
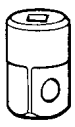
Items	Specified sealants	Characteristics
Contact surface of drive flange or free-wheeling hub and front axle hub	3M ATD Part No.8663 or equivalent	Semi-drying sealant
Contact surface of hub cap and drive flange		
Contact surface of differential cover and differential carrier		
Vent plug		
Free-wheeling clutch assembly		
Drive gear threaded hole	3M Stud Locking 4170 or equivalent	Anaerobic sealant

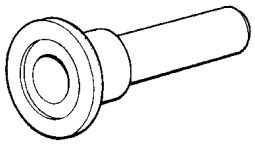
SPECIAL TOOLS

120002517

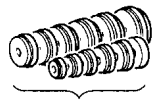
Tool	Number	Name	Use
	MB990590 A: MB990212 B: MB990211	Rear axle shaft oil seal remover A: Adapter B: Sliding hammer	• Removal of differential carrier oil seal • Removal and installation of inner shaft (Used together with MB990906)
	MB990954	Lock nut wrench	Removal and adjustment of lock nut <4WD>
	MB990925	Bearing and oil seal installer set	• Press-out and press-fitting of wheel bearing outer race • Press-fitting of oil seal (front hub) • Press-fitting of needle bearing (knuckle) • Press-fitting of bearing (free-wheeling clutch) • Press-fitting of oil seal (free-wheeling clutch) • Press-out and press-fitting of drive pinion front bearing outer race • Press-out and press-fitting of drive pinion rear bearing outer race • Press-fitting of drive shaft • Tapping in of side bearing outer race • Inspection of drive gear tooth contact
	MB991113 or MB990635	Steering linkage puller	• Disconnection of tie rod • Disconnection of upper ball joint • Disconnection of lower ball joint

Tool	Number	Name	Use
	MB990804	Knuckle arm puller	Disconnection of upper, lower ball joint and knuckle <2WD>
	MB990955	Oil seal installer	• Press-fitting of housing tube dust seal • Press-fitting of front axle hub oil seal (Used together with MB990938) • Press-fitting of rotor <2WD> (Used together with MB990938)
	MB990809	Pitman arm puller	Removal of upper ball joint, lower ball joint and knuckle <4WD>
	MB990956	Needle bearing installer	Press-fitting of knuckle needle bearing (Used together with MB990938)
	MB990985	Oil seal installer	Press-fitting of knuckle oil seal (Used together with MB990938)
	MB990906	Drive shaft attachment	Removal and installation of inner shaft (Used together with MB990211)
	MB990560	Bearing remover	Removal and press-fitting of inner shaft bearing
	MB990799	Ball joint remover and installer	Installation of free-wheel clutch bearing
	MB991168	Differential oil seal installer	Installation of free-wheel clutch oil seal
	MB990890 or MB990891	Rear suspension bushing base	Installation of free-wheel clutch bearing

Tool	Number	Name	Use
	MB990909	Working base	Support of front differential carrier assembly
	MB991116	Adapter	Support of front differential carrier assembly
	MB990810	Side bearing puller	Removal of side bearing inner race
	MB990811	Differential side bearing cap	
	MB990850	End yoke holder	Removal and installation of companion flange
	MB990339	Bearing puller	Removal of drive pinion front bearing inner race
	MB990648	Bearing remover	
	MB990901 A: MB990904 B: MB990903	Pinion height gauge set A: Drive pinion gauge assembly B: Drive pinion gauge	• Inspection of drive pinion rotation starting torque • Measurement of drive pinion height
	MB990685	Torque wrench	Measurement of drive pinion preload
	MB990326	Preload socket	

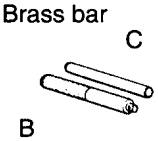
Tool	Number	Name	Use
	MB990802	Bearing installer	• Press-fitting of drive pinion front bearing inner race • Press-fitting of side bearing inner race
	MB990031 or MB990699	Drive pinion oil seal installer	Press-fitting of drive pinion oil seal
	MB990813	Tap	Removal of adhesive

MB990925



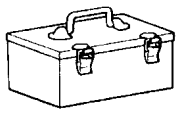
A
Installer adapter

Brass bar



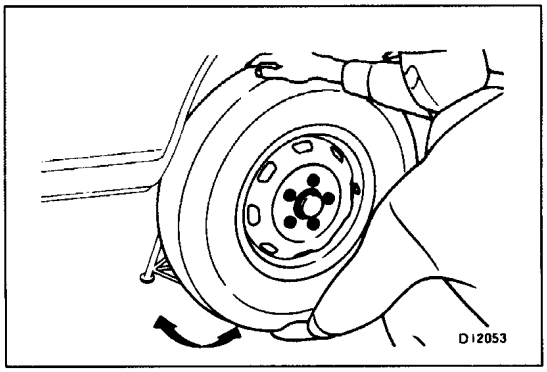
B
Bar (snap-in type)

Tool box



11W0113

	Contents of tool (MB990925)	O.D. mm		Contents of tool (MB990925)	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	–



SERVICE ADJUSTMENT PROCEDURES

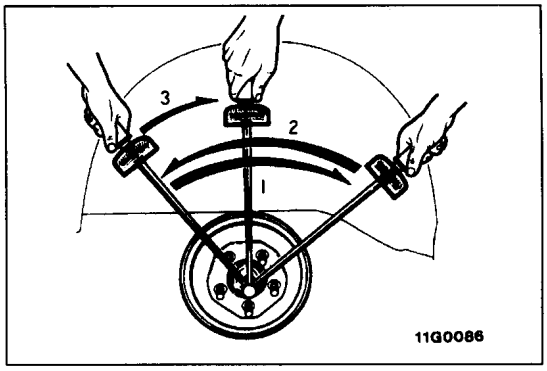
120000174

<2WD>

WHEEL BEARING PLAY INSPECTION

1. Inspect the play of the bearings while the vehicle is jacked up.

   Caution
   Do not confuse this play with the ball joint play.



2. If there is some play in the bearings, tighten the wheel bearing nuts to 29 Nm, and then turn the front hub assembly to run in the bearings.
3. Loosen the nuts to 0 Nm.
4. Re-tighten the nuts to 8 Nm.
5. If the split pin hole in the wheel bearing nut is not aligned with that in the knuckle, turn the nut back within 30°. Then install the split pin.

<4WD>

FRONT AXLE TOTAL BACKLASH CHECK

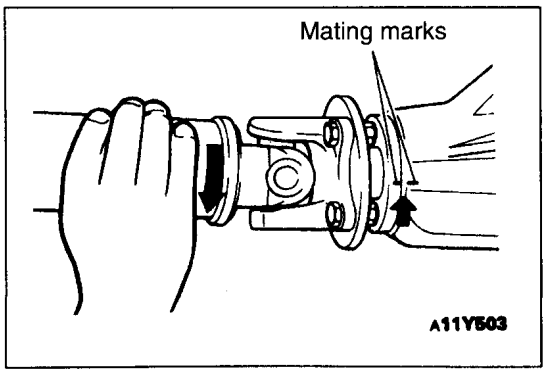
120000175

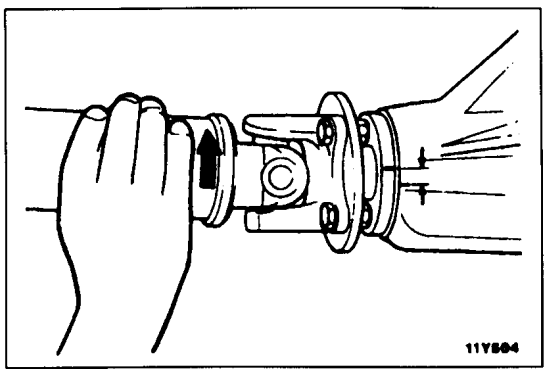
Observe the following procedure in order to switch powertrain to 4WD.

1. Turn the ignition switch off, and then put the transfer shift lever to the 2H position.

   Caution
   Do not jack up the vehicle.

2. Turn the propeller shaft until a click is heard.
3. Turn the companion flange clockwise until all play is removed. Mate mark on the dust cover of the companion flange with that on the differential carrier.

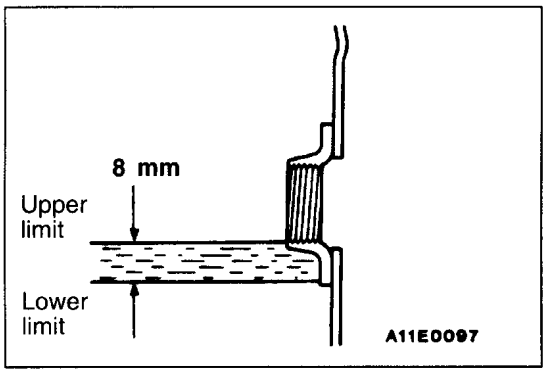




4. Turn the companion flange counterclockwise until all play is removed and measure the amount of distance through which the mating marks moved.

   Limit: 11mm

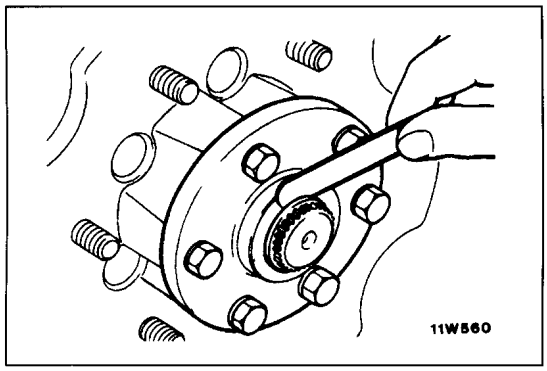
5. If the amount of backlash exceeds the limit value, check the following.
   (1) Drive gear backlash
   (2) Differential gear backlash
   (3) Play in the serrations and splines of the side gears, drive shaft, inner shaft and drive flange



FRONT AXLE GEAR OIL LEVEL CHECK 120000176

Remove the filler plug, and check the gear oil level. Check that gear oil level is not 8 mm below the bottom of filler plug hole.

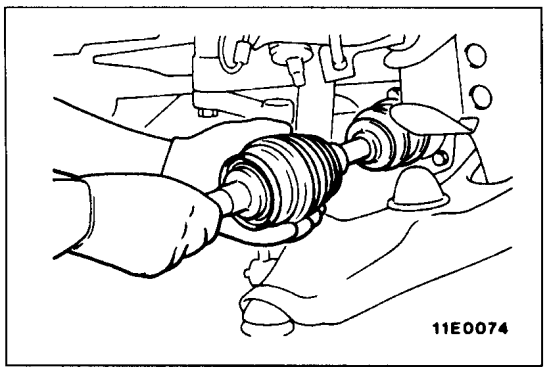
Specified gear oil: Hypoid gear oil API classification GL-5 or higher, SAE viscosity No. 90, 80W [Quantity: 0.9 ℓ]



DRIVE SHAFT AXIAL PLAY CHECK 120000177

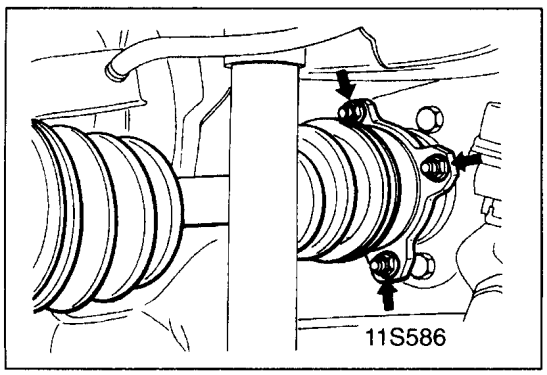
1. Jack the vehicle up and remove the front wheels.
2. Remove the hub cap.
3. Manually push the drive shaft in the direction in which it will closely contact the knuckle.
4. As shown in the figure, use a thickness gauge to measure the clearance between the drive flange and snap ring.

   Standard value: 0.4–0.7 mm
5. If the play is out of standard value, adjust by adding or removing shims.

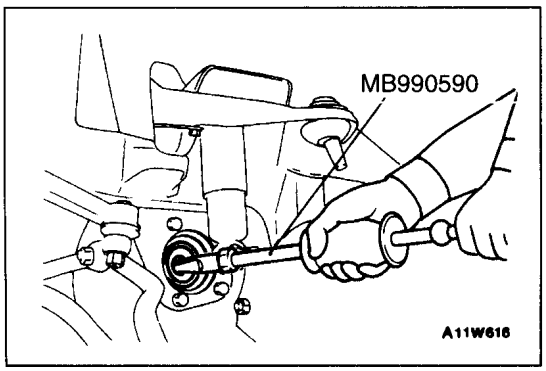


DIFFERENTIAL CARRIER OIL SEAL REPLACEMENT 120000178

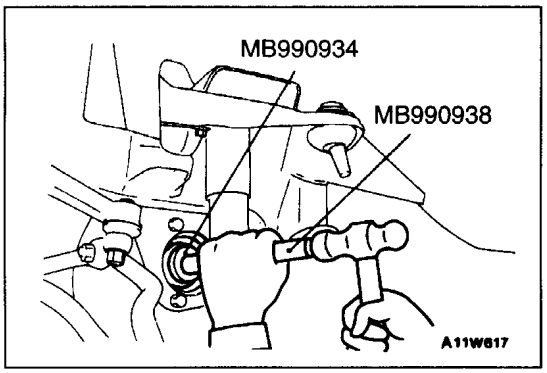
1. Remove the under cover.
2. Remove the shock absorber lower mounting bolts at the right and left.
3. Remove the front hub and knuckle assembly.
4. Remove the left drive shaft.



5. Remove the right drive shaft from the inner shaft assembly.
6. Remove the inner shaft.
7. Remove the actuator mounting bolt from the housing tube and remove the harness from the clamp.
8. Remove the differential mounting bracket (R.H.) and housing tube.

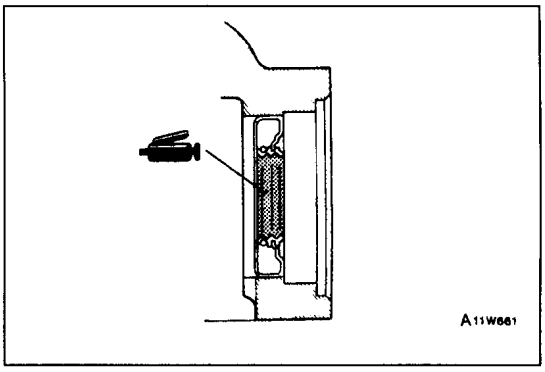


9. Use the special tool to remove the oil seal.



10. Press-fit the oil seal positively by using the special tools.

    NOTE
    For vehicles with 4-pinion type differential, there is a white painted identification mark on the metal ring of the oil seal.

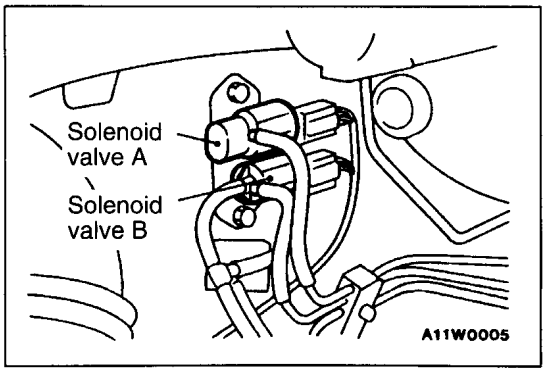


11. Apply multi-purpose grease to the lip of the oil seal and install it to the drive shaft (L.H.). For the right side, apply multi-purpose grease to the lip of the oil seal and install to the housing tube and differential mounting bracket (R.H.).

12. Install the inner shaft and drive shaft (R.H.).

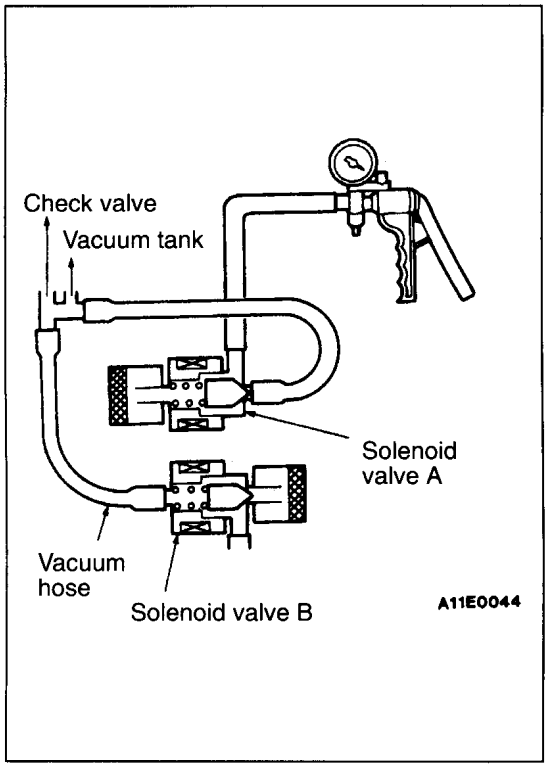
    Caution
    1. Do not damage the lip of the oil seal.
    2. The circlip attached to the B.J. side of the drive shaft should be replaced with a new clip.

13. Install the actuator and secure the harness with the clamp.
14. Install the shock absorber.
15. Install the hub and knuckle assembly.
16. Install the under cover.

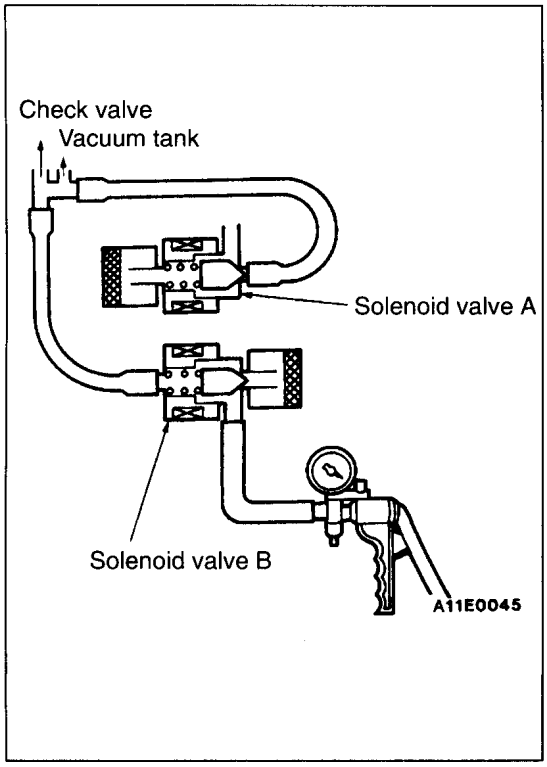


SOLENOID VALVE OPERATION CHECK 120000179

1. Remove the vacuum hoses (blue stripe, yellow stripe) from the solenoid valves.
2. Disconnect the harness connectors.



3. Connect a hand vacuum pump to solenoid valve A and carry out the following inspections.
   (1) Even if the hand pump is operated with no other operation, no negative pressure develops.
   (2) Negative pressure does not develop when battery voltage is applied to solenoid valve A. Meanwhile, negative pressure is maintained when the vacuum hose of solenoid valve B is blocked by bending.
   (3) When battery voltage is applied to solenoid valves A and B, negative pressure is maintained.



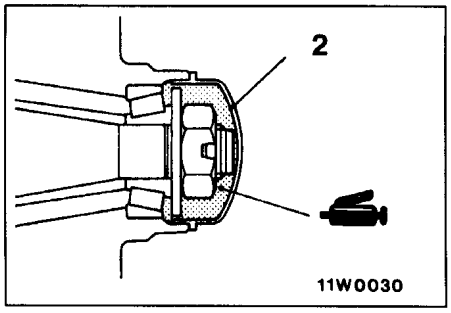
4. Connect the hand vacuum pump to solenoid valve B. Apply negative pressure and carry out the following inspections.
   (1) With no other operation, negative pressure is maintained.
   (2) When battery voltage is applied to solenoid valve B, negative pressure equalizes.
   (3) When battery voltage is applied to solenoid valve A, negative pressure equalizes.
5. Measure the resistance of the solenoid valves.

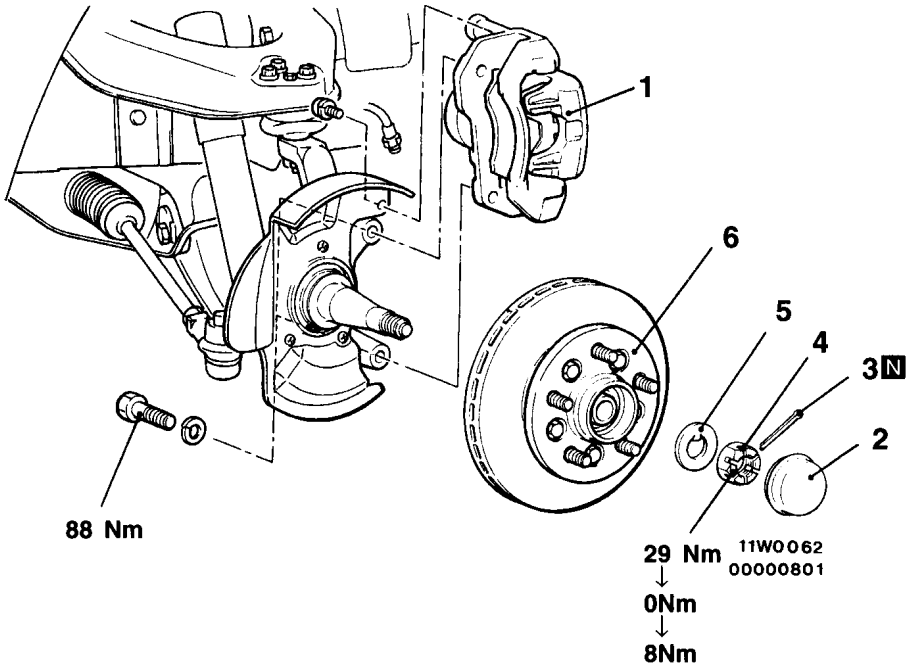
   Standard value: 36–46 Ω

FRONT HUB ASSEMBLY <2WD>

120000180

REMOVAL AND INSTALLATION





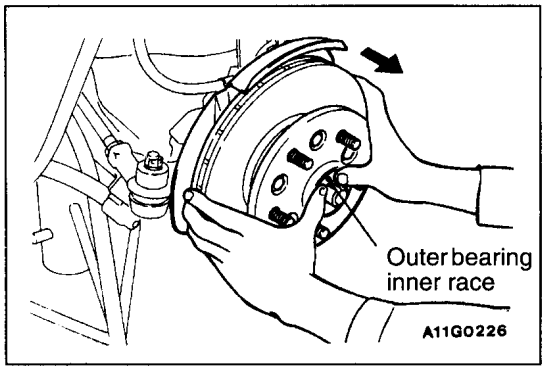
Removal steps

◀A▶ 1. Caliper assembly
2. Hub cap
3. Split pin
▶A◀ 4. Wheel bearing nut
5. Washer
◀B▶ 6. Front hub assembly

REMOVAL SERVICE POINTS

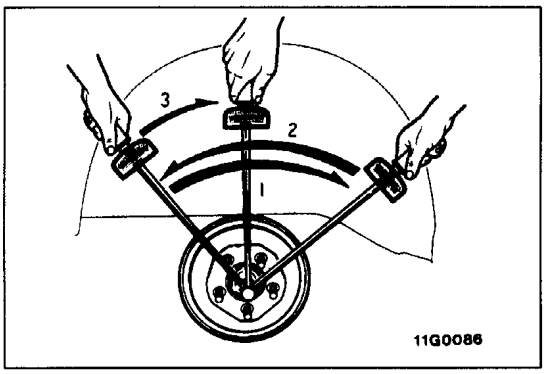
◀A▶ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire so that it does not fall.



◀B▶ FRONT HUB ASSEMBLY REMOVAL

Do not drop the outer bearing inner race.



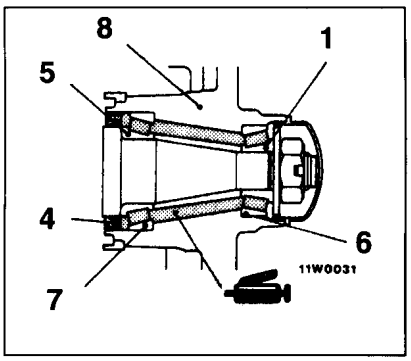
INSTALLATION SERVICE POINT

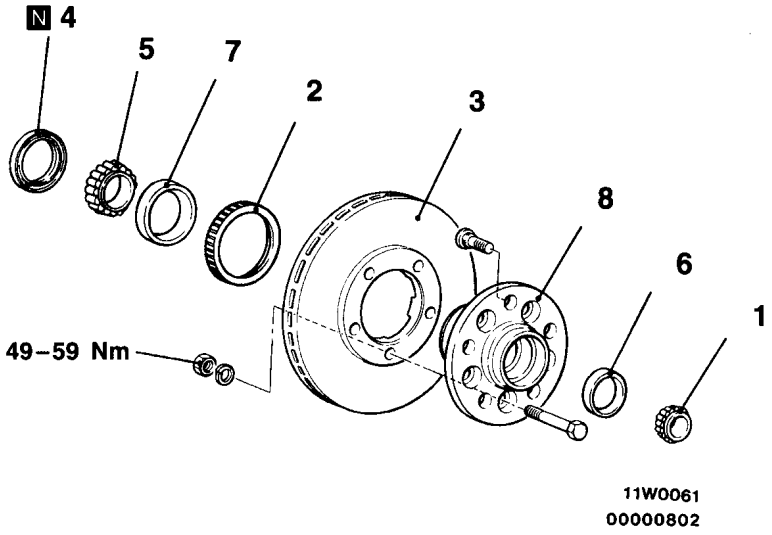
▶A◀ WHEEL BEARING NUT INSTALLATION

1. Tighten the wheel bearing nuts to 29 Nm, and then turn the front hub assembly to run in the bearings.
2. Loosen the nuts to 0 Nm.
3. Re-tighten the nuts to 8 Nm.
4. If the split pin hole in the wheel bearing nut is not aligned with that in the knuckle, turn the nut back within 30°. Then install the split pin.

DISASSEMBLY AND REASSEMBLY

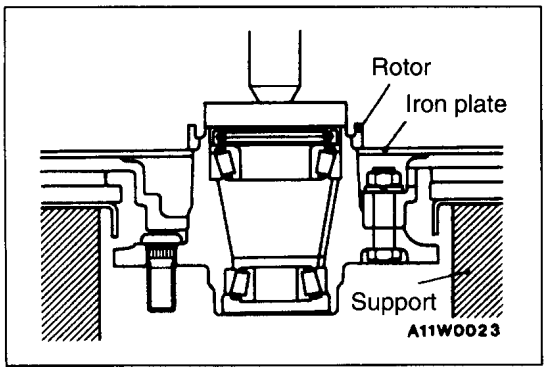
120000181





Disassembly steps

1. Outer bearing inner race
2. ◀A▶ ▶C◀ Rotor (Vehicles with ABS)
3. ◀B▶ Brake disc
4. ▶B◀ Oil seal
5. Inner bearing inner race
6. ◀C▶ ▶A◀ Outer bearing outer race
7. ◀C▶ ▶A◀ Inner bearing outer race
8. Front hub

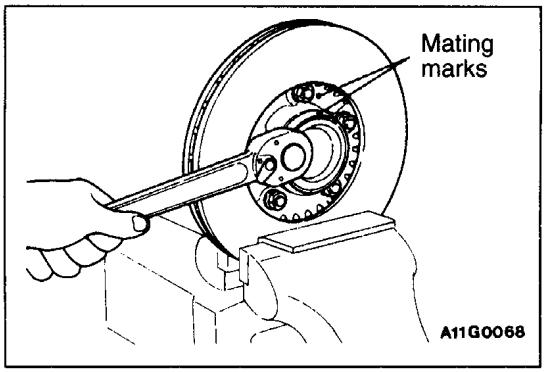


DISASSEMBLY SERVICE POINTS

◀A▶ ROTOR REMOVAL

Insert an iron plate of approximately 4 mm width between the rotor assembly and the brake disc, and use a press to remove the rotor.

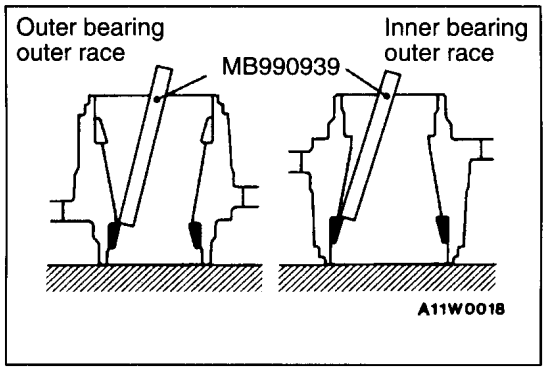
Caution
Put a piece of copper or aluminium sheeting between the brake disc and a support.



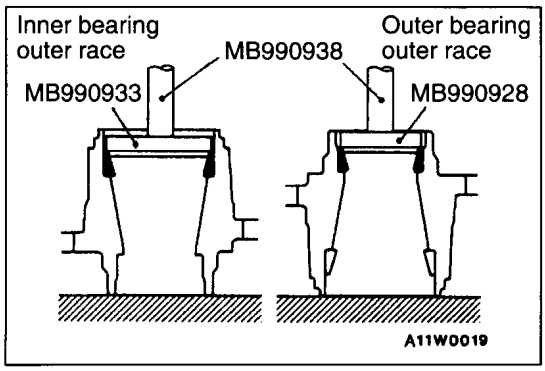
◀B▶ BRAKE DISC REMOVAL

Make the mating marks on the brake disc and front hub, and then separate the front hub and brake disc, if necessary.

Caution
Lock disc in vise and grip with copper or aluminum board.



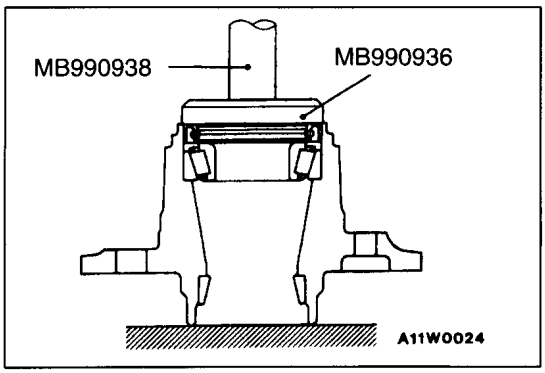
◀C▶ OUTER BEARING OUTER RACE / INNER BEARING OUTER RACE



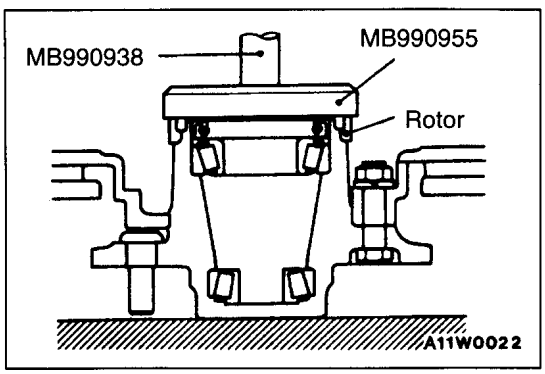
INSTALLATION SERVICE POINTS

▶A◀ INNER BEARING OUTER RACE / OUTER BEARING OUTER RACE

NOTE
To replace the bearing, replace the inner race and outer race assembly as a set.



▶B◀ OIL SEAL INSTALLATION

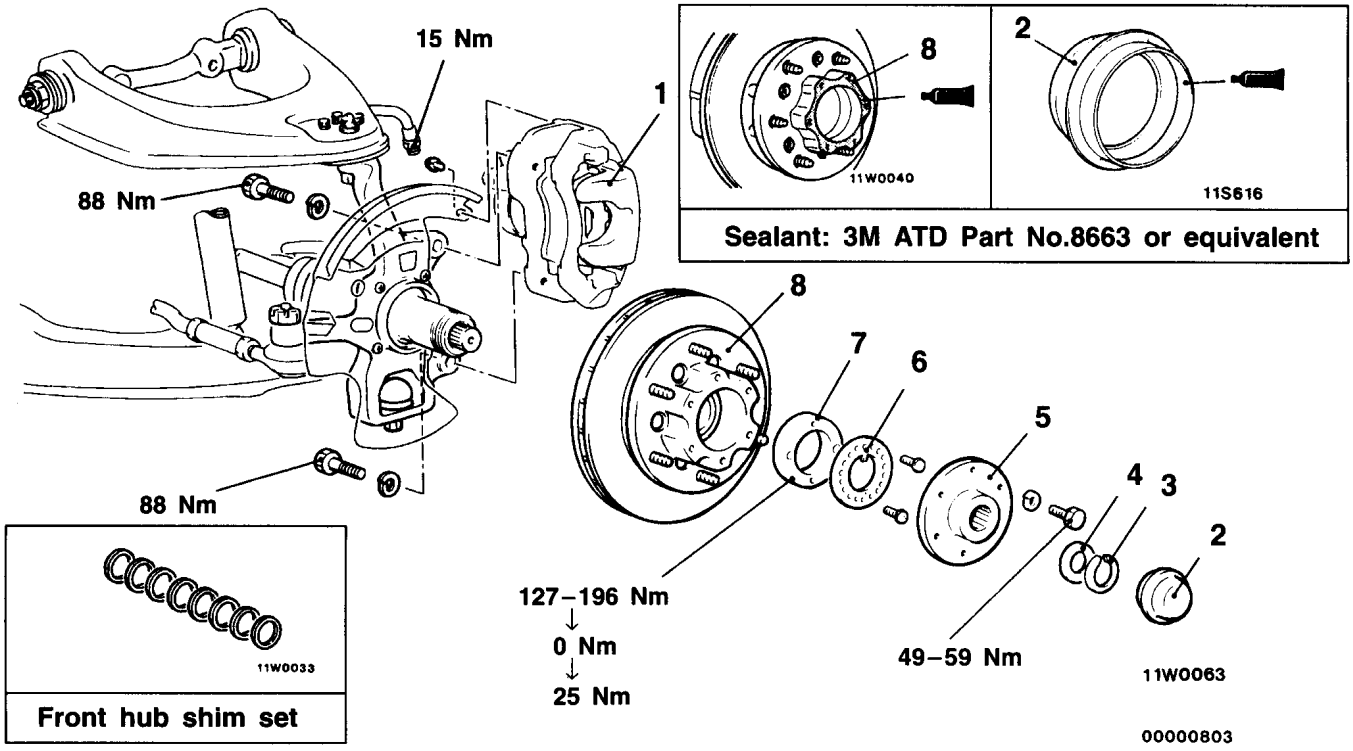


▶C◀ ROTOR INSTALLATION

FRONT HUB ASSEMBLY <4WD>

120002516

REMOVAL AND INSTALLATION



Removal steps

1. Caliper assembly
2. Hub cap

▶D◀ • Drive shaft axial play adjustment

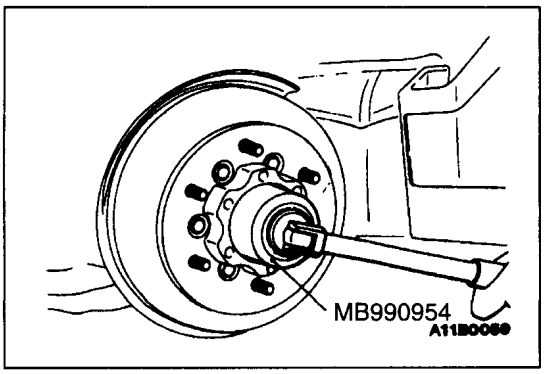
3. Snap ring
4. Shim
5. Drive flange

▶C◀ • Hub rotary sliding resistance and wheel bearing axial movement adjustment

▶B◀ 6. Lock washer

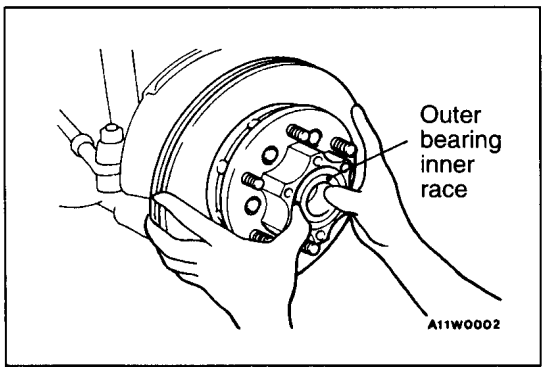
◀A▶ ▶A◀ 7. Lock nut

◀B▶ 8. Front hub assembly



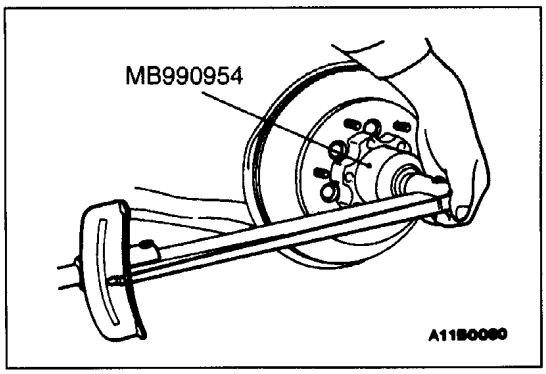
REMOVAL SERVICE POINTS

◀A▶ LOCK NUT REMOVAL



◀B▶ FRONT HUB ASSEMBLY REMOVAL

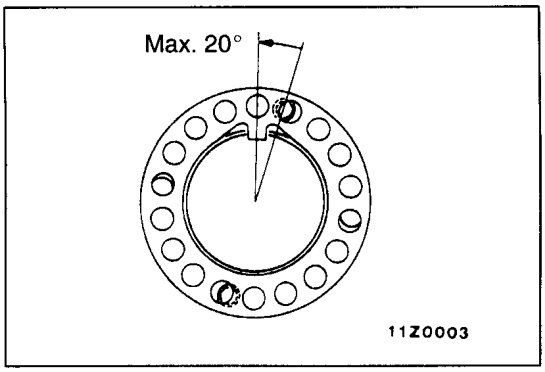
Do not drop the outer bearing inner race.



INSTALLATION SERVICE POINTS

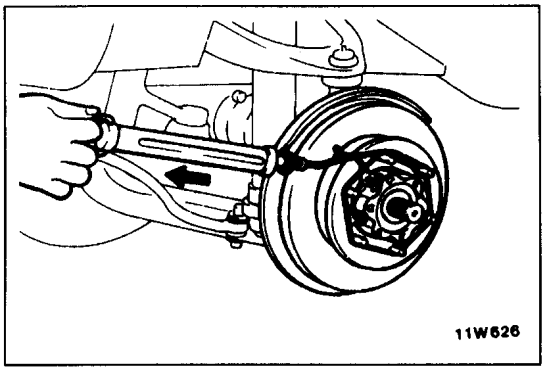
▶A◀ LOCK NUT INSTALLATION

Using the special tool, tighten the lock nut by the following procedures.
(1) Tighten the lock nut to 127–196 Nm, and then turn the front hub assembly to run in the bearings.
(2) Loosen the nuts to 0 Nm.
(3) After re-tightening to 25 Nm, loosen the lock nuts by approximately 30°.



▶B◀ LOCK WASHER INSTALLATION

Install the lock washer. If the hole position is not aligned with the lock nut, loosen it within a range of 20° until the holes are aligned.

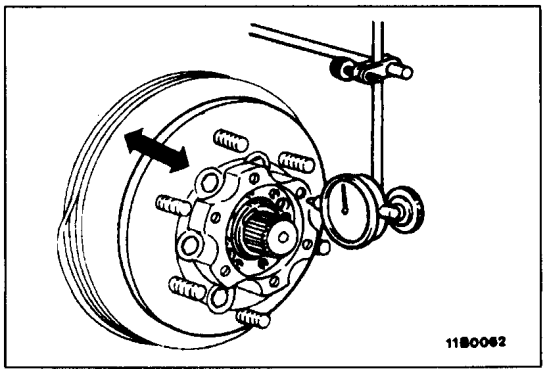


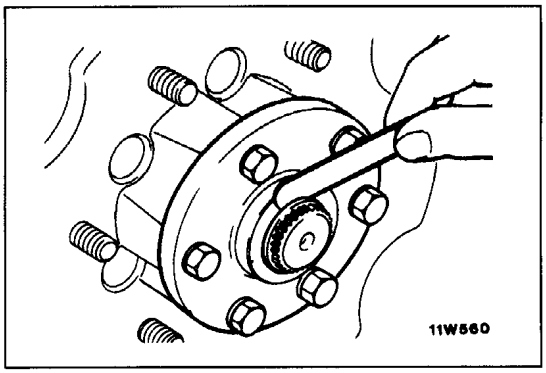
▶C◀ HUB ROTARY SLIDING RESISTANCE AND WHEEL BEARING AXIAL MOVEMENT ADJUSTMENT

1. Use a spring balance to measure the hub rotary sliding resistance (hub rotation starting torque) as shown in the illustration.

   Standard value: 7–26 N (0.5–1.8 Nm)
2. If the rotary sliding resistance is not within the standard value, remove the lock washer and adjust by the following procedures.
   (1) If the rotary sliding resistance is lower than the standard value, use the special tool (MB990954) to tighten the lock nut.
   (2) If the rotary sliding resistance is higher than the standard value, use the special tool (MB990954) to loosen the lock nut.
3. Install a dial gauge as shown in the illustration, and then move the hub in the axial direction and measure how far the front wheel bearing moves.

   Standard value: 0.05 mm or less
4. If the distance exceeds the standard value, remove the lock washer and use the special tool (MB990954) to tighten the lock nut.
5. If adjustment is not possible, disassemble the hub and inspect each part.





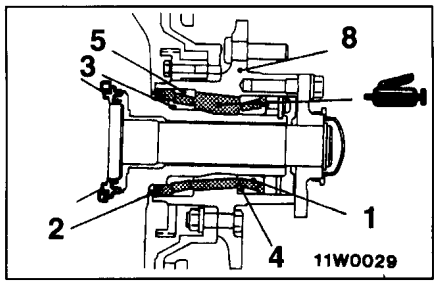
▶D◀ DRIVE SHAFT AXIAL PLAY ADJUSTMENT

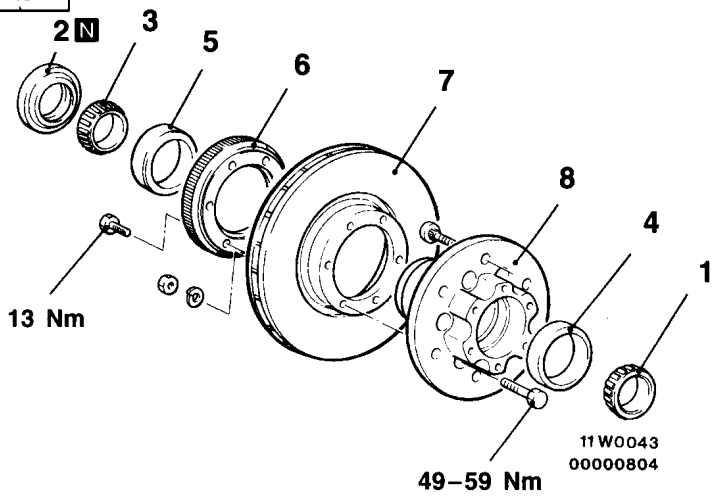
1. Push the drive shaft in by hand towards the knuckle until they touch.
2. Measure the clearance between the drive flange and the spacer with a thickness gauge as shown in the illustration.

   Standard value: 0.4–0.7 mm
3. If the amount of play is outside the standard value, adjust by selecting a shim that will bring the play to the standard value.

DISASSEMBLY AND REASSEMBLY

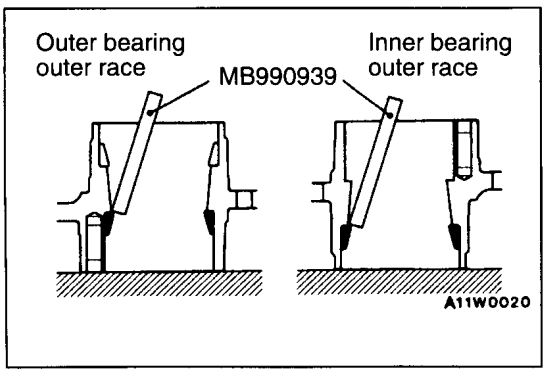
120000183





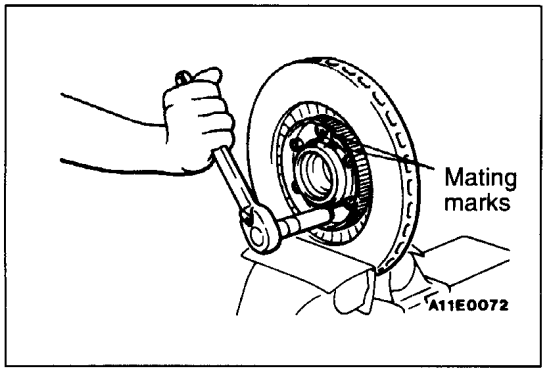
Disassembly steps

1. Outer bearing inner race
▶B◀ 2. Oil seal
3. Inner bearing inner race
◀A▶ ▶A◀ 4. Outer bearing outer race
◀A▶ ▶A◀ 5. Inner bearing outer race
◀B▶ 6. Rotor <Vehicles with ABS>
7. Brake disc
8. Front hub assembly



REMOVAL SERVICE POINTS

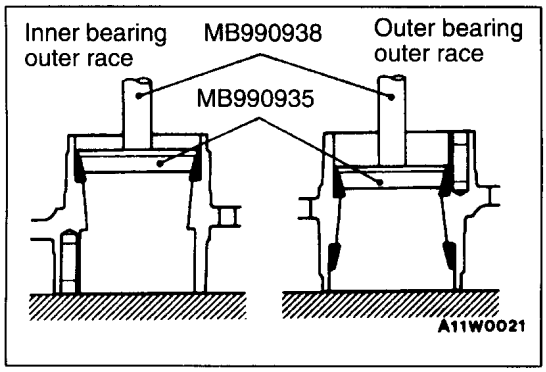
◀A▶ OUTER BEARING OUTER RACE / INNER BEARING OUTER RACE REMOVAL



◀B▶ BRAKE DISC REMOVAL

Make the mating marks on the brake disc and front hub, and then separate the front hub and brake disc, if necessary.

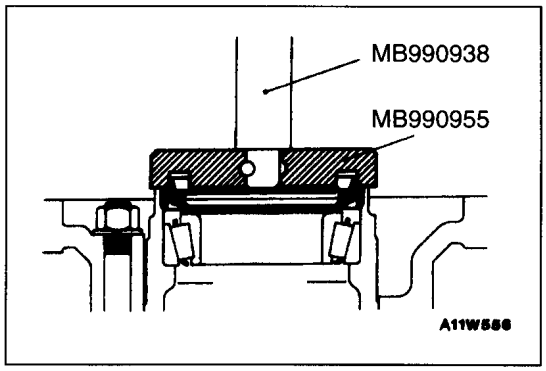
Caution
Lock disc in vise and grip with copper or aluminium board.



REASSEMBLY SERVICE POINTS

▶A◀ INNER BEARING OUTER RACE / OUTER BEARING OUTER RACE

NOTE
To replace the bearings, replace the inner race and outer race assembly as a set.



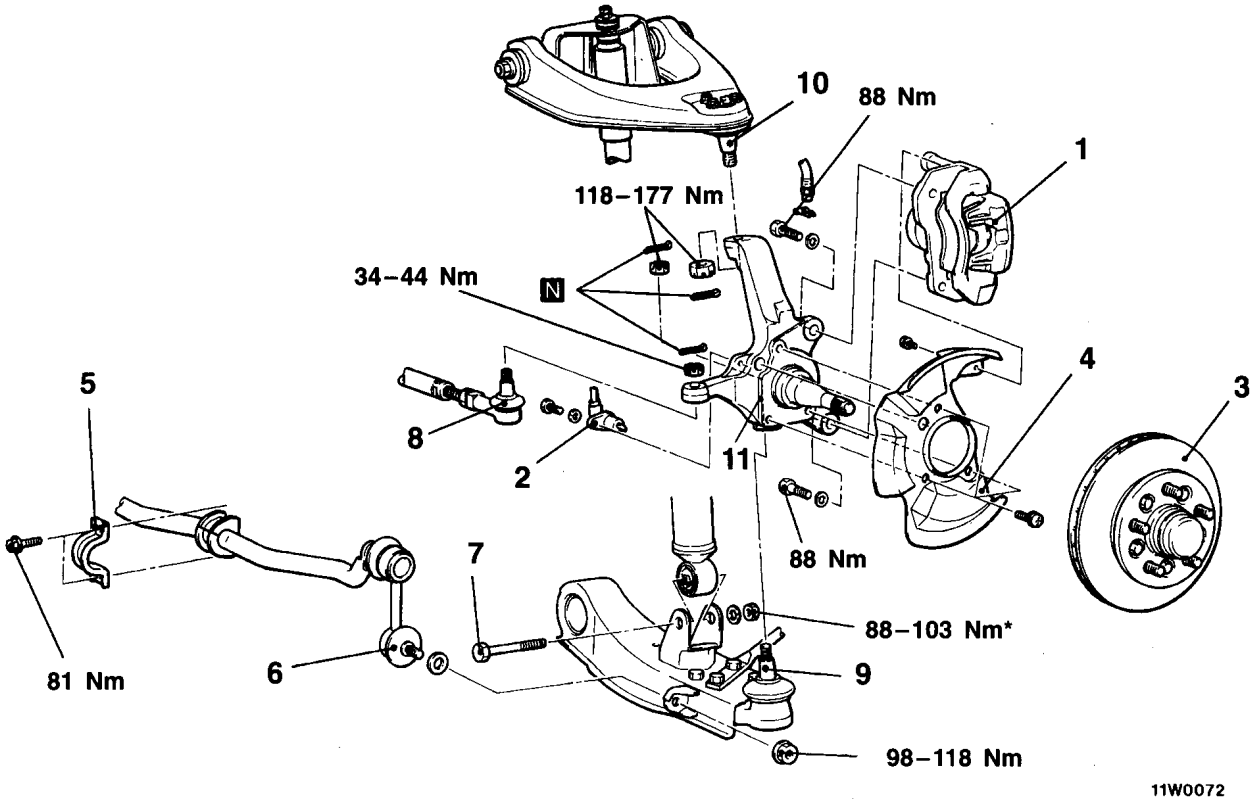
▶B◀ OIL SEAL INSTALLATION

KNUCKLE <2WD>

120000184

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Under Cover (Refer to GROUP 42 – Under Cover.)



Removal steps

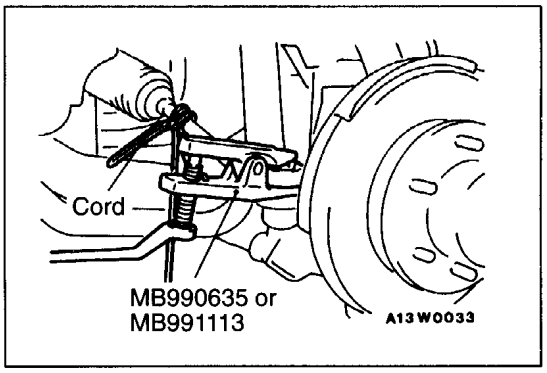
◀A▶ 1. Caliper assembly
2. Front speed sensor <Vehicles with ABS> (Refer to GROUP 35B – Wheel Speed Sensor.)
3. Hub assembly
4. Dust shield
▶C◀ 5. Clamp
▶B◀ 6. Stabilizer link
▶A◀ 7. Shock absorber lower mounting bolt
◀B▶ 8. Tie rod end connection
◀C▶ 9. Lower arm connection
◀C▶ 10. Upper arm connection
11. Knuckle

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

REMOVAL SERVICE POINTS

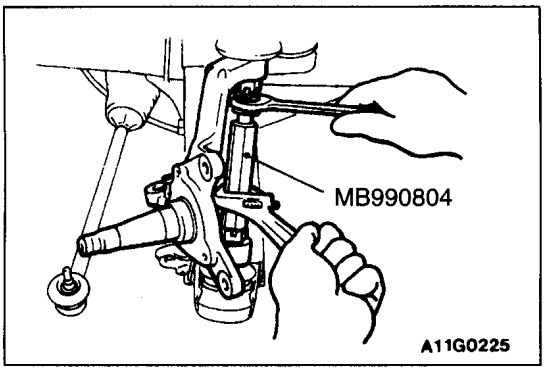
◀A▶ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire so that it does not fall.



◀B▶ TIE ROD END DISCONNECTION

Caution
1. **Use the special tool to loosen the nut only; do not remove it from the ball joint.**
2. **Tie the special tool with a cord not to let it fall off.**



◀C▶ LOWER ARM/UPPER ARM DISCONNECTION

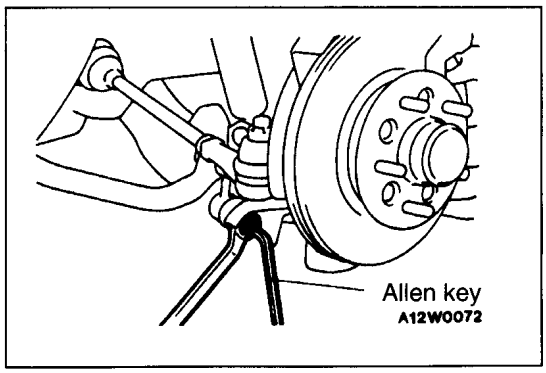
Caution
Use the special tool to loosen the nut only; do not remove it from the ball joint.

INSTALLATION SERVICE POINTS

▶A◀ SHOCK ABSORBER LOWER MOUNTING BOLT INSTALLATION

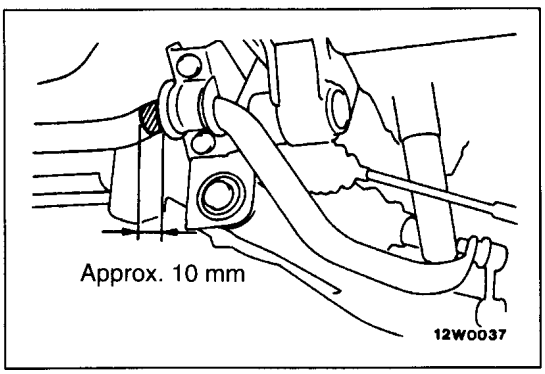
Insert the shock absorber lower mounting bolt from the front of the vehicle.

NOTE
Never insert from the rear of the vehicle, or the bolt may touch the stabilizer bar.



▶B◀ STABILIZER LINK INSTALLATION

Use an Allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.



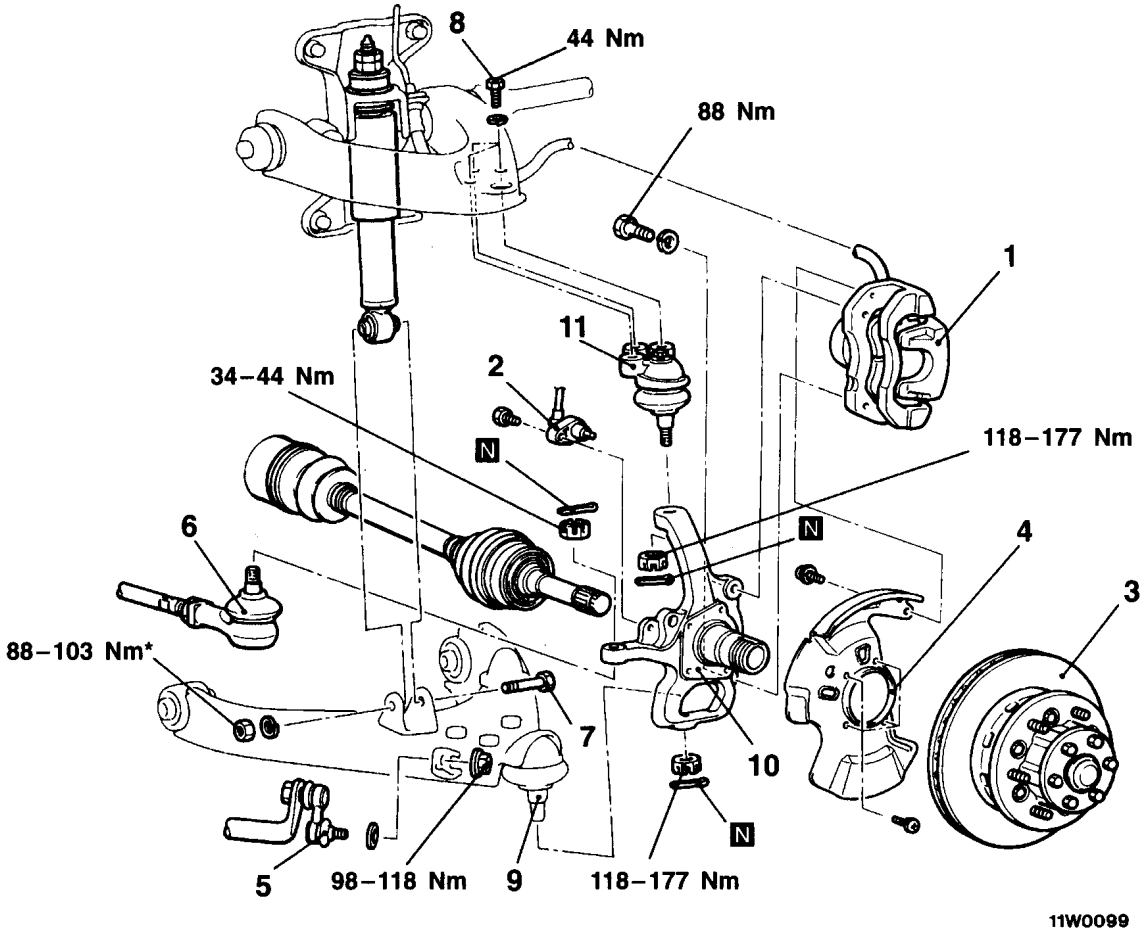
▶C◀ CLAMP INSTALLATION

1. Install the stabilizer bar so that the identification colour is on the left side.
2. Position the stabilizer bar so that its identification colour extends as shown in the illustration. Then tighten the clamp.

KNUCKLE <4WD>

120000185

REMOVAL AND INSTALLATION



Removal steps

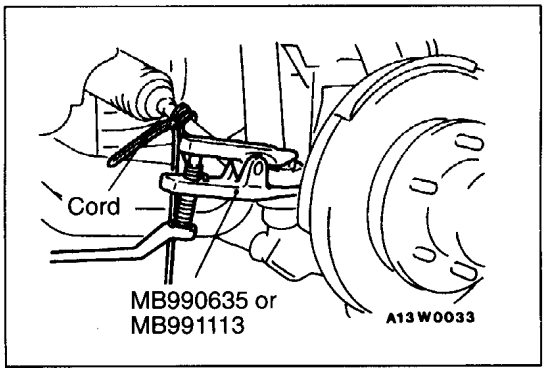
◀A▶ 1. Caliper assembly
2. Front speed sensor <Vehicles with ABS> (Refer to GROUP 35B – Wheel Speed Sensor.)
3. Hub assembly
4. Dust shield
▶C◀ 5. Stabilizer link connection
◀B▶ 6. Tie rod end connection
▶B◀ 7. Shock absorber lower mounting bolt
8. Upper ball joint mounting bolt
◀C▶ 9. Lower ball joint connection
◀D▶ ▶A◀ 10. Knuckle
◀E▶ 11. Upper ball joint

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

REMOVAL SERVICE POINTS

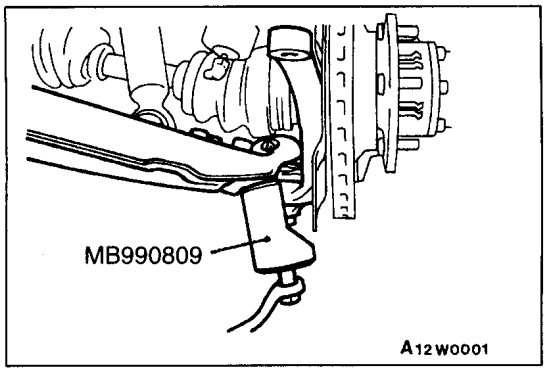
◀A▶ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire so that it does not fall.



◀B▶ TIE ROD END DISCONNECTION

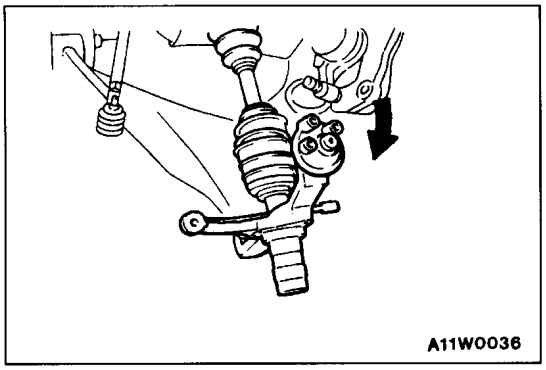
Caution
1. **Use the special tool to loosen the nut only; do not remove it from the ball joint.**
2. **Tie the special tool with a cord not to let it fall off.**



◀C▶ LOWER BALL JOINT DISCONNECTION

Caution
The nut should be loosened only, not removed.

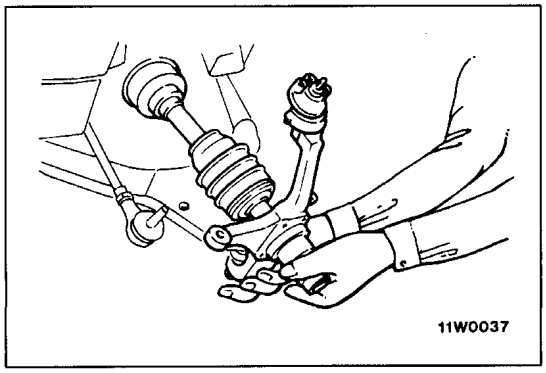
NOTE
Leave nut on lower ball joint until knuckle and upper arm are disconnected.



◀D▶ KNUCKLE REMOVAL

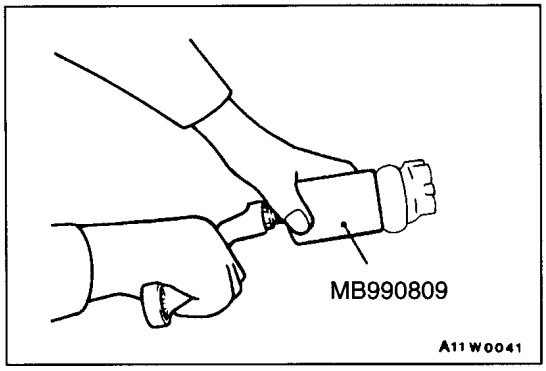
1. Press down lower arm and remove upper knuckle towards you.

   Caution
   Do not damage upper ball joint nipple with upper arm.



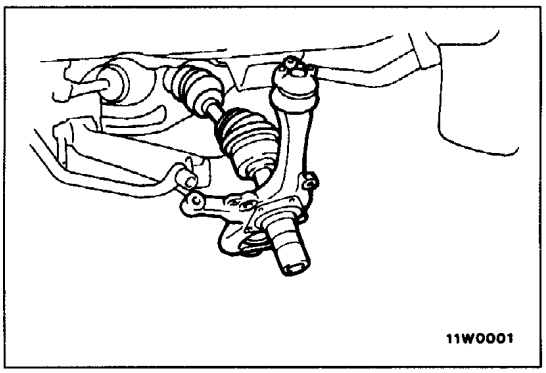
2. Slightly back off drive shaft from knuckle. Remove lower ball joint and knuckle holding nut.
3. Disconnect knuckle and lower ball joint.
4. Remove knuckle and front hub assembly from drive shaft assembly.

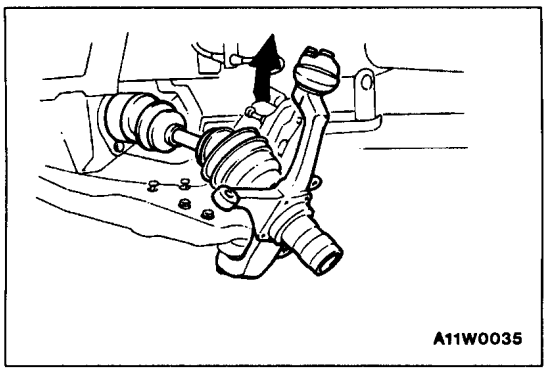
   Caution
   Do not damage knuckle oil seals with drive shaft spline.



◀E▶ UPPER BALL JOINT DISCONNECTION

Caution
The nut should be loosened only, not removed.


11W0001


A11W0035

INSTALLATION SERVICE POINTS

▶A◀ KNUCKLE INSTALLATION

1. Install upper ball joint on knuckle. Temporarily tighten slotted nut.
2. Insert knuckle into drive shaft.

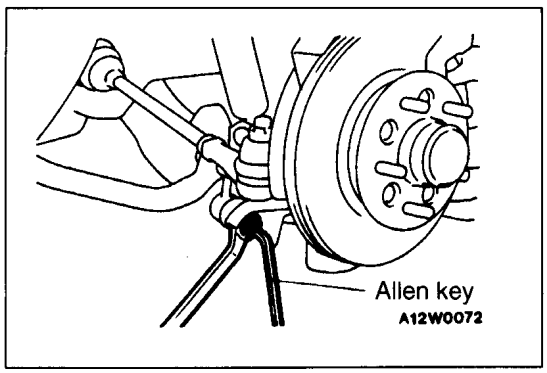
   Caution
   Do not damage oil seal with drive shaft spline.
3. Assemble knuckle and lower ball joint. Temporarily tighten slotted nut.
4. Push up lower arm to lock upper ball joint to upper arm.
5. Tighten upper and lower ball joint connecting nut to specified torque.

   Tightening torque: 118–177 Nm

▶B◀ SHOCK ABSORBER LOWER MOUNTING BOLT INSTALLATION

Insert the shock absorber lower mounting bolt from the rear of the vehicle.

NOTE
Do not insert from the front of the vehicle, or you may have trouble tightening the nut.



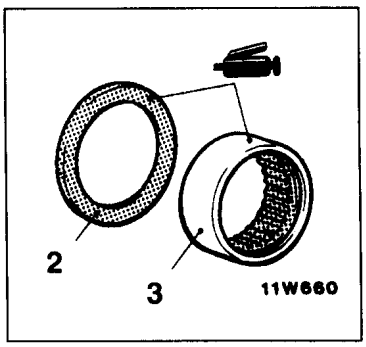
A12W0072

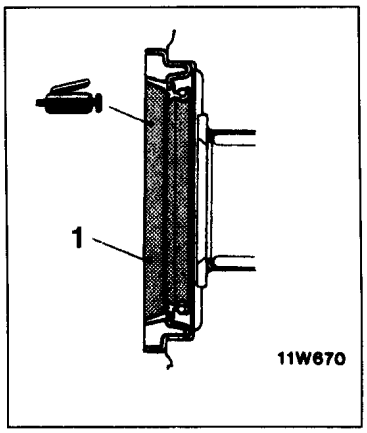
▶C◀ STABILIZER LINK INSTALLATION

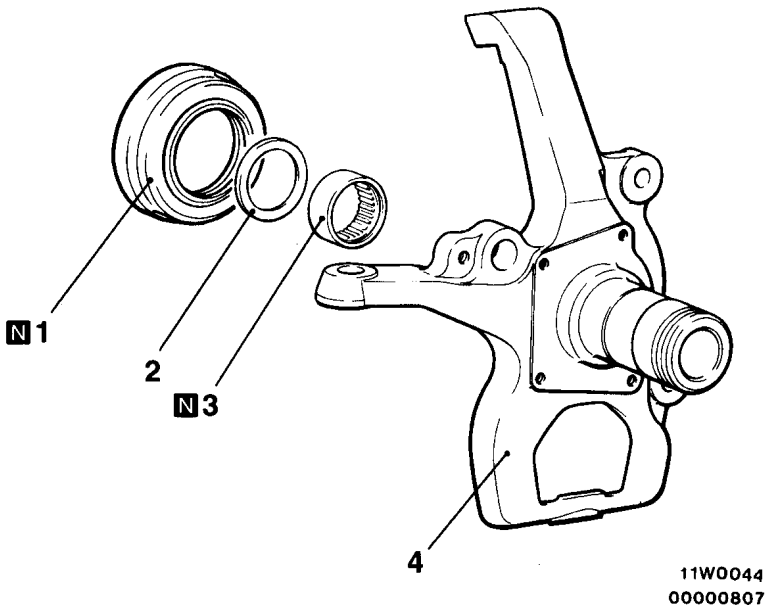
Use an Allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.

DISASSEMBLY AND REASSEMBLY

120000186

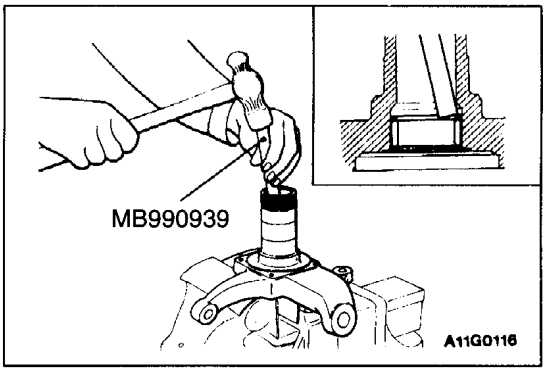






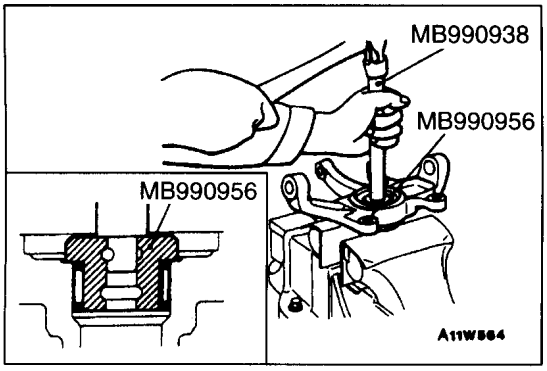
Disassembly steps

◀A▶ ▶C◀ ▶B◀ ▶A◀
1. Oil seal
2. Spacer
3. Needle bearing
4. Knuckle



DISASSEMBLY SERVICE POINT

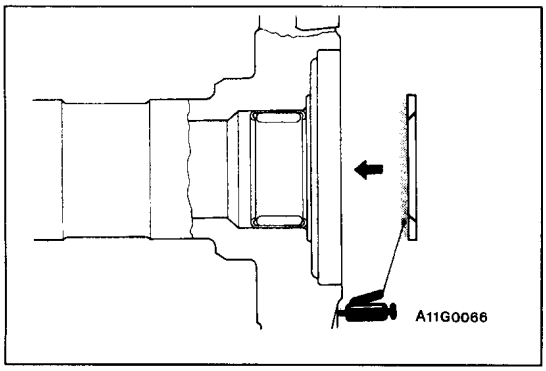
◀A▶ NEEDLE BEARING REMOVAL



REASSEMBLY SERVICE POINTS

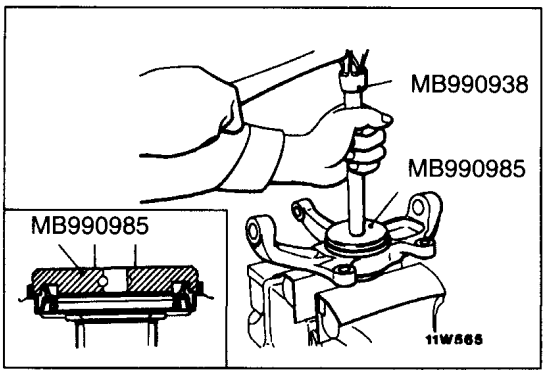
▶A◀ NEEDLE BEARING INSTALLATION

Caution
Be careful to prevent driving the needle bearing too far in.



▶B◀ SPACER INSTALLATION

Install the spacer to the knuckle with the chamfered side toward the centre of vehicle.



▶C◀ OIL SEAL INSTALLATION

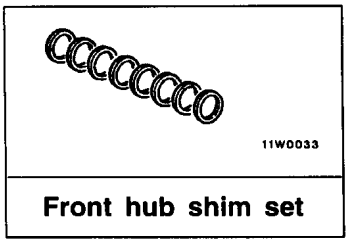
DRIVE SHAFT

120000187

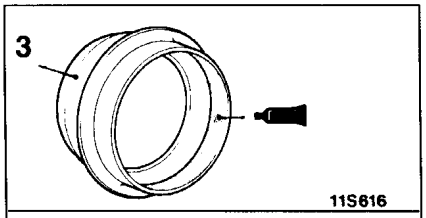
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Under Cover (Refer to GROUP 42 – Under Cover.)

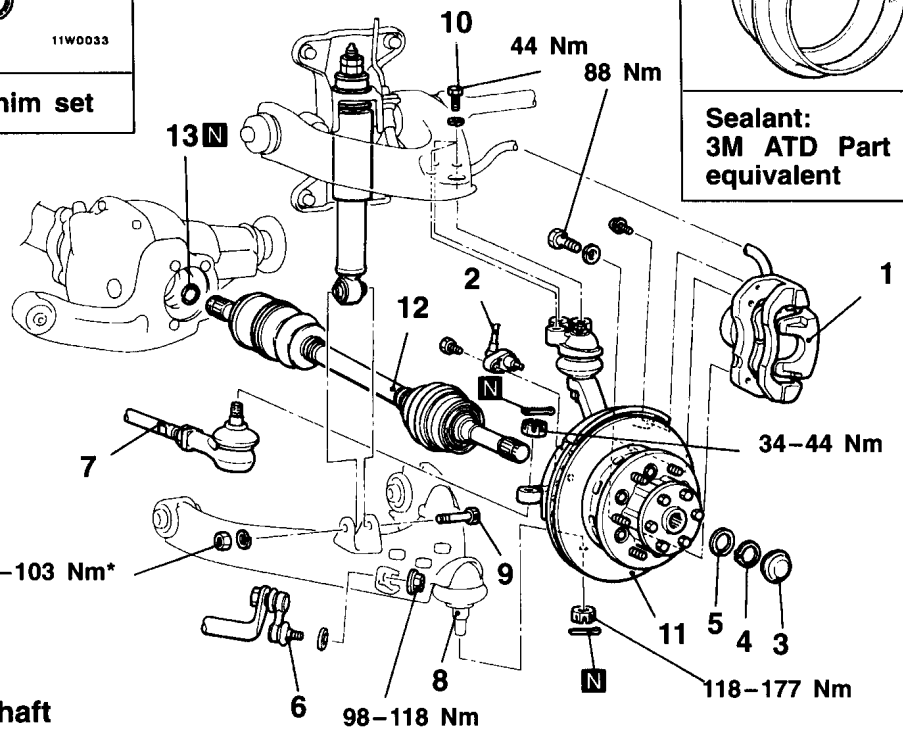
Left-side drive shaft



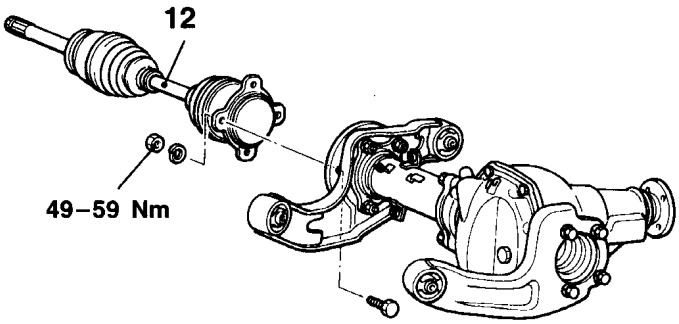
Front hub shim set



Sealant:
3M ATD Part No.8663 or equivalent



Right-side drive shaft



11W0100
00000808

Removal steps

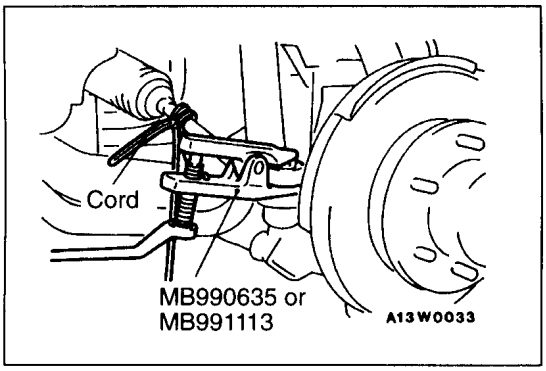
◀A▶ 1. Caliper assembly
2. Front speed sensor <Vehicles with ABS> (Refer to GROUP 35B – Wheel Speed Sensor.)
3. Hub cap
▶E◀ • Drive shaft axial play adjustment
4. Snap ring
5. Shim
▶D◀ 6. Stabilizer link connection
◀B▶ 7. Tie rod end connection
◀C▶ 8. Lower ball joint connection
▶C◀ 9. Shock absorber lower mounting bolt
10. Upper ball joint mounting bolt
◀D▶ ▶B◀ 11. Knuckle and front hub assembly
◀E▶ ▶A◀ 12. Drive shaft assembly
13. Circlip

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

REMOVAL SERVICE POINTS

◀A▶ CALIPER ASSEMBLY REMOVAL

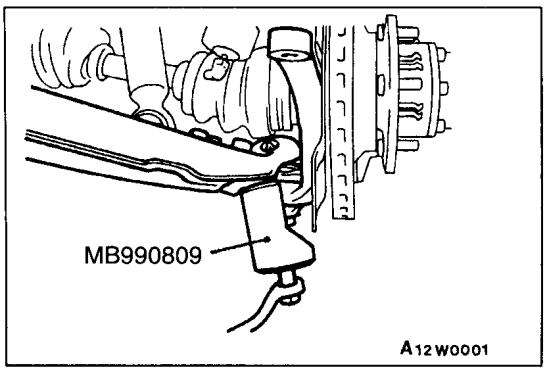
Secure the removed caliper assembly with wire so that it does not fall.



◀B▶ TIE ROD END DISCONNECTION

Caution

1. **Use the special tool to loosen the nut only; do not remove it from the ball joint.**
2. **Tie the special tool with a cord not to let it fall off.**



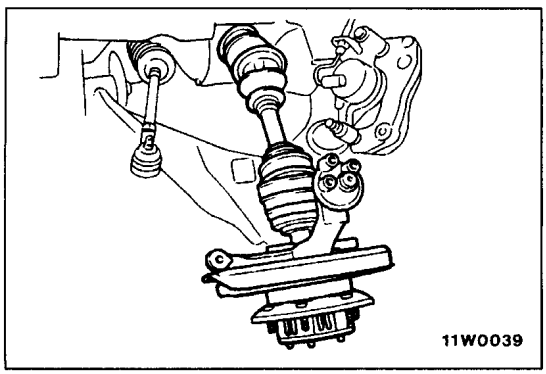
◀C▶ LOWER BALL JOINT DISCONNECTION

Caution

Use the special tool to loosen the nut only; do not remove it from the lower ball joint.

NOTE

Do not remove it until disassembling the upper arm and knuckle.



◀D▶ KNUCKLE AND FRONT HUB ASSEMBLY REMOVAL

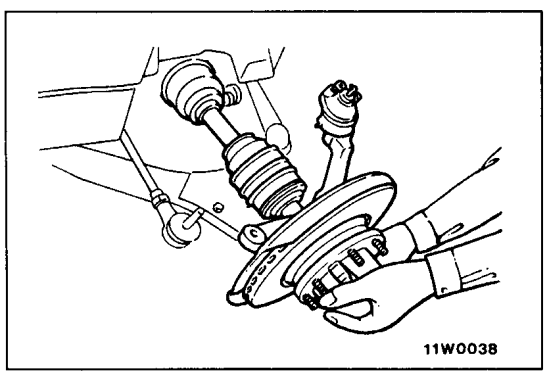
1. Press down lower arm and remove upper knuckle towards you.

   Caution

   Do not damage upper ball joint nipple with upper arm.

   NOTE

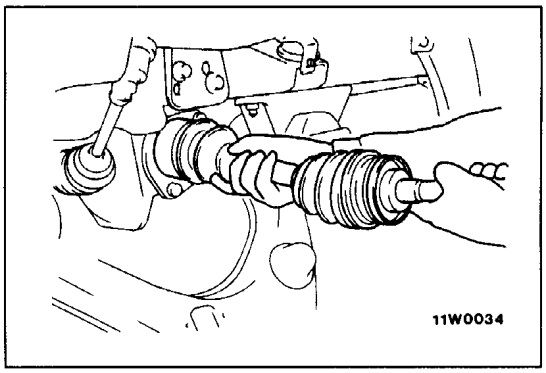
   Pull the D.O.J. side of the drive shaft assembly out slightly from the front differential carrier.



2. Slightly back off drive shaft from knuckle. Remove lower ball joint and knuckle holding nut.
3. Disconnect knuckle and lower ball joint.
4. Remove knuckle and front hub assembly from drive shaft assembly.

   Caution

   Do not damage knuckle oil seals with drive shaft spline.



◀E▶ DRIVE SHAFT (LEFT SIDE) REMOVAL

Caution
When pulling the drive shaft out from the differential carrier, be careful that the spline part of the drive shaft does not damage the oil seal.

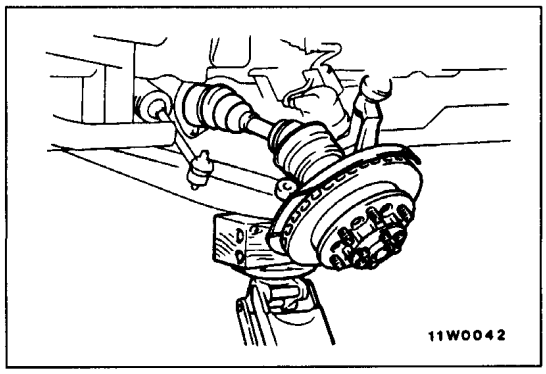
INSPECTION

- Check the boot for damage or deterioration.
- Check the ball joint for operating condition and excessive looseness.
- Check the splines for wear or damage.
- Check the differential carrier oil seal (L.H.) for damage.

INSTALLATION SERVICE POINTS

▶A◀ DRIVE SHAFT (LEFT SIDE) INSTALLATION

Caution
Do not damage the oil seal of the differential carrier by the drive shaft splines.



▶B◀ KNUCKLE AND FRONT HUB ASSEMBLY INSTALLATION

1. Insert knuckle and front hub assembly to drive shaft.

   Caution
   Do not damage knuckle oil seal with drive shaft spline.
2. Assemble knuckle and lower ball joint and temporarily tighten slotted nut.
3. Press up lower arm and lock upper ball joint onto upper arm.
4. Tighten lower ball joint mounting nuts to specified torque.

   Tightening torque: 118–177 Nm

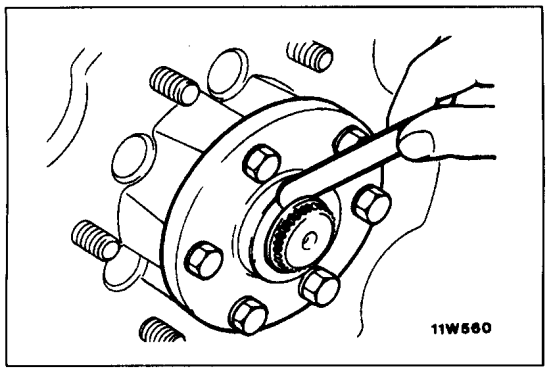
▶C◀ SHOCK ABSORBER LOWER MOUNTING BOLT INSTALLATION

Insert the shock absorber lower mounting bolt from the rear of the vehicle.

NOTE
Do not insert from the front of the vehicle, or you may have trouble when tightening the nut.

▶D◀ STABILIZER LINK INSTALLATION

Use an Allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.



▶E◀ DRIVE SHAFT AXIAL PLAY ADJUSTMENT

1. Push the drive shaft in by hand towards the knuckle until they touch.
2. Measure the clearance between the drive flange and the spacer with a thickness gauge as shown in the illustration.

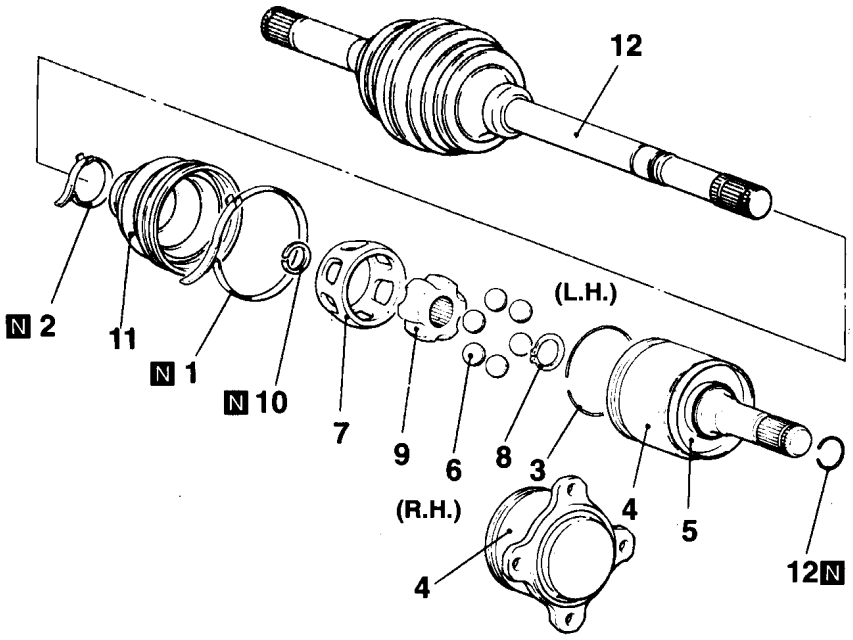
   Standard value: 0.4–0.7 mm

3. If the amount of play is outside the standard value, adjust by selecting a shim that will bring the play to the standard value.

   NOTE
   The shims available range from 0.3 mm thick to 0.6 mm thick in steps of 0.1 mm, and from 0.9 mm thick to 1.8 mm thick in steps of 0.3 mm.

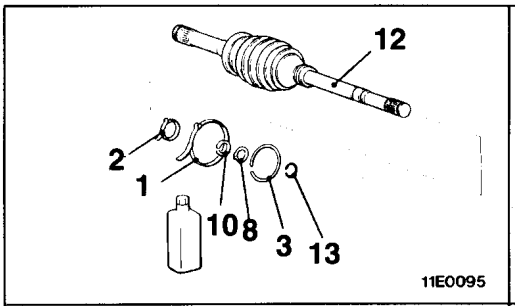
DISASSEMBLY AND REASSEMBLY

120002203



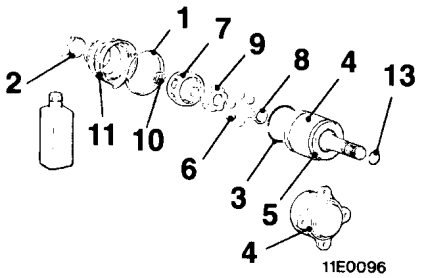
11E0078

00002679



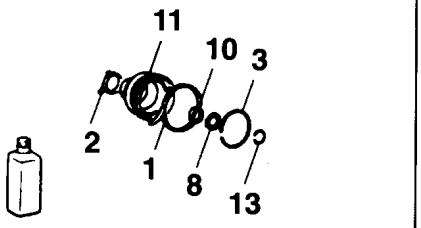
11E0095

B.J. repair kit L.H.



11E0096

D.O.J. repair kit



11W673

Boot repair kit (D.O.J.)

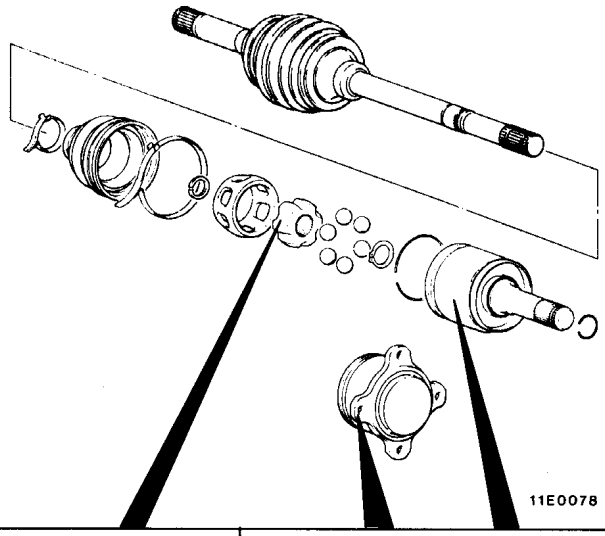
Disassembly steps

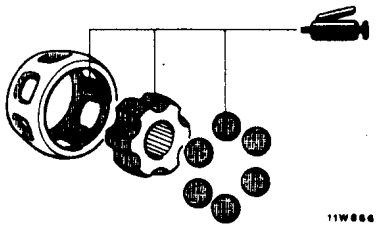
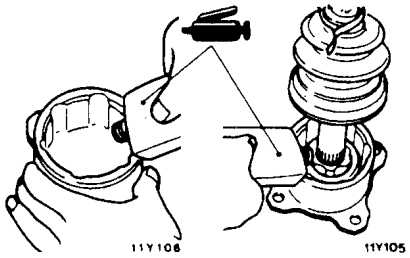
1. D.O.J. boot band (large)
2. D.O.J. boot band (small)
3. Circlip
4. D.O.J. outer race
5. Dust cover
◀A▶ 6. Balls
◀B▶ 7. D.O.J. cage
8. Snap ring
9. D.O.J. inner race
10. Snap ring <4D56 Wagon>
◀C▶ 11. D.O.J. boot
12. B.J. assembly
13. Circlip

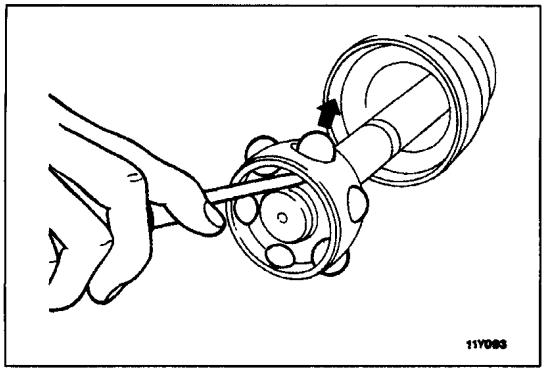
Reassembly steps

13. Circlip
12. B.J. assembly
▶A◀ 10. Snap ring
▶A◀ 9. D.O.J. inner race
▶A◀ 8. Snap ring
▶A◀ 7. D.O.J. cage
▶A◀ 6. Balls
▶B◀ 4. D.O.J. outer race
5. Dust cover
3. Circlip
▶C◀ 11. D.O.J. boot
▶C◀ 2. D.O.J. boot band (small)
▶C◀ 1. D.O.J. boot band (large)

Lubrication Points

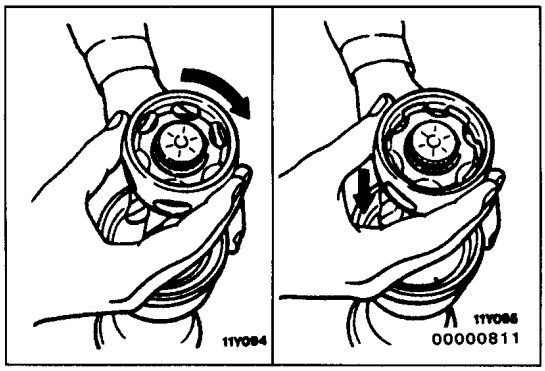


	
Grease: Repair kit grease	Grease: Repair kit grease 100g (60g inside joint, 40g inside boot)
Caution Do not mix old and new or different types of grease, as a special grease is used in the joint.	

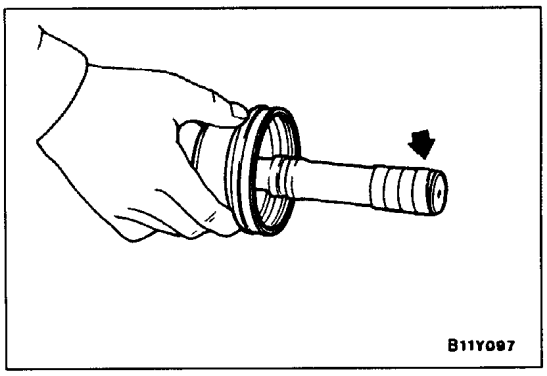


DISASSEMBLY SERVICE POINTS

◀A▶ BALLS REMOVAL

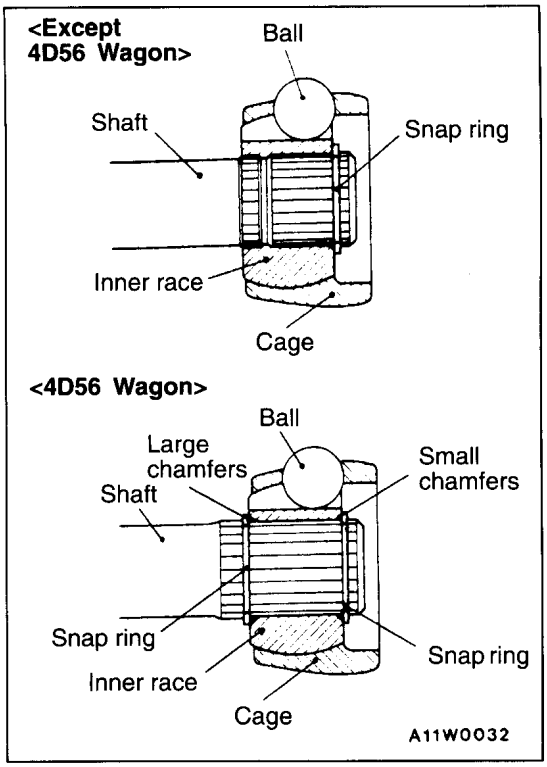


◀B▶ D.O.J. CAGE REMOVAL



◀C▶ D.O.J. BOOT REMOVAL

Wrap plastic tape around the spline part on the D.O.J. side of the drive shaft so that D.O.J. boot is not damaged when they are removed.

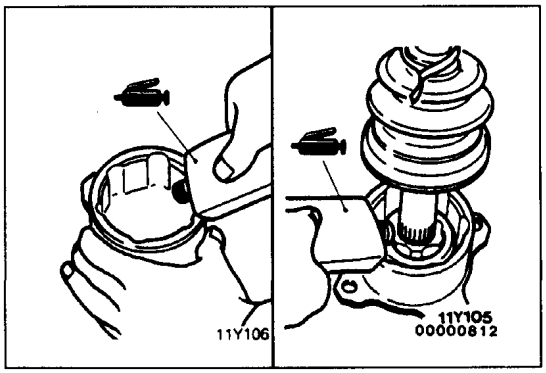


REASSEMBLY SERVICE POINTS

▶A◀ D.O.J. INNER RACE/SNAP RING/D.O.J. CAGE /BALLS INSTALLATION

Install the cage, balls and inner race to the drive shaft, and fit the snap ring securely to the groove in the drive shaft.

Caution
Install the inner race so that the large chamfers on the spline section are on the drive shaft side. <4D56 Wagon>



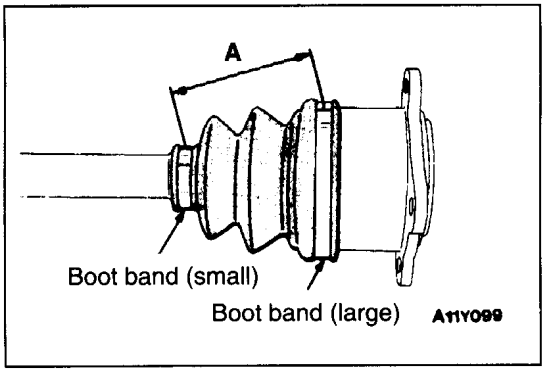
▶B◀ D.O.J. OUTER RACE INSTALLATION

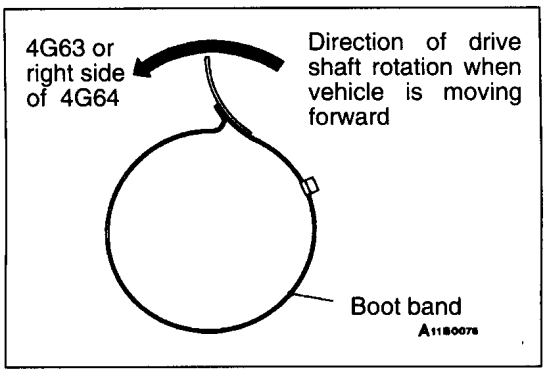
Fill the inside of the D.O.J. outer race and D.O.J. boot with the specified grease.

Specified grease: Repair kit grease 100g

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 use special grease. Do not mix old and new or different types of grease.





▶C◀ D.O.J. BOOT / D.O.J. BOOT BAND INSTALLATION

1. Position the D.O.J. outer race so that the distance between the boot bands is at the standard value.

   Standard value (A): 80±3 mm

2. Remove part of the D.O.J. boot from the D.O.J. outer race to release the air pressure inside the boot.

3. Secure the boot band (large) on D.O.J. boot.

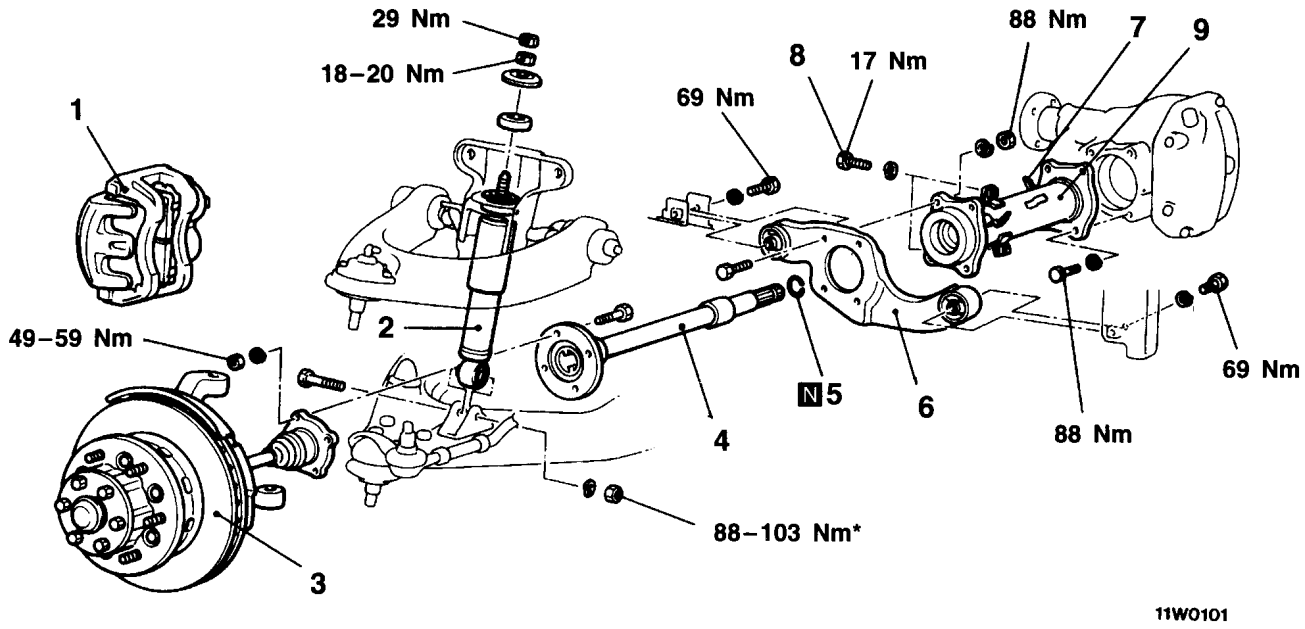
   Caution
   For 4G63 or right side of 4G64 engine, be careful about the shown direction when installing the boot bands to the right-side drive shaft

INNER SHAFT

120000189

REMOVAL AND INSTALLATION

Pre-removal and Post-installtion Operation
- Removal and Installation of Under Cover (Refer to GROUP 42 – Under Cover.)



Removal steps

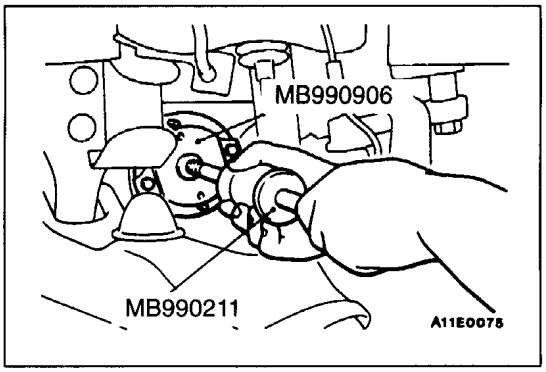
◀A▶ 1. Caliper assembly
2. Shock absorber
3. Hub assembly, knuckle, drive shaft (Refer to P.26-27.)
◀B▶ ▶A◀ 4. Inner shaft
5. Circlip
6. Differential mounting bracket (R.H.)
7. Free-wheeling engage switch connector
8. Actuator mounting bolts
9. Housing tube assembly

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

REMOVAL SERVICE POINTS

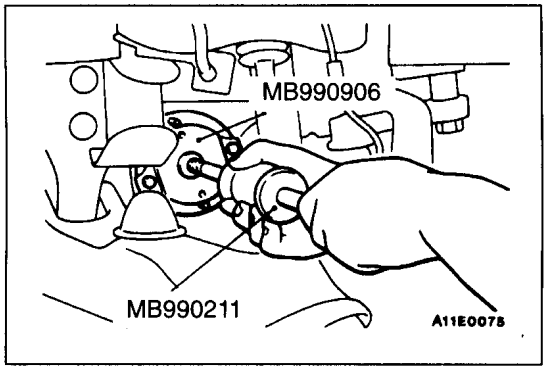
◀A▶ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire so that it does not fall.



◀B▶ INNER SHAFT REMOVAL

Caution
When pulling the inner shaft out from the front differential carrier, be careful that the spline part of the inner shaft does not damage the oil seal.



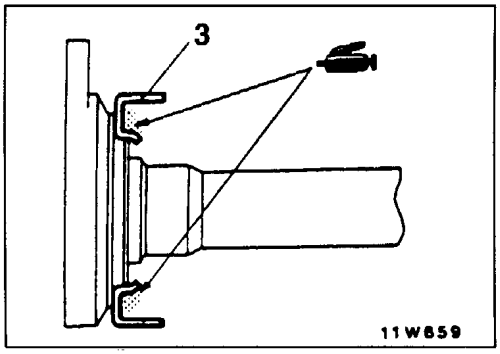
INSTALLATION SERVICE POINT

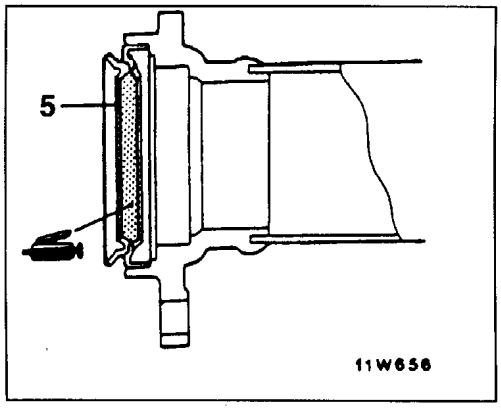
▶A◀ INNER SHAFT INSTALLATION

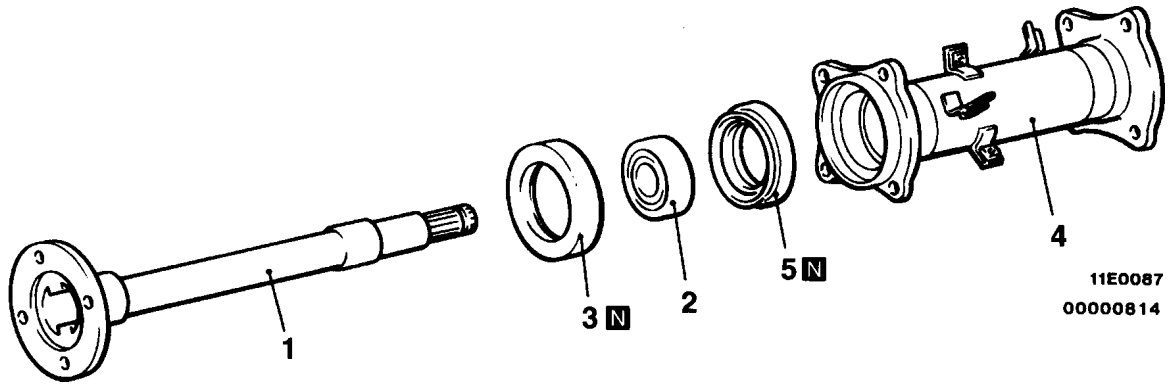
Caution
Be careful not to damage the lip of the dust seal and oil seal.

DISASSEMBLY AND REASSEMBLY

120000190

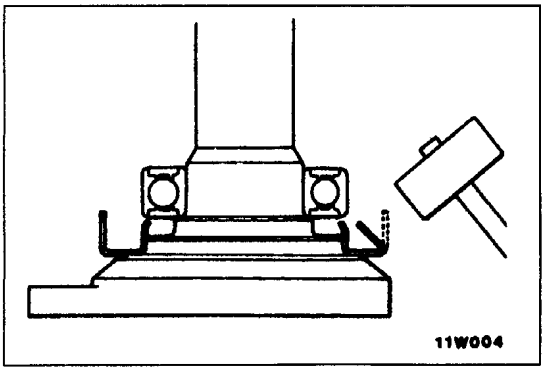






Disassembly steps

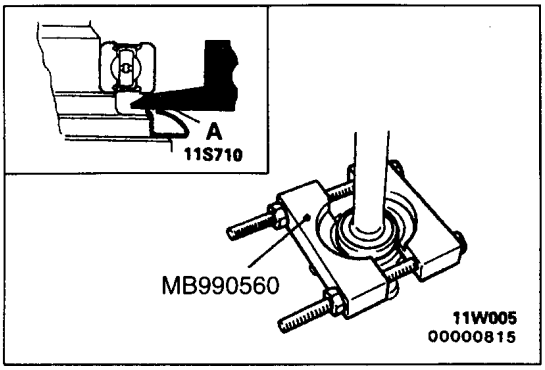
1. Inner shaft
◀A▶ ▶C◀ 2. Bearing
▶B◀ 3. Dust cover
4. Housing tube
▶A◀ 5. Dust seal



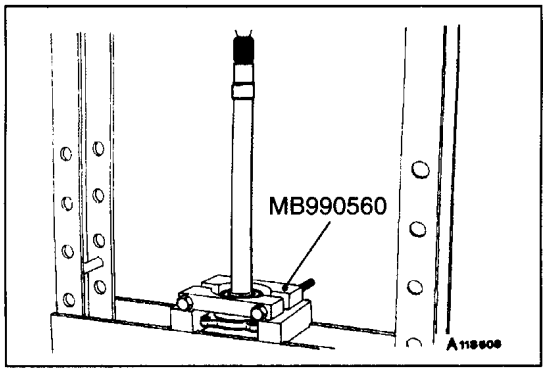
DISASSEMBLY SERVICE POINT

◀A▶ BEARING REMOVAL

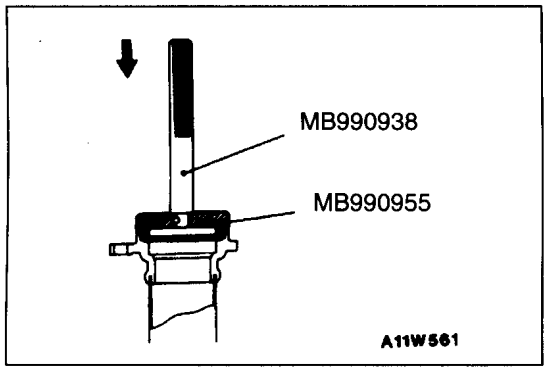
1. Bend the outside periphery of dust cover inward with a hammer.



2. After the special tool has been installed as shown, tighten the nut of the special tool until the portion "A" of the special tool touches the bearing outer race.



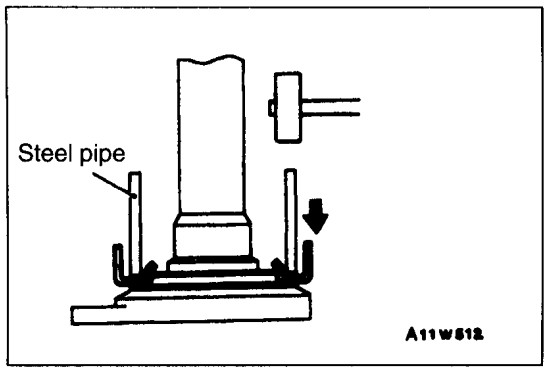
3. Press out the inner shaft from the bearing.



REASSEMBLY SERVICE POINTS

▶A◀ DUST SEAL INSTALLATION

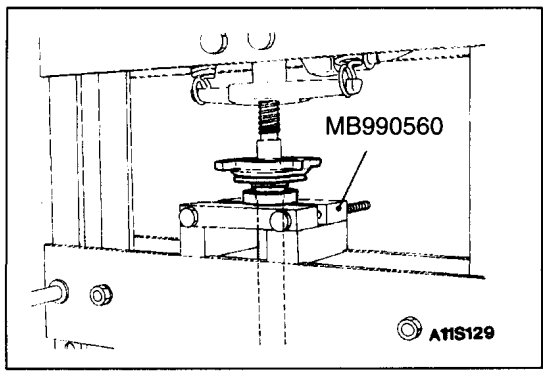
Press-fit the new dust seal into the housing tube by using the special tools, until it is flush with the housing tube end face.



▶B◀ DUST COVER INSTALLATION

Using a steel pipe, force a new dust cover onto the inner shaft.

Steel pipe	mm
Overall length	50
Outside diameter	75
Wall thickness	4



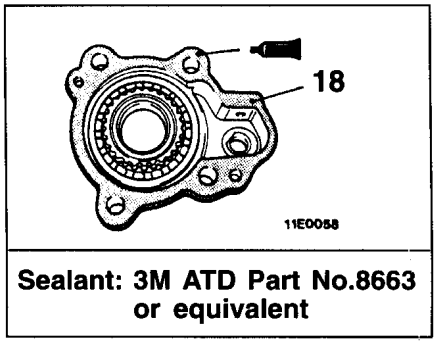
▶C◀ BEARING INSTALLATION

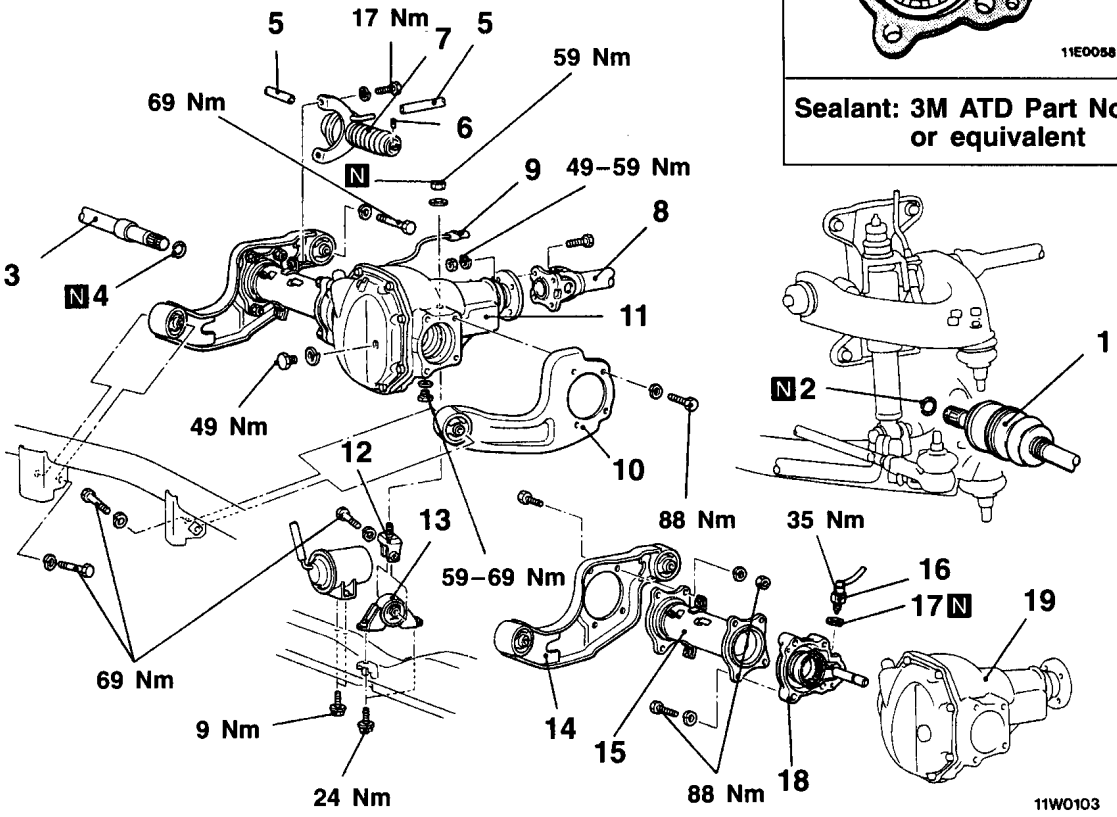
DIFFERENTIAL CARRIER

120002470

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
(1)Removal and Installation of Under Cover (Refer to GROUP 42 – Under Cover.)
(2)Draining and Supplying of Gear Oil (Refer to P.26-10.)

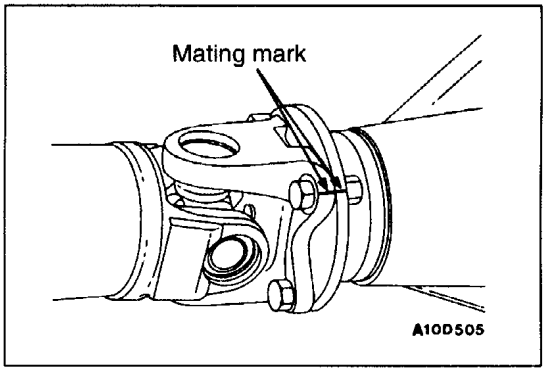




00000816

Removal steps

1. Drive shaft (Refer to P.26-27.)
2. Circlip
3. Inner shaft (Refer to P.26-34.)
4. Circlip
▶C◀ 5. Vacuum hose connection
6. Pin
7. Actuator assembly
◀A▶ ▶B◀ 8. Front propeller shaft connection
9. Free-wheeling engage switch connector
10. Differential mounting bracket (L.H.)
11. Front differential, housing tube, differential bracket (R.H.)
12. Differential support bracket
13. Differential mount insulator assembly
14. Differential mounting bracket (R.H.)
15. Housing tube
16. Free-wheeling engage switch
17. Gasket
18. Free-wheeling clutch assembly
▶A◀ • Clutch gear bearing axial play inspection
19. Front differential carrier assembly

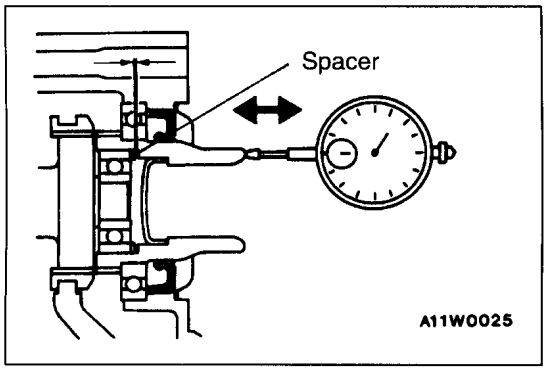


REMOVAL SERVICE POINT

◀A▶ FRONT PROPELLER SHAFT REMOVAL

Make the mating marks on the companion flange and flange yoke, disconnect the propeller shaft from the companion flange.

Caution
Suspend the propeller shaft from the body with wire, etc. to prevent it from falling.



INSTALLATION SERVICE POINTS

▶A◀ CLUTCH GEAR BEARING AXIAL PLAY INSPECTION

Check the axial play of the clutch gear bearing by the following procedure before installing the free-wheeling clutch assembly.

(1) Insert flat washers of the same thickness as the housing tube (9.0 mm) onto the bolt, and then temporarily install the free-wheeling clutch assembly to the front differential.

(2) Place a dial gauge against the end of the clutch gear and check the axial play of the clutch gear bearing.

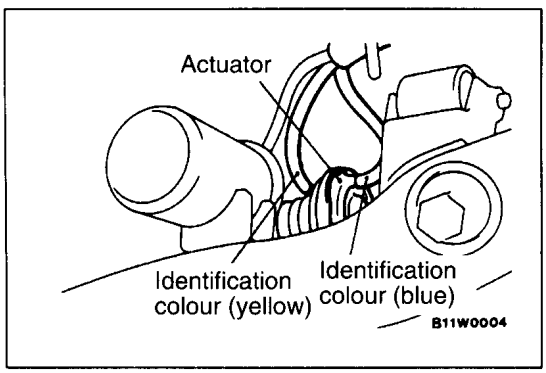
Standard value: 0.05–0.30 mm

(3) If the play is not within the standard value, disassemble the bearing and insert a spacer of the appropriate thickness.

NOTE
The thicknesses of the spacers vary in steps of 0.25 mm.

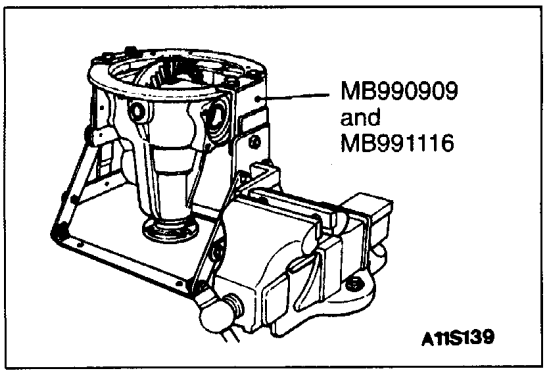
▶B◀ FRONT PROPELLER SHAFT INSTALLATION

Install the front propeller shaft so that the mating marks of the flange yoke and the differential carrier companion flange are aligned.



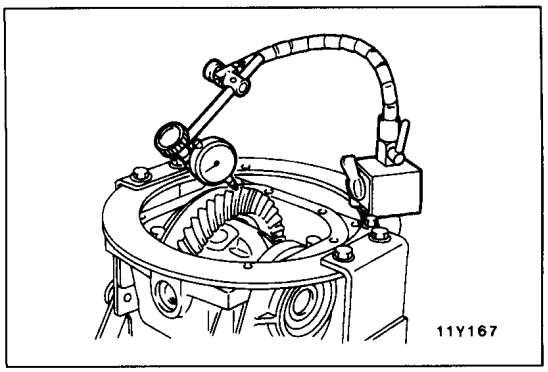
▶C◀ VACUUM HOSE INSTALLATION

Install the vacuum hoses so that they match the identification colours of the actuator assembly nipple.



INSPECTION BEFORE DISASSEMBLY

1. Remove the cover and gasket.
2. Hold the special tool in a vise, and install the differential carrier assembly to the special tool.

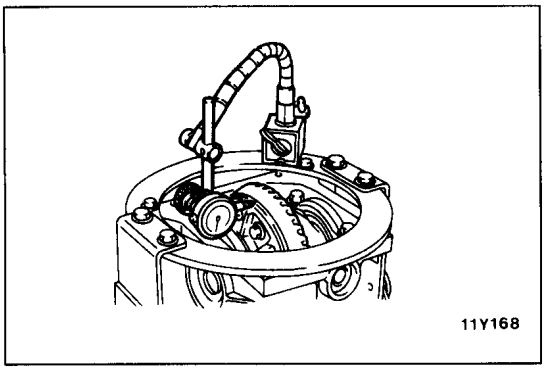


DRIVE GEAR BACKLASH

1. With the drive pinion locked in place, use a dial gauge to measure the drive gear backlash in four or more places on the drive gear.

   Standard value: 0.11–0.16 mm

2. If the backlash is not within the standard value, insert side bearing adjustment spacers, and then inspect the drive gear tooth contact.

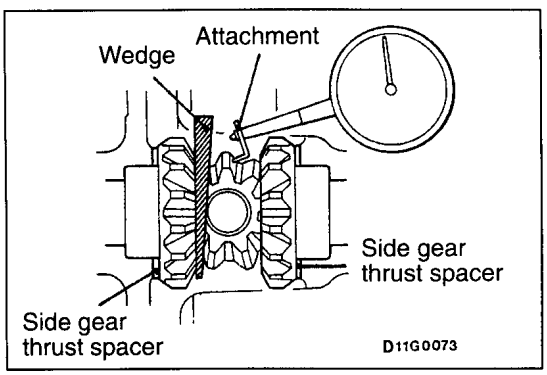


DRIVE GEAR RUNOUT

1. Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

   Limit: 0.05 mm

2. When runout exceeds the limit value, check for foreign object between drive gear rear side and differential case, or for loose drive gear installation bolts.
3. When check (2) gives normal results, reposition drive gear and differential case and remeasure.
4. If adjustment is impossible, replace differential case, or replace drive gear and pinion as a set.



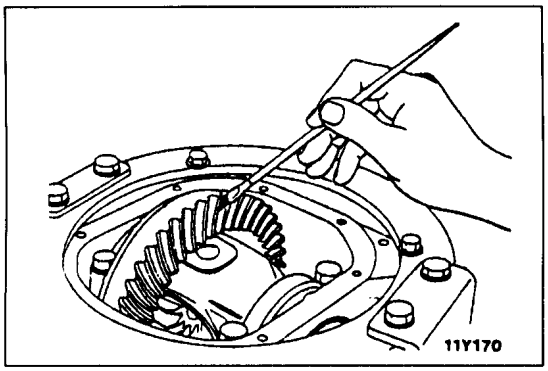
DIFFERENTIAL GEAR BACKLASH (EXCLUDING 4 PINION DIFFERENTIAL)

1. While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

   Standard value: 0–0.076 mm
   Limit: 0.2 mm

   Repeat the same procedure for both pinion gears.

2. If the backlash exceeds the limit, adjust by using the side gear thrust spacers.
3. If adjustment is impossible, replace the side gear and pinion gear as a set.

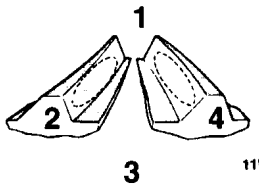


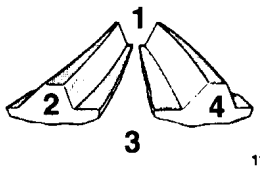
DRIVE GEAR TOOTH CONTACT

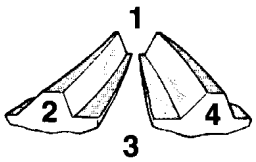
Check the tooth contact of drive gear by following the steps below.

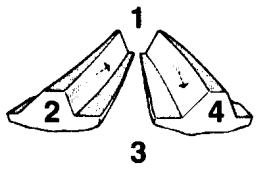
1. Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.
2. Insert the brass between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear so that the revolution torque (approximate 250–300 Ncm) is applied to the drive pinion.

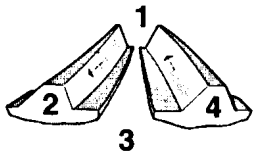
   Caution
   If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.
3. Check the tooth contact condition of the drive gear and drive pinion.

<table>
<tr><th>Standard tooth contact pattern</th><th>Problem</th><th>Solution</th></tr>
<tr><td>1 Narrow tooth side
2 Drive-side tooth surface (the side applying power during forward movement)
3 Wide tooth side
4 Coast-side tooth surface (the side applying power during reverse movement)
 

11W0115</td><td>Tooth contact pattern resulting from excessive pinion height
 

11W0116
The drive pinion is positioned too far from the centre of the drive gear.</td><td> 

11W0118
Increase the thickness of the drive pinion rear shim, and position the drive pinion closer to the centre of the drive gear. Also, for backlash adjustment, position the drive gear farther from the drive pinion.</td></tr>
<tr><td></td><td>Tooth contact pattern resulting from insufficient pionion height.
 

11W0117
The drive pinion is positioned too close to the centre of the drive gear.</td><td> 

11W0119
Decrease the thickness of the drive pinion rear shim, and position the drive pinion farther from the centre of the drive gear. Also, for backlash adjustment, position the drive gear closer to the drive pinion.</td></tr>
</table>

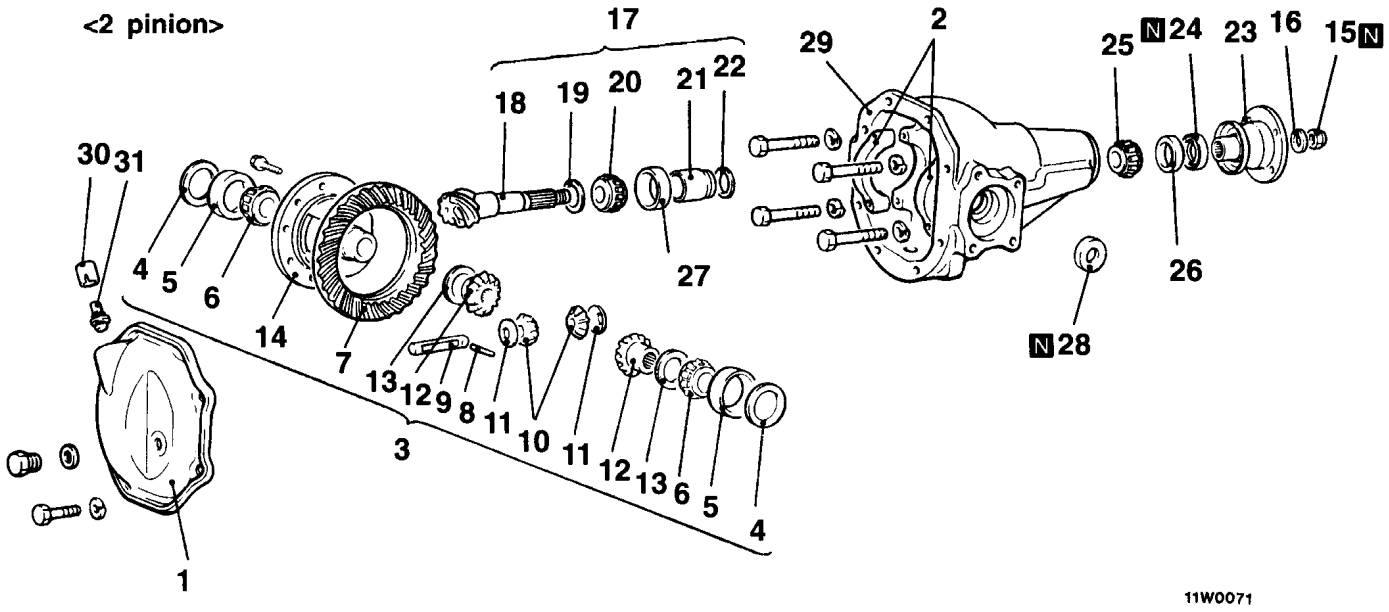
NOTE

Checking the tooth contact pattern is the way to confirm that the adjustments of the pinion height and backlash have been done properly. Continue to adjust the pinion height and backlash until the tooth contact pattern resembles the standard pattern.

If, even after adjustments have been made, the correct tooth contact pattern cannot be obtained, it means that the drive gear and the drive pinion have become worn beyond the allowable limit. Replace the gear set.

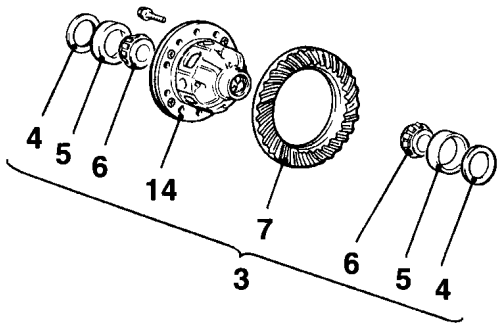
DISASSEMBLY

120002204



11W0071

<4 pinion>



11E0091

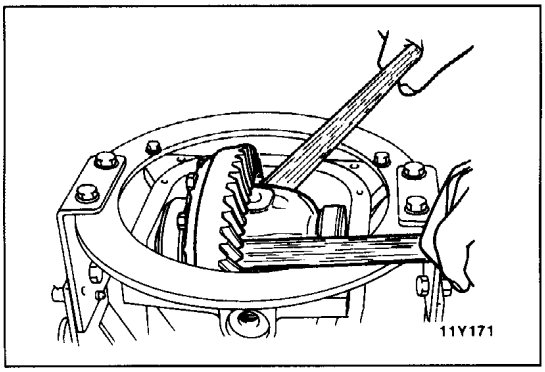
00000817

Disassembly steps

- Inspection before disassembly (Refer to P.26-41.)

1. Cover
2. Bearing cap
3. Differential case assembly
4. Side bearing spacer
5. Side bearing outer race
6. Side bearing inner race
7. Drive gear
8. Lock pin
9. Pinion shaft
10. Pinion gear
11. Pinion washer
12. Side gear
13. Side gear spacer
14. Differential case
15. Self-locking nut
16. Washer
17. Drive pinion assembly
18. Drive pinion
19. Drive pinion front shim (for pinion height adjustment)
20. Drive pinion front bearing inner race
21. Drive pinion spacer
22. Drive pinion rear shim (for turning torque adjustment)
23. Companion flange
24. Oil seal
25. Drive pinion rear bearing inner race
26. Drive pinion rear bearing outer race
27. Drive pinion front bearing outer race
28. Oil seal
29. Gear carrier
30. Plug cover
31. Vent plug

◀A▶ ◀B▶ ◀C▶ ◀D▶ ◀E▶ ◀F▶ ◀G▶ ◀H▶ ◀I▶

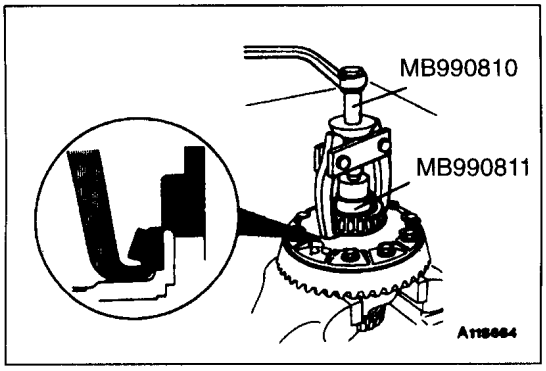


DISASSEMBLY SERVICE POINTS

◀A▶ DIFFERENTIAL CASE ASSEMBLY REMOVAL

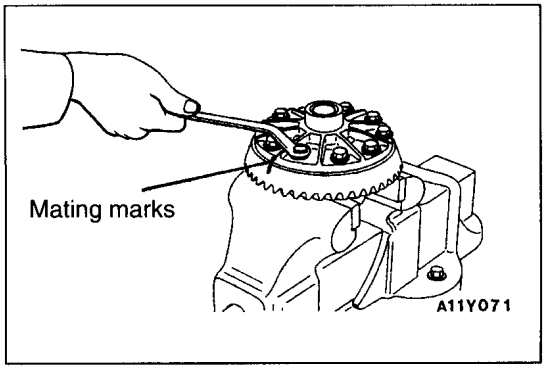
Caution
When taking out the differential case assembly, be careful not to drop and damage the side bearing outer races.

NOTE
Keep the right and left side bearings and side bearing adjusting spacers separately, so that they do not become mixed at the time of reassembly.



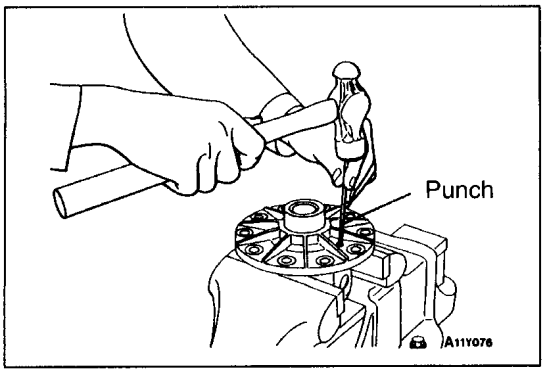
◀B▶ SIDE BEARING INNER RACE REMOVAL

NOTE
There are two notches provided (at the differential case side) for the claw part of the special tool; be sure to set the legs of special tool at these places.

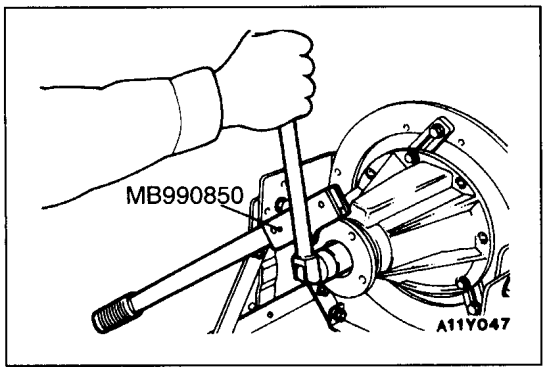


◀C▶ DRIVE GEAR REMOVAL

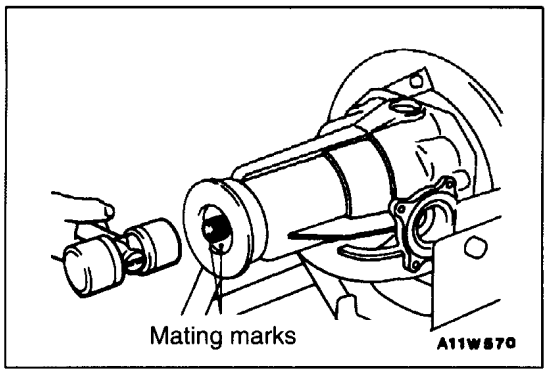
1. Make the mating marks to the differential case and the drive gear.
2. Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



◀D▶ LOCK PIN REMOVAL



◀E▶ SELF-LOCKING NUT REMOVAL

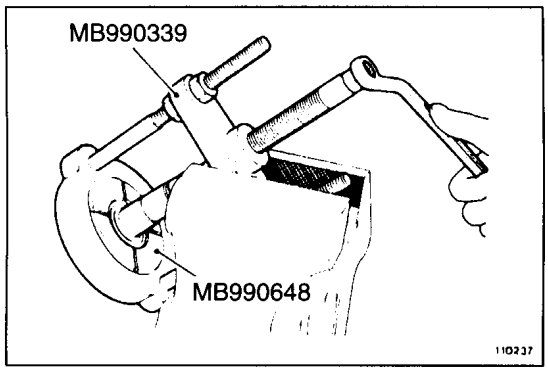


◀F▶ DRIVE PINION ASSEMBLY REMOVAL

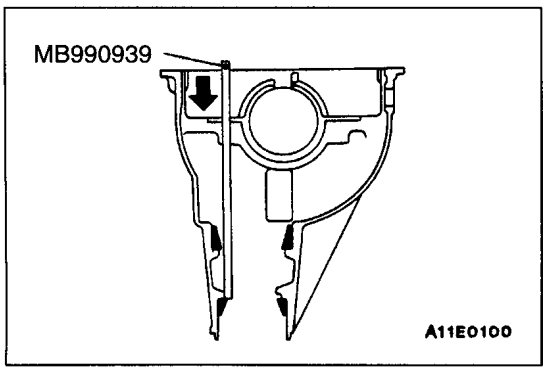
1. Make mating marks on the drive pinion and companion flange.

   Caution
   The mating mark made on the companion flange must not be on the coupling surface of the flange yoke and the front propeller shaft.

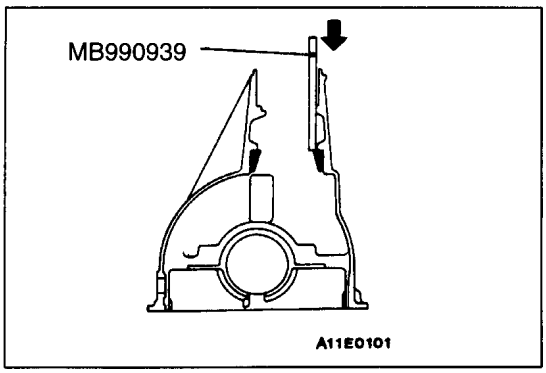
2. Drive out the drive pinion together with the drive pinion spacer and drive pinion shims.



◀G▶ DRIVE PINION FRONT BEARING INNER RACE REMOVAL



◀H▶ DRIVE PINION REAR BEARING OUTER RACE REMOVAL

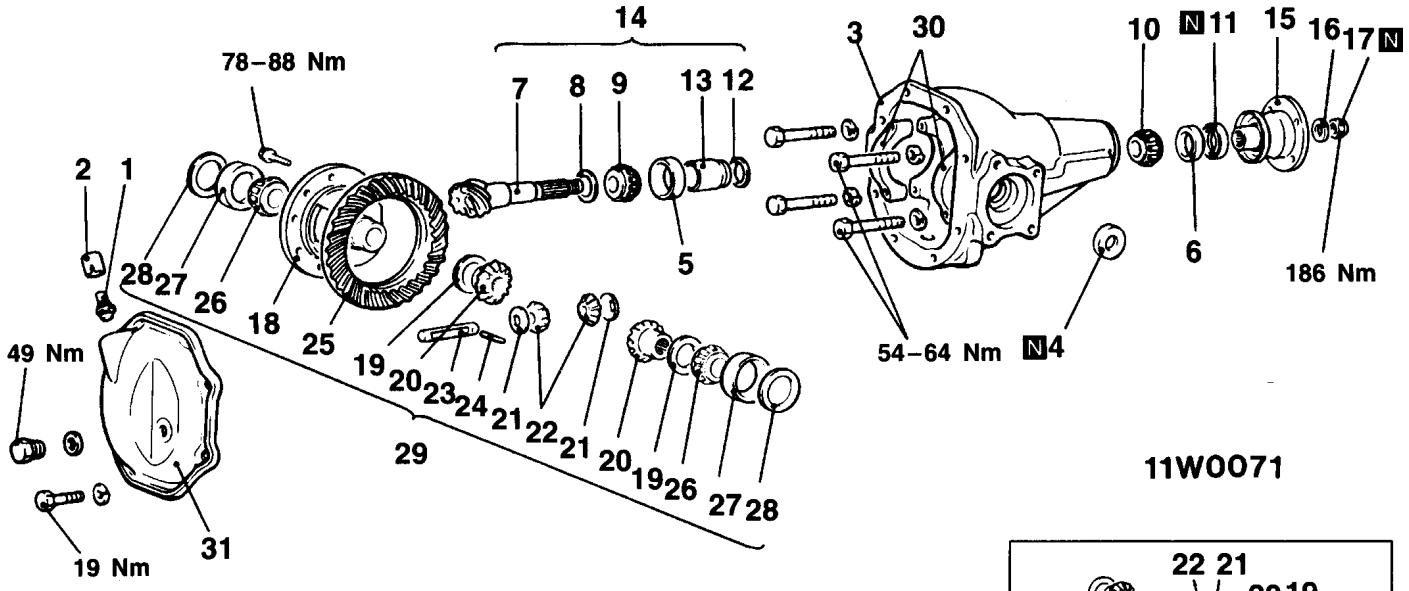


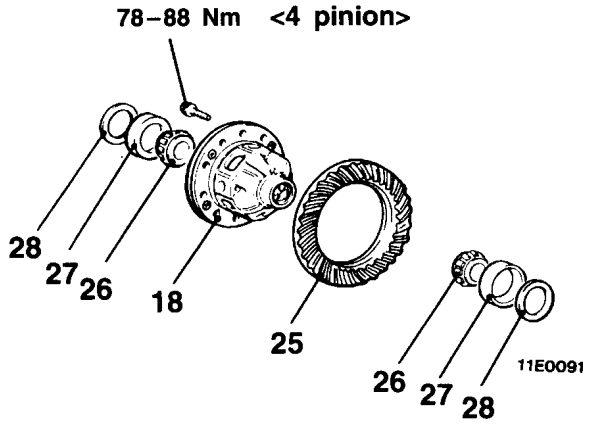
◀I▶ DRIVE PINION FRONT BEARING OUTER RACE REMOVAL

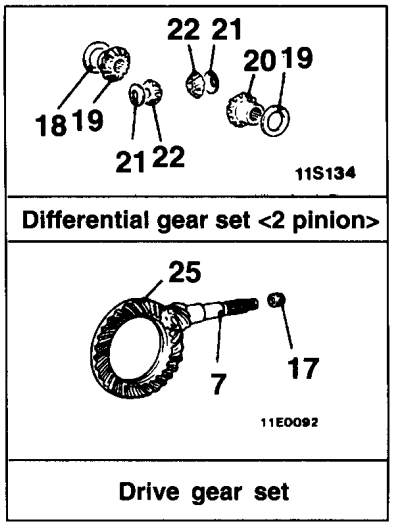
REASSEMBLY

120002205

<2 pinion>



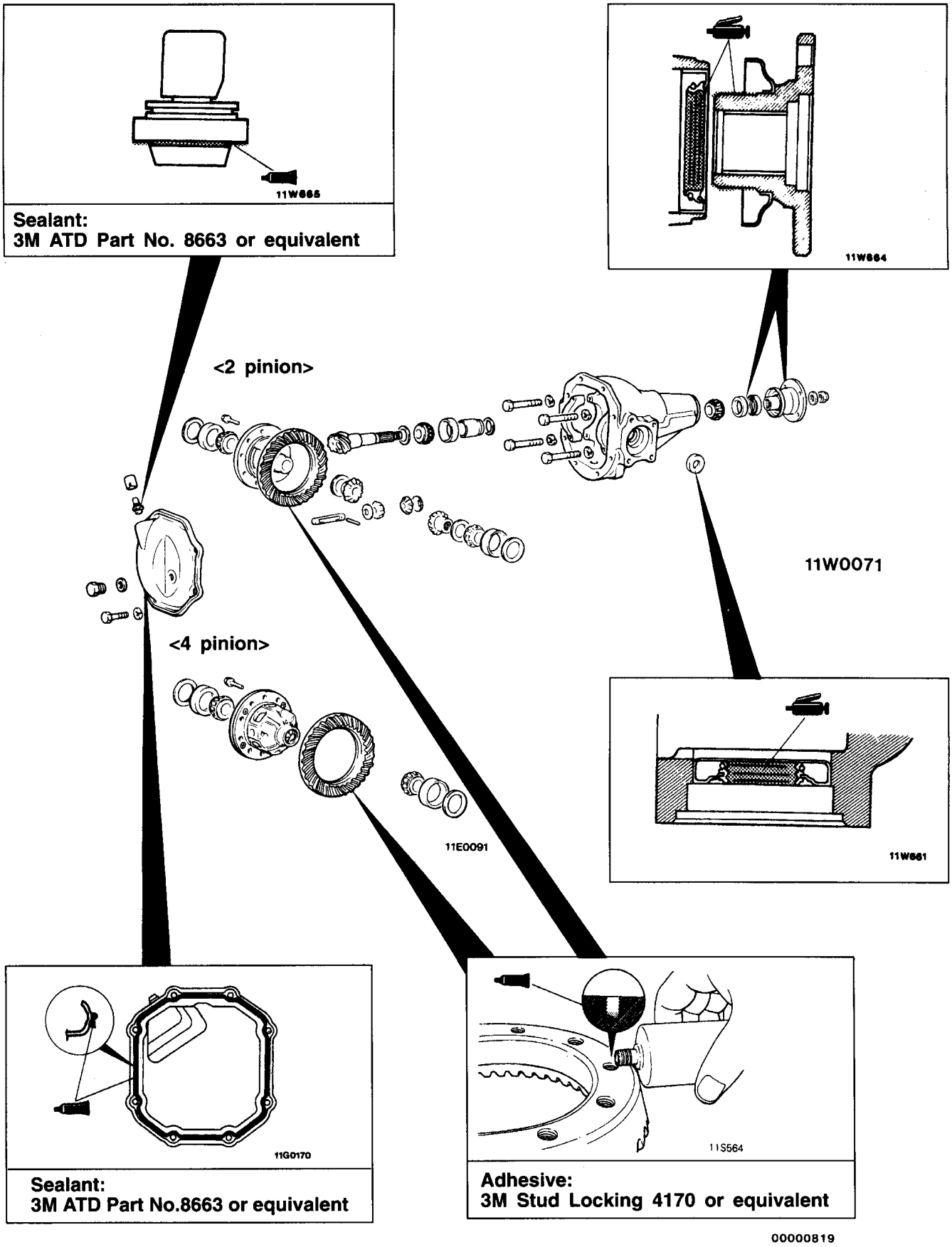




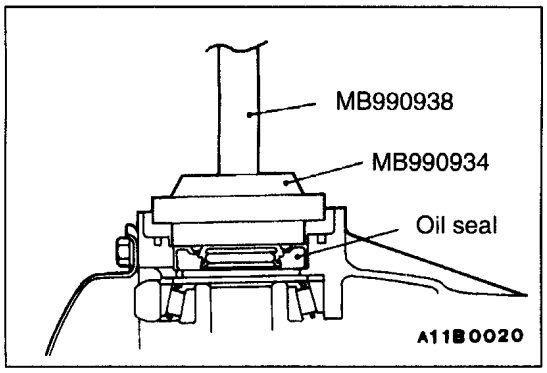
Reassembly steps

1. Vent plug
2. Plug cover
3. Gear carrier
- ▶A◀ 4. Oil seal
- ▶B◀ 5. Drive pinion front bearing outer race
- ▶C◀ 6. Drive pinion rear bearing outer race
- ▶D◀ • Pinion height adjustment
7. Drive pinion
8. Drive pinion front shim (for pinion height adjustment)
9. Drive pinion front bearing inner race
- ▶E◀ • Drive pinion turning torque adjustment
10. Drive pinion rear bearing inner race
11. Oil seal
12. Drive pinion rear shim (for turning torque adjustment)
13. Drive pinion spacer
14. Drive pinion assembly
15. Companion flange
16. Washer
17. Self-locking nut
18. Differential case
19. Side gear spacer
20. Side gear
21. Pinion washer
22. Pinion gear
- ▶F◀ • Differential gear backlash adjustment <2 pinion>
23. Pinion shaft
- ▶G◀ 24. Lock pin
- ▶H◀ 25. Drive gear
- ▶I◀ 26. Side bearing inner race
27. Side bearing outer race
28. Side bearing adjusting spacer
- ▶J◀ • Drive gear backlash adjustment
29. Differential case assembly
30. Bearing cap
31. Cover

Lubrication, Sealing and Adhesive Points

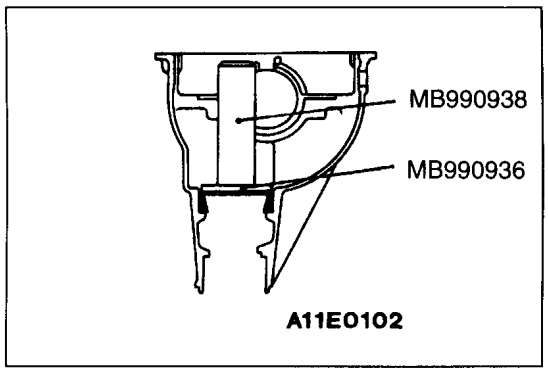


00000819

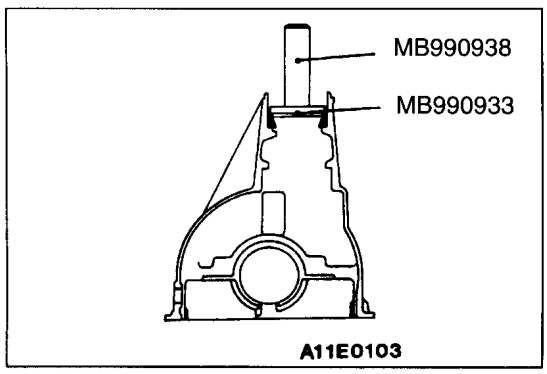


REASSEMBLY SERVICE POINTS

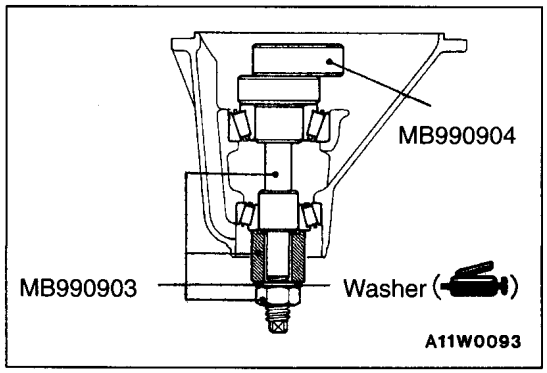
▶A◀ OIL SEAL INSTALLATION



▶B◀ DRIVE PINION FRONT BEARING OUTER RACE INSTALLATION



▶C◀ DRIVE PINION REAR BEARING OUTER RACE INSTALLATION

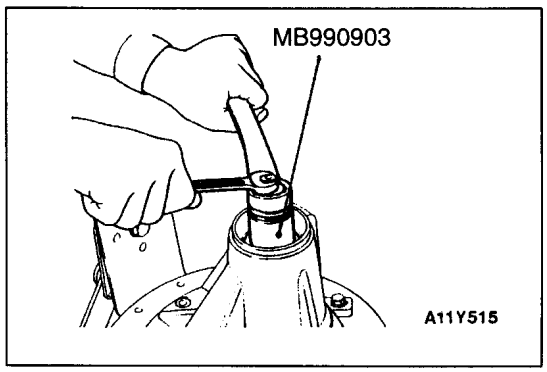


▶D◀ PINION HEIGHT ADJUSTMENT

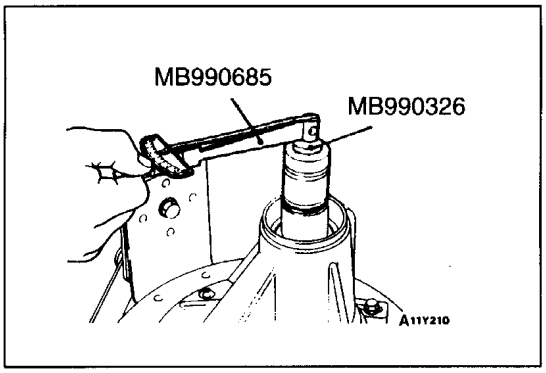
Adjust the drive pinion height by the following procedures.

(1) Apply multipurpose grease to the washer of the special tool.

(2) Install the special tool, drive pinion front and rear bearing inner races to the gear carrier.



(3) Tighten the nut of the special tool while measuring the rotation torque of the drive pinion. Carefully tighten the nut of the special tool until the rotation torque of the drive pinion (without oil seal) reaches at the standard value.



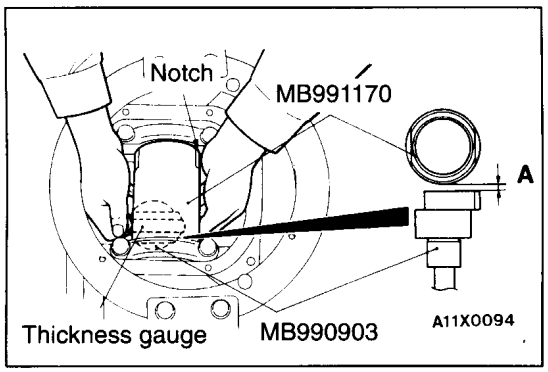
Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.5–0.7 Nm
New or reusing	Gear oil applied	0.3–0.4 Nm

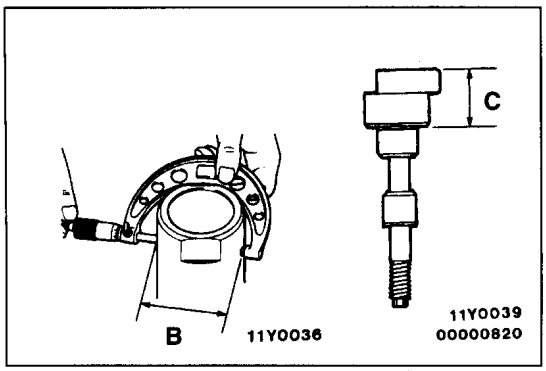
NOTE
The special tool cannot be turned a full revolution, so turn it several times within the range of movement to run in the bearing, and then measure the rotation torque.

(4) Clean the side bearing hub.
(5) Install the special tools to the side bearing hub of the gear carrier, and then install the bearing cap.

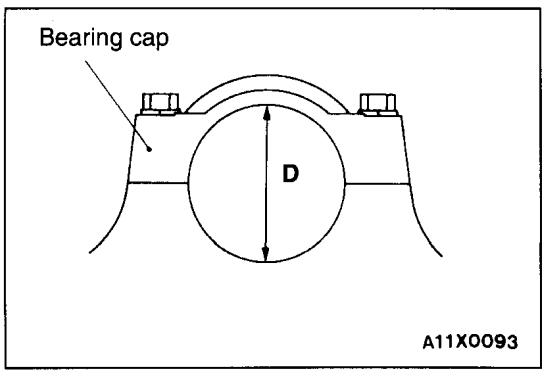
NOTE
Always check that the notch is in the shown position and that the special tools are touching firmly against the side bearing hub.



(6) Use a thickness gauge to measure the clearance (A) between the special tools.

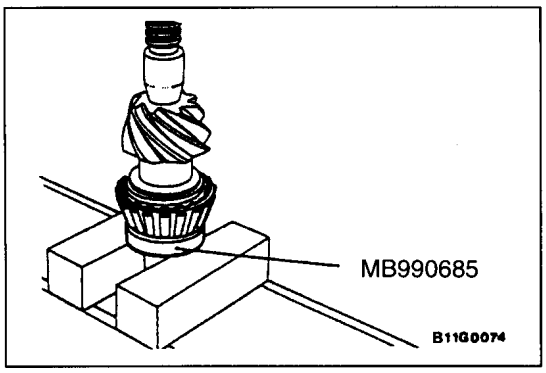


(7) Remove the special tools (MB991170, MB990903).
(8) Use a micrometer to measure the special tool in the places (B, C) shown in the illustration.



(9) Install the bearing cap, and then use a cylinder gauge and micrometer to measure the inside diameter (D) of the bearing cap as shown in the illustration.
(10) Calculate the thickness (E) of the required drive pinion rear shim by the following formula, and then select a spacer which most closely matches this thickness.

E=A+B+C–1/2D–91.0



(11) Fit the selected drive pinion front shim(s) to the drive pinion, and press-fit the drive pinion front bearing inner race by using the special tool.

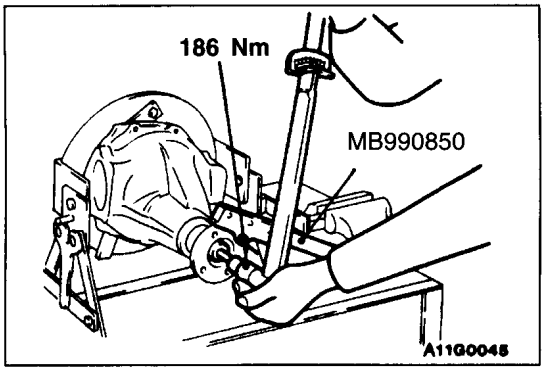
▶E◀ DRIVE PINION TURNING TORQUE ADJUSTMENT

Adjust the drive pinion rotation torque by using the following procedures:

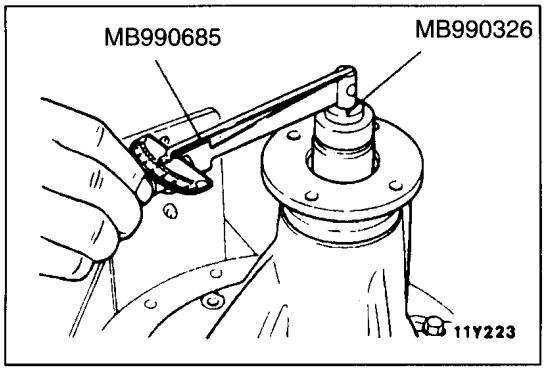
Without Oil Seal

(1) Insert the drive pinion into the gear carrier, and then install, from the front side of the carrier, then install the drive pinion spacer, drive pinion rear shim, drive pinion rear bearing inner race, and companion flange in that order.

NOTE
Do not install the oil seal.



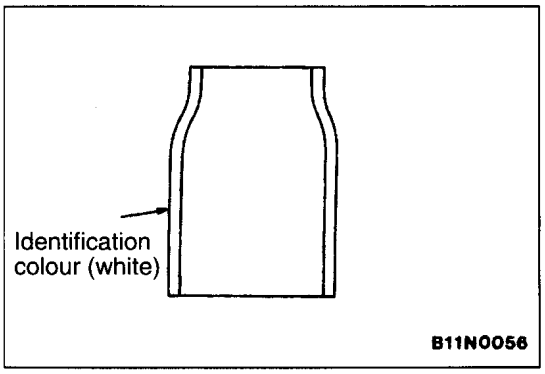
(2) Tighten the companion flange to the specified torque by using the special tool.



(3) Measure the drive pinion rotation torque (without the oil seal) by using the special tools.

Standard value:

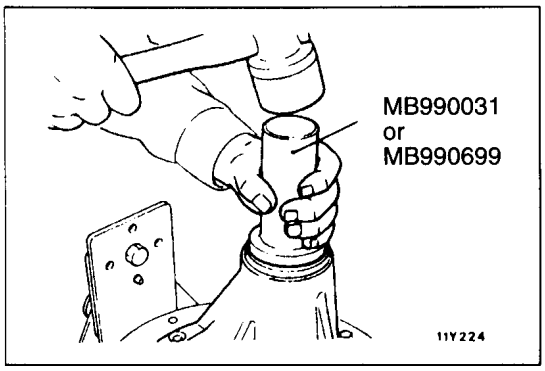
Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.3–0.5 Nm
New/reusing	Gear oil applied	0.15–0.25 Nm



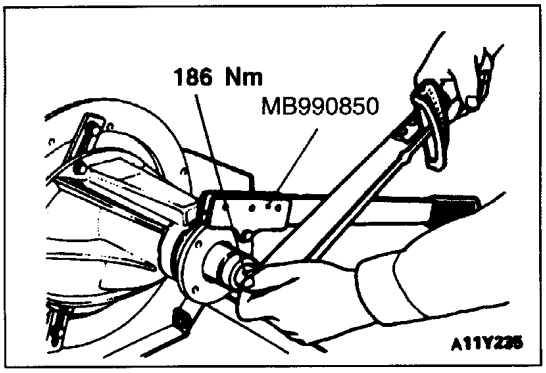
(4) If the drive pinion rotation torque is not within the range of the standard value, adjust the preload by replacing the drive pinion front shim(s) or the drive pinion spacer.

NOTE
When selecting the drive pinion rear shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers. Also, select the drive pinion spacer from the following two types.

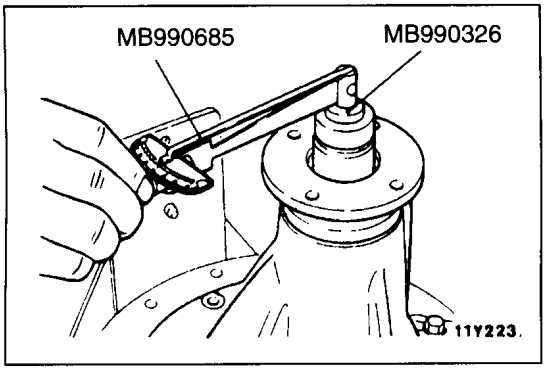
Drive pinion height (mm)	Identification colour
46.67	White
47.01	–



(5) Remove the companion flange and drive pinion again. Then, after inserting the drive pinion rear bearing inner race into the gear carrier, use the special tool to press-fit the oil seal.



(6) Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.

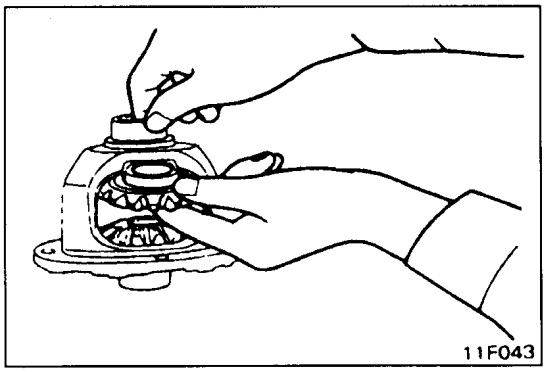


(7) Measure the drive pinion rotation torque (with the oil seal) by using the special tools.

Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.5–0.7 Nm
New/reusing	Gear oil applied	0.3–0.4 Nm

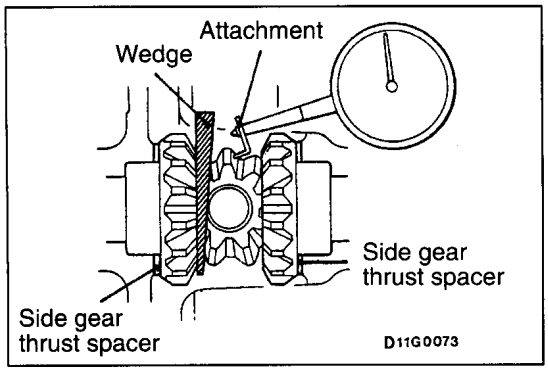
(8) If the drive pinion rotation torque is not within the standard value, check the tightening torque of the companion flange self-locking nut and the oil seal.



▶F◀ DIFFERENTIAL GEAR BACKLASH ADJUSTMENT <2 PINION>

1. Assemble the side gears, side gear spacers, pinion gears and pinion washers into the differential case.
2. Temporarily install the pinion shaft.

   NOTE
   Do not drive in the lock pin yet.



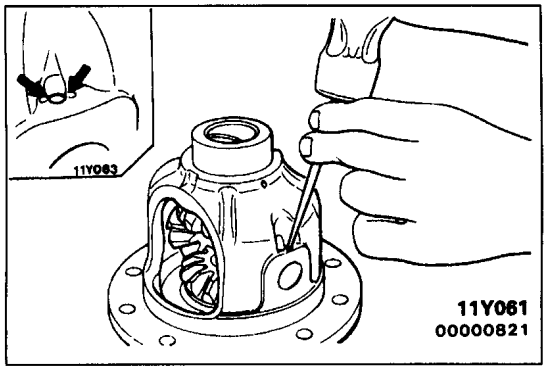
3. Insert a wedge between the side gear and the pinion shaft to lock the side gear.
4. Measure the differential gear backlash with a dial indicator on the pinion gear.

   Standard value: 0–0.076 mm

   Limit: 0.2 mm

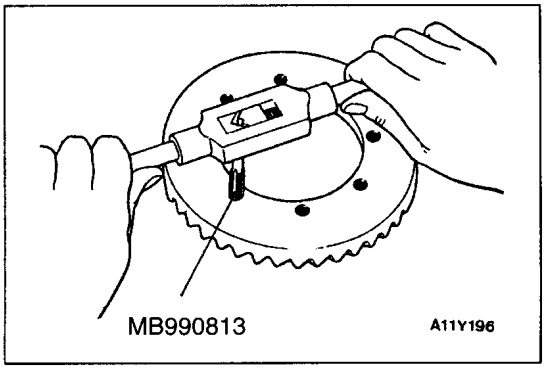
5. If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear spacers.

6. If adjustment is not possible, replace the side gears and pinion gears as a set.
7. Measure the differential gear backlash once again, and confirm that it is within the limit. If adjustment is not possible, replace the side gears and pinion gears as a set.



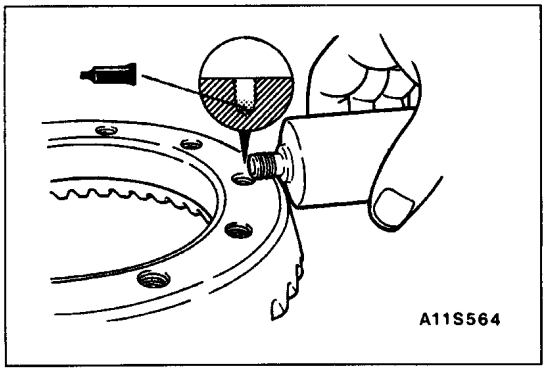
▶G◀ LOCK PIN INSTALLATION

1. Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.
2. Stake the lock pin with a punch at two points.



▶H◀ DRIVE GEAR INSTALLATION

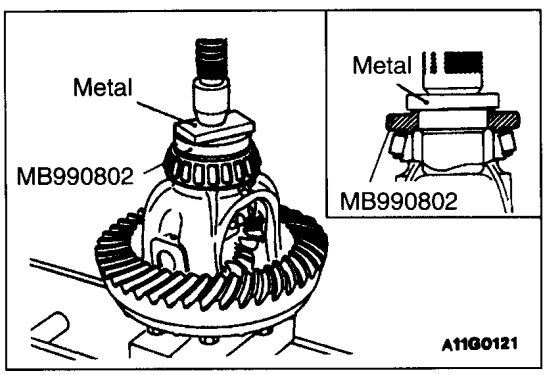
1. Clean the drive gear attaching bolts.
2. Remove the adhesive adhered to the threaded holes of the drive gear by using the special tool (tap M10 × 1.25), and then clean the threaded holes by applying compressed air.



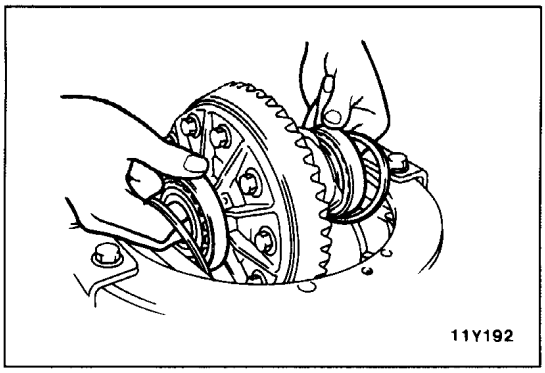
3. Apply the specified adhesive to the threaded holes of the drive gear.

   Specified adhesive: 3M Stud Locking 4170 or equivalent

4. Install the drive gear onto the differential case with the mating marks properly aligned. Tighten the bolts to the specified torque in a diagonal sequence.



▶I◀ SIDE BEARING INNER RACE INSTALLATION

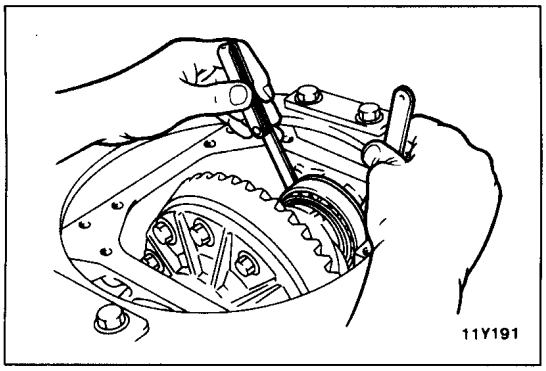


▶J◀ DRIVE GEAR BACKLASH ADJUSTMENT

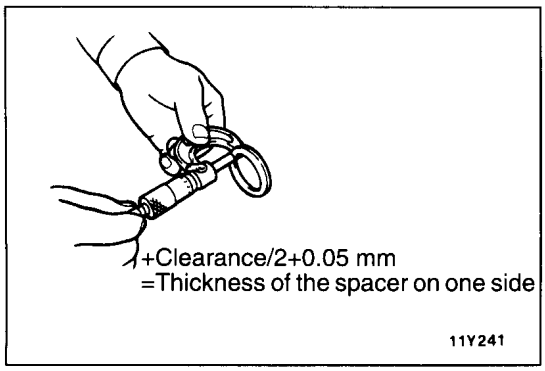
Adjust the drive gear backlash by the following procedures:

(1) Install the side bearing spacers, which are thinner than those removed, to the side bearing outer races, and then mount the differential case assembly into the gear carrier.

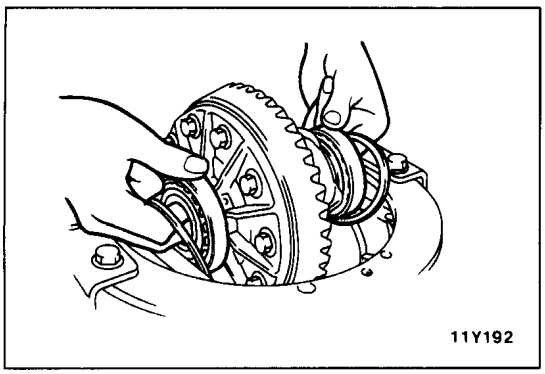
NOTE
Select side bearing spacers with the same thickness for both the drive pinion side and the drive gear side.



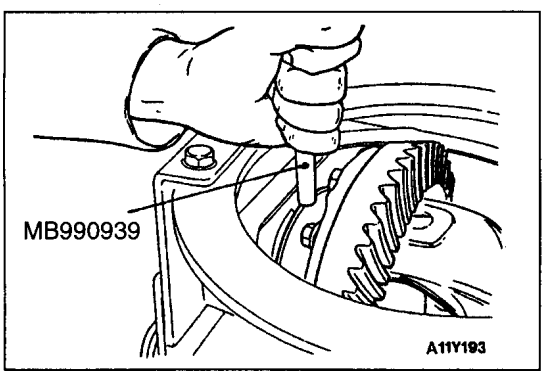
(2) Push the differential case assembly to one side, and measure the clearance between the gear carrier and the side bearing adjusting spacer with a thickness gauge.



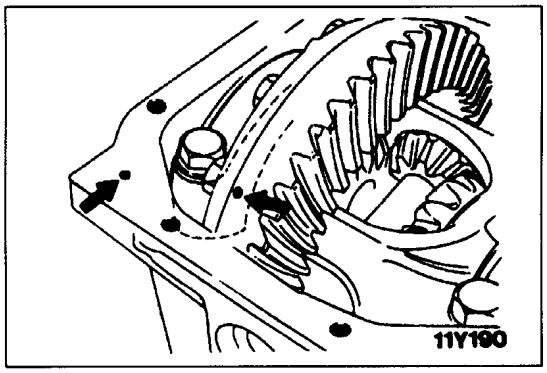
(3) Measure the thickness of the side bearing adjusting spacers on one side, select two pairs of spacers which correspond to that thickness plus one half of the clearance plus 0.05 mm, and then install one pair each to the drive pinion side and the drive gear side.



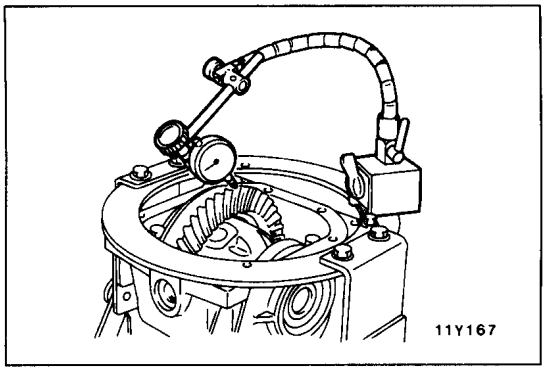
(4) Install the side bearing adjusting spacers and differential case assembly, as shown in the illustration, to the gear carrier.



(5) Tap the side bearing adjusting spacers with the special tool to fit them to the side bearing outer race.



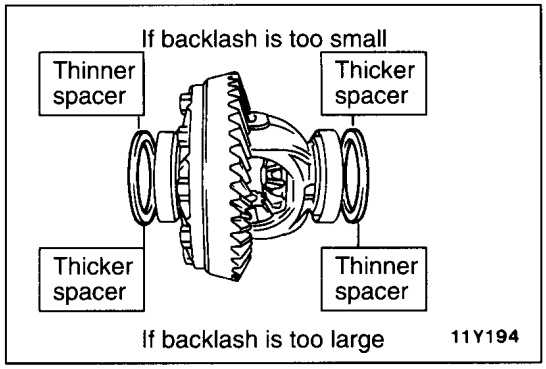
(6) Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.



(7) With the drive pinion locked in place, measure the drive gear backlash with a dial indicator on the drive gear.

NOTE
Measure at four points or more on the circumference of the drive gear.

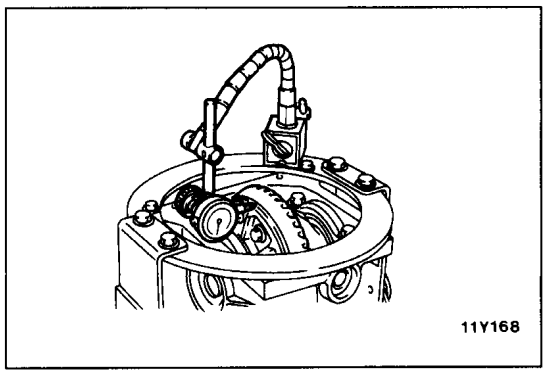
Standard value: 0.11–0.16 mm



(8) Change the side bearing adjusting spacers as illustrated, and then adjust the drive gear backlash between the drive gear and the drive pinion.

NOTE
When increasing the number of side bearing adjusting spacers, use the same number for each, and as few as possible.

(9) Check the drive gear and drive pinion for tooth contact. If poor contact is evident, make adjustment. (Refer to P.26-42.)



(10) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

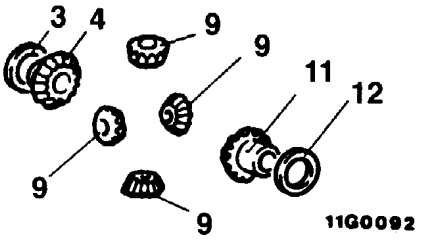
Limit: 0.05 mm

(11) If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure.

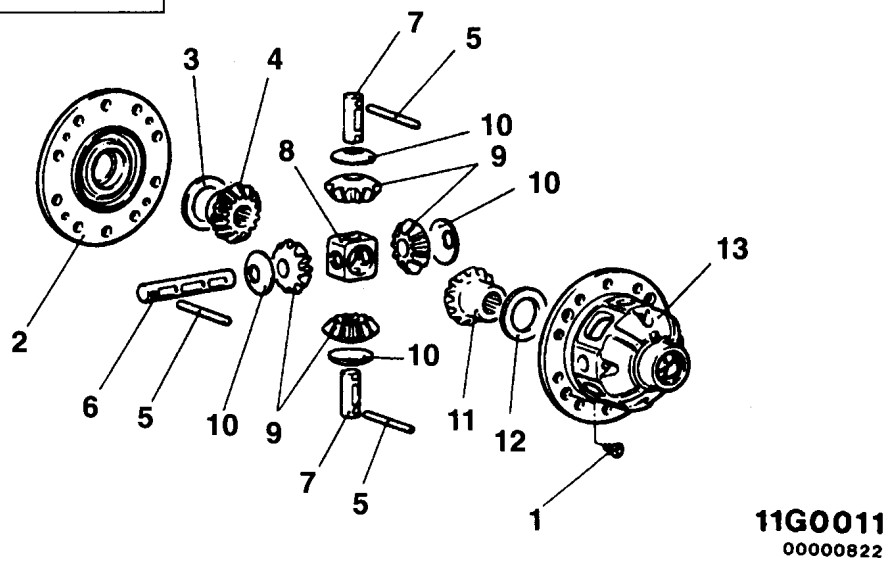
(12) If adjustment is not possible, replace the differential case or replace the drive gear and drive pinion as a set.

OVERHAUL (4 PINION CASE ASSEMBLY)

120000195

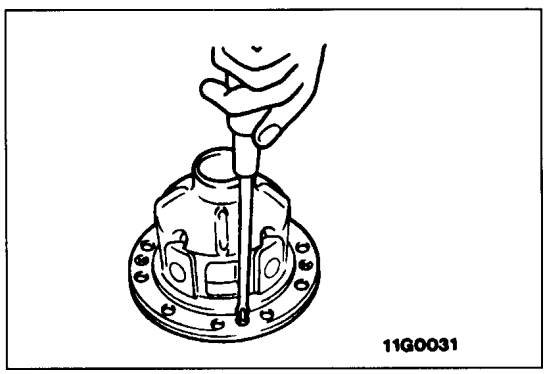


Differential gear set



Disassembly steps

◀A▶ 1. Screw
2. Case A
3. Side gear spacer (R.H.)
4. Side gear (R.H.)
▶B◀ • Backlash adjustment on differential gear case A side
◀B▶ • Differential gear backlash check
5. Lock pin
6. Pinion shaft-A
7. Pinion shaft-B
8. Pinion shaft holder
9. Pinion gear
10. Washer
11. Side gear (L.H.)
12. Side gear spacer (L.H.)
▶A◀ • Backlash adjustment on differential gear case B side
13. Case B

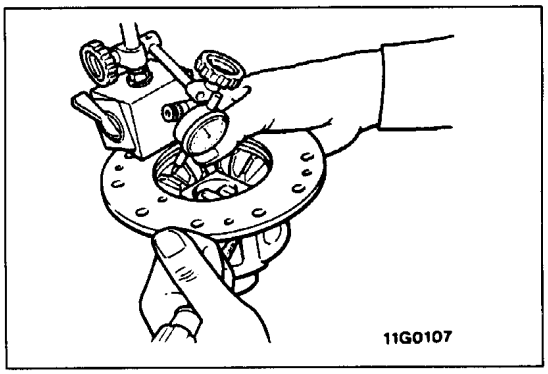


DISASSEMBLY SERVICE POINTS

◀A▶ SCREW REMOVAL

1. Evenly loosen 4 screws on case A and B to remove.
2. Set case B downward and remove case A, side gear spacer (R.H.) and side gear (R.H.).

NOTE
Check differential gear backlash to determine necessity of disassembling side gear (R.H.) and onward.



◀B▶ DIFFERENTIAL GEAR BACKLASH CHECK

Check differential gear backlash as follows.

(1) Insert cloth wrapped screwdriver through side of case B and lock side gear (L.H.) and pinion gear. (one piece)

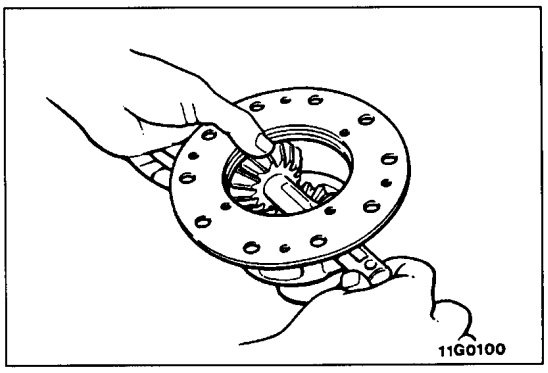
(2) Contact dial gauge on pinion gear facing the locked pinion gear and measure backlash within the standard value.

NOTE
Measure 2 pinion gears.

Standard value: 0.01–0.25 mm

(3) When backlash exceeds the standard value, adjust side gear spacer (L.H.).

NOTE
If backlash is within the standard value, assure appropriate gear spacer (R.H.) thickness and assemble 4 pinion case assembly.



REASSEMBLY SERVICE POINTS

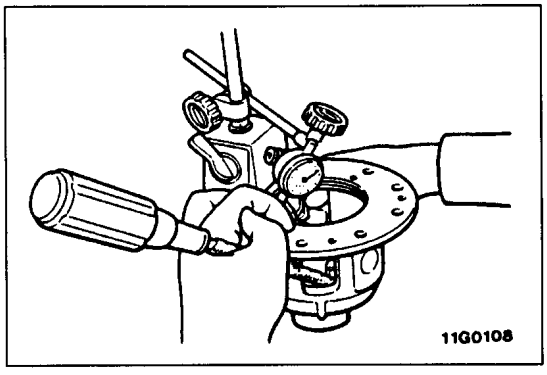
▶A◀ BACKLASH ADJUSTMENT ON DIFFERENTIAL GEAR CASE B SIDE

Adjust backlash on differential gear case B side as follows.

(1) Temporarily install side gear spacer (L.H.), side gear (L.H.), washers, 2 pinion gears and pinion shaft A on case B.

NOTE
Do not assemble pinion shaft holder, pinion shaft-B or the remaining pinion gears (2).

(2) Insert wrapped screwdriver through side of case B to lock one side of pinion gear and side gear (L.H.).



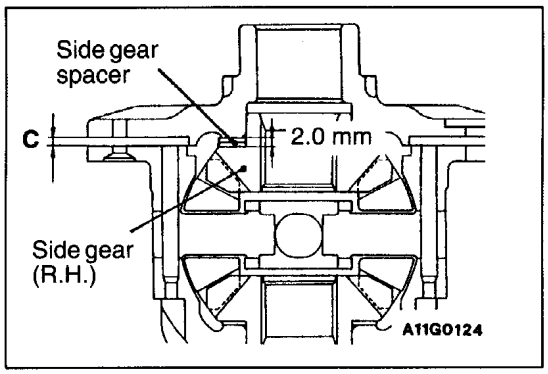
(3) Place dial gauge on unlocked pinion gear and measure differential gear backlash within the standard value.

NOTE
Measure 2 pinion gears.

Standard value: 0.01–0.25 mm

(4) When backlash exceeds the standard value, adjust with selected side gear spacer (L.H.).

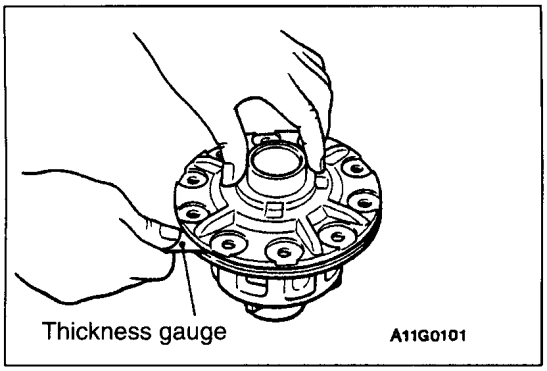
(5) Install washers, pinion gears, pinion shaft holder and pinion shaft-A and B. Lock with lock pin through case B.



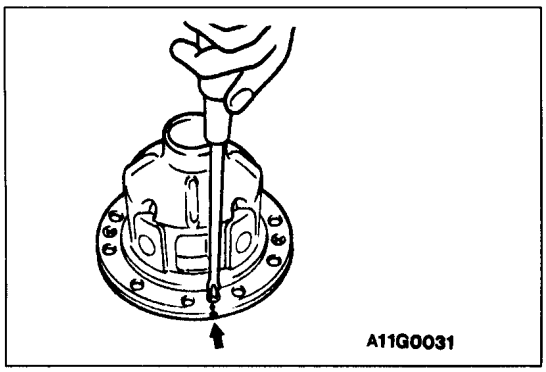
▶B◀ BACKLASH ADJUSTMENT ON DIFFERENTIAL GEAR CASE A SIDE

Adjust backlash as follows.

(1) Install side gear (R.H.) and 2 side gear spacers (1.0 mm thick). Press differential case A to differential case B.



(2) Measure flange space (C) between differential case A and B with thickness gauge.
(3) Calculate side gear spacer (R.H.) thickness (D) as follows:
D=2.0 mm–(C+0.2 mm)
(4) Choose spacer with a thickness nearest D in (3) and adjust differential gear backlash on the right side.



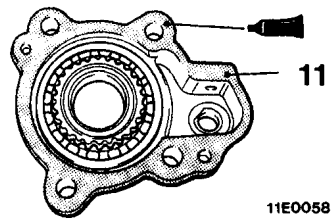
(5) Align the mating marks and assemble cases A and B.
(6) Check the inner shaft for smooth rotation.

FREE-WHEELING CLUTCH

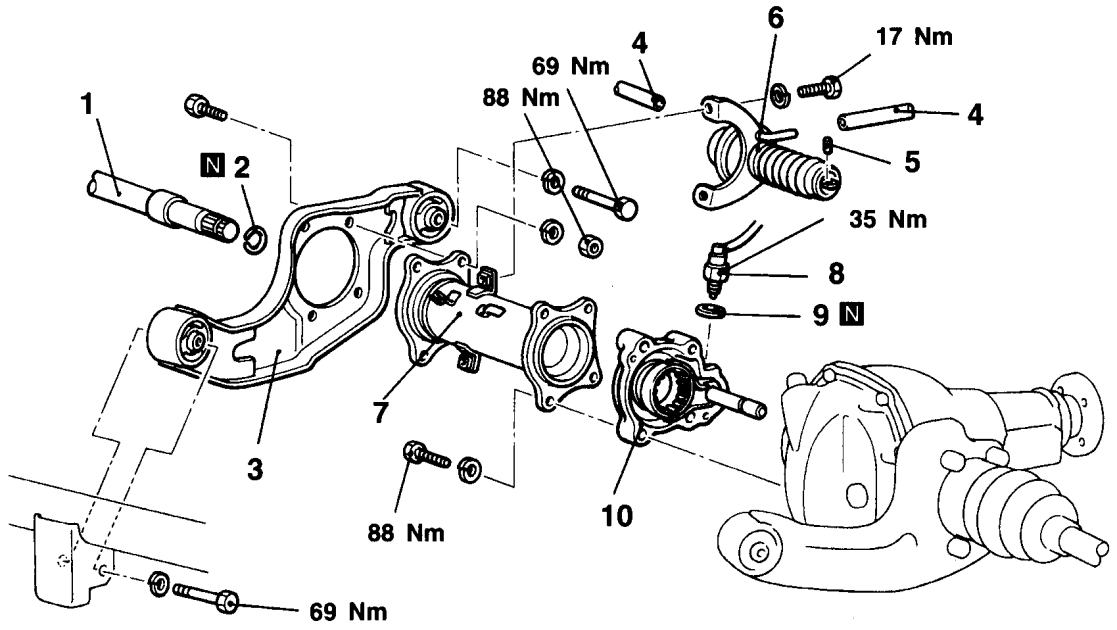
120002206

REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operations
(1) Removal and Installation of Under Cover
(Refer to GROUP 42 – Under Cover.)
(2) Draining and Supplying of Gear Oil (Refer to P.26-10.)



Sealant: 3M ATD Part No.8663 or equivalent



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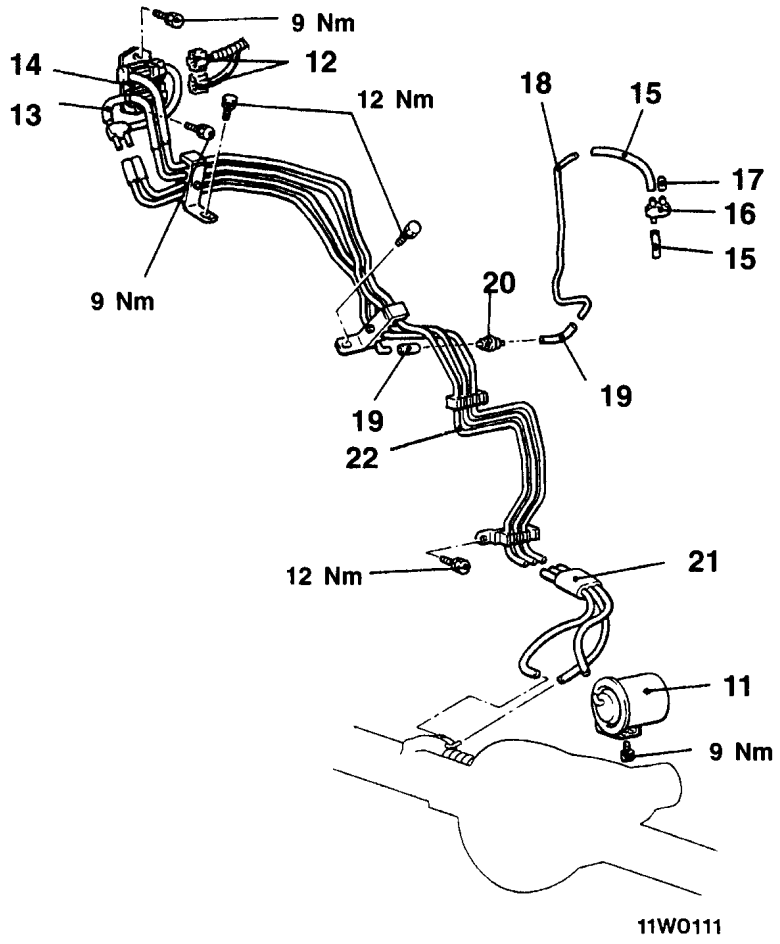
Free-wheeling clutch removal steps

1. Inner shaft (Refer to P.26-35.)
2. Circlip
3. Differential mounting bracket (L.H.)
▶E◀ 4. Vacuum hose
5. Pin
6. Actuator assembly
7. Housing tube
8. Free-wheeling engage switch
9. Gasket
10. Free-wheeling clutch assembly
▶D◀ • Clutch gear bearing axial play inspection
11. Vacuum tank

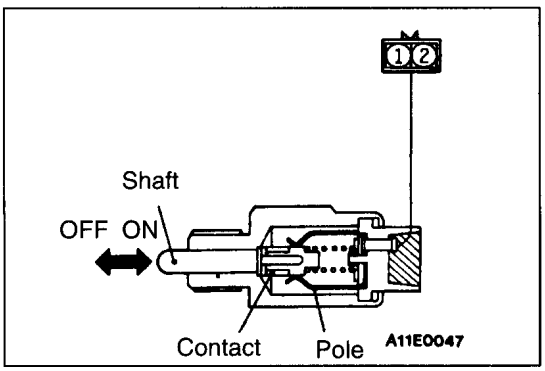


Solenoid valve assembly removal steps

12. Solenoid valve connector
13. Vacuum hose
▶C◀ 14. Solenoid valve assembly

Vacuum pipe assembly removal steps

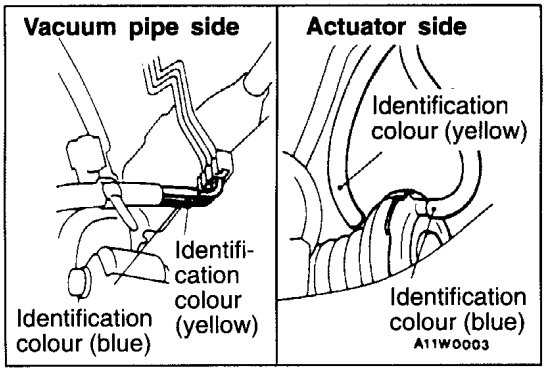
15. Vacuum hose (Vehicles with 4D56)
16. Vacuum terminal (Vehicles with 4D56)
17. Cap (Vehicles with 4D56)
18. Vacuum pipe
19. Vacuum hose
▶B◀ 20. Check valve
▶A◀ 21. Vacuum hose
▶A◀ 22. Vacuum pipe assembly



INSPECTION

FREE-WHEELING ENGAGE SWITCH

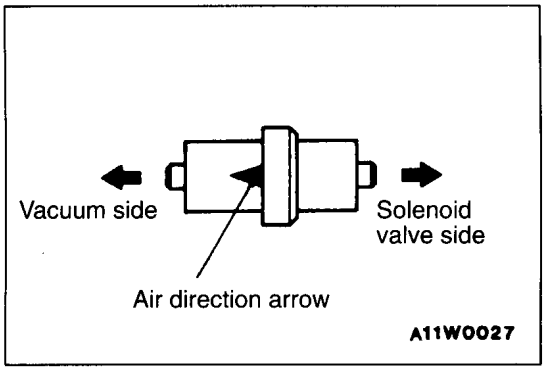
Shaft (switch) position	Terminal No.1	Terminal No.2
Pressed (ON)		
Released (OFF)	○	○



INSTALLATION SERVICE POINTS

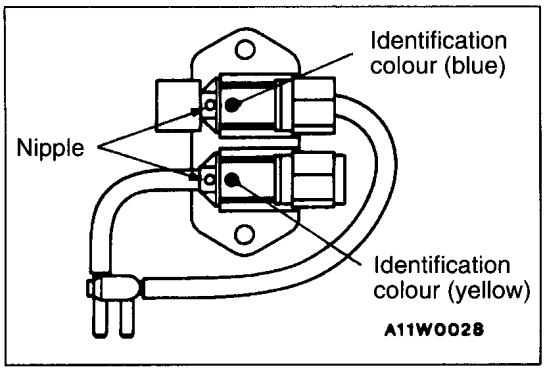
▶A◀ VACUUM PIPE ASSEMBLY / VACUUM HOSE INSTALLATION

Install the vacuum hoses so that the identification colours of the vacuum pipe assembly match those of the actuators. Note that there is no identification colour for the vacuum hose which is to be connected to the vacuum tank.



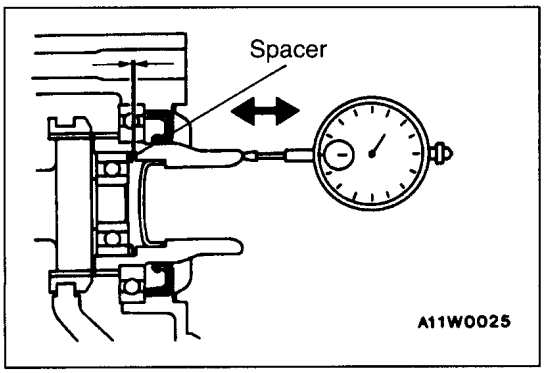
▶B◀ CHECK VALVE INSTALLATION

Install so that the air direction arrow points to the vacuum side.



▶C◀ SOLENOID VALVE ASSEMBLY INSTALLATION

Install so that the identification colours of the vacuum hoses match those of the solenoid valve assembly.



▶D◀ CLUTCH GEAR BEARING AXIAL PLAY INSPECTION

Check the axial play of the clutch gear bearing by the following procedure before installing the free-wheeling clutch assembly.

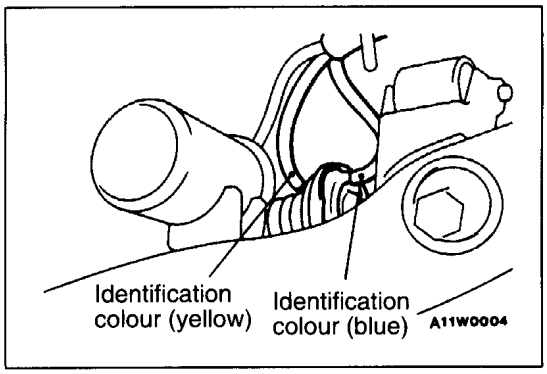
(1) Insert flat washers of the same thickness as the housing tube (9.0 mm) onto the bolt, and then provisionally install the free-wheeling clutch assembly to the front differential.

(2) Place a dial gauge against the end of the clutch gear and check the axial play of the clutch gear bearing.

Standard value: 0.05–0.30 mm

(3) If the axial play of the clutch gear bearing is not within the standard value, disassemble the bearing and insert a spacer of the appropriate thickness.

NOTE
The thicknesses of the spacers vary in steps of 0.25 mm.



▶E◀ VACUUM HOSE INSTALLATION

Connect the vacuum hoses so that the identification colours match those of the actuator assembly nipples.

DISASSEMBLY AND REASSEMBLY

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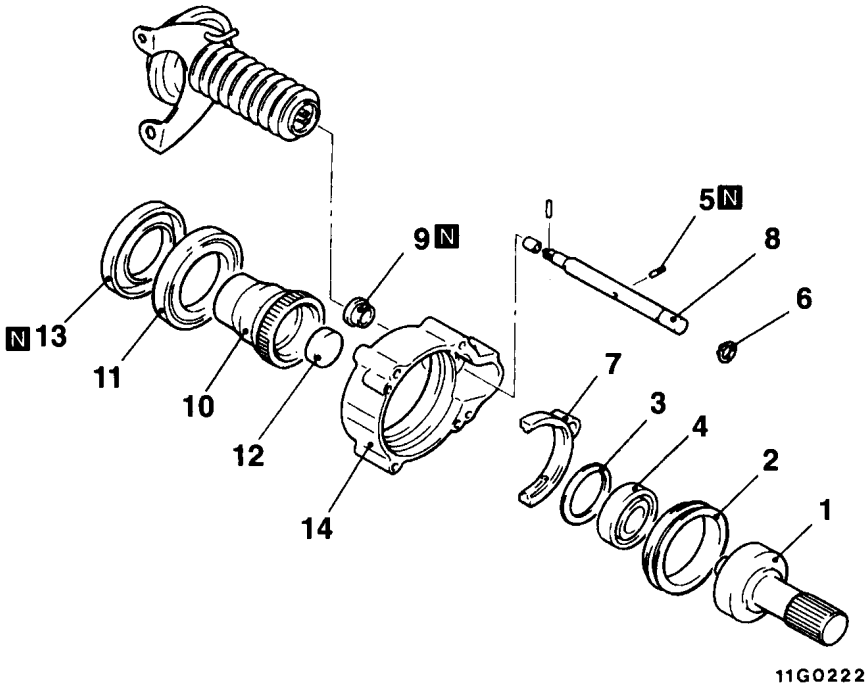

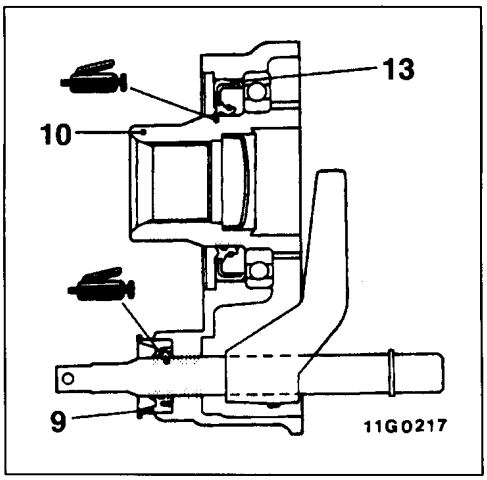

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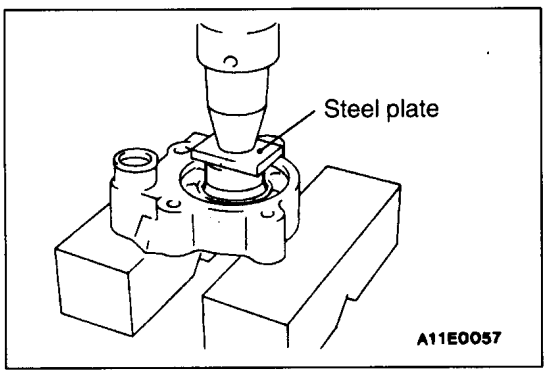
Removal steps

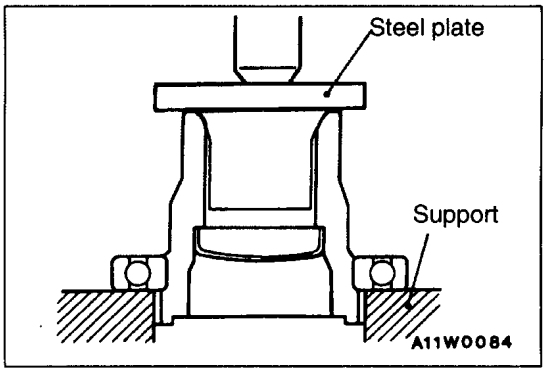
1. Main shaft
2. Clutch sleeve
3. Spacer
▶E◀ 4. Bearing
5. Spring pin
6. Snap ring
7. Shift fork
8. Shift rod
▶D◀ 9. Oil seal
◀A▶ 10. Clutch gear
◀B▶ ▶C◀ 11. Bearing
▶B◀ 12. Cap
▶A◀ 13. Oil seal
14. Clutch housing



DISASSEMBLY SERVICE POINTS

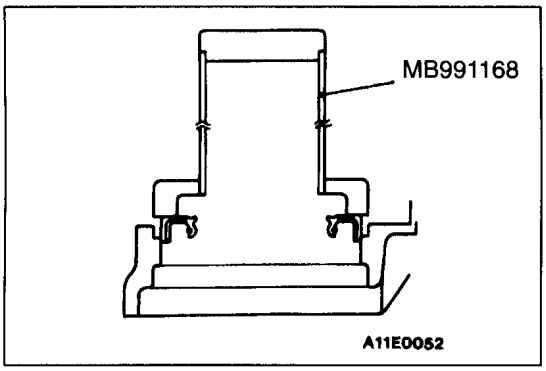
◀A▶ CLUTCH GEAR REMOVAL

Use a press and steel plate to remove the clutch gear and bearing together.



◀B▶ BEARING REMOVAL

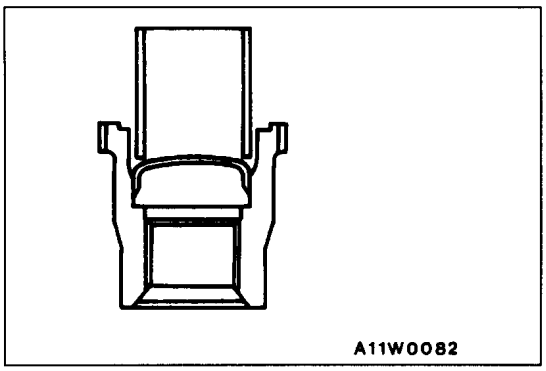
Use a press to hold the supports against the bearing inner race, and separate the clutch gear and bearing.



REASSEMBLY SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION

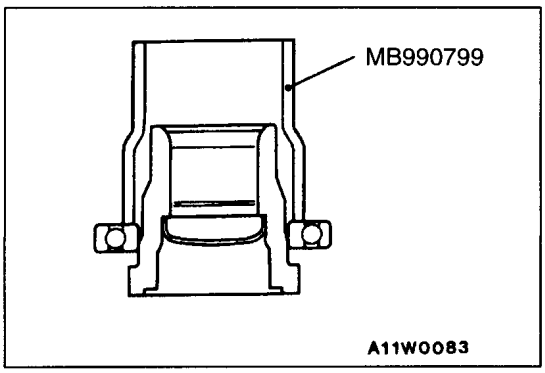
Use the special tool to tap the oil seal until it is flush with the clutch housing.



▶B◀ CAP INSTALLATION

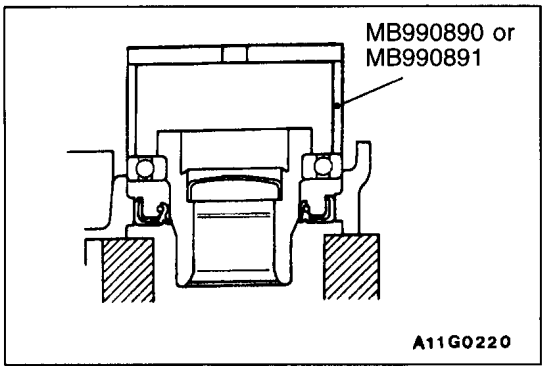
Use an iron bar with an outside diameter of approximate 30–35 mm to push in the sealing cap.

Caution
Be careful not to make a dent in the curved surface of the cylinder cap.



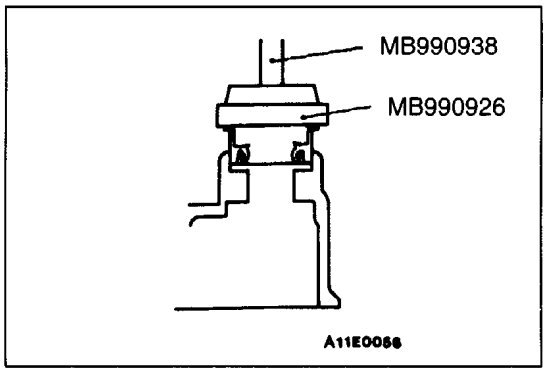
▶C◀ BEARING INSTALLATION

1. Use the special tool to press-fit the bearing to the shoulder of the clutch gear.

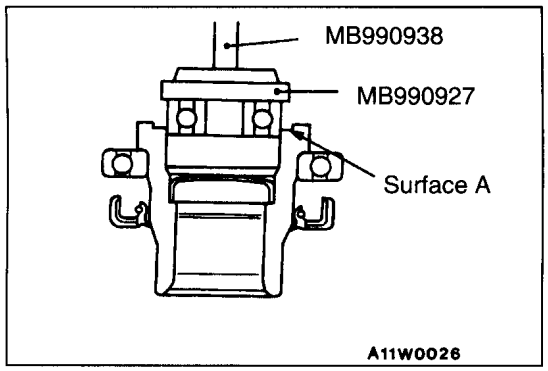


2. Use the special tool to press-fit the bearing to the side of the clutch housing.

   Caution
   Place the special tool against the outer race of the bearing.



▶D◀ OIL SEAL INSTALLATION



▶E◀ BEARING INSTALLATION

Use the special tool to press-fit the bearing until it is flush with the clutch gear (surface A).

REAR AXLE

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120002222

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SEALANTS 6

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DIFFERENTIAL CARRIER 31

LIMITED SLIP DIFFERENTIAL CASE ASSEMBLY <2WD 4G63> 50

LIMITED SLIP DIFFERENTIAL CASE ASSEMBLY <EXCEPT 2WD VEHICLES WITH 4G63 ENGINE> 55

GENERAL INFORMATION

120002207

- The rear axle is a banjo-type semi-floating type. The axle shaft bearings are: Single-taper bearings for 2WD and 4WD (Panel van and window van). Double-taper bearings for vehicles with ABS and 4WD (Wagon) vehicles. ABS rotor is press-fitted to the axle shaft retainer ring.
- Differential gear has 5 different types. A torque-responsive mechanical-type limited slip differential has a high performance against driving on unstable surfaces such as muddy roads.

REAR AXLE

Item		2WD vehicles with 4G63 engine and standard wheelbase	2WD vehicles (other than those with 4G63 engine and standard wheelbase)	4WD – Panel van and window van	4WD – Wagon
Axle housing type		Banjo type	Banjo type	Banjo type	Banjo type
Axle shaft	Support method	Semi-floating type	Semi-floating type	Semi-floating type	Semi-floating type
	Axle diameter (bearing×centre× total length) mm	38.1 × 33.0 × 747.2 (44.0×33.0×744.5)	40.0 × 34.5 × 744.5	40.0 × 34.5 × 741.5 (44.0×34.5×744.5)	40.0 × 34.5 × 744.5
	Bearing type	Single-taper (double-taper)	Single-taper (double-taper)	Single-taper (double-taper)	Double-taper
	Bearing (outside dia.× inside dia.) mm	60.5 × 38.1 (80.0×40.0)	80.0 × 40.0	80.0 × 40.0	80.0 × 40.0

NOTE
( ) indicates vehicles with ABS.

DIFFERENTIAL

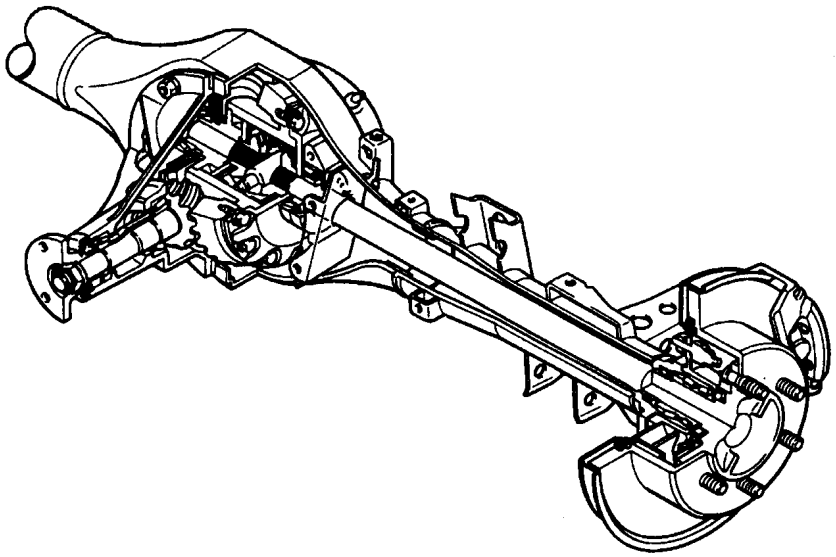
Item		2WD	2WD	2WD
		4G63 Standard wheelbase	4D56 Standard wheelbase	4G64
Drive gear type		Hypoid gear	Hypoid gear	Hypoid gear
Reduction ratio		4.875	4.222	4.636
Limited slip differential type		Torque-responsive mechanical type	Torque-responsive mechanical type	Torque-responsive mechanical type
Differential gear type (type × No. of teeth)	Side gear	Straight bevel gear × 2	Straight bevel gear × 2	Straight bevel gear × 2
	Pinion gear	Straight bevel gear × 2 (Straight bevel gear × 4)	Straight bevel gear × 2 (Straight bevel gear × 4)	Straight bevel gear × 2 (Straight bevel gear × 4)
Number of teeth	Drive gear	39	38	51
	Drive pinion	8	9	11
	Side gear	14	14	14
	Pinion gear	10	10	10
Bearing (O.D. × I.D.) mm	Side	73.4 × 41.3	80.0 × 45.2	80.0 × 45.2
	Front	64.3 × 30.2	68.3 × 30.2	68.3 × 30.2
	Rear	76.2 × 36.5	76.2 × 36.5	76.2 × 36.5

Item		2WD	2WD	4WD
		4D56 Long wheelbase	4G63 Long wheelbase	
Drive gear type		Hypoid gear	Hypoid gear	Hypoid gear
Reduction ratio		4.222	4.875	4.875
Limited slip differential type		Torque-responsive mechanical type	Torque-responsive mechanical type	Torque-responsive mechanical type
Differential gear type (type × No. of teeth)	Side gear	Straight bevel gear × 2	Straight bevel gear × 2	Straight bevel gear × 2
	Pinion gear	Straight bevel gear × 2 (Straight bevel gear × 4)	Straight bevel gear × 2 (Straight bevel gear × 4)	Straight bevel gear × 2 (Straight bevel gear × 4)
Number of teeth	Drive gear	38	39	39
	Drive pinion	9	8	8
	Side gear	19	14	14
	Pinion gear	10	10	10
Bearing (O.D. × I.D.) mm	Side	80.0 × 45.2	80.0 × 45.2	80.0 × 45.2
	Front	68.3 × 30.2	68.3 × 30.2	68.3 × 30.2
	Rear	79.4 × 36.5	76.2 × 36.5	76.2 × 36.5

NOTE
( ): Vehicles with limited slip differential

CONSTRUCTION DIAGRAM

120000407



11W0052

SERVICE SPECIFICATIONS

120002224

Item			Standard value	Limit
Axle shaft axial play mm		2WD (vehicles without ABS)	0.05–0.20	–
		2WD (vehicles with ABS) and 4WD	0–0.25	–
Rear axle total backlash mm			–	5
Limited slip differential preload Nm	2WD 4G63	Using special tool	17 or more	–
		Without using special tool	34 or more	–
	Except 2WD 4G63	Using special tool	13 or more	–
		Without using special tool	25 or more	–
Axle shaft retainer press-fitting force N	2WD 4G63 standard wheelbase (without ABS)		Initial press-fitting force 39,000 or more	–
			Final press-fitting force 59,000	–
	Except 2WD 4G63 standard wheelbase (without ABS)		Initial press-fitting force 49,000 or more	–
			Final press-fitting force 78,000	–
	4WD or 2WD (with ABS)		Initial press-fitting force 49,000 or more	–
			Final press-fitting force 98,000–108,000	–

Item			Standard value	Limit
Clearance between axle shaft retainer and snap ring mm			0–0.166	–
Drive gear runout mm			–	0.05
Drive gear backlash mm	4G63 Standard wheelbase		0.11–0.16	–
	4G63 Long wheelbase 4D56 Standard wheelbase 4G64		0.08–0.13	–
	4D56 Long wheelbase		0.13–0.18	–
Differential gear backlash mm	2WD 4G63 Standard wheelbase (without ABS)		0.01–0.076	0.2
	2WD 4G63 Standard wheelbase (with ABS) 4D56 Long wheelbase		0–0.076	0.2
	2WD 4G63 Long wheelbase 4D56 Standard wheelbase 4G64 4WD		0.01–0.25	0.2
Drive pinion turning torque Nm	Without oil seal	When replacing (with anti-rust agent)	0.6–0.9	–
		When replacing or reusing (with gear oil applied)	0.4–0.5	–
	With oil seal	When replacing (with anti-rust agent)	0.8–1.1	–
		When replacing or reusing (with gear oil applied)	0.6–0.7	–

Item			Standard value	Limit
Limited slip differential starting torque Nm	2WD 4G63	When a new clutch plate is used	49–78	–
		When re-installing current clutch plate	34–78	–
	Except 2WD vehicles with 4G63 engine	When a new clutch plate is used	39–74	–
		When re-installing current clutch plate	25–74	–
Friction plate and friction disc warping (flatness) mm			–	0.08
Friction plate and friction disc wear (difference in the thickness of the friction surface and the projections) mm			–	0.1
Horizontal difference between friction plate and friction disc thickness mm			0–0.05	–
Clearance between friction plate and friction disc mm		2WD 4G63	0.05–0.20	–
		Except 2WD vehicles with 4G63 engine	0.06–0.20	–
Difference between left and right dimensions from back thrust face of pressure ring to end of thrust washer mm		Except 2WD vehicles with 4G63 engine	0–0.05	–
Clearance in side gear axial direction mm		Except 2WD vehicles with 4G63 engine	0.05–0.20	–

LUBRICANTS

120002208

Item	Specified lubricants	Quantity		
Rear differential gear oil	• Conventional differential: Hypoid gear oil API classification GL-5 or higher SAE viscosity No. 90, 80 W • Limited slip differential: Hypoid gear oil MITSUBISHI Genuine Gear Oil Part No. 8149630 EX CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE 80W-90) or equivalent	2WD	4G63 Standard wheelbase	1.2 dm^3
			4D56 Standard wheelbase	1.6 dm^3
			4G63 Long wheelbase	
			4G64	
			4D56 Long wheelbase	2.6 dm^3
		4WD	4G64	1.8 dm^3
			4D56 (Standard wheelbase)	

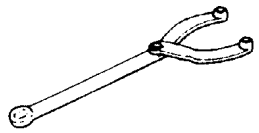
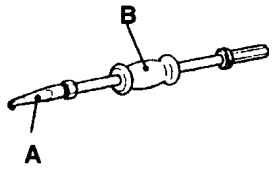
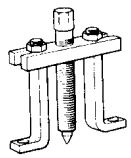
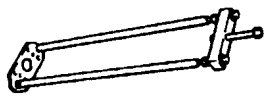
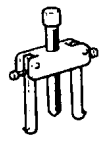
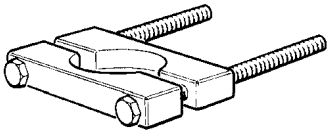
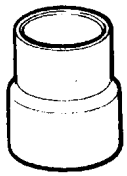
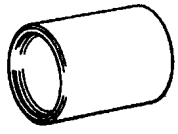
SEALANTS

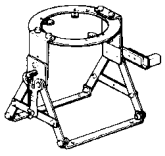
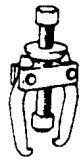
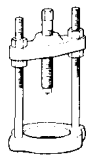
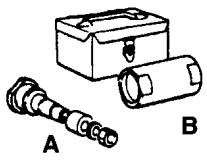
120000410

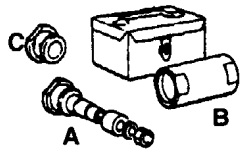
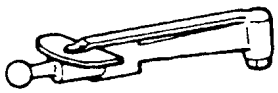
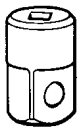
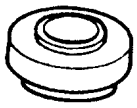
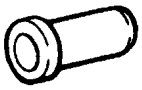
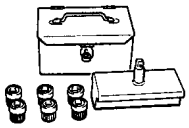
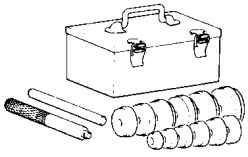
Items	Specified sealants	Remarks
Bearing case	3M ATD Part No. 8663 or equivalent	Semi-drying sealant
Dust cover		
Axle housing (differential carrier mounting part)		
Drive gear and differential case mounting part	3M Stud Locking 4170 or equivalent	Anaerobic sealant

SPECIAL TOOLS

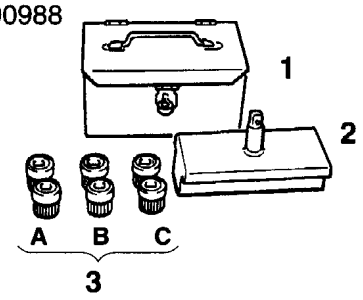
120000411

Tool	Number	Name	Use
	MB990767	End yoke holder	Measurement of the limited slip differential preload
	MB990590 A: MB990212 B: MB990211	Rear axle shaft oil seal remover A: Adapter B: Sliding hammer	Removal of axle shaft (Use together with MB990241, MB990211) Removal of axle housing oil seal
	MB990241	Rear axle shaft puller	Removal of axle shaft (Use together with MB990211)
	MB991552	Axle shaft bearing and case remover	Removal of the axle shaft bearing and bearing case
	MB990801	Rear axle bearing outer race remover	Removal of bearing case, bearing outer race <2WD vehicles without ABS (except vehicles with 4G63 Standard wheelbase)>
	MB990786	Rear axle bearing outer race bridge	
	MB990560	Bearing remover	• Removal of bearing inner race • Press-fitting of the axle shaft bearing inner race Press-fitting of the axle shaft retainer <2WD vehicles with ABS and 4WD vehicles>
	MB990799	Bearing inner race installer	
	MB990890 or MB990891	Rear suspension bushing base	Installation of bearing outer race

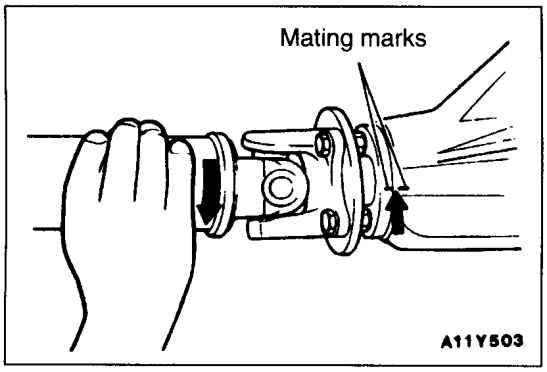
Tool	Number	Name	Use
	MB990787	Axle shaft bearing remover	Installation of rotor
	MB990909	Working base	Supporting of the differential carrier
	MB990201 MB990722	Side bearing adjusting special spanner	Removal and adjustment of the side bearing nut 2WD 4G63 Standard wheelbase: MB990722 Except 2WD vehicles with 4G63 Standard wheelbase : MB990201
	MB990810	Side bearing puller	Removal of the side bearing inner race
	MB990811	Side bearing cup	
	MB990850	End yoke holder	Removal of the companion flange
	MB990339	Bearing puller	Removal of the drive pinion rear bearing inner race
	MB990648	Bearing remover	
	MB990856 A: MB990858 B: MB990720	Pinion height gauge set A: Drive pinion gauge B: Cylinder gauge	Measurement of the pinion height <2WD 4G63 Standard wheelbase>

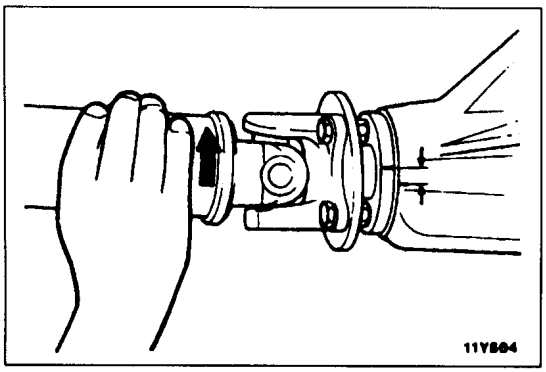
Tool	Number	Name	Use
	MB991171 A: MB990819 B: MB991170 C: MB991169	Pinion height gauge set A: Drive pinion gauge B: Cylinder gauge C: Drive pinion gauge attachment	Measurement of the pinion height <Except 2WD vehicles with 4G63 Standard wheelbase>
	MB990685	Torque wrench	Measurement of the starting torque of drive pinion
	MB990326	Preload socket	
	MB990813	Tap	Removal of adhesive
	MB990728	Bearing installer	• Press-fitting of the drive pinion rear bearing inner race • Press-fitting of the side bearing inner race <2WD 4G63 Standard wheelbase>
	MB990727	Drive pinion oil seal installer	Press-fitting of the drive pinion oil seal
	MB990802	Bearing installer	Press-fitting of the side bearing inner race <Except 2WD vehicles with 4G63 Standard wheelbase>
 Tool A B C	MB990988	Side gear holding tool set	Measurement of the clutch plate preload
	MB990925	Bearing and oil seal installer set	• Press-fitting of oil seal • Inspection of drive gear tooth contact • Removal of bearing outer race • For details of each installer, refer to GROUP 26 – Special Tools.

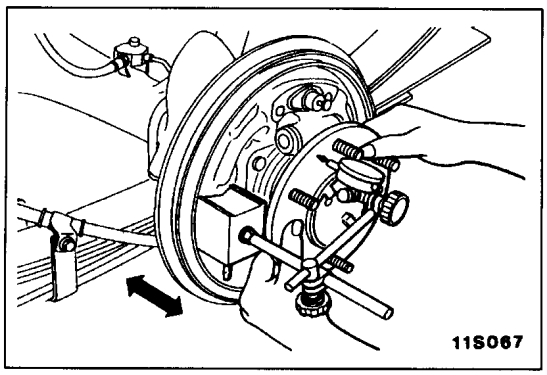
MB990988

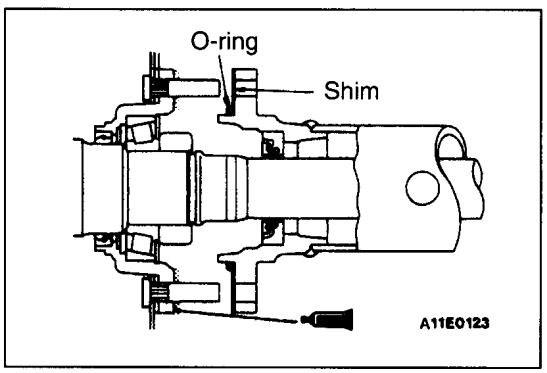


Tool number		Name	O.D. mm
1	MB990551	Box	–
2	MB990989	Base	–
3	(MB990990)	Tool A	25
	(MB990991)	Tool B	28
	(MB990992)	Tool C	31









SERVICE ADJUSTMENT PROCEDURES

120002209

REAR AXLE TOTAL BACKLASH CHECK

1. Park the vehicles on a flat, level surface.
2. Place the transmission control lever to the neutral position, and place the transfer control lever to the neutral position. Then pull the parking brake lever and raise the vehicle on a jack.
3. Turn the companion flange clockwise as far as it will go. Make the mating marks on the dust cover of the companion flange and on the differential carrier.
4. Turn the companion flange anti-clockwise as far as it will go, and measure the amount of distance through which the mating marks moved.

   Limit: 5 mm
5. If the backlash exceeds the limit value, remove the differential carrier assembly and check the following.
   - Drive gear backlash (Refer to P.27-34.)
   - Differential gear backlash (Refer to P.27-35.)

AXLE SHAFT AXIAL PLAY CHECK

120000413

1. Measure the axle shaft axial play by using a dial indicator.

   Standard value: 2WD (without ABS)
   0.05–0.20 mm
   2WD (with ABS), 4WD
   0–0.25 mm
2. For vehicles with drum brakes (vehicles without ABS), if the play is not within the standard value, replace the shim.

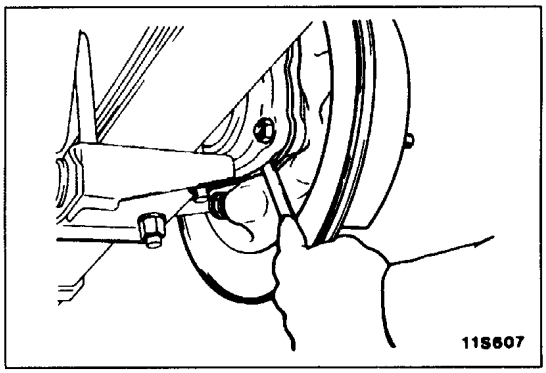
AXLE SHAFT AXIAL PLAY ADJUSTMENT

120000414

<2WD (without ABS)>

1. Insert a 1 mm thick shim and O-ring into the left side rear axle housing.
2. Apply the specified sealant to the mating surface of the bearing case, install the left axle shaft into rear axle housing and tighten the nuts to 49–59 Nm.

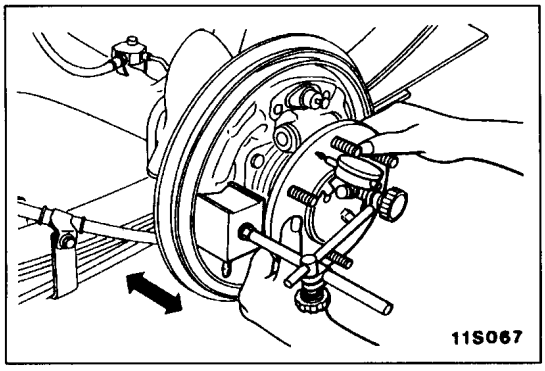
   Specified sealant: 3M ATD Part No. 8663 or equivalent



3. Temporarily install the right axle shaft assembly to the rear axle housing without installing the O-ring or shim.
4. Measure the clearance between the bearing case and rear axle housing end with a thickness gauge.

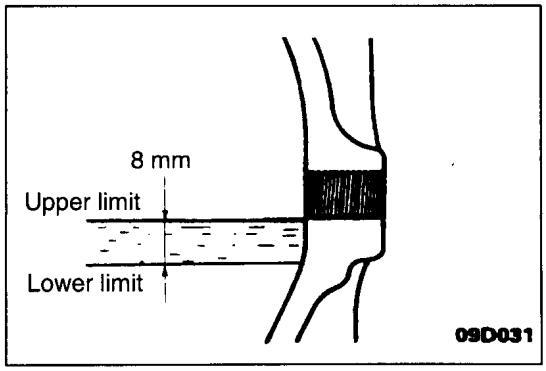
   NOTE
   Confirm that the measurement values do not differ in the horizontal and vertical positions.
5. Select shims of the thickness which is equal to the sum of the measured clearance and 0.05–0.20 mm.
   Remove the right axle shaft, and install shim(s) and O-ring on the right side rear axle housing end.
6. Apply the specified sealant to the mating surface of bearing case, install the right axle shaft into rear axle housing and tighten the nut to 49–59 Nm.

   Specified sealant: 3M ATD Part No. 8663 or equivalent



7. Check to assure that the axle shaft axial play is within the standard value.

   Standard value: 0.05–0.20 mm



GEAR OIL LEVEL CHECK 120002210

Check that gear oil level is not 8 mm below the bottom of filler plug hole.

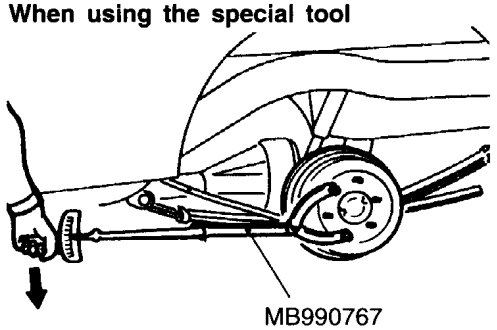
Specified gear oil:

<Conventional differential>
Hypoid gear oil API classification GL-5 or higher
SAE viscosity No. 90, 80W

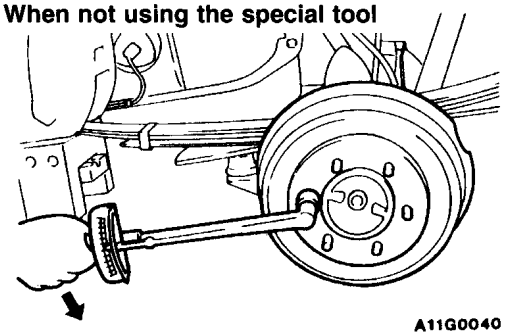
<Limited slip differential>
Hypoid gear oil MITSUBISHI Genuine Gear Oil Part No. 8149630 EX,
CASTROL HYPOY LS (GL-5, SAE 90),
SHELL-LSD (GL-5, SAE 80W-90) or equivalent

2WD 4G63 Standard wheelbase:	**1.2 dm^3**
2WD 4G63 Long wheelbase,	
4D56 Standard wheelbase, 4G64:	**1.6 dm^3**
4WD:	**1.8 dm^3**
4D56 Long wheelbase:	**2.6 dm^3**

When using the special tool



When not using the special tool



LIMITED SLIP DIFFERENTIAL PRELOAD MEASUREMENT

120000416

1. Place the shift lever in the neutral position and lock the front wheels.
2. Disconnect the propeller shaft from the differential.
3. With the parking brake fully released, jack up one rear wheel so that the other is still on the ground.
4. Measure the differential preload in the forward direction when using the special tool and when not using the special tool.

Standard value:

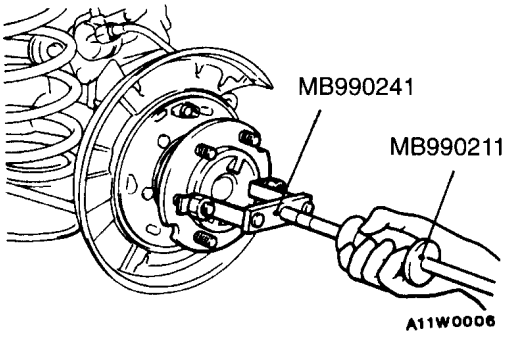
<2WD 4G63 Standard wheelbase>

Using the special tool	**17 Nm or more**
Without using the special tool	**34 Nm or more**

<Except 2WD vehicles with 4G63 Standard wheelbase>

Using the special tool	**13 Nm or more**
Without using the special tool	**25 Nm or more**

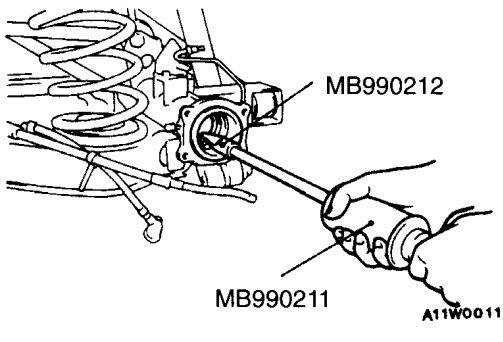
NOTE
If the differential preload is not within the standard value, disassemble the limited slip differential to check parts.



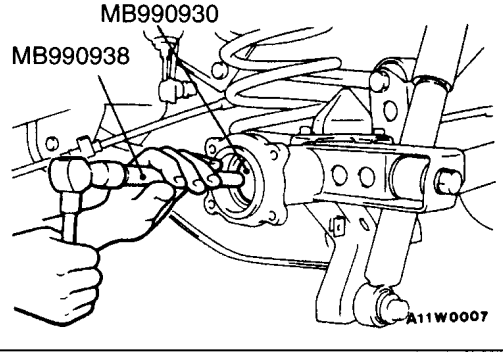
AXLE HOUSING OIL SEAL REPLACEMENT

120002437

1. Remove the axle shaft assembly (Refer to P.27-17, 25.)



2. Use special tools with hook attached to remove the oil seal.
3. Apply multipurpose grease to the oil seal fitting area of the rear axle housing.



4. Drive the new oil seal into the rear axle housing end by using the special tool.
5. Apply multipurpose grease to the oil seal lip.
6. Install the rear axle shaft.

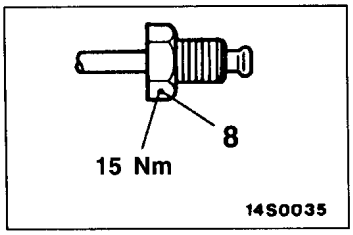
AXLE ASSEMBLY

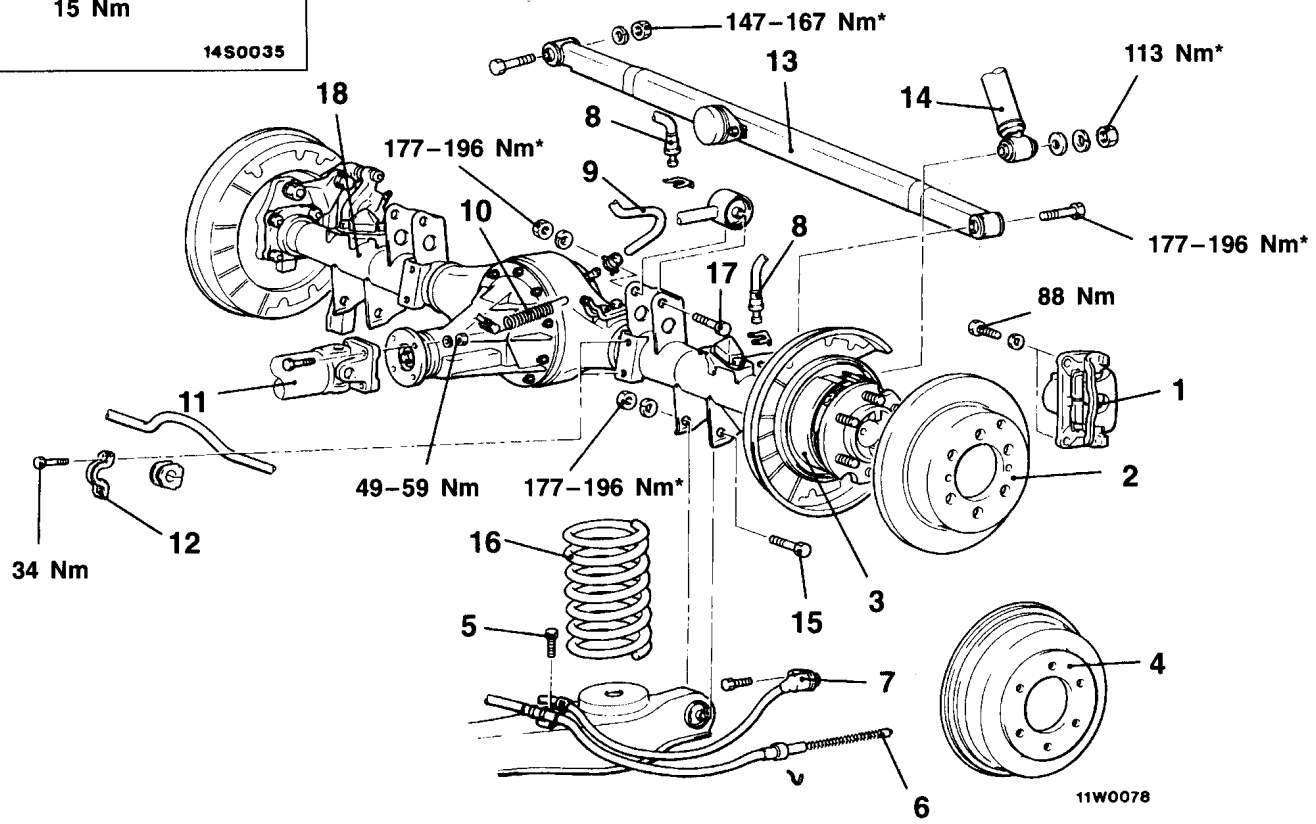
120002211

REMOVAL AND INSTALLATION

Post-installation Operation
- Brake Fluid Filling and Air Bleeding (Refer to GROUP 35A – Service Adjustment Procedures.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)

<Vehicles with coil springs>





00000988

Removal steps

1. Caliper assembly <Vehicles with disc brake>
2. Brake disc <Vehicles with disc brake>
3. Parking brake shoe assembly <Vehicles with disc brake> (Refer to GROUP 36 – Parking Brake Drum.)
4. Brake drum <Vehicles with drum brake>
5. Parking brake cable, speed sensor <Vehicles with ABS> attaching bolt
6. Parking brake cable connection
7. Speed sensor connection <Vehicles with ABS>
8. Brake tube connection
9. Breather hose connection
10. Load sensing spring connection

◀A▶ ▶B◀ 11. Propeller shaft connection

12. Clamp
13. Lateral rod

◀B▶ 14. Shock absorber connection

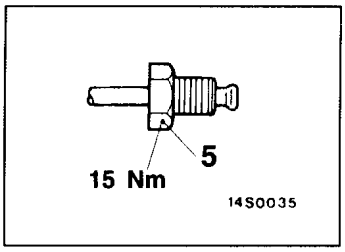
15. Lower arm mounting bolt
16. Rear spring
17. Upper control arm mounting bolt

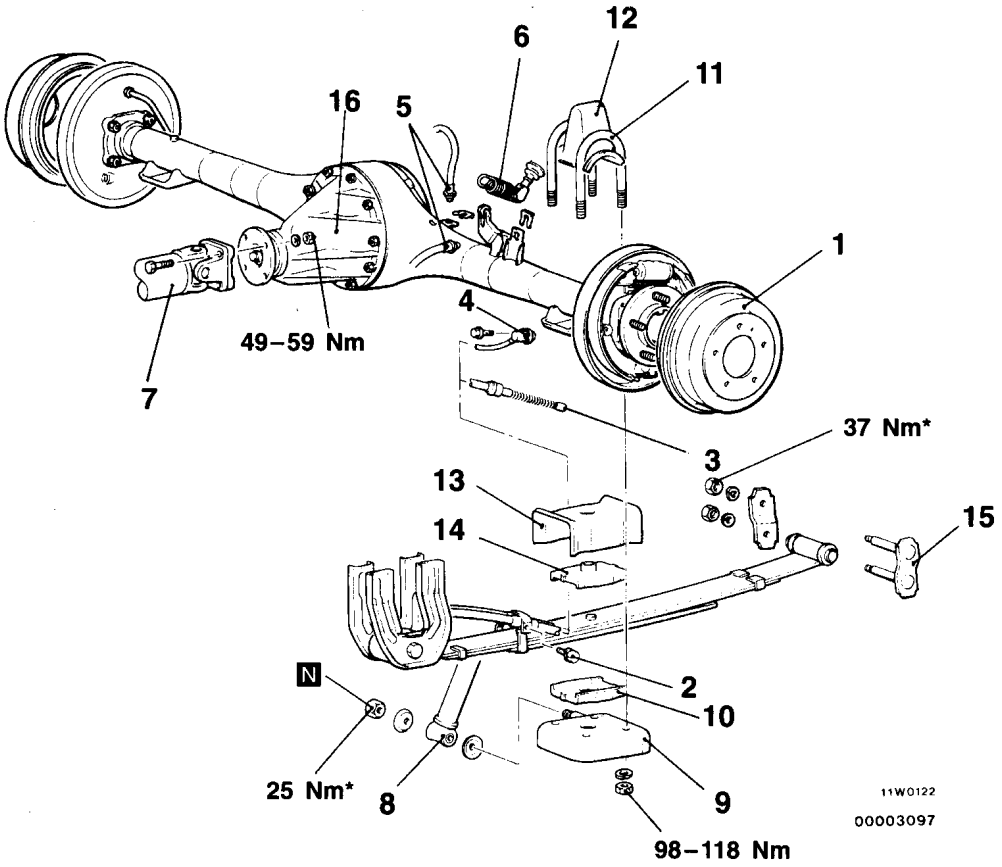
◀C▶ 18. Axle assembly

Caution

* **Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.**

<2WD vehicles with leaf springs>





Removal steps

1. Brake drum
2. Parking brake cable, speed sensor <Vehicles with ABS> attaching bolt
3. Parking brake cable connection
4. Speed sensor connection <Vehicles with ABS>
5. Brake tube connection
6. Load sensing proportioning valve connection

◀A▶ ▶B◀ 7. Propeller shaft connection

◀B▶ 8. Shock absorber connection

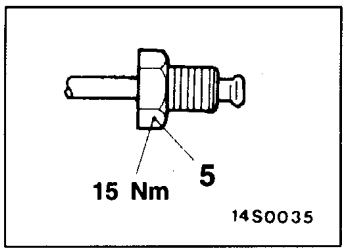
9. U-bolt seat
10. Spring pad
11. U-bolts
12. Bump stopper
13. Clamp
14. Spring pad
15. Shackle assembly

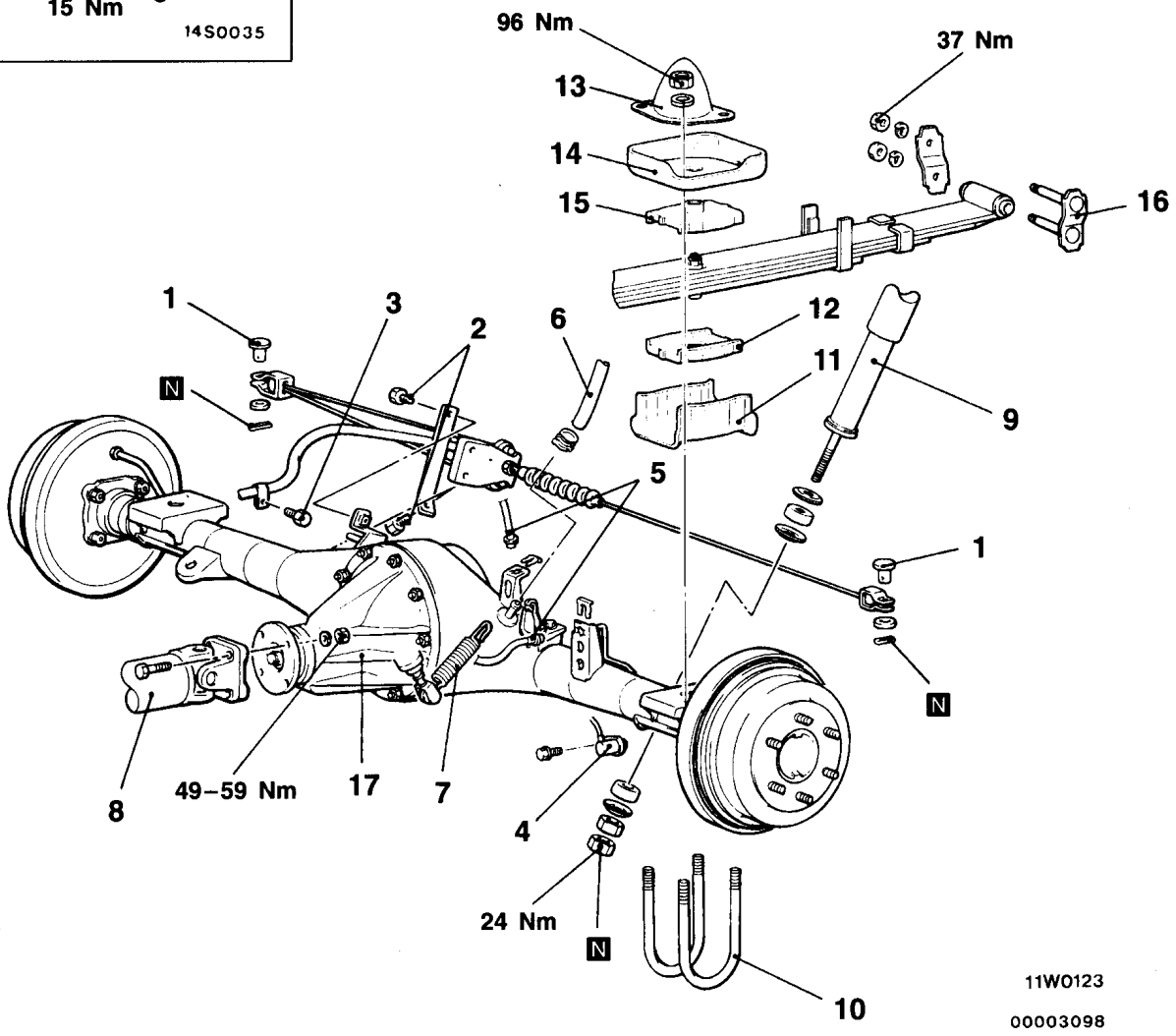
◀C▶ 16. Axle assembly

Caution

*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.**

<4WD vehicles with leaf springs>





Removal steps

1. Pin
2. Parking brake cable mounting bolt (Axle housing side)
3. Parking brake cable mounting bolt (Leaf spring side)
4. Speed sensor connection <Vehicles with ABS>
5. Brake tube connection
6. Breather hose connection
7. Load sensing proportioning valve connection

◀A▶ ▶B◀ 8. Propeller shaft connection

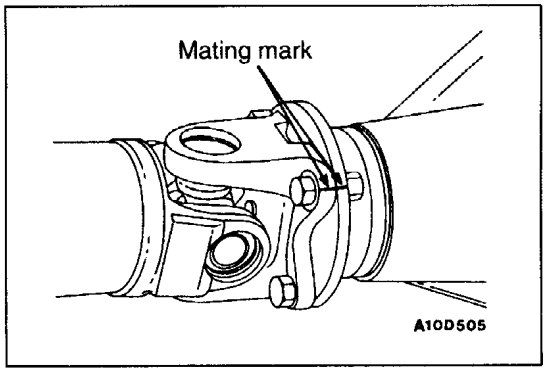
◀B▶ ▶A◀ 9. Shock absorber connection

10. U-bolts
11. Clamp
12. Spring pad
13. Bump stopper
14. U-bolt seat
15. Spring pad
16. Shackle assembly

◀C▶ 17. Axle assembly

Caution

*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles on the ground in the unladen condition.**

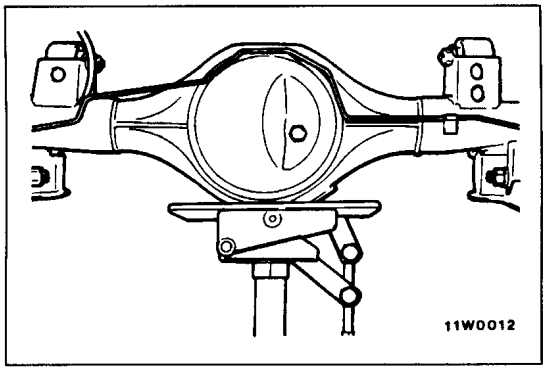


REMOVAL SERVICE POINTS

◀A▶ PROPELLER SHAFT REMOVAL

Make a mating marks on the companion flange and flange yoke, disconnect the propeller shaft from the companion flange.

Caution
Suspend the propeller shaft from the body with wire, etc. to prevent it from falling.



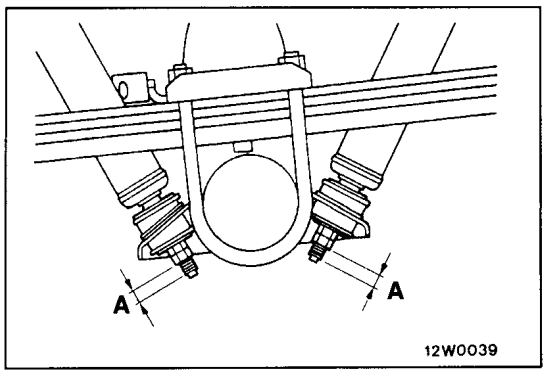
◀B▶ SHOCK ABSORBER REMOVAL

Support the axle housing with a jack before removing the shock absorber lower mounting nut.

◀C▶ AXLE ASSEMBLY REMOVAL

Take out the axle assembly from the rear of the vehicle.

Caution
Be careful not to drop the axle assembly, because it is unstable on the jack.



INSTALLATION SERVICE POINTS

▶A◀ SHOCK ABSORBER INSTALLATION

Standard value (A): 1–2 mm

▶B◀ PROPELLER SHAFT INSTALLATION

Align the mating marks on the flange yoke and the companion flange to install the propeller shaft.

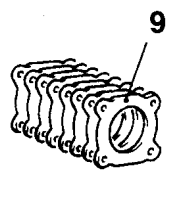
AXLE SHAFT <VEHICLES WITH DRUM BRAKE>

120002212

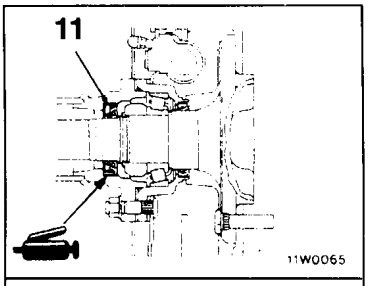
REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Brake Fluid

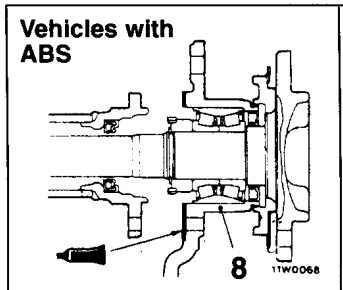
Post-installation Operation
- Air bleeding of Brake Line (Refer to GROUP 35A – Service Adjustment Procedures.)
- Adjustment of parking Brake Pull Rod (Refer to GROUP 36 – Service Adjustment Procedures.)

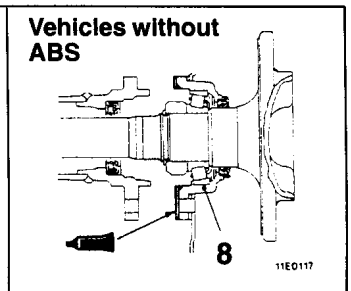


Rear axle shaft shim set

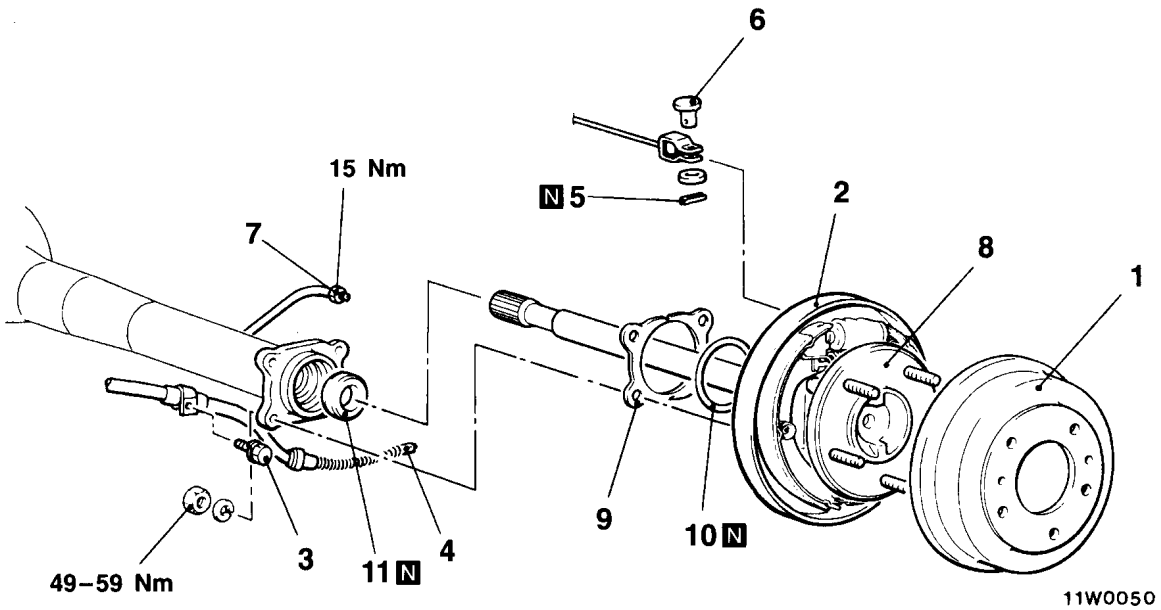


Apply to entire inside diameter of oil seal lip





Sealant: 3M ATD Part No. 8663 or equivalent



Removal steps

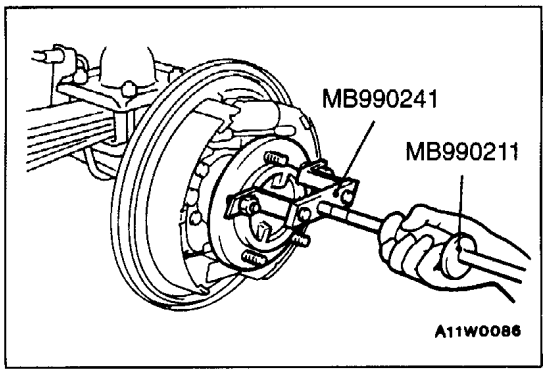
1. Brake drum
2. Shoe-lining assembly (Refer to GROUP 35A – Rear Drum Brake.)
3. Parking brake cable, speed sensor cable <Vehicles with ABS> attachment bolt
4. Parking brake cable connection
5. Split pin <4WD>
6. Pin <4WD>
7. Brake tube connection

▶B◀ • Axle shaft axial play adjustment <Vehicles without ABS>

◀A▶ 8. Axle shaft assembly

9. Shim <Vehicles without ABS>
10. O-ring

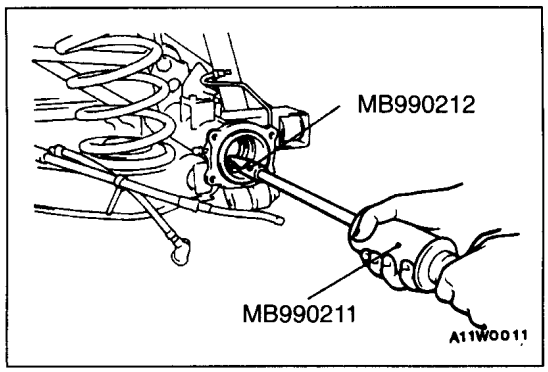
◀B▶ ▶A◀ 11. Oil seal



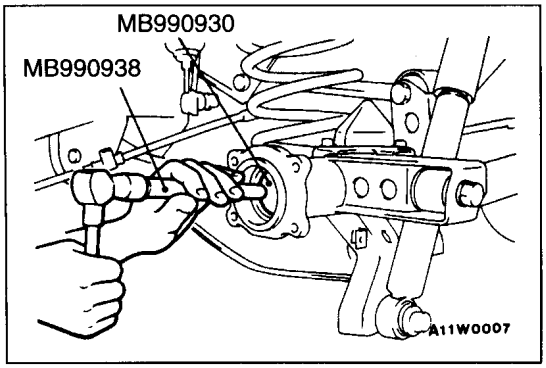
REMOVAL SERVICE POINTS

◀A▶ AXLE SHAFT ASSEMBLY REMOVAL

Caution
Be careful not to damage the oil seal when pulling axle shaft.

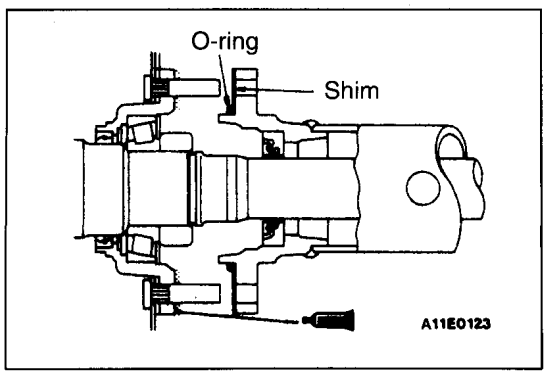


◀B▶ OIL SEAL REMOVAL



INSTALLATION SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION



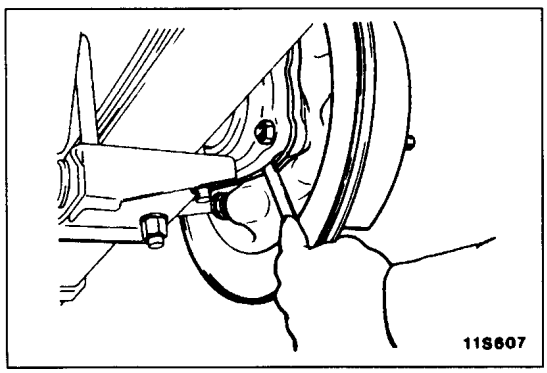
▶B◀ AXLE SHAFT AXIAL PLAY ADJUSTMENT <VEHICLES WITHOUT ABS>

When replacing the axle shaft or the wheel bearings, the following adjustment is needed. When removing and reinstalling the axle shaft, it is not needed and the same thickness and number of shims as previously should be used.

1. Insert a 1 mm thick shim and O-ring into the left side rear axle housing.
2. Apply the specified sealant to the mating surface of the bearing case, install the left axle shaft into rear axle housing and tighten the nuts to 49–59 Nm.

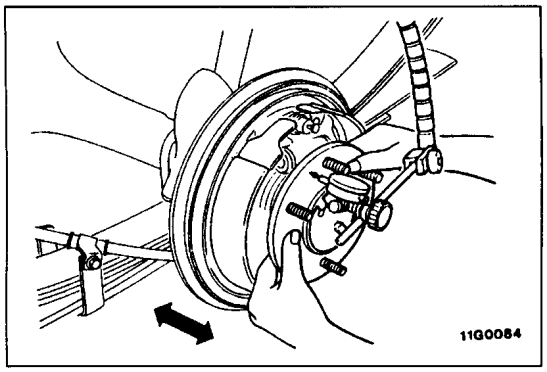
   Specified sealant: 3M ATD Part No. 8663 or equivalent
3. Temporarily install the right axle shaft assembly to the axle housing without installing the O-ring or shim.
4. Measure the clearance between the bearing case and rear axle housing end with a thickness gauge.

   NOTE
   Confirm that the measurement values do not differ in the horizontal and vertical positions.



5. Select shims of the thickness which is equal to the sum of the measured clearance and 0.05–0.20 mm.
6. Remove the right axle shaft, and install shim(s) and O-ring on the right side rear axle housing end.
7. Apply the specified sealant to the mating surface of bearing case, install the right axle shaft into rear axle housing and tighten the nut to 49–59 Nm.

Specified sealant: 3M ATD Part No. 8663 or equivalent



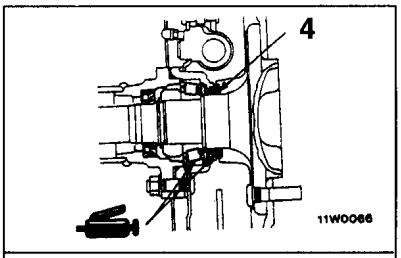
8. Check to ensure that the axle shaft axial play is within the standard value.

Standard value: 0.05–0.20 mm

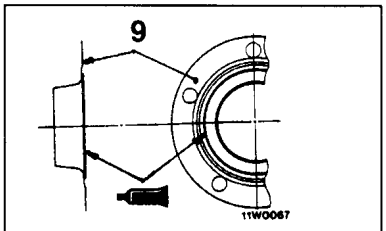
DISASSEMBLY AND REASSEMBLY

120002213

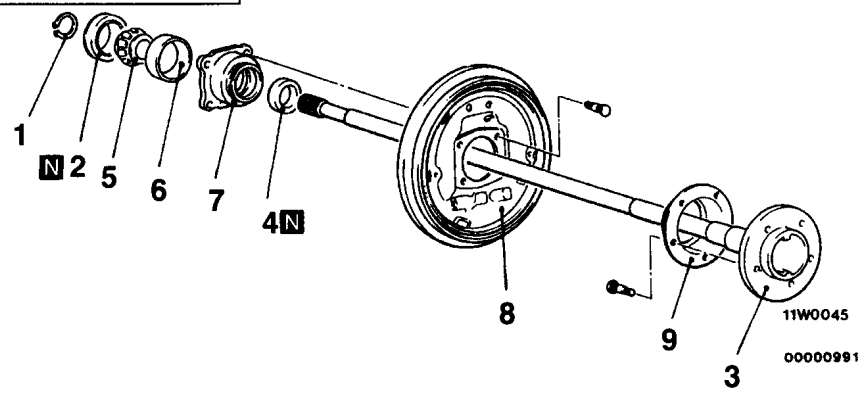
<VEHICLES WITHOUT ABS>



Apply to entire inside diameter of oil seal lip



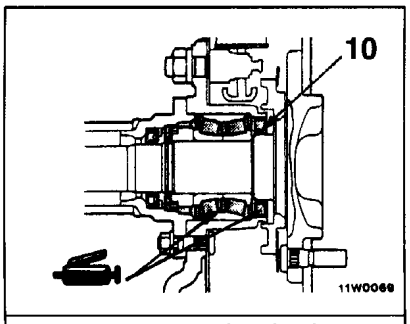
Sealant: 3M ATD Part No. 8663 or equivalent



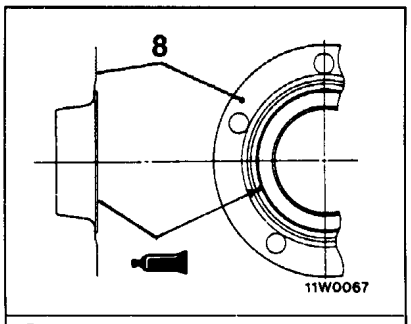
Disassembly steps

- ▶G◀ 1. Snap ring
- ◀A▶ ▶E◀ 2. Retainer
- ◀B▶ 3. Axle shaft
- ▶D◀ 4. Oil seal
- ▶C◀ 5. Bearing inner race
- ◀D▶ ▶A◀ 6. Bearing outer race
- 7. Bearing case
- 8. Backing plate
- 9. Dust cover

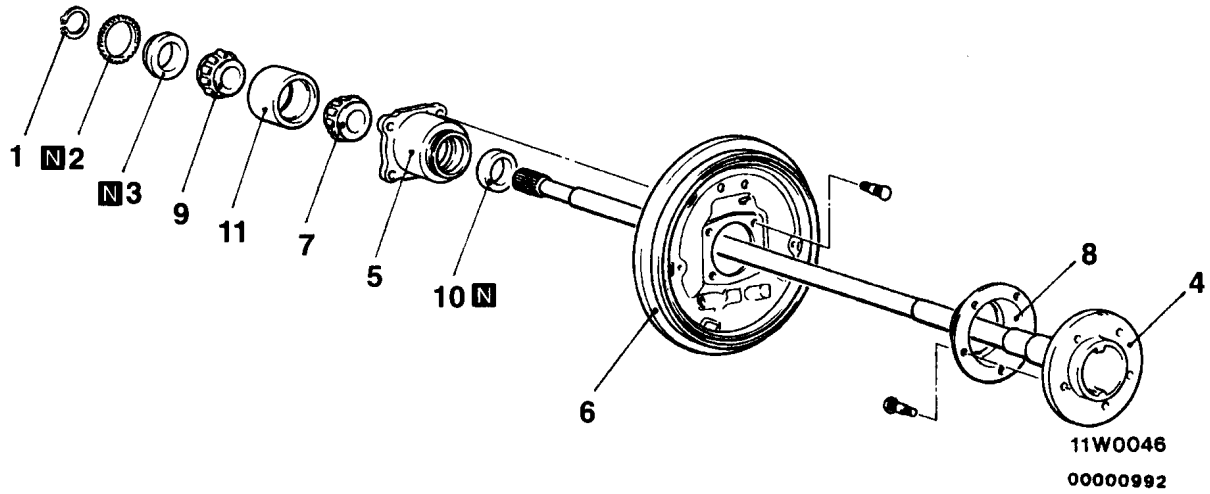
<VEHICLES WITH ABS>



Apply to entire inside diameter of oil seal lip



Sealant: 3M ATD Part No. 8663 or equivalent

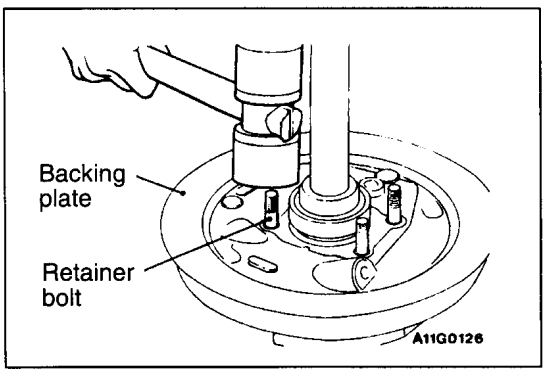


Disassembly steps

1. Snap ring
2. Rotor <Vehicles with ABS>
◀A▶ 3. Retainer
◀B▶ 4. Axle shaft
5. Bearing case
6. Backing plate
◀C▶ 7. Outer bearing inner race
8. Dust cover
9. Inner bearing inner race
10. Oil seal
◀D▶ 11. Bearing outer race

Reassembly steps

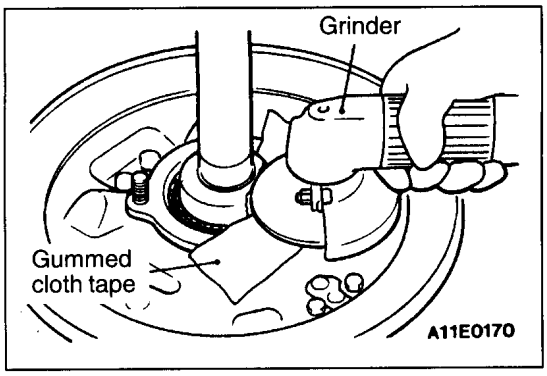
▶A◀ 11. Bearing outer race
▶B◀ 9. Inner bearing inner race
▶B◀ 7. Outer bearing inner race
▶D◀ 10. Oil seal
8. Dust cover
6. Backing plate
5. Bearing case
4. Axle shaft
▶E◀ 3. Retainer
▶F◀ 2. Rotor <Vehicles with ABS>
▶G◀ 1. Snap ring



DISASSEMBLY SERVICE POINTS

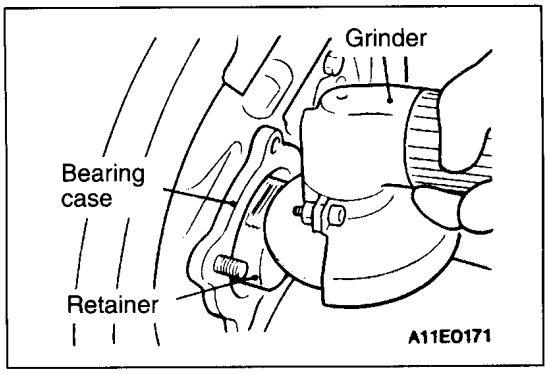
◀A▶ RETAINER REMOVAL

1. Remove one retainer bolt from the backing plate.



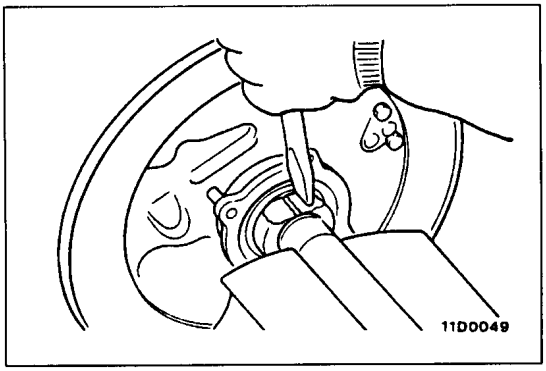
2. Apply gummed cloth tape around the edge of the bearing case for protection.
3. As shown in the figure, fix the axle shaft and shave off with grinder a point of its circumference locally until the wall thickness on the side of axle shaft of retainer and the side of bearing become approximately 1.0–1.5 mm and 2.0 mm respectively.

