



1992-1995 MONTERO

Service Manual

Body & Chassis

Service Manual

MONTERO

1992-1995

Volume 1

Chassis & Body

FOREWORD

This Service Manual has been prepared with the latest service information available at the time of publication. It is subdivided into various group categories and each section contains diagnosis, disassembly, repair, and installation procedures along with complete specifications and tightening references. Use of this manual will aid in properly performing any servicing necessary to maintain or restore the high levels of performance and reliability designed into these outstanding vehicles.



Mitsubishi Motors Corporation reserves the right to make changes in design or to make additions to or improvements in its products without imposing any obligations upon itself to install them on its products previously manufactured.

GROUP INDEX

110005034

General	00
Engine	11
Fuel	13
Cooling	14
Intake and Exhaust	15
Emission Control	17
Clutch	21
Manual Transmission	22
Automatic Transmission	23
Propeller Shaft	25
Front Axle	26
Rear Axle	27
Wheel and Tire	31
Power Plant Mount	32
Front Suspension	33
Rear Suspension	34
Service Brakes	35
Parking Brakes	36
Steering	37
Body	42
Exterior	51
Interior and Supplemental Restraint System (SRS)	52
Heater, Air Conditioning and Ventilation	55
Alphabetical Index	

NOTE: Electrical system information is contained in Volume 2 "Electrical" of this paired Service Manual. For overhaul procedures of engines or transmissions, refer to the separately issued Engine Service Manual or Manual/Automatic Transmission Service Manual.

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

11000002

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 (200°F) 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 the asterisks (*) in the table of contents in each group indicate operations requiring warnings.

GENERAL

CONTENTS

110005035

GENERAL DATA AND SPECIFICATIONS ...	30	Fuel System	54
HOW TO USE THIS MANUAL	3	Ignition Cables	57
Explanation of Manual Contents	4	Manual Transmission	60
Explanation of the Troubleshooting Guide	6	Positive Crankcase Ventilation System (Positive Crankcase Ventilation Valve)	54
Maintenance, Repair and Servicing Explanations	3	Propeller Shaft Joints	65
Model Indications	3	Rear Axle Oil (Limited Slip Differential)	65
Special Tool Note	3	Spark Plugs	56
Terms Definition	3	SRS Maintenance	66
Tightening Torque Indication	3	Timing Belt	57
HOW TO USE TROUBLESHOOTING/ INSPECTION SERVICE POINTS	7	Transfer	62
LUBRICATION AND MAINTENANCE	40	MASTER TROUBLESHOOTING	34
MAIN SEALANT AND ADHESIVE TABLE ...	70	PRECAUTION BEFORE SERVICE	21
MAINTENANCE SERVICE	54	Scan Tool	23
Air Cleaner Element	54	Service Electrical System	22
Automatic Transmission	61	Supplemental Restraint System (SRS)	21
Ball Joint and Steering Linkage Seals	64	Vehicle Washing	22
Ball Joints with Grease Fitting	64	RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE	42
Brake Hoses	64	SCHEDULED MAINTENANCE TABLE	45
Disc Brake Pads	63	TIGHTENING TORQUE	33
Distributor Cap and Rotor	57	TOWING AND HOISTING	27
Drive Belts	58	TREATMENT BEFORE/AFTER THE FORDING OF A STREAM	24
Drive Shaft Boots	64	VEHICLE IDENTIFICATION	14
EGR Valve	57	Chassis Number	19
Engine Coolant	62	Engine Model Stamping	20
Engine Oil	59	Vehicle Identification Code Chart Plate	14
Engine Oil Filter	59	Vehicle Identification Number Location	14
Evaporative Emission Canister	56	Vehicle Identification Number List	16
Evaporative Emission Control System (Except Evaporative Emission Canister)	55	Vehicle Information Code Plate	19
Exhaust System (Connection Portion of Muffler, Pipings and Converter Heat Shields)	65	Vehicle Safety Certification Label	20
Front Axle and Rear Axle	65		
Fuel Hoses	54		



HOW TO USE THIS MANUAL

110005762

MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model. Unless otherwise specified, each service procedure covers all models. Procedures covering specific models are identified by the model codes, or similar designation (engine type, transaxle type, etc.). A description of these designations is covered in this manual under "VEHICLE IDENTIFICATION".

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.

SERVICE PROCEDURES

The service steps are arranged in numerical order and attention must be paid in performing vehicle service are described in detail in SERVICE POINTS.

TERMS DEFINITION

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.

TIGHTENING TORQUE INDICATION

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.

SPECIAL TOOL NOTE

Only MMC special tool part numbers are called out in the repair sections of this manual. Please refer to the special tool cross reference chart, which is located in the service manual at the beginning of each group, for a cross reference from the MMC special tool number to the special tool number that is available in your market.

MODEL INDICATIONS

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

M/T: Indicates manual transmission, or models equipped with manual transmission.

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

MFI: Indicates multiport fuel injection, or engines equipped with multiport fuel injection.

A/C: Indicates air conditioning.

3.0L Engine: Indicates the 3.0 dm³ (181.3 cu.in.) <6G72> engine, or a model equipped with such an engine.

3.5L Engine: Indicates the 3.5 dm³ (213.4 cu.in.) <6G74> engine, or a model equipped with such an engine.

EXPLANATION OF MANUAL CONTENTS

11000006

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

Component Diagram

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

Indicates (by symbols) where lubrication is necessary.

Maintenance and Servicing Procedures

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

- **Removal steps :**
The part designation number corresponds to the number in the illustration to indicate removal steps.
- **Disassembly steps :**
The part designation number corresponds to the number in the illustration to indicate disassembly steps.

- **Installation steps :**
Specified in case installation is impossible in reverse order of removal steps. Omitted if installation is possible in reverse order of removal steps.
- **Reassembly steps :**
Specified in case reassembly is impossible in reverse order of disassembly steps. Omitted if reassembly is possible in reverse order of disassembly steps.

Classifications of Major Maintenance / Service points






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

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

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

Symbols for Lubrication, Sealants and Adhesives

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

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

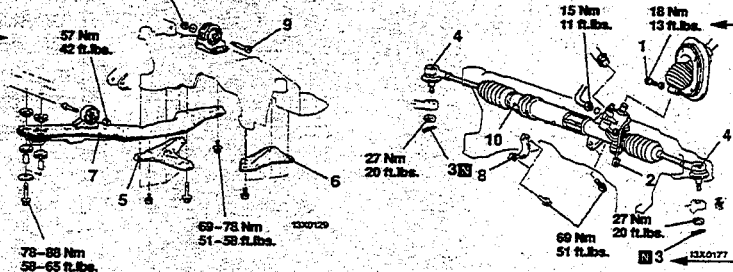
Indicates the group title. Indicates the section title. Indicates the group number. Indicates the page number.

STEERING – Power Steering Gear Box 37A-23

**POWER STEERING GEAR BOX
REMOVAL AND INSTALLATION**

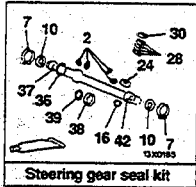
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Pre-removal Operation
 • Power Steering Fluid Draining (Refer to P.37A-15.)
 • Stabilizer Bar Removal (Refer to GROUP 33A – Stabilizer Bar)



Denotes tightening torque.

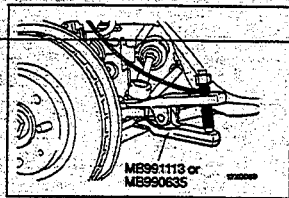
Denotes non-reusable part.



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

Removal steps

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

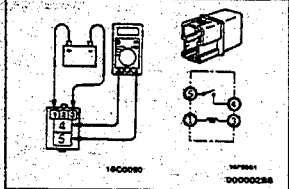


REMOVAL SERVICE POINTS
 ◀▶ TIE-ROD END DISCONNECTION

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

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

FOG LIGHT RELAY CONTINUITY CHECK



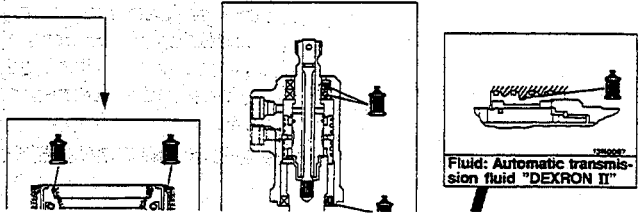
Battery voltage	Terminal			
	1	3	4	5
Power is not supplied	○	○		
Power is supplied	⊕	⊖	○	○

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

37A-28 STEERING – Power Steering Gear Box

LUBRICATION AND SEALING POINTS

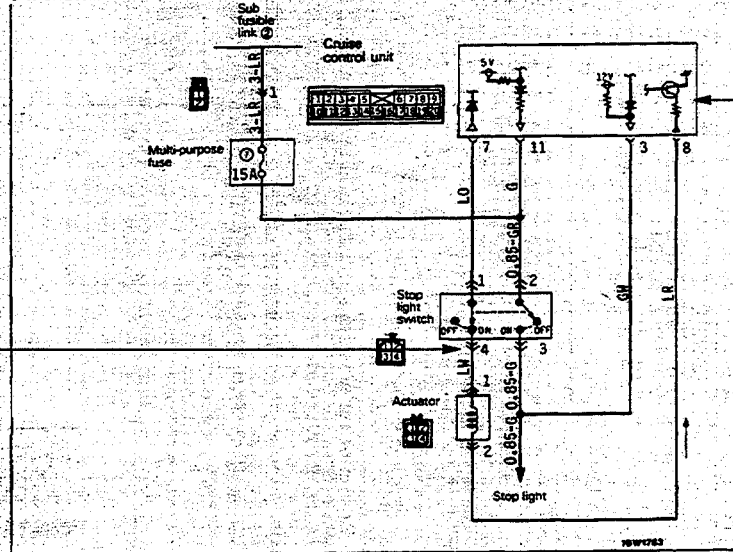
<Conventional power steering gear box>



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

EXPLANATION OF THE TROUBLESHOOTING GUIDE

6-1. CHECKING THE STOP LIGHT SWITCH CIRCUIT



Indicates a connector terminal number.

Indicates the circuit diagram for checking (including the interface of the air conditioning control module).

Provides the necessary description of circuit operation for basic understanding.

Description of operation

When the brake pedal is depressed during constant-speed travel, the stop light switch's (NC) contacts for the cruise-control system open, with the result that the current to the electromagnetic clutch of the actuator is interrupted, thus cancelling the constant-speed travel. At the same time, moreover, the closing of the

(NO) contacts for the stop light switch results in the sending of the cancel signal to the control unit, so that the actuator's electromagnetic clutch current is discontinued within the control unit, thereby cancelling the constant-speed travel. The flow of current is from the battery to the stop light switch, and the control unit.

Troubleshooting hint

Diagnosis No. 16 (automatically cancelled)
Auto-cruise control unit terminal voltage

Provides hints (including standards for judgement) when troubleshooting procedures are followed.

Indicates the check to be made.

Terminal No.	Signal	Conditions	Terminal voltage
3	Stop light switch (load side)	When the brake pedal is depressed When the brake pedal is not depressed	12V 0V
11	Stop light switch (power supply side)	At all times	12V

Indicates the diagnosis output code No. and the system conditions during output.

Indicates the terminals to be checked.

Indicates the conditions under which the check should be made.

Indicates the specification to be used for judgement of the check results. If there is no particular mention of conditions in the "Conditions" column, the column shows the specifications under normal conditions.

HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

110000008

Troubleshooting of electronic control systems for which the scan tool can be used follows the basic outline described below. Furthermore, even in systems for which the scan tool 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 trouble codes
- Method of erasing diagnostic trouble 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 diagnostic trouble code. (Refer to the next page on 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 scan tool show that all diagnostic trouble 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 on 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.

Terminal Voltage Checks

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

NOTE

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

Caution

Short-circuiting the positive (+) probe between a connector terminal and ground could damage the vehicle wiring, the sensor, the ECU, or all three.

Use care to prevent this !

3. If voltage readings differ from Normal Condition values, check related sensors, actuators, and wiring, then replace or repair.
4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Terminal Resistance and Continuity Checks

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

NOTE

Checks don't have to be carried out in the order given in the chart.

Caution

If resistance and continuity checks are performed on the wrong terminals, damage to the vehicle wiring, sensors, ECU, and/or ohmmeter may occur.

Use care to prevent this!

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

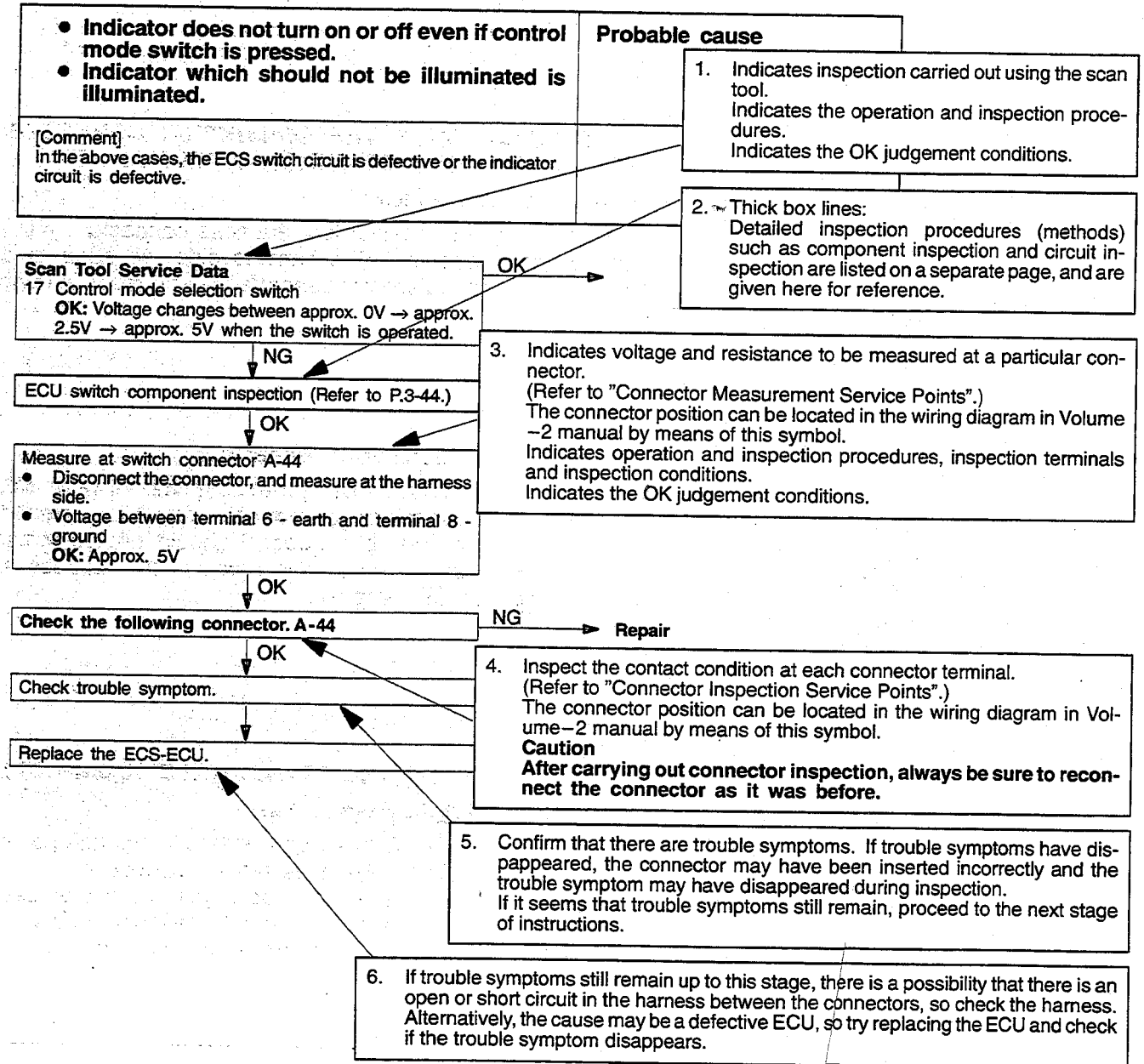
10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE

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

HOW TO USE THE INSPECTION PROCEDURES

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

CHECKING PROCEDURE 4



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 Volume 2 Electrical 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."

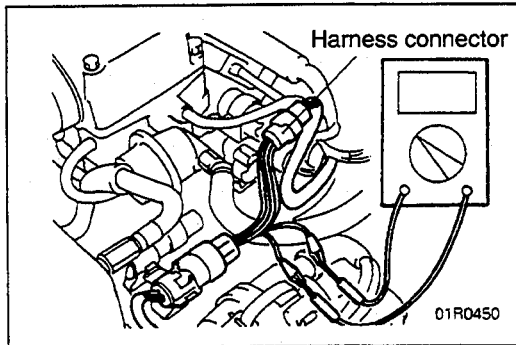
MEASURES TO TAKE AFTER REPLACING THE ECU

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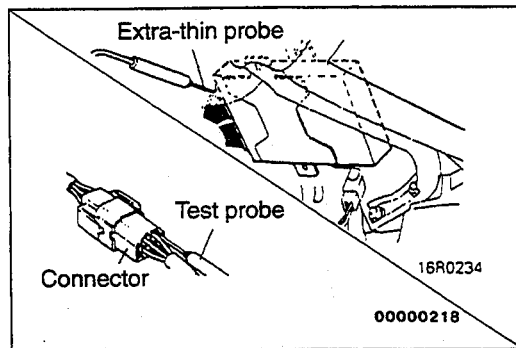
Turn the ignition switch to OFF when connecting and disconnecting the connectors, and turn the ignition switch to ON when measuring if there are no instructions to the contrary.



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

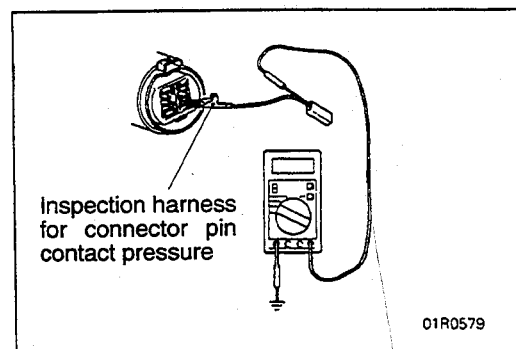
Waterproof Connectors

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



Ordinary (non-waterproof) Connectors

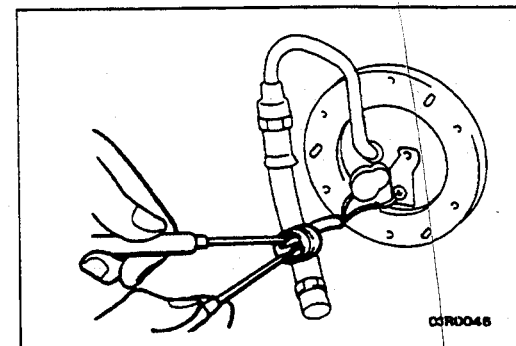
Check by inserting the test probe from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test probe, it should not be forced; use a special tool (the extra-thin probe in the harness set for checking) for this purpose.



IF INSPECTING WITH THE CONNECTOR DISCONNECTED

<When Inspecting a Female Pin>

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



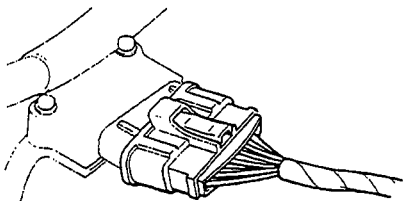
<When Inspecting a Male Pin>

Touch the pin directly with the test bar.

Caution

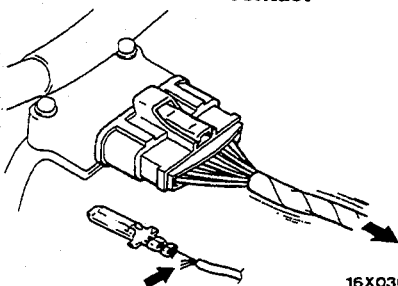
At this time, be careful not to short the connector pins with the test probes. To do so may damage the circuits inside the ECU.

Connector disconnected or improperly connected



16S0256

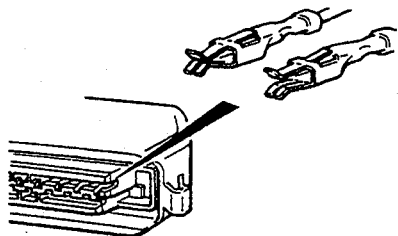
Defective connector contact



Harness wire breakage at terminal section

16X0369

Low contact pressure



16S0254
00000219

CONNECTOR INSPECTION SERVICE POINTS

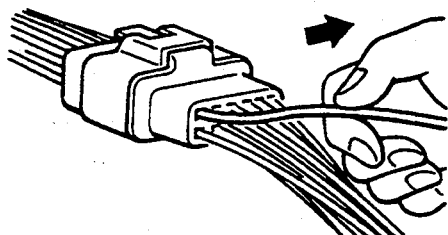
110000011

VISUAL INSPECTION

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

CONNECTOR PIN INSPECTION

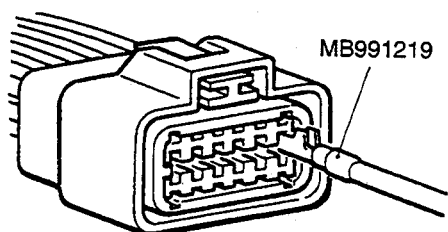
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even when the connector body is connected, because the pins may pull out of the back side of the connector. Therefore, gently pull the wires one by one to make sure that no pins pull out of the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



16R1317

CONNECTOR ENGAGEMENT INSPECTION

Use the special tool (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and female pins. [Pin drawing force : 1 N (.2 lbs.) or more]



MB991219

16R1318

HOW TO COPE WITH INTERMITTENT MALFUNCTIONS

110000012

Most intermittent malfunctions occur under certain conditions. If those conditions can be identified, the cause will be easier to find.

TO COPE WITH INTERMITTENT MALFUNCTION;

1. Ask the customer about the malfunction

Ask what it feels like, what it sounds like, etc. Then ask about driving conditions, weather, frequency of occurrence, and so on.

2. Determine the conditions from the customer's responses

Typically, almost all intermittent malfunctions occur from conditions like vibration, temperature and/or moisture change, poor connections. From the customer's replies, it should be reasoned which condition is influenced.

3. Use simulation test

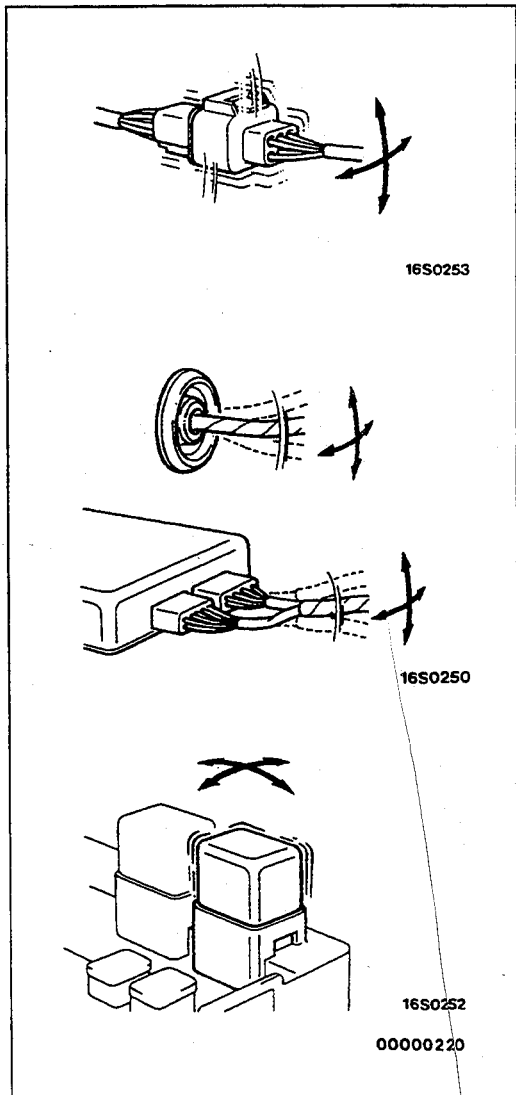
In the cases of vibration or poor connections, use the simulation tests below to attempt to

duplicate the customer's complaint. Determine the most likely circuit(s) and perform the simulation tests on the connectors and parts of that circuit(s). Be sure to use the inspection procedures provided for diagnostic trouble codes and trouble symptoms.

For temperature and/or moisture conditions related intermittent malfunctions, using common sense, try to change the conditions of the suspected circuit components, then use the simulation tests below.

4. Verify the intermittent malfunction is eliminated

Repair the malfunctioning part and try to duplicate the condition(s) again to verify the intermittent malfunction has been eliminated.



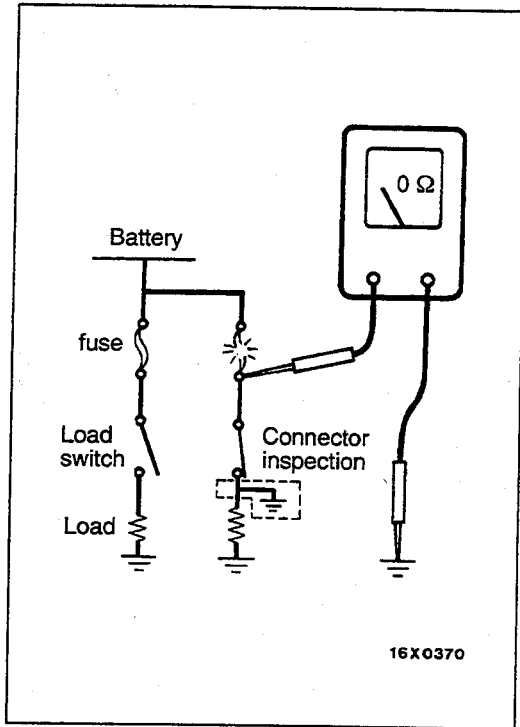
SIMULATION TESTS

For these simulation tests, shake, then gently bend, pull, and twist the wiring of each of these examples to duplicate the intermittent malfunction.

- Shake the connector up-and-down, and right-and-left.
- Shake the wiring harness up-and-down, and right-and-left.
- Vibrate the part or sensor.

NOTE

In case of difficulty in finding the cause of the intermittent malfunction, the data recorder function in the scan tool is effective.

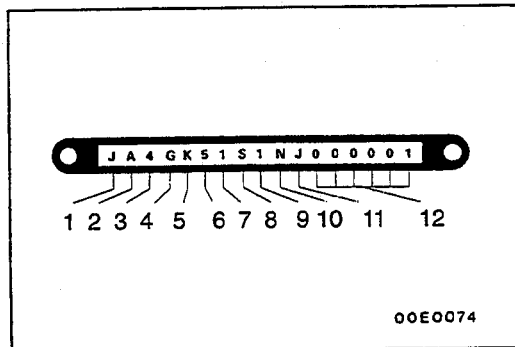
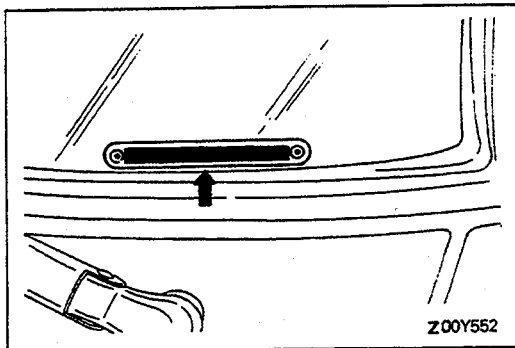


INSPECTION SERVICE POINTS FOR A BLOWN FUSE

Remove the fuse and measure the resistance between the load side of the fuse and ground. Set the switches of all circuits which are connected to this fuse to a condition of continuity. If the resistance is almost 0Ω at this time, there is a short somewhere between these switches and the load. If the resistance is not 0Ω , 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.)



VEHICLE IDENTIFICATION

110005036

VEHICLE IDENTIFICATION NUMBER LOCATION

The vehicle identification number (V.I.N.) is located on a plate attached to the left top side of the instrument panel.

VEHICLE IDENTIFICATION CODE CHART PLATE

110005037

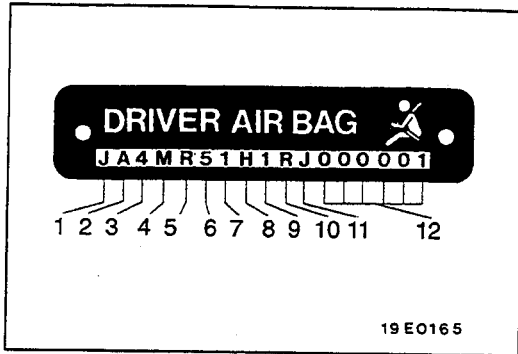
All vehicle identification numbers contain 17 digits. The vehicle number is a code which tells country, make, vehicle type, etc.

<UP TO 1993 MODELS>

No.	Items	Contents
1	Country	J; Japan
2	Make	A; Mitsubishi
3	Vehicle type	4; Multi-purpose vehicle
4	Others	G: 5001–6000lbs. and with hydraulic brakes (Build up to 1992)
4	Others	M: 5001–6000 lbs. and with hydraulic brakes (Build from 1993)
5	Line	K; MONTERO (Build up to 1992) R; MONTERO (Build from 1993)
6	Price class	3; Medium 4; High 5; Premium
7	Body	1; 5-door wagon
8	Engine	S; 3.0dm ³ (181.3 cu.in.) (Built up to 1992 models) H; 3.0dm ³ (181.3 cu.in.) (Built from 1993 models)
9	Check digits *	0, 1, 2, 3, 9, X
10	Model year	N; 1992year P; 1993year
11	Plant	J; Nagoya – 3
12	Serial number	000001 to 999999

NOTE

* Check digit means a single number or letter X used to verify the accuracy of transcription of vehicle identification number.



<1994 MODELS AND AFTER>

No.	Items	Contents
1	Country	J; Japan
2	Make	A; Mitsubishi
3	Vehicle type	4; Multi-purpose vehicle
4	Others	M: 5001– 6000lbs. and with hydraulic brakes
5	Line	R; MONTERO
6	Price class	3; Medium
		4; High
		5; Premium
7	Body	1; 5-door wagon
8	Engine	H; 3.0dm ³ (181.3 cu.in.)
		M; 3.5dm ³ (213.4 cu.in.)
9	Check digits *	0, 1, 2, 3, 9, X
10	Model year	R; 1994year
		S; 1995year
11	Plant	J; Nagoya – 3
12	Serial number	000001 to 999999

NOTE

- * Check digit means a single number or letter X used to verify the accuracy of transcription of vehicle identification number.

VEHICLE IDENTIFICATION NUMBER LIST

110005038

<1992 MODELS>

FEDERAL

V.I.N. (except sequence number)	Brand	Engine displacement	Model code
JA4GK31S□NJ	MITSUBISHI MONTERO	2,972 cm ³ (181.3 cu.in.)	V43VNDEL2M
			V43VRDEL2M
			V43WNDEL2M
V43WRDEL2M			
JA4GK41S□NJ			V43WNHEL2M
JA4GK51S□NJ			V43WRHEL2M
			V43WGRXEL2M

CALIFORNIA (Can also be sold in Federal states.)

V.I.N. (except sequence number)	Brand	Engine displacement	Model code
JA4GK31S□NJ	MITSUBISHI MONTERO	2,972 cm ³ (181.3 cu.in.)	V43VNDEL7M
			V43VRDEL7M
			V43WNDEL7M
JA4GK41S□NJ			V43WRDEL7M
JA4GK51S□NJ			V43WNHEL7M
			V43WRHEL7M
			V43WGRXEL7M

<1993 MODELS>

FEDERAL

V.I.N. (except sequence number)	Brand	Engine displacement	Model code
JA4MR31H□PJ	MITSUBISHI MONTERO	2,972 cm ³ (181.3 cu.in.)	V43VNDEL2M
			V43VRDEL2M
			V43WNDEL2M
			V43WRDEL2M
JA4MR41H□PJ			V43WNHEL2M
JA4MR51H□PJ			V43WRHEL2M
			V43WGRXEL2M

CALIFORNIA (Can also be sold in Federal states.)

V.I.N. (except sequence number)	Brand	Engine displacement	Model code
JA4MR31H□PJ	MITSUBISHI MONTERO	2,972 cm ³ (181.3 cu.in.)	V43VNDEL7M
			V43VRDEL7M
			V43WNDEL7M
			V43WRDEL7M
JA4MR41H□PJ			V43WNHEL7M
JA4MR51H□PJ			V43WRHEL7M
			V43WGRXEL7M

<1994 MODELS>

FEDERAL

V.I.N. (except sequence number)	Brand	Engine displacement	Model code
JA4MR31H□RJ	MITSUBISHI MONTERO	2,972 cm ³ (181.3 cu.in.)	V43WNDEL2M
			V43WRDEL2M
JA4MR41H□RJ			V43WNHEL2M
			V43WRHEL2M
JA4MR51H□RJ		V43WGRXEL2M	
JA4MR51M□RJ		3,497 cm ³ (213.4 cu.in.)	V45WGRXML2M

CALIFORNIA (Can also be sold in Federal states.)

V.I.N. (except sequence number)	Brand	Engine displacement	Model code
JA4MR31H□RJ	MITSUBISHI MONTERO	2,972 cm ³ (181.3 cu.in.)	V43WNDEL7M
			V43WRDEL7M
JA4MR41H□RJ			V43WNHEL7M
			V43WRHEL7M
JA4MR51H□RJ		V43WGRXEL7M	
JA4MR51M□RJ		3,497 cm ³ (213.4 cu.in.)	V45WGRXML7M

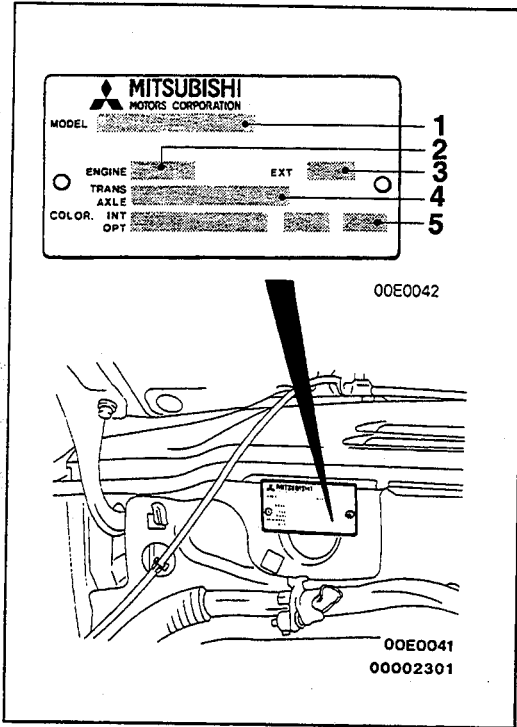
<1995 MODELS>

FEDERAL

V.I.N. (except sequence number)	Brand	Engine displacement	Model code
JA4MR31H□SJ	MITSUBISHI MONTERO	2,972cm ³ (181.3 cu.in.)	V43WNDEL2M
			V43WRDEL2M
JA4MR41H□SJ			V43WNHVL2M
			V43WRHVL2M
			V43WRHEL2M
JA4MR51H□SJ		V43WGRXEL2M	
JA4MR51M□SJ		3,497 cm ³ (213.4 cu.in.)	V45WGRXML2M

CALIFORNIA

V.I.N.(except sequence number)	Brand	Engine displacement	Model code
JA4MR41H□SJ	MITSUBISHI MONTERO	2,972 cm ³ (181.3 cu.in.)	V43WNHVL7M
			V43WRHVL7M
JA4MR51M□SJ		3,497 cm ³ (213.4 cu.in.)	V45WGRXML7M



VEHICLE INFORMATION CODE PLATE

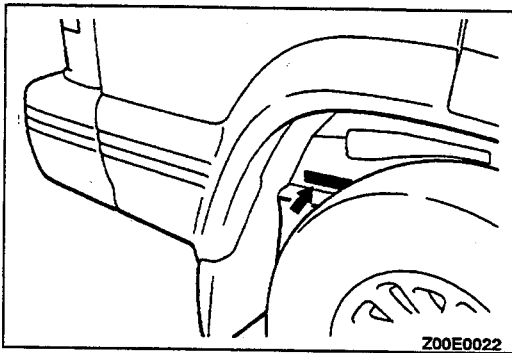
110005039

The vehicle information code plate is riveted onto the cowl top outer panel in the engine compartment.

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

No.	Items	Contents	
1	MODEL	V43WG	V43WG; Vehicle model
		RXEL2M	RXEL2M; Model series
2	ENGINE	6G72	Engine model
3	EXT	CA6A	Exterior code
4	TRANS AXLE	V4AW2	V4AW2; Transmission model
		4875	4875; Rear differential reduction
5	COLOR, INT OPT	R25	R25; Body color code
		87V	87V; Interior code
		03V	03V; Equipment code

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



CHASSIS NUMBER

110005040

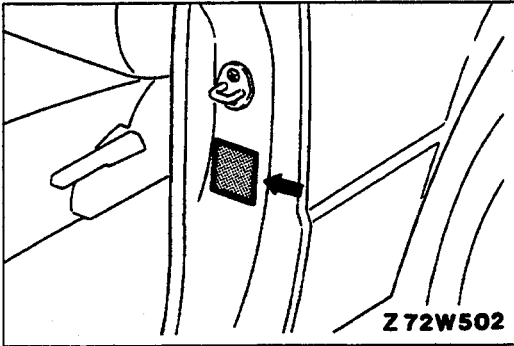
STAMPING LOCATION

The chassis number is stamped on the side of the frame near the right rear wheel.

CHASSIS NUMBER CODE CHART

Chassis number code	Contents	
V43W NJ000001	V43; Vehicle line	V43; MONTERO (3.0dm ³ Engine)
		V45; MONTERO (3.5dm ³ Engine)
	W; Body type	V; Van
		W; Wagon
NJ000001; Refer to 10th thru 17th digits of V.I.N. plate		

TSB Revision

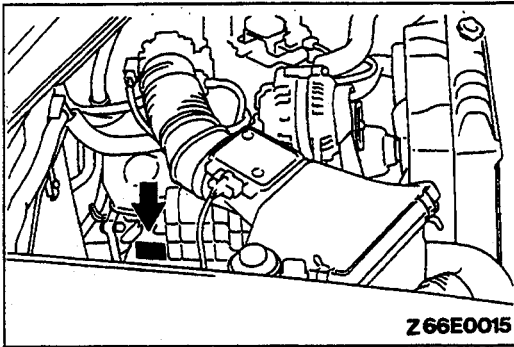


VEHICLE SAFETY CERTIFICATION LABEL

110005041

The vehicle safety certification label is attached to the face of the left door pillar.

This label indicates the month and year of manufacture, Gross Vehicle Weight Rating (G.V.W.R.), front and rear Gross Axle Weight Rating (G.A.W.R.), and Vehicle Identification Number (V.I.N.).



ENGINE MODEL STAMPING

110005042

The engine model is stamped at the right rear of the top of the cylinder block.

These engine model numbers are as shown as follows.

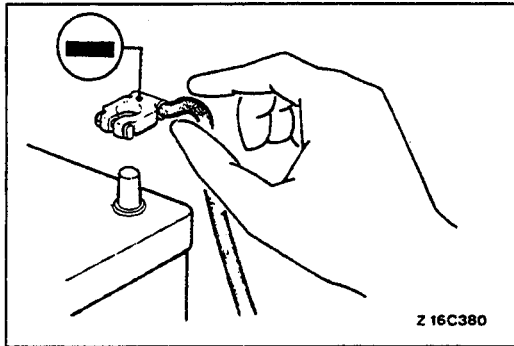
Engine model	Engine displacement
6G72 <3.0L engine>	2,972 cm ³ (181.3 cu.in.)
6G74 <3.5L engine>	3,497 cm ³ (213.4 cu.in.)

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

PRECAUTIONS BEFORE SERVICE

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

1. Items to follow when servicing SRS
 - (1) Be sure to read GROUP 52B – Supplemental Restraint System (SRS).
For safe operation, 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 there is a defect, replace the defective part.
 - (5) Warning labels must be heeded when servicing or handling SRS components. Warning labels can be found in the following locations.
 - Hood
 - Sun visor
 - Glove box
 - SRS diagnosis unit
 - Steering wheel
 - Air bag module
 - Clock spring
 - Front impact sensor
 - Frame on side of steering gear box
 - (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.
 - (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 light 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 temperatures of over 93°C (200°F), so remove the SRS components before drying or baking the vehicle after painting.
After re-installing them, check the SRS warning light operation to make sure that the system functions properly.



SERVICING ELECTRICAL SYSTEM

110005044

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

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.)
- After completion of the work steps (when the negative battery terminal is connected), warm up the engine and allow it to idle for approximately ten minutes under the conditions described below in order to stabilize engine control conditions, and then check to be sure that the idling is satisfactory.

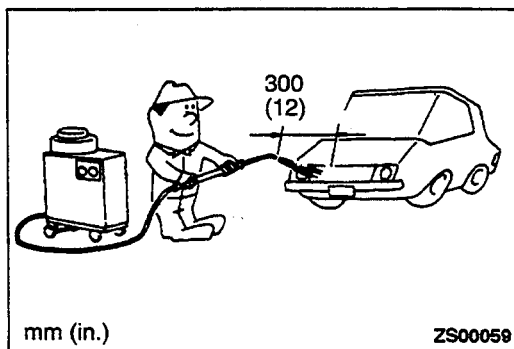
Engine coolant temperature: 85°–95°C
(185–203°F)

Lights and all accessories: OFF

Transmission: neutral position

(Automatic transmission models: N or P)

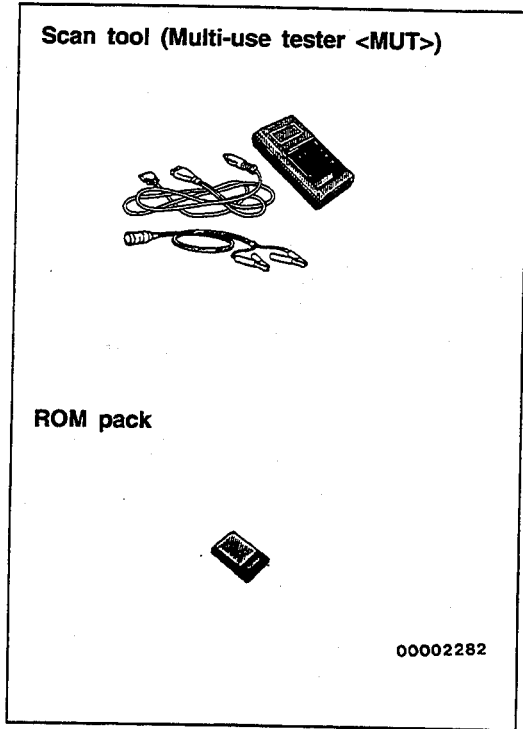
Steering wheel: straight-forward position



VEHICLE WASHING

110005045

If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to maintain the spray nozzle at a distance of at least 300 mm (12 in.) from any plastic parts and all opening parts (doors, luggage compartment, etc).



SCAN TOOL (MUT) <Vehicles built up to 1993>

110005046

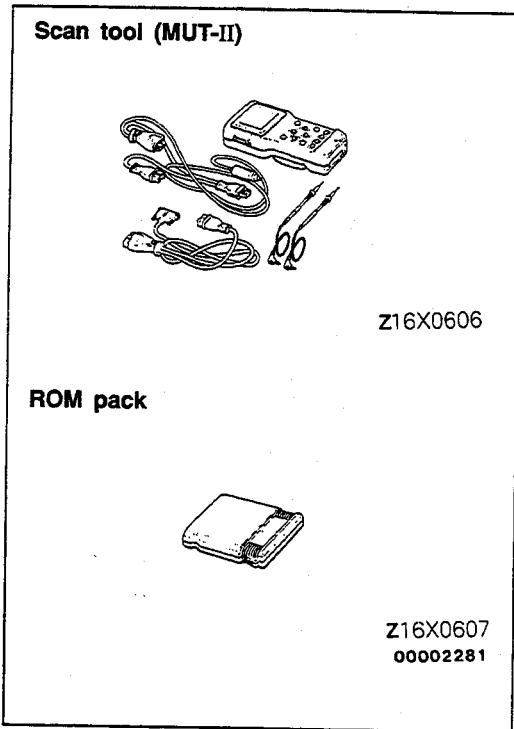
- (1) To operate the scan tool, refer to the "Multi-use Tester Operation Instructions."

Caution

Connection and disconnection of the scan tool should always be carried out with the ignition switch in the OFF position.

- (2) Always use a ROM pack that is appropriate for the vehicle.

ROM pack	Engine models
MB991423	1992 models
MB991466	1992 and 1993 models



SCAN TOOL (MUT-II) <All models>

110005047

To operate the scan tool, refer to "MUT-II Operating Instructions."

Caution

Connection and disconnection of the scan tool should always be carried out with the ignition switch in the OFF position.

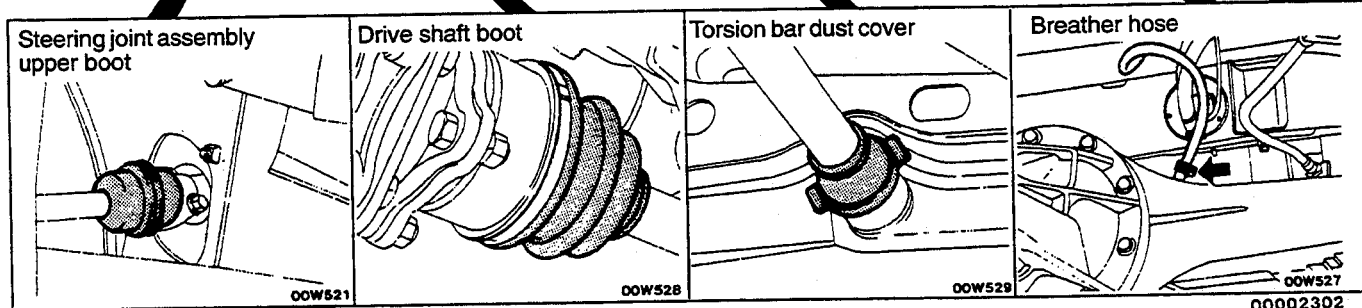
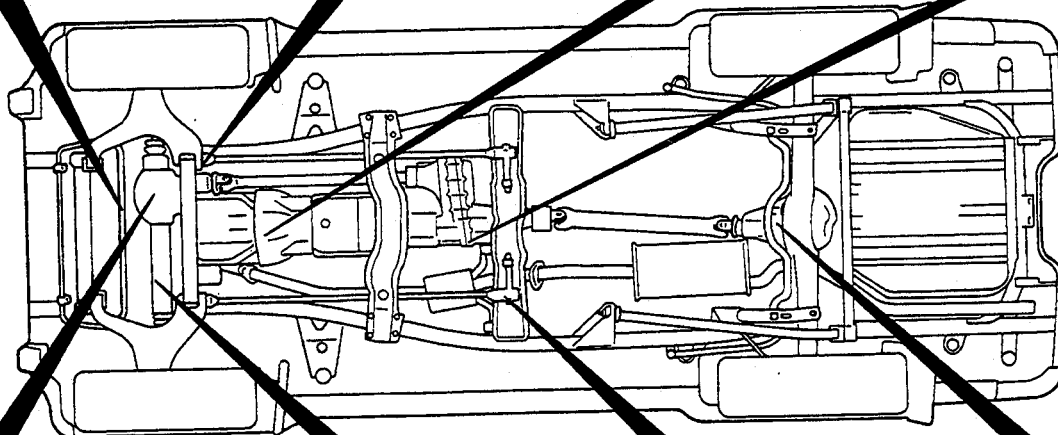
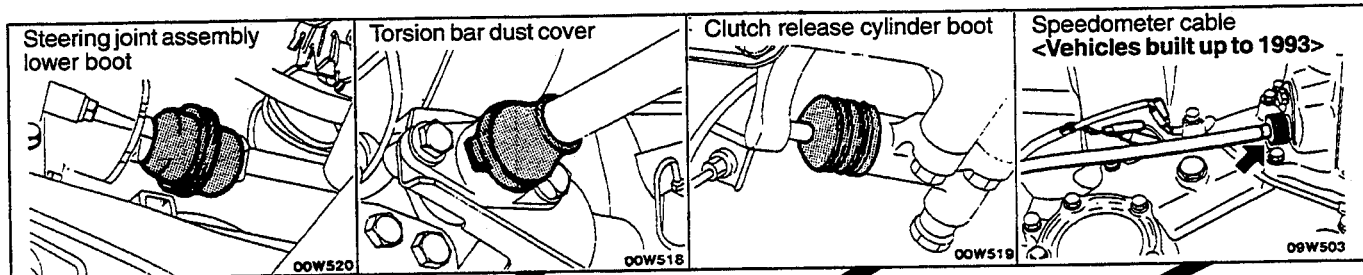
TREATMENT BEFORE/AFTER THE FORDING OF A STREAM

110005048

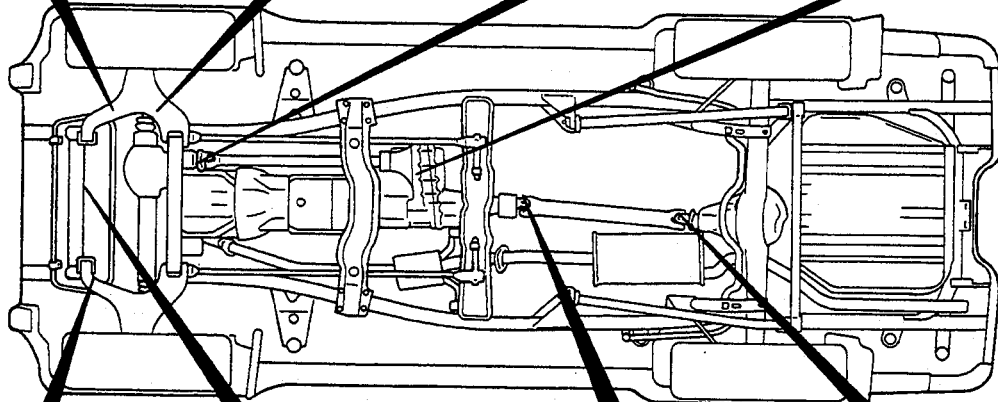
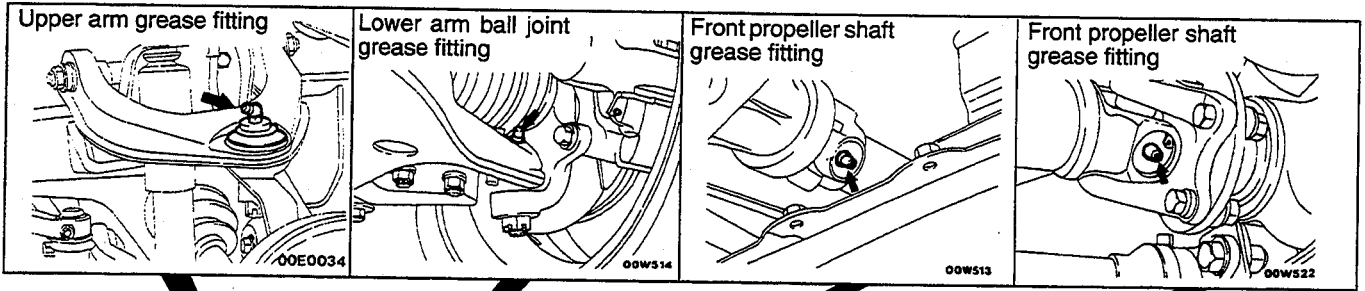
INSPECTION AND SERVICE BEFORE FORDING A STREAM

Vehicles which are driven through water, or which may possibly be driven through water, should be subjected to the following inspections and maintenance procedures in advance.

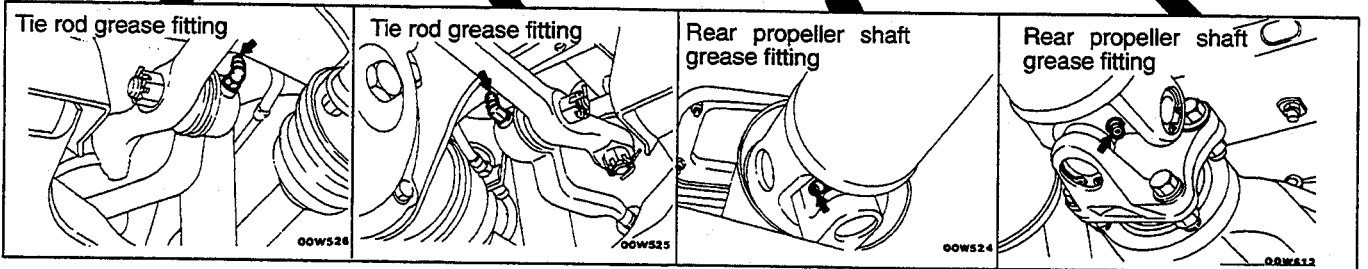
- Seal the speedometer cable with a water-resistant grease or tape. <Vehicles built up to 1993>
- Inspect the dust boots and breather hose for cracks or damage, and replace them if cracks or damage are found.



- Apply grease to the lubricating points of the front suspension, steering linkage and propeller shaft.



00E0029



00002303

INSPECTION AND SERVICE AFTER FORDING A STREAM

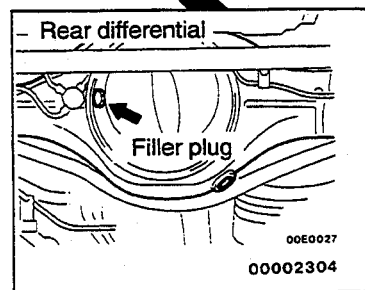
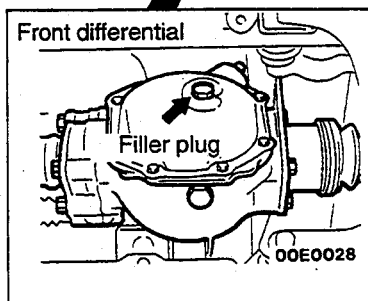
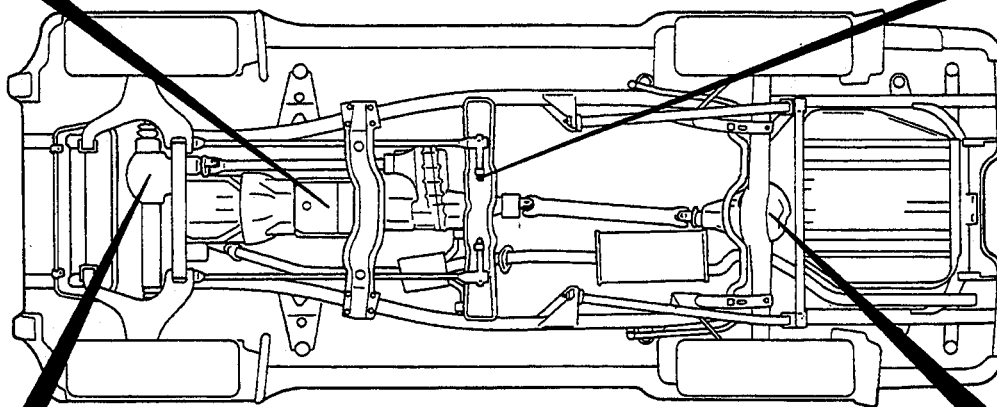
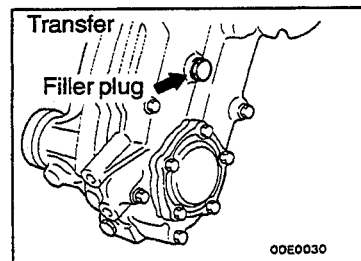
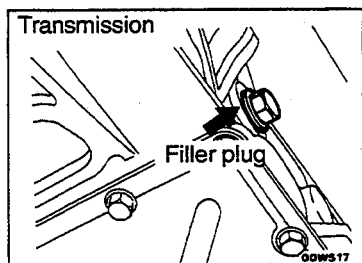
110005049

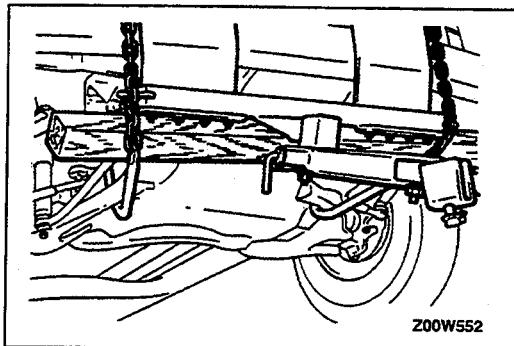
After fording a stream, check the following points. If an abnormal condition is evident, clean, replace or lubricate.

- Check for water, mud, sand, etc. in the rear brake drum, clutch housing, starter motor, brake pipe and fuel pipe.
- Check for water in the fluid or oil inside the front differential, rear differential, transmission and transfer.
- Apply grease to the lubricating points of the front suspension, steering linkage and propeller shaft.
- Check all boots and breather hoses for cracks or damage.

Caution

Check to be sure that there are no water and mud entering from each component connection.





TOWING AND HOISTING

110005050

This vehicle can only be towed from the front with conventional sling-type equipment and tow chain with grab hooks.

If the vehicle is towed from the rear, use a tow dolly.

A lumber spacer (4" x 4" x 55" wood beam) should be placed forward of the under guard and under the towing hook/shipping tie down hook.

Then, attach a J-hook to the lower arm.

A safety chain system must be used. This system must be completely independent of the primary lifting and towing attachment. Care must be taken in the installation of safety chains to insure they do not cause damage to the bumper, painted surfaces or lights.

LIFTING-GROUND CLEARANCE

The towed vehicle should be raised until the wheels are a minimum of 10 cm (4 in.) from the ground. Make sure that there is adequate ground clearance at the opposite end of the vehicle, especially when towing over rough terrain or when crossing sharp rises such as curbs. If necessary, the ground clearance can be increased by removing the wheels from the lifted end of the disabled vehicle and carrying the lifted end closer to the ground. A 20 cm (8 in.) ground clearance must be maintained between the brake discs and the ground.

FRONT TOWING PICK-UP

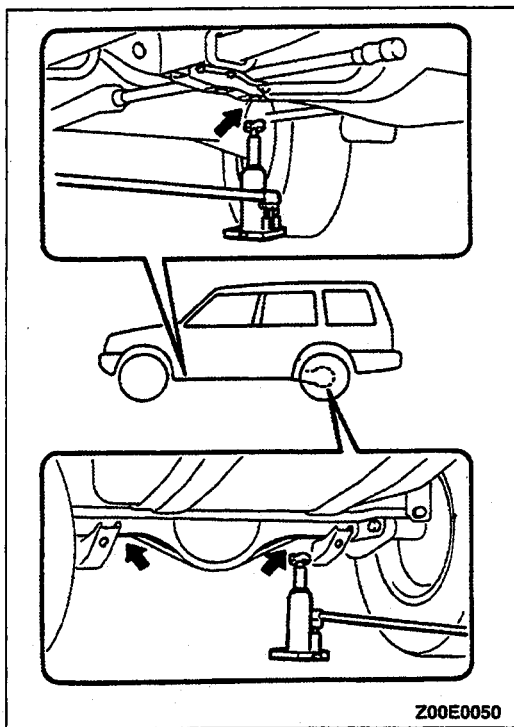
The vehicle may be towed on its rear wheels for extended distances, provided the parking brake is released.

Make sure that the transmission remains in the N position.

SAFETY PRECAUTION

The following precautions should be taken when towing the vehicle.

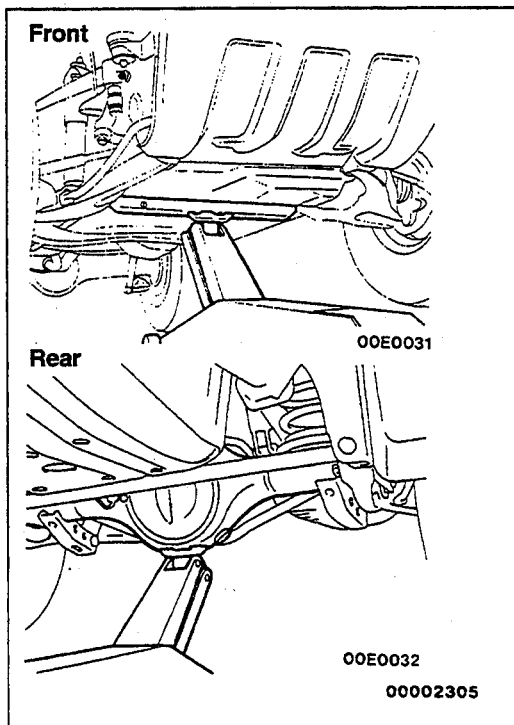
1. Remove exhaust tips and any other optional equipment that interface with the towing sling. Padding (heavy shop towel or carpeting) should be placed between the towing sling cross bar and any painted surfaces and bumper surfaces.
2. A safety chain system completely independent of the primary lifting and towing attachment must be used
3. Any loose or protruding parts of damaged vehicle such as hoods, doors, fenders, trim, etc., should be secured prior to moving the vehicle.
4. The operator should refrain from getting underneath a vehicle unless the vehicle is adequately supported by safety stands.
5. Never allow passengers to ride in a towed vehicle.
6. State and local rules and regulations must be followed when towing a vehicle.



HOISTING

EMERGENCY JACKING

Jack receptacles are located at the No. 2 crossmember and rear axle housing to accept the jack supplied with the vehicle for emergency road service. Always block the opposite wheels and jack only on a level surface.



FLOOR JACK

A regular floor jack may be used under the front crossmember or rear axle housing.

Caution

1. A floor jack must never be used on any part of the underbody.
2. Do not attempt to raise one entire side of the vehicle by placing a jack midway between front and rear wheels.

This practice may result in permanent damage to the body.

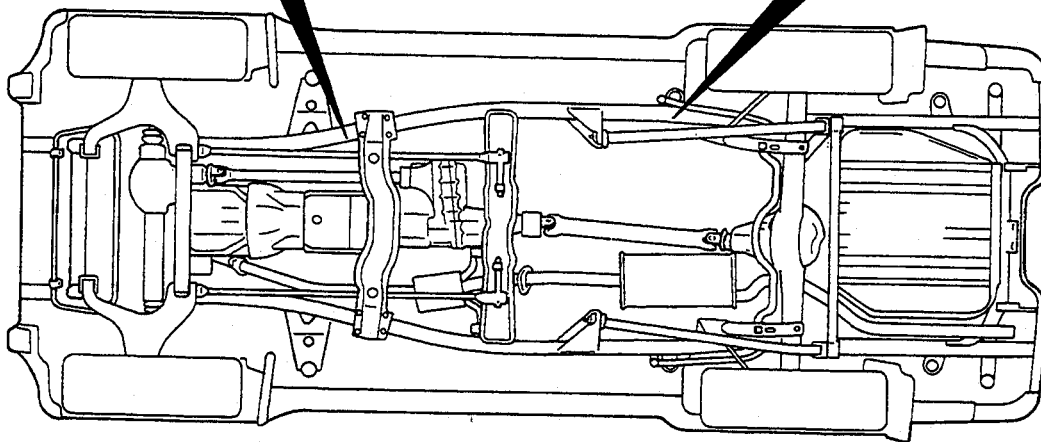
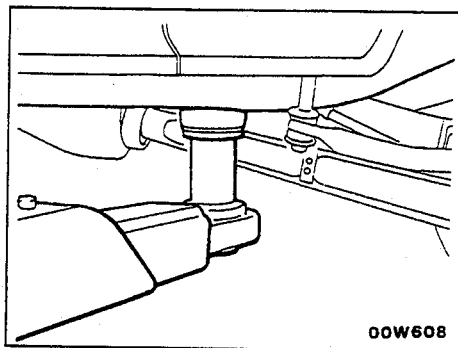
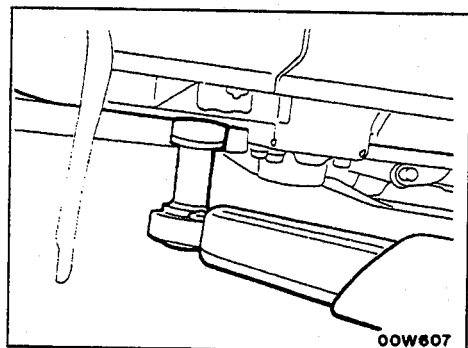
POST TYPE

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

Conventional hydraulic hoists may be used after determining that the adapter plates will make firm contact with the side frame.

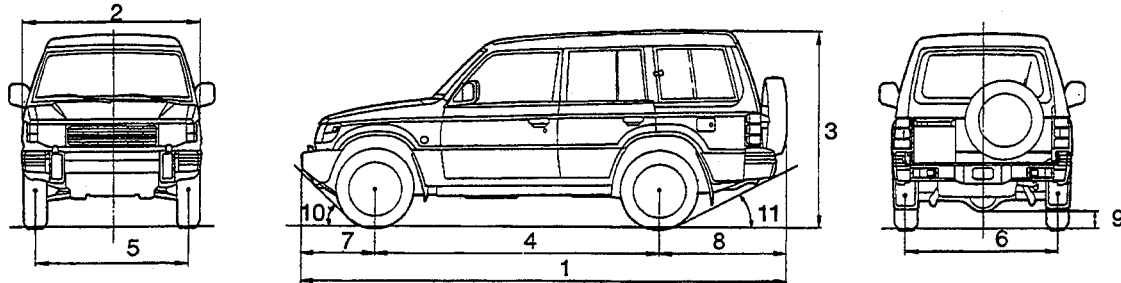
Caution

When service procedures require removal of the rear suspension, the fuel tank or the spare tire, additional weight on the rear end of the vehicle or anchor the vehicle to a hoist to prevent center of gravity changes.



GENERAL DATA AND SPECIFICATIONS

110005051



Z00E0040

<VEHICLES BUILT UP TO 1993>

Items		Medium line	High line	Premium line
Vehicle dimensions mm (in.)	Overall length	1 4,705 (185.2)	4,705 (185.2)	4,740 (186.6)
	Overall width	2 1,695 (66.7)	1,695 (66.7)	1,785 (70.3)
	Overall height	3 1,865 (73.4)	1,865 (73.4)	1,880 (74.0)
	Wheelbase	4 2,725 (107.3)	2,725 (107.3)	2,725 (107.3)
	Tread – front	5 1,420 (55.9)	1,420 (55.9)	1,465 (57.7)
	Tread – rear	6 1,435 (56.5)	1,435 (56.5)	1,480 (58.3)
	Overhang – front	7 720 (28.3)	720 (28.3)	720 (28.3)
	Overhang – rear	8 1,260 (49.6)	1,260 (49.6)	1,295 (51.0)
	Minimum running ground clearance	9 190 (7.5)	190 (7.5)	210 (8.3)
	Angle of approach degrees	10 40.0	40.0	42.0
	Angle of departure degrees	11 19.0	19.0	20.0
Vehicle weights kg (lbs.)	Curb weight	M/T: 1,875 (4,133) A/T: 1,870 (4,122)	M/T: 1,885 (4,155) A/T: 1,880 (4,144)	1,915 (4,221)
	Gross vehicle weight rating	2,600 (5,732)	2,600 (5,732)	2,600 (5,732)
	Gross axle weight rating – front	1,200 (2,645)	1,200 (2,645)	1,200 (2,645)
	Gross axle weight rating – Rear	1,650 (3,637)	1,650 (3,637)	1,650 (3,637)
Seating capacity		5		
Engine	Model No.	6G72		
	Piston displacement cm ³ (cu.in.)	2,972 (181.3)		
Transmission & transfer	Model No. & Type	M/T: V5MT1 – 5-speed manual A/T: V4AW2 – 4-speed automatic		
Fuel system	Fuel supply system	MFI		

<1994 MODELS>

Items			Medium line	High line	Premium line	
Vehicle dimensions mm (in.)	Overall length	1	4,705 (185.2)	4,705 (185.2)	4,740 (186.6)	4,740 (186.6)
	Overall width	2	1,695 (66.7)	1,695 (66.7)	1,785 (70.3)	1,785 (70.3)
	Overall height	3	1,865 (73.4)	1,865 (73.4)	1,880 (74.0)	1,910 (75.2)
	Wheelbase	4	2,725 (107.3)	2,725 (107.3)	2,725 (107.3)	2,725 (107.3)
	Tread – front	5	1,420 (55.9)	1,420 (55.9)	1,465 (57.7)	1,465 (57.7)
	Tread – rear	6	1,435 (56.5)	1,435 (56.5)	1,480 (58.3)	1,480 (58.3)
	Overhang – front	7	720 (28.3)	720 (28.3)	720 (28.3)	720 (28.3)
	Overhang – rear	8	1,260 (49.6)	1,260 (49.6)	1,295 (51.0)	1,295(51.0)
	Minimum running ground clearance	9	190 (7.5)	190 (7.5)	210 (8.3)	180 (7.1)
	Angle of approach degrees	10	40.0	40.0	42.0	42.0
	Angle of departure degrees	11	19.0	19.0	20.0	20.0
Vehicle weights kg (lbs.)	Curb weight		M/T: 1,880 (4,145) A/T: 1,875 (4,135)	M/T: 1,900 (4,190) A/T: 1,895 (4,175)	1,930 (4,255)	2,015(4,440)
	Gross vehicle weight rating		2,600 (5,732)	2,600 (5,732)	2,600 (5,732)	2,650 (5,840)
	Gross axle weight rating – front		1,200 (2,645)	1,200 (2,645)	1,200 (2,645)	1,200 (2,645)
	Gross axle weight rating – Rear		1,650 (3,637)	1,650 (3,637)	1,650 (3,637)	1,780 (3,925)
Seating capacity			5 (or 7*)		5 (or 7*)	
Engine	Model No.		6G72		6G74	
	Piston displacement cm ³ (cu.in.)		2,972 (181.3)		3,497 (213.4)	
Transmission & transfer	Model No. & Type		M/T: V5MT1 – 5-speed manual A/T: V4AW2 – 4-speed automatic		V4AW3 – 4-speed auto- matic	
Fuel system	Fuel supply system		MFI		MFI	

NOTE

*: Vehicles with optional third seat

<VEHICLES BUILT FROM 1995>

Items			V43WNDEL2M V43WRDEL2M V43WRHEL2M	V43WGRXEL2M	V43WNHVL2M V43WNHVL7M V43WRHVL2M V43WRHVL7M	V45WGRXML2M V45WGRXML7M
Vehicle dimensions mm (in.)	Overall length	1	4,705 (185.2)	4,740 (186.6)	4,705 (185.2)	4,740 (186.6)
	Overall width	2	1,695 (66.7)	1,785 (70.3)	1,695 (66.7)	1,785 (70.3)
	Overall height	3	1,865 (73.4)	1,880 (74.0)	1,895 (74.6)	1,910 (75.2)
	Wheelbase	4	2,725 (107.3)	2,725 (107.3)	2,725 (107.3)	2,725 (107.3)
	Tread – front	5	1,420 (55.9)	1,465 (57.7)	1,420 (55.9)	1,465 (57.7)
	Tread – rear	6	1,435 (56.5)	1,480 (58.3)	1,435(56.5)	1,480 (58.3)
	Overhang – front	7	720 (28.3)	720 (28.3)	720 (28.3)	720 (28.3)
	Overhang – rear	8	1,260 (49.6)	1,295 (51.0)	1,260 (49.6)	1,295 (51.0)
	Minimum running ground clearance	9	190 (7.5)	210 (8.3)	190 (7.5)	180 (7.1)
	Angle of approach degrees	10	40.0	42.0	40.0	42.0
Angle of departure degrees	11	19.0	20.0	19.0	20.0	
Vehicle weights kg (lbs.)	Curb weight		M/T: 1,880 (4,145) A/T: 1,875 (4,135)* ¹ 1,895 (4,175)* ²	1,930 (4,255)	M/T: 1,935 (4,265) A/T: 1,940 (4,275)	2,015 (4,440)
	Gross vehicle weight rating		2,600 (5,732)	2,600 (5,732)	2,600 (5,732)	2,650 (5,840)
	Gross axle weight rating – front		1,200 (2,645)	1,200 (2,645)	1,200 (2,645)	1,200 (2,645)
	Gross axle weight rating – Rear		1,650 (3,637)	1,650 (3,637)	1,650 (3,637)	1,780 (3,925)
Seating capacity			5 (or 7*)		5 (or 7*)	5 (or 7*)
Engine	Model No.	6G72			6G72	6G74
	Piston displacement cm ³ (cu.in.)	2,972 (181.3)			2,972 (181.3)	3,497 (213.4)
Transmission & transfer	Model No. & Type	M/T: V5MT1 5-speed manual A/T: V4AW2 4-speed automatic			M/T: V5MT1 5-speed manual A/T: V4AW3 4-speed automatic	
Fuel system	Fuel supply system	MFI			MFI	

NOTE

*: Vehicles with optional third seat

*1: V43WRDEL2M

*2: V43WRHEL2M

TIGHTENING TORQUE

Each torque value in the table is a standard value for tightening under the following conditions.

- (1) Bolts, nuts and washers are all made of steel and plated with zinc.
- (2) The threads and bearing surface of bolts and nuts are all in dry condition.

The values in the table are not applicable:

- (1) If toothed washers are inserted.
- (2) If plastic parts are fastened.
- (3) If bolts are tightened to plastic or die-cast inserted nuts.
- (4) If self-tapping screws or self-locking nuts are used

Standard bolt and nut tightening torque

Thread size		Torque Nm (ft.lbs.)		
Nominal bolt diameter (mm)	Pitch (mm)	Head mark "4"	Head mark "7"	Head mark "8"
M5	0.8	2.5 (1.8)	4.9 (3.6)	5.9 (4.3)
M6	1.0	4.9 (3.6)	8.8 (6.5)	9.8 (7.2)
M8	1.25	12 (8.7)	22 (16)	25 (18)
M10	1.25	24 (17)	44 (33)	52 (38)
M12	1.25	41 (30)	81 (60)	96 (71)
M14	1.5	72 (53)	137 (101)	157 (116)
M16	1.5	111 (82)	206 (152)	235 (174)
M18	1.5	167 (123)	304 (224)	343 (253)
M20	1.5	226 (166)	412 (304)	481 (354)
M22	1.5	304 (224)	559 (412)	647 (477)
M24	1.5	392 (289)	735 (542)	853 (629)

Flange bolt and nut tightening torque

Thread size		Torque Nm (ft.lbs.)		
Nominal bolt diameter (mm)	Pitch (mm)	Head mark "4"	Head mark "7"	Head mark "8"
M6	1.0	4.9 (3.6)	9.8 (7.2)	12 (8.7)
M8	1.25	13 (9.4)	24 (17)	28 (20)
M10	1.25	26 (19)	49 (36)	57 (42)
M10	1.5	24 (17)	44 (33)	54 (40)
M12	1.25	46 (34)	93 (69)	103 (76)
M12	1.75	42 (31)	81 (60)	96 (71)

MASTER TROUBLESHOOTING**ENGINE OVERHEATS**

Symptom	Probable cause	Reference page or remedy
Engine overheats	Malfunction of cooling system	14-4
	Incorrect ignition timing	16-30 to 50

ENGINE WILL NOT CRANK OR CRANKS SLOWLY.

Symptom	Probable cause	Reference page or remedy
Engine will not crank or cranks slowly.	Malfunction of starting system	16-20

ENGINE WILL NOT START OR IS HARD TO START (CRANKS OK).

Symptom	Probable cause	Reference page or remedy
Engine will not start or is hard to start (cranks OK).	No fuel supply to fuel injection system	13A-32
	Fuel injection system problems	13A-32
	Ignition system problems	16-30 to 50
	Vacuum leaks <ul style="list-style-type: none"> ● Purge control valve hose ● Vacuum hoses ● Intake manifold ● Intake manifold plenum ● Throttle body 	Repair as necessary
	Compression is too low	11A-9, 11B-10

ROUGH IDLE OR ENGINE STALLS

Symptom	Probable cause	Reference page or remedy
Rough idle or engine stalls	Vacuum leaks <ul style="list-style-type: none"> ● Purge control valve hose ● Vacuum hoses ● Intake manifold ● Intake manifold plenum ● Throttle body 	Repair as necessary
	Ignition system problems	16-30 to 50
	Idle speed set too low	13A-39
	Fuel injection system problems	13A-32
	Engine overheats	14-4
	Compression is too low	11A-9, 11B-10

ENGINE HESITATES OR POOR ACCELERATION.

Symptom	Probable cause	Reference page or remedy
Engine hesitates or poor acceleration.	Ignition system problems	16-30 to 50
	Vacuum leaks <ul style="list-style-type: none"> ● Purge control valve hose ● Vacuum hoses ● Intake manifold ● Intake manifold plenum ● Throttle body 	Repair as necessary
	Air cleaner clogged	00-54
	Fuel line clogged	13F-10
	Fuel injection system problems	13A-32
	Emission control system problem	17-3
	Engine overheats	14-4
	Compression is too low	11A-9, 11B-10

EXCESSIVE OIL CONSUMPTION

Symptom	Probable cause	Reference page or remedy
Excessive oil consumption	Oil leak	Repair as necessary
	Positive crankcase ventilation line is clogged	00-54
	Valve stem seal is worn or damaged	Replace
	Valve stem is worn	Replace

POOR FUEL MILEAGE

Symptom	Probable cause	Reference page or remedy
Poor fuel mileage	Fuel leak	Repair as necessary
	Ignition problems	16-30 to 50
	Fuel injection system problems	13A-32
	Compression is too low	11A-9, 11B-10
	Tires are improperly inflated	31-4
	Clutch slips	Repair as necessary
	Brakes drag	35A-4

NOISE

Symptom	Probable cause	Reference page or remedy
Noise	Loose bolts and nuts	Re-tighten as necessary
	Engine noise	11A-4, 11B-5

HARD STEERING

Symptom	Probable cause	Reference page or remedy
Hard steering	Loose power steering oil pump belt	37A-11
	Low fluid level	37A-11
	Air in power steering system	37A-12
	Low tire pressure	31-4
	Excessive turning resistance of upper or lower ball joint	33A-12, 15
	Excessively tight linkage ball joint	37A-39
	Improper front wheel alignment	33A-9
	Excessive turning resistance of tie-rod ball joint	37A-40
	No lubrication of tie-rod	Lubricate
	Sticky flow control valve	37A-33
	No lubrication of idler arm	37A-39

POOR RETURN OF STEERING WHEEL TO CENTER

Symptom	Probable cause	Reference page or remedy
Poor return of steering wheel to center	Improper front wheel alignment	33A-9
	Improper tire pressure	31-4
	Damaged front wheel bearing	26-15

POOR RIDING

Symptom	Probable cause	Reference page or remedy
Poor riding	Improper tire pressure	31-4
	Unbalanced wheels	31-4
	Improper front or rear wheel alignment	33A-9, 34-3
	Malfunction of shock absorber	33A-4
	Broken or worn stabilizer	33A-19, 20
	Broken or worn torsion bar spring	33A-17
	Loose suspension securing bolt(s)	Re-tighten
	Worn lower arm bushing	33A-14, 15, 16

ABNORMAL TIRE WEAR

Symptom	Probable cause	Reference page or remedy
Abnormal tire wear	Improper front or rear wheel alignment	33A-9, 34-3
	Improper tire pressure	31-4
	Unbalanced wheels	31-4
	Loose wheel bearings	26-15
	Malfunction of shock absorber	33A-4

ROAD WANDER

Symptom	Probable cause	Reference page or remedy
Road wander	Improper front or rear wheel alignment	33A-9, 34-3
	Excessive steering wheel play	37A-7
	Poor turning resistance of upper ball joint	33A-9
	Improper tire pressure	31-4
	Loose or worn lower arm or upper arm bushing	33A-11, 14
	Loose or worn wheel bearings	26-15

VEHICLE PULLS TO ONE SIDE

Symptom	Probable cause	Reference page or remedy
Vehicle pulls to one side	Improper front or rear wheel alignment	33A-9, 34-3
	Unbalanced or worn tires	31-4
	Uneven tire pressure	31-4
	Excessive turning resistance of upper ball joint	33A-12
	Wheel bearing seizure	26-15
	Broken or worn torsion bar spring	33A-17
	Bent front axle drive shaft	26-19
	Deformed lower arm	33A-14

STEERING WHEEL SHIMMY

Symptom	Probable cause	Reference page or remedy
Steering wheel shimmy	Improper front or rear wheel alignment	33A-9, 34-3
	Improper tire pressure	31-4
	Unbalanced wheels	Repair
	Poor turning resistance of upper ball joint	33A-16
	Excessive steering wheel play	37A-7
	Broken or worn stabilizer	33A-19, 20
	Worn lower arm or upper arm bushing	33A-15, 16
	Malfunction of shock absorber	33A-4
	Broken or weak torsion bar spring or coil spring	33A-17, 34-8
	Wear, play or seizure of wheel bearing	26-15

BOTTOMING

Symptom	Probable cause	Reference page or remedy
Bottoming	Overloaded vehicle	Correct
	Broken or weak torsion bar spring or coil spring	33A-17, 34-8
	Malfunction of shock absorber	33A-4

WHEEL BEARING TROUBLESHOOTING

Trouble	Symptom	Probable cause
Pitting	Pitting occurs because of uneven rotation of race and bearing surfaces	Excessive bearing preload Excessive load
Flaking	The surface peels because of uneven rotation of the race and bearing surfaces.	End of bearing life Improper bearing assembly
Cracking	Chipping or cracking of cage or roller edges	Impact when bearing was installed (such as being hit with a hammer)
Flat spotting	When a large load is applied, the race and roller contact surfaces compress, forming indentations.	Excessive bearing preload Excessive load Vibration when bearings are not used, such as during shipment on freight cars, transport trucks, etc.
Nicks	Rollers slide instead of rolling along the race surface, thus damaging the surface.	Improper grease Excessive bearing preload Excessive load Malfunction of oil seal
Smearing	Damage or wear caused by minute particles adhering to surfaces results in rough movement and such high temperatures that parts of the surface melt.	Excessive variation of loads on bearings Using grease other than that specified Improper grease
Rust or corrosion	Appears on various parts of the bearing	Using grease other than that specified Malfunction of oil seal Presence of water or moisture
Wear	Wear of surface areas caused by friction	Improper grease Foreign materials Rust or corrosion due to moisture Using grease other than that specified Malfunction of oil seal
Discoloration	Grease discoloration results from grease deterioration which causes particles of pigment contained in grease to adhere to surfaces Heat discoloration will appear as a deep brown or purple	Using grease other than that specified Malfunction of oil seal Excessive bearing preload Excessive load

LUBRICATION AND MAINTENANCE

110005054

Maintenance and lubrication service recommendations have been compiled to provide maximum protection for the vehicle owner's investment against all reasonable types of driving conditions. Since these conditions vary with the individual vehicle owner's driving habits, the area in which the vehicle is operated and the type of driving to which the vehicle is subjected, it is necessary to prescribe lubrication and maintenance service on a time frequency as well as mileage interval basis.

Oils, lubricants and greases are classified and graded according to standards recommended by the Society of Automotive Engineers (SAE), the American Petroleum Institute (API) and the National Lubricating Grease Institute (NLGI).

MAINTENANCE SCHEDULES

Information for service maintenance is provided in the "SCHEDULED MAINTENANCE TABLE".

Three schedules are provided; one for "Required Maintenance", one for "General Maintenance" and one for "Severe Usage Service."

The item numbers in "SCHEDULED MAINTENANCE TABLE" correspond to the section numbers in "MAINTENANCE SERVICE."

SEVERE SERVICE

Vehicles operating under severe service conditions will require more frequent service.

Component service information is included in appropriate units for vehicles operating under one or more of the following conditions:

1. Trailer towing or police, taxi or commercial type operation.
2. Operation of Vehicle
 - (1) Short-trip operation at freezing temperature (engine not thoroughly warmed up)
 - (2) More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)
 - (3) Extensive idling
 - (4) Driving in sandy areas
 - (5) Driving in salty areas
 - (6) Driving in dusty conditions
 - (7) Driving on off-road

ENGINE OIL

The SAE grade number indicates the viscosity of engine oils, for example, SAE 30, which is a single grade oil. Engine oils are also identified by a dual number, for example, SAE 10W-30, which indicates a multigrade oil.

The API classification system defines oil performance in terms of engine usage. Only engine oil designed "For Service SG EC II" or "For Service SG/CD II", when available, should be used. These oils contain sufficient chemical additives to provide maximum engine protection. Both the SAE grade and the API designation can be found on the container.

Caution

Test results submitted to EPA have shown that laboratory animals develop skin cancer after prolonged contact with used engine oil. Accordingly, the potential exists for humans to develop a number of skin disorders, including cancer, from such exposure to used engine oil.

Care should be taken, therefore, when changing engine oil, to minimize the amount and length of exposure time to used engine oil on your skin. Protective clothing and gloves, that cannot be penetrated by oil, should be worn. The skin should be thoroughly washed with soap and water, or use waterless hand cleaner, to remove any used engine oil. Do not use gasoline, thinners, or solvents.

GEAR LUBRICANTS

The SAE grade number also indicates the viscosity of Multi-Purpose Gear Lubricants.

The API classification system defines gear lubricants in terms of usage. Typical gear lubricants conforming to API GL-4 or GL-5 with a viscosity of SAE 80W or SAE 90 are recommended for manual transmissions, front axles and rear axles (conventional differential), and MITSUBISHI genuine gear oil Part No. 8149630EX or equivalent for rear axles (limited slip differential).

LUBRICANTS AND GREASES

Semi-solid lubricants bear the NLGI designation and are further classified as grades 0, 1, 2, 3, etc. Whenever "Chassis Lubricant" is specified, Multi-Purpose Grease, NLGI grade No. 2, should be used.

FUEL USAGE STATEMENT

Your vehicle must be unleaded gasoline only. This vehicle has a fuel filler tube which is especially designed to accept only the smaller-diameter unleaded gasoline dispensing nozzle.

CAUTION

Using leaded gasoline in your car will damage the catalytic converter, and affect the warranty coverage validity.

Your vehicle is designed to operate on unleaded gasoline having a minimum octane rating of 87 or 91 RON (Research Octane Number).

GASOLINES CONTAINING ALCOHOL

Some gasolines sold at service stations contain alcohol although they may not be so identified. Using fuels containing alcohol is not recommended unless the nature of the blend can be determined as being satisfactory.

Gasohol: A mixture of 10% ethanol (grain alcohol) and 90% unleaded gasoline may be used in your vehicle. If drivability problems are experienced as a result of using gasohol, it is recommended that the vehicle be operated on gasoline.

Methanol: Do not use gasolines containing methanol (wood alcohol). Using this type of alcohol can result in vehicle performance deterioration and damage critical parts in the fuel system components. Fuel system damage and performance problems resulting from the use of gasolines containing methanol may not be covered by the new vehicle warranty.

GASOLINES CONTAINING MTBE (METHY TERTIARY BUTYL ETHER)

Unleaded gasoline containing 15% or less MTBE may be used in your vehicle. (Fuel containing MTBE over 15% vol. may cause reduced engine performance and produce vapor lock or hard starting.

MATERIALS ADDED TO FUEL

Indiscriminate use of fuel system cleaning agents should be avoided. Many of these materials intended for gum and varnish removal may contain highly active solvents or similar ingredients that can be harmful to gasket and diaphragm materials used in fuel system component parts.

RECOMMENDED LUBRICANTS AND LUBRICANT CAPACITIES TABLE

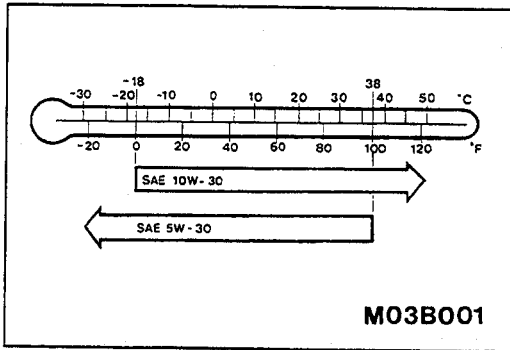
110005055

RECOMMENDED LUBRICANTS

Parts		Specifications	Remarks
Engine oil		API classification SG EC II or SG/CD EC II	For further details, refer to the SAE viscosity number.
Manual transmission		API classification GL-4	SAE grade number: SAE 75W-90 or 75W/85W
Automatic transmission		DIAMOND ATF SP, ATF DEXRON II or equivalent	–
Transfer		API classification GL-4	SAE grade number: SAE 75W-90 or 75W/85W
Front axle		API classification GL-5 or higher	For further details, refer to the SAE viscosity number.
Rear axle	Conventional differential	API classification GL-5 or higher	For further details, refer to the SAE viscosity number.
	Limited-slip differential	–	Mitsubishi Genuine Gear Oil Part No. 8149630EX or equivalent
Power steering		“DEXRON II” Automatic Transmission Fluid	–
Brakes and clutch		Conforming to DOT 3 or DOT 4	
Engine coolant		–	DIA-QUEEN LONG-LIFE COOLANT (Part No. 0103044) or HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT
Door hinges, back door hinges		Engine oil	–

LUBRICANT CAPACITIES TABLE

Description		Specifications
Engine oil dm ³ (qts.)	Crankcase (except for oil filter and oil cooler)	4.3 (4-1/2)
	Oil filter	0.3 (1/2)
	Oil cooler	0.3 (1/2)
Cooling system (including front heater and coolant reserve tank) dm ³ (qts.)		9.5 (10.0)
Manual transmission dm ³ (qts.)		2.5 (2.6)
Automatic transmission dm ³ (qts.)		7.2 (7.6)
Transfer dm ³ (qts.)	V5MT1, V4AW2	2.3 (2.4)
	V4AW3	2.5 (2.6)
Front axle dm ³ (qts.)		1.2 (1.3)
Rear axle dm ³ (qts.)		2.6 (2.7)
Power steering dm ³ (qts.)		1.06 (1.12)
Fuel tank dm ³ (gals.)		92 (24.3)



SELECTION OF LUBRICANTS

110005056

ENGINE OIL

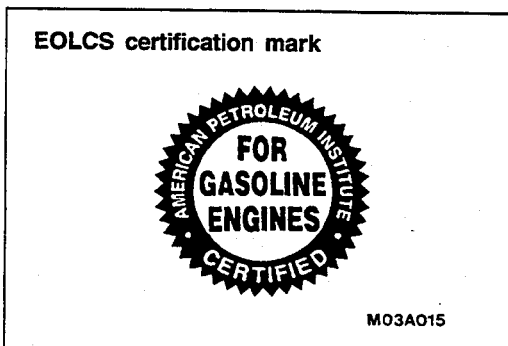
Engine oil should be used which conforms to the requirements of the API classification "For Service SH, SH/CD, SG or SG/CD ECII", and have the proper SAE grade number for the expected temperature range.

Caution

Nondetergent or straight mineral oil must never be used.

Energy Conserving Oil

In order to improve fuel economy and conserve energy, new lower friction engine oils have been developed. These oils are readily available and can be identified by such labels as "Energy Conserving II", "Energy Saving", "Improved Fuel Economy", etc.

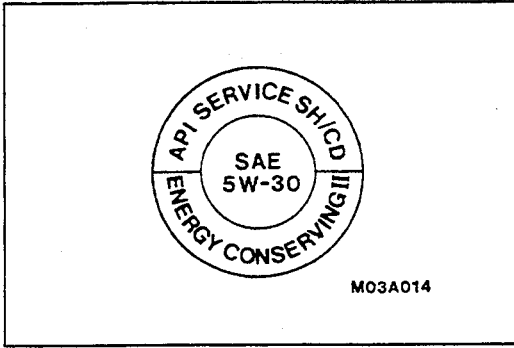


Oil Identification Symbol

Use only engine oils displaying the EOLCS certification mark on the front of the container.

These oils replace and improve upon the past API SERVICE SG and Energy Conserving II categories.

00-44 GENERAL – Recommended Lubricants and Lubricant Capacities Table



FRONT AXLE/REAR AXLE (CONVENTIONAL DIFFERENTIAL)

Lubricant	API classification GL-5 or higher
Expected temperature range	Viscosity range
Above -23°C (-10°F)	SAE 90 SAE 85W-90 SAE 80W-90
-20°C to -34°C (-10°F to -30°F)	SAE 80W SAE 80W-90
Below -34°C (-30°F)	SAE 75W

REAR AXLE (LIMITED SLIP DIFFERENTIAL)

Refer to GROUP 27 – Specifications.

SELECTION OF COOLANT COOLANT

11000507

Relationship between Coolant Concentration and Specific Gravity

Coolant temperature °C (°F) and specific gravity					Freezing temperature	Safe operating temperature	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)	°C (°F)	°C (°F)	%
1.054	1.050	1.046	1.042	1.036	-16 (3.2)	-11 (12.2)	30
1.063	1.058	1.054	1.049	1.044	-20 (-4)	-15 (5)	35
1.071	1.067	1.062	1.057	1.052	-25 (-13)	-20 (-4)	40
1.079	1.074	1.069	1.064	1.058	-30 (-22)	-25 (-13)	45
1.087	1.082	1.076	1.070	1.064	-36 (-32.8)	-31 (-23.8)	50
1.095	1.090	1.084	1.077	1.070	-42 (-44)	-37 (-35)	55
1.103	1.098	1.092	1.084	1.076	-50 (-58)	-45 (-49)	60

Example

The safe operating temperature is -15°C (5°F) when the measured specific gravity is 1.058 at the coolant temperature of 20°C (68°F)

Caution

1. If the concentration of the coolant is below 30%, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60%, both the anti-freeze and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.
2. Do not use a mixture of different brands of anti-freeze.

SCHEDULED MAINTENANCE TABLE

110005058

<VEHICLES BUILT UP TO 1993>

SCHEDULED MAINTENANCE SERVICE FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE

Inspection and service should be performed any time a malfunction is observed or suspected. Retain receipts for all vehicle emission services to protect your emission warranty.

No.	Emission Control System Maintenance	Service Intervals	Kilometers in Thousands	24	48	72	96	120	144	160	168	192
			Mileage in Thousands	15	30	45	60	75	90	100	105	120
1	Fuel System (Tank, Pipe Line and Connection, and Fuel Tank Filler Tube Cap)*	Check for Leaks Every 5 Years or					X					X
2	Fuel Hoses and Vapor Hoses	Check Condition Every 2 Years or		X			X		X			X
3	Air Cleaner Element	Replace at		X			X		X			X
4	Positive Crankcase Ventilation System (PCV system)	Clean at	Every 160,000 km (100,000 miles)									
5	Evaporative Emission Control System* (Except for Evaporative Emission Canister)	Check for Leaks and Clogging Every 5 Years or					X					X
6	Evaporative Emission Canister*	Replace at	Every 160,000 km (100,000 miles)									
7	Spark Plugs	Replace at		X			X		X			X
8	Ignition Cables*	Replace Every 5 Years or					X					X
10	Distributor Cap, Rotor and Spark Advancer System*	Check Every 5 Years or					X					X

NOTE

*: Except for California

GENERAL MAINTENANCE SERVICE FOR PROPER VEHICLE PERFORMANCE

No.	General Maintenance		Service Intervals	Kilometers in Thousands	24	48	72	96	120	144	160	168	192
				Mileage in Thousands	15	30	45	60	75	90	100	105	120
11	Timing Belt		Replace at					X					X
12	Drive Belt (for Generator)		Check Condition at			X		X		X			X
13	Engine Oil		Change Oil Every 12 Months or	Every 12,000 km (7,500 miles)									
14	Engine Oil Filter		Replace Every 12 Months or	X	X	X	X	X	X	X		X	X
15	Manual Transmission and Transfer Oil		Check Oil Level at			X		X		X			X
16	Automatic Transmission Fluid		Check Fluid Level Every 12 Months or	X	X	X	X	X	X	X		X	X
17	Automatic Transmission and Transfer Fluid		Change Fluid at			X		X		X			X
18	Engine Coolant		Change Coolant Every 2 Years or			X		X		X			X
19	Disc Brake Pads		Inspect for Wear Every 12 Months or	X	X	X	X	X	X	X		X	X
20	Brake Hoses		Check for Deterioration or Leaks Every 12 Months or	X	X	X	X	X	X	X		X	X
21	Ball Joint and Steering Linkage Seals		Inspect for Grease Leaks and Damage Every 2 Years or			X		X		X			X
22	Drive Shaft Boots		Inspect for Grease Leaks and Damage Every 12 Months or	X	X	X	X	X	X	X		X	X
23	Ball Joints with Grease Fitting		Lubricate with Grease Every 2 Years or			X		X		X		X	X
24	Front Axle and Rear Axle	With LSD*	Change Oil at			X		X		X		X	X
		Without LSD*	Inspect Oil Level at			X		X		X		X	X
25	Propeller Shaft Joints		Lubricate with Grease Every 2 Years or			X		X		X		X	X
26	Exhaust System Connection Portion of Muffler, Piping and Converter Heat Shields		Check and Service as Required Every 2 Years or			X		X		X		X	X

NOTE

*: LSD: Limited-slip differential

SCHEDULED MAINTENANCE UNDER SEVERE USAGE CONDITIONS

Maintenance should be carried out according to the following table:

No.	Maintenance Item	Service to be Performed	Mileage Intervals Kilometers in Thousands (Miles in Thousands)				Severe Usage Conditions
			24 (15)	48 (30)	72 (45)	96 (60)	
3	Air Cleaner Element	Replace	More Frequently				A and E
4	Positive Crankcase Ventilation System	Check and Clean as Required	More Frequently				A
7	Spark Plugs	Replace at	X	X	X	X	B and D
13	Engine Oil	Change Every 3 Months or	Every 4,800 km (3,000 miles)				A, B, C, D and G
14	Engine Oil Filter	Replace Every 6 Months or		X		X	A, B, C, D, and G
15	Manual Transmission and Transfer Oil	Change oil at	Every 9,600 km (6,000 miles)				B, G and H
19	Disk Brake Pads	Inspect for Wear	More Frequently				A and F

Severe usage conditions

- A—Driving in dusty conditions
- B—Trailer towing, or police, taxi or commercial type operation
- C—Extensive idling
- D—Short-trip operation at freezing temperatures (engine not thoroughly warmed up)
- E—Driving in sandy areas
- F—Driving in salty areas
- G—More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)
- H—Driving on off-road

<1994 MODELS>

SCHEDULED MAINTENANCE SERVICE FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE

Inspection and service should be performed any time a malfunction is observed or suspected. Retain receipts for all vehicle emission services to protect your emission warranty.

No.	Emission Control System Maintenance	Service Intervals	Kilometers in Thousands	24	48	72	96	120	144	160	168	192
			Mileage in Thousands	15	30	45	60	75	90	100	105	120
1	Fuel System (Tank, Pipe Line and Connection, and Fuel Tank Filler Tube Cap)*	Check for Leaks Every 5 Years or					X					X
2	Fuel Hoses	Check Condition Every 2 Years or			X		X		X			X
3	Air Cleaner Element	Replace at			X		X		X			X
4	Positive Crankcase Ventilation System (PCV system*)	Clean at	Every 160,000 km (100,000 miles)									
5	Evaporative Emission Control System* (Except for Evaporative Emission Canister)	Check for Leaks and Clogging Every 5 Years or					X					X
6	Evaporative Emission Canister*	Replace at	Every 160,000 km (100,000 miles)									
7	Spark Plugs	Replace	Except Platinum Plugs at		X		X		X			X
			Platinum Plugs Only at				X					X
8	Ignition Cables*	Replace Every 5 Years or					X					X
9	EGR System* (Except 6G72 MFI Engine)	EGR Valve	Replace at	Every 160,000 km (100,000 miles)								
10	Distributor Cap and Rotor (Except 6G74 MFI Engine)	Check Every 5 Years or					X					X

NOTE

*: Except for California

GENERAL MAINTENANCE SERVICE FOR PROPER VEHICLE PERFORMANCE

No.	General Maintenance	Service Intervals	Kilometers in Thousands	24	48	72	96	120	144	160	168	192
			Mileage in Thousands	15	30	45	60	75	90	100	105	120
11	Timing Belt	Replace at					X*3					X*3
12	Drive Belt (for Generator)	Check Condition at			X		X		X			X
13	Engine Oil	Change Oil Every 12 Months or	Every 12,000 km (7,500 miles)									
14	Engine Oil Filter	Replace Every 12 Months or	X	X	X	X	X	X	X		X	X
15	Manual Transmission and Transfer Oil	Check Oil Level at		X		X		X				X
16	Automatic Transmission Fluid	Check Fluid Level Every 12 Months or	X	X	X	X	X	X			X	X
17	Automatic Transmission and Transfer Fluid	Change Fluid at		X		X		X				X
18	Engine Coolant	Change Coolant Every 2 Years or		X		X		X				X
19	Disc Brake Pads	Inspect for Wear Every 12 Months or	X	X	X	X	X	X			X	X
20	Brake Hoses	Check for Deterioration or Leaks Every 12 Months or	X	X	X	X	X	X			X	X
21	Ball Joint and Steering Linkage Seals	Inspect for Grease Leaks and Damage Every 2 Years or		X		X		X				X
22	Drive Shaft Boots	Inspect for Grease Leaks and Damage Every 12 Months or	X	X	X	X	X	X			X	X
23	Ball Joints With Grease Fitting	Lubricate with Grease Every 2 Years or		X		X		X			X	X
24	Front Axle and Rear Axle	With LSD*1		X		X		X			X	X
		Without LSD*1		X		X		X			X	X
25	Propeller Shaft Joints	Lubricate with Grease Every 2 Years or		X		X		X			X	X
26	Exhaust System Connection Portion of Muffler, Piping and Converter Heat Shields	Check and Service as Required Every 2 Years or		X		X		X			X	X
27	SRS*2 air bag	Inspect the SRS System at	10 years									

NOTE

*1: LSD: Limited-slip differential

*2: SRS: Supplemental Restraint System

*3: For California, this maintenance is recommended but not required

SCHEDULED MAINTENANCE UNDER SEVERE USAGE CONDITIONS

Maintenance should be carried out according to the following table:

No.	Maintenance Item	Service to be Performed	Mileage Intervals Kilometers in Thousands (Miles in Thousands)	Mileage Intervals				Severe Usage Conditions
				24 (15)	48 (30)	72 (45)	96 (60)	
3	Air Cleaner Element	Replace		More Frequently				A and E
4	Positive Crankcase Ventilation System	Check and Clean as Required		More Frequently				A
7	Spark Plugs	Replace at		X	X	X	X	B and D
13	Engine Oil	Change Every 6 Months or		Every 4,800 km (3,000 miles)				A, B, C, D and G
14	Engine Oil Filter	Replace Every 6 Months or		Every 9,600 km (6,000 miles)				A, B, C, D and G
15	Manual Transmission and Transfer Oil	Change Oil at			X		X	B, G and H
19	Disc Brake Pads	Inspect for Wear		More Frequently				A and F

Severe usage conditions

A—Driving in dusty conditions

B—Trailer towing, or police, taxi or commercial type operation

C—Extensive idling

D—Short-trip operation at freezing temperatures (engine not thoroughly warmed up)

E—Driving in sandy areas

F—Driving in salty areas

G—More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)

H—Driving on off-road

<VEHICLES BUILT FROM 1995 MODELS>

SCHEDULED MAINTENANCE SERVICE FOR EMISSION CONTROL AND PROPER VEHICLE PERFORMANCE

Inspection and service should be performed any time a malfunction is observed or suspected. Retain receipts for all vehicle emission services to protect your emission warranty.

No.	Emission Control System Maintenance	Service Intervals	Kilometers in Thousands	24	48	72	96	120	144	160	168	192
			Mileage in Thousands	15	30	45	60	75	90	100	105	120
1	Fuel System (Tank, Pipe Line and Connection, and Fuel Tank Filler Tube Cap)	Check for Leaks Every 5 Years or					X					X
2	Fuel Hoses	Check Condition Every 2 Years or		X			X		X			X
3	Air Cleaner Element	Replace at		X			X		X			X
4	Positive Crankcase Ventilation System (PCV system)*	Clean at	Every 160,000 km (100,000 miles)									
5	Evaporative Emission Control System* (Except for Evaporative Emission Canister)	Check for Leaks and Clogging Every 5 Years or					X					X
6	Evaporative Emission Canister*	Replace at	Every 160,000 km (100,000 miles)									
7	Spark Plugs	Replace	Except Platinum Plugs at		X		X		X			X
			Platinum Plugs Only at				X					X
8	Ignition Cables*	Replace Every 5 Years or					X					X
9	EGR System* (Except 6G72 MFI Engine)	EGR Valve	Replace at	Every 160,000 km (100,000 miles)								
10	Distributor Cap and Rotor (6G72-12 VALVE Engine)	Check Every 5 Years or					X					X

NOTE

*: Except for California

GENERAL MAINTENANCE SERVICE FOR PROPER VEHICLE PERFORMANCE

No.	General Maintenance		Service Intervals	Kilometers in Thousands	24	48	72	96	120	144	160	168	192
				Mileage in Thousands	15	30	45	60	75	90	100	105	120
11	Timing Belt		Replace at					X*3			X*4		X*3
12	Drive Belt (for Generator, Water Pump, Power Steering Pump)		Check Condition at			X		X		X			X
13	Engine Oil		Change Oil Every 12 Months or	Every 12,000 km (7,500 miles)									
14	Engine Oil Filter		Replace Every 12 Months or*5	X	X	X	X	X	X	X		X	X
15	Manual Transmission and Transfer Oil		Check Oil Level at		X		X		X				X
16	Automatic Transmission Fluid		Check Fluid Level Every 12 Months or	X	X	X	X	X	X	X		X	X
17	Automatic Transmission and Transfer Fluid		Change Fluid at		X		X		X				X
18	Engine Coolant		Change Coolant Every 2 Years or		X		X		X				X
19	Disc Brake Pads		Inspect for Wear Every 12 Months or	X	X	X	X	X	X	X		X	X
20	Brake Hoses		Check for Deterioration or Leaks Every 12 Months or	X	X	X	X	X	X	X		X	X
21	Ball Joint and Steering Linkage Seals		Inspect for Grease Leaks and Damage Every 2 Years or		X		X		X				X
22	Drive Shaft Boots		Inspect for Grease Leaks and Damage Every 12 Months or	X	X	X	X	X	X	X		X	X
23	Ball Joints With Grease Fitting		Lubricate with Grease Every 2 Years or		X		X		X			X	X
24	Front Axle and Rear Axle	With LSD*1	Change Oil at		X		X		X			X	X
		Without LSD*1	Inspect Oil Level at		X		X		X			X	X
25	Propeller Shaft Joints		Lubricate with Grease Every 2 Years or		X		X		X			X	X
26	Exhaust System Connection Portion of Muffler, Piping and Converter Heat Shields		Check and Service as Re- quired Every 2 Years or		X		X		X			X	X
27	SRS*2 air bag		Inspect the SRS System at	10 years									

NOTE

*1: LSD: Limited-slip differential

*2: SRS: Supplemental Restraint System

*3: For California; this maintenance is recommended but not required

*4: Not required if belt was previously changed

*5: If the mileage is less than 12,000 km (7,500 miles) each year, the oil filter should be replaced at every oil change

SCHEDULED MAINTENANCE UNDER SEVERE USAGE CONDITIONS

Maintenance should be carried out according to the following table:

No.	Maintenance Item	Service to be Performed	Mileage Intervals Kilometers in Thousands (Miles in Thousands)	24 (15)	48 (30)	72 (45)	96 (60)	Severe Usage Conditions
3	Air Cleaner Element	Replace at		X	X	X	X	A and E
4	Positive Crankcase Ventilation System	Check and Clean as Required at					X	A
7	Spark Plugs	Replace at		X	X	X	X	B and D
13	Engine Oil	Change Every 3 Months or		Every 4,800 km (3,000 miles)				A, B, C, D and G
14	Engine Oil Filter	Replace Every 6 Months or		Every 9,600 km (6,000 miles)				A, B, C, D and G
15	Manual Transmission and Transfer Oil	Change Oil at			X		X	B, G and H
19	Disc Brake Pads	Inspect for Wear at		Every 9,600 km (6,000 miles) or 6 months				A and F

Severe usage conditions

A–Driving in dusty conditions

B–Trailer towing, or police, taxi or commercial type operation

C–Extensive idling

D–Short-trip operation at freezing temperatures (engine not thoroughly warmed up)

E–Driving in sandy areas

F–Driving in salty areas

G–More than 50% operation in heavy city traffic during hot weather above 32°C (90°F)

H–Driving on off-road

MAINTENANCE SERVICE

1. FUEL SYSTEM (Check for leaks)

110005059

TANK, PIPE LINE AND CONNECTIONS, AND FUEL TANK FILLER TUBE CAP

1. Check for damage or leakage in the fuel lines and connections.
2. Inspect the surface of fuel hoses for heat and mechanical damage. Hard and brittle rubber, cracking, checking, tears, cuts, abrasions and excessive swelling indicate deterioration of the rubber.
3. If the fabric casing of the rubber hose is exposed by cracks and abrasions in the fuel system, the hoses should be changed.

2. FUEL HOSES (Check)

110005060

Make sure that the hoses do not come in contact with any heat source or moving component which might cause heat damage or mechanical wear.

3. AIR CLEANER ELEMENT (Replace)

110005061

The air cleaner element will become dirty and loaded with dust during use, and the filtering effect will be substantially reduced. Replace it with a new one.

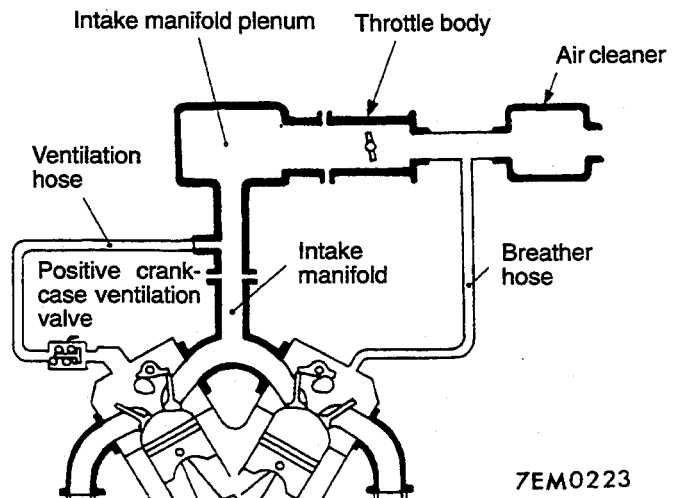
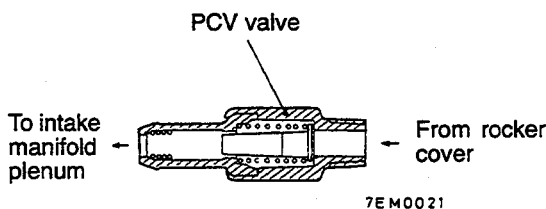
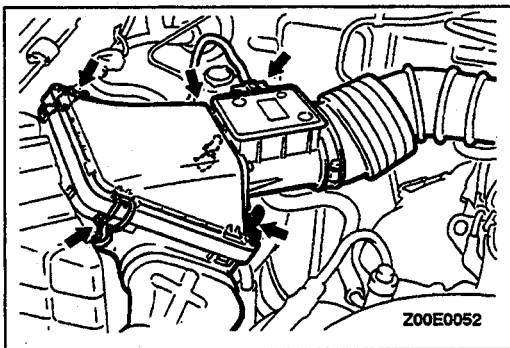
REPLACEMENT OF AIR CLEANER ELEMENT

1. Loosen the clamp coupling the air intake hose and the air cleaner cover, and separate the air intake hose
2. Disconnect the volume air flow sensor connector.
3. Disconnect the air cleaner cover clips.
4. Remove the air cleaner cover and replace the air cleaner element with a new one.
5. Clamp the clips and coupling, and then connect the volume air flow sensor connector.

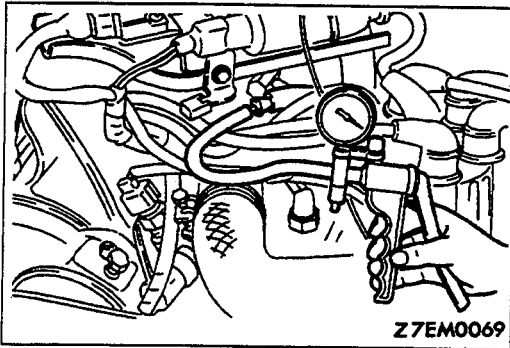
4. POSITIVE CRANKCASE VENTILATION SYSTEM (Positive crankcase ventilation valve) (Clean)

110005062

The crankcase ventilation system must be kept clean to maintain good engine performance.



00002307



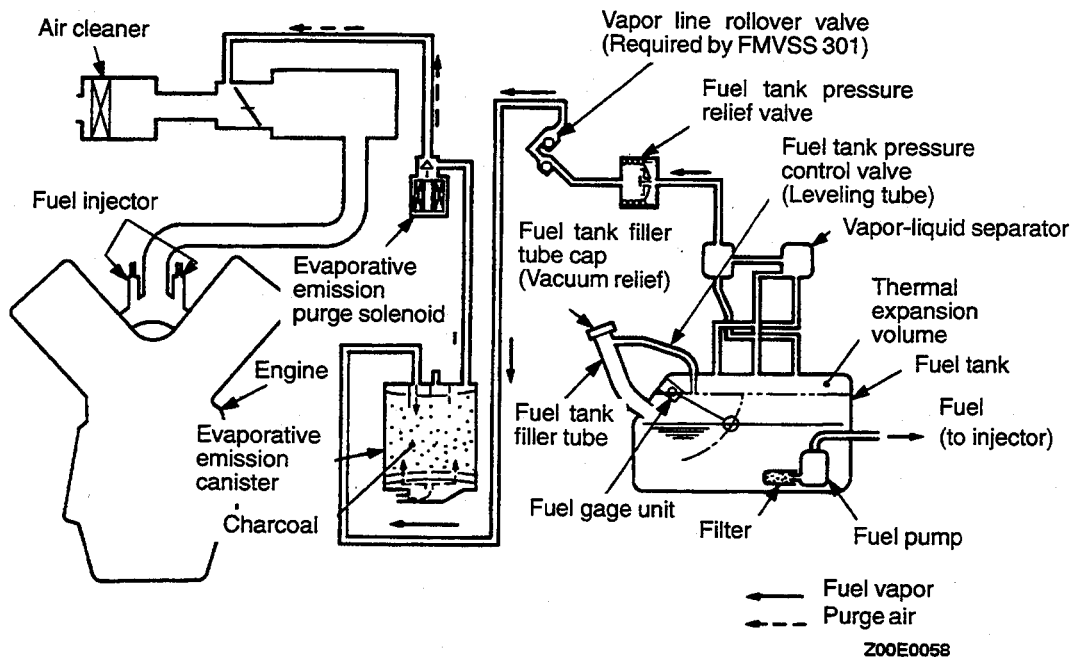
1. Disconnect the ventilation hose from the intake manifold plenum, and connect a hand vacuum pump to the ventilation hose.
2. At this time, make sure that there is leakage when negative pressure is applied. If there is no leakage when negative pressure is applied, either clean the positive crankcase ventilation valve or replace it.
3. After completion of the work, set the reset switch (at the rear of the meter to switch off the "maintenance-required" warning light. (Refer to GROUP 54 – Meters and Gages.)

5. EVAPORATIVE EMISSION CONTROL SYSTEM (Check for leaks and clogging) – Except evaporative emission canister

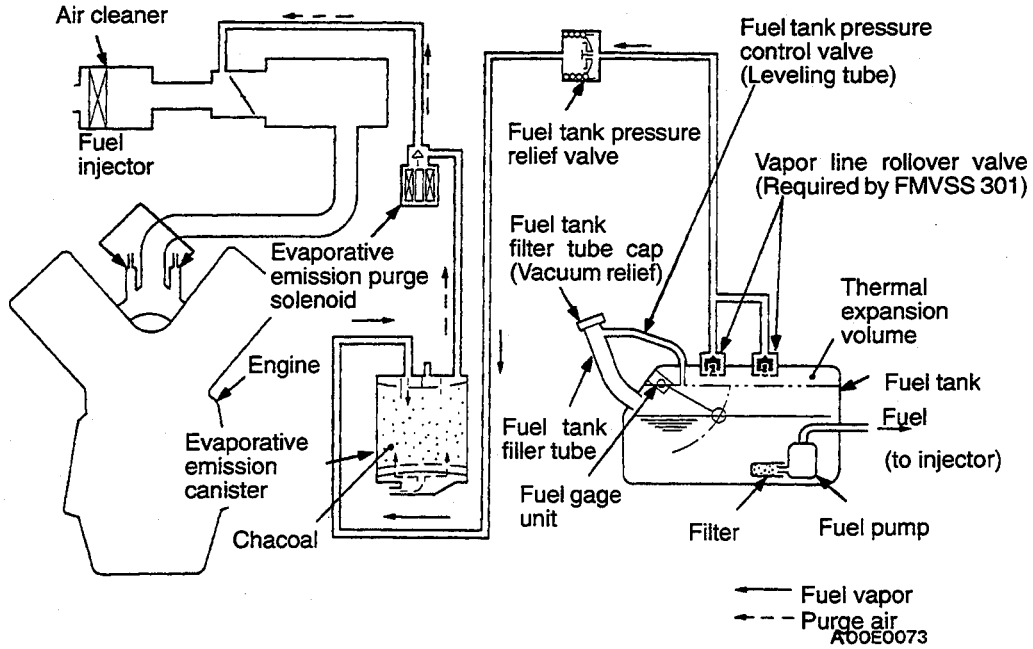
110005063

1. If the fuel-vapor vent line is clogged or damaged, the fuel vapor mixture will escape into the atmosphere causing excessive emissions. Disconnect the line at both ends, and blow it clean with compressed air. Remove the fuel tank filler tube cap from the filler tube and check to see if there is evidence that the packing makes improper contact to the filler pipe.
2. The fuel tank pressure relief valve installed on the vapor line should be checked for correct operation.

<Vehicles built up to 1994>



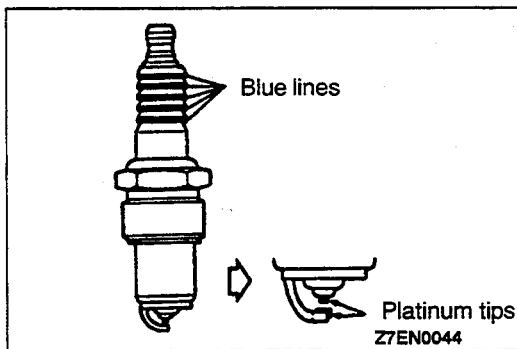
<Vehicles built from 1995>



6. EVAPORATIVE EMISSION CANISTER (Replace)

110005064

If or when the evaporative emission canister filter becomes clogged, the purge air volume will decrease and consequently, the evaporative emission canister capacity will be reduced. After completion of the work, set the reset switch (at the rear of the meter) to switch OFF the "maintenance-required" warning light. (Refer to GROUP 54 – Meters and Gages.)



7. SPARK PLUGS (Replace)

110005065

The spark plugs must fire properly to assure proper engine performance and emission control. Therefore, they should be replaced periodically with new ones.

Spark plug

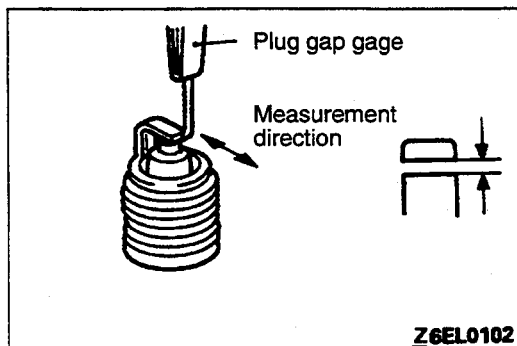
Maker	3.0L-12 VALVE engine	3.0L-24 VALVE engine, 3.5L engine
NGK	BPR5ES-11	PFR6J-11
NIPPON DENSO	W16EPR-11	PK20PR-P11
CHAMPION	RN11YC4	-

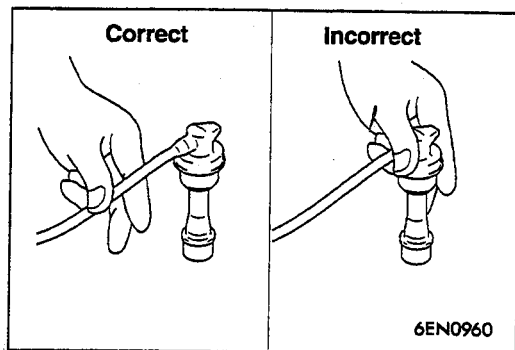
Spark plug gap: 1.0–1.1 mm (.039–.043 in.)

NOTE

Use care not to damage the platinum tips of the platinum plug. Don't adjust the gap either.

Specified torque: 25 Nm (15 ft.lbs.)



**8. IGNITION CABLES (Replace)**

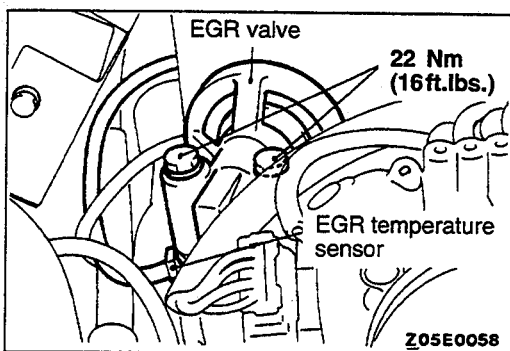
110005066

The ignition cables should be replaced periodically with new ones.

After replacing, make sure that the ignition cables and terminals are properly connected and fully seated.

NOTE

When disconnecting an ignition cable, be sure to hold the cable cap. If the cable is disconnected by pulling on the cable alone, an open circuit might result.

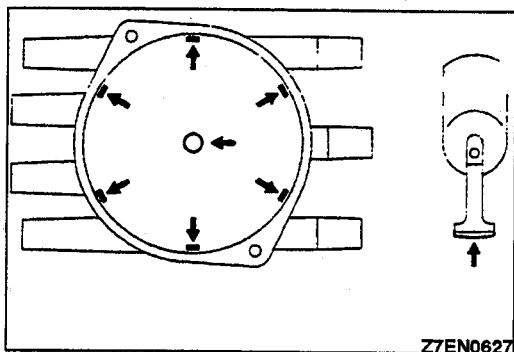
**9. EGR VALVE (Replace)**

110005067

Replace the EGR valve with a new one.

EGR VALVE REMOVAL

1. Disconnect the vacuum hoses from the EGR valve.
2. Remove the EGR valve and from the intake manifold plenum.
3. Install the EGR valve and new gasket to the intake manifold and tighten to the specified torque.
4. After completion of the work, set the reset switch (at the rear of the meter) to switch OFF the "maintenance-required" warning light.
(Refer to GROUP 54 – Meters and Gages.)

**10. DISTRIBUTOR CAP AND ROTOR (Check)**

110005068

Check the distributor cap and rotor to maintain driveability and good exhaust gas.

DISTRIBUTOR CAP AND ROTOR INSPECTION

Inspect by the following procedure, and repair or replace as necessary.

- Check the cap for cracks.
- Check the cap and rotor electrodes for damage.
- Wipe clean the cap and rotor.

11. TIMING BELT (Replace)

110005069

Replace the belt with a new one periodically to assure proper engine performance.

For removal and installation procedures, refer to GROUP 11 – Timing belt.

For inspection procedures, refer the Engine Overhaul Manual for the appropriate engine.

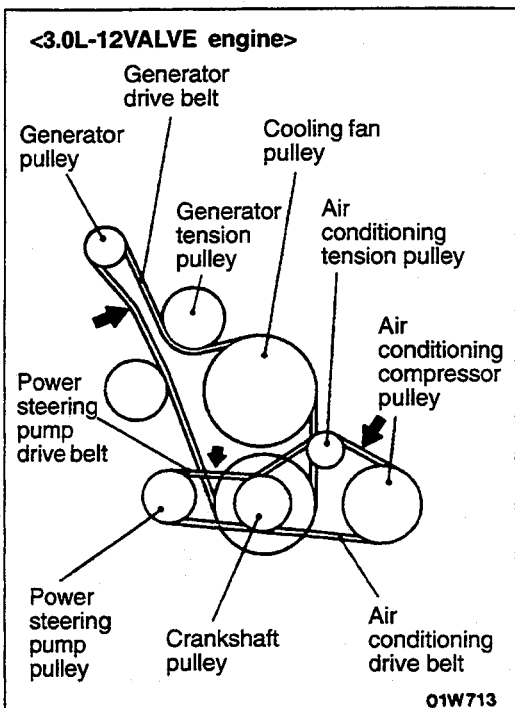
12. DRIVE BELTS (Check condition)

Check the tension of the drive belts. Inspect the belts for evidence of cuts and cracks, and replace it if defective. The deflection of the belts must be as shown in the illustration when depressed at a point midway between each of the pulleys with a force of 98 N (22 lbs.)

<3.0L-12VALVE engine>

Standard value:

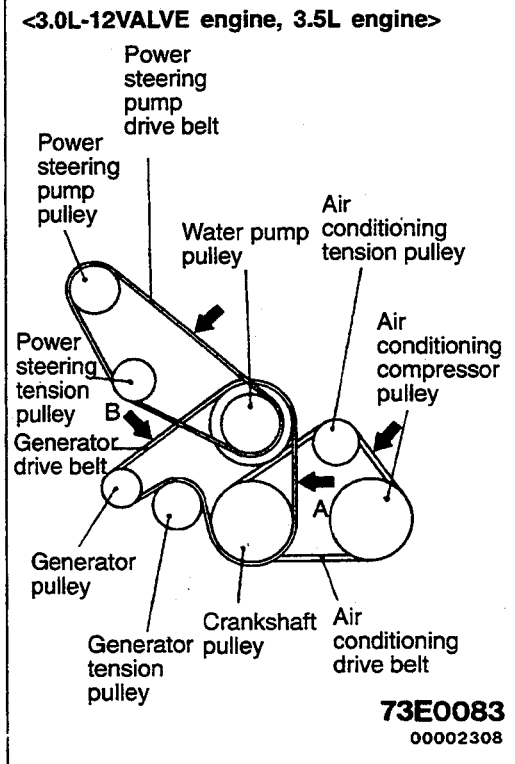
Item	Check value mm (in.)
For generator	8.0–10.0 (.32–.40)
For power steering	9.0–14.5 (.35–.57)
For air conditioning	6.5–7.5 (.26–.30)



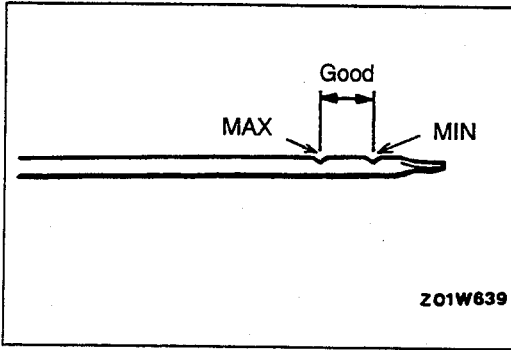
<3.0L-24VALVE engine, 3.5L engine>

Standard value:

Item	Check value mm (in.)	
	3.0L-24VALVE engine	3.5L engine
For generator	A	5.0–7.0 (.20–.28)
	B	8.5–10.5 (.33–.41)
For power steering		10.5–14.5 (.41–.57)
For air conditioning		6.5–7.5 (.26–.30)



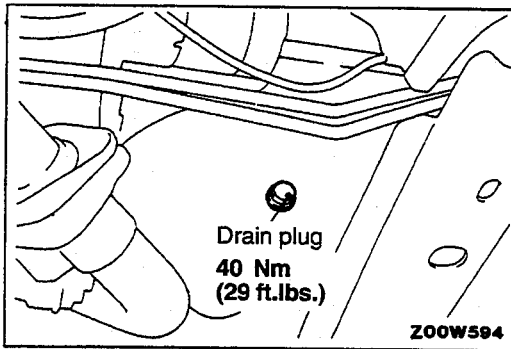
- A: Measure between the water pump pulley and the crankshaft pulley.
- B: Measure between the water pump pulley and the generator.



13. ENGINE OIL (Inspect oil Level)

110005071

1. Check that the engine oil level is within the range indicated on the oil level gage.
2. Make sure that the engine oil is clean and free from coolant or gasoline, and that it has an appropriate viscosity grade.

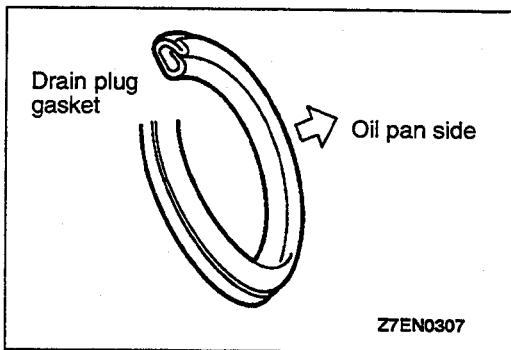


(Change)

Always use lubricants which conform to the requirements of the API classification "For Service SG EC II" or "For Service SG/CD EC II" when available, and have the proper SAE grade number for the expected temperature range.

Never use nondetergent or straight mineral oil.

1. After warming up the engine, remove the oil filler cap.
2. Remove the drain plug to allow the engine oil to drain.



3. Replace the drain plug gasket with a new one, and then tighten the drain plug to the specified torque.

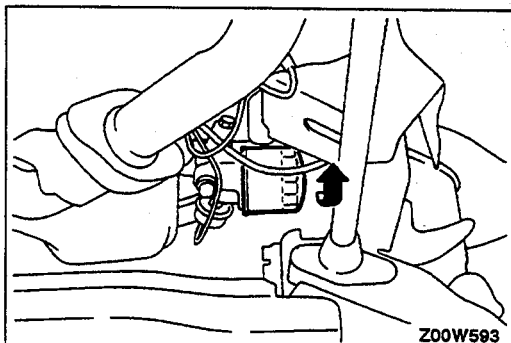
NOTE

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

4. Pour new engine oil in through the oil filler.

Engine oil capacity: 4.3 dm³ (4.5 qts.)
[excluding oil filter 0.3 dm³ (1/2 qt.) and oil cooler 0.3dm³ (1/2 qt.)]

5. Start the engine and run it at idle for a few minutes.
6. Stop the engine and check to ensure that the engine oil level is within the level range indicated on the dip stick.



14. ENGINE OIL FILTER (Change)

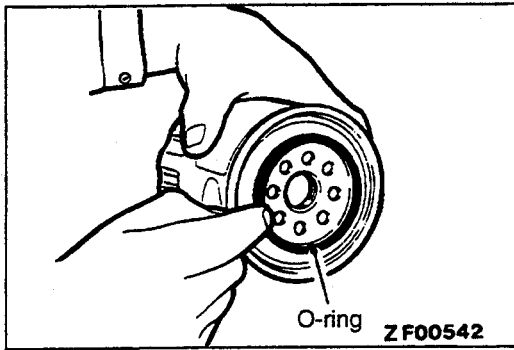
110005072

The quality of replacement filters varies considerably. Only high quality filters should be used to assure most efficient service.

Genuine oil filters require that the filter is capable of withstanding a pressure of 256 psi are high quality filters and are recommended as follows:

Oil Filter Part Number

Mitsubishi Genuine Parts: MD136790 or equivalent

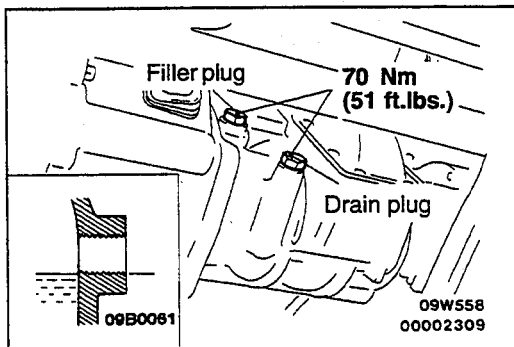


ENGINE OIL FILTER SELECTION

This vehicle is equipped with a full-flow, throw-away oil filter. The same type of filter is recommended as a replacement filter for this vehicle. It is possible, particularly in cold weather, that this vehicle may develop high oil pressure for a short duration. You should make sure that any replacement filter used on this vehicle is a high-quality filter and is capable of withstanding a pressure of 1,765 kPa (256 psi) [manufacturer's specifications] to avoid filter and engine damage. The following is a high-quality filter and is strongly recommended for use on this vehicle : Mitsubishi Engine Oil Filter P/N MD136790.

Any replacement oil filter should be installed in accordance with the oil filter manufacturer's installation instructions.

1. Remove the under cover.
2. Drain the engine oil by removing the oil drain plug.
3. Use an oil filter wrench to remove the engine oil filter.
4. Clean the surface of the filter bracket attachment.
5. Lubricate the O-ring of the new oil filter with a small amount of engine oil.
6. Screw on the oil filter by hand, and after the O-ring contacts the flange surface, tighten it another 3/4 turns with a filter wrench, etc. [approx. 14 Nm (10 ft.lbs.)].
7. Add new engine oil through the oil filler.
8. Race the engine two or three times to make sure that no engine oil leaks from the oil filter seal.
9. After stopping the engine, check the oil level and refill if necessary.



15. MANUAL TRANSMISSION (Check oil level)

110005073

Inspect each component for evidence of leakage, and check the oil level by remaining the filler plug. If the oil is contaminated, replace it with new oil.

INSPECTION

- With the vehicle on a level surface, remove the filler plug and check whether or not the oil is at the same level as the bottom of the threads.
- Check if the transmission oil is excessively dirty and if the viscosity is normal.

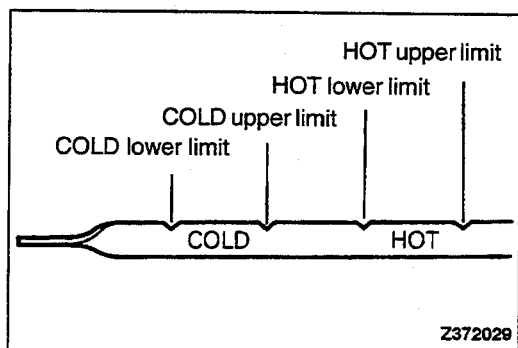
REPLACEMENT OF TRANSMISSION OIL

1. Remove the drain plug to allow the transmission fluid to drain.
2. Replace the drain plug gasket with a new one, and then tighten the drain plug.
3. Apply a coating of sealant to the threaded part when installing the drain plug and the filler plug of the transmission.

Specified sealant: Three Bond 1105D or equivalent

4. Fill with new oil through the filler plug until the oil level reaches the plug hole.

Manual transmission oil capacity: 2.5 dm³ (2.4 qts.)

**16. AUTOMATIC TRANSMISSION (Check the fluid level)**

110005074

Check the fluid level by removing the dipstick. If the fluid is contaminated, replace it with new fluid.

1. Place the vehicle on a level surface.
2. Wipe the area around the dipstick to remove accumulated dirt and then pull out the dipstick.
3. Move the selector lever to the "P" position and apply the parking brake, and then, start the engine.
4. Check that the engine idle speed and fluid operating temperature (50–80°C; 122–176°F) are normal.
5. Move the selector lever to each position in turn to fill the torque converter and hydraulic circuit with fluid. Then place the lever in the "N" position.
6. Check that the fluid level is in the "HOT" range of the dipstick. If the fluid level is low, add fluid until the level reaches the "HOT" range.

AUTOMATIC TRANSMISSION FLUID REPLACEMENT

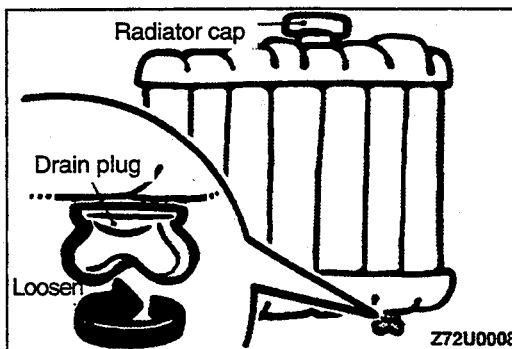
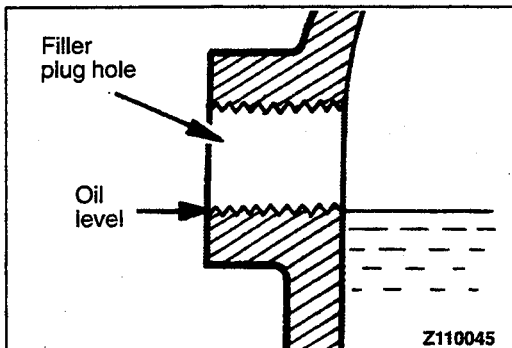
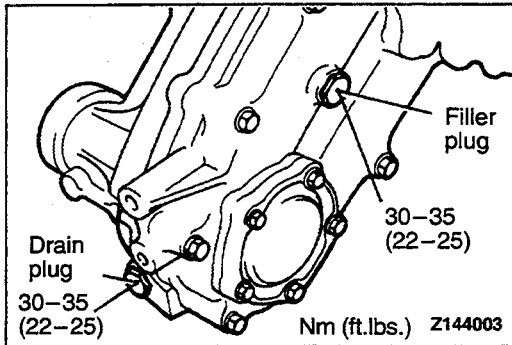
Drain the fluid and check whether there is any evidence of contamination.

Replenish with new fluid after the cause of any contamination has been corrected.

1. Place a large flat container beneath the drain plug.
2. Remove the drain plug to allow the transmission fluid to drain.
3. Replace the drain plug gasket with a new one, and then tighten the drain plug.
4. Pour 5 dm³ (10.6 pints) of specified ATF into case through dipstick hole. [Total quantity of ATF required is approx. 7 dm³ (14.8 pints). Actually however, approx. 5.5 dm³ (11.6 pints) of fluid can be replaced because rest of fluid remains in torque converter.]

Specified fluid: **DIAMOND ATF SP, ATF DEXRON II or equivalent**

5. Check the fluid level.



17. TRANSFER (Change oil)

110005075

Drain the fluid and check whether there is any evidence of contamination. Replenish with new fluid after the cause of any contamination has been corrected.

1. With the vehicle on a flat, level surface, drain out the transfer oil.
2. Replace the packing with a new one, and then close the drain plug.
3. Pour new transfer oil in through the filler plug until it reaches the same level as the plug hole.

Total transfer oil capacity:

<V5MT1, V4AW2>	2.3 dm ³ (2.4 qts)
<V4AW3>	2.5 dm ³ (2.6 qts)

18. ENGINE COOLANT

110005076

Check the cooling system parts such as the radiator, heater and oil cooler hoses, thermostat and the connections for leakage and damage.

CHANGING COOLANT

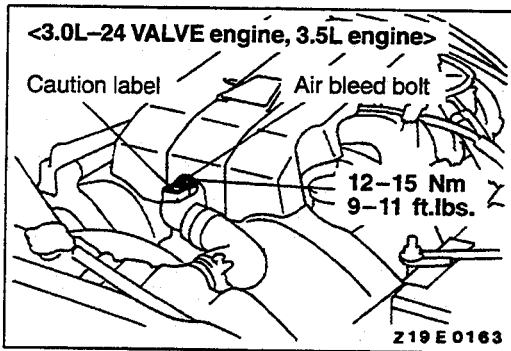
1. Set the temperature control lever to the HOT position.
2. Remove the radiator cap, radiator drain plug and engine drain plug to drain the coolant.

Caution

When removing the radiator cap, use care to avoid contact with hot coolant or steam. Place a shop towel over the cap and turn the cap counterclockwise a little to let the pressure escape through the vinyl tube. After relieving the steam pressure, remove the cap by slowly turning it counterclockwise.

3. Remove the reserve tank and drain the coolant.
4. After completely draining the coolant, reinstall the drain plugs and flush the engine and radiator using a radiator cleaning fluid.

5. After the flushing is completed, completely drain the cleaning fluid and install the radiator and engine drain plugs.
6. Loosen the air bleed bolt. <3.0L–24 VALVE engine, 3.5L engine>
7. By referring to the section on coolant (P.00-44), select an appropriate concentration for safe operating temperature within the range of 30 to 60%. Refill the system with a high quality ethylene glycol antifreeze at the selected concentration. A convenient mixture is a 50% water and 50% antifreeze solution [freezing point: -30°C (-32.8°F)]. (Pour in coolant until it overflows from the air bleed bolt hole, and then tighten the air bleed bolt. <3.0L–24 VALVE engine, 3.5L engine>)



Engine coolant total capacity

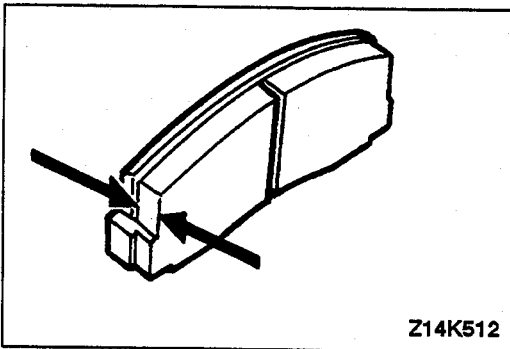
(including heater and coolant reserve tank)

9.5 dm³ (10.0 qts.)

8. Reinstall the radiator cap.
9. Start the engine and let it warm up until the thermostat opens.
10. After repeatedly racing the engine up to 3,000 rpm several times, stop the engine.
11. Remove the radiator cap after the engine has become cold, and pour in coolant up to the entrance for water supplying.
12. Add coolant to the reserve tank between the “FULL” and “LOW” mark if necessary.

Caution

Do not overfill the reserve tank.



19.DISC BRAKE PADS (Inspect for wear) 110005077

Check for fluid contamination and wear. Replace the complete set of pads if defective.

Thickness of lining

Limit: 2.0 mm (.79 in.)

Caution

The pads for the right and left wheels should be replaced at the same time. Never split or intermix brake pad sets. All four pads must be replaced as a complete set.

20. BRAKE HOSES (Check for deterioration or leaks)

110005078

Inspection of brake hoses and tubing should be included in all brake service operations.

The hoses should be checked for:

1. Correct length, severe surface cracking, pulling, scuffing or worn spots. (If the fabric casing of the hoses is exposed by cracks or abrasion in the rubber hose cover, the hoses should be replaced. Eventual deterioration of the hose and possible bursting failure may occur.)
2. Incorrect installation, casing twisting or interference with wheel, tire or chassis.

21. BALL JOINT AND STEERING LINKAGE SEALS (Inspect for grease leaks and damage)

110005079

1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the dust cover and boots for proper sealing, leakage and damage, and replace them if defective.

22. DRIVE SHAFT BOOTS (Inspect for grease leaks and damage)

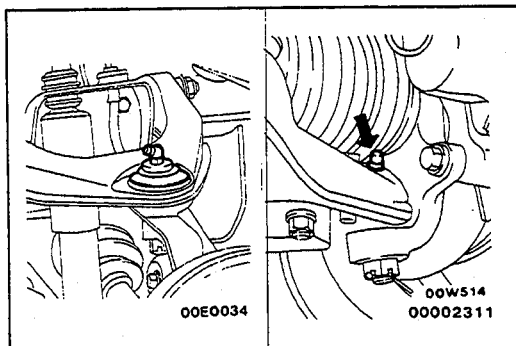
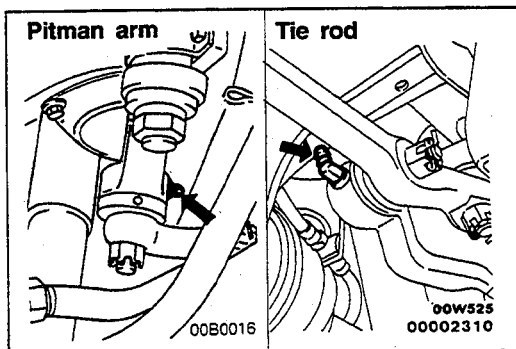
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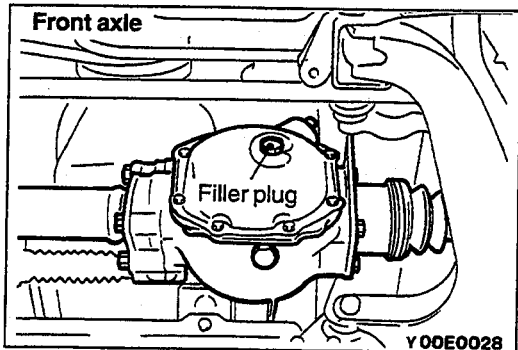
1. These components, which are permanently lubricated at the factory, do not require periodic lubrication. Damaged seals and boots should be replaced to prevent leakage or contamination of the grease.
2. Inspect the dust cover and boots for proper sealing, leakage and damage, and replace them if defective.

23. BALL JOINTS WITH GREASE FITTING (Lubricate with grease)

110005081

Fill with multipurpose grease at the grease fitting till the grease come out of the dust seal of the pitman arm, tie rod, lower control arm and upper control arm.

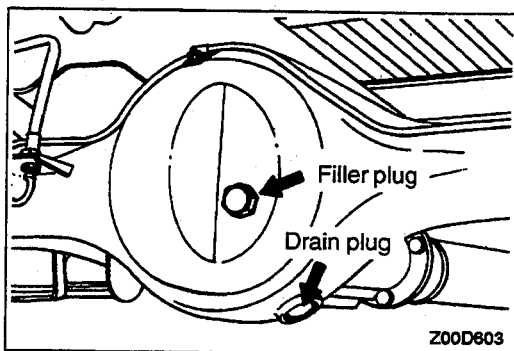
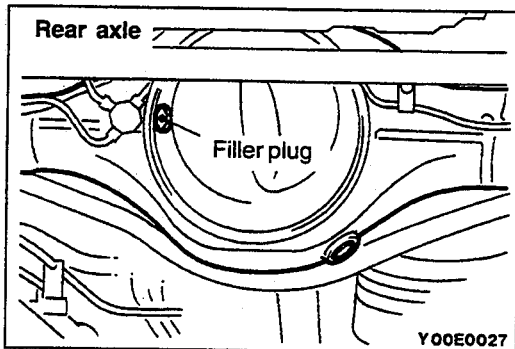




**24. FRONT AXLE AND REAR AXLE
(CONVENTIONAL DIFFERENTIAL)(Inspect oil level)**

110005082

Remove the filler plug and inspect the oil level at the bottom of the filler hole. If the oil level is slightly below the filler hole, the condition is satisfactory.

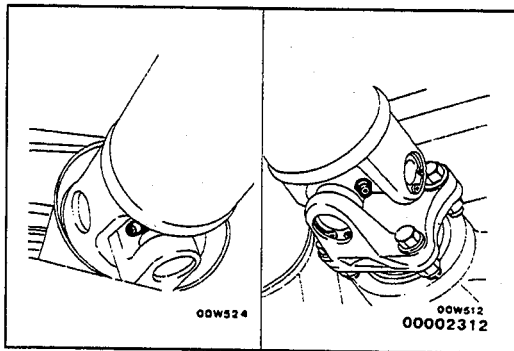


24. REAR AXLE OIL (LIMITED-SLIP DIFFERENTIAL)(Change)

110005083

Before changing the rear axle oil, check that there is no oil leakage from the rear axle housing. Remove the drain plug and drain out the oil. Replace the oil plug, and then pour new oil in through the filler hole.

Oil capacity: 2.6 dm³ (2.6 qts.) 3.0L Engine
3.2 dm³ (3.3 qts.) 3.5L Engine



25. PROPELLER SHAFT JOINTS (Lubricate with grease)

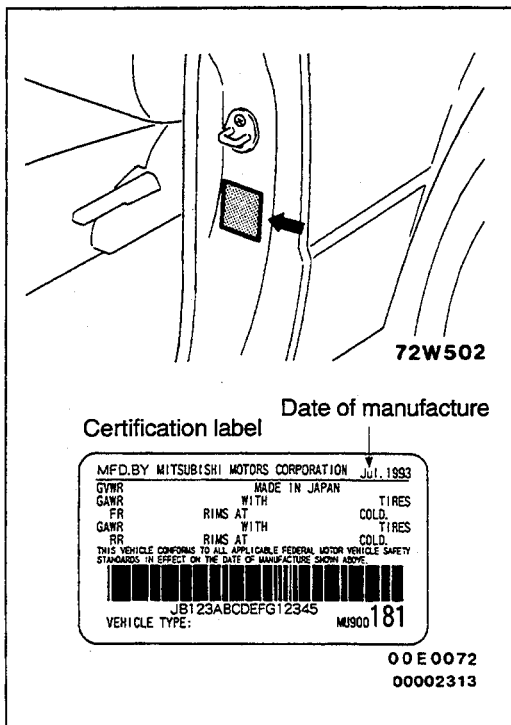
110005084

Lubricate the propeller shaft joints with grease. The propeller shaft joints should be repacked with multipurpose grease.

26. EXHAUST SYSTEM (CONNECTION PORTION OF MUFFLER, PIPINGS AND CONVERTER HEAT SHIELDS)(Check and service as required)

110005085

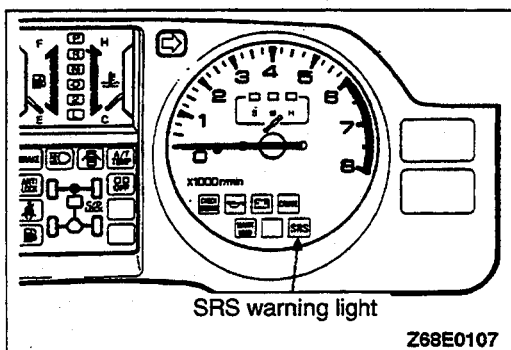
1. Check for holes and gas leaks due to damage, corrosion, etc.
2. Check the joints and connections for looseness and gas leaks.
3. Check the hanger rubber and brackets for damage.



27. SRS MAINTENANCE (SRS component check: damage, function, connection to wiring harness, etc.)

110005086

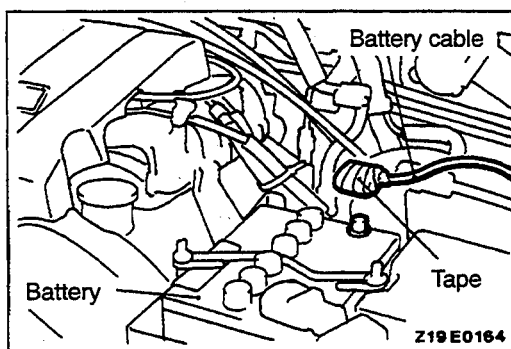
The SRS must be inspected by an authorized dealer 10 years after the car manufacture date shown on the certification label located on the left center pillar.



SRS WARNING LIGHT CHECK

Turn the ignition key to the ON position. Does the SRS warning light illuminate for about 7 seconds and turn OFF?

If yes, the SRS system is functioning properly. If not, refer to GROUP 52B – Troubleshooting.



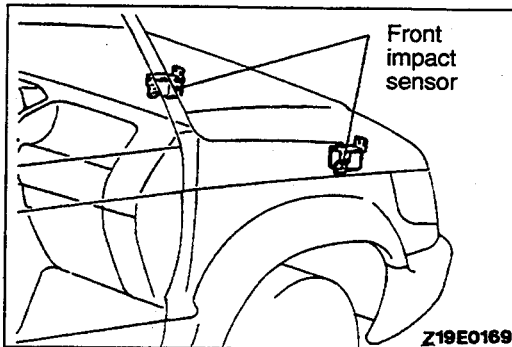
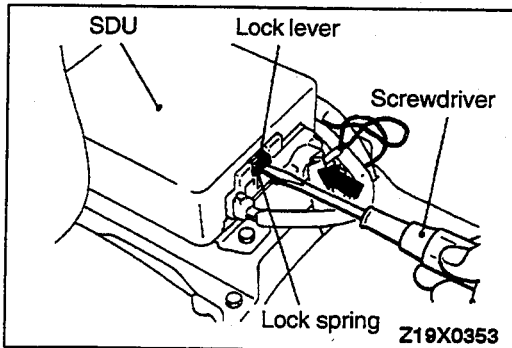
SRS COMPONENT VISUAL CHECK

1. 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. 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 cable is disconnected.

2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)



3. Place a flat-tipped (–) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion.)

4. Disconnect the red 14-pin connector from the SRS diagnosis unit while pressing down the lock of the connector.

FRONT IMPACT SENSORS

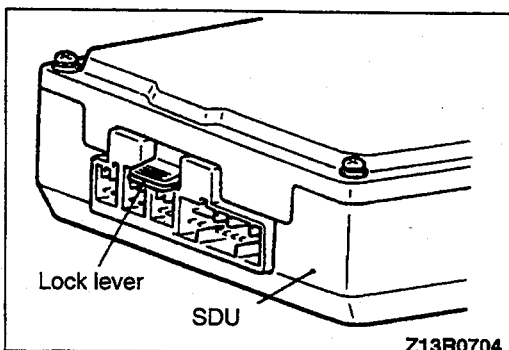
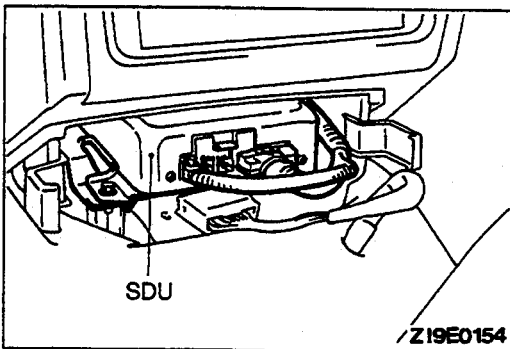
1. Check that the arrows on the sensors face toward the front of the vehicle.
2. Check the radiator support panel and front impact sensor for deformation or rust.

Caution

The SRS may not activate if a front impact sensor is not installed properly, which could result in serious injury or death to the vehicle's driver.

3. Check the wiring front impact sensor harness for binds, connector for damage, and check the terminals for deformation.

Replace sensor and/or wiring harness if they fail the visual check. (Refer to GROUP 52B – SRS Service Precautions and Front Impact Sensor.)

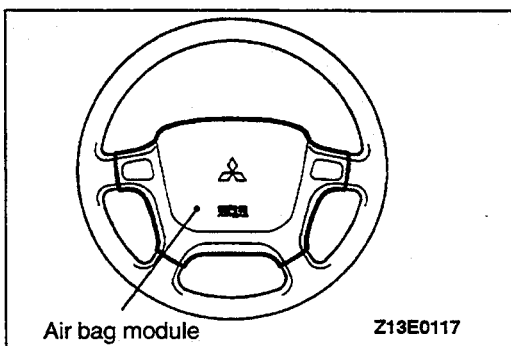
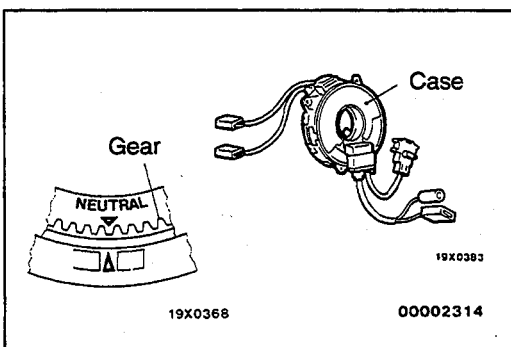
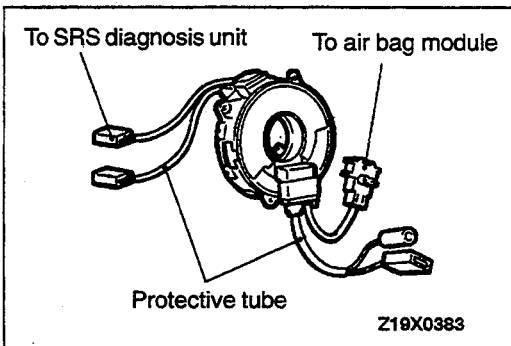
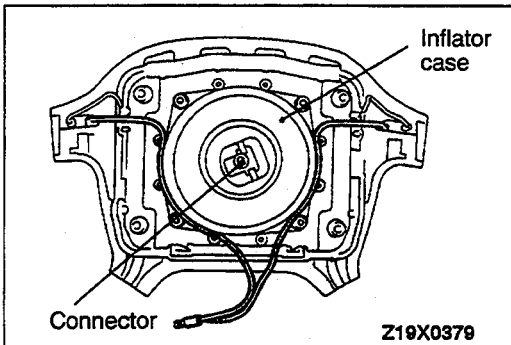
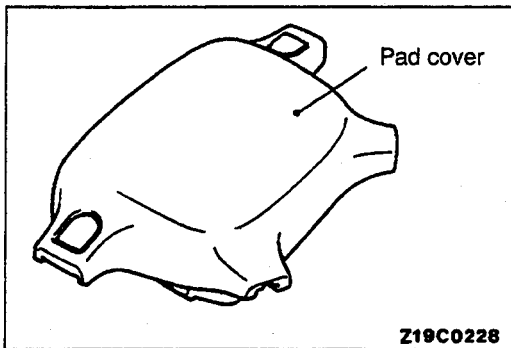
**SRS DIAGNOSIS UNIT (SDU)**

1. Check the SDU case and brackets for dents, cracks, deformation or rust.

Caution

The SRS may not activate if a SRS diagnosis unit (with built-in safing impact sensor) is not installed properly, which could result in serious injury or death to the vehicle's driver.

2. Check the connectors and lock lever for damage, and check the terminals for deformation or rust. Replace the SDU if it fails the visual check. (Refer to GROUP 52B – SRS Diagnosis Unit.)



AIR BAG MODULE, STEERING WHEEL AND CLOCK SPRING

1. Remove the air bag module, steering wheel and clock spring.
(Refer to GROUP 52B – Air Bag Module and Clock Spring.)

Caution

The removed air bag module should be stored in a clean, dry place with the pad cover face up.