Caution
Be careful not to damage the bearing case and the axle shaft.



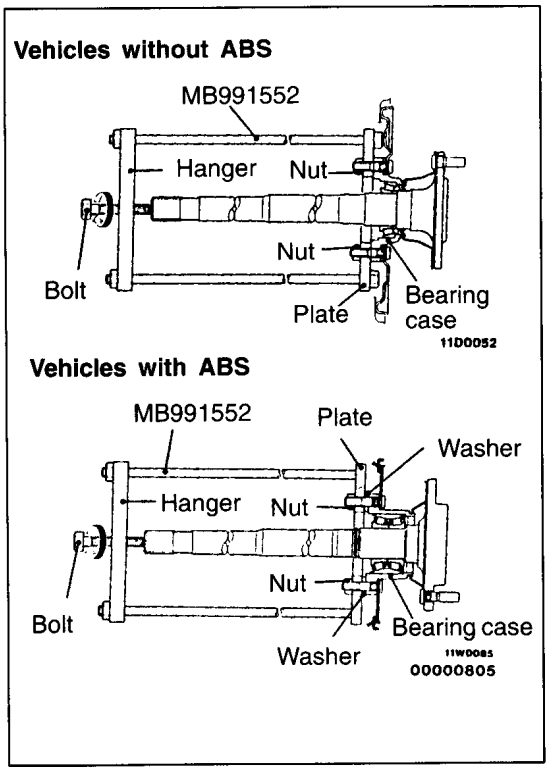
4. Fix the axle shaft and shave off the remaining 2.0 mm on the side of the bearing of the retainer.

Caution
Be careful not to damage the bearing case and the axle shaft.



5. Cut in with a chisel the place where the retainer ring has been shaven and remove the retainer ring.

Caution
Be careful not to damage the axle shaft.



◀B▶ AXLE SHAFT REMOVAL

<VEHICLES WITHOUT ABS>

1. Set the special tool by fixing its plate to the bearing case as shown in the figure.

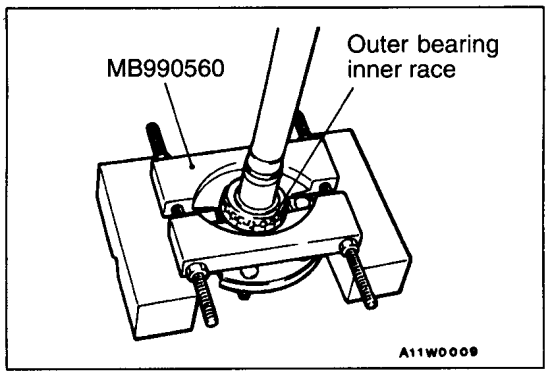
<VEHICLES WITH ABS>

1. Secure the special tool to the bearing case bolts with the nuts and adjust the height of the hanger. Then install the washers, plate and nuts in that order.

   NOTE
   The washers are used to eliminate the difference in height of the bearing case so that the plate and the bearing case are parallel.

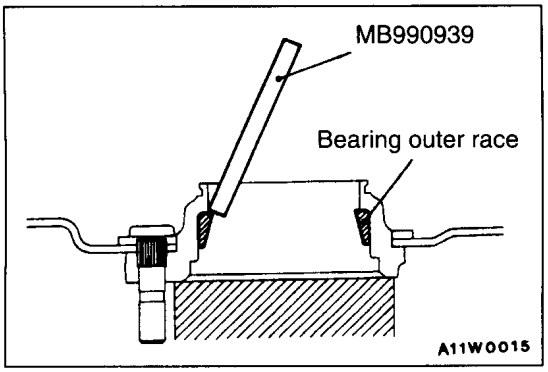
2. Place the end of the bolt against the centre of the axle shaft, and then tighten the nut to remove the axle shaft from the bearing case assembly.

   Caution
   The hanger and plate should be placed so that they are parallel.



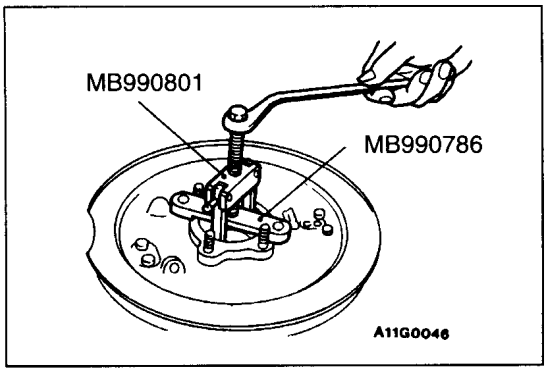
◀C▶ OUTER BEARING INNER RACE REMOVAL

Install the special tool as shown in the illustration, and then use a press to remove the outer bearing inner race from the axle shaft.

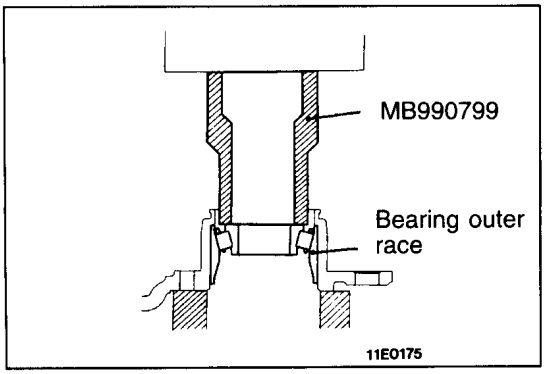


◀D▶ BEARING OUTER RACE REMOVAL

<4G63 Standard wheelbase (without ABS)>



<Except vehicles with 4G63 engine and Standard wheelbase (without ABS)>



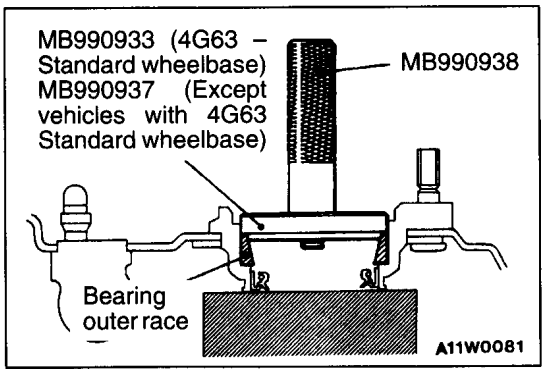
<VEHICLES WITH ABS>

Reinstall the outer bearing inner race that was removed previously, and then use the special tool and a press to remove the bearing outer race.

INSPECTION

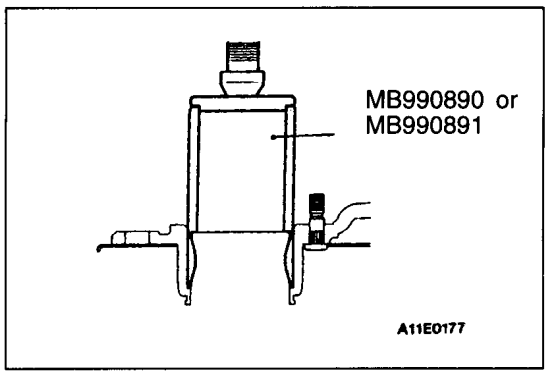
- Check the dust cover for deformation and damage.
- Check the inner and outer bearings for seizure, discoloration and rough raceway surface.
- Check the axle shaft for cracks, wear and damage.

REASSEMBLY SERVICE POINTS

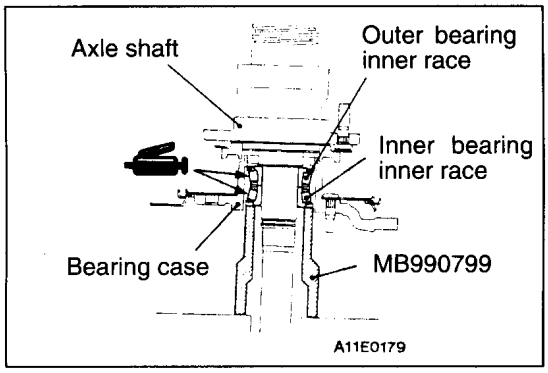


▶A◀ BEARING OUTER RACE INSTALLATION

<VEHICLES WITHOUT ABS>



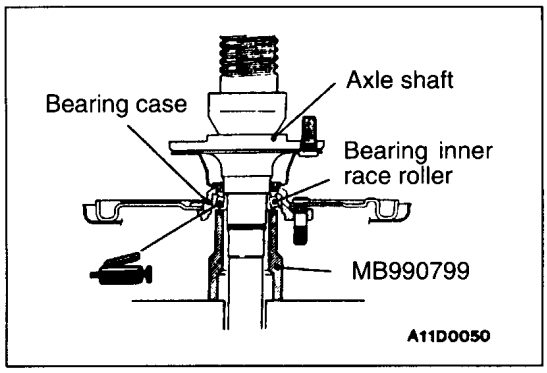
<VEHICLES WITH ABS>



▶B◀ INNER BEARING INNER RACE / OUTER BEARING INNER RACE INSTALLATION

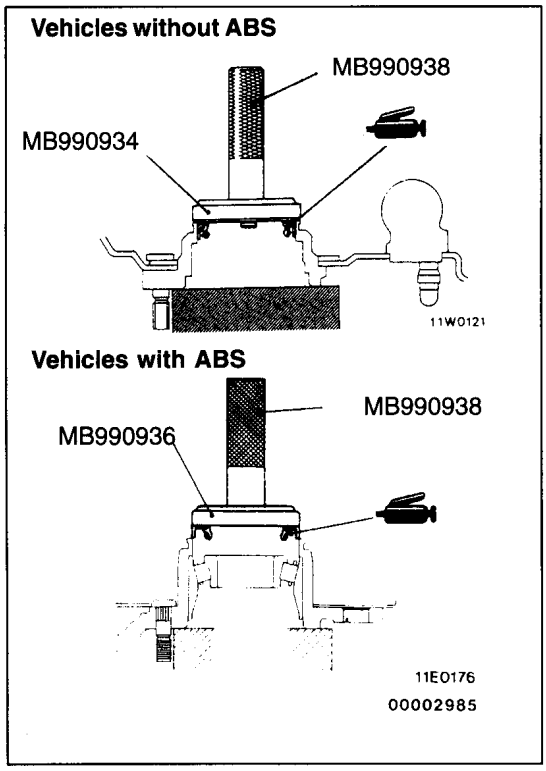
1. Apply multi-purpose grease to the roller surface and ends of the bearing.
2. Pass the axle shaft through the bearing case and the inner bearing inner race and outer bearing inner race.
3. Use the special tool to press-fit the inner bearing inner race and outer bearing inner race to the axle shaft.

Caution
Both bearing inner race, outer race sets should be press-fitted together.



▶C◀ BEARING INNER RACE INSTALLATION

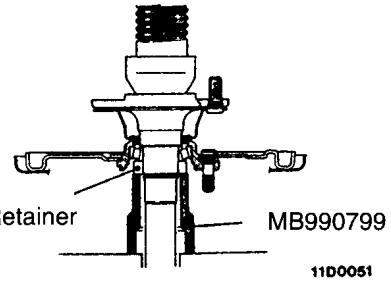
1. Apply multi-purpose grease to the roller surface and ends of the bearing.
2. Place the bearing case and the bearing inner race onto the axle shaft in that order.
3. Use the special tool to press-fit the bearing inner race to the axle shaft.



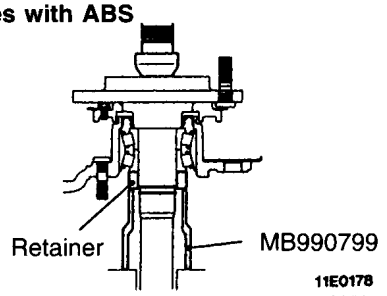
▶D◀ OIL SEAL INSTALLATION

1. Apply the multi-purpose grease to the external periphery of the oil seal.
2. Press-fit the oil seal into the bearing case until it is flush with the face of the bearing case by using the special tools.
3. Apply the multi-purpose grease to the lips of the oil seal.

Vehicles without ABS



Vehicles with ABS

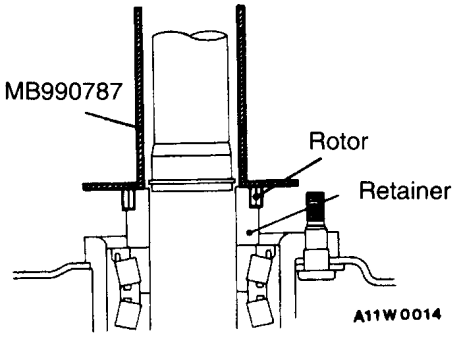


▶E◀ RETAINER INSTALLATION

Use the special tool to press-fit the retainer to the axle shaft, while checking that the press-fitting force is at the standard value.
If the initial press-fitting force is less than the standard value, replace the axle shaft.

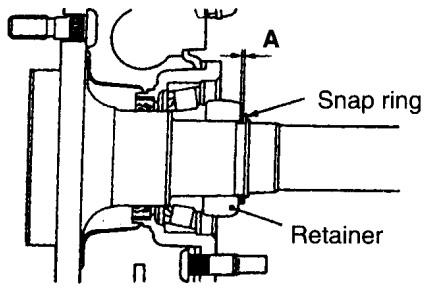
Standard value:

Item	Initial press-fitting force N	Final press-fitting force N
4G63 Standard wheelbase	39,000 or more	59,000
<Except vehicles with 4G63 Standard wheelbase>	49,000 or more	78,000
Vehicles with ABS	49,000 or more	98,000–108,000

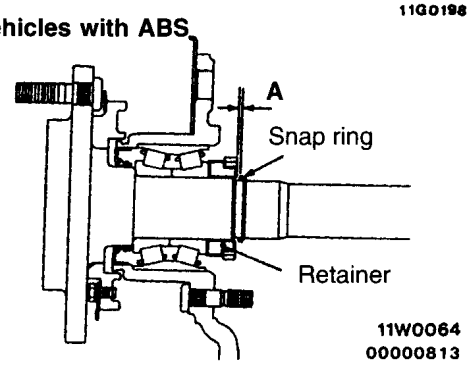


▶F◀ ROTOR INSTALLATION

Vehicles without ABS



Vehicles with ABS



▶G◀ SNAP RING INSTALLATION

1. After installing the snap ring, measure the clearance (A) between the snap ring and the retainer with a thickness gauge, and check that it is within the standard values.
   Standard value (A): 0–0.166 mm
2. If the clearance exceeds the standard value, change the snap ring so that the clearance is at the standard value.

Thickness of snap ring mm	Identification colour
2.17	–
2.01	Yellow
1.85	Blue
1.69	Purple
1.53*	Red

NOTE
* indicates vehicles other than with 4G63 standard wheelbase (without ABS).

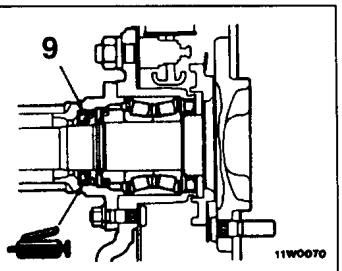
AXLE SHAFT <VEHICLES WITH DISC BRAKE>

120002214

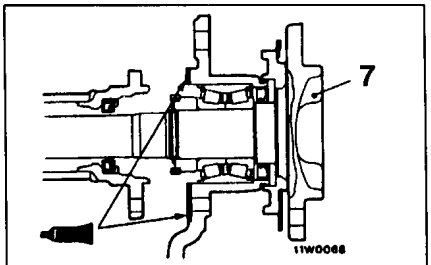
REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Brake Fluid

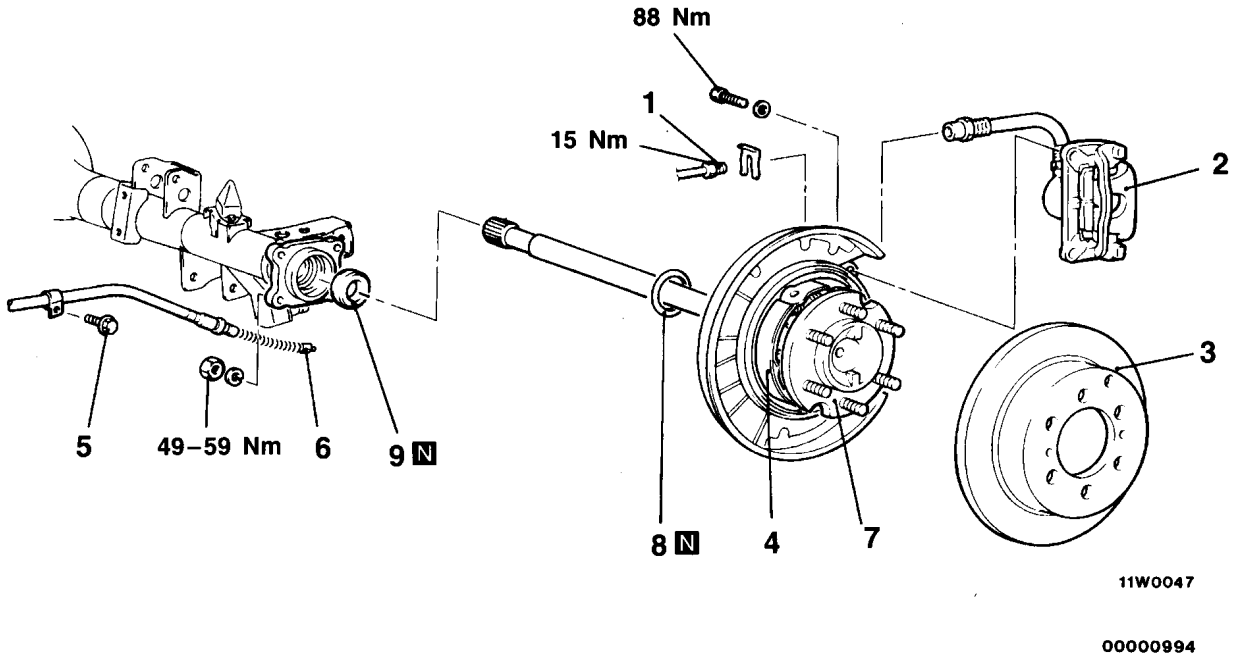
Post-installation Operation
- Air Bleeding of Brake Line (Refer to GROUP 35A – Service Adjustment Procedures.)
- Adjustment of Parking Brake Pull Rod (Refer to GROUP 36 – Service Adjustment Procedures.)



Apply to entire inside diameter of oil seal lip



Sealant: 3M ATD Part No. 8663 or equivalent



00000994

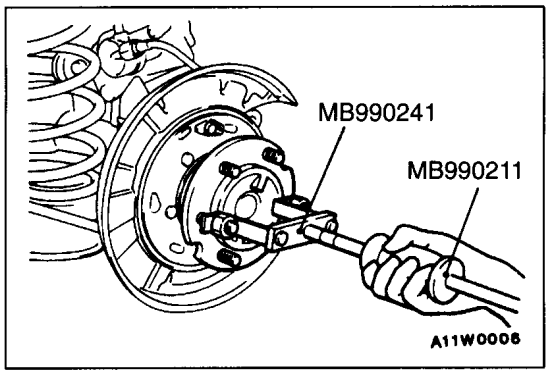
Removal steps

1. Brake tube connection
2. Caliper assembly
3. Brake disc
4. Parking brake shoe (Refer to GROUP 36 – Parking brake drum.)
5. Parking brake cable, speed sensor <Vehicles with ABS> attaching bolt
6. Parking brake cable connection

◀A▶ 7. Axle shaft assembly

8. O-ring

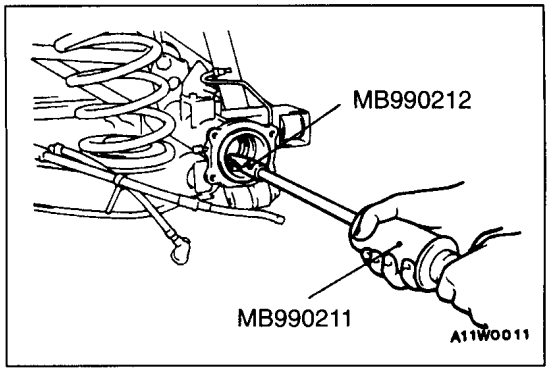
◀B▶ ▶A◀ 9. Oil seal



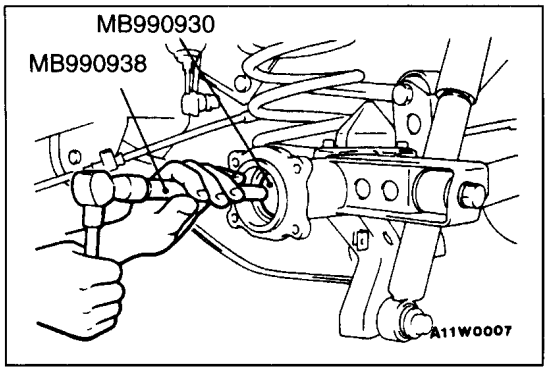
REMOVAL SERVICE POINTS

◀A▶ AXLE SHAFT ASSEMBLY REMOVAL

Caution
Be careful not to damage the oil seal when pulling axle shaft.



◀B▶ OIL SEAL REMOVAL

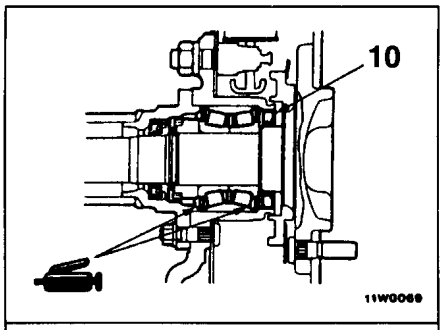


INSTALLATION SERVICE POINT

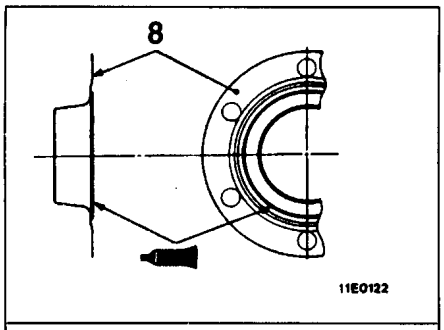
▶A◀ OIL SEAL INSTALLATION

DISASSEMBLY AND REASSEMBLY

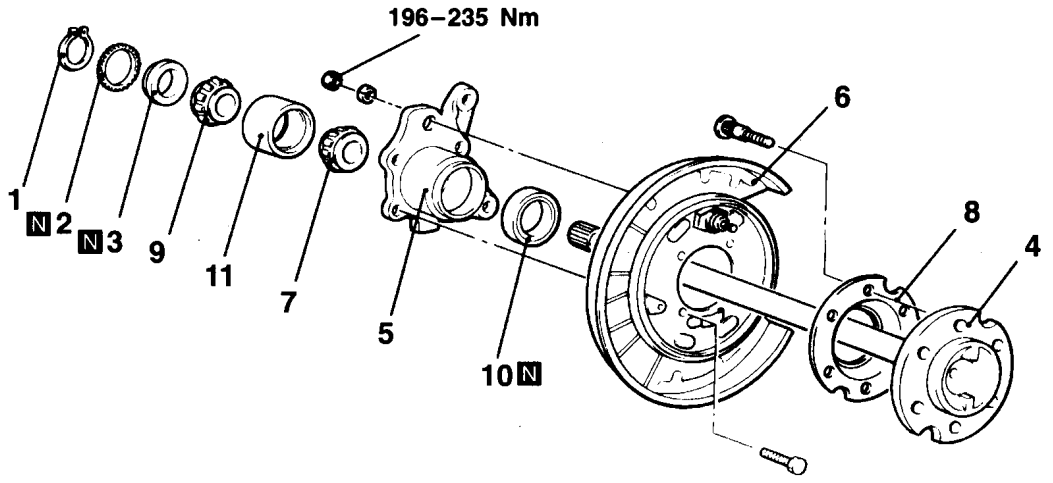
120002215



Apply to entire inside diameter of oil seal lip



Sealant: 3M ATD Part No. 8663 or equivalent



Disassembly steps

1. Snap ring
2. Rotor <Vehicles with ABS>
- ◀A▶ 3. Retainer
- ◀B▶ 4. Axle shaft
5. Bearing case
6. Backing plate
- ◀C▶ 7. Outer bearing inner race
8. Dust cover
9. Inner bearing inner race
10. Oil seal
- ◀D▶ 11. Bearing outer race

Reassembly steps

- ▶A◀ 11. Bearing outer race
- ▶B◀ 9. Inner bearing inner race
- ▶B◀ 7. Outer bearing inner race
- ▶C◀ 10. Oil seal

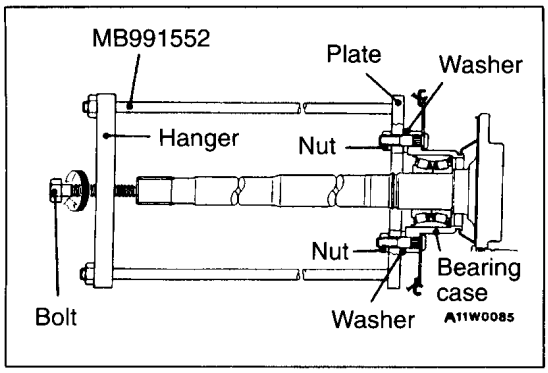
8. Dust cover
6. Backing plate
5. Bearing case
4. Axle shaft

- ▶D◀ 3. Retainer
- ▶E◀ 2. Rotor <Vehicles with ABS>
- ▶F◀ 1. Snap ring

DISASSEMBLY SERVICE POINTS

◀A▶ RETAINER REMOVAL

Refer to P.27-20.



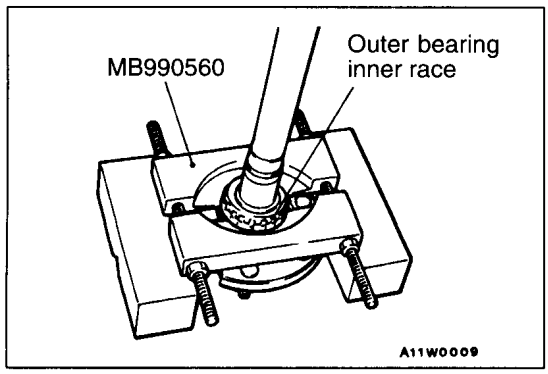
◀B▶ AXLE SHAFT REMOVAL

1. Secure the special tool to the bearing case bolts with the nuts and adjust the height of the hanger. Then install the washers, plate and nuts in that order.

   NOTE
   The washers are used to eliminate the difference in height of the bearing case so that the plate and the bearing case are parallel.

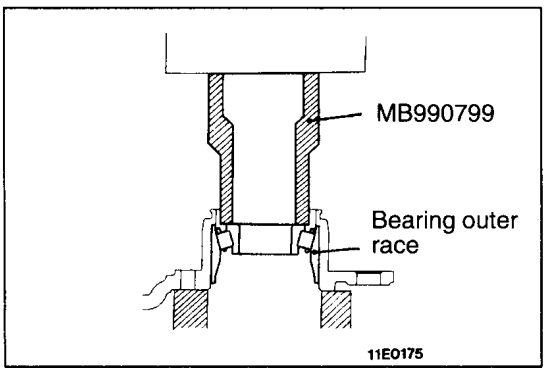
2. Place the end of the bolt against the centre of the axle shaft, and then tighten the nut to remove the axle shaft from the bearing case assembly.

   Caution
   The hanger and plate should be placed so that they are parallel.



◀C▶ OUTER BEARING INNER RACE REMOVAL

Install the special tool as shown in the illustration, and then use a press to remove the outer bearing inner race from the axle shaft.

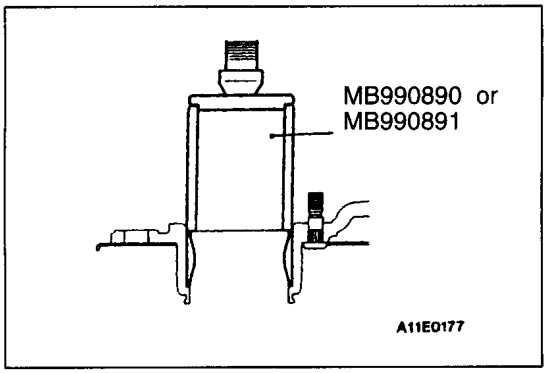


◀D▶ BEARING OUTER RACE REMOVAL

Reinstall the outer bearing inner race that was removed previously, and then use the special tool and a press to remove the outer bearing outer race.

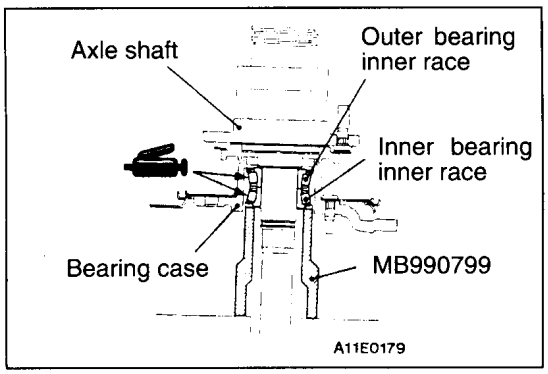
INSPECTION

- Check the dust cover for deformation and damage.
- Check the inner and outer bearings for seizure, discoloration and rough raceway surface.
- Check the axle shaft for cracks, wear and damage.



REASSEMBLY SERVICE POINTS

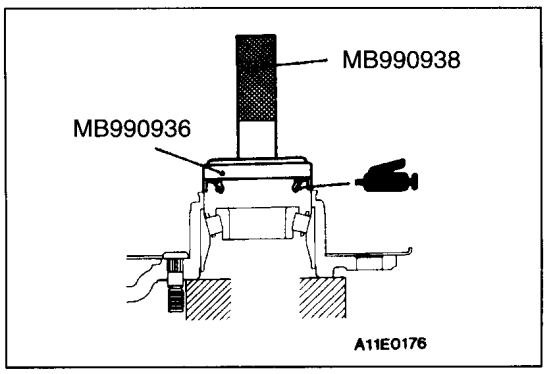
▶A◀ BEARING OUTER RACE INSTALLATION



▶B◀ INNER BEARING INNER RACE/OUTER BEARING INNER RACE INSTALLATION

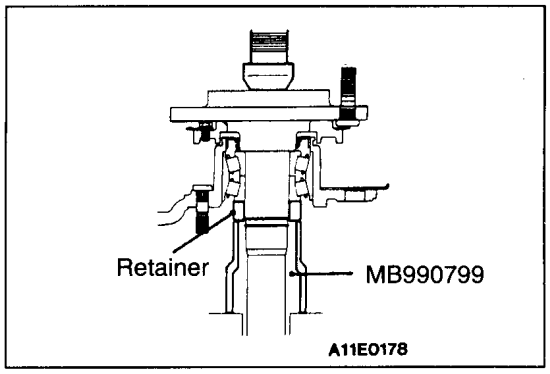
1. Apply multi-purpose grease to the roller surface and ends of the bearing.
2. Pass the axle shaft through the bearing case and the inner bearing inner race and outer bearing inner race.
3. Use the special tool to press-fit the inner bearing inner race and outer bearing inner race to the axle shaft.

Caution
Both bearing inner race, outer race sets should be press-fitted together.



▶C◀ OIL SEAL INSTALLATION

1. Apply the multipurpose grease to the external periphery of the oil seal.
2. Press-fit the oil seal into the bearing case until it is flush with the face of the bearing case by using the special tools.
3. Apply the multipurpose grease to the lips of the oil seal.

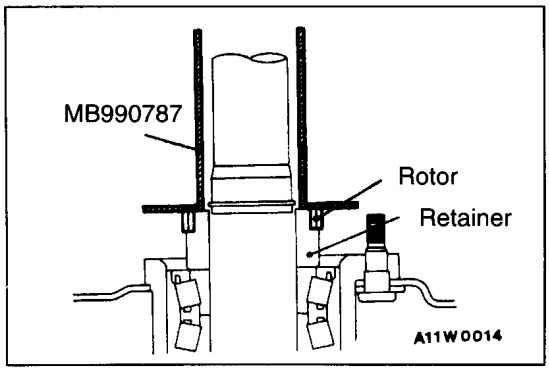


▶D◀ RETAINER INSTALLATION

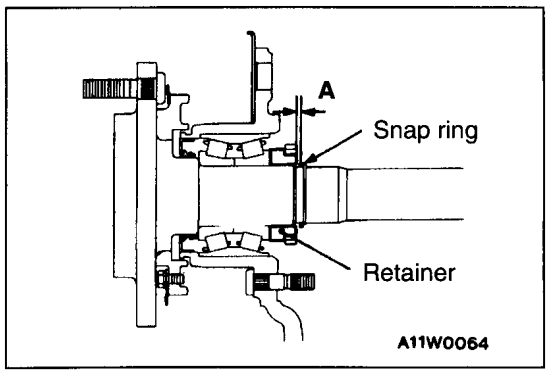
Use the special tool to press-fit the retainer to the axle shaft, while checking that the press-fitting force is at the standard value.
If the initial press-fitting force is less that the standard value, replace the axle shaft.

Standard value:

Initial press-fitting force N	49,000 or more
Final press-fitting force N	98,000–108,000



▶E◀ ROTOR INSTALLATION



▶F◀ SNAP RING INSTALLATION

1. After installing the snap ring, measure the clearance (A) between the snap ring and the retainer with a thickness gauge, and check that it is within the standard value.

   Standard value (A): 0–0.166 mm

2. If the clearance exceeds the standard value, change the snap ring so that the clearance is at the standard value.

Thickness of snap ring mm	Identification colour
2.17	–
2.01	Yellow
1.85	Blue
1.69	Purple
1.53	Red

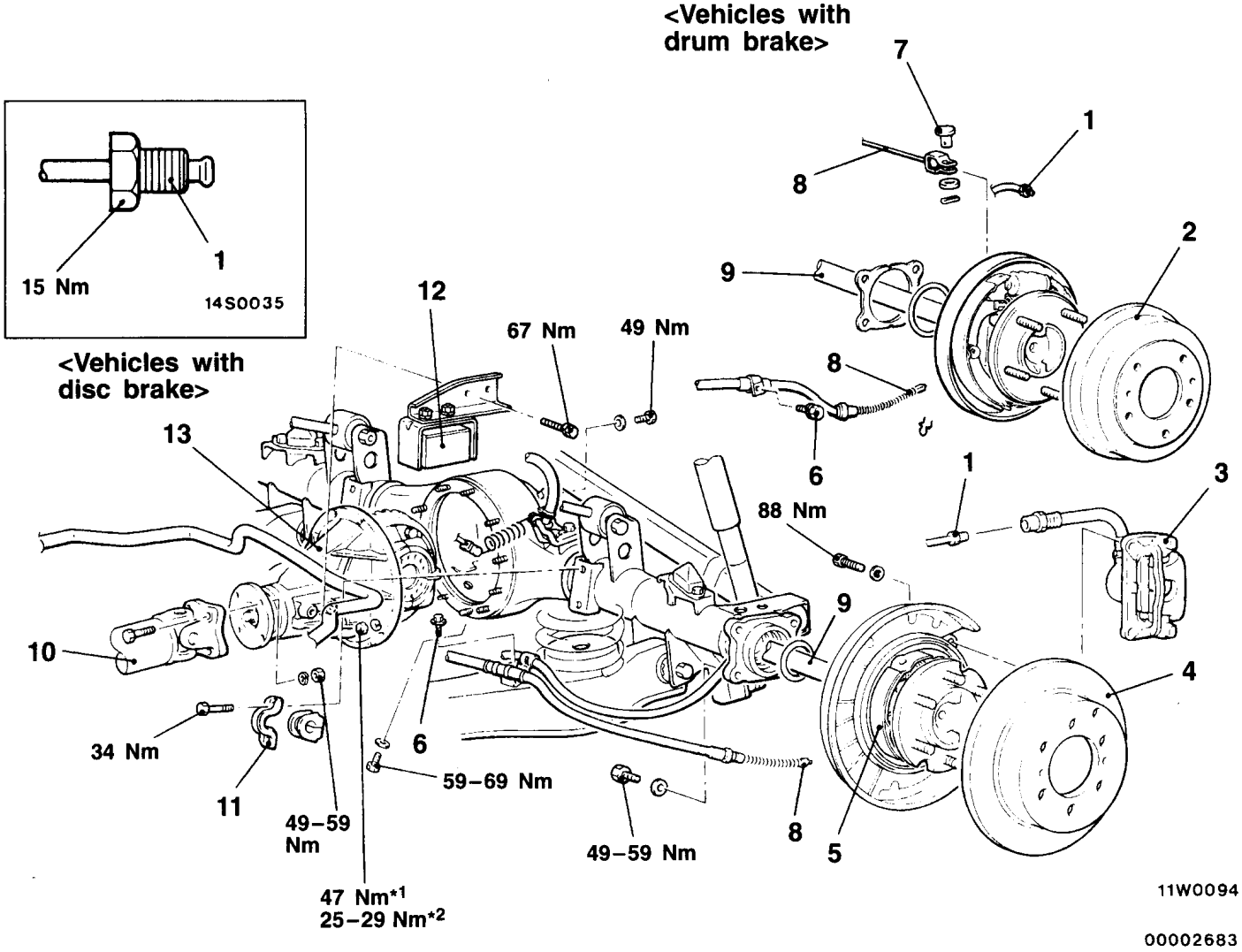
DIFFERENTIAL CARRIER

120002216

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Differential Gear Oil

Post-installation Operation
- Air Bleeding from Brake Lines (Refer to GROUP 35A – Service Adjustment Procedures.)
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36 – Service Adjustment Procedures.)
- Filling of Differential Gear Oil (Refer to P.27-11.)



Removal steps

1. Brake tube connection
2. Brake drum <Vehicles with drum brake>
3. Caliper assembly <Vehicles with disc brake>
4. Brake disc <Vehicles with disc brake>
5. Parking brake shoe assembly <Vehicles with disc brake> (Refer to GROUP 36 – Parking Brake Drum.)
6. Parking brake attaching bolt
7. Pin <4WD>
8. Parking brake cable connection

◀A▶ 9. Rear axle shaft assembly

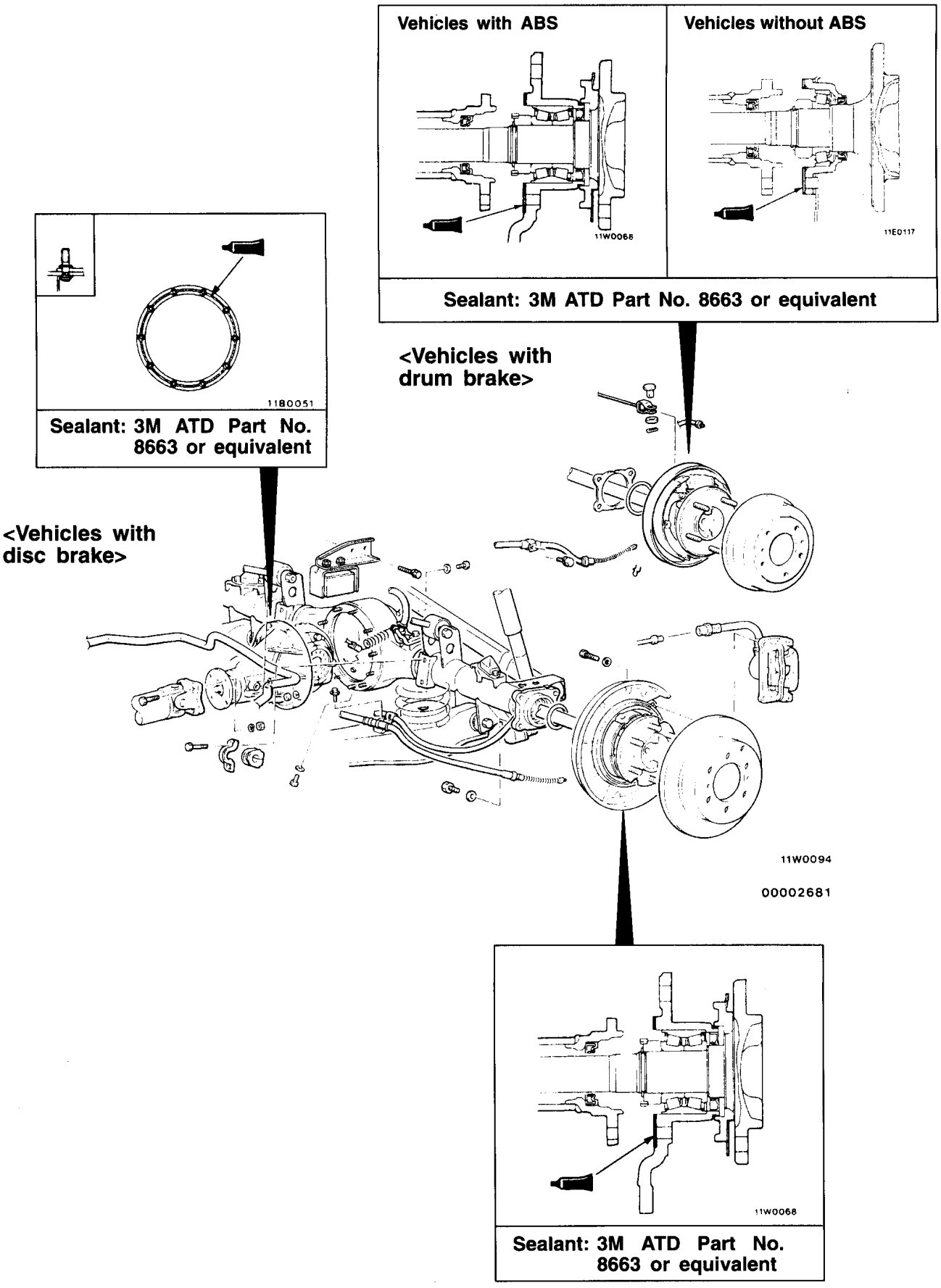
◀B▶ ▶A◀ 10. Rear propeller shaft connection

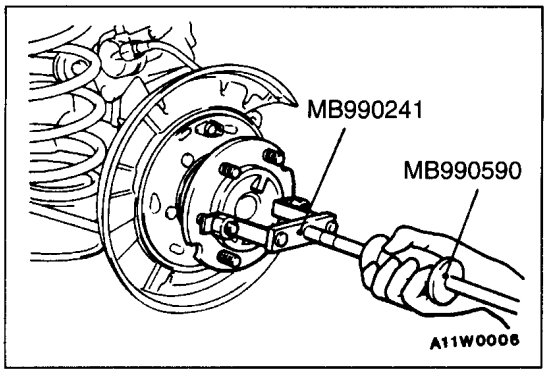
11. Clamp <Vehicles with stabilizer>
12. Dynamic dumper

◀C▶ 13. Differential carrier

NOTE
*1 4D56 Long wheelbase
*2 Except 4D56 Long wheelbase

Sealing Points



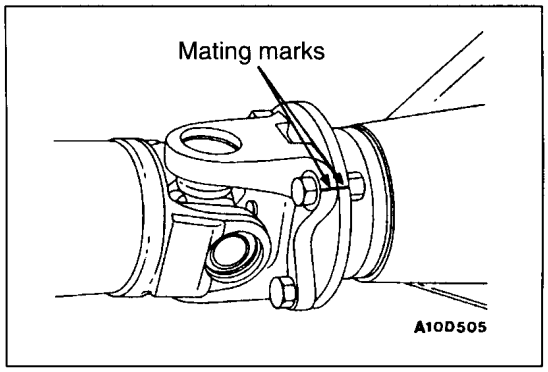


REMOVAL SERVICE POINTS

◀A▶ REAR AXLE SHAFT ASSEMBLY REMOVAL

Pull out the right and left axle shafts by about 70 mm. If it is difficult to pull out, use the special tools.

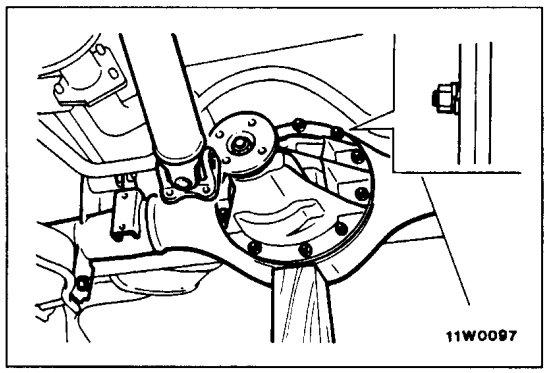
Caution
Be careful not to damage the oil seal when pulling axle shaft.



◀B▶ REAR PROPELLER SHAFT REMOVAL

Make the mating marks on the flange yoke of the rear propeller shaft and the companion flange of the differential case.

Caution
Suspend the propeller shaft from the body with wire, etc.



◀C▶ DIFFERENTIAL CARRIER REMOVAL

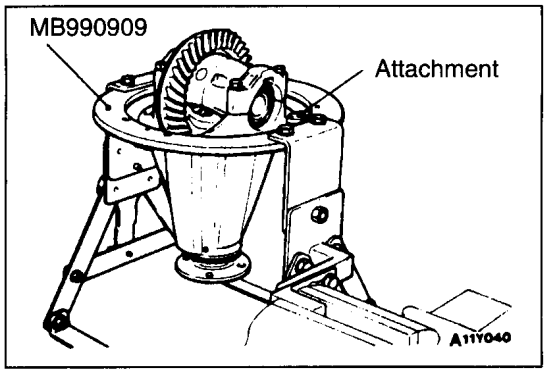
Remove the attaching nuts and strike the lower part of differential carrier assembly with a piece of timber several times to loosen, then remove the assembly.

Caution
Use care not to strike the companion flange.

INSTALLATION SERVICE POINT

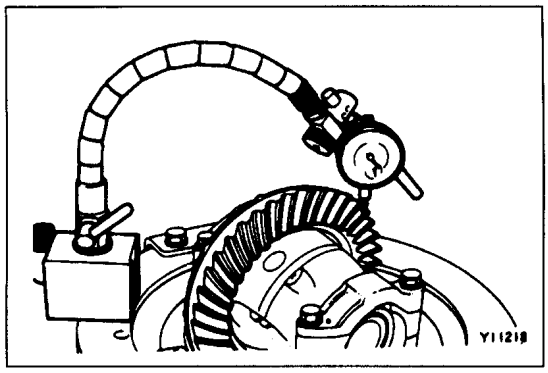
▶A◀ REAR PROPELLER SHAFT INSTALLATION

Align the mating marks on the flange yoke and the companion flange to install the propeller shaft.



INSPECTION BEFORE DISASSEMBLY 120002217

Secure the special tool with a vice and install the differential carrier assembly with the attachment. Then carry out the following inspection.



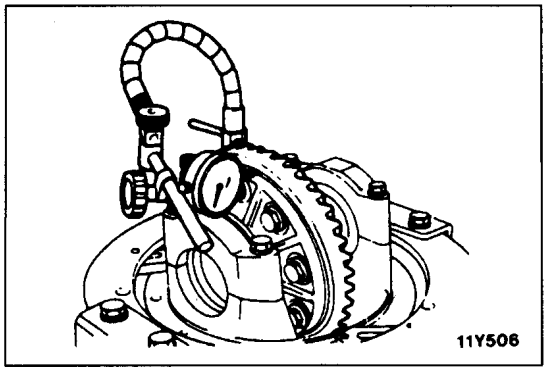
DRIVE GEAR BACKLASH

1. Place a dial gauge against the end of a drive gear tooth and secure the drive pinion. Then turn the drive gear and take measurements at four places or more to check the backlash.

   Standard value:

   0.11–0.16 4G63 Standard wheelbase
   0.08–0.13 4D56 Standard wheelbase, 4G64
   0.13–0.18 4D56 Long wheelbase

2. If the backlash is not within the standard value, replace the side bearing spacer, and then check the drive gear tooth contact.

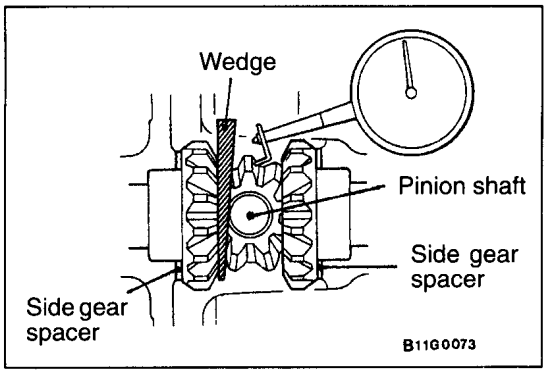


DRIVE GEAR RUNOUT

1. Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

   Limit: 0.05 mm

2. If the runout exceeds the limit value, check that there is no foreign material between the reverse side of the drive gear and the differential case, or that there is no looseness in the drive gear mounting bolt.
3. If step (2) is normal, change the assembly position of the drive gear and differential case, and then take another measurement.
4. If adjustment is impossible, replace the differential case or the drive gear and drive pinion as a set.



DIFFERENTIAL GEAR BACKLASH

1. Tap in a wooden wedge between the side gear and the pinion shaft and secure one side gear. Then place a dial gauge (with the measuring probe extended) against the pinion gear and measure the backlash.

   Standard value:

   0.01–0.076 2WD vehicles with 4G63 Standard wheelbase (without ABS)

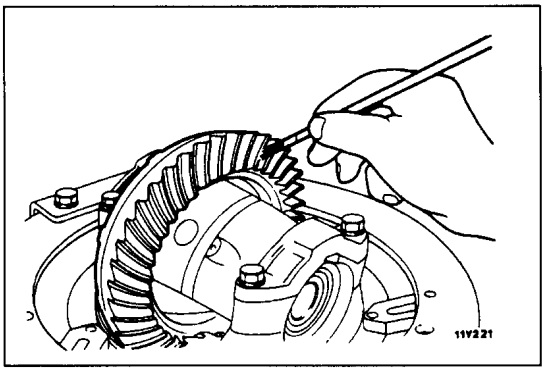
   0–0.076 2WD vehicles with 4G63 Standard wheelbase (with ABS), with 4D56 Long wheelbase

   0.01–0.25 mm 2WD 4G63 Long wheelbase, 4D56 Standard wheelbase, 4G64 or 4WD

   NOTE
   Check the other pinion gear by the same procedure.

   Limit: 0.2 mm

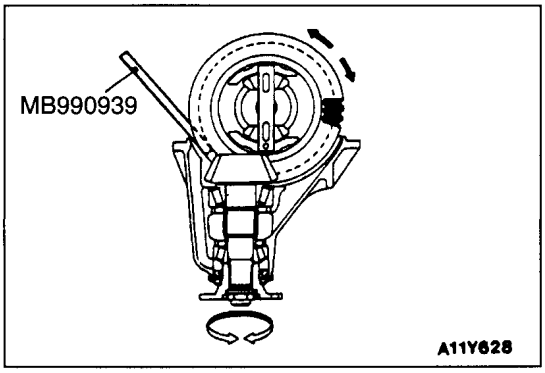
2. If the backlash exceeds the limit, replace the side gear spacers.
3. If adjustment is not possible, replace the side gears and pinion gears as a set.



DRIVE GEAR TOOTH CONTACT

Check the drive gear tooth contact by following the steps below.

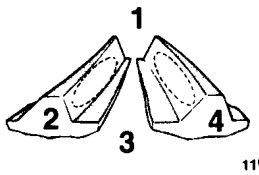
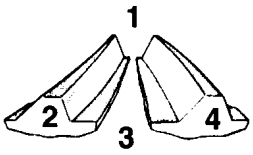
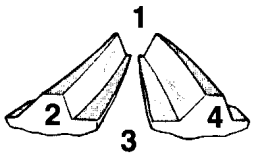
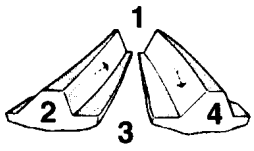
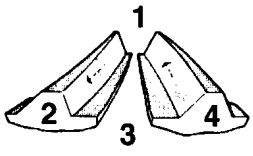
(1) Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.



(2) Insert a brass rod between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear, so that the revolution torque (approximately 2.5–3.0 Nm) is applied to the drive pinion.

Caution
If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.

(3) Check the tooth-contact condition of the drive gear and drive pinion.

<table>
<tr><th>Standard tooth contact pattern</th><th>Problem</th><th>Solution</th></tr>
<tr><td rowspan="2">1 Narrow tooth side
2 Drive-side tooth surface (the side applying power during forward movement)
3 Wide tooth side
4 Coast-side tooth surface (the side applying power during reverse movement)
 
11W0115</td><td>Tooth contact pattern resulting from excessive pinion height
 
11W0116
The drive pinion is positioned too far from the centre of the drive gear.</td><td> 
11W0118
Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the centre of the drive gear.
Also, for backlash adjustment, position the drive gear farther from the drive pinion.</td></tr>
<tr><td>Tooth contact pattern resulting from insufficient pinion height
 
11W0117
The drive pinion is positioned too close to the centre of the drive gear.</td><td> 
11W0119
Decrease the thickness of the pinion height adjusting shim, and position the drive pinion farther from the centre of the drive gear.
Also, for backlash adjustment, position the drive gear closer to the drive pinion.</td></tr>
</table>

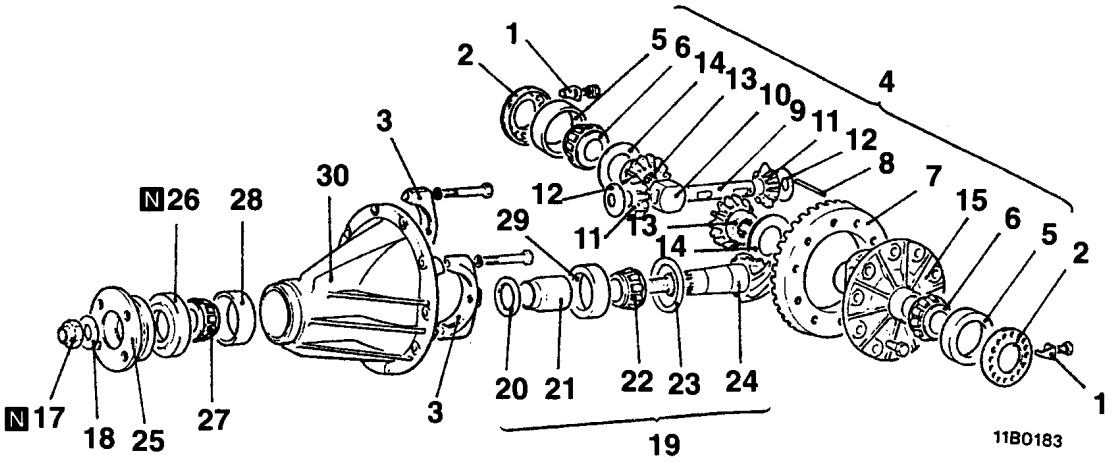
NOTE
Checking the tooth contact pattern is the way to confirm that the adjustments of the pinion height and backlash have been done properly. Continue to adjust the pinion height and backlash until the tooth contact pattern resembles the standard pattern.

If, even after adjustments have been made, the correct tooth contact pattern cannot be obtained, it means that the drive gear and the drive pinion have become worn beyond the allowable limit. Replace the gear set.

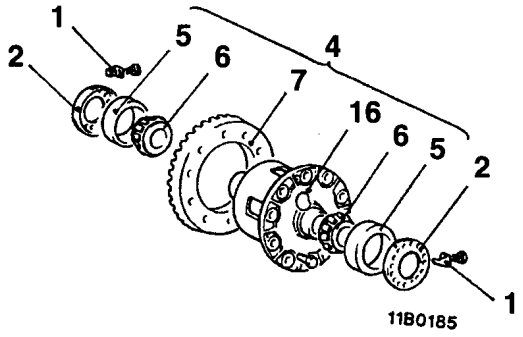
DISASSEMBLY

120002218

<Conventional differential>



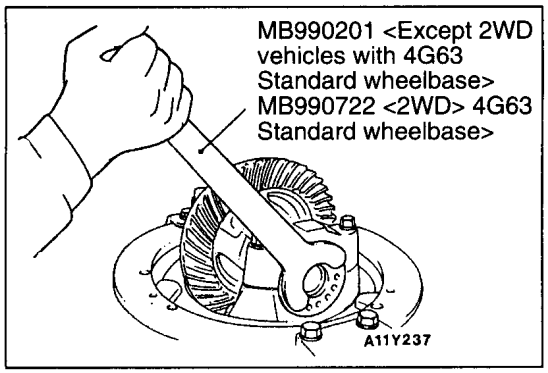
<Limited slip differential>



00000998

Disassembly steps

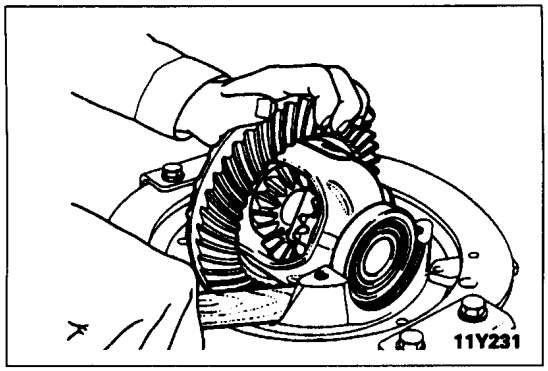
- Inspection before disassembly (P. 27-34.)
1. Lock plate
◀A▶ 2. Side bearing nut
3. Bearing cap
◀B▶ 4. Differential case assembly
5. Side bearing outer race
◀C▶ 6. Side bearing inner race
◀D▶ 7. Drive gear
◀E▶ 8. Lock pin
9. Pinion shaft
10. Thrust block
<2WD vehicles without ABS (except 4G63 standard wheelbase)>
<2WD vehicles with ABS (4G63 standard wheelbase)>
11. Pinion gear
12. Pinion washer
13. Side gear
14. Side gear thrust spacer
15. Differential case
16. Limited slip differential case assembly
◀F▶ 17. Self-locking nut
18. Washer
◀G▶ 19. Drive pinion assembly
20. Drive pinion front shim
(For adjusting preload of drive pinion)
21. Drive pinion spacer
◀H▶ 22. Drive pinion rear bearing inner race
23. Drive pinion rear shim
(For adjusting drive pinion height)
24. Drive pinion
25. Companion flange
◀I▶ 26. Oil seal
◀I▶ 27. Drive pinion front bearing inner race
◀I▶ 28. Drive pinion front bearing outer race
◀J▶ 29. Drive pinion rear bearing outer race
30. Differential carrier



DISASSEMBLY SERVICE POINTS

◀A▶ SIDE BEARING NUT REMOVAL

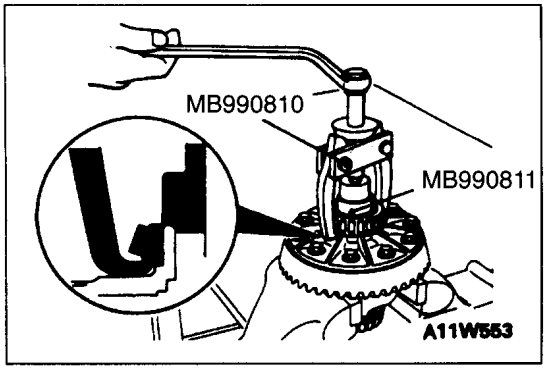
NOTE
Keep the right and left side bearings and side bearing nuts separately, so that they do not become mixed at the time of reassembly.



◀B▶ DIFFERENTIAL CASE ASSEMBLY REMOVAL

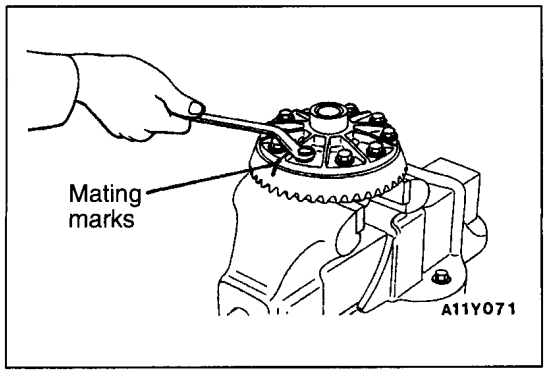
Use the handle of a hammer to remove the differential case assembly.

NOTE
Keep the right and left side bearings and side bearing nuts separately, so that they do not become mixed at the time of reassembly.



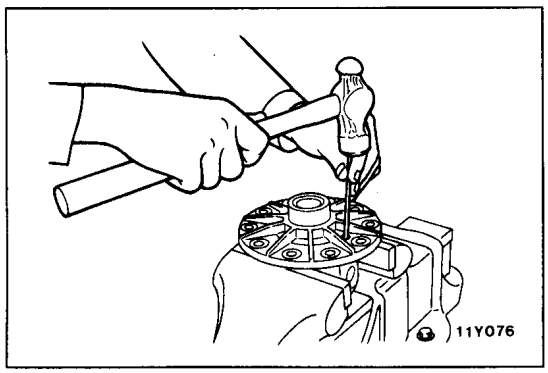
◀C▶ SIDE BEARING INNER RACE REMOVAL

NOTE
Attach the prongs of the special tool to the inner race of the side bearing through the openings in the differential case.

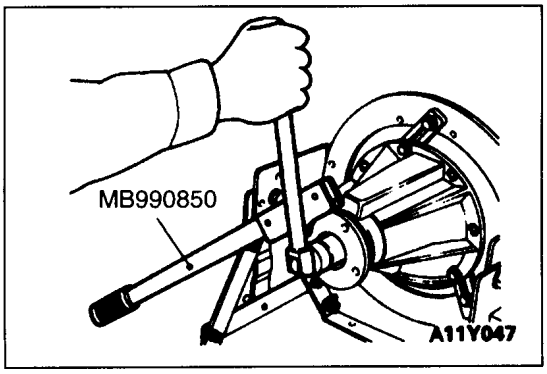


◀D▶ DRIVE GEAR REMOVAL

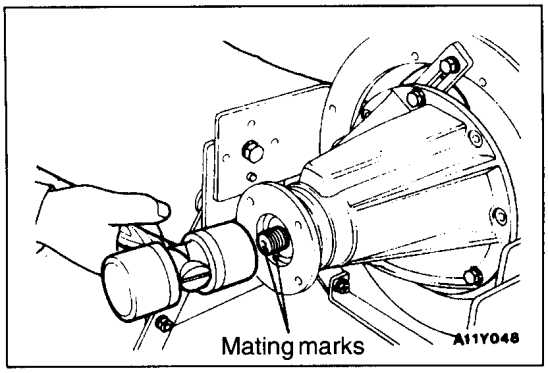
1. Make the mating marks to the differential case and the drive gear.
2. Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



◀E▶ LOCK PIN REMOVAL



◀F▶ SELF-LOCKING NUT REMOVAL

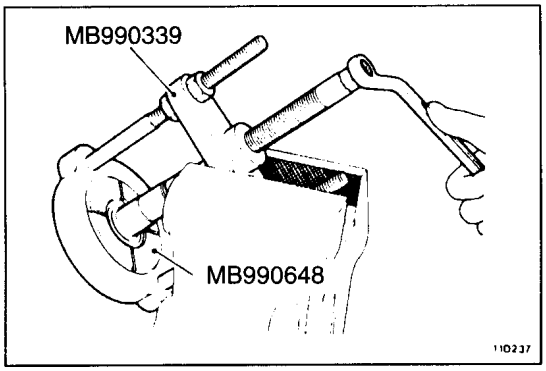


◀G▶ DRIVE PINION ASSEMBLY REMOVAL

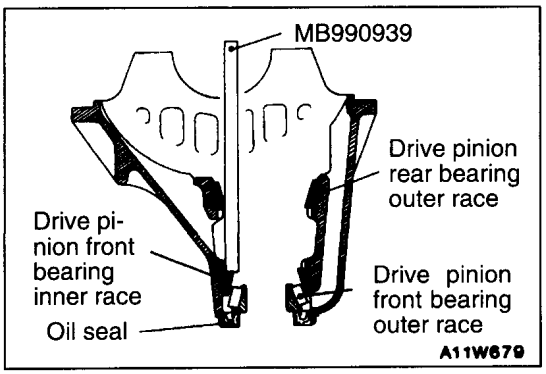
1. Make the mating marks to the drive pinion and companion flange.

   Caution
   Do not make mating marks on the contact surfaces of the companion flange and propeller shaft.

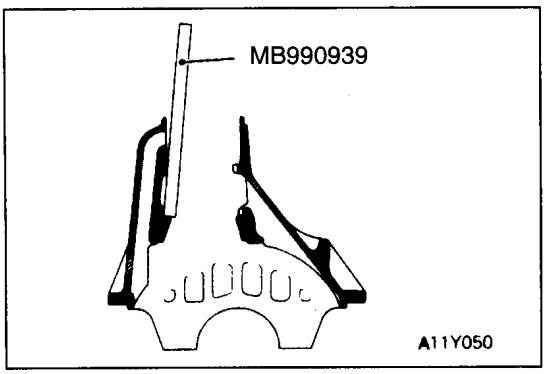
2. Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.



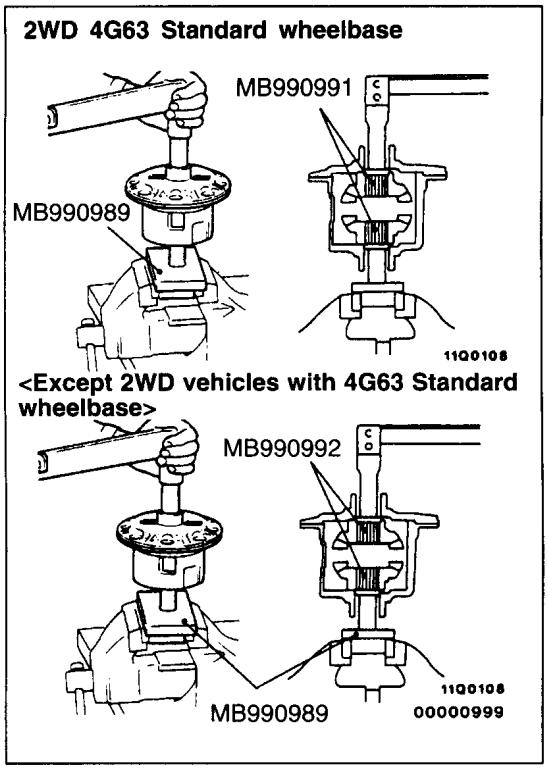
◀H▶ DRIVE PINION REAR BEARING INNER RACE REMOVAL



◀I▶ OIL SEAL/DRIVE PINION FRONT BEARING INNER RACE/DRIVE PINION FRONT BEARING OUTER RACE REMOVAL



◀J▶ DRIVE PINION REAR BEARING OUTER RACE REMOVAL



INSPECTION

DIFFERENTIAL PRELOAD INSPECTION

1. Use the special tool to measure the differential preload.

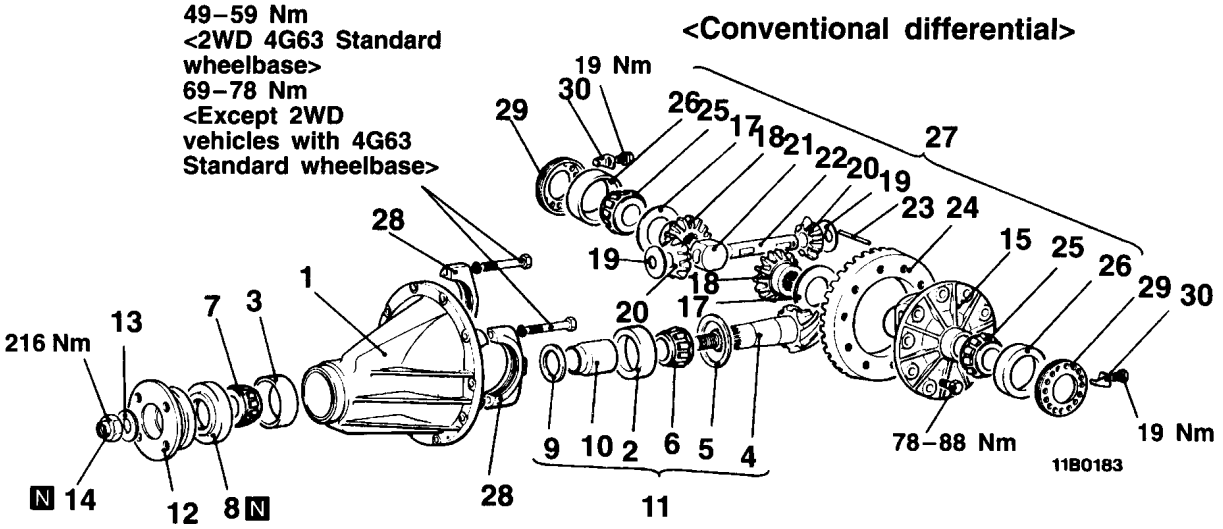
   Standard value:

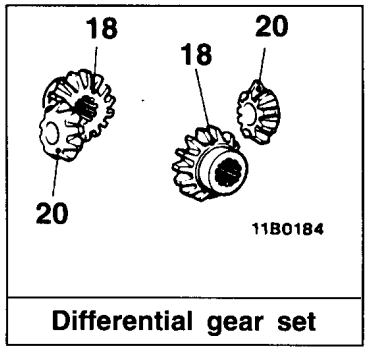
	When installing a new clutch plate Nm	When reinstalling the current clutch plate Nm
2WD 4G63 Standard wheelbase	49–78	34–78
<Except 2WD vehicles with 4G63 Standard wheelbase>	39–74	25–74

2. If the differential preload is not within the standard value, disassemble the differential case assembly and repair or replace the parts.

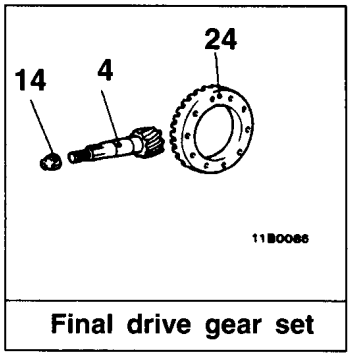
REASSEMBLY

120002219

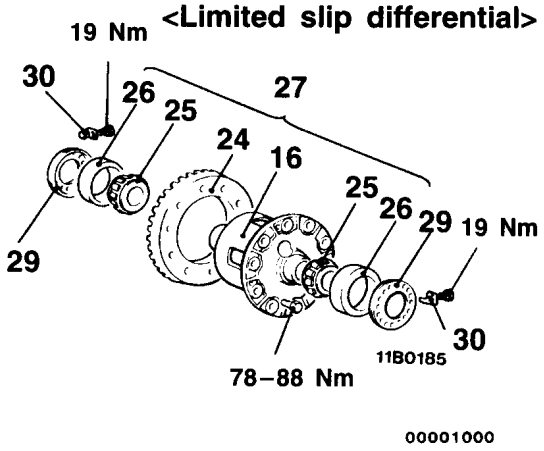




Differential gear set



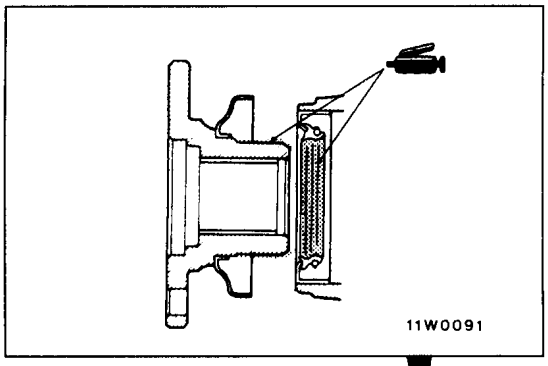
Final drive gear set



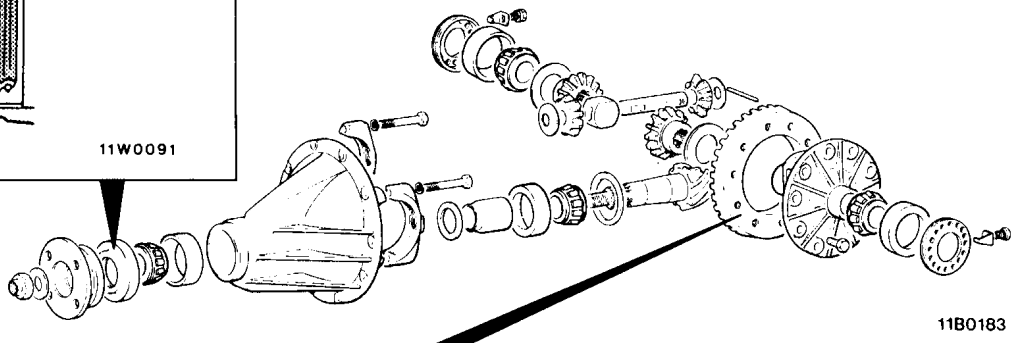
Reassembly steps

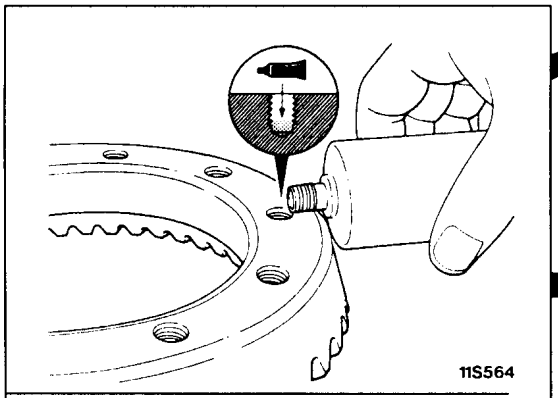
1. Differential carrier
▶A◀ 2. Drive pinion rear bearing outer race
▶B◀ 3. Drive pinion front bearing outer race
▶C◀ • Drive pinion height adjustment
4. Drive pinion
5. Drive pinion rear shim
(For adjusting drive pinion height)
6. Drive pinion rear bearing inner race
▶D◀ • Drive pinion preload adjustment
7. Drive pinion front bearing inner race
8. Oil seal
9. Drive pinion front shim
(For adjusting drive pinion preload)
10. Drive pinion spacer
11. Drive pinion assembly
12. Companion flange
13. Washer
14. Self-locking nut
15. Differential case
16. Limited slip differential case
17. Side gear thrust spacer
18. Side gear
19. Pinion washer
20. Pinion gear
▶E◀ • Differential gear backlash adjustment
21. Thrust block
<2WD vehicles without ABS (except 4G63 standard wheelbase)>
<2WD vehicles with ABS (4G63 standard wheelbase)>
22. Pinion shaft
▶F◀ 23. Lock pin
▶G◀ 24. Drive gear
▶H◀ 25. Side bearing inner race
26. Side bearing outer race
27. Differential case assembly
▶I◀ 28. Bearing cap
▶J◀ • Drive gear backlash adjustment
29. Side bearing nut
30. Lock plate

Lubrication and Adhesive Points



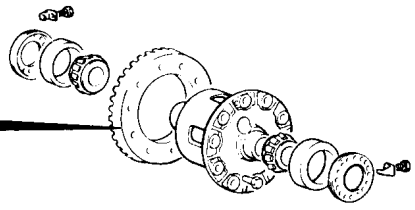
<Conventional differential>





Adhesive: 3M Stud Locking 4170 or equivalent

<Limited slip differential>



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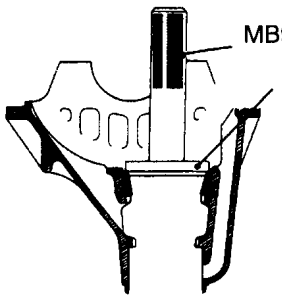
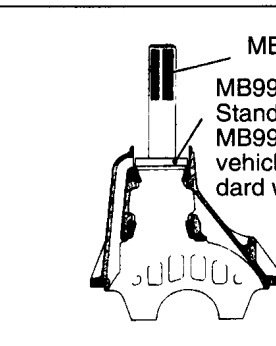


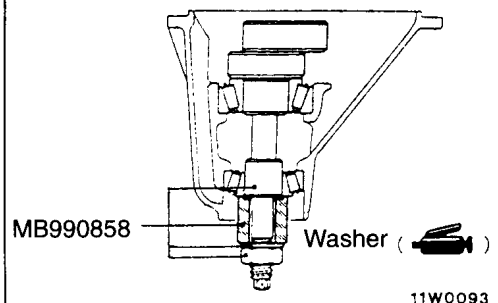
DISASSEMBLY SERVICE POINTS

▶A◀ DRIVE PINION REAR BEARING OUTER RACE PRESS-FITTING

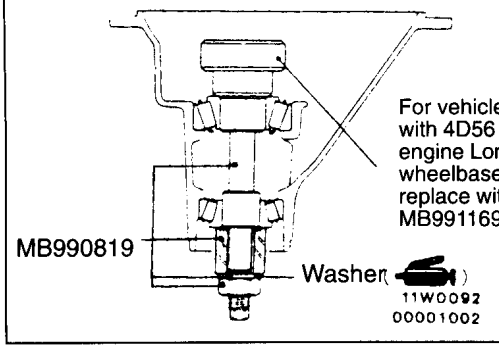


▶B◀ DRIVE PINION FRONT BEARING OUTER RACE PRESS-FITTING

<2WD 4G63 Standard wheelbase>



<Except 2WD vehicles with 4G63 engine Standard wheelbase>



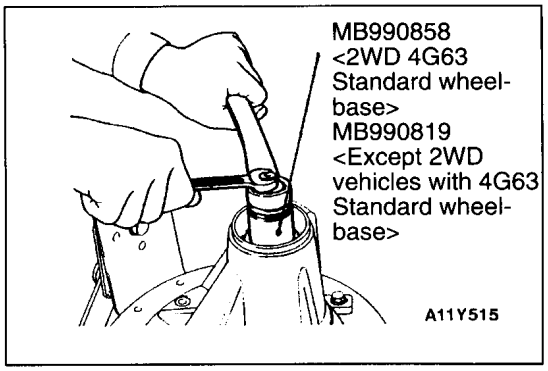
▶C◀ DRIVE PINION HEIGHT ADJUSTMENT

Adjust the drive pinion height by the following procedures:

(1) Apply multi-purpose grease to the washer of the special tool.

(2) Install special tools and drive pinion front and rear bearing inner races to the gear carrier in the sequence shown in the illustration.

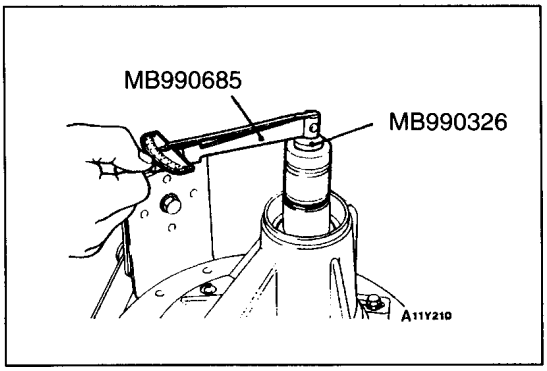
NOTE
For vehicles with 4D56 engine Long wheelbase, replace the drive pinion attachment only with MB991169.



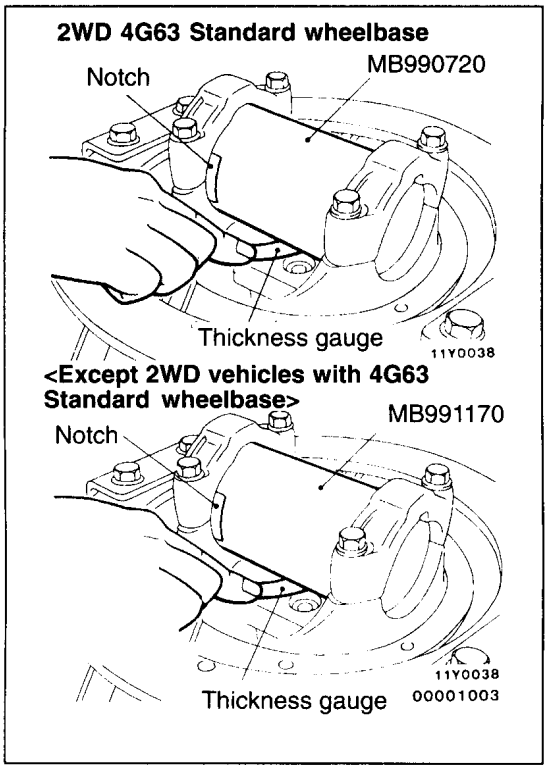
(3) Tighten the nut of the special tool step by step while measuring the rotation torque of the drive pinion. Then check the rotation torque is at the standard value.

Standard value:

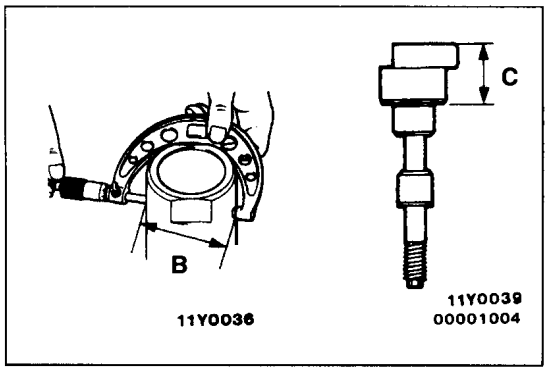
Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.6–0.9 Nm
New or reusing	Gear oil applied	0.4–0.5 Nm



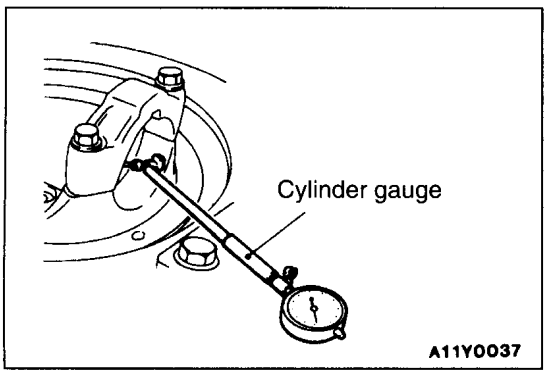
NOTE
With the differential for 2WD vehicles with 4G63 Standard wheelbase, the special tool cannot be turned a full revolution, so turn it several times within the range of movement to run in the bearing, and then measure the rotation torque.



(4) Clean the side bearing hub.
(5) Place the special tools between the side bearing hub of the gear carrier, and position the notch as shown in the illustration. Then tighten side bearing mounting bolt.
(6) Use a thickness gauge to measure the clearance (A) between the special tools.

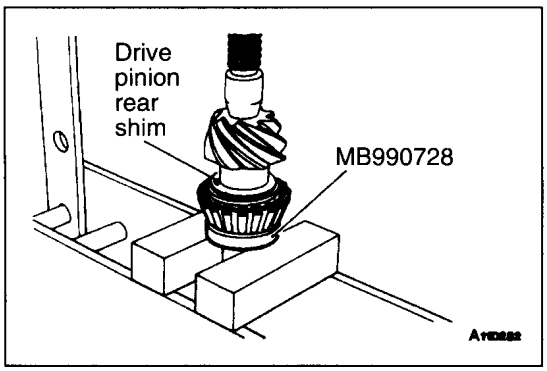


(7) Remove the special tools (MB990858, MB990819, MB991169).
(8) Use a micrometer to measure the dimensions (B, C) of the special tools.

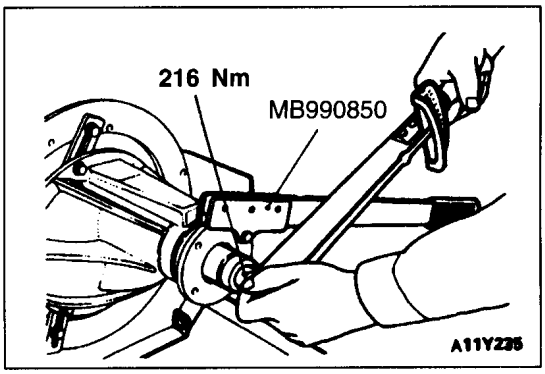


(9) Install the bearing cap, and then use a cylinder gauge to measure the inside diameter (D) of the bearing cap.
(10) Calculate the thickness (F) of the required drive pinion rear shim by the following formula, and then select a shim which most closely matches this thickness.
F=A+B+C–1/2D–E

E: 91.00 – 2WD 4G63 Standard wheelbase
100.00 – 2WD 4G63 Long wheelbase, 4D56 Standard wheelbase, 4G64 or 4WD
115.00 – 4D56 Long wheelbase



(11) Fit the selected drive pinion rear shim(s) to the drive pinion, and press-fit the drive pinion rear bearing inner race by using the special tool.

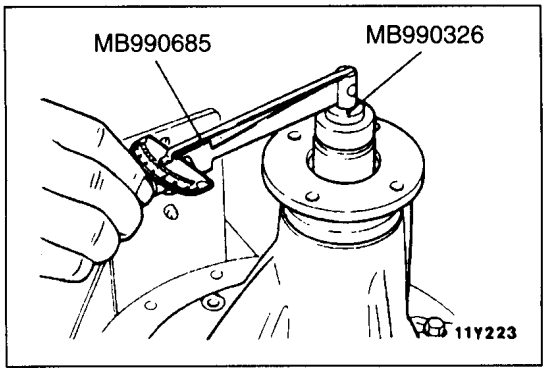


▶D◀ DRIVE PINION PRELOAD ADJUSTMENT

1. Insert the drive pinion into the gear carrier, and then install the following parts in that order from the carrier rear side. Drive pinion spacer, drive pinion front shim and drive pinion front bearing inner race, companion flange.

   NOTE
   Do not install the oil seal.

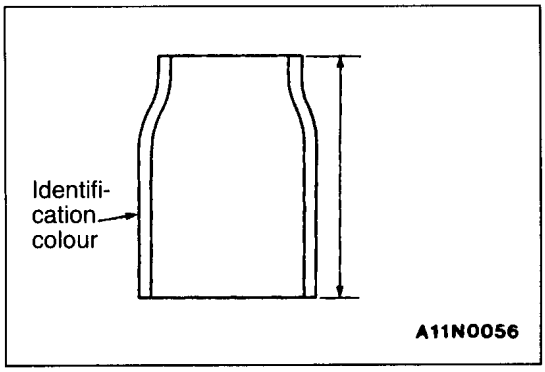
2. Tighten the companion flange to the specified torque by using the special tools.



3. Measure the drive pinion turning torque (without the oil seal).

   Standard value:

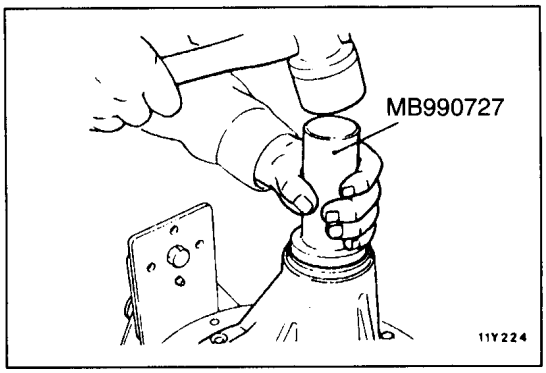
Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.6–0.9 Nm
New or reusing	Gear oil applied	0.4–0.5 Nm



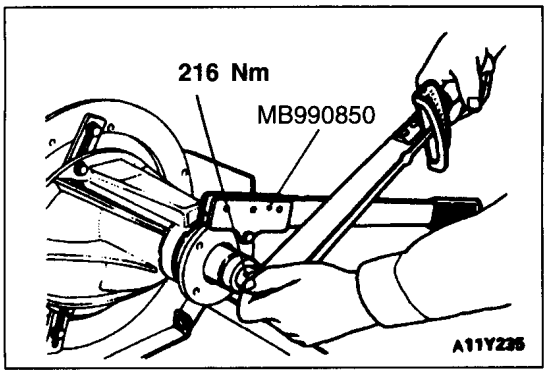
4. If the drive pinion turning torque is not within the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

   NOTE
   When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.
   Also, select the drive pinion spacer from the following two types.

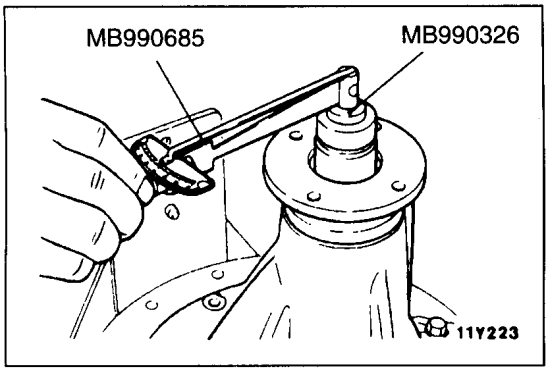
Item	Height of drive pinion spacer mm	Identification colour
2WD 4G63 Standard wheelbase	46.67	White
	47.01	–
<Except 2WD vehicles with 4G63 Standard wheelbase>	56.67	–
	57.01	White



5. Remove the companion flange and drive pinion again. Then insert the oil seal onto the drive pinion and use the special tool to press-fit the oil seal.



6. Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.

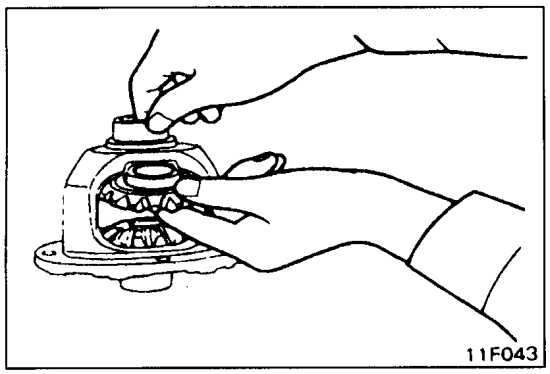


7. Measure the drive pinion turning torque (with oil seal) to verify that the drive pinion turning torque complies with the standard value.

Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.8–1.1 Nm
New or reusing	Gear oil applied	0.6–0.7 Nm

8. If the rotation torque is not within the standard value, check the tightening torque of the companion flange self-locking nut and the installation of the oil seal.



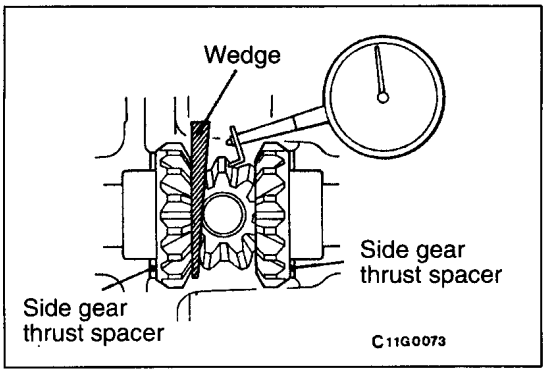
▶E◀ DIFFERENTIAL GEAR BACKLASH ADJUSTMENT

Adjust the differential gear backlash by the following procedure.

(1) Assemble the side gears, side gear thrust spacers, pinion gears, and pinion washers into the differential case.
(2) Temporarily install the pinion shaft.

NOTE
Do not assemble the thrust block and lock pin yet.

(3) Insert a wedge between the side gear and the pinion shaft to lock the side gear.
(4) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.



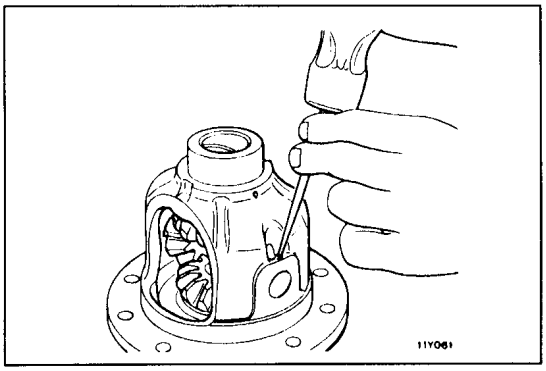
Standard value:

0.01–0.076 mm	**2WD 4G63 Standard wheelbase (without ABS)**
0–0.076 mm	**2WD 4G63 Standard wheelbase (with ABS), 4D56 Long wheelbase**
0.01–0.25 mm	**2WD 4G63 Long wheelbase, 4D56 Standard wheelbase, 4G64 or 4WD**

NOTE
Measure by the same procedure for the other pinion gear.

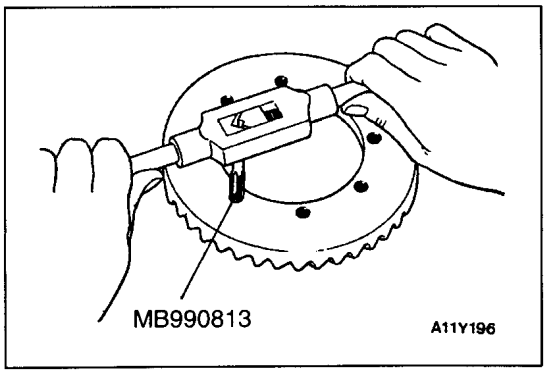
Limit: 0.2 mm

(5) If the backlash exceeds the limit value, replace side bearing adjustment spacers.
(6) If adjustment is not possible, replace the side gears and pinion gears as a set.
(7) Check that the backlash is within the limit value and that the differential gear turns smoothly.



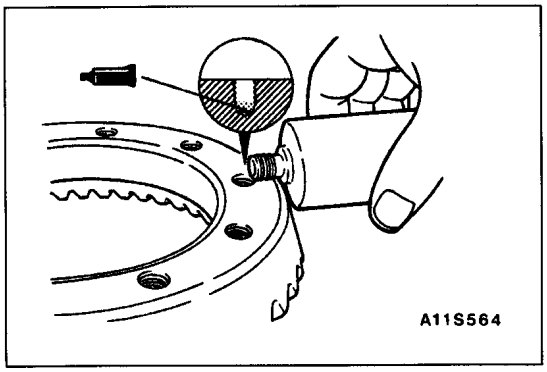
▶F◀ LOCK PIN INSTALLATION

1. Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.
2. Stake the lock pin with a punch at two points.



▶G◀ DRIVE GEAR INSTALLATION

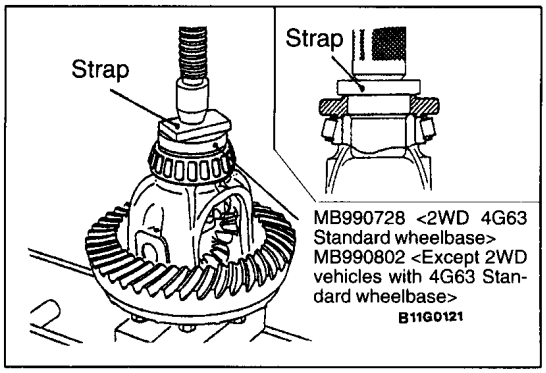
1. Clean the drive gear attaching bolts.
2. Remove the adhesive adhered to the threaded holes of the drive gear by turning the special tool (tap M10 × 1.25), and then clean the threaded holes by applying compressed air.



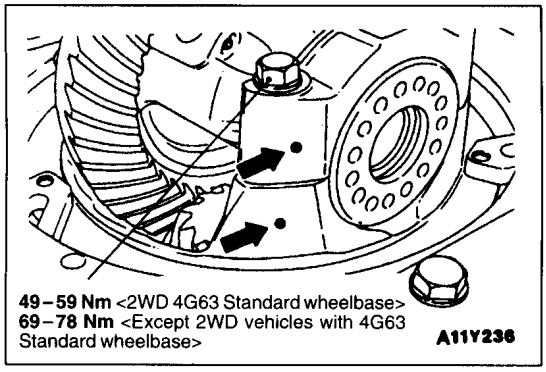
3. Apply the specified adhesive to the threaded holes of the drive gear.

   Specified adhesive: 3M Stud Locking 4170 or equivalent

4. Install the drive gear onto the differential case with the mating marks properly aligned. Tighten the bolts to the specified torque in a diagonal sequence.

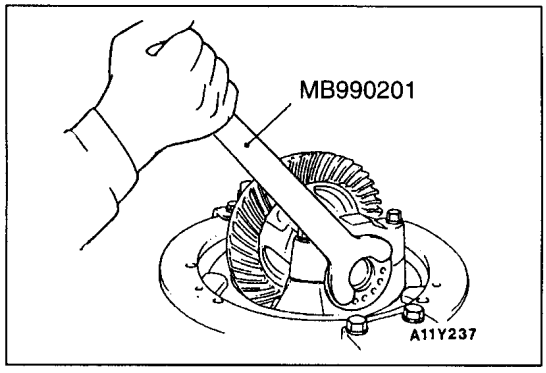


▶H◀ SIDE BEARING INNER RACE INSTALLATION



▶I◀ BEARING CAP INSTALLATION

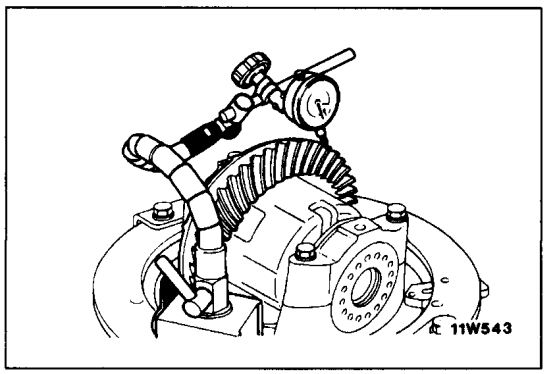
Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.



▶J◀ DRIVE GEAR BACKLASH ADJUSTMENT

Adjust drive gear backlash as follows:

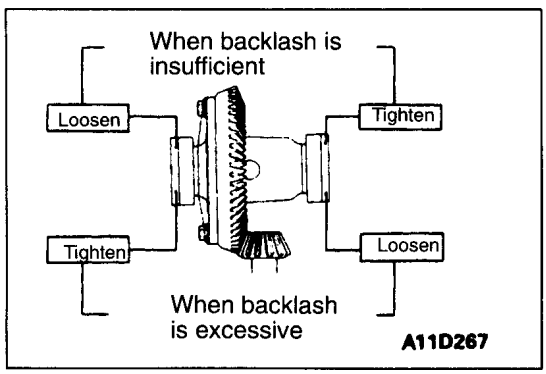
(1) Using the special tool, temporarily tighten the side bearing nut until it is in the state just before preloading of the side bearing.



(2) Measure the drive gear backlash.

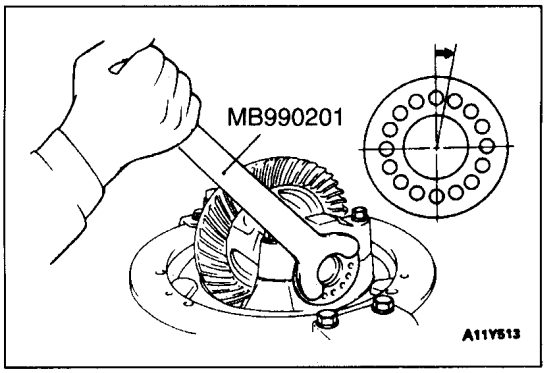
Standard value:

0.11–0.16 mm	**4G63 Standard wheelbase**
0.08–0.13 mm	**4D56 Standard wheelbase, 4G64**
0.13–0.18 mm	**4D56 Long wheelbase**

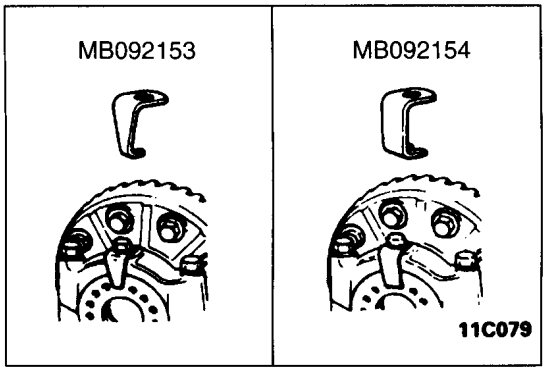


(3) Using the special tool (MB990201), adjust the backlash to standard value by moving the side bearing nut as shown.

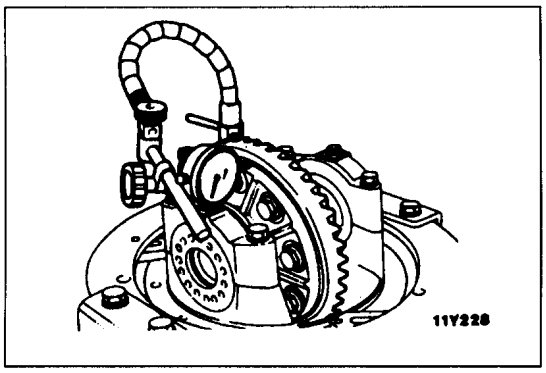
NOTE
First turn the side bearing nut for loosening, and then turn (by the same amount) the side bearing nut for tightening.



(4) Using the special tool, to apply the preload, turn down both right and left side bearing nuts on half the distance between centres of two neighbouring holes.



(5) Choose and install the lock plate (two kinds).
(6) Check the drive gear tooth contact. If poor contact is evident, make adjustment. (Refer to P. 27-35.)



(7) Measure the drive gear runout.

Limit: 0.05 mm

(8) When drive gear runout exceeds the limit, remove the differential case and then the drive gears, moving them to different positions and reinstall them.
(9) If adjustment is not possible, replace the differential case or drive gear and drive pinion as a set.

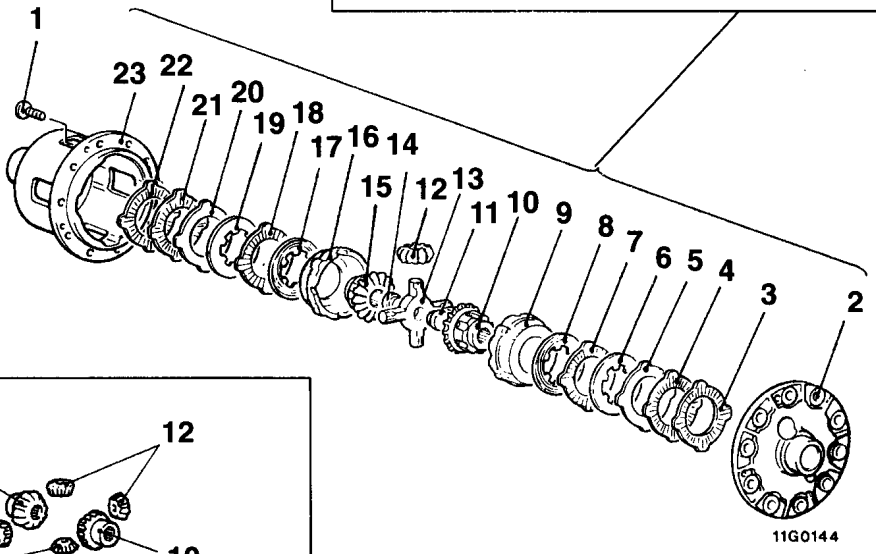
LIMITED SLIP DIFFERENTIAL CASE ASSEMBLY <2WD 4G63>

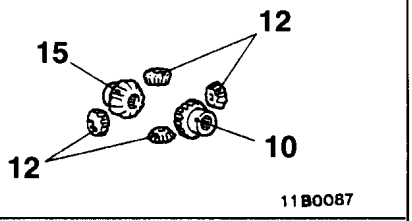
120000427

DISASSEMBLY AND REASSEMBLY

Gear oil:
MITSUBISHI Genuine Gear Oil Part No. 8149630EX, CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE 80W-90) or equivalent

Caution
Apply the specified gear oil to each component especially careful to coat contact surfaces and sliding surfaces.



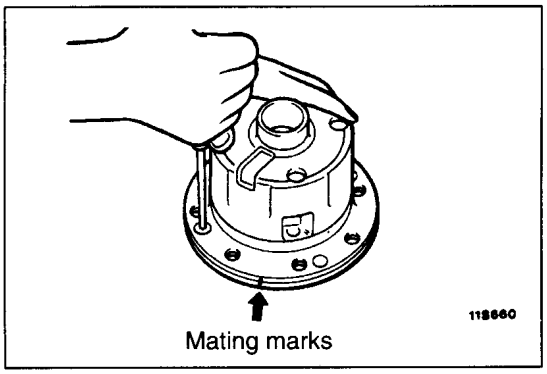


Differential gear set

00001005

Disassembly steps

▶C◀ • Differential preload of limited slip differential
◀A▶ ▶B◀ 1. Screw
2. Differential case (A)
3. Friction plate
4. Friction plate
5. Spring plate
6. Spring disc
7. Friction plate
8. Friction disc
9. Pressure ring
10. Side gear
11. Thrust block
12. Differential pinion gear
13. Differential pinion shaft
14. Thrust block
15. Side gear
16. Pressure ring
17. Friction disc
18. Friction plate
19. Spring disc
20. Spring plate
21. Friction plate
22. Friction plate
▶A◀ 23. Differential case (B)

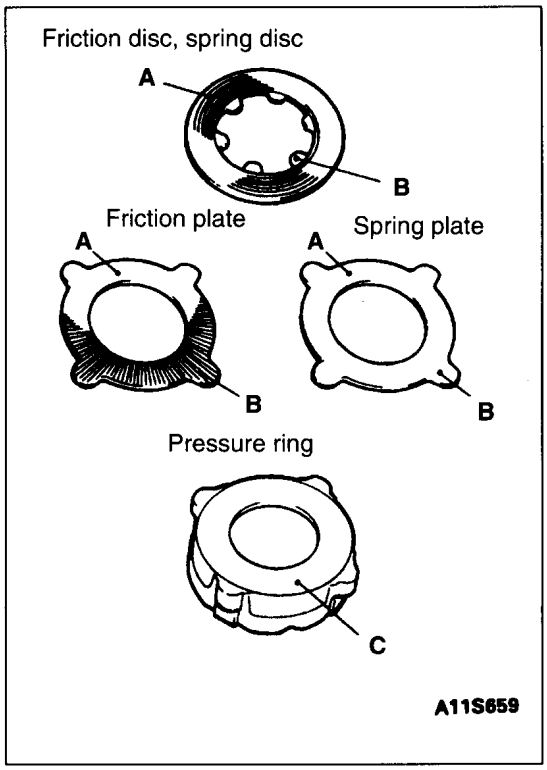


DISASSEMBLY SERVICE POINT

◀A▶ SCREW REMOVAL

1. Check the mating marks.

   NOTE
   The mating marks are represented by one of the following methods.
   (1) Engraving by a punch or electric pen
   (2) Identical arabic numerals
2. Loosen the mounting screws for differential case (A) and (B) evenly, step by step.
3. Separate differential case (B) and differential case (A), and take out the parts inside. Do not confuse the left and right spring plates, spring discs, friction plates and friction discs for further reassembly.



INSPECTION

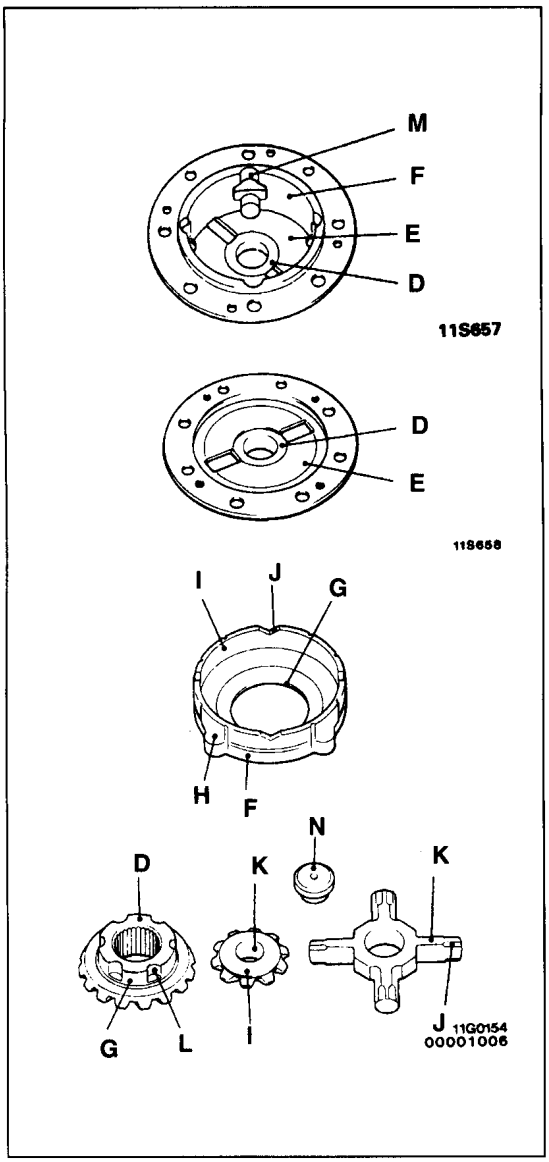
DIFFERENTIAL CASE COMPONENT CONTACT SLIDING SURFACE INSPECTION

1. Clean the disassembled parts with cleaning oil and dry them with compressed air.
2. Check the following items for each plate and disc and for the pressure ring.
   A. The friction surfaces of the friction plate, friction disc, spring plate.
      If there are any signs of seizure, severe friction, or colour change from the heat, it will adversely affect the locking performance; replace the part with a new one.

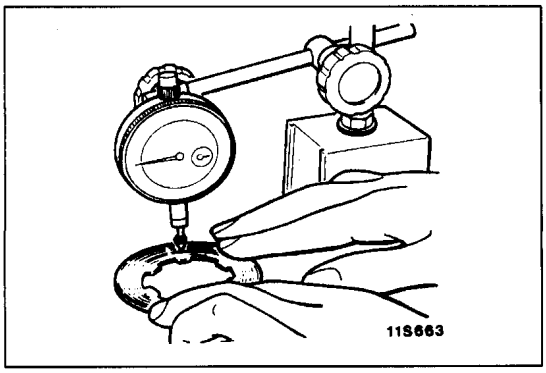
      NOTE
      The strong contact on the inner circumference of the friction surfaces is because of the spring plate; this wear is not abnormal.

   B. Inside and outside projections of friction disc, friction plate and spring plate.
      Replace any cracked or damaged parts.
   C. The friction surface of the friction disc and pressure ring. If there are nicks or scratches, repair the part by first grinding with an oil stone and then polishing with rubbing compound on a surface plate.

      NOTE
      The strong contact on the inner circumference of the friction surface is because of the spring plate; this wear is not abnormal.



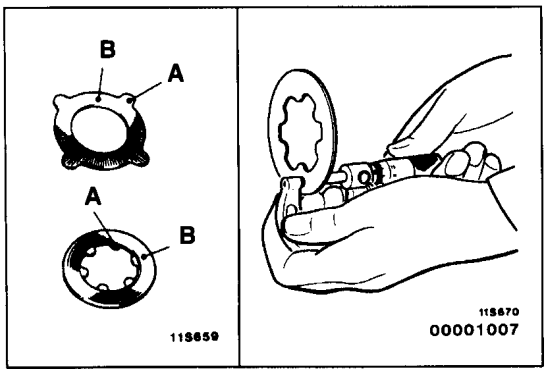
3. Inspect the contact and sliding surfaces listed below, and repair any nicks and burrs by using an oil stone.
   D. The sliding surfaces between the side gears and the case
   E. The spring contacting surface of the differential case and spring plate.
   F. The contact surfaces of the outer circumference of the pressure ring and the inner circumference of the differential case.
   G. The sliding surfaces of the hole in the pressure ring and the outer circumference of the side gear.
   H. The projection on the outer circumference of the pressure ring.
   I. The spherical surface of the differential pinion gear and the inner diameter of the pressure ring.
   J. The V-shaped groove in the pressure ring, and the V-shaped part in the pinion shaft.
   K. The outer diameter of the pinion shaft and the hole of the differential pinion gear.
   L. The outer circumference groove of the side gear.
   M. The inner circumference groove of the differential case.
   N. The sliding surface of the thrust block.



WARPING OF THE FRICTION PLATE AND FRICTION DISC

Using a dial indicator, measure the amount of warping (the flatness) of the friction plate and the friction disc on a surface plate by turning the friction plate or disc.

Limit: Max. 0.08 mm



WEAR OF THE FRICTION PLATE SPRING DISC AND FRICTION DISC

1. Measure the thickness of the friction surfaces (B) and projections (A) of the friction disc, spring disc and plate in several places. Then check that the differences between A and B are within the limit.

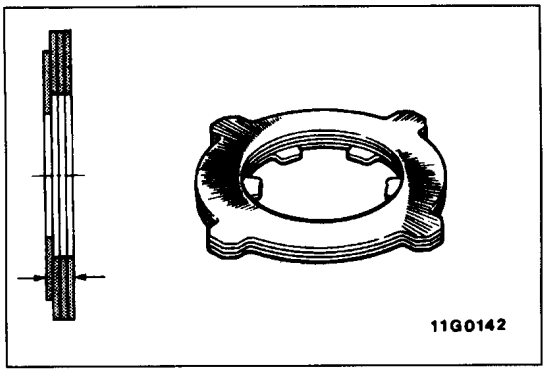
   Limit: 0.1 mm

2. If the parts are worn beyond the allowable limit, replace them with new parts.

REASSEMBLY SERVICE POINTS

▶A◀ DIFFERENTIAL CASE (B) INSTALLATION

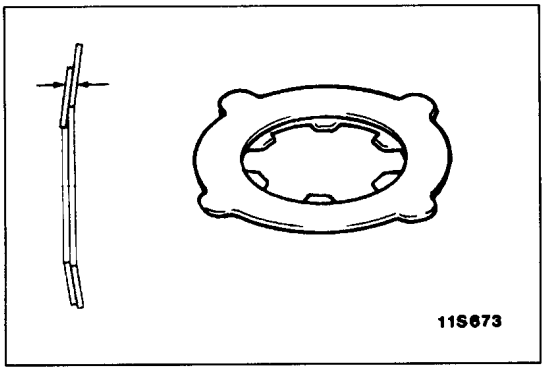
Before assembly, use the following method to adjust the clearance between the spring plates and differential cases (for adjustment of the clutch plate friction force), and to adjust the end play of the side gear when installing the internal components into the differential case.



(1) Arrange the friction discs and friction plates for each side, one on top of another, as shown in the figure, combining them so that the difference in thickness between the left and the right is the standard value.

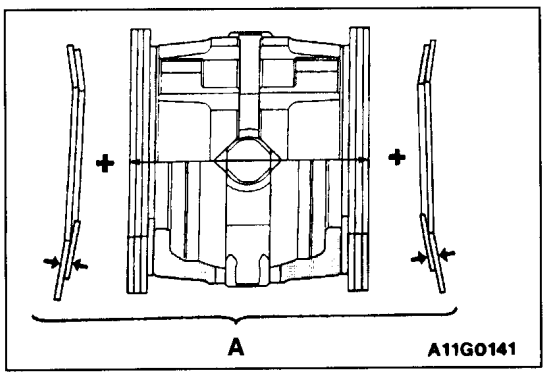
Standard value: 0–0.05 mm

NOTE
Two types of replacement parts are available:
Friction disc (with thicknesses of 1.6 mm and 1.7 mm)
Friction plate (with thicknesses of 1.7 mm and 1.8 mm)

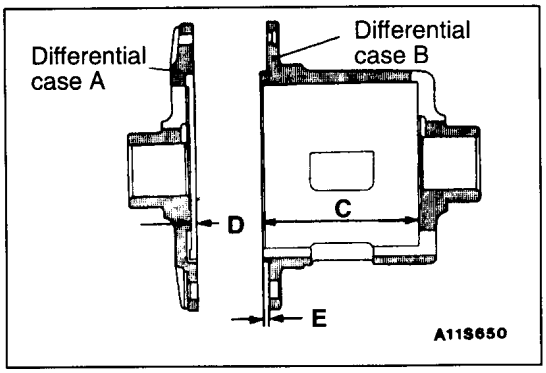


(2) Place the spring plate and spring disc together as shown in the illustration, and use a micrometer to measure the thickness. Place the parts together in the combination that gives the least difference in thickness between the two sets.

NOTE
Replacement parts of the spring plate and spring disc are 1.7 mm.

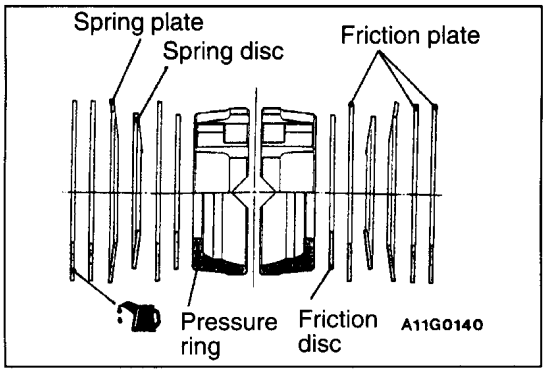


(3) Assemble the pressure ring's internal components (differential pinion shaft and pressure ring) and the friction discs and friction plates, and then as shown in the figure, measure the overall width.
(4) Calculate the total value (A) of the thickness of the spring disc and spring plate plus the value measured in (3) above.



(5) Obtain the dimension (B) between the spring plate contact surfaces when differential cases (A) and (B) are combined. (B = C + D – E)
(6) Change the thickness of the friction disc so that the clearance (B – A) between the differential case and the friction plate becomes the standard value.

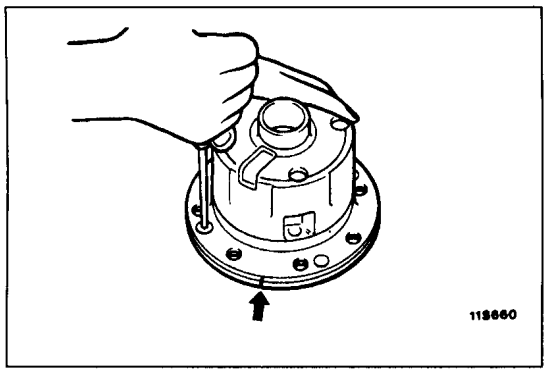
Standard value: 0.05–0.20 mm



(7) Apply specified gear oil to each part, and then insert each part into differential case (B) in the order shown in the illustration.

Gear oil:
MITSUBISHI Genuine Gear Oil Part No. 8149630 EX, CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE80W-90) or equivalent

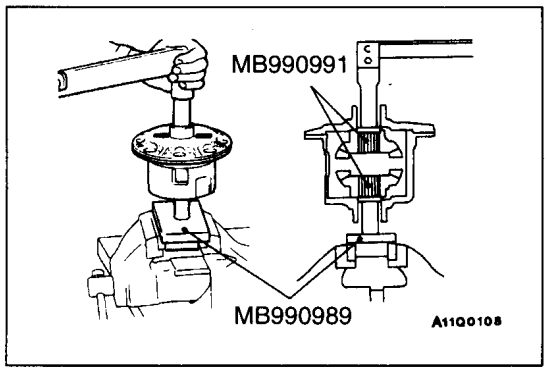
NOTE
Be particularly sure to apply oil to the contact surfaces and sliding surfaces.



▶B◀ SCREW INSTALLATION

1. Align the mating marks (the same numeral on each case) of differential case (A) and differential case (B).
2. Turning the screwdriver slowly several times, tighten the screw so that the cases are in close contact.

NOTE
If, even though the screw is tightened, the end surfaces of case (A) and case (B) do not come into close contact, probably the friction plate are not fit correctly into the groove, so make the assembly again.



▶C◀ DIFFERENTIAL PRELOAD INSPECTION FOR LIMITED SLIP DIFFERENTIAL

1. After assembly, in order to check the frictional force of the clutch plate, use the special tools to measure the starting torque.

Standard value:
When a new clutch plate is used
49–78 Nm
When the current clutch plate is reused
34–78 Nm

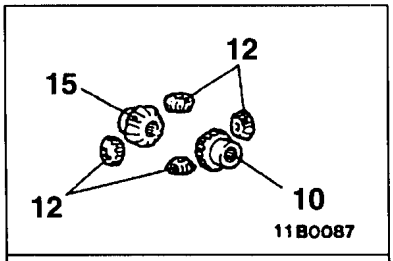
NOTE
Measure the starting torque after rotating slightly. When measuring the torque, do so at the beginning of movement.

2. If the starting torque is not within the standard value, disassemble the differential case assembly and repair or replace the parts.

LIMITED SLIP DIFFERENTIAL CASE ASSEMBLY <Except 2WD Vehicles with 4G63 Engine>

120002220

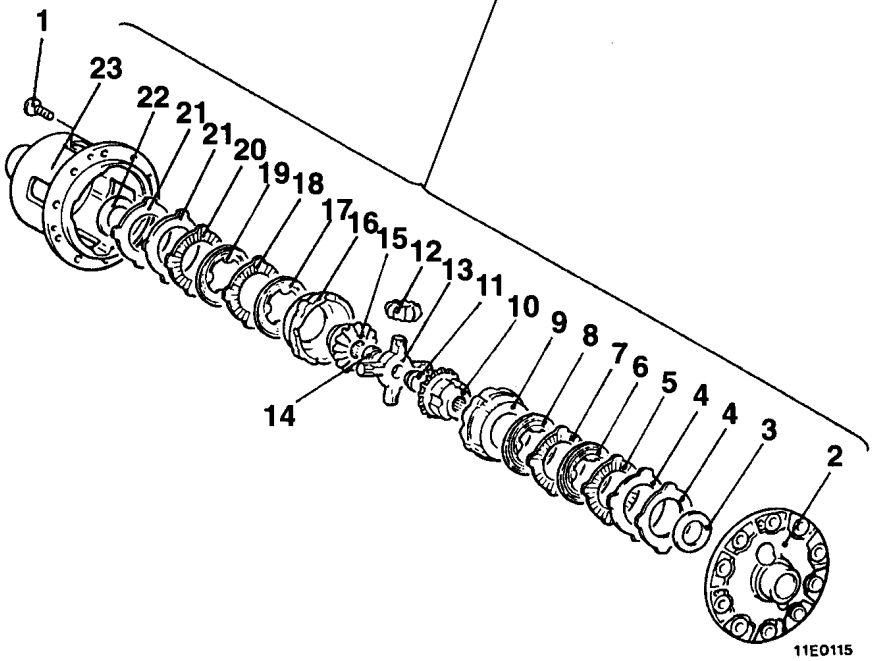
DISASSEMBLY AND REASSEMBLY



Differential gear set

Gear oil:
MITSUBISHI Genuine Gear Oil Part No. 8149630EX, CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE 80W-90) or equivalent

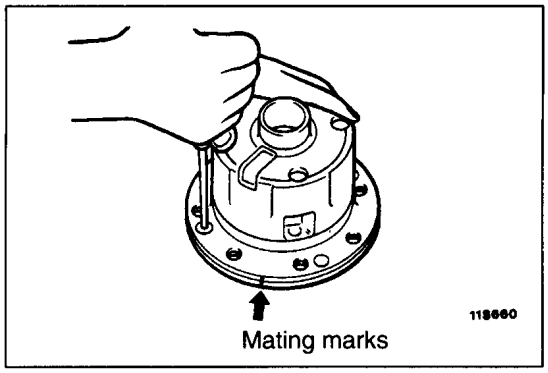
Caution
Apply the specified gear oil to each component especially careful to coat contact surfaces and sliding surfaces.



00001008

Disassembly steps

▶C◀ • Differential preload of limited slip differential
◀A▶ ▶B◀ 1. Screw
2. Differential case (A)
3. Thrust washer
4. Spring plate
5. Friction plate
6. Friction disc
7. Friction plate
8. Friction disc
9. Pressure ring
10. Side gear
11. Thrust block
12. Differential pinion gear
13. Differential pinion shaft
14. Thrust block
15. Side gear
16. Pressure ring
17. Friction disc
18. Friction plate
19. Friction disc
20. Friction plate
21. Spring plate
22. Thrust washer
▶A◀ 23. Differential case (B)

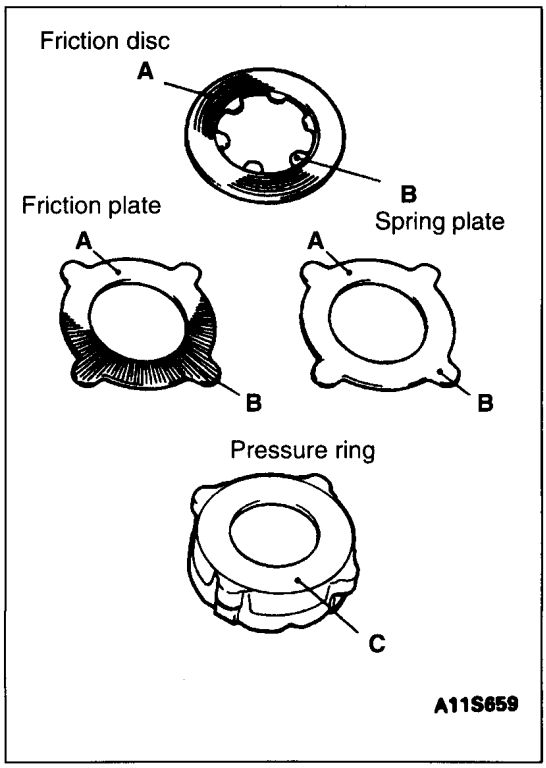


DISASSEMBLY SERVICE POINT

◀A▶ SCREW REMOVAL

1. Check the mating marks.

   NOTE
   The mating marks are represented by one of the following methods.
   (1) Engraving by a punch or electric pen.
   (2) Identical arabic numerals.
2. Loosen the mounting screws for differential case (A) and (B) evenly, step by step.
3. Separate differential case (B) and differential case (A), and take out the parts inside. Do not confuse the left and right spring plates, spring discs, friction plates and friction discs for further reassembly.



INSPECTION

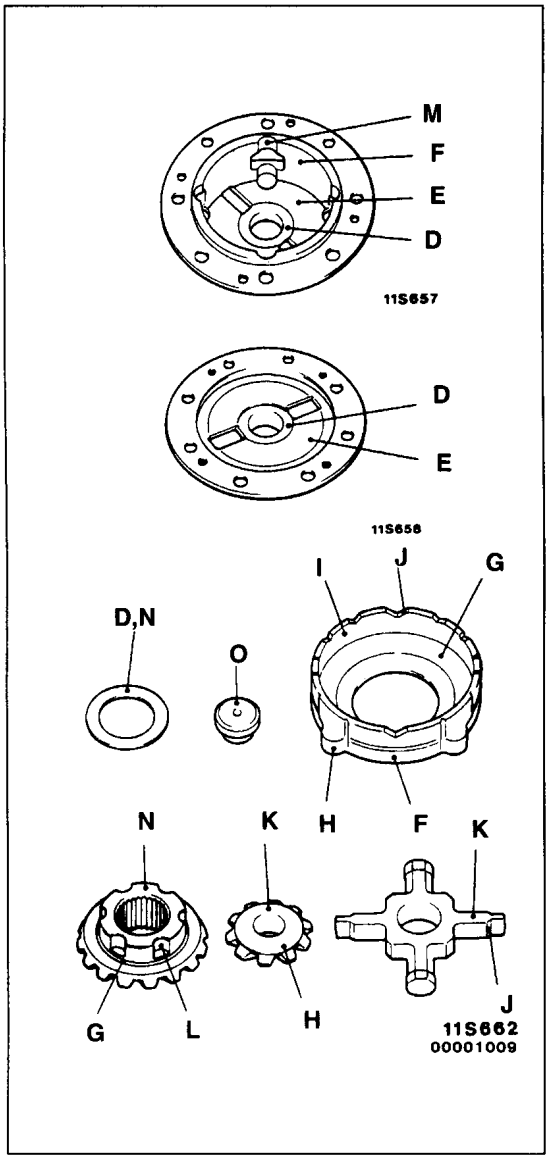
DIFFERENTIAL CASE COMPONENT CONTACT SLIDING SURFACE INSPECTION

1. Clean the disassembled parts with cleaning oil and dry them with compressed air.
2. Check the following items for each plate and disc and for the pressure ring.
   A. The friction surfaces of the friction plate, friction disc, spring plate.
      If there are any signs of seizure, severe friction, or colour change from the heat, it will adversely affect the locking performance; replace the part with a new one.

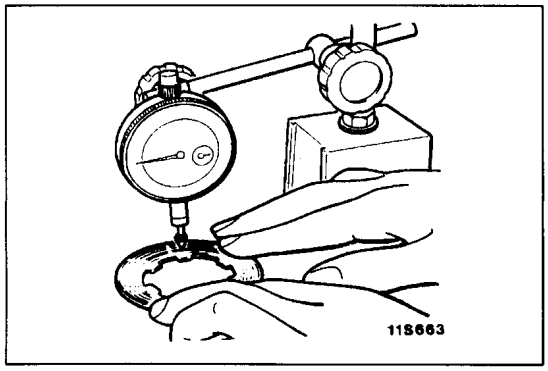
      NOTE
      The strong contact on the inner circumference of the friction surfaces is because of the spring plate; this wear is not abnormal.

   B. Inside and outside projections of friction disc, friction plate and spring plate.
      Replace any cracked or damaged parts.
   C. The friction surface of the friction disc and pressure ring. If there are nicks or scratches, repair the part by first grinding with an oil stone and then polishing with rubbing compound on a surface plate.

      NOTE
      The strong contact on the inner circumference of the friction surface is because of the spring plate; this wear is not abnormal.



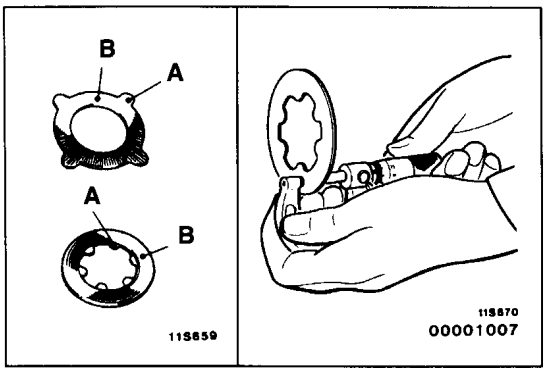
3. Inspect the contact and sliding surfaces listed below, and repair any nicks and burrs by using an oil stone.
   D. The sliding surfaces of the thrust washer and the case.
   E. The spring contacting surface of the differential case and spring plate.
   F. The contact surfaces of the outer circumference of the pressure ring and the inner circumference of the differential case.
   G. The sliding surfaces of the hole in the pressure ring and the outer circumference of the side gear.
   H. The projection on the outer circumference of the pressure ring.
   I. The spherical surface of the differential pinion gear and the inner diameter of the pressure ring.
   J. The V-shaped groove in the pressure ring, and the V-shaped part in the pinion shaft.
   K. The outer diameter of the pinion shaft and the hole of the differential pinion gear.
   L. The outer circumference groove of the side gear.
   M. The inner circumference groove of the differential case.
   N. The sliding surface of the thrust block.
   O. The sliding part of the thrust block.



WARPING OF THE FRICTION PLATE AND FRICTION DISC

Using a dial indicator, measure the amount of warping (the flatness) of the friction plate and the friction disc on a surface plate by turning the friction plate or disc.

Limit: Max. 0.08 mm



WEAR OF THE FRICTION PLATE SPRING PLATE AND FRICTION DISC

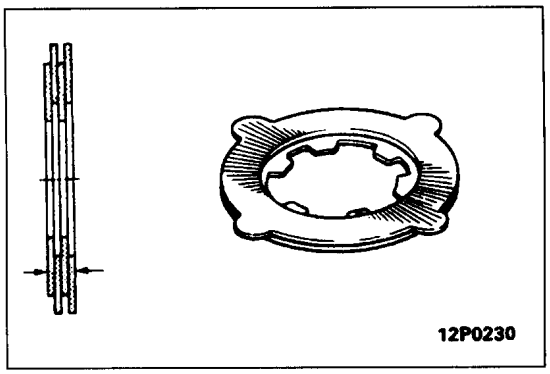
1. Measure the thickness of the friction surfaces (B) and projections (A) of the friction disc, spring disc and plate in several places. Then check that the differences between A and B are within the limit.

   Limit: 0.1 mm
2. If the parts are worn beyond the allowable limit, replace them with new parts.

REASSEMBLY SERVICE POINTS

▶A◀ DIFFERENTIAL CASE (B) INSTALLATION

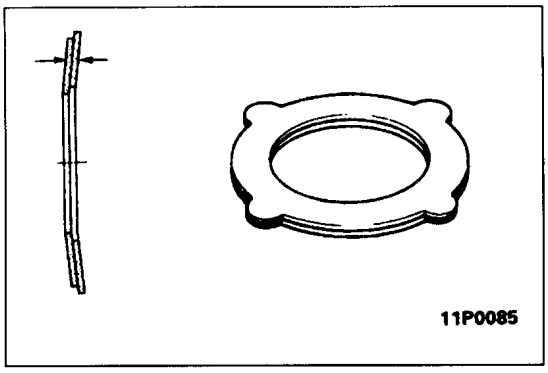
Before assembly, use the following method to adjust the clearance between the spring plates and differential cases (for adjustment of the clutch plate friction force), and to adjust the end play of the side gear when installing the internal components into the differential case.



(1) Arrange the two (each) friction discs and friction plates for each side, one on top of another, as shown in the figure, combining them so that the difference in thickness between the left and the right is the standard value.

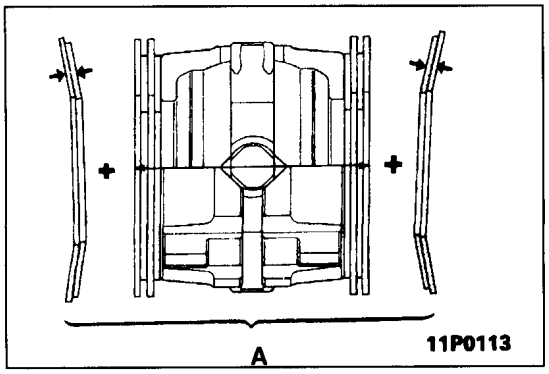
Standard value: 0–0.05 mm

NOTE
Two types of replacement parts are available:
Friction disc (with thicknesses of 1.6 mm and 1.7 mm)
Friction plate (with thicknesses of 1.75 mm and 1.85 mm)

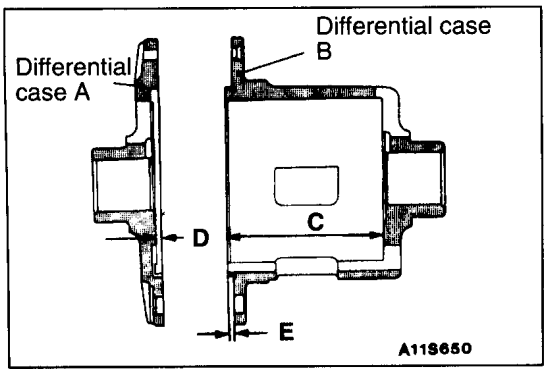


(2) Place the spring plates together as shown in the illustration, and use a micrometer to measure the thickness. Place the parts together in the combination that gives the least difference in thickness between the two sets.

NOTE
If replacing with new parts, the thickness of the spring plates and spring discs should be 1.75 mm.

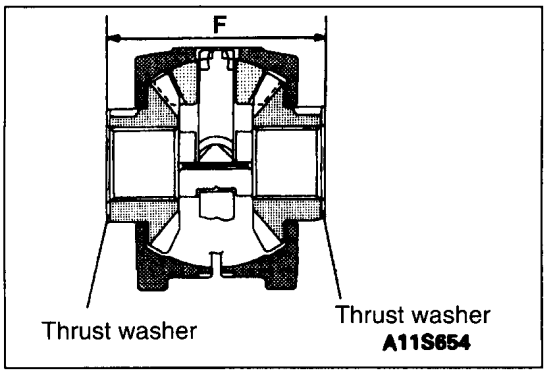


(3) Assemble the pressure ring's internal components (differential pinion shaft and pressure ring) and the friction discs and friction plates, and then as shown in the figure, measure the overall width.
(4) Calculate the total value (A) of the thickness of the spring disc and spring plate plus the value measured in (3) above.

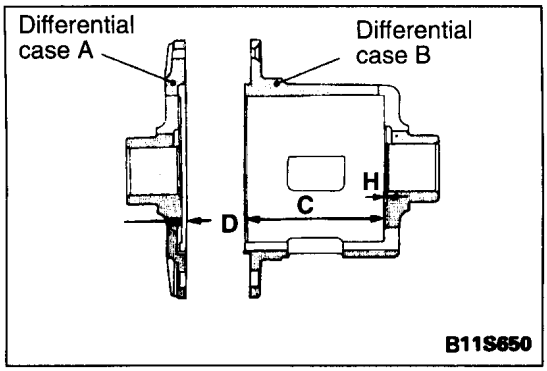


(5) Obtain the dimension (B) between the spring plate contact surfaces when differential cases (A) and (B) are combined. (B = C + D – E)
(6) Change the thickness of the friction disc so that the clearance (B – A) between the differential case and the spring plate becomes the standard value.

Standard value: 0.06–0.20 mm



(7) Remove the spring plates, spring discs, friction plates and friction disc.
(8) Measure the dimension (F) from the thrust washer end surface to end surface.



(9) Obtain the dimension (G) between the thrust washer contact surfaces when differential cases (A) and (B) are combined.
(G = C + D + H)

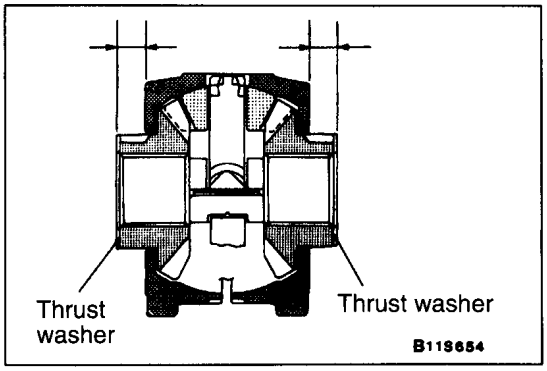
NOTE
Dimension (B) is the distance between the spring plate contact surfaces when differential cases (A) and (B) are combined. (Refer to P. 27-57.)

(10) Check that the clearance (G – F) in the side gear axial direction is within the standard value range.

Standard value:0.05–0.20 mm

(11) If the clearance is not within the standard value range, replace the thrust washers.

NOTE
1. Select washers in such a way that the clearances between the left and right pressure rings and the thrust washers remain the same as each other.
2. Three types of replacement parts are available: 1.50 mm, 1.60 mm and 1.70 mm.



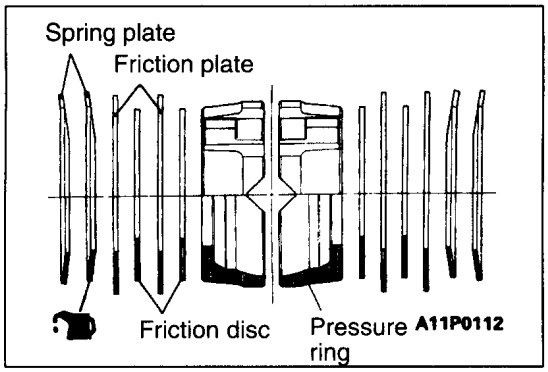
(12) Install the thrust washer as shown in the figure, and then select a thrust washer so that the difference between the left and right dimensions from the pressure ring rear face to the thrust washer end face is the standard value.

Standard value: 0–0.05 mm

NOTE
Measure the distance while squeezing the V-shaped groove manually.

(13) If the distance is not within the standard value, replace the thrust washers.

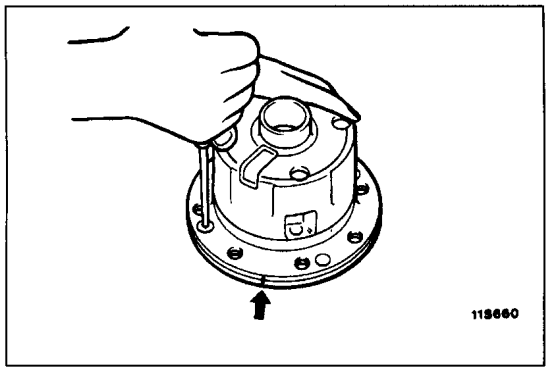
NOTE
Three types of replacement parts are available: 1.50 mm, 1.60 mm and 1.70 mm



(14)Apply specified gear oil to each part, and then insert each part into differential case (B) in the order shown in the illustration.

Gear oil: MITSUBISHI Genuine Gear Oil part No. 8149630EX, CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE 80W-90) or equivalent

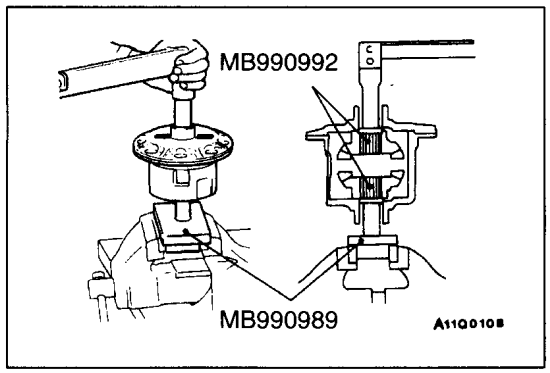
NOTE
Be particularly sure to apply oil to the contact surfaces and sliding surfaces.



▶B◀ SCREW INSTALLATION

1. Align the mating marks (the same numeral on each case) of differential case (A) and differential case (B).
2. Turning the screwdriver slowly several times, tighten the screw so that the cases are in close contact.

NOTE
If, even though the screw is tightened, the end surfaces of case (A) and case (B) do not come into close contact, probably the thrust washer and spring plate are not fit correctly into the groove, so make the assembly again.



▶C◀ DIFFERENTIAL PRELOAD INSPECTION FOR LIMITED SLIP DIFFERENTIAL

1. After assembly, in order to check the frictional force of the clutch plate, use the special tools to measure the starting torque.

Standard value:
When a new clutch plate is used
39–74 Nm
When the current clutch plate is reused
25–74 Nm

NOTE
Measure the starting torque after rotating slightly. When measuring the torque, do so at the beginning of movement.

2. If the starting torque is not within the standard value, disassemble the differential case assembly and repair or replace the parts.

WHEEL AND TYRE

CONTENTS

120002156

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SERVICE SPECIFICATIONS 2

TROUBLESHOOTING 3

SERVICE ADJUSTMENT PROCEDURES 4

Tyre Inflation Pressure Check 4

Tyre Wear Check 4

Wheel Runout Check 4

WHEEL AND TYRE 4

GENERAL INFORMATION

120002157

Items		2WD	4WD
Wheel (except spare wheel)	Tyre size	185R14C-8PR*1 195R14 98S*2	215SR15 100S
	Wheel type	Steel type	Steel type
	Wheel size	14×5 1/2JJ	15×6JJ
	Amount of wheel offset mm	40	33
Spare wheel	Tyre size	185R14C-8PR*1 195R14 98S*2	215SR15 100S
	Wheel type	Steel type	Steel type
	Wheel size	14×5 1/2JJ	15×6JJ
	Amount of wheel offset mm	40	33

NOTE
*1 Panel van and Window van
*2 Wagon

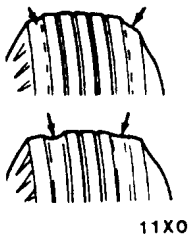
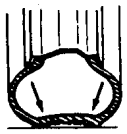
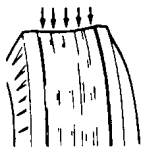
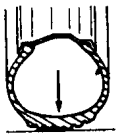
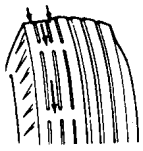
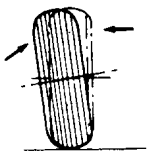
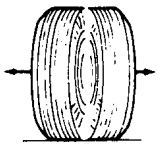
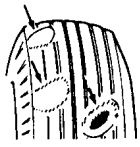
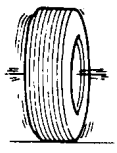
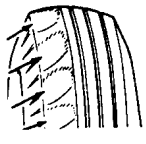
SERVICE SPECIFICATIONS

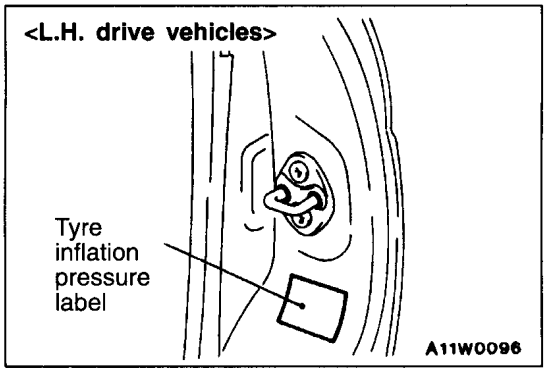
120002158

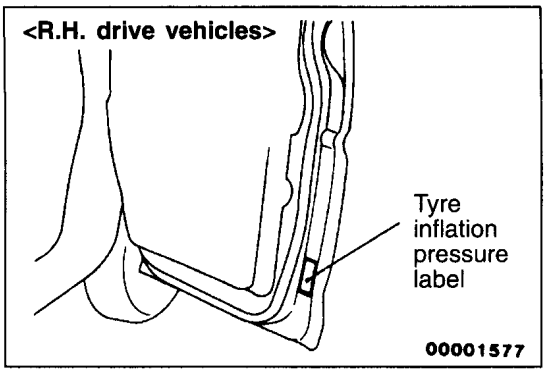
Items	Limit
Tread depth of tyre mm	1.6
Wheel runout (Radial runout) mm	1.2 or less
Wheel runout (Lateral runout) mm	1.2 or less

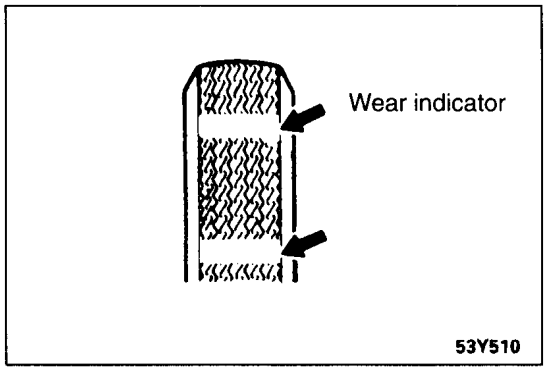
TROUBLESHOOTING

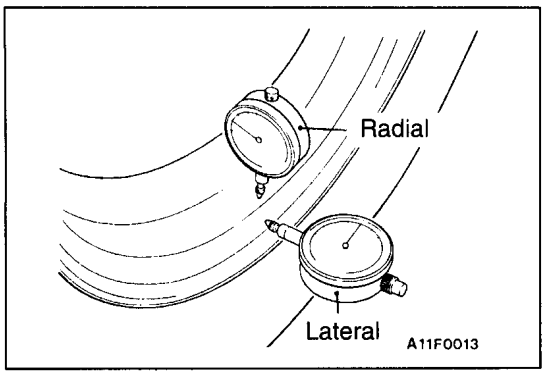
120002326

Symptom		Probable cause		Remedy	Reference page
Rapid wear at shoulders	 11X0109	Under-inflation or lack of rotation	 11X0116	Adjust the tyre pressure.	Refer to P. 31-4.
Rapid wear at centre	 11X0110	Over-inflation or lack of rotation	 11X0117		
Cracked treads	11X0111	Under-inflation		Adjust the tyre pressure.	Refer to P. 31-4.
Wear on one side	 11X0112	Excessive camber	 11X0118	Inspect the camber.	Refer to GROUP 33A – Service Adjustment Procedures.
Feathered edge	11X0113	Incorrect toe-in	 11X0119	Adjust the toe-in.	
Bald spots	 11X0114	Unbalanced wheel	 11X0120	Adjust the imbalanced wheels.	–
Scalloped wear	 11X0115	Lack of rotation of tyres or worn or out-of-alignment suspension		Rotate the tyres, inspect the front suspension alignment.	Refer to GROUP 33A – Service Adjustment Procedures.









SERVICE ADJUSTMENT PROCEDURES

120000962

TYRE INFLATION PRESSURE CHECK

NOTE
The tyre inflation pressure label is attached in the location shown in the illustration.

TYRE WEAR CHECK

120000963

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

120002159

Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, measure wheel runout with a dial indicator.

Limit: Radial runout 1.2 mm
Lateral runout 1.2 mm

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TYRE

120000965

INSTALLATION SERVICE POINT

Tighten the wheel nut to the specified torque.

Tightening torque: 118–137 Nm

POWER PLANT MOUNT

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120002165

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FRONT ENGINE MOUNT* <2WD> 4
<4WD> 5

REAR ENGINE MOUNT 6

FRONT DIFFERENTIAL MOUNT 7

Front Differential Mount Insulator Replacement 8

SUSPENSION CROSSMEMBER ASSEMBLY <2WD> 9
<4WD> 11

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: impact sensors, SRS diagnosis unit, 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

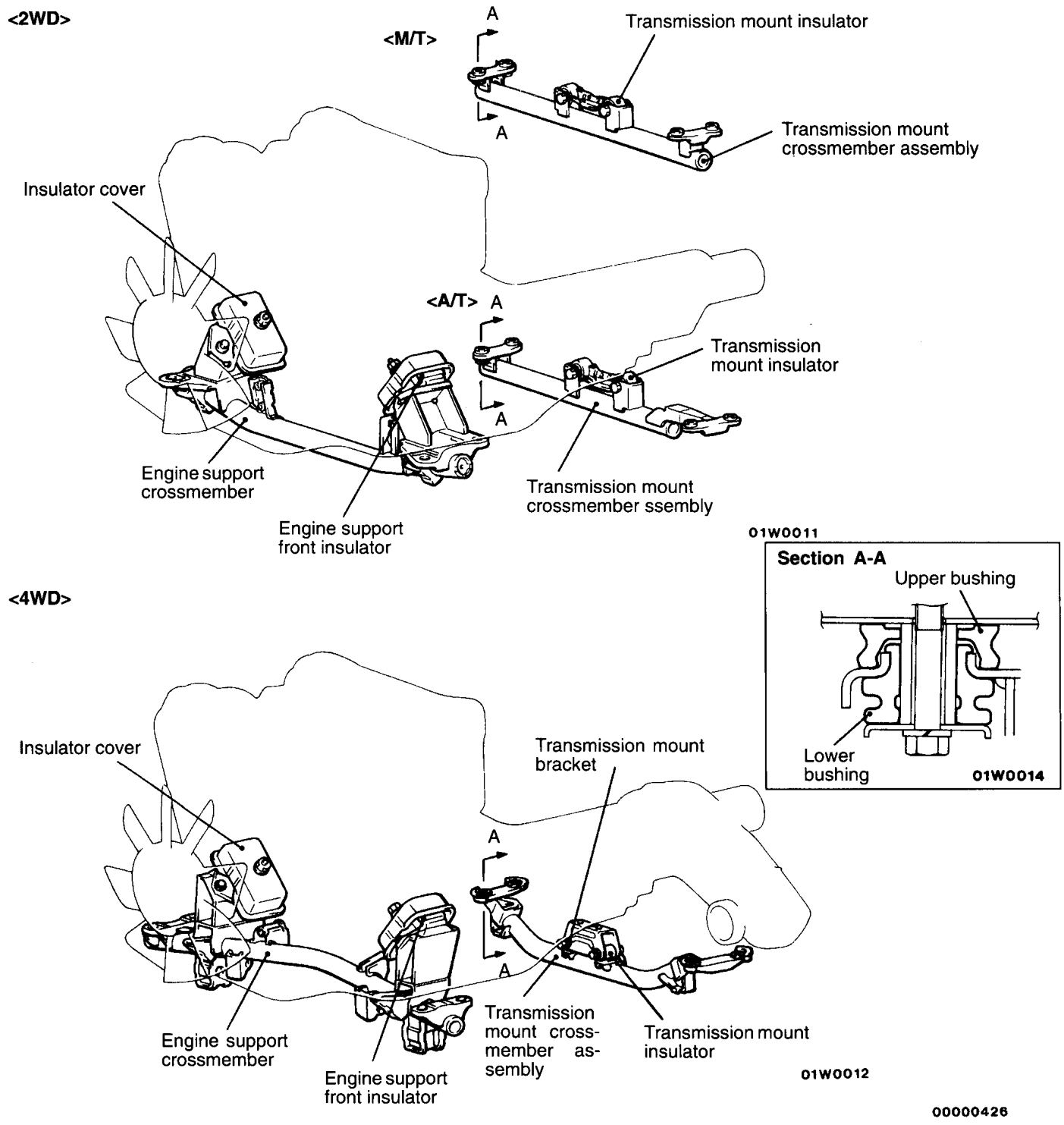
120000088

Two crossmembers support total four points:
The engine support crossmember assembly supports the engine via front insulators. The shear compression type insulators prevent engine vibration from entering vehicle.

The transmission mount crossmember assembly is mounted to the body via elastic bushings. It supports the transmission via the elastic insulator. The insulator prevents transmission vibration from entering vehicle. That is called double anti-vibration construction.

CONSTRUCTION DIAGRAM

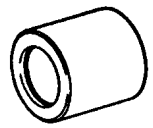
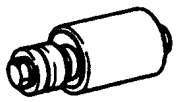
120002161



NOTE
The diagram shows the 4G64 engine.

SPECIAL TOOLS

120000090

Tool	Number	Name	Use
	MB991118	Bushing remover and installer	Driving out and press-fitting of front differential mount insulator
	MB991025	Bushing remover and installer	

FRONT ENGINE MOUNT <2WD>

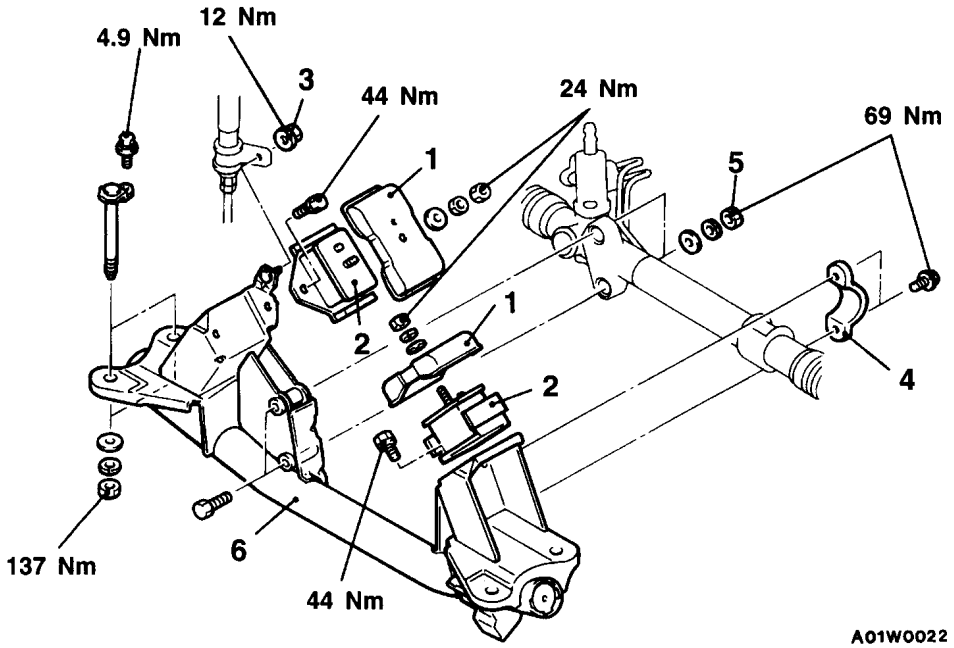
120000091

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
- Under Cover Panel Removal (Refer to GROUP 42 – Under Cover.)
- Stabilizer Bar Removal (Refer to GROUP 33A – Stabilizer Bar.)

Post-installation Operation
- Wheel Alignment Inspection and Adjustment (Refer to GROUP 33A – Service Adjustment Procedures.)
- Stabilizer Bar Installation (Refer to GROUP 33A – Stabilizer Bar.)
- Under Cover Panel Installation (Refer to GROUP 42 – Under Cover.)



Removal steps
- Engine assembly (Refer to GROUP 11 – Engine assembly.)

1. Insulator cover
2. Engine support front insulator
3. Power steering pressure hose installation nut <4G6>
4. Clamp
5. Power steering gear and linkage installation nut
6. Engine support crossmember assembly

FRONT ENGINE MOUNT <4WD>

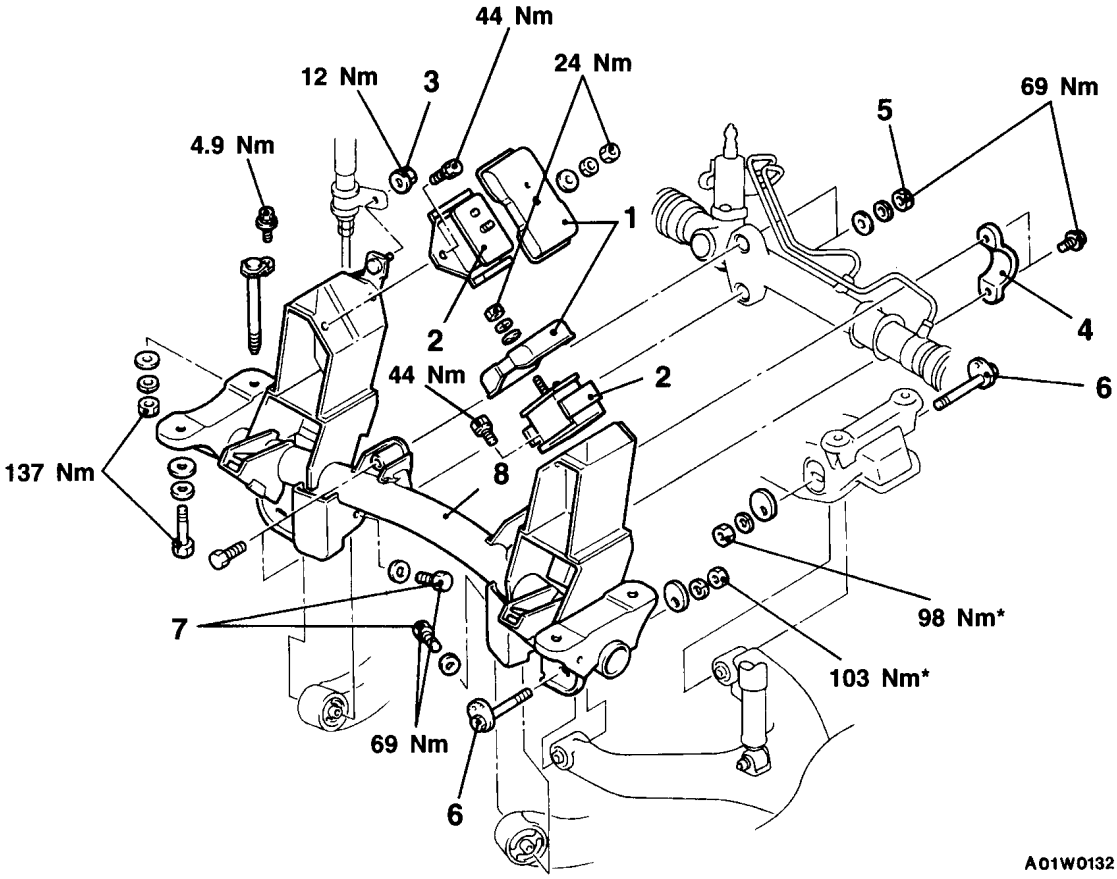
120000092

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
- Under Skid Plate, Under Cover Removal (Refer to GROUP 42 – Under Cover.)
- Stabilizer Bar Removal (Refer to GROUP 33A – Stabilizer Bar.)

Post-installation Operation
- Wheel Alignment Inspection and Adjustment (Refer to GROUP 33A – Service Adjustment Procedures.)
- Stabilizer Bar Installation (Refer to GROUP 33A – Stabilizer Bar.)
- Under Skid Plate, Under Cover Installation (Refer to GROUP 42 – Under Cover.)



Removal steps
- Engine assembly (Refer to GROUP 11 – Engine assembly.)

1. Insulator cover
2. Engine support front insulator
3. Power steering pressure hose installation nut <4G6>
4. Clamp
5. Power steering gear and linkage installation nut
6. Lower arm bolt assembly (for camber, caster adjustment)
7. Front differential mount installation nut
8. Engine support crossmember assembly

Caution
*** : Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

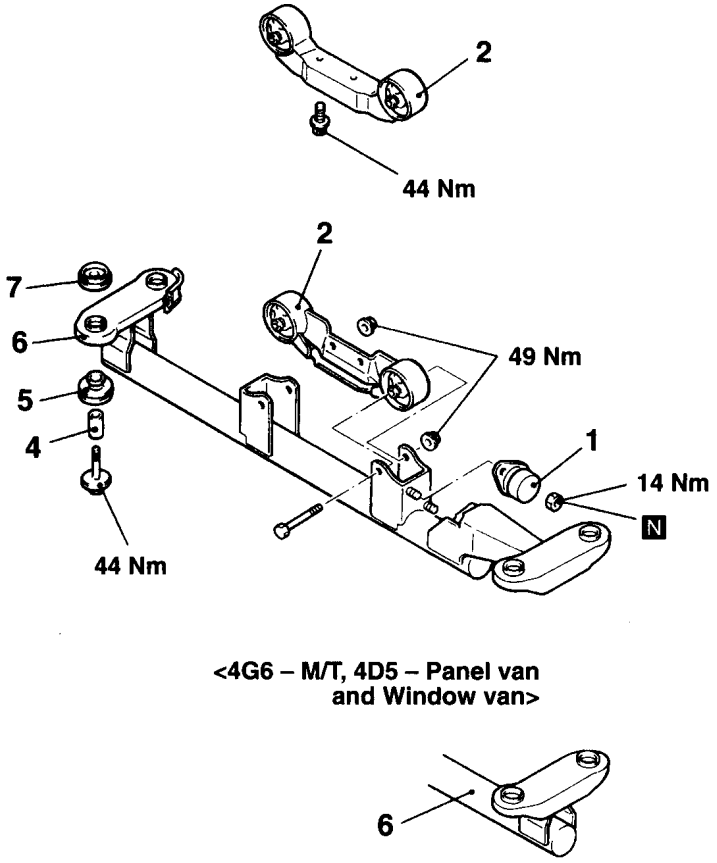
REAR ENGINE MOUNT

120002160

REMOVAL AND INSTALLATION

<2WD>

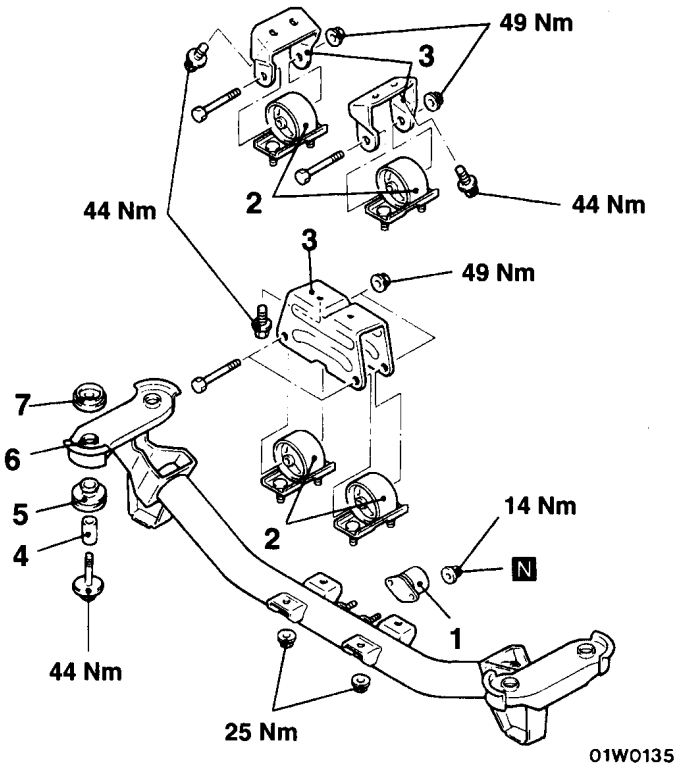
<4D5 – Wagon>



01W0020

<4WD>

<4D5 – Wagon>



01W0135

00002261

Removal steps

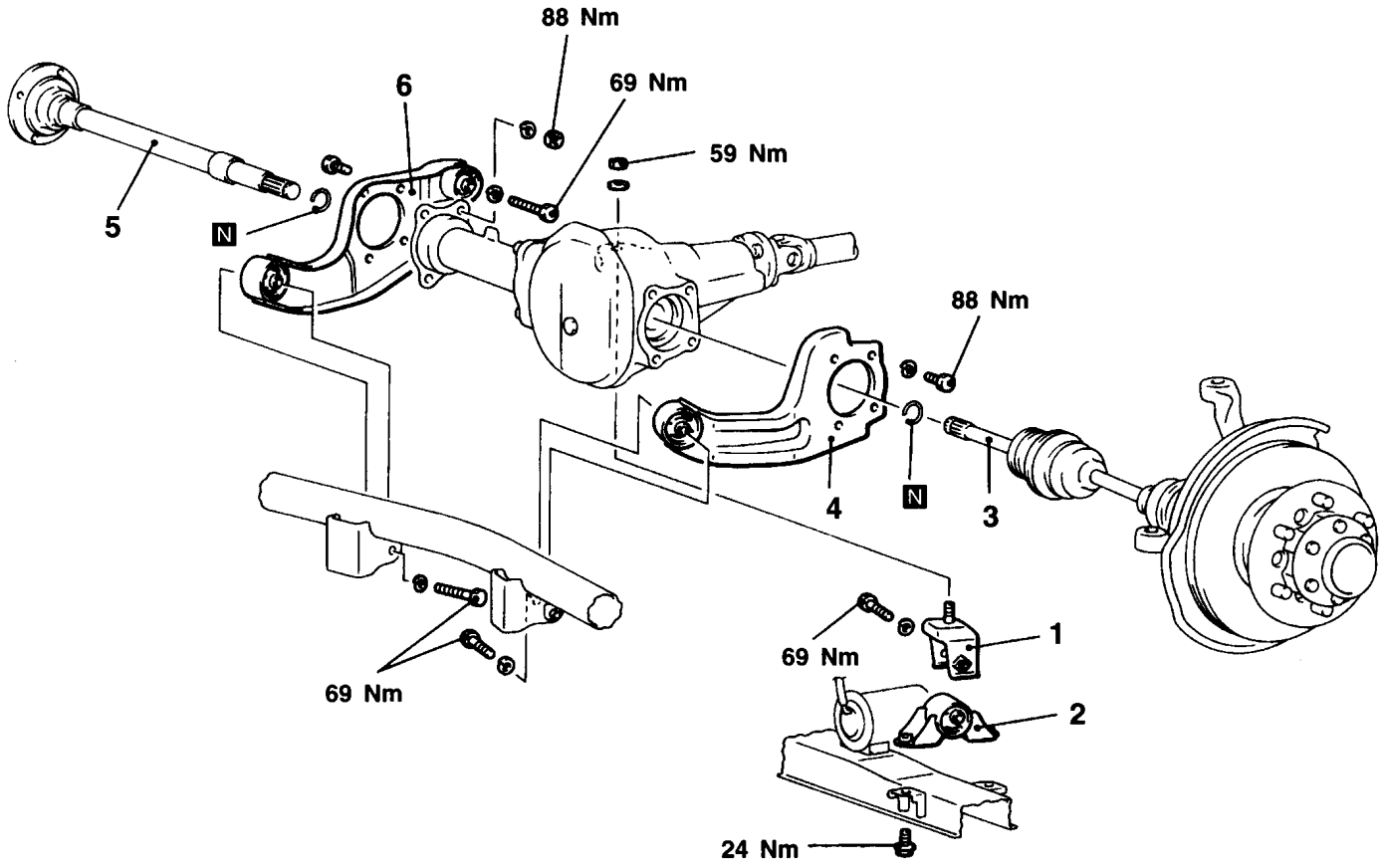
1. Dynamic damper <Vehicles with dynamic damper>
- Support the transmission by a transmission jack.
2. Transmission mount insulator assembly
3. Transmission mount bracket
4. Collar
5. Lower bushing
6. Transmission mount crossmember assembly
7. Upper bushing

FRONT DIFFERENTIAL MOUNT

120000094

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Skid Plate, Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



A01W0018

Differential mount insulator removal steps
- Support the front differential by a transmission jack.

1. Differential support bracket
2. Differential mount insulator assembly

Differential mount bracket assembly (L.H.) removal steps

3. Drive shaft (L.H.) (Refer to GROUP 26 – Drive Shaft.)
- Support the front differential by a transmission jack.

4. Differential mount bracket assembly (L.H.)

Differential mount bracket assembly (R.H.) removal steps

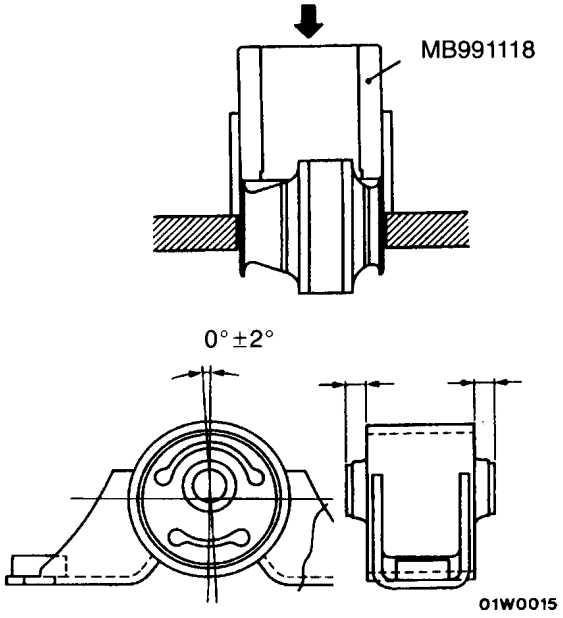
5. Inner shaft (Refer to GROUP 26 – Inner shaft.)
- Support the front differential by a transmission jack.

6. Differential mount bracket assembly (R.H.)

FRONT DIFFERENTIAL MOUNT INSULATOR REPLACEMENT

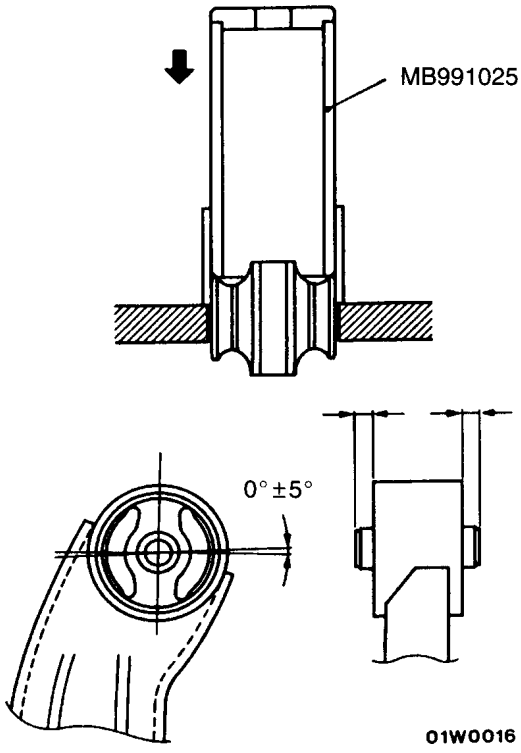
(1) Use the special tool and a press to take out and press-fit the insulators.
(2) Install the insulators so that they face in the same directions and protrude by the same amounts as shown in the illustrations.

Differential mount insulator assembly



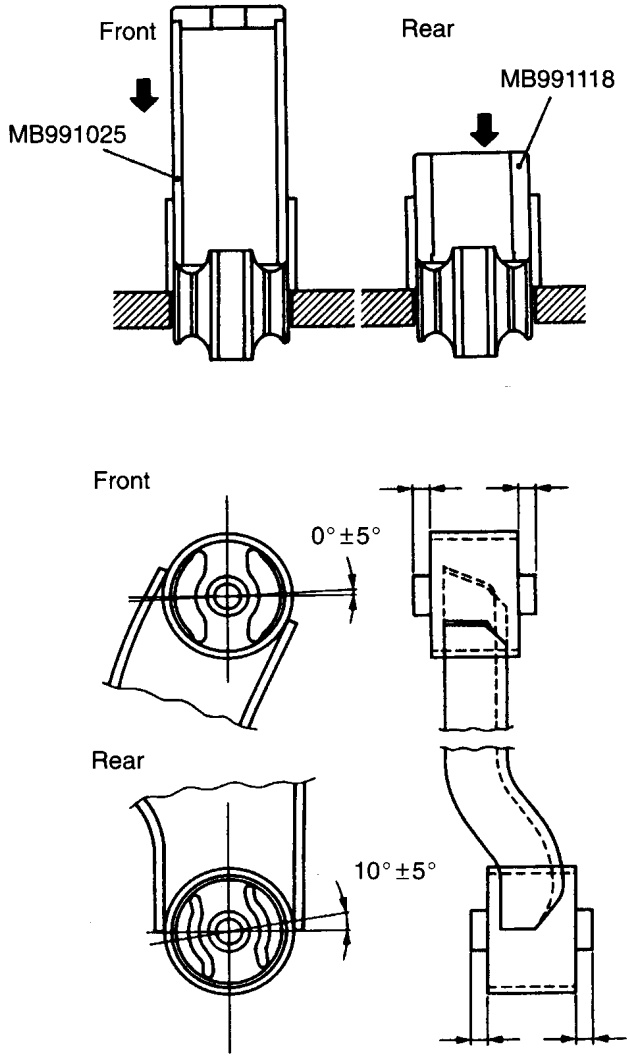
01W0015

Differential mount bracket assembly (L.H.)



01W0016

Differential mount bracket assembly (R.H.)



01W0017

00000428

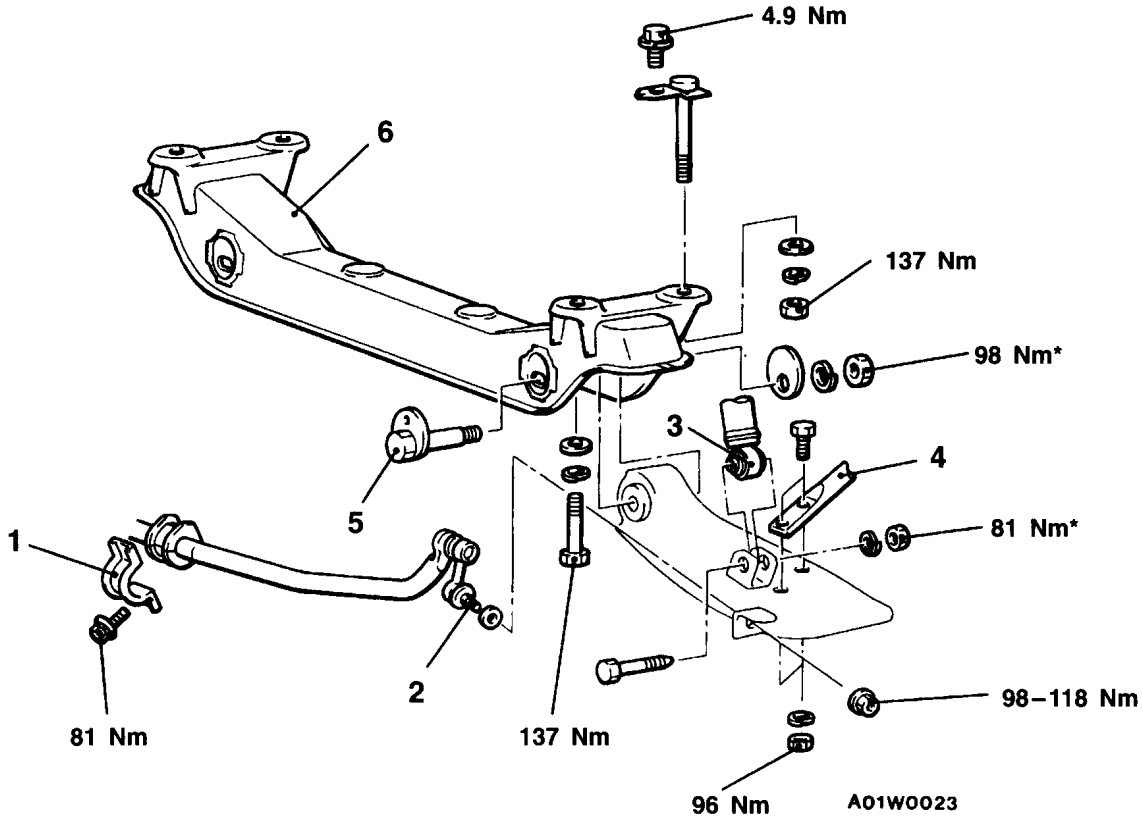
SUSPENSION CROSSMEMBER ASSEMBLY <2WD>

120000095

REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Cover Panel Removal (Refer to GROUP 42 – Under Cover.)

Post-installation Operation
- Wheel Alignment Inspection and Adjustment (Refer to GROUP 33A – Service Adjustment Procedures.)
- Under Cover Panel (Refer to GROUP 42 – Under Cover.)



Removal steps

1. Clamp
▶B◀ 2. Stabilizer link connection
▶A◀ 3. Shock absorber lower connection
4. Strut bar front connection
5. Lower arm bolt assembly (for camber adjustment)
6. Suspension crossmember assembly

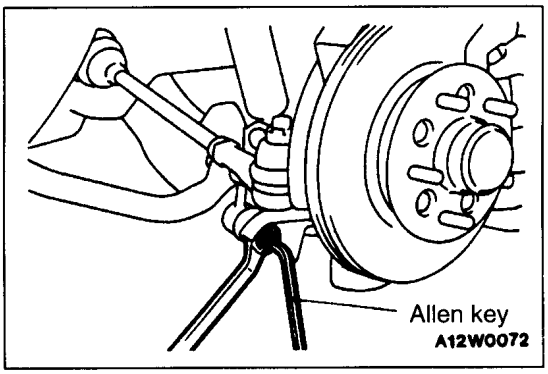
Caution
*** : Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

INSTALLATION SERVICE POINTS

▶A◀ SHOCK ABSORBER LOWER INSTALLATION

Insert the bolt from the front of the vehicle.

NOTE
If the bolt is inserted from the rear of the vehicle, it may touch the lower arm.



▶B◀ STABILIZER LINK INSTALLATION

Use an allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.

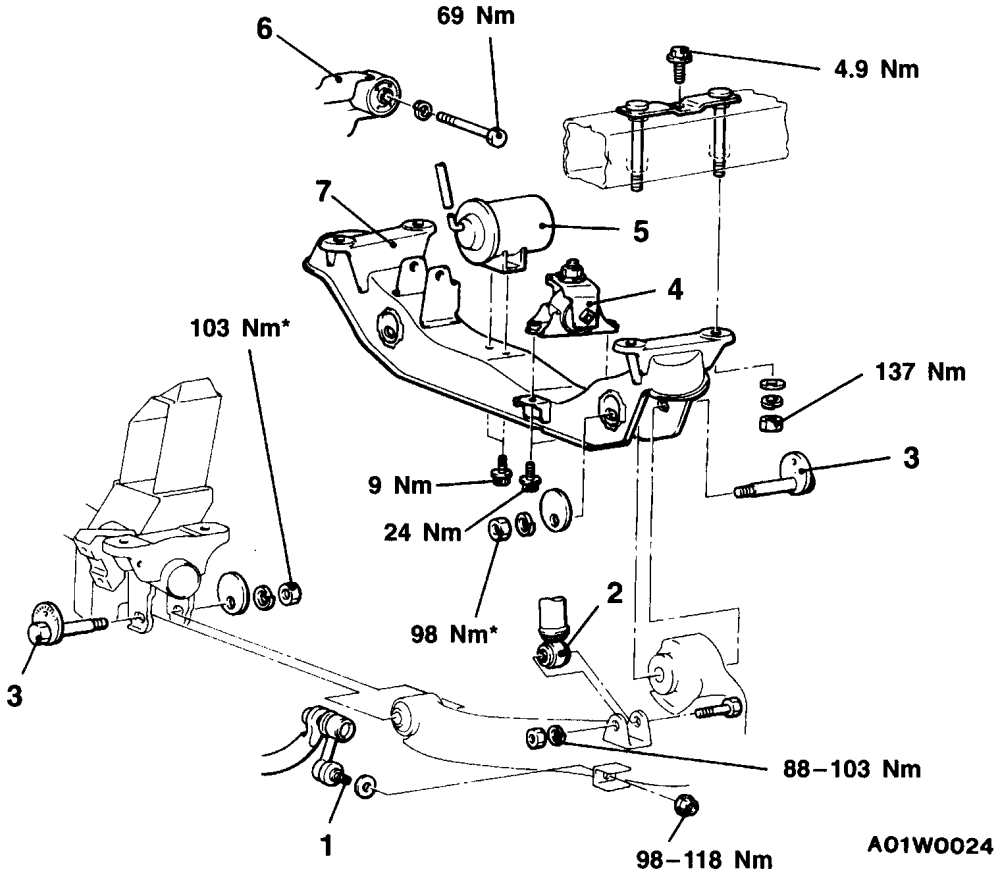
SUSPENSION CROSSMEMBER ASSEMBLY <4WD>

120000096

REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Skid Plate, Under Cover Removal (Refer to GROUP 42 – Under Cover.)

Post-installation Operation
- Wheel Alignment Inspection and Adjustment (Refer to GROUP 33A – Service Adjustment Procedures.)
- Under Skid Plate, Under Cover Removal (Refer to GROUP 42 – Under Cover.)



Removal steps

▶B◀ 1. Stabilizer link connection
▶A◀ 2. Shock absorber lower connection
3. Lower arm bolt assembly (for camber, caster adjustment)
4. Differential mount insulator assembly connection
5. Vacuum tank
6. Differential mount bracket (R.H.) connection
7. Suspension crossmember assembly

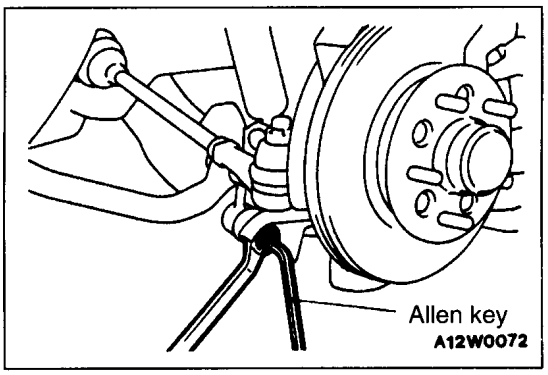
Caution
*** : Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

INSTALLATION SERVICE POINTS

▶A◀ SHOCK ABSORBER LOWER INSTALLATION

Insert the bolt from the rear of the vehicle.

NOTE
If the bolt is inserted from the front of the vehicle, it will become difficult to get to the nut to tighten it.



◀B▶ STABILIZER LINK INSTALLATION

Use an allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.

FRONT SUSPENSION

CONTENTS

120000132

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SEALANTS 4
SPECIAL TOOLS 5
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Front Wheel Alignment Inspection and Adjustment 7
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UPPER ARM 15
TORSION BAR 19
STRUT BAR <2WD> 22
STABILIZER BAR 23

GENERAL INFORMATION

120002183

The upper torsion-type double wishbone suspension with a torsion bar in the upper arm has been adopted.

In order to further increase steering stability and to improve ride comfort, the following items are reviewed:
Compliance
Spring and shock absorber characteristics
Wheel alignment
Bushings

TORSION BAR

Items	PA3V, PB3V	PA3W, PA5W, PA5V, PB5V	PA4W	PD4W, PD4V, PD5V	PD5W
Length × O.D. mm	1,065 × 19.6	1,065 × 20.4	1,065 × 21.2	1,165 × 21.4	1,165 × 22.2
Spring constant (wheel position) N/mm	25.6	30.0	34.9	33.0	38.2

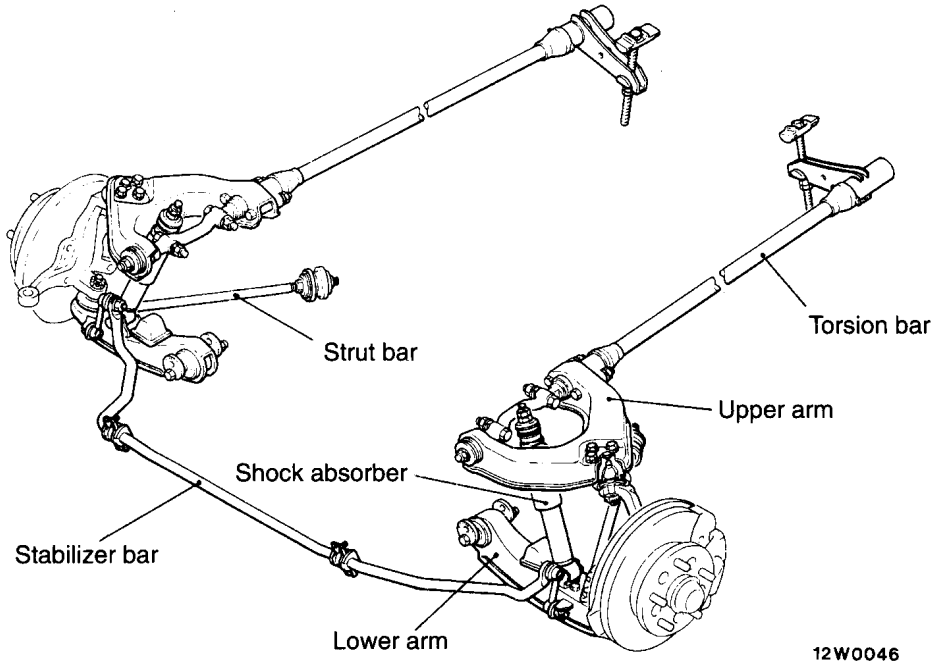
SHOCK ABSORBER

Items		2WD	4WD
Stroke mm		133	113
Damping force (at 0.3m/sec.)	Expansion N	3,432	3,138
	Contraction N	1,471	2,452

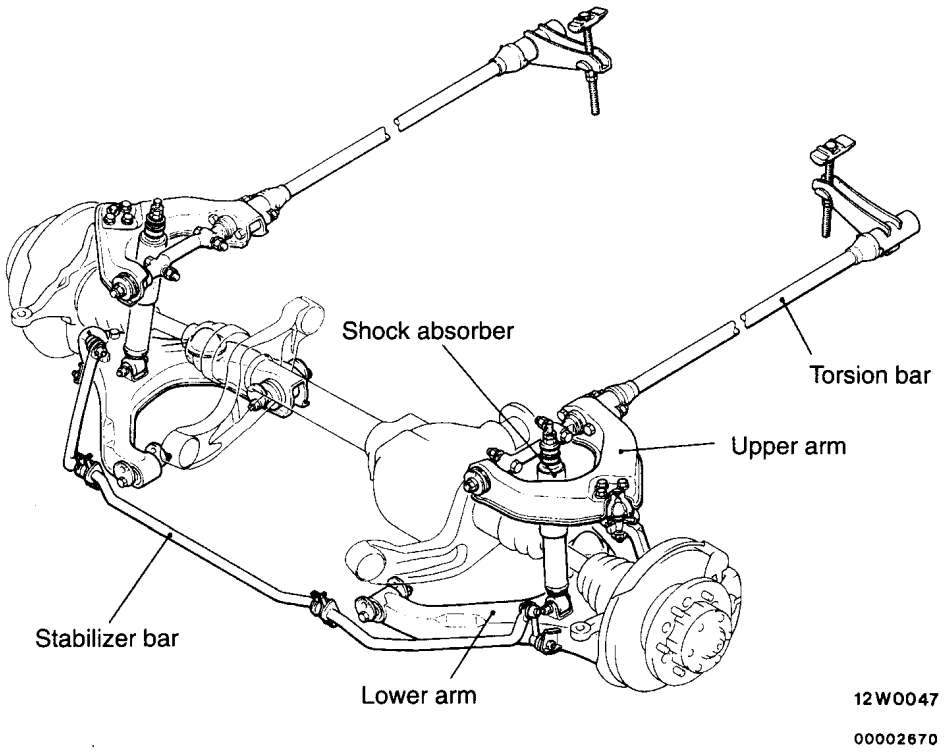
CONSTRUCTION DIAGRAM

120002185

<2WD>



<4WD>



00002670

SERVICE SPECIFICATIONS

120002323

Items			Standard value
Toe-in	At the centre of tyre tread mm		0 ± 3
	At the rim of disc wheel mm		0 ± 1.7
	Toe-angle (per wheel)		0° ± 7'
Toe-out angle on turns (inner wheel when outer wheel at 20°)		2WD	21° 18'
		4WD	20° 18'
Camber		2WD	0°00' ± 30' (Difference between right and left within 30')
		4WD	–0°20' ± 30' (Difference between right and left within 30')
Caster (laden)		2WD	3° 27' ± 30' (Difference between right and left within 30')
		4WD	4° 06' ± 30' (Difference between right and left within 30')
Kingpin inclination		2WD	15° 40'
		4WD	16° 05'
Side slip mm			0 ± 3
Press-fitting force for lower arm bushing <2WD> kN			19.6 or more
Lower arm ball joint starting torque Nm			1.0 – 4.5
Shock absorber piston rod protrusion amount mm		2WD	4.5 – 5.5
		4WD	6.5 – 7.5
Upper arm ball joint starting torque Nm			0.8 – 3.4
Distance from centre of lower arm mounting bolt to base of lower arm mm		2WD	94.5
		4WD	77
Rotation torque for stabilizer link ball joint Nm			0.7 – 2.0

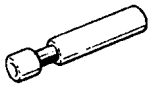
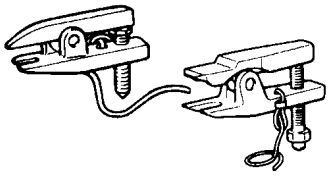
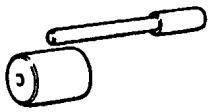
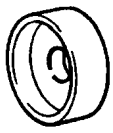
SEALANTS

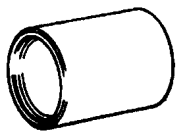
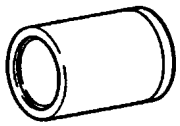
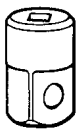
120000136

Items	Specified sealant	Remarks
Upper ball joint groove	3M ATD Part No.8663 or equivalent	Semi-drying sealant
Hub cap		

SPECIAL TOOLS

120000137

Tool	Number	Name	Use
	MB991304	Wheel alignment gauge attachment	Measurement of the wheel alignment <4WD>
	MB990804	Knuckle arm puller	Ball joint and knuckle removal <2WD>
	MB990809	Pitman arm puller	Ball joint and knuckle removal <4WD>
	MB990635 or MB991113	Steering linkage puller	Tie-rod end removal
	MB991179	Bushing remover and installer support	Preventing deformation when removing and installing the lower arm bushing <2WD>
	MB990649	Lower arm bushing remover and installer	Lower arm bushing removal and press-fitting <2WD>
	MB991526	Installer guide	Lower arm bushing press-fitting <2WD>
	MB990883	Arbor	Lower arm bushing removal and press-fitting (front) <4WD>
	MB990650	Bar	Lower arm bushing removal and press-fitting (rear) <4WD>

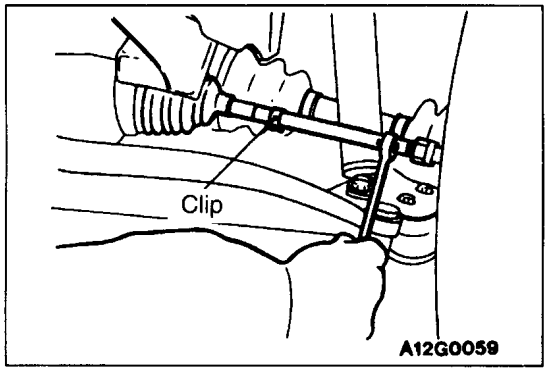
Tool	Number	Name	Use
	MB990889	Ring	Lower arm bushing press-fitting (front) <4WD>
	MB990890	Base	
	MB990884	Ring	Lower arm bushing press-fitting (rear) <4WD>
	MB990891	Base	
	MB990968	Torque wrench	• Measurement of rotation torque of upper arm ball joint • Measurement of rotation torque of stabilizer link ball joint
	MB990326	Preload socket	

SERVICE ADJUSTMENT PROCEDURES

120002324

FRONT WHEEL ALIGNMENT INSPECTION 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
At the rim of disc wheel 0 ± 1.7 mm
Toe angle (per wheel) 0° ± 7'

(1) If the toe-in is not within the standard value, adjust the toe-in by undoing the clips and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

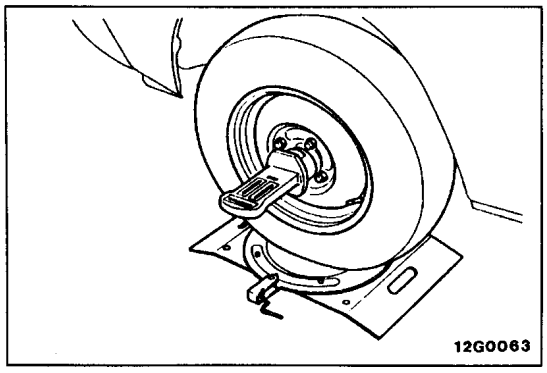
NOTE
The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

(2) Use a turning radius gauge to check that the steering angle is at the standard value.
(Refer to GROUP 37A – Service Adjustment Procedures.)

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.

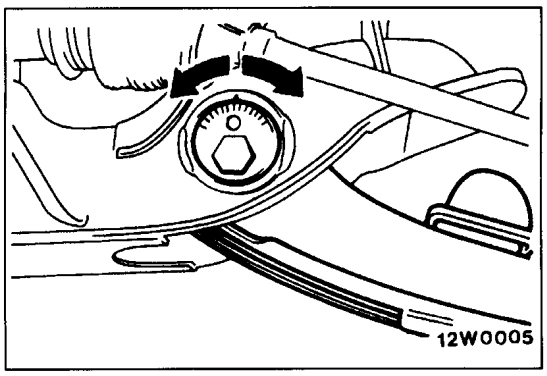
Standard value:
2WD 21°18' (inner wheel when outer wheel at 20°)
4WD 20°18' (inner wheel when outer wheel at 20°)



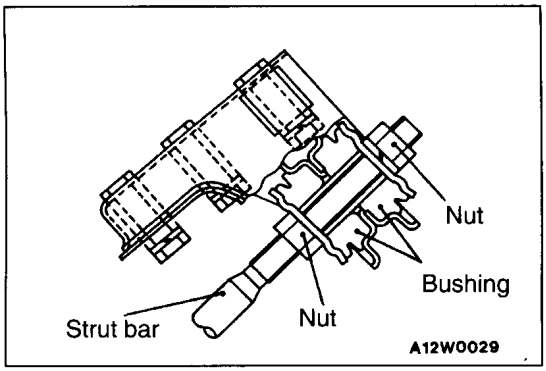
CAMBER, CASTER AND KINGPIN INCLINATION

<2WD>

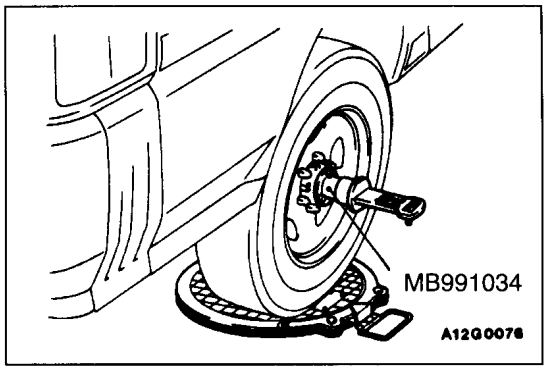
Standard value:
Camber 0°00' ± 30' (Difference between right and left within 30')
Caster 3°27' ± 30' (Difference between right and left within 30')
Kingpin inclination 15°40'



(1) If the camber is not within the standard value, turn the lower arm bolt assembly.



(2) If the caster is not within the standard value, turn the nut of the strut bar bushing.
(3) Measure the camber again and check that it is at the standard value. If it is not within the standard value, repeat the adjustment procedure.

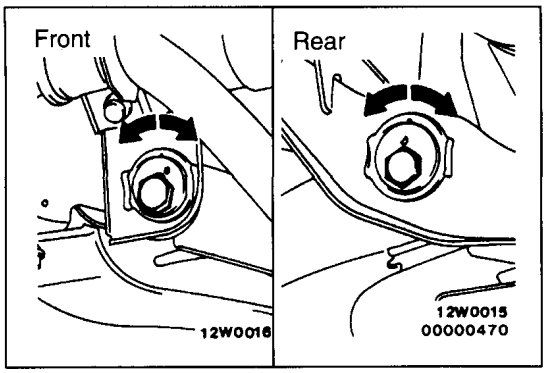


<4WD>

(1) Remove the drive flange.
(2) Use the special tool to measure the camber and caster.

Standard value:

Camber – 0°20' ± 30' (Difference between right and left within 30')
Caster 4°06' ± 30' (Difference between right and left within 30')
Kingpin inclination 16°05'



(3) If the camber or caster is not within the standard value, turn the lower arm bolt assembly (front and rear). (Refer to Camber / Caster Adjustment Table.)
(4) Check the alignment. If it is not within the standard value, repeat the adjustment procedure.

Reading the Camber/Caster Adjustment Table

Calculate the differences between the measured values and the standard values, and obtain how far the adjusting cam should be turned.

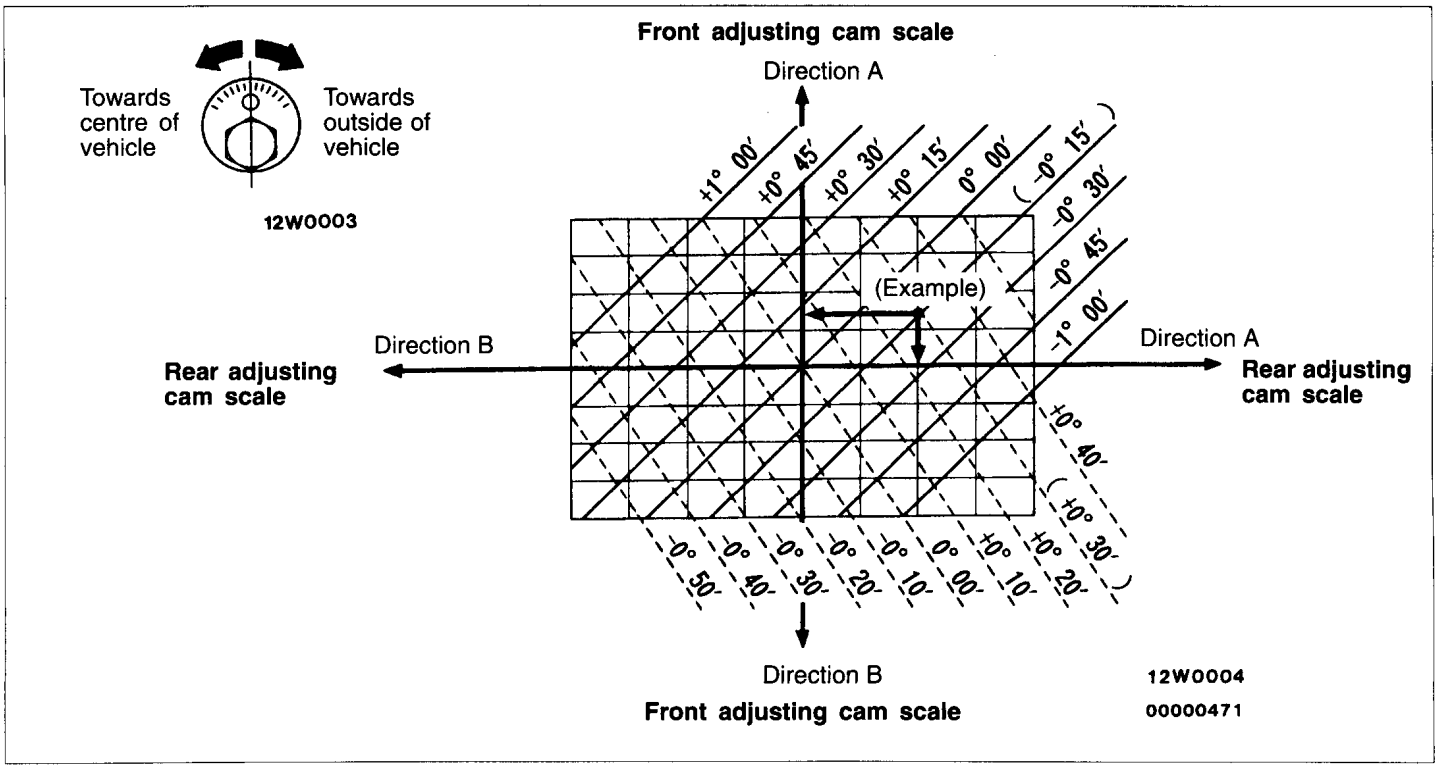
Example

Item	Measured value	Standard value	Difference
Camber	– 0°50'	– 0°20'	30'
Caster	4°21'	4°06'	15'

To reach the standard values in the above example, the front adjusting cam should be turned 1.5 points in direction A, and the rear adjusting cam should be turned 2 points in direction A.(See the table below.)

NOTE
The values on the vertical and horizontal axes represent a single point on the adjusting cam scales.

Camber/Caster Adjustment Table



SIDE SLIP

Standard value: 0 ± 3 mm

SHOCK ABSORBER AND LOWER ARM

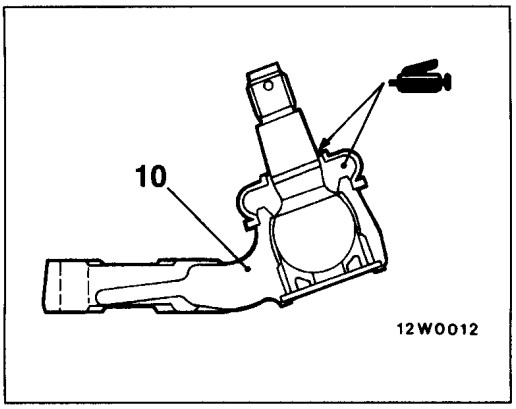
120000139

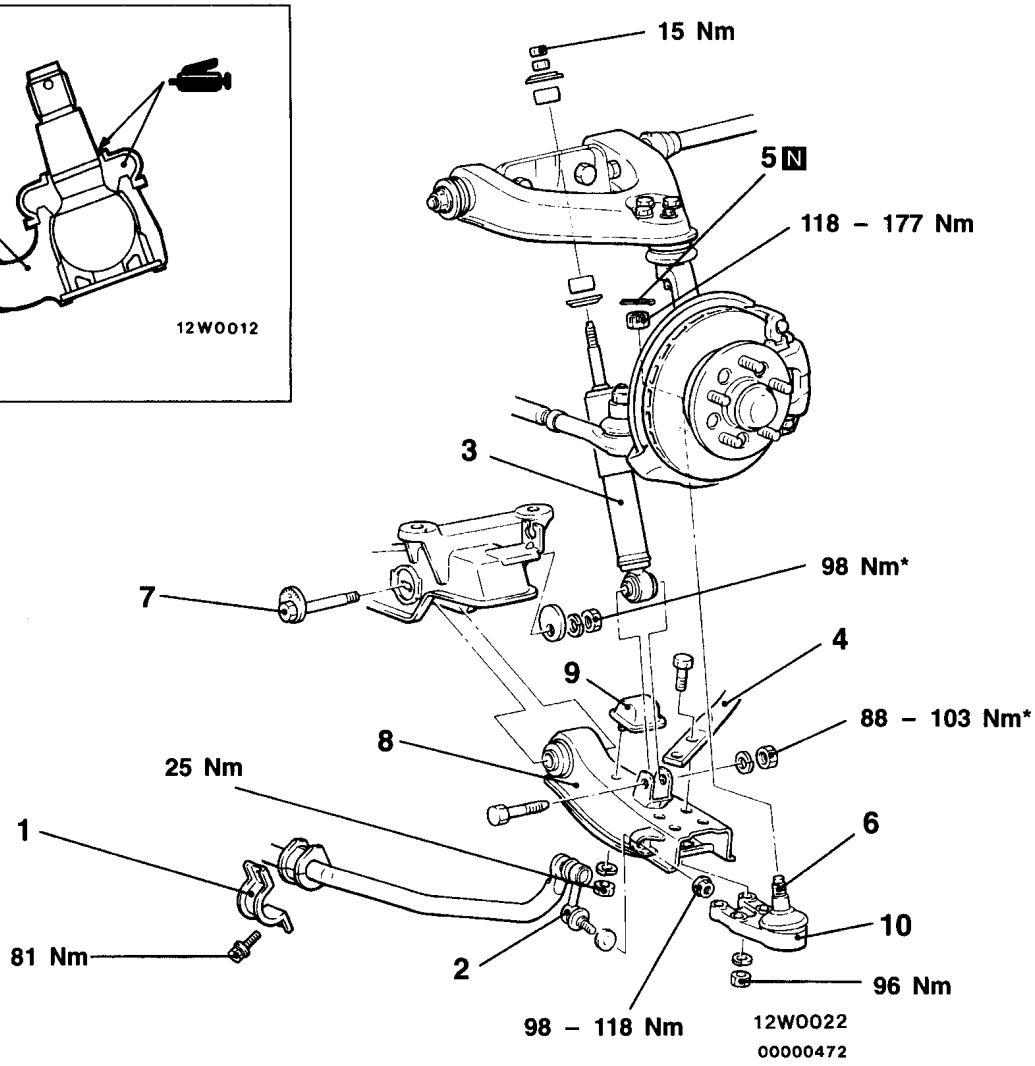
REMOVAL AND INSTALLATION

<2WD>

Pre-removal Operation
- Under Cover Removal
  (Refer to GROUP 42 – Under Cover.)

Post-installation Operation
- Wheel Alignment Adjustment (Refer to P.33A-7.)
- Under Cover Installation
  (Refer to GROUP 42 – Under Cover.)





Removal steps

1. Clamp
▶B◀ 2. Connection for stabilizer link
▶A◀ 3. Shock absorber
4. Connection for strut bar
5. Split pin
◀B▶ 6. Connection for lower arm ball joint
7. Lower arm bolt assembly
(for adjusting camber)
8. Lower arm
9. Bump stopper
10. Lower arm ball joint

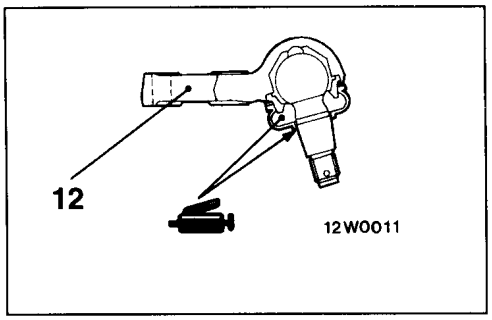
Caution

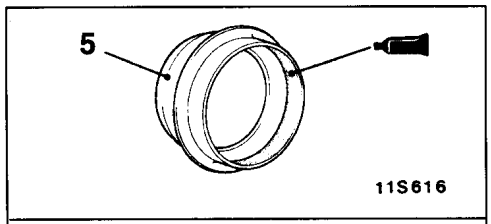
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

<4WD>

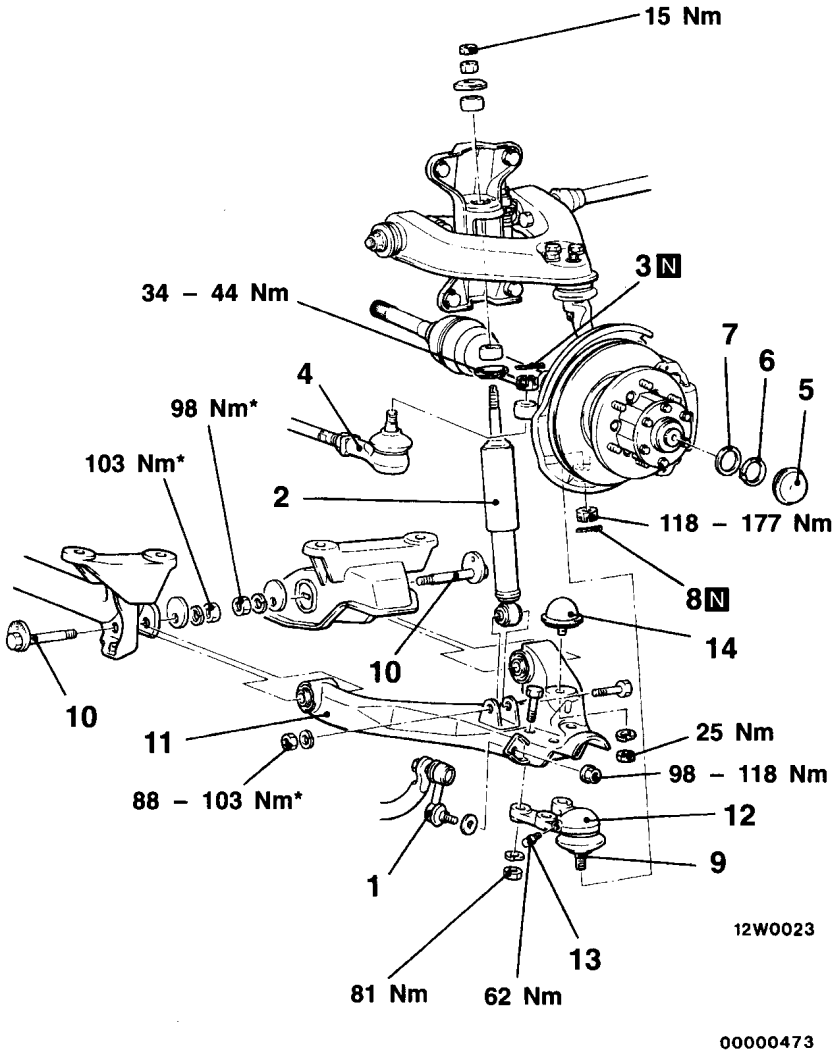
Pre-removal Operation
- Under Skid Plate and Under Cover Removal (Refer to GROUP 42 – Under Cover.)

Post-installation Operation
- Wheel Alignment Adjustment (Refer to P.33A-7.)
- Under Skid Plate and Under Cover Installation (Refer to GROUP 42 – Under Cover.)





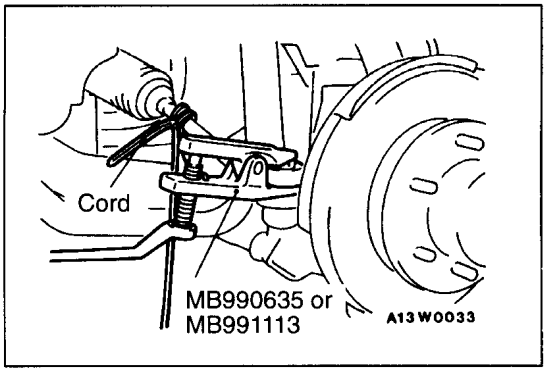
Sealant: 3M ATD Part No.8663 or equivalent



Removal steps

▶B◀ 1. Connection for stabilizer link
▶A◀ 2. Shock absorber
3. Split pin
◀A▶ 4. Connection for tie-rod end
5. Hub cap
6. Snap ring
7. Shim
8. Split pin
◀B▶ 9. Connection for lower arm ball joint
10. Lower arm bolt assembly (for adjusting camber and caster)
◀C▶ 11. Lower arm
12. Lower arm ball joint
13. Stopper bolt
14. Bump stopper

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

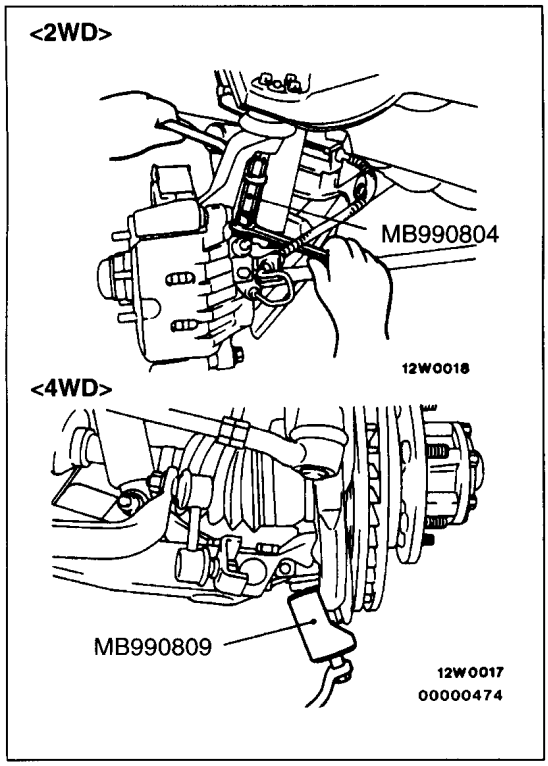


REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

Caution

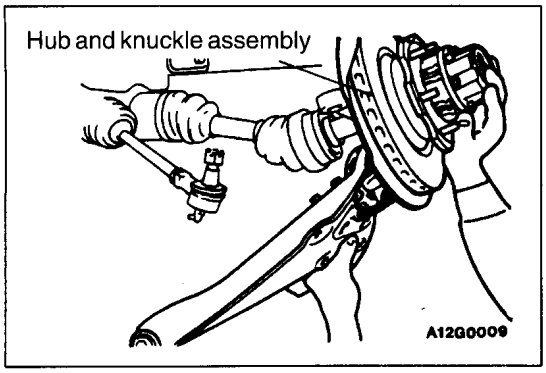
1. **Use the special tool to loosen the tie-rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
2. **Support the special tool with a cord, etc. not to let it come off.**



◀B▶ LOWER ARM BALL JOINT DISCONNECTION

Caution

Use the special tool to loosen the nut. Only loosen the nut; do not remove it from the ball joint.

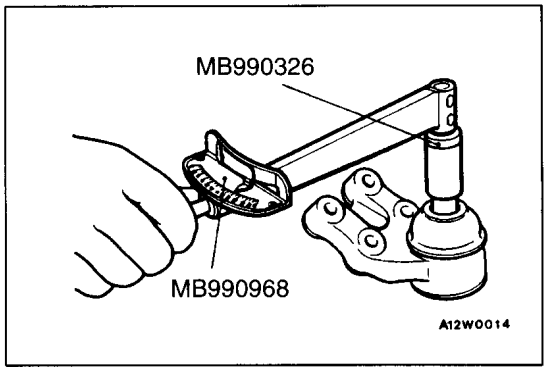


◀C▶ LOWER ARM REMOVAL

Raise the hub and knuckle assembly to remove the lower arm assembly from the knuckle.

Caution

Do not damage drive shaft dust cover, lower arm ball joint or ball joint dust cover.



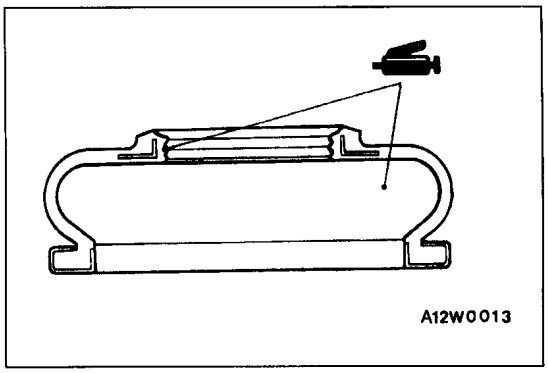
INSPECTION

LOWER ARM BALL JOINT STARTING TORQUE CHECK

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

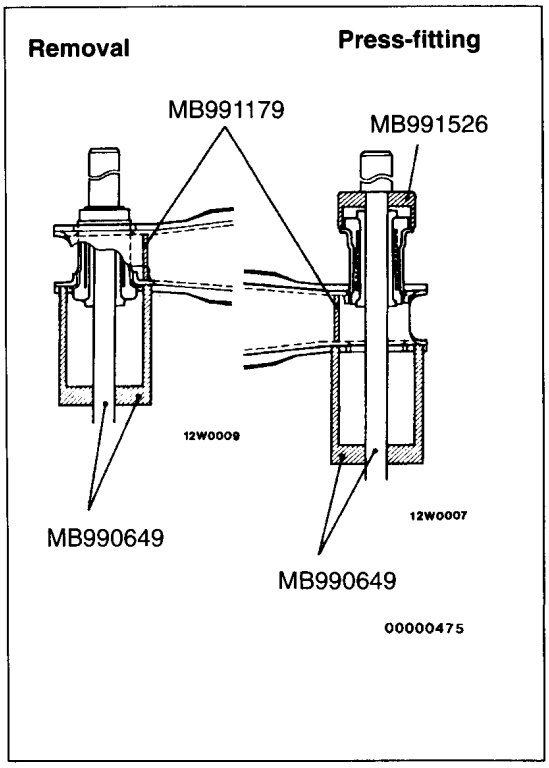
Standard value: 1.0 – 4.5 Nm

(2) If the starting torque exceeds the standard value, replace the lower arm ball joint.
(3) If the starting torque is lower than the standard value, check that the ball joint does not feel stiff. If it doesn't feel stiff, it is possible to use the ball joint.



LOWER ARM BALL JOINT DUST COVER REPLACEMENT

(1) Apply multipurpose grease to the lip and inside of the dust cover.
(2) Install the dust cover.



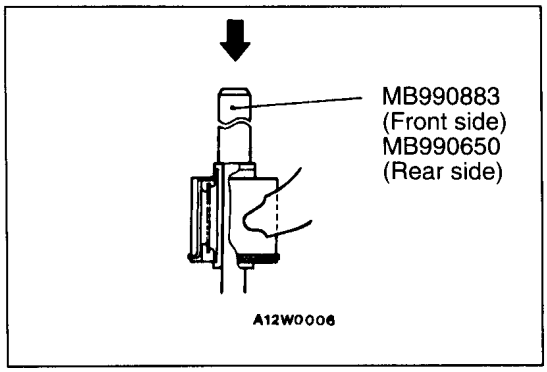
LOWER ARM BUSH REPLACEMENT

<2WD>

(1) Use the special tool to remove the lower arm bushing.
(2) Use the special tool to press-fit the lower arm bushing until the flange of the bushing touches the lower arm.
(3) Check that the press-fitting force is at the standard value while press-fitting the bushing.

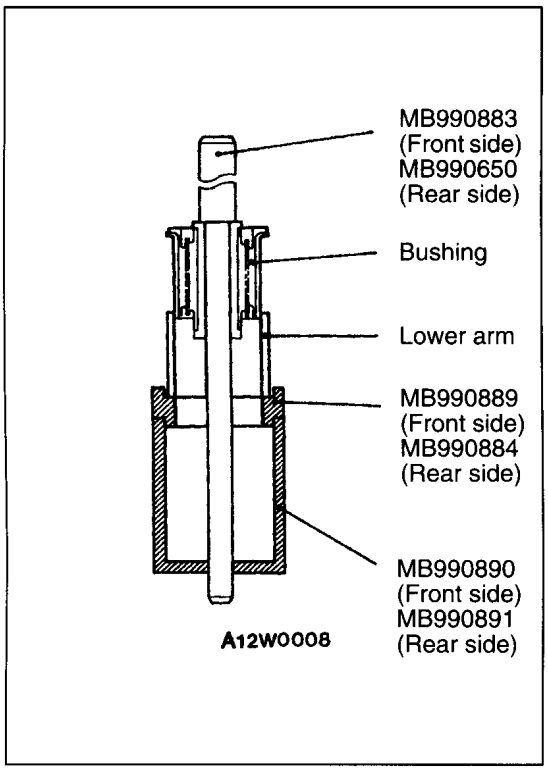
Standard value: 19.6 kN or more

(4) If the press-fitting force is less than the standard value, replace the lower arm.

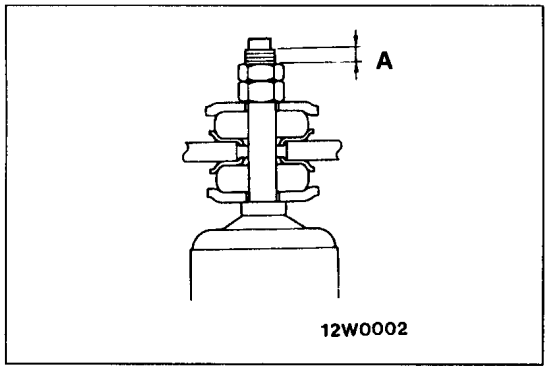


<4WD>

(1) Use the special tool to remove the bushing from the lower arm.



(2) Use the special tool to press-fit the lower arm bushing until the flange of the bushing touches the lower arm.



INSTALLATION SERVICE POINTS

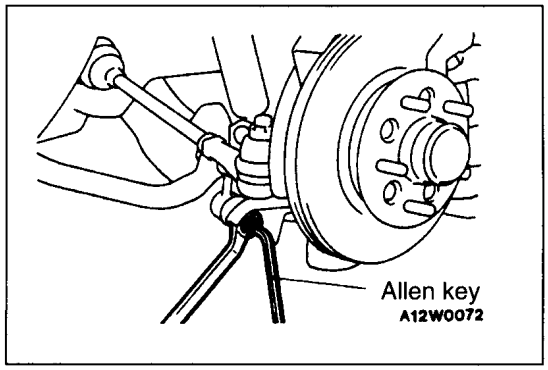
▶A◀ SHOCK ABSORBER INSTALLATION

(1) Install the shock absorber so that the distance (A) shown in the illustration is at the standard value.

Standard value (A): <2WD> 4.5 – 5.5 mm
<4WD> 6.5 – 7.5 mm

(2) Insert the shock absorber lower mounting bolt from the front of the vehicle for 2WD vehicles, and from the rear of the vehicle for 4WD vehicles.

NOTE
Never insert the bolt from the opposite side, or the bolt may touch a nearby part.



▶B◀ STABILIZER LINK INSTALLATION

Use an Allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.

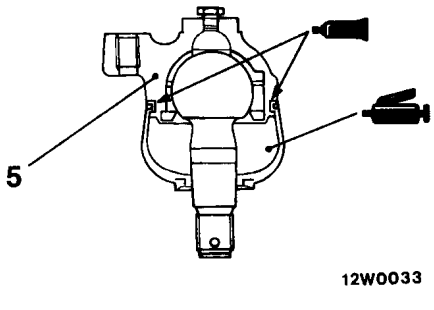
UPPER ARM

120000140

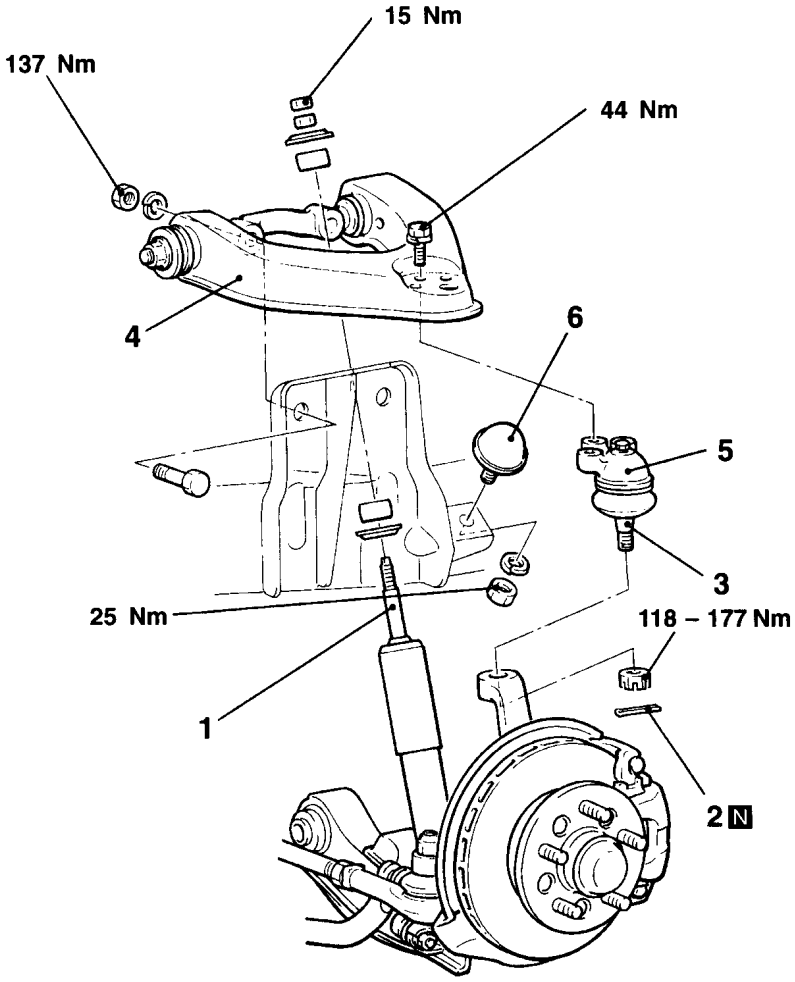
REMOVAL AND INSTALLATION

<2WD>

Pre-removal and Post-installation Operation
- Front Anchor Arm Removal and Installation (Refer to P.33A-19.)



Sealant: 3M ATD Part No.8663 or equivalent



00000476

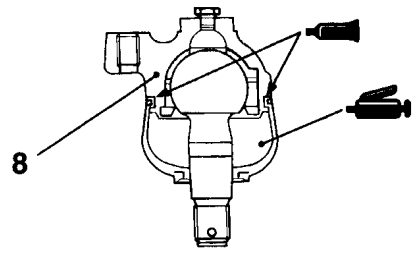
Removal steps

▶A◀ 1. Connection for shock absorber
2. Split pin
◀A▶ 3. Connection for upper arm ball joint
4. Upper arm
5. Upper arm ball joint
6. Rebound stopper

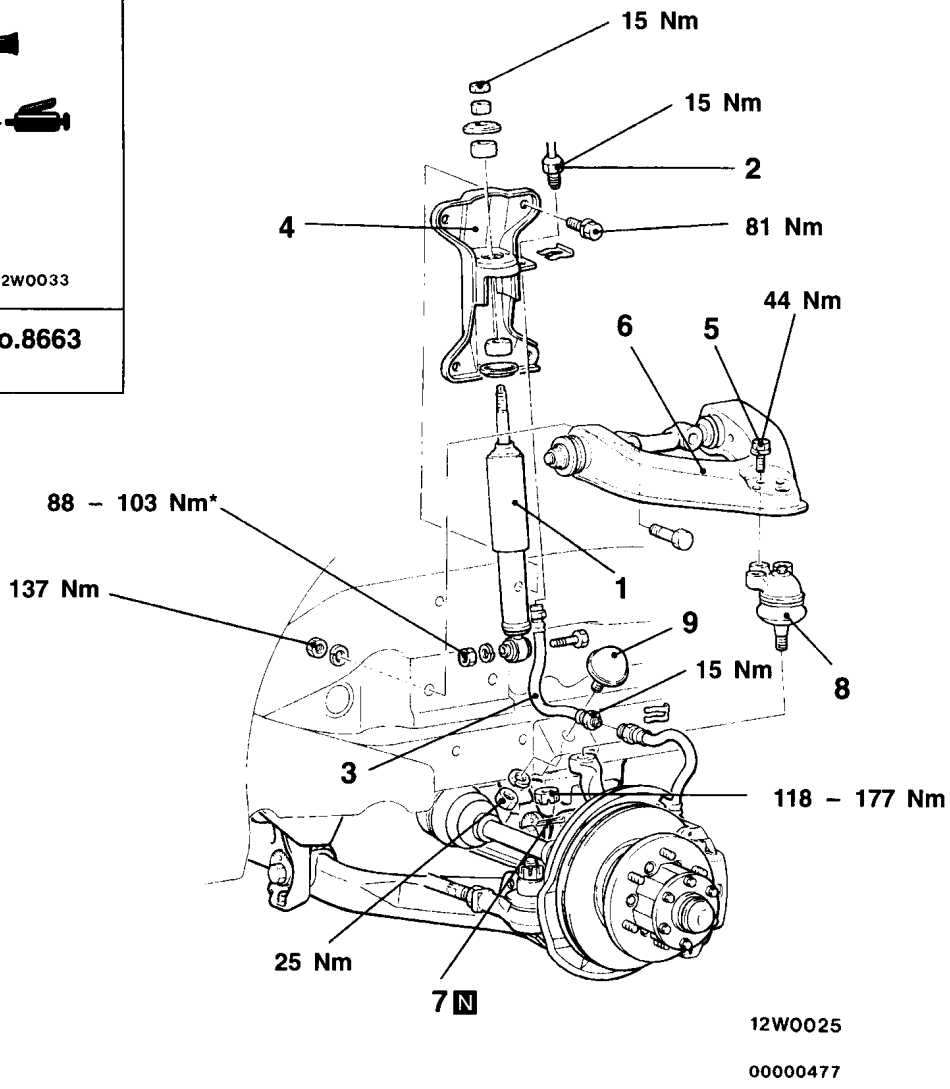
<4WD>

Pre-removal Operation
- Brake Fluid Draining
- Front Anchor Arm Removal (Refer to P.33A-19.)

Post-installation Operation
- Front Anchor Arm Installation (Refer to P.33A-19.)
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to GROUP 35A – Service Adjustment Procedures.)



Sealant: 3M ATD Part No.8663 or equivalent

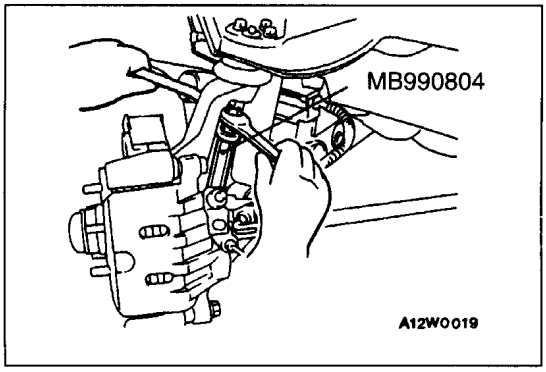


Removal steps

▶A◀ 1. Shock absorber
2. Connection for brake tube
3. Brake hose
4. Shock absorber bracket
5. Upper arm ball joint installation bolt
6. Upper arm
7. Split pin
◀B▶ 8. Upper arm ball joint
9. Rebound stopper

Caution

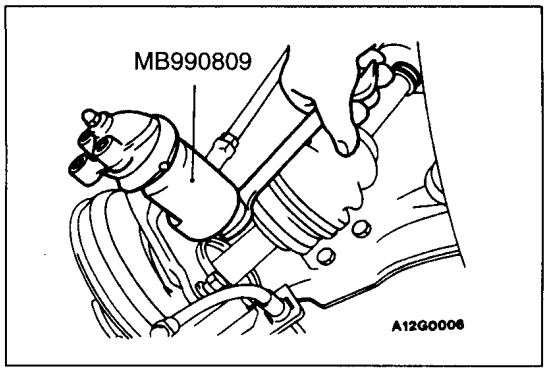
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**



REMOVAL SERVICE POINTS

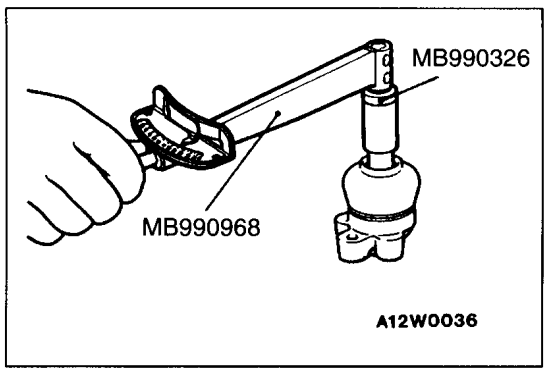
◀A▶ UPPER ARM BALL JOINT DISCONNECTION

Caution
Use the special tool to loosen the nut only; do not remove it from the ball joint.



◀B▶ UPPER ARM BALL JOINT REMOVAL

Caution
Use the special tool to loosen the nut only; do not remove it from the ball joint.



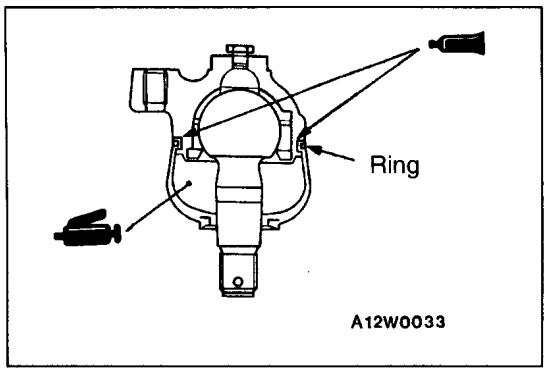
INSPECTION

UPPER ARM BALL JOINT STARTING TORQUE CHECK

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

Standard value: 0.8 – 3.4 Nm

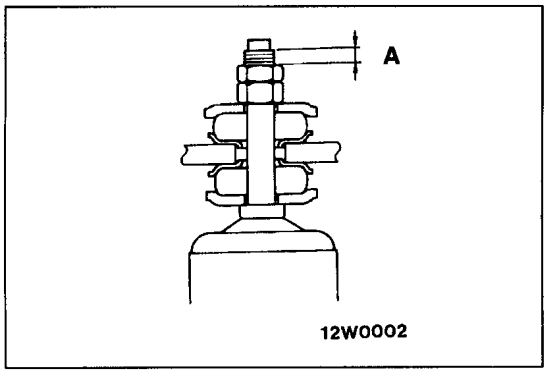
(2) If the starting torque exceeds the standard value, replace the upper arm ball joint.
(3) If the starting torque is lower than the standard value, check that the ball joint does not feel stiff. If it doesn't feel stiff, it is possible to use the ball joint.



UPPER ARM BALL JOINT DUST COVER REPLACEMENT

(1) Apply multipurpose grease to inside of the dust cover.
(2) Apply specified sealant to the groove of the ball joint, and then securely install the dust cover and ring.

Specified sealant: 3M ATD Part No.8663 or equivalent



INSTALLATION SERVICE POINT

▶A◀ SHOCK ABSORBER INSTALLATION

(1) Install the shock absorber so that the distance (A) shown in the illustration is at the standard value.

Standard value (A): <2WD> 4.5 – 5.5 mm
<4WD> 6.5 – 7.5 mm

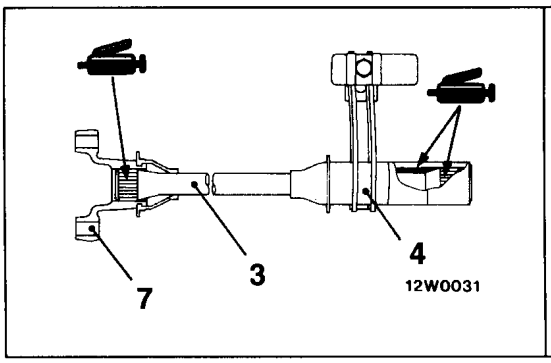
(2) Insert the shock absorber lower mounting bolt from the rear of the vehicle. <4WD>

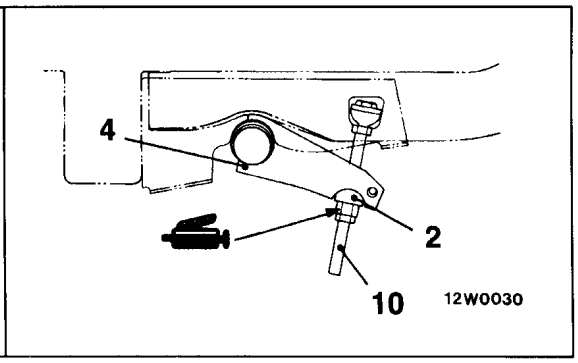
NOTE
Never insert the bolt from the opposite side, or the bolt may touch a nearby part.

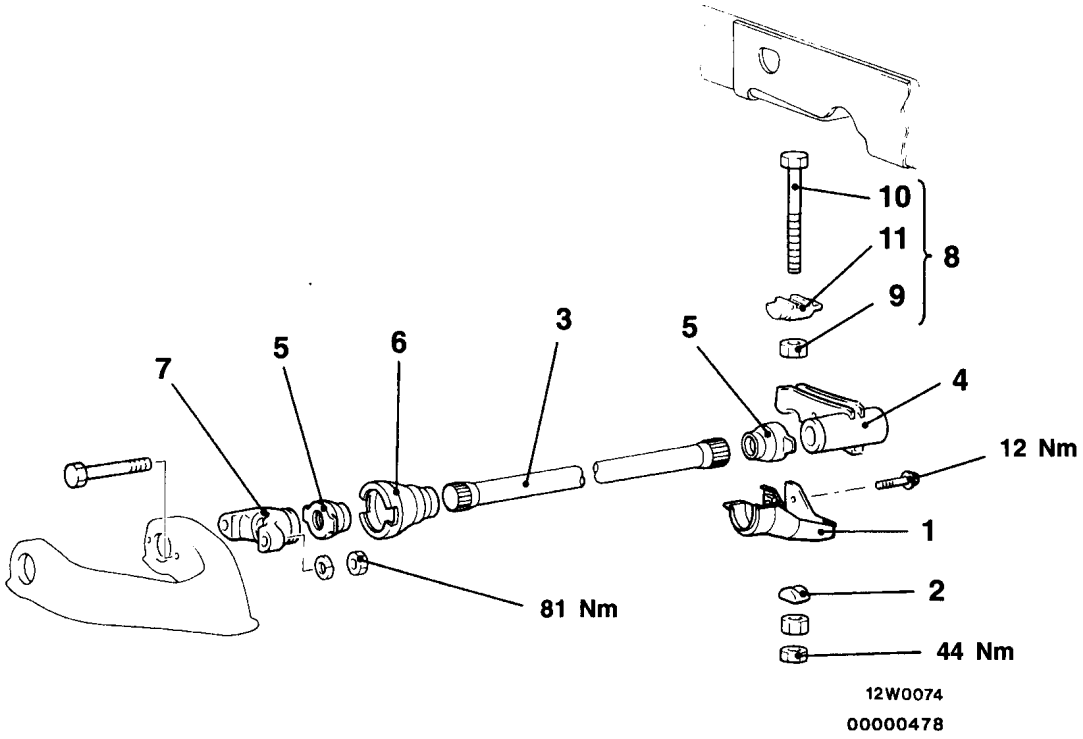
TORSION BAR

120002184

REMOVAL AND INSTALLATION

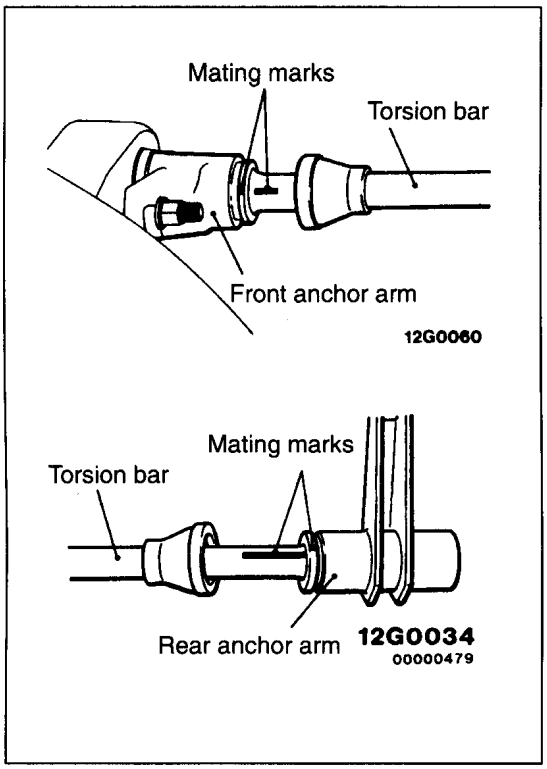






Removal steps

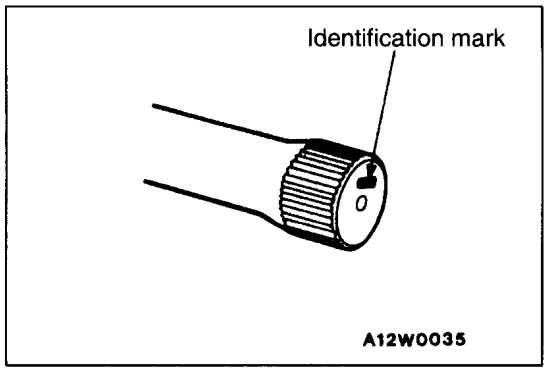
1. Heat protector (right hand only) <4WD – Petrol-powered vehicles>
2. Seat (A)
◀A▶ ▶A◀ 3. Torsion bar
4. Rear anchor arm
5. Dust cover
6. Heat cover <4WD>
7. Front anchor arm
8. Anchor bolt assembly
9. Nut
10. Anchor bolt
11. Seat (B)



REMOVAL SERVICE POINT

◀A▶ TORSION BAR REMOVAL

Slide the dust covers while being careful not to damage the dust cover lips. Then place a mating mark on the front anchor arm and torsion bar, and on the rear anchor arm and torsion bar.



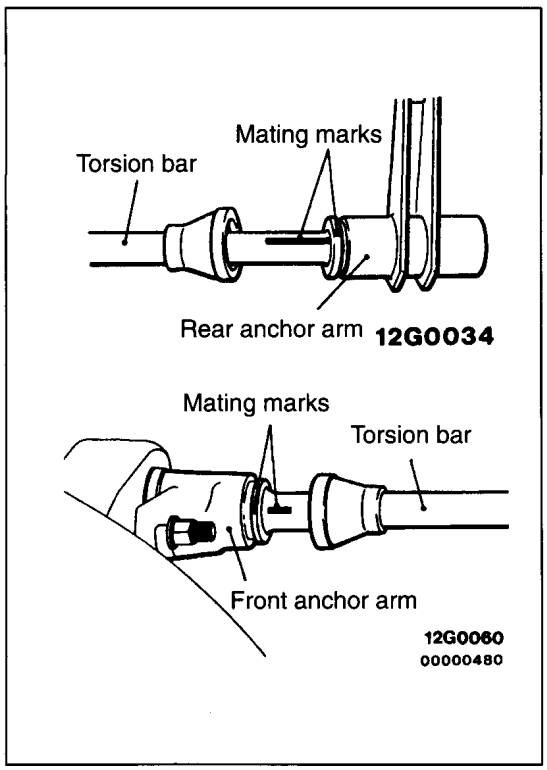
INSTALLATION SERVICE POINT

▶A◀ TORSION BAR INSTALLATION

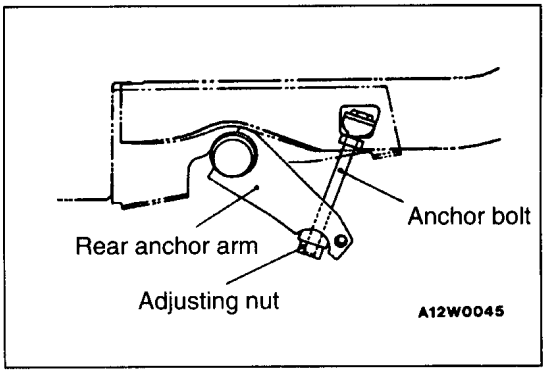
(1) Check the identification marks on the ends of both the left and right torsion bars.

R: Right end
L: Left end

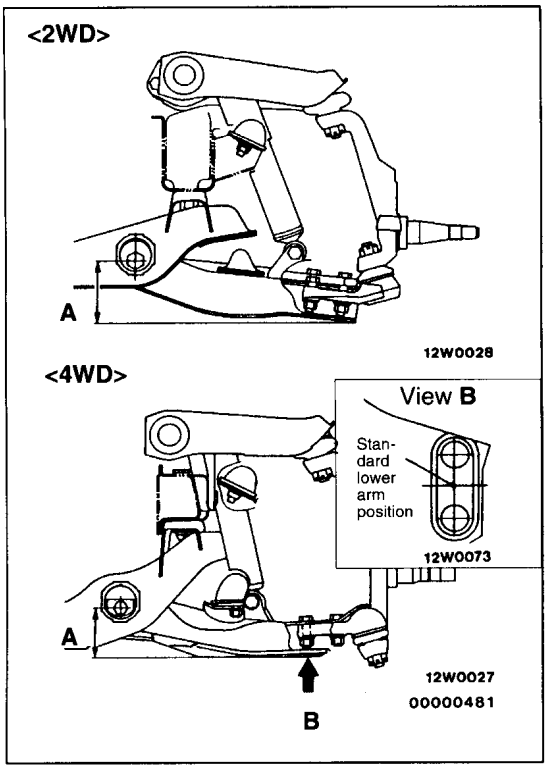
(2) Install the torsion bars so that the ends with the identification marks are facing towards the rear of the vehicle.



(3) To reuse the torsion bars, align the mating marks on the front anchor arm and torsion bar, and on the rear anchor arm and torsion bar.



(4) To replace the torsion bars, put the upper arm against the re-bound stopper. Then install the rear anchor arm to the torsion bar so that the end of the anchor bolt is flush with the end of the adjusting nut.



(5) Place the vehicle on the ground in the unladen condition. Then tighten the adjusting nut until the distance from the centre of the lower arm mounting bolt to the base of the lower arm is at the standard value.

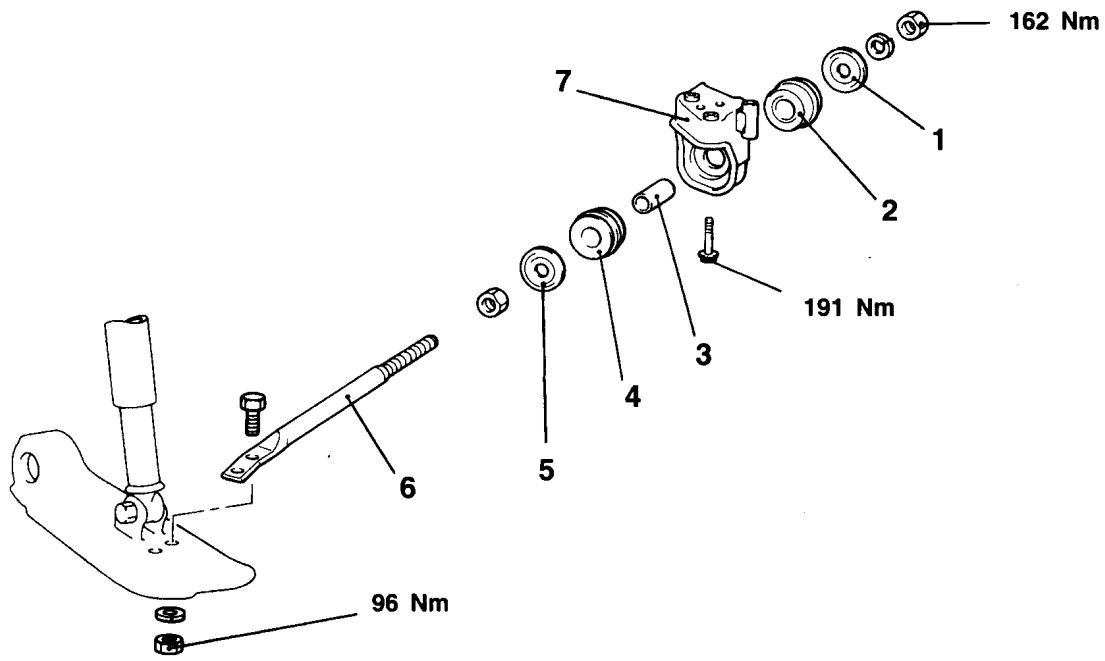
Standard value (A): <2WD> 94.5 mm
<4WD> 77 mm

STRUT BAR <2WD>

120000142

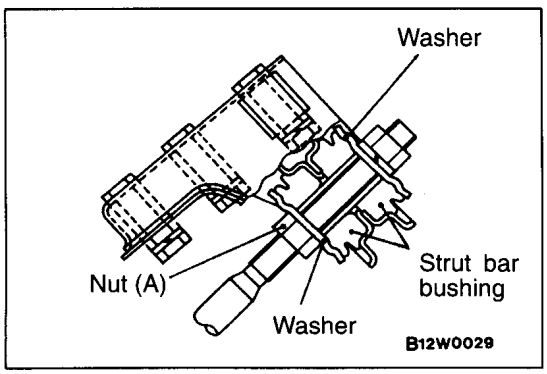
REMOVAL AND INSTALLATION

Post-Installation Operation
- Wheel Alignment Adjustment (Refer to P.33A-7.)



Removal steps

▶A◀ 1. Washer
▶A◀ 2. Strut bar bushing
3. Collar
▶A◀ 4. Strut bar bushing
▶A◀ 5. Washer
6. Strut bar
7. Strut bar bracket



INSTALLATION SERVICE POINT

▶A◀ WASHER/STRUT BAR BUSHING INSTALLATION

Install the washers and strut bar bushings as shown in the illustration.

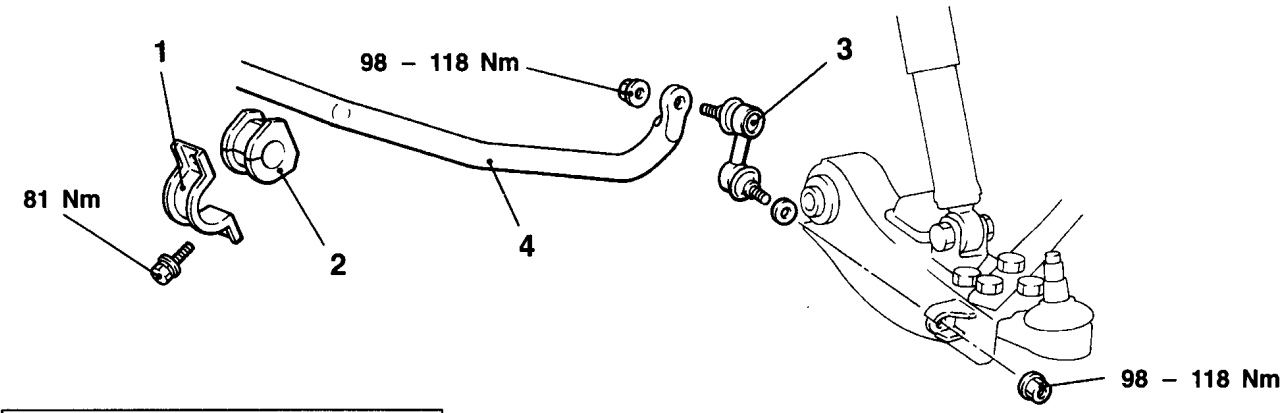
NOTE
The thread of the strut bar at nut (A) is crimped to prevent the nut from turning. When removing and installing the strut bar, its crimping will be destroyed but it can still be reused.

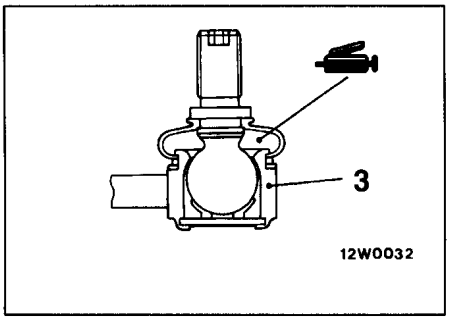
STABILIZER BAR

120000143

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)

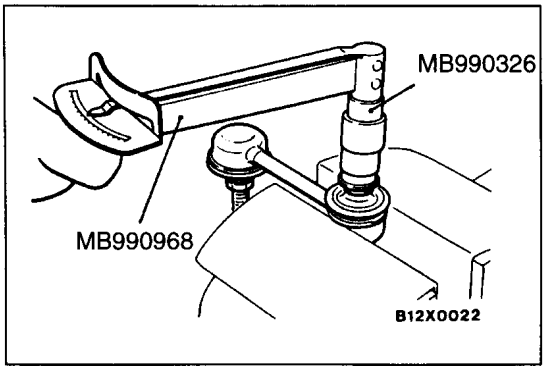




00000482

Removal steps

▶A◀ 1. Clamp
▶A◀ 2. Bushing
▶B◀ 3. Stabilizer link
▶A◀ 4. Stabilizer bar



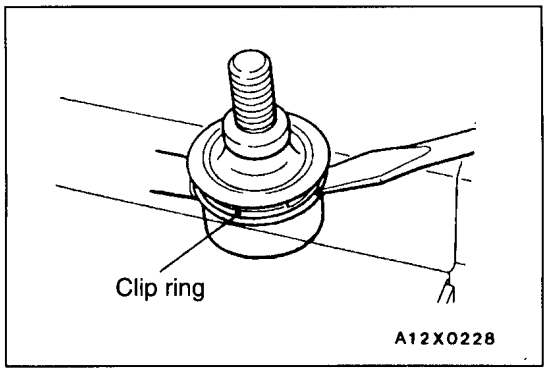
INSPECTION

STABILIZER LINK BALL JOINT ROTATION TORQUE INSPECTION

(1) Shake the stabilizer link ball joint stud several times before installing the nut to the stud. Then use the special tool to measure the rotation torque of the stabilizer link ball joint.

Standard value: 0.7 – 2.0 Nm

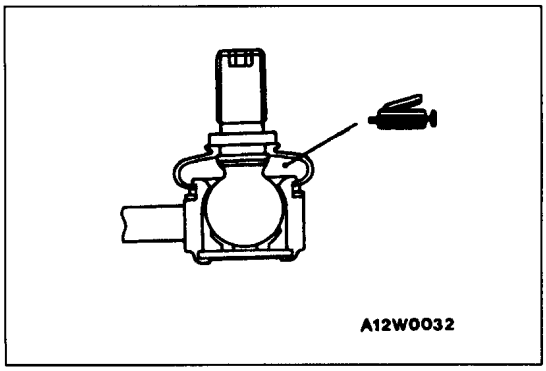
(2) If the rotation torque exceeds the standard value, replace the stabilizer link.
(3) If the rotation torque is lower than the standard value, check that the ball joint does not feel stiff. If it doesn't feel stiff, it is possible to use the ball joint.



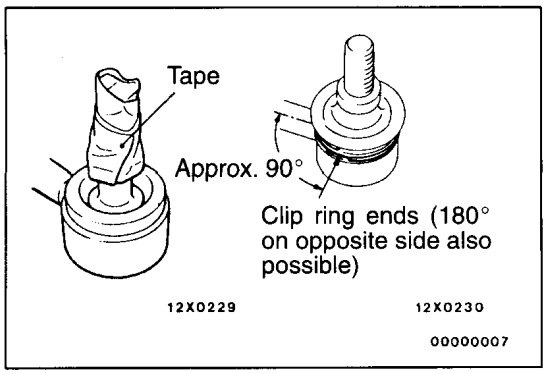
STABILIZER LINK DUST COVER REPLACEMENT

(1) Remove the clip ring and the dust cover.

Caution
Do not damage the dust cover.

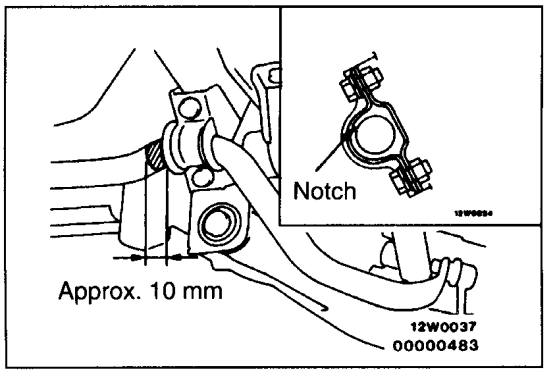


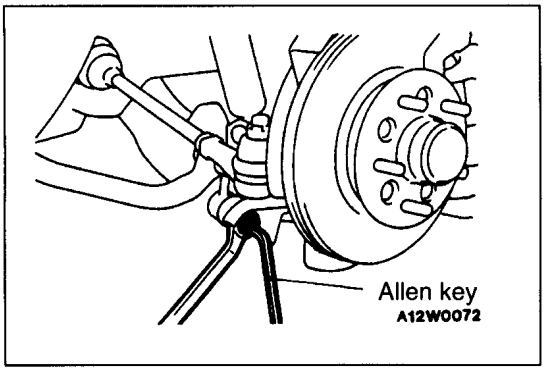
(2) Apply multipurpose grease to inside of the dust cover.



(3) Use vinyl tape to tape the stabilizer link where shown in the illustration, and then install the dust cover to the stabilizer link.
(4) Secure the dust cover by the clip ring.

NOTE
When installing the clip ring, align it so that its ends are located at a 90° angle from the axis of the stabilizer link.





INSTALLATION SERVICE POINTS

▶A◀ STABILIZER BAR/BUSHING/CLAMP INSTALLATION

(1) Position the stabilizer bar so that the identification colour is at the left and so that the notch in the bushing is facing upwards.
(2) Position the stabilizer bar so that the link mounting hole is above the lower arm.
(3) Install the clamp so that the identification colour on the stabilizer bar protrudes from the bushing by the amount shown in the illustration, and then tighten the clamp to the specified torque.

▶B◀ STABILIZER LINK INSTALLATION

Use an Allen key to tighten the nut while making sure that the stud on the stabilizer link does not turn as well.

REAR SUSPENSION

CONTENTS

120002524

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SERVICE SPECIFICATIONS 4
SPECIAL TOOLS 4
SERVICE ADJUSTMENT PROCEDURES 5
Rear Wheel Alignment 5
REAR SUSPENSION ASSEMBLY <LEAF SPRING TYPE> 6
REAR SUSPENSION ASSEMBLY <COIL SPRING TYPE> 9
STABILIZER BAR <COIL SPRING TYPE> .. 11

GENERAL INFORMATION

120002187

The rear suspension is the 5-link coil spring type axle suspension, which assures comfortable ride and outstanding steering stability or the leaf spring type axle suspension, which features outstanding strength.

LEAF SPRING

Items	PA3V, PA5V	PB3V, PB5V	PD4V, PD5V
Number of leaf springs	3	4	3
Straight span mm	1,200	1,200	1,200
Spring constant N/mm	35.4–75.0	40.6–96.9	35.8–80.6

COIL SPRING

Items	PA3W, PA5W	PA4W	PD4W, PD5W
Wire dia. × O.D. × free length mm	14.5–16.8 × 140.5 –142.8 × 322.5	14.0–16.5 × 140.0 –142.5 × 338.5	16.8 × 142.8 × 366.5
Spring constant N/mm	40.2–92.0	36.9–84.4	37.9–86.7
Identification colour	Brown × 2	Green × 2	Green

SHOCK ABSORBER

<LEAF SPRING TYPE>

Items		2WD	4WD
Stroke mm		170	226
Damping force (at 0.3 m/sec.)	Expansion N	1,177	1,177
	Contraction N	539	539

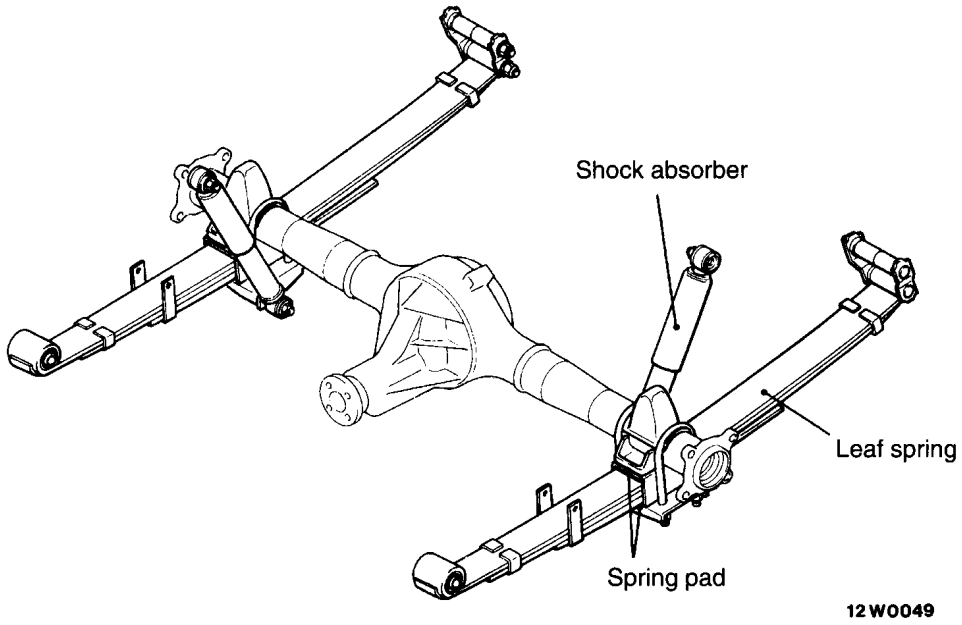
<COIL SPRING TYPE>

Items		2WD	4WD
Stroke mm		191	226
Damping force (at 0.3 m/sec.)	Expansion N	1,177	1,177
	Contraction N	539	539

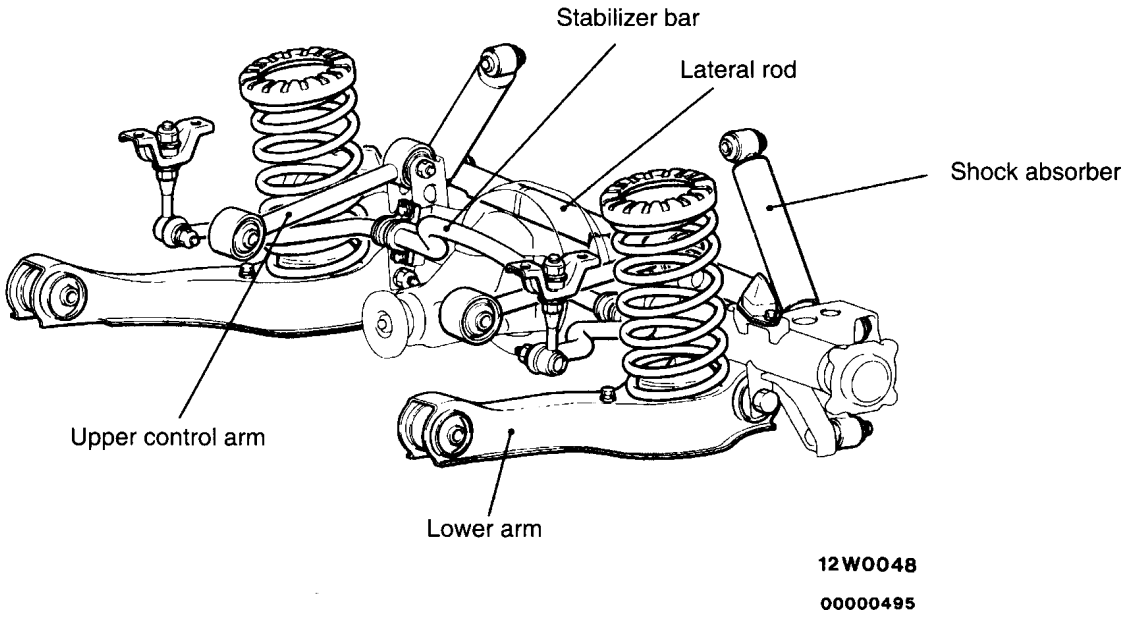
CONSTRUCTION DIAGRAM

120000146

<LEAF SPRING TYPE>



<COIL SPRING TYPE>



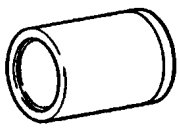
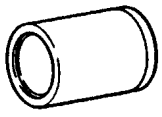
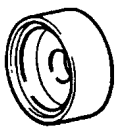
SERVICE SPECIFICATIONS

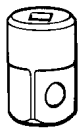
120002189

Items	Standard value
Toe-in mm	0
Camber	0°
Protruding length of shock absorber piston rod mm	1–2
Rotation torque for stabilizer link ball joint Nm	0.7–2.0
Protrusion amount of stabilizer link stud mm	3.8–5.8
Press-fitting force for lower arm bushing kN	14.7 or more

SPECIAL TOOLS

120000148

Tool	Number	Name	Use
	MB990650	Bar	• Removal and press-fitting of lateral rod bushing • Removal and press-fitting of lower arm bushing
	MB990891	Base	Removal of lower arm bushing
	MB990887	Ring	
	MB991526	Installer guide	
	MB991523	Remover base	Press-fitting of lower arm bushing
	MB991525	Installer base	

Tool	Number	Name	Use
	MB991558	Bushing remover and installer support	Removal and press-fitting of lower arm bushing
	MB990968	Torque wrench	Measurement of rotation torque of stabilizer link ball joint
	MB990326	Preload socket	

SERVICE ADJUSTMENT PROCEDURES

120000149

REAR WHEEL ALIGNMENT

The rear suspension assembly must be free of worn, loose or damaged parts prior to measurement of rear wheel alignment.

Standard value:
Toe-in 0 mm
Camber 0°

NOTE
Toe-in and camber are set at the factory and cannot be adjusted.

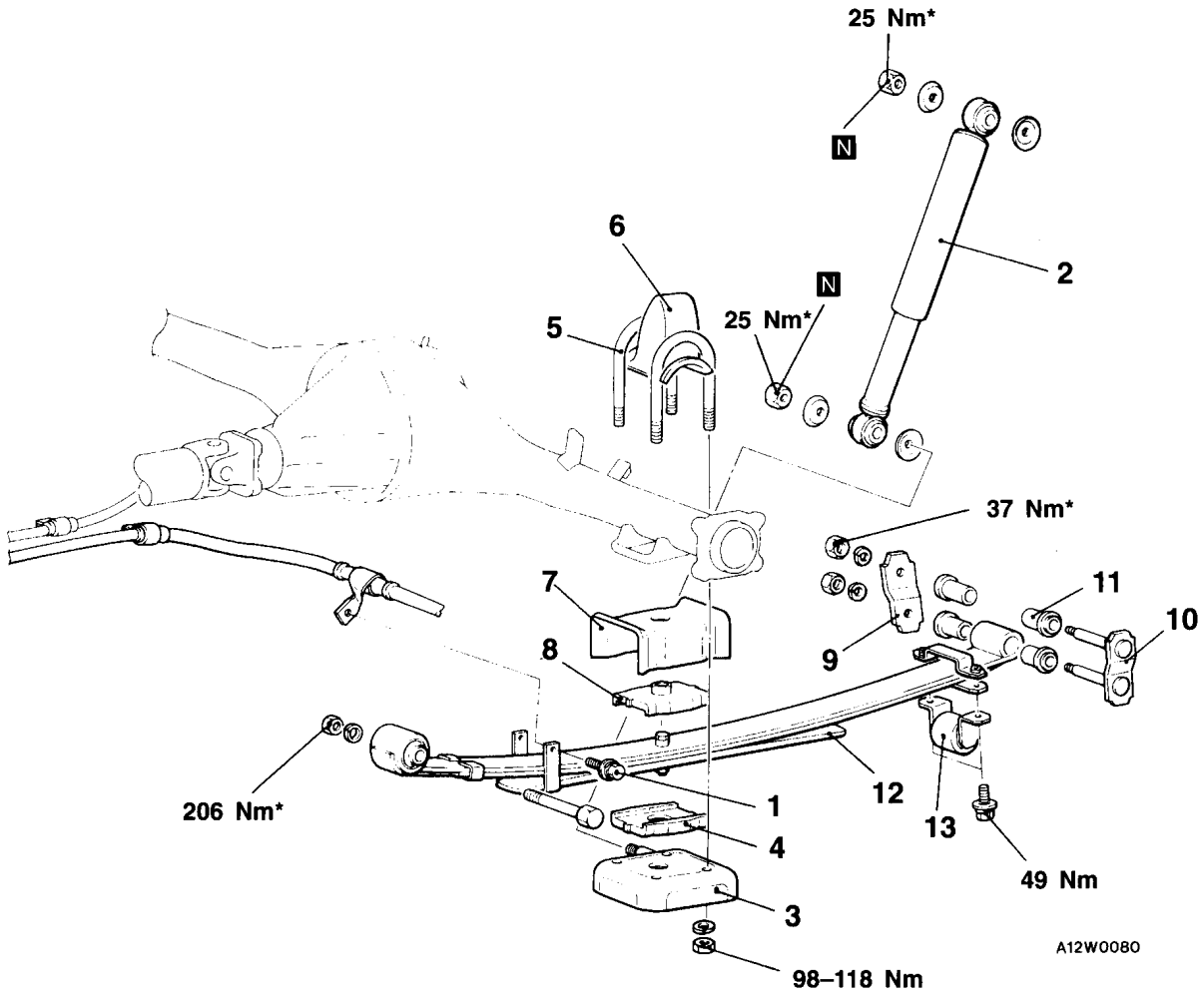
REAR SUSPENSION ASSEMBLY <LEAF SPRING TYPE>

120002188

REMOVAL AND INSTALLATION

<2WD>

Pre-removal Operation
- Support the axle housing with a jack.



Removal steps

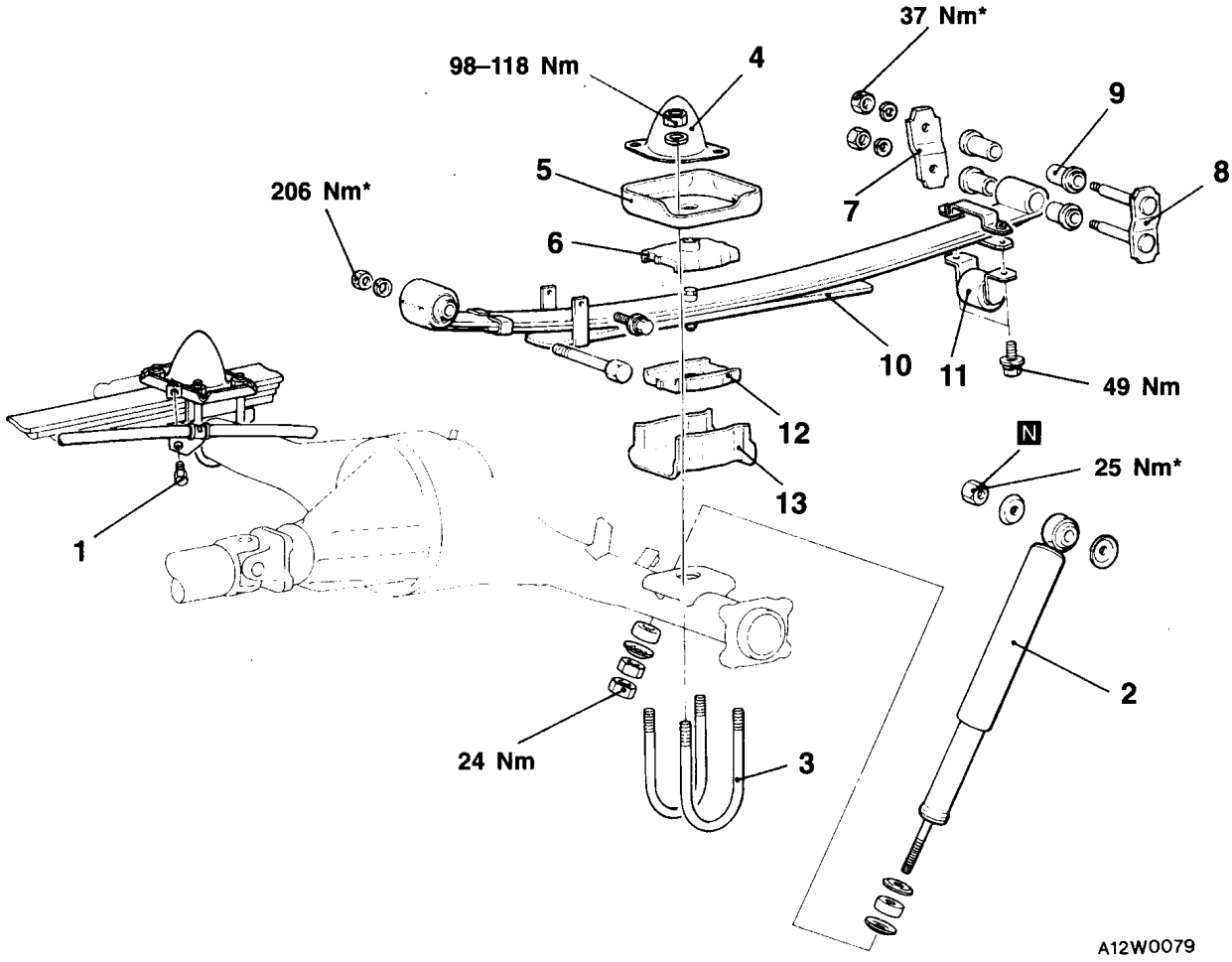
1. Parking brake cable attaching bolt
2. Shock absorber
3. U-bolt seat
4. Spring pad
▶B◀ 5. U-bolts
6. Bump stopper
7. Clamp
8. Spring pad
9. Shackle plate
10. Shackle assembly
11. Rubber bushings
12. Rear spring
13. Leaf damper

Caution

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

<4WD>

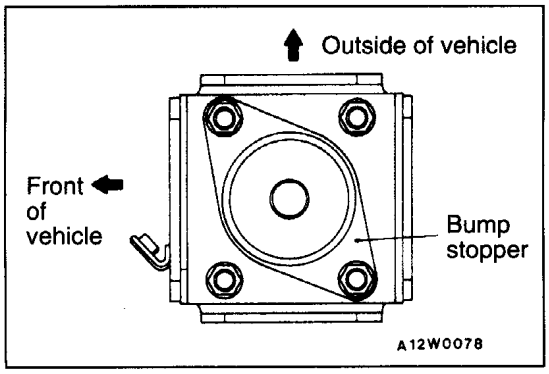
Pre-removal Operation
- Support the axle housing with a jack.



Removal steps

1. Parking brake cable attaching bolt
▶C◀ 2. Shock absorber
▶B◀ 3. U-bolts
▶A◀ 4. Bump stopper
5. U-bolt seat
6. Spring pad
7. Shackle plate
8. Shackle assembly
9. Rubber bushings
10. Rear spring
11. Leaf damper
12. Spring pad
13. Clamp

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

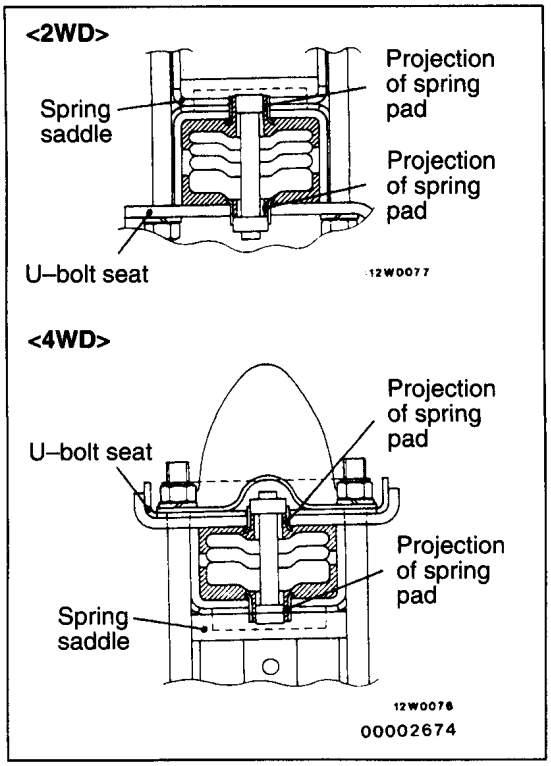


INSTALLATION SERVICE POINTS

▶A◀ BUMP STOPPER INSTALLATION

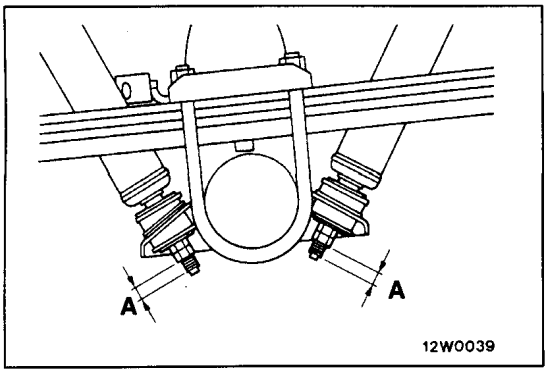
Install the bump stopper as shown in the figure.

NOTE
The illustration indicates the right side. The left side is symmetrical.



▶B◀ U–BOLTS INSTALLATION

Insert the projections on each spring pad securely into the spring saddle and U–bolt seat hole.



▶C◀ SHOCK ABSORBER INSTALLATION

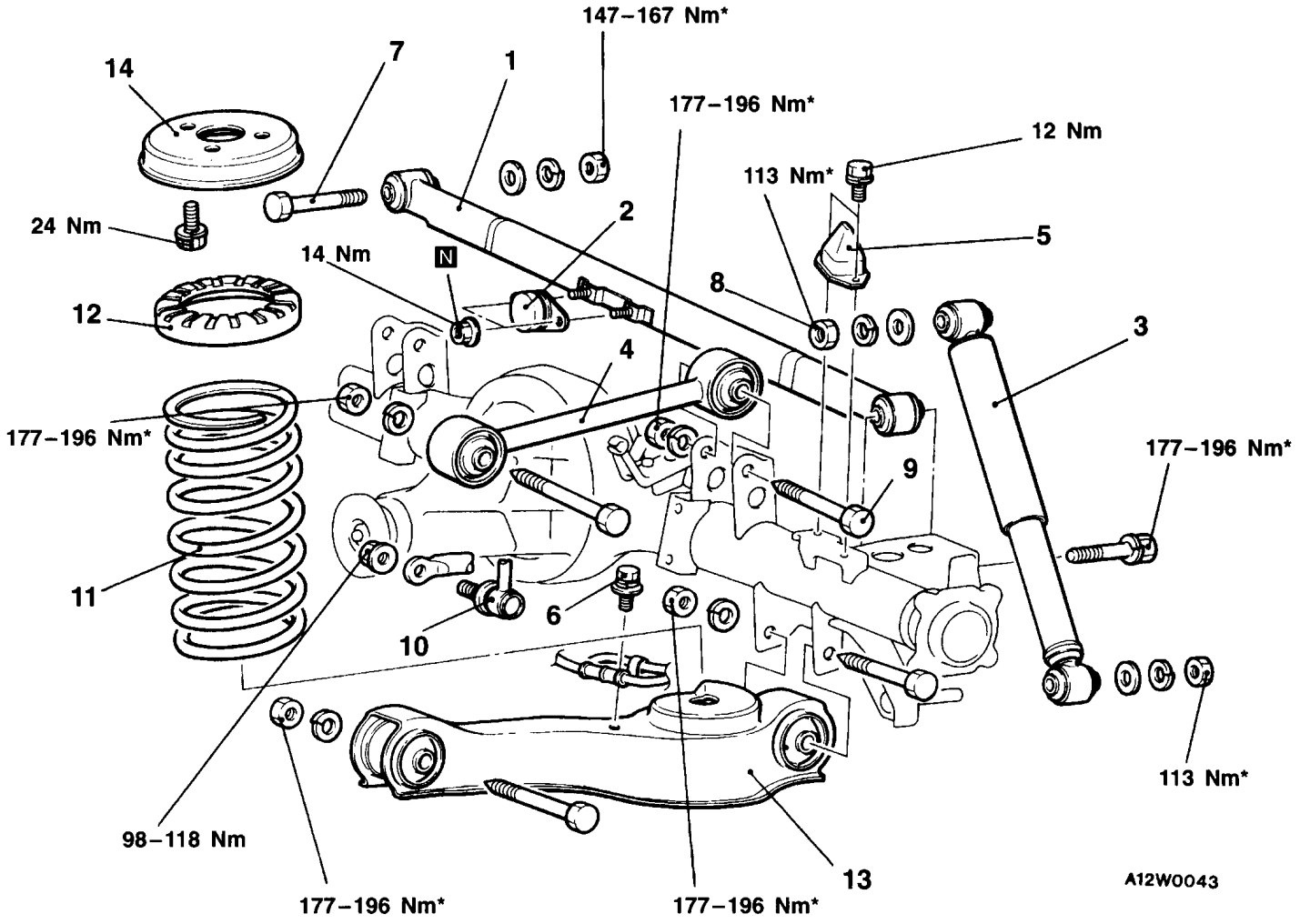
Standard value (A): 1–2 mm

REAR SUSPENSION ASSEMBLY <COIL SPRING TYPE>

120000151

REMOVAL AND INSTALLATION

Pre-removal Operation
- Support the axle housing with a jack.



Removal steps

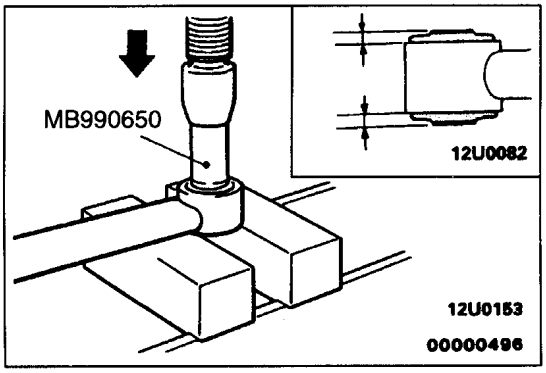
1. Lateral rod
2. Dynamic damper
3. Shock absorber
4. Upper control arm
5. Bump stopper

Rear spring and lower arm removal steps

6. Parking brake cable attaching bolt
7. Lateral rod mounting bolt (body side)
8. Shock absorber mounting bolt (body side)
9. Upper control arm mounting bolt (axle housing side)
10. Connection for stabilizer link
11. Rear spring
12. Rear spring pad
13. Lower arm
14. Rear spring support bracket

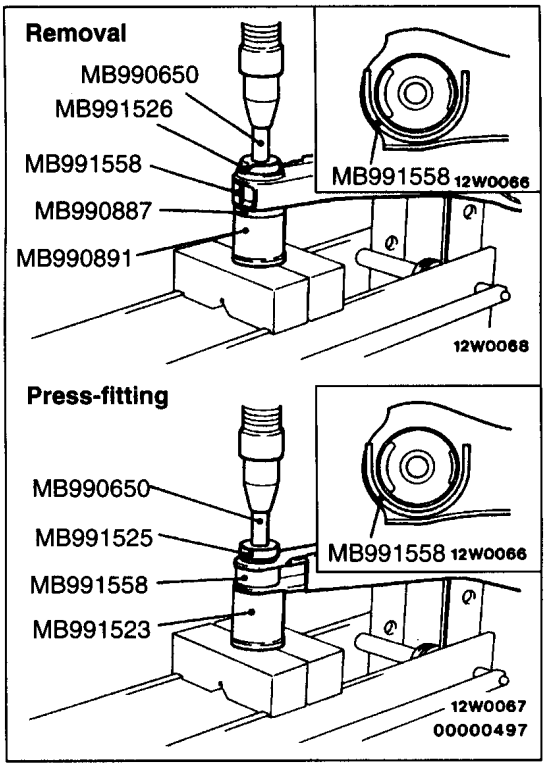
Caution

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**



LATERAL ROD BUSHING REPLACEMENT

(1) Use the special tool to drive out and press in the lateral rod bushing.
(2) Install the bushing so that the projection length is uniform.



LOWER ARM BUSHING REPLACEMENT

(1) Use the special tool to drive out and press-fit the lower arm bushing.

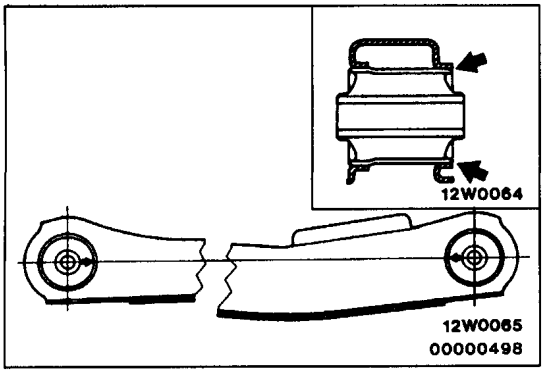
NOTE
If the special tool (MB991558) is hard to install, tap it with a plastic hammer.

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.

(2) Check that the press-fitting force is at the standard value while press-fitting the bushing.

Standard value:14.7 kN or more

(3) If the press-fitting force is less than the standard value, replace the lower arm.

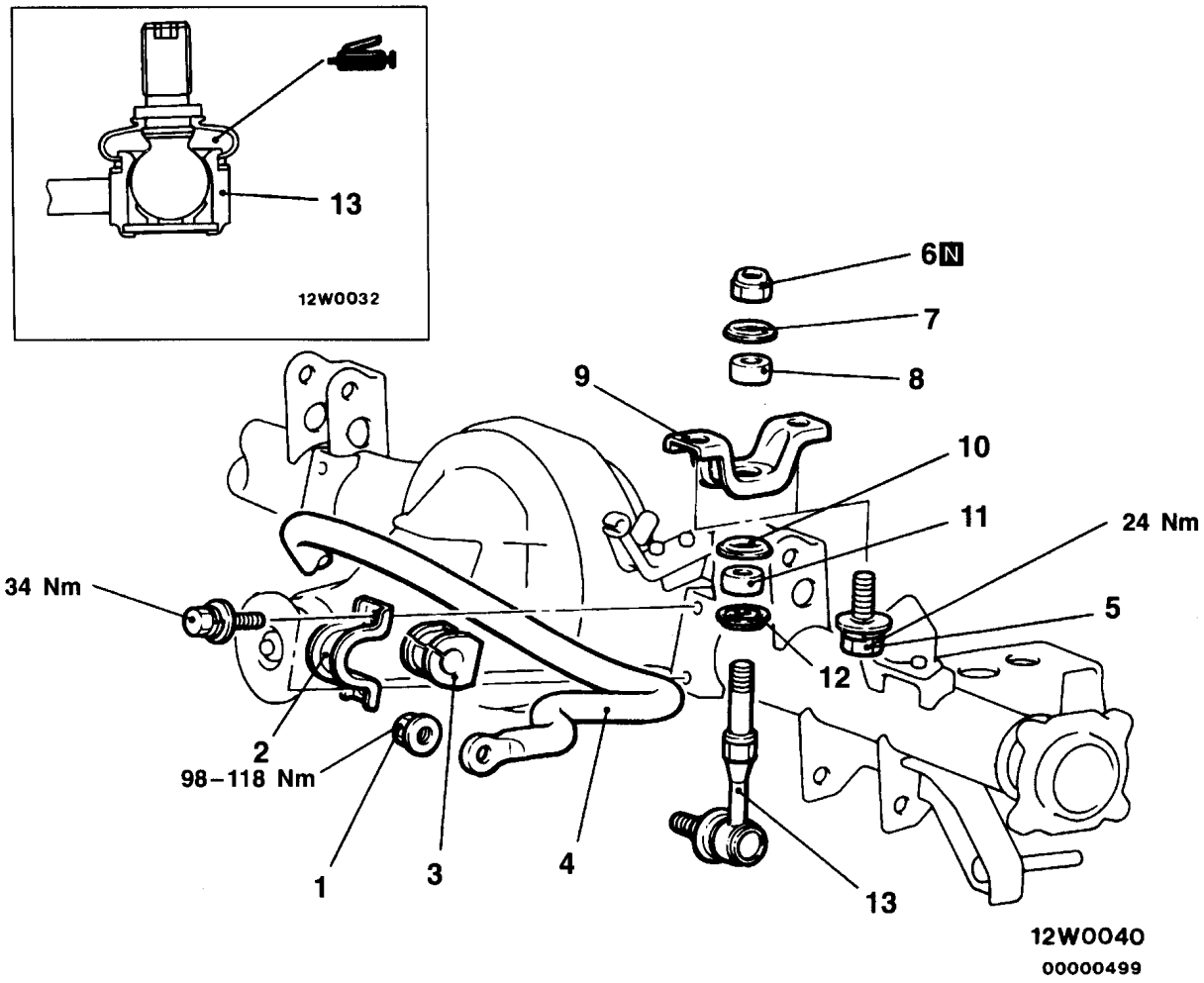


(4) Install so that the sections of the lower arm bushing and lower arm shown in the illustration are flush.
(5) Install the lower arm bushing so that the arrow marks point as shown in the illustration.

STABILIZER BAR <COIL SPRING TYPE>

120000152

REMOVAL AND INSTALLATION



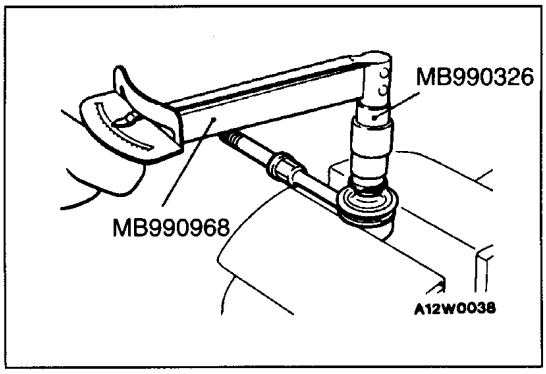
Stabilizer bar removal steps

1. Flange nut
2. Clamp
3. Bushing
4. Stabilizer bar

Stabilizer link removal steps

1. Flange nut
5. Stabilizer link bracket mounting bolt
6. Self-locking nut
7. Joint cup (A)
8. Stabilizer rubber
9. Stabilizer link bracket
10. Joint cup (B)
11. Stabilizer rubber
12. Joint cup (A)

▶A◀ 13. Stabilizer link



INSPECTION

STABILIZER LINK BALL JOINT ROTATION TORQUE INSPECTION

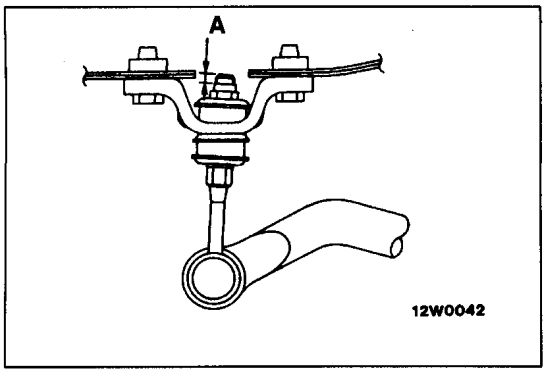
(1) Move the stabilizer link ball joint stud several times before installing the nut to the stud. Then use the special tool to measure the rotation torque of the stabilizer link ball joint.

Standard value: 0.7–2.0 Nm

(2) If the rotation torque exceeds the standard value, replace the stabilizer link.
(3) If the rotation torque is lower than the standard value, check whether the ball joint moves smoothly or not. If it doesn't move smoothly, it is possible to use the ball joint.

STABILIZER LINK DUST COVER REPLACEMENT

Refer to GROUP 33A – Stabilizer Bar.



INSTALLATION SERVICE POINT

▶A◀ STABILIZER LINK INSTALLATION

Install the stabilizer link so that the stud protrusion is at the standard value.

Standard value (A): 3.8–5.8 mm

Caution
There should not be any twisting in the stabilizer bar and stabilizer link when the vehicle is on the ground and in the unladen condition.

SERVICE BRAKES

CONTENTS

120000044

BASIC BRAKE SYSTEM 35A

ANTI-SKID BRAKING SYSTEM (ABS) <2WD> 35B

ANTI-SKID BRAKING SYSTEM (ABS) <4WD> 35C

NOTES

BASIC BRAKE SYSTEM

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120002234

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SEALANTS 5

SPECIAL TOOLS 5

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- Bleeding 11
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- Brake Lining Thickness Check <Vehicles with Rear Disc Brake> 19
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- Brake Lining and Brake Drum Connection Check <Vehicles with Rear Disc Brake> 20

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FRONT DISC BRAKE <DUAL PISTON TYPE> 36

REAR DISC BRAKE 41

REAR DRUM BRAKE <2WD> 45

REAR DRUM BRAKE <4WD> 49

GENERAL INFORMATION

120002235

The brake system has high reliability and durability which maintains excellent braking performance and brake feeling. The main features are as follows.

- A dual type master cylinder is equipped in all models.
- Both a single type and a tandem type brake booster have been adopted.
- The following types of front brake have been adopted.
  Floating caliper, double-piston, ventilated disc brakes (V4-W43, V5-W43) or floating caliper, single-piston, ventilated disc brakes (V4-S60, V5-S60).
- Both disc brakes and drum brakes have been adopted as the rear brakes.
  Floating caliper, single-piston, solid disc brakes (S5-S38) or leading-trailing type drum brakes.

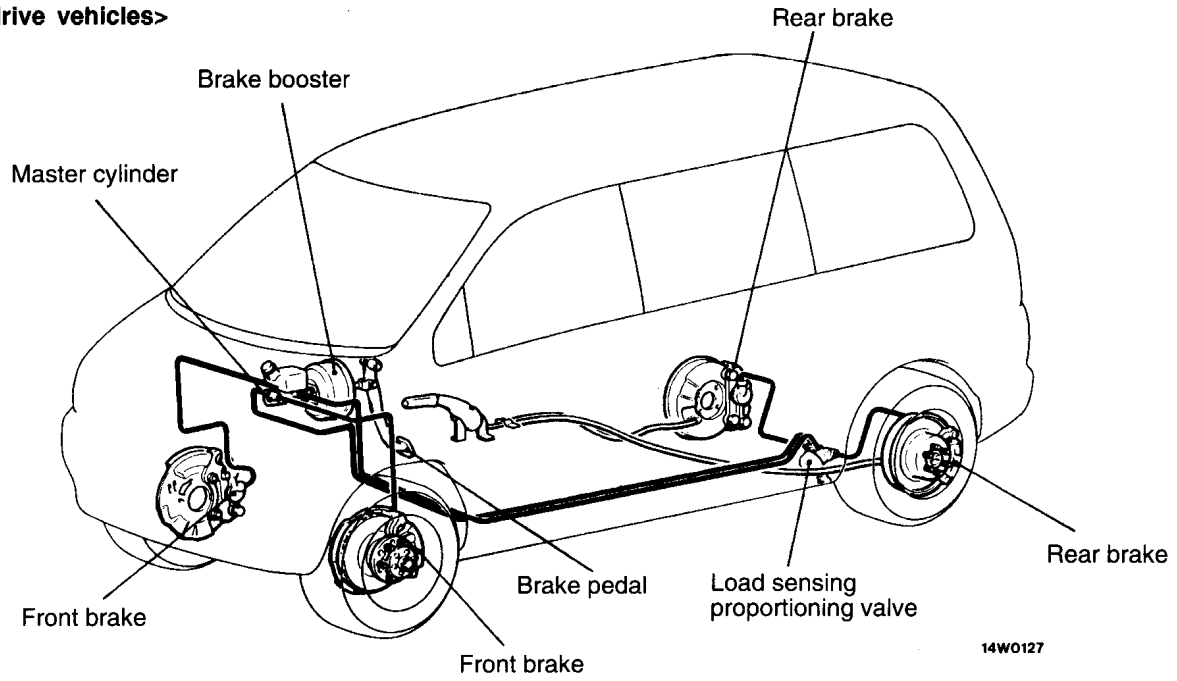
Items	2WD Wagon	2WD Panel van and window van <Standard wheelbase>	2WD Panel van and window van <Long wheelbase>	4WD Wagon	4WD Panel van and window van
Master cylinder I.D. mm	23.8	23.8	23.8	23.8	23.8
Brake booster effective dia. of power cylinder mm	205 + 230	230 or 205 + 230*2	205 + 230	205 + 230	205 + 230
Brake booster boosting ratio	6.5 <Petrol-powered vehicles> 7.0 <Diesel-powered vehicles>	4.5 or 6.5*2 <Petrol-powered vehicles> 5.5 or 7.0*2 <Diesel-powered vehicles>	6.5 <Petrol-powered vehicles> 7.0 <Diesel-powered vehicles>	6.5 <Petrol-powered vehicles> 7.0 <Diesel-powered vehicles>	6.5 <Petrol-powered vehicles> 7.0 <Diesel-powered vehicles>
Load sensing proportioning valve decompression ratio	0.15	0.15	0.15	0.15	0.15
Front brakes disc effective dia. mm	200	200	200	228	228
Front brakes wheel cylinder I.D. mm	60.3 or 42.9*1	60.3 or 42.9*1	42.9	42.9	42.9
Rear disc brakes disc effective dia. mm	–	–	–	272	–
Rear disc brakes wheel cylinder I.D. mm	–	–	–	38.1	–
Rear drum brakes drum I.D. mm	254	254	270	–	270
Rear drum brakes wheel cylinder I.D. mm	22.2	22.2	23.8	–	22.2
Rear drum brakes lining thickness mm	4.6	4.6	4.6	–	4.6

NOTE
*1 : Vehicles with 4G64, 4D56 engines and ABS.
*2 : Vehicles with ABS.

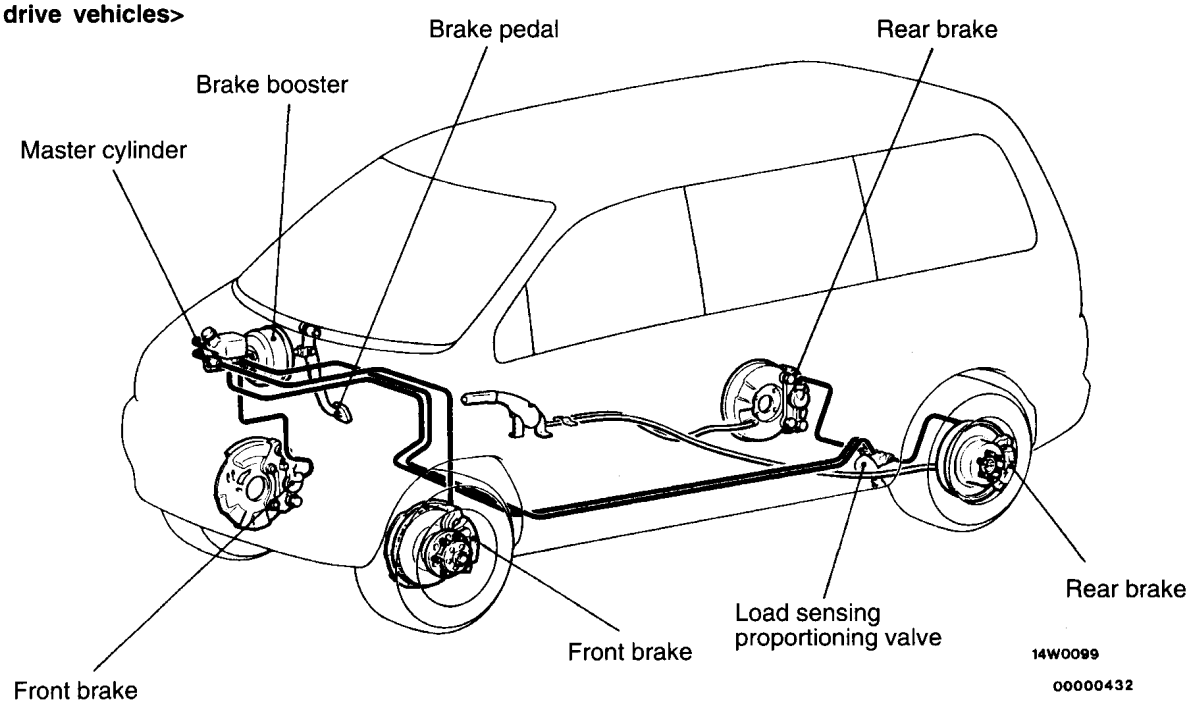
CONSTRUCTION DIAGRAM

120000047

<L.H. drive vehicles>



<R.H. drive vehicles>



SERVICE SPECIFICATIONS

120002236

Items			Standard value	Limit
Brake pedal height mm		L.H. drive vehicles	144–149	–
		R.H. drive vehicles	153–158	–
Brake pedal free play mm			3–8	–
Brake pedal to floor board clearance mm		2WD, 4WD Panel van and window van	85 or more	–
		4WD Wagon	75 or more	–
Load sensing proportioning valve output pressure kPa (Input pressure kPa)	2WD Panel van and window van	When load sensing spring length is 200.0 mm (when unladen)	2,626–3,410 (5,884)	–
			3,234–4,606 (11,760)	–
		When load sensing spring length is 235.5 mm (when laden)	8,526–10,080 (11,760)	–
	4WD Panel van and window van	When load sensing spring length is 200.0 mm (when unladen)	3,528–3,469 (5,884)	–
			3,234–4,606 (11,760)	–
		When load sensing spring length is 235.5 mm (when laden)	6,076–7,448 (11,760)	–
	Wagon	When load sensing spring length is 200.0 mm (when unladen)	3,528–4,508 (5,884)	–
			4,214–5,586 (11,760)	–
		When load sensing spring length is 218.0 mm (when laden)	7,840–9,408 (11,760)	–
Load sensing spring length <Distance between spring ends> mm			198–202	–
Booster push rod to master cylinder piston clearance mm		Diesel-powered vehicles	1.00–1.40	–
		Single brake booster <Petrol-powered vehicles>	0.65–1.05	–
		Tandem brake booster <Petrol-powered vehicles>	0.70–1.20	–
Front disc brake pad thickness mm			10	2.0
Front brake disc thickness mm			24	22.4
Front brake disc runout mm			–	0.07
Front disc brake drag force (tangential force of wheel mounting bolts) N			69 or less	–
Rear disc brake pad thickness mm			9.0	2.0
Rear brake disc thickness mm			18	16.4
Rear brake disc runout mm			–	0.08

Items		Standard value	Limit
Rear disc brake drag force (tangential force of wheel mounting bolts) N		69 or less	–
Rear drum brake lining thickness mm <Vehicles with drum brake>		4.7	1.0
Rear drum inside diameter mm <Vehicles with drum brake>	2WD Standard wheelbase	254.0	256.0
	2WD Long wheelbase, 4WD Panel van and window van	270.0	272.0
Rear drum brake lining thickness mm <Vehicles with disc brake>		6.5	4.5
Rear drum inside diameter mm <Vehicles with disc brake>		197.0	198.0
Front hub end play mm		0.05	–
Rear axle shaft axial play mm		–	0.25

LUBRICANTS

120000049

Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal	Repair kit grease
Guide pin boot inner surfaces	
Lock pin boot inner surfaces	
Piston boot mounting grooves	
Brake piston boot inner surfaces	
Lock pin bush inner surfaces	
Piston cup surface	
Rear brake shoe and backing plate contact surfaces	Brake grease SAE J310, NLGI No. 1
Auto adjuster assembly	

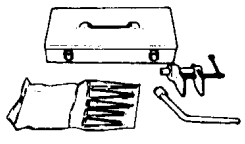
SEALANTS

120000050

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8663 or equivalent	Semi-drying sealant
Vacuum switch		
Shoe hold-down pin	3M ATD Part No. 8513 or equivalent	Drying sealant

SPECIAL TOOLS

120000051

Tool	Number	Name	Use
	MB990964 MB990520 MB990621 MB990623	Brake tool set	Pushing-in of the disc brake piston Installation of drum brake wheel cylinder piston cup

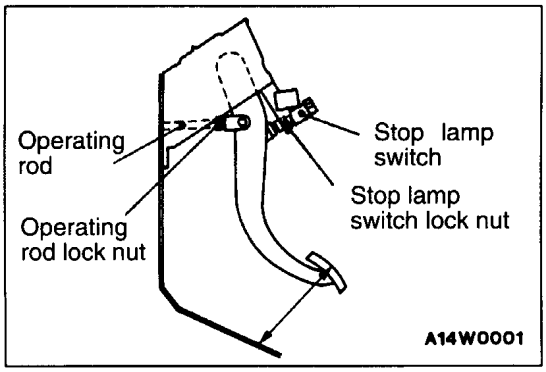
TROUBLESHOOTING

120000052

Symptom	Probable cause	Remedy
Vehicle pulls to one side when brakes are applied	Grease or oil on pad or lining surface	Replace
	Inadequate contact of pad or lining	Correct
	Auto adjuster malfunction	Adjust
	Drum ecentricity or uneven wear	Repair or replace as necessary
Insufficient braking power	Low or deteriorated brake fluid	Refill or change
	Air in brake system	Bleed air
	Overheated brake rotor due to dragging of pad or lining	Correct
	Inadequate contact of pad or lining	
	Brake booster malfunction	
	Clogged brake line	
	Grease or oil on pad or lining surface	Replace
	Load sensing proportioning valve malfunction	
	Auto adjuster malfunction	Adjust
Increased pedal stroke (Reduced pedal to floor board clearance)	Air in brake system	Bleed air
	Worn lining or pad	Replace
	Broken vacuum hose	
	Faulty master cylinder	
	Brake fluid leaks	Correct
	Auto adjuster malfunction	Adjust
	Excessive push rod to master cylinder clearance	
Brake drag	Incomplete release of parking brake	Correct
	Clogged master cylinder return port	
	Incorrect parking brake adjustment	Adjust
	Improper push rod to master cylinder clearance	
	Faulty master cylinder piston return spring	Replace
	Worn brake pedal return spring	
	Broken rear drum brake shoe return spring	
	Lack of lubrication in sliding parts	Lubricate

Symptom	Probable cause	Remedy
Insufficient parking brake function	Worn brake lining or pad	Replace
	Grease or oil on lining or pad surface	
	Parking brake cable sticking	
	Stuck wheel cylinder or caliper piston	
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable routing
	Auto adjuster malfunction	Adjust
Scraping or grinding noise when brakes are applied	Worn brake lining or pad	Replace
	Caliper to wheel interference	Correct or replace
	Dust cover to disc interference	
	Bent brake backing plate	
	Cracked drums or brake disc	
Squealing, groaning or chattering noise when brakes are applied	Disc brakes–Missing or damaged brake pad anti-squeak shim	Replace
	Brake drums and linings, discs and pads worn or scored	Correct or replace
	Improper lining parts	
	Disc brake-burred or rusted calipers	Clean or deburr
	Dirty, greased, contaminated or glazed linings	Clean or replace
	Drum brakes–Weak, damaged or incorrect shoe hold-down springs, loose or damaged shoe hold-down pins and springs	Correct or replace
	Incorrect brake pedal or booster push rod	Adjust

Symptom	Probable cause	Remedy
Squealing, noise when brakes are not applied	Bent or warped backing plate causing interference with drum	Replace
	Drum brakes–Weak, damaged or incorrect shoe-to-shoe spring	
	Poor return of brake booster or master cylinder or wheel cylinder	
	Loose or extra parts in brakes	Retighten
	Improper positioning of pads in caliper	Correct
	Improper installation of support mounting to caliper body	
	Improper machining of drum causing interference with backing plate or shoe	Replace drum
	Disc brakes–Rusted, stuck	Lubricate or replace
	Worn, damaged or insufficiently lubricated wheel bearings	
	Incorrect brake pedal or booster push-rod	Adjust
Groaning clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove stones, etc.
	Loose wheel nuts	Retighten
	Disc brakes–Loose installation bolt	
	Worn, damaged or dry wheel bearings	Lubricate or replace
	Disc brakes–Failure of shim	Replace
	Disc brakes–Wear on sleeve	
	Incorrect brake pedal or booster push-rod	Adjust



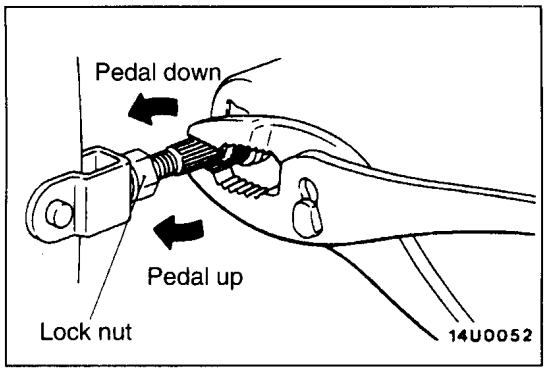
SERVICE ADJUSTMENT PROCEDURES

120002237

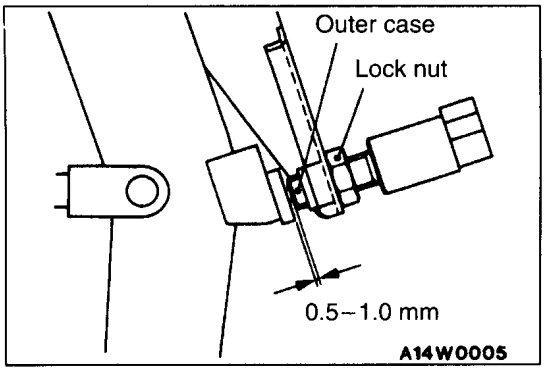
BRAKE PEDAL INSPECTION AND ADJUSTMENT

1. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, adjust as follows.

   Standard value: <L.H. drive vehicles>144–149 mm
   <R.H. drive vehicles>153–158 mm

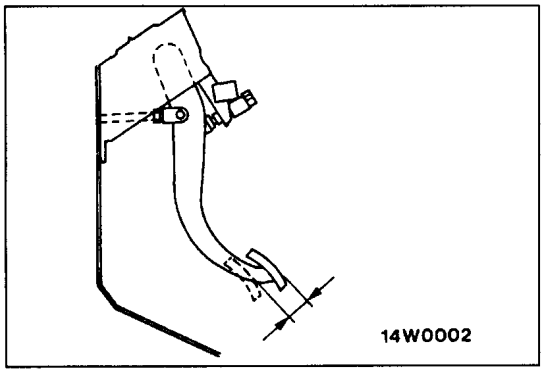


   (1) Disconnect the stop lamp switch connector, loosen the lock nut, and move the stop lamp switch to a position where it does not contact the brake pedal arm.
   (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.
   (3) After screwing in the stop lamp switch until it contacts the brake pedal stopper (just before the brake pedal is caused to move), return the stop lamp switch 1/2 to 1 turn and secure by tightening the lock nut.
   (4) Connect the connector of the stop lamp switch.
   (5) Check to be sure that the stop lamp is not illuminated with the brake pedal unpressed.

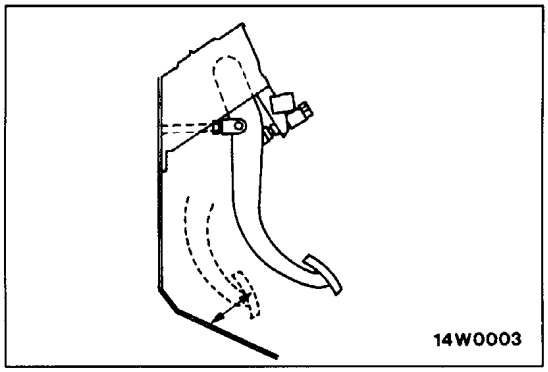


2. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.

   Standard value: 3–8 mm



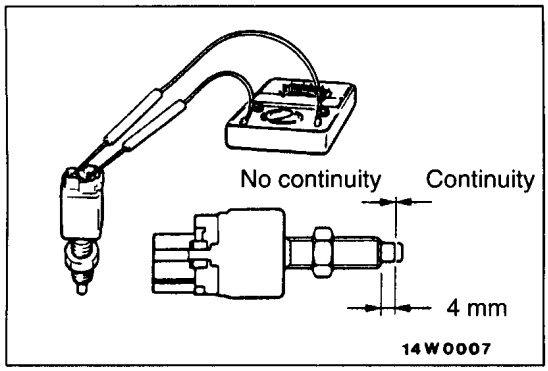
   If the free play exceeds the standard value, it is probably due to excessive play between the clevis pin and brake pedal arm.
   Check for excessive clearance and replace faulty parts as required.



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.

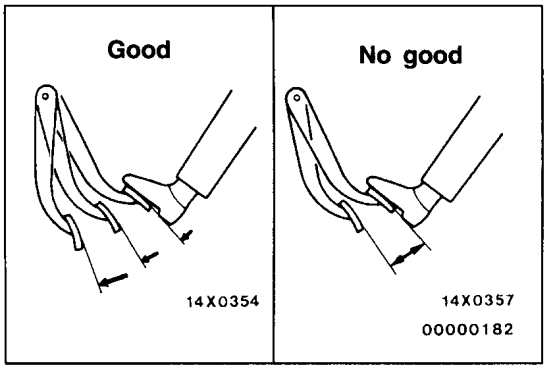
   Standard value: <2WD, 4WD Panel van and window van> 85 mm or more
   <4WD Wagon> 75 mm or more

   If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake. Adjust and replace defective parts as required.



STOP LAMP SWITCH INSPECTION 120000054

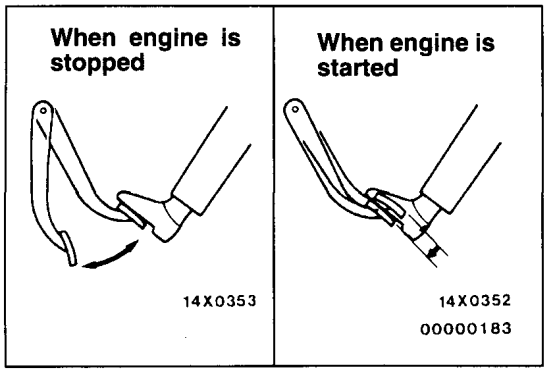
Connect a circuit tester to the stop lamp switch, and check whether or not there is continuity when the plunger of the stop lamp switch is pushed in and when it is released.
The stop lamp switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm from the outer case edge surface, and if there is continuity when it is released.



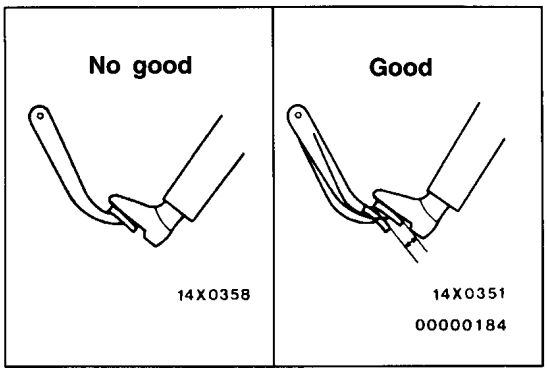
BRAKE BOOSTER OPERATING TEST 120000055

For simple checking of the brake booster operation, carry out the following tests:

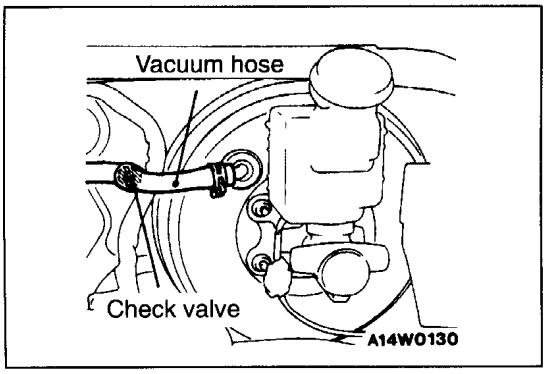
1. Run the engine for one or two minutes, and then stop it.
   If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is defective.



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.



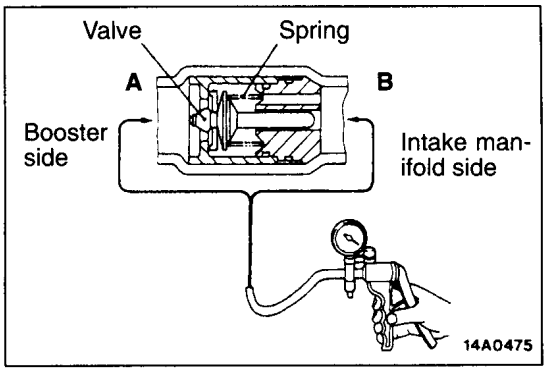
3. With the engine running, step on the brake pedal and then stop the engine.
   Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.
   If the above three tests are okay, the booster performance can be determined as good.
   If one of the above three tests in not okay at last, the check valve, vacuum hose, or booster will be defective.



CHECK VALVE OPERATION CHECK 120000056

When checking the check valve, keep the check valve fit in the vacuum hose.

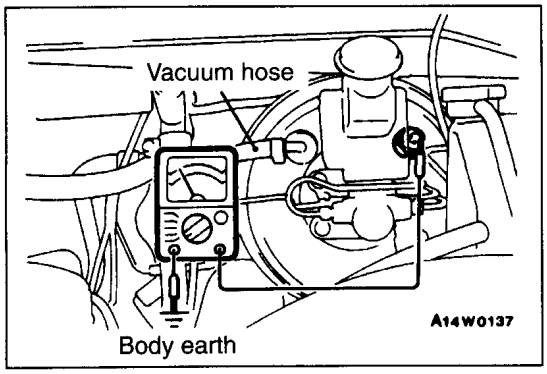
1. Remove the vacuum hose.
   NOTE
   The check valve is press-fitted inside the vacuum hose at the position of the marking.



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.



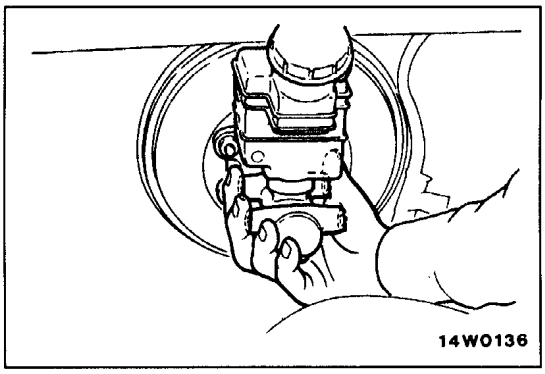
BRAKE BOOSTER VACUUM SWITCH CHECK <DIESEL-POWERED VEHICLES> 120000057

1. Connect an ohmmeter to the connector of the vacuum switch.
2. Start the engine and check for continuity when the vacuum hose is connected and when it is disconnected.
   The vacuum switch is in good condition if there is no continuity when the vacuum hose is connected, and if there is continuity when it is not connected.

BLEEDING 120000058

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

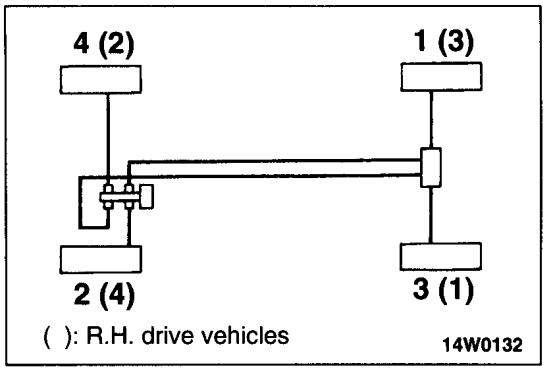
Specified brake fluid: DOT3 or DOT4



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 pipe line 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.



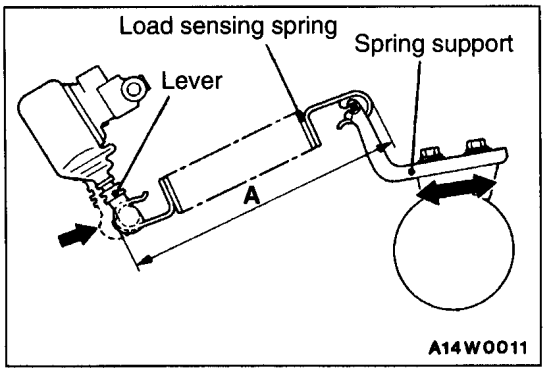
BRAKE PIPE LINE BLEEDING

Start the engine and bleed the air in the sequence shown in the figure.

LOAD SENSING SPRING LENGTH CHECK AND ADJUSTMENT 120000059

1. Park the vehicle on a level ground. The vehicle should be unloaded and supported only by wheels.

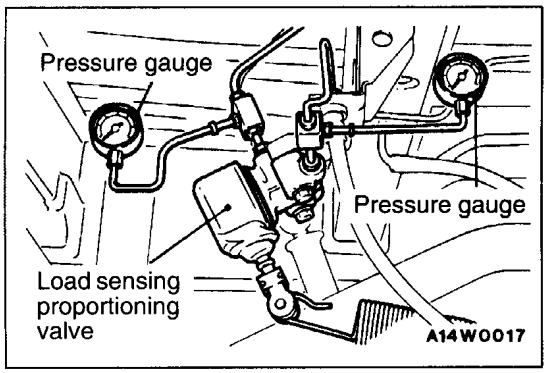
   Caution
   Never support the vehicle with jacks or other similar means.

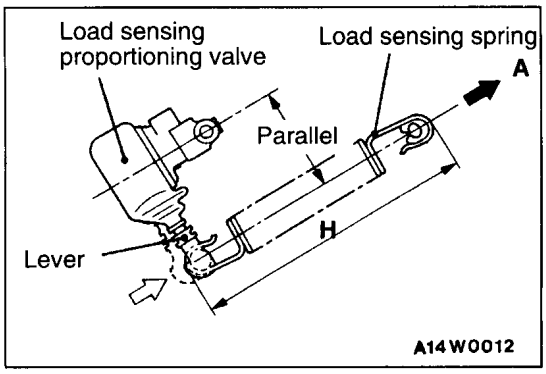


2. With the lever pressed all the way to the load sensing proportioning valve side, check whether or not the length (shown in the figure) of the spring (the length between its ends) is the standard value.

   Standard value (A): 198–202 mm

3. If the spring length is not within the standard value, loosen the bolt attaching the support and adjust the distance by moving the support.





LOAD SENSING PROPORTIONING VALVE FUNCTION TEST

120002238

1. Connect pressure gauges to the input and output ports of the load sensing proportioning valve.
2. Bleed the system. (Refer to P.35A-11, GROUP 35B – Service Adjustment Procedures.)
3. Disconnect the spring at the support side.
4. Place the spring so that it is in parallel with the load sensing proportioning valve, and then pull in the direction indicated by arrow A so that its length H shown in the figure (the length between its ends) is as noted below.

   NOTE
   At this time the lever is pressed all the way to the load sensing proportioning valve side.

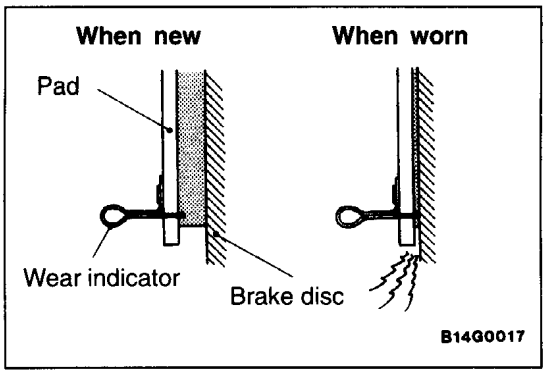
   Check at this time whether or not the output fluid's pressure, relative to the load sensing proportioning valve's input fluid pressure, is within the standard value.

   Standard value:

Items	Spring length H mm	Input fluid pressure kPa	Output fluid pressure kPa
2WD Panel van and window van	200.0*1	5,884	2,626–3,410
		11,760	3,234–4,606
	235.5*2	11,760	8,526–10,080
4WD Panel van and window van	200.0*1	5,884	2,685–3,469
		11,760	3,234–4,606
	235.5*2	11,760	6,076–7,448
Wagon	200.0*1	5,884	3,528–4,508
		11,760	4,214–5,586
	218.0*2	11,760	7,840–9,408

NOTE
*1 and *2 indicate the applicable lengths for unladen and laden vehicles respectively.

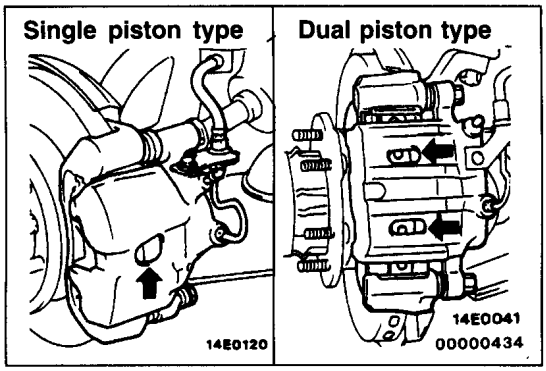
5. After making the check, install the spring. Disconnect the pressure gauges from the load sensing proportioning valve and bleed the air.
   (Refer to P.35A-11, GROUP 35B – Service Adjustment Procedures.)



DISC BRAKE PAD CHECK AND REPLACEMENT

120000061

NOTE
The brake pads have wear indicators that contact the brake disc when the brake pad thickness becomes 2 mm, and emit a squealing sound to warn the driver.

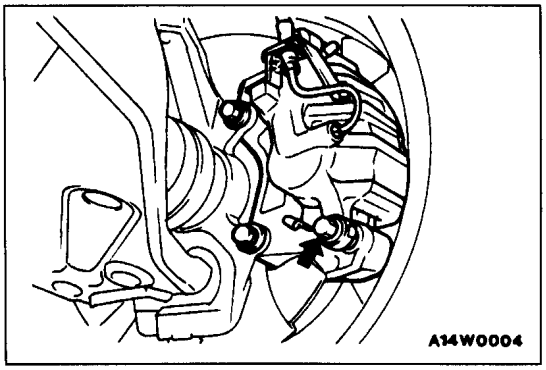


1. Check brake pad thickness through caliper body check port.

   Standard value: <Front> 10 mm
   <Rear> 9.0 mm

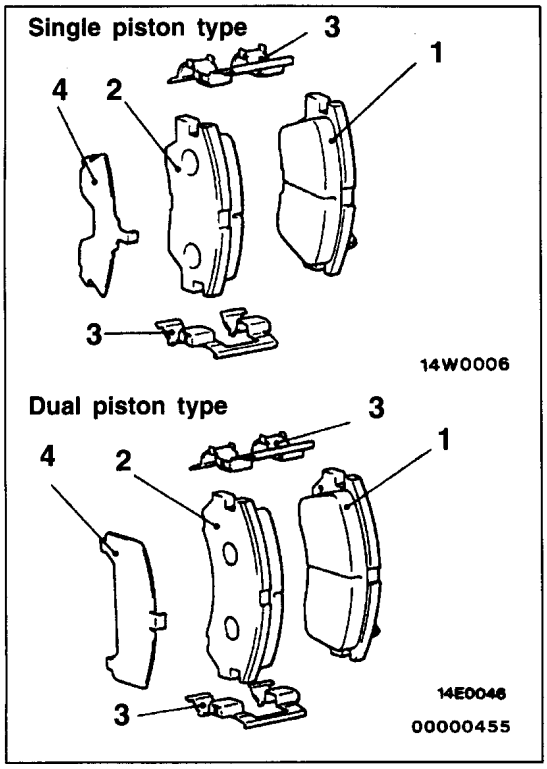
   Limit: 2.0 mm

   Caution
   1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
   2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**

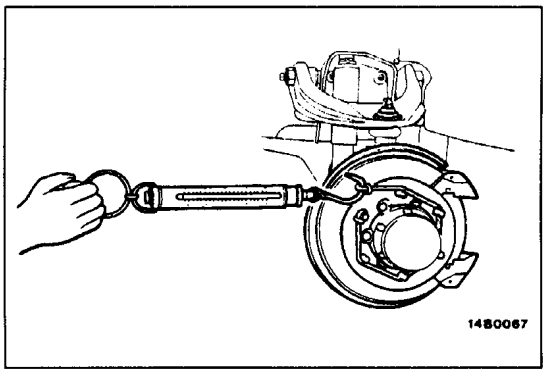


2. Remove lock pin. Lift caliper assembly and retain with wires.

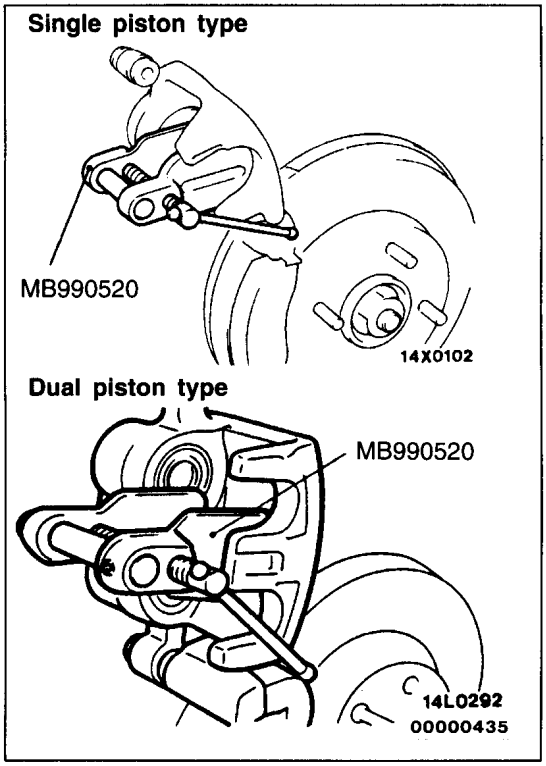
   Caution
   Do not wipe off the special grease that is on the lock pin or allow it to contaminate the lock pin.



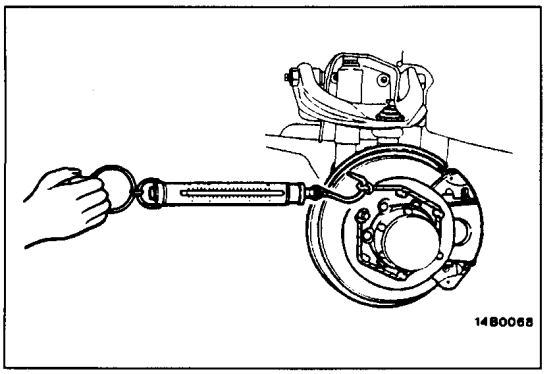
3. Remove the following parts from caliper support.
   1. Pad & wear indicator assembly
   2. Pad assembly
   3. Clip
   4. Outer shim



4. Measure hub torque (A) with pad removed to measure brake drag torque after pad installation.
   When measuring the brake drag torque for vehicles with LSD, remove the rear axle shaft. (Refer to GROUP 27 – Rear Axle.)
5. Securely attach the pad clip to the caliper support.



6. Clean piston and insert into cylinder with special tool.
7. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the lock pin.
8. Check brake drag torque as follows.
   (1) Start engine and hold brake pedal down for 5 seconds. (Pedal depression force approx. 196 N)
   (2) Stop engine.
   (3) Turn brake disc forward 10 times.



   (4) Check hub torque (B) with spring balance.
   (5) Calculate the drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

   Standard value: 69 or less

9. If the difference between brake drag torque and hub torque exceeds the standard value, disassemble piston and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

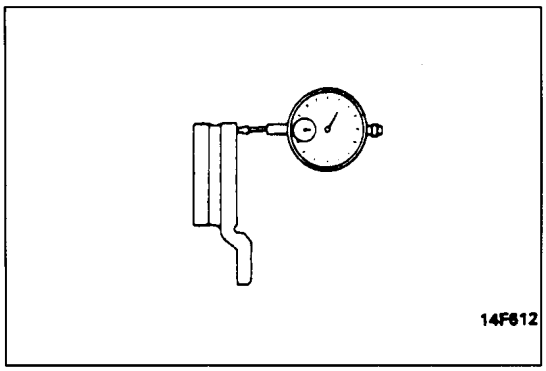
FRONT DISC BRAKE ROTOR INSPECTION

120000062

CAUTION
When servicing disc brakes, it is necessary to exercise caution to keep the disc brake 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.

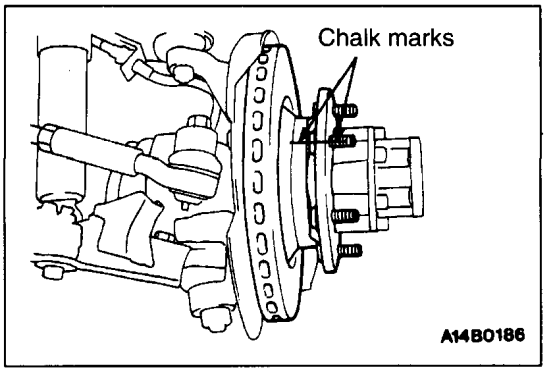

14F612

RUN-OUT CHECK

120000063

1. Remove the caliper support; then raise the caliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks, and rust. Clean the disc thoroughly and remove all rust.
3. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit: 0.07 mm

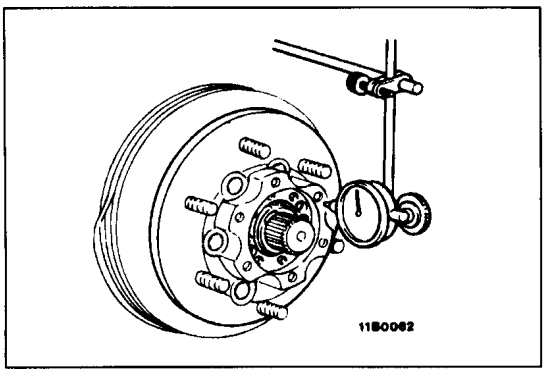


A14B0186

RUN-OUT CORRECTION

120000064

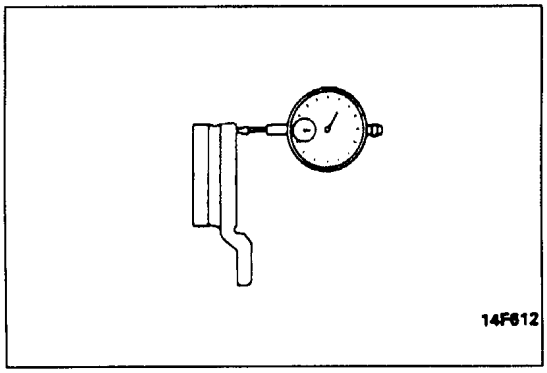
1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.
   (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.


11B0062

   (2) For 4WD, place a dial gauge as shown in the illustration, and then move the hub in the axial direction and measure the play.

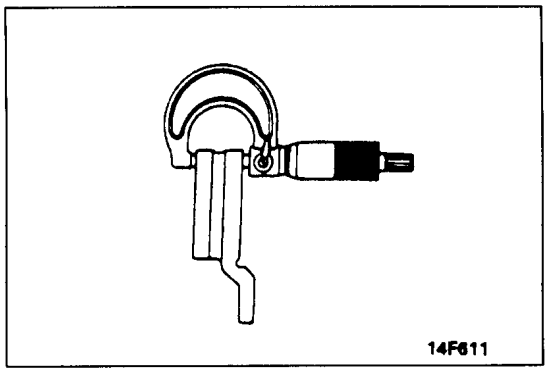
   Standard value: 0.05 mm

   If the play is equal to or exceeds the standard value, adjust the wheel bearing preload. (Refer to GROUP 26 – Front Hub Assembly <4WD>.)



(3) If the play does not exceed the standard value specification, install the brake disc at a position 180° away from the chalk mark, and then check the run-out of the brake disc once again.

2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the brake disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).



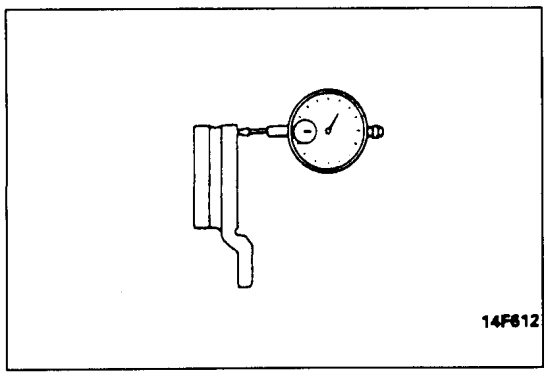
THICKNESS CHECK 120000065

1. Using a micrometer, measure disc thickness at eight positions, approximately 45° apart and 10 mm in from the outer edge of the disc.

   Brake disc thickness
   Standard value: 24 mm
   Limit: 22.4 mm

   Thickness variation (at least 8 position)
   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).

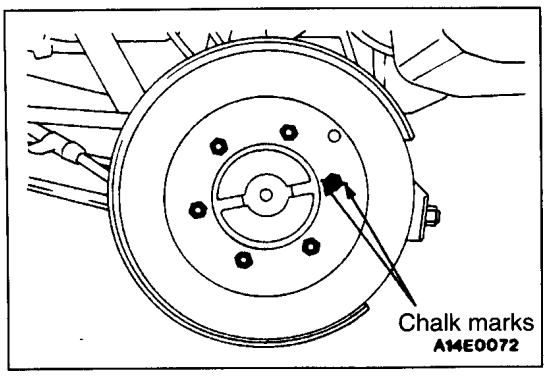


REAR BRAKE DISC RUN-OUT CHECK 120000066

1. Remove the caliper support, raise the caliper assembly, and secure it by using a wire, etc.
2. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the run-out of the disc.

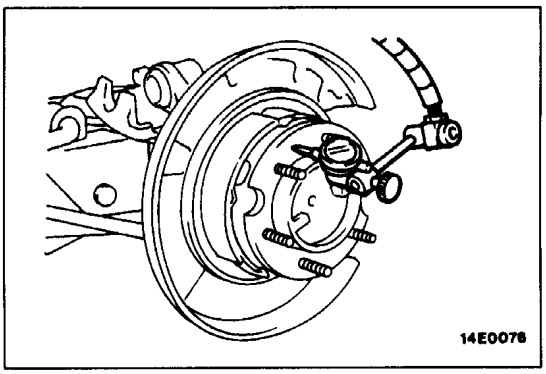
   Limit: 0.08 mm

   NOTE
   To secure the disc to the hub, tighten the nuts.



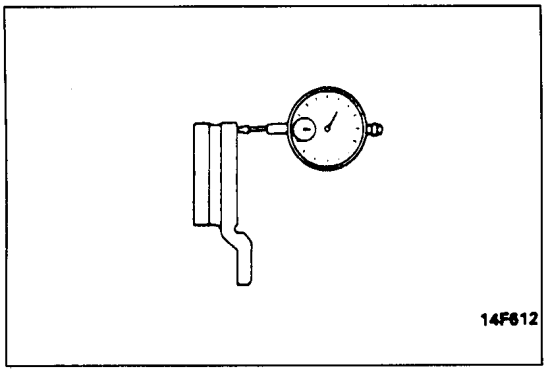
REAR BRAKE DISC RUN-OUT CORRECTION 120000067

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.



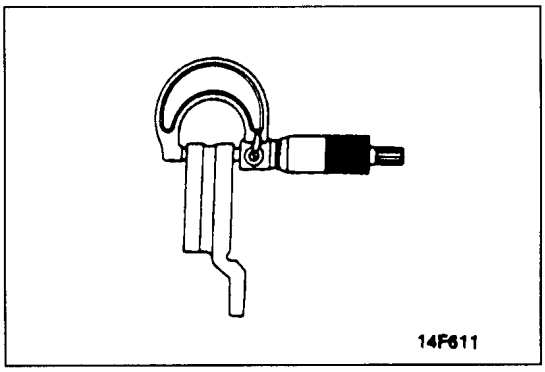
(2) Remove the brake disc, and then place a dial gauge as shown in the illustration; then move the hub in the axial direction and measure the play.

Limit: 0.25 mm



(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 problem cannot be corrected by changing the phase of the brake disc, replace the disc.



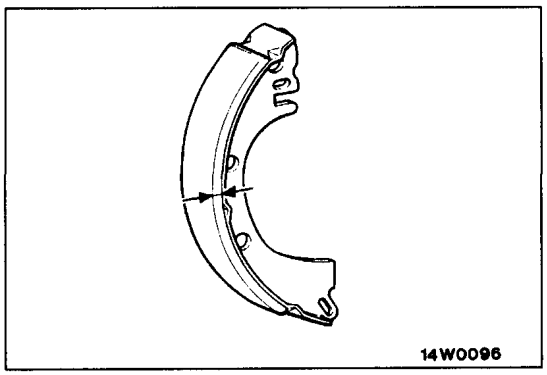
REAR BRAKE DISC THICKNESS CHECK 120000068

1. Remove dirt and rust from brake disc surface.
2. Measure disc thickness at 4 locations or more.

Standard value: 18 mm

Limit: 16.4 mm

Replace the discs and pad assembly for both left and right sides of the vehicle if they are worn beyond the specified limit.



BRAKE LINING THICKNESS CHECK 120000069

<VEHICLES WITH REAR DRUM BRAKE>

1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

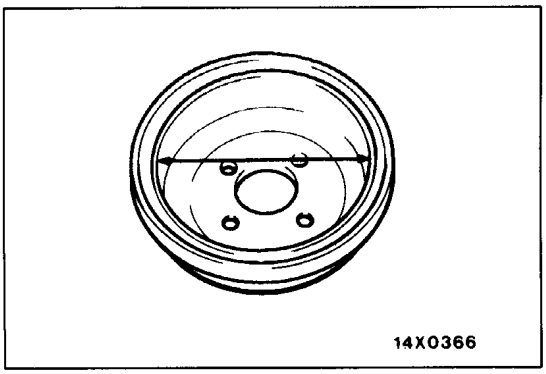
Standard value: 4.7 mm

Limit: 1.0 mm

Replace the shoe and lining assembly if brake lining thickness is less than the limit if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P.35A-45.

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 thicknesses of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.**



BRAKE DRUM INSIDE DIAMETER CHECK

120002239

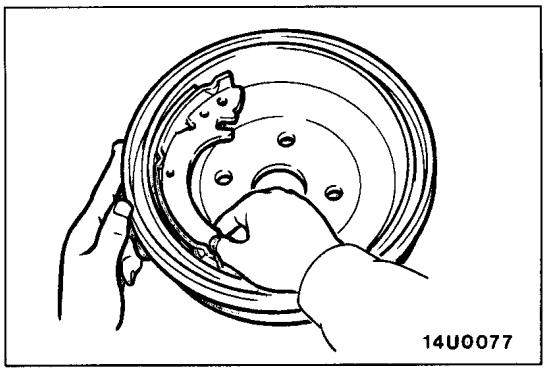
<VEHICLES WITH REAR DRUM BRAKE>

1. Remove the brake drum.
2. Measure the inside diameter of the brake drum at two or more locations.

   Standard value: <2WD Standard wheelbase> 254.0 mm
   <2WD Long wheelbase, 4WD Panel van and window van> 270.0 mm

   Limit: <2WD Standard wheelbase> 256.0 mm
   <2WD Long wheelbase, 4WD Panel van and window van> 272.0 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

120000071

<VEHICLES WITH REAR DRUM BRAKE>

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P.35A-45.)
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.

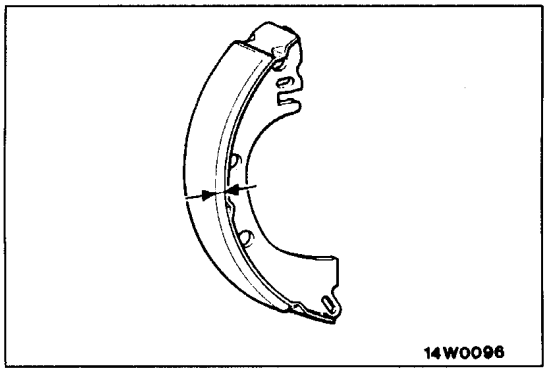
   NOTE
   Clean off chalk after check.

BRAKE LINING THICKNESS CHECK

120000072

<VEHICLES WITH REAR DISC BRAKE>

1. Remove the rear brake assembly, raise the rear brake assembly and secure it by using a wire, etc.
2. Remove the brake disc.



3. Measure the wear of the brake lining at the place worn the most.

   Standard value: 6.5 mm

   Limit: 4.5 mm

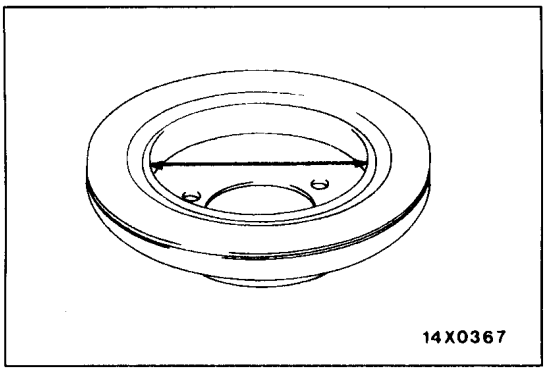
4. Replace the shoe and lining assembly if brake lining thickness is less than the limit or if it is not worn evenly.

Caution
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.

BRAKE DRUM INSIDE DIAMETER CHECK

120000073

<VEHICLES WITH REAR DISC BRAKE>

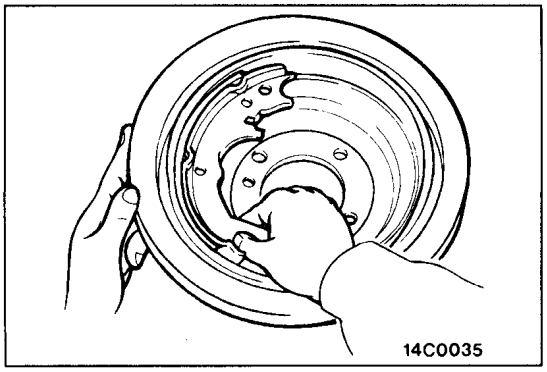


1. Remove the rear brake assembly, raise the rear brake assembly and secure it by using a wire, etc.
2. Remove the brake disc.
3. Measure the inside diameter of the brake disc at two or more locations.

   Standard value: 197.0 mm

   Limit: 198.0 mm

   Replace brake disc, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.



BRAKE LINING AND BRAKE DRUM CONNECTION CHECK

120000074

<VEHICLES WITH REAR DISC BRAKE>

1. Remove the rear brake assembly, raise the rear brake assembly and secure it by using a wire, etc.
2. Remove the brake disc.
3. Remove the shoe and lining assembly.
4. Chalk inner surface of brake disc and rub with shoe and lining assembly.
5. Replace shoe and lining assembly or brake disc if there are any irregular contact area.

   NOTE
   Clean off chalk after check.

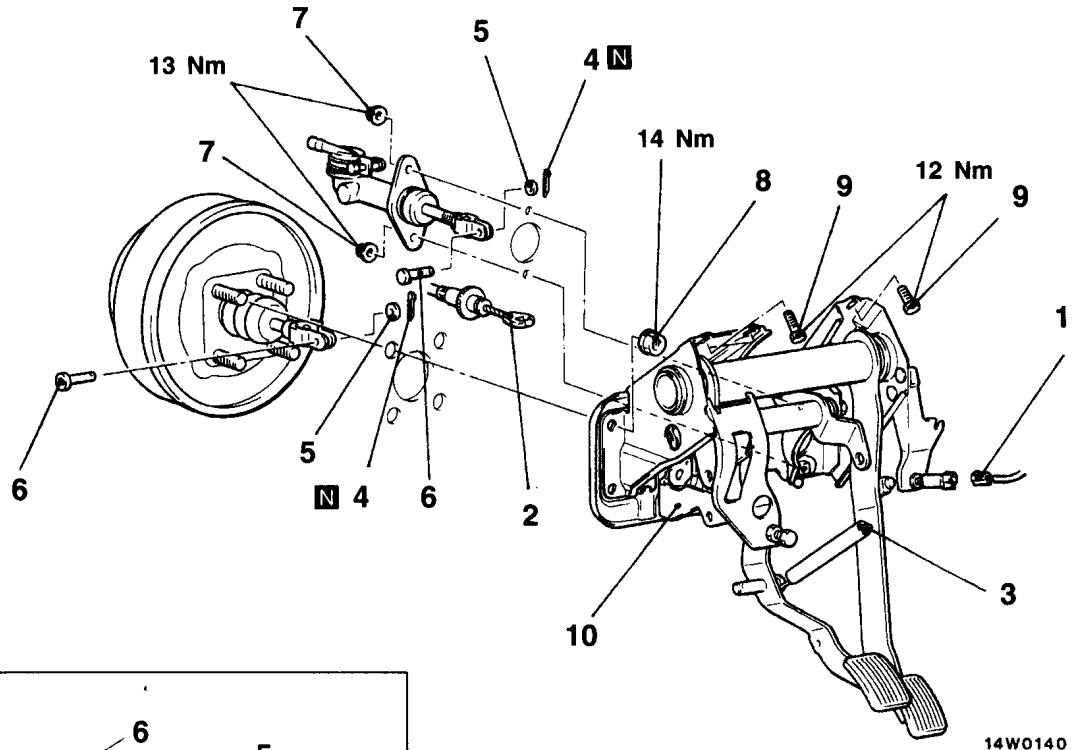
BRAKE PEDAL

120000075

REMOVAL AND INSTALLATION <L.H. drive vehicles>

Pre-removal Operation
- Under Cover Removal (Refer to GROUP 52A – Instrument Panel.)
- Steering Column Assembly Removal (Refer to GROUP 37A – Steering Wheel and shaft.)
- Junction Block Removal

Post-installation Operation
- Junction Block Installation
- Steering Column Assembly Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Under Cover Installation (Refer to GROUP 52A – Instrument Panel.)
- Brake Pedal Adjustment (Refer to P.35A-9.)



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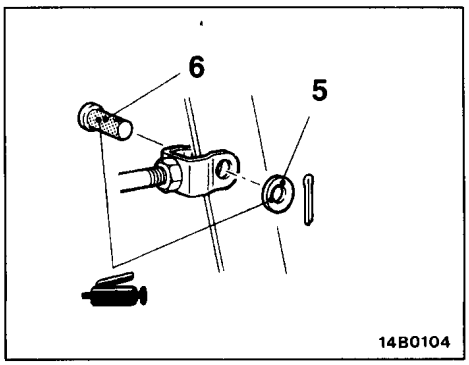

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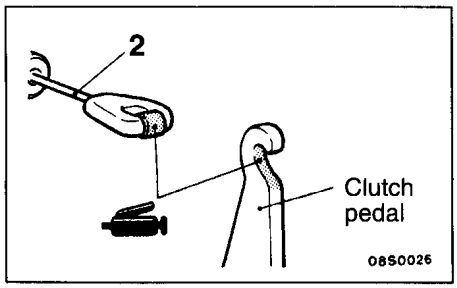
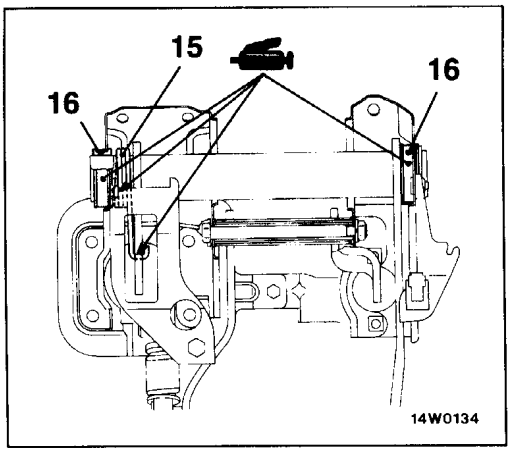


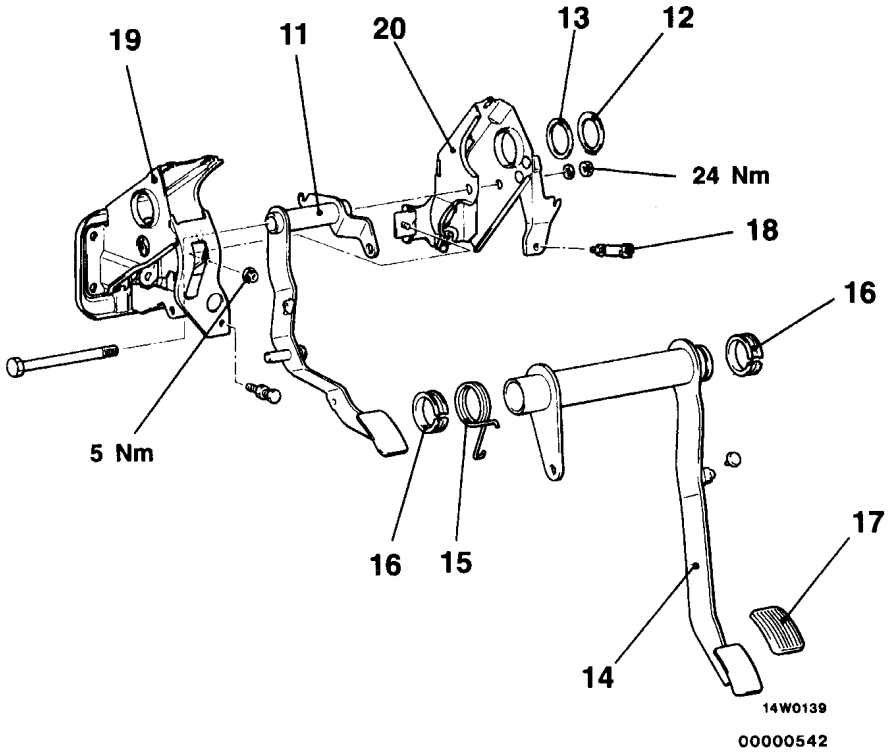
08S0026

Removal steps

1. Stop lamp switch connector
2. Clutch cable connection <Cable type clutch>
3. Clutch return spring <Cable type clutch and hydraulic clutch for petrol vehicles>
4. Split pin
5. Washer
6. Clevis pin
7. Clutch master cylinder mounting nuts <hydraulic clutch>
8. Brake booster mounting nuts
9. Pedal support member mounting bolts
10. Brake and clutch pedal assembly

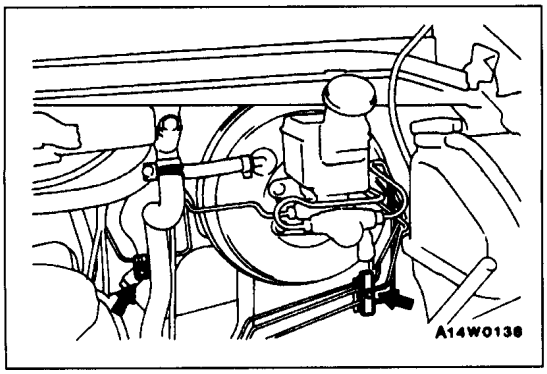
◀A▶





Removal steps

11. Clutch pedal (Refer to GROUP 21 – Clutch Pedal)
12. Snap ring
13. Washer
14. Brake pedal
15. Return spring
16. Bush
17. Pedal pad
18. Stop lamp switch
19. Support member (L.H.)
20. Support member (R.H.)



REMOVAL SERVICE POINT

◀A▶ BRAKE AND CLUTCH PEDAL ASSEMBLY REMOVAL

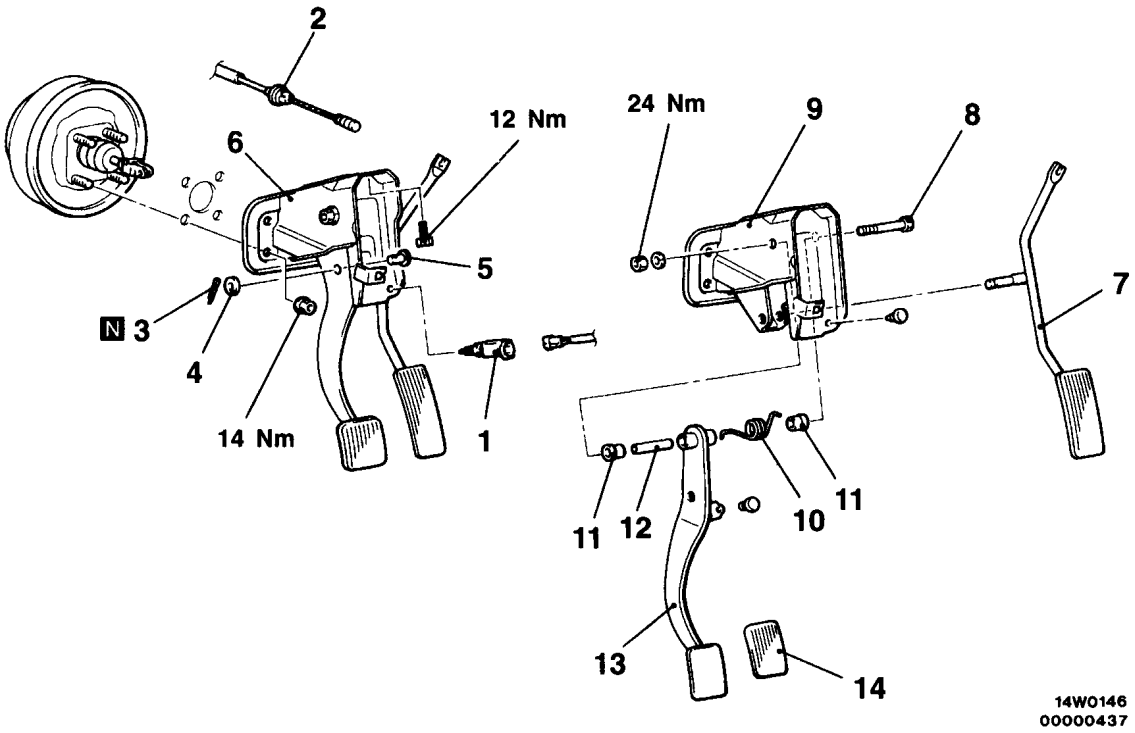
Remove the clamp bolt from the brake tube, push the master cylinder and brake booster slightly from the passenger's compartment towards the engine compartment. Then remove the brake and clutch pedal assembly.

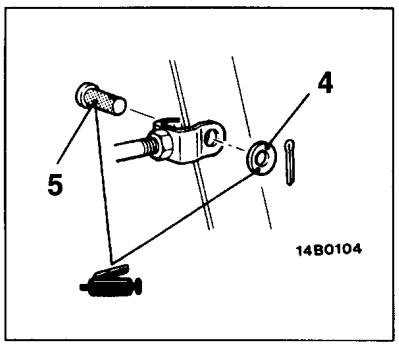
Caution
Do not apply any excessive force to the brake tube.

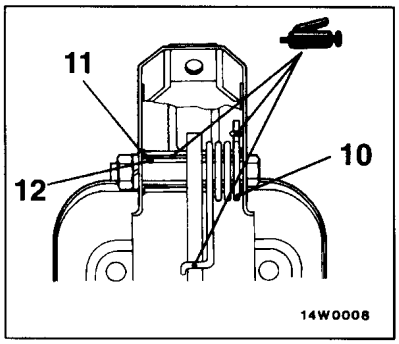
REMOVAL AND INSTALLATION <R.H. drive vehicles>

Pre-removal Operation
- Under Cover Removal
  (Refer to GROUP 52A – Instrument Panel.)
- Junction Block Removal

Post-installation Operation
- Junction Block Installation
- Under Cover Installation
  (Refer to GROUP 52A – Instrument Panel.)
- Brake Pedal Adjustment (Refer to P.35A-9.)







Removal steps

1. Stop lamp switch
2. Accelerator cable connection
3. Split pin
4. Washer
5. Clevis pin
6. Brake pedal assembly
7. Accelerator pedal (Refer to GROUP 13F – Accelerator Pedal.)
8. Brake pedal shaft bolt
9. Pedal support member
10. Brake pedal return spring
11. Bushing
12. Pipe
13. Brake pedal
14. Pedal pad

MASTER CYLINDER AND BRAKE BOOSTER

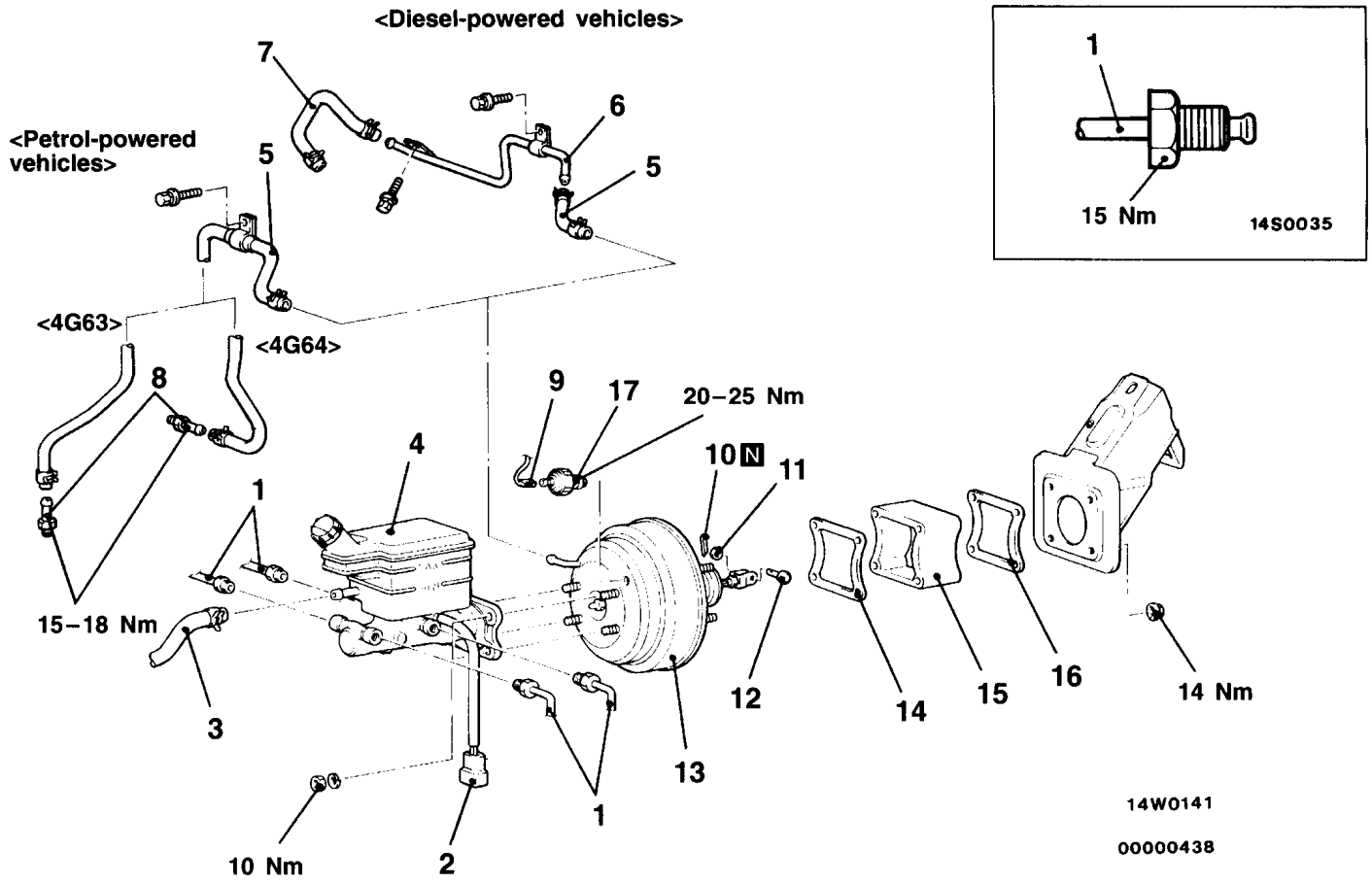
120002240

REMOVAL AND INSTALLATION

<L.H. drive vehicles>

Pre-removal Operation
- Battery Removal
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-11.)
- Battery Installation
- Brake Pedal Adjustment (Refer to P.35A-9.)



Removal steps

1. Brake tube connection
2. Brake fluid level sensor connector
3. Clutch hose connection
4. Master cylinder assembly

▶B◀ • Adjustment of clearance between brake booster push rod and primary piston

▶A◀ 5. Vacuum hose (With built-in check valve)

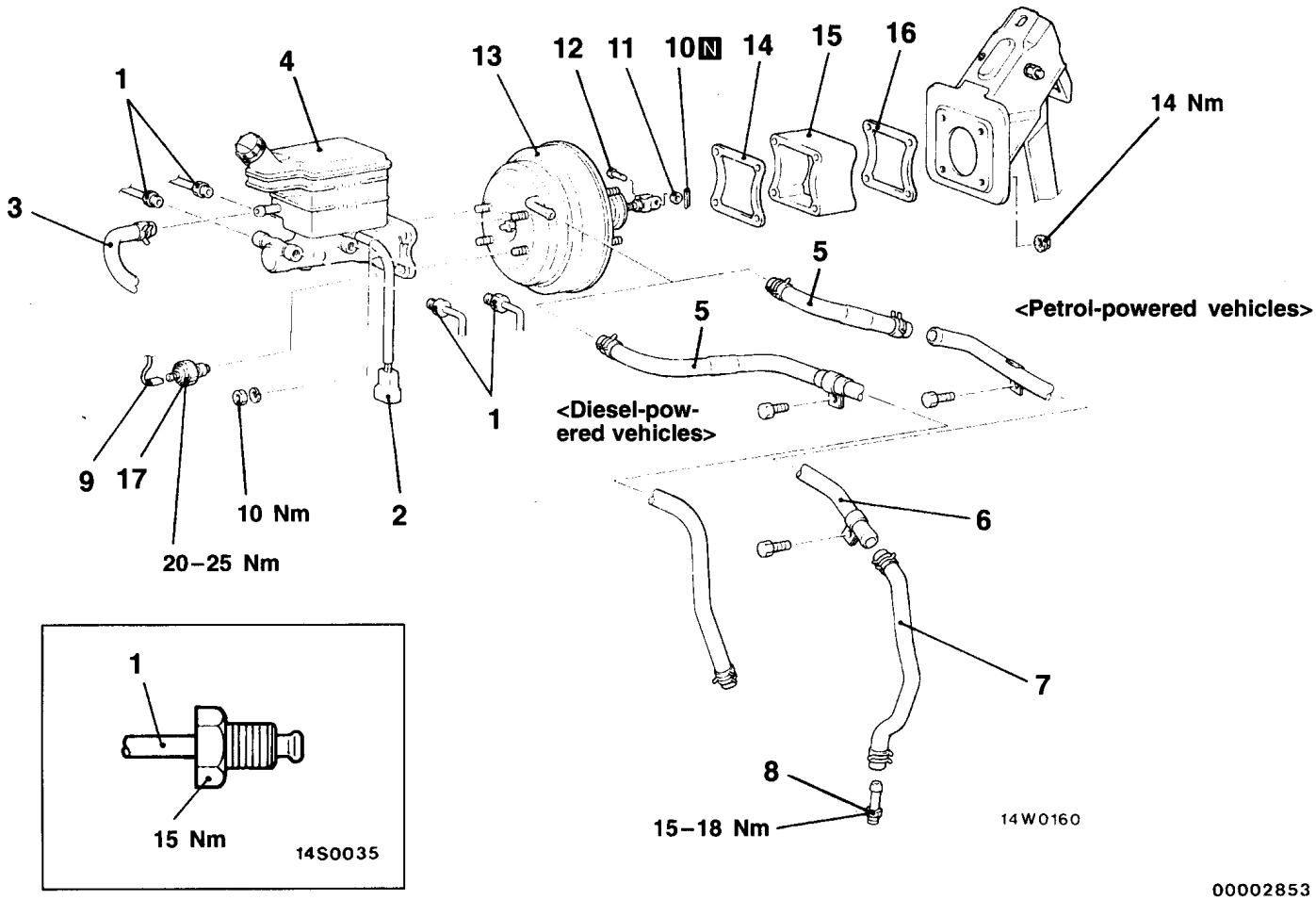
6. Vacuum pipe <Diesel-powered vehicles>
7. Vacuum hose <Diesel-powered vehicles>
8. Fitting <Petrol-powered vehicles>
9. Vacuum switch connector <Diesel-powered vehicles>
10. Split pin
11. Washer
12. Clevis pin
13. Brake booster
14. Sealer
15. Spacer <Single brake booster>
16. Sealer <Single brake booster>
17. Vacuum switch <Diesel-powered vehicles>

Caution
The check valve should not be removed from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.

<R.H. drive vehicles>

Pre-removal Operation
- Battery Removal
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-11.)
- Battery Installation
- Brake Pedal Adjustment (Refer to P.35A-9.)



Removal steps

1. Brake tube connection
2. Brake fluid level sensor connector
3. Clutch hose connection
4. Master cylinder assembly

▶B◀ • Clearance adjustment between brake booster push rod and primary piston

▶A◀ 5. Vacuum hose (With built-in check valve)

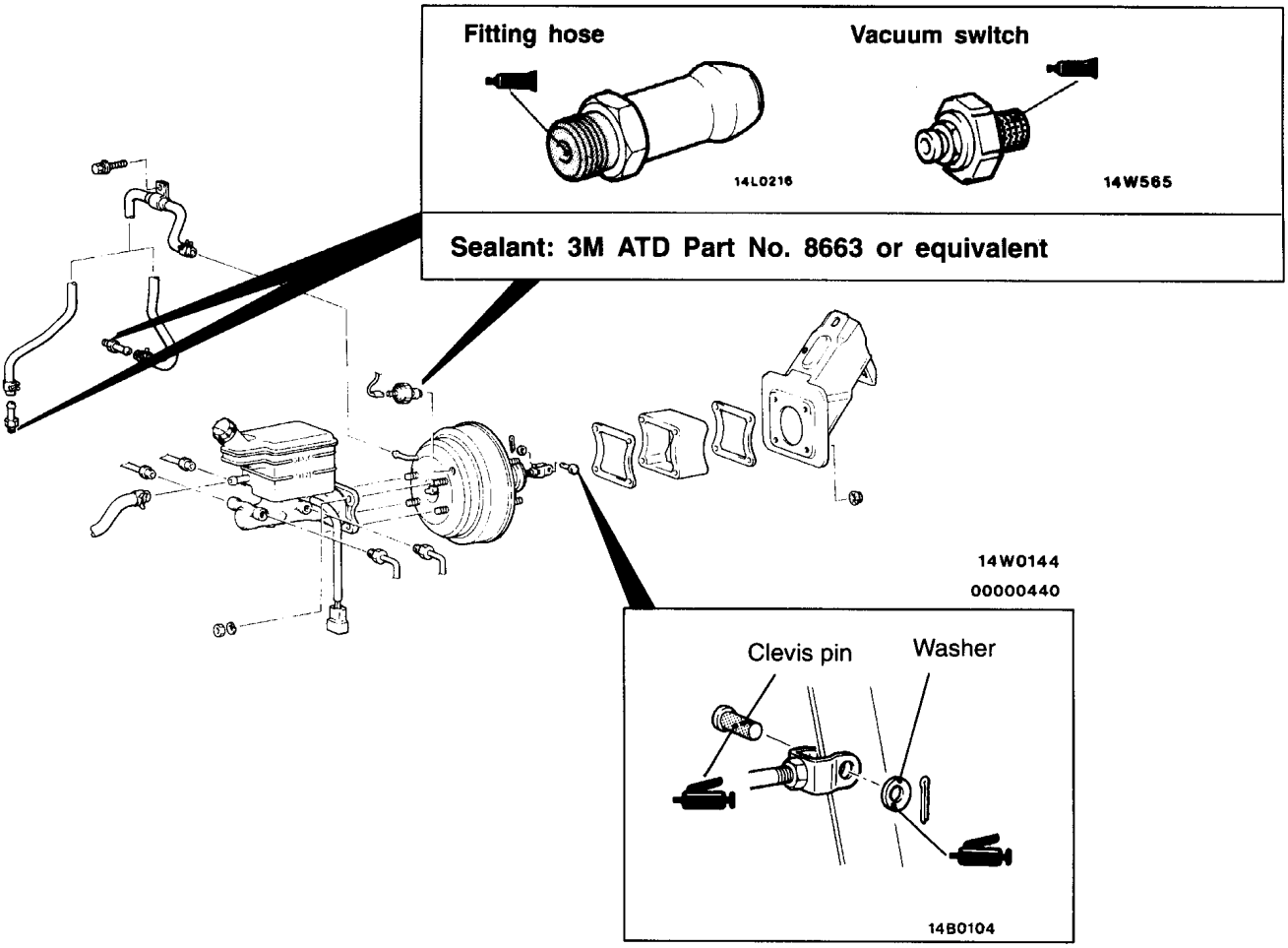
6. Vacuum pipe <Petrol-powered vehicles>

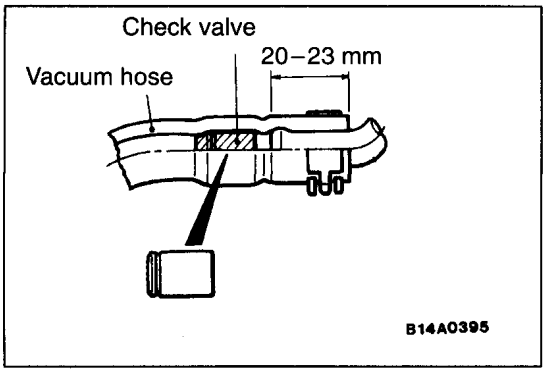
▶A◀ 7. Vacuum hose <Petrol-powered vehicles>

8. Fitting <Petrol-powered vehicles>
9. Vacuum switch connector <Diesel-powered vehicles>
10. Split pin
11. Washer
12. Clevis pin
13. Brake booster
14. Sealer
15. Spacer <Single brake booster>
16. Sealer <Single brake booster>
17. Vacuum switch <Diesel-powered vehicles>

Caution
The check valve should not be removed from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.

Lubrication and sealing points





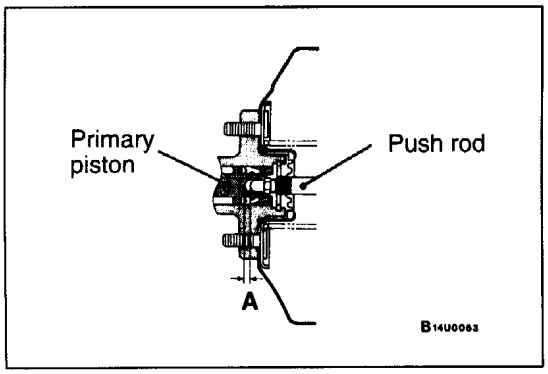
INSTALLATION SERVICE POINTS

▶A◀ VACUUM HOSE CONNECTION

(1) Install to the pipe part of the brake booster so that the amount of insertion of the vacuum hose is as shown in the figure.

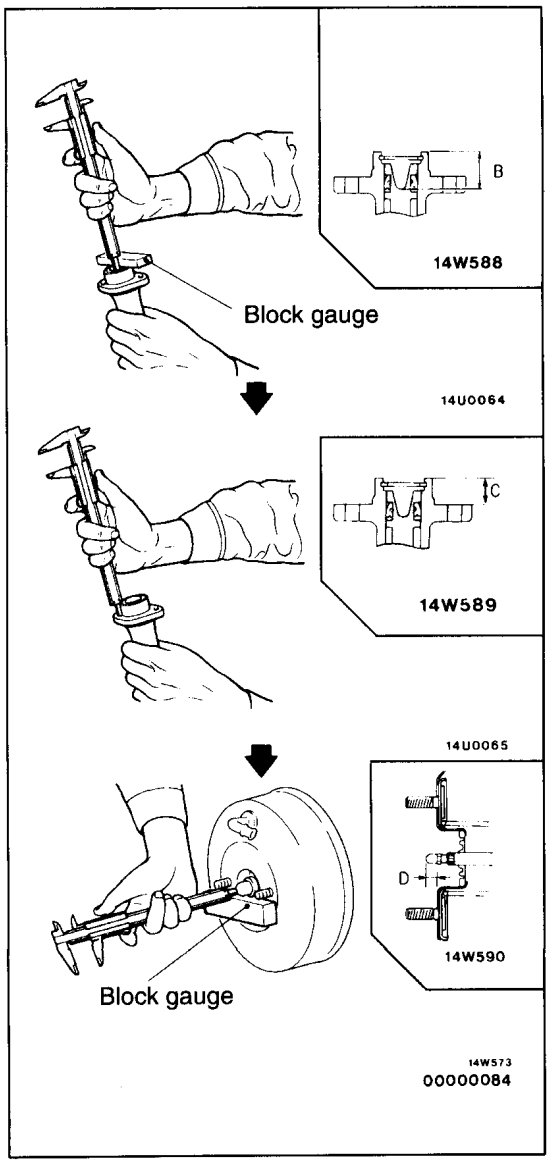
Caution
The check valve and the pipe part of the brake booster must not contact each other.

(2) For petrol-powered vehicles, insert the hose until its engine side contacts the edge of the hexagonal part of the fitting, and then secure it by the hose clip.



▶B◀ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

Adjust the clearance (A) between the brake booster push rod and primary piston as follows:

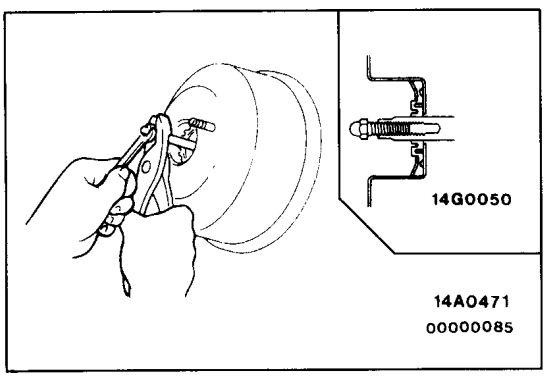


Calculate clearance A from the B, C and D measurements.
A = B – C – D

Standard value:

Brake booster size		Clearance A standard value mm
Single brake booster	Petrol-powered vehicles	0.65–1.05
	Diesel-powered vehicles	1.00–1.40
Tandem brake booster	Petrol-powered vehicles	0.70–1.20
	Diesel-powered vehicles	1.00–1.40

NOTE
When brake booster negative pressure (petrol-powered vehicles: –66.7 kPa, diesel-powered vehicles: –93.3 kPa) is applied, clearance value will become 0.10–0.50 mm.

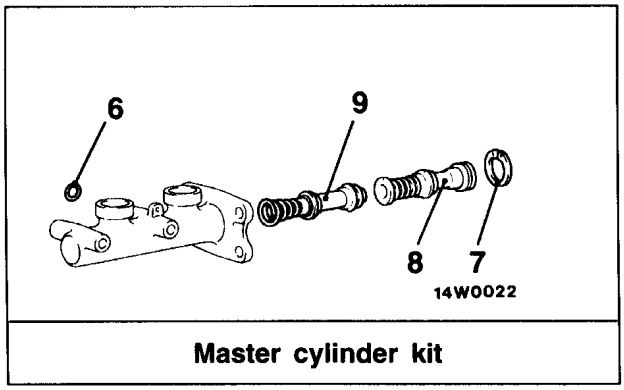


If the clearance is not within the standard value range, adjust by changing the push rod length by turning the screw of the push rod.

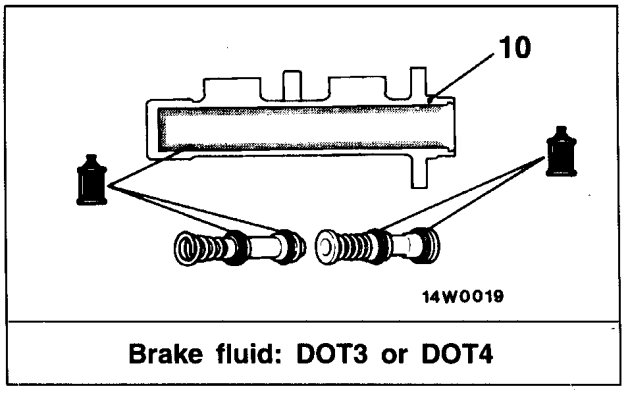
MASTER CYLINDER

120000077

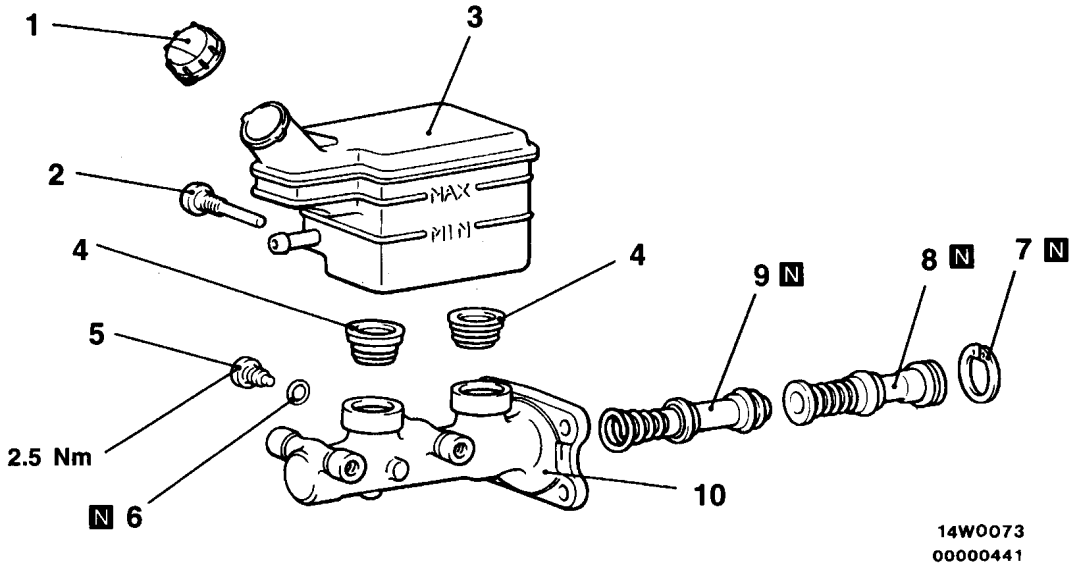
DISASSEMBLY AND REASSEMBLY



Master cylinder kit



Brake fluid: DOT3 or DOT4



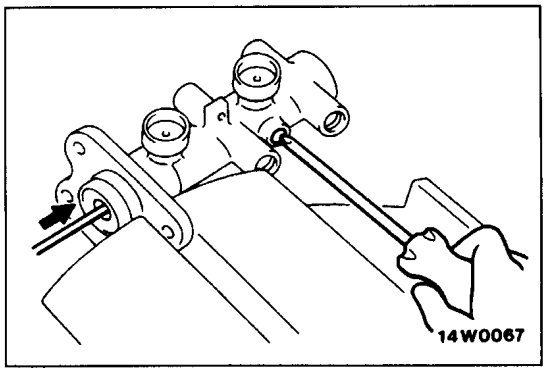
Disassembly steps

1. Reservoir cap
2. Reservoir stopper bolt
3. Reservoir
4. Reservoir seal

◀A▶ 5. Piston stopper bolt

◀B▶ 6. Gasket
7. Piston stopper ring
8. Primary piston assembly
9. Secondary piston assembly
10. Master cylinder body

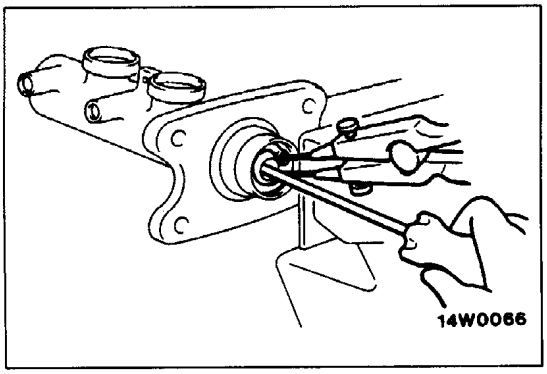
Caution
Do not disassemble the primary and secondary piston assembly.



DISASSEMBLY SERVICE POINTS

◀A▶ PISTON STOPPER BOLT DISASSEMBLY

Remove the piston stopper bolt, while depressing the piston.

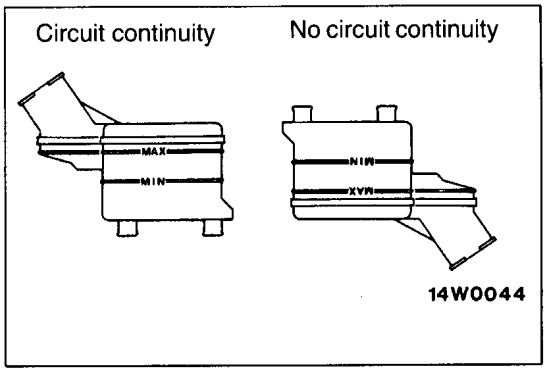


◀B▶ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear, damage or wear.
- Check the diaphragm for cracks and wear.



BRAKE FLUID LEVEL SENSOR CHECK

(1) Connect circuit tester to brake fluid level sensor.
(2) Sensor is in good condition if there is no circuit continuity when turning reservoir over and circuit continuity when returned to original position.

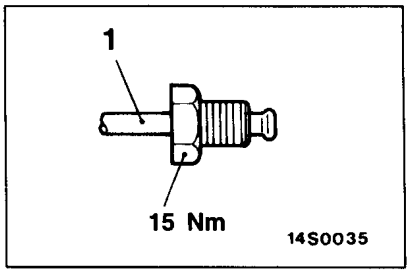
LOAD SENSING PROPORTIONING VALVE

120002241

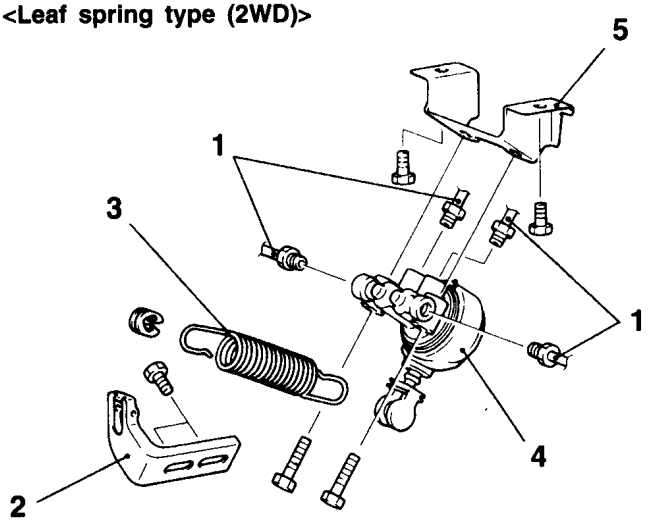
REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining

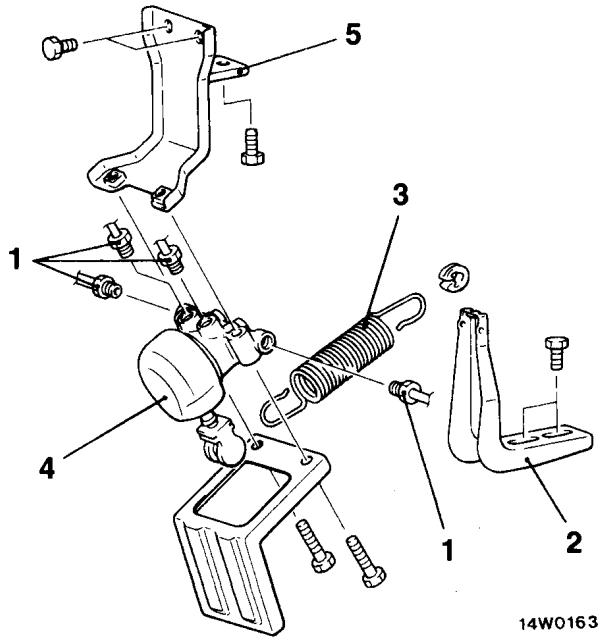
Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-11.)



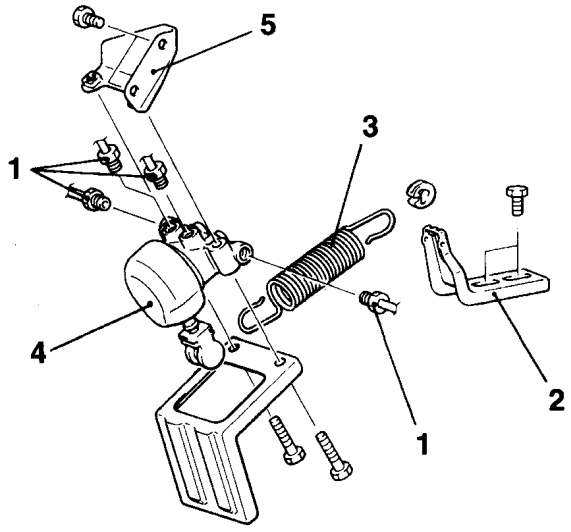
<Leaf spring type (2WD)>



<Leaf spring type (4WD)>



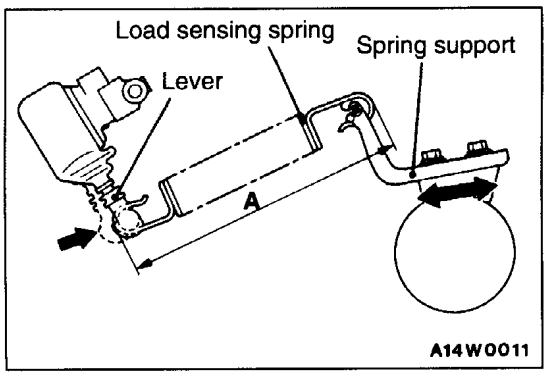
<Coil spring type>



Removal steps

1. Brake tube connection
▶A◀ 2. Spring support
3. Load sensing spring
4. Load sensing proportioning valve
5. Bracket

Caution
Do not disassemble the load sensing proportioning valve.



INSTALLATION SERVICE POINT

▶A◀ SPRING SUPPORT INSTALLATION

(1) Install the load sensing spring, and then tighten the spring support to the axle housing temporarily.
(2) Insert the lever of the load sensing proportioning valve fully into the valve side and hold it. Then adjust the spring support so that the spring length (the distance between the two ends of the spring) is at the standard value.

Standard value (A): 198–202 mm

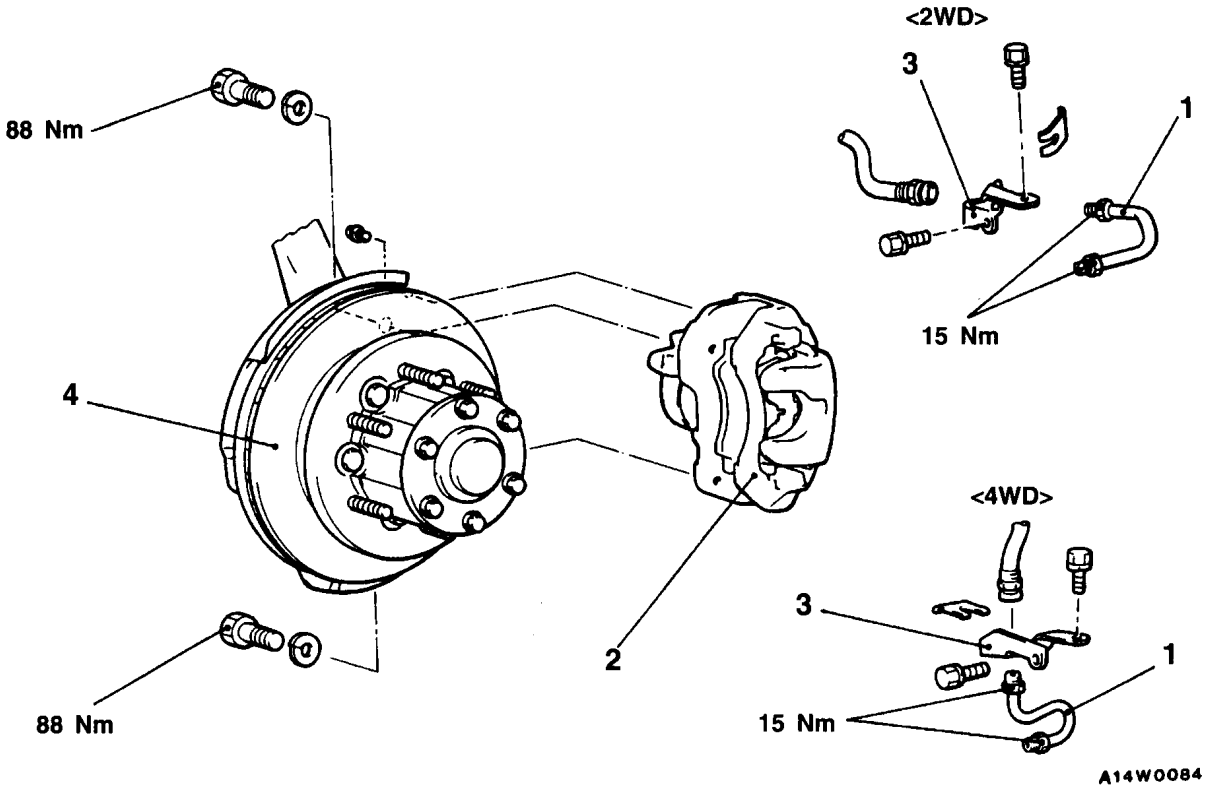
FRONT DISC BRAKE <SINGLE PISTON TYPE>

120000079

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-11.)



Removal steps

1. Brake tube
▶A◀ 2. Front brake assembly
3. Brake hose bracket
4. Brake disc (Refer to GROUP 26 – Front Hub Assembly)

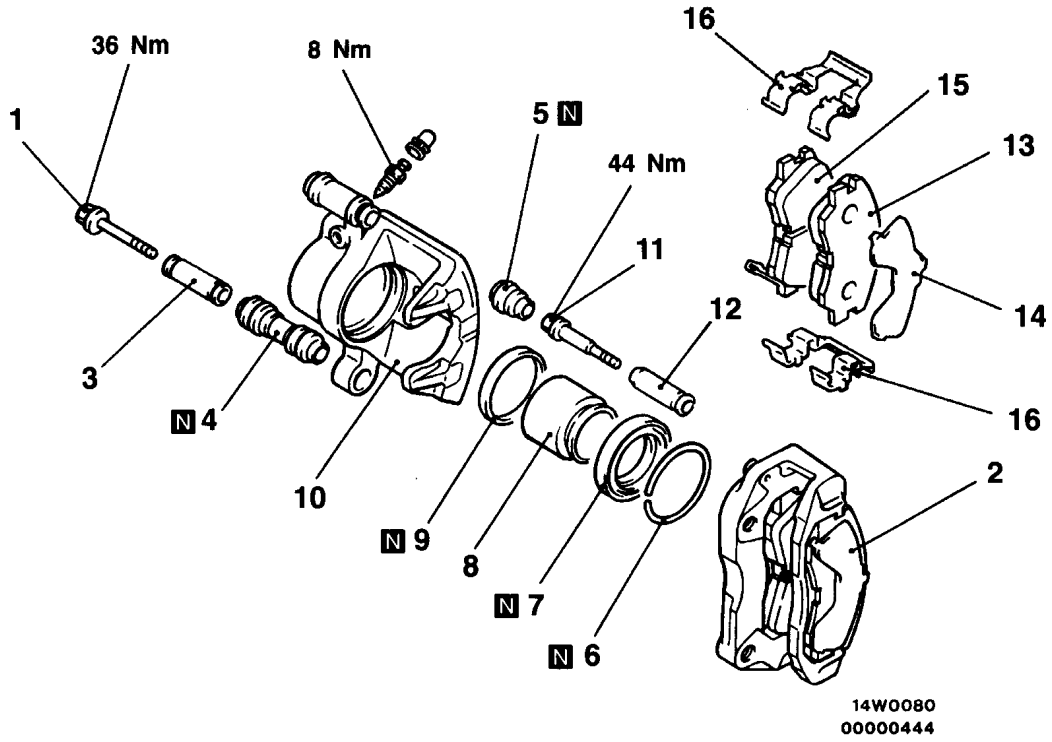
INSTALLATION SERVICE POINT

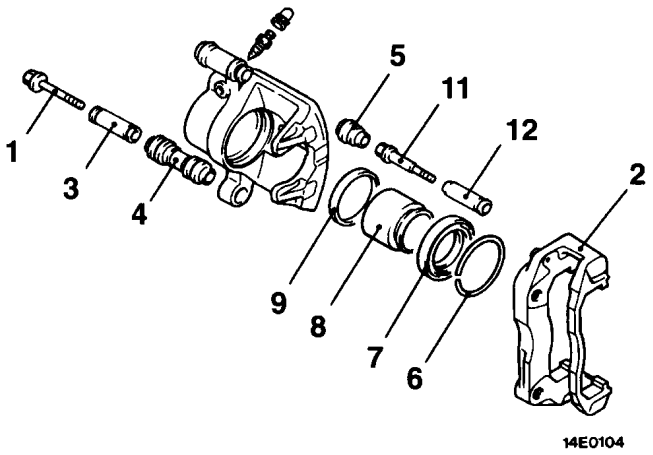
▶A◀ FRONT BRAKE ASSEMBLY INSTALLATION

Install the front brake assembly and measure the disc brake drag torque. (Refer to P. 35A-14.)

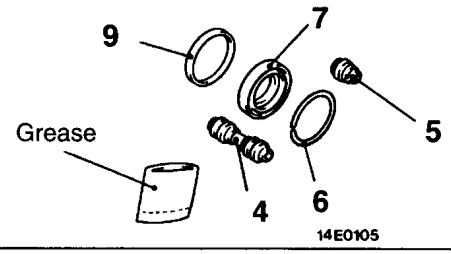
DISASSEMBLY AND REASSEMBLY

120000080

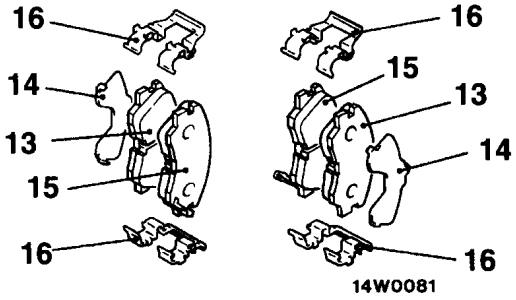




Brake caliper kit



Seal and boots repair kit



Pad repair kit

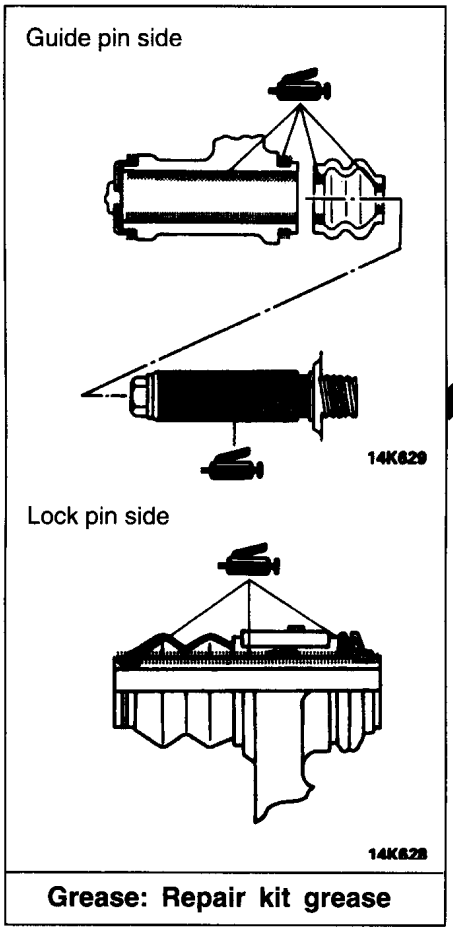
Caliper assembly disassembly steps

1. Lock pin
2. Caliper support (pad, clip, shim)
3. Lock pin sleeve
4. Lock pin boot
5. Guide pin boot
6. Boot ring
7. Piston boot ◀A▶
8. Piston ◀A▶
9. Piston seal ◀B▶
10. Caliper body
11. Guide pin
12. Guide pin sleeve

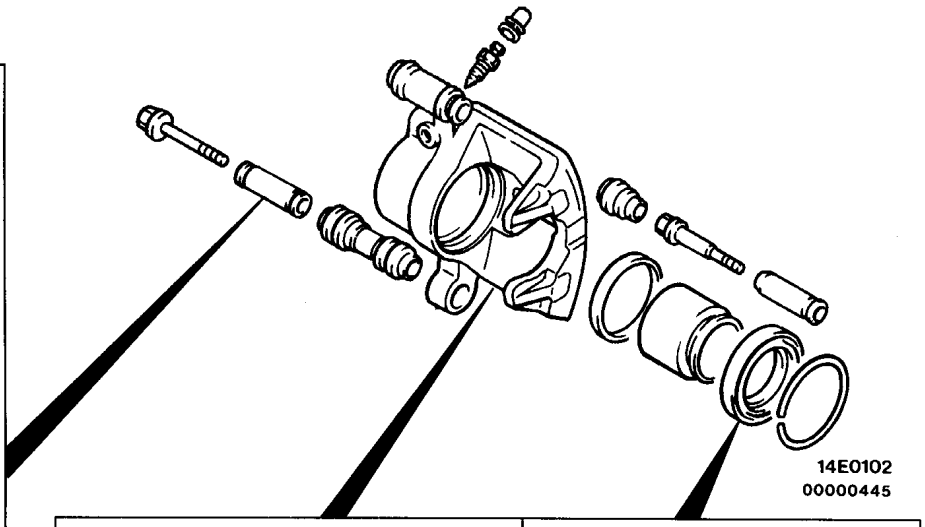
Pad assembly disassembly steps

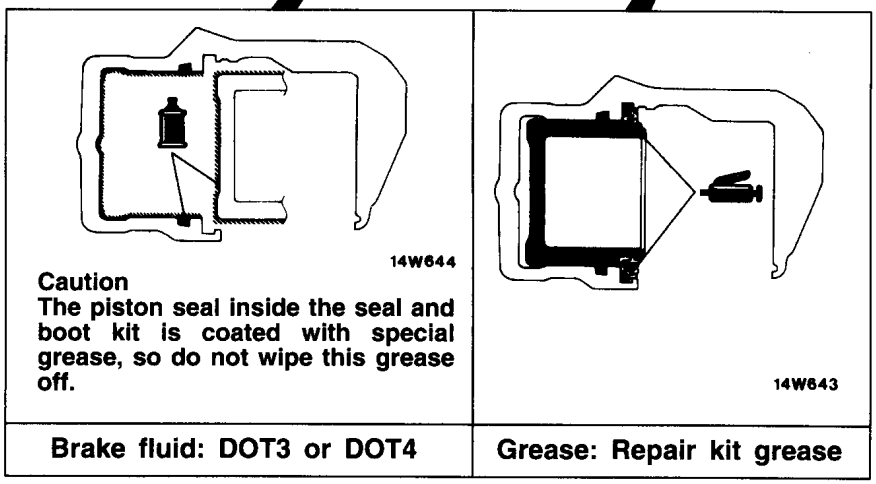
1. Lock pin
2. Caliper support (pad, clip, shim)
13. Pad assembly
14. Outer shim
15. Pad and wear indicator assembly
16. Clip

Lubrication points



Grease: Repair kit grease



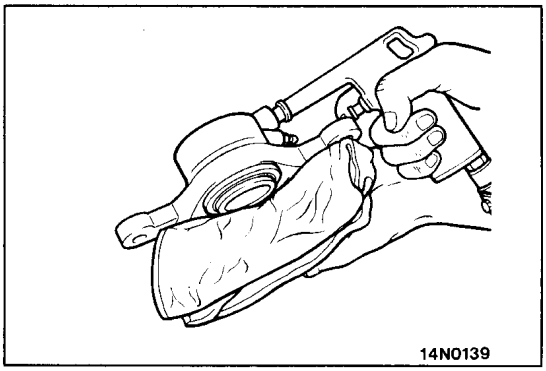


Brake fluid: DOT3 or DOT4

Grease: Repair kit grease

DISASSEMBLY SERVICE POINTS

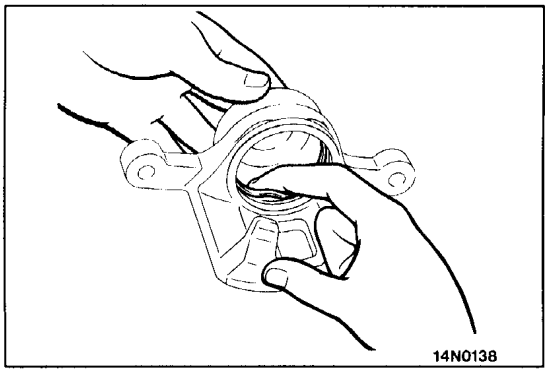
When disassembling the disc brakes, disassemble both sides (left and right) as a set.



◀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.

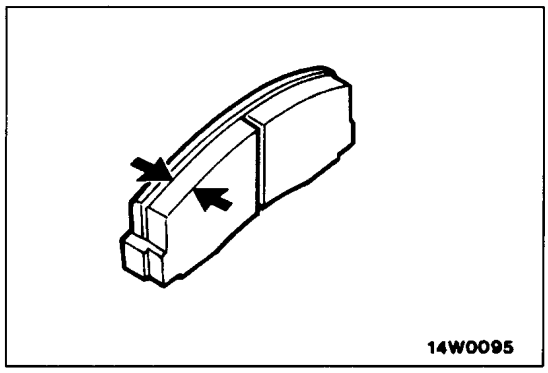
Caution
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloro-ethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.



PAD WEAR CHECK

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly if pad thickness is less than the limit value.

Standard value: 10 mm
Limit value: 2.0 mm

Caution

1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**

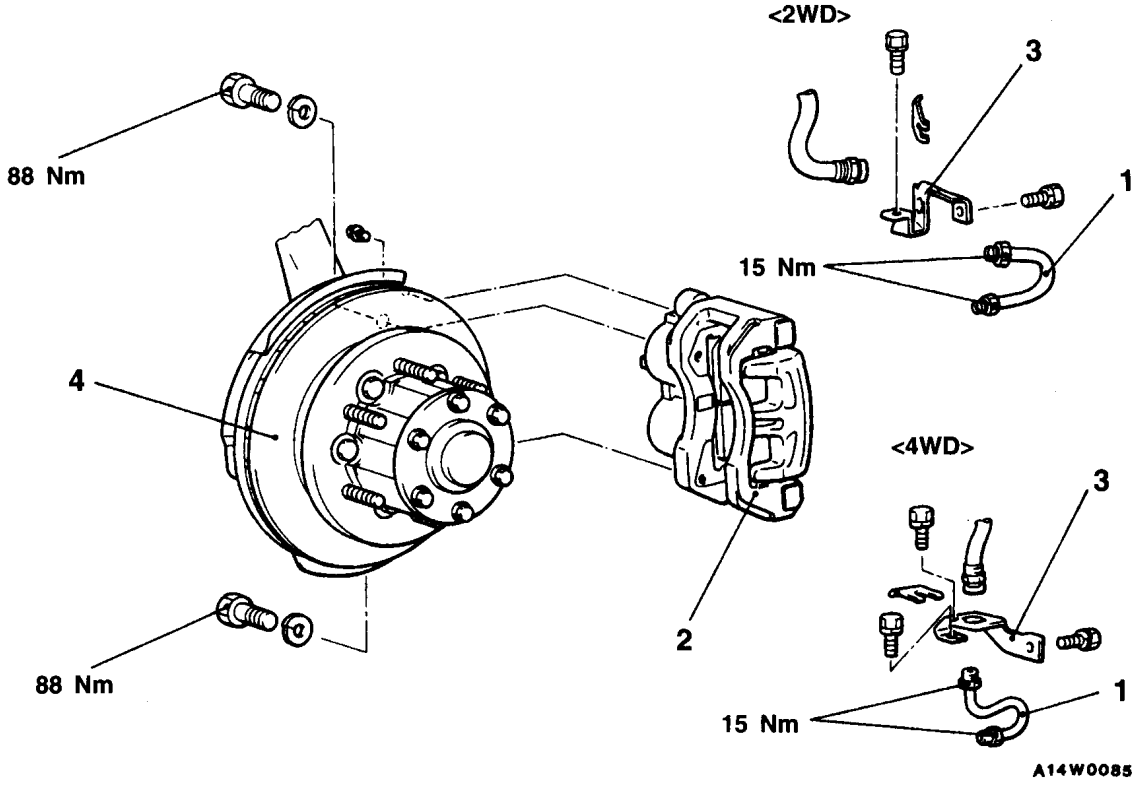
FRONT DISC BRAKE <DUAL PISTON TYPE>

120000081

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-11.)



Removal steps

1. Brake tube
▶A◀ 2. Front brake assembly
3. Brake hose bracket
4. Brake disc (Refer to GROUP 26 – Front Hub Assembly)

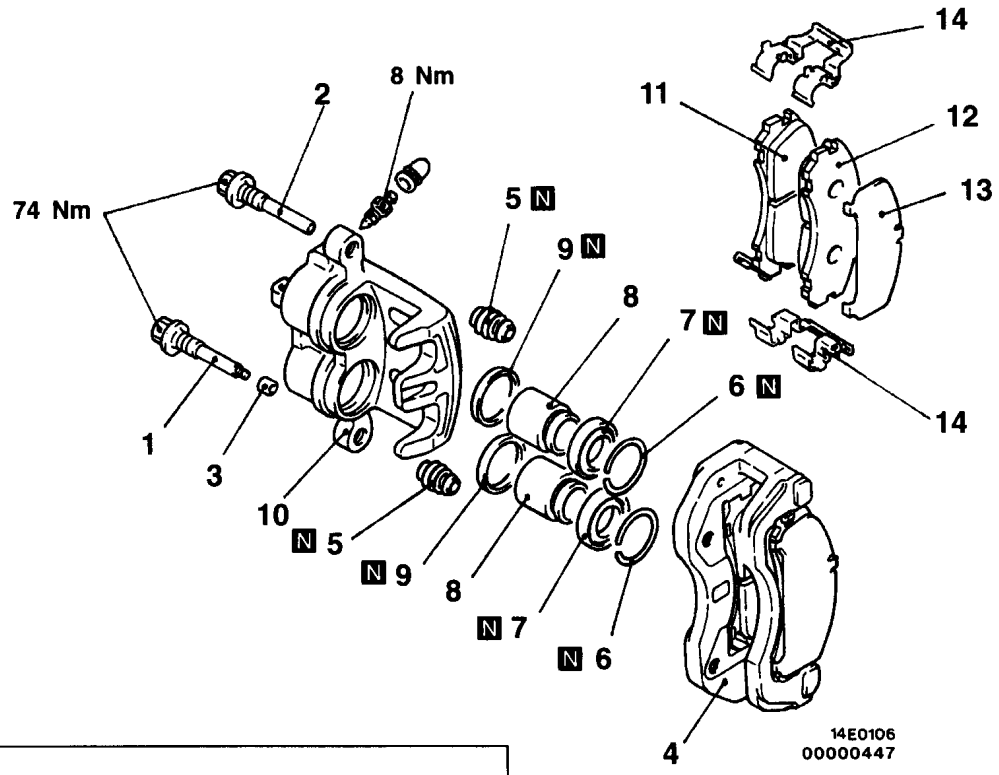
INSTALLATION SERVICE POINT

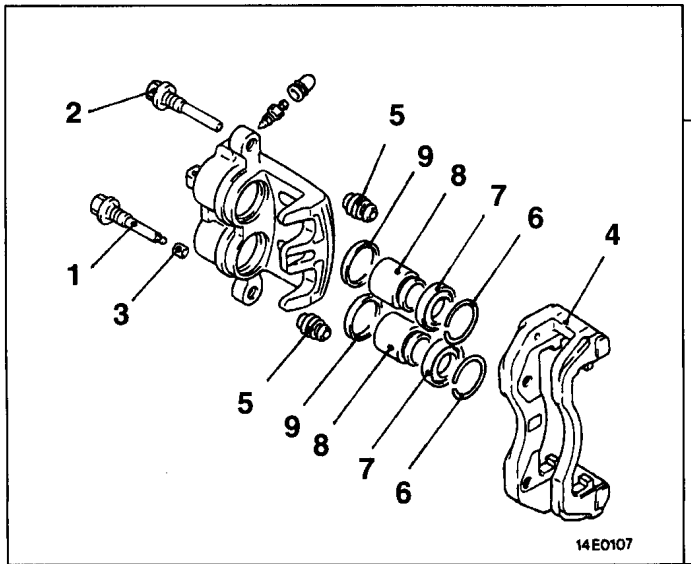
▶A◀ FRONT BRAKE ASSEMBLY INSTALLATION

Install the front brake assembly and measure the disc brake drag torque. (Refer to P. 35A-14.)

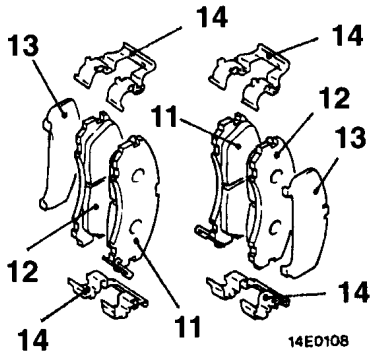
DISASSEMBLY AND REASSEMBLY

120000082

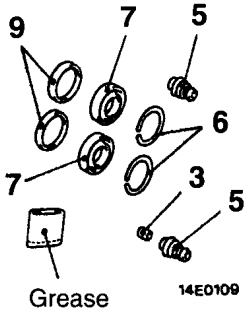




Brake caliper kit



Pad kit



Seal and boot kit

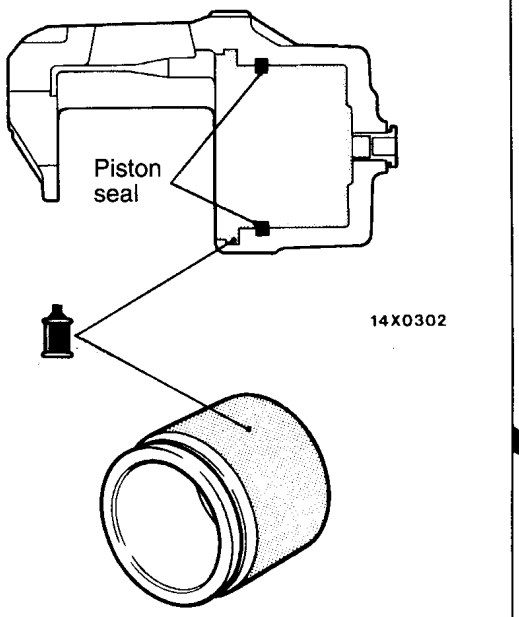
Caliper assembly disassembly steps

- ▶A◀ 1. Lock pin
- ▶A◀ 2. Guide pin
- 3. Bushing
- 4. Caliper support (Pad, clip and shim)
- 5. Pin boot
- 6. Boot ring
- ◀A▶ 7. Piston boot
- ◀A▶ 8. Piston
- ◀B▶ 9. Piston seal
- 10. Caliper body

Pad assembly disassembly steps

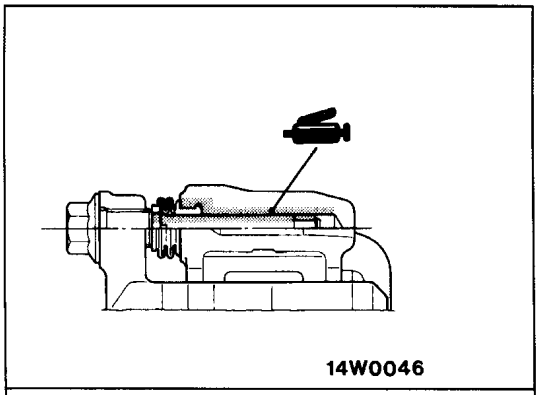
- ▶A◀ 1. Lock pin
- ▶A◀ 2. Guide pin
- 3. Bushing
- 4. Caliper support (Pad, clip and shim)
- 11. Pad and wear indicator assembly
- 12. Pad assembly
- 13. Outer shim
- 14. Clip

Lubrication points

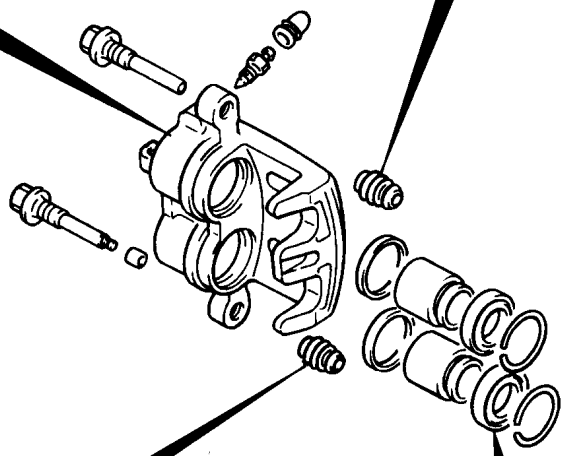


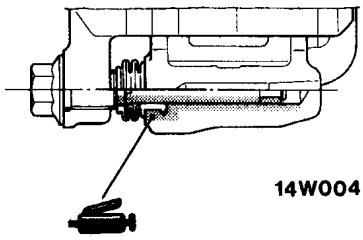
Caution
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off.

Brake fluid: DOT3 or DOT4

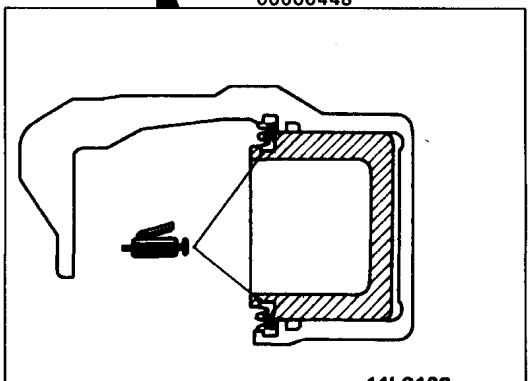


Grease: Repair kit grease

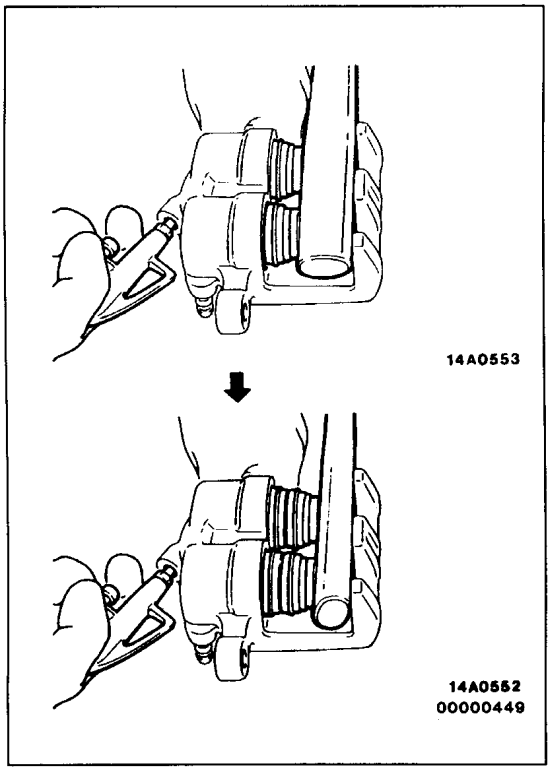




Grease: Repair kit grease



Grease: Repair kit grease



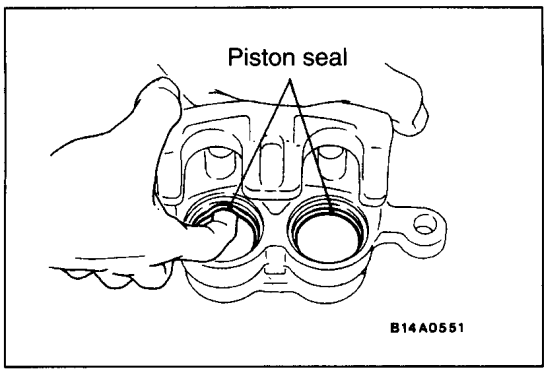
DISASSEMBLY SERVICE POINTS

When disassembling the disc brakes, disassemble both sides (left and right) as a set.

◀A▶ PISTON BOOT/PISTON REMOVAL

Pump in compressed air through the brake hose installation hole and remove the pistons and piston boot.

Caution
When removing the pistons, be sure to use the handle of a plastic hammer and adjust the height of the two pistons while pumping in air slowly in so that the pistons protrude evenly.
Do not remove one piston completely before trying to remove the other piston because it will become impossible to remove the second piston.



◀B▶ PISTON SEAL REMOVAL

(1) Remove piston seal with finger tip.

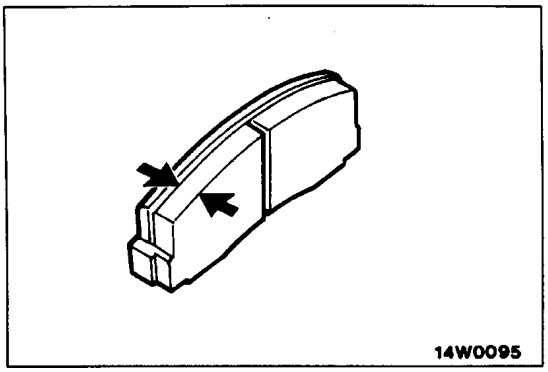
Caution
Do not use a screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloro-ethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.



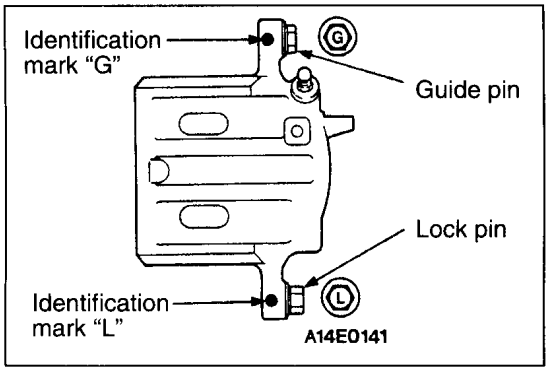
PAD WEAR CHECK

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly if pad thickness is less than the limit value.

Standard value: 10 mm
Limit value: 2.0 mm

Caution

1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**



REASSEMBLY SERVICE POINT

▶A◀ LOCK PIN/GUIDE PIN INSTALLATION

Install the guide pin and lock pin as illustrated so that each head mark of the guide pin and the lock pin matches the identification mark ("G" or "L") located on the caliper body.

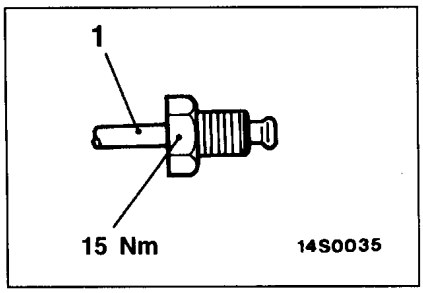
REAR DISC BRAKE

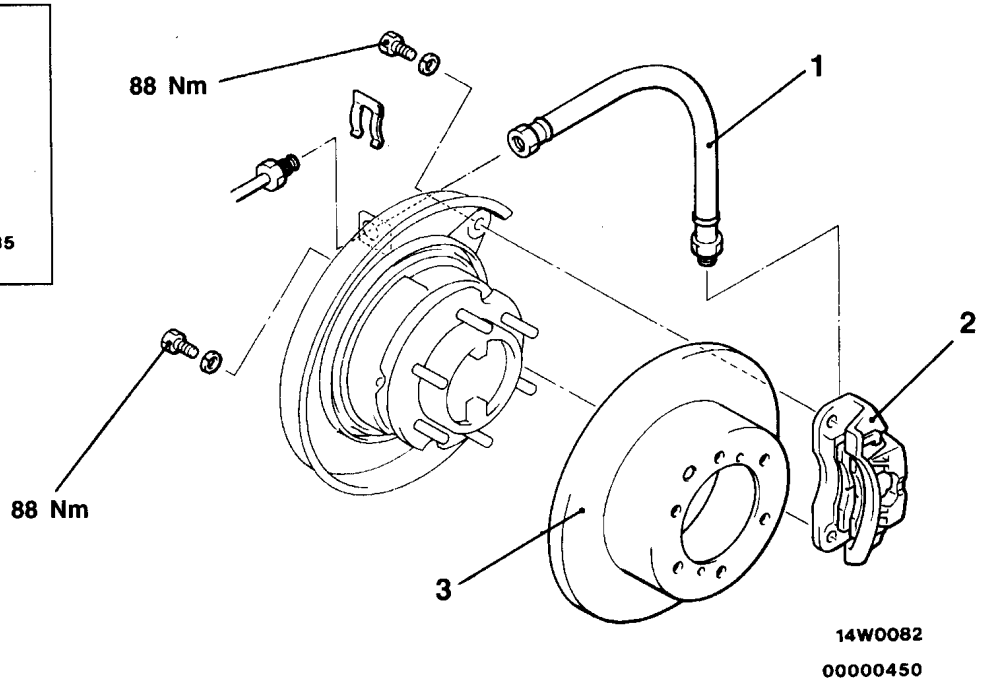
120000083

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-11.)





Removal steps

1. Brake hose connection
▶A◀ 2. Rear brake assembly
3. Brake disc

INSPECTION

- Check the brake disc for damage.
- Check the brake disc for thickness.
- Check the brake disc for run-out.

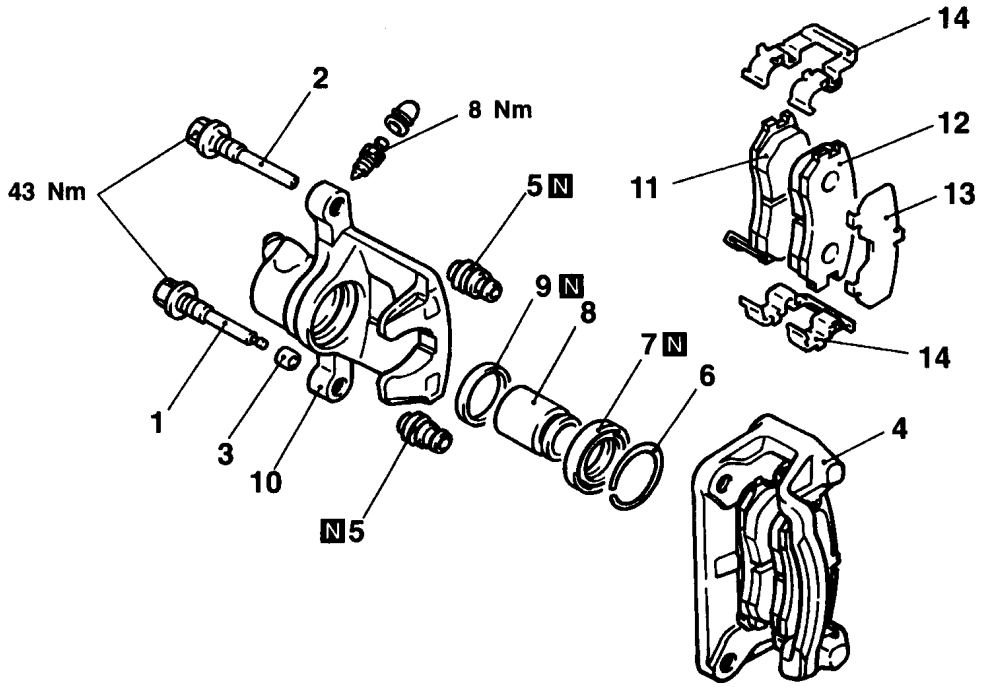
INSTALLATION SERVICE POINT

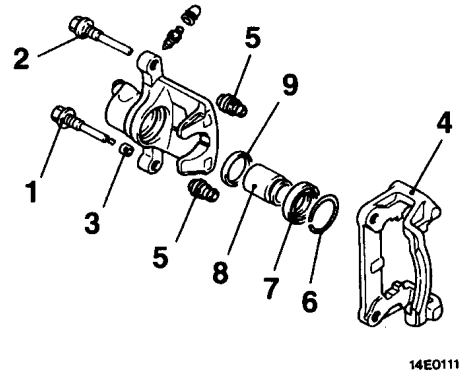
▶A◀ REAR BRAKE ASSEMBLY INSTALLATION

Install the rear brake assembly and measure the disc brake drag torque. (Refer P. 35A-14.)

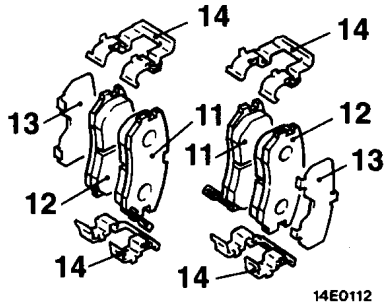
DISASSEMBLY AND REASSEMBLY

120000084

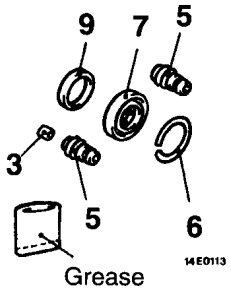




Brake caliper kit



Pad kit



Seal and boot kit

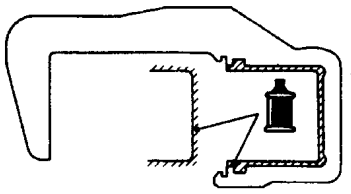
Caliper assembly disassembly steps

- ▶A◀ 1. Lock pin
- ▶A◀ 2. Guide pin
- 3. Bushing
- 4. Caliper support (Pad, clip and shim)
- 5. Pin boot
- 6. Boot ring
- ◀A▶ 7. Piston boot
- ◀A▶ 8. Piston
- ◀B▶ 9. Piston seal
- 10. Caliper body

Pad assembly disassembly steps

- ▶A◀ 1. Lock pin
- ▶A◀ 2. Guide pin
- 3. Bushing
- 4. Caliper support (Pad, clip and shim)
- 11. Pad and wear indicator assembly
- 12. Pad assembly
- 13. Outer shim
- 14. Clip

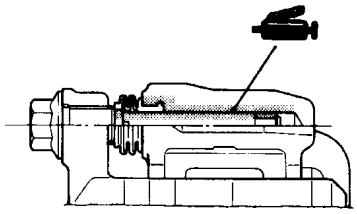
Lubrication points



14E0121

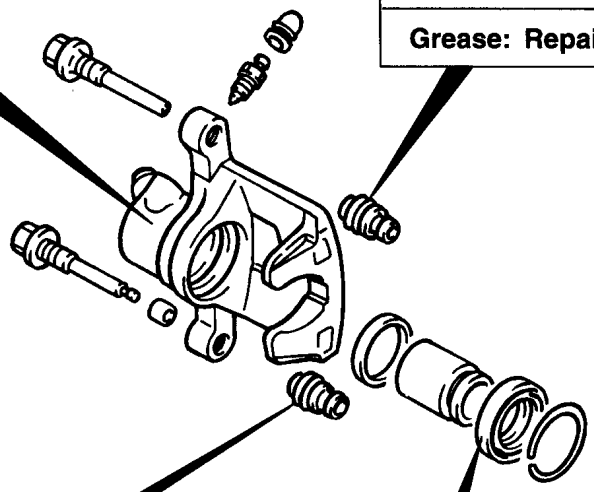
Caution
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off.

Brake fluid: DOT3 or DOT4

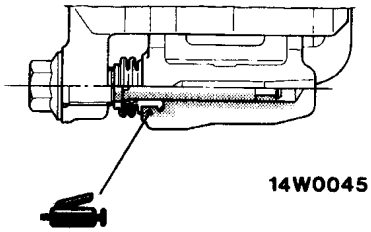


14W0046

Grease: Repair kit grease

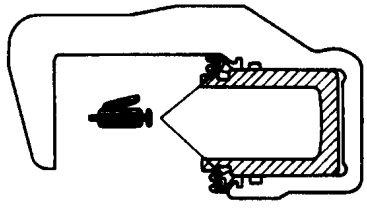


14E0110
00000452



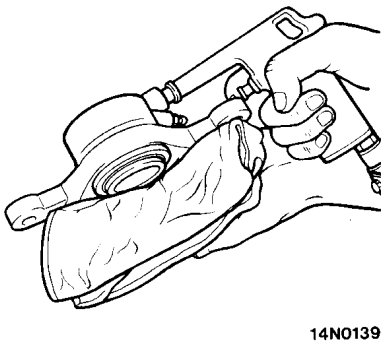
14W0045

Grease: Repair kit grease



14L0126

Grease: Repair kit grease



14N0139

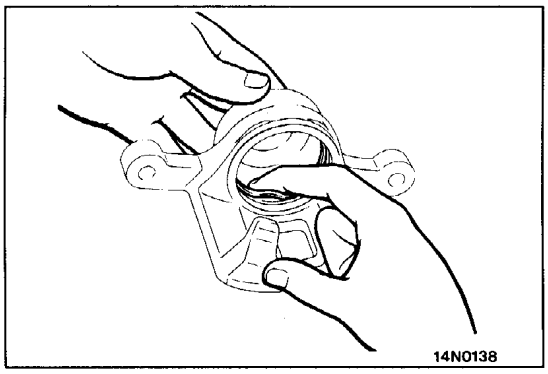
DISASSEMBLY SERVICE POINTS

When disassembling the 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.

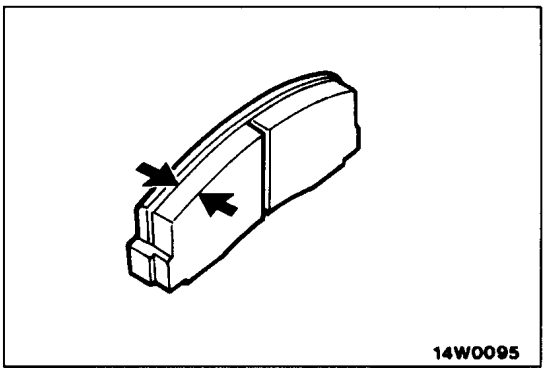
Caution
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloro-ethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.

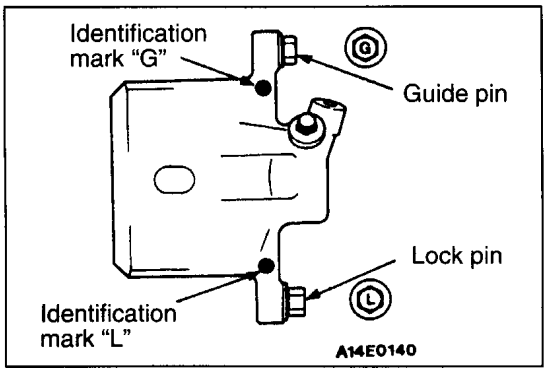


PAD WEAR CHECK

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly if pad thickness is less than the limit value.

Standard value: 9.0 mm
Limit value: 2.0 mm

Caution
1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**



REASSEMBLY SERVICE POINT

▶A◀ LOCK PIN/GUIDE PIN INSTALLATION

Install the guide pin and lock pin as illustrated so that each head mark of the guide pin and the lock pin matches the identification mark located on the caliper body.

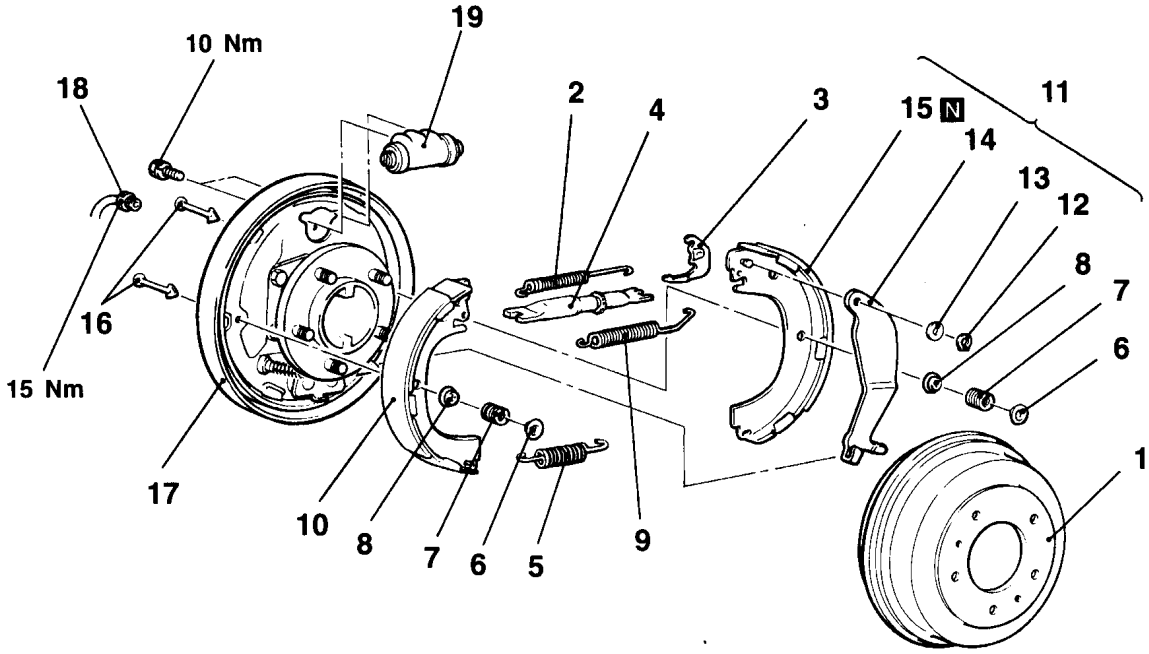
REAR DRUM BRAKE <2WD>

120002242

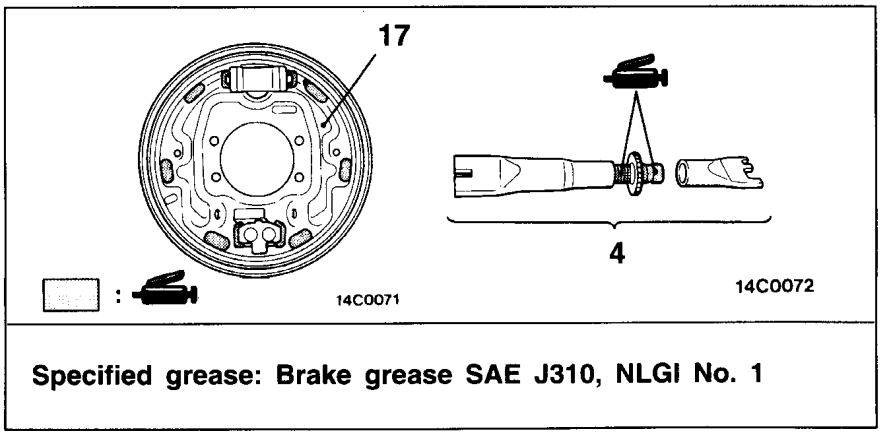
REMOVAL AND INSTALLATION

Pre-removal Operation
- Loosening the Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Filling and Air Bleeding (Refer to P. 35A-11 or GROUP 35B – Service Adjustment Procedures.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)

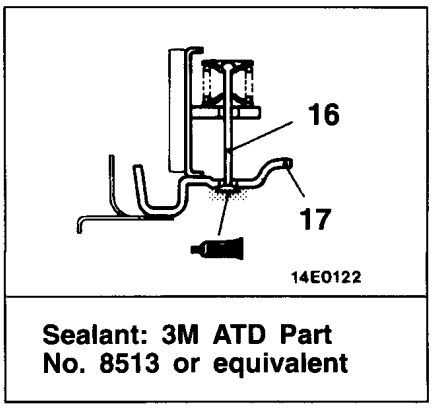


14W0094



Specified grease: Brake grease SAE J310, NLGI No. 1

00000453



Sealant: 3M ATD Part No. 8513 or equivalent

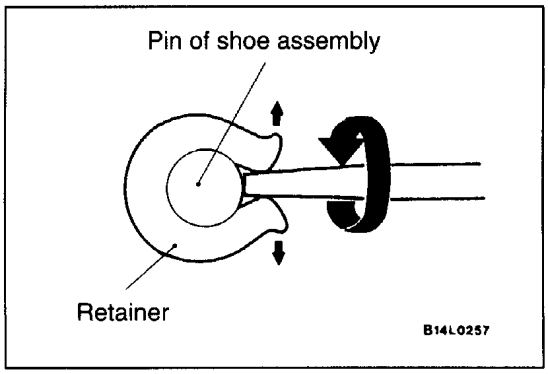
Rear drum brake removal steps

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 hold-down cup
9. Shoe-to-shoe spring
10. Shoe and lining assembly
11. Shoe and lever assembly

◀A▶ ▶B◀ 12. Retainer
▶A◀ 13. Wave washer
14. Parking lever
15. Shoe and lining assembly
16. Shoe hold-down pin
17. Backing plate (Refer to GROUP 27 – Rear Axle Shaft)

Wheel cylinder removal steps

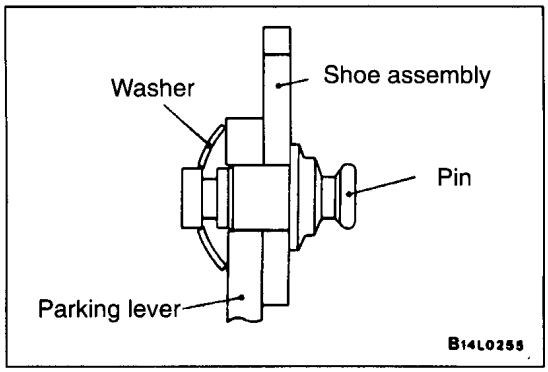
1. Brake drum
18. Brake tube connection
19. Wheel cylinder



REMOVAL SERVICE POINT

◀A▶ RETAINER REMOVAL

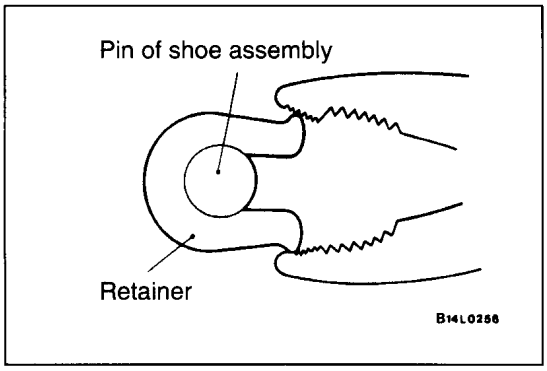
Use a screwdriver or the like to open up the retainer joint, and remove the retainer.



INSTALLATION SERVICE POINTS

▶A◀ WAVE WASHER INSTALLATION

Install the washer in the direction shown in the illustration.



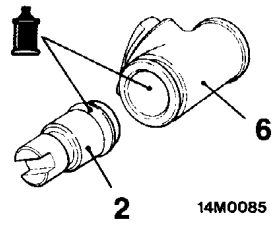
▶B◀ RETAINER INSTALLATION

Use pliers or the like to install the retainer or the pin positively.

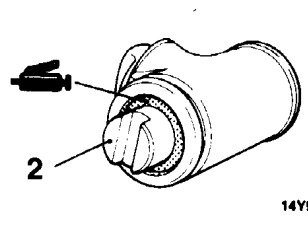
WHEEL CYLINDER

120000086

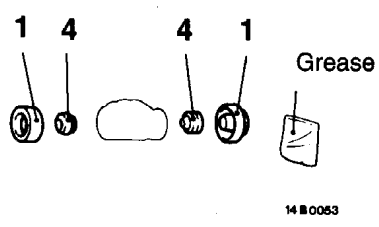
DISASSEMBLY AND REASSEMBLY



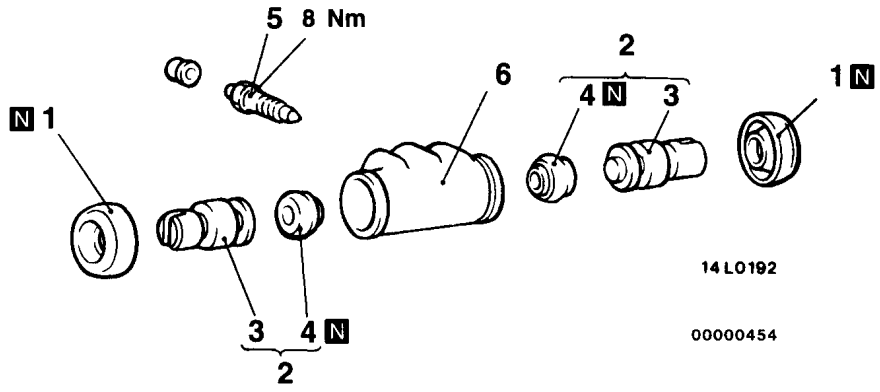
Brake fluid: DOT3 or DOT4



Grease: Repair kit grease



Wheel cylinder repair kit

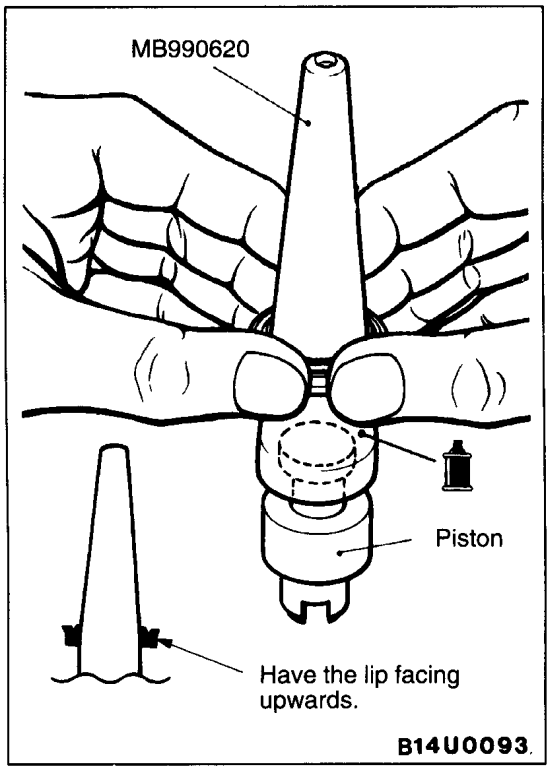


Disassembly steps

1. Boots
2. Piston assembly
3. ▶A◀ Pistons
4. ▶A◀ Piston cups
5. Bleeder screw
6. Wheel cylinder body

INSPECTION

Check the piston and wheel cylinder walls for rust or damage, and if there is any abnormality, replace the entire wheel cylinder assembly.



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.

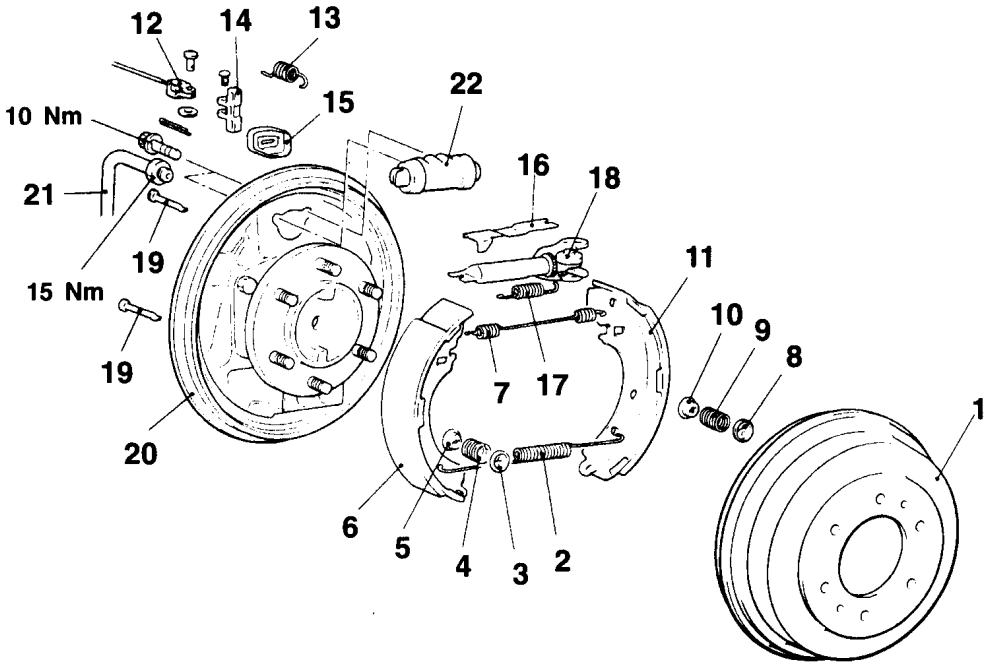
REAR DRUM BRAKE <4WD>

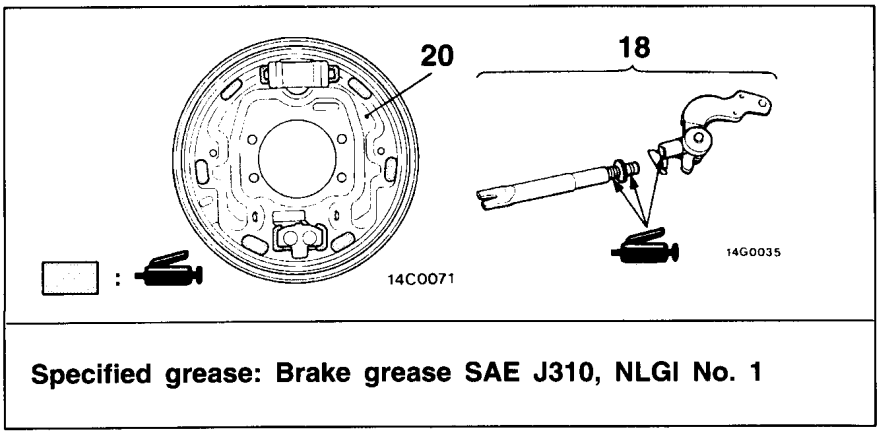
120002243

REMOVAL AND INSTALLATION

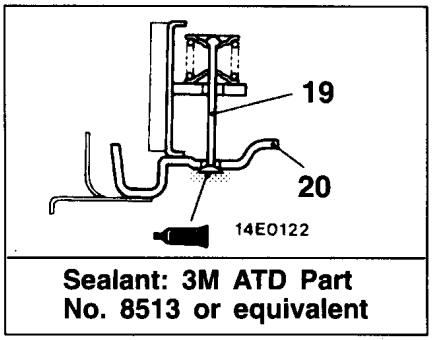
Pre-removal Operation
- Loosening the Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Filling and Air Bleeding (Refer to P. 35A-11 or GROUP 35B – Service Adjustment Procedures.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)





Specified grease: Brake grease SAE J310, NLGI No. 1



Sealant: 3M ATD Part No. 8513 or equivalent

00002855

Rear drum brake removal steps

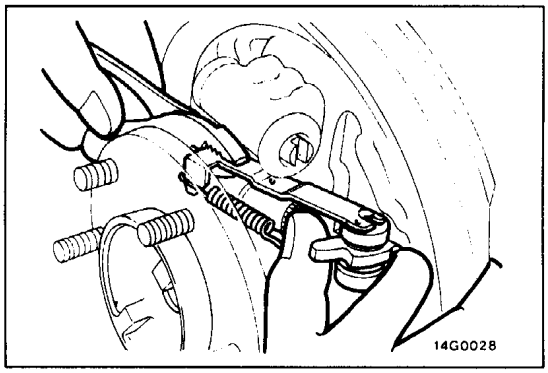
1. Brake drum
2. Lower shoe return spring
3. Shoe hold-down cup
4. Shoe hold-down spring
5. Shoe hold-down cup
6. Shoe and lining assembly
7. Upper shoe return spring
8. Shoe hold-down cup
9. Shoe hold-down spring
10. Shoe hold-down cup
11. Shoe and lining assembly
12. Parking brake cable connection
13. Lever return spring

◀A▶
◀A▶

14. Parking lever stopper
15. Lever boot
16. Lever return spring bracket
17. Spring
18. Adjuster lever assembly
19. Shoe hold-down pin
20. Backing plate (Refer to GROUP 27 – Rear Axle Shaft)

Wheel cylinder removal steps

1. Brake drum
21. Brake tube connection
22. Wheel cylinder



REMOVAL SERVICE POINT

◀A▶ LEVER RETURN SPRING BRACKET/SPRING REMOVAL

Pull the lever return spring bracket with pliers and remove it and spring from the adjuster lever assembly.

WHEEL CYLINDER

120002244

DISASSEMBLY AND REASSEMBLY

Refer to P.35A-47.

ANTI-SKID BRAKING SYSTEM (ABS) <2WD>

CONTENTS

120002245

GENERAL INFORMATION 3

SERVICE SPECIFICATIONS 4

LUBRICANTS 4

SEALANTS 4

SPECIAL TOOLS 4

TROUBLESHOOTING 5

SERVICE ADJUSTMENT PROCEDURES 29

Brake Pedal Inspection and Adjustment ..... Refer to GROUP 35A

Stop Lamp Switch Inspection ..... Refer to GROUP 35A

Brake Booster Operating Test ..... Refer to GROUP 35A

Brake Booster Vacuum Switch Check ..... Refer to GROUP 35A

CONTINUED ON NEXT PAGE

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

WARNING!

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

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

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

NOTE

The SRS includes the following components: impact sensors, SRS diagnosis unit, 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(*).

Bleeding 29
Load Sensing Spring Length Check and Adjustment ..... Refer to GROUP 35A
Load Sensing Proportioning Valve Function Test ..... Refer to GROUP 35A
Disc Brake Pad Check and Replacement ..... Refer to GROUP 35A
Front Disc Brake Rotor Inspection ..... Refer to GROUP 35A
Rear Brake Disc Run-out Check ..... Refer to GROUP 35A
Rear Brake Disc Run-out Correction ..... Refer to GROUP 35A
Rear Brake Disc Thickness Check ..... Refer to GROUP 35A
Brake Lining Thickness Check ..... Refer to GROUP 35A
Brake Drum Inside Diameter Check ..... Refer to GROUP 35A
Brake Lining and Brake Drum Connection Check ..... Refer to GROUP 35A
ABS Operation Check 30

BRAKE PEDAL ..... Refer to GROUP 35A

MASTER CYLINDER AND BRAKE BOOSTER 35

LOAD SENSING PROPORTIONING VALVE ..... Refer to GROUP 35A

FRONT DISC BRAKE .. Refer to GROUP 35A

REAR DISC BRAKE .... Refer to GROUP 35A

REAR DRUM BRAKE .. Refer to GROUP 35A

HYDRAULIC UNIT 41

WHEEL SPEED SENSOR 43

STEERING WHEEL SENSOR* 45

ELECTRONIC CONTROL UNIT* 46

GENERAL INFORMATION

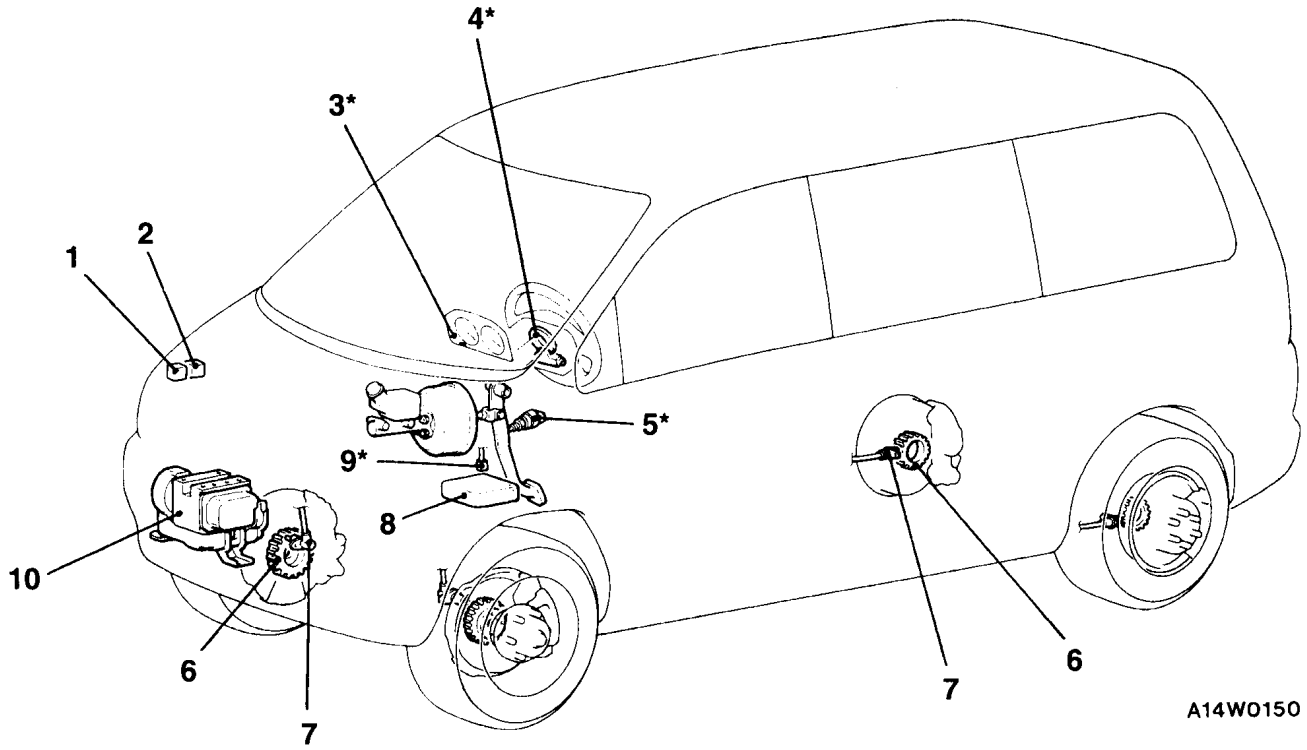
120000110

The ABS consists of wheel speed sensors, stop lamp switch hydraulic unit and the ABS-ECU. If a problem occurs in the system, the malfunctioning system can be identified by means of the diagnosis function, and the trouble symptom memory will not be erased even if the ignition switch is turned to OFF. (However, it will be erased if the battery is disconnected.)
In addition, reading of diagnosis codes and service data and actuator testing are possible using the MUT-II.

Items	Specifications
Speed sensor	Magnet coil type
Front rotor teeth	47
Rear rotor teeth	47

CONSTRUCTION DIAGRAM

120002438



NOTE
For R.H. drive vehicles, * indicates installaiton at the right side.

1. ABS valve relay
2. ABS motor relay
3. ABS warning lamp
4. Steering wheel sensor
5. Stop lamp switch
6. Rotor
7. Wheel speed sensor
8. ABS-ECU
9. Diagnosis connector
10. Hydraulic unit

SERVICE SPECIFICATIONS

120002440

Items		Standard value
Hydraulic unit solenoid valve internal resistance Ω	OUT	3.8
	IN	8.2
Speed sensor's internal resistance kΩ	Front	0.9–1.1
	Rear	1.4–2.0
Speed sensor insulation resistance kΩ		100 or more
Booster push rod to master cylinder piston clearance mm	Petrol-powered vehicles	0.70–1.20
	Diesel-powered vehicles	1.00–1.40

LUBRICANTS

120000113

Items	Specified lubricant
Brake fluid	DOT3 or DOT4

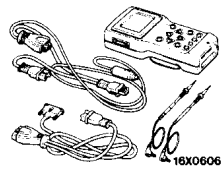
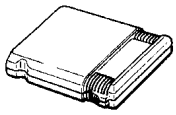
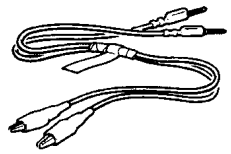
SEALANTS

120000114

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8663 or equivalent	Semi-drying sealant
Vacuum switch		

SPECIAL TOOLS

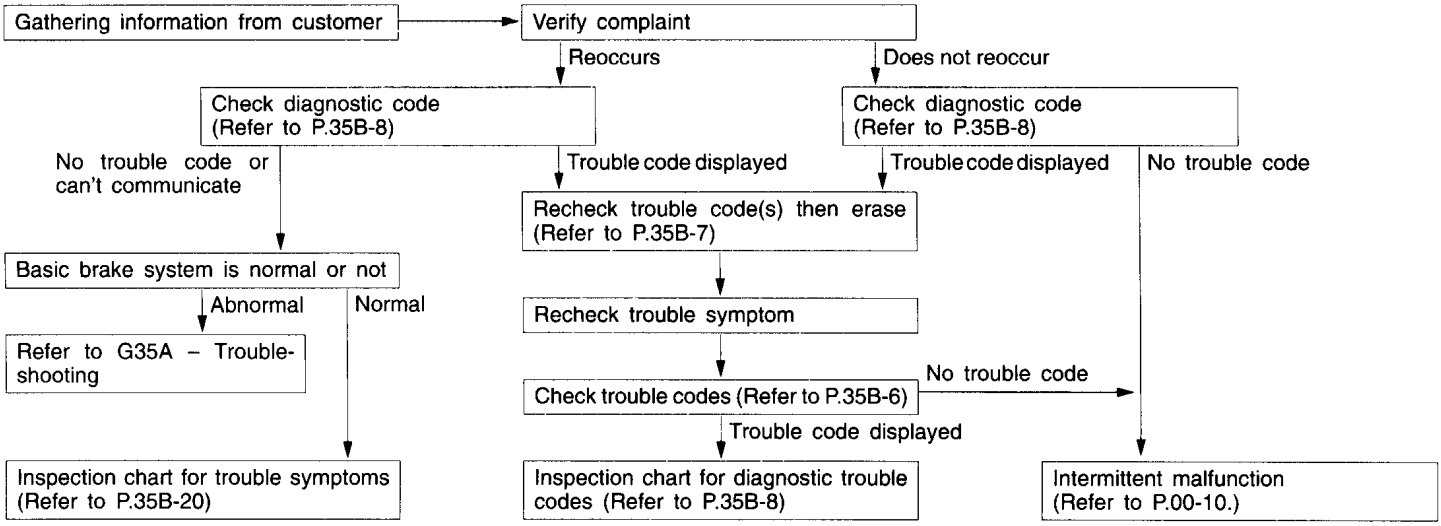
120000115

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	For checking of ABS (Diagnosis code display when using the MUT-II)
 16X0607	–	ROM pack	
	MB991529	Diagnosis code check harness	For checking of ABS (Diagnosis code display when using the ABS warning lamp)

TROUBLESHOOTING

120002441

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

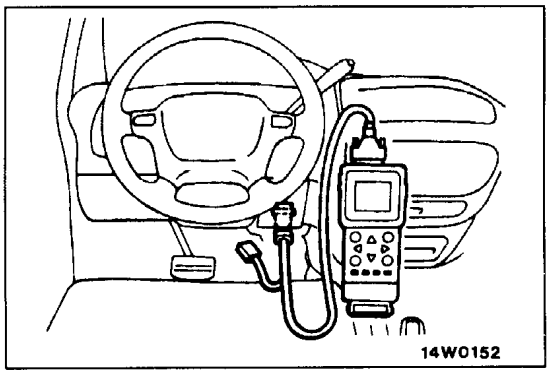


NOTES WITH REGARD TO DIAGNOSIS

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 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.



DIAGNOSTIC FUNCTION

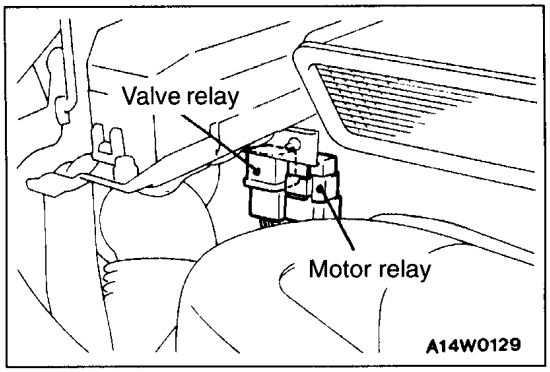
120002442

DIAGNOSTIC CODES CHECK

With the MUT-II

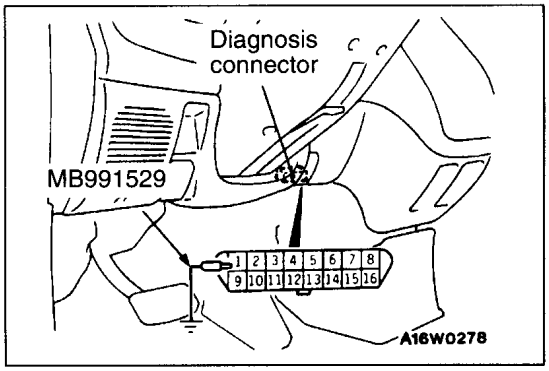
Connect the MUT-II to the diagnosis connector (16-pin), then check diagnostic codes.

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



Without the MUT-II

1. Turn the ignition switch off and then disconnect the valve relay connector.

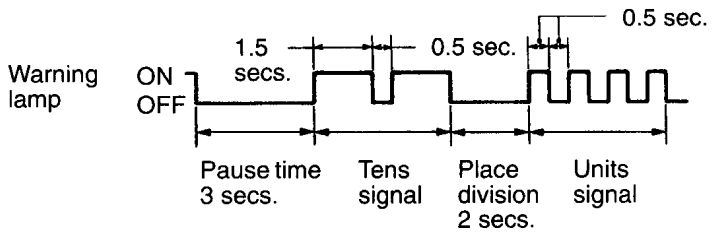


2. Use the special tool to earth diagnosis connector terminal No. 1.

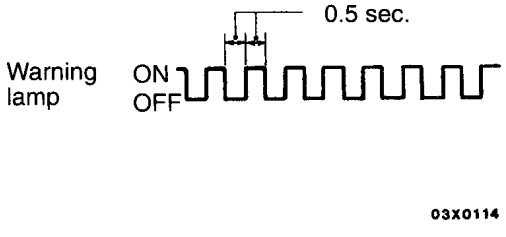
3. Turn the ignition switch to ON and then take a reading of the diagnosis codes from the flashing of the ABS warning lamp.

   NOTE
   Diagnosis code No. 51 (indicating an open or short circuit in the valve relay) will be always output, because the valve relay connector is disconnected.

When diagnosis code No. 24 is output



When no diagnosis code is output



4. Remedy the malfunctions indicated by the diagnosis codes, disconnect the diagnosis code check harness, and then reconnect the valve relay harness. Then turn the ignition switch to ON again to check the ABS warning lamp. (Refer to P.35B-19.) If the lamp indicates a malfunction, the valve relay system may be defective. (Refer to P.35B-17.)

ERASING DIAGNOSTIC CODES

With the MUT-II

Connect the MUT-II to the diagnosis connector (16-pin), then erase the diagnostic codes.

Without the MUT-II

Removing the battery cable from the battery (–) terminal for 10 seconds or more, then reconnect the cable.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

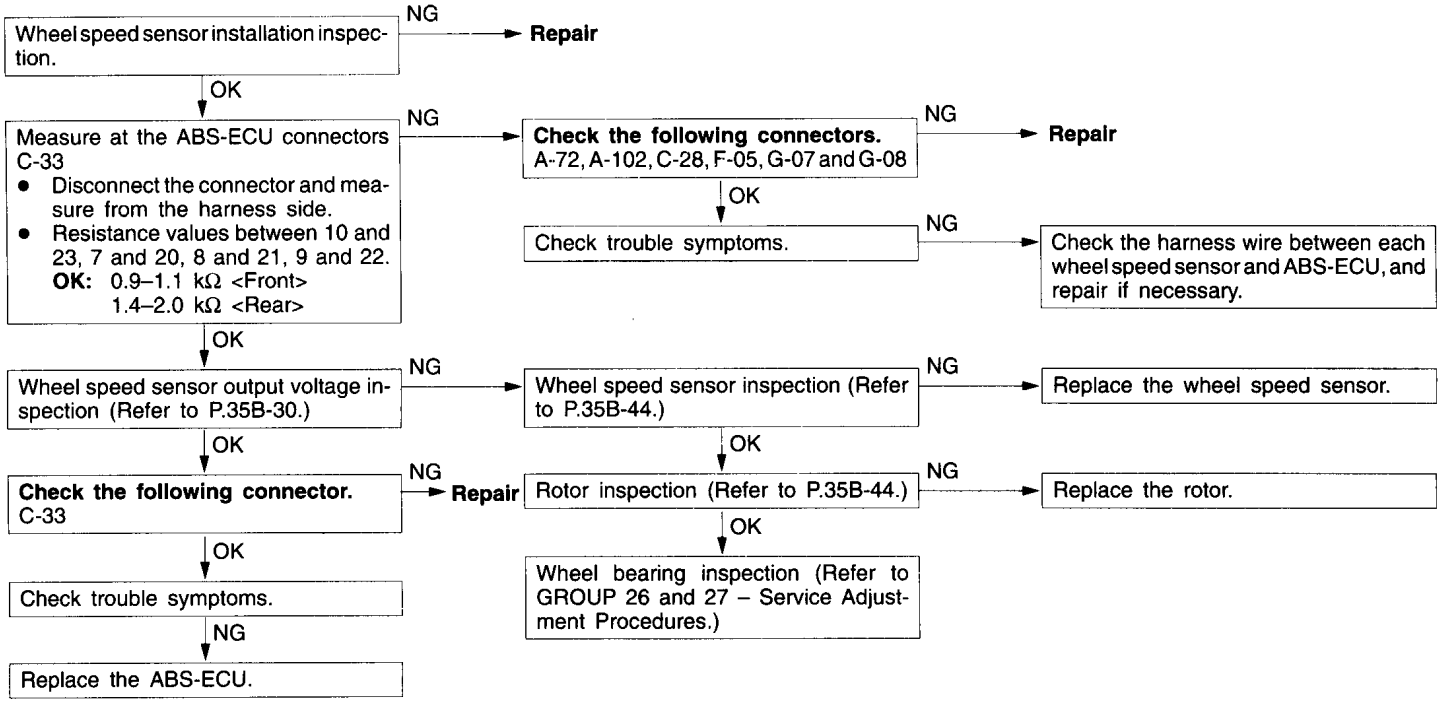
120002581

Inspect according to the inspection chart that is appropriate for the malfunction code.

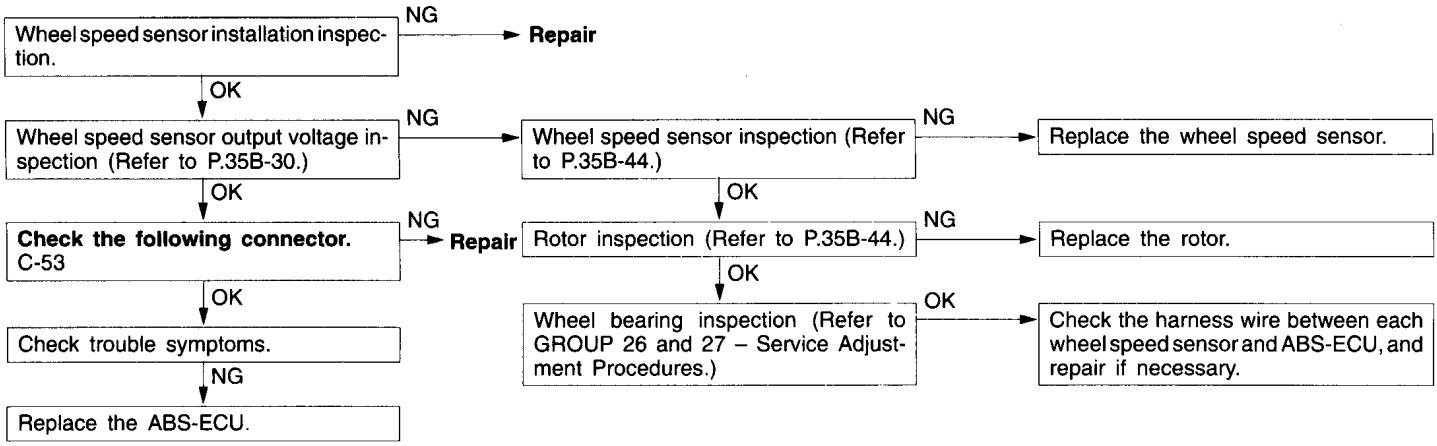
Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front-right wheel speed sensor	Open circuit	P.35B-9
12	Front-left wheel speed sensor		
13	Rear-right wheel speed sensor		
14	Rear-left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	P.35B-10
16	Power supply system		P.35B-10
21	Front-right wheel speed sensor	Short circuit	P.35B-11
22	Front-left wheel speed sensor		
23	Rear-right wheel speed sensor		
24	Rear-left wheel speed sensor		
33	Stop lamp switch system		P.35B-12
34	Steering wheel sensor	Open circuit	P.35B-13
35	Steering wheel sensor (ST-N)	Neutral position improperly detected	P.35B-14
36	Steering wheel sensor (ST-1, ST-2)	Steering angle improperly detected	P.35B-15
41	Front-right solenoid valve		P.35B-16
42	Front-left solenoid valve		
43	Rear-right solenoid valve		
44	Rear-left solenoid valve		
51	Valve relay		P.35B-17
53	Motor relay, motor		P.35B-18
63	ABS-ECU		P.35B-46 (Replace the ABS-ECU.)

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

Code No. 11, 12, 13, 14 Wheel speed sensor open circuit	Probable cause
[Comment] The ABS-ECU determines that an open circuit occurs in more than one line of wheel speed sensors.	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

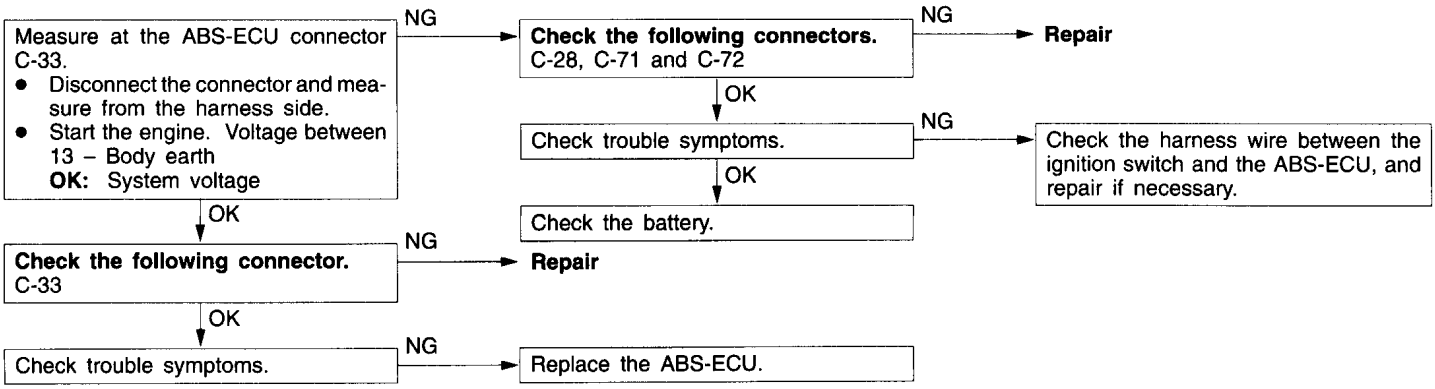


Code No. 15 Wheel speed sensor (Abnormal output signal)	Probable cause
[Comment] A wheel speed sensor outputs an abnormal signal (other than an open or short-circuit).	• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

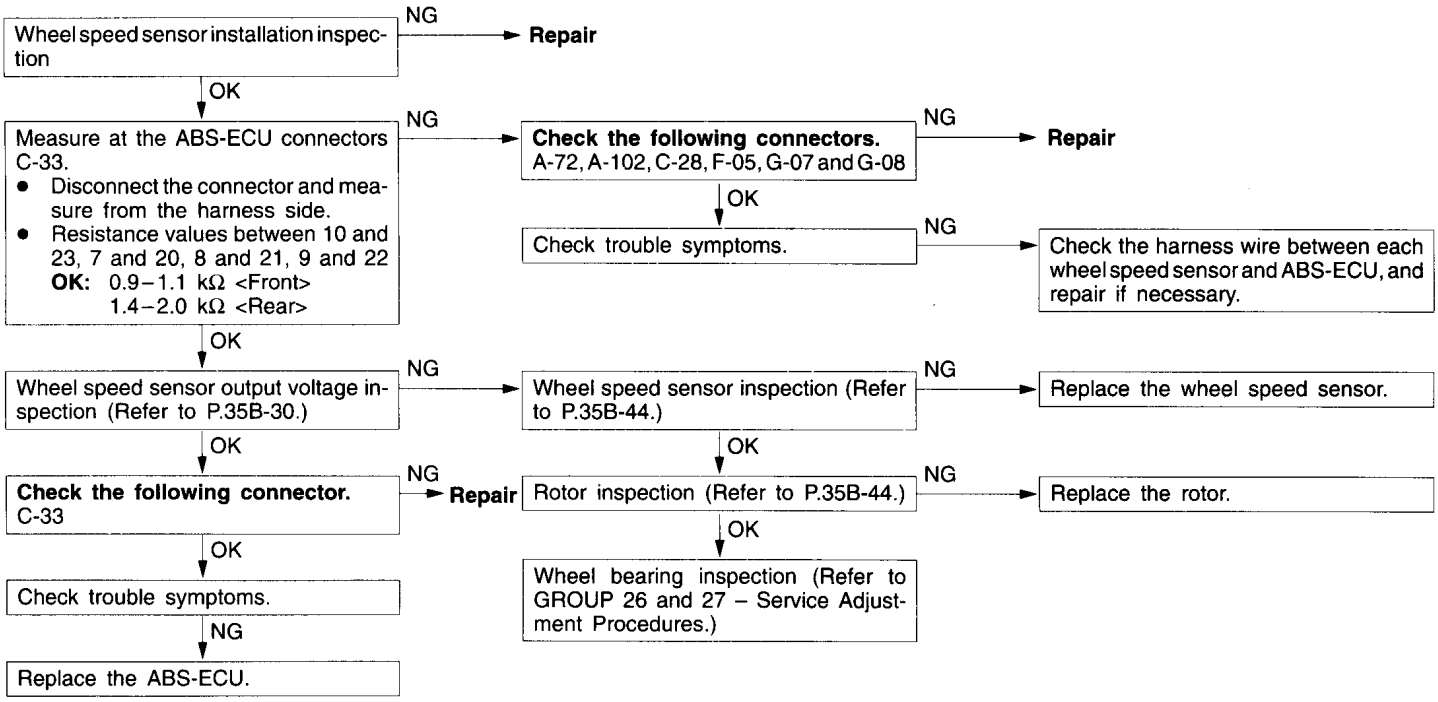


Code No. 16 Power supply system	Probable cause
[Comment] The voltage of the ABS-ECU power supply drops lower or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector. • Malfunction of ABS-ECU

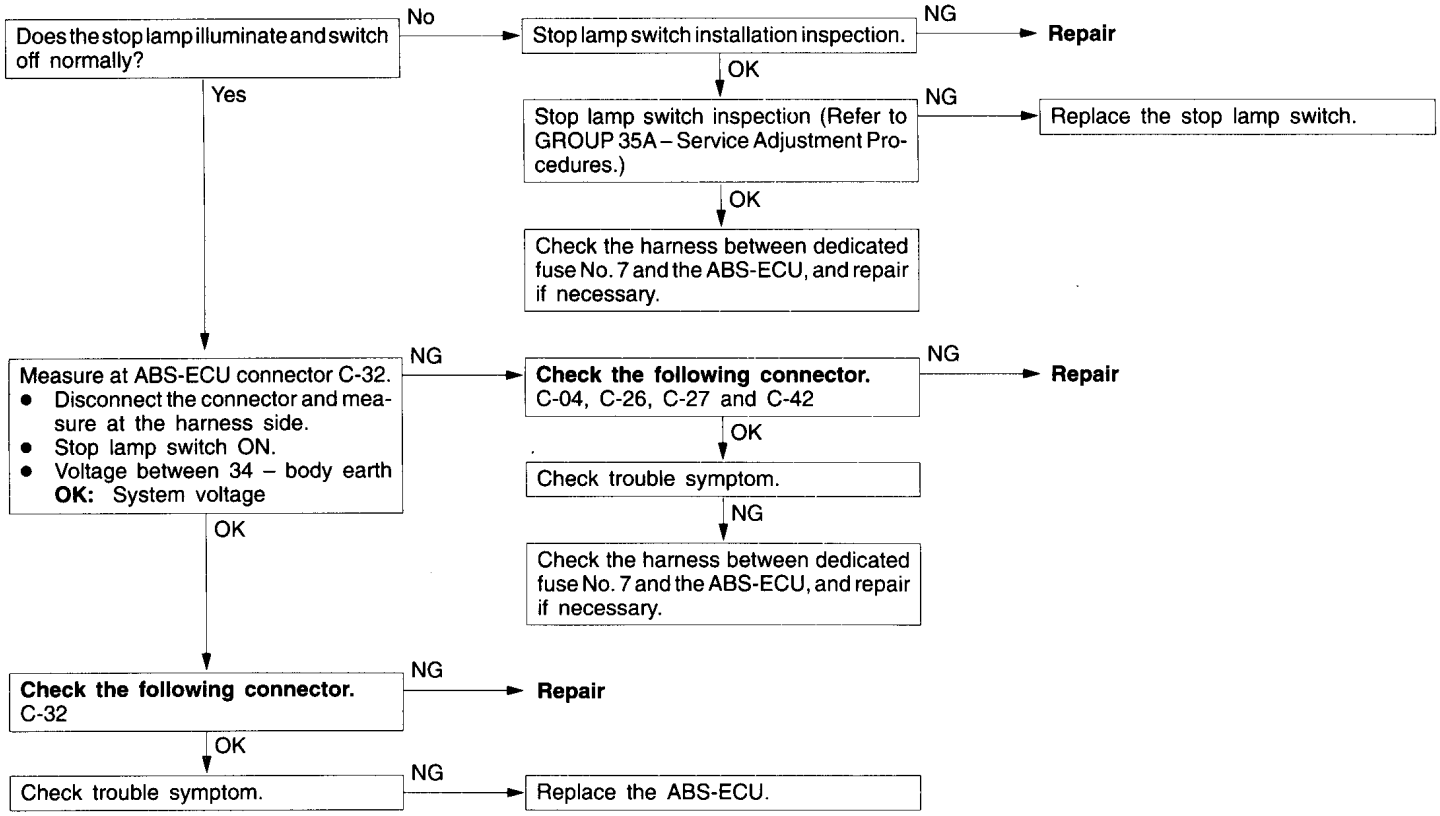
Caution
If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to standard value, this code is no longer output.
Before carrying out the follwing inspection, check the battery level, and refill distilled water if necessary.



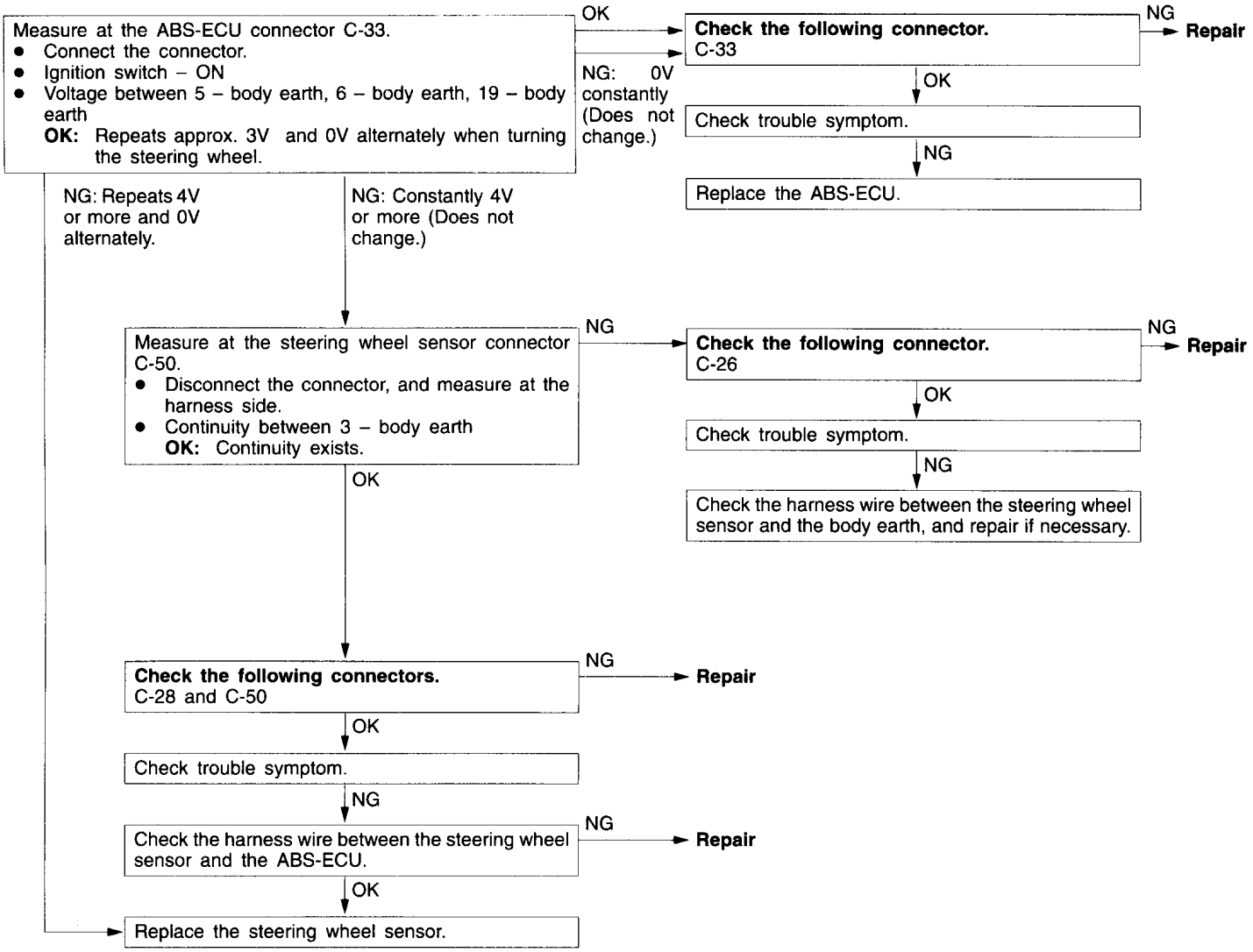
Code No. 21, 22, 23, 24 Wheel speed sensor short circuit	Probable cause
[Comment] These codes are output at the following times: • When an open circuit cannot be found, but more than one wheel speed sensor does not output any signal during driving at 8 km/h or higher. • When a chipped or plugged-up rotor tooth, etc. is detected. • When the sensor output drops and anti-lock control is continuously carried out due to a defective sensor or a warped rotor.	• Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



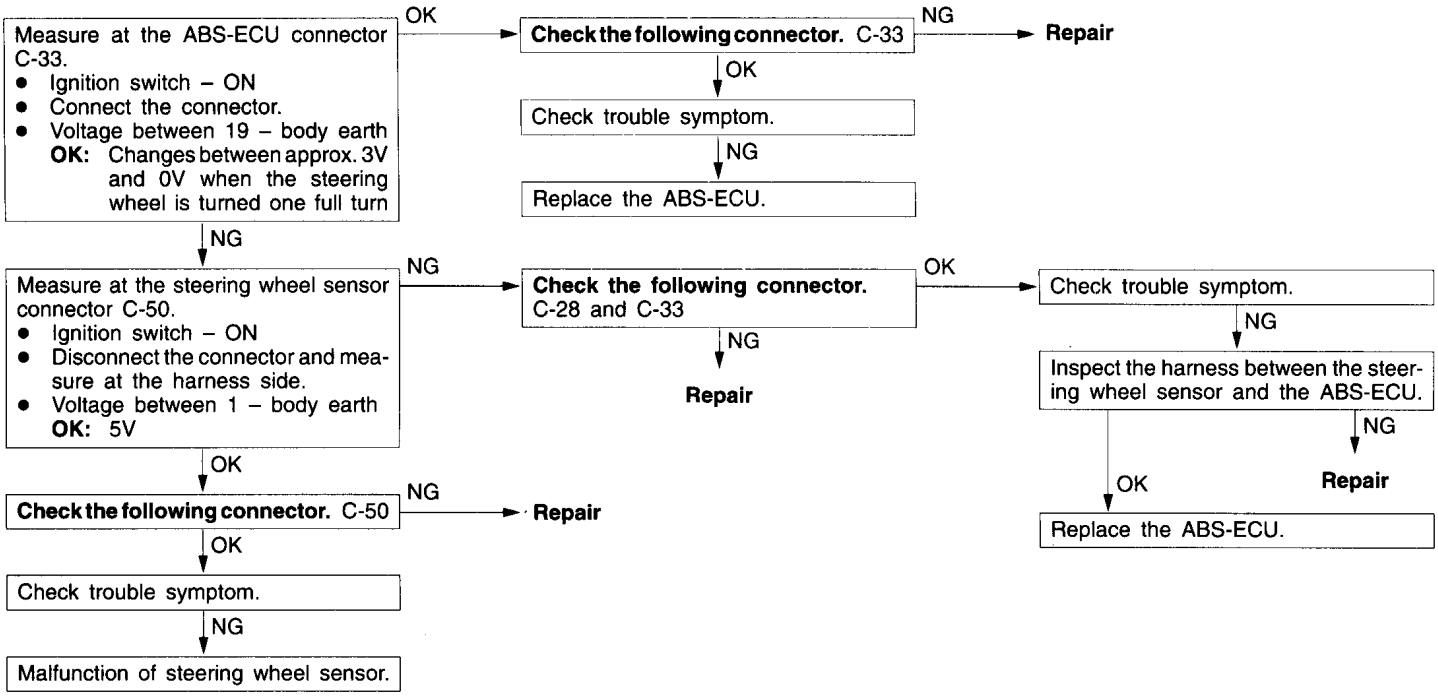
Code No. 33 Stop lamp switch system	Probable cause
[Comment] These codes are output at the following times: • When the stop lamp switch is not be turned off (when the stop lamp switch stays on for 15 minutes or more although the ABS is not operating). • When the ABS-ECU determines that there is an open circuit in harness of the stop lamp switch system.	• Malfunction of stop lamp switch • Malfunction of harness or connector • Malfunction of ABS-ECU



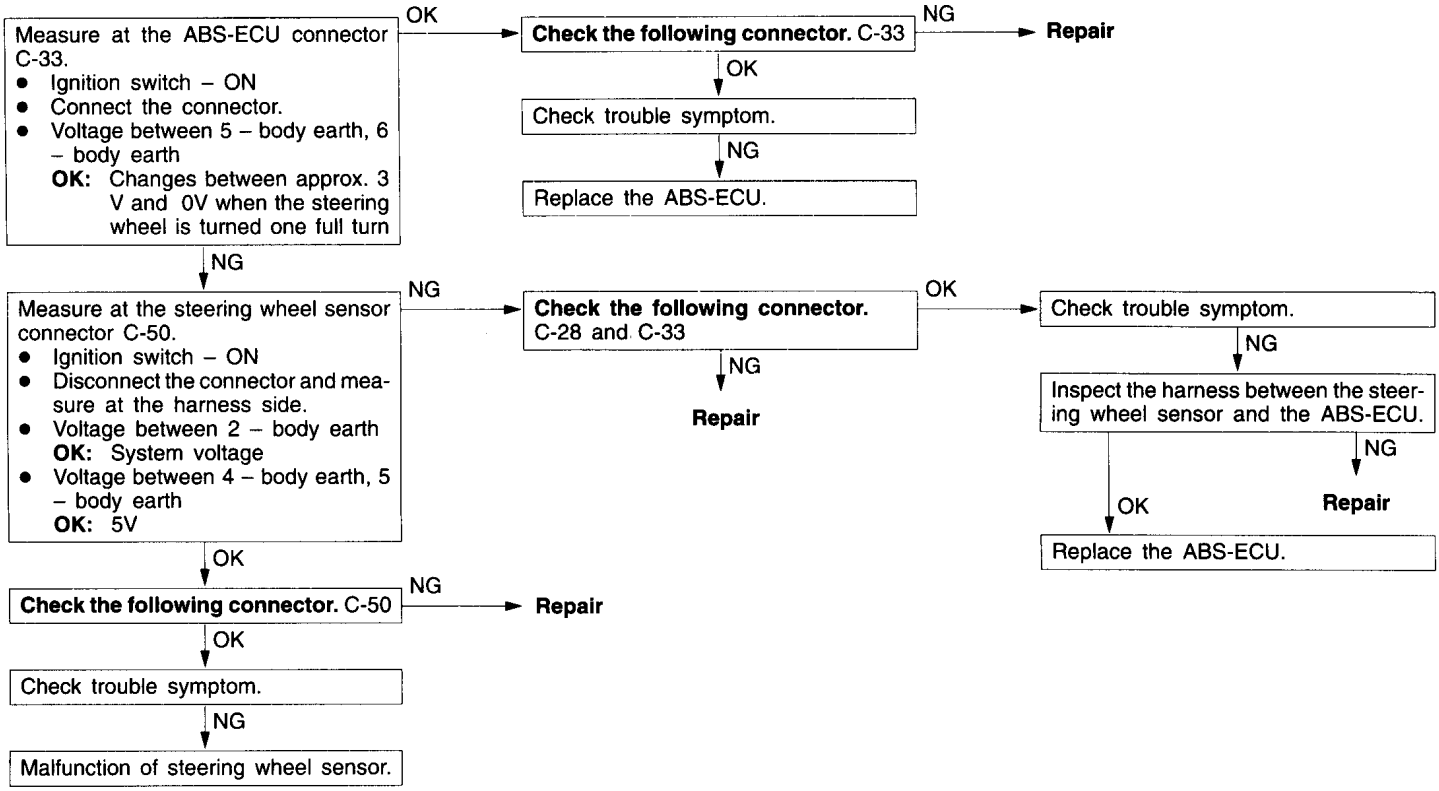
Code No. 34 Steering wheel sensor open circuit	Probable cause
[Comment] There is an open circuit in a signal line (ST-1, ST-2, STN) or earth line of the sensor.	• Malfunction of the steering wheel sensor • Malfunction of the connector or harness wire • Malfunction of the ABS-ECU



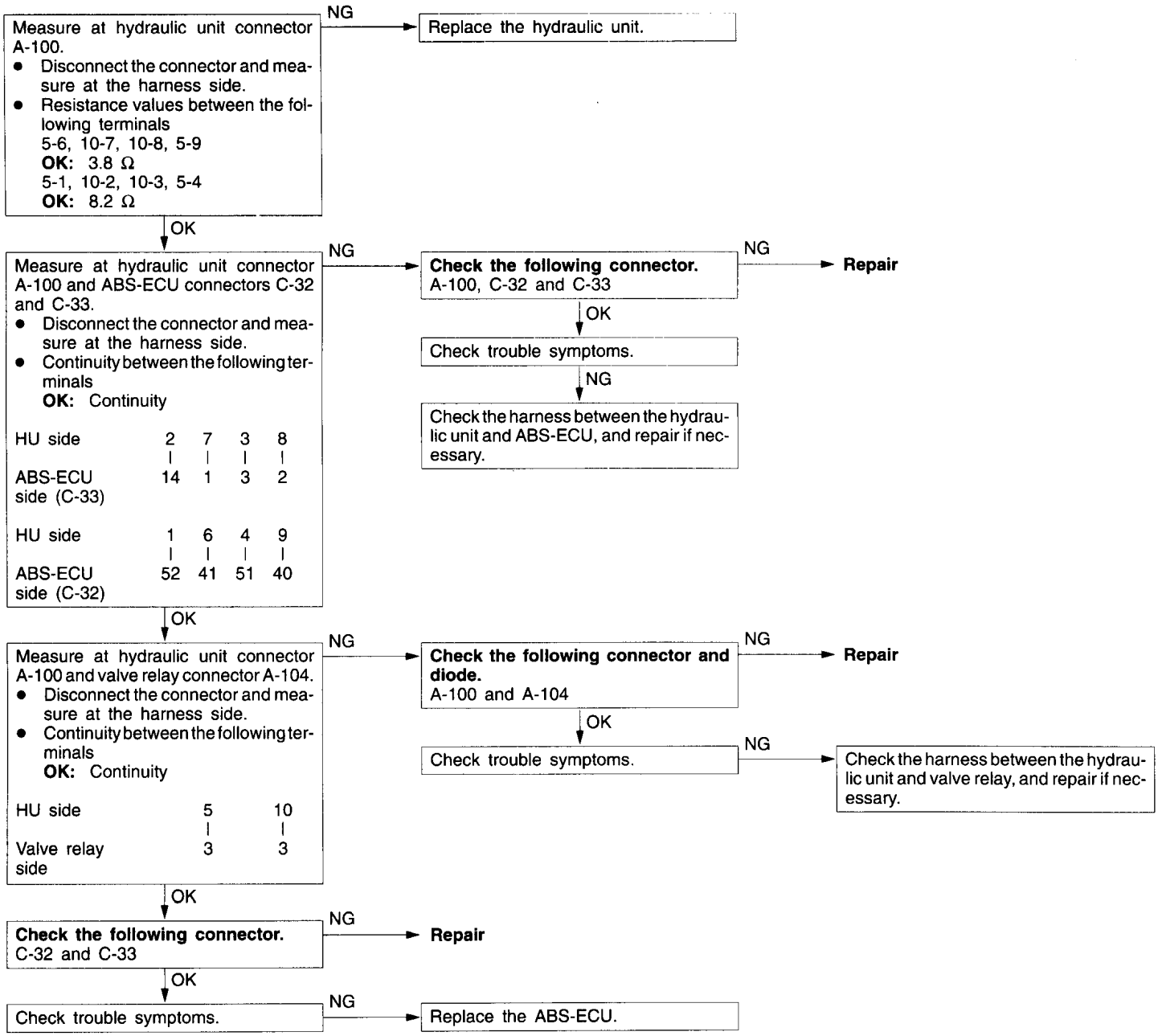
Code No. 35 Steering wheel sensor (ST-N) system (neutral position improperly detected)	Probable cause
[Comment] The steering wheel neutral position continues to be detected even when the steering wheel has been turned 40° or more.	• Malfunction of the steering wheel sensor • Malfunction of the connector or harness wire • Malfunction of the ABS-ECU



Code No. 36 Steering wheel sensor (ST-1, ST-2) system (Steering angle improperly detected)	Probable cause
[Comment] The steering angle signal does not change for five minutes or more during travelling at 10 km/h or higher.	• Malfunction of the steering wheel sensor • Malfunction of the connector or harness wire • Malfunction of the ABS-ECU

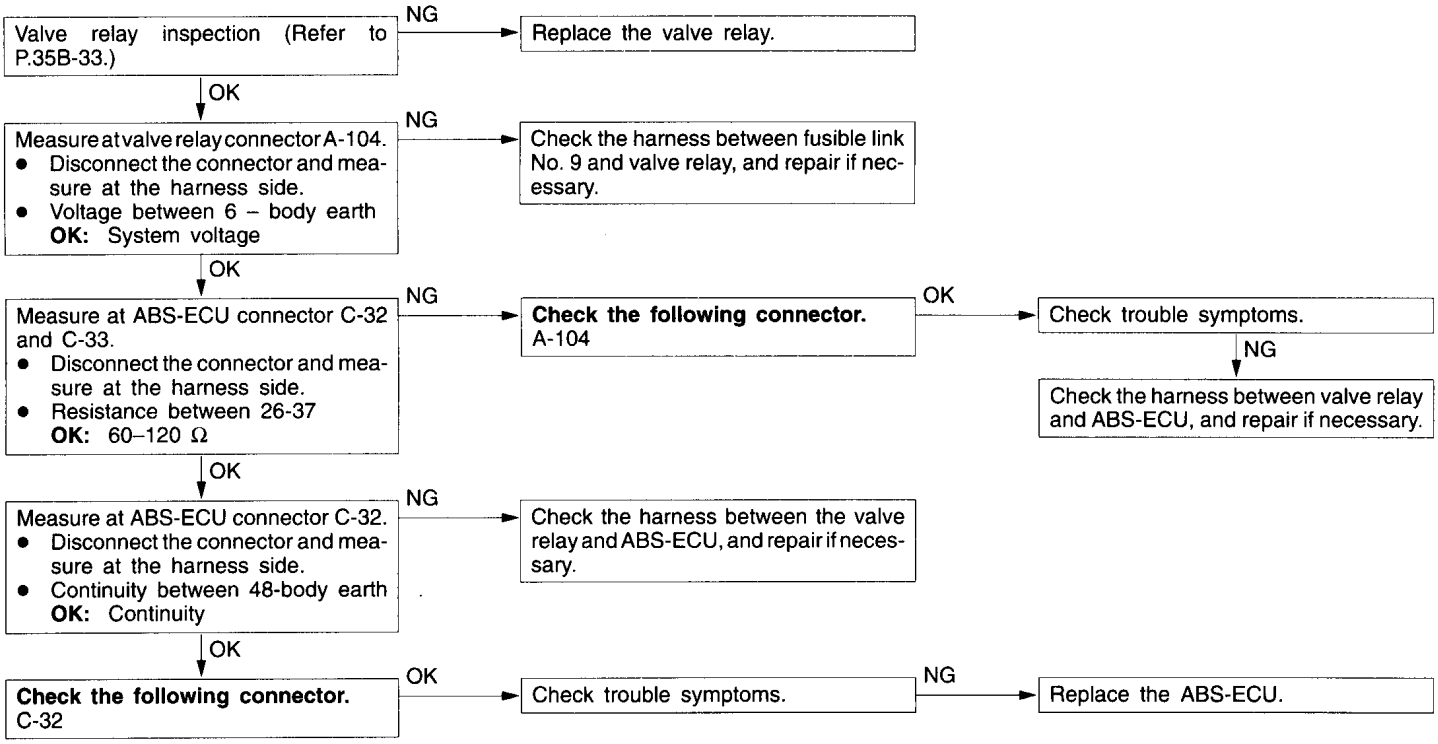


Code No. 41, 42, 43, 44 Solenoid valve	Probable cause
[Comment] The ABS-ECU always monitors the solenoid valve drive circuit. It determines that there is an open or short-circuit in the solenoid coil or in a harness: When no current flows in the solenoid even though the ABS-ECU turns on it, and vice versa.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU



Code No. 51 Valve relay	Probable cause
[Comment] 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 power 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 power monitor line, too. It determines that there is an open circuit when no current flows. If no current flows in the valve power 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

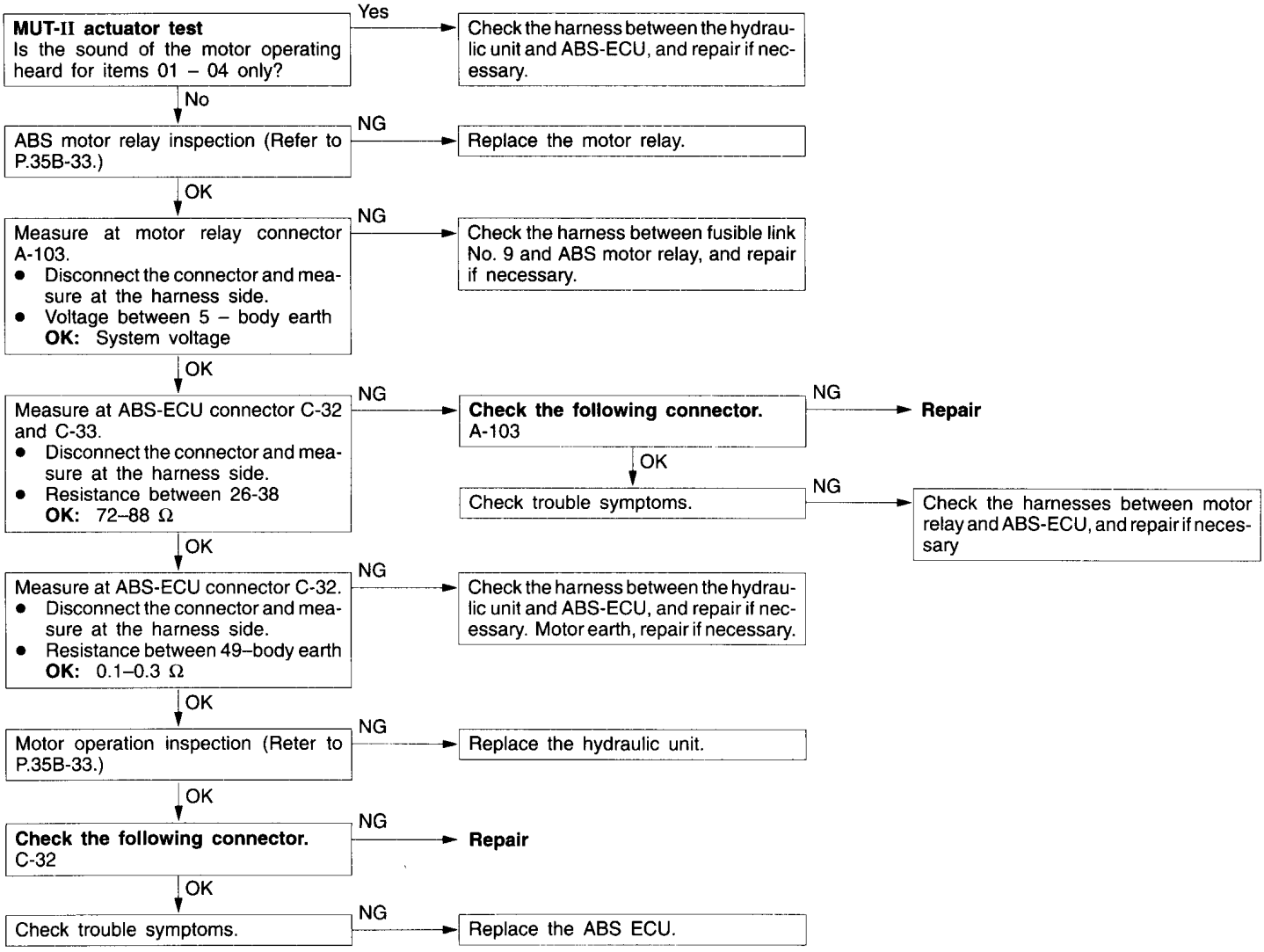
NOTE
Whenever reading the diagnosis codes using the ABS warning lamp (P.35B-6), this diagnosis code will be output. That is not a malfunction but because the valve relay connector is disconnected. After repairing all other malfunctions, connect the valve relay connector again to check the valve relay. 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.

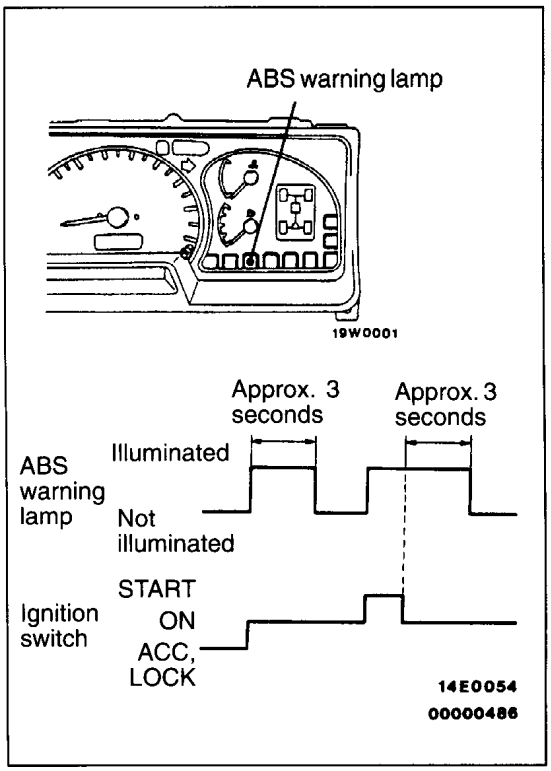


Code No. 53 Motor relay, motor	Probable cause
[Comment] These codes are output at the following times: When the motor relay is on but no signal is input to the motor monitor line (motor is not operating, etc.) When the motor relay is off but a signal is input to the motor monitor line for 5 seconds or more (motor continues operating, etc.) When the motor relay does not operate	• Malfunction of motor relay • Malfunction of wiring harness or connector • Malfunction of hydraulic unit • Malfunction of ABS-ECU

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.





ABS WARNING LAMP INSPECTION 120002443

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 stays switched off.
4. If the illumination is other than the above, check the diagnosis codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

120002582

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	P.35B-21
	Communication with ABS only is not possible.	2	P.35B-21
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate.		3	P.35B-22
After the engine starts, the lamp remains illuminated.		4	P.35B-22
When the ignition key is turned to "START", the ABS warning lamp does not illuminate.		5	P.35B-23
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	P.35B-23
Faulty ABS operation	Unequal braking power on both sides	7	P.35B-24
	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

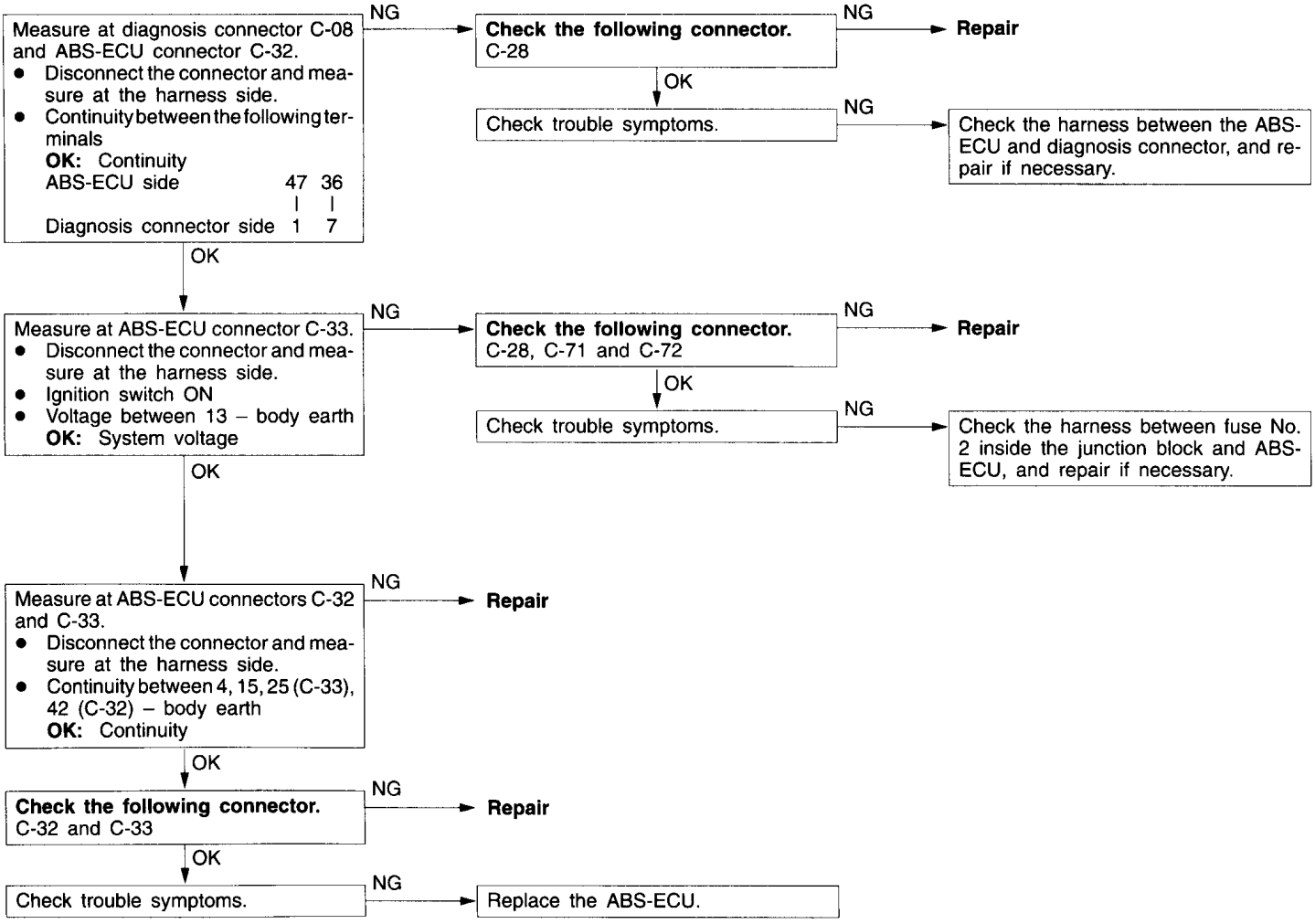
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting

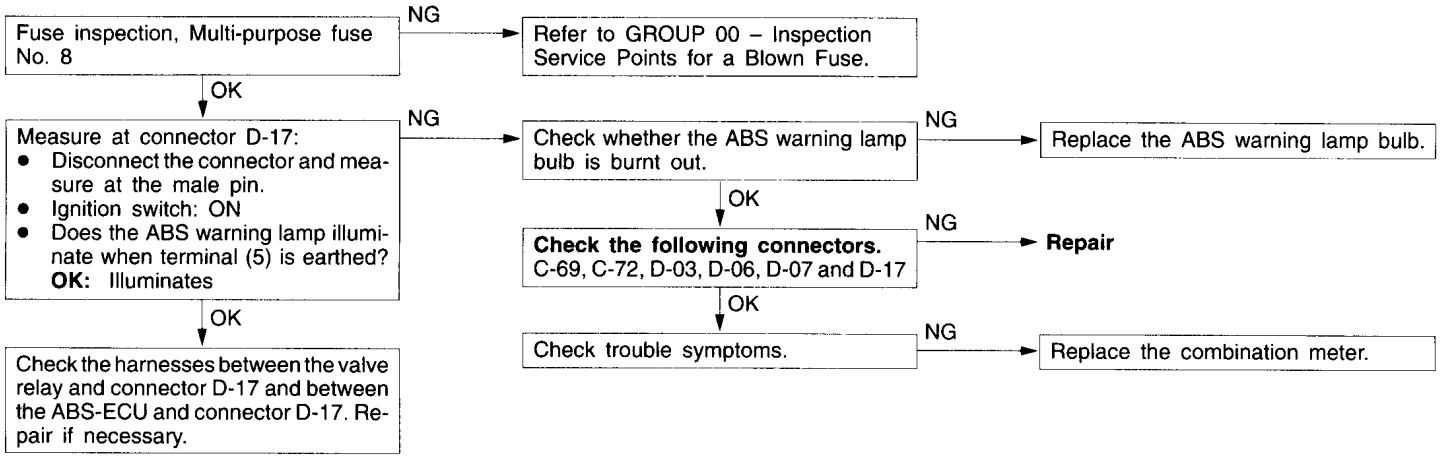
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication with ABS only is not possible.)	Probable cause
[Comment] 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 connecter • Malfunction of ABS-ECU



Inspection Procedure 3

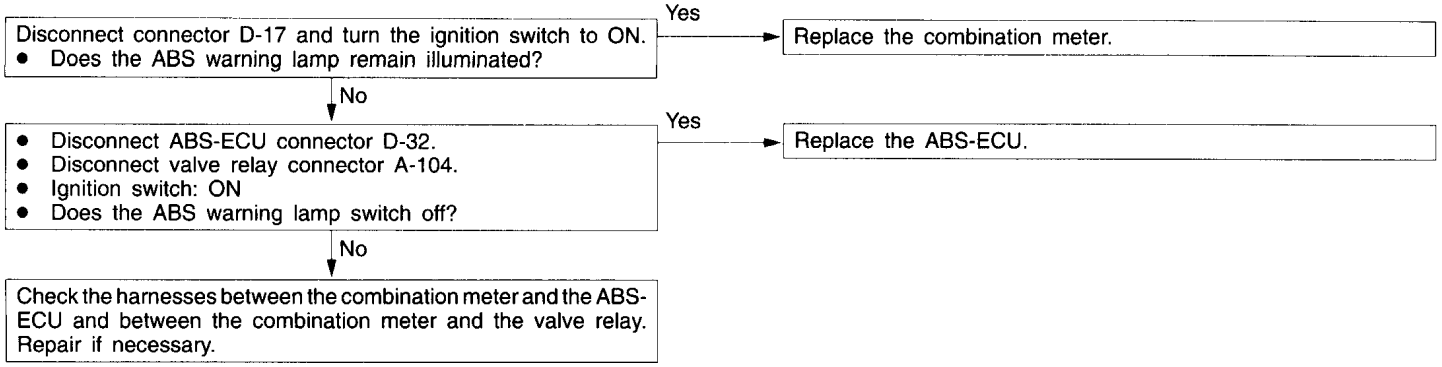
When ignition key is turned to "ON" (engine stopped), ABS warning lamp does not illuminate.	Probable cause
[Comment] When current flows in the ABS-ECU, the valve relay turns from off to on, off and back to on again as the initial check. So the ABS warning lamp will illuminate twice when the valve relay is off even if there is a problem with the circuit between the ABS warning lamp and the ABS-ECU. Therefore, if the lamp does not illuminate, 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 and in the circuit between the ABS warning lamp and the valve relay.	• Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector



Inspection Procedure 4

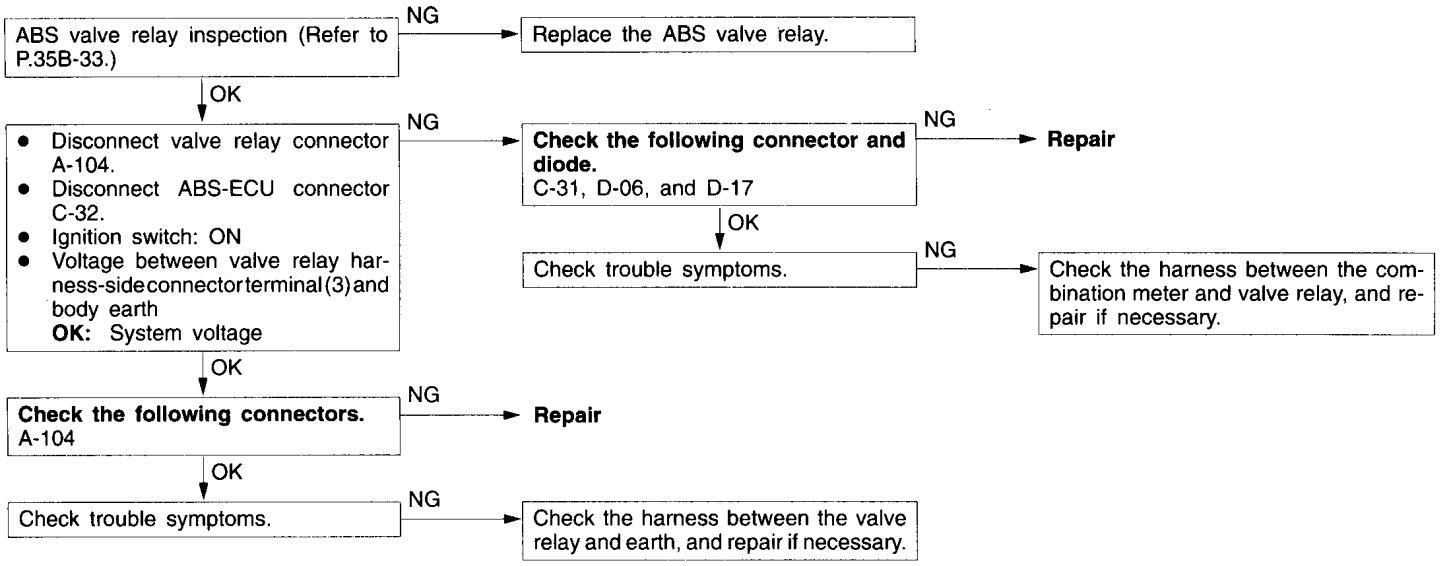
Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
[Comment] The cause is probably a short-circuit in the ABS warning lamp illumination circuit.	• Malfunction of combination meter • Malfunction of ABS-ECU • Malfunction of wiring harness

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.



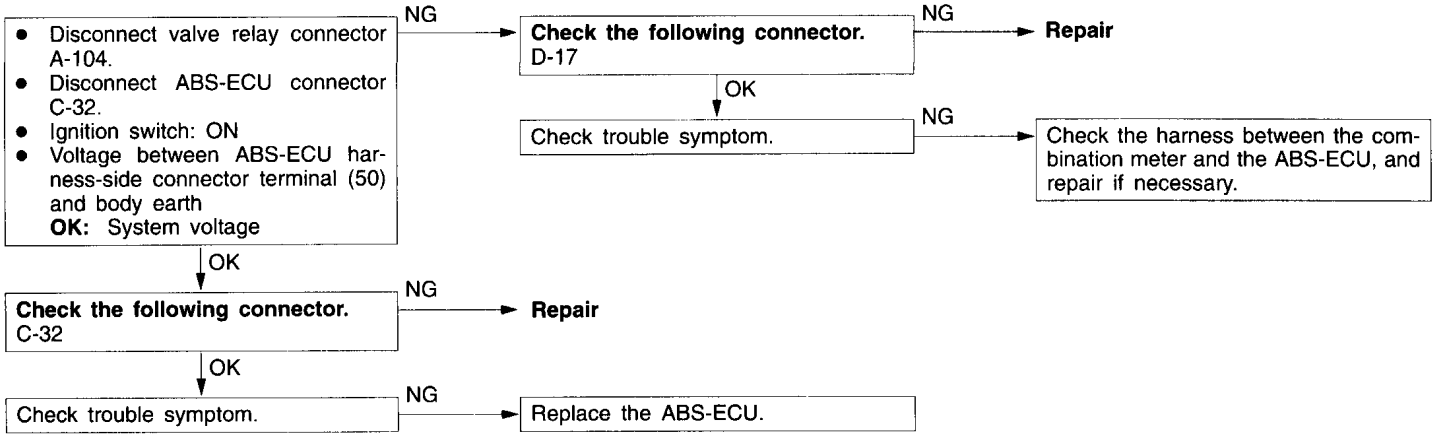
Inspection Procedure 5

When ignition key is turned to "START", ABS warning lamp does not illuminate.	Probable cause
[Comment] 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



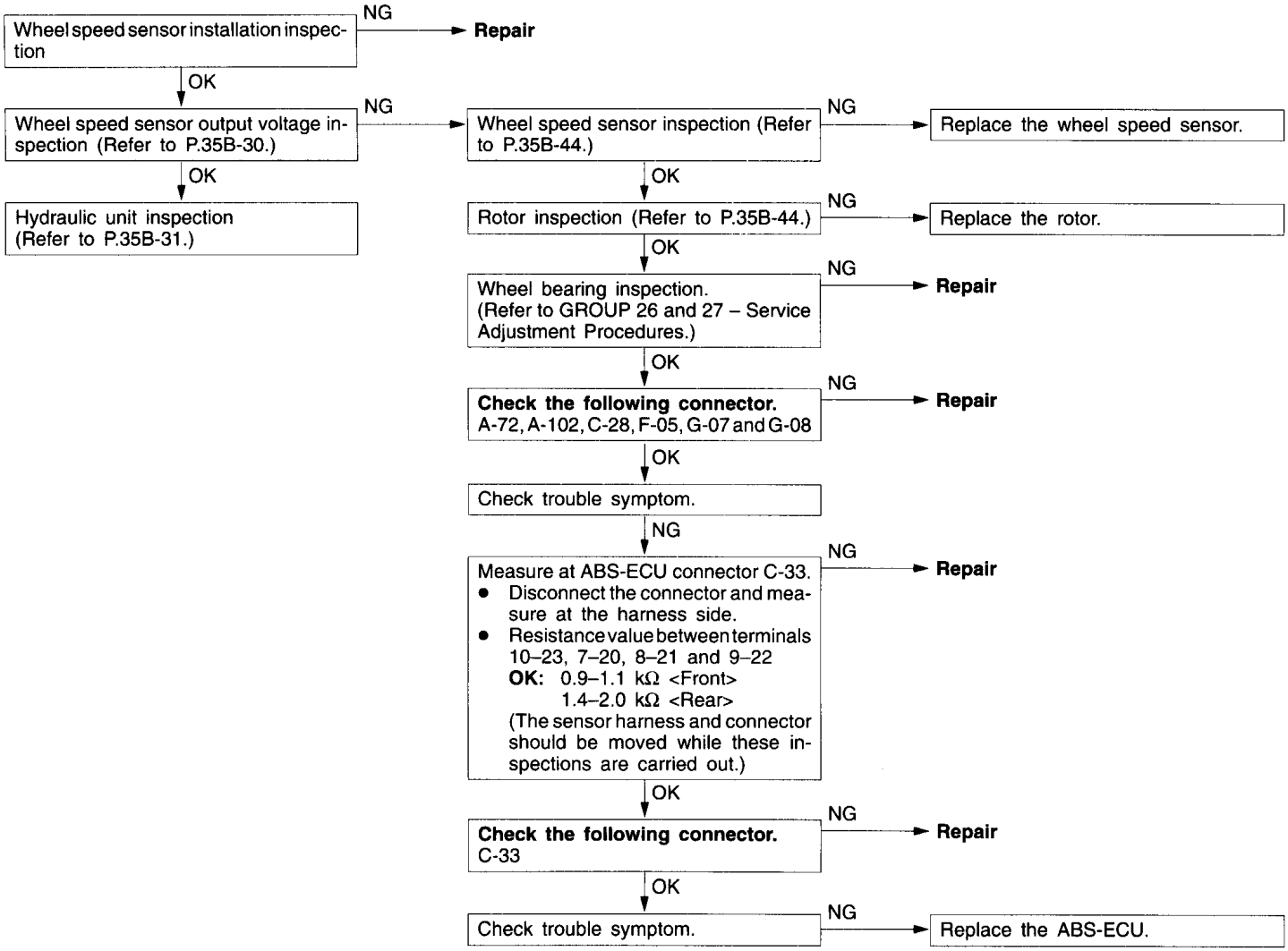
Inspection Procedure 6

The ABS warning lamp flashes twice after the ignition key is turned to "ON". The lamp illuminates when the ignition key is turned to "START", and when the key is returned to "ON", it flashes once.	Probable cause
[Comment] 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
[Comment] This varies depending on the driving conditions and the road surface conditions, so problem diagnosis is difficult. However, if a normal diagnosis code is displayed, carry out the following inspection.	• Improper installation of wheel speed sensor • Incorrect sensor harness contact • Foreign material adhering to wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU



SERVICE DATA REFERENCE TABLE

120000121

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	9–16V
33	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF
34	Steering wheel sensor (Steering angle)	Turn the steering wheel after neutral position is learnt.	MUT-II displays 0° immediately after battery is connected and 5° intervals after neutral position is learnt.
35	Steering wheel sensor (Neutral position detection)	Turn the steering wheel within ±5° from neutral position.	ON
		Other than the above	OFF
37	Steering wheel sensor (Neutral position learning)	Drive straight-forward at 10 km/h or more	ON
		Other than the above	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.

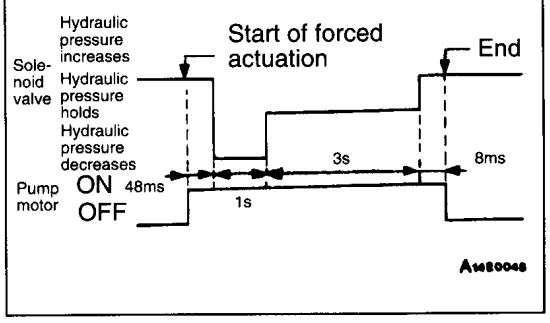
ACTUATOR TEST REFERENCE TABLE

120000122

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.

Activation pattern



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

120000123

TERMINAL VOLTAGE CHECK CHART

1. Measure the voltages between terminals (15), (25) and (42) (earth terminals) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.

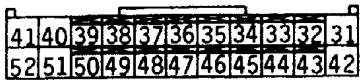
14W0043

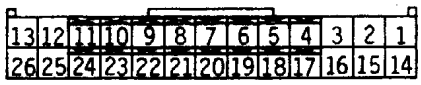
Connector terminal No.	Signal	Checking requirements		Normal condition
1	Output to front-left hydraulic unit solenoid valve (OUT side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
2	Output to rear-right hydraulic unit solenoid valve (OUT side)			
3	Output to rear-right hydraulic unit solenoid valve (IN side)			
5	Seering wheel sensor (ST–1) input	Ignition switch: ON Turn steering wheel slowly.		0 and approx. 3 V alternates.
6	Seering wheel sensor (ST–2) input	Ignition switch: ON Turn steering wheel slowly.		0 and approx. 3 V alternates.
13	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
14	Output to front-left hydraulic unit solenoid valve (IN side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
19	Steering wheel sensor (ST–N) input	Let the engine run at idle and position the steering wheel in the neutral.		0.5 V or less
		Let the engine run at idle and turn the steering wheel 90° from the neutral.		2.5–3.5 V
26	Output to relay power supply	Ignition switch: ON		System voltage
32	Memory power supply	Always		System voltage
34	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
36	MUT-II	Connect the MUT-II.		Serial communication with MUT-II
		Do not connect the MUT-II.		1 V or less
37	Output to valve relay	Ignition switch: ON	Approximately 1 second after engine is started, the relay is on.	2 V or less
			The system runs down. The relay is off.	System voltage
38	Output to motor relay	Ignition switch: ON Approximately 1 second after engine is started	Motor is on.	2 V or less
			Motor is off.	System voltage
39	Idle-up solenoid valve (–)	Ignition switch: ON (The motor is on approximately 1 second after engine is started.)		2 V or less
40	Output to rear-left hydraulic unit solenoid valve (OUT side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started.)		System voltage
41	Output to front-right hydraulic unit solenoid valve (OUT side)			
43	Idle-up solenoid valve (+)	Ignition switch: ON (The motor is on approximately 1 second after engine is started.)		System voltage
46	Ignition switch	Ignition switch: ON		System voltage
		Ignition switch: START		0 V
47	Input from diagnosis indication selection	Connect the MUT-II.		0 V
		Do not connect the MUT-II.		Approx. 12 V
48	Input from valve relay monitor	Ignition switch: ON		System voltage
49	Motor monitor	Ignition switch: ON Approximately 1 second after engine is started	Motor is on.	System voltage
			Motor is off.	0.5 V or less
50	Output to ABS warning lamp	Ignition switch: ON	The lamp is switched off.	System voltage
			The lamp is illuminated.	0–2 V
51	Output to rear-left hydraulic unit solenoid valve (IN side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started.)		System voltage
52	Output to front-right hydraulic unit solenoid valve (IN side)			

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.