2. Check the pad cover for dents, cracks or deformation.
3. Check the connector for damage and deformed terminals, and check the harness for binds.
4. Check the air bag inflator case for dents, cracks or deformation.
5. Check the harness which is built into the steering wheel and connectors for damage, and check the terminals for deformation.
6. Check the clock spring connectors and protective tube for damage, and check the terminals for deformation.

7. Visually check the clock spring case and the gears for damage.
8. Align the mating mark and the N position indicator and, after turning the vehicle's front wheels to the straight-ahead position, install the clock spring to the column switch.

Caution

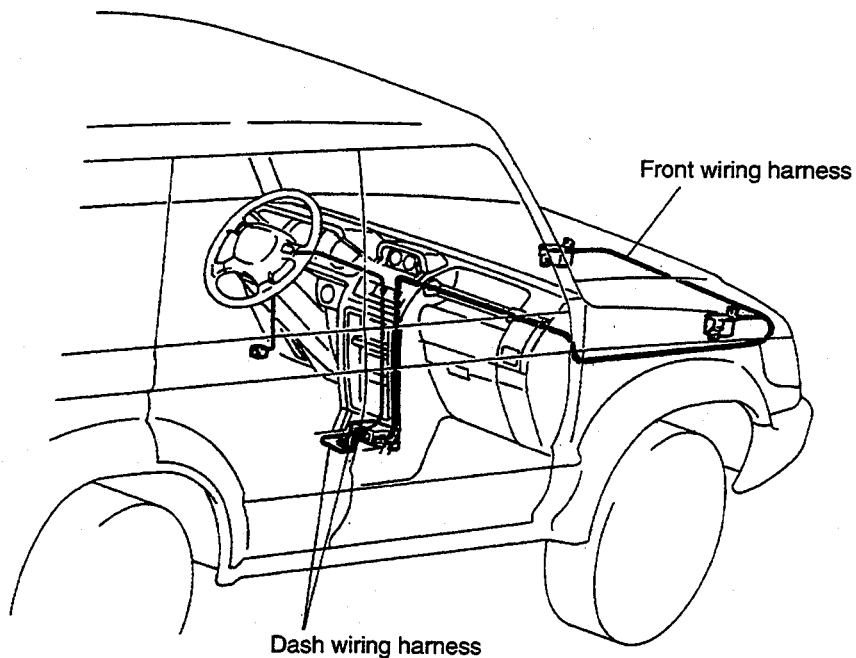
If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver and passenger.

9. Install the steering column covers, steering wheel and air bag module.
10. Check the steering wheel for noise, binds or difficult operation.
11. Check the steering wheel for excessive free play.
REPLACE ANY VISUALLY INSPECTED PART IF IT FAILS THAT INSPECTION.
(Refer to GROUP 52B – Air Bag Module and Clock Spring.)

Caution

The SRS may not activate if any of the above components are not installed properly, which could result in serious injury or death to the vehicle's driver.

WIRING HARNESS



Z19E0174

1. Check the connector for poor connection.
2. Check the harness for binds check the connectors for damage, and check the terminals for deformation.
REPLACE ANY CONNECTORS OR HARNESS THAT FAIL THE VISUAL INSPECTION.
(Refer to GROUP 52B – SRS Service Precautions.)

Caution

The SRS may not activate if SRS harnesses or connectors are damaged or improperly connected, which could result in serious injury or death to the vehicle's driver.

MAIN SEALANT AND ADHESIVE TABLE**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 (except 4G1 and 6G7 engines)	
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

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, Fender panel, Splash shield, Mud guard, Rear combination light	3M ATD Part No. 8625 or equivalent

ADHESIVES FOR INTERIOR TRIM

APPLICATION	Recommended brand
Adhesion of polyvinylchloride 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 ATD 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. 8531 or 3M ATD Part No. 8646 or equivalent
Sealing of tailgate hinges	

CHASSIS SEALANT

Application	Recommended brand
Sealing of flange surfaces and threaded portions	3M ATD Part No. 8659 or equivalent
Fuel gauge unit packing	
Sealing of flange surfaces, threaded portions, packing and dust cover <ul style="list-style-type: none"> ● Differential carrier packing ● Dust covers for ball 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.8155 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 <ul style="list-style-type: none"> ● 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	
Steering angle stopper bolt (jeep)	3M Nut locking Part No. 4171 or equivalent

UNDERCOAT

Application	Recommend brand
Undercoat	3M ATD Part No. 8864 or equivalent

NOTES

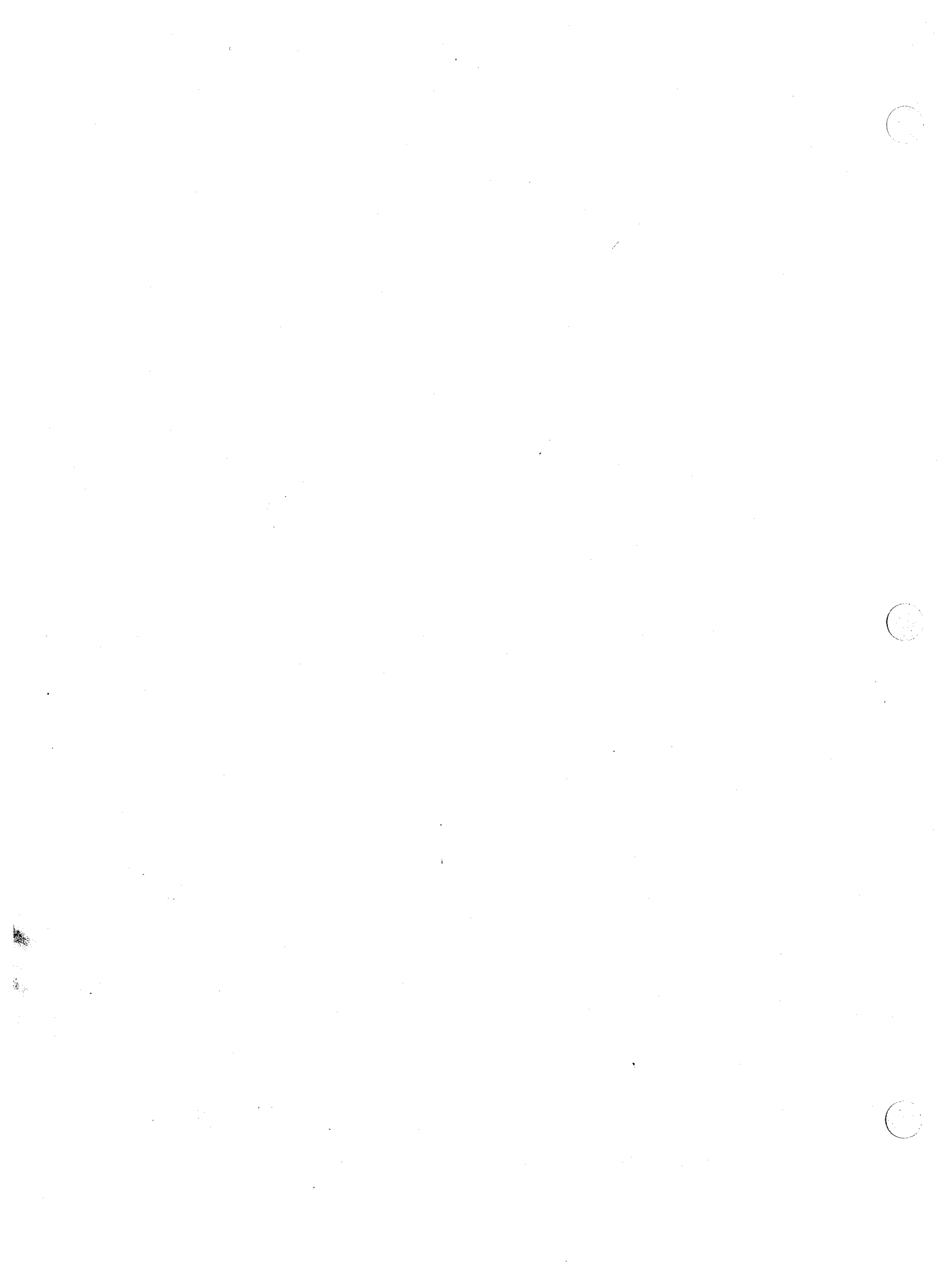
ENGINE

CONTENTS

110005664

3.0L ENGINE	11A
3.5L ENGINE	11B





3.0L ENGINE

CONTENTS

110005665

3.0L ENGINE <SOHC-12 VALVE>

CAM SHAFT OIL SEAL	16
CRANKSHAFT OIL SEALS	18
Front Oil Seal	18
Rear Oil Seal	19
CYLINDER HEAD GASKET	23
ENGINE ASSEMBLY	13
ENGINE OIL COOLER	30
GENERAL SPECIFICATIONS	2
OIL PAN AND OIL SCREEN	21
SEALANTS AND ADHESIVES	3
SERVICE ADJUSTMENT PROCEDURES ..	5
Basic Idle Speed Adjustment Refer to GROUP 13	
Compression Pressure Check	9
Curb Idle Speed Inspection	7
Drive Belt Tension Inspection and Adjustment	5
Idle Mixture Inspection	8
Ignition Timing Inspection and Adjustment ...	6
Lash Adjuster Check	11
Manifold Vacuum Inspection	10
Timing Belt Tension Adjustment	10
SERVICE SPECIFICATIONS	2
SPECIAL TOOLS	3
TIMING BELT	26
TROUBLESHOOTING	4

3.0L ENGINE <SOHC-24 VALVE>

CAMSHAFT OIL SEAL	46
CRANKSHAFT OIL SEALS	48
Front Oil Seal	48
Rear Oil Seal	49
CYLINDER HEAD GASKET	55
ENGINE ASSEMBLY	43
ENGINE OIL COOLER	63
GENERAL SPECIFICATIONS	31
OIL PAN AND OIL SCREEN	51
Oil Pan, Lower	51
Oil Pan, Upper and Oil Screen	53
SEALANT	32
SERVICE ADJUSTMENT PROCEDURES ..	35
Basic Idle Speed Adjustment Refer to GROUP 13	
Compression Pressure Check	40
Curb Idle Speed Inspection	37
Dashpot Inspection and Adjustment	39
Drive Belt Tension Inspection and Adjustment	35
Idle Mixture Inspection	38
Ignition Timing Inspection	36
Lash Adjuster Check	41
Manifold Vacuum Inspection	41
SERVICE SPECIFICATIONS	31
SPECIAL TOOLS	32
TIMING BELT	58
TROUBLESHOOTING	33

3.0L ENGINE <SOHC-12VALVE>

110005666

GENERAL SPECIFICATIONS

Items		Specifications	
Type		V-type, Over Head Camshaft	
Number of cylinders		6	
Bore mm (in.)		91.1 (3.587)	
Stroke mm (in.)		76.0 (2.992)	
Piston displacement cm ³ (cu. in.)		2,972 (181.4)	
Compression ratio		8.9	
Firing order		1-2-3-4-5-6	
Valve timing	Intake valve	Opens (BTDC)	19°
		Closes (ABDC)	59°
	Exhaust valve	Opens (BBDC)	59°
		Closes (ATDC)	19°
Valve overlap		38°	
Intake valve duration		258°	
Exhaust valve duration		258°	

SERVICE SPECIFICATIONS

110005667

Items		Standard value	Limit
Drive belt deflection mm (in.)	Generator V-ribbed type	When checked	8.0-10.0 (.32-.39)
		When new belt is installed	6.5-8.0 (.26-.32)
		When used belt is installed	9.0 (.35)
	Power steering pump	When checked	9.0-14.5 (.35-.57)
		When new belt is installed	8.0 (.32)
		When used belt is installed	10.0 (.39)
	A/C compressor	When checked	6.5-7.5 (.26-.29)
		When new belt is installed	5.0-6.0 (.20-.24)
		When used belt is installed	6.5-7.5 (.26-.29)
Drive belt tension N (lbs.)	Generator V-ribbed type	When checked	350-600 (79-132)
		When new belt is installed	500-700 (110-154)
		When used belt is installed	400 (88)
	A/C compressor	When checked	350-400 (77-88)
		When new belt is installed	500-600 (110-132)
		When used belt is installed	350-400 (77-88)
Timing belt tension N (lbs.)		200-300 (44.1-66.1)	-
Basic ignition timing at idle		5° ±2° BTDC	-
Actual ignition timing at curb idle		15° BTDC	-
CO concentration %		0.5 or less	-
HC concentration PPM		100 or less	-
Curb idle speed rpm		700±100	-
Compression pressure (250-400 rpm) kPa (psi)		1,200 (171)	min. 890 (127)
Compression pressure difference of all cylinder kPa (psi)		-	max. 100 (14)
Intake manifold vacuum at curb idle kPa (in. hg)		-	min. 60 (18)

TSB Revision



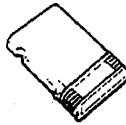
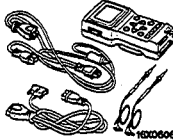

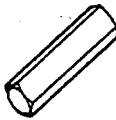
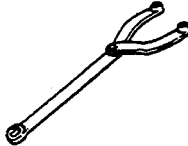

SEALANTS AND ADHESIVES

110005668

Items	Specified sealant or adhesive
Oil pan	mitsubishi GENUINE PART No. MD97089 or equivalent
Rocker cover and camshaft bearing cap seal	3M ATD Part No. 8660 or equivalent
Timing belt cover gasket	3M ATD Part No. 8001 or equivalent



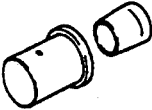

SPECIAL TOOLS

110005669

Tool	Tool number and name	Super session	Application
	MD998727 Oil pan remover	General service tool (Use a scraper and exercise care)	Removal of oil pan
	MB991341 Scan tool (Multi-use tester <MUT>)		Up to 1993 models Checking of engine idling speed
	ROM pack (For the number, refer to GROUP 00 - Precautions Before Service.)		Up to 1993 models Checking of engine idling speed
	MB991502 Scan tool (MUT-II)		All models Checking of the diagnosis code
	ROM pack Z16X0607		All models Checking of the diagnosis code
	MD998051 Wrench, cylinder head bolt	MD998051-01	Loosening and tightening of cylinder head bolt
	MB990767 End yoke holder	MB990767-01	Supporting the sprocket and shaft pulley during removing and installation
	MIT308239 Pulley holding pins		Supporting the sprocket and shaft pulley during removing and installation

TSB Revision

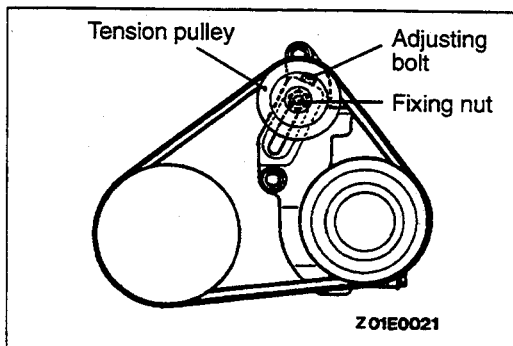
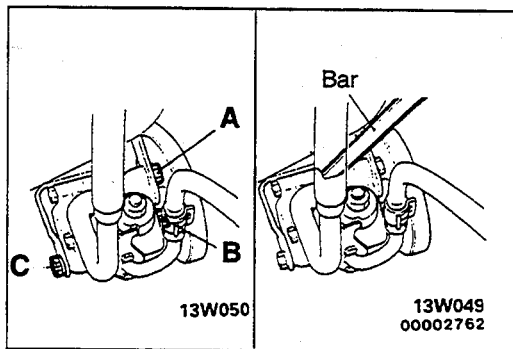
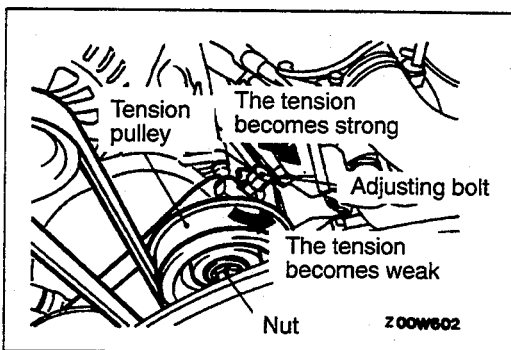
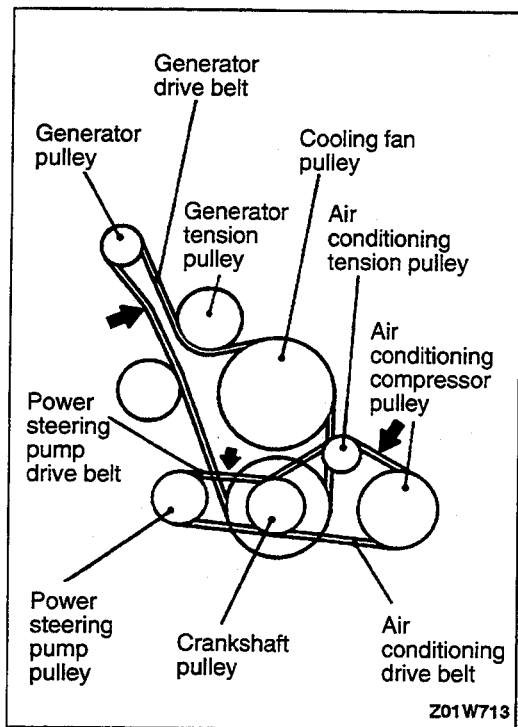
11A-4 3.0L ENGINE <SOHC-12VALVE> – Special Tools/Troubleshooting

Tool	Tool number and name	Super session	Application
	MD998716 Crankshaft wrench	MD998716-01	Used if the crankshaft needs to be rotated to attach the timing belt, etc.
	MD998713 Camshaft oil seal installer	MD998713-01	Press fitting the camshaft oil seal
	MD998717 Crankshaft front oil seal installer		Press-fitting of crankshaft front oil seal
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Press-fitting of crankshaft rear oil seal

TROUBLESHOOTING

110005670

Trouble Symptom	Probable Cause	Remedy
Compression is too low	Blown cylinder head gasket	Replace the gasket.
	Worn or damaged piston rings	Replace the rings.
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block.
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring.
Drop in oil pressure	Engine oil level is too low	Check the engine oil level.
	Malfunction of oil pressure switch	Replace the oil pressure switch.
	Clogged oil filter	Install a new filter.
	Worn oil pump gears or cover	Replace the gears and/or the cover.
	Thin or diluted engine oil	Change the engine oil to the correct viscosity.
	Stuck (open) oil relief valve	Repair the relief valve.
	Excessive bearing clearance	Replace the bearings.
Oil pressure too high	Stuck (closed) oil relief valve	Repair the relief valve.
Noisy valves	Malfunction of lash adjuster	Replace the lash adjuster.
	Thin or diluted engine oil (low oil pressure)	Change the engine oil.
	Worn or damaged valve stem or valve guide	Replace the valve and/or the guide.
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check the engine oil level.
	Thin or diluted engine oil	Change the engine oil.
	Excessive bearing clearance	Replace the bearings.
Timing belt noise	Incorrect belt tension	Adjust the belt tension.



SERVICE ADJUSTMENT PROCEDURES

110005671

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

Apply 98 N (22 lbs.) of force to the belt midway between the pulleys as shown in the illustration, and measure the deflection, or by using a belt-tension gage, check the belt tension.

Standard value:

Item		Check value	Adjustment value	
			New belt	Used belt
For generator	Deflection mm (in.)	8.0–10.0 (.32–.39)	6.5–8.0 (.26–.32)	9.0 (.35)
	Tension N (lbs.)	350–600 (77–132)	500–700 (110–154)	400 (88)
For power steering	Deflection mm (in.)	9.0–14.5 (.35–.57)	8.0 (.32)	10.0 (.39)
For A/C	Deflection mm (in.)	6.5–7.5 (.26–.29)	5–6 (.20–.24)	6.5–7.5 (.26–.29)
	Tension N (lbs.)	35–40 (77–88)	50–60 (110–132)	35–40 (77–80)

GENERATOR DRIVE BELT TENSION ADJUSTMENT

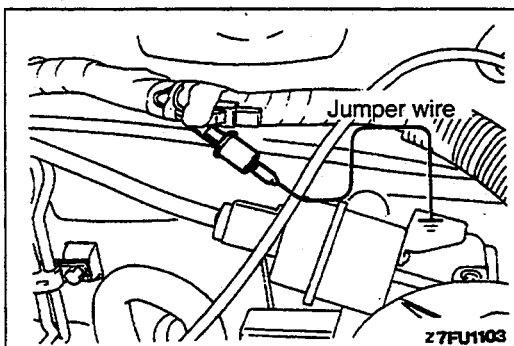
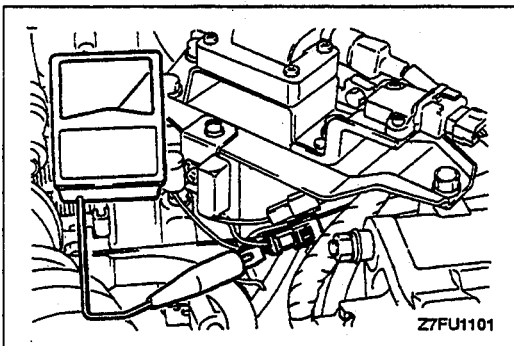
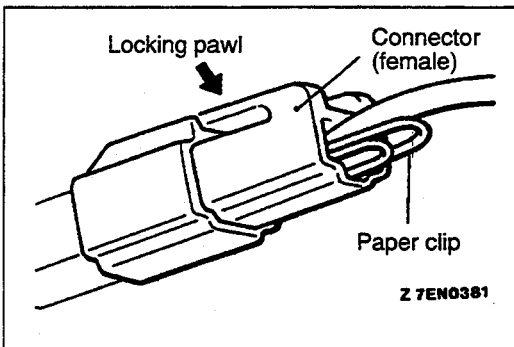
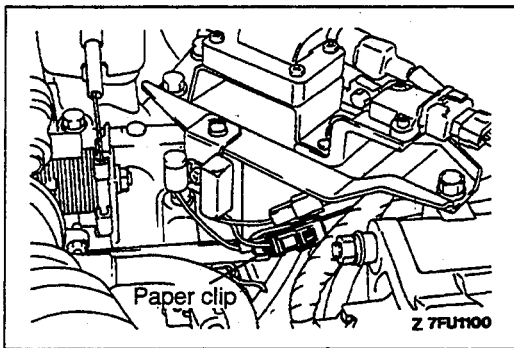
- (1) Loosen the tension pulley fixing nut.
- (2) Adjust the belt tension using the adjusting bolt.
- (3) Tighten the fixing nut.
- (4) Crank the engine once or more.
- (5) Check the belt tension.

POWER STEERING OIL PUMP DRIVE BELT DEFLECTION ADJUSTMENT

- (1) Loosen power steering fixing bolts (A), (B) and (C).
- (2) Move the power steering pump and the tension belt moderately and adjust.
- (3) Tighten the fixing bolts (A), (B) and (C) in that order.
- (4) Crank the engine once or more.
- (5) Check the belt tension.

AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

- (1) Loosen the tension pulley fixing nut.
- (2) Adjust the belt tension using the adjusting bolt.
- (3) Tighten the fixing nut.
- (4) Crank the engine once or more.
- (5) Check the belt tension.



IGNITION TIMING INSPECTION AND ADJUSTMENT

110005672

- (1) Before inspection and adjustment, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)

- (2) Insert a paper clip into the 1-pin connector between the primary side of the ignition coil and the noise filter. The connector should not be disconnected.

Caution

Insert the paper clip along the terminal from the opposite side to the locking pawl of the female connector, as shown in the illustration.

- (3) Connect a primary voltage detection-type speedometer to the paper clip.

NOTE

Do not use the scan tool. If the scan tool is connected to the data link connector, the ignition timing will be unchanged instead of reverting to the standard ignition timing.

- (4) Connect a timing light.
- (5) Start the engine and run it at idle.
- (6) Check that the idle speed is at the standard value.

Standard value: 700±100 rpm

- (7) Turn the ignition switch to OFF.
- (8) Disconnect the waterproof female connector from the ignition timing adjustment connector (brown).

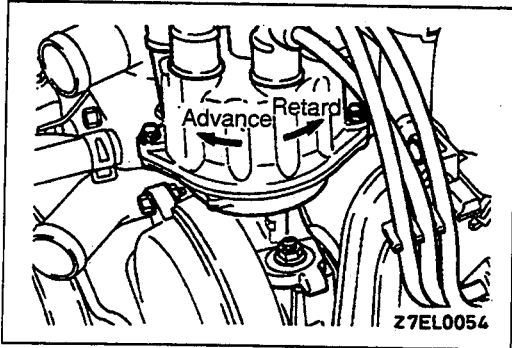
- (9) Use a jumper wire to ground the ignition timing adjustment terminal.

NOTE

Grounding the ignition timing adjustment terminal will change the ignition timing to standard.

- (10) Start the engine and run it at idle.
- (11) Check the standard ignition timing.

Standard value: 5° BTDC±2°



- (12) If the timing is outside the standard value, adjust by turning the distributor.
- (13) After adjusting the ignition timing, tighten the mounting nut, being careful not to move the distributor.
- (14) Stop the engine, remove the jumper lead from the ignition timing adjustment connector (brown), and return the connector to its original condition.
- (15) Start the engine and check that the ignition timing is at the standard value.

Standard value: Approx. 15° BTDC

NOTE

1. Ignition timing is variable within about $\pm 7^\circ$, even under normal operating conditions.
2. It is automatically further advanced by about 5° from 15° BTDC at higher altitudes.

CURB IDLE SPEED INSPECTION

110005673

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: $80\text{--}95^\circ\text{C}$ ($176\text{--}203^\circ\text{F}$)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)

- (2) Check the basic ignition timing.

Standard value: 5° BTDC $\pm 2^\circ$

- (3) After turning the ignition switch to OFF, connect a tachometer or the scan tool to the data link connector (white).

NOTE

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

- (4) Start the engine and run it at idle.
- (5) Run the engine at idle for 2 minutes.
- (6) Check the idle speed.

Curb idle speed: 700 ± 100 rpm

NOTE

The idle speed is adjusted automatically by the idle air control (IAC) system.

- (7) If there is a deviation from the standard value refer to GROUP 13A—Check Chart Classified by Trouble Symptoms, and check the MFI components.

IDLE MIXTURE INSPECTION

110005674

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)

- (2) Check to be sure that the ignition timing is at the standard value.

Standard value: 5° BTDC±2°

- (3) After turning the ignition switch to OFF, connect a tachometer, or connect the scan tool to the data link connector.

NOTE

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

- (4) Start the engine and race it at an engine speed of 2,500 rpm for two minutes.
- (5) Connect a CO and HC tester.
- (6) Check the CO concentration and the HC concentration while the engine is idling.

**Standard value: CO concentration: 0.5% or less
HC concentration: 100 ppm or less**

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

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

NOTE

If the results of the checks for all items are normal but the CO and HC concentrations still exceed the standard values, replace the three-way catalyst.

COMPRESSION PRESSURE CHECK

110005675

- (1) Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)
- (2) Disconnect the spark plug cables.
- (3) Remove all of the spark plugs.
- (4) Disconnect the distributor connector.

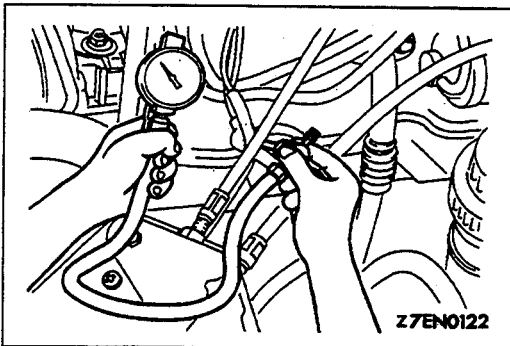
NOTE

Doing this will prevent the engine control module from carrying out ignition and fuel injection.

- (5) Cover the spark plug hole with a rag, 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. Do not let water, oil, fuel, etc. enter the cylinder through cracks, or these heated materials will gush out from the spark plug hole, which is dangerous.



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

Standard value: 1200 kPa (171 psi.) / 250-400 rpm
Limit: min. 890 kPa (127 psi.) / 250-400 rpm

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

Limit: max. 100 kPa (14 psi.)

- (9) If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (6) to (8).
 - 1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
 - 2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure leaking from the gasket.

- (10) Reconnect the distributor connector.
- (11) Reinstall the spark plugs and spark plug cables.
- (12) Use the scan tool to erase the diagnostic trouble codes, or disconnect the negative battery cable for 10 seconds or more and then re-connect it.

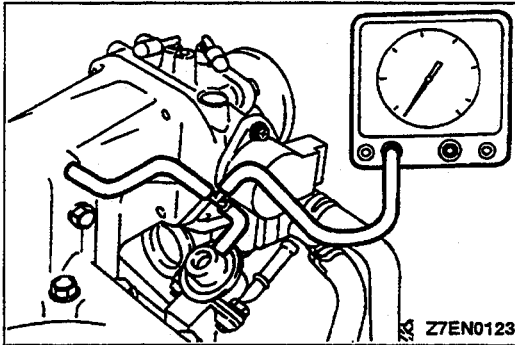
NOTE

This will erase the diagnostic trouble code resulting from the distributor connector being disconnected.

MANIFOLD VACUUM INSPECTION

110005676

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for AT)



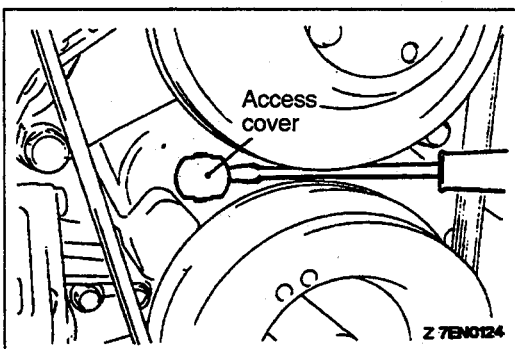
- (2) Connect a tachometer or connect the scan tool to the data link connector (white).

NOTE

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

- (3) Connect a three-way joint to the vacuum hose between the intake manifold plenum and the fuel-pressure regulator, and then connect a vacuum gage.
- (4) Start the engine and check that the idle speed is within the standard value range.
Take a reading of the vacuum gage.

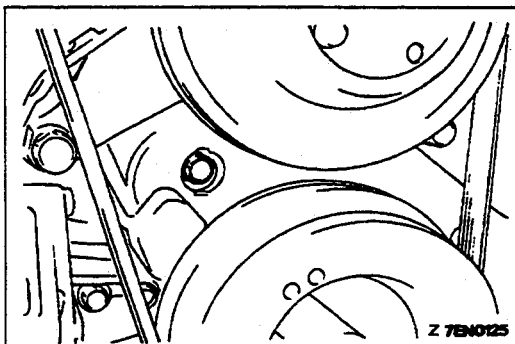
Limit: min. 60 kPa (18 in.Hg)



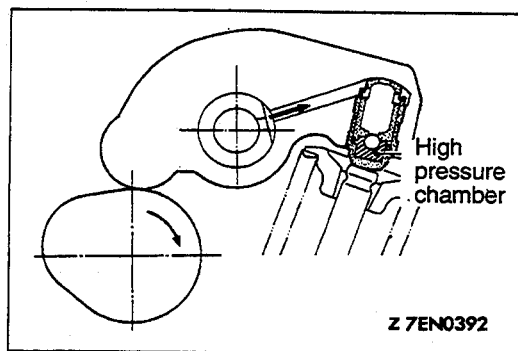
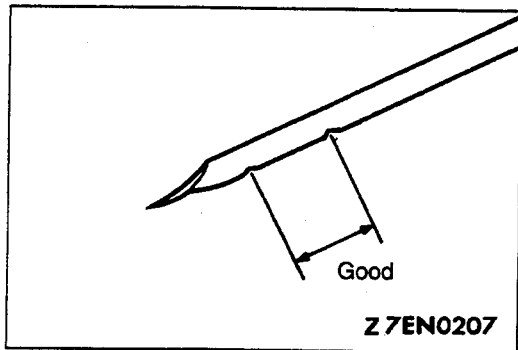
TIMING BELT TENSION ADJUSTMENT

110005677

- (1) Remove the access cover.



- (2) Loosen the timing belt tensioner mounting bolt 1 or 2 turns.
- (3) Turn the crankshaft two turns in the clockwise direction.
- (4) Tighten the timing belt tensioner mounting bolt.
- (5) Attach the access cover.



LASH ADJUSTER CHECK

110005678

NOTE

Directly after starting the engine or while the engine is running, if an abnormal sound (knocking) that seems to be coming from the lash adjuster is heard and doesn't stop, carry out the following inspection.

- (1) Check the engine oil and replenish or replace the oil if necessary.

NOTE

- If there is a small amount of oil, air is sucked in through the oil strainer and gets into the oil passage.
- If the amount of oil is greater than normal, oil is mixed by the crank, and a large amount of air is mixed into the oil.
- Air and oil will not separate easily in oil that has degenerated, and the amount of air mixed into the oil will increase.

If the air mixed into the oil due to the above reasons gets into the high pressure chamber of the lash adjuster, the air inside the high pressure chamber will be compressed when the valve is open and the lash adjuster will over-compress, resulting in an abnormal noise when the valve closes. This is the same effect as if the valve clearance is adjusted by mistake to be too large. Here, if the air inside the lash adjuster is released, then the operation has returned to normal.

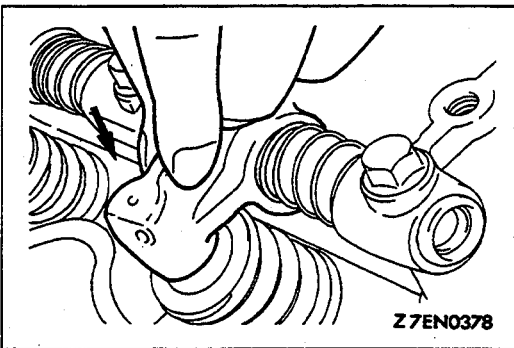
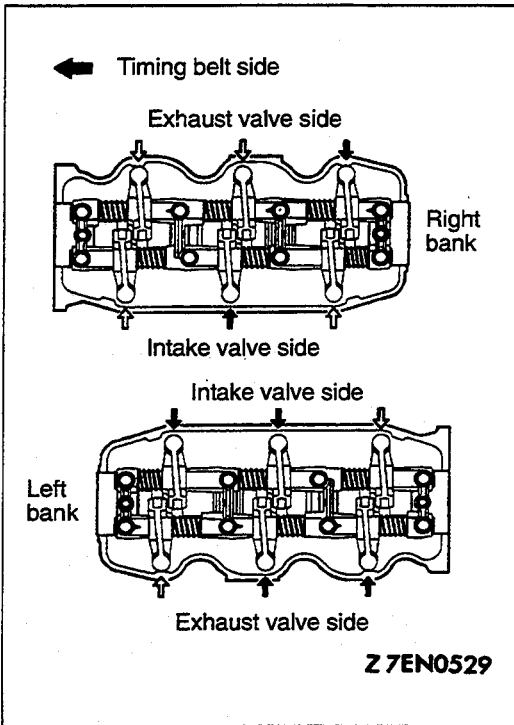
- (2) Start the engine and gently race * the engine several times (10 times or less).

If the abnormal noise is stopped by the racing, air has been released from the high pressure chamber, and the functioning of the lash adjuster has returned to normal.

* After gradually increasing the engine speed from idle speed to 3000 rpm (over 30 seconds), gradually reduce the engine speed back to idle speed (over 30 seconds).

NOTE

- Parking on a slope for a long period will decrease the amount of oil inside the lash adjuster, and then air may get into the high pressure chamber when starting the engine.
- After parking the vehicle for long periods, the oil drains out of the oil passage, and it takes time for the oil to be supplied to the lash adjuster, so air can get into the high pressure chamber.



- (3) If the abnormal noise is not stopped by the racing, check the lash adjuster by the following procedure.
- 1) Stop the engine.
 - 2) Set the engine No. 1 cylinder to the compression top dead center position.
 - 3) Push the rocker arm in the locations indicated by \leftarrow in the illustration at left to check if the rocker arm moves down or not.
 - 4) Slowly turn the crankshaft 360° clockwise.
 - 5) Check the rocker arm in the locations indicated by \leftarrow in the illustration at left using the same procedure as in step 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 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 Service 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 another cause of the abnormality.

ENGINE ASSEMBLY

110005679

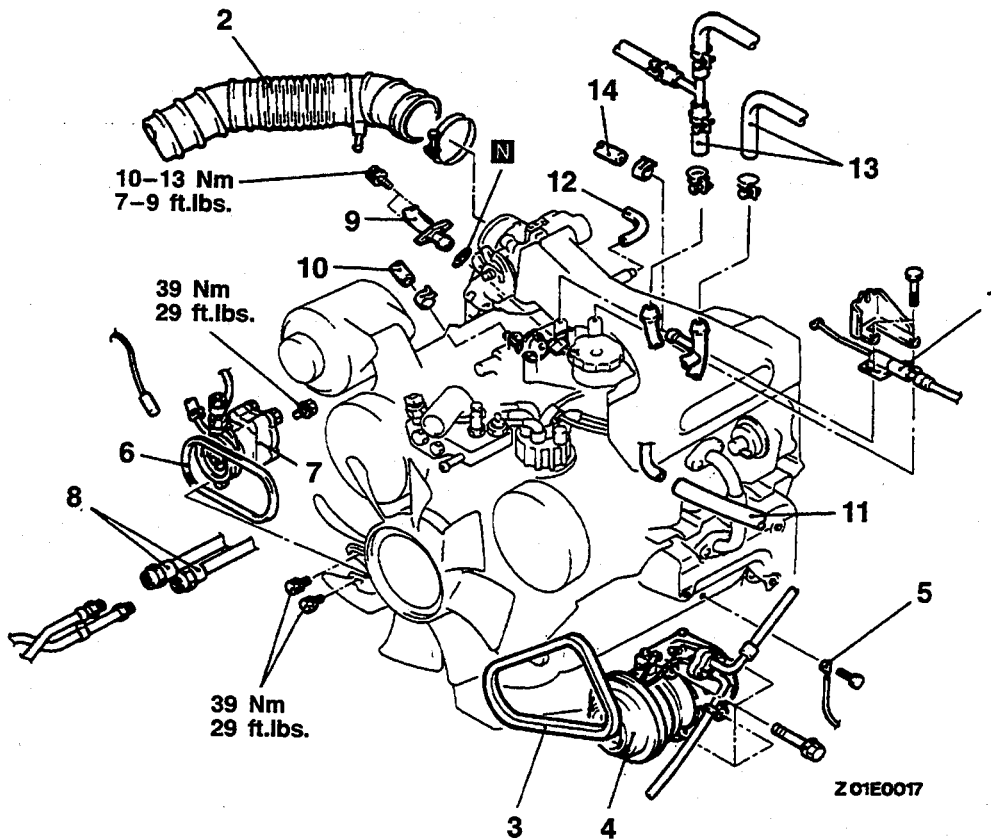
REMOVAL AND INSTALLATION

Pre-removal Operation

- The Hood Removal (Refer to GROUP 42 – Hood.)
- The Radiator Removal (Refer to GROUP 14 – Radiator.)
- Under Skid Plate, Undercover Removal
- Front Exhaust Pipe Removal (Refer to GROUP 15 – Exhaust Pipe, Muffler and Catalytic Converter.)
- Transmission and Transfer Assembly Removal (M/T: Refer to GROUP 22 – Transmission and Transfer Assembly.) (A/T: Refer to GROUP 23 – Transmission and Transfer Assembly.)

Post-installation Operation

- Transmission and Transfer Assembly Installation (M/T: Refer to GROUP 22 – Transmission and Transfer Assembly.) (A/T: Refer to GROUP 23 – Transmission and Transfer Assembly.)
- Front Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe, Muffler and Catalytic Converter.)
- Under Skid Plate, Undercover Installation
- Radiator Installation (Refer to GROUP 14 – Radiator.)
- Hood Installation (Refer to GROUP 42 – Hood.)
- Engine Adjustment (Refer to P.11A-5.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
- Engine Oil Supplying and Checking

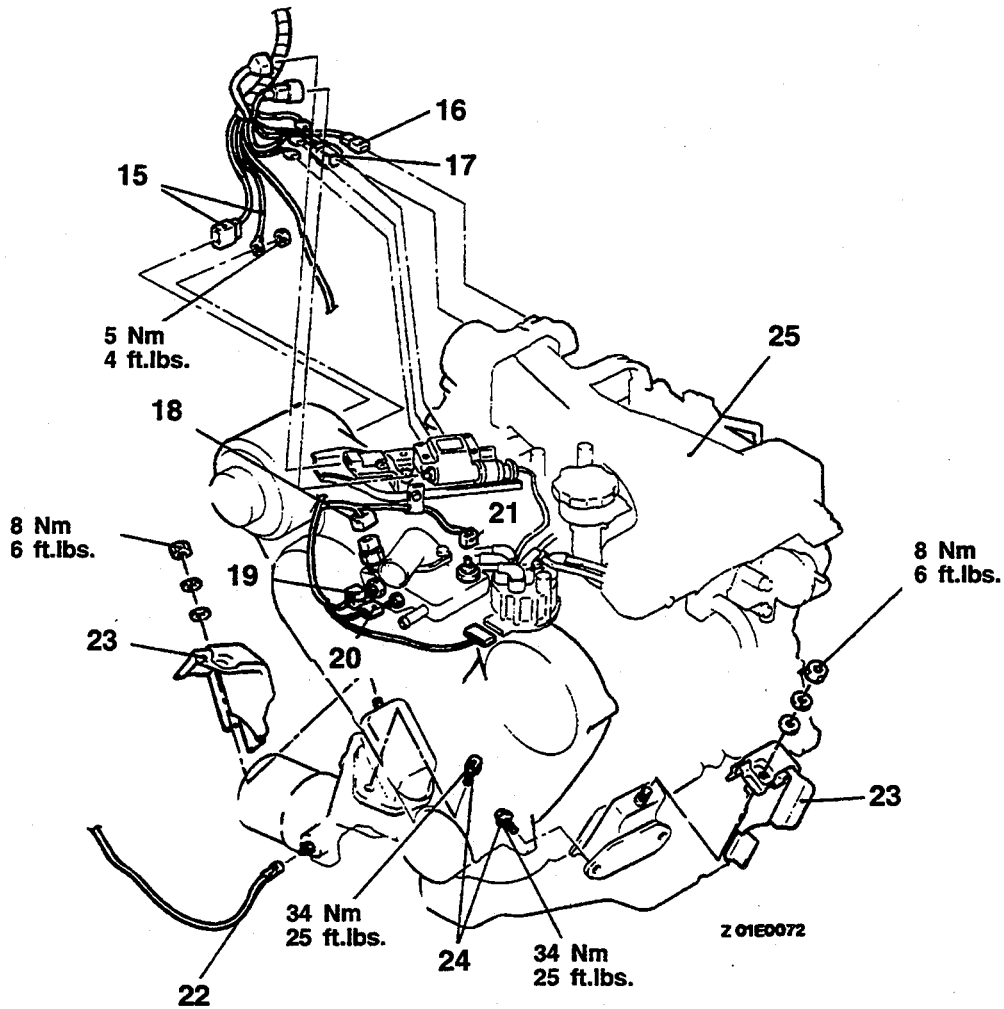


Removal steps

1. Accelerator cable connection
2. Air intake hose
3. Drive belt <A/C>
4. Compressor <A/C>
5. Connection for ground cable
6. Drive belt (Power steering)
7. Oil pump (Power steering)

8. Oil cooler hose connection
9. High pressure fuel hose connection
10. Fuel return hose connection
11. Vacuum hose connection
12. Brake booster vacuum hose connection
13. Heater hose connections
14. Heater hose B connection

TSB Revision



- 15. Generator connector
- 16. IAC motor connector
- 17. TPS connector
- 18. Air conditioning engine coolant temperature switch connector
- 19. Engine coolant temperature sensor connector

- 20. Thermo switch connector <A/T>
- 21. Engine coolant temperature gage unit connector
- 22. Oil pressure gage unit connector
- 23. Heat protectors
- 24. Engine mounting bolt
- 25. Engine assembly

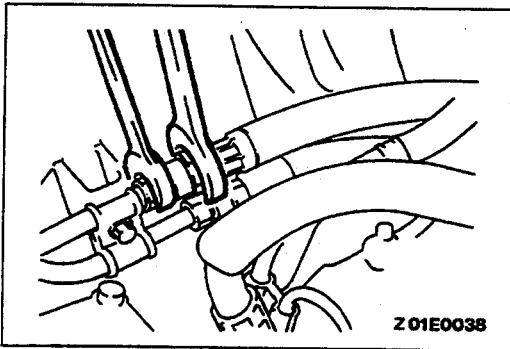


REMOVAL SERVICE POINTS**◀A▶ COMPRESSOR <A/C>/OIL PUMP (POWER STEERING) REMOVAL**

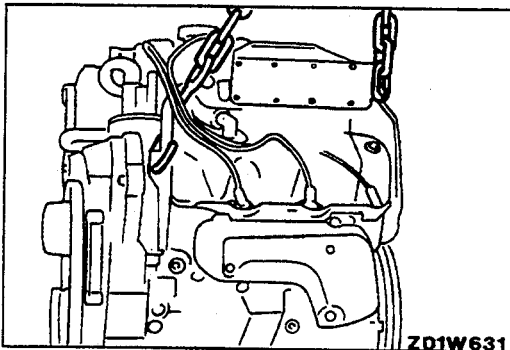
Remove the oil pump and air conditioning compressor (with the hose attached).

NOTE

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

**◀B▶ OIL COOLER HOSE CONNECTION REMOVAL**

Use a spanner or similar tool to disconnect the oil cooler hose.

**◀C▶ ENGINE ASSEMBLY REMOVAL**

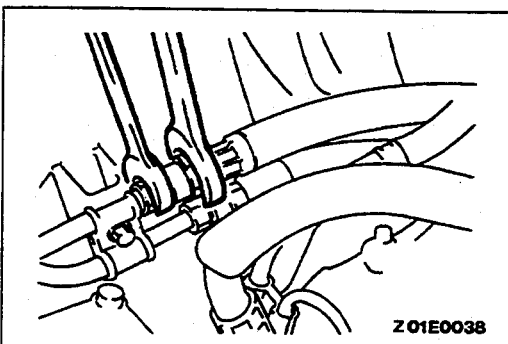
- (1) Check that all cables, hoses, harness connectors, etc. are disconnected from the engine.
- (2) Lift the chain block slowly to remove the engine assembly upward from the engine compartment.

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

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

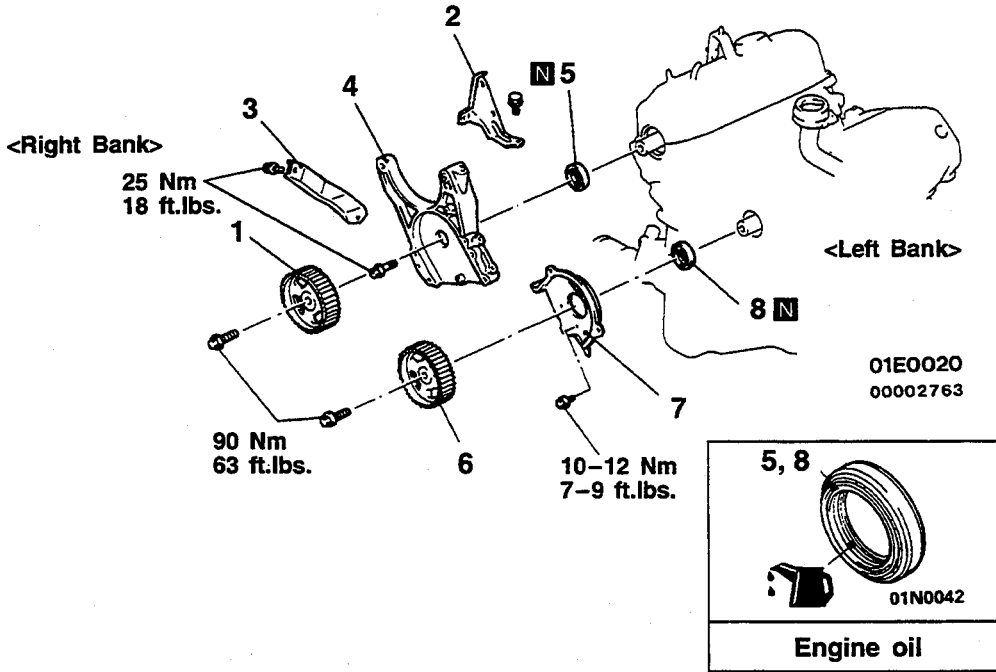
▶B▶ OIL COOLER HOSE CONNECTION

Use a spanner or similar tool to connect the oil cooler hose.



CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION



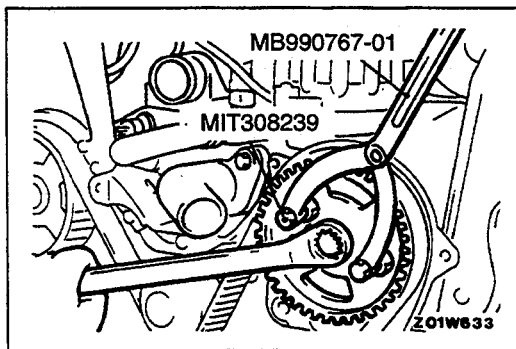
Removal steps <Right Bank>

- Generator (Refer to GROUP 16 – Generator.)
- Timing Belt (Refer to P.11A-26.)
- 1. Camshaft sprocket
- 2. Cooling fan stay
- 3. Generator bracket stay
- 4. Generator bracket
- 5. Oil seal



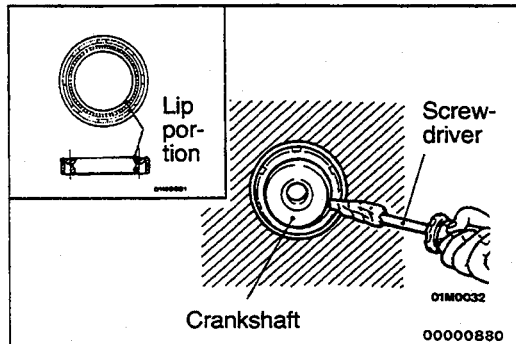
Removal steps <Left bank>

- Timing Belt (Refer to P.11A-26.)
- 6. Camshaft sprocket
- 7. Timing belt rear cover
- 8. Oil seal



REMOVAL SERVICE POINTS

◀A▶ CAMSHAFT SPROCKET REMOVAL

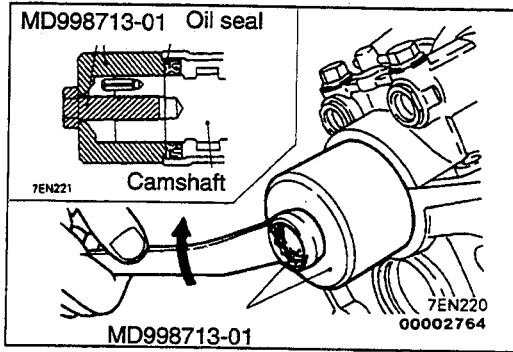


◀B▶ OIL SEAL REMOVAL

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

Caution

Take care not to damage the camshaft and cylinder head.

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

- (1) Apply a slight amount of engine oil to the circumference of the lip of the camshaft oil seal.
- (2) Use the special tool to insert the oil seal.

CRANKSHAFT OIL SEALS

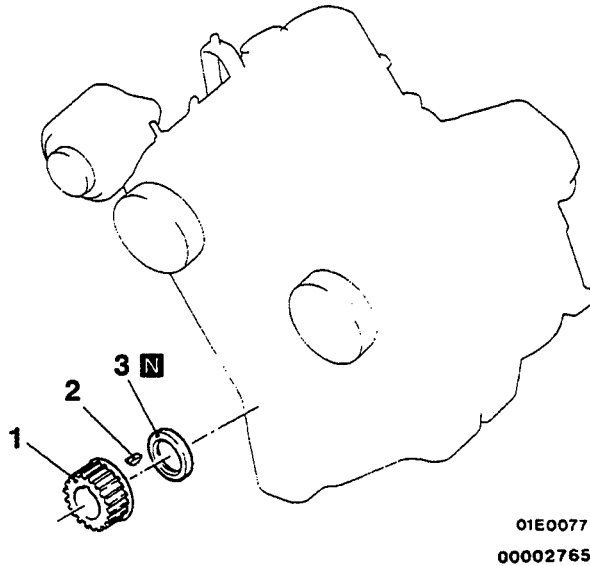
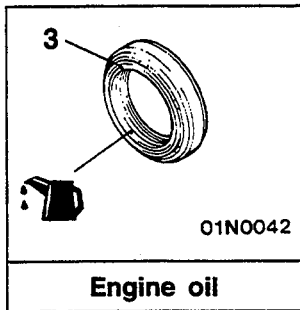
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FRONT OIL SEAL

REMOVAL AND INSTALLATION

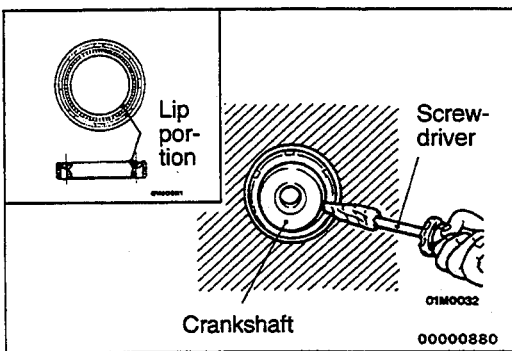
Pre-removal and Post-installation Operation
 • Timing Belt Removal (Refer to P.11A-26.)

Adjustment
 • Engine Adjustment (Refer to P.11A-5.)



Removal steps

1. Crankshaft sprocket
2. Key
3. Oil seal



REMOVAL SERVICE POINTS

◀▶ OIL SEAL REMOVAL

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

Caution

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

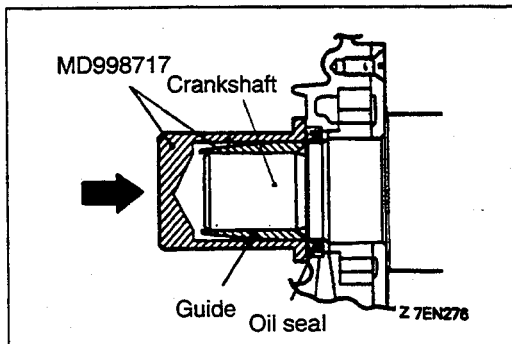
INSTALLATION SERVICE POINTS

▶◀ OIL SEAL INSTALLATION

Use the special tool to tap the oil seal into the oil pump case.

NOTE

Tap it until it is flush with the surface.

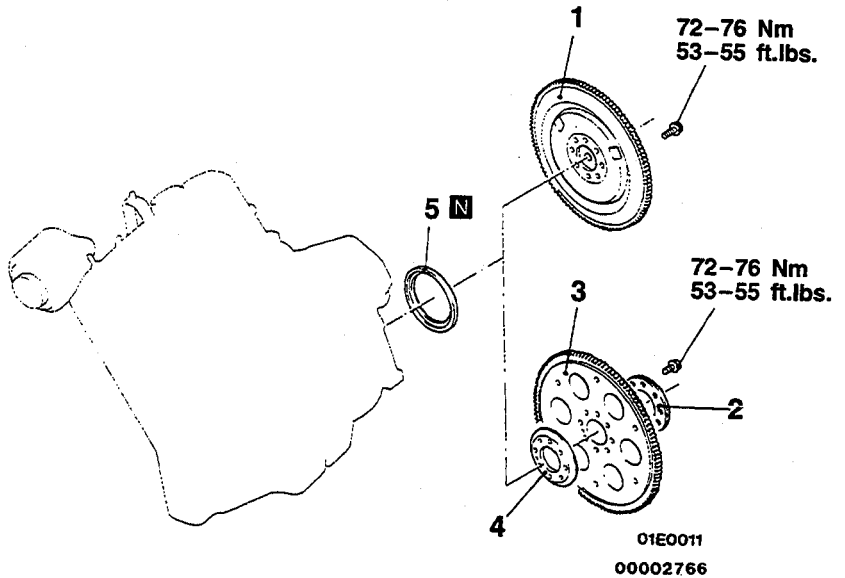
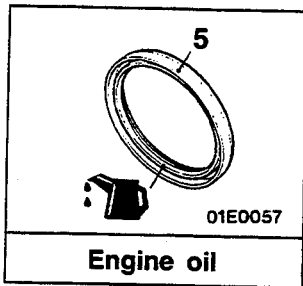


REAR OIL SEAL REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

Removal and Installation

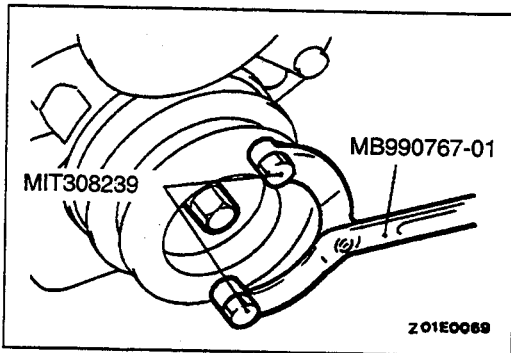
- Transmission
(M/T: Refer to GROUP 22 – Transmission and Transfer Assembly.)
(A/T: Refer to GROUP 23 – Transmission and Transfer Assembly.)
- Clutch <M/T>



Removal steps



1. Flywheel assembly <M/T>
2. Adaptor plate A <A/T>
3. Drive plate <A/T>
4. Adaptor plate B <A/T>
5. Oil seal



REMOVAL SERVICE POINTS

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

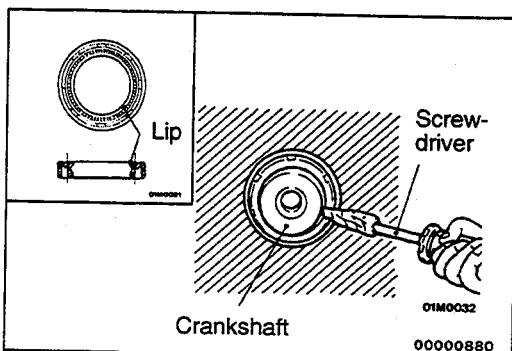
Use the special tool to stop the crankshaft pulley from turning, and then remove the flywheel, adapter plates and the drive plate.

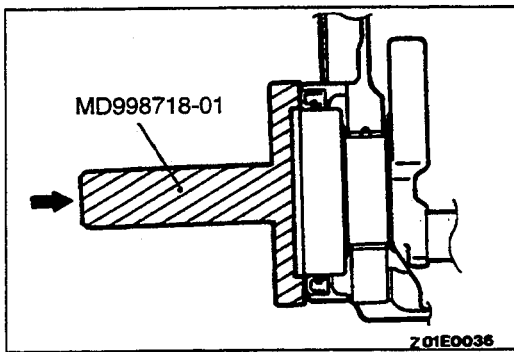
◀B▶ OIL SEAL REMOVAL

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

Caution

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



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

Use the special tool to press-fit a new crankshaft rear oil seal into the oil seal case.

OIL PAN AND OIL SCREEN

REMOVAL AND INSTALLATION

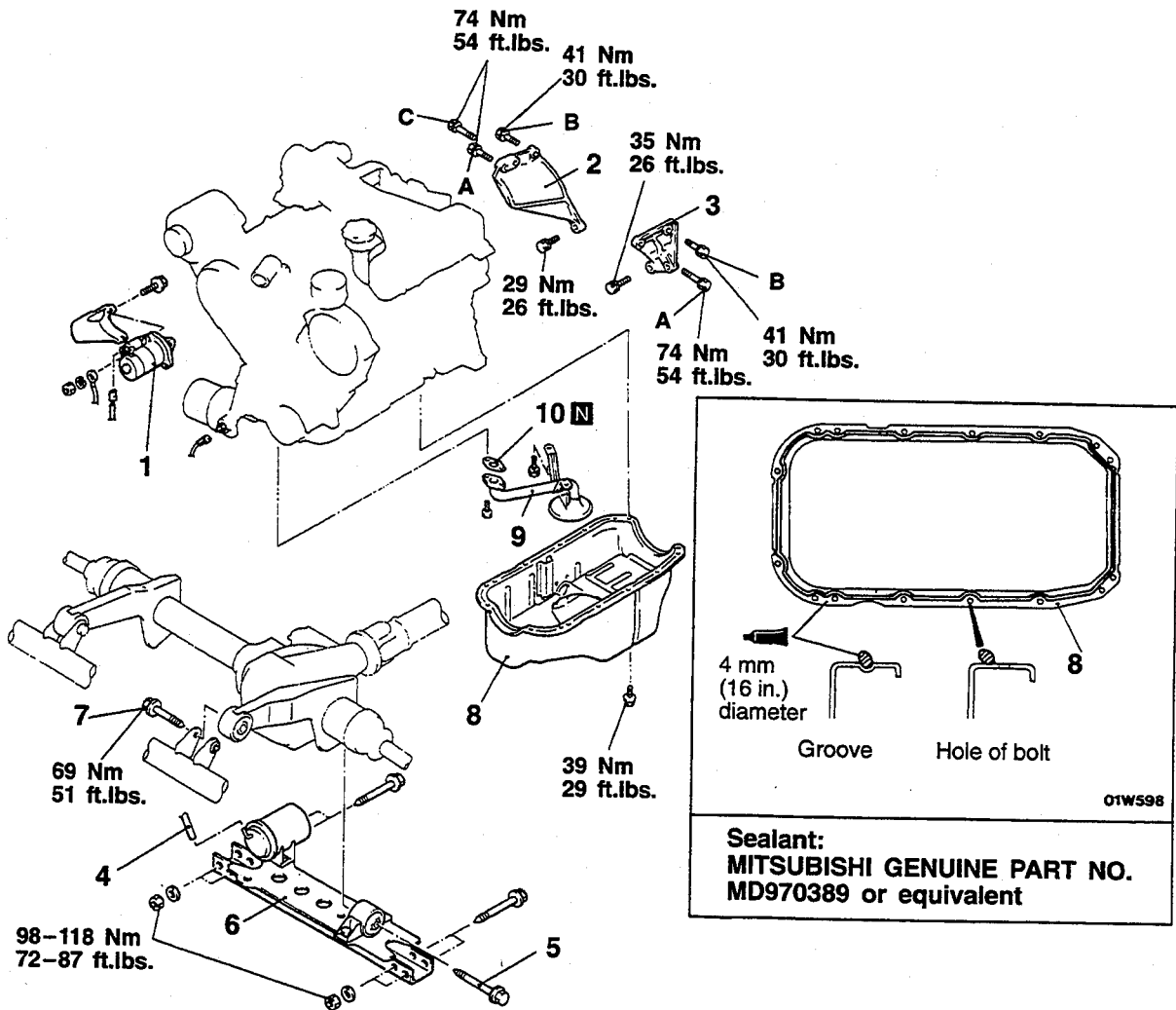
Pre-removal and Post-installation Operation

Removal and Installation

- Under Skid Plate, Undercover
- Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe, Mufflers and Catalytic Converter.)

Draining and Supplying

- Engine Oil (Refer to GROUP 00 – Maintenance Service.)



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Symbol	d × ℓ mm (in.)	NOTE
A	12 × 35 (.47 × 1.37)	<p>Z04U0025</p>
B	10 × 30 (.39 × 1.18)	
C	12 × 50 (.47 × 1.96)	

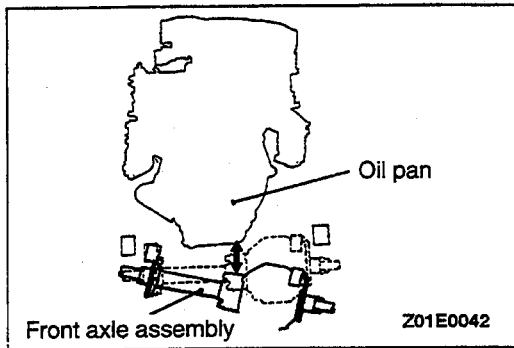
Removal steps

1. Starter
2. Transmission stay (R.H.)
3. Transmission stay (L.H.)
4. Vacuum hose
5. Bolt



6. Front suspension crossmember
7. Bolt
8. Oil pan
9. Oil screen
10. Oil screen gasket

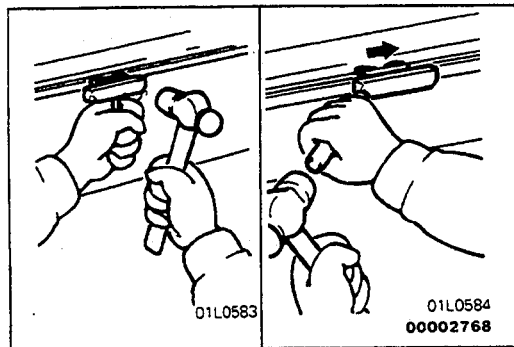
TSB Revision



REMOVAL SERVICE POINTS

◀A▶ BOLT REMOVAL

After removing the mounting bolt, lower the front axle assembly as far as possible and so that there is enough space to remove the oil pan.



◀B▶ OIL PAN REMOVAL

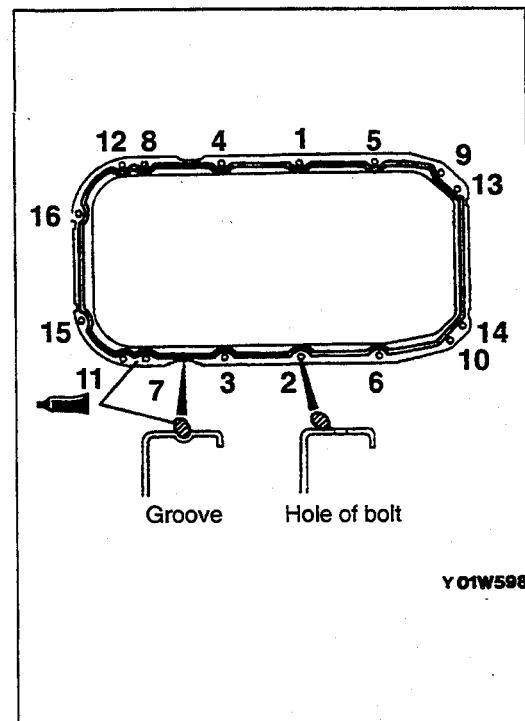
- (1) Remove the oil pan bolts.
- (2) Tap the general special tool between the oil pan and cylinder block.
- (3) Slide the special tool by tapping it at an angle to remove the oil pan.

Caution

Using a screwdriver or chisel in place of the special tool can damage the gasket seat surface and cause oil leakage.

INSPECTION

- Check the oil pan for cracks.
- Check the oil pan sealant-coated surface for damage and deformation.
- Check the oil screen for cracked, clogged or damaged wire net and pipe.



INSTALLATION SERVICE POINT

▶A◀ OIL PAN INSTALLATION

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE

The sealant should be applied in a continuous bead approximately 4 mm (.16 in.) in diameter.

- (4) Install the oil pan to the cylinder block within 15 minutes after applying the sealant.

Caution

1. Tighten the oil pan mounting bolt in the order illustrated.
2. After installing the oil pan, wait at least 30 minutes before starting the engine.

CYLINDER HEAD GASKET

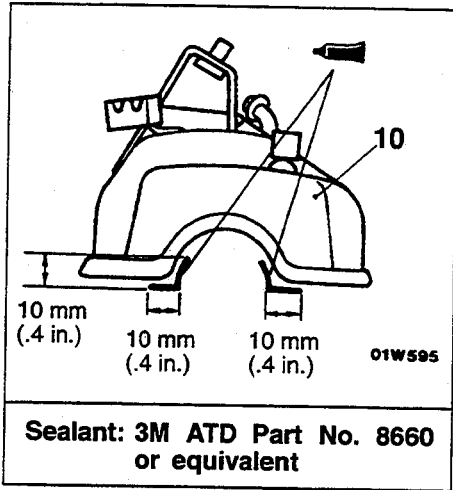
REMOVAL AND INSTALLATION

Pre-removal Operation

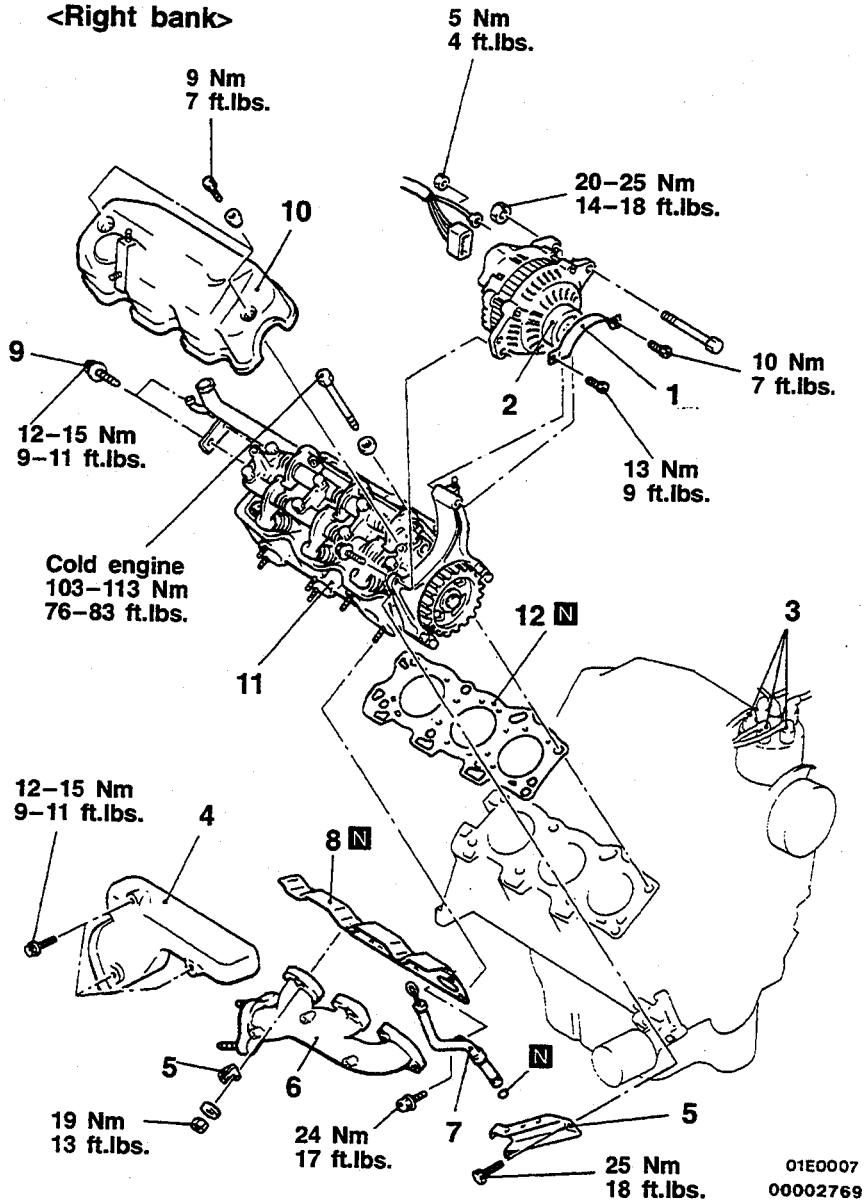
- Engine Coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)
- Timing Belt Removal (Refer to P.11A-26.)
- Intake Manifold Removal
- Under Skid Plate, Undercover Removal
- Front Exhaust Pipe Removal (Refer to GROUP 15 – Exhaust Pipe, Mufflers and Catalytic Converter.)

Post-installation Operation

- Front Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe, Mufflers and Catalytic Converter.)
- Under Skid Plate, Undercover Installation
- Intake Manifold Installation
- Timing Belt Installation (Refer to P.11A-26.)
- Engine Coolant Supplying (Refer to GROUP 14 – Service Adjustment Procedures.)



<Right bank>

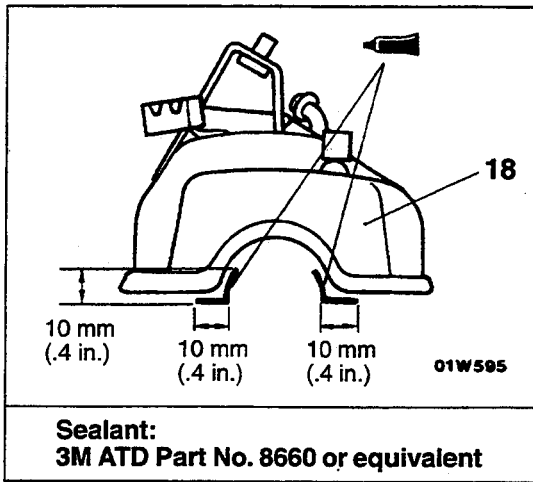


Removal steps of right bank

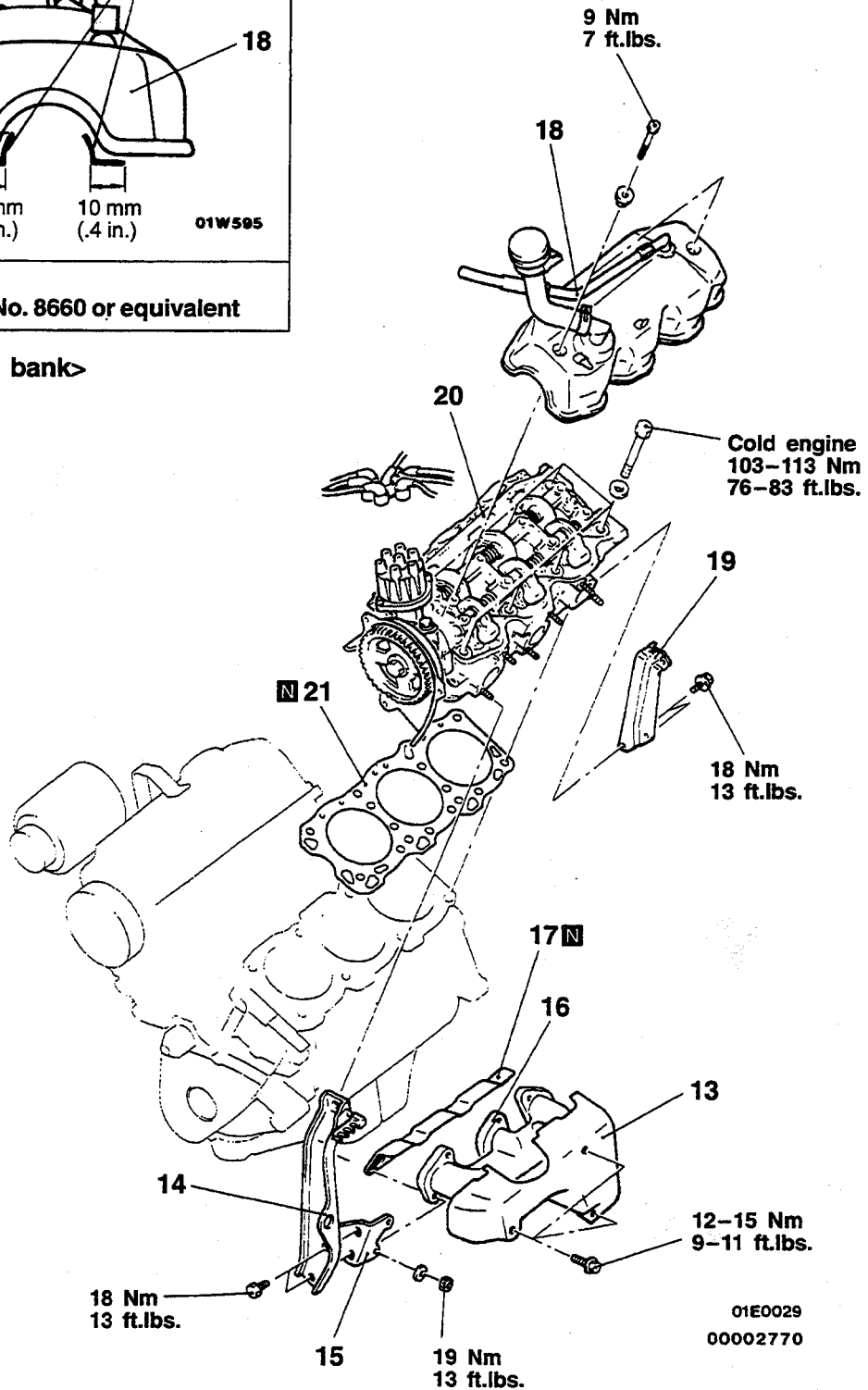
- | | |
|---------------------------------------------------------|----------------------------|
| 1. Generator pulley cover | 6. Exhaust manifold (R.H.) |
| 2. Generator | 7. Oil level gage guide |
| 3. Spark plug cable connection (No. 1, No. 3 and No. 5) | 9. Bolt |
| 4. Heat protector | 10. Rocker cover |
| 5. Generator stay | 11. Cylinder head assembly |
| | 12. Cylinder head gasket |



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<Left bank>

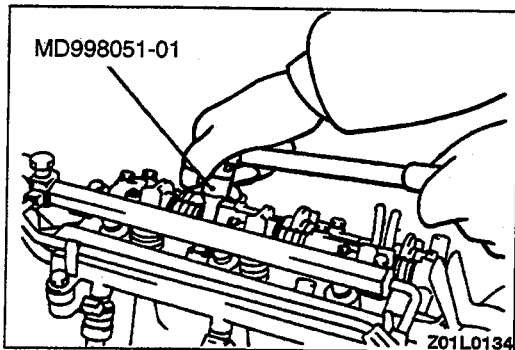


Removal steps of left bank

- 13. Heat protector
- 14. Intake manifold plenum stay (Front)
- 15. Bracket
- 16. Exhaust manifold (L.H.)
- 17. Gasket

- 18. Rocker cover
- 19. Intake manifold plenum stay (Rear)
- 20. Cylinder head assembly
- 21. Cylinder head gasket

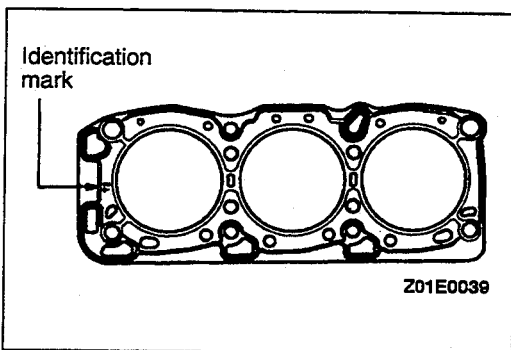




REMOVAL SERVICE POINTS

◀A▶ CYLINDER HEAD ASSEMBLY REMOVAL

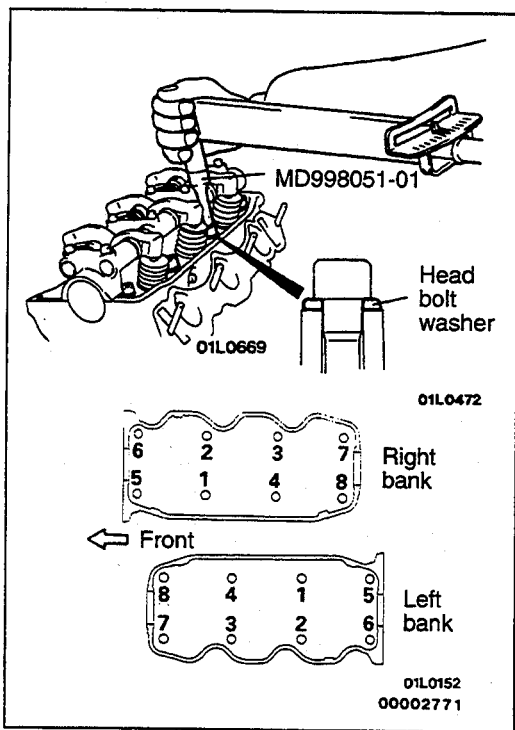
Use the special tool to remove the bolts after loosening them in the order shown in the illustration (in 2 or 3 cycles), and then remove the cylinder head assembly.



INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

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



▶B◀ CYLINDER HEAD ASSEMBLY INSTALLATION

Use the special tool to tighten the bolts in the order shown in two or three steps.

Caution

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

TIMING BELT

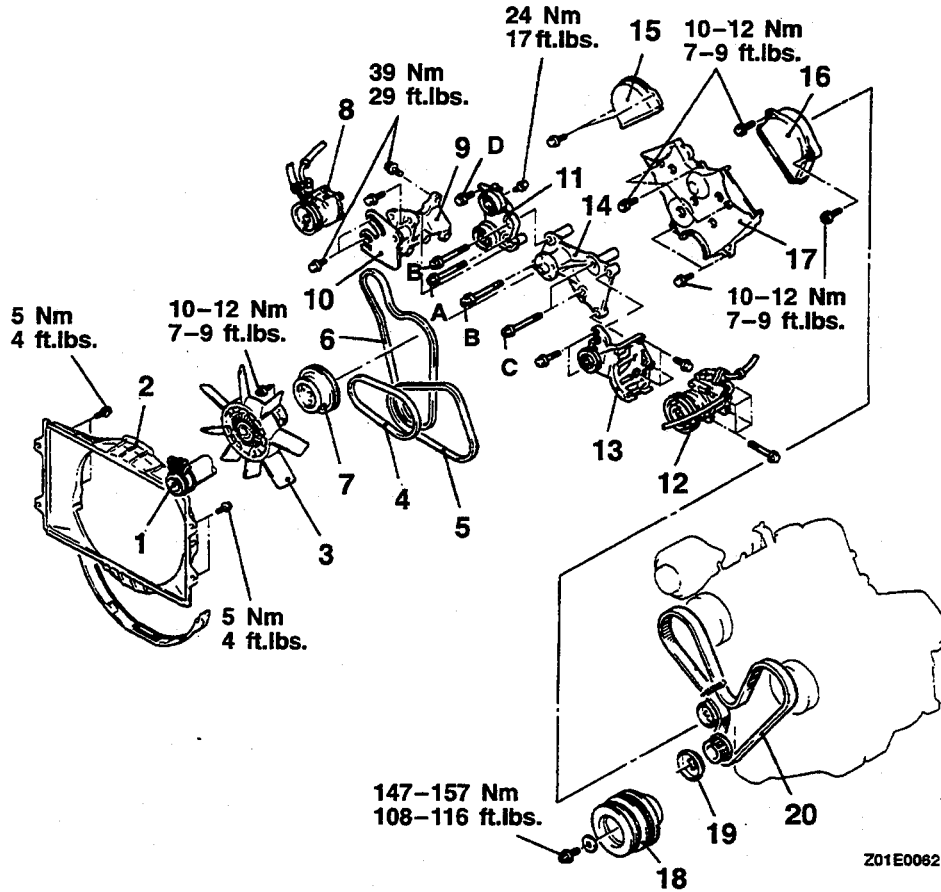
REMOVAL AND INSTALLATION

Pre-removal Operation

- Engine Coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)

Post-installation Operation

- Engine Coolant Filling (Refer to GROUP 14 – Service Adjustment Procedures.)
- Engine Adjustment (Refer to P.11A-5.)



Z01E0062

Symbol	Hardness category	d × l mm (in.)	Torque Nm (ft.lbs.)	Note
A	7T	10 × 85 (.39 × 3.34)	42 (30)	
B		10 × 95 (.39 × 3.74)		
C		12 × 100 (.47 × 3.93)	75 (54)	
D		8 × 20 (.31 × .79)	16 (12)	

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Removal steps

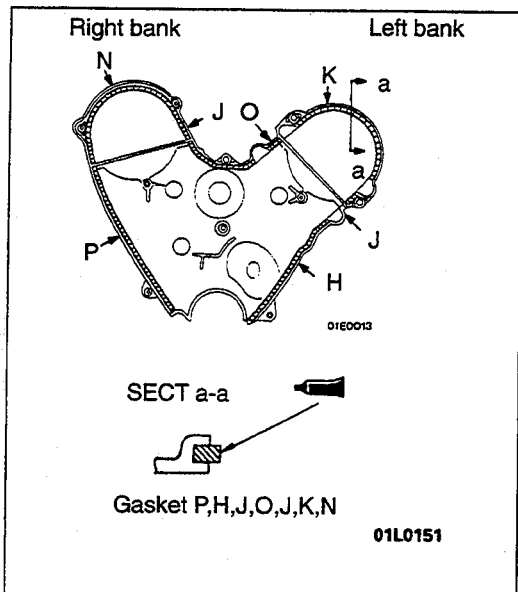
1. Radiator upper hose connection
2. Radiator shroud
3. Cooling fan clutch assembly
 - Adjustment of drive belt tension (Refer to P.11A-5.)
4. Drive belt (Power steering)
5. Drive belt <A/C>
6. Drive belt (Generator, Cooling fan)
7. Cooling fan pulley
8. Power steering oil pump
9. Oil pump bracket
10. Oil pump mounting bracket



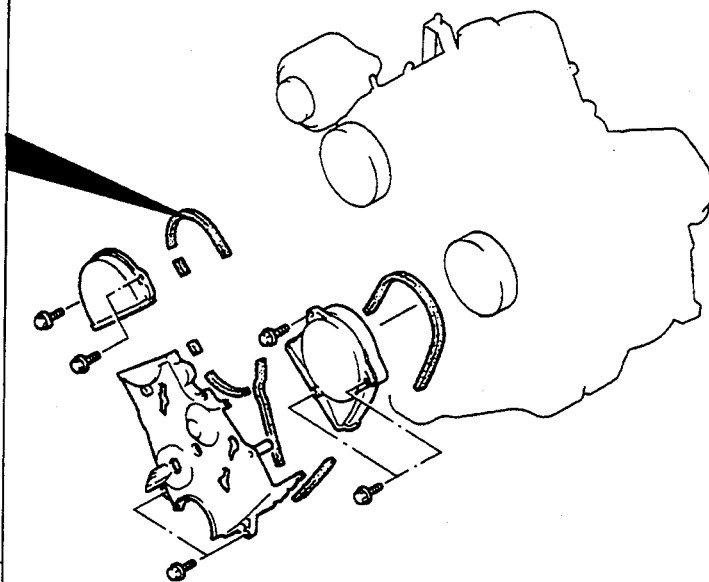
11. Tension pulley bracket
12. Compressor <A/C>
13. Compressor bracket
14. Cooling fan bracket assembly
15. Timing belt cover outer (A)
16. Timing belt cover outer (B)
17. Timing belt cover outer (C)
18. Crankshaft pulley
19. Front flange
20. Timing belt

TSB Revision

ADHESIVE POINTS



Adhesive:
3M ATD Part No. 8001 or equivalent



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REMOVAL SERVICE POINTS

◀A▶ POWER STEERING OIL PUMP REMOVAL

Remove the power steering oil pump from the bracket, and secure to the body using wire or similar materials.

NOTE

Remove the power steering oil pump with the pressure hose and return hose still attached.

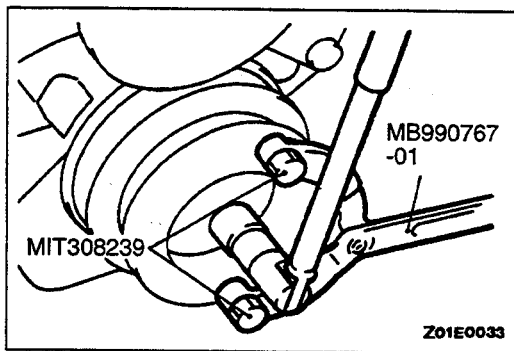
◀B▶ COMPRESSOR REMOVAL <AIR CONDITIONING>

Remove the compressor from the bracket, and secure to the body using wire or similar materials.

NOTE

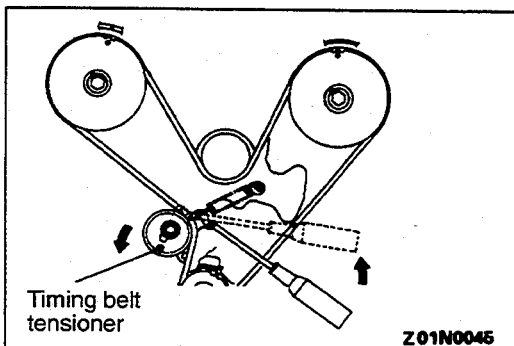
Remove the compressor with the high pressure hose and low pressure hose still attached.

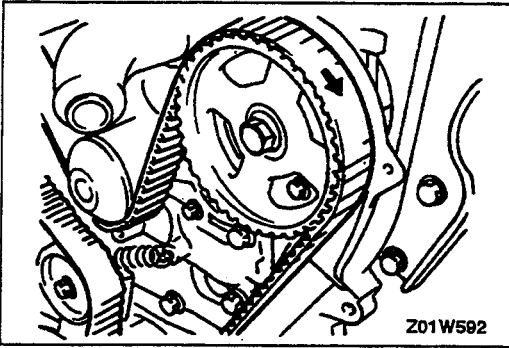
◀C▶ CRANKSHAFT PULLEY REMOVAL



◀D▶ TIMING BELT REMOVAL

- (1) Loosen the timing belt tensioner bolt and turn the timing belt tensioner counterclockwise along the slot.





- (2) Mark an arrow on the belt to reuse it. When the belt is reinstalled, be sure to make the arrow point in the same direction as before removal.

Caution

1. Do not let water or oil touch the belt, or it will be damaged easily. Keep the timing belt, sprocket, and tensioner stay clean and dry while removed, and never wash them. Parts that have become too dirty should be replaced.
2. If any parts are oily, check whether there are any oil leaks in any oil seals or the camshaft oil seal on the front of the engine.

INSTALLATION SERVICE POINTS

▶◀TIMING BELT INSTALLATION

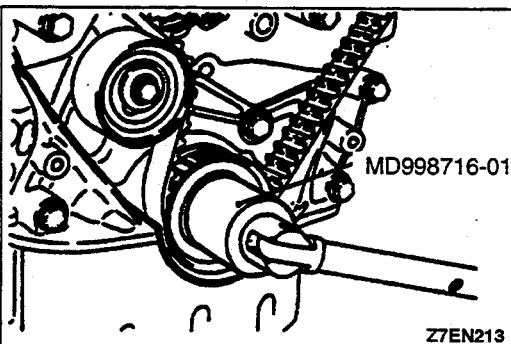
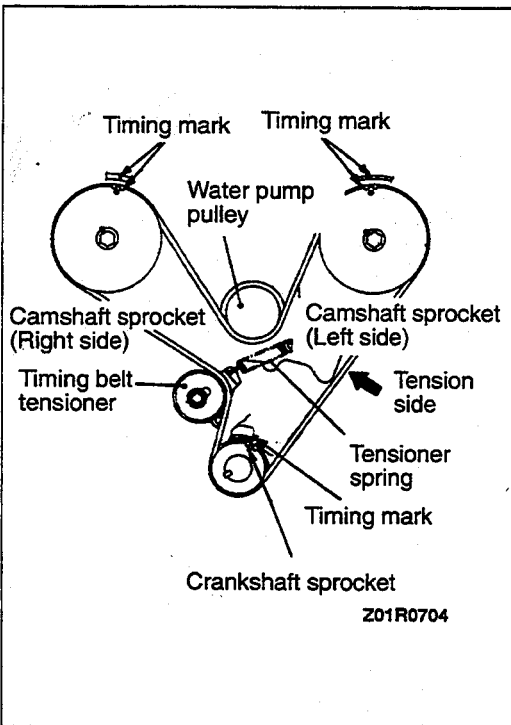
- (1) Align the timing marks of the camshaft sprockets (on the right and left sides) and the crankshaft sprocket (at the top dead center of the No. 1 cylinder compression stroke).
- (2) First, route the timing belt on the crankshaft sprocket, then on the camshaft sprocket on the side without slackness in the tight side.
- (3) Next, run the timing belt onto the water pump pulley, the camshaft sprocket on the left side, and the timing belt tensioner.
- (4) Apply force counterclockwise to the camshaft sprocket on the right side. If the tight side of the belt is defective, check that the timing marks are all aligned.

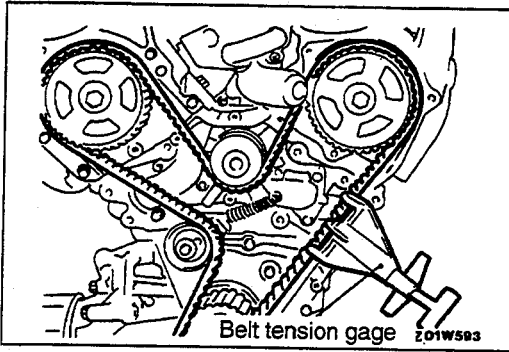
- (5) Attach the flange.
- (6) Loosen the fixing bolts of the provisionally-tightened tensioner one or two turns and tighten the timing belt with the tensioner spring force.
- (7) Use the special tool to turn the crankshaft two turns in the normal rotating direction (clockwise).

NOTE

Turn the crankshaft smoothly, but not in the opposite direction (counterclockwise).

- (8) Re-align the sprocket's timing marks and tighten the tensioner fixing bolts.



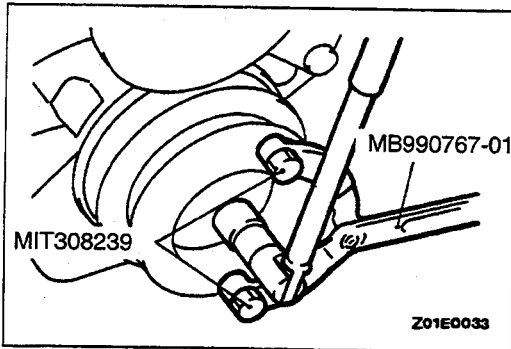


- (9) Measure the belt tension with a belt tension gage at the indicated place.

Standard value: 200–300 N (44.1–66.1 lbs.)

Caution

Touch the hooks to the tooth bottoms and the spindle to the back of the belt.



▶B◀ CRANKSHAFT PULLEY INSTALLATION

Use the special tool to attach the crankshaft pulley to the crankshaft.

ENGINE OIL COOLER

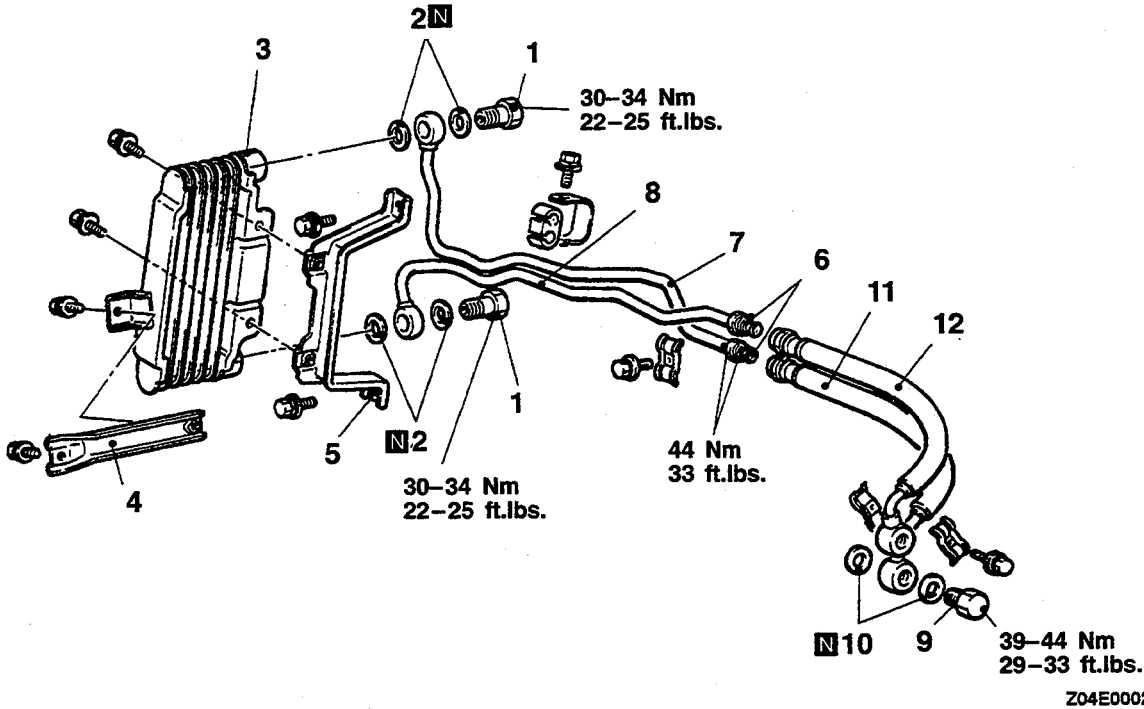
REMOVAL AND INSTALLATION

Pre-removal Operation

- Radiator Grille Removal

Post-installation Operation

- Radiator Grille Installation
- Engine Oil Supplying and Checking



Removal steps

1. Eye bolts
2. Gaskets
3. Engine oil cooler
4. Stay
5. Bracket
6. Engine oil cooler pipe connection

7. Return pipe
8. Feed pipe
9. Eye bolts
10. Gaskets
11. Return hose
12. Feed hose

REMOVAL SERVICE POINT

▶A◀ EYE BOLTS REMOVAL

Caution

Be sure to hold the weld nut of the oil cooler while loosening the eye bolt.

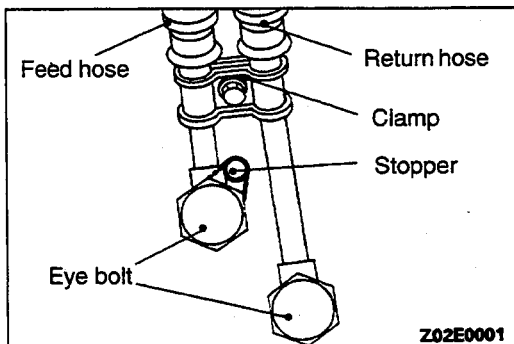
INSPECTION

- Check for foreign material between the oil cooler fins.
- Check the oil cooler fins for bends or damage.
- Check the oil cooler pipes for cracks, damage, clogging or deterioration.

INSTALLATION SERVICE POINTS

▶A◀ FEED HOSE/RETURN HOSE/EYE BOLTS (ENGINE SIDE) INSTALLATION

- (1) Provisionally tighten the eye bolts, and install the clamp so that it touches the crimps on the hoses.
- (2) Fully tighten the eye bolt on the return hose.
- (3) Place the feed hose against the stopper, and fully tighten the eye bolt on the feed hose.



3.0L ENGINE <SOHC-24VALVE>

110005687

GENERAL SPECIFICATIONS

Items		Specifications	
Type		V-type, Over Head Camshaft	
Number of cylinders		6	
Bore mm (in.)		91.1 (3.587)	
Stroke mm (in.)		76.0 (2.992)	
Piston displacement cm ³ (cu.in.)		2,972 (181.4)	
Compression ratio		9.0	
Firing order		1-2-3-4-5-6	
Valve overlap		19°	
Valve timing	Intake valve	Opens (BTDC)	45°
		Closes (ABDC)	49°
	Exhaust valve	Opens (BBDC)	15°
		Closes (ATDC)	34°
Intake valve duration		244°	
Exhaust valve duration		244°	

SERVICE SPECIFICATIONS

110005688

Items			Standard value	Limit	
Drive belt deflection mm (in.)	Generator V-ribbed type	When checked	A	5.0–7.0 (.20–.28)	–
			B	8.5–10.5 (.33–.41)	–
		When new belt is installed	A	4.0–5.0 (.16–.20)	–
			B	5.5–7.5 (.22–.30)	–
		When used belt is installed	A	5.5–6.5 (.22–.26)	–
			B	8.0–9.0 (.31–.35)	–
	Power steering pump	When checked		10.5–14.5 (.41–.57)	–
				9.5–11.5 (.37–.45)	–
				11.5–13.5 (.45–.53)	–
	A/C compressor	When checked		6.5–7.5 (.26–.30)	–
				5.0–6.0 (.20–.24)	–
				6.5–7.5 (.26–.30)	–
Drive belt tension N (lbs.)	Generator V-ribbed type	When checked	392–588 (87–130)	–	
		When new belt is installed	637–833 (141–184)	–	
		When used belt is installed	441–539 (98–119)	–	
	Power steering pump	When checked	294–490 (66–110)	–	
		When new belt is installed	490–686 (110–154)	–	
		When used belt is installed	343–441 (77–99)	–	
Basic ignition timing at idle			5°±3° BTDC	–	
Actual ignition timing at curb idle			15° BTDC	–	
CO concentration %			0.5 or less	–	
HC concentration PPM			100 or less	–	
Curb idle speed rpm			700±100	–	

TSB Revision

Items	Standard value	Limit
Compression pressure (250-400 rpm) kPa (psi)	1,200 (171)	min. 890 (127)
Compression pressure difference of all cylinder kPa (psi)	–	max. 100 (14)
Intake manifold vacuum at curb idle kPa (in.Hg)	–	min. 60 (18)
Timing belt Amount of projection of auto tensioner rod mm (in.). (Distance between the tensioner arm and auto tensioner body)	3.8–4.5 (.149–.177)	–

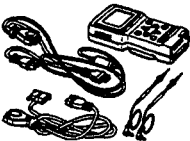

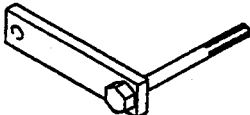

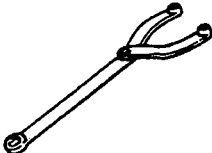
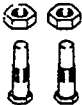
SEALANT


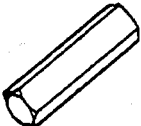

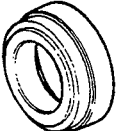
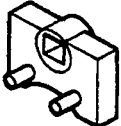

110005689

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

SPECIAL TOOLS

110005690

Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool (MUT-II)		Checking of the diagnostic trouble code
 Z16X0807	ROM pack		
	MD998781 Flywheel stopper		Flywheel <M/T> or drive plate <A/T> supporting
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Installation of the crankshaft rear oil seal
	MB990767 End yoke holder	MB990767-01	Supporting the sprocket and shaft pulley during removal and installation Use with MD998715
	MD998715 Pulley holding pins		Supporting the crankshaft pulley when crank- shaft bolt and pulley are removed or reinstalled. Use together with MB990767 Camshaft pulley supporting

Tool	Tool number and name	Supersession	Application
	MD998769 Crankshaft sprocket spacer		Used if the crankshaft needs to be rotated to attach the timing belt, etc.
	MD998051 Wrench, cylinder head bolt	MD998051-01	Loosening and tightening of cylinder head bolt
	MD998713 Camshaft oil seal installer	MD998713-01	Camshaft oil seal installation
	MB991559 Camshaft oil seal installer		Press fitting the camshaft oil seal (For left bank)
	MD998767 Tension pulley socket wrench		Adjustment of the timing belt
	MD998717 Crankshaft front oil seal installer		Press-fitting of crankshaft front oil seal

TROUBLESHOOTING

110005691

Trouble Symptom	Probable Cause	Remedy
Compression is too low	Blown cylinder head gasket	Replace the gasket.
	Worn or damaged piston rings	Replace the rings.
	Worn piston or cylinder	Repair or replace the piston and/or the cylinder block.
	Worn or damaged valve seat	Repair or replace the valve and/or the seat ring
Drop in oil pressure	Engine oil level is too low	Check the engine oil level.
	Malfunction of oil pressure switch	Replace the oil pressure switch.
	Clogged oil filter	Install a new filter.
	Worn oil pump gears or cover	Replace the gears and/or the cover.
	Thin or diluted engine oil	Change the engine oil to the correct viscosity.
	Stuck (open) oil relief valve	Repair the relief valve.
	Excessive bearing clearance	Replace the bearings.

TSB Revision

Trouble Symptom	Probable Cause	Remedy
Oil pressure too high	Stuck (closed) oil relief valve	Repair the relief valve.
Noisy valves	Malfunction of lash adjuster	Replace the lash adjuster.
	Thin or diluted engine oil (low oil pressure)	Change the engine oil.
	Worn or damaged valve stem or valve guide	Replace the valve and/or the guide.
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check the engine oil level.
	Thin or diluted engine oil	Change the engine oil.
	Excessive bearing clearance	Replace the bearings.

SERVICE ADJUSTMENT PROCEDURES

110005692

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

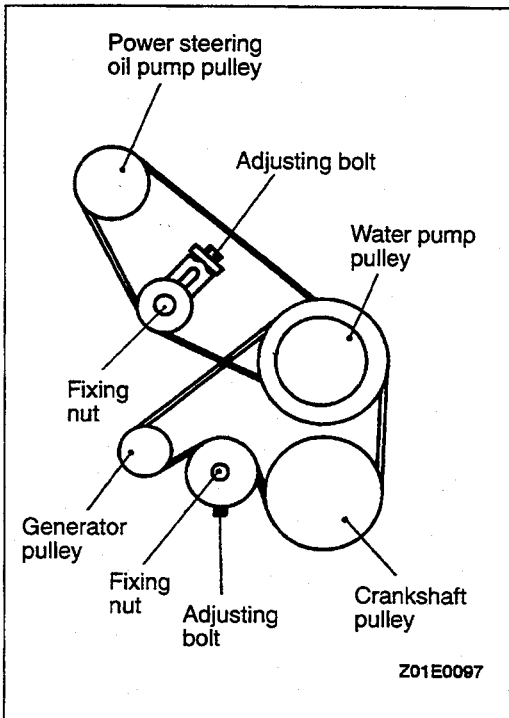
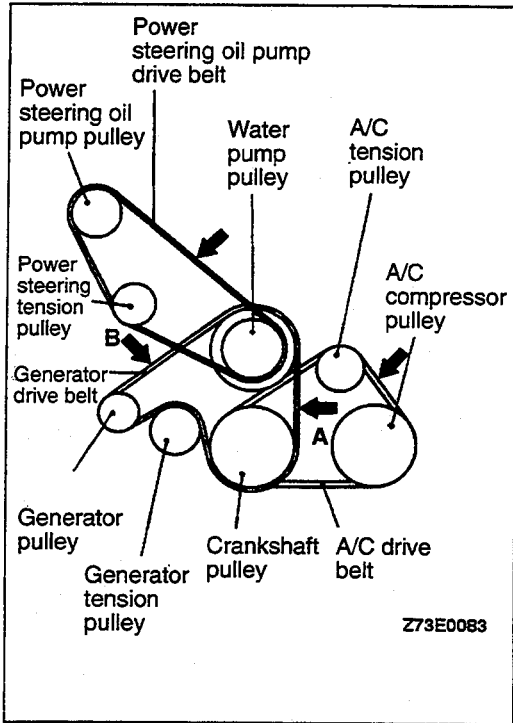
Apply 98 N (22 lbs.) of force to the belt midway between the pulleys as shown in the illustration, and measure the deflection, or by using a belt-tension gage, check the belt tension.

Standard value:

Item		Check value	Adjustment value new belt	Adjustment value used belt
For generator	Deflection mm (in.)	A: 5.0–7.0 (.20–.28)	A: 4.0–5.0 (.16–.20)	A: 5.5–6.5 (.22–.26)
		B: 8.5–10.5 (.33–.41)	B: 5.5–7.5 (.22–.30)	B: 8.0–9.0 (.31–.35)
	Tension N (lbs.)	392–588 (87–130)	637–833 (141–184)	441–539 (98–119)
For power steering	Deflection mm (in.)	10.5–14.5 (.41–.57)	9.5–11.5 (.37–.45)	11.5–13.5 (.45–.53)
	Tension N (lbs.)	294–490 (66–110)	490–686 (110–154)	343–441 (77–99)
For A/C	Deflection mm (in.)	6.5–7.5 (.26–.30)	5.0–6.0 (.20–.24)	6.5–7.5 (.26–.30)

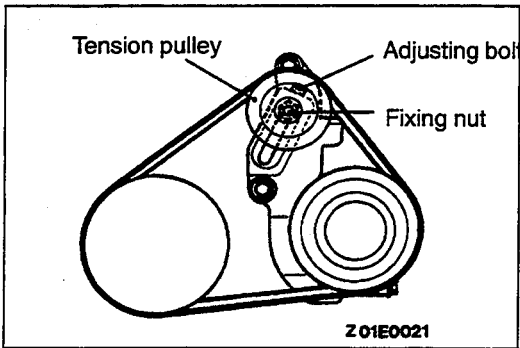
A: Measure between the water pump pulley and the crankshaft pulley.

B: Measure between the water pump pulley and the generator.



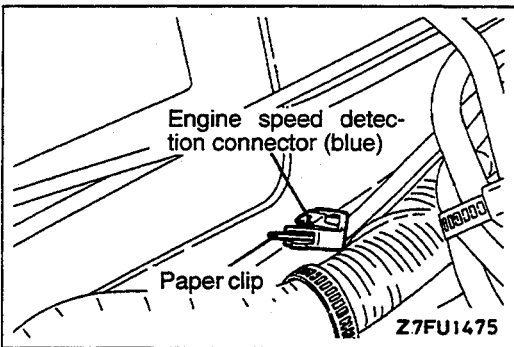
GENERATOR DRIVE BELT AND POWER STEERING OIL PUMP DRIVE BELT TENSION ADJUSTMENT

- (1) Loosen the tension pulley fixing nut.
- (2) Adjust the belt tension using the adjusting bolt.
- (3) Tighten the fixing nut.
- (4) Crank the engine once or more.
- (5) Check the belt tension.



AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

- (1) Loosen the tension pulley fixing nut.
- (2) Adjust the belt tension using the adjusting bolt.
- (3) Tighten the fixing nut.
- (4) Crank the engine once or more.
- (5) Check the belt tension.



IGNITION TIMING INSPECTION

110005693

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)
- (2) Insert a paper clip into the engine speed detection connector (blue), and then connect a tachometer to the paper clip.

NOTE

Do not use the scan tool. If the scan tool is connected to the data link connector, the ignition timing will be unchanged instead of reverting to the basic ignition timing.

- (3) Set the timing light.
- (4) Start the engine and run it at idle.
- (5) Check the curb idle speed.

Curb Idle speed: 700±100 rpm

NOTE

The reading on the tachometer indicates one-third of the actual engine speed. In other words, the actual engine speed is three times the indication on the tachometer.

- (6) Turn the ignition switch to OFF.
- (7) Disconnect the waterproof female connector from the ignition timing adjustment connector (brown).
- (8) Use a jumper wire to ground the ignition timing adjustment terminal.

NOTE

Grounding this terminal sets the engine to the basic ignition timing.

- (9) Start the engine and run it at idle.
- (10) Check the basic ignition timing.

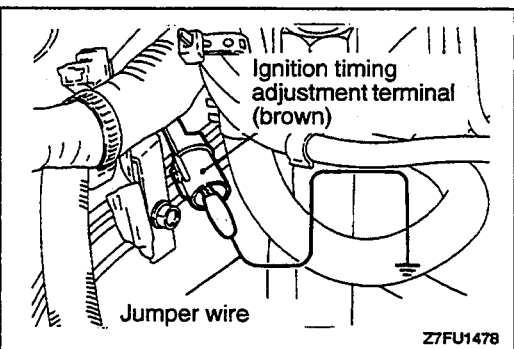
Basic ignition timing: 5° BTDC±3°

- (11) If the ignition timing is not within the standard value range, refer to GROUP 13A – On-vehicle Inspection of MFI Components and inspect the crankshaft position sensor.
- (12) Disconnect the jumper wire connected at step (8).
- (13) Check that the idling ignition timing is at the correct value.

Actual ignition timing: Approx. 15° BTDC

NOTE

- (1) Ignition timing is variable within about±7°, even under normal operating conditions.
- (2) And it is automatically further advanced by about 5° from 15° BTDC at higher altitudes.



CURB IDLE SPEED INSPECTION

110005694

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)
- (2) Check the basic ignition timing.

Standard value: 5° BTDC±3°

- (3) After turning the ignition switch to OFF, connect a tachometer or the scan tool to the data link connector (white).

NOTE

For the procedures for setting the tachometer, refer to P.11A-36.

- (4) Start the engine and run it at idle.
- (5) Run the engine at idle for 2 minutes.
- (6) Check the idle speed.

Curb idle speed: 700±100 rpm

NOTE

The idle speed is adjusted automatically by the idle air control (IAC) system.

- (7) If there is a deviation from the standard value refer to GROUP 13A – Check Chart Classified by Trouble Symptoms, and check the MFI components.

IDLE MIXTURE INSPECTION

110005695

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)
- (2) Check to be sure that the ignition timing is at the standard value.

Standard value: 5° BTDC±3°

- (3) After turning the ignition switch to OFF, connect a tachometer, or connect the scan tool to the data link connector.

NOTE

For the procedures for setting the tachometer, refer to P.11A-36.

- (4) Start the engine and race it at an engine speed of 2,500 rpm for two minutes.
- (5) Connect a CO and HC tester.
- (6) Check the CO concentration and the HC concentration while the engine is idling.

**Standard value: CO concentration: 0.5% or less
HC concentration: 100 ppm or less**

- (7) If the concentrations are outside the standard values, check the following items.
 - Diagnostic output
 - Closed loop control
(If closed loop control is being carried out normally, the heated oxygen sensor output signal will vary between 0–400 mV and 600–1,000 mV while the engine is idling.)
 - Fuel pressure
 - Injectors
 - Ignition coil, spark plug cables, spark plugs
 - Evaporative emission control system
 - Compression pressure

NOTE

If the results of the checks for all items are normal but the CO and HC concentrations still exceed the standard values, replace the three-way catalyst.

DASHPOT INSPECTION AND ADJUSTMENT
<1995 models for California>

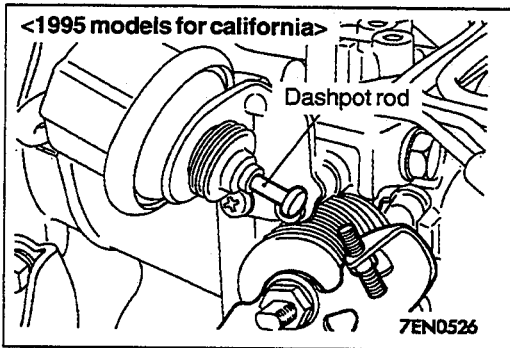
110008465

- (1) Inspect the idle speed before inspection and adjustment of the dashpot.
- (2) Set the vehicle in the following conditions before dashpot inspection and adjustment.
 - Engine coolant temperature: 80–95°C
 - Lights, electrical cooling fan and accessories: OFF
 - Transaxle: neutral
- (3) Set the tachometer or connect the scan tool to the data link connector (white).

NOTE

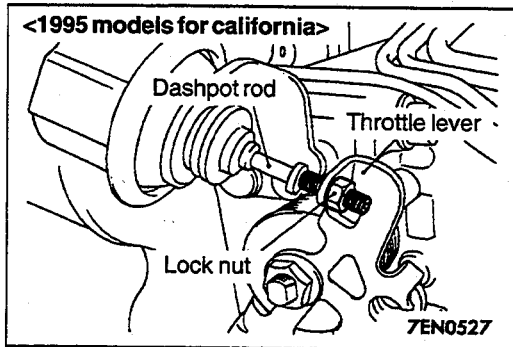
For the procedures for setting the tachometer, refer to P.11-36.

- (4) Start the engine.



- (5) Open the throttle valve until the dashpot rod makes a full stroke.
- (6) Close the throttle valve slowly to find a point where the throttle lever contacts the dashpot rod (a point where the dashpot starts to contract). Hold the throttle valve at this point.
- (7) Check the engine speed (at which the dashpot starts to operate).

Standard value: 2,200±200 rpm



- (8) If the engine speed is not within the specified limit, loosen the lock nut on the rod and turn the rod to make adjustment for proper dashpot starting engine speed.
- (9) Release the throttle valve to make sure that the engine speed slowly drops to the idle speed.

COMPRESSION PRESSURE CHECK

110005696

- (1) Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)
- (2) Disconnect the spark plug cables.
- (3) Remove all of the spark plugs.
- (4) Disconnect the crankshaft position sensor connector.

NOTE

Doing this will prevent the engine control module from carrying out ignition and fuel injection.

- (5) Cover the spark plug hole with a rag, 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. Do not let water, oil, fuel, etc. enter the cylinder through cracks, or these heated materials will gush out from the spark plug hole, which is dangerous.

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

Standard value: 1200 kPa (171 psi.)/250–400 rpm

Limit: min. 890 kPa (127 psi.)/250–400 rpm

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

Limit: max. 100 kPa (14 psi.)

- (9) If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (6) to (8).

- 1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
- 2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure leaking from the gasket.

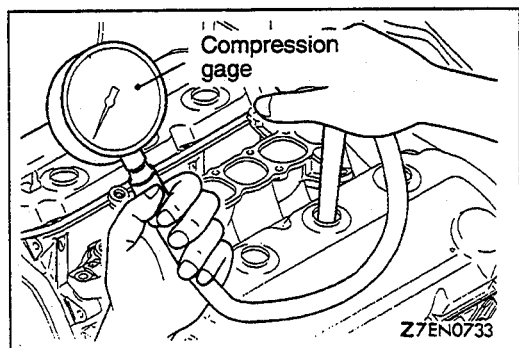
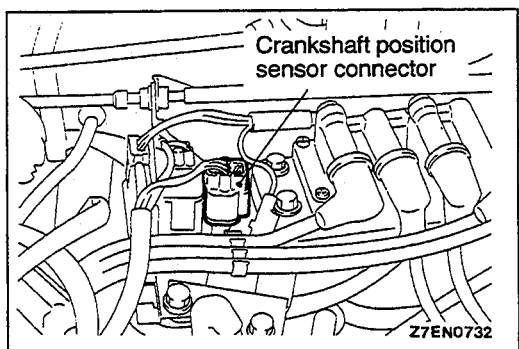
- (10) Reconnect the crankshaft position sensor connector.

- (11) Reinstall the spark plugs and spark plug cables.

- (12) Use the scan tool to erase the diagnostic trouble codes, or disconnect the negative battery cable for 10 seconds or more and then re-connect it.

NOTE

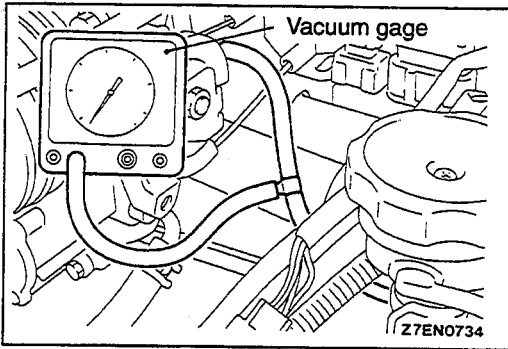
This will erase the diagnostic trouble code resulting from the distributor connector being disconnected.



MANIFOLD VACUUM INSPECTION

110005697

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for A/T)



- (2) Connect a tachometer or connect the scan tool to the data link connector (white).

NOTE

For the procedures for setting the tachometer, refer to P.11A-36.

- (3) Connect a three-way joint to the vacuum hose between the intake manifold plenum and the fuel-pressure regulator, and then connect a vacuum gage.
- (4) Start the engine and check that the idle speed is within the standard value range.
Take a reading of the vacuum gage.

Limit: min. 60 kPa (18 in.Hg)

LASH ADJUSTER CHECK

110005698

NOTE

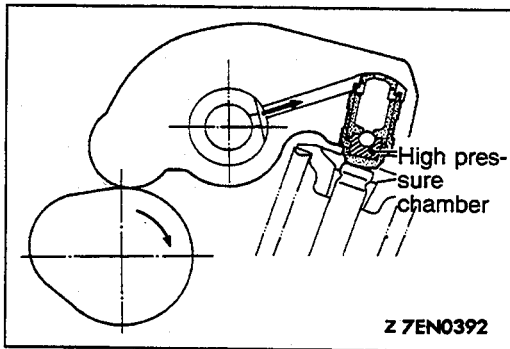
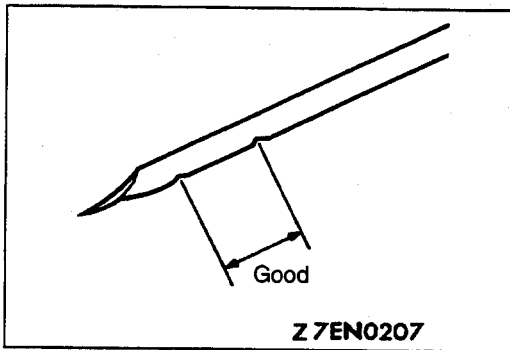
Directly after starting the engine or while the engine is running, if an abnormal sound (knocking) that seems to be coming from the lash adjuster is heard and doesn't stop, carry out the following inspection.

- (1) Check the engine oil and replenish or replace the oil if necessary.

NOTE

- If there is a small amount of oil, air is sucked in through the oil strainer and gets into the oil passage.
- If the amount of oil is greater than normal, oil is mixed by the crank, and a large amount of air is mixed into the oil.
- Air and oil will not separate easily in oil that has degenerated, and the amount of air mixed into the oil will increase.

If the air mixed into the oil due to the above reasons gets into the high pressure chamber of the lash adjuster, the air inside the high pressure chamber will be compressed when the valve is open and the lash adjuster will over-compress, resulting in an abnormal noise when the valve closes. This is the same effect as if the valve clearance is adjusted by mistake to be too large. Here, if the air inside the lash adjuster is released, then the operation has returned to normal.



- (2) Start the engine and gently race * the engine several times (10 times or less).

If the abnormal noise is stopped by the racing, air has been released from the high pressure chamber, and the functioning of the lash adjuster has returned to normal.

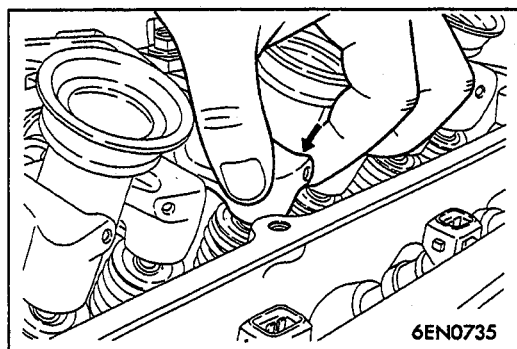
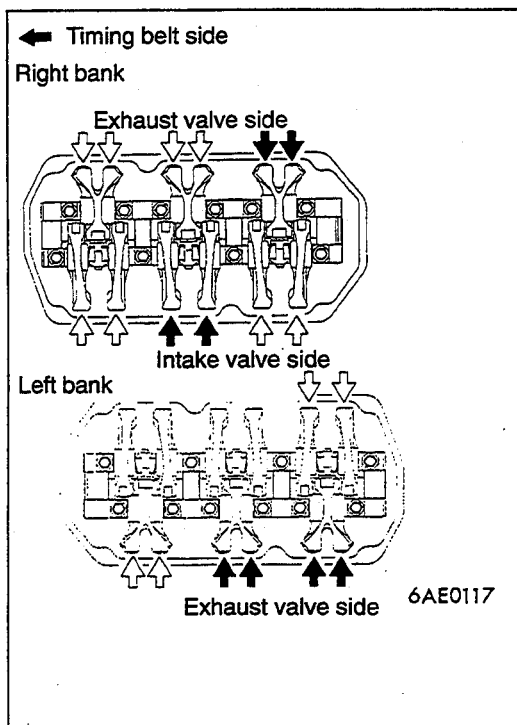
- * After gradually increasing the engine speed from idle speed to 3000 rpm (over 30 seconds), gradually reduce the engine speed back to idle speed (over 30 seconds).

NOTE

- Parking on a slope for a long period will decrease the amount of oil inside the lash adjuster, and then air may get into the high pressure chamber when starting the engine.
- After parking the vehicle for long periods, the oil drains out of the oil passage, and it takes time for the oil to be supplied to the lash adjuster, so air can get into the high pressure chamber.

- (3) If the abnormal noise is not stopped by the racing, check the lash adjuster by the following procedure.

- 1) Stop the engine.
- 2) Set the engine No. 1 cylinder to the compression top dead center position.
- 3) Push the rocker arm in the locations indicated by ⇨ in the illustration at left to check if the rocker arm moves down or not.
- 4) Slowly turn the crankshaft 360° clockwise.
- 5) Check the rocker arm in the locations indicated by ➡ in the illustration at left using the same procedure as in step 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 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 Service Manual.

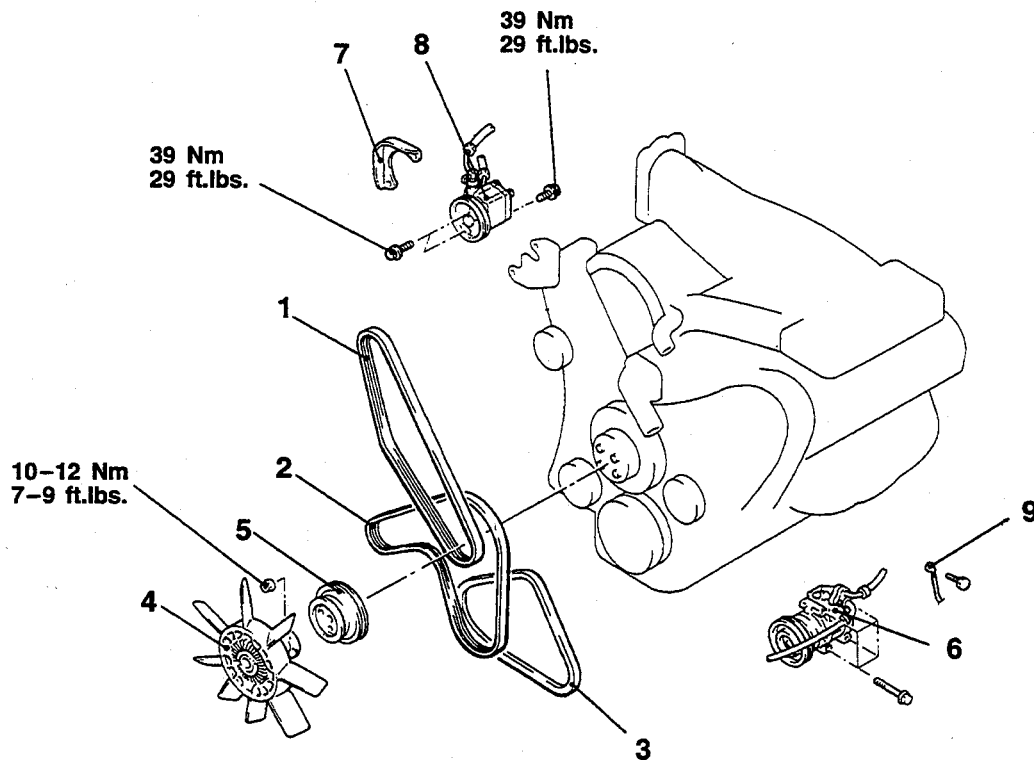
Furthermore, if the rocker arm feels extremely stiff and cannot be lowered when it is pressed, the lash adjuster is normal, so investigate for another cause of the abnormality.

ENGINE ASSEMBLY**REMOVAL AND INSTALLATION****Pre-removal Operation**

- Hood Removal (Refer to GROUP 42 – Hood.)
- Battery and Battery Tray Removal
- Cruise Control Intermediate Link Removal (Refer to GROUP 13G – Cruise Control.)
- Radiator Removal (Refer to GROUP 14 – Radiator.)
- Under Skid Plate, Undercover Removal
- Front Exhaust Pipe <FEDERAL> or Warm up Three-way Catalytic Converter <CALIFORNIA> Removal (Refer to GROUP 15 – Exhaust Pipe, Muffler and Catalytic Converter.)
- Transmission and Transfer Assembly Removal (M/T: Refer to GROUP 22 – Transmission and Transfer Assembly) (A/T: Refer to GROUP 23 – Transmission and Transfer Assembly.)

Post-installation Operation

- Transmission and Transfer Assembly Installation (M/T: Refer to GROUP 22 – Transmission and Transfer Assembly.) (A/T: Refer to GROUP 23 – Transmission and Transfer Assembly.)
- Front Exhaust Pipe <FEDERAL> or Warm up three-way Catalytic Converter <CALIFORNIA> Installation (Refer to GROUP 15 – Exhaust Pipe, Muffler and Catalytic Converter.)
- Under Skid Plate, Undercover Installation
- Radiator Installation (Refer to GROUP 14 – Radiator.)
- Battery and Battery Tray Installation
- Cruise Control Intermediate Link Installation and Adjustment (Refer to GROUP 13G – Cruise Control.)
- Hood Installation (Refer to GROUP 42 – Hood.)
- Engine Adjustment (Refer to P.11A-35.)
- Accelerator cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
- Throttle Cable Adjustment <A/T> (Refer to GROUP 23 – Service Adjustment Procedures.)
- Engine Oil Supplying and Checking



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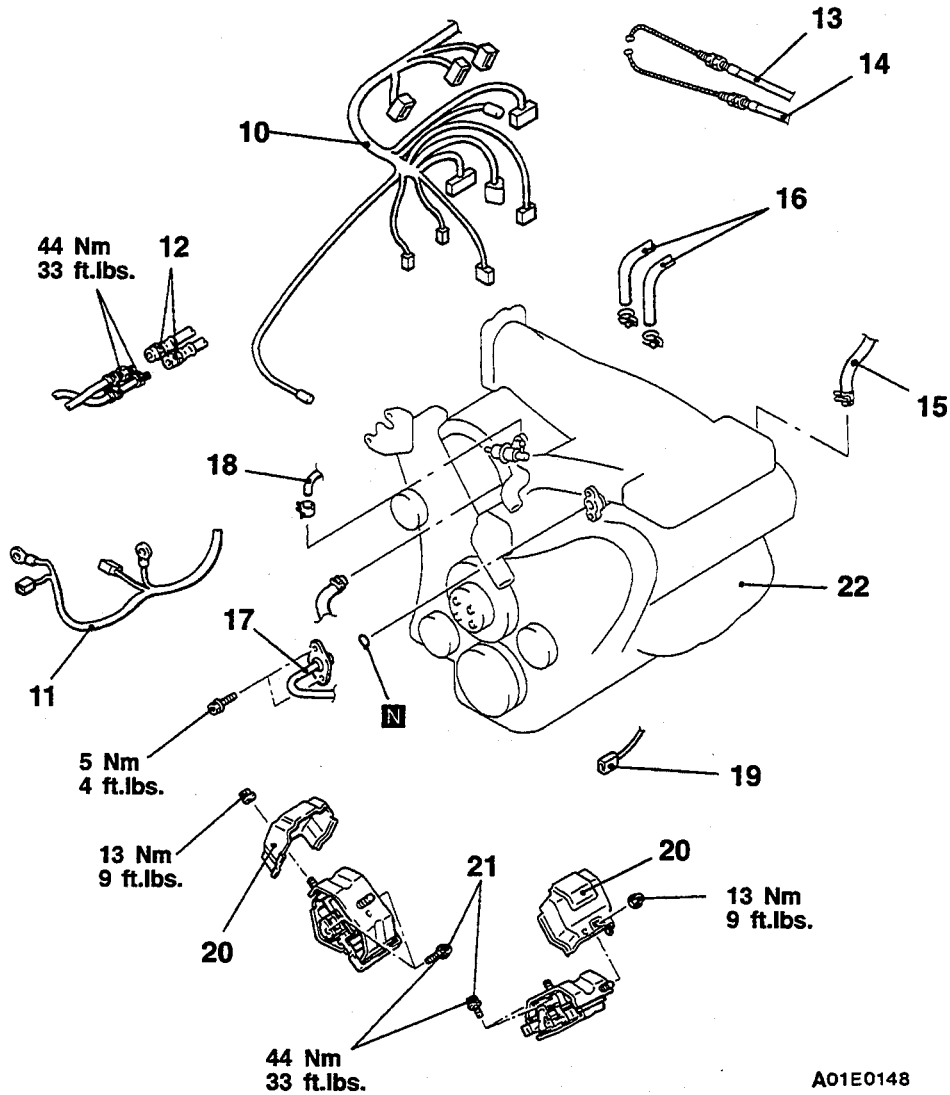
Removal Steps

1. Power steering drive belt
2. Generator drive belt
3. A/C drive belt
4. Cooling fan
5. Water pump pulley
6. A/C compressor

7. Cover
8. Power steering pump
9. Ground cable connection

◀A▶

TSB Revision



- 10. Engine control harness connection
- 11. Generator and starter harness connection
- 12. Engine oil cooler hose connection
- 13. Accelerator cable connection
- 14. Throttle cable connection
- 15. Brake booster vacuum hose connection

- 16. Heater hose connection
- 17. Fuel hose connection
- 18. Fuel return hose connection
- 19. Oil pressure switch harness connection
- 20. Heat protectors
- 21. Engine mounting bolt
- 22. Engine assembly

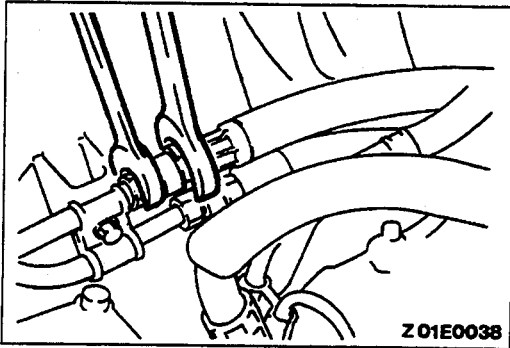
REMOVAL SERVICE POINTS

◀A▶ COMPRESSOR <A/C>/OIL PUMP (POWER STEERING) REMOVAL

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

NOTE

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

**◀B▶ OIL COOLER HOSE CONNECTION REMOVAL**

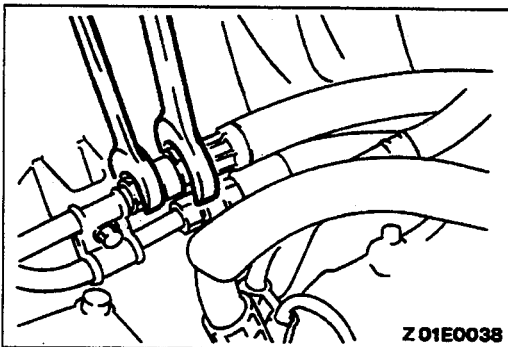
Use a spanner or similar tool to remove the oil cooler hose connection.

◀C▶ ENGINE ASSEMBLY REMOVAL

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

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

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

**▶B◀ OIL COOLER HOSE CONNECTION**

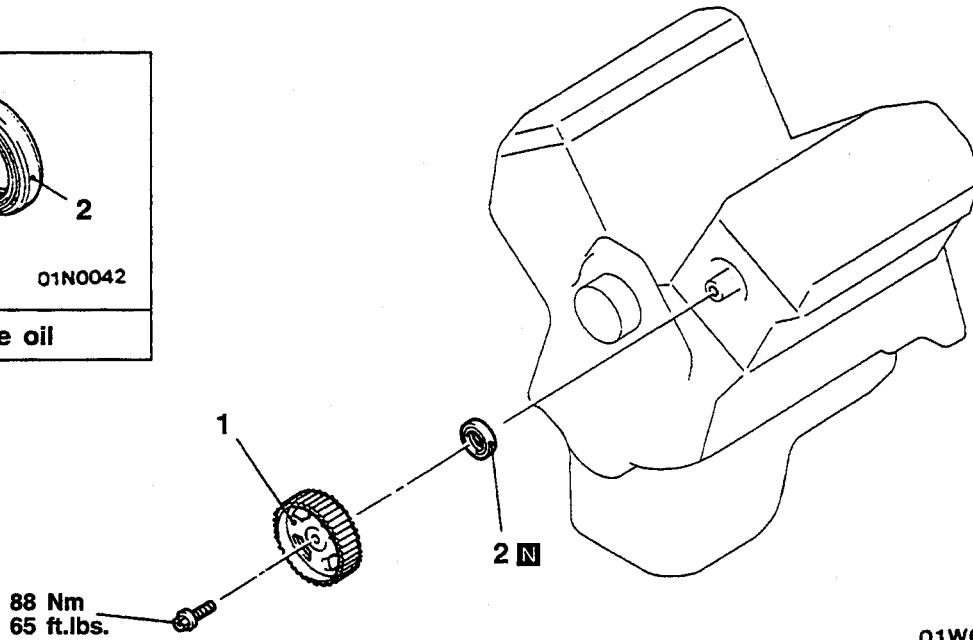
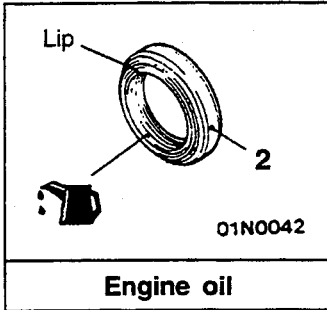
Use a spanner or similar tool to connect the oil cooler hose.

CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation operation

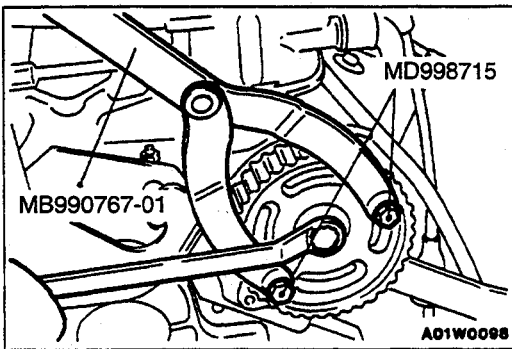
- Removal and Installation of Timing Belt (Refer to GROUP 11A-58.)



O1W0056
00002773

Removal steps

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



REMOVAL SERVICE POINTS

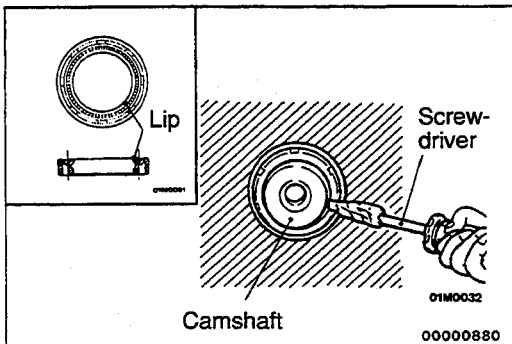
◀A▶ CAMSHAFT SPROCKET REMOVAL

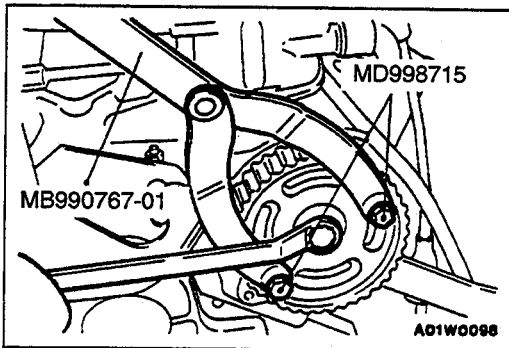
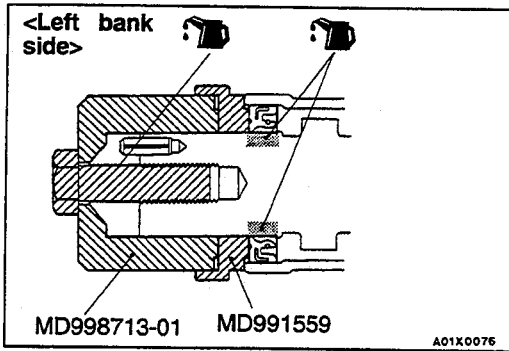
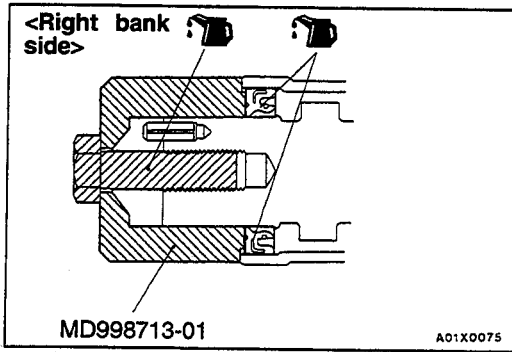
◀B▶ CAMSHAFT OIL SEAL REMOVAL

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

Caution

Use care not to damage the camshaft and cylinder head.





INSTALLATION SERVICE POINTS

▶A◀ CAMSHAFT OIL SEAL INSTALLATION

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

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

▶B◀ CAMSHAFT SPROCKET INSTALLATION

CRANKSHAFT OIL SEALS

FRONT OIL SEAL

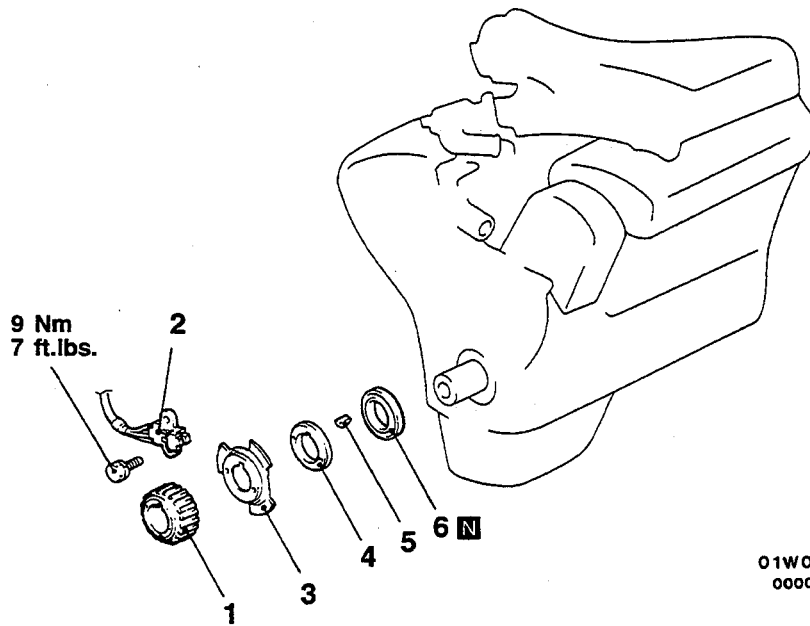
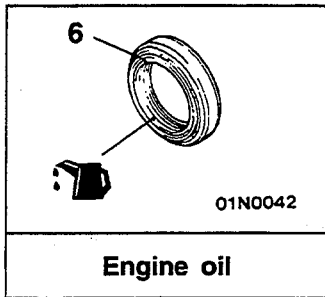
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Removal and Installation of Timing Belt (Refer to P.11A-58.)

Adjustment

- Engine Adjustment (Refer to P.11A-35.)

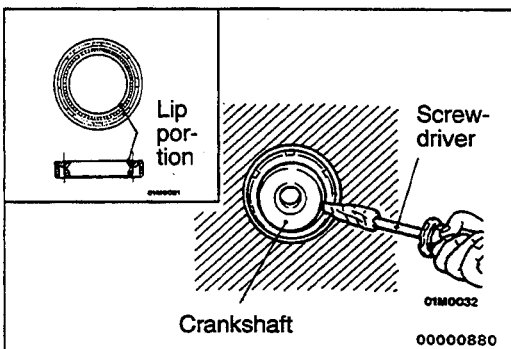


01W0058
00002774

Removal steps

1. Crankshaft sprocket
2. Crankshaft position sensor
3. Crankshaft sensing blade
4. Crankshaft spacer
5. Key
6. Crankshaft front oil seal

◀A▶ ▶B▶



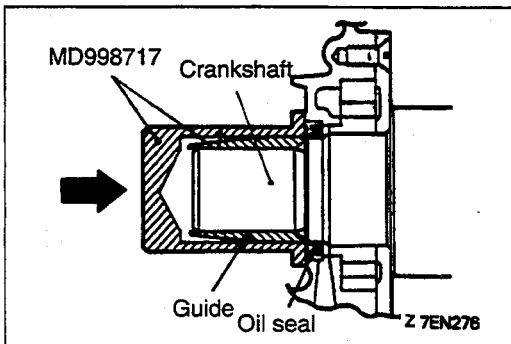
REMOVAL SERVICE POINT

◀A▶ **OIL SEAL REMOVAL**

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

Caution

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



INSTALLATION SERVICE POINT

▶A▶ **OIL SEAL INSTALLATION**

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

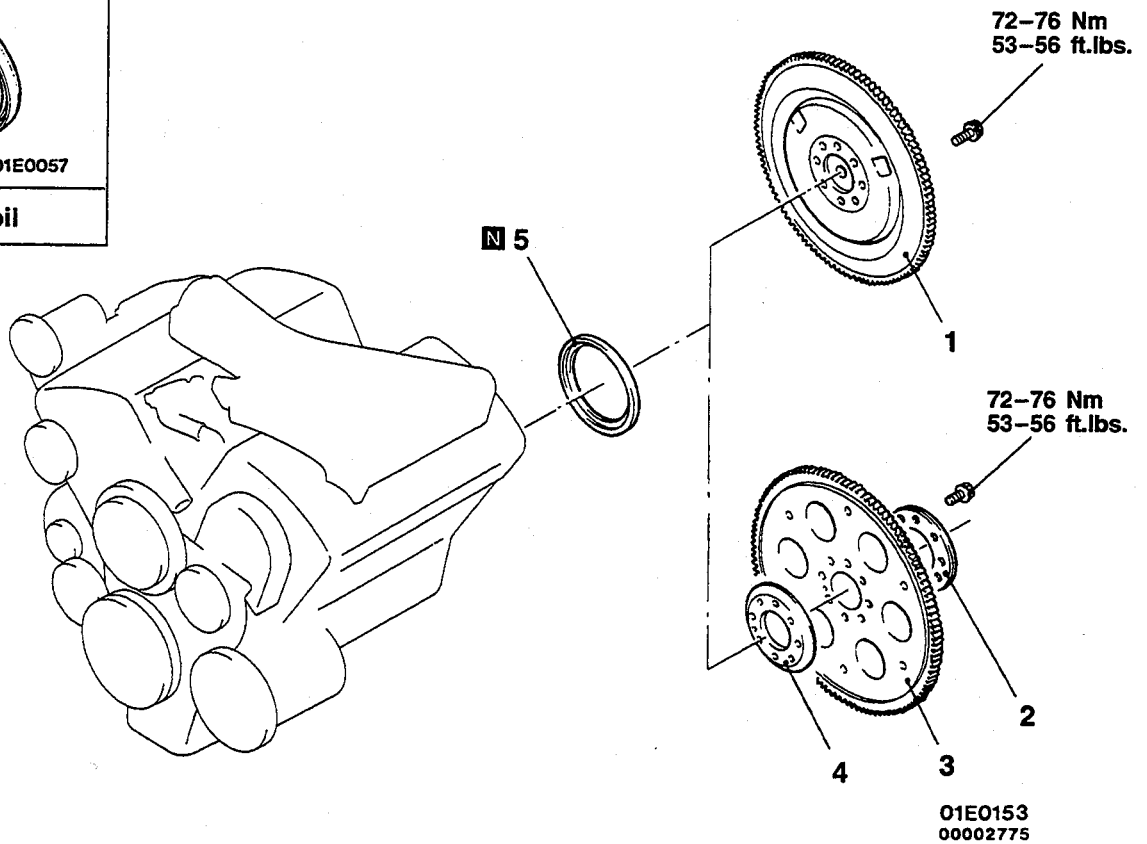
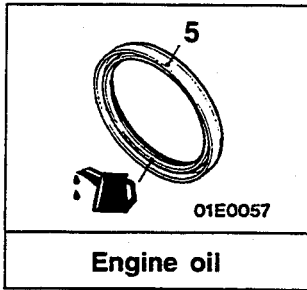
NOTE

Knock it as far as the surface.

**REAR OIL SEAL
REMOVAL AND INSTALLATION**

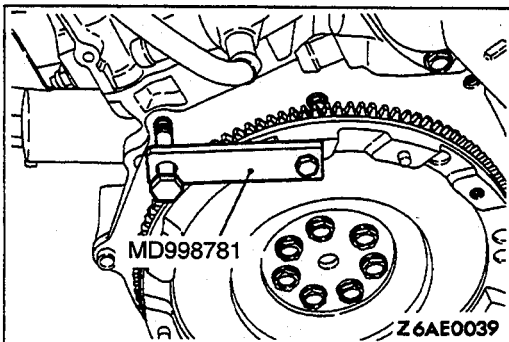
Pre-removal and Post-installation Operation

- Removal and Installation of Transmission
(M/T: Refer to GROUP – 22 Transmission and Transfer Assembly)
(A/T: Refer to GROUP 23 – Transmission and Transfer Assembly)



Removal Steps

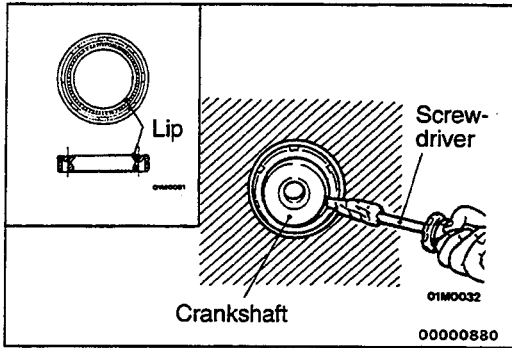
- | | | |
|-----|-----|----------------------------|
| ◀A▶ | ▶B▶ | 1. Flywheel assembly <M/T> |
| ◀A▶ | ▶B▶ | 2. Adaptor plate A <A/T> |
| ◀A▶ | ▶B▶ | 3. Drive plate <A/T> |
| ◀A▶ | ▶B▶ | 4. Adaptor plate B <A/T> |
| ◀B▶ | ▶A▶ | 5. Oil seal |



REMOVAL SERVICE POINTS

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

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

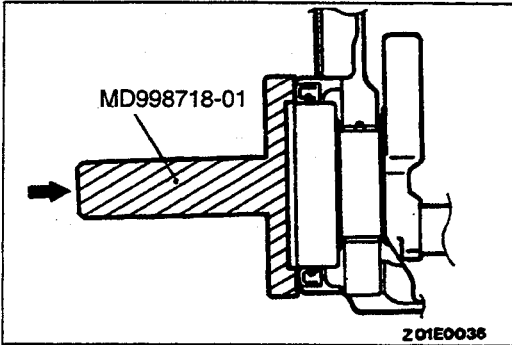


◀B▶ OIL SEAL REMOVAL

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

Caution

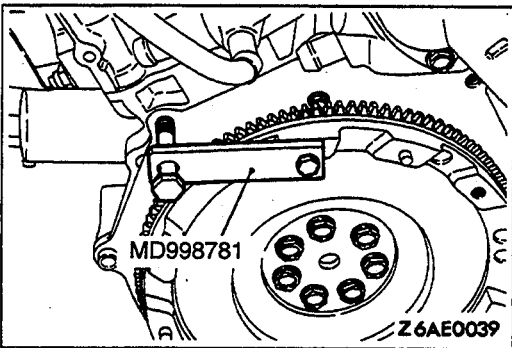
Take care not to damage the crankshaft and oil seal case.



INSTALLATION SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION

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



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

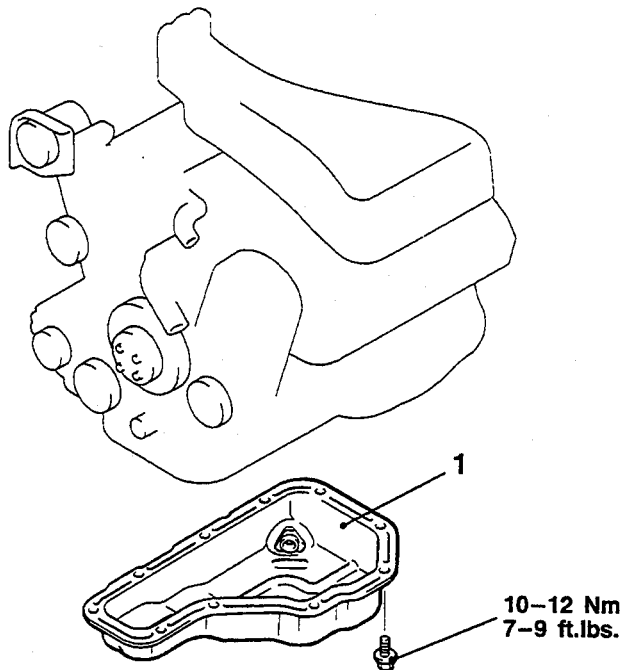
Use the special tool to secure the drive plate, and tighten the bolts.

OIL PAN AND OIL SCREEN**OIL PAN, LOWER****REMOVAL AND INSTALLATION****Pre-removal and Post-installation Operation**
Removal and Installation

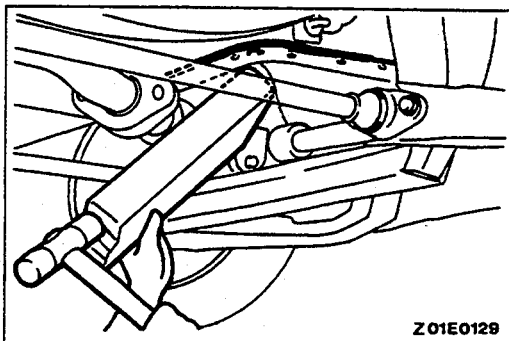
- Under Skid Plate, Undercover
- Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe, Mufflers and Catalytic Converter.)

Draining and Supplying

- Engine Oil (Refer to GROUP 00 – Maintenance Service.)

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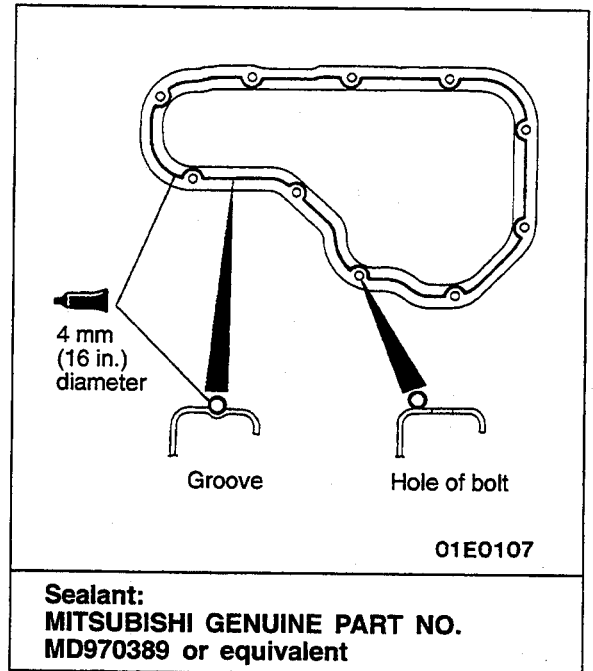
◀A▶ ▶A◀ 1. Oil pan, lower

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

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

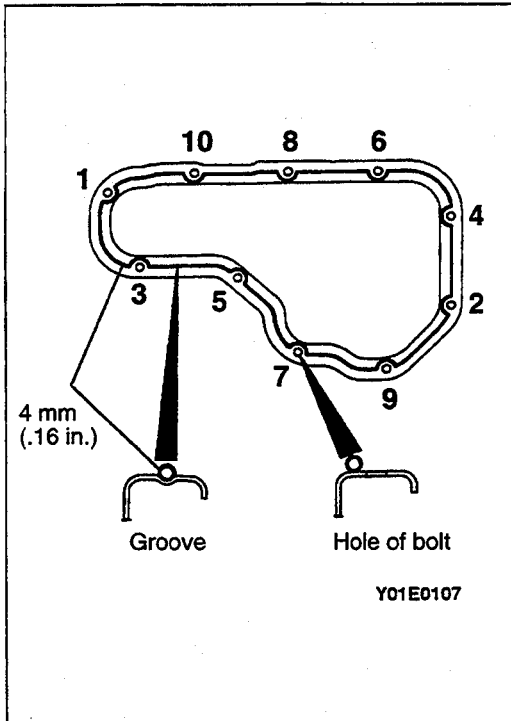
Caution

The use of an oil pan remover (MD998727) can damage the oil pan, upper (aluminum made).



INSPECTION

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

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

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE

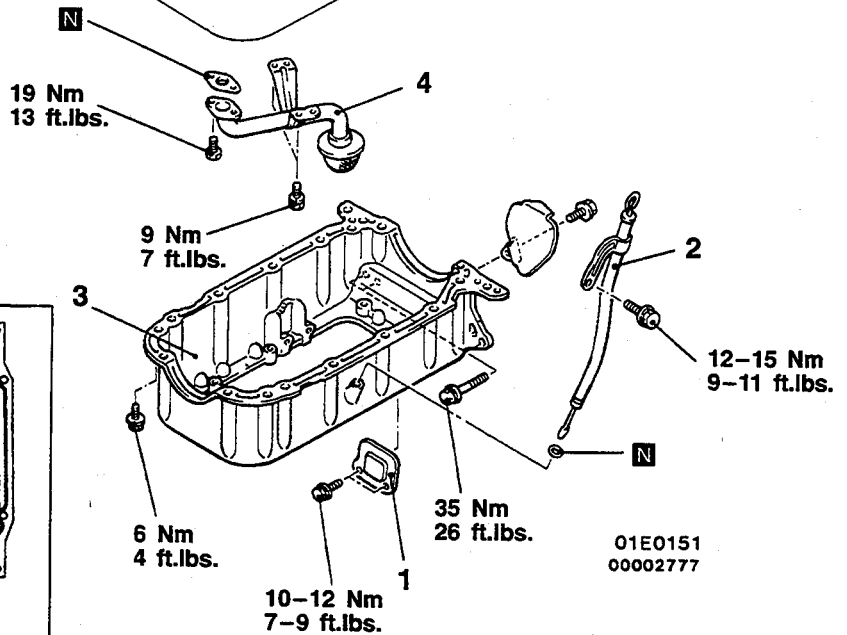
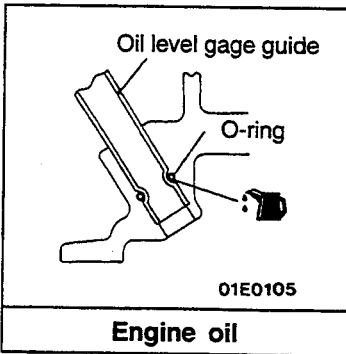
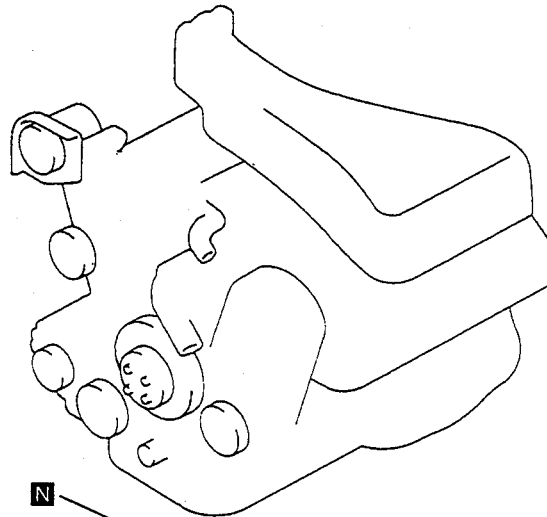
The sealant should be applied in a continuous bead approximately 4 mm (.16 in.) in diameter.

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

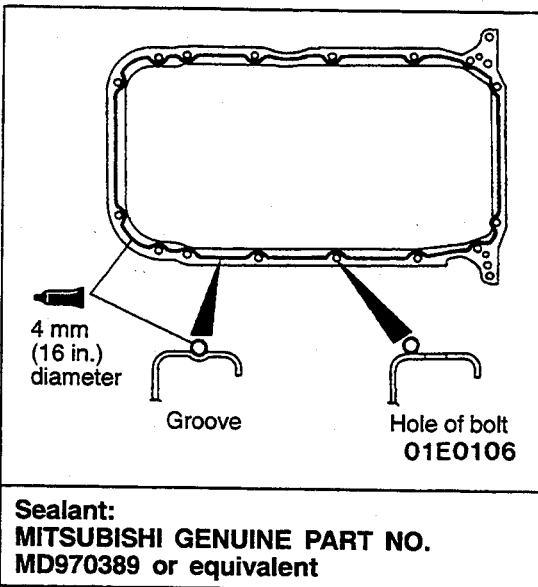
**OIL PAN, UPPER AND OIL SCREEN
REMOVAL AND INSTALLATION**

Pre-removal and Post-installation Operation
Removal and Installation

- Oil pan, Lower (Refer to P.11-51.)
- Front Differential Carrier (Refer to GROUP 26 – Differential Carrier.)



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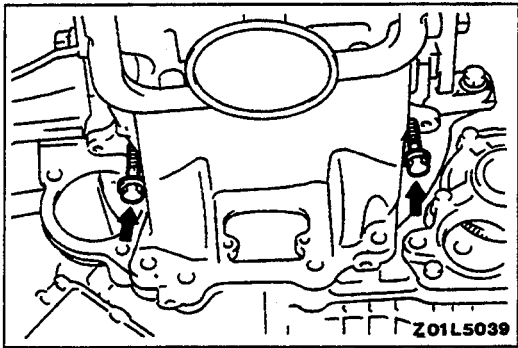


Removal steps

1. Cover
2. Oil level gage guide

3. Oil pan, upper
4. Oil screen

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

Install a bolt [diameter × length: 10 × 38 mm (.39 × 1.50 in.)] to link the oil pan, upper with the transaxle in the hole of the oil pan, upper as shown in the illustration, and then tighten the bolt to remove the oil pan, upper.

INSPECTION

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

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

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

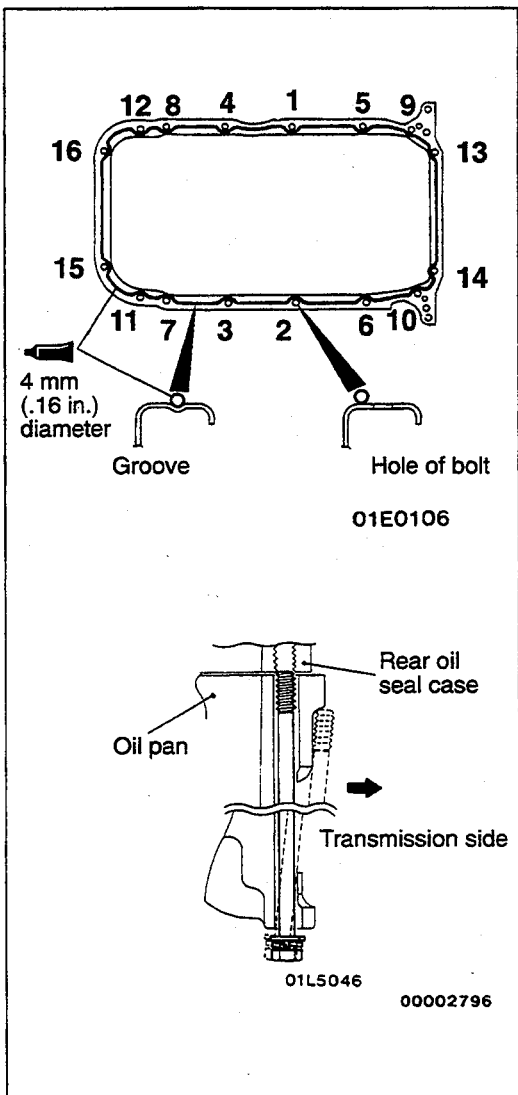
NOTE

The sealant should be applied in a continuous bead approximately 4 mm (.16 in.) in diameter.

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

Caution

The bolt holes for bolts 13 and 14 in the illustration are cut away on the transmission side, so be careful not to insert these bolts at an angle.

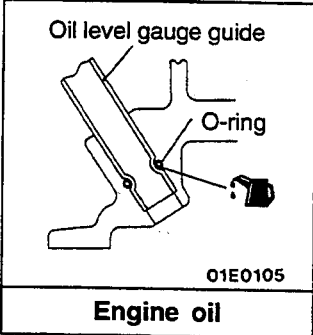
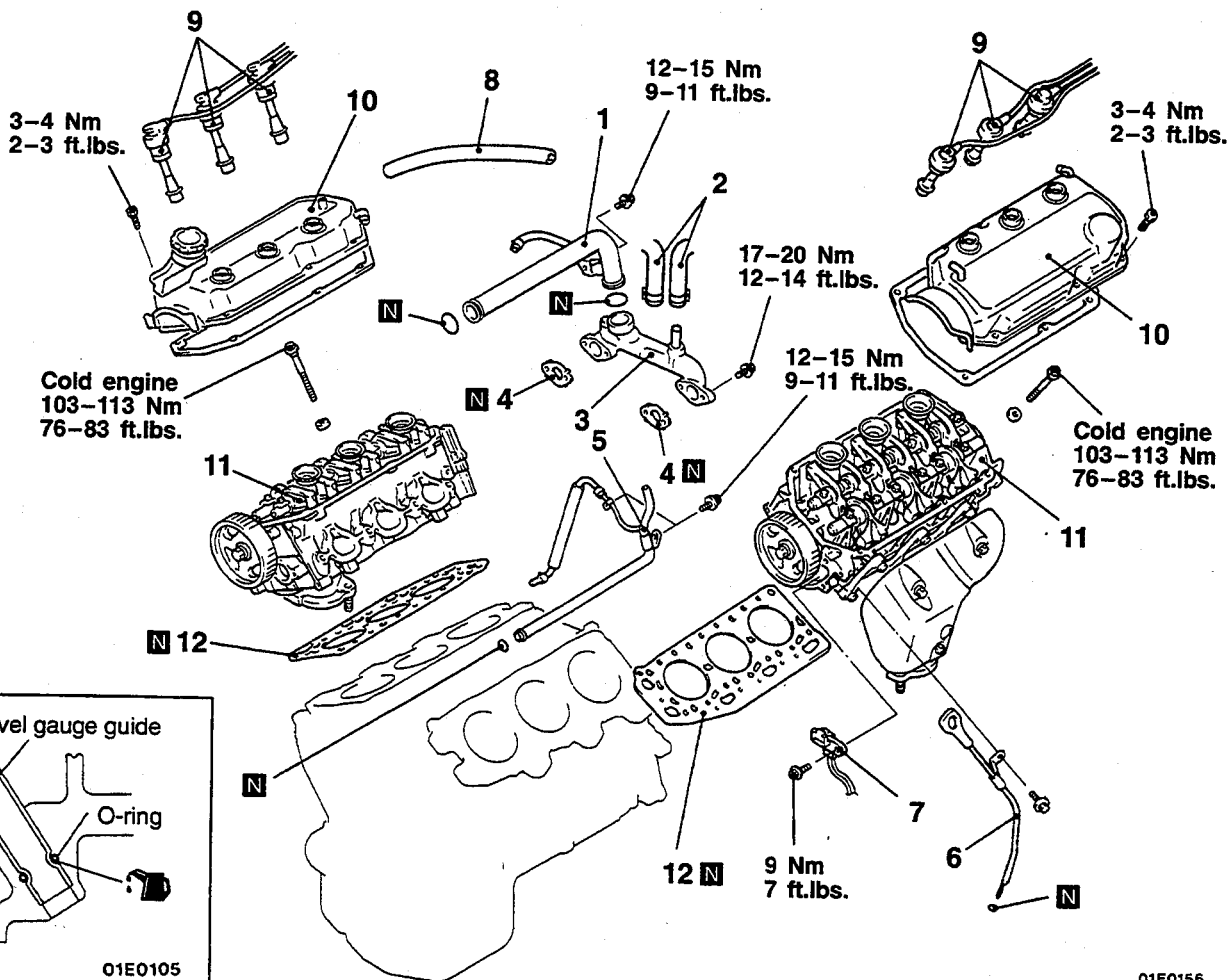


CYLINDER HEAD GASKET

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to GROUP 14 – Service Adjustment Procedures.)
- Removal and Installation of Timing Belt (Refer to P.11A-58.)
- Removal and Installation of intake Manifold (Refer to GROUP 15 – Intake Manifold.)

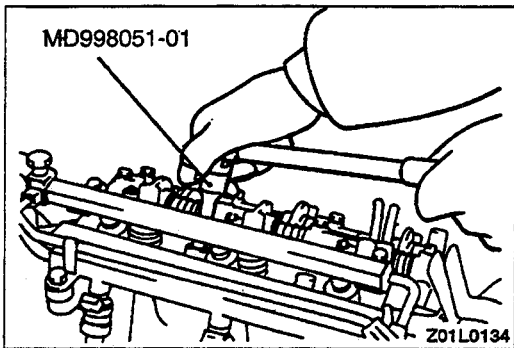


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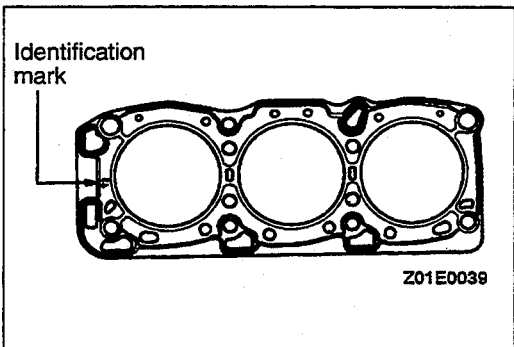
Removal steps

- ▶C◀ 1. Water outlet pipe
- ▶D◀ 2. Heater hose
- ▶D◀ 3. Water passage
- ▶C◀ 4. Gasket
- ▶C◀ 5. Water pipe and hose assembly
- ▶C◀ 6. Oil level gage guide <Only left bank is removed>
- ▶A◀ ▶B◀ 7. Camshaft position sensor <Only left bank is removed>
- ▶A◀ ▶B◀ 8. Ventilation hose
- ▶A◀ ▶B◀ 9. Spark plug cable
- ▶A◀ ▶B◀ 10. Rocker cover
- ▶A◀ ▶B◀ 11. Cylinder head assembly
- ▶A◀ ▶B◀ 12. Cylinder head gasket

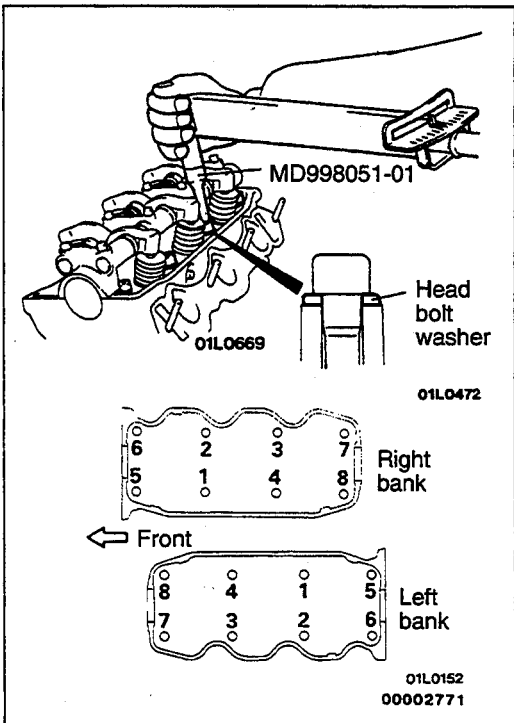
TSB Revision

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

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

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

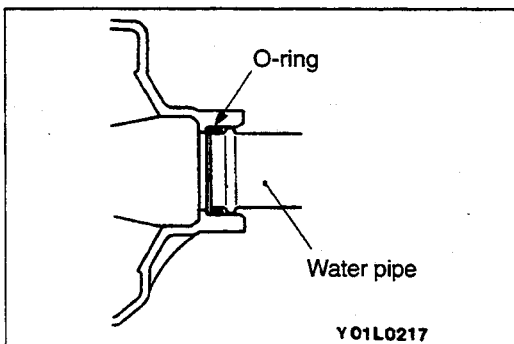
- (1) Degrease the mounting surface of the cylinder head gasket.
- (2) Lay the cylinder head gasket on cylinder block with the identification mark at front top.

**▶B◀ CYLINDER HEAD ASSEMBLY INSTALLATION**

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

Caution

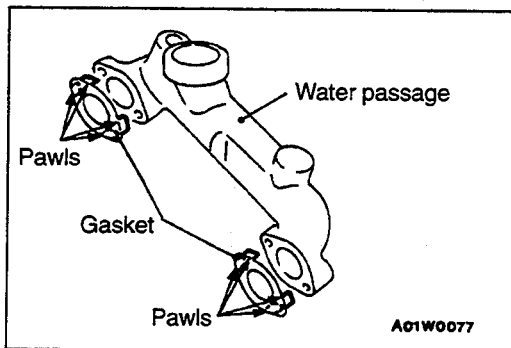
Attach the head bolt washer in the direction shown in the figure.

**▶C◀ WATER PIPE AND HOSE ASSEMBLY / WATER OUTLET PIPE INSTALLATION**

Rinse the mounting location of the O-ring and water pipe with water, and install the O-ring and water pipe.

Caution

1. Do not apply oil and grease to water pipe O-ring.
2. Keep the water pipe connections free of sand, dust, etc.
3. Insert water pipe until its end bottoms.

**►D◄ GASKET/WATER PASSAGE INSTALLATION**

Bend the tabs onto the water passage assembly, and then install the water passage assembly to the cylinder head so that the gasket doesn't slip.

TIMING BELT

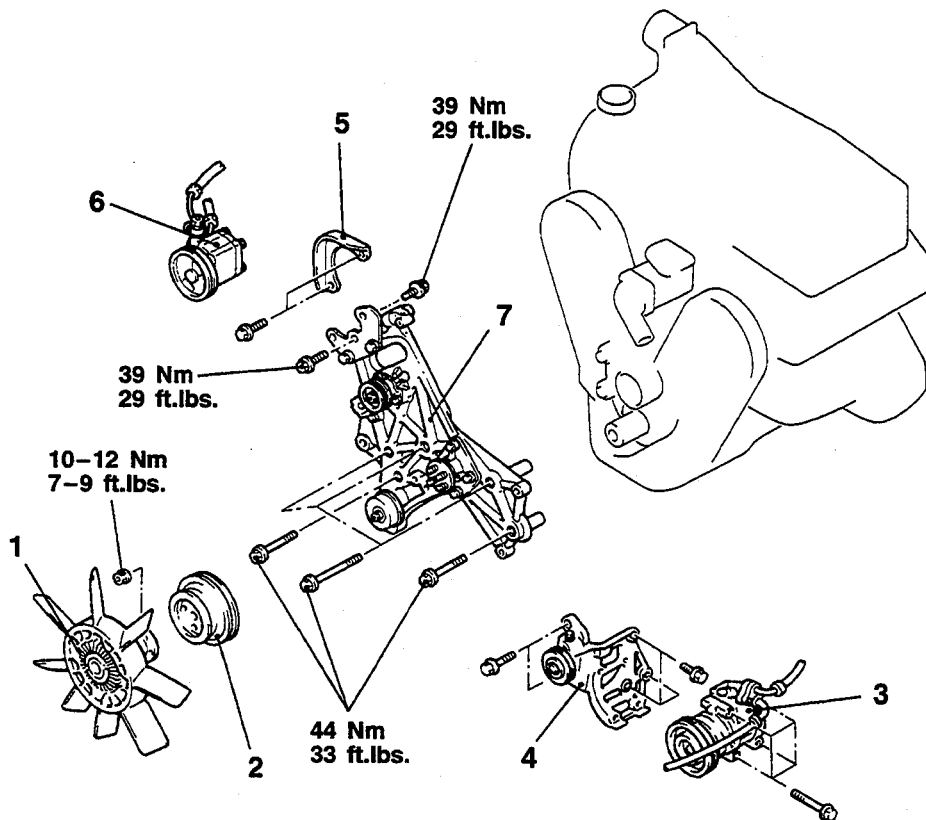
REMOVAL AND INSTALLATION

Pre-removal Operation

- Radiator Removal
(Refer to GROUP 14 – Radiator.)
- Generator Removal
(Refer to GROUP 16 – Generator.)
- Under Skid Plate, Undercover Removal

Post-installation Operation

- Under Skid Plate, Undercover Installation
- Generator Installation
(Refer to GROUP 16 – Generator.)
- Radiator Installation (Refer to GROUP 14 – Radiator.)
- Engine Adjustment (Refer to P.11A-35.)



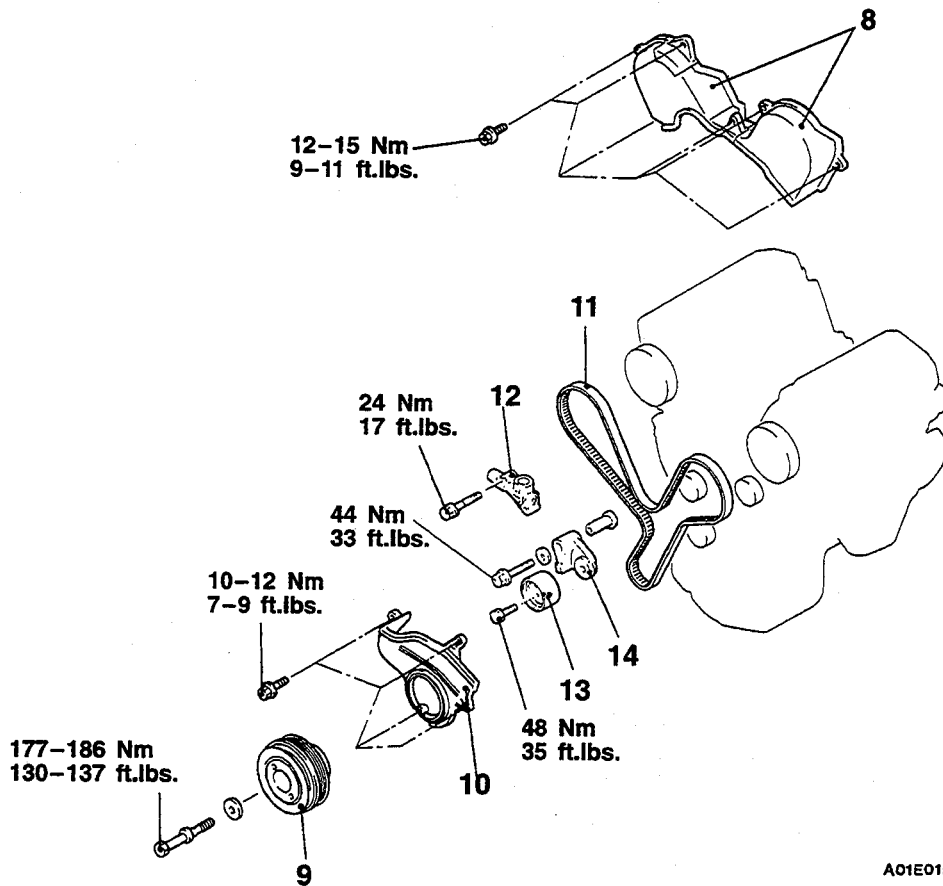
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Removal steps

1. Cooling fan clutch assembly
2. Water pump pulley
3. Compressor <A/C>
4. Compressor bracket <A/C>



5. Cover
6. Power steering oil pump
7. Accessory mount



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- ◀B▶ ▶C▶ 8. Timing belt upper cover
- ◀C▶ ▶B▶ 9. Crankshaft pulley
- ▶A▶ ▶B▶ 10. Timing belt lower cover
- ▶C▶ ▶B▶ 11. Timing belt

- ▶A▶ ▶B▶ 12. Auto tensioner
- ▶A▶ ▶B▶ 13. Tension pulley
- ▶A▶ ▶B▶ 14. Tension arm assembly

REMOVAL SERVICE POINTS

◀A▶ COMPRESSOR <A/C>/OIL PUMP (POWER STEERING) REMOVAL

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

NOTE

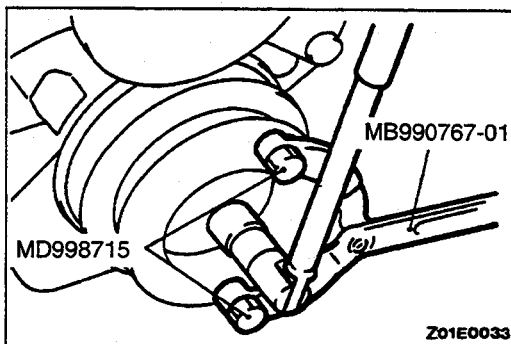
Suspend the removed oil pump (by using wire or similar material) at a place where no damage will be caused during removal/installation of the engine assembly.

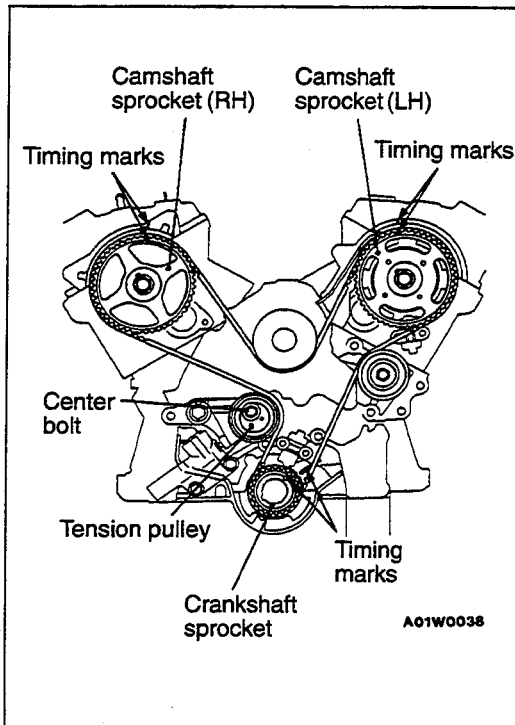
◀B▶ CRANKSHAFT PULLEY REMOVAL

Using special tools, remove the crankshaft pulley from the crankshaft.

Caution

Use only the specified special tools, or a damaged pulley damper could result.



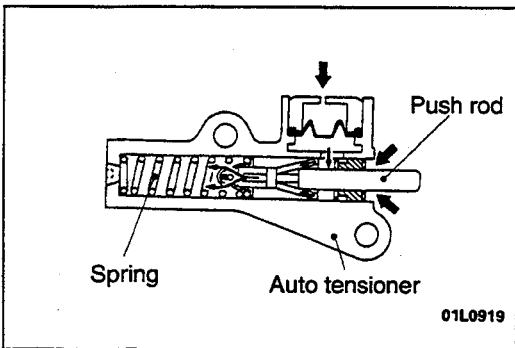


◀▶ TIMING BELT REMOVAL

- (1) Align the timing marks.
- (2) Loosen the center bolt on the tension pulley to remove the timing belt.

Caution

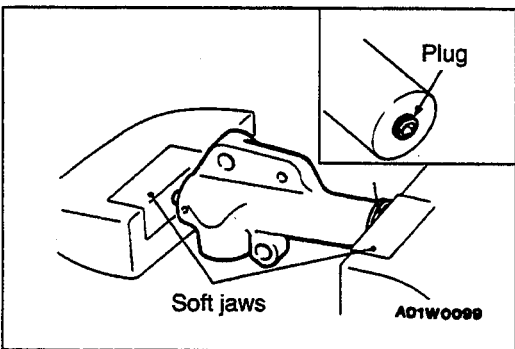
Make a mark on the back of the timing belt, indicating the direction of rotation, so it may be reassembled in the same direction, if it is to be reused.



INSPECTION

AUTO TENSIONER

- Check the auto tensioner for possible leaks.
- Check the push rod for cracks.



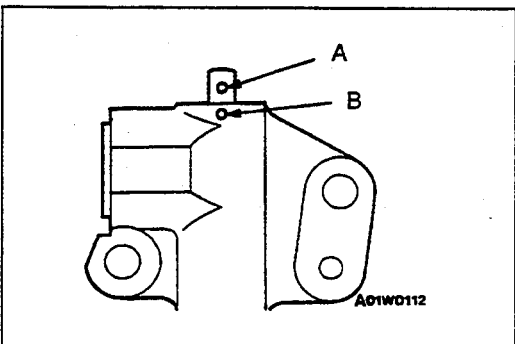
INSTALLATION SERVICE POINTS

▶◀ AUTO TENSIONER INSTALLATION

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

Caution

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



- 3) Insert a wire [1.4 mm (.055 in.) in diameter] into the set holes.

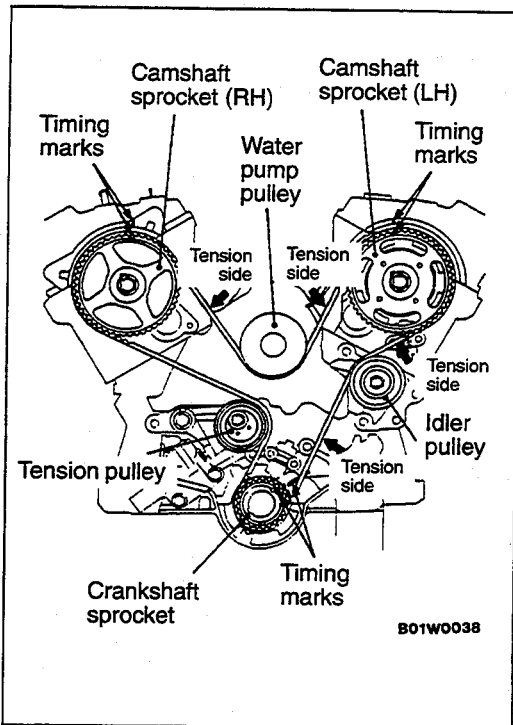
NOTE

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

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

Caution

Leave the wire installed in the auto tensioner.

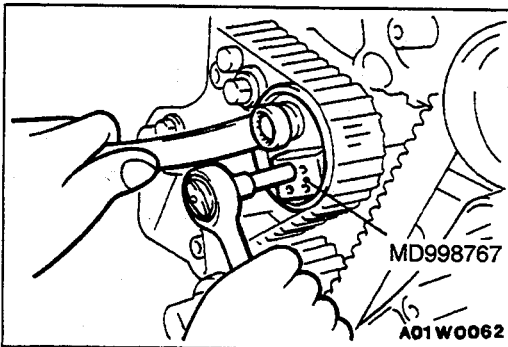
**►◀ TIMING BELT INSTALLATION**

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

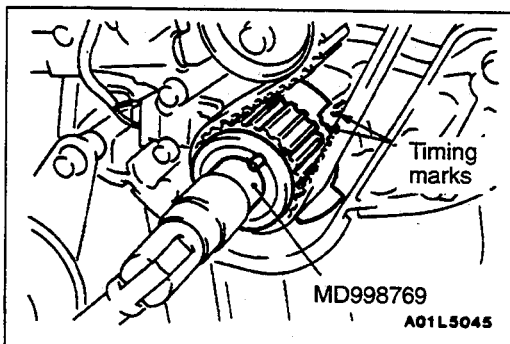
Caution

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

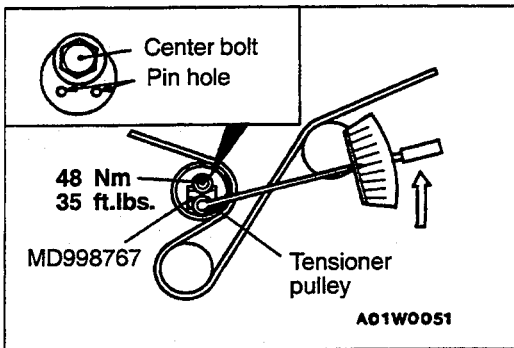
- (3) Turn the camshaft sprocket (right side) counterclockwise until the tension side of the timing belt is firmly stretched, and then check again that all timing marks are aligned.



- (4) Use the special tool to push the tension pulley into the timing belt, and then temporarily tighten the center bolt.



- (5) Use the special tool to turn the crankshaft 1/4 of a turn counterclockwise and then turn it again clockwise until the timing marks are aligned.

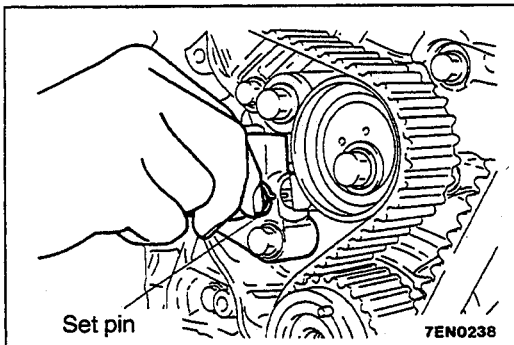


- (6) Loosen the center bolt on the tensioner pulley. Using the special tool and torque wrench, apply tensioning torque to the timing belt and, at the same time, tighten the center bolt to specification.

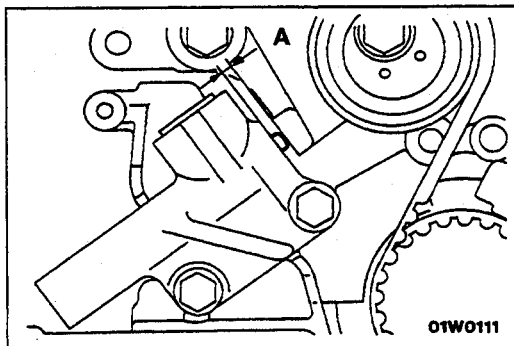
Reference value: 4.4 Nm (3.3 ft.lbs.)
(Timing belt tensioning torque)

Caution

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



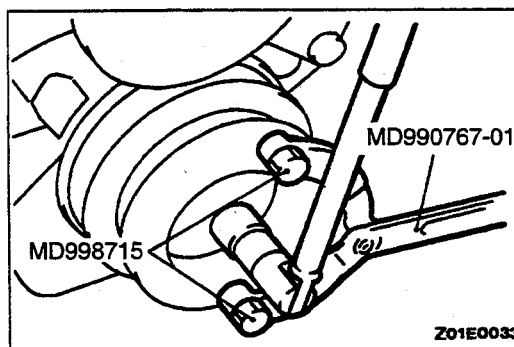
- (7) Remove the setting pin that has been inserted into the auto tensioner.
- (8) Turn the crankshaft two turns clockwise to align the timing marks.



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

Standard value (A): 3.8 to 4.5 mm (.149 to .177 in.)

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



►◄ CRANKSHAFT PULLEY INSTALLATION

Using the special tool, attach the crankshaft pulley to the crankshaft.

Caution

Use only the specified special tools, otherwise a damaged pulley damper could result.

ENGINE OIL COOLER

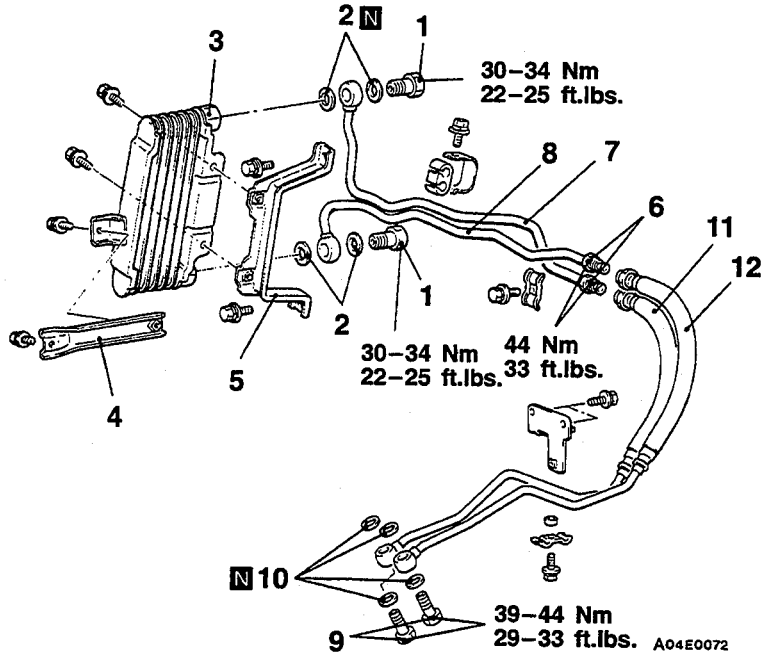
REMOVAL AND INSTALLATION

Pre-removal Operation

- Radiator Grille Removal

Post-installation Operation

- Radiator Grille Installation
- Engine Oil Supplying and Checking



Removal steps

1. Eye bolts
2. Gaskets
3. Engine oil cooler
4. Stay
5. Bracket
6. Engine oil cooler pipe connection

7. Return pipe
8. Feed pipe
9. Eye bolts
10. Gaskets
11. Return hose
12. Feed hose

REMOVAL SERVICE POINT

◀A▶ EYE BOLTS REMOVAL

Caution

Be sure to hold the weld nut of the oil cooler while loosening the eye bolt.

INSPECTION

- Check for foreign material between the oil cooler fins.
- Check the oil cooler fins for bends or damage.
- Check the oil cooler pipes for cracks, damage, clogging or deterioration.

NOTES



3.5L ENGINE

CONTENTS

110005706

CAMSHAFT OIL SEAL	17	SERVICE SPECIFICATIONS	2
CRANKSHAFT OIL SEAL	19	SPECIAL TOOLS	3
Front Oil Seal	19	TIMING BELT	30
Rear Oil Seal	20	TROUBLESHOOTING	5
CYLINDER HEAD GASKET	26		
ENGINE ASSEMBLY	14		
ENGINE OIL COOLER	36		
GENERAL SPECIFICATIONS	2		
OIL PAN AND OIL SCREEN	22		
Oil Pan, Lower	22		
Oil Pan, Upper And Oil Screen	24		
SEALANTS	3		
SERVICE ADJUSTMENT PROCEDURES	6		
Basic Idle Speed Adjustment Refer to GROUP	13		
Compression Pressure Check	10		
Curb Idle Speed Inspection	8		
Drive Belt Tension Inspection and Adjustment	6		
Idle Mixture Inspection	9		
Ignition Timing Inspection	7		
Lash Adjuster Check	12		
Manifold Vacuum Inspection	11		

3.5L ENGINE

110005707

GENERAL SPECIFICATIONS

Items		Specifications	
Type		V-type, Double Over Head Camshaft	
Number of cylinders		6	
Bore mm (in.)		93.0 (3.661)	
Stroke mm (in.)		85.8 (3.378)	
Piston displacement cm ³ (cu.in.)		3,497 (213.4)	
Compression ratio		9.5	
Firing order		1-2-3-4-5-6	
Valve timing	Intake valve	Opens (BTDC)	11°
		Closes (ABDC)	60°
	Exhaust valve	Opens (BBDC)	43°
		Closes (ATDC)	20°
Valve overlap		32°	
Intake valve duration		252°	
Exhaust valve duration		244°	

SERVICE SPECIFICATIONS

110005708

Items			Standard value	Limit	
Drive belt deflection mm (in.)	Generator V-ribbed type	When checked	A	5.0–7.0 (.20–.28)	–
			B	7.5–9.5 (.30–.37)	–
		When new belt is installed	A	4.0–5.0 (.16–.20)	–
			B	5.5–7.5 (.22–.30)	–
		When used belt is installed	A	5.5–6.5 (.22–.26)	–
			B	8.0–9.0 (.31–.35)	–
	Power steering pump	When checked		13.0–17.0 (.51–.67)	–
		When new belt is installed		11.0–13.0 (.43–.51)	–
		When used belt is installed		14.0–16.0 (.55–.63)	–
	A/C com- pressor	When checked		6.5–7.5 (.26–.29)	–
When new belt is installed			5.0–6.0 (.20–.24)	–	
When used belt is installed			6.5–7.5 (.26–.29)	–	
Drive belt tension N (lbs.)	Generator V-ribbed type	When checked	392–588 (87–130)	–	
		When new belt is installed	637–833 (141–184)	–	
		When used belt is installed	441–539 (98–119)	–	

A: Measure between the water pump pulley and the crankshaft pulley.
 B: Measure between the water pump pulley and the generator.

Items		Standard value	Limit
Drive belt tension N (lbs.)	Power steering pump	When checked	294–490 (66–110)
		When new belt is installed	490–686 (110–154)
		When used belt is installed	343–441 (77–99)
Basic ignition timing at idle		5° ± 3° BTDC	–
Actual ignition timing at curb idle		15° BTDC	–
CO concentration %		0.5 or less	–
HC concentration PPM		100 or less	–
Curb idle speed rpm		700 ± 100	–
Compression pressure (250–400 rpm) kPa (psi)		1,270 (184)	Min. 960 (139)
Compression pressure difference of all cylinder kPa (psi)		–	Max. 100 (14)
Intake manifold vacuum at curb idle kPa (in. Hg)		–	Min. 60 (18)
Timing belt			
Amount of projection of auto tensioner rod mm (in.) (Distance between the tensioner arm and auto tensioner body)		3.8–4.5 (.149–.177)	–

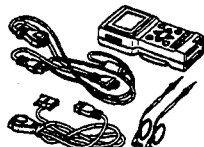
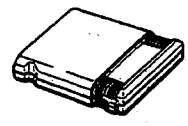
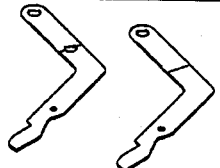
SEALANTS

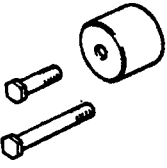
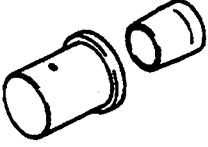
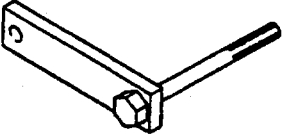

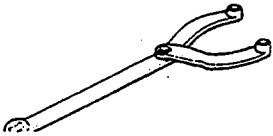
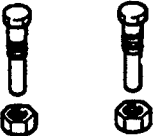
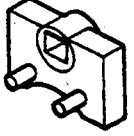

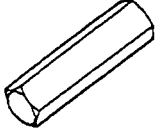
110005709

Items	Recommended sealant
Oil pan	MITSUBISHI GENUINE Part No. MD970389 or equivalent
Rocker cover	3M ATD Part No. 8660 or equivalent

SPECIAL TOOLS

110005710

Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool (MUT-II)		Checking of the diagnostic trouble code
 Z16X0607	ROM pack		
	MD998782 Valve lifter set		Removal of the lash adjuster

Tool	Tool number and name	Supersession	Application
	MD998761 Camshaft oil seal installer	MD998761-01	Installation of the camshaft oil seals
	MD998717 Crankshaft front oil seal installer		Installation of the crankshaft front oil seal
	MD998781 Flywheel stopper		Supporting the drive plate
	MD998718 Crankshaft rear oil seal installer	MD998718-01	Installation of the crankshaft rear oil seal
	MB990767 End yoke holder	MB990767-01	Supporting the sprocket and shaft pulley during removal and installation
	MD998754 Crankshaft pulley holder pin		Supporting the crankshaft pulley when removing and installing the crankshaft bolt and pulley. Use together with MB990767
	MD998767 Tension pulley socket wrench		Adjustment of the timing belt
	MD998769 Crankshaft sprocket spacer		Used if the crankshaft needs to be rotated to attach the timing belt, etc.
	MD998051 Wrench, cylinder head bolt	MD998051-01	Loosening and tightening of cylinder head bolt

TROUBLESHOOTING

110005711

Symptom	Probable Cause	Remedy
Compression is too low.	Cylinder head gasket is blown.	Replace the gasket.
	Piston ring is worn or damaged.	Replace the rings.
	Piston or cylinder is worn.	Repair or replace the piston and/or the cylinder block.
	Valve seat is worn or damaged.	Repair or replace the piston and/or the seat ring.
Oil pressure drops.	Engine oil level is too low.	Check the engine oil level.
	Malfunction of oil pressure switch	Replace the oil pressure switch.
	Oil filter is clogged	Install a new filter.
	Oil pump gears or cover are worn.	Replace the gears and/or the cover.
	Thin or diluted engine oil	Change the engine oil to the correct viscosity.
	Oil relief valve is stuck (opened).	Repair the relief valve.
	Excessive bearing clearance	Replace the bearings.
Oil pressure is too high.	Oil relief valve is stuck (closed).	Repair the relief valve.
Noisy valves	Malfunction of lash adjuster	Replace the lash adjuster.
	Thin or diluted engine oil (low oil pressure)	Change the engine oil.
	Valve stem or valve guide is worn or damaged.	Replace the valve and/or the guide.
Connecting rod noise/ main bearing noise	Insufficient oil supply	Check the engine oil level.
	Thin or diluted engine oil	Change the engine oil.
	Excessive bearing clearance	Replace the bearings.

SERVICE ADJUSTMENT PROCEDURES

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

11005712

Apply 98 N (22 lbs.) of force to the belt halfway between the pulleys as shown in the illustration, and measure the belt deflection, or use a belt-tension gage to check the belt tension.

Standard value:

Item	Check value	Adjustment value		
		New belt	Used belt	
For generator	Deflection mm (in.)	A: 5.0–7.0 (.20–.28)	A: 4.0–5.0 (.16–.20)	A: 5.5–6.5 (.22–.26)
		B: 7.5–9.5 (.30–.37)	B: 5.5–7.5 (.22–.30)	B: 8.0–9.0 (.31–.35)
	Tension N (lbs.)	392–588 (87–130)	637–833 (141–184)	441–539 (98–119)
For power steering	Deflection mm (in.)	13.0–17.0 (.51–.67)	11.0–13.0 (.43–.51)	14.0–16.0 (.55–.63)
	Tension N (lbs.)	294–490 (66–110)	490–686 (110–154)	343–441 (77–99)
For A/C	Deflection mm (in.)	6.5–7.5 (.26–.30)	5.0–6.0 (.20–.24)	6.5–7.5 (.26–.30)

A: Measure between the water pump pulley and the crankshaft pulley.

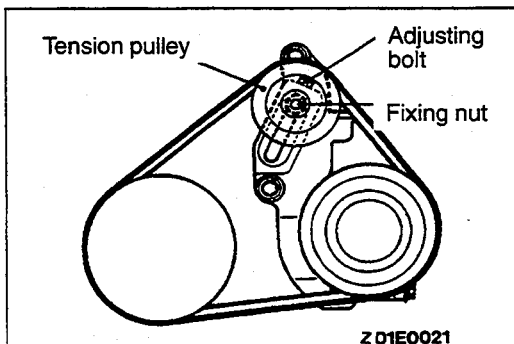
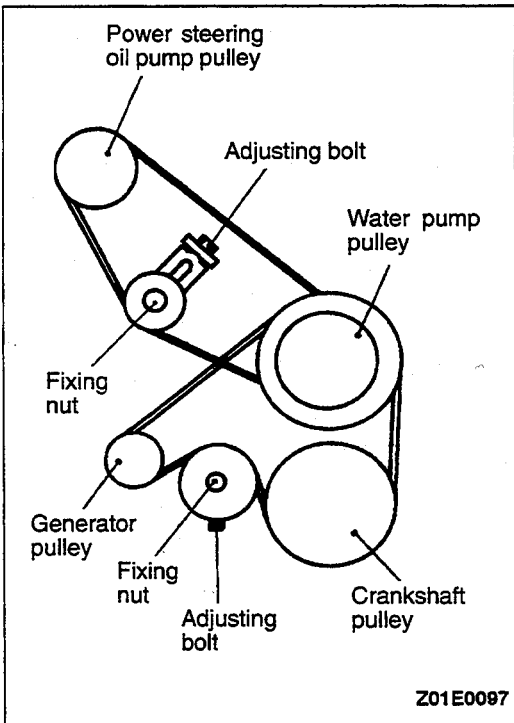
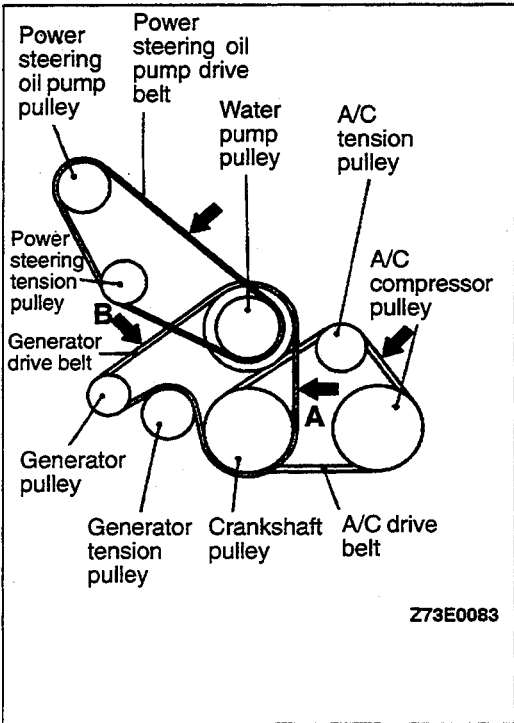
B: Measure between the water pump pulley and the generator.

GENERATOR DRIVE BELT AND POWER STEERING OIL PUMP DRIVE BELT TENSION ADJUSTMENT

- (1) Loosen the tension pulley fixing nut.
- (2) Adjust the belt tension using the adjusting bolt.
- (3) Tighten the fixing nut.
- (4) Crank the engine once or more.
- (5) Check the belt tension.

AIR CONDITIONING COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

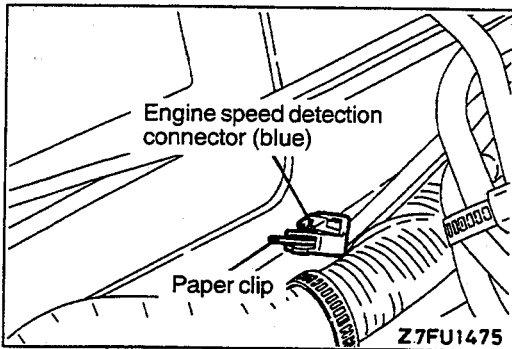
- (1) Loosen the tension pulley fixing nut.
- (2) Adjust the belt tension using the adjusting bolt.
- (3) Tighten the fixing nut.
- (4) Crank the engine once or more.
- (5) Check the belt tension.



IGNITION TIMING INSPECTION

110005713

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: P range



- (2) Insert a paper clip into the engine speed detection connector (blue), and then connect a tachometer to the paper clip.

NOTE

Do not use the scan tool. If the scan tool is connected to the data link connector, the ignition timing will be unchanged instead of reverting to the basic ignition timing.

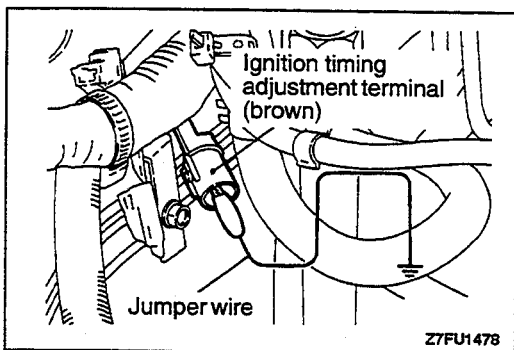
- (3) Set the timing light.
- (4) Start the engine and run it at idle.
- (5) Check the curb idle speed.

Curb idle speed: 700±100 rpm

NOTE

The reading on the tachometer indicates one-third of the actual engine speed. In other words, the actual engine speed is three times the indication on the tachometer.

- (6) Turn the ignition switch to OFF.
- (7) Disconnect the waterproof female connector from the ignition timing adjustment connector (brown).



- (8) Use a jumper wire to ground the ignition timing adjustment terminal.

NOTE

Grounding this terminal sets the engine to the basic ignition timing.

- (9) Start the engine and run it at idle.
- (10) Check the basic ignition timing.

Basic ignition timing: 5° BTDC ± 3°

- (11) If the ignition timing is not within the standard value range, refer to GROUP 13A – On-vehicle Inspection of MFI Components and inspect the crankshaft position sensor.
- (12) Disconnect the jumper wire connected at step (8).
- (13) Check that the idling ignition timing is at the correct value.

Actual ignition timing: Approx. 15° BTDC

NOTE

- (1) Ignition timing is variable within about ±7°, even under normal operating conditions.
- (2) And it is automatically further advanced by about 5° from 15° BTDC at higher altitudes.

CURB IDLE SPEED INSPECTION

110005714

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: P range
- (2) Check the basic ignition timing.

Standard value: 5° BTDC±3°

- (3) After turning the ignition switch to OFF, connect a tachometer, or connect the scan tool to the data link connector (white).

NOTE

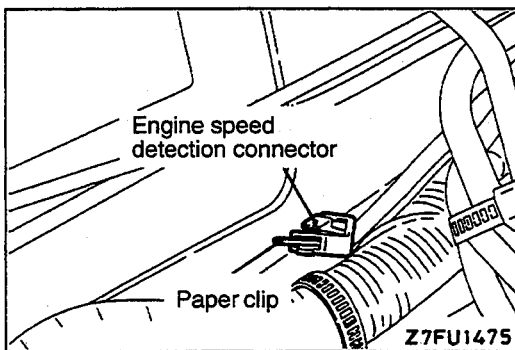
For the procedure for connecting the tachometer, refer to P.11B-7.

- (4) Run the engine at idle for two minutes.
- (5) Check the idle speed.

Curb idle speed: 700±100 rpm

NOTE

- (1) The idle speed is automatically regulated by the idle-speed control system.
- (2) The engine speed indicated is a third of actual speed. In other words, the reading of the tachometer times 3 is actual speed.
- (6) If the engine speed is not at the standard value, refer to GROUP 13A – Check Chart Classified by Problem Symptoms, and check the MFI components.



IDLE MIXTURE INSPECTION

110005715

- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: P range
- (2) Check that the ignition timing is at the standard value.
Standard value: 5° BTDC±3°

- (3) After turning the ignition switch to OFF, connect a tachometer, or connect the scan tool to the data link connector (white).

NOTE

For the procedure for connecting the tachometer, refer to P.11B-7.

- (4) Start the engine and race it at a speed of 2,500 rpm for two minutes.
- (5) Connect a CO and HC tester.
- (6) Check the CO concentration and the HC concentration while the engine is idling.

Standard value**CO concentration: 0.5% or less****HC concentration: 100 ppm or less**

- (7) If the concentrations are outside the standard values, check the following items.
 - Diagnostic output
 - Closed loop control
(If closed loop control is being carried out normally, the heated oxygen sensor output signal will vary between 0–400 mV and 600–1,000 mV while the engine is idling.)
 - Fuel pressure
 - Injectors
 - Ignition coil, spark plug cables and spark plugs
 - Leaks from EGR system and EGR valve
 - Evaporative emission control system
 - Compression pressure

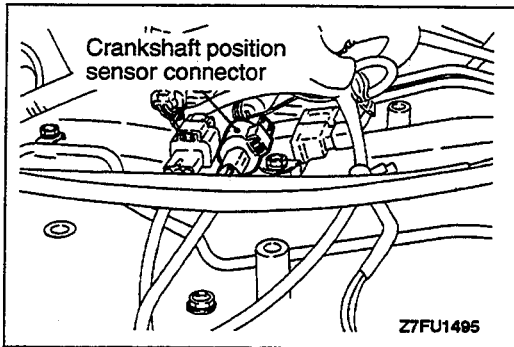
NOTE

If the results of the checks for all items are normal but the CO and HC concentrations still exceed the standard values, replace the three-way catalyst.

COMPRESSION PRESSURE CHECK

110005716

- (1) Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: P range
- (2) Remove all of the spark plugs.



- (3) Disconnect the crankshaft position sensor connector.

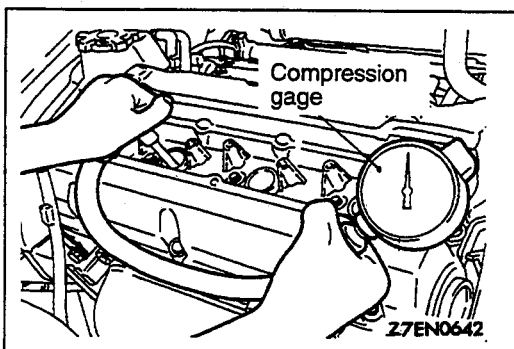
NOTE

Doing this will prevent the engine control module from carrying out ignition and fuel injection.

- (4) Cover the spark plug holes with a shop towel, and after the engine has been cranked, check that no foreign material is adhering to the rag.

Caution

1. When you crank the engine, keep away from the spark plug mounting holes.
2. If a compression measurement is carried out with water, oil, fuel, etc. in the cylinder due to the cracks in the cylinders, these substances heated to a very high temperature will blow off the spark plug mounting holes, which could be dangerous.



- (5) Install a compression gage to a spark plug mounting hole.
- (6) Crank the engine to measure the compression pressure.

Standard value: 1270 kPa (184 psi) / 250–400 rpm

Limit: Min. 960 kPa (139 psi) / 250–400 rpm

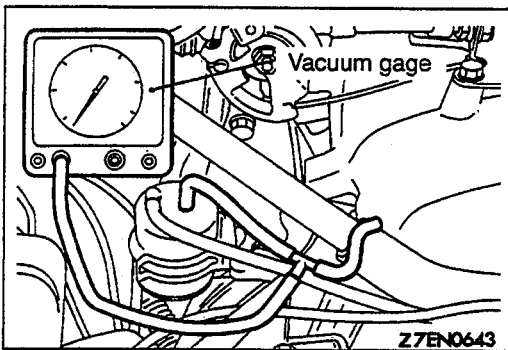
- (7) Measure the compression of all the cylinders, and check that the pressure differences of the cylinders are below the limit.

Limit: Max. 100 kPa (14 psi)

- (8) If there is cylinder in which the compression pressure or pressure difference is beyond the limit value, pour in a small amount of engine oil through the spark plug mounting hole, and repeat steps (6) through (7).
 - 1) If the small amount of oil poured in causes the compression pressure to rise, then it is likely that either the piston ring, cylinder wall surface or both are worn or damaged.
 - 2) If the small amount of oil poured in does not cause the compression pressure to rise, then valve seizure, poor valve contact, or leakage from the gasket is suspected.
- (9) Reconnect the crankshaft position sensor connector.
- (10) Reinstall the spark plugs and spark plug cables.
- (11) Use the scan tool to erase the diagnostic trouble codes, or disconnect the negative battery cable for 10 seconds or more and then re-connect it.

NOTE

This will erase the diagnostic trouble code resulting from the crankshaft position sensor connector being disconnected.

**MANIFOLD VACUUM INSPECTION**

110005717

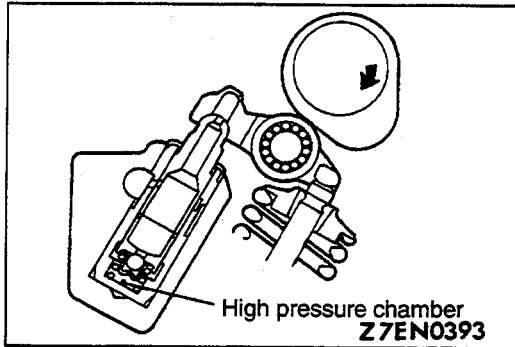
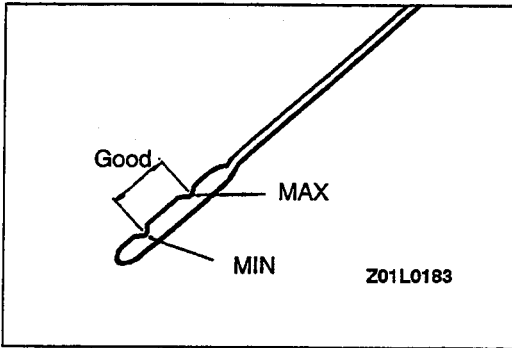
- (1) Before inspection, set the vehicle to the following condition.
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: P range
- (2) Connect a tachometer, or connect the scan tool to the data link connector (white).

NOTE

For the procedure for connecting the tachometer, refer to P.11B-7.

- (3) Install the T-joint to the vacuum hose between the intake manifold plenum and the vacuum motor, and then connect the vacuum gage.
- (4) Start the engine and check that the idle speed is within the standard value range.
- (5) Check the manifold vacuum.

Limit: Min. 60 kPa (18 in. Hg)



LASH ADJUSTER CHECK

110005718

NOTE

Directly after starting the engine or while the engine is running, if an abnormal sound (knocking) that seems to be coming from the lash adjuster is heard and doesn't stop, carry out the following inspection.

- (1) Check the engine oil and replenish or replace the oil if necessary.

NOTE

- (1) If the engine oil level is low, the air drawn in from the oil strainer will be trapped in the oil passage.
- (2) If the engine oil level is higher than the specified level, agitation of the oil by the crankshaft could cause a large amount of air to enter the oil.
- (3) Deteriorated oil contains a large amount of air, because the air, once trapped, is not readily separated from the oil.

If the air trapped due to these causes enters the high pressure chamber in the lash adjuster, the air in the high pressure chamber will be compressed while the valve is in the opened position. The lash adjuster will be drawn too far in, and will produce noise when the valve closes. This is the same phenomenon that occurs when the valve clearance is adjusted to an excessive dimension. In this case, the condition will return to normal if the air escapes from the lash adjuster.

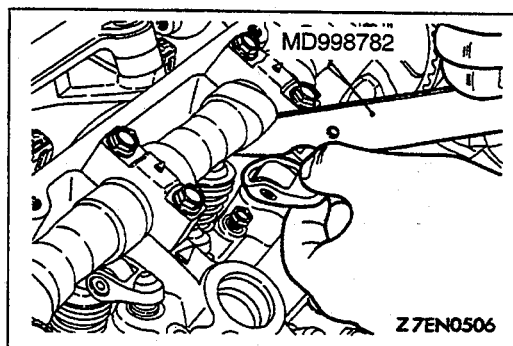
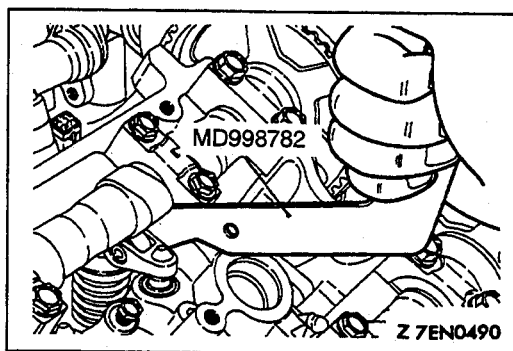
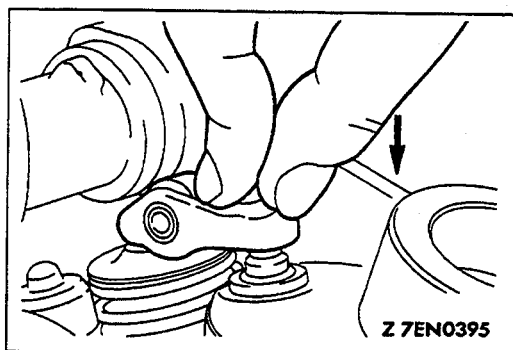
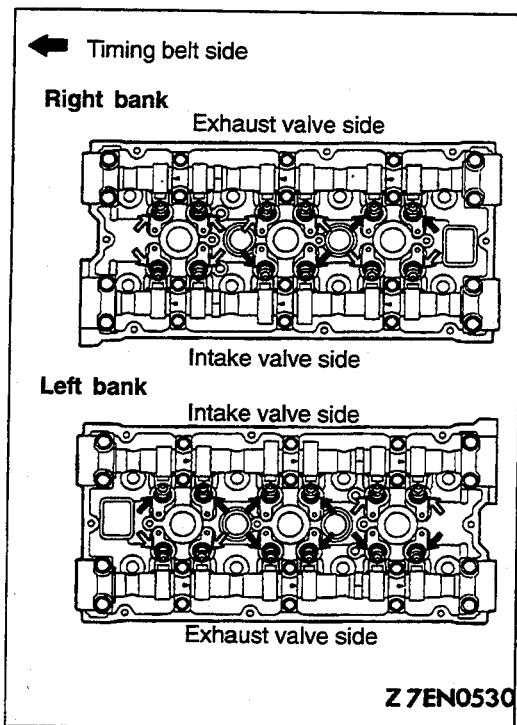
- (2) Start the engine and gently race* it several times (10 times or less).

If racing the engine causes the noise to die away, it means that the air has escaped from the high pressure chamber of the lash adjuster and that the lash adjuster has returned to the normal condition.

- * After gradually increasing the engine speed from idle speed to 3000 rpm (over 30 seconds), gradually reduce the engine speed back to idle speed (over 30 seconds).

NOTE

- (1) When the vehicle is parked on a slope for a long period, the oil in the lash adjuster will decrease. When the engine is started, air might enter the high pressure chamber.
- (2) After a long period of parking during which the oil in the oil passage drains away, it will take same time before the oil is re-supplied to the lash adjuster. Therefore, air could enter the high pressure chamber during this time.



(3) If any abnormal noise is not eliminated by racing, check the lash adjuster by the following procedure.

- 1) Stop the engine.
- 2) Set the engine No. 1 cylinder to the compression top dead center position.
- 3) Press the rocker arm at the place indicated by the ← arrow in the illustration to check whether the rocker arm is lowered or not.
- 4) Slowly turn the crankshaft 360° clockwise.
- 5) By the same procedure as in step 3), check the rocker arm at the area indicated by the ← arrow in the illustration.
- 6) Push down the rocker arm at a portion located right above the lash adjuster. If the rocker arm goes down readily, there is a malfunction of the lash adjuster. Replace it with a new one in accordance with step (4).

In addition, when replacing the lash adjuster, make sure that all air is removed from the lash adjuster before installation. Then carry out inspection in accordance with steps 1) through 5) to make sure that there is no abnormality.

NOTE

- (1) A leak-down test can be carried out to accurately determine whether the lash adjuster is defective or not.
- (2) For the procedures for the leak-down test and for bleeding air from the lash adjuster, refer to the Engine Service Manual.

In addition, if the rocker arm feels very stiff or cannot be pushed down, the lash adjuster is normal. Therefore, check for some other cause of the noise.

(4) Lash Adjuster Replacement Procedure

Caution

In the cylinders which are being removed, the valves will touch the pistons when the valves are pushed down, so the crankshaft should be turned to lower the piston positions.

In addition, the rocker arm located at the valve which is lifted by the cam cannot be removed. Therefore, turn the crankshaft to keep the cam from lifting the valve before removal of the rocker arm.

1. Use the special tool to press the valve down, and then remove the roller rocker arm.
2. Pull out the lash adjuster from the cylinder head.
3. Install a new lash adjuster from which the air has been bled to the cylinder head.
4. Use the special tool to press the valve down, and then install the roller rocker arm.

NOTE

When the roller rocker arm is installed, place the pivot side of the rocker arm on the lash adjuster. Then, push down the valve and place the slipper side of the rocker arm on the valve stem end.

ENGINE ASSEMBLY

110005719

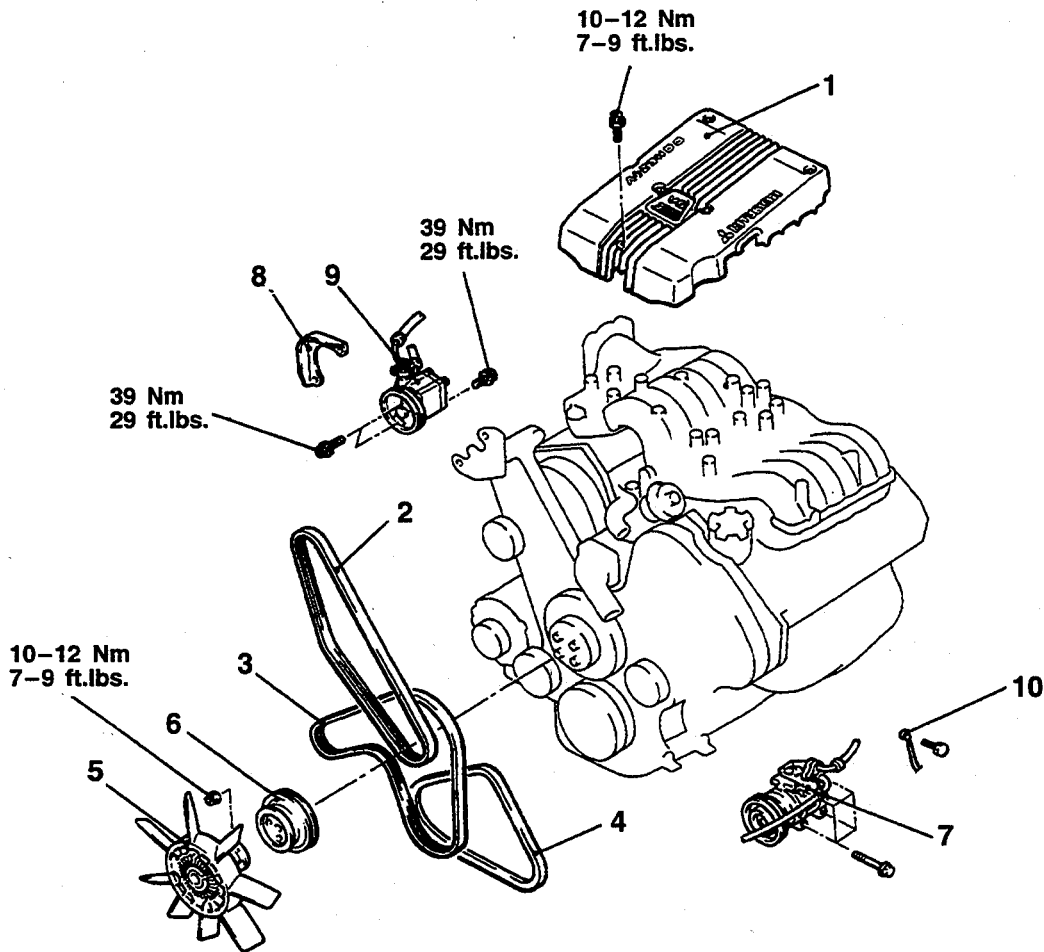
REMOVAL AND INSTALLATION

Pre-removal Operation

- Hood Removal (Refer to GROUP 42 – Hood.)
- Battery and Battery Tray Removal
- Cruise Control Intermediate Link Removal (Refer to GROUP 13G – Cruise Control.)
- Radiator Removal (Refer to GROUP 14 – Radiator.)
- Under Skid Plate, Undercover Removal
- Front Exhaust Pipe Removal (Refer to GROUP 15 – Exhaust Pipe, Muffler and Catalytic Converter.)
- Transmission and Transfer Assembly Removal (Refer to GROUP 23 – Transmission and Transfer Assembly.)

Post-installation Operation

- Transmission and Transfer Assembly Installation (Refer to GROUP 23 – Transmission and Transfer Assembly.)
- Front Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe Muffler and Catalytic Converter.)
- Under Skid Plate, Undercover Installation
- Radiator Installation (Refer to GROUP 14 – Radiator.)
- Battery and Battery Tray Installation
- Cruise Control Intermediate Link Installation and Adjustment (Refer to GROUP 13G – Cruise Control.)
- Hood Installation (Refer to GROUP 42 – Hood.)
- Engine Adjustment (Refer to P.11B-5.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
- Throttle Cable Adjustment (Refer to GROUP 23 – Service Adjustment Procedures.)
- Engine Oil Supplying and Checking



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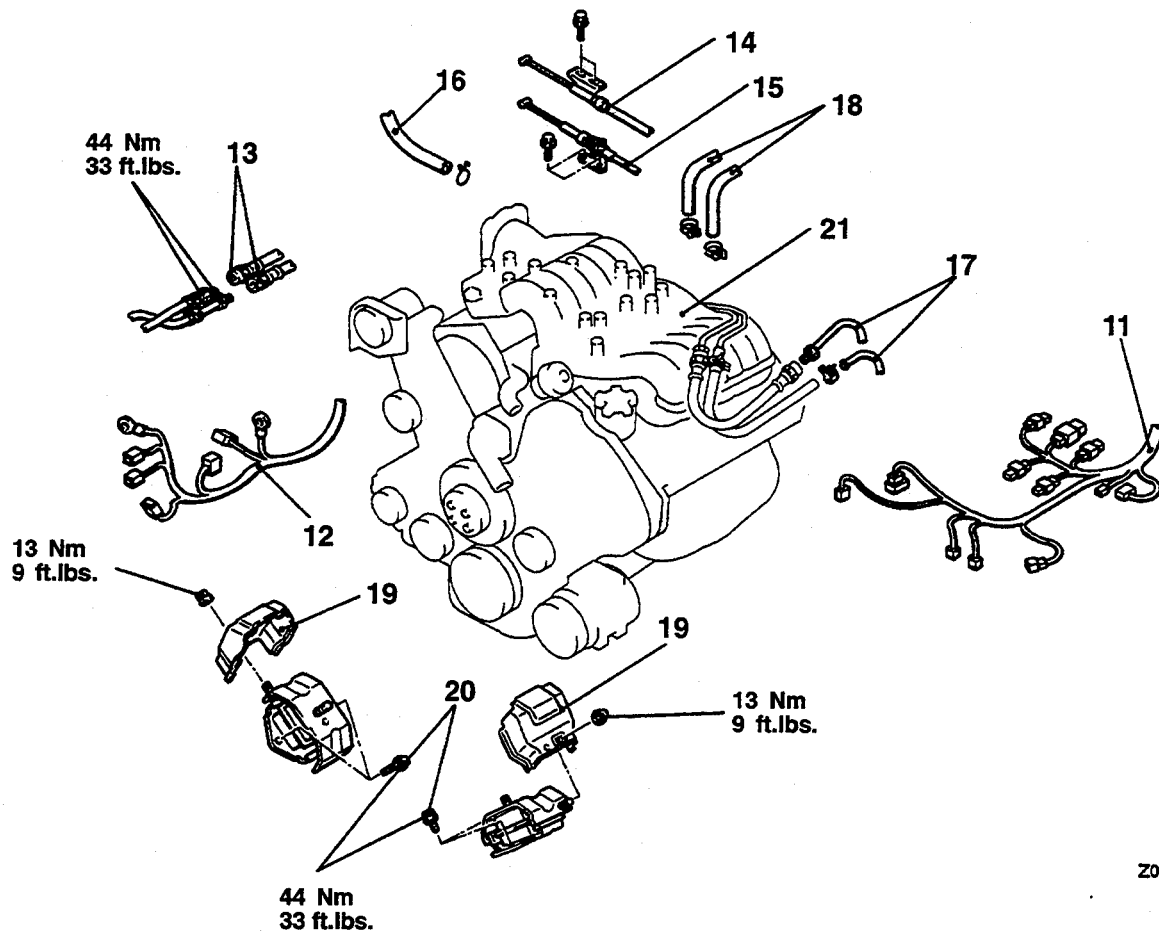
Removal Steps

1. Intake manifold plenum cover
2. Power steering drive belt
3. Generator drive belt
4. A/C drive belt
5. Cooling fan



6. Water pump pulley
7. A/C compressor
8. Cover
9. Power steering pump
10. Ground cable connection

TSB Revision



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- | | |
|----------------------------------------------|------------------------------------------|
| 11. Engine control harness connection | 16. Brake booster vacuum hose connection |
| 12. Generator and starter harness connection | 17. Fuel hose connection |
| 13. Engine oil cooler hose connection | 18. Heater hose connection |
| 14. Accelerator cable connection | 19. Heat protectors |
| 15. Throttle cable connection | 20. Engine mounting bolt |
| | 21. Engine assembly |



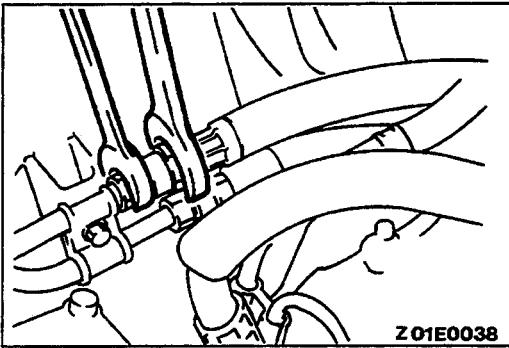
REMOVAL SERVICE POINTS

◀A▶ COMPRESSOR <A/C>/OIL PUMP (POWER STEERING) REMOVAL

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

NOTE

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

**◀B▶ OIL COOLER HOSE DISCONNECTION**

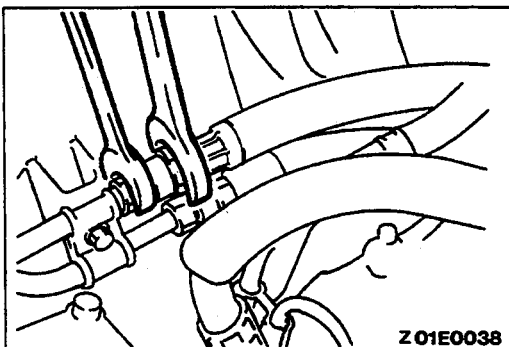
Use a spanner or similar tool to disconnect the oil cooler hose.

◀C▶ ENGINE ASSEMBLY REMOVAL

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

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

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

**▶B◀ OIL COOLER HOSE CONNECTION**

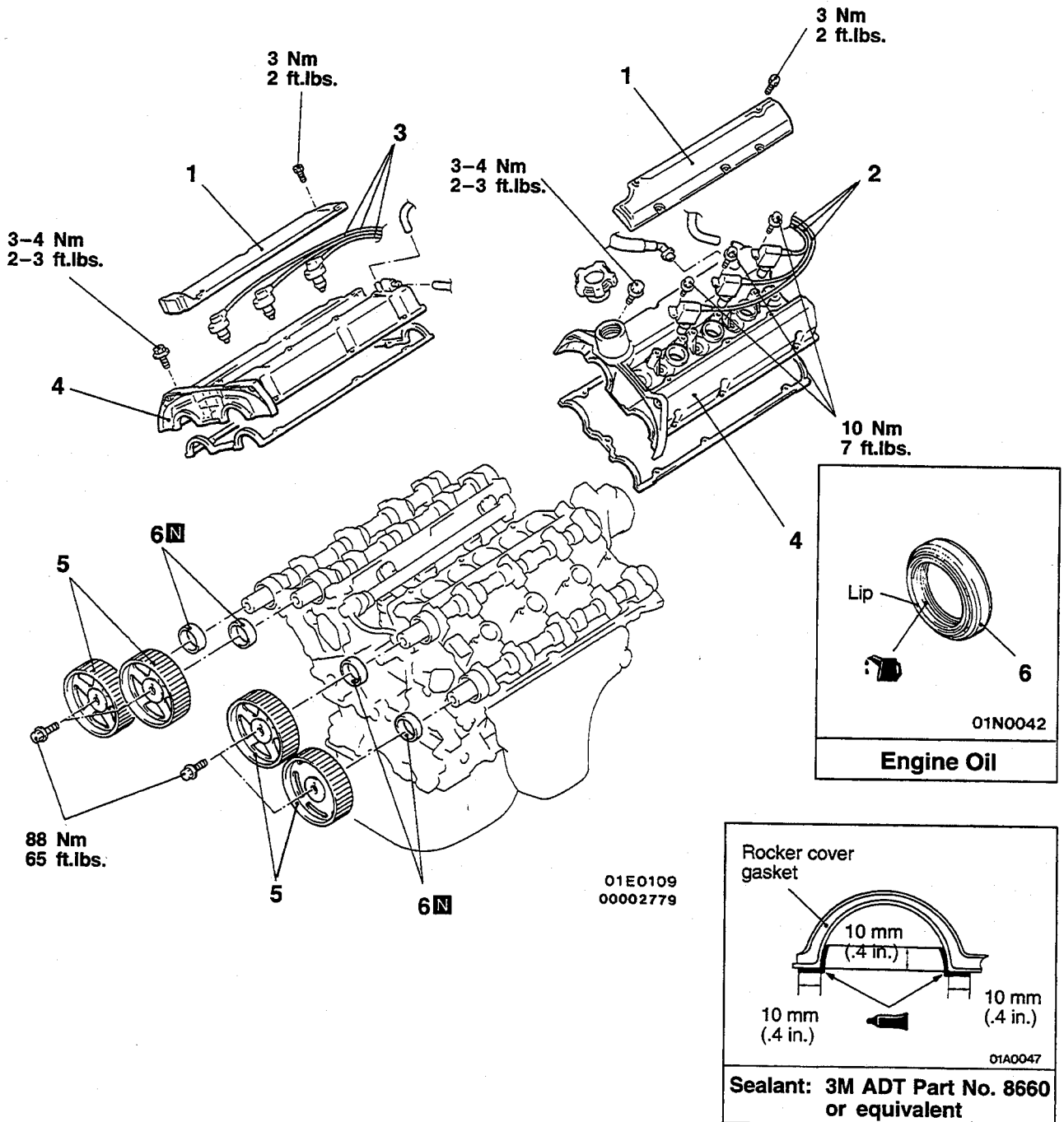
Use a spanner or similar tool to connect the oil cooler hose.

CAMSHAFT OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Intake Manifold Plenum Removal and Installation (Refer to GROUP 15 – Intake Manifold.)
- Timing Belt Removal and Installation (Refer to GROUP 11B-30.)



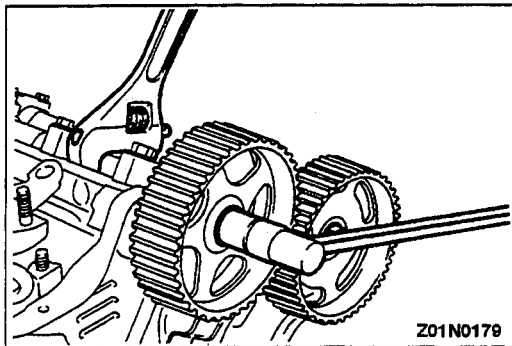
Removal steps

1. Center cover
2. Ignition coil
3. Spare plug cable



4. Rocker cover
5. Camshaft sprocket
6. Camshaft oil seals

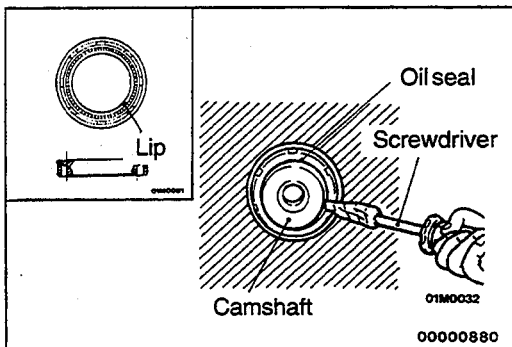
TSB Revision

**REMOVAL SERVICE POINTS****◀A▶ CAMSHAFT SPROCKET REMOVAL**

Use a wrench to hold the hexagonal part of the camshaft to prevent the crankshaft from turning, and then loosen the camshaft sprocket bolt.

Caution

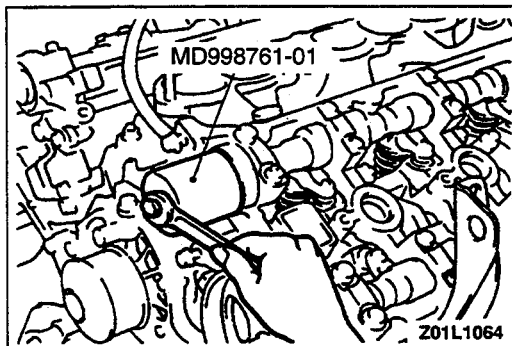
Do not hold the camshaft sprocket with a tool, or a damaged sprocket could result.

**◀B▶ CAMSHAFT OIL SEAL REMOVAL**

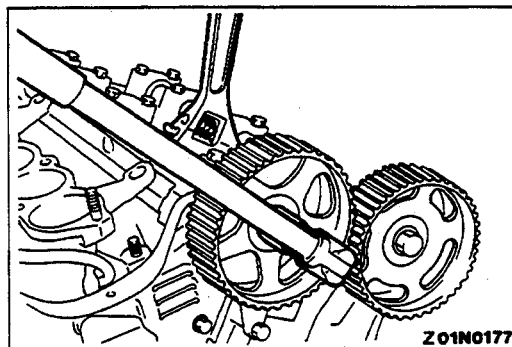
- (1) Cut out a portion of the camshaft oil seal lip.
- (2) Cover the tip of a screwdriver with a cloth and apply it to the cutout in the oil seal to pry off the oil seal.

Caution

Be careful not to damage the camshaft and cylinder head.

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

Apply engine oil to the entire circumference of the oil seal lip, and then use the special tool to press-fit the oil seal.

**▶B▶ CAMSHAFT SPROCKET INSTALLATION**

Use a wrench to hold the hexagonal part of the camshaft to prevent the crankshaft from turning, and then tighten the camshaft sprocket bolt.

Caution

Do not hold the camshaft sprocket with a tool, or a damaged sprocket could result.

CRANKSHAFT OIL SEAL

FRONT OIL SEAL

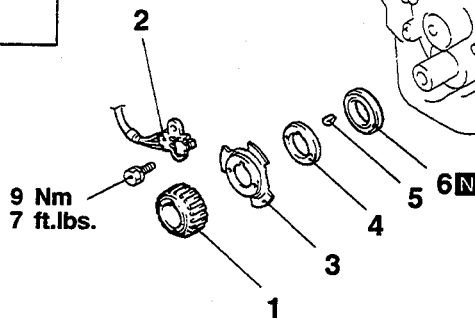
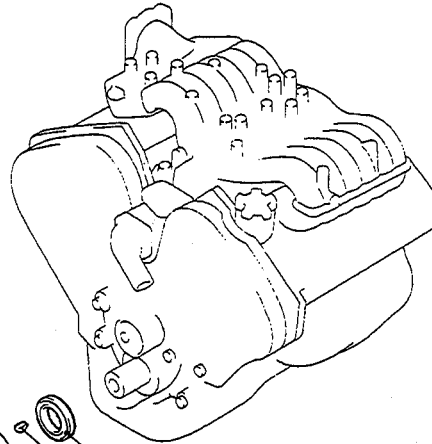
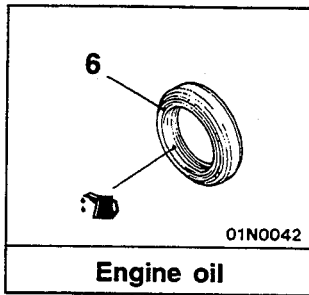
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Timing Belt Removal and Installation (Refer to P.11B-30.)

Adjustment

- Engine Adjustment (Refer to P.11B-6.)



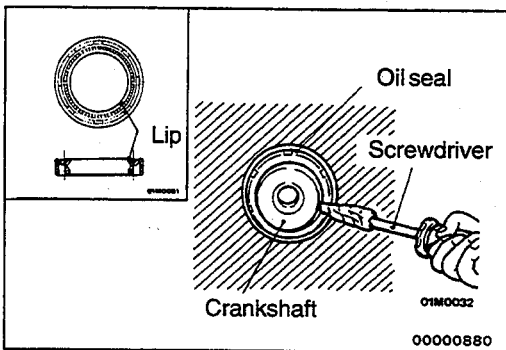
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Removal steps

1. Crankshaft sprocket
2. Crankshaft position sensor
3. Crankshaft sensing blade

4. Crankshaft spacer
5. Key

6. Crankshaft front oil seal



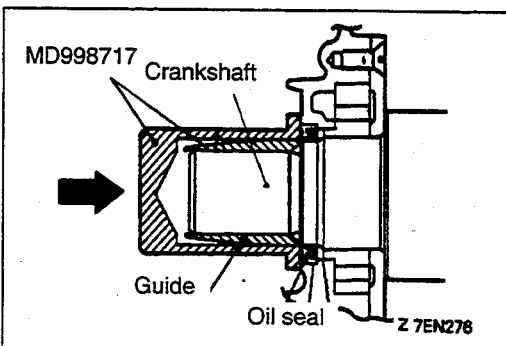
REMOVAL SERVICE POINTS

◀A▶ OIL SEAL REMOVAL

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

Caution

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



INSTALLATION SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION

Use the special tool to tap the oil seal into the oil pump case.

NOTE

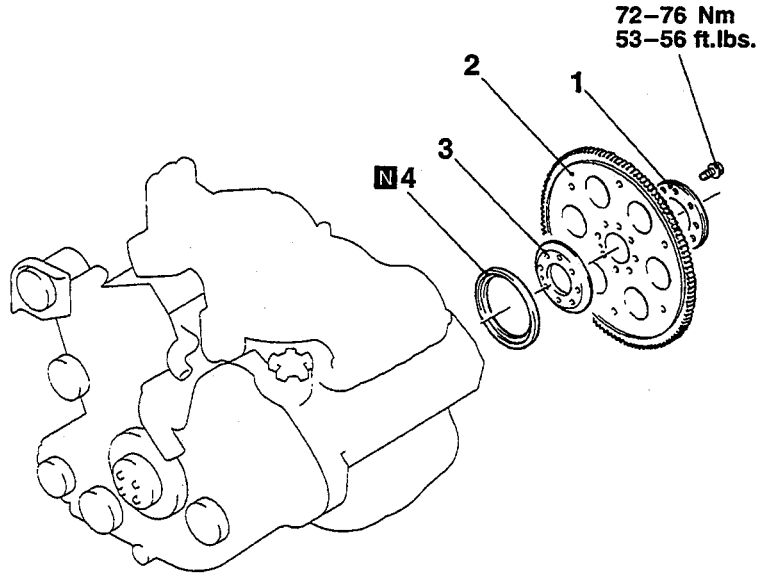
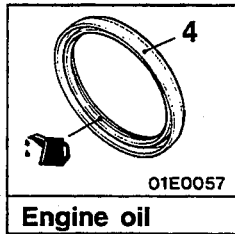
Tap it until it is flush with the surface.

REAR OIL SEAL

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

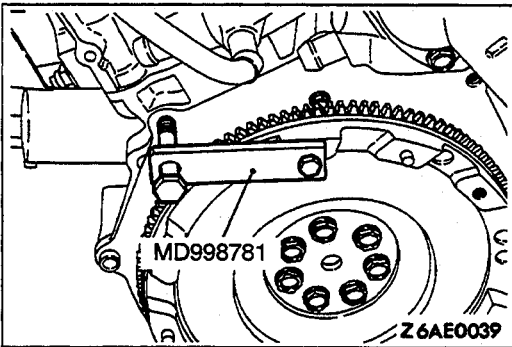
- Transmission Removal and Installation
(Refer to GROUP 23 – Transmission and Transfer Assembly.)



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Removal steps

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



REMOVAL SERVICE POINTS

◀A▶ **ADAPTOR PLATE A/DRIVE PLATE/ADAPTOR PLATE B REMOVAL**

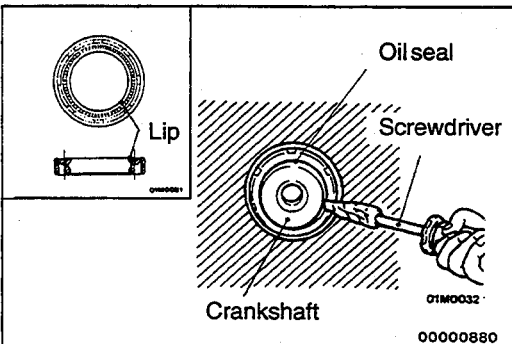
Use the special tool to secure the drive plate, and then remove the bolts.

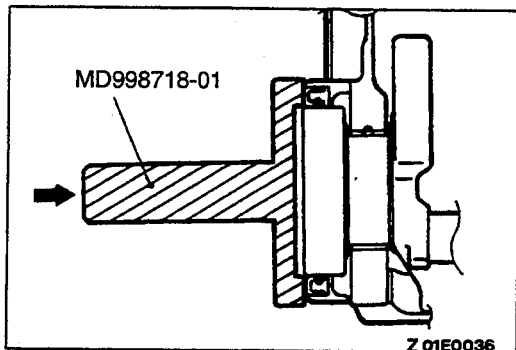
◀B▶ **OIL SEAL REMOVAL**

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

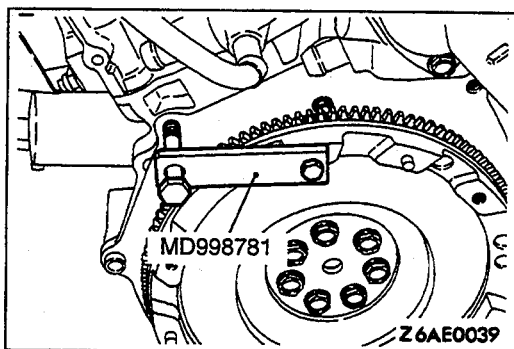
Caution

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



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

Use the special tool to press-fit a new crankshaft rear oil seal into the oil seal case.

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

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

OIL PAN AND OIL SCREEN

OIL PAN, LOWER

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REMOVAL AND INSTALLATION

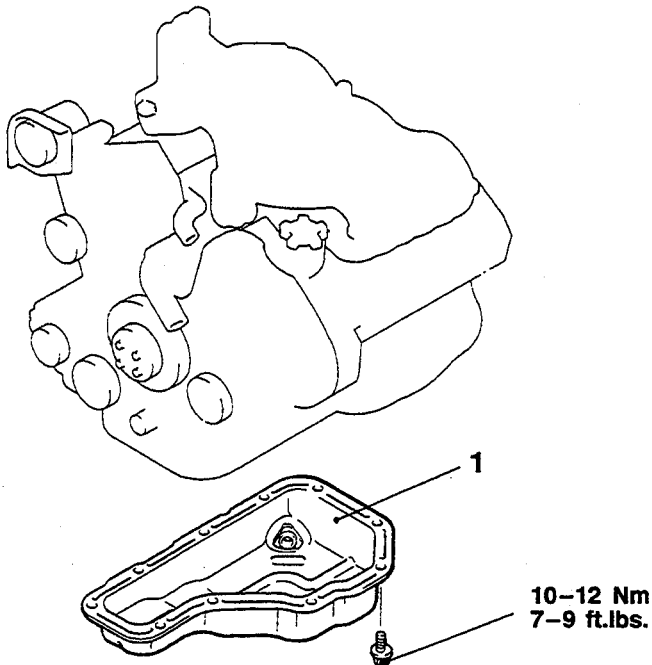
Pre-removal and Post-installation Operation

Removal and Installation

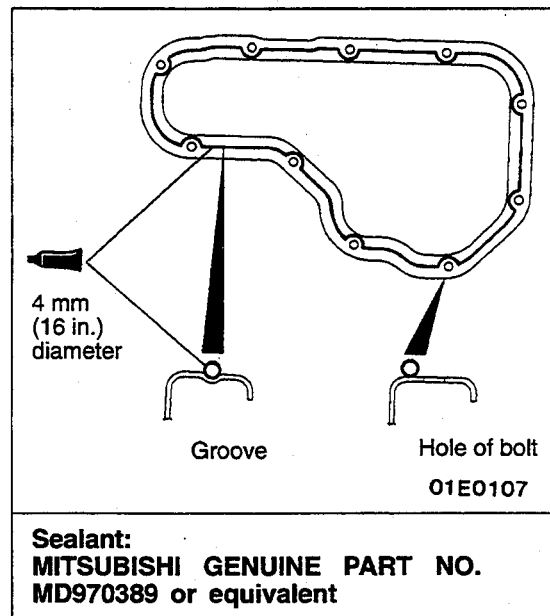
- Under Skid Plate, Undercover
- Front Exhaust Pipe (Refer to GROUP 15 – Exhaust Pipe, Mufflers and Catalytic Converter.)

Draining and Supplying

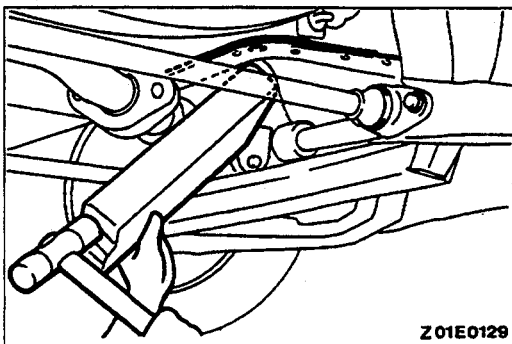
- Engine Oil (Refer to GROUP 00 – Maintenance Service.)



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◀A▶ ▶A▶ 1. Oil pan, lower

**REMOVAL SERVICE POINT**

◀A▶ OIL PAN, LOWER REMOVAL

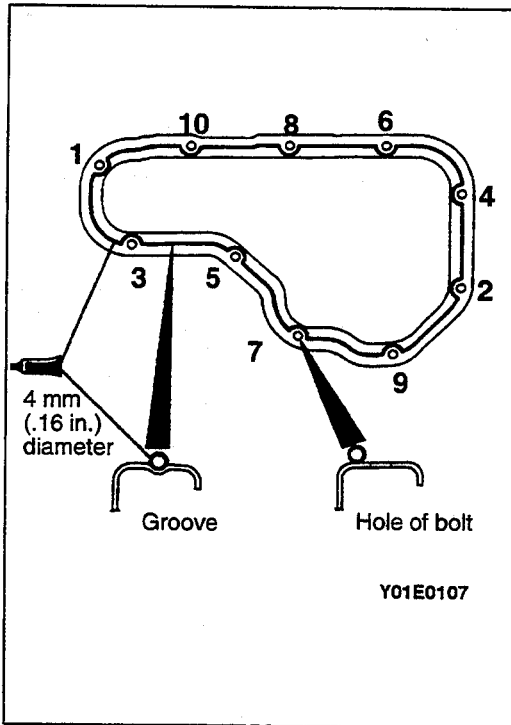
- (1) Remove the oil pan, lower installation bolt.
- (2) Place a wooden block to the oil pan, lower as shown in the figure and remove by tapping with a hammer.

Caution

The use of an oil pan remover (MD998727) can damage the oil pan, upper (aluminum made).

INSPECTION

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

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

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

NOTE

The sealant should be applied in a continuous bead approximately 4 mm (.16 in.) in diameter.

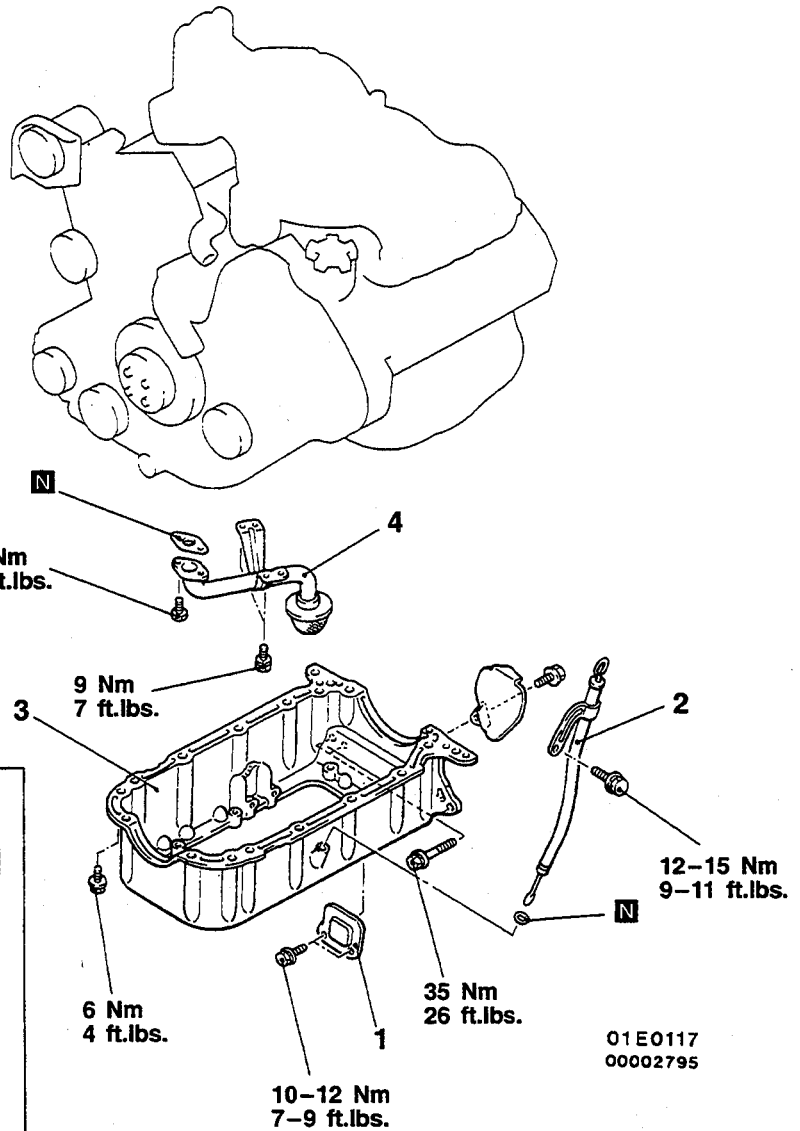
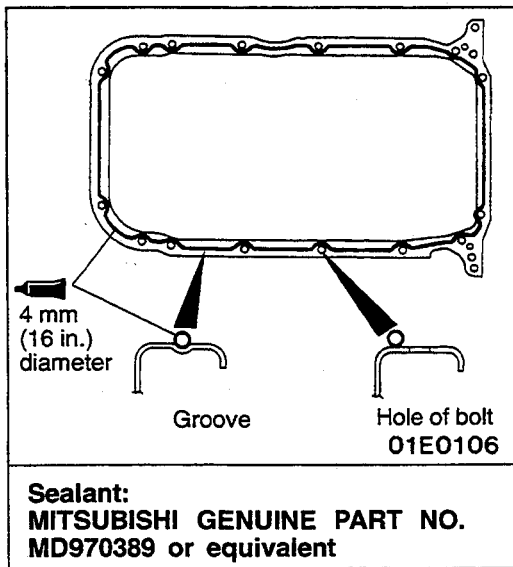
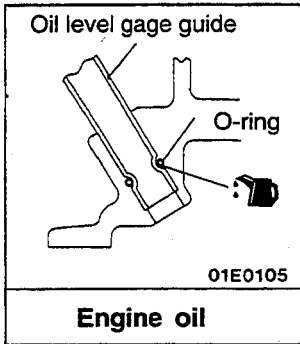
- (4) Install the oil pan to the cylinder block within 30 minutes after applying the sealant.
- (5) Tighten the oil pan mounting bolts in the order shown in the illustration at left.

**OIL PAN, UPPER AND OIL SCREEN
REMOVAL AND INSTALLATION**

Pre-removal and Post-installation Operation

Removal and Installation

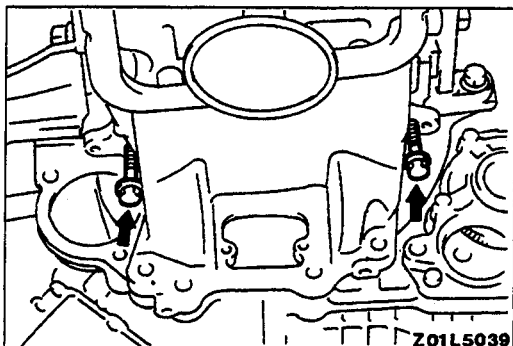
- Oil Pan, Lower (Refer to P.11B-22)
- Front Differential Carrier (Refer to GROUP 26 – Differential Carrier.)



Removal steps

1. Cover
2. Oil level gage guide

- ◀A▶ ▶A▶
3. Oil pan, upper
 4. Oil screen

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

Install a bolt [diameter × length: 10×38 mm (.39×1.50 in.)] to link the oil pan, upper with the transaxle in the hole of the oil pan, upper as shown in the illustration, and then tighten the bolt to remove the oil pan, upper.

INSPECTION

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

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

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

Specified sealant: MITSUBISHI GENUINE PART No. MD970389 or equivalent

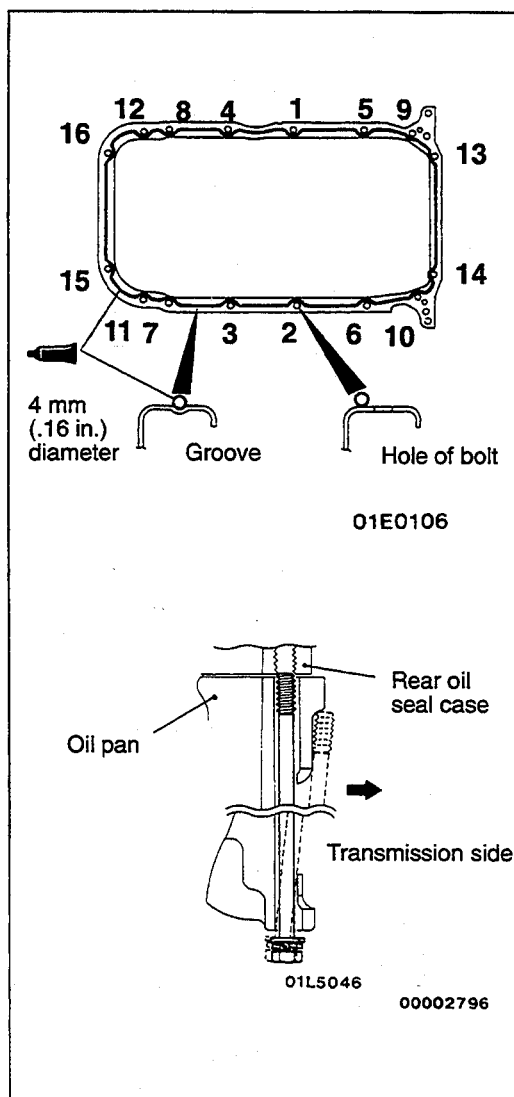
NOTE

The sealant should be applied in a continuous bead approximately 4 mm (.16 in.) in diameter.

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

Caution

The bolt holes for bolts 13 and 14 in the illustration are cut away on the transmission side, so be careful not to insert these bolts at an angle.



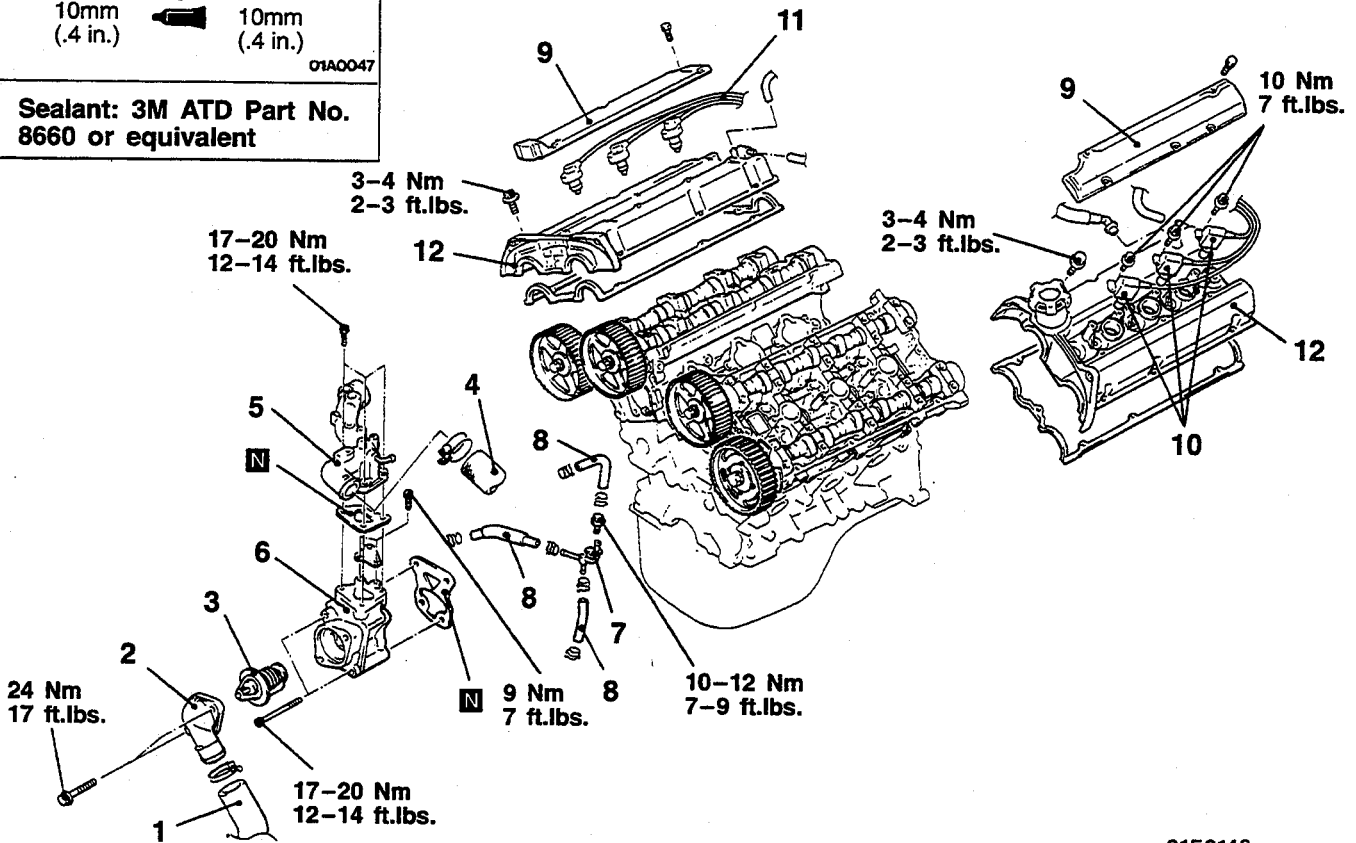
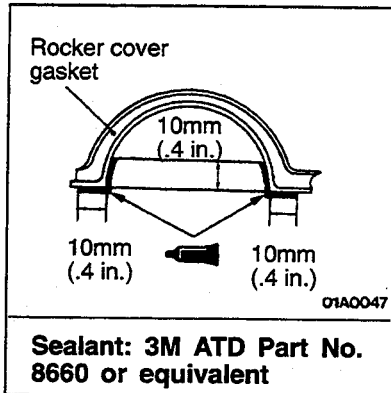
CYLINDER HEAD GASKET

110005723

REMOVAL AND INSTALLATION

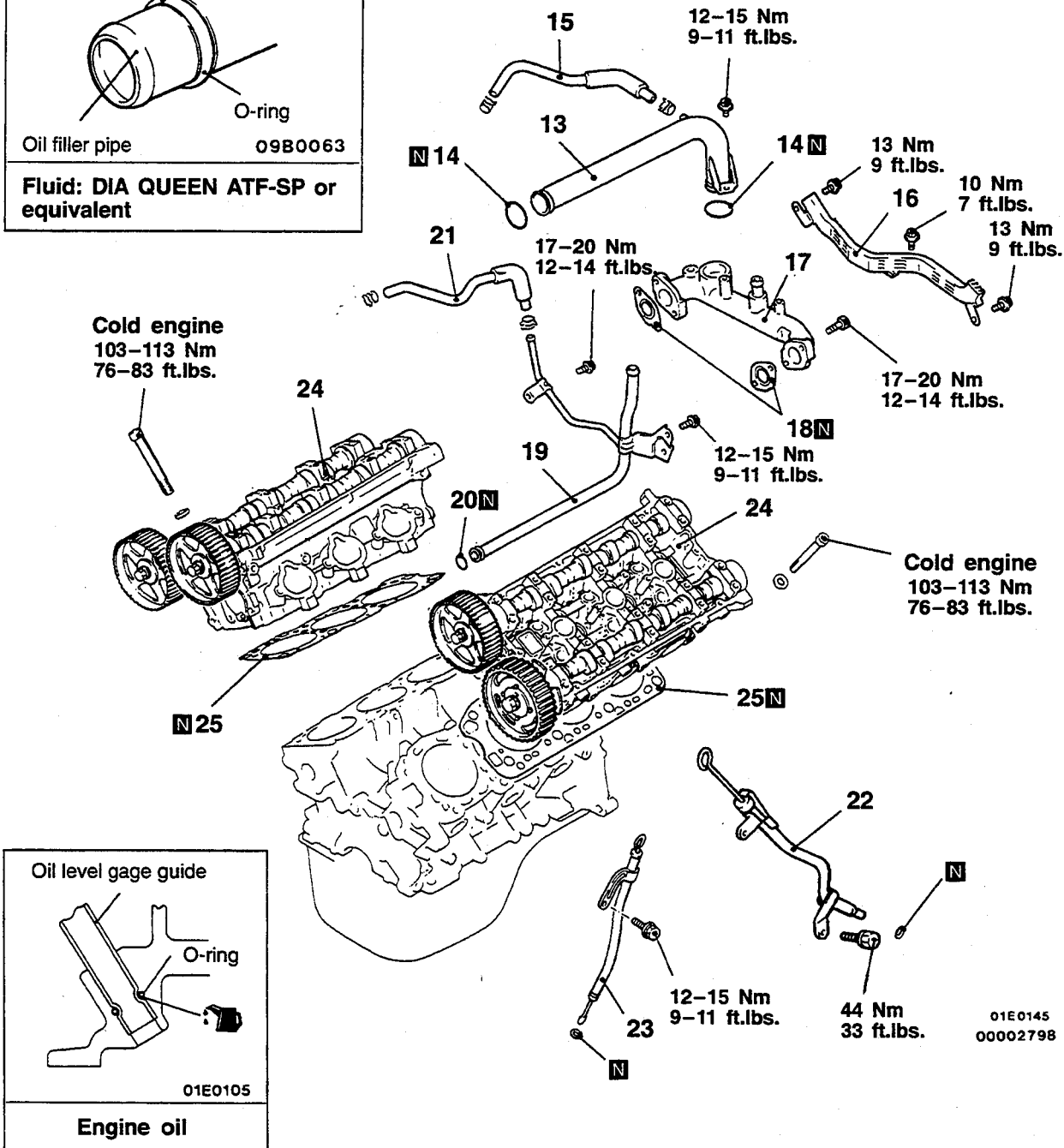
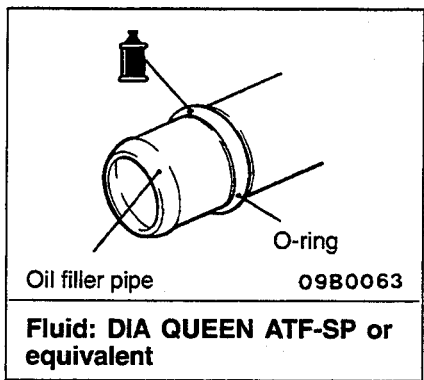
Pre-removal and Post-installation Operation

- Engine Coolant Draining and Supplying (Refer to GROUP 14 – Service Adjustment Procedures.)
- Removal and Installation of Timing Belt (Refer to P.11B-30)
- Removal and Installation of intake Manifold (Refer to GROUP 15 – Intake manifold.)
- Removal and Installation of Exhaust Manifold (Refer to GROUP 15 – Exhaust Manifold.)

01E0146
00002797**Removal steps**

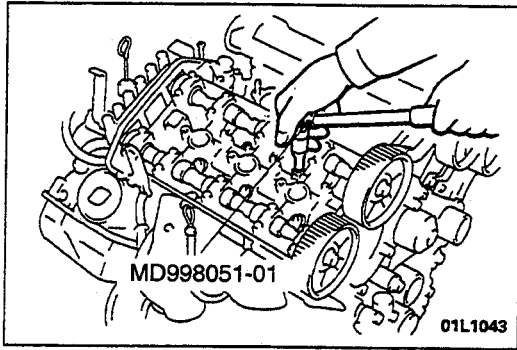
1. Radiator lower hose connection
2. Water inlet fitting
3. Thermostat
4. Radiator upper hose connection
5. Water outlet fitting
6. Thermostat case
7. Water line joint
8. Water hose
9. Center cover
10. Ignition coil
11. Spark plug cable
12. Rocker cover

TSB Revision



- ▶C◀ 13. Water outlet pipe
- ▶C◀ 14. O-ring
- ▶D◀ 15. Water hose
- ▶D◀ 16. Spark plug cable support
- ▶D◀ 17. Water passage
- ▶D◀ 18. Gasket
- ▶A◀ 19. Water pipe assembly

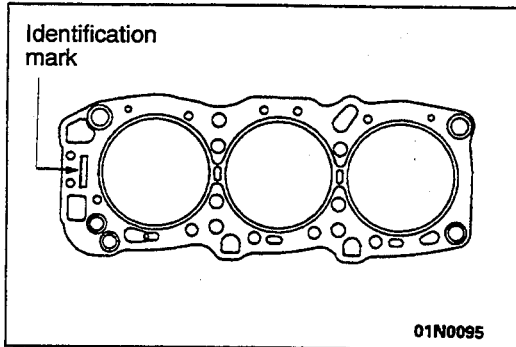
- ▶C◀ 20. O-ring
- ▶A◀ 21. Water hose
- ▶A◀ 22. Oil filler pipe
- ▶A◀ 23. Oil level gage guide
- ▶B◀ 24. Cylinder head assembly
- ▶A◀ 25. Cylinder head gasket



REMOVAL SERVICE POINTS

◀A▶ CYLINDER HEAD ASSEMBLY REMOVAL

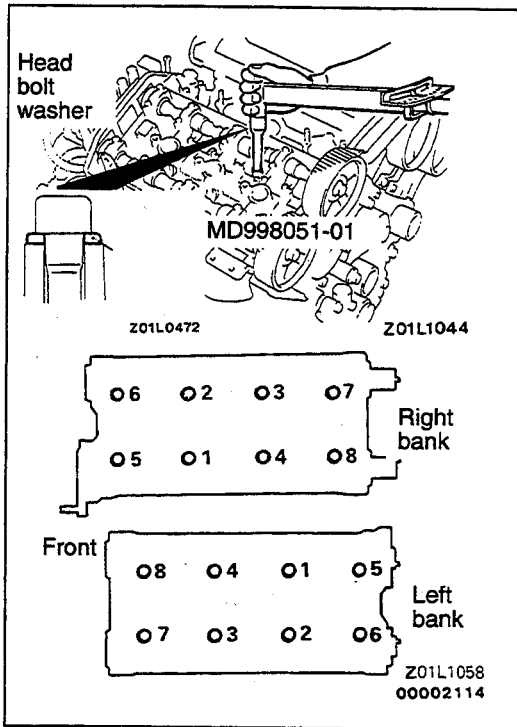
Using the special tool, after loosening the bolts (in 2 or 3 cycles), remove the cylinder head assembly.



INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

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

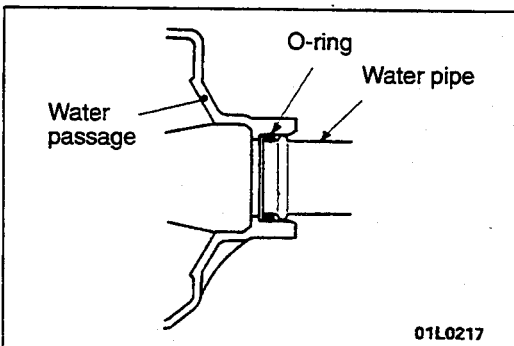


▶B◀ CYLINDER HEAD ASSEMBLY INSTALLATION

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

Caution

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

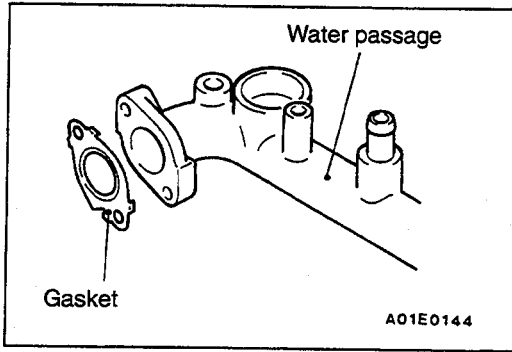


▶C◀ O-RINGS INSTALLATION

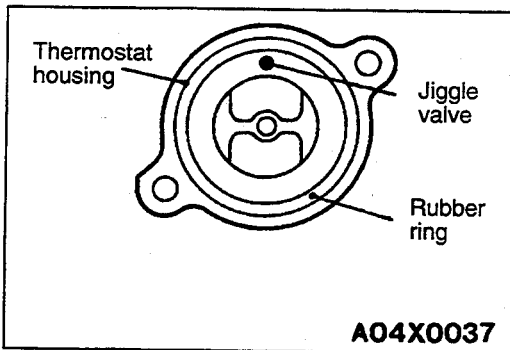
Rinse the mounting location of the O-ring and water pipe with water, and install the O-ring and water pipe.

Caution

1. Do not apply oil and grease to water pipe O-ring.
2. Keep the water pipe connections free of sand, dust, etc.
3. Insert water pipe until its end bottoms.

**►D◄ INSTALLATION OF GASKET AND WATER PASSAGE**

- (1) Install the gasket to the water passage so that it faces as shown in the illustration.
- (2) Install the water passage to the cylinder head.

**►E◄ INSTALLATION OF THERMOSTAT**

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

Caution

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

TIMING BELT

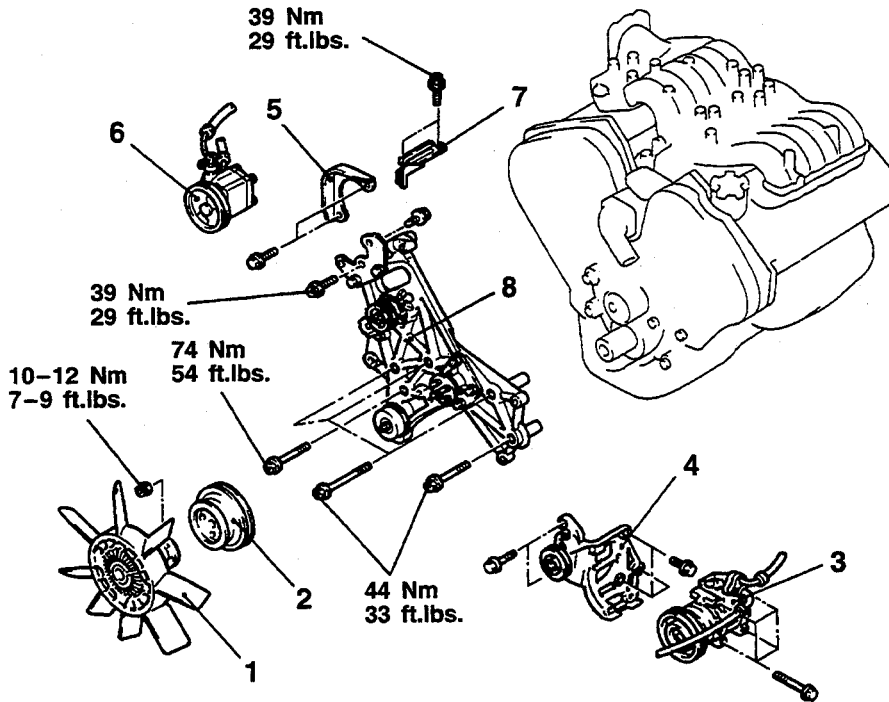
REMOVAL AND INSTALLATION

Pre-removal Operation

- Radiator Removal (Refer to GROUP 14 – Radiator.)
- Generator Assembly Removal (Refer to GROUP 16 – Generator.)
- Battery and Battery Tray Removal
- Under Skid Plate, Undercover Removal

Post-installation Operation

- Under Skid Plate, Undercover Installation
- Battery and Battery Tray Installation
- Generator Installation (Refer to GROUP 16 – Generator.)
- Radiator Installation (Refer to GROUP 14 – Radiator.)
- Engine Adjustment (Refer to P.11B-6.)



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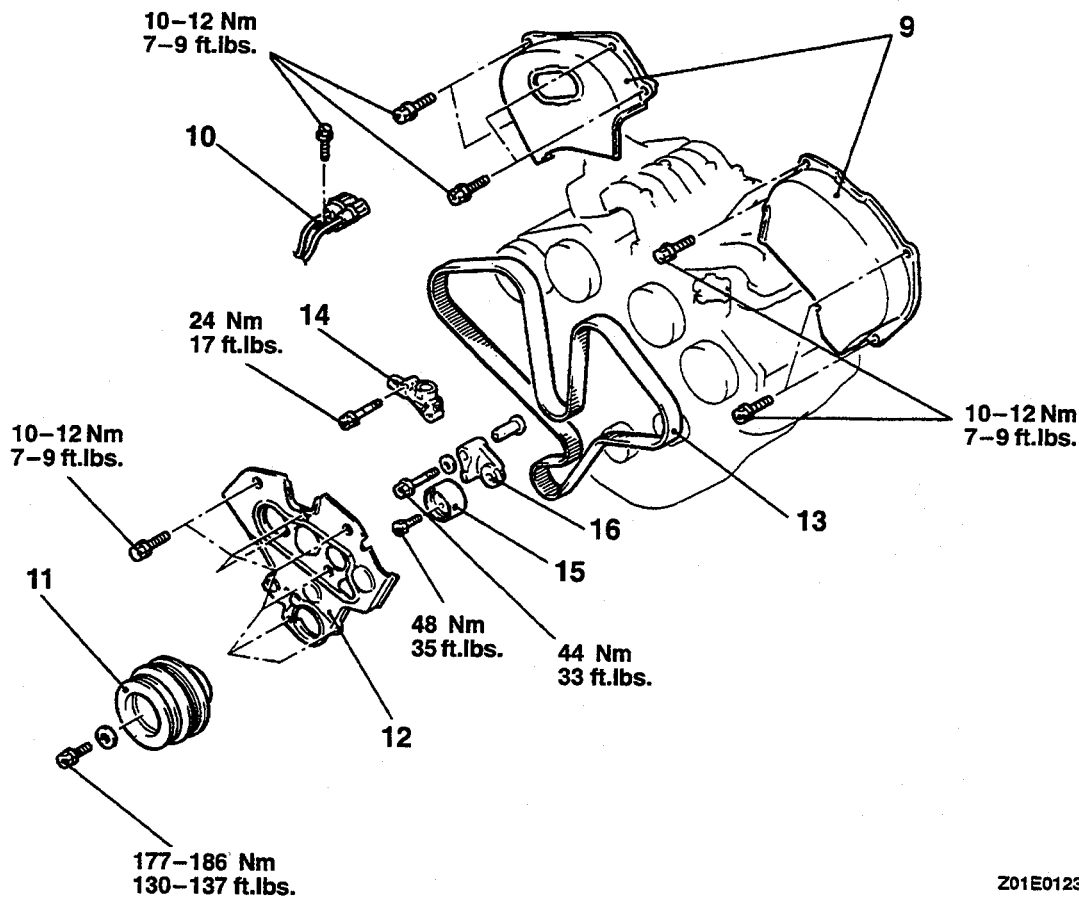
Symbol	Hardness category	d × l mm (in.)	Symbol
A	7T	10 × 80 (.39 × 3.15)	
B		10 × 100 (.39 × 3.93)	
C		12 × 100 (.47 × 3.93)	

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Removal steps

1. Cooling fan clutch assembly
2. Water pump pulley
3. Compressor <A/C>
4. Compressor bracket <A/C>
5. Cover
6. Power steering oil pump
7. Accessory mount stay
8. Accessory mount





Z01E0123

- 9. Timing belt upper cover
- 10. Crankshaft position sensor connector
- 11. Crankshaft pulley
- 12. Timing belt lower cover
- Adjustment of timing belt tension
- 13. Timing belt
- 14. Auto tensioner
- 15. Tension pulley
- 16. Tension arm assembly.

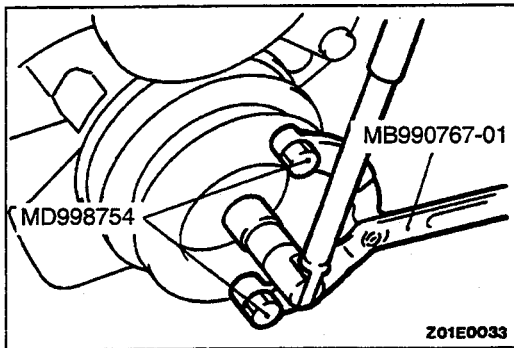
REMOVAL SERVICE POINTS

◀A▶ COMPRESSOR <A/C>/OIL PUMP (POWER STEERING) REMOVAL

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

NOTE

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

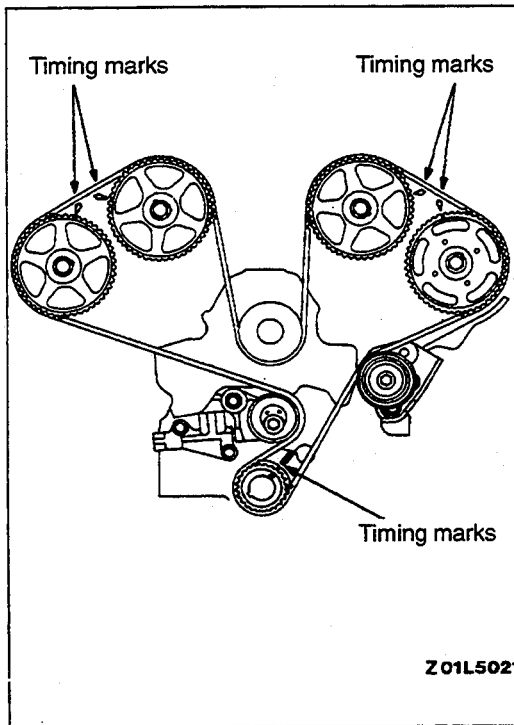


◀B▶ CRANKSHAFT PULLEY REMOVAL

Use the special tools to remove the crankshaft pulley from the crankshaft.

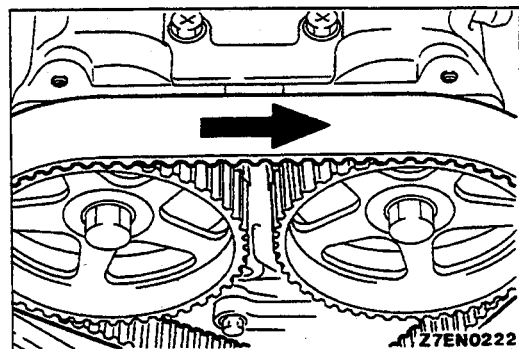
Caution

Use only the specified special tools, or a damaged pulley damper could result.



◀C▶ TIMING BELT REMOVAL

(1) Align the timing marks.



(2) Loosen the center bolt on the tension pulley to remove the timing belt.

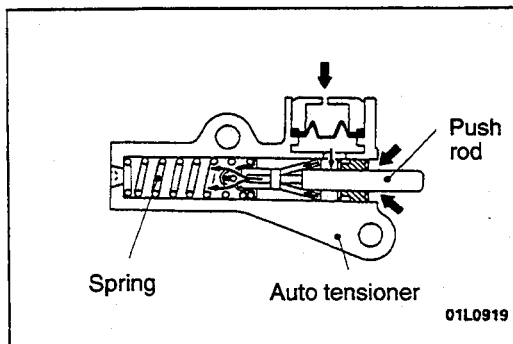
Caution

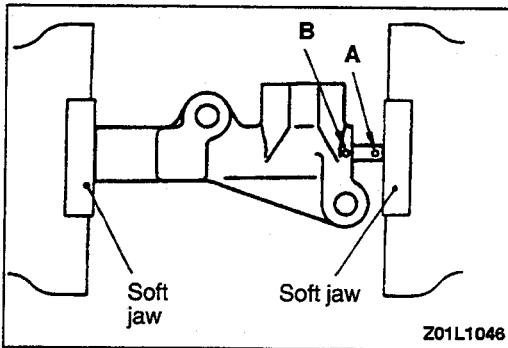
1. If the timing belt is to be re-used, mark the flat side of the belt with an arrow indicating the direction of rotation.
2. The cam of the front bank camshaft lifts the valve by means of the rocker arm and the camshaft sprocket will easily turn because of the valve spring force, so be careful not to insert your fingers, etc.

INSPECTION

AUTO TENSIONER

- Check the auto tensioner for possible leaks.
- Check the push rod for cracks.





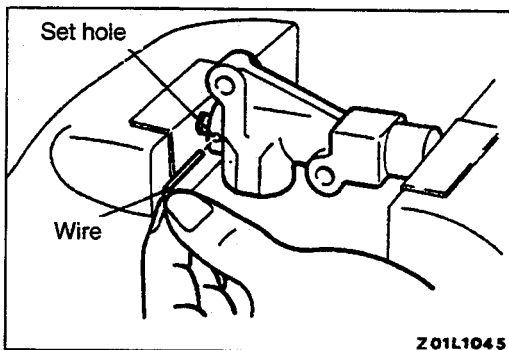
INSTALLATION SERVICE POINTS

▶A◀AUTO TENSIONER INSTALLATION

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

Caution

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



- 3) Insert a wire with a diameter of 1.4 mm (.055 in.) into the set holes.

NOTE

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

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

Caution

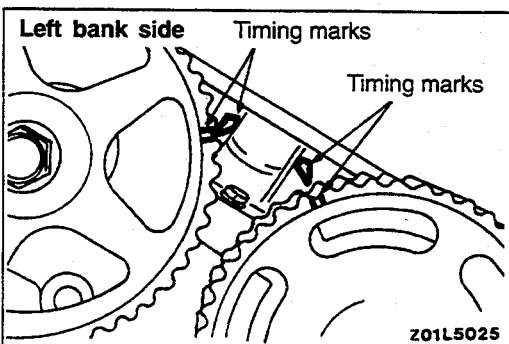
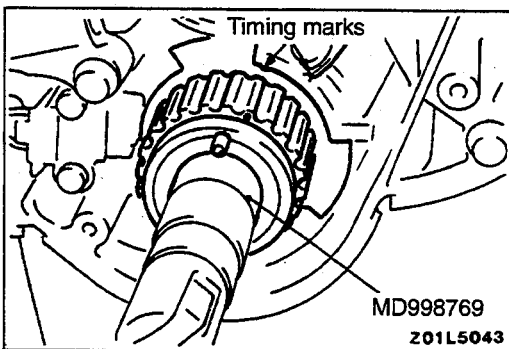
Leave the wire installed to the auto tensioner.

▶B◀TIMING BELT INSTALLATION

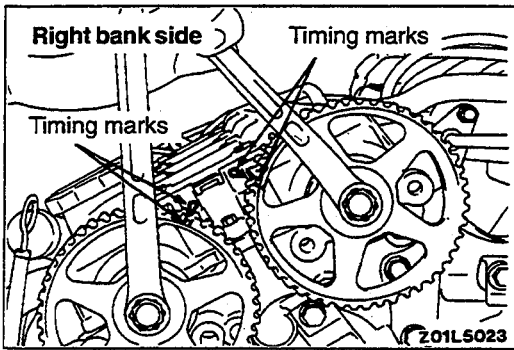
- (1) Install the crankshaft pulley and turn the crankshaft sprocket timing mark forward 3 teeth to move the piston slightly past No. 1 cylinder top dead center.

Caution

If the camshaft sprocket is turned while the No. 1 cylinder is at compression top dead center, there is a danger that the valve and piston will interfere.



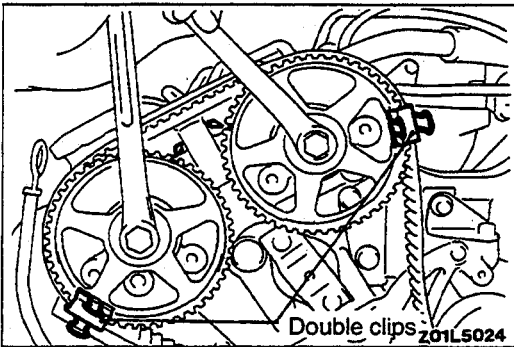
- (2) Align the timing mark of the left bank side camshaft sprocket.



- (3) Align the timing mark of the right bank side camshaft sprocket and hold the sprocket with a wrench so that it doesn't turn.

Caution

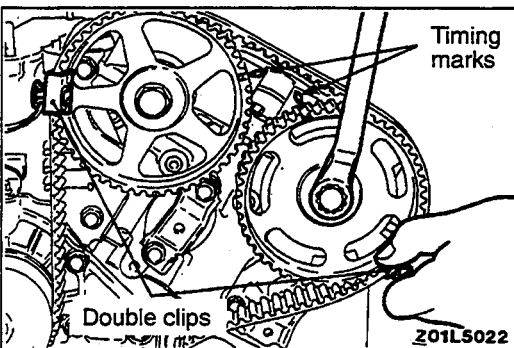
1. The camshaft sprocket will easily turn because of the valve spring force, so be careful not to insert your fingers, etc.
2. If the sprocket on one side of the right bank is turned one full revolution while the sprocket timing marks on the opposite side of the right bank are aligned, the intake and exhaust valves may cause interference.



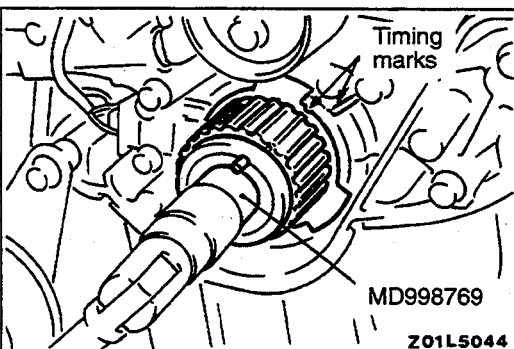
- (4) Check that the camshaft sprocket timing mark of the right bank side is aligned and clamp timing belt with double clips.

Caution

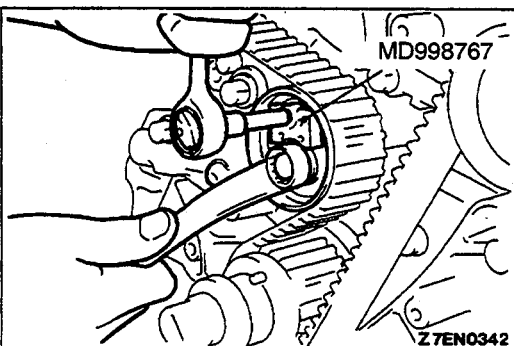
If the timing belt is being reused, install so that the arrow marked on it at the time of removal is pointing in the clockwise direction.



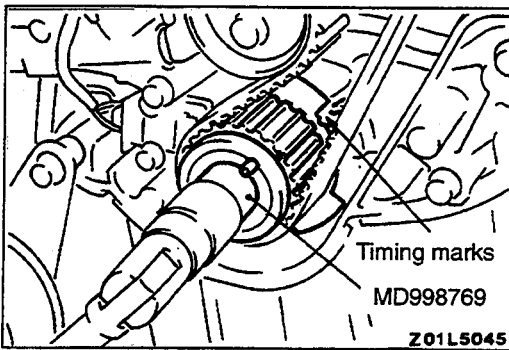
- (5) Set the timing belt onto the water pump pulley.
- (6) Check that the camshaft sprocket timing mark of the left bank side is aligned and clamp the timing belt with double clips.
- (7) Set the timing belt onto the idler pulley.



- (8) After aligning the crankshaft sprocket timing marks, turn the crankshaft one turn counterclockwise.
- (9) Set the timing belt onto the crankshaft sprocket.
- (10) Set the timing belt onto the tension pulley.

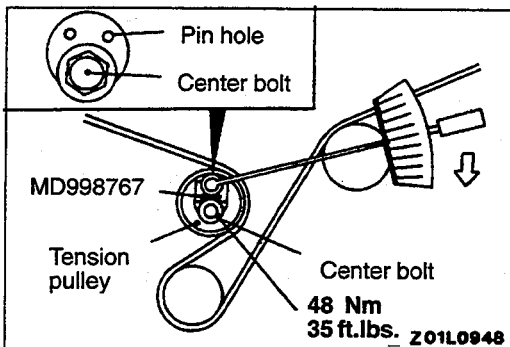


- (11) Place the tension pulley pin hole so that it is towards the top. Press the tension pulley onto the timing belt, and then provisionally tighten the fixing bolt.
- (12) Align the crankshaft sprocket timing marks.
- (13) Check that each of the sprocket timing marks is aligned.
- (14) Remove the 4 double clips.



◀▶TIMING BELT TENSION ADJUSTMENT

- (1) After turning the crankshaft 1/4 of a turn counterclockwise, turn it clockwise to the position where the timing marks are aligned.

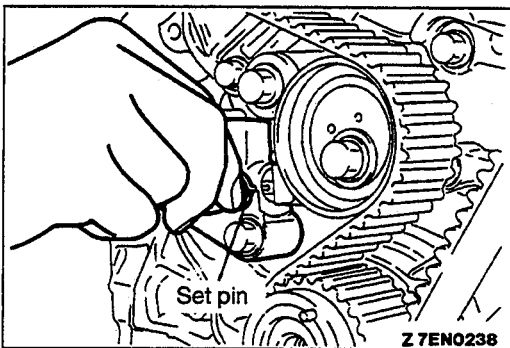


- (2) Loosen the center bolt on the tension pulley. Then, while using the special tool and torque wrench to apply tensioning torque to the timing belt, and tighten the center bolt to the specified torque.

Reference value: 9.4 Nm (7 ft.lbs.)
(Timing belt tensioning torque)

Caution

Make sure that the tension pulley does not rotate when the center bolt is tightened.



- (3) Remove the set pin from the auto tensioner. Make sure that the set pin can be easily removed at this time.
- (4) Rotate the crankshaft two turns clockwise and leave it as is for five minutes or more. Then, check again that the set pin can be easily removed from and installed to the auto tensioner.

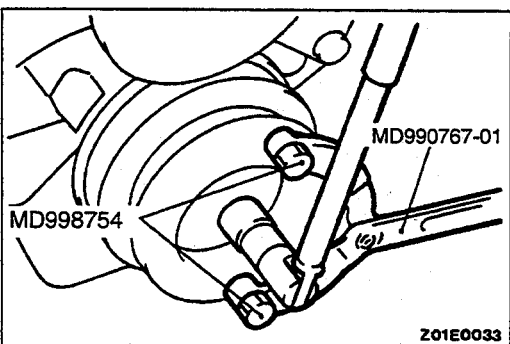
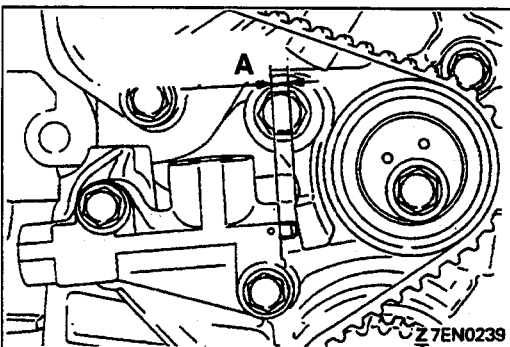
NOTE

Even if the set pin cannot be easily inserted, the auto tensioner is normal if its rod protrusion is within the standard value range.

Standard value (A): 3.8–4.5 mm (.149 to .177 in.)

If the protrusion is out of specification, repeat steps (1) to (4).

- (5) Check again that the timing marks on all sprockets are aligned properly.



◀▶CRANKSHAFT PULLEY INSTALLATION

Use the special tools to attach the crankshaft pulley to the crankshaft.

Caution

Use only the specified special tools, or a damaged pulley damper could result.

ENGINE OIL COOLER

REMOVAL AND INSTALLATION

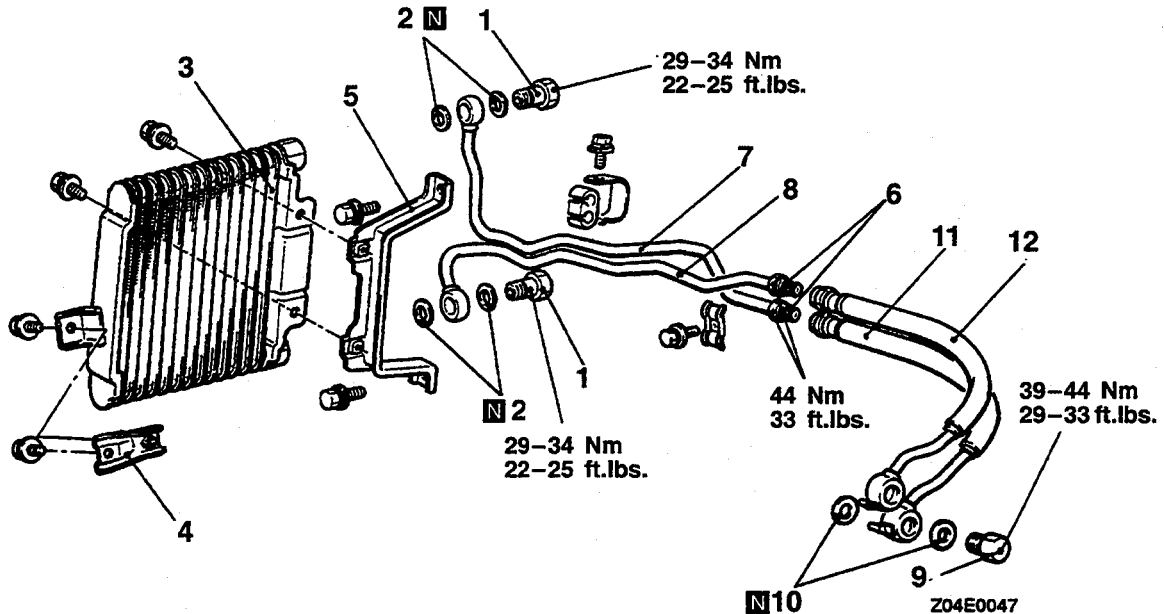
110005725

Pre-removal Operation

- Radiator Grille Removal

Post-installation Operation

- Radiator Grille Installation
- Supplying and Checking of Engine Oil



Removal steps

1. Eye bolts
2. Gaskets
3. Engine oil cooler
4. Stay
5. Bracket
6. Engine oil cooler hose connection

7. Return pipe
8. Feed pipe
9. Eye bolts
10. Gaskets
11. Return hose
12. Feed hose

REMOVAL SERVICE POINT

◀A▶ EYE BOLTS REMOVAL

Caution

Be sure to hold the weld nut of the oil cooler while loosening the eye bolt.

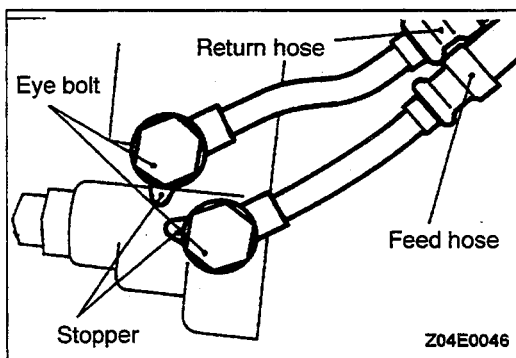
INSPECTION

- Check for foreign material between the oil cooler fins.
- Check the oil cooler fins for bends or damage.
- Check the oil cooler hoses for crack, damage, clogging or deterioration.

INSTALLATION SERVICE POINTS

▶B◀ FEED HOSE/RETURN HOSE/EYE BOLTS (ENGINE SIDE) INSTALLATION

- (1) Provisionally tighten the eye bolts, and then install the clamp so that it touches the crimps on the hoses.
- (2) Fully tighten the eye bolt on the return hose.
- (3) Place the feed hose against the stopper, and then fully tighten the eye bolt on the feed hose.



FUEL

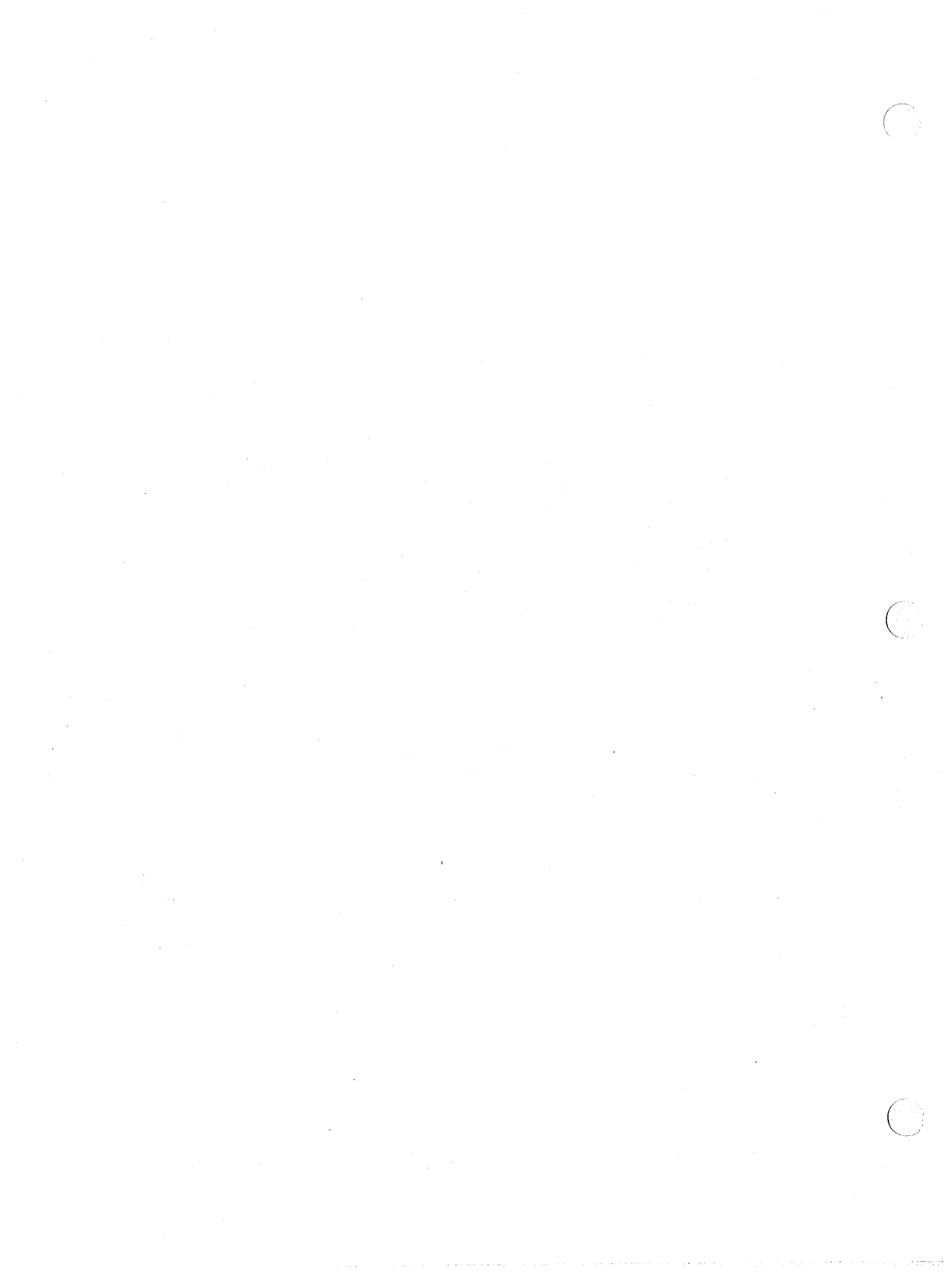
CONTENTS

110008754

MULTIPOINT FUEL INJECTION	13A
ELECTRONIC CONTROL TYPE CARBURETOR	13B
CONVENTIONAL TYPE CARBURETOR	13C
VARIABLE VENTURI TYPE CARBURETOR	13D
DIESEL FUEL	13E
FUEL SUPPLY AND ENGINE CONTROL	13F
CRUISE CONTROL SYSTEM	13G
TRACTION CONTROL SYSTEM	13H

NOTE

The tinted sections are not included in this manual.