14W0042

Connector terminal No.	Signal	Normal condition
1 – Body earth	Front-left solenoid valve (OUT side)	3.8 Ω
2 – Body earth	Rear-right solenoid valve (OUT side)	3.8 Ω
3 – Body earth	Rear-right solenoid valve (IN side)	8.2 Ω
7–20	Front-left wheel speed sensor (+ wire)	0.9–1.1 kΩ
8–21	Rear-right wheel speed sensor (+ wire)	1.4–2.0 kΩ
9–22	Rear-left wheel speed sensor (+ wire)	1.4–2.0 kΩ
10–23	Front-right wheel speed sensor (+ wire)	0.9–1.1 kΩ
14 – Body earth	Front-left solenoid valve (IN side)	8.2 Ω
15 – Body earth	ABS-ECU earth	Continuity
25 – Body earth		
39–43	Idle-up solenoid valve	33–39 Ω
40 – Body earth	Rear-left solenoid valve (OUT side)	3.8 Ω
41 – Body earth	Front-right solenoid valve (OUT side)	3.8 Ω
42 – Body earth	ABS-ECU earth	Continuity
48 – Body earth	Valve relay monitor input	Continuity
49 – Body earth	Motor monitor	Continuity
51 – Body earth	Rear-left solenoid valve (IN side)	8.2 Ω
52 – Body earth	Front-right solenoid valve (IN side)	8.2 Ω

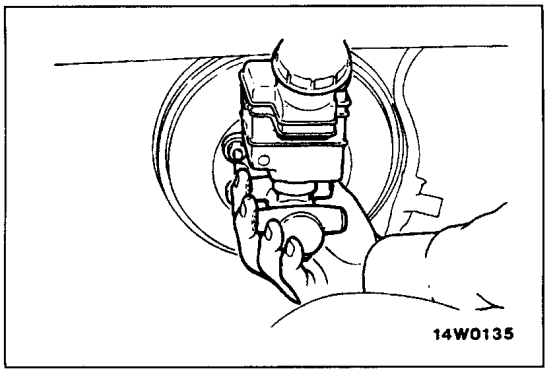
SERVICE ADJUSTMENT PROCEDURES

120000124

BLEEDING

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

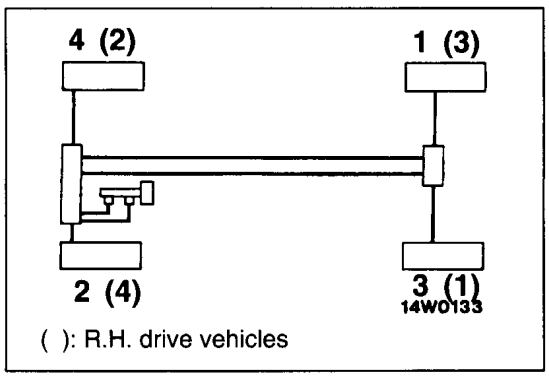
Specified brake fluid: DOT3 or DOT4



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 pipe line will become easier. (When brake fluid is not contained in the master cylinder.)

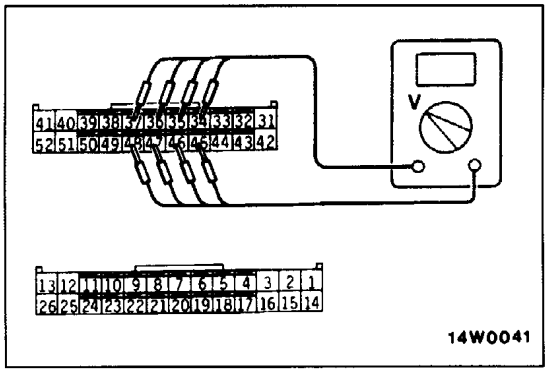
(1) Fill the reserve tank with brake fluid.
(2) Keep the brake pedal depressed.
(3) Have another person cover the master cylinder outlet with a finger.
(4) With the outlet still closed, release the brake pedal.
(5) Repeat steps (2) – (4) three to four times to fill the master cylinder with brake fluid.



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.



ABS OPERATION CHECK

120000125

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ECU harness connector and measure from the harness side connector.

   Caution
   Be sure to remove the connector's double lock and insert the probe into the harness side. Inserting it into the terminal side will result in a bad connection.

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.	7	10	9	8
	20	23	22	21

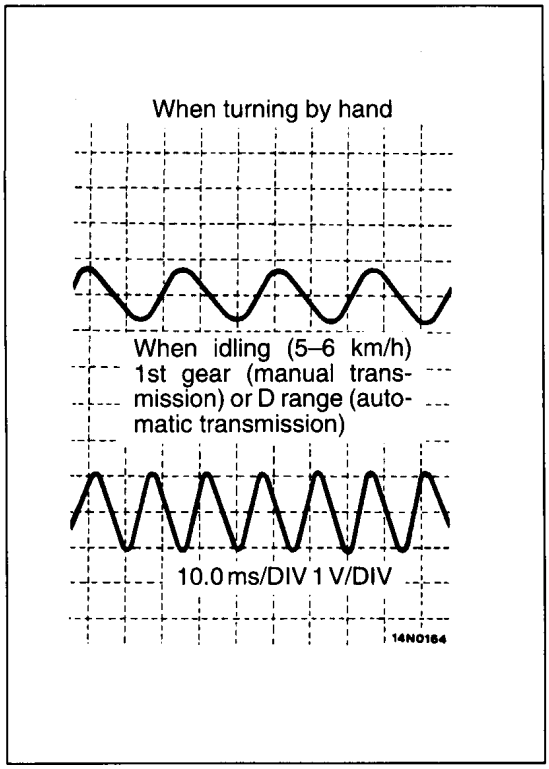
Output voltage

When measuring with a circuit tester:
70 mV or more

When measuring with an oscilloscope:
200 mV p-p or more

4. If the output voltage is lower than the above values, the reason could be as follow:
   - Faulty wheel speed sensor.

   So replace the wheel speed sensor.



Inspecting Wave Forms With An Oscilloscope

Use the following method to observe the output voltage wave form from each wheel sensor with an oscilloscope.

- Start the engine, and rotate the rear wheels by engaging 1st gear (vehicles with manual transmission) or D range (vehicles with automatic transmission). Turn the front wheels manually so that they rotate at a constant speed.

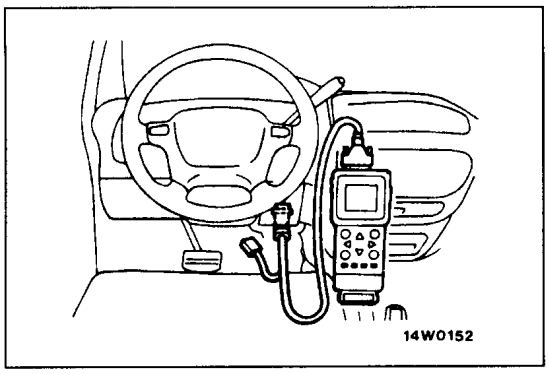
NOTE

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) INSPECTION

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 as shown in the diagram.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.

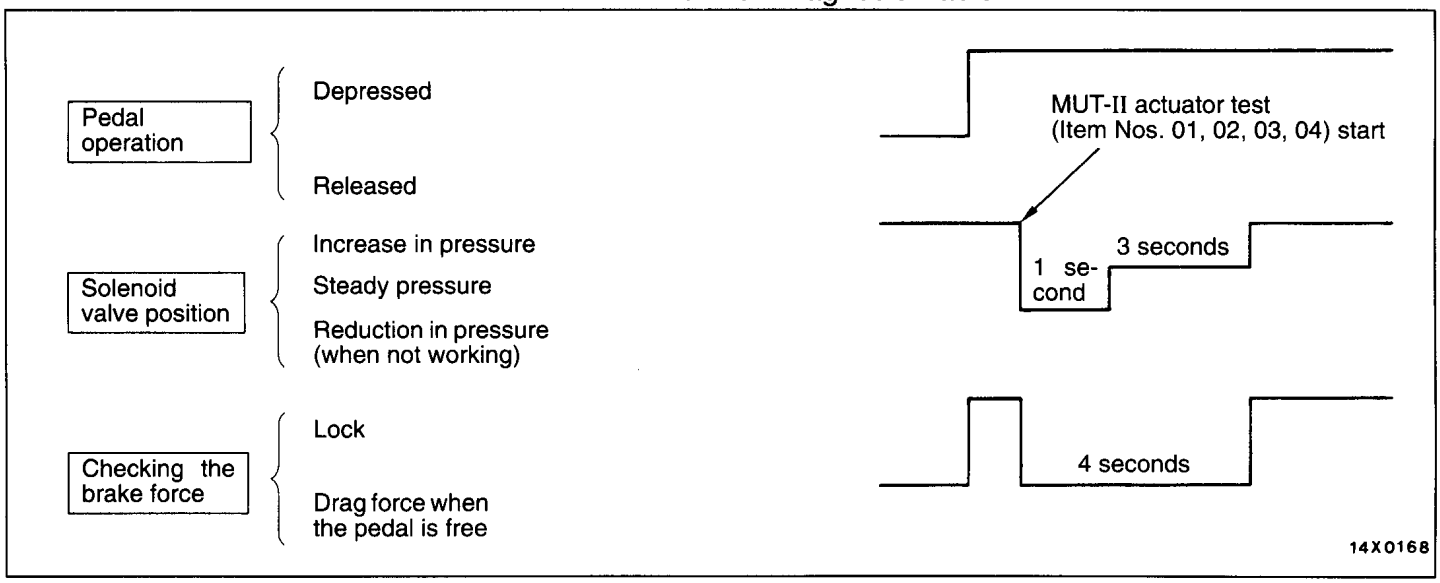
   NOTE
   1. At this time, the ABS system will switch to the MUT-II mode and the ABS warning lamp will illuminate.
   2. When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.

5. Use the MUT-II to force-drive the actuator.

6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed.
When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check to be sure that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven.

Front wheel	785–981 N
Rear wheel	294–490 N

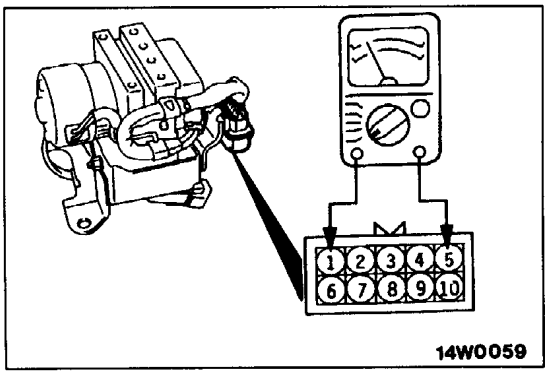
The result should be as shown in the following diagram.
7. If the result of inspection is abnormal, correct according to the "Diagnosis Table."



Diagnosis Table

No.	Operation	Judgement –Normal	Judgement –Abnormal	Probable cause	Remedy
01	(1) Depress brake pedal to lock wheel. (2) Using the MUT-II, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel manually to check the change of brake force.	Brake force released for 4 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than HU	Check and clean brake line
02				Clogged hydraulic circuit in HU	Replace HU assembly
03			Brake force is not released	Incorrect HU brake tube connection	Connect correctly
04				HU solenoid valve not functioning correctly	Replace HU assembly

8. After inspection, disconnect the MUT-II immediately after turning the ignition switch to OFF.

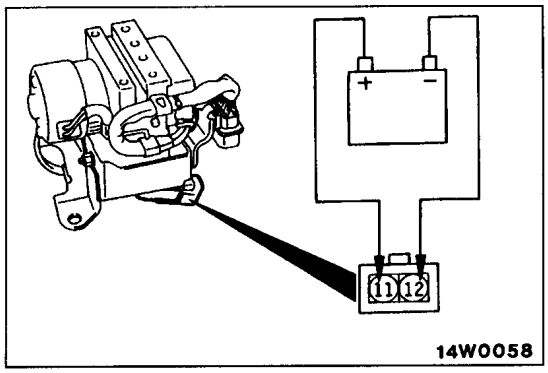


SOLENOID VALVE CHECK

Measure the resistance between terminals.

Standard value:

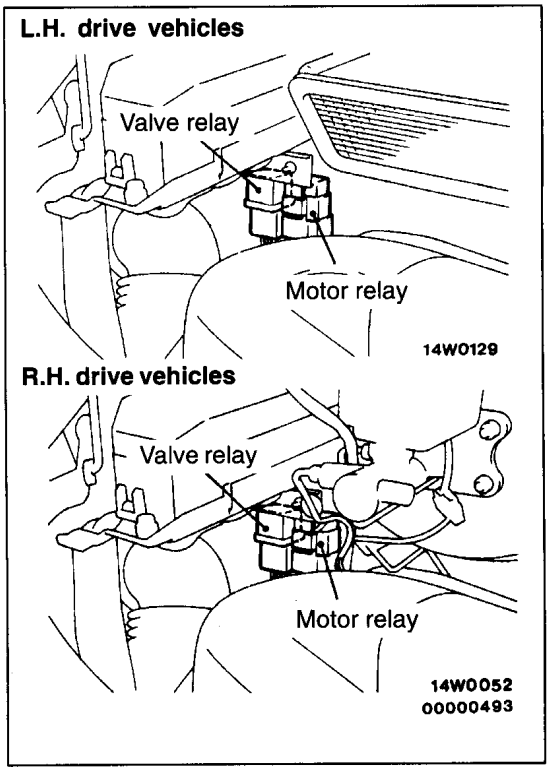
Solenoid valve	Measurement terminals	Resistance between terminals
Front OUT (right side)	5–6	3.8 Ω
Front OUT (left side)	10–7	
Rear OUT (right side)	10–8	
Rear OUT (left side)	5–9	
Front IN (right side)	5–1	8.2 Ω
Front IN (left side)	10–2	
Rear IN (right side)	10–3	
Rear IN (left side)	5–4	



MOTOR OPERATION CHECK

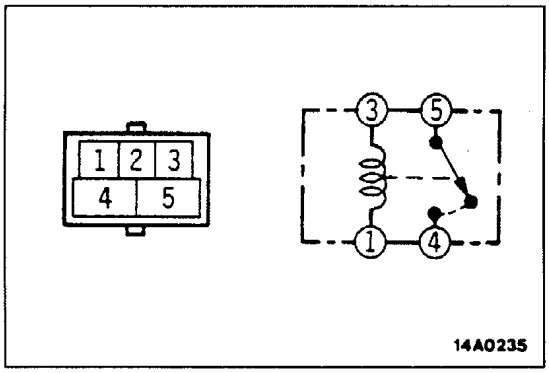
Connect the battery and check to be sure that the sound of the hydraulic unit motor operating can be heard.

Caution
The battery power should not be applied for more than 1 second.



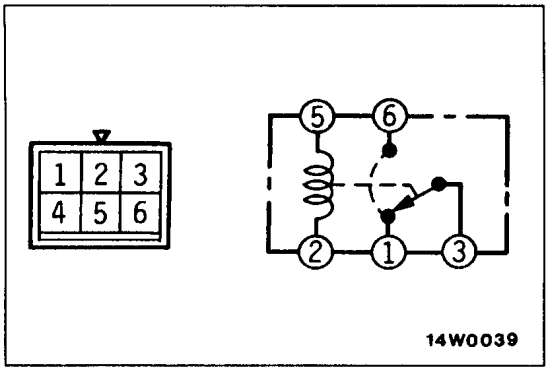
MOTOR RELAY AND VALVE RELAY INSPECTION

Check for continuity between the terminals of the relay with and without power as shown in the chart overleaf.



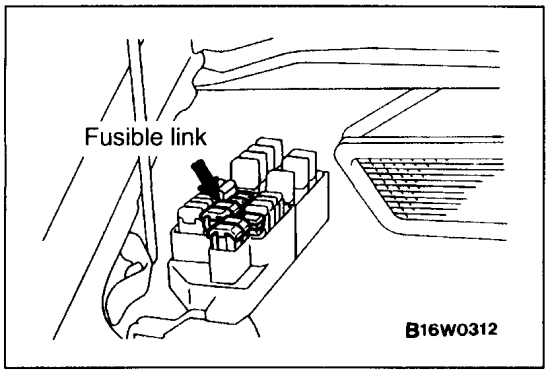
Motor relay <when energizing coil is at normal temperature (20°±15°C)>

When there is no current	Between terminals 3 and 1	74±25 Ω
	Between terminals 4 and 5	No continuity (∞ Ω)
When there is current between terminals 3 and 1	Between terminals 4 and 5	Continuity (approx. 0 Ω)



Valve relay <when energizing coil is at normal temperature (20°±15°C)>

When there is no current	Between terminals 2 and 5	80±25 Ω
	Between terminals 1 and 3	Continuity (approx. 0 Ω)
	Between terminals 3 and 6	No continuity (∞ Ω)
When there is current between terminals 2 and 5	Between terminals 1 and 3	No continuity (∞ Ω)
	Between terminals 3 and 6	Continuity (approx. 0 Ω)



REMEDY FOR A FLAT BATTERY

When booster cables are used to start the engine when the battery is completely flat and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire, and driving might not be possible.

This happens because ABS consumes a great amount of current for its self-check function; the remedy is to either allow the battery to recharge sufficiently, or to remove the fusible link for ABS circuit, thus disabling the anti-skid brake system. The ABS warning lamp will illuminate when the fusible link (for ABS) is removed.

After the battery has sufficiently recharged, install the fusible link (for ABS) and restart the engine; then check to be sure the ABS warning lamp is not illuminated.

MASTER CYLINDER AND BRAKE BOOSTER

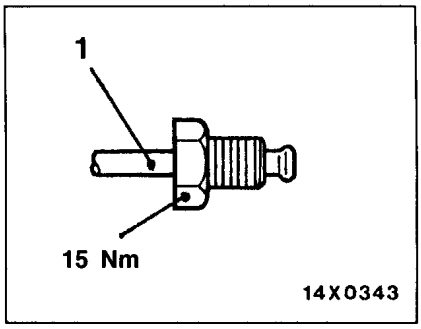
120002246

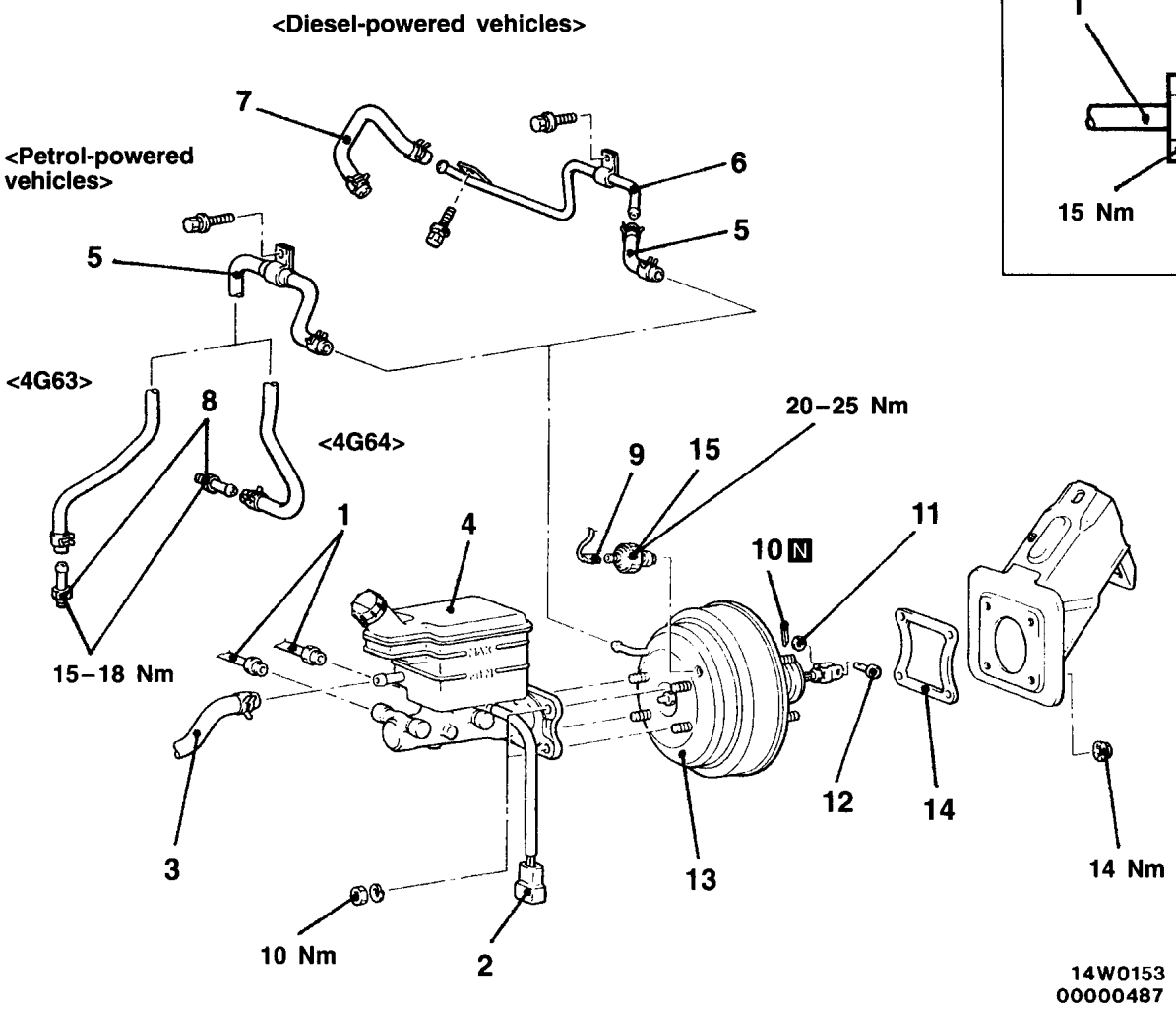
REMOVAL AND INSTALLATION

<L.H. drive vehicles>

Pre-removal Operation
- Battery Removal
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35B-29.)
- Battery Installation
- Brake Pedal Adjustment (Refer to GROUP 35A – Service Adjustment Procedures.)





Removal steps

1. Brake tube connection
2. Brake fluid level sensor connector
3. Clutch hose connection
4. Master cylinder assembly

▶B◀ • Clearance adjustment between brake booster push rod and primary piston

▶A◀ 5. Vacuum hose (With built-in check valve)

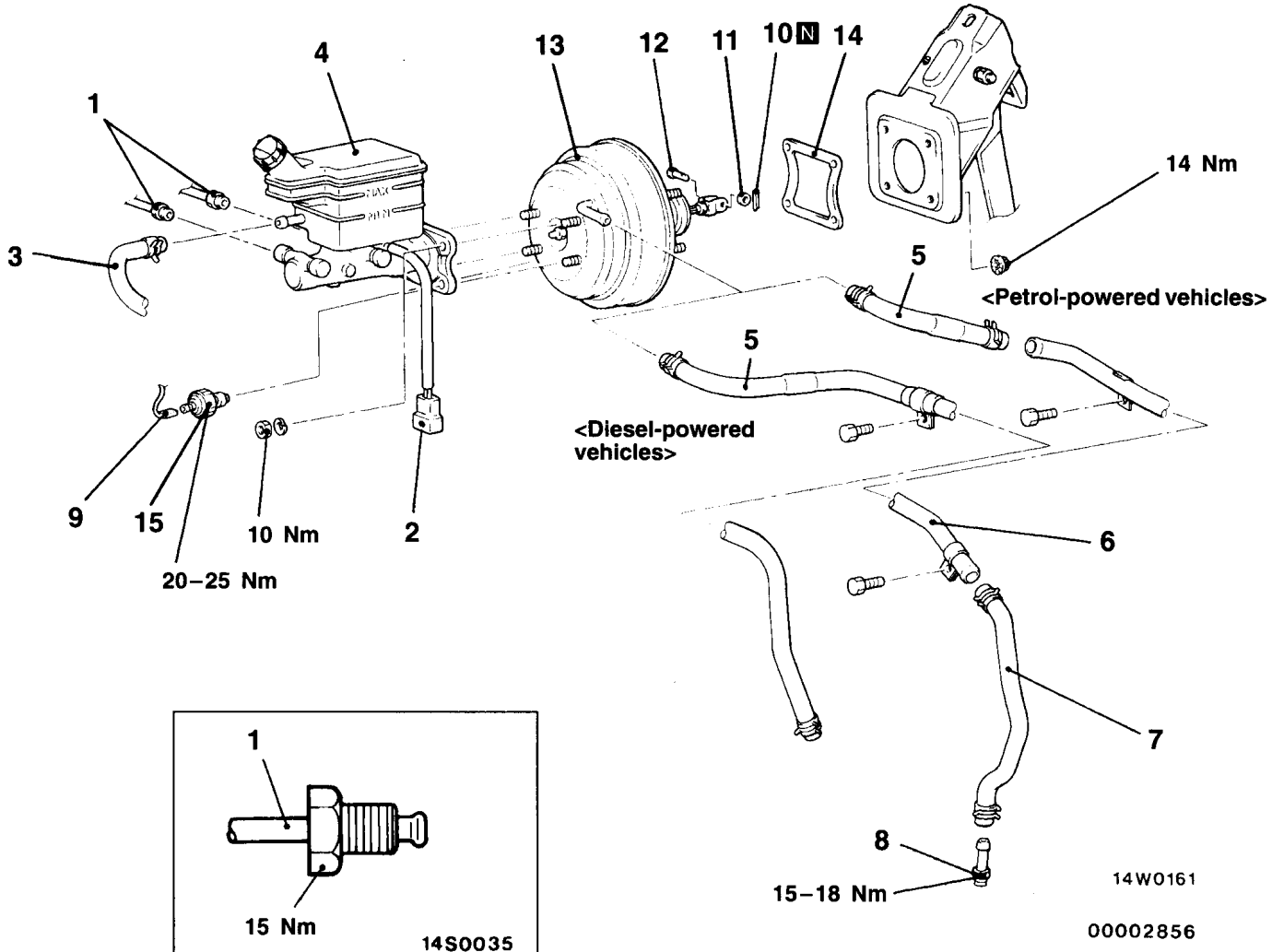
6. Vacuum pipe <Diesel-powered vehicles>
7. Vacuum hose <Diesel-powered vehicles>
8. Fitting <Petrol-powered vehicles>
9. Vacuum switch connector <Diesel-powered vehicles>
10. Split pin
11. Washer
12. Clevis pin
13. Brake booster
14. Sealer
15. Vacuum switch <Diesel-powered vehicles>

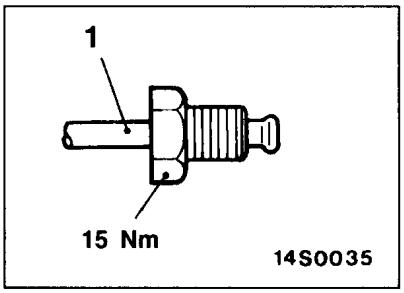
Caution
The check valve should not be removed from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.

<R.H. drive vehicles>

Pre-removal Operation
- Battery Removal
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35B-29.)
- Battery Installation
- Brake Pedal Adjustment (Refer to GROUP 35A – Service Adjustment Procedures.)



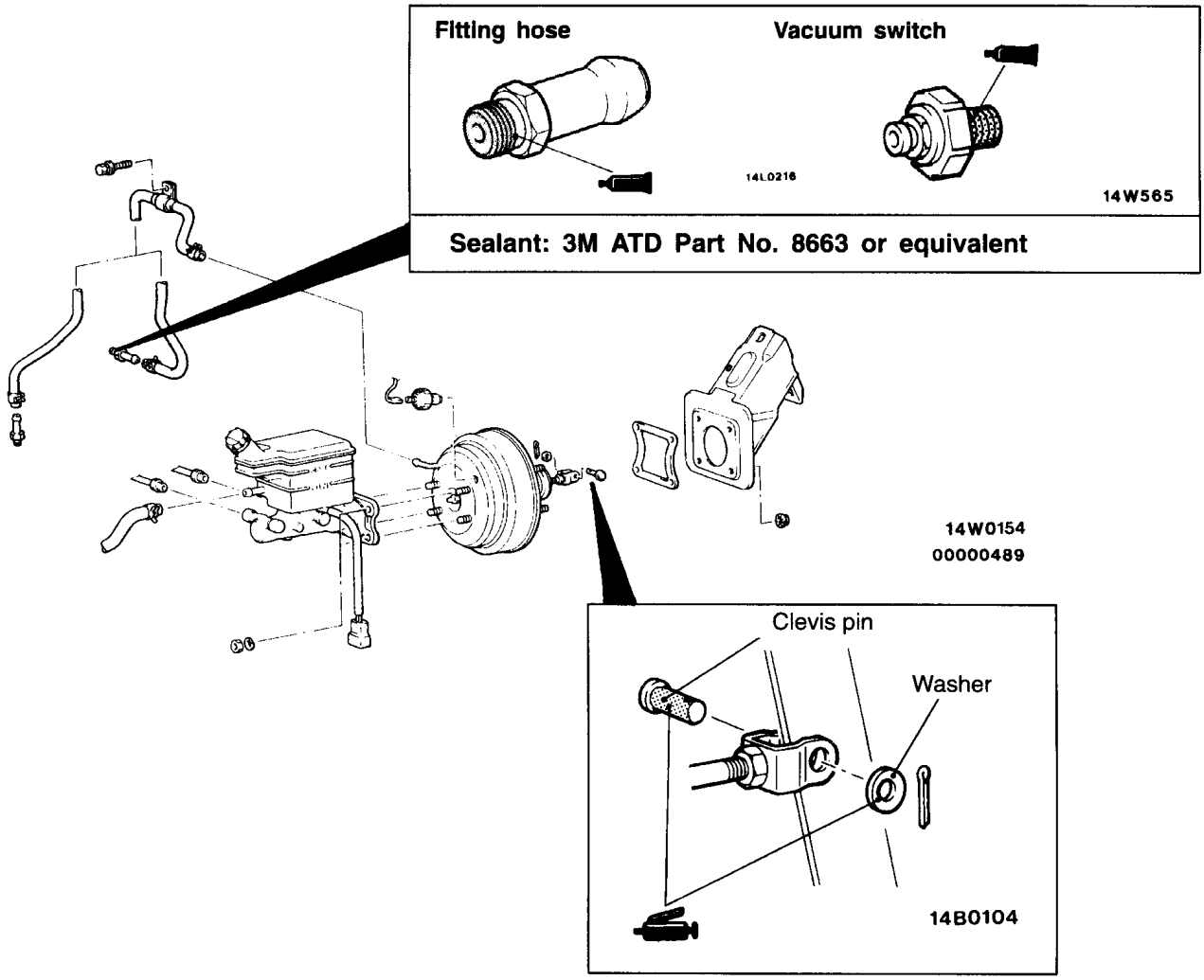


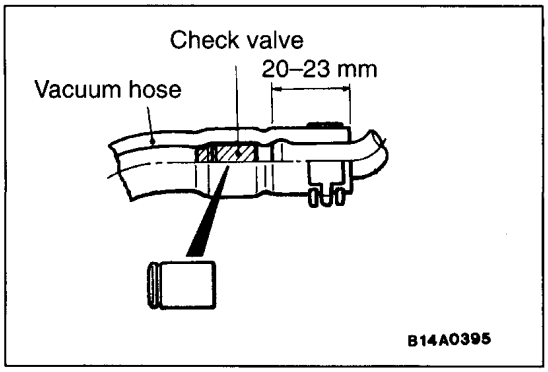
Removal steps

1. Brake tube connection
2. Brake fluid level sensor connector
3. Clutch hose connection
4. Master cylinder assembly
- ▶B◀ • Clearance adjustment between brake booster push rod and primary piston
- ▶A◀ 5. Vacuum hose (With built-in check valve)
6. Vacuum pipe <Petrol-powered vehicles>
- ▶A◀ 7. Vacuum hose <Petrol-powered vehicles>
8. Fitting <Petrol-powered vehicles>
9. Vacuum switch connector <Diesel-powered-vehicles>
10. Split pin
11. Washer
12. Clevis pin
13. Brake booster
14. Sealer
15. Vacuum switch <Diesel-powered vehicles>

Caution
The check valve should not be removed from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.

Lubrication and Sealing points





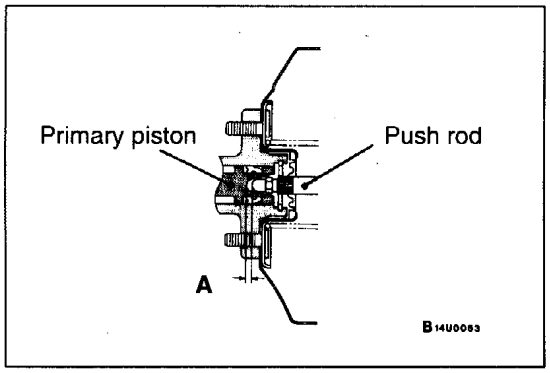
INSTALLATION SERVICE POINTS

▶A◀ VACUUM HOSE CONNECTION

(1) Install to the pipe part of the brake booster so that the amount of insertion of the vacuum hose is as shown in the figure.

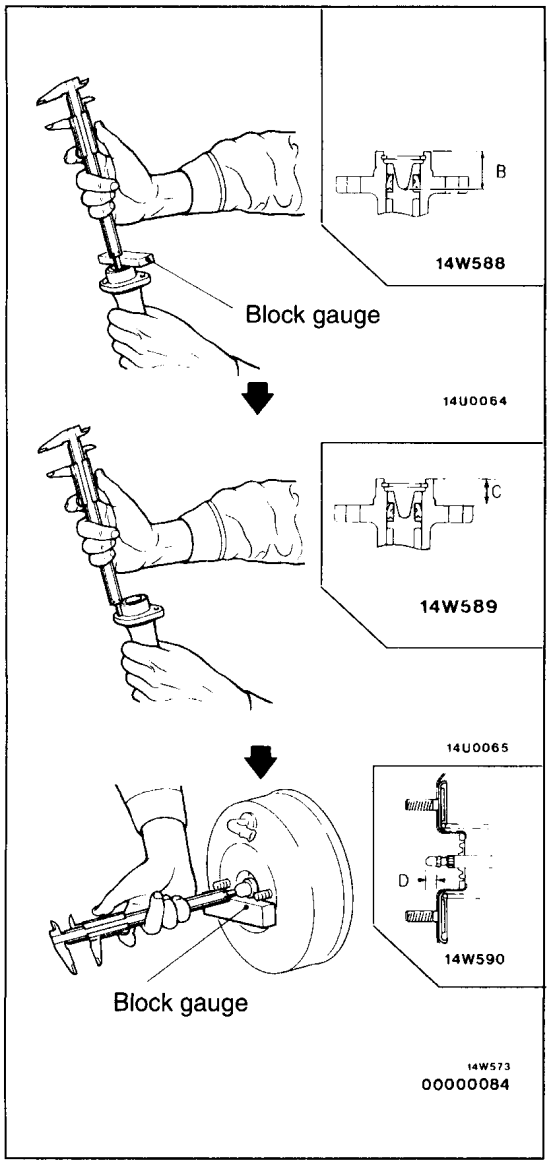
Caution
The check valve and the pipe part of the brake booster must not contact each other.

(2) For petrol-powered vehicles, insert the hose until its engine-side contacts the edge of the hexagonal part of the fitting, and then secure it by the hose clip.



▶B◀ CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON

Adjust the clearance (A) between the brake booster push rod and primary piston as follows:

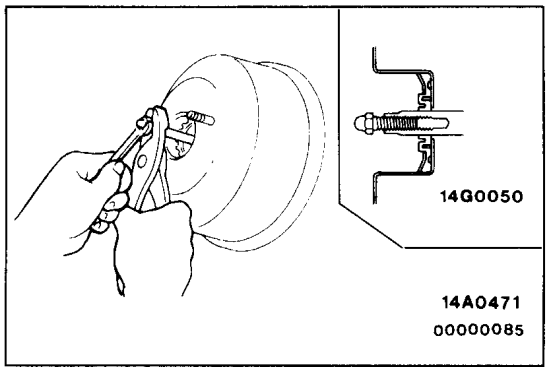


Calculate clearance A from the B, C and D measurements.
A = B – C – D

Standard value:

Item	Clearance A standard value mm
Petrol-powered vehicles	0.70–1.20
Diesel-powered vehicles	1.00–1.40

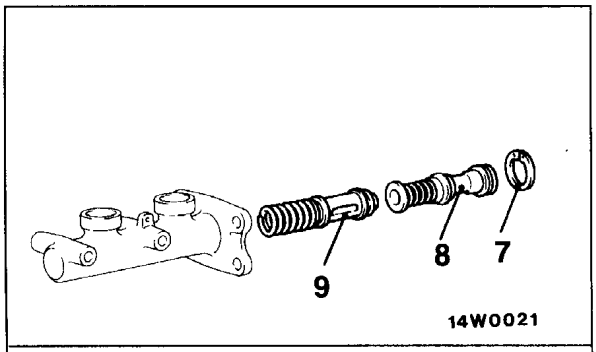
NOTE
When brake booster negative pressure (petrol-powered vehicles: –66.7 kPa, diesel-powered vehicles: –93.3 kPa) is applied, clearance value will become 0.10–0.50 mm.



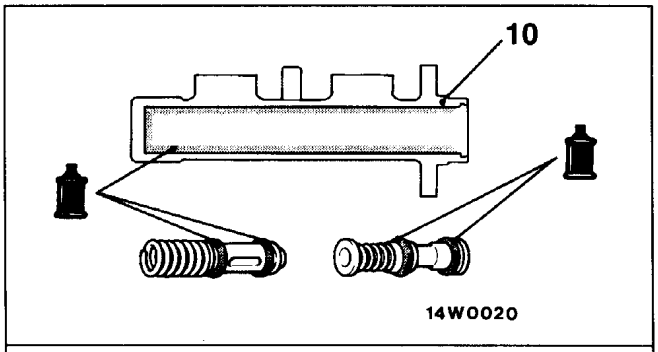
If the clearance is not within the standard value range, adjust by changing the push rod length by turning the screw of the push rod.

MASTER CYLINDER
120000127

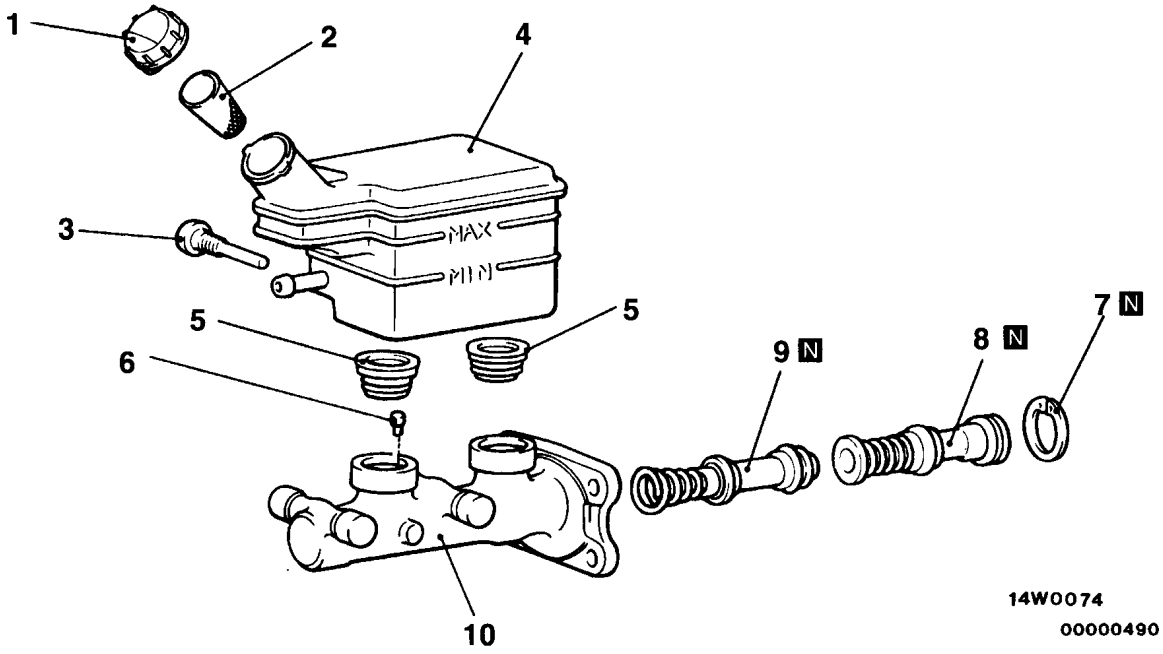
DISASSEMBLY AND REASSEMBLY



Master cylinder kit



Brake fluid: DOT3 or DOT4



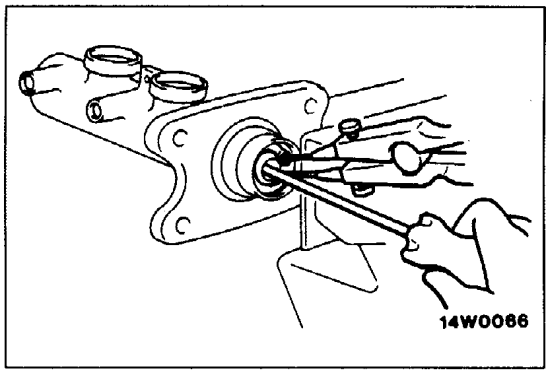
Disassembly steps

1. Reservoir cap
2. Filter
3. Reservoir stopper bolt
4. Reservoir
5. Reservoir seal

◀A▶

6. Piston stopper
7. Piston stopper ring
8. Primary piston assembly
9. Secondary piston assembly
10. Master cylinder body

Caution
Do not disassemble the primary and secondary piston assemblies.



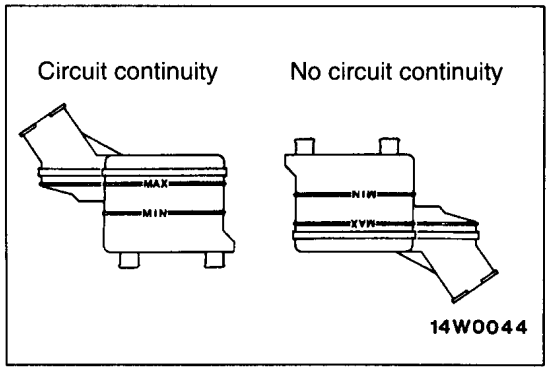
DISASSEMBLY SERVICE POINT

◀A▶ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear, damage or wear.
- Check the diaphragm for cracks and wear.



BRAKE FLUID LEVEL SENSOR CHECK

(1) Connect circuit tester to brake fluid level sensor.
(2) Sensor is in good condition if there is no circuit continuity when turning reservoir over and circuit continuity when returned to original position.

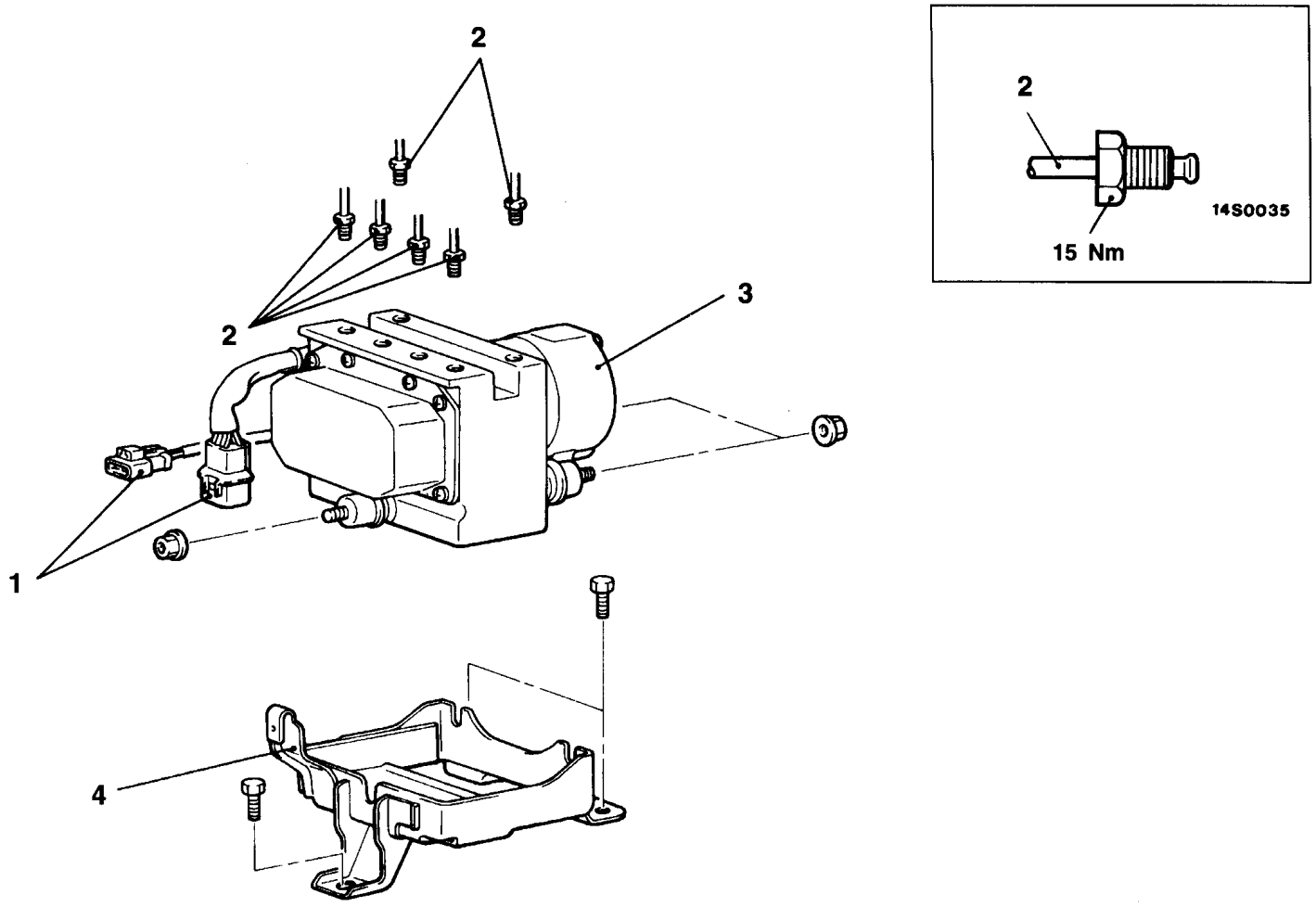
HYDRAULIC UNIT

120002444

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Cleaner Removal (Refer to GROUP 15 – Air Cleaner.)

Post-installation Operation
- Air Cleaner Installation (Refer to GROUP 15 – Air Cleaner.)
- Brake Fluid Supplying
- Brake Lines Bleeding (Refer to P.35B-29.)
- Hydraulic Unit Checking (Refer to P.35B-31.)



00000491

Removal steps

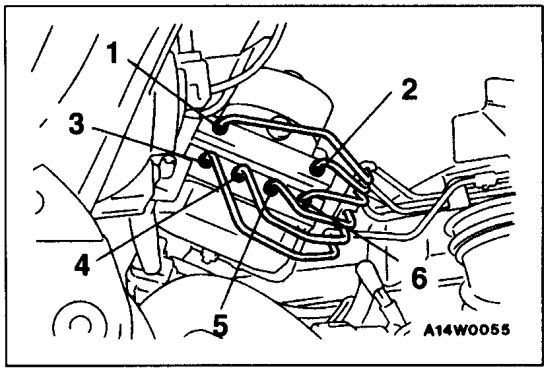
1. Harness connector
2. ▶A◀ Brake tube connection
3. ◀A▶ Hydraulic unit
4. Hydraulic unit bracket

REMOVAL SERVICE POINT

◀A▶ HYDRAULIC UNIT REMOVAL

Caution

1. **The hydraulic unit is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit is not to be disassembled; its nuts and bolts should absolutely not be loosened.**
3. **The hydraulic unit must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit must not be turned upside down or laid on its side.**



INSTALLATION SERVICE POINT

▶A◀ BRAKE TUBE CONNECTION

Connect the tube to the hydraulic unit as shown in the illustration.

1. Master cylinder (for rear)
2. Master cylinder (for front)
3. Front brake (R.H.)
4. Rear brake (L.H.)
5. Rear brake (R.H.)
6. Front brake (L.H.)

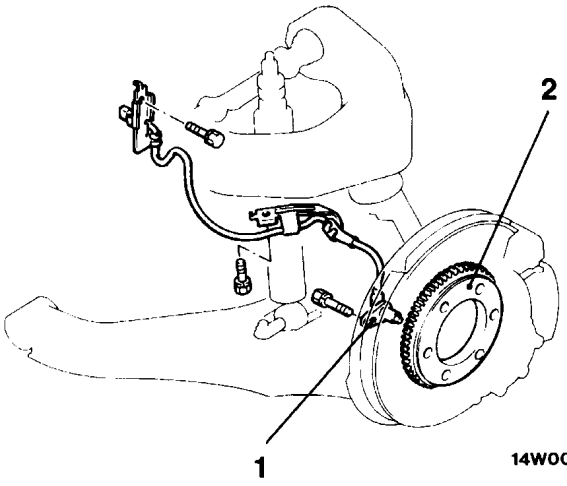
WHEEL SPEED SENSOR

120000129

REMOVAL AND INSTALLATION

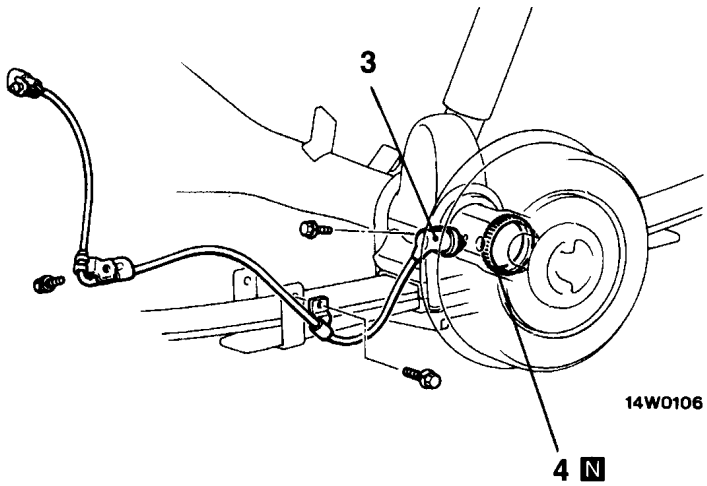
Post-installation Operation
- Wheel Speed Sensor Output Voltage Checking (Refer to P.35B-30.)

Front



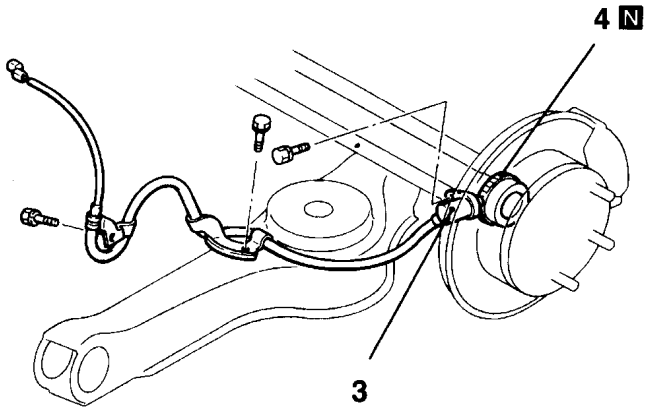
14W0093

Rear – Vehicles with leaf springs



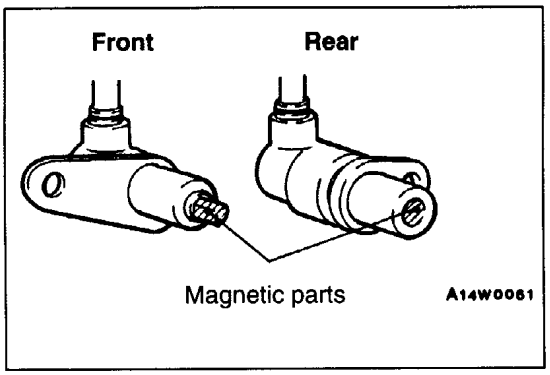
14W0106

Rear – Vehicles with coil springs



14W0091
00000492

1. Front speed sensor
2. Front rotor (Refer to GROUP 26 – Front Hub.)
3. Rear speed sensor
4. Rear rotor (Refer to GROUP 27 – Rear Axle Shaft.)

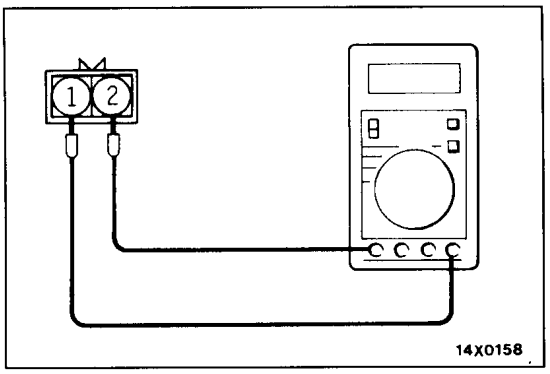


INSPECTION

SPEED SENSOR

(1) Check whether any metallic foreign material has adhered to the parts shown in the illustration at the speed sensor tip, and if so, remove it.

NOTE
The section shown in the illustration can become magnetized because of the magnet built into the speed sensor, with the result that foreign metallic material easily adheres to it.



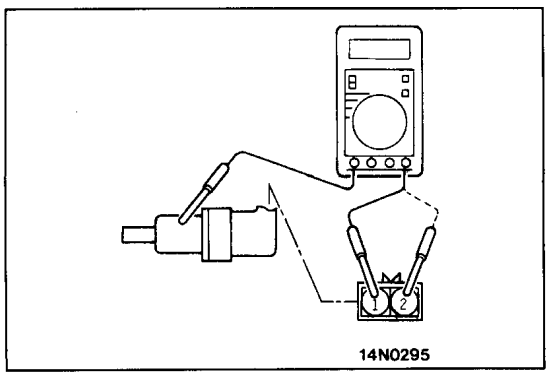
(2) Measure the resistance between the speed sensor terminals.

Standard value: <Front> 0.9–1.1 kΩ
<Rear> 1.4–2.0 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. Check the connector connection and the terminal insertion.

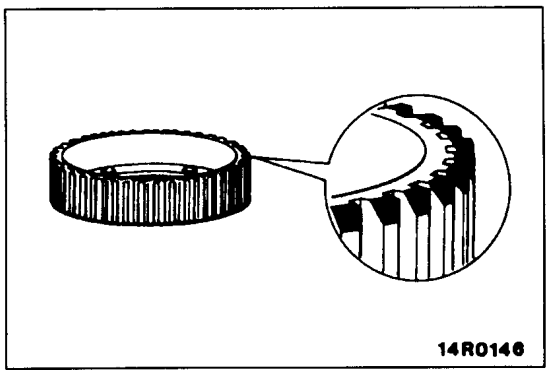


SPEED SENSOR INSULATION INSPECTION

(1) Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

Standard value: 100 kΩ or more

(2) If the speed sensor insulation resistance is outside the standard value range, replace with a new speed sensor.



TOOTHED ROTOR

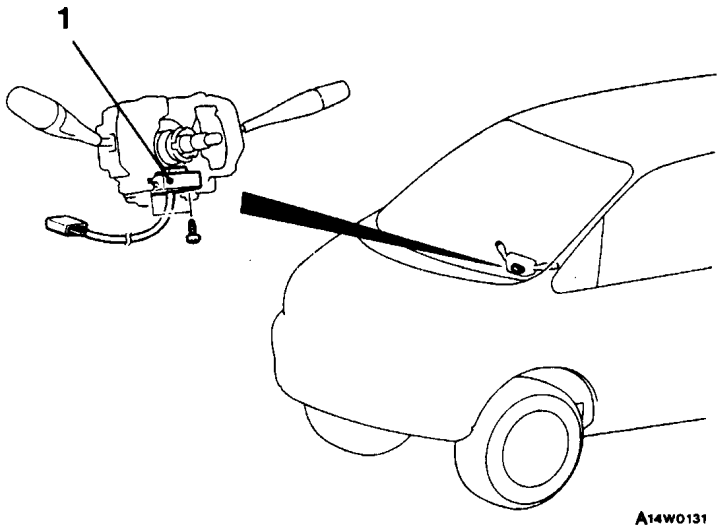
Check whether rotor teeth are broken or deformed, and, if so, replace the rotor.

STEERING WHEEL SENSOR

120000130

REMOVAL AND INSTALLATION

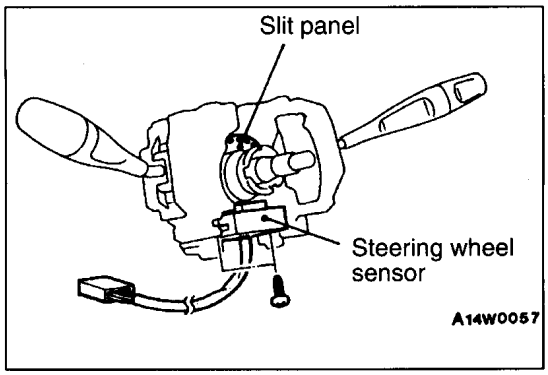
Caution : SRS
When removing the air bag module and clock spring, refer to GROUP 52B – Service Precautions and GROUP 52B – Air Bag Module and Clock Spring before carrying out these operations.



Removal steps

- Steering wheel and column cover removal (Refer to GROUP 37A – Steering wheel and Shaft.)
- Column switch removal (Refer to GROUP 51 – Windshield wiper and washer.)

◀A▶ 1. Steering wheel sensor



REMOVAL SERVICE POINT

◀A▶ STEERING WHEEL SENSOR REMOVAL

Remove the steering wheel sensor from the column switch.

Caution

1. **The steering wheel sensor utilizes a photo coupler and care should be paid to ensure that no dust or grease are allowed to come into contact with it.**
2. **Be careful and ensure that the column switch side slit panel is not bent nor oil allowed to come into contact with it.**

INSPECTION

Refer to P.35B-26.

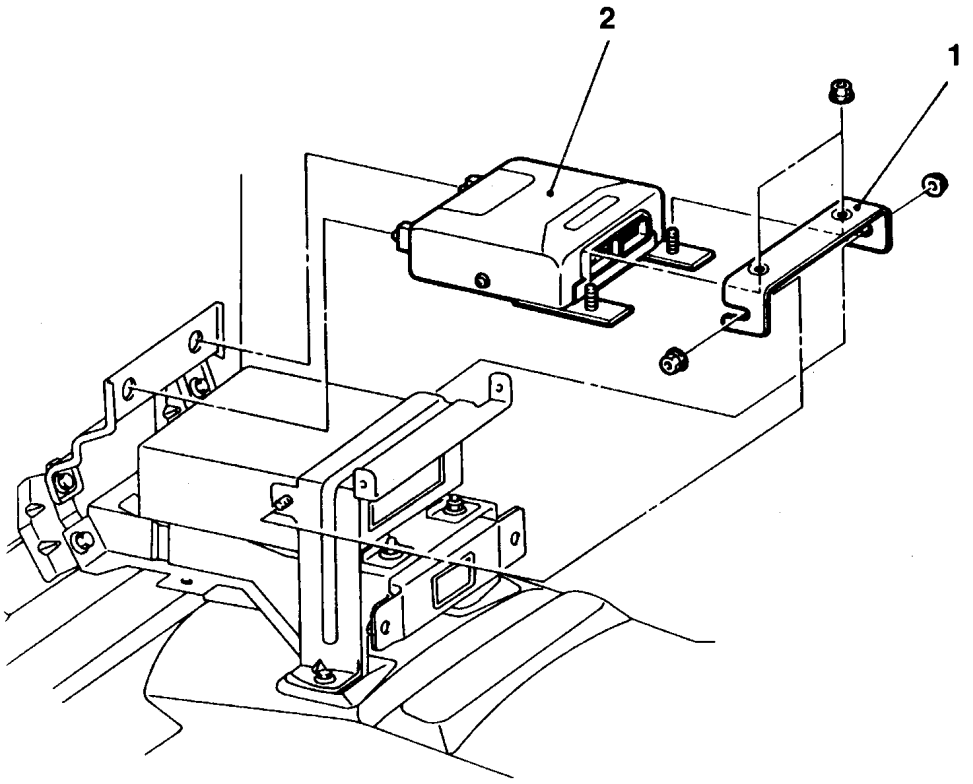
ELECTRONIC CONTROL UNIT

120000131

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 diagnostic unit or other components.

Pre-removal and Post-installation Operation
- Computer Cover Removal and Installation (Refer to GROUP 52A-Instrument Panel.)



A03W0014

Removal steps
1. ABS bracket
2. ABS-ECU

INSPECTION

Refer to P.35B-26.

ANTI-SKID BRAKING SYSTEM (ABS) <4WD>

CONTENTS

120000153

GENERAL INFORMATION 2
SERVICE SPECIFICATION 3
SPECIAL TOOLS 3
TROUBLESHOOTING 4
G-SENSOR 13

For the items below, refer to GROUP 35A.

LUBRICANTS

SEALANTS

SERVICE ADJUSTMENT PROCEDURES

- Brake Pedal Inspection and Adjustment
- Stop Lamp Switch Inspection
- Brake Booster Operating Test
- Brake Booster Vacuum Switch Check
- Load Sensing Spring Length Check and Adjustment
- Load Sensing Proportioning Valve Function Test
- Disc Brake Pad Check and Replacement
- Front Disc Brake Rotor Inspection
- Rear Brake Disc Run-out Check
- Rear Brake Disc Run-out Correction
- Rear Brake Disc Thickness Check
- Brake Lining Thickness Check
- Brake Drum Inside Diameter Check
- Brake Lining and Brake Drum Connection Check

BRAKE PEDAL

LOAD SENSING PROPORTIONING VALVE

FRONT DISC BRAKE

REAR DISC BRAKE

REAR DRUM BRAKE

For the items below, refer to GROUP 35B.

SERVICE ADJUSTMENT PROCEDURES

- Bleeding
- ABS Operation Check

MASTER CYLINDER AND BRAKE BOOSTER

HYDRAULIC UNIT

WHEEL SPEED SENSOR

STEERING WHEEL SENSOR

ELECTRONIC CONTROL UNIT

GENERAL INFORMATION

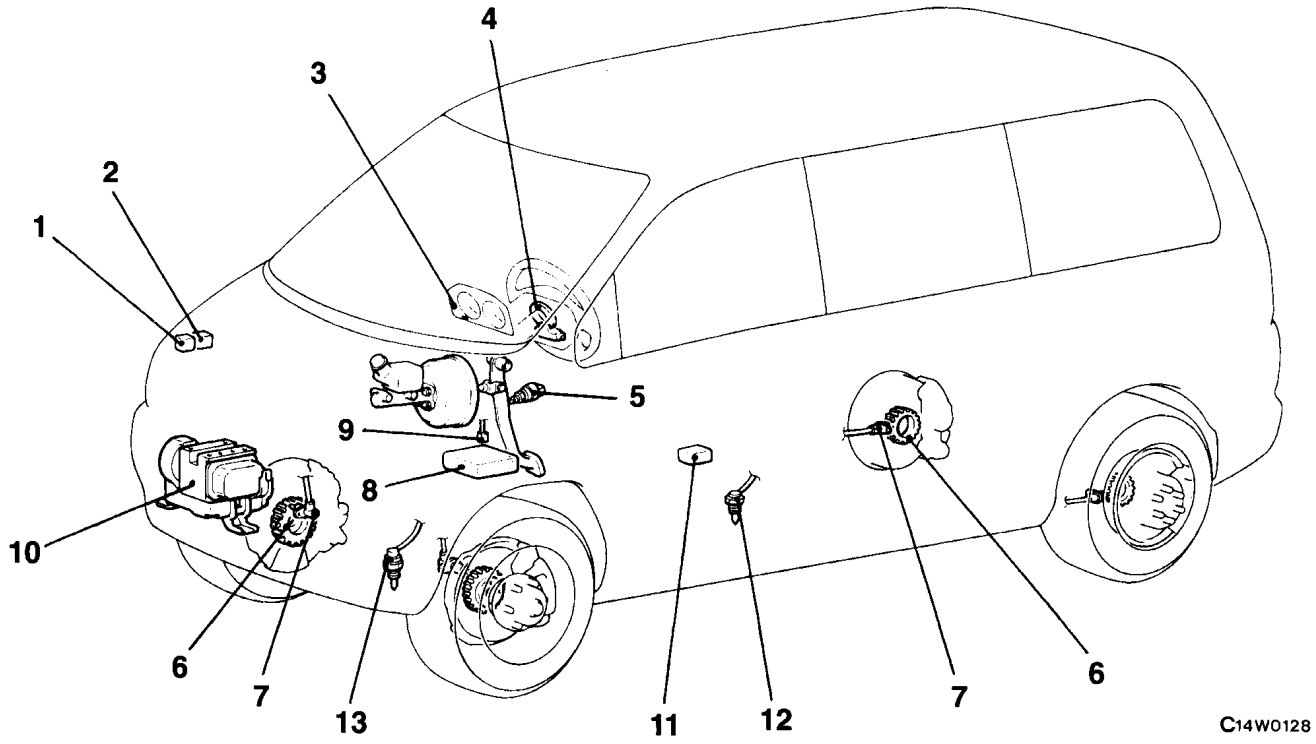
120000154

The ABS consists of wheel speed sensors, stop lamp switch hydraulic unit and the ABS-ECU. If a problem occurs in the system, the malfunctioning system can be identified by means of the diagnosis function, and the trouble symptom memory will not be erased even if the ignition switch is turned to OFF. (However, it will be erased if the battery is disconnected.)
In addition, reading of diagnosis codes and service data and actuator testing are possible using the MUT-II.

Items	Specifications
Speed sensor	Magnet coil type
Front rotor teeth	47
Rear rotor teeth	47

CONSTRUCTION DIAGRAM

120002439



1. ABS valve relay
2. ABS motor relay
3. ABS warning lamp
4. Steering wheel sensor
5. Stop lamp switch
6. Rotor
7. Wheel speed sensor
8. ABS-ECU
9. Diagnosis connector
10. Hydraulic unit
11. G-sensor
12. 4WD position detection switch
13. Free wheel engage switch

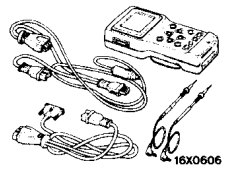
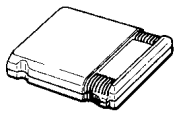
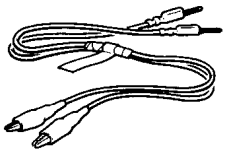
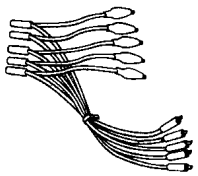
SERVICE SPECIFICATION

120000156

Items		Standard value
G-sensor output voltage V	When installed	2.3–2.7
	When removed with arrow mark facing down	3.3–3.7

SPECIAL TOOLS

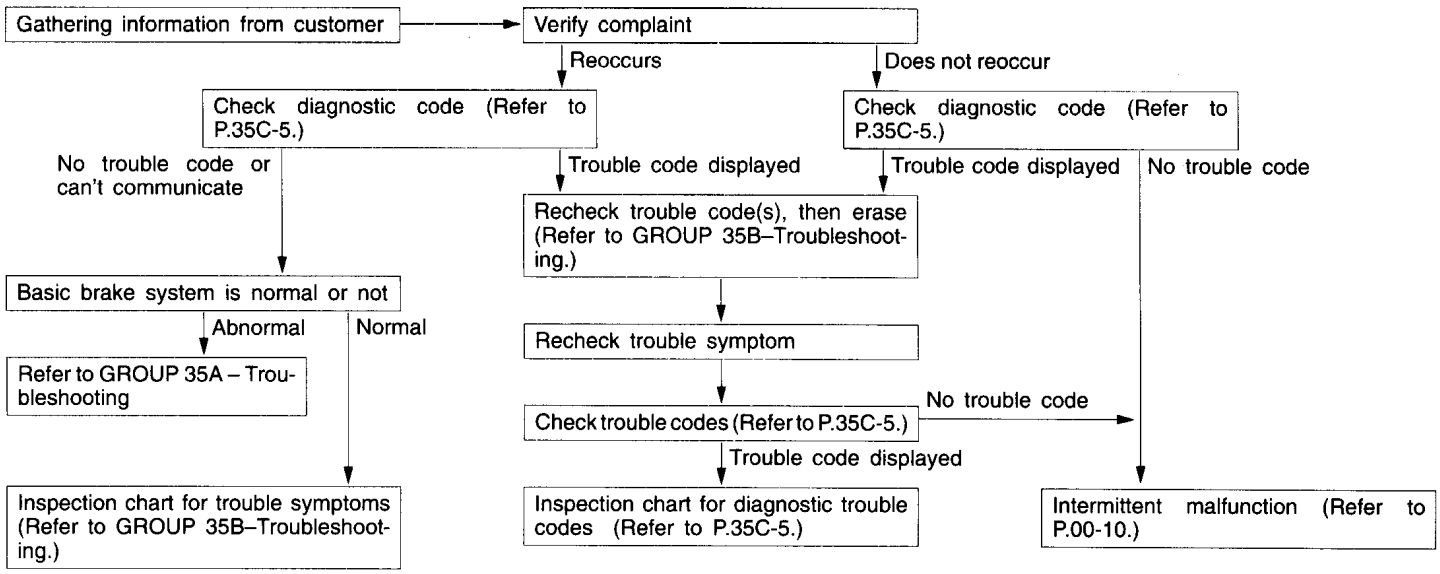
120000157

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	For checking of ABS (Diagnosis code display when using the MUT-II)
 16X0607	–	ROM pack	
	MB991529	ABS check harness	For checking of ABS (Diagnosis code display when using the ABS warning lamp)
	MB991348	Test harness set	For checking of G-sensor

TROUBLESHOOTING

120000158

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



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 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 operating (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)
ABS operation (Long braking distance)	For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.

- Diagnosis detection condition can vary depending on the diagnosis code.
  To recheck trouble symptom, requirements listed in the "Comment" should be satisfied.

DIAGNOSTIC FUNCTION

120000159

Refer to GROUP 35B – Troubleshooting.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

120002580

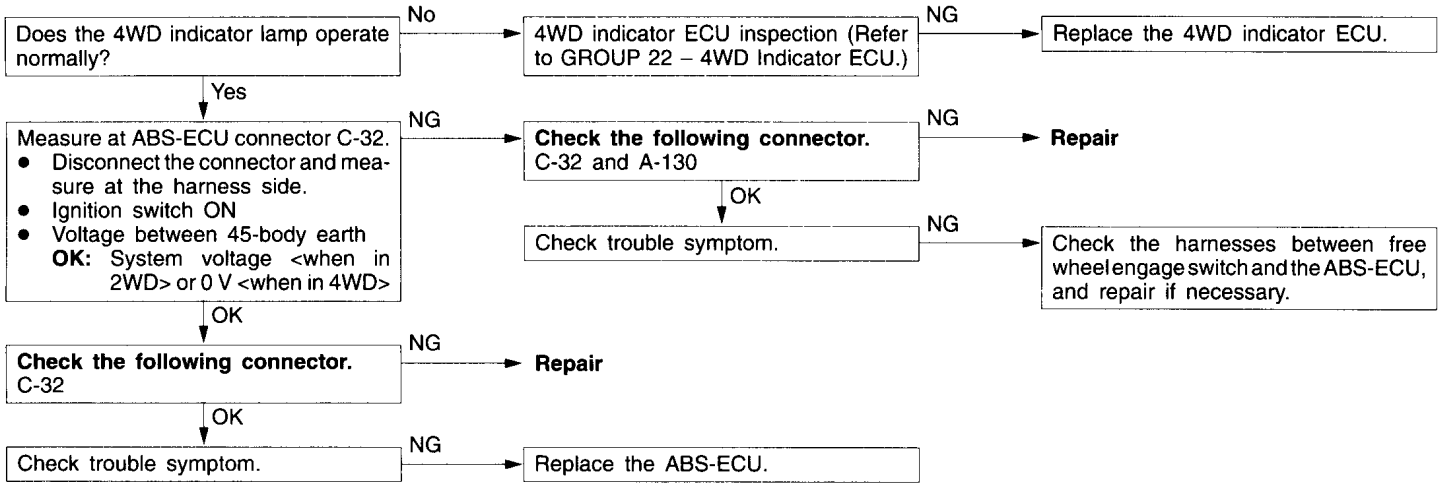
Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front-right wheel speed sensor	Open circuit	Refer to GROUP 35B – Troubleshooting.
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	Refer to GROUP 35B – Troubleshooting.
16	Power supply system		Refer to GROUP 35B – Troubleshooting.
21	Front right wheel speed sensor	Short circuit	Refer to GROUP 35B – Troubleshooting.
22	Front left wheel speed sensor		
23	Rear right wheel speed sensor		
24	Rear left wheel speed sensor		
25	Free wheel engage switch		P.35C-6
26	4WD position detection switch		P.35C-7
32	G-sensor system		P.35C-8
33	Stop lamp switch system		Refer to GROUP 35B – Troubleshooting.
34	Steering wheel sensor	Open circuit	Refer to GROUP 35B – Troubleshooting.
35	Steering wheel sensor (ST-N)	Neutral position improperly detected	Refer to GROUP 35B – Troubleshooting.
36	Steering wheel sensor (ST-1, ST-2)	Steering angle improperly detected	Refer to GROUP 35B – Troubleshooting.
41	Front right solenoid valve		Refer to GROUP 35B – Troubleshooting.
42	Front left solenoid valve		
43	Rear right solenoid valve		
44	Rear left solenoid valve		
51	Valve relay		Refer to GROUP 35B – Troubleshooting.
53	Motor relay, motor		Refer to GROUP 35B – Troubleshooting.
63	ABS-ECU		Refer to GROUP 35B – Electronic Control Unit. (Replace the ABS-ECU.)

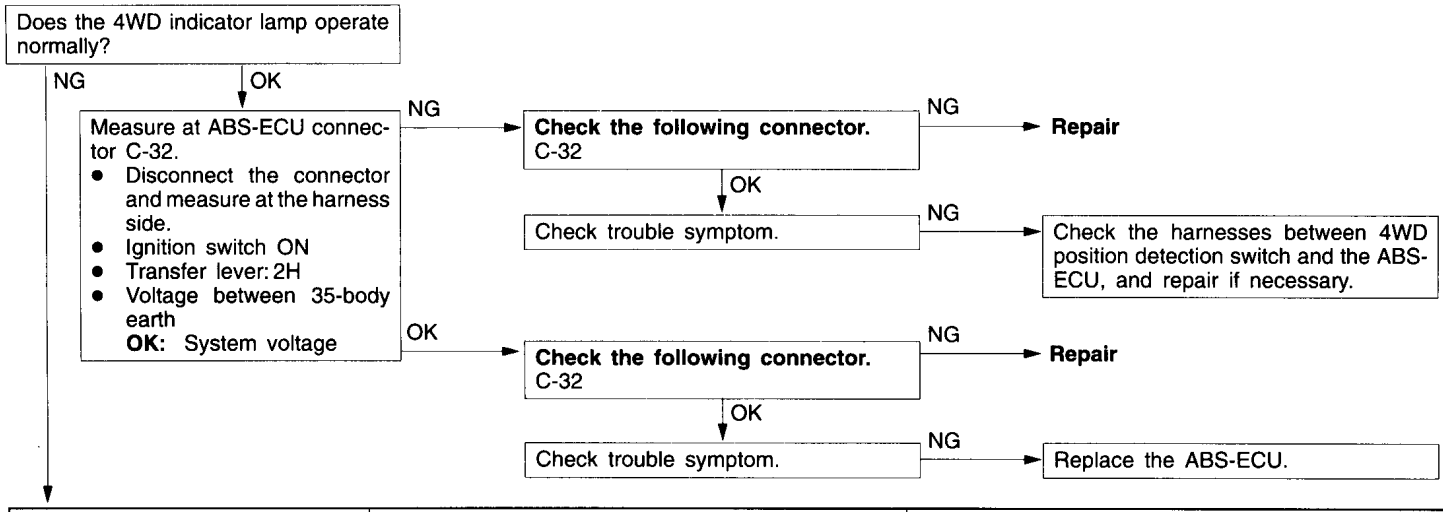
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSTIC TROUBLE

For diagnosis code numbers other than those listed below, refer to GROUP 35B – Troubleshooting.

Code No.25 Free wheel engage switch	Probable cause
[Comment] ABS-ECU determines that an open circuit exists in the free wheel engage switch system.	• Malfunction of wiring harness or connector • Malfunction of 4WD indicator ECU • Malfunction of ABS-ECU



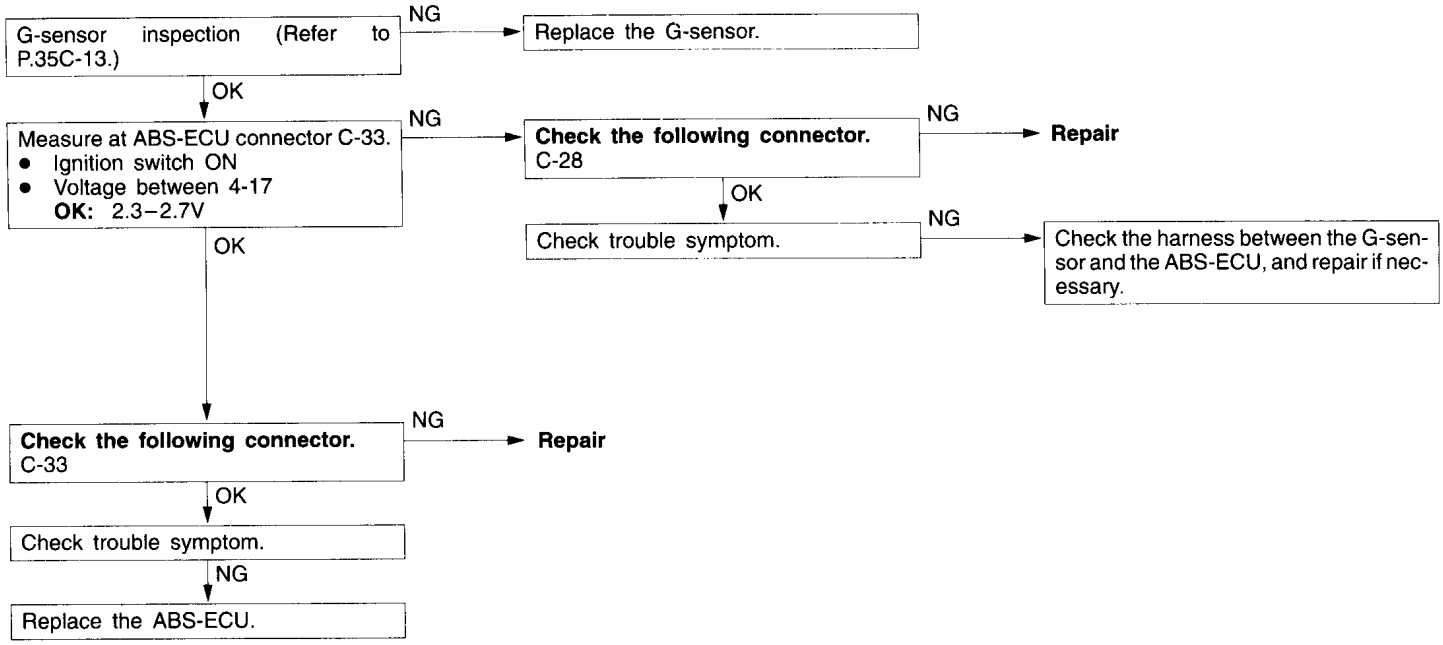
Code No.26 4WD position detection switch	Probable cause
[Comment] This code is output at the following times: ABS-ECU determines that an open circuit exists in the 4WD detection switch system. The free wheel engage switch is off and the 4WD detection switch is on at a vehicle speed of 15 km/h or more for 5 seconds or more.	• Malfunction of wiring harness or connector • Malfunction of free wheel engage switch • Malfunction of 4WD indicator ECU • Malfunction of 4WD position detection switch • Malfunction of ABS-ECU



Trouble symptom	Main cause	Remedy
Even when the transfer shift lever is in the "4H" position, the 4WD front wheel indicator lamp does not illuminate.	Broken harness wire between the 4WD indicator ECU and the free-wheel engage switch, or broken earth wire from the free-wheel engage switch	Repair the harness.
	Free wheel engage switch is defective.	Replace the switch.
Even when the transfer shift lever is in the "4H" position, the free wheel differential indicator lamp does not illuminate.	Broken harness wire between the 4WD indicator ECU and the 4WD position detection switch	Repair the harness.
	Broken wire in the 4WD indicator ECU circuit	4WD indicator ECU inspection (Refer to GROUP 22 – 4WD Indicator ECU.)
Free wheel differential indicator lamp illuminates regardless of the position of the transfer shift lever.	Short in the harness wire in the 4WD position detection switch circuit	Repair the harness.
	4WD position detection switch is defective.	Replace the switch.
	Short in the ABS-ECU circuit	Replace the ABS-ECU.
	Short in the 4WD indicator ECU circuit	4WD indicator ECU inspection (Refer to GROUP 22 – 4WD Indicator ECU.)
No indicator is illuminated.	Power circuit in the 4WD indicator ECU is defective.	Repair the harness.
	4WD indicator ECU is defective.	4WD indicator ECU inspection (Refer to GROUP 22 – 4WD Indicator ECU.)

NOTE
When checking a short in the ABS-ECU circuit, remove the ABS-ECU connector and check if the 4WD indicator returns to normal. If it returns to normal, the ABS-ECU is defective. Furthermore, if the ABS-ECU is normal, then the 4WD indicator ECU will be defective.

Code No.32 G-sensor system	Probable cause
[Comment] This code is output at the following times: The G-sensor output is less than 0.5 V or more than 4.5 V. An open or short circuit is present in the G-sensor system.	• Malfunction of G-sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



ABS WARNING LAMP INSPECTION

120000161

Refer to GROUP 35B – Troubleshooting.

INSPECTION CHART FOR TROUBLE SYMPTOMS

120000162

Refer to GROUP 35B – Troubleshooting.

DATA LIST REFERENCE TABLE

120000163

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	IG power supply voltage and valve monitor voltage	9–16V
25	Free wheel engage switch	Engage 4WD.	ON
		Engage 2WD.	OFF
26	4WD detection switch	Place the transfer lever at 4H.	ON
		Place the transfer lever at 2H.	OFF
32	G-sensor output voltage	Stop the vehicle.	2.3–2.7V
		Perform a test run.	Display value fluctuates with a mean value of 2.5 V.
33	Stop lamp switch	Depress the brake pedal.	ON
		Release the brake pedal.	OFF
34	Steering wheel sensor (Steering angle)	Turn the steering wheel after neutral position is learnt.	Displays 0° immediately after battery is connected and 5° intervals after neutral position is learnt.
35	Steering wheel sensor (Neutral position detection)	Turn the steering wheel within ±5° from the neutral.	ON
		Other than the above	OFF
37	Steering wheel sensor (Neutral position learning)	When driving straight-forward at 10 km/h or more	ON
		Other than the above	OFF

2. When the ABS-ECU shuts off ABS operation.

When the diagnosis system stops the ABS-ECU, the MUT-II display data will be unreliable.

ACTUATOR TEST INSPECTION TABLE

120000164

Refer to GROUP 35B – Troubleshooting.

INSPECTION AT ABS-ECU TERMINALS

120000165

TERMINAL VOLTAGE CHART

1. Measure the voltages between terminals (15), (25) and (42) (earth terminals) and each respective terminal.
2. The terminal arrangements are shown in the illustrations below.

14W0043

Connector terminal No.	Signal	Checking requirements		Normal condition
1	Output to front-left hydraulic unit solenoid valve (OUT side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
2	Output to rear-right hydraulic unit solenoid valve (OUT side)			
3	Output to rear-right hydraulic unit solenoid valve (IN side)			
4	G-sensor signal	Ignition switch: ON		2.3–2.7 V (Horizontal condition)
5	Steering wheel sensor input from steering wheel sensor (ST-1)	Ignition switch: ON Turn the steering wheel slowly.		Alternates between 0 and approx. 3 V
6	Steering wheel sensor input from steering wheel sensor (ST-2)	Ignition switch: ON Turn the steering wheel slowly.		Alternates between 0 and approx. 3 V
13	ABS-ECU power supply	Ignition switch: ON		System voltage
		Ignition switch: START		0V
14	Output to front-left hydraulic unit solenoid valve (IN side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
17	G-sensor earth	Always		0V
19	Steering wheel sensosr input from steering wheel sensor (ST-N)	Let the engine run at idle and keep the steering wheel neutral.		0.5 V or less
		Let the engine run at idle and turn the steering wheel 90° from the neutral.		2.5–3.5V
26	Output to relay power supply	Ignition switch: ON		System voltage
31	Free wheel engage switch	Ignition switch: ON	2WD	System voltage
			4WD	1 V or less

Connector terminal No.	Signal	Checking requirements		Normal condition
32	Memory power supply	Always		System voltage
34	Input from stop lamp switch	Ignition switch: ON	Stop lamp switch ON	System voltage
			Stop lamp switch OFF	1 V or less
35	Input from 4WD detection switch	Ignition switch: ON	Transfer lever position: 2H	System voltage
			Transfer lever position: 4H	1 V or less
36	MUT-II	Connect the MUT-II.		Serial communication with MUT-II
		Do not connect the MUT-II.		1 V or less
37	Output to valve relay	Ignition switch: ON	Approximately 1 second after engine is started. The relay is on.	2 V or less
			The system runs down. The relay is off.	System voltage
38	Output to motor relay	Ignition switch: ON (Approximately 1 second after engine is started)	Motor is on	2 V or less
			Motor is off	System voltage
39	Idle-up solenoid valve (–)	Ignition switch: ON (When motor is on approximately 1 second after engine is started)		2 V or less
40	Output to rear-left hydraulic unit solenoid valve (OUT side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
41	Output to front-right hydraulic unit solenoid valve (OUT side)			
43	Idle-up solenoid valve (+)	Ignition switch: ON (When motor is on approximately 1 second after engine is started)		System voltage
45	Input from free wheel engage switch	Ignition switch: ON	Engage 2WD.	System voltage
			Engage 4WD.	1 V or less
46	Ignition switch	Ignition switch: ON		System voltage
		Ignition switch: START		0V
47	Input from diagnosis indication selection	Connect the MUT-II.		0V
		Do not connect the MUT-II.		Approx. 12 V
48	Input from valve relay monitor	Ignition switch: ON		System voltage
49	Motor monitor	Ignition switch: ON (Approximately 1 second after engine is started)	Motor is on	System voltage
			Motor is off	0.5 V or less
50	Output to ABS warning lamp	Ignition switch: ON	The lamp is switched off	System voltage
			The lamp illuminates	0–2V
51	Output to rear-left hydraulic unit solenoid valve (IN side)	Ignition switch: ON (When solenoid valve is off approximately 1 second after engine is started)		System voltage
52	Output to front-right hydraulic unit solenoid valve (IN side)			

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 arrangements are shown in the illustrations below.

14W0042

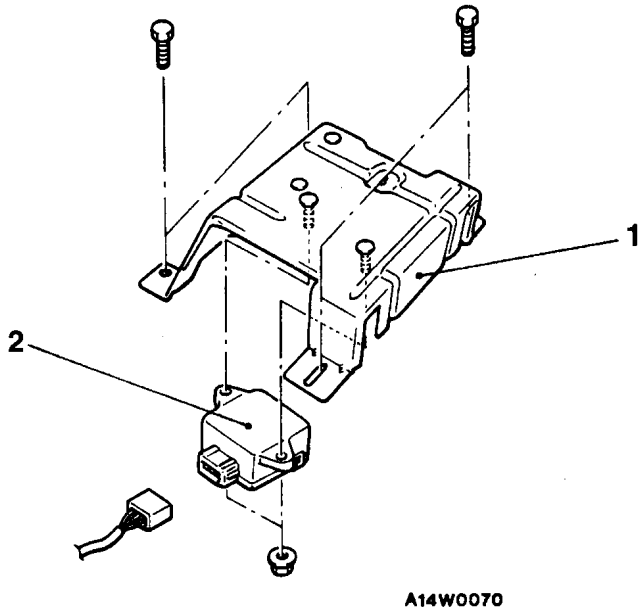
Connector terminal No.	Signal	Normal condition
1–Body earth	Front-left solenoid valve (OUT side)	3.8Ω
2–Body earth	Rear-right solenoid valve (OUT side)	3.8Ω
3–Body earth	Rear-right solenoid valve (IN side)	8.2Ω
7–20	Front-left wheel speed sensor (+ wire)	0.9–1.1kΩ
8–21	Rear-right wheel speed sensor (+ wire)	1.4–2.0kΩ
9–22	Rear-left wheel speed sensor (+ wire)	1.4–2.0kΩ
10–23	Front-right wheel speed sensor (+ wire)	0.9–1.1kΩ
14–Body earth	Front-left solenoid valve (IN side)	8.2Ω
15–Body earth	ABS-ECU earth	Continuity
25–Body earth		
39–43	Idle-up solenoid valve	33–39Ω
40-Body earth	Rear-left solenoid valve (OUT side)	3.8Ω
41–Body earth	Front-right solenoid valve (OUT side)	3.8Ω
42–Body earth	ABS-ECU earth	Continuity
48–Body earth	Input from valve relay monitor	Continuity
49–Body earth	Motor monitor	Continuity
51–Body earth	Rear-left solenoid valve (IN side)	8.2Ω
52–Body earth	Front-right solenoid valve (IN side)	8.2Ω

G-SENSOR

120000166

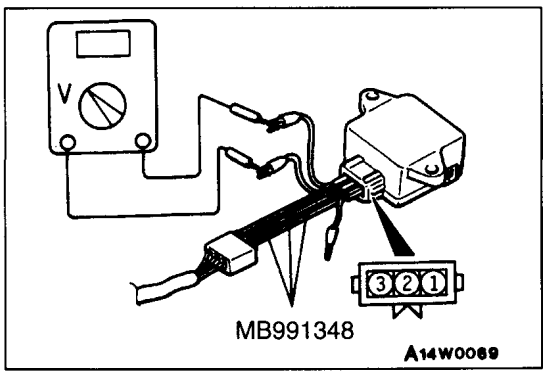
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Driver's Side Front Seat Removal and Installation (Refer to GROUP 52A – Seat.)



Removal steps
1. G-sensor bracket
2. G-sensor

Caution
Do not drop the G-sensor or subject it to shocks.

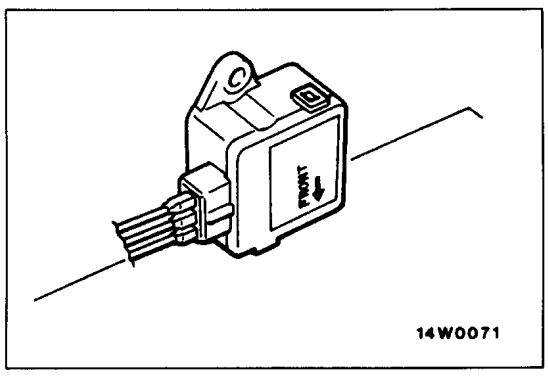


INSPECTION

(1) Disconnect the G-sensor connector and connect the special tool between the terminals of the disconnected connector.

(2) Turn the ignition switch to ON and take a reading of the following output voltage.
Between terminals (2) and (3).

Standard value: 2.3–2.7V



(3) With the special tool still connected, secure the G-sensor so that the FRONT mark on the sensor mounting surface faces straight down, and then take a reading of the following output voltage between terminals (2) and (3).

Standard value: 3.3–3.7V

(4) If the voltage is outside the standard value, after checking to be sure that there is no abnormality in the power supply and earth wires, replace the G-sensor.

PARKING BRAKES

CONTENTS

120002162

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SERVICE SPECIFICATIONS 3
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GENERAL INFORMATION

120000248

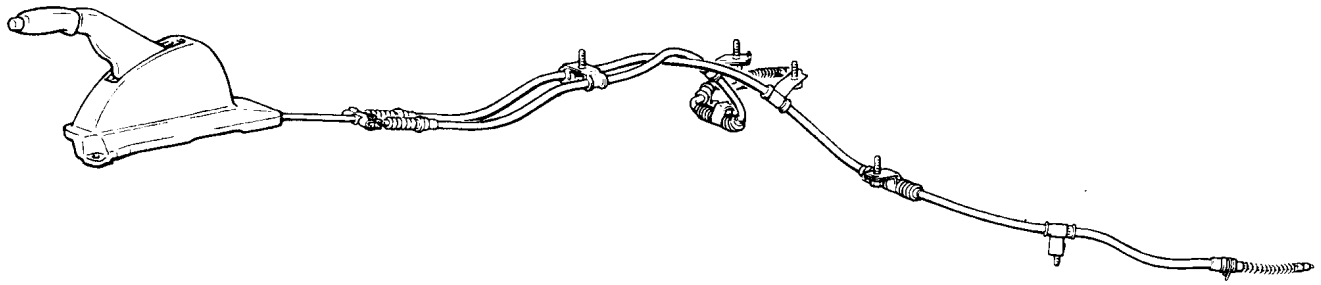
The parking brake is of a mechanical rear-wheel brake construction in all vehicles. Drum-type or drum in-disc type brakes are employed depending on the vehicle model.

The operation method utilizes a parking brake lever which is in an offset position at the driver's side.

CONSTRUCTION DIAGRAM

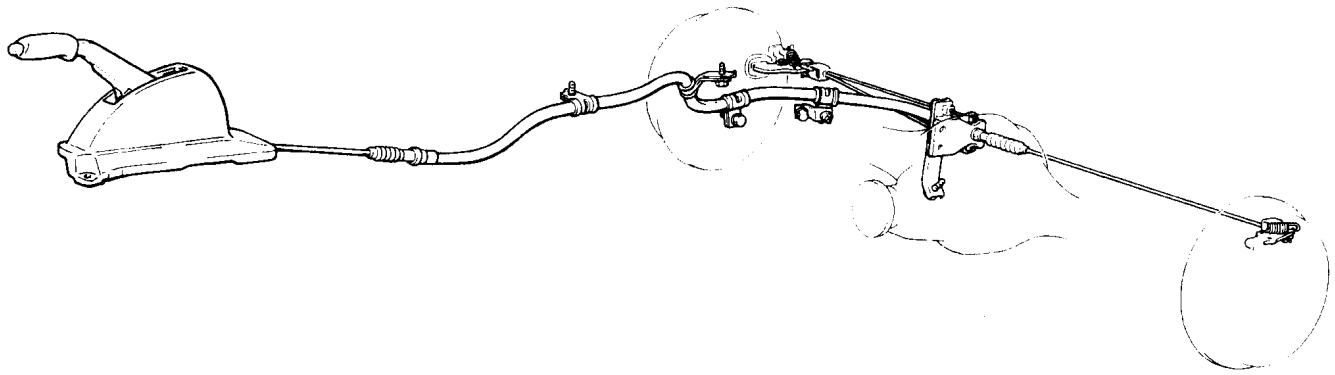
120002163

<V-shaped cabling>



14W0155

<T-shaped cabling>



14W0156

00002262

SERVICE SPECIFICATIONS

120000250

Items	Standard value	Limit
Parking brake lever stroke	7–9 notches	–
Brake lining thickness mm	6.5	4.5
Brake drum inside diameter mm	197.0	198.0

LUBRICANTS

120000251

Items	Specified lubricants	Quantity
Backing plate	Brake grease SAE J310, NLGI No. 1	As required
Shoe and lining assembly		
Adjuster		
Parking lever pin head		

SEALANT

120000252

Items	Specified sealant	Remarks
Shoe hold-down pin	3M ATD Part No. 8513 or equivalent	Drying sealant
Backing plate		

SERVICE ADJUSTMENT PROCEDURE

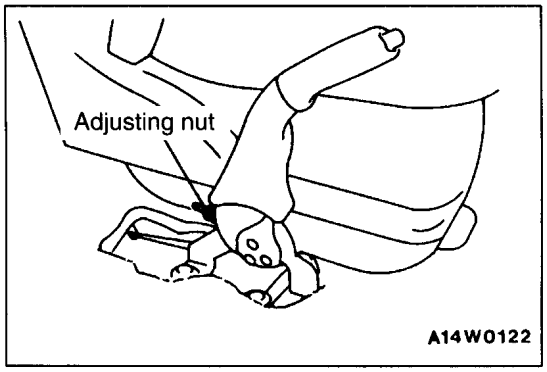
120000253

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: 7–9 notches



2. Lever Stroke Adjustment
   Tighten the adjusting nut as far as the end of the cable rod as shown in the illustration. Then release the parking brake cable to adjust the parking lever stroke by the following procedure.

   <Vehicles with drum brake>

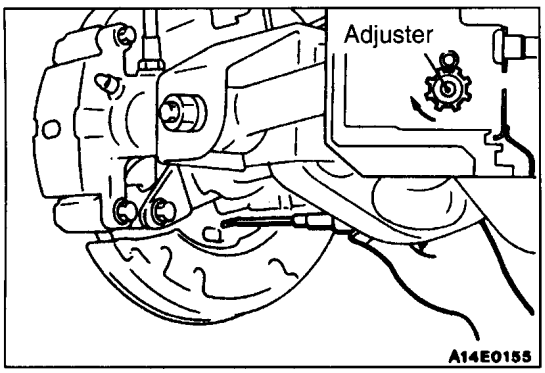
   (1) With the engine idling, forcefully depress the brake pedal five of six times and confirm that the pedal stroke stops changing.

   NOTE
   If the pedal stroke stops changing, the automatic-adjustment mechanism is functioning normally, and the clearance between the shoe and drum is correct.

   (2) Turn the adjusting nut to adjust the parking brake lever stroke to within the standard value range.

   Caution
   If the number of brake lever notches engaged is less than the standard value, the cable has been pulled excessively. Be sure to adjust it to the standard value.

   (3) After making the adjustment, check to be sure that there is no play between the adjusting nut and the parking brake lever.
   (4) After adjusting the lever stroke, jack up the rear of the vehicle.
   (5) With the parking brake lever in the released position, turn the rear wheel to confirm that the rear brakes are not dragging.



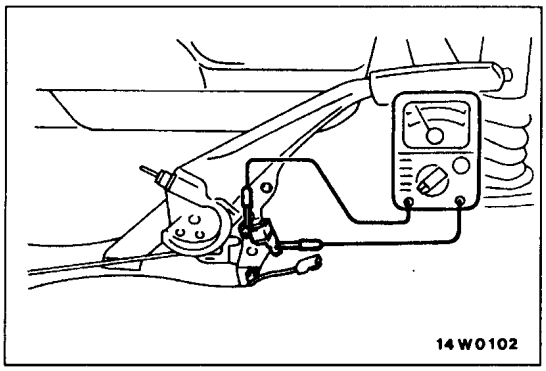
<Vehicles with drum in-disc brake>

(1) Remove the adjustment hole plug and then use a flat-tipped screwdriver to turn the adjuster as shown in the illustration until the disc will not rotate. Return the adjuster 3 or 4 notches in the opposite direction to the direction of the arrow.

(2) Turn the adjusting nut to adjust the parking brake lever stroke to within the standard value range.

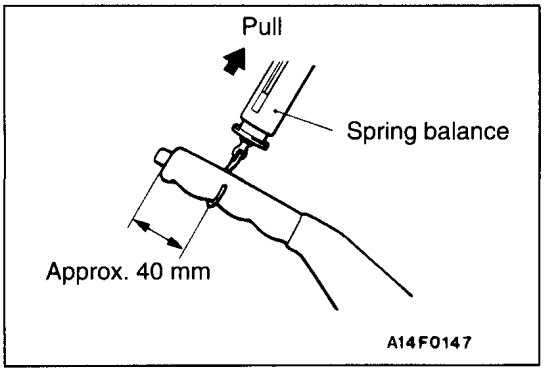
Caution
If the number of brake lever notches engaged is less than the standard value, the cable has been pulled excessively. Be sure to adjust it to the standard value.

(3) After making the adjustment, check to be sure that there is no play between the adjusting nut and the parking brake lever.
(4) After adjusting the lever stroke, jack up the rear of the vehicle.
(5) With the parking brake lever in the released position, turn the rear wheel to confirm that the rear brakes are not dragging.



PARKING BRAKE SWITCH CHECK 120000254

1. Disconnect the connector of the parking brake switch, and connect an ohmmeter to the parking brake switch and the switch installation bolt.
2. The parking brake switch is good if there is continuity when the parking brake lever is pulled and there is no continuity when it is returned.



LINING RUNNING-IN 120000255

<Vehicles with drum in-disc brake>

Carry out running-in by the following procedure when replacing the parking brake linings or the rear brake disc rotors, or when brake performance is insufficient.

(1) Adjust the parking brake stroke to the specified value.
(2) Hook a spring balance onto the centre of the parking brake lever grip and pull it with a force of 98–147 N in a direction perpendicular to the handle.
(3) Drive the vehicle at a constant speed of 35–50 km/h for 100 meters.
(4) Release the parking brake and let the brakes cool for 5–10 minutes.
(5) Repeat the procedure in steps (2) to (4) 4–5 times.

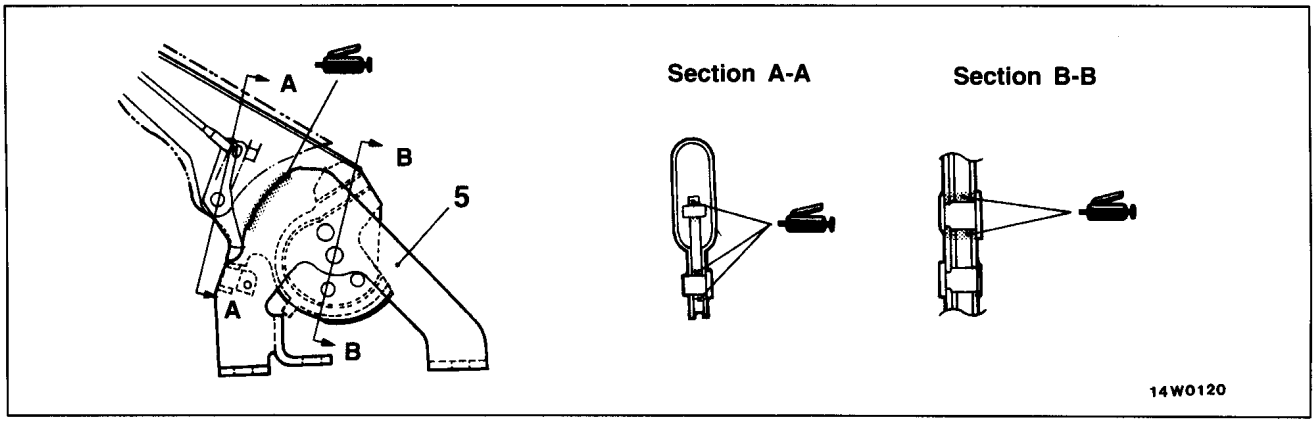
Caution
Carry out running-in in a place with good visibility, and pay careful attention to safety.

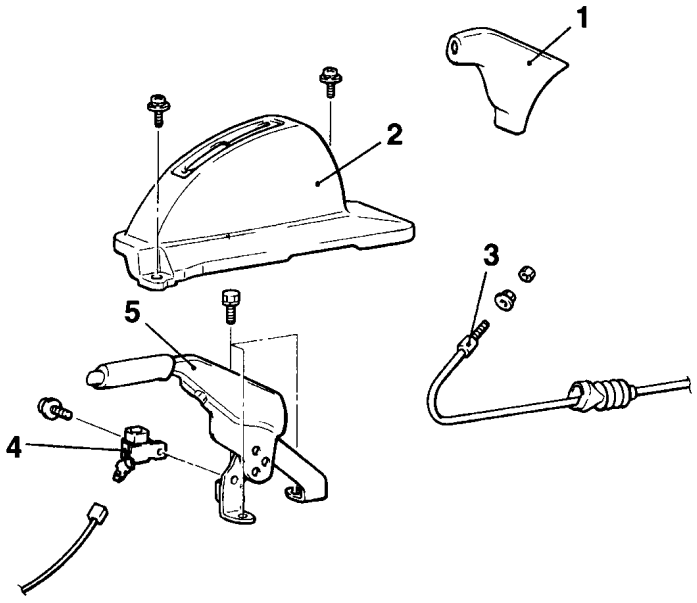
PARKING BRAKE LEVER

120002325

REMOVAL AND INSTALLATION

Post-installation Operation
- Parking Brake Lever Stroke Adjustment (Refer to P.36-4.)





00000962

Removal steps

1. Parking lever cover <Wagon>
2. Parking cover
3. Parking brake cable connection
4. Parking brake switch
5. Parking brake lever

PARKING BRAKE CABLE

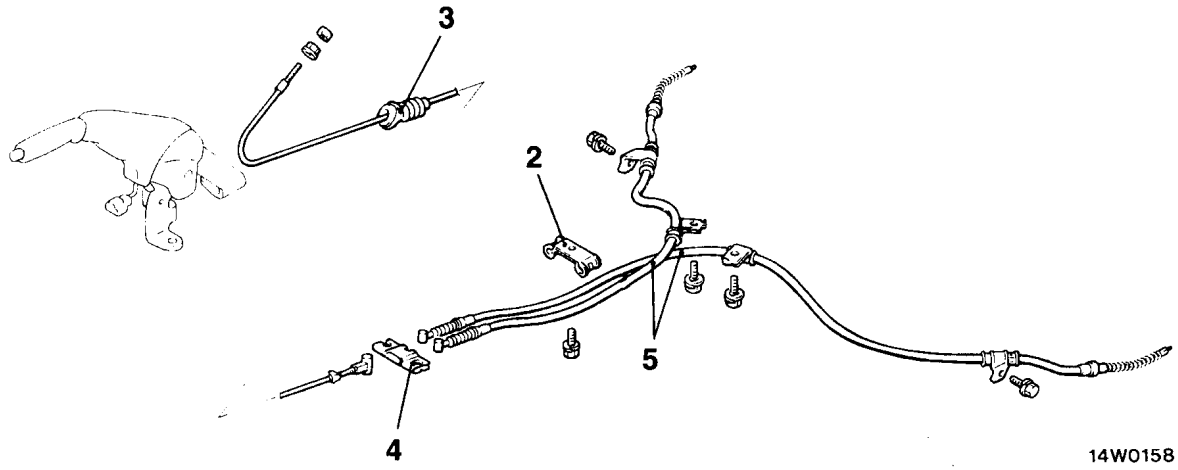
120002164

REMOVAL AND INSTALLATION

Post-installation Operation
- Parking Brake Lever Stroke Adjustment (Refer to P.36-4.)

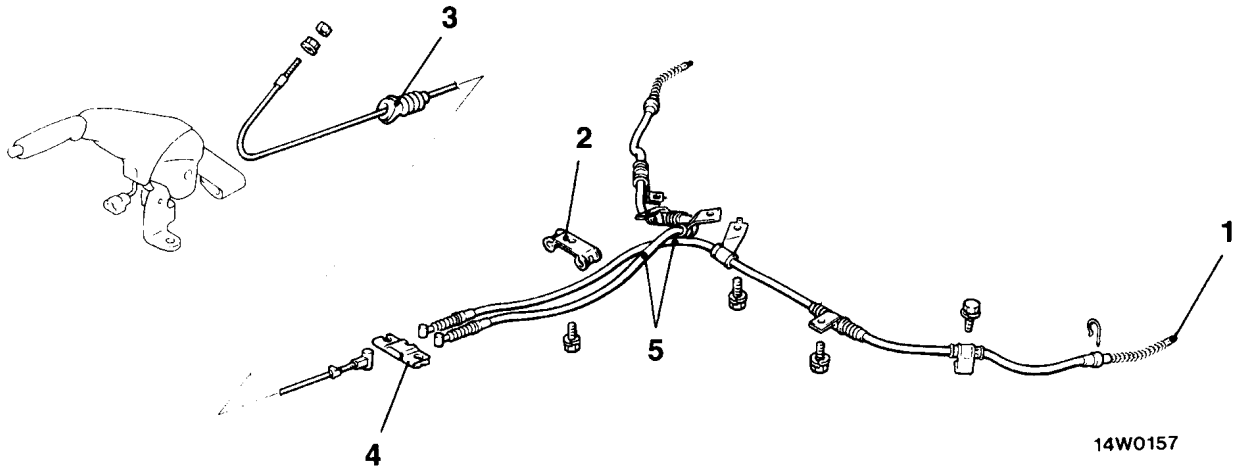
<V-shaped cabling>

<Vehicles with drum brake>



14W0158

<Vehicles with drum-in disc brake>



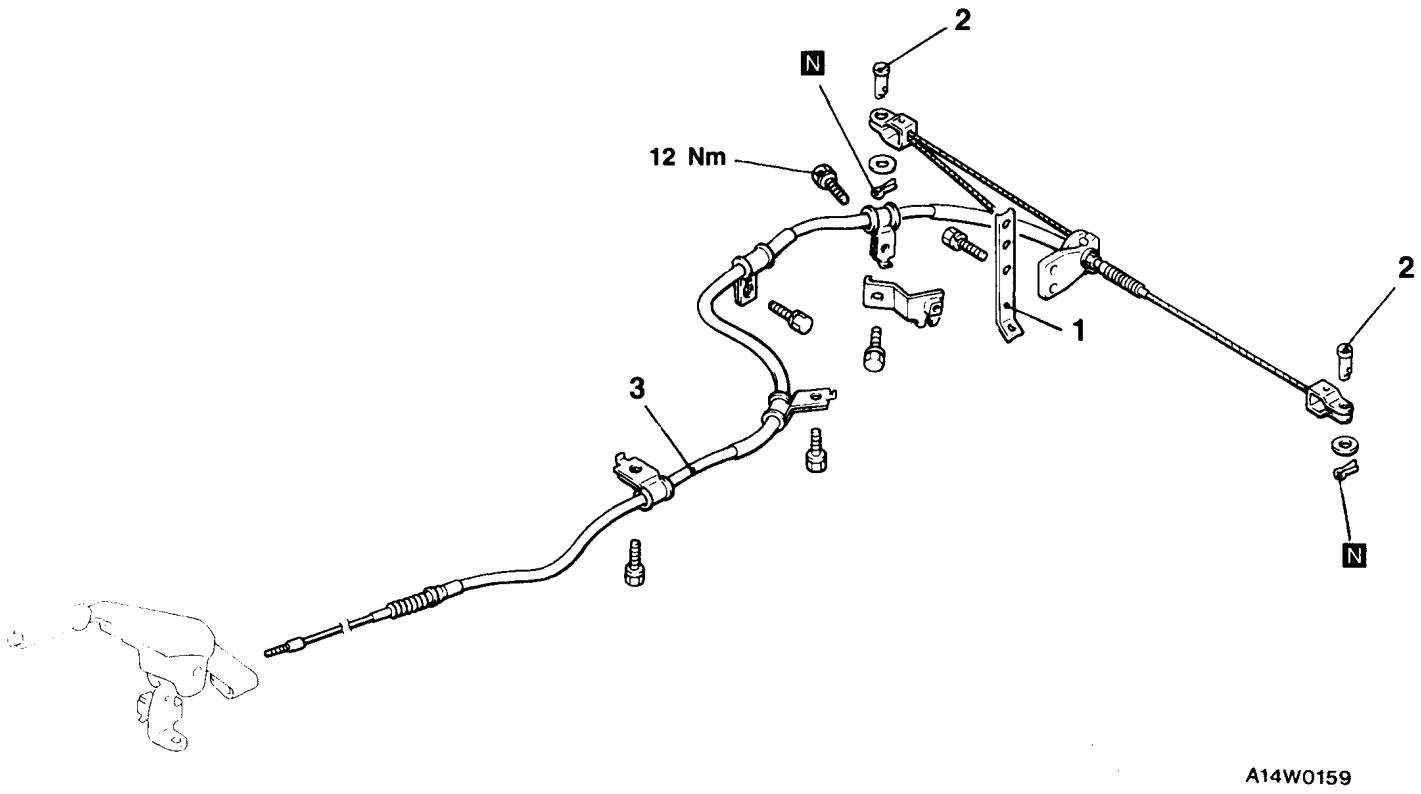
14W0157

00002263

Removal steps
- Shoe and lining assembly <Vehicles with drum brake> (Refer to GROUP 35 – Rear Drum Brake.)

1. Parking brake cable connection <Vehicles with drum-in disc brake> (Refer to P.36-9.)
2. Cable clamp
3. Front parking brake cable
4. Cable equalizer
5. Parking brake cable

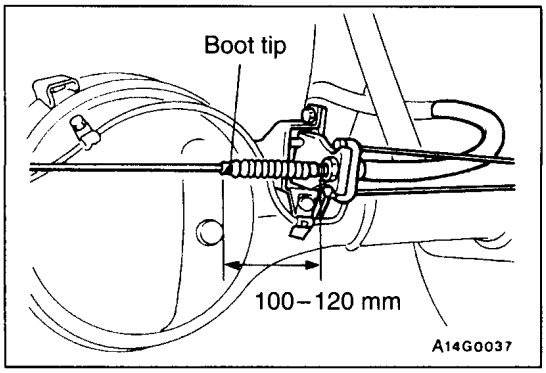
<T-shaped cabling>



Removal steps

1. Plate
2. Clevis pin

▶A◀ 3. Parking brake cable



INSTALLATION SERVICE POINT

▶A◀ PARKING BRAKE CABLE INSTALLATION

(1) Confirm parking brake boot has the dimension given in the figure with the parking brake lever assembly restored.

(2) When the boot length is not as indicated in the figure, adjust the lenthg by sliding the boot tip.

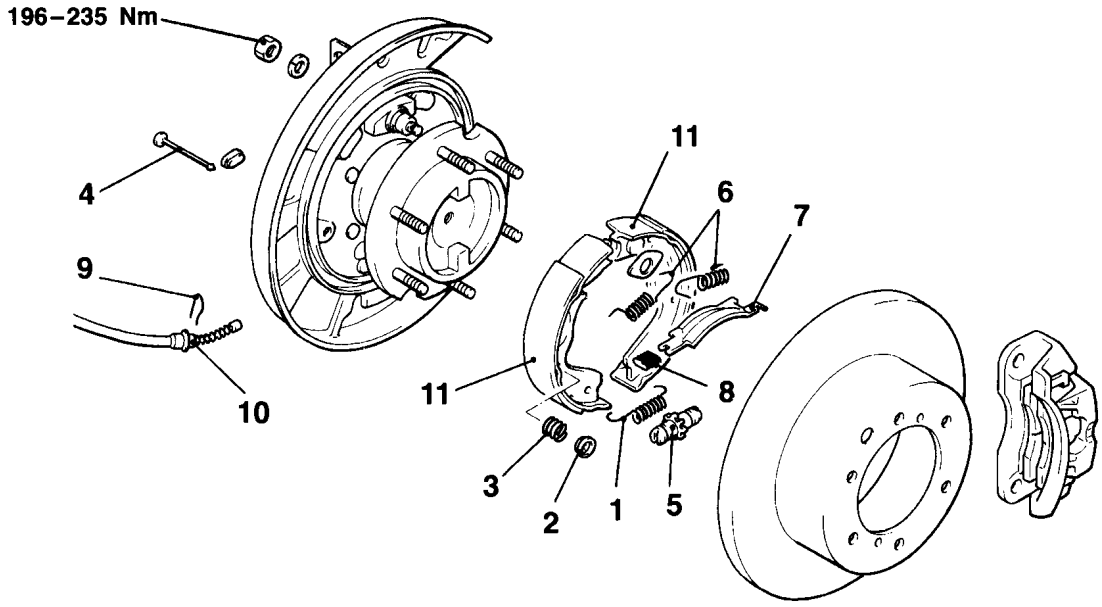
NOTE

If the boot attaching dimension is too long, the boot may come out of the parking brake cable outer casing as the brake is used, allowing moisture to enter into the casing and the cable may subsequently stick.

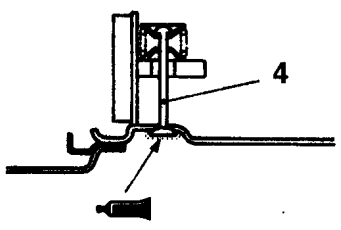
PARKING BRAKE DRUM

120000258

REMOVAL AND INSTALLATION

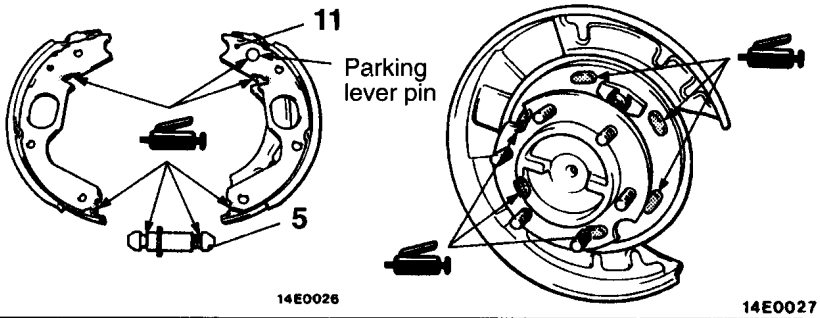


14W0103



14E0031

Sealant: 3M ATD Part No. 8513 or equivalent



14E0026

14E0027

Brake grease: Brake grease SAE J310, NLGI No. 1

00000964

Removal steps

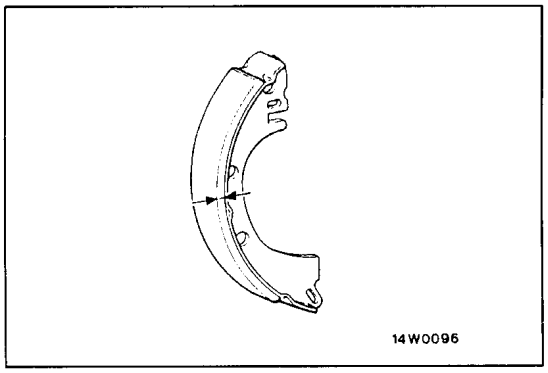
- Rear brake disc (Refer to GROUP 35 – Rear Disc Brake.)

1. Adjusting wheel spring
2. Shoe hold-down cup
3. Shoe hold-down spring
4. Shoe hold-down pin

▶B◀ 5. Adjuster

▶A◀ 6. Shoe-to-anchor spring

7. Strut
8. Strut-to-shoe spring
9. Clip
10. Parking brake cable connection
11. Shoe and lining assembly



INSPECTION

BRAKE LINING THICKNESS CHECK

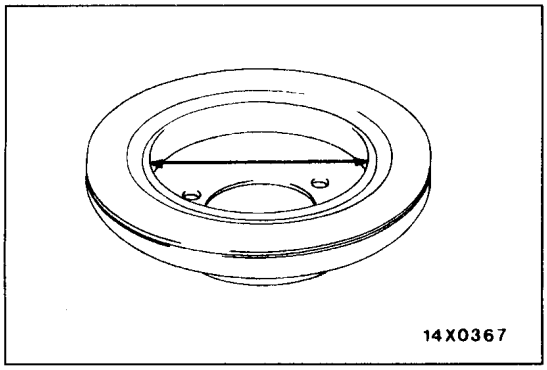
1. Measure the wear of the brake lining at the place worn the most.

   Standard value: 6.5 mm

   Limit: 4.5 mm

2. Replace the shoe and lining assembly if brake lining thickness is less than the limit or if it is not worn evenly.

   Caution
   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.



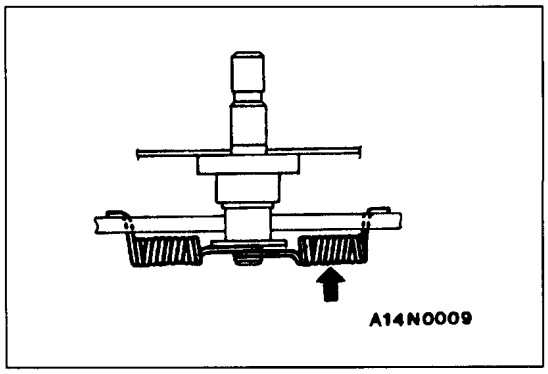
BRAKE DRUM INSIDE DIAMETER CHECK

1. Measure the inside diameter of the brake disc at two or more locations.

   Standard value: 197.0 mm

   Limit: 198.0 mm

2. Replace brake disc, shoe and lining assembly if wear exceeds the limit value or is badly imbalanced.

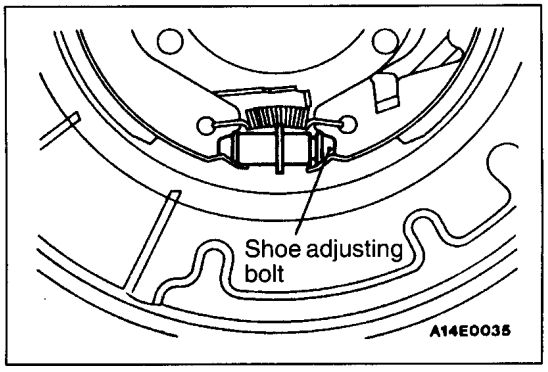


INSTALLATION SERVICE POINTS

▶A◀ SHOE-TO-ANCHOR SPRING INSTALLATION

The load on the respective shoe-to-anchor springs is different, so the spring in the figure has been painted.

NOTE
The figure shows the left wheel; for the right wheel, the position is symmetrical.



▶B◀ ADJUSTER INSTALLATION

Install the adjuster so that the shoe adjusting bolt of left hand wheel is attached towards the front of the vehicle, and the shoe adjusting bolt of right hand wheel is towards the rear of the vehicle.

STEERING

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120002166

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SPECIAL TOOLS 5

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- Steering Angle Check 7
- Tie Rod End Ball Joint Variation Check (Shaft Direction) 8
- Tie Rod End Ball Joint Starting Torque Check 8
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- Fluid Level Check 10
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- Power Steering Oil Pressure Switch Check <Petrol> 14

STEERING WHEEL AND SHAFT* 15

POWER STEERING GEAR BOX* 21

POWER STEERING OIL PUMP 27

POWER STEERING HOSES 32

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: impact sensors, SRS diagnosis unit, 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

120002167

Engine speed-responsive hydraulic power steering has been adopted as standard in all vehicle models. The main features are as follows. Four-spoke steering wheels have been adopted. In addition, SRS (Supplemental Restraint System) is provided as an option in all vehicles.

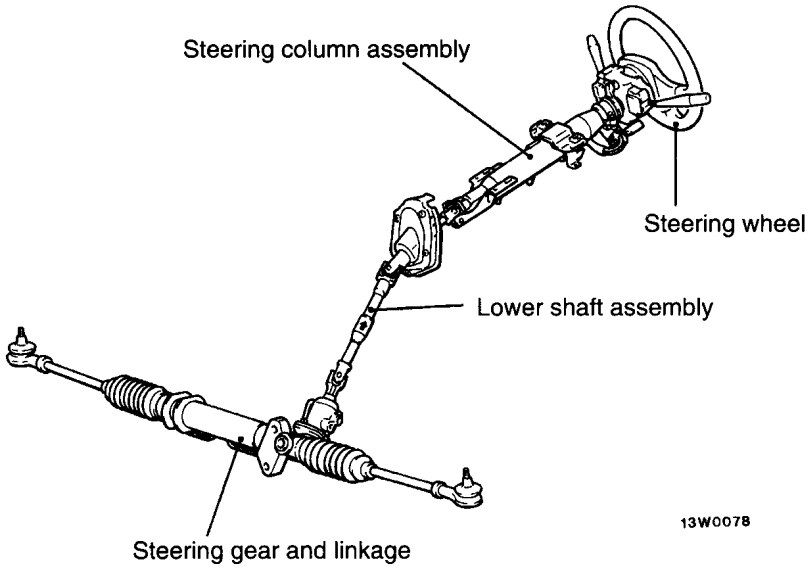
The steering column in all vehicles has a shock absorber mechanism and a tilt steering mechanism. A vane-type oil pump with a fluid flow control system included has been adopted.
The steering gear and linkage is an integral rack and pinion type.

Items		Specifications
Gear box	Type	Rack and pinion
Oil pump	Type	Vane type
	Displacement mℓ/rev.	9.6
	Relief set pressure kPa	9,300–10,000

CONSTRUCTION DIAGRAM

120002168

L.H. drive vehicles



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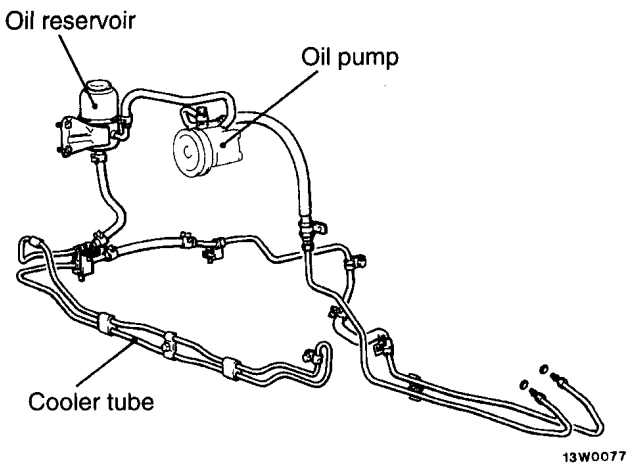

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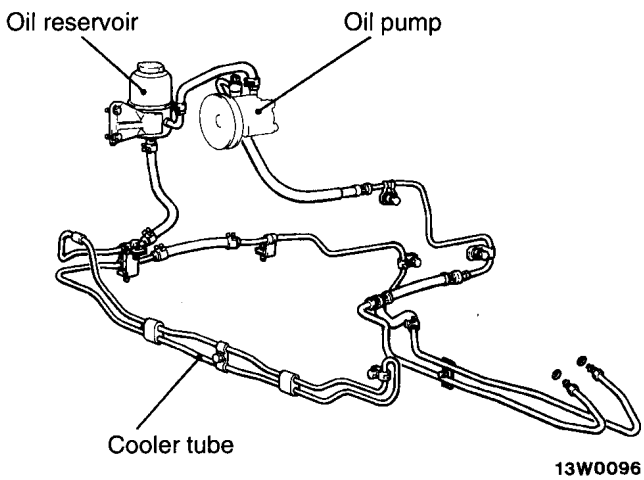
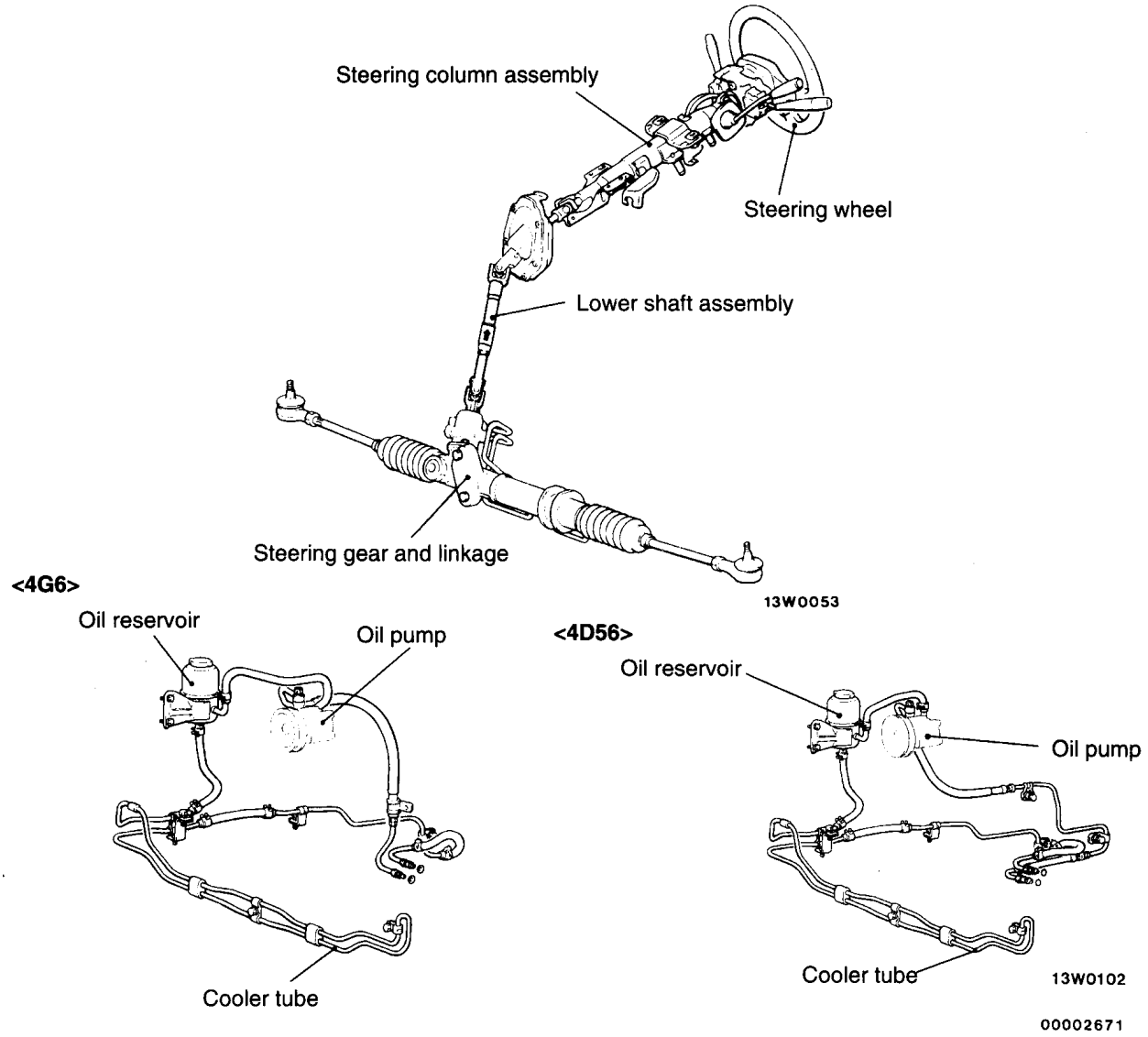


00000723

R.H. drive vehicles



SERVICE SPECIFICATIONS

120002169

Items			Standard value	Limit
Steering wheel free play mm		With engine running	–	30
		With engine stopped	10 or less	–
Steering angle	2WD	Inner wheel	37° 45' $\binom{+0°}{-3°}$	–
		Outer wheel	33° 55'	–
	4WD	Inner wheel	32° 23' $\binom{+0°}{-3°}$	–
		Outer wheel	32° 07'	–
Variation of tie rod end ball joint shaft direction mm			–	1.5
Tie rod end ball joint starting torque Nm			0.5–2.5	–
Engine idle speed r/min		4G64, 4D56	750	–
		4G63-M/T	800	–
		4G63-A/T	850	–
Stationary steering effort N			36 or less	–
V-Belt deflection mm/tension N	4G6	When belt tension is inspected	5.5–7.5/294–490	–
		When belt tension is readjusted	6.0–7.0/343–441	–
		When new belt is installed	4.0–6.0/490–686	–
	4D56	When belt tension is inspected	8.0–12.0/294–490	–
		When belt tension is readjusted	9.0–11.0/343–441	–
		When new belt is installed	6.0–8.0/490–686	–
Oil pump relief pressure kPa			9,300–10,000	–
Oil pump pressure kPa	Pressure under no-load conditions		981 or less	–
	Steering gear retention hydraulic pressure		9,300–10,000	–
Oil pressure switch operating pressure kPa		OFF→ON	1,765–2,354	–
		ON→OFF	981–2,354	–
Total pinion preload (Change in torque: 0.4 Nm) Nm			0.6–1.32	–
Tie-rod joint swing resistance N			6–21	–
Tie-rod joint swing torque Nm			1.5–5	–

LUBRICANTS

120000022

Items	Specified lubricants	Quantity
Bellows	Silicone grease	As required
Power steering fluid	Automatic transmission fluid DEXRON or DEXRON II	1.0ℓ
Flow control valve	Automatic transmission fluid DEXRON or DEXRON II	As required
Friction surface of rotor, vane, cam ring and pump cover		
O-ring		

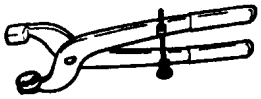
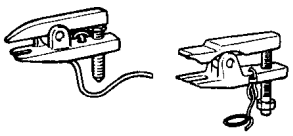
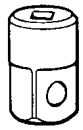
SEALANT

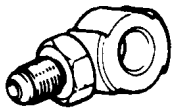
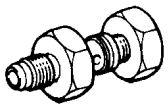
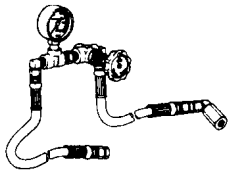
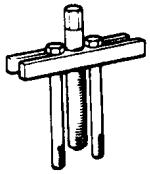
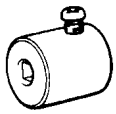
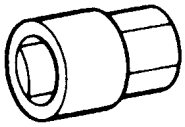
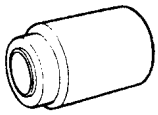
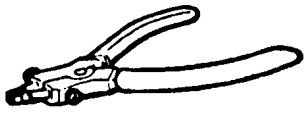
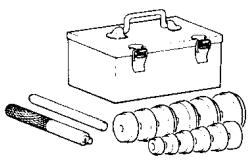
120000023

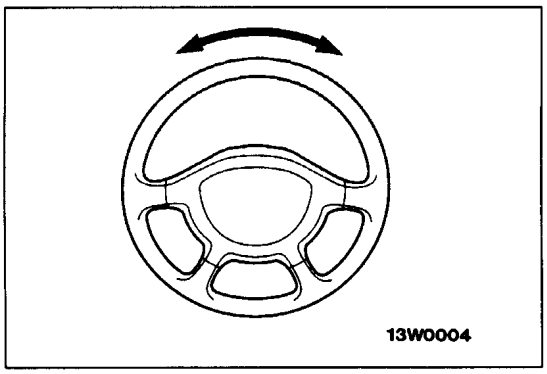
Items	Specified sealant	Remarks
Power steering rack support cover screw	3M ATD Part No. 8661 or equivalent	Semi-drying sealants
Dust cover lip for tie rod end ball joint		

SPECIAL TOOLS

120002521

Tool	Number	Name	Use
	MB990948	Linkage joint gauge	Ball joint variation check for shaft direction
	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

Tool	Number	Name	Use
	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
	MB991204	Torque wrench socket	Adjustment of rack support Removal of rack support cover
	MB990776	Front axle base	Installation of dust cover for tie rod end ball joint
	MB990628	Snap ring pliers	To remove and install the snap ring of the pulley and shaft
	MB990925	Bearing and oil seal installer set	Installation of the oil seal and bearing (Refer to GROUP 26 – Special Tools.)



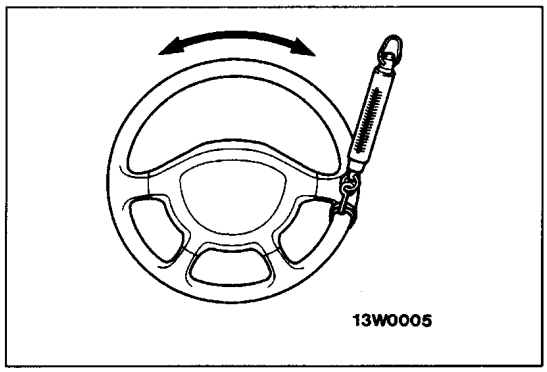
SERVICE ADJUSTMENT PROCEDURES

120000025

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.

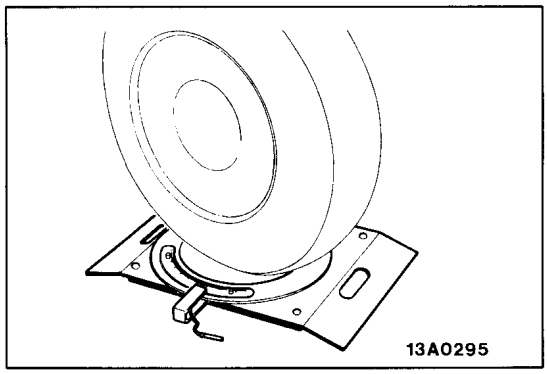
   Limit: 30 mm
3. When play exceeds the limit, check for play on steering shaft connection and steering linkage. Correct or replace.



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

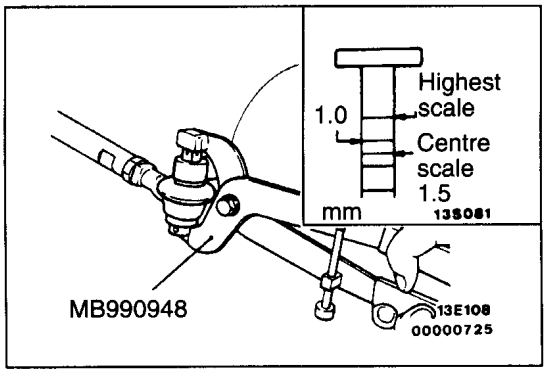
120000026

1. Locate front wheels on turning radius gauge and measure steering angle.

   Standard value:

Items	2WD	4WD
Inside wheel	37° 45' $\binom{+0°}{-3°}$	32° 23' $\binom{+0°}{-3°}$
Outside wheel	33° 55'	32° 07'

2. When the angle is not within the standard value, the toe is probably incorrect. Adjust toe (Refer to GROUP 33A – Service Adjustment Procedures) and recheck steering angle.

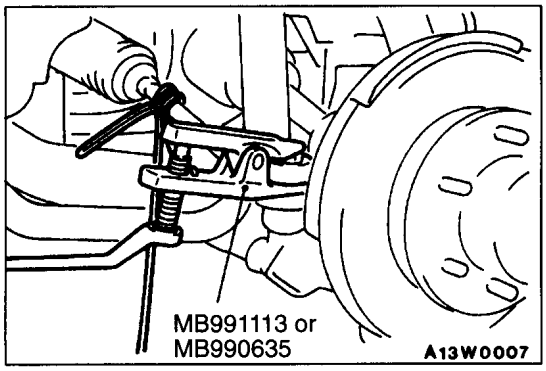


TIE ROD END BALL JOINT VARIATION CHECK (SHAFT DIRECTION) 120000027

1. Hold ball joint with the special tool.
2. Set special tool scale at its highest and measure variation with ball stud compressed. The variation should locate between the highest and centre scales.

   Limit: 1.5 mm
3. When the variation exceeds the centre scale, replace the tie-rod end.

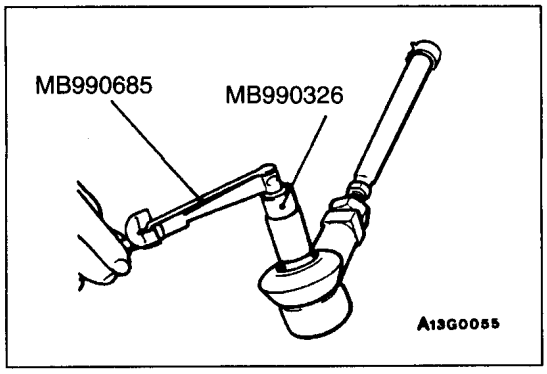
   Caution
   Even if the variation is within the limit, check ball joint starting torque.



TIE ROD END BALL JOINT STARTING TORQUE CHECK 120000028

1. Disconnect tie rod and knuckle with special tool.

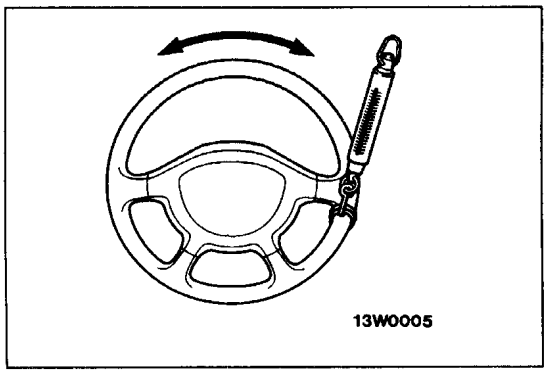
   Caution
   1. **Using the special tool, loosen the tie rod end mounting nut. Only loosen the nut; do not remove it from the ball joint.**
   2. **Supprot the special tool with a cord, etc. to prevent it from coming off.**



2. Move ball joint stud several times and install nut on stud. Measure ball joint starting torque with special tools.

   Standard value: 0.5–2.5 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.
5. Tighten the nut to the specified torque, and then install a new split pin.

   Tightening torque: 39 Nm



STATIONARY STEERING EFFORT CHECK

120002170

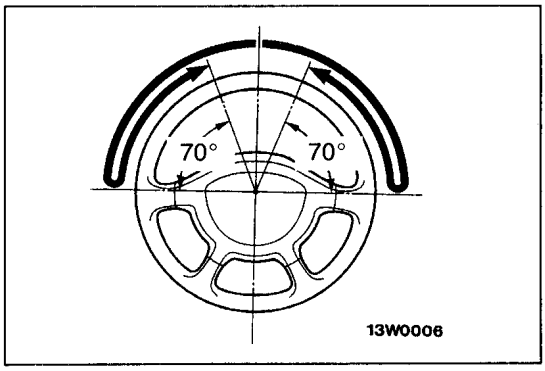
1. With the vehicle stopped on a flat, paved surface, turn the steering wheel to the straight ahead position.
2. Start the engine and check whether or not the engine idle speed is the standard value.

   Standard value:

Engine idle speed r/min	Remarks
750	4G64, 4D56
800	4G63-M/T
850	4G63-A/T

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: 36 N or less
   Fluctuation allowance: 5 N or less



CHECKING STEERING WHEEL RETURN TO CENTRE

120000030

To make this test, conduct a road test and check as follows.

1. Make both gradual and sudden turns and check the steering "feeling" to be sure that there is not difference in the steering force required and the wheel return between left and right turns.
2. At a speed of 35 km/h, turn the steering wheel 90° and release the steering wheel after 1 or 2 seconds. If the steering wheel then returns 70° or more, the return can be judged to the satisfactory.

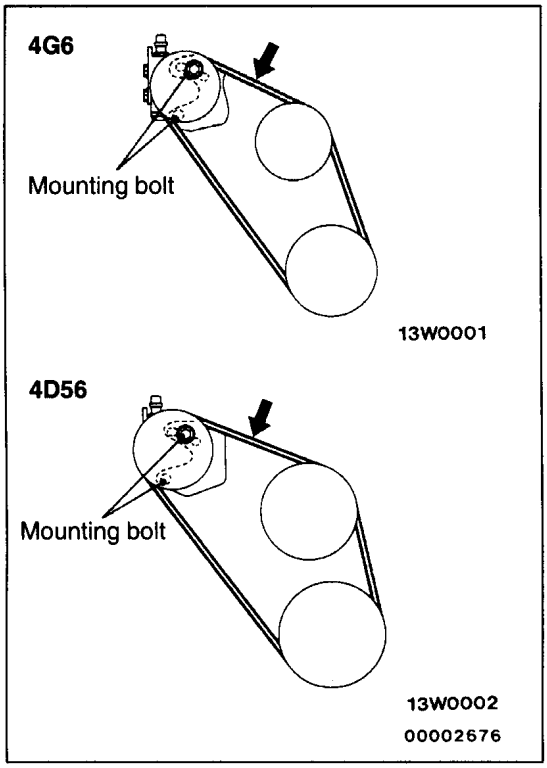
   NOTE
   There will be a momentary feeling or "heaviness" when the wheel is turned quickly, but this is not abnormal. (This is because the oil pump discharge amount is especially apt to be insufficient during idling.)

DRIVE BELT TENSION CHECK

120002171

Check to be sure that the belt is not damaged and that the drive-belt is correctly attached to the groove of the pulley.

NOTE
If there is abnormal noise or belt slippage, check the belt tension and check for unusual wear or abrasion, or damage, of the pulley contact surface, and for scars or scratches on the pulley.



1. Press in drive belt at the illustrated position with about 98 N and measure deflection or use a belt tension gauge to check whether the belt tension is at the standard value.

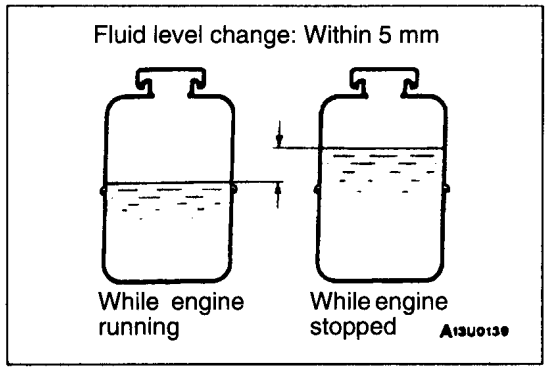
Standard value:

4G6	Deflection mm	Tension N
When belt tension is inspected	5.5–7.5	294–490
When belt tension is readjusted	6.0–7.0	343–441
When new belt is installed	4.0–6.0	490–686

4D56	Deflection mm	Tension N
When belt tension is inspected	8.0–12.0	294–490
When belt tension is readjusted	9.0–11.0	343–441
When new belt is installed	6.0–8.0	490–686

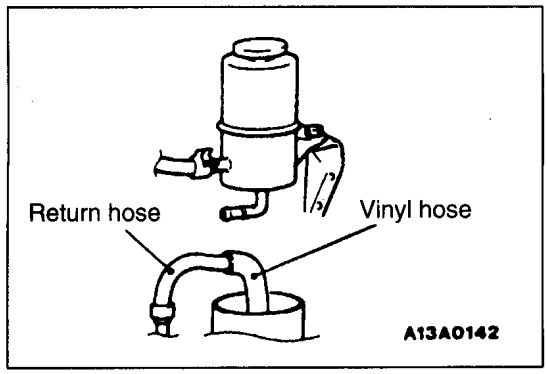
2. If the deflection is out of the standard values, adjust the belt tension using the following procedure.

   Loosen the oil pump mounting bolt, and then move the oil pump to adjust the V-belt tension to the standard value.



FLUID LEVEL CHECK 120000032

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 runnning. If the change of the fluid level is 5 mm or more, air bleeding should be done.



FLUID REPLACEMENT 120000033

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. On vehicles with a petrol engine, disconnect the high tension cable. On vehicles with a diesel engine, remove the fuel cut valve connector attached to the injection pump.

Caution
Be careful not to position the high-tension cable near the carburettor or 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 120000034

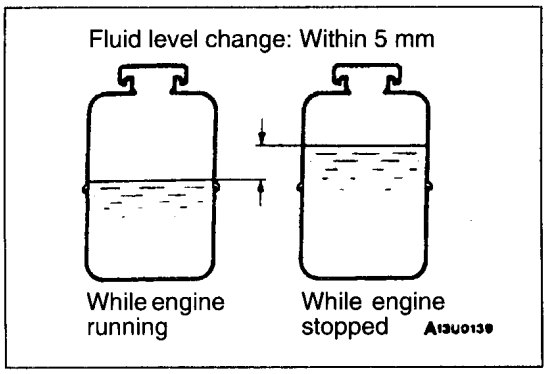
1. Jack up the front wheels and support them by using a rigid rack.
2. Manually turn the oil pump pulley a few times.
3. Turn the steering wheel all the way to the left and to the right five or six times.
4. On vehicles with a petrol engine, disconnect the high-tension cable. On vehicles with a diesel engine, remove the fuel cut valve connector attached to the injection pump.

Caution
Be careful not to position the high-tension cable near the carburettor or 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.**

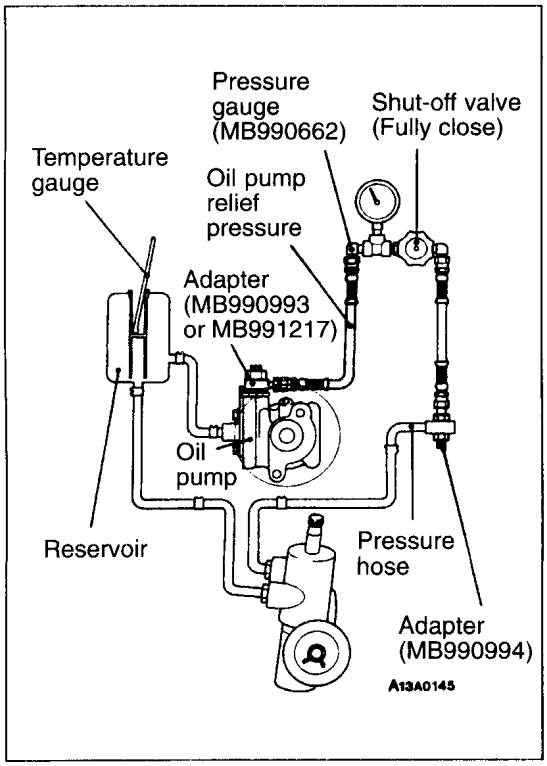
6. On vehicles with a petrol engine, connect the ignition cable. On vehicles with a diesel engine, connect the fuel cut valve connector attached to the injection pump. Start the engine (idling).
7. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
8. Confirm 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

120002176

CHECKING THE OIL PUMP RELIEF PRESSURE

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at 1,000±100 r/min.
4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range.

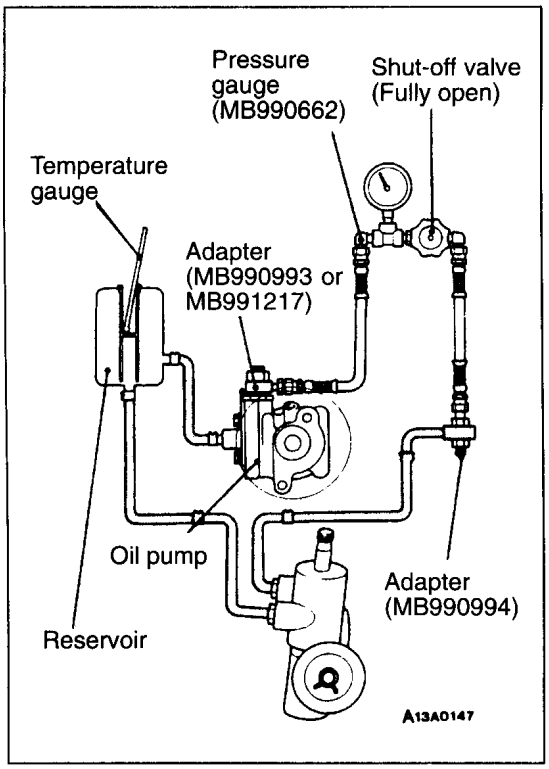
   Standard value: 9,300–10,000 kPa

   Caution
   Pressure gauge shut off valve must not remain closed for more than 10 seconds.

5. If it is not within the standard value, overhaul the oil pump.
6. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 18 Nm

7. Bleed the system.



CHECKING THE PRESSURE UNDER NO-LOAD CONDITIONS

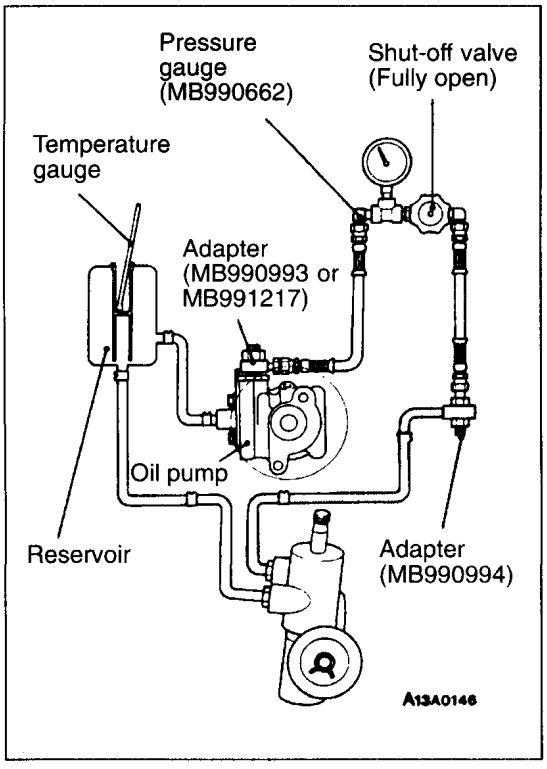
1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at 1,000±100 r/min.
4. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

   Standard value: 981 kPa or less

5. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
6. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 18 Nm

7. Bleed the system.



CHECKING THE STEERING GEAR RETENTION HYDRAULIC PRESSURE

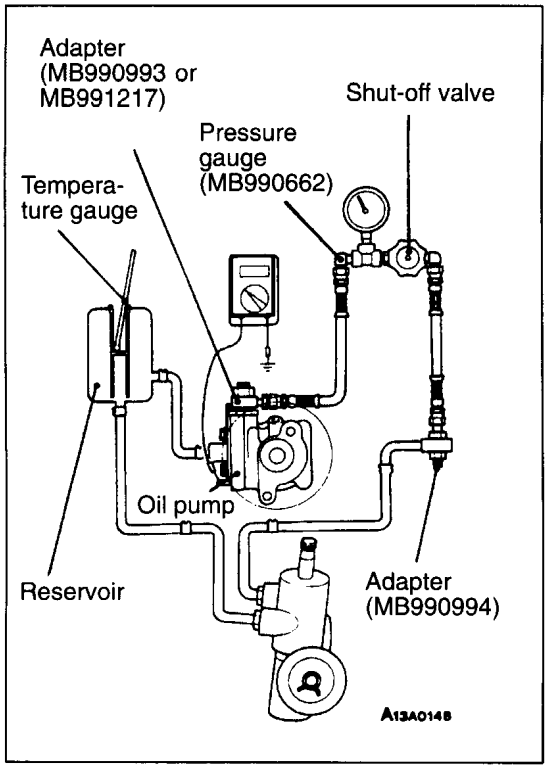
1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at 1,000±100 r/min.
4. Fully open the shut-off valve of the pressure gauge.
5. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is the standard value.

   Standard value: 9,300–10,000 kPa

6. When not within the standard value, overhaul the steering gear box.
   Remeasure fluid pressure.
7. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 18 Nm

8. Bleed the system.



POWER STEERING OIL PRESSURE SWITCH CHECK <Petrol>

120000036

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: 1,765–2,354 kPa

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: 981–2,354 kPa

7. Remove the special tools, and then tighten the pressure hose to the specified torque.

   Tightening torque: 18 Nm

8. Bleed the system.

STEERING WHEEL AND SHAFT

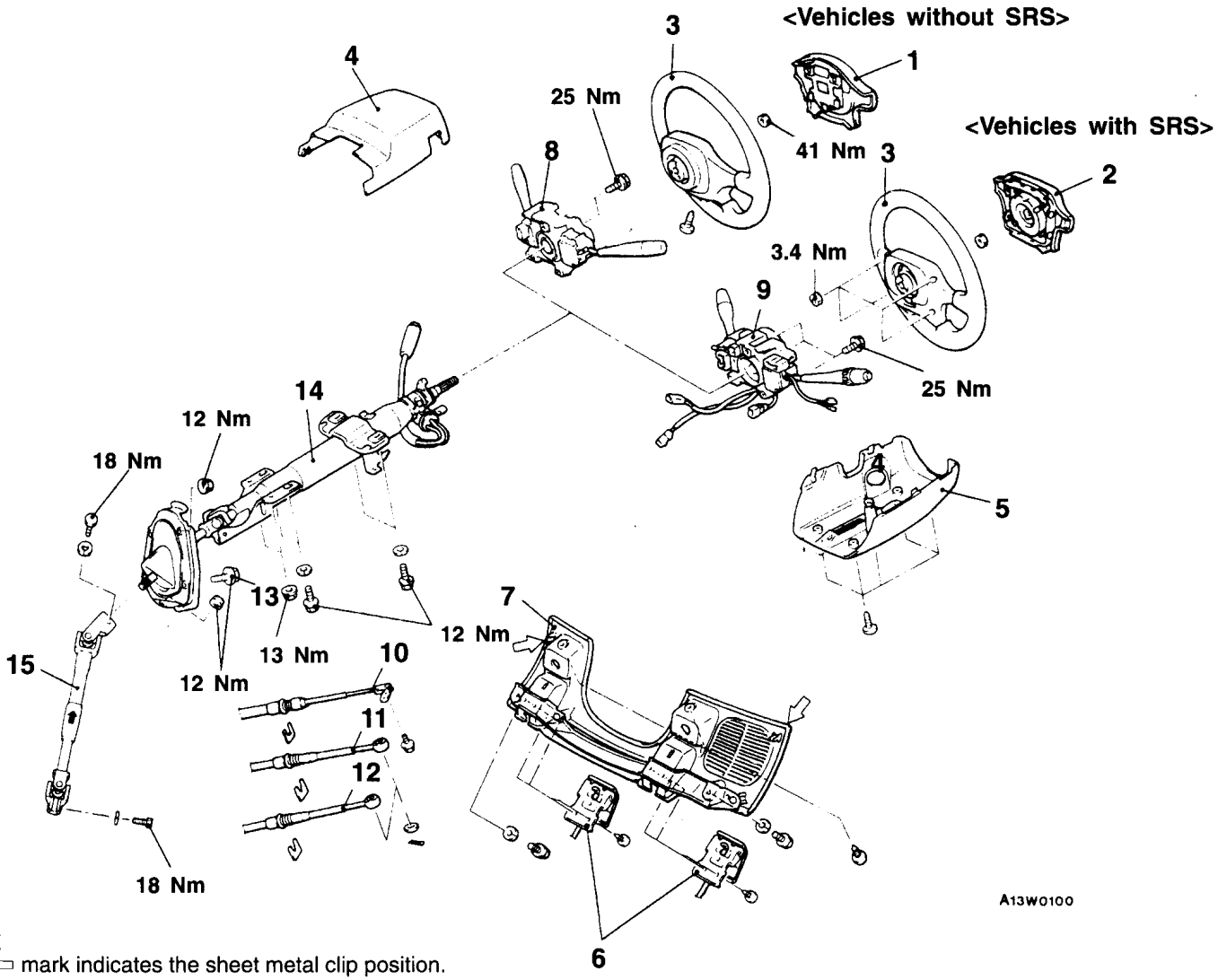
120002172

REMOVAL AND INSTALLATION

<L.H. drive vehicles>

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

Post-installation Operation
- Checking Steering Wheel Position with Wheels Straight Ahead



NOTE
The ⇦ mark indicates the sheet metal clip position.

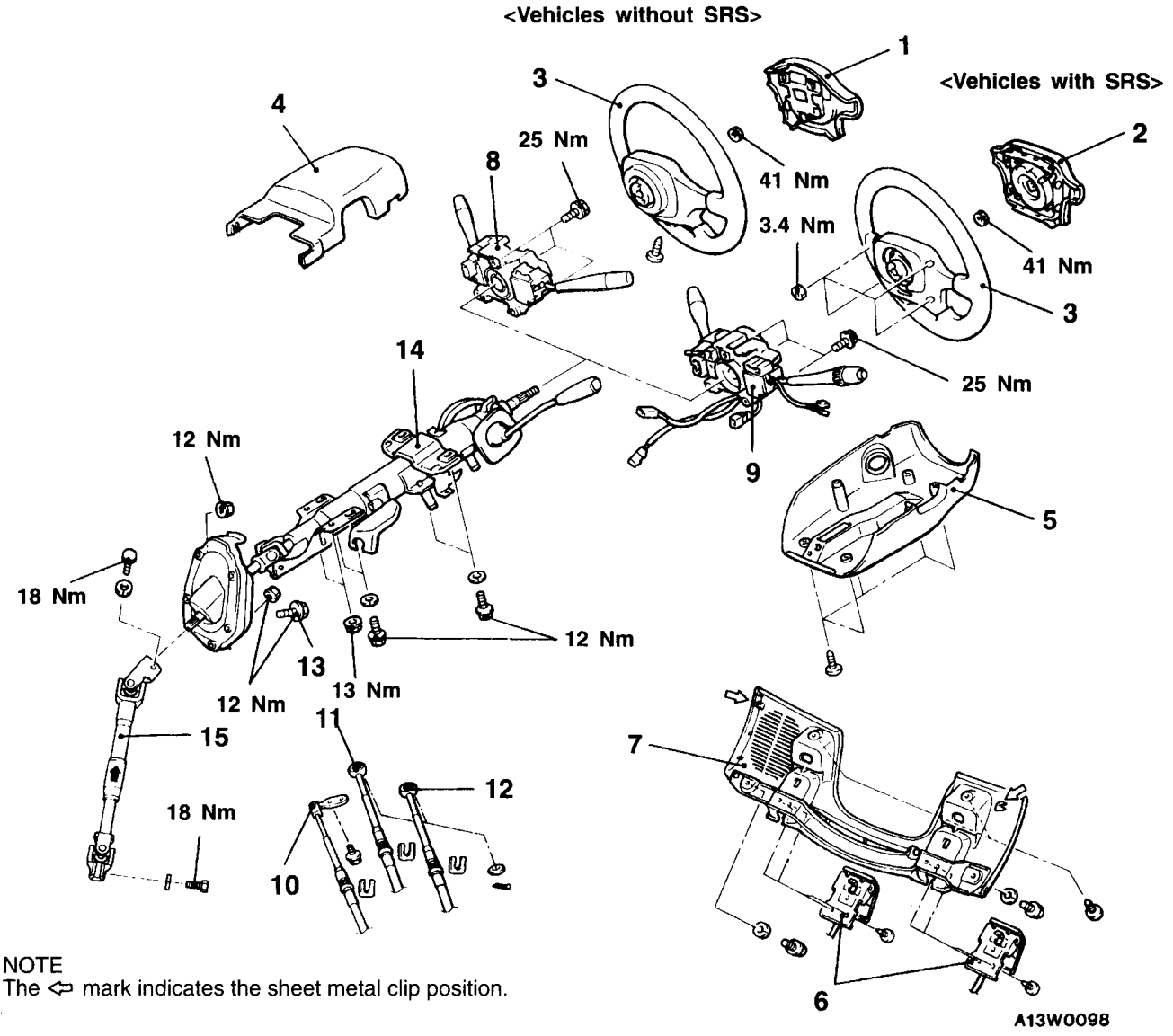
Removal steps

1. Horn pad <Vehicles without SRS>
2. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
◀A▶ ▶C◀ 3. Steering wheel
4. Upper column cover
5. Lower column cover
6. Hood lock release handle and fuel lid lock release handle
7. Instrument under cover
▶B◀ 8. Column switch
▶B◀ 9. Clock spring and column switch (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
10. Transmission control cable assembly <A/T> (Refer to GROUP 23 – Transmission Control.)
11. Shift cable assembly <M/T–Column shift> (Refer to GROUP 22 – Transmission Control.)
12. Select cable assembly <M/T–Column shift> (Refer to GROUP 22 – Transmission Control.)
13. Retainer attachment bolt
14. Steering column assembly
▶A◀ 15. Lower shaft assembly

<R.H. drive vehicles>

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

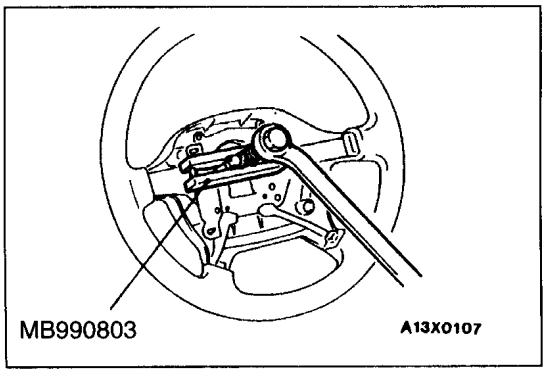
Post-installation Operation
- Checking Steering Wheel Position with Wheels Straight Ahead



NOTE
The ⇦ mark indicates the sheet metal clip position.

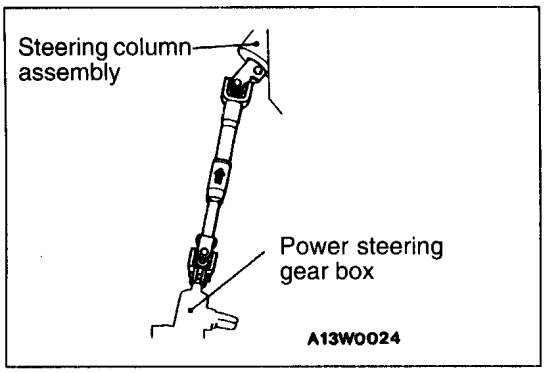
Removal steps

1. Horn pad <Vehicles without SRS>
2. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
◀A▶ ▶C◀ 3. Steering wheel
4. Upper column cover
5. Lower column cover
6. Hood lock release handle and fuel lid lock release handle
7. Instrument under cover
▶B◀ 8. Column switch
▶B◀ 9. Clock spring and column switch (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
10. Transmission control cable assembly <A/T> (Refer to GROUP 23 – Transmission Control.)
11. Shift cable assembly <M/T–Column shift> (Refer to GROUP 22 – Transmission Control.)
12. Select cable assembly <M/T–Column shift> (Refer to GROUP 22 – Transmission Control.)
13. Retainer attachment bolt
14. Steering column assembly
▶A◀ 15. Lower shaft assembly



REMOVAL SERVICE POINT

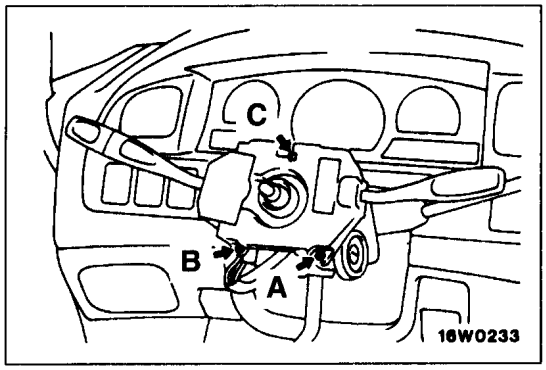
◀A▶ STEERING WHEEL REMOVAL



INSTALLATION SERVICE POINTS

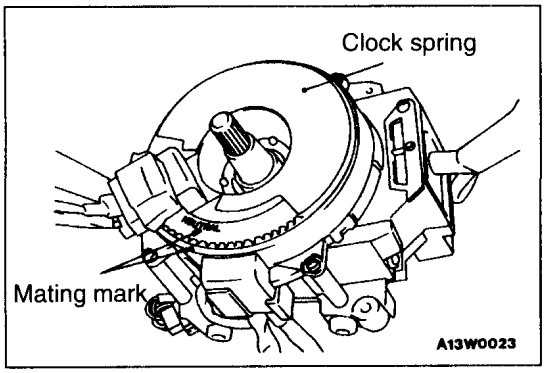
▶A◀ LOWER SHAFT ASSEMBLY INSTALLATION

Install the shaft so that its arrow faces upwards.



▶B◀ CLOCK SPRING AND COLUMN SWITCH/COLUMN SWITCH INSTALLATION

Tighten the screws in an alphabetical order.



▶C◀ STEERING WHEEL INSTALLATION

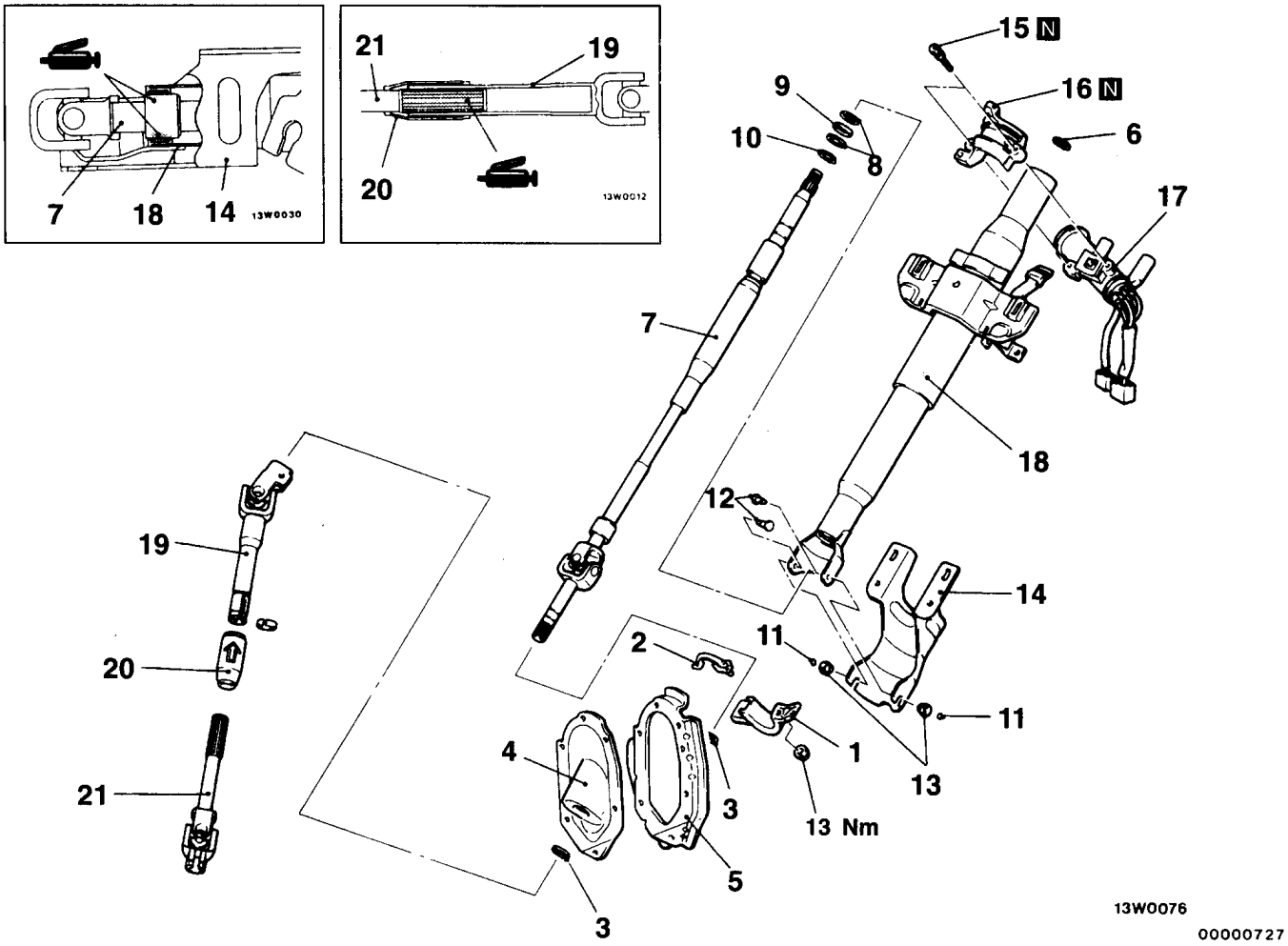
Line up the "NEUTRAL" mark of the clock spring with the mating mark before installing the steering wheel.

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.

STEERING COLUMN ASSEMBLY, LOWER SHAFT ASSEMBLY DISASSEMBLY AND REASSEMBLY

120000038

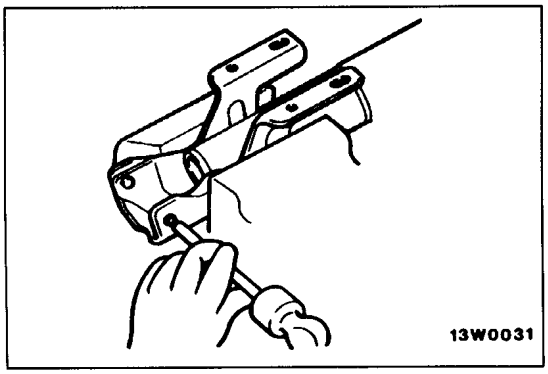


Steering column assembly disassembly steps

- ▶B◀ 1. Steering shaft bracket A
- ▶B◀ 2. Steering shaft bracket B
- 3. Snap ring
- 4. Joint cover
- 5. Retainer
- 6. Snap ring
- 7. Steering shaft assembly
- 8. Bearing spacer stopper
- 9. Bearing spacer
- 10. Snap ring
- 11. Snap ring
- ◀A▶ 12. Clevis pin
- 13. Bushing
- 14. Tilt lower bracket
- ▶A◀ 15. Special bolt
- ◀B▶ ▶A◀ 16. Steering lock bracket
- ◀B▶ ▶A◀ 17. Steering lock cylinder
- 18. Steering column

Lower shaft assembly disassembly steps

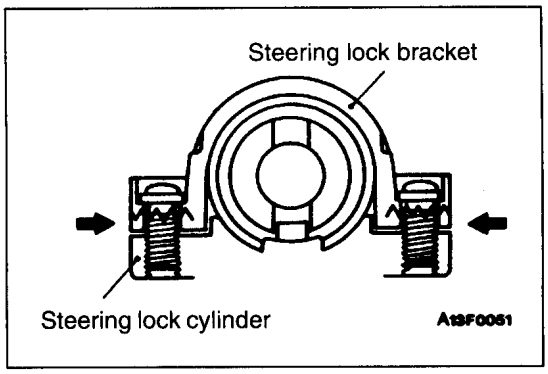
- 19. Pipe assembly
- 20. Dust cover
- 21. Shaft assembly



DISASSEMBLY SERVICE POINTS

◀A▶ CLEVIS PIN REMOVAL

Use a punch to remove the clevis pin.



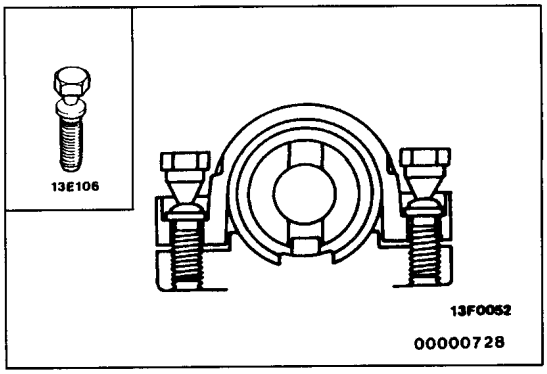
◀B▶ STEERING LOCK BRACKET/STEERING LOCK CYLINDER REMOVAL

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 POINTS

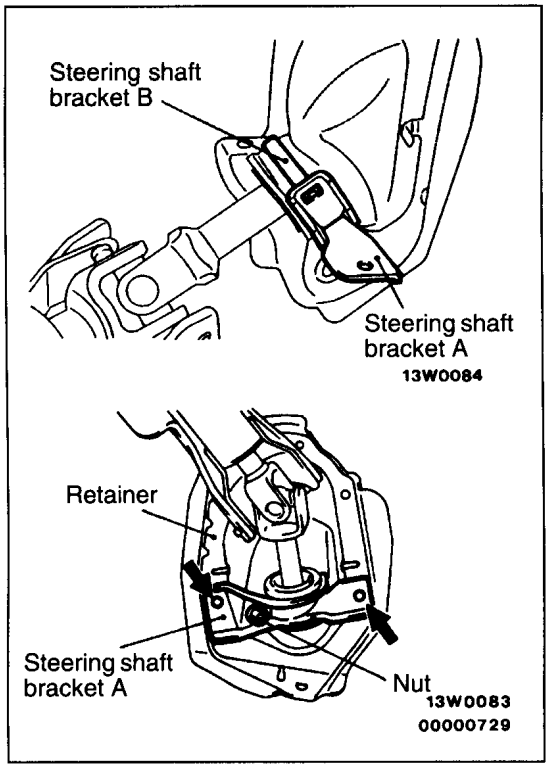
▶A◀ STEERING LOCK CYLINDER/STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION

(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.



▶B◀ STEERING SHAFT BRACKET B /STEERING SHAFT BRACKET A INSTALLATION

(1) Hook steering shaft bracket B into the hole in steering shaft bracket A.

(2) Position steering shaft bracket A so that the holes indicated by the arrows are aligned with the holes in the retainer, and then tighten the nut to the specified torque.

Tightening torque: 13 Nm

POWER STEERING GEAR BOX

120000039

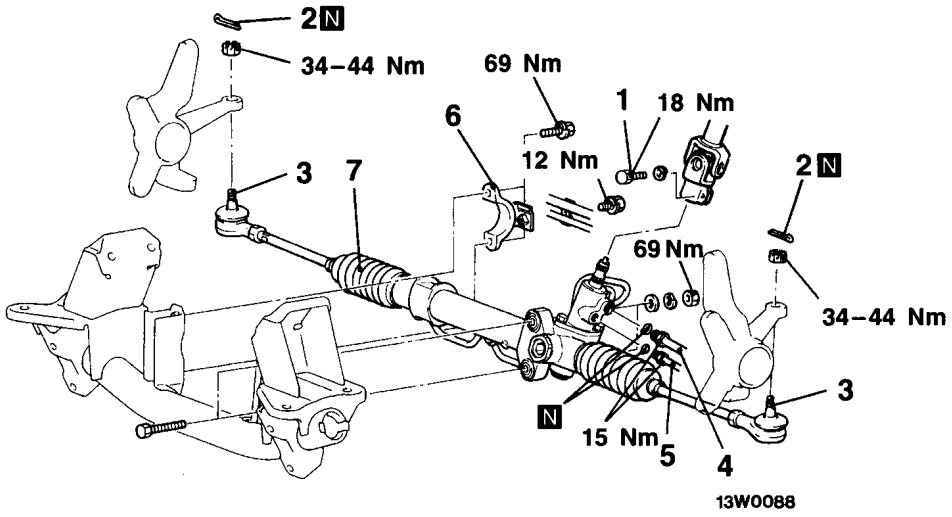
REMOVAL AND INSTALLATION

CAUTION: SRS
For vehicles with SRS, before removal of steering gear box, refer to GROUP 52B, center front wheels and remove ignition key. Failure to do so may damage SRS clock spring and render SRS system inoperative, risking serious driver injury.

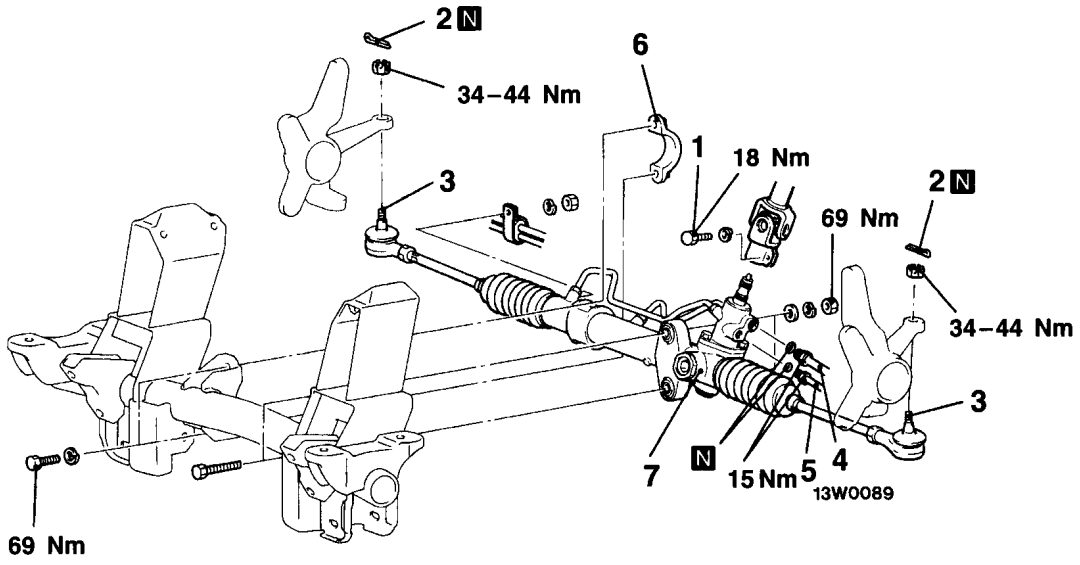
Pre-removal Operation
(1) Power Steering Fluid Draining (Refer to P. 37A-10.)
(2) Air Cleaner Assembly Removal
(3) Under Cover Removal (Refer to GROUP 42 – Under Cover.)

Post-installation Operation
(1) Under Cover Installation (Refer to GROUP 42 – Under Cover.)
(2) Air Cleaner Assembly Installation
(3) Power Steering Fluid Supplying (Refer to P. 37A-10.)
(4) Power Steering Fluid Line Bleeding (Refer to P. 37A-11.)
(5) Steering Wheel Position with Wheels Straight Ahead Checking
(6) Front Wheel Alignment Adjustment (Refer to GROUP 33A – Service Adjustment Procedures.)

<2WD>



<4WD>



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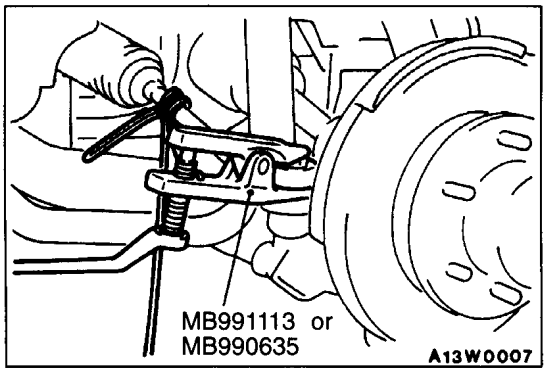
Removal steps

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



REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

Caution

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

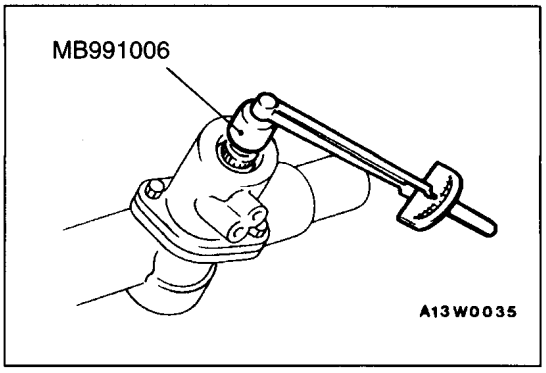
◀B▶ GEAR BOX ASSEMBLY REMOVAL

(1) Move the rack completely to the right and then remove the gear box from the crossmember.
(2) While tilting the gear box downward, remove it to the left.

Caution
Be careful not to damage the bellows and the tie-rod end dust cover when removing the gear box assembly.

INSPECTION

- Check the rubber parts for cracks and breakage.

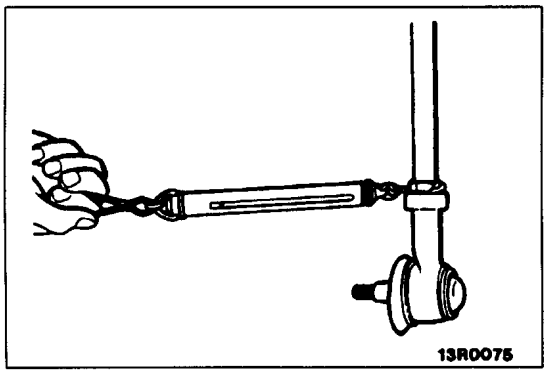


GEAR BOX TOTAL PINION TORQUE

Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value: 0.6–1.32
[Change in torque: 0.4 Nm]

NOTE
When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.
If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion starting torque again.
If the 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: 6–21 N [1.5–5 Nm]

(3) If the measured value exceeds the standard value, replace tie rod assembly.
(4) Even if the measured value is below the standard value, the tie rod which swings smoothly without excessive play must be used.

DISASSEMBLY AND REASSEMBLY

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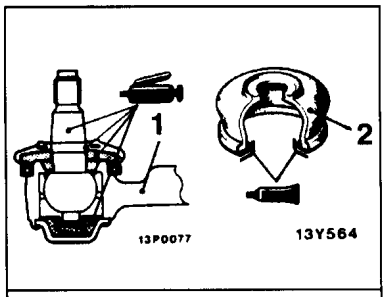
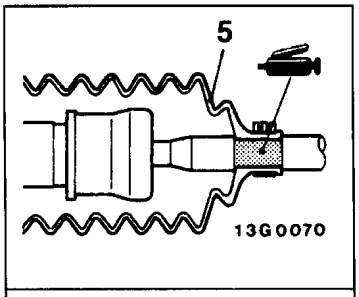
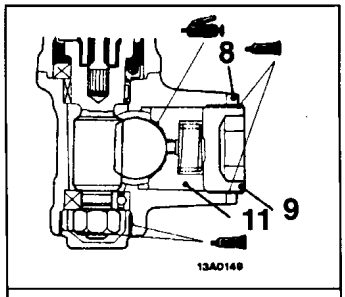


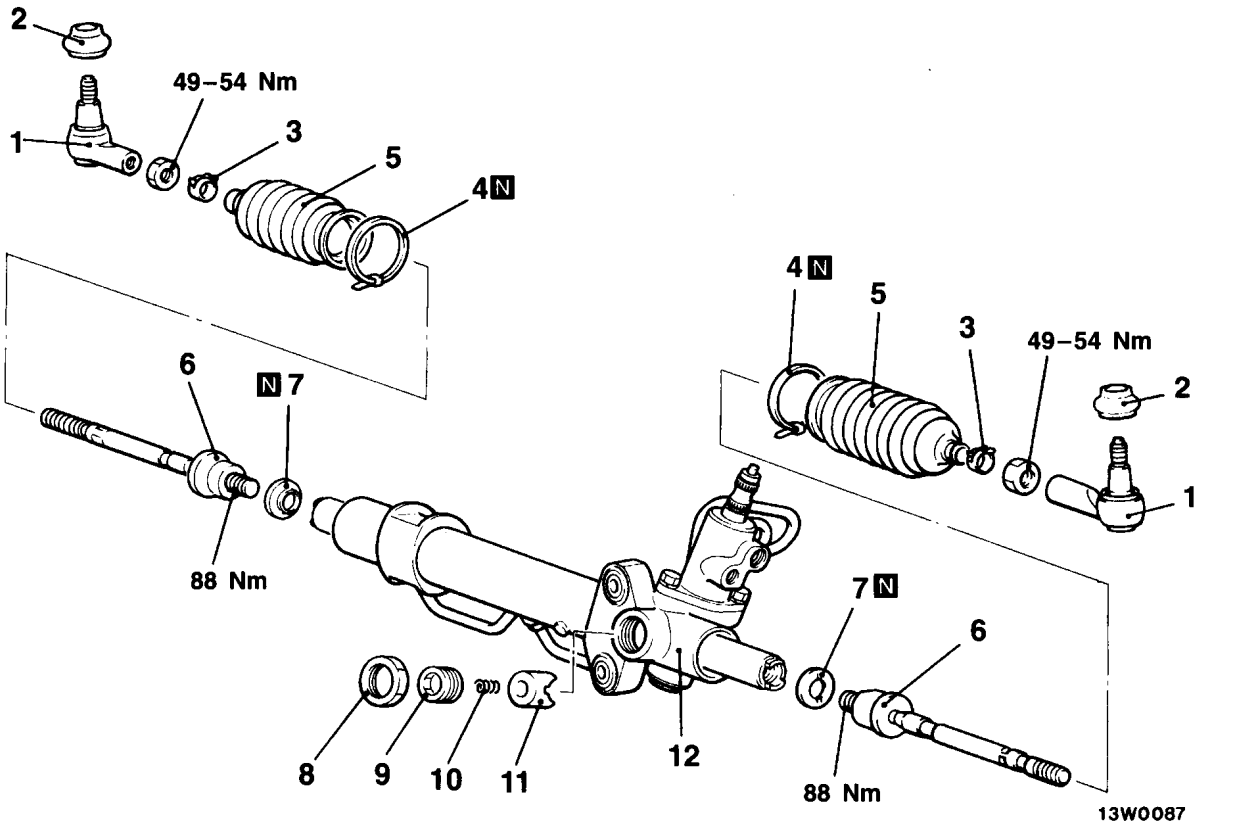
Sealant: 3M ATD Part No. 8661 or equivalent



Grease: Silicone grease



Sealant: 3M ATD Part No. 8661 or equivalent



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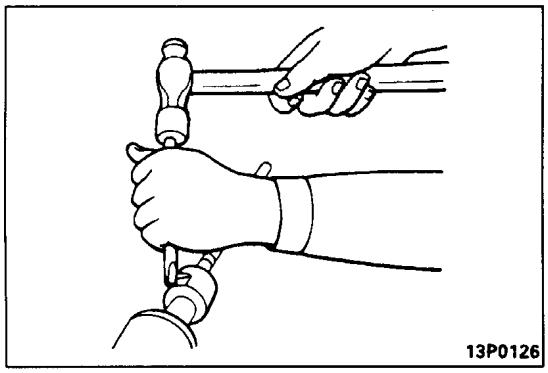
Disassembly steps

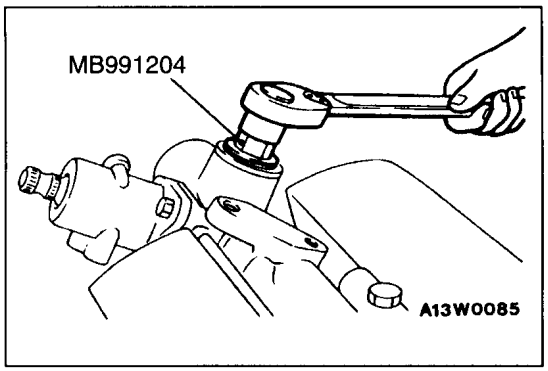
- ▶D◀ 1. Tie rod end
- ▶C◀ 2. Dust cover
- 3. Bellows clip
- 4. Bellows band
- 5. Bellows
- ◀A▶ ▶B◀ 6. Tie rod
- ◀A▶ ▶B◀ 7. Tab washer
- 8. Locking nut
- ▶A◀ • Total pinion torque adjustment
- ◀B▶ 9. Rack support cover
- 10. Rack support spring
- 11. Rack support
- 12. Gear box



DISASSEMBLY SERVICE POINTS

◀A▶ TIE ROD/TAB WASHER REMOVAL

Unstake the tab washer which fixes the tie rod and rack with a chisel.



◀B▶ RACK SUPPORT COVER REMOVAL

Using the special tool, remove the rack support cover from the gear box.

INSPECTION

RACK

- Check the rack tooth surfaces for damage or wear.
- Check the oil seal contact surfaces for uneven wear.
- Check the rack for bends.

PINION AND VALVE ASSEMBLY

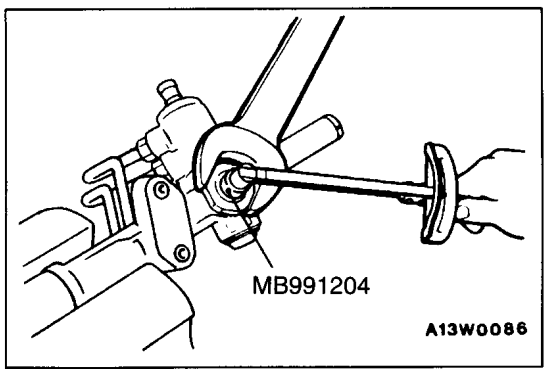
- Check the pinion gear tooth surfaces for damage or wear.
- Check for worn or defective seal ring.

BEARING

- Check for roughness or abnormal noise during bearing operation.
- Check the bearing for play.
- Check the needle roller bearings for roller slip-off.

OTHERS

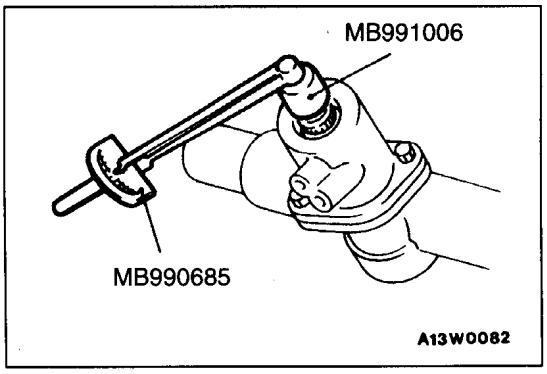
- Check the cylinder inner surface of the rack housing for damage.
- Check the boots for damage, cracking or deterioration.
- Check the rack support for uneven wear or dents.
- Check the rack bushing for uneven wear or damage.



REASSEMBLY SERVICE POINTS

▶A◀ TOTAL PINION TORQUE ADJUSTMENT

(1) Position rack at its centre. Tighten rack support cover to 15 Nm.
(2) In neutral position, rotate pinion shaft clockwise one turn/4–6 seconds with special tool. Return rack support cover 30°–60° and adjust torque to the standard value.



(3) Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value: 0.6–1.32 Nm

[Change in torque: 0.4 Nm]

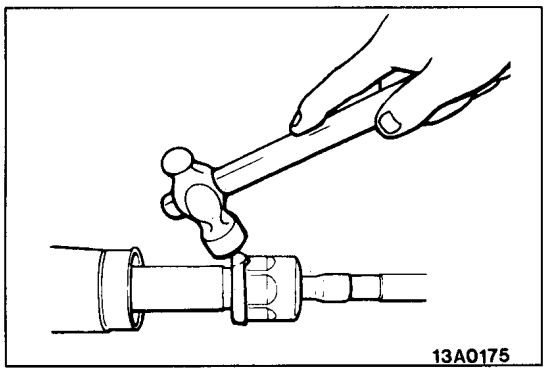
Caution

1. **When adjusting, set the standard value at its highest value.**
2. **Assure no ratcheting or catching when operating rack towards the shaft direction.**

NOTE

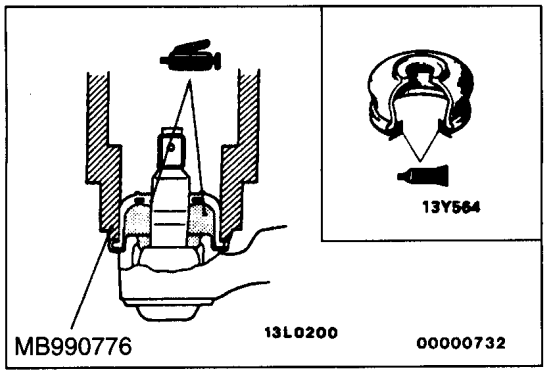
When it cannot be adjusted within the specified return angle, check rack support cover components or replace.

(4) After adjusting, lock rack support cover with lock nut.



▶B◀ TAB WASHER/TIE ROD INSTALLATION

After installing tie-rod to rack, fold tab washer end (2 locations) to tie rod notch.

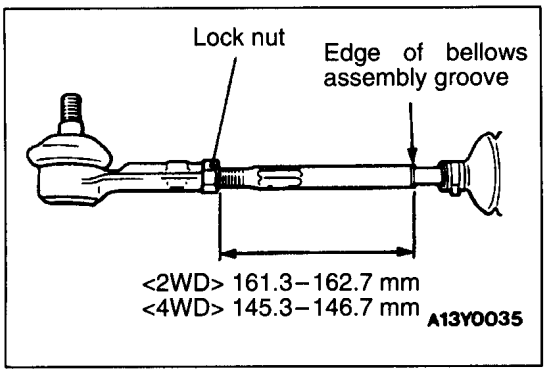


▶C◀ DUST COVER INSTALLATION

(1) Pack dust cover interior with multipurpose grease.
(2) Apply specified sealant to dust cover lip.

Specified fluid: 3M ATD Part No. 8661 or equivalent

(3) Using the special tool, install the dust cover to the tie rod end ball joint.



▶D◀ TIE ROD END INSTALLATION

Screw in tie-rod end to have its right and left length as illustrated. Lock with lock nut.

POWER STEERING OIL PUMP

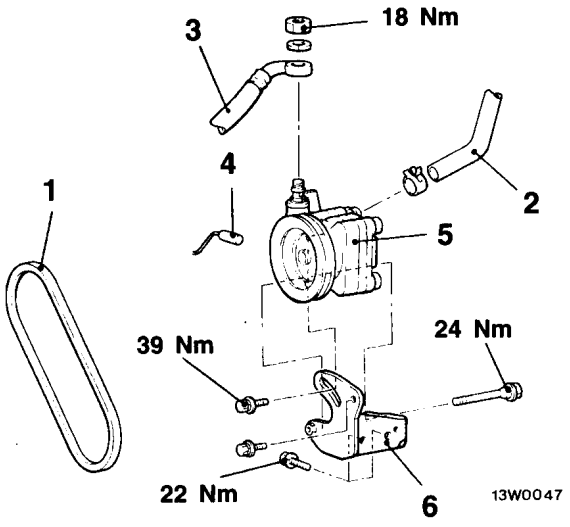
120002173

REMOVAL AND INSTALLATION

Pre-removal Operation
- Power Steering Fluid Draining (Refer to P. 37A-10.)

Post-installation Operation
- Power Steering Fluid Supplying (Refer to P. 37A-10.)
- Drive-belt Tension Adjusting (Refer to P. 37A-9.)
- Power Steering Fluid Line Bleeding (Refer to P. 37A-11.)
- Oil Pump Pressure Check (Refer to P. 37A-12.)

<4G6>



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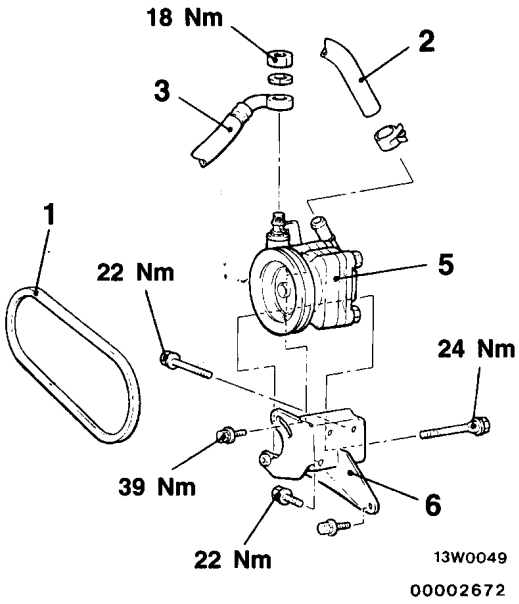
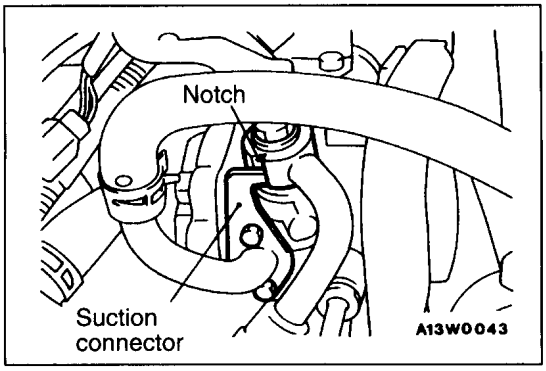


Removal steps

1. Drive-belt
▶B◀ 2. Suction hose
▶A◀ 3. Pressure hose
4. Pressure switch connector
5. Oil pump
6. Oil pump bracket

INSPECTION

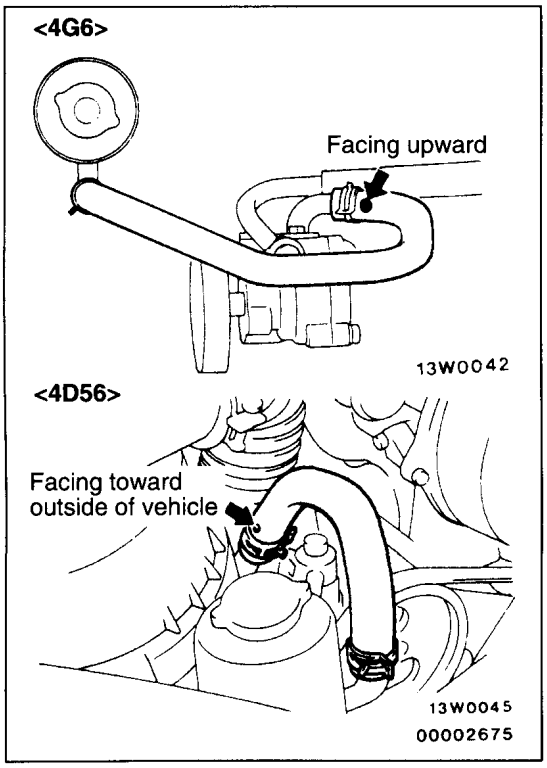
Check the drive-belt for cracks.
Check the pulley assembly for uneven rotation.



INSTALLATION SERVICE POINTS

▶A◀ PRESSURE HOSE INSTALLATION

Connect the pressure hose so that its notch part contacts the suction connector.



▶B◀ SUCTION HOSE INSTALLATION

Install the hose so that the marking is positioned as shown in the illustration.

DISASSEMBLY AND REASSEMBLY

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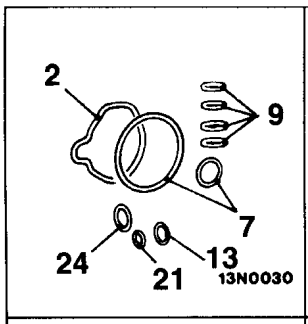
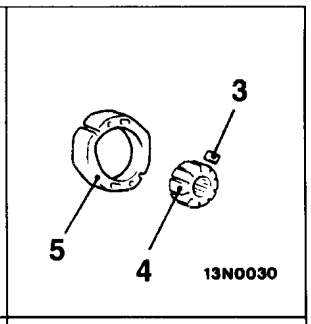
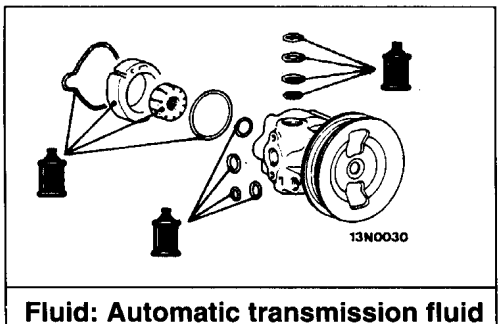


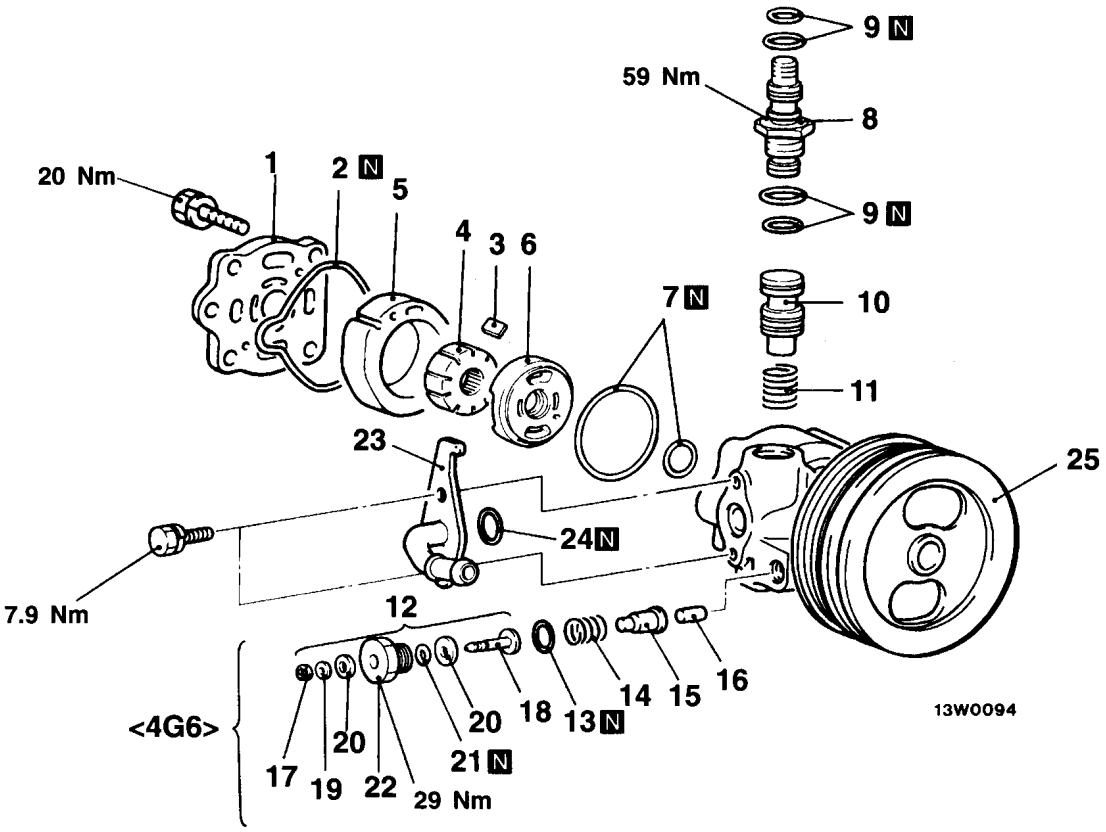
Oil pump seal kit



Oil pump cartridge kit



Fluid: Automatic transmission fluid DEXRON or DEXRON II



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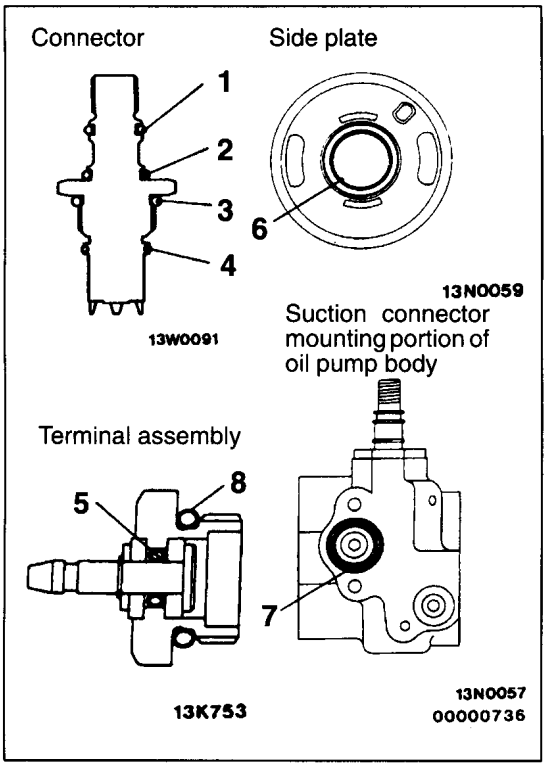
Disassembly steps

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.

INSPECTION

- Check the flow control valve for clogging.
- Check the pulley assembly for wear or damage.
- Check the groove of rotor and vane for "Stepped" wear.
- Check the contact surface of cam ring and vanes for "stepped" wear.
- Check the vanes for damage.

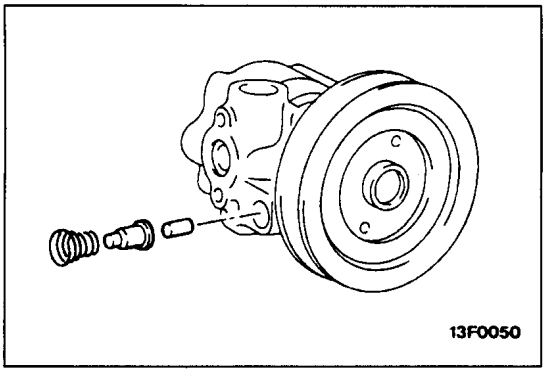


REASSEMBLY SERVICE POINTS

▶A◀ O-RINGS INSTALLATION

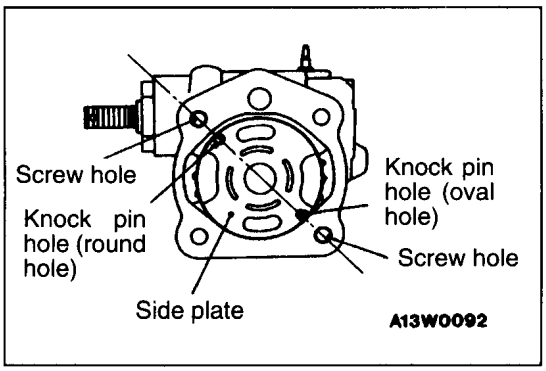
Apply specified fluid on O-rings to install.

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



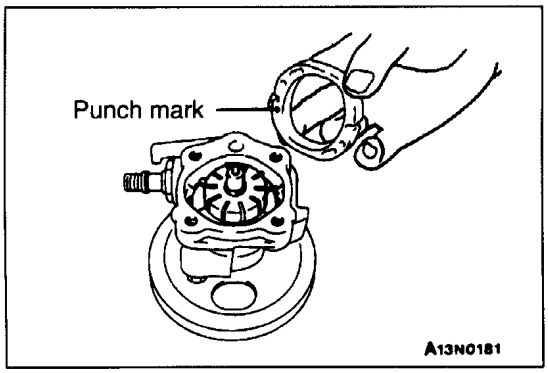
▶B◀ SPRING INSTALLATION

Fit the spring to the oil pump body with the larger diameter end at the terminal assembly side.



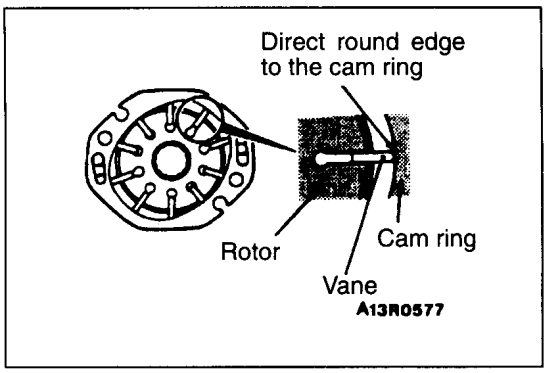
▶C◀ SIDE PLATE INSTALLATION

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.

POWER STEERING HOSES

120002175

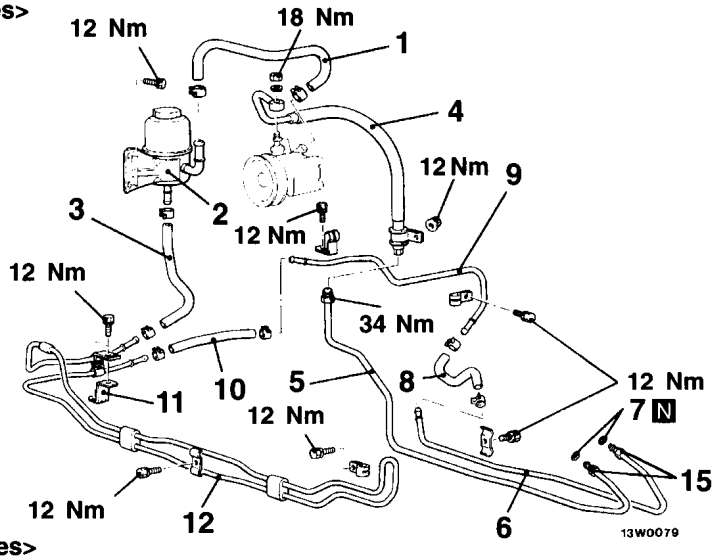
REMOVAL AND INSTALLATION

Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-10.)
- Front Bumper Removal (Refer to GROUP 51 – Front Bumper.)

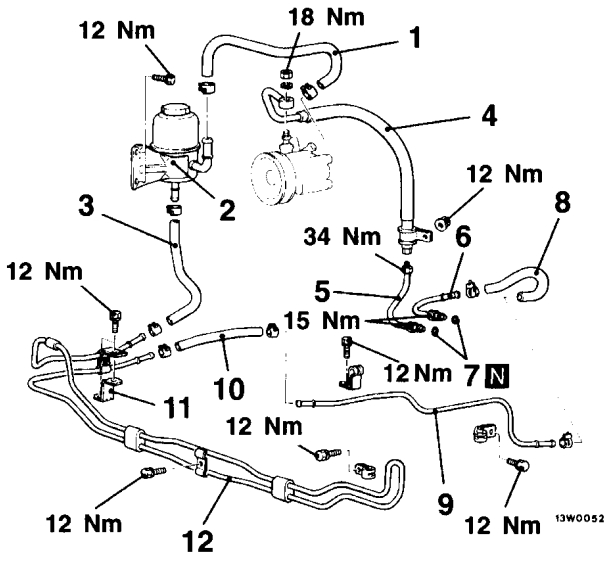
Post-installation Operation
- Front Bumper Installation (Refer to GROUP 51 – Front Bumper.)
- Power Steering Fluid Supplying (Refer to P.37A-10.)
- Power Steering Fluid Line Bleeding (Refer to P. 37A-11.)

4G6 – 2WD

<L.H. drive vehicles>



<R.H. drive vehicles>

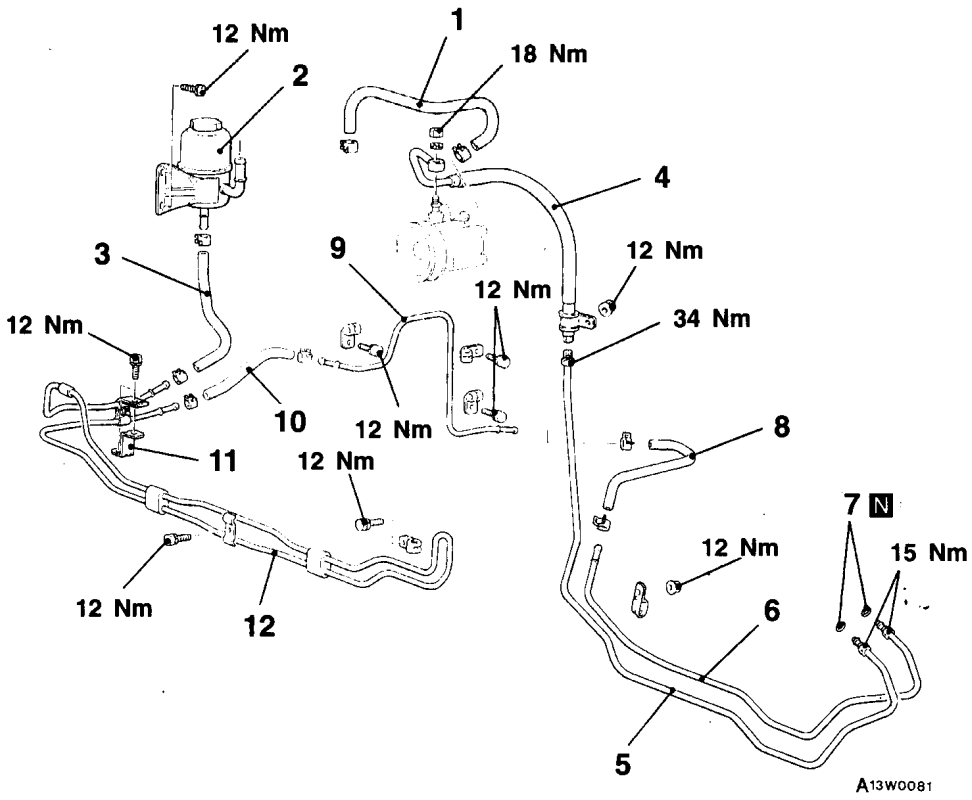


00000737

Removal steps

▶E◀ 1. Suction hose
2. Oil reservoir
▶D◀ 3. Return hose
▶C◀ 4. Pressure hose
5. Pressure tube
6. Return tube
7. O-ring
▶B◀ 8. Return hose
9. Return tube
10. Return hose
11. Cooler tube bracket
▶A◀ 12. Cooler tube

4G6 – 4WD

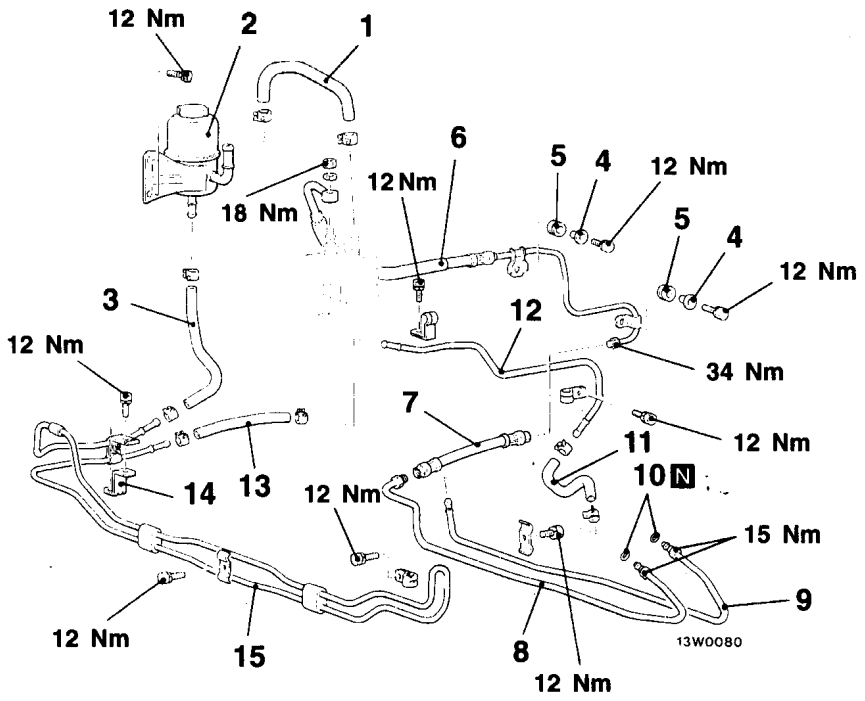


Removal steps

- ▶E◀ 1. Suction hose
- 2. Oil reservoir
- ▶D◀ 3. Return hose
- ▶C◀ 4. Pressure hose
- 5. Pressure tube
- 6. Return tube
- 7. O-ring
- ▶B◀ 8. Return hose
- 9. Return tube
- 10. Return hose
- 11. Cooler tube bracket
- ▶A◀ 12. Cooler tube

4D56 – 2WD

<L.H. drive vehicles>



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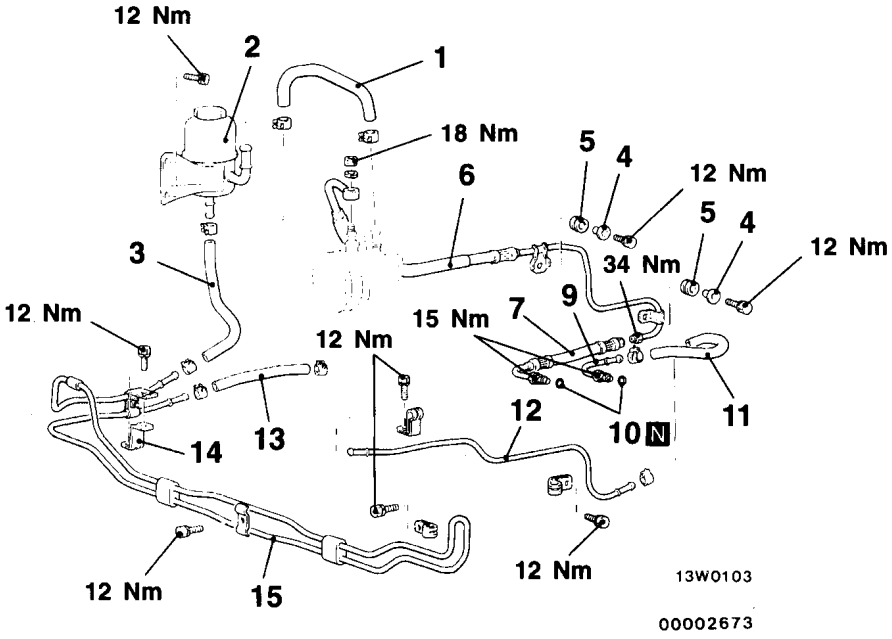
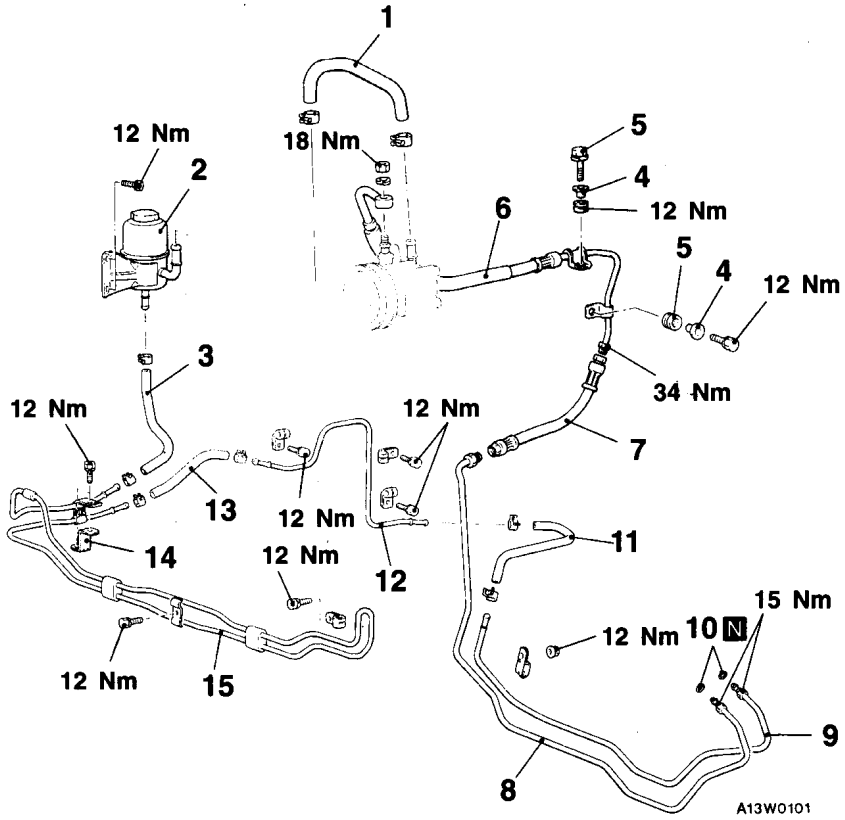


Removal steps

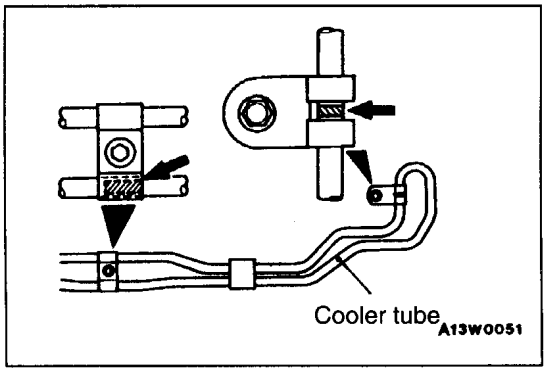
- ▶E◀ 1. Suction hose
- 2. Oil reservoir
- ▶D◀ 3. Return hose
- 4. Distance piece
- 5. Bushing
- ▶C◀ 6. Pressure hose
- 7. Pressure hose
- 8. Pressure tube
- 9. Return tube
- 10. O-ring
- ▶B◀ 11. Return hose
- 12. Return tube
- 13. Return hose
- 14. Cooler tube bracket
- ▶A◀ 15. Cooler tube

4G56 – 4WD



Removal steps

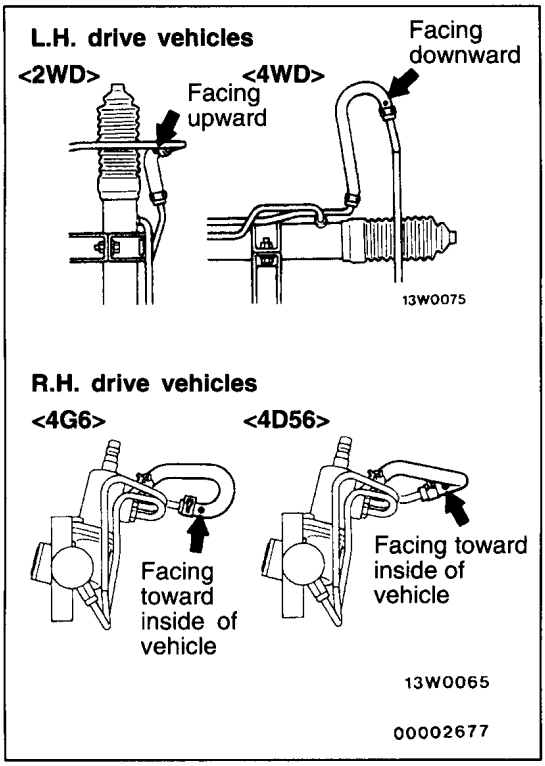
- ▶E◀ 1. Suction hose
- 2. Oil reservoir
- ▶D◀ 3. Return hose
- 4. Distance piece
- 5. Bushing
- ▶C◀ 6. Pressure hose
- 7. Pressure hose
- 8. Pressure tube
- 9. Return tube
- 10. O-ring
- ▶B◀ 11. Return hose
- 12. Return tube
- 13. Return hose
- 14. Cooler tube bracket
- ▶A◀ 15. Cooler tube



INSTALLATION SERVICE POINTS

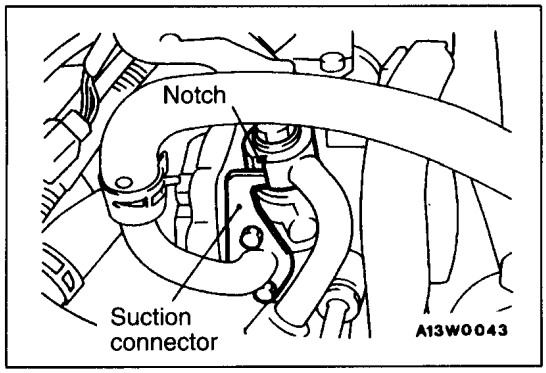
▶A◀ COOLER TUBE INSTALLATION

Connect the cooler tube so that the marking is positioned as shown in the illustration.



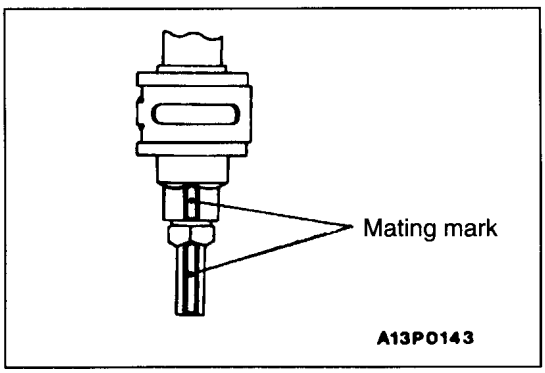
▶B◀ RETURN HOSE INSTALLATION

Connect the return hose so that the marking is positioned as shown in the illustration.

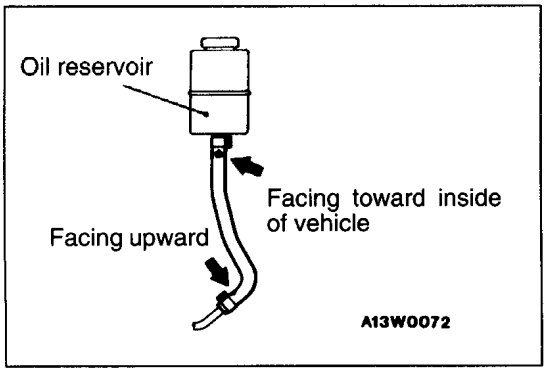


▶C◀ PRESSURE HOSE INSTALLATION

(1) Connect the pressure hose so that its notch part contacts the suction connector.

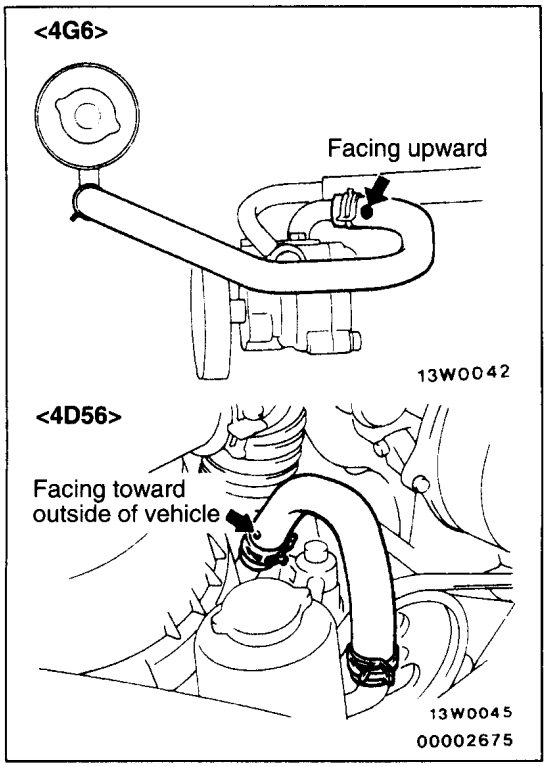


(2) Align the marks on the pressure hose and pressure tube, and install the pressure hose. <4G6>



▶D◀ RETURN HOSE INSTALLATION

Connect the return hose so that the marking is positioned as shown in the illustration.



▶E◀ SUCTION HOSE INSTALLATION

Connect the return hose so that the marking is positioned as shown in the illustration.

BODY

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120002523

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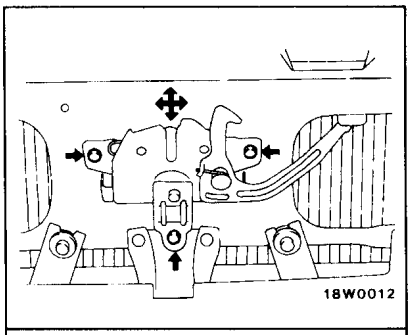
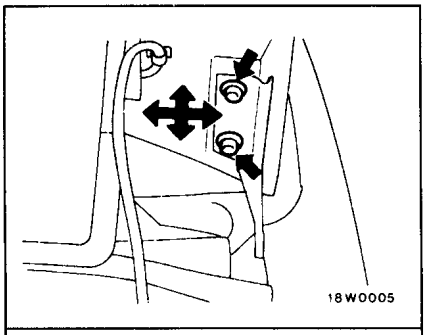
HOOD

120002228

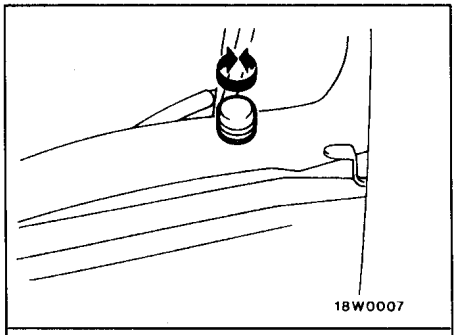
REMOVAL AND INSTALLATION



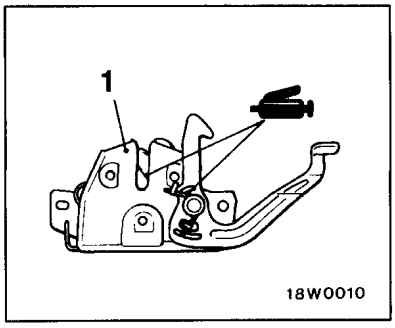
Hood latch and hood striker linkage adjustment

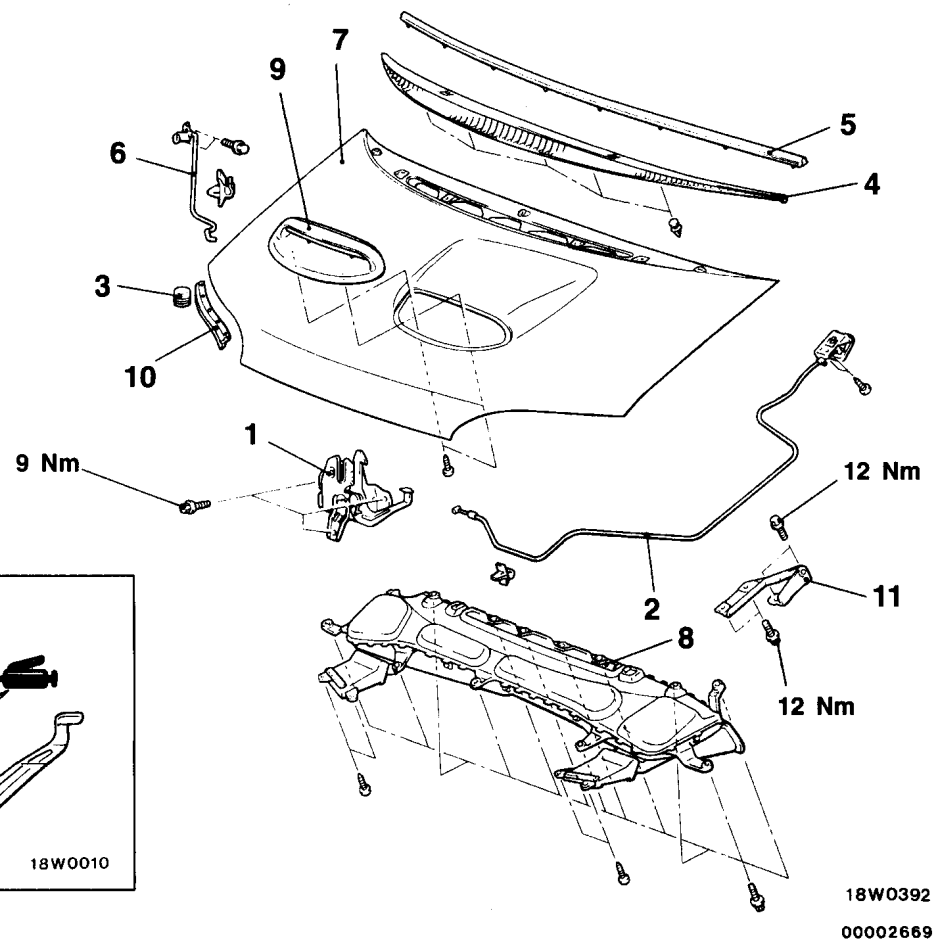


Hood clearance adjustment



Hood height adjustment





1. Hood latch
2. Hood lock release cable
3. Hood bumper
4. Hood end garnish
5. Hood weatherstrip
6. Hood support rod

Hood and Hood hinge removal steps

- Washer hose (Refer to GROUP 51 – Windshield wiper and Washer.)

7. Hood
8. Air intake duct assembly
9. Hood air intake garnish <Vehicles with turbocharger and inter-cooler>
10. Hood front weatherstrip
11. Hood hinge

FENDER

120000431

SEALANT

Item	Specified sealant	Remark
Splash shield	3M ATD Part No. 8625 or equivalent	Ribbon sealer

SPECIAL TOOL

120000432

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of delta window glass garnish

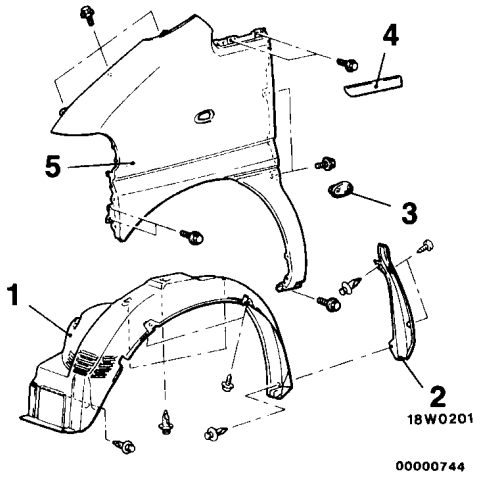
FENDER

120000433

REMOVAL AND INSTALLATION

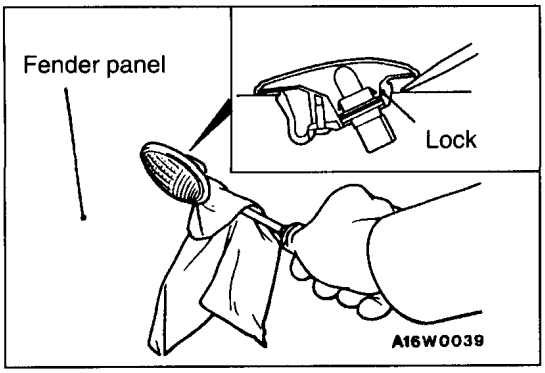
Pre-removal and Post-installation Operation
- Front Turn-Signal Lamp (Refer to GROUP 54 – Front Turn-signal Lamp.)
- Radiator Grille (Refer to GROUP 51 – Grilles, Garnishes and Mouldings.)
- Front Bumper (Refer to GROUP 51 – Front Bumper.)

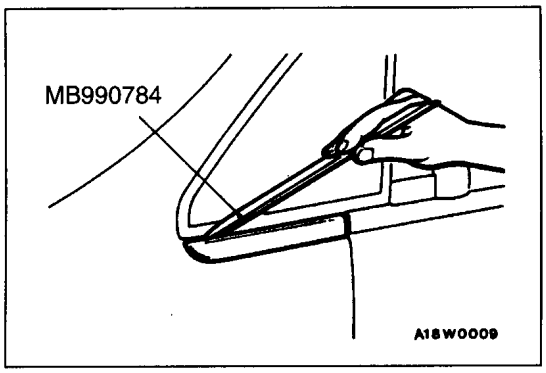
Sealant: 3M ATD Part No. 8625 or equivalent



Removal steps
1. Splash shield
2. Front pillar cover
3. Side turn-signal lamp
4. Delta window glass garnish
5. Fender

◀A▶
◀B▶





REMOVAL SERVICE POINTS

◀A▶ SIDE TURN SIGNAL LAMP REMOVAL

Use a flat-tipped (–) screwdriver or similar tool to unhook the lock from the fender panel, and then remove the side turn signal lamp.

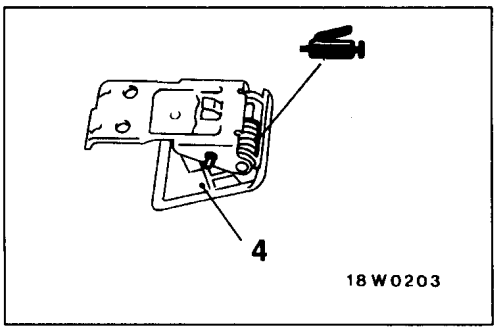
◀B▶ DELTA WINDOW GLASS GARNISH REMOVAL

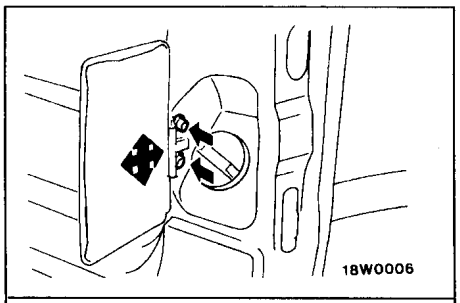
Use the special tool to lever out the garnish.

FUEL FILLER DOOR

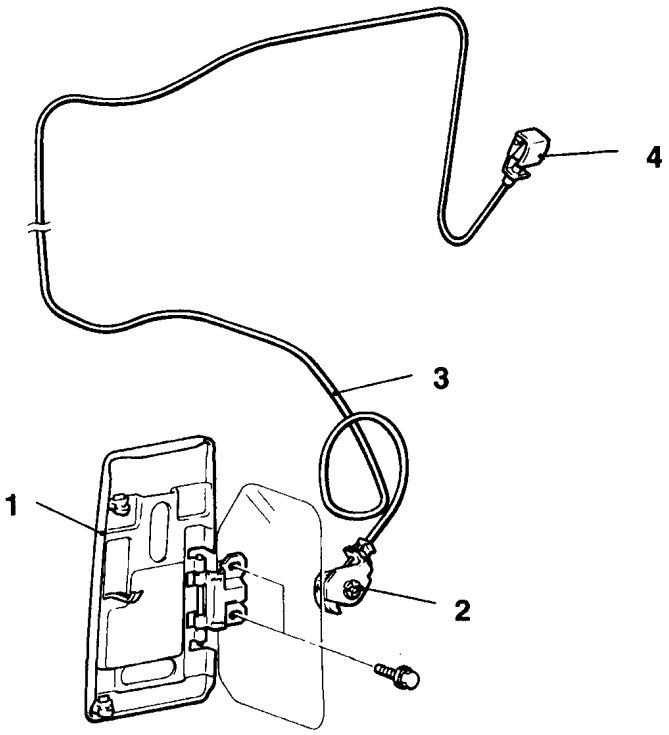
120000434

REMOVAL AND INSTALLATION





Fuel filler door height and clearance adjustment



18W0344

00000745

Removal steps

1. Fuel filler door assembly
2. Fuel filler door lock hook assembly
3. Fuel lid release cable
4. Fuel lid lock release handle

WINDOW GLASS

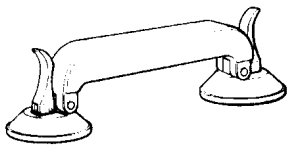
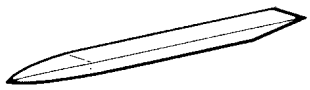
120000435

ADHESIVES

Items	Specified adhesives
Windshield	3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealants or equivalent
Delta window glass	
Tailgate window glass	
Roof window glass	
Windshield molding	Both-sided tape (6 mm wide and 0.125 mm thick)
Roof window molding	

SPECIAL TOOLS

120000436

Tool	Number	Name	Use
	MB990480	Glass holder	• Removal and installation of windshield • Removal and installation of quarter window glass • Removal and installation of tailgate window glass
	MB990784	Ornament remover	• Removal of delta window glass garnish • Removal of opening trim

WINDOW REPAIR

120000437

The following glass sections are installed by means of a liquid urethane adhesive method.

- Windshield
- Delta window glass
- Tailgate window glass
- Roof 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
Dam	Available as service part
Anti-rust solvent (or Tectyl 506T....Valvoline Oil Company)	For rust prevention
Isopropyl alcohol	For grease removal from bonded surface
Piano wire	Dia.×length: (0.6 mm×1m For cutting adhesive)
Adhesive gun	For pressing-out adhesive

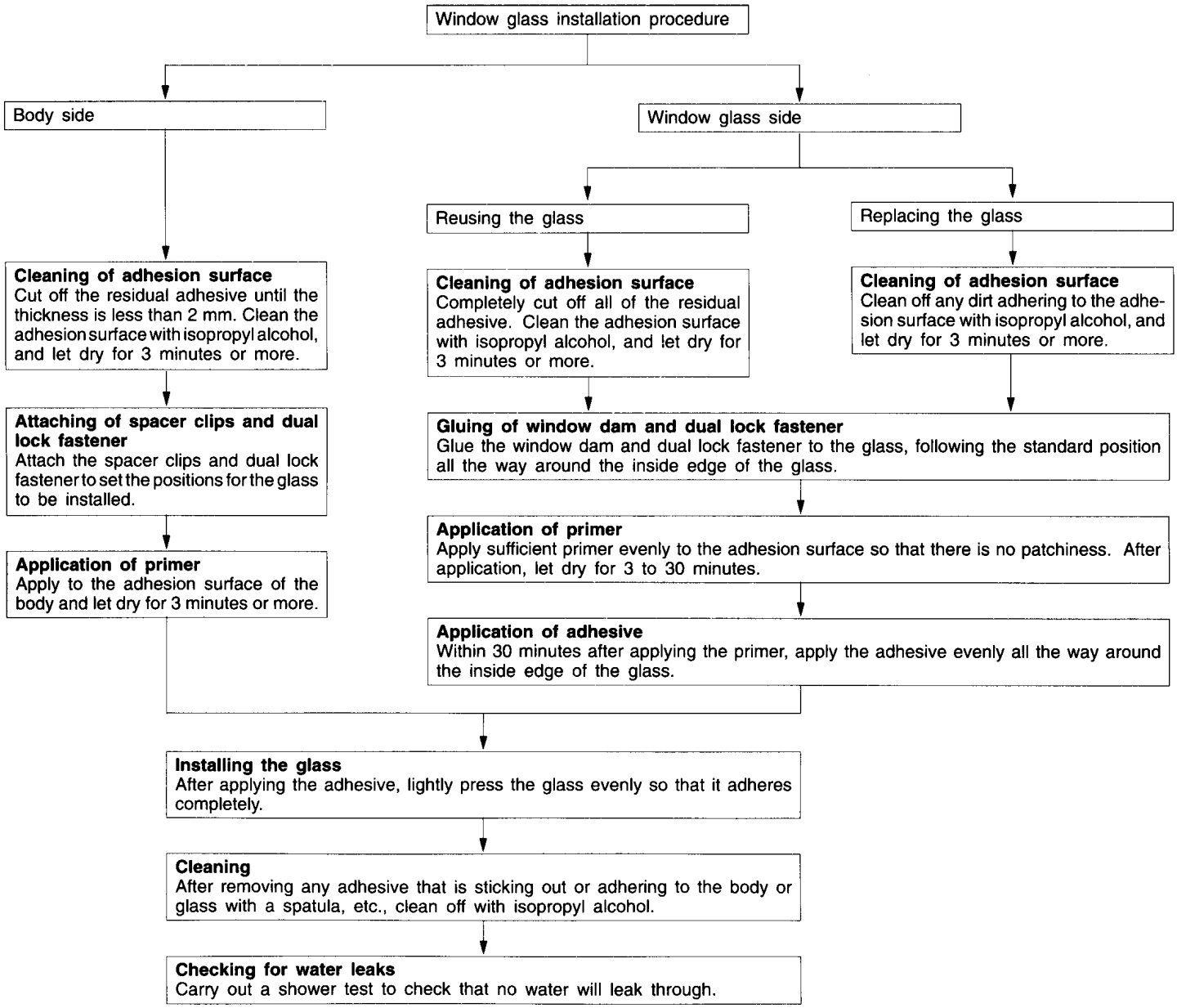
HANDLING OF AUTO WINDOW SEALER

Keep the sealant in a cool place, not exposed to the direct rays of the sun. Do not place any heavy article on the sealant nor press it, otherwise it will become deformed. Avoid storing the sealant for more than 6 months, because it will lose its sealing effect.

BODY PINCH-WELD FLANGE SERVICING

Before servicing the body pinch-weld flange, remove old adhesive completely. If the flange requires painting, bake it after painting is completed.

WORKING PROCESS

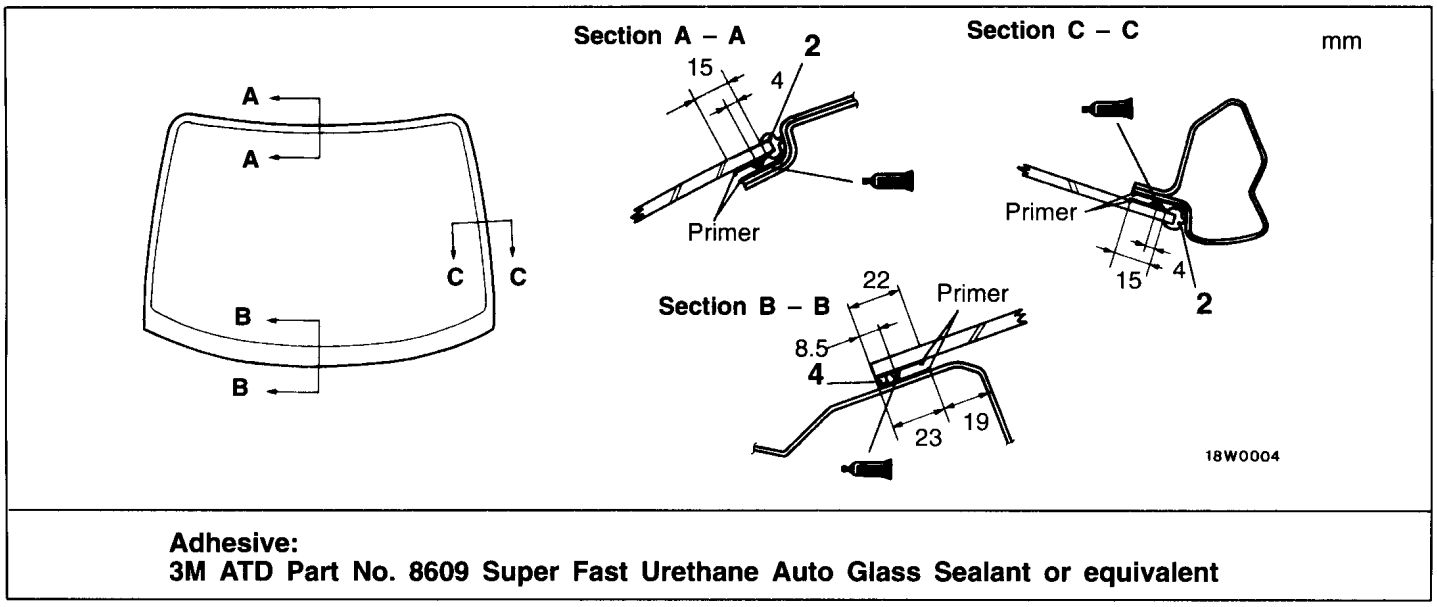


WINDSHIELD

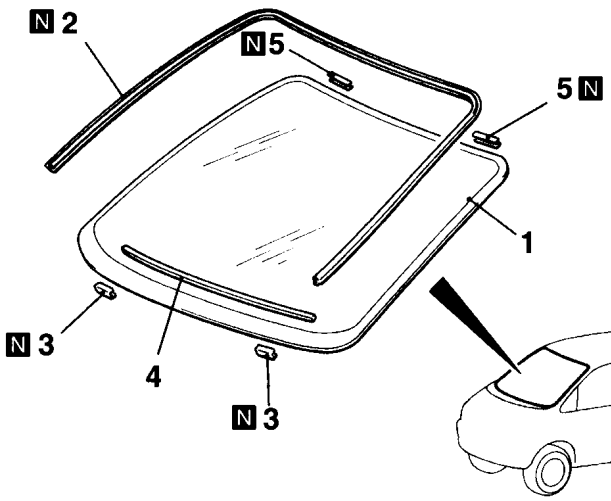
120000438

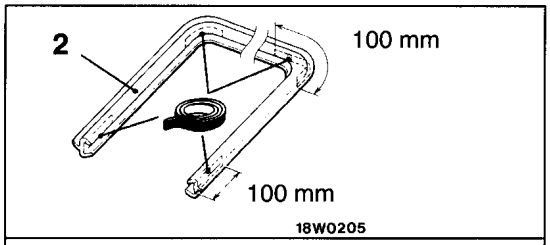
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Deck Garnish (Refer to GROUP 51 – Grilles, Garnishes and Mouldings.)
- Front Pillar Trim (Refer to GROUP 52A – Trims.)
- Headlining (Refer to GROUP 52A – Headlining.)



Adhesive:
3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent

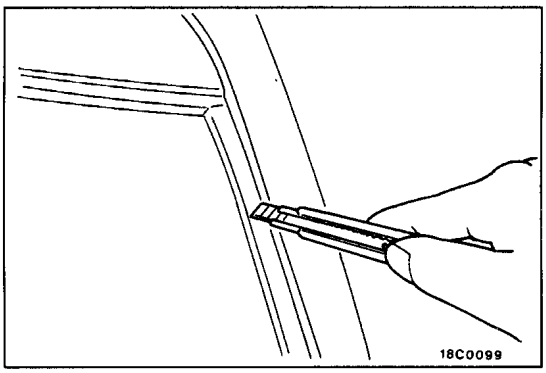




Adhesive tape: Both-sided tape (6 mm wide and 0.125 mm thick)

Removal steps

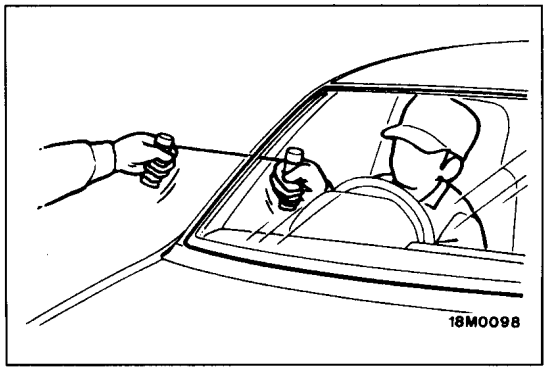
◀A▶ ▶A◀ 1. Windshield
2. Windshield moulding
▶A◀ 3. Windshield protector
▶A◀ 4. Window spacer
▶A◀ 5. Dual lock fastener



REMOVAL SERVICE POINT

◀A▶ WINDSHIELD REMOVAL

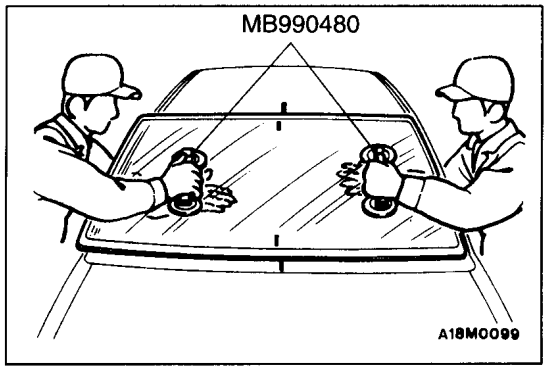
1. In order to protect the body (paint surface), apply cloth tape to all body areas around the installed windshield glass.
2. Cut the moulding with a cutter knife.



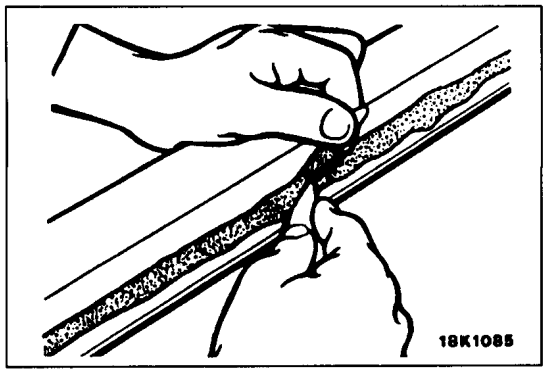
3. Using a sharp-point drill, make hole in the windshield glass adhesive.
4. Pass the piano wire from the inside of the vehicle through the hole.
5. Pull the piano wire alternately from the inside and outside along the windshield glass to cut the adhesive.

Caution
Do not let the piano wire touch the edge of the windshield glass.

6. Make mating marks on the windshield glass and body.



7. Use the special tool to remove the windshield glass.

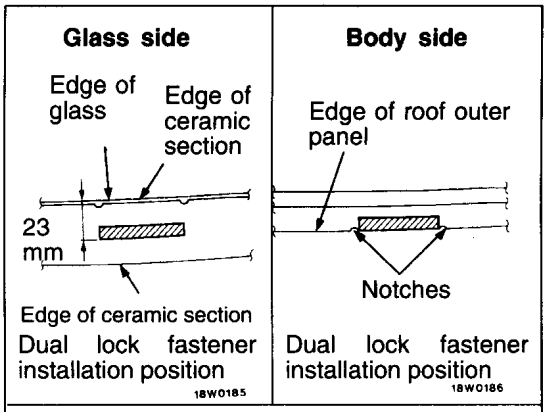


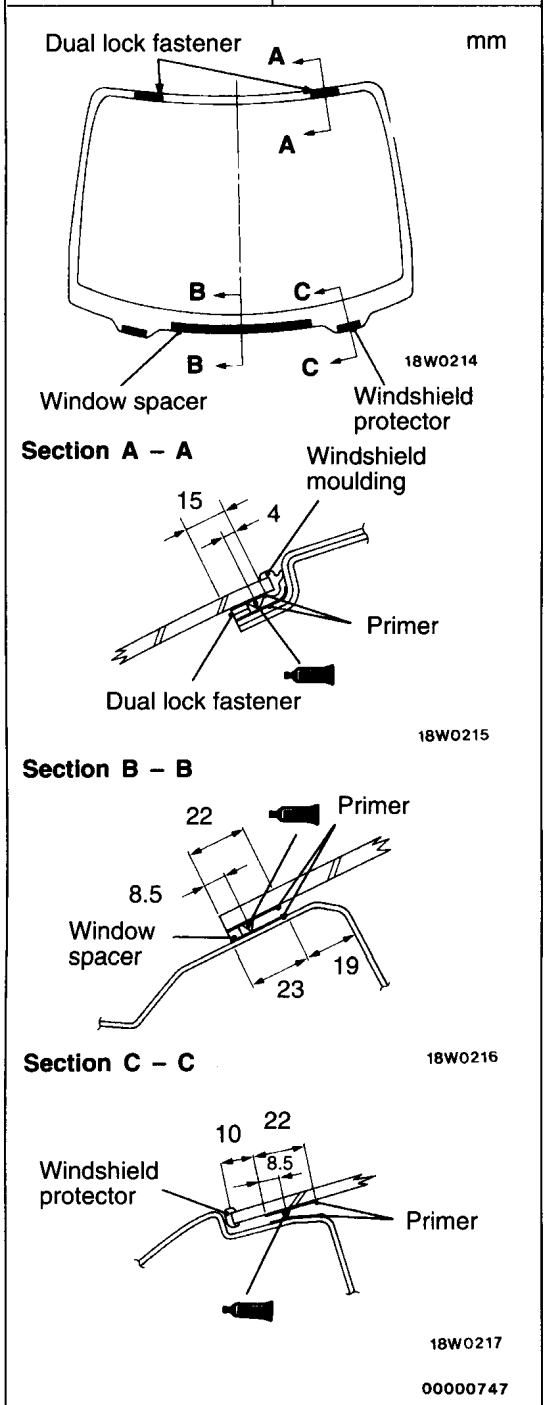
8. Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm around the entire circumference of the body flange.
9. Finish the flange surfaces so that they are smooth.

Caution
(1) Be careful not to remove more adhesive than is necessary.
(2) Be careful also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with repair paint or anti-rust agent.

10. When reusing the glass, remove the adhesive still adhering to the glass, and clean with isopropyl alcohol.
11. Clean the body side in the same way.

Caution
Let the cleaned places stand for 3 minutes or more, and carry out the next procedures after they have dried. Also, do not touch any surface that has been cleaned.



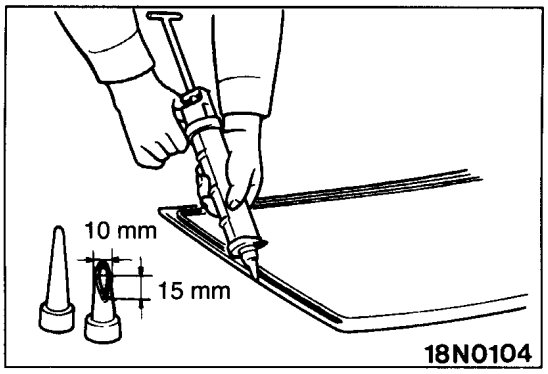


INSTALLATION SERVICE POINT

▶A◀ DUAL LOCK FASTENER/WINDOW SPACER/WINDSHIELD PROTECTOR/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 unleaded petrol 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 places shown in the illustration.
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. Also, a too thick application will weaken the adhesive.
   (2) Do not touch the coated surface.
5. Install the dual lock fasteners, windshield protectors and window spacer in the positions shown in the illustration. Check that there are no bends or uneveness.
6. Align dual lock fasteners on the body flange with those on the windshield, and then attach them to the body flange.



7. 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.

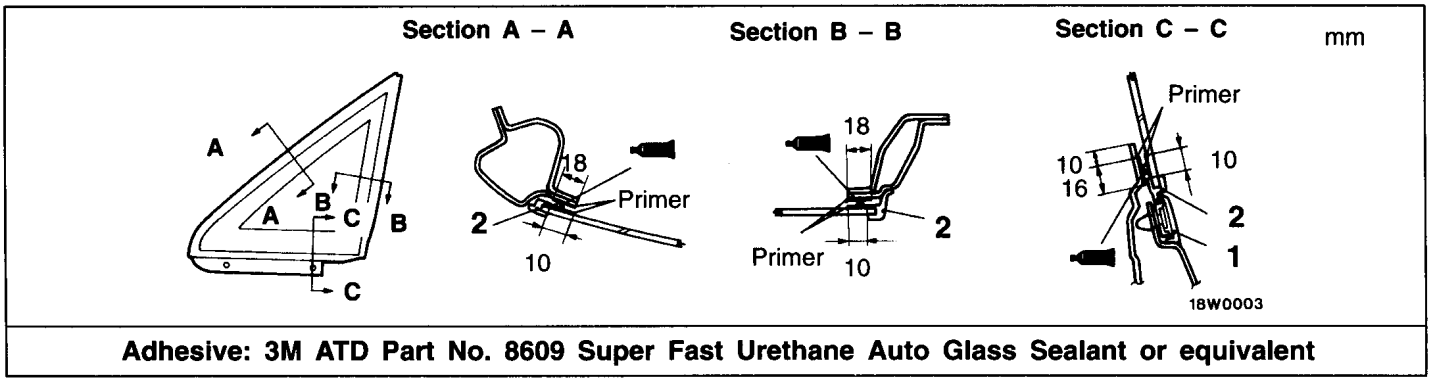
8. Align the mating marks on the glass and the body, and lightly press the windshield glass evenly so that it adheres completely.
9. Use a spatula or the like to remove any excessive adhesive. Then clean the surface with unleaded petrol. Try not to move the vehicle until the adhesive sets.
10. Wait 30 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.

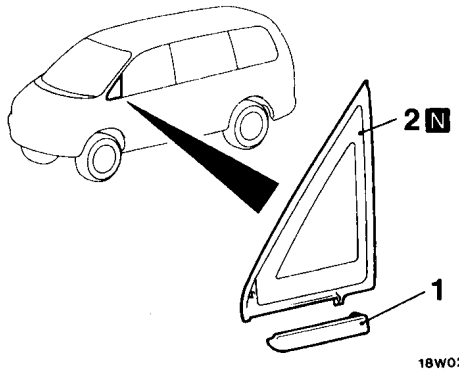
DELTA WINDOW GLASS

120000439

REMOVAL AND INSTALLATION



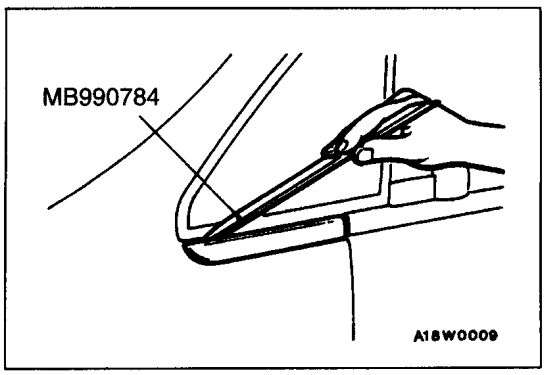
Adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent

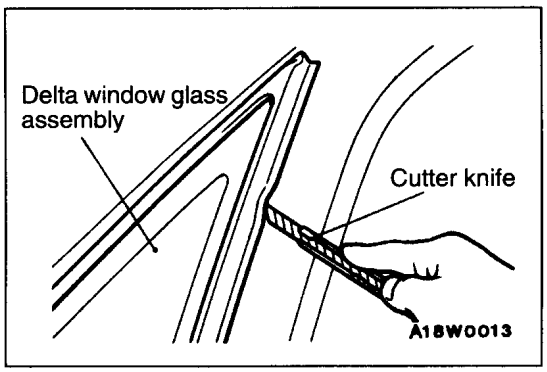


00000748

Removal steps

◀A▶ 1. Delta window glass garnish
◀B▶ ▶A◀ 2. Delta window glass assembly





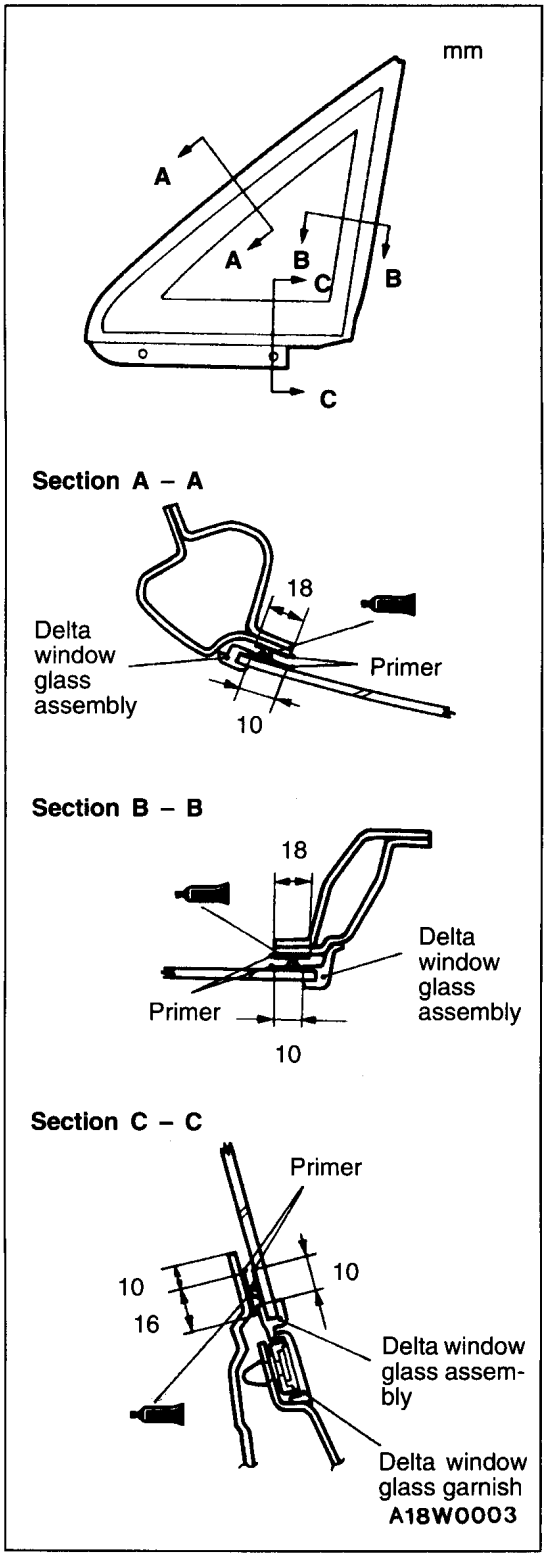
REMOVAL SERVICE POINTS

◀A▶ DELTA WINDOW GLASS GARNISH REMOVAL

Use the special tool to lever out the garnish.