MULTIPOINT FUEL INJECTION

CONTENTS

110005763

GENERAL INFORMATION	3	Power Supply (MFI relay) and Ignition Switch-IG	49
MFI System Diagram	3	Throttle Position Sensor	66
ON-VEHICLE INSPECTION OF MFI COMPONENTS		Vehicle Speed Sensor	80
<SOHC-12 valve engine>	44	Volume Air Flow Sensor	56
Air Conditioning Switch and Compressor Clutch Relay	84	ON-VEHICLE INSPECTION OF MFI COMPONENTS	
Anti-lock Braking Signal	104	<SOHC-24 valve engine, DOHC>	111
Barometric Pressure Sensor	62	Air Conditioning Switch and Compressor Clutch Relay	152
Camshaft Position Sensor	70	Anti-Lock Braking Signal	193
Closed Throttle Position Switch	68	Barometric Pressure Sensor	131
Component Inspection Procedure	48	Camshaft Position Sensor	139
Component Location	44	Closed Throttle Position Switch	137
Crankshaft Position Sensor	74	Component Inspection Procedure	118
Engine Control Module Power Ground	52	Component Location <SOHC>	111
Engine Control Module Terminal Voltage Check	108	Component Location <DOHC>	115
Engine Coolant Temperature Sensor	64	Crankshaft Position Sensor	142
Evaporative Emission Purge Solenoid	102	EGR Solenoid <DOHC>	191
Fuel Pressure Test	105	EGR Temperature Sensor <DOHC>	157
Fuel Pump	53	Electrical Load Switch <DOHC>	155
Idle Air Control Motor (Stepper Motor)	93	Engine Control Module Power Ground	122
Ignition Coil and Ignition Power Transistor	98	Engine Control Module Terminal Voltage Check	199
Ignition Switch-ST and Park/Neutral Position Switch <A/T>	78	Engine Coolant Temperature Sensor	133
Ignition Switch-ST <M/T>	76	Evaporative Emission Purge Solenoid <Federal - SOHC, California - DOHC - From 1995 models>	185
Injectors	89	Evaporative Emission Purge Solenoid <California - SOHC>	187
Intake Air Temperature Sensor	60		
Heated Oxygen Sensor	86		
Power Steering Pressure Switch	82		

Evaporative Emission Purge Solenoid
 <DOHC – Up to 1994 models, Federal – DOHC
 – From 1995 models> 189

Fuel Pressure Test <DOHC> 196

Fuel Pressure Test <SOHC> 194

Fuel Pump 123

Heated Oxygen Sensor <Federal> 159

Heated Oxygen Sensor
 <California – SOHC> 161

Heated Oxygen Sensor
 <California – DOHC> 164

Idle Air Control Motor (Stepper Motor) 171

Ignition Coil and Ignition Power Transistor
 <SOHC> 173

Ignition Coil and Ignition Power Transistor
 <DOHC> 178

Ignition Switch-ST <M/T> 145

Ignition Switch-ST and
 Park/Neutral Position Switch <A/T> 146

Injectors 167

Intake Air Temperature Sensor 129

Knock Sensor <DOHC> 153

Power Steering Pressure Switch 150

Power Supply (MFI relay) and
 Ignition Switch-IG 119

Throttle Position Sensor 135

Variable Induction Control Solenoid
 <DOHC> 183

Vehicle Speed Sensor 148

Volume Air Flow Sensor 126

SERVICE ADJUSTMENT PROCEDURES 39

Basic Idle Speed Adjustment 39

Closed Throttle Position Switch and
 Throttle Position Sensor Adjustment 42

Fixed SAS Adjustment 44

Throttle Body (Throttle Valve Area)
 Cleaning 42

SPECIAL TOOLS 10

SPECIFICATIONS 9

General Specifications 9

Sealant 10

Service Specifications 10

TROUBLESHOOTING 12

Check Chart Classified by Problem
 Symptoms 32

Check Engine/Malfunction Indicator Lamp 14

Explanation and Precaution Related to
 Harness Checking 13

Explanation of Troubleshooting Procedures 12

On-board Diagnostic 15

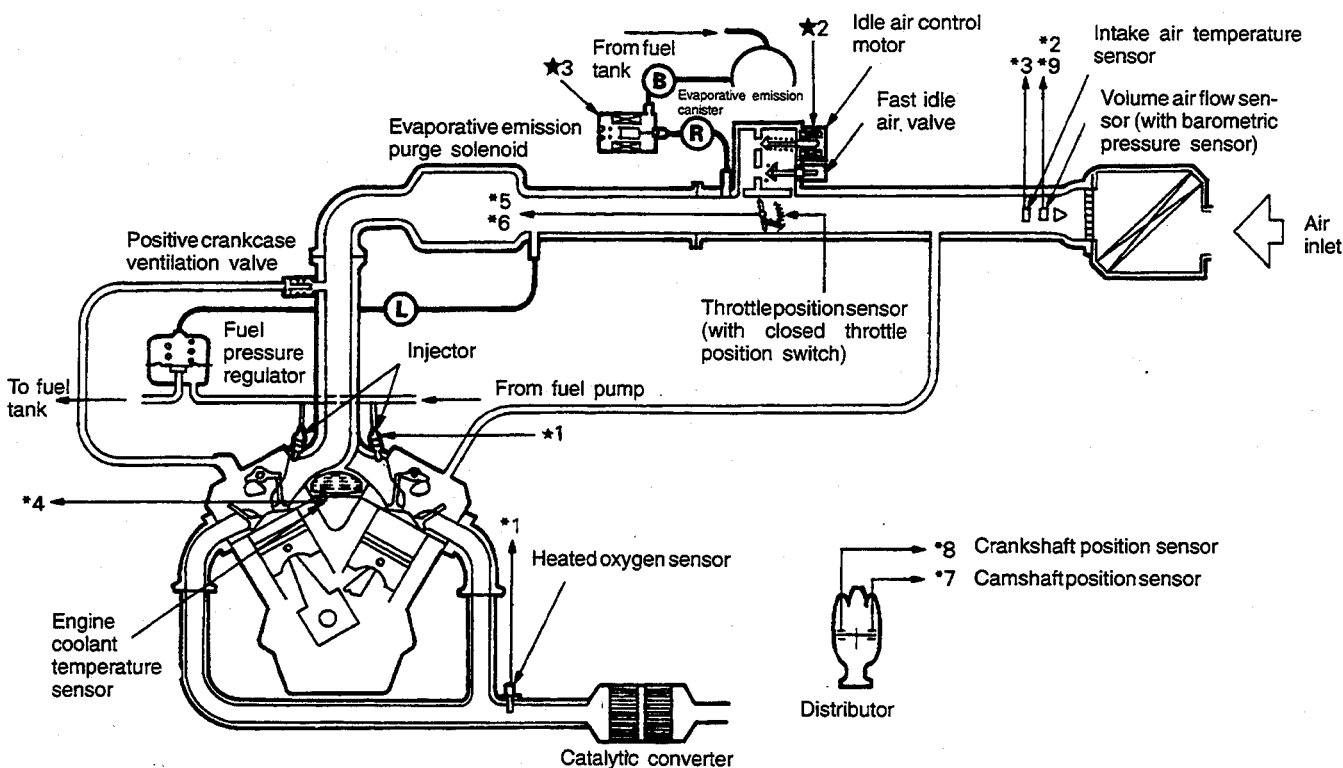
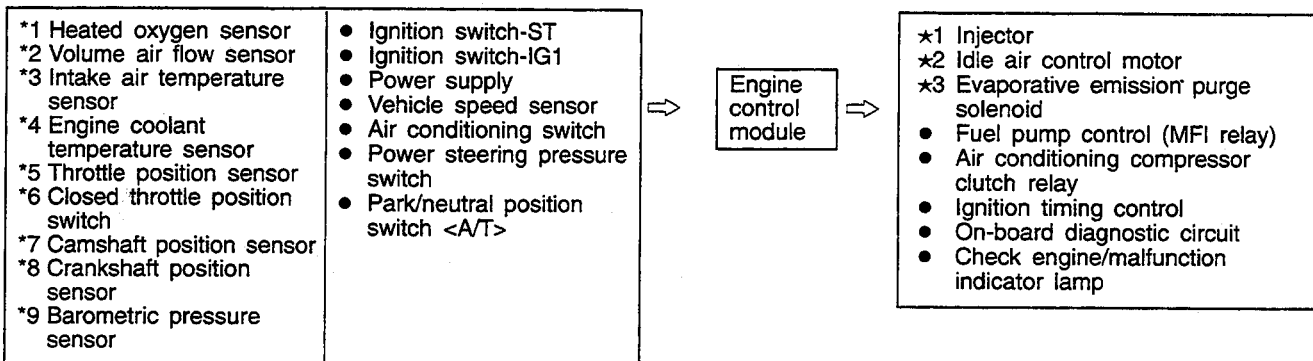
Problem Symptoms Table
 (For Your Information) 38

Reading of Diagnostic Trouble Codes 29

GENERAL INFORMATION

MFI SYSTEM DIAGRAM

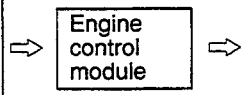
<SOHC-12 valve engine (Up to 1992 models)>



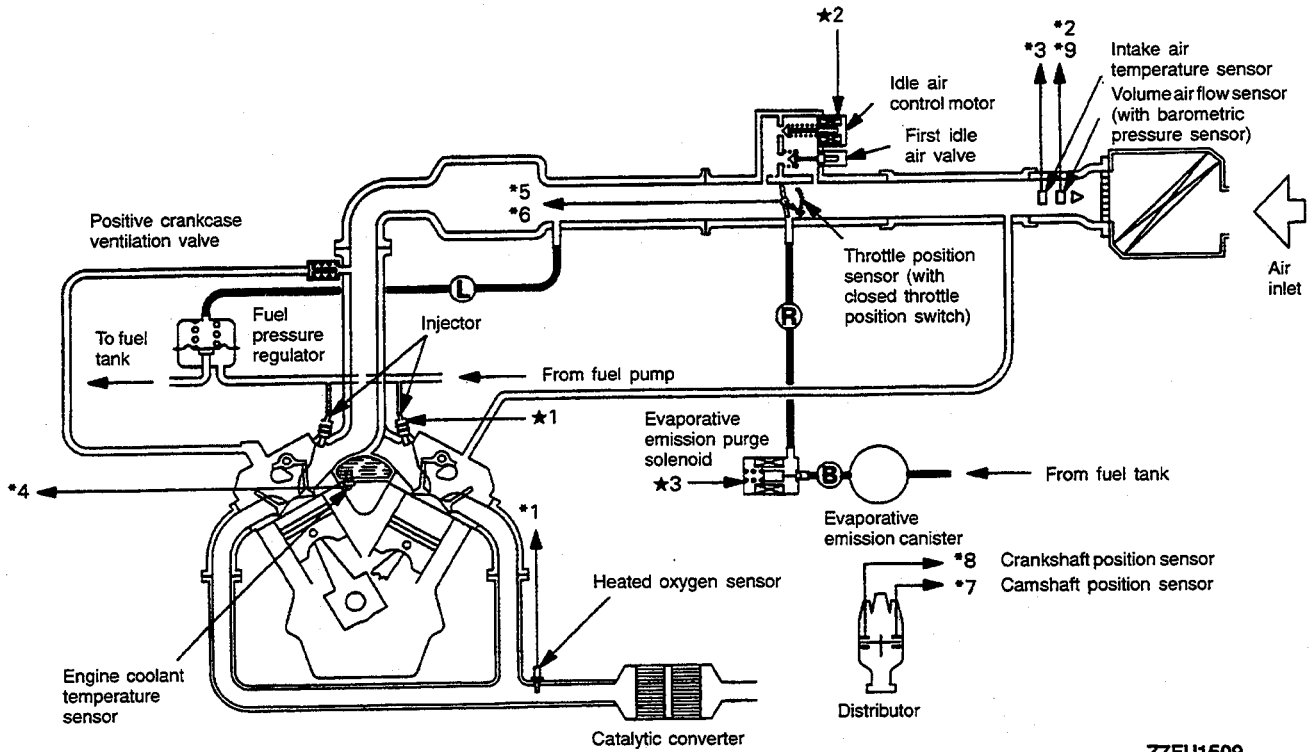
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<SOHC-12 valve engine (1993 models and 1994 models)>

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| <ul style="list-style-type: none"> *1 Heated oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Engine coolant temperature sensor *5 Throttle position sensor *6 Closed throttle position switch *7 Camshaft position sensor *8 Crankshaft position sensor *9 Barometric pressure sensor | <ul style="list-style-type: none"> ● Ignition switch-ST ● Ignition switch-IG1 ● Power supply ● Vehicle speed sensor ● Air conditioning switch ● Power steering pressure switch ● Park/neutral position switch <A/T> |
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| <ul style="list-style-type: none"> *1 Injector *2 Idle air control motor *3 Evaporative emission purge solenoid | <ul style="list-style-type: none"> ● Fuel pump control (MFI relay) ● Air conditioning compressor clutch relay ● Ignition timing control ● On-board diagnostic circuit ● Check engine/malfunction indicator lamp |
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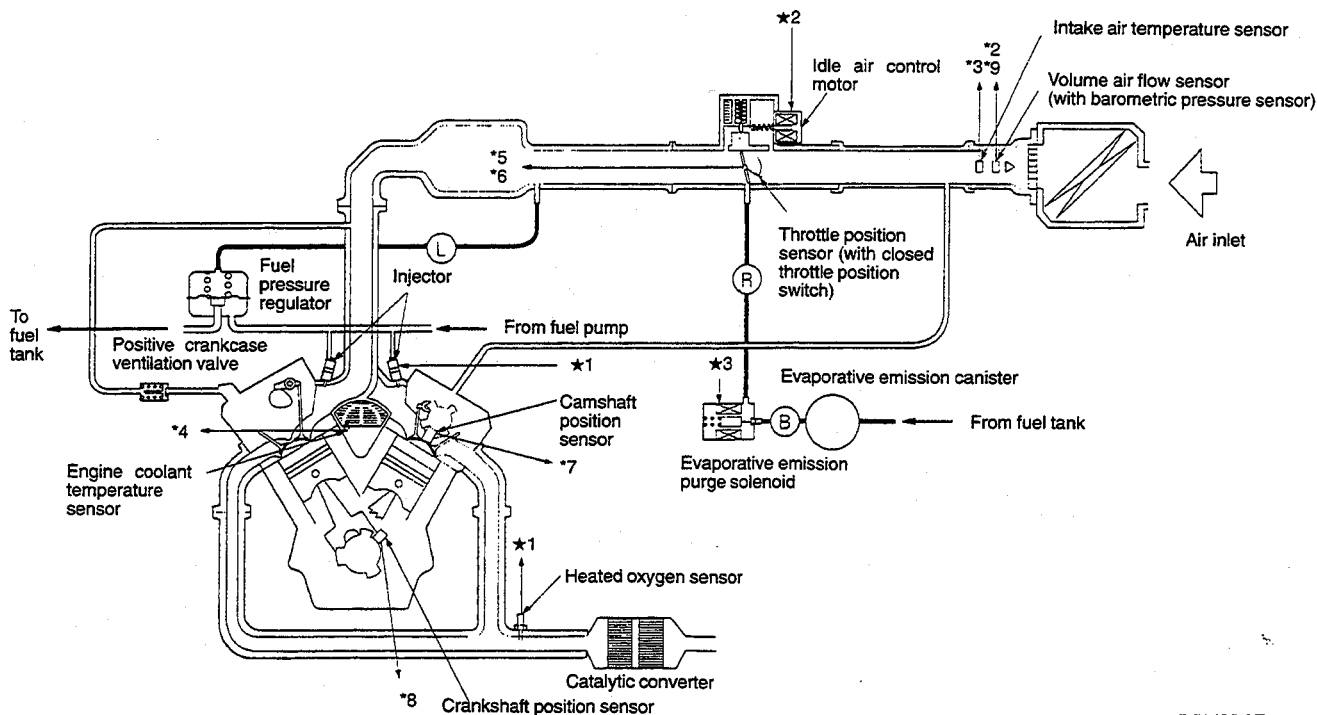
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<SOHC-24 valve engine (Federal – From 1995 models)>

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| <ul style="list-style-type: none"> *1 Heated oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Engine coolant temperature sensor *5 Throttle position sensor *6 Closed throttle position switch *7 Camshaft position sensor *8 Crankshaft position sensor *9 Barometric pressure sensor | <ul style="list-style-type: none"> ● Ignition switch-ST ● Ignition switch-IG1 ● Power supply ● Vehicle speed sensor ● Air conditioning switch ● Power steering pressure switch ● Park/neutral position switch <A/T> |
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Engine control module

- | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ★1 Injector ★2 Idle air control motor ★3 Evaporative emission purge solenoid ● Fuel pump control (MFI relay) ● Air conditioning compressor clutch relay ● Ignition timing control ● On-board diagnostic circuit ● Check engine/malfunction indicator lamp |
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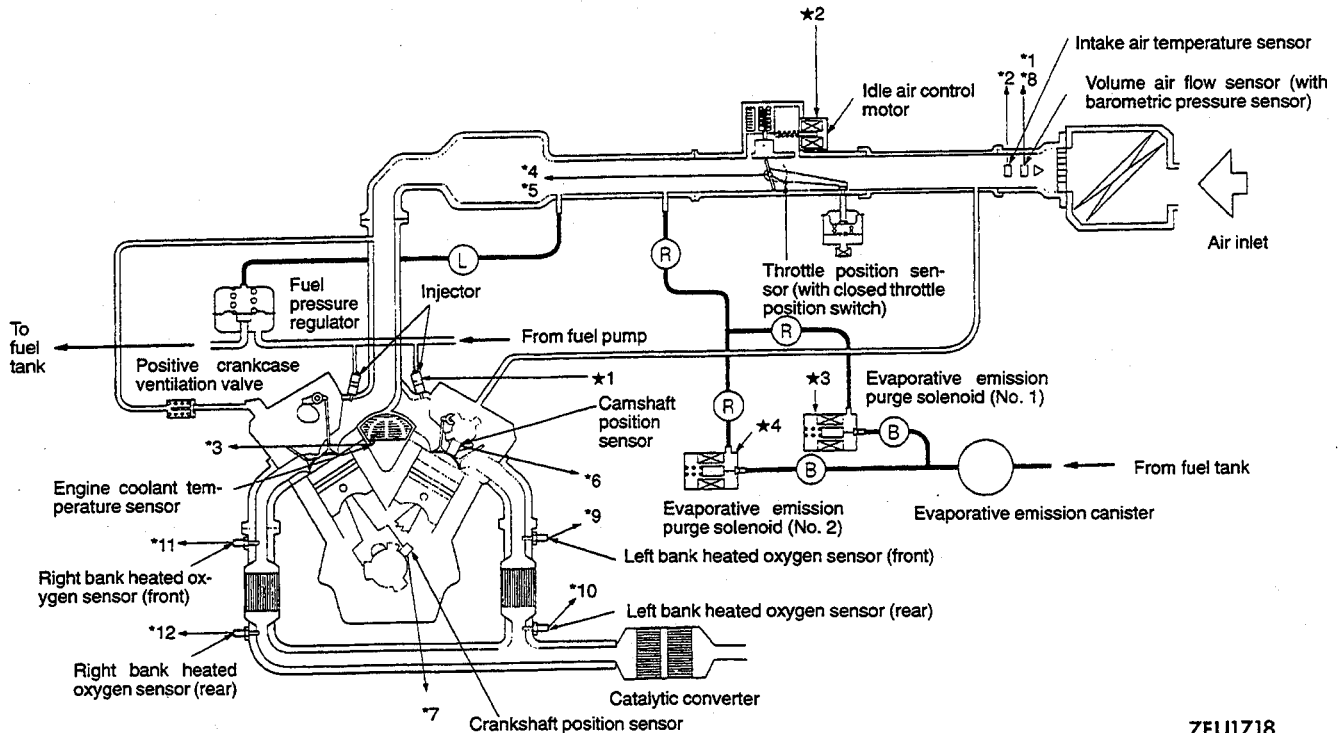
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<SOHC-24 valve engine (California – From 1995 models)>

- *1 Volume air flow sensor
 - *2 Intake air temperature sensor
 - *3 Engine coolant temperature sensor
 - *4 Throttle position sensor
 - *5 Closed throttle position switch
 - *6 Camshaft position sensor
 - *7 Crankshaft position sensor
 - *8 Barometric pressure sensor
 - *9 Left bank heated oxygen sensor (front)
 - *10 Left bank heated oxygen sensor (rear)
 - *11 Right bank heated oxygen sensor (front)
 - *12 Right bank heated oxygen sensor (rear)
- Ignition switch-ST
 - Ignition switch-IG1
 - Power supply
 - Vehicle speed sensor
 - Air conditioning switch
 - Power steering pressure switch
 - Park/neutral position switch <A/T>

⇒ Engine control module ⇒

- *1 Injector
- *2 Idle air control motor
- *3 Evaporative emission purge solenoid <No. 1>
- *4 Evaporative emission purge solenoid <No. 2>
- Fuel pump control (MFI relay)
- Air conditioning compressor clutch relay
- Ignition timing control
- On-board diagnostic circuit
- Check engine/malfunction indicator lamp



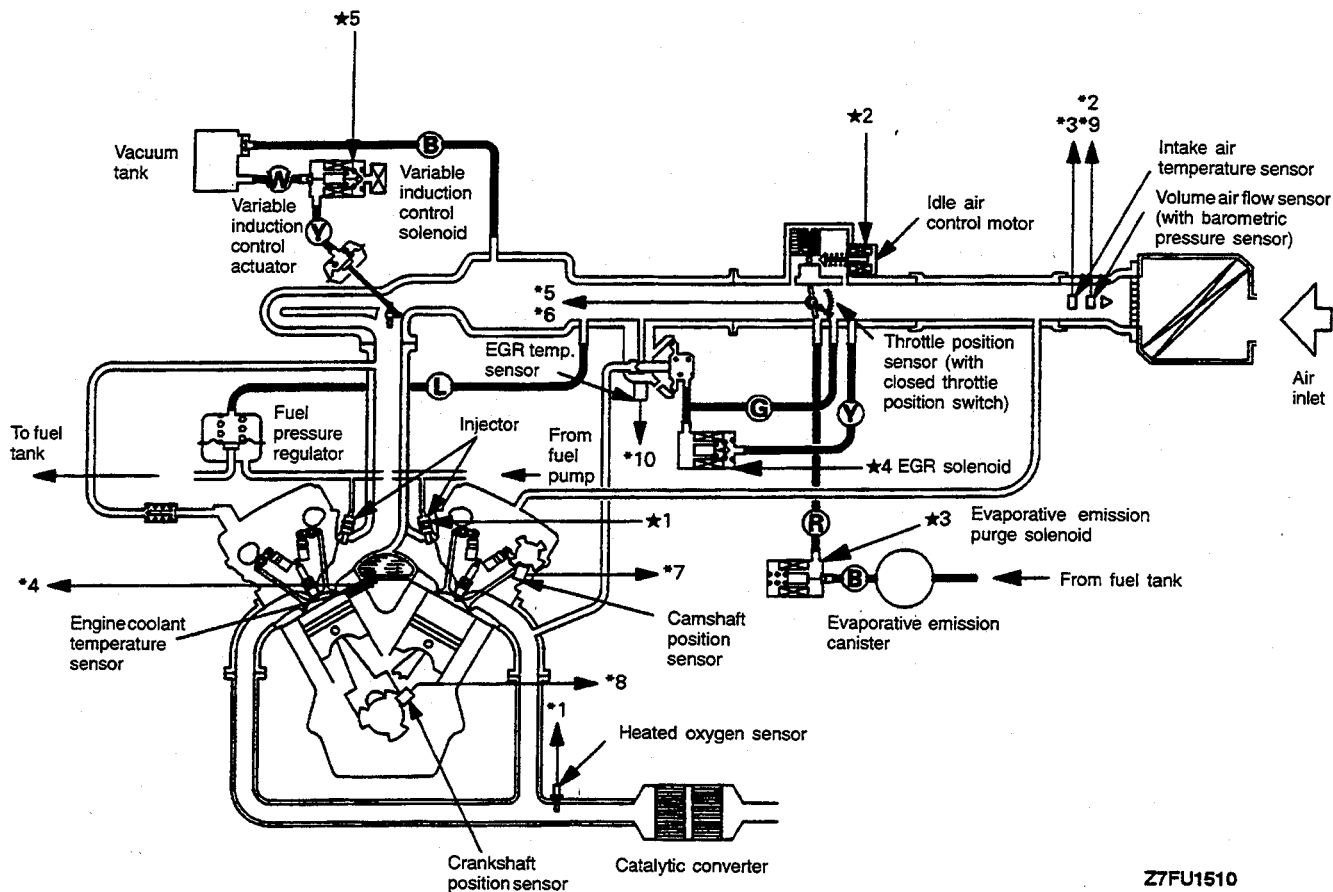
7FU1718

<DOHC (Federal and California – 1994 models)>

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| <ul style="list-style-type: none"> *1 Heated oxygen sensor *2 Volume air flow sensor *3 Intake air temperature sensor *4 Engine coolant temperature sensor *5 Throttle position sensor *6 Closed throttle position switch *7 Camshaft position sensor *8 Crankshaft position sensor *9 Barometric pressure sensor *10 EGR temperature sensor | <ul style="list-style-type: none"> • Ignition switch-ST • Ignition switch-IG1 • Power supply • Vehicle speed sensor • Air conditioning switch • Power steering pressure switch • Park/neutral position switch • Knock sensor |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

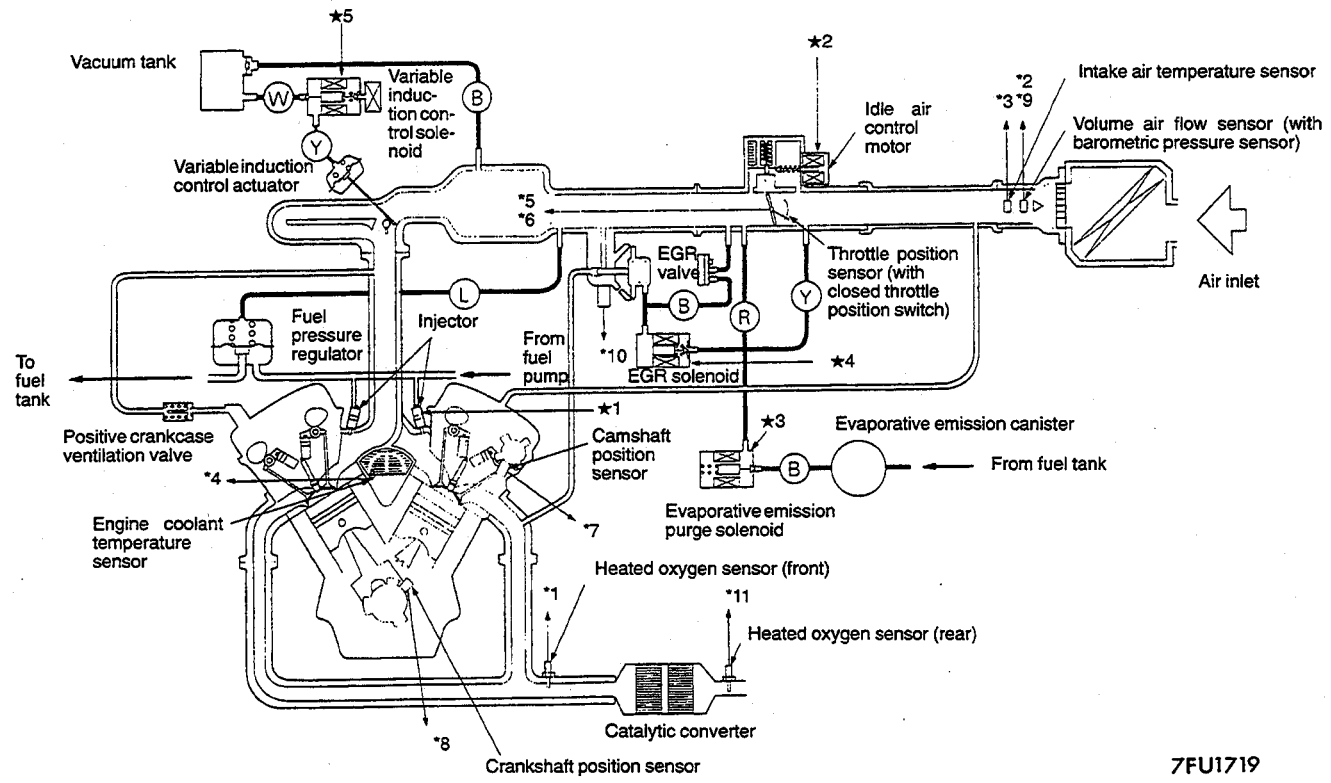
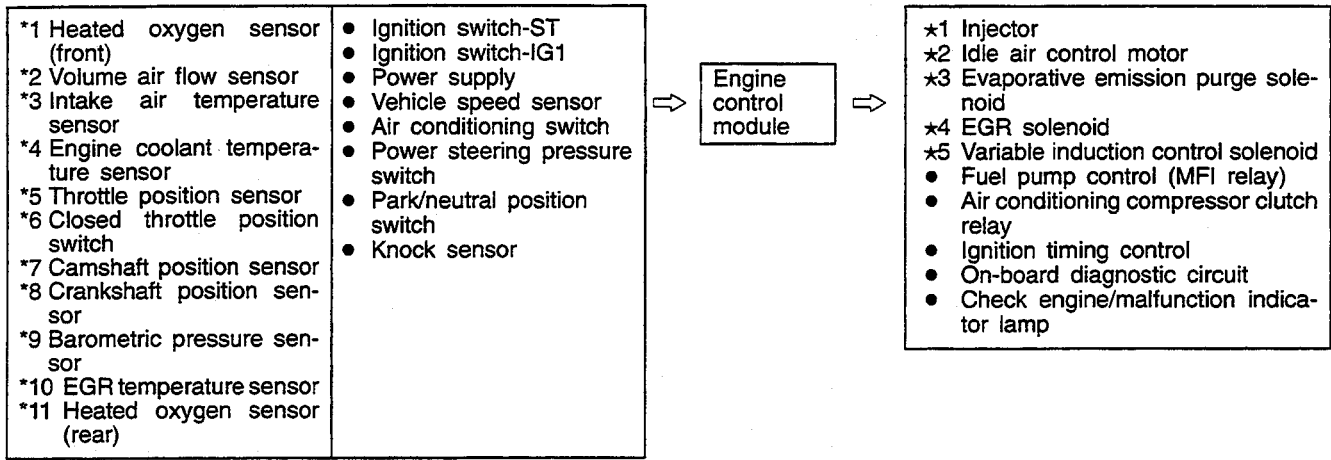
Engine control module

- | | |
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| <ul style="list-style-type: none"> *1 Injector *2 Idle air control motor *3 Evaporative emission purge solenoid *4 EGR solenoid *5 Variable induction control solenoid | <ul style="list-style-type: none"> • Fuel pump control (MFI relay) • Air conditioning compressor clutch relay • Ignition timing control • On-board diagnostic circuit • Check engine/malfunction indicator lamp |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



Z7FU1510

<DOHC (California – From 1995 models)>



7FU1719

SPECIFICATIONS

GENERAL SPECIFICATIONS

Items		Specifications
Throttle body	Throttle bore mm (in.)	54 (2.13) <SOHC-12 valve engine> 60 (2.36) <DOHC, SOHC-24 valve engine>
	Throttle position sensor	Variable resistor type
	Idle air control motor	Stepper motor type (Stepper motor type by-pass air control system)
	Closed throttle position switch	Rotary contact type
Engine control module	Identification model No.	SOHC E2T37475 <12 valve engine, Federal – 24 valve engine> E2T37484 <California – 24 valve engine>
		DOHC E2T39972 <Up to 1994 model> E2T39980 <Federal – From 1995 model> E2T39979 <California – From 1995 model>
Sensors	Volume air flow sensor	Karman vortex type
	Barometric pressure sensor	Semiconductor type
	Intake air temperature sensor	Thermistor type
	Engine coolant temperature sensor	Thermistor type
	Heated oxygen sensor	Zirconia type
	Vehicle speed sensor	Reed switch type
	Park/Neutral position switch <A/T>	Contact switch type
	Knock sensor <DOHC>	Piezoelectric type
	Camshaft position sensor	Photo interrupter type <SOHC-12 valve engine> Hall element type <DOHC, SOHC-24 valve engine>
	Crankshaft position sensor	Photo interrupter type <SOHC-12 valve engine> Hall element type <DOHC, SOHC-24 valve engine>
	Power steering pressure switch	Contact switch type
Actuators	Multiport fuel injection (MFI) relay	Contact switch type
	Injector type and number	Electromagnetic, 6
	Injector identification mark	B210H <SOHC-12 valve engine> DDH210 <SOHC-24 valve engine> SDH240 <DOHC>
	Evaporative emission purge solenoid	ON/OFF type solenoid <Up to 1994 model, Federal – From 1995 model> Duty cycle type solenoid <California – From 1995 model>
	EGR solenoid <DOHC>	Duty cycle type solenoid
	Variable induction control solenoid <DOHC>	ON/OFF type solenoid
Fuel pressure regulator	Regulated pressure kPa (psi)	335 (47.6)

SERVICE SPECIFICATIONS

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Items		Specifications
Basic ignition timing		5°±2° BTDC at curb idle <SOHC-12 valve engine> 5°±3° BTDC at curb idle <DOHC, SOHC-24 valve engine>
Curb idle speed rpm		700±100
Idle speed when air conditioning ON rpm		900 in neutral
Basic idle speed rpm		700±50
Throttle position sensor adjusting voltage mV		400–1,000
Throttle position sensor resistance kΩ		3.5–6.5
Idle air control motor coil resistance Ω		28–33 [at 20°C (68 °F)]
Intake air temperature sensor resistance kΩ		2.7 [at 20°C (68 °F)]
Engine coolant temperature sensor resistance kΩ	20°C (68 °F)	2.4
	80°C (176 °F)	0.3
Heated oxygen sensor output voltage V		0.6–1.0
Fuel pressure kPa (psi)	Vacuum hose disconnection	330–350 (47–50) at curb idle
	Vacuum hose connection	Approx. 270 (38) at curb idle
Injector coil resistance Ω		13–16 [at 20°C (68 °F)]
Evaporative emission purge solenoid coil resistance Ω		36–44 [at 20°C (68 °F)]
EGR solenoid coil resistance Ω		36–44 [at 20°C (68 °F)]
Variable induction control solenoid coil resistance Ω		36–44 [at 20°C (68 °F)]



SEALANT




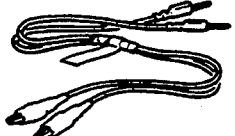

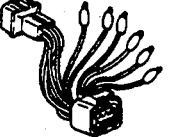
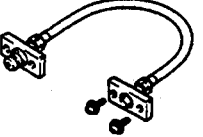
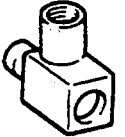
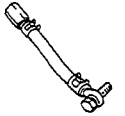

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Items	Specified sealant
Engine coolant temperature sensor threaded portion	3M Nut Locking Part No. 4171 or equivalent

SPECIAL TOOLS

110005768

Tool	Tool Number and tool name	Supersession	Application
	MB991341 Scan Tool (Multi-Use Tester <MUT>)	MB991341C	Up to 1993 models <ul style="list-style-type: none"> • Reading of diagnostic trouble codes • Multiport fuel injection (MFI) system inspection
	ROM pack (For the number, refer to GROUP 00 – Precautions Before Service.)		

Tool	Tool Number and tool name	Supersession	Application
	MB991502 Scan tool (MUT-II)	MB991502	All models <ul style="list-style-type: none"> ● Reading of diagnostic trouble codes ● MFI system inspection
	ROM pack		
	MB991348 Test harness set	Tool not available	<ul style="list-style-type: none"> ● Adjustment of throttle position sensor ● Inspection using an oscilloscope
	MB991529 Reading of diagnostic trouble codes	Tool not necessary if scan tool (MUT-II) is available	<ul style="list-style-type: none"> ● Reading of diagnostic trouble codes ● Basic idle speed adjustment
	MD998464 Test harness (4 pin, square)	MD998464-01	<ul style="list-style-type: none"> ● Heated oxygen sensor inspection
	MD998463 Test harness (6 pin, square)	MD998463-01	<ul style="list-style-type: none"> ● Idle air control motor inspection ● Inspection using an oscilloscope
	MD998753 Extension hose	MIT210196	SOHC – 12 valve engine, DOHC <ul style="list-style-type: none"> ● Fuel pressure measurement
	MD998700 Hose adapter	MIT215144	
	MD998709 Adapter hose	MIT210196	SOHC – 24 valve engine <ul style="list-style-type: none"> ● Fuel pressure measurement
	MD998742 Fuel pressure test adapter	MB998742-01	

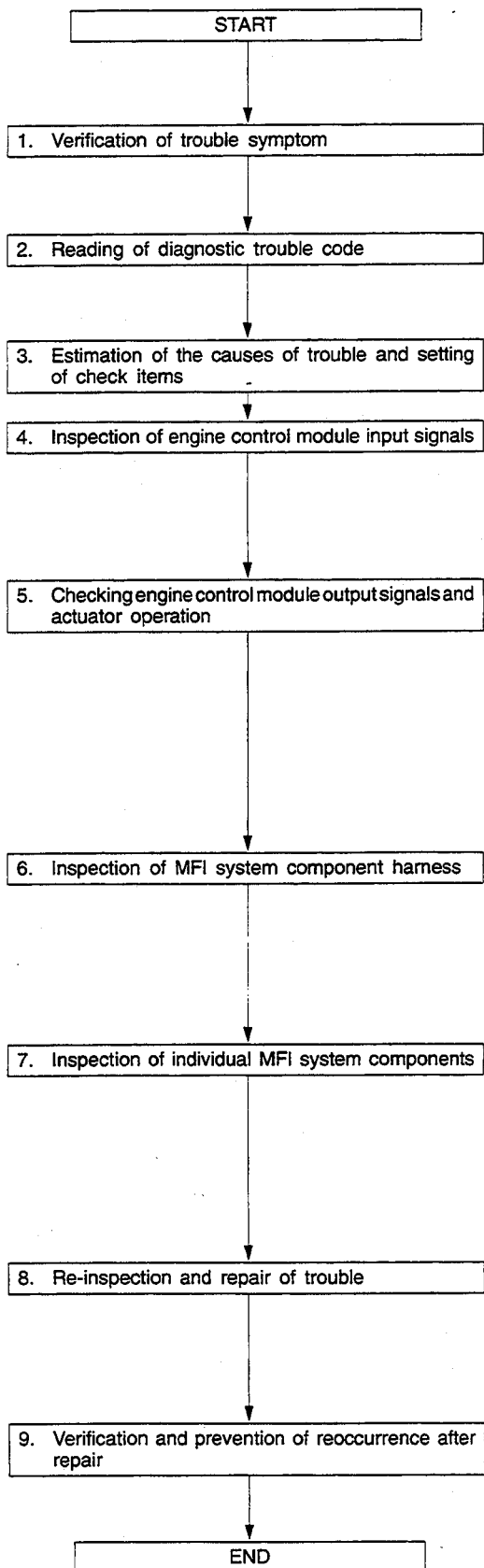
TROUBLESHOOTING

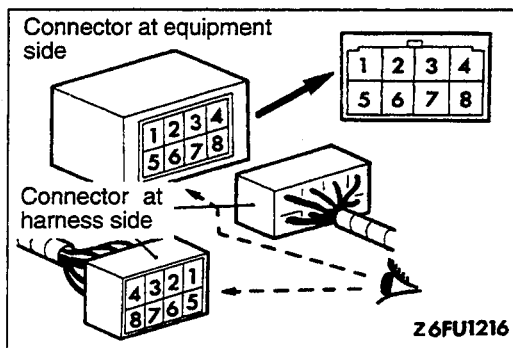
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EXPLANATION OF TROUBLESHOOTING PROCEDURES

Effective troubleshooting procedures for MFI system problems are given below.

1. Verification of trouble system
 - Reproduce the trouble symptoms and verify the characteristics of the trouble and the conditions (engine condition, driving conditions, etc.) under which they are produced.
2. Reading of diagnostic trouble code
 - Take a reading of the diagnostic trouble codes and if a diagnostic trouble code is output, locate and correct the trouble while referring to the DIAGNOSTIC CHART.
3. Estimation of the causes of trouble and setting of check items
 - Referring to the Check Chart, verify the check items and checking order for the trouble symptom.
4. Checking engine control module input and output signals
 - Using a scan tool or analyzer, check the input and output signals of the engine control module.
 - If the input and output signals are normal, the sensor input/actuator control is judged as normal. Then, check the input and output signals of the next check item.
5. Checking engine control module output signals and actuator operation
 - Use the scan tool to check the signals output from the engine control module. Also, drive the actuator using the actuator test function to check the actuator operation.
 - Use an oscilloscope to check the signals output from the engine control module.
 - If the signals output from the engine control module and the operation of the actuator are normal, the actuator control is judged to be normal. Then, check the next check item.
6. Inspection of MFI system component harness
 - If the engine control module input/output signals are abnormal, check the MFI system component body harness and repair as necessary.
 - After repairing, check the engine control module input/output signals again. If they are normal, proceed to check the input/output signals of the next check item.
7. Inspection of individual MFI system components
 - If the body harness is normal but the engine control module input/output signals are abnormal, check individual MFI system components and repair or replace as necessary.
 - After repairing or replacement, check the engine control module input/output signals again. If they are normal, proceed to check the input/output signals of the next check item.
8. Re-inspection and repair of trouble
 - If the harness inspection and individual component inspection results are normal but the engine control module input/output signals are abnormal, re-examine the causes of the trouble while referring to the troubleshooting hints and the checks and repairs included in other groups.
9. Verification and prevention of reoccurrence after repair
 - Carry out tests to see if the same problems occur again and make sure that the same problems will not be repeated.
 - Eliminate the causes of the trouble to prevent its reoccurrence.

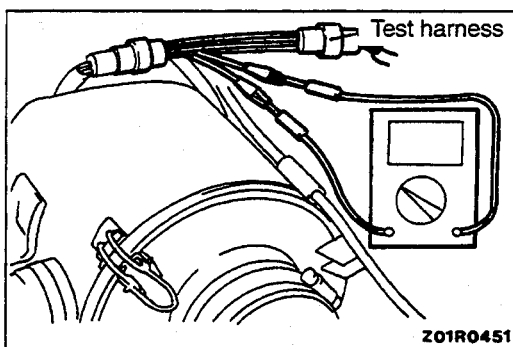




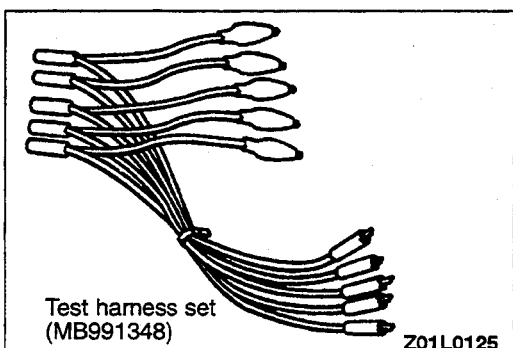
EXPLANATION AND PRECAUTION RELATED TO HARNESS CHECKING

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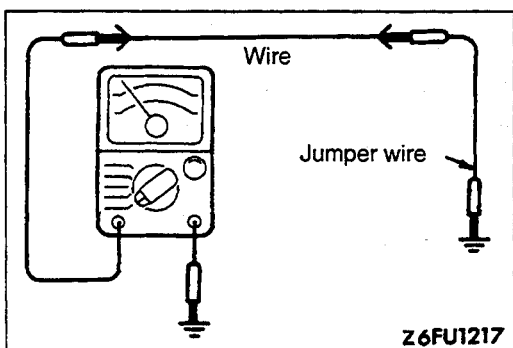
- Connector symbols are described as seen from the terminal end for the connector.
- The abbreviation "B+" used for the normal judgment value when checking the voltage is the abbreviation for battery positive voltage.



- Be sure to use the special tool (test harness) when, for a waterproof connector, checking while the circuit is conductive. If probe is inserted from the harness side, the waterproof capability will be lowered, thereby causing/corrosion, so never do so.
- When a connector is disconnected in order to check terminal voltage, etc., never insert a probe if the terminal to be checked is a female pin, because the forceful insertion of a probe will cause improper or incomplete contact.

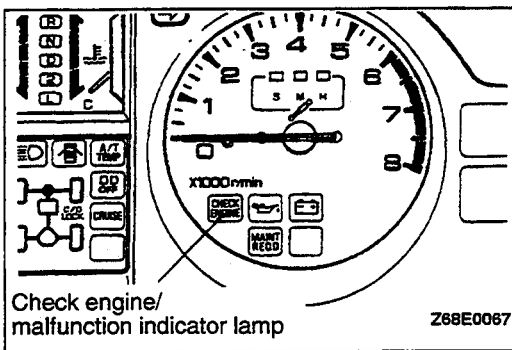
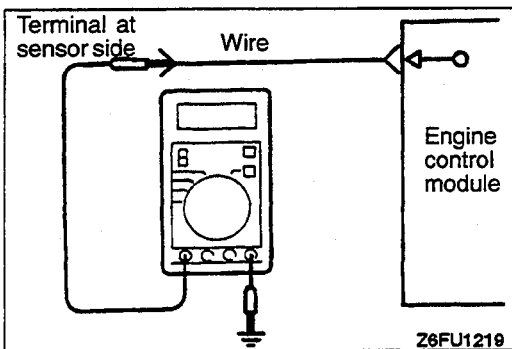
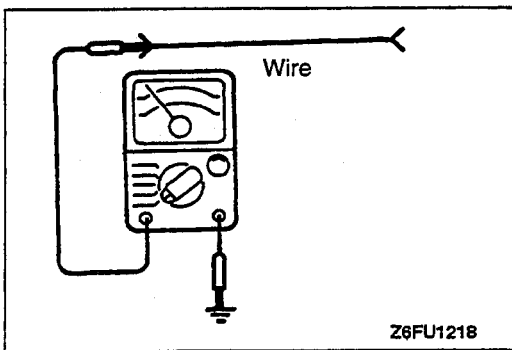


- Also, if there is no test harness that conforms to the connector, use the test harness set (MB991348) which can be directly connected between the terminals.



- When disconnecting the connector and inspecting the terminal voltage, etc., if the inspection terminal is a female pin, the special tool (inspection harness set: MB991223) should be used instead of inserting a probe.

- When checking for damaged or disconnected wiring of a harness (open circuit) and if both ends of the harness are unconnected, use a jumper wire to ground one end of the harness, and then check for continuity between the other end and ground. By doing this, you can check for damaged or disconnected wiring, and, if there is no continuity, the harness should be repaired. However, when checking for a open circuit in the power supply line, check for continuity between both ends directly, without using a jumper wire to ground one end of the harness.



- When checking for a harness short-circuit (short-circuit to ground), open one end of the harness and then check for continuity between the other end and ground. If there is continuity, the harness is short-circuited to ground and should be repaired.

- If the voltage (power-supply voltage) supplied to a sensor is not normal, repair the harness. If the voltage to the sensor is still not normal after the harness has been repaired, replace the engine control module and check again.

CHECK ENGINE/MALFUNCTION INDICATOR LAMP

110005771

Among the on-board diagnostic items, a check engine/malfunction indicator lamp illuminates to notify the driver of the emission control items when an irregularity is detected. However, when an irregular signal returns to normal and the engine control module judges that it has returned to normal, the check engine/malfunction indicator lamp switches off. Moreover, when the ignition switch is turned off, the lamp switches off. Even if the ignition switch is turned on again, the lamp does not illuminate until the irregularity is detected. Here, immediately after the ignition switch is turned on, the check engine/malfunction indicator lamp illuminates for 5 seconds to indicate that the lamp operates normally.

Item indicated by the lightening check engine/malfunction indicator lamp

Engine control module	Camshaft position sensor
Heated oxygen sensor	Barometric pressure sensor
Volume air flow sensor	Ignition timing adjustment signal
Intake air temperature sensor	Injector
Throttle position sensor	EGR system <DOHC>
Engine coolant temperature sensor	Ignition coil/ignition power transistor unit <DOHC>
Crankshaft position sensor	-

Caution

The check engine/malfunction indicator lamp will illuminate when the line of the terminal for ignition timing adjustment is short-circuited. Therefore, the lamp will come on even when the terminal for ignition timing adjustment is grounded at the time of adjusting the ignition timing. In this case, however, it is not abnormal.

CHECK ENGINE/MALFUNCTION INDICATOR LAMP INSPECTION

- (1) Check that the lamp illuminates for about five seconds and then switches off when the ignition switch is turned on.
- (2) If the light does not illuminate, check for damage or disconnection of the harness, or for a blown fuse or a failed light bulb.

ON-BOARD DIAGNOSTIC

110005772

The engine control module monitors the input/output signals (some signals at all times and the others under specified conditions) of the engine control module. When it is noticed that an irregularity has continued for a specified time or longer from when the irregular signal is initially monitored, passing a certain number, the engine control module judges that an irregularity has occurred, memorizes the diagnostic trouble code, and outputs the signal to the on-board diagnostic output terminals. There are 21 on-board diagnostic items, including the normal state, and the diagnostic results can be read out with a voltmeter or scan tool. Moreover, since memorization of the diagnostic trouble codes is backed up directly by the battery, the diagnostic results are memorized even if the ignition key is turned off. The diagnostic trouble codes will, however, be erased when the battery terminal or the engine control module connector is disconnected. The diagnostic trouble codes are also erased by setting the ignition switch to the ON position and then sending the diagnostic-trouble-code erase signal from the scan tool to the engine control module.

Caution

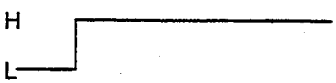


If the sensor connector is disconnected while the ignition switch is ON, a diagnostic trouble code is recorded. In this instance, either send the diagnostic-trouble-code erase signal from the scan tool to the engine control module, or disconnect the negative battery terminal for ten seconds or longer to erase the diagnostic memory.











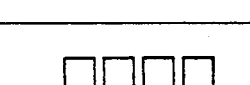
The 21 diagnostic items are provided as follows, and if plural items are activated, they are all indicated sequentially from the smallest code number.

Caution

An ignition timing adjustment signal diagnostic trouble code is output when the ignition timing adjustment terminal line is short-circuited to the ground. Therefore, the diagnostic trouble code is output when the ignition timing adjustment terminal is grounded.. However, this is not a malfunction.

DIAGNOSTIC CHART

Code No.	Diagnostic code pattern	On-board diagnostic item	Check item (Remedy)	Memory
—	 <p style="text-align: center;">03Z0011</p>	Engine control module	<ul style="list-style-type: none"> ● Fuse ● Harness and connector ● Ground (Replace the ECM if power + ground available) 	—
11	 <p style="text-align: center;">03Z0002</p>	Heated oxygen sensor <Up to 1994 model, Federal – From 1995 model> Heated oxygen sensor (front) <California – DOHC – From 1995 model> Left bank heated oxygen sensor (front) <California – SOHC – From 1995 model>	<ul style="list-style-type: none"> ● Harness and connector ● Heated oxygen sensor ● Fuel pressure ● Injectors (Replace if defective.) ● Intake air leaks 	Retained
12	 <p style="text-align: center;">03Z0003</p>	Volume air flow sensor	<ul style="list-style-type: none"> ● Harness and connector (If the harness and connector are normal, replace the volume air flow sensor assembly.) 	Retained

Code No.	Diagnostic code pattern	On-board diagnostic item	Check item (Remedy)	Memory
13	H L  03Z0004	Intake air temperature sensor	<ul style="list-style-type: none"> ● Harness and connector ● Intake air temperature sensor 	Retained
14	H L  03Z0005	Throttle position sensor	<ul style="list-style-type: none"> ● Harness and connector ● Throttle position sensor ● Closed throttle position switch 	Retained
21	H L  03Z0020	Engine coolant temperature sensor	<ul style="list-style-type: none"> ● Harness and connector ● Engine coolant temperature sensor 	Retained
22	H L  03Z0019	Crankshaft position sensor	<ul style="list-style-type: none"> ● Harness and connector (If the harness and connector are normal, replace the distributor assembly.) 	Retained
23	H L  03Z0018	Camshaft position sensor	<ul style="list-style-type: none"> ● Harness and connector (If the harness and connector are normal, replace the distributor assembly.) 	Retained
24	H L  03Z0017	Vehicle speed sensor (reed switch)	<ul style="list-style-type: none"> ● Harness and connector ● Vehicle speed sensor (reed switch) 	Retained
25	H L  03Z0016	Barometric pressure sensor	<ul style="list-style-type: none"> ● Harness and connector (If the harness and connector are normal, replace barometric sensor assembly.) 	Retained
31	H L  03Z0029	Knock sensor <DOHC>	<ul style="list-style-type: none"> ● Harness and connector (If the harness and connector are normal, replace the knock sensor.) 	Retained
36	H L  03Z0024	Ignition timing adjustment signal	<ul style="list-style-type: none"> ● Harness and connector 	—
39	H L  03Z0021	Right bank heated oxygen sensor (front) <California – SOHC – From 1995 model>	<ul style="list-style-type: none"> ● Harness and connector ● Heated oxygen sensor ● Fuel pressure ● Injectors (Replace if defective) ● Intake air leaks 	Retained
41	H L  03Z0030	Injector	<ul style="list-style-type: none"> ● Harness and connector ● Injector oil resistance 	Retained

Code No.	Diagnostic code pattern	On-board diagnostic item	Check item (Remedy)	Memory
43		EGR <DOHC>	<ul style="list-style-type: none"> ● Harness and connector ● EGR temperature sensor ● EGR valve ● EGR solenoid ● EGR valve control vacuum 	Retained
44		Ignition coil/ignition power transistor unit for cylinders 1 and 4 <SOHC-24 valve engine, DOHC>	<ul style="list-style-type: none"> ● Harness and connector ● Ignition coil ● Ignition power transistor unit 	Retained
52		Ignition coil/ignition power transistor unit for cylinders 2 and 5 <SOHC-24 valve engine, DOHC>	<ul style="list-style-type: none"> ● Harness and connector ● Ignition coil ● Ignition power transistor unit 	Retained
53		Ignition coil/ignition power transistor unit for cylinders 3 and 6 <SOHC-24 valve engine, DOHC>	<ul style="list-style-type: none"> ● Harness and connector ● Ignition coil ● Ignition power transistor unit 	Retained
59		Heated oxygen sensor (rear) <California – DOHC – From 1995 model> Left bank heated oxygen sensor (Rear) <California – SOHC – From 1995 model>	<ul style="list-style-type: none"> ● Harness and connector ● Heated oxygen sensor ● Fuel pressure ● Injectors (Replace if defective) ● Intake air leaks 	Retained
69		Right bank heated oxygen sensor (Rear) <California – SOHC – From 1995 model>	<ul style="list-style-type: none"> ● Harness and connector ● Heated oxygen sensor ● Fuel pressure ● Injectors (Replace if defective) ● Intake air leaks 	Retained
—		Normal condition	—	—

NOTE

Do not replace the ECM until a thorough terminal check reveals there are no open or short-circuits.

DIAGNOSTIC DETECTION LOGIC

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Fault ID	Title	Effect	Probable Causes
11	<p>Heated Oxygen Sensor <Up to 1994 models, Federal – From 1995 models>/Heated Oxygen Sensor (front) <California – DOHC – From 1995 models>/Left Bank Heated Oxygen Sensor (front) <California – SOHC – From 1995 models></p>		
<p>Background</p> <ul style="list-style-type: none"> • The oxygen sensor converts the oxygen density in the exhaust gas to a voltage and outputs it. • The engine control module checks the change of an oxygen sensor output voltage (Lean/Rich) in the air/fuel ratio closed loop control. <p>Range of Check</p> <ul style="list-style-type: none"> • 3 minutes have passed after engine was started. • Engine coolant temperature is approx. 80°C (176°F) or more. • Intake air temperature is 20–50°C (68–122°F). • Engine speed is approx. 1900–2200 r/min. • Vehicle is moving at constant speed on a flat, level road surface. <p>Set Conditions</p> <p>The oxygen sensor output voltage does not cross specified voltage for specified seconds.</p>		<p>Limp-in Air/fuel ratio closed loop control is not performed.</p>	<ul style="list-style-type: none"> • Oxygen sensor deteriorated. • Open or shorted oxygen sensor circuit, or loose connector. • Incorrect fuel pressure. • Injector failed. • Air intake. • Engine control module failed.

Fault ID	Title	Effect	Probable Causes
12	<p>Volume Air Flow Sensor</p>		
<p>Background</p> <ul style="list-style-type: none"> • While the engine is running, the volume air flow sensor outputs a pulse signal which corresponds to the volume of air flow. • The engine control module checks whether the frequency of this signal output by the volume air flow sensor while the engine is running is at or above the set value. <p>Range of Check</p> <p>Engine speed is 500 r/min. or more.</p> <p>Set Conditions</p> <p>Sensor output frequency is 3 Hz or less for 4 seconds.</p>		<p>Limp-in</p> <p>(a) Uses the throttle position sensor signal and engine speed signal (crankshaft position sensor signal) for basic injector drive time and basic ignition timing from the pre-set mapping.</p> <p>(b) Fixes the IAC motor in the appointed position so idle air control is not performed.</p>	<ul style="list-style-type: none"> • Volume air flow sensor failed. • Open or shorted volume air flow sensor circuit, or loose connector. • Engine control module failed.

Fault ID	Title	Effect	Probable Causes
13	Intake Air Temperature Sensor		
<p>Background</p> <ul style="list-style-type: none"> ● The intake air temperature sensor converts the intake air temperature to a voltage and outputs it. ● The engine control module checks whether the voltage is within a specified range. <p>Range of Check</p> <ul style="list-style-type: none"> ● Ignition switch : ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. <p>Set Conditions</p> <ul style="list-style-type: none"> ● Sensor output voltage is 4.6 V or more (corresponding to an intake air temperature of -45°C (-49°F) or less) for 4 seconds. <p>or</p> <ul style="list-style-type: none"> ● Sensor output voltage is 0.2 V or less (corresponding to an intake air temperature of 125 °C (257°F) or more) for 4 seconds. 			

Fault ID	Title	Effect	Probable Causes
14	Throttle Position Sensor		
<p>Background</p> <ul style="list-style-type: none"> ● The throttle position sensor outputs a voltage which corresponds to the throttle valve opening angle. ● The engine control module checks whether the voltage is within a specified range. In addition, it checks that the voltage output does not become too large while the engine is idling. <p>Range of Check</p> <ul style="list-style-type: none"> ● Ignition switch : ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. <p>Set Conditions</p> <ul style="list-style-type: none"> ● When the closed throttle position switch is ON, the sensor output voltage is 2 V or more for 4 seconds. <p>or</p> <ul style="list-style-type: none"> ● The sensor output voltage is 0.2 V or less for 4 seconds. 			

Fault ID	Title	Effect	Probable Causes
21	Engine Coolant Temperature Sensor		
<p>Background</p> <ul style="list-style-type: none"> The engine coolant temperature sensor converts the engine coolant temperature to a voltage and outputs it. The engine control module checks whether the voltage is within a specified range. In addition, it checks the engine coolant temperature (signal) does not drop while the engine is warming up. <p>Range of Check, Set Conditions</p> <p>Range of check</p> <ul style="list-style-type: none"> Ignition switch : ON Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. <p>Set conditions</p> <ul style="list-style-type: none"> Sensor output voltage is 4.6 V or more (corresponding to an engine coolant temperature of -45°C (-49°F) or less for 4 seconds. <p>or</p> <ul style="list-style-type: none"> Sensor output voltage is 0.1 V or less (corresponding to an engine coolant temperature of 140°C (284°F) or more for 4 seconds. <p>Range of check</p> <ul style="list-style-type: none"> Ignition switch : ON Engine speed is approx. 50 r/min. or more. <p>Set conditions</p> <ul style="list-style-type: none"> The sensor output voltage increases from 1.6 V or less (corresponding to an engine coolant temperature of 40°C (104°F) or more) to 1.6 V or more (corresponding to an engine coolant temperature of 40°C (104°F) or less). After this, the sensor output voltage is 1.6 V or more for 5 minutes. 		<p>Limp-in Controls as if the engine coolant temperature is 80°C (176°F).</p>	<ul style="list-style-type: none"> Engine coolant temperature sensor failed. Open or shorted the engine coolant temperature sensor circuit, or loose connector. Engine control module failed.

Fault ID	Title	Effect	Probable Causes
22	Crankshaft Position Sensor		
<p>Background</p> <ul style="list-style-type: none"> ● When the engine is running, the crankshaft position sensor outputs a pulse signal. ● The engine control module checks whether the pulse signal is input while the engine is cranking. ● The engine control module checks the pulse signal patterns of the crankshaft position sensor. <p>Range of Check, Set Conditions</p> <p>Range of check</p> <ul style="list-style-type: none"> ● Ignition switch : ON ● Engine is not cranking. <p>Set conditions</p> <p>Regular signal patterns for cylinder discrimination from the crankshaft position sensor signal and the camshaft position sensor signal are not input 20 times in a 10 seconds period.</p> <p>Range of check</p> <p>Engine is cranking.</p> <p>Set conditions</p> <p>Sensor output voltage does not change for 4 seconds (no pulse signal input).</p>			

Fault ID	Title	Effect	Probable Causes
23	Camshaft Position Sensor		
<p>Background</p> <ul style="list-style-type: none"> ● When the engine is running, the camshaft position sensor outputs a pulse signal. ● The engine control module checks whether the pulse signal is input. ● The engine control module checks the pulse signal patterns of the camshaft position sensor. <p>Range of Check, Set Conditions</p> <p>Range of check</p> <ul style="list-style-type: none"> ● Ignition switch : ON ● Engine speed is approx. 50 r/min. or more. <p>Set conditions</p> <p>Sensor output voltage does not change for 4 seconds (no pulse signal input).</p> <p>Range of check</p> <ul style="list-style-type: none"> ● Ignition switch : ON ● Engine is not cranking. <p>Set conditions</p> <p>Regular signal patterns for cylinder discrimination from the crankshaft position sensor signal and the camshaft position sensor signal are not input 20 times in a 10 seconds period.</p>			

Fault ID	Title	Effect	Probable Causes
24	Vehicle Speed Sensor	No limp-in	<ul style="list-style-type: none"> ● Vehicle speed sensor failed. ● Open or shorted vehicle speed sensor circuit, or loose connector. ● Engine control module failed.
<p>Background</p> <ul style="list-style-type: none"> ● The vehicle speed sensor outputs a pulse signal while the vehicle is driven. ● The engine control module checks whether the pulse signal is output. <p>Range of Check</p> <ul style="list-style-type: none"> ● Ignition switch : ON ● Excluding 60 seconds after the ignition switch is turned to ON or immediately after the engine starts. ● Closed throttle position switch : OFF ● Engine speed is 3000 r/min. or more. ● Driving under high engine load conditions. <p>Set Conditions</p> <p>Sensor output voltage does not change for 4 seconds (no pulse signal input).</p>			

Fault ID	Title	Effect	Probable Causes
25	Barometric Pressure Sensor	Limp-in Controls as if the barometric pressure is 101 kPa (760 mmHg)(sea level).	<ul style="list-style-type: none"> ● Barometric pressure sensor failed. ● Open or shorted barometric pressure sensor circuit, or loose connector. ● Engine control module failed.
<p>Background</p> <ul style="list-style-type: none"> ● The barometric pressure sensor outputs a voltage which corresponds to the barometric pressure. ● The engine control module checks whether this voltage is within a specified range. <p>Range of Check</p> <ul style="list-style-type: none"> ● 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. <p>Set Conditions</p> <ul style="list-style-type: none"> ● Sensor output voltage is 4.5 V or more (corresponding to a barometric pressure of 114 kPa (33.7 in.Hg) or more) for 4 seconds. <p>or</p> <ul style="list-style-type: none"> ● Sensor output voltage is 0.2 V or less (corresponding to a barometric pressure of 5.33 kPa (1.57 in.Hg) or less) for 4 seconds. 			

Fault ID	Title	Effect	Probable Causes
31 <DOHC>	Knock Sensor		
<p>Background</p> <ul style="list-style-type: none"> ● The knock sensor converts the vibration of the cylinder block into a voltage and outputs it. If there is a malfunction of the knock sensor, the voltage output will not change. ● The engine control module checks whether the voltage changes. <p>Range of Check</p> <ul style="list-style-type: none"> ● Ignition switch : ON ● Excluding 60 seconds after the ignition switch is turned ON or immediately after the engine starts. ● Engine speed is approx. 5000 r/min or more <p>Set Conditions</p> <ul style="list-style-type: none"> ● The change in the knock sensor output voltage (knock sensor peak voltage at each 1/3 revolution of the crankshaft) is less than 0.06V for 200 times in succession. 			

Fault ID	Title	Effect	Probable Causes
36	Ignition Timing Adjusting Signal		
<p>Background</p> <ul style="list-style-type: none"> ● If there is a short circuit in the line between the engine control module and the ignition timing adjustment terminal, the line voltage will become low. ● The engine control module checks whether this occurs. <p>Range of Check Ignition switch : ON</p> <p>Set Conditions The ignition timing adjusting signal wire is shorted to the ground.</p>			

Fault ID	Title	Effect	Probable Causes
39 <California–SOHC– From 1995 models>	Right Bank Heated Oxygen Sensor (front)		
<p>Background</p> <ul style="list-style-type: none"> ● The oxygen sensor converts the oxygen density in the exhaust gas to a voltage and outputs it. ● The engine control module checks the change of an oxygen sensor output voltage (Lean/Rich) in the air/fuel ratio closed loop control. <p>Range of Check</p> <ul style="list-style-type: none"> ● 3 minutes have passed after engine was started. ● Engine coolant temperature is approx. 80°C (176°F) or more. ● Intake air temperature is 20–50 °C (68–122°F) ● Engine speed is approx. 1,900–2,200 r/min. ● Vehicle is moving at constant speed on a flat, level road surface. <p>Set Conditions</p> <p>The oxygen sensor output voltage dose not cross specified voltage for specified seconds.</p>			

Fault ID	Title	Effect	Probable Causes
41	Injector		
<p>Background</p> <ul style="list-style-type: none"> ● A surge voltage is generated when the injectors are driven and the current flowing to the injector coil is shut off. ● The engine control module checks this surge voltage. <p>Range of Check</p> <ul style="list-style-type: none"> ● Engine speed is approx. 50–1,000 r/min. ● The throttle position sensor output voltage is 1.15V or less. ● Actuator test by scan tool is not carried out. <p>Set Conditions</p> <p>Surge voltage of injector oil is not detected for 4 seconds.</p>			

Fault ID	Title	Effect	Probable Causes
43	EGR System	No limp-in	<ul style="list-style-type: none"> ● EGR valve does not open. ● EGR control vacuum is too low. ● EGR solenoid failed. ● EGR temperature sensor failed. ● Open or shorted EGR temperature sensor circuit, or loose connector. ● Engine control module failed.
<p>Background</p> <ul style="list-style-type: none"> ● EGR temperature sensor converts the EGR gas temperature to a voltage and outputs it. ● Engine control module checks whether an output voltage of the EGR temperature sensor is within a specified range. <p>Range of Check</p> <ul style="list-style-type: none"> ● Approx. 6 minutes or more have passed after engine was started. ● Intake-air temperature is 0–55°C (32–131°F) ● Barometric pressure is 93.3 kPa (27.6 in.Hg) or more ● Engine speed is approx. 1,900–2,100 r/min. ● Vehicle is moving at constant speed on a flat, level road surface. ● The above conditions continue for a continuous period of 15 seconds. <p>Set Conditions</p> <ul style="list-style-type: none"> ● Sensor output voltage is approx. 3.5V (corresponding to an EGR temperature of 70°C (158°F)) or more. ● When the range of check operation given above which accompany starting of the engine are carried out two times in succession, a problem is detected after each operation. 			

Fault ID	Title	Effect	Probable Causes
44, 52, 53 <SOHC-24 valve engine, DOHC>	Ignition Coil, Ignition Power Transistor Unit (1–4, 2–5, 3–6)	Limp-in Cuts fuel of an ignition signal abnormal cylinder.	<ul style="list-style-type: none"> ● Ignition coil failed ● Disconnection or short circuit of the primary ignition circuit, or imperfect contact of the connector. ● Ignition power transistor unit failed. ● Engine control module failed.
<p>Background</p> <ul style="list-style-type: none"> ● Ignition power transistor unit converts ON/OFF variation of the ignition coil to the pulse signal (Ignition signal) and outputs it. ● The engine control module detects whether ignition occurs or not by checking this signal while the engine is running. <p>Range of Check</p> <ul style="list-style-type: none"> ● Engine speed is approx. 50–4,000 r/min. ● Engine is not cranking. <p>Set Conditions</p> <p>The ignition signal from the same coil is not input for 4 seconds. However, this excludes cases where no ignition signal is input from any coils.</p>			

Fault ID	Title	Effect	Probable Causes
59	Heated oxygen sensor (rear) <California-DOHC-From 1995 models>/ Left Bank Heated Oxygen Sensor (rear) <California-SOHC-From 1995 models>	Limp-in The air/fuel ratio feedback control (closed loop control) is performed only by using a signal of the oxygen sensor (front) which is installed on the front side of the catalytic converter.	<ul style="list-style-type: none"> ● Oxygen sensor deteriorated. ● Open or shorted oxygen sensor circuit, or loose connector. ● Engine control module failed.
<p>Background</p> <ul style="list-style-type: none"> ● The oxygen sensor converts the oxygen density in the exhaust gas to a voltage and outputs it. ● The engine control module checks an output voltage of the oxygen sensor when the oxygen-volume in the exhaust gas is little (Air/fuel ratio is rich.) <p>Range of Check</p> <ul style="list-style-type: none"> ● Approx. 3 minutes or more have passed after engine was started. ● Engine coolant temperature is approx. 80°C (176°F) or more. ● Closed throttle position switch : OFF ● The throttle position sensor output voltage is 4.1V or more. ● Open loop control in operation. ● 20 seconds have passed after deceleration finished. <p>Set Conditions</p> <ul style="list-style-type: none"> ● The heated oxygen sensor (rear) output voltage is 0.1V or less. ● The heated oxygen sensor (front) output voltage is 0.5V or more. ● The above conditions continue for a continuous period of 5 seconds. 			

Fault ID	Title	Effect	Probable Causes
69 <California-SOHC-From 1995 models>	Right Bank Heated Oxygen Sensor (rear)	Limp-in The air/fuel ratio feedback control (closed loop control) is performed only by using a signal of the oxygen sensor (front) which is installed on the front side of the catalytic converter.	<ul style="list-style-type: none"> ● Oxygen sensor deteriorated. ● Open or shorted oxygen sensor circuit, or loose connector. ● Engine control module failed.
<p>Background</p> <ul style="list-style-type: none"> ● The oxygen sensor converts the oxygen density in the exhaust gas to a voltage and outputs it. ● The engine control module checks an output voltage of the oxygen sensor when the oxygen volume in the exhaust gas is little (Air/fuel ratio is rich.) <p>Range of Check</p> <ul style="list-style-type: none"> ● Approx. 3 minutes or more have passed after engine was started. ● Engine coolant temperature is approx. 80°C (176°F) or more. ● Closed throttle position switch : OFF ● The throttle position sensor output voltage is 4.1V or more. ● Open loop control in operation. ● 20 seconds have passed after deceleration finished. <p>Set Conditions</p> <ul style="list-style-type: none"> ● The heated oxygen sensor (rear) output voltage is 0.1V or less. ● The heated oxygen sensor (front) output voltage is 0.5V or more. ● The above conditions continue for a continuous period of 5 seconds. 			

**FAIL-SAFE/BACKUP FUNCTION QUICK
REFERENCE TABLE**

110005774

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

Malfunctioning item	Control contents during malfunction
Volume air flow sensor	(1) Uses the throttle position sensor (TPS) signal and engine speed signal (crankshaft position sensor signal) to take readings of the basic injector drive timing and basic ignition timing from the pre-set mapping. (2) Fixes the idle air control motor in the appointed position so idle air control is not performed.
Intake air temperature sensor	Controls the intake air temperature to 25°C (77°F).
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls the engine coolant temperature to 80°C (176°F). (This control will be continued until the ignition switch is turned to OFF even though the sensor signal returns to normal.)
Camshaft position sensor	Injects fuel simultaneously into all cylinders. (However, when the No. 1 cylinder top dead center is not detected at all after the ignition switch is turned to ON.)
Barometric pressure sensor	Controls the barometric pressure to 760 mmHg (30 in.Hg).
Knock sensor <DOHC>	Switches from ignition timing for premium gasoline to ignition timing for regular gasoline.
Ignition coil/ignition power transistor unit <DOHC>	Fuel is cut in the cylinder where the ignition signal is abnormal.
Heated oxygen sensor (front)	Air/fuel ratio closed loop control is not performed.
Heated oxygen sensor (rear)	The air/fuel ratio closed loop control will be made by using only the signal of the heated oxygen sensor (front) which is located at the front of catalytic converter.

READING OF DIAGNOSTIC TROUBLE CODES

110005775

Precautions for Operation

- (1) When battery positive voltage is low, no detection of failure is possible. Be sure to check the battery for voltage and other conditions before starting the test.
- (2) Diagnostic items are erased if the battery or the engine control module connector is disconnected. Do not disconnect the battery before the diagnostic result is completely read.
- (3) Be sure to connect or disconnect the scan tool with the ignition switch turned off. If the scan tool is disconnected while the ignition switch is at the ON position, an ABS diagnostic trouble code may be stored and the ABS warning lamp may thus illuminate.

WHEN USING THE SCAN TOOL [MULTI-USE TESTER (MUT) <Up to 1993 model> OR SCAN TOOL (MUT-II) <All model>]

Caution

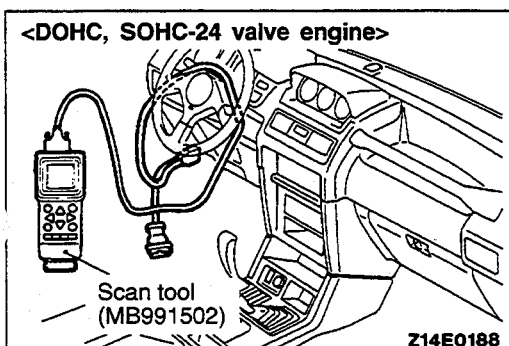
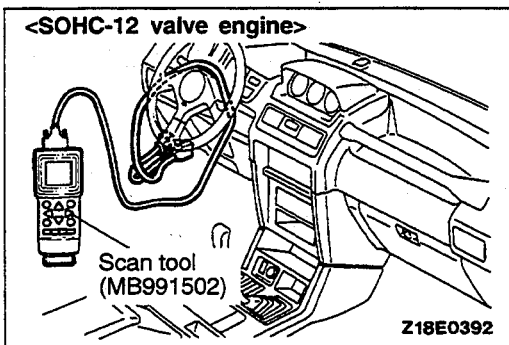
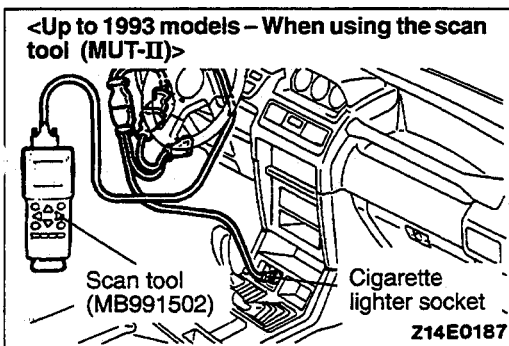
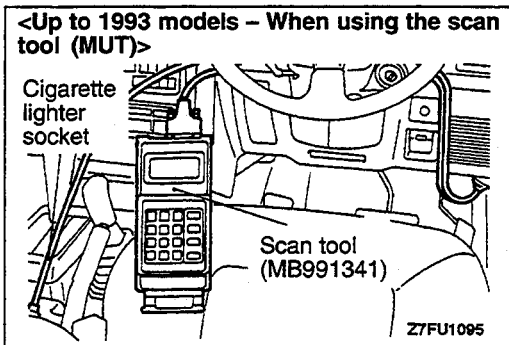
Connection and disconnection of the scan tool should always be made with the ignition switch in the OFF position.

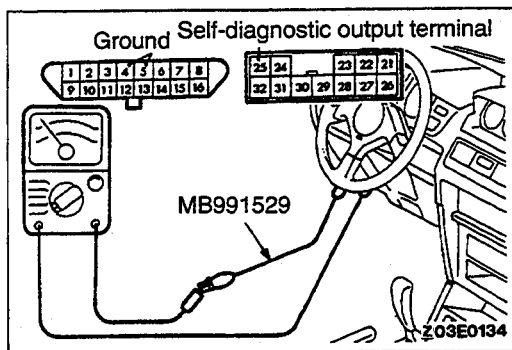
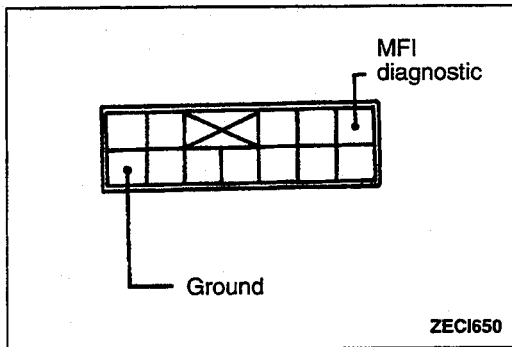
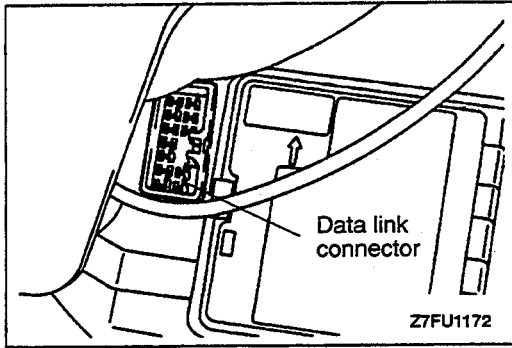
- (1) Connect the scan tool to the data link connector.

NOTE

When connecting the scan tool to vehicles built before 1993, use the adaptor harness which is supplied as an accessory to the scan tool sub-assembly.

- (2) Turn the ignition switch to ON.
- (3) Take a reading of the diagnostic output.
- (4) Repair the problem location while referring to the diagnostic chart.
- (5) After turning the ignition switch once to OFF, turn it back to ON.
- (6) Erase the diagnostic trouble code.
- (7) Check again that the condition is normal.





WHEN USING THE VOLTMETER

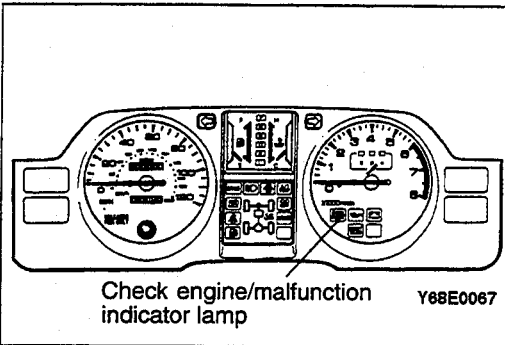
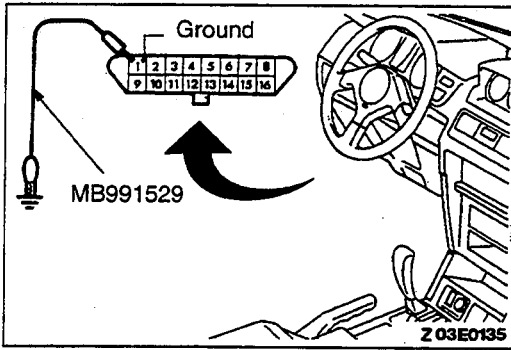
<Up to 1993 models>

- (1) Connect an analog-type voltmeter to the diagnostic output terminal (terminal (1)) and to the ground terminal (terminal (12)) of the data link connector (white).
- (2) Turn the ignition switch to ON.
- (3) Take a reading of the diagnostic output from the movement of the needle of the voltmeter.
- (4) Repair the problem location while referring to the diagnostic chart.
- (5) Erase the diagnostic trouble code by the following procedure.
 - 1) Turn the ignition switch to OFF.
 - 2) After disconnecting the battery cable from the battery terminals for 10 seconds or more, reconnect the cable.
 - 3) Turn the ignition switch to ON and take a reading of the diagnostic output to check if a normal code is output.
 - 4) Let the engine warm up and then run it at idle for about 10 minutes.

WHEN USING THE VOLTMETER

<SOHC-12 valve engine>

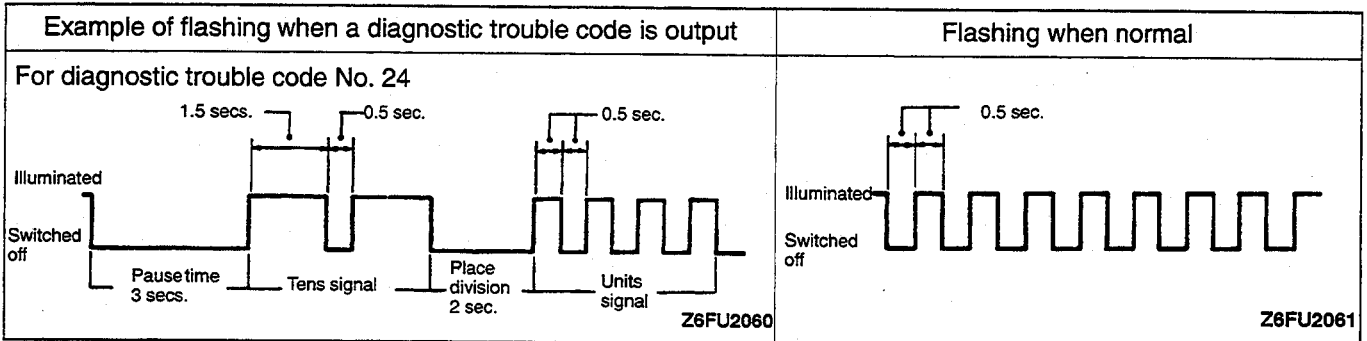
- (1) Use the special tool (diagnostic trouble code check harness) to connect an analog-type voltmeter to the diagnostic output terminal (terminal (25)) and to the ground terminal (terminal (4) or (5)) of the data link connector.
- (2) Turn the ignition switch to ON.
- (3) Read the diagnostic code pattern from the voltmeter and record it.
- (4) Referring to the diagnostic chart, repair the defective part.
- (5) Erase the diagnostic trouble code using the following procedure.
 - 1) Turn the ignition switch to OFF.
 - 2) Disconnect the negative battery cable from the battery terminal for 10 seconds or more and then reconnect it.
 - 3) Turn the ignition switch to ON and take a reading of the diagnostic output to check that a normal code is output.



**WHEN USING THE CHECK ENGINE/MALFUNCTION <INDICATOR LAMP>
<DOHC, SOHC-24 valve engine>**

- (1) Use the special tool (diagnostic trouble code check harness) to connect the diagnostic test mode control terminal (terminal (1)) of the data link connector to the ground.
- (2) Turn the ignition switch to ON.
- (3) Take a reading of the diagnostic output from the flashing of the check engine/malfunction indicator lamp.
- (4) Repair the problem location while referring to the diagnostic chart.
- (5) Erase the diagnostic trouble code by the following procedure.
 - 1) Turn the ignition switch to OFF.
 - 2) After disconnecting the battery cable from the battery terminals for 10 seconds or more, reconnect the cable.
 - 3) Turn the ignition switch to ON and take a reading of the diagnostic output to check if a normal code is output.
 - 4) Let the engine warm up and then run it at idle for about 10 minutes.

DIAGNOSTIC RESULT DISPLAY METHOD WHEN USING THE CHECK ENGINE/MALFUNCTION INDICATOR LAMP



NOTE

Other diagnostic trouble codes also are output as voltage patterns corresponding to the same code numbers as when using the scan tool.

Diagnosis by DIAGNOSTIC TEST MODE II (INCREASED SENSITIVITY)

- (1) Using the scan tool, changeover the diagnostic test mode of the engine control module to DIAGNOSTIC TEST MODE II. (INCREASED SENSITIVITY)
- (2) Carry out a road test.
- (3) Read the diagnostic trouble code by the same procedure as in “READING OF DIAGNOSTIC TROUBLE CODES” and repair the malfunctioning part.
- (4) After turning the ignition switch once to OFF, turn it back to ON.

NOTE

Turning the ignition switch to OFF will cause the engine control module to changeover the diagnostic test module from the diagnostic test mode II to the diagnostic test mode I.

- (5) Erase the diagnostic trouble code.

CHECK CHART CLASSIFIED BY PROBLEM SYMPTOMS

110005776

<SOHC-12 valve engine>

Items	Starting	Starting	Idling stability	Idling stability	Idling stability	Reference page
	Will not start	Fires up and dies, Hard starting	Idling instability (rough idling)	Incorrect idle speed	Engine stall	
Power supply (MFI relay) and ignition switch-IG	1 (1)					13A-49
Engine control module power ground	2 (2)					13A-52
Fuel pump	3 (3)	1 (1)			1 (1)	13A-53
Volume air flow sensor					11 (10)	13A-56
Intake air temperature sensor			5			13A-60
Barometric pressure sensor			7			13A-62
Engine coolant temperature sensor		(3)	6 (5)	1 (1)	5 (5)	13A-64
Throttle position sensor						13A-66
Closed throttle position switch			3 (3)	2 (2)	4 (4)	13A-68
Camshaft position sensor	5 (5)	6 (7)			8 (7)	13A-70
Crankshaft position sensor	6 (6)	7 (8)			9 (8)	13A-74
Ignition switch-ST <M/T>	4 (4)	3 (4)				13A-76
Ignition switch-ST and Park/Neutral position switch <A/T>	4 (4)	3 (4)		5		13A-78
Vehicle speed sensor					6	13A-80
Power steering pressure switch				3		13A-82
Air conditioning switch and compressor clutch relay				4		13A-84
Heated oxygen sensor			9			13A-86
Injectors	8 (8)	2 (2)	2 (2)		3 (3)	13A-89
Idle air control motor (stepper motor)		4 (5)	1 (1)	6 (3)	2 (2)	13A-93
Ignition coil and ignition power transistor	7 (7)				10 (9)	13A-98
Evaporative emission purge solenoid			8			13A-102
Anti-lock brake signal						13A-104
Fuel pressure		5 (6)	4 (4)		7 (6)	13A-105

NOTE

The numbers in the chart indicate check order [(): cold engine, without(): warm engine].

Items	Driving	Driving	Driving	Driving	Driving	Driving	Stop- ping	Refer- ence page
	Hesita- tion, Sag	Poor accel- eration	Stumble	Shock	Surge	Knock- ing	Run-on (diesel- ing)	
Power supply (MFI relay) and ignition switch-IG								13A-49
Engine control module power ground								13A-52
Fuel pump	1 (1)	1 (1)						13A-53
Volume air flow sensor	8 (8)		5 (5)	5 (5)		3 (3)		13A-56
Intake air temperature sensor	4 (4)	4 (4)				1 (1)		13A-60
Barometric pressure sensor	7 (7)	6 (6)				2 (2)		13A-62
Engine coolant temperature sensor	6 (6)	5 (5)	4 (4)		3 (3)			13A-64
Throttle position sensor	5 (5)		3 (3)	4 (4)				13A-66
Closed throttle position switch								13A-68
Camshaft position sensor				2 (2)				13A-70
Crankshaft position sensor				3 (3)				13A-74
Ignition switch-ST <M/T>								13A-76
Ignition switch-ST and Park/Neutral position switch <A/T>								13A-78
Vehicle speed sensor				6				13A-80
Power steering pressure switch								13A-82
Air conditioning switch and compressor clutch relay								13A-84
Heated oxygen sensor								13A-86
Injectors	2 (2)	2 (2)	1 (1)		1 (1)		1	13A-89
Idle air control motor (stepper motor)				8 (6)				13A-93
Ignition coil and ignition power transistor		7 (7)		1 (1)		4 (4)		13A-98
Evaporative emission purge solenoid								13A-102
Anti-lock brake signal				7				13A-104
Fuel pressure	3 (3)	3 (3)	2 (2)		2 (2)			13A-105

NOTE

The numbers in the chart indicate check order [(): cold engine, without(): warm engine].

<SOHC-24 valve engine>

Items	Starting	Starting	Idling stability	Idling stability	Idling stability	Reference page
	Will not start	Fires up and dies, Hard starting	Idling instability (rough idling)	Incorrect idle speed	Engine stall	
Power supply (MFI relay) and ignition switch-IG	1 (1)					13A-119
Engine control module power ground	2 (2)					13A-122
Fuel pump	3 (3)	1 (1)			1 (1)	13A-123
Volume air flow sensor					11 (10)	13A-126
Intake air temperature sensor			5			13A-129
Barometric pressure sensor			7			13A-131
Engine coolant temperature sensor		(3)	6 (5)	1 (1)	5 (5)	13A-133
Throttle position sensor						13A-135
Closed throttle position switch			3 (3)	2 (2)	4 (4)	13A-137
Camshaft position sensor	5 (5)	6 (7)			8 (7)	13A-139
Crankshaft position sensor	6 (6)	7 (8)			9 (8)	13A-142
Ignition switch-ST <M/T>	4 (4)	3 (4)				13A-145
Ignition switch-ST and Park/Neutral position switch <A/T>	4 (4)	3 (4)		5		13A-146
Vehicle speed sensor					6	13A-148
Power steering pressure switch				3		13A-150
Air conditioning switch and compressor clutch relay				4		13A-152
Heated oxygen sensor			9			13A-159
Injectors	8 (8)	2 (2)	2 (2)		3 (3)	13A-167
Idle air control motor (stepper motor)		4 (5)	1 (1)	6 (3)	2 (2)	13A-171
Ignition coil and ignition power transistor	7 (7)				10 (9)	13A-173
Evaporative emission purge solenoid			8			13A-185
Anti-lock brake signal						13A-193
Fuel pressure		5 (6)	4 (4)		7 (6)	13A-194

NOTE

The numbers in the chart indicate check order [(): cold engine, without(): warm engine].

Items	Driving	Driving	Driving	Driving	Driving	Driving	Stopping	Reference page
	Hesitation, Sag	Poor acceleration	Stumble	Shock	Surge	Knocking	Run-on (dieseling)	
Power supply (MFI relay) and ignition switch-IG								13A-119
Engine control module power ground								13A-122
Fuel pump	1 (1)	1 (1)						13A-123
Volume air flow sensor	8 (8)		5 (5)	5 (5)		3 (3)		13A-126
Intake air temperature sensor	4 (4)	4 (4)				1 (1)		13A-129
Barometric pressure sensor	7 (7)	6 (6)				2 (2)		13A-131
Engine coolant temperature sensor	6 (6)	5 (5)	4 (4)		3 (3)			13A-133
Throttle position sensor	5 (5)		3 (3)	4 (4)				13A-135
Closed throttle position switch								13A-137
Camshaft position sensor				2 (2)				13A-139
Crankshaft position sensor				3 (3)				13A-142
Ignition switch-ST <M/T>								13A-145
Ignition switch-ST and Park/Neutral position switch <A/T>								13A-146
Vehicle speed sensor				6				13A-148
Power steering pressure switch								13A-150
Air conditioning switch and compressor clutch relay								13A-152
Heated oxygen sensor								13A-159
Injectors	2 (2)	2 (2)	1 (1)		1 (1)		1	13A-167
Idle air control motor (stepper motor)				8 (6)				13A-171
Ignition coil and ignition power transistor		7 (7)		1 (1)		4 (4)		13A-173
Evaporative emission purge solenoid								13A-185
Anti-lock brake signal				7				13A-193
Fuel pressure	3 (3)	3 (3)	2 (2)		2 (2)			13A-194

NOTE

The numbers in the chart indicate check order [(): cold engine, without(): warm engine].

<DOHC>

Items	Starting	Starting	Idling stability	Idling stability	Idling stability	Reference page
	Will not start	Fires up and dies, Hard starting	Idling instability (rough idling)	Incorrect idle speed	Engine stall	
Power supply (MFI relay) and ignition switch-IG	1 (1)					13A-119
Engine control module power ground	2 (2)					13A-122
Fuel pump	3 (3)	1 (1)			1 (1)	13A-123
Volume air flow sensor					11 (10)	13A-126
Intake air temperature sensor			5			13A-129
Barometric pressure sensor			7			13A-131
Engine coolant temperature sensor		(3)	6 (5)	1 (1)	5 (5)	13A-133
Throttle position sensor						13A-135
Closed throttle position switch			3 (3)	2 (2)	4 (4)	13A-137
Camshaft position sensor	5 (5)	6 (7)			8 (7)	13A-139
Crankshaft position sensor	6 (6)	7 (8)			9 (8)	13A-142
Ignition switch-ST and Park/Neutral position switch	4 (4)	3 (4)		6		13A-146
Vehicle speed sensor					6	13A-148
Power steering pressure switch				3		13A-150
Air conditioning switch and compressor clutch relay				4		13A-152
Knock sensor						13A-153
Electrical load switch				5		13A-155
Heated oxygen sensor			9			13A-159
Injectors	8 (8)	2 (2)	2 (2)		3 (3)	13A-167
Idle air control motor (stepper motor)		4 (5)	1 (1)	7 (3)	2 (2)	13A-171
Ignition coil and ignition power transistor	7 (7)				10 (9)	13A-178
Variable induction control solenoid						13A-183
Evaporative emission purge solenoid			8			13A-185
EGR solenoid						13A-191
Anti-lock brake signal						13A-193
Fuel pressure		5 (6)	4 (4)		7 (6)	13A-196

NOTE

The numbers in the chart indicate check order [(): cold engine, without(): warm engine].

Items	Driving	Driving	Driving	Driving	Driving	Driving	Stop- ping	Refer- ence page
	Hesita- tion, Sag	Poor accel- eration	Stumbl e	Shock	Surge	Knock- ing	Run-on (diesel- ing)	
Power supply (MFI relay) and ignition switch-IG								13A-119
Engine control module power ground								13A-122
Fuel pump	1 (1)	1 (1)						13A-123
Volume air flow sensor	10 (10)		5 (5)	5 (5)		4 (4)		13A-126
Intake air temperature sensor	6 (6)	5 (5)				2 (2)		13A-129
Barometric pressure sensor	9 (9)	7 (7)				3 (3)		13A-131
Engine coolant temperature sensor	8 (8)	6 (6)	4 (4)		3 (3)			13A-133
Throttle position sensor	7 (7)		3 (3)	4 (4)				13A-135
Closed throttle position switch								13A-137
Camshaft position sensor				2 (2)				13A-139
Crankshaft position sensor				3 (3)				13A-142
Ignition switch-ST and Park/Neutral position switch								13A-146
Vehicle speed sensor				6				13A-148
Power steering pressure switch								13A-150
Air conditioning switch and compressor clutch relay								13A-152
Knock sensor						1 (1)		13A-153
Electrical load switch								13A-155
Heated oxygen sensor								13A-159
Injectors	2 (2)	2 (2)	1 (1)		1 (1)		1	13A-167
Idle air control motor (stepper motor)				8 (6)				13A-171
Ignition coil and ignition power transistor		8 (8)		1 (1)		5 (5)		13A-178
Variable induction control solenoid	4 (4)	4 (4)						13A-183
Evaporative emission purge solenoid								13A-185
EGR solenoid	5 (5)		6 (6)		4 (4)			13A-191
Anti-lock brake signal				7				13A-193
Fuel pressure	3 (3)	3 (3)	2 (2)		2 (2)			13A-196

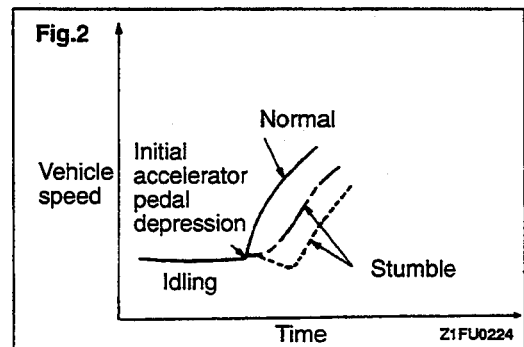
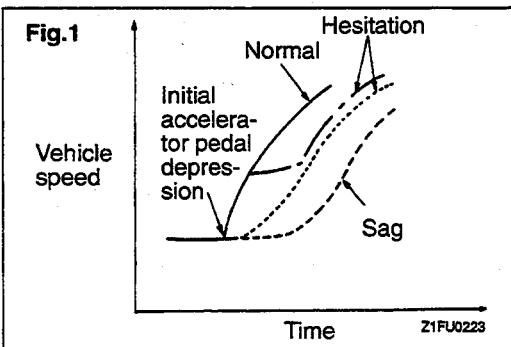
NOTE

The numbers in the chart indicate check order [(): cold engine, without(): warm engine].

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

110005777

Item		Symptom
Starting	Won't start (no initial combustion)	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
Idling stability	Hunting	Engine speed doesn't remain constant; changes at idling.
	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 idling.
	Incorrect idle speed	The engine doesn't idle at the correct speed.
	Engine stall (Die out)	This non-continuity in idling includes the following elements. The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicle is moving or not.
	Engine stall (Pass out)	This non-continuity in idling includes the following elements. The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	Hesitation and sag	"Hesitation" is the delay in response of the vehicle speed (engine rpm) 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 rpm) during such acceleration. Serious hesitation is called "sag." (Refer to Fig.1)
	Poor acceleration	The 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 rpm increase is delayed when the accelerator pedal is initially depressed for acceleration from the stopped condition. (Refer to Fig.2)
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is slight acceleration and deceleration feel usually at steady, light throttle cruise must notable under light loads.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run-on (Dieseling)	The engine continues to run even after the ignition switch is turned OFF. This is called dieseling.



SERVICE ADJUSTMENT PROCEDURES

110005778

BASIC IDLE SPEED ADJUSTMENT

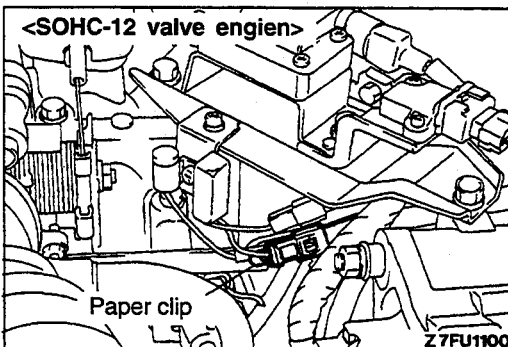
NOTE

1. The basic idle speed has been factory-adjusted with the engine speed adjusting screw and does not normally require adjustment.
 2. If the adjustment has been disturbed, the idle speed is too high or the idle speed drops because a load such as that from the air conditioning is being applied to the engine, try carrying out adjustment by the following procedure.
 3. If adjustment is required, first check that the ignition plug, injector, idle air control motor, and compression pressure are normal.
- (1) Before starting the inspection and adjustment procedures, set the vehicle in the following conditions:
 - Engine coolant temperature: 80–95°C (176–203°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (P for vehicles on automatic transmission)
 - Steering wheel: Straight-forward position
 - (2) Connect the scan tool to the data link connector (white).

NOTE

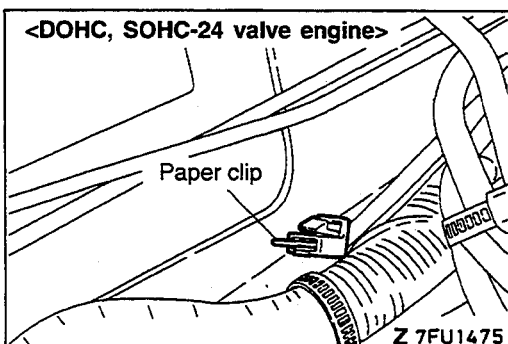
Connection of the scan tool grounds the diagnostic test mode control terminal.

- (3) If not using the scan tool proceed as follows:



<SOHC-12 valve engine>

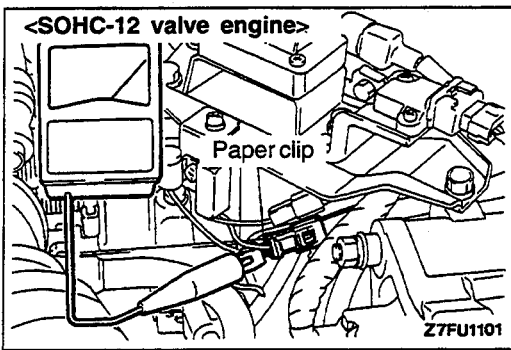
- 1) Insert the paper clip into the female side of the 1-pin connector as shown in the illustration at left. Do not disconnect the connector at this time.



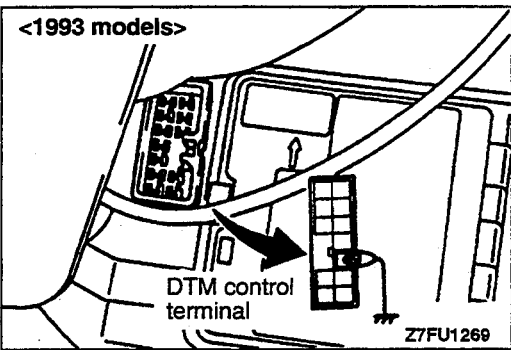
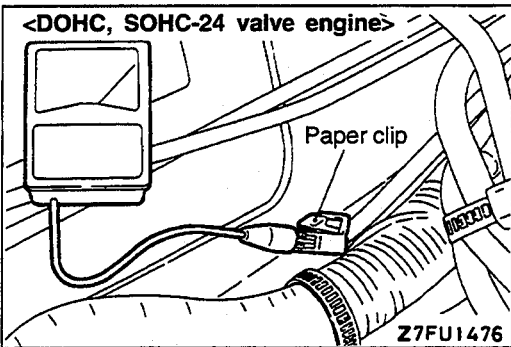
<DOHC, SOHC-24 valve engine>

- 1) Insert a paper clip into the 1-pin blue connector as shown in the illustration.

13A-40 MULTIPOINT FUEL INJECTION – Service Adjustment Procedures

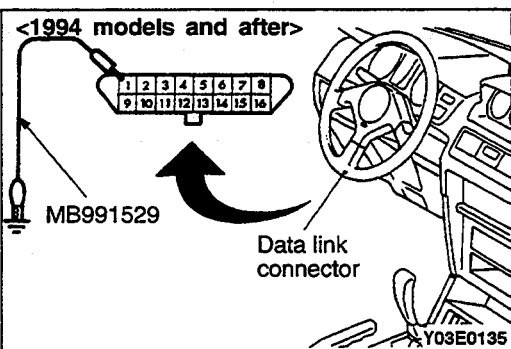


- 2) Connect a primary voltage-detecting tachometer to the paper clip.



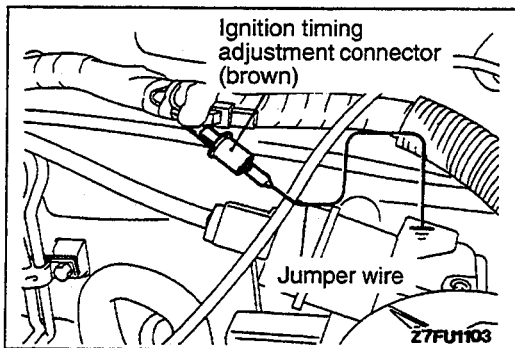
<Up to 1993 models>

- 3) Use a jumper wire to ground the diagnostic test mode control terminal (terminal (10)) of the data link connector.

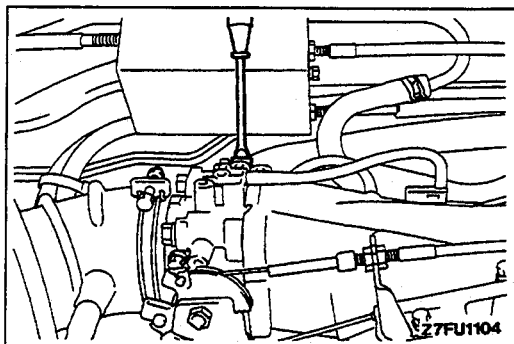


<1994 models and after>

- 3) Use the special tool (diagnostic trouble code check harness) to connect the diagnostic test mode control terminal (terminal (1)) of the data link connector (16-pin) to the ground.



- (4) Disconnect the waterproof female connector from the ignition timing adjusting connector (brown).
- (5) Use a jumper wire to ground the ignition timing adjusting terminal.



- (6) Start the engine and run at idle.
- (7) Check the basic idle speed.

Basic idle speed: 700±50 rpm

NOTE

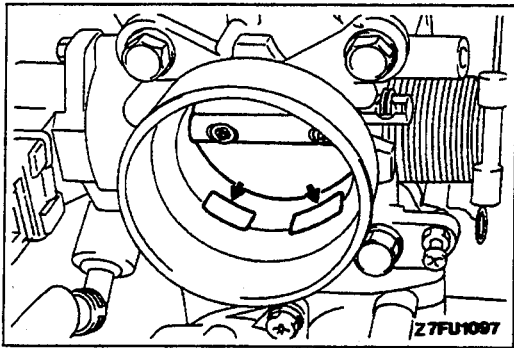
1. The engine speed may be low by 20 to 100 rpm while the vehicle is new [distance driven approx. 500 km (300 miles) or less], but no adjustment is necessary.
2. If the engine stalls or speed is low despite a sufficient distance driven [approx. 500 km (300 miles) or more], the cause is probably deposits on the throttle valve. In this case, clean the throttle valve. (Refer to P.13A-42.)

- (8) If the basic idle speed is outside the standard value, adjust by turning the engine speed adjusting screw.

NOTE

If the idle speed is higher than the standard value even when the engine speed adjusting screw is fully tightened, check if there is evidence of the fixed SAS being moved. If the closed throttle position switch seems to have been moved, adjust it. If it does not seem to have been moved, there may be a leak caused by deteriorated fast idle air valve (FIAV). In such a case, replace the throttle body.

- (9) Turn the ignition switch to OFF.
- (10) When the scan tool has not been used, remove the jumper wire from the diagnostic test mode control terminal.
- (11) Remove the jumper wire from the ignition timing adjusting terminal and re-connect the connector.
- (12) Start the engine again and run at idle for 10 minutes to make sure that the engine runs at proper idle speed.



THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

110005779

- (1) Start the engine and warm it up until the temperature of the engine coolant reaches 80°C (176°F) or higher; then stop the engine.
- (2) Disconnect the air intake hose at the throttle body side.
- (3) Plug the bypass intake port inlet (arrow) into the throttle body.

Caution

Never let cleaning liquid get into the bypass intake.

- (4) Spray cleaning liquid from the intake port of the throttle body onto the valve, and then leave as is for about five minutes.
- (5) Start the engine and race it a few times; then let it run at idle speed for about one minute.

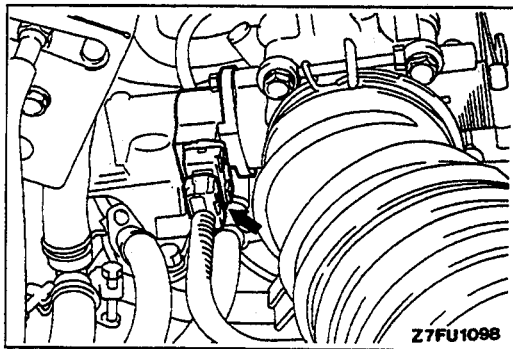
NOTE

The engine idling speed is unstable (or the engine stalls), let the engine run with the throttle valve slightly open.

- (6) If deposits are not removed from the throttle valve, repeat steps (4) and (5).
- (7) Remove the plug from the bypass intake port inlet in the throttle body.
- (8) Connect the air intake hose.
- (9) Using the scan tool erase the diagnostic trouble code or disconnect the negative battery cable for more than 10 seconds and then connect it again.
- (10) Adjust the basic idle speed. (Refer to P.13A-39.)

NOTE

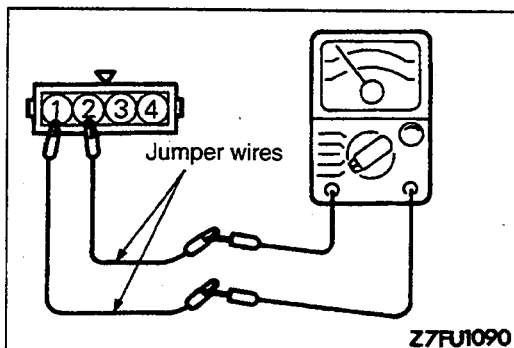
If hunting of the idling engine occurs after adjusting the basic idling speed, disconnect the negative battery cable from the battery terminal for more than 10 seconds, and then idle the engine again.



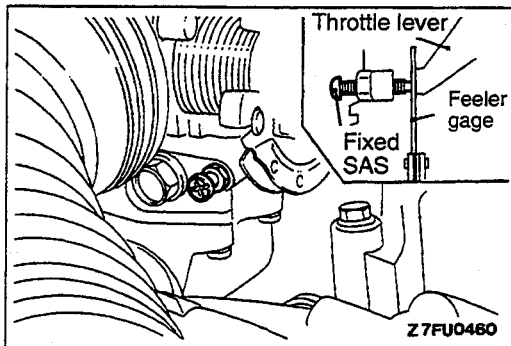
CLOSED THROTTLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT

110005780

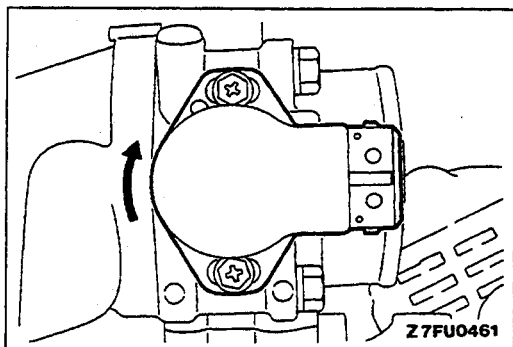
- (1) Disconnect the throttle position sensor connector.



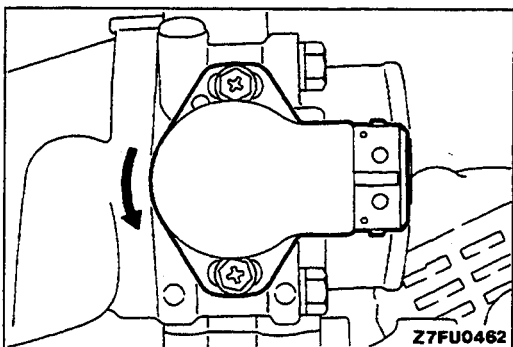
- (2) Use jumper wires to connect an ohmmeter between terminal (2) (closed throttle position switch) and terminal (1) (sensor ground) of the throttle position sensor.



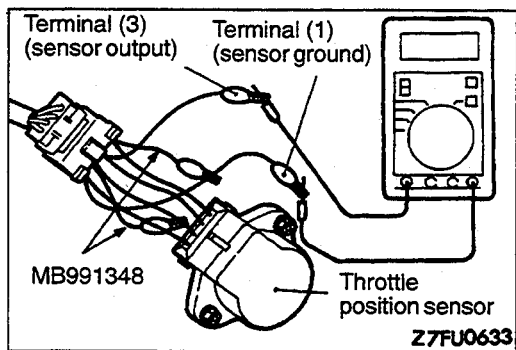
- (3) Insert a feeler gage with a thickness of 0.65 mm (.0256 in.) between the fixed SAS and throttle lever.



- (4) Loosen the throttle position sensor mounting bolts and turn the throttle position sensor body fully clockwise.
(5) In this condition, check for continuity between terminal (1) and terminal (2).



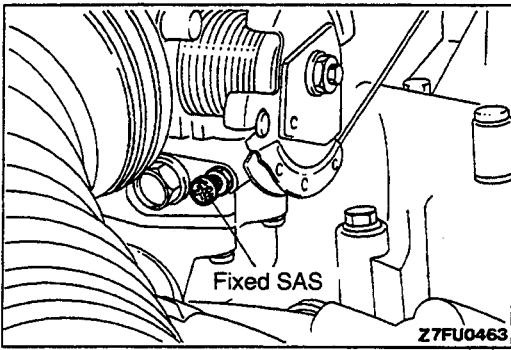
- (6) Slowly turn the throttle position sensor counterclockwise until you find a point at which there is no continuity between terminal (1) and terminal (2). Then, tighten the throttle position sensor mounting bolt securely.
(7) Connect the throttle position sensor connector.



- (8) Connect the scan tool to the data link connector (white).
(9) If not using the scan tool, proceed as follows:
1) Disconnect the throttle position sensor connectors and connect the special tool. Test Harness Set, between the disconnected connectors:
2) Connect a digital voltmeter between throttle position sensor terminal (3) (sensor output) and terminal (1) (sensor ground).
(10) Turn the ignition switch to ON (but do not start the engine).
(11) Check the throttle position sensor output voltage.

Standard value: 400–1,000 mV

- (12) If the voltage is outside the standard value, check the throttle position sensor and associated harnesses.
(13) Remove the feeler gage.
(14) Turn the ignition switch to OFF.



FIXED SAS ADJUSTMENT

110005781

NOTE

1. The fixed SAS has been factory-adjusted. Never attempt to move it.
2. If the adjustment is incorrect, adjust by following the procedure given below.
 - (1) Sufficiently slacken the accelerator cable.
 - (2) Loosen the lock nut on the fixed SAS.
 - (3) Sufficiently loosen the fixed SAS by turning it counterclockwise to fully close the throttle valve.
 - (4) Turn the fixed SAS clockwise slowly to find a point at which it contacts the throttle lever (where the throttle valve starts opening). From that point, tighten the fixed SAS further 1 1/4 turns.
 - (5) While holding the fixed SAS to prevent it from turning, tighten the lock nut securely.
 - (6) Adjust the accelerator cable tension. (Refer to P.13F-4.)
 - (7) Adjust the basic idle speed.
 - (8) Adjust the closed throttle position switch and throttle position sensor (TPS). (Refer to P.13A-42.)

ON-VEHICLE INSPECTION OF MFI COMPONENTS <SOHC-12 valve engine>

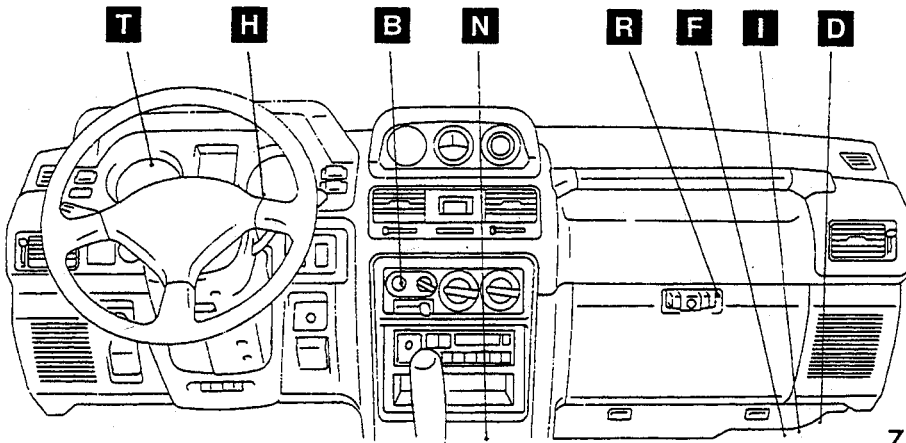
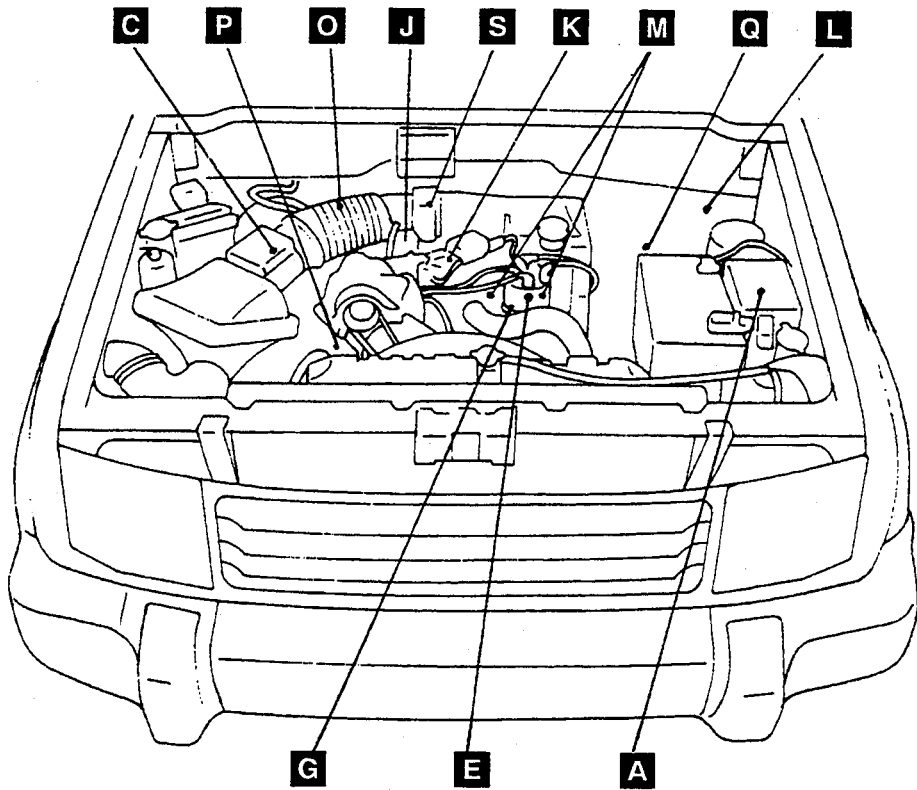
110005782

COMPONENT LOCATION

Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	A	Ignition coil (ignition power transistor)	K
Air conditioning switch	B	Ignition timing adjustment connector	L
Check engine/malfunction indicator lamp	H	Injector	M
Crankshaft position sensor	E	Multiport fuel injection (MFI) relay	D
Data link connector	R	Park/neutral position switch (Vehicles with automatic transmission)	N
Engine control module	F		
Engine coolant temperature sensor	G	Power steering pressure switch	P
Evaporative emission purge solenoid	Q	Throttle position sensor (with closed throttle position switch)	S
Fuel pump check connector	I	Vehicle speed sensor (reed switch)	T
Heated oxygen sensor	O	Volume air flow sensor (with intake air temperature sensor and barometric pressure sensor)	C
Idle air control motor	J		

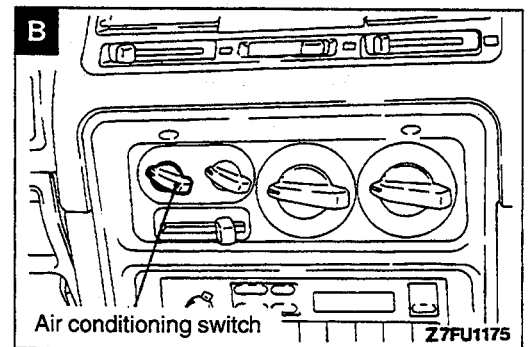
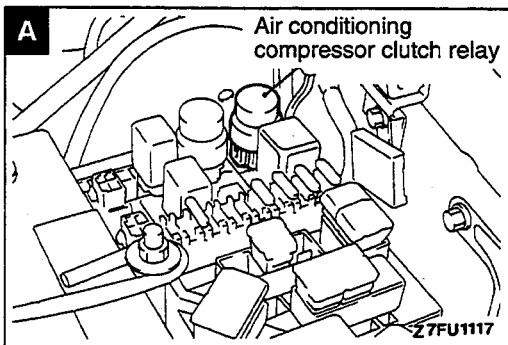
NOTE

The entries in the "Name" column are arranged in alphabetical order.



7FU1167

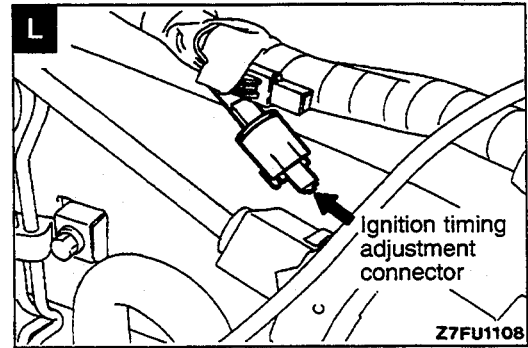
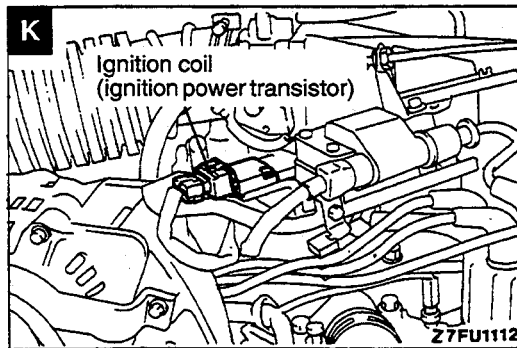
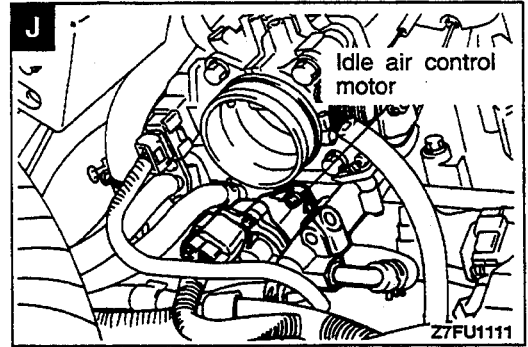
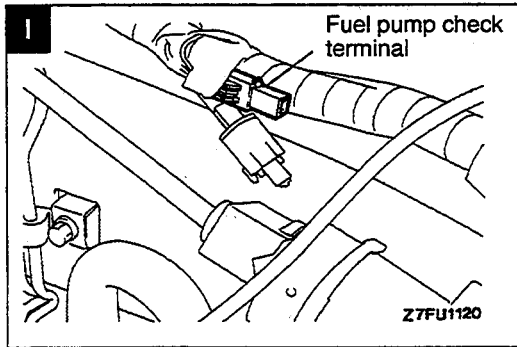
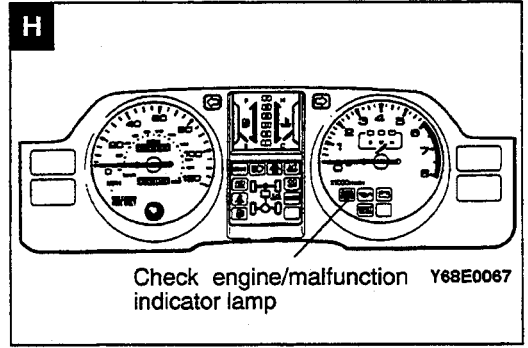
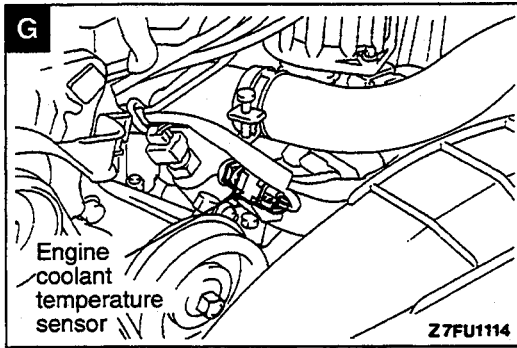
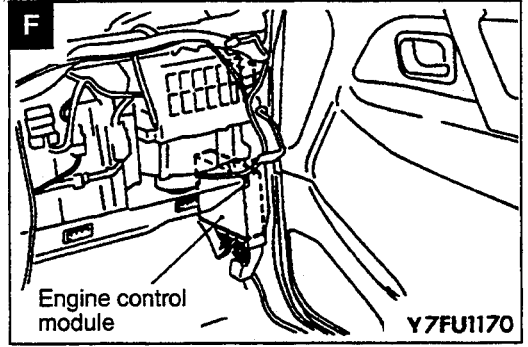
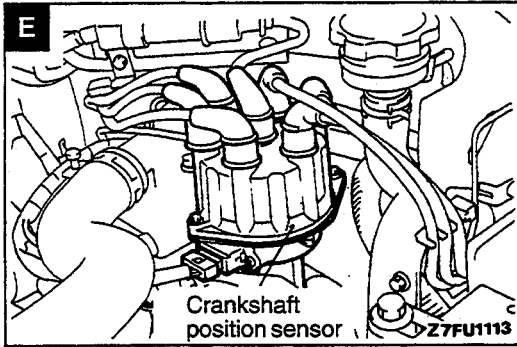
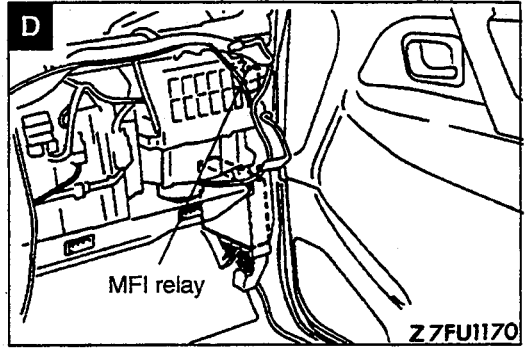
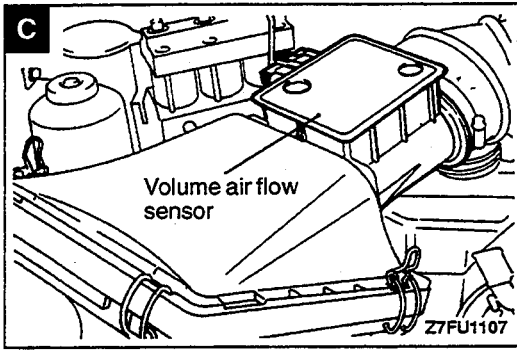
7FU1658

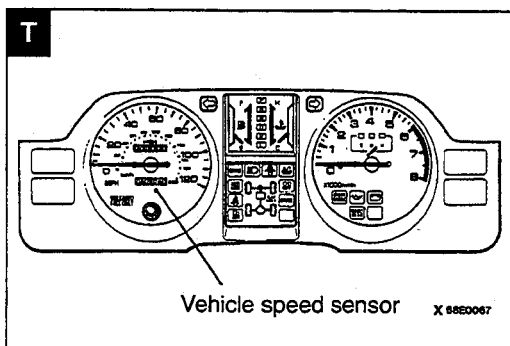
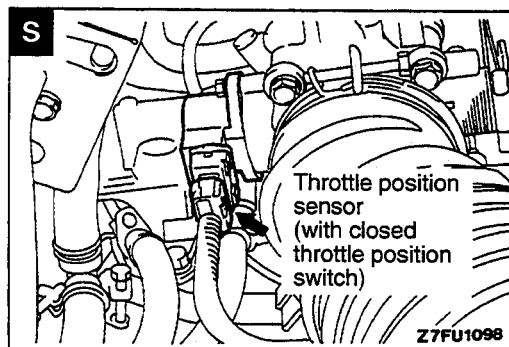
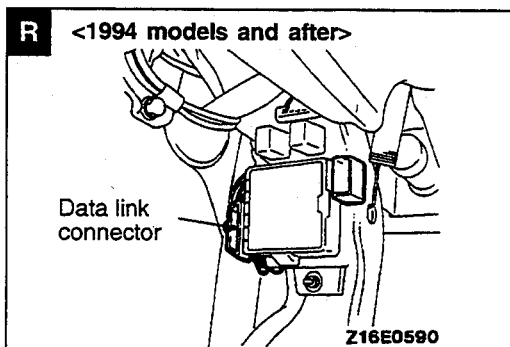
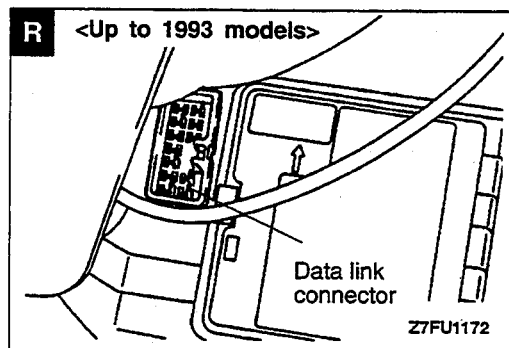
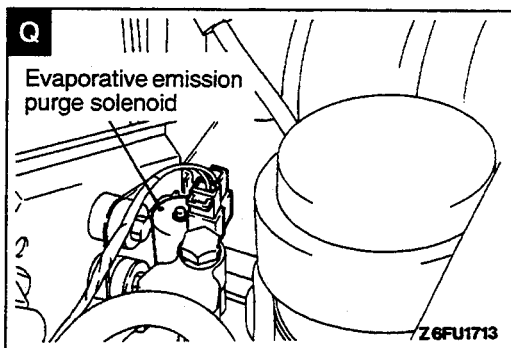
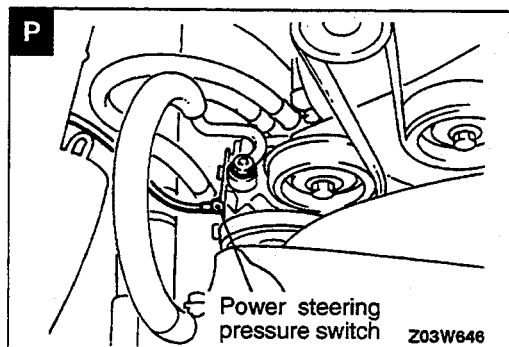
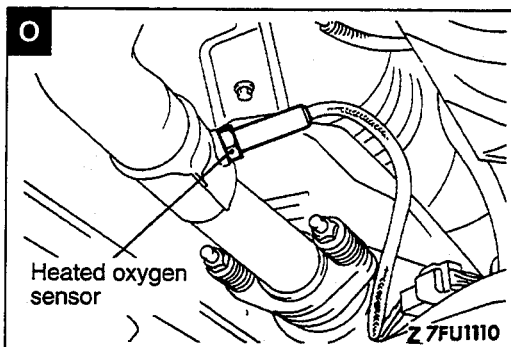
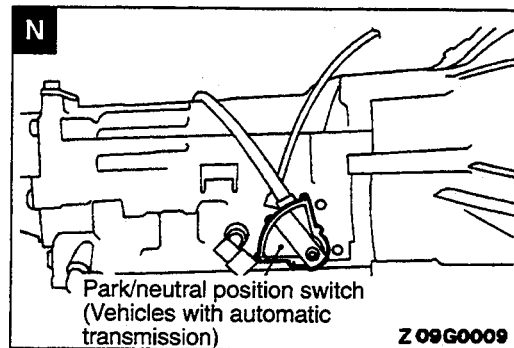
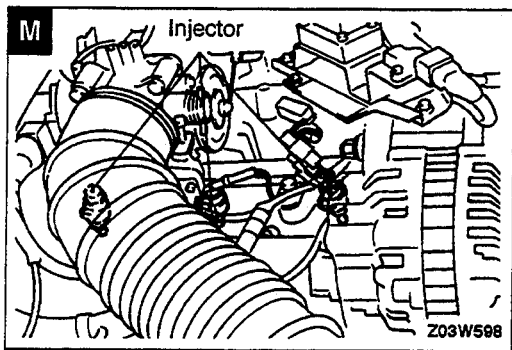


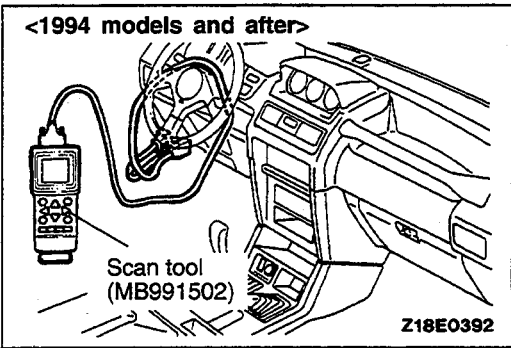
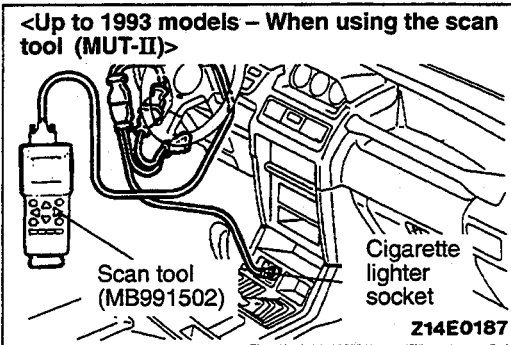
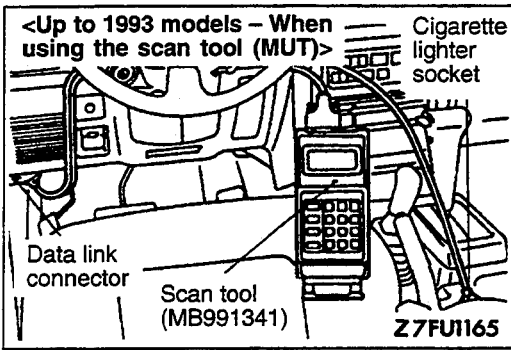
TSB Revision

13A-46 MULTIPOINT FUEL INJECTION – <SOHC-12 valve engine>

On-Vehicle Inspection of MFI Components



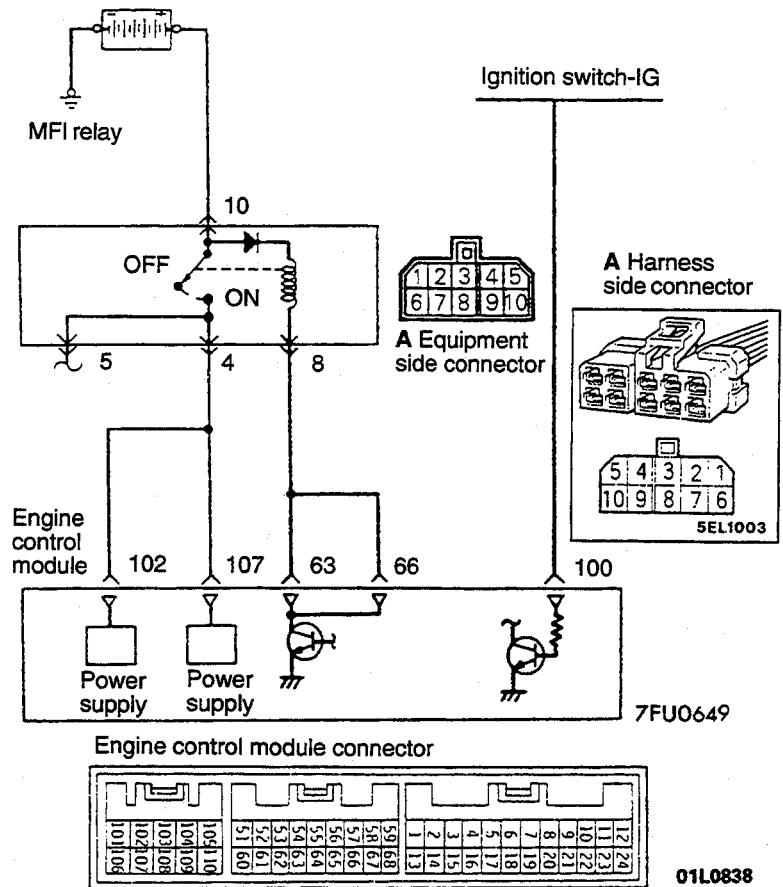
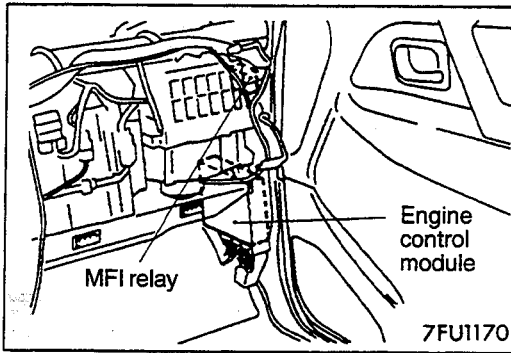




COMPONENT INSPECTION PROCEDURE 110005783
USING SCAN TOOL

- (1) Check by the data reading and actuator test function. If any abnormality is found, check the body harness, components, etc., and repair as necessary.
- (2) After repairing, check again with the scan tool to make sure that the input and output signals are now normal.
- (3) Erase the diagnostic trouble code.
- (4) Disconnect the scan tool.
- (5) Start the engine and perform running test, etc. to make sure that the troubles have been corrected.

POWER SUPPLY (MFI RELAY) AND IGNITION SWITCH-IG



OPERATION

- While the ignition switch is ON, battery positive voltage is supplied to the engine control module, injectors, volume air flow sensor, etc.
- When the ignition switch is turned to the ON position, battery positive voltage is supplied from the ignition switch to the engine control module. When battery positive voltage is supplied to the engine control module, the power transistor is switched ON and current flows to the MFI relay coil.
- As a result, the MFI relay switch is switched ON, and power is supplied, by way of the MFI relay switch, from the battery to the engine control module.

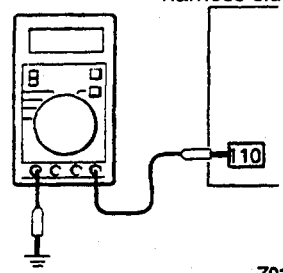
INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Standard value V
Data reading	16	Engine control module power supply voltage	Ignition switch: ON	B+

HARNESS INSPECTION

1 Engine control module harness side connector



Z01L0427

Measure the ignition switch-IG terminal input voltage.

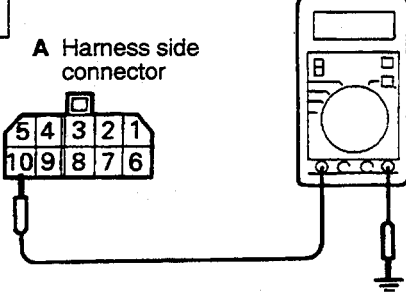
- Engine control module connector: Disconnected

Ignition switch	Voltage (V)
OFF	0-1
ON	B+

OK → **2**

✗ → Repair the harness. (110-Ignition switch or inspect the ignition switch.)

2 A Harness side connector



Z7FU0537

Measure the power supply voltage of the MFI relay.

- Ignition switch: OFF
- MFI relay connector: Disconnected

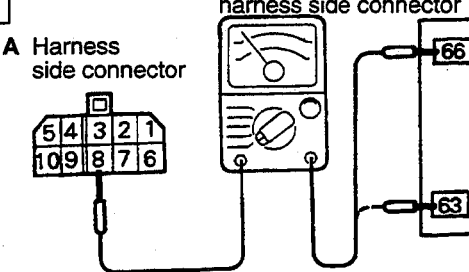
Voltage(V)
B+

OK → **3**

✗ → Repair the harness. (A10-Battery)

3 Engine control module harness side connector

A Harness side connector



Z7FU0467

Check for an open circuit or a short-circuit to ground between the MFI relay and the engine control module.

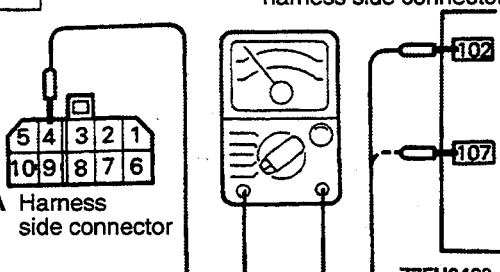
- Engine control module connector: Disconnected
- MFI relay connector: Disconnected

OK → **4**

✗ → Repair the harnesses. (A8-63) (A8-66)

4 Engine control module harness side connector

A Harness side connector



Z7FU0468

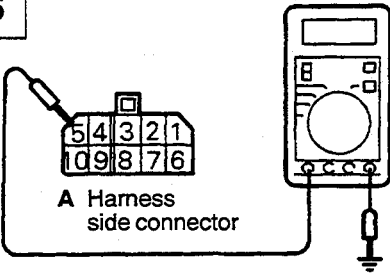
Check for an open circuit or a short-circuit to ground between the MFI relay and the engine control module.

- MFI relay connector: Disconnected
- Engine control module connector: Disconnected

OK → **5**

✗ → Repair the harnesses. (A4-102) (A4-107)

5 A Harness side connector



Z7FU1218

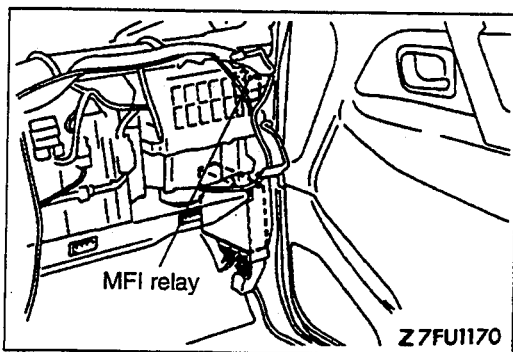
Measure the power supply voltage of the actuator.

- MFI relay connector: Connected
- Engine control module connector: Connected

Engine	Voltage (V)
Cranking	8 or higher
Racing	B+

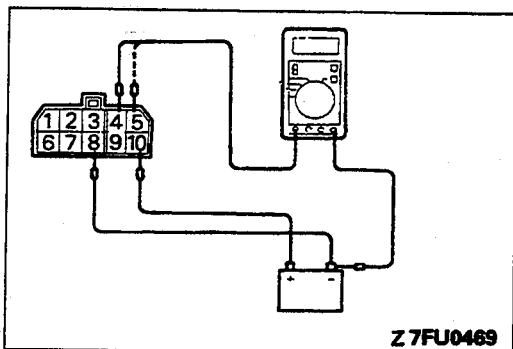
OK → **STOP**

✗ → MFI relay or engine control module is defective.



MULTIPOINT FUEL INJECTION (MFI) RELAY INSPECTION

(1) Remove the MFI relay.



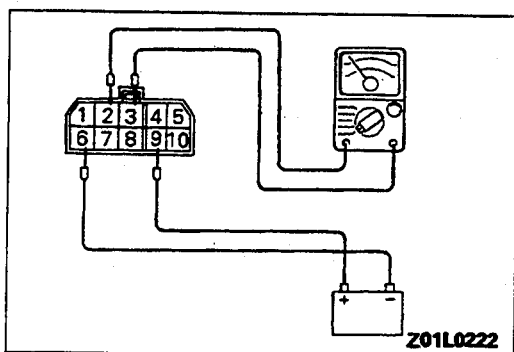
(2) Using jumper wires, connect terminal (10) of the MFI relay to the positive battery terminal and connect terminal (8) of the relay to the negative battery terminal.

Caution

- When connecting the jumper wires, be careful not to connect them to the wrong terminals, since this could damage the relay.

(3) Measure the voltage at terminal (4) and terminal (5) of the MFI relay while connecting and disconnecting the jumper wire to the negative battery terminal.

Jumper wire	Voltage at terminal (4)	Voltage at terminal (5)
Connected	B+	B+
Disconnected	0 V	0 V



(4) Using jumper wires, connect terminal (9) of the MFI relay to the positive battery terminal and connect terminal (6) of the relay to the negative battery terminal.

(5) Check for continuity between terminal (2) and terminal (3) of the MFI relay while connecting and disconnecting the jumper wire and the negative battery terminal.

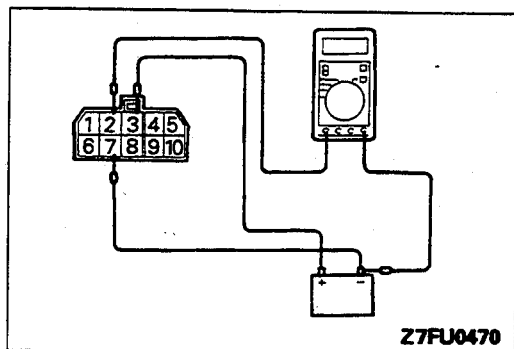
Jumper wire	Continuity between terminal (2) and terminal (3)
Connected	Continuity
Disconnected	No continuity

(6) Using jumper wires, connect terminal (3) of the MFI relay to the positive battery terminal and connect terminal (7) of the relay to the negative battery terminal.

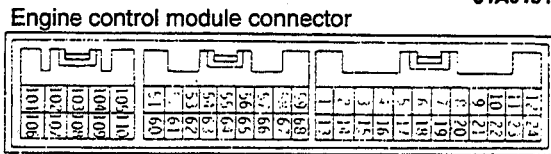
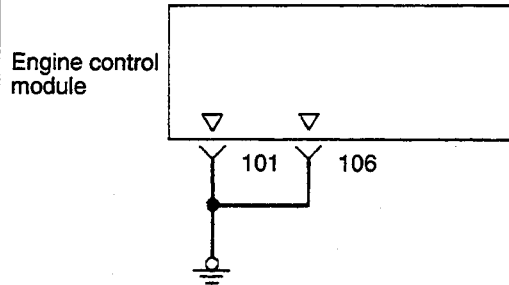
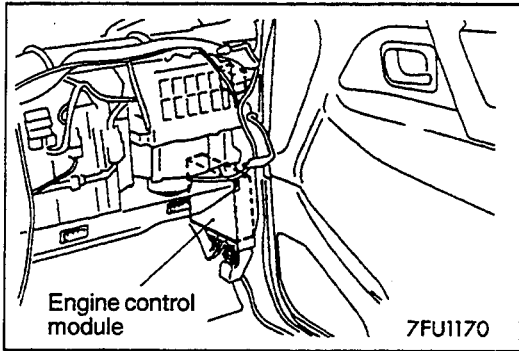
(7) Measure the voltage at terminal (2) of the MFI relay while connecting and disconnecting the jumper wire to the negative battery terminal.

Jumper wire	Voltage at terminal (2)
Connected	B+
Disconnected	0 V

(8) Replace the MFI relay if it is defective.



ENGINE CONTROL MODULE POWER GROUND



01L0838
7FU1660

OPERATION

Grounds of the engine control module.

TROUBLESHOOTING HINTS

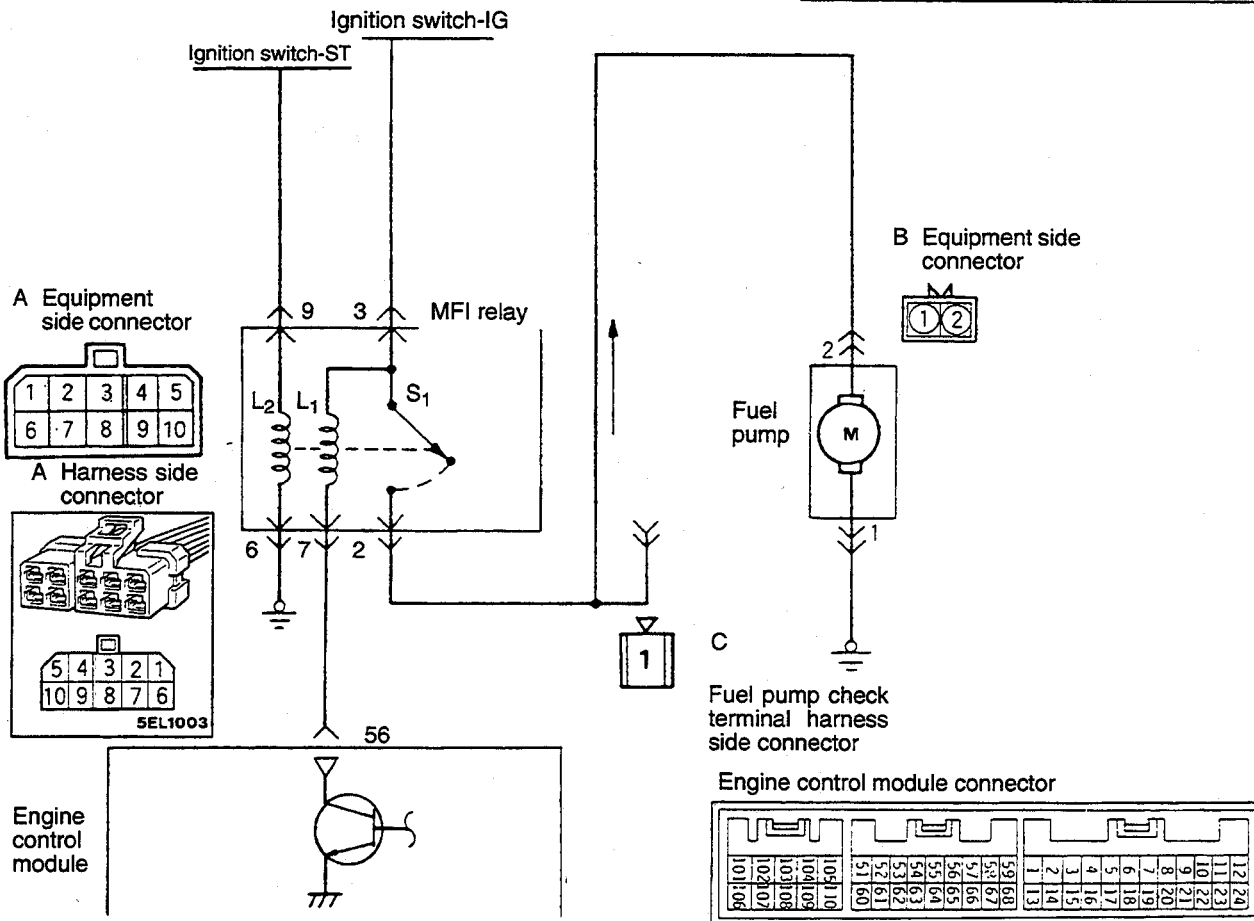
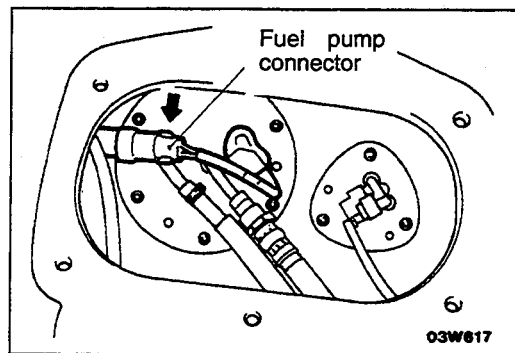
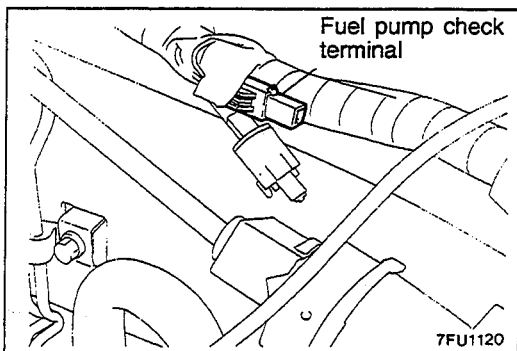
If there is incorrect or incomplete contact of the engine control module's ground line, the engine control module will not function correctly.

HARNESS INSPECTION

<p>1</p>	<p>Engine control module harness side connector</p> <p style="text-align: right;">Z01P0150</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> Engine control module connector: Disconnected 	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">STOP</div> </div> <div style="display: flex; align-items: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Repair the harness. (101 – Ground, 106 – Ground)</p> </div> </div> </div>
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110005786

FUEL PUMP



01L0838

7FU1036

7FU1661

OPERATION

- Activate the fuel pump during engine cranking and while the engine is running.
- When the ignition switch is turned to the START position, current flows, by way of the MFI relay coil, from the ignition switch to ground. As a result, the MFI relay switch is switched on, and the power for activation of the fuel pump is supplied, by way of the MFI relay switch, from the battery to the fuel pump.
- While the engine is running, the engine control module switches ON the power transistor, after which current flows to the MFI relay coil, and the power for activation of the fuel pump is supplied to the fuel pump.
- When the MFI relay switch is switched ON, battery positive voltage is also applied to the engine control module, and so the engine control module detects the fact that the power for activation of the fuel pump is being supplied to the fuel pump.

TSB Revision

INSPECTION

Using Scan tool

Function	Item No.	Activation	Check conditions	Check description	Normal condition
Actuator test	07	Activates the fuel pump and circulates the fuel.	<ul style="list-style-type: none"> Engine cranking Fuel pump forced activation Make the check under both of the above conditions.	Pinch the return hose and feel the pulsations of the fuel flow.	Pulsations can be felt.
				Listen close to the fuel tank for the sound of the pump operating.	Sound can be heard.

HARNESS INSPECTION

1

Z7FU1124

Check the fuel pump.

- Apply battery positive voltage to the checking terminal and operate the pump.

OK → **4**

✗ → **2**

2

B Harness side connector

Z1FU0521

Check the ground circuit of the fuel pump.

- Fuel pump connector: Disconnected

OK → **3**

✗ → Repair the harness. (B1-Ground)

3

B Harness side connector

Z1FU0522

Check for continuity between the fuel pump and the checking terminal.

- Fuel pump connector: Disconnected
- MFI relay connector: Disconnected

OK → **4**

✗ → Repair the harness. (B2-C1)

4

A Harness side connector

Z7FU1037

Check for continuity between the checking terminal and the MFI relay terminal.

- MFI relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → **5**

✗ → Repair the harness. (A2-C1)

5 A Harness side connector

Measure the power supply voltage of the MFI relay.

- MFI relay connector: Disconnected

Ignition switch	Voltage (V)
START (A9 when checking)	8 or higher
ON (A3 when checking)	B+

OK → **6**

✗ → Repair the harness. (Ignition switch ON – A3 Ignition switch (START – A9) or check the ignition switch.)

Z7FU0474

6 Engine control module harness side connector

A Harness side connector

Check for an open circuit or a short-circuit to ground between the MFI relay and the engine control module.

- MFI relay connector: Disconnected
- Engine control module connector: Disconnected

OK → **7**

✗ → Repair the harness. (A7–56)

Z7FU0475

7 A Harness side connector

Check for continuity in the ground circuit.

- MFI relay connector: Disconnected

OK → **8**

✗ → Repair the harness. (A6–Ground)

Z7FU0476

8 A Harness side connector

B Harness side connector

Check for an open circuit or a short-circuit to ground between the MFI relay and the fuel pump.

- MFI relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → **STOP**

✗ → Repair the harness. (A2–B2)

Z6FU1333

9 A Harness side connector

Measure the power supply voltage of the fuel pump.

- MFI relay connector: Connected
- Engine control module connector: Connected

Engine	Voltage (V)
Cranking	8 or higher
Racing	B+

OK → **STOP**

✗ → MFI relay or engine control module is defective.

Z7FU1220

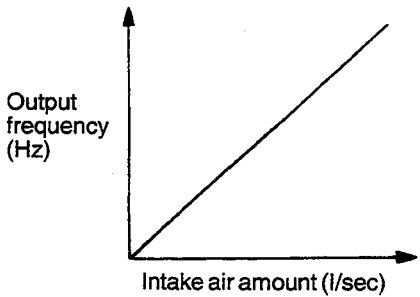
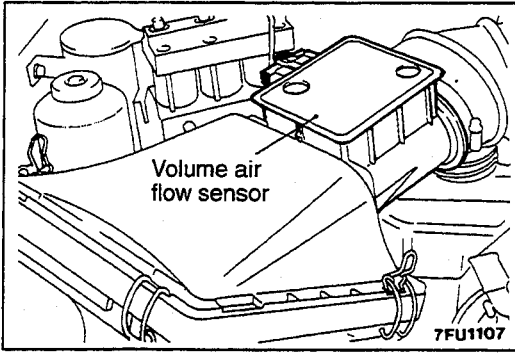
MULTIPOINT FUEL INJECTION (MFI) RELAY INSPECTION

Refer to P.13A-51.

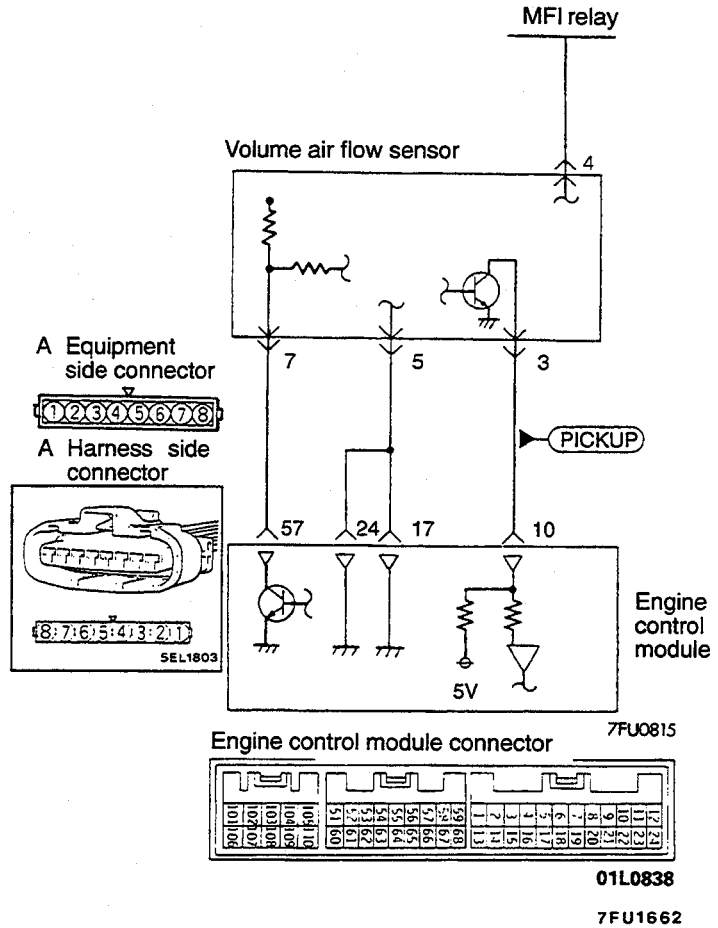
FUEL PUMP INSPECTION

Refer to P.13A-7.

VOLUME AIR FLOW SENSOR



16Z451



OPERATION

- The volume air flow sensor is incorporated within the air cleaner, it functions to convert the amount of engine air intake to pulse signals of a frequency proportional to the amount of engine air intake, and to input those signals to the engine control module. The engine control module then, based upon those signals, calculates the amount of fuel injection, etc.
- The power for the volume air flow sensor is supplied from the MFI relay to the volume air flow sensor, and is grounded at the engine control module. The volume air flow sensor, by intermitting the flow of the 5 V voltage applied from the engine control module, produces pulse signals.

TROUBLESHOOTING HINTS

- Hint 1:
If the engine sometimes stalls, try starting the engine and shaking the volume air flow sensor harness. If the engine then stalls, incorrect or improper contact of the volume air flow sensor connector is the probable cause.
- Hint 2:
If the volume air flow sensor output frequency is any value other than zero when the ignition switch is switched ON (but the engine is not started), a malfunction of the volume air flow sensor or of the engine control module is the probable cause.

Hint 3:

If idling is possible even though the volume air flow sensor output frequency is outside the standard value, the cause is usually a malfunction other than of the volume air flow sensor.

[Examples]

- (1) The flow of air within the volume air flow sensor is disturbed. (Air duct disconnection or clogged air cleaner element.)
- (2) Incomplete combustion inside a cylinder (Malfunction of spark plugs, ignition coil, injectors, compression pressure, etc.)
- (3) Air is drawn into the intake manifold through a leaking gasket, etc.

INSPECTION

**Using scan tool
Volume air flow sensor**

Function	Item No.	Data display	Check conditions	Engine conditions	Standard value Hz
Data reading	12	Sensor detection air flow (frequency)	<ul style="list-style-type: none"> • Engine coolant temperature: 80–95°C (176–203°F) • Lights and all accessories: OFF • Transmission: neutral (P range for vehicles with A/T) • Steering wheel: neutral position 	Idling (700 rpm)	22–48
				2,000 rpm	60–100
				Racing	Frequency increases by racing.

NOTE

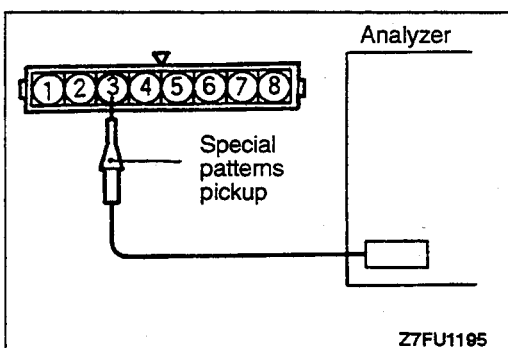
When the vehicle is new [driven approximately 500 km (300 miles) or less], the volume air flow sensor output frequency may be approximately 10% higher than indicated above.

Volume air flow sensor reset signal

Function	Item No.	Data display	Inspection condition	Engine state	Normal display
Data list	34	Reset signal condition	<ul style="list-style-type: none"> • Engine warming up 	Idling (700 rpm)	ON
				2,000 rpm	OFF

Volumetric efficiency

Function	Item No.	Data display	Inspection condition	Engine condition	Standard value
Data list	37	Volumetric efficiency	<ul style="list-style-type: none"> • Engine coolant temperature: 80–95°C (176–203°F) • Lights, electrical cooling fan and all accessories: OFF • Transmission: Neutral (P range for vehicles with A/T) • Steering wheel: Straight forward position 	Idling (700 rpm)	15–35%
				2,000 rpm	15–35%
				Racing	Volumetric efficiency increases according to amount of racing.



Wave Pattern Inspection Using an Analyzer

Measurement Method

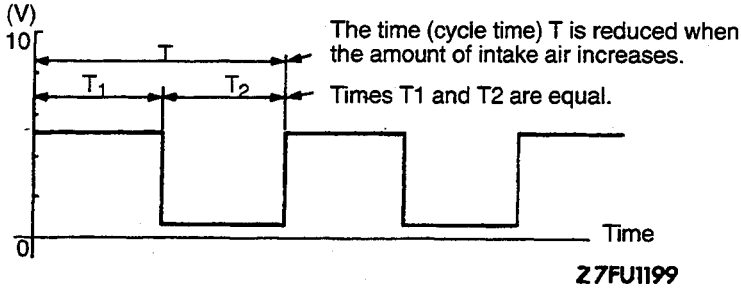
- (1) Disconnect the volume air flow sensor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
- (2) Connect the analyzer special patterns pickup to terminal (3) of the volume air flow sensor connector.

Alternative method (when test harness is not available)

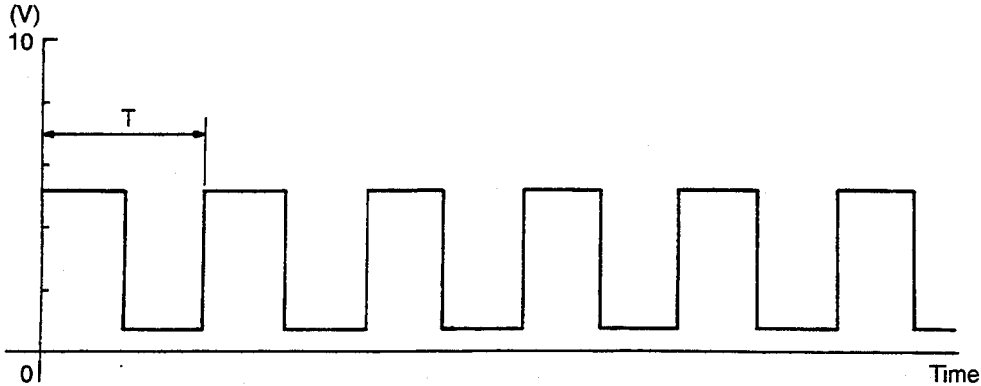
Connect the analyzer special patterns pickup to ECM terminal (70).

Standard wave pattern

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine rpm	Idling (700 rpm)



Observation conditions (Pattern changes with engine speed changes)



Wave pattern observation points

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

Examples of abnormal wave patterns

- Example 1

Cause of problem

Malfunction of sensor interface

Wave pattern characteristics

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

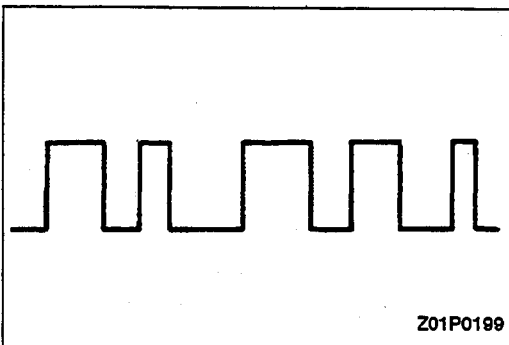
- Example 2

Cause of problem

Damaged rectifier or vortex generation column

Wave pattern characteristics

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



HARNES INSPECTION

1

A Harness side connector

B Control relay harness side connector

Z7FU1221

Check for continuity between the volume air flow sensor and the MFI relay.

- MFI relay connector: Disconnected
- Volume air flow sensor connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

~~OK~~ → Repair the harness. (A4–B4)

2

A Harness side connector

Z7FU0657

Check for continuity in the ground circuit.

- Connector: Disconnected

OK → **3**

~~OK~~ → Repair the harnesses. (A5–17) (A5–24)

3

A Harness side connector

Engine control module harness side connector

Z7FU1222

Check for an open or short-circuit between the volume air flow sensor and the engine control module.

- Volume air flow sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → **4**

~~OK~~ → Repair the harnesses. (A3–10) (A7–57)

4

A Harness side connector

Z7FU0656

Measure the applied voltage.

- Volume air flow sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

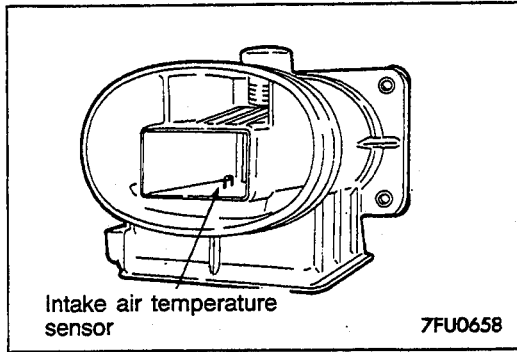
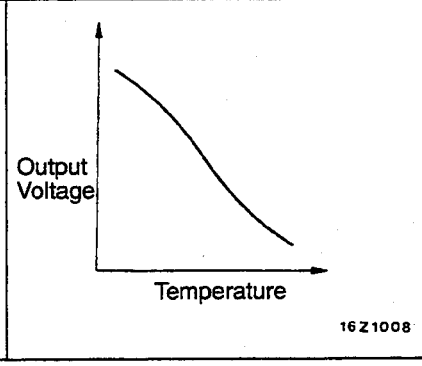
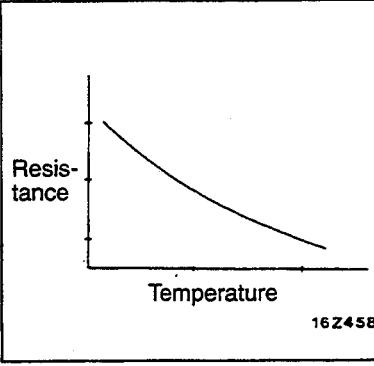
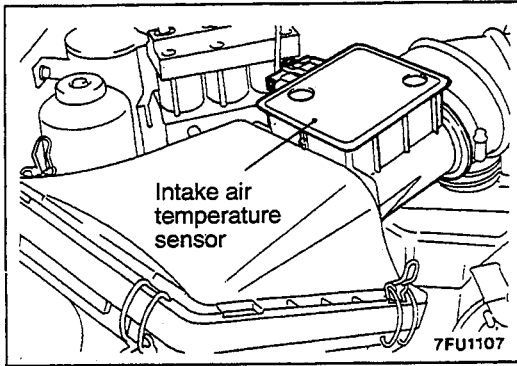
Voltage (V)
4.8–5.2

OK → STOP

~~OK~~ → Replace the engine control module.