◀B▶ DELTA WINDOW GLASS ASSEMBLY REMOVAL

Use a knife to cut the adhesive, and then remove the delta window glass assembly.



INSTALLATION SERVICE POINT

▶A◀ DELTA WINDOW GLASS ASSEMBLY INSTALLATION

Apply primer and adhesive in the places shown in the illustration, and then install the delta window glass by the same procedure as for the windshield glass. (Refer to P.42-10.)

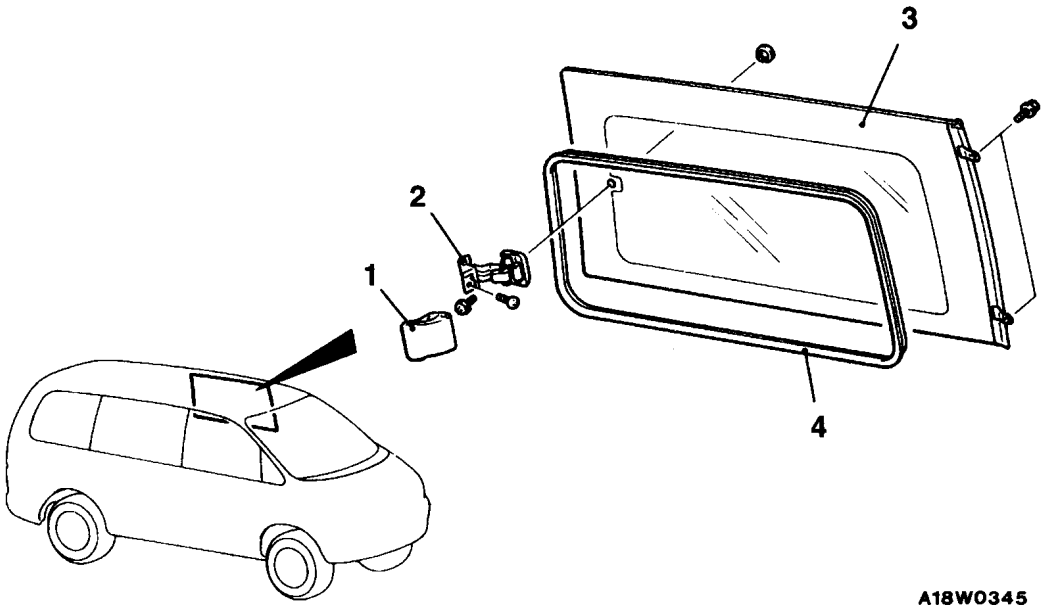
REAR WINDOW GLASS

120000440

REMOVAL AND INSTALLATION

<SWING–OUT WINDOW>

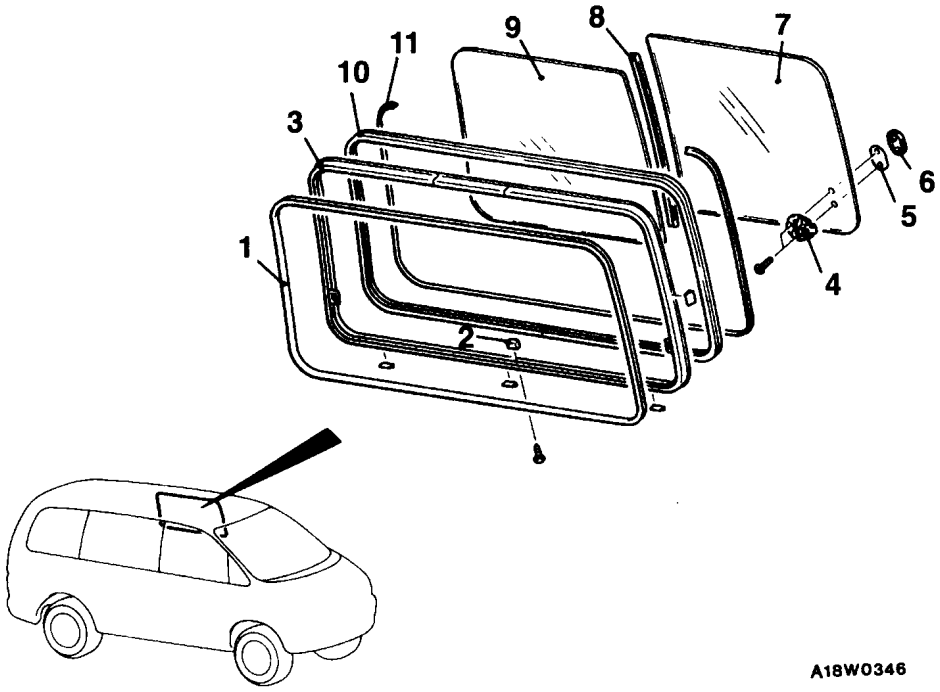
Pre-removal and Post-installation Operation
- Beltline Trim Removal and Installation
  (Refer to GROUP 52A – Trims.)



Removal steps

1. Link cover
2. Rear window link assembly
3. Rear side window glass
4. Rear side window weatherstrip

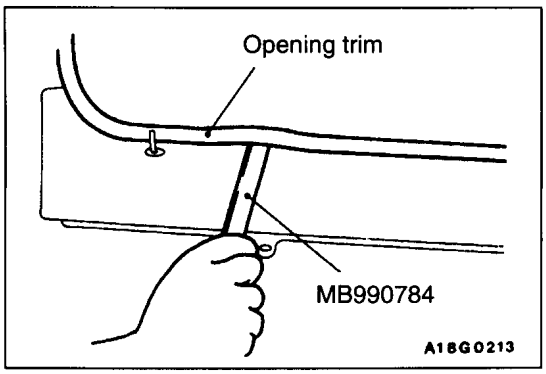
<SLIDE TYPE>



Removal steps

◀A▶ 1. Opening trim
2. Glass stopper
3. Rear side window frame assembly
4. Side glass lock assembly
5. Packing
6. Connector

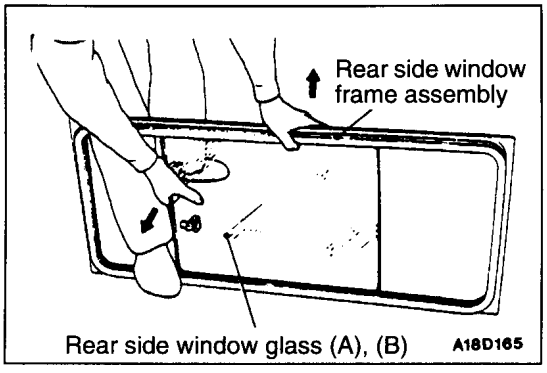
◀B▶ 7. Rear side window glass (A)
8. Centre seal
◀B▶ 9. Rear side window glass (B)
10. Rear window runchannel
11. Protector



REMOVAL SERVICE POINTS

◀A▶ OPENING TRIM REMOVAL

Use the special tool to remove the opening trim.



◀B▶ REAR SIDE WINDOW GLASS (A), (B) REMOVAL

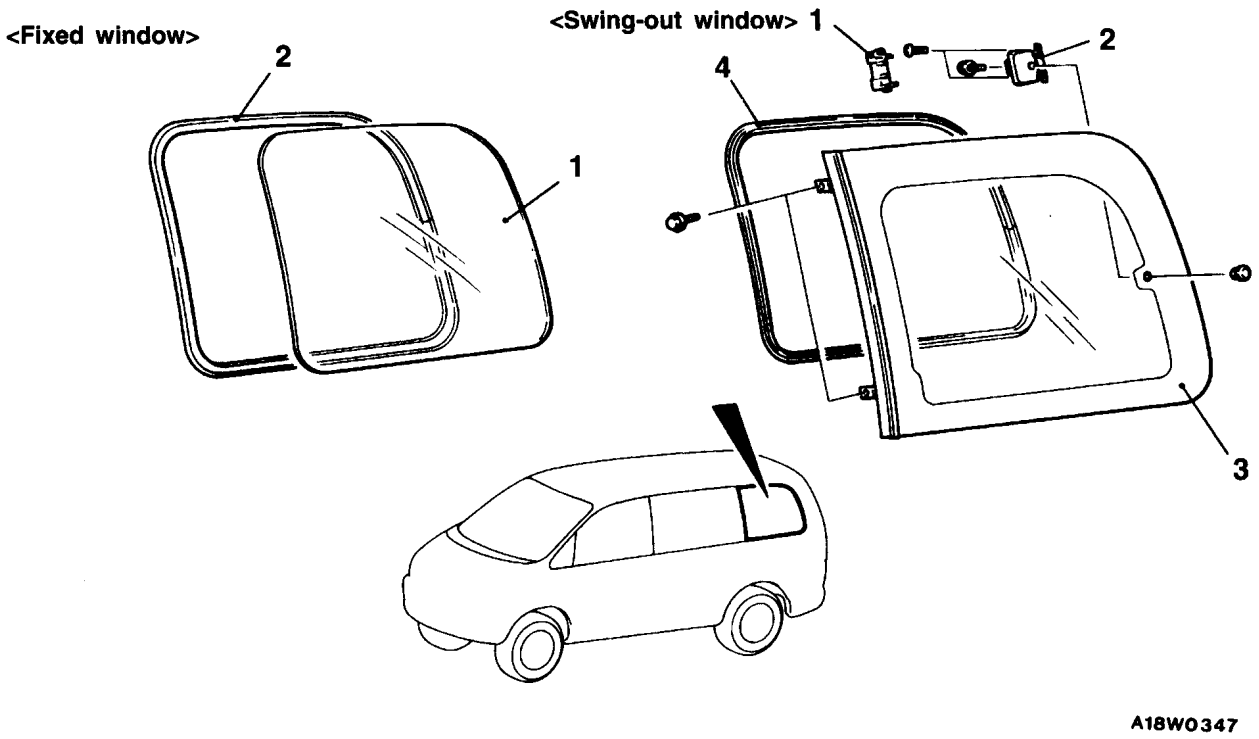
Move the glass to the centre of the frame assembly, and pull the top and bottom of the frame assembly at the middle to remove the glass.

QUARTER WINDOW GLASS

120000441

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Quarter Trim Removal and Installation
  (Refer to GROUP 52A – Trims.)



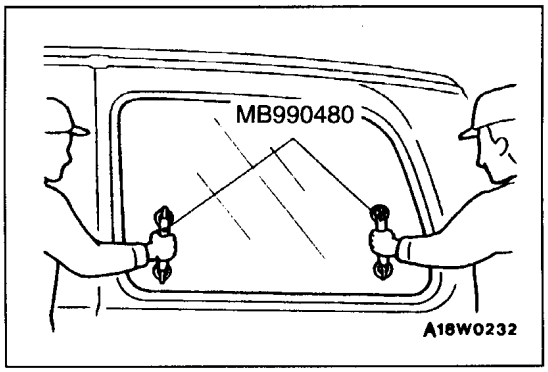
A18W0347

Removal steps
<Fixed window>

◀A▶ ▶A◀ 1. Quarter window glass
◀A▶ ▶A◀ 2. Quarter window weatherstrip

<Swing-out window>

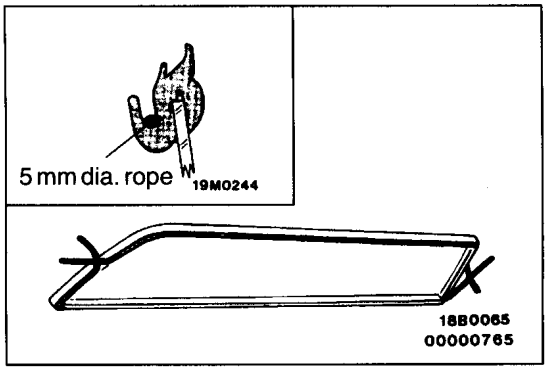
1. Lever
2. Link
3. Quarter window glass
4. Quarter window weatherstrip



REMOVAL SERVICE POINT

◀A▶ QUARTER WINDOW GLASS/QUARTER WINDOW WEATHERSTRIP REMOVAL

1. Affix the special tools to the glass, and then remove the glass with the weatherstrip.
2. Remove the weatherstrip from the glass.

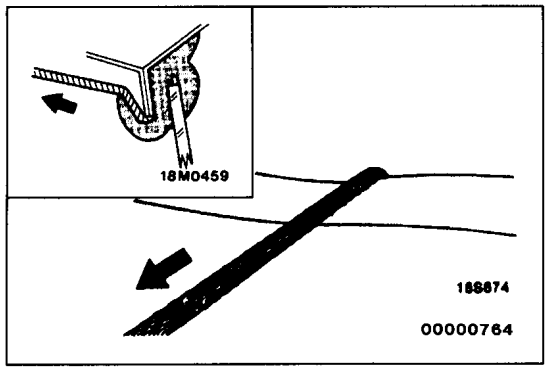


INSTALLATION SERVICE POINT

▶A◀ QUARTER WINDOW WEATHERSTRIP/QUARTER WINDOW GLASS REMOVAL

1. Repair any deformation in the body flange if necessary.
2. Attach the weatherstrip to the glass.
3. Insert a rope into the weatherstrip groove.

   NOTE
   Place the rope so that it overlaps at both ends as shown in the illustration.



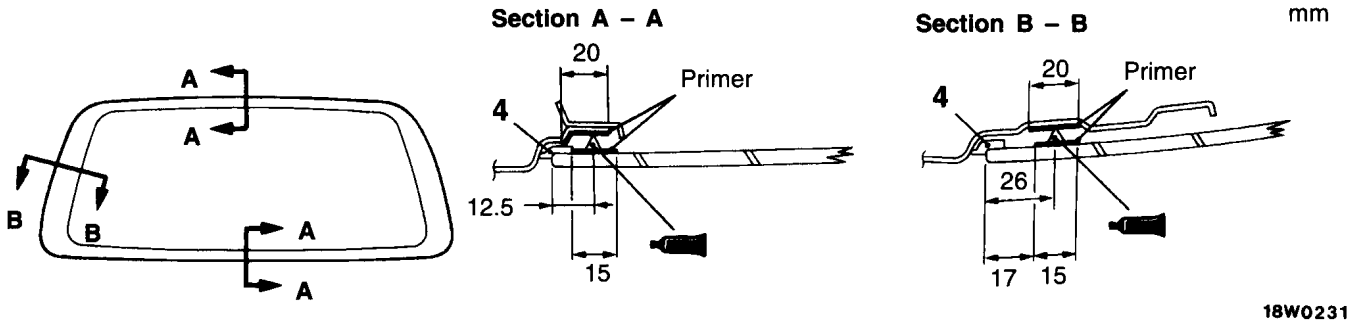
4. Affix the special tools to the glass in the same way as removing it. Place the ends of the rope into the vehicle at this time.
5. While pressing the glass outside the vehicle, simultaneously pull the rope gently at an angle perpendicular to the glass. Fit the lip of the weatherstrip into the body flange.
6. Tap the glass repeatedly until it fits firmly into the body flange.

TAILGATE WINDOW GLASS

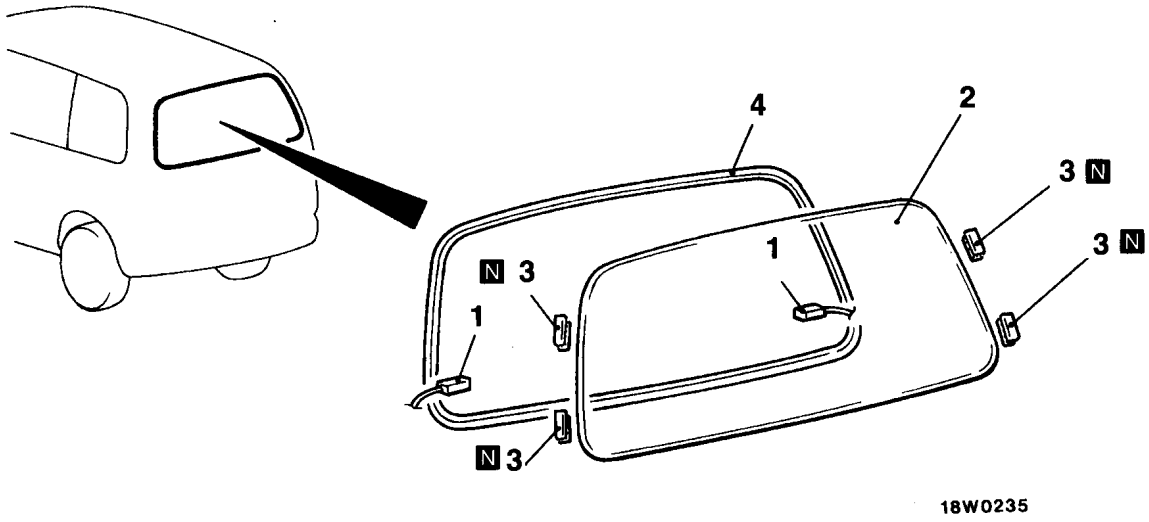
120000442

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Rear Wiper Blade and Arm Assembly Removal and Installation (Refer to GROUP 51 – Rear Wiper and Washer.)
- High Mounted Stop Lamp Removal and Installation (Refer to GROUP 54 – High Mounted Stop Lamp.)



Adhesive:
3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent



00000749

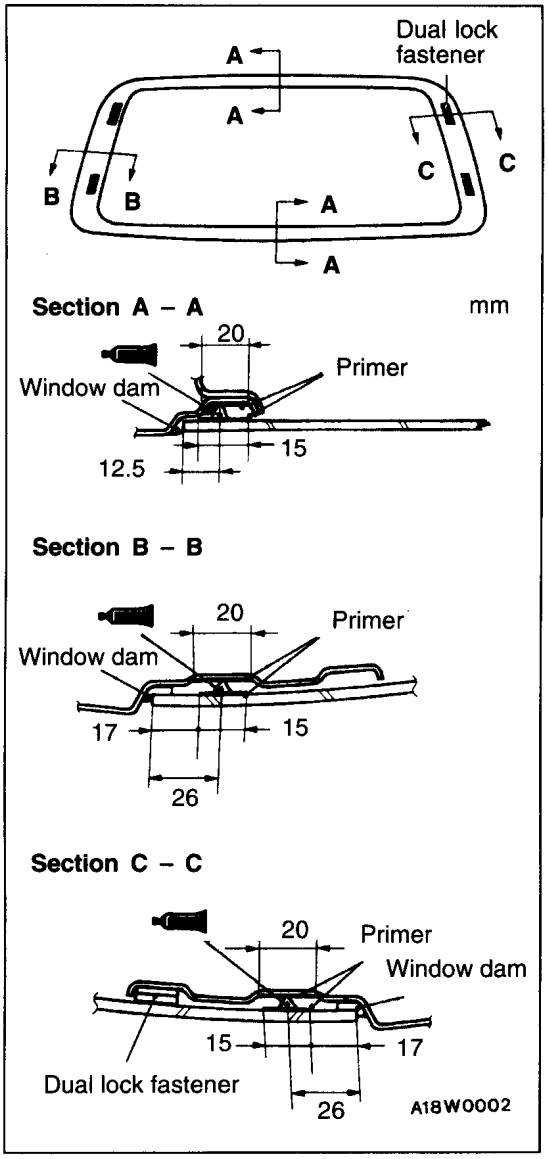
Removal steps

◀A▶ ▶A◀ 1. Harness connector
▶A◀ 2. Tailgate window glass
▶A◀ 3. Dual lock fastener
▶A◀ 4. Window dam

REMOVAL SERVICE POINT

◀A▶ TAILGATE WINDOW GLASS REMOVAL

Remove the tailgate window glass by the same procedure as for the windshield. (Refer to P.42-10.)



INSTALLATION SERVICE POINT

▶A◀ WINDOW DAM/DUAL LOCK FASTENER/TAILGATE WINDOW GLASS INSTALLATION

(1) Use unleaded petrol to degrease the glass and body where the window dam and dual lock fasteners are to be attached. Then install them.
(2) Apply primer and adhesive in the places shown in the illustration, and then install the tailgate window glass by the same procedure as for the windshield glass. (Refer to P.42-10.)

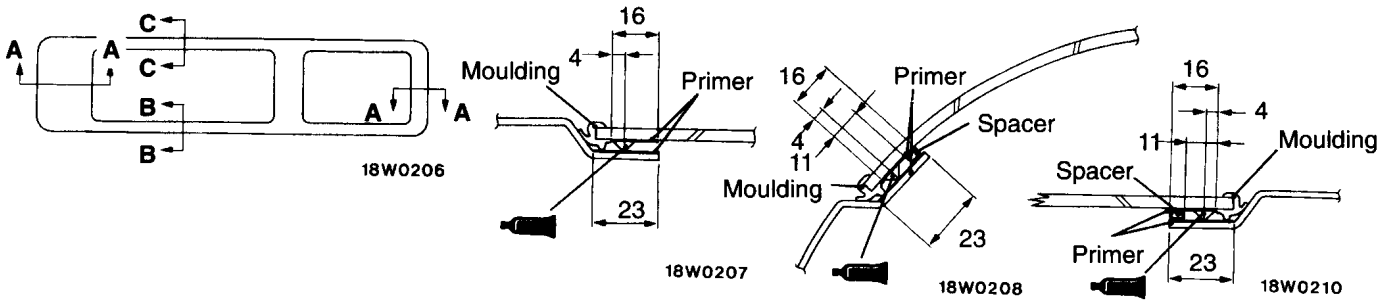
ROOF WINDOW GLASS

120002229

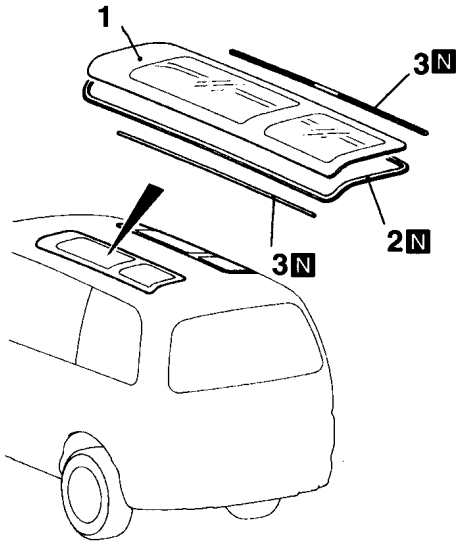
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Headlining Removal and Installation (Refer to GROUP 52A – Headlining.)
- Roof Duct Removal and Installation (Refer to GROUP 55 – Roof Duct.)
- Crystal Lite Roof Sunshade Removal and Installation (Refer to P.42-87.)

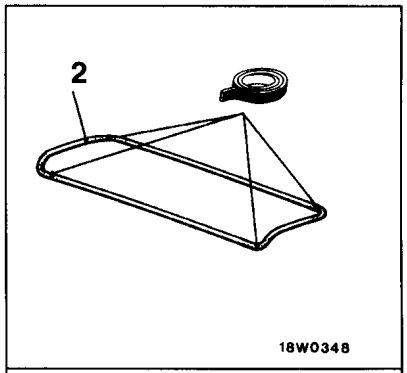
Section A – A Section B – B Section C – C mm



Adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent



00000750



Adhesive tape: Both-sided tape (6 mm wide and 0.125 mm thick)

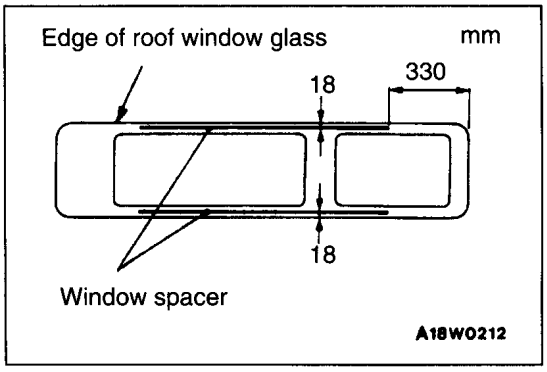
Removal steps

◀A▶ ▶B◀ 1. Roof window glass
2. Roof window moulding
▶A◀ 3. Window spacer

REMOVAL SERVICE POINT

◀A▶ ROOF WINDOW GLASS REMOVAL

Remove the tailgate window glass by the same procedure as for the windshield. (Refer to P.42-10.)



INSTALLATION SERVICE POINTS

▶A◀ WINDOW SPACER INSTALLATION

Use unleaded petrol to degrease the glass and body where the window spacers are to be attached. Then install them.

▶B◀ ROOF WINDOW GLASS INSTALLATION

Apply primer and adhesive, and then install the roof window glass by the same procedure as for the windshield glass. (Refer to P.42-10.)

FRONT DOOR

120000444

SERVICE SPECIFICATIONS

Items		Standard value
Door outside handle play mm		6–13
Power window operation current A		8 or less (at 20°C)
Door inside handle play mm		0–14
Glass pad and glass holder installation position mm	Distance (A) between glass holder and rear edge of glass	80.5–82.0
	Distance (B) between glass holders	573.5–576.5

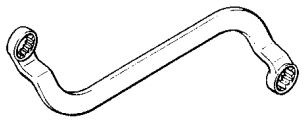
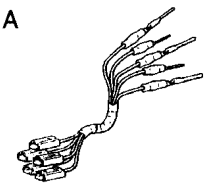
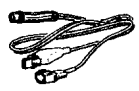
SEALANT

120000445

Items	Specified sealant	Remark
Waterproof film	3M ATD Part No. 8625 or equivalent	Ribbon sealer

SPECIAL TOOLS

120000446

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of front door trim
	MB990834	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: 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

120002230

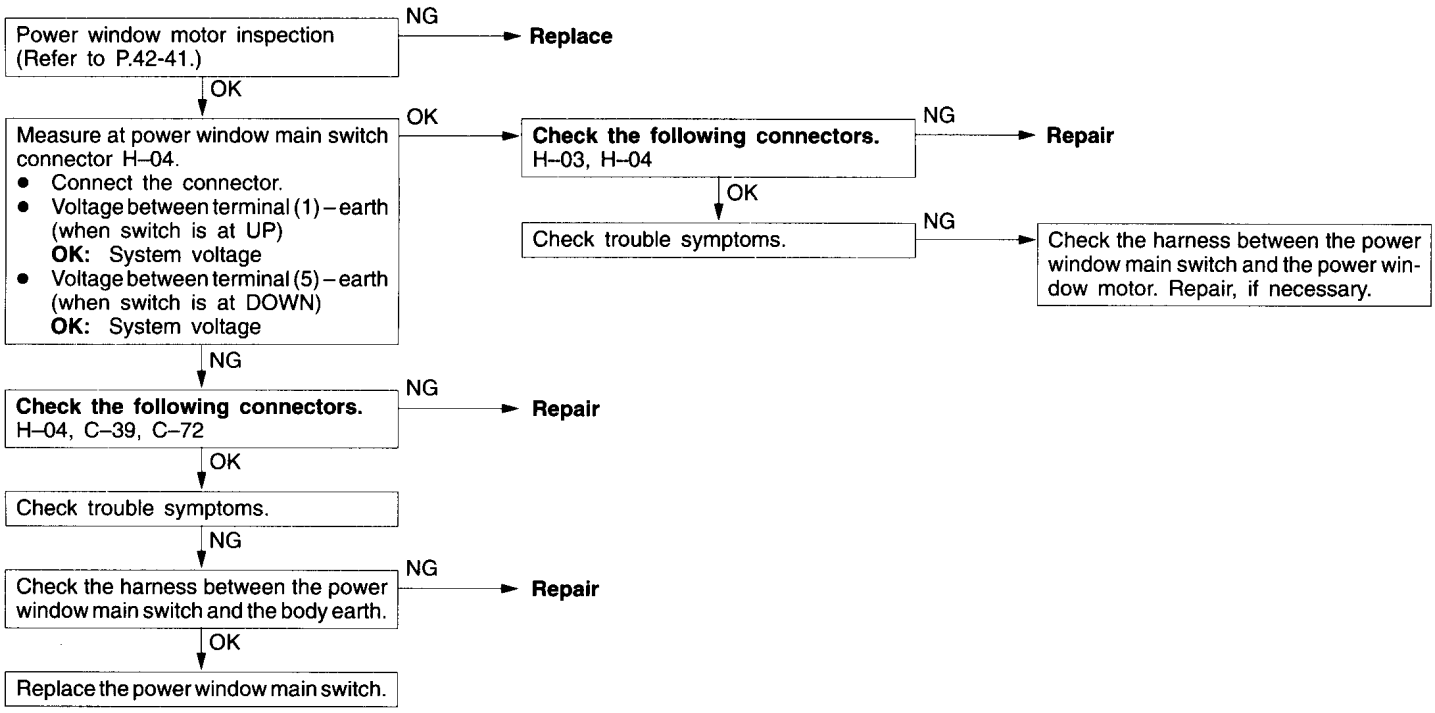
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure	Reference page
Power windows	Driver's power window cannot be operated by the power window main switch.	1	P.42-26
	Passenger's power window cannot be operated by the power window main switch (however, it can be operated by the sub-switch).	2	P.42-27
	Passenger's power window cannot be operated by the power window sub-switch (however, it can be operated by the main switch).	3	P.42-27
	Passenger's power window cannot be operated by the power window sub-switch, nor can it be operated by the power window main switch.	4	P.42-28
	When the glass is raised, it then lowers automatically.	5	P.42-29
	The glass is not lowered when something is jammed in the window.	6	P.42-29
	When the glass is fully raised, it then lowers automatically.	7	P.42-30
Door locking mechanism	Doors do not lock or unlock when the door key switch is turned.	8	P.42-31
	None of the door lock functions operate.	9	P.42-32
	Some doors do not lock or unlock.	10	P.42-33

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

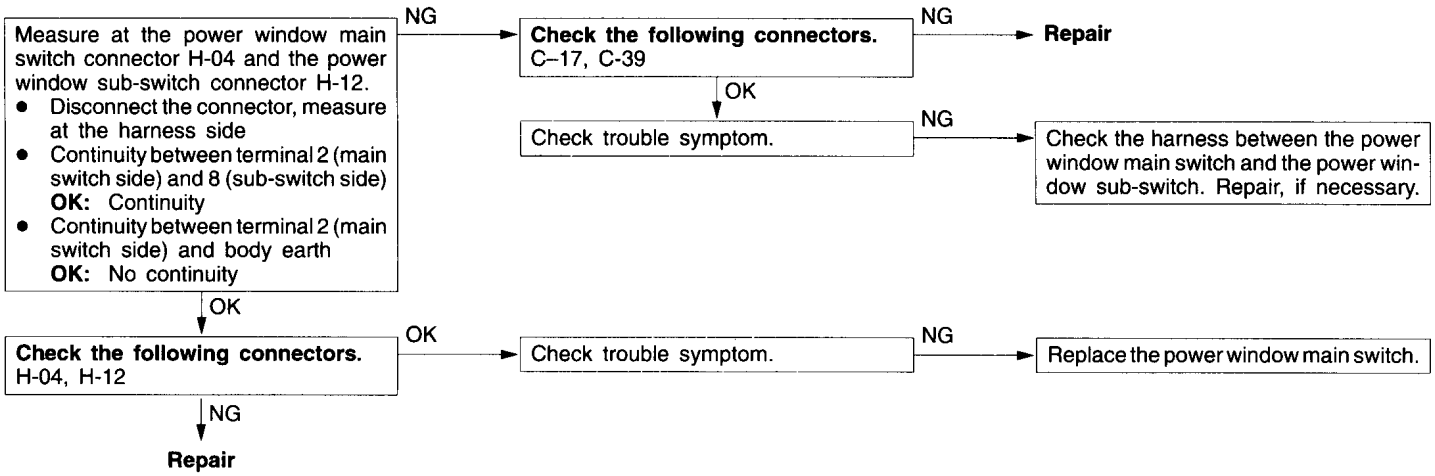
Inspection Procedure 1

Driver's power window cannot be operated by the power window main switch.	Probable cause
[Comment] One of the following items may be defective. Earth circuit in the power window main switch Power supply circuit for driving the power window motor Control circuit in the power window main switch.	• Malfunction of power window motor • Malfunction of power window main switch • Malfunction of wiring harness or connector



Inspection Procedure 2

Passenger's power window cannot be operated by the power window main switch (however, it can be operated by the sub-switch).	Probable cause
[Comment] The power window main switch may be defective or there may be either short circuit or open circuit in the communication line.	• Malfunction of power window main switch • Malfunction of wiring harness or connector



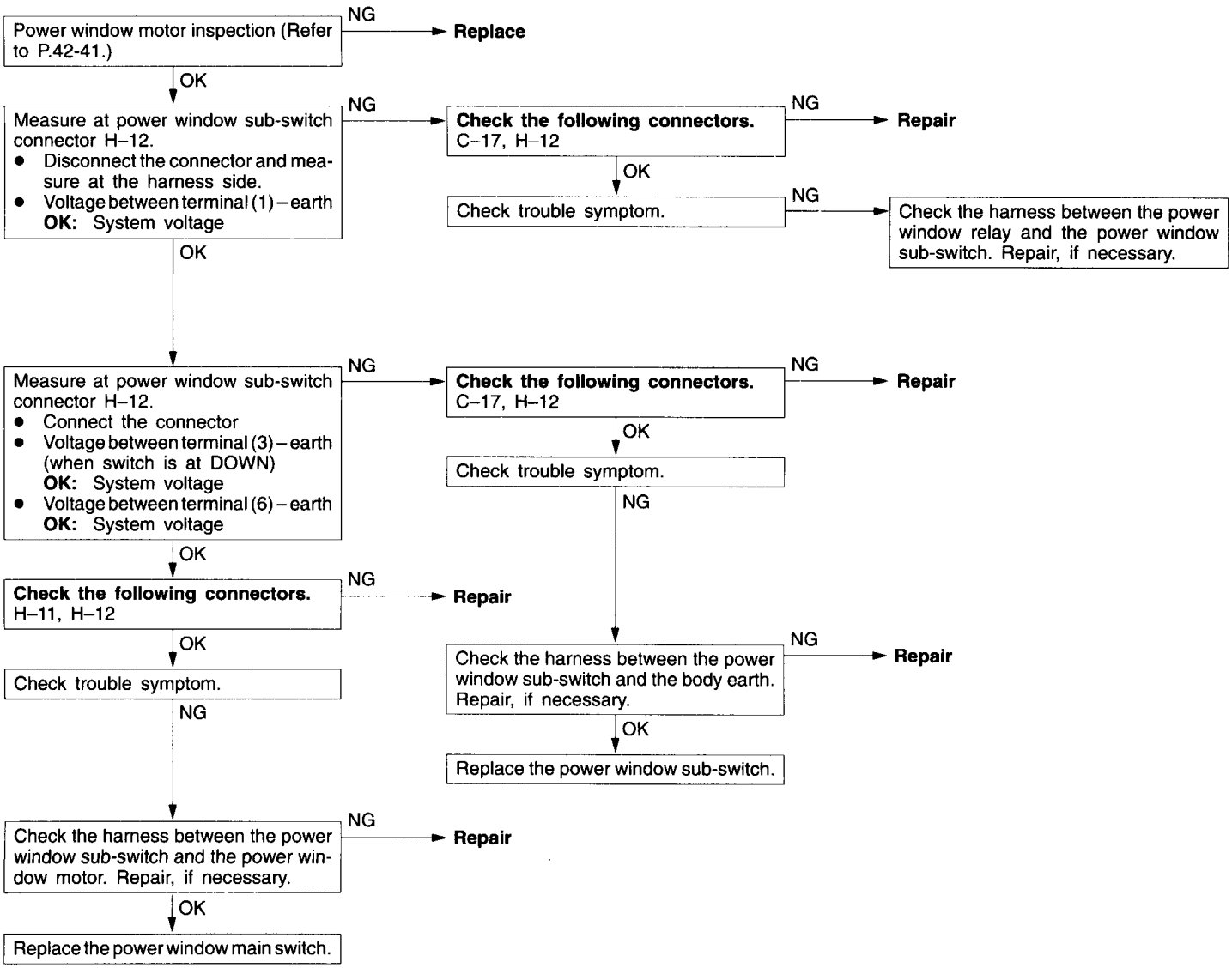
Inspection Procedure 3

Passenger's power window cannot be operated by the power window sub-switch. (however, it can be operated by the main switch)	Probable cause
[Comment] The power window sub-switch may be defective.	• Malfunction of power window sub-switch

Replace the power window sub-switch.

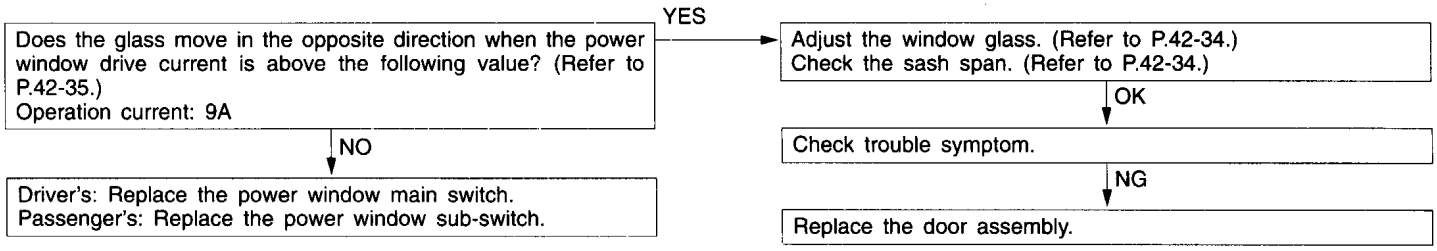
Inspection Procedure 4

Passenger's power window cannot be operated by the power window sub-switch, nor can it be operated by the power window main switch.	**Probable cause**
[Comment] One of the following items may be defective. Power supply circuit or earth circuit for the power window sub-switch Power supply circuit for the power window motor Power window main switch due to a malfunction of the lock 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



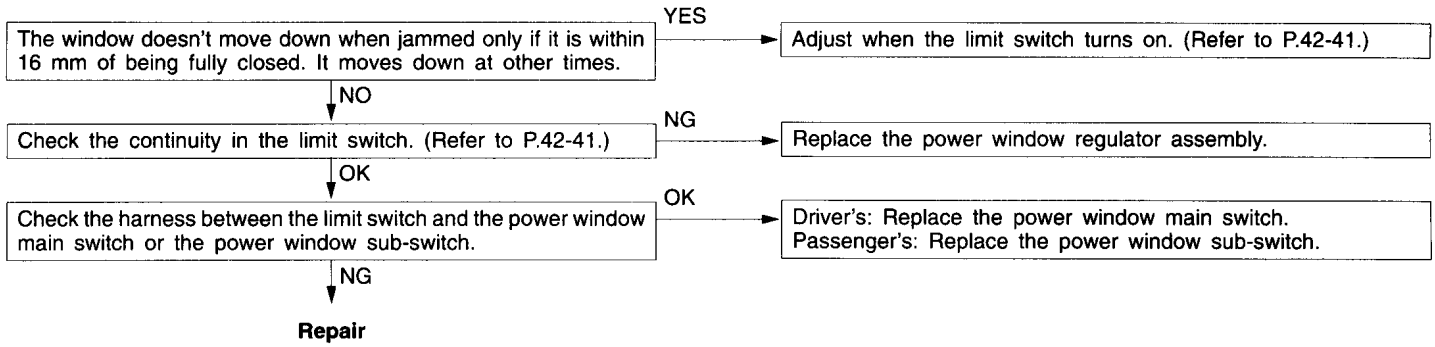
Inspection Procedure 5

When the glass is raised, it then lowers automatically.	Probable cause
[Comment] The sliding resistance is too large when the glass rises. So it is misjudged that something is jammed in the window, and the window is lowered automatically.	• Window glass maladjustment • Incorrect installation or fitting of glass slider • Malfunction of power window main switch or power window sub-switch



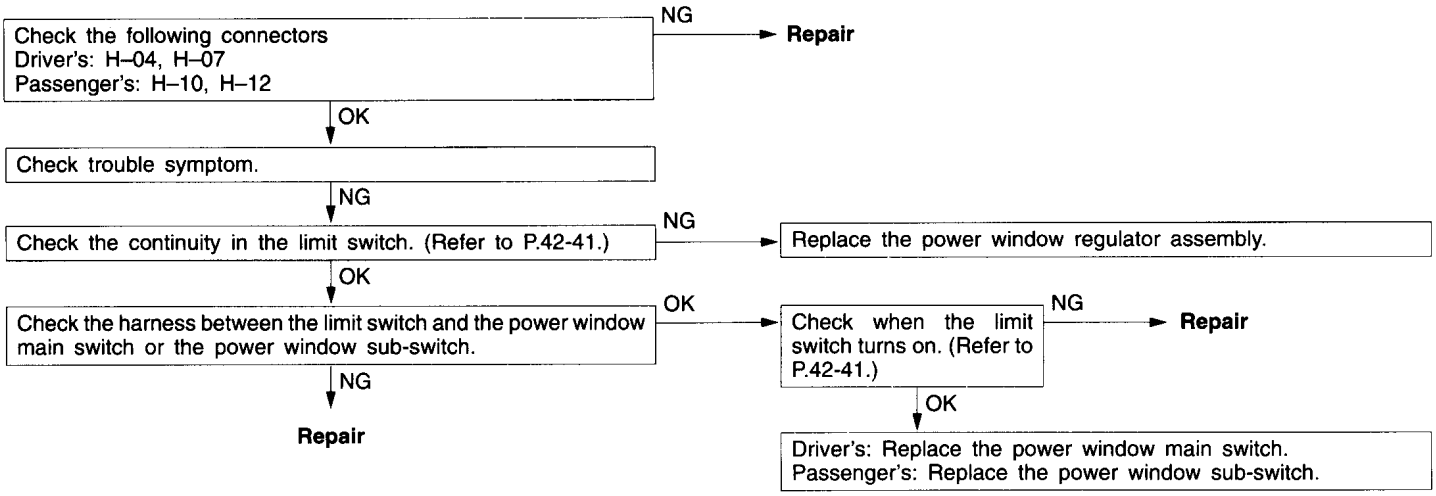
Inspection Procedure 6

The glass is not lowered when something is jammed in the window.	Probable cause
[Comment] The safety mechanism does not work under the following conditions, and the window will not be lowered when 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 16 mm of being fully closed (standard setting to prevent the window from being lowered)	• Malfunction of limit switch • Malfunction of harness • Incorrect limit switch operation position • Malfunction of power window main switch or power window sub-switch



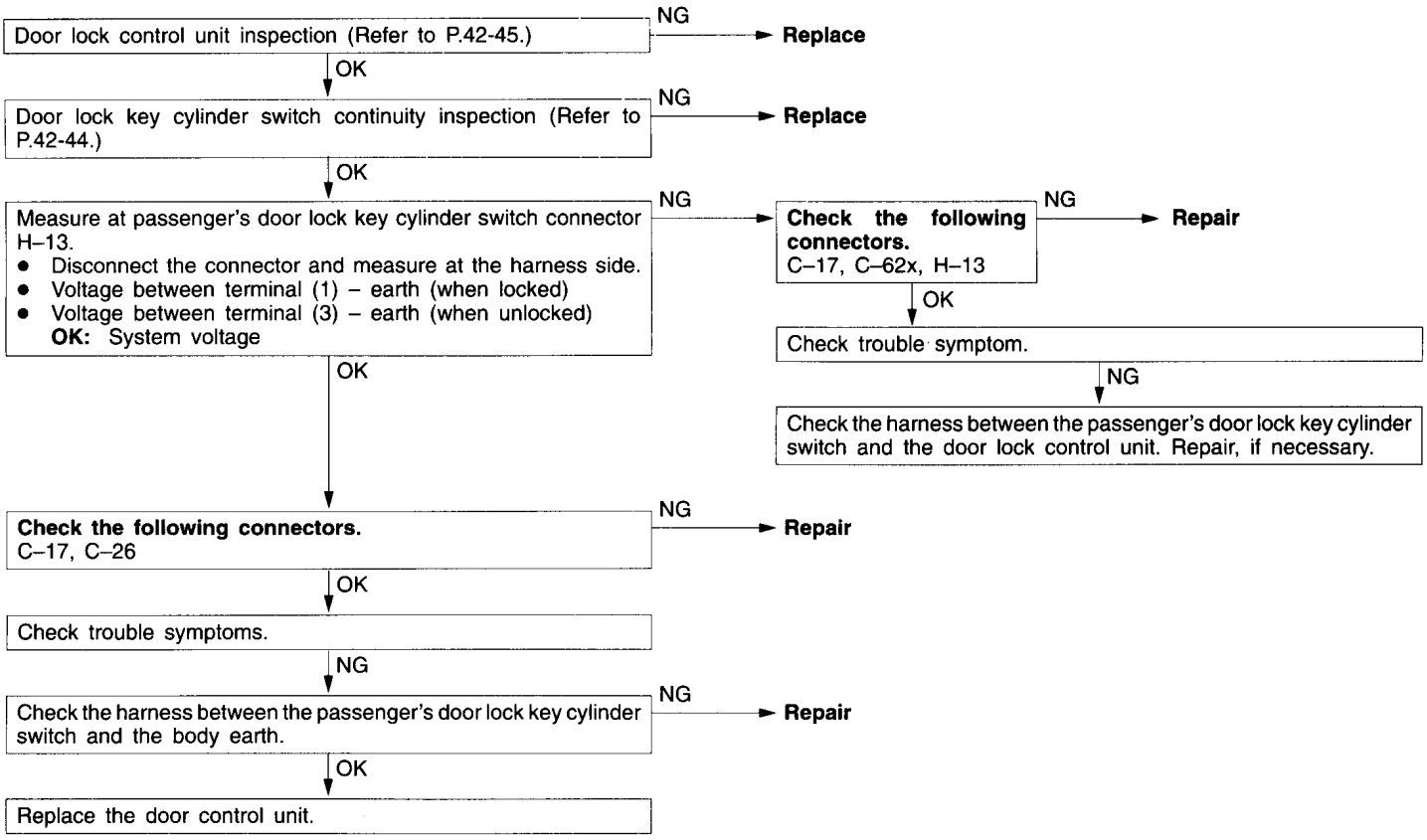
Inspection Procedure 7

When the glass is fully raised, it then lowers automatically.	Probable cause
[Comment] When the window is within 16 mm before being fully closed, the window will not be lowered. Therefore, a defective limit switch or a short-circuit in a harness may be present.	• Malfunction of limit switch • Incorrect limit switch operation position • Malfunction of wiring harness or connector



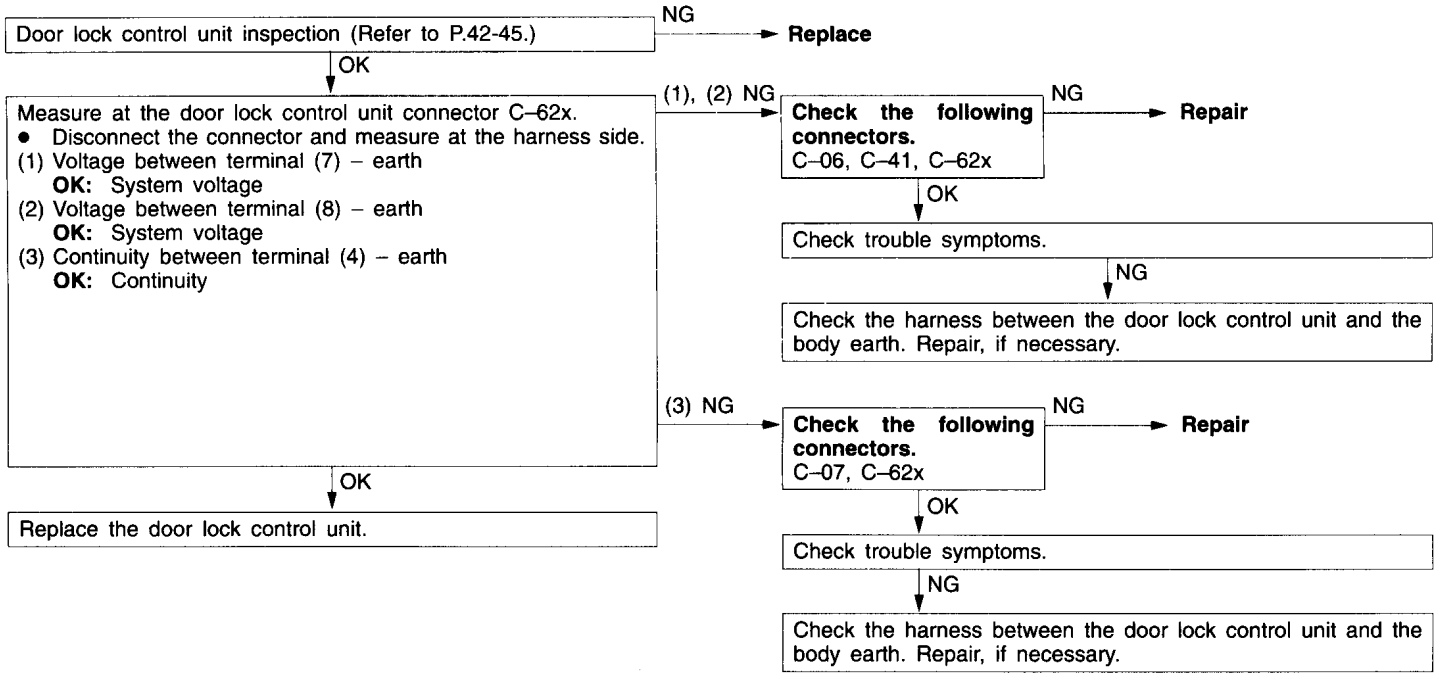
Inspection Procedure 8

Doors do not lock or unlock when the door key switch is turned.	Probable cause
[Comment] The door lock control unit or the door key switch may be defective. A harness or connector may be defective.	• Malfunction of door key switch • Malfunction of door lock control unit • Malfunction of wiring harness or connector



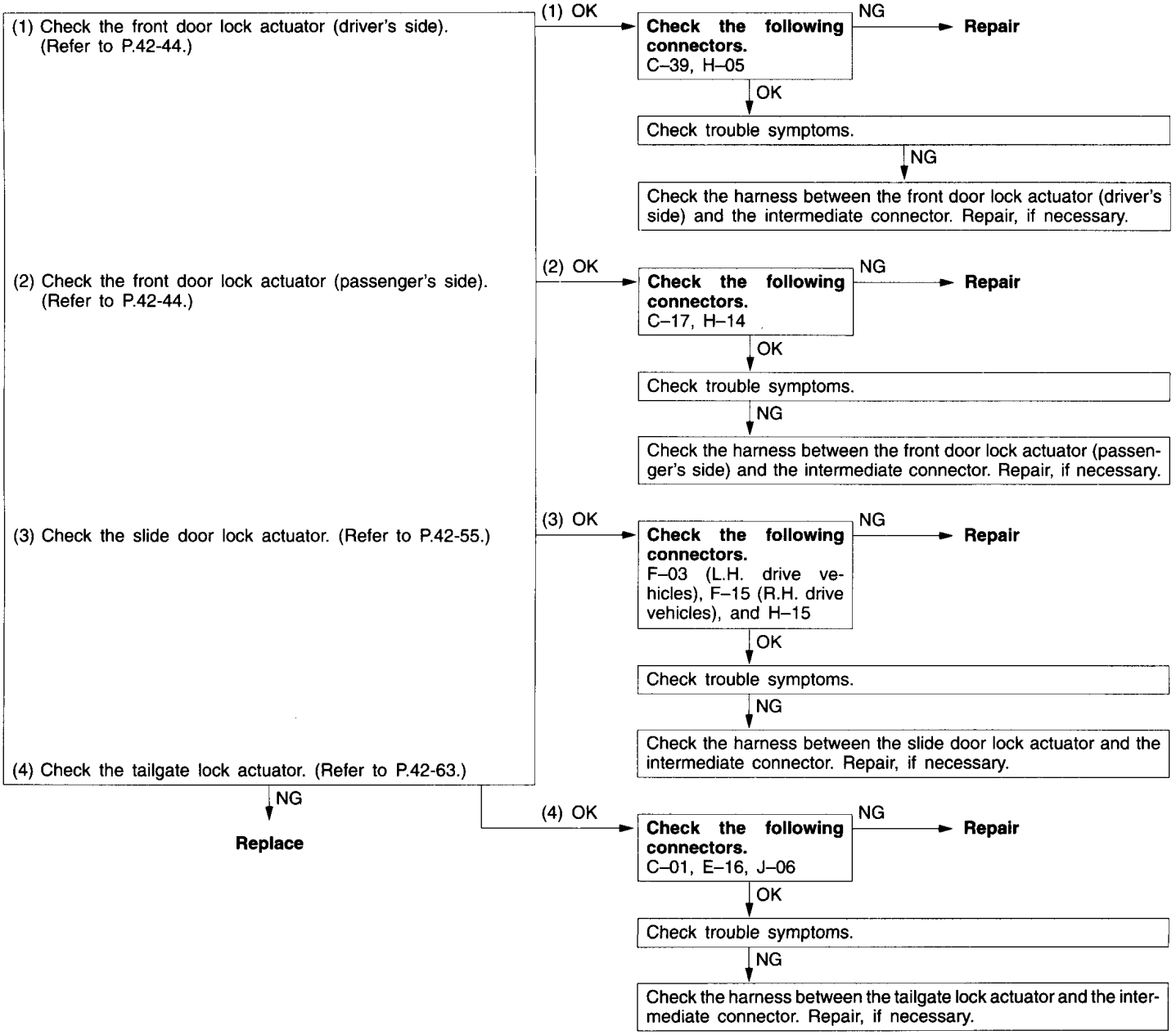
Inspection Procedure 9

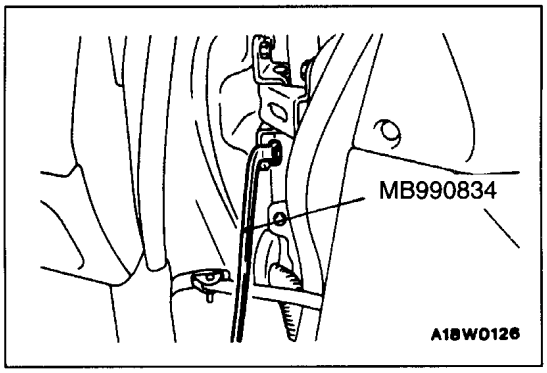
None of the door lock functions operate.	Probable cause
[Comment] Power circuit system or earth circuit system of the door lock control unit may be defective.	• Malfunction of door lock control unit • Malfunction of wiring harness or connector

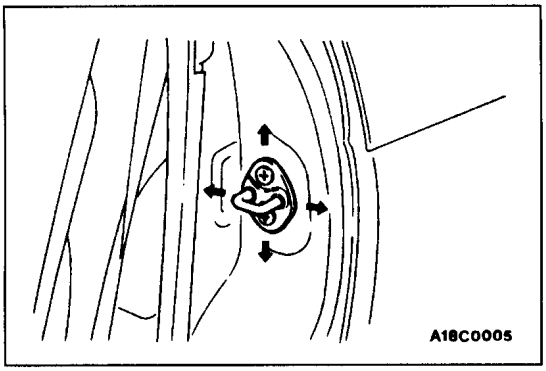


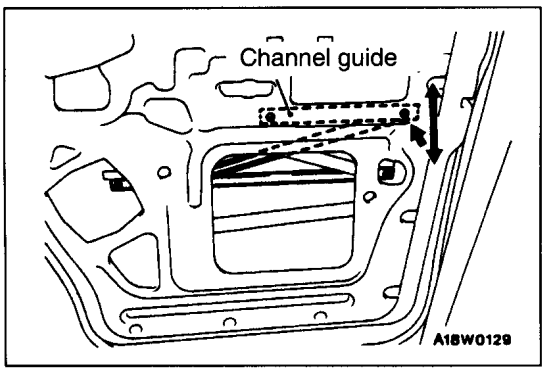
Inspection Procedure 10

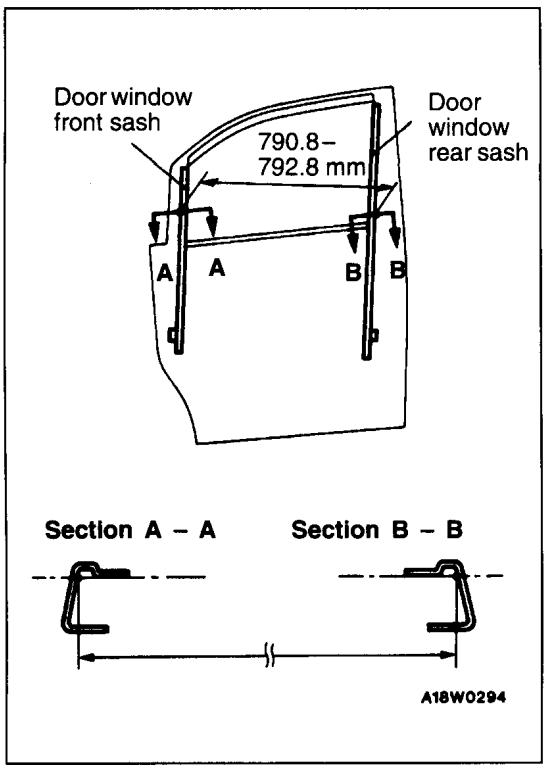
Some doors do not lock or unlock.	Probable cause
[Comment] The door lock actuator, a harness or connector may be defective.	• Malfunction of door lock actuator • Malfunction of wiring harness or connector











SERVICE ADJUSTMENT PROCEDURES

120000448

DOOR FIT ADJUSTMENT

1. If the clearance between the door and the vehicle body is uneven, affix protective tape to the fender around the hinge and to the edge of the door. Then use the special tool to loosen the door hinge mounting bolts on the body, and adjust the clearance around the door so that it becomes even.
2. If the door and the body are not flush with each other, use the special tool to loosen the door hinge mounting bolts. Then align the door.
3. If the striker and latch do not mesh properly, adjust the position of the striker.

DOOR WINDOW GLASS ADJUSTMENT 120002096

Check that the window glass moves smoothly and touches the glass runchannel firmly when it is fully raised and fully lowered. If the window glass doesn't move properly, adjust by the following procedure.

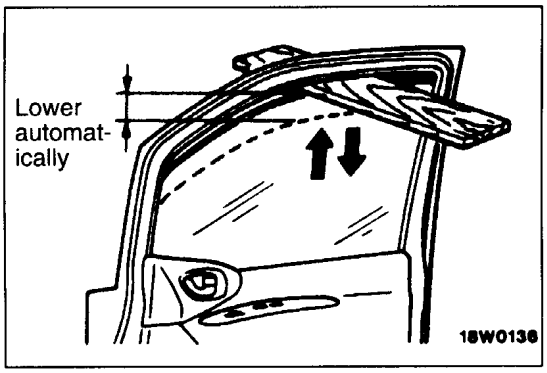
(1) Remove the door trim and waterproof film. (Refer to P.42-38.)
(2) Raise the window glass, loosen the channel guide mounting bolts and adjust the vertical tilt of the glass.

SASH SPAN INSPECTION 120002097

If the window glass automatically starts moving downwards at the wrong time while it is being raised, check the sash span.

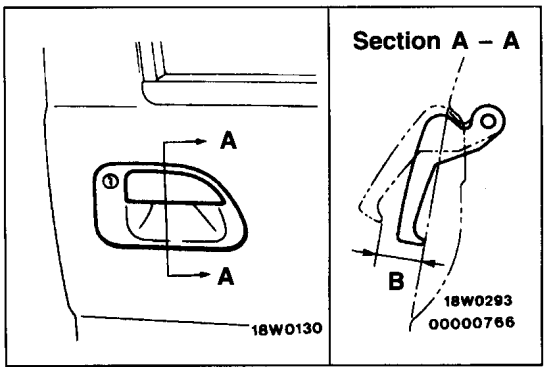
(1) Remove the door trim and waterproof film. (Refer to P.42-38.)
(2) Remove the runchannel and measure the shortest distance between the front and rear sashes. If the distance is not within the standard value, replace the door assembly.

NOTE
The sash span cannot be adjusted.



POWER WINDOW SAFETY MECHANISM INSPECTION 120002098

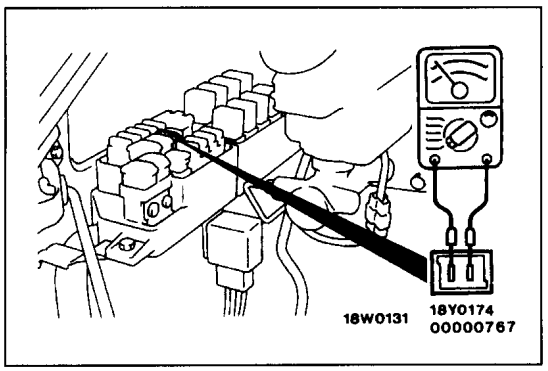
1. Place a wooden board with a thickness of approximately 20 mm as shown in the illustration, and then raise the window glass.
2. Check that the window lowers automatically when the window clamps the wooden board. If this doesn't happen, refer to "Troubleshooting" (P.42-29).



DOOR OUTSIDE HANDLE PLAY INSPECTION 120002099

1. Check that the door outside handle play is within the standard value range.

   Standard value (B): 6–13 mm
2. If the door outside handle play is not within the standard value range, check the door outside handle or the door latch assembly. Replace, if necessary.



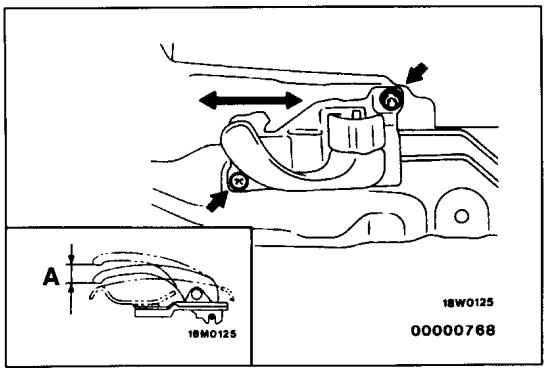
POWER WINDOW OPERATION CURRENT INSPECTION 120002100

1. Remove the fuse for the power window and connect an ammeter as shown in the illustration.
2. A larger current flows when the window starts or finishes rising. So measure the operation current in the interval between these two points.

   Standard value: 8 A or less (at 20°C)
3. If the operation current is not within the standard value, refer to "Troubleshooting" (P.42-29).

CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR) INSPECTION 120002101

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 window glass starts to move downwards within 60 seconds.



DOOR INSIDE HANDLE PLAY INSPECTION AND ADJUSTMENT 120002102

1. Check the door inside handle play.

   Standard value (A): 0–14 mm
2. If the play is not within the standard value range, remove the door trim (refer to P.42-38) and loosen the inside handle mounting screws.
3. Move the inside handle back and forth to adjust the play.

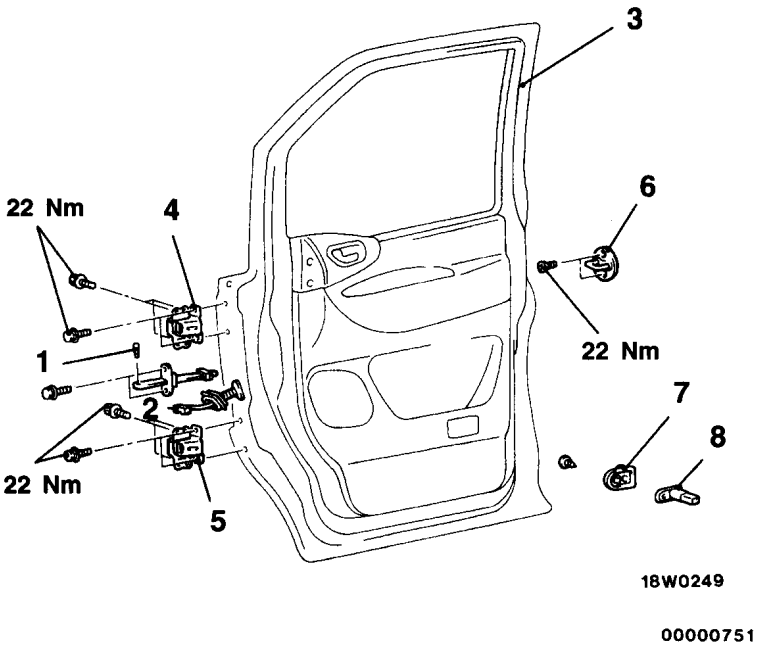
FRONT DOOR ASSEMBLY

120000449

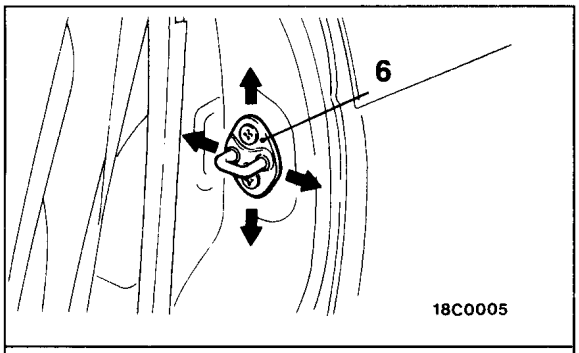
REMOVAL AND INSTALLATION

Pre-removal Operation
- Cowl Side Trim Removal (Refer to GROUP 52A – Trims.)

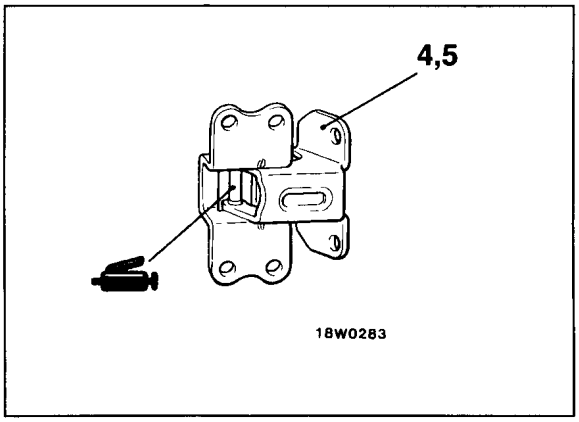
Post-installation Operation
- Cowl Side Trim Installation (Refer to GROUP 52A – Trims.)
- Door Adjustment (Refer to P.42-34.)



00000751



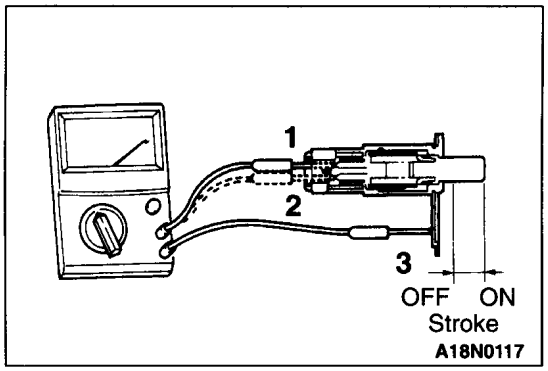
Adjustment of the door stepping and the door latch linkage

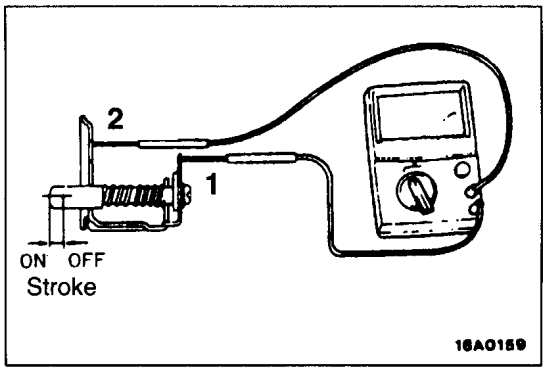


Front door assembly removal steps
1. Spring pin
2. Harness connector
3. Front door assembly
4. Front door upper hinge
5. Front door lower hinge

Striker removal
6. Striker

Door switch removal steps
7. Door switch cap
8. Door switch





INSPECTION

DOOR SWITCH CONTINUITY INSPECTION

Driver's door switch

Switch position	Terminal No.		
	1	2	3
Open (ON)	○	○	○
Depressed (OFF)			

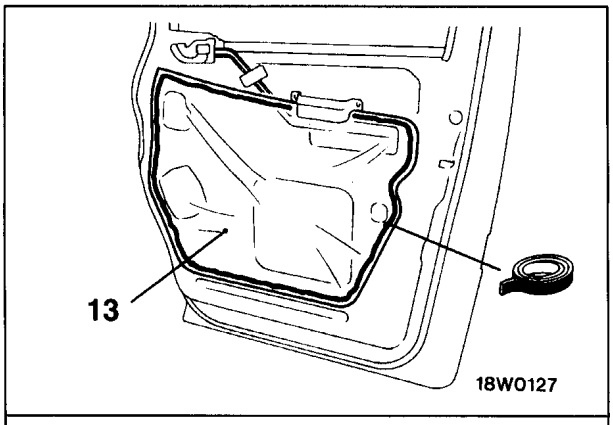
Passenger's door switch

Switch position	Terminal No.	
	1	2
Open (ON)	○	○
Depressed (OFF)		

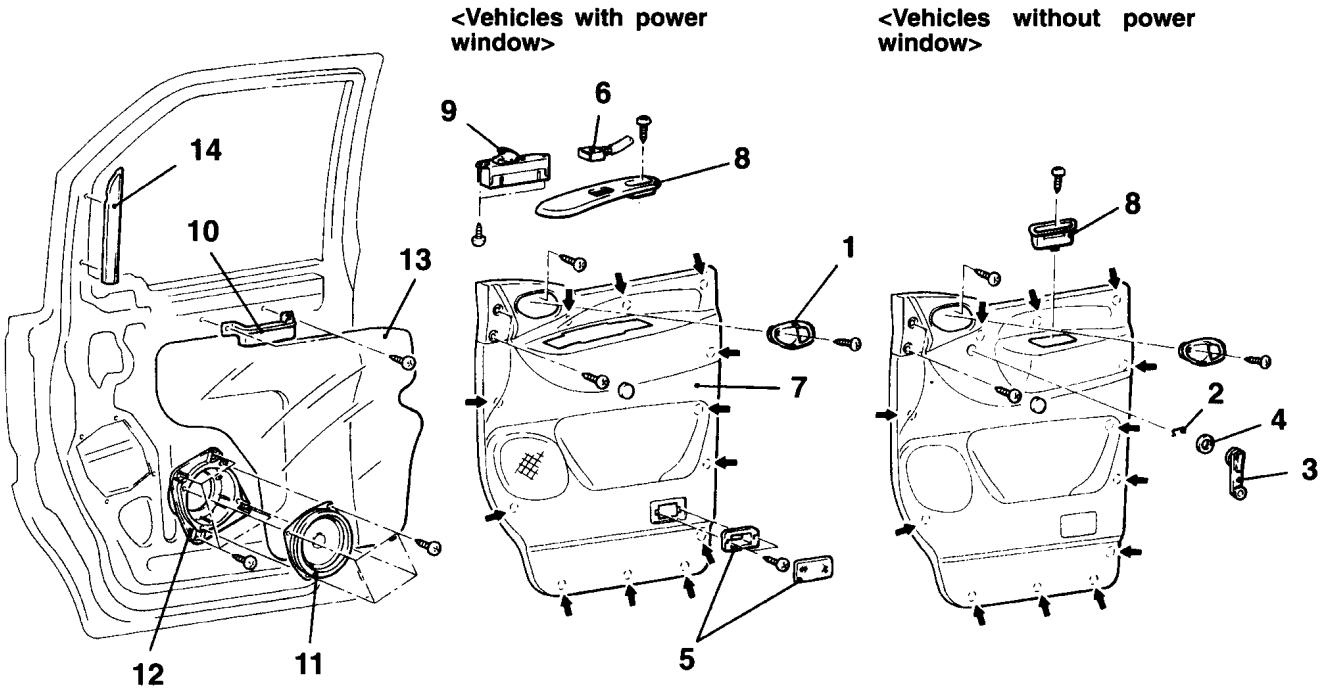
FRONT DOOR TRIM AND WATERPROOF FILM

120000450

REMOVAL AND INSTALLATION



Sealant: 3M ATD Part No. 8625 or equivalent

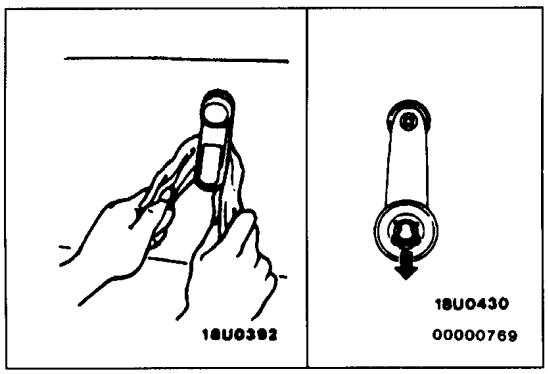


00000752

Removal steps

◀A▶ 1. Door inside handle cover
2. Clip
▶A◀ 3. Regulator handle
4. Escutcheon
5. Door courtesy lamp
6. Harness connector
7. Front door trim
8. Pull handle box
9. Power window switch
10. Pull handle bracket
11. Speaker
12. Speaker cover
13. Waterproof film
14. Sash trim

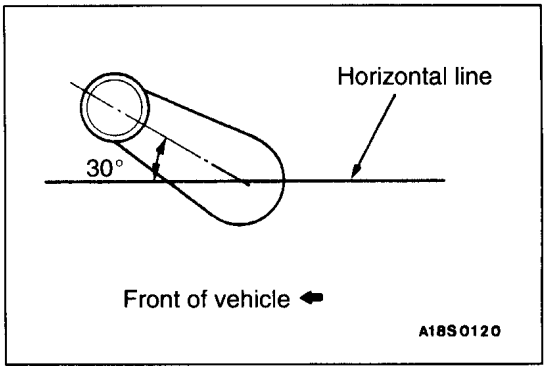
NOTE
The ⬅ mark indicates the resin clip position.



REMOVAL SERVICE POINT

◀A▶ CLIP REMOVAL

Remove the clip by using a rag, and then remove the regulator handle.



INSTALLATION SERVICE POINT

▶A◀ REGULATOR HANDLE INSTALLATION

1. Install the escutcheon and the clip to the regulator handle.
2. Fully close the window glass, and install the regulator handle so that it faces as shown in the illustration.

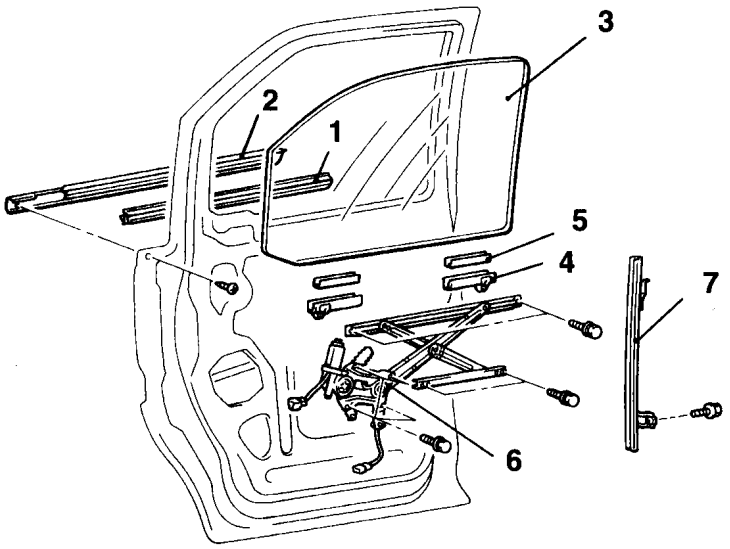
DOOR GLASS AND REGULATOR

120000451

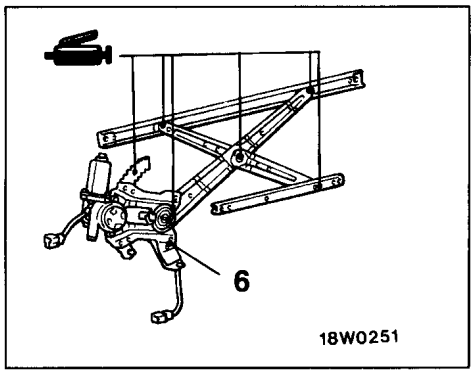
REMOVAL AND INSTALLATION

Pre-removal Operation
- Front Door Trim and Waterproof Film Removal (Refer to P.42-38.)

Post-installation Operation
- Front Door Window Glass Adjustment (Refer to P.42-34.)
- Front Door Trim and Waterproof Film Installation (Refer to P.42-38.)



18W0248

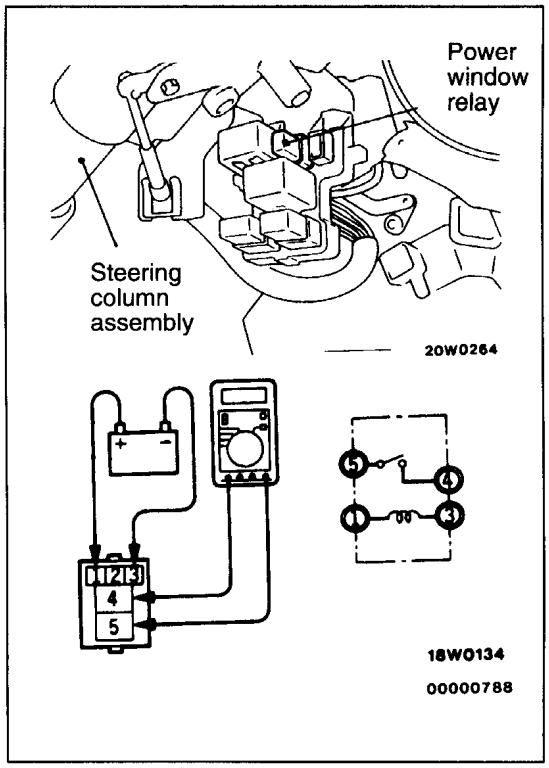


18W0251

00000753

Removal steps

1. Front door beltline inner weatherstrip
2. Front door beltline outer weatherstrip
▶B◀ 3. Front door window glass
4. Glass holder
5. Glass pad
6. Window regulator assembly
▶A◀ 7. Rear lower sash



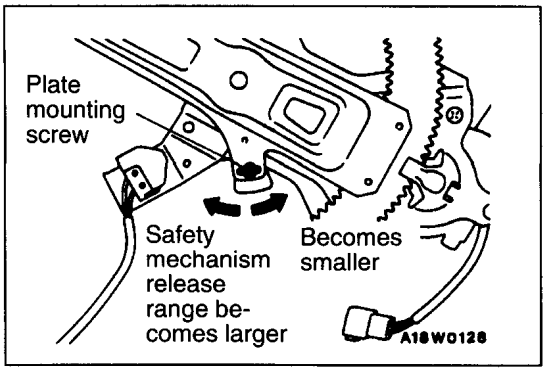
INSPECTION

POWER WINDOW RELAY CONTINUITY INSPECTION

System voltage	Terminal No.			
	1	3	4	5
Not applied	○	○		
Applied	⊕	⊖	○	○

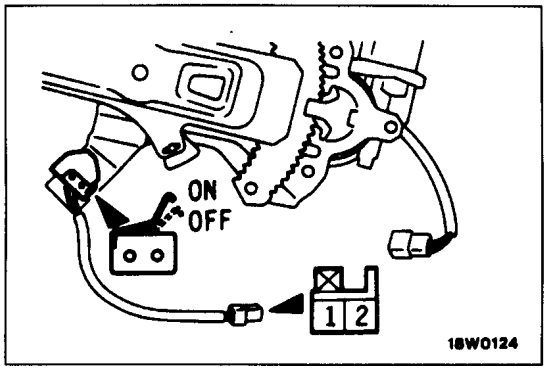
POWER WINDOW MOTOR INSPECTION

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.
3. Replace the window regulator assembly if necessary.



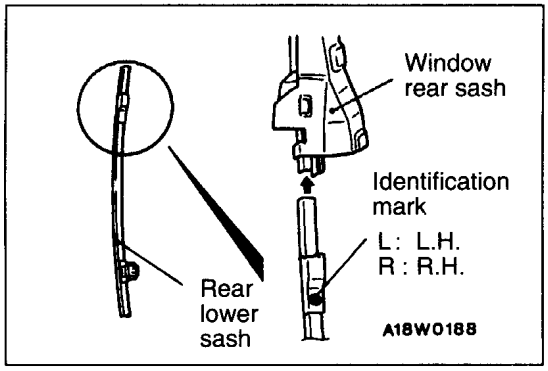
LIMIT SWITCH OPERATION POSITION ADJUSTMENT

Loosen the plate mounting screw and move the plate to the left or right to adjust where the limit switch starts working (safety mechanism stops working).



LIMIT SWITCH CONTINUITY INSPECTION

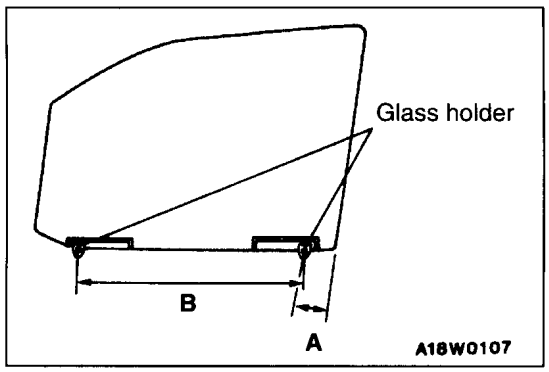
Switch position	Terminal No.	
	1	2
ON	○	○
OFF		



INSTALLATION SERVICE POINTS

▶A◀ REAR LOWER SASH INSTALLATION

1. Check the identification mark on the rear lower sash.
2. Insert the rear lower sash into the window rear sash.



▶B◀ FRONT DOOR WINDOW GLASS INSTALLATION

Install the glass pad and the glass holders to the window glass as shown in the illustration.

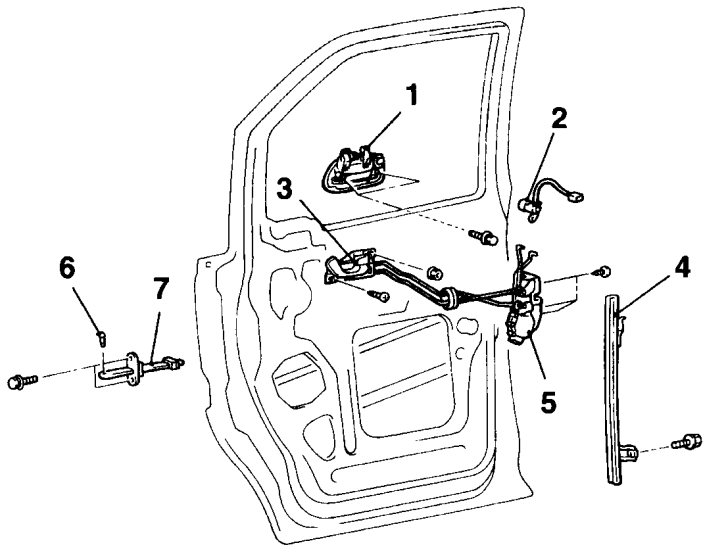
Standard valve: (A) 80.5–82.0mm
(B) 573.5–576.5mm

FRONT DOOR HANDLE AND LATCH

120000452

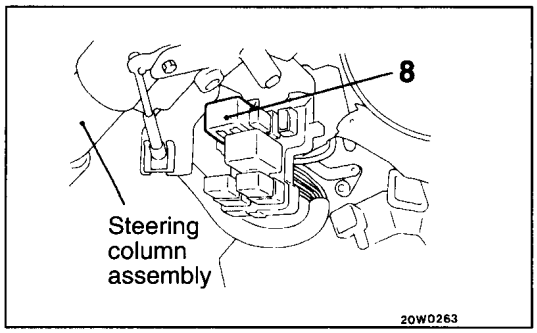
REMOVAL AND INSTALLATION

Post-installation Operation
- Door Outside Handle Play Inspection (Refer to P.42-35.)
- Door Inside Handle Play Inspection and Adjustment (Refer to P.42-35.)

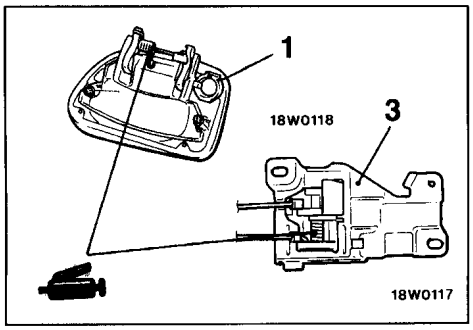


18W0250

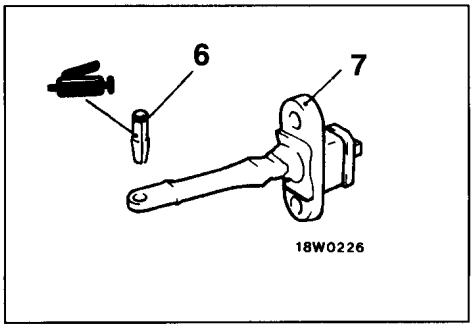
00000754



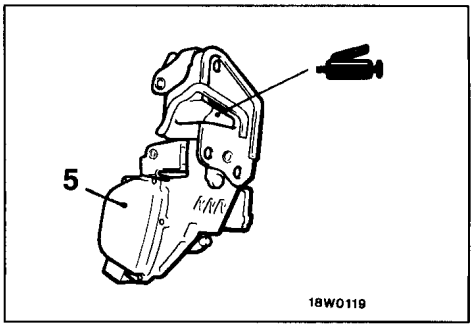
20W0263



18W0117



18W0226



18W0119

Front door outside handle and lock key cylinder removal
- Front door trim and waterproof film (Refer to P.42-38.)

1. Front door outside handle
2. Front door lock key cylinder

Front door inside handle and front door latch removal
- Front door trim and waterproof film (Refer to P.42-38.)

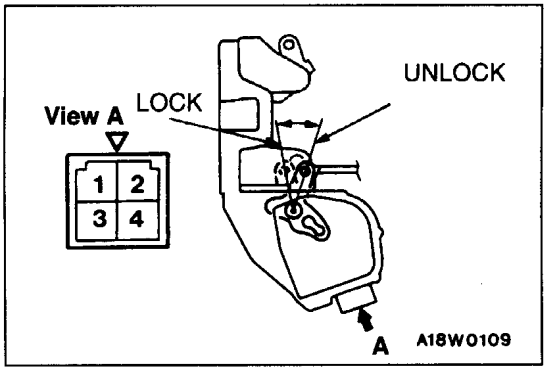
3. Front door inside handle
▶B◀ 4. Rear lower sash
5. Front door latch assembly

Door check removal
- Front door trim and waterproof film (Refer to P.42-38.)

6. Spring pin
▶A◀ 7. Door check

Door lock control unit removal

8. Door lock control unit



INSPECTION

FRONT DOOR LOCK ACTUATOR INSPECTION <Driver's side>

L.H. drive vehicles

Lock position	Terminal No.				Rod movement
	1	2	3	4	
LOCK			⊕	⊖	LOCK→UNLOCK
UNLOCK			⊖	⊕	UNLOCK→LOCK
LOCK					
UNLOCK	○	○			

R.H. drive vehicles

Lock position	Terminal No.				Rod movement
	1	2	3	4	
LOCK			⊖	⊕	LOCK→UNLOCK
UNLOCK			⊕	⊖	UNLOCK→LOCK
LOCK					
UNLOCK	○	○			

<Passenger's side>

L.H. drive vehicles

Lock position	Terminal No.		Rod movement
	3	4	
LOCK	⊖	⊕	LOCK→UNLOCK
UNLOCK	⊕	⊖	UNLOCK→LOCK

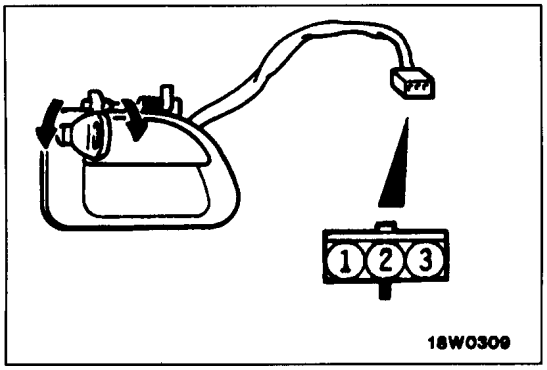
R.H. drive vehicles

Lock position	Terminal No.		Rod movement
	3	4	
LOCK	⊕	⊖	LOCK→UNLOCK
UNLOCK	⊖	⊕	UNLOCK→LOCK

FRONT DOOR LOCK KEY CYLINDER SWITCH CONTINUITY INSPECTION

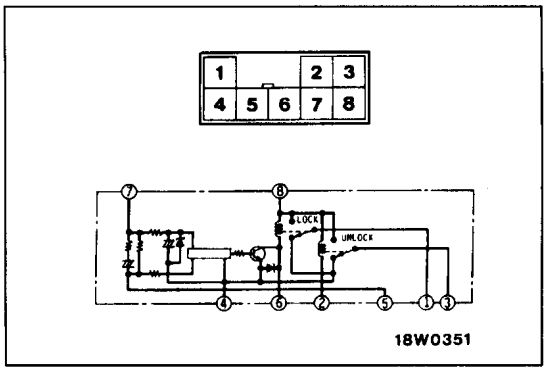
<L.H. drive vehicles – Passenger's side>

Switch position	Terminal No.		
	1	2	3
LOCK	○	○	
OFF			
UNLOCK		○	○



<R.H. drive vehicles – Passenger's side>

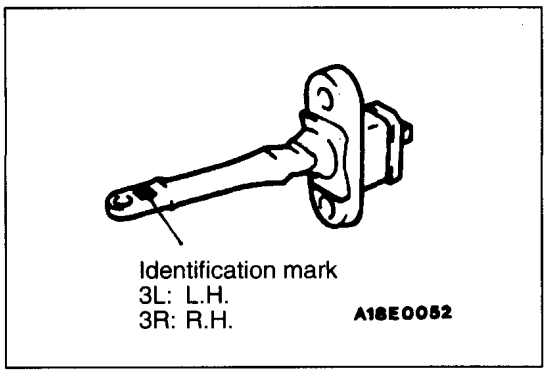
Switch position	Terminal No.		
	1	2	3
LOCK		○	○
OFF			
UNLOCK	○	○	



DOOR LOCK CONTROL UNIT INSPECTION

1. Apply system voltage to terminals (7) and (8), and connect terminal (4) to earth.
2. Measure the voltage under the following conditions.

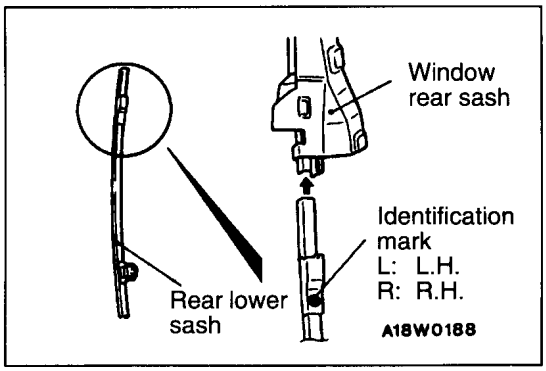
Measurement conditions	Terminal No.	
	1	2
Terminal (6) earthed	System voltage	0V
Terminal (2) earthed	0V	System voltage
Terminal (5) earthed	0V	System voltage



INSTALLATION SERVICE POINTS

▶A◀ DOOR CHECK INSTALLATION

Install the door check so that the identification mark is facing upwards.



▶B◀ REAR LOWER SASH INSTALLATION

1. Check the identification mark on the rear lower sash.
2. Insert the rear lower sash into the window rear sash.

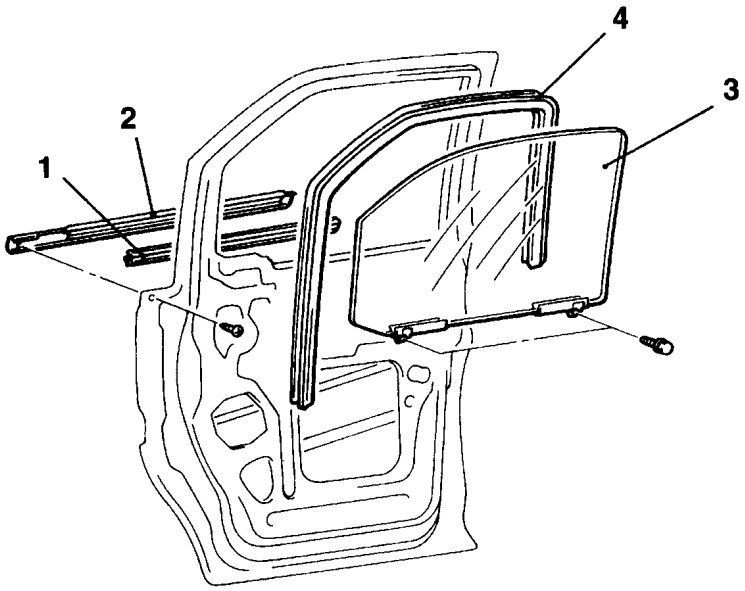
FRONT DOOR RUNCHANNEL

120000453

REMOVAL AND INSTALLATION

Pre-removal Operation
- Front Door Trim and Waterproof Film Removal (Refer to P.42-38.)

Post-installation Operation
- Door Window Glass Adjustment (Refer to P.42-34.)
- Front Door Trim and Waterproof Film Installation (Refer to P.42-38.)



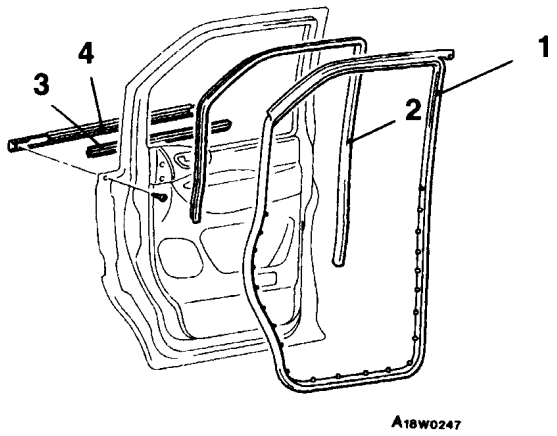
A18W0246

Removal steps
1. Front door beltline inner weatherstrip
2. Front door beltline outer weatherstrip
3. Front door window glass
4. Front door window runchannel

FRONT DOOR WEATHERSTRIP

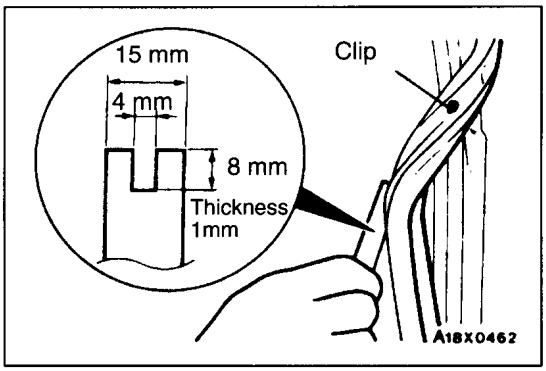
120002231

REMOVAL AND INSTALLATION



Removal steps

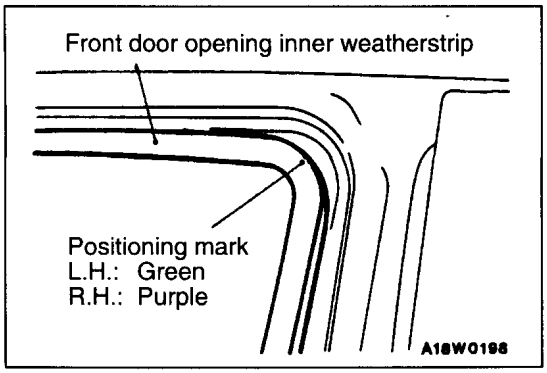
◀A▶ ▶B◀ 1. Front door opening outer weatherstrip
▶A◀ 2. Front door opening inner weatherstrip
3. Front door beltline inner weatherstrip
4. Front door beltline outer weatherstrip



REMOVAL SERVICE POINT

◀A▶ FRONT DOOR OPENING OUTER WEATHERSTRIP REMOVAL

Make a tool as shown in the illustration to remove the door opening weatherstrip.



INSTALLATION SERVICE POINTS

▶A◀ FRONT DOOR OPENING INNER WEATHERSTRIP INSTALLATION

Check the identification colours at left and right, and then install the weatherstrip so that the positioning marks are aligned.

▶B◀ FRONT DOOR OPENING OUTER WEATHERSTRIP INSTALLATION

The left and right ends of the weatherstrip can be identified by the colours of the clips.

Item	Identification colour
L.H.	White
R.H.	Brown

SLIDE DOOR

120000455

SERVICE SPECIFICATIONS

Items	Standard value
Door outside handle play mm	3–6
Door inside handle play mm	4–9

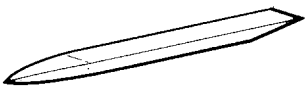
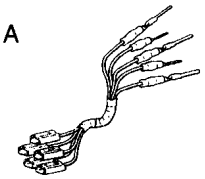
SEALANT

120000456

Items	Specified sealant	Remark
Waterproof film	3M ATD Part No. 8625 or equivalent	Ribbon sealer

SPECIAL TOOLS

120000457

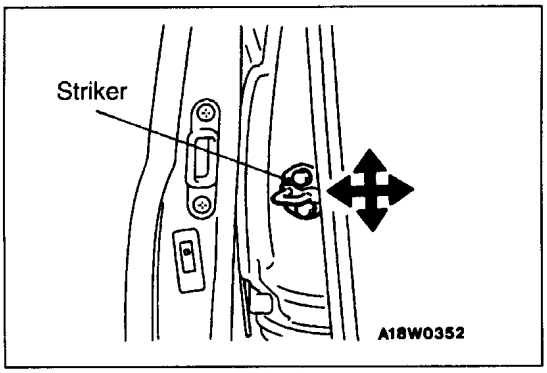
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of slide door trim
A  B C D	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection

TROUBLESHOOTING

120000458

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Reference page
Door lock mechanism does not operate.	P.42-25.

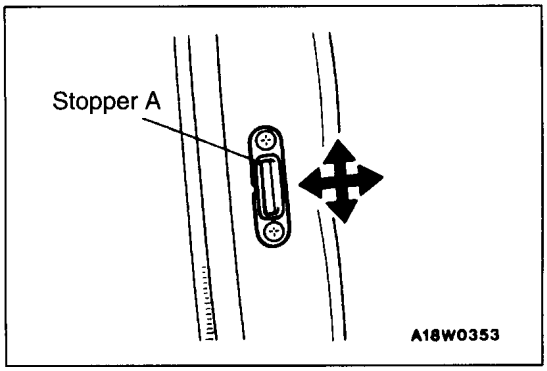


SERVICE ADJUSTMENT PROCEDURES

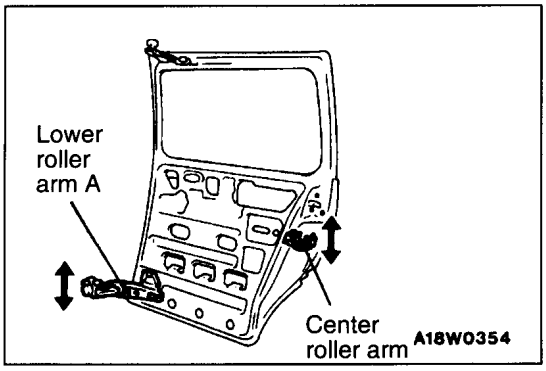
120000459

DOOR FIT ADJUSTMENT

1. If the striker and latch do not mesh properly, move the striker up and down and to the left and right.



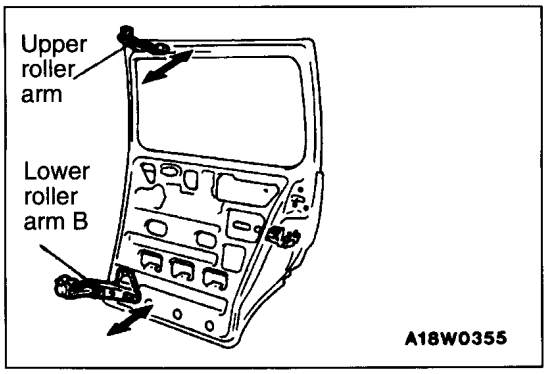
2. Check the positioning of stopper (A) when the door is closed. If it is incorrect, move the stopper (A) up and down and to the left and right.



3. If the clearance between the door and the vehicle body is not even or if the door and body are not flush when the door is closed, adjust by the following procedure.

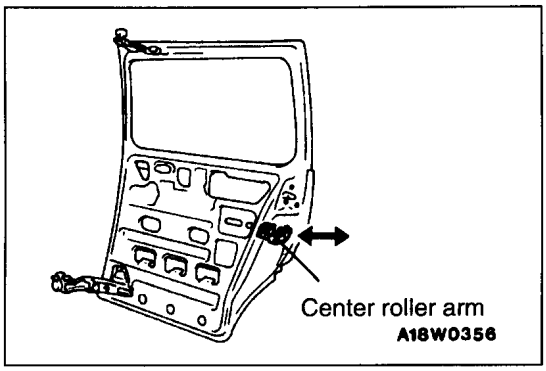
Vertical adjustment

(1) Remove the slide door trim and the weatherproof film. (Refer to P.42-53.)
(2) Loosen the center roller arm and lower roller arm A mounting bolts and move the center roller arm and lower roller arm A up or down.



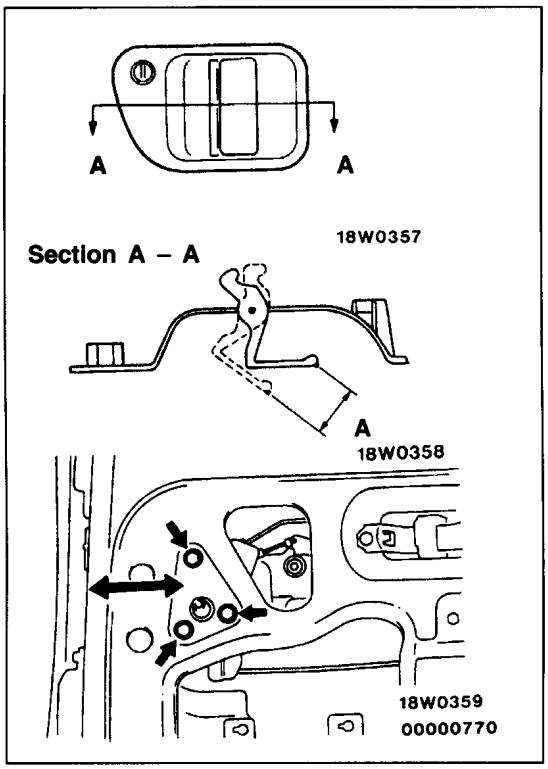
Lateral adjustment

Loosen the upper roller arm and lower roller arm B mounting bolts and move the upper roller arm and lower roller arm B to the left or right.



Forward/back adjustment

(1) Remove the slide door trim and the weatherproof film. (Refer to P.42-53.)
(2) Loosen the center roller arm mounting bolt and move the center roller arm forward or back.



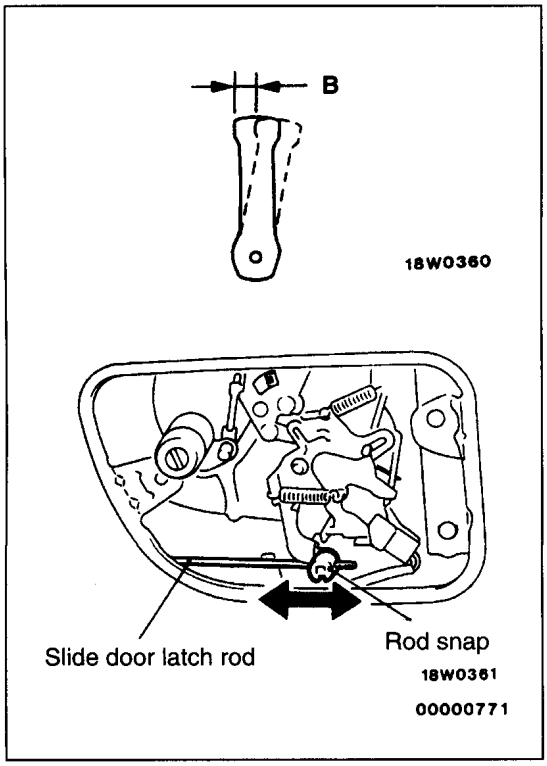
DOOR OUTSIDE HANDLE PLAY INSPECTION AND ADJUSTMENT

120002103

Standard value (A): 3–6 mm

If the play is not within the standard value, adjust by the following procedure.

(1) Remove the slide door trim and the waterproof film. (Refer to P.42-53.)
(2) Loosen the slide door link assembly mounting bolt and move the slide door link assembly forward or back.



DOOR INSIDE HANDLE PLAY INSPECTION AND ADJUSTMENT

120002104

Standard value (B): 4–9 mm

If the play is not within the standard value, adjust by the following procedure.

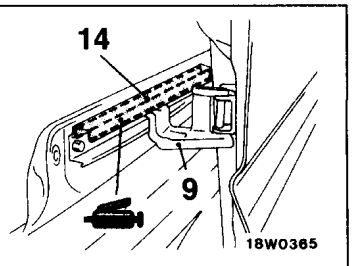
(1) Remove the slide door trim and the waterproof film. (Refer to P.42-53.)
(2) Remove the slide door outside handle.
(3) Move the slide door latch rod forward or back.

SLIDE DOOR ASSEMBLY

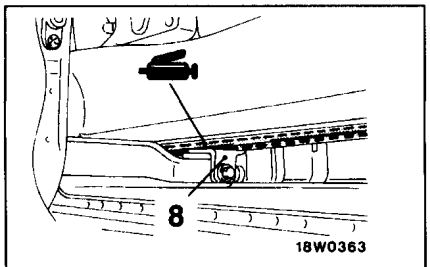
120000460

REMOVAL AND INSTALLATION

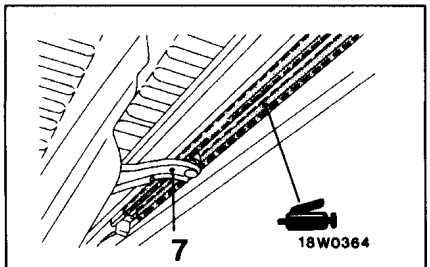
Post-installation Operation
- Door Adjustment (Refer to P.42-49.)



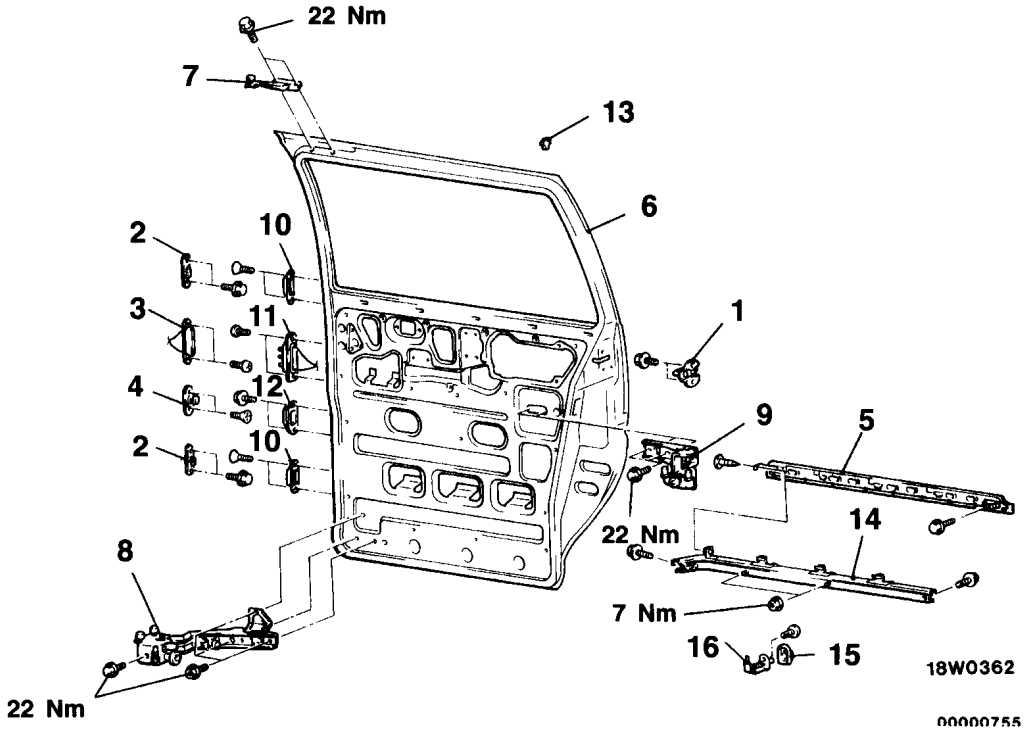
Sliding surface between center roller arm and center rail



Sliding surface between body and roller



Sliding surface between body and roller



1. Striker
▶A◀ 2. Stopper (A)
3. Contact switch (A)
4. Slide door front hook

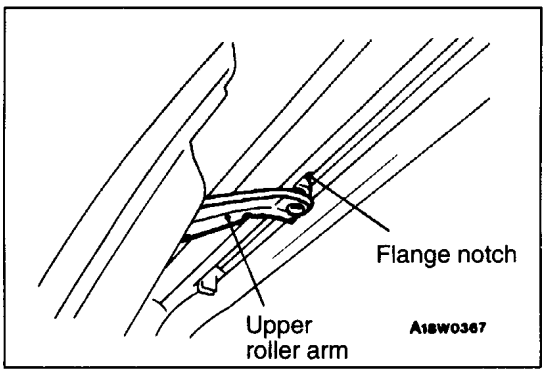
Slide door assembly removal steps

5. Slide door center rail cover
◀A▶ 6. Slide door assembly
7. Upper roller arm
8. Lower roller arm
9. Center roller arm
▶A◀ 10. Stopper (B)
- Slide door trim (Refer to P.42-53.)

11. Contact switch (B)
12. Slide door front catch
13. Open upper stopper
14. Slide door center rail

Door switch removal steps

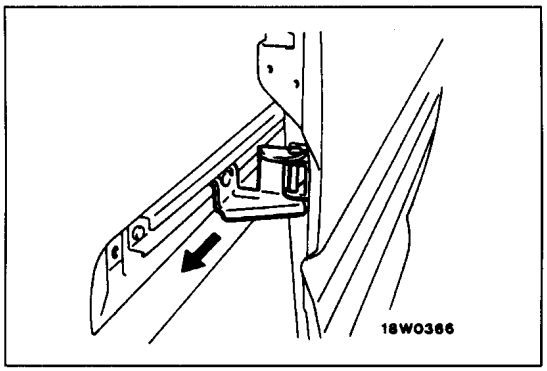
15. Door switch cap
16. Door switch



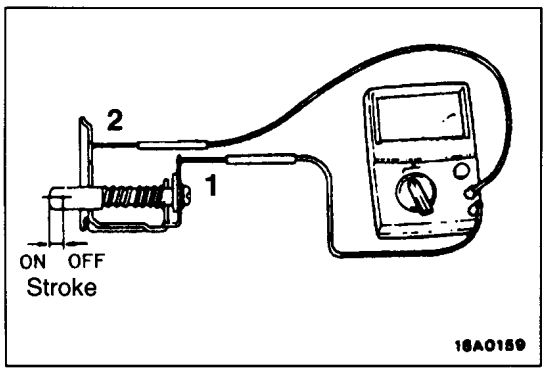
REMOVAL SERVICE POINT

◀A▶ SLIDE DOOR ASSEMBLY REMOVAL

1. Remove the upper roller arm from the flange notch at the rear edge of the upper rail.



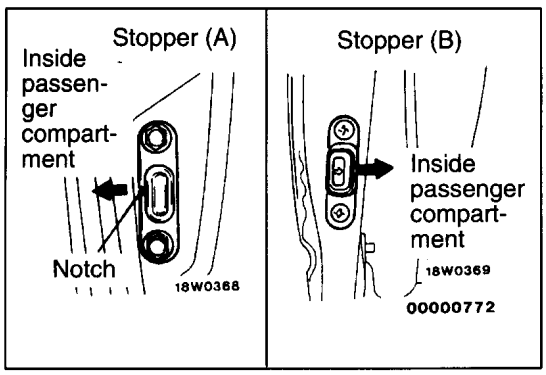
2. Move the slide door assembly to the rear, and then remove the center roller arm from the center rail.



INSPECTION

DOOR SWITCH CONTINUITY INSPECTION

Switch position	Terminal No.	
	1	2
Open (ON)	○	○
Depressed (OFF)		



INSTALLATION SERVICE POINT

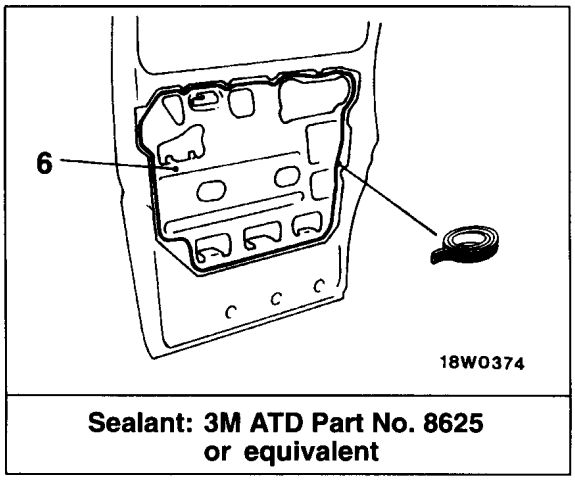
▶A◀ STOPPER (B), (A) INSTALLATION

Install stopper (A) and stopper (B) so that the notch and arrow respectively face inside the passenger compartment.

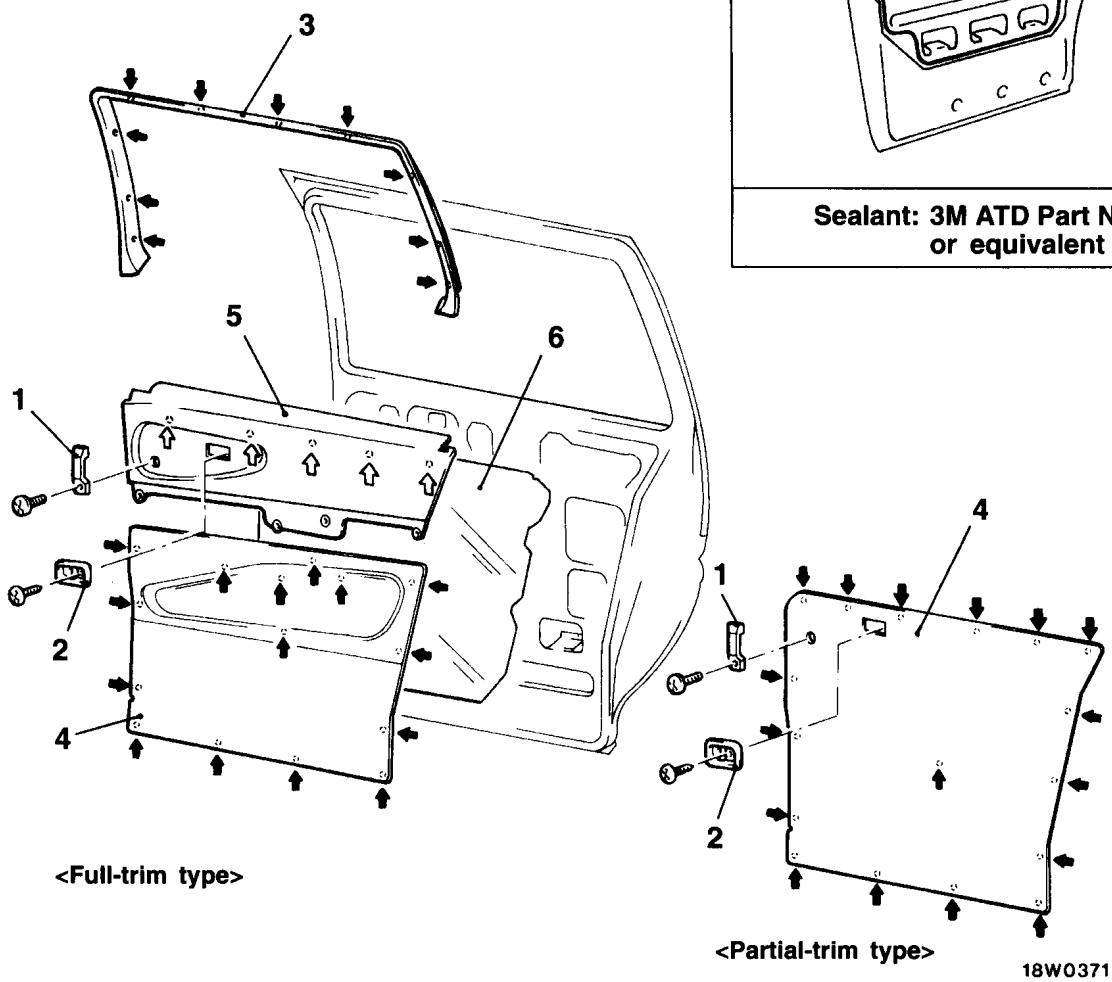
SLIDE DOOR TRIM AND WATERPROOF FILM

120000461

REMOVAL AND INSTALLATION



Sealant: 3M ATD Part No. 8625 or equivalent



<Full-trim type>

<Partial-trim type>

18W0371

00000756

NOTE
(1)The ⬅ mark indicates the resin clip position.
(2)The ⇦ mark indicates the sheet metal clip position.

Removal steps

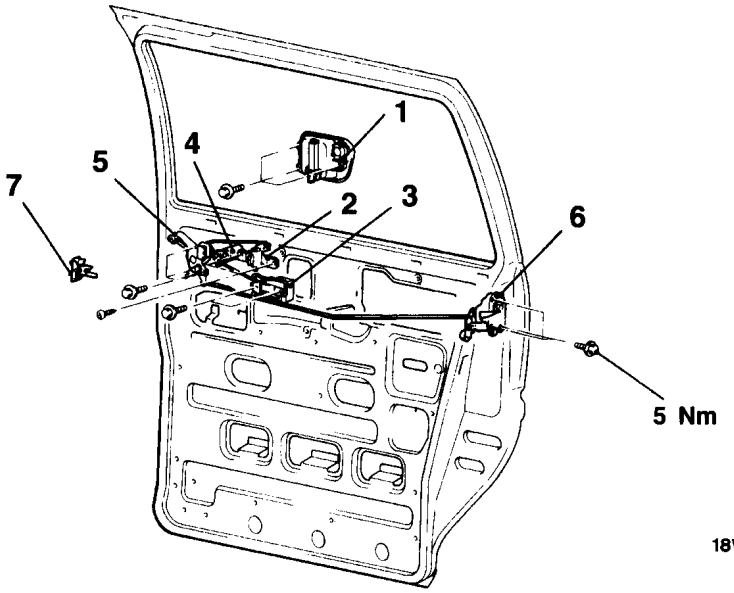
1. Slide door inside handle
2. Inside lock cover
3. Slide door sash trim
4. Slide door trim
5. Slide door upper trim
6. Waterproof film

SLIDE DOOR HANDLE AND LATCH

120000462

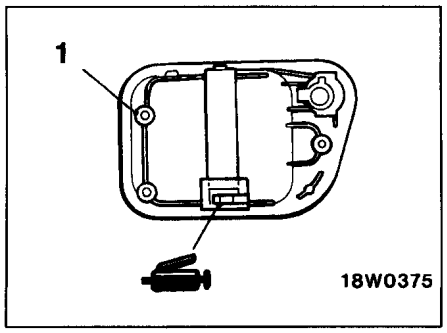
REMOVAL AND INSTALLATION

Post-Installation Operation
- Door Outside Handle Play Inspection and Adjustment (Refer to P.42-50.)
- Door Inside Handle Play Inspection and Adjustment (Refer to P.42-50.)

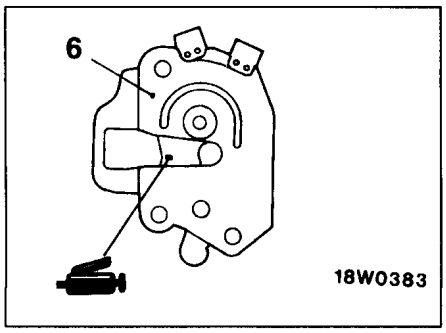


18W0388

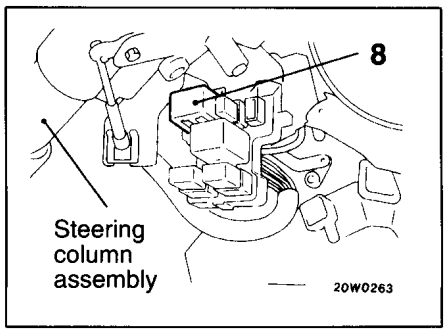
00000757



18W0375



18W0383



20W0263

Slide door outside handle removal steps
- Slide door inside handle, slide door trim, waterproof film (Refer to P.42-53.)

1. Slide door outside handle

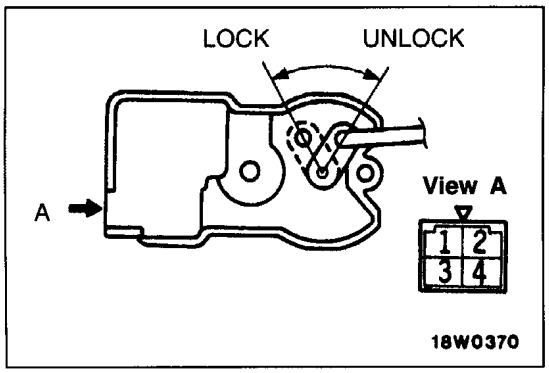
Slide door latch removal steps
- Slide door inside handle, slide door trim, waterproof film (Refer to P.42-53.)

2. Inside lock knob
3. Slide door lock actuator
4. Slide door lock key cylinder
5. Slide door link assembly
6. Slide door latch assembly

▶A◀ 7. Slide door child protection

Door lock control unit removal

8. Door lock control unit



INSPECTION

SLIDE DOOR LOCK ACTUATOR INSPECTION

<L.H. drive vehicles>

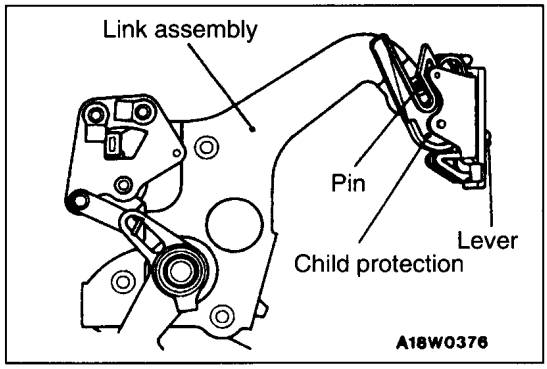
Lock position	Terminal No.				Rod movement
	1	2	3	4	
LOCK	⊖	- - - - -	⊕		LOCK→UNLOCK
UNLOCK	⊕	- - - - -	⊖		UNLOCK→LOCK

<R.H. drive vehicles>

Lock position	Terminal No.				Rod movement
	1	2	3	4	
LOCK	⊕	- - - - -	⊖		LOCK→UNLOCK
UNLOCK	⊖	- - - - -	⊕		UNLOCK→LOCK

DOOR LOCK CONTROL UNIT INSPECTION

(Refer to P.42-45.)



INSTALLATION SERVICE POINT

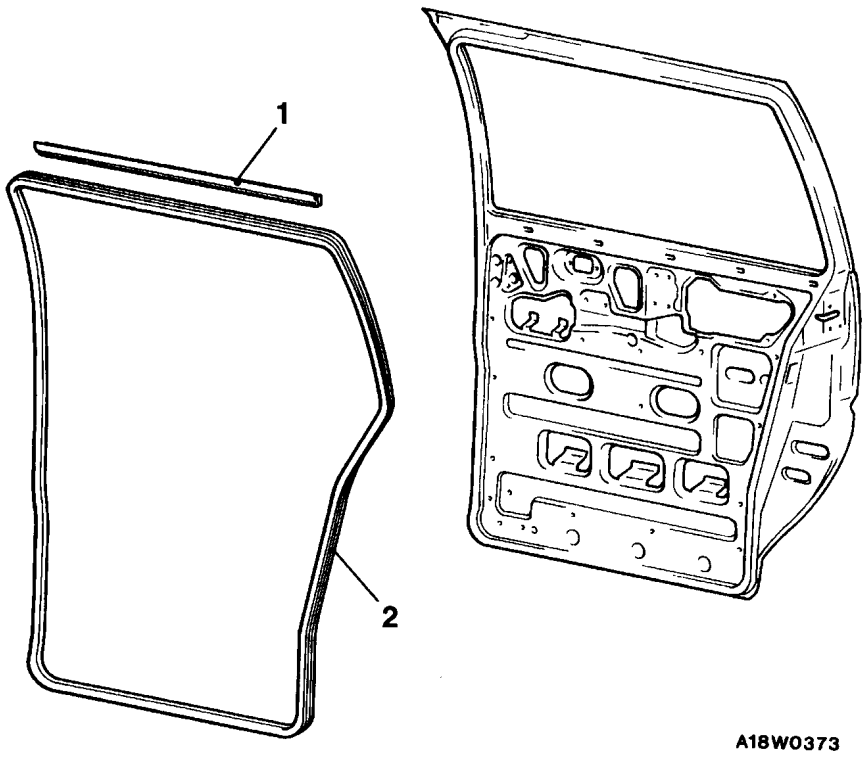
▶A◀ SLIDE DOOR CHILD PROTECTION INSTALLATION

1. Lock the child protection lock lever.
2. Insert the link assembly pin into the child protection lock lever, and then install the child protection lock to the door.

SLIDE DOOR WEATHERSTRIP

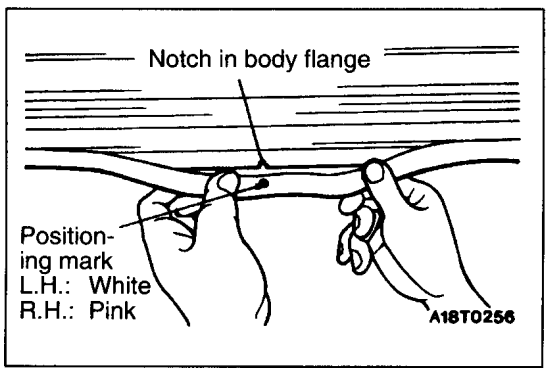
120000463

REMOVAL AND INSTALLATION



Removal steps

▶A◀ 1. Slide door opening outer weatherstrip
2. Slide door opening upper weatherstrip



INSTALLATION SERVICE POINT

▶A◀ SLIDE DOOR OPENING OUTER WEATHERSTRIP INSTALLATION

Check the identification colours at left and right . Then align the weatherstrip positioning mark with the notch in the body flange to install the weatherstrip.

TAILGATE

120000464

SERVICE SPECIFICATION

Items	Standard value
Tailgate handle play mm	2–3

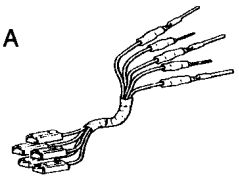
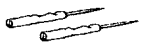
SEALANT

120000465

Items	Specified sealant	Remark
Waterproof film	3M ATD Part No. 8625 or equivalent	Ribbon sealer

SPECIAL TOOLS

120000466

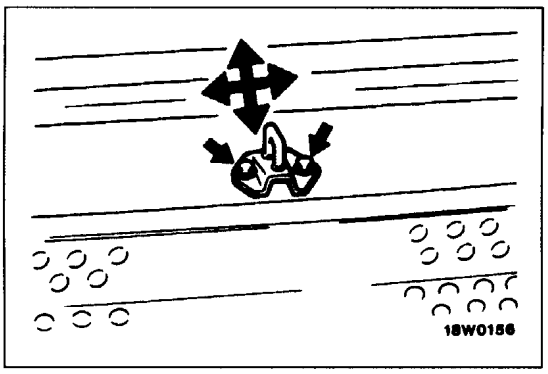
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of the tailgate trim
A  B C D 	MB991223 A: MB991219 B: MB991220 C: MB991221 D: MB991222	Harness set A: Test harness B: LED harness C: LED harness adapter D: Probe	Measurement of terminal voltage A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection

TROUBLESHOOTING

120000467

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Reference page
Door lock mechanism does not operate.	P.42-25

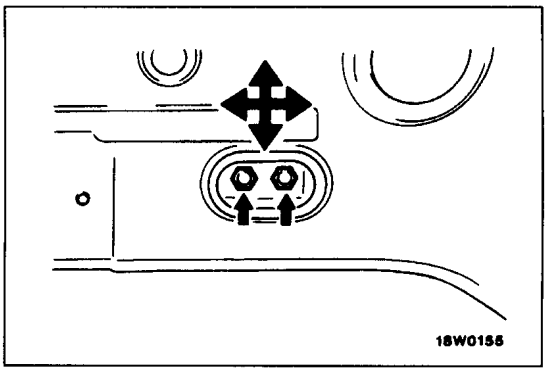


SERVICE ADJUSTMENT PROCEDURES

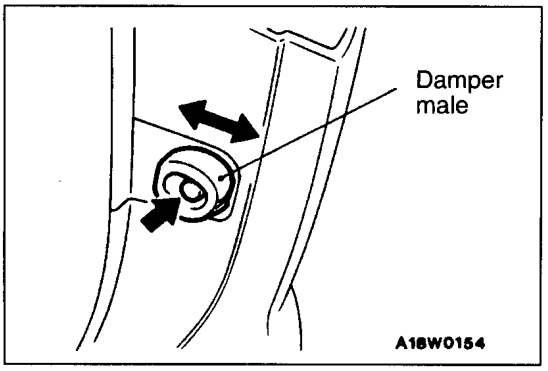
120000468

TAILGATE FIT ADJUSTMENT

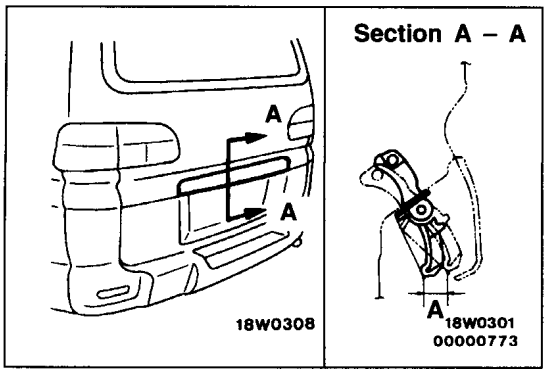
1. If the striker and latch do not mesh properly, move the striker up and down and to the left and right.



2. If the clearance around the tailgate is not even when the tailgate is closed, move the tailgate hinge forward and back or to the left and right.



3. Check the fitting of the damper male when the tailgate is closed. If the position is not correct, move the damper male forward and back.



TAILGATE HANDLE PLAY INSPECTION 120002105

1. Check the tailgate handle play.

   Standard value (A): 2–3 mm

2. If the play is not within the standard value range, check and replace the tailgate handle or the tailgate latch assembly.

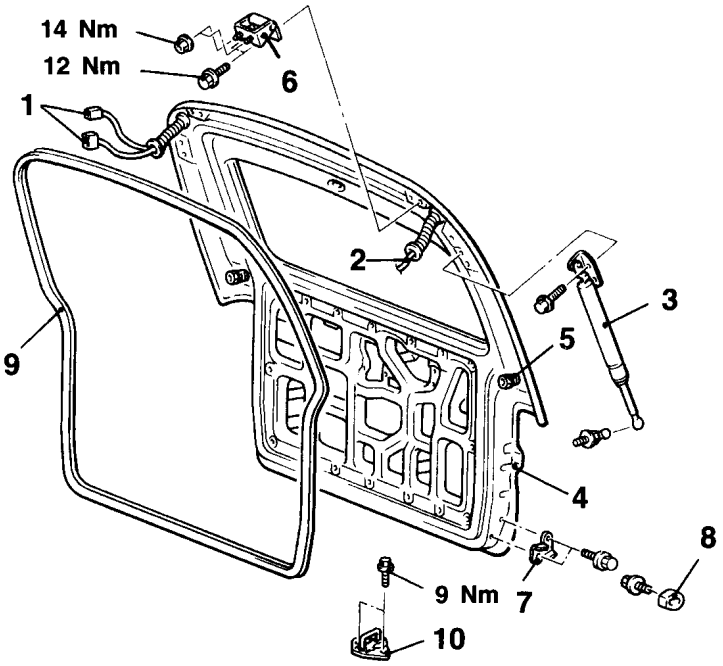
TAILGATE ASSEMBLY

120002521

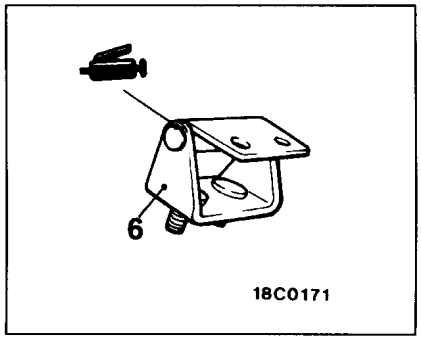
REMOVAL AND INSTALLATION

Pre-removal Operation
- Rear Headlining Removal (Refer to GROUP 52A – Headlining.)

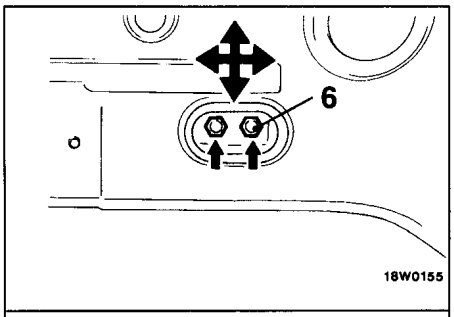
Post-installation Operation
- Rear Headlining Installation (Refer to GROUP 52A – Headlining.)
- Tailgate Fit Adjustment (Refer to P.42-58.)



18W0243

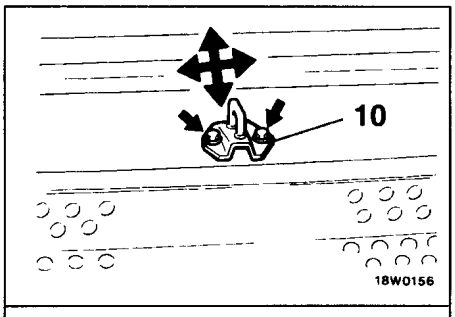


18C0171



18W0155

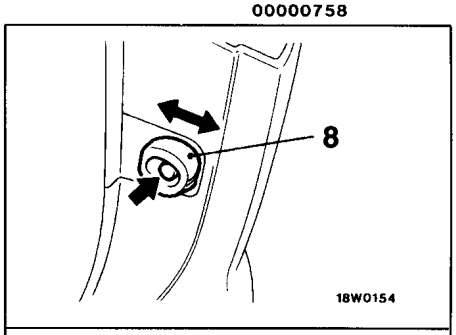
Tailgate clearance adjustment



18W0156

Tailgate height and tailgate striker meshing adjustment

00000758



18W0154

Tailgate fit adjustment

Removal steps

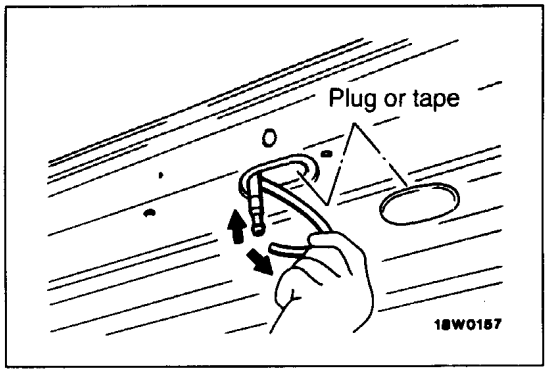
◀A▶
1. Harness connector
2. Rear window washer tube connection
3. Tailgate gas spring
4. Tailgate assembly
5. Tailgate bumper
6. Tailgate hinge
7. Damper female
8. Damper male

▶A◀
9. Tailgate opening weatherstrip

Striker removal

10. Striker

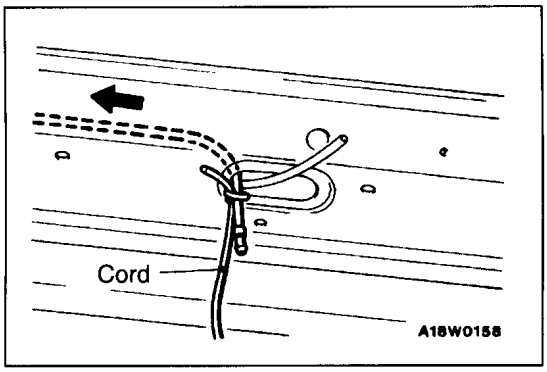
Caution
1. Do not disassemble or throw the tailgate gas spring into fire.
2. Punch a hole in the gas spring before disposal to release the gas inside.



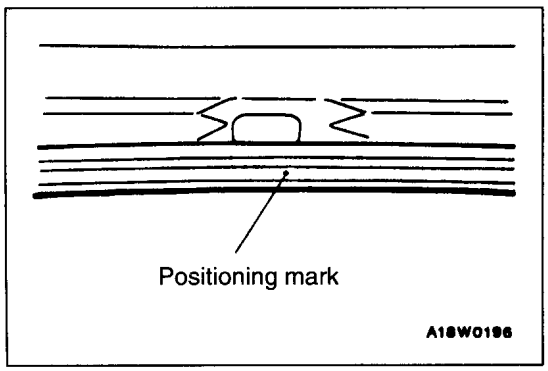
REMOVAL SERVICE POINT

◀A▶ REAR WINDOW WASHER TUBE DISCONNECTION

1. Pull the rear window washer tube through the access hole in the middle of the tailgate, and then disconnect the tube.



2. If reusing the tailgate, tie a cord to the end of the rear window washer tube for reinstallation. Then remove the rear window washer tube while letting the cord pass and stay inside the tailgate.

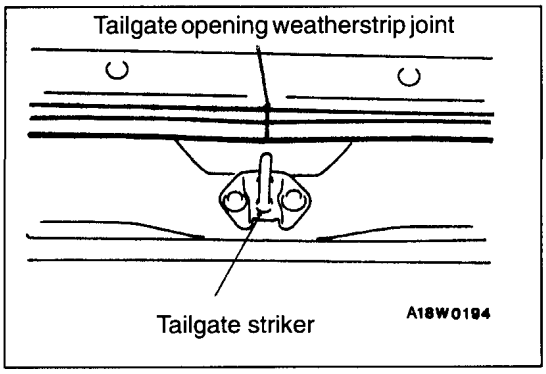


INSTALLATION SERVICE POINT

▶A◀ TAILGATE OPENING WEATHERSTRIP INSTALLATION

Check the identification colour, and then align the positioning mark with the top centre of the tailgate to install the weatherstrip.

Item	Identification colour
For high roof	Pink
For standard roof	White

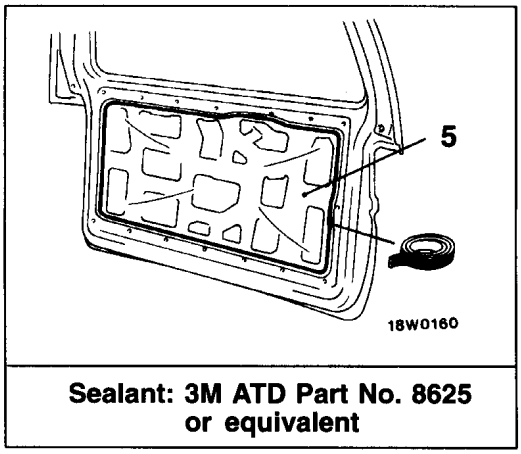


NOTE
Check that the joint of the tailgate opening weatherstrip is centred.

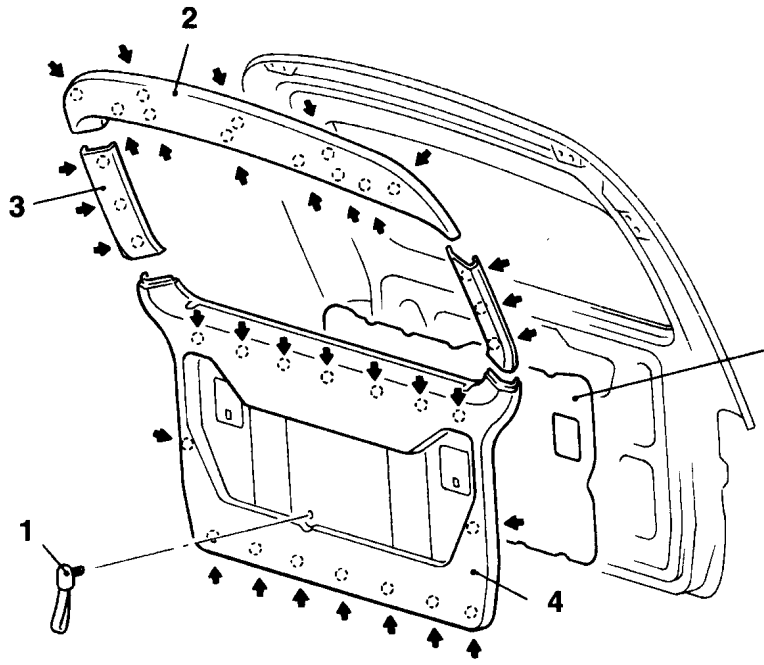
TAILGATE TRIM AND WATERPROOF FILM

120000470

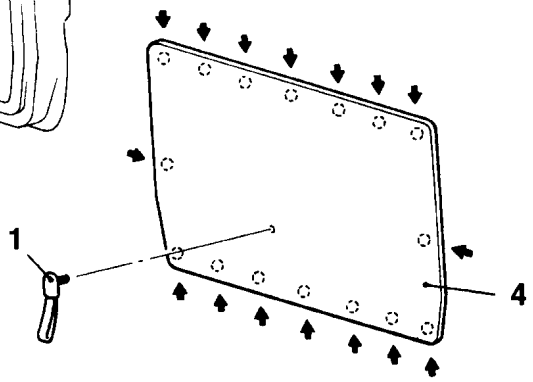
REMOVAL AND INSTALLATION



Sealant: 3M ATD Part No. 8625 or equivalent



<Full-trim type>



<Partial-trim type>

NOTE
The ⬅ mark indicates the resin clip position.

18W0244

00000759

Removal steps

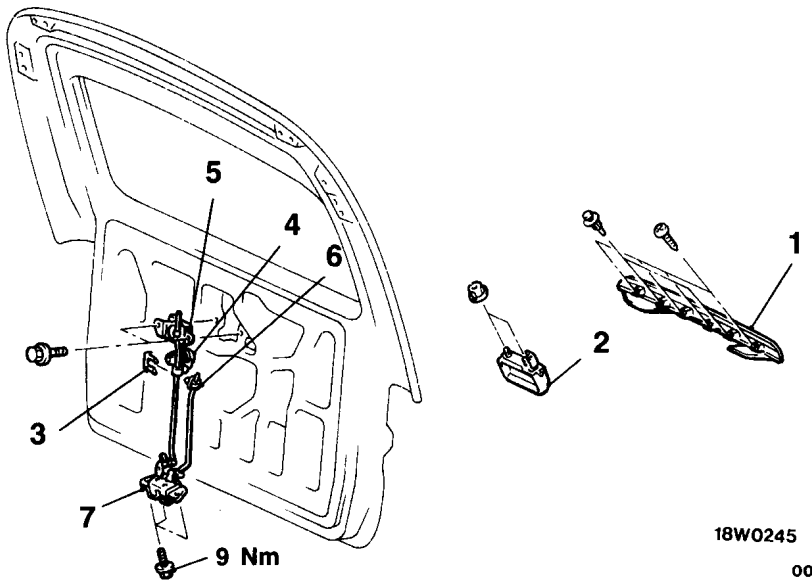
1. Pull down strap assembly
2. Tailgate upper trim
3. Tailgate upper side trim
4. Tailgate lower trim
5. Waterproof film

TAILGATE HANDLE AND LATCH

120000471

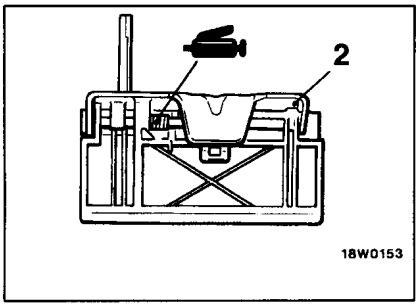
REMOVAL AND INSTALLATION

Post-installation Operation
- Tailgate Handle Play Inspection (Refer to P.42-58.)

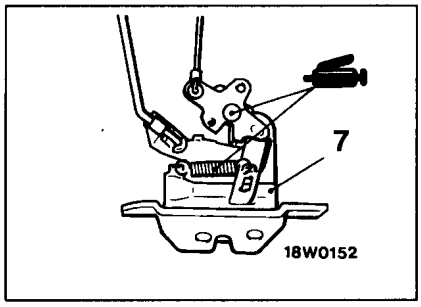


18W0245

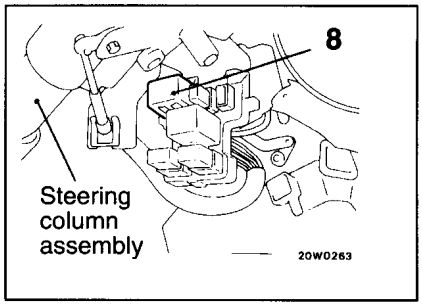
00000760



18W0153



18W0152



20W0263

Tailgate handle and latch and lock key cylinder removal
- Tailgate trim and waterproof film (Refer to P.42-61.)

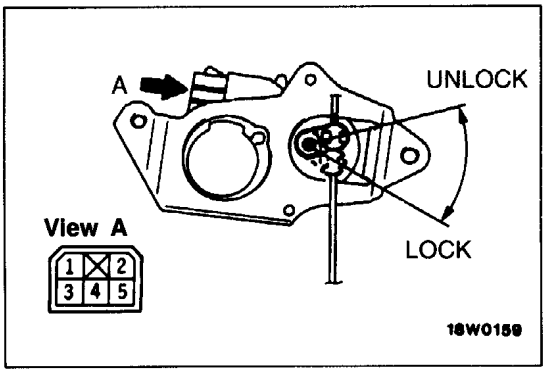
1. Tailgate garnish
2. Tailgate handle
3. Cylinder lock retainer
4. Tailgate lock key cylinder

Tailgate latch removal
- Tailgate trim and waterproof film (Refer to P.42-61.)

5. Tailgate lock actuator
6. Holder
7. Tailgate latch assembly

Door lock control unit removal

8. Door lock control unit



INSPECTION

TAILGATE LOCK ACTUATOR INSPECTION

Lock position	Terminal No.				Rod movement
	1	2	3	4	
LOCK	⊕	⊖			LOCK→UNLOCK
UNLOCK	⊖	⊕			UNLOCK→LOCK

DOOR LOCK CONTROL UNIT INSPECTION

(Refer to P.42-45.)

FRONT SUNROOF

120000472

SERVICE SPECIFICATIONS

Items	Standard value
Roof lid glass sliding resistance N	108 or less
Sunroof motor clutch slippage force N	29–59

TROUBLESHOOTING

120000473

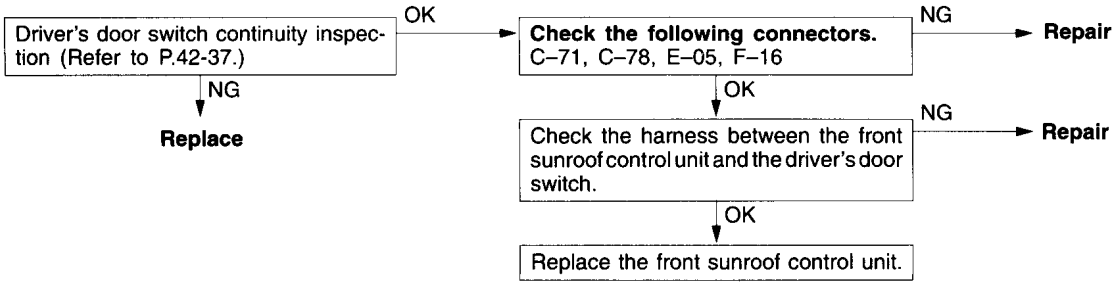
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Front sunroof does not operate within 30 seconds after driver's door is opened.	1	P.42-64
Front sunroof does not operate at all.	2	P.42-64

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

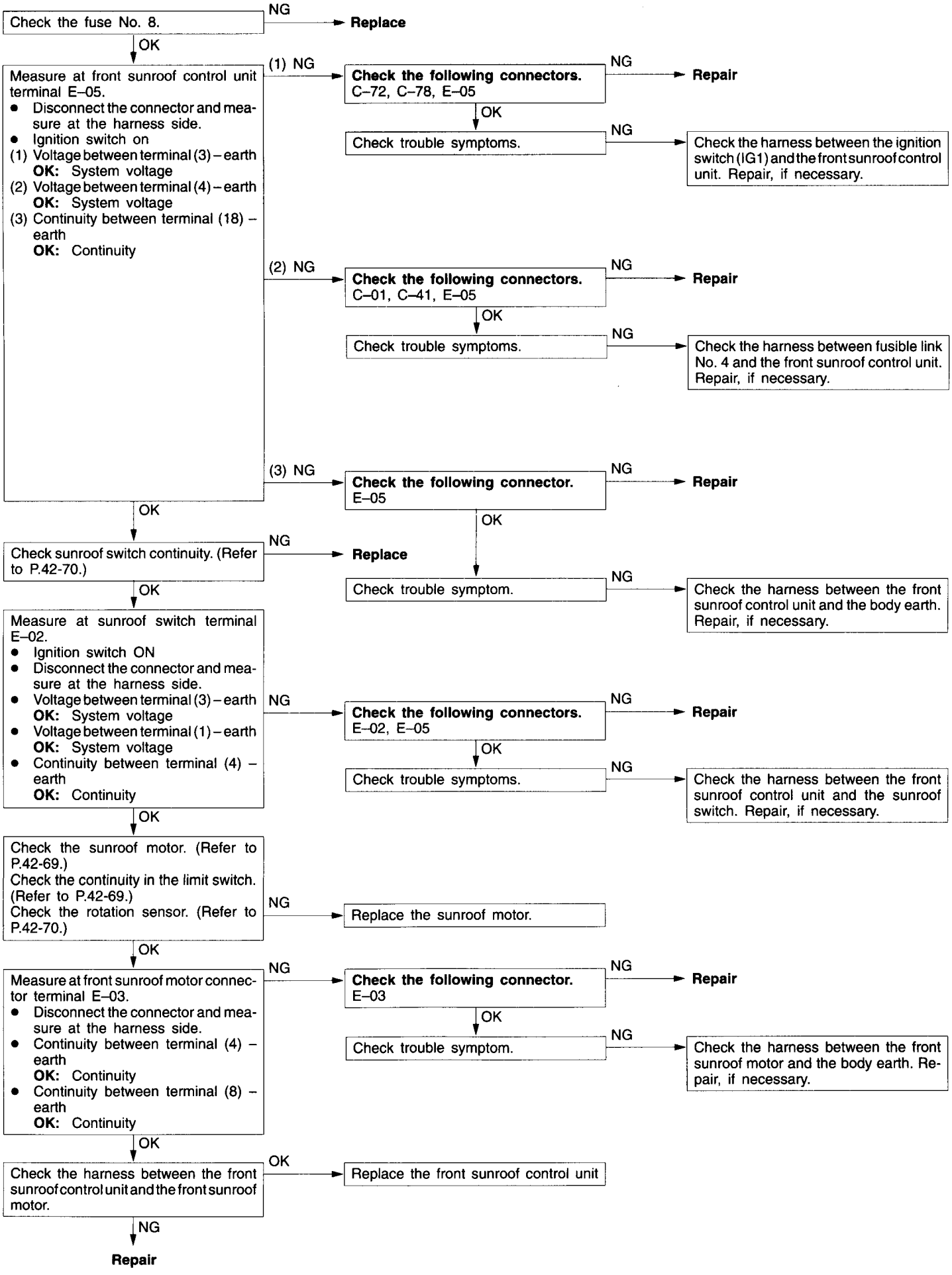
Inspection Procedure 1

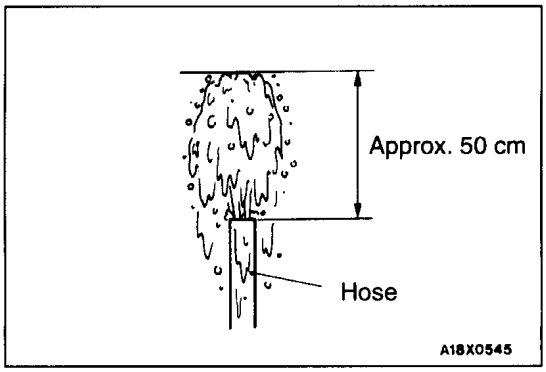
Front sunroof does not operate within 30 seconds after driver's door is opened.	**Probable cause**
[Comment] After the driver's door is opened within 30 seconds after the ignition switch is turned off, the sunroof can still be operated for a further 30 seconds. If it is impossible, the driver's door switch or the front sunroof control unit may be defective.	• Malfunction of door switch (driver's side) • Malfunction of front sunroof control unit • Malfunction of wiring harness or connector



Inspection Procedure 2

Front sunroof does not operate at all.	**Probable cause**
[Comment] One of the following items may be defective. Sunroof switch Front sunroof motor Front sunroof control unit Power supply circuit (including the fuse)	• Malfunction of sunroof switch • Malfunction of front sunroof motor • Malfunction of front sunroof control unit • Malfunction of wiring harness or connector


Check the fuse No. 8.
NG
Replace
OK
Measure at front sunroof control unit terminal E–05.
• Disconnect the connector and measure at the harness side.
• Ignition switch on
(1) Voltage between terminal (3) – earth
OK: System voltage
(2) Voltage between terminal (4) – earth
OK: System voltage
(3) Continuity between terminal (18) – earth
OK: Continuity
(1) NG
Check the following connectors.
C–72, C–78, E–05
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the ignition switch (IG1) and the front sunroof control unit. Repair, if necessary.
(2) NG
Check the following connectors.
C–01, C–41, E–05
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between fusible link No. 4 and the front sunroof control unit. Repair, if necessary.
(3) NG
Check the following connector.
E–05
NG
Repair
OK
OK
Check sunroof switch continuity. (Refer to P.42-70.)
NG
Replace
OK
Check trouble symptom.
NG
Check the harness between the front sunroof control unit and the body earth. Repair, if necessary.
Measure at sunroof switch terminal E–02.
• Ignition switch ON
• Disconnect the connector and measure at the harness side.
• Voltage between terminal (3) – earth
OK: System voltage
• Voltage between terminal (1) – earth
OK: System voltage
• Continuity between terminal (4) – earth
OK: Continuity
NG
Check the following connectors.
E–02, E–05
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the front sunroof control unit and the sunroof switch. Repair, if necessary.
OK
Check the sunroof motor. (Refer to P.42-69.)
Check the continuity in the limit switch. (Refer to P.42-69.)
Check the rotation sensor. (Refer to P.42-70.)
NG
Replace the sunroof motor.
OK
Measure at front sunroof motor connector terminal E–03.
• Disconnect the connector and measure at the harness side.
• Continuity between terminal (4) – earth
OK: Continuity
• Continuity between terminal (8) – earth
OK: Continuity
NG
Check the following connector.
E–03
NG
Repair
OK
Check trouble symptom.
NG
Check the harness between the front sunroof motor and the body earth. Repair, if necessary.
OK
Check the harness between the front sunroof control unit and the front sunroof motor.
OK
Replace the front sunroof control unit
NG
Repair



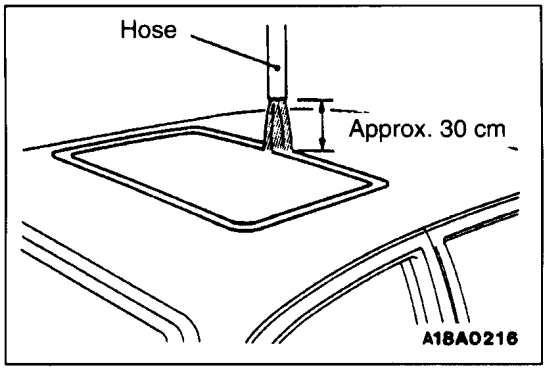
SERVICE ADJUSTMENT PROCEDURES

120000474

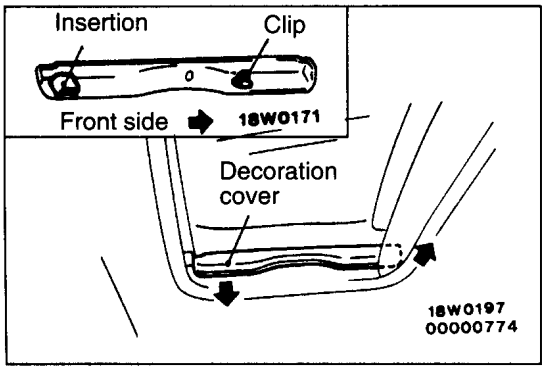
SUNROOF LEAKAGE INSPECTION

Check if there are any leaks in the sunroof by the following procedure.

(1) Fully close the roof lid glass.
(2) Adjust the water pressure so that water comes out of the hose to a height of approximately 50 cm when the hose is held vertically facing upwards.



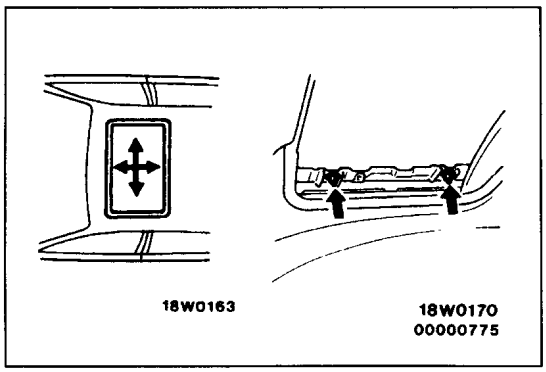
(3) Hold the end of the hose about 30 cm above the roof and let the water run onto the weatherstrip for 5 minutes or more.
(4) While doing this, check if any water leaks through into the passenger compartment from around the roof lid glass.

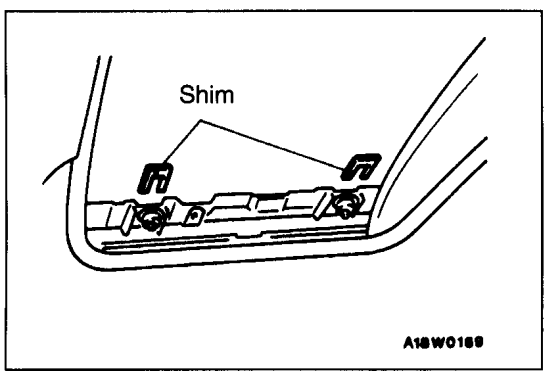


SUNROOF FIT ADJUSTMENT

1. Fully close the roof lid glass.
2. Fully open the sunshade.
3. Lower the front edge of the decoration cover and then pull the rear edge into the passenger compartment to remove the decoration cover.
4. Loosen the four roof lid glass assembly mounting nuts to adjust the roof lid glass assembly forward and back or to the left and right.

   NOTE
   If impossible by the above step, adjust the sunroof motor by tilting up the sunroof fully. (Refer to P.42-70.)





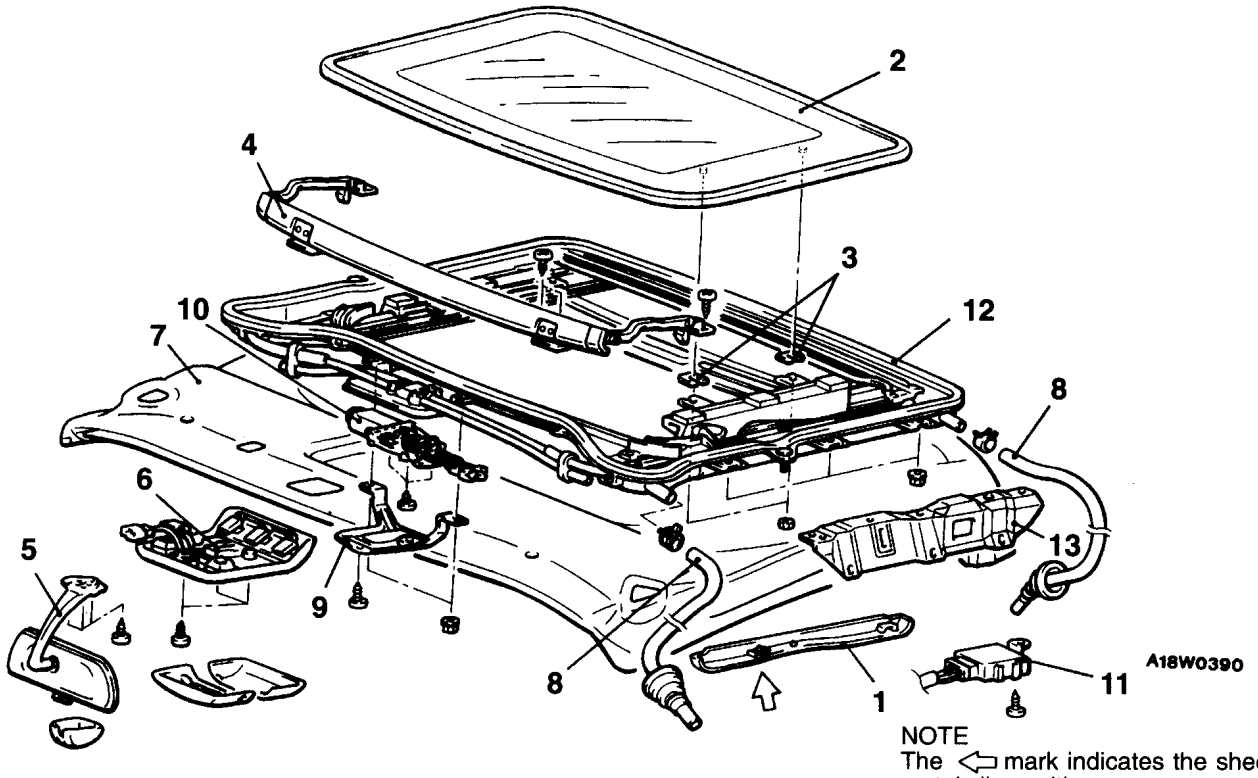
5. To adjust the height of the roof lid glass, loosen the four roof lid glass assembly mounting nuts. Then change the shims between the roof lid glass assembly and the lifter.
6. Check that the sunroof operates smoothly.

FRONT SUNROOF

120002522

REMOVAL AND INSTALLATION

Post-Installation Operation
<Roof Lid Glass Assembly and Front Sunroof Assembly>
- Sunroof water Test (Refer to P.42-66.)
- Sunroof Fit Adjustment (Refer to P.42-66.)



NOTE
The ⇦ mark indicates the sheet metal clip position.

Roof lid glass assembly removal steps

◀A▶ 1. Decoration cover
2. Roof lid glass assembly
3. Shim

Deflector removal steps

4. Deflector

Front sunroof switch and room lamp assembly removal steps

5. Room mirror
6. Front sunroof switch and room lamp assembly

Drain hose removal steps

7. Front headlining (Refer to GROUP 52A – Headlining.)

◀B▶ ▶B◀ 8. Drain hose

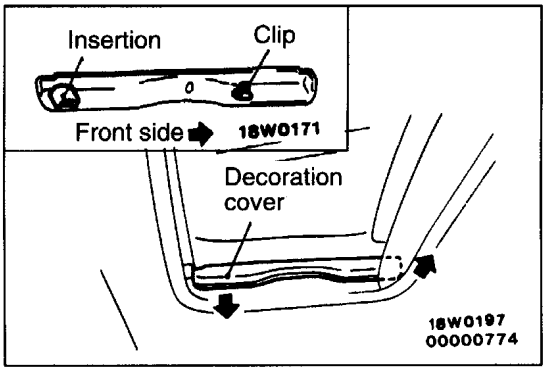
Front sunroof motor and front sunroof control unit removal steps

7. Front headlining (Refer to GROUP 52A – Headlining.)
9. Room lamp bracket

◀C▶ ▶A◀ 10. Front sunroof motor
11. Front sunroof control unit

Front sunroof assembly removal steps

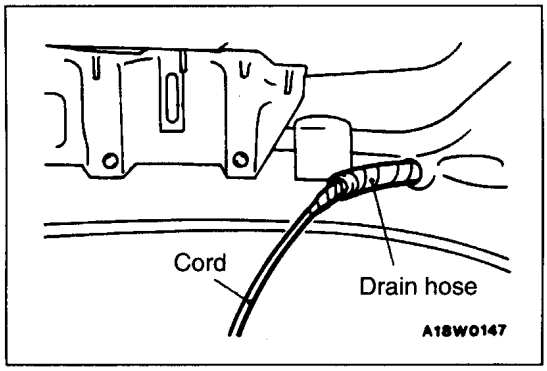
7. Front headlining (Refer to GROUP 52A – Headlining.)
8. Drain hose connection
9. Room lamp bracket
12. Front sunroof assembly
13. Set bracket



REMOVAL SERVICE POINTS

◀A▶ DECORATION COVER REMOVAL

Lower the front edge of the decoration cover and then pull the rear edge into the passenger compartment to remove the decoration cover.



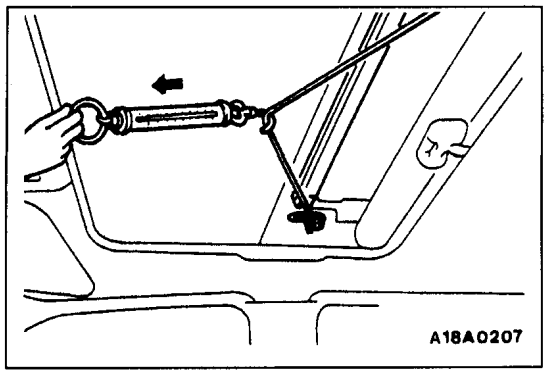
◀B▶ DRAIN HOSE REMOVAL

1. Remove the fender. (Refer to P.42–5.)
2. Remove the grommet, 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▶ FRONT SUNROOF MOTOR REMOVAL

Caution
Always tilt up the roof lid glass fully before removing the sunroof motor. Otherwise, the sunroof will not operate properly after reinstalling the motor.

INSPECTION



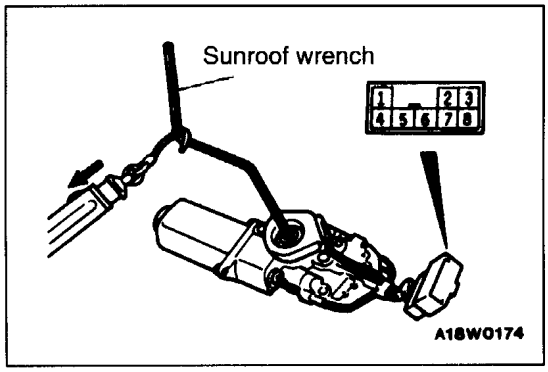
SLIDING RESISTANCE OF ROOF LID GLASS CHECK

Remove the sunroof motor, and then check the sliding resistance of the roof lid glass by the following procedure.

(1) Remove the front headlining. (Refer to GROUP 52A - Headlining.)
(2) Remove the decoration cover.
(3) Loosen the roof lid glass front mounting nuts and tie a rope to them.
(4) Tilt up the roof lid glass fully and then remove the sunroof motor.
(5) Use a spring balance to measure the sliding resistance of the roof lid glass.

Standard value: 108 N or less

(6) If the sliding resistance of the roof lid glass is higher than the standard value, check the following.
Sunroof assembly installation, warping or jamming by foreign materials
Drive cable connection
Tilt of roof lid glass
(7) Tilt up the roof lid glass fully, and set the sunroof motor to the specified position, and then install the sunroof motor. (Refer to P.42-70.)

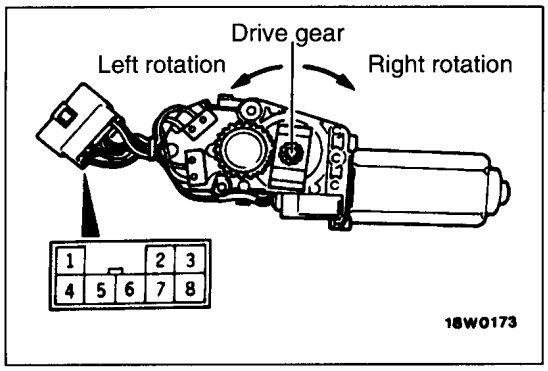


SLIDING FORCE OF SUNROOF MOTOR'S CLUTCH CHECK

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: 29–59 N

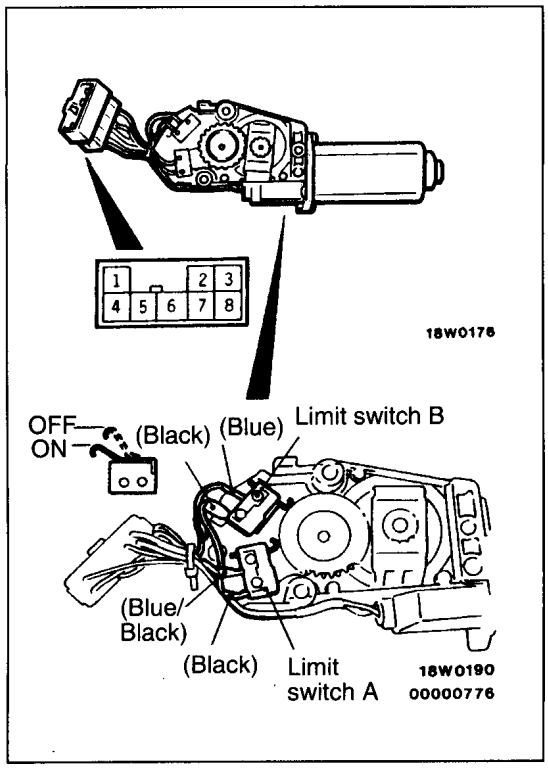
   Caution
   1. **The spring balance should be kept a right angle to the sunroof wrench.**
   2. **If a wrench other than that in the on-board tools is used, the value for the clutch sliding force will be different, so only the on-board tool should be used.**
4. If the clutch sliding force is outside the 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	
⊖ - - - - - - -	- - - - - - ⊕	Left
⊕ - - - - - - -	- - - - - - ⊖	Right

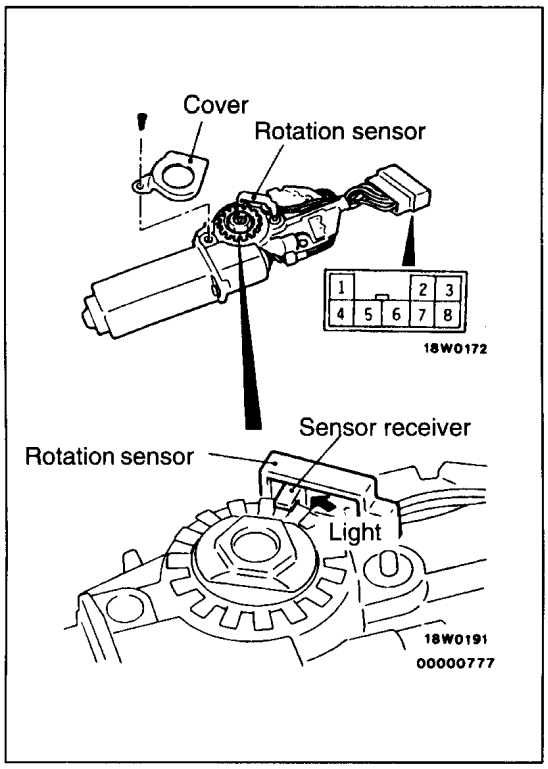


LIMIT SWITCH CONTINUITY CHECK

1. Remove the limit switches from the sunroof motor, and then check the operation of the limit switches.

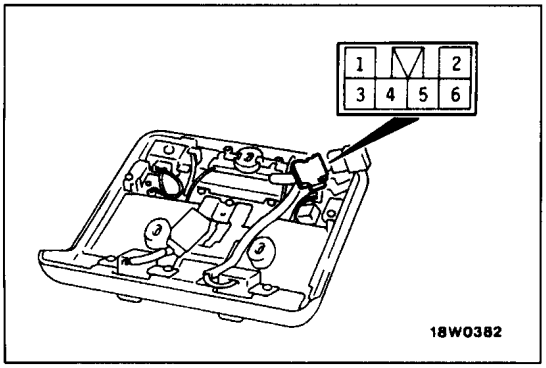
Switch		Terminal No.		
		4	5	6
Limit switch A	ON	○		○
	OFF			
Limit switch B	ON	○	○	
	OFF			

2. Check the identification colours. Then install the limit switches as shown in the illustration.



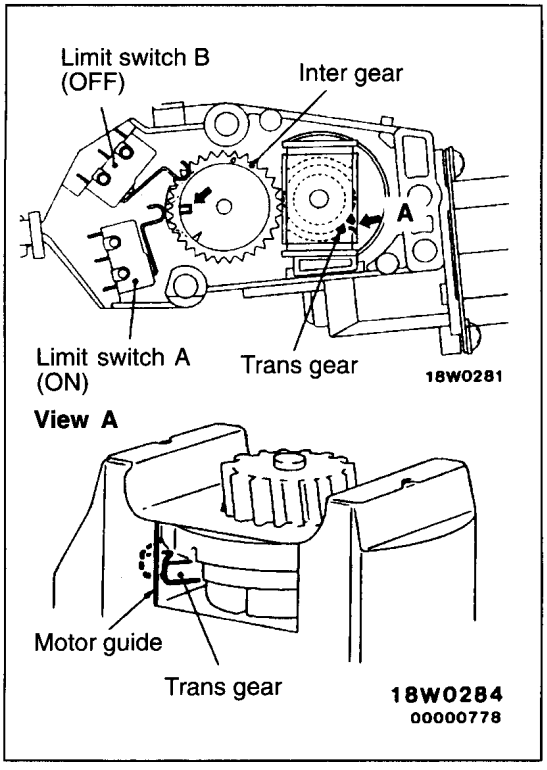
ROTATION SENSOR INSPECTION

1. When connecting an ohmmeter negative probe to terminal (3) and the positive probe to terminal (8), there should be continuity. When the probes are reversed, there should be no continuity.
2. Remove the cover, and then check that there is no continuity when connecting the negative probe to terminal (7) and the positive probe to terminal (8). Also check that there is continuity when the probes are connected to the same terminals and light is shined onto the sensor receiver.



SUNROOF SWITCH CONTINUITY INSPECTION

Switch position	Terminal No.		
	1	3	4
Open		○	○
Close	○		○

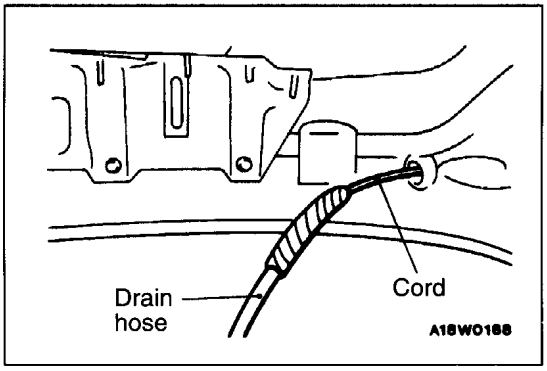


INSTALLATION SERVICE POINTS

▶A◀ FRONT SUNROOF MOTOR INSTALLATION

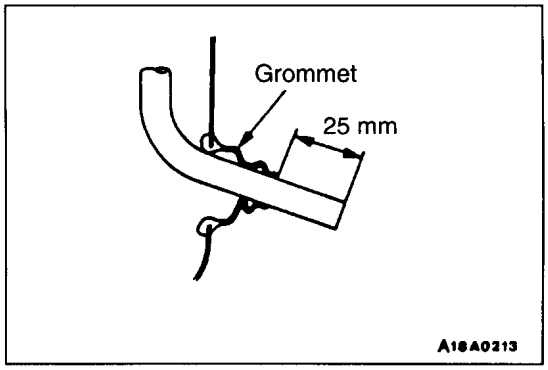
Use the sunroof wrench to set the sunroof motor to the full tilt-up position by the following procedure.

(1) Align the pawl of the inter gear with the on position of limit switch (A).
(2) Align the groove of the trans gear with the corner of the motor guide.



▶B◀ DRAIN HOSE INSTALLATION

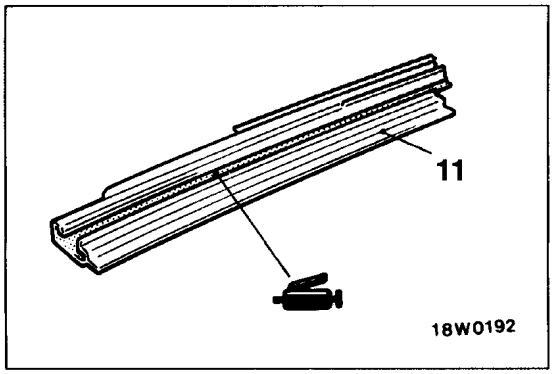
1. Tie the end of the drain hose to the cord that stays in the tailgate, and wind plastic tape around the tie until it is smooth.
2. Pull the cord to pull in the drain hose.

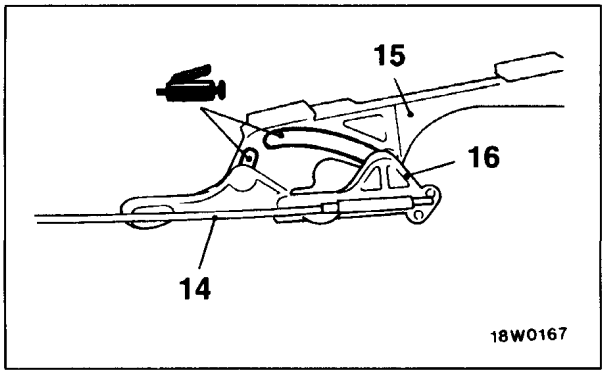


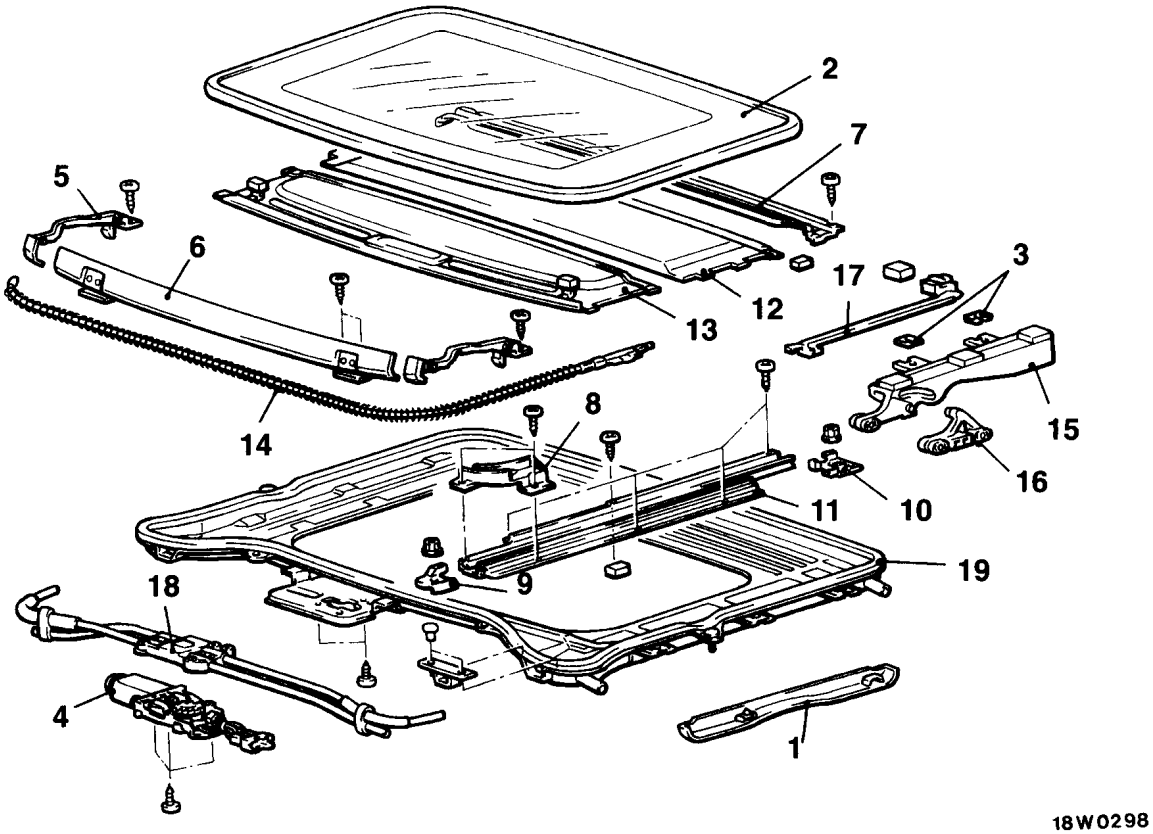
3. Install the grommet and let the drain hose extend as shown in the illustration.
4. Install the fender. (Refer to P.42-5.)

DISASSEMBLY AND REASSEMBLY

120002116

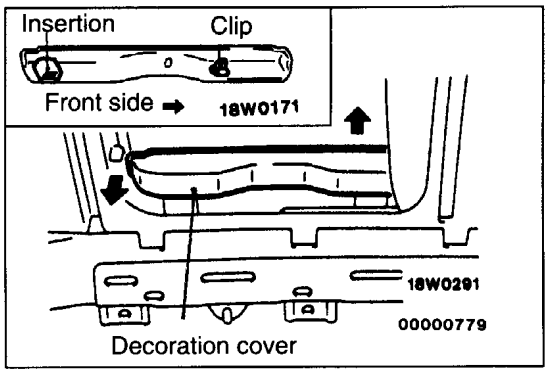






Disassembly steps

◀A▶ 1. Decoration cover
2. Roof lid glass assembly
3. Shim
◀B▶ ▶A◀ 4. Front sunroof motor
5. Deflector link assembly
6. Deflector assembly
7. Drip rail
8. Front drip
9. Front holder
10. Rear holder
11. Rail assembly
12. Sunshade (B)
13. Sunshade (A)
14. Drive cable
15. Lifter assembly
16. Slider assembly
17. Timing rear assembly
18. Drive unit assembly
19. Frame assembly



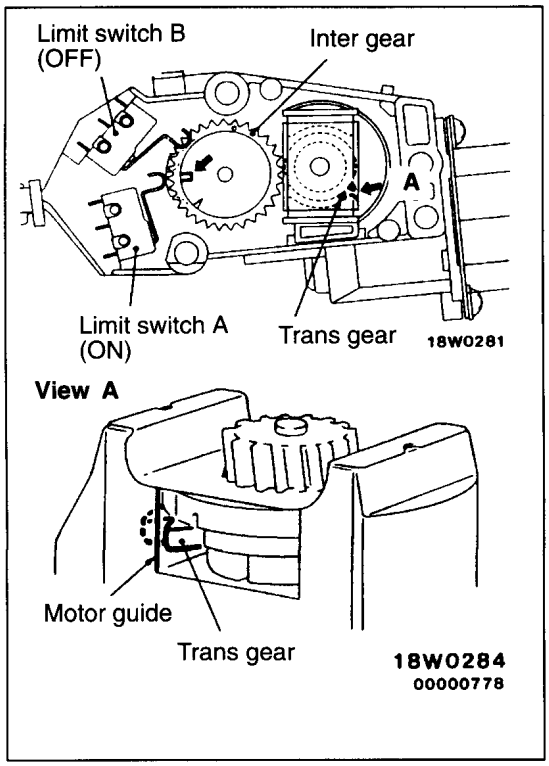
DISASSEMBLY SERVICE POINTS

◀A▶ DECORATION COVER REMOVAL

Lower the front edge of the decoration cover and then pull the rear edge into the passenger compartment to remove the decoration cover.

◀B▶ FRONT SUNROOF MOTOR REMOVAL

Caution
Always tilt up the roof lid glass fully before removing the sunroof motor. Otherwise, the sunroof will not operate properly after reinstalling the motor.



REASSEMBLY SERVICE POINT

▶A◀ FRONT SUNROOF MOTOR INSTALLATION

Use the sunroof wrench to set the sunroof motor to the full tilt-up position by the following procedure.
(1) Align the pawl of the inter gear with the position of limit switch (A).
(2) Align the groove of the trans gear with the corner of the motor guide.

REAR SUNROOF

120000476

SERVICE SPECIFICATIONS

Items	Standard value
Roof lid glass sliding resistance N	216 or less
Sunroof motor clutch sliding force N	29–59

TROUBLESHOOTING

120000477

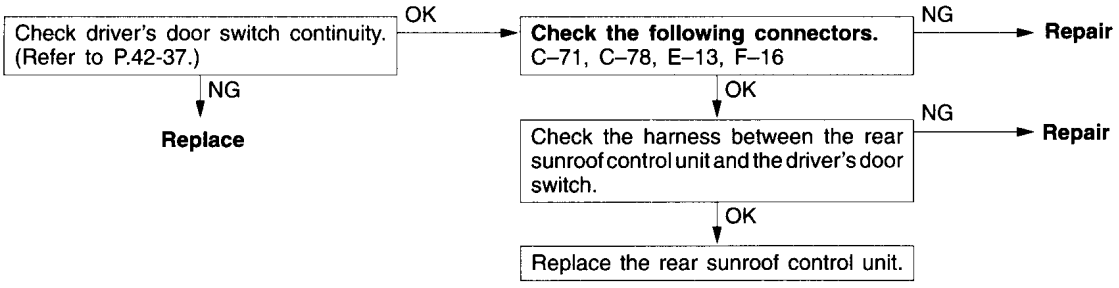
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Rear sunroof does not operate within 30 seconds after driver's door is opened.	1	P.42-74
Rear sunroof cannot be operated by either the sunroof switch for front seat or for rear seat.	2	P.42-74
Rear sunroof cannot be operated by the sunroof switch (for front seat). (However, it can be operated by the sunroof switch (for rear seat).)	3	P.42-76
Rear sunroof cannot be operated by the sunroof switch (for rear seat). (However, it can be operated by the sunroof switch (for front seat).)	4	P.42-76

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

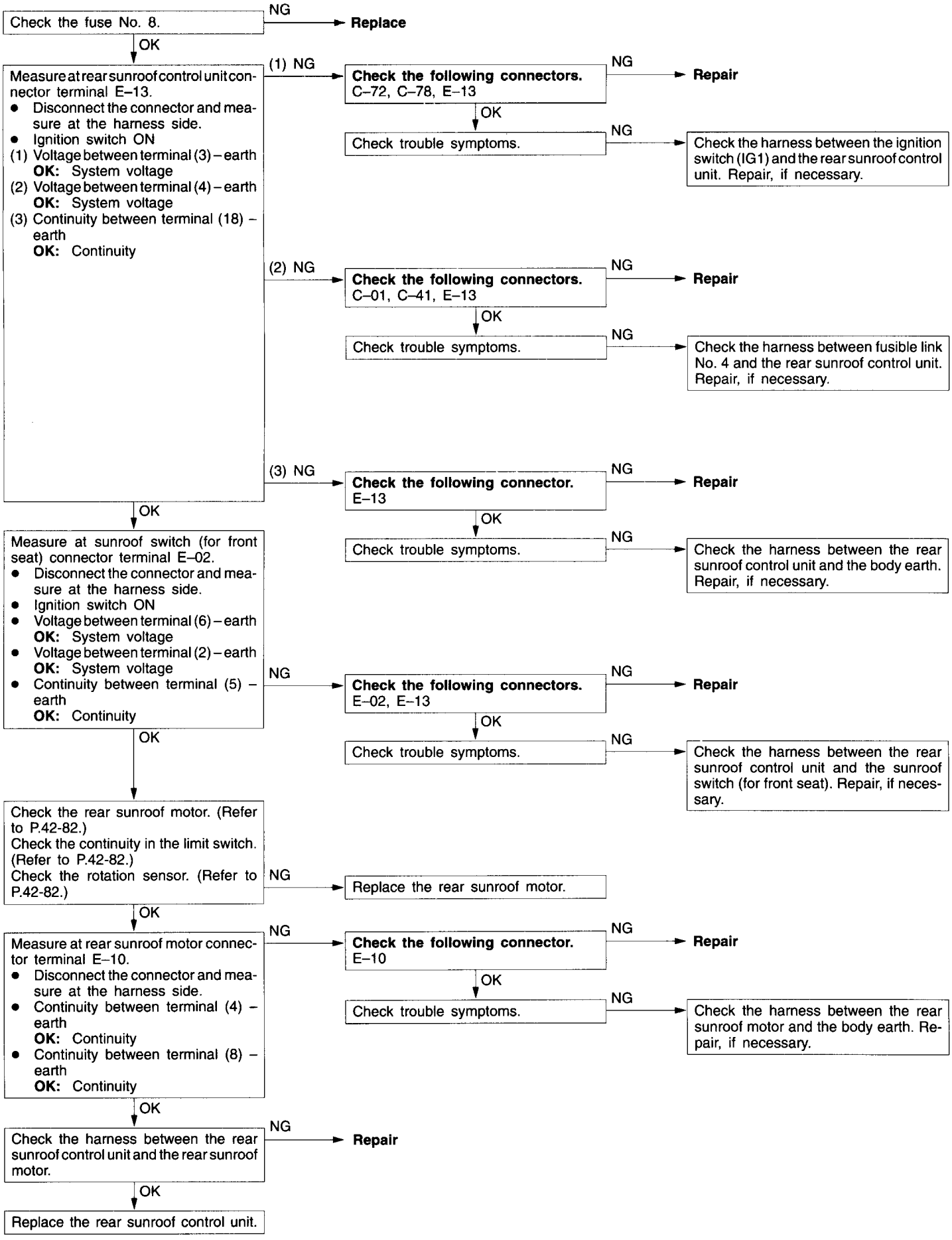
Inspection Procedure 1

Rear sunroof does not operate within 30 seconds after driver's door is opened.	**Probable cause**
[Comment] After the driver's door is opened within 30 seconds after the ignition switch is turned off, the sunroof can still be operated for a further 30 seconds. If it is impossible, the driver's door switch or the rear sunroof control unit may be defective.	• Malfunction of driver's door switch • Malfunction of rear sunroof control unit • Malfunction of wiring harness or connector



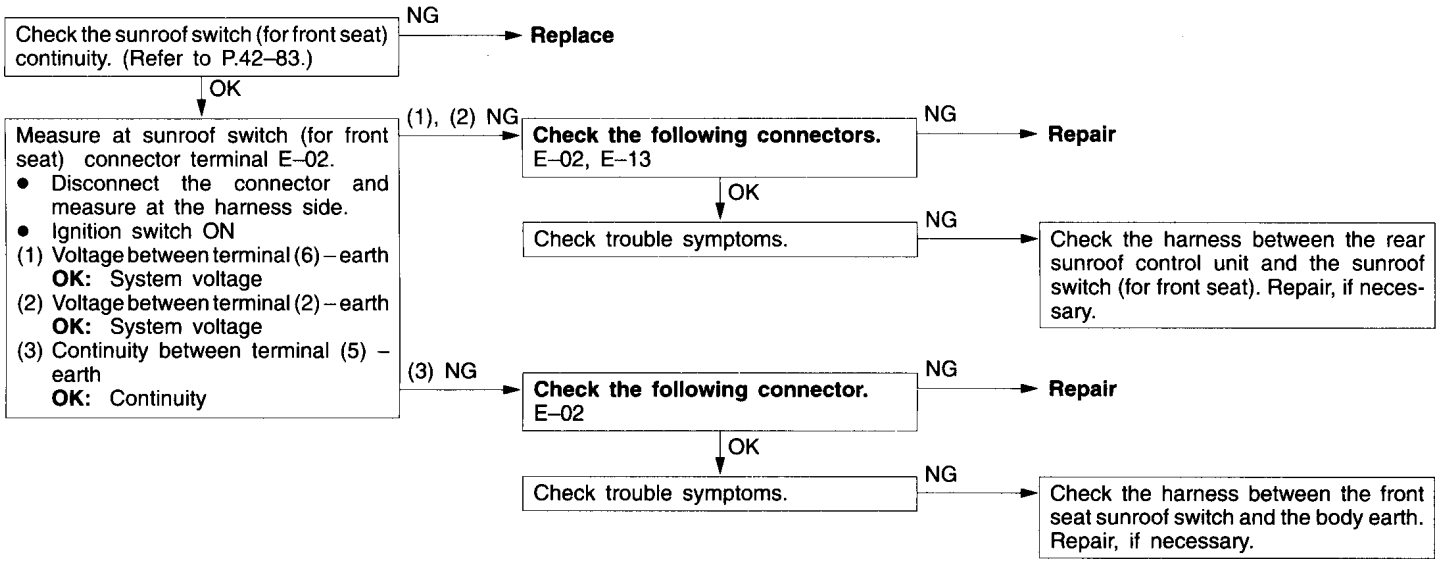
Inspection Procedure 2

Rear sunroof cannot be operated by either the sunroof switch for front seat or for rear seat.	**Probable cause**
[Comment] One of the following items may be defective. Rear sunroof motor Rear sunroof control unit Power supply circuit (including the fuse)	• Malfunction of rear sunroof motor • Malfunction of rear sunroof control unit • Malfunction of wiring harness or connector


Check the fuse No. 8.
NG
Replace
OK
Measure at rear sunroof control unit connector terminal E–13.
• Disconnect the connector and measure at the harness side.
• Ignition switch ON
(1) Voltage between terminal (3) – earth
OK: System voltage
(2) Voltage between terminal (4) – earth
OK: System voltage
(3) Continuity between terminal (18) – earth
OK: Continuity
(1) NG
Check the following connectors.
C–72, C–78, E–13
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the ignition switch (IG1) and the rear sunroof control unit. Repair, if necessary.
(2) NG
Check the following connectors.
C–01, C–41, E–13
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between fusible link No. 4 and the rear sunroof control unit. Repair, if necessary.
(3) NG
Check the following connector.
E–13
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the rear sunroof control unit and the body earth. Repair, if necessary.
OK
Measure at sunroof switch (for front seat) connector terminal E–02.
• Disconnect the connector and measure at the harness side.
• Ignition switch ON
• Voltage between terminal (6) – earth
OK: System voltage
• Voltage between terminal (2) – earth
OK: System voltage
• Continuity between terminal (5) – earth
OK: Continuity
NG
Check the following connectors.
E–02, E–13
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the rear sunroof control unit and the sunroof switch (for front seat). Repair, if necessary.
OK
Check the rear sunroof motor. (Refer to P.42-82.)
Check the continuity in the limit switch. (Refer to P.42-82.)
Check the rotation sensor. (Refer to P.42-82.)
NG
Replace the rear sunroof motor.
OK
Measure at rear sunroof motor connector terminal E–10.
• Disconnect the connector and measure at the harness side.
• Continuity between terminal (4) – earth
OK: Continuity
• Continuity between terminal (8) – earth
OK: Continuity
NG
Check the following connector.
E–10
NG
Repair
OK
Check trouble symptoms.
NG
Check the harness between the rear sunroof motor and the body earth. Repair, if necessary.
OK
Check the harness between the rear sunroof control unit and the rear sunroof motor.
NG
Repair
OK
Replace the rear sunroof control unit.

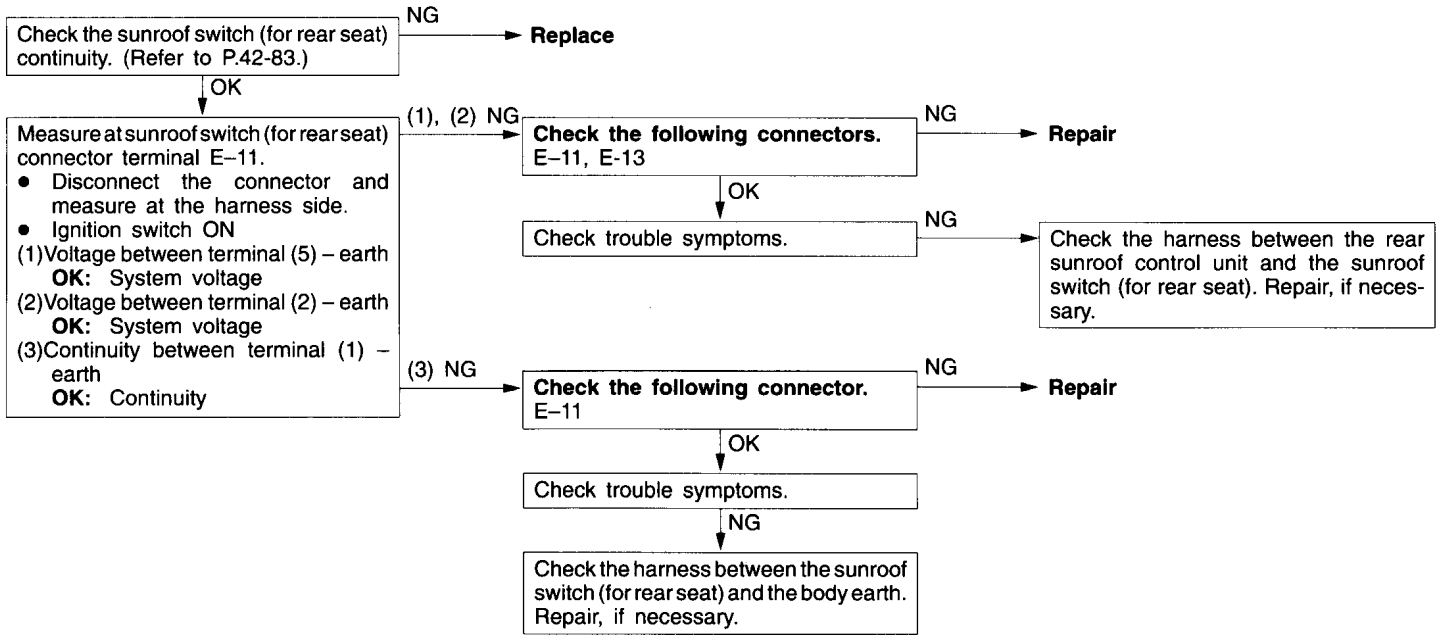
Inspection Procedure 3

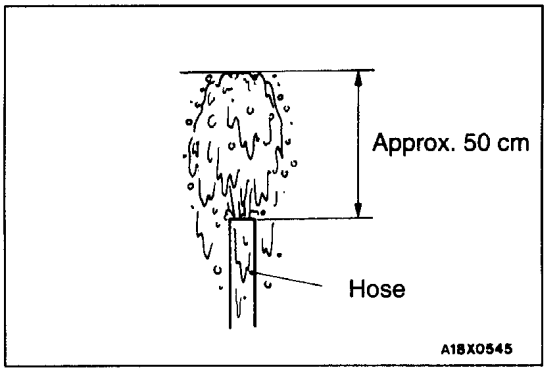
Rear sunroof cannot be operated by the sunroof switch (for front seat). (However, it can be operated by the sunroof switch (for rear seat).)	Probable cause
[Comment] The sunroof switch (for front seat) or related harnesses may be defective.	• Malfunction of sunroof switch (for front seat) • Malfunction of wiring harness or connector



Inspection Procedure 4

Rear sunroof cannot be operated by the sunroof switch (for rear seat). (However, it can be operated by the sunroof switch (for front seat).)	Probable cause
[Comment] The sunroof switch (for rear seat) or related harnesses may be defective.	• Malfunction of sunroof switch (for rear seat) • Malfunction of wiring harness or connector





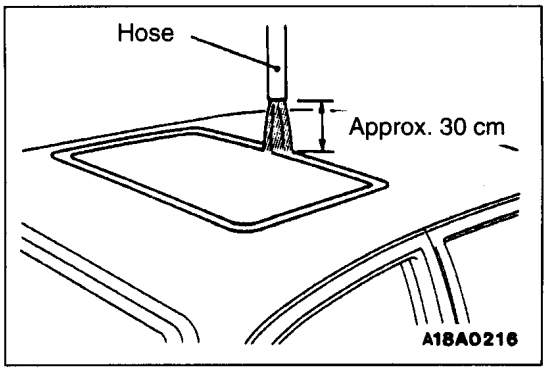
SERVICE ADJUSTMENT PROCEDURES

120000478

SUNROOF LEAKAGE INSPECTION

Check if there are any leaks in the sunroof by the following procedure.

(1) Fully close the roof lid glass.
(2) Adjust the water pressure so that water comes out of the hose to a height of approximately 50 cm when the hose is held vertically facing upwards.

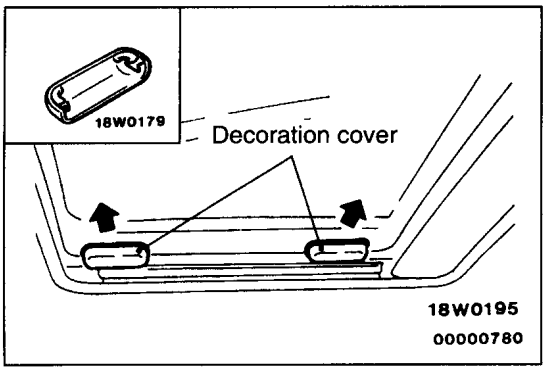


(3) Hold the end of the hose about 30 cm above the roof and let the water run onto the weatherstrip for 5 minutes or more.
(4) While doing this, check if any water leaks through into the passenger compartment from around the roof lid glass.

SUNROOF FIT ADJUSTMENT

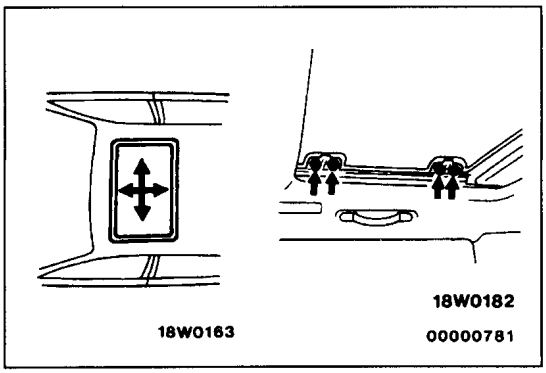
120002107

1. Fully close the roof lid glass.
2. Fully open the sunshade.
3. Remove the decoration cover by pulling it into the passenger compartment.

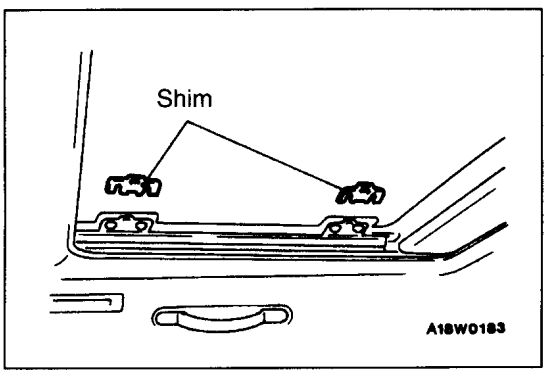


4. Loosen the eight roof lid glass assembly mounting nuts and move the roof lid glass assembly forward and back or to the left and right.

   NOTE
   If impossible by the above step, adjust the sunroof motor by closing the sunroof fully. (Refer to P.42-83.)



5. To adjust the height of the roof lid glass, loosen the eight roof lid glass assembly mounting nuts. Then change the shims between the roof lid glass assembly and the slider assembly.
6. Check that the sunroof operates smoothly.

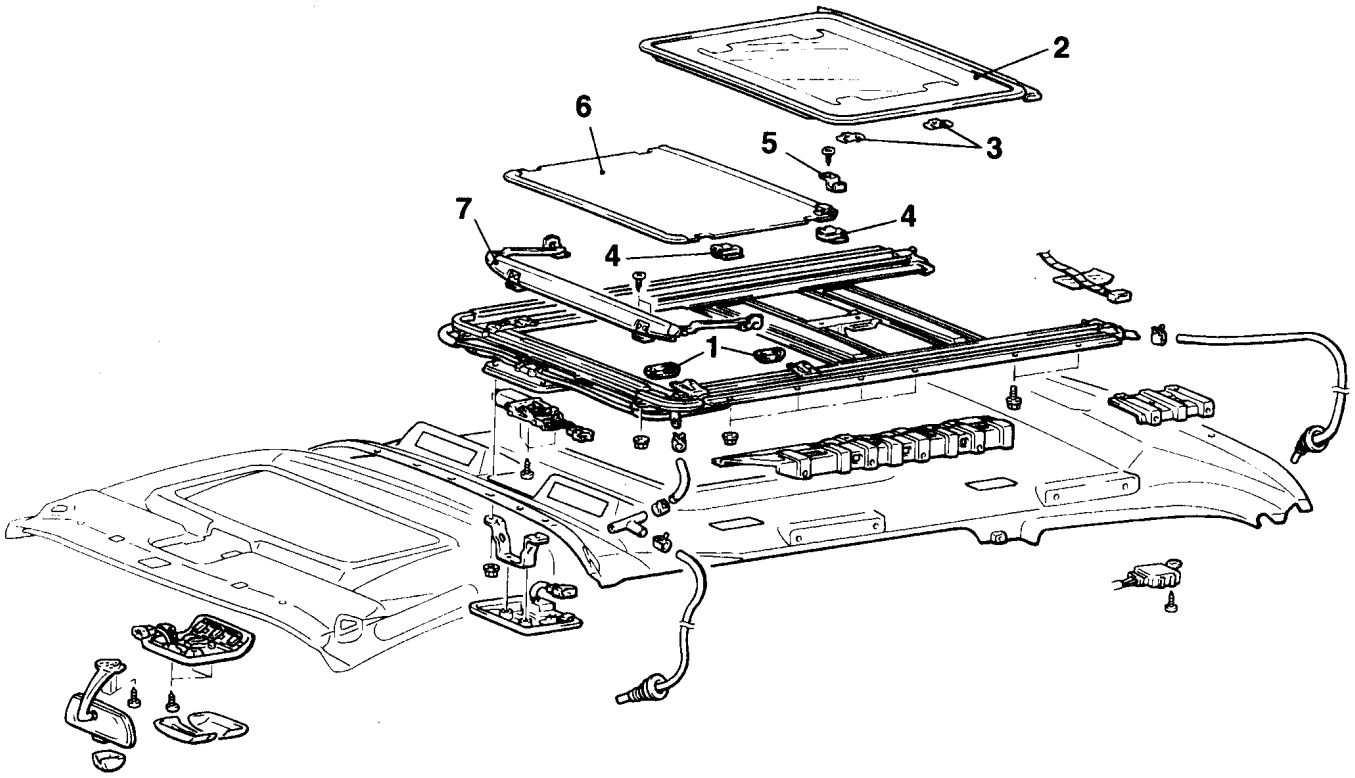


REAR SUNROOF

120002232

REMOVAL AND INSTALLATION

Post-Installation Operation
- Sunroof Water Test (Refer to P.42-77.)
- Sunroof Fit Adjustment (Refer to P.42-77.)



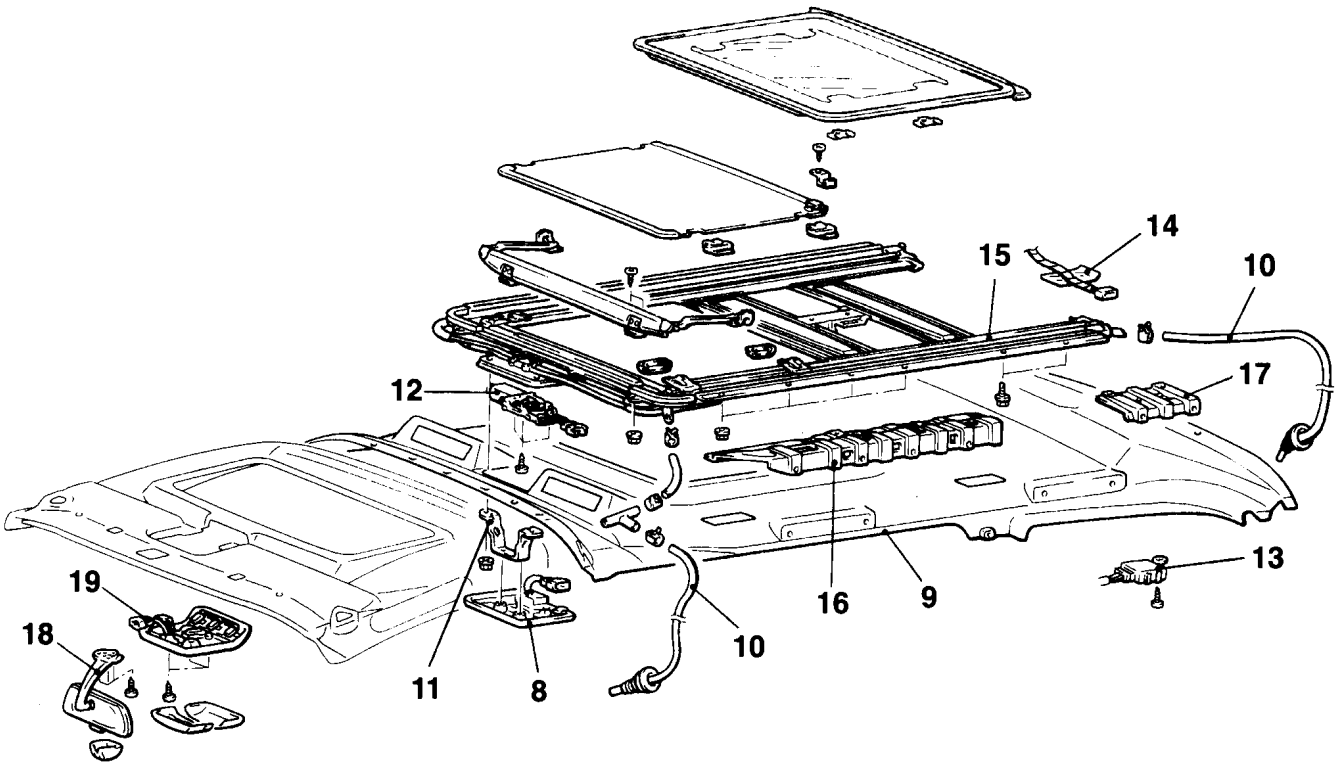
A18W0393

Roof lid glass assembly and sunshade removal steps

◀A▶ 1. Decoration cover
2. Roof lid glass assembly
3. Shim
◀B▶ 4. Sunshade shoe cover
5. Sunshade holder
◀C▶ 6. Sunshade assembly

Deflector removal

7. Deflector



B18W0393

Rear sunroof switch removal steps

8. Rear sunroof switch assembly
18. Room mirror
19. Rear sunroof switch and room lamp assembly

Drain hose removal steps

8. Rear sunroof switch assembly
9. Rear headlining (Refer to GROUP 52A – Headlining.)
◀D▶ ▶B◀ 10. Drain hose

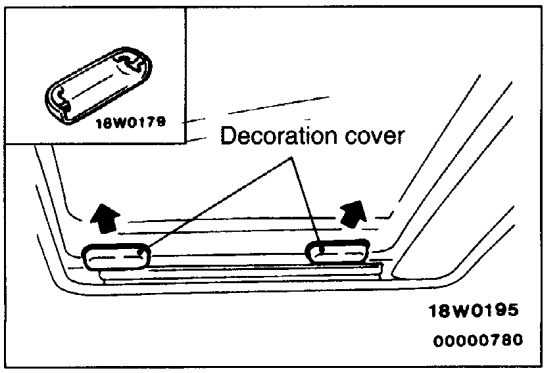
Rear sunroof motor and rear sunroof control unit removal steps

8. Rear sunroof switch assembly
9. Rear headlining (Refer to GROUP 52A – Headlining.)
11. Rear sunroof switch bracket
◀E▶ ▶A◀ 12. Rear sunroof motor
13. Rear sunroof control unit

Rear sunroof assembly removal steps

8. Rear sunroof switch assembly
9. Rear headlining (Refer to GROUP 52A – Headlining.)
10. Drain hose connection
11. Rear sunroof switch bracket
14. Harness attaching tape
- Roof duct (Refer to GROUP 55 – Roof duct.)

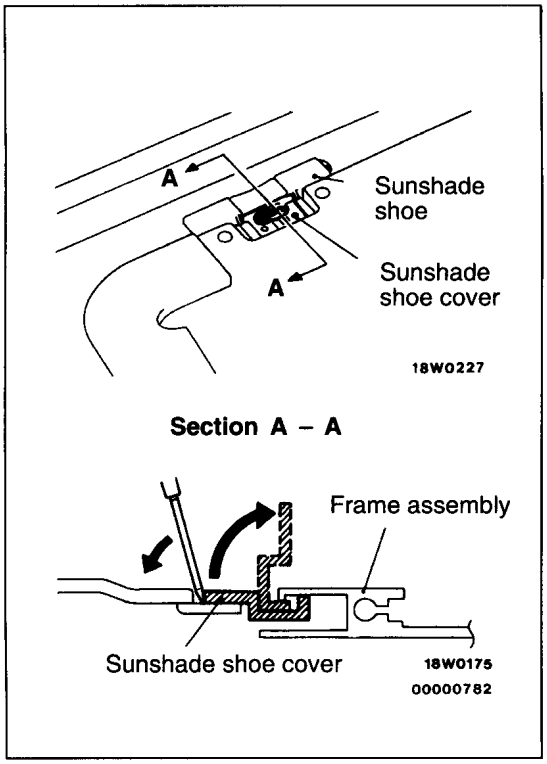
15. Rear sunroof assembly
16. Set bracket, front
17. Set bracket, rear



REMOVAL SERVICE POINTS

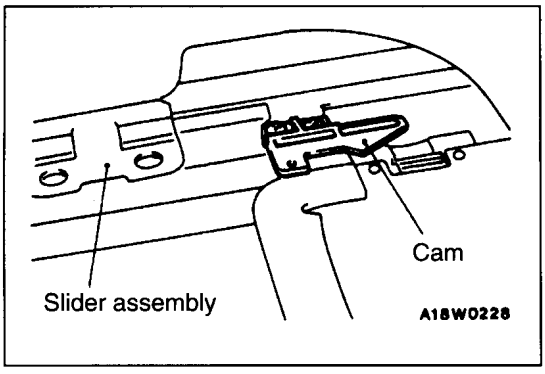
◀A▶ DECORATION COVER REMOVAL

Remove the decoration cover by pulling it into the passenger compartment.



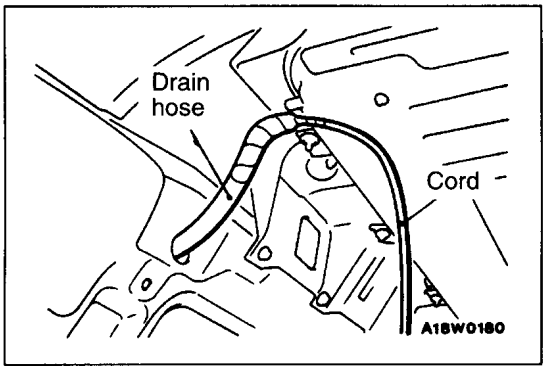
◀B▶ SUNSHADE SHOE COVER REMOVAL

Use a flat-tipped screwdriver to remove the four sunshade shoe covers.



◀C▶ SUNSHADE ASSEMBLY REMOVAL

1. Remove the cam from the slider assembly.
2. Move the only slider assembly to the fully-open position.
3. Remove the sunshade assembly from the roof opening.



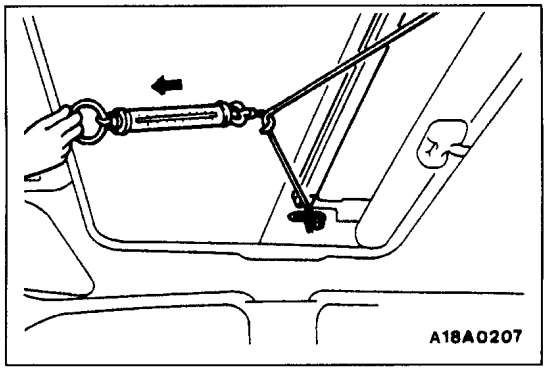
◀D▶ DRAIN HOSE REMOVAL

Remove the grommet, tie a cord to the end of the drain hose, and wind plastic tape around the tie until it is smooth. Then pull the drain hose out from the passenger compartment.

◀E▶ REAR 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.

INSPECTION

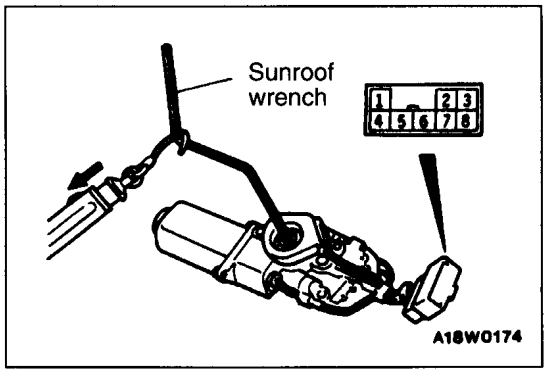


SLIDING RESISTANCE OF ROOF LID GLASS CHECK

Remove the sunroof motor, and then check the sliding resistance of the roof lid glass by the following procedure.
(1) Remove the rear headlining. (Refer to GROUP 52A – Headlining.)
(2) Remove the decoration cover. (Refer to P.42-80.)
(3) Loosen the roof lid glass front mounting nuts and tie a rope to them.
(4) Close the roof lid glass fully and then remove the sunroof motor.
(5) Use a spring balance to measure the sliding resistance of the roof lid glass.

Standard value: 216 N or less

(6) If the sliding resistance of the roof lid glass is higher than the standard value, check the following.
Sunroof assembly installation, warping or jamming by foreign materials
Drive cable sticked
Tilt of roof lid glass
(7) Close the roof lid glass fully, and set the sunroof motor to the specified position, and then install the sunroof motor. (Refer to P.42-83.)



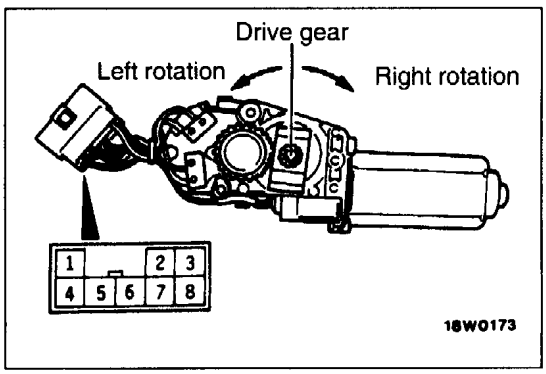
SLIDING FORCE OF SUNROOF MOTOR'S CLUTCH CHECK

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: 29–59 N

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 force will be different, so only the on-board tool should be used.

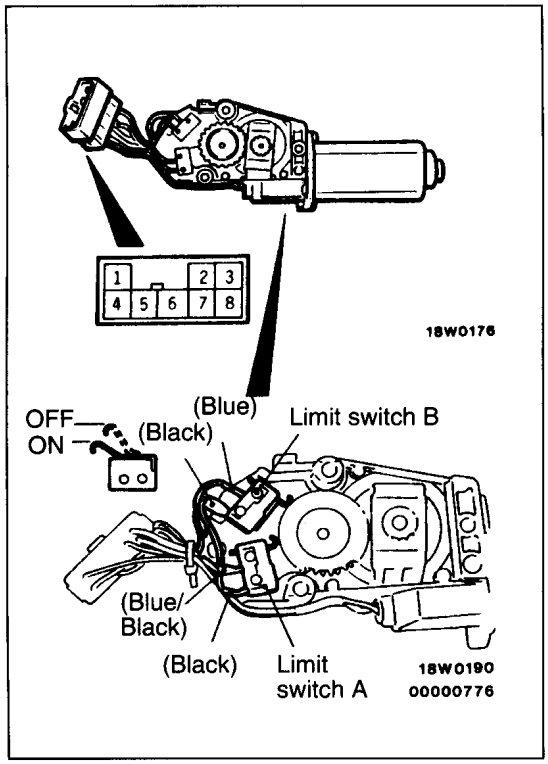
4. If the clutch sliding force is outside the standard value, turn the motor adjuster to adjust it.



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	
⊖ - - - - - - -	- - - - - - ⊕	Left
⊕ - - - - - - -	- - - - - - ⊖	Right

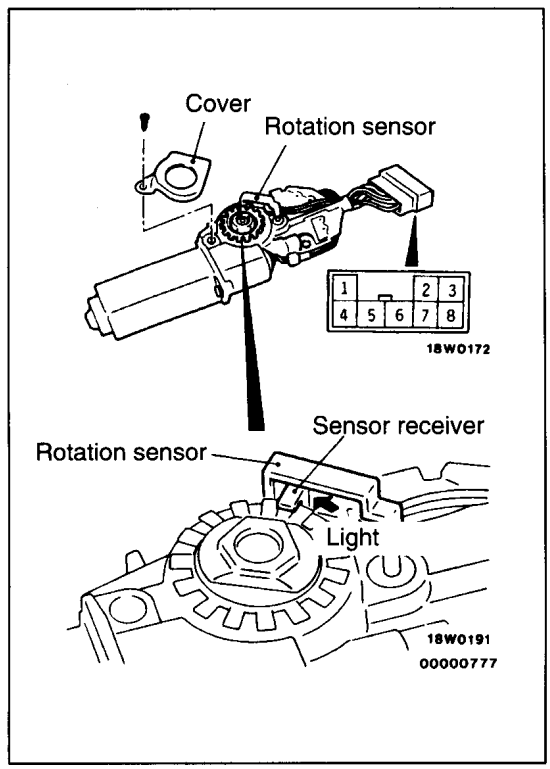


LIMIT SWITCH CONTINUITY INSPECTION

1. Remove the limit switches from the sunroof motor, and then check the operation of the limit switches.

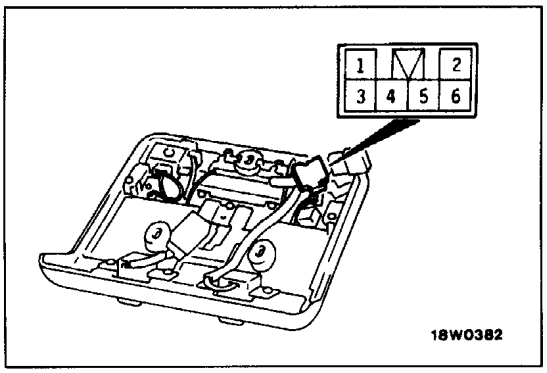
Switch		Terminal No.		
		4	5	6
Limit switch A	ON	○		○
	OFF			
Limit switch B	ON	○	○	
	OFF			

2. Check the identification colours . Then install the limit switches as shown in the illustration.



ROTATION SENSOR INSPECTION

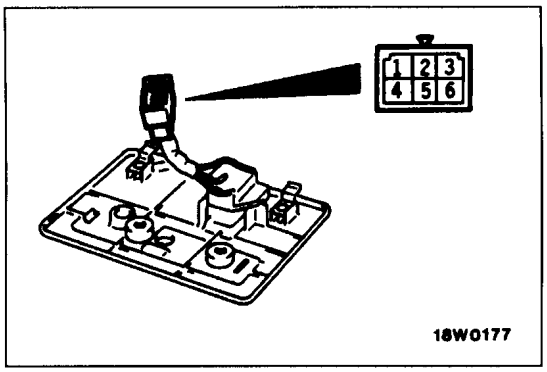
1. When connecting an ohmmeter negative probe to terminal (3) and the positive probe to terminal (8), there should be continuity. When the probes are reversed, there should be no continuity.
2. Remove the cover, and then check that there is no continuity when connecting the negative probe to terminal (7) and the positive probe to terminal (8). Also check that there is continuity when the probes are connected to the same terminals and light is shined onto the sensor receiver.



SUNROOF SWITCH CONTINUITY INSPECTION

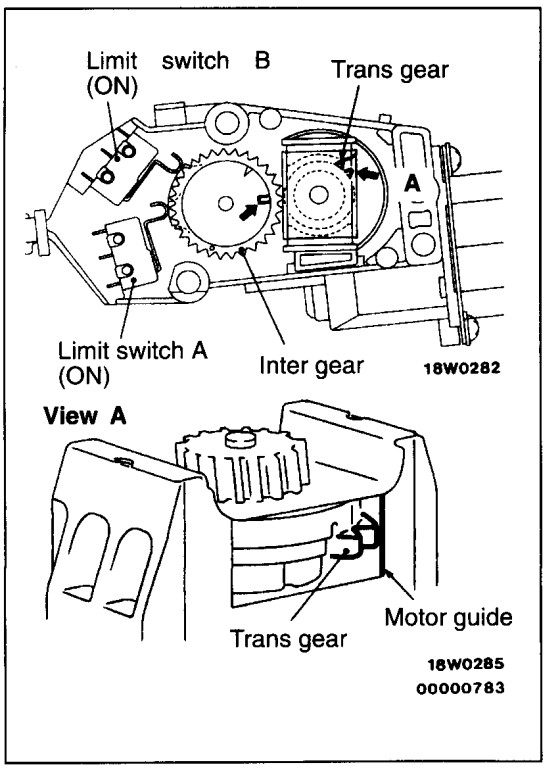
(For front seat)

Switch position	Terminal No.		
	2	5	6
Open		○	○
Close	○		○



(For rear seat)

Switch position	Terminal No.		
	1	2	5
Open	○		○
Close	○	○	

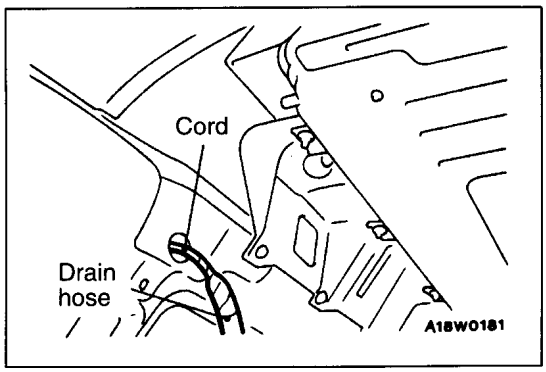


INSTALLATION SERVICE POINTS

▶A◀ REAR SUNROOF MOTOR INSTALLATION

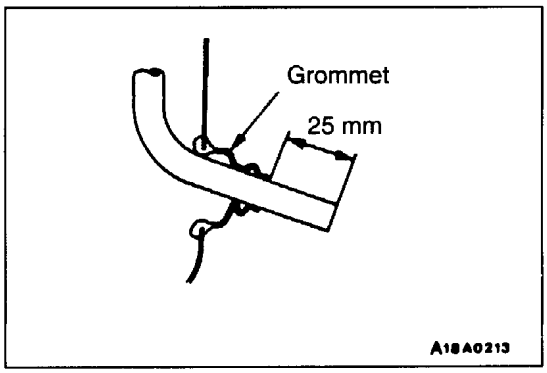
Use the sunroof wrench to set the sunroof motor to the fully-open position by the following procedure.

(1) Set the inter gear so that the pawl is on the side of the trans gear.
(2) Align the teeth of the trans gear with the corner of the motor guide.



▶B◀ DRAIN HOSE INSTALLATION

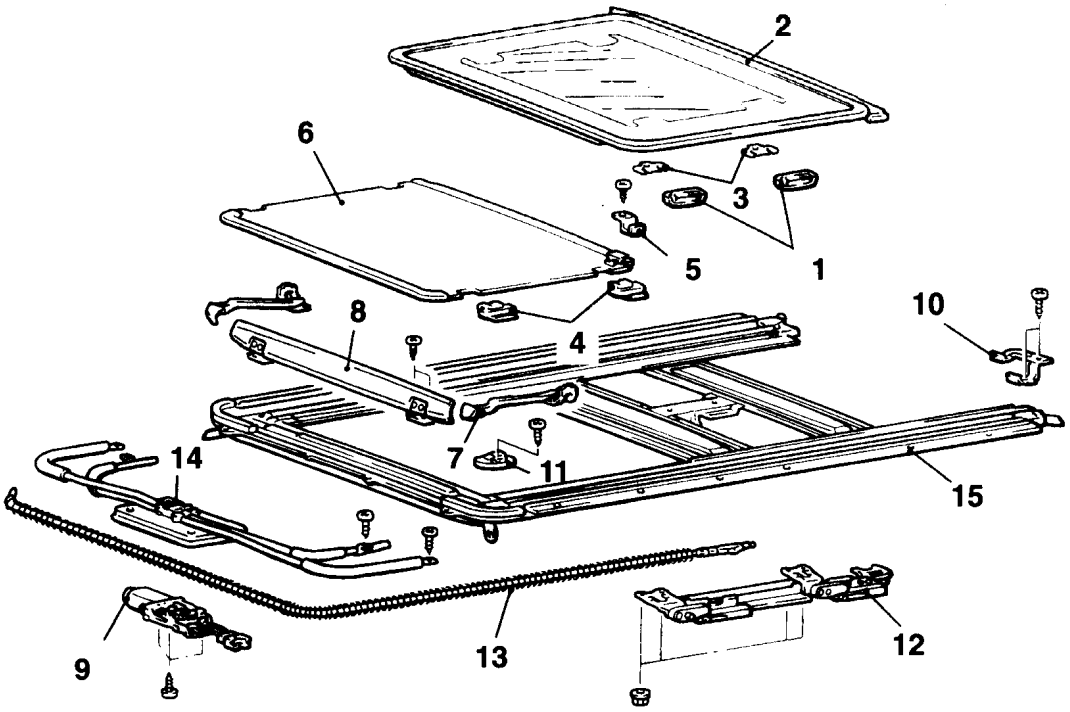
1. Tie the end of the drain hose to the cord that stays in the tailgate, and wind plastic tape around the tie until it is smooth.
2. Pull the cord to pull in the drain hose.



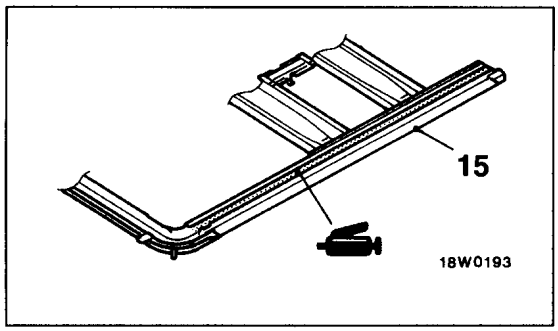
3. Install the grommet and let the drain hose extend as shown in the illustration.

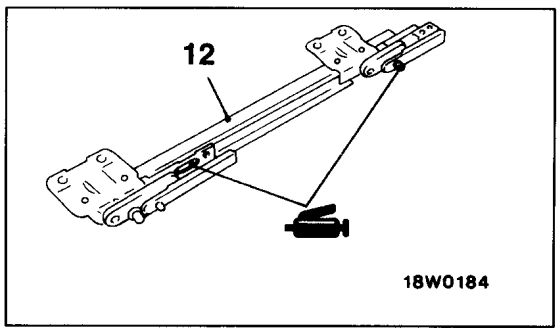
DISASSEMBLY AND REASSEMBLY

120002117



18W0296



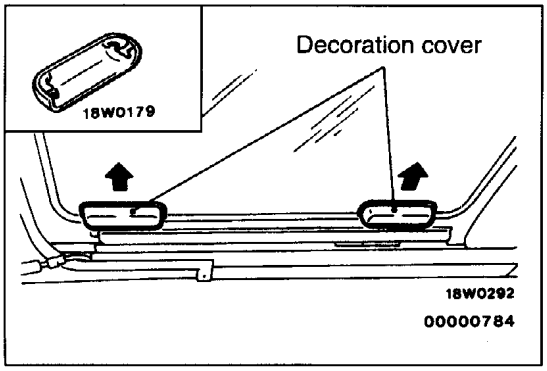


00000762

Disassembly steps

◀A▶
1. Decoration cover
2. Roof lid glass assembly
3. Shim
4. Sunshade shoe cover
5. Sunshade holder shoe
6. Sunshade assembly
7. Deflector link assembly
8. Deflector assembly

◀B▶ ▶A◀
9. Rear sunroof motor
10. Rear holder
11. Front holder
12. Slider assembly
13. Drive cable
14. Drive unit assembly
15. Frame assembly



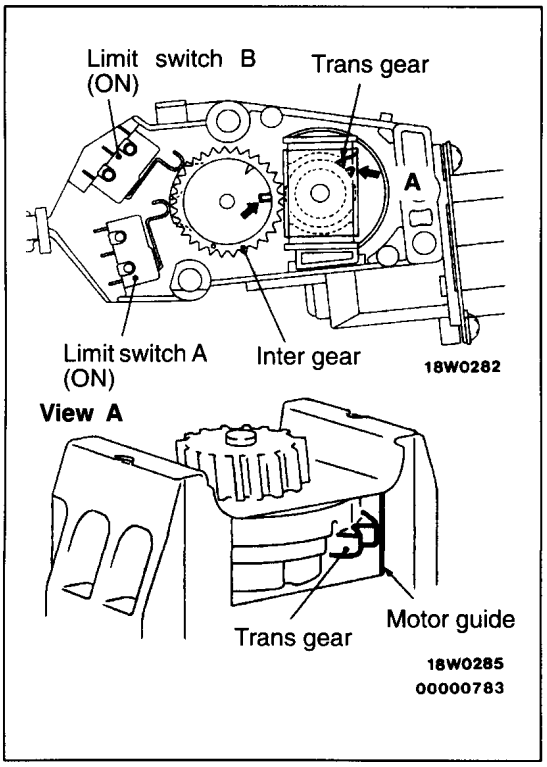
DISASSEMBLY SERVICE POINTS

◀A▶ DECORATION COVER REMOVAL

Remove the decoration cover by pulling it into the passenger compartment.

◀B▶ REAR 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.



REASSEMBLY SERVICE POINT

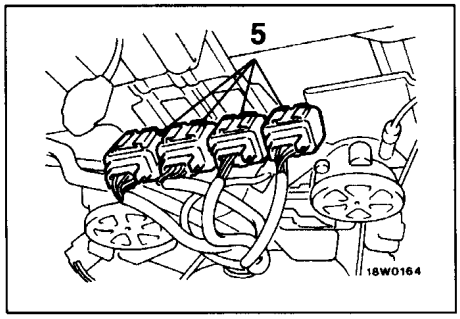
▶A◀ REAR SUNROOF MOTOR INSTALLATION

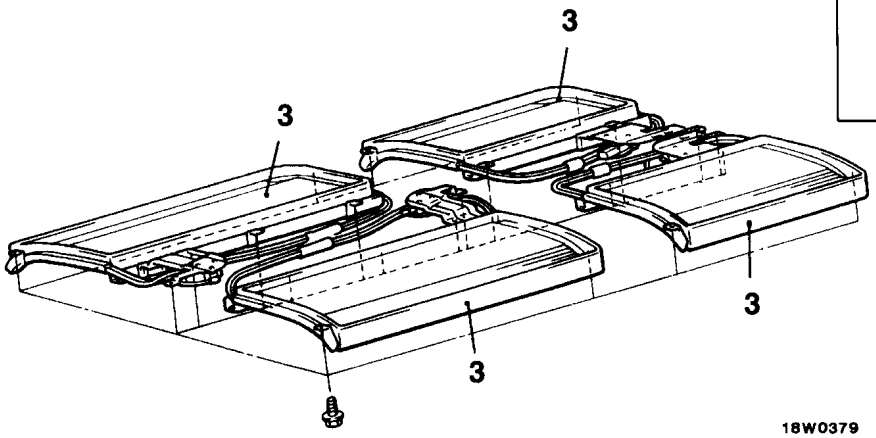
Use the sunroof wrench to set the sunroof motor to the fully-closed position by the following procedure.
(1) Set the inter gear so that the pawl is on the side of the trans gear.
(2) Align the teeth of the trans gear with the corner of the motor guide.

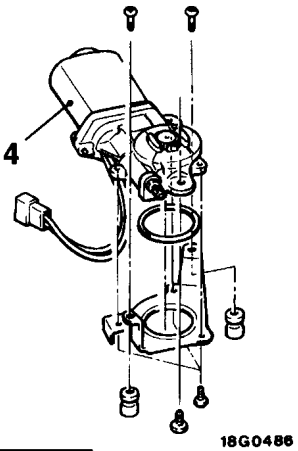
CRYSTAL LITE ROOF SUNSHADE

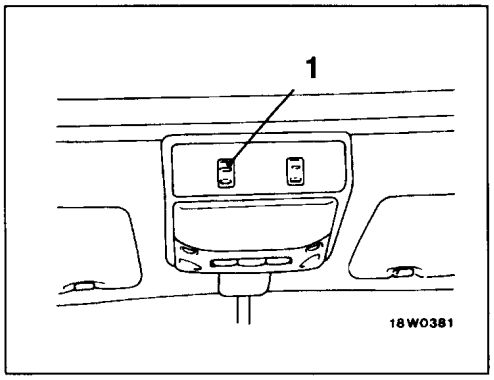
120002233

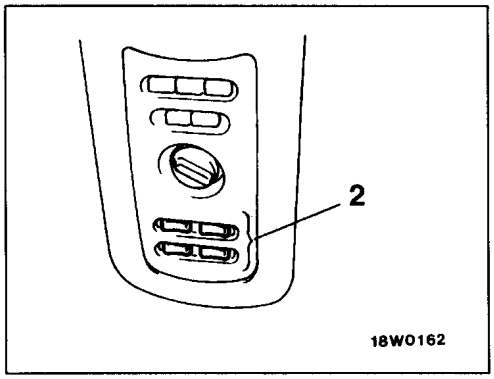
REMOVAL AND INSTALLATION











00000763

1. Sunshade switch and room lamp assembly (For front seat)
2. Sunshade switch and room lamp assembly (For rear seat)

Sunshade assembly removal steps

- Rear headlining (Refer to GROUP 52A – Headlining.)
- Roof duct (Refer to GROUP 55 – Roof duct.)

3. Sunshade assembly

Sunshade motor removal steps

- Rear headlining (Refer to GROUP 52A – Headlining.)
- Roof duct (Refer to GROUP 55 – Roof Duct.)

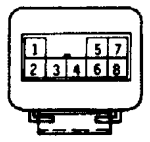
4. Sunshade motor

Sunshade relay removal steps

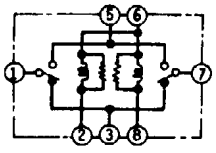
- Rear headlining (Refer to GROUP 52A – Headlining.)

5. Sunshade relay

NOTE
There is no special order in which the sunshade relays need to be installed.



16G0338



16G0340

00000785

INSPECTION

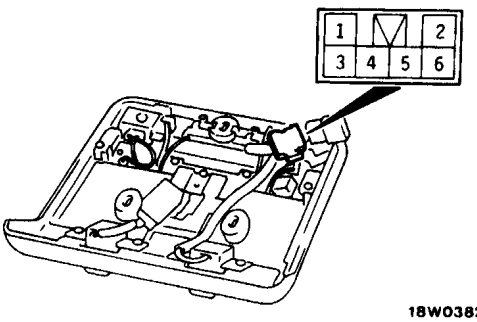
SUNSHADE RELAY CONTINUITY INSPECTION

System voltage	Terminal No.						
	1	2	3	5	6	7	8
Not applied	○	○	○		○	○	○
Applied	○	⊖		○	⊕		
				○	⊕	○	⊖

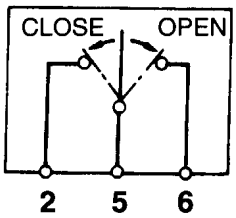
SUNSHADE SWITCH CONTINUITY INSPECTION

(For front seat)

Switch position	Terminal No.		
	2	5	6
OPEN		○	○
CLOSE	○	○	



18W0382

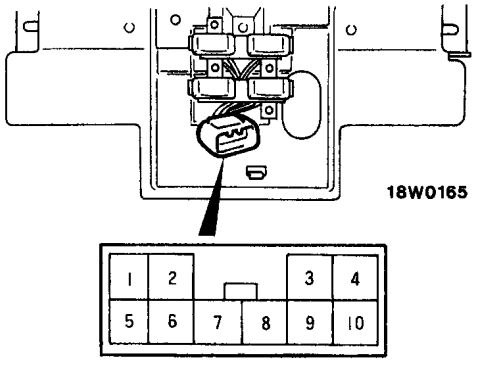


18G0482

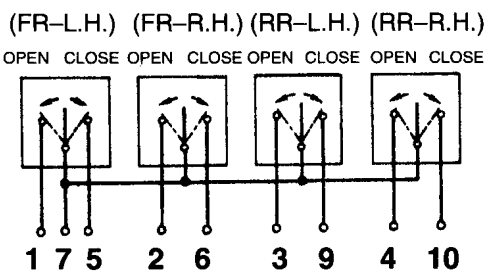
00000786

(For rear seat)

Switch position		Terminal No.									
		1	2	3	4	5	6	7	8	9	10
OPEN	FR–L.H.	○						○			
	FR–R.H.		○					○			
	RR–L.H.			○				○			
	RR–R.H.				○			○			
OFF											
CLOSE	FR–L.H.					○		○			
	FR–R.H.						○	○			
	RR–L.H.							○		○	
	RR–R.H.							○			○



18W0165



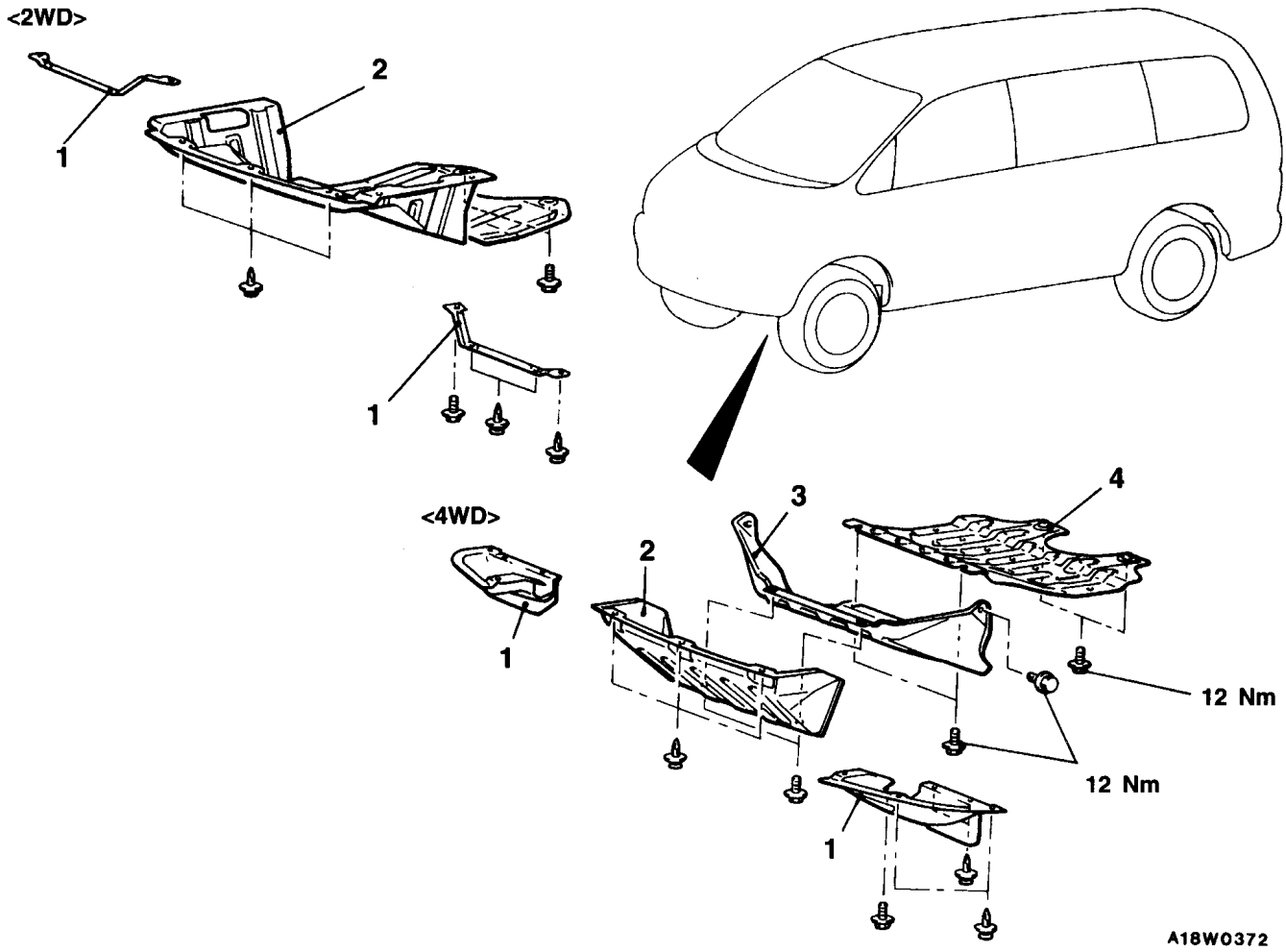
18G0483

00000787

UNDER COVER

120000481

REMOVAL AND INSTALLATION



Removal steps

<2WD>

1. Under cover plate
2. Under cover panel

<4WD>

1. Under cover side panel
2. Under cover panel
3. Under skid plate
4. Under cover

EXTERIOR

CONTENTS

120002128

FRONT BUMPER 3

REAR BUMPER 4

GRILLES, GARNISHES AND MOULDINGS 5

SPECIAL TOOL 5

GRILLES, GARNISHES AND MOULDINGS 5

WINDSHIELD WIPER AND WASHER* 6

SERVICE SPECIFICATION 6

WINDSHIELD WIPER AND WASHER 6

Inspection 8

Column Switch Inspection 8

REAR WIPER AND WASHER* 9

SERVICE SPECIFICATION 9

REAR WIPER AND WASHER 9

Inspection 11

Column Switch Inspection 11

Intermittent Wiper Relay Inspection 11

Washer Motor Inspection 12

HEADLAMP WASHER* 13

Inspection 14

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: impact sensors, SRS diagnosis unit, 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 (*).

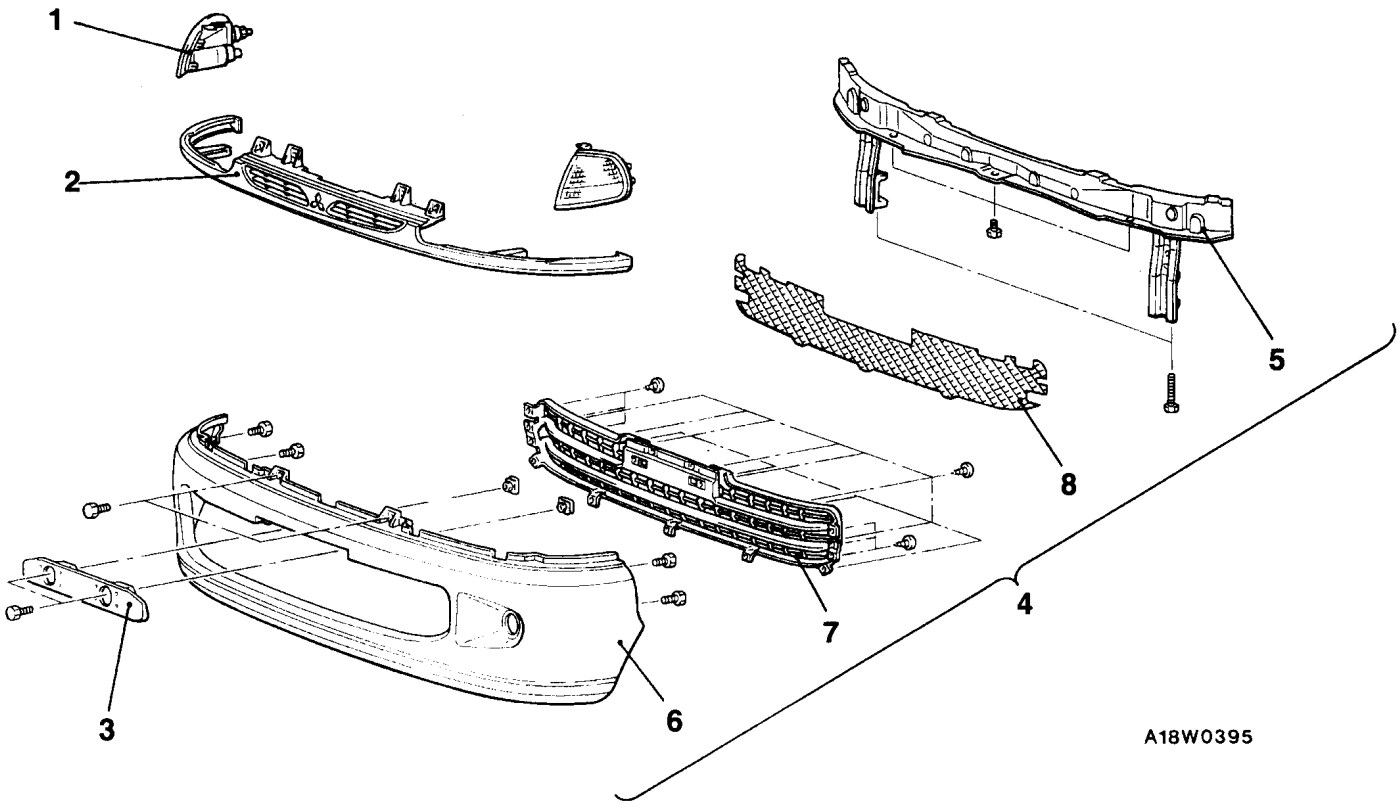
DOOR MIRROR 15
SPECIAL TOOL 15
DOOR MIRROR 15
Inspection 16
REAR UNDER GUARD <4WD> 17
ADHESIVE 17
REAR UNDER GUARD 17
STEP <4WD> 18
ADHESIVE 18
STEP 18

FRONT BUMPER

120002129

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
(1)Splash Shield Removal and Installation
(Refer to GROUP 42 – Fender.)
(2)Under Cover Panel Removal and Installation
(Refer to GROUP 42 – Under Cover.)



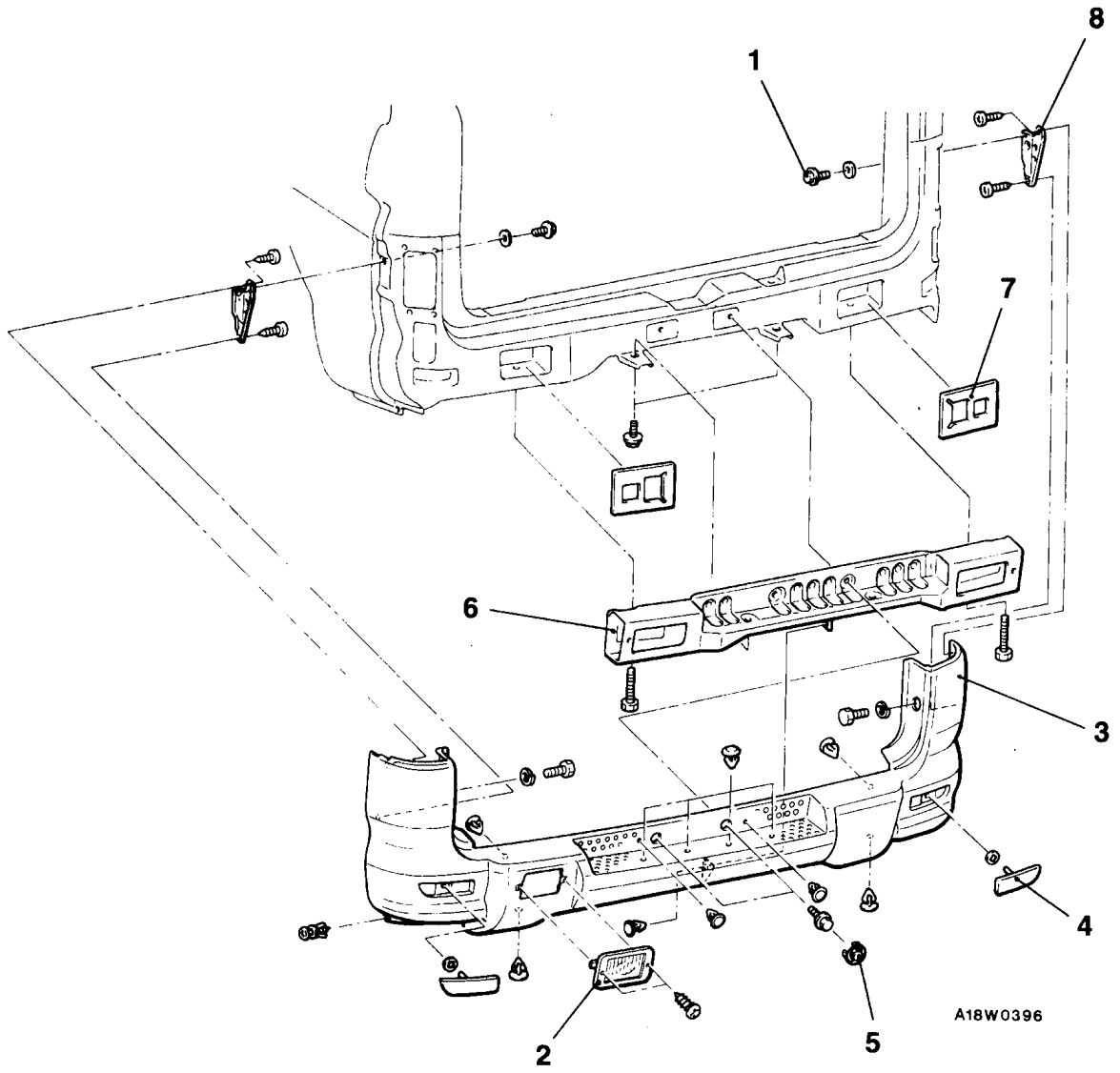
Removal steps

1. Front turn signal lamp (Refer to GROUP 54 – Front Turn Signal Lamp.)
2. Radiator grille (Refer to P. 51-5.)
3. License plate bracket assembly
4. Bumper assembly
5. Front bumper reinforcement
6. Bumper face
7. Under grille
8. Net

REAR BUMPER

120002130

REMOVAL AND INSTALLATION



NOTE
The rear fog lamp is only installed at driver's side.

Removal steps

- Gate pillar trim lower (Refer to GROUP 52A – Trim.)
- Rear washer tank (Refer to P.51-10.)

1. Bolt
2. Rear fog lamp
3. Rear bumper face
4. Reflector
5. Cap
6. Rear bumper back beam assembly
7. Packing
8. Rear bumper side bracket

GRILLES, GARNISHES AND MOULDINGS

120000392

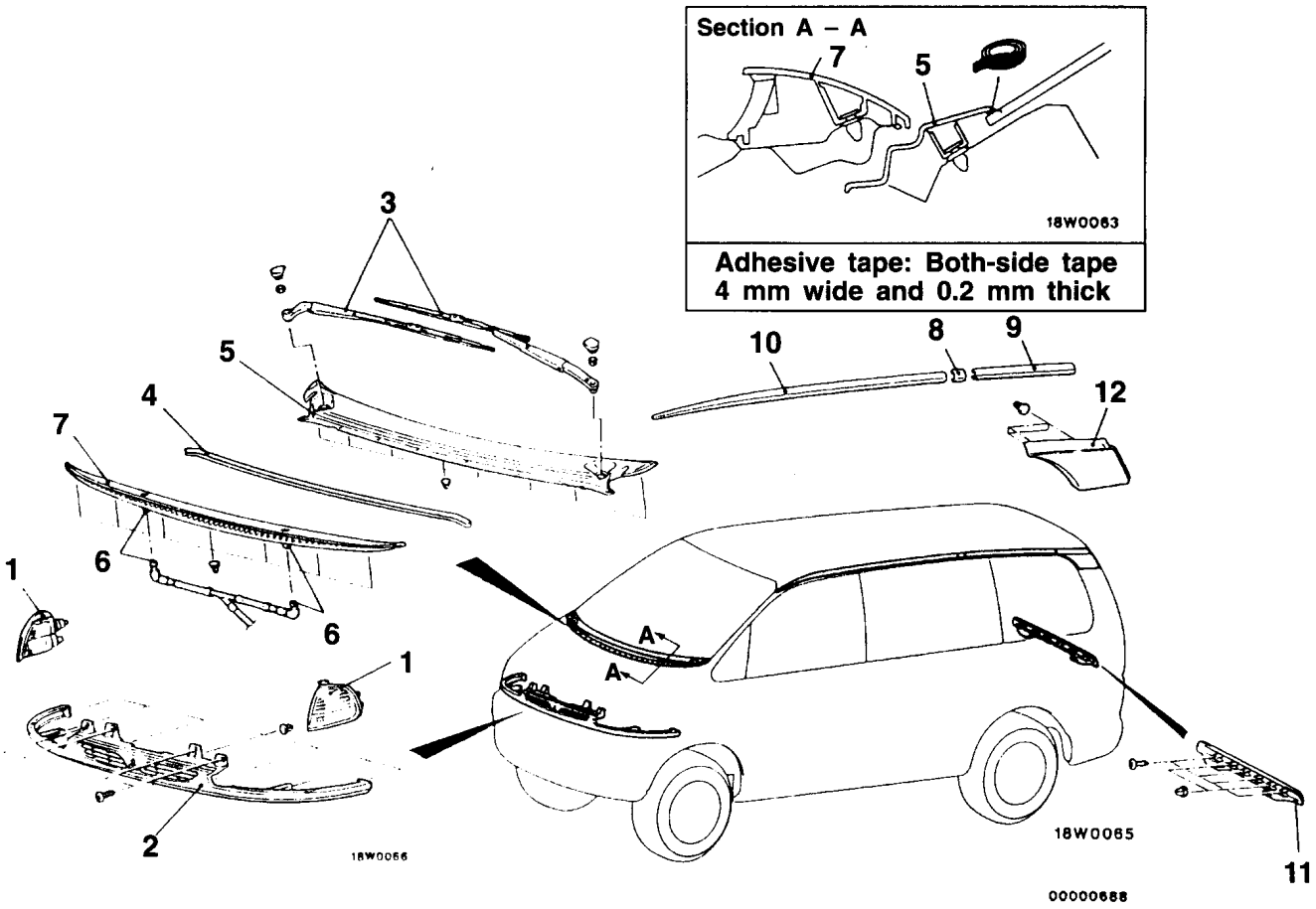
SPECIAL TOOL

Tool	Number	Name	Use
	MB990449	Window moulding remover	Removal of roof drip moulding, etc.

GRILLES, GARNISHES AND MOULDINGS

120000393

REMOVAL AND INSTALLATION



Radiator grille removal steps

1. Front turn signal lamp (Refer to GROUP 54 – Front Turn Signal Lamp.)
2. Radiator grille

Front deck garnish removal steps

3. Wiper arm assembly
4. Hood weatherstrip
5. Front deck garnish

Hood end garnish removal steps

- Air intake duct assembly (Refer to GROUP 42 – Hood.)

6. Washer hose connection
7. Hood end garnish

Drip moulding removal steps

8. Joint
9. Rear drip moulding
10. Front drip moulding

Tailgate garnish removal steps

- Tailgate trim (Refer to GROUP 52A – Trim.)

11. Tailgate garnish

D pillar garnish removal

12. D pillar garnish

WINDSHIELD WIPER AND WASHER

120002131

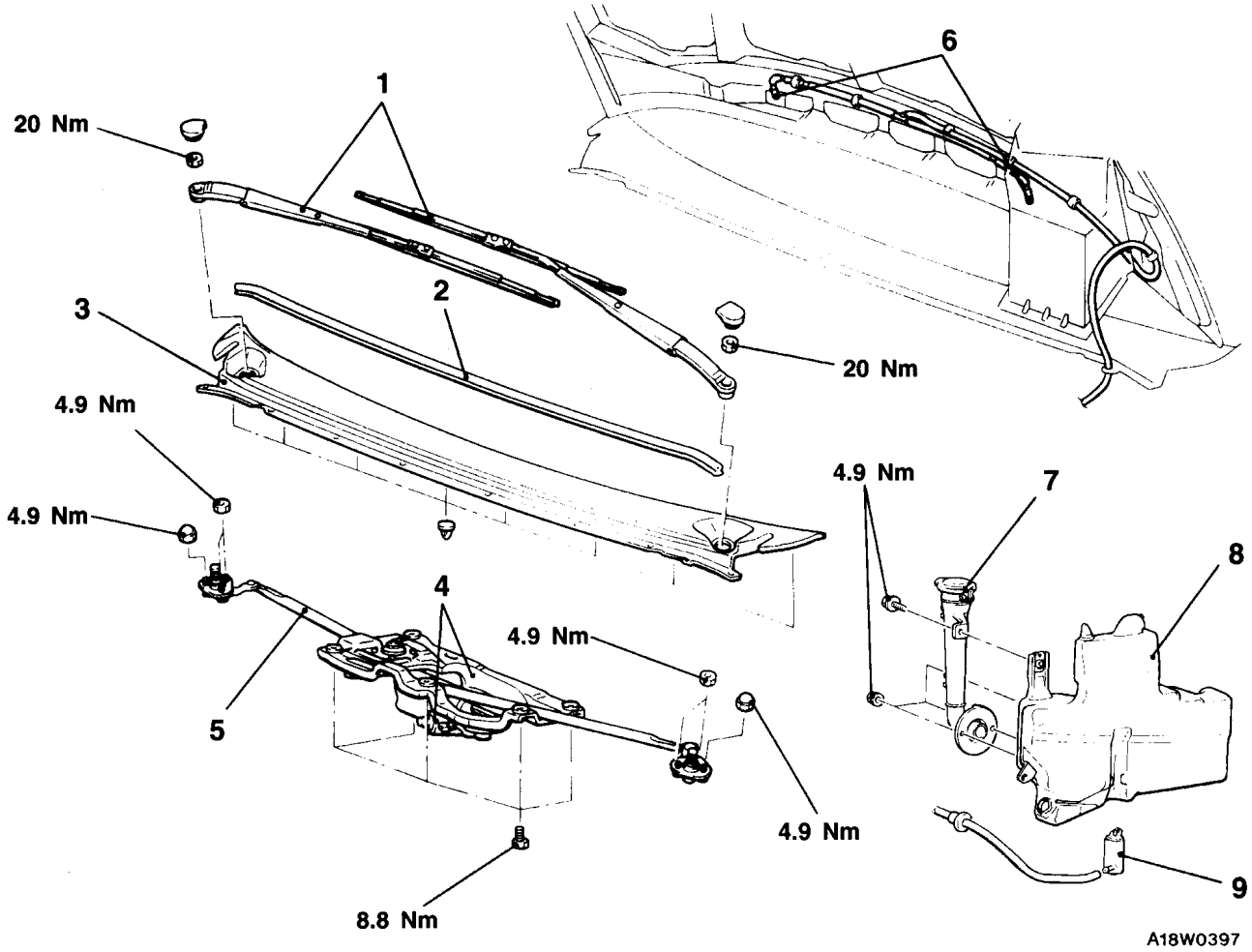
SERVICE SPECIFICATION

Items		Standard value
Windshield wiper blade installation position mm	R.H. (Distance from the front deck garnish end)	30±5
	L.H. (Distance from the wiper blade R.H.)	60±5

WINDSHIELD WIPER AND WASHER

120002132

REMOVAL AND INSTALLATION



Wiper motor and linkage removal steps

▶A◀ 1. Wiper arm and blade assembly
2. Hood weatherstrip
3. Front deck garnish
4. Wiper motor and bracket assembly
5. Link assembly

Washer nozzle removal steps

- Air intake duct assembly
  (Refer to GROUP 42 – Hood.)

6. Washer nozzle

Washer tank removal steps

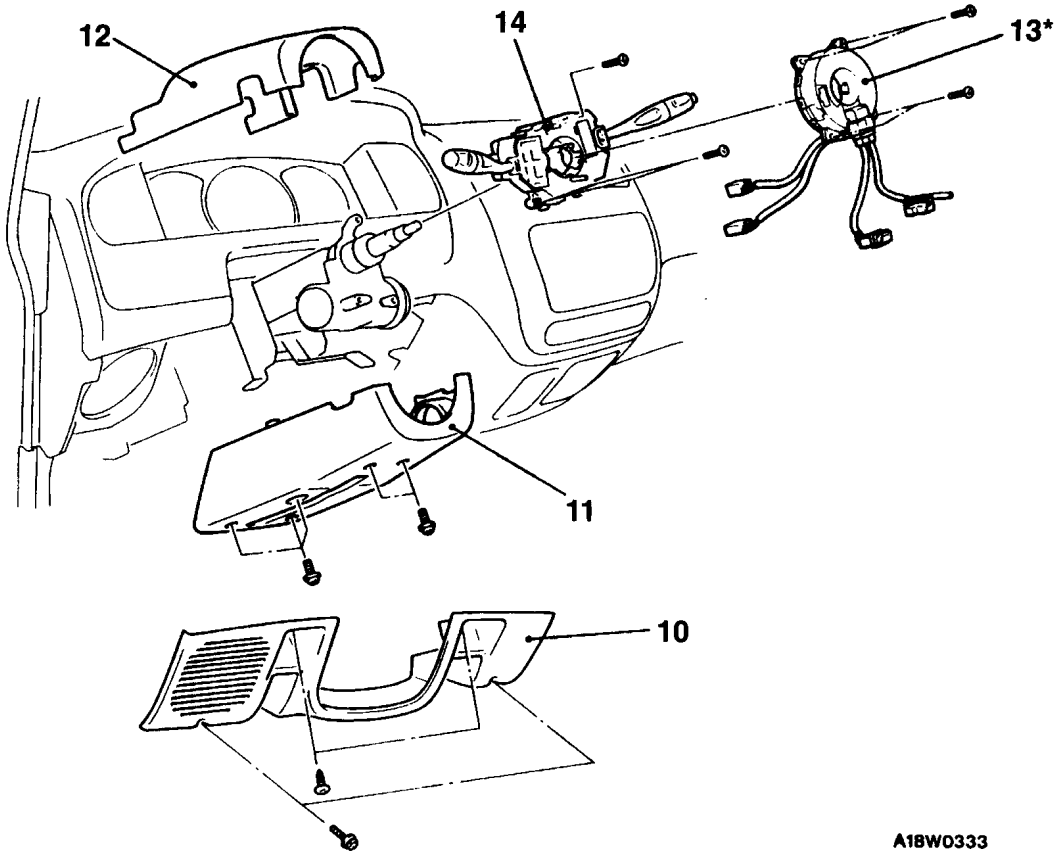
- Reserve tank
  (Refer to GROUP 14 – Radiator.)

7. Inlet assembly
- Splash shield
  (Refer to GROUP 42 – Fender.)

8. Windshield washer tank
9. Washer motor and pump assembly

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

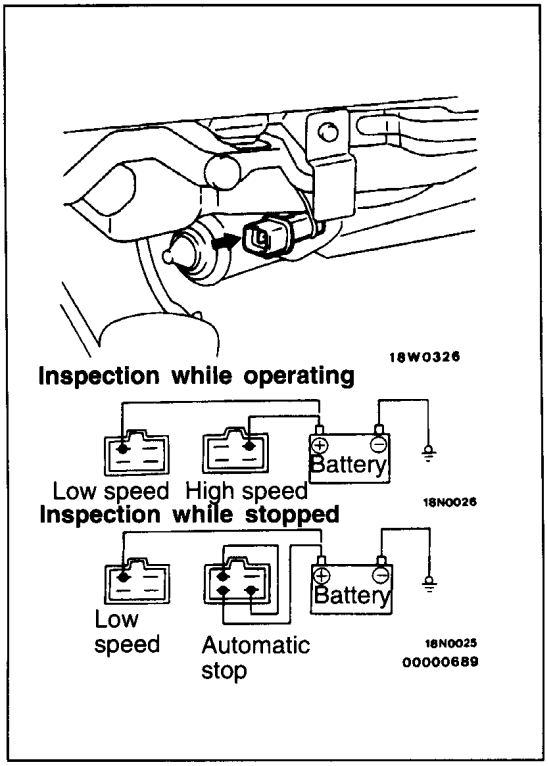
Post-Installation Operation
- Checking Steering Wheel Position with Wheels Straight Ahead



Column switch removal steps
- Horn pad (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

10. Under cover (Refer to GROUP 52A – Instrument panel.)
11. Column cover, lower
12. Column cover, upper
13. Clock spring* <Vehicles with SRS> (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
14. Column switch assembly (With built-in wiper and washer switch, and wiper relay)

NOTE
Parts marked with * should not be removed from the column switch except when removal is absolutely necessary.



INSPECTION

WIPER MOTOR INSPECTION

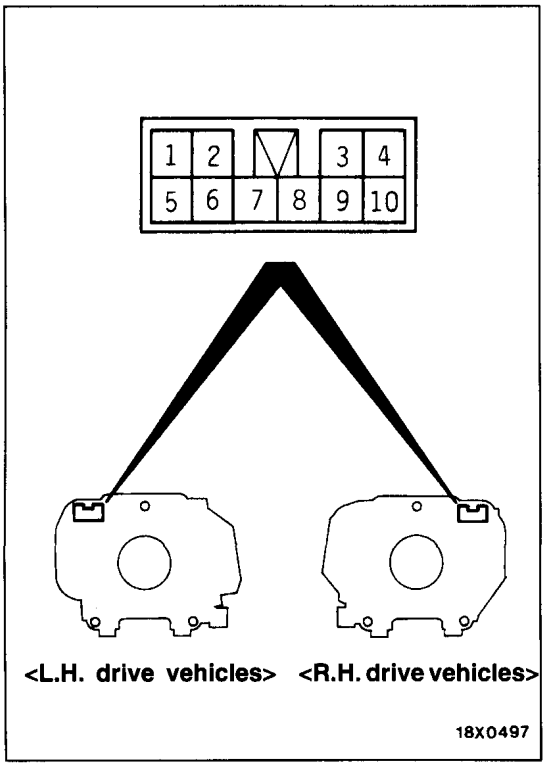
Check the wiper motor after disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

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.



COLUMN SWITCH INSPECTION

Wiper and Washer Switch Continuity Inspection

<L.H. drive vehicles>

Switch position		Terminal No.				
		6	7	8	9	10
Wiper switch	OFF		○	○		
	1 (LO)			○		○
	2 (HI)				○	○
Washer switch	ON	○				○

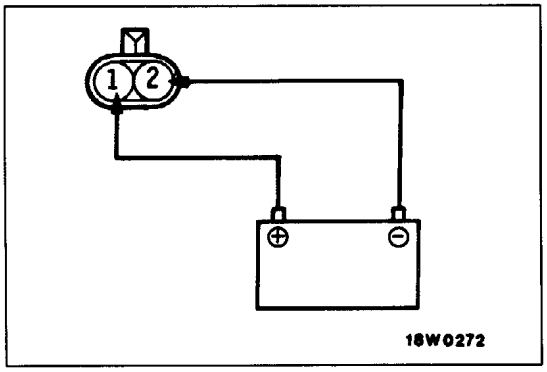
<R.H. drive vehicles>

Switch position		Terminal No.				
		8	9	10	11	12
Wiper switch	OFF			○	○	
	1 (LO)	○		○		
	2 (HI)	○	○			
Washer switch	ON	○				○

Intermittent Wiper Relay; Intermittent Operation Inspection (integrated into the column switch assembly)

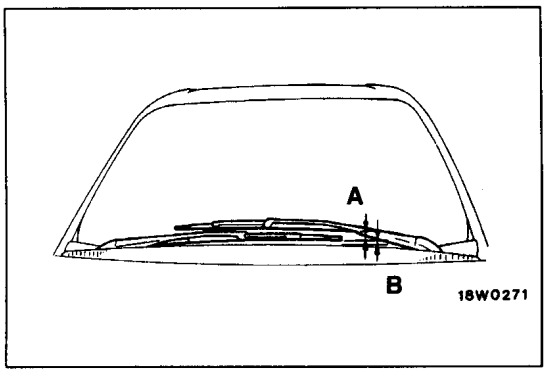
(1) Connect the column switch connector.
(2) Turn the ignition switch to ACC.
(3) Inspect the intermittent operation time when the wiper switch is turned to INT.

Vehicles with variable intermittent control
FAST: Approx. 2 seconds
SLOW: Approx. 15 seconds



WASHER MOTOR

(1) With the washer motor installed to the washer tank, fill the washer tank with water.
(2) When the battery is connected as shown in the figure, check that the water squirts out strongly.



INSTALLATION SERVICE POINT

▶A◀ WIPER ARM AND BLADE ASSEMBLY INSTALLATION

Install the wiper blade in the specified position (standard value).

Standard value:
Distance from the wiper blade (R.H.)
(A): 60±5 mm
Distance from the front deck garnish end
(B): 30±5 mm

REAR WIPER AND WASHER

120000396

SERVICE SPECIFICATION

Items	Standard value
Rear wiper blade's stop position (Distance from the rear window glass ceramic end line) mm	70±5

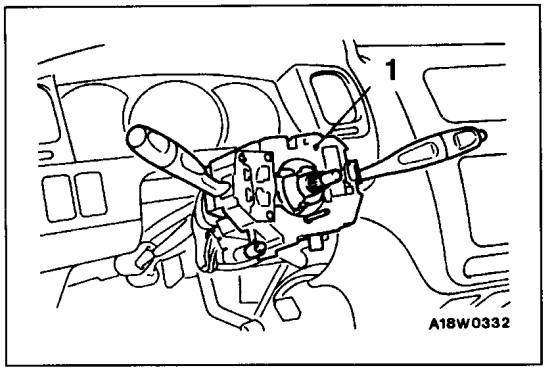
REAR WIPER AND WASHER

120002133

REMOVAL AND INSTALLATION

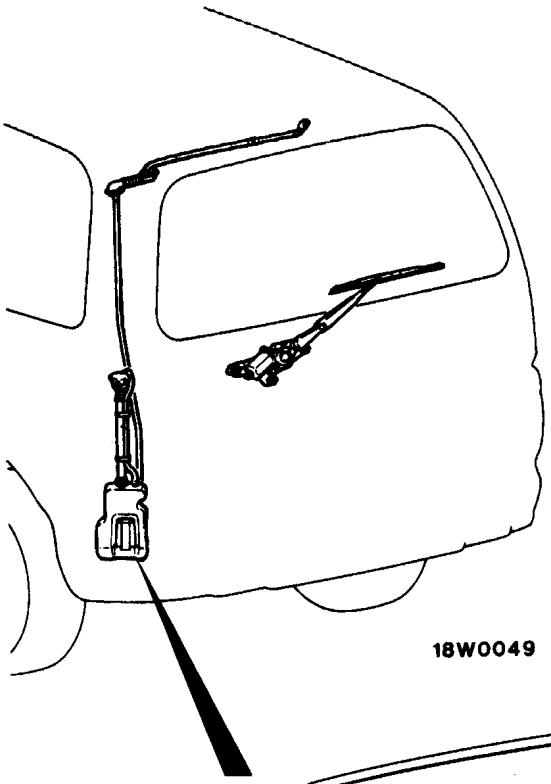
CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – Service Precautions and Air Bag Module and Clock Spring.

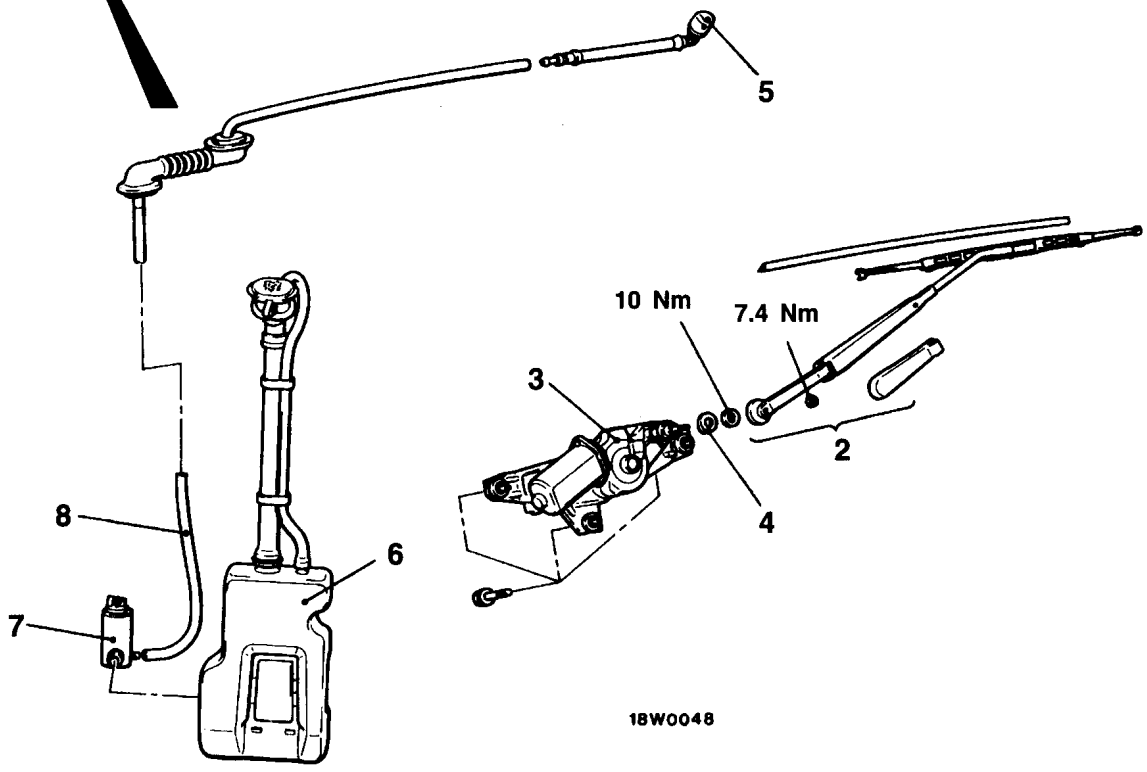
Post-installation Operation
<Column switch assembly>
- Checking Steering Wheel Position with Wheels Straight Ahead



Column switch removal

1. Column switch assembly (Wiper and washer switch) (Refer to P. 51-7.)





00000690

Wiper motor removal steps

- Tailgate trim
  (Refer to GROUP 52A – Trim.)

▶A◀ 2. Wiper arm and blade assembly
3. Motor and bracket assembly
4. Packing and washer

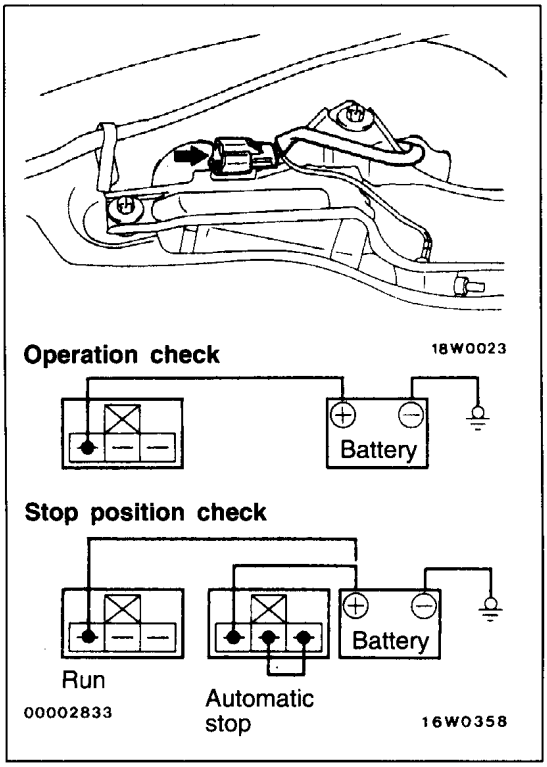
Washer nozzle removal

5. Washer nozzle

Washer tank removal steps

- Box lid (Refer to GROUP 52A – Trim.)

6. Washer tank assembly
7. Washer motor
8. Washer hose assembly



INSPECTION

WIPER MOTOR INSPECTION

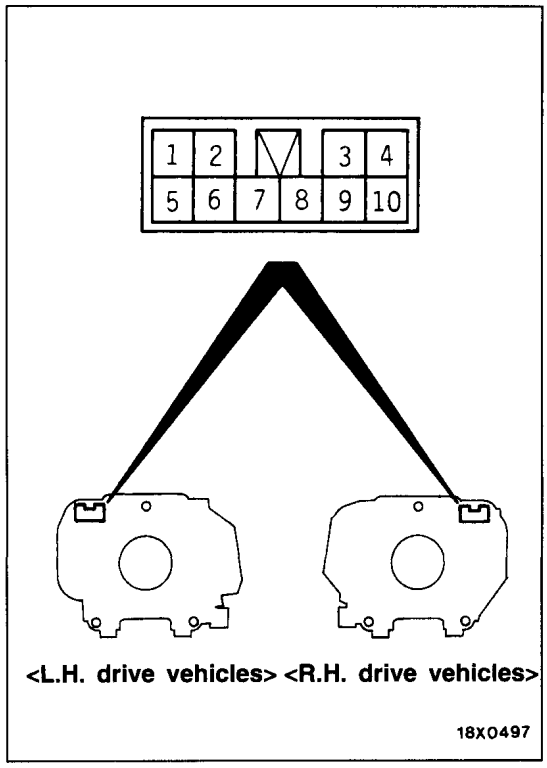
Check the wiper motor after first disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

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.

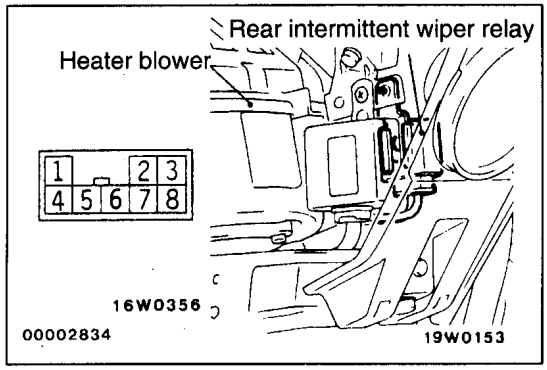


COLUMN SWITCH INSPECTION

Wiper and Washer Switch Continuity Inspection

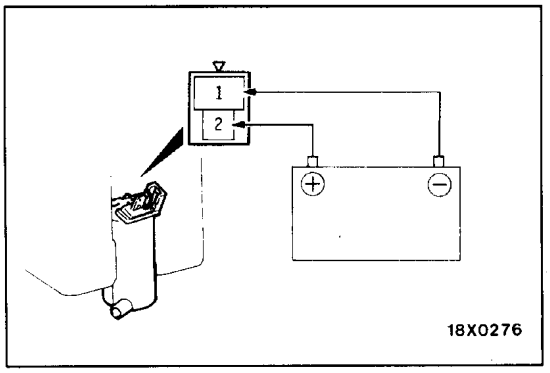
Switch position		Terminal No.			
		2	3	4	10, 8*
Wiper switch	INT		○		○
	ON			○	○
Washer switch	ON	○			○

*: R.H. drive vehicles



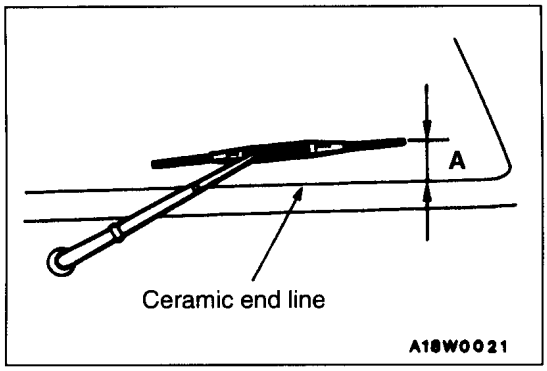
INTERMITTENT WIPER RELAY INSPECTION

(1) Check to be sure that there is continuity between terminals (1) – (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.



WASHER MOTOR INSPECTION

(1) With the washer motor installed to the washer tank, fill the washer tank with water.
(2) When the battery is connected as shown in the figure, check that the water squirts out strongly.



INSTALLATION SERVICE POINT

▶A◀ WIPER ARM ASSEMBLY INSTALLATION

Install the wiper arm to the pivot shaft so that the wiper blade's stop position is the position (standard value) shown in the illustration.

Standard value (A): 70±5 mm

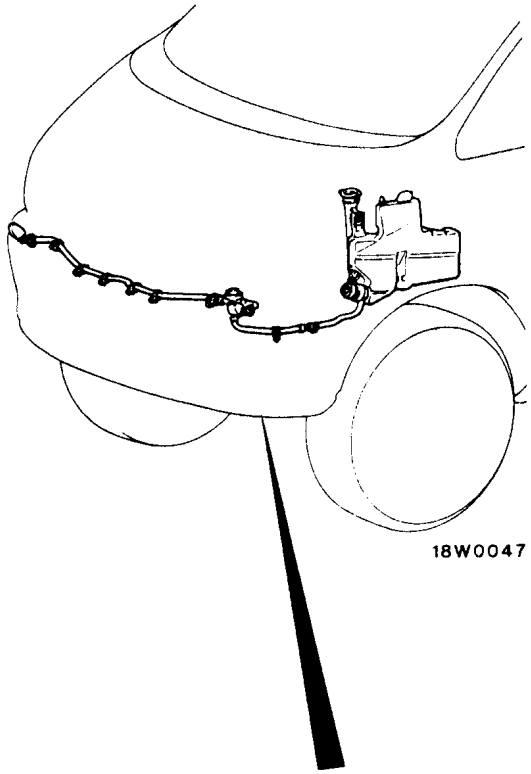
HEADLAMP WASHER

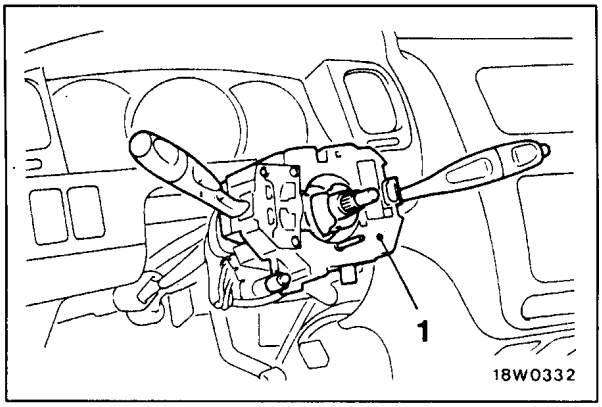
120002134

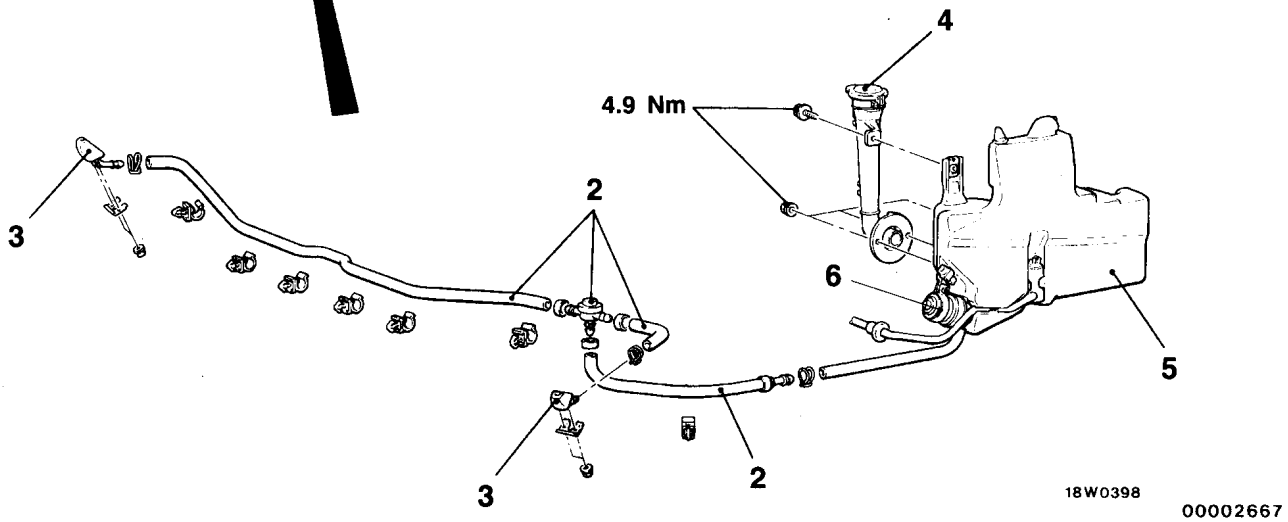
REMOVAL AND INSTALLATION

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

Post-Installation Operation
<Column switch assembly>
- Checking Steering Wheel Position with Wheels Straight Ahead



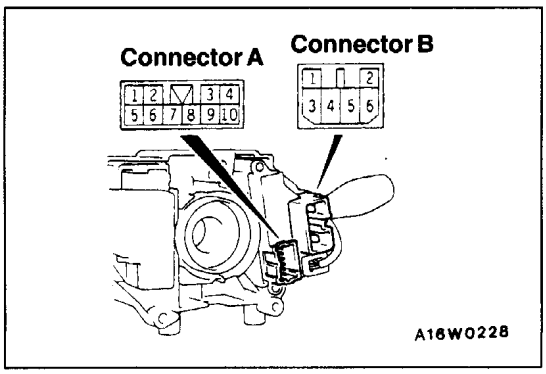




1. Column switch assembly (Headlamp washer switch) (Refer to P.51-14.)

Nozzle assembly removal steps
- Front bumper (Refer to P.51-3.)
2. Washer hose and check valve assembly
3. Nozzle assembly

Washer tank removal steps
- Reserve tank (Refer to GROUP 14 – Radiator.)
4. Inlet assembly
- Splash shield (Refer to GROUP 42 – Fender.)
5. Washer tank
6. Washer motor and washer fluid level switch

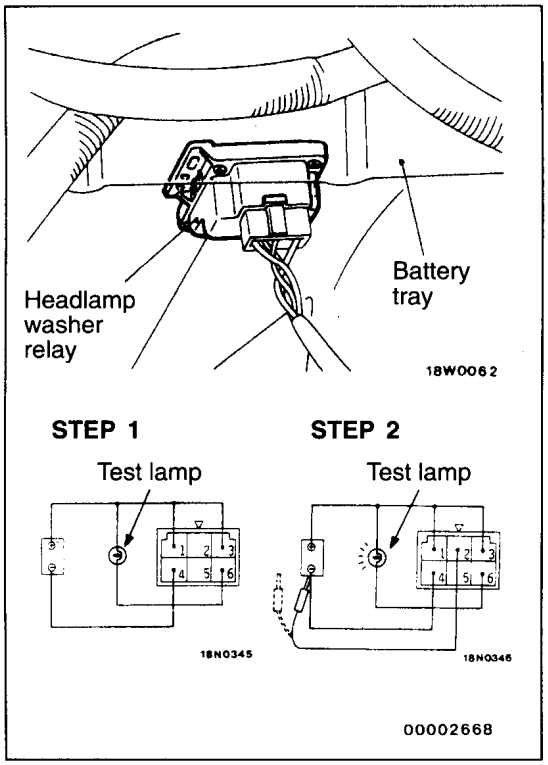


INSPECTION

COLUMN SWITCH INSPECTION

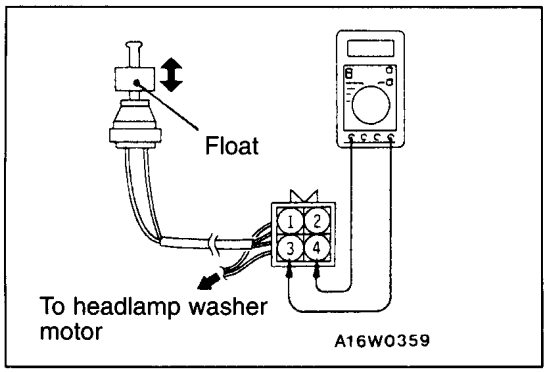
Headlamp Washer Switch Continuity Inspection

Check the continuity between termianl 2 of connector A and termianl 1 of connector B with the headlamp washer switch in ON position.



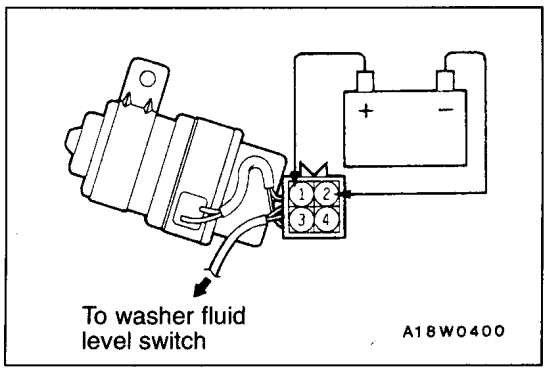
HEADLAMP WASHER RELAY INSPECTION

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 termianl (2) to battery (–).



WASHER FLUID LEVEL SWITCH CONTINUITY INSPECTION

1. Remove the washer fluid level switch from the washer tank.
2. Connect a circuit tester to the connector of washer fluid level switch.
3. Move the float up and down.
4. Check to be sure that there is continuity between the terminals when the float is down.



HEADLAMP WASHER MOTOR INSPECTION

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.

DOOR MIRROR

120000398

SPECIAL TOOL

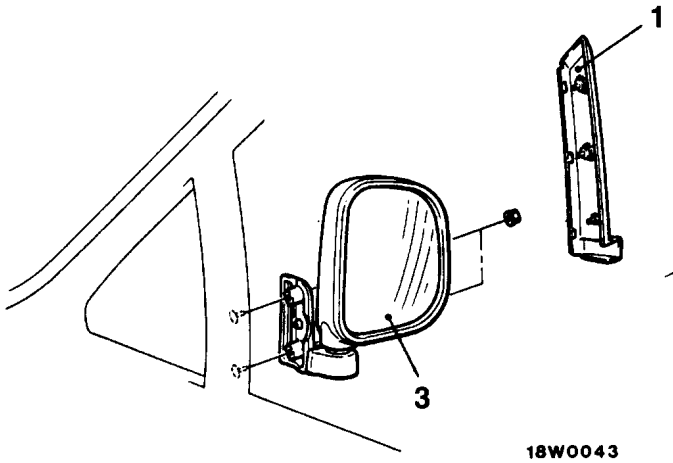
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of electric remote-controlled door mirror switch.

DOOR MIRROR

120002233

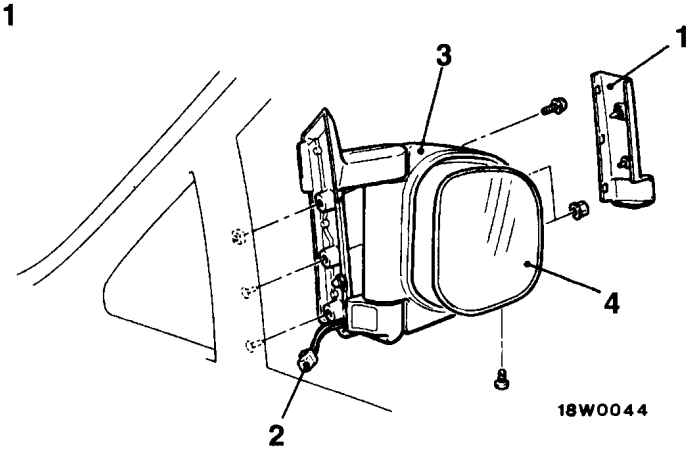
REMOVAL AND INSTALLATION

<Manual type>

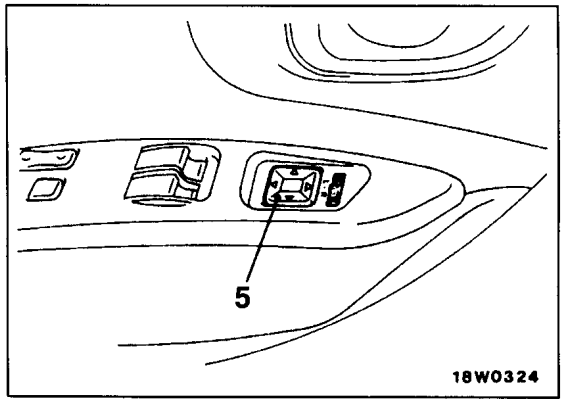


18W0043

<Electric remote-controlled type>



18W0044



18W0324

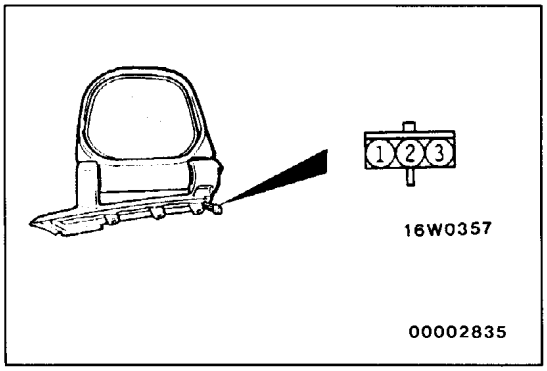
00000693

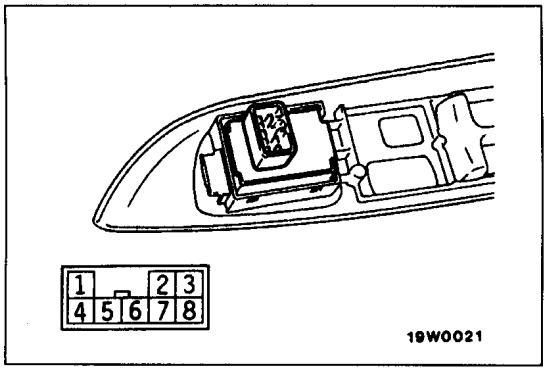
Door mirror removal steps

1. Mirror cover assembly
2. Harness connector <Vehicles with electric remote-controlled mirror>
3. Door mirror assembly
4. Mirror

Electric remote-controlled door mirror switch removal

5. Electric remote-controlled door mirror switch





INSPECTION

ELECTRIC REMOTE-CONTROLLED DOOR MIRROR INSPECTION

Battery connection terminal			Direction of operation
1	2	3	
⊖		⊕	UP
⊕		⊖	DOWN
⊕	⊖		LEFT
⊖	⊕		RIGHT

ELECTRIC REMOTE-CONTROLLED DOOR MIRROR SWITCH CONTINUITY INSPECTION

Direction of operation	Selector switch position	Terminal No.						
		1	2	3	4	5	6	7
UP	L.H. side			○		○		
	OFF	○	○					
	R.H. side			○				○
DOWN	L.H. side	○				○		
	OFF		○	○				
	R.H. side	○						○
LEFT	L.H. side	○			○			
	OFF		○	○				
	R.H. side	○					○	
RIGHT	L.H. side			○	○			
	OFF	○	○					
	R.H. side			○			○	

REAR UNDER GUARD <4WD>

120000401

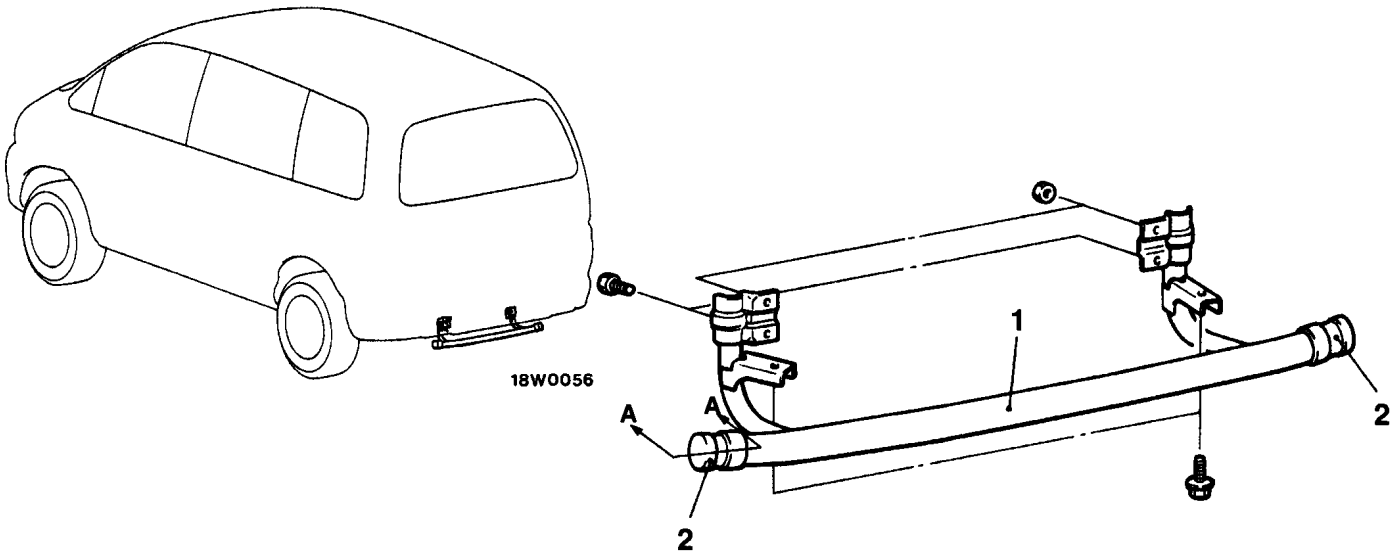
ADHESIVE

Item	Specified adhesive
Rear under guard and caps	3M Part No. EC-1368 or 3M ATD Part No. 8080 or equivalent

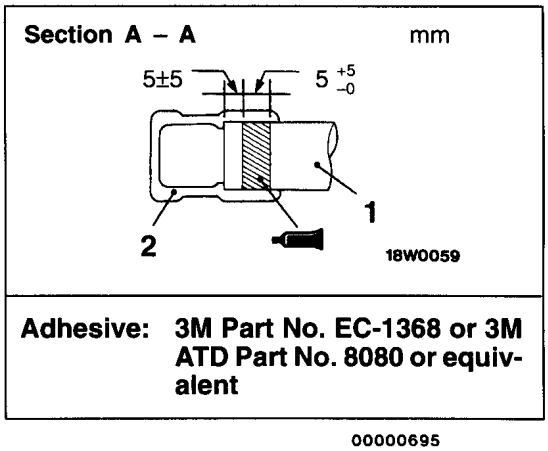
REAR UNDER GUARD

120000402

REMOVAL AND INSTALLATION



18W0058



00000695

Removal steps

1. Rear under guard
2. Caps

STEP <4WD>

120000403

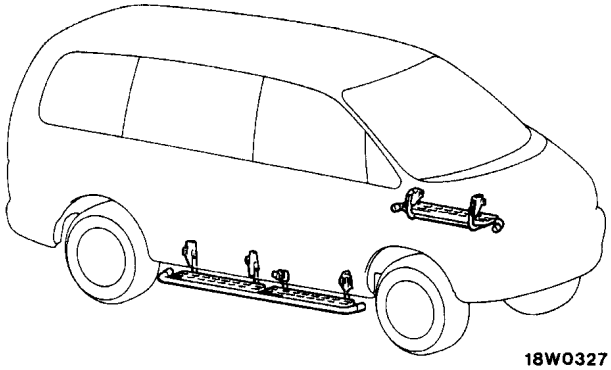
ADHESIVE

Item	Specified adhesive
Step assembly (A), (B) and caps	3M Part No. EC-1368 or 3M ATD Part No. 8080 or equivalent

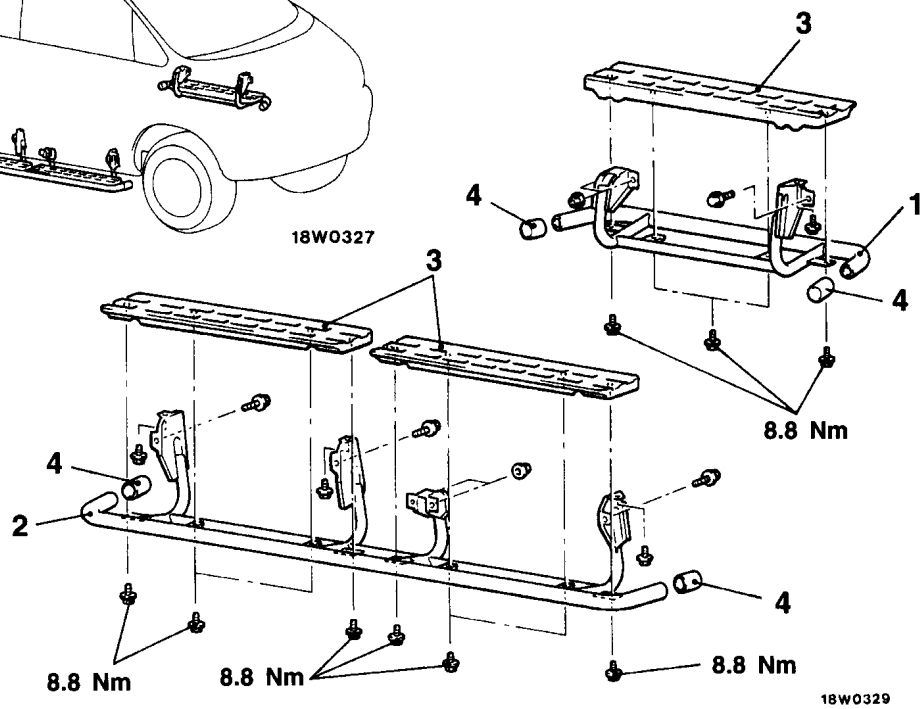
STEP

120000404

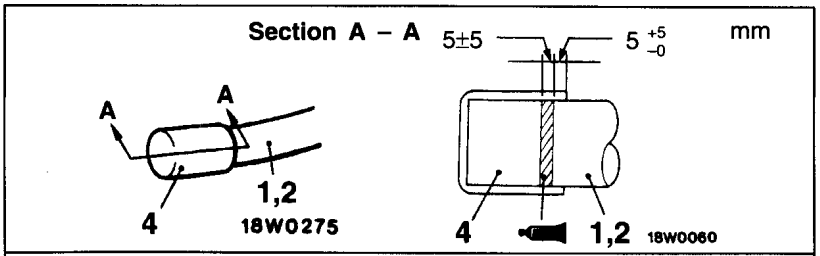
REMOVAL AND INSTALLATION



18W0327



18W0329



Adhesive: 3M Part No. EC-1368 or 3M ATD Part No. 8080 or equivalent

00000696

Removal steps

1. Step assembly (A)
2. Step assembly (B)
3. Side step
4. Caps

INTERIOR

CONTENTS

120000359

INTERIOR 52A

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) 52B

NOTES

INTERIOR

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120002292

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HEADLINING (MOULDED TYPE) 17

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Front Seat 20

Second Seat (Bench Type) 22

Second Seat (Separate Type) 24

Third Seat 26

Heated Seat Switch 28

SEAT BELT 29

Front Seat Belt 29

Second Seat Belt 30

Third Seat Belt 31

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: impact sensors, SRS diagnosis unit, 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 (*)

ADHESIVE

120000361

Item	Specified adhesive
Headlining (Paste type)	3M Part No.EC-1368 or 3M ATD Part No.8080 or equivalent

SPECIAL TOOL

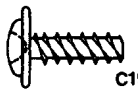
120000362

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of instrument panel, trim, etc.

INSTRUMENT PANEL

120002293

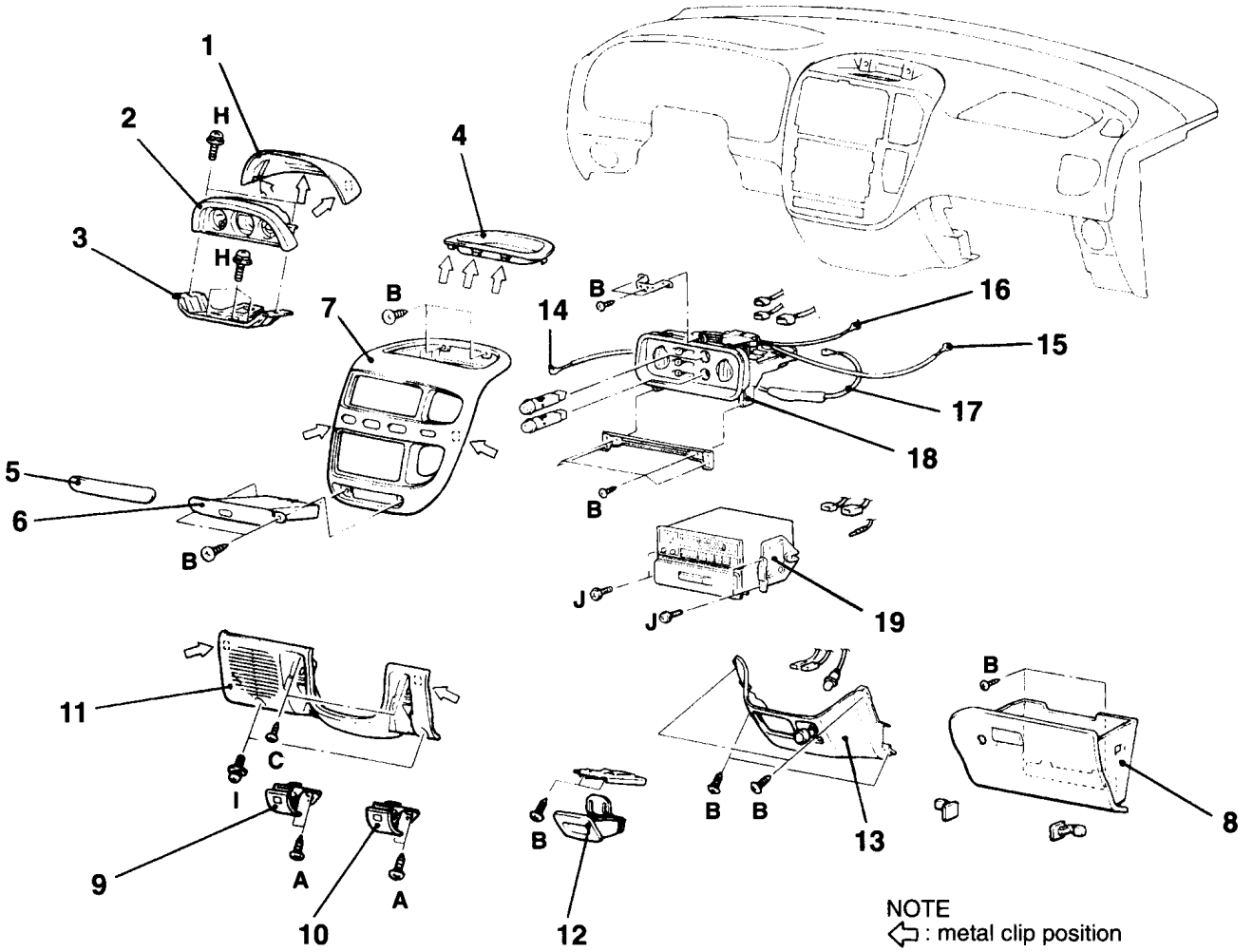
For installation of the instrument panel, the bolts and screws described below are used. They are indicated by symbols in the illustration.

Name	Symbol	Size mm (D×L)	Colour	Shape
Tapping screw	A	5×12	–	A19N0001
	B	5×16		
	C	5×20		
	D	4×10	–	 C19N0001
	E	5×12		
	F	5×16		
	G	5×35	Black	D19N0001
Washer assembled screw	H	5×16	–	E19N0001
	I	5×20		
	J	5×16	–	F19N0001
Washer assembled bolt	K	6×16	–	H19N0001
	L	8×30		

D = Thread diameter
L = Effective thread length

REMOVAL AND INSTALLATION

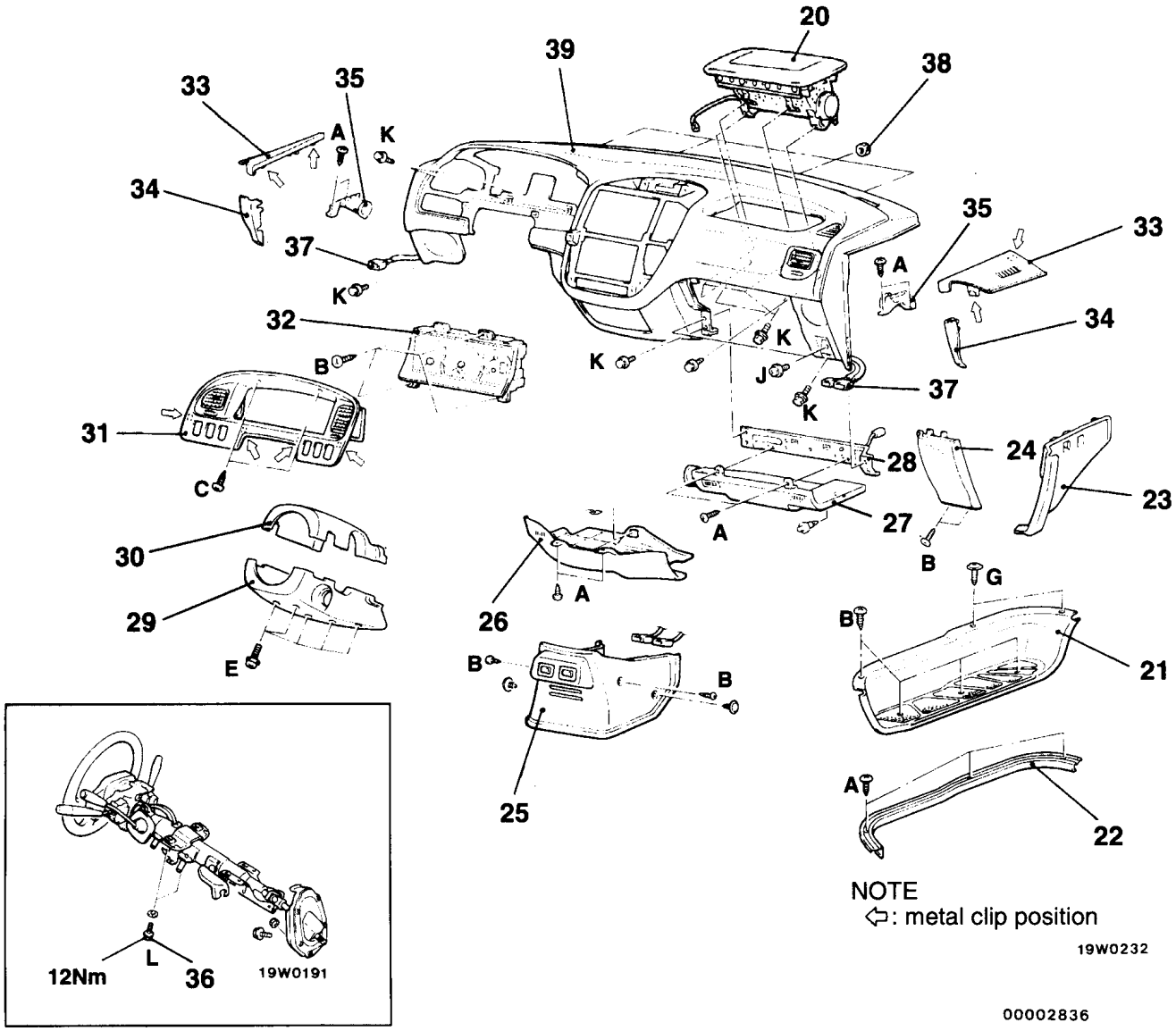
CAUTION: SRS
When removing and installing the computer cover from vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit.



A19W0222

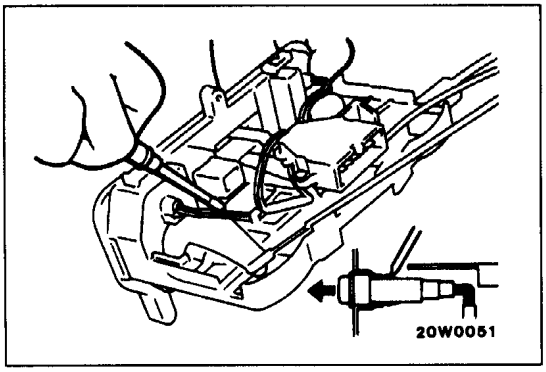
Removal steps

1. Multi-meter panel <4WD>
2. Multi-meter assembly <4WD>
3. Multi-meter bracket <4WD>
4. Instrument panel tray <2WD>
5. Cover <Vehicles without cup holder assembly>
6. Cup holder assembly
7. Centre panel
8. Glove box
9. Hood lock release handle
10. Fuel lid lock release handle
11. Under cover
12. Ashtray assembly
13. Centre under cover
- ▶D◀ 14. Air outlet changeover damper cable connection
- ▶C◀ 15. Inside/outside air changeover damper cable connection
- ▶B◀ 16. Air mix damper cable connection
- ▶A◀ 17. Cool air bypass damper cable connection
- ◀A▶ 18. Heater control assembly
19. Radio and tape player



Removal steps

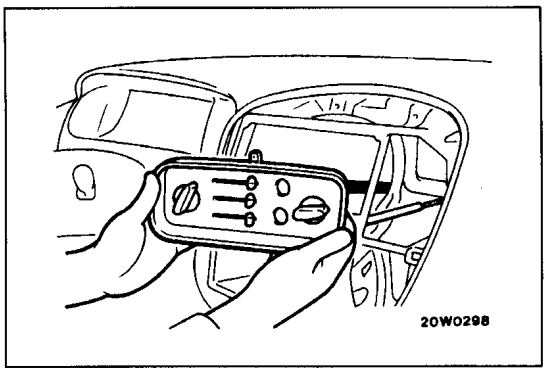
20. Air bag module <Vehicles with front passenger's air bag>
21. Front door step trim <Wagon and Panel van with full trim> (Refer to P.52A-9.)
22. Front door step upper plate <Except vehicles with full trim> (Refer to P.52A-7.)
23. Cowl side trim (R.H.)
24. Speaker garnish
25. Computer cover
26. Heater cover
27. Shower duct
28. Glove box frame
29. Column cover, lower
30. Column cover, upper
31. Meter hood assembly
32. Combination meter
33. Instrument panel side trim
34. Instrument panel side lower trim
35. Side defroster duct (B)
36. Steering column mounting bolt
37. Harness connector
38. Mounting nut <Engine compartment side>
39. Instrument panel



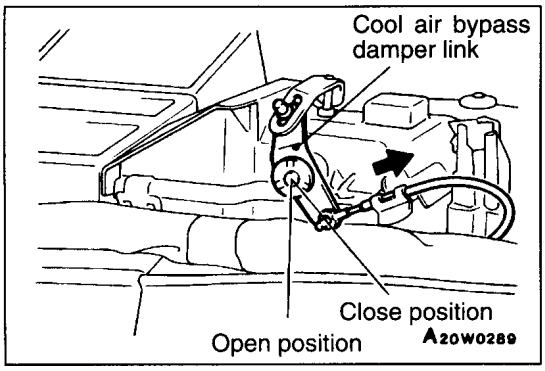
REMOVAL SERVICE POINT

◀A▶ HEATER CONTROL ASSEMBLY REMOVAL

(1) Pull the heater control assembly out slightly from the instrument panel.
(2) Push the upper tab to remove the A/C switch from the heater control assembly. Then pull the A/C switch forward slightly and disconnect the connector. <Vehicles with A/C>



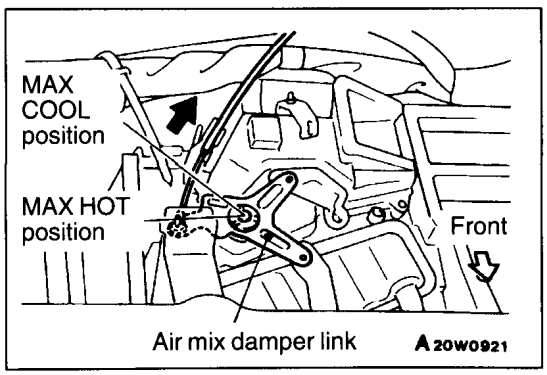
(3) Tilt the heater control assembly towards the passenger's seat to remove it. At this time, make sure that the air outlet changeover control cable doesn't recoil.



INSTALLATION SERVICE POINTS

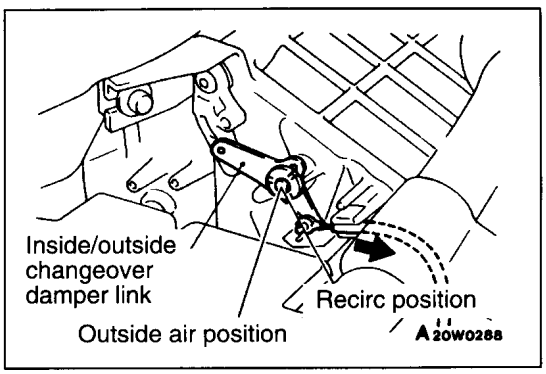
▶A◀ COOL AIR BYPASS DAMPER LEVER CABLE CONNECTION

(1) Set the cool air bypass damper lever on the heater control assembly to the close position.
(2) Set the cool air bypass damper lever at the bottom of the heater unit to the close position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.



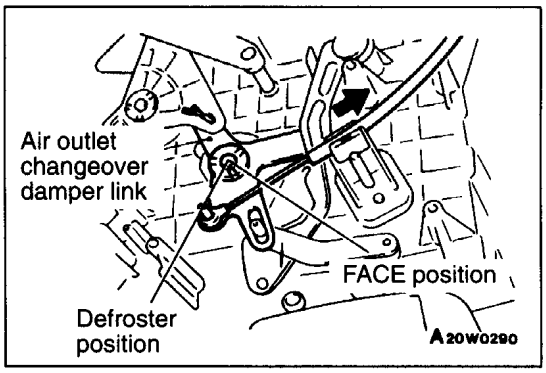
▶B◀ AIR MIX DAMPER CABLE CONNECTION

(1) Set the temperature control knob on the heater control assembly to the MAX HOT position.
(2) Set the air mix damper lever at the bottom of the heater unit to the MAX HOT position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.



▶C◀ INSIDE/OUTSIDE AIR CHANGEOVER DAMPER CABLE INSTALLATION

(1) Set the inside/outside air changeover lever on the heater control assembly to the RECIRC position.
(2) Set the inside/outside air changeover damper lever of the blower motor to the RECIRC position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.

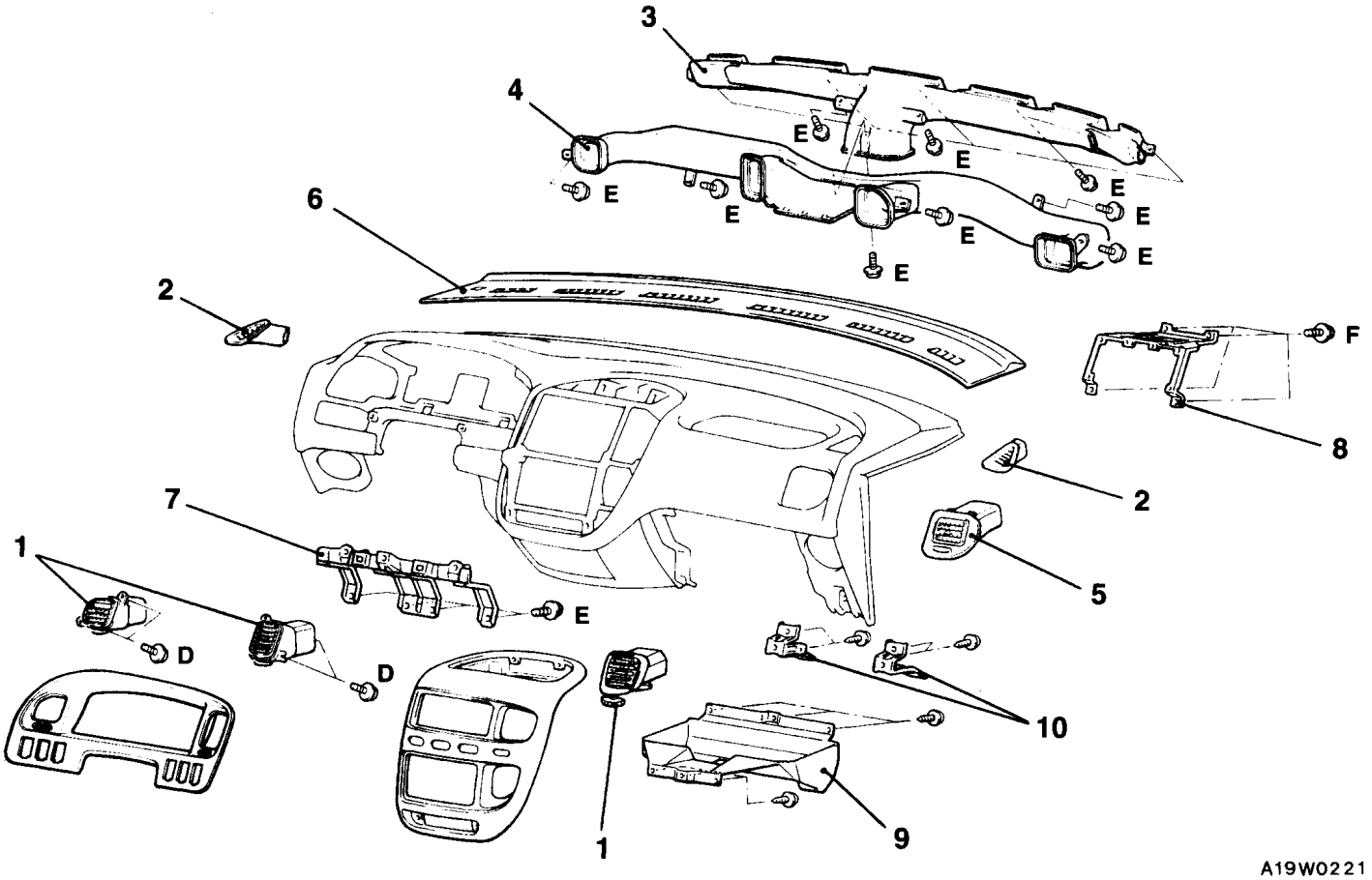


▶D◀ AIR OUTLET CHANGEOVER DAMPER CABLE INSTALLATION

(1) Set the knob for the air outlet changeover on the heater control assembly to the Defroster position.
(2) Set the air outlet changeover damper lever of the heater unit to the Defroster position and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.

DISASSEMBLY AND REASSEMBLY

120002294



Disassembly steps

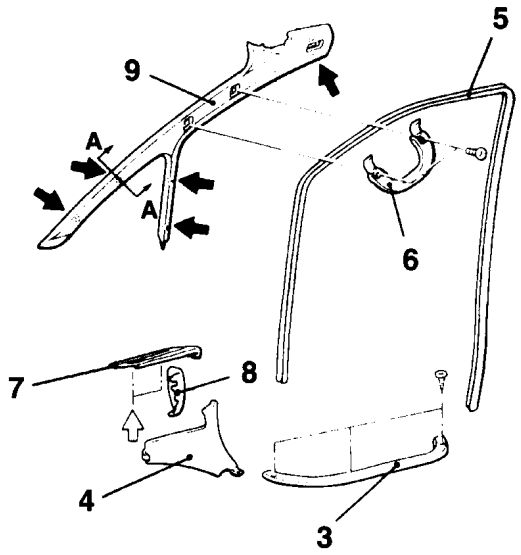
1. Air outlet
2. Side defroster duct (A)
3. Defroster nozzle
4. Distribution duct
5. Air outlet
6. Defroster garnish
7. Combination meter support
8. Instrument panel reinforcement
9. Air bag module support <Vehicles with front passenger's air bag>
10. Instrument panel support bracket

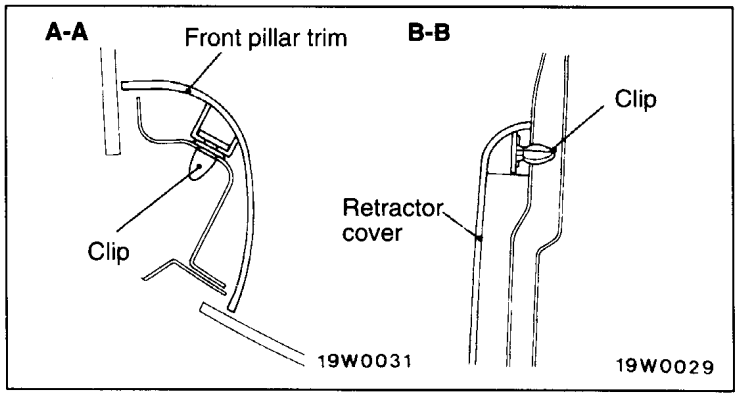
TRIMS

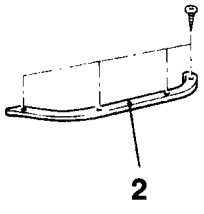
120002295

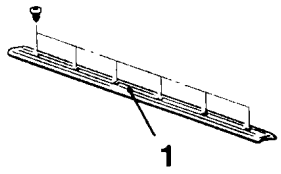
REMOVAL AND INSTALLATION

<Partial Trim>



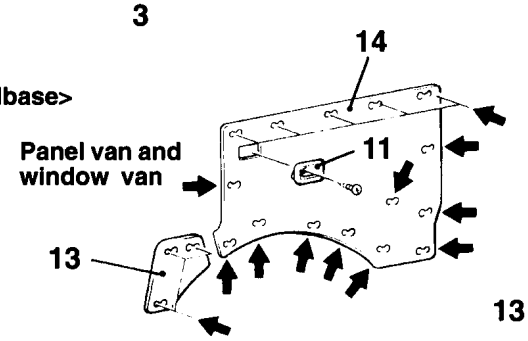


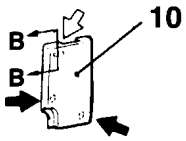


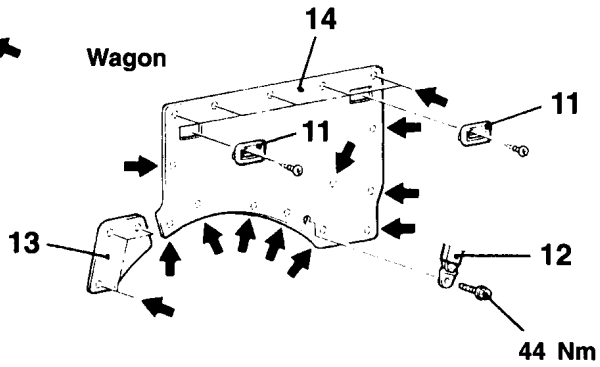


R.H. side

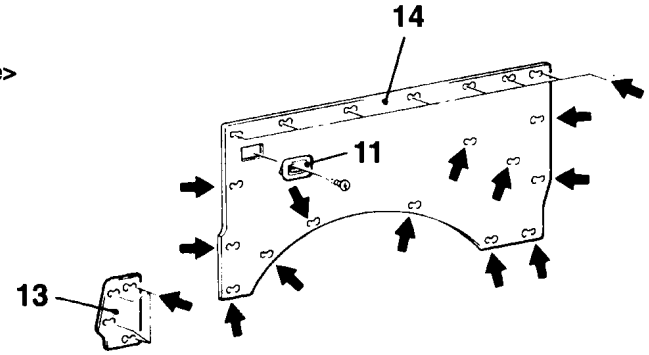
<Standard wheelbase>

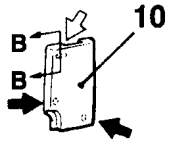






<Long wheelbase>





NOTE
(1) ⇦ : Metal clip position
(2) ⬅ : Resin clip position
(3) As for door trim, refer to GROUP 42 – Door.

19W0196

00002837

1. Tailgate step plate
2. Rear door step upper plate

Cowl side trim removal steps

- Front seat (Refer to P.52A-20.)

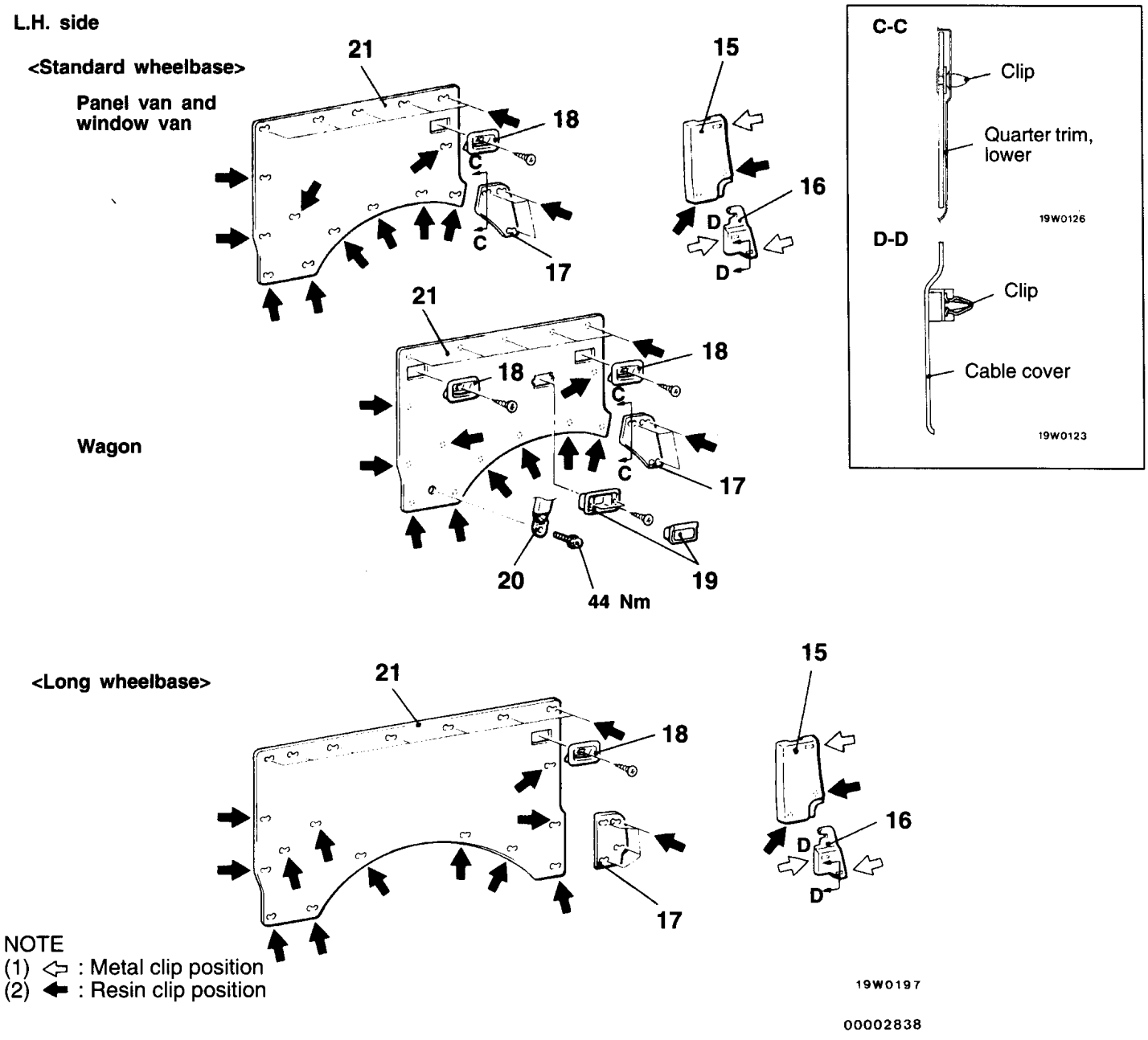
3. Front door step upper plate
4. Cowl side trim

Front pillar trim removal

5. Front door opening weatherstrip, inner
6. Assist grip (passenger's side)
7. Instrument panel side trim
8. Instrument panel side lower trim
9. Front pillar trim

Retractor cover and quarter trim (R.H.) removal steps

10. Retractor cover (R.H.)
11. Belt guide
12. Third seat belt
13. Quarter trim, lower (R.H.)
14. Quarter trim (R.H.)



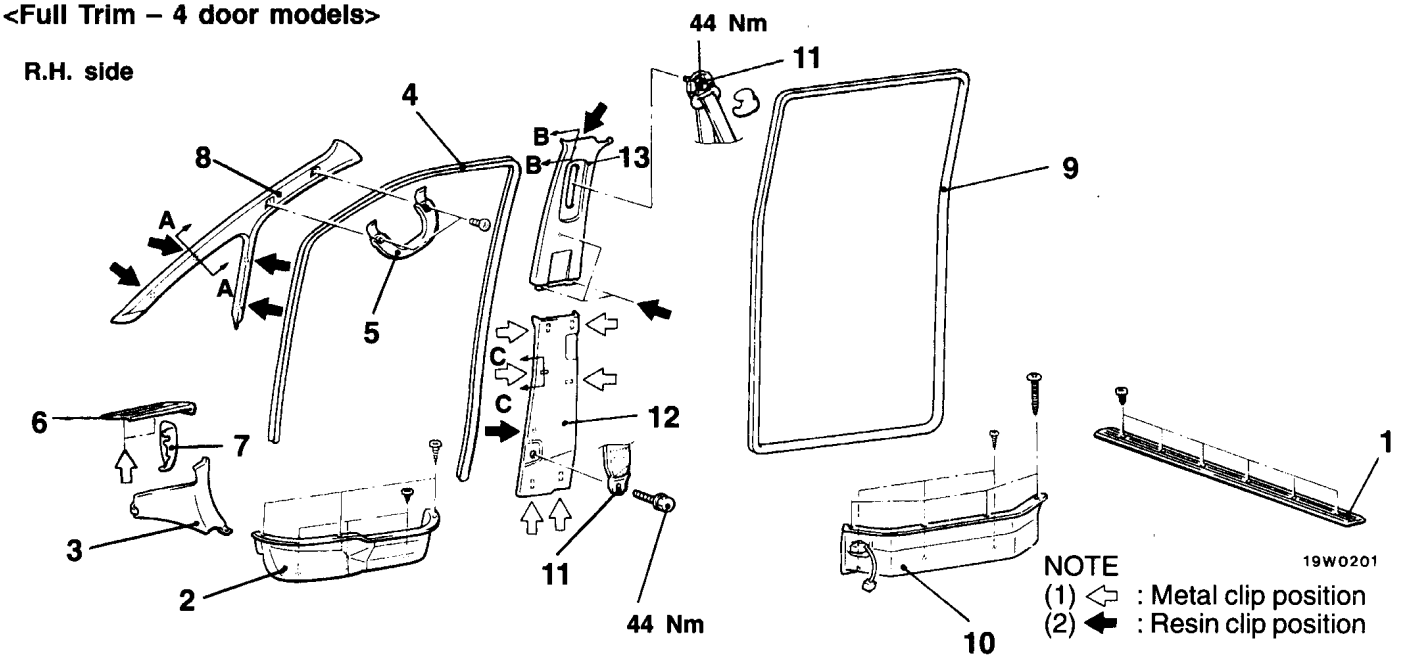
NOTE
(1) ⇦ : Metal clip position
(2) ⬅ : Resin clip position

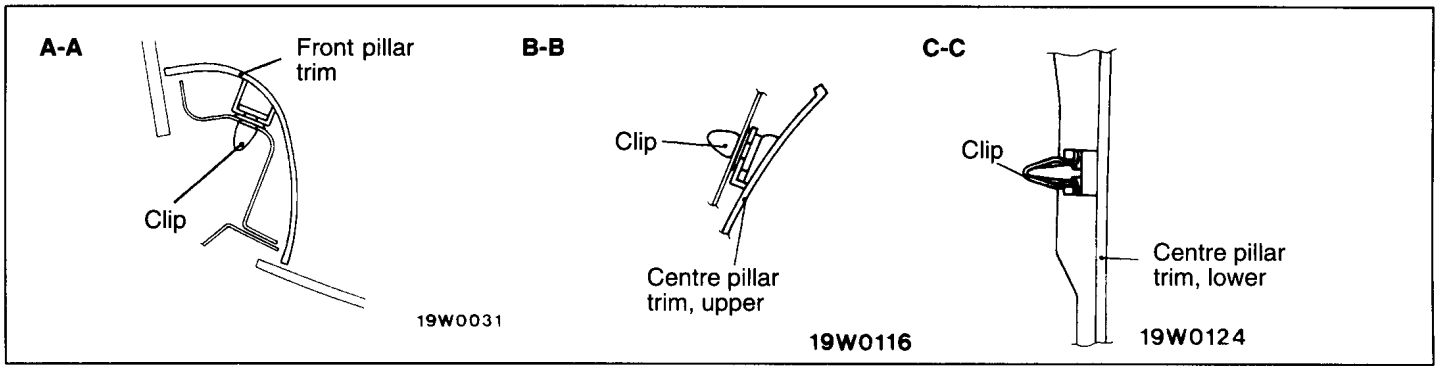
00002838

Retractor cover and quarter trim (L.H.) removal steps

15. Retractor cover (L.H.)
    - Second seat <Window van and wagon> (Refer to P.52A-22.)
16. Cable cover
17. Quarter trim, lower (L.H.)
18. Belt guide
19. Ashtray
20. Third seat belt
21. Quarter trim (L.H.)

<Full Trim – 4 door models>





00002839

1. Tailgate step trim

Cowl side trim removal steps

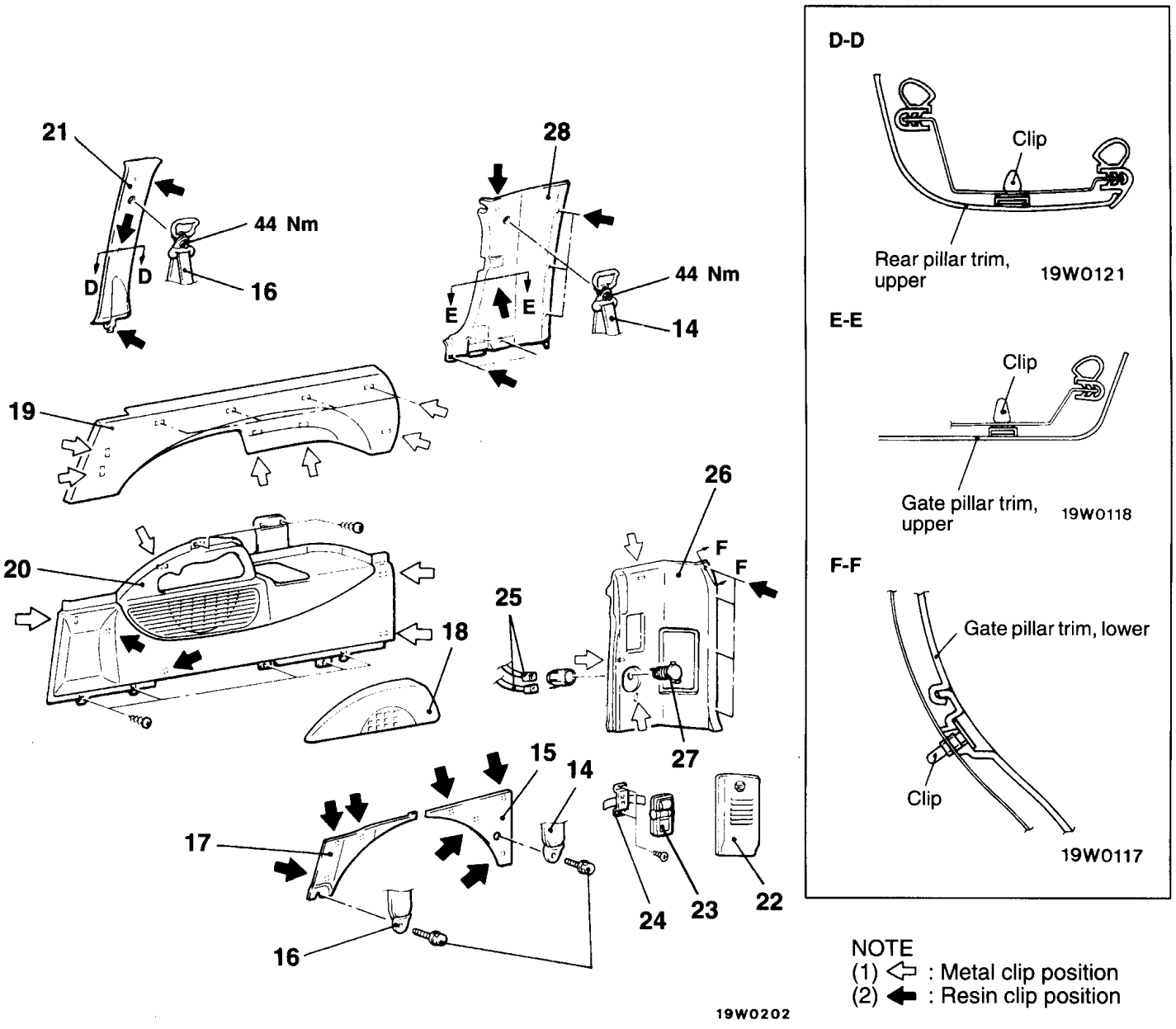
- Front seat (Refer to P.52A-20.)
2. Front door step trim
3. Cowl side trim

Front pillar trim removal steps

4. Front door opening weatherstrip, inner
5. Assist grip (R.H. side only)
6. Instrument panel side trim
7. Instrument panel side lower trim
8. Front pillar trim

Centre pillar trim removal steps

9. Rear door opening weatherstrip, inner
10. Rear door step trim
11. Front seat belt (R.H.)
12. Centre pillar trim, lower
13. Centre pillar trim, upper



NOTE
(1) ⇦ : Metal clip position
(2) ⬅ : Resin clip position

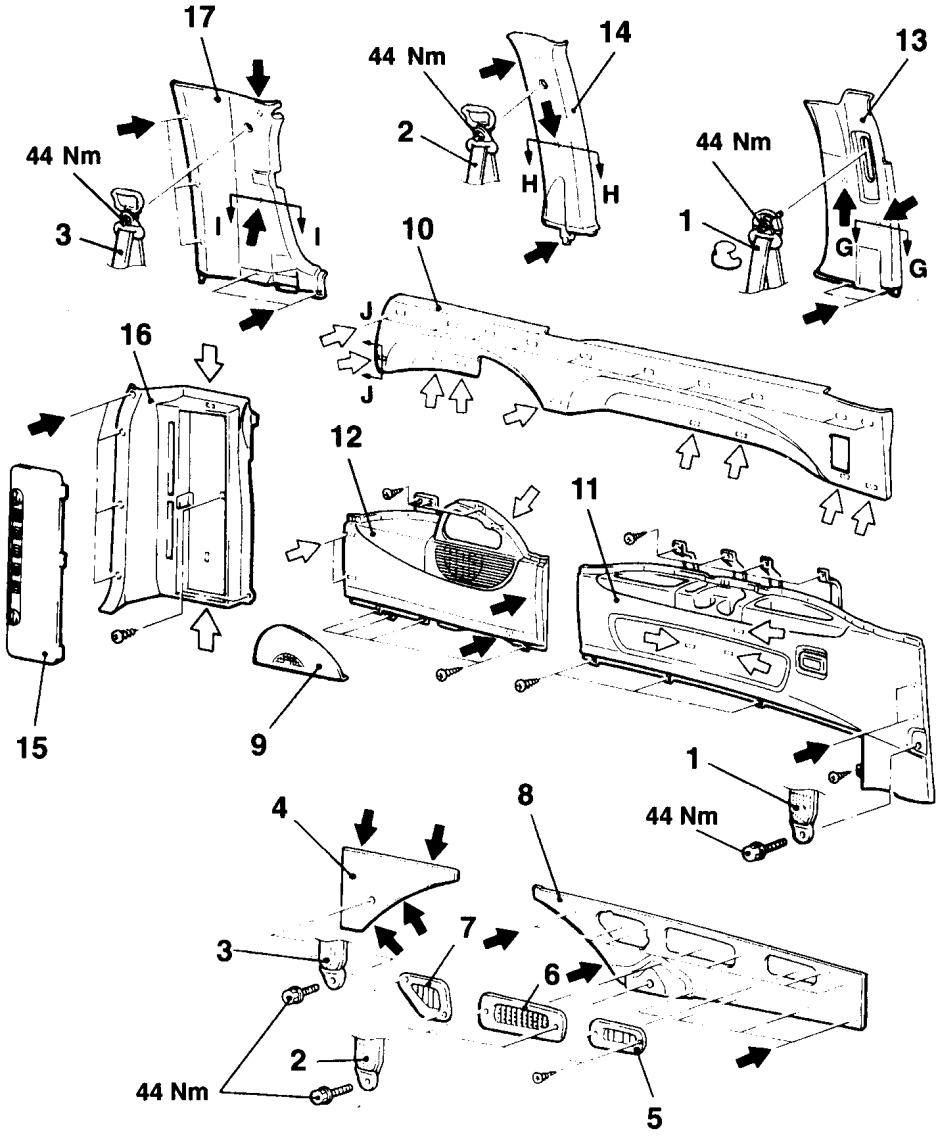
00002840

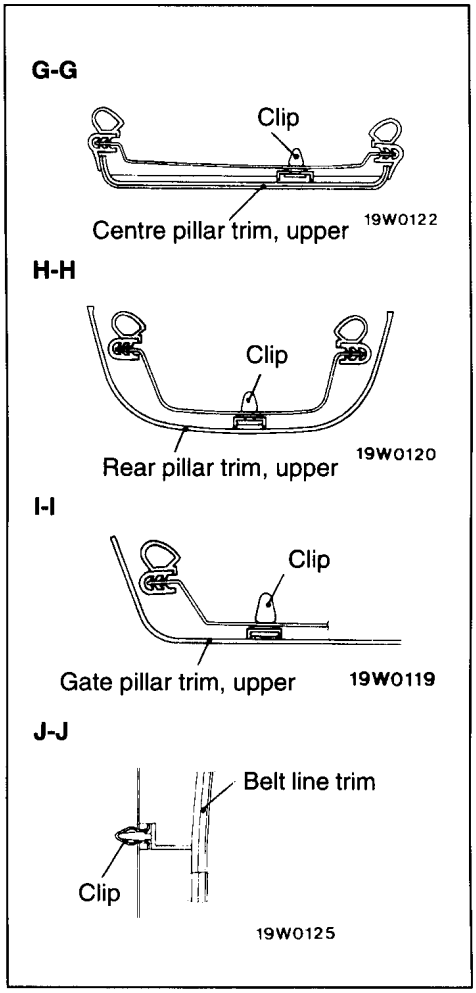
Quarter trim and pillar trim (R.H.) removal steps

- Second seat (R.H.) and third seat (R.H.) (Refer to P.52A-22, 24, 26)

14. Third seat belt (R.H.)
15. Quarter trim, lower, rear
16. Second seat belt (R.H.)
17. Quarter trim, lower, front
18. Speaker garnish
19. Belt line trim
20. Quarter trim, upper
21. Rear pillar trim, upper
22. Jack lid
23. Inspection lamp
24. Inspection lamp bracket
25. Harness connector
26. Gate pillar trim, lower
27. Accessory socket
28. Gate pillar trim, upper

L.H. side





NOTE
(1) ⇦ : Metal clip position
(2) ⬅ : Resin clip position

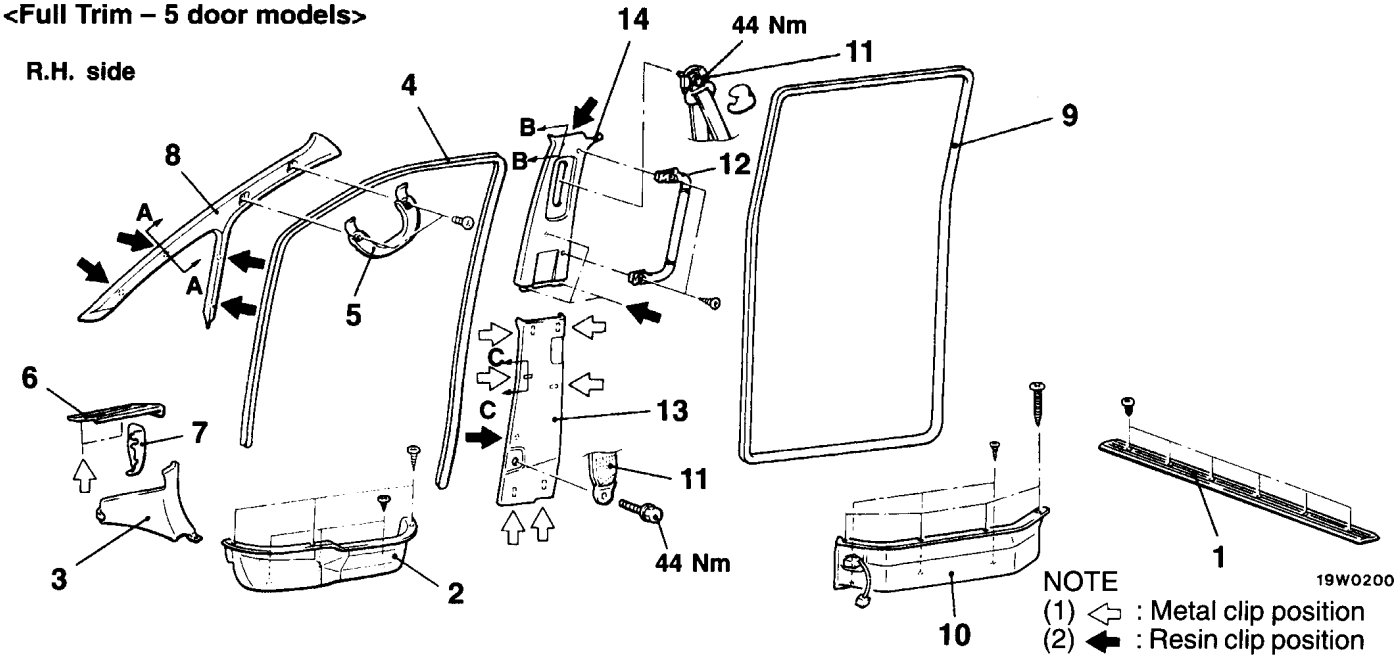
19W0199 00002841

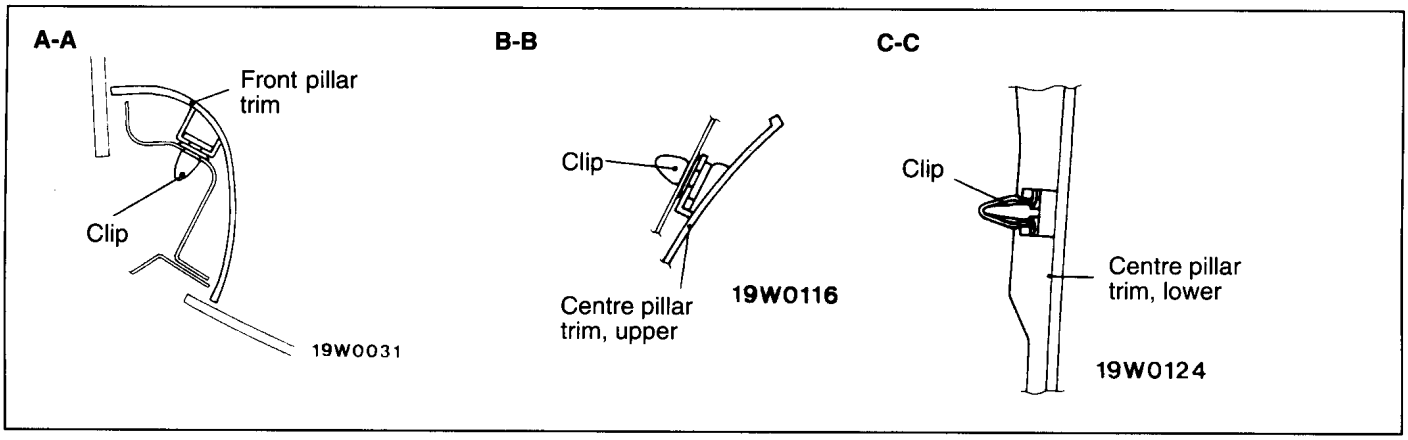
Rear side trim, quarter trim and pillar trim (L.H.) removal steps

- Second seat (L.H.) and third seat (L.H.) (Refer to P.52A-24, 26)

1. Front seat belt (L.H.)
2. Second seat belt (L.H.)
3. Third seat belt (L.H.)
4. Quarter trim, lower, rear
5. Foot grille A
6. Rear air inlet grille
7. Foot grille B
8. Rear side trim, lower
9. Speaker garnish
10. Belt line trim
11. Rear side trim, upper
12. Quarter trim, upper
13. Centre pillar trim, upper
14. Rear pillar trim, upper
15. Box lid
16. Gate pillar trim, lower
17. Gate pillar trim, upper

<Full Trim – 5 door models>





00002842

1. Tailgate step trim

Cowl side trim removal steps

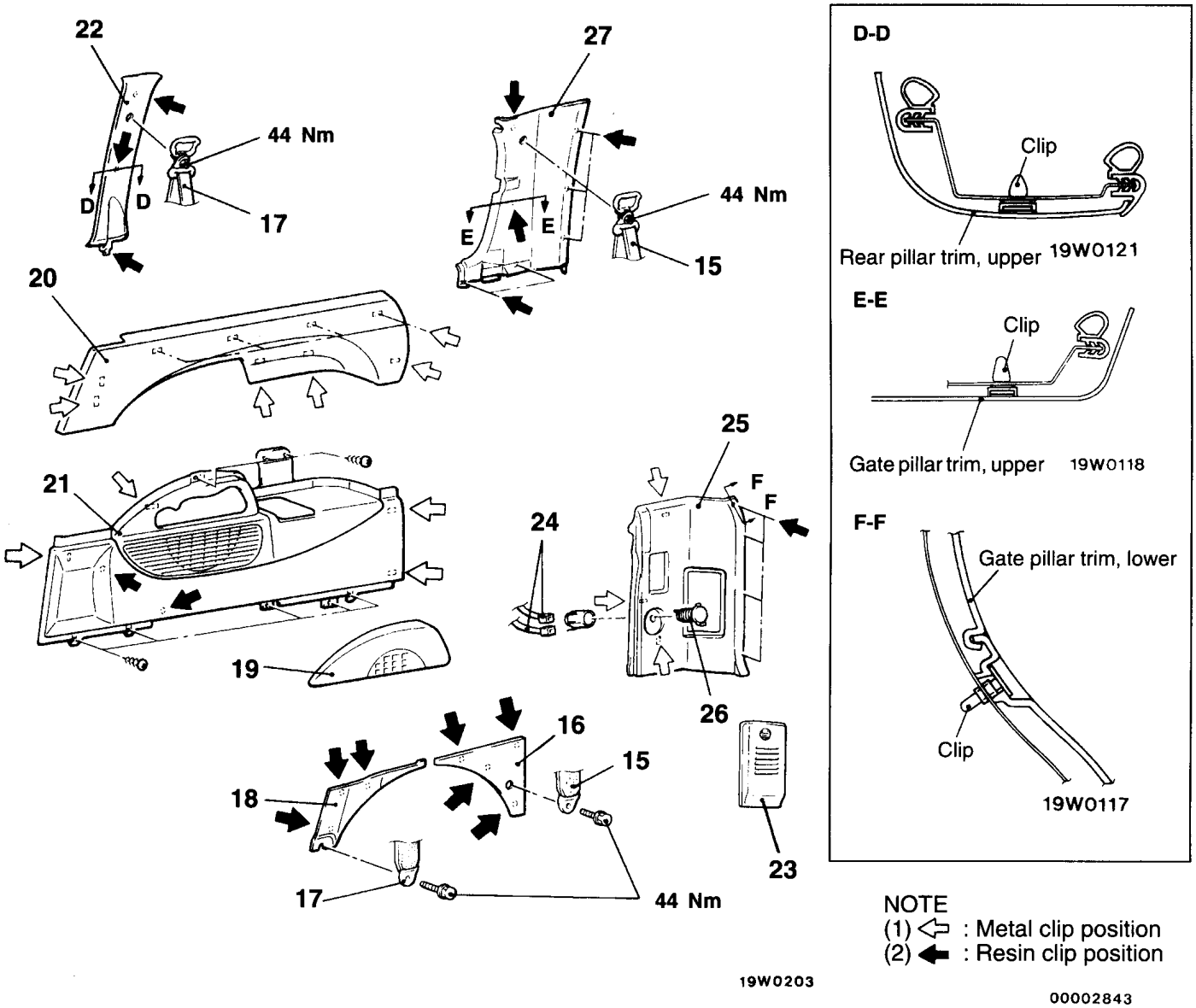
- Front seat (Refer to P.52A-20.)
2. Front door step trim
3. Cowl side trim

Front pillar trim removal steps

4. Front door opening weatherstrip, inner
5. Assist grip (R.H. side only)
6. Instrument panel side trim
7. Instrument panel side lower trim
8. Front pillar trim

Centre pillar trim removal steps

9. Rear door opening weatherstrip, inner
10. Rear door step trim
11. Front seat belt (R.H.)
12. Rear door grip <4WD>
13. Centre pillar trim, lower
14. Centre pillar trim, upper



NOTE
(1) ⇦ : Metal clip position
(2) ⬅ : Resin clip position

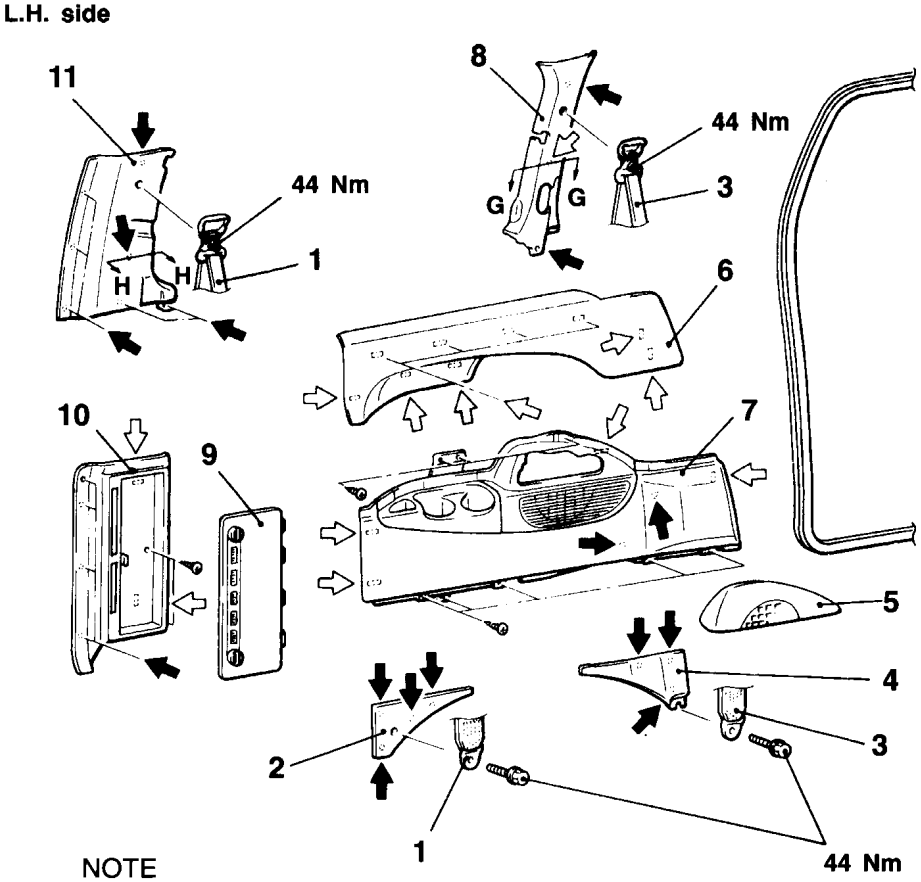
00002843

Quarter trim (R.H.) removal steps

- Second seat (R.H.) and third seat (R.H.) (Refer to P.52A-22, 26.)

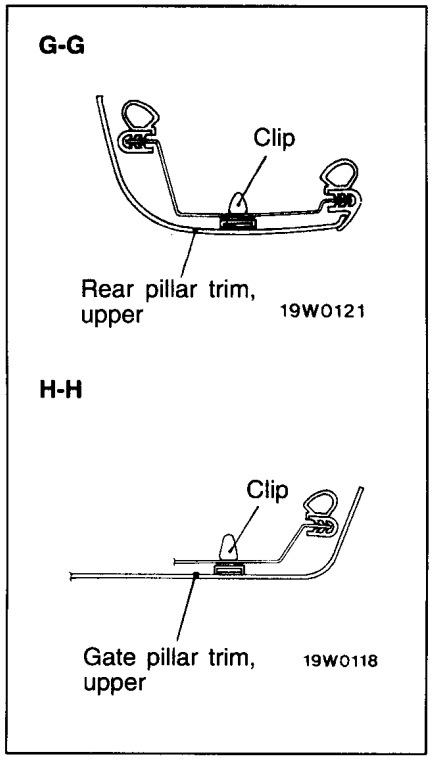
15. Third seat belt (R.H.)
16. Quarter trim, lower, rear
17. Second seat belt (R.H.)
18. Quarter trim, lower, front
19. Speaker garnish
20. Belt line trim
21. Quarter trim, upper
22. Rear pillar trim, upper
23. Jack lid
24. Harness connector
25. Gate pillar trim, lower
26. Accessory socket <Wagon>
27. Gate pillar trim, upper

L.H. side



NOTE
(1) ⇦ : Metal clip position
(2) ⬅ : Resin clip position

19W0198



00002844

Quarter trim and pillar trim (L.H.) removal steps

- Second seat (L.H.) and third seat (L.H.) (Refer to P.52A-22. 26.)

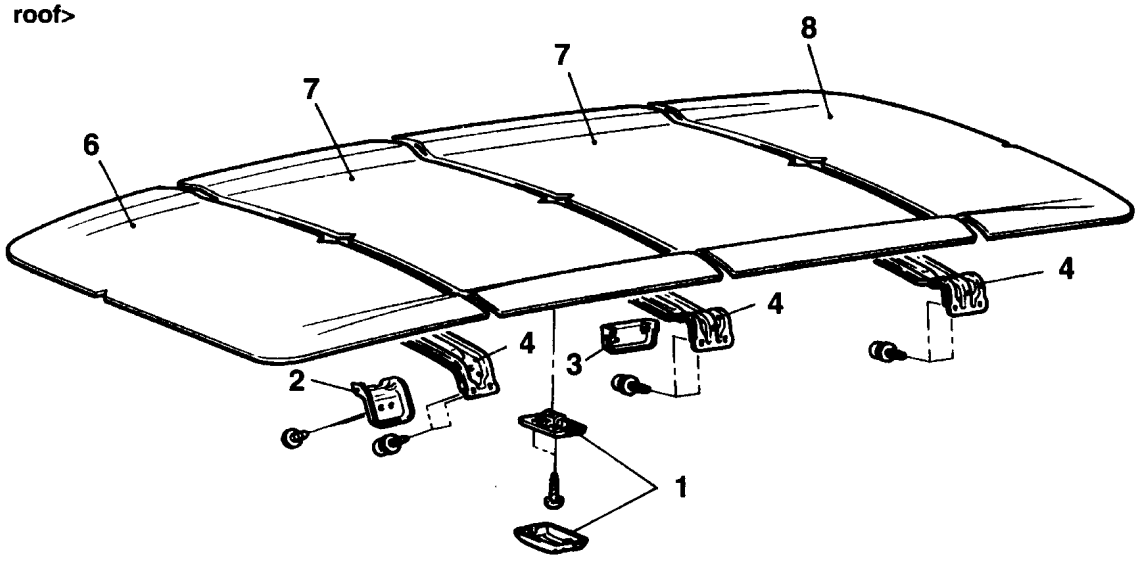
1. Third seat belt (L.H.)
2. Quarter trim, lower, rear (L.H.)
3. Second seat belt (L.H.)
4. Quarter trim, lower, front
5. Speaker garnish
6. Belt line trim
7. Quarter trim, upper
8. Rear pillar trim, upper
9. Box lid
10. Gate pillar trim, lower
11. Gate pillar trim, upper

HEADLINING (PASTE TYPE)

120000365

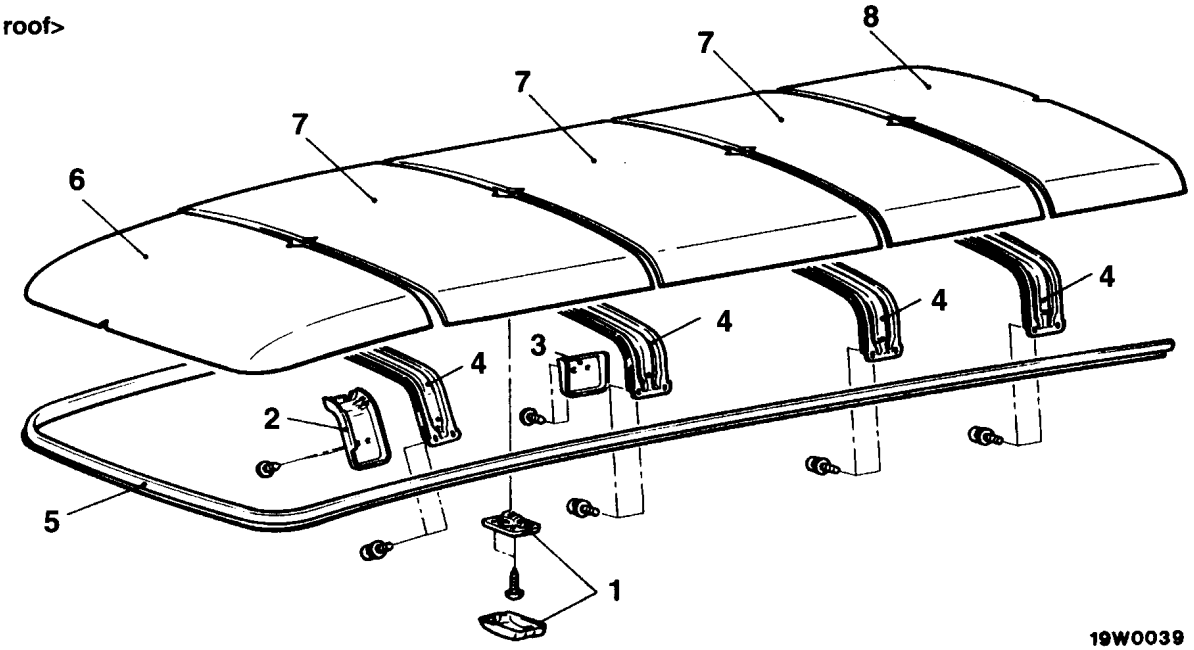
REMOVAL AND INSTALLATION

<Standard roof>



19W0037

<High roof>



19W0039

00000697

Removal steps

1. Room lamp assembly
2. Roof bow protector A
3. Roof bow protector B
4. Roof bow
5. Roof rail trim

◀A▶ ▶A◀ 6. Headlining (front)
◀A▶ ▶A◀ 7. Headlining (center)
◀A▶ ▶A◀ 8. Headlining (rear)

REMOVAL SERVICE POINT

◀A▶ HEADLINING REMOVAL

(1) Slowly peel the headlining away, beginning with the corner of the roof panel, while making sure that the sponge portion of the headlining is not left behind on the roof panel.
(2) Thoroughly remove the drying sealer and sponge left behind on the roof panel, using a toluole solution, etc., while paying attention to prevent uneven headlining surface.

INSTALLATION SERVICE POINT

▶A◀ HEADLINING INSTALLATION

(1) Being careful to prevent wrinkles and slackness, bond the headlining.
(2) Insert the edges securely into the roof panel flange, using a spatula, etc..

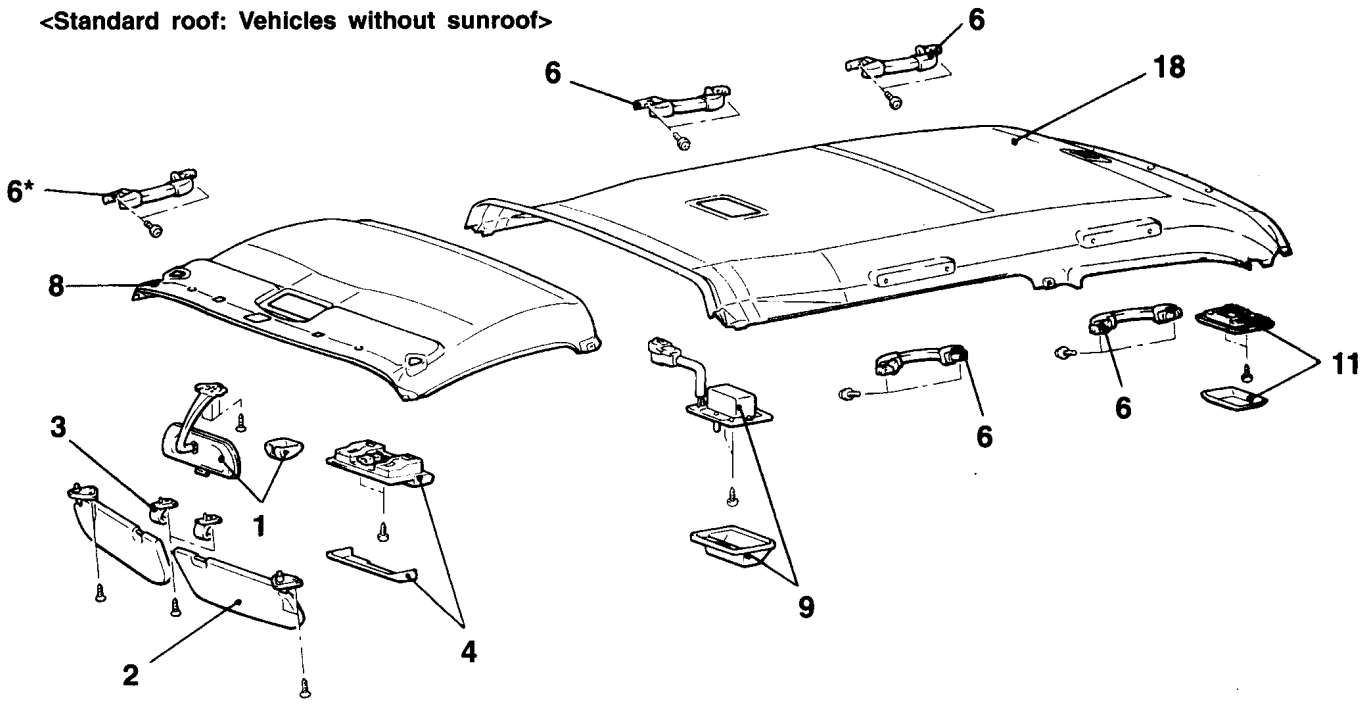
HEADLINING (MOULDED TYPE)

120002296

REMOVAL AND INSTALLATION

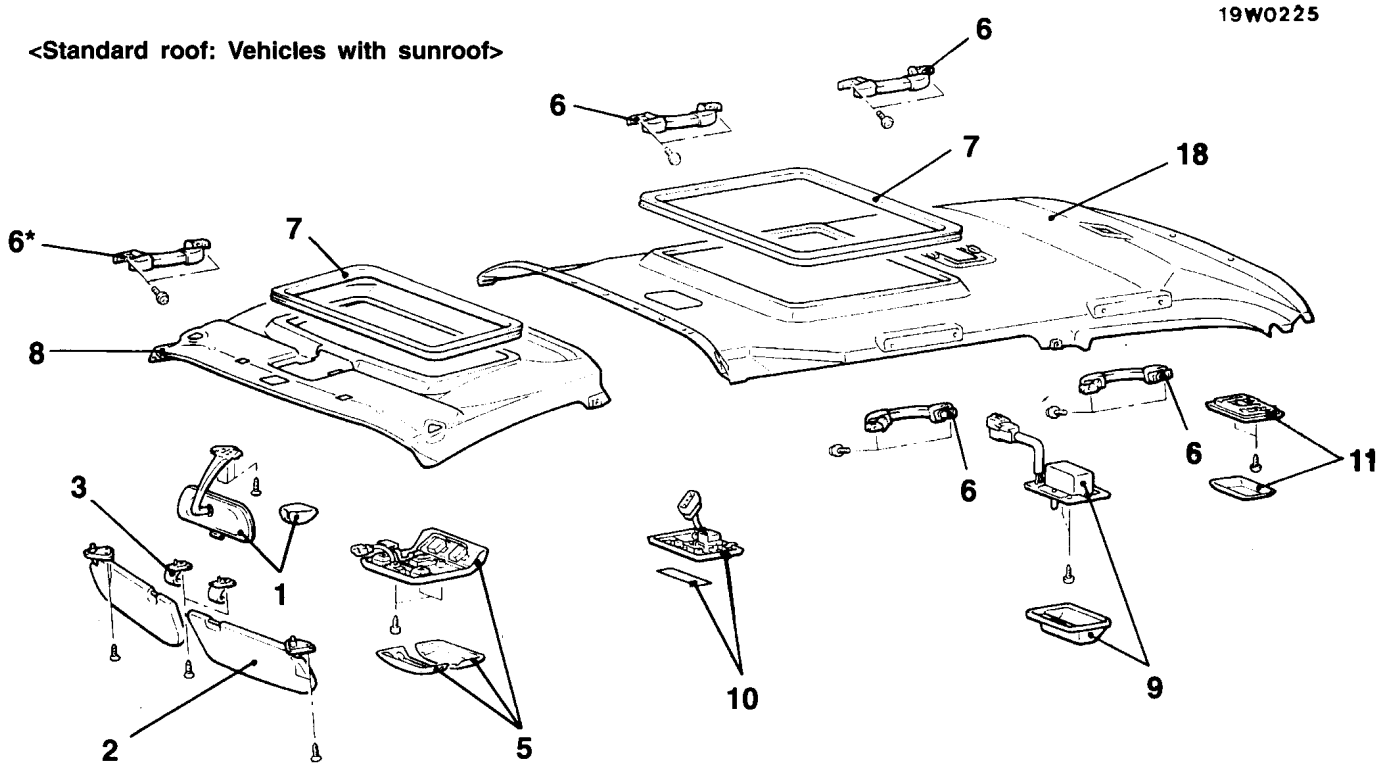
Pre-removal and Post-installation Operation
<Headlining>
- Front pillar trim, Centre pillar trim, Belt line trim, Quarter trim, upper, Rear side trim, upper, Rear pillar trim and Gate pillar trim Removal and Installation (Refer to P.52A-9, 12.)

<Standard roof: Vehicles without sunroof>



19W0225

<Standard roof: Vehicles with sunroof>

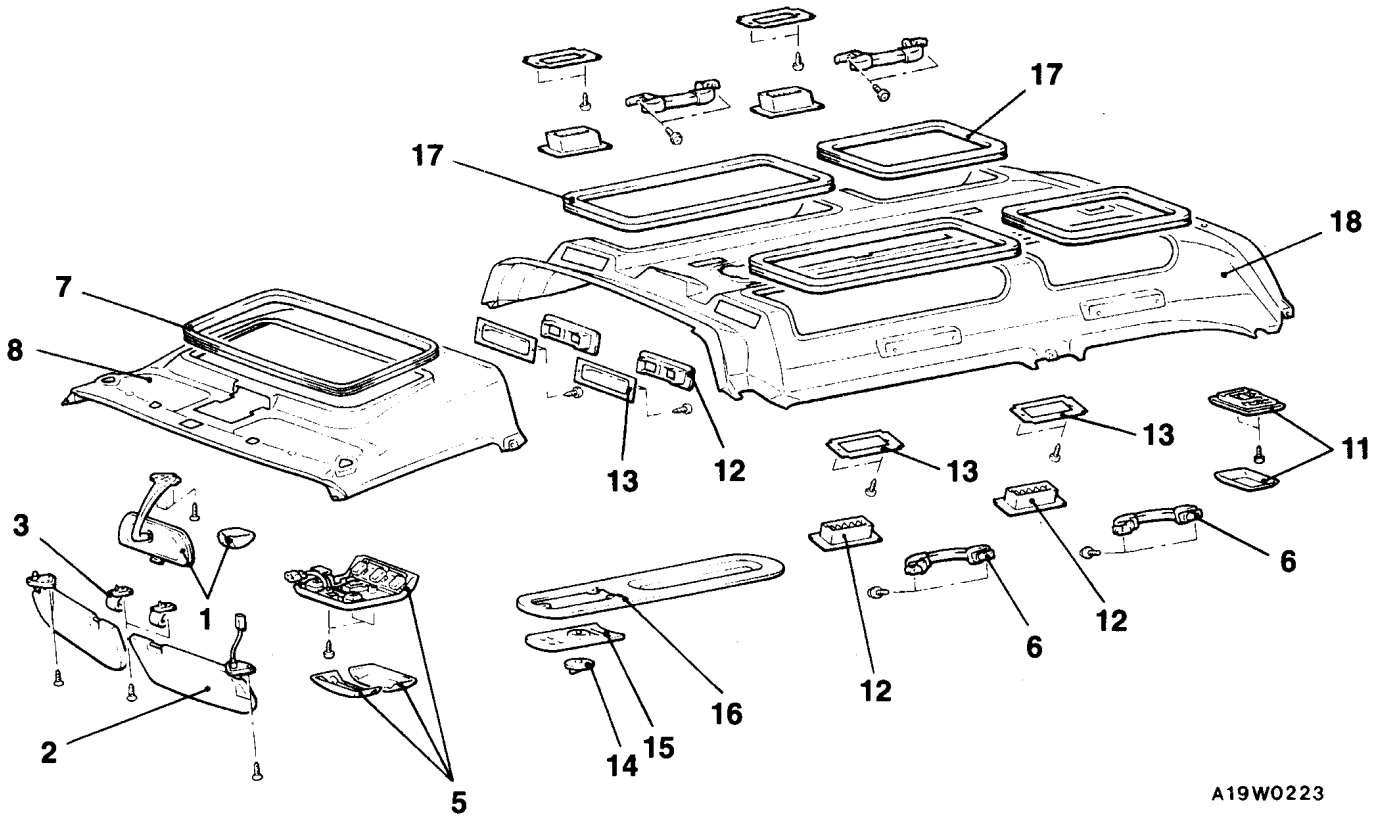


19W0224

NOTE
*: Indicates 4WD

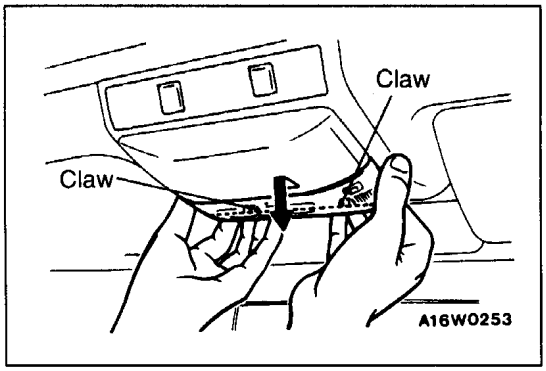
00002845

<Crystal lite roof>



Removal steps

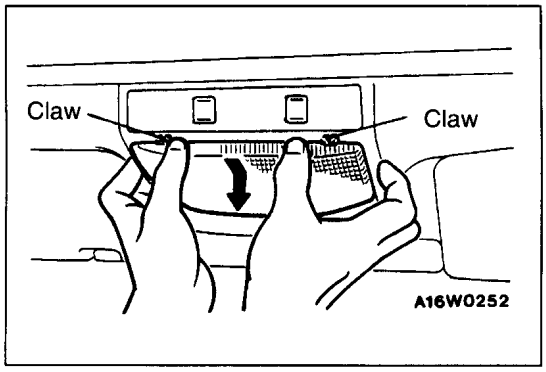
1. Inside rear view mirror
2. Sunvisor assembly
3. Sunvisor holder
4. Front room lamp
   <Vehicles without sunroof>
◀A▶ 5. Front room lamp
   <Vehicles with sunroof>
6. Assist grip
7. Sunroof opening trim
   <Vehicles with sunroof>
8. Front headlining
9. Rear room lamp
10. Sunroof switch
    <Vehicles with sunroof>
11. Cargo room lamp
12. Air outlet grille <Crystal lite roof>
13. Retainer <Crystal lite roof>
14. Dimmer switch knob
    <Crystal lite roof>
15. Switch panel <Crystal lite roof>
16. Centre garnish <Crystal lite roof>
17. Roof blind rail trim
    <Crystal lite roof>
18. Rear headlining



REMOVAL SERVICE POINT

◀A▶ FRONT ROOM LAMP ASSEMBLY REMOVAL

(1) While pushing the claws of the room lamp switch cover, pull the cover downwards to remove it.

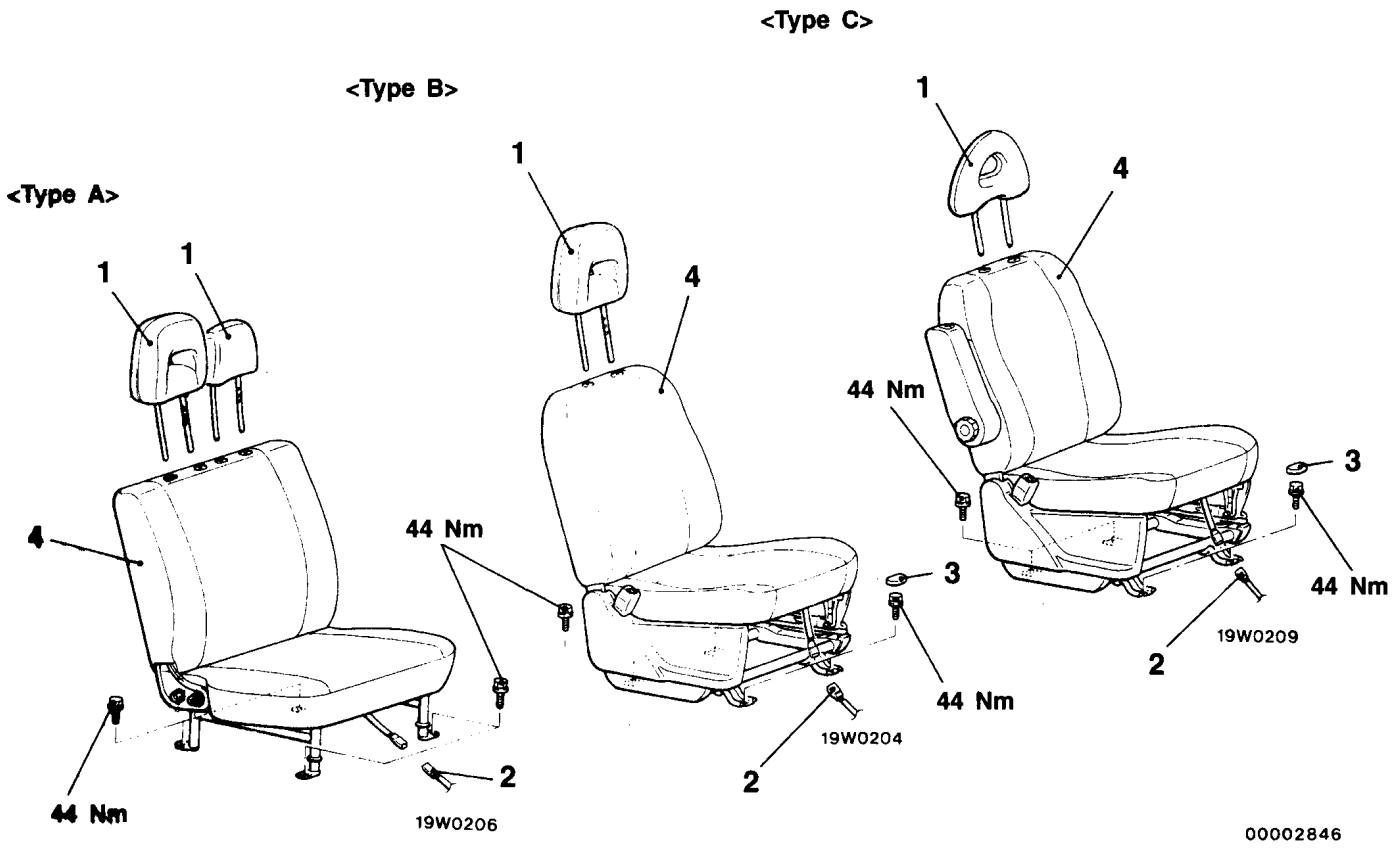


(2) While pushing the claws of the room lamp lens, pull the lens downwards to remove it.

SEAT

120002297

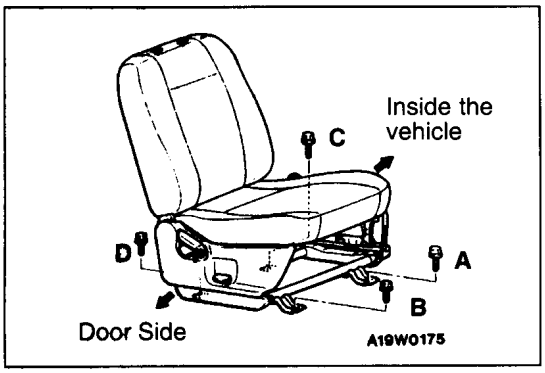
FRONT SEAT
REMOVAL AND INSTALLATION



Removal steps

1. Headrestraint
2. Harness connector
   <Vehicles with heated seat>
3. Seat anchor cover

▶A◀ 4. Front seat assembly



INSTALLATION SERVICE POINT

▶A◀ FRONT SEAT ASSEMBLY INSTALLATION

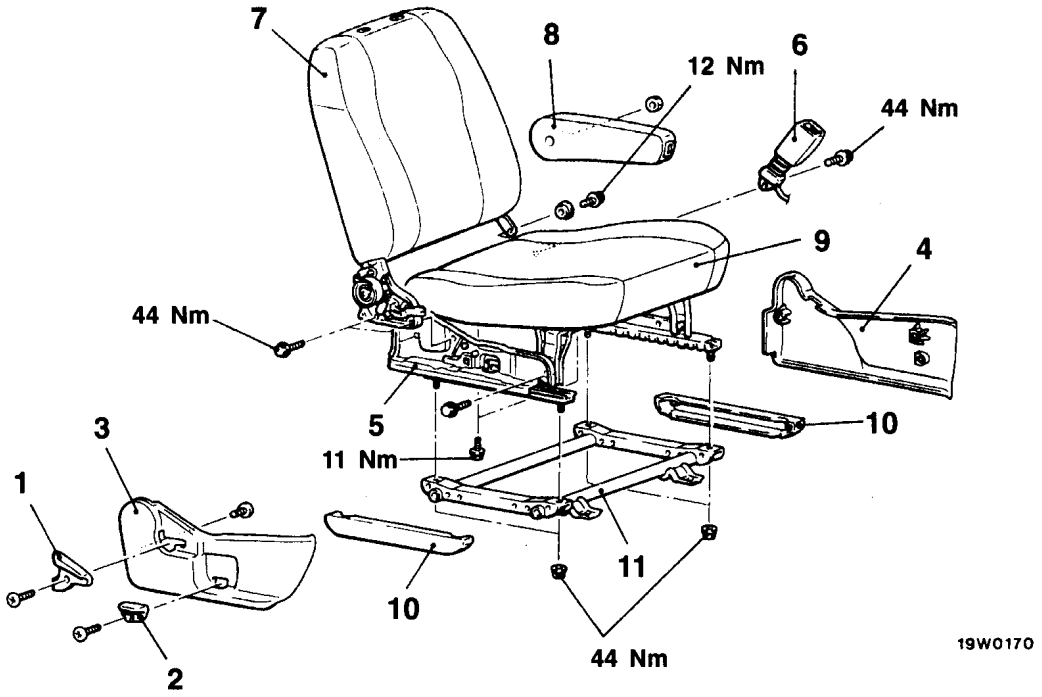
Tighten the front seat mounting bolts in the order A, B, C, and D.

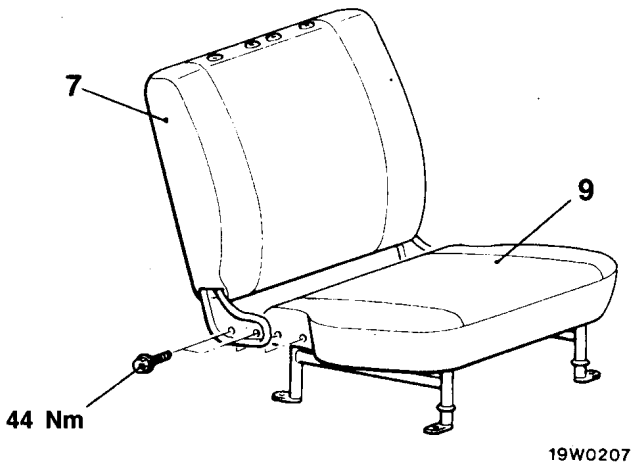
Caution

Do not slide the seat while tightening the bolts. If the above procedures are not observed, the seat adjusters at left and right will not be aligned properly with each other and a locking mechanism will be damaged.

DISASSEMBLY AND REASSEMBLY

120002298





00002847

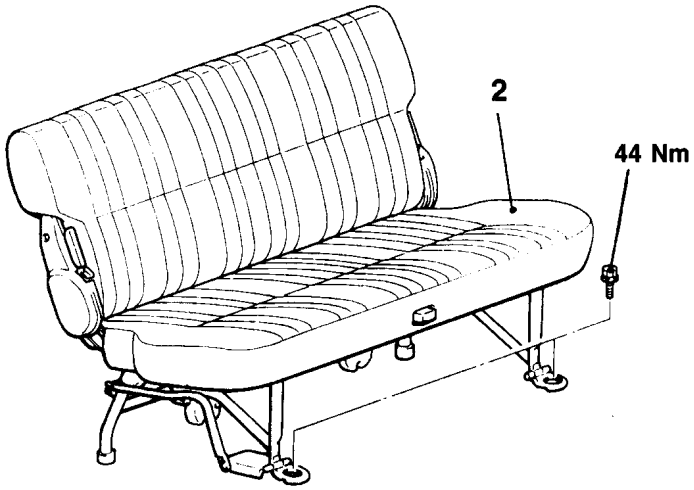
Disassembly steps

1. Reclining knob
2. Seat adjuster knob
3. Hinge cover, R.H.
4. Hinge cover, L.H.
5. Seat adjuster
6. Inner seat belt
7. Front seat back
8. Armrest
9. Front seat cushion
10. Stand cover
11. Stand assembly

SECOND SEAT (BENCH TYPE) REMOVAL AND INSTALLATION

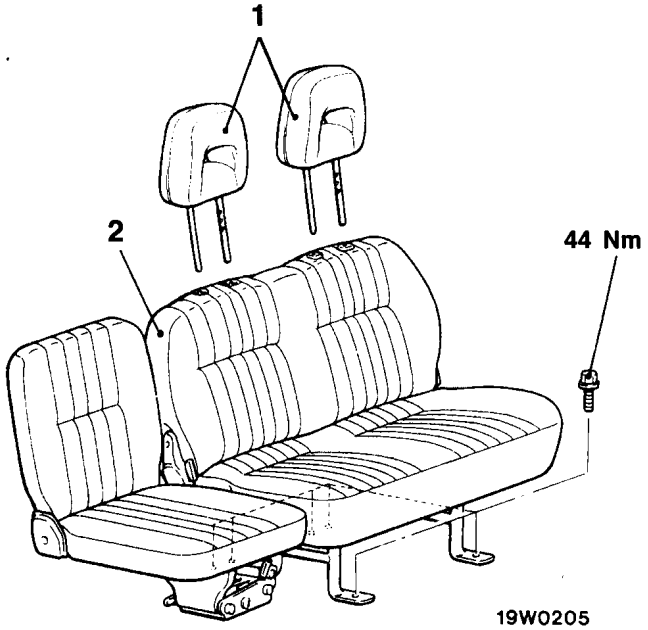
120002299

<Bench folding type>



19W0213

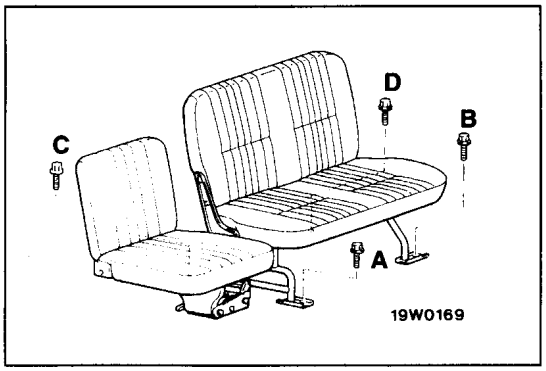
<Bench fixed type>



00002848

Removal steps

1. Headrestraint
▶A◀ 2. Second seat assembly



INSTALLATION SERVICE POINT

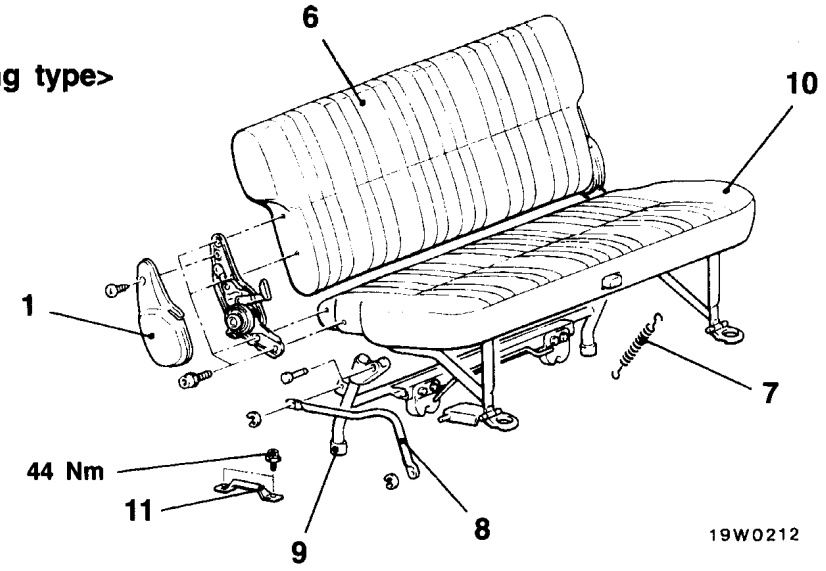
▶A◀ SECOND SEAT ASSEMBLY INSTALLATION

Tighten the second seat mounting bolts in the order A, B, C, and D. (For All models)

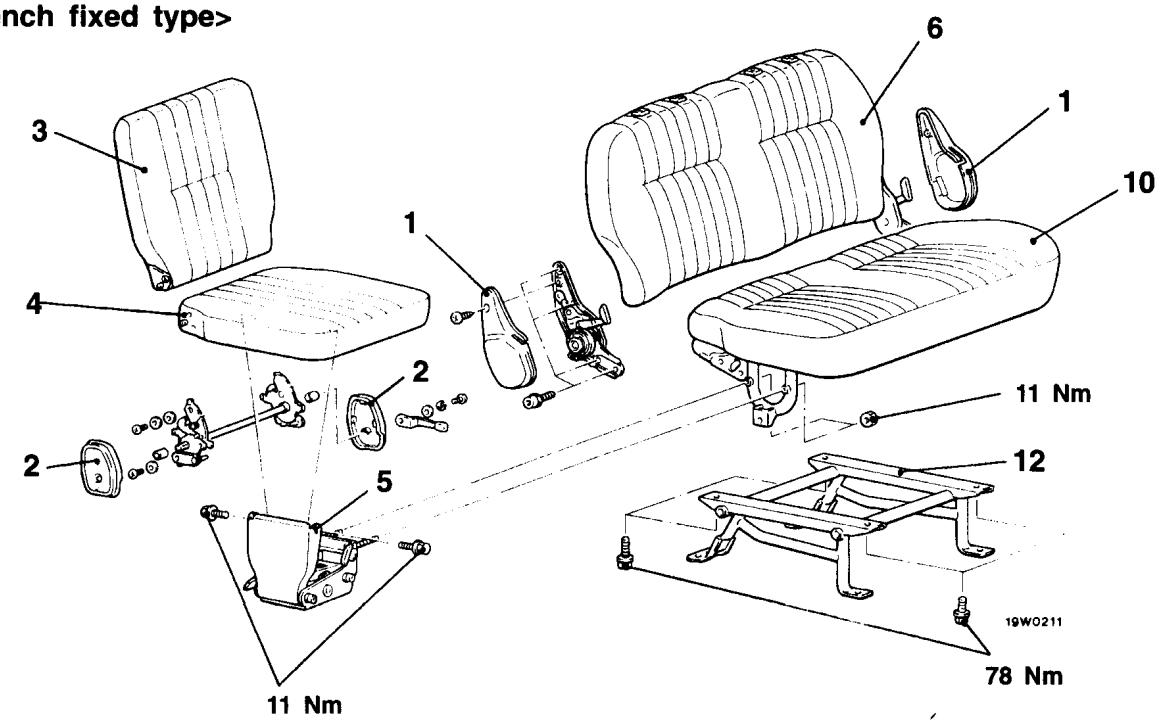
DISASSEMBLY AND REASSEMBLY

120002300

<Bench folding type>



<Bench fixed type>



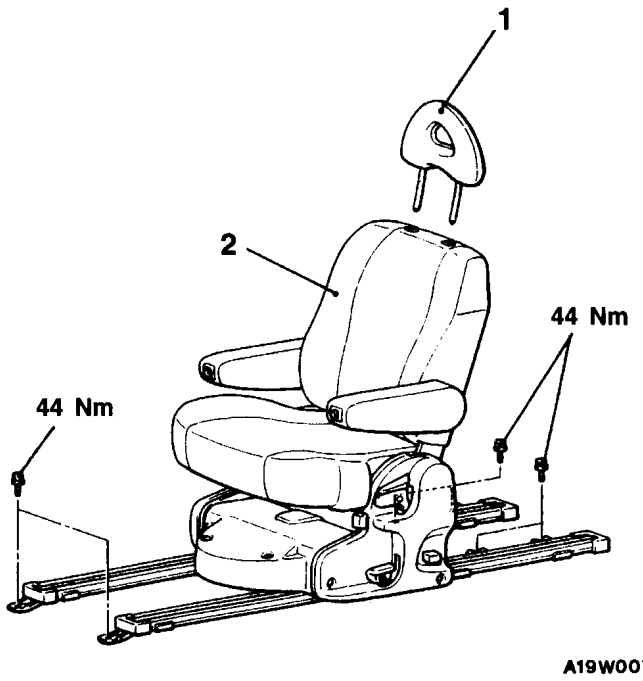
00002849

Disassembly steps

1. Reclining cover
2. Hinge cover <Bench fixed type>
3. Jump seat back <Bench fixed type>
4. Jump seat cushion <Bench fixed type>
5. Jump seat link assembly <Bench fixed type>
6. Second seat back
7. Spring <Bench folding type>
8. Shaft <Bench folding type>
9. Rear seat stay assembly <Bench folding type>
10. Second seat cushion
11. Striker <Bench folding type>
12. Floor stay assembly <Bench fixed type>

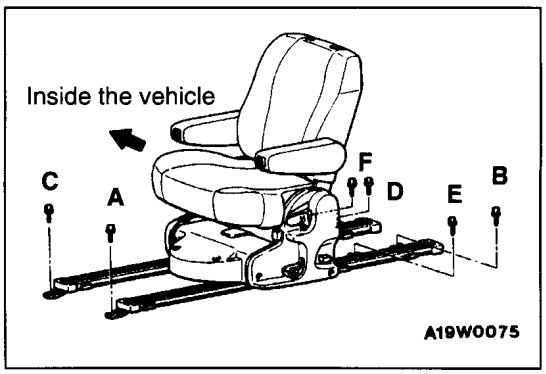
SECOND SEAT (SEPARATE TYPE) REMOVAL AND INSTALLATION

120000369



Removal steps

1. Headrestraint
▶A◀ 2. Second seat assembly



INSTALLATION SERVICE POINT

▶A◀ SECOND SEAT ASSEMBLY INSTALLATION

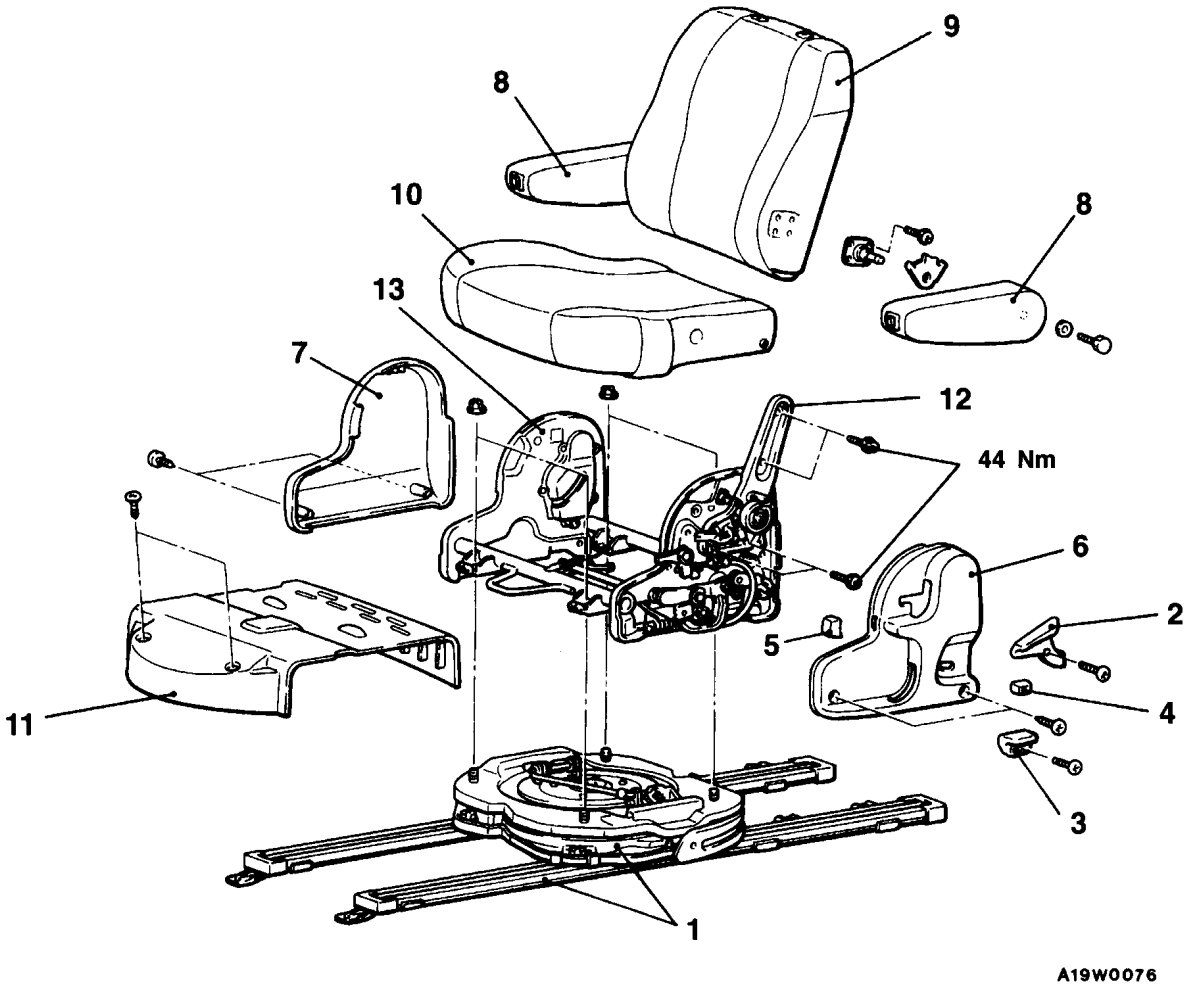
Tighten the second seat mounting bolts in the order A, B, C, D, E, and F.

Caution

Do not slide the seat while tightening the bolts. If the above procedures are not observed, the seat adjusters at left and right will not be aligned properly with each other and a locking mechanism will be damaged.

DISASSEMBLY AND REASSEMBLY

120002111

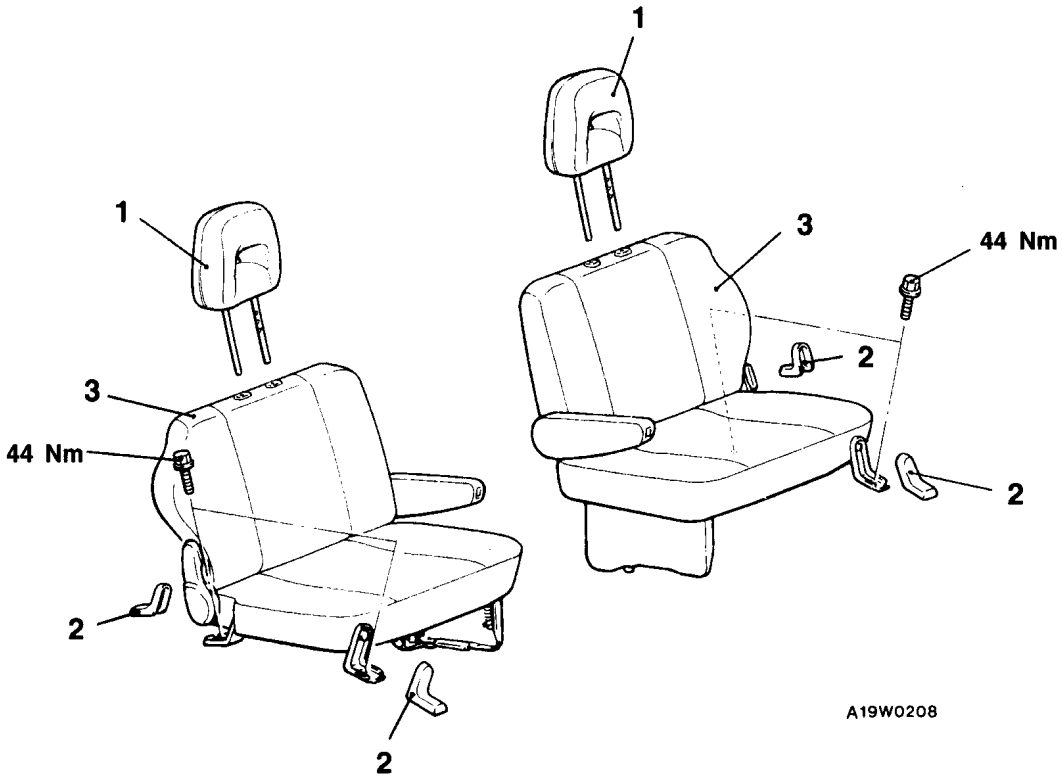


Removal steps

1. Swivel and rail assembly
2. Reclining knob
3. Seat adjuster lever
4. Tip-up knob
5. Swivel knob
6. Shield cover, L.H.
7. Shield cover, R.H.
8. Armrest
9. Second seat back
10. Second seat cushion
11. Footrest cover
12. Reclining adjuster
13. Inside cover

THIRD SEAT
REMOVAL AND INSTALLATION

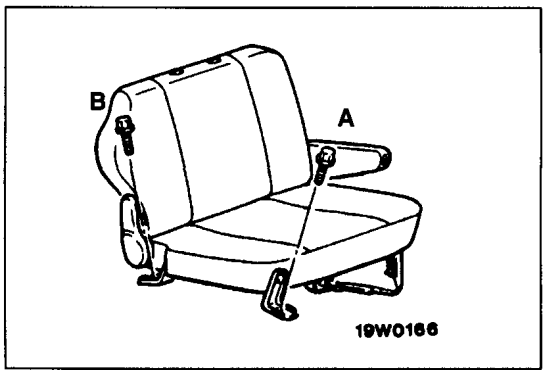
120002301



Removal steps

1. Headrestraint
2. Cover

▶A◀ 3. Third seat assembly



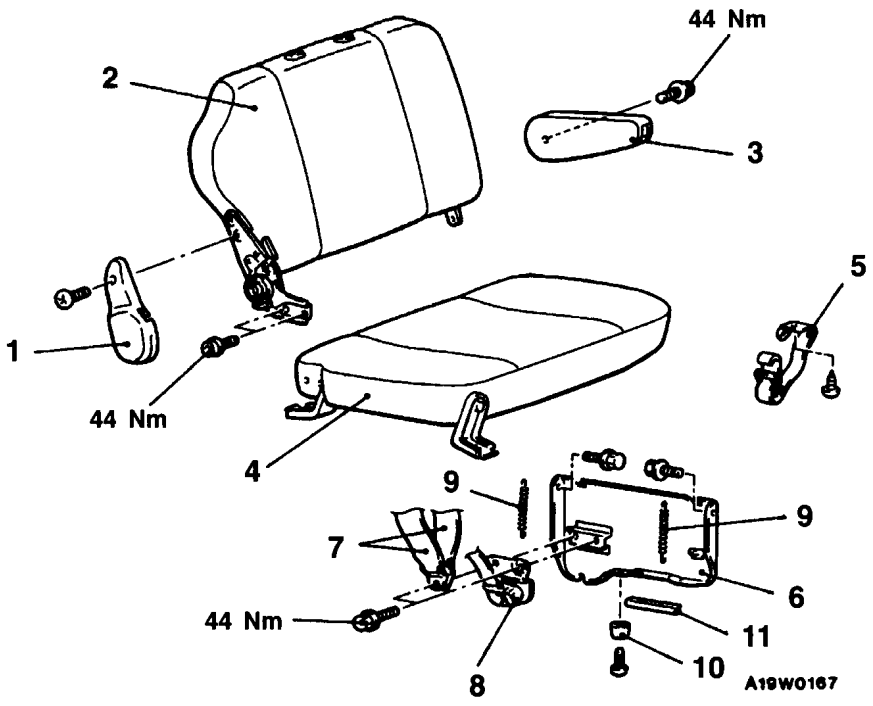
INSTALLATION SERVICE POINT

▶A◀THIRD SEAT ASSEMBLY INSTALLATION

Tighten the third seat mounting bolts in the order A and B.

DISASSEMBLY AND REASSEMBLY

120002302



Removal steps

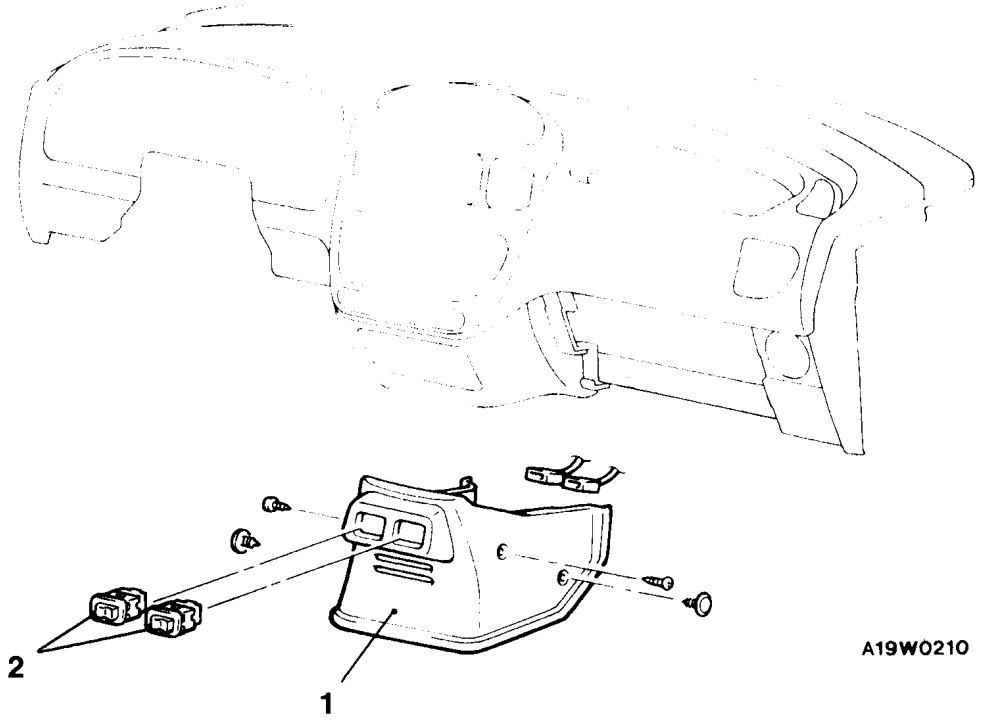
1. Reclining adjuster cover
2. Third seat back
3. Armrest <Crystal lite roof>
4. Third seat cushion
5. Strap assembly
6. Stay assembly
7. Third seat belt
8. Latch assembly
9. Spring
10. Damper
11. Trim

HEATED SEAT SWITCH

120002303

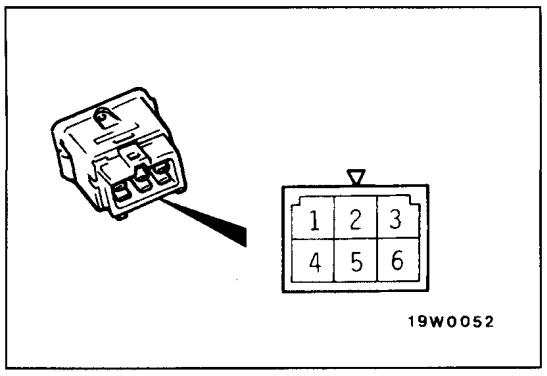
REMOVAL AND INSTALLATION

CAUTION: SRS
When removing and installing the computer cover from vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit.



Removal steps

1. Computer cover
2. Heated seat switch



INSPECTION

HEATED SEAT SWITCH CONTINUITY INSPECTION

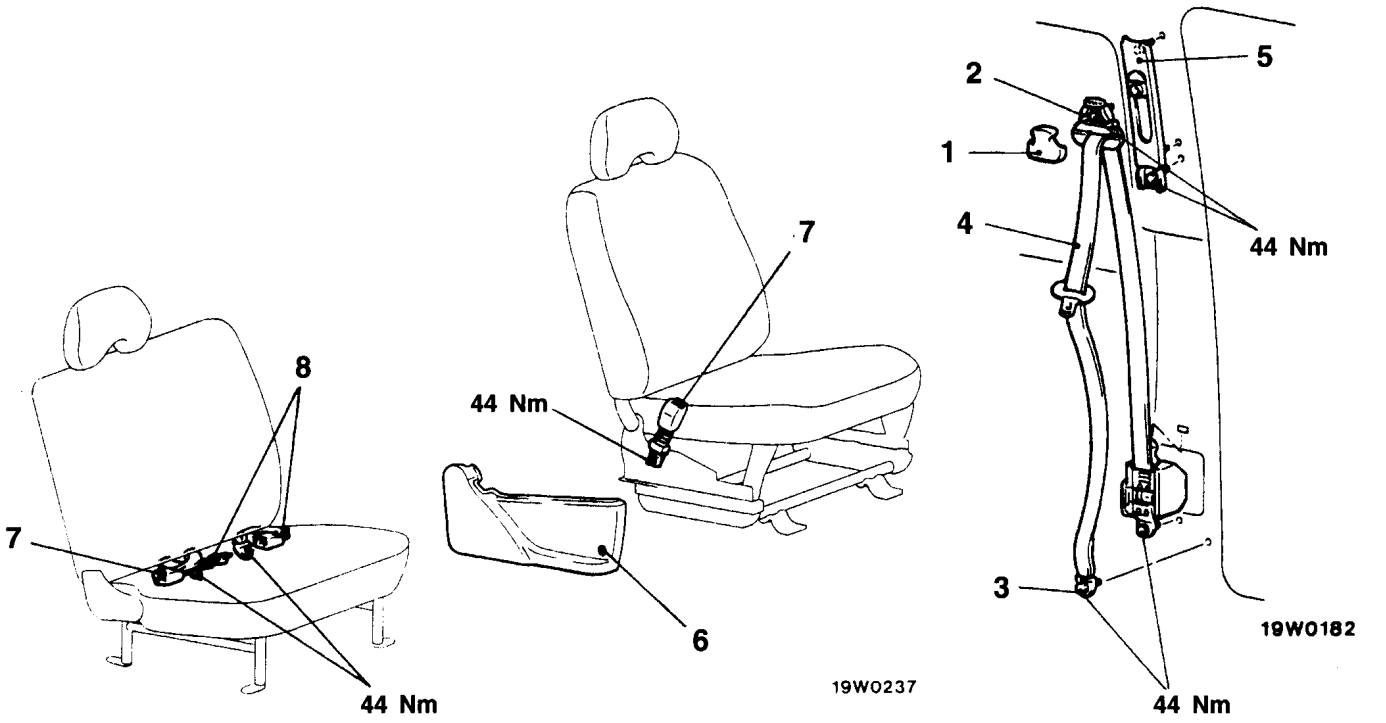
Switch position	Terminal No.					
	1	2	5	6	3	4
HI	○—○		○—○		IND	
OFF						
LO		○—○				

SEAT BELT

120002304

FRONT SEAT BELT

REMOVAL AND INSTALLATION



Outer seat belt removal steps

1. Sash guide cover
2. Sash guide
3. Anchor bolt
- Retractor cover <Partial trim> (Refer to P.52A-7.)
- Belt line trim <Full trim> (Refer to P.52A-11.)
- Rear side trim upper <Full trim> (Refer to P.52A-11.)
- Rear door grip <4WD> (Refer to P.52A-12.)
- Centre pillar trim, upper (Refer to P.52A-9, 12.)
- Centre pillar trim, lower (Refer to P.52A-9, 12.)

4. Outer seat belt
5. Adjustable seat belt anchor

Inner seat belt removal steps

- Front seat assembly (Refer to P.52A-20.)

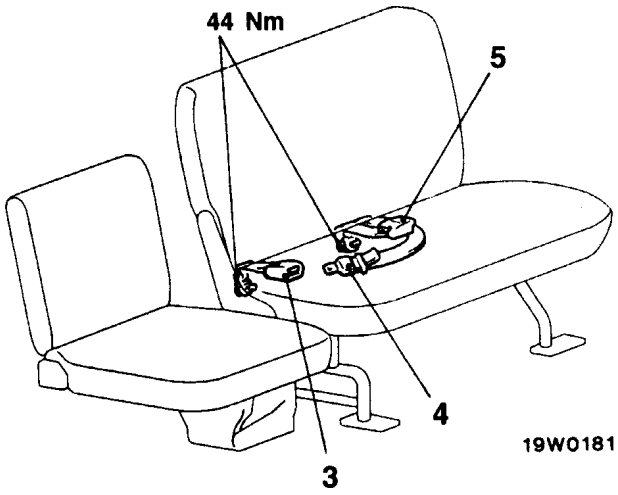
6. Hinge cover
7. Inner seat belt

Lap belt removal

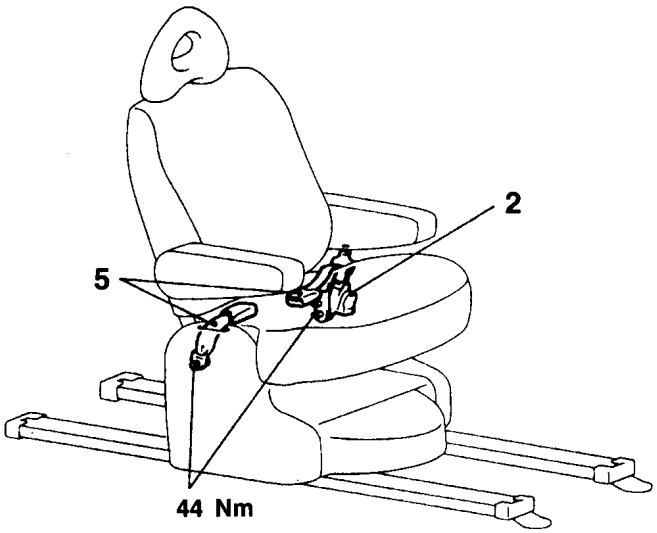
8. Lap belt

SECOND SEAT BELT REMOVAL AND INSTALLATION

120002305



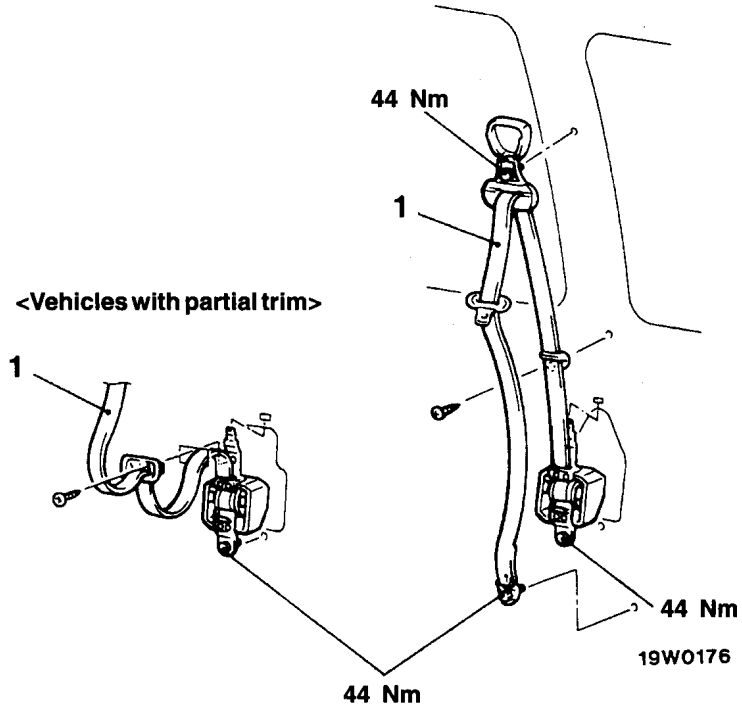
19W0181



19W0178

<Vehicles with full trim>

<Vehicles with partial trim>



19W0176

00002850

Outer seat belt removal steps

- Quarter trim <partial trim> (Refer to P.52A-7, 8.)
- Belt line trim <full trim> (Refer to P.52A-10, 11, 13, 14.)
- Quarter trim, upper <full trim> (Refer to P.52A-10, 11, 13, 14.)

1. Outer seat belt

Rear seat belt and centre seat belt removal steps

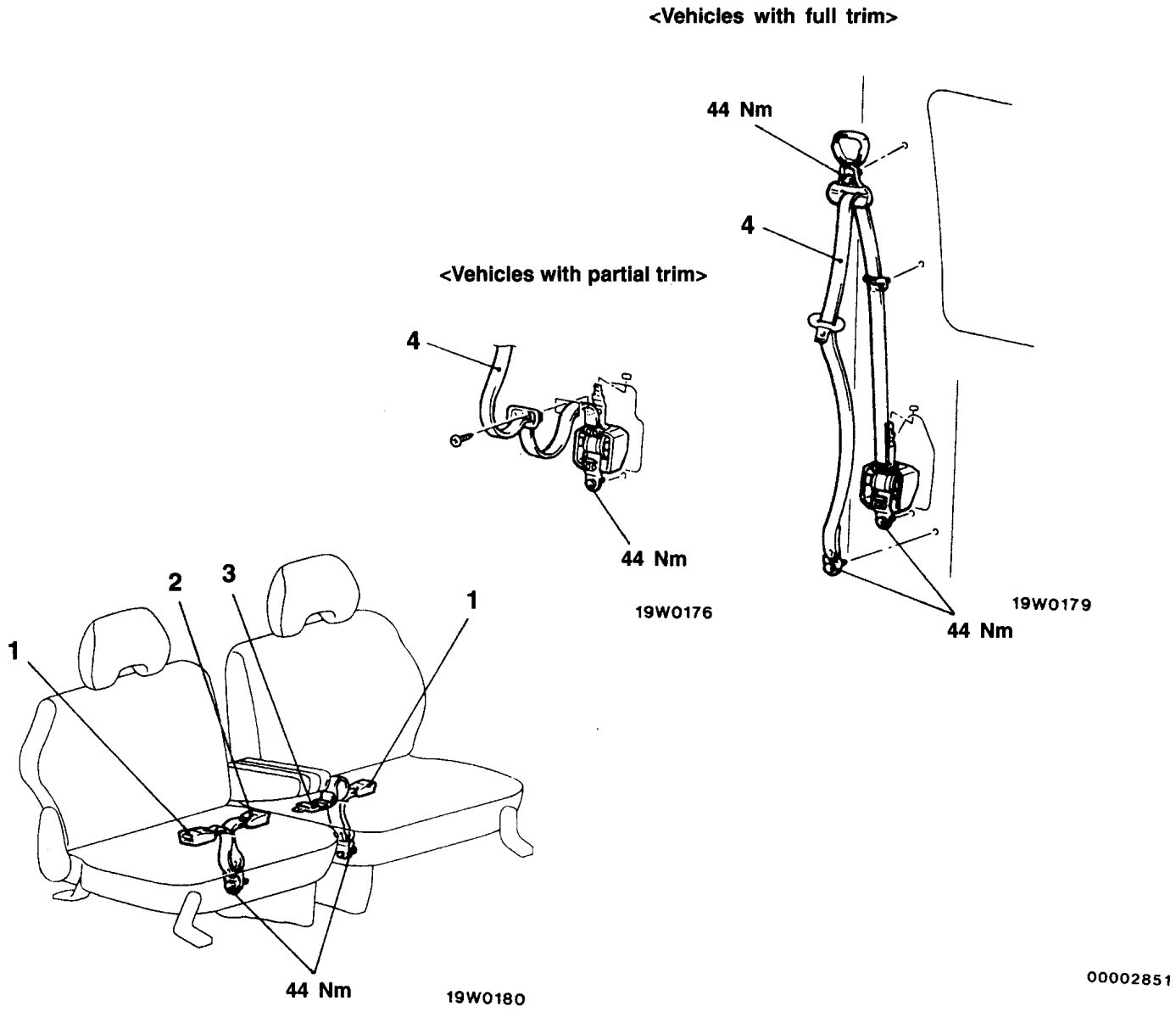
2. Rear seat belt
3. Centre inner seat belt
4. Centre outer seat belt

Inner seat belt removal

5. Inner seat belt

THIRD SEAT BELT
REMOVAL AND INSTALLATION

120002306



1. Inner seat belt
2. Centre inner seat belt
3. Centre outer seat belt

Outer seat belt removal steps

- Gate pillar trim, lower <full trim> (Refer to P.52A-10, 11, 13, 14.)
- Quarter trim <partial trim> (Refer to P.52A-7, 8.)

4. Outer seat belt

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

120002291

SERVICE PRECAUTIONS 2
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AIR BAG MODULE DISPOSAL PROCEDURES 43
Undeployed Air Bag Module Disposal 43
Deployed Air Bag Module Disposal Procedures 48
SENSOR CABLE INSTALLATION PROCEDURES 50

CAUTION

- **Carefully read and observe the information in the SERVICE PRECAUTIONS (P.52B-2.) prior to any service.**
- **For information concerning troubleshooting or maintenance, always observe the procedures in the Troubleshooting (P.52B-5.) section.**
- **If any SRS components are removed or replaced in connection with any service procedures, be sure to follow the procedures in the INDIVIDUAL COMPONENT SERVICE section (P.52B-31.) for the components involved.**
- **If you have any questions about the SRS, please contact your local distributor.**

SERVICE PRECAUTIONS

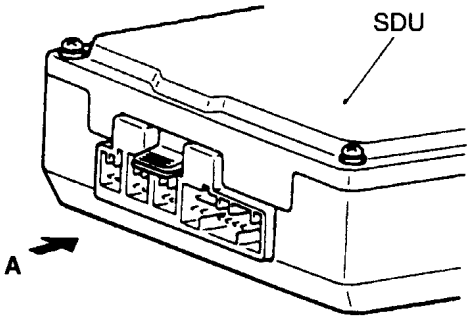
120002280

1. In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment on or near SRS components, except those specified on P.52B-5.
3. **Never Attempt to Repair the Following Components:**
   - Front Impact Sensors
   - SRS Diagnosis Unit (SDU)
   - Clock Spring
   - Air Bag Module (Driver's side or front passenger's side*)

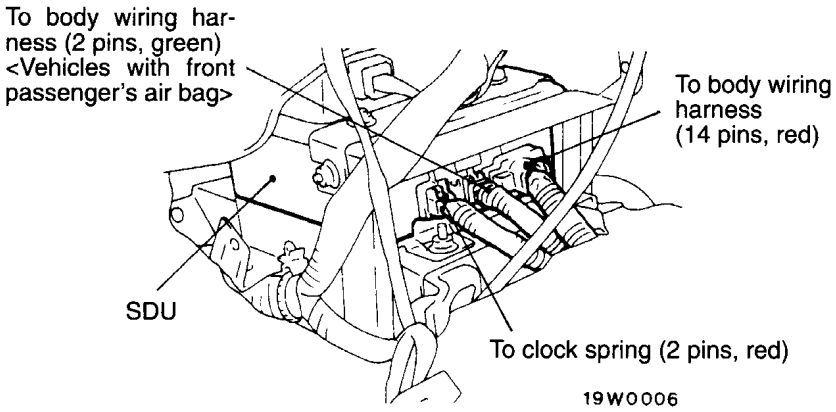
   NOTE
   *: Vehicles with passenger's air bag
4. Do not attempt to repair the wiring harness connectors of the SRS. If any of the connectors are diagnosed as faulty, replace the wiring harness. If the wires are diagnosed as faulty, replace or repair the wiring harness according to the following table.

Harness connector (No. of terminals, colour)	SDU terminal No.	Destination of harness	Corrective action
2 pins, red	1, 2	Body wiring harness → Clock spring	Replace clock spring
–	3, 4	–	–
2 pins, green	5*1, 6*1	Body wiring harness → Air bag module (Front passenger's side)	Carrect or replace each wiring harness
14 pins, red	7, 8	–	–
	9	Body wiring harness→ Diagnosis connector	Correct or replace each wiring harness
	10	Body wiring harness → Control wiring harness → Body wiring harness → Ignition switch (ST)	
	11	Body wiring harness → Instrument panel wiring harness → Junction block (fuse No.4)	
	12	Body wiring harness → Junction block (fuse No.8)	
	13, 14	Body wiring harness → Instrument panel wiring harness → Combination meter (SRS warning lamp)	
	15	Body wiring harness → Front wiring harness → Front impact sensor (+)(R.H.)	Sensor cable*2 installation procedures (Refer to P.52B-50.)
	16	Body wiring harness → Front wiring harness → Front impact sensor (+)(L.H.)	
	17	Body wiring harness → Front wiring harness → Front impact sensor (–)(L.H.)	
	18	Body wiring harness → Front wiring harness → Front impact sensor (–)(R.H.)	
	19, 20	Body wiring harness → Earth	Correct or replace each wiring harness

NOTE
(1) *1: Vehicles with front passenger's air bag
(2) The sensor cable marked with*2 is available as service part.

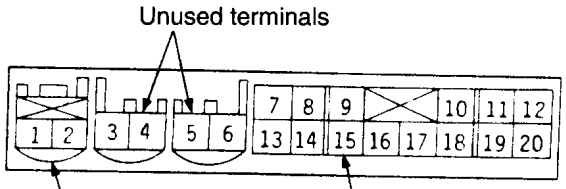


View A A13R0704



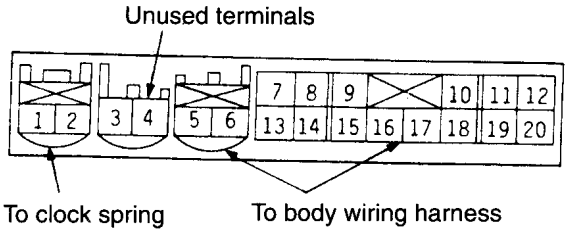
19W0006

<Vehicles without front passenger's air bag>

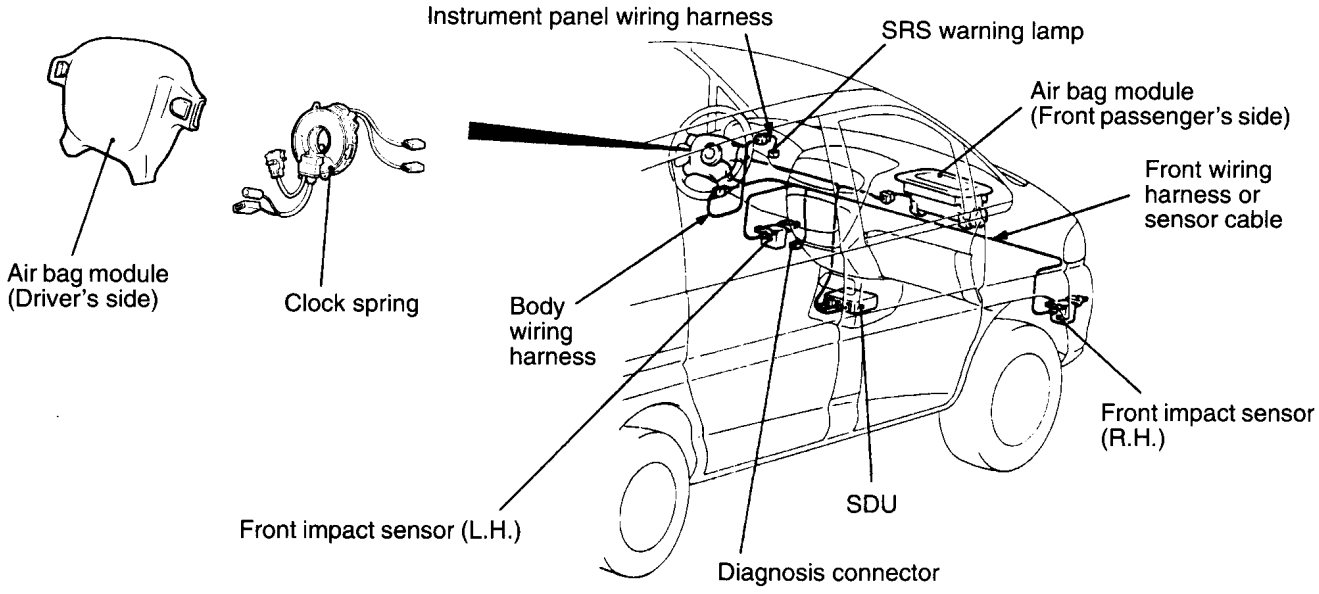


19X0524

<Vehicles with front passenger's air bag>



19N0303



19W0234 00003083

5. **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.**
6. SRS components should not be subjected to heat over 93°C, so remove the front impact sensors, SRS diagnosis unit, air bag module and clock spring before drying or baking the vehicle after painting.
7. Whenever you finish servicing the SRS, erase the diagnosis codes and check the SRS warning lamp operation to make sure that the system functions properly. (Refer to P.52B-5.)

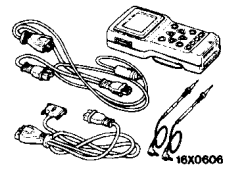
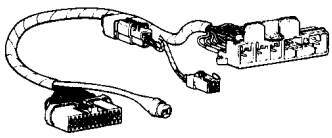
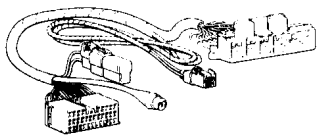
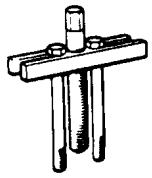
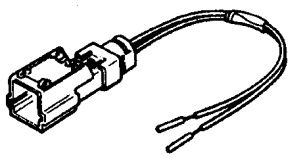
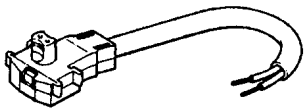
SERVICE SPECIFICATIONS

120000236

Items	Standard value
Front impact sensor resistance Ω	2,000 ± 20
Clock spring resistance Ω	Less than 0.4

SPECIAL TOOLS

120002281

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Reading diagnosis codes • Erasing diagnosis code • Reading trouble period • Reading erase times
16X0607	–	ROM pack	
	MB991349 <Vehicles without front passenger's air bag>	SRS Check harness	Checking the SRS electrical circuitry
	MB991530 <Vehicles with front passenger's air bag>		
	MB990803	Steering wheel puller	Removal of steering wheel
	MB686560	SRS air bag adapter harness A	Deployment of air bag module inside the vehicle
	MB628919	SRS air bag adapter harness B	Deployment of air bag module outside the vehicle

TEST EQUIPMENT

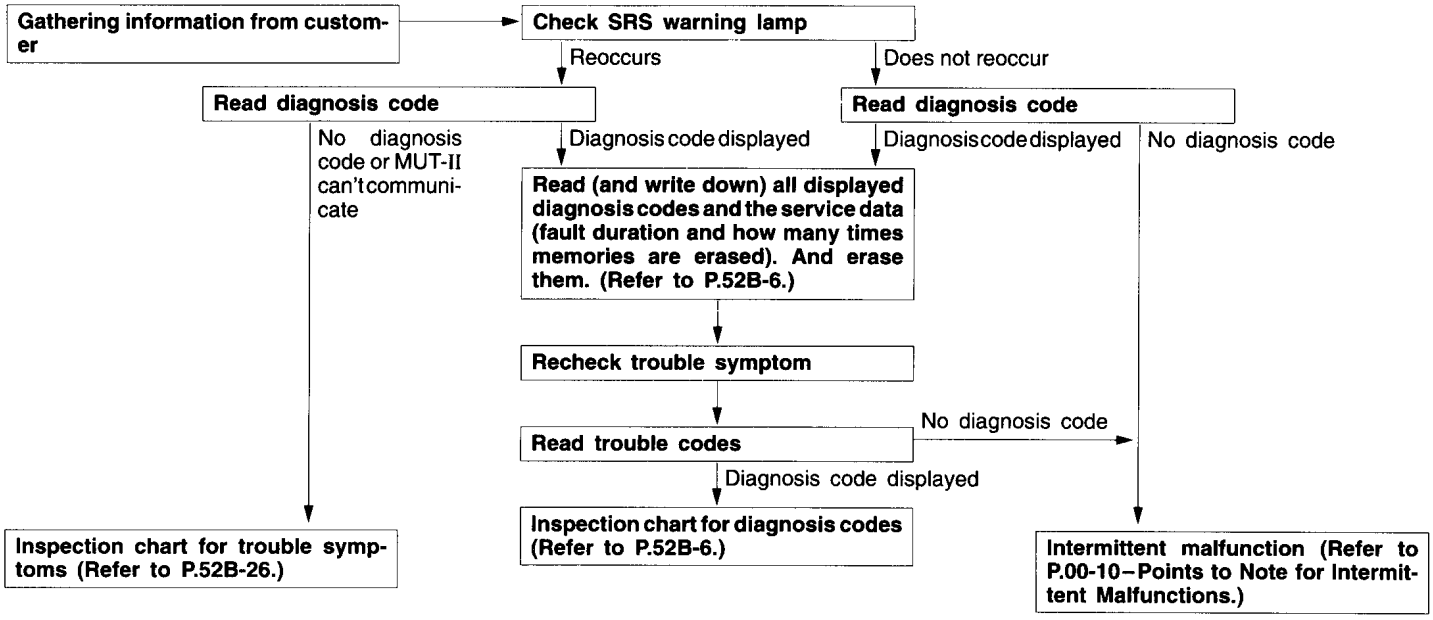
120000238

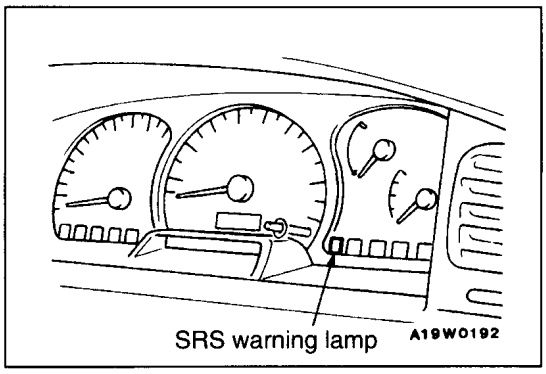
Tool	Name	Use
13R0746	Digital multi-meter	Checking the SRS electrical circuitry [Use a multi-meter for which the maximum test current is 2 mA or less at the minimum range of resistance measurement]

TROUBLESHOOTING

120002282

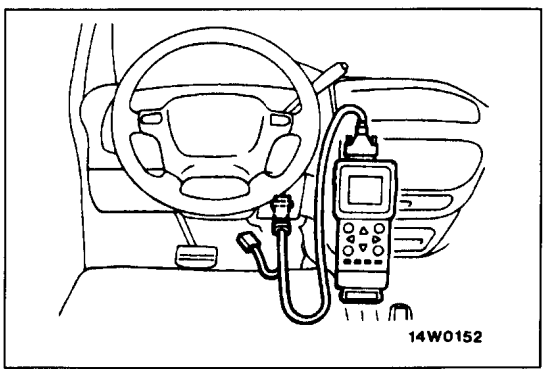
1. STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING





2. "SRS" WARNING LAMP CHECK

Turn the ignition with the key "ON" position. Does the "SRS" warning lamp illuminate for about 7 seconds, turn OFF and then remain extinguished for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-6.



3. DIAGNOSIS CODE READING

(1) Connect the MUT-II to the diagnois connector located at the relay box.
(2) Read the service date (fault duration and how many times memories are erased) using the MUT-II.

NOTE
1. Maximum stored period: 9999 minutes (approximately 7 days)
2. Maximum number of times to be stored: 250

4. DIAGNOSIS CODE ERASING METHOD

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

5. INSPECTION CHART FOR DIAGNOSIS CODES

Code No.	Diagnosis item	Reference page
11, 12, 13	Front impact sensor system	P.52B-7
21, 22	Air bag module (squib) system	P.52B-9
24*1	Front passenger's side air bag module (squib)	P.52-11
25*1		
31, 32	SDU capacitor system	P.52B-13
33*2	Cranking signal system	P.52B-14
34*2	Connector lock system	P.52B-16
41*2	IG_1 (A) power circuit system	P.52B-17
42*2	IG_1 (B) power circuit system	P.52B-19
43	SRS warning lamp drive circuit system Lamp does not illuminate*2	P.52B-21
	SRS warning lamp drive circuit system Lamp does not switch off	P.52B-23
44	SRS warning lamp drive circuit system	P.52B-24
45	SDU non-volatile memory (EEPROM) and A/D converter system	P.52B-25

NOTE
(1) *1: Vehicles with front passenger's air bag.
(2) If the vehicle condition returns to normal, the diagnosis code with *2 mark will be automatically erased, and the SRS warning lamp will return to normal.
If the vehicle has a discharged battery, it will store the fault codes 41 or 42. When these diagnosis coded are displayed, check the battery.

6. INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSTIC TROUBLE

Code No.11, 12 or 13 Front impact sensor system	Probable cause
[Comment] (1) These diagnosis codes are output if there is abnormal resistance between the input terminals of the front impact sensor. The trouble causes for each code No. are as follows. (Refer to the chart 1.) (2) Diagnosis codes 11, 12 and 13 are sometimes generated in combination with malfunction codes relating to the air bag module (squib) (code Nos. 21 and 22), but sometimes only one may be output instead of both being memorized. Because of this, the air bag module should also be inspected at the same time. The relationships between the codes are as follows. (Refer to the chart 2.)	• Malfunction of front impact sensor • Malfunction of harnesses of connectors • Malfunction of SDU

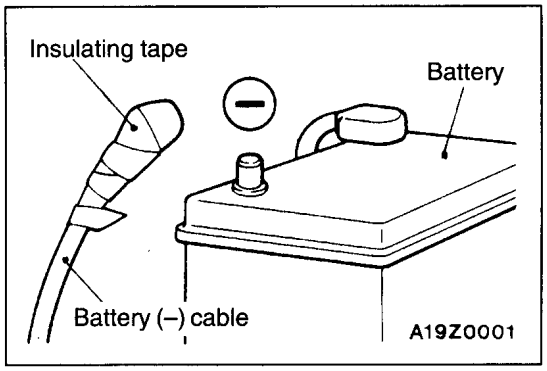
CHART 1

Code No.	Trouble Symptom
11	• Short in front impact sensor or harness short • Short in front impact sensor or air bag module (squib) harnesses leading to the vehicle body earth • Short in front impact sensor or air bag module (squib) harnesses leading to the power supply
12	• Open circuit in either left or right front impact sensor open harness • Short in front impact sensor or air bag module (squib) harnesses leading to the power supply
13	• Open circuit in both left and right front impact sensors or open harness • Short in front impact sensor or air bag module (squib) harnesses leading to the power supply

CHART 2

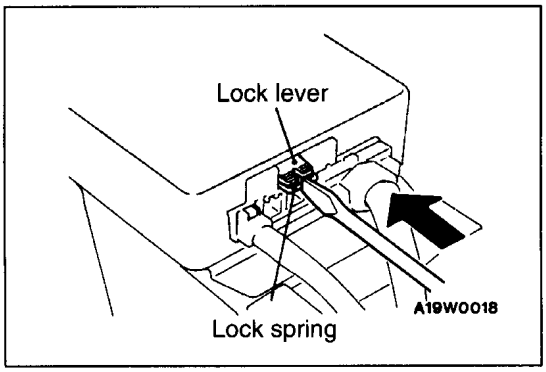
Item		Front impact sensor		
		Short	Open circuit (1 sensor)	Open circuit (2 sensors)
Air bag module (driver's side squib)	Short	11 or 21	12 or 21	13 or 21
	Open circuit	11 or 22	12 or 22	13 or 22
Air bag module (front passenger's side squib)*	Short	11 or 24	12 or 24	13 or 24
	Open circuit	11 or 25	12 or 25	13 or 25

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



Caution

1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)

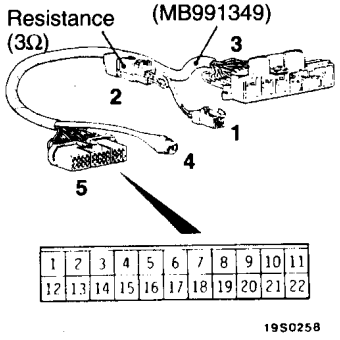


2. To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.

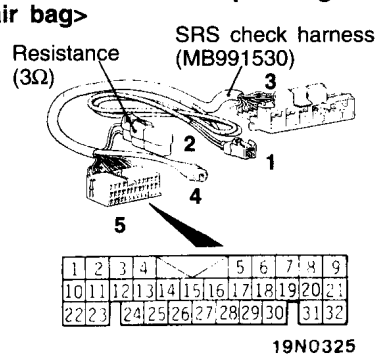
Inspection of front impact sensor (Refer to P.52B-32.) NG → **Replace**

OK ↓

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



00003084

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-36.
- Connect SRS check harness connector (3).
- Resistance between terminals (15) – (18)
  OK: 2,000 ± 20Ω
- Resistance between terminals (16) – (17)
  OK: 2,000 ± 20Ω
- Continuity between terminals 15, 16, 17, 18 – Body earth
  OK: No continuity

NG → **Check the following connectors.** C-36, C-40, A-26. and A-32 NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Inspect or repair harness between SDU and front impact sensor.

NG ↓

Install the sensor harness.

OK ↓

- Inspect the air bag module (driver's side squib) system. (Refer to P.52B-37.)
- Inspect the air bag module (front passenger's side squib) system.* (Refer to P.52B-38.)

OK ↓

Replace the SDU.

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

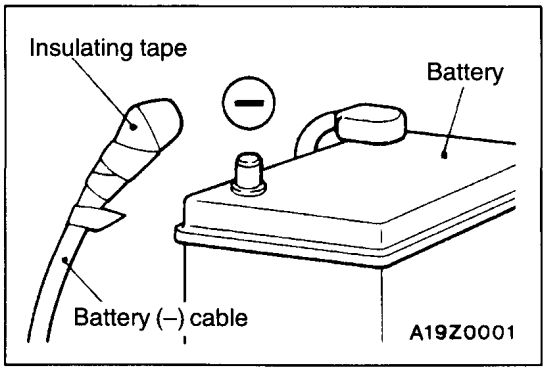
Code No.21 or 22 Air bag module (drive's side squib) system	Probable cause
[Comment] (1) These diagnosis codes are output if there is abnormal resistance between the input terminals of the air bag module (driver's side squib). The trouble causes for each code No. are as follows. (Refer to chart 1.) (2) Diagnosis codes 21 and 22 are sometimes generated in combination with malfunction codes relating to the front impact sensor (code Nos. 11, 12 and 13), but sometimes only one may be output instead of both being memorized. Because of this, the front impact sensor should also be inspected at the same time. The relationships between the codes are as follows. (Refer to chart 2.)	• Malfunction of clock spring • Malfunction of harnesses or connectors • Malfunction of air bag module (driver's side squib) • Malfunction of SDU

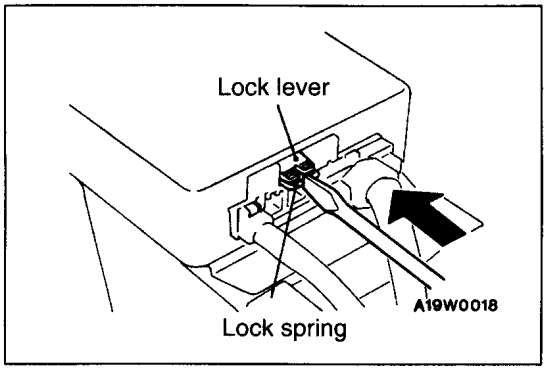
Chart 1

Code No.	Trouble Symptom
21	• Short in air bag module (driver's side squib) or harness short • Short in clock spring • Short in air bag module (driver's side squib) or front impact sensor harnesses leading to the power supply
22	• Open circuit in air bag module (driver's side squib) or open harness • Open circuit in clock spring • Malfunction of connector contact • Short in air bag module (driver's side squib) or front impact sensor harnesses leading to the power supply

Chart 2

Item		Front impact sensor		
		Short	Open circuit (1 sensor)	Open circuit (2 sensors)
Air bag module (driver's side squib)	Short	11 or 21	12 or 21	13 or 21
	Open circuit	11 or 22	12 or 22	13 or 22

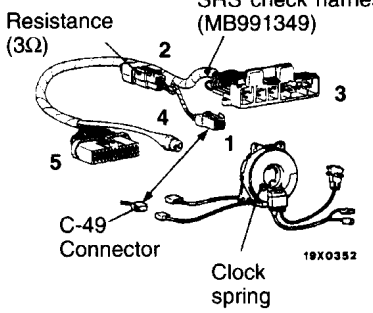




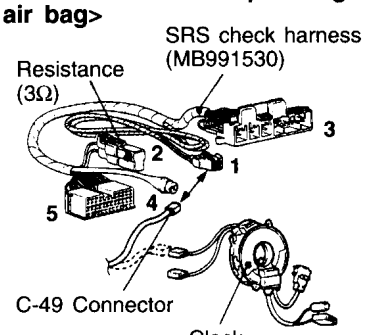
Caution

1. **After the ignition switch has been placed at the LOCK position and the negative (–) terminal of the battery has been disconnected, wait for more than 60 seconds before starting work. Wind a tape around the disconnected (–) terminal for insulation. (Refer to P.52B-3, No.5)**
2. **Do not attempt to measure the air bag module (squib) circuit resistance. Use of a tester in measuring the circuit resistance will supply current to the squib, or erroneous deployment due to static electricity could cause serious injury.**
3. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



00003085

MUT-II DIAGNOSIS CODE

- Disconnect clock spring connector C-49.
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

Are code Nos. 21 and 22 output?

No → Clock spring inspection. (Refer to P.52B-40.) → NG → **Replace**

OK ↓

Check the following connectors. C-34 and C-49 → NG → **Repair**

OK ↓

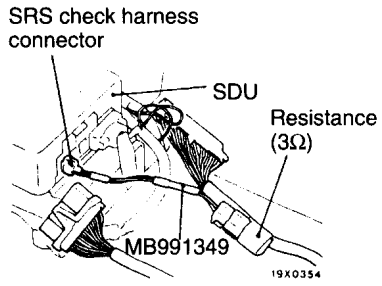
Check trouble symptom.

NG ↓

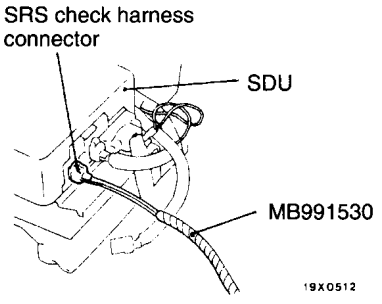
Replace the air bag module (driver's side squib).

Yes ↓

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



00003086

MUT-II DIAGNOSIS CODE

- Connect clock spring connector C-49
- Disconnect SDU connector C-34
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

Are code Nos. 21 and 22 output?

No → Check the harness between the SDU and clock spring, and repair if necessary.

Yes → Inspect the front impact sensor system (Refer to P.52B-33.)

OK ↓

Replace the SDU.

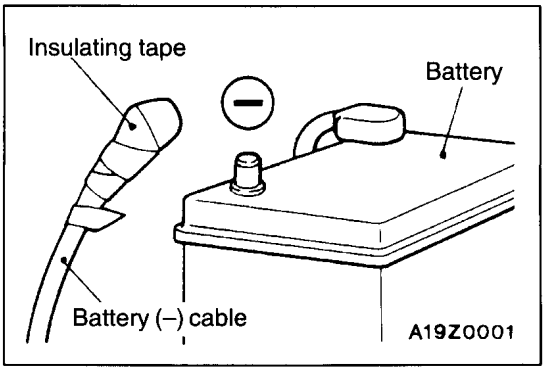
Code No. 24 or 25 Air bag module (front passenger's side squib) system <Vehicles with front passenger's air bag>	Probable cause
[Comment] (1) These diagnosis codes are output if there is abnormal resistance between the input terminals of the air bag module (front passenger's side squib). The trouble causes for each code No. are as follows. (2) Diagnosis codes 24 and 25 are sometimes generated in combination with malfunction codes relating to the front impact sensor (code Nos. 11, 12 and 13), but sometimes only one may be output instead of both being memorised. Because of this, the front impact sensor should aiso be inspected at the same time. The relationships between the codes are as follows.	• Malfunction of harnesses or connectors • Malfunction of air bag module (front passenger's side squib) • Malfunction of SDU

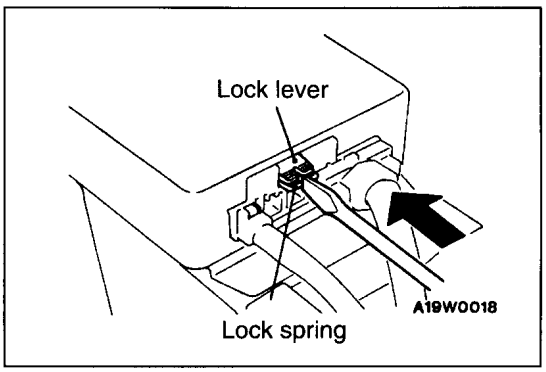
Chart 1

Code No.	Trouble Symptom
24	• Short in air bag module (front passenger's side squib) or harness short. • Short in air bag module (front passenger's side squib) or front impact sensor harnesses leading to the power supply
25	• Open circuit in air bag module (front passenger's side squib) or open harness • Malfucntion of connector contact • Short in air bag module (front passenger's side squib) or front impact sensor harnesses leading to the power supply

Chart 2

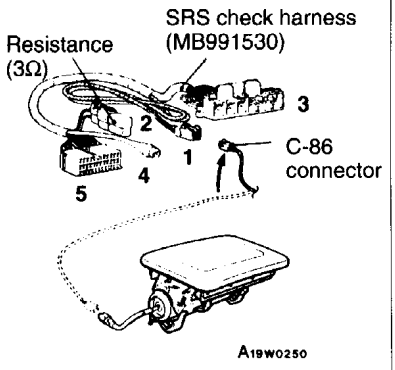
Item		Front impact sensor		
		Short	Open circuit (1 sensor)	Open circuit (2 sensors)
Air bag module (front passenger's side squib)	Short	11 or 24	12 or 24	13 or 24
	Open circuit	11 or 25	12 or 25	13 or 25





Caution

1. **After the ignition switch has been placed at the LOCK position and the negative (–) terminal of the battery has been disconnected, wait for more than 60 seconds before starting work. Wind a tape around the disconnected (–) terminal for insulation. (Refer to P.52B-3, No.5)**
2. **Do not attempt to measure the air bag module (squib) circuit resistance. Use of a tester in measuring the circuit resistance will supply current to the squib, or erroneous deployment due to static electricity could cause serious injury.**
3. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**



MUT-II SELF DIAGNOSIS CODE

- Disconnect air bag module (front passenger's side) connector C-86
- Connect SRS check harness connector (1).
- Erase diagnosis code momory Are code Nos. 24 and 25 output?

No → **Check the following connectors.** C-86 and C-88 → NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Replace the air bag module (front passenger's side squib).

Yes ↓

Inspect harness between SDU and air bag module (front passenger's side) → NG → **Repair**

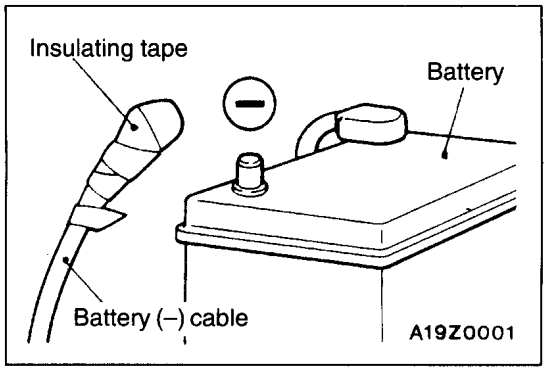
OK ↓

Inspect the front impact sensor system (Refer to P.52B-33.)

OK ↓

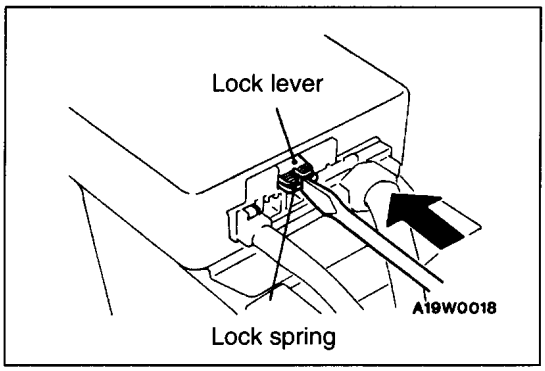
Replace the SDU.

Code No.31 or 32 SDU capacitor system	Probable cause
[Comment] These diagnosis codes are output if the voltage at the SDU capacitor terminals is higher (No.31) or lower (No.32) than the specified value for 5 seconds or more. However, if diagnosis code Nos. 41 and 42 are being output due to a drop in battery voltage, code No.32 will not be detected.	• Malfunction of front impact sensor • Malfunction of SDU



Caution

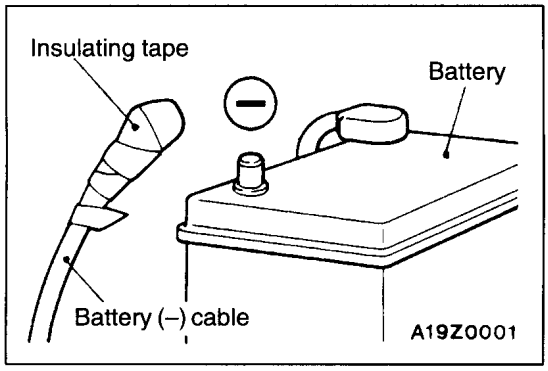
1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5)**



2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

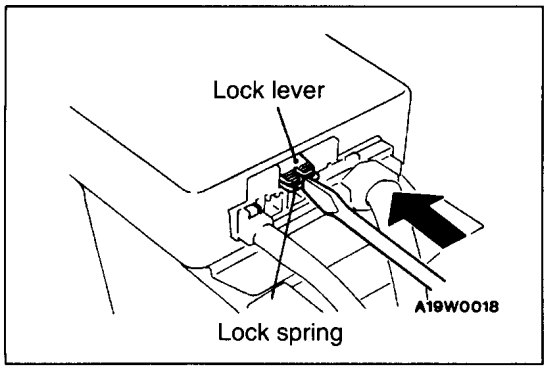
The capacitor inside the SDU is probably defective, so replace the SDU. However, code No.32 could also be a result of a short in the front impact sensor, so inspection of the front impact sensor system should also be carried out. (Refer to P.52B-7.)

Code No.33 Cranking signal system	Probable cause
[Comment] The cranking signal is provided in order to prevent mistaken detection of power supply voltage drops at the IG1 terminal during cranking. This diagnosis code is output if the cranking signal is output for a continuous period of 45 seconds or more (cranking signal harness is shorted to the power supply). However, if the vehicle condition returns to normal (except when cranking), diagnosis code No.33 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of harnesses of connectors • Malfunction of SDU



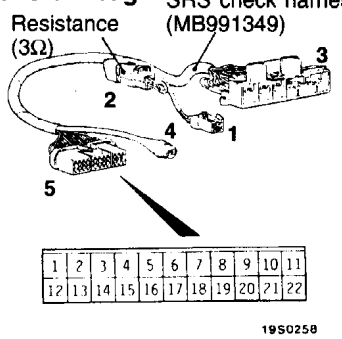
Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)**

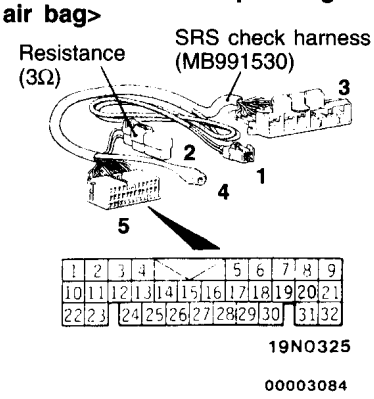


2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



Measure at SRS check harness connector (5).
- Disconnect SDU connector C-36.
- Connect SRS check harness connector (3).
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connectors.** C-36 → NG → **Repair**

OK ↓

Check trouble symptoms.

NG ↓

Check the harness wire between each, SDU and earth, and repair if necessary.

OK ↓

Measure at SRS check harness connector (5).
- Ignition switch ON
- Voltage between terminal (10) and body earth

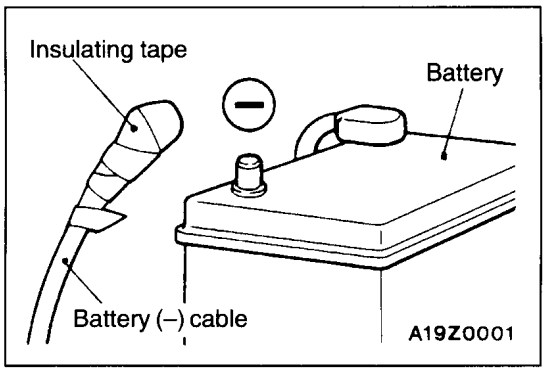
OK: 0V

OK → Replace the SDU.

NG ↓

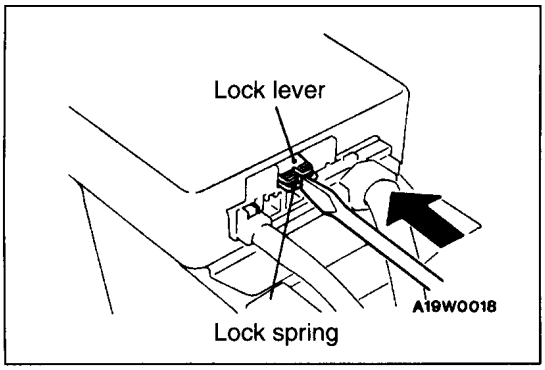
Check the harness between the SDU and ignition switch (ST), and repair if necessary.

Code No.34 Connector lock system	Probable cause
[Comment] This diagnosis code is output if the double lock shorting bar of the SDU connector is detected to be open. 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 SDU

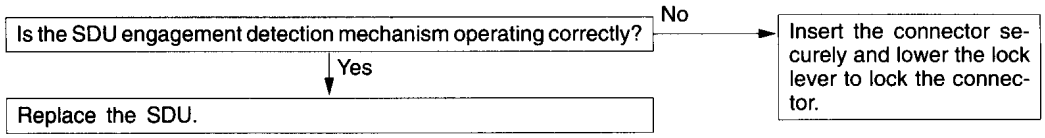


Caution

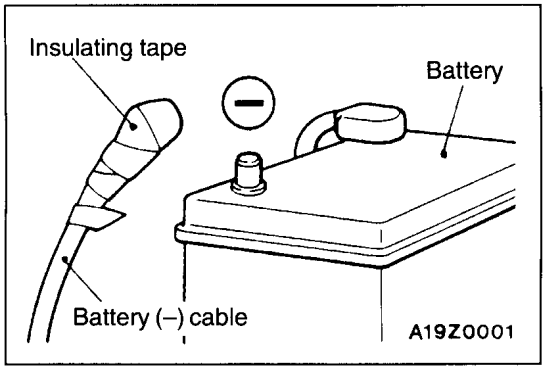
1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)**



2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

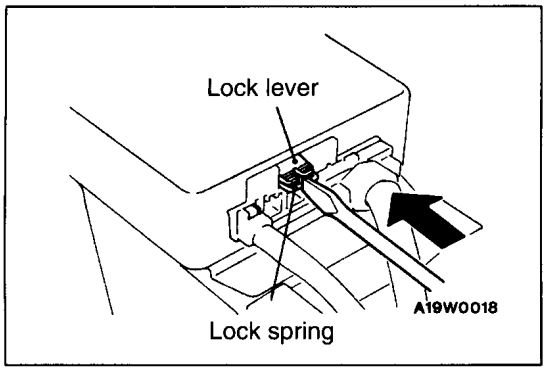


Code No.41 IG_1 (A) power circuit system	Probable cause
[Comment] This diagnosis code is output if the voltage between the IG_1 (A) terminal and the earth is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnosis code No.41 will be automatically erased, and the SRS warining lamp will switch off.	• Malfunction of harnesses or connectors • Malfunction of SDU



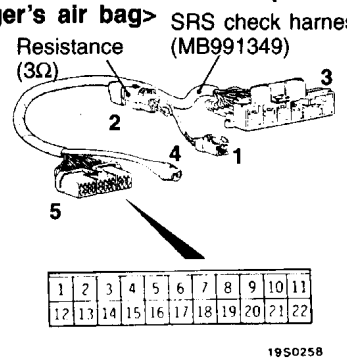
Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)**

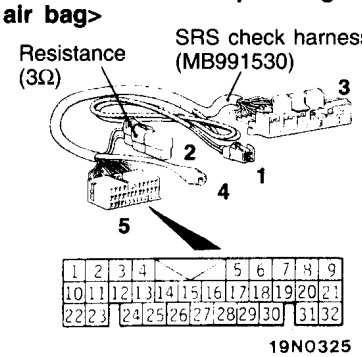


2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



00003084

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-36.
- Connect SRS check harness connector (3).
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connector.** C-36 → NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the SDU and earth, and repair if necessary.

OK → Measure at SRS check harness connector (5).
- Ignition switch ON
- Voltage between terminal (12) and body earth

OK: 9 V or more

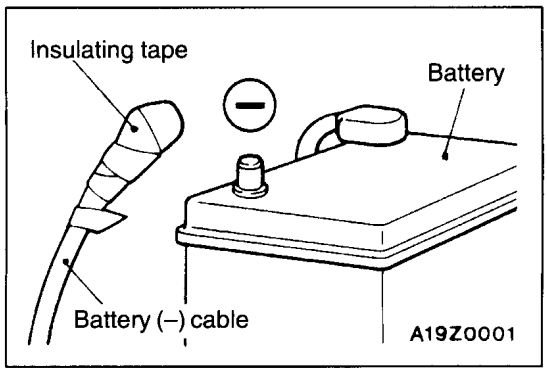
NG → **Check the following connectors.** C-69, C-70, C-72 and D-28 → NG → **Repair**

OK → Replace the SDU.

OK → Check trouble symptom.

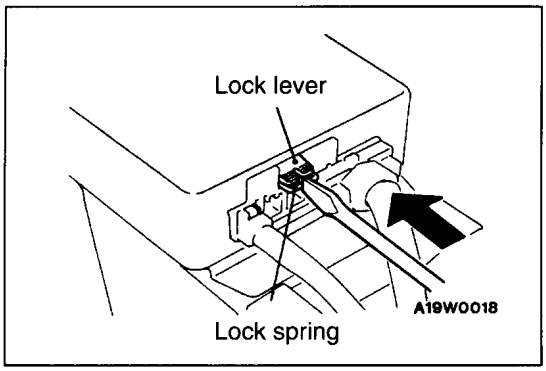
NG → Check the harness between the SDU and ignition switch IG1 (A), and repair if necessary.

Code No.42 IG_1 (B) power circuit system	Probable cause
[Comment] 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.41 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of harnesses or connectors



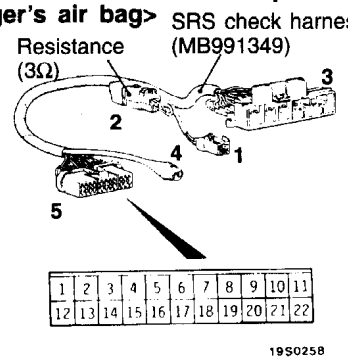
Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)**

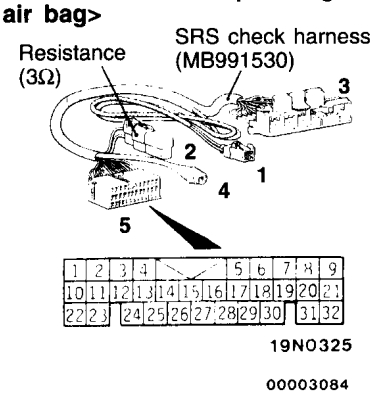


2. **To unlock the SDU connecter, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



00003084

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-36.
- Connect SRS check harness connector (3).
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connector.** C-36 → NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the SDU and earth, and repair if necessary.

OK → Measure at SRS check harness connector (5).
- Ignition switch: ON
- Voltage between the terminal (11) and body earth.

OK: 9 V or more

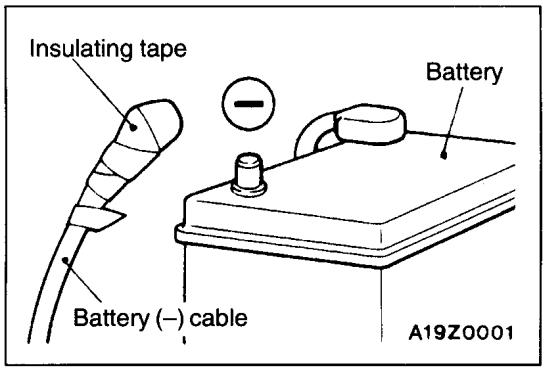
NG → **Check the following connectors.** C-69, C-70, C-72 and D-28 → NG → **Repair**

OK → Replace the SDU.

OK → Check trouble symptom.

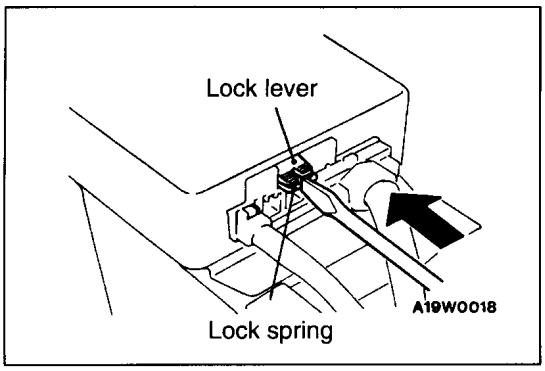
NG → Check the harness between the SDU and ignition switch IG1 (B), and repair if necessary.

Code No.43 SRS warning lamp drive circuit system (Lamp does not illuminate.)	Probable cause
[Comment] This diagnosis code is output when an open circuit occurs for a continuous period of 5 seconds while the SDU is monitoring the SRS warning lamp and the lamp is OFF (transistor OFF). However, if this code is output due to an open circuit, if the vehicle condition returns to normal, this diagnosis code No.43 will be automatically erased, and the SRS warning lamp will return to normal.	• Malfunction of harnesses or connectors • Blown bulb • Malfunction of SDU • Malfunction of combination meter



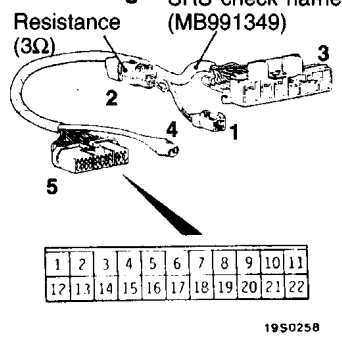
Caution

1. **Turn the ignition key to the "LOCk" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)**

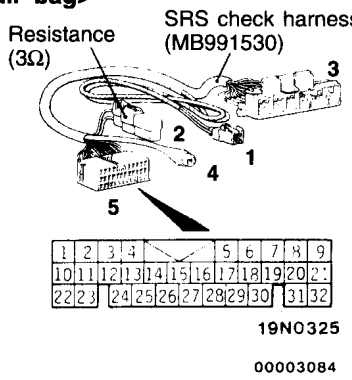


2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



Measure at SRS check harness connector (5).
- Disconnect SDU connector C-36.
- Connect SRS check harness connector (3).
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connector.** C-36 — NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness between the SDU and earth, and repair if necessary.

OK ↓

Measure at SRS check harness connector (5).
- Ignition switch ON
- Connect terminal (13) to body earth.
  OK: Lamp illuminates.
- Connect terminal (14) to the body earth.
  OK: Lamp illuminates.

NG → Blown bulb inspection — NG → **Repair**

OK ↓

Check the following connectors. D-28, D-01, D-02, D-07, C-69 and C-72 — NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

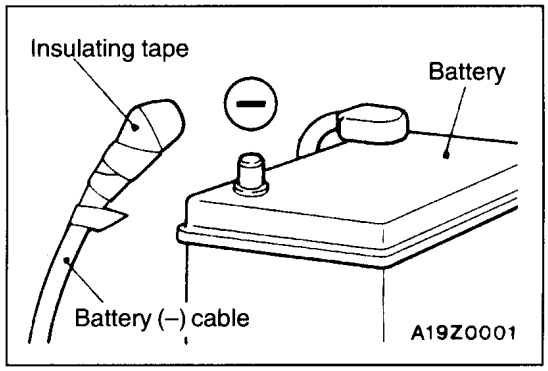
Check the harness between the SDU and ignition switch (IG1), and repair if necessary. — NG → **Repair**

OK ↓

Replace the SDU.

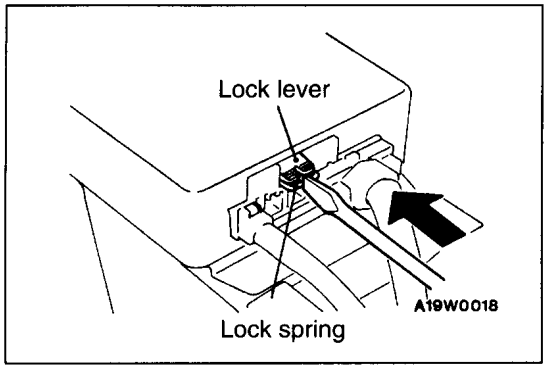
Replace the combination meter.

Code No.43 SRS warning lamp drive circuit system (Lamp does not switch off.)	Probable cause
[Comment] This diagnosis code is output when a short to earth occurs in the harness between the lamp and the SDU while the SDU is monitoring the SRS warning lamp and the lamp is ON.	• Malfunction of harnesses or connectors • Malfunction of SDU

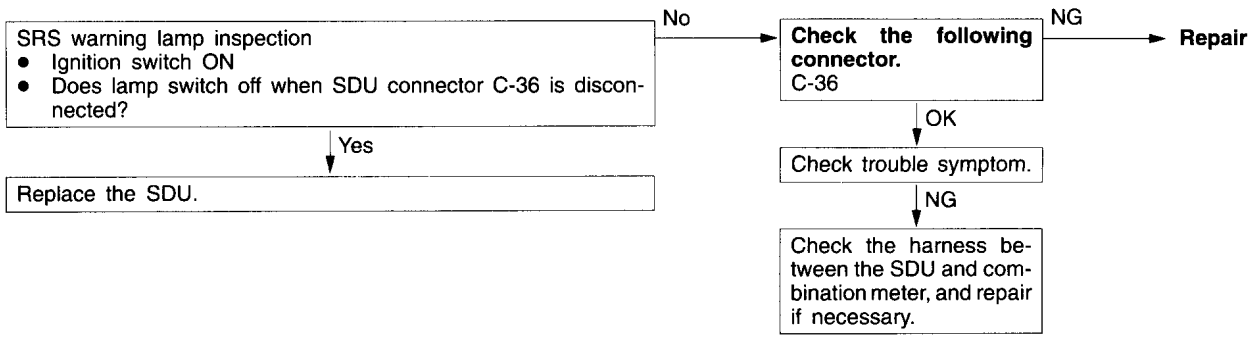


Caution

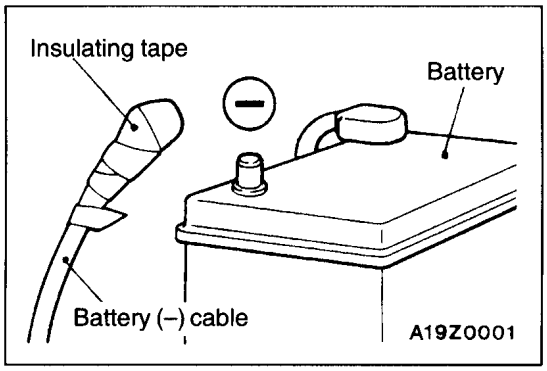
1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)**



2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

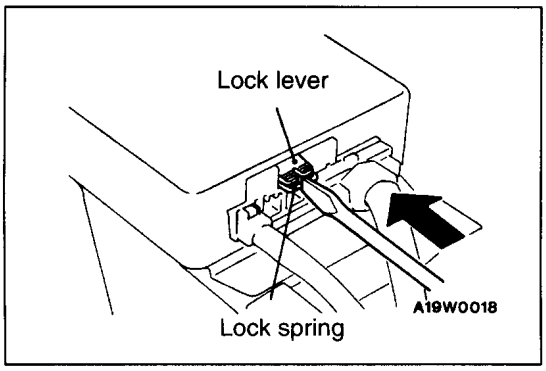


Code No.44 SRS warning lamp drive circuit system	Probable cause
[Comment] This diagnosis code is output when a short occurs in the lamp drive circuit or a malfunction of the output transistor inside the SDU is detected while the SDU is monitoring the SRS warning lamp drive circuit.	• Malfunction of harnesses or connectors • Malfunction of SDU



Caution

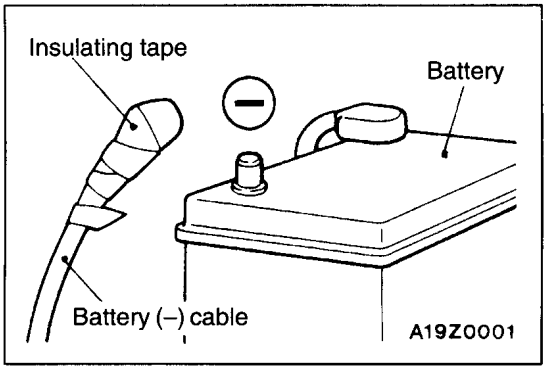
1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5).**



2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

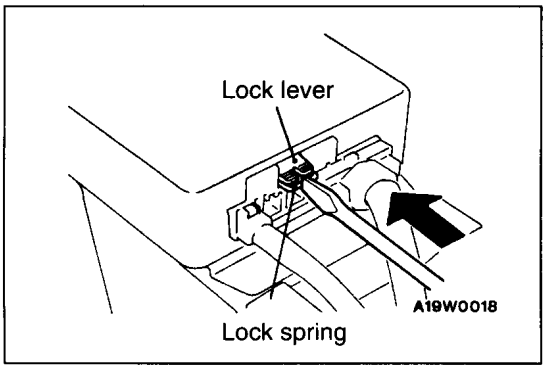
If the results of inspection of the SRS warning lamp drive circuit system (refer to P.52B-21) are normal, the transistor inside the SDU is probably defective, so replace the SDU.

Code No.45 SDU non-volatile memory (EEPROM) and A/D converter system	Probable cause
[Comment] This diagnosis code is output if there is a malfunction in the SDU non-volatile memory (EEPROM) or A/D converter.	• Malfunction of SDU



Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)**



2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

The SDU non-volatile memory (EEPROM) or A/D converter is probably defective, so replace the SDU.

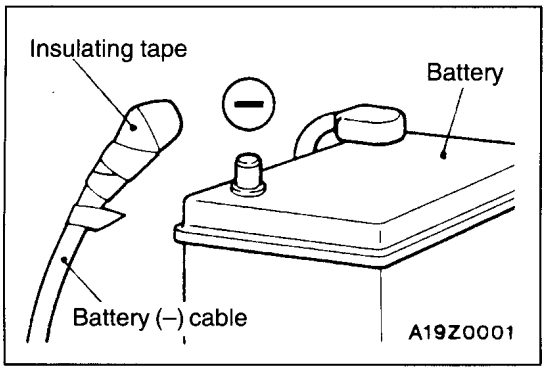
7. INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	1	P.52B-26
SRS warning lamp does not illuminate.	Refer to diagnosis code No.43.	P.52B-21
SRS warning lamp is still on		P.52B-23

8. INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

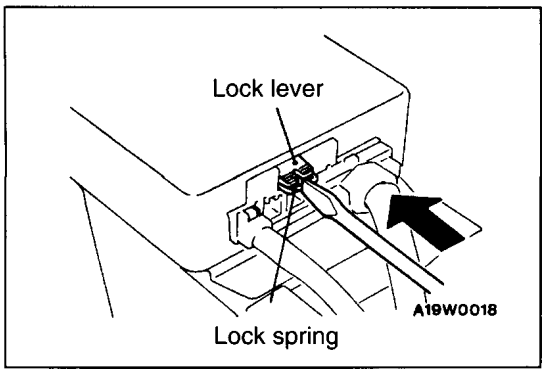
Inspection procedure 1

Communication with MUT-II is not possible.	Probable cause
[Comment] If communication with all system is not possible, the cause is probably diagnosis circuit malfunction. If communication is not possible with the SRS only, the cause is probably an open circuit in the diagnosis output circuit of the SRS or in the power circuit (including earth circuit).	• Malfunction of harnesses or connectors



Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)**



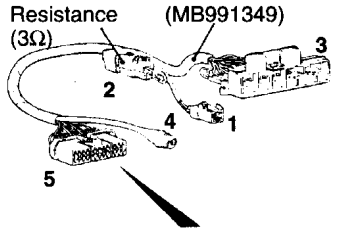
2. **To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit. In this case, do not force the lock lever up.**

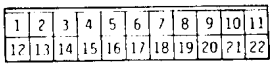
Is it possible to communicate with MUT-II? → No → **Check or repair the MUT-II diagnosis circuit.**

↓ Yes

<Vehicles without front passenger's air bag>

Resistance (3Ω) — SRS check harness (MB991349)

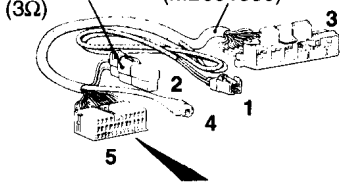


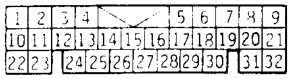


19S0258

<Vehicles with front passenger's air bag>

Resistance (3Ω) — SRS check harness (MB991530)





19N0325

00003084

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-36.
- Connect SRS check harness connector (3).
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connector.** C-36 → NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the SDU and earth, and repair if necessary.

↓ OK

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-36.
- Connect SRS check harness connector (3).
- Voltage between the terminal (11) and body earth.
  OK: 9 V or more
- Voltage between the terminal (12) and body earth
  OK: 9 V or more

NG → **Check the following connectors.** D-28, C-69, C-70 and C-72 → NG → **Repair**

OK → Check trouble symptom.

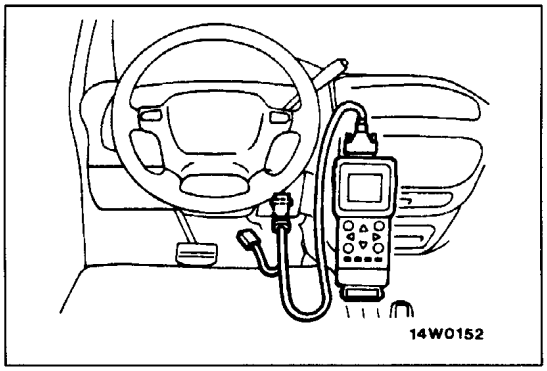
NG → Check the harness between the SDU and ignition switch IG1 (A) or ignition switch IG1 (B), and repair if necessary.

↓ OK

Inspect the harness between the SDU and diagnosis connector. → NG → **Repair**

↓ OK

Replace the SDU.



POST-COLLISION DIAGNOSIS 120002283

To inspect and service the SRS after a collision (whether or not the air bag has deployed), perform the following steps.

SRS DIAGNOSIS UNIT MEMORY CHECK

1. Connect the MUT-II to the diagnosis connector located at the relay box.

   Caution
   Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.

2. Read (and write down) all displayed diagnosis codes. (Refer to P.52B-6.)

   NOTE
   If the battery power supply has been disconnected or disrupted by the collision, the MUT-II cannot communicate with the SRS diagnosis unit. Inspect and, if necessary, repair the body wiring harness before proceeding further.

3. Read the service data (fault duration and how many times memories are erased) using the MUT-II.

   NOTE
   (1) Maximum stored period: 9999 minutes (approximately 7 days)
   (2) Maximum number or times to be stored: 250

4. Erase the diagnosis codes and after waiting 45 seconds or more read (and write down) all displayed diagnosis codes. (Refer to P.52B-6.)

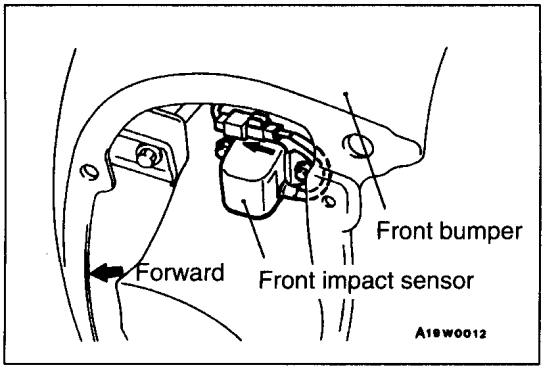
REPAIR PROCEDURE

WHEN AIR BAG DEPLOYS IN A COLLISION.

1. Replace the following parts with new ones.
   - Front impact sensors (Refer to P.52B-32.)
   - SRS diagnosis unit (SDU)(Refer to P.52B-34.)
   - Air bag module (Refer to P.52B-37.)
2. Check the following parts and replace if there are any malfunctions.
   - Clock spring (Refer to P.52B-37.)
   - 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-2.)

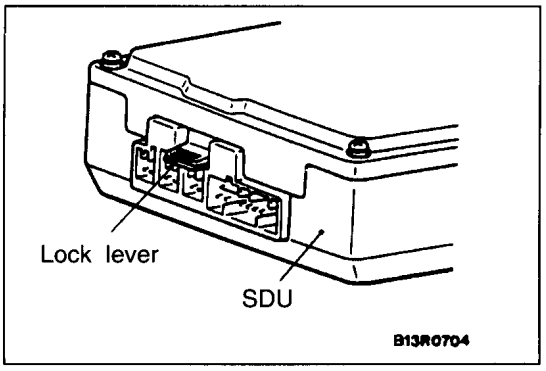
WHEN AIR BAG DOES NOT DEPLOY IN LOW-SPEED COLLISION.

Check the SRS components.
If the SRS components are showing any visible damage such as dents, crancks, 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-31.



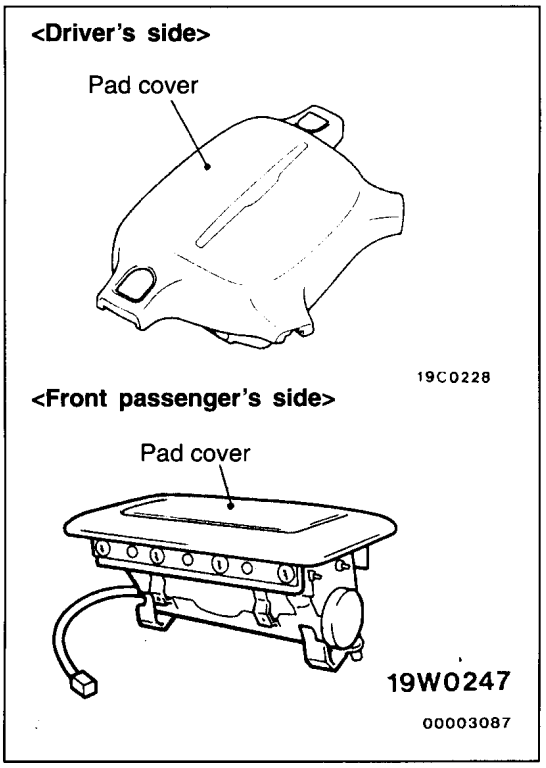
Front impact sensors

1. Check headlamp support panel for deformation or rust.
2. Check front impact sensor for dents, cracks, deformation or rust.
3. Check sensor harnesses for binds, connectors for damage, and terminals for deformation.



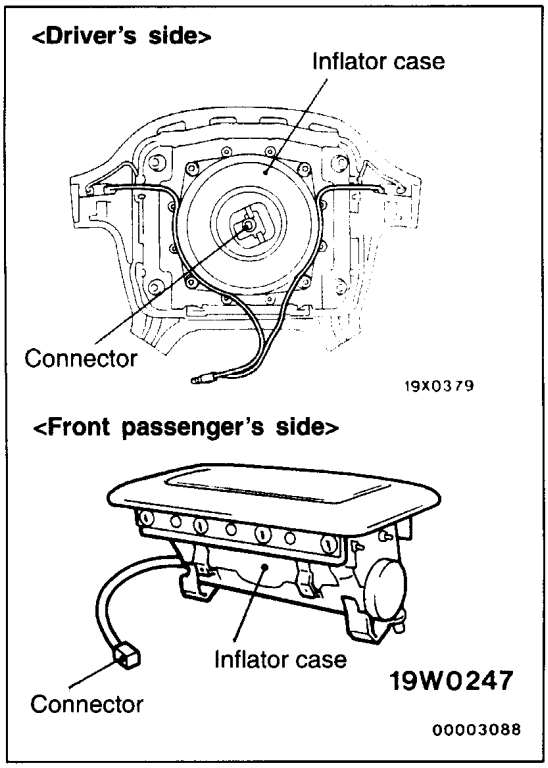
SRS diagnosis unit (SDU)

1. Check SDU case and brackets for dents, cracks or deformation.
2. Check connectors and lock lever for damage, and terminals for deformation.

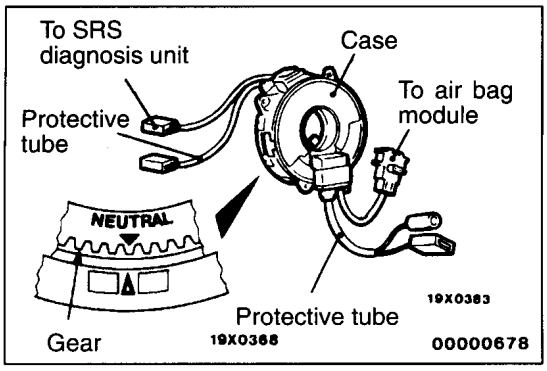


Air bag modules

1. Check pad cover for dents, cracks or deformation.



2. Check connector for damage, terminals deformities, and harness for binds.
3. Check air bag inflator case for dents, cracks or deformities.
4. Install air bag module to steering wheel to check fit or alignment with the wheel.



Clock spring

1. Check clock spring connectors and protective tube for damage, and terminals for deformation.
2. Visually check the case and the gear for damage.

Steering wheel, steering column and intermediate joint

1. Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
2. Install air bag module to check fit or alignment with steering wheel.
3. Check steering wheel for noise, binds or difficult operation and excessive free play.

Harness connector (body and front wiring harness)

Check harnesses for binding, connectors for damage, poor connections, and terminals for deformation. (Refer to P.52B-2.)

INDIVIDUAL COMPONENT SERVICE

120002284

If the SRS components are to be removed, follow each procedure. (P.52B-32 – P.52B-42.)

Caution

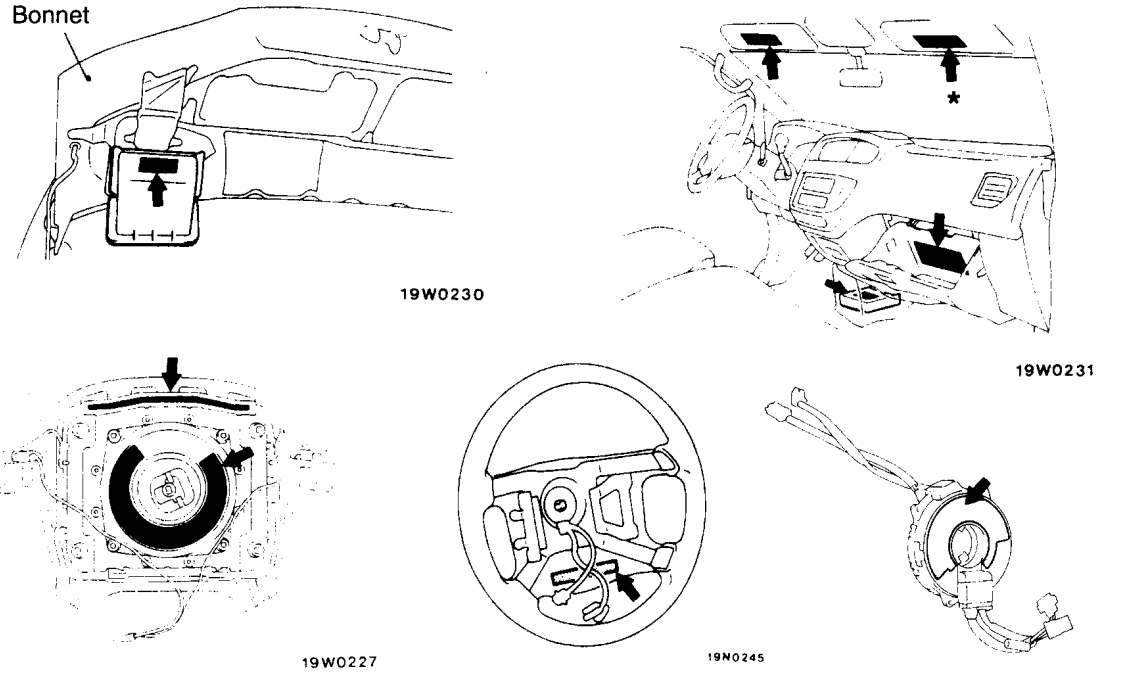
1. **SRS components should not be subjected to heat over 93°C, so remove the front impact sensors, SRS diagnosis unit and air bag module and clock spring before drying or baking the vehicle after painting.**
2. **If the SRS components are removed for the purpose of check, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.**

WARNING/CAUTION LABELS

120002285

A number of caution labels relating to the SRS are found in the vehicle, as shown in the following illustration. Follow label instructions when servicing SRS.

If labels are dirty or damaged, replace them with new ones.



00003089

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

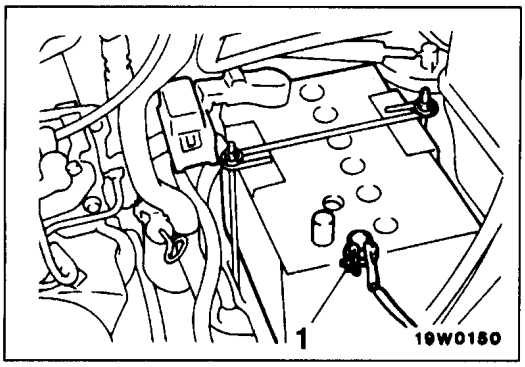
FRONT IMPACT SENSORS

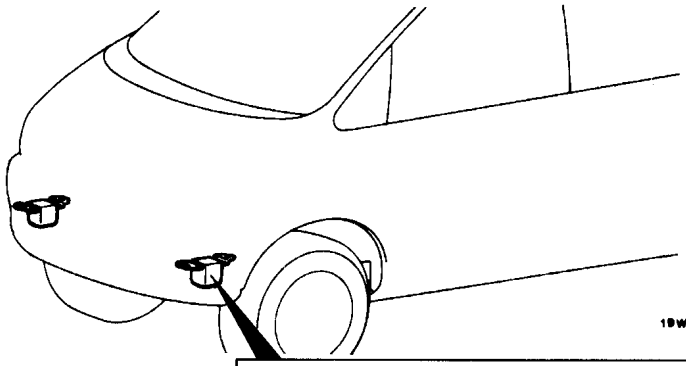
120002286

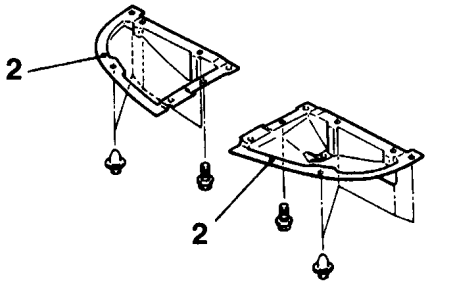
Caution
1. **Never repair or disassemble a front impact sensor. If faulty, replace it.**
2. **Handle the front impact sensors very carefully, taking care not to drop them or otherwise subject them to impact. If a sensor is seen to be dented, cracked, deformed or rusted, replace it with a new one.**
3. **Replace sensors with new ones after the air bag has deployed.**

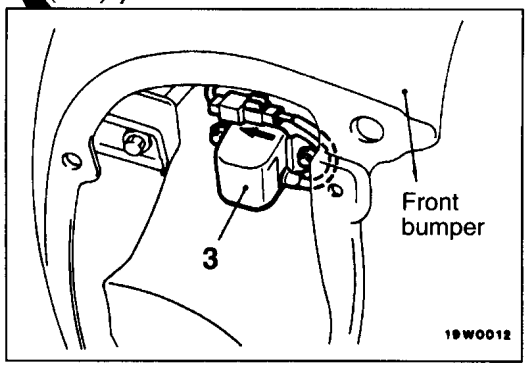
REMOVAL AND INSTALLATION

Pre-removal Operation
- Turn the ignition key to the "LOCK" position.







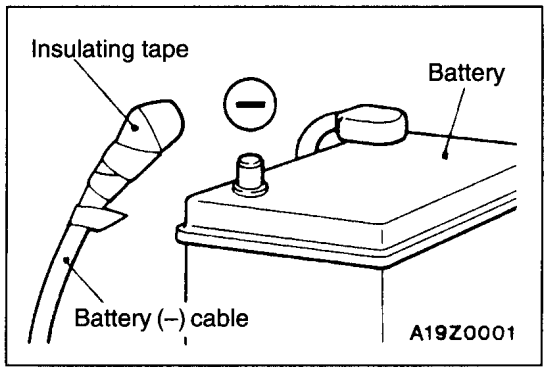


00000680

Removal steps

▶C◀ ◀A▶ • Post-installation inspection
1. Negative (–) Battery cable connection
2. Under panel side cover (Refer to GROUP 42 – Under cover.)

▶B◀ 3. Front impact sensor
▶A◀ • Pre-installation inspection

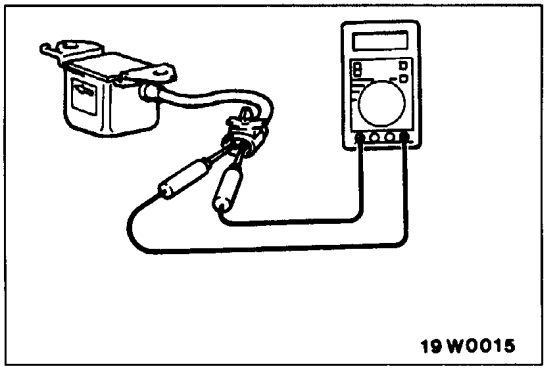


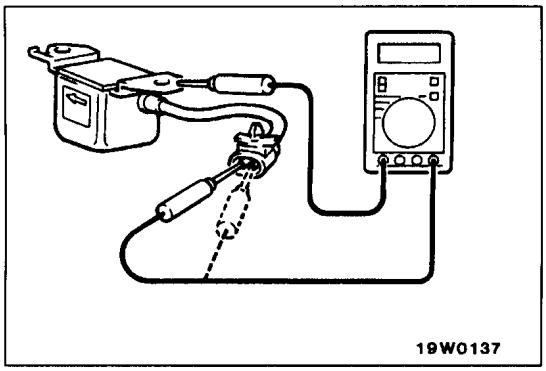
REMOVAL SERVICE POINT

◀A▶ NEGATIVE (–) BATTERY CABLE DISCONNECTION

Disconnect the negative battery cable from the battery and tape the terminal.

Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)





INSPECTION

1. Check the front impact sensor for dents, cracks, deformation or rust.

   Caution
   If a dent, crack, deformation or rust is detected, replace with a new sensor.

2. Measure the resistance between terminals and check whether it is within the standard value.

   Standard value: 2,000 ± 20Ω

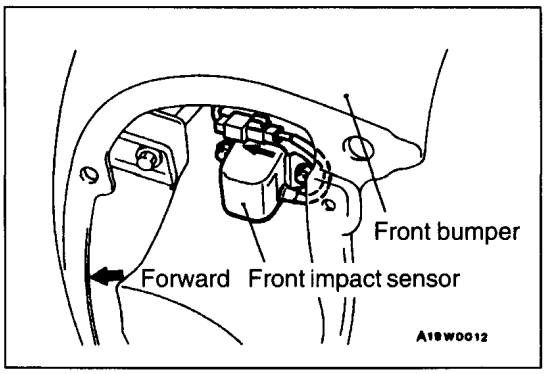
   Caution
   Always replace the sensor with a new one if the resistance is not within the standard value.

3. Check headlamp support panel for deformation or rust.
4. Check the continuity between the terminal and bracket. If there is a continuity, the insulation is malfunctioned, and replace the sensor with a new one.

INSTALLATION SERVICE POINTS

▶A◀ PRE-INSTALLATION INSPECTION

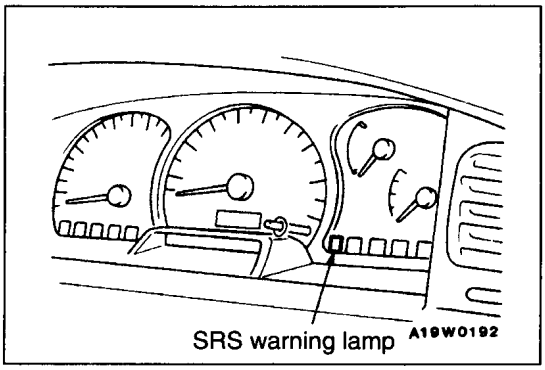
To mount the new front impact sensor, visually check it and measure the resistance between the terminals. (Refer to the previous item "INSPECTION")



▶B◀ FRONT IMPACT SENSOR INSTALLATION

(1) Securely connect the connector.
(2) Set the front impact sensor toward the front of the vehicle as shown by the arrow in the illustration, and install it securely.

Caution
The SRS may not activate properly if a front impact sensor is not installed properly, which could result in serious injury or death to the vehicle's driver.



▶C◀ POST-INSTALLATION INSPECTION

(1) Reconnect the negative battery terminal.
(2) Turn the ignition key to the "ON" position.
(3) Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 45 seconds after turning OFF?
(4) If yes, SRS system is functioning properly.
If no, consult page 52B-6.

SRS DIAGNOSIS UNIT (SDU)

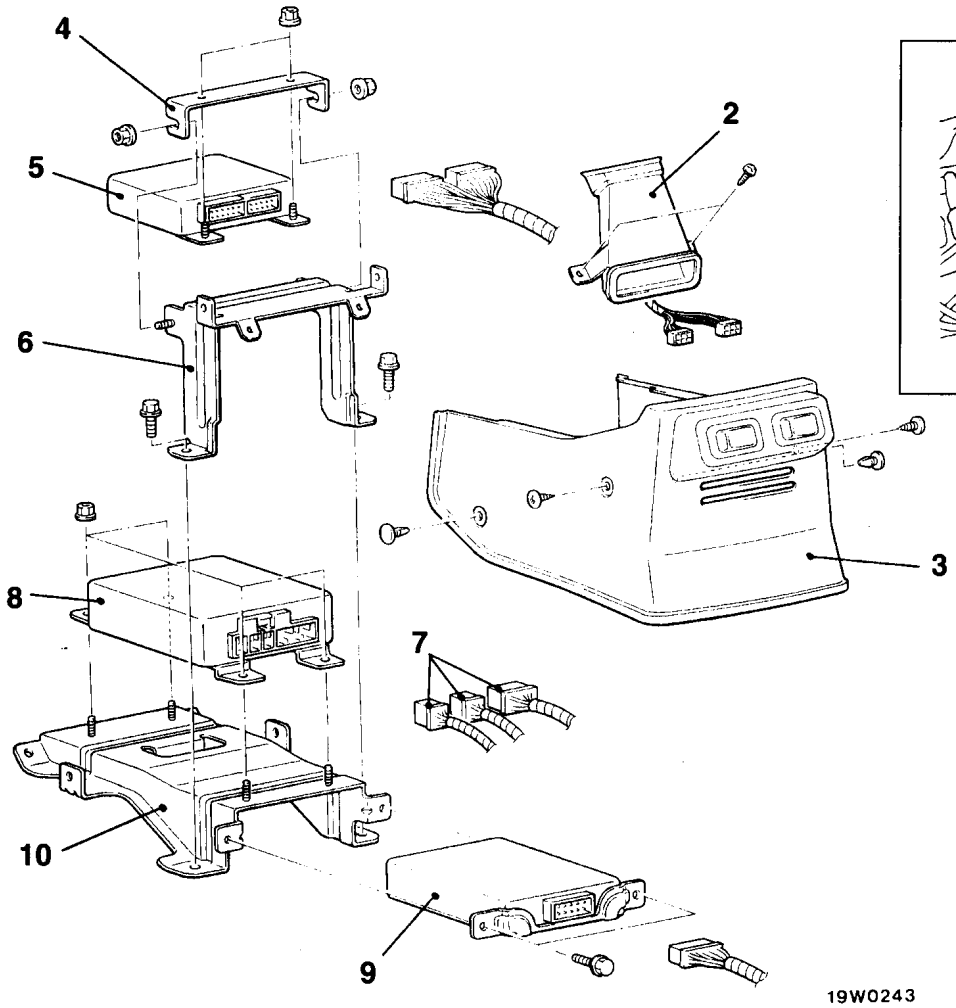
120002287

Caution

1. **Never attempt to disassemble or repair the SDU. If faulty, replace it.**
2. **Do not drop or subject the SDU to impact or vibration.**
   If denting, cracking, deformation, or rust are discovered in the SDU, replace it with a new SDU. Discard the old one.
3. **After deployment of an air bag, replace the SDU with a new one.**
4. **Never use an ohmmeter on or near the SDU, and use only the special test equipment described on P.52B-5**

REMOVAL AND INSTALLATION

Pre-removal Operation
- Turn the ignition key to the "LOCK" position.



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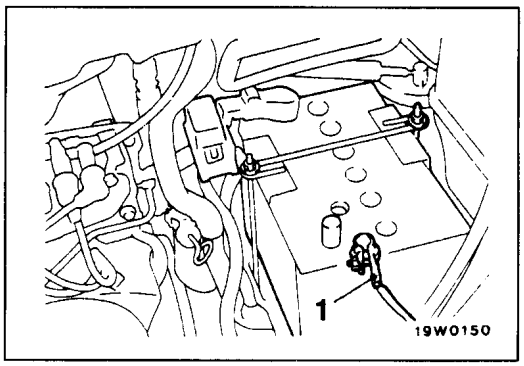
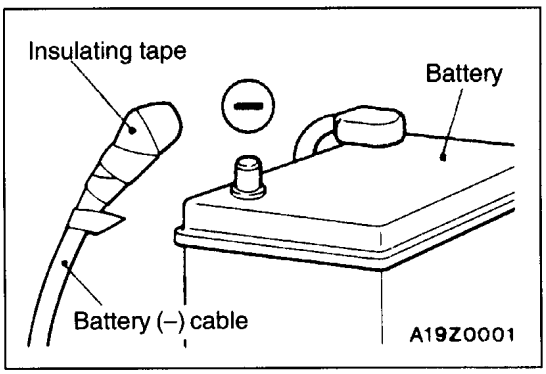


00003091

Removal steps

◀A▶ ▶C◀ • Post-installation inspection
1. Negative (–) battery cable connection
2. Foot distribution rear duct
3. Computer cover
4. ABS bracket
5. ABS ECU

◀B▶ ▶B◀ 6. Rear ABS bracket
7. Harness connector
▶A◀ 8. SRS diagnosis unit (SDU)
9. A/T ECU
10. SRS diagnosis unit (SDU) bracket

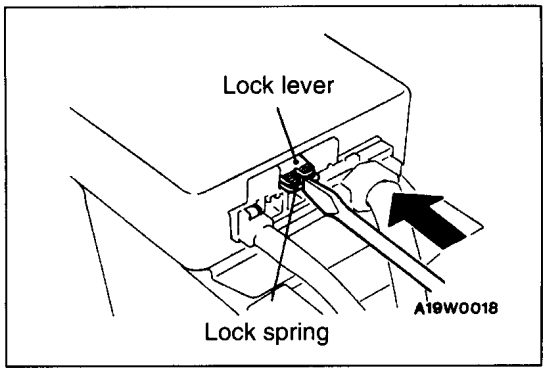


REMOVAL SERVICE POINTS

◀A▶ NEGATIVE (–) BATTERY CABLE DISCONNECTION

Disconnect the negative battery cable from the battery and tape the terminal.

Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3. No.5.)



◀B▶ HARNESS CONNECTOR DISCONNECTION

(1) To unlock the SDU connector, place a flat-tipped screwdriver against the lock spring at the lock lever notch and push the spring toward the unit.

Caution
Do not use excessive force to raise the lock lever.

(2) While pushing the locks of each connector downwards, remove each connector from the SDU.

Caution
Because a double lock mechanism is employed for the SDU connectors, be careful not to exert undue force to remove the connectors, as this will damage them.

INSPECTION

- Check the SDU case and brackets for dents, cracks or deformation.

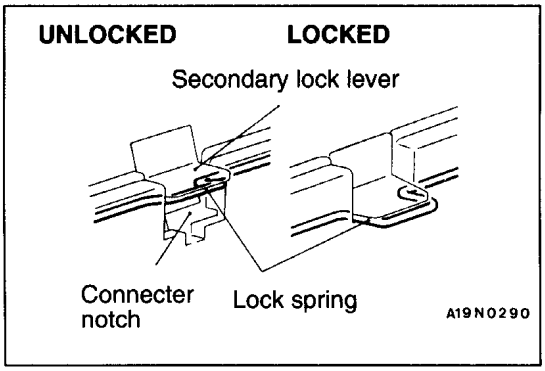
Caution
If a dent, crack, deformation or rust is discovered, replace the SDU with a new one.

NOTE
For checking of the SDU other than described above, refer to the section concerning troubleshooting. (Refer to P.52B-5.)

INSTALLATION SERVICE POINTS

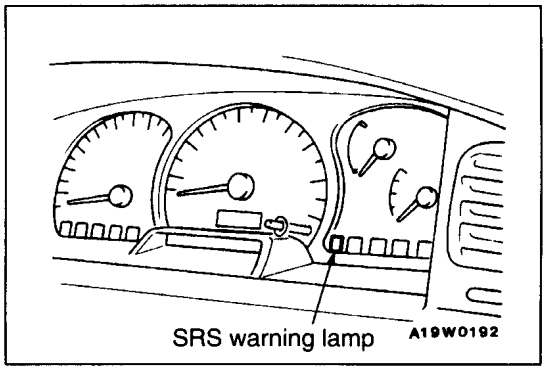
▶A◀ SRS DIAGNOSIS UNIT (SDU) INSTALLATION

Caution
The SRS may not activate if SDU is not installed properly, which could result in serious injury or death to the vehicle's driver.



▶B◀ HARNESS CONNECTOR CONNECTION

After connecting each harness connector securely and correctly to the SDU, be sure to press down the lock lever of the SDU.



▶C◀ POST-INSTALLATION INSPECTION

(1) Reconnect the negative battery terminal.
(2) Turn the ignition key to the "ON" position.
(3) Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 45 seconds after turning OFF?
(4) If yes, SRS system is functioning properly.
If no, consult page 52B-6.

AIR BAG MODULES AND CLOCK SPRING

120002288

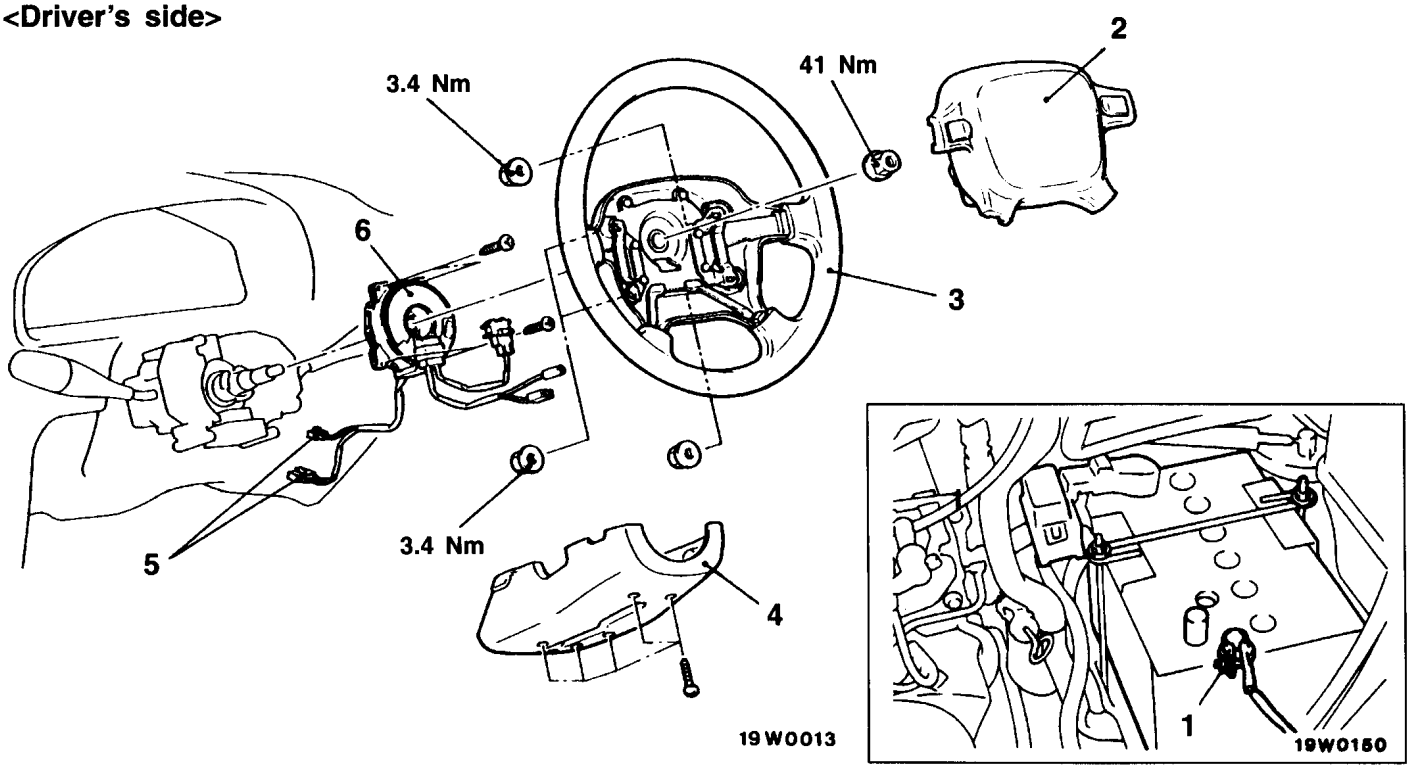
Caution

1. **Never attempt to disassemble or repair the air bag modules or clock spring. If faulty, replace it.**
2. **Do not drop the air bag modules or clock spring or allow contact with water, grease or oil. Replace it with a new one if a dent, crack, deformation or rust is detected.**
3. **The air bag modules should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.**
4. **Do not expose the air bag modules to temperatures over 93°C.**
5. **After deployment of an air bags, replace the clock spring with a new one.**
6. **Wear gloves and safety glasses when handling air bags that have already deployed.**
7. **An undeployed air bag modules should only be disposed of in accordance with the procedures (Refer to P.52B-43).**

REMOVAL AND INSTALLATION

Pre-removal Operation
- After setting the wheel and the front wheels to the straight ahead position, remove the ignition key.

<Driver's side>



00000682

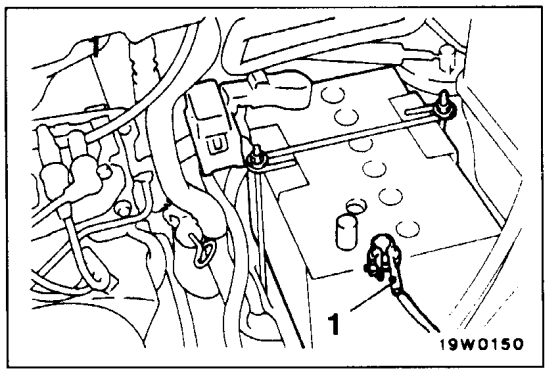
Air bag module removal steps

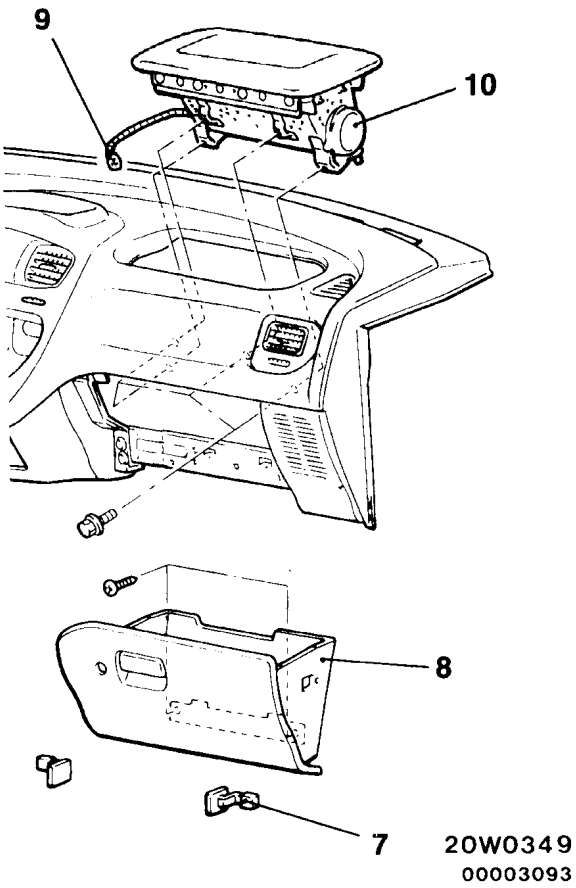
- ▶E◀ • Post-installation inspection
- ◀A▶ 1. Negative (–) battery cable connection
- ◀B▶ ▶D◀ 2. Air bag module
- ▶A◀ • Pre-installation inspection

Clock spring removal steps

- ▶E◀ • Post-installation inspection
- ◀A▶ 1. Negative (–) battery cable connection
- ◀B▶ ▶D◀ 2. Air bag module
- ◀C▶ ▶C◀ 3. Steering wheel
- 4. Column cover, lower
- 5. Clock spring and body wiring harness connection
- ◀D▶ ▶B◀ 6. Clock spring
- ▶A◀ • Pre-installation inspection

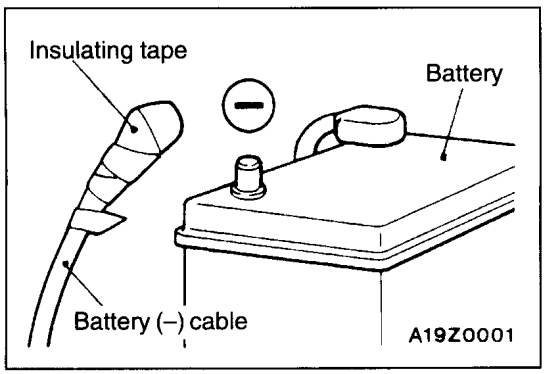
<Front passenger's side>





Air bag module removal steps

- ▶E◀ • Post-installation inspection
- ◀A▶ 1. Negative (–) battery cable connection
- 7. Stopper
- 8. Glove box
- 9. Air bag module and body wiring harness connection
- ◀B▶ 10. Air bag module
- ▶A◀ • Pre-installation inspection



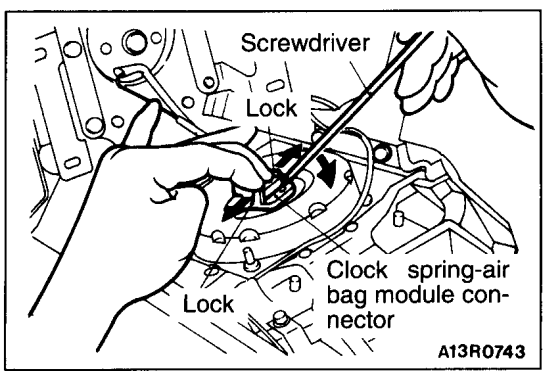
REMOVAL SERVICE POINTS

◀A▶ NEGATIVE (–) BATTERY CABLE DISCONNECTION

Disconnect the negative battery cable from the battery and tape the terminal.

Caution

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)

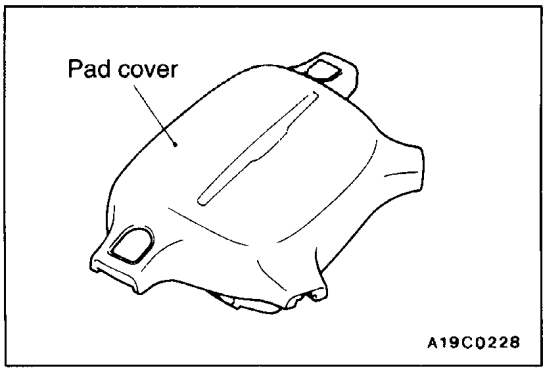


◀B▶ AIR BAG MODULE REMOVAL (DRIVER'S SIDE)

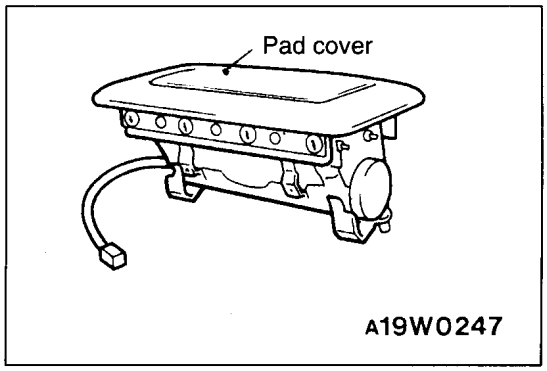
When disconnecting the connector of the clock spring from the air bag module, press the air bag's lock toward the outer side to spread it open. Use a screwdriver, as shown in the figure at the left, to pry so as to remove connector gently.

Caution

1. **When disconnecting the air bag module-clock spring connector, take care not to apply excessive force to it.**

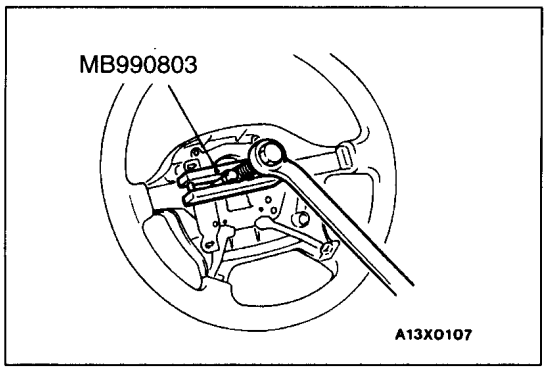


2. The removed air bag module should be stored in a clean, dry place with the pad cover face up.



◀B▶ AIR BAG MODULE REMOVAL (FRONT PASSENGER'S SIDE)

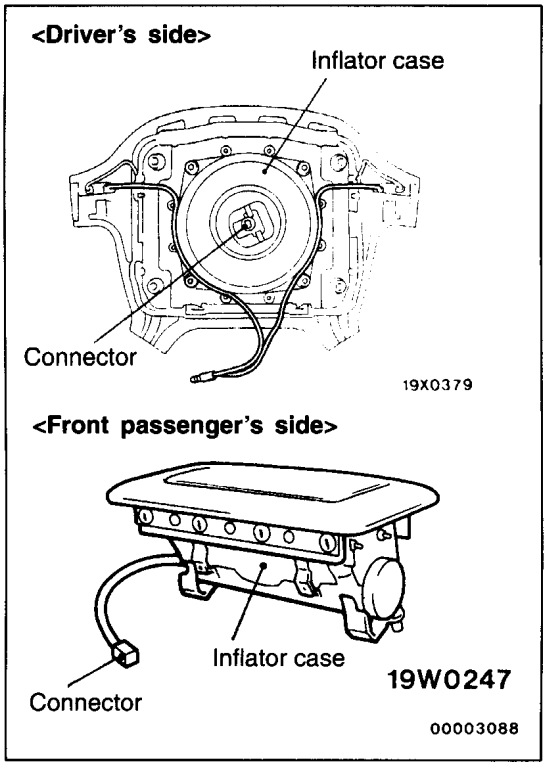
Caution
The removed air bag module should be stored in a clean, dry place with the pad cover face up.