INTAKE AIR TEMPERATURE SENSOR

110005788

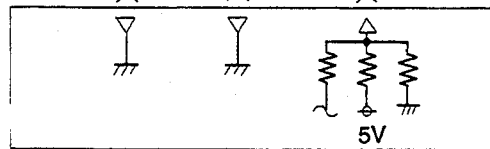
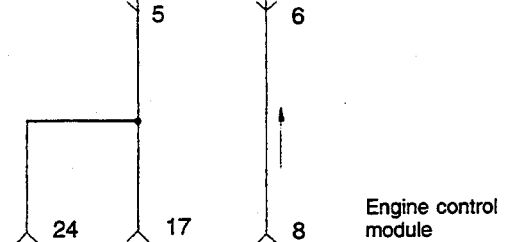
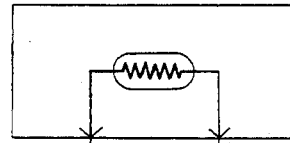
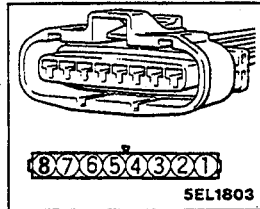


A Equipment side connector



Volume air flow sensor connector

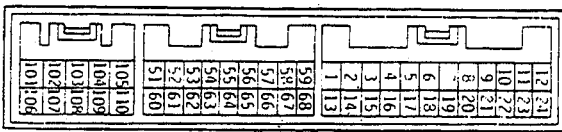
A Harness side connector



7FU0800

7FU1663

Engine control module connector



01L0838

OPERATION

- The intake air temperature sensor functions to convert the temperature of the air drawn into the engine to a voltage, and to input that voltage as a signal to the engine control module. The engine control module, based upon those signals, then corrects the amount to fuel injection, etc.
- The 5 V power supply within the engine control module is supplied, by way of the resistance within the unit, to the intake air temperature sensor, it passes through the intake air temperature sensor, which is a type of resistor, and is grounded as the engine control module. Note

that the resistance of the intake air temperature sensor decreases when the temperature of the intake air increases.

- The intake air temperature sensor terminal voltage becomes higher when the resistance of the intake air temperature sensor increases, and becomes lower when the resistance decreases. Consequently, the intake air temperature sensor terminal voltage varies in accordance with the temperature of the intake air, becoming lower when the temperature of the intake air increases.

TROUBLESHOOTING HINTS

Because the intake air temperature of the intake air in the air cleaner, it indicates a temperature different than the temperature of the outside air when the engine is running.

INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Intake air temperature °C (°F)	Standard value °C
Data reading	13	Sensor detection temperature	Ignition switch: ON or engine running	When -20 (-4)	-20
				When 0 (32)	0
				When 20 (68)	20
				When 40 (104)	40
				When 80 (176)	80

HARNESS INSPECTION

1

A Harness side connector

Z7FU0657

Check for continuity in the ground circuit.

- Volume air flow sensor connector: Disconnected

OK

✗

→

2

→

Repair the harnesses.
(A5-17)
(A5-24)

2

Harness side connector

Engine control module harness side connector

Z7FU1223

Check for an open or short-circuit between the intake air temperature sensor and the engine control module.

- Volume air flow sensor connector: Disconnected
- Engine control module connector: Disconnected

OK

✗

→

3

→

Repair the harness.
(A6-8)

3

A Harness side connector

Z7FU0660

Measure the power supply voltage.

- Volume air flow sensor connector: Disconnected
- Ignition switch: ON
- Engine control module connector: Connected

OK

✗

→

STOP

→

Repair the engine control module.

Voltage (V)	
4.5-4.9	

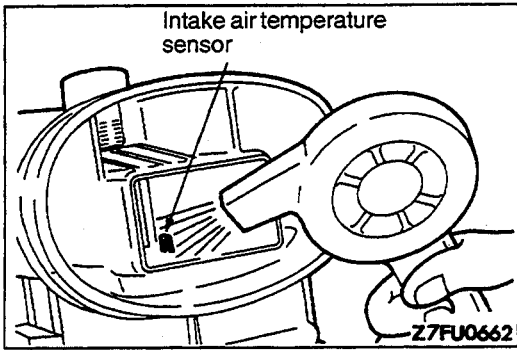
Volume air flow sensor side connector

Z7FU0661

SENSOR INSPECTION

- Disconnect the volume air flow sensor connectors.
- Measure the resistance between terminal (5) and terminal (6).

Temperature °C (°F)	Resistance kΩ
0 (32)	6.0
20 (68)	2.7
80 (176)	0.4



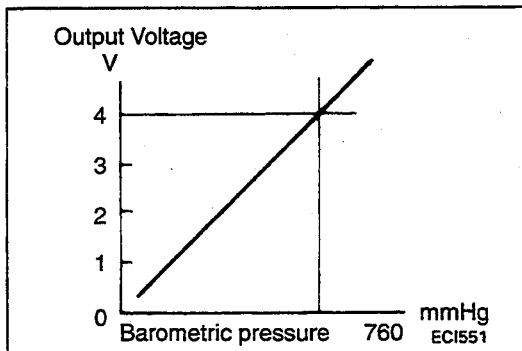
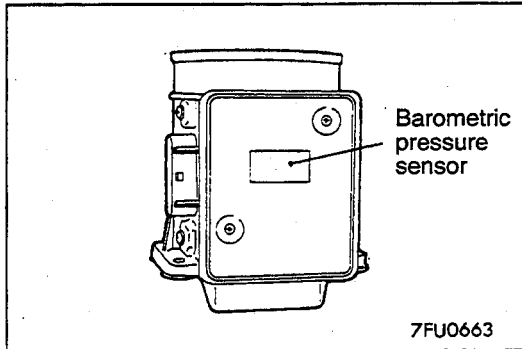
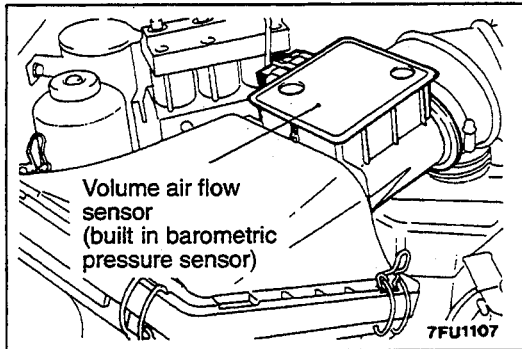
(3) Measure the resistance while heating the sensor using a hair drier.

Temperature °C (°F)	Resistance kΩ
Higher	Smaller

(4) If resistance does not decrease as heat increases or the resistance remains unchanged, replace the volume air flow sensor assembly

BAROMETRIC PRESSURE SENSOR

110005789

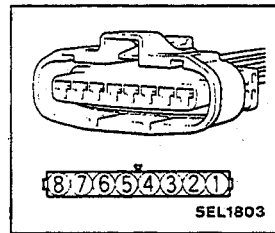


A Equipment side connector



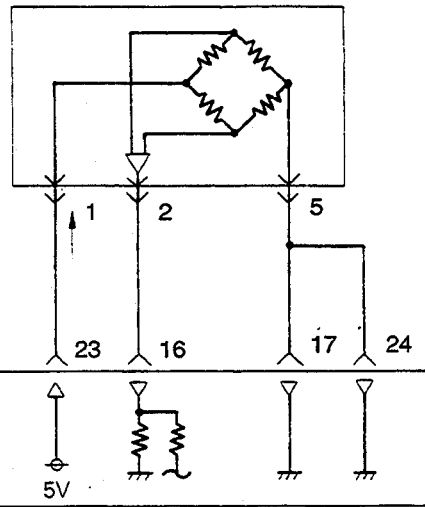
Volume air flow sensor connector

A Harness side connector



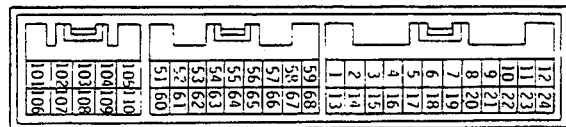
Engine control module

Barometric pressure sensor



7FU1177

Engine control module connector



01L0838
7FU1664

OPERATION

- The barometric pressure sensor functions to convert the barometric pressure to voltage, and to input that voltage (as signals) to the engine control module. The engine control module based upon those signals, then corrects the amount of fuel injection, etc.
- The 5 V power supply within the engine control module is supplied to the barometric pressure

sensor; it passes through the circuitry within the sensor, and is grounded at the engine control module.

- The barometric-pressure sensor output voltage is supplied to the engine control module in proportion to the barometric pressure (absolute pressure).

TROUBLESHOOTING HINTS

Hint 1:
If there is a malfunction of the barometric pressure sensor, drivability of the vehicle will become worse, particularly at high altitudes.

Hint 2:
If, during high-speed driving, there is a noticeable sharp drop of the displayed pressure of the barometric-pressure sensor, check for clogging of the air cleaner.

INSPECTION
Using Scan tool

Function	Item No.	Data display	Check conditions	Altitude m (ft.)	Standard value kPa (mmHg)
Data reading	25	Sensor detection pressure	Ignition switch: ON	When at 0 (0)	101 (760)
				When at 600 (1,969)	95 (710)
				When at 1,200 (3,937)	88 (660)
				When at 1,800 (5,906)	81 (610)

HARNESS INSPECTION

1

A Harness side connector

Z7FU0657

Check for continuity in the ground circuit.

- Volume air flow sensor connector: Disconnected

OK → **2**

✗ → Repair the harnesses. (A5-17) (A5-24)

2

A Harness side connector

Z7FU1224

Check for an open or short-circuit between the barometric pressure sensor and the engine control module.

- Volume air flow sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → **3**

✗ → Repair the harnesses. (A2-16) (A1-23)

3

A Harness side connector

Z7FU0665

Measure the power supply voltage of the barometric pressure sensor.

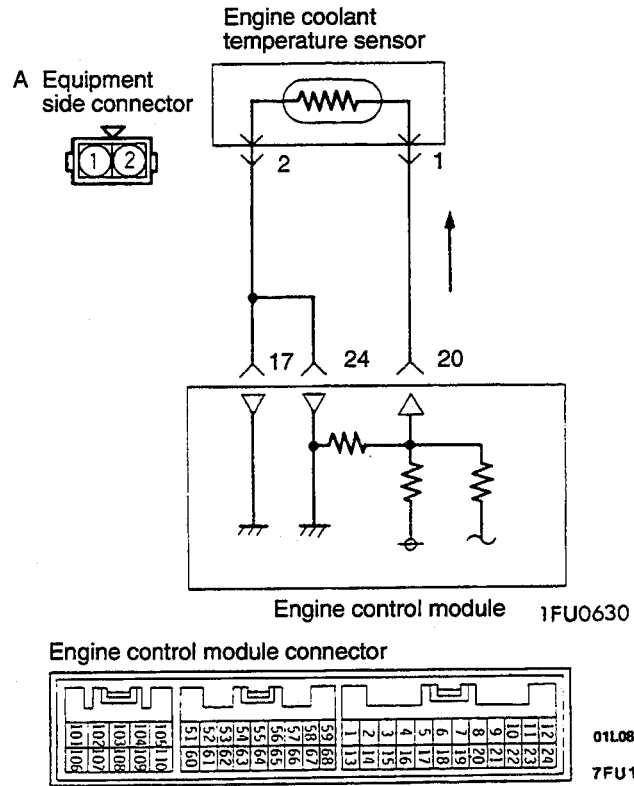
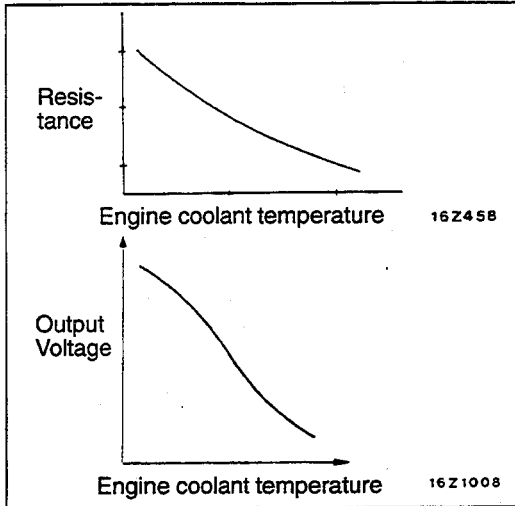
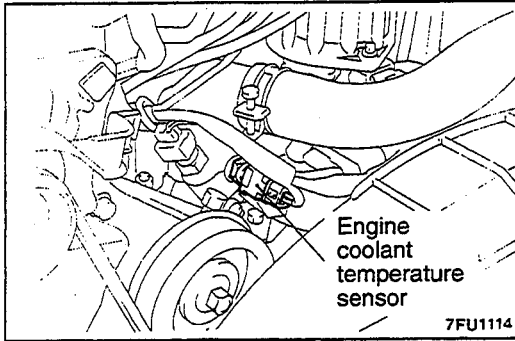
- Volume air flow sensor connector: Disconnected
- Ignition switch: ON
- Engine control module connector: Connected

Voltage (V)
4.8-5.2

OK → **STOP**

✗ → Replace the engine control module.

ENGINE COOLANT TEMPERATURE SENSOR



OPERATION

- The engine coolant temperature sensor functions to convert the barometric pressure to voltage, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, regulates the amount of fuel injection and the fast-idling speed when the engine is cold.
- The 5 V power supply within the engine control module is supplied, by way of the resistance within the unit, to the engine coolant temperature sensor; it passes through the engine coolant temperature sensor, which is a type of resistor, and is grounded at the engine control module. Note that the resistance of the engine coolant temperature sensor decreases when the temperature of the engine coolant increases.

- The engine coolant temperature sensor terminal voltage becomes higher when the resistance of the engine coolant temperature sensor increases, and becomes lower when the resistance decreases. Consequently, the engine coolant temperature sensor terminal voltage varies in accordance with the temperature of the engine coolant, becoming lower when the temperature of the engine coolant increases.

TROUBLESHOOTING HINTS

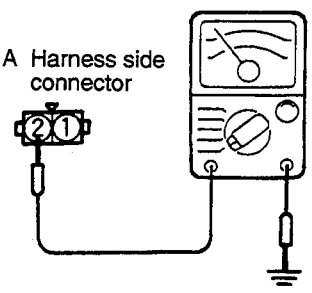


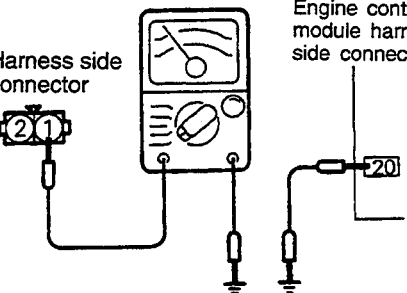


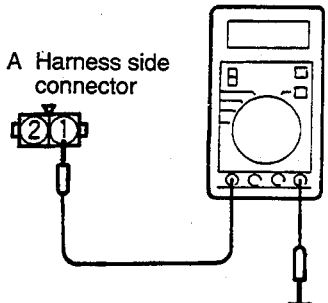



If, during engine warm-up, the fast-idling speed is not correct, or black smoke is emitted, the problem is usually a malfunction of the coolant temperature sensor.

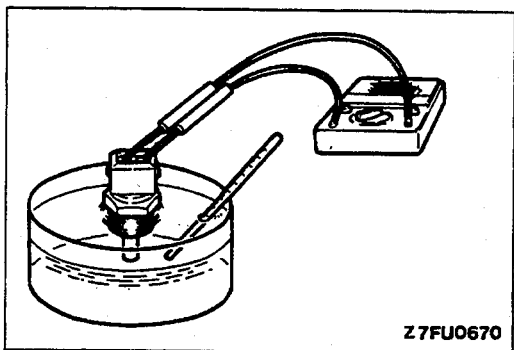
INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Engine coolant temperature °C(°F)	Standard value °C
Data reading	21	Sensor detection temperature	Ignition switch: ON or engine running	When -20 (-4)	-20
				When 0 (32)	0
				When 20 (68)	20
				When 40 (104)	40
				When 80 (176)	80

HARNESS INSPECTION

<p>1</p>  <p style="text-align: right;">Z7FU0668</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Connector: Disconnected 	<div style="text-align: center;">  → 2 </div> <div style="text-align: center; margin-top: 20px;">  → Repair the harnesses. (A2-17) (A2-24) </div>		
<p>2</p>  <p style="text-align: right;">Z7FU1225</p>	<p>Check for an open or short-circuit between the engine coolant temperature sensor and the engine control module.</p> <ul style="list-style-type: none"> • Engine coolant temperature sensor connector: Disconnected • Engine control module connector: Disconnected 	<div style="text-align: center;">  → 3 </div> <div style="text-align: center; margin-top: 20px;">  → Repair the harness. (A1-20) </div>		
<p>3</p>  <p style="text-align: right;">Z7FU0669</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> • Engine coolant temperature sensor connector: Disconnected • Engine control module connector: Connected • Ignition switch: ON <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">4.5-4.9</td> </tr> </table>	Voltage (V)	4.5-4.9	<div style="text-align: center;">  →  </div> <div style="text-align: center; margin-top: 20px;">  → Replace the engine control module. </div>
Voltage (V)				
4.5-4.9				



SENSOR INSPECTION

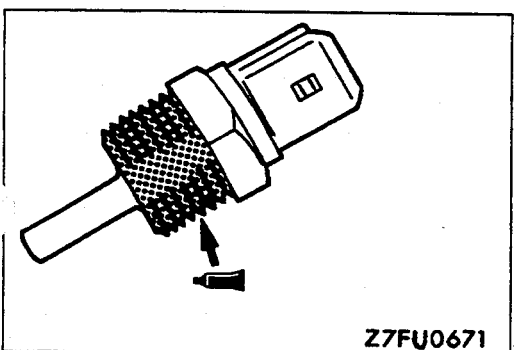
- (1) Remove the engine coolant temperature sensor from the intake manifold.
- (2) With temperature sensing portion of coolant temperature sensor immersed in hot water check resistance.

Temperature °C (°F)	Resistance kΩ
0 (32)	5.8
20 (68)	2.4
40 (104)	1.1
80 (176)	0.3

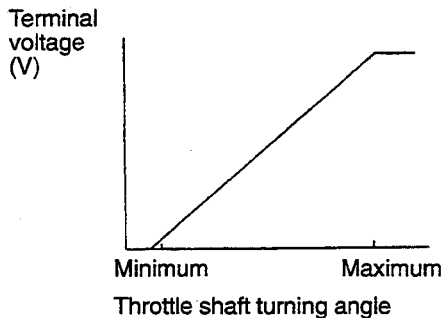
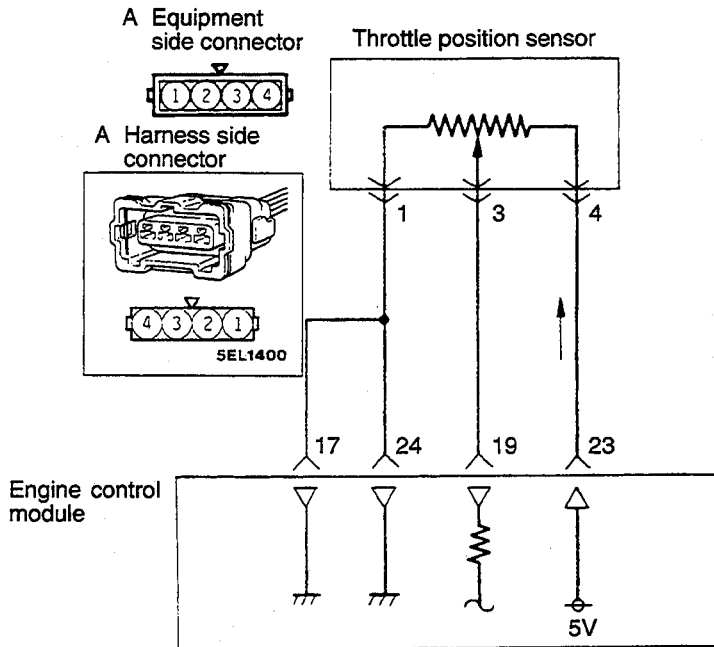
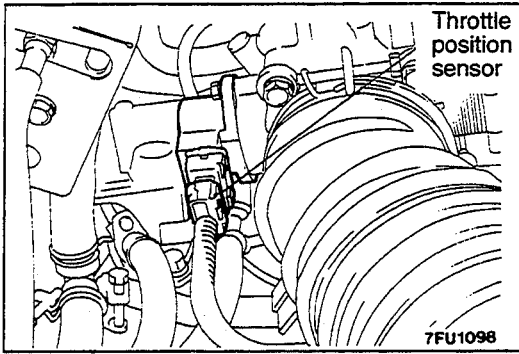
- (3) If the resistance is outside the standard value greatly, replace the sensor.

INSTALLATION

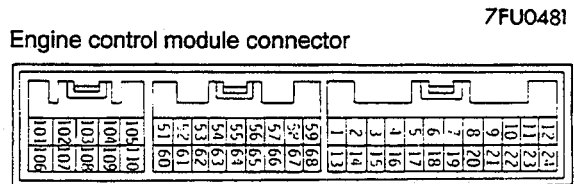
- (1) Apply specified sealant to the threaded portion.
Specified sealant: 3M Nut Locking Part No. 4171 or equivalent
- (2) Install the engine coolant temperature sensor and tighten it to the specified torque.
Sensor tightening torque: 30 Nm (22 ft.lbs)
- (3) Fasten the harness connectors securely.



THROTTLE POSITION SENSOR



162481



01L0838 7FU1666

OPERATION

- The throttle position sensor functions to convert the degree of opening of the throttle valve to voltage, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, then regulates the amount of fuel injection, etc.
- The 5 V power supply within the engine control module is supplied to the throttle position sensor, after which it passes through the resistance within the sensor and is grounded as the engine control module.
- When the throttle valve shaft is rotated all the way from the idling position to the fully open position, the resistance between the throttle position sensor's variable-resistance terminal and the ground terminal also increases in accordance with that rotation, and, as a result, the voltage of the throttle position sensor's variable-resistance terminal also becomes higher in accordance with that rotation.

TROUBLESHOOTING HINTS

- Hint 1:
The signals of the throttle position sensor are more important for control of the automatic transmission than for control of the engine; shifting "impact shocks" are produced if there is a malfunction of the throttle position sensor.
- Hint 2:
If the voltage of the throttle position sensor is outside the standard value, check once again after making the throttle position sensor adjustment. In addition, if there are any indication that the fixed SAS has been moved, adjust the fixed SAS.

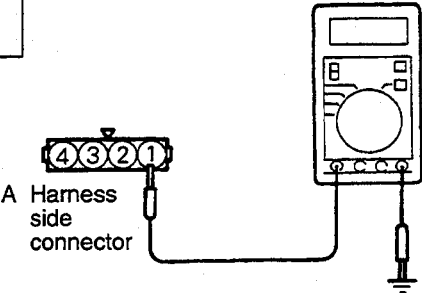
INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Throttle valve	Standard value mV
Data reading	14	Sensor detection voltage	Ignition switch: ON for 15 seconds or more	Set to the idling position.	300-1,000
				Open gradually.	Becomes higher proportionally to valve opening
				Open fully.	4,500-5,500

HARNESS INSPECTION

1



Z6FU1241

Check for continuity in the ground circuit.

- Throttle position sensor connector: Disconnected

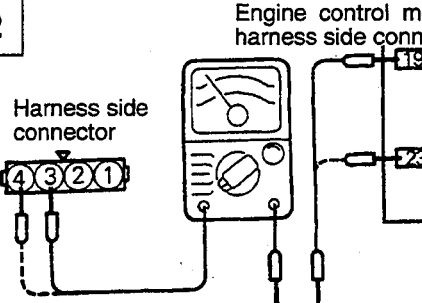
OK →

~~OK~~ →

2

Repair the harnesses.
(A4-17)
(A4-24)

2



Z7FU1270

Check for an open or short-circuit between the throttle position sensor and the engine control module.

- Throttle position sensor connector: Disconnected
- Engine control module connector: Disconnected
- All control module connectors, such as the ECM connector, which use throttle position sensor output: Disconnected

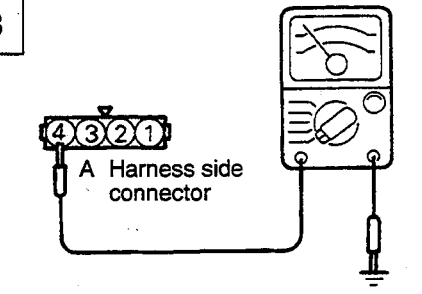
OK →

~~OK~~ →

3

Repair the harnesses.
(A3-19)
(A4-23)

3



Z6FU1242

Measure the applied voltage.

- Throttle position sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

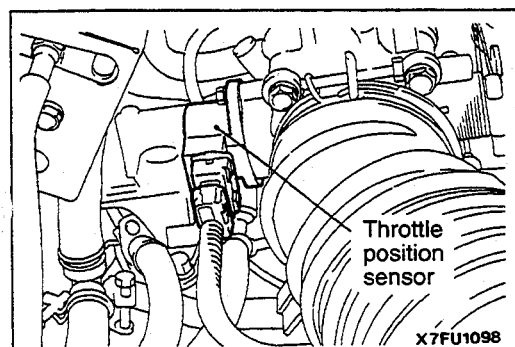
Voltage (V)
4.8-5.2

OK →

~~OK~~ →

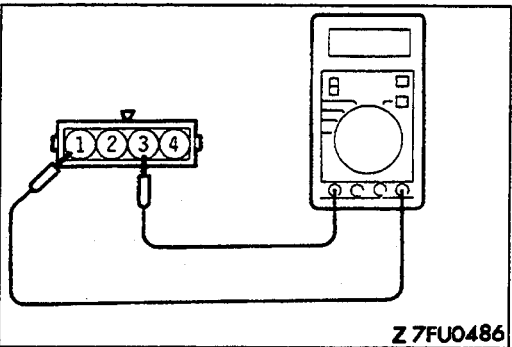
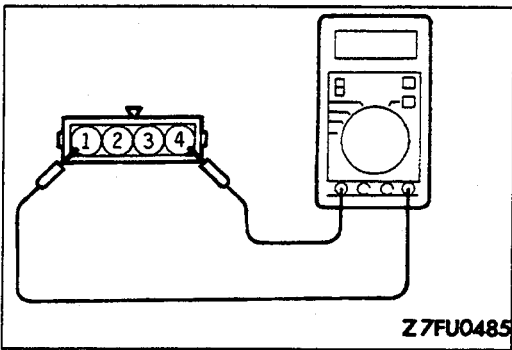
STOP

Replace the engine control module.



SENSOR INSPECTION

(1) Disconnect the throttle position sensor connector.



- (2) Measure the resistance between terminal (1) (sensor ground) and terminal (4) (sensor power).
Standard value: 3.5–6.5 kΩ
- (3) Connect a pointer type ohmmeter between terminal (1) (sensor ground) and terminal (3) (sensor output).
- (4) Open the throttle valve slowly from the idle position to the full open position and check that the resistance changes smoothly in proportion with the throttle valve opening angle.

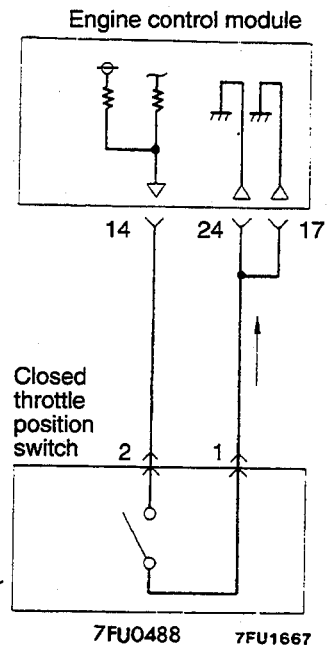
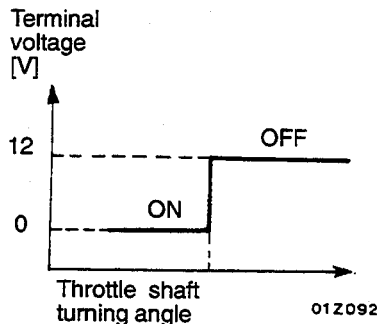
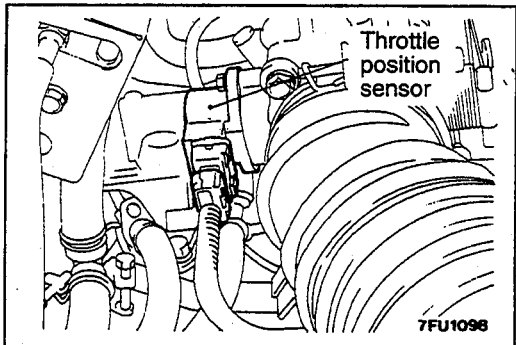
- (5) If the resistance is outside the standard value, or fails to change smoothly, replace the throttle position sensor.

TPS installation torque: 2.0 Nm (1.5 ft.lbs.)

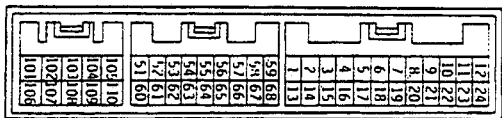
For the closed throttle position switch and throttle position sensor adjustment procedure, refer to P.13A-60.

CLOSED THROTTLE POSITION SWITCH

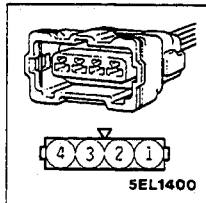
110005792



Engine control module connector



A Harness side connector



A Equipment side connector



OPERATION

- The closed throttle position switch functions to convert (to HIGH/LOW-level voltage) data as to whether the accelerator is depressed or released, and to input that voltage (as signals) to the engine control module. The engine control module, based upon those signals, regulates the idle air control motor.
- Voltage within the engine control module is applied, by way of the resistance, to the closed throttle position switch. When the foot is taken off the accelerator, the closed throttle position switch is switched ON, so the current is grounded. As result, the closed throttle position switch terminal voltage changes from HIGH to LOW level.

TROUBLESHOOTING HINTS

If there is an abnormal condition of the closed throttle position switch output even though the results of the checking of the closed throttle position switch harness and of the component itself indicate a normal condition, the cause is probably one of the following.

- (1) Incorrect adjustment of the accelerator cable or the cruise-control cable.
- (2) Incorrect adjustment of the fixed SAS.

INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Throttle valve	Normal display
Data reading	26	Switch status	Ignition switch: ON (Operate the accelerator several times and check.)	Set to the idling position.	ON
				Open slightly.	OFF

HARNESS INSPECTION

1

A Harness side connector

Engine control module harness side connector

Z6FU1243

Check for an open or short-circuit between the closed throttle position switch and the engine control module.

- Engine control module connector: Disconnected
- Throttle position sensor connector: Disconnected

OK → **2**

✗ → Repair the harness. (A2-14)

2

A Harness side connector

Z7FU0483

Check for continuity in the ground circuit.

- Throttle position sensor connector: Disconnected

OK → **3**

✗ → Repair the harnesses. (A1-17) (A1-24)

3

A Harness side connector

Z7FU0684

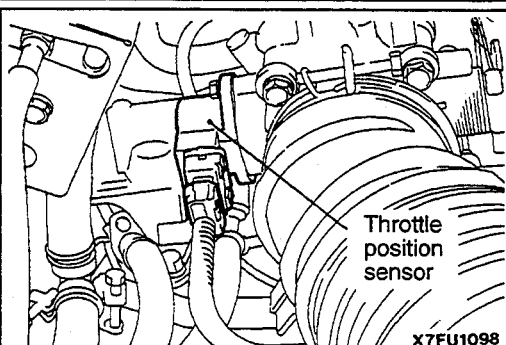
Measure the power supply voltage of the closed throttle position switch.

- Throttle position sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
4 or higher

OK → **STOP**

✗ → Replace the engine control module.



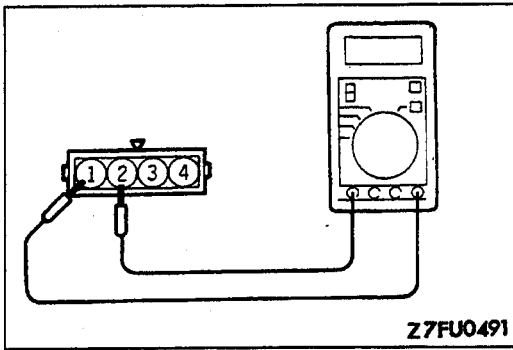
SENSOR INSPECTION

- (1) With the accelerator pedal released, check that the throttle valve lever or the fixed SAS is pushed.

NOTE

If it is not pushed, adjust the fixed SAS. (Refer to P.13A-44.)

- (2) Disconnect the throttle position sensor connector.



- (3) Check for continuity between throttle position sensor connector terminal (1) (sensor ground) and terminal (2) (closed throttle position switch).

Accelerator pedal	Continuity
Depressed	No continuity ($\infty \Omega$)
Released	Continuity (0Ω)

NOTE

If there is no continuity when the accelerator pedal is released, loosen the throttle position sensor installation screw; then, after turning all the way in the clockwise direction, check again.

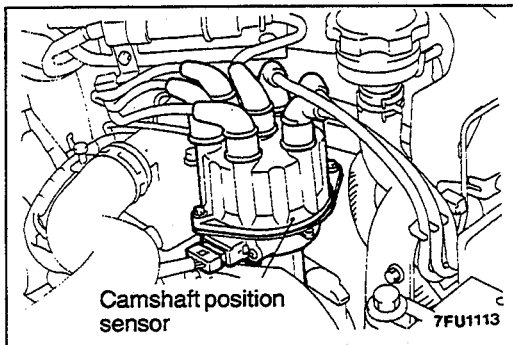
- (4) Replace the throttle position sensor (with built-in closed throttle position switch) if there is a malfunction.

NOTE

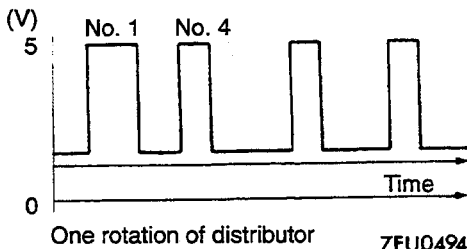
For the closed throttle position switch and throttle position sensor adjustment procedure, refer to P.13A-42.

CAMSHAFT POSITION SENSOR

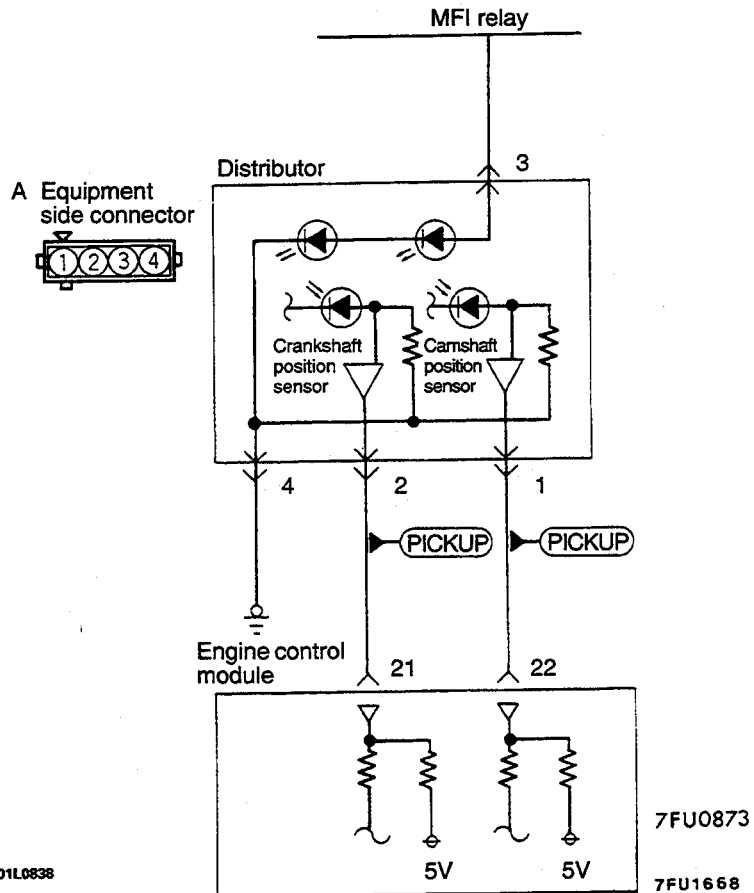
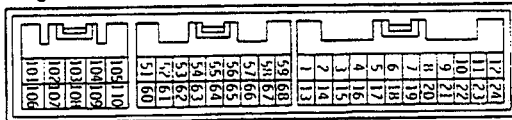
110005793



Output characteristics



Engine control module connector



OPERATION

- The camshaft position sensor functions to detect the top dead center position of the No. 1 cylinder and to convert those data to pulse signals that are input to the engine control mod-

ule. The engine control module, based upon those signals, calculates the sequence of fuel injection.

- The power for the camshaft position sensor is supplied from the MFI relay and is grounded to the vehicle body. The camshaft position sensor,

by intermitting the flow (to ground) of the 5 V voltage applied from the engine control module, produces pulse signals.

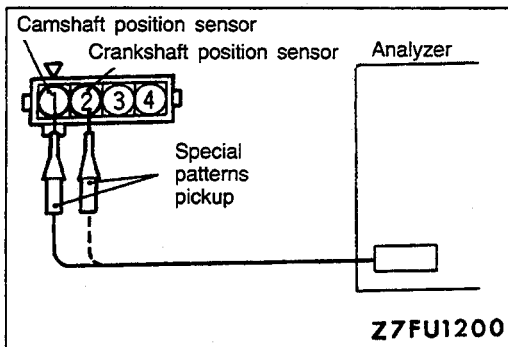
TROUBLESHOOTING HINTS

If there is a malfunction for the camshaft position sensor, the sequential injection will not be correct,

resulting in such problems as engine stalling, unstable idling, and poor acceleration.

INSPECTION

Wave Pattern Inspection Using an Analyzer



Measurement Method

- (1) Disconnect the distributor connector and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
- (2) Connect the analyzer special patterns pickup to terminal (1) of the distributor connector. (When inspecting the camshaft position sensor signal wave pattern.)
- (3) Connect the analyzer special patterns pickup to terminal (2) of the distributor connector. (When inspecting the crankshaft position sensor signal wave pattern.)

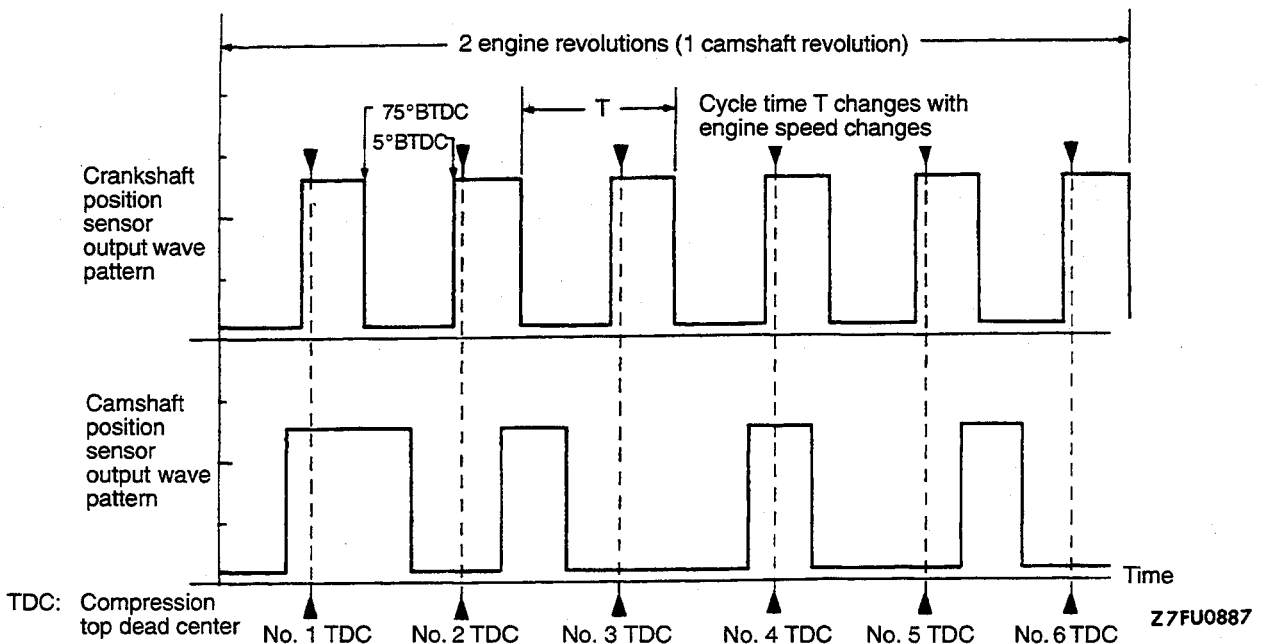
Alternative method (when test harness is not available)

- (1) Connect the analyzer special patterns pickup to ECM terminal (68) for the camshaft position sensor.
- (2) Connect the analyzer special patterns pickup to ECM terminal (69) for the crankshaft position sensor.

Standard wave pattern

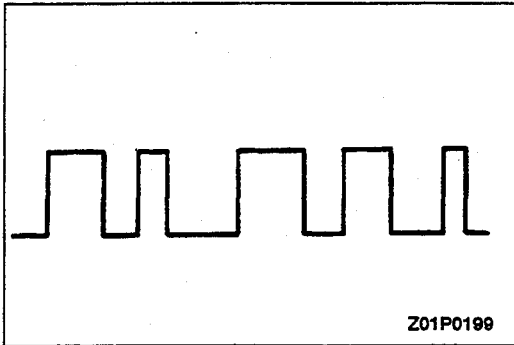
Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine rpm	Idling (700 rpm)



Wave pattern observation points

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



Examples of abnormal wave patterns

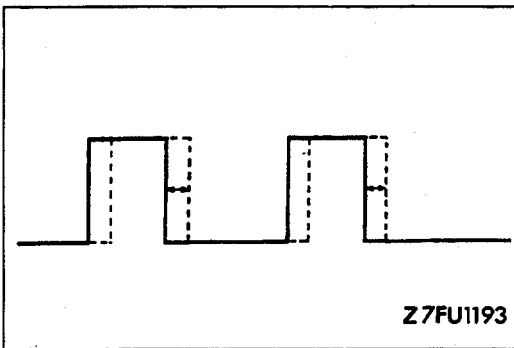
- Example 1

Cause of problem

Malfunction of sensor interface

Wave pattern characteristics

Short 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.

HARNESS INSPECTION

<p>1</p> <p>Harness side connector 4 3 2 1 A</p> <p>B MFI relay harness side connector 5 4 3 2 1 0 9 8 7 6</p> <p>Z7FU1230</p>	<p>Check for continuity between the camshaft position sensor and the MFI relay.</p> <ul style="list-style-type: none"> • MFI relay connector: Disconnected • Distributor connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> • Touch the ohmmeter probes to both ends of the harness. 	<p>OK → 2</p> <p>✗ → Repair the harness. (A3-B5)</p>
-------------------------------------------------------------------------------------------------------------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------

2 A Harness side connector

Z7FU0497

Check for continuity in the ground circuit.

- Distributor connector: Disconnected

OK → **3**

✗ → Repair the harness. (A4-Ground)

3 Engine control module harness side connector

A Harness side connector

Z7FU1271

Check for an open or short-circuit between the camshaft position sensor and the engine control module.

- Engine control module connector: Disconnected
- Distributor connector: Disconnected

OK → **4**

✗ → Repair the harnesses. (A1-22) (A2-21)

4 A Harness side connector

Z7FU0498

Check the output circuit voltage.

- Distributor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

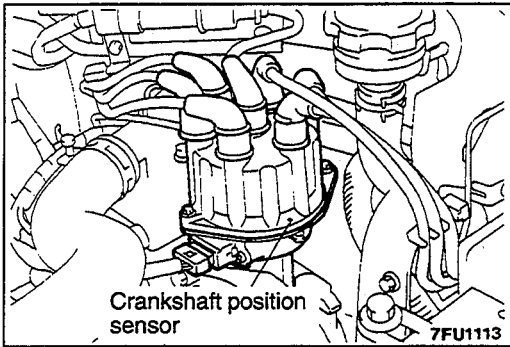
Voltage (V)
4.8-5.2

OK → **STOP**

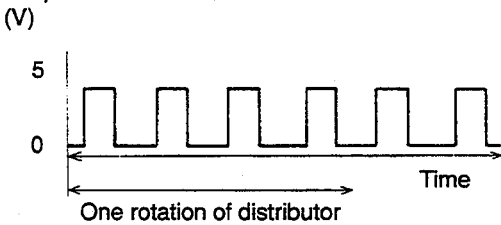
✗ → Replace the engine control module.

CRANKSHAFT POSITION SENSOR

110005794

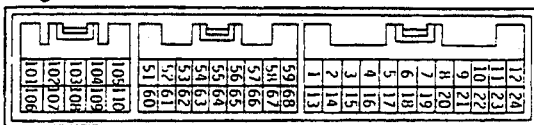


Output characteristics

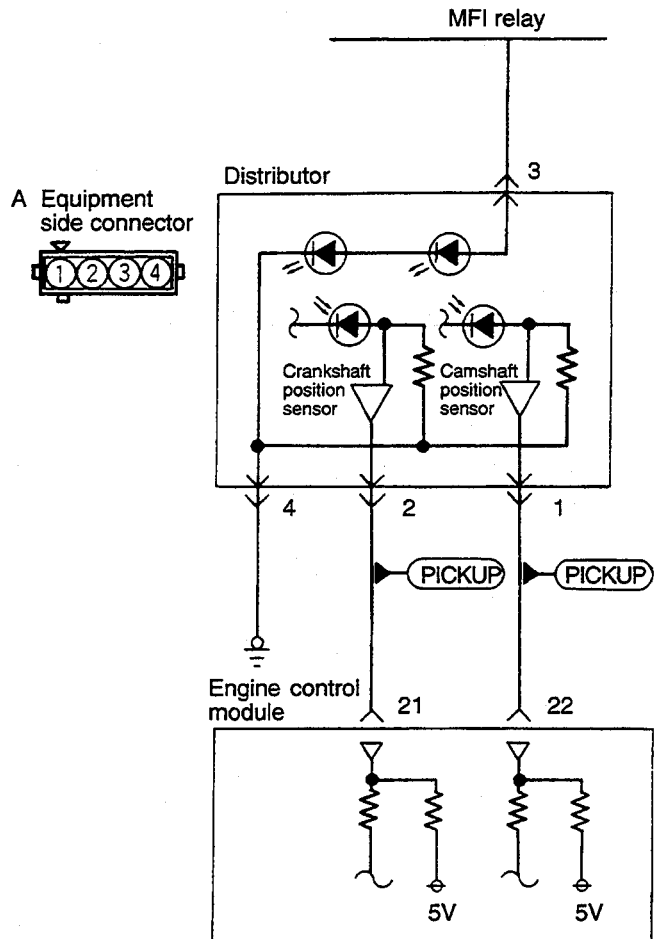


7FU0553

Engine control module connector



01L0838



7FU0873

7FU1669

OPERATION

- The crankshaft position sensor functions to detect the crank angle (position) of each cylinder, and to convert those data to pulse signals, which are then input to the engine control module. The engine control module, based upon those signals, calculates the engine rpm, and also regulates the fuel injection timing and the ignition timing.
- The power for the crankshaft position sensor is supplied from the MFI relay and is grounded to the vehicle body. The crankshaft position sensor, by intermitting the flow (to ground) of the 5 V voltage applied from the engine control module, produces pulse signals.

TROUBLESHOOTING HINTS

Hint 1:
 If an impact is suddenly felt during driving or the engine suddenly stalls during idling, try shaking

the crankshaft position sensor during idling. If the engine stalls, the cause is probably improper or incomplete contact of the crankshaft position sensor's connector.

Hint 2:

If the crankshaft position sensor output rpm is 0 rpm during cranking when the engine cannot be started, the cause is probably a malfunction of the crankshaft position sensor or a broken timing belt.

Hint 3:

If the indicated value of the crankshaft position sensor output rpm is 0 rpm during cranking when the engine cannot be started, the cause is probably a failure of the ignition coil's primary current to intermittently pulse correctly, so a malfunction of the ignition system circuitry, the ignition coil and/or the power transistor is the probable cause.

Hint 4:

If idling is possible even though the crankshaft position sensor indicated rpm is outside the standard value, the cause is usually a malfunction of something other than the crankshaft position sensor.

Examples:

- (1) Malfunction of engine coolant-temperature sensor
- (2) Malfunction of idle air control motor
- (3) Incorrect adjustment of the standard idling speed.

INSPECTION
Using Scan tool

Function	Item No.	Data display	Check conditions	Check description	Normal condition
Data reading	22	Cranking rpm	<ul style="list-style-type: none"> • Engine is being cranked. • Tachometer connected. (The tachometer is used to check the intermittent pulsation of the ignition coil's primary current.) 	Compare the cranking rpm and the rpm indicated by the scan tool.	Both agree.

Function	Item No.	Data display	Check conditions	Engine coolant temperature °C (°F)	Standard value rpm
Data reading	22	Idling rpm	<ul style="list-style-type: none"> • Engine: Idling • Closed throttle position switch: ON 	When -20 (-4)	1,500-1,700
				When 0 (32)	1,250-1,450
				When 20 (68)	1,050-1,250
				When 40 (104)	850-1,050
				When 80 (176)	600-800

Wave Pattern Inspection Using an Analyzer

Refer to the camshaft position sensor section (P.13A-71.)

HARNES INSPECTION

1

Check for continuity between the crankshaft position sensor and the MFI relay.

- MFI relay connector: Disconnected
- Distributor connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

✗ → Repair the harness. (A3-B5)

2

Check for continuity in the ground circuit.

- Distributor connector: Disconnected

OK → **3**

✗ → Repair the harness. (A4-Ground)

3

A Harness side connector

Engine control module harness side connector

Z7FU1271

Check for an open or short-circuit between the crankshaft position sensor and the engine control module.

- Engine control module connector: Disconnected
- Distributor connector: Disconnected

OK → **4**

✗ → Repair the harnesses. (A2-21) (A1-22)

4

A Harness side connector

Z7FU0489

Measure the applied voltage.

- Distributor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

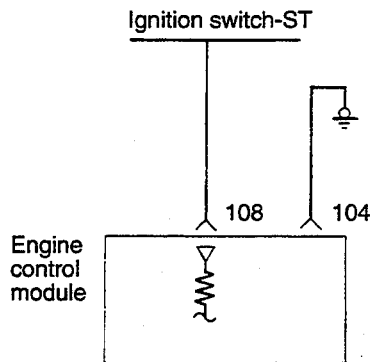
Voltage (V)
4.8-5.2

OK → **STOP**

✗ → Replace the engine control module.

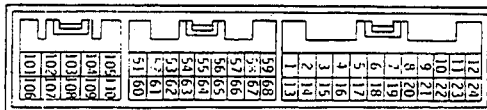
IGNITION SWITCH-ST <M/T>

110005795



1FU0638

Engine control module connector



01L0838

7FU1670

OPERATION

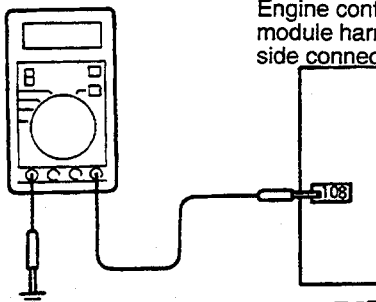
- The ignition switch-ST inputs HIGH signals to the engine control module during engine cranking. The engine control module, based on those signals, regulates fuel injection during starting, etc.
- When the ignition switch is turned to the START position, the battery positive voltage during engine cranking is applied to the engine control module by way of the ignition switch, and the engine control module thus detects the fact that the engine is cranking.

INSPECTION
Using Scan tool

Function	Item No.	Data display	Check conditions	Engine	Normal display
Data reading	18	Switch status	● Ignition switch: ON	Stopped	OFF
				Cranking	ON

HARNES INSPECTION

1



Engine control module harness side connector

Z 6FU1258

Measure the engine control module input voltage.

- Engine control module connector: Disconnected
- Ignition switch: START

Voltage (V)
8 or higher

OK

→ **2**

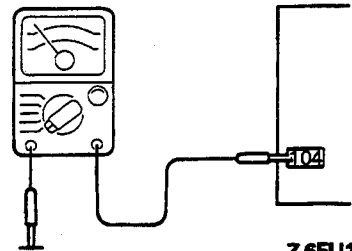
~~**OK**~~

→

2

Repair the harness. (108 – Ignition switch)

2




Engine control module harness side connector

Z 6FU1259

Check for continuity in the ground circuit.

- Engine control module connector: Disconnected

OK

→ 

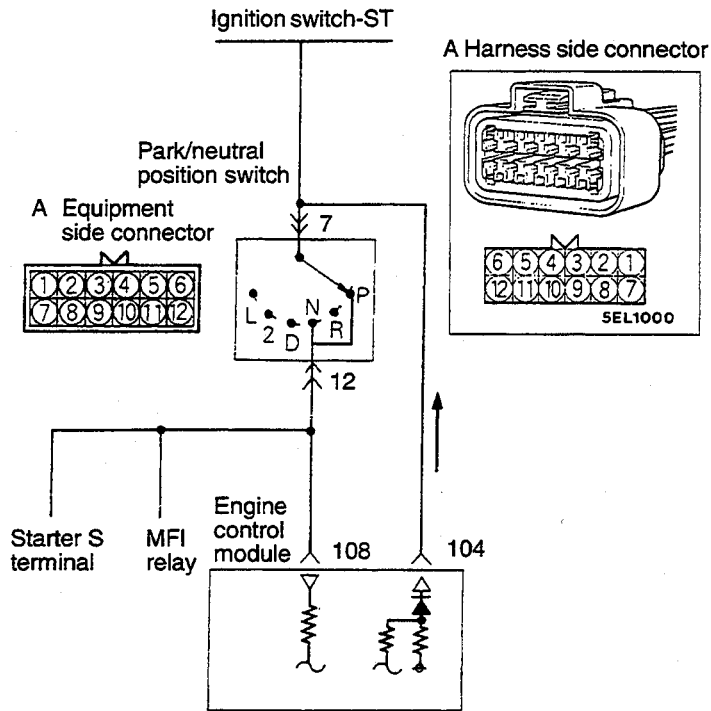
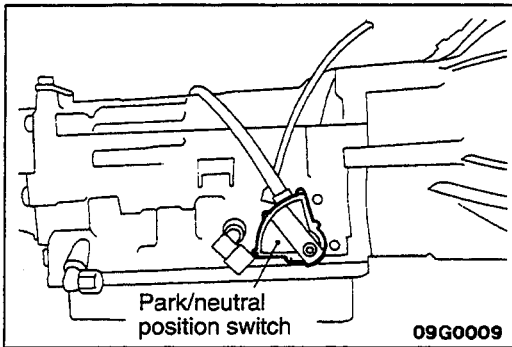
~~**OK**~~

→

Repair the harness (104 – Ground)

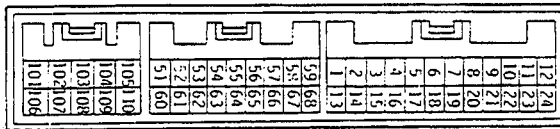
IGNITION SWITCH-ST AND PARK/NEUTRAL POSITION SWITCH <A/T>

110005796



7FU1125

Engine control module connector



01L0838
7FU1671

OPERATION

- The ignition switch-ST inputs HIGH signals to the engine control module during engine cranking. The engine control module regulates fuel injection during starting, etc. based on those signals.
- When the ignition switch is set to START, the battery positive voltage during engine cranking is applied to the engine control module by way of the ignition switch and the park/neutral position switch, and the engine control module thus detects the fact that the engine is cranking. Note that battery positive voltage is not applied to the engine control module if the selector lever is in a position other than P or N.
- The park/neutral position switch functions to convert the voltage to HIGH level or LOW level depending upon whether the selector lever is in the P or N position or is at some position other than P or N, and inputs the result to the engine control module. The engine control module, based upon those signals, then regulates the operation of the idle air control motor.

- Battery positive voltage inside the engine control module is applied via the resistance to the park/neutral position switch. When the selector lever is placed in the P or N position, continuity is created, between the engine control module's park/neutral position switch terminal and the ground via the starter motor, and the terminal voltage becomes low.

TROUBLESHOOTING HINTS

If the output of the park/neutral position switch is abnormal even though the results of the checking of the park/neutral position switch harness and of the component itself are normal, the cause is probably improper adjustment of the control cable.

INSPECTION

Using Scan tool

Ignition switch-ST

Function	Item No.	Data display	Check conditions	Engine	Normal display
Data reading	18	Switch status	● Ignition switch: ON	Stopped	OFF
				Cranking	ON

Inhibitor switch

Function	Item No.	Data display	Check conditions	Selector lever position	Normal display
Data reading	29	Shift position	● Ignition switch: ON	P or N	P or N
				D, 2, L or R	D, 2, L or R

HARNESS INSPECTION

1

Z7FU1126

Measure the power supply voltage of the park/neutral position switch.

- Engine control module connector: Disconnected
- Park/neutral position switch connector: Disconnected
- Ignition switch: START

Voltage (V)
B+

OK → **2**

✗ → Check the power supply circuit.

2

Z7FU1273

Check for continuity between the park/neutral position switch and the engine control module.

- Engine control module connector: Disconnected
- Park/neutral position switch connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **3**

✗ → Repair the harnesses. (A7-104) (A12-108)

3

Z7FU1126

Measure the park/neutral position switch terminal input voltage.

- Engine control module connector: Connected
- Park/neutral position switch connector: Disconnected
- Ignition switch: ON

Voltage (V)
B+

OK → **STOP**

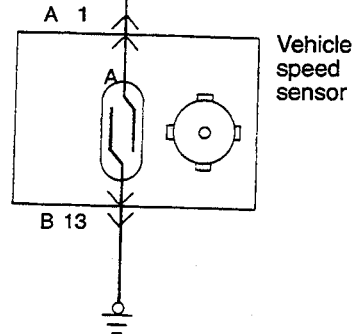
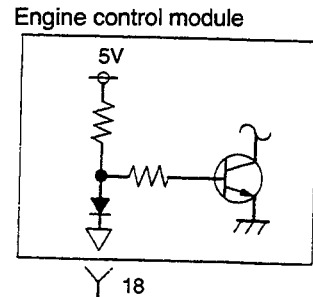
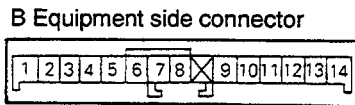
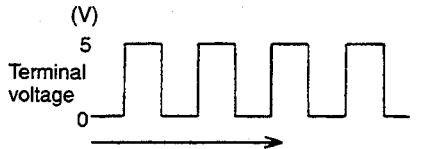
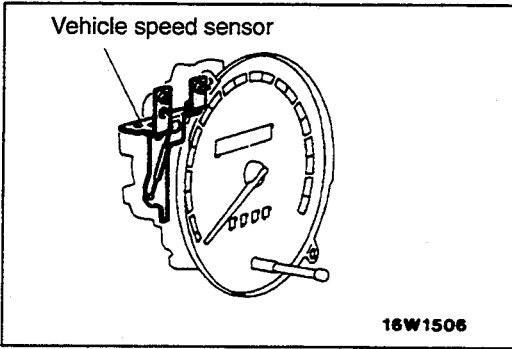
✗ → Replace the engine control module.

PARK/NEUTRAL POSITION SWITCH INSPECTION

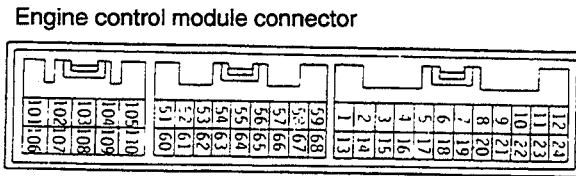
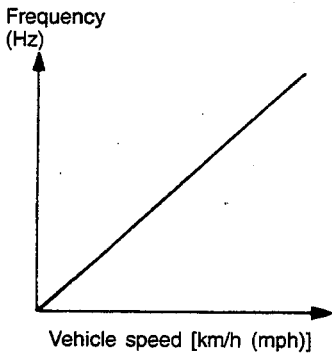
Refer to GROUP 23 – Service Adjustment Procedures.

110005797

VEHICLE SPEED SENSOR



7FU1127



01L0838

7FU1672

OPERATION

- The vehicle speed sensor is incorporated within the speedometer; it converts vehicle speed data to pulse signals and inputs those signals to the engine control module. The engine control module, based upon those signals, regulates the idle air control motor, etc.
- The vehicle speed sensor, by intermitting by the lead switch the flow (to ground) of the approximately 5 V voltage applied from the

engine control module, produces vehicle speed signals.

TROUBLESHOOTING HINTS

If there is damaged or disconnected wiring or a short-circuit in the vehicle speed sensor signal circuit, the engine may stall when the vehicle speed is reduced and the vehicle is stopped.

HARNES INSPECTION

1

Engine control module harness side connector

18

Z01A0508

Check for continuity in the vehicle speed sensor output circuit.

- Engine control module connector: Disconnected
- Move the vehicle.

Continuity

Continuity

No continuity

OK

→

4

✗

→

2

2

A Harness side connector

Engine control module harness side connector

Z7FU1274

Check for an open or short-circuit between the vehicle speed sensor and the engine control module.

- Engine control module connector: Disconnected
- Vehicle speed sensor connector: Disconnected

OK → **3**

OK → Repair the harness. (A1-18)

3

B Harness side connector

Z7FU1129

Check for continuity in the ground circuit.

- Vehicle speed sensor connector: Disconnected

OK → **4**

OK → Repair the harness. (B13-Ground)

4

A Harness side connector

Z7FU1128

Measure the applied voltage.

- Vehicle speed sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
4.5-4.9

OK → **STOP**

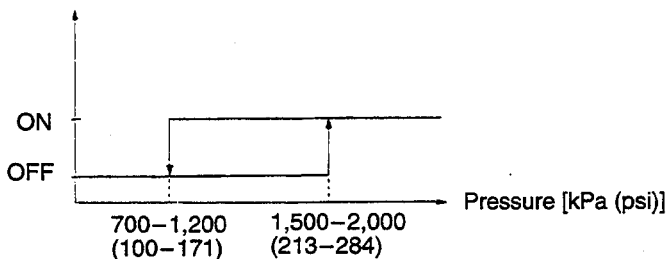
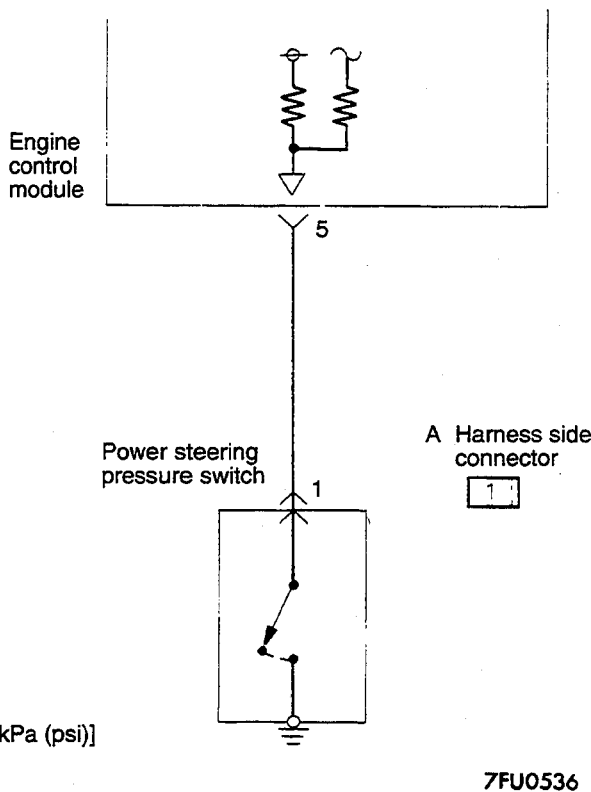
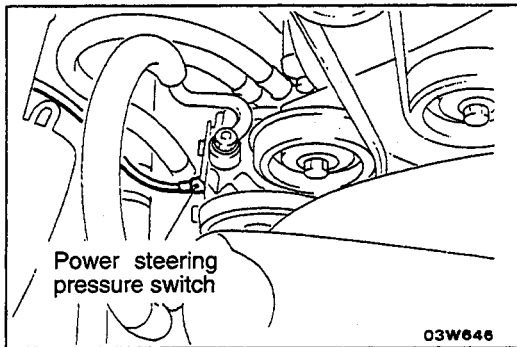
OK → Replace the engine control module.

SENSOR INSPECTION

Refer to GROUP 54 - Meters and Gages.

POWER STEERING PRESSURE SWITCH

110005798



Engine control module connector

101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124
51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74

01L0838

7FU1673

OPERATION

- The power steering pressure switch converts presence/absence of power steering load into low/high voltage and inputs it to the engine control module, which then controls the idle air control motor based on this signal.
- The battery positive voltage in the engine control module is applied through a resistor to the power steering pressure switch. Steering operation causes the power steering fluid pressure to increase, turning the switch on. As a result, continuity is produced between the battery positive terminal and the ground. This causes the power steering fluid pressure terminal voltage to go from high to low.

INSPECTION

Using Scan tool

Function	Item No.	Data display	Check condition	Steering wheel	Normal display
Data reading	27	Switch state	Engine: Idling	Steering wheel neutral position (wheels straight-ahead direction)	OFF
				Steering wheel half turn	ON

Checking Fluid Pressure

Steering wheel	Oil pump delivery pressure (ref. value)
Straight forward	700–1,200 kPa (100–171 psi)
Turned	1,500–2,000 kPa (213–284 psi)

HARNESS INSPECTION

1

Z7FU1235

Check for an open or short-circuit between the power steering pressure switch and the engine control module.

- Power steering pressure switch connector: Disconnected
- Engine control module connector: Disconnected

OK → **2**

✗ → Repair the harness. (A1–5)

2

Z7FU0505

Measure the applied voltage.

- Power steering pressure switch connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
B+

OK → **STOP**

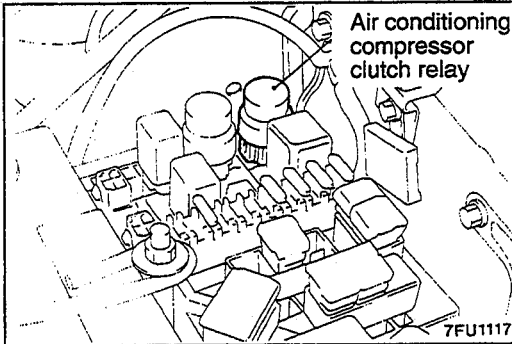
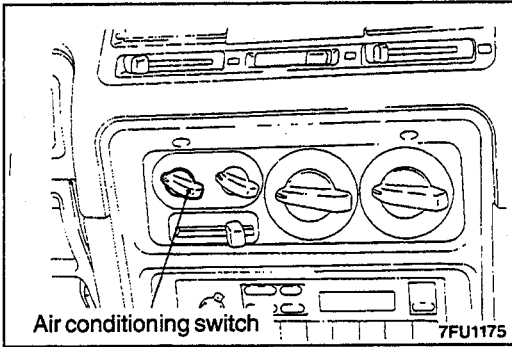
✗ → Replace the engine control module.

SENSOR INSPECTION

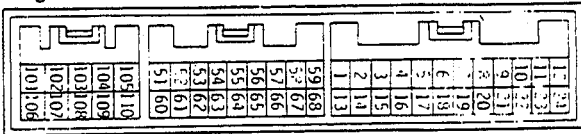
Refer to GROUP 37A – Service Adjustment Procedures.

AIR CONDITIONING SWITCH AND COMPRESSOR CLUTCH RELAY

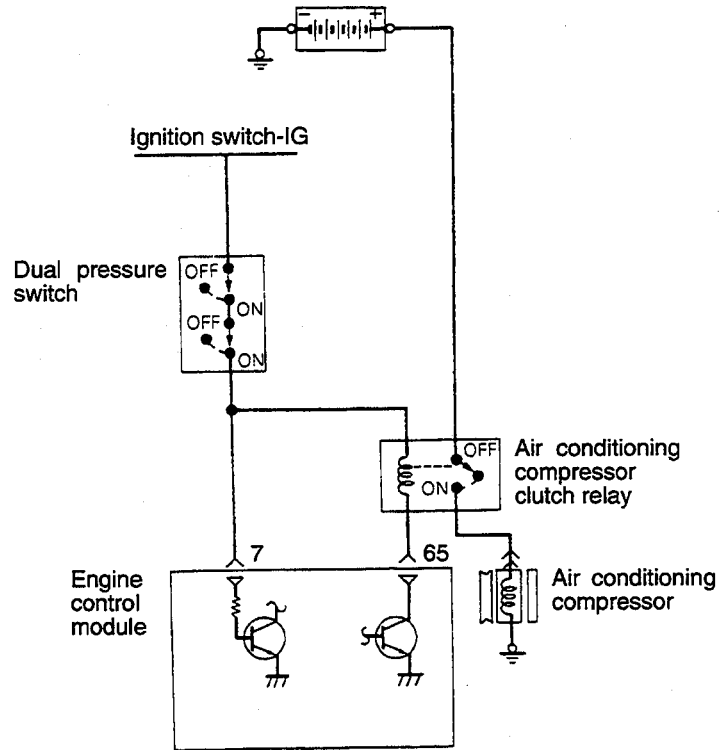
110005799



Engine control module connector



01L0838



7FU0821

7FU1674

OPERATION

- The air conditioning switch applies battery positive voltage to the engine control module when the air conditioning is switched ON.
- When the air conditioning signals are input, the engine control module activates the idle air control motor, and also switches ON the power transistor. As a result, current flows to the compressor clutch relay coil and the relay switch is switched ON; the air conditioning compressor's magnetic clutch is activated.

TROUBLESHOOTING HINTS

If the air conditioning compressor's magnetic clutch is not activated when the air conditioning switch is switched on during idling, the cause is probably a malfunction of the air conditioning control system.

INSPECTION

Using Scan tool

Air conditioning switch

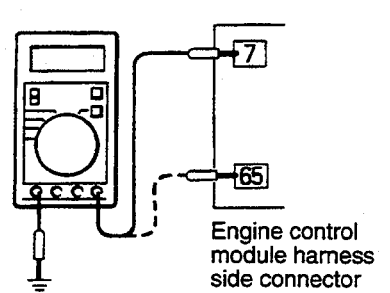
Function	Item No.	Data display	Check conditions	Air conditioning switch	Normal display
Data reading	28	Switch status	<ul style="list-style-type: none"> Engine idling (The air conditioning compressor should be activated when the air conditioning switch is switched on.) 	OFF	OFF
				ON	ON

Air conditioning compressor clutch relay

Function	Item No.	Data display	Check conditions	Air conditioning switch	Normal display
Data reading	49	Air conditioning compressor clutch relay status	Engine: Idling after having warmed up	OFF	OFF (Compressor clutch not activated)
				ON	ON (Compressor clutch not activated)

HARNESS INSPECTION

1




Engine control module harness side connector
Z01R0863


Measure the power supply voltage of the air conditioning circuit.


- Engine control module connector: Disconnect
- Ignition switch: ON
- Air conditioning switch: ON

Voltage (V)
6 or higher



→





→

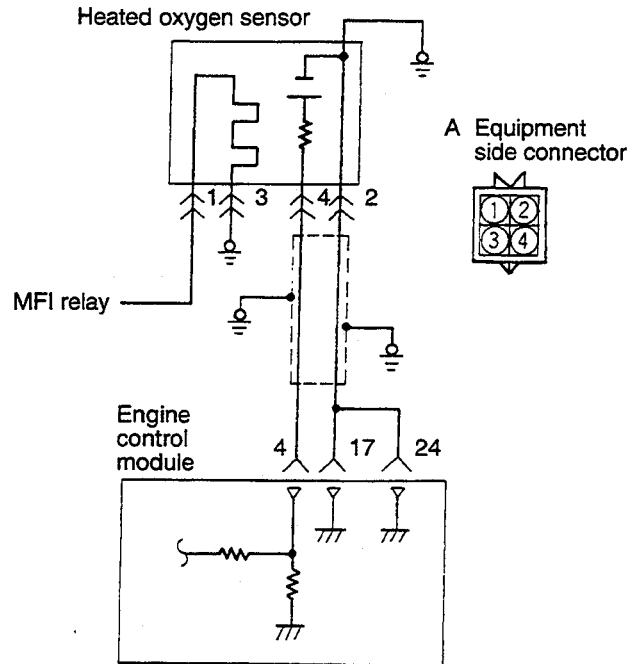
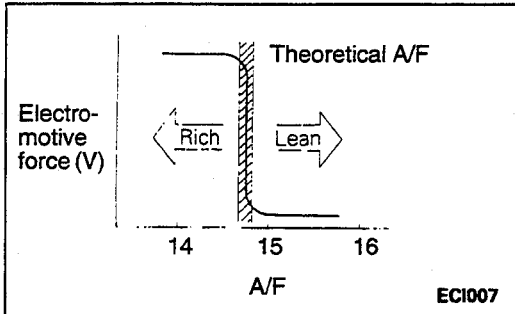
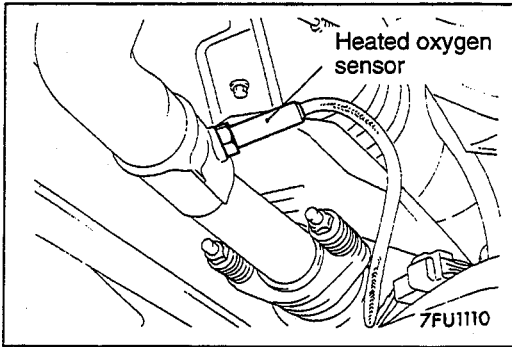
Check the air conditioning circuit.

AIR CONDITIONING INSPECTION

Refer to GROUP 55 – Service Adjustment Procedures.

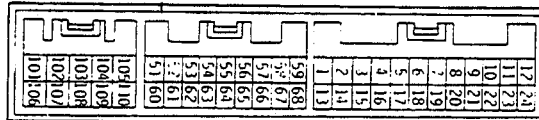
HEATED OXYGEN SENSOR

110005800



7FU1130

Engine control module connector



01L0838

7FU1675

OPERATION

- The heated oxygen sensor functions to detect the concentration of oxygen in the exhaust gas; it converts those data to voltage, and inputs the resulting signals to the engine control module.
- If the air/fuel mixture ratio is richer than the theoretical air/fuel mixture ratio (i.e., if the concentration of oxygen in the exhaust gas is low), a voltage of approximately 1 V is output; if the air/fuel mixture ratio is leaner than the theoretical air/fuel mixture ratio (i.e., if the concentration is dense), a voltage of approximately 0 V is output.
- The engine control module, based upon those signals, regulates the amount of fuel injection so that the air/fuel mixture ratio becomes the theoretical air/fuel mixture ratio.
- Battery positive voltage is supplied, by way of the MFI relay, to the heated oxygen sensor heater. As a result, the sensor element is heated by the heater, so that the heated oxygen sensor shows excellent response even if the temperature of the exhaust gas is low.

TROUBLESHOOTING HINTS

Hint 1:
The exhaust gas purification performance will worsen if there is a malfunction of the heated oxygen sensor.

Hint 2:
If the heated oxygen sensor output voltage is outside the standard value even though the results of the checking of the heated oxygen sensor are normal, the cause is probably a malfunction of a component related to mixture control.

[Examples]

- (1) Malfunction of injector
- (2) Air is drawn into the intake manifold from a leaking gasket, etc.
- (3) Malfunction of volume air flow sensor, intake air temperature sensor, barometric pressure sensor or engine coolant temperature sensor

INSPECTION

Using Scan tool

Function	Item No.	Data display	Check conditions	Engine condition rpm	Standard value mV
Data reading	11	Sensor detection voltage	<ul style="list-style-type: none"> Engine: Warm up (Make the mixture lean by engine speed reduction, and rich by racing.) 	When sudden deceleration from 4,000	200 or lower
				When engine is suddenly raced	600–1,000
			<ul style="list-style-type: none"> Engine: Warm up using the heated oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the engine control module 	Idling (700 rpm) 2,000	Changes repeatedly between 400 mV or lower and 600–1,000 mV

HARNESS INSPECTION

1

B MFI relay harness side connector

A Harness side connector

Z7FU1275

Check for continuity between the heated oxygen sensor and the MFI relay.

- MFI relay connector: Disconnected
- Heated oxygen sensor connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

✗ → Repair the harness. (A1–B5)

2

A Harness side connector

Engine control module harness side connector

Z7FU1132

Check for an open circuit or a short-circuit to ground between the heated oxygen sensor and the engine control module.

- Heated oxygen sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → **3**

✗ → Repair the harness. (A4–4)

3

A Harness side connector

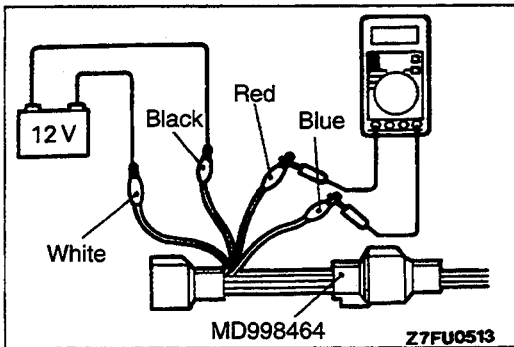
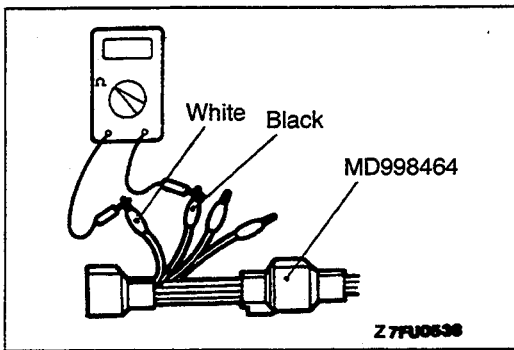
Z7FU1133

Check for continuity in the ground circuit.

- Heated oxygen sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → **STOP**

✗ → Repair the harnesses. (A2–17) (A2–24) (A3 – Ground)



SENSOR INSPECTION

- (1) Disconnect the connector to the heated oxygen sensor, then use the special tool (test harness) to make connections with the connection on the heated oxygen sensor side.
- (2) Check that there is continuity between terminal (1) (black clip of the special tool) and terminal (3) (white clip) of the heated oxygen sensor connector [approx. 20Ω at a temperature of 20°C (68°F)].
- (3) If there is no continuity, replace the heated oxygen sensor.
- (4) Warm up the engine until the coolant temperature is 80°C (176°F) or higher.
- (5) Using jumper wires, connect terminal (1) (black clip of the special tool) and terminal (3) (white clip) of the heated oxygen sensor with the positive battery terminal and negative battery terminal respectively.

CAUTION

When connecting the jumper wires, be careful not to connect them to the wrong terminals, since this could damage the heated oxygen sensor.

- (6) Connect a digital voltmeter to terminal (2) (red clip of the special tool) and terminal (4) (blue clip).
- (7) While repeatedly racing the engine, measure the heated oxygen sensor's output voltage.

Engine	Heated Oxygen Sensor Output Voltage	Remarks
During racing	0.6–1.0 V	If the air-fuel ratio becomes rich while repeatedly racing the engine, the output of the heated oxygen sensor will be 0.6–1.0 V if it is normal.

- (8) If the measurements are not as specified, the cause is probably a malfunction of the heated oxygen sensor.

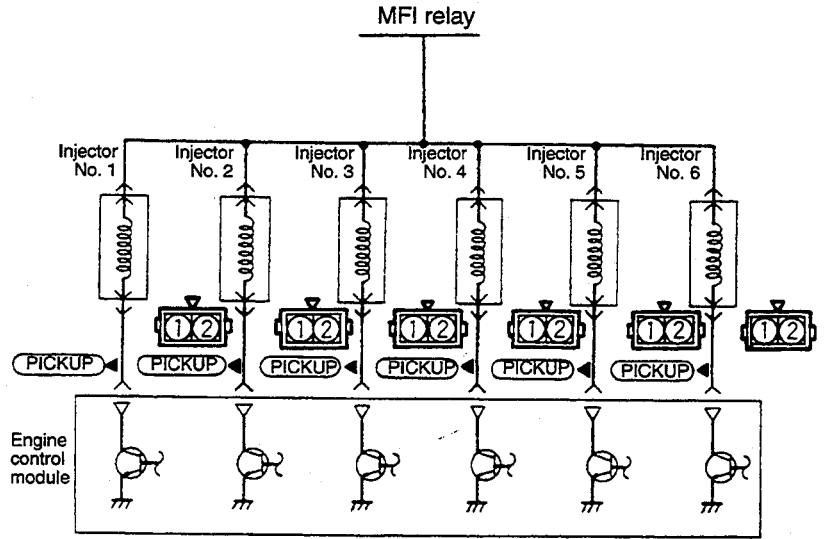
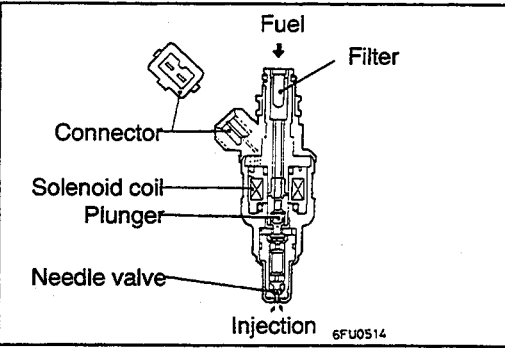
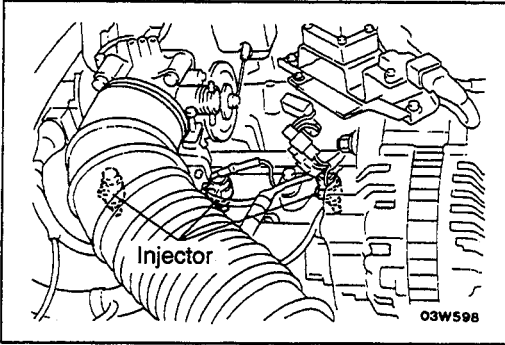
INSTALLATION

- (1) For removal and installation of the heated oxygen sensor, refer to GROUP 15 – Exhaust Manifold.
- (2) Tighten the heated oxygen sensor to specified torque.

Specified torque: 45 Nm (33 ft.lbs.)

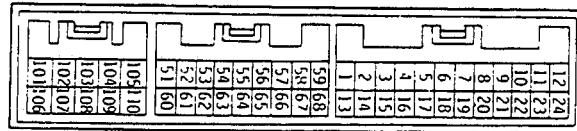
110005801

INJECTORS



7FU0692

Engine control module connector



01L0838

7FU1676

OPERATION

- The injector is an injection nozzle with a solenoid which injects fuel according to the injection signal coming from the engine control module.
- The injector has a fixed nozzle opening area and the fuel pressure against manifold inside pressure is regulated to a fixed level. Therefore, the volume of fuel injected by the injector is determined by the time during which the needle valve is open, namely, by the time during which the solenoid coil is energized.
- The battery positive voltage is applied through the MFI relay to this injector. When the engine control module turns on the power transistor in the unit, the solenoid coil is energized to open the injector valve, which then injects fuel.

TROUBLESHOOTING HINTS

Hint 1:
 If there is a problem with starting while the engine is warm, perform the combustion test and check for leakage of the injectors.

Hint 2:
 If the engine can't be started and the injectors are not activated during cranking, the cause is probably a malfunction such as described below, not a problem with the injectors.

- (1) Malfunction of power supply circuit or ground circuit of engine control module
- (2) Malfunction of MFI relay
- (3) Malfunction of crankshaft position sensor and/or camshaft position sensor

Hint 3:
 If there is a cylinder for which the idling condition does not change when, during idling, the fuel injection

of the injectors is cut off in sequence, check that cylinder as described below.

- (1) Check the injector and harness.
- (2) Check the spark plugs and the high-tension cable.
- (3) Check the compression pressure.

Hint 4:
 If the injector activation time is outside the standard value even though the results of the checking of the injector's harness and of the injector itself are normal, the cause is probably one of the following.

- (1) Incomplete combustion inside a cylinder (Malfunction of spark plugs, ignition coil, compression pressure, etc.)
- (2) Increased engine resistance

INSPECTION

Using Scan tool

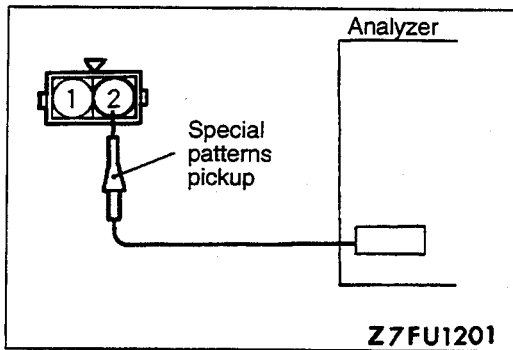
Function	Item No.	Data display	Check conditions	Engine coolant temperature °C (°F)	Standard value ms
Data reading	41	Activation time*1	Engine cranking	When 0 (32)*2	Approx. 12.6–15.4
				When 20 (68)	Approx. 36–44
				When 80 (176)	Approx. 8.1–9.9

Function	Item No.	Data display	Check conditions	Engine condition rpm	Standard value ms
Data reading	41	Activation time*3	<ul style="list-style-type: none"> ● Engine coolant temp: 85–95°C (185–203°F) ● Lights and all accessories: OFF ● Transmission: neutral (P range for vehicles with A/T) ● Steering wheel: neutral position 	Idling (700 rpm)	2.4–3.6
				2,000	2.3–3.5
				When raced suddenly	Increases.

NOTE

- *1: Indicates the injector-activation time when the power source voltage is 11 V and the cranking speed is 250 rpm or less.
- *2: At a coolant temperature of 0°C (32°F), there is synchronous injection for all six cylinders.
- *3: For a new vehicle [driven approximately 500 km (300 miles) or less] the injector-activation may be about ten percent longer than indicated above.

Function	Item No.	Drive content	Check condition	Normal condition
Actuator test	01	No. 1 injector shut off	Engine: Idling after having warmed up (Shut off the injectors in sequence after engine has warmed up and check the idling condition)	Changing from the idling condition (becoming less stable or stalling)
	02	No. 2 injector shut off		
	03	No. 3 injector shut off		
	04	No. 4 injector shut off		
	05	No. 5 injector shut off		
	06	No. 6 injector shut off		



Wave Pattern Inspection Using an Analyzer

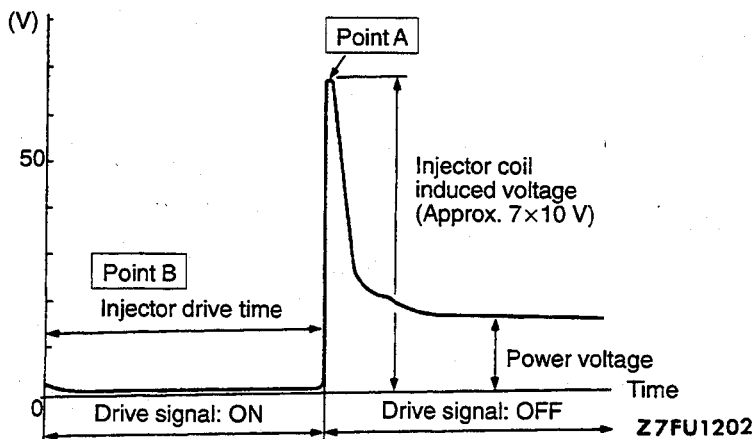
- (1) Disconnect the injector connector, and connect the special tool (test harness: MB991348) in between. (The power side and the engine control module side terminals should both be connected.)
- (2) Connect the analyzer special patterns pickup to the engine control module test harness clip.

Alternative method (when test harness is not available)

Connect the analyzer special patterns pickup to ECM terminals (51), (52), (60), (61), (105) and (109).

**Standard wave pattern
Observation conditions**

Function	Special patterns
Pattern height	Variable
Variable knob Pattern selector	Display
Engine rpm	Idling (700 rpm)

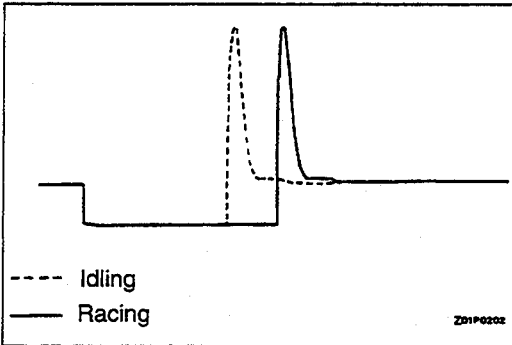


Wave pattern observation points

Point A: Height of injector coil induced voltage

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

Point B: Injector drive time



- The injector drive timing will be synchronized with the scan tool 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.

HARNES INSPECTION

1

G MFI relay harness side connector

Harness side connector

Z7FU1241

Check for continuity between the injectors and the MFI relay.

- Injector connector: Disconnected
- MFI relay connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

✗ → Repair the harnesses. (ABCDEF 1-5)

2

Harness side connector

Engine control module harness side connector

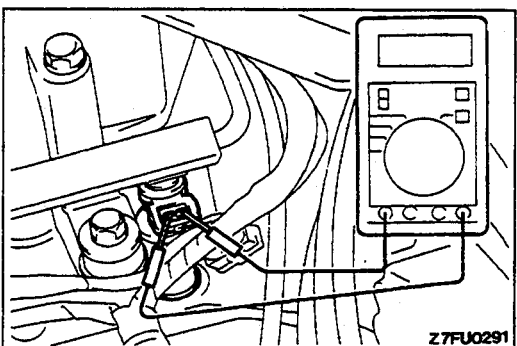
Z7FU0693

Check for an open circuit or a short-circuit to ground between the injector and the engine control module.

- Engine control module connector: Disconnected
- Injector connector: Disconnected

OK → **STOP**

✗ → Repair the harnesses. (ABCDEF 2-51, 52, 60, 61, 105, 109)



ACTUATOR INSPECTION

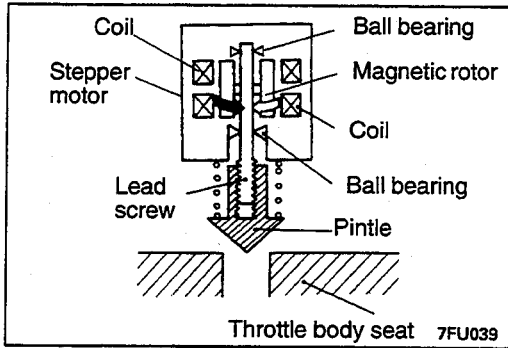
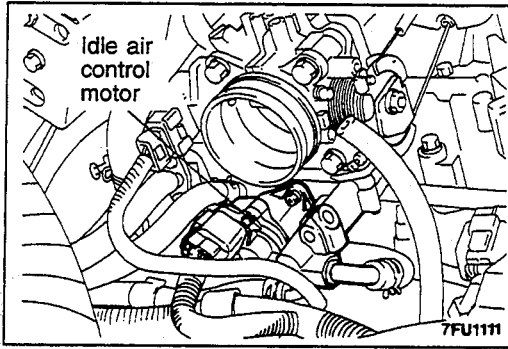
Measuring Resistance Between Terminals

- (1) Disconnect the connector for the injectors.
- (2) Measure the resistance between the terminals.

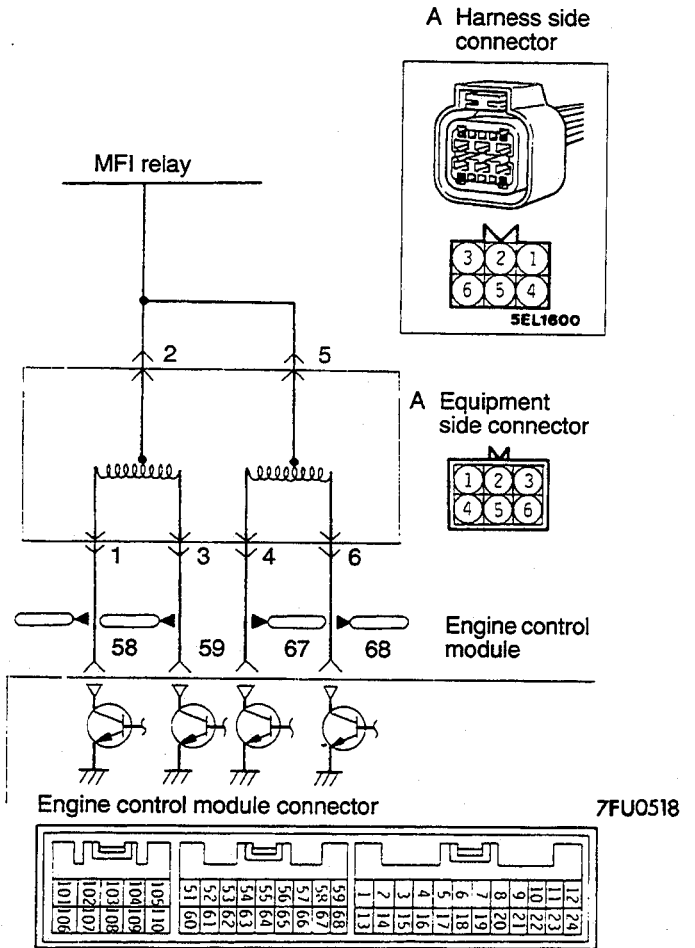
Standard value: 13-16 Ω at 20°C (60°F)

- (3) Connect the connector for the injectors.

IDLE AIR CONTROL MOTOR (STEPPER MOTOR)



Idle air control motor



OPERATION

- The amount of air taken in during idling is regulated by the opening and closing of the servo valve located in the air passage that bypasses the throttle valve.
- The servo valve is opened or closed by the activation of the stepper motor (incorporated within the idle air control motor in the forward or reverse direction.
- Battery positive voltage is supplied, by way of the MFI relay, to the coil of the stepper motor. The engine control module switches ON the power transistors (located within the engine control module) in sequential order, and, when current flows to the stepper motor coil, the stepper motor is activated in the forward or reverse direction.

TROUBLESHOOTING HINTS

Hint 1:
If the number of stepper motor steps increases to 100–120 steps or decreases to 0 step, the cause is probably a malfunction of the stepper motor or damaged or disconnected wiring of the harness.

Hint 2:
If the number of stepper motor steps is outside the standard value even through the results of the checking of the harness of the idle air control motor and of the component itself indicate no abnormal condition, the cause is probably one of the following.

- (1) Incorrect adjustment of the standard idling speed.
- (2) Deposits adhering to the throttle valve.
- (3) Air drawn into the intake manifold from a leaking gasket, etc.
- (4) Incomplete combustion inside a cylinder (Malfunction of spark plugs, ignition coil, injectors, compression pressure, etc.)

INSPECTION

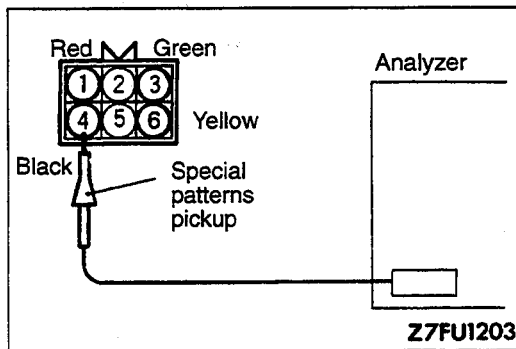
Using the Scan Tool

Function	Item No.	Data display	Check conditions	Load conditions	Standard value STEP
Data reading	45	Stepper motor steps	<ul style="list-style-type: none"> ● Engine coolant temperature: 85–95°C (185–203°F) ● Lights and all accessories: OFF ● Transmission: neutral (P range for vehicles with A/T) ● Steering wheel; neutral position ● Closed throttle position switch: On (The compressor clutch should be activated when the air conditioning switch is switched on.) ● Engine: Idling 	● Air conditioning switch: OFF	2–25
				● Air conditioning switch: OFF → ON	Increase by 10–70
				<ul style="list-style-type: none"> ● Air conditioning switch: OFF ● Selector lever: N → D position 	Increase by 5–50

NOTE
When the vehicle is new [driven approximately 500 km (300 miles) or less] the number of steps may be about 30 steps greater than the standard value indicated above.

Caution

When the select lever is shifted to the D position, the brakes must be used to prevent the vehicle from moving forward.



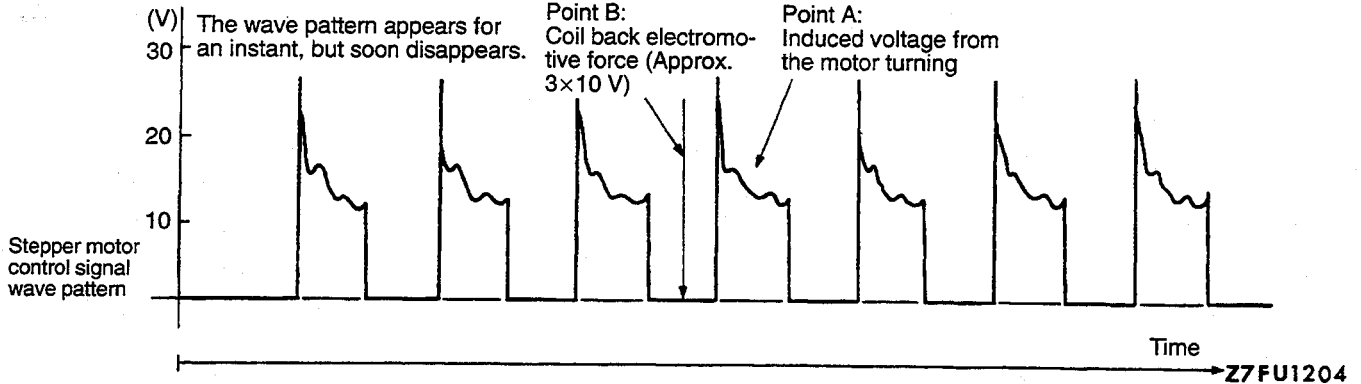
Wave Pattern Inspection Using an Analyzer
Observation method

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

Alternative method (when test harness is not available)
Connect the analyzer special patterns pickup to ECM terminals (58), (59), (67) and (68).

**Standard wave pattern
Observation conditions**

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



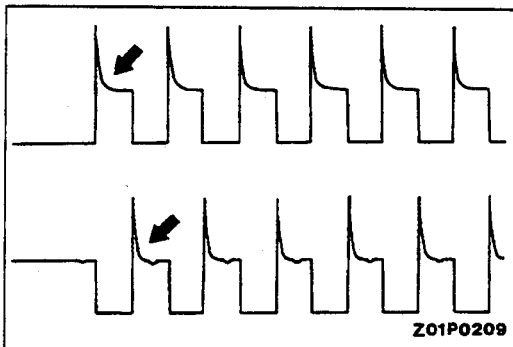
Wave pattern observation points

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

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

Point B: Height of coil back electromotive force

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



Abnormal wave pattern

Cause of problem

Malfunction of motor (Motor is not operating)

Wave pattern characteristics

Induced voltage from the motor turning does not appear.

HARNES INSPECTION

1

A Harness side connector

B MFI relay harness side connector

Z7FU1243

Check for continuity between the idle air control motor and the MFI relay.

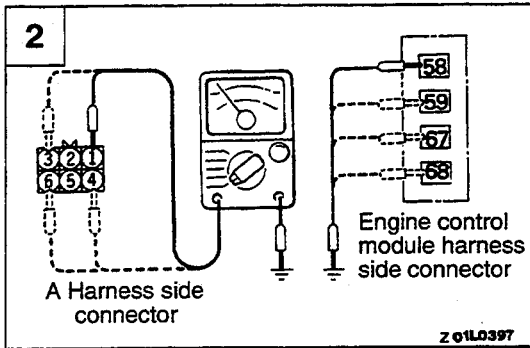
- Idle air control motor connector: Disconnected
- MFI relay connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

OK → Repair the harnesses. (A2-B5) (A5-B5)

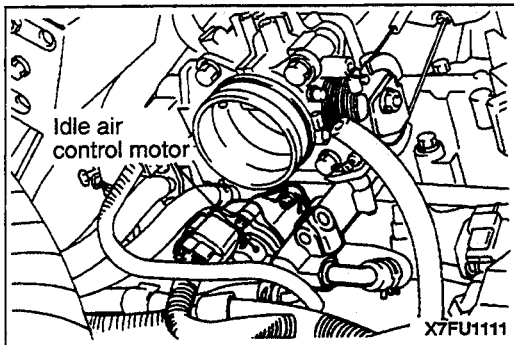


Check for an open circuit or a short-circuit to ground between the idle air control motor and the engine control module.

- Engine control module connector: Disconnected
- Idle air control motor connector: Disconnected



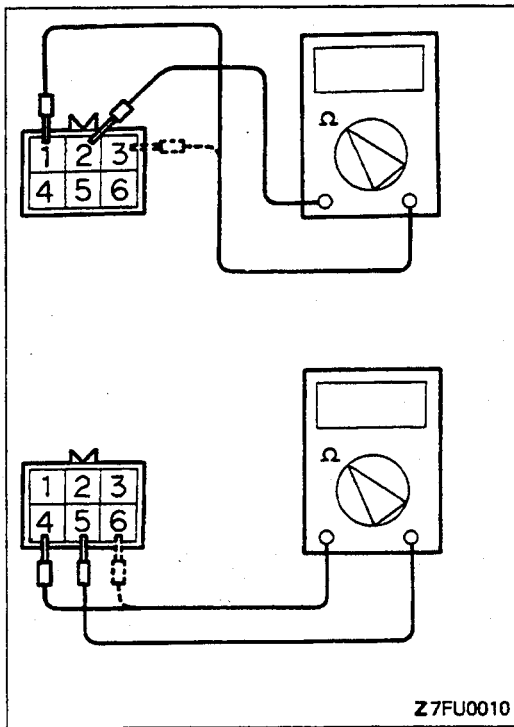
Repair then harnesses. (A1-58), (A3-59), (A4-67), (A6-68)



ACTUATOR INSPECTION

Checking Operation Sound

- (1) Check that the operating sound of the stepper motor can be heard over the idle air control motor when the ignition switch is turned to the ON position (without starting the engine).
- (2) If no operating sound can be heard, check the stepper motor drive circuit. (If the circuit is good, a defective stepper motor or engine control module is suspected.)



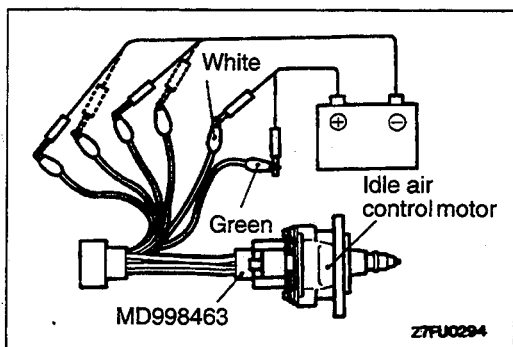
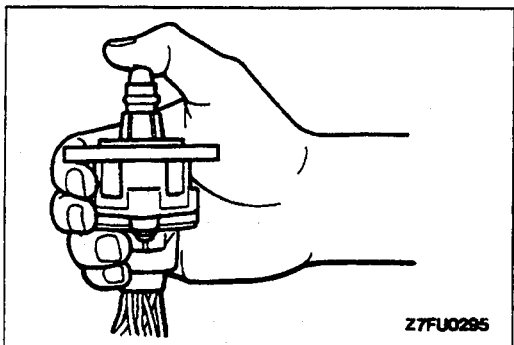
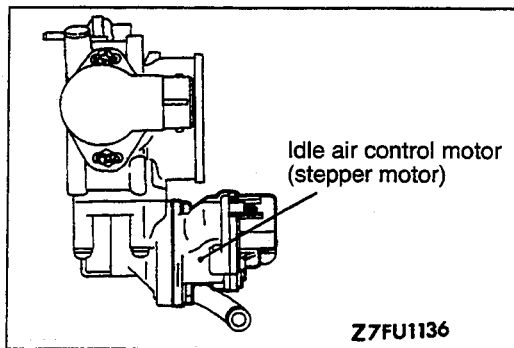
Checking Coil Resistance

- (1) Disconnect the idle air control motor connector and connect the special tool (test harness).
- (2) Measure the resistance between terminal (2) (White clip of the special tool) of the connector at the idle air control motor side and terminal (1) (red clip) or terminal (3) (blue clip).

Standard value: 28-33 Ω [at 20°C (68°F)]

- (3) Measure the resistance between terminal (5) (green clip of the special tool) of the connector at the idle air control motor side and terminal (6) (yellow clip) or terminal (4) (black clip).

Standard value: 28-33 Ω [at 20°C (68°F)]

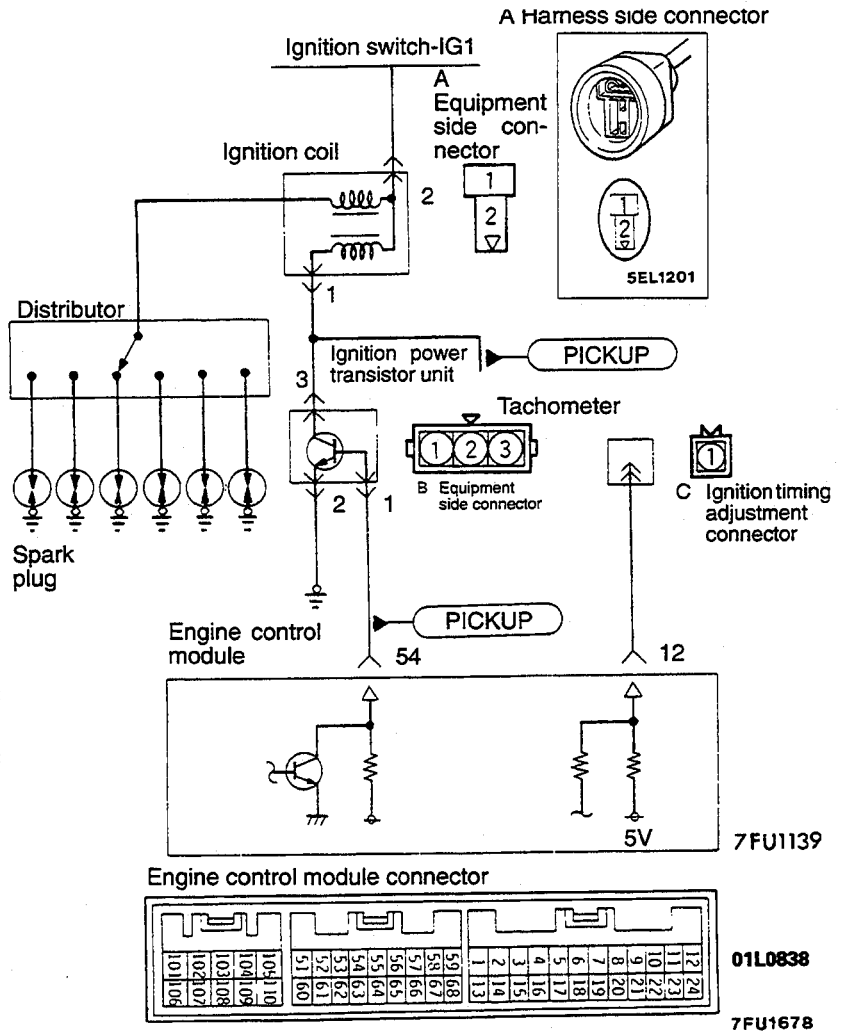
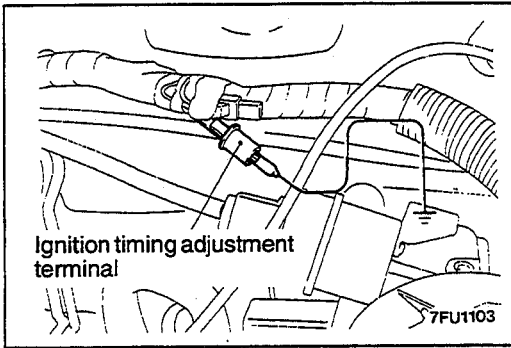
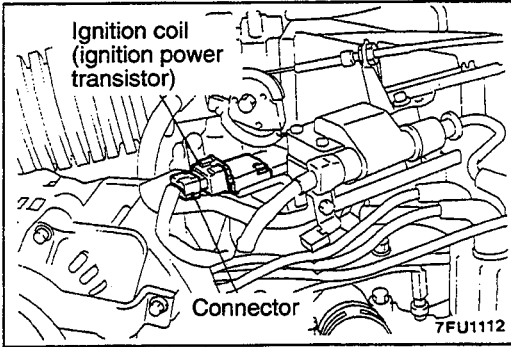


Checking the operation

- (1) Remove the throttle body.
- (2) Remove the stepper motor.

- (3) Connect the special tool (test harness) to the idle air control motor connector.
- (4) Connect the positive terminal of a power source (approx 6 V) to the white clip or the green clip.
- (5) While holding the idle air control motor as shown in the illustration, connect the negative power source terminal to each clip in the sequence described below, and check whether or not there is vibration (a feeling of very slight shaking of the stepper motor) as a result of activation of the stepper motor.
 - 1 Connect the negative power source terminal to the red and black clips.
 - 2 Connect the negative power source terminal to the blue and black clips.
 - 3 Connect the negative power source terminal to the blue and yellow clips.
 - 4 Connect the negative power source terminal to the red and yellow clips.
 - 5 Connect the negative power source terminal to the red and black clips.
 - 6 Repeat the test in the reverse (5–1) sequence.
- (6) If vibration is felt as a result of this test,, the stepper motor can be considered to be normal.

IGNITION COIL AND IGNITION POWER TRANSISTOR



OPERATION

- When the ignition power transistor unit is switched on by the signals from the engine control module, the primary current of the ignition coil will flow. When the ignition power transistor unit is switched off, the primary current flow is interrupted, and high voltage is produced at the secondary coil.
- When the engine control module switches off the transistor within the unit, the battery positive voltage within the unit is applied to the ignition power transistor unit, and the ignition power transistor unit is switched on. In addition, the ignition power transistor unit is switched off when the engine control module switches on the transistor within the unit.

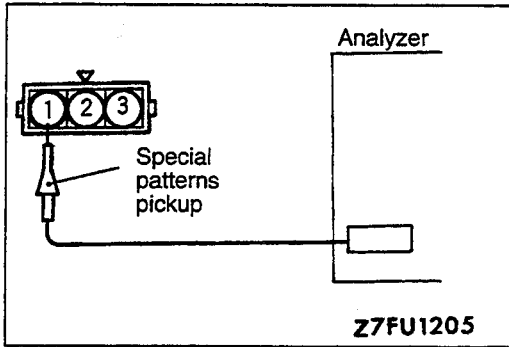
INSPECTION

Using Scan tool
Spark advance value

Function	Item No.	Data display	Check conditions	Engine state rpm	Standard value °BTDC
Data reading	44	Spark advance	<ul style="list-style-type: none"> • Engine: Warmed up • Timing light: set (The timing light is set so as to check the actual ignition timing.) 	Idling (700 rpm)	7-23
				2,000	18-38

Ignition timing adjustment mode

Function	Item No.	Data display	Inspection condition	Engine condition	Normal display
Data list	36	Continuity at the ground connection of the ignition timing adjustment terminal	Engine: Idling	Ground the ignition timing adjustment terminal.	ON
				Disconnect the ground from the ignition timing adjustment terminal.	OFF



Wave Pattern Inspection Using an Analyzer

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

<Measurement method>

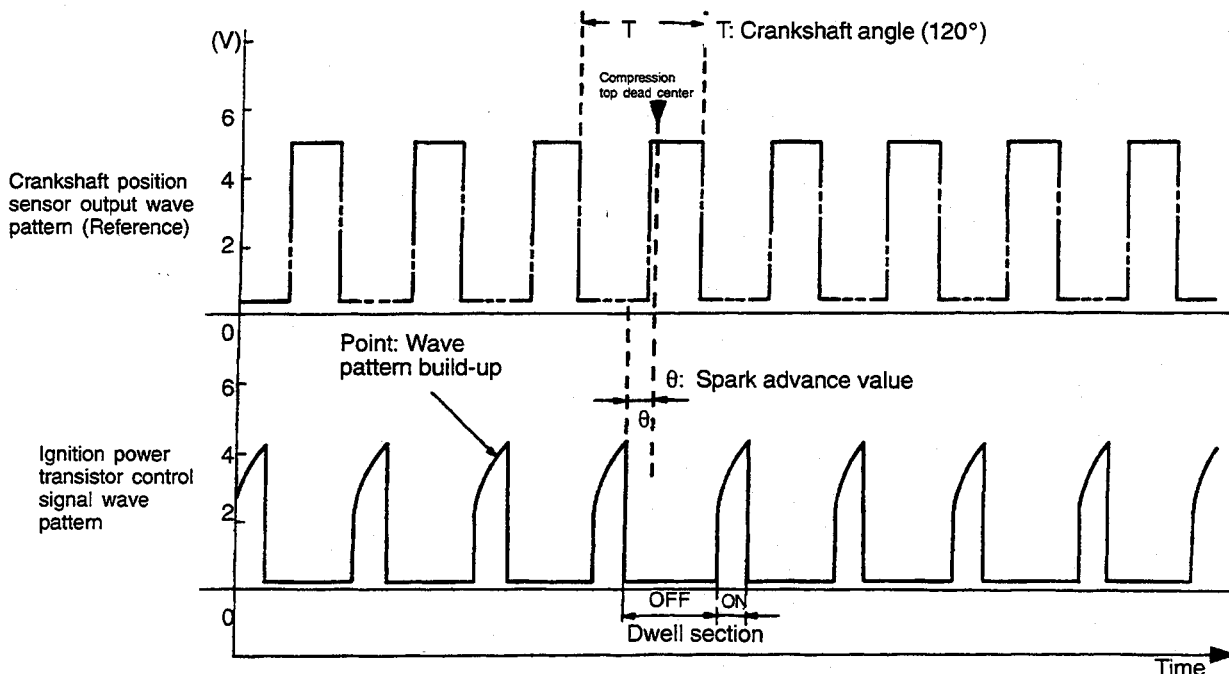
- (1) Disconnect the ignition power transistor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
- (2) Connect the analyzer special patterns pickup to the ignition power transistor connector terminal (1).

Alternative method (when test harness is not available)

Connect the analyzer special patterns pickup to ECM terminal (54) for the ignition power transistor.

**Standard wave pattern
Observation conditions**

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine	Approx. 1,200 rpm

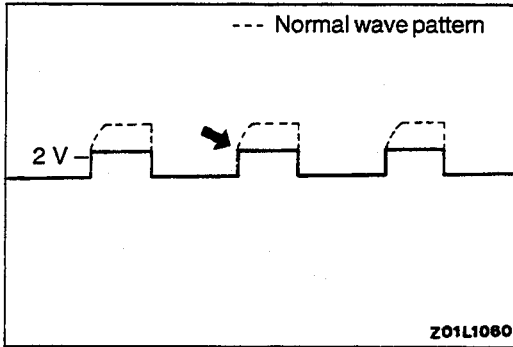


Z7FU1206

Wave pattern observation points

Point: Condition of wave pattern build-up 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. 2 V to approx. 4.5 V at the top right	Normal
Rectangular wave of approx. 2 V	Open circuit in ignition primary circuit
Rectangular wave at power voltage	Malfunction of ignition power transistor



Examples of abnormal wave patterns

● Example 1

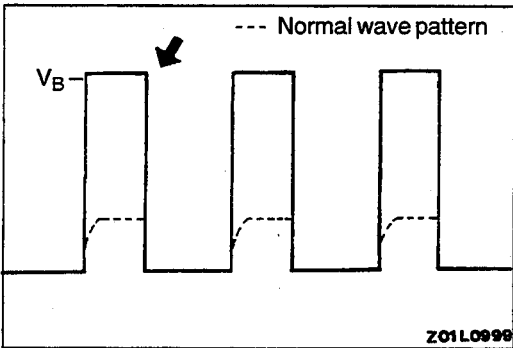
Wave pattern during engine cranking

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 2 V too low.



Example 2

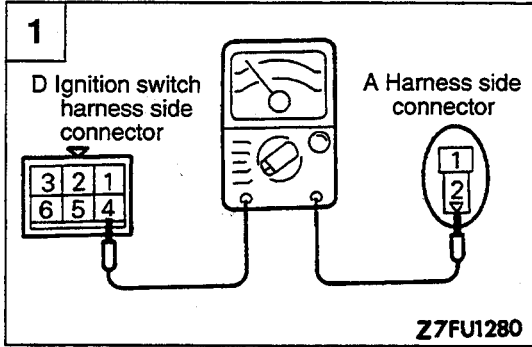
Wave pattern during engine cranking

Cause of problem

Malfunction of ignition power transistor

Wave pattern characteristics

Power voltage results when the ignition power transistor is on.



Check for continuity between the ignition coil and the ignition switch-IG.

- Ignition switch connector: Disconnected
- Ignition coil connector: Disconnected

NOTE

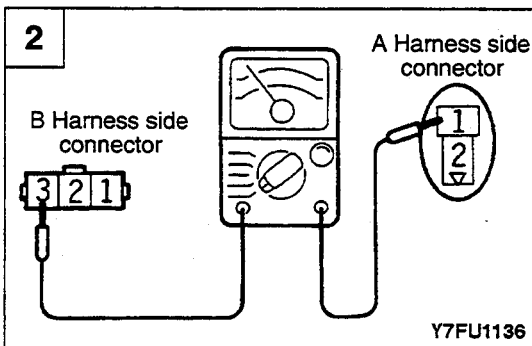
- Touch the ohmmeter problems to both ends of the harness.



2



Repair the harness. (A2-D4)



Check for an open circuit or a short-circuit to ground between the ignition power transistor and ignition coil.

- Ignition coil connector: Disconnected
- Ignition power transistor connector: Disconnected



3



Repair the harness. (A1-B3)

3 A Harness side connector

Z7FU1246

Check for a short-circuit between the ignition power transistor and the ignition coil.

- Ignition coil connector: Disconnected
- Ignition power transistor connector: Disconnected

OK → **4**

✗ → Check for a short-circuit in the ignition coil primary circuit.

4 B Harness side connector

Engine control module harness side connector

Z7FU1245

Check for an open or short-circuit between the ignition power transistor and the engine control module.

- Ignition power transistor connector: Disconnected
- Engine control module connector: Disconnected

OK → **5**

✗ → Repair the harness. (B1-54)

5 B Harness side connector

Z7FU0837

Check for continuity in the ignition power transistor ground circuit.

- Ignition power transistor connector: Disconnected

OK → **6**

✗ → Repair the harness. (B2-Ground)

6 B Harness side connector

Z7FU1247

Measure the voltage of the ignition power transistor control signal.

- Ignition power transistor connector: Disconnected
- Ignition switch: START

Voltage (V)
2.0-6.0

OK → **7**

✗ → Repair the harness. (B1-54)

7 C Ignition timing adjustment connector

Z7FU1060

Measure the voltage at the ignition timing adjustment terminal.

- Ignition switch: ON

Voltage (V)
4.0–5.2

→

→

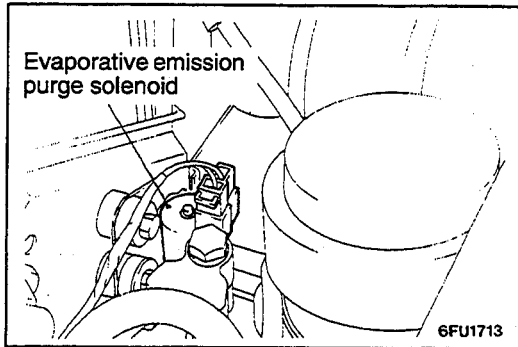
Repair the harness.
(C1–12)

ACTUATOR INSPECTION

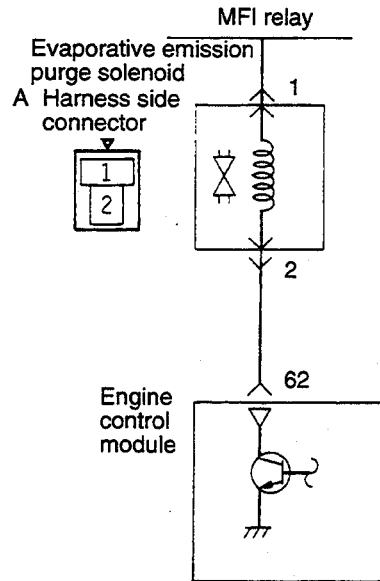
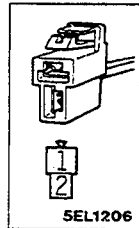
Refer to GROUP 16 – Ignition System.

EVAPORATIVE EMISSION PURGE SOLENOID

110005804

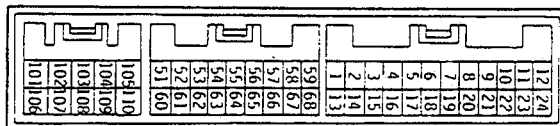


A Equipment side connector



01A0324

Engine control module connector



01L0838

7FU1679

OPERATION

- The evaporative emission purge solenoid is an ON/OFF type of solenoid; it functions to regulate the introduction of purge air from the evaporative emission canister to the intake manifold plenum.
- Battery positive voltage is supplied, by way of the MFI relay, to the evaporative emission purge solenoid. When the engine control module switches on the ignition power transistor within the unit, current flows to the coil, and purge air is introduced.

INSPECTION

Using Scan tool

Function	Item No.	Activation	Check conditions	Normal condition
Actuator test	08	Solenoid is switched from off to on.	• Ignition switch: ON	Operation sound can be heard during activation

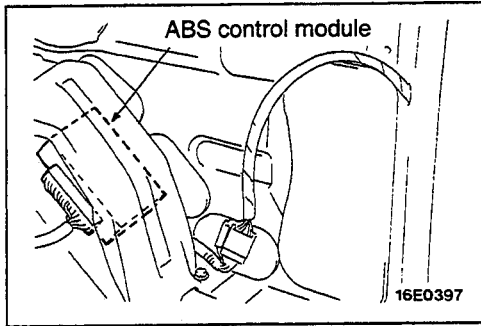
HARNESS INSPECTION

<p>1</p> <p style="text-align: center;">Z 7FU1253</p>	<p>Check for continuity between the evaporative emission purge solenoid and the MFI relay.</p> <ul style="list-style-type: none"> • Evaporative emission purge solenoid connector: Disconnected • MFI relay connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> • Touch the ohmmeter probes to both ends of the harness. 	<p>OK →</p> <p>✗ →</p>	<p>2</p> <p>Repair the harness. (A1–B5)</p>
<p>2</p> <p style="text-align: center;">Z 7FU0526</p>	<p>Check for an open circuit or a short-circuit to ground between the evaporative emission purge solenoid and the engine control module.</p> <ul style="list-style-type: none"> • Evaporative emission purge solenoid connector: Disconnected • Engine control module connector: Disconnected 	<p>OK →</p> <p>✗ →</p>	<p>STOP</p> <p>Repair the harness. (A2–62)</p>

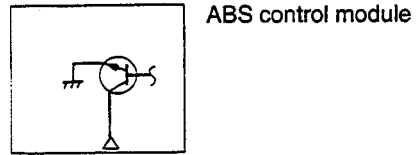
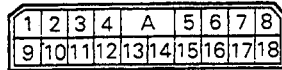
ACTUATOR INSPECTION

Refer to GROUP 17 – Service Adjustment Procedures.

ANTI-LOCK BRAKING SIGNAL

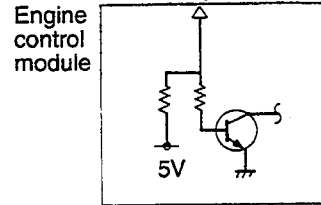


ABS control module equipment side connector



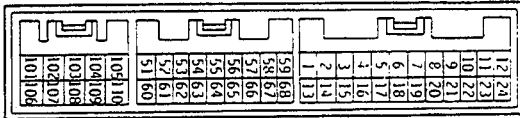
12

ABS hydraulic unit



9

Engine control module connector



01L0838

7FU1137

7FU1680

OPERATION

- The anti-lock braking signal is output by the anti-lock braking system (ABS) control module to the engine control module as a signal to indicate whether the motor relay is being driven or not. The engine control module controls the idle air control motor by means of this signal, and gives accurate anti-lock braking effectiveness.
- The ABS control module turns the ignition power transistor ON when the motor relay is being driven, and the output terminal which has battery positive voltage applied is shorted to the ground. This causes the anti-lock braking signal to change from HIGH to LOW.

HARNES INSPECTION

1 ABS control module harness side connector Engine control module harness side connector

Z6FU1543

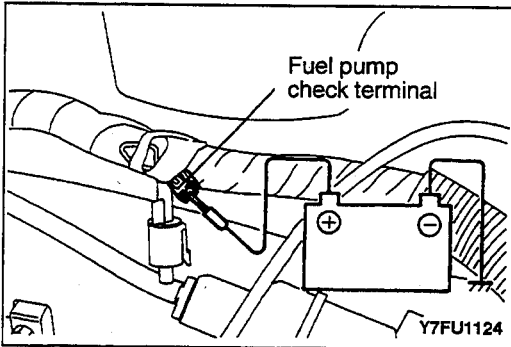
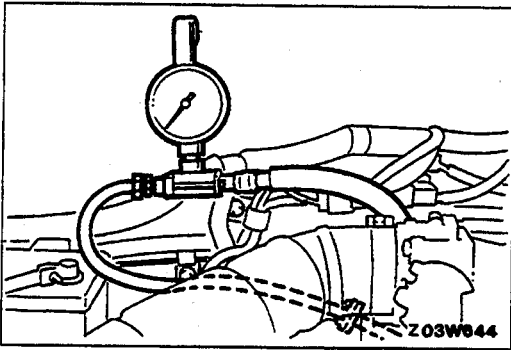
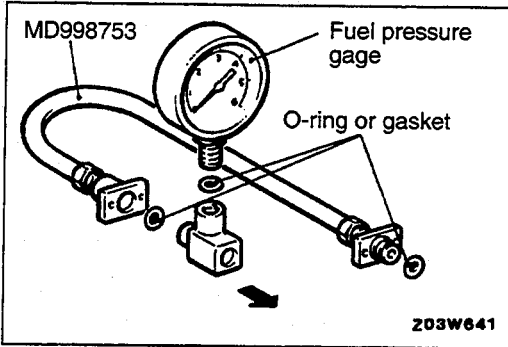
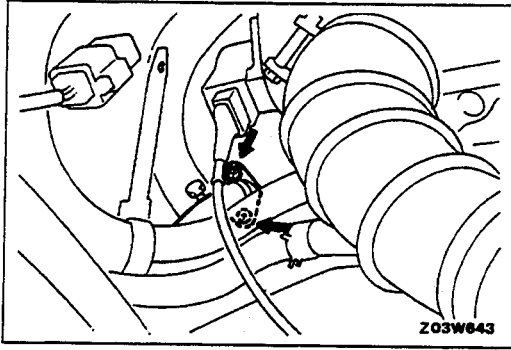
Check for an open or short-circuit between the ABS control module and the engine control module.

- ABS control module connector: Disconnected
- Engine control module connector: Disconnected

Repair the harness.
(12-9)

110005806

FUEL PRESSURE TEST



- (1) Reduce the internal pressure of the fuel pipes and hoses.
- (2) Disconnect the high pressure fuel hose at the fuel rail side.

Caution

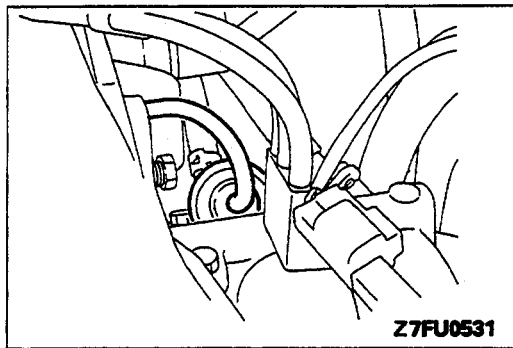
Cover the hose connection with a shop towel to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

- (3) Connect a fuel pressure gage to the special tool, placing an adequate O-ring or gasket between the gage end special tool prevent fuel leaks.

- (4) Attach the special tool which was connected in step (3) to the fuel rail.

- (5) Connect a jumper wire to the terminal for activation of the fuel pump and to the positive battery terminal to activate the fuel pump. With fuel pressure applied, check that there is no fuel leakage from the fuel pressure gage and the special tool connection part.
- (6) Disconnect the jumper wire from the terminal for activation of the fuel pump to stop the fuel pump.
- (7) Start the engine and let it idle.
- (8) Measure the fuel pressure during idling.

Standard value: Approx. 270 kPa (38 psi) at curb idle



- (9) Disconnect the vacuum hose from the fuel pressure regulator, and then measure the fuel pressure while using a finger to plug the end of the hose.

Standard value: 330–370 kPa (47–53 psi) at curb idle speed

- (10) Check that the fuel pressure during idling does not decrease even after the engine is raced a few times.
(11) Use a finger to gently press the fuel return hose while repeatedly racing the engine, and check that there is fuel pressure in the return hose also.

NOTE

There will be no fuel pressure in the return hose if there is insufficient fuel flow.

- (12) If the fuel pressure measured in steps (9) to (12) is outside the standard value range, check for the probable cause by referring to the table below, and then make the appropriate repair.

Condition	Probable cause	Remedy
<ul style="list-style-type: none"> ● Fuel pressure is too low. ● Fuel pressure drops during racing. ● No fuel pressure in fuel return hose. 	Fuel filter is clogged.	Replace the fuel filter.
	Malfunction of valve seat inside the fuel pressure regulator, or fuel leakage to return side caused by spring deterioration.	Replace the fuel pressure regulator.
	Low fuel pump discharge pressure.	Replace the fuel pump.
Fuel pressure is too high.	The valve inside the fuel pressure regulator is sticking.	Replace the fuel pressure regulator.
	Clogging of the fuel return hose and/or the pipe.	Clean or replace the hose and/or pipe.
Fuel pressure does not change when vacuum hose is connected and disconnected.	Damaged vacuum hose or clogged nipple.	Replace the vacuum hose, or clean the nipple.

- (13) Stop the engine and check for a change of the value indicated by the fuel pressure gage. The condition is normal if there is no decrease in the indicated value within two minutes. If there is a decrease in the indicated value, monitor the speed of the decrease, and, referring to the table below, determine the cause of the problem and make the appropriate repair.

Condition	Probable cause	Remedy
After the engine is stopped, the fuel pressure drops gradually.	Injector leakage.	Replace the injector.
	Leakage at the fuel pressure regulator valve seat.	Replace the fuel pressure regulator.
There is a sudden sharp drop of the fuel pressure immediately after the engine is stopped.	The check valve (within the fuel pump) is not closed.	Replace the fuel pump.

- (14) Reduce the internal pressure of the fuel pipes and hose. (Refer to P.13F-3.)

- (15) Disconnect the fuel pressure gage and the special tool from the fuel rail.

Caution

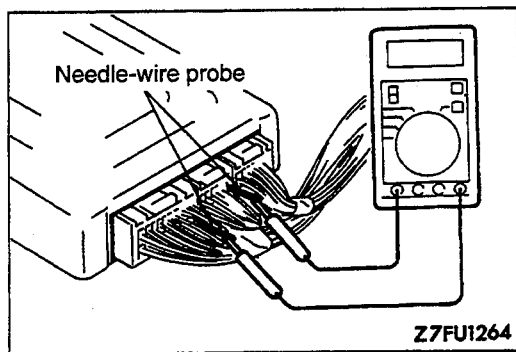
Because there will be some residual pressure in the fuel pipe line, use a shop towel to cover so that fuel doesn't splatter.

- (16) Replace the O-ring at the end of the high-pressure fuel hose with a new one.

- (17) After connecting the high-pressure fuel hose to the fuel rail, tighten the installation bolt to the specified torque.

Tightening torque: 5 Nm (3.6 ft.lbs)

- (18) Check that there is no fuel leakage.
- 1) Apply battery positive voltage to the terminal for activation of the fuel pump so as to activate the fuel pump.
 - 2) With fuel pressure applied, check for leakage of the fuel line.



ENGINE CONTROL MODULE TERMINAL VOLTAGE CHECK

110005807

- (1) Connect a needle wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
- (2) Insert the needle wire probe into each of the engine control module 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 control module connectors connected.
2. Make the voltage measurement between terminal (26) (ground terminal) and each terminal.
3. Pull out the engine control module to make it easier to reach the connector terminals.
4. The checks do not have to be carried out in the order given in the chart.

Caution

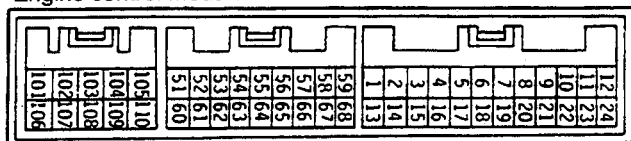
Never short-circuit the positive (+) probe between a connector terminal and ground, or the vehicle wiring, the sensor, the engine control module, etc., will be damaged.

- (3) If the voltmeter indication is outside the standard value, check the corresponding sensor, actuator and related electrical wiring and repair or replace as necessary.
- (4) After repairing or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Terminal Voltage Check Chart

Engine Control Module Terminal Arrangement

Engine control module connector



Terminal No.	Check Item	Check Condition (Engine Condition)	Standard value	Remarks
103	Backup power supply	Ignition switch: OFF	B+	
102	Power supply	Ignition switch: ON	B+	
107				
110	Ignition switch-IG	Ignition switch: ON	B+	
63	MFI relay (power supply)	Ignition switch: OFF	B+	
66		Ignition switch: ON	0-3 V	
56	MFI relay (fuel pump)	Ignition switch: ON	B+	
		Engine: Idling	0-3 V	
23	Sensor applied voltage	Ignition switch: ON	4.5-5.5 V	

Terminal No.	Check Item	Check Condition (Engine Condition)		Standard value	Remarks
10	Volume air flow sensor	Engine: Idling		2.2–3.2 V	
		Engine: 2,000 rpm			
57	Volume air flow sensor reset signal	Engine: Idling		0–1 V	
		Engine: 3,000 rpm		6–9 V	
8	Intake air temperature sensor	Ignition switch: ON	Air intake temperature of 0°C (32°F)	3.2–3.8 V	
			Air intake temperature of 20°C (68°F)	2.3–2.9 V	
			Air intake temperature of 40°C (104°F)	1.5–2.1 V	
			Air intake temperature of 80°C (176°F)	0.4–1.0 V	
16	Barometric pressure sensor	Ignition switch: ON	Altitude of 0 m (0 ft.)	3.7–4.3 V	
			Altitude of 1,200 m (3,937 ft.)	3.2–3.8 V	
20	Engine coolant temperature sensor	Ignition switch: ON	Coolant temperature of 0°C (32°F)	3.2–3.8 V	
			Coolant temperature of 20°C (68°F)	2.3–2.9 V	
			Coolant temperature of 40°C (104°F)	1.3–1.9 V	
			Coolant temperature of 80°C (176°F)	0.3–0.9 V	
19	Throttle position sensor	Ignition switch: ON for 15 seconds or more	Idling	0.3–1.0 V	
			Wide open throttle	4.5–5.5 V	
14	Closed throttle position switch	Ignition switch: ON	Set the throttle valve to the idle position.	0–1 V	
			Slightly open the throttle valve.	4 V or higher	
22	Camshaft position sensor	Engine: Cranking		0.2–3.0 V	
		Engine: Idling			
21	Crankshaft position sensor	Engine: Cranking		0.2–3.0 V	
		Engine: Idling			
108	Ignition switch-ST	Engine: Cranking		8 V or higher	M/T
104	Park/neutral position switch	Ignition switch: ON	Set the selector lever to P or N.	0–3 V	A/T
			Set the selector lever to D, 2, L or R.	8–14 V	
18	Vehicle speed sensor	<ul style="list-style-type: none"> ● Ignition switch: ON ● Move the vehicle slowly forward. 		0 ↔ 5 V (Changes repeatedly)	
5	Power steering pressure switch	Engine: Idling after having warmed up	Set the steering wheel to the straight-forward.	B+	
			Half turn the steering wheel.	0–3 V	

TSB Revision

Terminal No.	Check Item	Check Condition (Engine Condition)	Standard value	Remarks	
7	Air conditioning switch	Engine: Idling	Turn the air conditioning switch to OFF.	0–3 V	
			Turn the air conditioning switch to ON (air conditioning compressor is operating).	B+	
65	Air conditioning compressor clutch relay	<ul style="list-style-type: none"> Engine: Idling Air conditioning switch: OFF → ON (Air compressor is operating) 	B+ or temporarily 6 V or more → 0–3 V		
4	Heated oxygen sensor	Engine: Warmed up, 2,000 rpm (Check using a digital type voltmeter.)	0 ↔ 0.8 V (Changes repeatedly)		
51	No. 1 injector	Engine: Idling after having warmed up, rapidly depress the accelerator pedal	From 11–14 V, momentarily drops slightly		
52	No. 2 injector				
60	No. 3 injector				
61	No. 4 injector				
105	No. 5 injector				
109	No. 6 injector				
58	Stepper motor coil <A1>	<ul style="list-style-type: none"> Engine: 3,000 rpm Check immediately after hot restart 	B+ ↑↓ 0–3 V (Changes repeatedly)		
59	Stepper motor coil <A2>				
67	Stepper motor coil <B1>				
68	Stepper motor coil <B2>				
54	Ignition power transistor unit	Engine: 3,000 rpm	0.3–3 V		
62	Evaporative emission purge solenoid	Ignition switch: ON	B+		
		Engine: Warmed up, 3,000 rpm	0–3 V		
12	Ignition timing adjustment terminal	Ignition switch: ON	Ground the ignition timing adjustment terminal.	0–1 V	
			Disconnect the ground from the ignition timing adjustment terminal.	4.0–5.5 V	
64	Check engine/malfunction indicator lamp	Ignition switch: OFF → ON	0–3 V ↓ 9–13 V (After several seconds have elapsed)		
9	Anti-lock braking signal	Engine: Idling	B+		
		<ul style="list-style-type: none"> When vehicle first starts to move after turning the ignition switch to ON Vehicle speed: 0 → 10 km/h (0–6 mph) 	B+ ↓ 0–3 V (temporarily)		

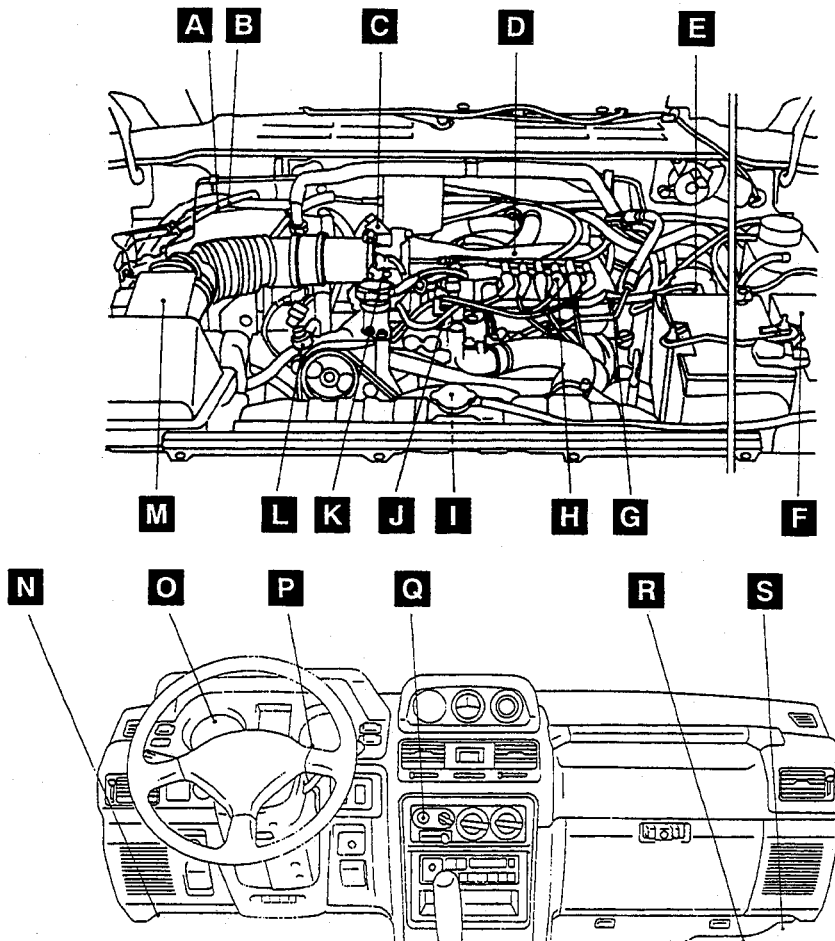
ON-VEHICLE INSPECTION OF MFI COMPONENTS

<SOHC-24 valve engine, DOHC> COMPONENT LOCATION <SOHC>

Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	F	Ignition coil (Ignition power transistor)	H
Air conditioning switch	Q	Ignition timing adjustment connector	B
Camshaft position sensor	G	Injector	D
Check engine / Malfunction indicator lamp	P	Multiport fuel injection (MFI) relay	S
Crankshaft position sensor	I	Park / Neutral position switch (Vehicles with automatic transmission)	U
Data link connector	N		
Engine control module	R	Power steering pressure switch	L
Engine coolant temperature sensor	J	Throttle position sensor (with closed throttle position switch)	C
Evaporative emission purge solenoid	E		
Fuel pump check connector	A	Vehicle speed sensor (reed switch)	O
Heated oxygen sensor	T	Volume air flow sensor (with intake air temperature sensor and barometric pressure sensor)	M
Idle air control motor	K		

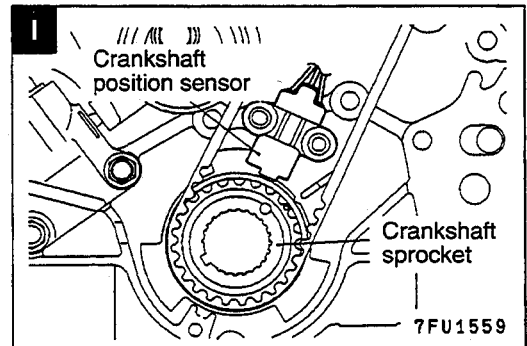
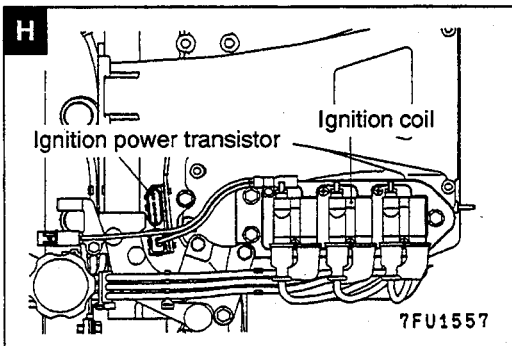
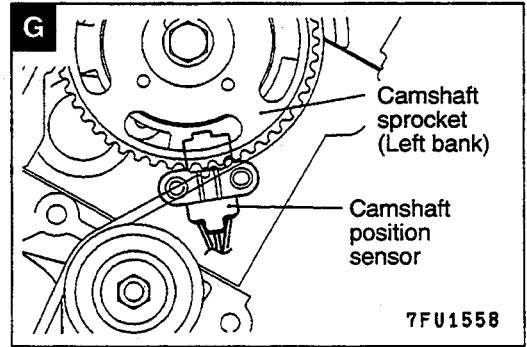
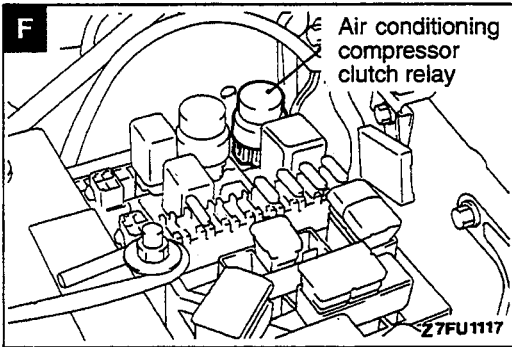
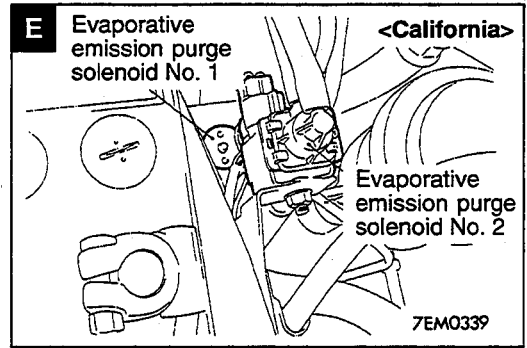
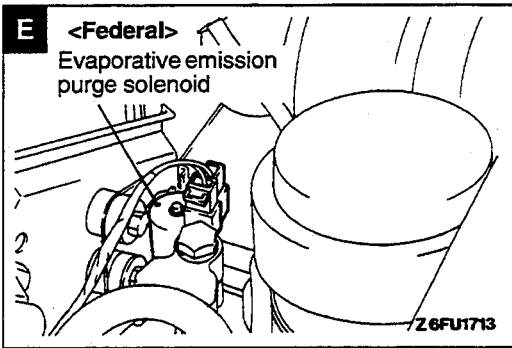
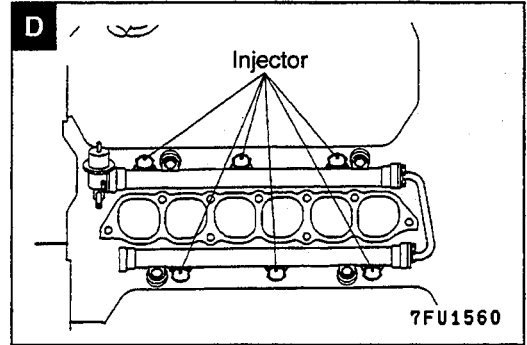
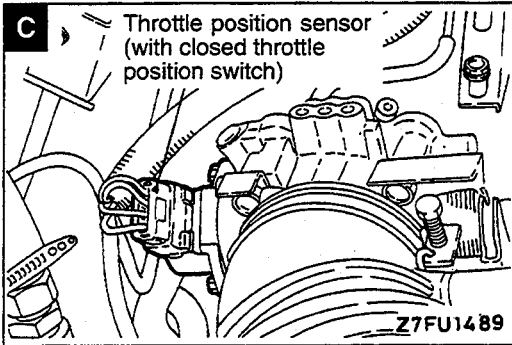
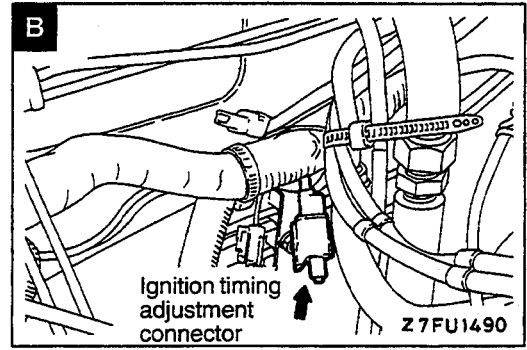
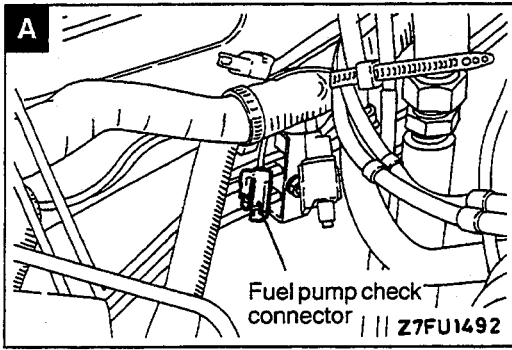
NOTE

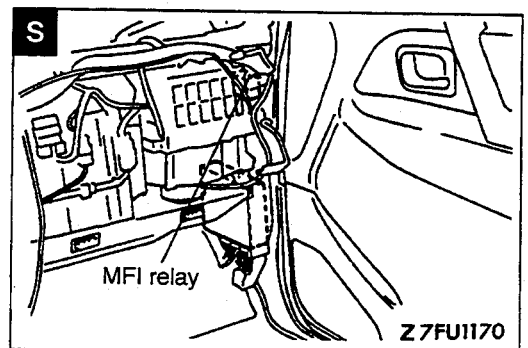
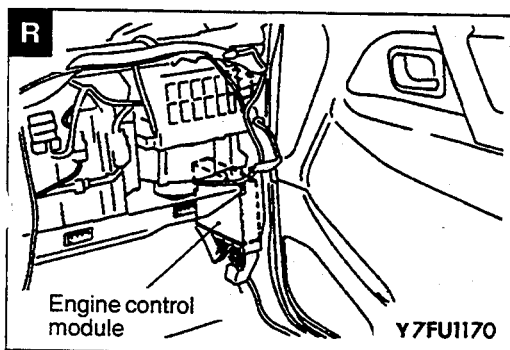
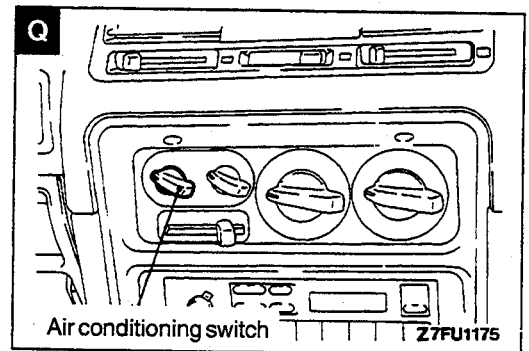
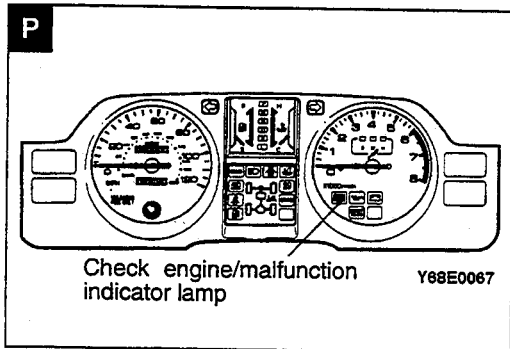
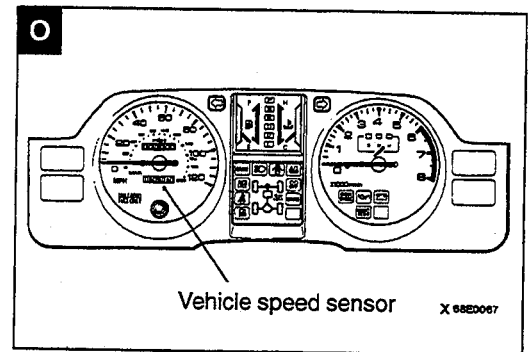
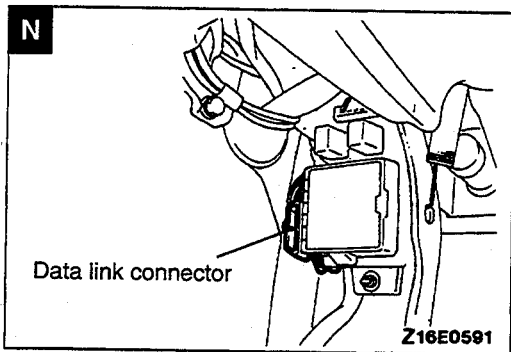
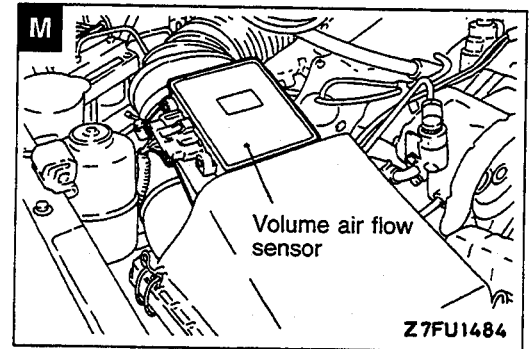
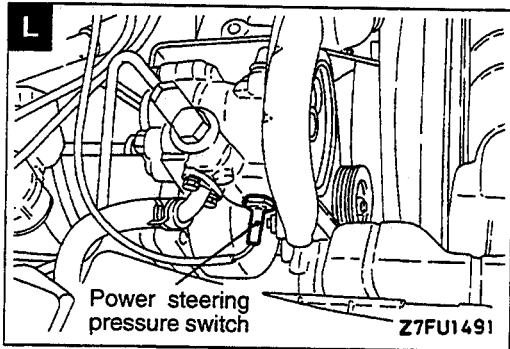
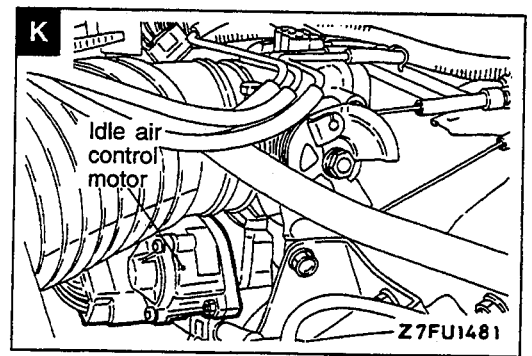
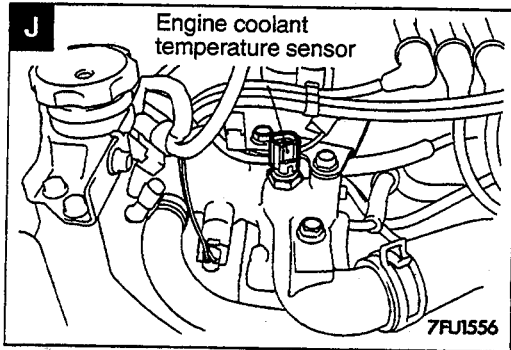
The entries in the "Name" column are arranged in alphabetical order.