◀C▶ STEERING WHEEL REMOVAL

◀D▶ CLOCK SPRING REMOVAL

Caution
The removed clock spring should be stored in a clean, dry place.



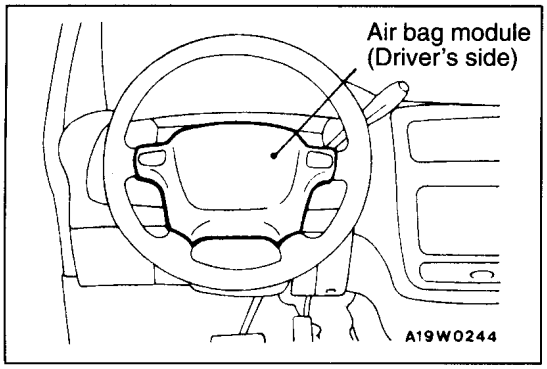
INSPECTION

AIR BAG MODULES

If any improper part is found during the following inspection, replace the air bag modules with a new one.
Dispose of the old one according to the specified procedure. (Refer to P.52B-43.)

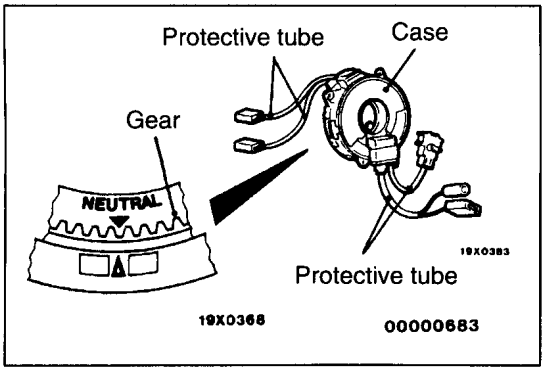
Caution
Never attempt to measure the circuit resistance of the air bag modules (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bags deployment will result in serious personal injury.

(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.



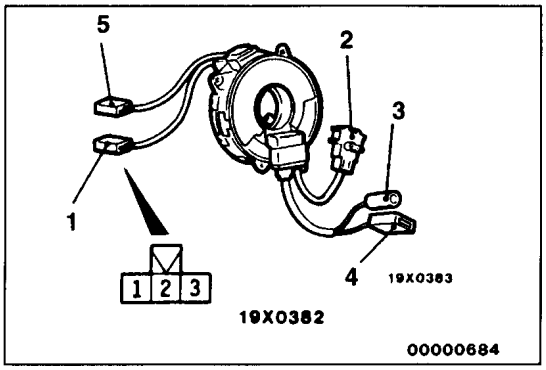
(4) Install the air bag module to steering wheel to check fit or alignment with the wheel.

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-43.)



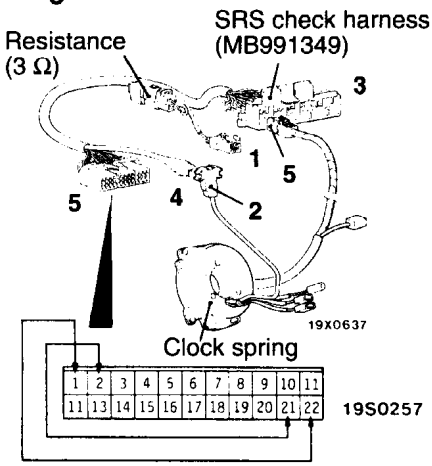
CLOCK SPRING

If, as result of following checks, even one abnormal point is discovered, replace the clock spring with a new one.
(1) Check connectors and protective tube for damage, and terminals for deformation.
(2) Visually check the case and the gears for damage.

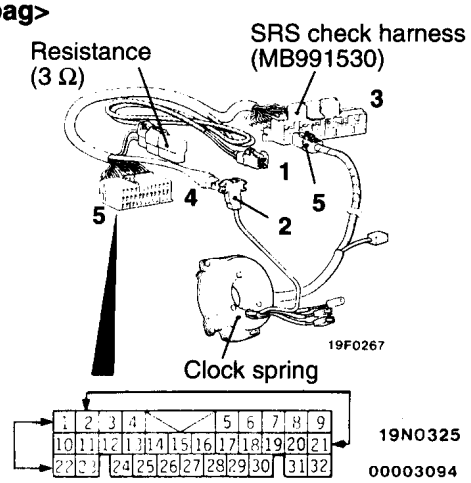


(3) Check for continuity between the terminal 3 of the No.1 connector and the No.3 connector.

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



(4) Joint the No.5 connector of the clock spring to the No.3 connector of the SRS Check Harness.
(5) Joint the No.2 connector of the clock spring to the No.4 connector of the SRS Check Harness.
(6) Check for continuity between terminal 1 and terminal 22, and terminal 2 and terminal 21, of SRS Check Harness connector No.5 using a digital multi-meter.

Standard value: Less than 0.4 Ω

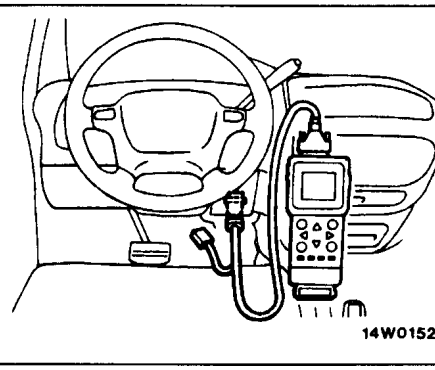
INSTALLATION SERVICE POINTS

▶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-43.)

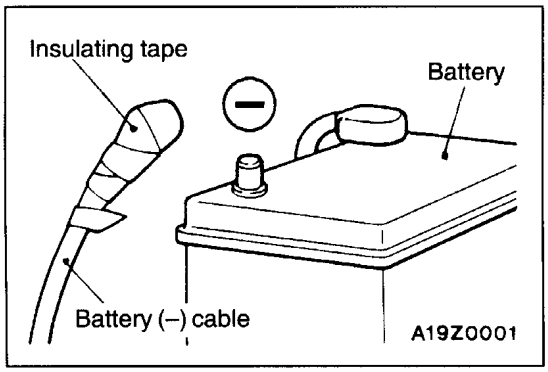
(2) Connect the battery (–) terminal.



(3) Connect the MUT-II to the diagnosis connector located at the relay box.

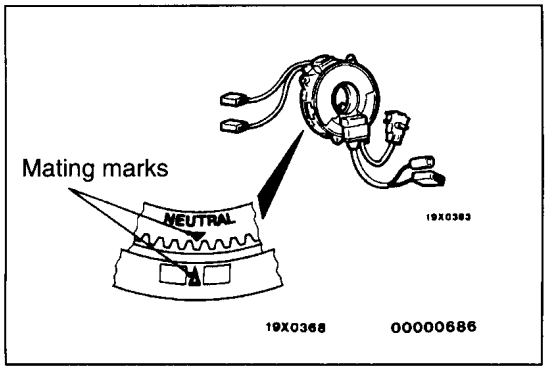
Caution
Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.

(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 (Diagnosis code No.22).(Refer to P.52B-9.)



(6) Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal.

Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)



▶B◀ CLOCK SPRING INSTALLATION

Align the mating mark and "NEUTRAL" position indicator of the clock spring, and after turning the front wheels to the straight-ahead position, install the clock spring to the column switch.

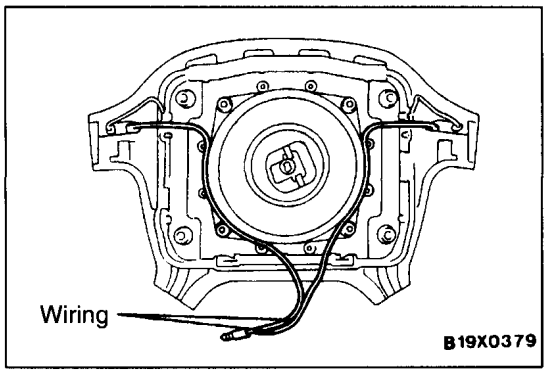
Caution
If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational, or the cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver.

▶C◀ STEERING WHEEL INSTALLATION

(1) Install the steering wheel.

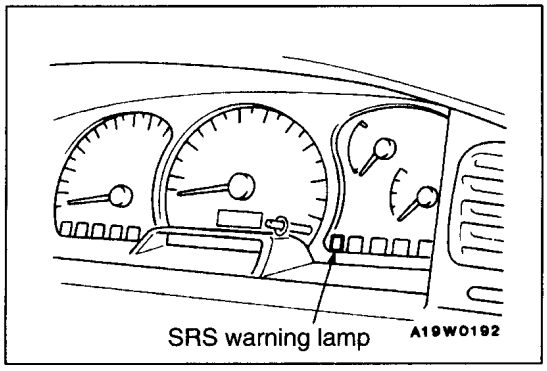
Caution
Be sure when installing the steering wheel, that the harness of the clock spring does not become caught or tangled.

(2) After clamping, turn the steering wheel all the way in both directions to confirm that steering is normal.



▶D◀ AIR BAG MODULE INSTALLATION

Install the air bag module, taking care that no wiring is caught by it.



▶E◀ POST-INSTALLATION INSPECTION

(1) After installing the clock spring, the steering wheel, the column covers and the air bag module, check steering wheel for noise, binds or difficult operation.
(2) Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the "SRS" warning lamp illuminate for about 7 seconds, and then remain extinguished for at least 45 seconds after turning OFF? If yes, SRS system is functioning properly. If no, consult page 52B-6.

AIR BAG MODULE DISPOSAL PROCEDURES

120002289

Before either disposing of a vehicle equipped with air bags, or prior to disposing of the air bag modules, be sure to first follow the procedures described below to deploy the air bags.

UNDEPLOYED AIR BAG MODULE DISPOSAL

Caution

1. **If the vehicle is to be scrapped, or otherwise disposed of, deploy the air bags inside the vehicle. If the vehicle will continue to be operated and only the air bag modules are to be disposed of, deploy the air bags outside the vehicle.**
2. **Since a large amount of smoke is produced when the air bags are deployed, select a well-ventilated site. Moreover, never attempt the test near a smoke sensor.**
3. **Since there is a loud noise when the air bags are deployed, avoid residential areas whenever possible. If anyone is nearby, give warning of the impending noise.**
4. **Suitable ear protection should be worn by personnel performing these procedures or by people in the immediate area.**

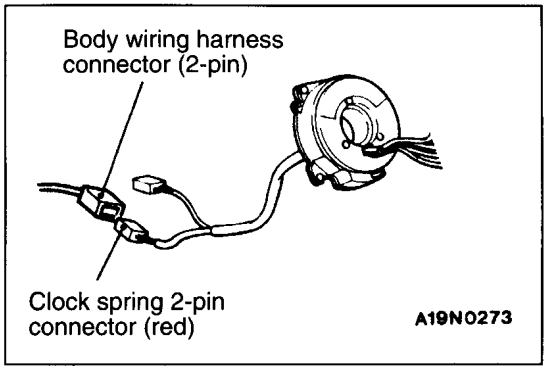
DEPLOYMENT INSIDE THE VEHICLE

(when disposing of a vehicle)

(1) Open all windows and doors of the vehicle. Move the vehicle to an isolated spot.

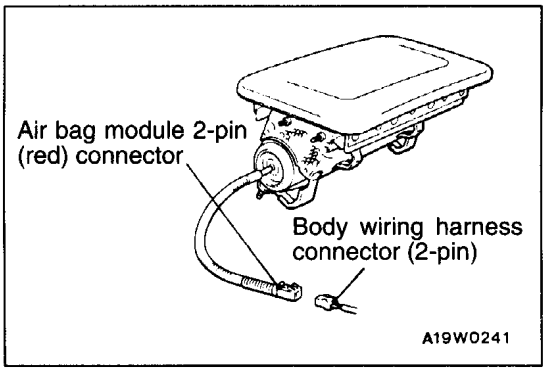
(2) Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

Caution
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-3, No.5.)

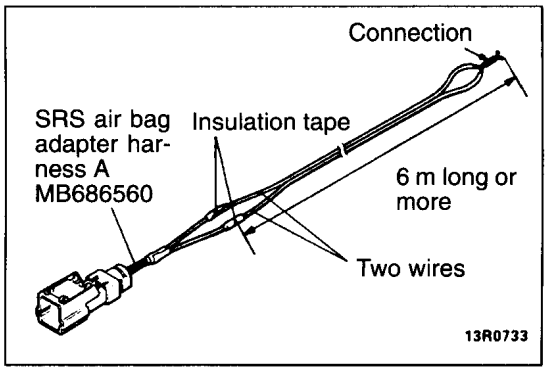


(3) To deploy the air bag module (driver's side)
a. Remove the steering column cover, lower.
b. Remove the connection between the clock spring 2-pin connector (red) and the body wiring harness connector.

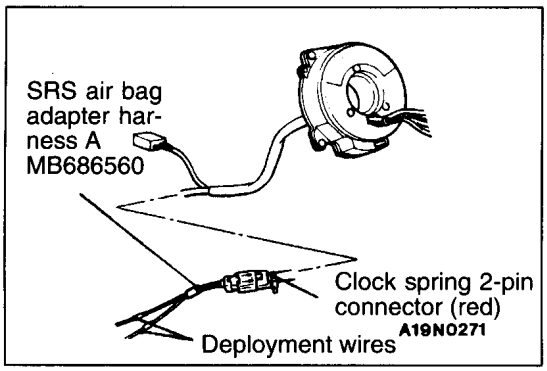
NOTE
If the clock spring connector is disconnected from the body wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.



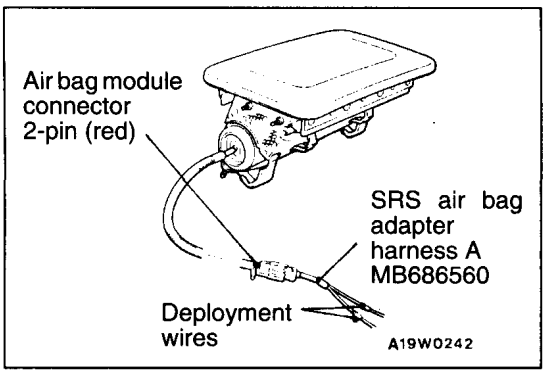
(4) To deploy the air bag module (front passenger's side):
1. Remove the glove box. (Refer to P.52B-38.)
2. Remove the connection between the air bag module (front passenger's side) connector (red 2-pin) and the body wiring harness connector.



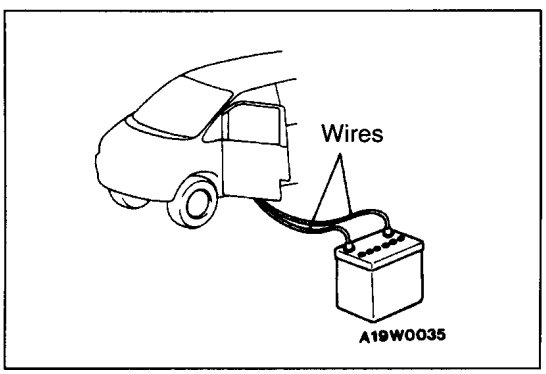
(5) Connect two wires, each six meters long or more, to the two leads of SRS air bag adapter harness A and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.



(6) Connect the clock spring 2-pin connector (red) to SRS air bag adapter harness A and pass the deployment wires out of the vehicle.



(7) To deploy the air bag module (front passenger's side): Connect the 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 vehicles.



(8) At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (removed from the vehicle) to deploy the air bag.

Caution

1. **Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle.**
2. **The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.**
3. **If the air bag module fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.**

(9) Dispose of the air bag module after deployment according to the Deployed Air Bag Module Disposal Procedures. (Refer to P.52B-48.)

DEPLOYMENT OUTSIDE THE VEHICLE

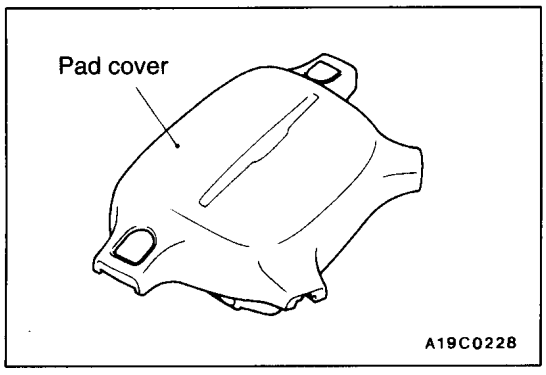
Caution

1. **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 down-wind from the battery.**

To deploy the air bag module (driver's side)

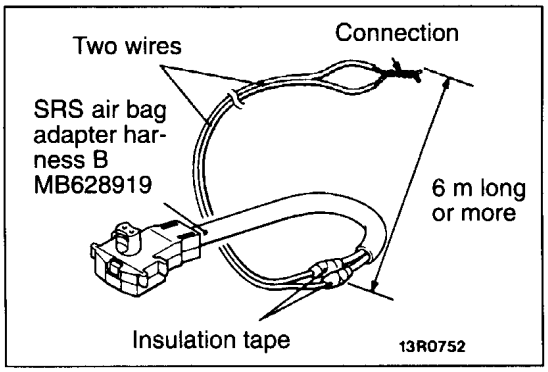
(1) Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

Caution
Wait at last 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-3, No.5.)

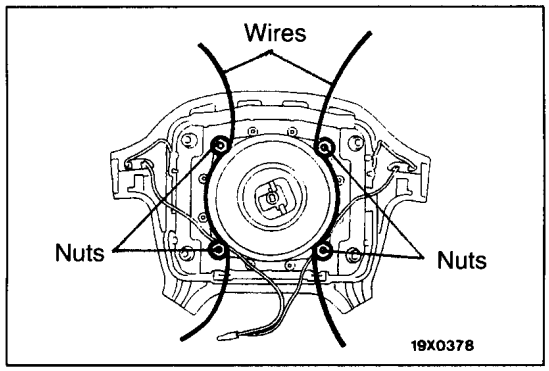


(2) Remove the air bag module from the vehicle. (Refer to P.52B-37.)

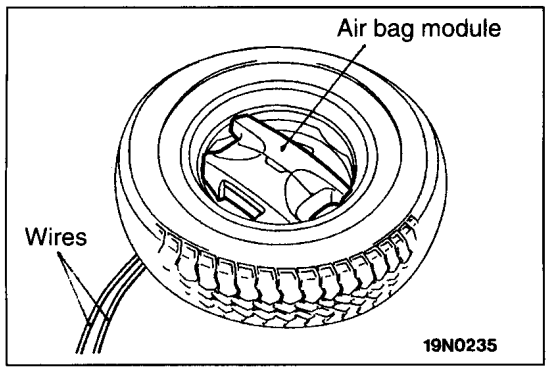
Caution
The air bag module should be stored on a flat surface and placed so that the pad cover face up. Do not place anything on top of it.



(3) Connect two wires, each six meters long or more, to the two leads of SRS air bag adapter harness B, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.

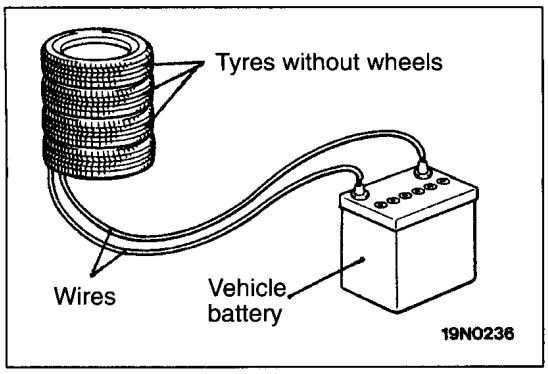


(4) Install nuts that are no longer needed to the four bolts on the rear side of the air bag module, and tie on some thick wire to secure to the wheel.
(5) Take the SRS air bag adaptor harness B that is connected to the wires, pass it beneath the tyre attached to a wheel, and connect it to the air bag module.



(6) Insert the air bag module into the wheel, and secure it with the wires that are tied to the bolts, with the air bag facing upward.

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.



(7) Place three old tyres with no wheels on top of the tyre secured to the air bag module.
(8) At a location as far away from the air bag module as possible, and from a shielded position, if possible, disconnect the two connected wires from each other and connect them to the terminals of the battery (removed from the vehicle) to deploy the air bag.

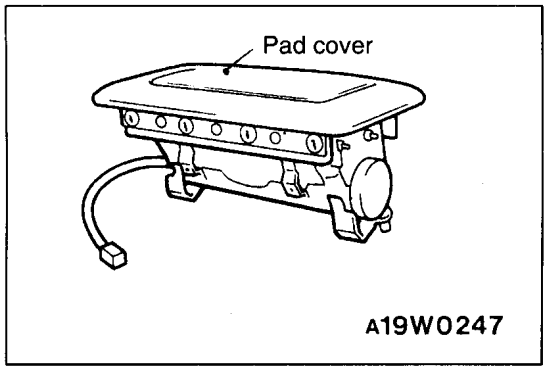
Caution
1. **Before deployment, check carefully to be sure that no one is nearby.**
2. **The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.**
3. **If the air bag module fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.**

(9) Dispose of the air bag module after deployment according to the Deployed Air Bag Module Disposal Procedures.

To deploy the air bag module (front passenger's side):

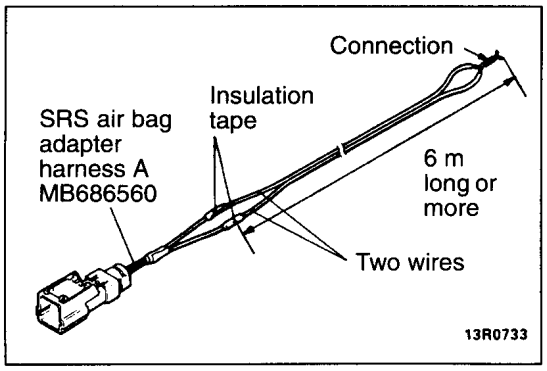
(1) Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

Caution
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-3, No. 5)

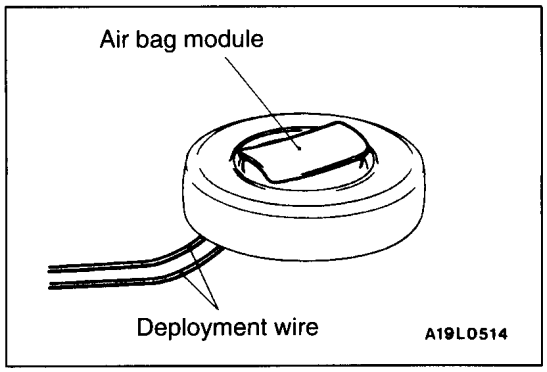


(2) Remove the air bag module for the vehicle. (Refer to P.52B-38.)

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.



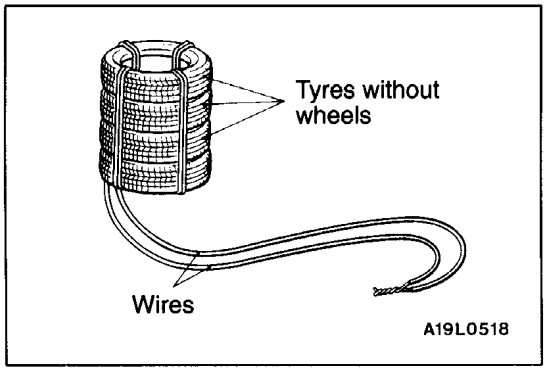
(3) Connect two wires, each six meters long or more, to the two leads of SRS air bag adapter harness A, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.



(4) Connect the 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.

(5) 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.**



(6) Place three old tyres with no wheels on top of the tyre secured to the air bag module, and secure all tyres with ropes (4 locations).

(7) At a location as far away from the air bag module as possible, and from a shielded position, if possible, disconnect the two connected wires from each other and connect them to the two terminals of the battery (removed from the vehicles) to deploy the air bag.

Caution

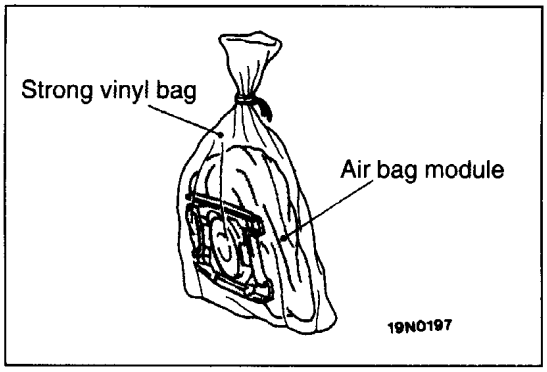
1. **Before deployment, check carefully to be sure that no one is nearby.**
2. **The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.**
   Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (as shown below) for post-deployment handling instructions.
3. **If the air bag module fails to deploy when the procedures above are followed, do not go near the module. Contact your local distributor.**

(8) Dispose of the air bag module after deployment according to the Deployed Air Bag Module Disposal Procedures.

DEPLOYED AIR BAG MODULE DISPOSAL PROCEDURES

After deployment, the air bag module should be disposed of in the same manner as any other scrap parts, 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 to cool before attempting to handle it.
(2) Do not put water or oil on the air bag after deployment.
(3) There may be, adhered to the deployed air bag module, material that could irritate the eyes and/or skin, so wear gloves and safety glasses when handing a deployed air bag module. IF DESPITE THESE PRECAUTIONS, THE MATERIAL DOES GET INTO THE EYES OR ON THE SKIN, IMMEDIATELY RINSE THE AFFECTED AREA WITH A LARGE AMOUNT OF CLEAN WATER.
IF ANY IRRITATION DEVELOPS, SEEK MEDICAL ATTENTION.



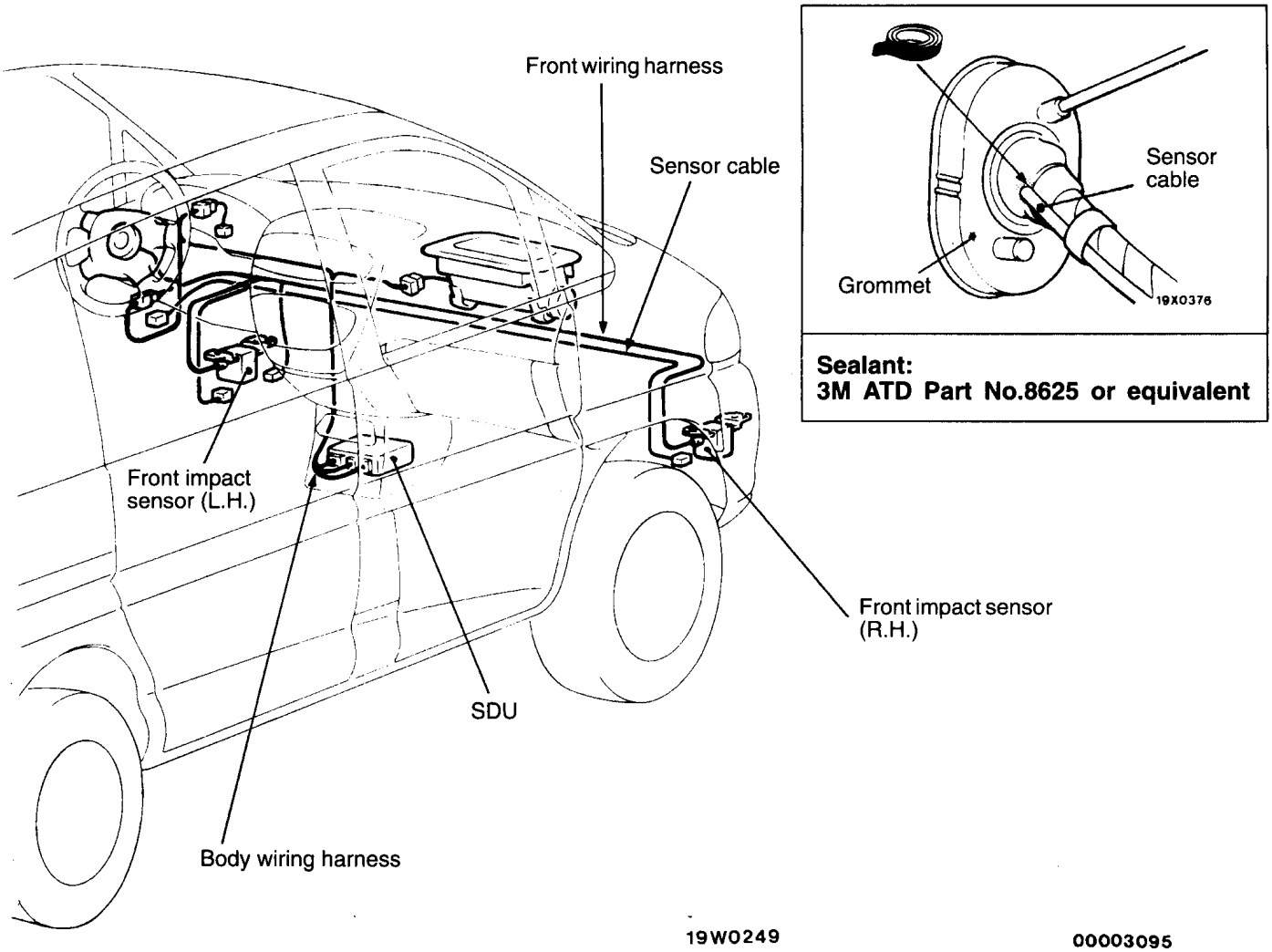
(4) Tightly seal the air bag module in a strong vinyl bag for disposal.
(5) Be sure to always wash your hands after completing this operation.

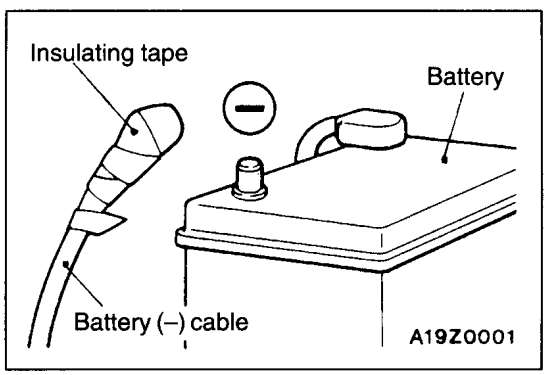
SENSOR CABLE INSTALLATION PROCEDURES

120002290

If there is a malfunction in the front wiring harness between the front impact sensor and body wiring harness, install the sensor cable. (Refer to P.52B-2.)

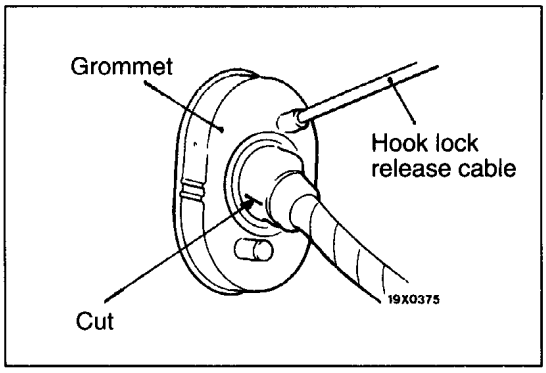
Pre-removal and Post-installation Operation
- Front Fender Panel Removal and Installation (Refer to GROUP 42 – Fender.)
- Front Bumper Removal and Installation (Refer to GROUP 51 – Bumper.)



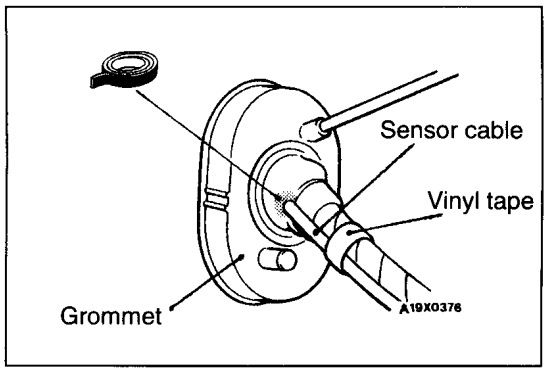


(1) Disconnect the negative battery cable and tape the terminal.

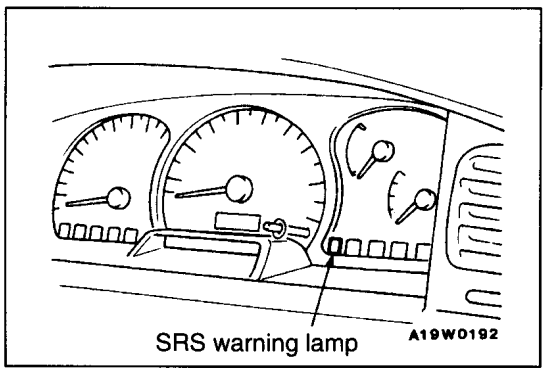
Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-3, No.5.)



(2) Make a cut in the grommet in the place shown in the illustration, and pass the sensor cable through the cut.



(3) Run the sensor cable along the front wiring harness, and then secure the cable to the harness with insulation tape.
(4) Apply the specified sealant to the grommet cut portion.



(5) Connect the sensor cable to the impact sensor and to the body wiring harness.

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 45 seconds after turning OFF?
(4) If yes, SRS system is functioning properly.
If no, consult page 52B-6.

CHASSIS ELECTRICAL

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120002078

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

WARNING!

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

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

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

NOTE

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

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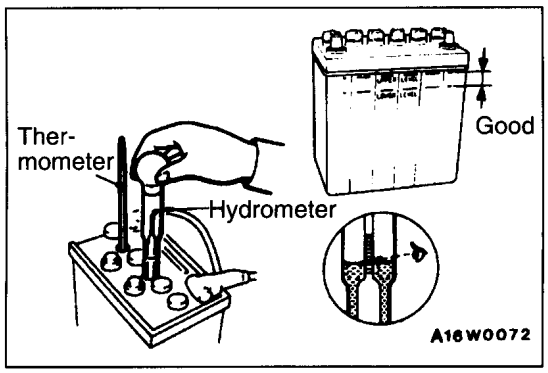
BATTERY

120000276

SERVICE SPECIFICATION

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



SERVICE ADJUSTMENT PROCEDURES

FLUID LEVEL AND SPECIFIC GRAVITY INSPECTION

120000277

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

VISUAL INSPECTION

120000278

Inspect after removing the battery.

Caution
If battery fluid has leaked from the battery, use rubber gloves to protect your hands when removing the battery.

1. If there is corrosion of the battery stays or battery brackets from the battery fluid, clean by washing in warm or cold water.
2. If there is a leak from a crack in the battery case, replace the battery.
3. Clean the battery terminals with a wire brush, and replace any parts that are damaged.

CHARGING

120000279

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.

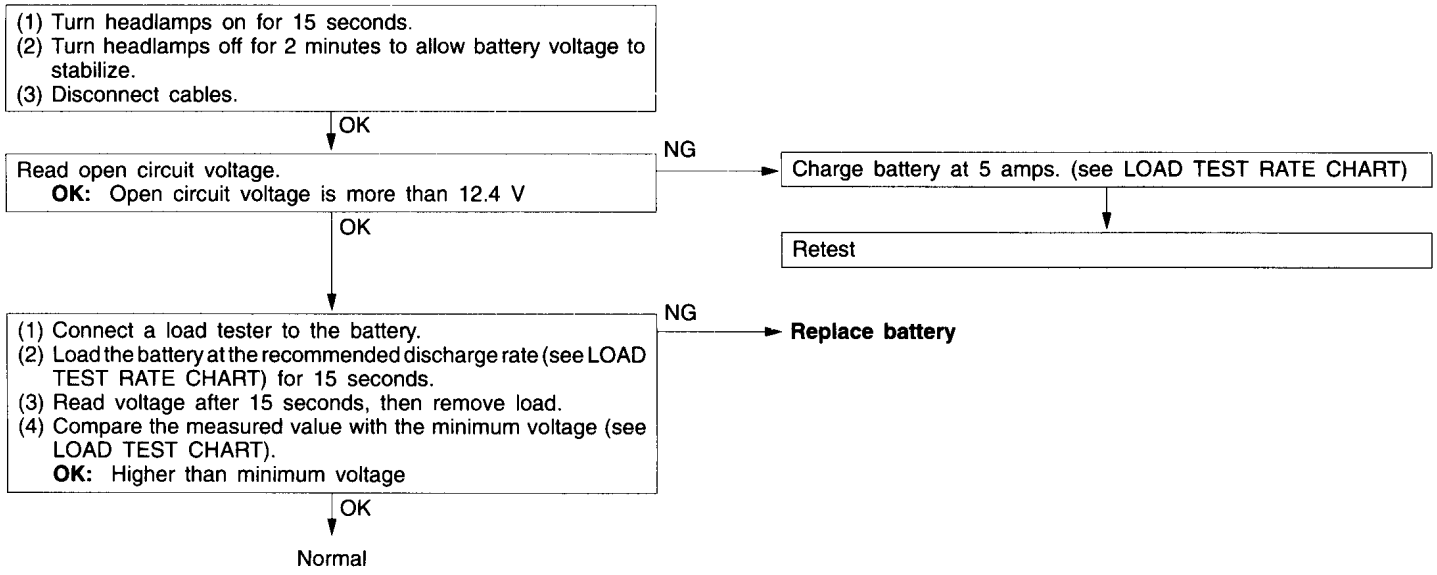
Caution

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

120002079

TEST STEP



LOAD TEST RATE CHART

Battery type	75D23R	65D23R	80D26R	95D31R
Charging time when fully discharged h [5-amp rated current charging]	11	11	12	14
Load test (Amps)	260	210	290	310

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

120002080

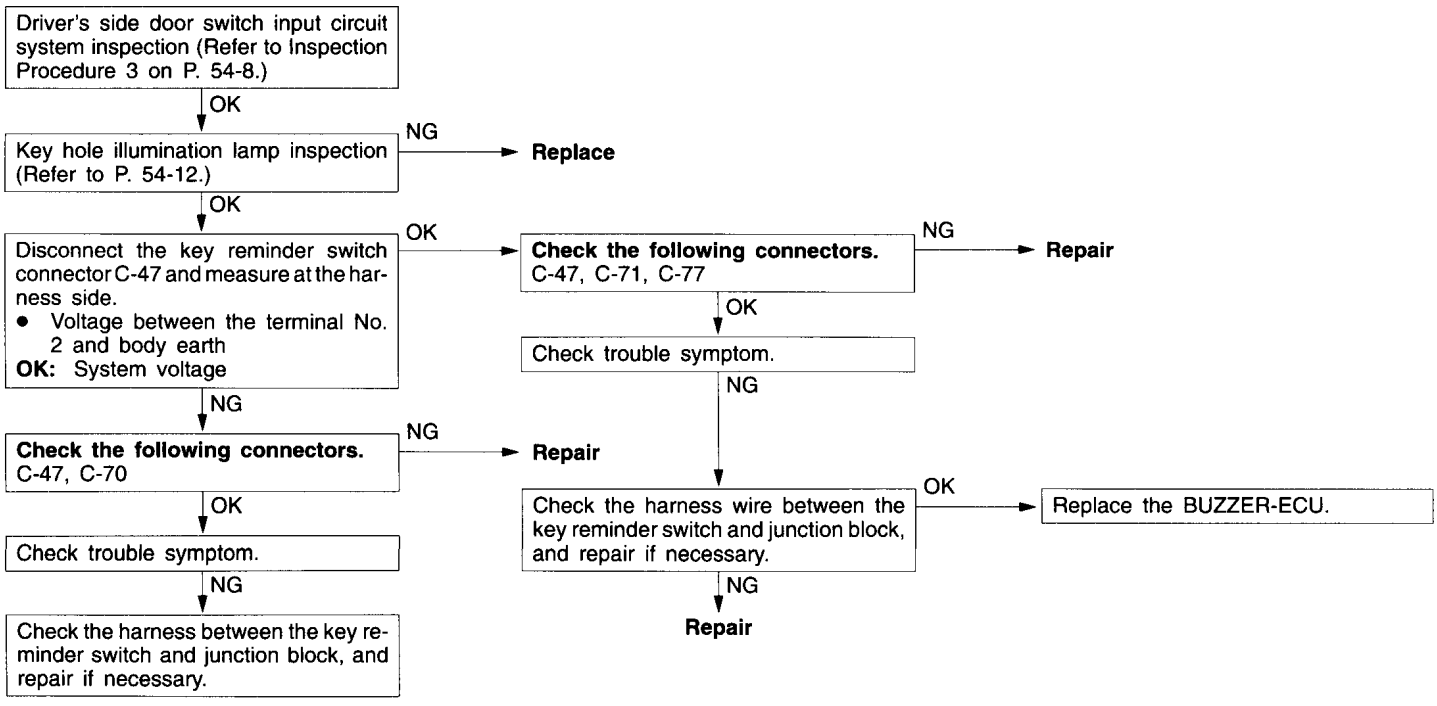
TROUBLESHOOTING

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Even if the driver's side door is opened, the key hole illumination lamp does not illuminate.	1	P. 54-7
The key hole illumination lamp remains illuminated.	2	P. 54-8

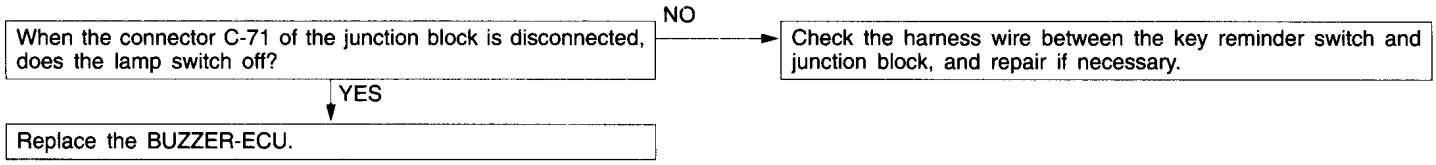
Inspection Procedure 1

Even if driver's side door is opened, key hole illumination lamp does not illuminate.	**Probable cause**
[Comment] The cause is probably a defective key hole illumination lamp circuit system or a defective driver's side door switch input circuit system.	• Malfunction of driver's side door switch • Malfunction of key hole illumination lamp • Malfunction of harness or connector • Malfunction of BUZZER-ECU



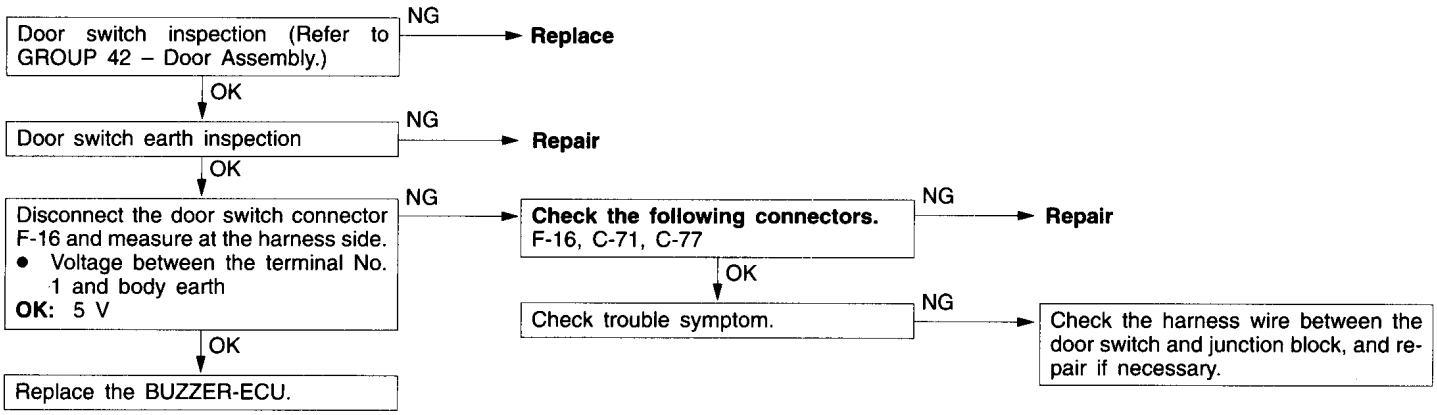
Inspection Procedure 2

Key hole illumination lamp remains illuminated.	Probable cause
[Comment] The cause is probably a harness short or a defective BUZZER-ECU.	• Malfunction of harness • Malfunction of BUZZER-ECU



Inspection Procedure 3

Driver's side door switch input circuit system inspection



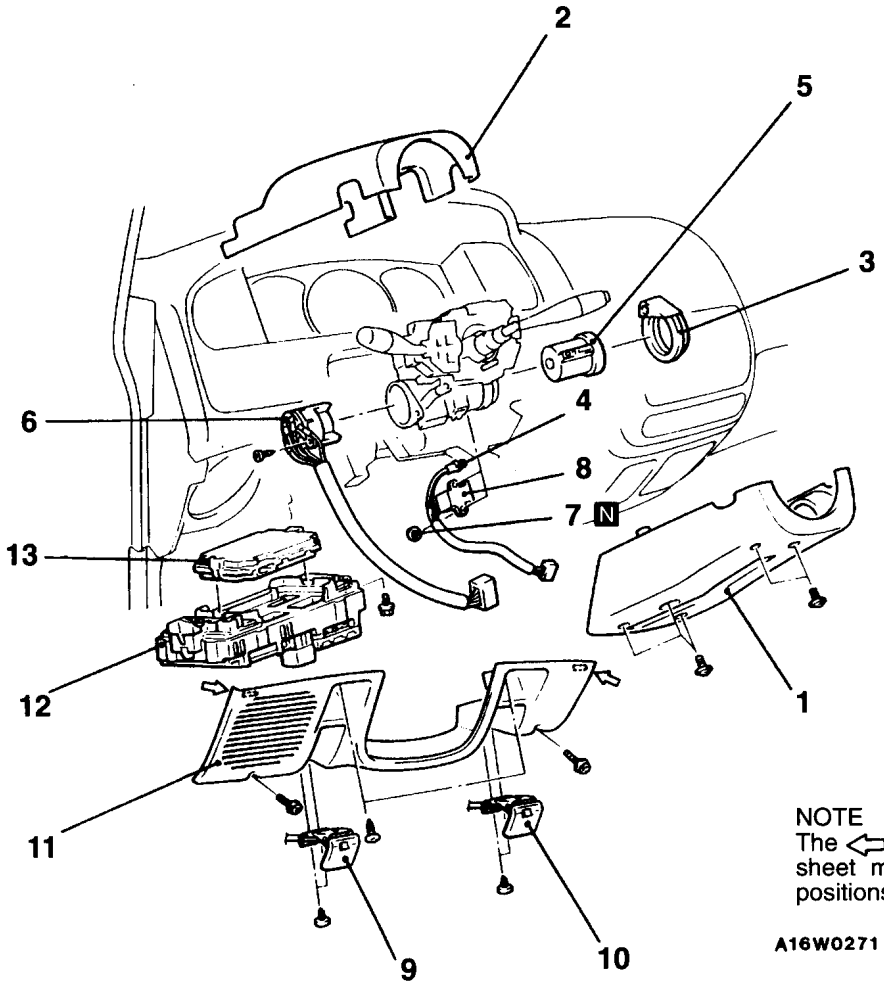
IGNITION SWITCH

120002081

REMOVAL AND INSTALLATION

<L.H. drive vehicles>

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



NOTE
The ⇦ marks indicate the sheet metal clip installation positions.

A16W0271

Steering lock cylinder removal steps
- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

1. Column cover, lower
2. Column cover, upper
◀A▶ 3. Ignition key cylinder illumination ring
◀B▶ 5. Steering lock cylinder

Key reminder switch or key hole illumination lamp removal steps
- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

1. Column cover, lower
2. Column cover, upper
◀A▶ 3. Ignition key cylinder illumination ring
4. Key hole illumination lamp
7. Push nut
8. Key reminder switch

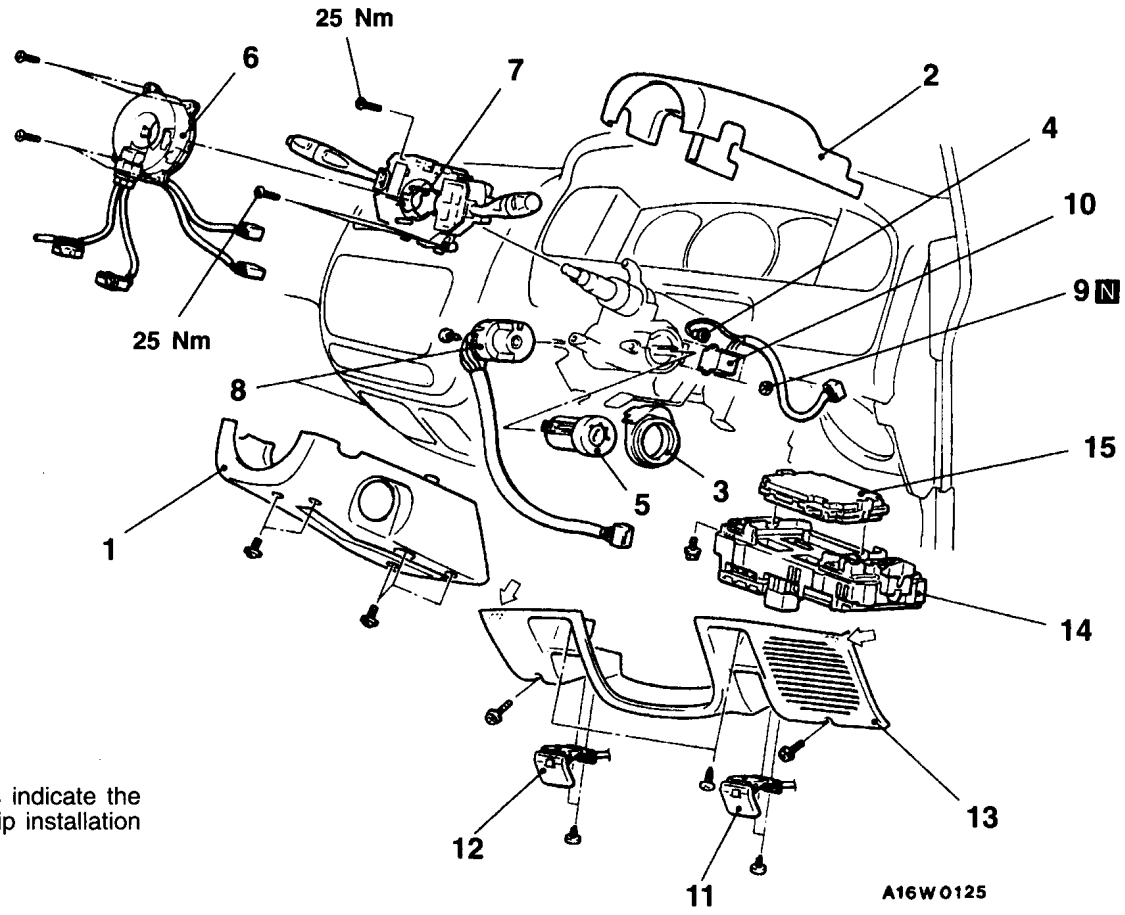
Ignition switch removal steps
- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

1. Column cover, lower
2. Column cover, upper
6. Ignition switch

BUZZER-ECU removal steps
9. Hood lock release handle
10. Fuel lid lock release handle
11. Under cover
12. Junction block
13. BUZZER-ECU

<R.H. drive vehicles>

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



NOTE
The ⇦ marks indicate the sheet metal clip installation positions.

Steering lock cylinder removal steps
- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

1. Column cover, lower
2. Column cover, upper
◀A▶ 3. Ignition key cylinder illumination ring
◀B▶ 5. Steering lock cylinder

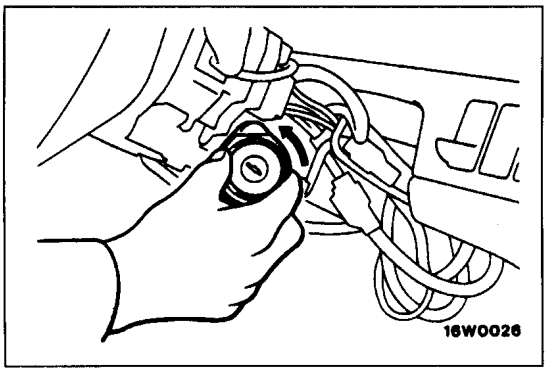
Key reminder switch or key hole illumination lamp removal steps
- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

1. Column cover, lower
2. Column cover, upper
◀A▶ 3. Ignition key cylinder illumination ring
4. Key hole illumination lamp
9. Push nut
10. Key reminder switch

Ignition switch removal steps
- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

1. Column cover, lower
2. Column cover, upper
6. Clock spring <Vehicles with SRS>
▶A◀ 7. Column switch
8. Ignition switch

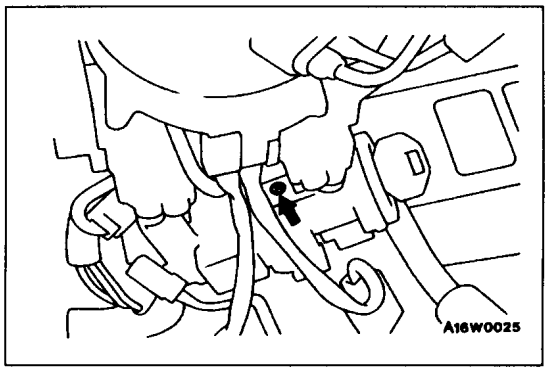
BUZZER-ECU removal steps
11. Hood lock release handle
12. Fuel lid lock release handle
13. Under cover
14. Junction block
15. BUZZER-ECU



REMOVAL SERVICE POINTS

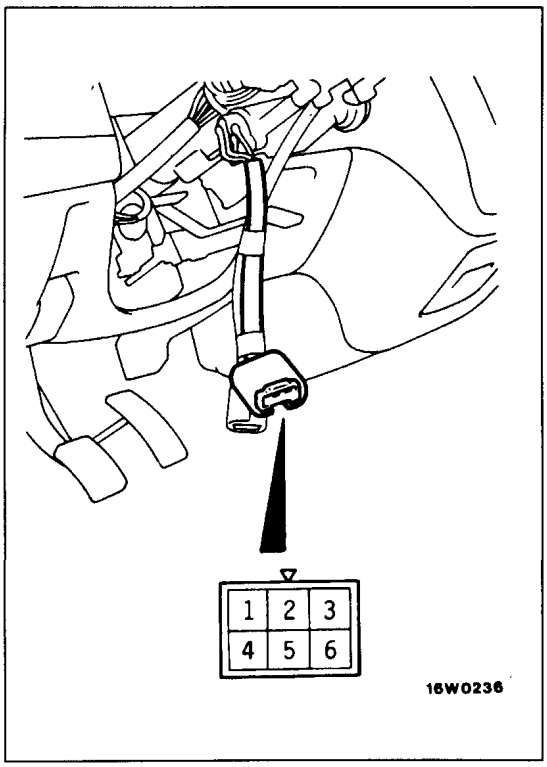
◀A▶ IGNITION KEY CYLINDER ILLUMINATION RING REMOVAL

Turn the ignition key cylinder illumination ring to the left and remove it.



◀B▶ STEERING LOCK CYLINDER REMOVAL

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

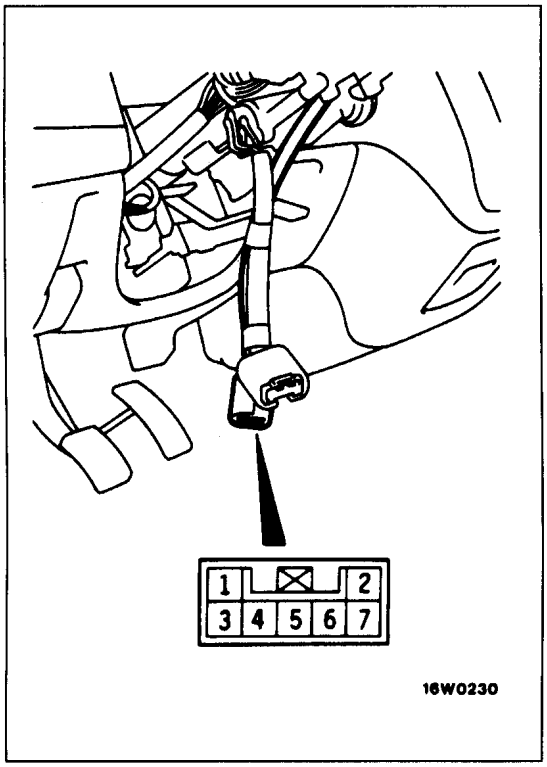


INSPECTION

IGNITION SWITCH CONTINUITY INSPECTION

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

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

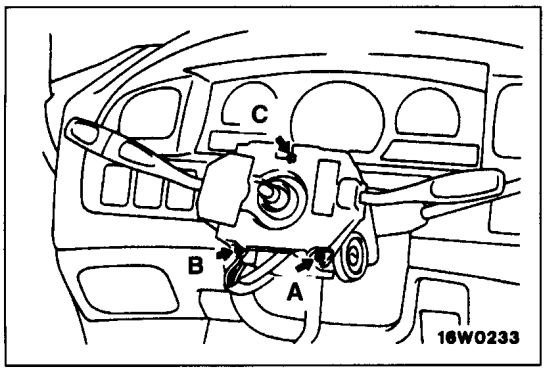


KEY REMINDER SWITCH CONTINUITY INSPECTION

(1) Remove the under cover.
(2) Remove the column cover lower and upper.
(3) Disconnect the wiring connector from the key reminder switch.
(4) Check the continuity between the terminals when the ignition key is pulled out of and inserted into the steering lock cylinder.

Ignition key	Terminal No.					
	1	2	3	4	6	7
Pulled out		*				
Inserted						

NOTE
*: indicates key hole illumination lamp continuity.



INSTALLATION SERVICE POINT

▶A◀ COLUMN SWITCH ASSEMBLY INSTALLATION

Tighten the column switch assembly mounting screws to the specified torque in the order of A, B, and C.

Tightening torque: 25 Nm

COMBINATION METERS

120000284

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		Petrol-powered vehicles	700	±117
			3,000	+150
			5,000	+250
			6,000	+300
		Diesel-powered vehicles	1,000	+100
			3,000	+150
			4,750	+160
Fuel gauge unit resistance Ω			Float point F	3±0.6
			Float point E	110±2.5
Fuel gauge unit float height mm			A (Float point F)	254.9
			B (Float point E)	209.6
Fuel gauge resistance Ω	Vehicles without tachometer	Power supply and earth		105–120
		Power supply and fuel gauge		50–60
		Fuel gauge and earth		160–175
	Vehicles with tachometer	Power supply and earth		230–271
		Power supply and fuel gauge		94–107
		Fuel gauge and earth		135–165
Engine coolant temperature gauge resistance Ω	Vehicles without tachometer	Power supply and engine coolant temperature gauge		50–60
	Vehicles with tachometer	Power supply and earth		192–233
		Power supply and engine coolant temperature gauge		53–59
		Engine coolant temperature gauge and earth		245–292
Engine coolant temperature gauge unit resistance (at 70°C) Ω				104±13.5

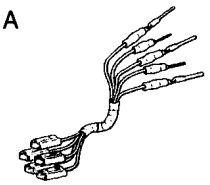
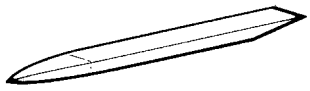
SEALANT

120000285

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

SPECIAL TOOLS

120000286

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 • Engine coolant temperature gauge simple inspection <Diesel-powered vehicles> A: Connector pin contact pressure inspection B, C: Power circuit inspection D: Commercial tester connection
	MB990784	Ornament remover	Removal of meter hood

TROUBLESHOOTING

120002093

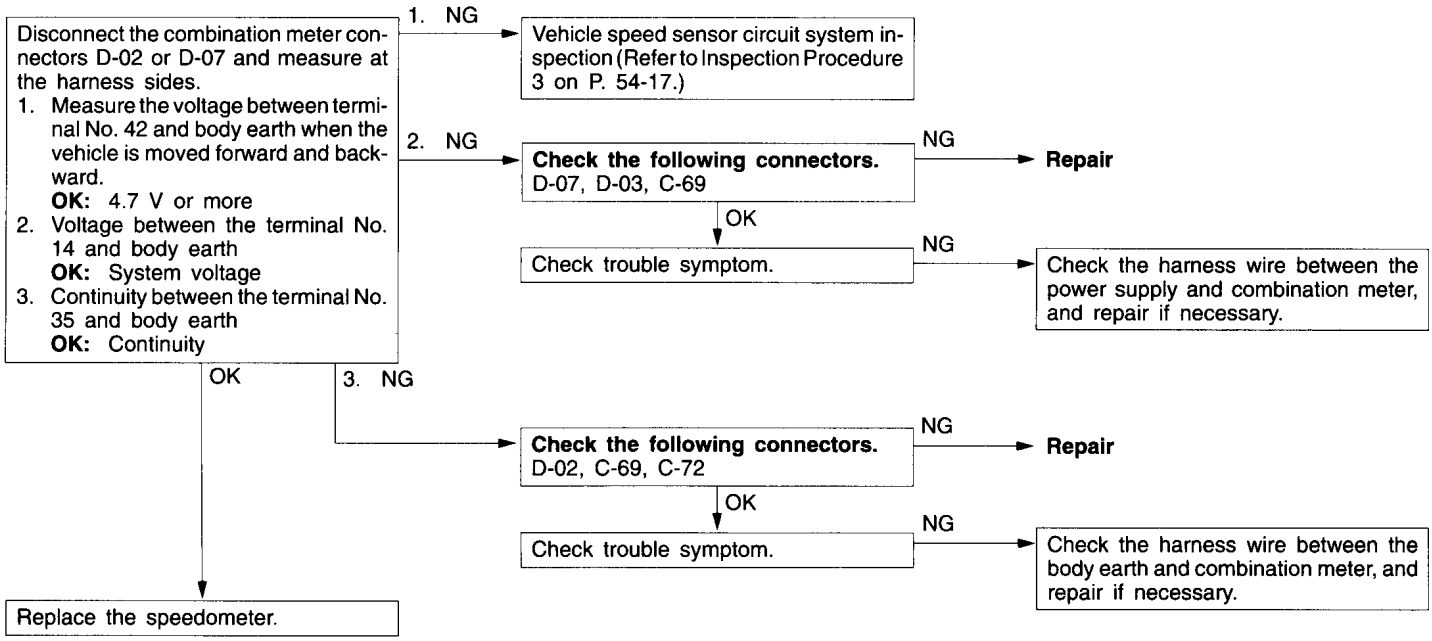
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Speedometer does not operate.	1	P. 54-15
Tachometer does not operate.	2	P. 54-16

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

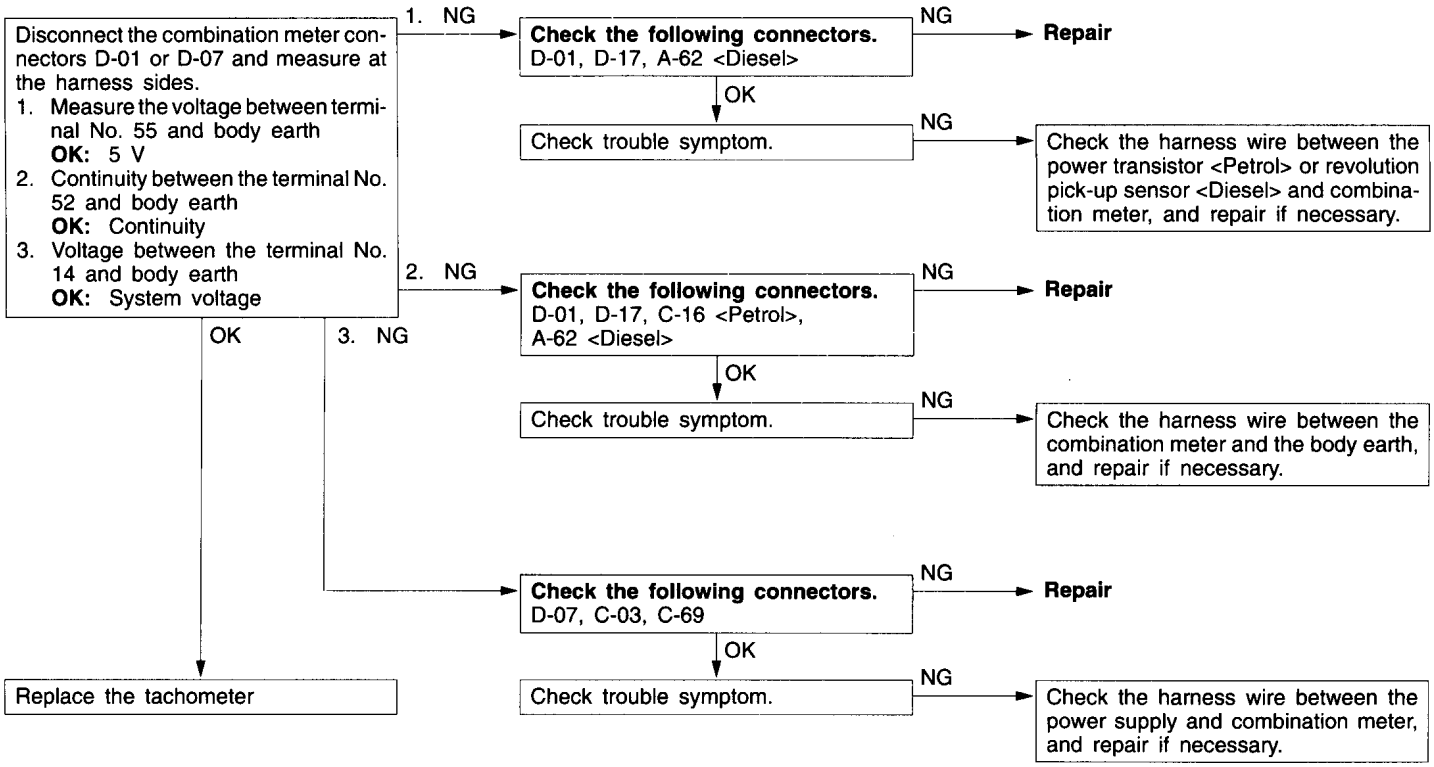
Inspection Procedure 1

Speedometer does not operate.	Probable cause
[Comment] The cause is probably 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



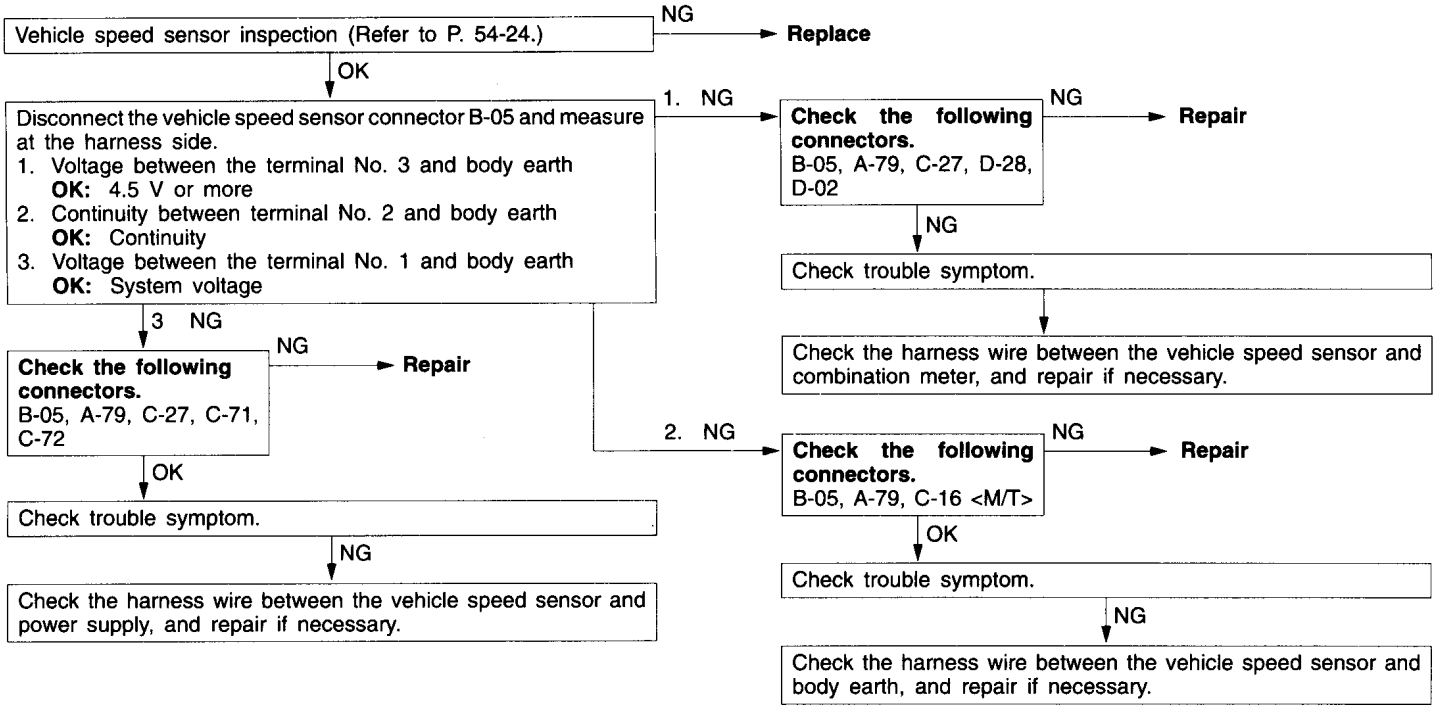
Inspection Procedure 2

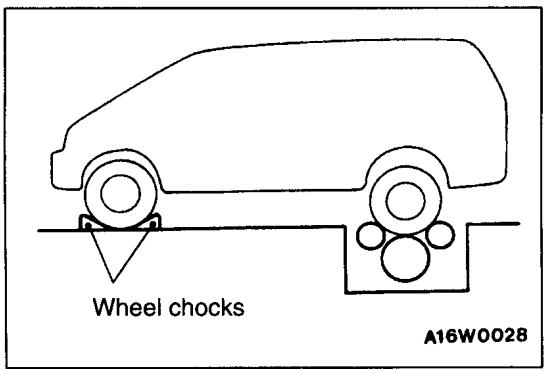
Tachometer does not operate.	Probable cause
[Comment] The ignition signal may not be input from the engine, or there may be a malfunction in the power supply or earth circuit.	• Malfunction of tachometer • Malfunction of harness or connector



Inspection Procedure 3

Vehicle speed sensor circuit system inspection





SERVICE ADJUSTMENT PROCEDURES

120000288

SPEEDOMETER INSPECTION

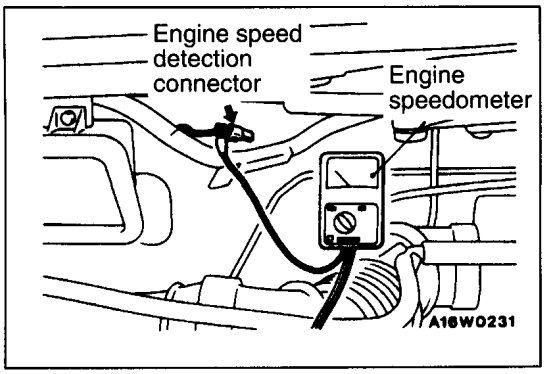
1. Adjust the pressure of the tyres to the specified level. (Refer to GROUP 31 – Service Specifications.)
2. Set the vehicle onto a speedometer tester and use wheel chocks to hold the front wheels.

   Caution
   Place the transfer shift lever in the 2H position. <4WD>
3. Check if the speedometer indicator range is within the standard values.

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

   Standard values:

Standard indication km/h (mph)	Allowable range km/h (mph)
40 (20)	40–48 (20–25)
80 (40)	80–92 (40–47)
120 (60)	120–136 (60–69)
160 (80)	160–180 (80–91)
– (100)	– (100–114)



TACHOMETER INSPECTION

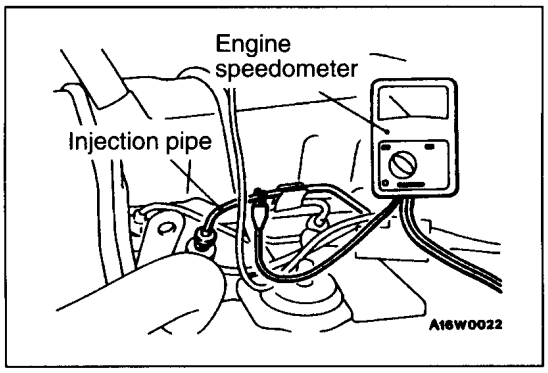
120000289

<Petrol-powered vehicles>

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach the engine speedometer.

   NOTE
   For tachometer inspection, use of a fluxmeter-type engine speedometer is recommended. (Because a fluxmeter only needs to be clipped to the high tension cable.)
2. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variations are within the standard values.

   Standard values:
   1,000 r/min. : ±117 r/min.
   3,000 r/min. : ±150 r/min.
   5,000 r/min. : ±250 r/min.
   6,000 r/min. : ±300 r/min.



<Diesel-powered vehicles>

1. Connect the engine speedometer to the injection pipe.
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:
1,000 r/min. : ±100 r/min.
3,000 r/min. : ±150 r/min.
4,750 r/min. : ±160 r/min.

FUEL GAUGE SIMPLE INSPECTION

120000290

Remove the fuel gauge unit connector. (Refer to Fig. 1.)

↓

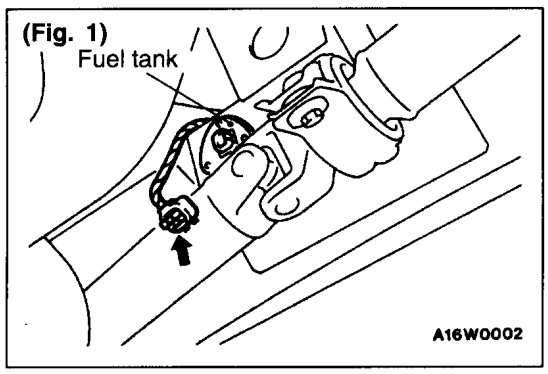
Use the special tool to connect a test lamp (12 V – 3.4 W) to the harness connector. (Refer to Fig. 2.)

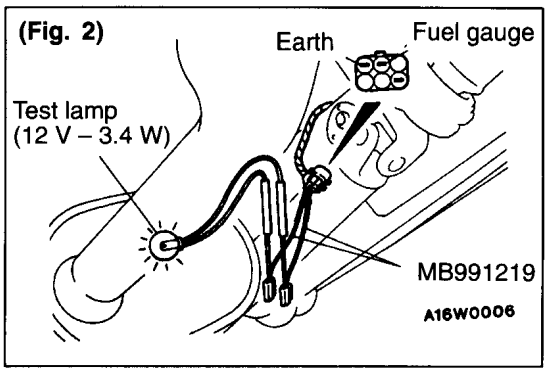
↓

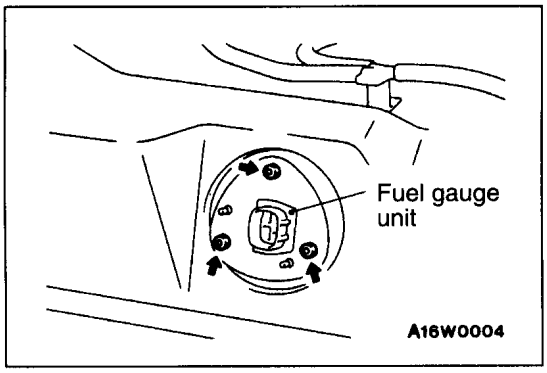
When the ignition switch is turned to ON, the test lamp illuminates. —OK→ The needle of the fuel gauge moves. —OK→ Replace the fuel gauge unit.

When the ignition switch is turned to ON, the test lamp illuminates. —NG→ Repair the harness

The needle of the fuel gauge moves. —NG→ Replace the fuel gauge.

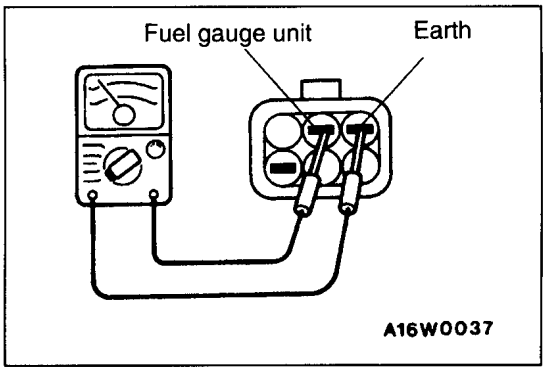






FUEL GAUGE UNIT INSPECTION 120000291

Remove the fuel gauge unit from the fuel tank.

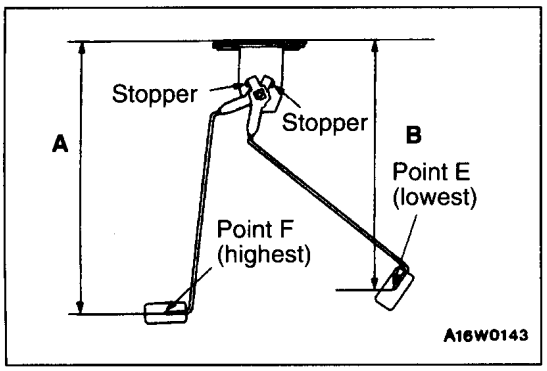


FUEL GAUGE UNIT RESISTANCE

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: 3±0.6 Ω
   Point E: 110±2.5 Ω

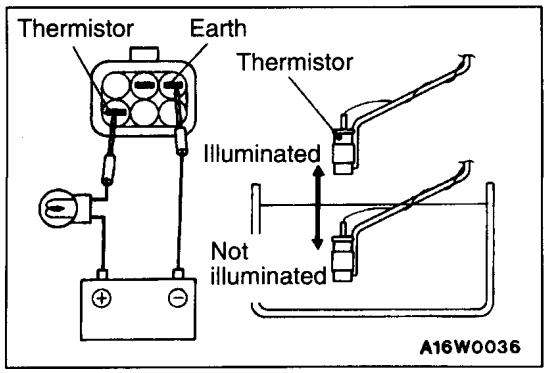
2. Check that resistance value changes smoothly when float moves slowly between point F (highest) and point E (lowest).



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: 254.9 mm
B: 209.6 mm



THERMISTOR

1. Connect fuel gauge unit (thermistor) to battery via test lamp (12 V – 3.4W). Immerse in water.
2. Condition is good if lamp goes off when the thermistor or level switch is immersed in water and goes on when it is took out of water.

Caution
After completing this test, wipe the unit, dry and install it in the fuel tank.

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE INSPECTION

120002082

Remove the engine coolant gauge unit connector.

↓

Connect a test lamp (12 V – 3.4 W) between the harness side connector and the earth.
NOTE
Check the Diesel-powered vehicles <4D56> using a special tool. (Refer to the illustration below.)

↓

When the ignition switch is turned to ON, the test lamp illuminates.

OK → The needle of the engine coolant temperature gauge moves.

NG → Replace the engine coolant temperature gauge.

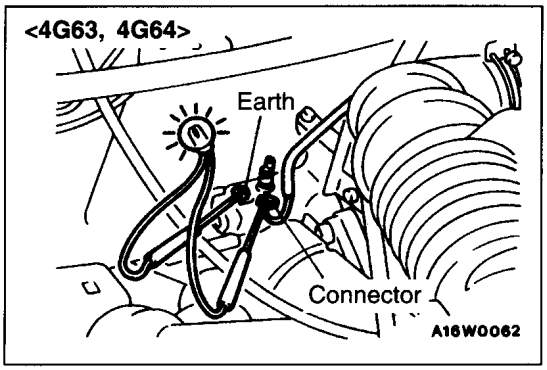
NG ↓

Repair the harness.

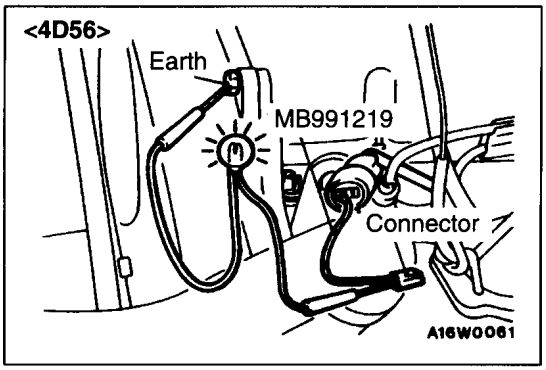
OK ↓

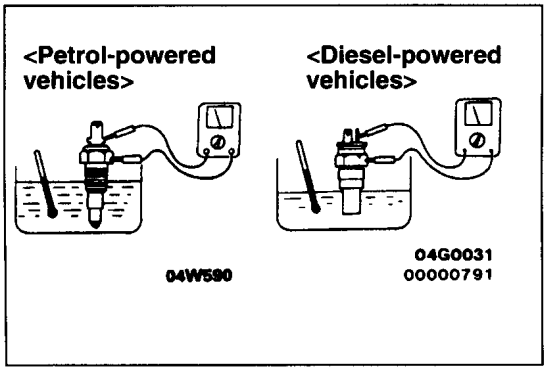
Replace the engine coolant temperature gauge unit.

<4G63, 4G64>



<4D56>



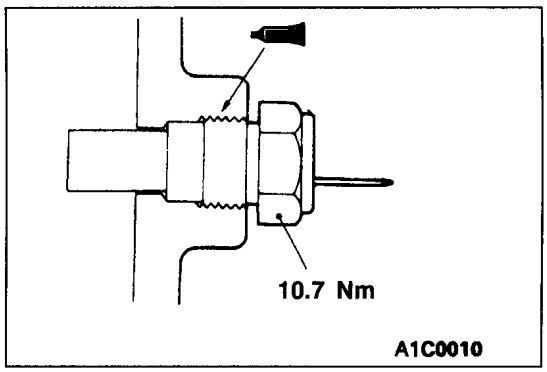


ENGINE COOLANT TEMPERATURE GAUGE UNIT INSPECTION

120000293

1. Bleed the engine coolant. (Refer to GROUP 14 – Service Adjustment Procedures.)
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.

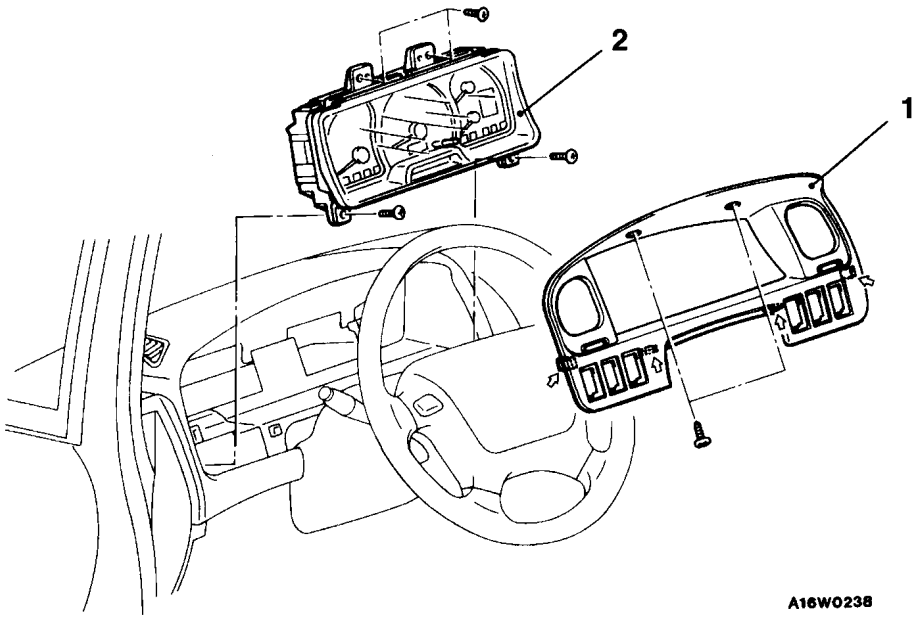
   Specified sealant: 3M Adhesive Nut Locking No. 4171 or equivalent

5. Add engine coolant. (Refer to GROUP 14 – Service Adjustment Procedures.)

COMBINATION METERS

120000294

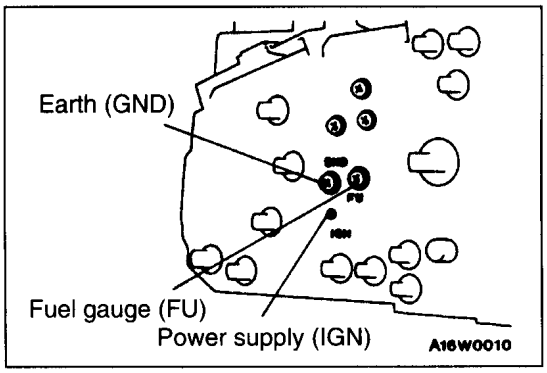
REMOVAL AND INSTALLATION



NOTE
The ⇦ marks indicate the sheet metal clip installation positions.

Removal steps

1. Meter hood
2. Combination meter



INSPECTION

FUEL GAUGE RESISTANCE

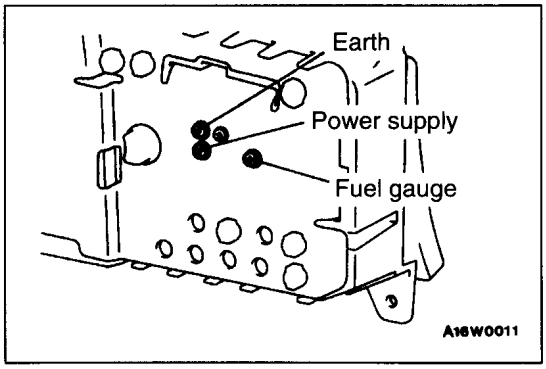
<Vehicles with Tachometer>

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

NOTE
The terminal positions are indicated by FU, GND and IGN.

Standard value:
Power supply (IGN)–Earth (GND): 230–271 Ω
Power supply (IGN)–Fuel gauge: 94–107 Ω
Fuel gauge (FU)–Earth (GND): 135–165 Ω

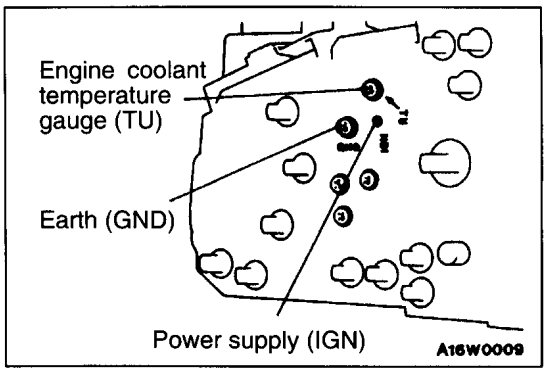
Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.



<Vehicles without Tachometer>

Use a circuit tester to measure the resistance value between the terminals.

Standard value:
Power supply–Earth: 105–120 Ω
Power supply–Fuel gauge: 50–60 Ω
Fuel gauge–Earth: 160–175 Ω



ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE

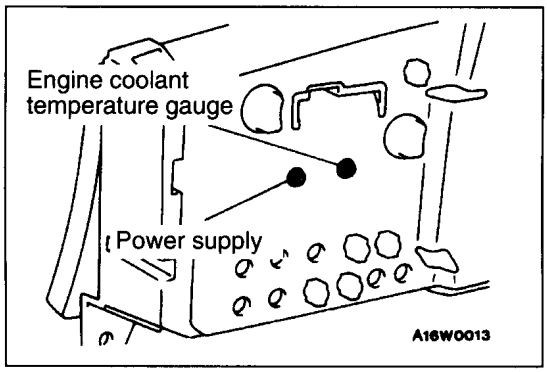
<Vehicles with Tachometer>

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

NOTE
The terminal positions are indicated by FU, GND and IGN.

Standard value:
Power supply (IGN)–Earth: 192–233 Ω
Power supply (IGN)–Engine coolant temperature gauge (TU): 53–59 Ω
Engine coolant temperature gauge (TU)–Earth (GND): 245–292 Ω

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

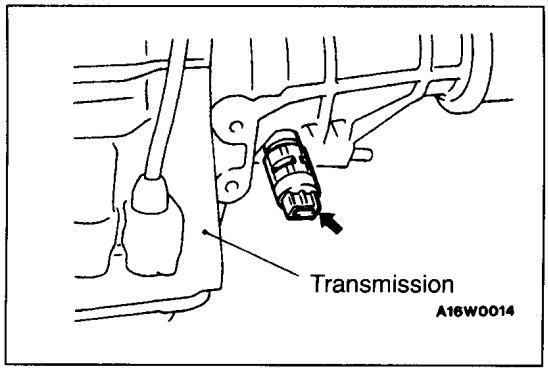


<Vehicles without Tachometer>

Use a circuit tester to measure the resistance value between the terminals.

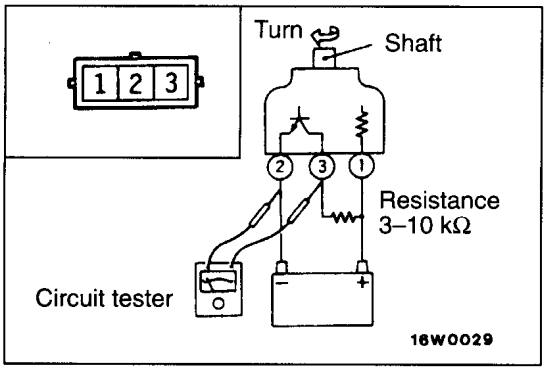
Standard value:

Power supply–Engine coolant temperature gauge: 50–60 Ω



VEHICLE SPEED SENSOR

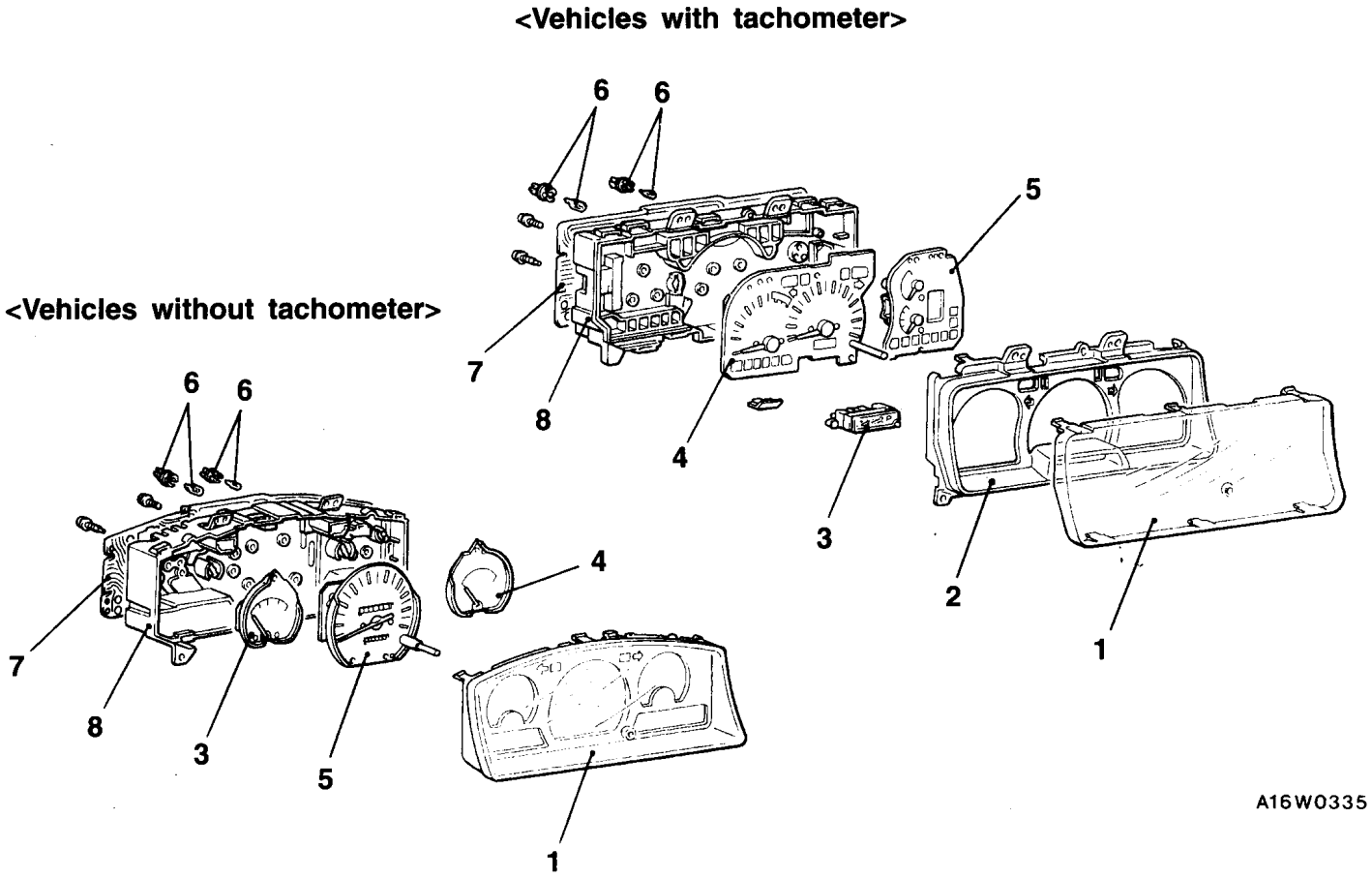
1. Remove the vehicle speed sensor.



2. Connect a 3–10 kΩ resistance as shown in the illustration.
3. Turn the shaft of the vehicle speed sensor and check to be sure that there is voltage between terminals 2–3. (1 turn=4 pulses)

DISASSEMBLY AND REASSEMBLY

120002123



Disassembly steps

<Vehicles without tachometer>

1. Meter glass, window plate
3. Fuel gauge
4. Engine coolant temperature gauge
5. Speedometer
6. Bulb, socket
7. Printed-circuit board
8. Meter case

<Vehicles with tachometer>

1. Meter glass
2. Window plate
3. Automatic transmission indication lamp assembly
4. Speedometer, tachometer
5. Engine coolant temperature gauge, Fuel gauge
6. Bulb, socket
7. Printed-circuit board
8. Meter case

MULTI-METER

120002094

TROUBLESHOOTING

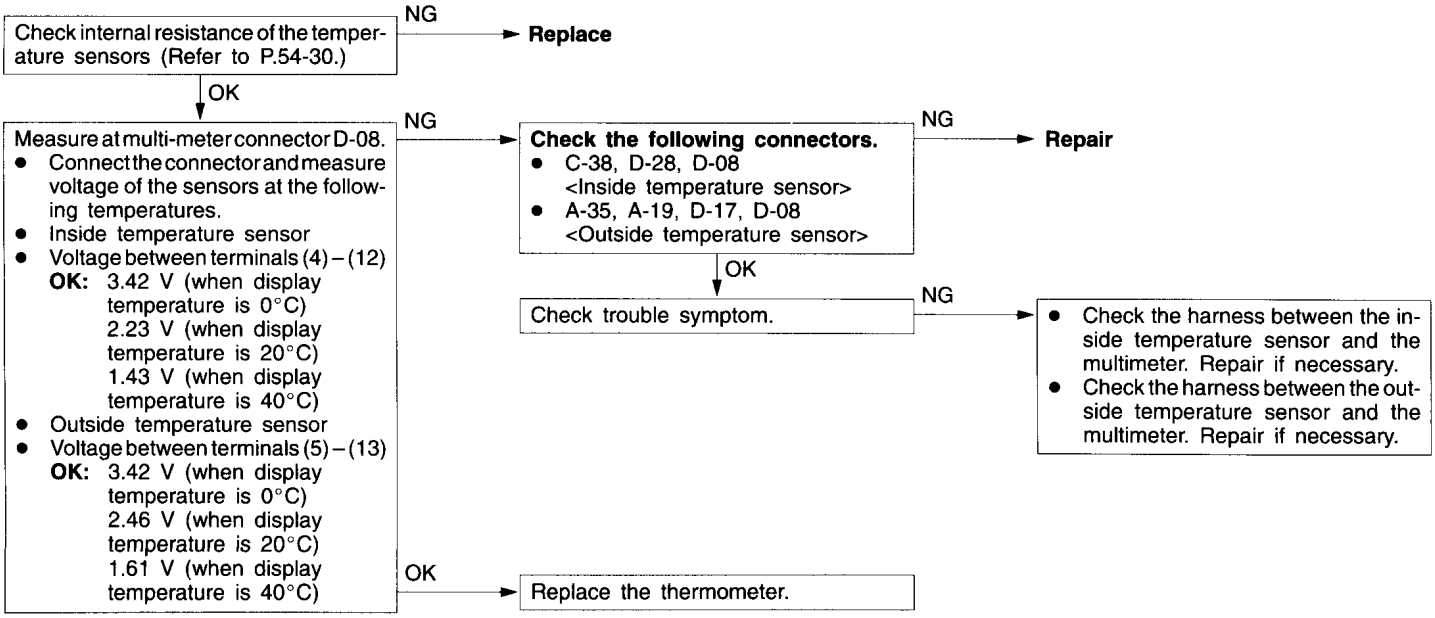
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Actual inside temperature or outside temperature is different from those on the temperature gauge.	1	P. 54-26
One or both of the inside temperature or outside temperature is not displayed.	2	P. 54-27

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

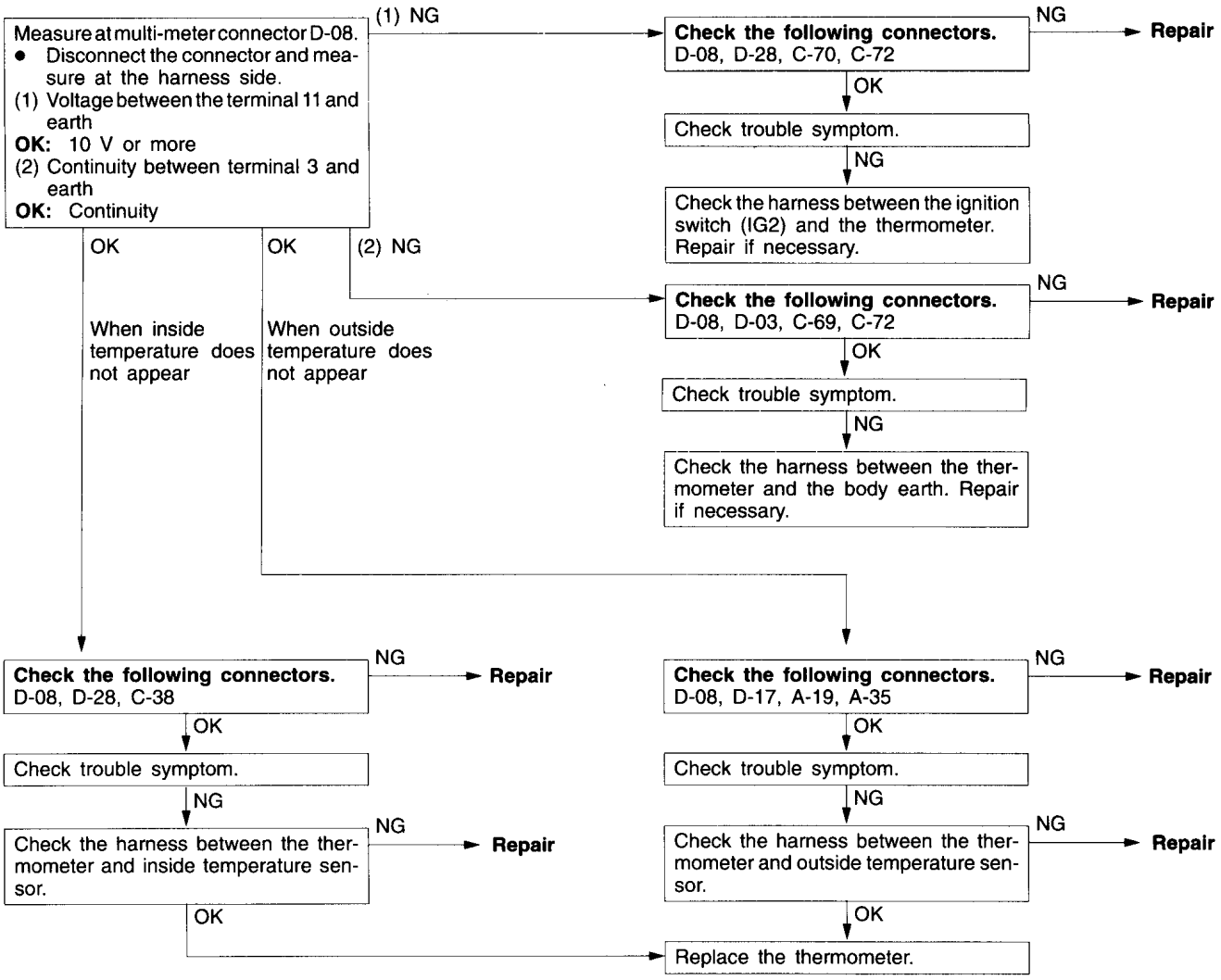
Inspection Procedure 1

Actual inside temperature or outside temperature is different from those on the temperature gauge.	**Probable cause**
[Comment] The defective internal resistance of the temperature sensors or thermometer may be present.	• Malfunction of inside temperature sensor • Malfunction of outside temperature sensor • Malfunction of harness or connector • Malfunction of thermometer



Inspection Procedure 2

One or both of the inside temperature or outside temperature is not displayed.	Probable cause
[Comment] A harness or connector, or the thermometer may be defective.	• Malfunction of harness or connector • Malfunction of thermometer



SERVICE ADJUSTMENT PROCEDURE

120000296

VOLTMETER SIMPLE INSPECTION

Start the engine and run it at idle.

↓

Connect a voltmeter to the battery. (Refer to the illustration below.)

↓

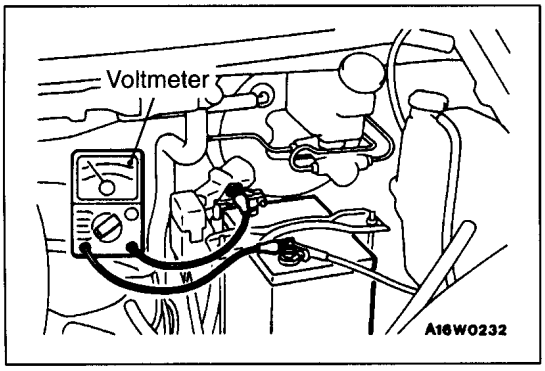
The voltmeter needle of the multi-meter swings.

OK → The values indicated by the voltmeter needle and the needle of the multi-meter voltmeter are almost identical.

NG → Replace the voltmeter of the multi-meter.

NG ↓ Repair the harness or replace the voltmeter of the multi-meter.

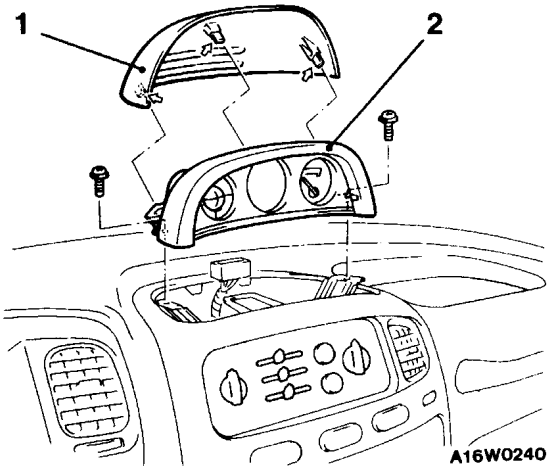
OK ↓ **Normal**



MULTI-METER

120000297

REMOVAL AND INSTALLATION



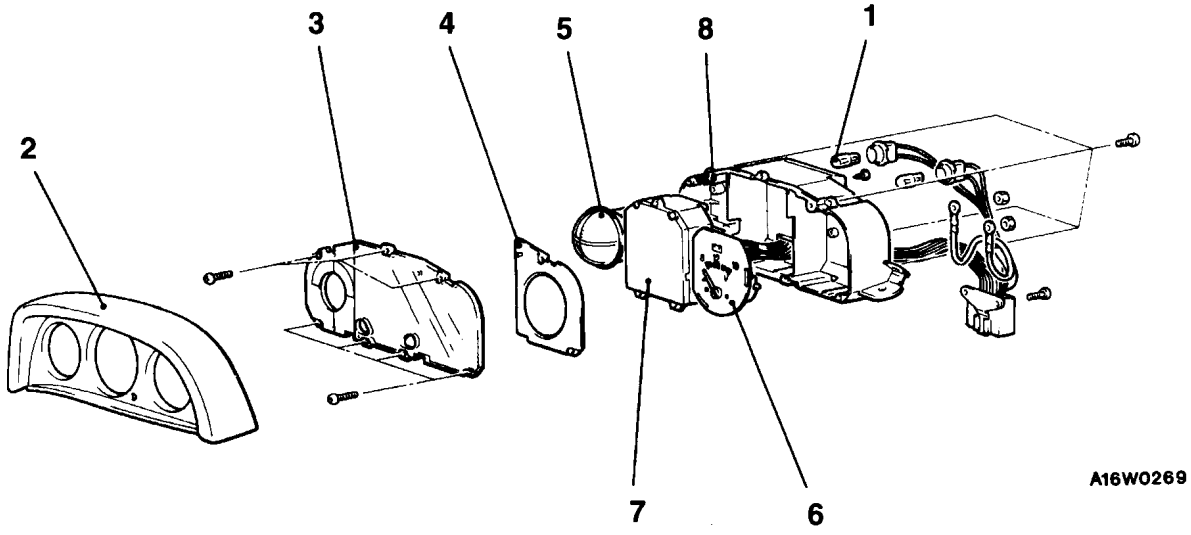
NOTE
The ⇦ marks indicate the sheet metal clip installation positions.

Removal steps

1. Multi-meter panel
2. Multi-meter

DISASSEMBLY AND REASSEMBLY

120002119



Disassembly steps

1. Bulb
2. Meter garnish
3. Meter glass
4. Window plate
5. Inclinometer
6. Voltmeter
7. Thermometer
8. Meter case

OUTSIDE TEMPERATURE SENSOR, INSIDE TEMPERATURE SENSOR

120000298

SERVICE SPECIFICATIONS

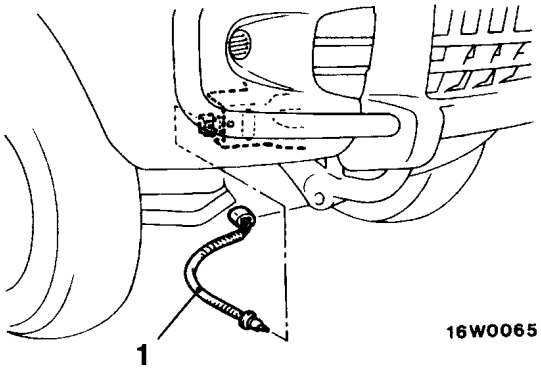
Item		Standard value
Internal resistance of inside temperature sensor and outside temperature sensor Ω	At 20°C	Approx. 1,200
	At 40°C	Approx. 500

OUTSIDE TEMPERATURE SENSOR, INSIDE TEMPERATURE SENSOR

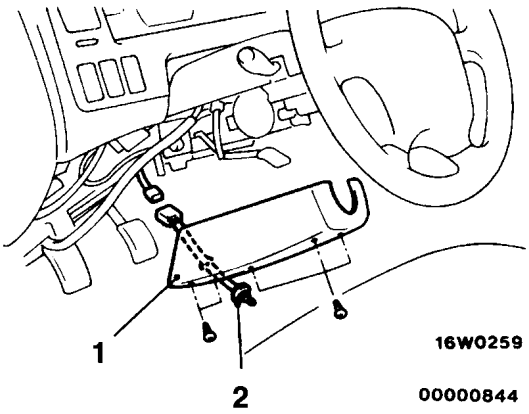
120000299

REMOVAL AND INSTALLATION

<Outside temperature sensor>



<Inside temperature sensor>



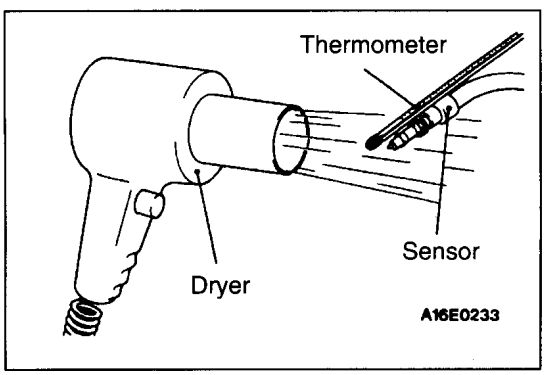
Outside temperature sensor removal steps

- Under cover side panel (R.H.) (Refer to GROUP 42 – Under Cover.)

1. Outside temperature sensor

Inside temperature sensor removal steps

1. Column cover, lower
2. Inside temperature sensor



INSPECTION

INSIDE TEMPERATURE SENSOR AND OUTSIDE TEMPERATURE SENSOR INTERNAL RESISTANCE INSPECTION

Check that the internal resistances of the inside temperature sensor and outside temperature sensor are at the standard values at temperatures of 20°C and 40°C.

Standard value: Approx. 1,200 Ω (At 20°C)
Approx. 500 Ω (At 40°C)

HEADLAMP

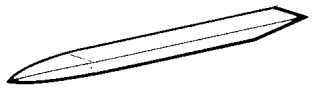
120002247

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
Resistor resistance Ω <R.H. drive vehicles>		Approx. 1	–

SPECIAL TOOL

120002084

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of headlamp leveling switch

TROUBLESHOOTING

120002085

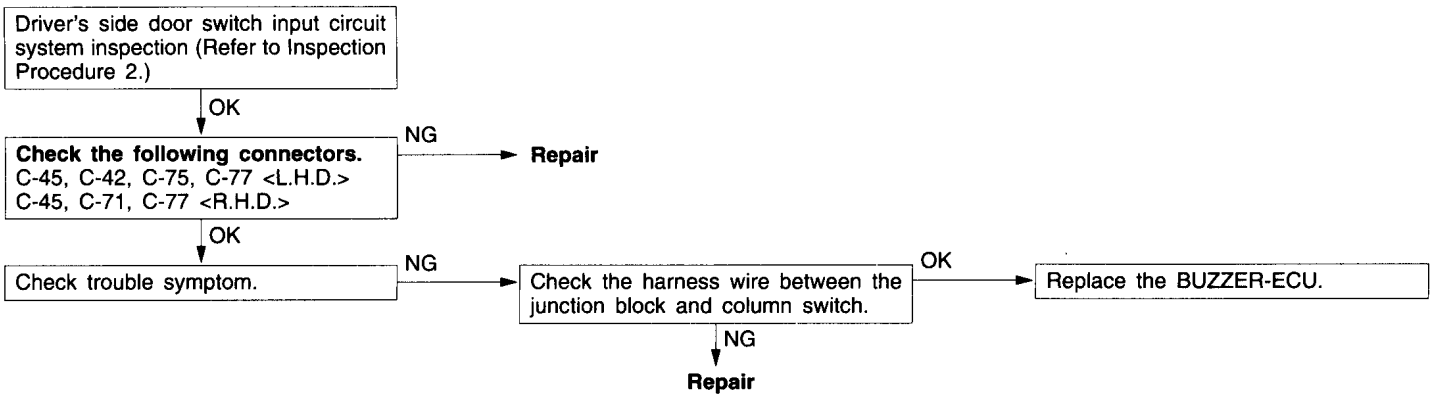
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
While the tail lamps or headlamps are illuminated, driver's side door is opened but the light reminder warning buzzer does not sound.	1	P. 54-32

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

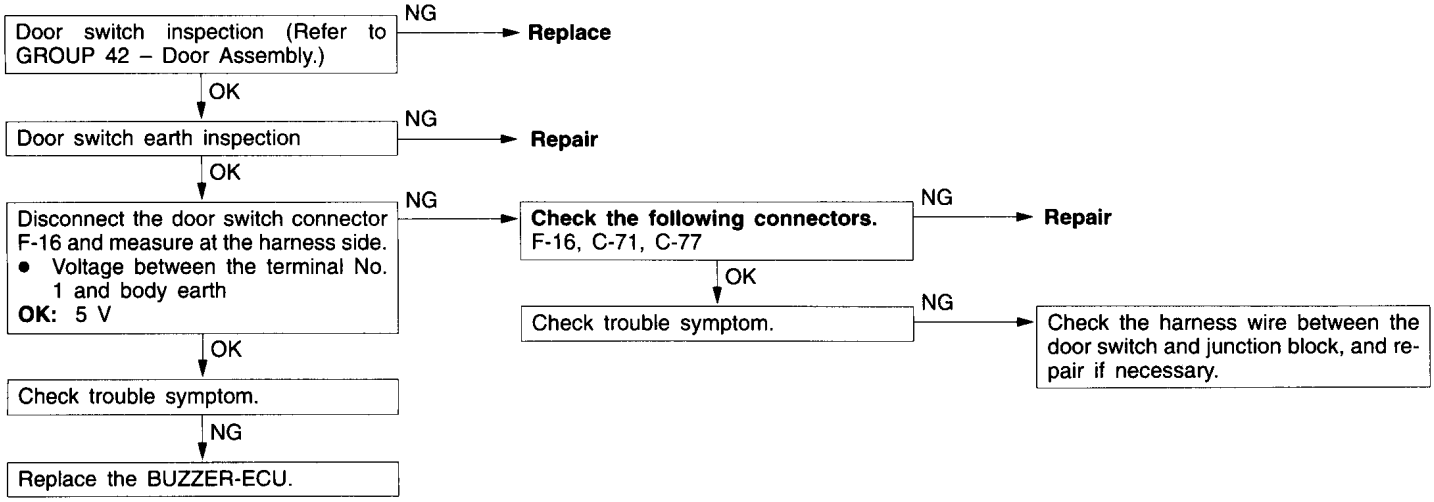
Inspection Procedure 1

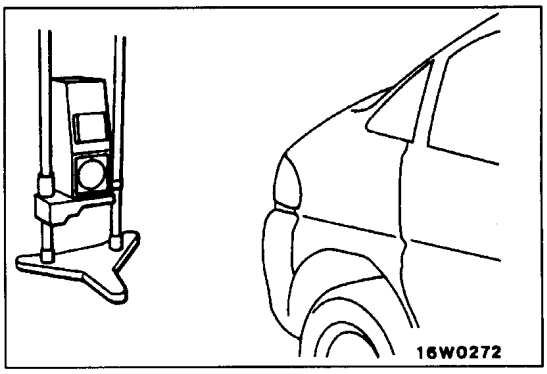
While the tail lamps or headlamps are illuminated, driver's side door is opened but the light reminder warning buzzer does not sound.	Probable cause
[Comment] The cause is probably a defective lighting switch input circuit system or a defective driver's side door switch input circuit system.	• Malfunction of driver's side door switch • Malfunction of harness or connector • Malfunction of BUZZER-ECU



Inspection Procedure 2

Driver's side door switch input circuit system inspection





SERVICE ADJUSTMENT PROCEDURES

120002511

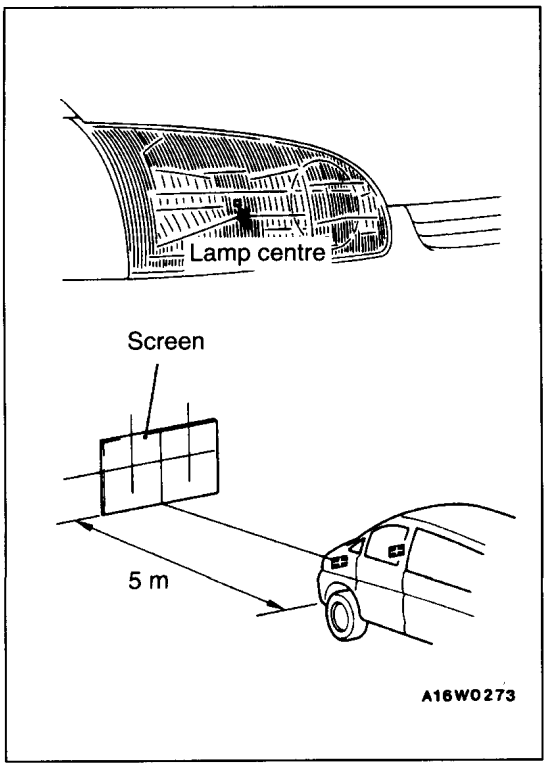
HEADLAMP AIMING

<USING A BEAMSETTING EQUIPMENT>

1. The headlamps should be aimed with the proper beamsetting equipment, and in accordance with the equipment manufacturer'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 regulations.

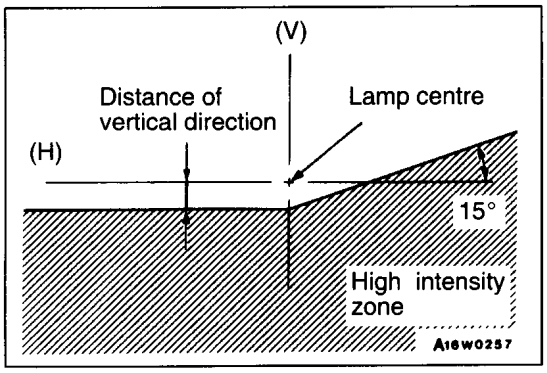
2. Alternately turn the adjusting screw to adjust the headlamp aiming. (Refer to P. 54-34.)



<USING A SCREEN>

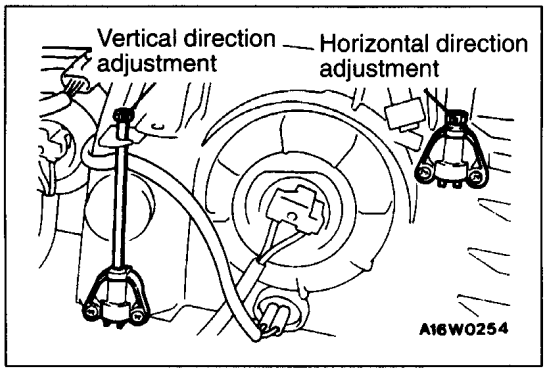
1. Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in driver's position.
2. Set the distance between the screen and the lamp centre mark of the headlamps as shown in the illustration.

   NOTE
   The lamp centre mark (□ mark) is engraved on the outer lens.



3. Check if the beam shining onto the screen is at the standard value.

   Standard value: <For low beam adjustment>
   (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.

NOTE
The reflectors for low beam and high beam have been combined into a single part, so if the low beam adjustment is made, high beam adjustment is not necessary.

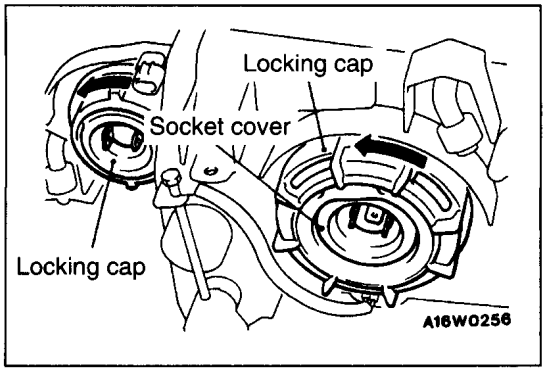
INTENSITY MEASUREMENT 120002512

Using a photometer, and following its manufacturer'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 the engine speed at 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.

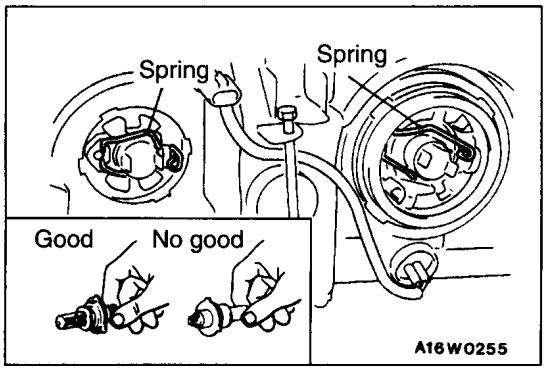
$I = Er^2$ Where: I=intensity (cd)
E=illumination (lux)
r=distance (m) from headlamps to illuminometer



BULB REPLACEMENT 120000304

<Headlamp Bulb>

1. Remove the connector lock and disconnect the headlamp connector.
2. Turn the locking cap to the left to remove it. (High beam only)
3. Turn the locking cap to the left, and then remove the socket cover. (Low beam only)



4. Remove the bulb attachment spring and pull out the bulb.

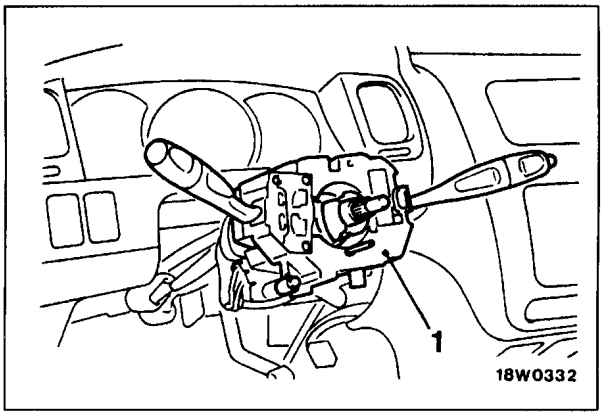
Caution
Do not touch the surface of the bulb with bare fingers or gloves. If the surface is dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.

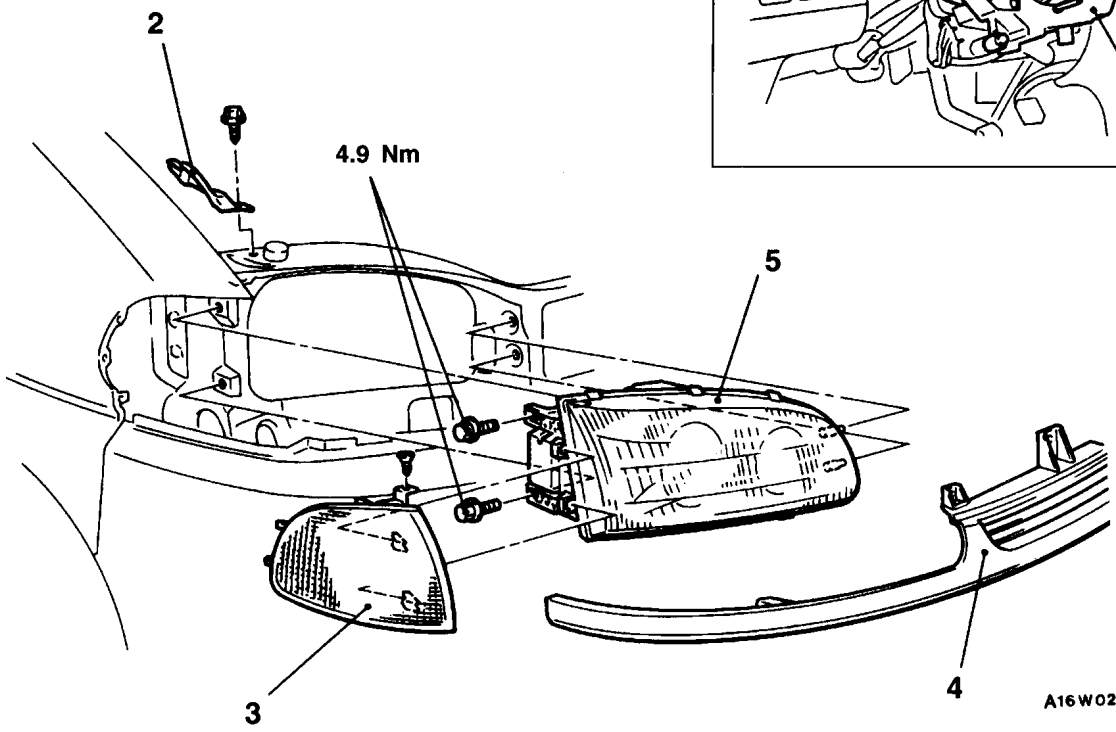
HEADLAMP

120002086

REMOVAL AND INSTALLATION

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



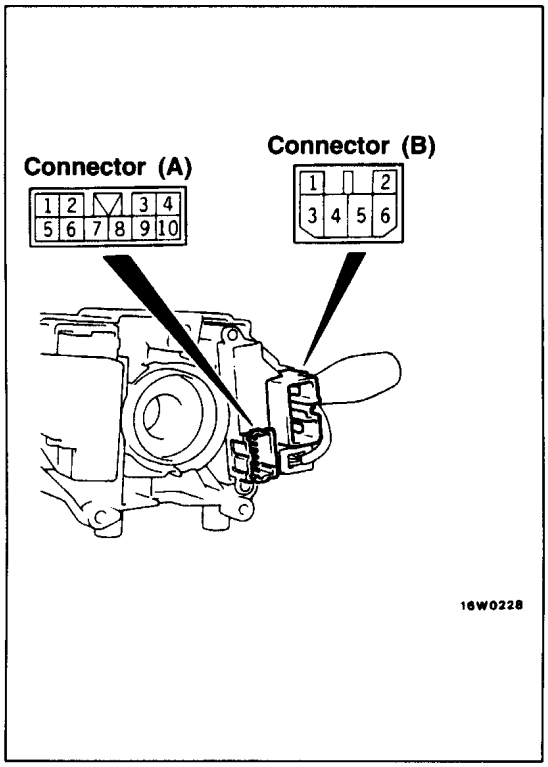


Column switch removal

1. Column switch (Refer to GROUP 51 – Windshield Wiper and Washer.)

Headlamp removal steps

2. Cover (R.H. only)
3. Front turn-signal lamp
4. Radiator grille (Refer to GROUP 51 – Garnish·Moulding.)
5. Headlamp

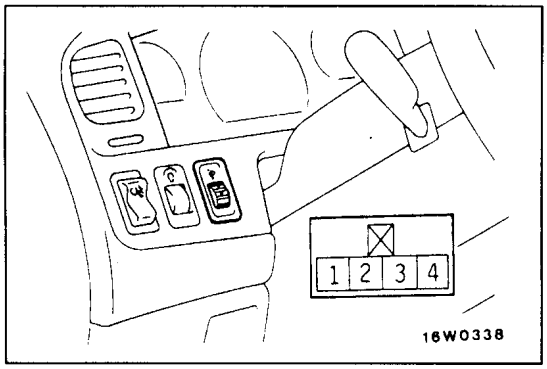


INSPECTION

LIGHTING SWITCH AND DIMMER/PASSING SWITCH CONTINUITY INSPECTION

Switch position		Connector (A) terminal No.			Connector (B) terminal No.				
		5	6	7	1	2	3	4	6
LIGHTING SWITCH	OFF								
	TAILLAMP	○		○					
		○			○				
	HEADLAMP		○		○				
DIMMER SWITCH	LOW BEAM						○	○	
	HIGH BEAM							○	○
PASSING SWITCH					○	○		○	○

NOTE
○- -○ indicates continuity of R.H. drive vehicles.

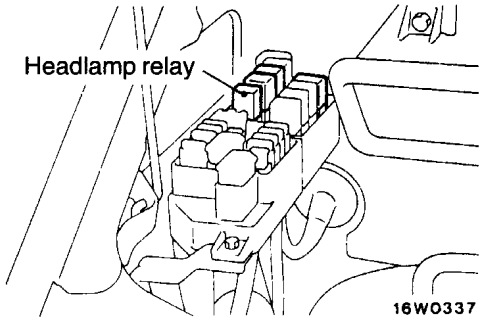


HEADLAMP LEVELING SWITCH RESISTANCE INSPECTION

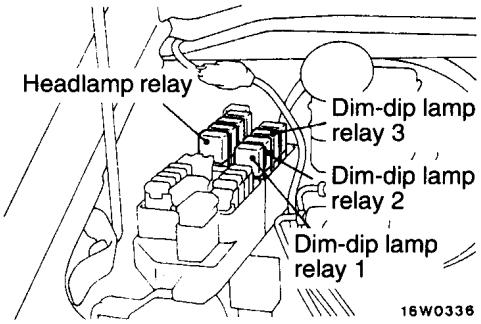
(1) Remove the headlamp leveling switch.
(2) Operate the switch, and check the resistance between the terminal No. 3 and No. 4.

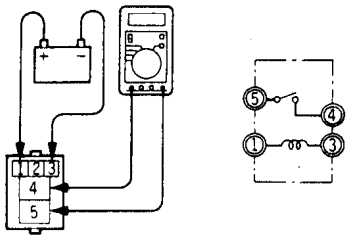
Switch position	0	1	2	3	4
Resistance Ω	120	300	620	1,100	2,000

<L.H.drive vehicles>



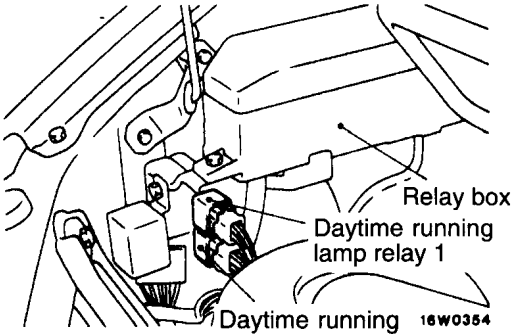
<R.H.drive vehicles>

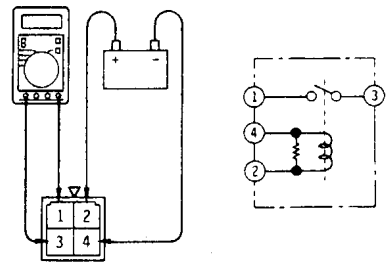




HEADLAMP RELAY, DIM-DIP LAMP RELAY 1, 2 AND 3 CONTINUITY INSPECTION

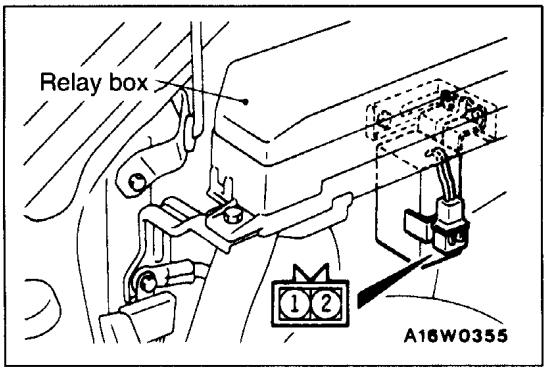
Battery voltage	Terminal No.			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○





DAYTIME RUNNING LAMP RELAY 1, 2 CONTINUITY INSPECTION

Battery voltage	Terminal No.			
	1	2	3	4
Power is supplied	○	⊕	○	⊖
Power is not supplied		○		○



RESISTOR RESISTANCE INSPECTION

<R.H. drive vehicles>

Disconnect the resistor's connector, and then measure the resistance between the terminal No.1 and No. 2.

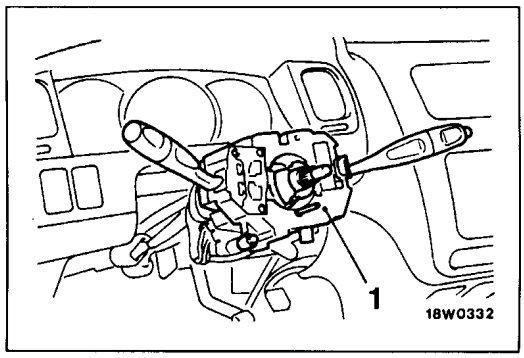
Standard value: Approx. 1 Ω

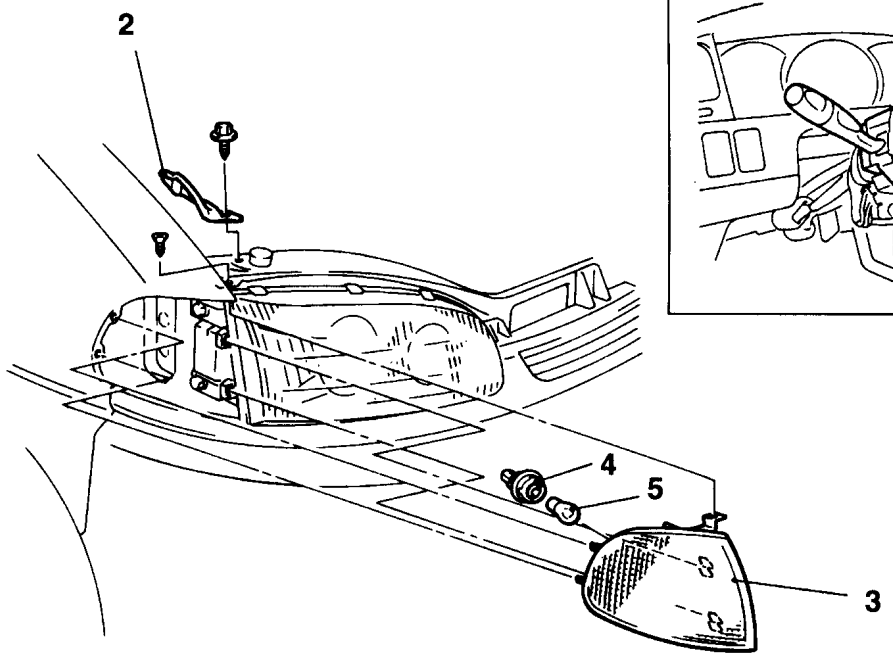
FRONT TURN-SIGNAL LAMP

120000306

REMOVAL AND INSTALLATION

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





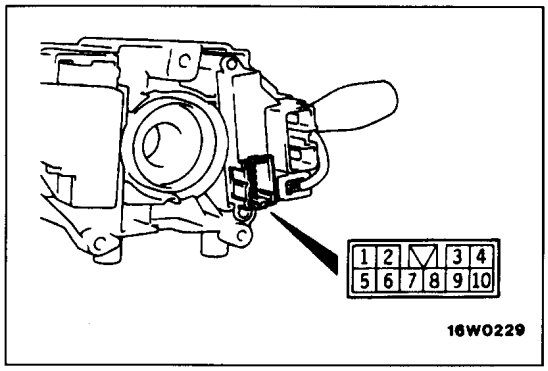
00000878

Column switch removal

1. Column switch (Refer to GROUP 51 – Windshield Wiper and Washer.)

Front turn-signal lamp removal steps

2. Cover (R.H. only)
3. Front turn-signal lamp
4. Bulb socket
5. Bulb



INSPECTION

TURN-SIGNAL LAMP SWITCH CONTINUITY INSPECTION

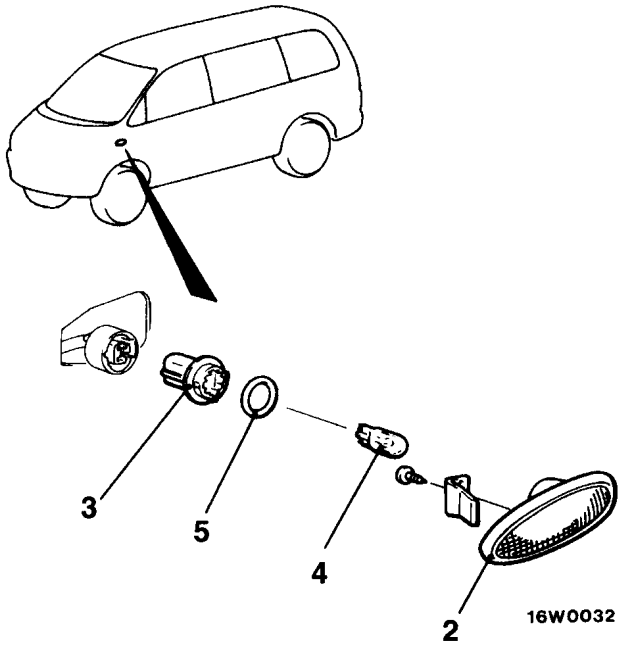
Switch position	Terminal No.		
	3	8	9
R.H.		○	○
OFF			
L.H.	○	○	

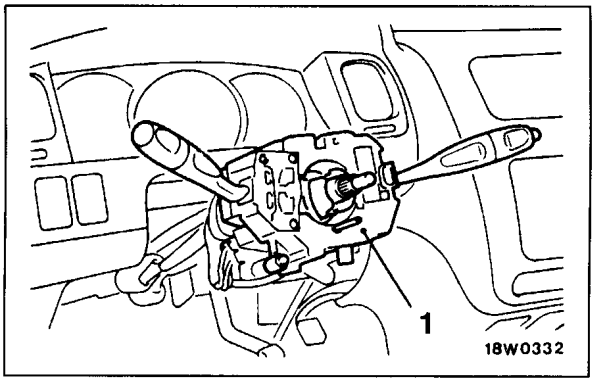
SIDE TURN-SIGNAL LAMP

120000307

REMOVAL AND INSTALLATION

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





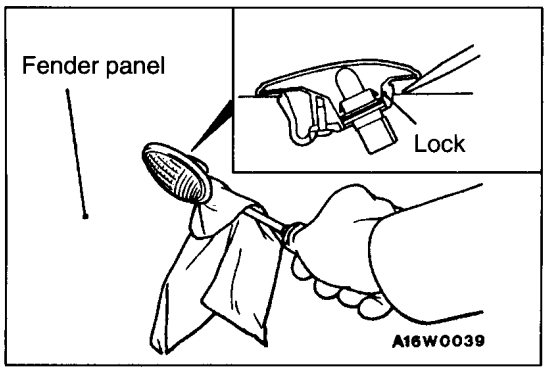
00000790

Column switch removal

1. Column switch (Refer to GROUP 51 – Windshield Wiper and Washer.)

Side turn-signal lamp removal steps

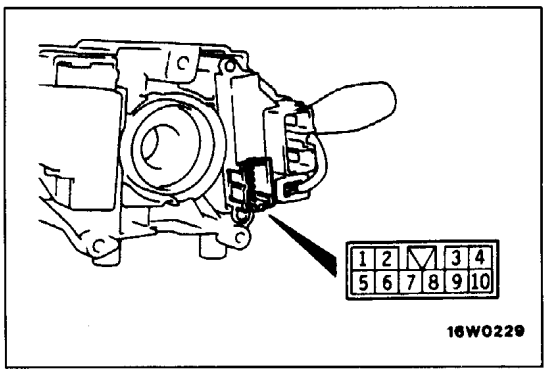
◀A▶ ▶A◀ 2. Side turn-signal lamp
3. Bulb socket
4. Bulb
5. Packing

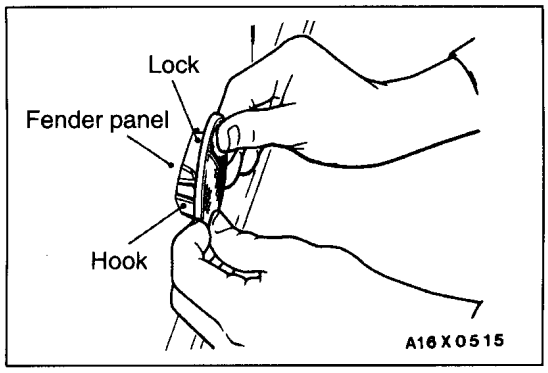


REMOVAL SERVICE POINT

◀A▶ SIDE TURN-SIGNAL LAMP REMOVAL

Use a flat-tipped screwdriver or similar tool to remove the lock from the fender panel, and then remove the side turn-signal lamp.





INSPECTION

TURN-SIGNAL LAMP SWITCH CONTINUITY INSPECTION

Switch position	Terminal No.		
	3	8	9
R.H.		○——	——○
OFF			
L.H.	○——	——○	

INSTALLATION SERVICE POINT

▶A◀ SIDE TURN-SIGNAL LAMP INSTALLATION

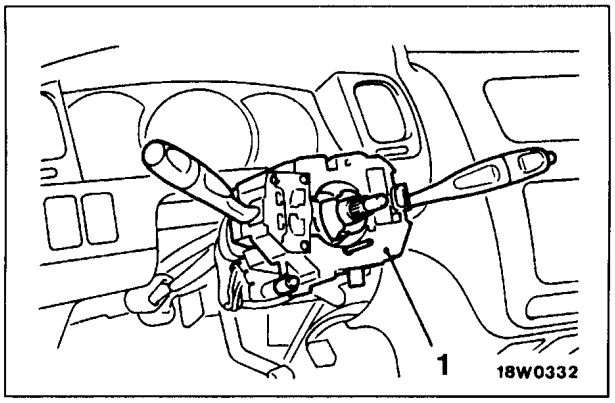
(1) Fit the lock into the fender panel.
(2) Push the side turn-signal lamp into the fender panel, and secure it with the hook.

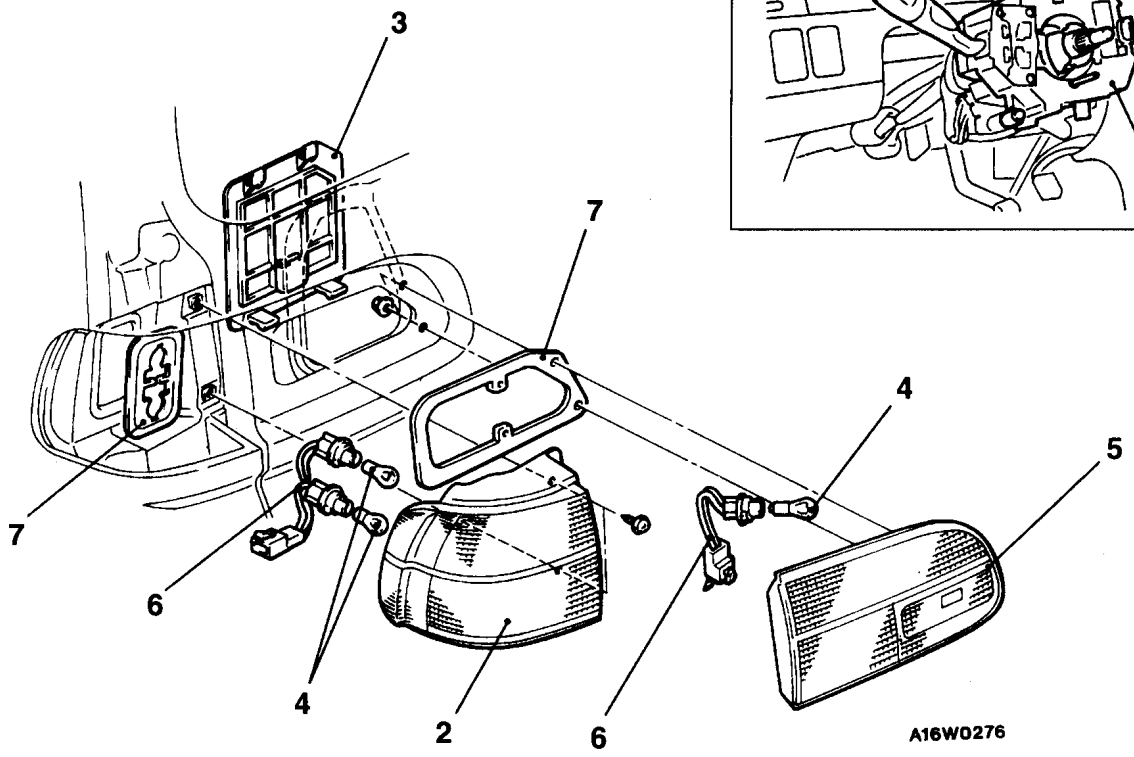
REAR COMBINATION LAMP, TAILGATE LAMP

1200002087

REMOVAL AND INSTALLATION

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





00000877

Column switch removal

1. Column switch (Refer to GROUP 51 – Windshield Wiper and Washer.)

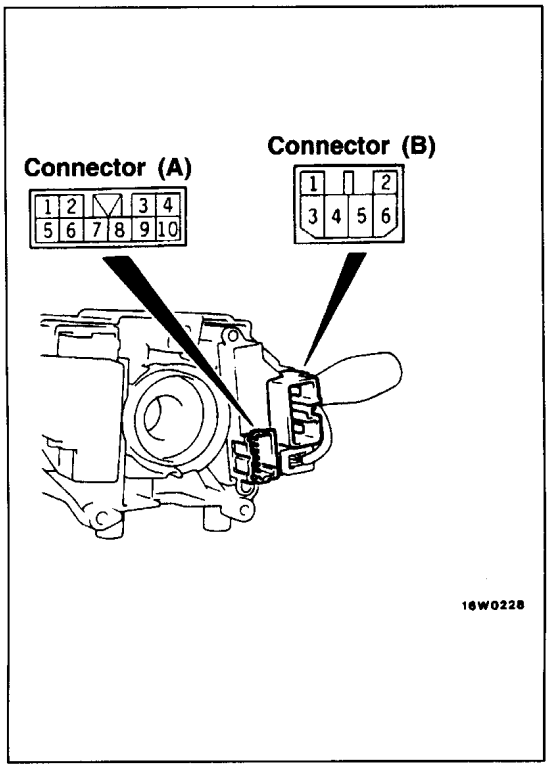
Rear combination lamp removal steps

2. Rear combination lamp
4. Bulb
6. Bulb socket assembly
7. Gasket

Tailgate lamp removal steps

- Tailgate lower trim <Semi-trim type> (Refer to GROUP 42 – Tailgate Trim and Waterproof Film.)

3. Cover <Full-trim type>
4. Bulb
5. Tailgate lamp
6. Bulb socket assembly
7. Gasket

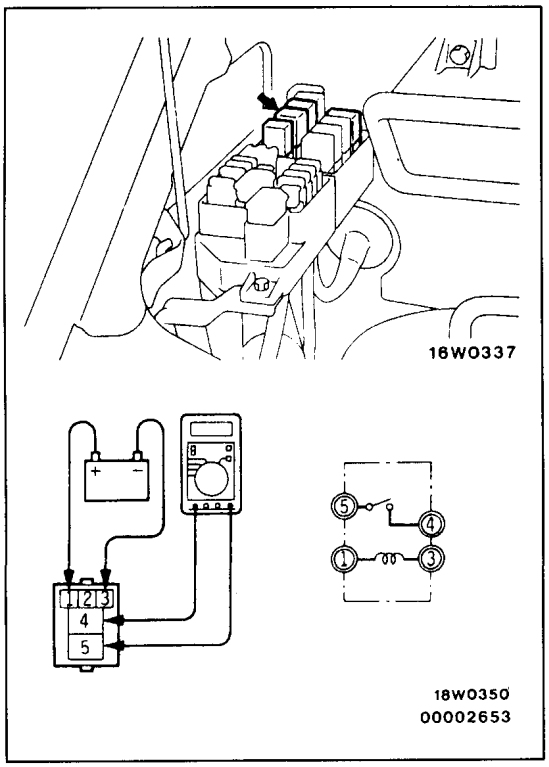


INSPECTION

LIGHTING SWITCH AND TURN-SIGNAL LAMP SWITCH CONTINUITY INSPECTION

Switch position		Connector (A) terminal No.					Connector (B) terminal No.
		3	5	7	8	9	1
LIGHTING SWITCH	OFF						
	TAILLAMP	○		○			
		○	- - -	- - -	- - -	- - -	○
TURN-SIGNAL LAMP SWITCH	R.H.				○	○	
	OFF						
	L.H.	○			○		

NOTE
○—○ indicates continuity of R.H. drive vehicles.



TAILLAMP RELAY CONTINUITY INSPECTION

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

REAR FOG LAMP

120002088

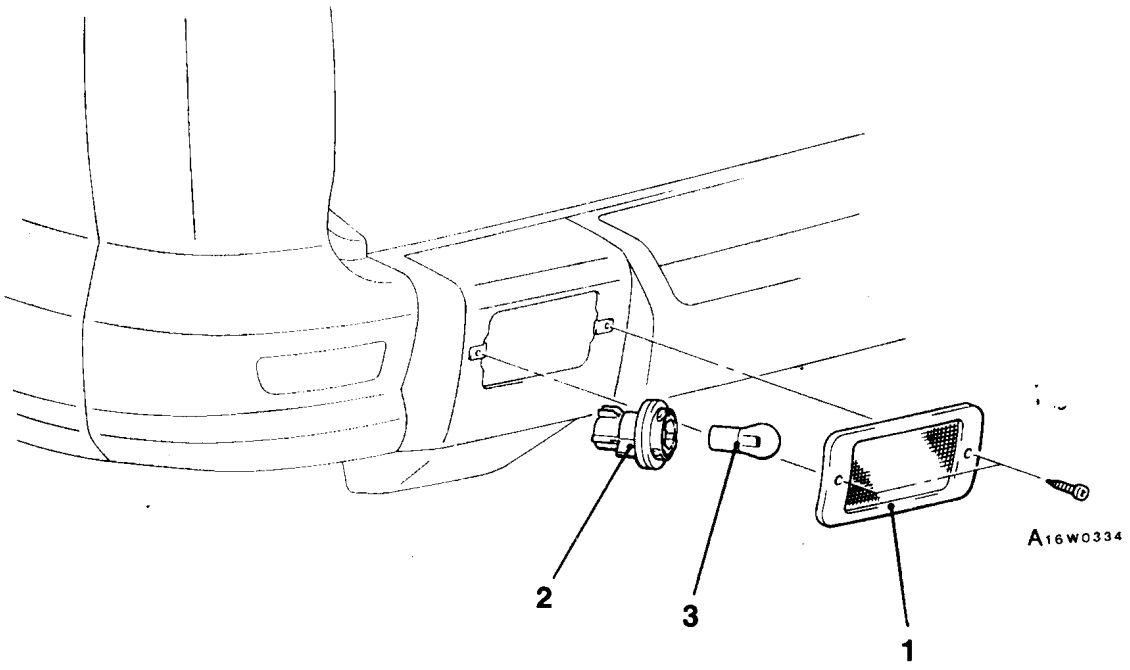
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of rear fog lamp switch

REAR FOG LAMP

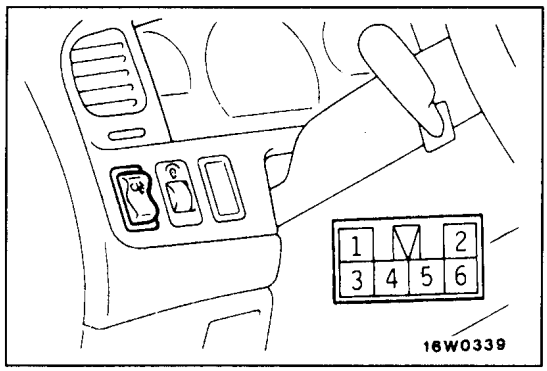
120002089

REMOVAL AND INSTALLATION



NOTE
The rear fog lamp is only installed at driver's side.

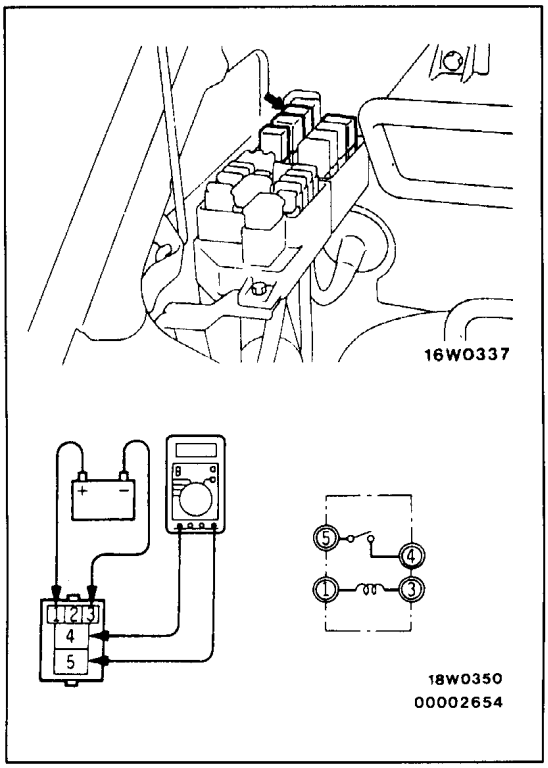
Removal steps
1. Rear fog lamp
2. Bulb socket
3. Bulb



INSPECTION

REAR FOG LAMP SWITCH CONTINUITY INSPECTION

Switch position	Terminal No.				
	1	2		3	6
OFF			ILL		
ON			ILL		



REAR FOG LAMP RELAY CONTINUITY INSPECTION

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

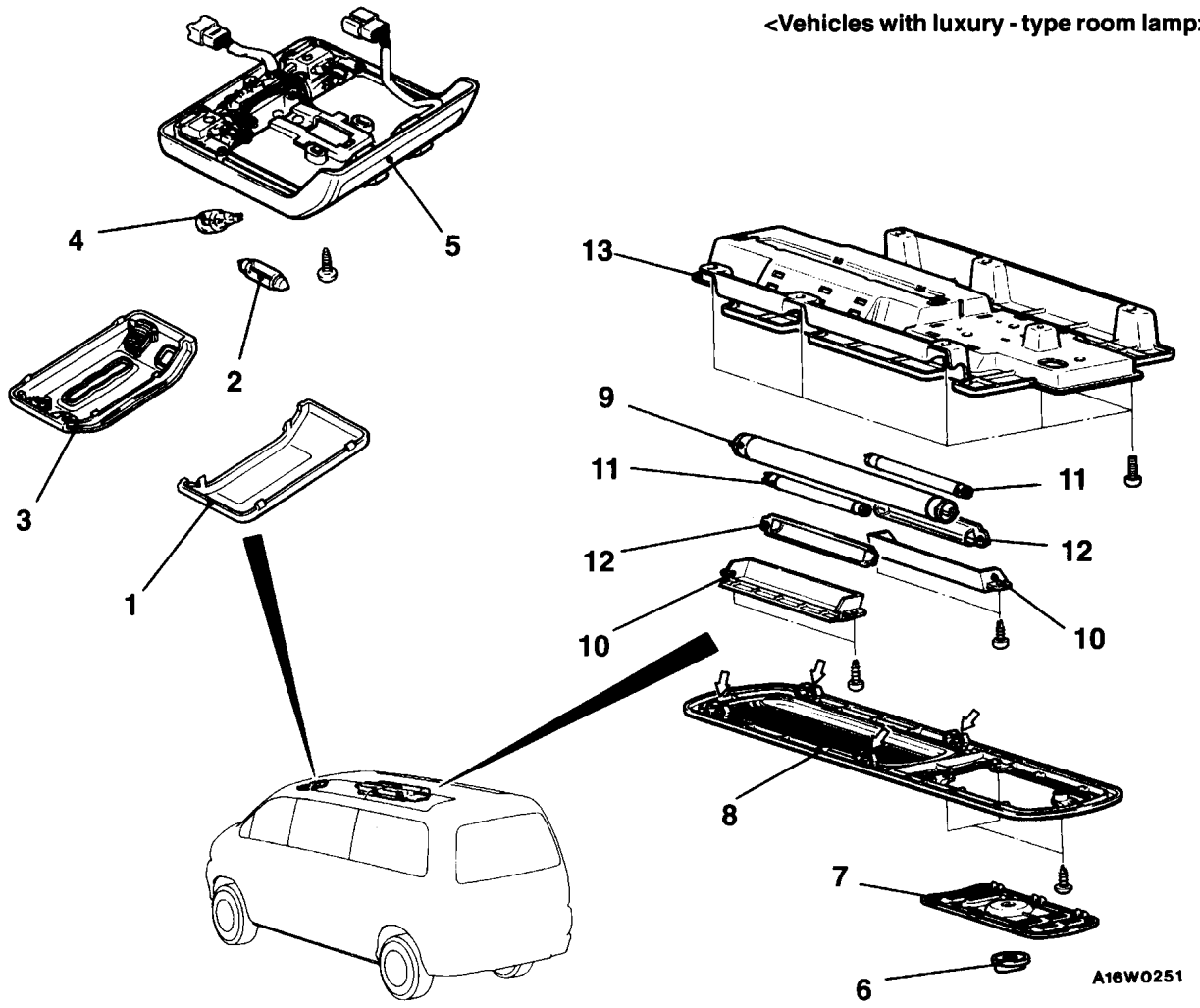
INTERIOR LAMP

120000314

REMOVAL AND INSTALLATION

<Vehicles with sunroof>

<Vehicles with luxury - type room lamp>

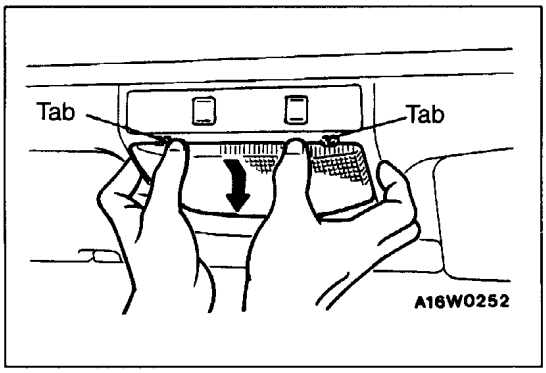


NOTE
The ⇦ mark indicates the sheet metal clip position.

Removal steps

◀A▶ 1. Room lamp lens
2. Room lamp bulb
◀B▶ 3. Room lamp switch cover
4. Map lamp bulb
5. Room lamp and sunroof switch body
6. Light adjustment switch knob
7. Switch panel
8. Centre garnish
9. Fluorescent light (15 W)
10. Cover
11. Fluorescent light (6 W)
12. Lens tube
- Headlining (Refer to GROUP 52A – Headlining.)

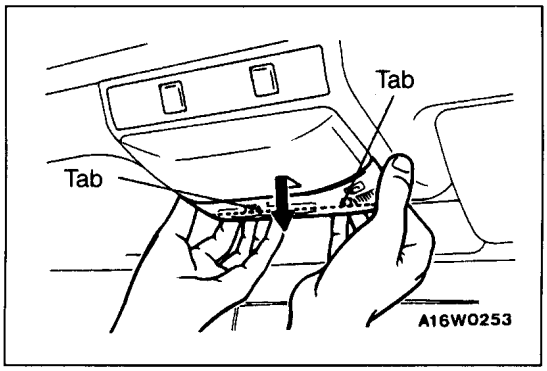
13. Lamp body



REMOVAL SERVICE POINTS

◀A▶ ROOM LAMP LENS REMOVAL

To remove, press the room lamp tab while pulling downwards.



◀B▶ ROOM LAMP SWITCH COVER REMOVAL

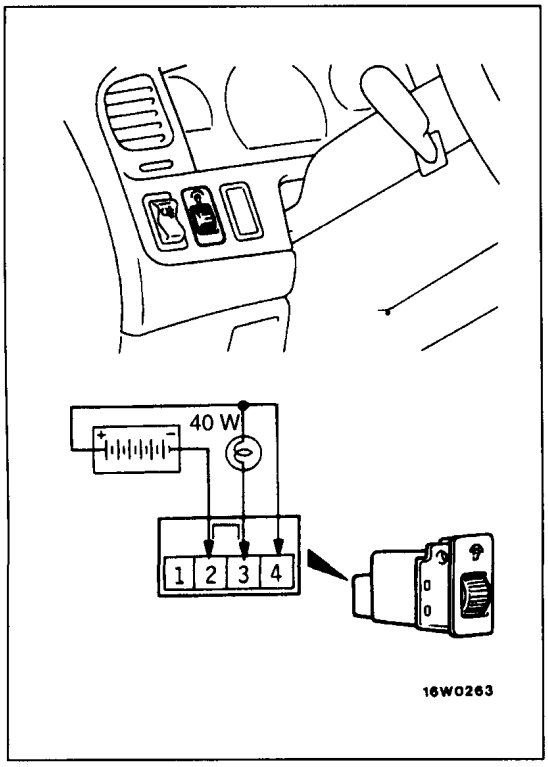
To remove, press the room lamp switch cover tab while pulling downwards.

RHEOSTAT

120000315

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of rheostat



RHEOSTAT

120000316

INSPECTION

(1) Connect the battery and the test lamp (40 W) 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 LAMP SWITCH

120000317

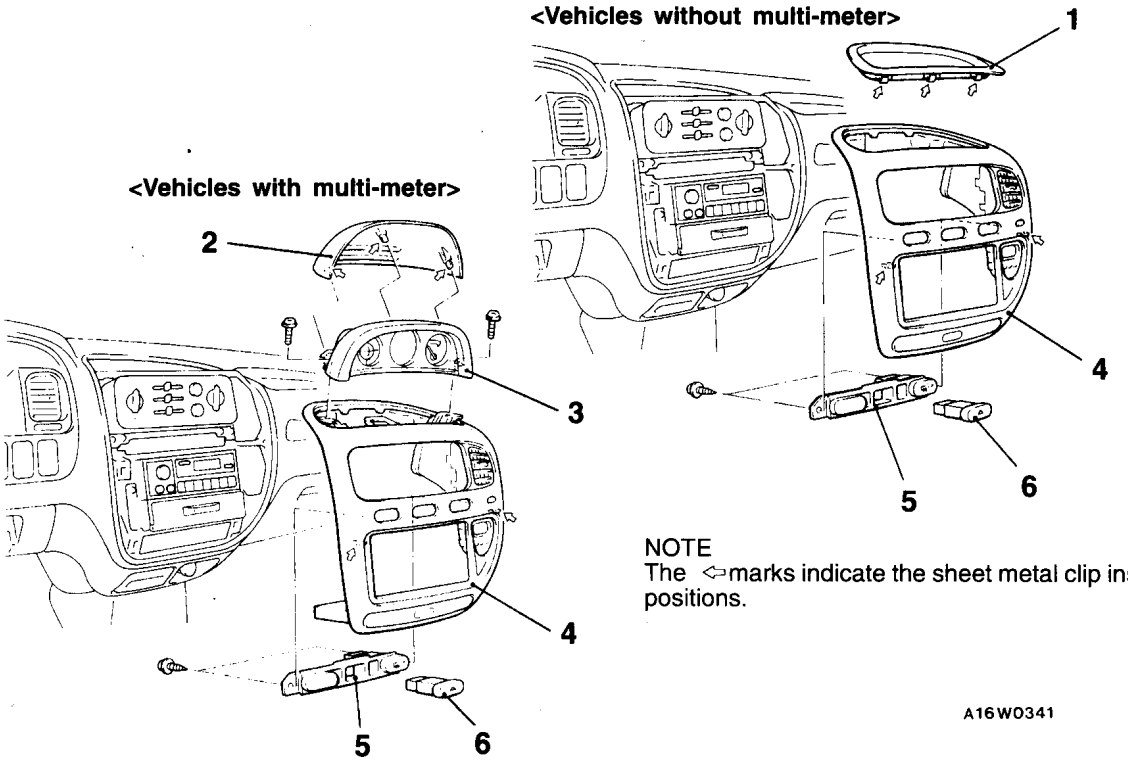
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	• Removal of centre panel • Removal of multi-meter panel • Removal of tray

HAZARD LAMP SWITCH

120002124

REMOVAL AND INSTALLATION

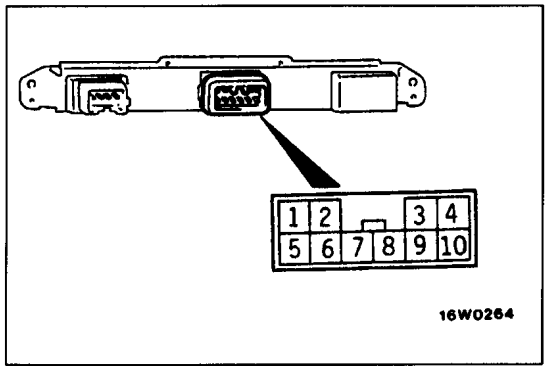


NOTE
The ⇦marks indicate the sheet metal clip installation positions.

A16W0341

Removal steps

1. Tray
2. Multi-meter panel
3. Multi-meter
4. Centre panel (Refer to GROUP 52A – Instrument Panel.)
5. Switch holder
6. Hazard lamp switch



INSPECTION

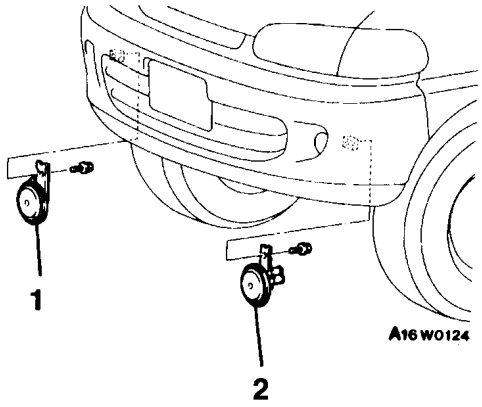
HAZARD LAMP SWITCH CONTINUITY INSPECTION

Switch position	Terminal No.										
	1	2	3	4	5	6	7	8	9		10
OFF					○		○	○	○	ILL ○	○
ON	○	○	○	○	○	○			○	ILL ○	○

HORN

120002090

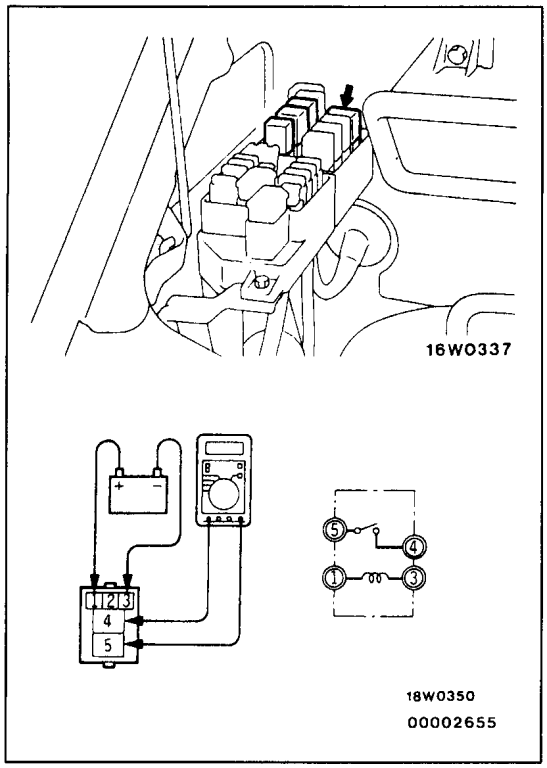
REMOVAL AND INSTALLATION



Removal steps

- Under cover side panel
  (Refer to GROUP 42 – Under Cover.)

1. Horn (High sound) <Vehicles with dual horn>
2. Horn (Low sound)



INSPECTION

HORN RELAY CONTINUITY INSPECTION <Vehicles with SRS>

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

CIGARETTE LIGHTER

120000320

SPECIAL TOOL

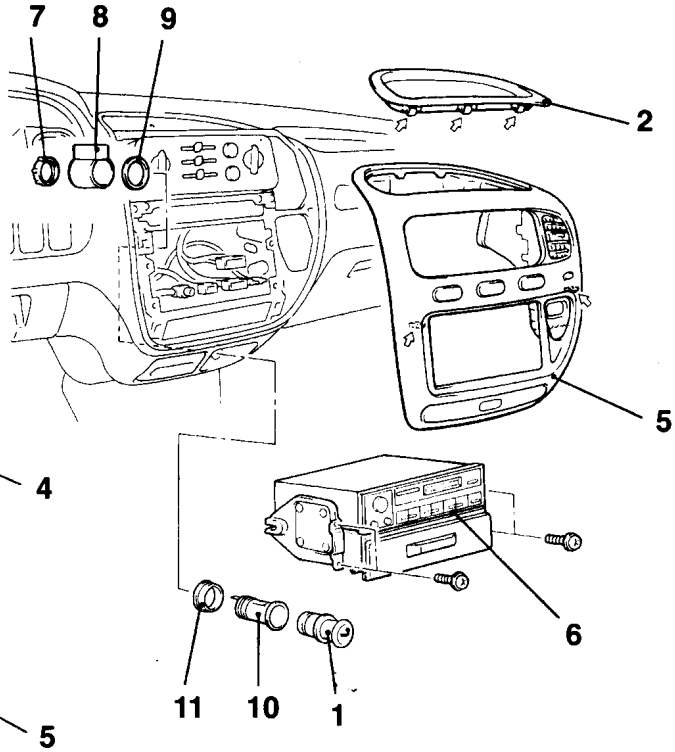
Tool	Number	Name	Use
	MB990784	Ornament remover	• Removal of centre panel • Removal of multi-meter panel • Removal of tray

CIGARETTE LIGHTER

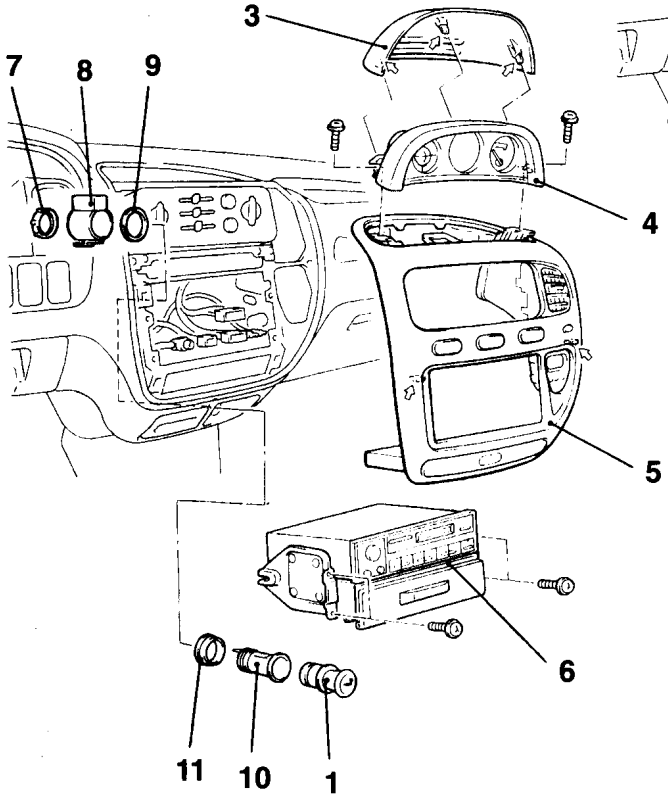
120002125

REMOVAL AND INSTALLATION

<Vehicles without multi-meter>



<Vehicles with multi-meter>

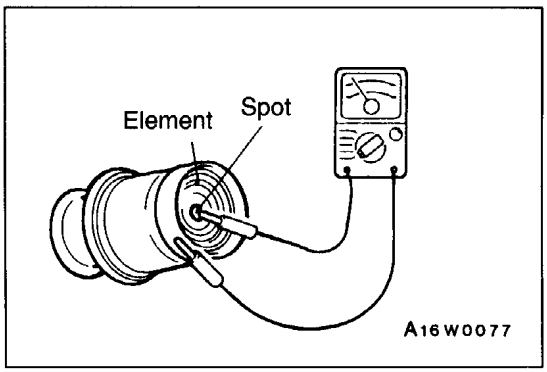


NOTE
The ⇦ marks indicate the sheet metal clip installation positions.

A16W0344

Removal steps

1. Plug
2. Tray
3. Multi-meter panel
4. Multi-meter
5. Centre panel (Refer to GROUP 52 A – Instrument Panel.)
6. Radio and tape player
7. Fixing ring
8. Socket case
9. Socket washer
10. Socket
11. Protector



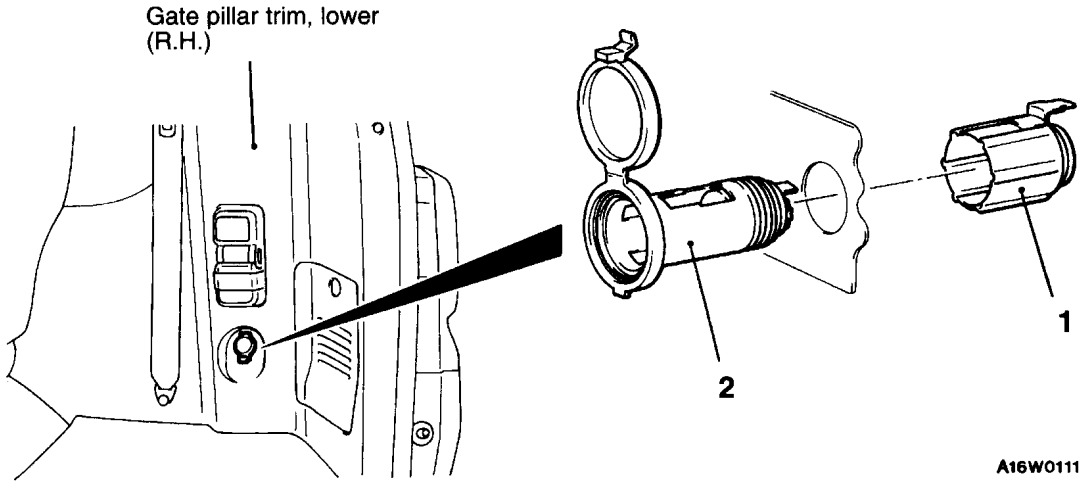
INSPECTION

- Take out the plug, and check for a worn edge on the element spot connection, and for shreds of tobacco or other material on the element.
- Using a circuit tester, check the continuity of the element.

ACCESSORY SOCKET

120000322

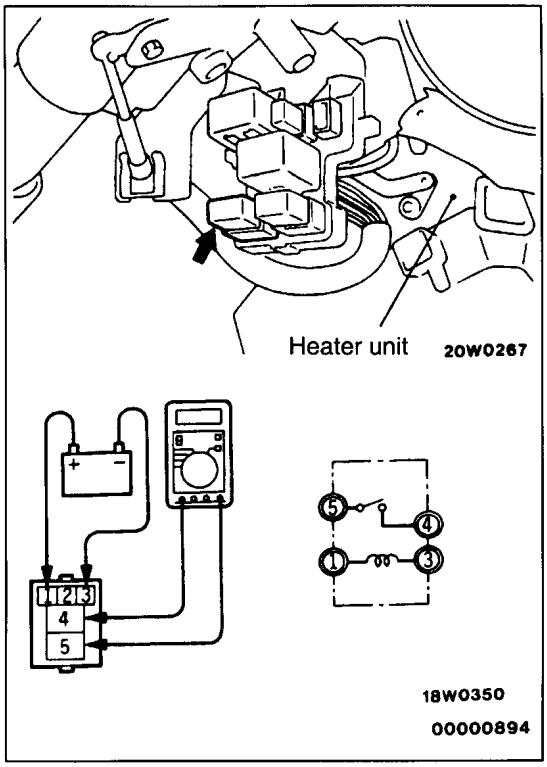
REMOVAL AND INSTALLATION



Removal steps

- Gate pillar trim, lower (R.H.)
  (Refer to GROUP 52A – Trim.)

1. Socket
2. Outer case



INSPECTION

ACCESSORY SOCKET RELAY CONTINUITY INSPECTION

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

CLOCK

120000323

SPECIAL TOOL

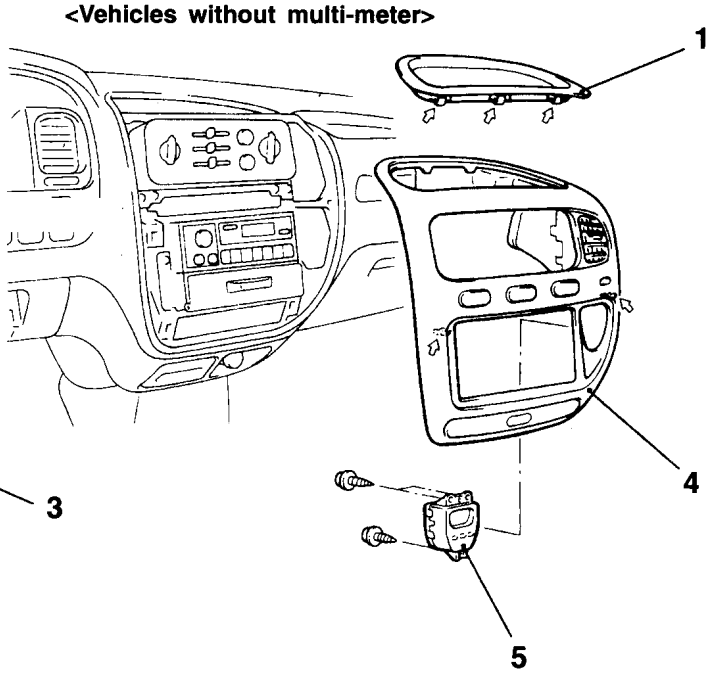
Tool	Number	Name	Use
	MB990784	Ornament remover	• Removal of centre panel • Removal of multi-meter • Removal of tray

CLOCK

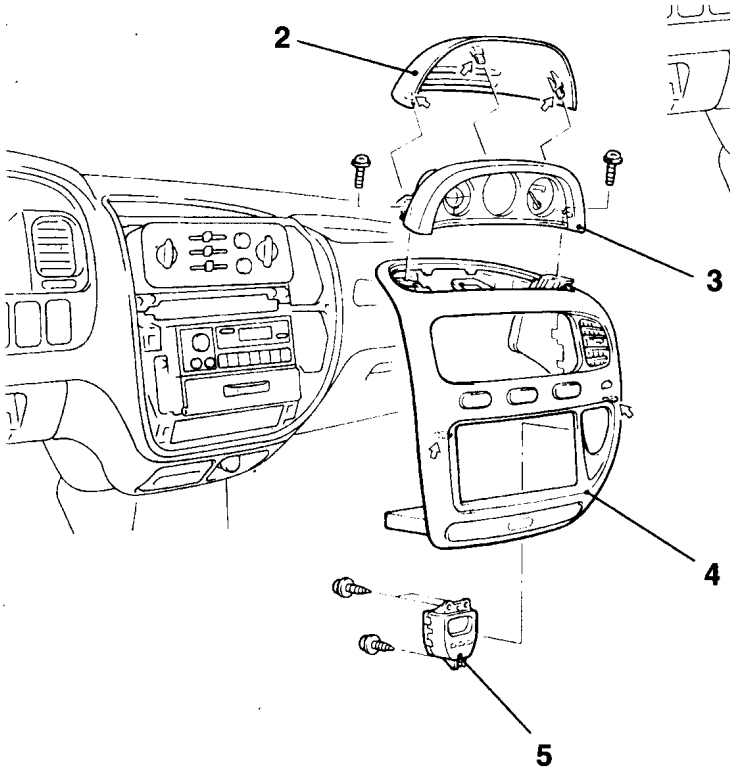
120002126

REMOVAL AND INSTALLATION

<Vehicles without multi-meter>



<Vehicles with multi-meter>



NOTE
The ⇦marks indicate the sheet metal clip installation-positions.

A16W0343

Removal steps

1. Tray
2. Multi-meter panel
3. Multi-meter
4. Centre panel (Refer to GROUP 52A – Instrument Panel.)
5. Clock

RADIO AND TAPE PLAYER

120000325

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of centre panel

TROUBLESHOOTING

120002091

QUICK-REFERENCE TROUBLESHOOTING CHART

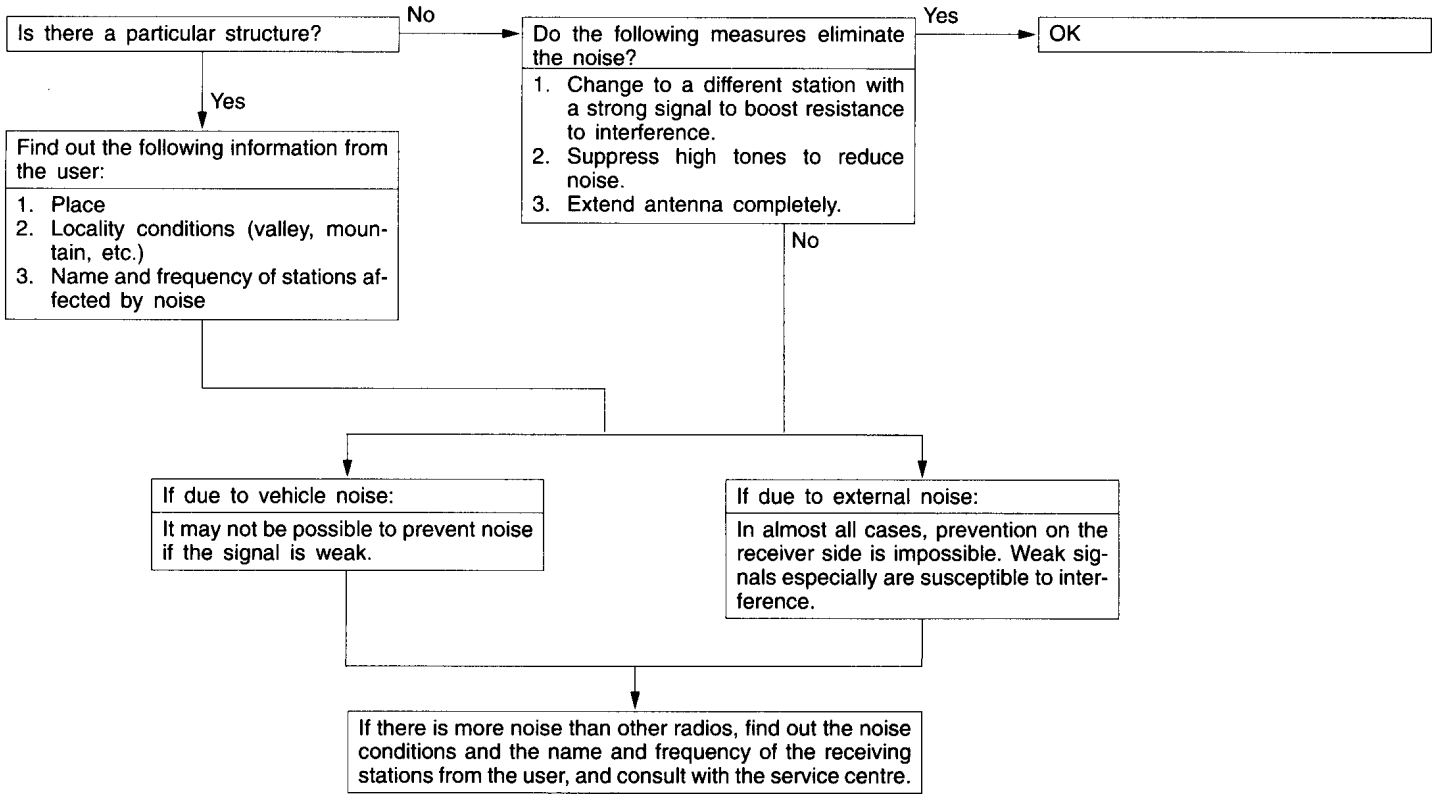
Items	Problem symptom	Relevant chart
Noise	Noise appears at certain places when travelling (AM).	A–1
	Noise appears at certain places when travelling (FM).	A–2
	Mixed with noise, only at night (AM).	A–3
	Broadcasts can be heard but both AM and FM have a lot of noise.	A–4
	There is more noise either on 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 LW 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

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

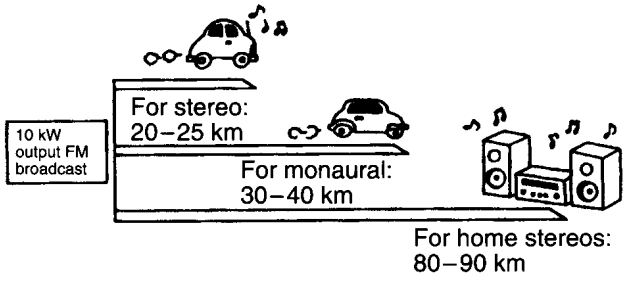
No ↓

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.

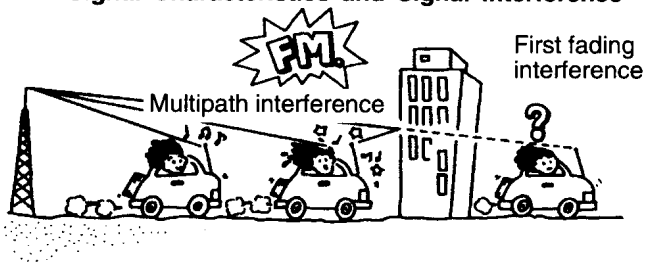
NOTE
About FM waves:
FM waves have the same properties as light, and can be deflected and blocked. Wave reception is not possible in the shadow of obstructions such as buildings or mountains.

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

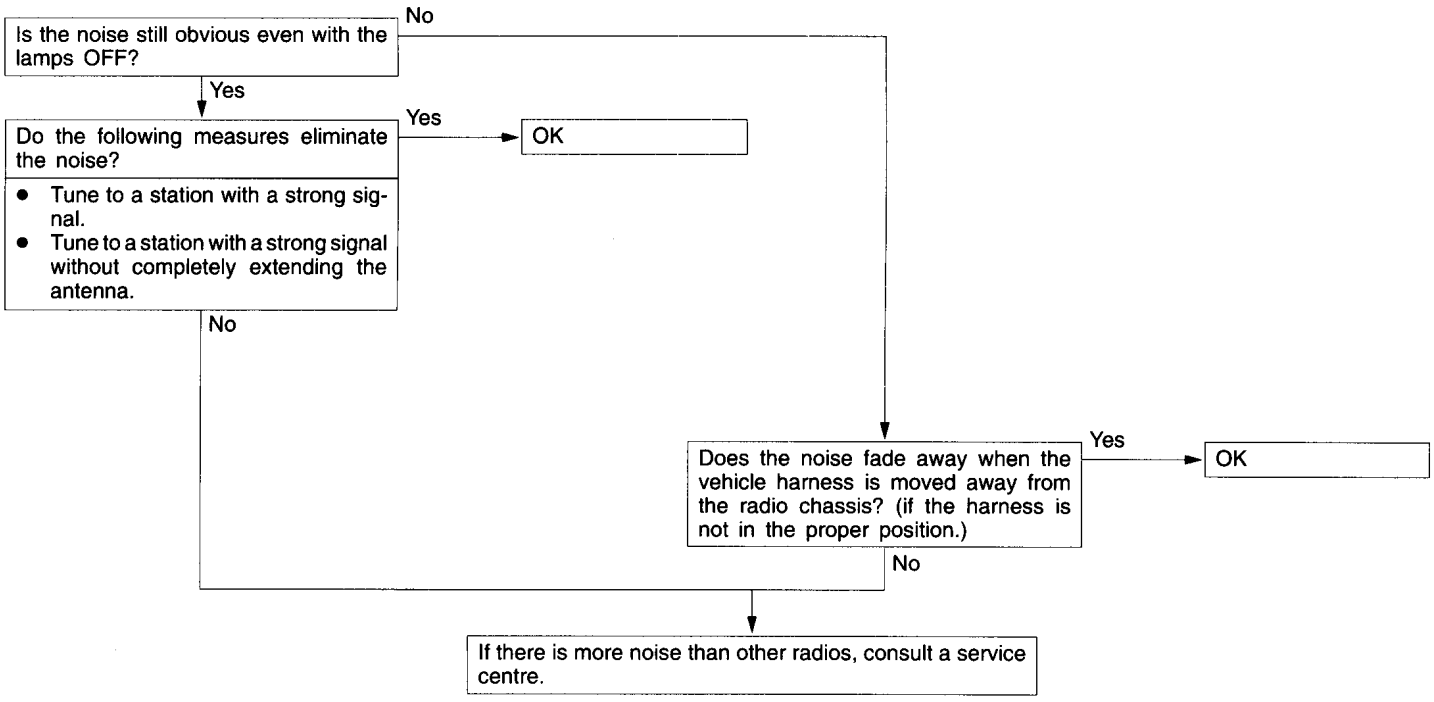


16W0268

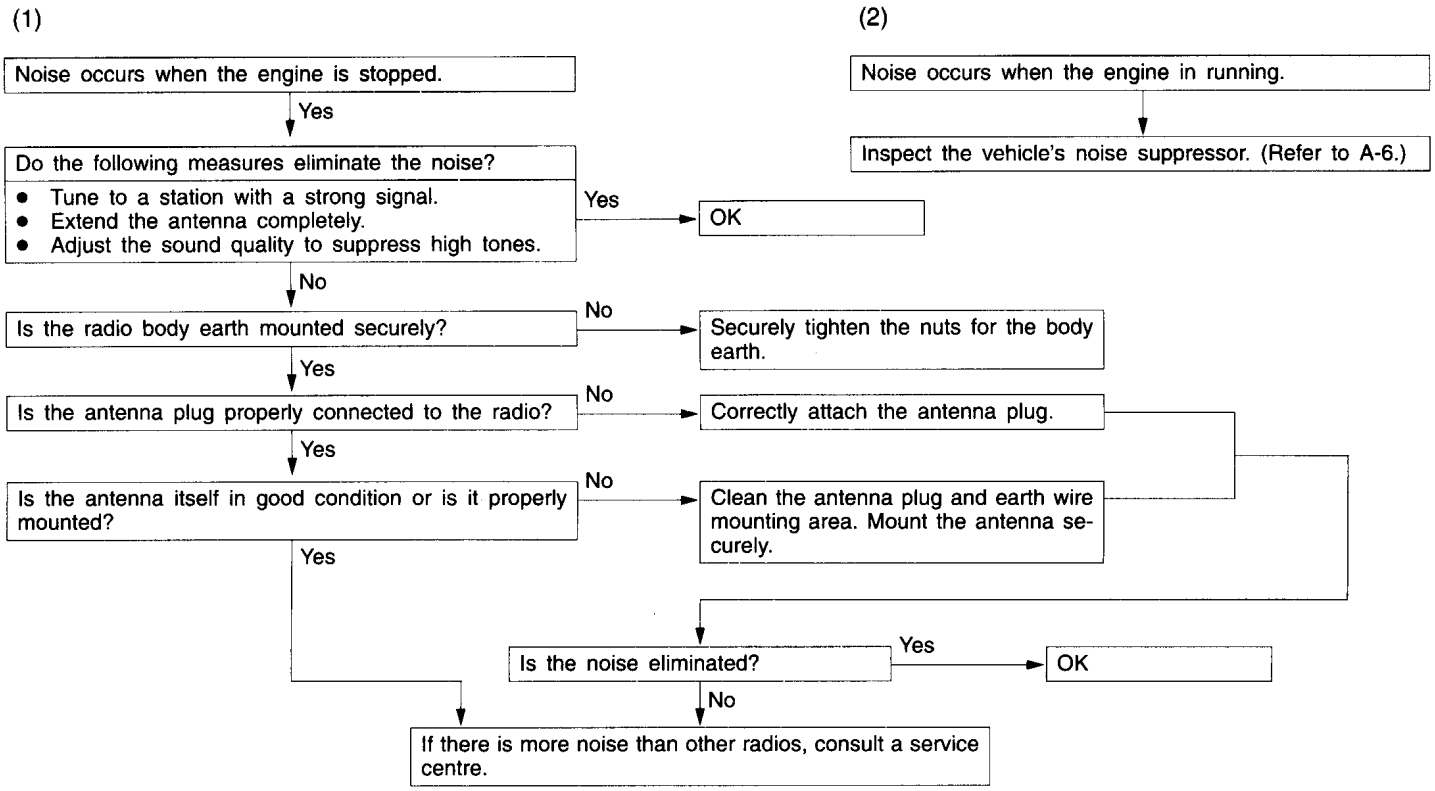
A–3 Mixed with noise, only at night (AM).

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.



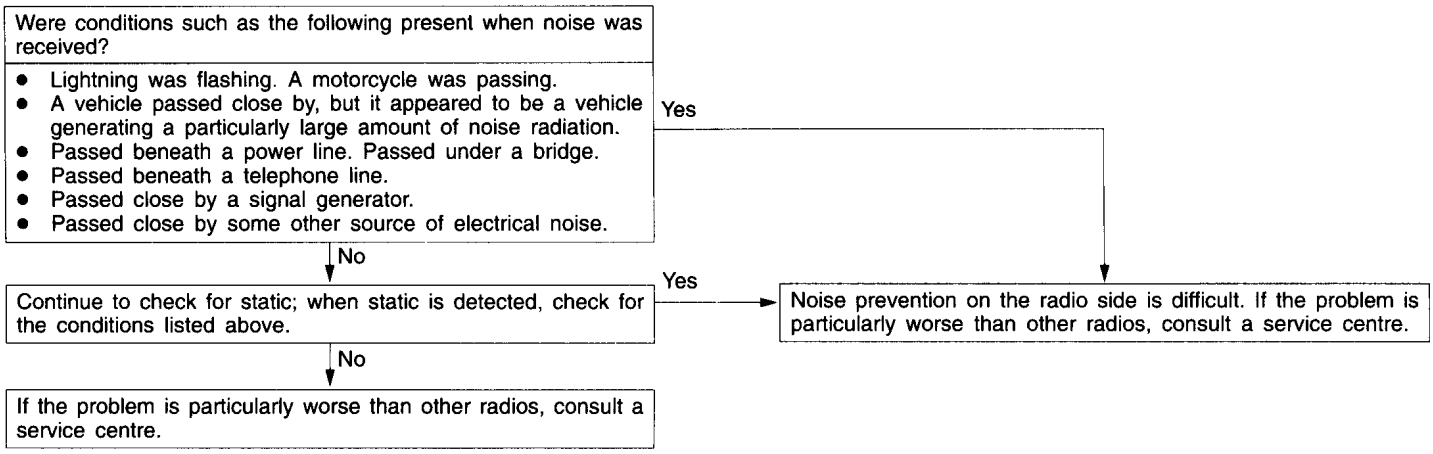
A-4 Broadcasts can be heard but both AM and FM have a lot of noise.



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 and 2 on P.54-62.) • Check or replace the noise capacitor. (Refer to Fig. 3 on P.54-62.)
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.

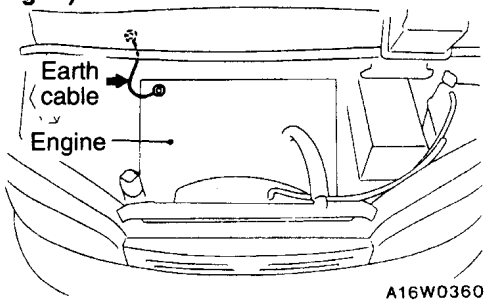
Caution

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.**

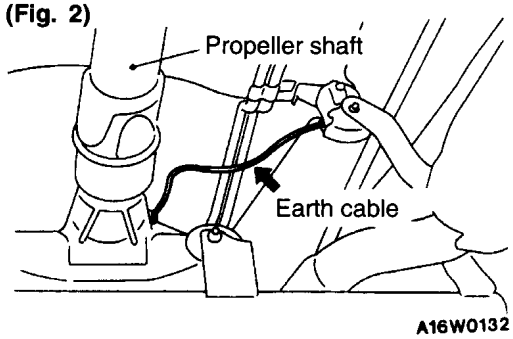
NOTE

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.

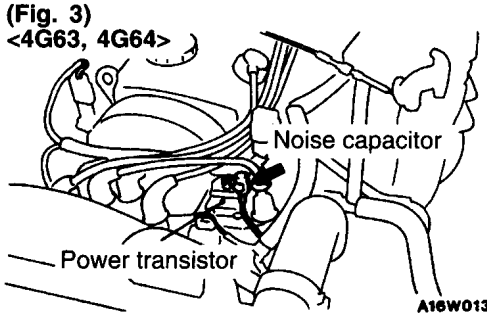
(Fig. 1)



(Fig. 2)



(Fig. 3)
<4G63, 4G64>



A–7 Some noise appears when there is vibration or shocks during travelling.

Are connectors properly connected?
- No → Ensure proper connection.
- Yes ↓

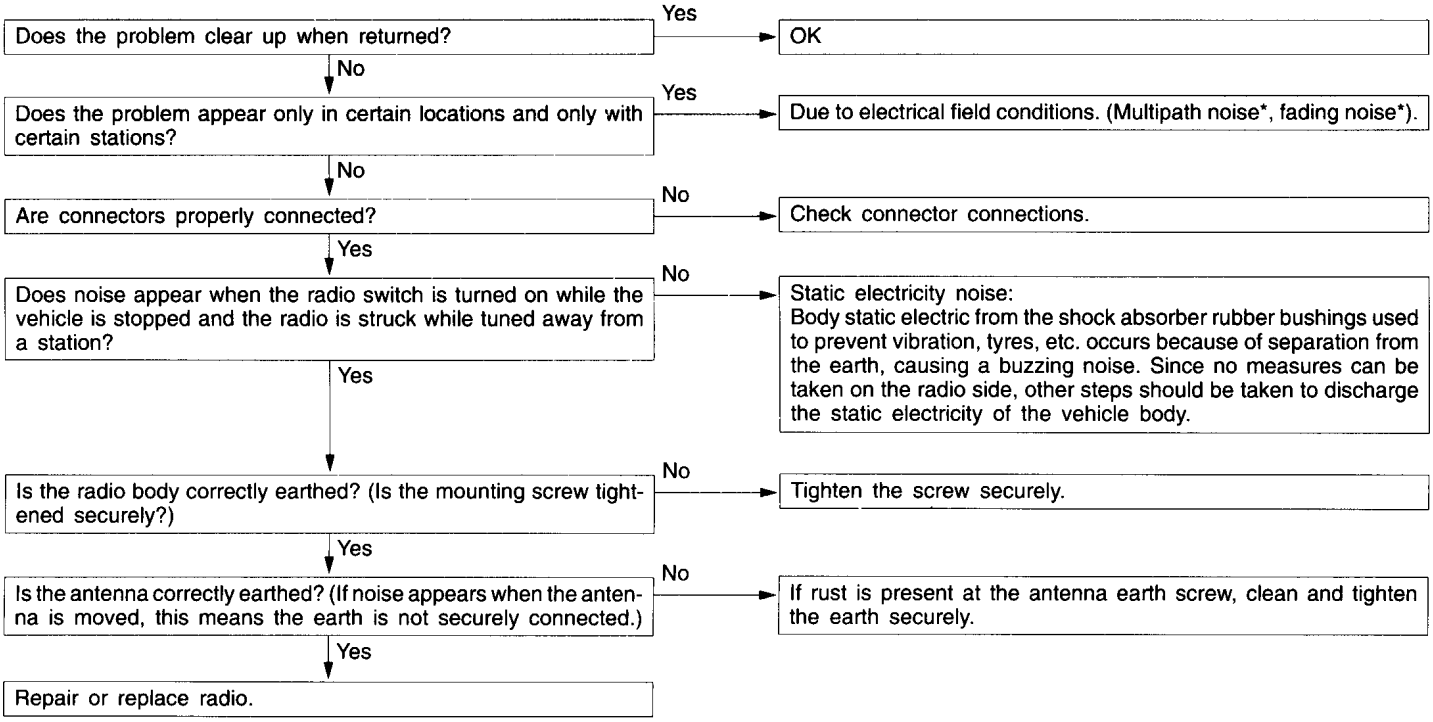
Does noise appear when the radio switch is turned on while the vehicle is stopped and the radio is struck while tuned away from a station?
- No → Static electricity noise: Body static electric from the shock absorber rubber bushings used to prevent vibration, tyres, etc. occurs because of separation 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.

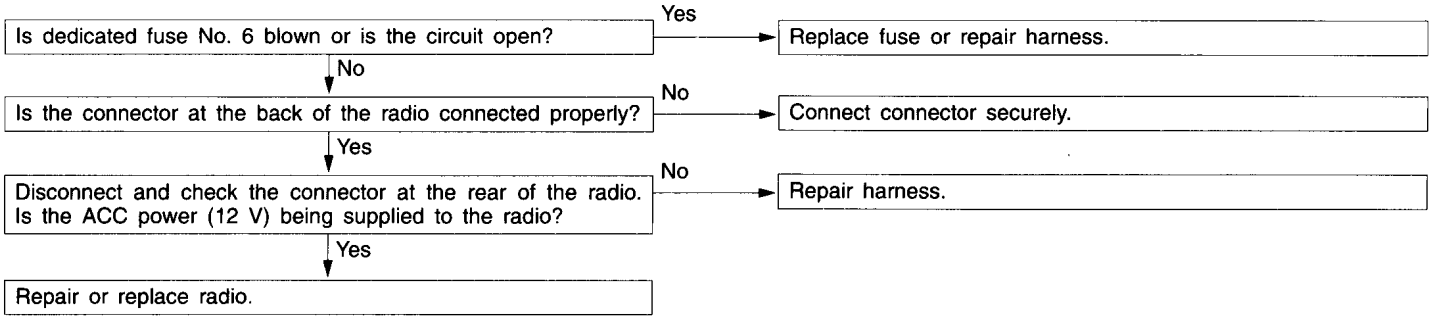
Noise is often created by the following factors, and often the radio is OK when it is checked individually.

- Travelling conditions of the vehicle
- Terrain of area travelled through
- Surrounding buildings
- Signal conditions
- Time period

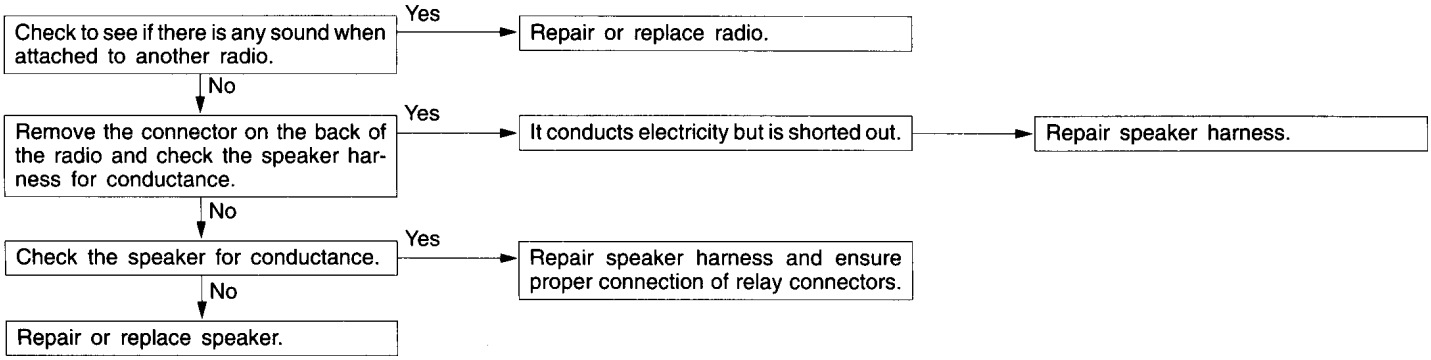
For this reason, if there are still problems with noise even after the measures described in steps A–1 to A–8 have been taken, get information on the factors listed above as well as determining whether the problem occurs with AM or FM, the station names, frequencies, etc., and contact a service centre.

B. RADIO

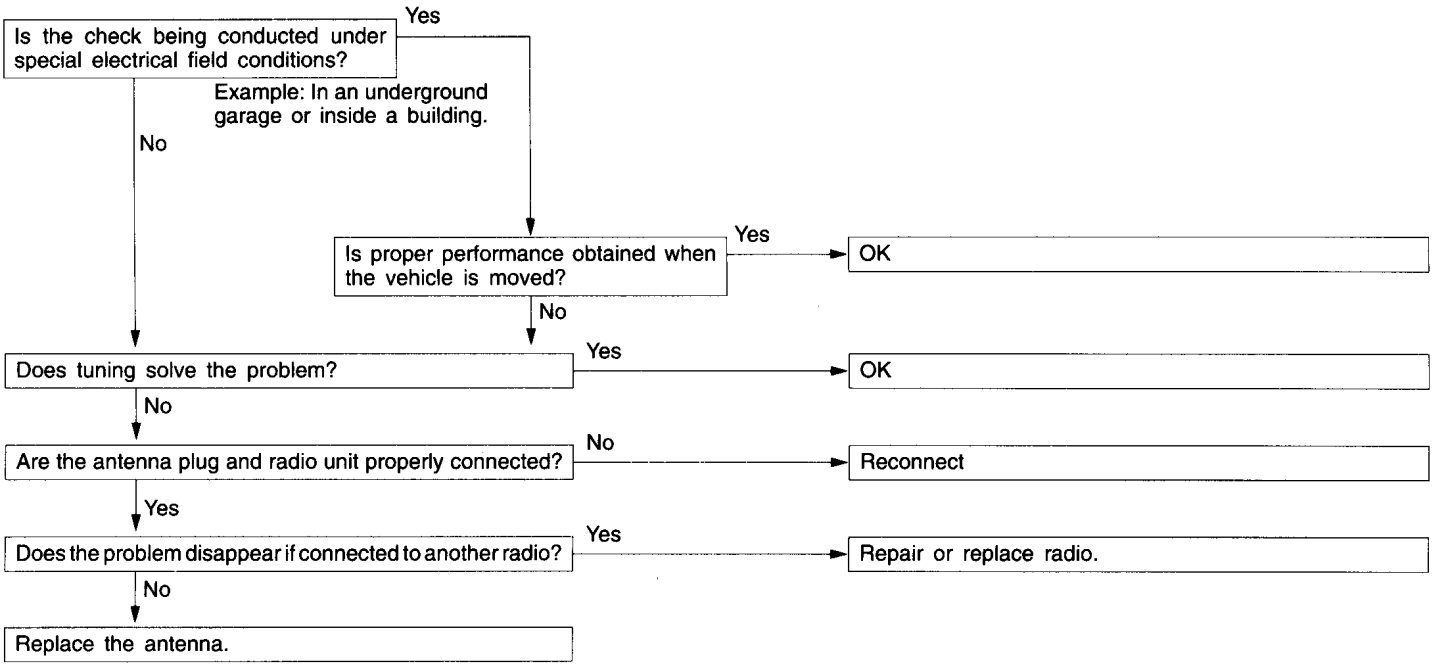
B–1 No power is supplied when the switch is set to ON.



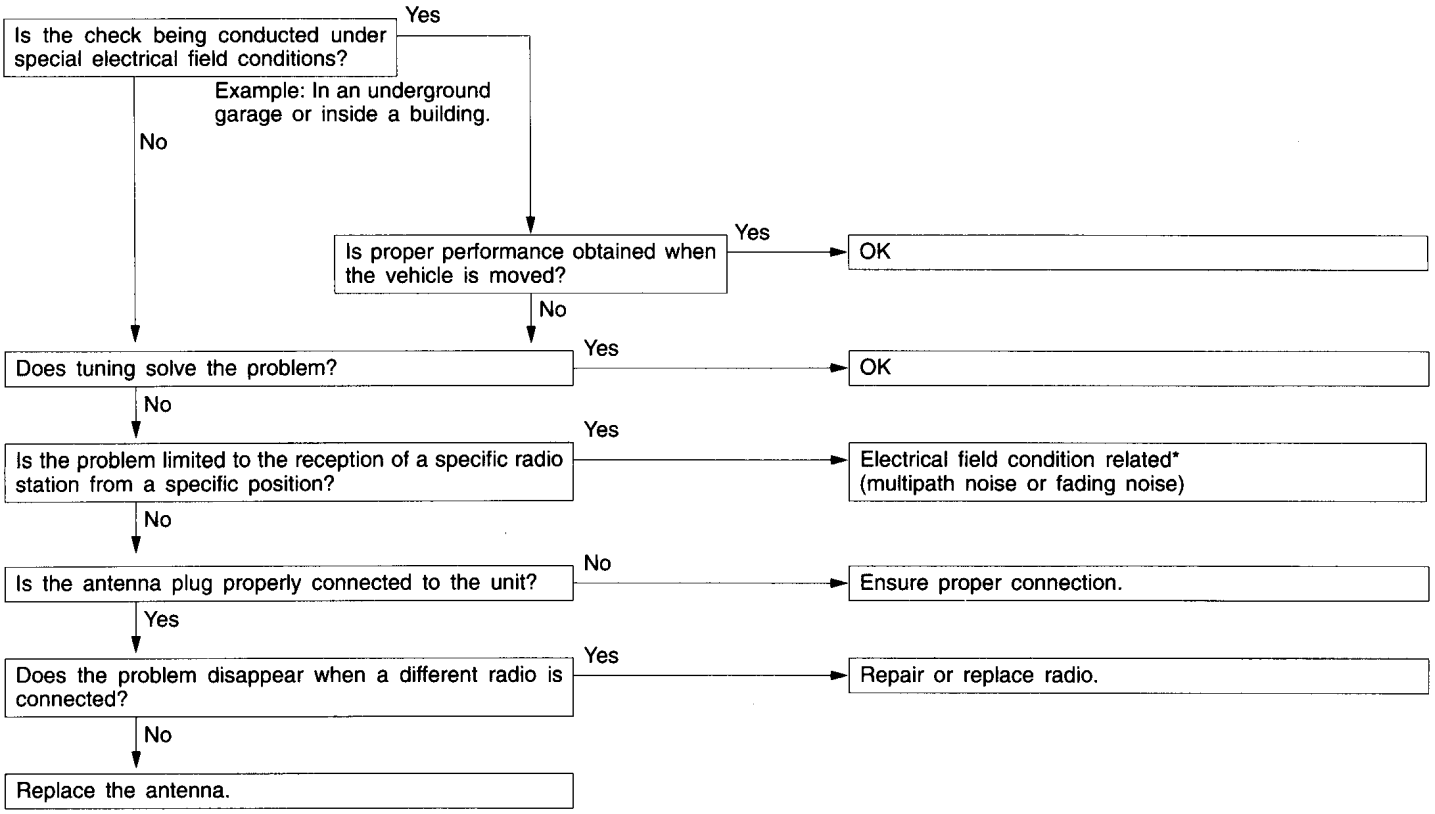
B–2 No sound from one speaker.



B–3 There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.

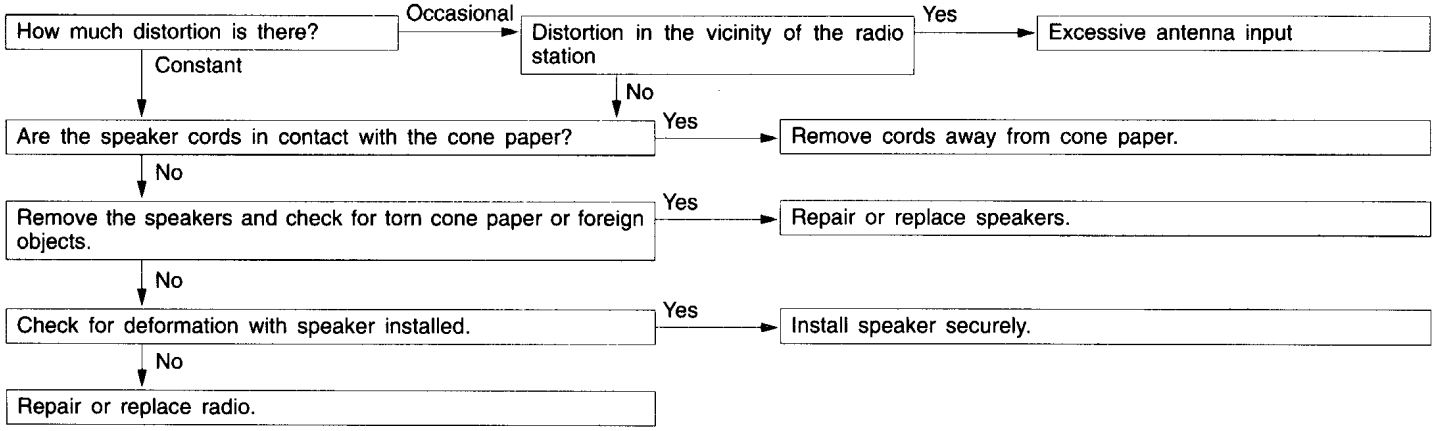


B–4 Insufficient sensitivity.

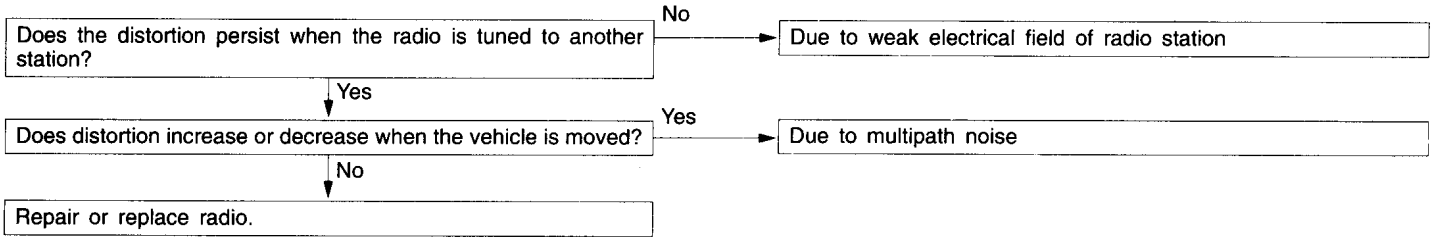


* For multipath noise and fading noise problems, refer to P. 54-63.

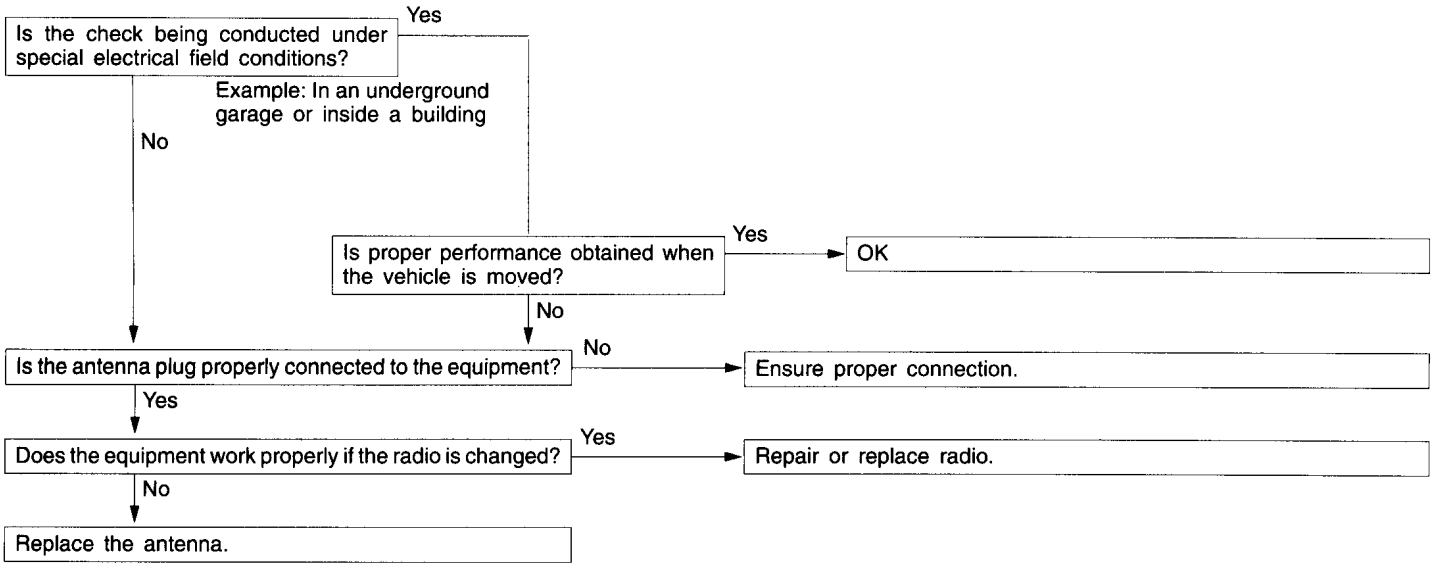
B–5 Distortion on AM or on both AM and FM.



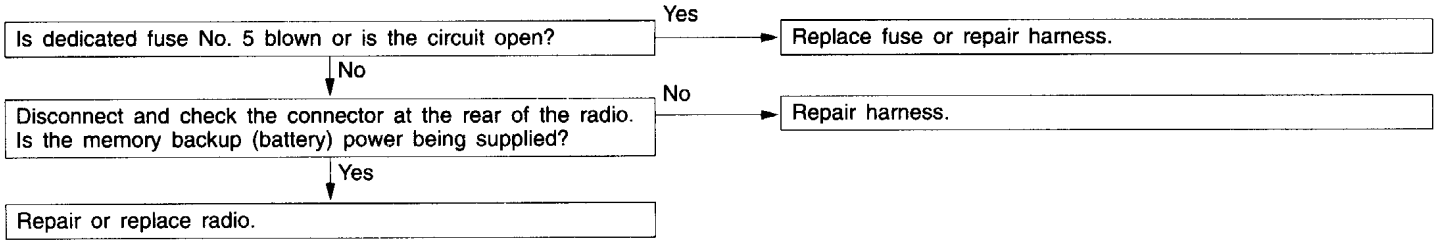
B–6 Distortion on FM only



B–7 Too few automatic select stations.

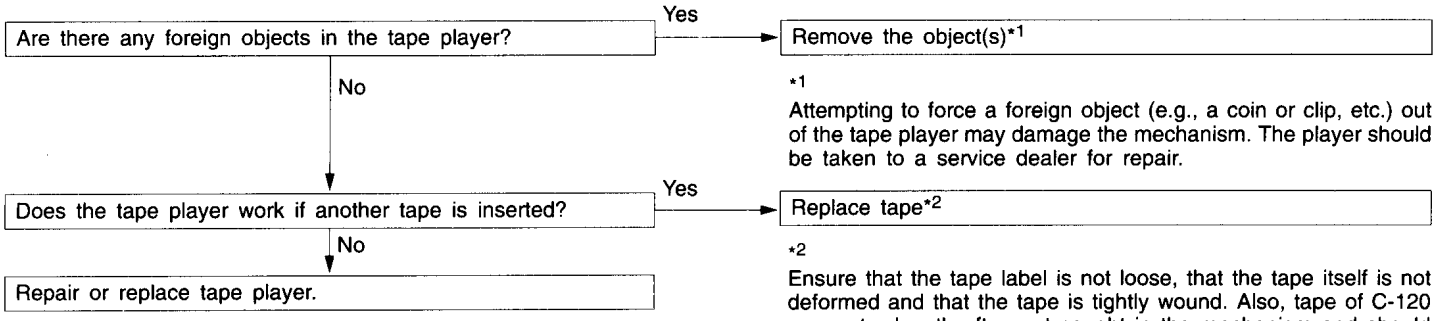


B–8 Insufficient memory (preset stations are erased).



C. TAPE PLAYER

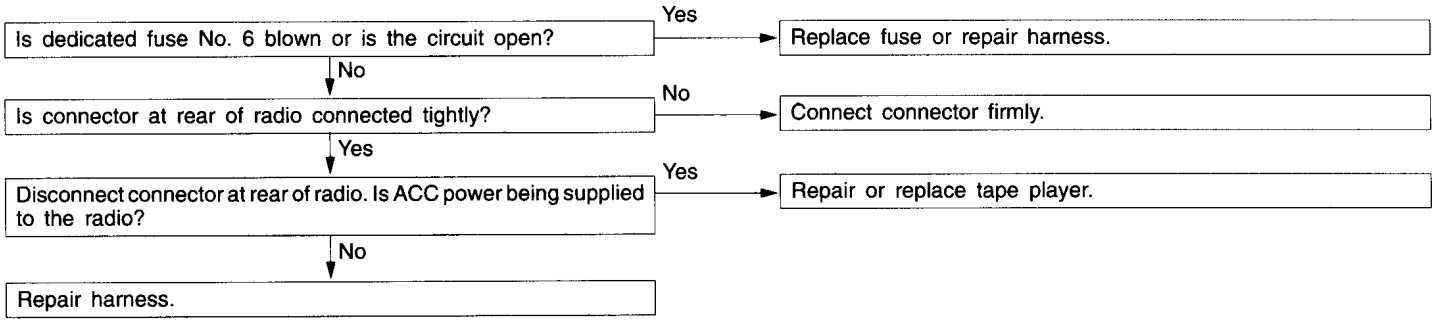
C–1 Cassette tape will not be inserted.



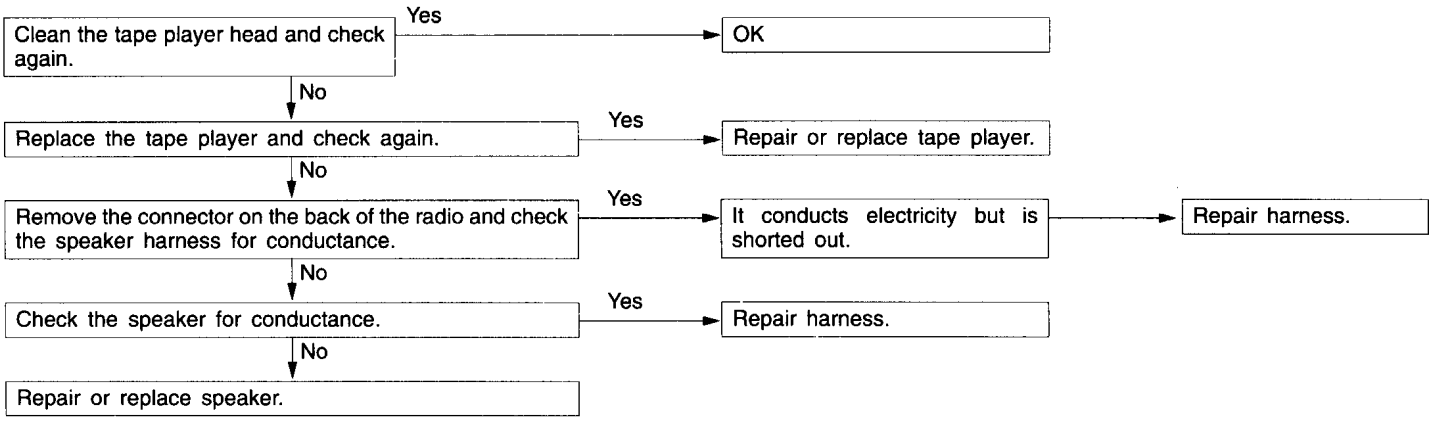
*1
Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the tape player may damage the mechanism. The player should be taken to a service dealer for repair.

*2
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

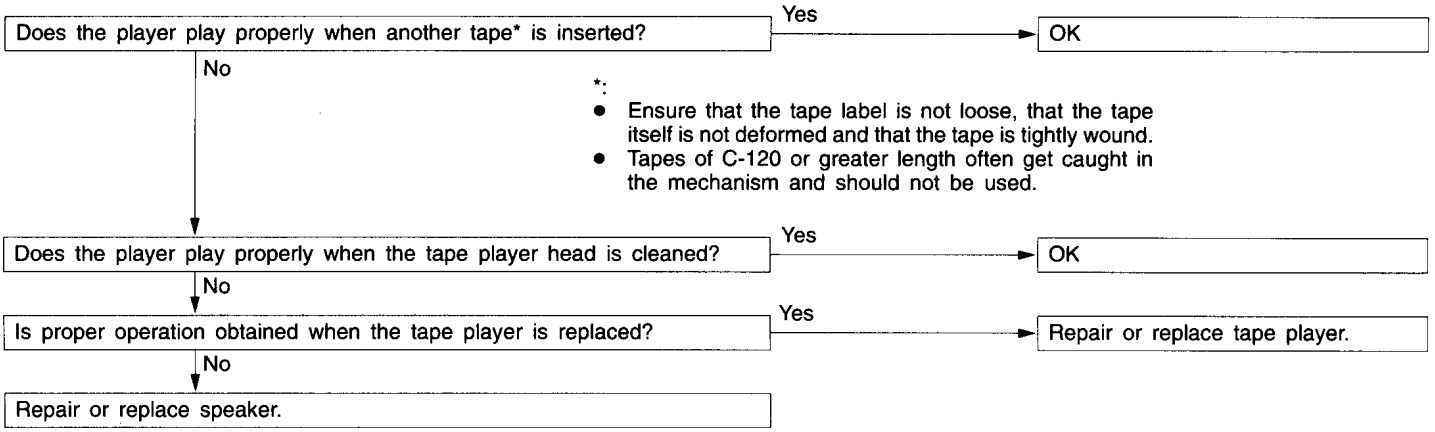
C–2 No sound (even after a tape has been inserted).



C–3 No sound from one speaker.



C–4 Sound quality is poor, or sound is weak.



C–5 Cassette tape will not be ejected.

The problems covered here are all the result of the use of a bad tape (deformed or not properly tightened) or of a malfunction of the tape player itself. Malfunctions involving the tape becoming caught in the mechanism and ruining the case are also possible, and attempting to force the tape out of the player can cause damage to the mechanism. The player should be taken to a service dealer for repair.

C–6 Uneven revolution. Tape speed is fast or slow.

Does the player play OK if the tape*1 is changed?
- Yes → OK
- No ↓

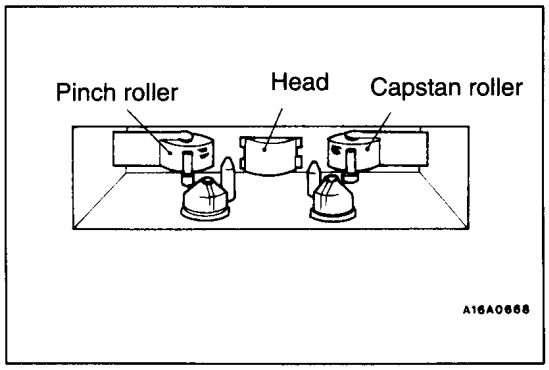
*1
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

Are there any foreign objects *2 inside the tape player?
- Yes → Remove foreign object(s).
- No ↓

*2
Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the tape player may damage the mechanism. The player should be taken to a service dealer for repair.

Is the head or capstan roller dirty? (Refer to the illustration below.)
- Yes → Clean.
- No ↓

Repair or replace tape player.



C–7 Faulty auto reverse.

Does the player play OK if the tape* is changed?
- Yes → OK
- No ↓

*:
- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound.
- Tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Does the problem only occur while the vehicle is being driven?
- No → Repair or replace tape player.
- Yes ↓

Is the tape player properly installed to the vehicle?
- No → Ensure tape player installation.
- Yes ↓

Repair or replace tape player.

C–8 Tape gets caught in mechanism*1.

*1
When the tape is caught in the mechanism, the case may not eject. When this occurs, do not try to force the tape out as this may damage the tape player mechanism. Take the cassette to a service dealer for repair.

Does the player play OK if the tape*2 is changed?

Yes → Tape used is bad.

No ↓

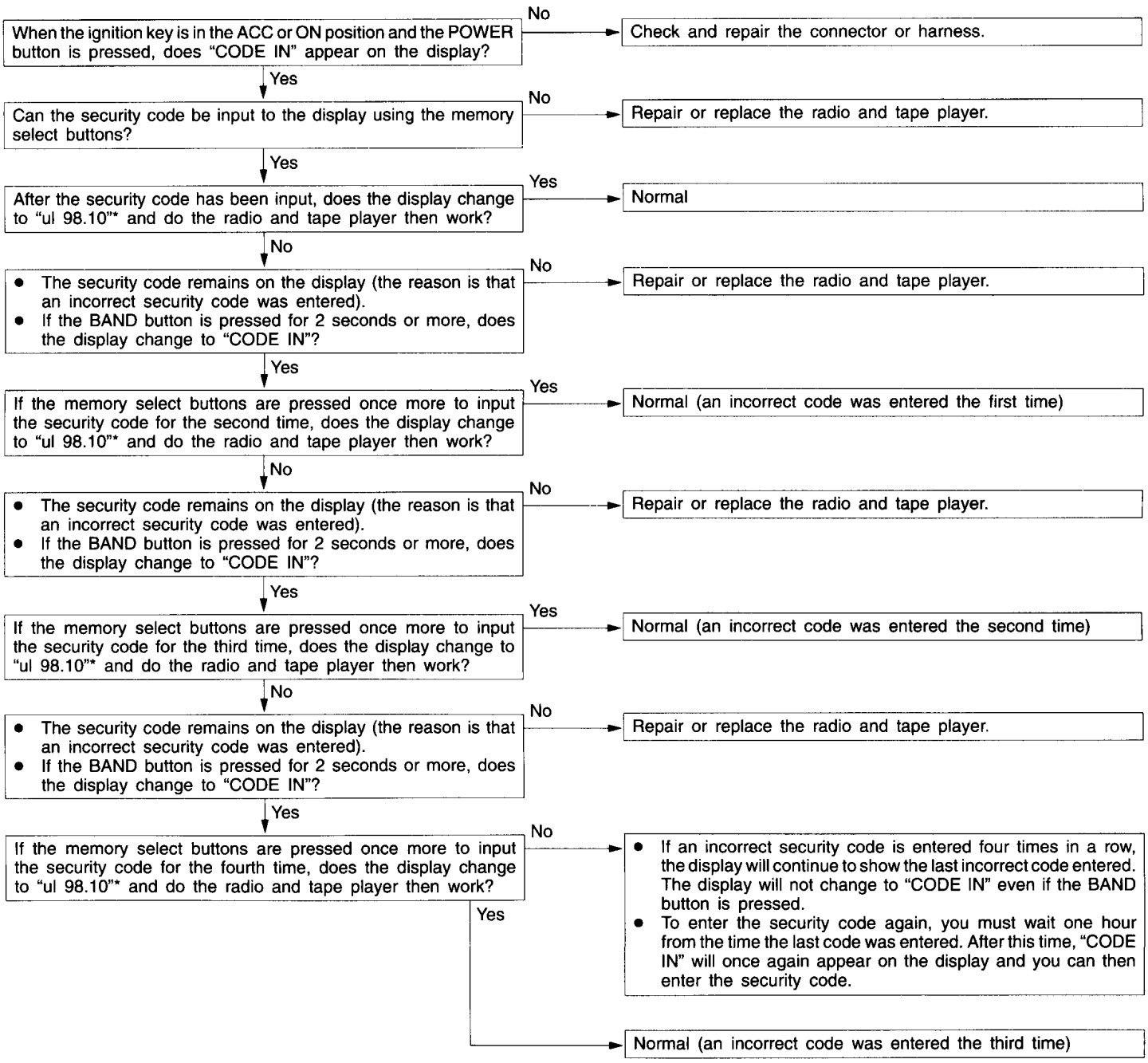
*2
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Repair or replace tape player.

RADIO AND TAPE PLAYER WITH ANTI-THEFT SYSTEM

120002307

- After the power supply to the radio and tape player has been interrupted for 5 seconds or more, the anti-theft system will prevent the radio and tape player from working, even if the power supply is restored. Problems with the anti-theft system can be found using the flow chart below.



NOTE

*: If approximately 4 – 5 hours have not yet passed since the power supply was interrupted, the radio and tape player display will show the last display which was recorded.

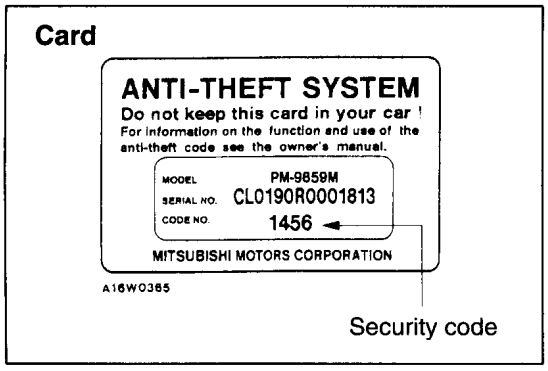
PROCEDURE FOR INPUT OF SECURITY CODE FOR RADIO AND TAPE PLAYER WITH ANTI-THEFT SYSTEM

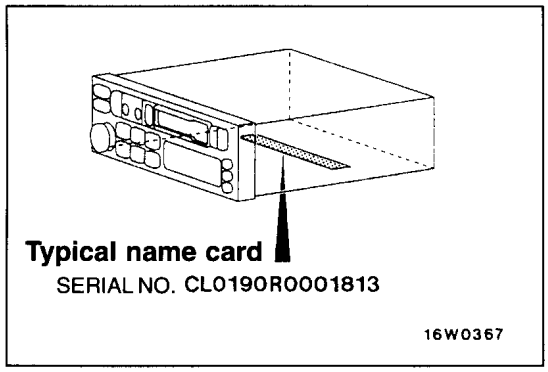
120002321

The radio and tape player does not operate in the following states.

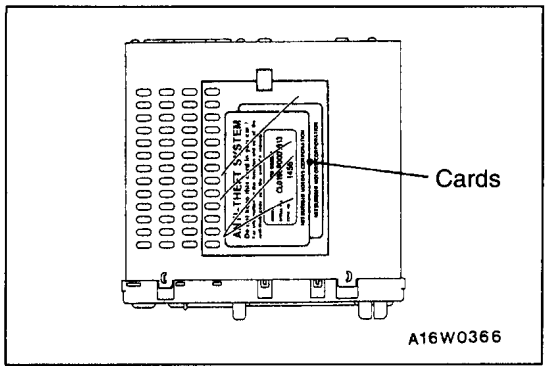
(1) Power supply to the radio and tape player has been suspended for more than 5 seconds continuously by removing the cable from the battery terminal or disconnecting the harness connectors.
(2) The power supply to the radio and tape player has been suspended for more than 5 seconds owing to blown fuse or discharged battery.
(3) The radio and tape player has been replaced.
If the radio and tape player does not operate for these causes, input the security code by the following procedure to operate it.

1. Using any of the following methods, confirm the security code.
   (1) Read the security code indicated on the cards retained by the car.



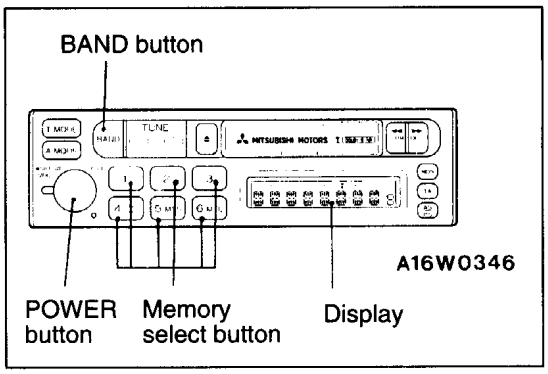


(2) If the security code is unknown owing to the user's loss of the cards.
   1. Remove the radio and tape player, refer to P.54-74.
   2. Read the serial No. stamped on the radio and tape player.
   3. Look up the security code (anti-theft code table) corresponding th the serial number and make inquiries to the authorized Mitsubishi dealer.

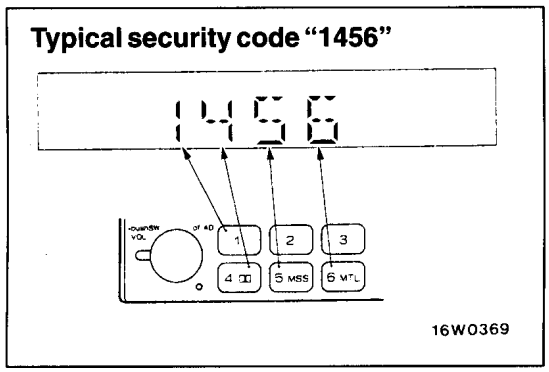


(3) When the radio and tape player is replaced
Read the security code on the cards attached to the upper surface of the replacement radio and tape player.

NOTE
Deliver the cards (two) to the user.



2. Return power supply for the radio and player to the normal state.
3. Turn the ignition key to the "ACC" or "ON" position.
4. Press the POWER button, and "CODE IN" will be displayed on the display.

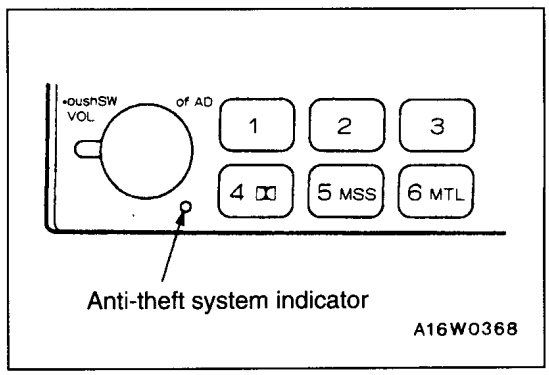


5. Press No. 1 through No. 6 momory select buttons and set the 4-digit security code indicated on the card.
6. If the entered code number is correct, the radio and tape player will operate and "ul 98.10" will be displayed in display.

NOTE
If approximately 4 – 5 hours have not yet passed since the power supply was interrupted, the radio and tape player display will show the last display which was recorded.

7. If the entered code is wrong, the radio and tape player will not operate and the display will remain unchanged.
8. When you will try to enter the security code again, press BAND button for more than 2 seconds. Then "CODE IN" will reapper in display. Repeat the steps 5 and 6 to enter the code number.

NOTE
(1) If a mistake is made in entry procedure of the security code, you can try the procedure four more times.
(2) After the setting has been attempted four times, "CODE IN" will appear on the display after approximately one hour has passed with the ignigion key in the ACC or ON position. Repeat steps 5 and 6 to enter the security code.



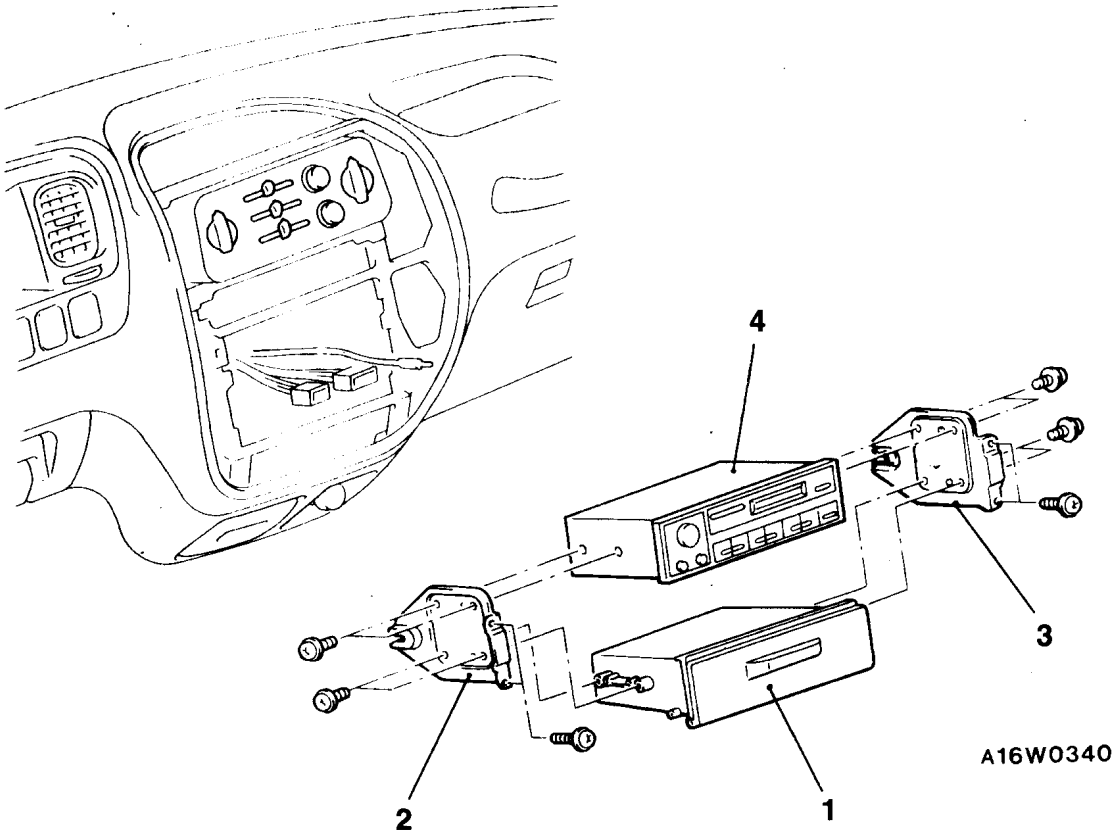
Anti-theft System Indicator

1. When the ignition key is turned to the "LOCK" position, the anti-theft system indicator blinks to indicate that the anti-theft system is active.
2. If you want to turn off this indicator, turn the ignition key to the "LOCK" position and press the BAND button for more than 2 seconds.
3. To let the indicator blink agin, repeat the above procedure.

RADIO AND TAPE PLAYER

120002092

REMOVAL AND INSTALLATION



Removal steps

- Centre panel (Refer to GROUP 52A – Instrument Panel.)

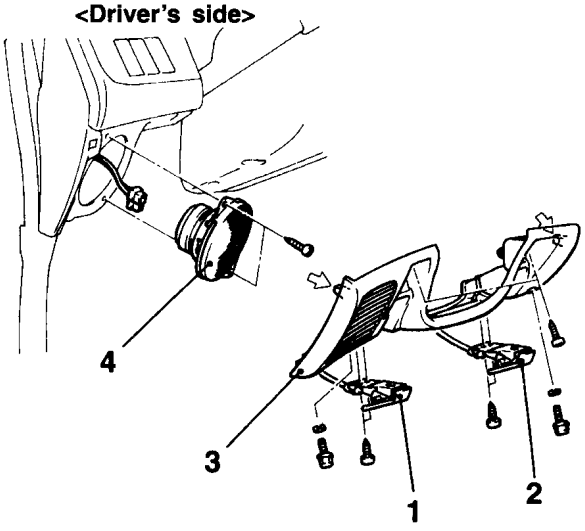
1. Box
2. Radio bracket (LH)
3. Radio bracket (RH)
4. Radio and tape player

SPEAKER

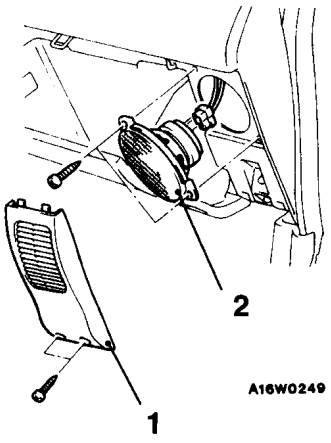
120000328

REMOVAL AND INSTALLATION

<Driver's side>



<Front Passenger's side>



NOTE
The ⇦ marks indicate the sheet metal clip installation positions.

Removal steps

<Driver's side>

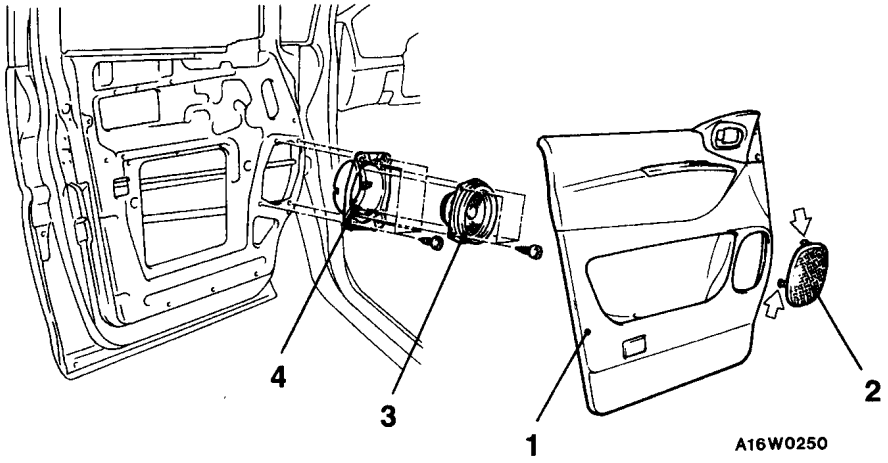
1. Hood lock release handle
2. Fuel lid lock release handle
3. Under cover
4. Speaker

<Front passenger's side>

- Cowl side trim (L.H.) (Refer to GROUP 52A – Trim.)

1. Speaker garnish
2. Speaker

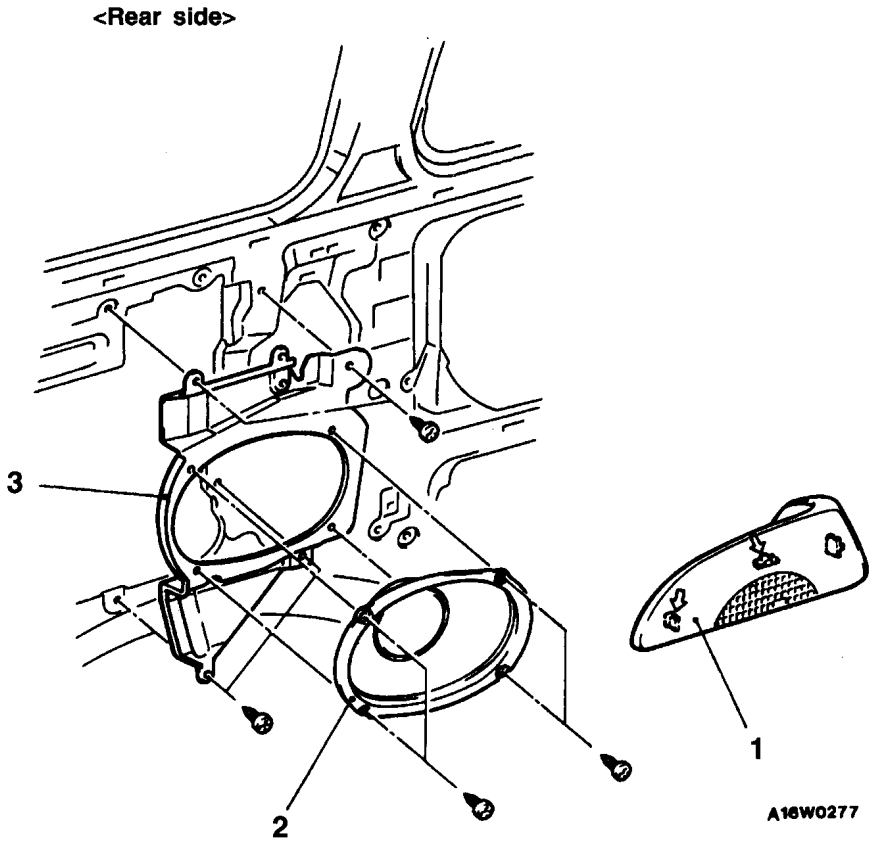
<Door Side>



NOTE
The ⇦ marks indicate the sheet metal clip installation positions.

Removal steps

1. Door trim (Refer to GROUP 42 – Door Trim and Waterproof Film.)
2. Speaker garnish
3. Speaker
4. Speaker cover



NOTE
The ⇦ marks indicate the sheet metal clip installation positions.

Removal steps

1. Speaker garnish
- Quarter trim, upper (Refer to GROUP 52A – Trim.)
2. Speaker
3. Speaker bracket

ANTENNA

120000329

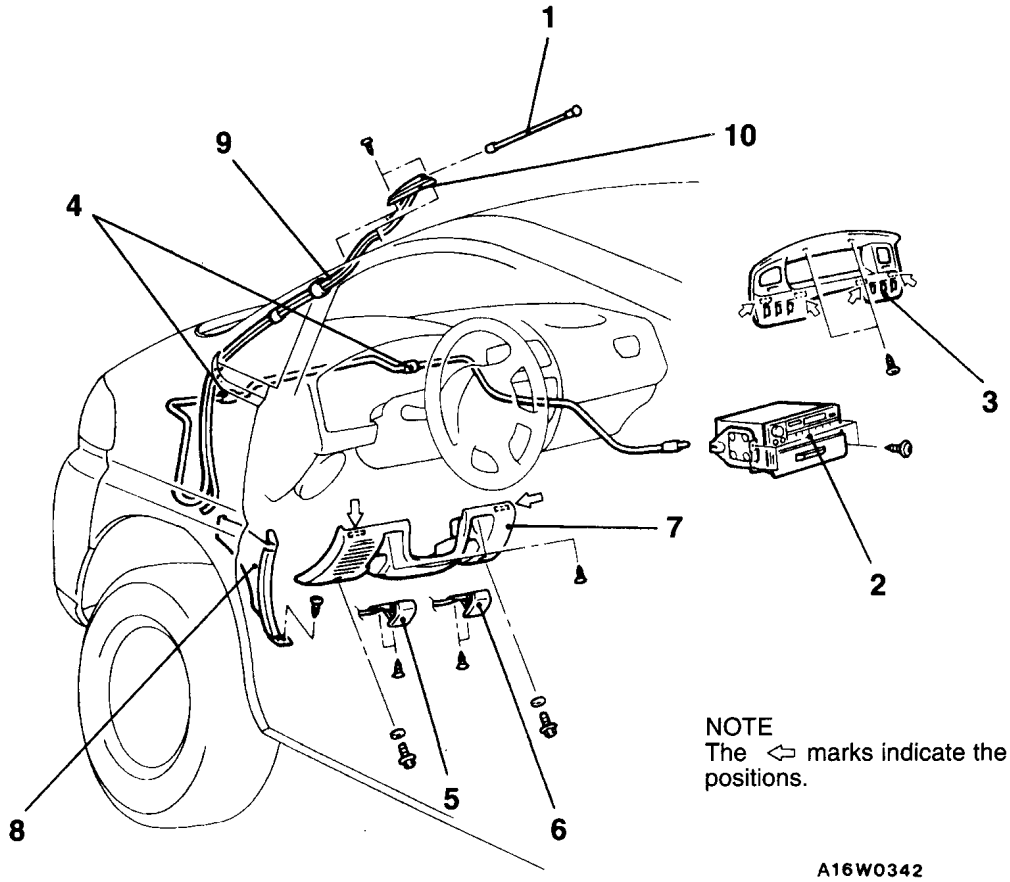
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of meter hood

ANTENNA

120002083

REMOVAL AND INSTALLATION



NOTE
The ⇦ marks indicate the sheet metal installation positions.

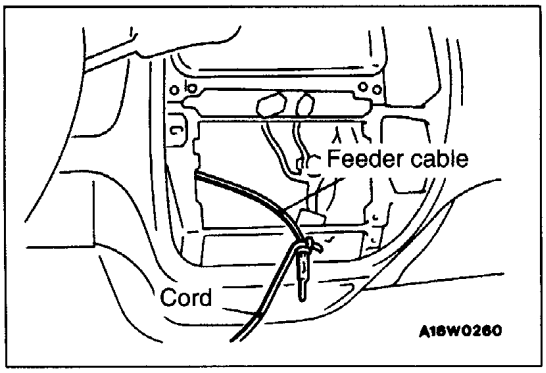
A16W0342

Removal steps

1. Pole
2. Radio and tape player
3. Meter hood
4. Clip
5. Hood lock release handle
6. Fuel lid lock release handle

◀A▶

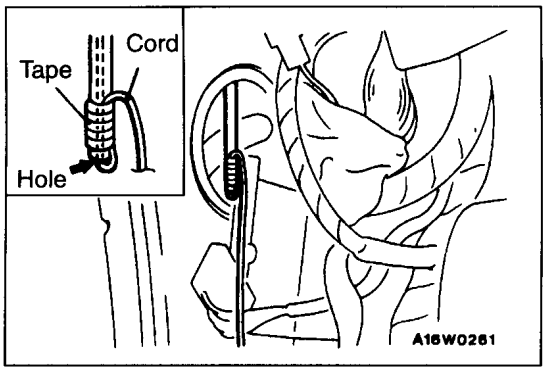
7. Under cover
8. Cowl side trim (Refer to GROUP 52A – Trim.)
9. Antenna base
10. Base



REMOVAL SERVICE POINT

◀A▶ ANTENNA BASE REMOVAL

(1) Tie a cord to the end of the feeder cable.



(2) Pull out the antenna base until the end of the drain pipe can be seen.
(3) Pass the cord through the hole in the end of the drain pipe and wrap it with vinyl tape.

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

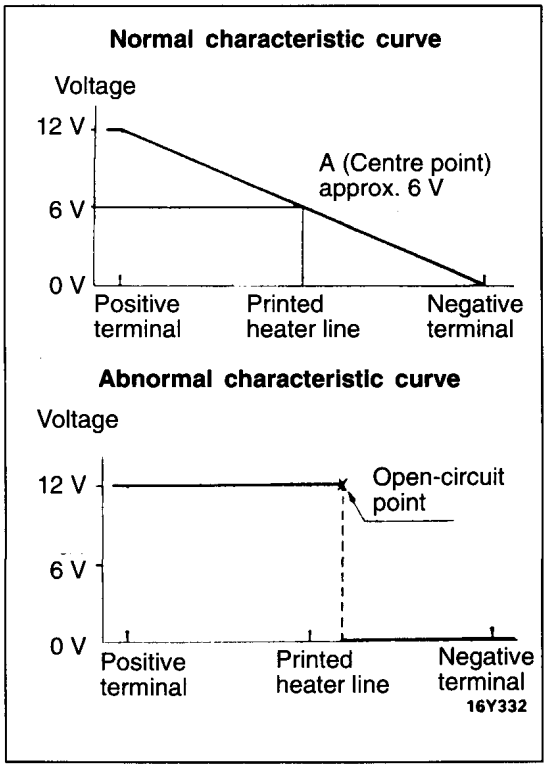
(4) Pull out the antenna base little by little to remove it.

REAR WINDOW DEFOGGER

120000331

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	• Removal of centre panel • Removal of multi-meter panel • Removal of tray



SERVICE ADJUSTMENT PROCEDURE

120000332

PRINTED-HEATER LINE INSPECTION

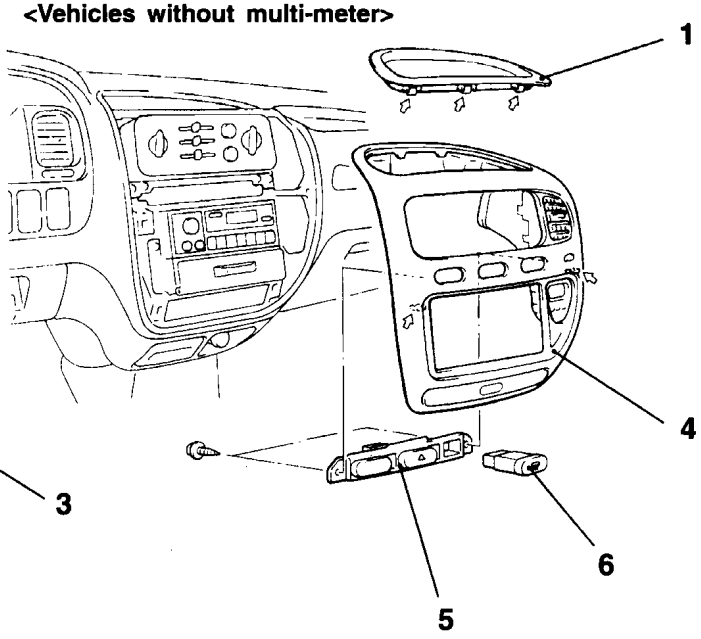
(1) Run engine at 2,000 r/min. Check heater element with battery at full.
(2) Turn ON rear window defogger switch. Measure heater element voltage with circuit tester at rear window glass centre A.
Condition is good if it indicates about 6V.
(3) If 12 V is indicated at A, there is a break in the negative 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

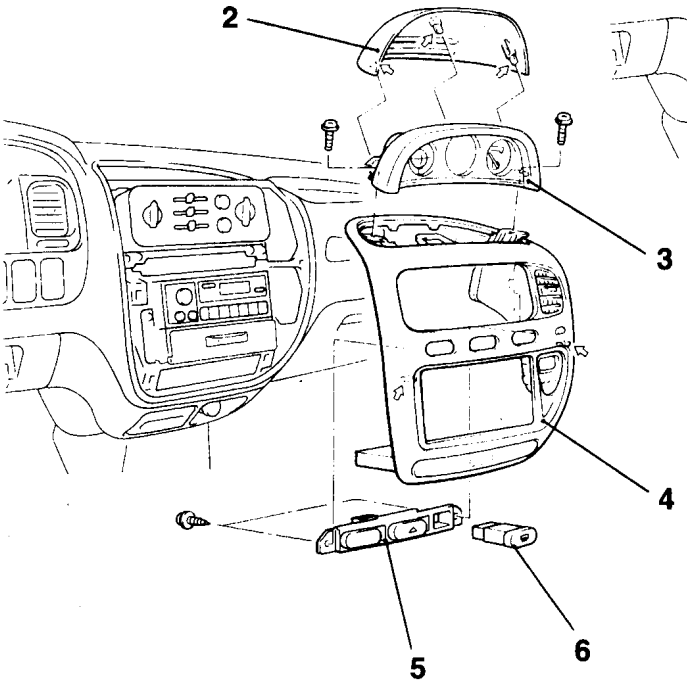
120002128

REMOVAL AND INSTALLATION

<Vehicles without multi-meter>



<Vehicles with multi-meter>



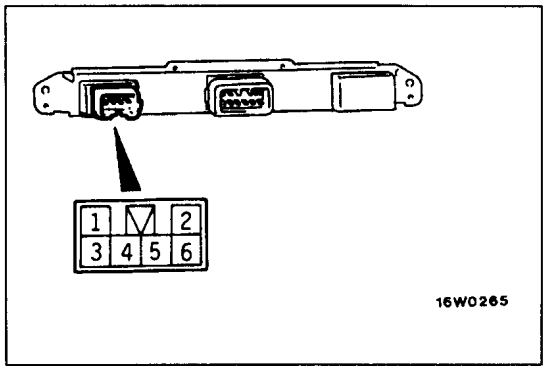
NOTE
The ⇦marks indicate the sheet metal clip installation positions.

A16W0345

Removal steps

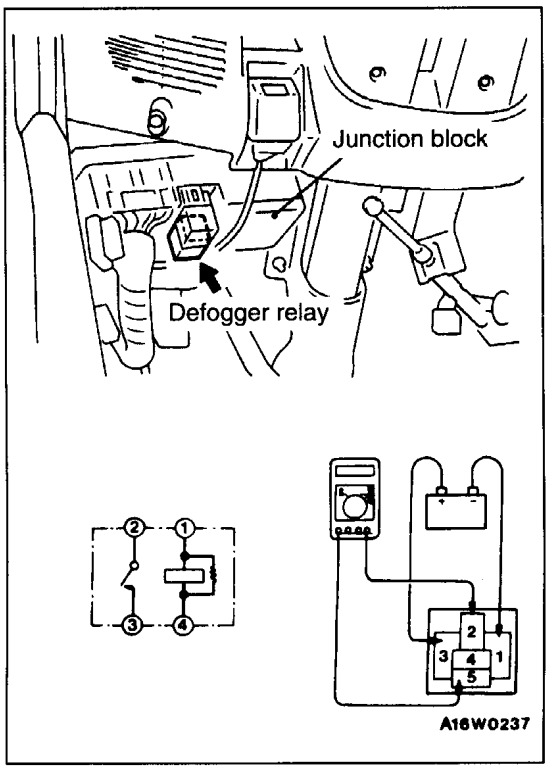
1. Tray
2. Multi-meter panel
3. Multi-meter
4. Centre panel (Refer to GROUP 52A–Instrunment Panel.)
5. Switch holder
6. Rear window defogger switch

INSPECTION



DEFOGGER SWITCH CONTINUITY INSPECTION

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



REAR WINDOW DEFOGGER RELAY CONTINUITY INSPECTION

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

HEATER, AIR CONDITIONER AND VENTILATION

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120002254

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

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GENERAL INFORMATION

120002255

FRONT HEATER

The front heater system uses a three-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.

REAR HEATER

Two types of rear heater system are used: a built-in type which is installed in the under floor, and an under seat type which is installed in the rear floor.

SINGLE A/C

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.

DUAL A/C

The rear A/C unit is installed below the rear floor, and the main switch is provided at both the driver's seat and the rear seat so that operation can be from either position.
The overhead dual A/C is constructed so that it mounts on the ceiling and blows cool air from the ceilig to the passenger seats.

Items		Specifications
Front heater unit		Three-way-flow full-air-mix system
Rear heater unit	Built-in type	Air-mix system
	Under seat type	General-purpose water temperature type
Front heater performance kJ/h		18,837
Rear heater performance kJ/h	Built-in type	13,814
	Under seat type	12,558
Compressor model	Single A/C	Inclined-plate type <DKS-15CH>
	Dual A/C	Scroll type <MSC-130CV>
Front A/C cooling performance kJ/h	Single A/C	17, 581
	Dual A/C	18,000
Rear A/C cooling performance kJ/h	Built-in type	11,721
	Overhead type	8,372

SAFETY PRECAUTIONS

120000484

Because R-134a refrigerant is a hydrofluorocarbon (HFC) which contains hydrogen atoms in place of chlorine atoms, it will not cause damage to the ozone layer.
Ozone filters out harmful radiation from the sun. To assist in protecting the ozone layer, Mitsubishi Motors Corporation recommends an R-134a refrigerant recycling device.
Refrigerant R-134a is transparent and colorless 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 cool 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 adding R-134a into the refrigeration system keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

Caution
1. **A leak detector for designed 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

120002256

Items		Standard value	Remarks
Idle speed r/min.	4G63–M/T	700±50	"N" range
	4G63–A/T	750±50	"P" range
	4G64	800±50	"N" or "P" range
	4D56	750±30	
Idle-up speed r/min.	4G63	850–950	
	4D56	900–1,000	
Idle-up solenoid valve Ω		Approx. 40	–
Resistor (for blower motor) Ω	HI–LO	1.96±7%	Between terminals 2–3
	HI–ML	0.95±7%	Between terminals 2–1
	HI–MH	0.33±7%	Between terminals 2–4
Resistor (for air outlet changeover damper motor potentiometer) kΩ		Approx. 1–3	Between terminals 6–8 or Between terminals 7–8
Resistor (for pseudo signal) (Vehicles with overhead A/C) kΩ		4.7	–
Resistor (for rear blower motor – Built-in type) Ω	HI–LO	1.56±7%	Between terminal 4–3
	HI–ML	0.86±7%	Between terminals 4–6
	HI–MH	0.44±7%	Between terminals 4–5
Resistor (for rear blower motor – Under seat type) Ω		Approx. 1.7	Between terminals 2–3
Air gap (Magnetic clutch) mm		0.3–0.6	–
Engine coolant temperature switch (for A/C cut-off) °C	ON (continuity)	108 or less	–
	OFF (no continuity)	112–118 or more	–
Engine coolant temperature switch (for condenser fan) <4D56> °C	ON (continuity)	100–104 or more	–
	OFF (no continuity)	97 or less	–
Engine coolant temperature switch (for condenser fan) <4G63, 4G64> °C	ON (continuity)	99–105 or more	–
	OFF (no continuity)	95 or less	–

LUBRICANTS

120002657

Items		Quantity	Specified lubricants
Single A/C	Compressor refrigerant unit lubricant mℓ	180	ZXL 100PG
	Each connection of refrigerant line	As required	
	Refrigerant g	Approx. 650	R134a (HFC-134a)
Dual A/C	Compressor refrigerant unit lubricant mℓ	240	SUN PAG 56
	Each connection of refrigerant line Lip seal of the compressor	As required	
	Refrigerant g	Approx. 950	R134a (HFC-134a)

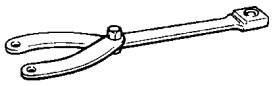
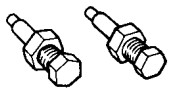
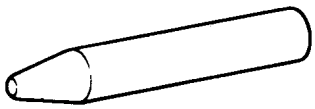
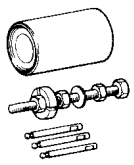
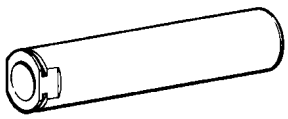
SEALANT

120000487

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

SPECIAL TOOLS

120000488

Tool	Number	Name	Use
	MB991367	Special spanner	Removal and installation of armature mounting nut of compressor
	MB991386	Pin	
	MB991459	Lip seal installer guide	Installation of lip seal <Dual A/C>
	MB991456	Bearing puller	Removal of compressor bearing <Dual A/C>
	MB991458	Lip seal installer and remover	Removal and installation of lip seal <Dual A/C>

TROUBLESHOOTING

120002257

TROUBLESHOOTING PROCEDURE

(1) Check that the air ducts and rods are not off.
(2) Check that the connectors are connected securely and that there are no blown fuses.
(3) In carrying out the troubleshooting procedure, first look up the Troubleshooting Quick-Reference Chart to know the inspection items and then start the inspection procedure detailed in the following pages.
(4) When checking components, be sure to disconnect the connectors first.

TROUBLESHOOTING QUICK-REFERENCE CHART

1. Front Heater and Front A/C

Inspection item	Trouble symptom 1	Trouble symptom 2	Trouble symptom 3
	When the ignition switch is "ON", the A/C does not operate.	When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	Blower fan and motor don't turn.
Fuse	1		1
Connector (including harness)	2		2
Refrigerant amount	3	1	
A/C compressor relay	4	7	
Magnetic clutch	5	8	
Dual pressure switch	6	2	
Front A/C switch	7		
Front blower motor relay			3
Front blower motor			4
Front blower switch	8		5
Resistor (for front blower motor)			6
Front air thermo sensor	9	3	
Thermostat <Single A/C>	10	4	
Refrigerant temperature switch <Dual A/C>	11	5	
Engine coolant temperature switch <for A/C cut-off>	12	6	
Front magnetic valve <Dual A/C>	13	9	
A/C-ECU <Dual A/C>	14	10	
Engine ECU <Petrol-powered vehicles>	15		

NOTE
Numbers indicate the inspection order.

Trouble symptom	Problem cause	Remedy	Reference page
When the ignition switch is "ON", the A/C does not operate.	1. Fuse blown	Replace the fuse	–
	2. Harness or connector is defective	Repair the harness or connector	–
	3. Refrigerant leak or overfilling of refrigerant	Replenish the refrigerant, repair the leak or take out some of the refrigerant	P.55-17, 20
	4. A/C compressor relay is defective	Replace A/C compressor relay	P.55-24
	5. Magnetic clutch is defective	Replace the armature plate, rotor or clutch coil	P.55-63, 65
	6. Dual pressure switch is defective	Replace the dual pressure switch	P.55-24, 73, 74
	7. Front A/C switch is defective	Replace the front A/C switch	P.55-30, 31
	8. Front blower switch is defective	Replace the front blower switch	P.55-30, 33
	9. Front air thermo sensor is defective	Replace the front air thermo sensor	P.55-39
	10. Thermostat is defective <Single A/C>	Replace the thermostat	P.55-39
	11. Refrigerant temperature switch is defective <Dual A/C>	Replace the A/C compressor assembly	P.55-62, 67
	12. Engine coolant temperature switch (for A/C cut-off) is defective	Replace the engine coolant temperature switch	P.55-80
	13. Front magnetic valve is defective <Dual A/C>	Replace the front magnetic valve	P.55-74, 78
	14. A/C-ECU is defective <Dual A/C>	Replace the A/C-ECU	P.55-15, 37
	15. Engine ECU is defective <Petrol-powered vehicles>	Replace the engine ECU	–
When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	1. Refrigerant leak	Replenish the refrigerant and repair the leak	P.55-17
	2. Dual pressure switch is defective	Replace the dual pressure switch	P.55-24, 73, 74
	3. Front air thermo sensor is defective	Replace the front air thermo sensor	P.55-39
	4. Thermostat is defective <Single A/C>	Replace the thermostat	P.55-39
	5. Refrigerant temperature switch is defective <Dual A/C>	Replace the A/C compressor assembly	P.55-62, 67
	6. Engine coolant temperature switch (for A/C cut-off) is defective	Replace the engine coolant temperature switch	P.55-80, 81

Trouble symptom	Problem cause	Remedy	Reference page
When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	7. A/C compressor relay is defective	Replace the A/C compressor relay	P.55-24
	8. Magnetic clutch is defective	Replace the armature plate, rotor or clutch coil	P.55-63, 65
	9. Front magnetic valve is defective <Dual A/C>	Replace the front magnetic valve	P.55-74, 78
	10. A/C-ECU is defective	Replace the A/C-ECU	P.55-15, 37
Blower fan and motor don't turn.	1. Fuse blown	Replace the fuse.	–
	2. Harness or connector is defective	Repair the harness or connector	–
	3. Front blower motor relay is defective	Replace the front blower motor relay	P.55-25
	4. Front blower motor is defective	Replace the front blower motor	P.55-35, 36
	5. Front blower switch is defective	Replace the front blower switch	P.55-30, 31, 33
	6. Resistor (for front blower motor) is defective	Replace the resistor	P.55-35, 36

2. Rear Heater and Rear A/C (Built-in Type)

Inspection item	Trouble symptom 1	Trouble symptom 2	Trouble symptom 3	Trouble symptom 4
	Rear A/C does not operate independently.	When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	Blower fan and motor don't turn.	Blower change-over is not possible.
Connector (including harness)	1	1	1	1
Rear A/C switch	2			
Rear blower motor relay	3		2	
Rear magnetic valve	4	2		
Rear air thermo sensor	5	3		
Resistor (for rear blower motor)				2
Rear blower motor			3	4
Rear blower switch			4	3
Rear heater switch (rear panel side)	6		5	
Rear heater switch (front panel side)	7		6	
A/C-ECU	8	4		

NOTE
Numbers indicate the inspection order.

Trouble symptom	Problem cause	Remedy	Reference page
Rear A/C does not operate independently.	1. Harness or connector is defective	Repair the harness or connector	–
	2. Rear A/C switch is defective	Replace the rear A/C switch	P.55-40, 41
	3. Rear blower motor relay is defective	Replace the rear blower motor relay	P.55-25
	4. Rear magnetic valve is defective	Replace the rear magnetic valve	P.55-75, 78
	5. Rear air thermo sensor is defective	Replace the rear air thermo sensor	P.55-45, 46
	6. Rear heater switch (rear panel side) is defective	Replace the rear heater switch (rear panel side)	P.55-40, 41
	7. Rear heater switch (front panel side) is defective	Replace the rear heater switch (front panel side)	P.55-30, 31
	8. A/C-ECU is defective	Replace the A/C-ECU	P.55-15, 37
When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	1. Harness or connector is defective.	Repair the harness or connector	–
	2. Rear magnetic valve is defective	Replace the rear magnetic valve	P.55-75, 78
	3. Rear air thermo sensor is defective	Replace the rear air thermo sensor	P.55-45, 46
	4. A/C-ECU is defective	Replace the A/C-ECU	P.55-15, 37

Trouble symptom	Problem cause	Remedy	Reference page
Blower fan and motor don't turn.	1. Harness or connector is defective	Repair the harness or connector	–
	2. Rear blower motor relay is defective	Replace the rear blower motor relay	P.55-25
	3. Rear blower motor is defective	Replace the rear blower motor	P.55-52, 53
	4. Rear blower switch is defective	Replace the rear blower switch	P.55-40, 41
	5. Rear heater switch (rear panel side) is defective	Replace the rear heater switch (rear panel side)	P.55-40, 41
	6. Rear heater switch (front panel side) is defective	Replace the rear heater switch (front panel side)	P.55-30, 31
Blower changeover is not possible.	1. Harness or connector is defective	Repair the harness or connector	–
	2. Resistor (for rear blower motor) is defective	Replace the resistor	P.55-52, 53
	3. Rear blower switch is defective	Replace the rear blower switch	P.55-40, 41
	4. Rear blower motor is defective	Replace the rear blower motor	P.55-52, 53

3. Rear Heater (Under Seat Type)

Inspection item	Trouble symptom 1	Trouble symptom 2
	Blower fan and motor don't turn.	Air volume cannot be controlled in two steps.
Fuse blown	1	
Connection (including harness)	2	
Rear blower motor	3	
Rear heater switch	4	1
Rear blower resistor		2
Rear blower motor HI relay	5	3
Rear blower motor LO relay	6	4

NOTE
Numbers indicate the inspection order.

Trouble symptom	Problem cause	Remedy	Reference page
Blower fan and motor don't turn.	1. Fuse blown	Replace the fuse	–
	2. Harness or connector is defective	Repair the harness or connector	–
	3. Rear blower motor is defective	Replace the rear blower motor	P.55-55, 56
	4. Rear heater switch is defective	Replace the rear heater switch	P.55-30, 31
	5. Rear blower motor HI relay is defective	Replace the rear blower motor HI relay	P.55-25
	6. Rear blower motor LO relay is defective	Replace the rear blower motor LO relay	P.55-55, 56

Trouble symptom	Problem cause	Remedy	Reference page
Air volume cannot be controlled in two steps.	1. Rear heater switch is defective	Replace the rear heater switch	P.55-30, 31
	2. Rear blower resistor is defective	Replace the rear blower resistor	P.55-55
	3. Rear blower motor HI relay is defective	Replace the rear blower motor HI relay	P.55-25
	4. Rear blower motor LO relay is defective	Replace the rear blower motor LO relay	P.55-55, 56

4. Rear A/C (Overhead type)

Inspection item	Trouble symptom 1	Trouble symptom 2	Trouble symptom 3	Trouble symptom 4
	Rear cooler does not operate independently.	Temperature cannot be controlled by the blower air temperature control switch.	Blower fan and motor don't turn.	Blower change-over is not possible.
Fuse	1		1	
Connector (including harness)	2	1	2	1
Rear A/C switch	3		3	
Rear blower motor relay	4		4	
Resistor (for pseudo signal)	5	2		
Rear magnetic valve	6	3		
Rear air thermo sensor	7	4		
Blower air temperature control switch		5		
Resistor (for rear blower motor)				2
Rear blower motor			5	4
Rear blower switch			6	3
Rear cooler ECU	8	6		
A/C-ECU	9	7		

NOTE
Numbers indicate the inspection order.

Trouble symptom	Problem cause	Remedy	Reference page
Rear cooler does not operate independently.	1. Fuse blown	Replace the fuse	–
	2. Harness or connector is defective	Repair the harness or connector	–
	3. Rear A/C switch is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	4. Rear blower motor relay is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	5. Resistor (for pseudo-signal) is defective	Replace the resistor (for pseudo signal)	P.55-37, 38
	6. Rear magnetic valve is defective	Replace the rear magnetic valve	P.55-76, 77, 78
	7. Rear air thermo sensor is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	8. Rear cooler ECU is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	9. A/C-ECU is defective	Replace the A/C-ECU	P.55-15, 37
Temperature cannot be controlled by the blower air temperature control switch.	1. Harness or connector is defective	Repair the harness or connector	–
	2. Resistor (for pseudo-signal) is defective	Replace the resistor (for pseudo signal)	P.55-37, 38
	3. Rear magnetic valve is defective	Replace the rear magnetic valve	P.55-76, 77, 78
	4. Rear air thermo sensor is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	5. Blower air temperature control switch is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	6. Rear cooler ECU is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	7. A/C-ECU is defective	Replace the A/C-ECU	P.55-15, 37
Blower fan and motor don't turn.	1. Fuse blown	Replace the fuse	–
	2. Harness or connector is defective	Repair the harness or connector	–
	3. Rear A/C switch is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	4. Rear blower motor relay is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	5. Rear blower motor is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	6. Rear blower switch is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
Blower changeover is not possible.	1. Harness or connector is defective	Repair the harness or connector	–
	2. Resistor (for rear blower motor) is defective	Replace the resistor	P.55-37, 38
	3. Rear blower switch is defective	Replace the rear evaporator assembly	P.55-47, 48, 49
	4. Rear blower motor is defective	Replace the rear evaporator assembly	P.55-47, 48, 49

5. A/C Auxilary Components

Inspection item	Trouble symptom 1	Trouble symptom 2	Trouble symptom 3
	Front condenser fan motor doesn't turn.	When the A/C is operating, side condenser fan does not turn. <Dual A/C>	When the A/C is operating, idle engine speed doesn't rise. <4G63, 4D56>
Fuse	1	1	
Connector (including harness)	2	2	1
Front condenser fan relay	3		
Side condenser fan relay		3	
Front condenser fan motor	4		
Side condenser fan motor		4	
A/C-ECU	5	5	
Engine coolant temperature switch (for condenser fan)	6		
Idle-up solenoid valve <4G63, 4D56>			2

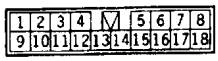
NOTE
Numbers indicate the inspection order.

Trouble symptom	Problem cause	Remedy	Reference page
Front condenser fan motor doesn't turn.	1. Fuse blown	Replace the fuse	–
	2. Harness or connector is defective	Repair the harness or connector	–
	3. Front condenser fan relay is defective	Replace the front condenser fan relay	P.55-24
	4. Front condenser fan motor is defective	Replace the front condenser fan motor	P.55-69, 70
	5. A/C-ECU is defective	Replace the A/C-ECU	P.55-15, 37
	6. Engine coolant temperature switch (for condenser fan) is defective	Replace the engine coolant temperature switch	P.55-80, 81
When the A/C is operating, side condenser fan does not turn. <Dual A/C>	1. Fuse blown	Replace the fuse	–
	2. Harness or connector is defective	Repair the harness or connector	–
	3. Side condenser fan relay is defective	Replace the side condenser fan relay	P.55-24
	4. Side condenser fan motor is defective	Replace the side condenser fan motor	P.55-71, 72
	5. A/C-ECU is defective	Replace the A/C-ECU	P.55-15, 37
When the A/C is operating, idle engine speed doesn't rise. <4G63, 4D56>	1. Harness or connector is defective	Repair the harness or connector	–
	2. Idle-up solenoid valve is defective	Replace the idle-up solenoid valve	P.55-28, 82

A/C-ECU TERMINALS INSPECTION <DUAL A/C>

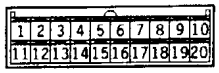
120002258

<Overhead type>



20W0241

<Built-in type>



20W0242

00000545

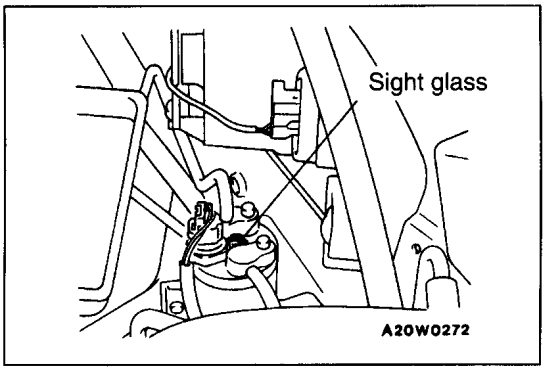
Terminal No.	Check Item	Check Condition	Normal Condition
1	Ignition switch input	When ignition switch is ON	System voltage
2	Front A/C switch input	When the ignition switch, front blower switch and front A/C switch are all ON	System voltage
3	Front magnetic valve	When ignition switch is ON	System voltage
4	A/C output	Turn off A/C.	0V
		Turn on A/C.	System voltage
5	Front condenser fan relay output (relay coil)	Turn off A/C.	0V
		Turn on A/C.	System voltage
6	Front compressor magnetic valve output	When the ignition switch, rear heater switch and rear A/C switch are all ON	0V (outputs during compressor capacity control only)
7	Engine coolant temperature sensor output	When lighting switch is ON	System voltage
8	Earth	At all times	Continuity
9	Earth	At all times	Continuity
10	Rear A/C switch input	When rear heater switch and rear A/C switch are ON	System voltage
11	Rear magnetic valve	When rear heater switch is ON	System voltage
12	Rear air thermo sensor power supply	When ignition switch is ON	2.4V
13	Rear air thermo sensor input	Sensor temperature is 25°C (4.0 kΩ)	2.4V
14	Front air thermo sensor input	Sensor temperature is 25°C (4.0 kΩ)	2.4V
15	Front air thermo sensor power supply	When ignition switch is ON	2.4V

SERVICE ADJUSTMENT PROCEDURES

120000492

COMPRESSOR DRIVE BELT ADJUSTMENT

Refer to GROUP 11 – Service Adjustment Procedures.

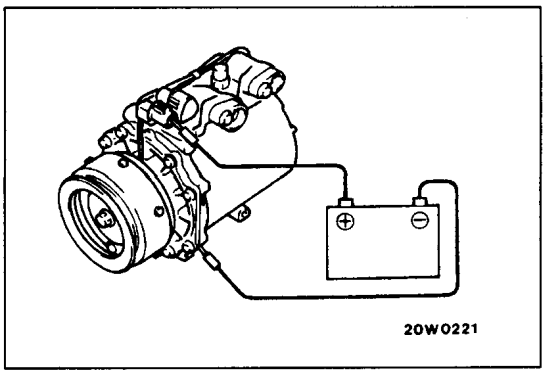


SIGHT GLASS REFRIGERANT LEVEL TEST

120000493

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

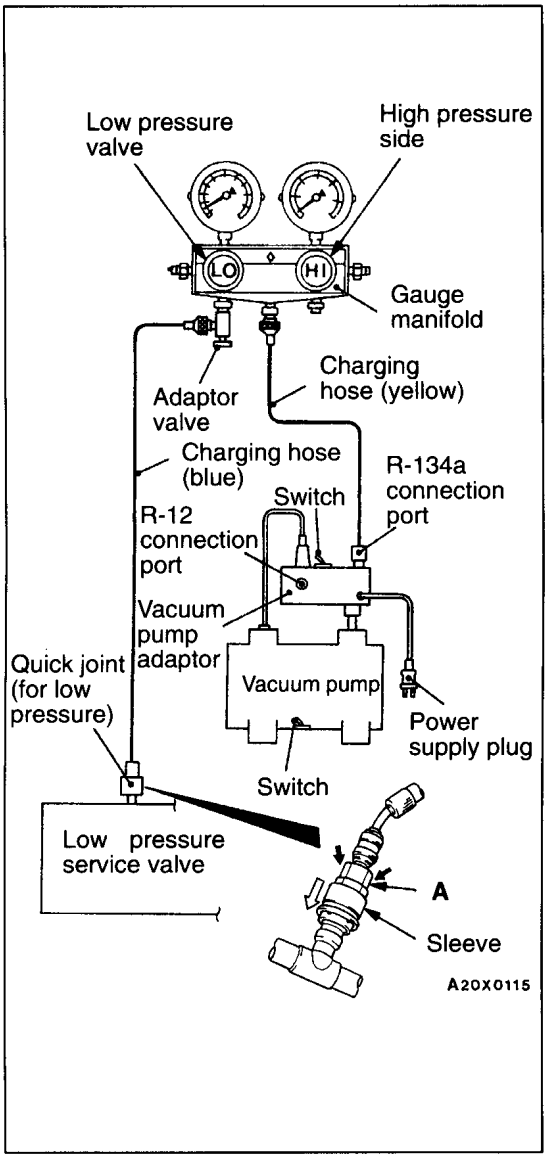
120000494

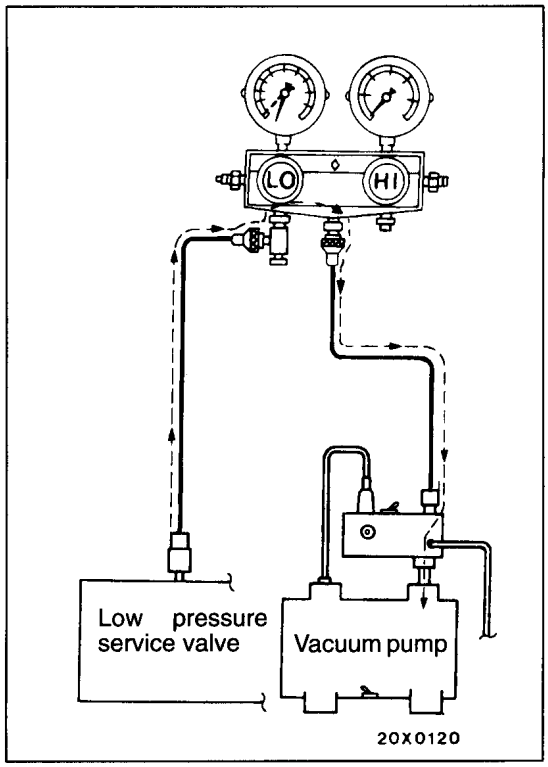
1. Disconnect the connector (1P) to the magnetic clutch.
2. Connect battery (+) voltage directly to the connector for the magnetic clutch.
3. If the magnetic clutch is normal, there will be a "click". If the pulley and armature do not make contact ('click'), there is a malfunction.

RECEIVER DRIER TEST

120000495

1. Operate the unit and check the piping temperature by touching the receiver drier outlet and inlet.
2. If there is a difference in the temperatures, the receiver drier is restricted.
   Replace the receiver drier.





CHARGING

120000496

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.

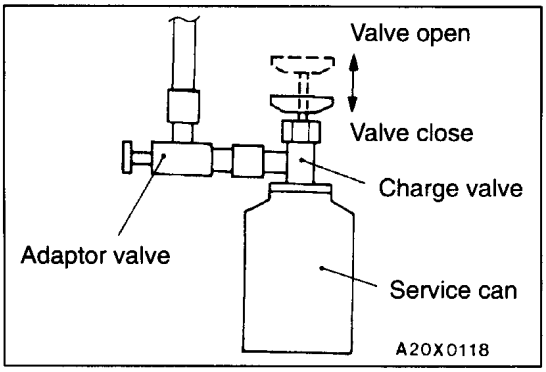
   Caution
   1. Use tools that are suited to R-134a.
   2. To install the quick joint, press section A firmly against the service valve until a click is heard. When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.
5. Close the high and low pressure 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.

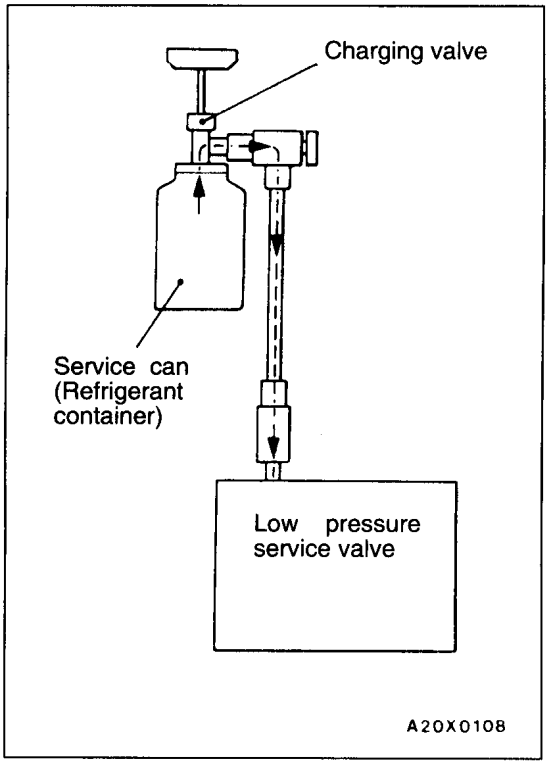
    Caution
    Do not operate the compressor for evacuation.
13. Evacuate to a vacuum reading of 100 kPa or higher (takes approx. 10 minutes).
14. Turn the vacuum pump adaptor switch OFF and allow to stand it for 5 minutes.

    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 can.
17. Turn the handle of the adaptor valve back all the way (valve closed), remove it from the gauge manifold and install the service can.
18. Tighten the handle of the charging valve (valve closed) to puncture the service can.



19. Turn the handle of the charging valve back (valve open) and tighten the handle of the adaptor valve (valve open) to charge the system with refrigerant.

    Caution
    If the service can is inverted, liquid refrigerant may be drawn into the compressor damaging it by liquid compression. Keep the service can upright to ensure that refrigerant is charged in gas state.

20. If the refrigerant is not drawn in, turn the handle of the adaptor valve back all the way (valve closed).
21. Check for gas leaks using a leak detector.
    If a gas leak is detected, re-tighten the connections, and then repeat the charging procedure from evacuation in step (12).

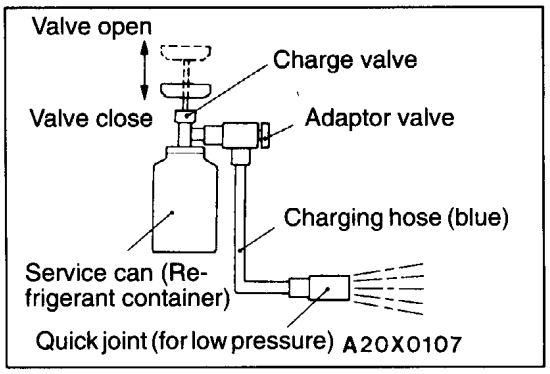
    Caution
    The leak detector for R-134a should be used.

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.

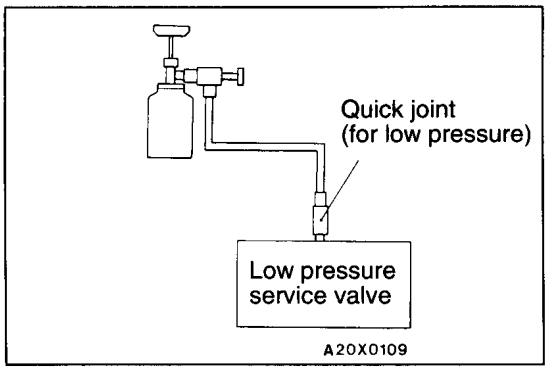
26. After charging with refrigerant, turn the handle of the adaptor valve back all the way (valve closed).
27. Tighten the charging valve handle (valve closed).
    Remove the quick joint (for low pressure) from the low-pressure service valve.

    NOTE
    If the service can is not emptied completely, keep the handles of the charging valve and adaptor valve closed for the next charging.



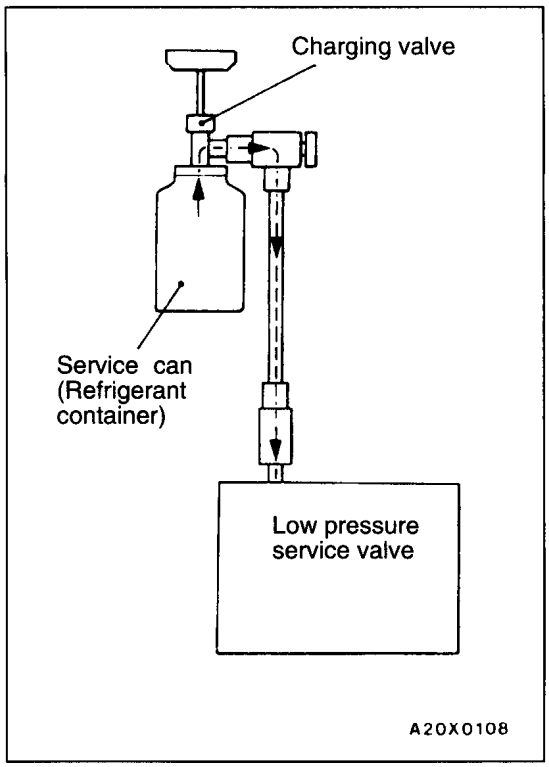
CORRECTING LOW REFRIGERANT LEVEL IN CASE THE SERVICE CAN IS USED

1. Install the charge valve with the handle turned all the way back (valve open) to the service can.
2. Install the adaptor value 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 piece 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.

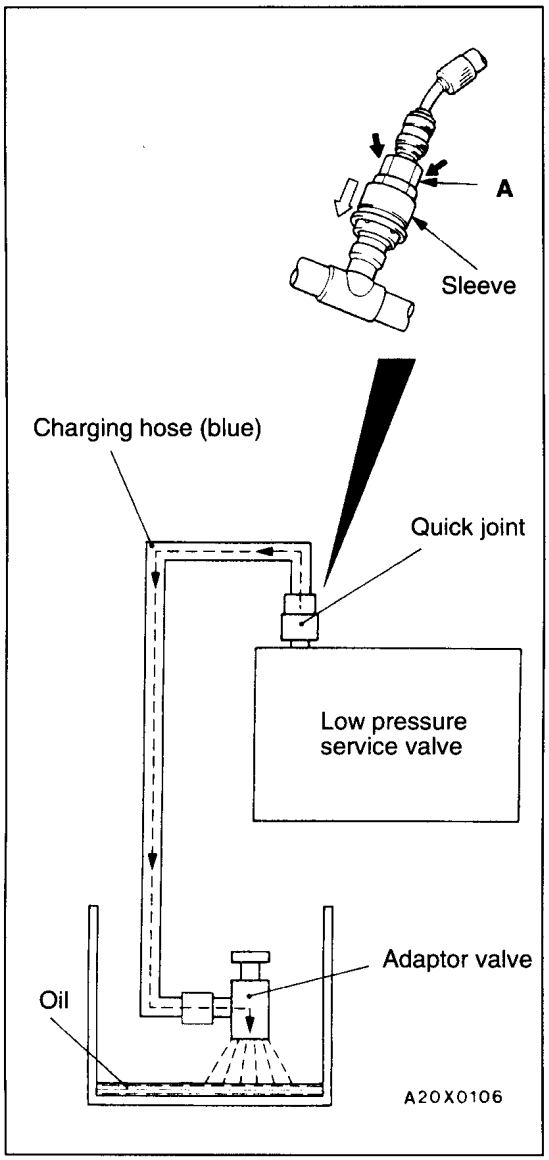


8. Start the engine.
9. Operate the air conditioner and set at the lowest temperature (MAX. COOL).
10. Fix the engine speed at 1,500 r/min..
11. Tighten the handle of the adaptor valve (valve open), and replenish refrigerant checking the quantity through the sight glass.

    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 charged in gas state.

12. After replenishing is completed, turn the handle of the adaptor valve all the way back (valve close), and remove the quick joint.

    NOTE
    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. Turn the engine at an engine speed of 1,200–1,500 r/min. for approximately 5 minutes with the A/C operating to return the oil.

   NOTE
   Returning the oil will be more effective if it is done while driving.

2. Stop the engine.
3. Connect the charging hose (blue) to the adaptor valve with its handle turned back all the way (valve closed).
4. Connect the quick joint to the charging hose (blue).
5. Install the quick joint to the low pressure service valve.

   NOTE
   The low-pressure service valve should be connected to the compressor.

   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 180 mℓ, 240 mℓ* of refrigerant oil.

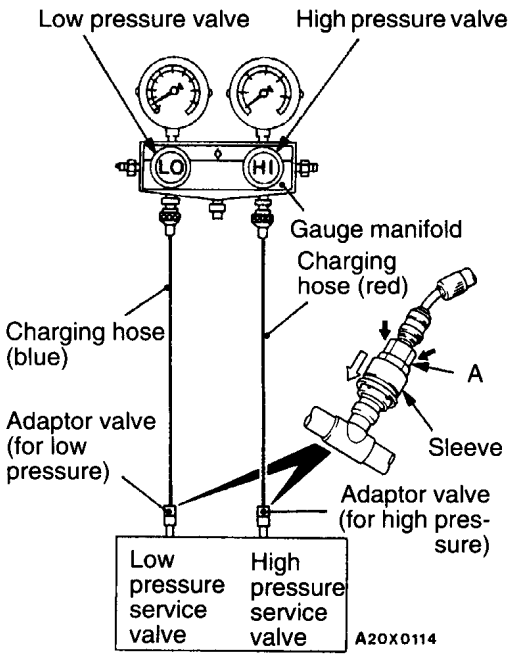
NOTE
*: For dual A/C

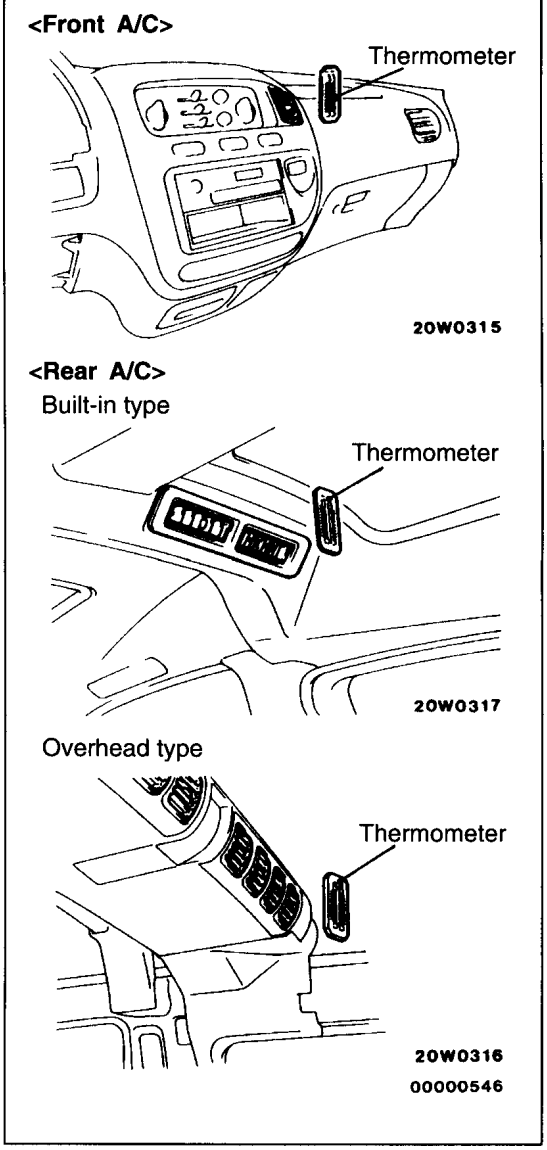
While the air conditioning system is in operation, the oil is carried through the entire system by the refrigerant.
Some of this oil will be trapped and retained in various parts of the system.
When the following system components are charged, it is necessary to add oil to the system to replace the oil being removed with the component.

Compressor oil:
- **Vehicles with single A/C ZXL 100PG**
- **Vehicles with dual A/C SUN PAG 56**

Quantity:

Item	Single A/C	Dual A/C
Evaporator mℓ	40	60
Condenser mℓ	40	60
Suction hose mℓ	10	10
Receiver mℓ	10	10





PERFORMANCE TEST

120000497

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 liquid 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 1,500 r/min. with A/C clutch engaged.
9. Engine should be warmed up with passenger side door open.
10. Insert a thermometer in the 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

SINGLE A/C

Garage ambient temperature °C	35
Discharge air temperature °C	12
Compressor discharge pressure kPa	1,843
Compressor suction pressure kPa	196

DUAL A/C

Type		Built-in type	Overhead type
Garage ambient temperature °C		35	35
Discharge air temperature °C	Front	10	10
	Rear	14	16
Compressor discharge pressure kPa		1,608	1,608
Compressor suction pressure kPa		245	245

REFRIGERANT LEAK REPAIR 120000498

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.

COMPRESSOR NOISE 120000499

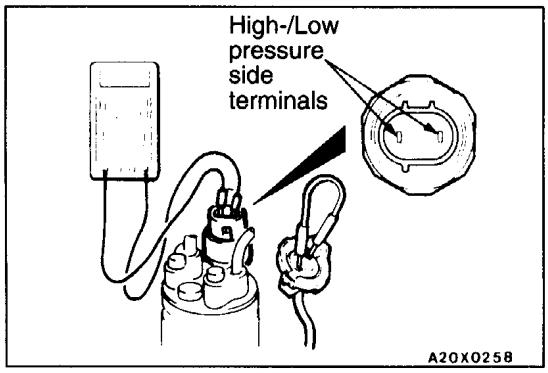
You must first know the conditions when the noise occurs. These conditions are: weather, vehicle speed, in gear or neutral, engine temperature or any other special conditions.
Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering or alternator).
Improper accessory drive belt tension can cause a misleading noise when the compressor is engaged and little or no noise when the compressor is disengaged.
Drive belts are speed-sensitive. That is, at different engine speeds, and depending upon belt tension, belts can develop unusual noises that are often mistaken for mechanical problems within the compressor.

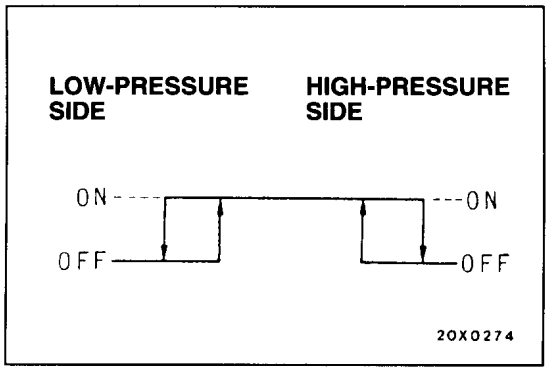
HANDLING TUBING AND FITTINGS

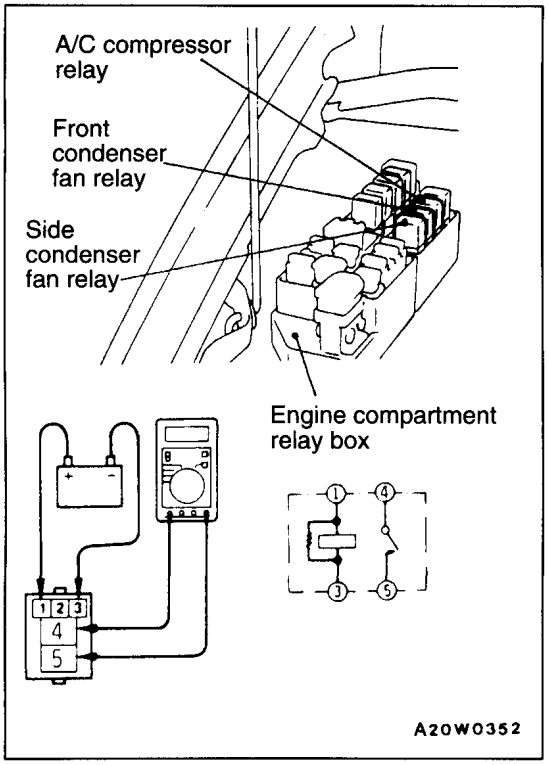
Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed. The system must be completely discharged before opening any fitting 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 to 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-ring, these O-rings are not reusable.

ADJUSTMENT

1. Select a quiet area for testing. Duplicate conditions as much as possible. Switch compressor on and off several times to clearly identify compressor noise. To duplicate high ambient conditions (high head pressure), restrict air flow through condenser. Install manifold gauge set to make sure discharge pressure doesn't exceed 2,070 kPa.
2. Tighten all compressor mounting bolts, clutch mounting bolt, and compressor drive belt. Check to assure clutch coil is tight (no rotation or wobble).
3. Check refrigerant hoses for rubbing or interference that can cause unusual noises.
4. Check refrigerant charge. (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.







DUAL PRESSURE SWITCH CHECK 120000500

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.

<Single A/C>

Switch position	OFF→ON	ON→OFF
Low-pressure side kPa	186	177
High-pressure side kPa	2,059	2,648

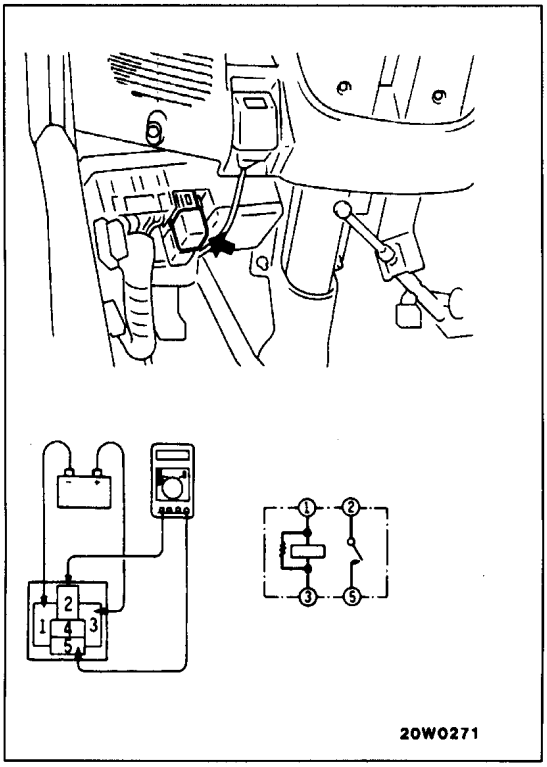
<Dual A/C>

Switch position	OFF→ON	ON→OFF
Low-pressure side kPa	221	196
High-pressure side kPa	2,549	3,138

POWER RELAY CHECK 120002259

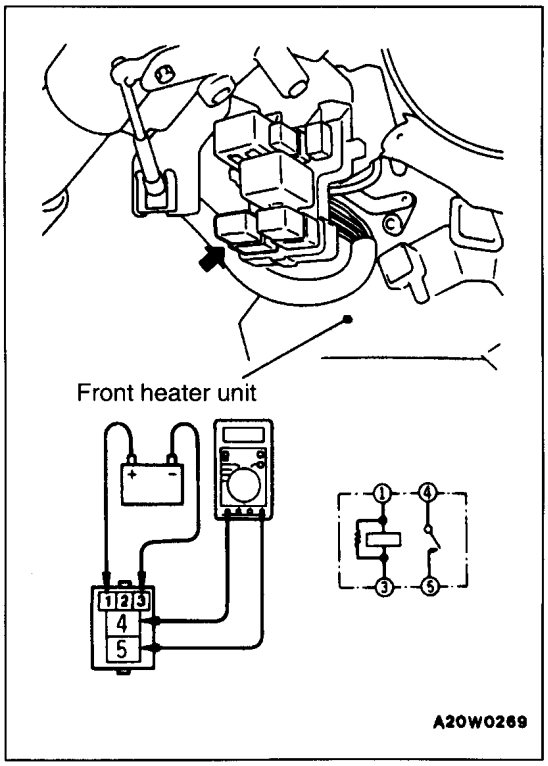
A/C COMPRESSOR RELAY, FRONT CONDENSER FAN RELAY AND SIDE CONDENSER FAN RELAY CONTINUITY INSPECTION

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



FRONT BLOWER MOTOR RELAY CONTINUITY INSPECTION

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



REAR BLOWER MOTOR RELAY <DUAL A/C (BUILT-IN TYPE)> REAR BLOWER MOTOR HI RELAY <DUAL A/C (OVERHEAD TYPE)> CONTINUITY INSPECTION

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

IDLE-UP OPERATION CHECK 120002260

<4G63>

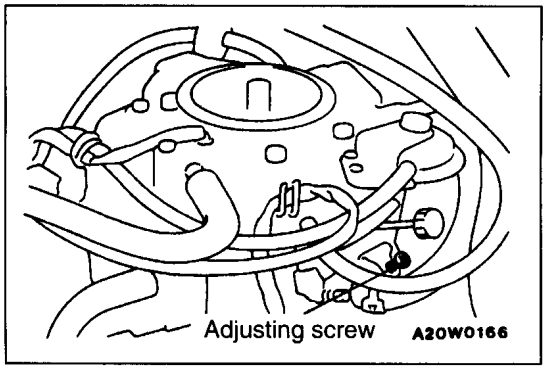
1. Before inspection and adjustment set vehicle in the following condition:
- Engine coolant temperature: 80–90°C
- Lights, electric cooling fan and accessories: Set to OFF
- Transmission: Neutral (N or P for vehicles with A/T)
- Steering wheel: Straight forward

2. Check whether or not the idling speed is the standard value.

   Standard value:
   700±50 r/min. <A/T>
   750±50 r/min. <M/T>

3. If there is a deviation of the idling speed from the standard value, make the adjustment of the idling speed. (Refer to GROUP 11 – Service Adjustment Procedures.)
4. Check to be sure that the idling speed becomes the standard value when the A/C switch is switched ON and the A/C is activated.

   Standard value: 850–950 r/min.



5. If there is a deviation of the idling speed from the standard value, adjust the idling speed by turning the adjusting screw for adjustment.

<4D56>

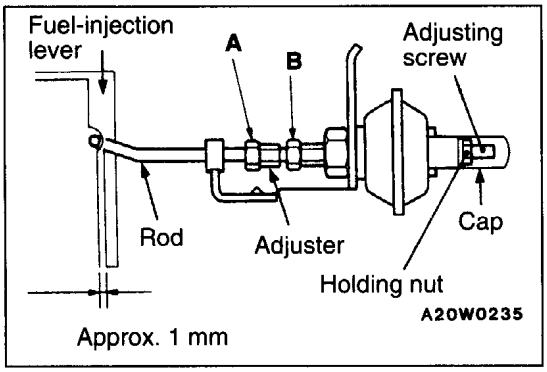
1. Before inspection and adjustment, set vehicle in the following condition:
- Engine coolant temperature: 80–90°C
- Lights, electric cooling fan and accessories: Set to OFF
- Transmission: Neutral
- Steering wheel: Straight forward

2. Check whether or not the idling speed is the standard value.

   Standard value: 750±30 r/min.

3. If there is a deviation of the idling speed from the standard value, make the adjustment of the idling speed. (Refer to GROUP 11 – Service Adjustment Procedures.)
4. Check to be sure that the idling speed becomes the standard value when the A/C switch is switched ON and the A/C is activated.

   Standard value: 900–1,000 r/min.

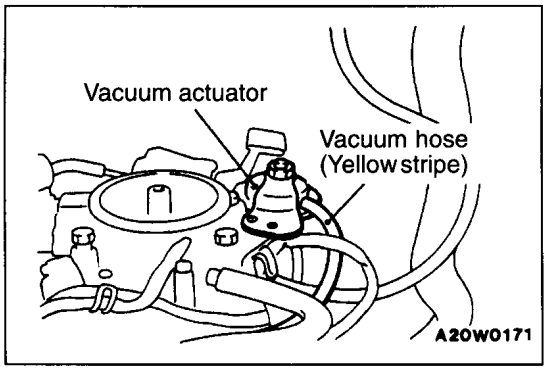


5. If there is a deviation of the idling speed from the standard value, make the adjustment of the idling speed by following the procedures described below.
   (1) Loosen nuts (A) and (B).
   (2) Adjust, by using the adjuster, so that the end of the vacuum actuator's rod is at the position indicated in the illustration.
   (3) Securely tighten nuts (A) and (B).
   (4) After activating the vacuum actuator, check to be sure that the rod and the lever do not contact when the activation is cancelled.
   (5) Remove the cap and loosen the nut for holding.
   (6) Adjust to the specified r/min. by turning the adjusting screw.
   (7) Securely tighten the holding nut, and then attach the cap.

<4G64>

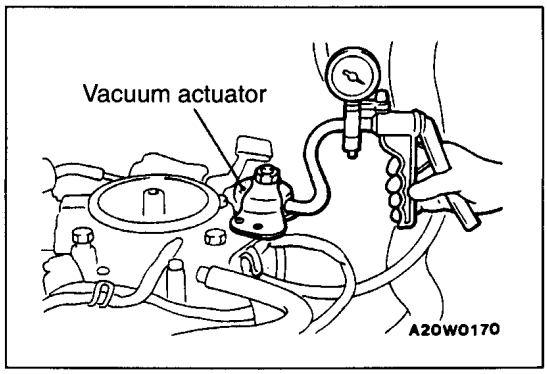
The idle speed is automatically controlled by the ISC system, and so need not be adjusted.

Standard value: 800±50 r/min.



VACUUM ACTUATOR CHECK <4G63> 120000503

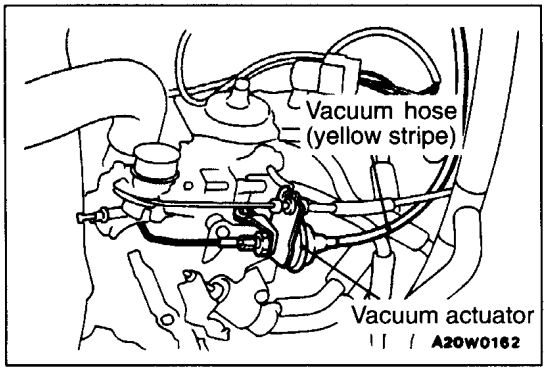
1. Pull off the vacuum hose (yellow stripe) connected to the vacuum actuator.
2. Connect a manual vacuum pump to the nipple of the vacuum actuator.



3. Check that the rod of the vacuum actuator assembly is drawn up when negative pressure is applied.
4. Apply 87 kPa of negative pressure and check that the vacuum does not leak.
5. Start the engine and let it run at idle. Then cover the end of the vacuum hose (yellow stripe) with a finger and check the negative pressure when the A/C switch is turned on and off.

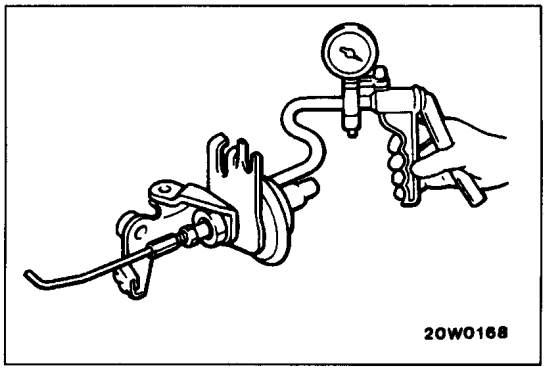
A/C switch	Negative pressure at hose end
OFF	No
ON	Yes

Caution
Be careful not to damage the vacuum hose.



VACUUM ACTUATOR CHECK <4D56> 120000504

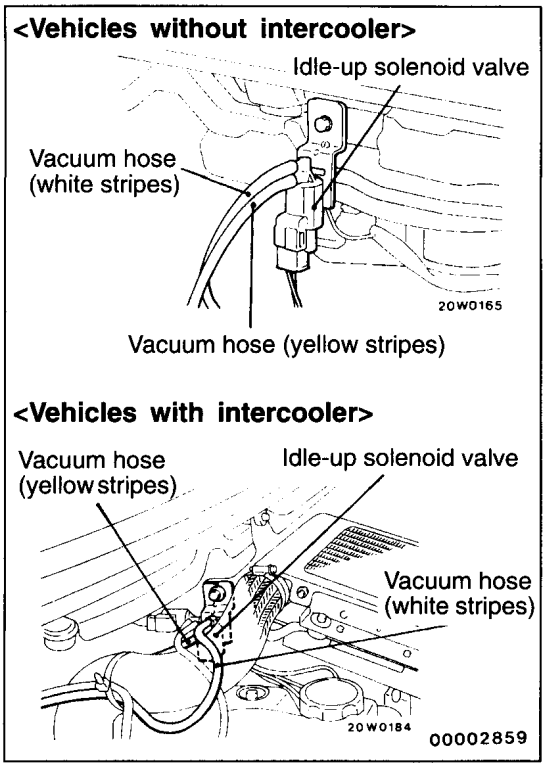
1. Pull off the vacuum hose (yellow stripe) connected to the vacuum actuator.



2. Connect a manual vacuum pump to the nipple of the vacuum actuator.
3. Check to be sure that the vacuum actuator rod starts to contract when 8 kPa of negative pressure is applied, and that the rod contracts to its full stroke when 12 kPa of negative pressure is applied.
4. Disconnect the manual vacuum pump from the vacuum actuator, and connect the vacuum hose (yellow stripe) to the vacuum actuator.
5. Start the engine and let it run at idle. Then cover the end of the vacuum hose (yellow stripe) with a finger and check the negative pressure when the A/C switch is turned on and off.

A/C switch	Negative pressure at hose end
OFF	No
ON	Yes

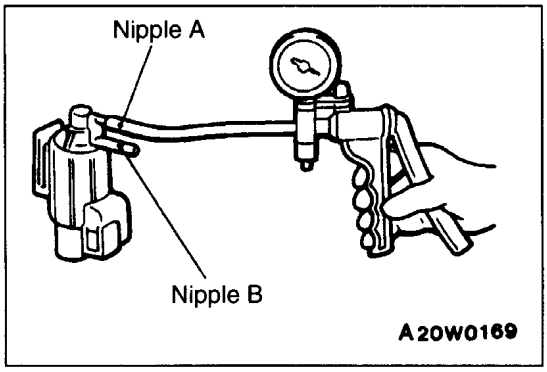
Caution
Be careful, when connecting the vacuum hose not to damage it.



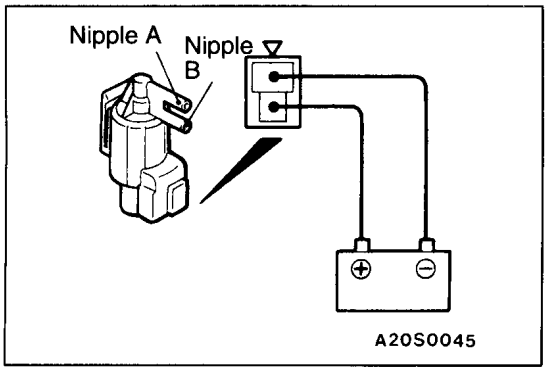
IDLE-UP SOLENOID VALVE CHECK <4G63, 4D56>

120002261

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



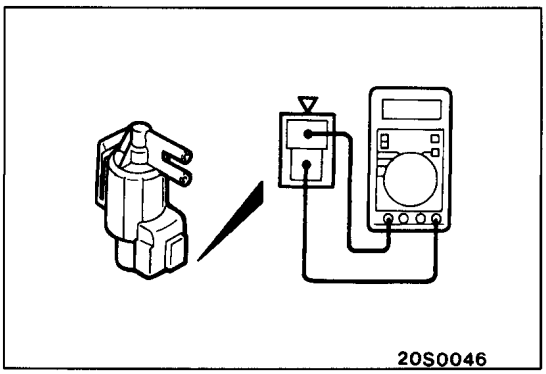
3. Connect a manual vacuum pump to the nipple A.



4. Check air-tightness by applying a vacuum with voltage applied directly from the battery to the solenoid valve terminal and without applying voltage.

Battery voltage	Nipple B	Vacuum condition
Applied	Open	Vacuum leaks from nipple B
	Blocked with finger*1	Vacuum is maintained
Not applied	Open	Vacuum is maintained
	Blocked with finger*2	

NOTE
In case of mark *1, a vacuum can be felt but in case of mark *2, a vacuum can not be felt.



5. Measure the resistance of the solenoid valve.
   Standard value: Approx. 40Ω

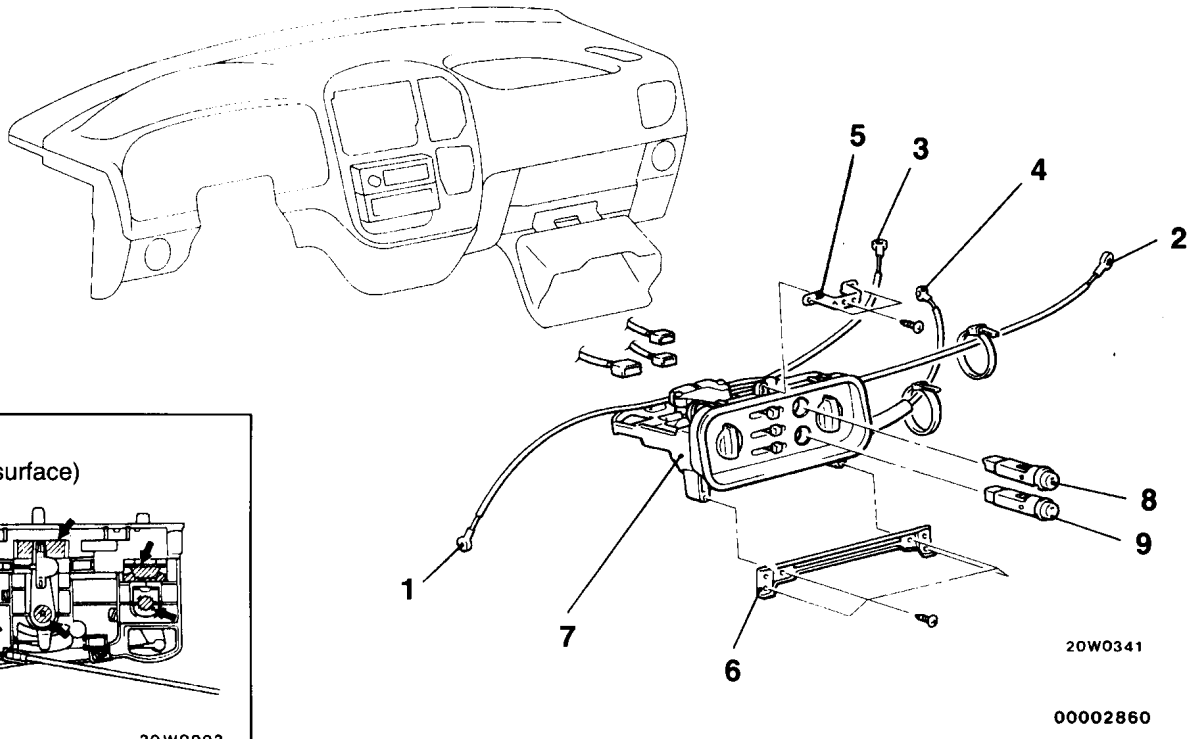
6. When disconnecting the vacuum hose, always make a mark so that the hose can be reconnected at original position.

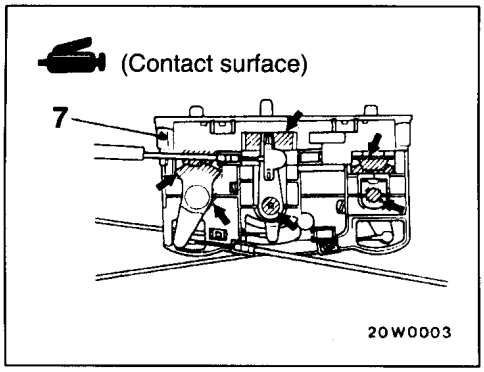
FRONT PANEL ASSEMBLY, REAR HEATER SWITCH AND FRONT A/C SWITCH

120002262

REMOVAL AND INSTALLATION

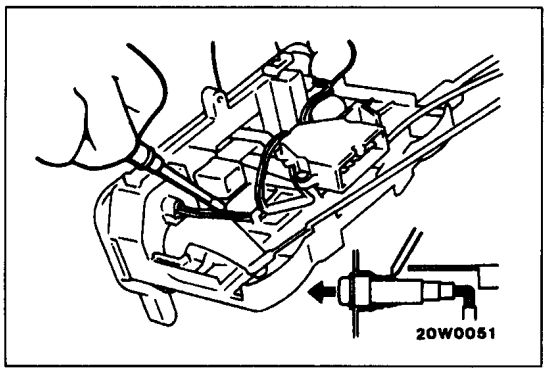
Pre-removal and Post-installation Operation
(1)Centre Panel Removal and Installation
(Refer to GROUP 52A – Instrument Panel.)
(2)Glove Box Stopper Removal and Installation
(3)Under Cover Removal and Installation
(Refer to GROUP 52A – Instrument Panel.)





Removal steps

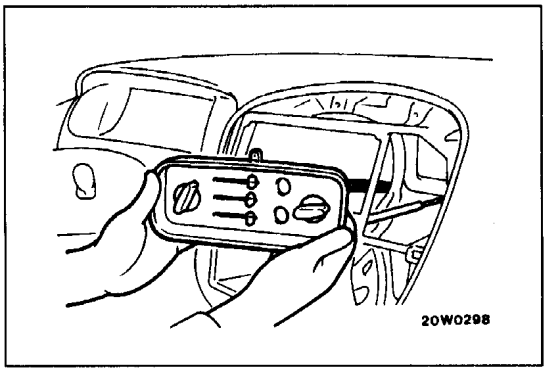
▶D◀ 1. Air outlet changeover damper cable connection
▶C◀ 2. Inside/outside air changeover damper cable connection
▶B◀ 3. Air mixing damper cable connection <Vehicles with heater>
▶A◀ 4. Cool air bypass damper cable connection
5. Heater upper bracket
6. Heater control lower bracket
◀A▶ 7. Front panel assembly
8. Rear heater switch
9. Front A/C switch



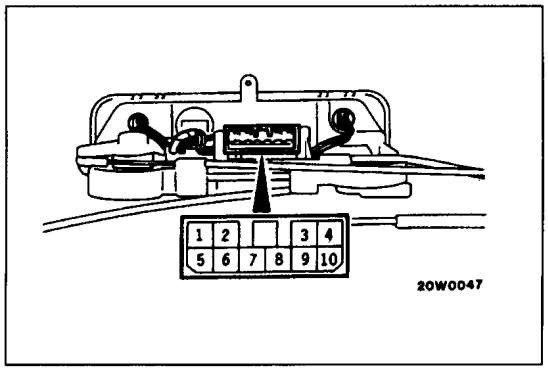
REMOVAL SERVICE POINT

◀A▶ FRONT PANEL ASSEMBLY REMOVAL

(1) Pull the front panel assembly out slightly from the instrument panel.
(2) Push the tab on top of the A/C switch from the top of the front panel assembly. Then pull the A/C switch forward to disconnect the connector.



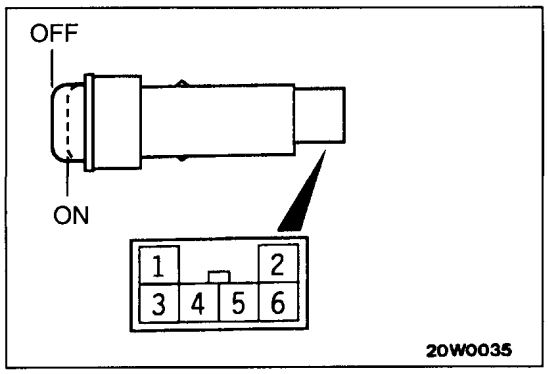
(3) Push the front panel assembly while being careful that the air outlet changeover control cable doesn't recoil. Then tilt it towards the passenger's seat and remove it.



INSPECTION

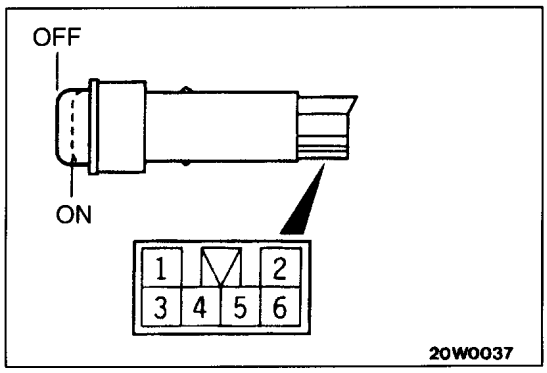
FRONT BLOWER SWITCH CONTINUITY INSPECTION

Lever position	Terminal No.										
	1	ILL	5	2	3	4	6	7	8	9	10
OFF	○	○	○								
LO	○	○	○	○	○		○	○			
ML	○	○	○	○	○		○		○		
MH	○	○	○	○	○	○	○			○	
HI	○	○	○	○	○	○	○				○



FRONT A/C SWITCH CONTINUITY

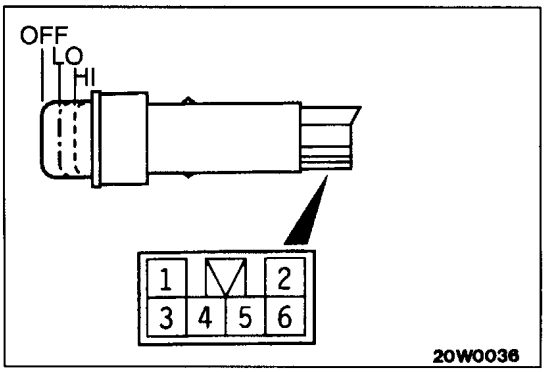
Switch position	Terminal No.						
	1	4	IND	5	3	ILL	6
OFF	○		○	○	○	○	○
ON	○	○	○	○	○	○	○



REAR HEATER SWITCH CONTINUITY INSPECTION

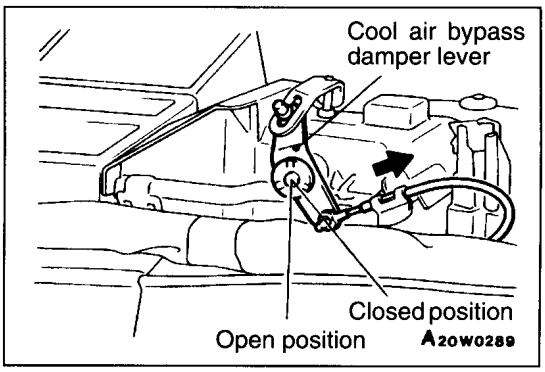
<Vehicles with built-in type rear heater>

Switch position	Terminal No.							
	1	2	4	IND	5	3	ILL	6
OFF	○	○		○	○	○	○	○
ON	○		○	○	○	○	○	○
	○							



<Vehicles with under seat type rear heater>

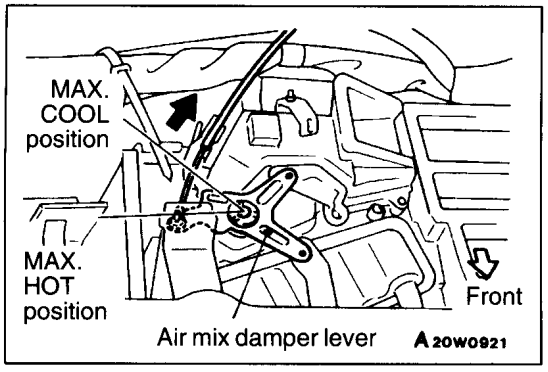
Switch position	Terminal No.							
	1	2	4	IND	5	3	ILL	6
OFF						○	○	○
LO		○	○	Green ◀	○	○	○	○
HI	○	○	○	Orange ◀	○	○	○	○



INSTALLATION SERVICE POINTS

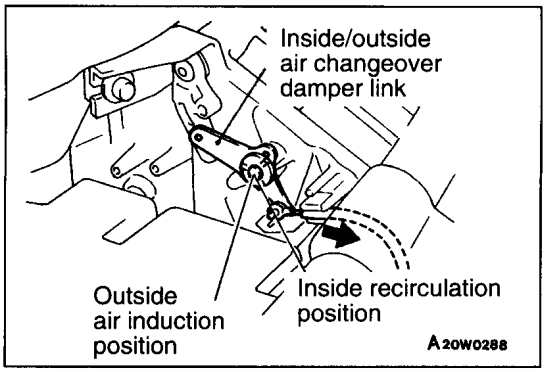
▶A◀ COOL AIR BYPASS DAMPER CABLE INSTALLATION

(1) Set the cool air bypass lever on the front panel assembly to the closed position.
(2) Set the cool air bypass damper lever at the bottom of the heater unit to the closed position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then clamp it.



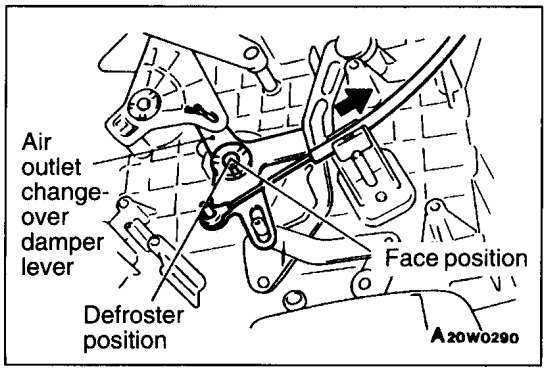
▶B◀ AIR MIXING DAMPER CABLE INSTALLATION

(1) Set the temperature control knob on the front panel assembly to the MAX. HOT position.
(2) Set the air mix damper lever at the bottom of the heater unit to the MAX. HOT position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then clamp it.



▶C◀ INSIDE/OUTSIDE AIR CHANGEOVER DAMPER CABLE INSTALLATION

(1) Set the inside/outside air changeover lever on the front panel assembly to the inside recirculation position
(2) Set the inside/outside air changeover damper lever of the blower motor to the inside recirculation position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then clamp it.

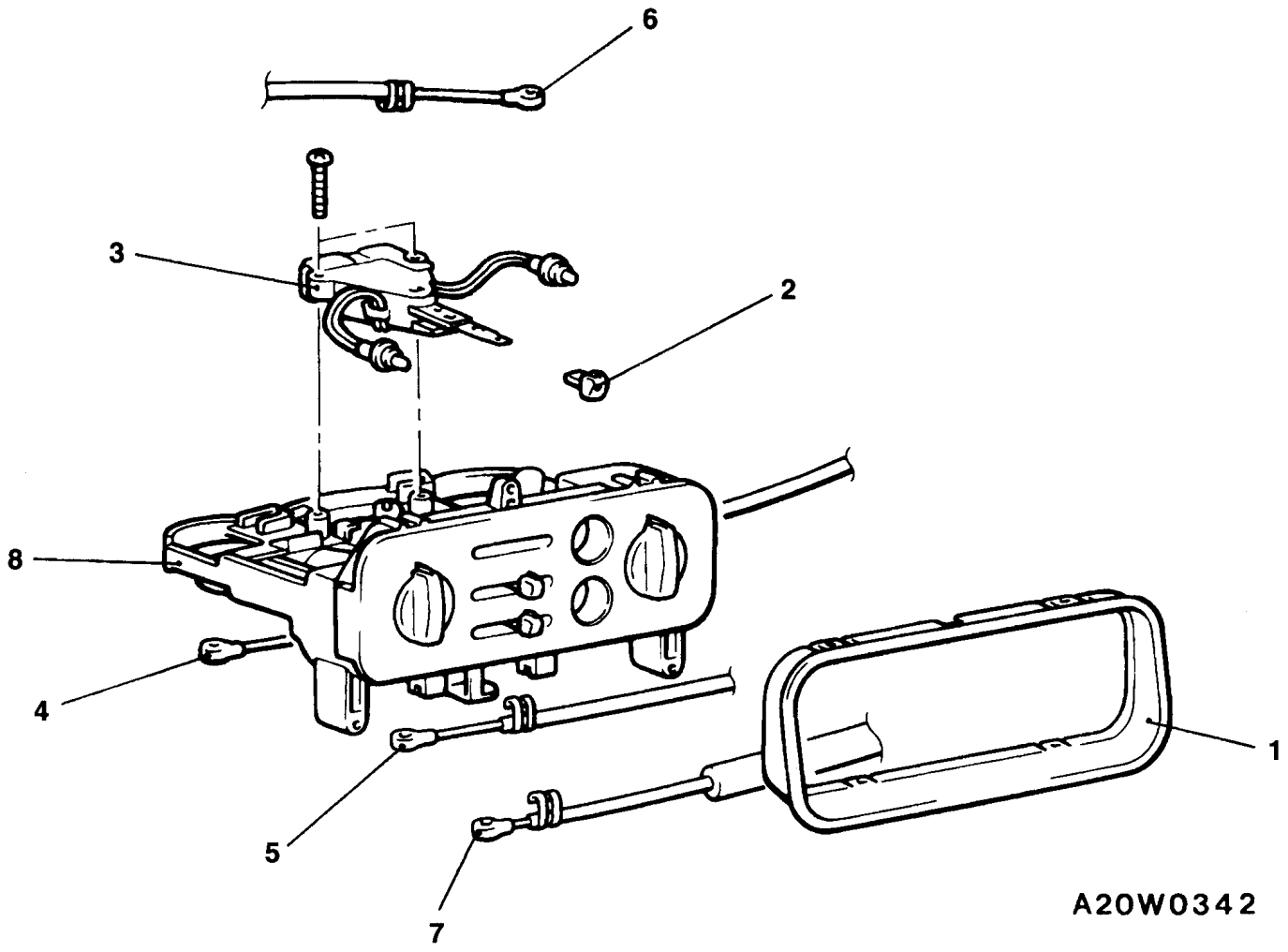


▶D◀ AIR OUTLET CHANGEOVER DAMPER CABLE INSTALLATION

(1) Set the air outlet changeover knob on the front panel assembly to the defroster position.
(2) Set the air outlet changeover damper lever of the heater unit to the defroster position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then clamp it.

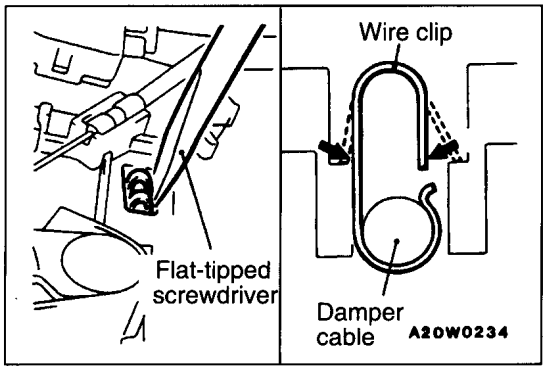
FRONT PANEL ASSEMBLY DISASSEMBLY AND REASSEMBLY

120002263



Disassembly steps

1. Panel cover
2. Knob
3. Front blower switch
4. ◀A▶ Air mix damper cable
5. ◀A▶ Inside/outside changeover damper cable
6. ◀A▶ Air outlet changeover damper cable
7. ◀A▶ Cool air bypass damper lever
8. Base assembly



DISASSEMBLY SERVICE POINT

◀A▶ EACH DAMPER CABLE REMOVAL

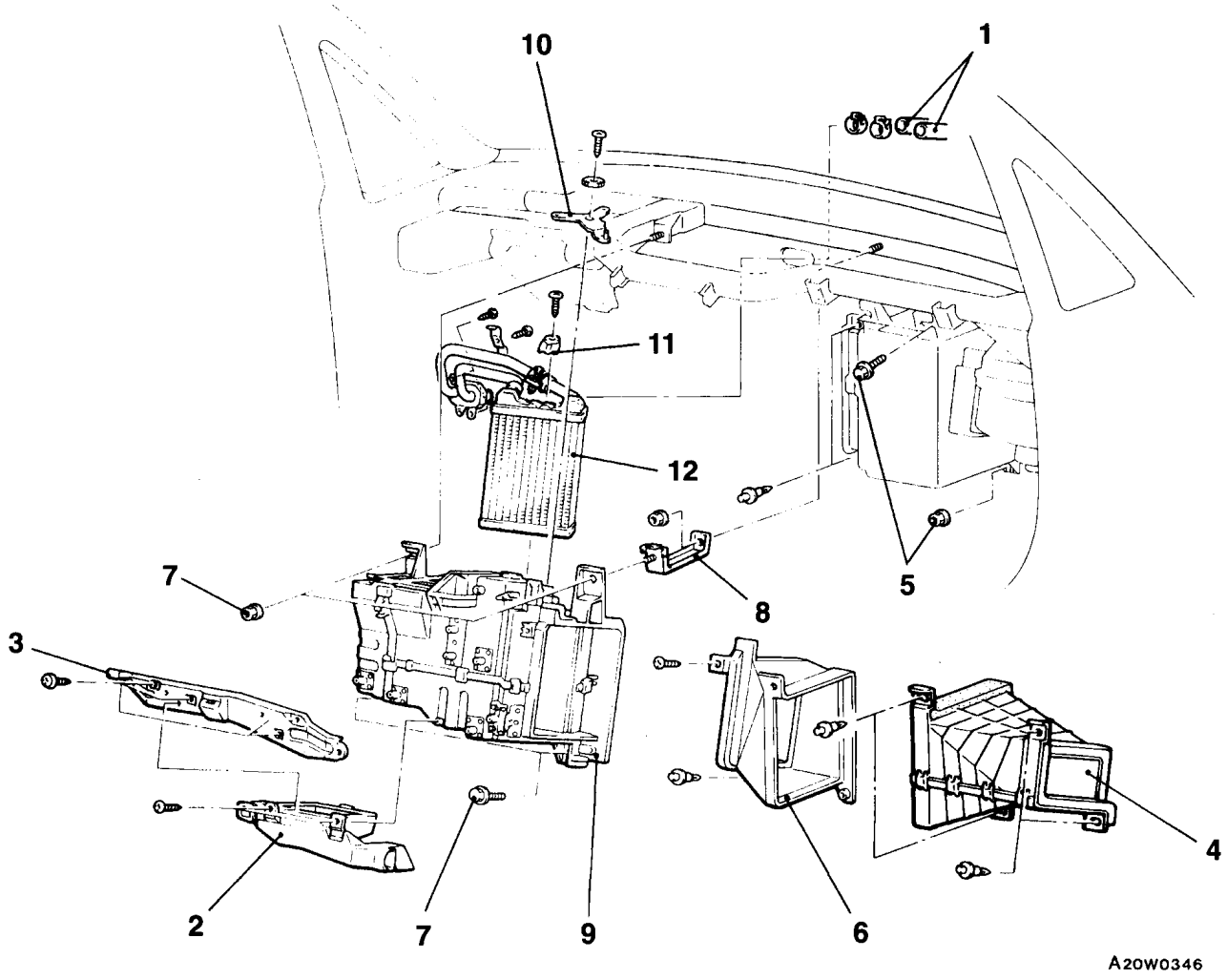
Insert a flat-tipped screwdriver to disengage the claws, and then remove the cables.

FRONT HEATER UNIT AND FRONT HEATER CORE

120002264

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(2) Instrument Panel Assembly Removal and Installation (Refer to GROUP 52A – Instrument Panel.)
CAUTION: SRS
When removing and installing the computer cover from vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit or the components.



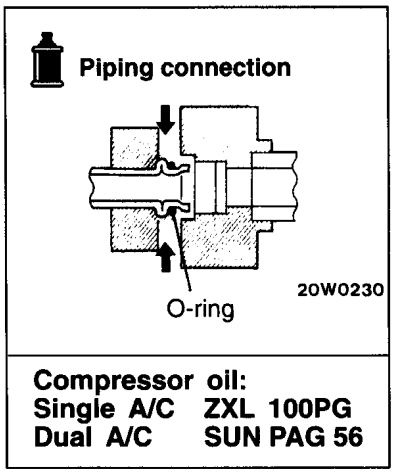
Removal steps

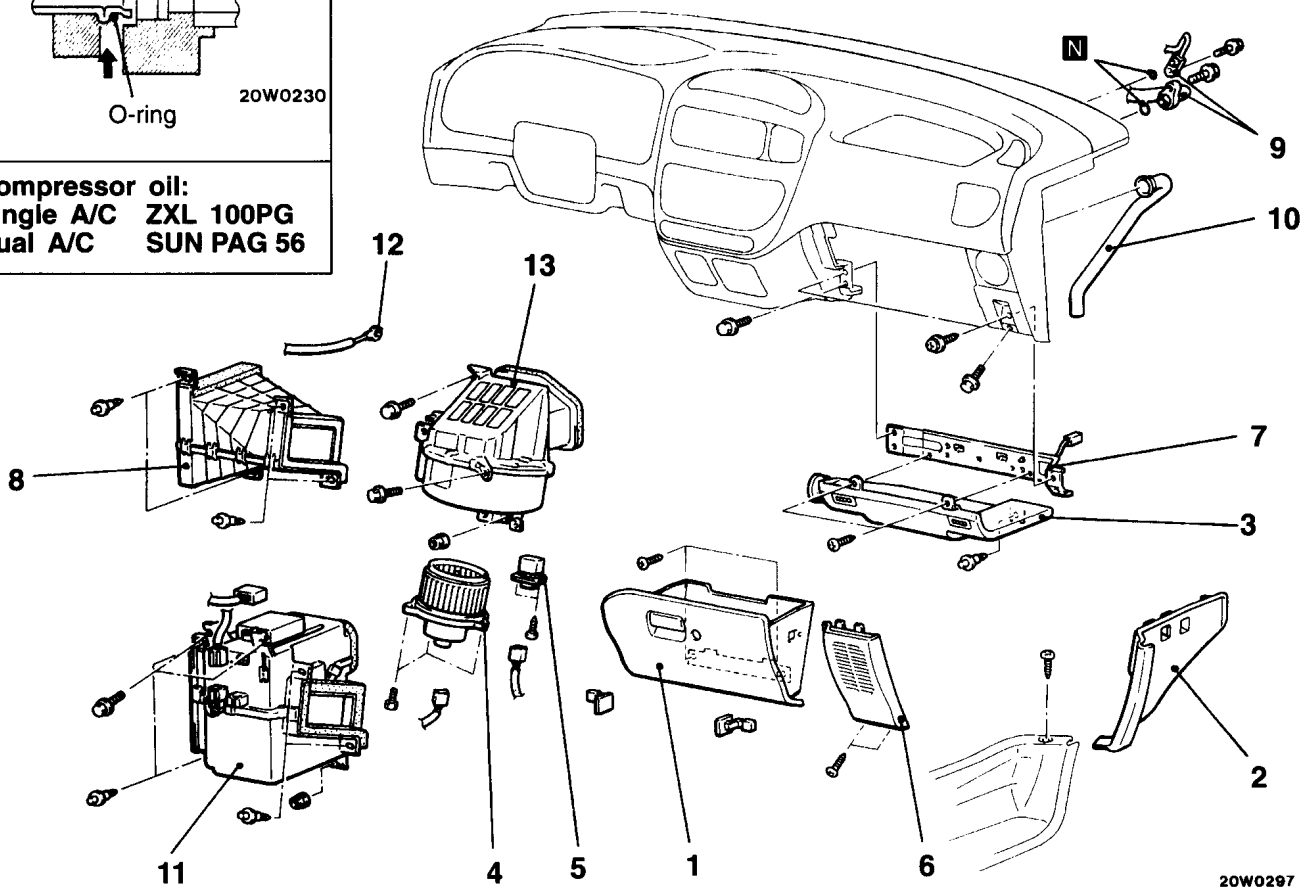
1. Heater hose connection
2. Foot distribution duct
3. Centre frame
4. Joint duct B
5. Evaporator installation bolt and nut <Vehicles with A/C>
6. Joint duct
7. Front heater unit installation bolt and nut
8. Heater bracket
9. Front heater unit
10. Air mix damper link
11. Bracket
12. Front heater core

FRONT BLOWER MOTOR ASSEMBLY AND RESISTOR

120002265

REMOVAL AND INSTALLATION





00000549

Front blower motor assembly and resistor removal steps

1. Glove box
2. Cowl side trim
   (Refer to GROUP 52A – Trim.)
3. Shower duct <Vehicles with ABS>
4. Front blower motor assembly
5. Resistor

Blower case assembly removal steps

- Discharge and Charging of Refrigerant
  (Refer to P.55-17, 20.)

1. Glove box
2. Cowl side trim
   (Refer to GROUP 52A – Trim.)
3. Shower duct <Vehicles with ABS>

◀A▶

6. Speaker garnish
7. Glove box frame
8. Joint duct B
9. Suction hose, liquid pipe and cooling unit connection
   <Vehicles with A/C>
10. Drain hose <Vehicles with A/C>
11. Evaporator <Vehicles with A/C>

▶A◀

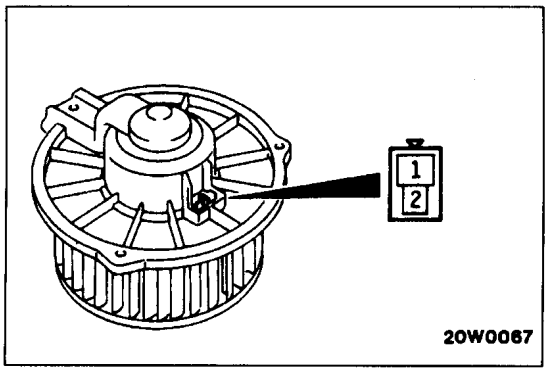
12. Inside/outside air changeover damper cable connection
13. Blower case assembly

REMOVAL SERVICE POINT

◀A▶ SUCTION HOSE, LIQUID PIPE AND COOLING UNIT DISCONNECTION

If the hoses are disconnected, cap the hoses with a blank plug to prevent entry of dust, dirt, and water.

Caution
Seal the hoses completely. Otherwise, the compressor oil and receiver will absorb water vapour easily.

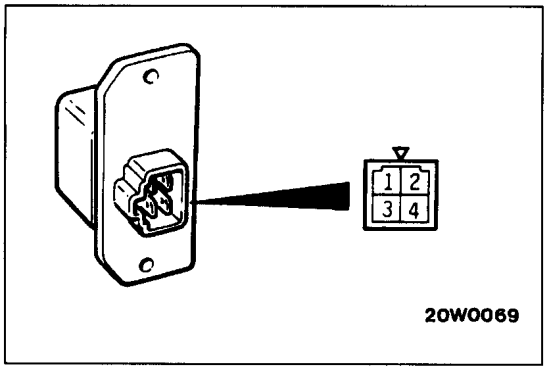


INSPECTION

BLOWER FAN AND MOTOR INSPECTION

When battery voltage is applied between the terminals, check to be sure that the motor operates. Also, check to be sure that there is no abnormal noise.

Battery terminals		Motor
1	2	
⊖ - - - - - -	- - - - - - ⊕	Runs



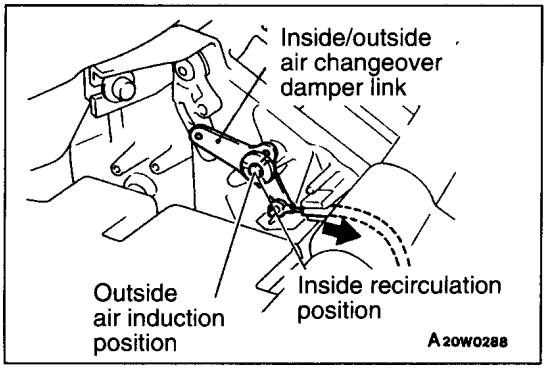
Caution
Do not touch the blower during inspection, or it may lead to personal injury.

RESISTOR INSPECTION

Use a circuit tester to measure the resistance between the terminals as indicated below. Check to be sure that the measured value is at the standard value.

Standard value:

Measurement terminal	Standard value Ω
Between terminals 2–3 (LO)	1.96±7%
Between terminals 2–1 (ML)	0.95±7%
Between terminals 2–4 (MH)	0.33±7%



INSTALLATION SERVICE POINT

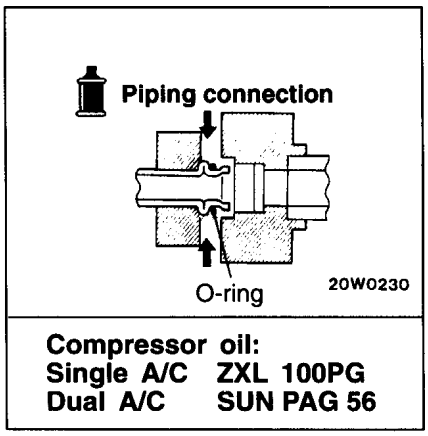
▶A◀ INSIDE/OUTSIDE AIR CHANGEOVER DAMPER CABLE INSTALLATION

(1) Set the inside/outside air changeover lever on the front panel assembly to the inside recirculation position.
(2) Set the inside/outside air changeover damper lever of the blower motor to the inside recirculation position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then clamp it.

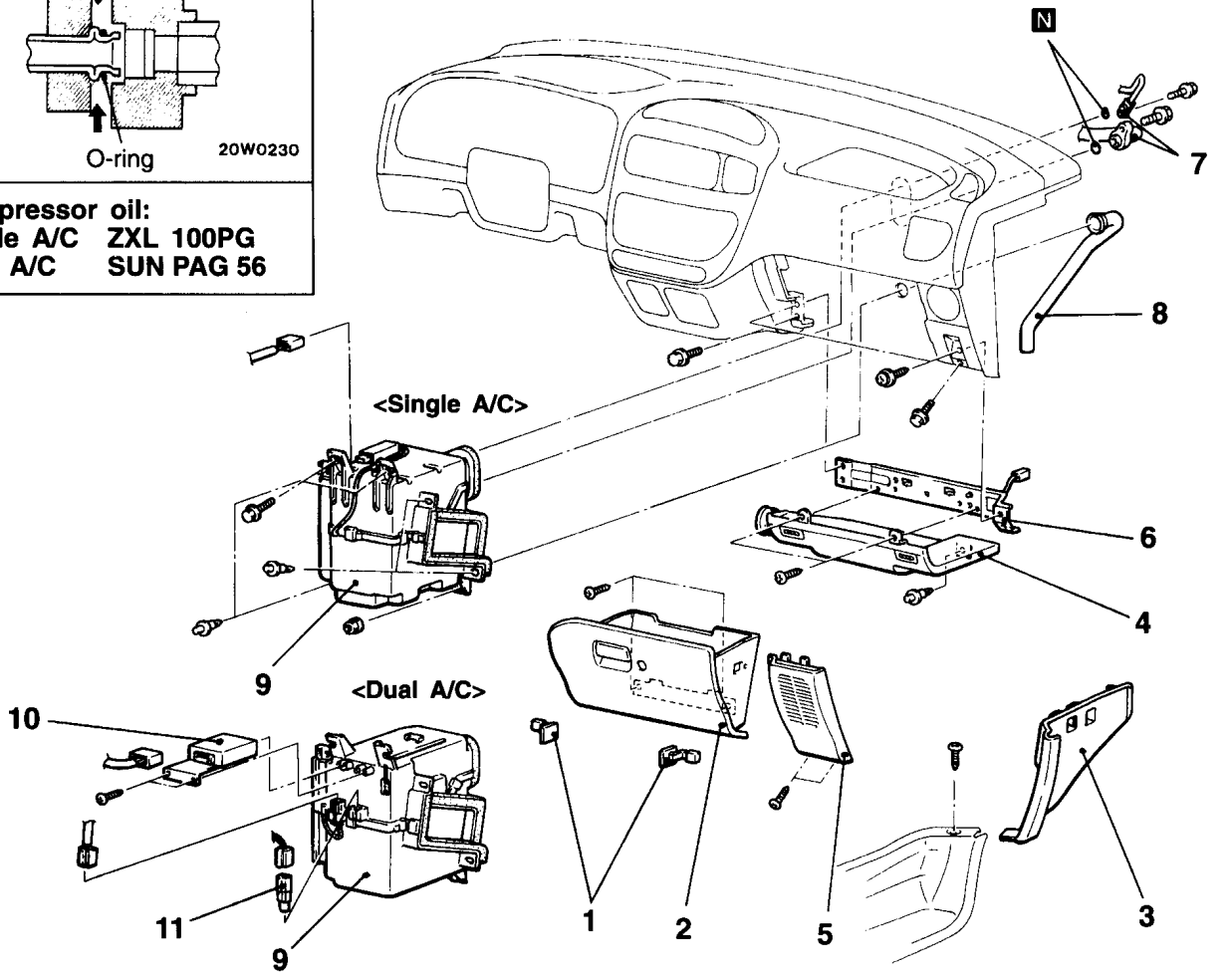
FRONT EVAPORATOR AND A/C-ECU

120002266

REMOVAL AND INSTALLATION



Compressor oil:
Single A/C ZXL 100PG
Dual A/C SUN PAG 56



Front evaporator removal steps

- Discharging and Charging of Refrigerant (Refer to P.55-17, 20.)

1. Glove box stopper
2. Glove box
3. Cowl side trim (Refer to GROUP 52A – Trim.)
4. Shower duct <Vehicles with ABS>
5. Speaker garnish
6. Glove box frame

◀A▶ 7. Suction hose and liquid pipe connection

8. Drain hose

▶A◀ 9. Front evaporator

A/C-ECU removal steps

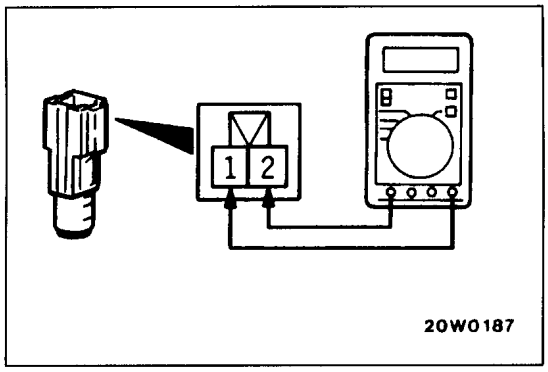
1. Glove box stopper
10. A/C-ECU
11. Resistor <Vehicles with overhead type rear evaporator>

REMOVAL SERVICE POINT

◀A▶ SUCTION HOSE AND LIQUID PIPE DISCONNECTION

Plug the disconnected hose and the cooling unit nipple with blind caps not to let foreign matter get into them.

Caution
Seal the hoses completely. Otherwise, the compressor oil and receiver will absorb water vapour easily.



INSPECTION

RESISTOR INSPECTION <VEHICLES WITH OVERHEAD TYPE REAR EVAPORATOR>

Use a circuit tester to measure the resistance between the terminals in the illustration. Check to be sure that the measured value is at the standard value.

Standard value: 4.7 kΩ

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).

<Vehicles with single A/C>

Compressor oil: ZXL 100PG

Quantity: 40 mℓ

<Vehicles with dual A/C>

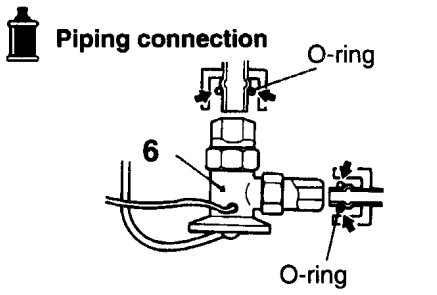
Compressor oil: SUN PAG 56

Quantity: 30 mℓ

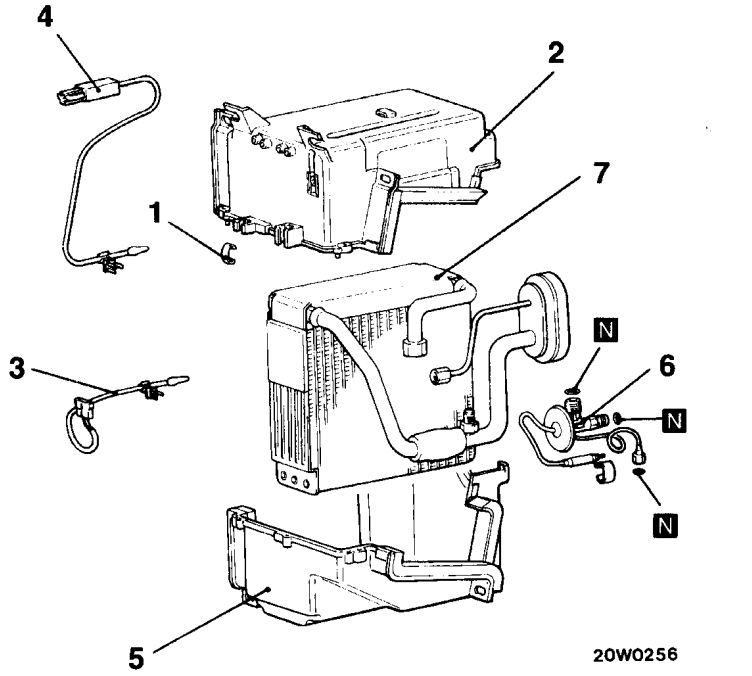
FRONT EVAPORATOR

120002121

DISASSEMBLY AND REASSEMBLY



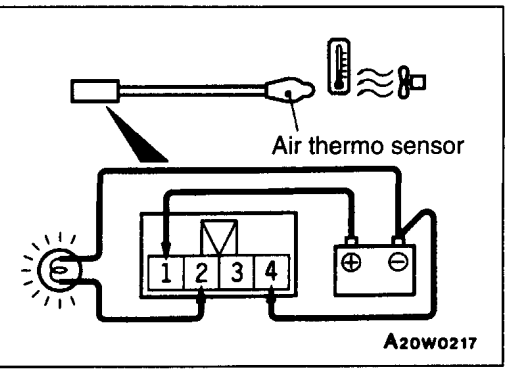
Compressor oil:
Single A/C ZXL 100PG
Dual A/C SUN PAG 56

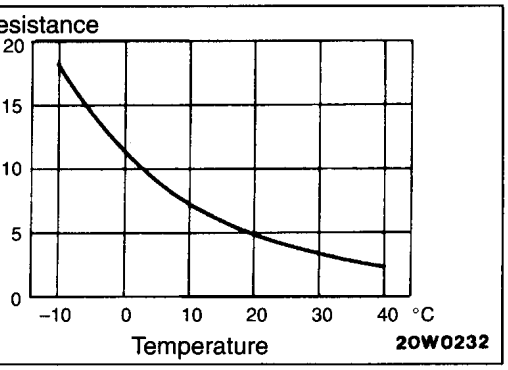


00000552

Disassembly steps

1. Clip
2. Evaporator case (upper)
3. Air thermo sensor <Dual A/C>
4. Thermostat <Single A/C>
5. Evaporator case (lower)
6. Expansion valve
7. Evaporator





INSPECTION

THERMOSTAT INSPECTION <SINGLE A/C>

(1) Apply battery voltage between the thermostat terminals shown in the illustration, and connect a test lamp to terminal (2).
(2) Blow cool air onto the air thermo sensor and check that the test lamp switches off when the cool air temperature becomes approximately 3°C or less.

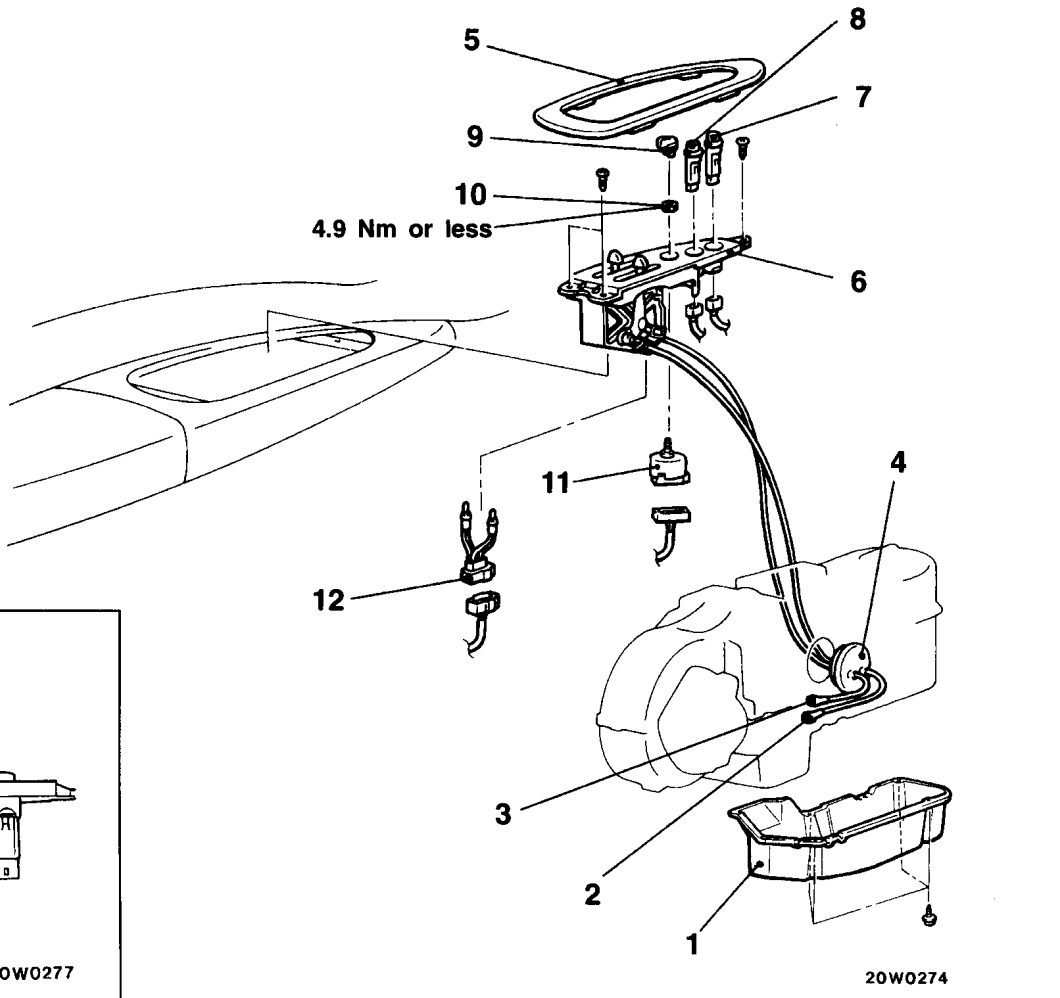
AIR THERMO SENSOR INSPECTION <DUAL A/C>

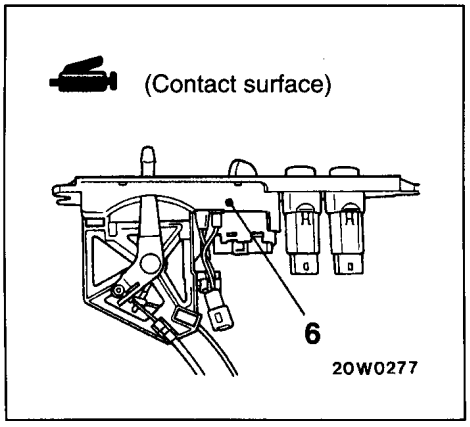
When the resistance value between the sensor terminals is measured under two or more temperature conditions, the resistance value should be close to the values shown in the graph.

REAR PANEL ASSEMBLY AND REAR A/C SWITCH <BUILT-IN TYPE>

120000512

REMOVAL AND INSTALLATION

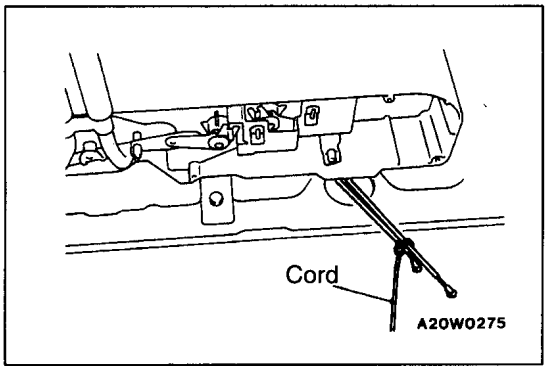




00000553

Removal steps

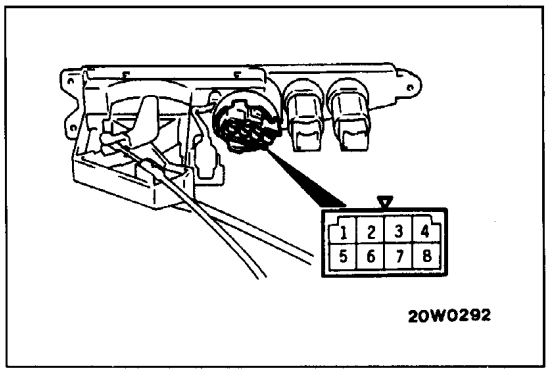
1. Link cover
- ▶B◀ 2. Air mixing damper cable connection
- ▶A◀ 3. Air outlet changeover damper cable connection
4. Wire grommet
5. Rear heater control bezel
- ◀A▶ 6. Rear panel assembly
7. Rear heater switch
8. Rear A/C switch
9. Knob
10. Lock nut
11. Rear blower switch
12. Illumination lamp assembly

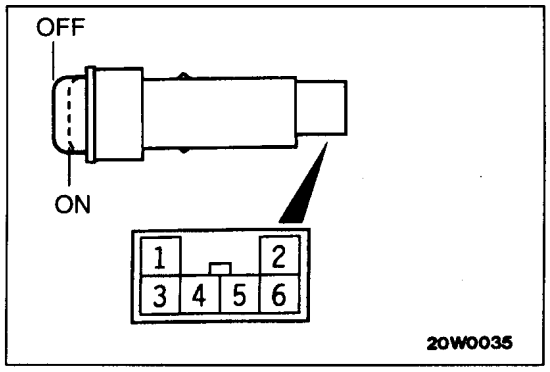


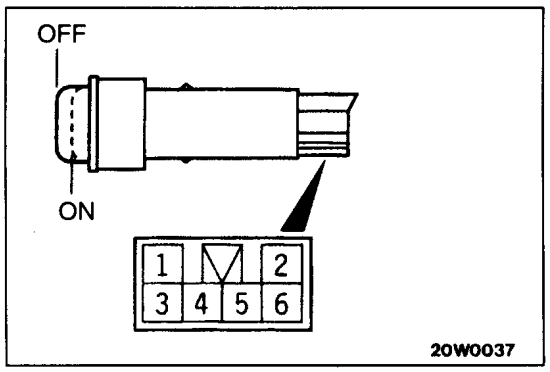
REMOVAL SERVICE POINT

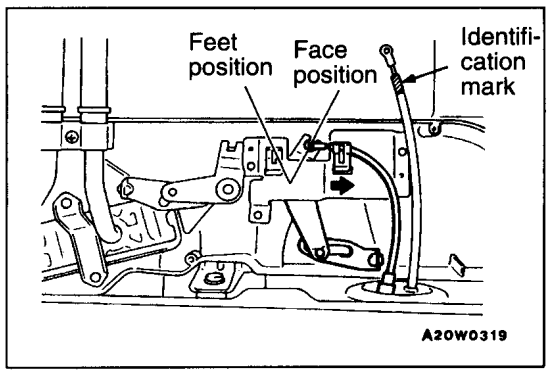
◀A▶ REAR PANEL ASSEMBLY REMOVAL

Tie a cord to the end of the control cable for easier reinstallation.









INSPECTION

REAR BLOWER SWITCH CONTINUITY INSPECTION

Knob position	Terminal No.				
	2	3	5	6	7
LO		○	○		
ML			○	○	
MH	○		○		
HI			○		○

REAR A/C SWITCH CONTINUITY INSPECTION

Switch position	Terminal No.						
	1	4	IND	5	3	ILL	6
OFF	○		○	○	○	○	○
ON	○	○	○	○	○	○	○

REAR HEATER SWITCH CONTINUITY INSPECTION

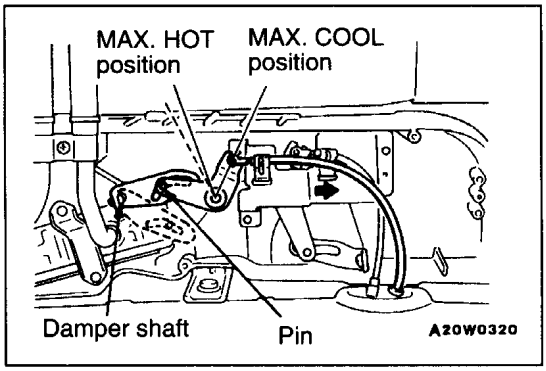
Switch position	Terminal No.							
	1	2	4	IND	5	3	ILL	6
OFF	○	○		○	○	○	○	○
ON	○		○	○	○	○	○	○

INSTALLATION SERVICE POINTS

▶A◀ AIR OUTLET CHANGEOVER DAMPER CABLE INSTALLATION

(1) Set the air outlet changeover lever on the rear panel assembly to the face position.
(2) Set the air outlet changeover damper lever of the heater unit to face position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then clamp it.

NOTE
The air mixing damper cable has a yellow identification mark on its end.



▶B◀ AIR MIXING DAMPER CABLE INSTALLATION

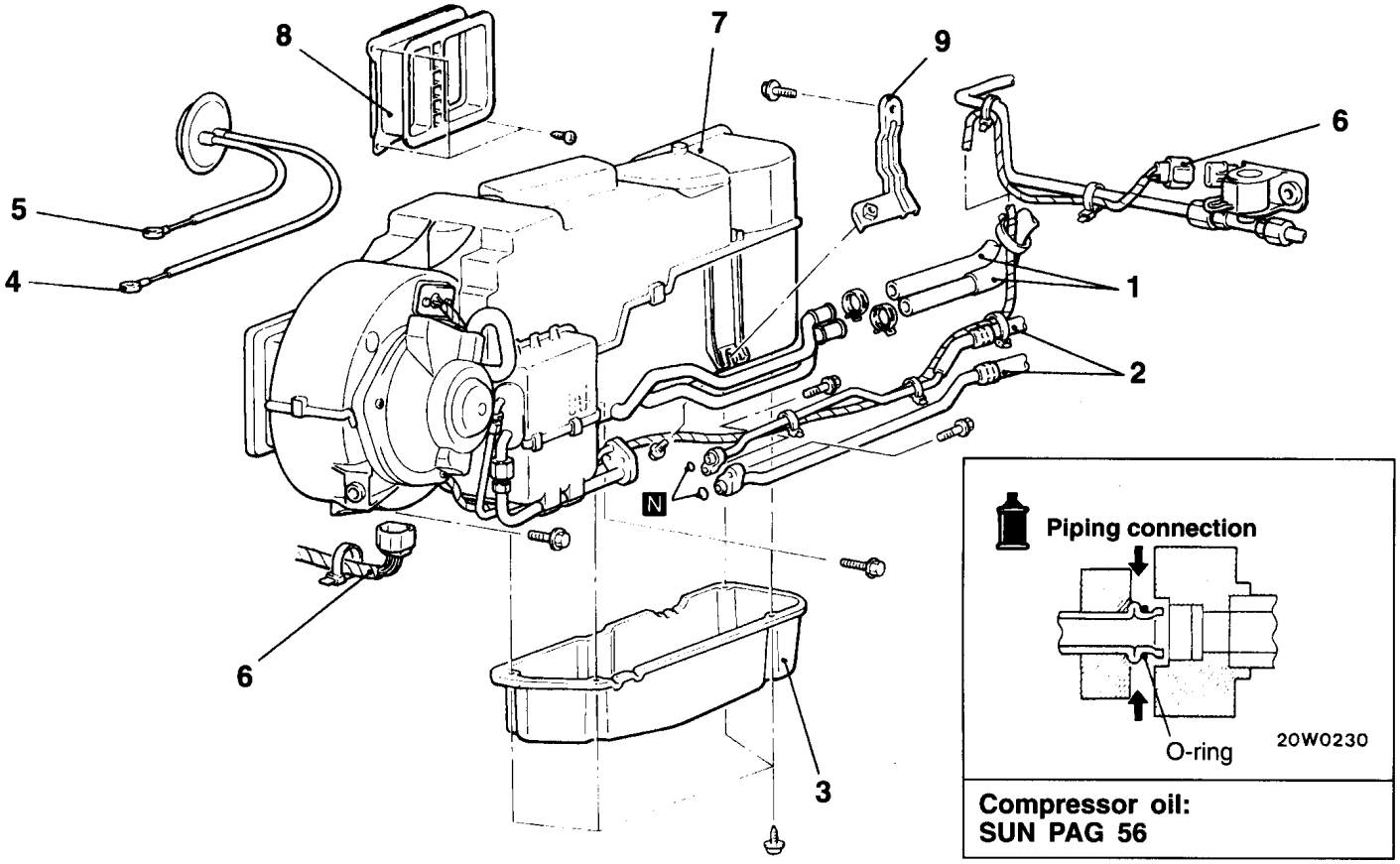
(1) Set the temperature control lever on the rear panel assembly to the MAX. COOL position.
(2) Set the air mix damper lever at the bottom of the heater unit to the MAX. COOL position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness.
(4) Position the damper shaft and pin as shown in the illustration, and then clamp the cable.

REAR EVAPORATOR ASSEMBLY <BUILT-IN TYPE>

120002267

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1)Refrigerant Discharging and Charging
(Refer to P.55-17, 20)
(2)Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)



20W0324

00002861

Removal steps

◀A▶ ▶C◀ 1. Rear water hose connection
◀B▶ 2. Rear suction hose and rear liquid hose connection
3. Link cover
▶B◀ 4. Air mixing damper cable connection
▶A◀ 5. Air outlet changeover damper cable connection
6. Connector
7. Rear unit assembly
8. Rear joint duct
9. Rear unit bracket

REMOVAL SERVICE POINTS

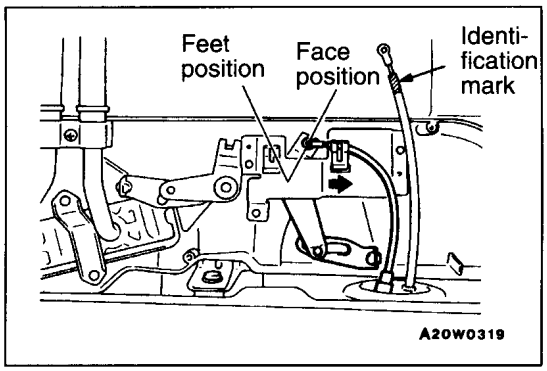
◀A▶ REAR WATER HOSE DISCONNECTION

Caution
Be sure to cool down the coolant inside the rear heater core and rear water pipe before disconnecting the hose. Otherwise, it will lead to personal injury.

◀B▶ REAR SUCTION HOSE AND REAR LIQUID DISCONNECTION

Plug the disconnected hose and the cooling unit nipple with blind caps not to let foreign matter get into them.

Caution
Seal the hoses completely. Otherwise, the compressor oil and receiver will absorb water vapour easily.

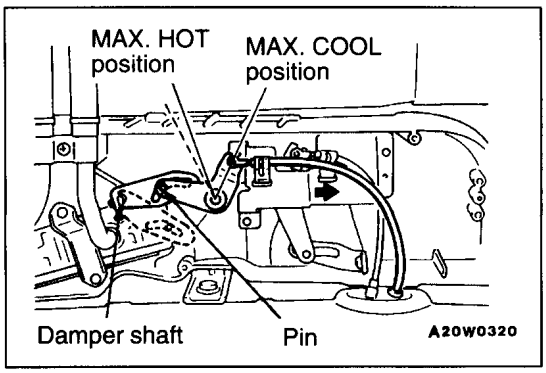


INSTALLATION SERVICE POINTS

▶A◀ AIR OUTLET CHANGEOVER DAMPER CABLE INSTALLATION

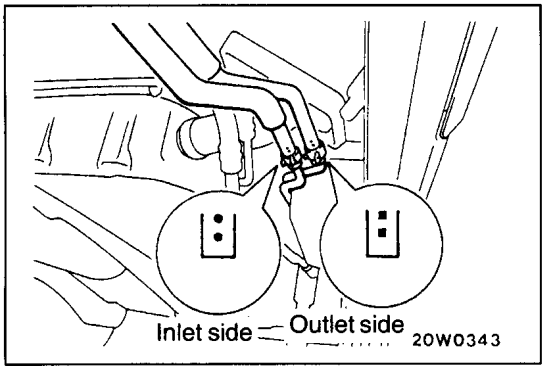
(1) Set the air outlet changeover lever on the rear panel assembly to the face position.
(2) Set the air outlet changeover damper lever of the heater unit to face position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then clamp it.

NOTE
The air mixing damper cable has a yellow identification mark on its end.



▶B◀ AIR MIX DAMPER CABLE INSTALLATION

(1) Set the temperature control lever on the rear panel assembly to the MAX. COOL position.
(2) Set the air mix damper lever at the bottom of the heater unit to the MAX. COOL position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness.
(4) Position the damper shaft and pin as shown in the illustration, and then clamp the cable.

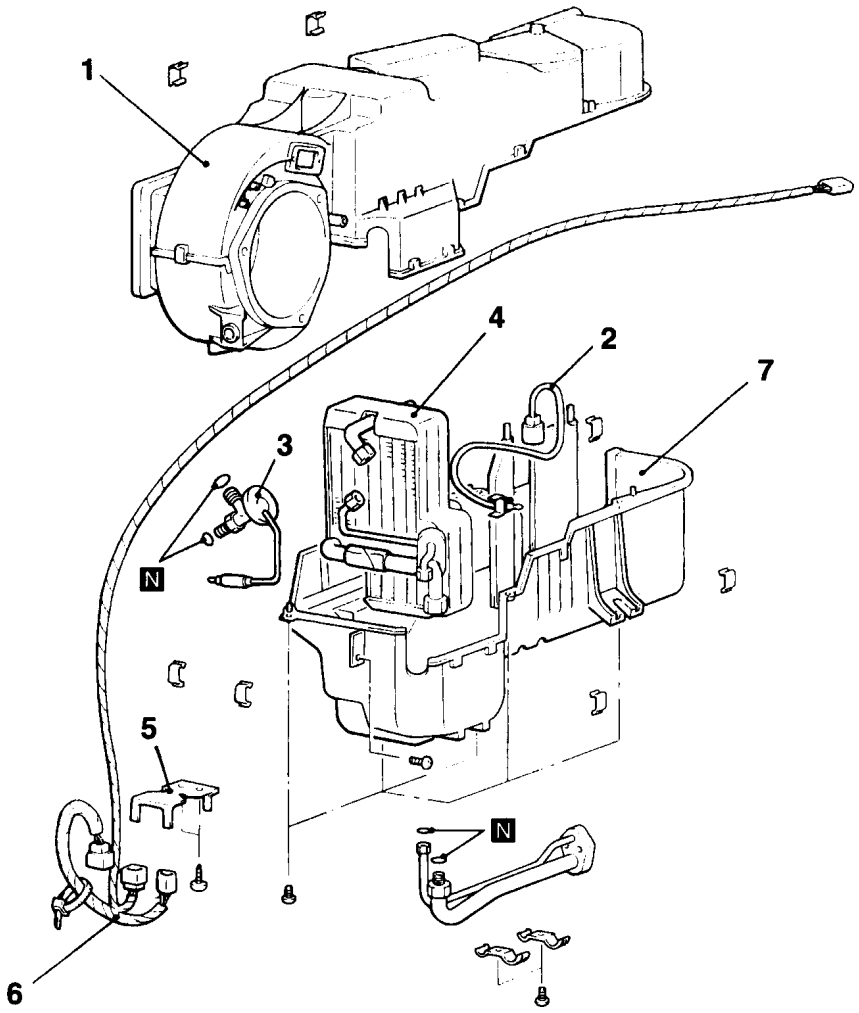


▶C◀ REAR WATER HOSE INSTALLATION

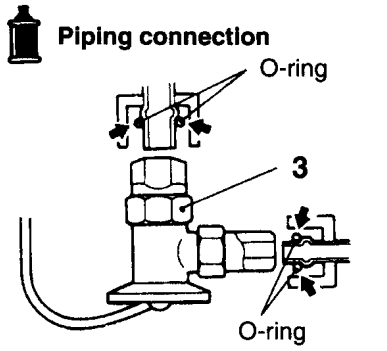
Connect the rear water hose so that the pink hose identification mark is at the bottom.

DISASSEMBLY AND REASSEMBLY

120002513



20W0347



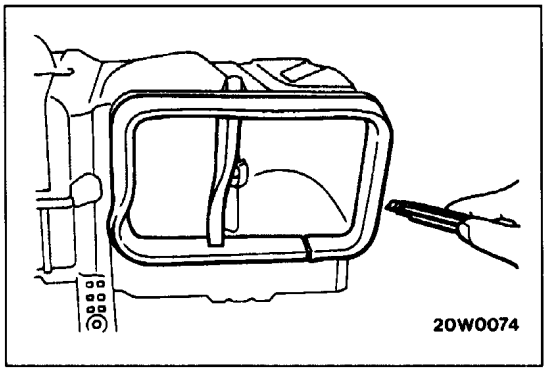
20W0295

Compressor oil:
SUN PAG 56

00002862

Disassembly steps

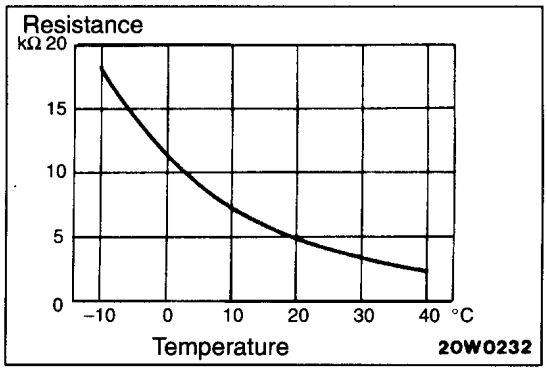
◀A▶ 1. Rear unit case (upper)
2. Air thermo sensor
3. Expansion valve
▶A◀ 4. Rear evaporator
5. Harness bracket
6. Wiring harness
7. Rear unit case (lower)



DISASSEMBLY SERVICE POINT

◀A▶ REAR UNIT CASE (UPPER) REMOVAL

(1) Use a knife to cut the packing between the upper and lower cases.
(2) Remove the six screws and the seven clips, and then remove the upper case.



INSPECTION

AIR THERMO SENSOR INSPECTION

When the resistance value between the sensor terminals is measured under two or more temperature conditions, the resistance value should be close to the values shown in the graph.

REASSEMBLY SERVICE POINT

▶A◀ REAR 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: 30 mℓ

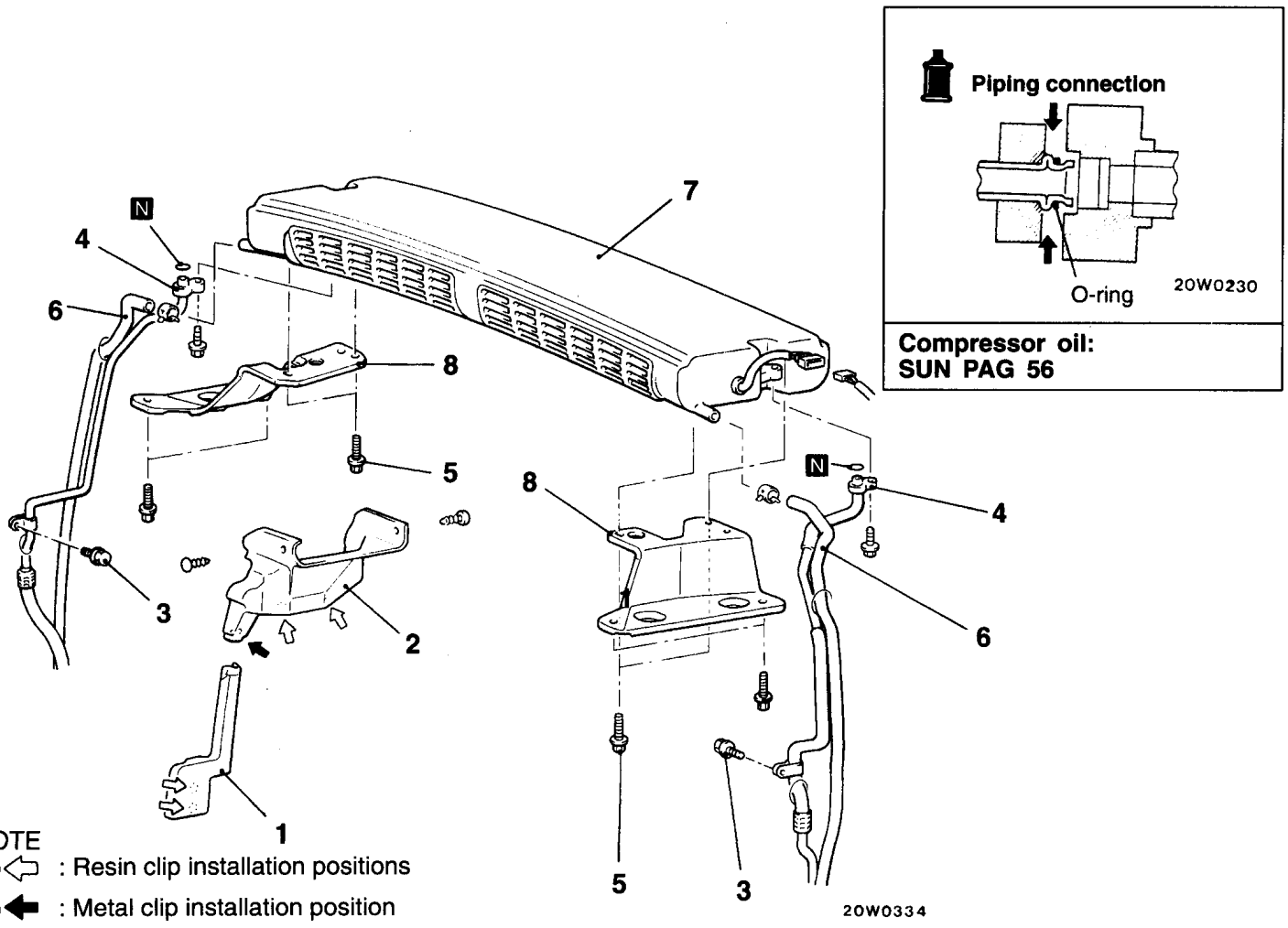
REAR EVAPORATOR ASSEMBLY <OVERHEAD TYPE>

120002268

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-17, 20.)

<High roof>



NOTE
(1)⇦ : Resin clip installation positions
(2)⬅ : Metal clip installation position

00002863

Removal steps

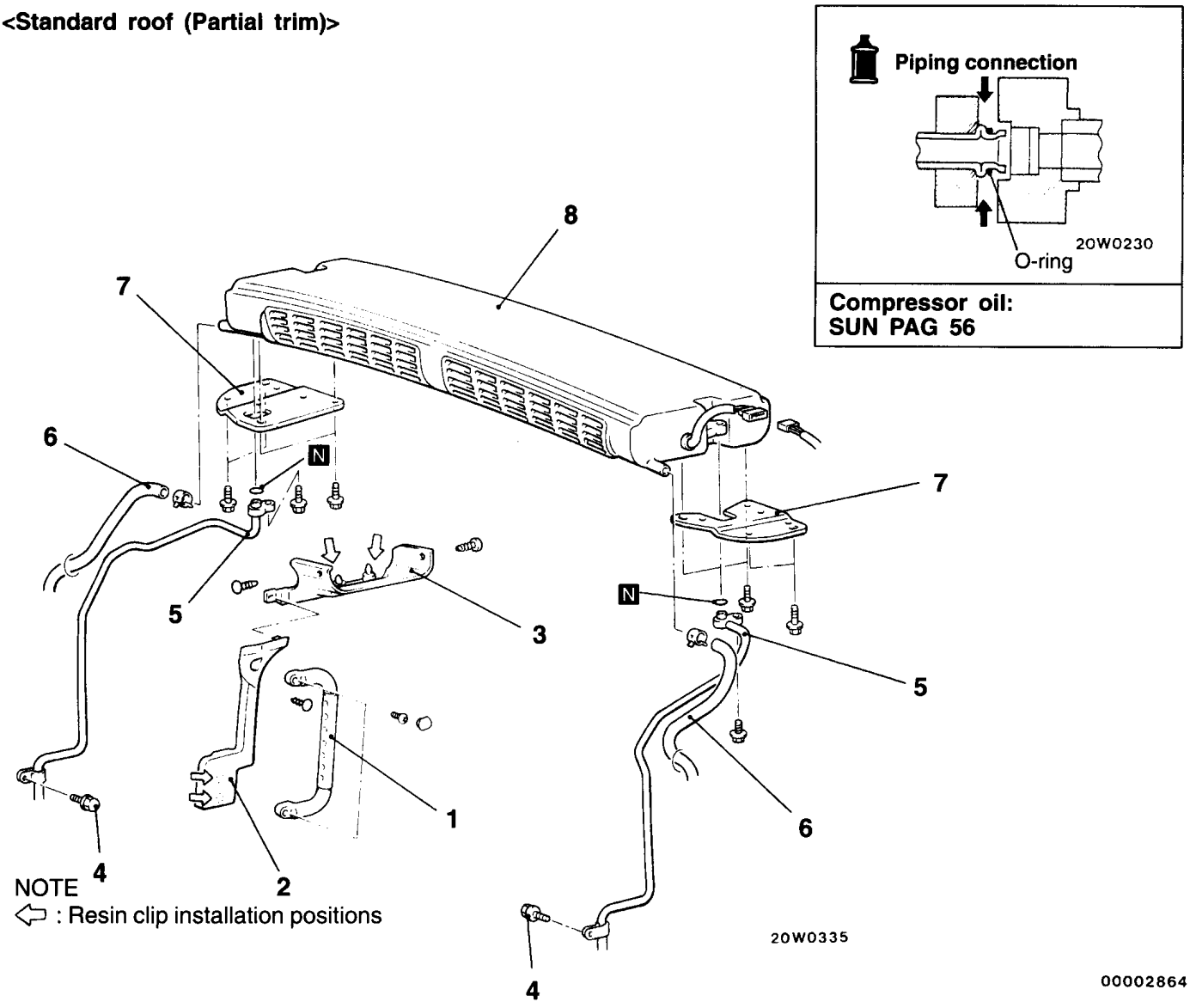
1. Centre pillar cover
2. Rear cooler bracket cover
3. Bolt
4. Liquid hose and discharge hose connection

◀A▶ ▶A◀

5. Bolt
6. Drain hose connection
7. Rear evaporator assembly
8. Rear cooler bracket

Pre-removal and Post-installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-17, 20.)

<Standard roof (Partial trim)>



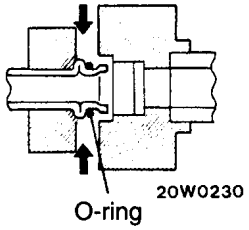
Removal steps

1. Rear door grip <4WD>
2. Centre pillar cover
3. Rear cooler bracket cover
4. Bolt
5. Liquid hose and discharge hose connection
6. Drain hose connection
7. Rear cooler bracket
▶A◀ 8. Rear evaporator assembly

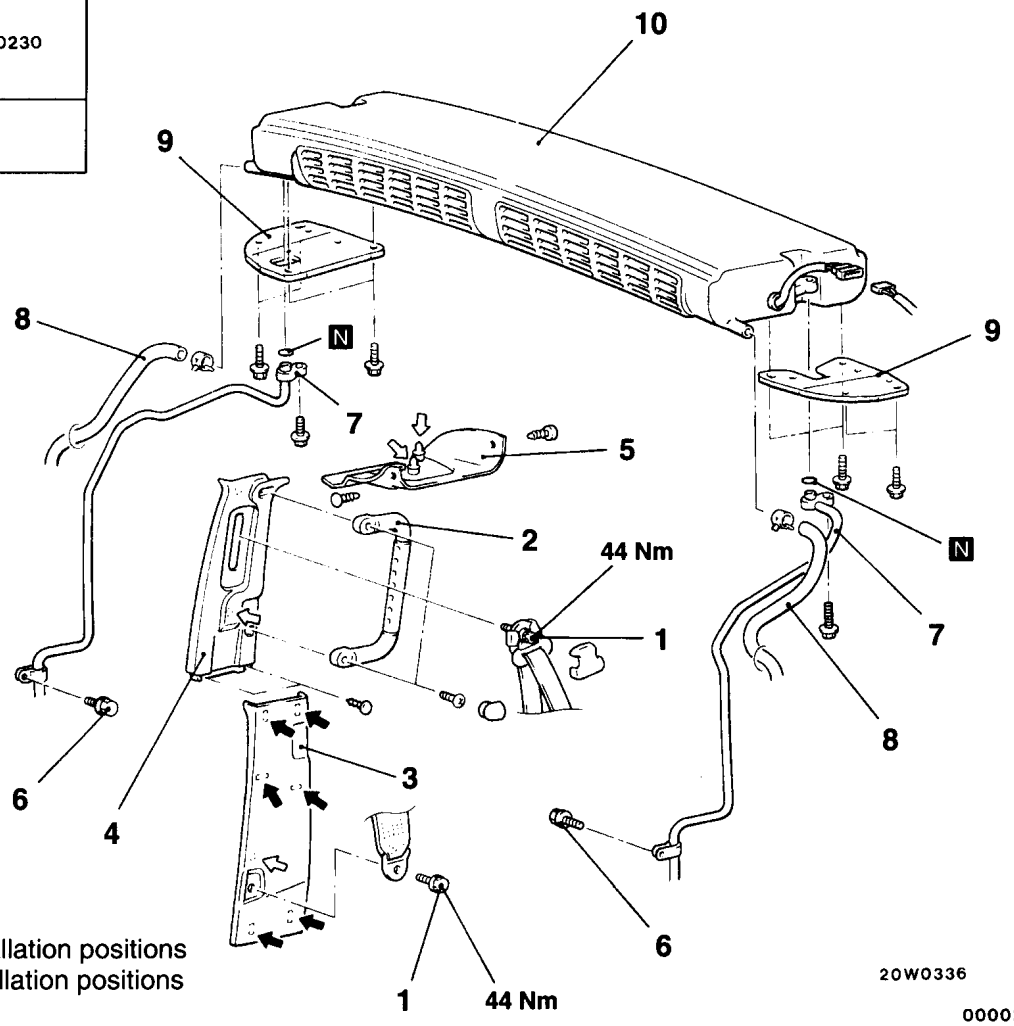
Pre-removal and Post-Installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-17, 20.)

<Standard roof (Full trim)>

Piping connection



Compressor oil:
SUN PAG 56



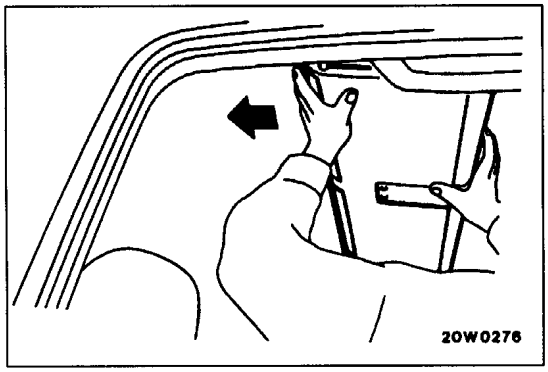
NOTE
(1) ⬅ : Resin clip installation positions
(2) ⇦ : Metal clip installation positions

00002865

Removal steps

1. Front seat belt anchor bolt
2. Rear door grip <4WD>
3. Centre pillar trim, lower
4. Centre pillar trim, upper
5. Rear cooler bracket cover
6. Bolt
7. Liquid hose and discharge hose connection
8. Drain hose connection
9. Rear cooler bracket

▶A◀ 10. Rear evaporator assembly



REMOVAL SERVICE POINT <HIGH ROOF>

◀A▶ REAR EVAPORATOR ASSEMBLY REMOVAL

With the bracket secured to the body, remove the rear evaporator assembly sliding it to the front of the vehicle.

INSTALLATION SERVICE POINT

▶A◀ REAR EVAPORATOR ASSEMBLY 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

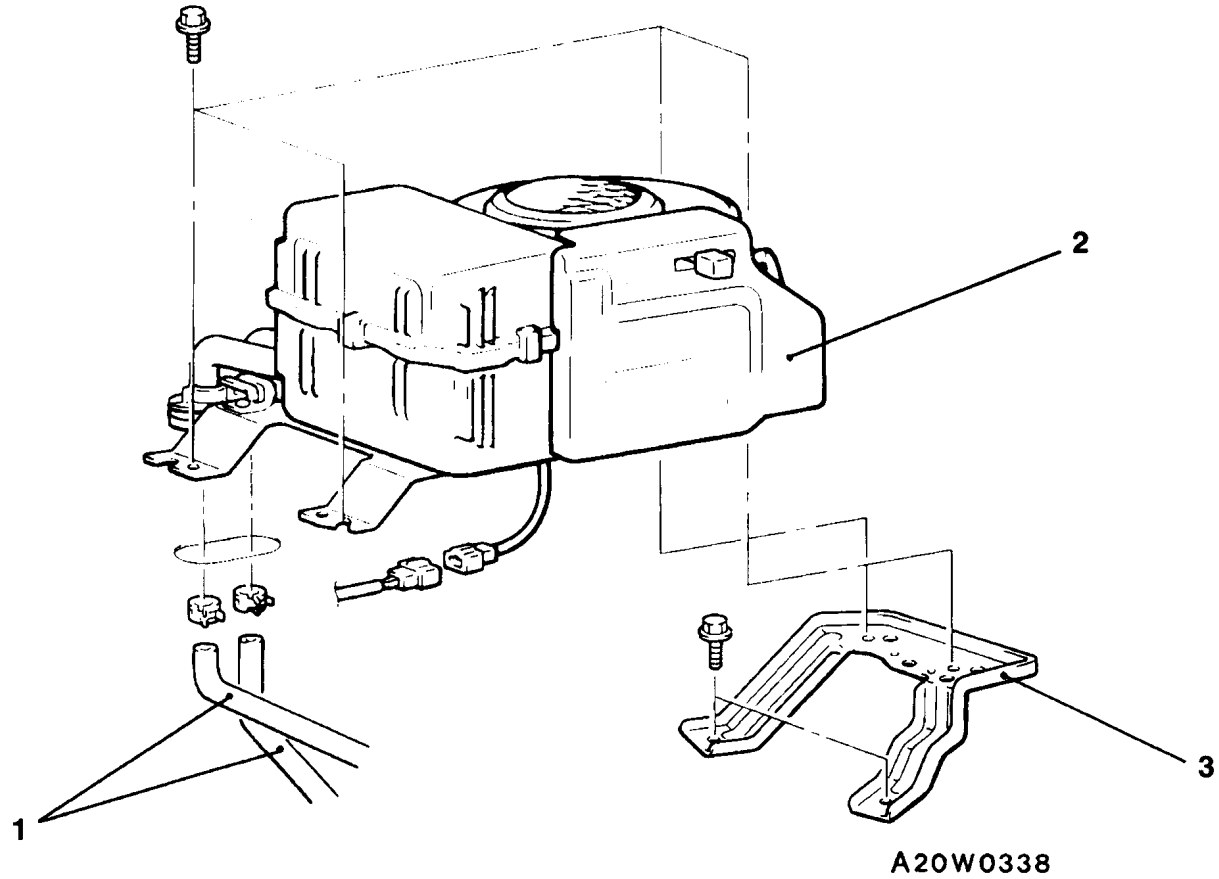
Quantity: 30 mℓ

REAR HEATER UNIT <UNDER SEAT TYPE>

120002269

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(2) Second Seat Removal and Installation (Refer to GROUP 52A – Rear Seats.)



A20W0338

Removal steps

◀A▶ 1. Rear water hose connection
2. Rear heater unit
3. Rear heater bracket

REMOVAL SERVICE POINT

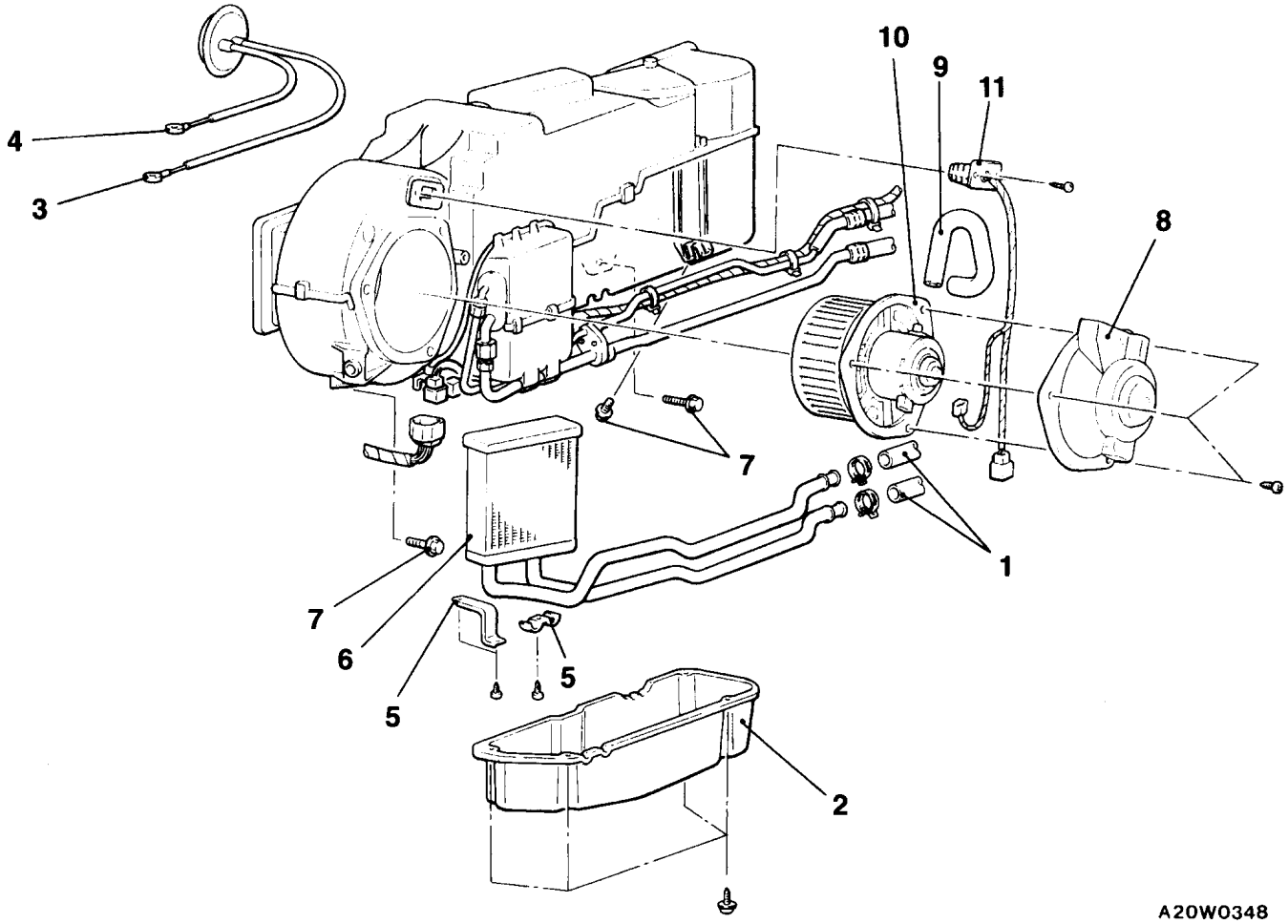
◀A▶ REAR WATER HOSE DISCONNECTION

Caution
Be sure to cool down the coolant inside the rear heater core and rear water pipe before disconnecting the hose. Otherwise, it will lead to personal injury.

REAR HEATER CORE, REAR BLOWER MOTOR ASSEMBLY AND RESISTOR <BUILT-IN TYPE>

120002270

REMOVAL AND INSTALLATION



Rear heater core removal steps

- Draining and Supplying of the Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

◀A▶ ▶C◀ 1. Rear water hose connection
2. Link cover
▶B◀ 3. Air mixing damper cable connection
5. Bracket
6. Rear heater core

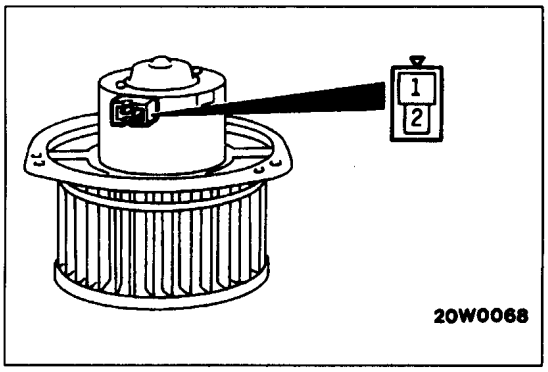
Rear blower motor assembly and resistor removal steps

2. Link cover
▶B◀ 3. Air mixing damper cable connection
▶A◀ 4. Air outlet changeover damper cable connection
7. Bolt
8. Motor cover
9. Hose
10. Rear blower motor assembly
11. Resistor

REMOVAL SERVICE POINT

◀A▶ REAR WATER HOSE DISCONNECTION

Caution
Be sure to cool down the coolant inside the rear heater core and rear water pipe before disconnecting the hose. Otherwise, it will lead to personal injury.



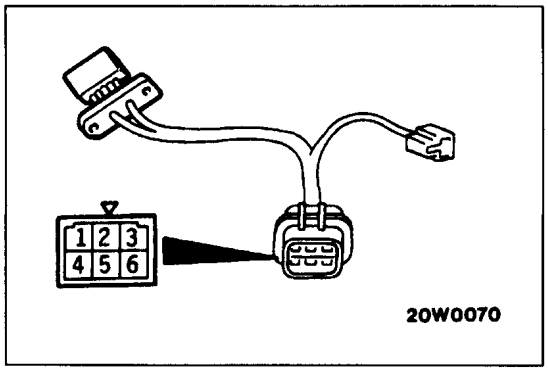
INSPECTION

BLOWER FAN AND MOTOR INSPECTION

When battery voltage is applied between the terminals check to be sure that the motor operates. Also, check to be sure that there is no abnormal noise.

Battery terminals		Motor
1	2	
⊖ - - - - - -	- - - - - - ⊕	Runs

Caution
Do not touch the blower during inspection, or it may lead to personal injury.

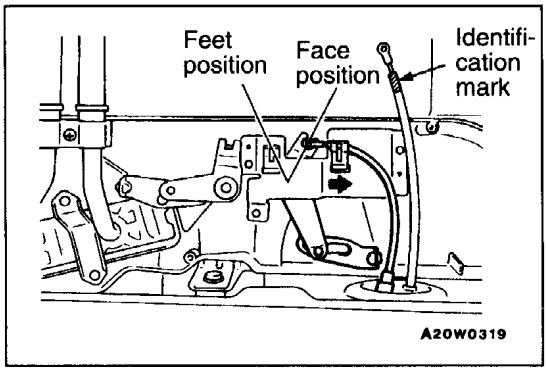


RESISTOR INSPECTION

Use a circuit tester to measure the resistance between the terminals as indicated below. Check to be sure that the measured value is at the standard value.

Standard value:

Measurement terminal	Standard value Ω
Between terminals 4–3 (LO)	1.56±7%
Between terminals 4–6 (ML)	0.86±7%
Between terminals 4–5 (MH)	0.44±7%

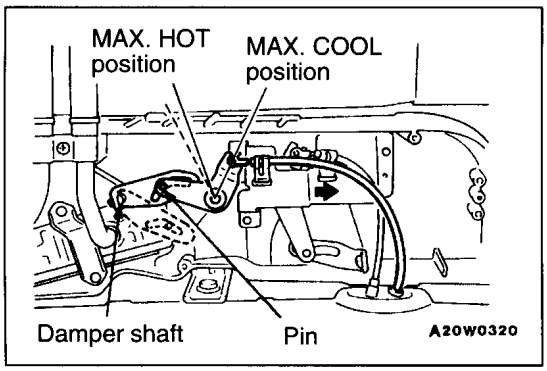


INSTALLATION SERVICE POINTS

▶A◀ AIR OUTLET CHANGEOVER DAMPER CABLE INSTALLATION

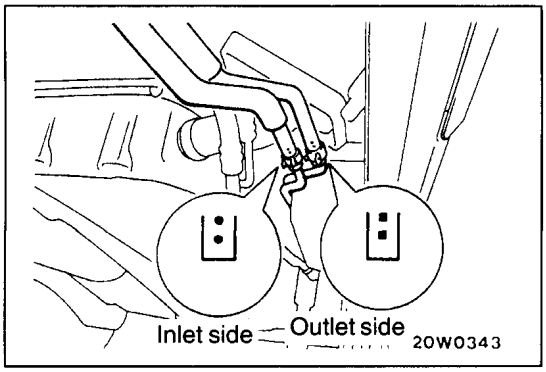
(1) Set the air outlet changeover lever on the rear panel assembly to the face position.
(2) Set the air outlet changeover damper lever of the heater unit to face position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness, and then clamp it.

NOTE
The air mixing damper cable has a yellow identification mark on its end.



▶B◀ AIR MIX DAMPER CABLE INSTALLATION

(1) Set the temperature control lever on the rear panel assembly to the MAX. COOL position.
(2) Set the air mix damper lever at the bottom of the heater unit to the MAX. COOL position, and install the cable to the lever pin.
(3) Pull the outer cable in the direction of the arrow so that there is no looseness.
(4) Position the damper shaft and pin as shown in the illustration, and then clamp the cable.



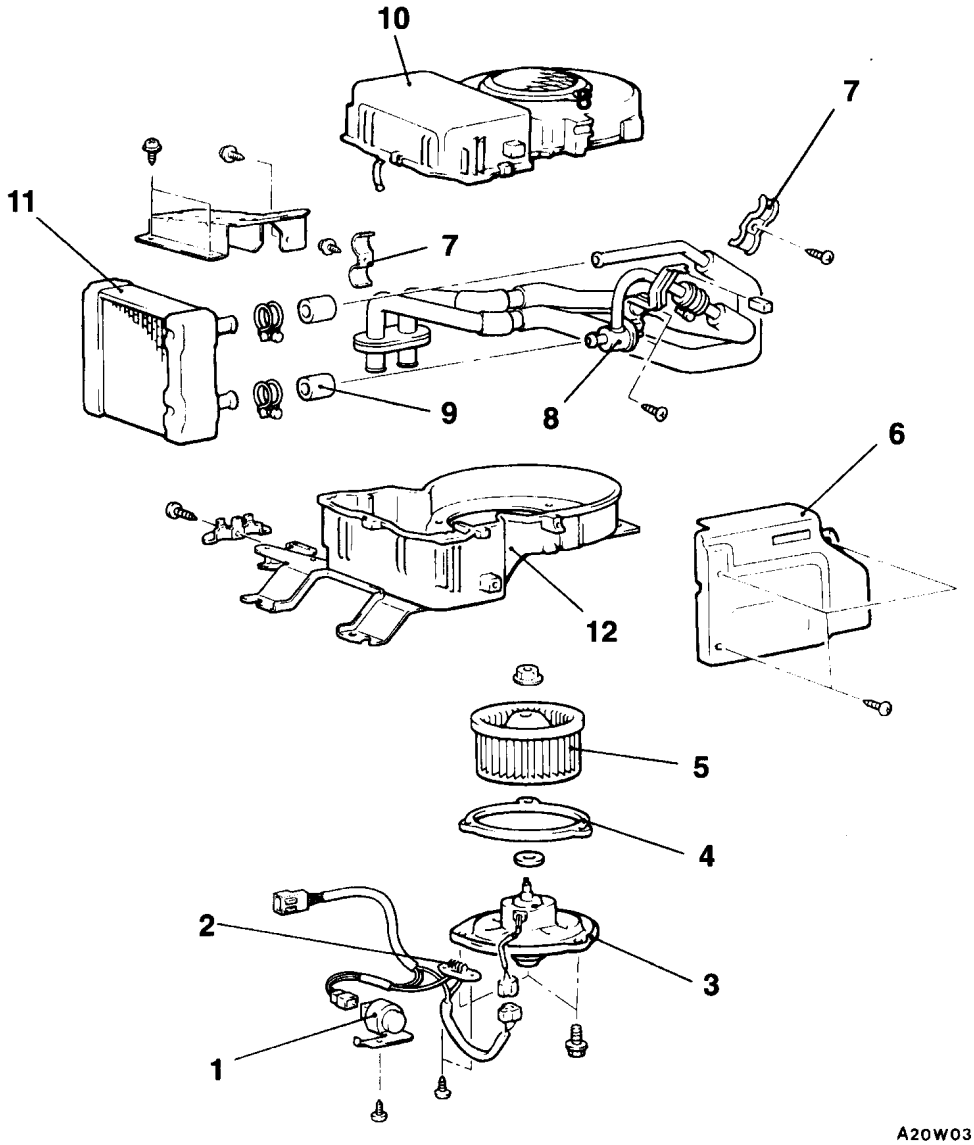
▶C◀ REAR WATER HOSE INSTALLATION

Connect the rear water hose so that the pink hose identification mark is at the bottom.

REAR HEATER CORE, REAR BLOWER MOTOR ASSEMBLY, BLOWER MOTOR LO RELAY AND RESISTOR <UNDER SEAT TYPE> 120002271

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(2) Second Seat Removal and Installation (Refer to GROUP 52A – Rear Seats.)
(3) Rear Heater Unit Removal and Installation (Refer to P.55-51.)



A20W0337

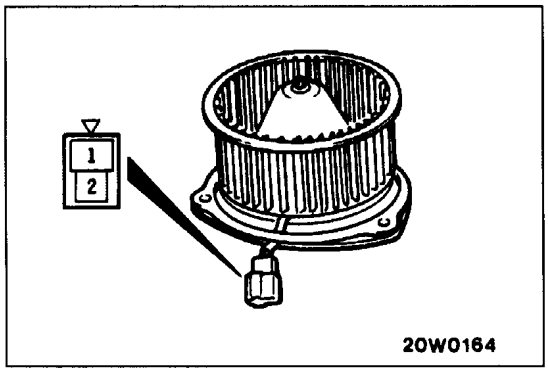
1. Blower motor LO relay
2. Resistor

Rear blower motor assembly and resistor removal steps

3. Rear blower motor assembly
4. Packing
5. Blower fan

Rear heater core removal steps

6. Heater cover
7. Clamp
8. Valve assembly
9. Hose
10. Heater case (upper)
11. Rear heater core
12. Heater case (lower)



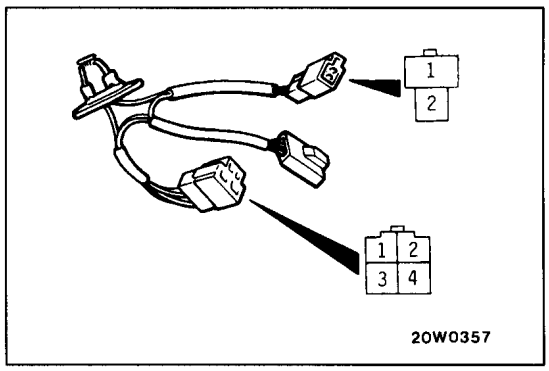
INSPECTION

BLOWER FAN AND MOTOR INSPECTION

When battery voltage is applied between the terminals, check to be sure that the motor operates. Also, check to be sure that there is no abnormal noise.

Battery terminals		Motor
1	2	
⊖ - - - - - -	- - - - - - ⊕	Runs

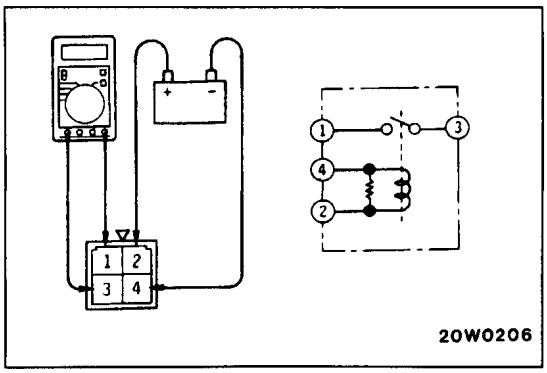
Caution
Do not touch the blower during inspection, or it may lead to personal injury.



RESISTOR INSPECTION

Use an ohmmeter to check that the resistance between terminal (2) of the 2-pin connector and terminal (2) of the 4-pin connector is at the standard value.

Standard value: approx. 1.7Ω



REAR BLOWER MOTOR LO RELAY CONTINUITY INSPECTION

Battery voltage	Terminal No.			
	1	2	3	4
Power is not supplied		○		○
Power is supplied	○	⊕	○	⊖

HEATER HOSE

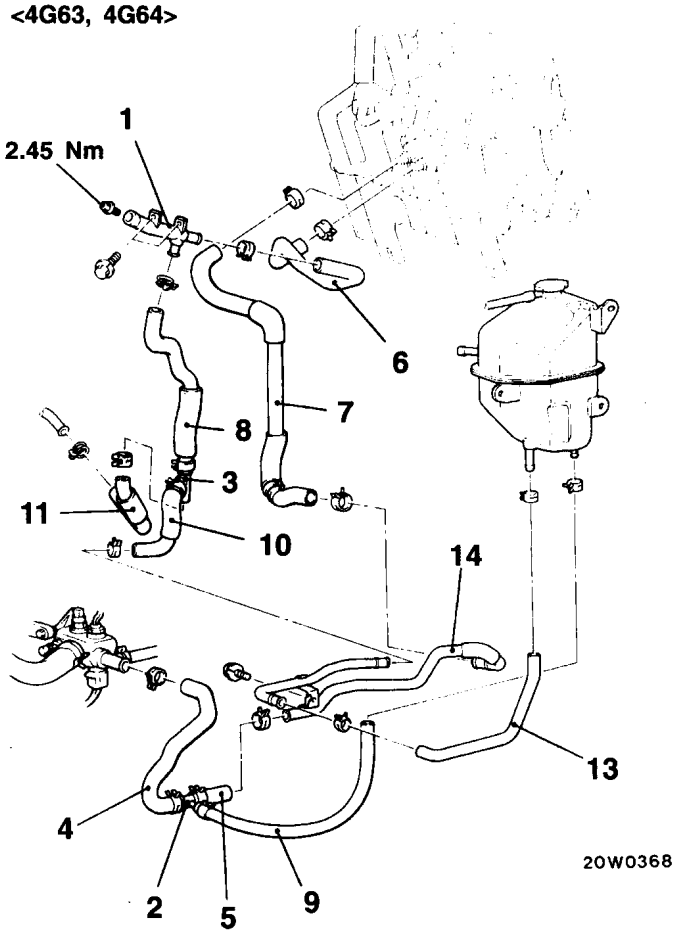
120002514

REMOVAL AND INSTALLATION

Vehicles Without Rear Heater

Pre-removal and Post-installation Operation
(1)Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(2)Battery and Battery Tray Removal and Installation

<4G63, 4G64>



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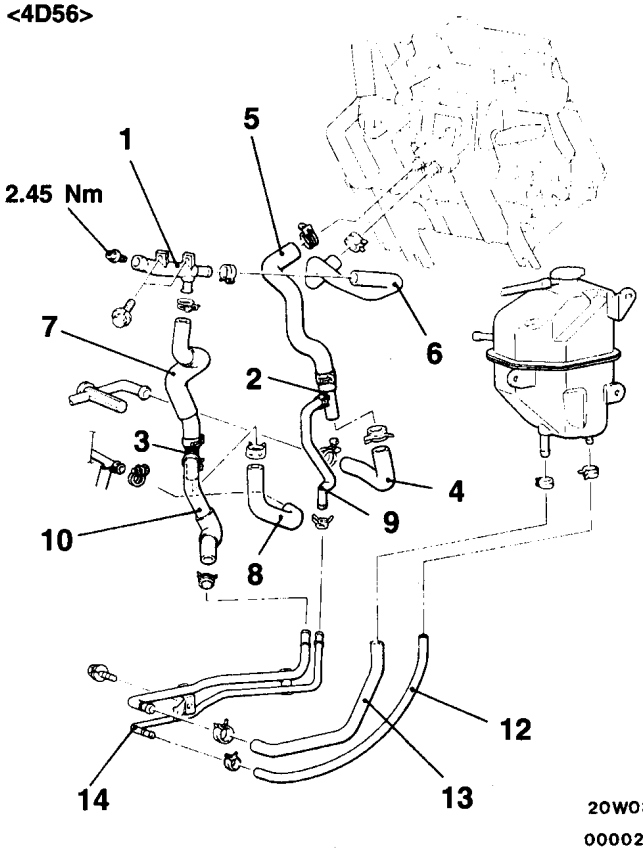


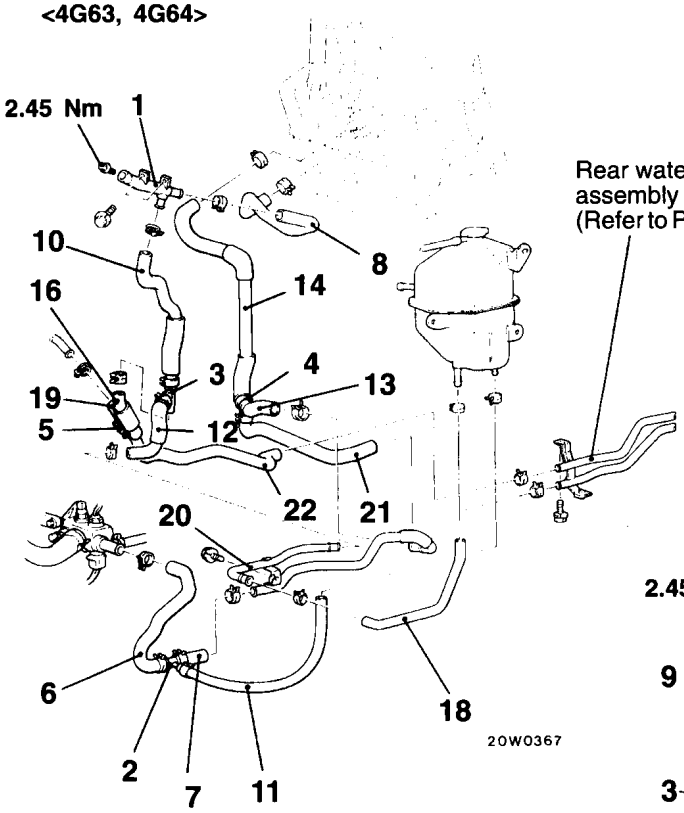
Removal steps

1. Separator box
2. Water hose assembly A
3. Water hose assembly B
▶A◀ 4. Water hose A
▶A◀ 5. Water hose B
▶A◀ 6. Water hose C
▶A◀ 7. Water hose D
▶A◀ 8. Water hose E
▶A◀ 9. Water hose F
▶A◀ 10. Water hose G
▶A◀ 11. Water hose J
12. Water hose
▶A◀ 13. Water hose M
14. Water pipe assembly

Vehicles With Rear Heater (Engine Room Side)

Pre-removal and Post-installation Operation
(1) Under Cover Removal and Installation <4G63, 4G64> (Refer to GROUP 42 – Under Cover.)
(2) Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(3) Battery and Battery Tray Removal and Installation

<4G63, 4G64>



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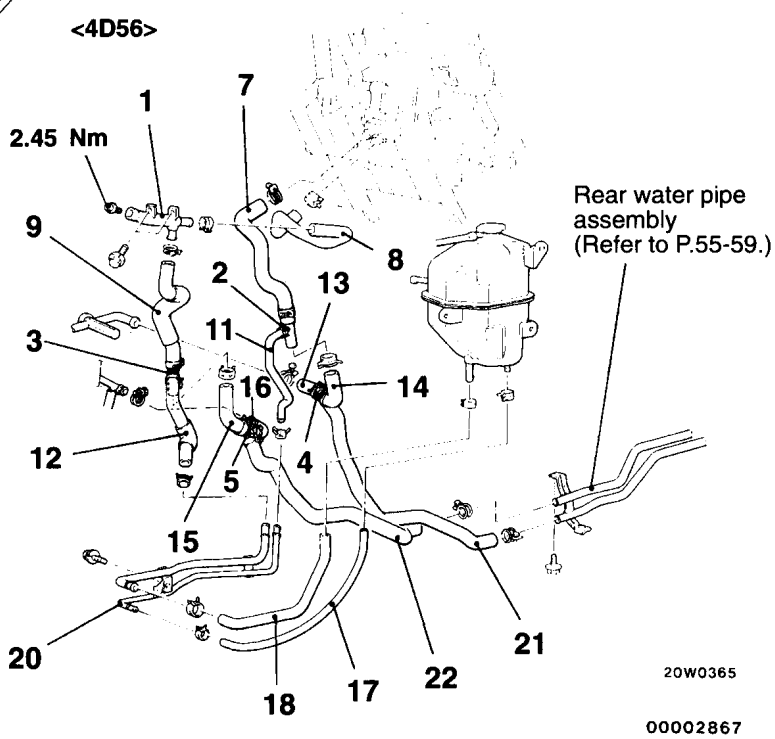


00002867

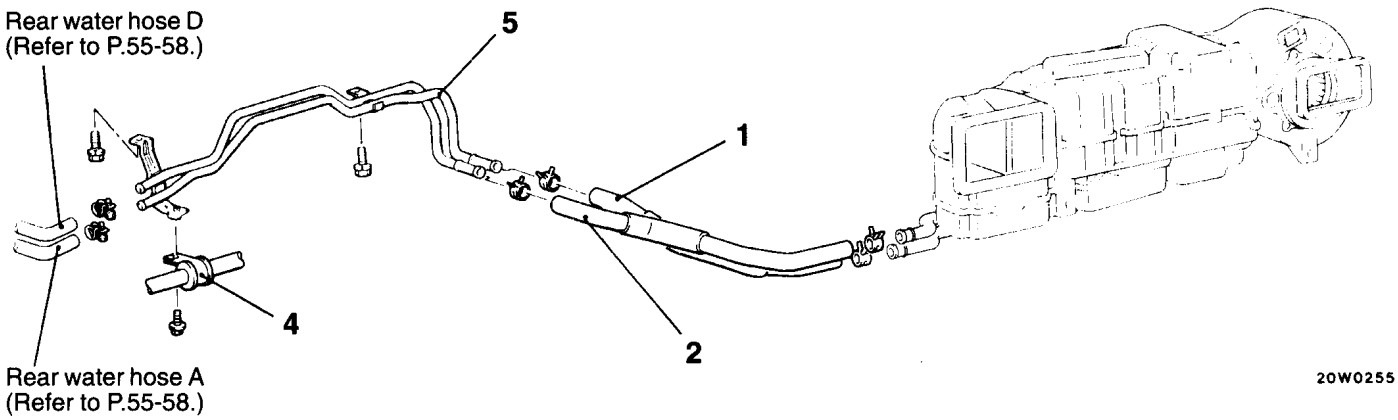
Removal steps

1. Separator box
2. Water hose assembly A
3. Water hose assembly B
4. Water hose assembly C
5. Water hose assembly D
▶A◀ 6. Water hose A
▶A◀ 7. Water hose B
▶A◀ 8. Water hose C
▶A◀ 9. Water hose D
▶A◀ 10. Water hose E
▶A◀ 11. Water hose F
▶A◀ 12. Water hose G
▶A◀ 13. Water hose H
▶A◀ 14. Water hose I
▶A◀ 15. Water hose J
▶A◀ 16. Water hose K
17. Water hose
▶A◀ 18. Water hose M
▶A◀ 19. Water hose N
20. Water pipe assembly
▶A◀ 21. Rear water hose A
▶A◀ 22. Rear water hose D

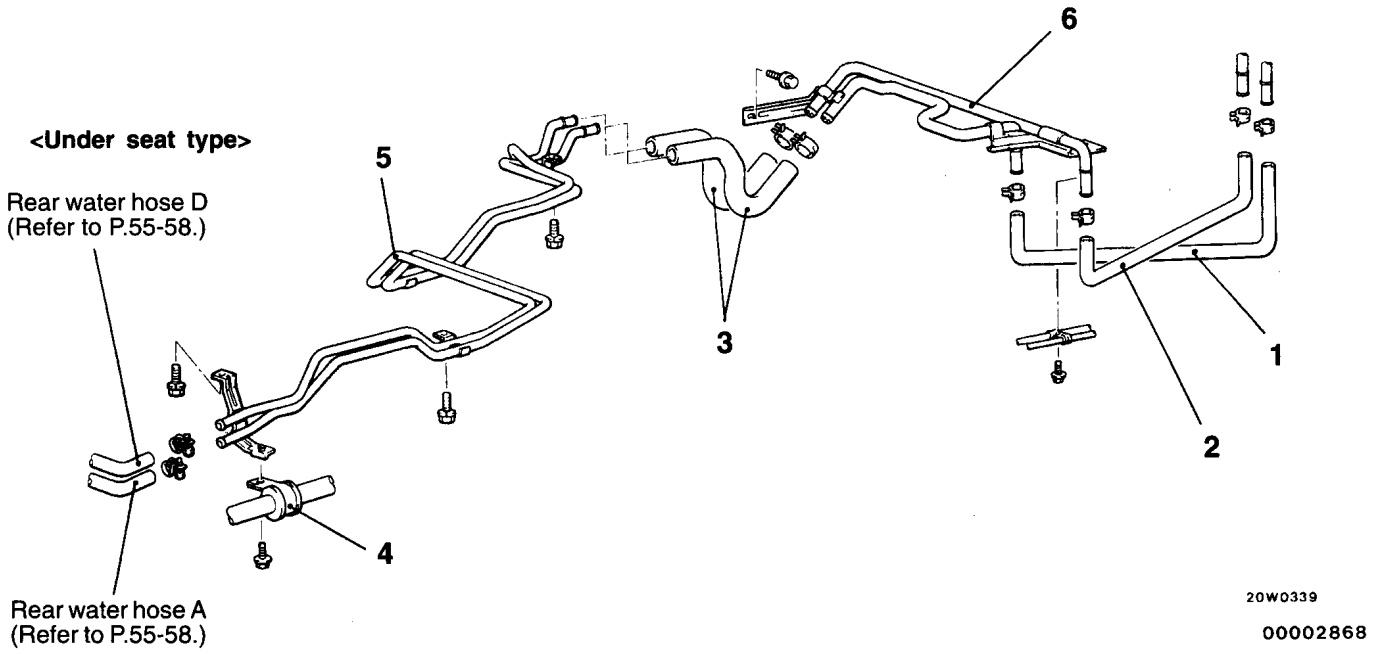
Vehicles With Rear Heater (Under Floor Side)

Pre-removal and Post-installation Operation
- Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

<Built-in type>



<Under seat type>



▶A◀ 1. Rear water hose B
▶A◀ 2. Rear water hose C
3. Rear water hose

Rear water pipe assembly removal steps
- Exhaust pipe (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
- Heat protector panel
- Propeller shaft assembly (Refer to GROUP 25 – Propeller Shaft.)

4. Discharge hose connection <Vehicles with dual A/C>
5. Water pipe assembly
6. Rear water pipe assembly

INSTALLATION SERVICE POINT

▶A◀ WATER HOSE CONNECTION

Connect water hoses according to the table below.

Engine	Hose	Mark	Direction of marking
4G63, 4G64	A, B, D, G, I	1 round (blue)	Facing up
	J	2 round (blue)	
	C	Rectangular (yellow)	
	E	2 round (blue)	Towards the radiator
	F	1 round (blue)	Towards the engine
	M	2 round (white)	
	Rear A	Rectangular (blue)	Facing down
	Rear D	2 square (blue)	
4D56	A, B, F, G, H	1 round (white)	Facing up
	E, K	2 round (white)	
	C	Rectangular (yellow)	
	D	2 round (white)	Towards the radiator
	M	2 round (white)	Towards the engine
	Rear A	Rectangular (white)	Facing down
	Rear D	2 square (white)	

NOTE
A single marking indicates that the engine coolant gets into the heater core; two markings indicate that it comes out of the heater core.

<Built-in type>

Connect to:	Hose	Mark	Direction of marking
Rear water pipe assembly	Rear B	1 round (pink)	Facing down
	Rear C	Rectangular (pink)	
Rear unit assembly	Rear B	2 round (pink)	
	Rear C	2 square (pink)	

<Under seat type>

Connect to:	Hose	Mark	Direction of marking
Rear water pipe assembly	Rear B	1 round (red)	Facing the radiator
	Rear C	Rectangular (red)	
Rear heater unit	Rear B	2 round (red)	
	Rear C	2 square (red)	
Water pipe assembly	Rear water hose	1 round (yellow)	Facing down
Rear water pipe assembly	Rear water hose	2 round (yellow)	

COMPRESSOR AND TENSION PULLEY

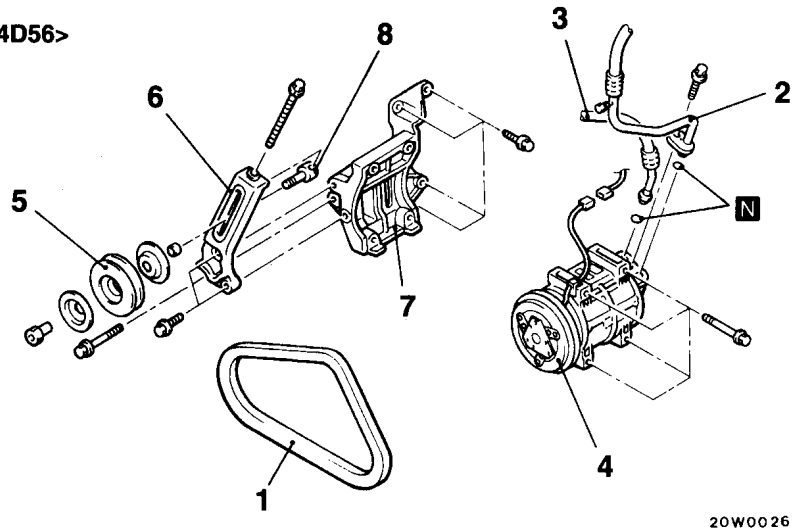
120002515

REMOVAL AND INSTALLATION

Single A/C

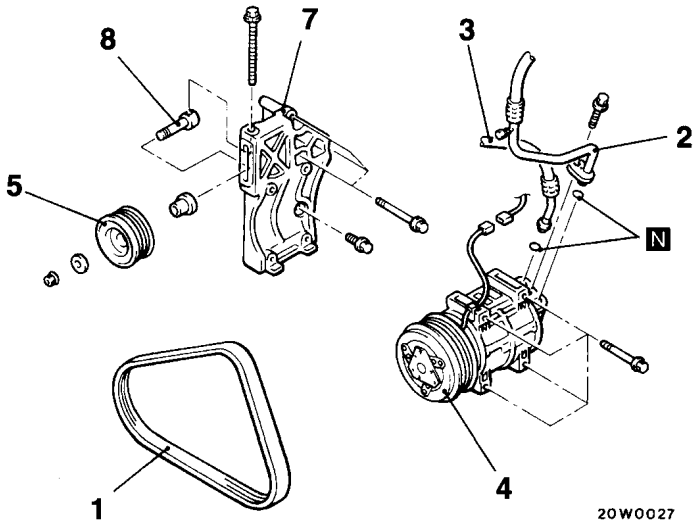
Post-installation Operation
- Compressor Drive Belt Adjustment (Refer to GROUP 11 – Service Adjustment Procedures.)

<4D56>



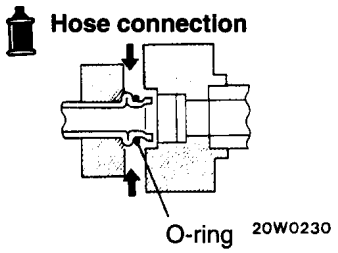
20W0026

<4G63, 4G64>



20W0027

00002869



Compressor oil:
ZXL 100PG

Compressor and tension pulley removal steps

◀A▶ 1. Compressor drive belt
- Discharging and charging of refrigerant (Refer to P.55-17, 20.)

◀B▶ 2. Suction hose connection

◀B▶ 3. Discharge hose connection
- Under cover (Refer to GROUP 42 – Under Cover.)

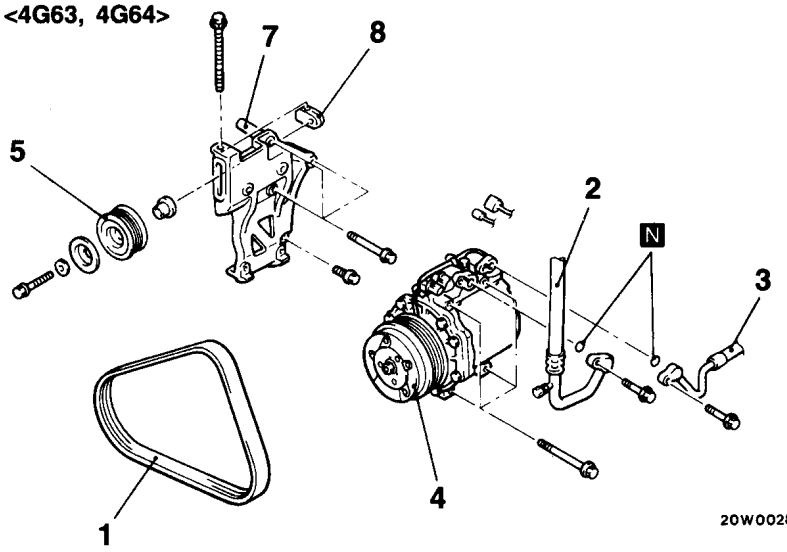
◀C▶ ▶A◀ 4. Compressor

5. Tension pulley
6. Tension pulley bracket assembly <4D56>
7. Compressor bracket
8. Shaft

Dual A/C

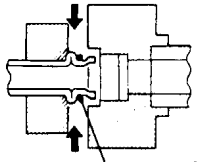
Post-installation Operation
- Compressor Drive Belt Adjustment (Refer to GROUP 11 – Service Adjustment Procedures.)

<4G63, 4G64>



20W0028

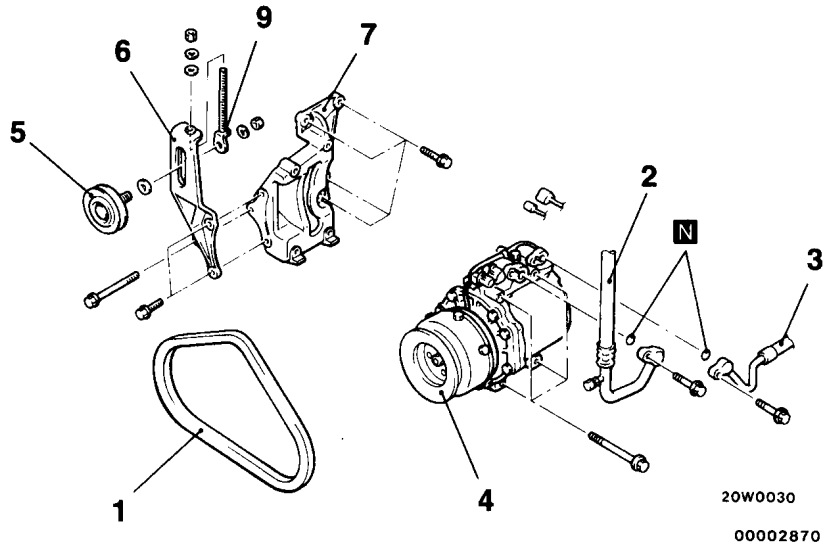
Hose connection



20W0230

Compressor oil: SUN PAG 56

<4D56>



20W0030

00002870

Compressor and tension pulley removal steps

◀A▶ 1. Compressor drive belt
- Discharging and charging of refrigerant (Refer to P.55-17, 20.)
- Battery and battery tray

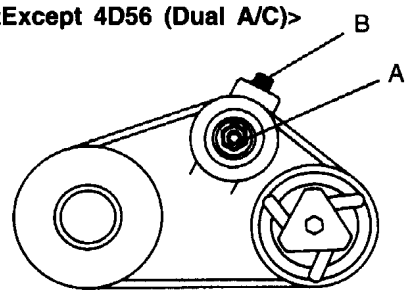
◀B▶ 2. Suction hose connection

◀B▶ 3. Discharge hose connection
- Under cover (Refer to GROUP 42 – Under Cover.)

◀C▶ ▶A◀ 4. Compressor

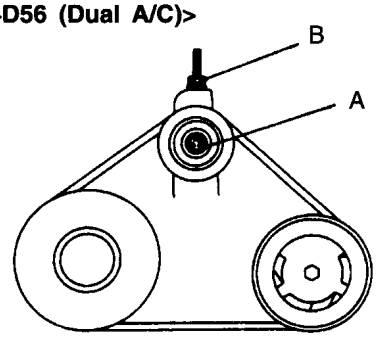
5. Tension pulley
6. Tension pulley bracket assembly <4D56>
7. Compressor bracket
8. Adjust plate <4G63, 4G64>
9. Adjust bolt

<Except 4D56 (Dual A/C)>



20W0082

<4D56 (Dual A/C)>



20W0083

00000565

REMOVAL SERVICE POINTS

◀A▶ COMPRESSOR DRIVE BELT REMOVAL

(1) Loosen nut "A" or bolt "A" for holding the tension pulley.
(2) Loosen bolt "B" or nut "B" for adjustment.
(3) Remove the compressor drive belt.

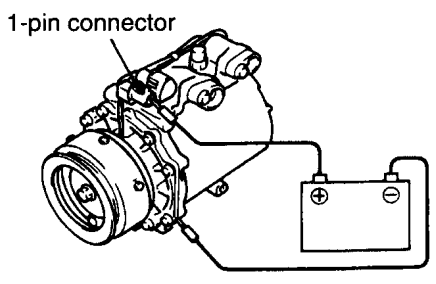
◀B▶ SUCTION HOSE, DISCHARGE HOSE DISCONNECTION

Plug the disconnected hose and the compressor nipple not to let foreign matter get into them.

Caution
Seal the hoses completely. Otherwise, the compressor oil and receiver will absorb water vapour easily.

◀C▶ COMPRESSOR REMOVAL

When doing this work, be careful not to spill the compressor oil.



A20W0221

INSPECTION

COMPRESSOR MAGNETIC CLUTCH OPERATION INSPECTION

Connect the battery (+) terminal to the compressor side terminal, and earth the battery (–) terminal to the body of the compressor. The condition is normal if the sound of the magnetic clutch (click) can be heard.

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) Remove (from the new compressor) the amount of oil calculated according to the following formula, and then install the new compressor.
New compressor oil amount

<Single A/C>: 180 mℓ – X mℓ = Y mℓ

<Dual A/C>: 240 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.

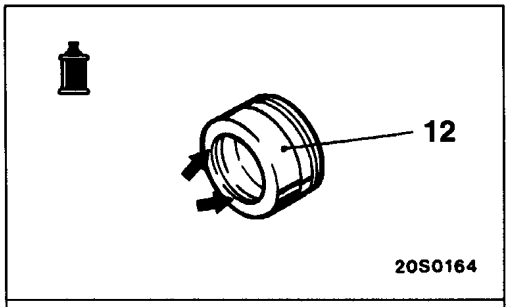
Quantity :

Item	Single A/C	Dual A/C
Front evaporator mℓ	40	30
Rear evaporator mℓ	–	30
Front condenser mℓ	40	30
Side condenser mℓ	–	30
Suction hose mℓ	10	10
Receiver mℓ	10	10

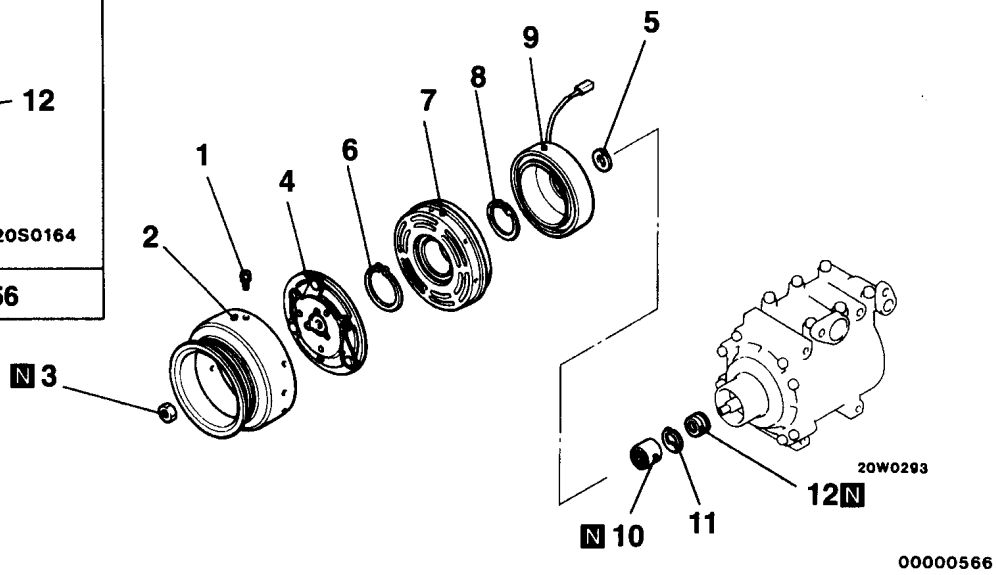
MAGNETIC CLUTCH

120000017

DISASSEMBLY AND REASSEMBLY

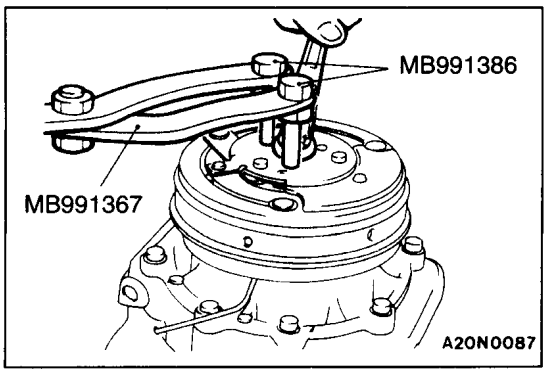


Compressor oil: SUN PAG 56



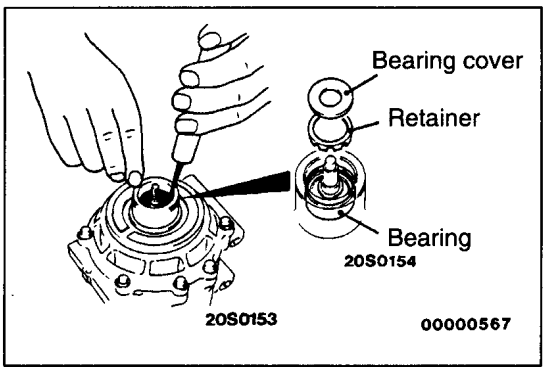
Disassembly steps

1. Bolt <4D56>
2. Pulley <4D56>
   - ▶G◀ • Air gap adjustment
- ◀A▶ ▶F◀ 3. Nut
   - ▶E◀ 4. Armature plate
5. Shims
- ▶D◀ 6. Snap ring
7. Rotor
8. Snap ring
- ▶C◀ 9. Clutch coil
- ◀B▶ ▶B◀ 10. Bearing <Compressor for dual A/C>
11. Snap ring <Compressor for dual A/C>
- ◀C▶ ▶A◀ 12. Lip seal <Compressor for dual A/C>



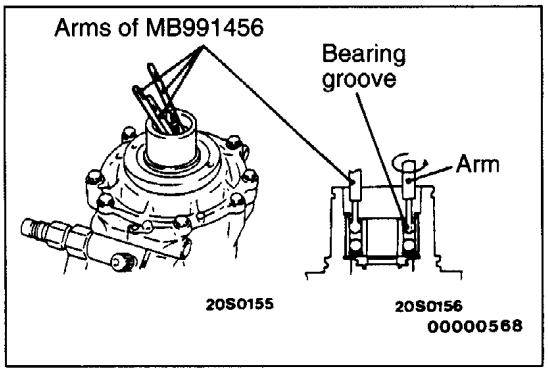
DISASSEMBLY SERVICE POINTS

◀A▶ NUT REMOVAL

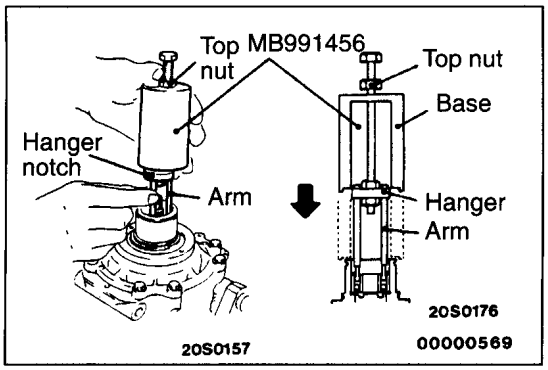


◀B▶ BEARING REMOVAL <Compressor for dual A/C>

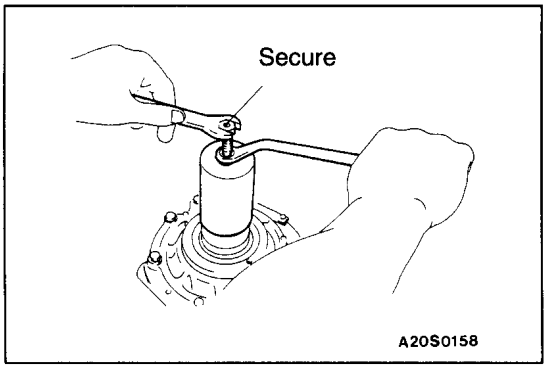
(1) Use a pointed tool such as an awl to remove the bearing cover and retainer.



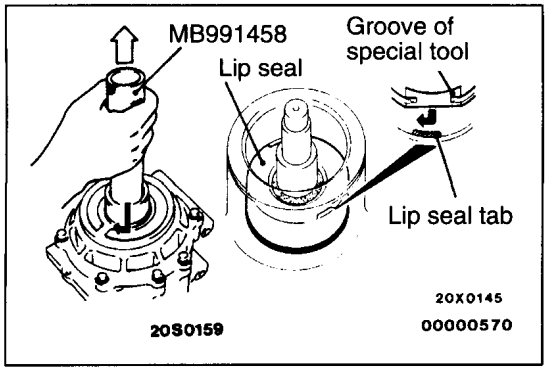
(2) Insert the arms (3) of the special tool into the bearing groove at regular intervals.
(3) Turn the arms 90° to secure the arms to the bearing.



(4) Set the 3 arms installed to the bearing into the notches (3 places) located on the hanger of the special tool.
(5) Lower the base of the special tool to cover the hanger, and tighten the top nut until it touches the base.

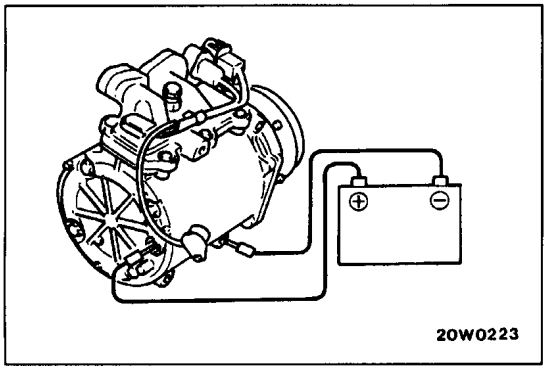


(6) Next, with the bolt of the special tool secured, tighten the nut, and remove the bearing from the compressor.



◀C▶ LIP SEAL REMOVAL <Compressor for dual A/C>

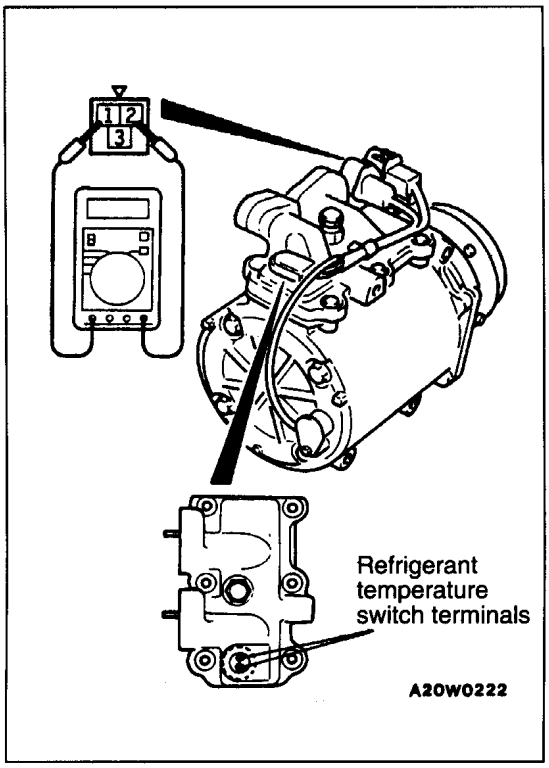
Catch the groove of the special tool on the lip seal tab, and slowly pull the lip seal straight upwards.



INSPECTION

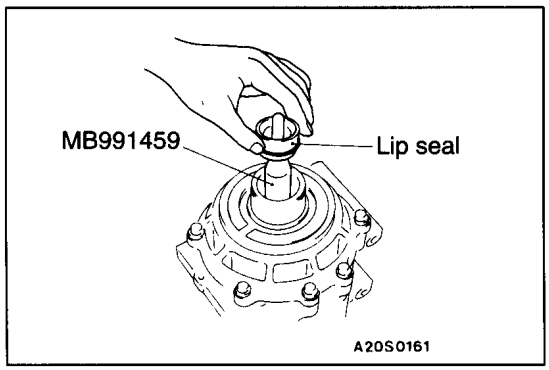
COMPRESSOR MAGNETIC VALVE OPERATION INSPECTION

Connect the battery (+) terminal to the compressor side terminal, and earth the battery (–) terminal to the body of the compressor. The condition is normal if the sound of the magnetic valve (click) can be heard.



REFRIGERANT TEMPERATURE SWITCH SIMPLE INSPECTION

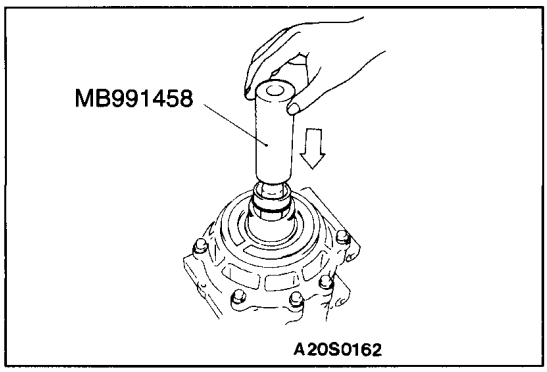
Check that there is continuity between connector terminals (1) and (2) and between the refrigerant temperature switch terminals when the air conditioner is not operating. If there is no continuity, replace the compressor assembly.



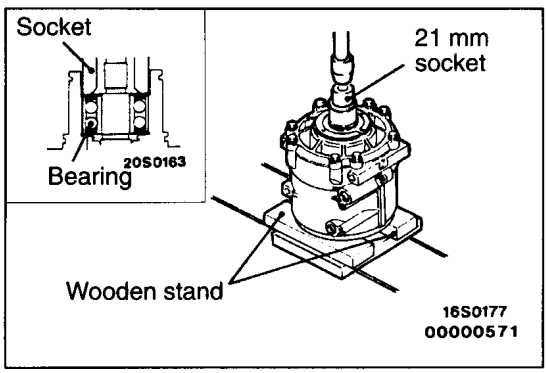
REASSEMBLY SERVICE POINTS

▶A◀ LIP SEAL INSTALLATION <Compressor for dual A/C>

(1) Install the special tool to the compressor crank shaft.
(2) Apply compressor oil to the sliding surface of the lip seal and the O-ring, and insert the lip seal.

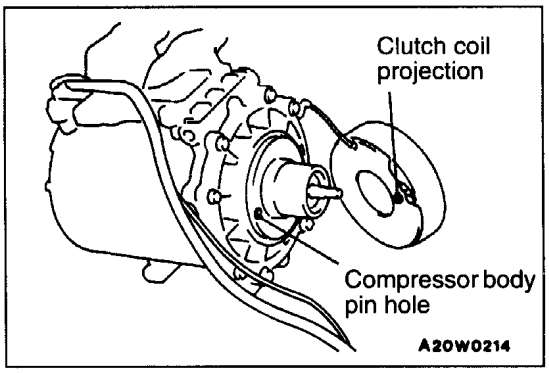


(3) Use the special tool to insert the lip seal.



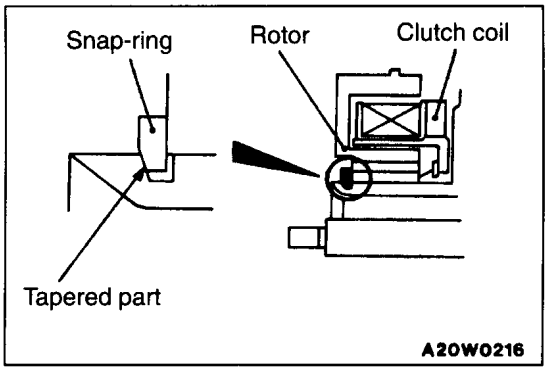
▶B◀ BEARING INSTALLATION <Compressor for dual A/C>

Use a wooden stand and a 21 mm socket to insert the bearing into the compressor.



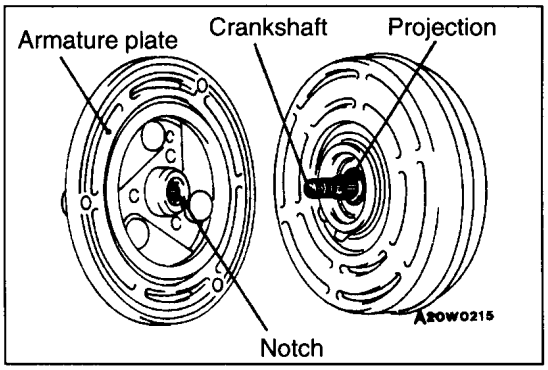
▶C◀ CLUTCH COIL INSTALLATION

When installing the clutch coil to the A/C compressor body, install so that the pin hole of the A/C compressor body and the clutch coil projection are aligned.



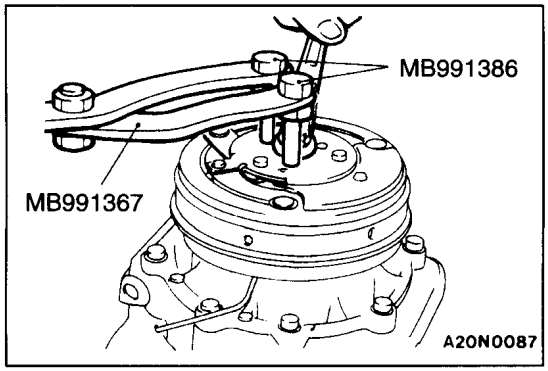
▶D◀ SNAP RING INSTALLATION

Install the snap ring so that the tapered surface is at the outer side.

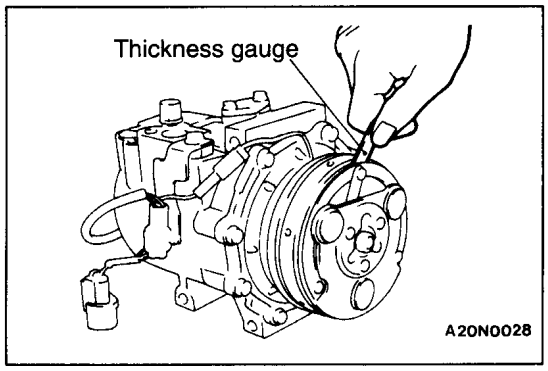


▶E◀ ARMATURE PLATE INSTALLATION

Align the projection on the crankshaft serration with the armature notch, and then fit them together.



▶F◀ NUT INSTALLATION



▶G◀ AIR GAP ADJUSTMENT

Check whether or not the air gap of the clutch is within the standard value.

Standard value: 0.3–0.6 mm <Single A/C>
0.4–0.6 mm <Dual A/C>

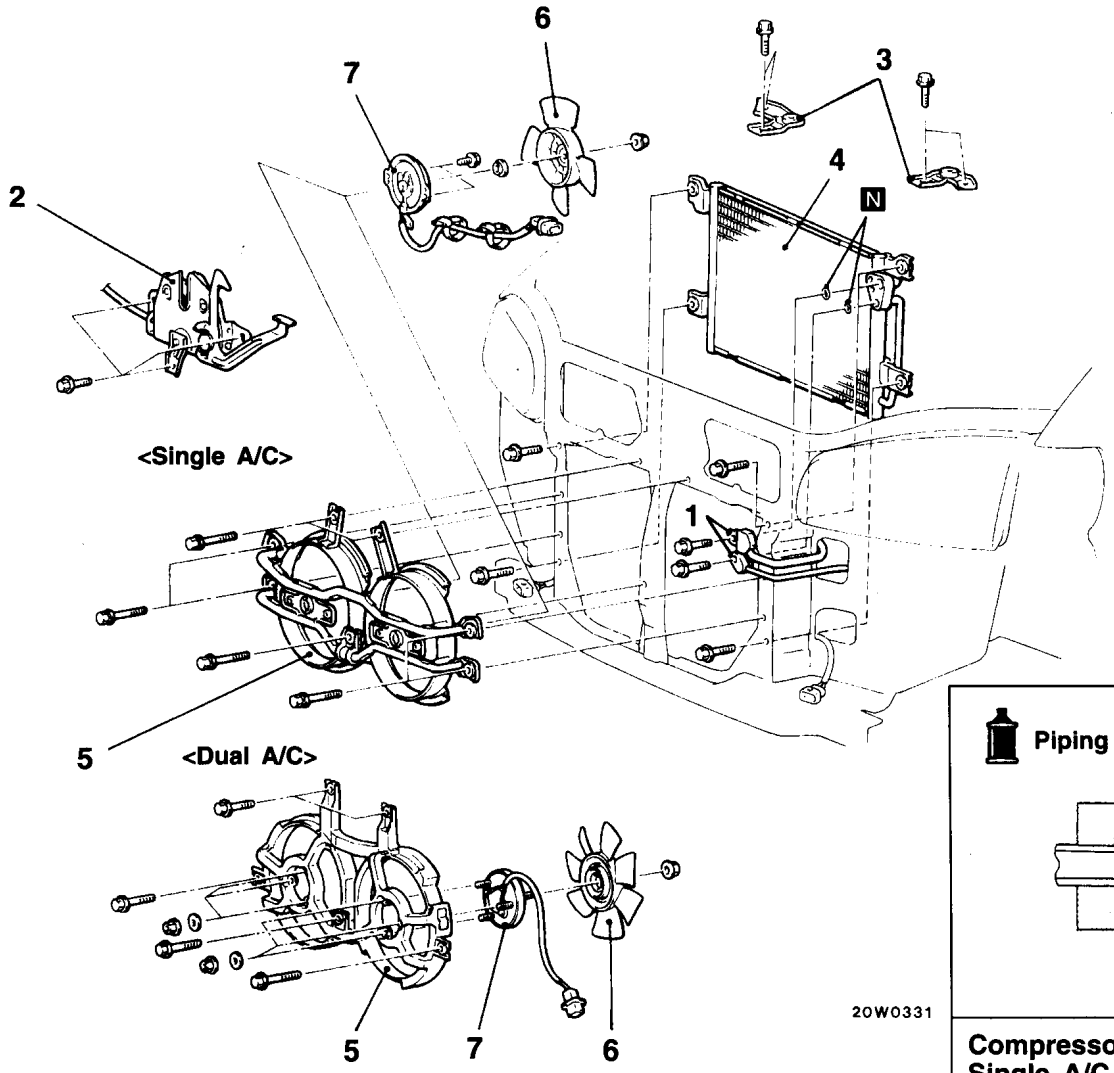
NOTE
If there is a deviation of the air gap from the standard value, make the necessary adjustment by adjusting the number of shims.

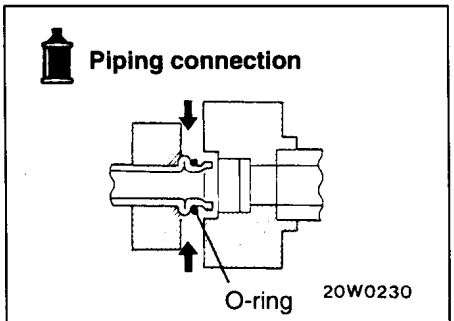
FRONT CONDENSER AND CONDENSER FAN MOTOR

120002272

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Bumpe Removal and Installation (Refer to GROUP 51 – Bumper.)





Compressor oil:
Single A/C ZXL 100PG
Dual A/C SUN PAG 56

00002871

Front condenser removal steps
- Discharging and charging of refrigerant (Refer to P.55-17, 20.)

◀A▶ 1. Discharge hose and liquid pipe A connection
2. Hood latch
3. Radiator upper bracket
◀B▶ ▶A◀ 4. Front condenser

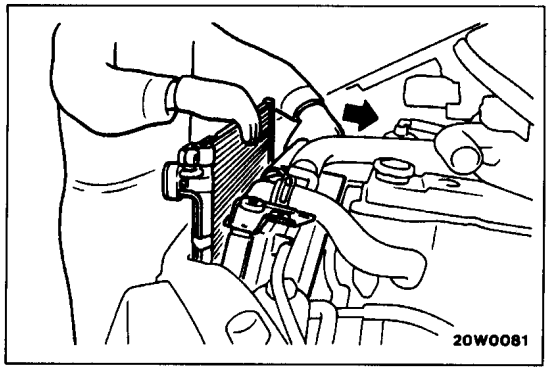
Condenser fan motor removal steps
5. Condenser fan motor and shroud assembly
6. Condenser fan
7. Condenser fan motor

REMOVAL SERVICE POINTS

◀A▶ DISCHARGE HOSE AND LIQUID PIPE A DISCONNECTION

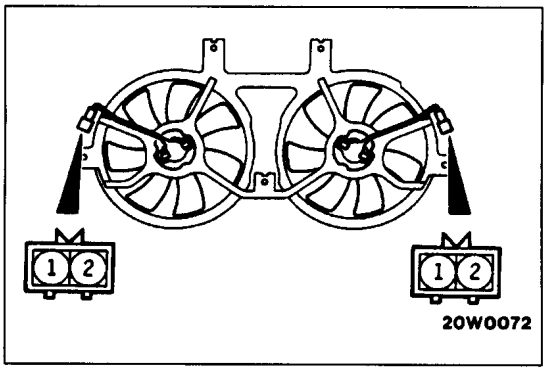
Plug the disconnected hose and the condenser nipple not to let foreign matter get into them.

Caution
Seal the hoses completely. Otherwise, the compressor oil and receiver will absorb water vapour easily.



◀B▶ FRONT CONDENSER REMOVAL

(1) Remove the mounting bolts from the front of the headlamp support member.
(2) Pull out the stay at the bottom of the radiator, and then slide the radiator towards the engine.
(3) Lift up the front condenser assembly to remove it.



INSPECTION

CONDENSER FAN AND MOTOR INSPECTION

When battery voltage is applied between the terminals, check to be sure that the motor operates. Also, check to be sure that there is no abnormal noise.

Battery terminals		Motor
1	2	
⊖ - - - - - - -	- - - - - - - ⊕	Runs

Caution
Do not touch the fan during inspection, or it may lead to personal injury.

INSTALLATION SERVICE POINT

▶A◀ FRONT CONDENSER INSTALLATION

When replacing the front condenser, refill it with a specified amount of compressor oil and install it (to the vehicle).

<Single A/C>

Compressor oil: ZXL 100PG

Quantity: 40 mℓ

<Dual A/C>

Compressor oil: SUN PAG 56

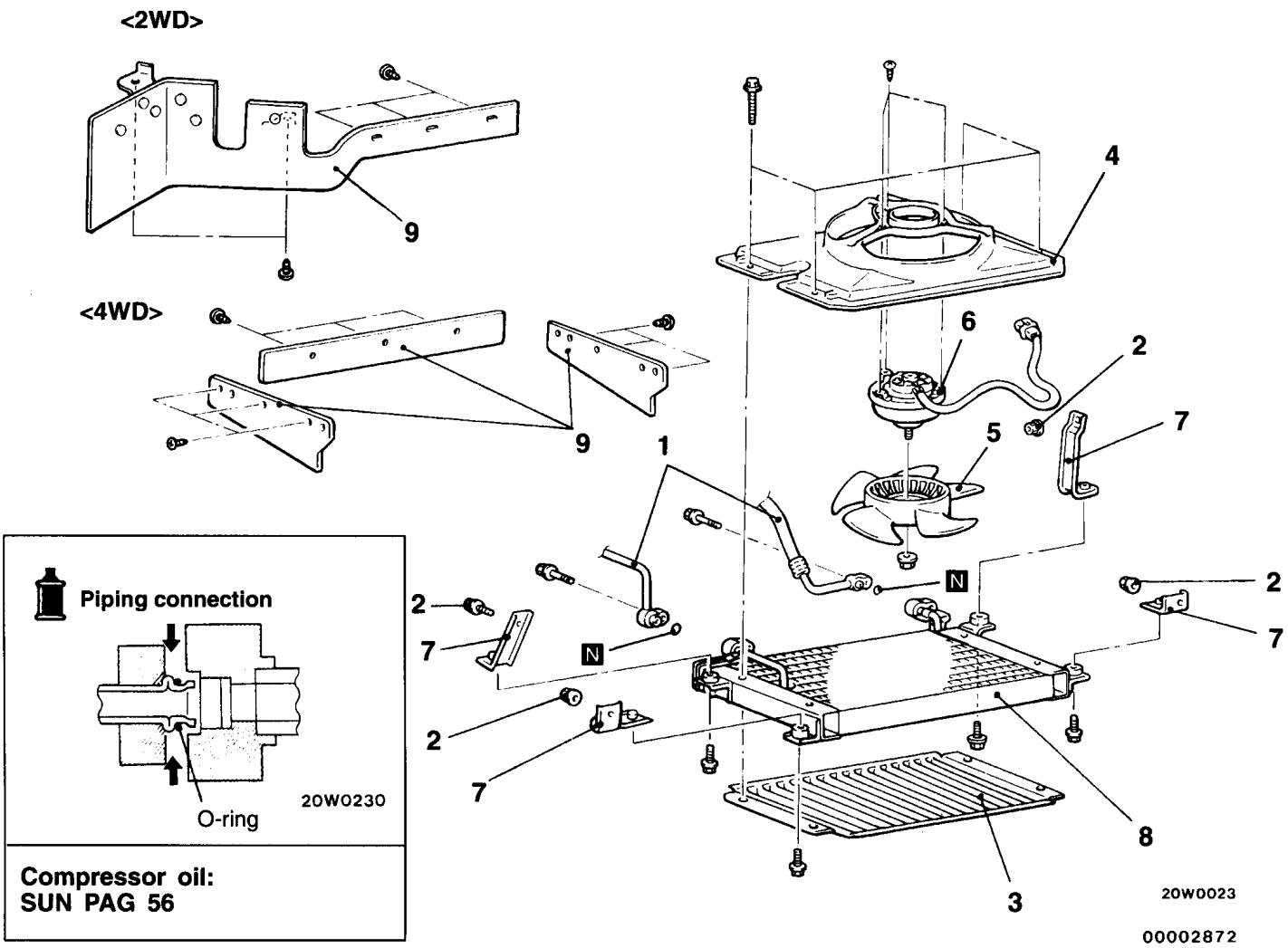
Quantity: 30 mℓ

SIDE CONDENSER AND CONDENSER FAN MOTOR <DUAL A/C>

120002273

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Discharging and Charging of Refrigerant (Refer to P.55-17, 20.)



Removal steps

◀A▶
1. Discharge hose and discharge pipe A connection
2. Side condenser assembly mounting bolt and nut
3. Grille
4. Shroud
5. Condenser fan
6. Condenser fan motor
7. Bracket

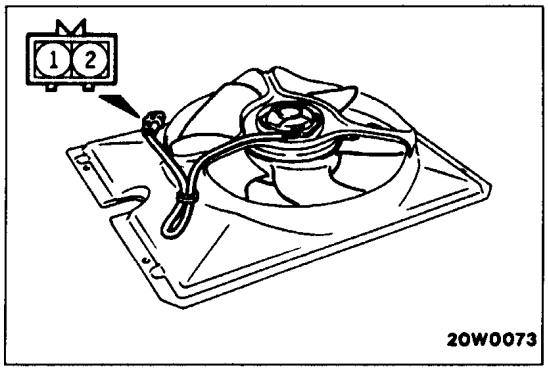
▶A◀
8. Side condenser
9. Rubber plate

REMOVAL SERVICE POINT

◀A▶ DISCHARGE HOSE AND DISCHARGE PIPE A DISCONNECTION

Plug the disconnected hose, the pipe and the condenser assembly nipple not to let dust or other foreign matter get into them.

Caution
Seal the hoses completely. Otherwise, the compressor oil and receiver will absorb water vapour easily.



INSPECTION

CONDENSER FAN AND MOTOR INSPECTION

When battery voltage is applied between the terminals, check to be sure that the motor operates. Also, check to be sure that there is no abnormal noise.

Battery terminals		Motor
1	2	
⊖ - - - - - - -	- - - - - - ⊕	Runs

Caution
Do not touch the fan during inspection, or it may lead to personal injury.

INSTALLATION SERVICE POINT

▶A◀ SIDE CONDENSER INSTALLATION

When replacing the side condenser, refill it with a specified amount of compressor oil and install it (to the vehicle).

Compressor oil: SUN PAG 56

Quantity: 30 mℓ

REFRIGERANT LINE

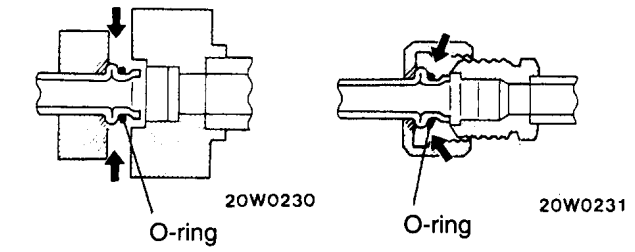
120002274

REMOVAL AND INSTALLATION

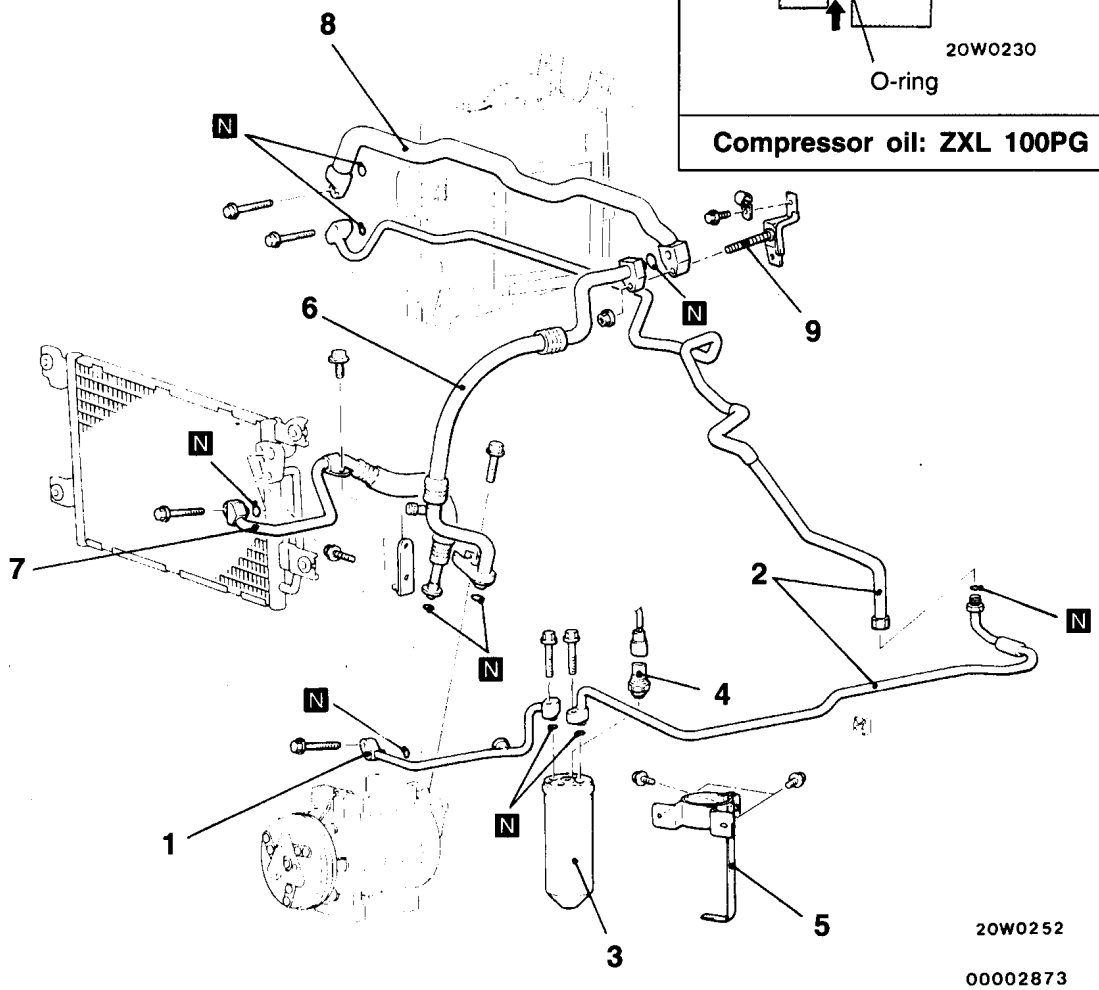
Single A/C

Pre-removal and Post-installation Operation
(1)Discharging and Charging of Refrigerant
(Refer to P.55-17, 20.)
(2)Battery and Battery Tray Removal and Installation
(3)Front Bumper Removal and Installation
(Refer to GROUP 51 – Bumper.)

Piping connection



Compressor oil: ZXL 100PG



00002873

Receiver assembly removal steps

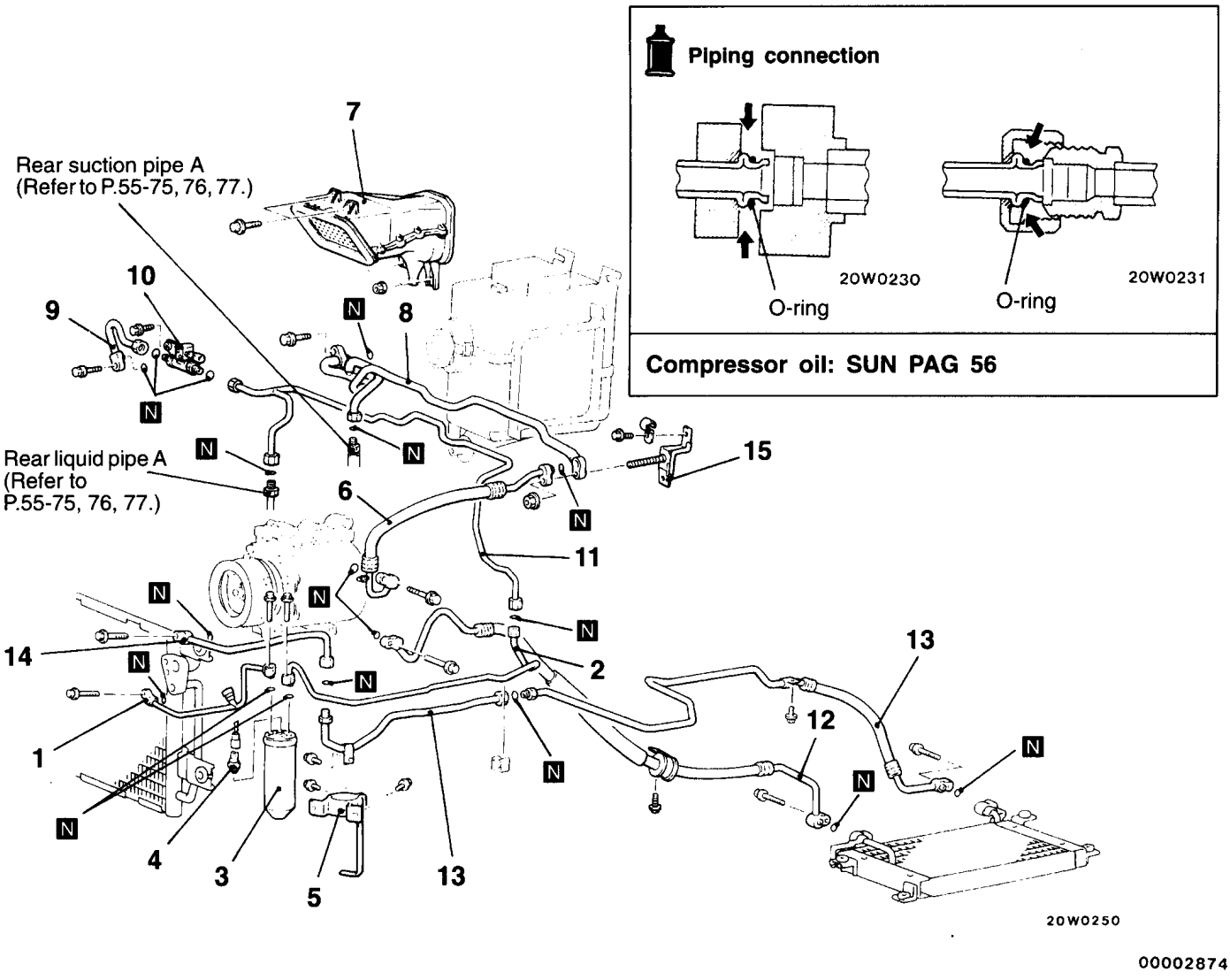
◀A▶ 1. Liquid pipe A
◀A▶ 2. Liquid pipe assembly B
▶A◀ 3. Receiver assembly
4. Dual pressure switch
5. Receiver bracket

Hoses disconnection

◀A▶ ▶A◀ 6. Suction hose
◀A▶ 7. Discharge hose
◀A▶ 8. Suction pipe
9. Suction hose bracket

Dual A/C (Front Refrigerant Line)

Pre-removal and Post-installation Operation
(1)Discharging and Charging of Refrigerant
(Refer to P.55-17, 20.)
(2)Battery and Battery Tray Removal and Installation
(3)Front Bumper Removal and Installation
(Refer to GROUP 51 – Bumper.)



Receiver assembly removal steps

◀A▶ 1. Liquid pipe A
◀A▶ 2. Liquid pipe B
▶A◀ 3. Receiver assembly
4. Dual pressure switch
5. Receiver bracket

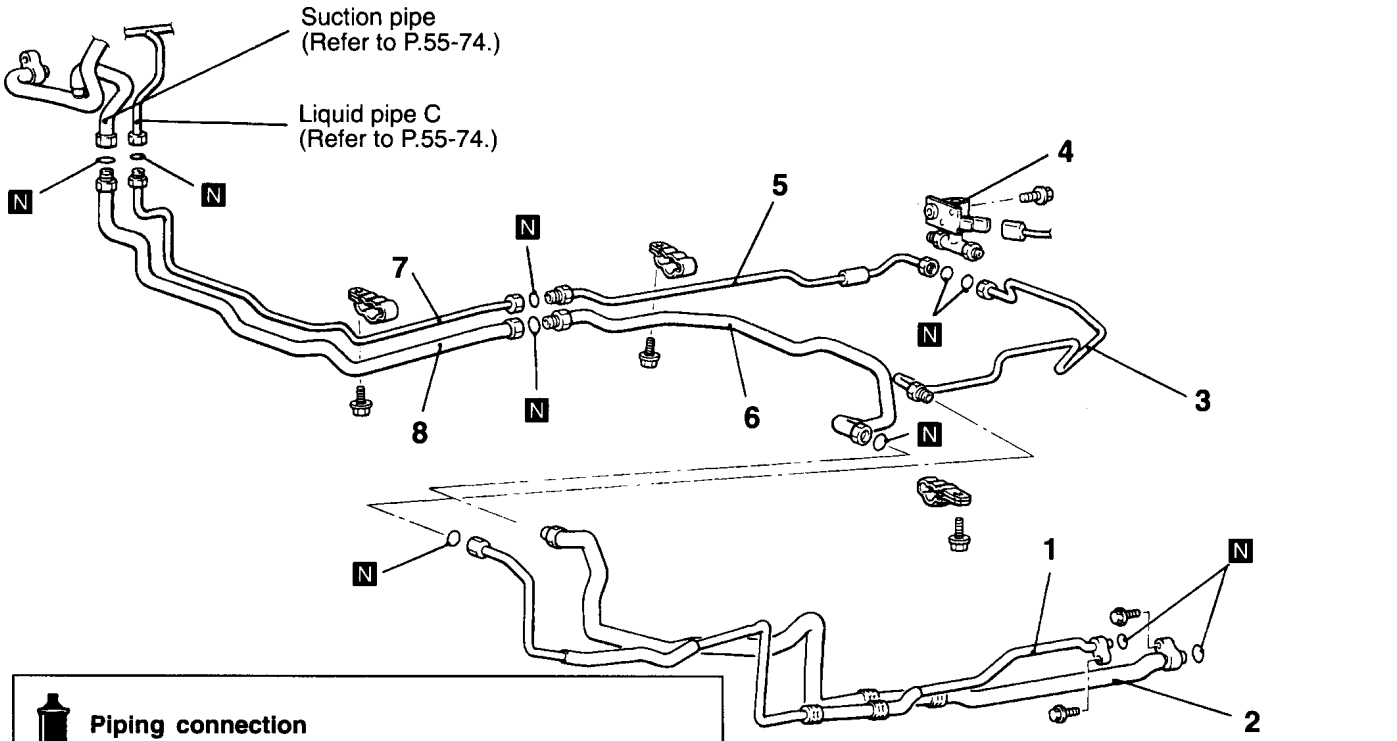
Hoses and pipes disconnection

◀A▶ ▶A◀ 6. Suction hose
7. Air intake duct assembly C
◀A▶ 8. Suction pipe
◀A▶ 9. Liquid pipe
10. Front magnetic valve
11. Liquid pipe C
◀A▶ 12. Discharge hose
◀A▶ 13. Discharge pipe A
◀A▶ 14. Discharge pipe B
15. Suction hose bracket

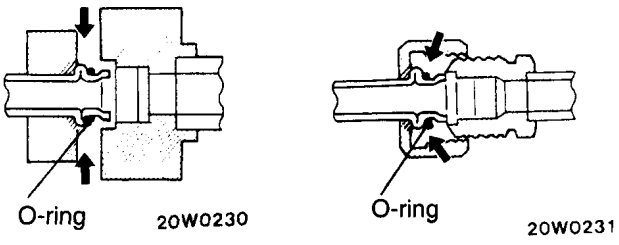
Dual A/C (Rear Refrigerant Line)

Pre-removal and Post-installation Operation
(1)Discharging and Charging of Refrigerant
(Refer to P.55-17, 20.)
(2)Battery and Battery Tray Removal and Installation
(3)Exhaust Pipe Removal and Installation
(Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(4)Heat Protector Panel Removal and Installation

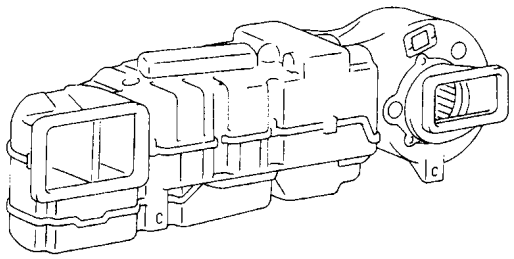
<Built-in type>



Piping connection



Compressor oil: SUN PAG 56



20W0253
00002875

Hoses and pipes disconnection

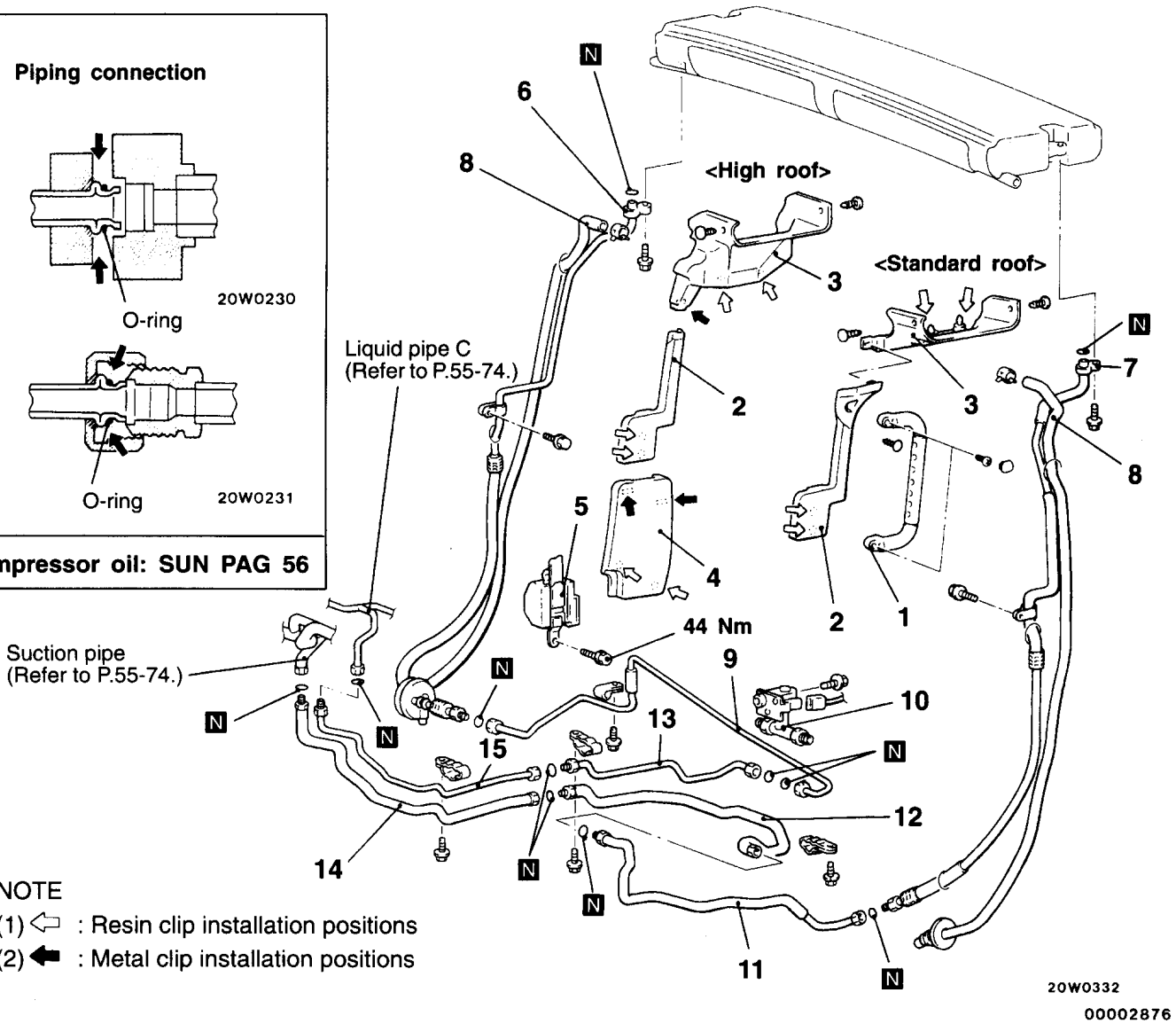
◀A▶ 1. Rear liquid hose
◀A▶ 2. Rear suction hose
3. Liquid pipe F
4. Rear magnetic valve
5. Liquid pipe E
6. Suction pipe B
7. Liquid pipe D
8. Suction pipe A

Pre-removal and Post-installation Operation
(1)Discharging and Charging of Refrigerant
(Refer to P.55-17, 20.)
(2)Battery and Battery Tray Removal and Installation
(3)Exhaust Pipe Removal and Installation
(Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(4)Heat Protector Panel Removal and Installation

<Overhead type (Partial trim)>

Piping connection

Compressor oil: SUN PAG 56



00002876

NOTE
(1) ⇦ : Resin clip installation positions
(2) ⬅ : Metal clip installation positions

Hoses and pipes disconnection

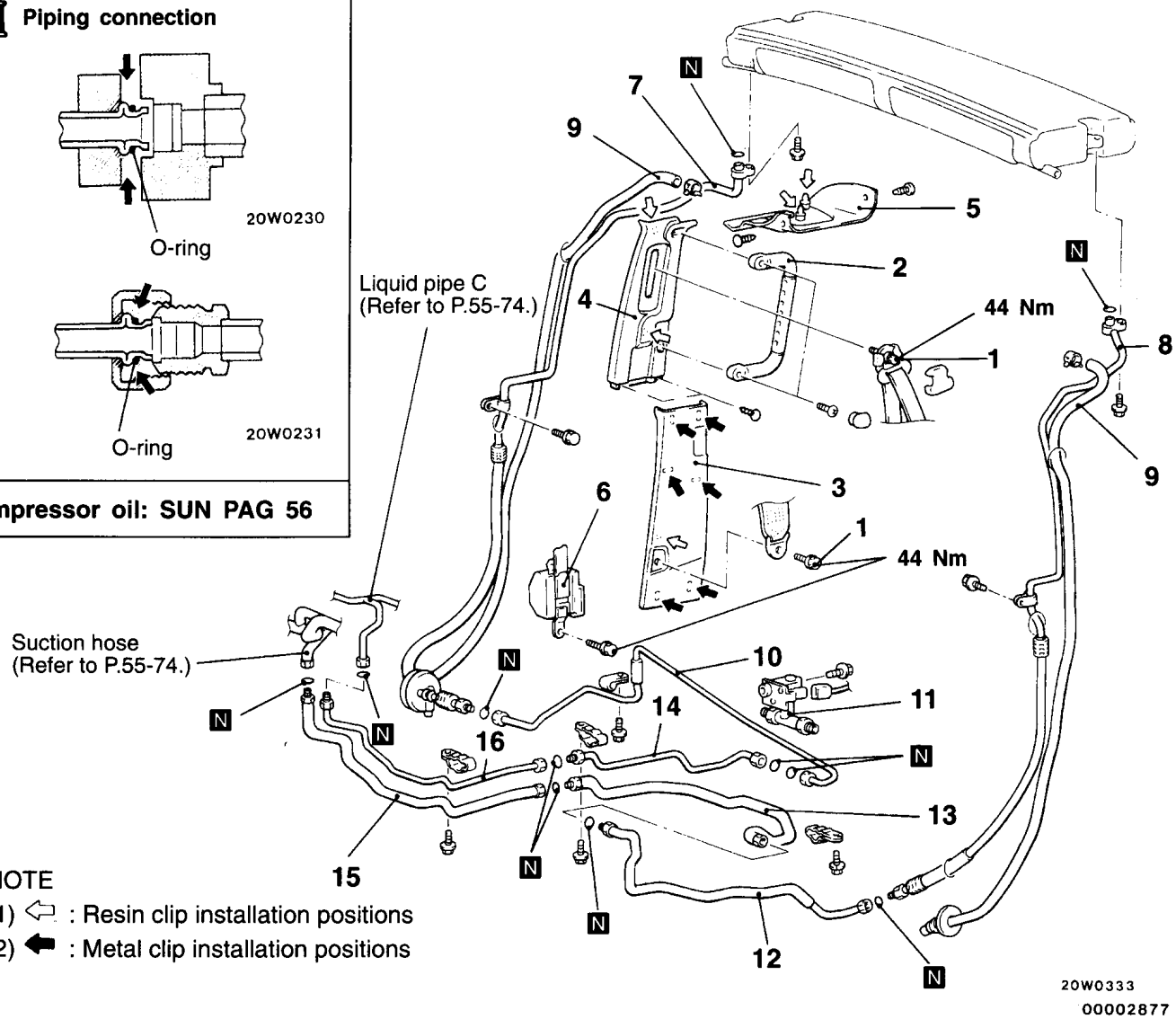
1. Rear door grip <4WD>
2. Centre pillar cover
3. Rear cooler bracket cover
4. Retractor cover
5. Front seat belt retractor connection
6. Rear liquid hose ◀B▶
7. Rear discharge hose ◀B▶
8. Drain hose ◀B▶
9. Liquid pipe F
10. Rear magnetic valve
11. Suction pipe C
12. Suction pipe B
13. Liquid pipe E
14. Suction pipe A
15. Liquid pipe D

Pre-removal and Post-installation Operation
(1)Discharging and Charging of Refrigerant
(Refer to P.55-17, 20.)
(2)Battery and Battery Tray Removal and Installation
(3)Exhaust Pipe Removal and Installation
(Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(4)Heat Protector Panel Removal and Installation

<Overhead type (Full trim)>

Piping connection

Compressor oil: SUN PAG 56



NOTE
(1) ⇦ : Resin clip installation positions
(2) ⬅ : Metal clip installation positions

Hoses and pipes disconnection

1. Front seat belt anchor bolt
2. Rear door grip <4WD>
3. Center pillar trim, lower
3. Center pillar trim, upper
5. Rear cooler bracket cover
6. Front seat belt retractor
◀B▶ 7. Rear liquid hose
◀B▶ 8. Rear discharge hose
◀B▶ 9. Drain hose
10. Liquid pipe F
11. Rear magnetic valve
12. Suction pipe C
13. Suction pipe B
14. Liquid pipe E
15. Suction pipe A
16. Liquid pipe D

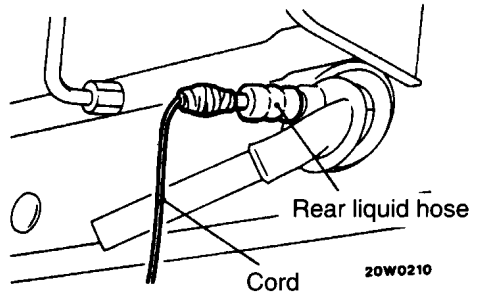
REMOVAL SERVICE POINTS

◀A▶ HOSES AND PIPES DISCONNECTION

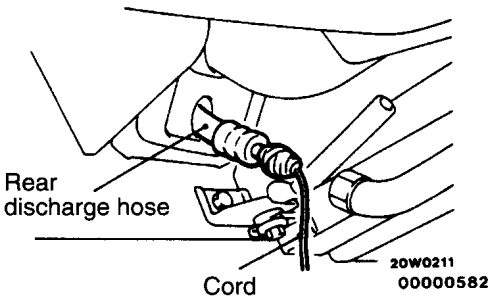
Plug the condenser, compressor and cooling unit nipples not to let dust or other foreign matter get into them.

Caution
Seal the hoses completely. Otherwise, the compressor oil and receiver will absorb water vapour easily.

<R.H.>

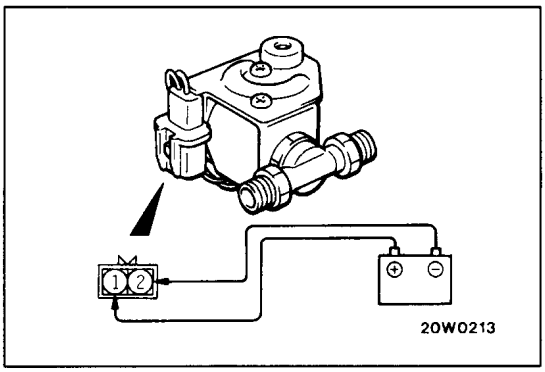


<L.H.>



◀B▶ REAR LIQUID HOSE, REAR DISCHARGE HOSE AND DRAIN HOSE REMOVAL

Remove the grommet. Tie a cord to the end of the hose, wind plastic tape around it so that there is no unevenness, and pull the hose out into the passenger compartment.



INSPECTION

MAGNETIC VALVE INSPECTION

Apply battery voltage to the magnetic valve terminals, and then check that operating sound can be heard.

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.

<Single A/C>

Compressor oil: ZXL 100PG

Quantity:

Suction hose: 10 mℓ

Receiver: 10 mℓ

<Dual A/C>

Compressor oil: SUN PAG 56

Quantity:

Suction hose: 10 mℓ

Receiver: 10 mℓ

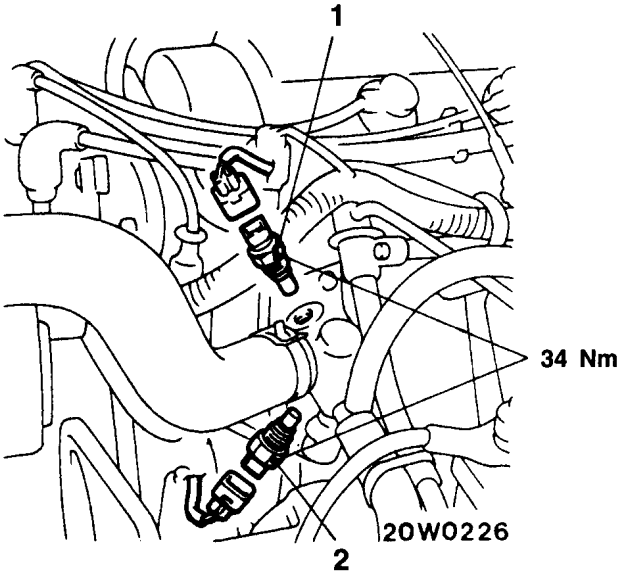
ENGINE COOLANT TEMPERATURE SWITCH

120002275

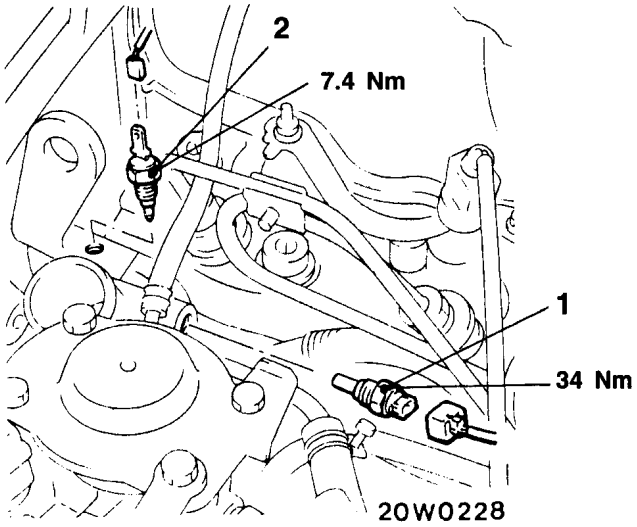
REMOVAL AND INSTALLATION

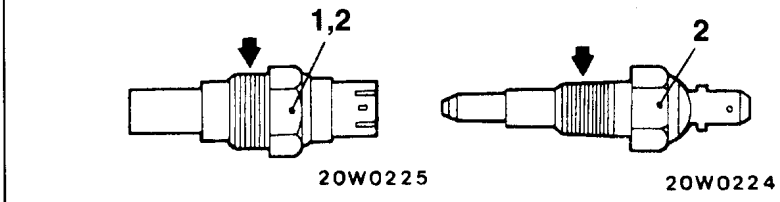
Pre-removal and Post-installation Operation
(1) Refilling Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(2) Intercooler Removal and Installation <Vehicles with intercooler> (Refer to GROUP 15 – Intercooler.>

<4G63, 4G64>



<4D56>

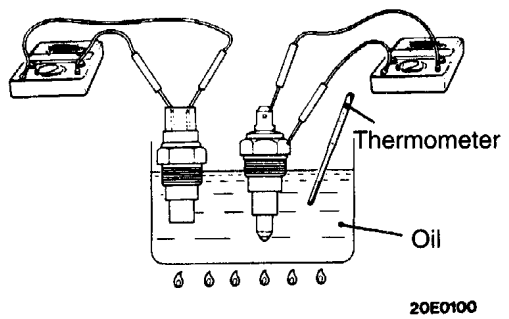




Sealant: 3M Nut Locking Part No. 4171 or equivalent

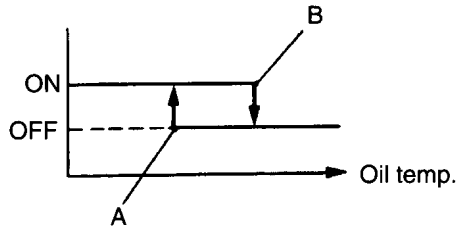
00002878

1. Engine coolant temperature switch (for A/C cut-off)
2. Engine coolant temperature switch (for condenser fan and compressor magnetic valve)



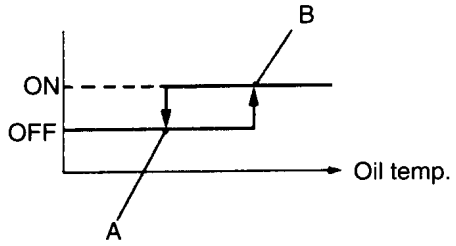
20E0100

<For A/C cut-off>



20W0237

<For condenser fan>



20W0204
00000585

INSPECTION

ENGINE COOLANT TEMPERATURE SWITCH CONTINUITY INSPECTION

(1) Dip the engine coolant temperature switch in oil and heat the oil with a gas burner or similar item.

Caution
Do not heat any more than is necessary.

(2) Check the continuity with a circuit tester as the temperature of the oil changes, and the condition is normal if the continuity is within the following ranges.

Standard value:

Engine coolant temperature switch	Temperature	Continuity
For A/C cut-off	Less than 108°C (Temperature at point A)	ON (Continuity)
	More than 112–118°C (Temperature at point B)	OFF (No continuity)
For conditioner fan	Less than 95°C <4G63, G64> Less than 97°C <4D56> (Temperature at point A)	OFF (No continuity)
	More than 99–105°C <4G63, 4G64> More than 100–104°C <4D56> (Temperature at point B)	ON (Continuity)

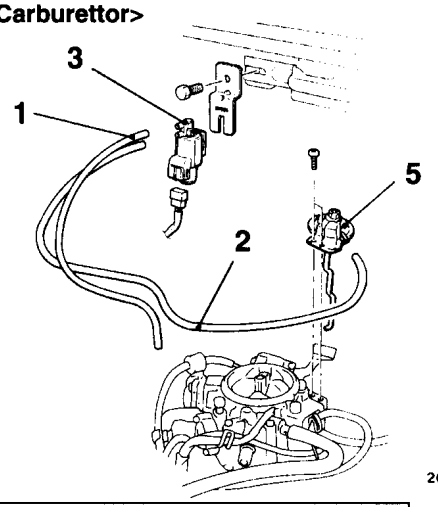
IDLE-UP SYSTEM <4G63 – Carburettor, 4D56>

120002276

REMOVAL AND INSTALLATION

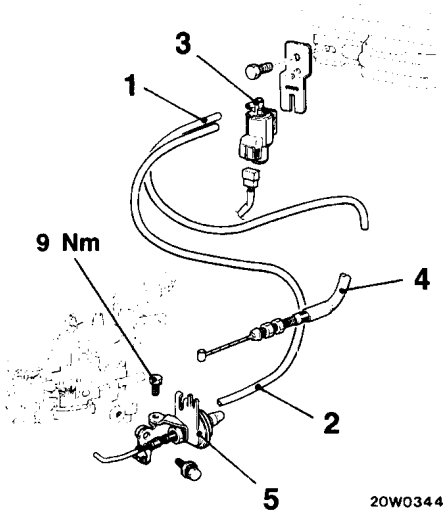
Post-installation Operation
(1)Accelerator Cable Adjustment <4D56> (Refer to GROUP 13 – Service Adjustment Procedures.)
(2)Idle-up Operation Check (Refer to P.55-26.)

<4G63 – Carburettor>



20W0192

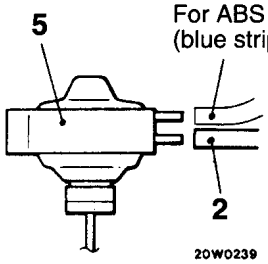
<4D56 – Vehicles without intercooler>



20W0344

Vehicles with ABS

<4G63 – Carburettor>



20W0239

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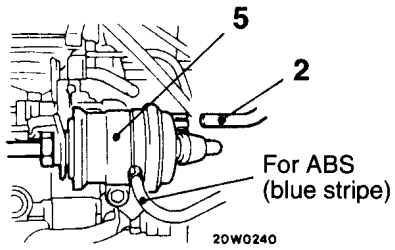
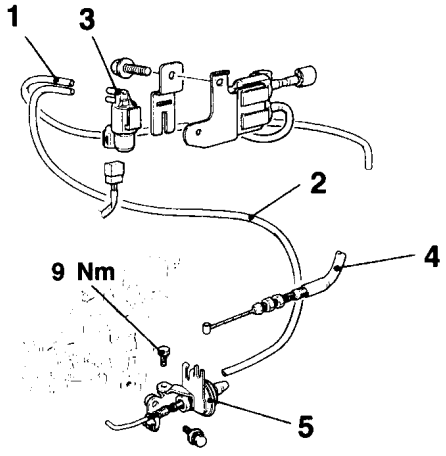


20W0240

<4D56 – Vehicles with intercooler>



20W0345

00002879

Idle-up solenoid valve removal steps

1. Vacuum hose (white stripe) connection
2. Vacuum hose (yellow stripe) connection
3. Idle-up solenoid valve

Vacuum actuator assembly removal steps

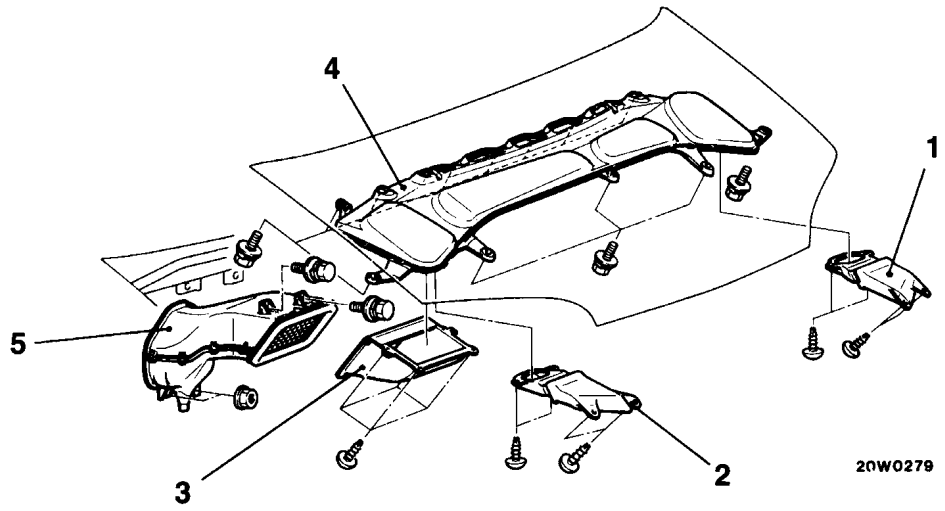
- Air horn assembly <4G63> (Refer to GROUP 15 – Air Cleaner.)
- Intercooler <Vehicles with intercooler> (Refer to GROUP 15 – Intercooler>
2. Vacuum hose (yellow stripe) connection
4. Accelerator cable connection <4D56>
5. Vacuum actuator assembly

VENTILATORS

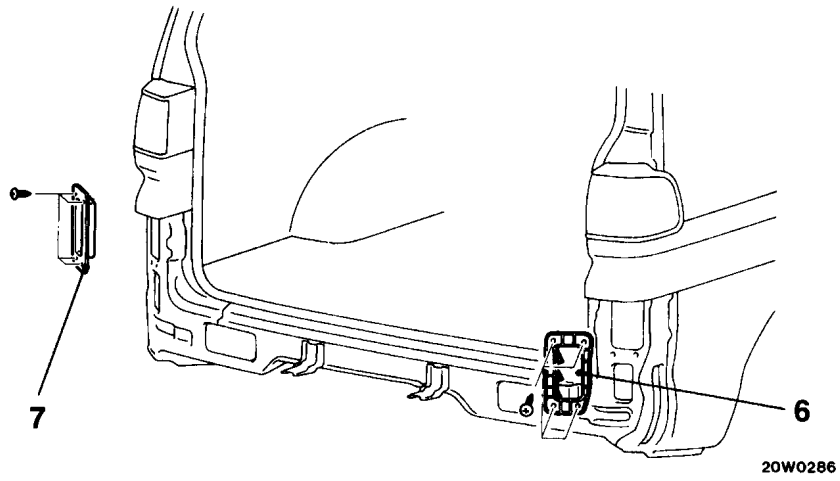
120000526

REMOVAL AND INSTALLATION

<Front>



<Rear>



00000587

Front ventilator duct removal steps

1. Air intake drain duct assembly L.H.
2. Air intake drain duct R.H.
3. Air intake duct B
4. Air intake duct A
   - Battery
5. Air intake duct C

Rear ventilator duct removal steps

- Rear bumper
  (Refer to GROUP 51 – Bumper.)

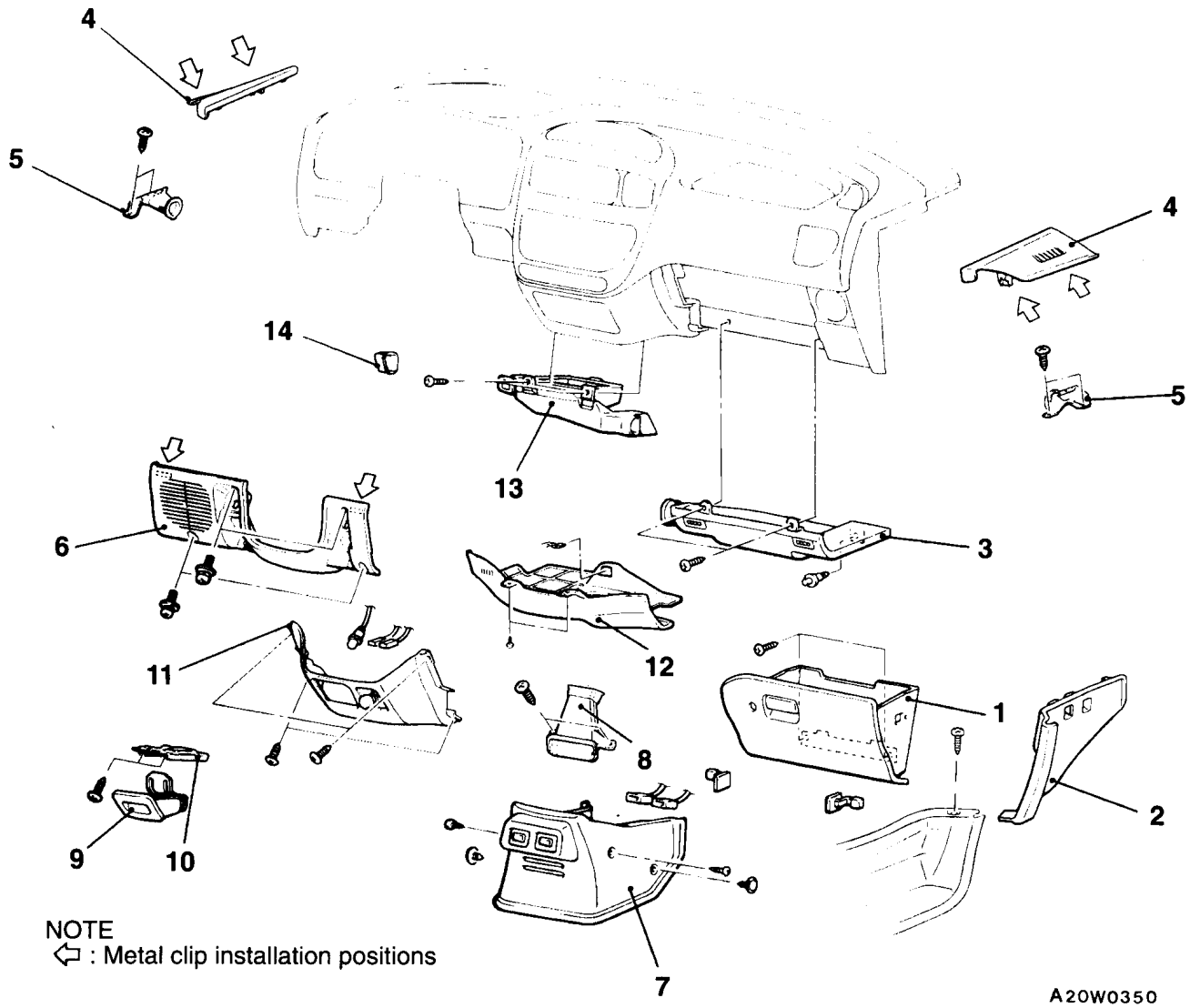
6. Rear ventilator duct assembly R.H.
7. Rear ventilator duct assembly L.H.

VENTILATORS (INSTRUMENT PANEL)

120002277

REMOVAL AND INSTALLATION

CAUTION:SRS
(1) When removing and installing the computer cover (vehicles equipped with SRS), do not let it bump against the SRS diagnostic unit.
(2) For the passenger side air bag module removal/ installation, always observe the service procedures of GROUP 52B – Air Bag Modules and Clock Spring.



NOTE
⇦ : Metal clip installation positions

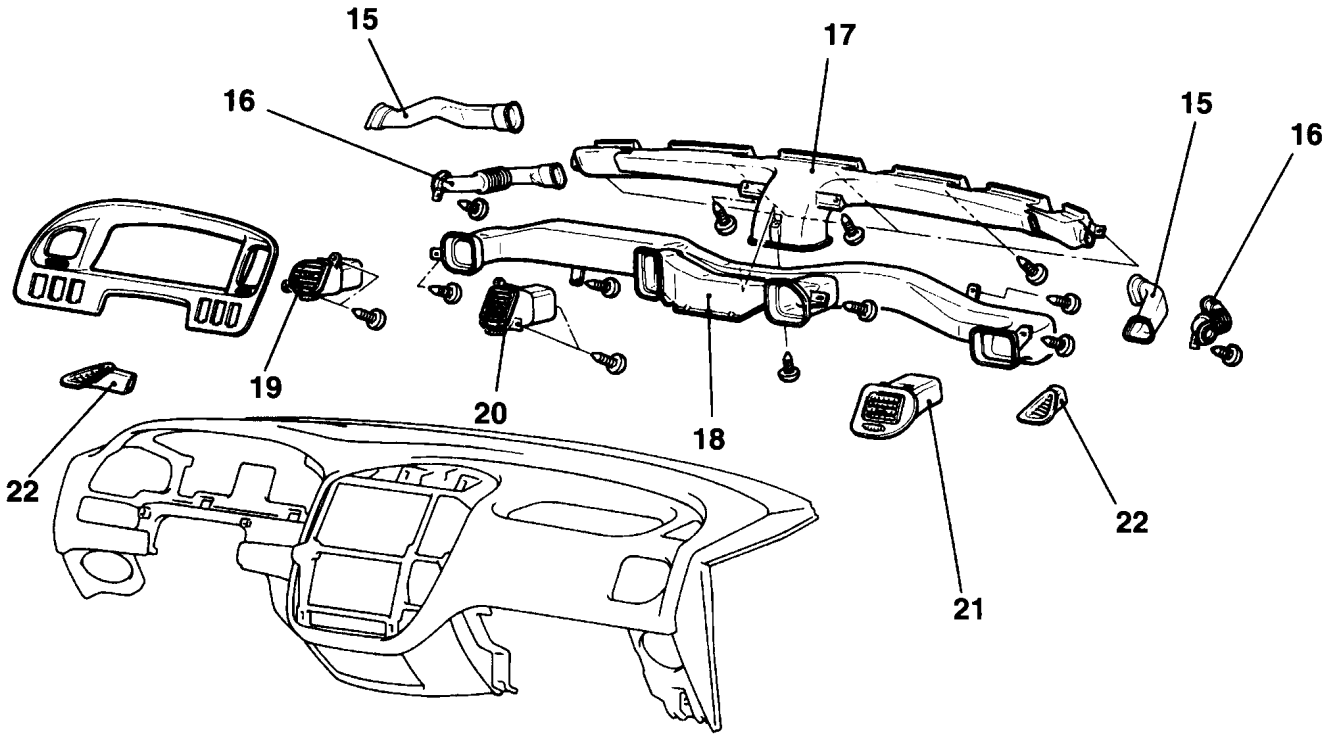
Shower duct removal steps
1. Glove box assembly
2. Cowl side trim
   (Refer to GROUP 52A – Trim.)
3. Shower duct <Vehicles with ABS>

Side defroster duct B removal steps
4. Instrument panel side trim
5. Side defroster duct B

Foot distribution duct removal steps
6. Under cover assembly
7. Computer cover assembly
8. Foot distribution rear duct
9. Ashtray
10. Bracket
11. Centre under cover
12. Heater cover
13. Foot distribution duct
14. Lap cover

Pre-removal and Post-installation Operation
- Instrument Panel Removal and Installation
  (Refer to GROUP 52A – Instrument Panel.)

CAUTION:SRS
(1) When removing and installing the computer cover (vehicles equipped with SRS), do not let it bump against the SRS diagnostic unit.
(2) For the passenger side air bag module removal/installation, always observe the service procedures of GROUP 52B – Air Bag Modules and Clock Spring.



Defroster nozzle and distribution duct removal steps
15. Side defroster duct
16. Side defroster hose
17. Defroster nozzle
18. Distribution duct

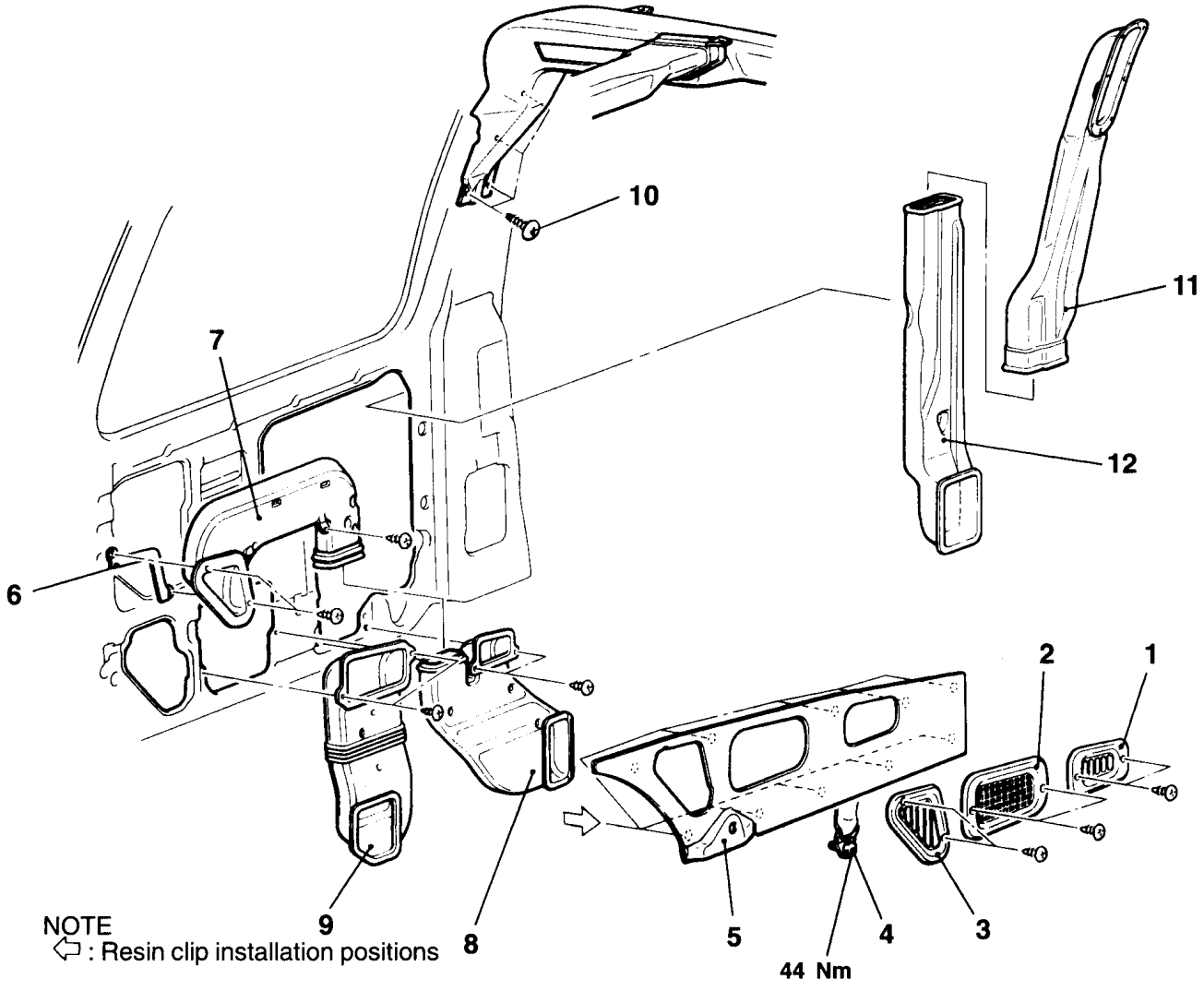
Air outlet assembly removal steps
19. Side air outlet assembly (driver's side)
20. Centre air outlet assembly (driver's side)
21. Side air outlet assembly (passenger's side)
22. Side defroster grille A

REAR VENTILATORS <BUILT-IN TYPE>

120002278

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Refrigerant Discharging and Charging (Refer to P.55-17, 20.)
(2) Draining and Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
(3) Rear Evaporator Assembly Removal and Installation (Refer to P.55-43.)
(4) Rear Panel Assembly Removal and Installation (Refer to P.55-43.)
(5) Third Seat Assembly Removal and Installation (Refer to GROUP 52A – Rear Seats.)



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Removal steps

1. Foot grille A
2. Rear air inlet grille
3. Foot grille B
4. Seat belt anchor bolt
5. Rear side trim, lower
- Rear side trim, upper (Refer to GROUP 52A – Trims.)

6. Bracket
7. Rear heater duct B
8. Rear heater duct A
9. Rear air inlet duct
- Rear headlining (Refer to GROUP 52A – Headlining.)

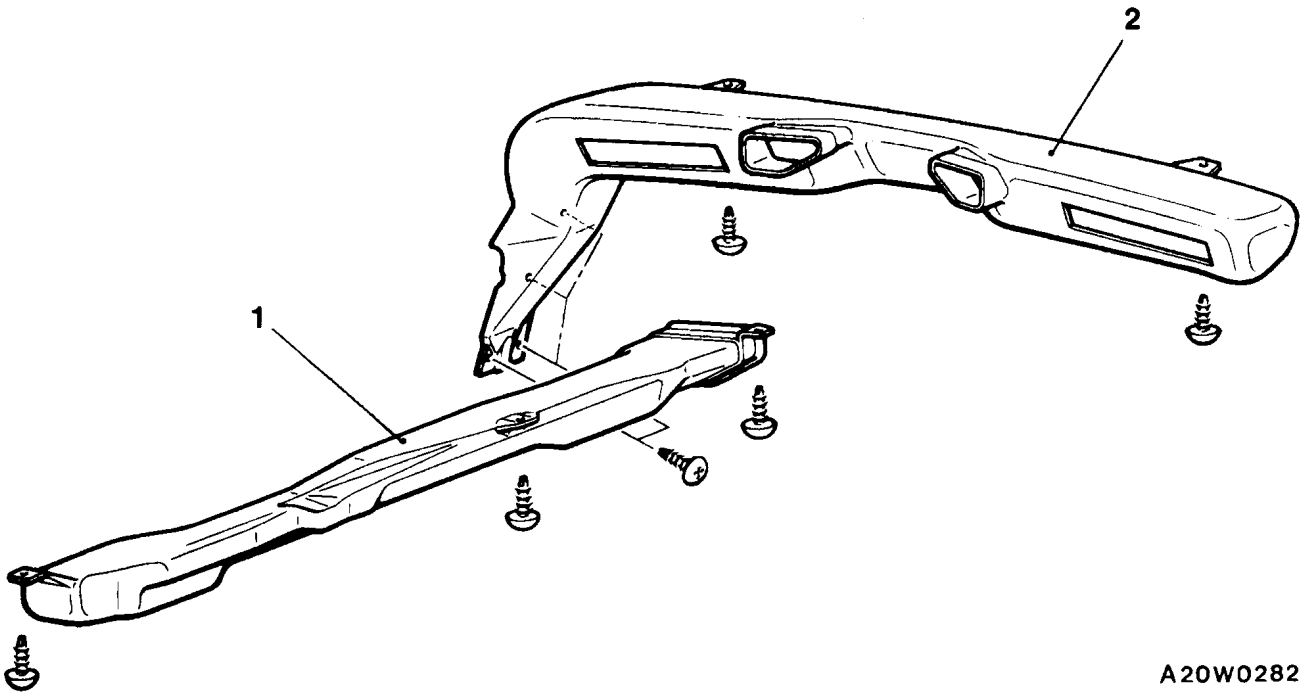
10. Screw
11. Pillar duct B
12. Pillar duct A

ROOF DUCT <BUILT-IN TYPE>

120002279

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Headlining Removal and Installation
  (Refer to GROUP 52A – Headlining.)



Removal steps
1. Centre duct
2. Roof duct