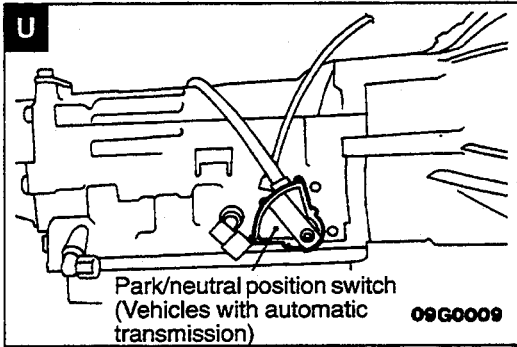
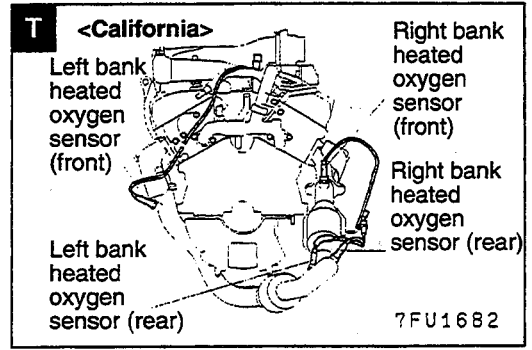
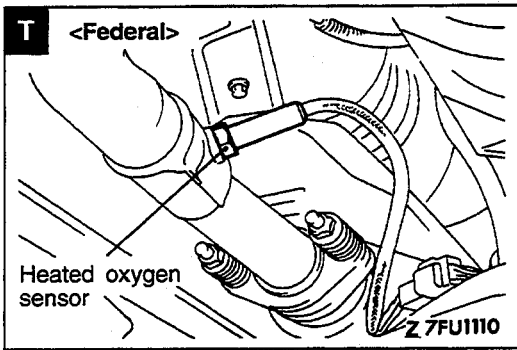
7FU1167

7FU1681





13A-114 MULTIPOINT FUEL INJECTION – <SOHC-24 valve engine, DOHC> **On-Vehicle Inspection of MFI Components**
<SOHC-24 valve engine, DOHC>



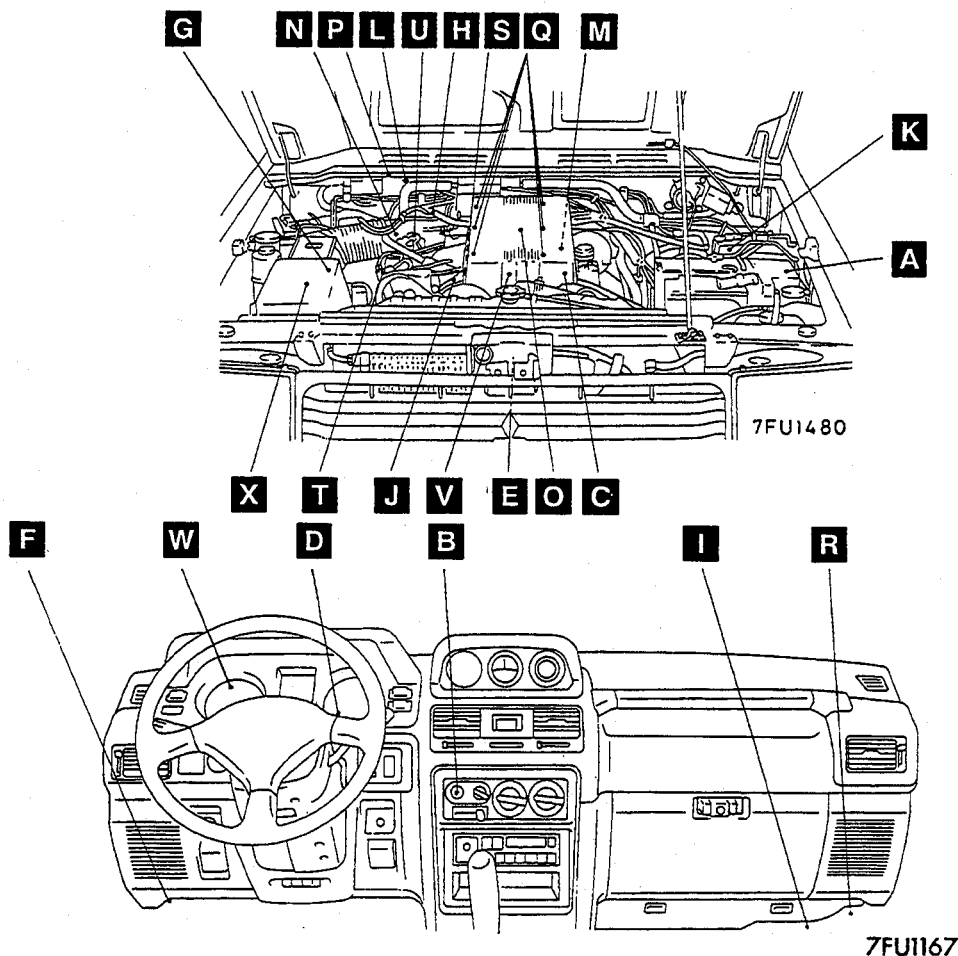
COMPONENT LOCATION <DOHC>

110005809

Name	Symbol	Name	Symbol
Air conditioning compressor clutch relay	A	Ignition coil (ignition power transistor)	O
Air conditioning switch	B	Ignition timing adjustment connector	P
Camshaft position sensor	C	Injector	Q
Check engine/malfunction indicator lamp	D	Multiport fuel injection (MFI) relay	R
Crankshaft position sensor	E	Park/neutral position switch (Vehicles with automatic transmission)	S
Data link connector	F		
EGR solenoid	G	Power steering pressure switch	T
EGR temperature sensor	H	Throttle position sensor (with closed throttle position switch)	U
Engine control module	I		
Engine coolant temperature sensor	J	Variable induction control solenoid	V
Evaporative emission purge solenoid	K	Vehicle speed sensor (reed switch)	W
Fuel pump check connector	L	Volume air flow sensor (with intake air temperature sensor and barometric pressure sensor)	X
Heated oxygen sensor	M		
Idle air control motor	N		

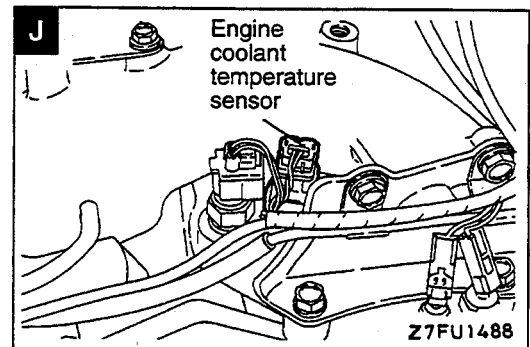
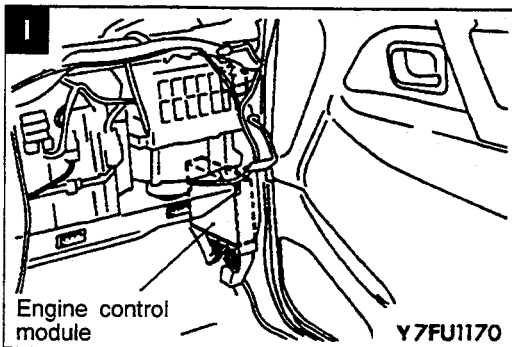
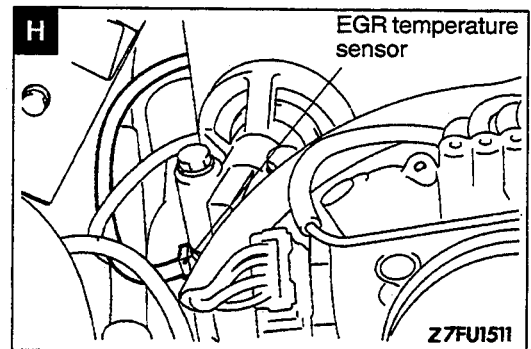
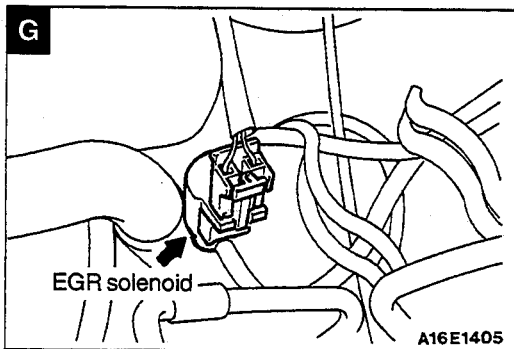
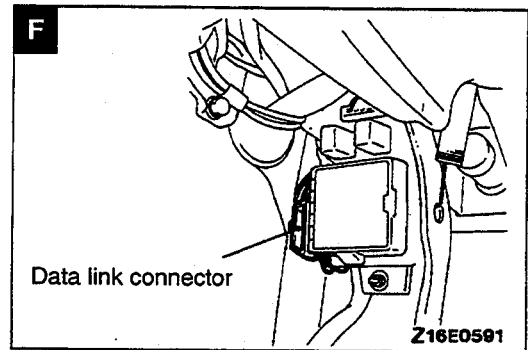
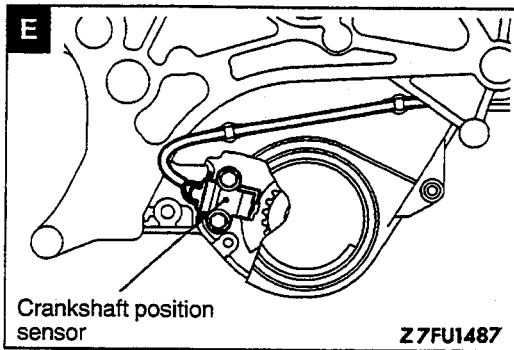
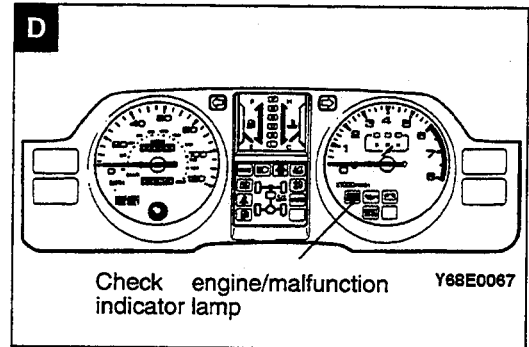
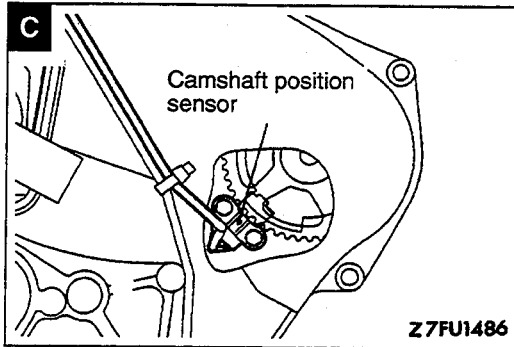
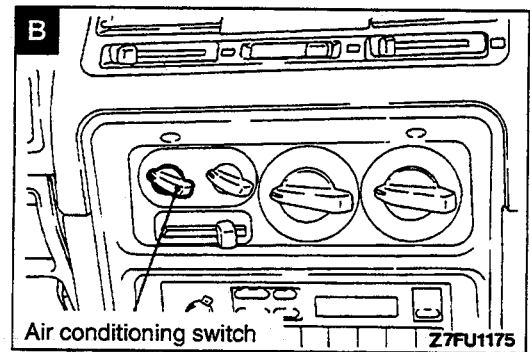
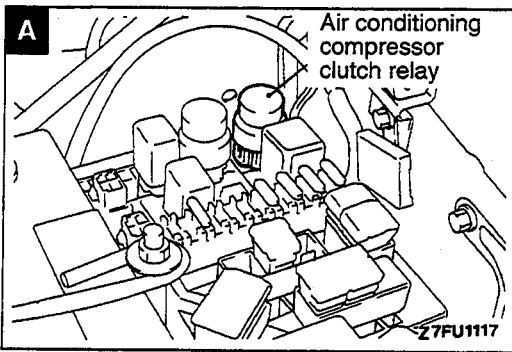
NOTE

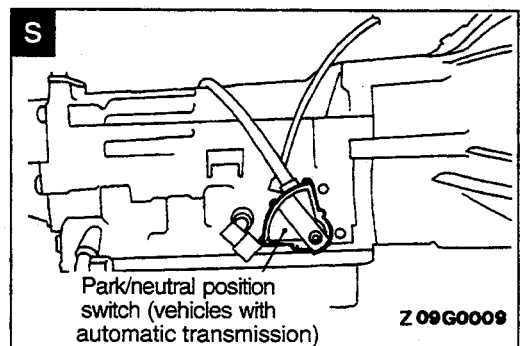
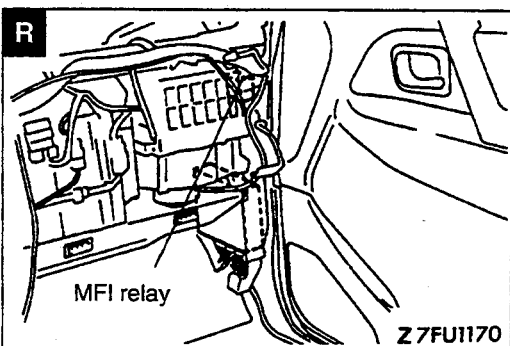
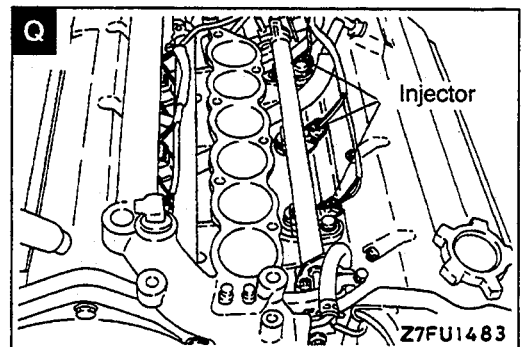
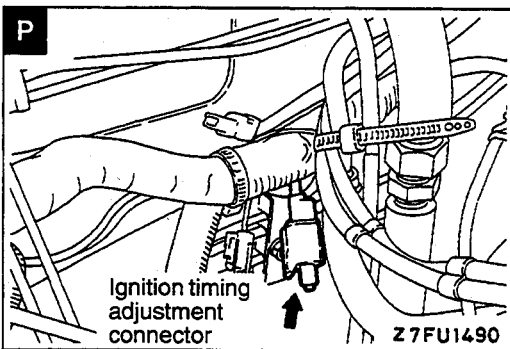
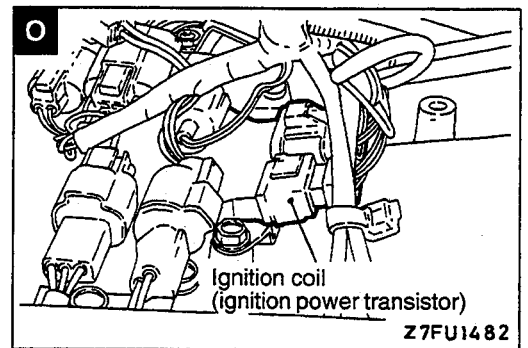
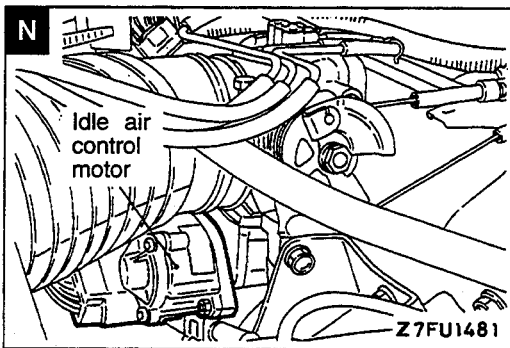
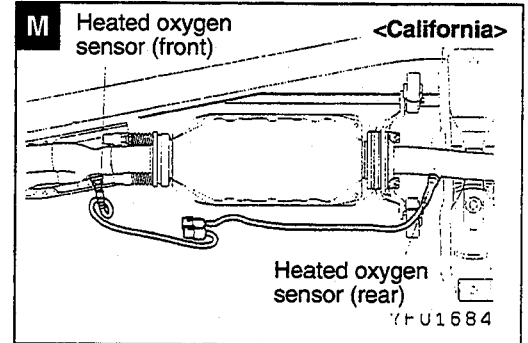
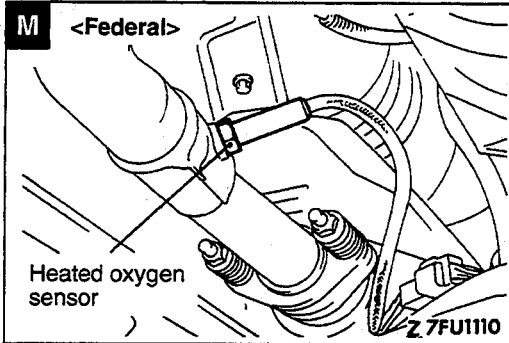
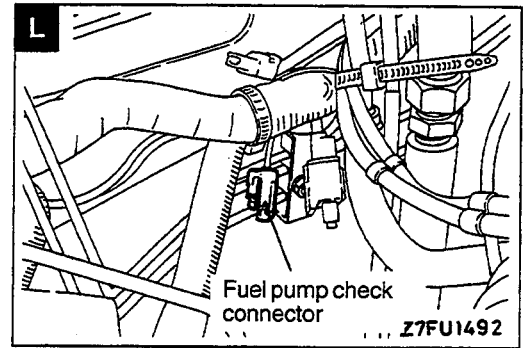
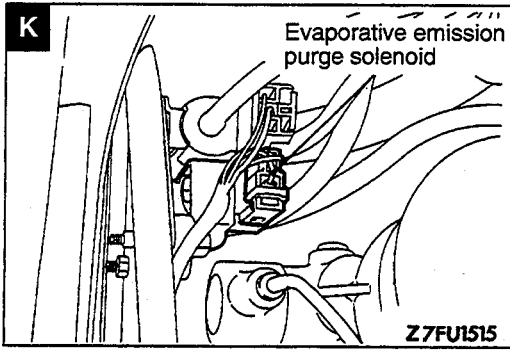
The entries in the "Name" column are arranged in alphabetical order.

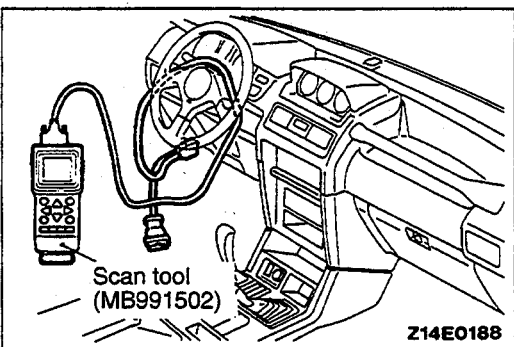
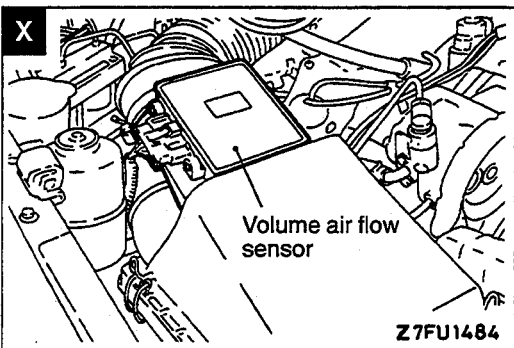
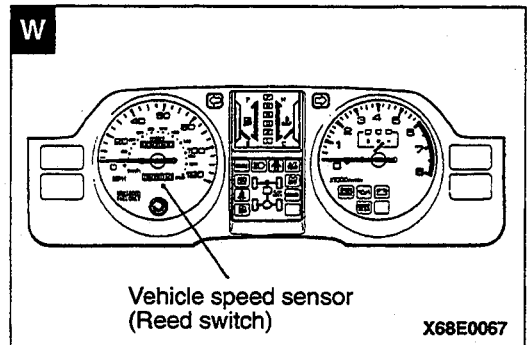
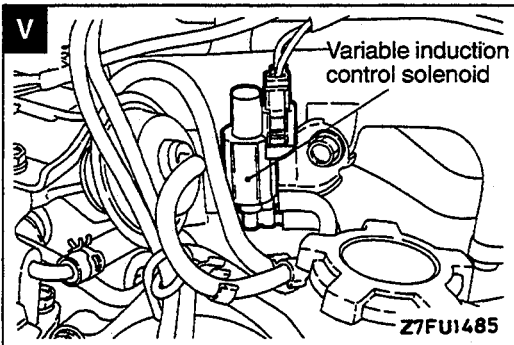
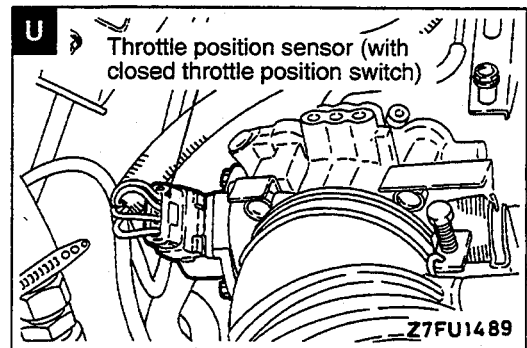
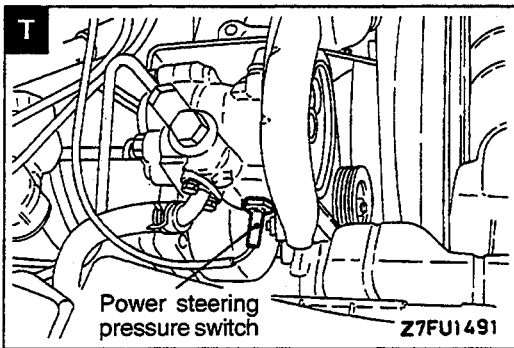


7FU1683

13A-116 MULTIPOINT FUEL INJECTION – <SOHC-24 valve engine, DOHC>







COMPONENT INSPECTION PROCEDURE

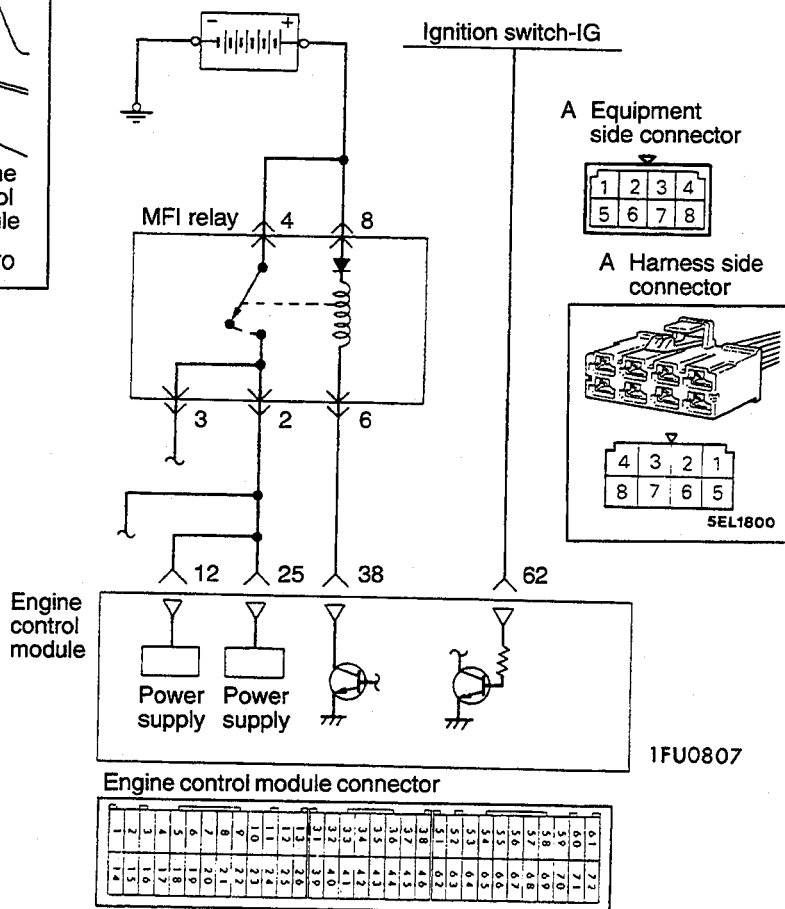
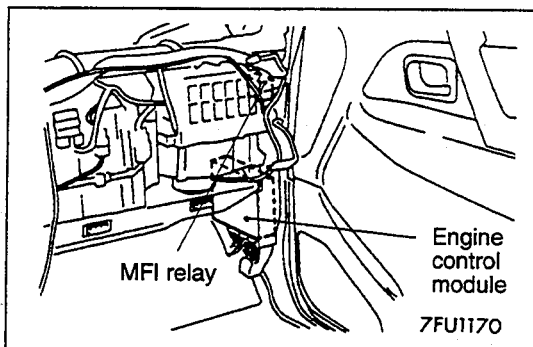
110005810

USING SCAN TOOL

- (1) Check by the data reading and actuator test function. If any abnormality is found, check the body harness, components, etc., and repair as necessary.
- (2) After repairing, check again with the scan tool to make sure that the input and output signals are now normal.
- (3) Erase the diagnostic trouble code.
- (4) Disconnect the scan tool.
- (5) Start the engine and perform running test, etc. to make sure that the troubles have been corrected.

POWER SUPPLY (MFI RELAY) AND IGNITION SWITCH-IG

110005811



9FU0101 7FU1685

OPERATION

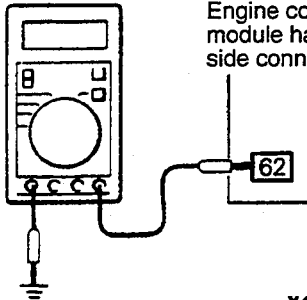
Refer to P.13A-49.

INSPECTION

Refer to P.13A-49.

HARNESS INSPECTION

1



Engine control module harness side connector

62

Y01L0427

Measure the ignition switch-IG terminal input voltage.

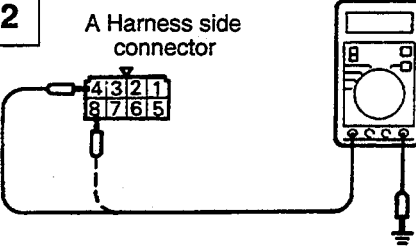
- Engine control module connector: Disconnected

Ignition switch	Voltage (V)
OFF	0-1
ON	B+

OK → **2**

✗ → Repair the harness. (110-Ignition switch or inspect the ignition switch.)

2



A Harness side connector

Z1FU0808

Measure the power supply voltage of the MFI relay.

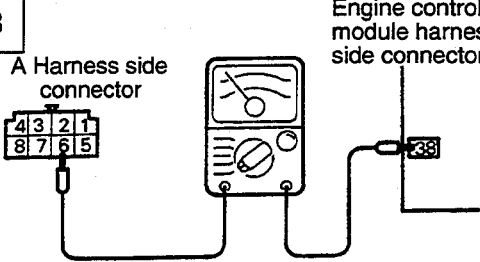
- Ignition switch: OFF
- MFI relay connector: Disconnected

Voltage (V)
B+

OK → **3**

✗ → Repair the harness. (A10-Battery)

3



A Harness side connector

Engine control module harness side connector

Z1FU0809

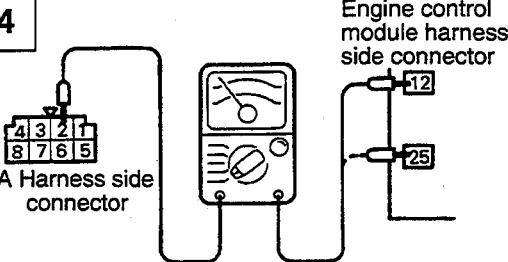
Check for an open circuit or a short-circuit to ground between the MFI relay and the engine control module.

- Engine control module connector: Disconnected
- MFI relay connector: Disconnected

OK → **4**

✗ → Repair the harnesses. (A8-63) (A8-66)

4



A Harness side connector

Engine control module harness side connector

Z6AF0050

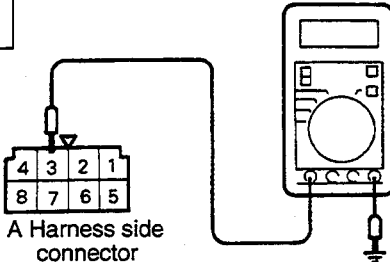
Check for an open circuit or a short-circuit to ground between the MFI relay and the engine control module.

- MFI relay connector: Disconnected
- Engine control module connector: Disconnected

OK → **5**

✗ → Repair the harnesses. (A4-102) (A4-107)

5



A Harness side connector

Z6AF0051

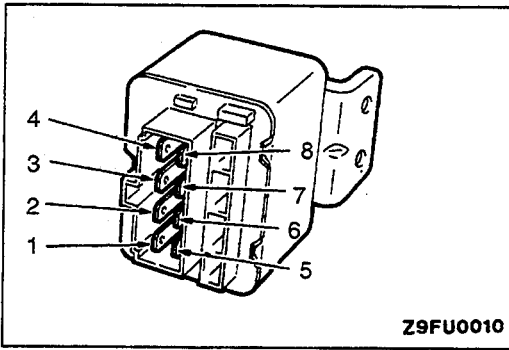
Measure the power supply voltage of the actuator.

- MFI relay connector: Connected
- Engine control module connector: Connected

Engine	Voltage (V)
Cranking	8 or higher
Racing	B+

OK → STOP

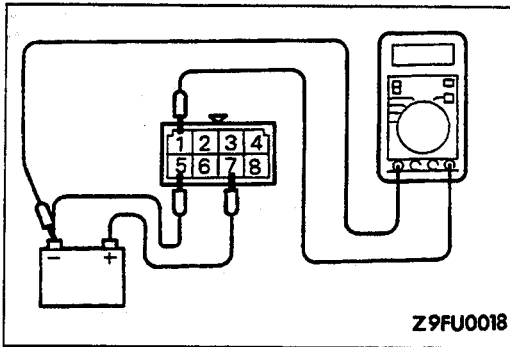
✗ → MFI relay or engine control module is defective.



MULTIPOINT FUEL INJECTION (MFI) RELAY INSPECTION

- (1) Remove the MFI relay.
- (2) Check for continuity between the MFI relay terminals.

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



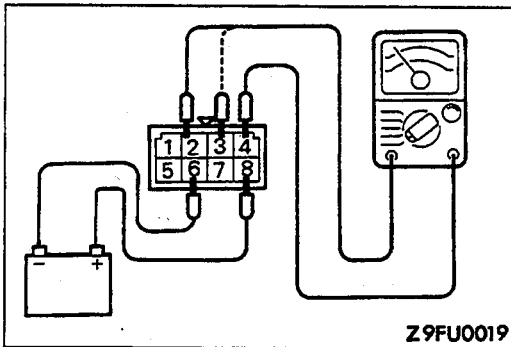
- (3) Use jumper wires to connect MFI relay terminal (7) to the positive battery terminal and terminal (5) to the negative battery terminal.

Caution

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

- (4) Check the voltage at MFI relay terminal (1) while connecting and disconnecting the jumper wire at the negative battery terminal

Jumper wire	Voltage at terminal (1)
Connected	B+
Disconnected	0 V

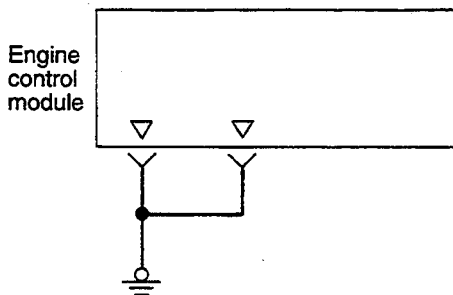
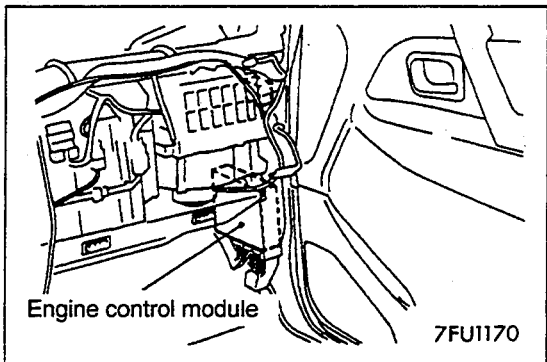


- (5) Use the jumper wires to connect MFI relay terminal (8) to the positive battery terminal and terminal (6) to the negative battery terminal.
- (6) Check for continuity between MFI relay terminals (2)–(4) and terminals (3)–(4) while connecting and disconnecting the jumper wire at the negative battery terminal.

Jumper wire	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 an incorrect condition, replace the MFI relay.

ENGINE CONTROL MODULE POWER GROUND



01A0191

Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61

9FU0101 7FU1686

OPERATION

Refer to P.13A-52.

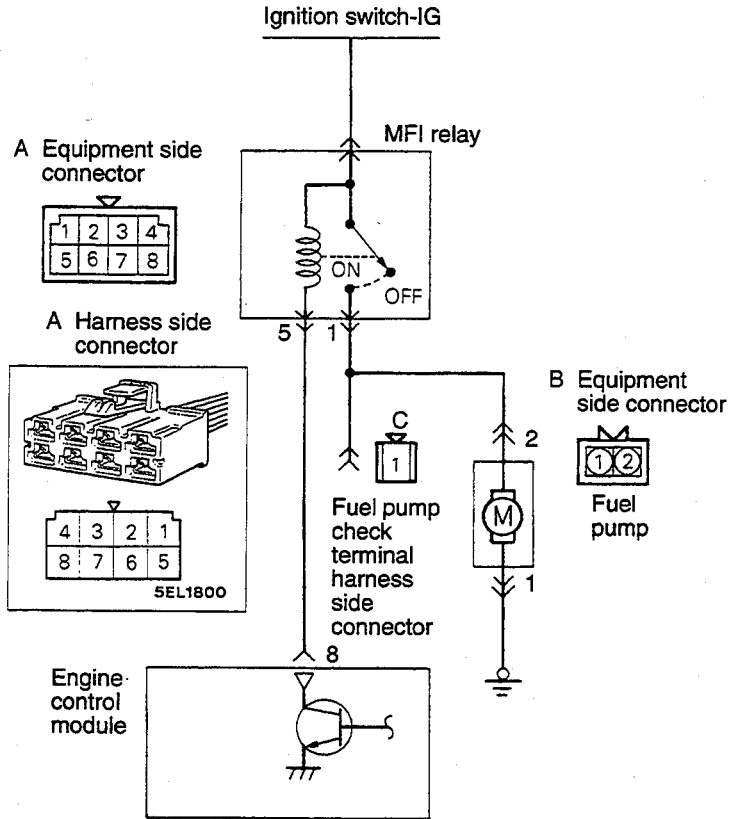
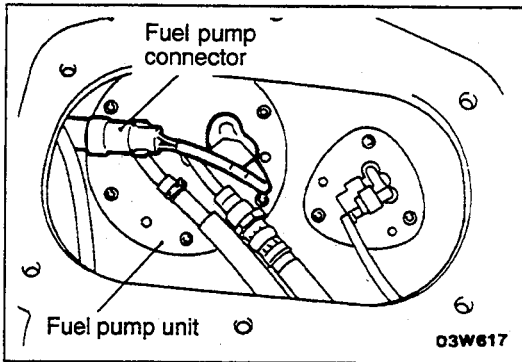
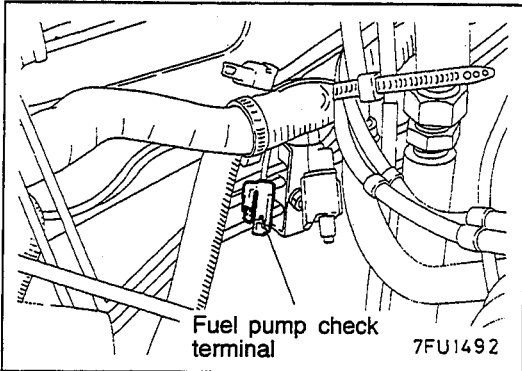
TROUBLESHOOTING HINTS

Refer to P.13A-52.

HARNESS INSPECTION

1	<p>Engine control module harness side connector</p> <p>13</p> <p>26</p> <p>Y01P0150</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> Engine control module connector: Disconnected <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> </div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 10px;"> <div style="text-align: center;"> </div> <div style="text-align: center;"> <p>Repair the harnesses. (13-Ground, 26-Ground)</p> </div> </div>
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FUEL PUMP



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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6AF0109

9FU0101 7FU1687

OPERATION

- The fuel pump is driven when the engine is cranking and while the engine is running.
- When the engine is cranking and while the engine is running, the engine control module turns the power transistor ON to supply power

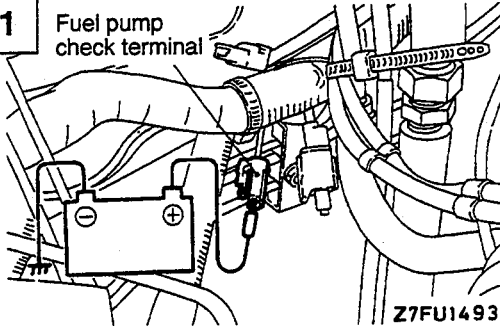
to the MFI relay coil. This causes the MFI relay switch to turn ON, and current is supplied from the ignition switch via the MFI relay switch to drive the fuel pump.

INSPECTION

Refer to P.13A-54.

HARNESS INSPECTION

1 Fuel pump check terminal



Z7FU1493

Check the fuel pump.

- Apply battery positive voltage to the checking terminal and operate the pump.

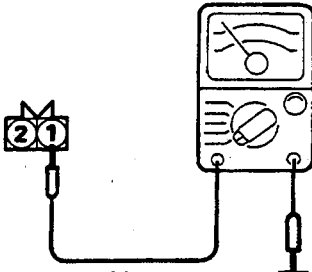
OK →

2

~~**OK**~~ →

4

2



B Harness side connector

Z1FU0521

Check the ground circuit of the fuel pump.

- Fuel pump connector: Disconnected

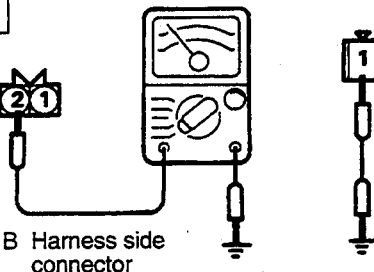
OK →

3

~~**OK**~~ →

Repair the harness.
(B1–Ground)

3



B Harness side connector

Z1FU0522

Check for continuity between the fuel pump and the checking terminal.

- Fuel connector: Disconnected
- MFI relay connector: Disconnected

OK →

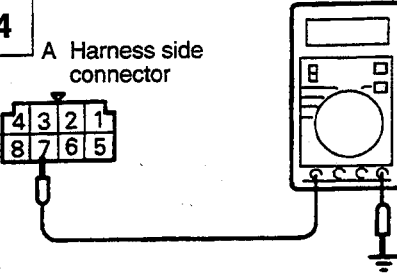
4

~~**OK**~~ →

Repair the harness.
(B2–C1)

4

A Harness side connector



Z9FU0023

Measure the power supply voltage of the MFI relay.

- MFI relay connector: Disconnected

Ignition switch	Voltage (V)
OFF	0
ON	B+

OK →

5

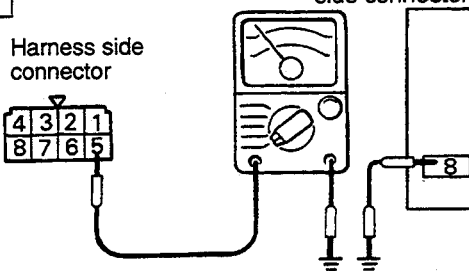
~~**OK**~~ →

Repair the harness.
(A7–Ignition switch-IG) or check the ignition switch.

5

A Harness side connector

ECM harness side connector



Z 01A0354

Check for an open circuit or a short-circuit to ground between the MFI relay and the engine control module.

- MFI relay connector: Disconnected
- Engine control module connector: Disconnected

OK →

6

~~**OK**~~ →

Repair the harness.
(A5–8)

6

A Harness side connector

Z9FU0024

Check for continuity between the fuel pump and the checking terminal.

- Fuel pump connector: Disconnected
- MFI relay connector: Disconnected

OK → **7**

OK → Repair the harness. (A1-C1)

7

B Harness side connector

A Harness side connector

Z6AF0162

Check for an open circuit or a short-circuit to ground between the MFI relay and the fuel pump.

- MFI relay connector: Disconnected
- Fuel pump connector: Disconnected

OK → **8**

OK → Repair the harness. (A1-B2)

8

A Harness side connector

Z6FU1753

Measure the power supply voltage of the fuel pump.

- MFI relay connector: Connected
- Engine control module connector: Connected

Engine	Voltage (V)
Cranking	8 or higher
Racing	B+

OK → **STOP**

OK → MFI relay or engine control module is defective.

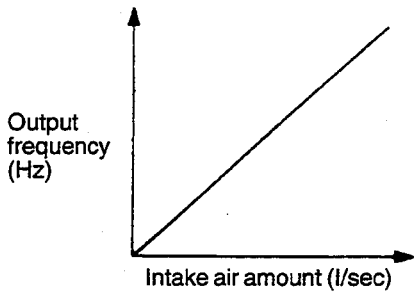
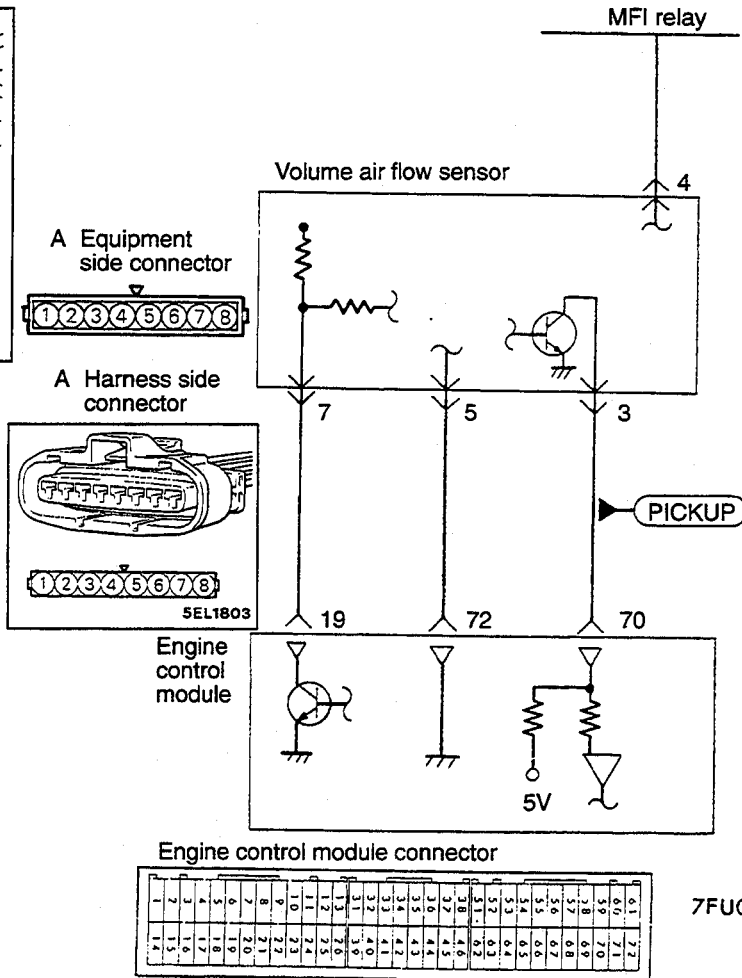
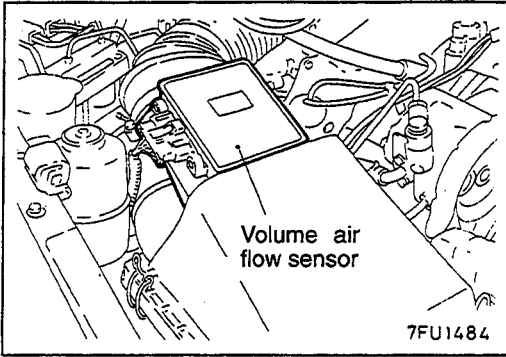
MULTIPOINT FUEL INJECTION (MFI) RELAY INSPECTION

Refer to P.13A-121.

FUEL PUMP INSPECTION

Refer to P.13A-7.

VOLUME AIR FLOW SENSOR



16Z451

OPERATION

Refer to P.13A-56.

TROUBLESHOOTING HINTS

Refer to P.13A-56.

INSPECTION

Using scan tool

Volume air flow sensor

Function	Item No.	Data display	Check conditions	Engine conditions	Standard value Hz
Data reading	12	Sensor detection air flow (frequency)	<ul style="list-style-type: none"> • Engine coolant temperature: 80–95°C (176–203°F) • Lights and all accessories: OFF • Transmission: P range • Steering wheel: Straight forward position 	Idling (700 rpm)	27–53 <Up to 1994 models, California-DOHC-From 1995 models> 25–51 <SOHC> 29–55 <Federal-DOHC-From 1995 models>
				2,000 rpm	60–100 <Up to 1994 models, California-DOHC-From 1995 models>
				2,500 rpm	74–114 <Federal-SOHC> 68–108 <California-SOHC> 91–131 <Federal-DOHC-From 1995 models>
				Racing	Frequency increased by racing.

NOTE

When the vehicle is new [driven approximately 500 km (300 miles) or less], the volume air flow sensor output frequency may be approximately 10% higher than indicated above.

Volume air flow sensor reset signal

Function	Item No.	Data display	Inspection condition	Engine state	Normal display
Data list	34	Reset signal condition	<ul style="list-style-type: none"> • Engine warming up 	Idling (700 rpm)	ON
				2,500 rpm	OFF

Volumetric efficiency

Function	Item No.	Data display	Inspection condition	Engine condition	Standard value
Data list	37	Volumetric efficiency	<ul style="list-style-type: none"> • Engine coolant temperature: 80–95°C (176–203°F) • Lights, electrical cooling fan and all accessories: OFF • Transmission: P range • Steering wheel: Straight forward position 	Idling (700 rpm)	15–35%
				2,500 rpm	15–35%
				Racing	Volumetric efficiency increases according to amount of racing.

Wave Pattern Inspection Using an Analyzer

Refer to P.13A-57.

HARNESS INSPECTION

1

A Harness side connector

B Control relay harness side connector

Z6AF0052

Check for continuity between the volume air flow sensor and the MFI relay.

- MFI relay connector: Disconnected
- Volume air flow sensor connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

~~**OK**~~ → Repair the harness. (A4-B2)

2

A Harness side connector

Z7FU0657

Check for continuity in the ground circuit.

- Connector: Disconnected

OK → **3**

~~**OK**~~ → Repair the harness. (A5-72)

3

A Harness side-connector

Engine control module harness side connector

Y7FU1222

Check for an open or short-circuit between the volume air flow sensor and the engine control module.

- Volume air flow sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → **4**

~~**OK**~~ → Repair the harnesses. (A3-70) (A7-19)

4

A Harness side connector

Z7FU0656

Measure the applied voltage.

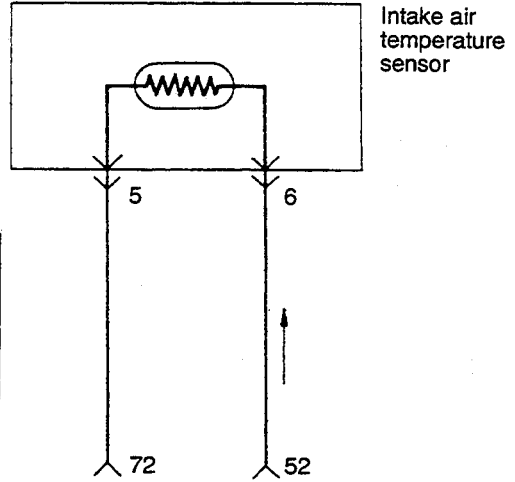
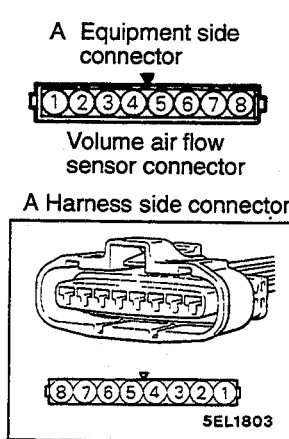
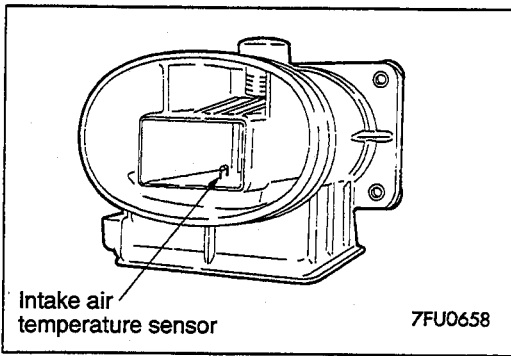
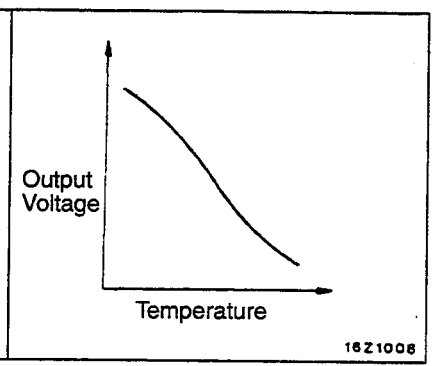
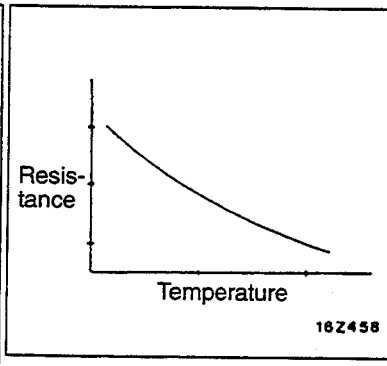
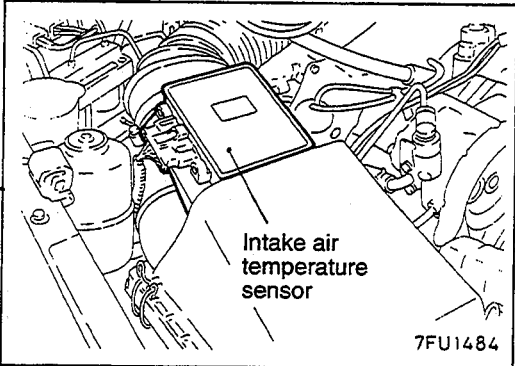
- Volume air flow sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: "ON"

Voltage (V)
4.8-5.2

OK → **STOP**

~~**OK**~~ → Replace the engine control module.

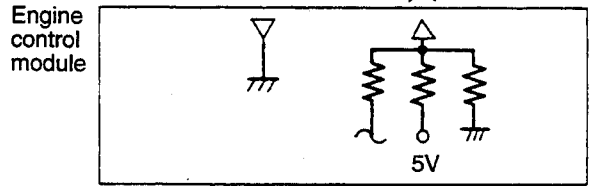
INTAKE AIR TEMPERATURE SENSOR



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101



7FU0659 7FU1689

OPERATION

Refer to P.13A-60.

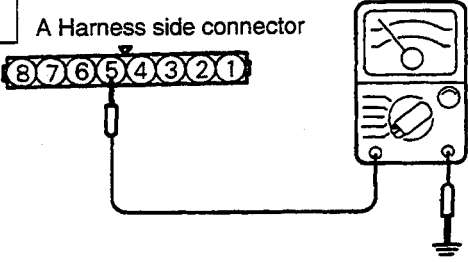
TROUBLESHOOTING HINTS

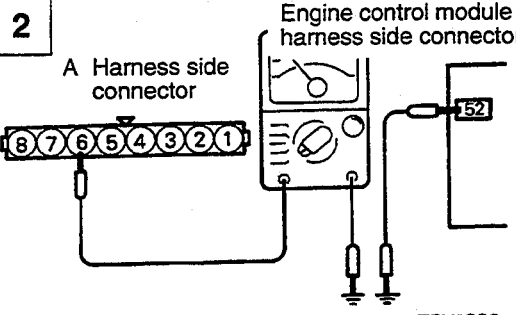
Refer to P.13A-60.

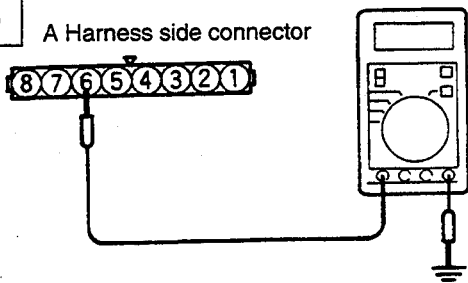
INSPECTION

Refer to P.13A-61.

HARNESS INSPECTION

<p>1 A Harness side connector</p>  <p style="text-align: right; font-size: small;">Z7FU0657</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Volume air flow sensor connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">2</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Repair the harness. (A5-72)</p> </div> </div>
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<p>2 A Harness side connector</p>  <p style="text-align: right; font-size: small;">Y 7FU1223</p>	<p>Engine control module harness side connector</p> <p>Check for an open or short-circuit between the intake air temperature sensor and the engine control module.</p> <ul style="list-style-type: none"> • Volume air flow sensor connector: Disconnected • Engine control module connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">3</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Repair the harness. (A6-52)</p> </div> </div>
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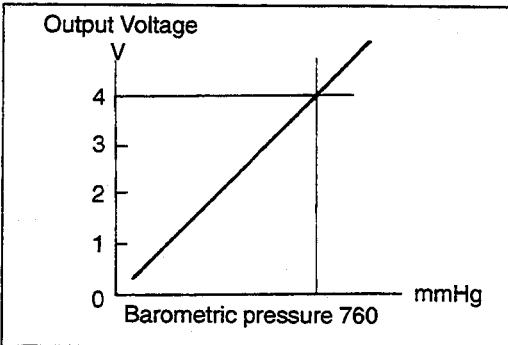
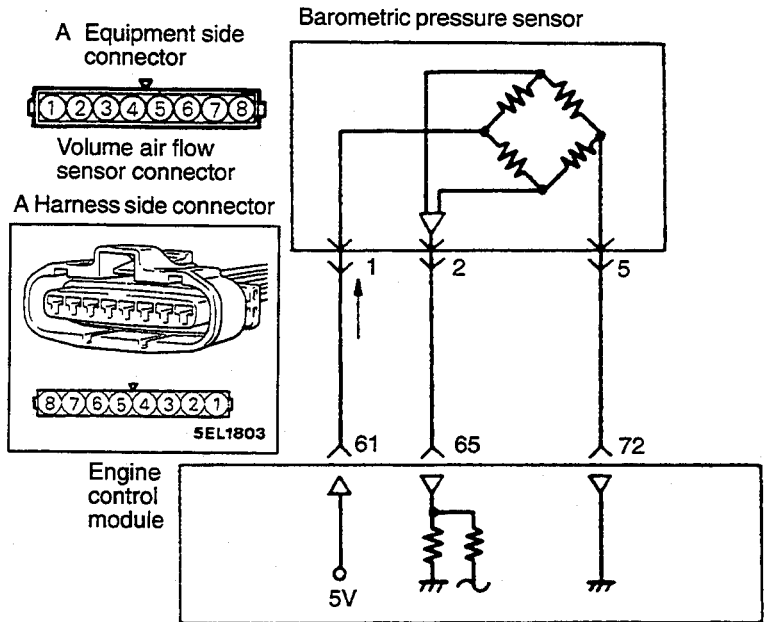
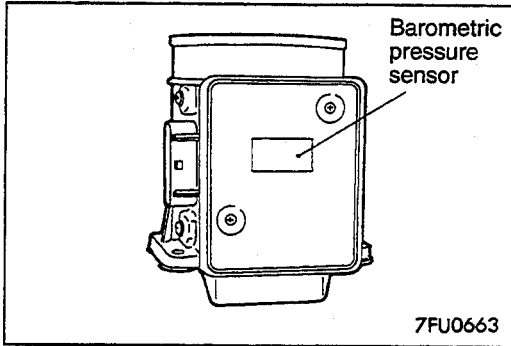
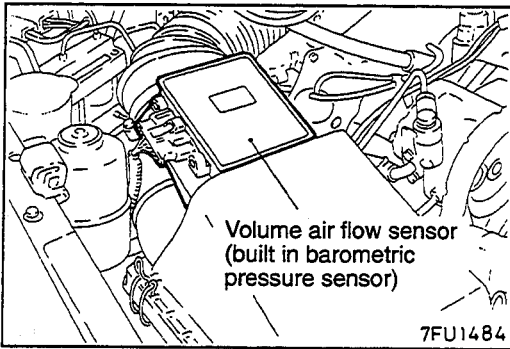
<p>3 A Harness side connector</p>  <p style="text-align: right; font-size: small;">Z7FU0660</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> • Volume air flow sensor connector: Disconnected • Ignition switch: ON • Engine control module connector: Connected <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">4.5-4.9</td> </tr> </table>	Voltage (V)	4.5-4.9	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; text-align: center;">STOP</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="font-size: 2em; margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Repair the engine control module.</p> </div> </div>
Voltage (V)				
4.5-4.9				

SENSOR INSPECTION

Refer to P.13A-61.

110005816

BAROMETRIC PRESSURE SENSOR



7FU0664

Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1690

OPERATION

Refer to P.13A-62.

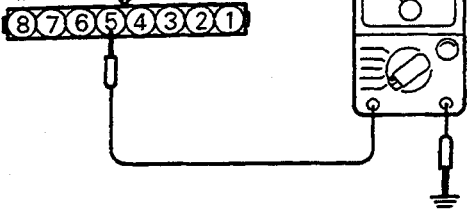
TROUBLESHOOTING HINTS

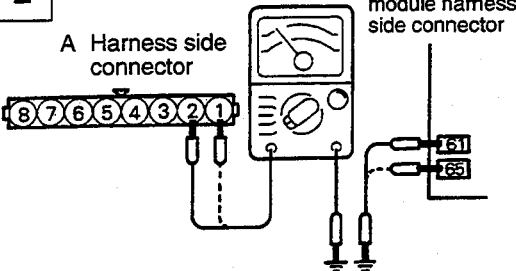
Refer to P.13A-63.

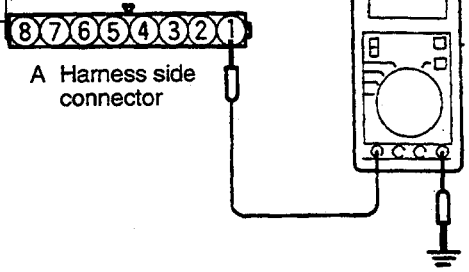
INSPECTION

Refer to P.13A-63.

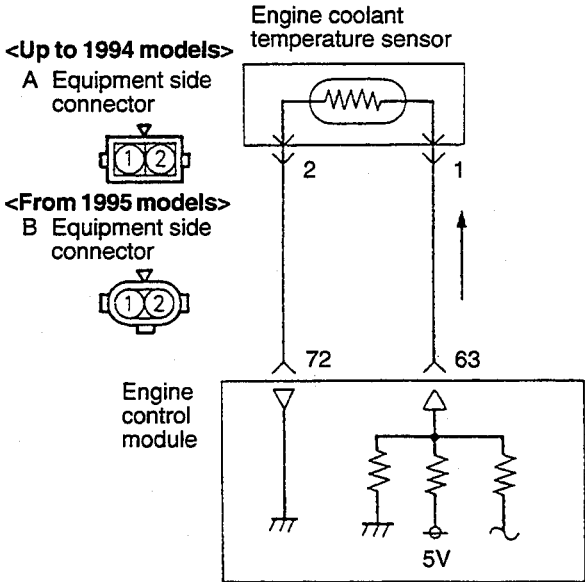
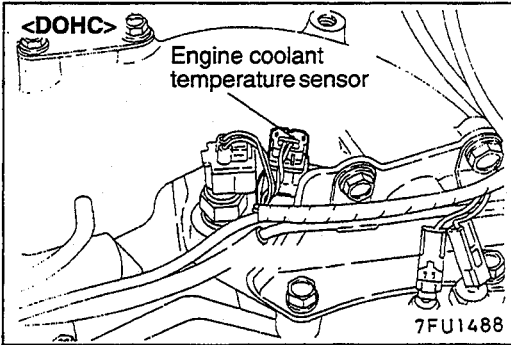
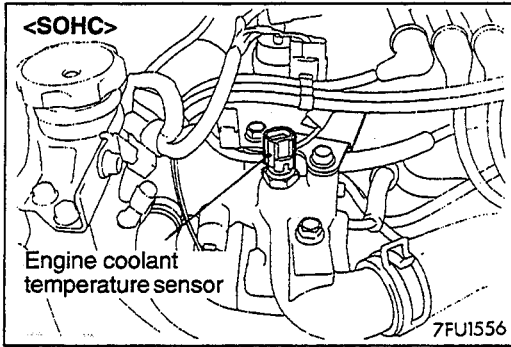
HARNES INSPECTION

<p>1</p> <p>A Harness side connector</p>  <p style="text-align: right;">Z7FU0657</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Volume air flow sensor connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">2</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Repair the harness. (A5-72)</p> </div> </div>
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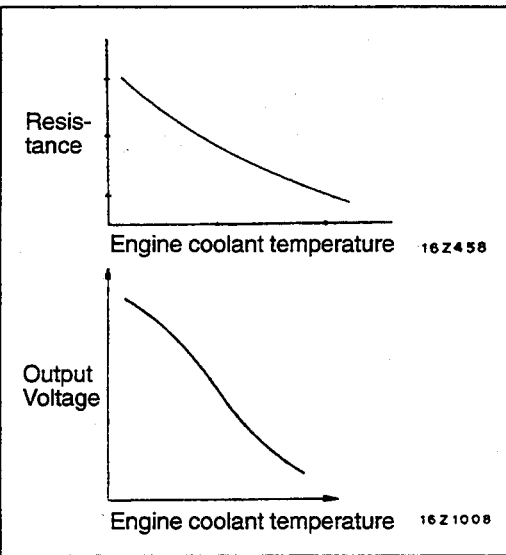
<p>2</p> <p>A Harness side connector</p>  <p style="text-align: right;">Y7FU1224</p>	<p>Check for an open or short-circuit between the barometric pressure sensor and the engine control module.</p> <ul style="list-style-type: none"> • Volume air flow sensor connector: Disconnected • Engine control module connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">3</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Repair the harnesses. (A2-65) (A1-61)</p> </div> </div>
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<p>3</p> <p>A Harness side connector</p>  <p style="text-align: right;">Z7FU0665</p>	<p>Measure the power supply voltage of the barometric pressure sensor.</p> <ul style="list-style-type: none"> • Volume air flow sensor connector: Disconnected • Ignition switch: ON • Engine control module connector: Connected <table border="1" style="margin-top: 10px; width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">4.8-5.2</td> </tr> </table>	Voltage (V)	4.8-5.2	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <div style="font-size: 1.5em; margin-bottom: 5px;">STOP</div> </div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Replace the engine control module.</p> </div> </div>
Voltage (V)				
4.8-5.2				

ENGINE COOLANT TEMPERATURE SENSOR



9FU0252



Engine control module

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61

9FU0101

7FU1691

OPERATION

Refer to P.13A-64.

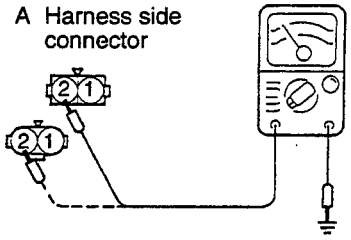


TROUBLESHOOTING HINTS

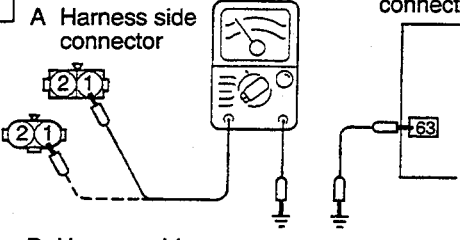


Refer to P.13A-64.

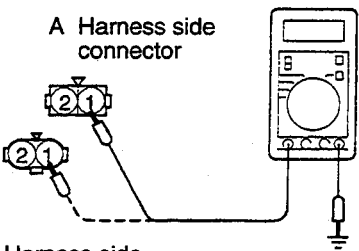



INSPECTION

Refer to P.13A-64.

HARNESS INSPECTION

<p>1</p> <p>A Harness side connector</p>  <p>B Harness side connector</p> <p style="text-align: right;">9FU0253</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center; gap: 10px;"> <div style="text-align: center;">  </div> <div style="font-size: 2em;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center; margin: 0 auto;">2</div> </div> <div style="display: flex; align-items: center; justify-content: center; gap: 10px; margin-top: 10px;"> <div style="text-align: center;">  </div> <div style="font-size: 2em;">→</div> <div style="text-align: left; padding-left: 10px;"> <p>Repair the harness. (A2-72) (B2-72)</p> </div> </div>
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<p>2</p> <p>Engine control module harness side connector</p> <p>A Harness side connector</p>  <p>B Harness side connector</p> <p style="text-align: right;">9FU0254</p>	<p>Check for an open or short-circuit between the engine coolant temperature sensor and the engine control module.</p> <ul style="list-style-type: none"> • Engine coolant temperature sensor connector: • Engine control module connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center; gap: 10px;"> <div style="text-align: center;">  </div> <div style="font-size: 2em;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center; margin: 0 auto;">3</div> </div> <div style="display: flex; align-items: center; justify-content: center; gap: 10px; margin-top: 10px;"> <div style="text-align: center;">  </div> <div style="font-size: 2em;">→</div> <div style="text-align: left; padding-left: 10px;"> <p>Repair the harness. (A1-63) (B1-63)</p> </div> </div>
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<p>3</p> <p>A Harness side connector</p>  <p>B Harness side connector</p> <p style="text-align: right;">9FU0255</p>	<p>Measure the power supply voltage.</p> <ul style="list-style-type: none"> • Engine coolant temperature sensor connector: Disconnected • Engine control module connector: Connected • Ignition switch: ON <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="padding: 2px;">Voltage (V)</td> </tr> <tr> <td style="padding: 2px; text-align: center;">4.5-4.9 V</td> </tr> </table>	Voltage (V)	4.5-4.9 V	<div style="display: flex; align-items: center; justify-content: center; gap: 10px;"> <div style="text-align: center;">  </div> <div style="font-size: 2em;">→</div> <div style="text-align: center;">  </div> </div> <div style="display: flex; align-items: center; justify-content: center; gap: 10px; margin-top: 10px;"> <div style="text-align: center;">  </div> <div style="font-size: 2em;">→</div> <div style="text-align: left; padding-left: 10px;"> <p>Replace the engine control module.</p> </div> </div>
Voltage (V)				
4.5-4.9 V				

SENSOR INSPECTION

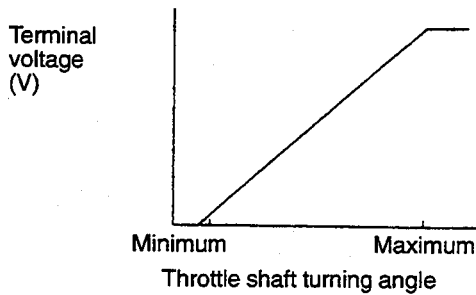
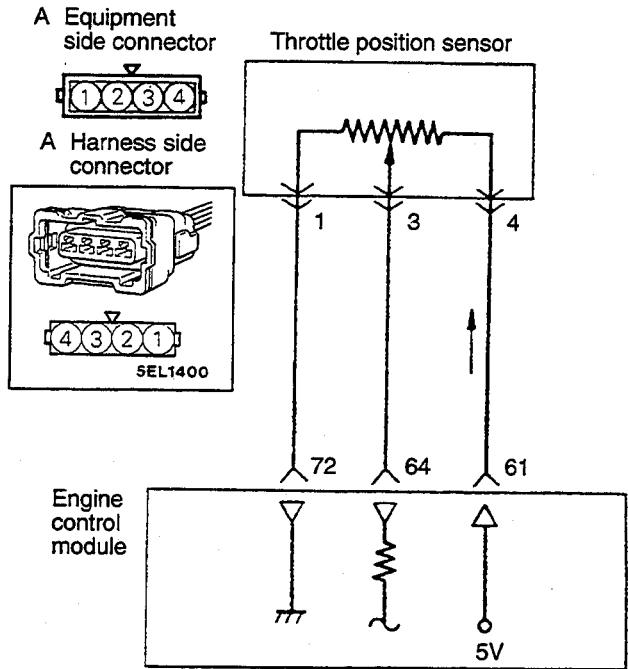
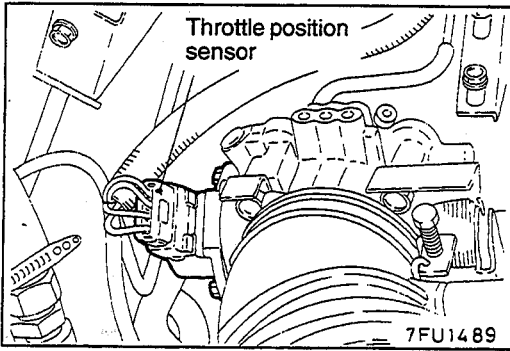
Refer to P.13A-65.

INSTALLATION

Refer to P.13A-65.

110005818

THROTTLE POSITION SENSOR



16Z461

7FU0672

Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1692

OPERATION

Refer to P.13A-66.

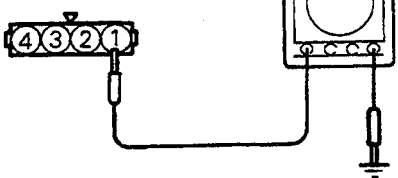
TROUBLESHOOTING HINTS

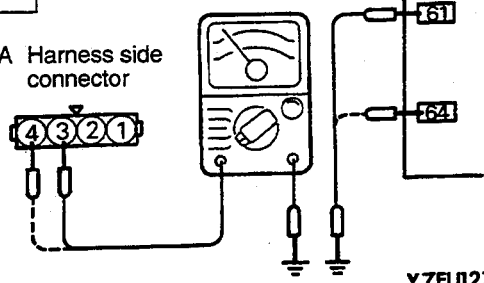
Refer to P.13A-66.

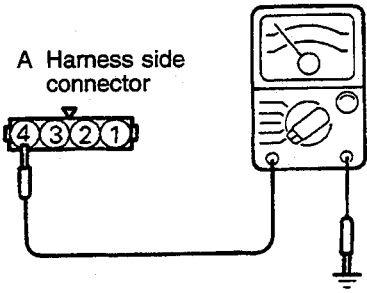
INSPECTION

Refer to P.13A-67.

HARNESS INSPECTION

<p>1</p> <p>A Harness side connector</p>  <p style="text-align: right; font-size: small;">Z6FU1241</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Throttle position sensor connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">2</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Repair the harness. (A1-72)</p> </div> </div>
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<p>2</p> <p>A Harness side connector</p> <p>Engine control module harness side connector</p>  <p style="text-align: right; font-size: small;">Y7FU1270</p>	<p>Check for an open or short-circuit between the throttle position sensor and the engine control module.</p> <ul style="list-style-type: none"> • Throttle position sensor connector: Disconnected • Engine control module connector: Disconnected • All control module connectors which are connected to the throttle position sensor: Disconnected 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">3</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Repair the harnesses. (A3-64) (A4-61)</p> </div> </div>
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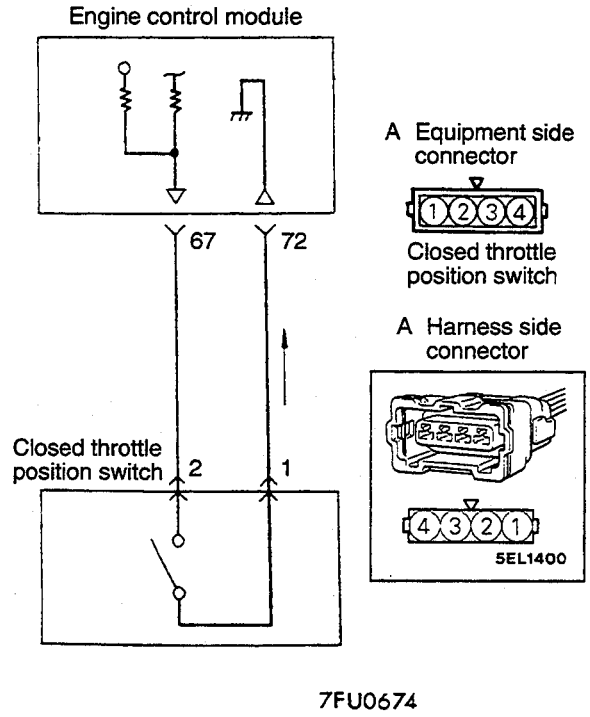
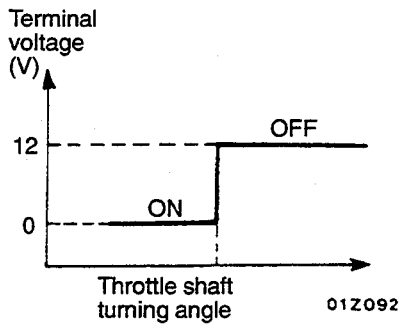
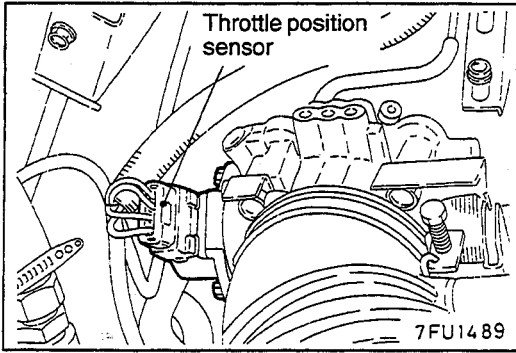
<p>3</p> <p>A Harness side connector</p>  <p style="text-align: right; font-size: small;">Z6FU1242</p>	<p>Measure the applied voltage.</p> <ul style="list-style-type: none"> • Throttle position sensor connector: Disconnected • Engine control module connector: Connected • Ignition switch: ON <table border="1" style="margin: 10px auto; width: 80%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">4.8-5.2</td> </tr> </table>	Voltage (V)	4.8-5.2	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <div style="font-size: 1.5em; margin-bottom: 5px;">STOP</div> </div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="text-align: left;"> <p>Replace the engine control module.</p> </div> </div>
Voltage (V)				
4.8-5.2				

SENSOR INSPECTION

Refer to P.13A-67.

110005819

CLOSED THROTTLE POSITION SWITCH



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1693

OPERATION

Refer to P.13A-68.

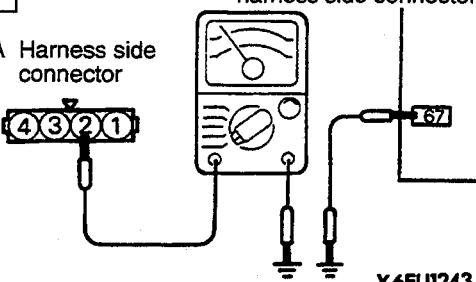
TROUBLESHOOTING HINTS

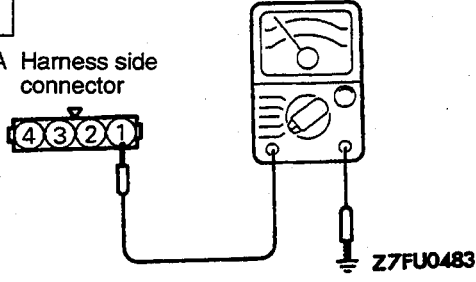
Refer to P.13A-69.

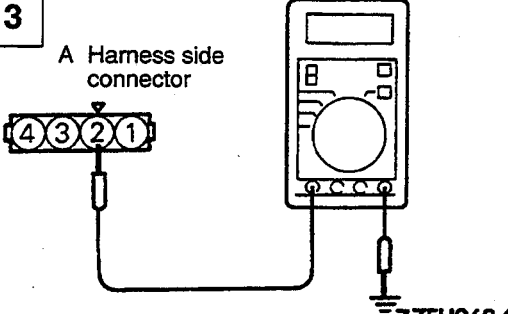
INSPECTION

Refer to P.13A-69.

HARNESS INSPECTION

<p>1</p> <p>A Harness side connector</p>  <p style="text-align: right;">Y6FU1243</p>	<p>Engine control module harness side connector</p> <p>Check for an open or short-circuit between the closed throttle position switch and the engine control module.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Throttle position sensor connector: Disconnected 	<p style="text-align: center; font-size: 2em;">OK</p> <p style="text-align: center;">→</p> <div style="border: 1px solid black; width: 30px; height: 30px; text-align: center; line-height: 30px; margin: 0 auto;">2</div> <p style="text-align: center; font-size: 2em;">OK</p> <p style="text-align: center;">→</p> <p>Repair the harness. (A2-67)</p>
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<p>2</p> <p>A Harness side connector</p>  <p style="text-align: right;">Z7FU0483</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Throttle position sensor connector: Disconnected 	<p style="text-align: center; font-size: 2em;">OK</p> <p style="text-align: center;">→</p> <div style="border: 1px solid black; width: 30px; height: 30px; text-align: center; line-height: 30px; margin: 0 auto;">3</div> <p style="text-align: center; font-size: 2em;">OK</p> <p style="text-align: center;">→</p> <p>Repair the harness. (A1-72)</p>
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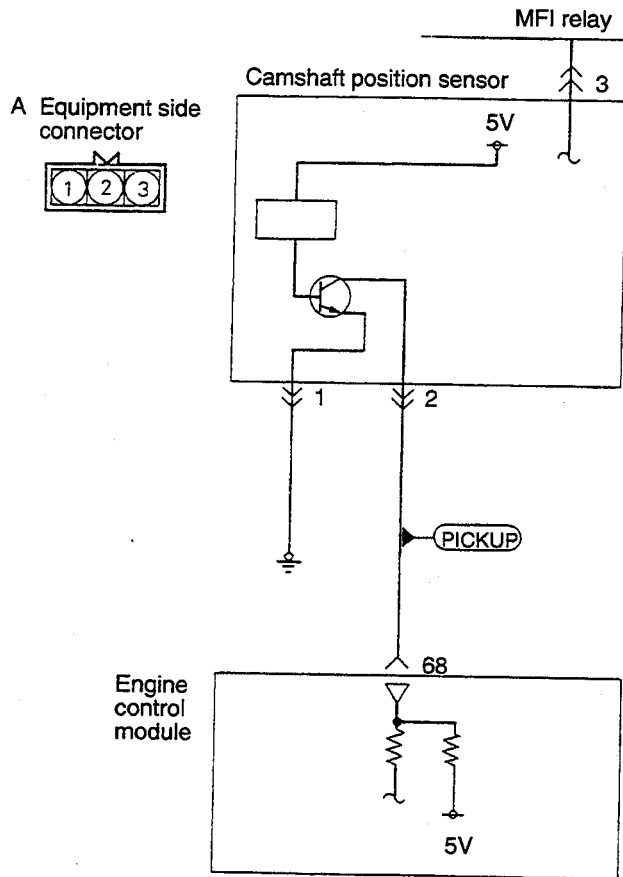
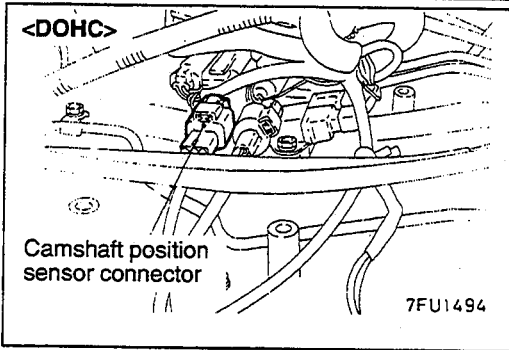
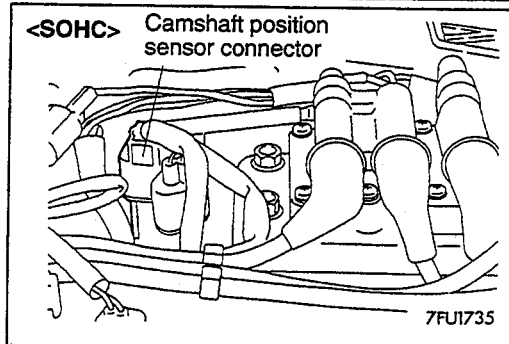
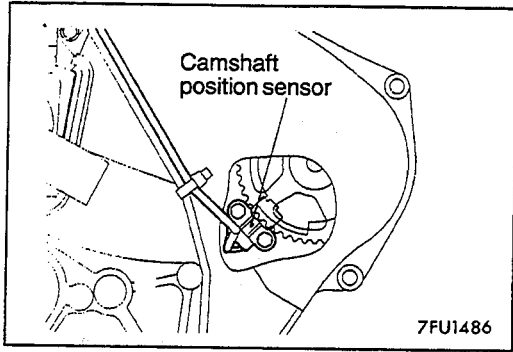
<p>3</p> <p>A Harness side connector</p>  <p style="text-align: right;">Z7FU0684</p>	<p>Measure the power supply voltage of the closed throttle position switch.</p> <ul style="list-style-type: none"> • Throttle position sensor connector: Disconnected • Engine control module connector: Connected • Ignition switch: ON <table border="1" style="width: 100%; margin-top: 10px;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">4 or higher</td> </tr> </table>	Voltage (V)	4 or higher	<p style="text-align: center; font-size: 2em;">OK</p> <p style="text-align: center;">→</p> <div style="border: 1px solid black; width: 40px; height: 40px; margin: 0 auto; text-align: center; line-height: 40px;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin: 0 auto; text-align: center; line-height: 20px;">STOP</div> </div> <p style="text-align: center; font-size: 2em;">OK</p> <p style="text-align: center;">→</p> <p>Replace the engine control module.</p>
Voltage (V)				
4 or higher				

SENSOR INSPECTION

Refer to P.13A-69.

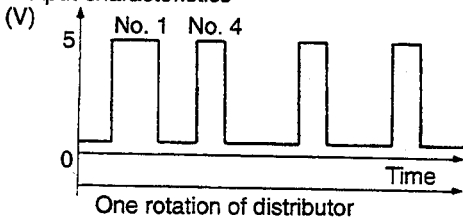
110005820

CAMSHAFT POSITION SENSOR



6AF0054

Output characteristics



7FU0494

Engine control module

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1694

OPERATION

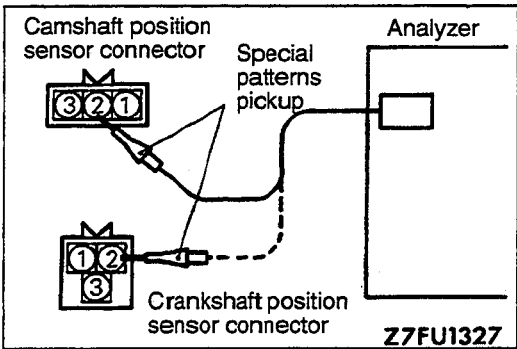
- The camshaft position sensor senses the top dead center on compression stroke, converts it into a pulse signal and inputs it to the engine control module, which then computes the fuel injection sequence, etc. based on the input signal.
- Power to the camshaft position sensor is supplied from the multipoint fuel injection relay and is grounded to the body. The camshaft position sensor generates a pulse signal as it repeatedly connects to and disconnects from the 5 V voltage supplied from the engine control module and ground.

TROUBLESHOOTING HINTS

- Hint 1: If the camshaft position sensor does not function correctly, correct sequential injection is not being carried out, so that the engine may stall, run irregularly at idle or fail to accelerate normally.
- Hint 2: If the sensor outputs a pulse signal when the ignition switch is turned ON (without starting the engine), the cause is probably a malfunction of the camshaft position sensor or engine control module.

INSPECTION

Wave pattern inspection with analyzer



Measurement Method

- (1) Disconnect the connector of the camshaft position sensor, and connect the special tool (test harness: MB991348) across the disconnected connector parts. (Connect the tool to all terminals.)
- (2) Connect the special patterns pickup of the analyzer to the terminal (2) of the camshaft position sensor connector (in order to inspect the signal waveform of the camshaft position sensor).
- (3) Disconnect the connector of the crankshaft position sensor, and connect the special tool (test harness: MD998478) across the disconnected connector parts.
- (4) Connect the special patterns pickup of the analyzer to the terminal (2) of the crankshaft position sensor connector (in order to inspect the signal waveform of the crankshaft position sensor).

Standard wave pattern

Refer to P.13A-71.

Wave pattern observation points

Refer to P.13A-72.

Examples of abnormal wave patterns

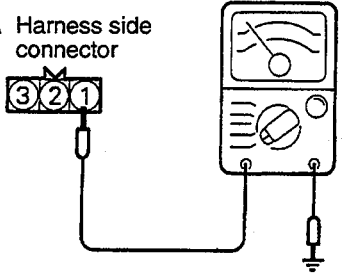
Refer to P.13A-72.

HARNESS INSPECTION

<p>1</p> <p>B MFI relay harness side connector</p> <p>A Harness side connector</p> <p style="text-align: right;">Z6AF0056</p>	<p>Check for continuity between the camshaft position sensor and the MFI relay.</p> <ul style="list-style-type: none"> • MFI relay connector: Disconnected • Camshaft position sensor connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> • Insert the probes of the circuit tester into both ends of the harness. 	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; align-items: center; margin-bottom: 10px;"> <div style="font-size: 2em; font-weight: bold; margin-right: 10px;">OK</div> <div style="font-size: 2em;">→</div> <div style="border: 1px solid black; padding: 5px 10px; margin-left: 10px;">2</div> </div> <div style="display: flex; align-items: center;"> <div style="font-size: 2em; font-weight: bold; margin-right: 10px;">OK</div> <div style="font-size: 2em;">→</div> <div style="margin-left: 10px;"> <p>Repair the harness. (A3–B3)</p> </div> </div> </div>
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2

A Harness side connector



Z6AF0057

Check for continuity in the ground circuit.

- Camshaft position sensor connector: Disconnected

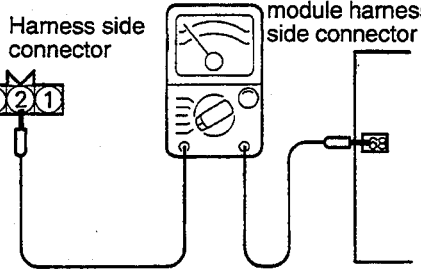
OK → **3**

OK → Repair the harness. (A1–Ground)

3

A Harness side connector

Engine control module harness side connector



Y 7FU1313

Check for an open circuit or a short-circuit to ground between the camshaft position sensor and engine control module.

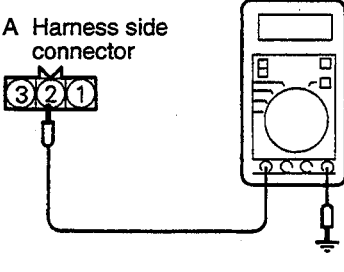
- Engine control module connector: Disconnected
- Camshaft position sensor connector: Disconnected

OK → **4**

OK → Repair the harness. (A2–68)

4

A Harness side connector



Z6AF0059

Measure the applied voltage.

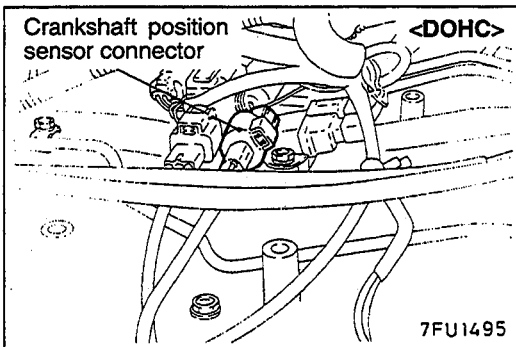
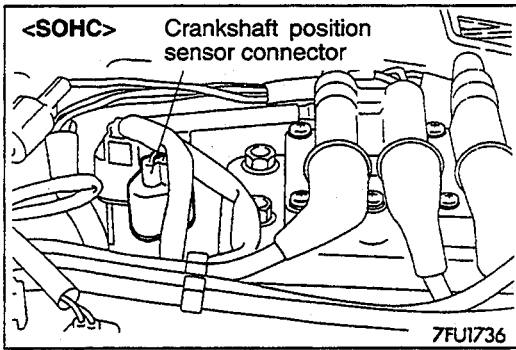
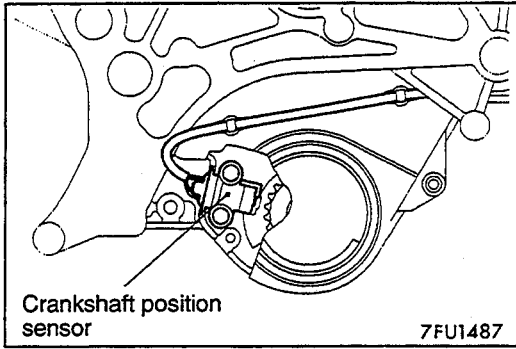
- Camshaft position sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

Voltage (V)
4.8–5.2

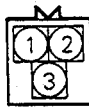
OK → **STOP**

OK → Repair the engine control module.

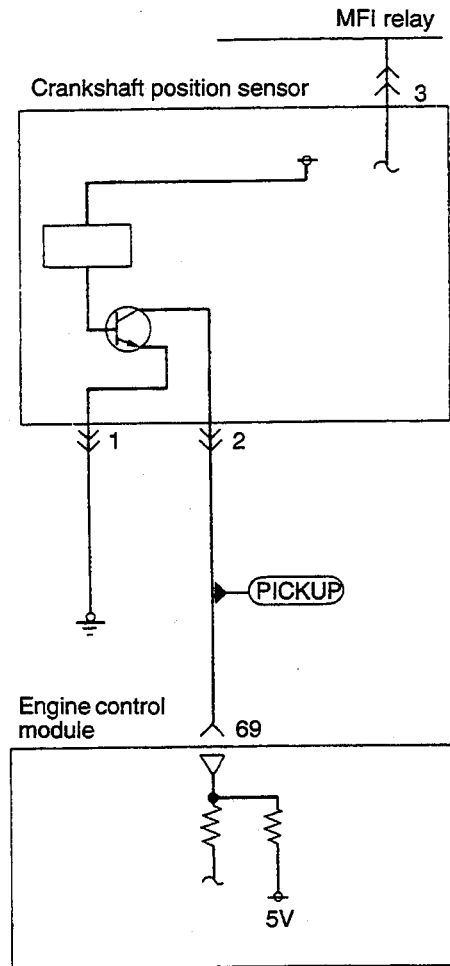
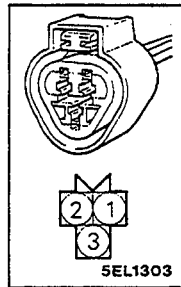
CRANKSHAFT POSITION SENSOR



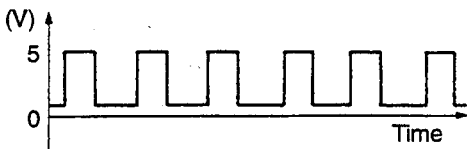
A Equipment side connector



A Harness side connector



6AF0060



7FU0682

Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0F01

7FU1695

OPERATION

Refer to P.13A-74.

TROUBLESHOOTING HINTS

Refer to P.13A-74.

INSPECTION

Using Scan Tool

Function	Item No.	Data display	Check conditions	Check description	Normal condition
Data reading	22	Cranking rpm	<ul style="list-style-type: none"> • Engine is being cranked. • Tachometer connected. (The tachometer is used to check the intermittent pulsation of the ignition coil's primary current.) 	Compare the cranking rpm and the rpm indicated by the scan tool.	Both agree.

Function	Item No.	Data display	Check conditions	Engine coolant temperature °C (°F)	Standard value rpm
Data reading	22	Idling rpm	<ul style="list-style-type: none"> • Engine: Idling • Closed throttle position switch: ON 	When -20 (-4)	1,275–1,475 <Up to 1994 models, Federal–From 1995 models> 1,300–1,500 <California–From 1995 models>
				When 0 (32)	1,225–1,425 <Up to 1994 models, Federal–From 1995 models> 1,300–1,500 <California–From 1995 models>
				When 20 (68)	1,100–1,300 <Up to 1994 models, Federal–From 1995 models> 1,300–1,500 <California–From 1995 models>
				When 40 (104)	950–1,150 <Up to 1994 models, Federal–From 1995 models> 1,050–1,250 <California–From 1995 models>
				When 80 (176)	600–800

Wave Pattern Inspection Using a Analyzer

Refer to the camshaft position sensor section (P.13A-71.)

HARNES INSPECTION

1

A Harness side connector

B MFI relay harness side connector

Z6AF0061

Check for continuity between the crankshaft position sensor and the MFI relay.

- MFI relay connector: Disconnected
- Crankshaft position sensor connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

~~OK~~ → Repair the harness. (A3-B3)

2

A Harness side connector

Z6AF0062

Check for continuity in the ground circuit.

- Crankshaft position sensor connector: Disconnected

OK → **3**

~~OK~~ → Repair the harness. (A1-Ground)

3

A Harness side connector

Engine control module harness side connector

Z7FU1313

Check for an open circuit or a short-circuit to ground between the crankshaft position sensor and the engine control module.

- Engine control module connector: Disconnected
- Crankshaft position sensor connector: Disconnected

OK → **4**

~~OK~~ → Repair the harness. (A2-69)

4

A Harness side connector

Z6AF0064

Measure the applied voltage.

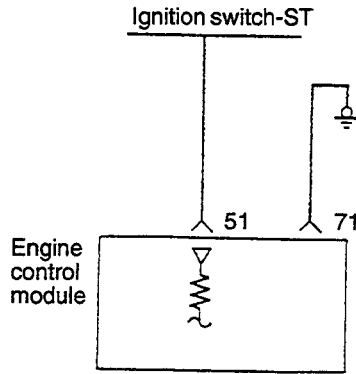
- Crankshaft position sensor connector: Disconnected
- Engine control module connector: Disconnected
- Ignition switch: ON

Voltage (V)
4.8-5.2

OK → STOP

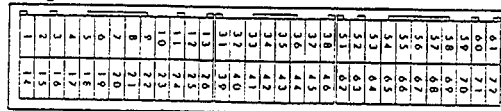
~~OK~~ → Replace the engine control module.

IGNITION SWITCH-ST <M/T>



1FU0638

Engine control module connector



9FU0101

7FU1744

OPERATION

Refer to P.13A-76.

INSPECTION

Refer to P.13A-77.

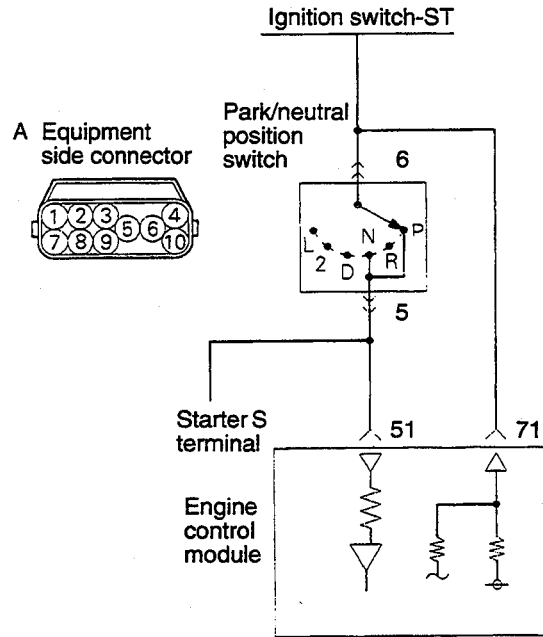
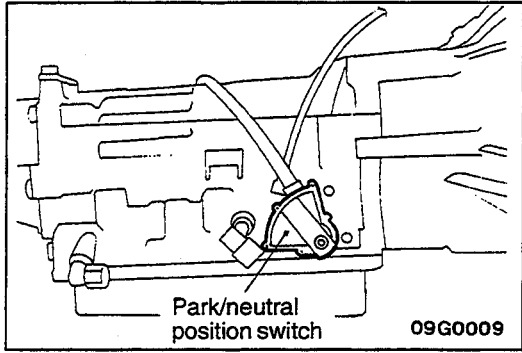
HERNESS INSPECTION

1	<p>Engine control module harness side connector</p> <p style="text-align: right;">Z 6FU1258</p>	<p>Measure the engine control module input voltage.</p> <ul style="list-style-type: none"> Engine control module connector: Disconnected Ignition switch: START <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">8 or higher</td> </tr> </table>	Voltage (V)	8 or higher	<p>OK → 2</p> <p>✗ → Repair the harness. (51 – Ignition switch)</p>
Voltage (V)					
8 or higher					

2	<p>Engine control module harness side connector</p> <p style="text-align: right;">Z 6FU1259</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> Engine control module connector: Disconnected 	<p>OK → STOP</p> <p>✗ → Repair the harness (71 – Ground)</p>
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IGNITION SWITCH-ST AND PARK/NEUTRAL POSITION SWITCH <AT>

110005822



7FU1528

Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1696

OPERATION

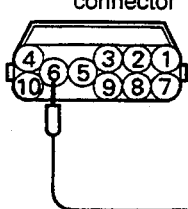
Refer to P.13A-78.

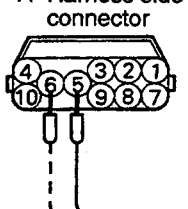
TROUBLESHOOTING HINTS

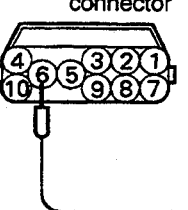
Refer to P.13A-79.

INSPECTION

Refer to P.13A-79.

<p>1</p> <p>A Harness side connector</p>  <p style="text-align: right;">Z7FU1529</p>	<p>Measure the power supply voltage of the park/neutral position switch.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Park/neutral position switch connector: Disconnected • Ignition switch: START <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr><td style="text-align: center;">Voltage (V)</td></tr> <tr><td style="text-align: center;">B+</td></tr> </table>	Voltage (V)	B+	<p>OK →</p> <p>✗ →</p>	<p style="text-align: center;">2</p> <p>Check the power supply circuit.</p>
Voltage (V)					
B+					

<p>2</p> <p>A Harness side connector</p>  <p style="text-align: right;">Z7FU1530</p>	<p>Check for continuity between the park/neutral position switch and the engine control module.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Park/neutral position switch connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> • Touch the ohmmeter probes to both ends of the harness. 	<p>OK →</p> <p>✗ →</p>	<p style="text-align: center;">3</p> <p>Repair the harnesses. (A5-51) (A6-71)</p>
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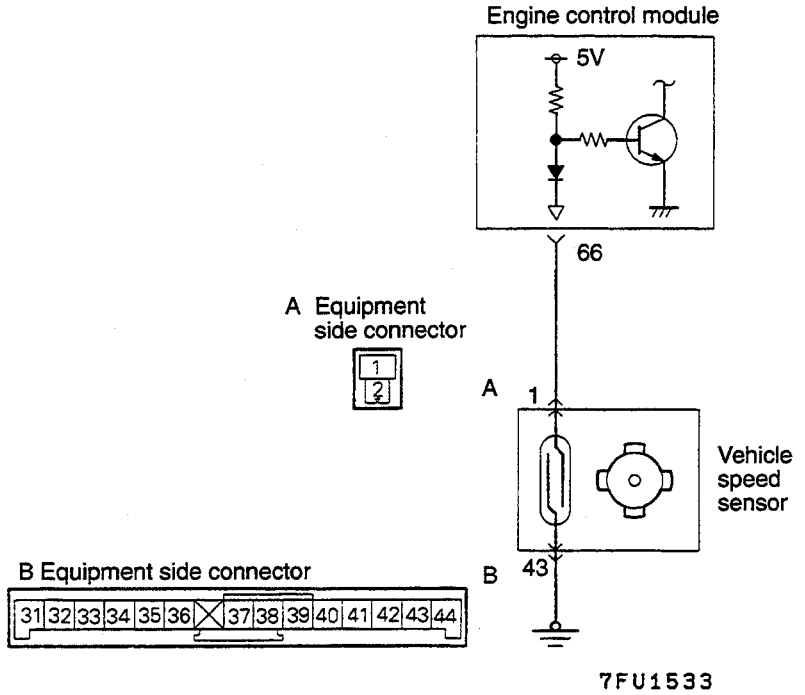
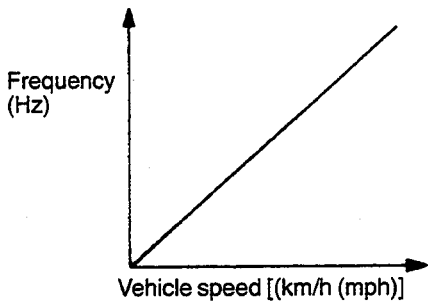
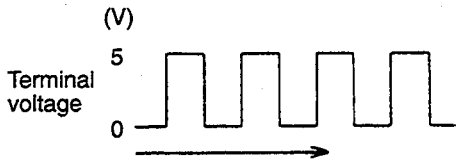
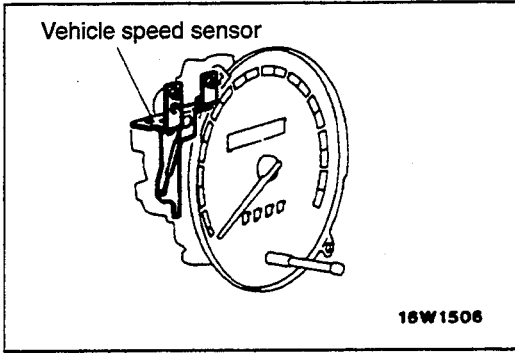
<p>3</p> <p>A Harness side connector</p>  <p style="text-align: right;">Z7FU1529</p>	<p>Measure the park/neutral position switch terminal input voltage.</p> <ul style="list-style-type: none"> • Engine control module connector: Connected • Park/neutral position switch connector: Disconnected • Ignition switch: ON <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <tr><td style="text-align: center;">Voltage (V)</td></tr> <tr><td style="text-align: center;">B+</td></tr> </table>	Voltage (V)	B+	<p>OK →</p> <p>✗ →</p>	<p style="text-align: center;">STOP</p> <p>Replace the engine control module.</p>
Voltage (V)					
B+					

PARK/NEUTRAL POSITION SWITCH INSPECTION

Refer to GROUP 23 – Service Adjustment Procedures.

110005823

VEHICLE SPEED SENSOR



Engine control module connector

41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101
7FU1697

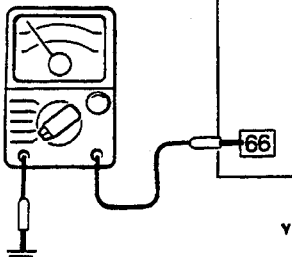
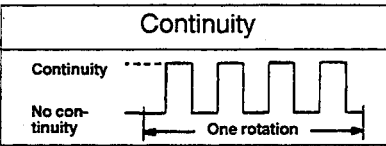
OPERATION

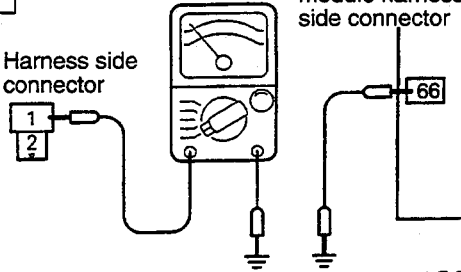
Refer to P.13A-80.

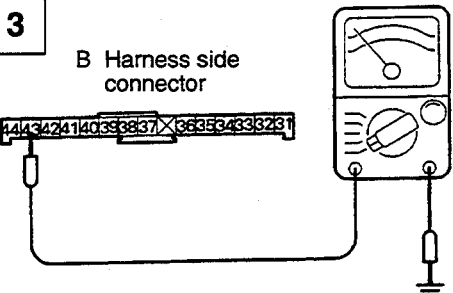
TROUBLESHOOTING HINTS

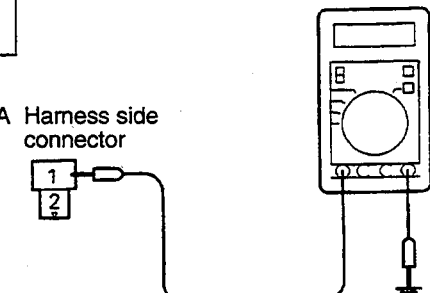
Refer to P.13A-80.

HARNES INSPECTION

1	<p>Engine control module harness side connector</p>  <p style="text-align: right;">Y01A0508</p>	<p>Check for continuity in the vehicle speed sensor output circuit.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Move the vehicle. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p style="text-align: center;">Continuity</p>  </div>	<p>OK → 4</p> <p>✗ → 2</p>
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2	<p>A Harness side connector</p> <p>Engine control module harness side connector</p>  <p style="text-align: right;">Z7FU1535</p>	<p>Check for an open or short-circuit between the vehicle speed sensor and the engine control module.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Vehicle speed sensor connector: Disconnected 	<p>OK → 3</p> <p>✗ → Repair the harness. (A1-66)</p>
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3	<p>B Harness side connector</p>  <p style="text-align: right;">Z7FU1532</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Vehicle speed sensor connector: Disconnected 	<p>OK → 4</p> <p>✗ → Repair the harness. (B43-Ground)</p>
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4	<p>A Harness side connector</p>  <p style="text-align: right;">Z7FU1531</p>	<p>Measure the applied voltage.</p> <ul style="list-style-type: none"> • Vehicle speed sensor connector: Disconnected • Engine control module connector: Disconnected • Ignition switch: ON <div style="border: 1px solid black; padding: 5px; margin-top: 10px; text-align: center;"> <p>Voltage (V)</p> <hr/> <p>4.5-4.9</p> </div>	<p>OK → STOP</p> <p>✗ → Replace the engine control module.</p>
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SENSOR INSPECTION

Refer to GROUP 54 – Meters and Gages.

HARNESS INSPECTION

1	<p>A Harness side connector</p> <p>Engine control module harness side connector</p> <p style="text-align: right;">Y 7FU1235</p>	<p>Check for an open or short-circuit between the power steering pressure switch and the engine control module.</p> <ul style="list-style-type: none"> • Power steering pressure switch connector: Disconnected • Engine control module connector: Disconnected 	<p>OK →</p> <p>OK →</p>	<p style="text-align: center;">2</p> <p>Repair the harness. (A1-37)</p>
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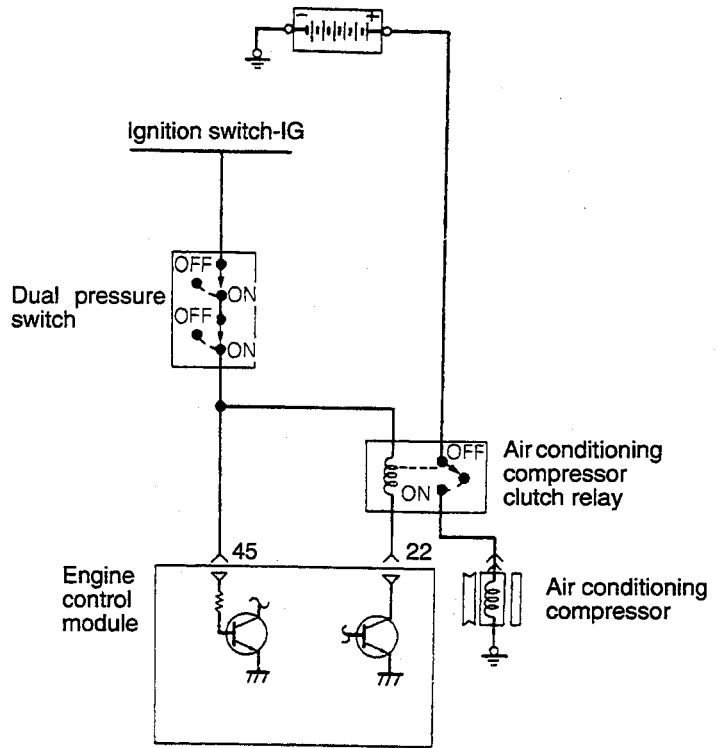
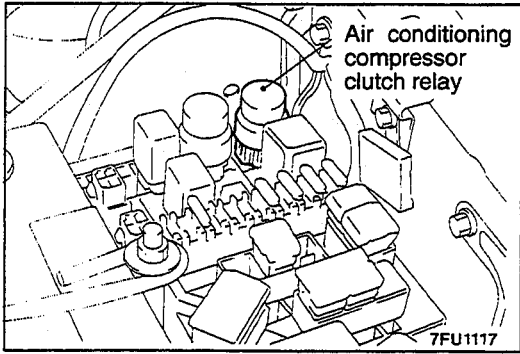
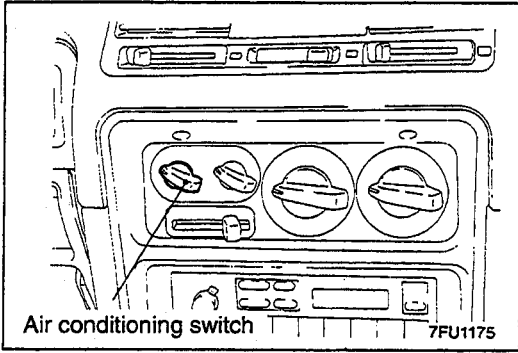
2	<p>A Harness side connector</p> <p style="text-align: right;">Y 7FU0505</p>	<p>Measure the applied voltage.</p> <ul style="list-style-type: none"> • Power steering pressure switch connector: Disconnected • Engine control module connector: Connected • Ignition switch: ON <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">B+</td> </tr> </table>	Voltage (V)	B+	<p>OK →</p> <p>OK →</p>	<p style="text-align: center;">STOP</p> <p>Replace the engine control module.</p>
Voltage (V)						
B+						

SENSOR INSPECTION

Refer to GROUP 37A – Service Adjustment Procedures.

AIR CONDITIONING SWITCH AND COMPRESSOR CLUTCH RELAY

110005825



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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7FU0821

9FU0101

7FU1699

OPERATION

Refer to P.13A-84.

TROUBLESHOOTING HINTS

Refer to P.13A-84.

INSPECTION

Refer to P.13A-85.

HARNESS INSPECTION

1

Engine control module harness side connector

Y01R0863

Measure the power supply voltage of the air conditioning circuit.

- Engine control module connector: Disconnect
- Ignition switch: ON
- Air conditioning switch: ON

Voltage (V)	
6 or higher	

OK

→

STOP

OK

→

Check the air conditioning circuit.

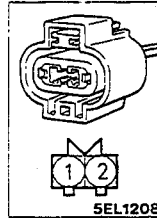
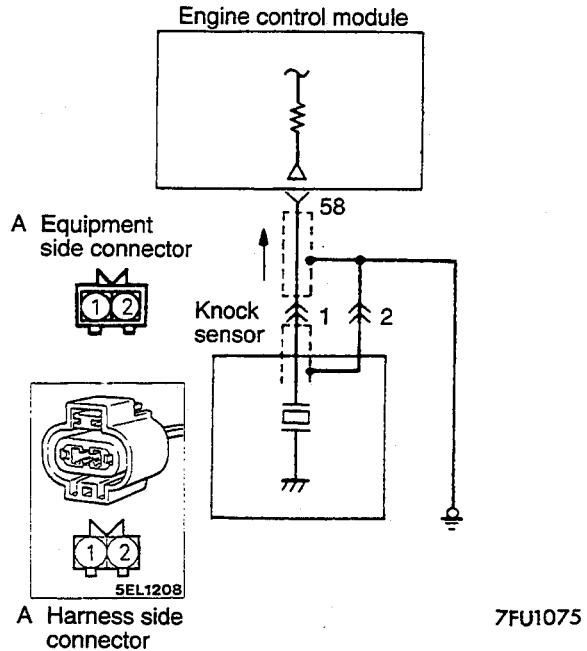
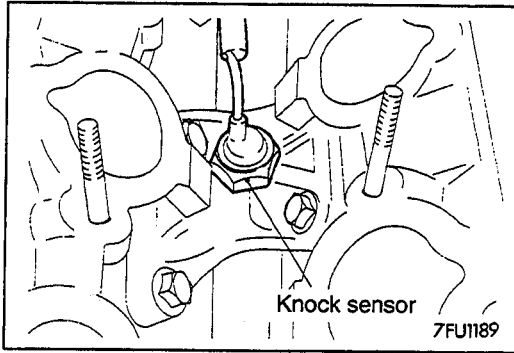
AIR CONDITIONING INSPECTION

Refer to GROUP 55 – Service Adjustment Procedures.

TSB Revision

110005826

KNOCK SENSOR <DOHC>



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101 7FU1700

OPERATION

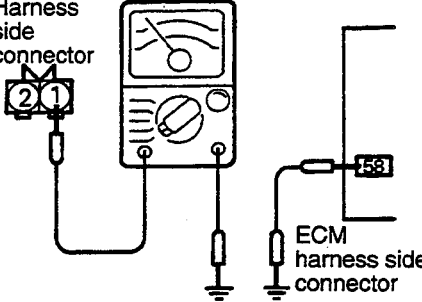
The knock sensor converts cylinder block vibrations due to knocking into voltage according to the strength of the vibrations and inputs it to the engine control module. The engine control module controls the delay in spark timing according to this signal.

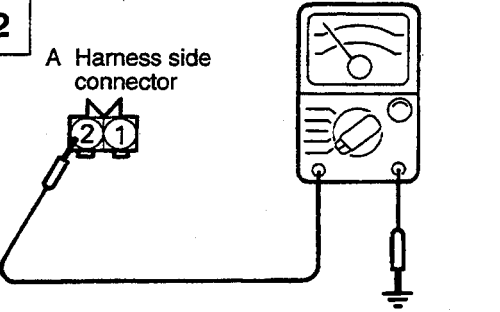
TROUBLESHOOTING HINTS

When knocking occurs when driving at maximum load, the following troubles, other than the knock sensor, can be inferred.

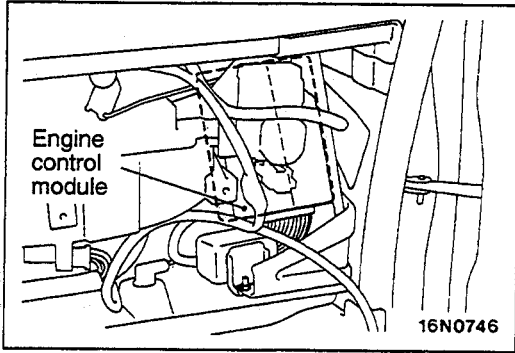
- (1) Incorrect spark plug heat rating
- (2) Incorrect gasoline
- (3) Incorrect standard spark timing adjustment

HARNESS INSPECTION

1	<p>A Harness side connector</p>  <p style="text-align: center;">Z7FU0906</p>	<p>Check for an open circuit or a short-circuit to ground between the knock sensor and the engine control module.</p> <ul style="list-style-type: none"> • Knock sensor connector: Disconnected • Engine control module connector: Disconnected 	<div style="display: flex; flex-direction: column; align-items: center; gap: 20px;"> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 5px; font-weight: bold; font-size: 24px;">OK</div> <div style="margin: 0 10px;">→</div> <div style="border: 1px solid black; padding: 5px; font-weight: bold; font-size: 24px;">2</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 5px; font-weight: bold; font-size: 24px;">OK</div> <div style="margin: 0 10px;">→</div> <div style="text-align: left;"> <p>Repair the harness. (A1-58)</p> </div> </div> </div>
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2	<p>A Harness side connector</p>  <p style="text-align: center;">Z6FU1302</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Knock sensor connector: Disconnected 	<div style="display: flex; flex-direction: column; align-items: center; gap: 20px;"> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 5px; font-weight: bold; font-size: 24px;">OK</div> <div style="margin: 0 10px;">→</div> <div style="border: 1px solid black; padding: 5px; font-weight: bold; font-size: 24px;">STOP</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; border-radius: 50%; padding: 5px; font-weight: bold; font-size: 24px;">OK</div> <div style="margin: 0 10px;">→</div> <div style="text-align: left;"> <p>Repair the harness. (A2-Ground)</p> </div> </div> </div>
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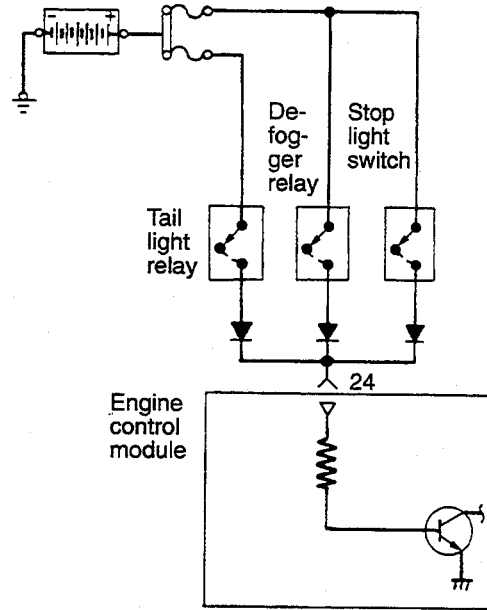
ELECTRICAL LOAD SWITCH <DOHC>



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
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9FU0101



7FU0688

7FU1701

OPERATION

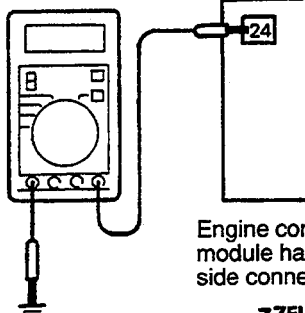
- The electrical load switch inputs the ON/OFF condition of the switch of equipment which consumes a large amount power during idling (equipment with a large electrical load) to the engine control module. The engine control module controls the idle air control motor based on this signal.
- When the switch of the equipment which creates a large electrical load is turned on, battery positive voltage is applied to the engine control module to indicate that the equipment switch is turned on.

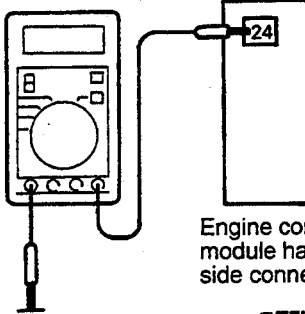
INSPECTION

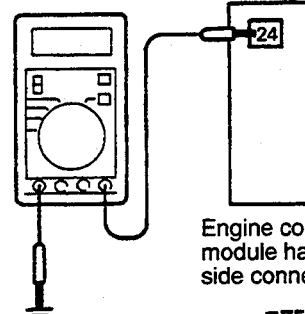
Using the Scan Tool

Function	Item No.	Data display	Check condition	Equipment state	Normal display
Data reading	33	Switch condition	Operation of equipment: OFF	Lighting switch only: OFF → ON	OFF → ON
				Rear defogger switch only: OFF → ON	OFF → ON
				Brake pedal only: Depressed → Released	ON → OFF

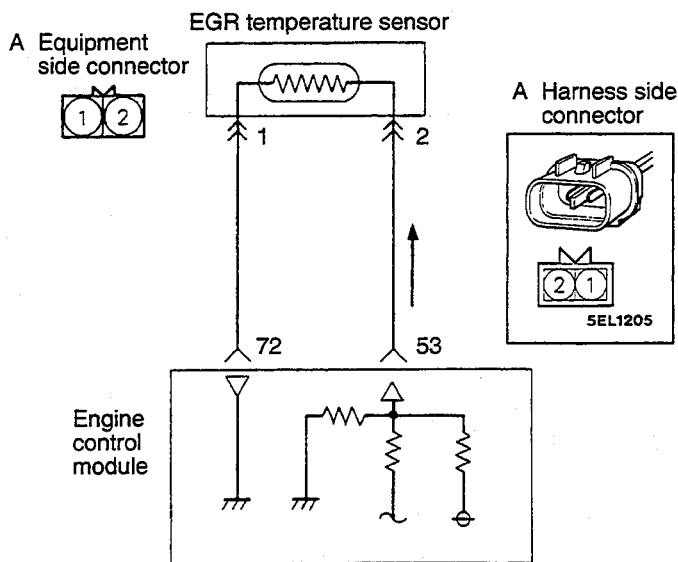
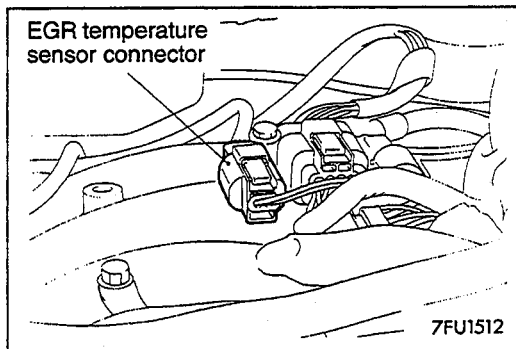
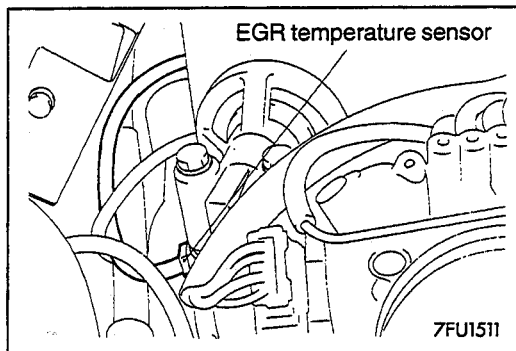
HARNESS INSPECTION

1	 <p>Engine control module harness side connector Z7FU0689</p>	<p>Measure the engine control module input voltage.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Lighting switch: ON (Tail light relay on) <table border="1" style="width: 100%;"> <tr><td style="text-align: center;">Voltage (V)</td></tr> <tr><td style="text-align: center;">B+</td></tr> </table>	Voltage (V)	B+	<p>OK → 2</p> <p>OK → Check the circuits which are related to the tail light relay.</p>
Voltage (V)					
B+					

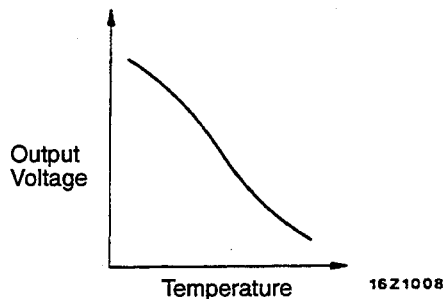
2	 <p>Engine control module harness side connector Z7FU0689</p>	<p>Measure the engine control module input voltage.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Defogger switch: ON (Defogger relay on) <table border="1" style="width: 100%;"> <tr><td style="text-align: center;">Voltage (V)</td></tr> <tr><td style="text-align: center;">B+</td></tr> </table>	Voltage (V)	B+	<p>OK → 3</p> <p>OK → Check the circuits which are related to the defogger relay.</p>
Voltage (V)					
B+					

3	 <p>Engine control module harness side connector Z7FU0689</p>	<p>Measure the engine control module input voltage.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Brake pedal: Depressed (Stop light switch ON) <table border="1" style="width: 100%;"> <tr><td style="text-align: center;">Voltage (V)</td></tr> <tr><td style="text-align: center;">B+</td></tr> </table>	Voltage (V)	B+	<p>OK → STOP</p> <p>OK → Check the circuits which are related to the stop light relay.</p>
Voltage (V)					
B+					

EGR TEMPERATURE SENSOR <DOHC>



7FU1239



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----

9FU0101
7FU1702

OPERATION

- The EGR temperature sensor converts the temperature of EGR gas downstream from the EGR valve to voltage and inputs it to the engine control module. The engine control module judges the condition of the EGR by this signal. If there is abnormal condition, the check engine/malfunction indicator lamp is turned on to notify the driver.
- 5 volts power supply in the engine control module is applied to the EGR temperature sensor through the resistance in the unit. This power supply further passes through the EGR temperature sensor, which is a kind of a resistor, and is grounded at the engine control module. The resistance of the EGR temperature sensor is characterized by a decrease in resistance with an increase of EGR temperature due to increase in quantity of EGR.
- EGR temperature sensor terminal voltage increases or decreases in accordance with EGR temperature sensor resistance. Therefore, the EGR temperature sensor terminal voltage changes with EGR gas temperature. The higher the EGR gas temperature, the lower the EGR temperature sensor terminal voltage.

INSPECTION

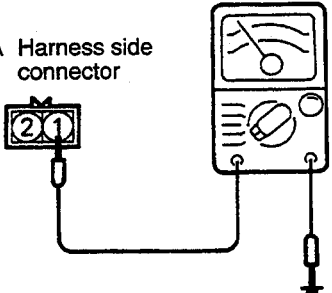
Using Scan Tool

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	43	Sensor temperature	Engine: Warmed up • Engine is maintained in a constant condition for 2 minutes or more • Disconnect the vacuum hose (green stripe) from the EGR control solenoid and attach the blind cap both to the solenoid nipple and to the vacuum hose end that was disconnected.	Idling (700 rpm)	100°C (212°F) or less
				3,500 rpm	120°C (248°F) or more

HARNESS INSPECTION

1

A Harness side connector



Z7FU1257

Check for continuity in the ground circuit.

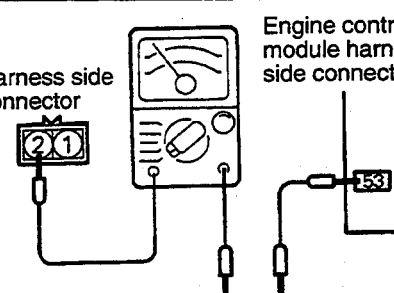
- EGR temperature sensor connector: Disconnected

OK → **2**

OK → Repair the harness. (A1-72)

2

A Harness side connector



Z7FU1258

Check for an open circuit or a short-circuit to ground between the EGR temperature sensor and the engine control module.

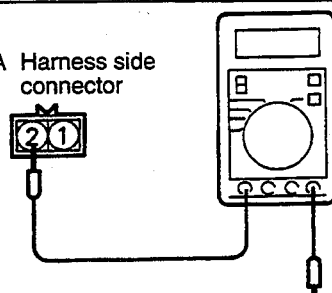
- EGR temperature sensor connector: Disconnected
- Engine control module connector: Disconnected

OK → **3**

OK → Replace the harness. (A2-53)

3

A Harness side connector



Z7FU1259

Measure the applied voltage.

- EGR temperature sensor connector: Disconnected
- Engine control module connector: Connected
- Ignition switch: ON

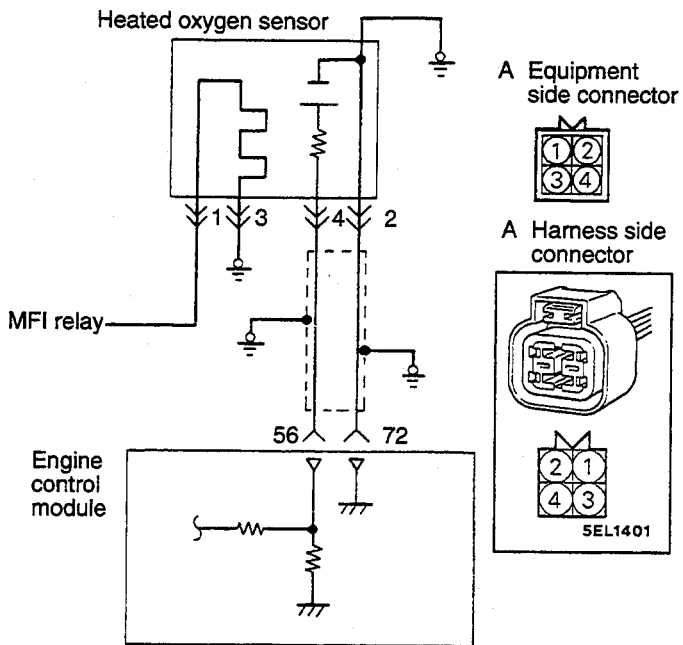
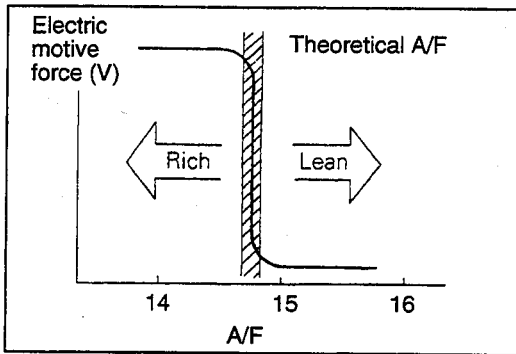
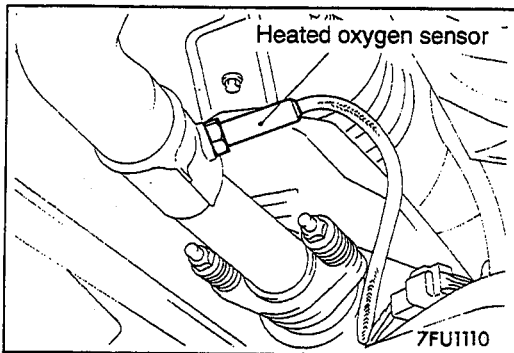
Voltage (V)
4.3-4.7

OK → **STOP**

OK → Replace the engine control module.

HEATED OXYGEN SENSOR <Federal>

110005829



6AF0076

Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61

9FU0101

7FU1703

OPERATION

Refer to P.13A-86.

TROUBLESHOOTING HINTS

Refer to P.13A-86.

INSPECTION

Refer to P.13A-87.

HARNESS INSPECTION

<p>1</p> <p>A Harness side connector</p> <p>B MFI relay harness side connector</p> <p style="text-align: right;">Z6AF0077</p>	<p>Check for continuity between the heated oxygen sensor and the MFI relay.</p> <ul style="list-style-type: none"> • MFI relay connector: Disconnected • Heated oxygen sensor connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> • Touch the ohmmeter probes to both ends of the harness. 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">2</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="padding-left: 10px;"> <p>Repair the harness. (A1–B3)</p> </div> </div>
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<p>2</p> <p>A Harness side connector</p> <p>Engine control module harness side connector</p> <p style="text-align: right;">Y7FU1132</p>	<p>Check for an open circuit or a short-circuit to ground between the heated oxygen sensor and the engine control module.</p> <ul style="list-style-type: none"> • Heated oxygen sensor connector: Disconnected • Engine control module connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">3</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="padding-left: 10px;"> <p>Repair the harness. (A4–56)</p> </div> </div>
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<p>3</p> <p>A Harness side connector</p> <p style="text-align: right;">Z7FU1133</p>	<p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Heated oxygen sensor connector: Disconnected • Engine control module connector: Disconnected 	<div style="display: flex; align-items: center; justify-content: center;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center;">STOP</div> </div> <div style="display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <div style="font-size: 2em; margin-right: 10px;">OK</div> <div style="margin-right: 10px;">→</div> <div style="padding-left: 10px;"> <p>Repair the harnesses. (A2–72) (A3–Ground)</p> </div> </div>
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SENSOR INSPECTION

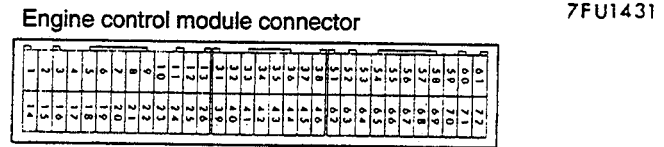
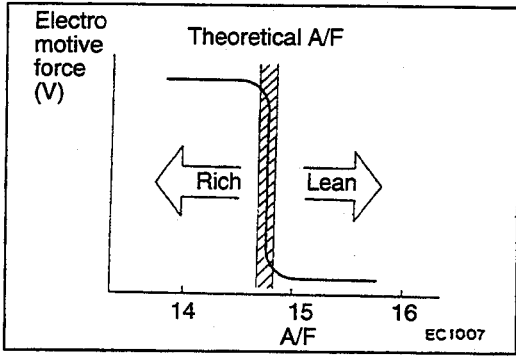
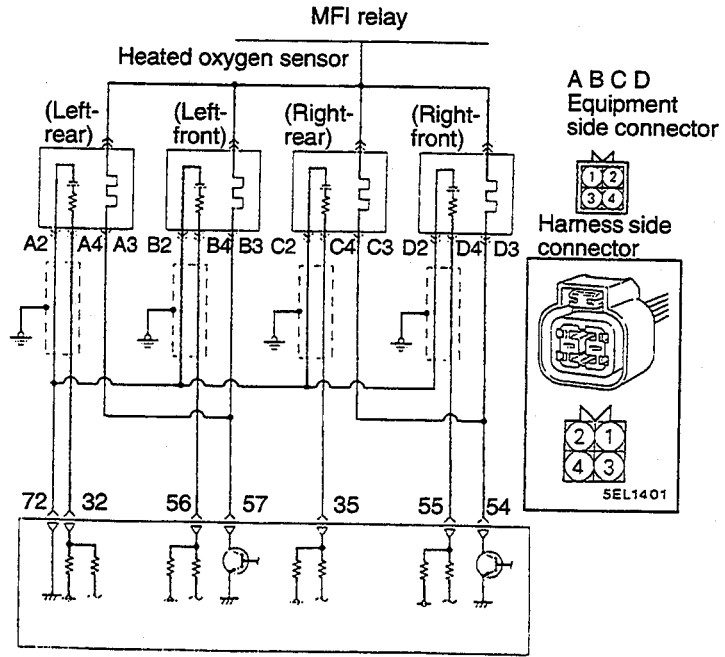
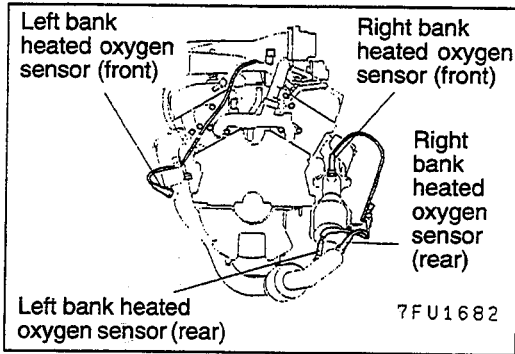
Refer to P.13A-88.

INSTALLATION

Refer to P.13A-88.

110005830

HEATED OXYGEN SENSOR <California – SOHC>



9FU0101

7FU1704

OPERATION

Refer to P.13A-86.

TROUBLESHOOTING HINTS

Refer to P.13A-86.

INSPECTION

Using Scan Tool

<Heated Oxygen Sensor (front)>

Function	Item No.	Data display	Check condition	Engine condition	Standard value
Data reading	11 39	Sensor detection voltage	Engine: Warm-up (Make the mixture lean by engine speed reduction, and rich by racing)	When sudden deceleration from 4,000 rpm	200 mV or lower
				When engine is suddenly raced	600–1,000 mV
	Engine: Warm-up (Using the heated oxygen sensor signal, check the air/fuel mixture ratio, and also check the condition of control by the engine control module)	700 rpm (Idling) 2,000 rpm	Changes repeatedly between 400 mV or lower and 600–1,000 mV		

TSB Revision

<Heated Oxygen Sensor (rear)>

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	59 69	Sensor voltage	<ul style="list-style-type: none"> • Transaxle: Second <M/T>, L range <A/T> • Drive with wide open throttle 	3,500 rpm	600–1,000 mV

<Heated Oxygen Sensor Heater (front, rear)>

Function	Item No.	Data display	Check condition	Engine state	Normal indication
Data reading	48	Heater condition	Engine: Warm-up	700 rpm (Idle)	ON
				5,000 rpm	OFF

HARNESS INSPECTION

1

ABCD
Harness side
connector

E
MFI relay harness
side connector

7FU1450

Check for continuity between heated oxygen sensor and MFI relay.

- MFI relay connector: Disconnected
- Heated oxygen sensor connector: Disconnected

NOTE
Insert the probes of the circuit tester into both ends of the harness.

→ **2**

→ Repair the harness.
(A, B, C, D1–E3)

2

ABCD
Harness side
connector

Engine control
module harness
side connector

7FU1439

Check for an open-circuit, or a short-circuit to ground, between the engine control module and the heated oxygen sensor.

- Heated oxygen sensor connector: Disconnected
- Engine control module connector: Disconnected

→ **3**

→ Repair the harness.
(A4–32)
(B4–35)
(C4–55)
(D4–56)

3

ABCD
Harness side
connector

Engine control
module harness
side connector

7FU1440

Check for an open-circuit, or a short-circuit to ground, between the engine control module and the heated oxygen sensor.

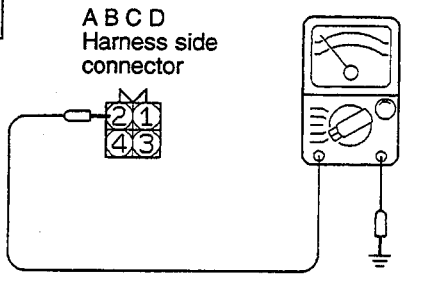
- Heated oxygen sensor connector: Disconnected
- Engine control module connector: Disconnected

→ **4**

→ Repair the harness.
(A3, B3–57)
(C3, D3–54)

4


A B C D
Harness side
connector



7FU1441


Check for continuity of the ground circuit.

- Connector: Disconnected



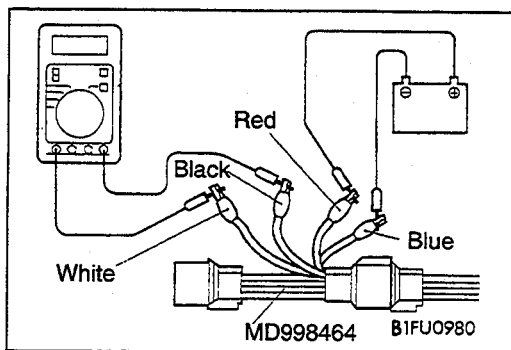
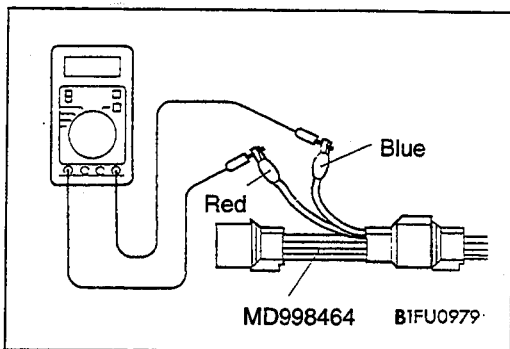
→

2



→

Repair the harness.
(A2, B2, C2, D2-72)



SENSOR INSPECTION

- (1) Disconnect the heated oxygen sensor connector and connect the special tool, Test Harness, to the heated oxygen sensor connector.
- (2) Check that there is continuity [approx. 20 Ω at 20°C (68°F)] across terminals 1 and 3 of the heated oxygen sensor connector.
- (3) If there is no continuity, replace the heated oxygen sensor (rear).

- (4) Warm up the engine until the engine coolant temperature becomes 80°C (176°F) or higher.
- (5) Using jumper wires, connect terminals 1 (red clip of the special tool) and 3 (blue clip) of the heated oxygen sensor connector to battery ⊕ and ⊖ terminals respectively.

Caution

Ensure that the jumper wires are connected correctly, as wrong connections result in a broken heated oxygen sensor.

- (6) Connect a digital voltmeter across terminals 2 (black clip of the special tool) and 4 (white clip).
- (7) Race the engine repeatedly and measure the output voltage of the heated oxygen sensor.

Engine	Heated oxygen sensor output voltage	Remarks
When engine is raced	0.6–1.0 V	When the air-fuel mixture becomes richer as a result of repeated racing, the heated oxygen sensor should output a voltage of 0.6–1.0 V.

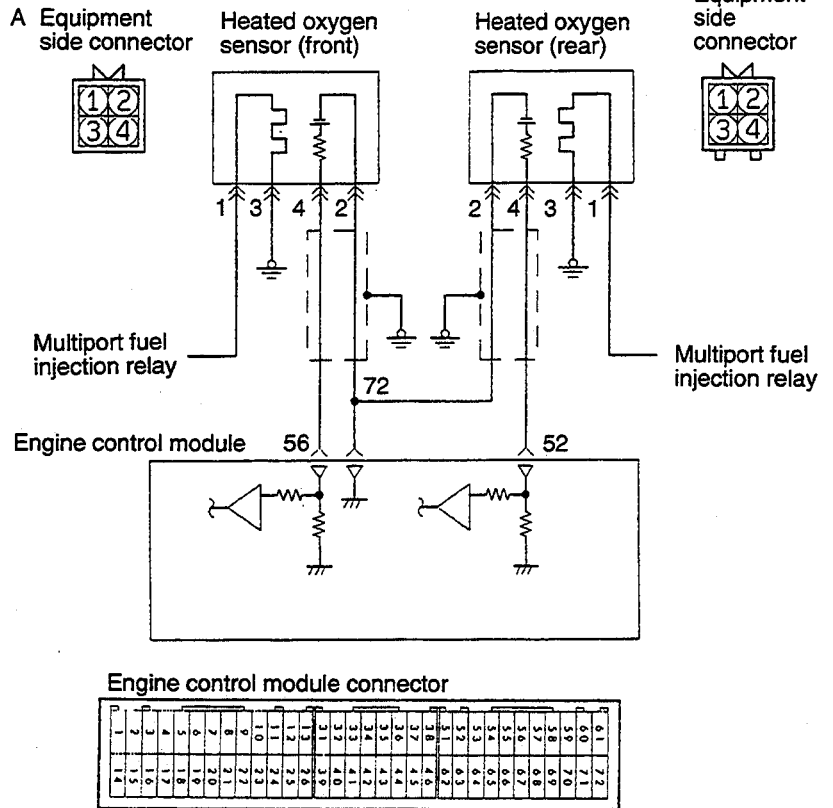
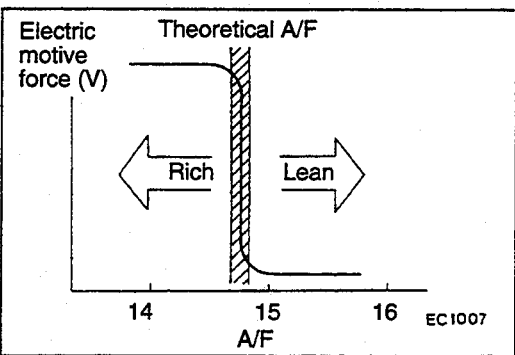
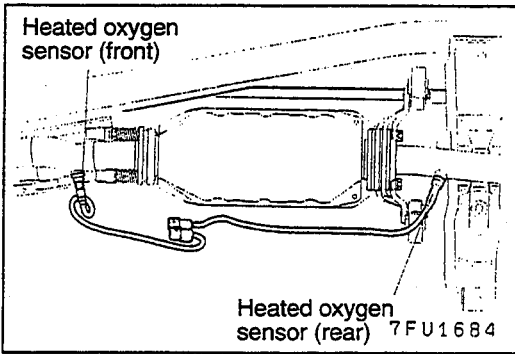
- (8) If the measurements are not as specified, defective heated oxygen sensor is suspected.

INSTALLATION

- (1) For removal and installation of heated oxygen sensor, refer to GROUP 15 – Exhaust Manifold.
- (2) Tighten the heated oxygen sensor to specified torque.

HEATED OXYGEN SENSOR <California-DOHC>

110005831



9FU0101

7FU1705

OPERATION

Refer to P.13A-86.

TROUBLESHOOTING HINTS

Refer to P.13A-86.

INSPECTION

Using Scan Tool

<Heated Oxygen Sensor (front)>

Function	Item No.	Data display	Check condition	Engine condition	Standard value
Data reading	11	Sensor detection voltage	Engine: Warm-up (Make the mixture lean by engine speed reduction, and rich by racing)	When sudden deceleration from 4,000 rpm	200 mV or lower
				When engine is suddenly raced	600–1,000 mV
			Engine: Warm-up (Using the heated oxygen sensor signal, check the air/fuel mixture ratio and also check the condition of control by the engine control module.	Idle speed 2,000 rpm	Changes repeatedly between 400 mV or lower and 600–1,000 mV

<Heated Oxygen Sensor (rear)>

Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	59	Sensor voltage	<ul style="list-style-type: none"> • Transaxle: L range • Accelerate the vehicle with wide open throttle. 	3,500 rpm	600–1,000 mV

<Heated Oxygen Sensor Heater (front)>

Function	Item No.	Data display	Check condition	Engine state	Normal indication
Data reading	48	Heater condition	Engine: Warm-up	Idle speed	ON
				5000 rpm	OFF

HARNES INSPECTION

1

7FU1720

Check for continuity between the heated oxygen sensor and the MFI relay.

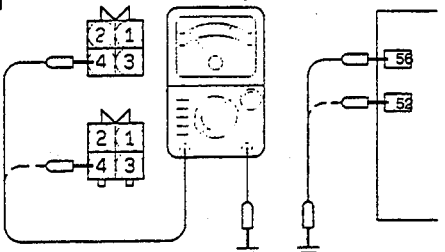
- MFI relay connector: Disconnected
- Heated oxygen sensor connector: Disconnected

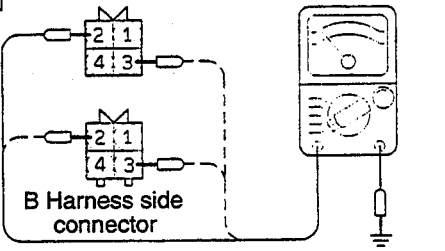
NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

✗ → Repair the harness. (A1–C3) (B1–C3)

<p>2 A Harness side connector</p>  <p>B Harness side connector</p> <p style="text-align: right;">7FU1721</p>	<p>Engine control module harness side connector</p> <p>Check for an open circuit or a short-circuit to ground between the heated oxygen sensor and the engine control module.</p> <ul style="list-style-type: none"> • Heated oxygen sensor connector: Disconnected • Engine control module connector: Disconnected 	<p style="font-size: 2em; text-align: center;">OK</p> <p style="font-size: 2em; text-align: center;">OK</p>	<p style="text-align: center; border: 1px solid black; width: 30px; margin: 0 auto;">3</p> <p>Repair the harness. (A4-56) (B4-52)</p>
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<p>3 A Harness side connector</p>  <p>B Harness side connector</p> <p style="text-align: right;">7FU1722</p>	<p>Engine control module harness side connector</p> <p>Check for continuity in the ground circuit.</p> <ul style="list-style-type: none"> • Heated oxygen sensor connector: Disconnected • Engine control module connector: Disconnected 	<p style="font-size: 2em; text-align: center;">OK</p> <p style="font-size: 2em; text-align: center;">OK</p>	<p style="text-align: center; border: 1px solid black; width: 30px; margin: 0 auto;">STOP</p> <p>Repair the harnesses. (A2-72) (A3-Ground) (B2-72) (B3-Ground)</p>
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SENSOR INSPECTION

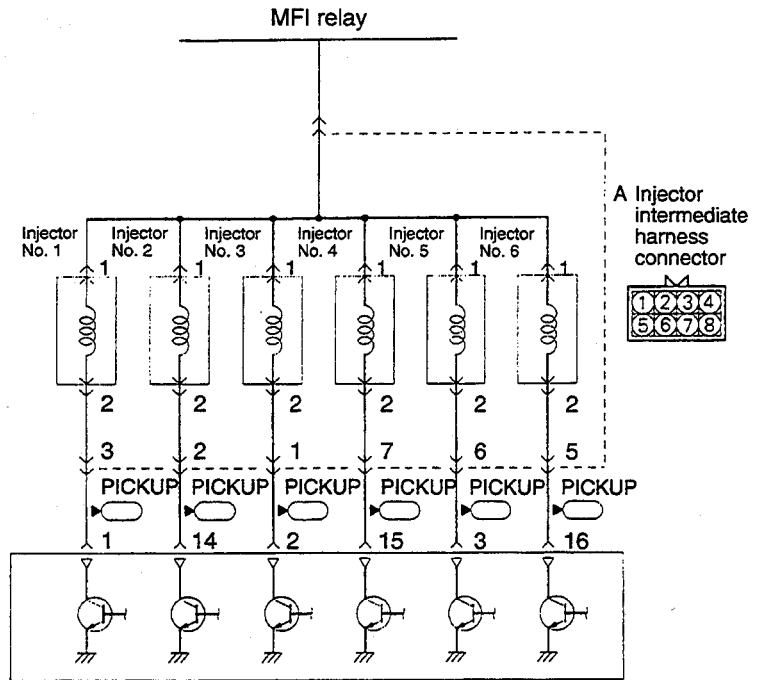
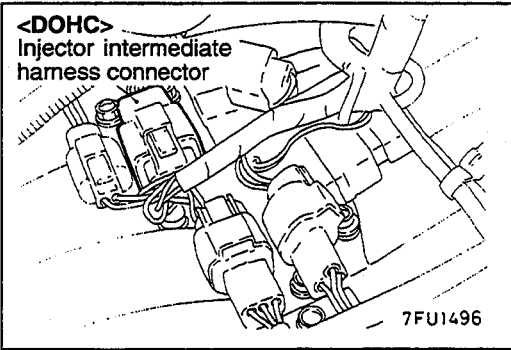
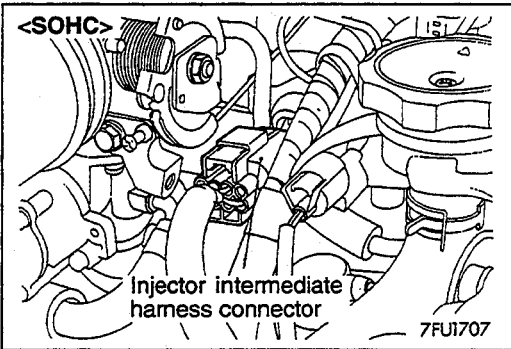
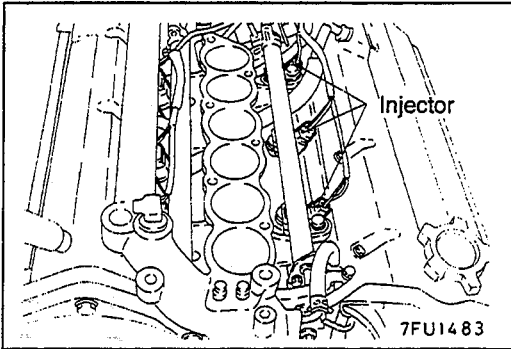
Refer to P.13A-88.

INSTALLATION

Refer to P.13A-88.

110005832

INJECTORS



7FU1472

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1706

OPERATION

Refer to P.13A-89.

TROUBLESHOOTING HINTS

Refer to P.13A-90.

13A-168 MULTIPOINT FUEL INJECTION – <SOHC-24 valve engine, DOHC>

On-Vehicle Inspection of MFI Components

INSPECTION

Using Scan Tool

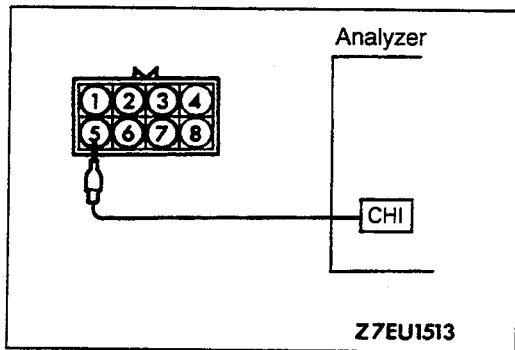
Function	Item No.	Data display	Check conditions	Engine coolant temperature °C (°F)	Standard value ms
Data reading	41	Activation time*1	Engine cranking	When 0 (32)*2	90–110 <Up to 1994 models> 15.4–18.9 <From 1995 models>
				When 20 (68)	42–51.3 <Up to 1994 models> 38–46.4 <SOHC> 42.8–52.4 <DOHC–From 1995 models>
				When 80 (176)	9.1–11.1 <Up to 1994 models> 9.9–12.2 <From 1995 models>

Function	Item No.	Data display	Check conditions	Engine condition rpm	Standard value ms
Data reading	41	Activation time*3	<ul style="list-style-type: none"> • Engine coolant temp: 85–95°C (185–203°F) • Lights and all accessories: OFF • Transmission: neutral (P range for vehicles with A/T) • Steering wheel: straight forward position 	Idling (700 rpm)	2.3–3.5 <Up to 1994 models, California–DOHC–From 1995 models> 2.5–3.8 <Federal–From 1995 models> 2.8–4.0 <California–SOHC>
				2,000	2.0–3.2 <Up to 1994 models, California–DOHC–From 1995 models>
				2,500	2.3–3.6 <SOHC> 2.1–3.3 <Federal–DOHC–From 1995 models>
				When raced suddenly	Increases.

NOTE

- *1: Indicates the injector-activation time when the power source voltage is 11 V and the cranking speed is 250 rpm or less.
- *2: At a coolant temperature of 0°C (32°F), there is synchronous injection for all six cylinders.
- *3: For a new vehicle [driven approximately 500 km (300 miles) or less] the injector-activation may be about ten percent longer than indicated above.

Function	Item No.	Drive content	Check condition	Normal condition
Actuator test	01	No. 1 injector shut off	Engine: Idling after having warmed up (Shut off the injectors in sequence after engine has warmed up, and check the idling condition)	Changing from the idling condition (becoming less stable or stalling)
	02	No. 2 injector shut off		
	03	No. 3 injector shut off		
	04	No. 4 injector shut off		
	05	No. 5 injector shut off		
	06	No. 6 injector shut off		



Wave Pattern Inspection Using an Analyzer

- (1) Disconnect the injector intermediate harness, and connect the special tool (harness connector MD998474).
- (2) Connect the oscilloscope probes according to the details given in the table below.

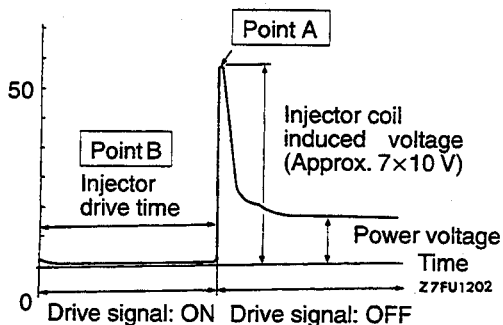
	No. 1 cylinder	No. 2 cylinder	No. 3 cylinder	No. 4 cylinder	No. 5 cylinder	No. 6 cylinder
Male connector side terminal (2)	3	2	1	7	6	5
Clip (lead wire)	Green (green and black)	White (white)	Blue (blue)	Yellow (yellow)	Red (red)	Black (black)

Alternative method (when test harness is not available)

Connect the analyzer special patterns pickup to ECM terminals (1), (2), (3), (14), (15) and (16).

**Standard wave pattern
Observation conditions**

Function	Special patterns
Pattern height	Variable
Variable knob pattern selector	Display
Engine rpm	Idling (700 rpm)

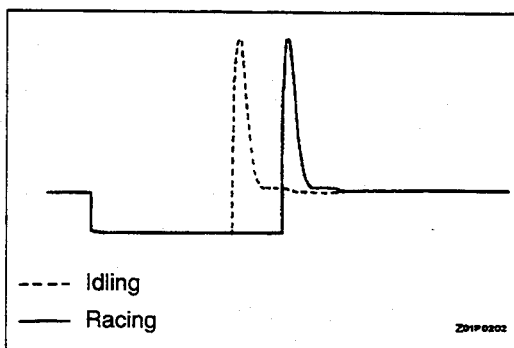


Wave pattern observation points

Point A: Height of back electromotive force in the solenoid coil

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

Point B: Injector drive time



- The injector drive timing will be synchronized with the scan tool 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.

HARNESS INSPECTION

1

A Female-side connector of injector intermediate harness

B MFI relay harness side connector

Z7FU1498

Check for continuity between the injectors and the MFI relay.

- Injector intermediate harness connector: Disconnected
- MFI relay connector: Disconnected

NOTE

- Touch the ohmmeter probes to both ends of the harness.

OK → **2**

✗ → Repair the harness. (A8-B3)

2

A Female-side connector of injector intermediate harness

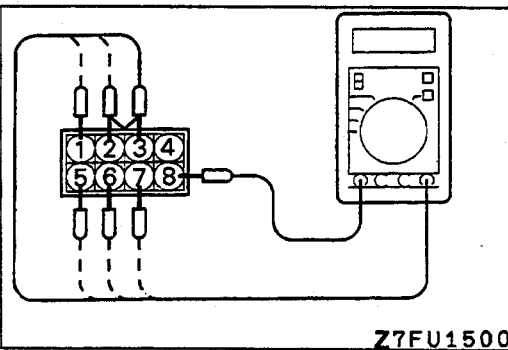
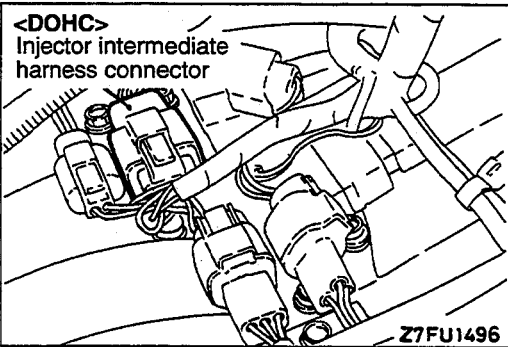
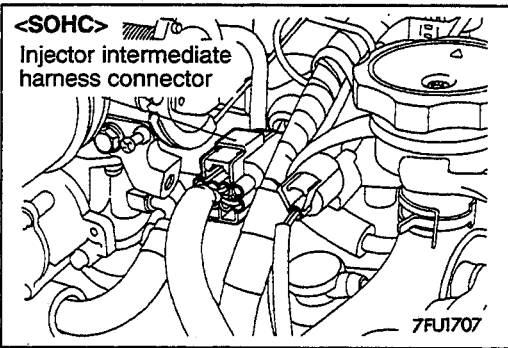
Z7FU1499

Check for an open circuit or a short-circuit to ground between the injector and the engine control module.

- Engine control module connector: Disconnected
- Injector intermediate harness connector: Disconnected

OK → STOP

✗ → Repair the harness. (A1-2) (A2-14) (A3-1) (A5-16) (A6-3) (A7-15)



ACTUATOR INSPECTION

Measuring Resistance Between Terminals

(1) Disconnect the injector intermediate harness.

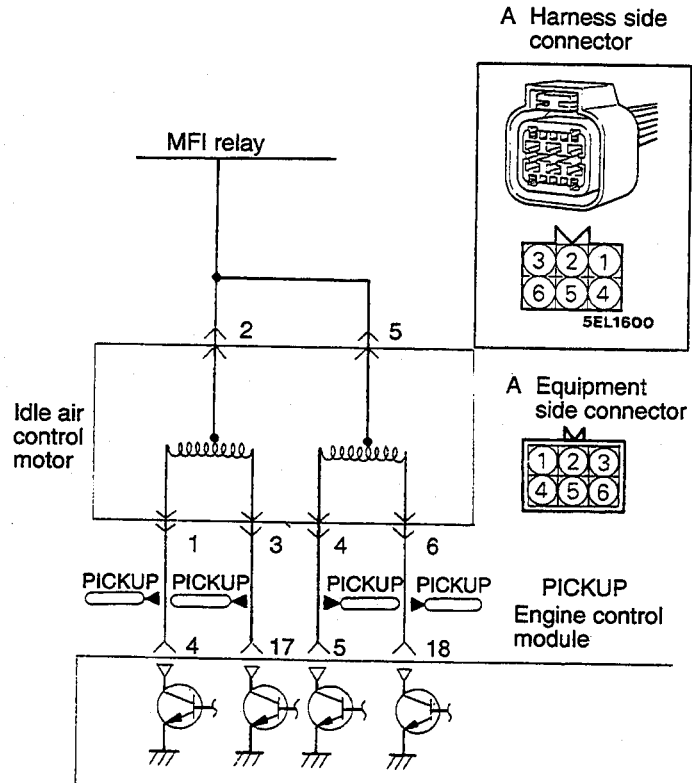
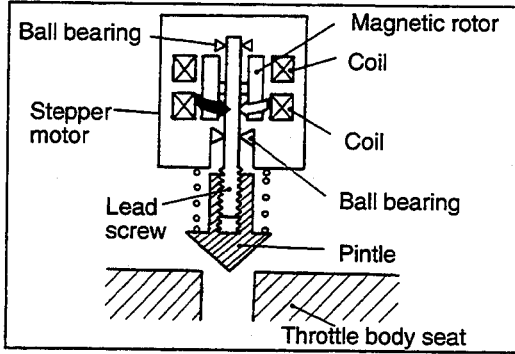
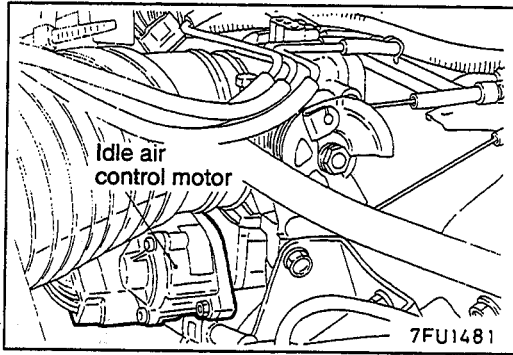
(2) Measure the resistance between the terminals.

Injector No.	Measurement terminal	Resistance
No. 1	8-3	13-16Ω (20°C)
No. 2	8-2	
No. 3	8-1	
No. 4	8-7	
No. 5	8-6	
No. 6	8-5	

(3) Connect the injector intermediate harness.

110005833

IDLE AIR CONTROL MOTOR (STEPPER MOTOR)



7FU0518

Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
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9FU0101

7FU1708

OPERATION

Refer to P.13A-93.

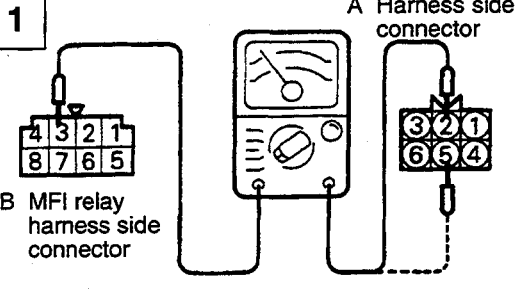


TROUBLESHOOTING HINTS

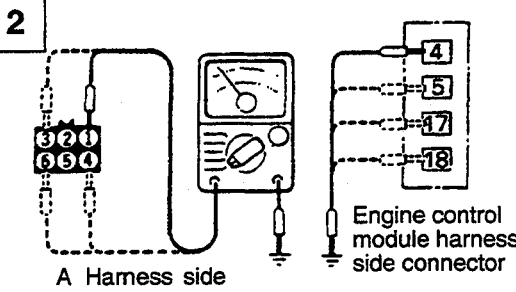



Refer to P.13A-94.

INSPECTION

Refer to P.13A-94.

HARNESS INSPECTION

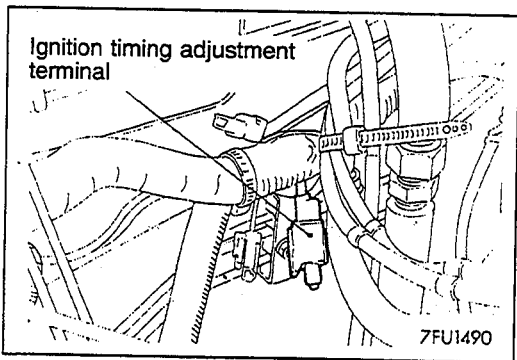
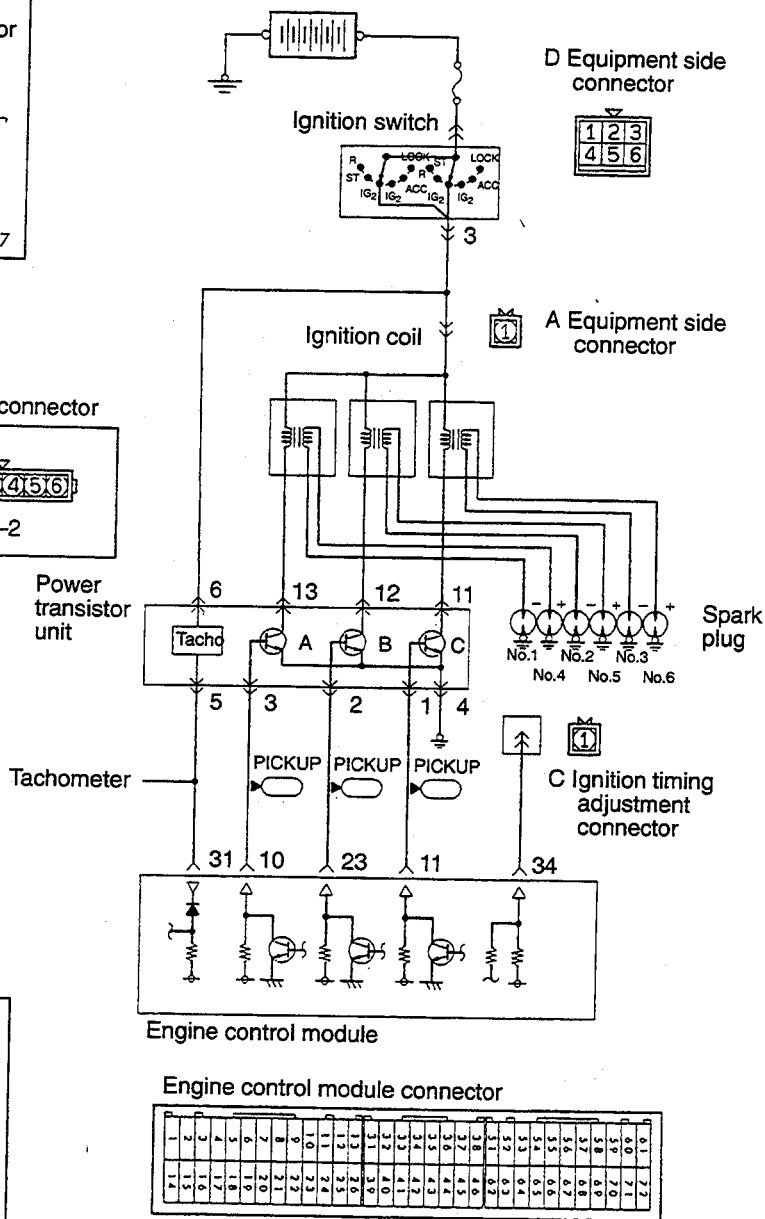
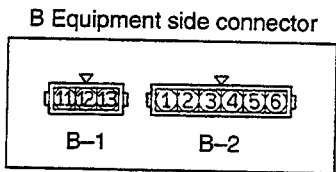
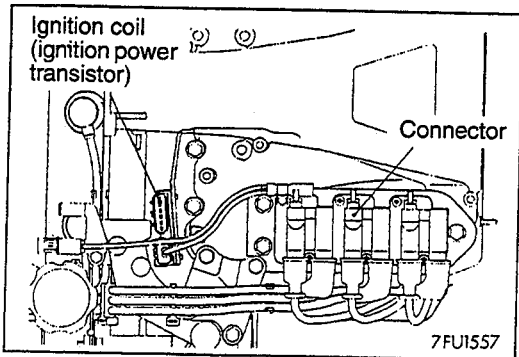
<p>1</p>  <p style="text-align: right;">A Harness side connector</p> <p style="text-align: left;">B MFI relay harness side connector</p> <p style="text-align: right; font-size: small;">Z6AF0070</p>	<p>Check for continuity between the idle air control motor and the MFI relay.</p> <ul style="list-style-type: none"> • Idle air control motor connector: Disconnected • MFI relay connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> • Touch the ohmmeter probes to both ends of the harness. 	<div style="text-align: center; margin-bottom: 20px;">  → <div style="border: 1px solid black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-left: 10px;">2</div> </div> <div style="text-align: center;">  → <p style="margin-left: 10px;">Repair the harness. (A2 – B3) (A5 – B3)</p> </div>
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<p>2</p>  <p style="text-align: right;">A Harness side connector</p> <p style="text-align: left;">Engine control module harness side connector</p> <p style="text-align: right; font-size: small;">V0X0397</p>	<p>Check for an open circuit or a short-circuit to ground between the idle air control motor and the engine control module.</p> <ul style="list-style-type: none"> • Engine control module connector: Disconnected • Idle air control motor connector: Disconnected 	<div style="text-align: center; margin-bottom: 20px;">  → <div style="border: 1px solid black; width: 30px; height: 30px; display: flex; align-items: center; justify-content: center; margin-left: 10px;">  </div> </div> <div style="text-align: center;">  → <p style="margin-left: 10px;">Repair then harnesses. (A1 – 4, A3 – 17, A4 – 5, A6 – 18)</p> </div>
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ACTUATOR INSPECTION

Refer to P.13A-96.

IGNITION COIL AND IGNITION POWER TRANSISTOR <SOHC>



9FU0101
7FU1709

OPERATION

- When the ignition power transistor unit A is turned on by the signal from the engine control module, primary current flows to the ignition coil A. When the ignition power transistor unit A is turned off, the primary current is shut off and a high voltage is induced in the secondary coil A, causing the ignition plugs of No. 1 and No. 4 cylinders to spark. When the ignition power transistor unit B is turned off, the ignition plugs of No. 2 and No. 5 cylinder spark. In addition, when the ignition power transistor unit C is turned off, the ignition plugs of No. 3 and No. 6 cylinders spark.
- When the engine control module turns off the transistor in the unit, the battery positive voltage in the unit is applied to the ignition power transistor unit to turn it on. When the engine control module turns on the transistor in the unit, the ignition power transistor unit is turned off.

TSB Revision

13A-174 MULTIPOINT FUEL INJECTION – <SOHC-24 valve engine, DOHC>

On-Vehicle Inspection of MFI Components
<SOHC-24 valve engine, DOHC>

INSPECTION

Using Scan Tool

<Spark Advance>

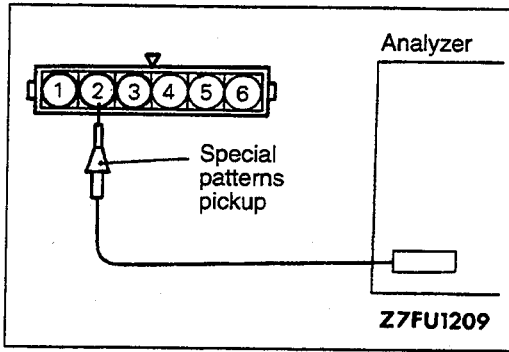
Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	44	Ignition advance	<ul style="list-style-type: none"> • Engine: Warmed up • Timing light: Set (set timing light to check actual ignition timing) 	Idling (700 rpm)	7–23° BTDC
				2,500 rpm	27–47° BTDC

<Ignition Timing Adjustment Mode>

Function	Item No.	Data display	Check condition	Terminal condition	Normal display
Data reading	36	Continuity between the ignition timing adjustment terminal and the ground	<ul style="list-style-type: none"> • Engine: Idling 	Ignition timing adjustment terminal is grounded.	ON
				Ignition timing adjustment terminal is disconnected from ground	OFF

<Standard Ignition Timing>

Function	Item No.	Drive	Check condition	Normal condition
Actuator test	17	Set to ignition timing adjustment mode.	<ul style="list-style-type: none"> • Engine: Idling • Timing light: Set 	Actual ignition timing: 5° BTDC ± 3°



Wave Pattern Inspection Using an Analyzer

- Primary signal of ignition coil
Refer to GROUP 16 – Ignition System.
- Control signal of ignition power transistor

Measurement Method

- (1) Disconnect the connector of the power transistor, and connect the special tool (test harness: MB991348) across the disconnected connector parts.
- (2) Sequentially connect the special patterns pickup of the analyzer to each of terminal (1) (No. 3–No. 6), terminal (2) (No. 2–No. 5) and terminal (3) (No. 1–No. 4) of the ignition power transistor unit connector.

Alternative method (when test harness is not available)

Connect the analyzer special patterns pickup to ECM terminals (10), (11) and (23) for the ignition power transistor.

Standard wave pattern

Refer to P.13A-99.

Wave pattern observation points

Refer to P.13A-100.

Examples of abnormal wave patterns

Refer to P.13A-100.

HARNESSES INSPECTION

1

D Harness side connector

A Harness side connector

7FU1723

Check for continuity between the ignition coil and the ignition switch-IG.

- Ignition switch connector: Disconnected
- Ignition coil connector: Disconnected

NOTE

- Touch the ohmmeter problems to both ends of the harness.

OK → **2**

✗ → Repair the harnesses. (A1-D4)

2

B-2 Harness side connector

A Harness side connector

7FU1724

Check for continuity between the ignition power transistor unit and the ignition coil.

- Ignition coil connector: Disconnected
- Ignition power transistor connector: Disconnected

OK → **3**

✗ → Repair the harnesses. (A1-B6)

3

B-1 Harness side connector

7FU1729

Measure the power supply voltage of the ignition coil.

- Ignition power transistor: Disconnected
- Ignition switch: ON

Voltage (V)
B+

OK → **4**

✗ → Repair the harness. (B11, B12, B13-Ignition coil)

4

B-2 Harness side connector

Engine control module harness side connector

Z7FU1250

Check for an open circuit or a short-circuit to ground between the ignition power transistor and the engine control module.

- Ignition power transistor connector: Disconnected
- Engine control module connector: Disconnected

OK → **5**

✗ → Repair the harness. (B1-11) (B2-23) (B3-10) (B5-31)

5

B-2 Harness side connector

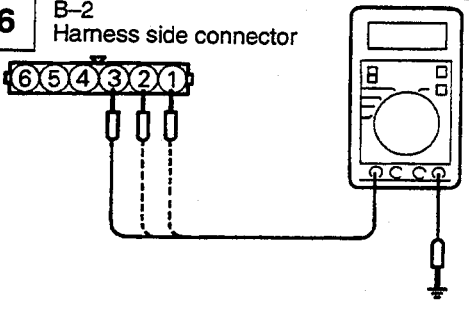
Z7FU0700

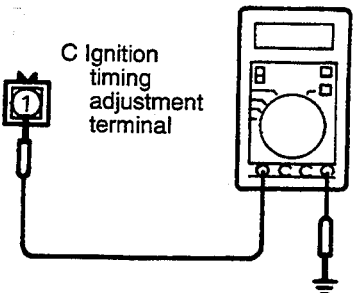
Check for continuity in the ground circuit of the ignition power transistor.

- Ignition power transistor connector: Disconnected

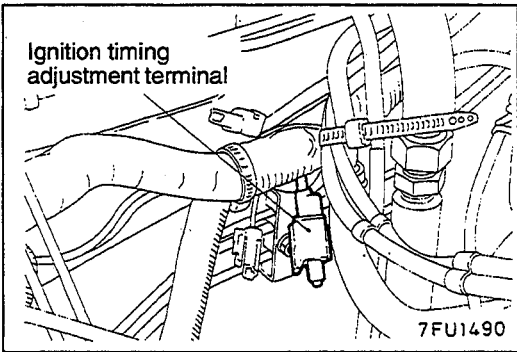
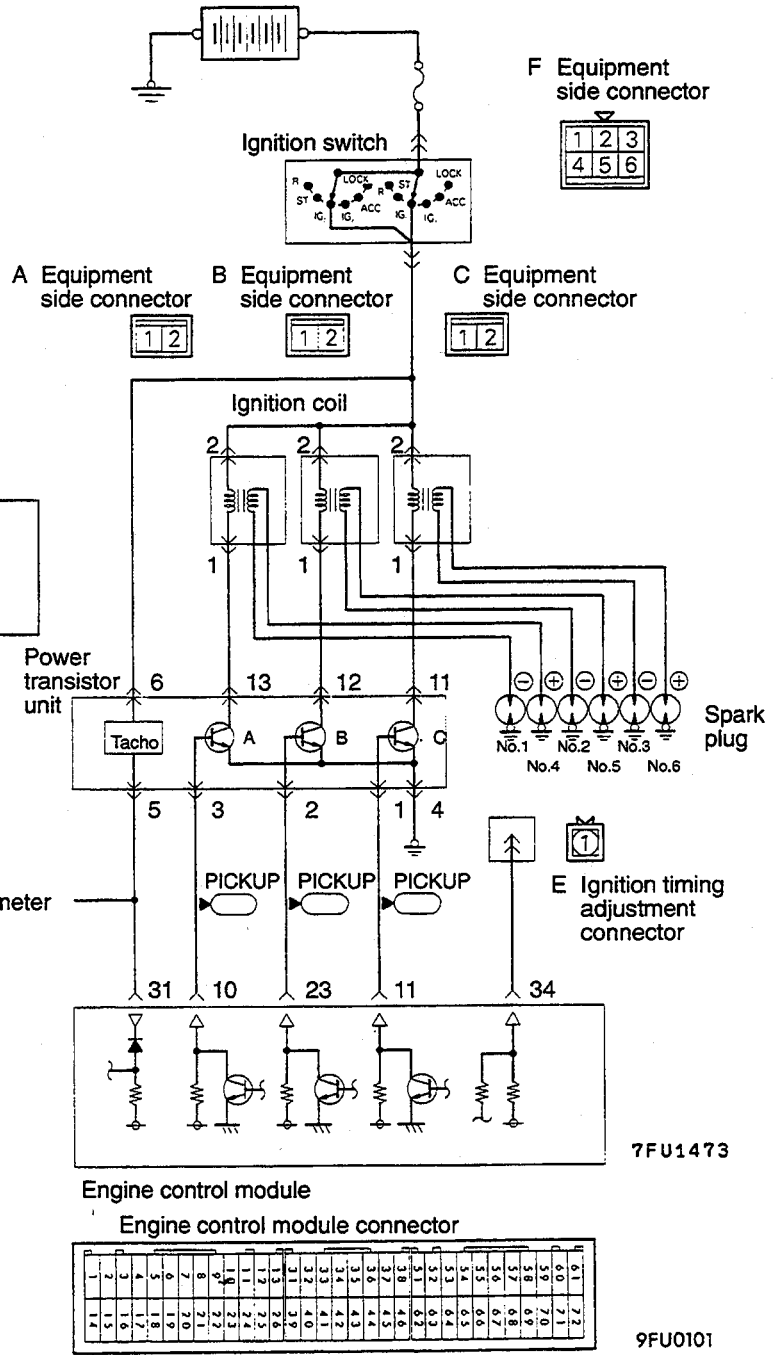
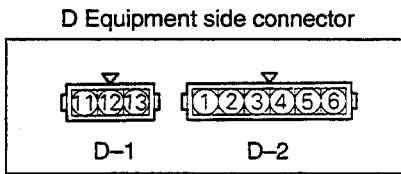
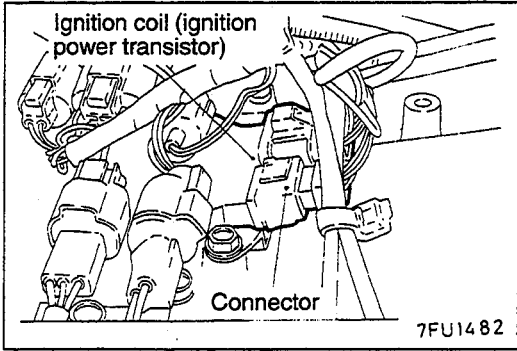
OK → **6**

✗ → Repair the harness. (B4-Ground)

<p>6 B-2 Harness side connector</p>  <p style="text-align: right;">Z7FU1252</p>	<p>Measure the ignition power transistor control signal voltage.</p> <ul style="list-style-type: none"> Ignition power transistor connector: Disconnected Ignition switch: START <table border="1" style="width: 100%;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">0.5–4.0</td> </tr> </table>	Voltage (V)	0.5–4.0	<p style="text-align: center;">OK → 7</p> <p style="text-align: center;">OK → Repair the harnesses. (B1–11) (B2–23) (B3–10)</p>
Voltage (V)				
0.5–4.0				

<p>7 C Ignition timing adjustment terminal</p>  <p style="text-align: right;">Z7FU1060</p>	<p>Measure the terminal voltage of the ignition timing adjustment terminal.</p> <ul style="list-style-type: none"> Ignition switch: ON <table border="1" style="width: 100%;"> <tr> <td style="text-align: center;">Voltage (V)</td> </tr> <tr> <td style="text-align: center;">4.0–5.2</td> </tr> </table>	Voltage (V)	4.0–5.2	<p style="text-align: center;">OK → 2</p> <p style="text-align: center;">OK → Repair the harness. (C1–34)</p>
Voltage (V)				
4.0–5.2				

IGNITION COIL AND IGNITION POWER TRANSISTOR <DOHC>



OPERATION

- When the ignition power transistor unit A is turned on by the signal from the engine control module, primary current flows to the ignition coil A. When the ignition power transistor unit A is turned off, the primary current is shut off and a high voltage is induced in the secondary coil A, causing the ignition plugs of No. 1 and No. 4 cylinders to spark. When the ignition power transistor unit B is turned off, the ignition plugs of No. 2 and No. 5 cylinder spark. In addition, when the ignition power transistor unit C is turned off, the ignition plugs of No. 3 and No. 6 cylinders spark.
- When the engine control module turns off the transistor in the unit, the battery positive voltage in the unit is applied to the ignition power transistor unit to turn it on. When the engine control module turns on the transistor in the unit, the ignition power transistor unit is turned off.

TSB Revision

INSPECTION

Using Scan Tool

<Spark Advance>

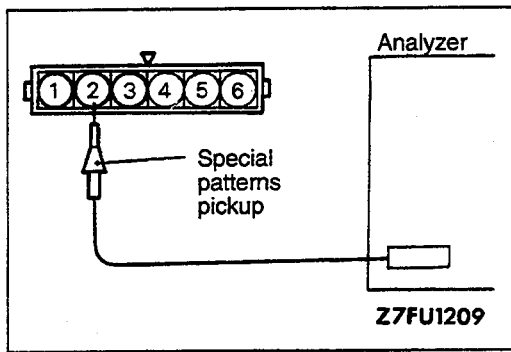
Function	Item No.	Data display	Check condition	Engine state	Standard value
Data reading	44	Ignition advance	<ul style="list-style-type: none"> • Engine: Warmed up • Timing light: Set (set timing light to check actual ignition timing) 	Idling (700 rpm)	2–18° BTDC
				2,000 rpm <Up to 1994 models>	18–38° BTDC
				2,500 rpm <From 1995 models>	19–39° BTDC

<Ignition Timing Adjustment Mode>

Function	Item No.	Data display	Check condition	Terminal condition	Normal display
Data reading	36	Continuity between the ignition timing adjustment terminal and the ground	<ul style="list-style-type: none"> • Engine: Idling 	Ignition timing adjustment terminal is grounded.	ON
				Ignition timing adjustment terminal is disconnected from ground	OFF

<Standard Ignition Timing>

Function	Item No.	Drive	Check condition	Normal condition
Actuator test	17	Set to ignition timing adjustment mode.	<ul style="list-style-type: none"> • Engine: Idling • Timing light: Set 	Actual ignition timing: 5° BTDC ± 3°



Wave Pattern Inspection Using an Analyzer

- Primary signal of ignition coil
Refer to GROUP 16 – Ignition System.
- Control signal of ignition power transistor

Measurement Method

- (1) Disconnect the connector of the power transistor, and connect the special tool (test harness: MB991348) across the disconnected connector parts.
- (2) Sequentially connect the special patterns pickup of the analyzer to each of terminal (1) (No. 3–No. 6), terminal (2) (No. 2–No. 5) and terminal (3) (No. 1–No. 4) of the ignition power transistor unit connector.

Alternative method (when test harness is not available)

Connect the analyzer special patterns pickup to ECM terminals (10), (11) and (23) for the ignition power transistor.

Standard wave pattern

Refer to P.13A-99.

Wave pattern observation points

Refer to P.13A-100.

Examples of abnormal wave patterns

Refer to P.13A-100.

HARNES INSPECTION

<p>1 F Harness side connector</p> <p>A, B, C Harness side connector</p> <p>Z7FU1501</p>	<p>Check for continuity between the ignition coil and the ignition switch-I.G.</p> <ul style="list-style-type: none"> Ignition switch connector: Disconnected Ignition coil connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> Touch the ohmmeter problems to both ends of the harness. 	<p>OK → 2</p> <p>✗ → Repair the harnesses. (A2-F4) (B2-F4) (C 2-F4)</p>
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<p>2 D-2 Harness side connector</p> <p>A, B, C Harness side connector</p> <p>Z7FU1502</p>	<p>Check for continuity between the ignition power transistor unit and the ignition coil.</p> <ul style="list-style-type: none"> Ignition coil connector: Disconnected Ignition power transistor connector: Disconnected 	<p>OK → 3</p> <p>✗ → Repair the harnesses. (A2-D6) (B2-D6) (C 2-D6)</p>
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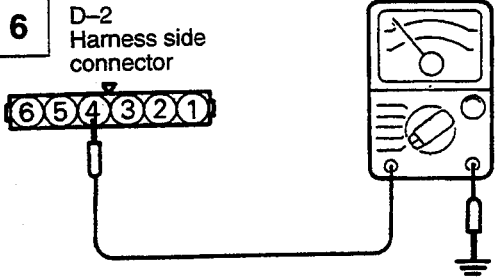
<p>3 D-1 Harness side connector</p> <p>A, B, C Harness side connector</p> <p>Z7FU1503</p>	<p>Check for continuity between the ignition power transistor and the ignition coil.</p> <ul style="list-style-type: none"> Ignition coil connector: Disconnected Ignition power transistor connector: Disconnected 	<p>OK → 4</p> <p>✗ → Repair the harnesses. (A1-D13) (B1-D12) (C1-D11)</p>
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<p>4 A, B, C Harness side connector</p> <p>Z7FU1504</p>	<p>Check for an short-circuit to ground between the ignition power transistor and the ignition coil.</p> <ul style="list-style-type: none"> Ignition coil connector: Disconnected Ignition power transistor connector: Disconnected 	<p>OK → 5</p> <p>✗ → Check for a short-circuit in the primary circuit of the ignition coil.</p>
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<p>5 D-2 Harness side connector</p> <p>Engine control module harness side connector</p> <p>Z7FU1250</p>	<p>Check for an open circuit or a short-circuit to ground between the ignition power transistor and the engine control module.</p> <ul style="list-style-type: none"> Ignition power transistor connector: Disconnected Engine control module connector: Disconnected 	<p>OK → 6</p> <p>✗ → Repair the harnesses. (D1-11) (D2-23) (D3-10) (D5-31)</p>
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13A-182 MULTIPOINT FUEL INJECTION – <SOHC-24 valve engine, DOHC>

6 D-2
Harness side
connector



Z7FU0700

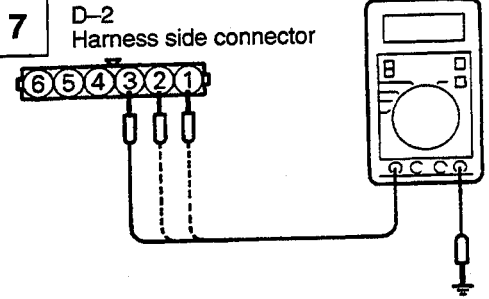
Check for continuity in the ground circuit of the ignition power transistor.

- Ignition power transistor connector: Disconnected

OK → **7**

OK → Repair the harness. (D4 – Ground)

7 D-2
Harness side connector



Z7FU1252

Measure the ignition power transistor control signal voltage.

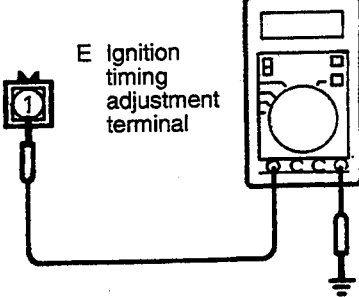
- Ignition power transistor connector: Disconnected
- Ignition switch: START

Voltage (V)
0.5–4.0

OK → **8**

OK → Repair the harnesses. (D1–11) (D2–23) (D3–10)

8 E Ignition timing adjustment terminal



Z7FU1060

Measure the terminal voltage of the ignition timing adjustment terminal.

- Ignition switch: ON

Voltage (V)
4.0–5.2

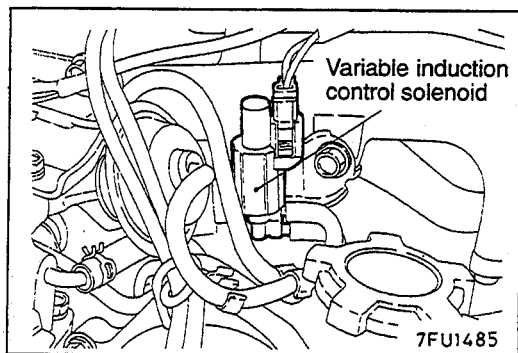
OK → **STOP**

OK → Repair the harness. (C1–34)

ACTUATOR INSPECTION

Refer to GROUP 16 – Ignition System.

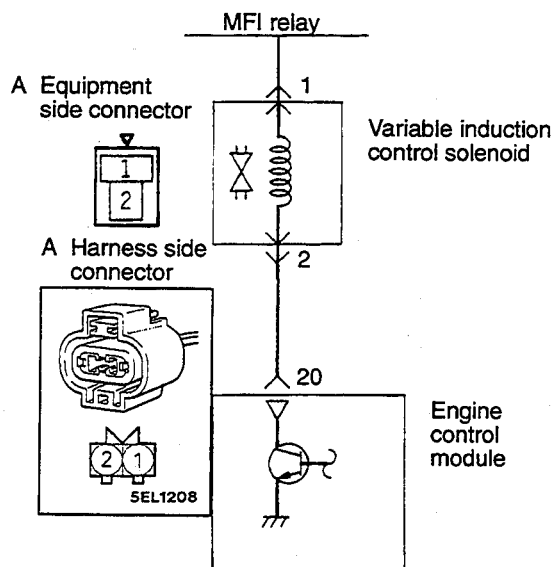
VARIABLE INDUCTION CONTROL SOLENOID <DOHC>



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101



01A0324 7FU1711

OPERATION

- The variable induction control solenoid is an ON/OFF type of solenoid which switches the pressure introduced to the variable induction control vacuum actuator between intake manifold pressure and atmospheric pressure.
- Battery positive voltage is supplied to the variable induction control solenoid via the MFI relay. When the engine control module turns the power transistor inside the module on, current flows in the solenoid coil and the negative pressure inside the intake manifold is introduced to the variable induction control vacuum actuator. This causes the variable induction control vacuum actuator to operate and close the control solenoid.

INSPECTION

Using Scan Tool

Function	Item No.	Activation	Check conditions	Normal condition
Actuator test	11	Switches solenoid from off to on	Ignition switch: ON	Operation sound can be heard during activation.

HARNES INSPECTION

<p>1</p> <p>B MFI relay harness side connector</p> <p>A Harness side connector</p> <p style="text-align: right;">Z6AF0073</p>	<p>Check for continuity between the variable induction control solenoid and the MFI relay.</p> <ul style="list-style-type: none"> • Variable induction control solenoid connector: Disconnected • MFI relay connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> • Insert the circuit tester probes into both ends of the harness. 	<div style="text-align: center;"> → <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center; margin-left: 10px;">2</div> </div> <div style="text-align: center;"> → <div style="padding-left: 10px;">Repair the harness. (A1–B3)</div> </div>
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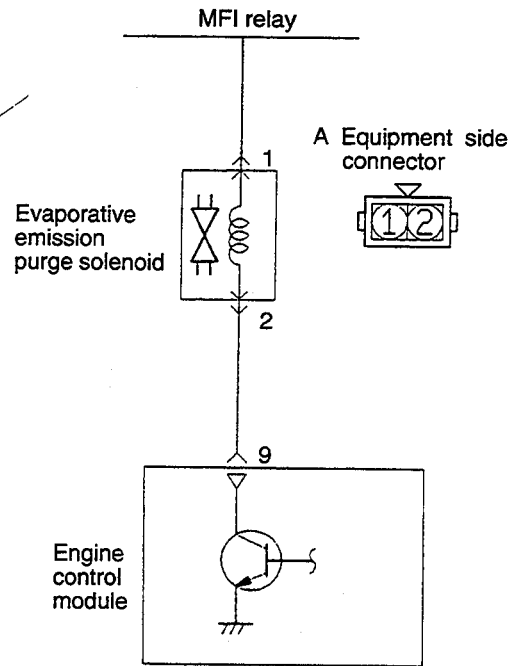
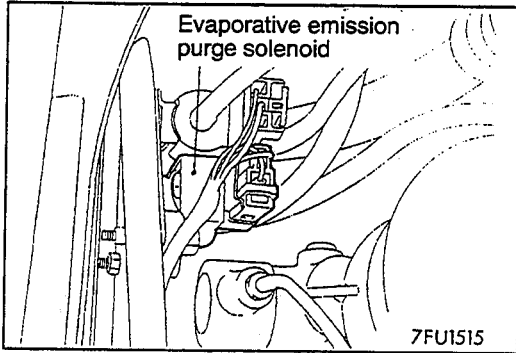
<p>2</p> <p>A Harness side connector</p> <p>Engine control module harness side connector</p> <p style="text-align: right;">7FU0526</p>	<p>Check for an open or short-circuit between the variable induction control solenoid and the engine control module.</p> <ul style="list-style-type: none"> • Variable induction control solenoid connector: Disconnected • Engine control module connector: Disconnected 	<div style="text-align: center;"> → <div style="text-align: center; margin-left: 10px;"> </div> </div> <div style="text-align: center;"> → <div style="padding-left: 10px;">Repair the harness. (A2–20)</div> </div>
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ACTUATOR INSPECTION

Refer to GROUP 15 – Service Adjustment Procedures.

EVAPORATIVE EMISSION PURGE SOLENOID
 <Federal – SOHC, California – DOHC – From 1995 model>

110005837



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1712

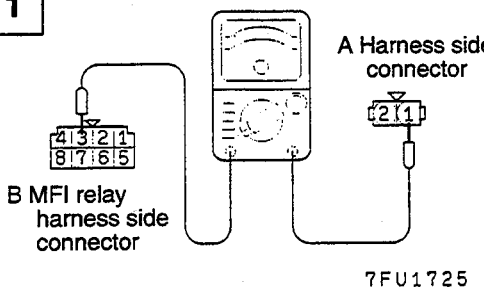


OPERATION

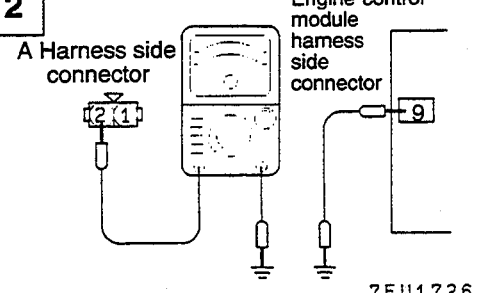



- The evaporative emission purge solenoid is an ON/OFF type (SOHC) or duty control type (DOHC) of solenoid; it functions to regulate the introduction of purge air from the evaporative emission canister to the intake manifold plenum.
- Battery positive voltage is supplied, by way of the MFI relay, to the evaporative emission purge solenoid. When the engine control module switches on the ignition power transistor within the unit, current flows to the coil, and purge air is introduced.

INSPECTION

Refer to P.13A-103.

HARNESS INSPECTION

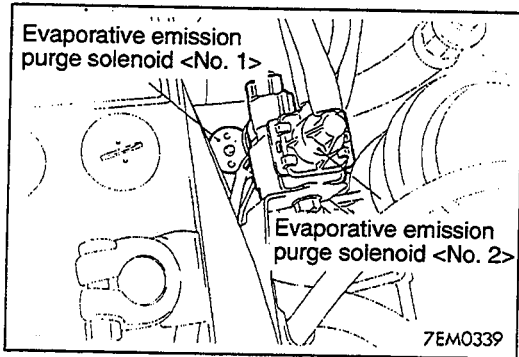
<div style="border: 1px solid black; padding: 2px; width: 20px; text-align: center; margin-bottom: 5px;">1</div>  <p style="font-size: small;">B MFI relay harness side connector</p> <p style="font-size: small;">A Harness side connector</p> <p style="text-align: right; font-size: small;">7FU1725</p>	<p>Check for continuity between the evaporative emission purge solenoid and the MFI relay.</p> <ul style="list-style-type: none"> ● Evaporative emission purge solenoid connector: Disconnected ● MFI relay connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> ● Touch the ohmmeter probes to both ends of the harness. 	<div style="text-align: center; margin-bottom: 10px;">  → <div style="border: 1px solid black; padding: 2px; width: 20px; text-align: center; margin: 0 auto;">2</div> </div> <div style="text-align: center;">  → Repair the harness. (A1-B3) </div>
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<div style="border: 1px solid black; padding: 2px; width: 20px; text-align: center; margin-bottom: 5px;">2</div>  <p style="font-size: small;">A Harness side connector</p> <p style="font-size: small;">Engine control module harness side connector</p> <p style="text-align: right; font-size: small;">7FU1726</p>	<p>Check for an open circuit or a short-circuit to ground between the evaporative emission purge solenoid and the engine control module.</p> <ul style="list-style-type: none"> ● Evaporative emission purge solenoid connector: Disconnected ● Engine control module connector: Disconnected 	<div style="text-align: center; margin-bottom: 10px;">  →  </div> <div style="text-align: center;">  → Repair the harness. (A2-9) </div>
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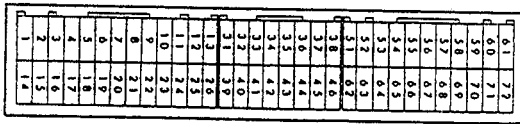
ACTUATOR INSPECTION

Refer to GROUP 17 – Service Adjustment Procedures.

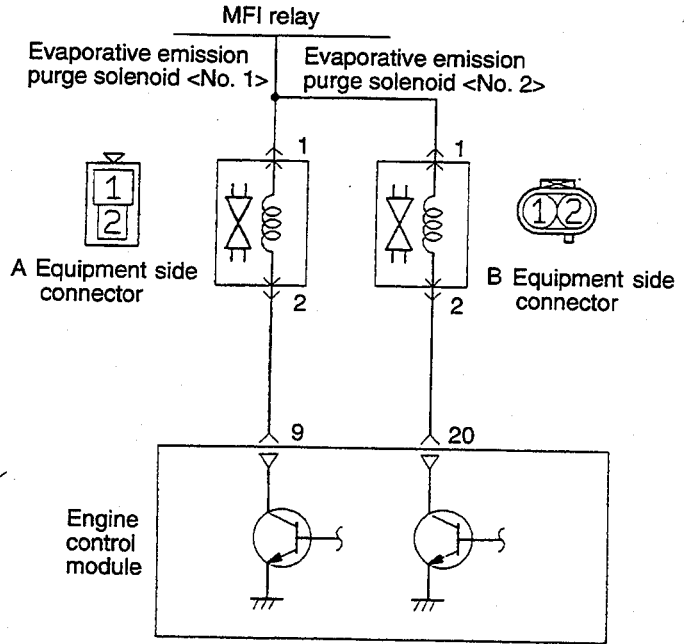
EVAPORATIVE EMISSION PURGE SOLENOID <California – SOHC>



Engine control module connector



9FU0101



7FU1713

OPERATION

- The evaporative emission purge solenoid is an duty control type of solenoid; it functions to regulate the introduction of purge air from the evaporative emission canister to the intake manifold plenum.

- Battery positive voltage is supplied, by way of the MFI relay, to the evaporative emission purge solenoid. When the engine control module switches on the ignition power transistor within the unit, current flows to the coil, and purge air is introduced.

INSPECTION

Using Scan tool

Function	Item No.	Drive content	Check condition	Normal state
Actuator test	08	EVAP purge solenoid <No. 1> from OFF to ON	Ignition switch: ON	Operating sound is heard when driven
	28	EVAP purge solenoid <No. 2> from OFF to ON		

HARNESS INSPECTION

<div style="border: 1px solid black; padding: 2px; width: 20px; text-align: center; margin-bottom: 5px;">1</div> <p style="font-size: small;">C MFI relay harness side connector</p> <p style="font-size: small;">A Harness side connector</p> <p style="font-size: small;">B Harness side connector</p> <p style="text-align: right; font-size: small;">7FU1727</p>	<p>Check for continuity between the evaporative emission purge solenoid and the MFI relay.</p> <ul style="list-style-type: none"> ● Evaporative emission purge solenoid connector: Disconnected ● MFI relay connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> ● Touch the ohmmeter probes to both ends of the harness. 	<div style="text-align: center; font-size: 2em; margin-bottom: 10px;">OK</div> <div style="text-align: center; font-size: 2em;">OK</div> <div style="text-align: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center; margin: 0 auto;">2</div> <p>Repair the harness. (A1-C3) (B1-C3)</p> </div>
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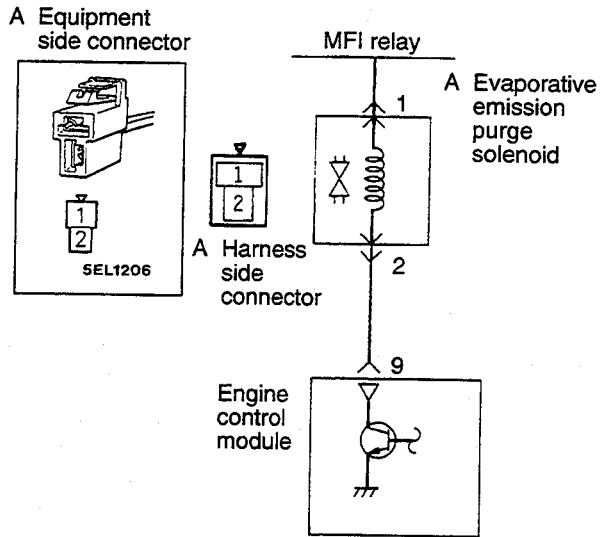
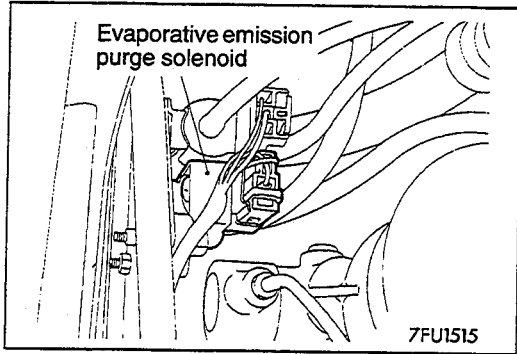
<div style="border: 1px solid black; padding: 2px; width: 20px; text-align: center; margin-bottom: 5px;">2</div> <p style="font-size: small;">A Harness side connector</p> <p style="font-size: small;">Engine control module harness side connector</p> <p style="font-size: small;">B Harness side connector</p> <p style="text-align: right; font-size: small;">7FU1728</p>	<p>Check for an open circuit or a short-circuit to ground between the evaporative emission purge solenoid and the engine control module.</p> <ul style="list-style-type: none"> ● Evaporative emission purge solenoid connector: Disconnected ● Engine control module connector: Disconnected 	<div style="text-align: center; font-size: 2em; margin-bottom: 10px;">OK</div> <div style="text-align: center; font-size: 2em;">OK</div> <div style="text-align: center; margin-top: 10px;"> <div style="border: 1px solid black; padding: 5px; width: 30px; text-align: center; margin: 0 auto;"> <div style="border: 1px solid black; width: 15px; height: 15px; margin: 0 auto;"></div> <p style="margin: 0;">STOP</p> </div> <p>Repair the harness. (A2-9) (B2-20)</p> </div>
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ACTUATOR INSPECTION

Refer to GROUP 17 - Service Adjustment Procedures.

EVAPORATIVE EMISSION PURGE SOLENOID
 <DOHC – Up to 1994 models, Federal – DOHC – From 1995 models>

110005839



01A0324

Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1714

OPERATION

Refer to P.13A-103.

INSPECTION

Refer to P.13A-103.

13A-190 MULTIPOINT FUEL INJECTION – <SOHC-24 valve engine, DOHC>

HARNESS INSPECTION

<p>1</p> <p>A Harness side connector</p> <p>B MFI relay harness side connector</p> <p style="text-align: right;">Z6AF0073</p>	<p>Check for continuity between the evaporative emission purge solenoid and the MFI relay.</p> <ul style="list-style-type: none"> Evaporative emission purge solenoid connector: Disconnected MFI relay connector: Disconnected <p>NOTE</p> <ul style="list-style-type: none"> Touch the ohmmeter probes to both ends of the harness. 	<p>OK → 2</p> <p>✗ → Repair the harness. (A1-B3)</p>
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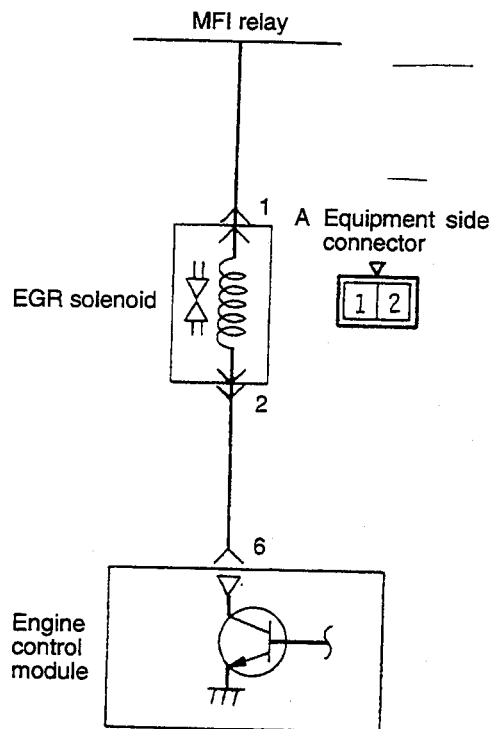
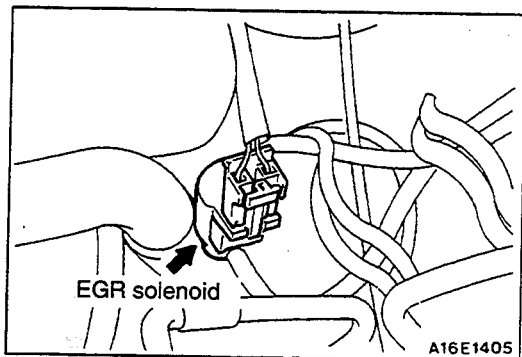
<p>2</p> <p>Harness side connector</p> <p>Engine control module harness side connector</p> <p style="text-align: right;">X7FU0526</p>	<p>Check for an open circuit or a short-circuit to ground between the evaporative emission purge solenoid and the engine control module.</p> <ul style="list-style-type: none"> Evaporative emission purge solenoid connector: Disconnected Engine control module connector: Disconnected 	<p>OK → STOP</p> <p>✗ → Repair the harness. (A2-9)</p>
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ACTUATOR INSPECTION

Refer to GROUP 17 – Service Adjustment Procedures.

110005840

EGR SOLENOID <DOHC>



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

01W657

7FU1715

OPERATION

- The EGR solenoid is a duty control type solenoid. It makes control by leaking EGR valve operating negative pressure to the throttle body A port.
- Power supply from the battery is sent through the MFI relay to the EGR solenoid. When the engine control module turns off the power transistor inside the module, current no longer flows through the coil and EGR valve operating negative pressure leaks.

TROUBLESHOOTING HINT

If the results of EGR solenoid on-vehicle and off vehicle inspections are normal but the diagnostic trouble code for EGR system failure is displayed, check the EGR valve, vacuum hose and EGR passage for blockage.

INSPECTION

Using Scan Tool

Function	Item No.	Drive content	Check condition	Normal condition
Actuator test	10	Turn solenoid from off to on	Ignition switch: ON	Operation sound can be heard during activation

HARNESS INSPECTION

1

A Harness side connector

B MFI relay harness side connector

Z6AF0074

Check for continuity between the EGR solenoid and the MFI relay.

- EGR solenoid connector: Disconnected
- MFI relay connector: Disconnected

NOTE

- Touch the circuit tester probes to both ends of the harness.

OK → **2**

OK → Repair the harness. (A1-B3)

2

A Harness side connector

Engine control module harness side connector

ZG1A0825

Check for an open circuit or a short-circuit to ground between the EGR solenoid and the engine control module.

- EGR solenoid connector: Disconnected
- Engine control module connector: Disconnected

OK → **STOP**

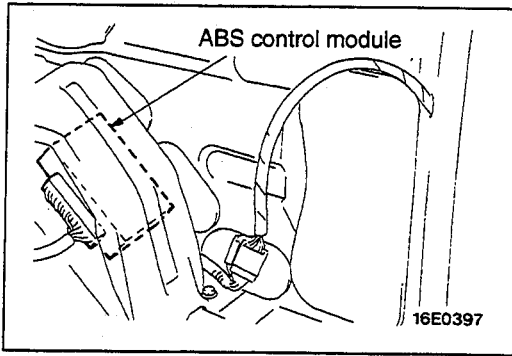
OK → Repair the harness. (A2-6)

ACTUATOR INSPECTION

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

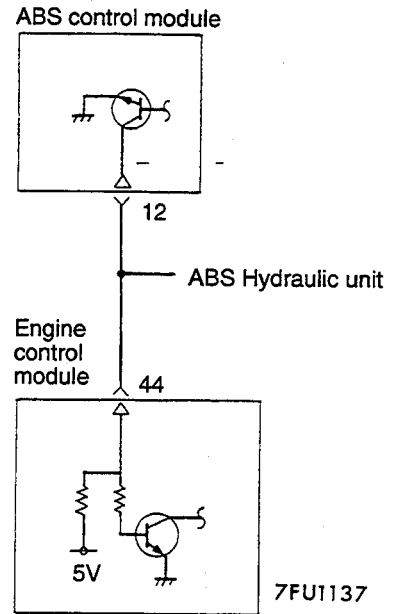
110005841

ANTI-LOCK BRAKING SIGNAL



ABS control module equipment side connector

1	2	3	4	A	5	6	7	8	
9	10	11	12	13	14	15	16	17	18



Engine control module connector

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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9FU0101

7FU1716

OPERATION

- The anti-lock braking signal is output by the anti-lock braking system (ABS) control module to the engine control module as a signal to indicate whether the motor relay is being driven or not. The engine control module controls the idle air control motor by means of this signal, and gives accurate anti-lock braking effectiveness.
- The ABS control module turns the ignition power transistor ON when the motor relay is being driven, and the output terminal which has battery positive voltage applied is short-circuited to the ground. This causes the anti-lock braking signal to change from HIGH to LOW.

HARNESS INSPECTION

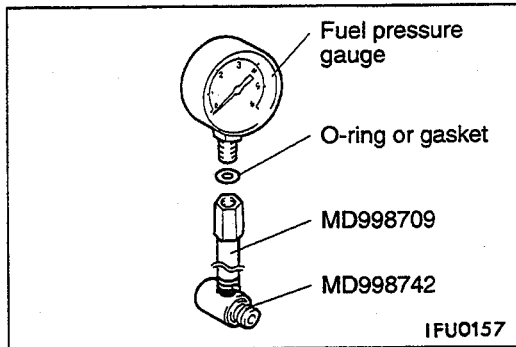
<p>1 ABS control module harness side connector</p> <p>Engine control module harness side connector</p> <p>12</p> <p>44</p> <p>Y6FU1543</p>	<p>Check for an open or short-circuit between the ABS control module and the engine control module.</p> <ul style="list-style-type: none"> • ABS control module connector: Disconnected • Engine control module connector: Disconnected 	<p>OK → STOP</p> <p>OK → Repair the harness. (12-44)</p>
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FUEL PRESSURE TEST <SOHC>

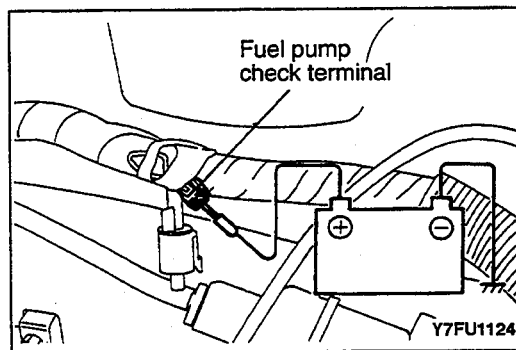
- (1) Reduce the internal pressure of the fuel pipes and hoses.
- (2) Remove the fuel pressure regulator at the fuel rail side.

Caution

Cover the fuel pressure regulator with a shop towel to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.

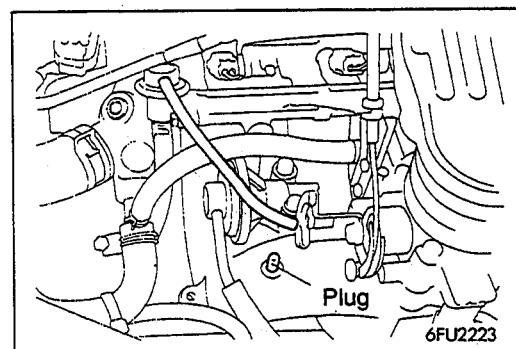


- (3) Connect a fuel pressure gage to the special tool, placing an adequate O-ring or gasket between the gage end special tool prevent fuel leaks.
- (4) After carrying out step (3), install the special tool between the fuel rail and the fuel pressure regulator.



- (5) Connect a jumper wire to the terminal for activation of the fuel pump and to the positive battery terminal to activate the fuel pump. With fuel pressure applied, check that there is no fuel leakage from the fuel pressure gage and the special tool connection part.
- (6) Disconnect the jumper wire from the terminal for activation of the fuel pump to stop the fuel pump.
- (7) Start the engine and let it idle.
- (8) Measure the fuel pressure during idling.

Standard value: Approx. 270 kPa (38 psi) at curb idle



- (9) Disconnect the vacuum hose (blue stripe) from the intake manifold and then plug the nipple. Measure the fuel pressure in this condition.

Standard value: 330–370 kPa (47–53 psi) at curb idle speed

- (10) Check that the fuel pressure during idling does not decrease even after the engine is raced a few times.
- (11) Use a finger to gently press the fuel return hose while repeatedly racing the engine, and check that there is fuel pressure in the return hose also.

NOTE

There will be no fuel pressure in the return hose if there is insufficient fuel flow.

- (12) If the fuel pressure measured in steps (9) to (12) is outside the standard value range, check for the probable cause by referring to the table below, and then make the appropriate repair.

Condition	Probable cause	Remedy
<ul style="list-style-type: none"> ● Fuel pressure is too low. ● Fuel pressure drops during racing. ● No fuel pressure in fuel return hose. 	Fuel filter is clogged.	Replace the fuel filter.
	Malfunction of valve seat inside the fuel pressure regulator, or fuel leakage to return side caused by spring deterioration.	Replace the fuel pressure regulator.
	Low fuel pump discharge pressure.	Replace the fuel pump.
Fuel pressure is too high.	The valve inside the fuel pressure regulator is sticking.	Replace the fuel pressure regulator.
	Clogging of the fuel return hose and/or the pipe.	Clean or replace the hose and/or pipe.
Fuel pressure does not change when vacuum hose is connected and disconnected.	Damaged vacuum hose or clogged nipple.	Replace the vacuum hose, or clean the nipple.

(13) Stop the engine and check for a change of the value indicated by the fuel pressure gage. The condition is normal if there is no decrease in the indicated value within two minutes. If there is a decrease in the indicated value, monitor the speed of the decrease, and, referring to the table below, determine the cause of the problem and make the appropriate repair.

Condition	Probable cause	Remedy
After the engine is stopped, the fuel pressure drops gradually.	Injector leakage.	Replace the injector.
	Leakage at the fuel pressure regulator valve seat.	Replace the fuel pressure regulator.
There is a sudden sharp drop of the fuel pressure immediately after the engine is stopped.	The check valve (within the fuel pump) is not closed.	Replace the fuel pump.

(14) Reduce the internal pressure of the fuel pipes and hose. (Refer to P.13F-3.)

(15) Disconnect the fuel pressure gage and the special tool from the fuel rail.

Caution

Because there will be some residual pressure in the fuel pipe line, use a shop towel to cover so that fuel doesn't splatter.

(16) Replace the O-ring at the end of the high-pressure fuel hose with a new one.

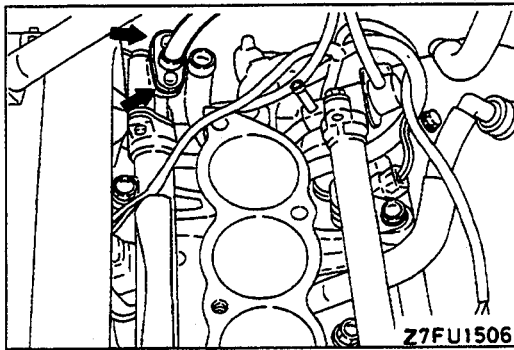
(17) After connecting the high-pressure fuel hose to the fuel rail, tighten the installation bolt to the specified torque.

Tightening torque: 5 Nm (3.6 ft.lbs)

(18) Check that there is no fuel leakage.

- 1) Apply battery positive voltage to the terminal for activation of the fuel pump so as to activate the fuel pump.
- 2) With fuel pressure applied, check for leakage of the fuel line.

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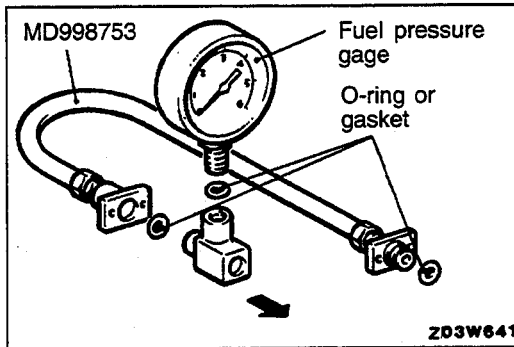


FUEL PRESSURE TEST <DOHC>

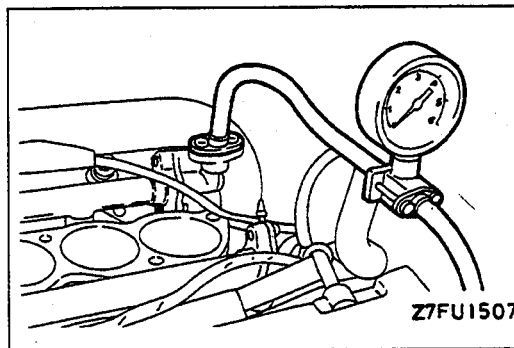
- (1) Reduce the internal pressure of the fuel pipes and hoses.
- (2) Remove the intake manifold plenum.
- (3) Disconnect the high pressure fuel hose at the fuel rail side.

Caution

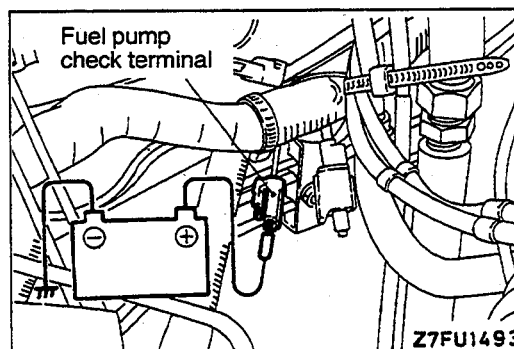
Cover the hose connection with a shop towel to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



- (4) Connect a fuel pressure gage to the special tool, placing an adequate O-ring or gasket between the gage end special tool to prevent fuel leaks.



- (5) Attach the special tool which was connected in step (4) to the fuel rail.



- (6) Connect a jumper wire to the terminal for activation of the fuel pump and to the positive battery terminal to activate the fuel pump. With fuel pressure applied, check that there is no fuel leakage from the fuel pressure gage and the special tool connection part.
- (7) Measure the fuel pressure.

Standard value: 330–370 kPa (47–53 psi) at curb idle speed

(8) If the fuel pressure measured in steps (7) is outside the standard value range, check for the probable cause by referring to the table below, and then make the appropriate repair.

Condition	Probable cause	Remedy
Fuel pressure is too low.	Fuel filter is clogged.	Replace the fuel filter.
	Malfunction of valve seat inside the fuel pressure regulator, or fuel leakage to return side caused by spring deterioration.	Replace the fuel pressure regulator.
	Low fuel pump discharge pressure.	Replace the fuel pump.
Fuel pressure is too high.	The valve inside the fuel pressure regulator is sticking.	Replace the fuel pressure regulator.
	Clogging of the fuel return hose and/or the pipe.	Clean or replace the hose and/or pipe.

- (9) Disconnect the lead wire from the fuel pump activation terminal (black) to stop the fuel pump, and then check for a change of the value indicated by the fuel pressure gage. The condition is normal if there is no decrease in the indicated value within two minutes. If there is a decrease in the indicated value, monitor the speed of the decrease, referring to the table below, determine the cause of the problem and make the appropriate repair.

Condition	Probable cause	Remedy
After the fuel pump is stopped, the fuel pressure drops gradually.	Injector leakage.	Replace the injector.
	Leakage at the fuel pressure regulator valve seat.	Replace the fuel pressure regulator.
There is a sudden sharp drop of the fuel pressure immediately after the fuel pump is stopped.	The check valve (within the fuel pump) is not closed.	Replace the fuel pump.

- (10) Connect a vacuum pump to the fuel pressure regulator and apply 80 kPa (600 mmHg) of negative pressure to remove the residual pressure inside the fuel pipe line.
 (11) Disconnect the fuel pressure gage and the special tool from the fuel rail.

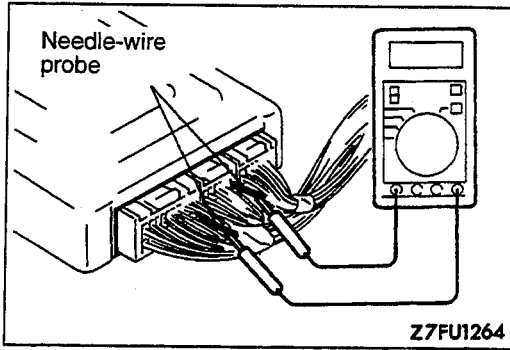
Caution

Because there will be some residual pressure in the fuel pipe line, use a shop towel to cover so that fuel doesn't splatter.

- (12) Replace the O-ring at the end of the high-pressure fuel hose with a new one.
 (13) After connecting the high-pressure fuel hose to the fuel rail, tighten the installation bolt to the specified torque.

Tightening torque: 5 Nm (3.6 ft.lbs)

- (14) Check that there is no fuel leakage.
 1) Apply battery positive voltage to the terminal for activation of the fuel pump so as to activate the fuel pump.
 2) With fuel pressure applied, check for leakage of the fuel line.
 (15) Install the intake manifold plenum.



ENGINE CONTROL MODULE TERMINAL VOLTAGE CHECK

110005843

- (1) Connector a needle wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
- (2) Insert the needle wire probe into each of the engine control module 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 control module connectors connected.
2. Make the voltage measurement between terminal (26) (ground terminal) and each terminal.
3. Pull out the engine control module to make it easier to reach the connector terminals.
4. The checks do not have to be carried out in the order given in the chart.

Caution

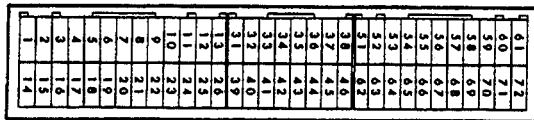
Never short-circuit the positive (+) probe between a connector terminal and ground, or the vehicle wiring, the sensor, the engine control module, etc., will be damaged.

- (3) If the voltmeter indication is outside the standard value, check the corresponding sensor, actuator and related electrical wiring and repair or replace as necessary.
- (4) After repairing or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Terminal Voltage Check Chart

Engine Control Module Terminal Arrangement

Engine control module connector



Z9FU0101

Terminal No.	Check item	Check condition (Engine condition)	Standard value	Remarks
60	Backup power supply	Ignition switch: OFF	B+	
12	Power supply	Ignition switch: ON	B+	
25				
62	Ignition switch-IG	Ignition switch: ON	B+	
38	MFI relay (power supply)	Ignition switch: OFF	B+	
		Ignition switch: ON	0-3 V	
8	MFI relay (fuel pump)	Ignition switch: ON	B+	
		Engine: Idling	0-3 V	

13A-200 MULTIPOINT FUEL INJECTION – <SOHC-24 valve engine, DOHC>

On-Vehicle Inspection of MFI Components

Terminal No.	Check item	Check condition (Engine condition)		Standard value	Remarks
61	Sensor applied voltage	Ignition switch: ON		4.5–5.5 V	
70	Volume air flow sensor	Engine: Idling		2.2–3.2 V	
		Engine: 2,000 rpm			
19	Volume air flow sensor reset signal	Engine: Idling		0–1 V	
		Engine: 3,000 rpm		6–9 V	
52	Intake air temperature sensor	Ignition switch: ON	Air intake temperature of 0°C (32°F)	3.2–3.8 V	
			Air intake temperature of 20°C (68°F)	2.3–2.9 V	
			Air intake temperature of 40°C (104°F)	1.5–2.1 V	
			Air intake temperature of 80°C (176°F)	0.4–1.0 V	
65	Barometric pressure sensor	Ignition switch: ON	Altitude of 0 m (0 ft.)	3.7–4.3 V	
			Altitude of 1,200 m (3,937 ft.)	3.2–3.8 V	
63	Engine coolant temperature sensor	Ignition switch: ON	Coolant temperature of 0°C (32°F)	3.2–3.8 V	
			Coolant temperature of 20°C (68°F)	2.3–2.9 V	
			Coolant temperature of 40°C (104°F)	1.3–1.9 V	
			Coolant temperature of 80°C (176°F)	0.3–0.9 V	
64	Throttle position sensor	Ignition switch: ON for 15 seconds or more	Idling	0.3–1.0 V	
			Wide open throttle	4.5–5.5 V	
67	Closed throttle position switch	Ignition switch: ON	Set the throttle valve to the idle position	0–1 V	
			Slightly open the throttle valve.	4 V or higher	
68	Camshaft position sensor	Engine: Cranking		0.2–3.0 V	
		Engine: Idling			
69	Crankshaft position sensor	Engine: Cranking		0.2–3.0 V	
		Engine: Idling			
51	Ignition switch-ST	Engine: Cranking		8 V or higher	M/T
71	Park/neutral position switch	Ignition switch: ON	Set the selector lever to P or N.	0–3 V	A/T
			Set the selector lever to D, 2, L or R.	8–14 V	
66	Vehicle speed sensor	<ul style="list-style-type: none"> Ignition switch: ON Move the vehicle slowly forward 		9 ↔ 5 V (Repeat the variation.)	
37	Power steering pressure switch	Engine: Idling after having warmed up	Set the steering wheel to the straight-forward	B+	
			Half turn the steering wheel.	0–3 V	

Terminal No.	Check item	Check condition (Engine condition)		Standard value	Remarks
45	Air conditioning switch	Engine: Idling	Turn the air conditioning switch to OFF.	0–3 V	
			Turn the air conditioning switch to ON (Air conditioning compressor is operating)	B+	
22	Air conditioning compressor clutch relay	<ul style="list-style-type: none"> • Engine: Idling • Air conditioning switch: OFF → ON (Air compressor is operating) 		Changes from B+ or temporarily 6 V higher to 0–3 V as A/C clutch cycles	
24	Electrical load switch	Engine: Idling	Turn the lighting switch off.	0–3 V	DOHC
			Turn the lighting switch on.	B+	
55 <California-SOHC> 56 <Federal, California>	Heated oxygen sensor	Engine: Warmed up, 2,000 rpm (Check using a digital type voltmeter)		0 ↔ 0.8 V (changes repeatedly)	
32<California> 35<California-SOHC>	Heated oxygen sensor (rear)	<ul style="list-style-type: none"> • Transaxle: second<M/T> L range<A/T> • Drive with wide open throttle • Engine: 3,500 rpm or more 		0.6–1.0 V	
1	No. 1 Injector	Engine: While engine is idling after having warmed up, rapidly depress the accelerator pedal		From 11–14 V, momentarily drops slightly	
14	No. 2 Injector				
2	No. 3 Injector				
15	No. 4 Injector				
3	No. 5 Injector				
16	No. 6 Injector				
4	Stepper motor coil <A1>	Engine: Warmed up Check immediately after hot restart		Changes repeatedly between B+ and 0–3 V	
17	Stepper motor coil <A2>				
5	Stepper motor coil <B1>				
18	Stepper motor coil <B2>				
10	Ignition power transistor unit A	Engine: 3,000 rpm		0.3–3 V	
23	Ignition power transistor unit B				
11	Ignition power transistor unit C				

13A-202 MULTIPOINT FUEL INJECTION – <SOHC-24 valve engine, DOHC> On-Vehicle Inspection of MFI Components

Terminal No.	Check item	Check condition (Engine condition)		Standard value	Remarks
9	Evaporative emission purge solenoid <No. 1>	Ignition switch: ON		B+	
		Engine: Warmed up, 3,000 rpm		0–3 V	
20	Evaporative emission purge solenoid <No. 2>	Ignition switch: ON		B+	California –SOHC
		Engine: Warmed up, 3,500 rpm		0–10 V	
31	Engine ignition signal	Engine: 3,000 rpm		0.3–3 V	
34	Ignition timing adjustment terminal	Ignition switch: ON	Ground the ignition timing adjustment terminal.	0–1 V	
			Disconnect the ground from the ignition timing adjustment terminal.	4.0–5.5 V	
36	Check engine/malfunction indicator lamp	Ignition switch: OFF → ON		Changes from 0–3 V to 9–13 V (after several seconds have elapsed)	
6	EGR solenoid	Ignition switch: ON		B+	DOHC
		Engine: While engine is idling after having warmed up, rapidly depress the accelerator pedal		Temporarily drops slightly from B+	
53	EGR temperature sensor	Ignition switch: ON	Sensor temperature of 50°C (122°F)	3.6–4.4 V	DOHC
			Sensor temperature of 100°C (212°F)	2.2–3.0 V	
20	Variable induction control solenoid	Engine: Idling		0–3 V	DOHC
		Engine: 5,000 rpm		B+	
44	Anti-lock braking signal	Engine: Idling		B+	
		<ul style="list-style-type: none"> ● When vehicle first starts to move after turning the ignition switch to ON ● Vehicle speed: 0 → 10 km/h (0 → 0.6 mph) 		Changes B+ to 0–3 V (temporarily)	

FUEL SUPPLY AND ENGINE CONTROL

CONTENTS

110005726

ACCELERATOR CABLE AND ACCELERATOR PEDAL	14	SERVICE ADJUSTMENT PROCEDURES	3
FUEL LINE AND VAPOR LINE	10	Accelerator Cable Play Adjustment	4
FUEL PUMP	5	Fuel Pressure	3
FUEL TANK	6	Fuel Pump Operation Check	4
GENERAL SPECIFICATIONS	2	SERVICE SPECIFICATIONS	2
		SPECIAL TOOLS	3
		TROUBLESHOOTING	2

GENERAL SPECIFICATIONS

110005727

Items		Specifications
Fuel	Tank capacity dm ³ (U.S. gal., Imp. gal.)	92 (24.3, 20.2)
Fuel pump	Type	Electrical, in-tank type
	Driven by	Electric motor

SERVICE SPECIFICATIONS

110005728

Items	Standard value
Accelerator cable play mm (in.)	1–2 (.04–.08)

TROUBLESHOOTING

FUEL TANK AND FUEL LINE

110005729





Trouble Symptom	Probable Cause	Remedy
Malfunction of engine due to insufficient fuel supply	Bent or kinked fuel pipe or hose	Repair or replace
	Clogged fuel pipe or hose	Clean or replace
	Dirty or rusted fuel tank interior	
	Clogged fuel filter or in-tank fuel filter	Replace
	Malfunction of fuel pump (clogged pump filter)	
	Water in fuel filter	Replace the fuel filter or clean the fuel tank and fuel line.
Malfunction of evaporative emission control system (when tank cap is removed, pressure releasing noise is heard)	Missing vapor line	Correct
	Disconnected vapor line piping joint	
	Folded, bent, cracked or clogged vapor line	Replace
	Malfunction of filler tube	
	Malfunction of fuel tank pressure control valve	

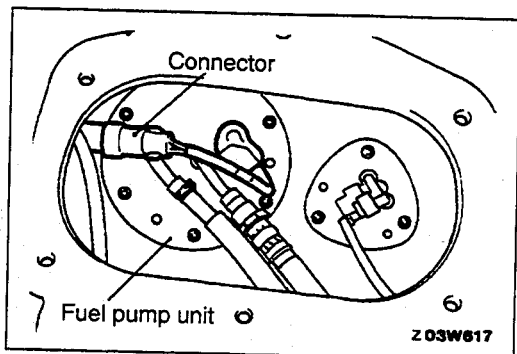
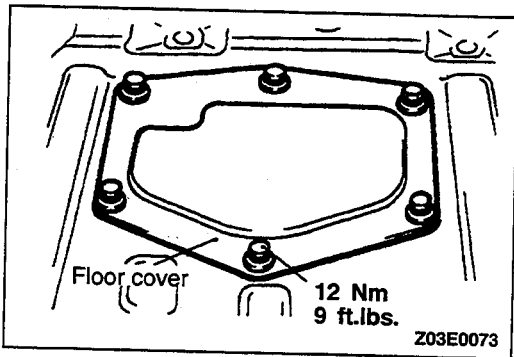
ACCELERATOR CABLE AND ACCELERATOR PEDAL

Trouble Symptom	Probable Cause	Remedy
Throttle valve will not fully open or close	Incorrectly adjusted accelerator cable	Adjust
	Broken return spring	Replace
	Malfunction of throttle lever	
Accelerator pedal operation not smooth (over acceleration)	Accelerator pedal incorrectly tightened	Repair
	Incorrectly installed accelerator cable	
	Accelerator cable requires lubrication	Lubricate or replace

SPECIAL TOOLS

110005730

Tool	Tool number and tool name	Supersession	Application
	MB991341 Scan tool (Multi-use tester <MUT>)		Up to 1993 models Fuel pump operation check
	ROM pack (For the number, refer to GROUP 00–Pre- cautions Before Ser- vice.)		
	MB991502 Scan tool (MUT-II)		All models Fuel pump operation check
 Z16X0807	ROM pack		



SERVICE ADJUSTMENT PROCEDURES

FUEL PRESSURE

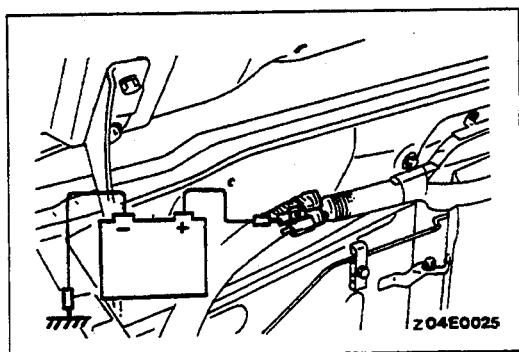
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HOW TO REDUCE THE FUEL LINE INTERNAL PRESSURE

When removing the fuel pipe and hose, etc., fuel under high pressure will be inside the fuel line, so carry out the following procedure to release the pressure to prevent the fuel from spraying out.

- (1) Take out the carpet in the cargo compartment and remove the floor cover.
- (2) Disconnect the fuel pump unit connector.
- (3) After starting the engine and letting it run until it stops, turn the ignition switch to OFF.
- (4) Connect the fuel pump unit connector.
- (5) Install the floor cover packing and the floor cover.

TSB Revision



FUEL PUMP OPERATION CHECK

110005732

- (1) Use the scan tool to force-drive the fuel pump, and check the operation of the fuel pump.
(For inspection using the scan tool, refer to P.13A-53, 123.)
- (2) If the fuel pump does not operate, check by the following procedure. If the results are normal, check the drive circuit.
 - 1) Turn the ignition switch to OFF.
 - 2) When the fuel pump drive connector is connected directly to the battery, check that the sound of the fuel pump operation can be heard.

NOTE

It is hard to hear the sound of an in-tank type fuel pump. So remove the fuel tank filler tube cap to hear it from the tank inlet.

- 3) Check if the fuel pressure can be felt by pinching the high pressure fuel hose with fingertips.

ACCELERATOR CABLE PLAY ADJUSTMENT

110005733

<VEHICLES WITHOUT CRUISE CONTROL SYSTEM>

For models equipped with the cruise control system, refer to P.13G-26.

(3.0L ENGINE-12 VALVE)

- (1) Check that there are no sharp bends in the routing of the accelerator cable.
- (2) Check that the throttle link is touching the fixed SAS (stopper).
- (3) Move the plate to bring the inner cable play to the standard value, and then tighten the adjusting bolt.

Standard value: 1–2 mm (.04–.08 in.)

NOTE

If there is excessive play in the accelerator cable, the vehicle speed drop (“undershoot”) when climbing a slope will be large.

If there is no play (excessive tension) in the accelerator cable, the idling speed will increase.

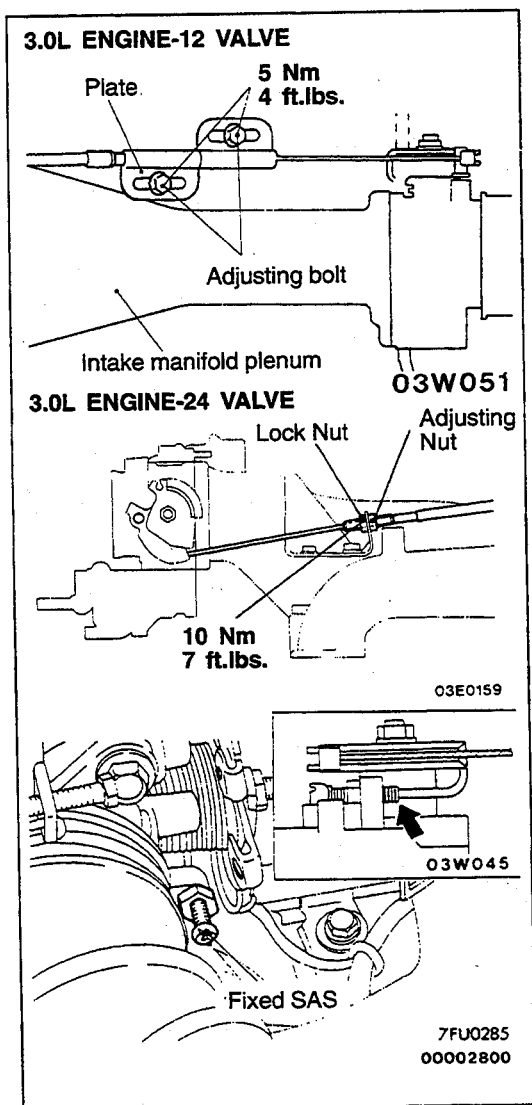
- (4) After adjustment confirm that throttle valve fully opens and closes by operating pedal.

(3.0L ENGINE-24 VALVE)

- (1) Check to see if there is any sharp bend in the wiring of the accelerator cable.
- (2) Confirm that the throttle lever is touched by the fixed SAS.
- (3) Check to see if the inner cable play is at the standard value.

Standard value: 1–2 mm (.04–.08 in.)

- (4) If the play is outside the standard value, adjust by sliding the adjusting nut so that the inner cable play is brought to the standard value, and then tighten the nut.



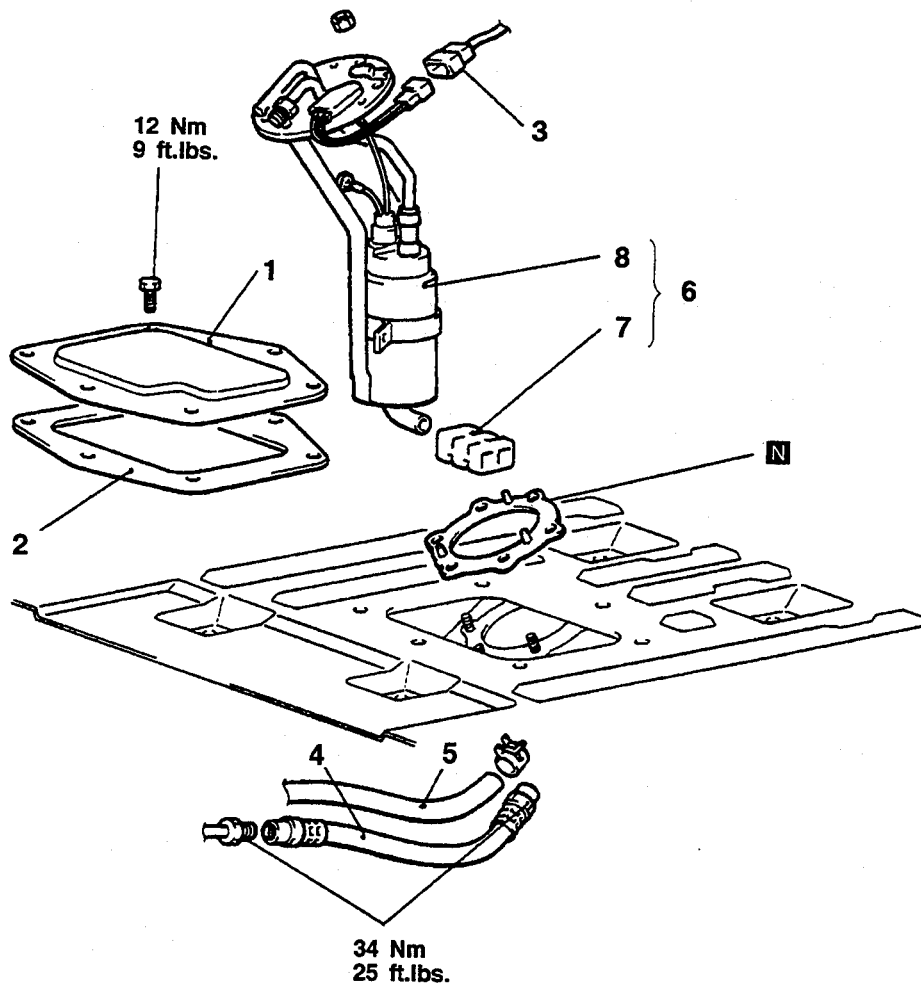
FUEL PUMP

110005734

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Fuel Drain and Filling
- Floor Carpet Removal and Installation



Removal steps

1. Floor cover
2. Packing
3. Fuel pump connector
4. High-pressure fuel hose

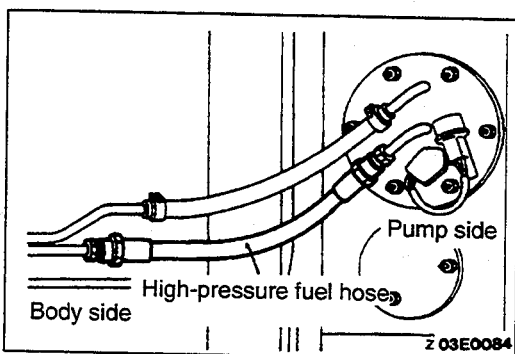
5. Fuel return hose connection
6. Fuel pump and filter assembly
7. Filter
8. Fuel pump assembly



REMOVAL AND INSTALLATION SERVICE POINT

REMOVAL AND INSTALLATION OF HIGH-PRESSURE FUEL HOSE

- (1) After disconnecting the high-pressure fuel hose at the body-side main pipe connection, disconnect the pump-side connection.
- (2) Install in the reverse order from removal.



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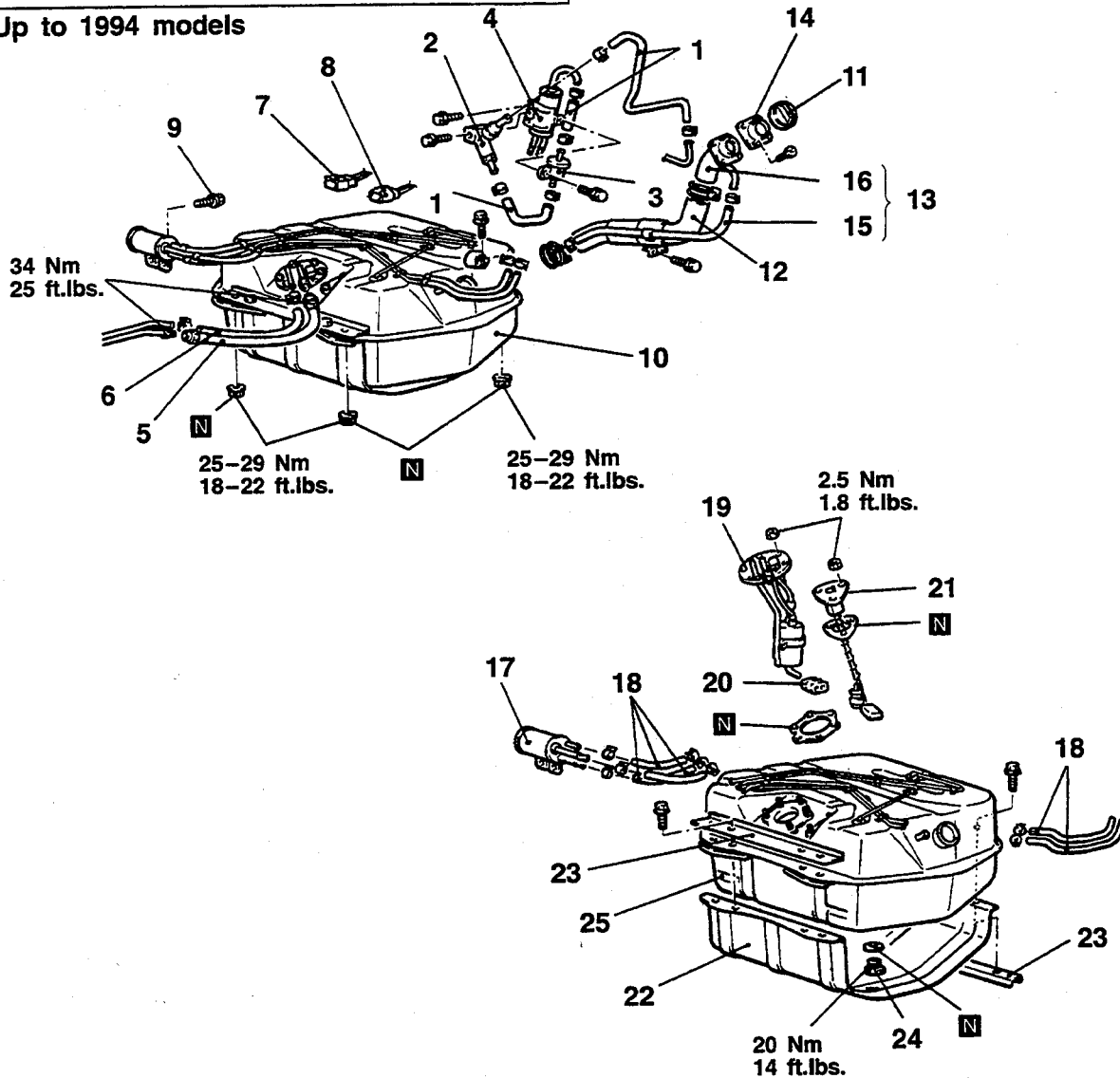
FUEL TANK

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Fuel Draining and Filling
- Fuel Tank Filler Tube Protector Removal and Installation
- Floor Carpet Removal and Installation
- Floor Cover Removal and Installation

Up to 1994 models



Removal steps

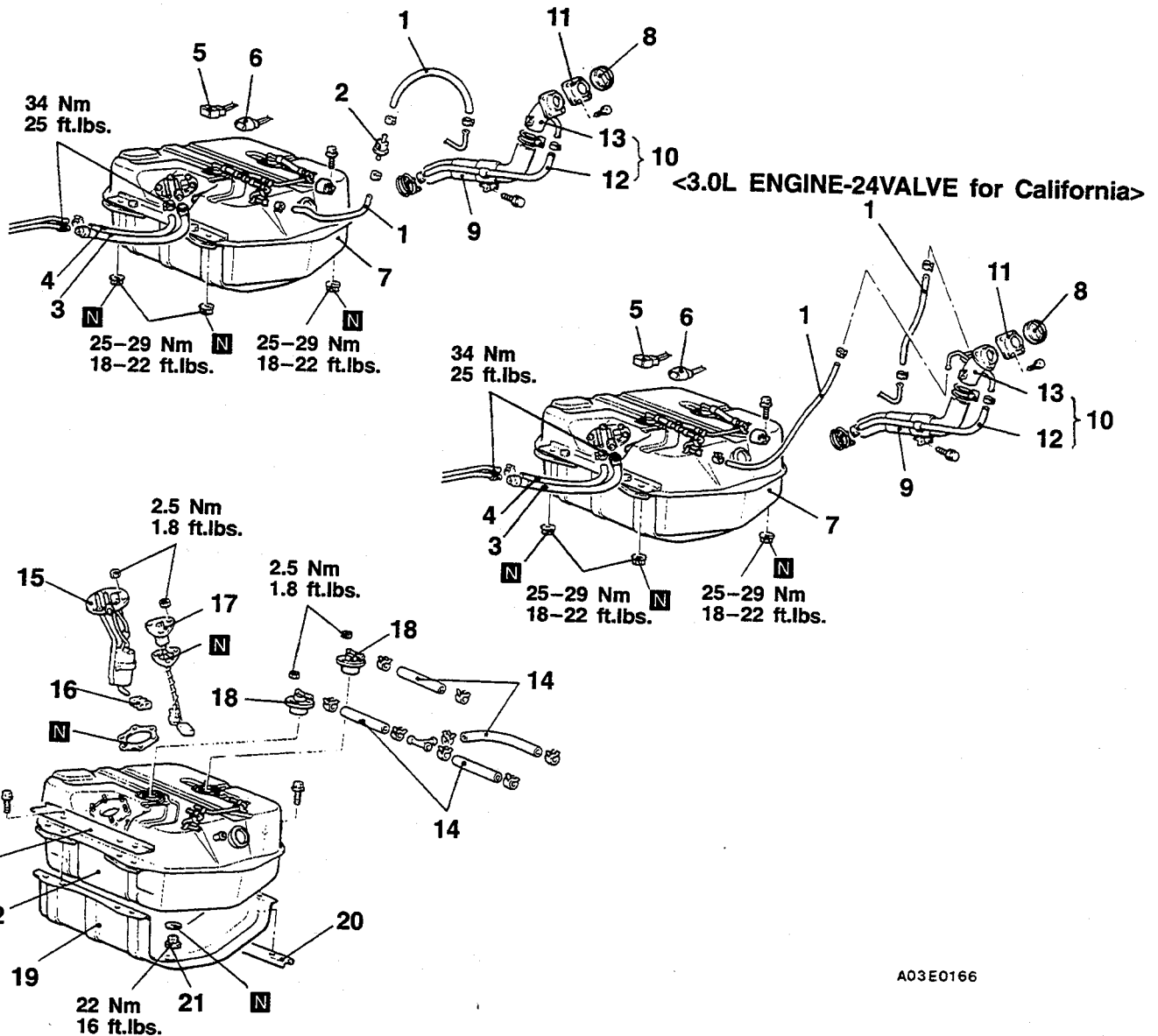
1. Vapor hoses
2. Fuel tank rollover valve
3. Fuel tank pressure relief valve
4. Separator tank
5. High-pressure fuel hose
6. Fuel return hose
7. Fuel pump connector
8. Fuel gage unit connector
9. Bolts
10. Fuel tank assembly
11. Fuel tank filler tube cap
12. Fuel tank filler hose

13. Fuel tank filler tube and vapor hose assembly
14. Packing
15. Vapor hose
16. Fuel tank filler tube
17. Separator tank
18. Vapor hoses
19. Fuel pump assembly
20. Filter
21. Fuel gage unit
22. Fuel tank protector
23. Plate
24. Drain plug
25. Fuel tank

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1995 models and after

<Except 3.0L ENGINE-24VALVE for California>

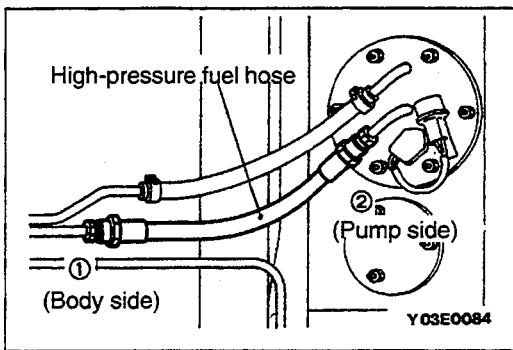


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Removal steps

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>1. Vapor hoses</p> <p>2. Fuel tank pressure relief valve <Except 3.0L ENGINE-24VALVE for California></p> <p>3. High pressure fuel hose</p> <p>4. Fuel return hose</p> <p>5. Fuel pump connector</p> <p>6. Fuel gage unit connector</p> <p>7. Fuel tank assembly</p> <p>8. Fuel tank filler cap</p> <p>9. Fuel tank filler hose</p> <p>10. Fuel tank filler tube and vapor hose assembly</p> | <p>11. Packing</p> <p>12. Vapor hose</p> <p>13. Fuel tank filler tube</p> <p>14. Vapor hoses</p> <p>15. Fuel pump assembly</p> <p>16. Filter</p> <p>17. Fuel gage unit</p> <p>18. Fuel tank rollover valve</p> <p>19. Fuel tank protector</p> <p>20. Plate</p> <p>21. Drain plug</p> <p>22. Fuel tank</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TSB Revision



REMOVAL SERVICE POINT

◀A▶ HIGH-PRESSURE FUEL HOSE REMOVAL

After disconnecting the high-pressure fuel hose at the body-side main pipe connection, disconnect the pump-side connection.

Caution

The fuel line has some residual pressure, so cover it with a shop towel.

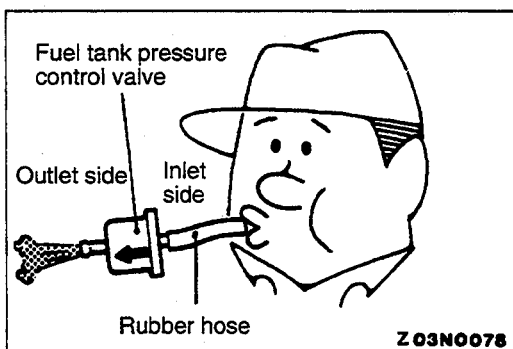
INSPECTION

- Check the hoses and the pipes for cracks or damage.
- Check the fuel tank filler tube cap for malfunction.
- Check the fuel tank for deformation, corrosion or cracks.
- Check the fuel tank for dust or foreign material.

NOTE

If the inside of the fuel tank is to be cleaned, use any one of the following:

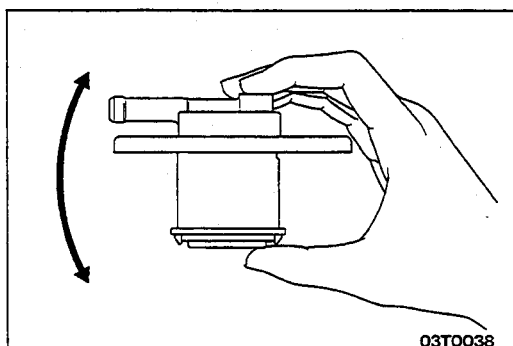
- (1) Kerosene
 - (2) Trichloroethylene
 - (3) A neutral emulsion type detergent
- Check the in-tank fuel filter for damage or clogging.
 - Check the check valve for malfunction.



FUEL TANK PRESSURE RELIEF VALVE

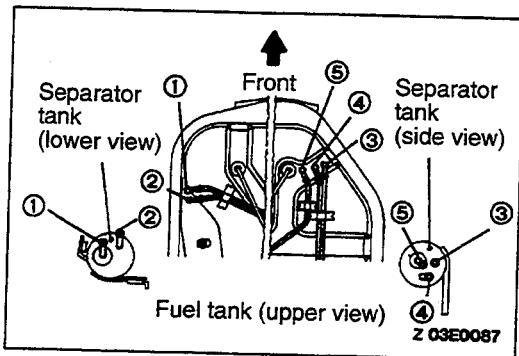
Attach a clean rubber hose, and check the operation of the fuel tank pressure relief valve.

Inspection Procedure	Normal Condition
Blow lightly from the inlet side (fuel tank side).	Air passes through after a slight resistance is felt.
Blow lightly from the outlet side (evaporative emission canister side).	Air passes through.



FUEL TANK ROLLOVER VALVE <1995 MODELS AND AFTER>

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.



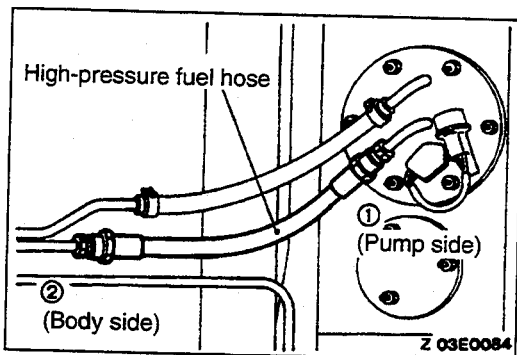
INSTALLATION SERVICE POINTS

▶A◀ VAPOR HOSES/SEPARATOR TANK INSTALLATION

Connect the vapor hoses with the corresponding numbers as shown in the illustration.

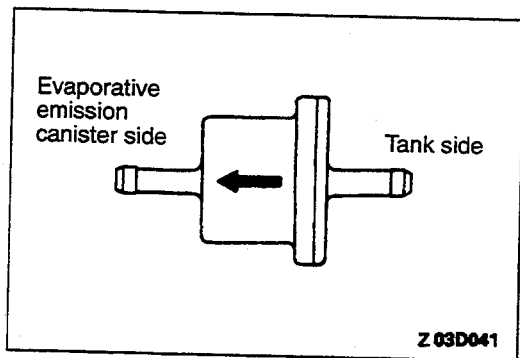
Caution

Connect the vapor hose with the identification mark (yellow tape) between (1)-(1), with the mark toward the separator tank side.



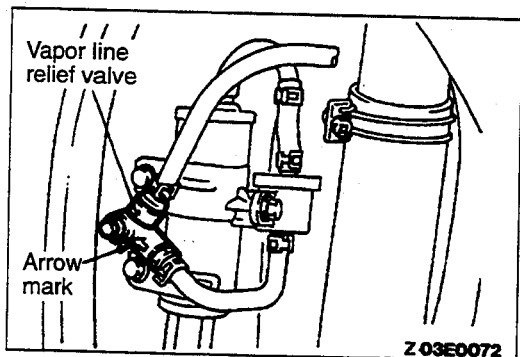
▶B◀ HIGH-PRESSURE FUEL HOSE INSTALLATION

After tightening the high-pressure fuel hose at the pump side, tighten the connection at the body-side main pipe.



▶C◀ FUEL TANK PRESSURE RELIEF VALVE INSTALLATION

Install the fuel tank pressure relief valve, being careful not to mistake the direction.



▶D◀ FUEL TANK ROLLOVER VALVE INSTALLATION

<Up to 1994 MODELS>

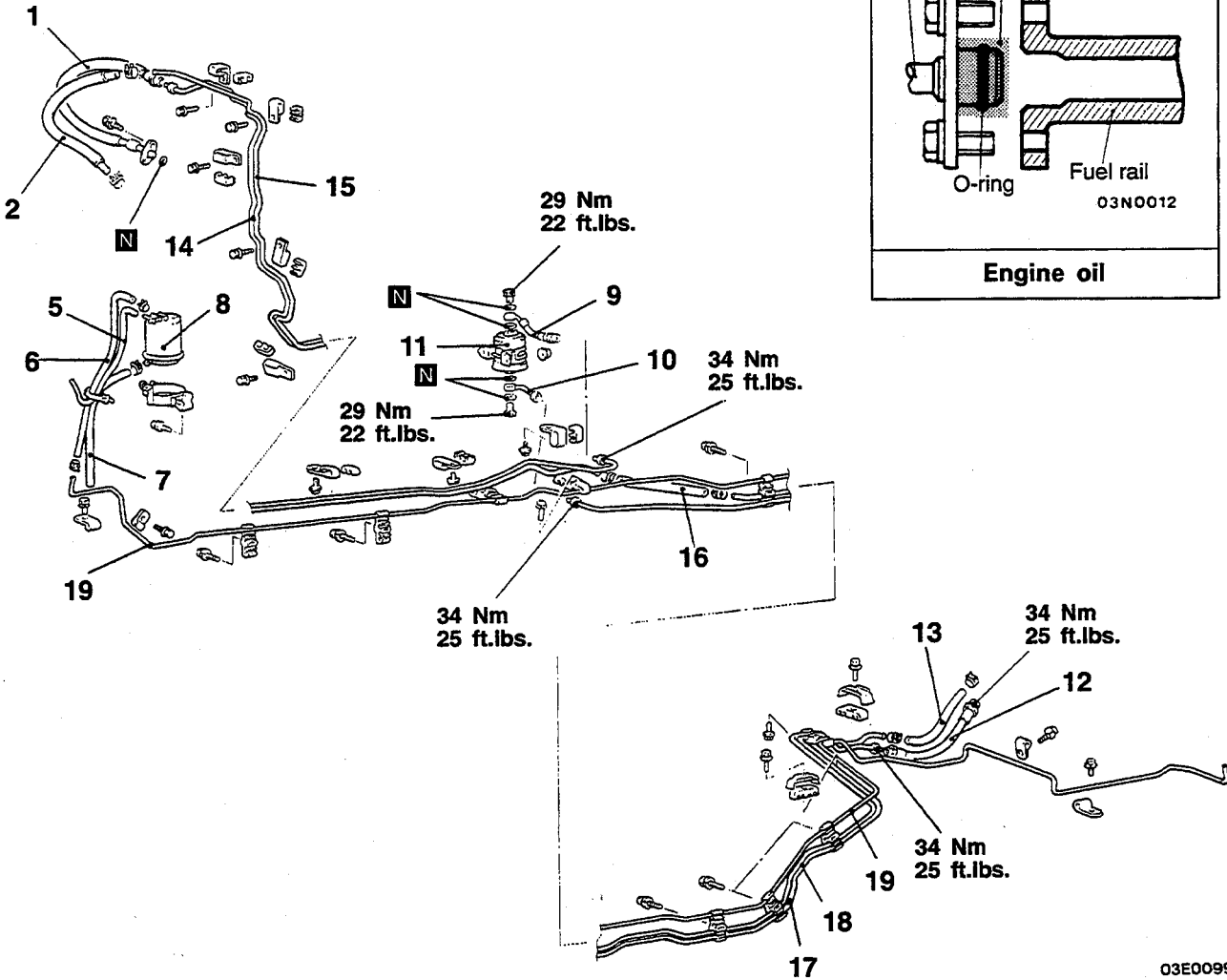
Install the fuel tank rollover valve as shown in the illustration, being careful not to mistake the direction.

FUEL LINE AND VAPOR LINE

REMOVAL AND INSTALLATION

Pre-removal Operation
 • Residual Pressure Release from High-pressure Fuel Hose (Refer to P.13F-3.)

Up to 1993 Models



03E0099
00002801

Removal steps

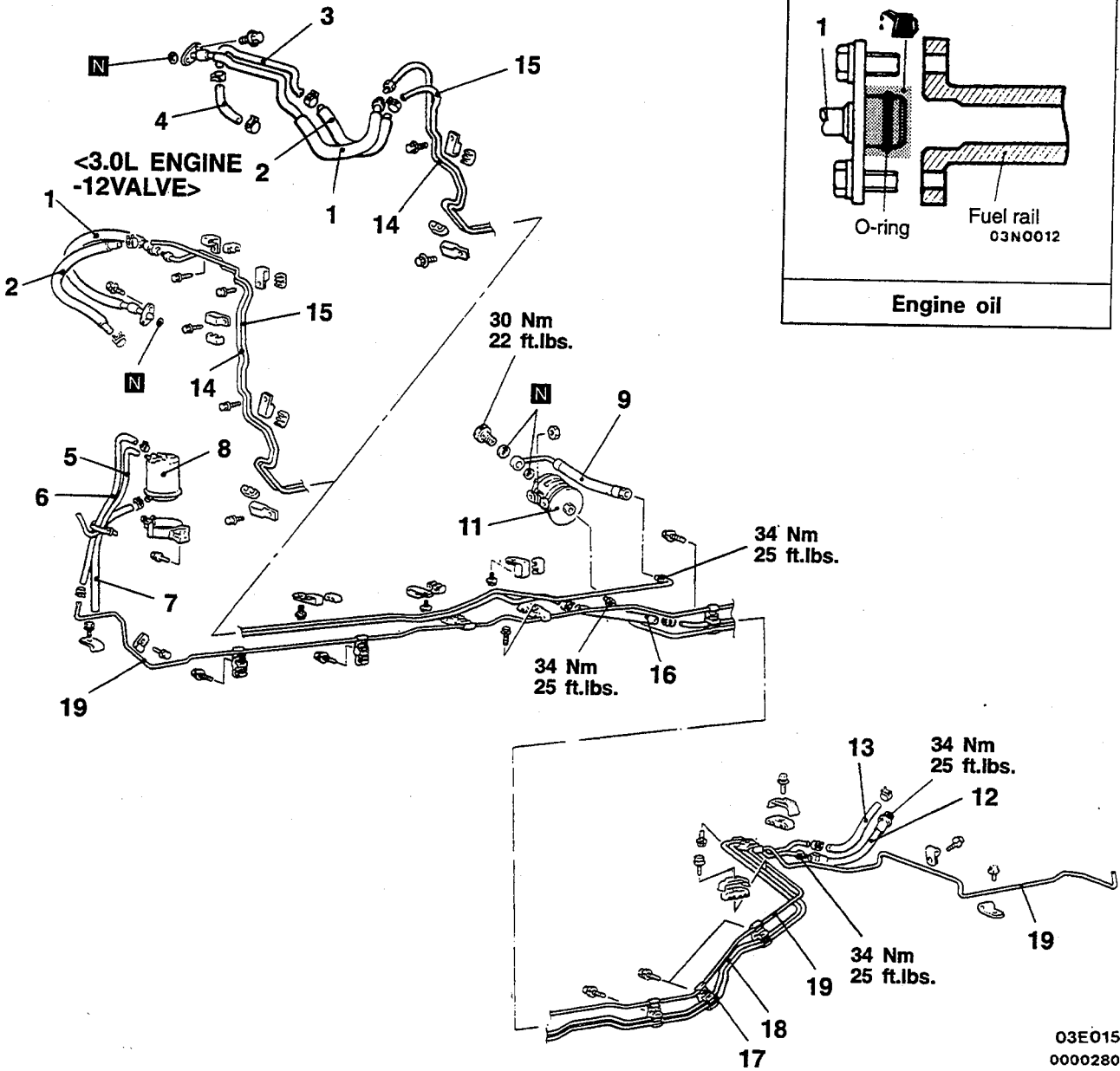
- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>◀A▶ ▶B▶ 1. High-pressure fuel hose</p> <p>▶A▶ ▶A▶ 2. Fuel return hose</p> <p>▶A▶ ▶A▶ 5. Fuel vapor hose</p> <p>▶A▶ ▶A▶ 6. Fuel vapor hose</p> <p>▶A▶ ▶A▶ 7. Fuel vapor hose</p> <p>▶B▶ ▶B▶ 8. Evaporative emission canister</p> <p>▶B▶ ▶B▶ 9. High-pressure fuel hose</p> | <p>▶C▶ ▶A▶ 12. High-pressure fuel hose</p> <p>▶A▶ ▶A▶ 13. Fuel return hose</p> <p>▶A▶ ▶A▶ 14. Fuel main pipe (front)</p> <p>▶A▶ ▶A▶ 15. Fuel return pipe (front)</p> <p>▶A▶ ▶A▶ 16. Fuel return hose</p> <p>▶A▶ ▶A▶ 17. Fuel main pipe (rear)</p> <p>▶A▶ ▶A▶ 18. Fuel return pipe (rear)</p> <p>▶A▶ ▶A▶ 19. Fuel vapor pipe</p> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TSB Revision

FUEL SUPPLY AND ENGINE CONTROL – Fuel Line and Vapor Line 13F-11

1994 models and after

<3.5L ENGINE>



Removal steps

- ◀A▶ ▶B▶ 1. High-pressure fuel hose
- ▶A▶ ▶B▶ 2. Fuel return hose
- ▶A▶ ▶B▶ 3. Fuel return pipe
- ▶A▶ ▶B▶ 4. Fuel return hose
- ▶A▶ ▶B▶ 5. Fuel vapor hose
- ▶A▶ ▶B▶ 6. Fuel vapor hose
- ▶A▶ ▶B▶ 7. Fuel vapor hose
- ▶B▶ ▶B▶ 8. Evaporative emission canister
- ▶B▶ ▶B▶ 9. High-pressure fuel hose
- ▶B▶ ▶B▶ 10. Joint assembly

- ◀C▶ ▶A▶ 11. Fuel filter
- ▶A▶ ▶A▶ 12. High-pressure fuel hose
- ▶A▶ ▶A▶ 13. Fuel return hose
- ▶A▶ ▶A▶ 14. Fuel main pipe (front)
- ▶A▶ ▶A▶ 15. Fuel return pipe (front)
- ▶A▶ ▶A▶ 16. Fuel return hose
- ▶A▶ ▶A▶ 17. Fuel main pipe (rear)
- ▶A▶ ▶A▶ 18. Fuel return pipe (rear)
- ▶A▶ ▶A▶ 19. Fuel vapor pipe

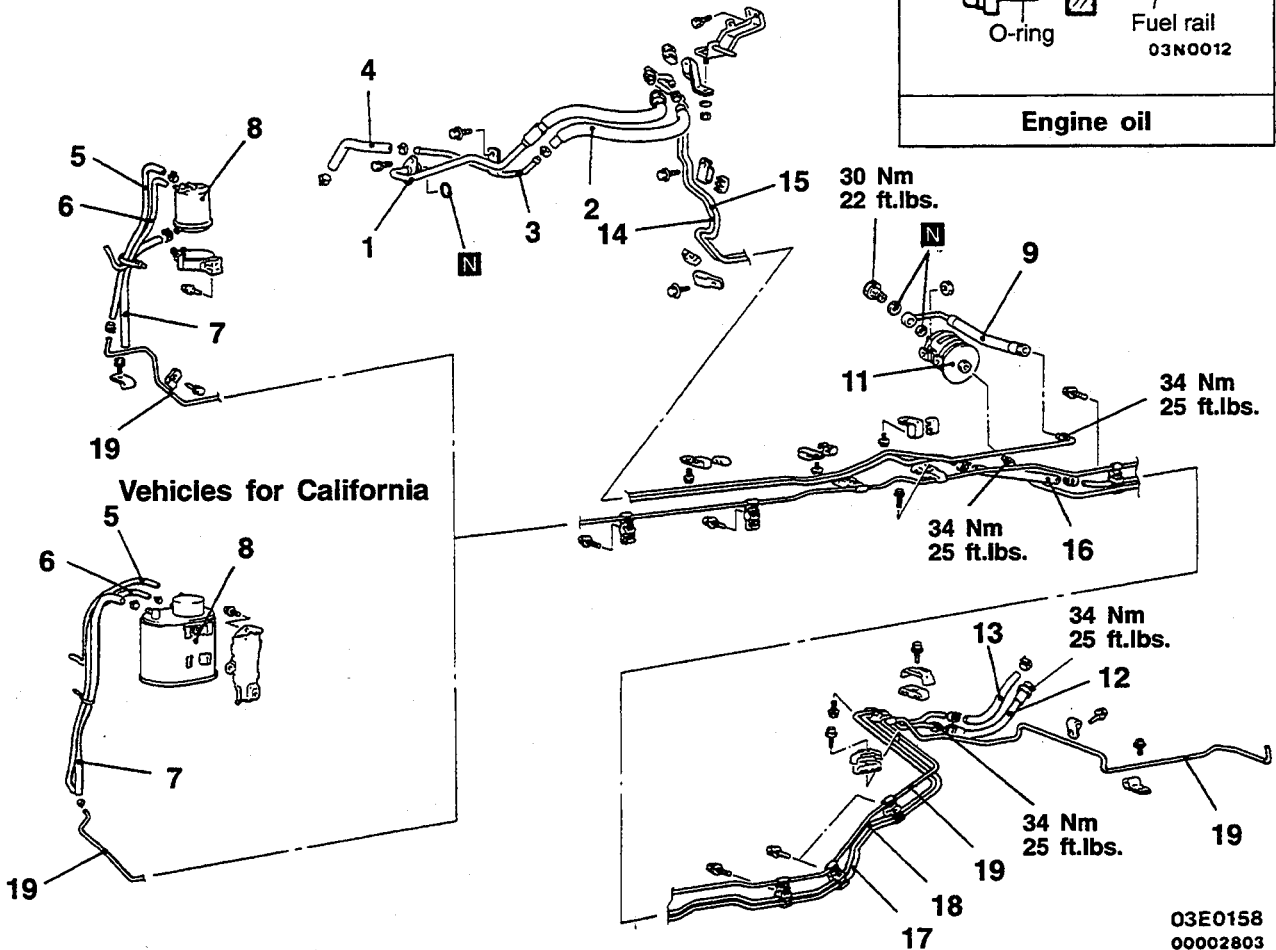
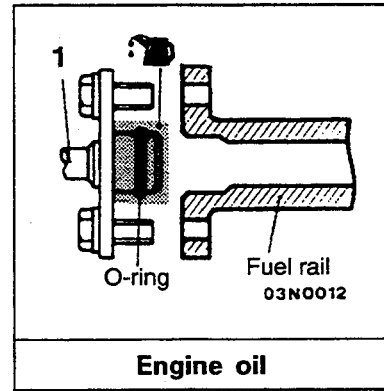
03E0157
00002802

TSB Revision

13F-12 FUEL SUPPLY AND ENGINE CONTROL – Fuel Line and Vapor Line

<3.0L ENGINE-24VALVE>

Vehicles for Federal



03E0158
00002803

Removal steps

- ◀A▶ ▶B▶ 1. High-pressure fuel hose
- ▶A▶ ▶A▶ 2. Fuel return hose
- ▶A▶ ▶A▶ 3. Fuel return pipe
- ▶A▶ ▶A▶ 4. Fuel return hose
- ▶A▶ ▶A▶ 5. Fuel vapor hose
- ▶A▶ ▶A▶ 6. Fuel vapor hose
- ▶A▶ ▶A▶ 7. Fuel vapor pipe
- ▶B▶ ▶B▶ 8. Evaporative emission canister
- ▶B▶ ▶B▶ 9. High-pressure fuel hose
- ▶B▶ ▶B▶ 10. Joint assembly
- ▶B▶ ▶B▶ 11. Fuel filter

- ▶C▶ ▶A▶ 12. High-pressure fuel hose
- ▶A▶ ▶A▶ 13. Fuel return hose
- ▶A▶ ▶A▶ 14. Fuel main pipe (front)
- ▶A▶ ▶A▶ 15. Fuel return pipe (front)
- ▶A▶ ▶A▶ 16. Fuel return hose
- ▶A▶ ▶A▶ 17. Fuel main pipe (rear)
- ▶A▶ ▶A▶ 18. Fuel return pipe (rear)
- ▶A▶ ▶A▶ 19. Fuel vapor pipe

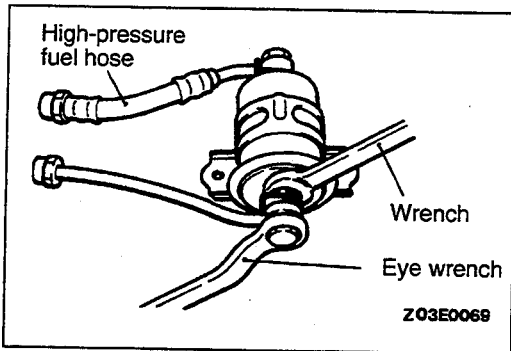
TSB Revision

REMOVAL SERVICE POINTS

◀A▶ HIGH-PRESSURE FUEL HOSE REMOVAL

Caution

Cover the high-pressure hose connection with shop towels to prevent splashing of fuel that could be caused by some residual pressure in the fuel pipe line.

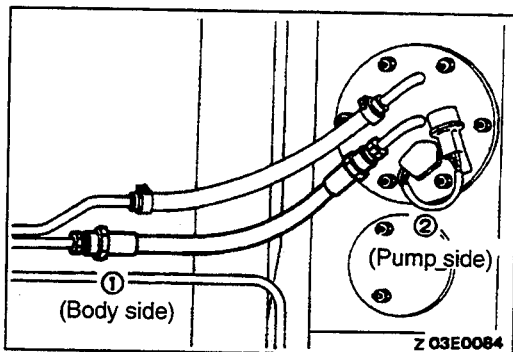


◀B▶ HIGH-PRESSURE FUEL HOSE/JOINT ASSEMBLY REMOVAL

Hold the fuel filter with a wrench and use an eye wrench to remove the eye bolt which is securing the high-pressure fuel hose joint assembly.

◀C▶ HIGH-PRESSURE FUEL HOSE REMOVAL

After disconnecting the high-pressure fuel hose at the body-side main pipe connection, disconnect the pump-side connection.



INSPECTION

- Check the fuel hoses and pipes for cracks, bends, deformation, deterioration or clogging.
- Check the fuel filter for clogging or damage.
- Check the evaporative emission canister for clogging or damage.

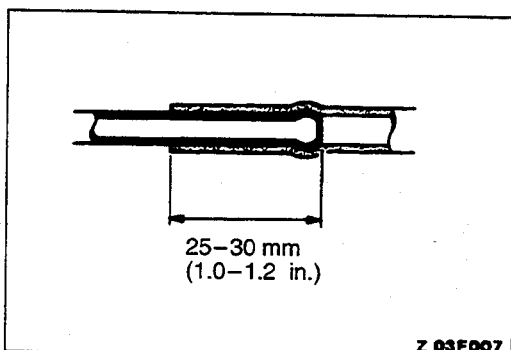
INSTALLATION SERVICE POINTS

▶A◀ FUEL RETURN HOSE/FUEL VAPOR HOSE INSTALLATION

Insert each hose approximately 25–30 mm (1.0–1.2 in.) into the corresponding pipe.

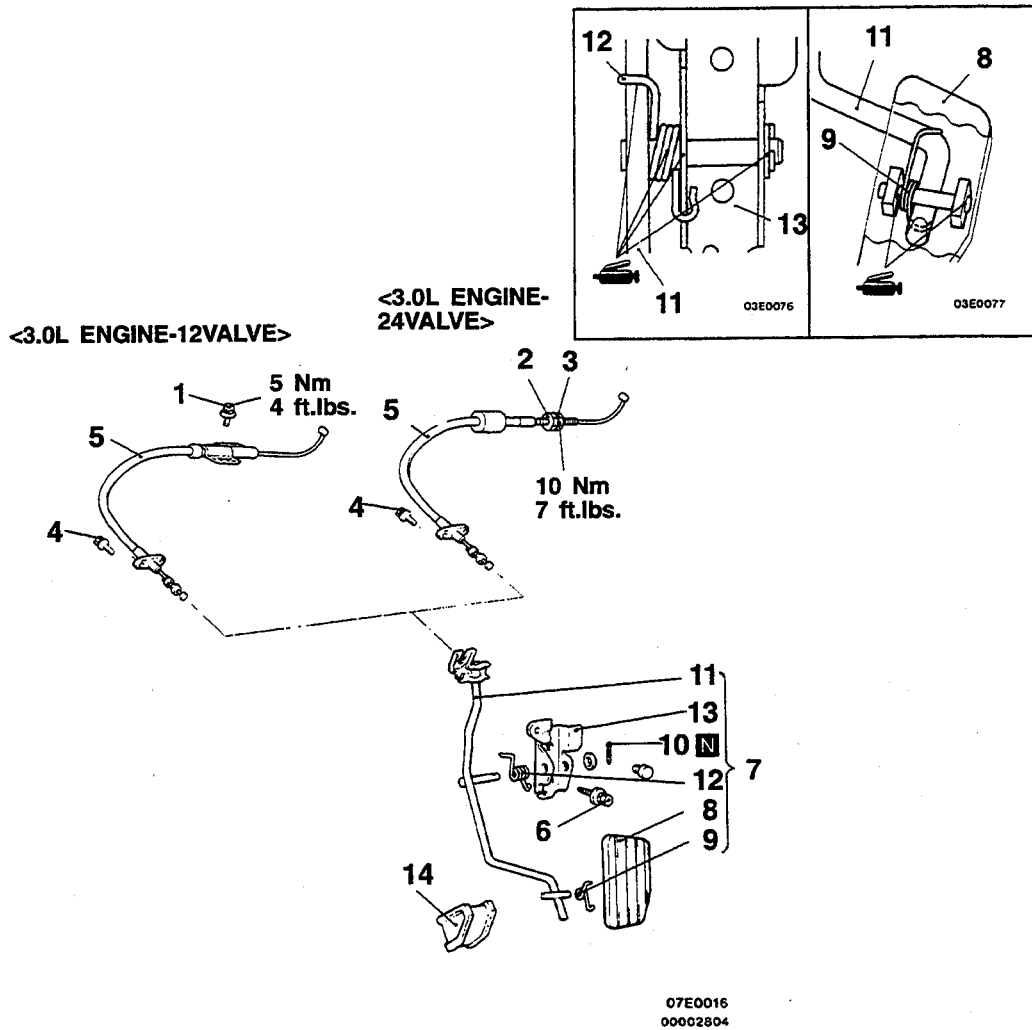
▶B◀ HIGH-PRESSURE FUEL HOSE (FUEL RAIL SIDE) INSTALLATION

Insert the hose, being careful not to damage the O-ring, and tighten securely.



ACCELERATOR CABLE AND ACCELERATOR PEDAL

REMOVAL AND INSTALLATION



Accelerator cable removal steps

- Adjustment of accelerator cable (Refer to P. 13F-4.)
- 1. Accelerator cable adjusting bolts
- 2. Accelerator cable adjusting nut
- 3. Accelerator cable lock nut
- 4. Accelerator cable mounting bolts
- 5. Accelerator cable

Accelerator pedal removal steps

- 6. Accelerator arm bracket mounting bolts
- 7. Accelerator pedal assembly
- 8. Pedal
- 9. Spring
- 10. Cotter pin
- 11. Accelerator arm
- 12. Return spring
- 13. Accelerator arm bracket
- 14. Stopper

INSPECTION

- Check the cable for damage.
- Check the cable outer casing for damage.
- Check the cable for uneven movement.
- Check the accelerator arm for bends.
- Check the return spring for deterioration.
- Check the connection of the accelerator cable and end fitting.

CRUISE CONTROL SYSTEM

CONTENTS

110005738

CRUISE CONTROL*	32	SERVICE SPECIFICATIONS	2
GENERAL SPECIFICATIONS	2	SPECIAL TOOLS	2
SERVICE ADJUSTMENT PROCEDURES	26	TROUBLESHOOTING	3
Control Cable Check and Adjustment	26		
Cruise Control Main Switch Check	28		
Cruise Control Switch Check	29		
Individual Parts Check	30		

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 (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) and GROUP 00 – Maintenance Service before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS diagnosis unit, SRS warning light, 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 SPECIFICATIONS

110005739

Items		Specifications
Main switch	Rated load A	1
	Voltage drop V	0.15 or less
Control switch	Rated load A	SET: 0.1 RESUME: 0.1 CANCEL: 1.2
	Voltage drop V	0.2 or less
Cruise control unit	Set error km/h (mph)	0 ⁰ -1.0 (0 ⁰ -.6)
	Range of speed control km/h (mph)	40-200 (25-124)
Actuator	Drive system	Vacuum type
	Stroke mm (in.)	38-42 (1.5-1.7)
Motor-driven vacuum pump	Rated load A	0.4 or less



SERVICE SPECIFICATIONS

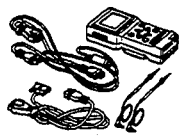


110005740

Items	Standard value
Accelerator cable play mm (in.)	0-1 (0-.04)
Throttle cable play mm (in.)	1-2 (.04-.08)
Cruise control cable play mm (in.)	1-2 (.04-.08)
Control valve, release valve resistance Ω	50-60

SPECIAL TOOLS

110005741

Tool	Tool number and tool name	Supersession	Application
	MB991341 Scan tool (Multi-use tester <MUT>)		Up to 1993 models Checking of the on-board diagnostic output
	ROM pack (For the number, refer to GROUP 00- Precautions Before Service.)		

Tool	Tool number and tool name	Supersession	Application
	MB991502 Scan tool (MUT-II)	MB991502	All models Checking of the diagnostic
 Z16X0607	ROM pack		
	MB991529 Diagnostic trouble code check harness	Tool not necessary if scan tool (MUT-II) is available	Checking of diagnostic output when using a voltmeter

TROUBLESHOOTING

110005742

Before commencing troubleshooting, carry out each of the following inspections, and make repairs if necessary.

- Check that the following parts are all installed correctly.
 - Motor-driven vacuum pump assembly
 - Actuator
 - Intermediate link

- Each cable
- Vacuum hose

And check that each cable and vacuum hose circuit is correct.

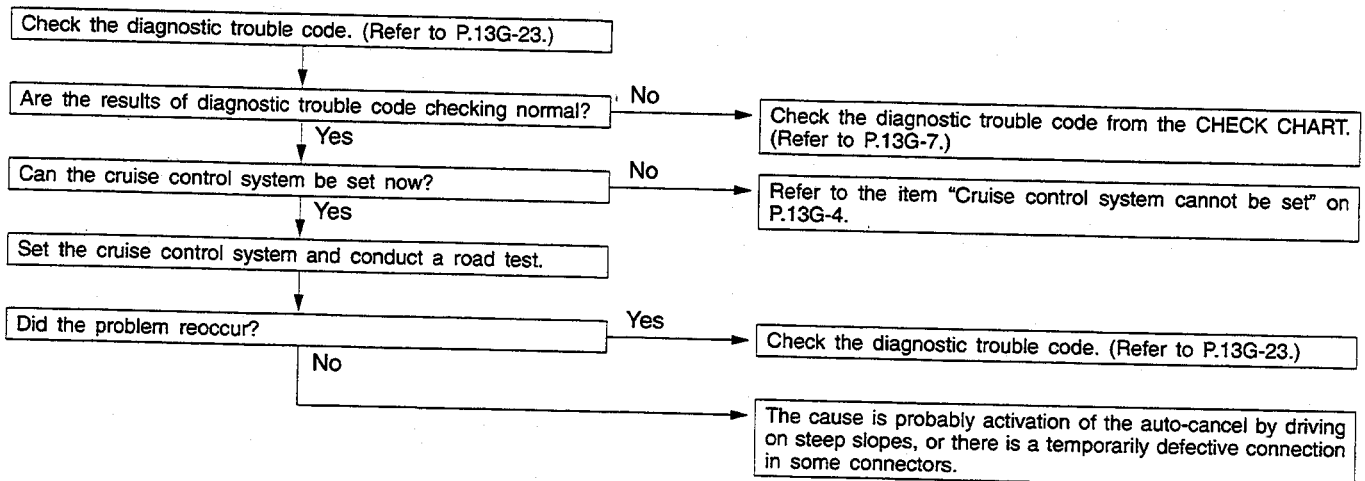
- Check to be sure that the movement of the intermediate link and each cable is smooth.
- Check to be sure that there is not too much play or tension in each cable.

TROUBLESHOOTING QUICK-REFERENCE CHART

110005743

Cruise control system is canceled when cancellation not wanted.
Or, the cruise control system cannot be set after an automatic cancellation.

ECU: Electronic control unit



Cruise control system cannot be set.

NOTE
Thus, this chart is to be used for troubleshooting if it is not possible to use the on-board diagnostic for checking.

Prepare to carry out input checking. (Refer to P.13G-24.)

Are the results of all input checks normals?

Yes No

Check results	Probable Cause	Remedy	Check Chart No.
Code 21 remains even though the SET switch is turned to OFF.	SET switch ON malfunction	Replace the control switch.	No. 2
	SET switch input line short-circuit	Repair the harness.	
Code 22 remains even though the RESUME switch is turned to OFF.	RESUME switch ON malfunction	Replace the control switch.	No. 3
	RESUME switch input line short-circuit	Repair the harness.	
Code 23 remains even though the stop light switch is turned OFF by releasing the brake pedal.	Malfunction of stop light switch circuit	Replace the stop light switch or repair the harness.	No. 7
Code 25 remains, and code 24 does not appear, even though the vehicle speed reaches approximately 40 km/h (25 mph).	Malfunction of vehicle speed sensor circuit (damaged or disconnected wiring, or short-circuit)	Check or repair the vehicle speed sensor circuit.	No. 5
Code 26 remains even though the clutch pedal position switch is turned OFF by releasing the clutch pedal. <M/T>	Malfunction of clutch pedal position switch circuit	Replace the clutch pedal position switch or repair the harness.	No. 8
Code 26 remains even though the selector lever is moved to any position but "N" or "P". <A/T>	Malfunction of park/neutral position switch circuit	Replace the park/neutral position switch or repair the harness.	No. 9
Code 27 remains even though the CANCEL switch is OFF.	Malfunction of CANCEL switch circuit	Replace the control switch or repair the harness.	No. 4
Code 28 remains even though the accelerator is released.	Malfunction of throttle position sensor circuit	Replace the sensor or repair the harness.	No. 11
Code 29 remains even though the closed throttle position switch is ON.	Malfunction of closed throttle position switch circuit	Replace the switch or repair the harness.	No. 11

Check the motor-driven vacuum pump circuit. (Go to check chart No. 6)

NOTE
If the results of the check of the motor-driven vacuum pump circuit (check chart No. 6) and actuator reveal no abnormal condition, replace the electronic control unit (ECU).

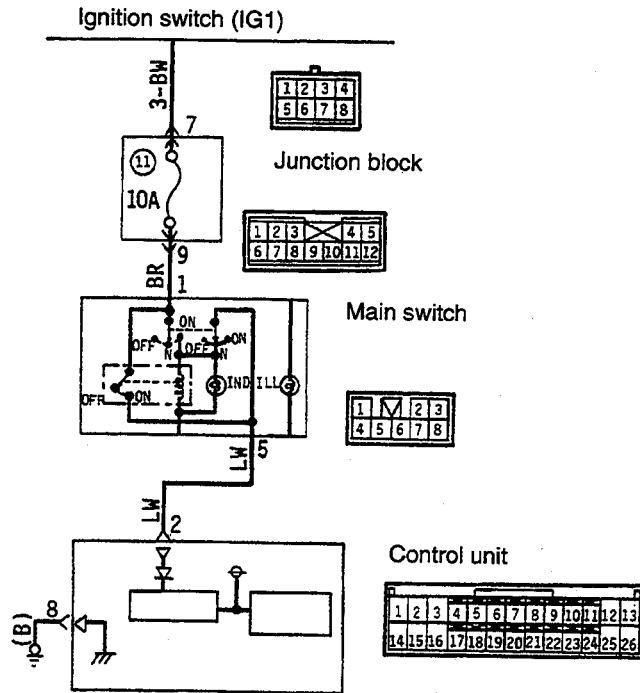
Trouble Symptom	Probable Cause	Check Chart No.	Remedy
<ul style="list-style-type: none"> • The set vehicle speed varies greatly upward or downward. • “Hunching” (repeated alternating acceleration and deceleration) occurs after the setting is made. 	Malfunction of vehicle speed sensor circuit	No. 5	Repair the vehicle speed sensor system or replace the part.
	Malfunction of speedometer cable or speedometer drive gear		
	Poor motor-driven vacuum pump circuit contact	No. 6	Repair the motor-driven vacuum pump or replace the part.
	Malfunction of motor-driven vacuum pump		
	Malfunction of ECU	–	Replace the ECU.
The cruise control system is not canceled when the brake pedal is depressed.	Damaged or disconnected wiring of the stop light switch input circuit or stop light switch (for cruise control) or poor contact (short-circuit)	If input check code No. 23 indicates a malfunction, see check chart No. 7.	Repair the harness or replace the stop light switch.
	Short-circuit in motor-driven vacuum pump drive circuit	No. 6	Repair the harness or replace the motor-driven vacuum pump.
	Malfunction of ECU	–	Replace the ECU.
The cruise control system is not canceled when the clutch pedal is depressed. <M/T> (However, it is canceled when the brake pedal is depressed.)	Damaged or disconnected wiring of clutch pedal position switch input circuit	If input check code No. 23 indicates a malfunction, see check chart No. 8.	Repair the harness, or repair or replace the clutch pedal position switch.
	Incorrect clutch pedal position switch installation (won't switch ON)		
	Malfunction of ECU	–	Replace the ECU.
The cruise control system is not canceled when the selector lever is moved to “N”. <A/T> (However, it is canceled when the brake pedal is depressed.)	Damaged or disconnected wiring of park/neutral position switch input circuit	If input check code No. 23 indicates a malfunction, see check chart No. 9.	Repair the harness, or repair or replace the park/neutral position switch.
	Improper adjustment of park/neutral position switch		
	Malfunction of ECU	–	Replace the ECU.

Trouble Symptom	Probable Cause	Check Chart No.	Remedy
The vehicle cannot decelerate when the SET switch is operated.	Temporarily damaged or disconnected wiring of SET switch input circuit	No. 2	Repair the harness or replace the control switch.
	Poor motor-driven vacuum pump circuit contact	No. 6	Repair the harness or replace the motor-driven vacuum pump.
	Malfunction of cruise actuator		
	Malfunction of ECU	–	Replace the ECU.
The vehicle cannot accelerate or resume speed when the RESUME switch is operated.	Damaged or disconnected wiring or short-circuit of RESUME switch input circuit	No. 3	Repair the harness or replace the control switch.
	Poor motor-driven vacuum pump circuit contact	No. 6	Repair the harness or replace the motor-driven vacuum pump.
	Malfunction of motor-driven vacuum pump		
	Malfunction of ECU	–	Replace the ECU.
Cruise control system can be set while traveling at a vehicle speed of less than 40 km/h (25 mph), or there is no automatic cancellation at that speed.	Malfunction of vehicle speed sensor circuit	No. 5	Repair the vehicle speed sensor system or replace the part.
	Malfunction of speedometer cable or speedometer drive gear		
	Malfunction of ECU	–	Replace the ECU.
The indicator of the main switch is not illuminated. (But the cruise control system is normal.)	Damaged or disconnected bulb of indicator light or malfunction of main switch	–	Repair the harness or replace the main switch.
	Disconnected or damaged harness		
Overdrive is not canceled during constant speed driving. <A/T>	Malfunction of circuit related to overdrive cancellation, or malfunction of ECU	No. 10	Repair the harness or replace the part.
Transmission does not shift to overdrive during normal driving. <A/T>			

CHECK CHART

110005744

1. CONTROL UNIT POWER SUPPLY CIRCUIT CHECK



Z03E0022

Description of operation

When the main switch is turned to ON while the ignition switch is ON, current flows to the ignition switch (IG₁), to fuse No. 11 of the junction block,

and to the main switch, the control unit, and to ground. When the ignition switch is turned off, the main switch is also turned off.

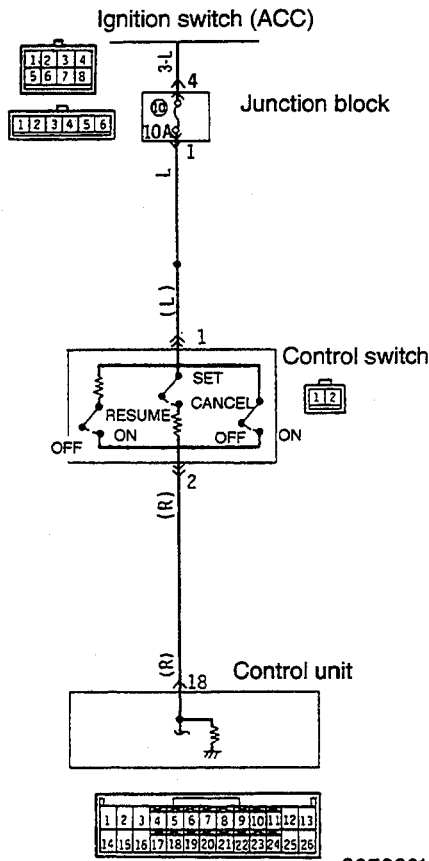
Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
2	Control unit power supply	When the main switch is turned to ON	Battery positive voltage
8	Control unit ground	At all times	0 V

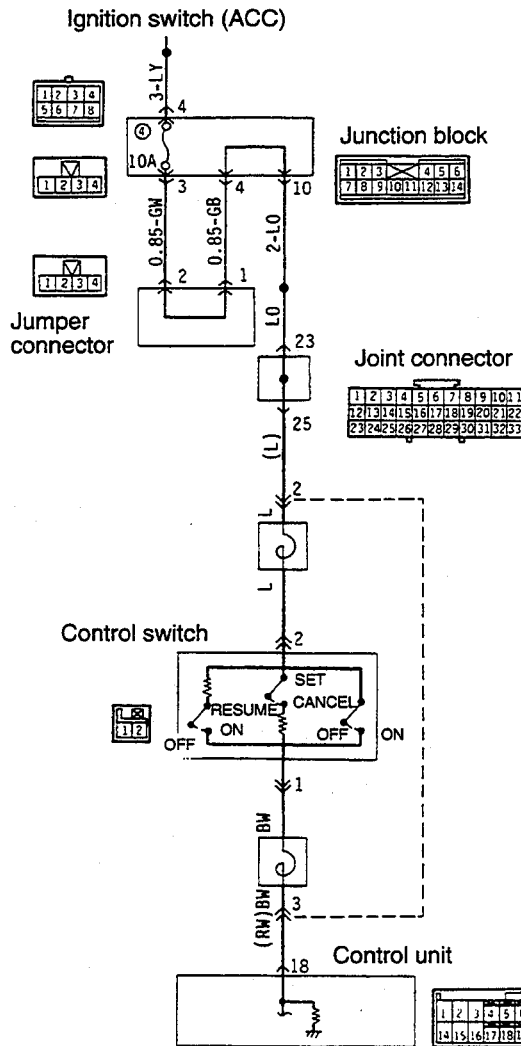
2. SET SWITCH CIRCUIT CHECK

<Up to 1993 models>



03E0021

<1994 models and after>



03E0161
00002813

Description of operation

When driving at the desired speed [40–200 km/h (25–124 mph)] and the main switch of the cruise control system is pressed to ON, by turning the control switch to SET, the vehicle speed at this time will become the constant driving speed. Also, during constant speed driving, if the control switch is held

continuously at SET, the vehicle speed will gradually decrease (COAST), and when the control switch is released, the speed then will be the constant driving speed. Current flows to fuse No. 4 of the junction block, to the control switch (SET) and to the control unit.

Troubleshooting hint

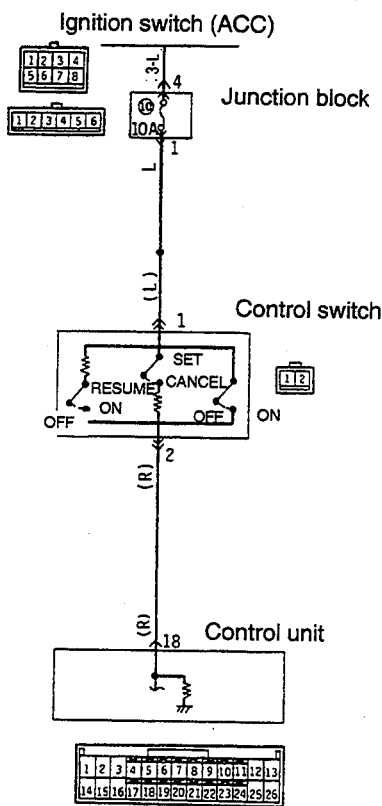
Diagnosis—No. 5 (automatically canceled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
18	SET switch	When the control switch is turned to SET	3 V
		When the control switch is turned to OFF	0 V

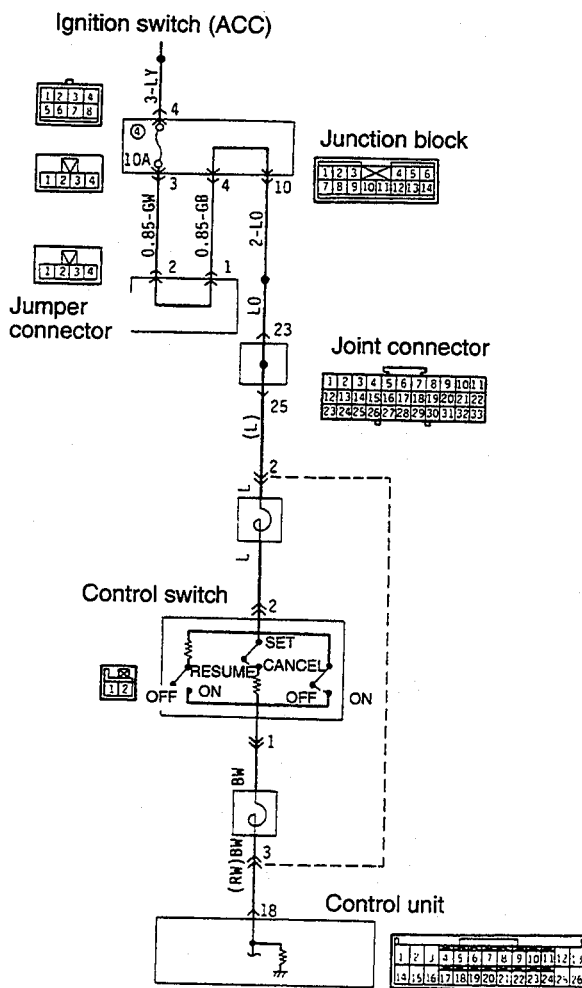
3. RESUME SWITCH CIRCUIT CHECK

<Up to 1993 models>



03E0021

<1994 models and after>



03E0161
00002813

Description of operation

The set speed (before cancellation) resumes when the control switch is turned to RESUME, even if the constant-speed control has been canceled. However, if the main switch is switched OFF and if the vehicle speed decreases to 40 km/h (25 mph) or lower, that speed will not be resumed, even if the control switch is turned to RESUME. In addition, when the control switch is turned to RESUME and held while the vehicle is traveling

at a constant speed, the vehicle speed will increase, and the speed at which the switch is subsequently released will become the newly set constant speed. Current flows to fuse No. 4 of the junction block, to the control switch (RESUME) and to the control unit.

Troubleshooting hint

Diagnosis—No. 5 (automatically canceled)

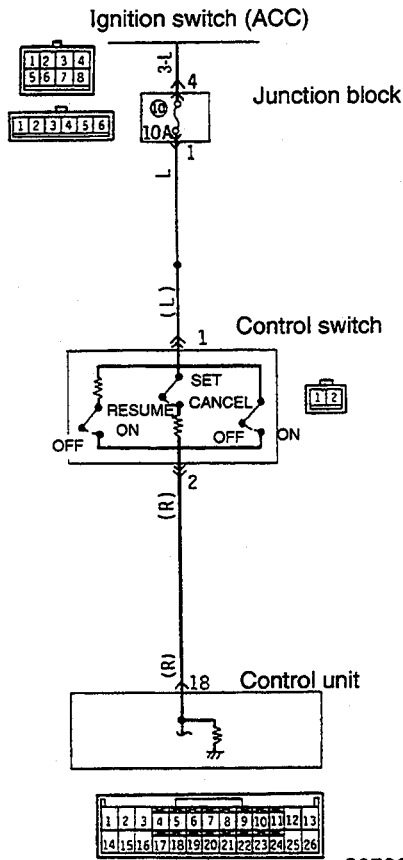
ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
18	RESUME switch	When the control switch is turned to RESUME	6 V
		When the control switch is turned to OFF	0 V

TSB Revision

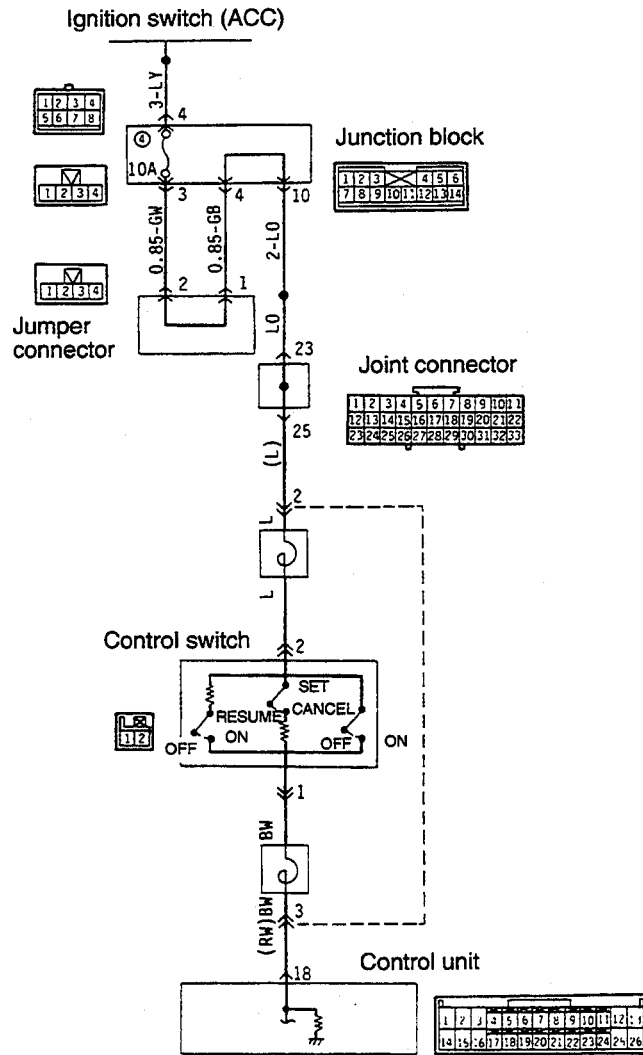
4. CANCEL SWITCH CIRCUIT CHECK

<Up to 1993 models>



03E0021

<1994 models and after>



03E0161
0002813

Description of operation

During constant speed driving, when the control switch is turned to CANCEL, a cancel signal is sent to the control unit, the current to the motor-driven vacuum pump is stopped, and constant speed driving is canceled.

Current flows to fuse No. 4 of the junction block, to the control switch (CANCEL) and to the control unit.

Troubleshooting hint

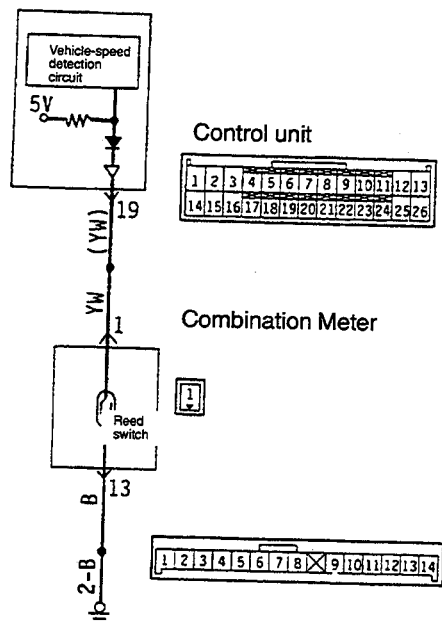
Diagnosis—No. 15 (automatically canceled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
18	CANCEL switch	When the control switch is turned to CANCEL	Battery positive voltage
		When the control switch is turned to OFF	0 V

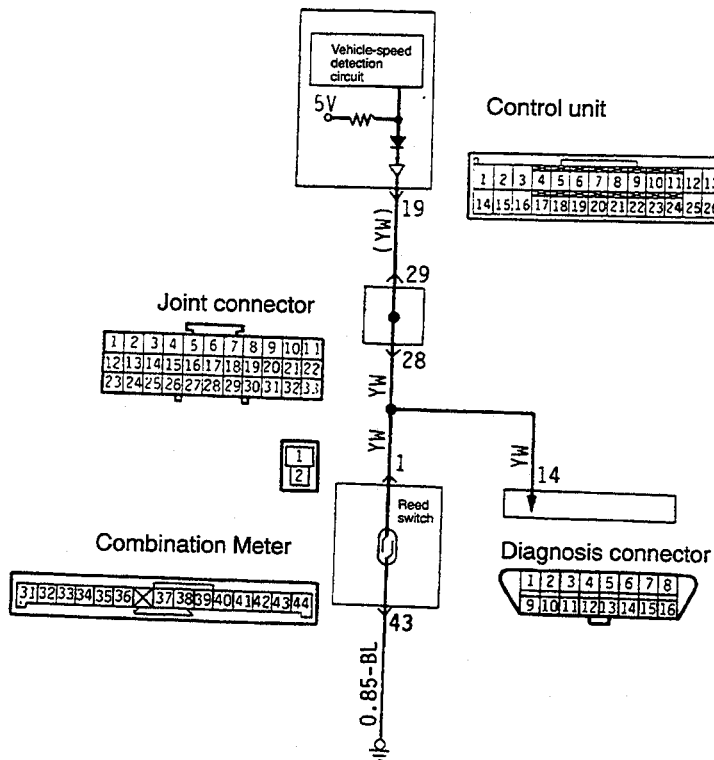
5. VEHICLE SPEED SENSOR CIRCUIT CHECK

<Up to 1993 models>



03E0019

<1994 models and after>



03E0138
00002814

Description of operation

The vehicle speed sensor is installed within the speedometer. It sends pulse signals which are proportional to the rotation speed of the transmission's output gear (vehicle speed) to the control unit.

This vehicle speed sensor is the reed switch type of sensor. It generates four pulse signals for each rotation of the speedometer's driven gear.

Troubleshooting hint

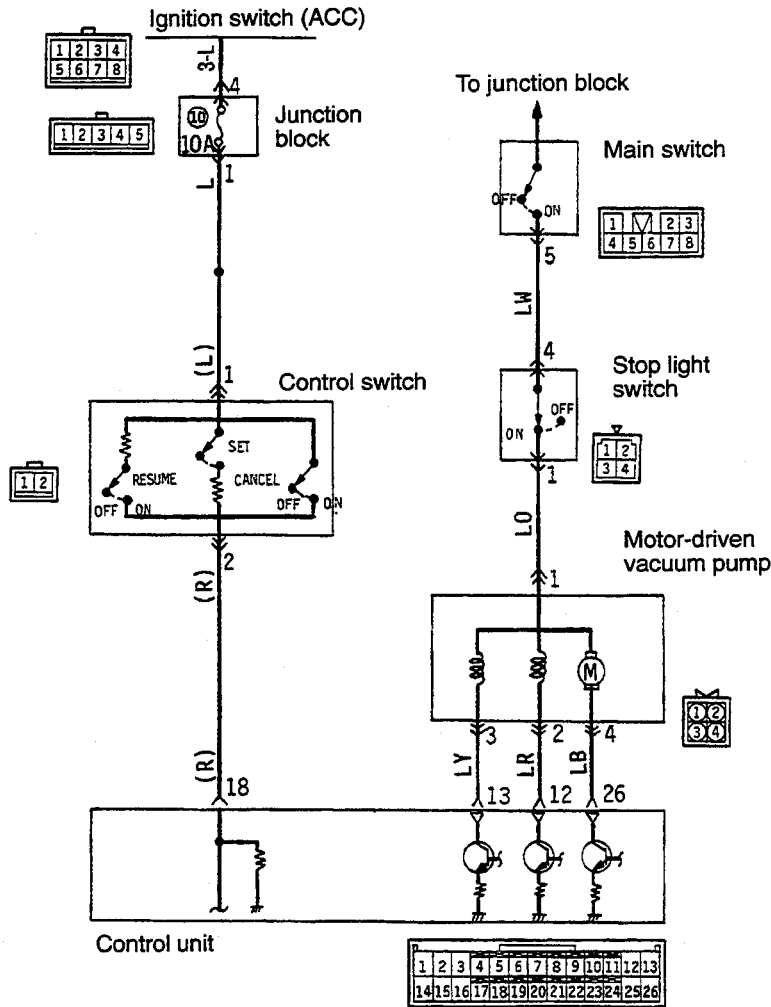
Diagnosis—No. 12 (automatically canceled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
19	Vehicle speed sensor	Set the shift lever to the "1" position <M/T> or the selector lever to the "D" position <A/T> and move the vehicle forward slowly.	0–0.6 V ← → 2 V or higher (Flashing)

6. MOTOR-DRIVEN VACUUM PUMP CIRCUIT CHECK

<Up to 1993 models>



Z03E0020

Description

HOLD MODE

When driving at 40 km/h (25 mph) and the main switch is turned to ON and the control switch is turned to SET, the control unit receives a “set” signal. The control unit stops current from flowing to the motor-driven vacuum pump, and makes current flow to the solenoid coils in the control valve and the release valve to close both valves together.

Also, after reaching the desired speed, the motor-driven vacuum pump and the control valve turn ON and OFF repeatedly according to the driving conditions.

ACCELERATION MODE

When the control switch is moved to RESUME, the control unit receives a “resume” signal. The control unit controls current flow to the motor-driven vacuum pump and to the solenoid coils in the control valve and the release valve to close both valves together.

DECELERATION MODE

When the control switch is moved to SET, the control unit receives a “set” signal. The control unit stops current from flowing to the motor-driven vacuum

pump and to the solenoid coil in the control valve in order to open the valve. Simultaneously, the current flowing to the solenoid coil in the release valve is stopped, closing the valve.

RELEASE MODE

When the control switch is moved to CANCEL, the control unit receives a “cancel” signal. The control unit stops current from flowing to the motor-driven vacuum pump and to the solenoid coils in the control valve and the release valve to open both valves together.

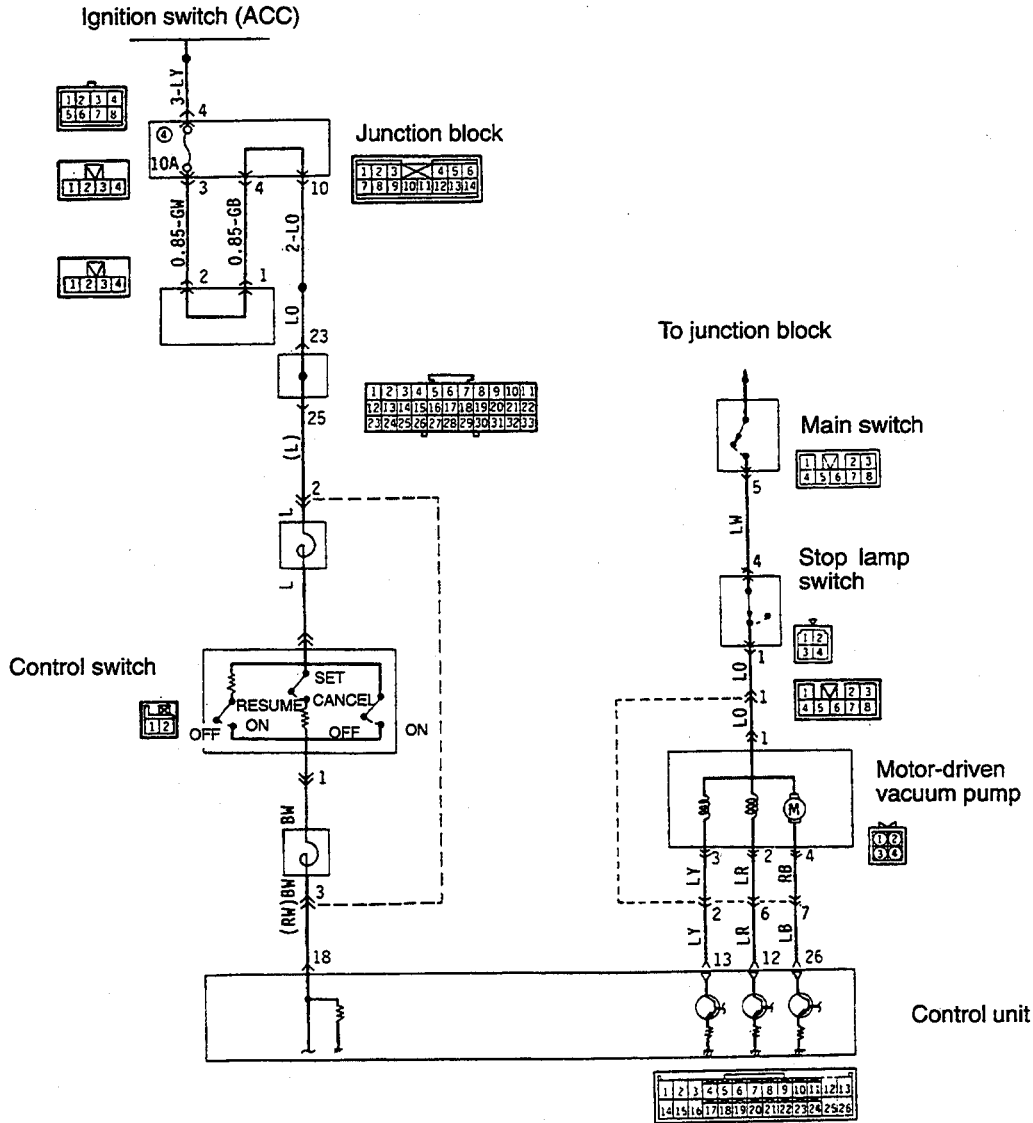
Troubleshooting hint

Diagnosis–No. 11 (automatically canceled)

ECU terminal voltage

Terminal No.	Signal	Hold Mode/Terminal Voltage (V)	Acceleration Mode/Terminal Voltage (V)	Deceleration Mode/Terminal Voltage (V)	Release Mode/Terminal Voltage (V)
26	Motor-driven vacuum pump drive	Battery positive voltage	0	Battery positive voltage	Battery positive voltage
13	Control valve open/close		0	Battery positive voltage	Battery positive voltage
12	Release valve open/close		0	0	Battery positive voltage

6. MOTOR-DRIVEN VACUUM PUMP CIRCUIT CHECK



03E0160

Description

HOLD MODE

When driving at 40 km/h (25 mph) and the main switch is turned to ON and the control switch is turned to SET, the control unit receives a "set" signal. The control unit stops current from flowing to the motor-driven vacuum pump, and makes current flow to the solenoid coils in the control valve and the release valve to close both valves together.

Also, after reaching the desired speed, the motor-driven vacuum pump and the control valve turn ON and OFF repeatedly according to the driving conditions.

ACCELERATION MODE

When the control switch is moved to RESUME, the control unit receives a “resume” signal. The control unit controls current flow to the motor-driven vacuum pump and to the solenoid coils in the control valve and the release valve to close both valves together.

pump and to the solenoid coil in the control valve in order to open the valve. Simultaneously, the current flowing to the solenoid coil in the release valve is stopped, closing the valve.

DECELERATION MODE

When the control switch is moved to SET, the control unit receives a “set” signal. The control unit stops current from flowing to the motor-driven vacuum

RELEASE MODE

When the control switch is moved to CANCEL, the control unit receives a “cancel” signal. The control unit stops current from flowing to the motor-driven vacuum pump and to the solenoid coils in the control valve and the release valve to open both valves together.

Troubleshooting hint

Diagnosis-No.11 (automatically canceled)

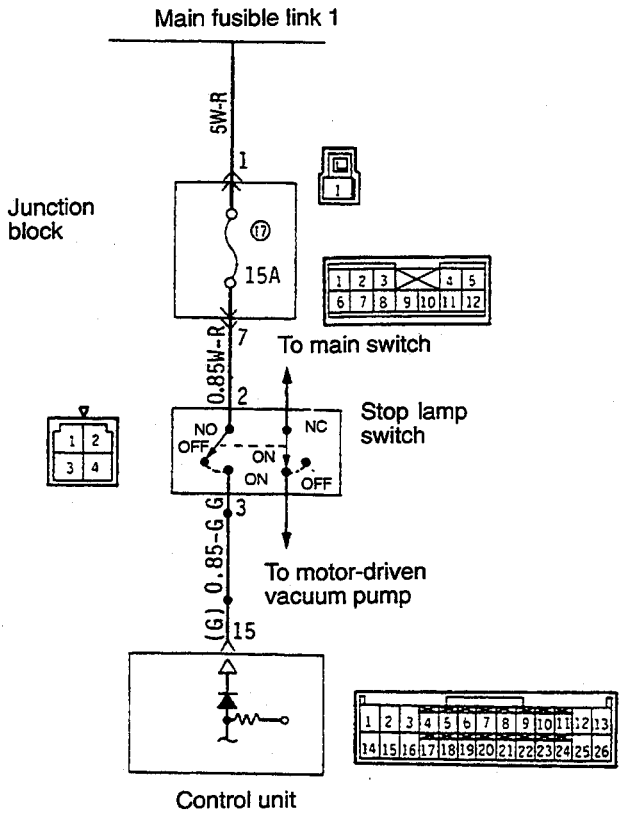
ECU terminal voltage

Terminal No.	Signal	Hold model Terminal Voltage (V)	Acceleration mode/Terminal Voltage (V)	Deceleration mode/Terminal Voltage (V)	Release mode/Terminal Voltage (V)
26	Motor-driven vacuum pump drive	Battery positive voltage	0	Battery positive voltage	Battery positive voltage
13	Control valve open/close		0	Battery positive voltage	Battery positive voltage
12	Release valve open/close		0	0	Battery positive voltage

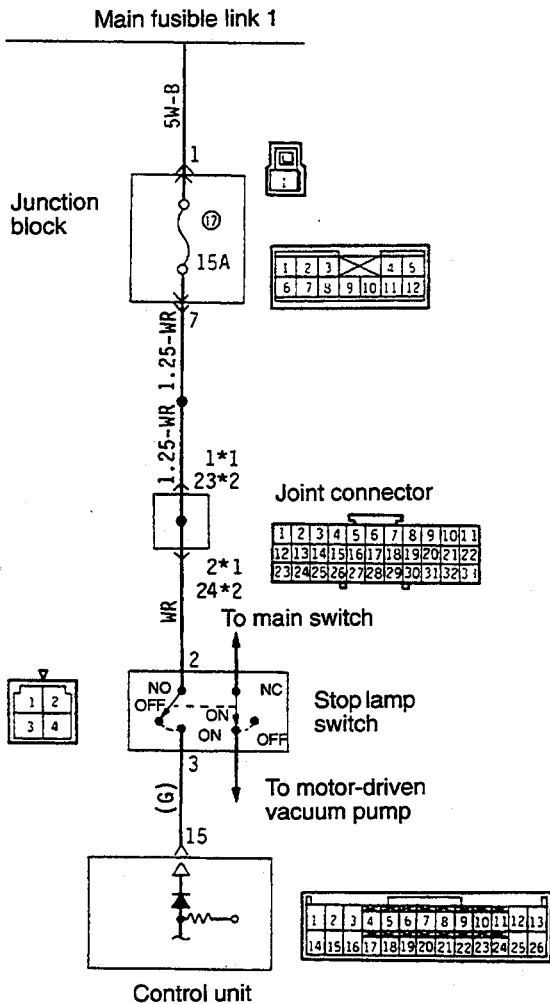
7. STOP LIGHT SWITCH CIRCUIT CHECK

<Up to 1993 models>

<1994 models and after>



03E0017



03E0140
00002815

NOTE

- (1) NC: Normally closed
- (2) NO: Normally opened

Description of operation

When the brake pedal is depressed during constant-speed travel, the stop light switch's (NC) contacts for the cruise control system open. Thus the current to the motor-driven vacuum pump is interrupted to cancel the constant-speed travel.

At the same time, moreover, the closing of the (NO) contacts for the stop light results in the sending

of the cancel signal to the control unit, so that the motor-driven vacuum pump current is stopped within the control unit, thereby canceling the constant-speed travel.

Troubleshooting hint

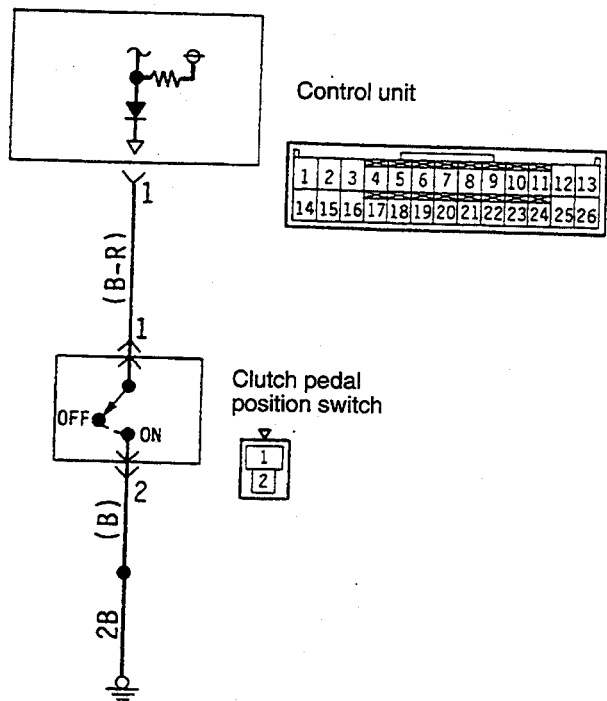
ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
15	Stop light switch (load side)	When the brake pedal is depressed	Battery positive voltage
		When the brake pedal is not depressed	0 V

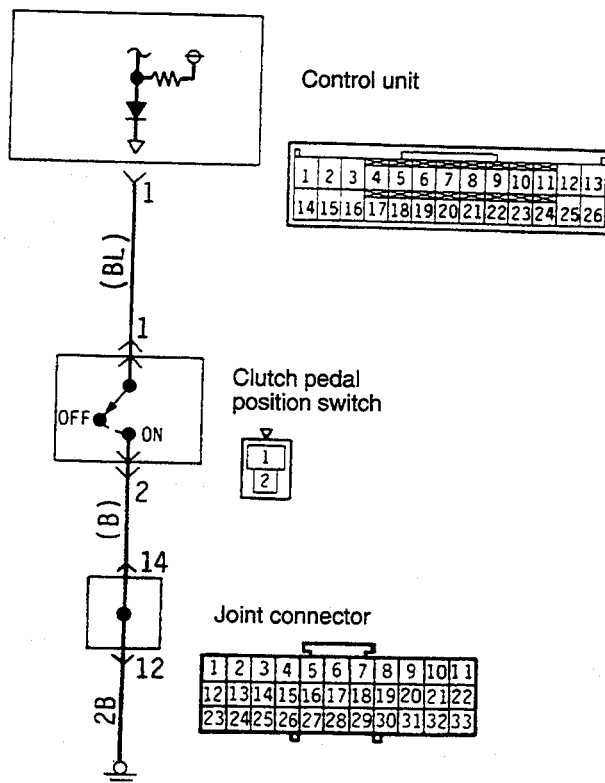
8. CLUTCH PEDAL POSITION SWITCH CIRCUIT CHECK <M/T>

<Up to 1993 models>

<1994 models and after>



03E0018



03E0163
00002816

Description of operation

If the clutch pedal is depressed when driving at a constant speed, the clutch pedal position switch is turned ON and a cancel signal is input to the control unit and the determined driving speed is

anceled, because the current flows to the control unit, to the clutch pedal position switch and to the ground.

Troubleshooting hint

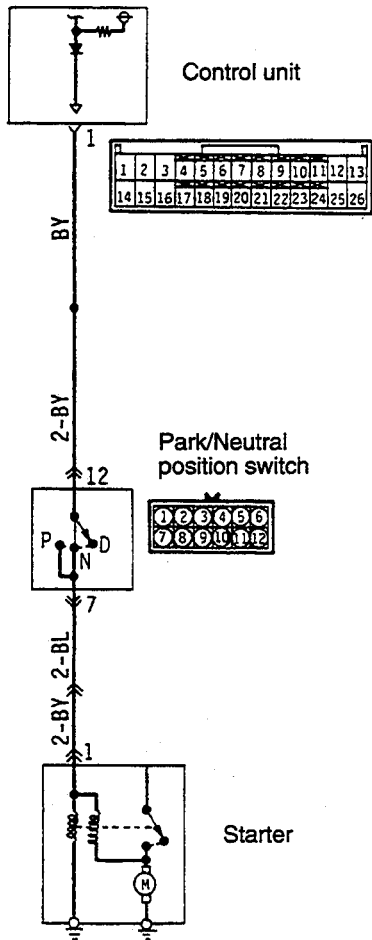
ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
1	Clutch pedal position switch	When the clutch pedal is depressed	Battery positive voltage
		When the clutch pedal is not depressed	0 V

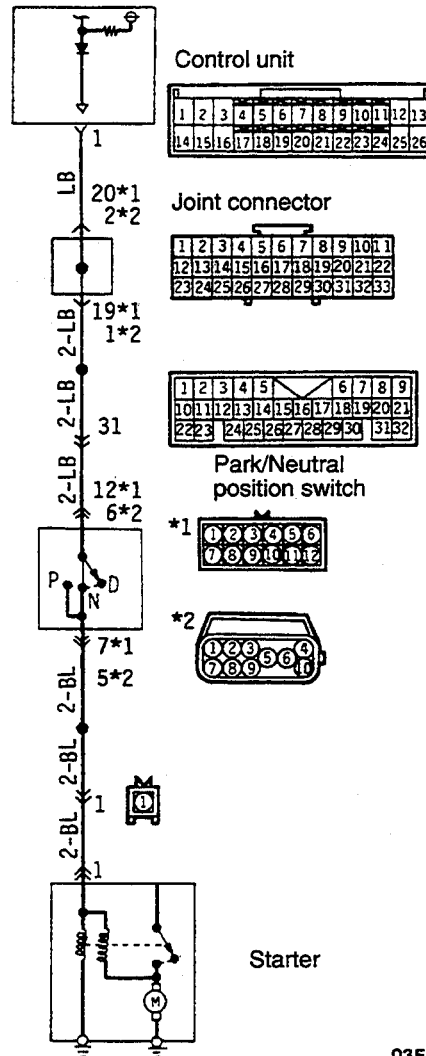
9. PARK/NEUTRAL POSITION SWITCH CIRCUIT CHECK <A/T>

<Up to 1993 models>

<1994 model and after>



03E0050



03E0142
00002817

Remarks
*1: 3.0L Engine – 12 VALVE
*2: 3.0L Engine – 24 VALVE and 3.5L Engine

Description of operation

The park/neutral position switch also functions as the switch for the starter. If the selector lever is moved to N during constant-speed travel, current flows to the control unit, park/

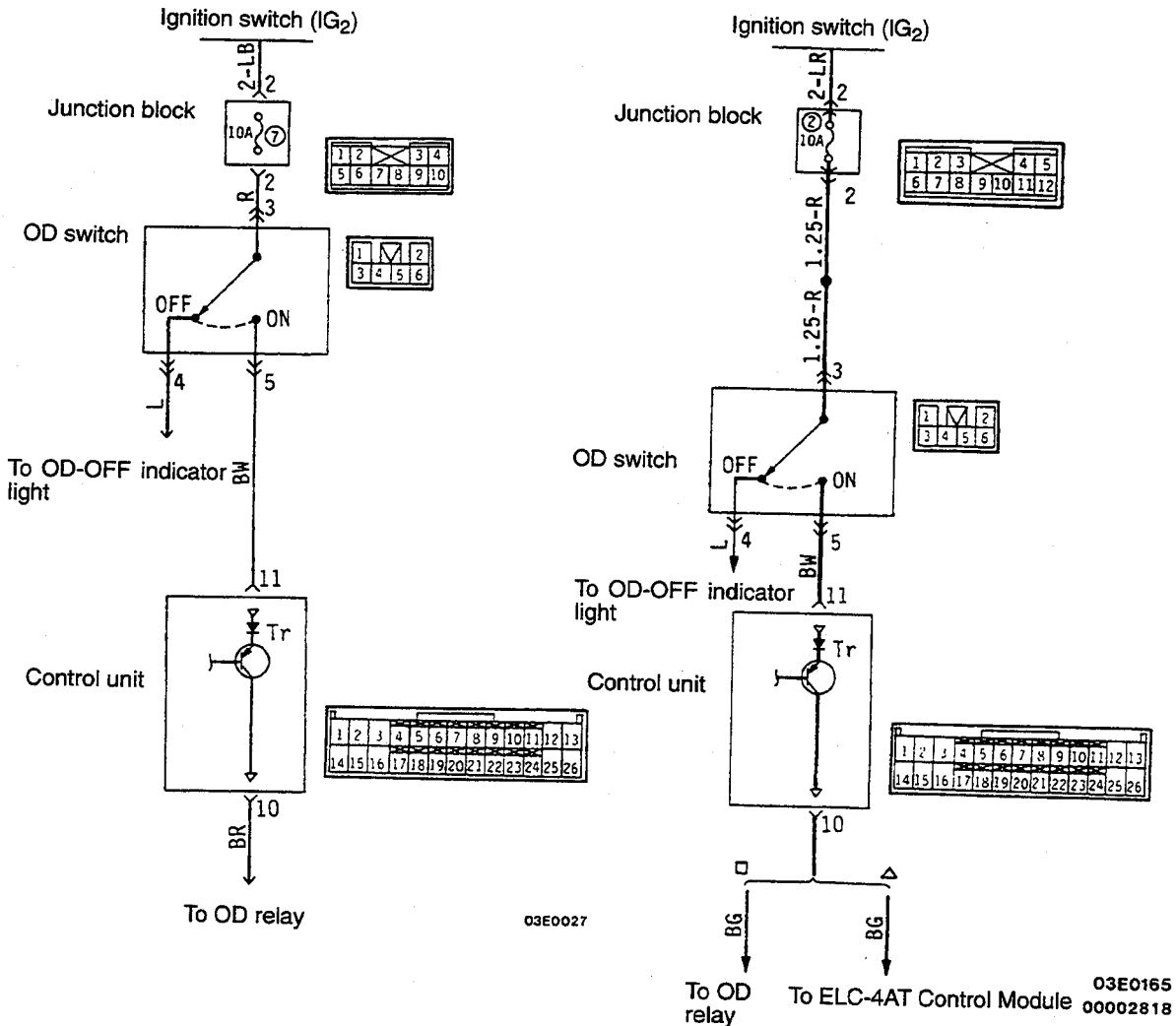
neutral position switch, starter motor, and to the ground; the cancel signal is therefore input to the control unit, thus canceling the constant-speed travel.

Troubleshooting hint

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
1	Park/Neutral position switch	Neutral	Battery positive voltage

10. OVERDRIVE CANCELLATION FUNCTION CIRCUIT CHECK <A/T>



Remark
 □ : 3.0L ENGINE – 12 VALVE
 Δ : 3.0L ENGINE – 24 VALVE
 and 3.5L ENGINE

Description of operation

This function cancels the overdrive for a certain period, if during constant-speed travel, the actual vehicle speed decreases to less than the vehicle speed retained in the memory. And then this function causes the vehicle speed to return to the vehicle speed retained in the memory.

Overdrive will be canceled in the following cases:

- If the control switch is turned to RESUME

- If the actual vehicle speed decreases to 7 km/h (4.4 mph) or more below the constant driving speed

Here, the OD-ON signal output from the control unit turns the transistor off, so the current flowing through the overdrive switch is stopped at the transistor, which cancels the overdrive.

Troubleshooting hint

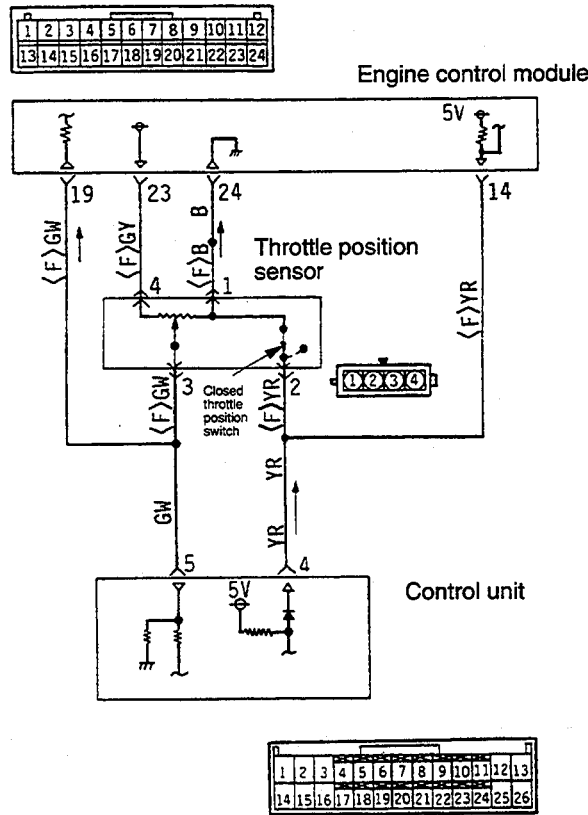
ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
1	OD switch	When the OD switch is turned to ON	Battery positive voltage

TSB Revision

11. THROTTLE POSITION SENSOR AND CLOSED THROTTLE POSITION SWITCH CIRCUIT CHECK

<Up to 1993 models>



03E0028

Description of operation

The throttle position sensor and closed throttle position switch are mounted in the throttle body and are sensors in the MFI system.

The throttle position sensor converts the opening position of the throttle valve to a voltage value, and inputs it to the control unit. The control unit compares

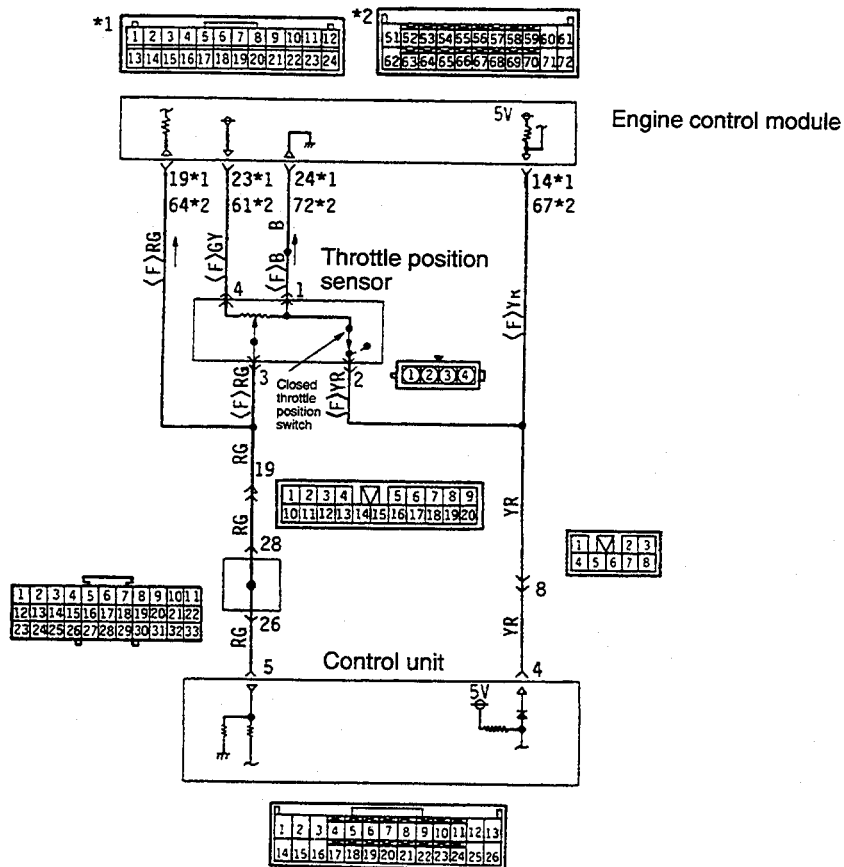
this signals with the vehicle speed signal and changes the amount of actuator control accordingly. The closed throttle position switch turns ON and OFF depending on the voltage value from the throttle position sensor to compensate for fluctuations or deviations in the voltage.

Diagnosis—No. 17 (automatically canceled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
4	Closed throttle position switch	When accelerator pedal is depressed	4.5–5.5 V
		When accelerator pedal is released	0 V
5	Throttle position sensor	When accelerator pedal is fully depressed	4.0–5.5 V
		When accelerator pedal is released	0.5–0.7 V

11. THROTTLE POSITION SENSOR AND CLOSED THROTTLE POSITION SWITCH CIRCUIT CHECK



Remarks
 *1: 3.0L ENGINE – 12 VALVE
 *2: 3.0L ENGINE – 24 VALVE
 and 3.5L ENGINE

03E0144

Description of operation

The throttle position sensor and closed throttle position switch are mounted in the throttle body and are sensors in the MFI system.

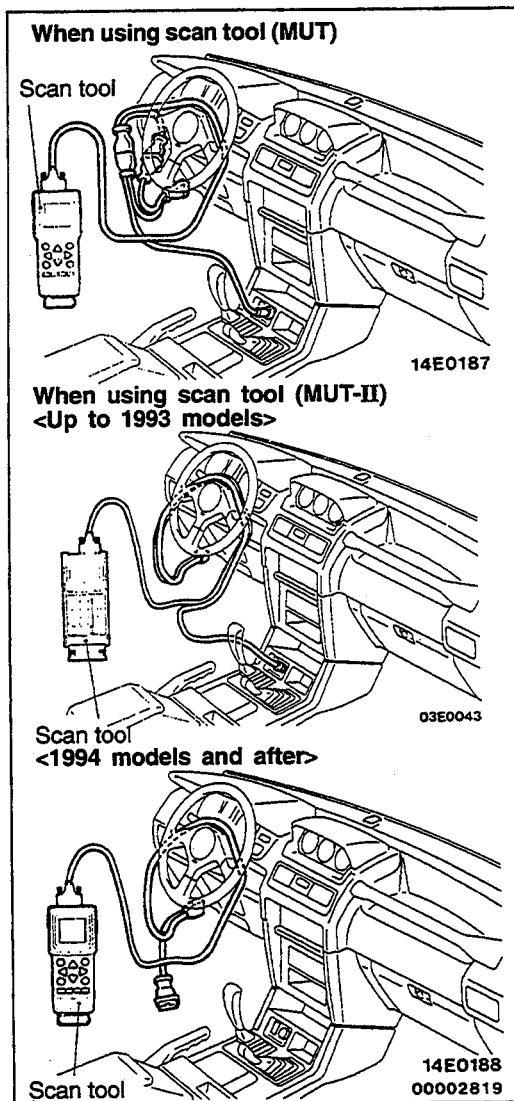
The throttle position sensor converts the opening position of the throttle valve to a voltage value, and inputs it to the control unit. The control unit compares this signals with the vehicle speed signal and

changes the amount of actuator control accordingly. The closed throttle position switch turns ON and OFF depending on the voltage value from the throttle position sensor to compensate for fluctuations or deviations in the voltage.

Diagnosis – No.17 (automatically canceled)

ECU terminal voltage

Terminal No.	Signal	Conditions	Terminal Voltage
4	Closed throttle position switch	When accelerator pedal is depressed	4.5–5.5 V
		When accelerator pedal is released	0 V
5	Throttle position sensor	When accelerator pedal is fully depressed	4.0–5.5 V
		When accelerator pedal is released	0.5–0.7 V



CHECK USING DIAGNOSTIC TEST MODE

110005745

Diagnostic test mode checking is performed when there has been an automatic cancellation without cancel switch operation.

NOTE

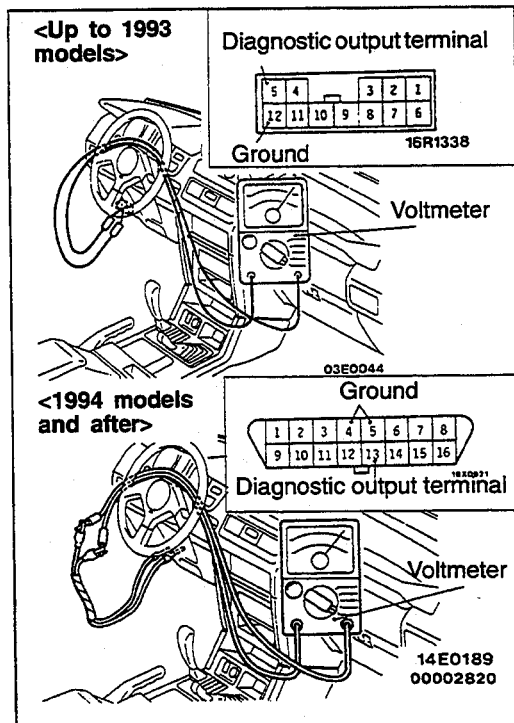
1. If it cannot communicate with the scan tool, check the scan tool power supply circuit or the ground circuit.
2. Even when the ignition key is placed in the OFF position, all diagnostic trouble codes are stored and retained, until the battery cable is disconnected, to make sure that the problems encountered in the past can be checked.

WITH SCAN TOOL [MULTI-USE TESTER (MUT) <Up to 1993 models> or MUT-II <All models>]

Caution

The ignition switch should always be turned OFF when connecting and disconnecting the scan tool.

- (1) Read the diagnostic trouble code.
- (2) Refer to the diagnostic chart and repair the defective point.
- (3) Clear the diagnostic trouble codes by the following procedure.
 - 1) Place the ignition switch in the ON position.
 - 2) With the SET switch in the ON state, set the main switch to ON. In less than 1.0 second thereafter, set the RESUME switch to ON.
 - 3) With the SET switch in the ON state again, keep the stop light switch in the ON state for more than 5 seconds.
 - 4) Turn off the main switch once, and then turn it on again after releasing the control unit from being in the input check mode.
 - 5) Check the diagnostic trouble code to verify that a normal code is output.



WITH VOLTMETER <Up to 1993 models>

- (1) Connect an analog voltmeter across the diagnostic output terminal and ground terminal of the data link connector.
- (2) Place the ignition switch and main switch in the ON position.
- (3) Read the diagnostic trouble code on the basis of the deflection of the pointer of the voltmeter.
- (4) Refer to the diagnostic chart and repair the defective point.
- (5) Clear the diagnostic trouble codes in the same way as when a scan tool is used.






WITH VOLTMETER <1994 models and after>

Use the special tool to connect a voltmeter between the ground terminal and the diagnostic output terminal of the data link connector.

Read the diagnostic trouble codes by the indicator deflection.

DIAGNOSTIC CODE PATTERNS AND CODES

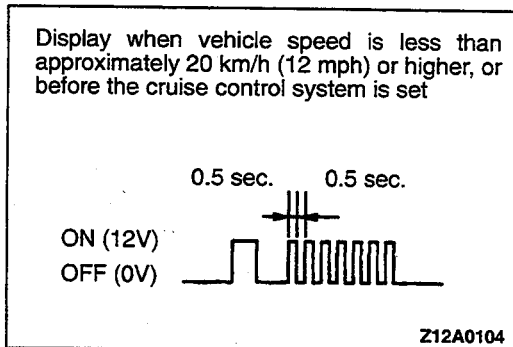
110005746

Code No.	Diagnostic code pattern (using a voltmeter)	Probable Cause	Check Chart No.
11		Abnormal condition of motor-driven vacuum pump system	No. 6
12		Abnormal condition of vehicle speed signal system	No. 5
15		Malfunction of control switch (when SET and RESUME switches are switched ON simultaneously)	Nos. 2 and 3
16		Abnormal condition of ECU	Nos. 7, 8 and 9
17		Abnormal condition of throttle position sensor Abnormal condition of closed throttle position switch	No. 11

Z12A0104

NOTE

1. These diagnostic trouble codes are displayed when the main switch is ON and the vehicle is not driving at constant speed.



2. After erasing the diagnostic trouble codes. If the power supply of the control unit is normal when the power supply of the control unit is turned to ON once again. Under the above conditions, the on-board diagnostic output code display will be as below, regardless of whether the system condition is normal or not.
 - 1) If the scan tool is used: "NORMAL!!" will be displayed.
 - 2) If a voltmeter is used: Continuous ON/OFF signals will be displayed at 0.5 second intervals. (Refer to the illustration at left.)

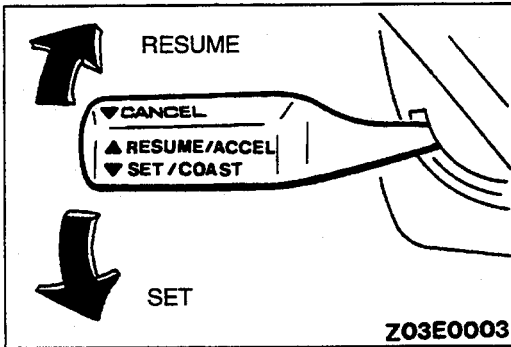
INPUT CHECKING

110005747

Input checks should be made when the cruise control system cannot be set and when it is necessary to check whether or not the input signals are normal when a malfunction related to the cruise control system occurs.

NOTE

1. On-board diagnostic terminal outputs display patterns.
2. Display codes are displayed only if the circuit is normal according to the conditions shown in the "Input Check Table".



Carry out input checking by the following procedure.

- (1) The connection of the scan tool is the same as for on-board diagnostic check.
- (2) Turn the ignition switch to ON.
- (3) When the control switch is moved to SET, press the main switch to ON, and within second, turn the control switch to RESUME to display the results of input checking.




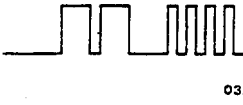

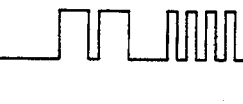



- (4) Perform each input operation according to the Input Check Table and read the codes.

NOTE

1. If two or more input operations are performed simultaneously, the codes will be output in order starting from the lowest number.
2. Each code will be displayed in order of priority beginning from No. 1. If there is no display, there may be a malfunction of the ECU power-supply circuit or the SET and/or RESUME switch (control switch). Check according to check charts 1, 2 and 3.

INPUT CHECK TABLE

110005748

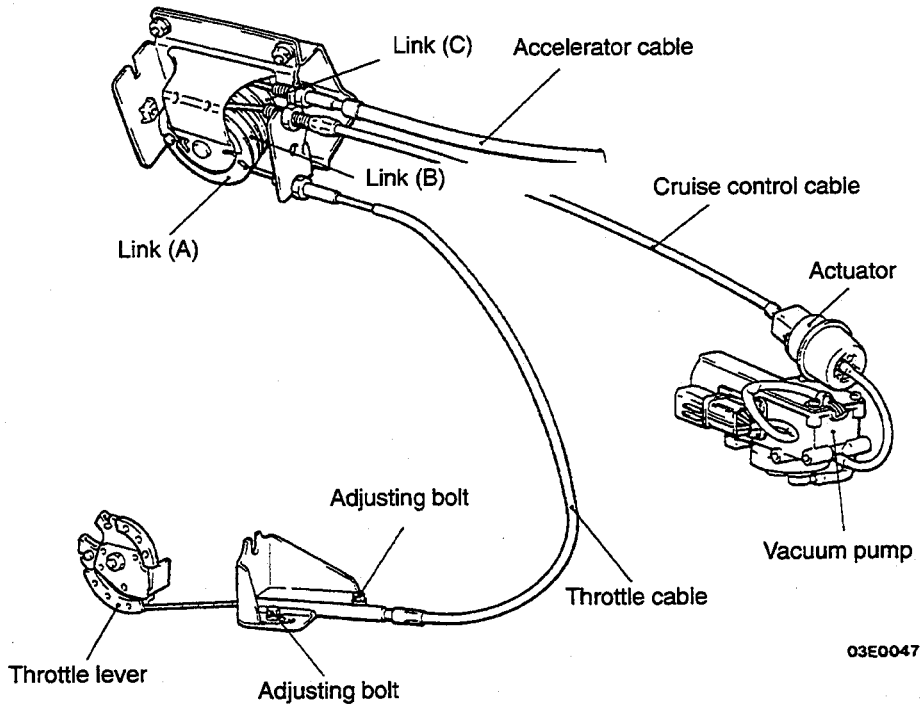
Check No.	Input operation	Code No.	Diagnostic code pattern (using a voltmeter)	Check results
1	SET switch ON	21	 03Z0020	SET switch circuit normal
2	RESUME switch ON	22	 03Z0019	RESUME switch circuit normal
3	Stop light switch (brake pedal depressed)	23	 03Z0018	Stop light switch normal
4	Driving at approximately 40 km/h (25 mph) or higher	24	 03Z0017	When both No. 4 and No. 5 can be confirmed, the vehicle speed sensor circuit is normal.
5	Driving at less than approximately 40 km/h (25 mph)	25	 03Z0016	
6	1. Clutch pedal position switch ON (clutch pedal depressed) <M/T> 2. Park/Neutral position switch ON (selector lever to "N" position) <A/T>	26	 03Z0015	Clutch pedal position switch or park/neutral position switch normal
7	CANCEL switch ON	27	 03Z0014	CANCEL switch circuit normal
8	Throttle position sensor output (when the accelerator pedal is depressed more than half way)	28	 03Z0013	Throttle position sensor normal
9	Closed throttle position switch OFF (accelerator pedal depressed)	29	 03Z0012	Closed throttle position switch normal

SERVICE ADJUSTMENT PROCEDURES

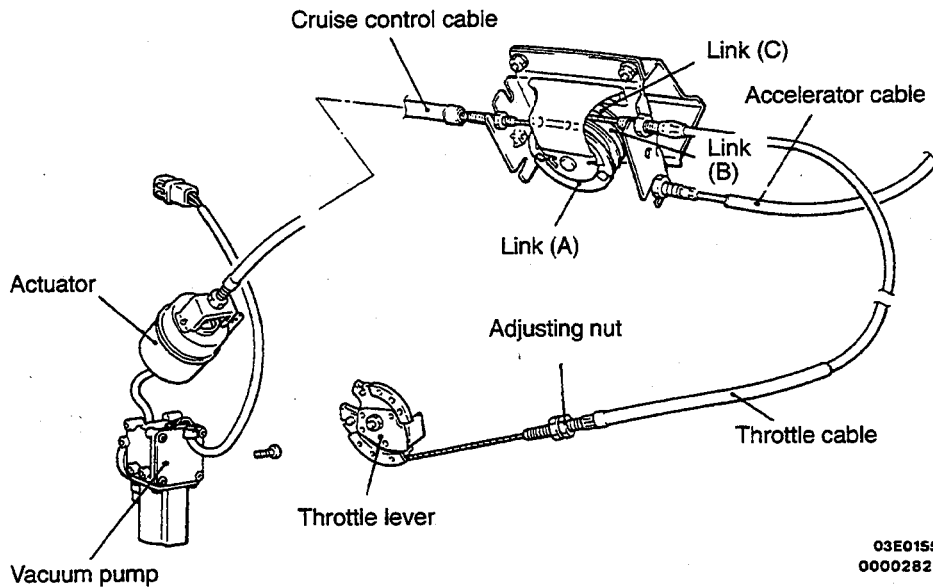
CONTROL CABLE CHECK AND ADJUSTMENT

110005748

<Except 3.0L ENGINE – 24VALVE for California>

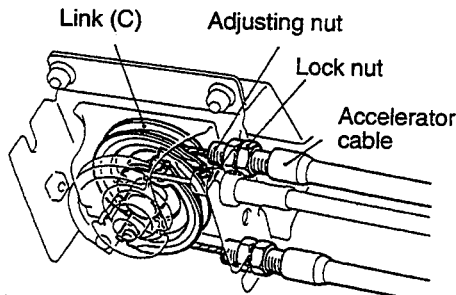


<3.0L ENGINE – 24 VALVE for California>



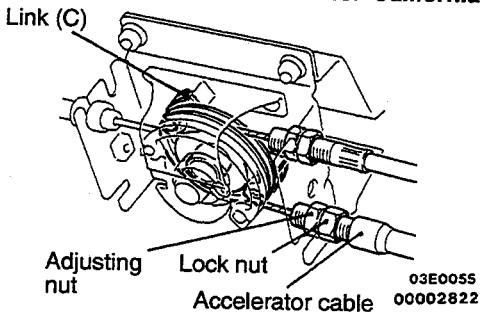
- (1) Remove the link protector. (Refer to P.13G-32.)
 - (2) Check if there is any deflection in the inner cables of the accelerator cable, cruise control cable and throttle cable.
- If there is excessive deflection or no play in an inner cable, loosen the adjusting bolts and nuts to release each link from the throttle lever.
(Do not remove the adjusting bolts or nuts.)

<Except 3.0L ENGINE – 24 VALVE for California>



03E0052

<3.0L ENGINE – 24 VALVE for California>



03E0055
00002822

Accelerator Cable

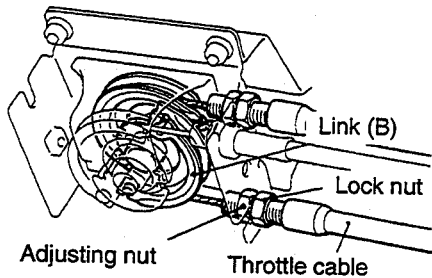
- (1) While holding link (C) so that it is touching the stopper, adjust the play of the accelerator cable with the adjusting nut so that the cable play is at the standard value.

Standard value

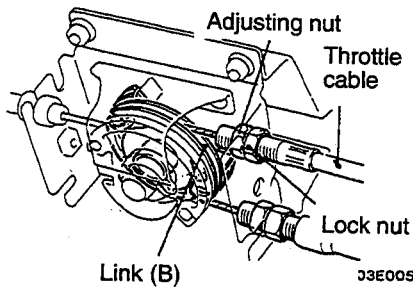
ELC-4A/T 2–3 mm (.08–.12 in.)
 Except ELC-4A/T 0–1 mm (0–.04 in.)

- (2) After adjusting, secure the cable with the lock nut.

<Except 3.0L ENGINE – 24 VALVE for California>



<3.0L ENGINE – 24 VALVE for California>



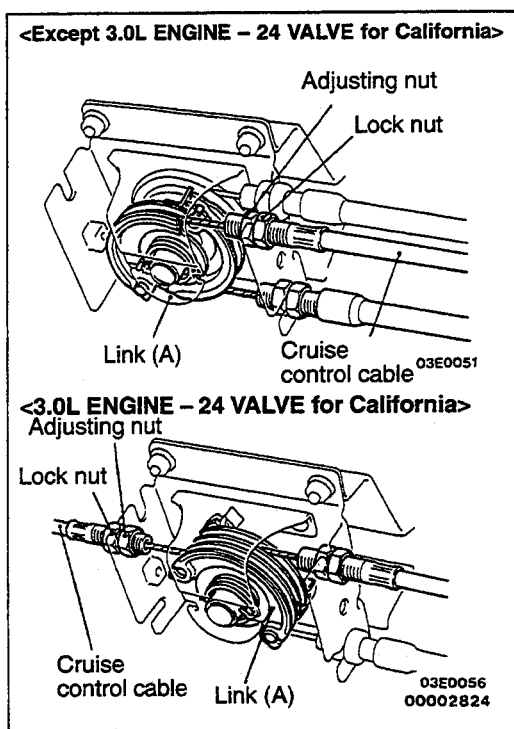
03E0055
00002823

Throttle Cable

- (1) While holding link (B) so that it is touching link (C), adjust the play of the throttle cable with the adjusting nut and adjusting bolts <throttle lever side> so that the cable play is at the standard value.

Standard value: 1–2 mm (.04–.08 in.)

- (2) After adjusting, secure the cable with the lock nut.



Cruise Control Cable

- (1) While holding link (A) so that it is touching link (B), adjust the play of the cruise control cable with the adjusting nut so that the cable play is at the standard value.

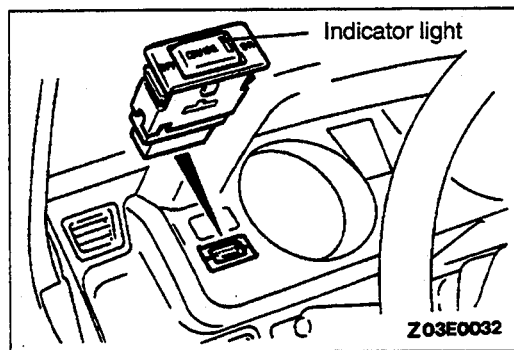
Standard value: 1–2 mm (.04–.08 in.)

- (2) After adjusting, secure the cable with the lock nut.

CRUISE CONTROL MAIN SWITCH CHECK

110005750

- (1) Turn the ignition switch to ON.
- (2) Check that the indicator light within the switch illuminates when the main switch is turned to ON.



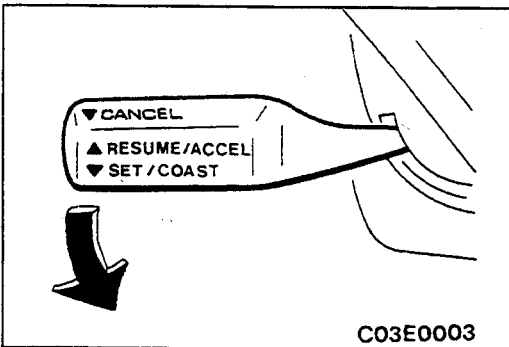
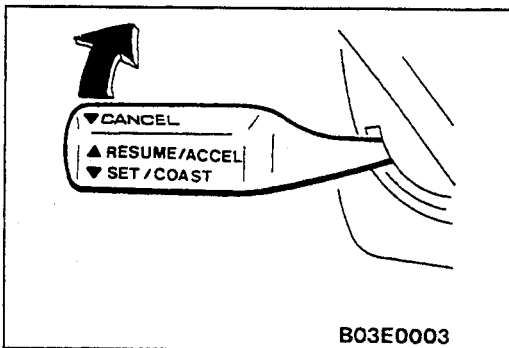
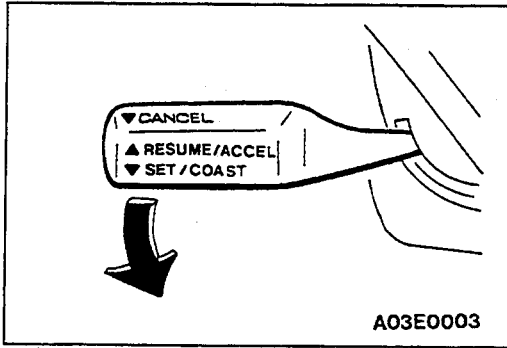
CRUISE CONTROL SWITCH CHECK

Cruise Control Setting Check

- (1) Switch ON the main switch.
- (2) Drive at the desired speed within the range of approximately 40 – 200 km/h (25–124 mph).
- (3) Turn the control switch to the SET position.
- (4) Check that when the switch is released the speed is the desired constant speed.

NOTE

If the vehicle speed decreases to approximately 15 km/h (9 mph) below the set speed, because of climbing a hill for example, the cruise control will be canceled.



Speed Increase Setting Check

- (1) Set to the desired speed.
- (2) Turn the control switch to RESUME.
- (3) Check that acceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE

Even if, during acceleration, the vehicle speed reaches or exceeds the high limit [approximately 200 km/h (124 mph)], acceleration will continue, however, when the switch is released, the set speed (“memorized speed”) will become the high limit of the vehicle speed.

Speed Reduction Setting Check

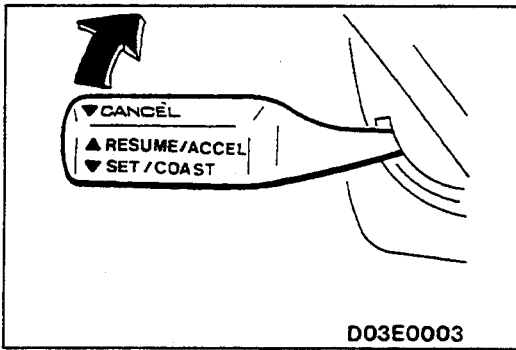
- (1) Set to the desired speed.
- (2) Turn the control switch to SET.
- (3) Check that deceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

NOTE

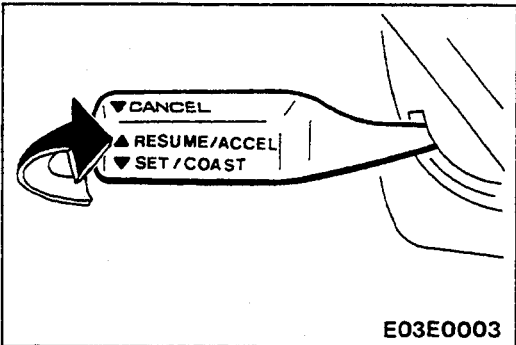
When the vehicle speed reaches the low limit [approximately 40 km/h (25 mph)] during deceleration, the automatic speed control will be canceled.

Cruise Control Cancellation Check and Check of Return to the Set Speed Before Cancellation

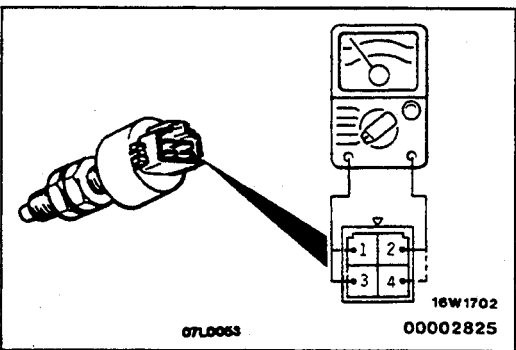
- (1) Set the cruise speed control.
- (2) Check that there is a return to ordinary driving when either of the operations below is performed.



- 1) The cruise control switch is turned to CANCEL.
- 2) The brake pedal is depressed.
- 3) The clutch pedal is depressed. <M/T>
- 4) The selector lever is at "N". <A/T>



- (3) Turn the control switch to RESUME while driving at a vehicle speed of approximately 40 km/h (25 mph) or higher, and check that there is a return to the cruise control speed before the function is canceled and the vehicle travels at a constant speed.
- (4) When driving at constant speed, check that the vehicle returns to the normal driving condition when the main switch is turned to OFF.



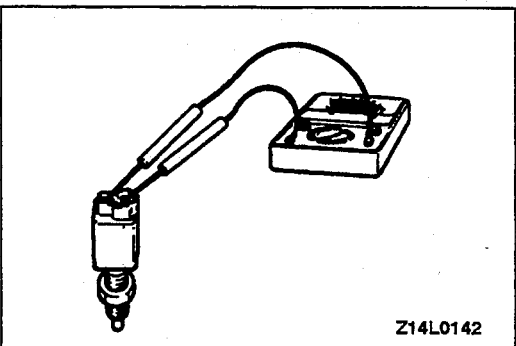
INDIVIDUAL PARTS CHECK

110005752

Stop Light Switch/Brake Switch Check

- (1) Disconnect the connector.
- (2) Check for continuity between the terminals of the switch.

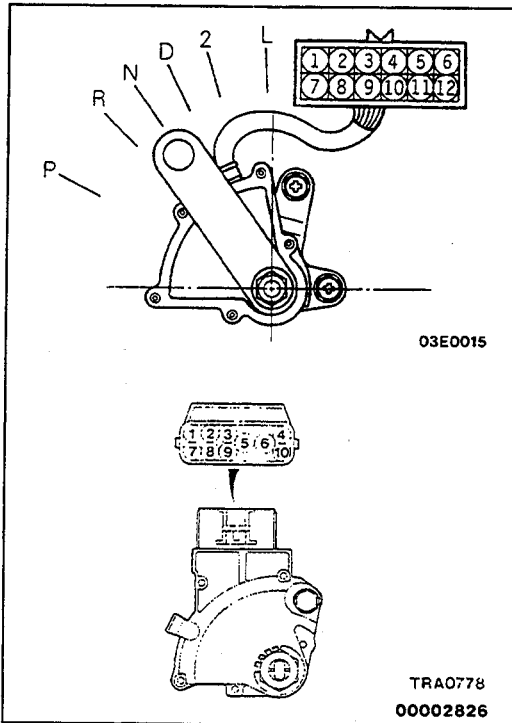
Measurement conditions	Brake switch terminal		Stop light switch terminal	
	1	4	2	3
When brake pedal is depressed			○—○	
When brake pedal is not depressed	○—○			



Clutch Pedal Position Switch Check <M/T>

110005753

- (1) Disconnect the connector.
- (2) Check that there is continuity between the connector terminals when the clutch pedal is depressed.



Park/Neutral Position Switch (“N” position) Check
<A/T> 110005754

<3.0L ENGINE-12VALVE>

- (1) Disconnect the connector.
- (2) Check that there is continuity between connector terminals (7) – (12) when the selector lever is moved to the “N” range.

<3.0L ENGINE-24VALVE and 3.5L ENGINE>

- (1) Disconnect the connector.
- (2) Check to be sure that there is continuity between connector terminals (5) and (6) when the selector lever is moved to the “N” range.

Throttle Position Sensor Check 110005755

Refer to P.13A-84, 149.

Closed Throttle Position Switch Check 110005756

Refer to P.13A-86, 151.

Vehicle Speed Sensor Check 110005757

Refer to GROUP 54–Meters and Gages.

Cruise Vacuum Pump Check 110005758

<Solenoid valve (Control valve, Release valve)>

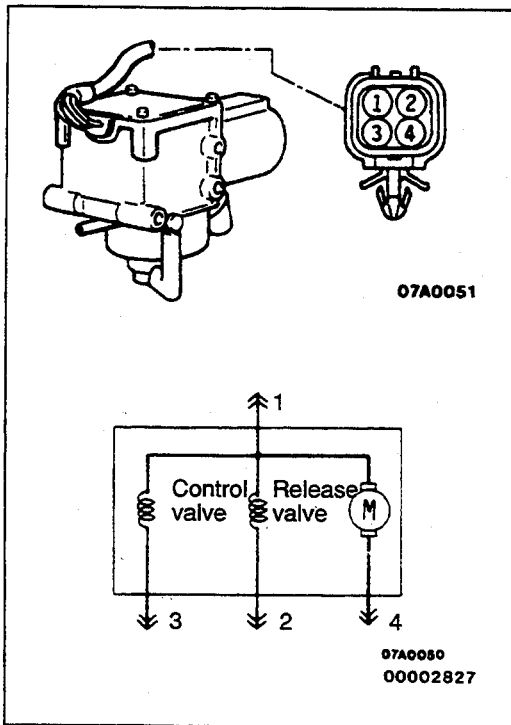
- (1) Disconnect the cruise vacuum pump connector.
- (2) Measure the resistance between terminals (1)–(2) and between (1)–(3).

Standard value: 50–60 Ω

- (3) Check that the solenoid valve makes an operating noise when battery positive voltage is applied between terminals (1)–(2) and between (1)–(3).
- (4) If there is a malfunction of the solenoid valve, replace the cruise vacuum pump assembly.

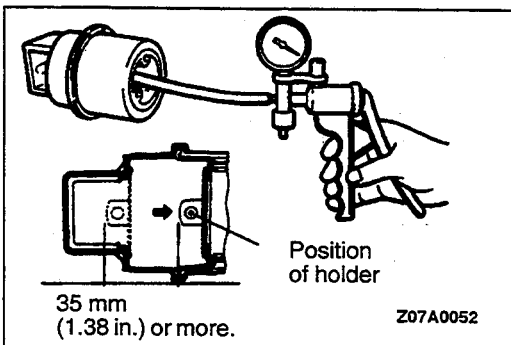
<Motor>

- (1) Disconnect the cruise vacuum pump connector.
- (2) Check that the motor operates when battery positive voltage is applied between terminals (1)–(4).



Actuator Check 110005759

- (1) Remove the actuator.
- (2) Apply negative pressure to the actuator with the vacuum pump and check that the holder moves more than 35 mm (1.38 in.). In addition, check that there is no change in the position of the holder when negative pressure is maintained in that condition.
- (3) First install the actuator, and then inspect and adjust the cruise control cable. (Refer to P. 13G-26.)



CRUISE CONTROL

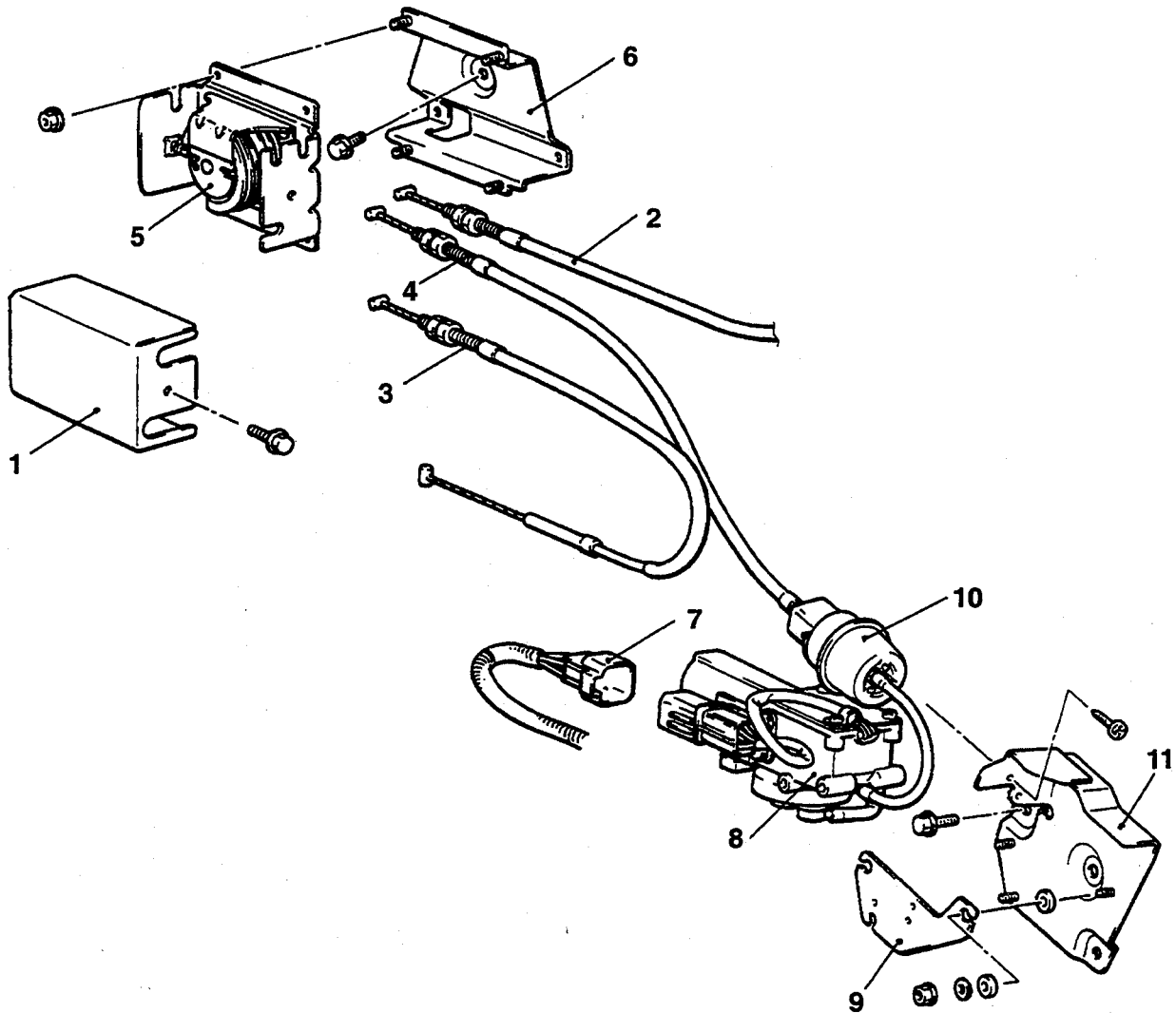
REMOVAL AND INSTALLATION <LINK AND ACTUATOR>

110005760

Post-installation Operation

- Control Cables Adjustment (Refer to P.13G-26.)

<Except 3.0L ENGINE – 24VALVE for California>



Z03E0034

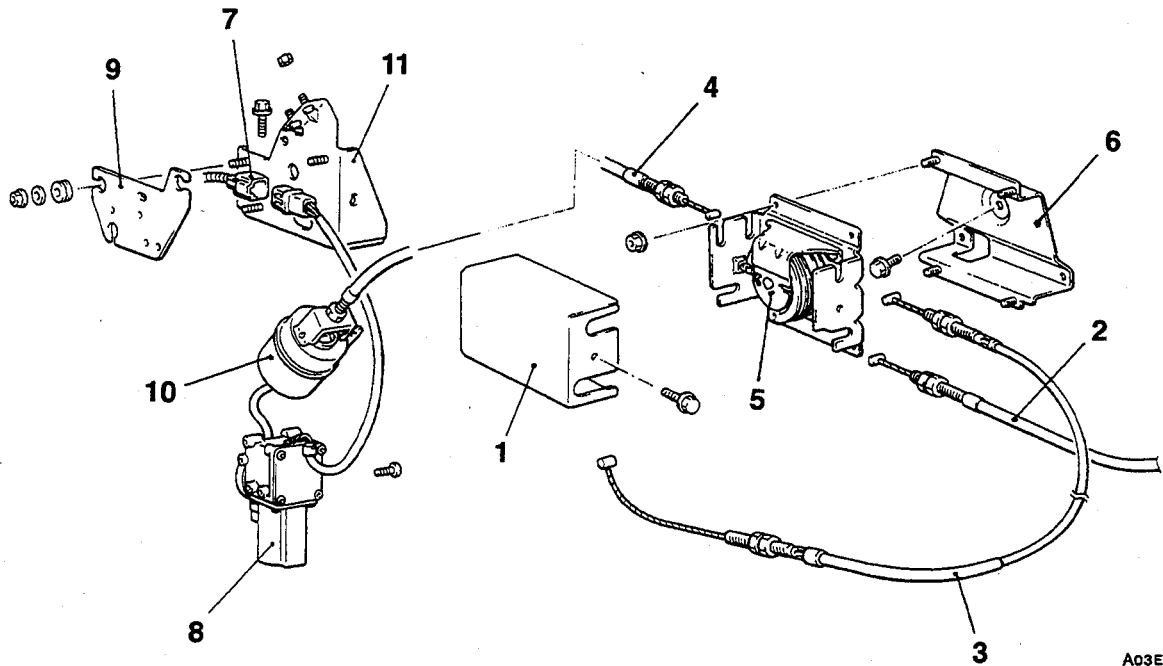
Intermediate link removal steps

1. Link protector
2. Connection for accelerator cable and link
3. Connection for throttle cable and link
4. Connection for cruise control cable and link
5. Intermediate link
6. Link bracket

Actuator removal steps

4. Connection for cruise control cable and link
7. Wiring connector
8. Vacuum pump
9. Pump bracket
10. Actuator
11. Actuator bracket

<3.0L ENGINE – 24 VALVE for California>



A03E0154

Intermediate link removal steps

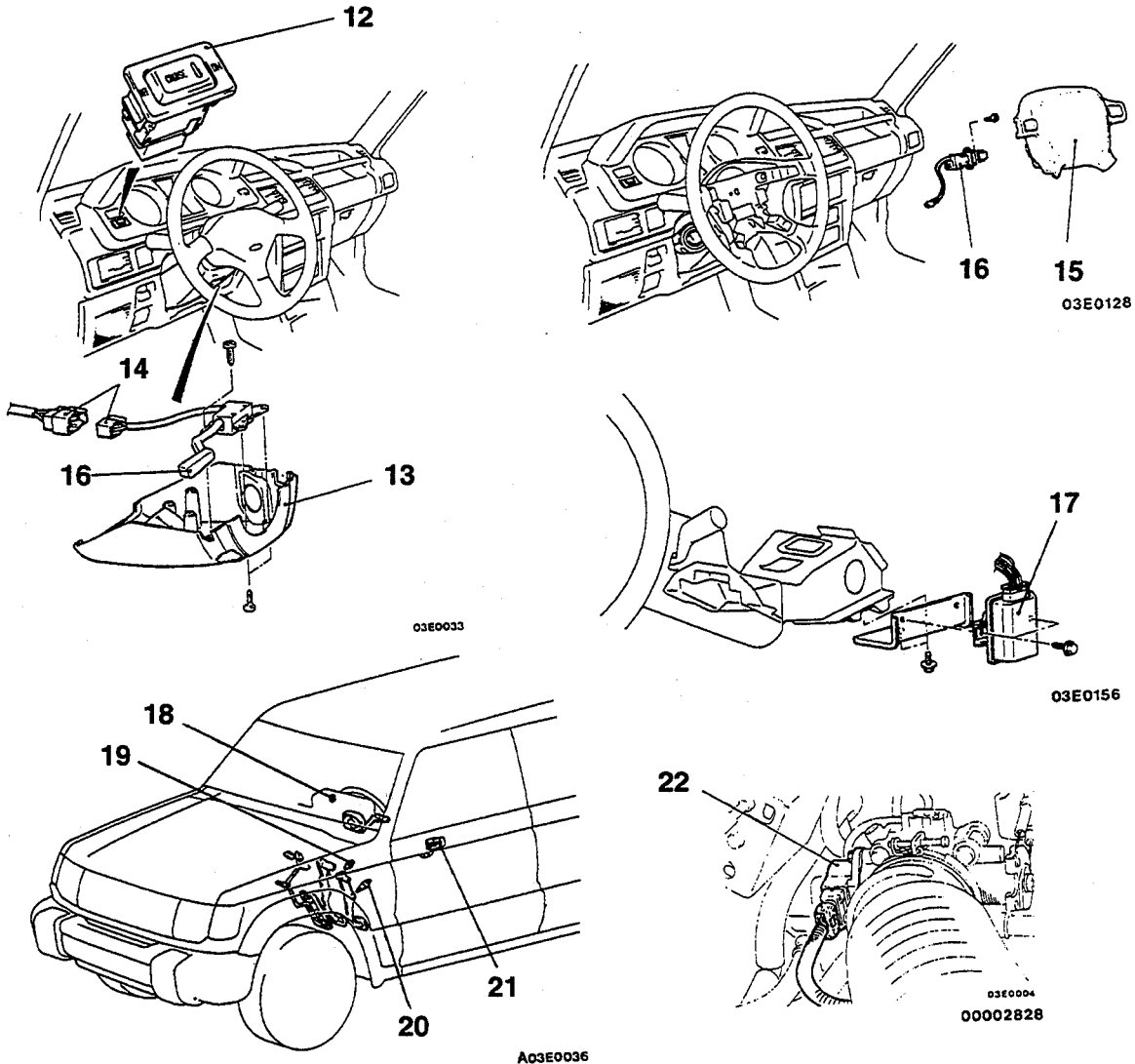
1. Link protector
2. Connection for accelerator cable and link
3. Connection for throttle cable and link.
4. Connection for cruise control cable and link
5. Intermediate link
6. Link bracket

Actuator removal steps

4. Connection for cruise cable and link
7. Wiring connector
8. Vacuum pump
9. Pump bracket
10. Actuator
11. Actuator bracket

REMOVAL AND INSTALLATION <SWITCHES, CONTROL UNIT AND SENSORS>

110005761



Removal steps of switches

CAUTION: SRS
 Before removal of air bag module,
 refer to GROUP 52B – SRS
 Service Precautions and Air Bag
 Module and Clock Spring.

12. Main switch

<Up to 1993 models>

- 13. Steering column lower trim
- 14. Wiring connectors
- 16. Control switch

<1994 models and after>

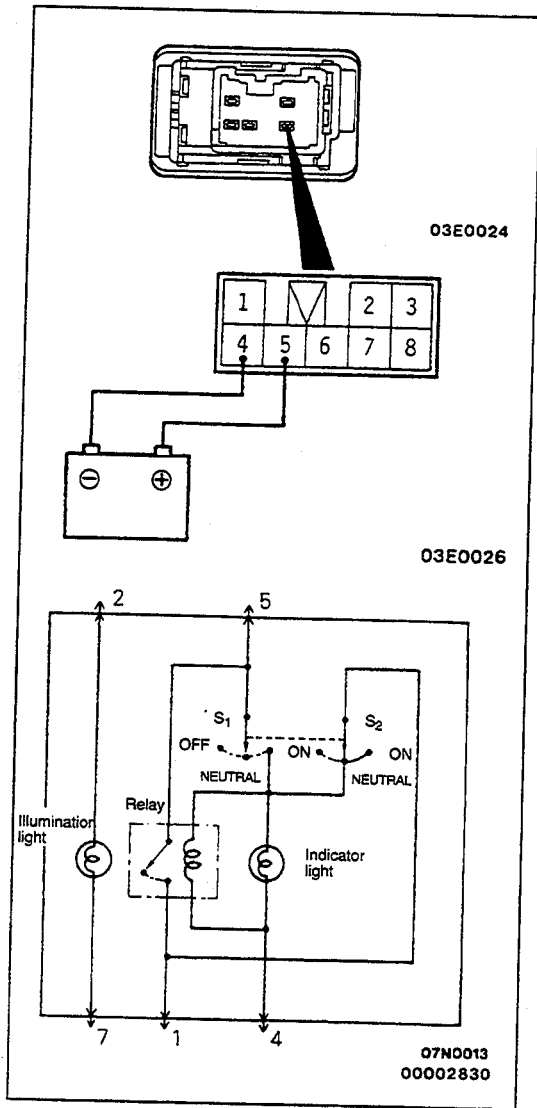
- 15. Air bag module (Refer to GROUP 52B
– Air Bag Module and Clock Spring.)
- 16. Control switch

Removal steps of control unit

- Instrument panel
(Refer to GROUP 52 – Instrument
Panel.)
- 17. Control unit

Removal steps of sensors

- 18. Vehicle speed sensor (reed switch)
(Refer to GROUP 54 – Meters and
Gages.)
- 19. Stop light switch
- 20. Clutch pedal position switch <M/T>
- 21. Park/Neutral position switch <A/T>
- 22. TPS (Throttle position sensor)



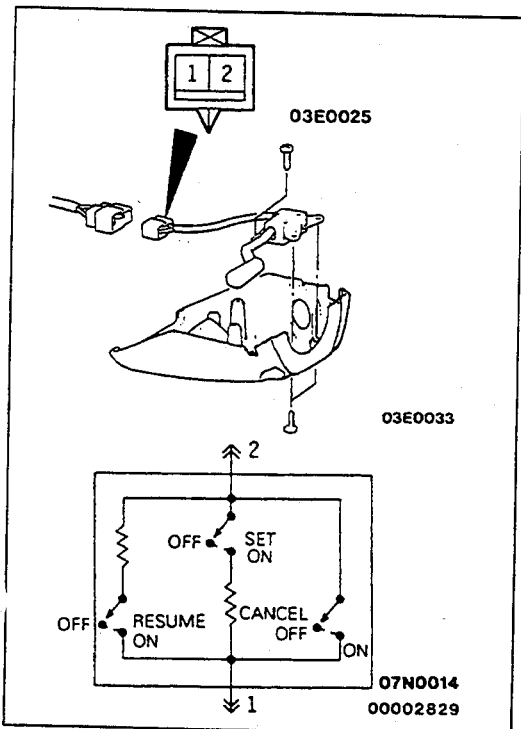
INSPECTION

CRUISE CONTROL MAIN SWITCH

- (1) Operate the main switch and check the continuity between the terminals.

Switch state	Terminal					
	2	Illumination	7	5	1	4
Pressed to OFF	○	⊕	○			
Neutral position	○	⊕	○		○	○
Pressed to ON	○	⊕	○	○		○

- (2) Connect the positive battery terminal to terminal (5) and the negative battery terminal to terminal (4), and then check that there is battery positive voltage between terminal (1) and the ground when the main switch is turned to ON and during the period before it is turned to OFF. Check that the battery positive voltage between terminal (1) and the ground is reduced to 0 V when the main switch is turned to OFF.



CRUISE CONTROL SWITCH

- (1) Remove the steering column lower cover.
- (2) Disconnect the connector of the control switch and operate the control switch to measure the resistance between the individual terminals.

If the readings are as shown below, the control switch may be considered good.

Switch operation	Resistance between terminals
When the switch is not operated	No continuity
When the switch is turned to CANCEL	Approx. 0 Ω
When the switch is turned to RESUME	Approx. 820 Ω
When the switch is turned to SET	Approx. 2,700 Ω

NOTES



COOLING

CONTENTS

11000557

COOLING FAN	7	SERVICE SPECIFICATIONS	2
GENERAL SPECIFICATIONS	2	SPECIAL TOOL	3
LUBRICANTS	3	THERMOSTAT <3.0L-12VALVE engine>	9
RADIATOR*	6	THERMOSTAT <3.0L-24VALVE engine, 3.5L engine>	11
SEALANTS AND ADHESIVES	3	THERMO SWITCH <A/T>, ENGINE COOLANT TEMPERATURE GAGE UNIT, ENGINE COOLANT TEMPERATURE SENSOR AND AIR CONDITIONING ENGINE COOLANT TEMPERATURE SWITCH	15
SERVICE ADJUSTMENT PROCEDURES	4	TROUBLESHOOTING	4
Drive Belt Deflection Adjustment	5	WATER PUMP	13
Drive Belt Deflection Check	5		
Engine Coolant Concentration Test	5		
Engine Coolant Leak Check	4		
Engine Coolant Replacement	5		
Radiator Cap Pressure Test	5		

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 (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) and GROUP 00 – Maintenance Service before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS diagnosis unit, SRS warning light, 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 SPECIFICATIONS

110005558

Items		Specifications
Cooling method		Water-cooled pressurized, forced circulation
Radiator type		Pressurized corrugated fin type
Radiator Performance kJ/h (kcal/h, BTU/h)	3.0L engine – A/T	193,396 (46,200, 183,333)
	3.0L engine – M/T	182,093 (43,500, 172,619)
	3.5L engine	200,930 (48,000, 190,476)
Automatic transmission oil cooler <Vehicles with A/T> performance kJ/h (kcal/h, BTU/h)		6,195 (1,480, 5,873)
Thermostat type		Wax type with jiggle valve
Thermostat identification mark	3.0L-12VALVE engine	88 (Stamped on flange)
	3.0L-24VALVE engine, 3.5L engine	82 (Stamped on flange)
Fan clutch type		Thermo type with spiral type bimetal
Water pump type		Centrifugal-type impeller

SERVICE SPECIFICATIONS

110005559

Items		Standard value	Limit
Radiator cap	High pressure valve opening pressure kPa (psi)	75–105 (11–15)	65 (9.2)
	Vacuum valve opening pressure kPa (psi)	–5 or less (–.7 or less)	–
Range of coolant antifreeze concentration %		30–60	–
Thermostat	Valve opening temperature of thermostat	3.0L-12VALVE engine °C (°F)	88 (190)
		3.0L-24VALVE engine °C (°F)	82 (180)
		3.5L-engine °C (°F)	82 (180)
	Full-opening temperature of thermostat	3.0L-12VALVE engine °C (°F)	100 (212)
		3.0L-24VALVE engine °C (°F)	95 (203)
		3.5L-engine °C (°F)	95 (203)
Engine coolant temperature gage unit resistance At 70°C (158°F) Ω		104±13.5	–
Engine coolant temperature sensor resistance	At 20°C (68°F) kΩ	2.37±0.24	–
	At 80°C (176°F) Ω	290±32	–
Thermo switch <A/T> (always opened type) OFF→ON operating temperature °C (°F)		More than 50 (112)	–

LUBRICANTS

110005560

Items	Recommended antifreeze	Quantity
Engine coolant	DIA QUEEN LONG-LIFE COOLANT (Part No. 0103044) or HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	9.5 dm ³ (10.0 qts.)*

NOTE

* includes 0.65 dm³ (.69 qts.) in reserve tank.

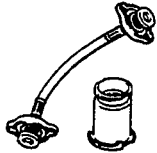
SEALANTS AND ADHESIVES

110005561

Items	Specified sealants and adhesives
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent
Engine coolant temperature sensor	
Engine coolant temperature gage unit	3M ATD Part No. 8660 or equivalent
Thermo switch <AT>	

SPECIAL TOOL

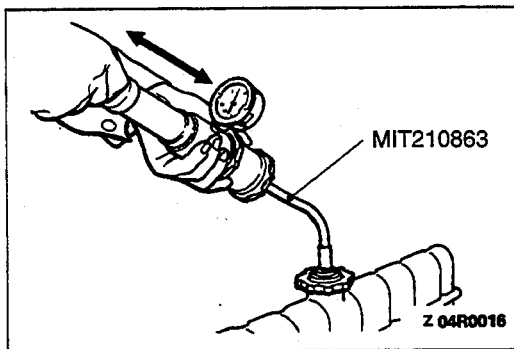
110005562

Tool	Tool number and name	Supersession	Application
	MIT210863 Radiator cap test adapter		Radiator cap pressure test

TROUBLESHOOTING

110005563

Trouble Symptom	Probable Cause	Remedy
Overheat	Insufficient engine coolant	Refill
	Antifreeze concentration too great	Correct
	Loose or broken drive belt	Replace
	Fan clutch does not operate	Replace
	Damaged or blocked (insufficiently ventilated) radiator fins	Correct
	Water leaks Damaged radiator core joint	Replace
	Corroded or cracked hoses (radiator hose, heater hose, etc.)	Replace
	Loose bolt or malfunction of gasket in water outlet fitting (thermostat)	Correct or replace
	Loose water pump mounting bolt or faulty gasket	Correct or replace
Faulty radiator cap valve or incorrect setting of spring	Replace	
Faulty thermostat operation	Replace	
Faulty water pump operation	Replace	
Water passage is clogged with slime, rust deposit or other foreign substance	Clean	
No rise in temperature	Faulty thermostat	Replace



SERVICE ADJUSTMENT PROCEDURES

ENGINE COOLANT LEAK CHECK

110005564

1. Loosen radiator cap.
2. Check that the coolant level is up to the filler neck.
3. Install a radiator cap tester to the radiator filler neck and apply 160 kPa (23 psi) pressure. Hold for two minutes in that condition, while checking for leakage from the radiator, hose or connections.

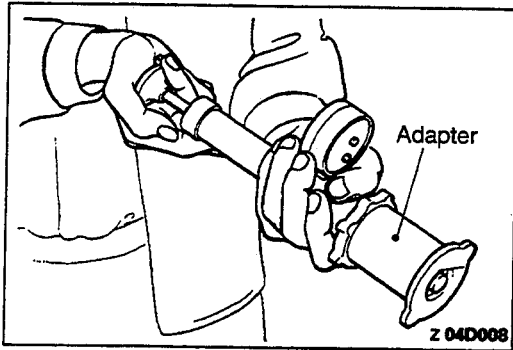
Caution

Be sure to completely clean away moisture from the places checked.

When the tester is removed, be careful not to spill any coolant from it.

Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.

4. If there is leakage, repair or replace the appropriate part.

**RADIATOR CAP PRESSURE TEST**

110005565

1. Use the adapter to attach the cap to the tester.
2. Increase the pressure until the indicator of the gage stops moving.

Standard value: 75–105 kPa (11–15 psi)**Limit: 65 kPa (9.2 psi)**

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

NOTE

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

ENGINE COOLANT REPLACEMENT

110005566

Refer to GROUP 00–Maintenance Service.

ENGINE COOLANT CONCENTRATION TEST

110005567

Refer to GROUP 00–Maintenance Service.

DRIVE BELT DEFLECTION CHECK

110005568

Refer to GROUP 11–Service Adjustment Procedures.

DRIVE BELT DEFLECTION ADJUSTMENT

110005569

Refer to GROUP 11–Service Adjustment Procedures.

RADIATOR

110005570

REMOVAL AND INSTALLATION

Caution: SRS

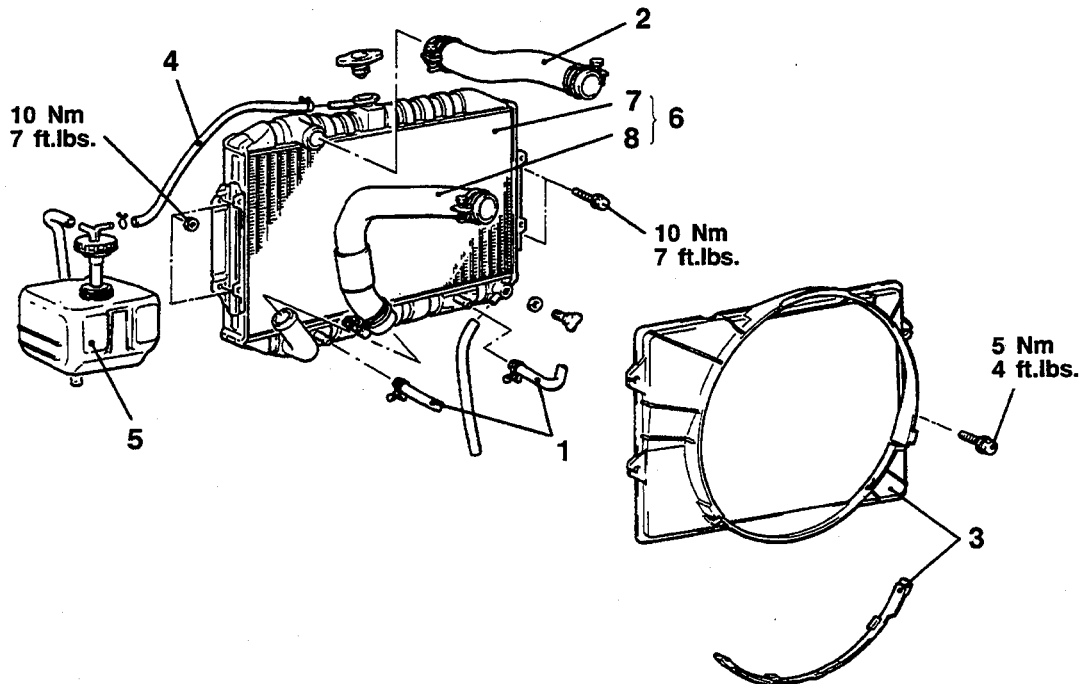
Be careful not to subject the front impact sensor to any shocks during removal and installation of the radiator.

Pre-removal Operation

- Engine Coolant Draining
- Under Cover Removal <A/T>
- Air Cleaner Case Removal <3.0L-24VALVE engine, 3.5L engine>

Post-installation Operation

- Under Cover Installation <A/T>
- Air Cleaner Case Installation <3.0L-24VALVE engine, 3.5L engine>
- Engine Coolant Supplying
- Automatic Transmission Fluid Supplying <A/T> (Refer to GROUP 23 – Service Adjustment Procedures)



Z 04E0007

Removal steps

1. Automatic transmission oil cooler hose connection <A/T>
2. Radiator upper hose
3. Radiator shroud
4. Overflow hose
5. Reserve tank
6. Radiator and radiator lower hose
7. Radiator
8. Radiator lower hose

INSPECTION

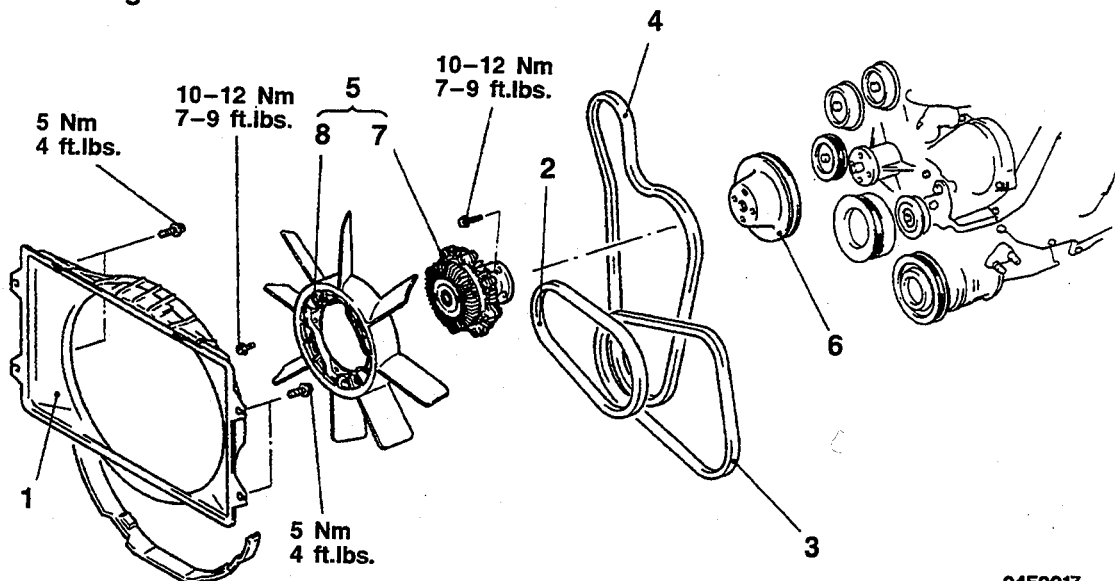
- Check for foreign material between radiator fins.
- Check the radiator fins for bend or damage.
- Check the radiator for corrosion, damage, rust or scaling.
- Check the radiator hoses for cracks, damage or deterioration.
- Check the reserve tank for damage.
- Check the spring of radiator cap for deterioration.
- Check the packing of radiator cap for damage or cracks.

COOLING FAN

REMOVAL AND INSTALLATION

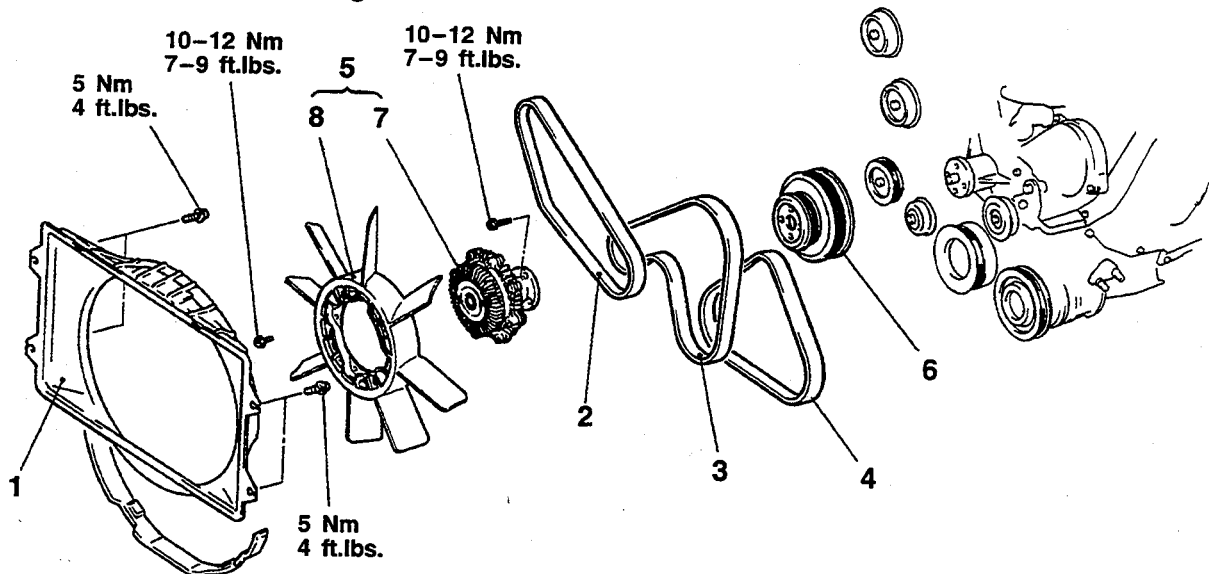
110005571

<3.0L-12VALVE engine>



04E0017

<3.0L-24VALVE engine, 3.5L engine>



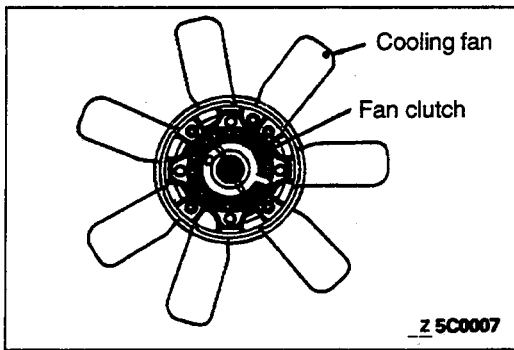
04E0058
00002064

Removal steps <3.0L-12VALVE engine>

1. Shroud
2. Drive belt (Power steering)
3. Drive belt (Air conditioning)
4. Drive belt (Generator)
5. Cooling fan and fan clutch assembly
6. Pulley
7. Fan clutch
8. Cooling fan

Removal steps <3.0L-24VALVE engine, 3.5L engine>

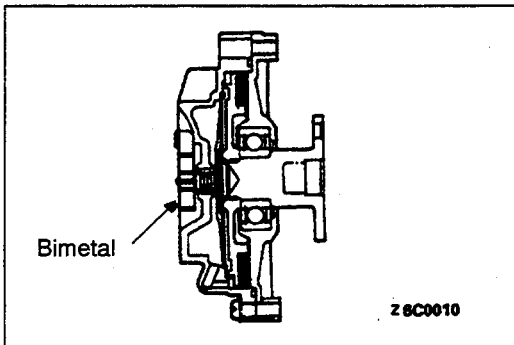
1. Shroud
2. Drive belt (Power steering)
3. Drive belt (Generator)
4. Drive belt (Air conditioning)
5. Cooling fan and fan clutch assembly
6. Pulley
7. Fan clutch
8. Cooling fan



INSPECTION

COOLING FAN

- Check the blades for damage and cracks.
- Check for cracks or damage around the bolt holes in the fan hub.
- If any portion of fan is damaged or cracked, replace cooling fan.



FAN CLUTCH

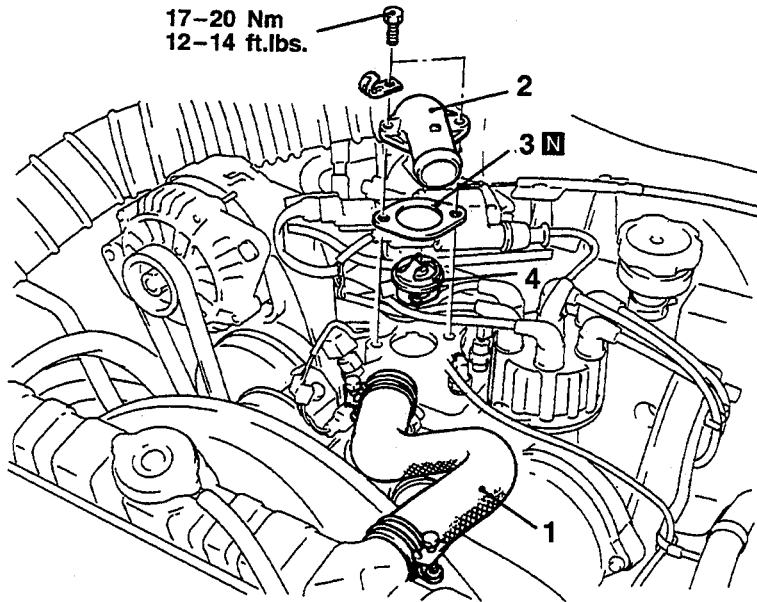
- Check that the fluid in the fan clutch is not leaking at the case joints and seals. If the fluid quantity decreases due to leakage, the fan speed will decrease and engine overheating might result.
- When a fan attached to an engine is turned by hand, it should give a sense of some resistance. If fan turns lightly, it is faulty.
- Check bimetal strip for damage.

THERMOSTAT <3.0L-12VALVE engine>

110005572

REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operation**
- Engine Coolant Draining and Supplying

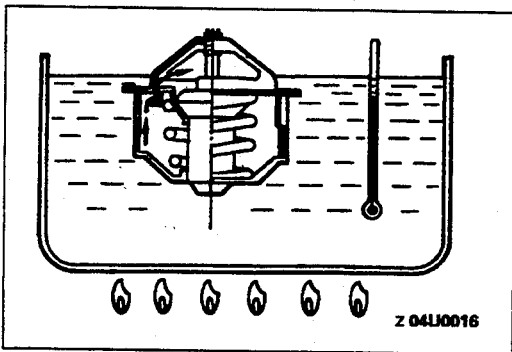


Z04W578

Removal steps

1. Radiator upper hose connection
2. Water outlet fitting

3. Water outlet fitting gasket
4. Thermostat



INSPECTION

- Check that the valve closes tightly at room temperature.
- Check for defects or damage.
- Check for rust or encrustation on the valve, and remove if any.
- Immerse the thermostat in container of water. Stir to raise water temperature and check that the thermostat valve opening temperature and the temperature with valve fully open [valve lift-over 8 mm (.31 in.)] are at the standard values.

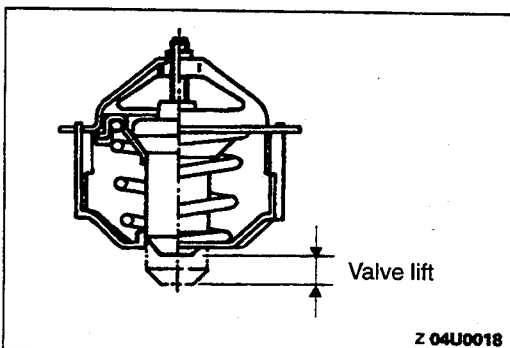
Standard value:

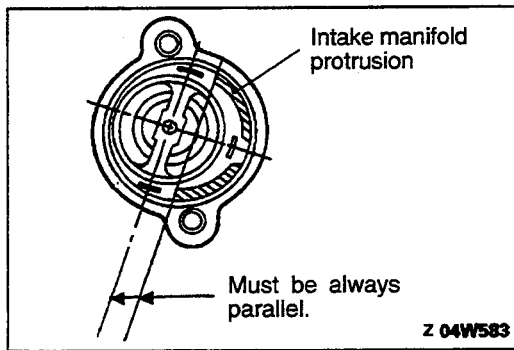
Valve opening temperature 88°C (190°F)

Fully open 100°C (212°F)

NOTE

Measure valve height when fully closed. Calculate lift by measuring the height when fully open.





INSTALLATION SERVICE POINT

▶◀ THERMOSTAT INSTALLATION

Install the thermostat to the intake manifold as illustrated.

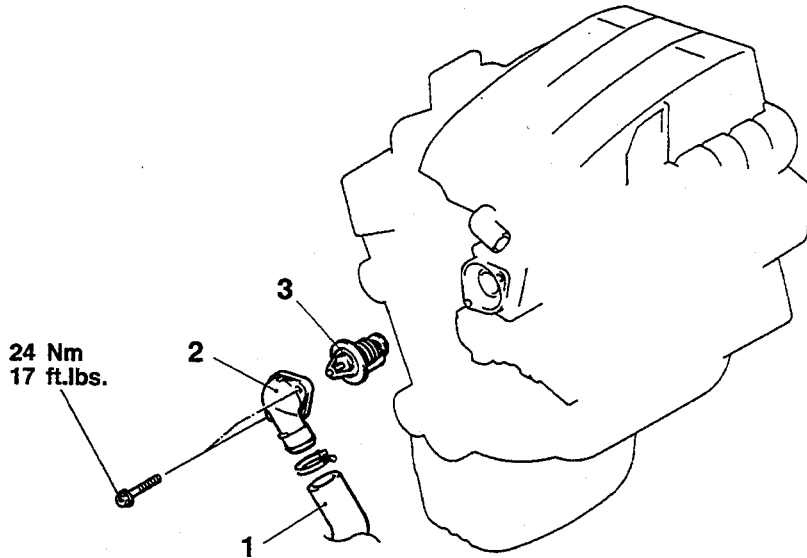
Caution

The thermostat flange fits over the manifold seat; ensure that the thermostat is not installed at an angle.

THERMOSTAT<3.0L-24VALVE engine, 3.5L engine>

REMOVAL AND INSTALLATION

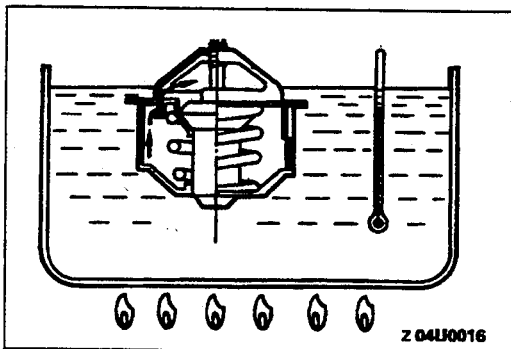
- Pre-removal and Post-installation Operation**
- Engine Coolant Draining and Supplying



Z 01E0110

Removal steps

1. Radiator lower hose connection
2. Water inlet fitting
3. Thermostat



INSPECTION

- Check that valve closes tightly at room temperature.
- Check for defects or damage.
- Check for rust or encrustation on valve. Remove if any.
- Immerse thermostat in container of water. Stir to raise water temperature and check that thermostat valve opening temperature and the temperature with valve fully open [valve lift-over 8 mm (.31 in.)] are at the standard value.

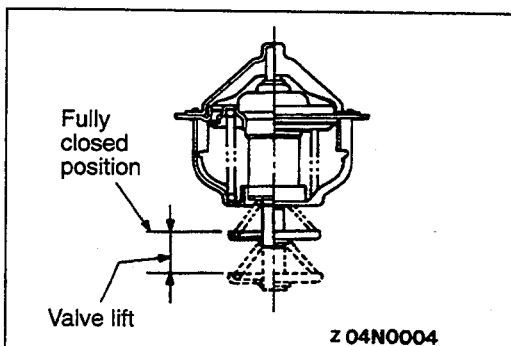
Standard value:

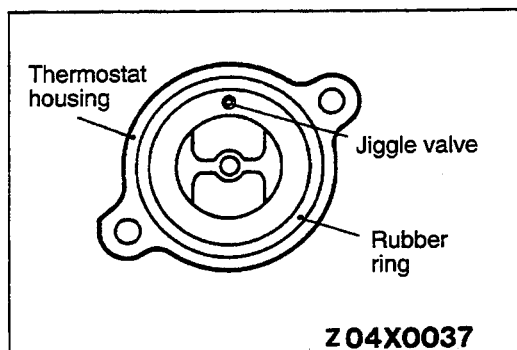
Valve opening temperature 82°C (180°F)

Fully open 95°C (203°F)

NOTE

Measure valve height when fully closed. Calculate lift by measuring the height when fully open.





INSTALLATION SERVICE POINT

►A◄ THERMOSTAT INSTALLATION

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

Caution

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

WATER PUMP

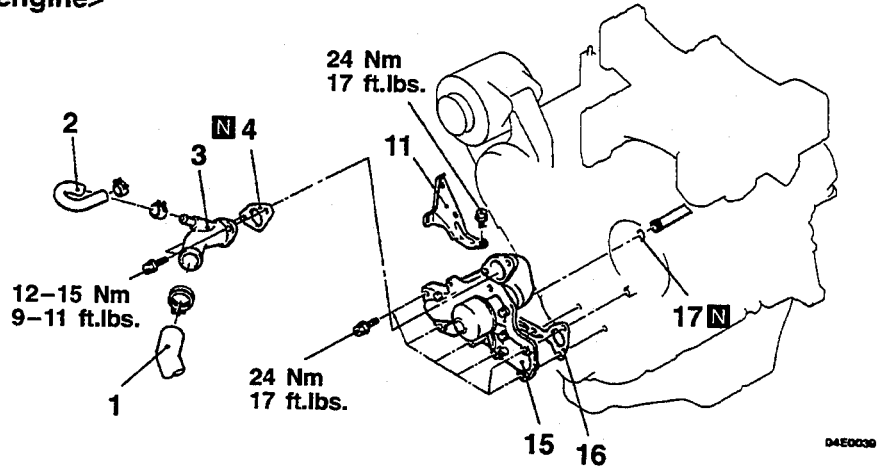
11000574

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

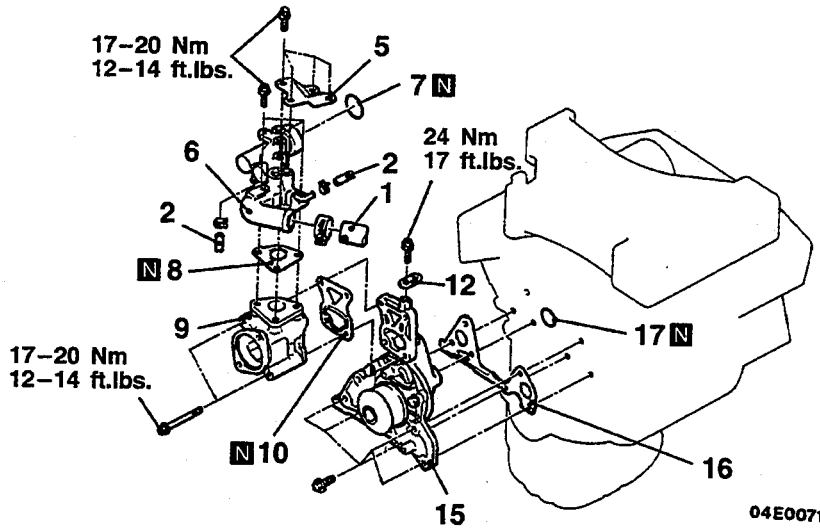
- Engine Coolant Draining and Supplying
- Timing Belt Removal and Installation
(Refer to GROUP 11 – Timing Belt.)

<3.0L-12VALVE engine>



04E0030

<3.0L-24VALVE engine>



04E0071

00002065

Removal steps <3.0L – 12VALVE engine>

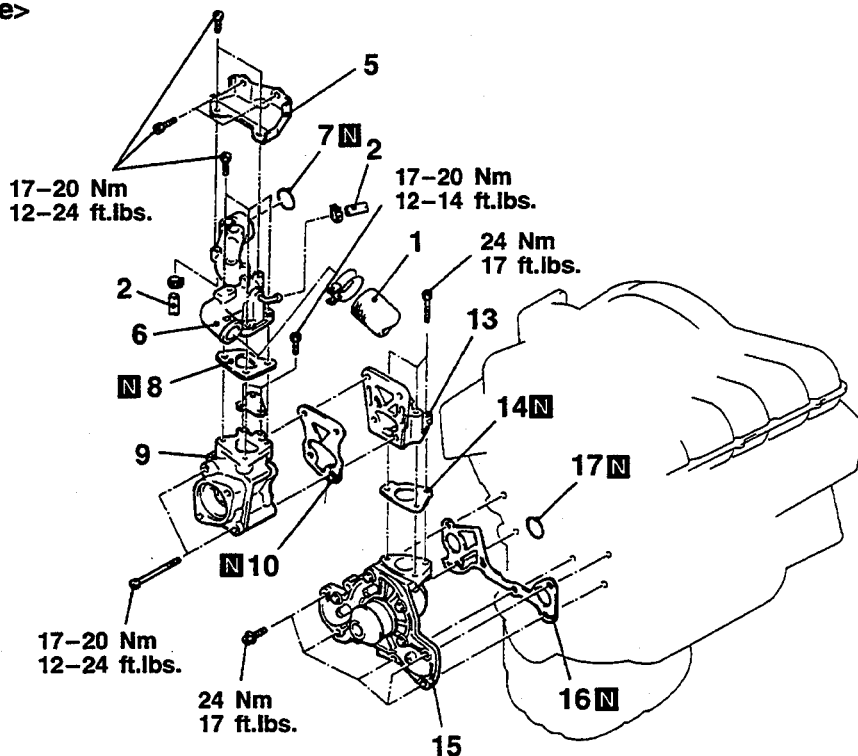
1. Radiator hose
 2. Water hose
 3. Water inlet fitting
 4. Water inlet fitting gasket
 11. Tensioner bracket stay
 15. Water pump
 16. Water pump gasket
- ▶A◀ 17. O-ring

Removal steps <3.0L-24VALVE engines>

- Thermostat (Refer to P.14-11.)
1. Radiator hose
 2. Water hose
 5. Water outlet fitting bracket
 6. Water outlet fitting
 - ▶A◀ 7. O-ring
 8. Gasket
 9. Thermostat case
 10. Gasket
 12. Water pump bracket
 15. Water pump
 16. Water pump gasket
 - ▶A◀ 17. O-ring

TSB Revision

<3.5L engine>

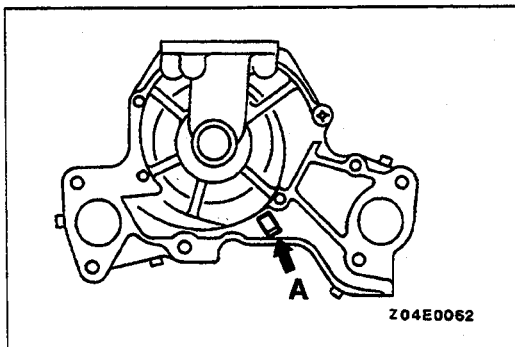


Removal steps <3.5L engine>

- Thermostat (Refer to P.14-11.)
- 1. Radiator hose
- 2. Water hose
- 5. Water outlet fitting bracket
- 6. Water outlet fitting
- 7. O-ring
- 8. Gasket



- 9. Thermostat case
- 10. Gasket
- 13. Water pump fitting
- 14. Water pump fitting gasket
- 15. Water pump
- 16. Water pump gasket
- 17. O-ring



INSPECTION

WATER PUMP

- Check each part for cracks, damage or wear, and replace the water pump assembly if necessary.
- Check the bearing for damage, abnormal noise and sluggish rotation, and replace the water pump assembly if necessary.
- Check the seal unit for leaks, and replace the water pump assembly if necessary.
- Check for water leakage if water leaks from hole "A" seal unit is faulty. Replace as an assembly.

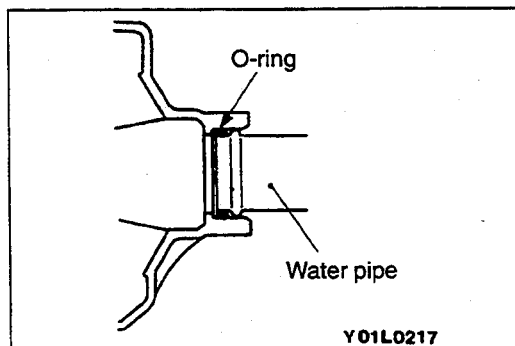
INSTALLATION SERVICE POINT

▶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. Do not apply oil and grease to water pipe O-ring.
2. Keep the water pipe connections free of sand, dust, etc.
3. Insert water pipe until its end bottoms.

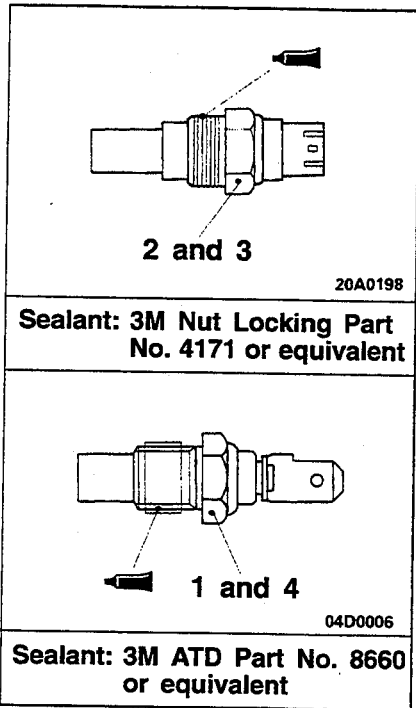


THERMO SWITCH <A/T>, ENGINE COOLANT TEMPERATURE GAGE UNIT, ENGINE COOLANT TEMPERATURE SENSOR AND AIR CONDITIONING ENGINE COOLANT TEMPERATURE SWITCH

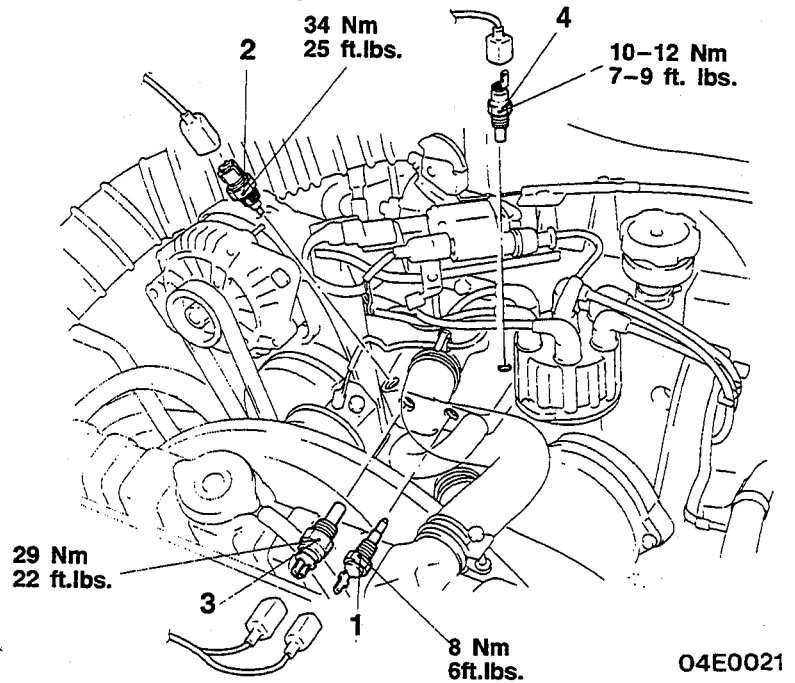
110005575

REMOVAL AND INSTALLATION

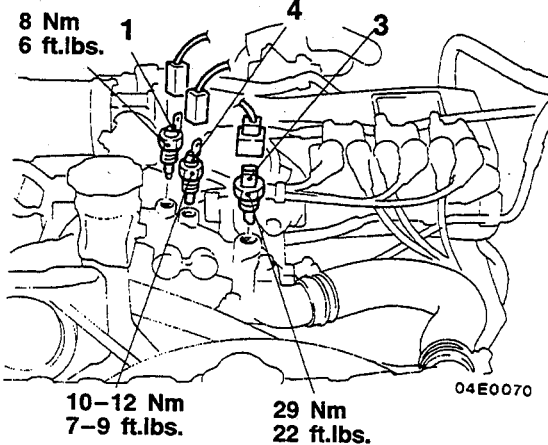
- Pre-removal and Post-installation Operation**
- Engine Coolant Draining and Supplying



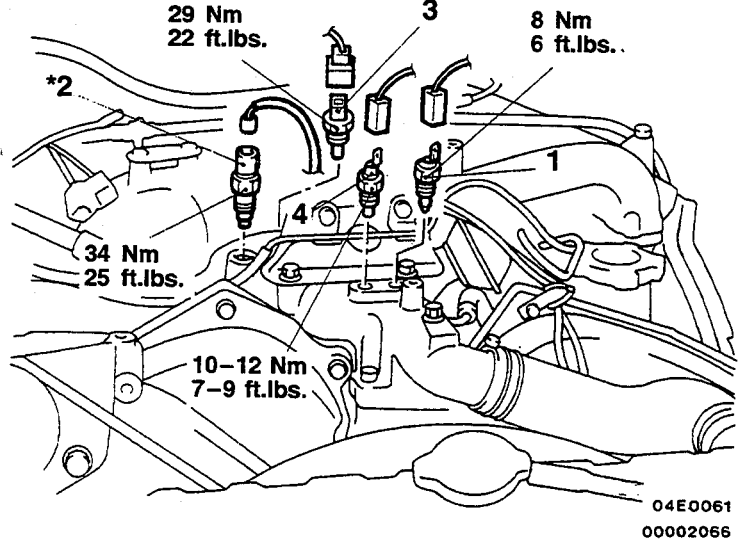
<3.0L-12VALVE engine>



<3.0L-24VALVE engine>



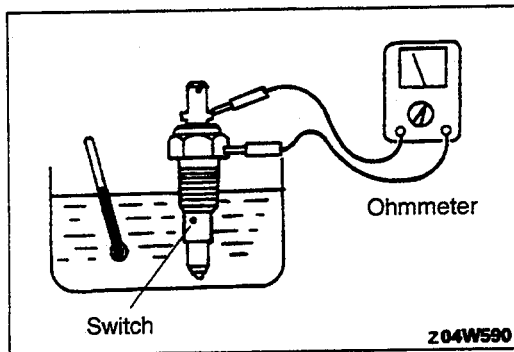
<3.5L engine>



1. Thermo switch <A/T>
2. Air conditioning engine coolant temperature switch

3. Engine coolant temperature sensor
4. Engine coolant temperature gage unit

NOTE
*: 1994 models only



INSPECTION

THERMO SWITCH <A/T>

Raise the water temperature and check the continuity when it reaches the specified temperature.

Standard value:

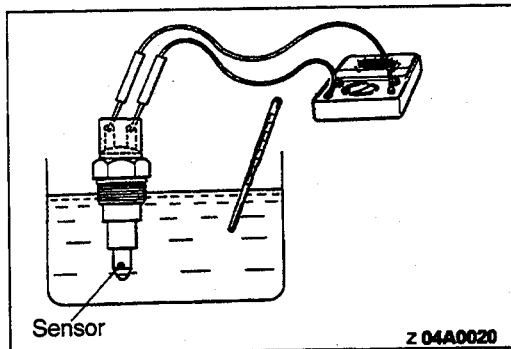
- <3.0L-12VALVE engine, 3.5L engine>
 - 50 °C (122 °F) or more: Continuity
 - 50 °C (122 °F) dimmer: No continuity
- <3.0L-24VALVE engine>
 - 35 °C (95 °F) or more: Continuity
 - 35 °C (95 °F) dimmer: No continuity

ENGINE COOLANT TEMPERATURE SENSOR

Raise the water temperature and measure the resistance if within the standard value.

Standard value:

- 2.37±0.24 kΩ [at 20 °C (68 °F)]
- 290±32 Ω [at 80 °C (176 °F)]

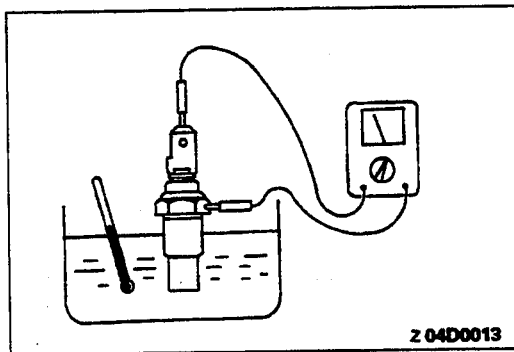


ENGINE COOLANT TEMPERATURE GAGE UNIT

Immerse the gage unit in hot water at 70 °C (158 °F) and measure the resistance value with an ohmmeter.

Standard value:

- 104±13.5 Ω [at 70 °C (158 °F)]



AIR CONDITIONING ENGINE COOLANT TEMPERATURE SWITCH

Refer to GROUP 55 – Air Conditioning Engine Coolant Temperature Switch.

INTAKE AND EXHAUST

CONTENTS

110005576

EXHAUST MANIFOLD <3.0L-12VALVE engine>	7	EXHAUST PIPE, MUFFLER AND CATALYTIC CONVERTER <3.5L engine> ...	12
EXHAUST MANIFOLD <3.0L-24VALVE engine>	8	GENERAL SPECIFICATIONS	2
EXHAUST MANIFOLD <3.5L engine>	9	INTAKE MANIFOLD <3.0L-24VALVE engine, 3.5L engine>	5
EXHAUST PIPE, MUFFLER AND CATALYTIC CONVERTER <3.0L-12VALVE engine, 3.0L-24VALVE engine For Federal>	10	SERVICE ADJUSTMENT PROCEDURES	2
EXHAUST PIPE, MUFFLER AND CATALYTIC CONVERTER <3.0L-24VALVE engine For CALIFORNIA>	11	Intake Manifold Vacuum Inspection	2
		Variable Induction System Inspection	3
		SERVICE SPECIFICATIONS	2
		TROUBLESHOOTING	2

GENERAL SPECIFICATIONS

110005577

Items		Specifications
Air filter	Type	Dry type
	Element	Unwoven cloth type
Exhaust system	Front exhaust pipe	Dual type
	Muffler	Expansion resonance type
	Coupling	Spherical coupling and flat coupling
	Suspension system	Rubber hangers and rubber suspenders

SERVICE SPECIFICATIONS

110005578

Items	Standard	Limit
Intake and exhaust manifolds Distortion of cylinder head contacting surface mm (in.)	Less than 0.15 (.0059)	0.3 (.012)

TROUBLESHOOTING

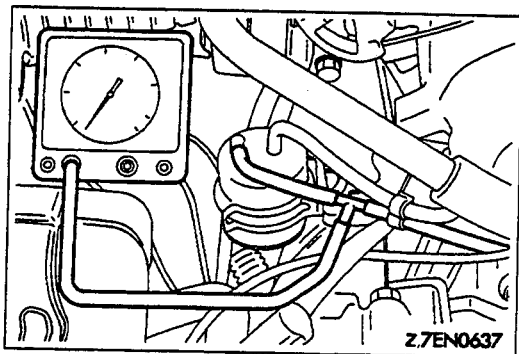
110005579

Trouble Symptom	Probable Cause	Remedy
Exhaust gas leakage	Loose joints	Re-tighten
	Broken pipe or muffler	Repair or replace
Abnormal noise	Broken separator in muffler	Replace
	Broken rubber hangers or suspender	Replace
	Interference of pipe or muffler with vehicle body	Correct
	Broken pipe or muffler	Repair or replace

SERVICE ADJUSTMENT PROCEDURES
INTAKE MANIFOLD VACUUM INSPECTION

110005580

Refer to GROUP 11 – Service Adjustment Procedures.



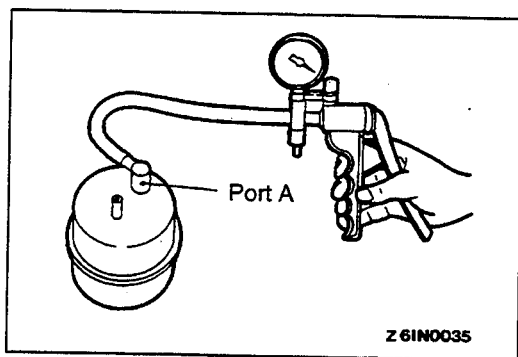
VARIABLE INDUCTION SYSTEM INSPECTION

110005581

- (1) Warm up the engine.
- (2) Connect a tachometer.
- (3) Connect a vacuum gage, via a T-joint, between the variable induction control solenoid and the variable induction control vacuum actuator.
- (4) Start the engine, and check to be sure that negative pressure is applied to the vacuum gage according to the items in the table below.

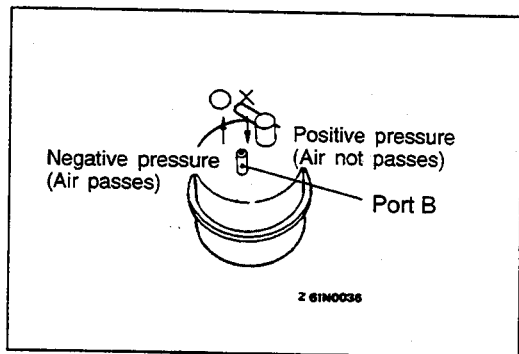
Engine speed	Normal Condition	Control Valve
3,200 rpm or less	Negative pressure is maintained	Closed
From 3,200 rpm or less, engine is suddenly raced	Negative pressure does not change	Closed
3,400 rpm or more	Negative pressure leaks	Open

- (5) Check to be sure that the rod of the variable induction control vacuum actuator moves during inspection.



VACUUM TANK INSPECTION

- (1) Install a hand vacuum pump to port A and check to be sure that air-tightness is maintained when 500 mm Hg of negative pressure is applied. After checking, remove the hand vacuum pump.

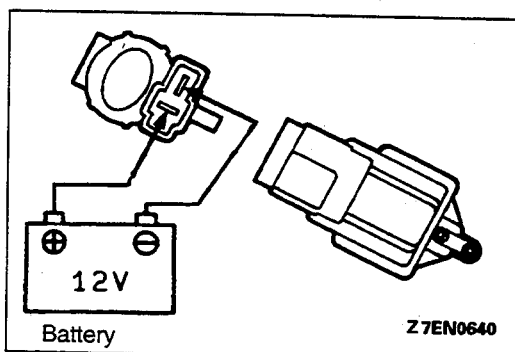


- (2) Check to be sure that air passes through when negative pressure is applied to port B, and that air does not pass through when positive pressure is applied to port B.

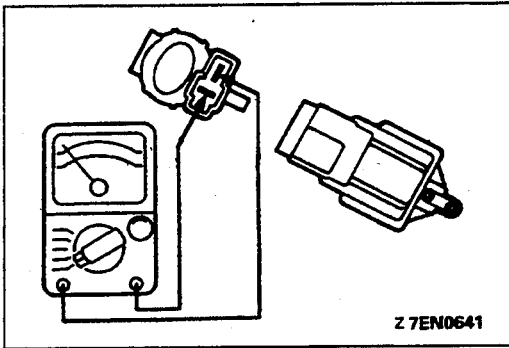
VARIABLE INDUCTION CONTROL SOLENOID INSPECTION

(1) OPERATION CHECK

Apply negative pressure to the vacuum tank side nipple (connected to the white vacuum hose) of the variable induction control solenoid with a hand vacuum pump, and check the air-tightness when voltage is applied to and removed from the variable induction control solenoid terminals.



Battery Positive Voltage	Other Nipple of Variable Induction Control Solenoid	Normal Condition
When applied	Open	Negative pressure leaks
	Covered with a finger	Negative pressure is maintained
When not applied	Open	Negative pressure is maintained



(2) COIL CONTINUITY CHECK

Use a circuit tester to measure the resistance of the coil.

Standard value: 36–44 Ω [At 20°C (68°F)]

INTAKE MANIFOLD <3.0L-24VALVE engine, 3.5L engine>

110005582

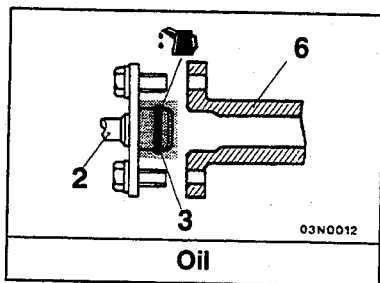
REMOVAL AND INSTALLATION

Pre-removal Operation

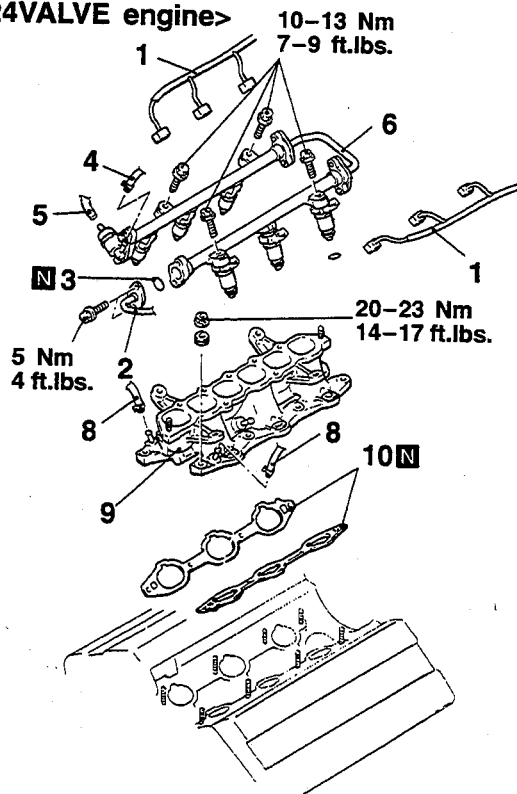
- Residual Pressure Release from High Pressure Hose (Refer to GROUP 13A – Service Adjustment Procedure.)
- Engine Coolant Draining (Refer to GROUP 00 – Coolant Replacement.)
- Intake Manifold Plenum Removal

Post-installation Operation

- Intake Manifold Plenum Installation
- Engine Coolant Filling (Refer to GROUP 00 – Coolant Replacement.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
- Throttle Cable Adjustment (Refer to GROUP 23 – Service Adjustment Procedures.)
- Fuel Leakage Checking

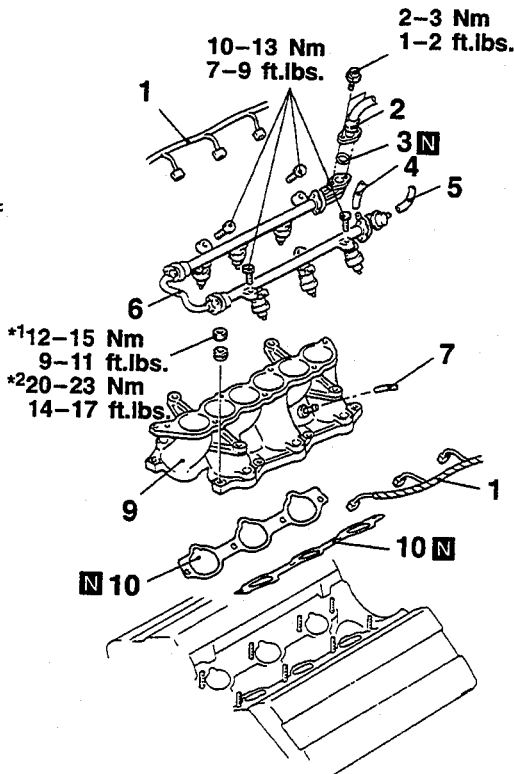


<3.0L-24VALVE engine>



05E0064

<3.5L engine>



03E0123

00002067

Removal steps

1. Connection of injector harness
2. Connection for high-pressure fuel hose
3. O-ring
4. Connection for fuel return hose
5. Connection for vacuum hose

6. Fuel rail (with injectors)
7. Connection for ventilation hose
8. Connection for water hose
9. Intake manifold
10. Intake manifold gasket



NOTE

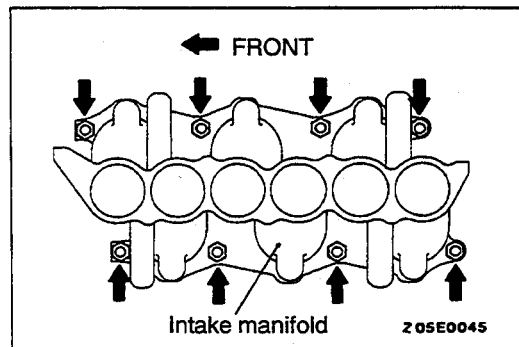
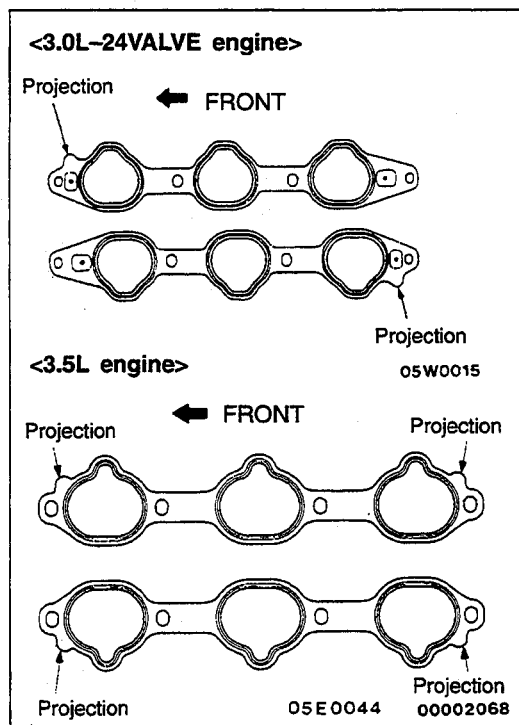
- *1: For black cone disc springs
- *2: For green cone disc springs

TSB Revision

INSPECTION

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

- (1) Damage or cracking of any part.
- (2) Clogging of the negative pressure (vacuum) outlet port, or clogging of the water or gas passages.



INSTALLATION SERVICE POINTS

▶A◀ INTAKE MANIFOLD GASKET INSTALLATION

Install the gaskets so that the projections face in the directions shown in the illustration.

▶B◀ INTAKE MANIFOLD INSTALLATION

Tighten the intake manifold mounting nuts one bank after the other by the following procedure.

<For green cone disc springs>

- (1) Tighten the nuts in the right bank to 7 Nm (5 ft.lbs.).
- (2) Tighten the nuts in the left bank to 20 to 23 Nm (14 to 17 ft.lbs.).
- (3) Tighten the nuts in the right bank to 20 to 23 Nm (14 to 17 ft.lbs.).
- (4) Repeat steps (2) and (3) one more time respectively.

<For black cone disc springs>

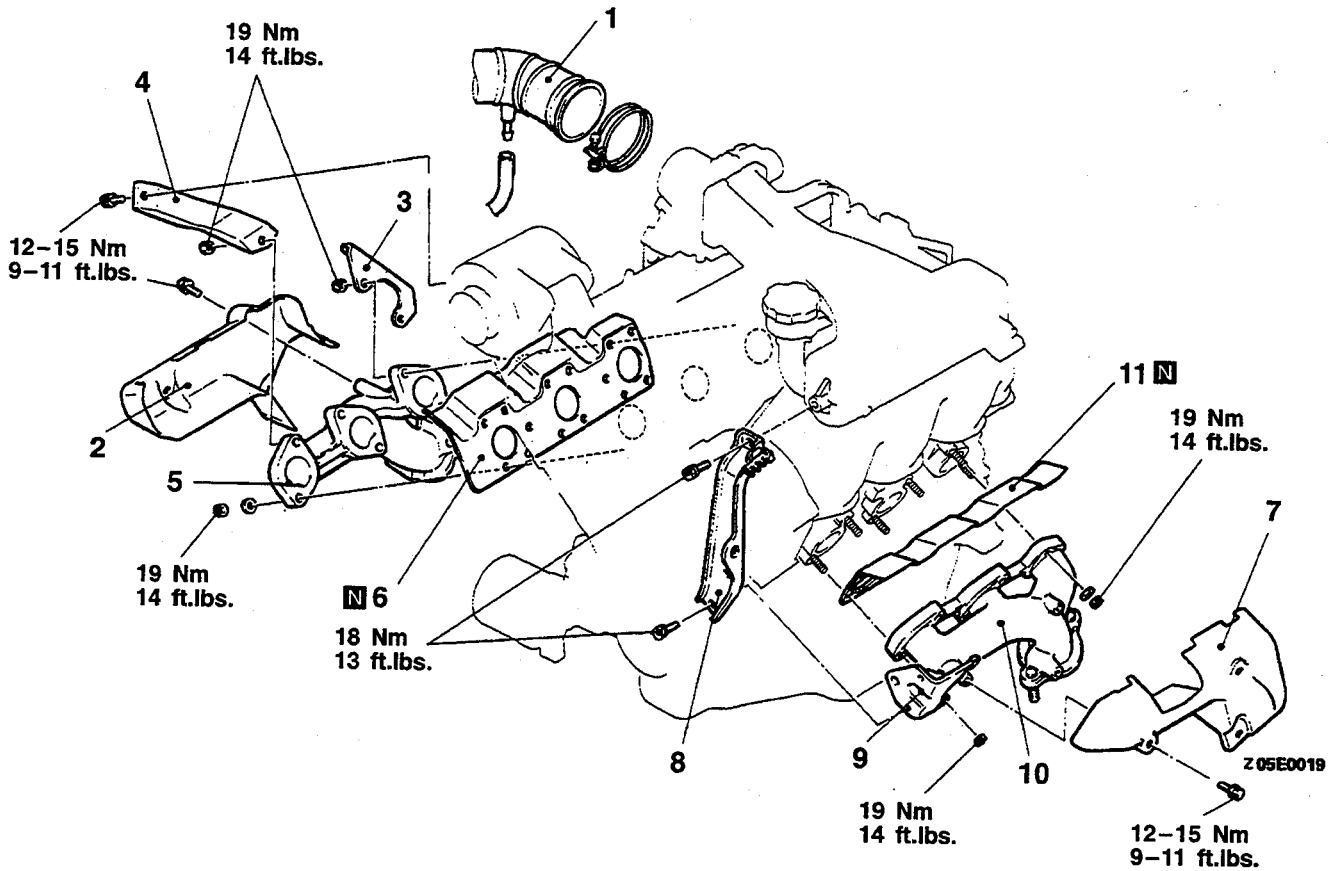
- (1) Tighten the nuts in the right bank to 3 to 5 Nm (2.2 to 5 ft.lbs.).
- (2) Tighten the nuts in the left bank to 12 to 15 Nm (9 to 11 ft.lbs.).
- (3) Tighten the nuts in the right bank to 12 to 15 Nm (9 to 11 ft.lbs.).
- (4) Repeat steps (2) and (3) one more time respectively.

EXHAUST MANIFOLD <3.0L-12VALVE engine>

110005583

REMOVAL AND INSTALLATION

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



Removal steps of exhaust manifold (Right)

1. Air duct
2. Heat protector
3. Engine hanger
4. Generator stay
5. Exhaust manifold
6. Exhaust manifold gasket

Removal steps of exhaust manifold (Left)

7. Heat protector
8. Air intake plenum stay (front)
9. Bracket
10. Exhaust manifold
11. Exhaust manifold gasket

INSPECTION

EXHAUST MANIFOLD

- Damage or cracking of any part.

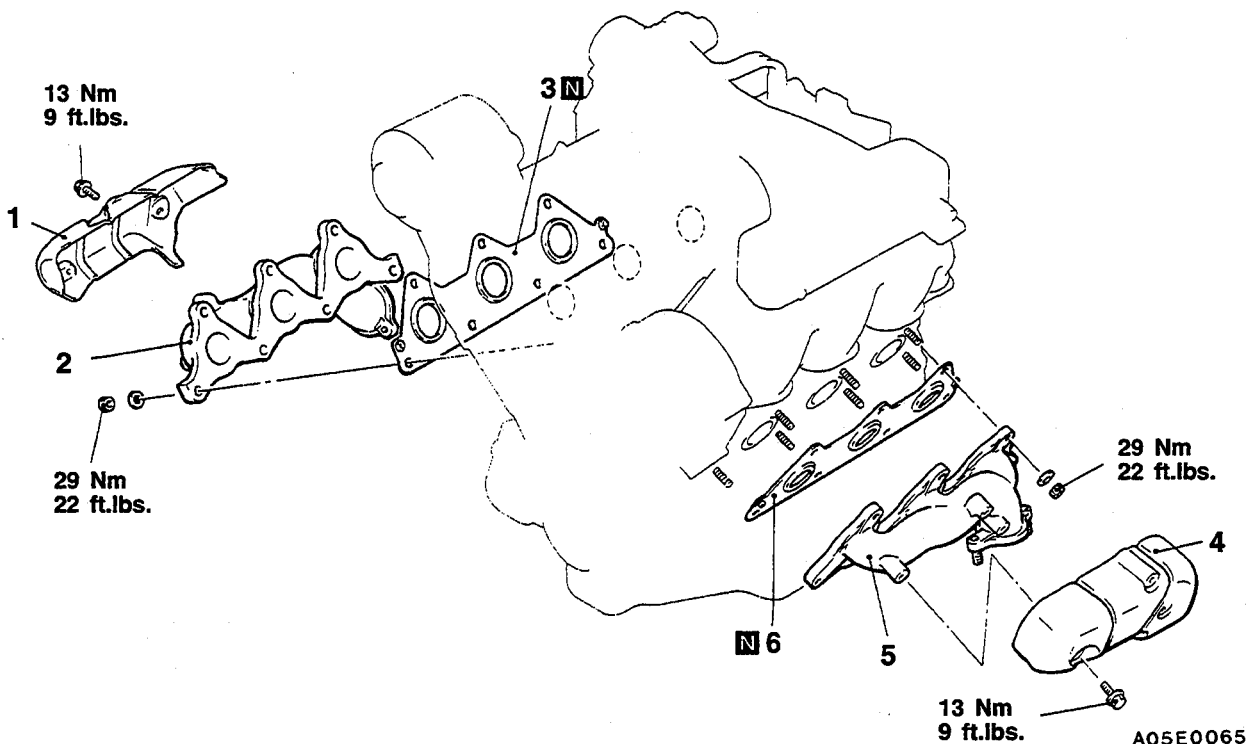
EXHAUST MANIFOLD <3.0L-24VALVE engine>

110005584

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Front Exhaust Pipe <FEDERAL> or Warm up Three-way Catalytic Converter <CALIFORNIA> Removal and Installation (Refer to P.15-10, 11.)



Removal steps of exhaust manifold (Right)

- Air duct and air cleaner cover
- 1. Heat protector (R.H.)
- 2. Exhaust manifold (R.H.)
- 3. Gasket

Removal steps of exhaust manifold (Left)

- Battery and battery tray
- 4. Heat protector (L.H.)
- 5. Exhaust manifold (L.H.)
- 6. Gasket

INSPECTION

EXHAUST MANIFOLD

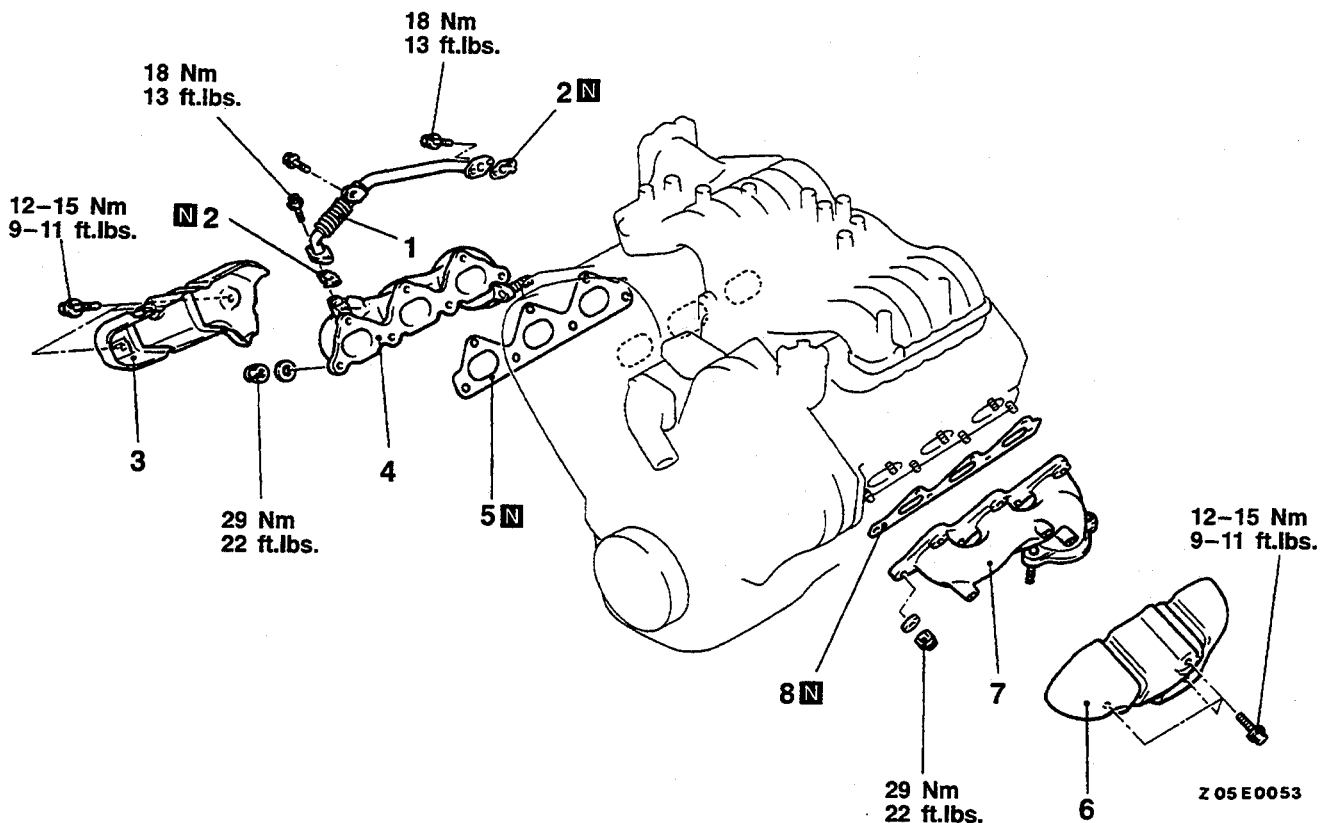
- Damage or cracking of any part.

EXHAUST MANIFOLD <3.5L engine>

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Front Exhaust Pipe Removal and Installation (Refer to P.15-12.)



Removal steps of exhaust manifold (Right)

- Air duct and air cleaner cover
- 1. EGR pipe
- 2. Gasket
- 3. Heat protector (R.H.)
- 4. Exhaust manifold (R.H.)
- 5. Gasket

Removal steps of exhaust manifold (Left)

- Battery and battery tray
- 6. Heat protector (L.H.)
- 7. Exhaust manifold (L.H.)
- 8. Gasket

INSPECTION

EXHAUST MANIFOLD

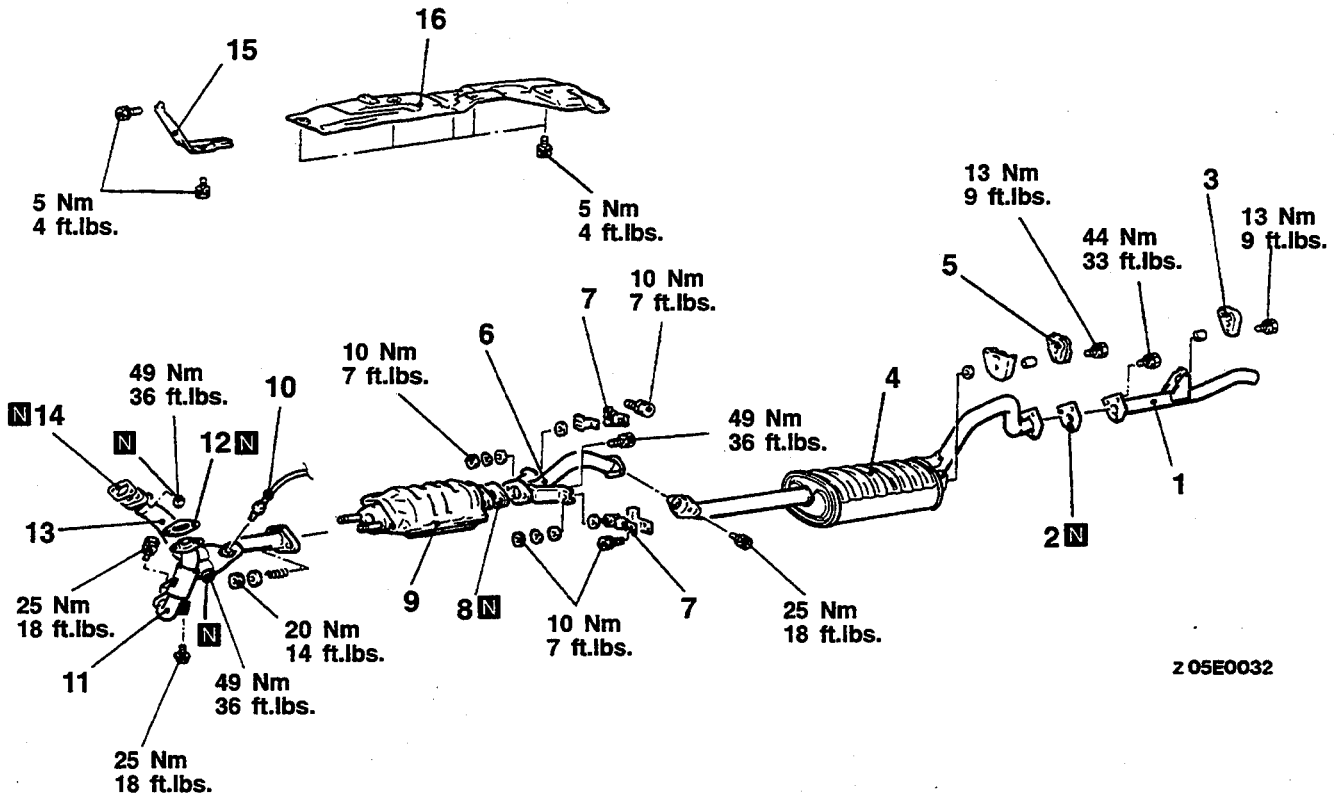
- Damage or cracking of any part.

EXHAUST PIPE, MUFFLER AND CATALYTIC CONVERTER <3.0L-12VALVE engine, 3.0L-24VALVE engine For Federal>

110005586

REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operation**
- Under Cover Removal and Installation



Z 05E0032

Removal steps

1. Tail pipe
2. Gasket
3. Hanger
4. Main muffler
5. Hanger
6. Center exhaust pipe
7. Suspender
8. Gasket
9. Catalytic converter
10. Heated oxygen sensor
11. Front exhaust pipe (L.H.)
12. Gasket
13. Front exhaust pipe (R.H.)
14. Gasket
15. Heat protector
16. Front panel heat protector

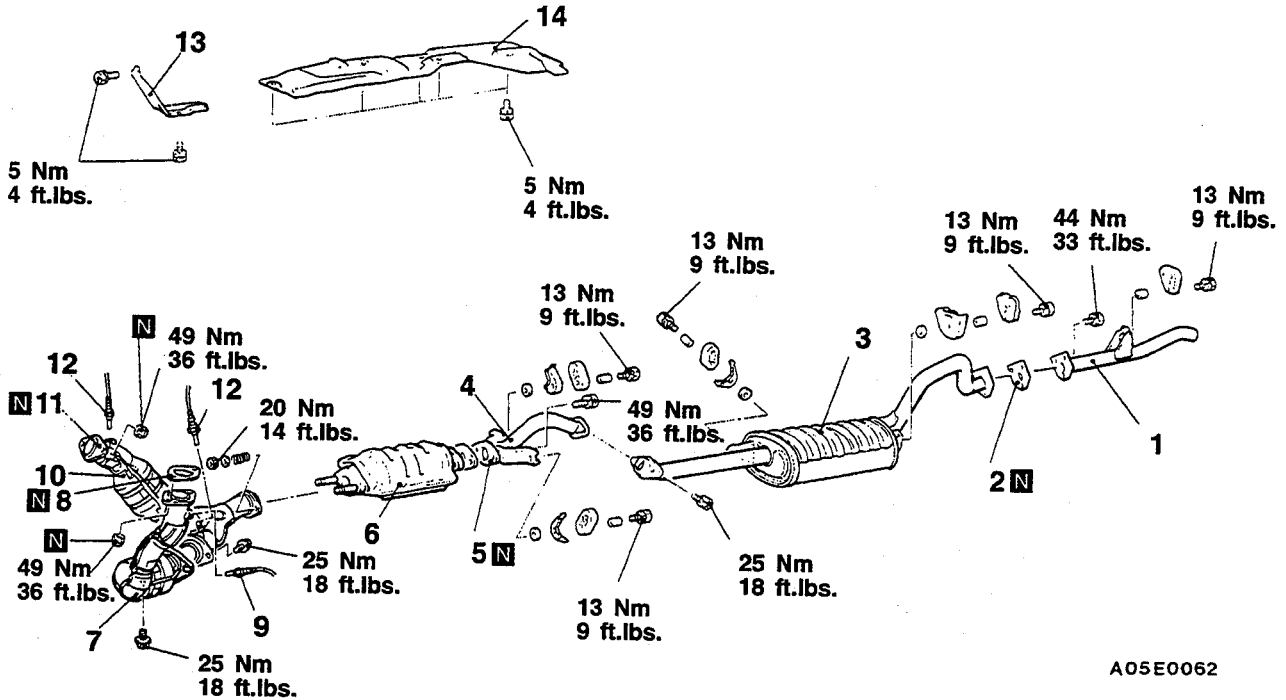
INSPECTION

- Check the mufflers and pipes for corrosion or damage.
- Check the rubber hangers and rubber suspenders for deterioration or damage.
- Check for gas leakage from the mufflers and pipes.

EXHAUST PIPE, MUFFLER AND CATALYTIC CONVERTER <3.0L-24VALVE engine For CALIFORNIA>

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
 • Under Cover Removal and Installation



A05E0062

Removal steps

- | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Tail pipe 2. Gasket 3. Main muffler 4. Center exhaust pipe 5. Gasket 6. Catalytic converter 7. Left bank warm up three-way catalytic converter | <ol style="list-style-type: none"> 8. Gasket 9. Heated oxygen sensor 10. Right bank warm up three-way catalytic converter 11. Gasket 12. Heated oxygen sensor 13. Heat protector 14. Front panel heat protector |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

INSPECTION

- Check the mufflers and pipes for corrosion or damage.
- Check the rubber hangers and rubber suspenders for deterioration or damage.
- Check for gas leakage from mufflers and pipes.

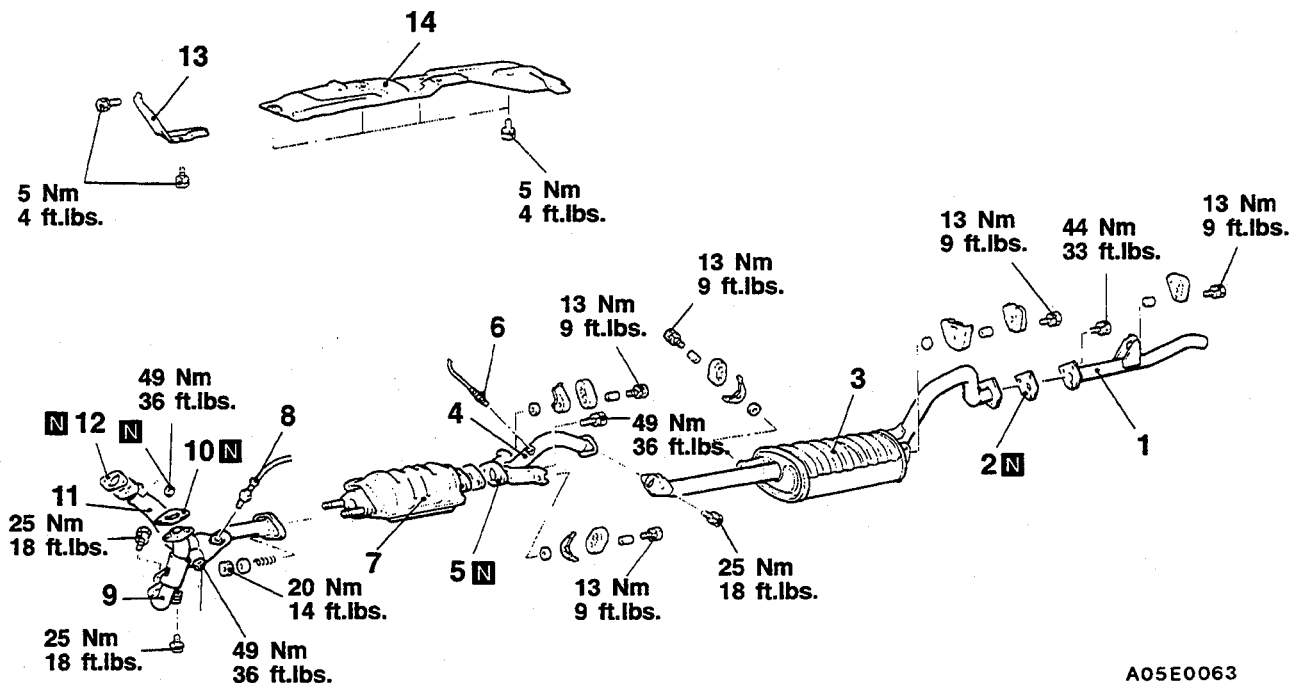
TSB Revision

EXHAUST PIPE, MUFFLER AND CATALYTIC CONVERTER <3.5L engine>

110005588

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
 • Under Cover Removal and Installation



A05E0063

Removal steps

- | | |
|-------------------------------------------------------------------|--------------------------------|
| 1. Tail pipe | 7. Catalytic converter |
| 2. Gasket | 8. Heated oxygen sensor |
| 3. Main muffler | 9. Front exhaust pipe (L.H.) |
| 4. Center exhaust pipe | 10. Gasket |
| 5. Gasket | 11. Front exhaust pipe (R.H.) |
| 6. Heated oxygen sensor
<For CALIFORNIA 1995 models and after> | 12. Gasket |
| | 13. Heat protector |
| | 14. Front panel heat protector |

INSPECTION

- Check the mufflers and pipes for corrosion or damage.
- Check the rubber hangers and rubber suspenders for deterioration or damage.
- Check for gas leakage from mufflers and pipes.

EMISSION CONTROL

CONTENTS

1100005844

EMISSION CONTROL	2	TROUBLESHOOTING	3
EVAPORATIVE EMISSION CONTROL SYSTEM	15	VACUUM HOSES	3
EXHAUST EMISSION CONTROL SYSTEM	27	Vacuum Hoses Routing	3
EXHAUST GAS RECIRCULATION (EGR) SYSTEM <DOHC>	23	Vacuum Circuit Diagram	6
POSITIVE CRANKCASE VENTILATION SYSTEM	12		
SPECIFICATIONS	2		
General Specifications	2		
Service Specifications	2		

EMISSION CONTROL**SPECIFICATIONS****GENERAL SPECIFICATIONS**

110005845

Positive crankcase ventilation system		Closed type with positive crankcase ventilation valve
Evaporative emission control system (Evaporative emission canister storage type)	Evaporative emission canister	Charcoal type
	Evaporative emission purge solenoid	ON/OFF solenoid valve <Federal, California – Up to 1994 model> Duty cycle solenoid valve <California – From 1995 model>
Exhaust gas recirculation system <DOHC>	EGR valve	Vacuum-activated diaphragm type
	EGR temperature sensor	Thermistor type
	EGR solenoid	Duty cycle solenoid valve
Three-way catalytic converter		Monolith type

SERVICE SPECIFICATIONS

Items		Specifications
Evaporative emission purge solenoid coil resistance	Ω	36–44 [at 20°C (68°F)]
EGR temperature sensor resistance <DOHC>	$k\Omega$	60–83 [at 50°C (122°F)] 11–14 [at 100°C (212°F)]
EGR solenoid coil resistance <DOHC>	Ω	36–44 [at 20°C (68°F)]

TROUBLESHOOTING

110005846

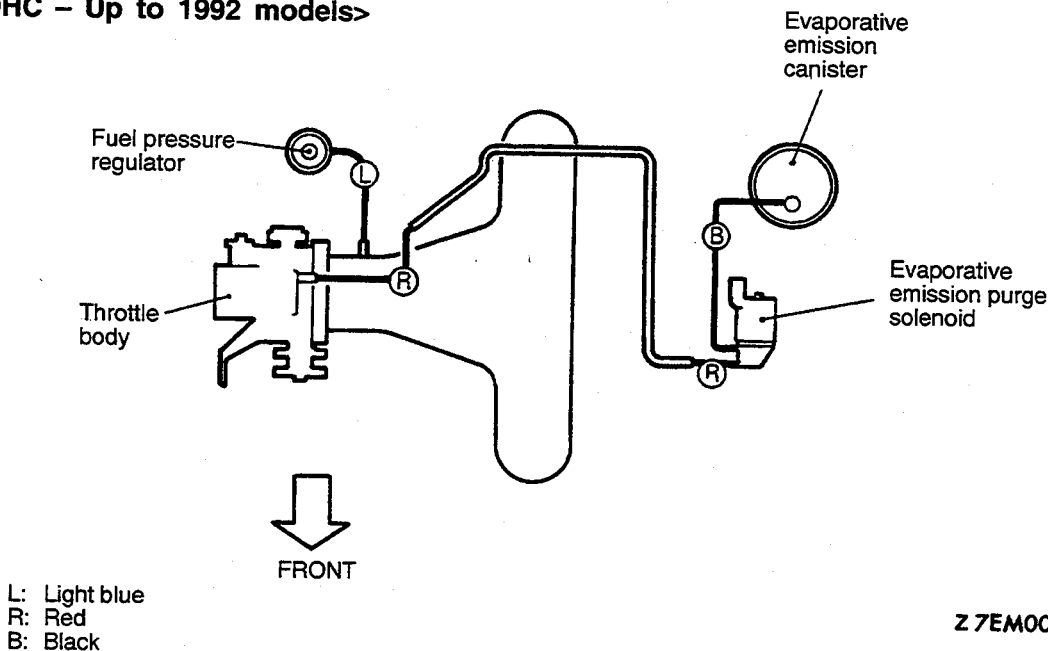
Trouble Symptom	Probable Cause	Remedy
Engine will not start or is hard to start	Disconnected or damaged vacuum hoses	Repair or replace
	The EGR valve is not closed.	Repair or replace
	Malfunction of evaporative emission purge solenoid	Repair or replace
Rough idle or engine stalls	Disconnected or damaged vacuum hoses	Repair or replace
	The EGR valve is not closed.	Repair or replace
	Malfunction of positive crankcase ventilation system	Replace
	Malfunction of purge control system	Check the system. If there is a problem, check its component parts.
Excessive oil consumption	Clogged positive crankcase ventilation line	Check the positive crankcase ventilation system
Engine hesitates or poor acceleration	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts.
Poor fuel mileage	Malfunction of the exhaust gas recirculation system	Check the system; if there is a problem, check its component parts.

VACUUM HOSES

110005847

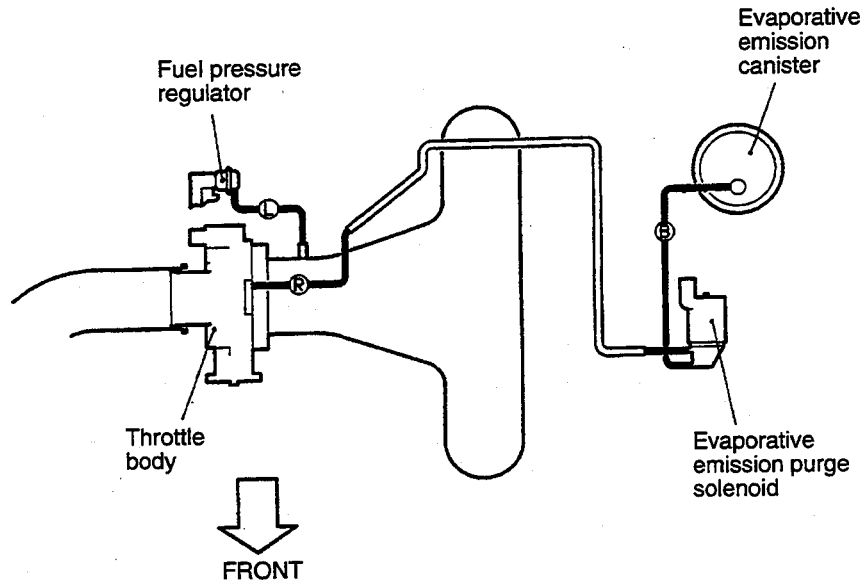
VACUUM HOSE ROUTING

<SOHC – Up to 1992 models>



Z7EM0088

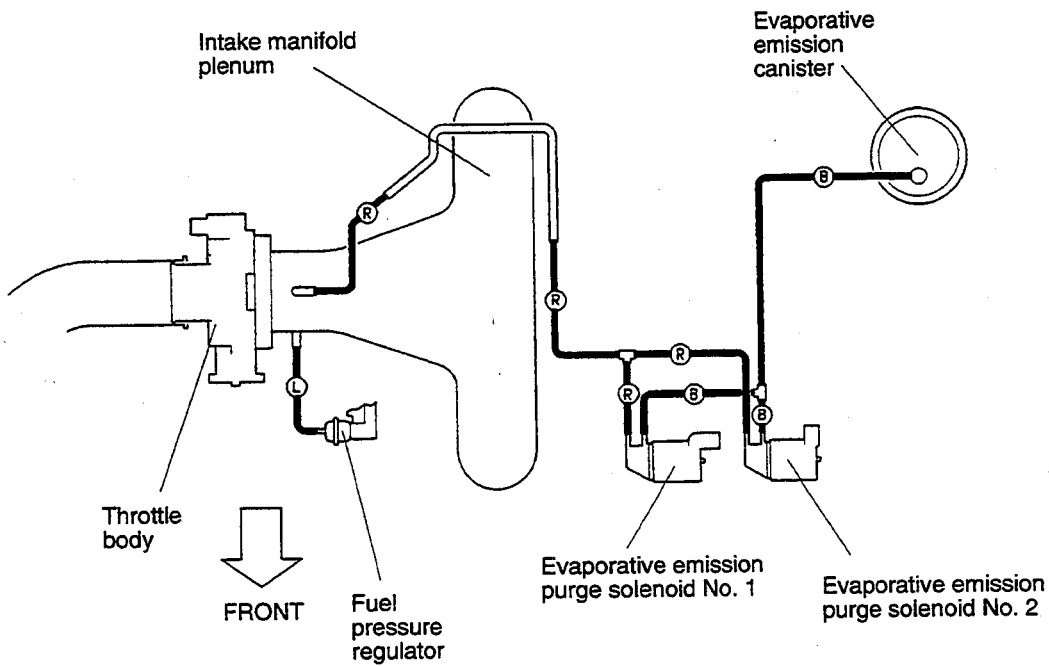
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B: Black
L: Light blue
R: Red

Z7EM0300

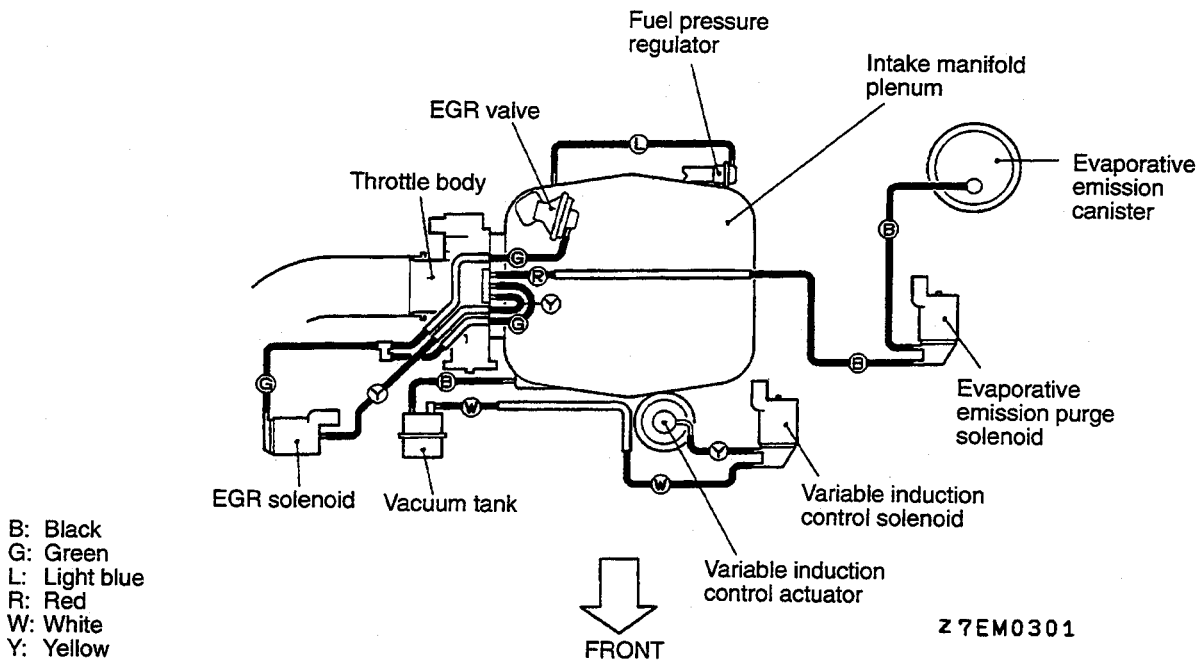
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B: Black
L: Light blue
R: Red

7EM0329

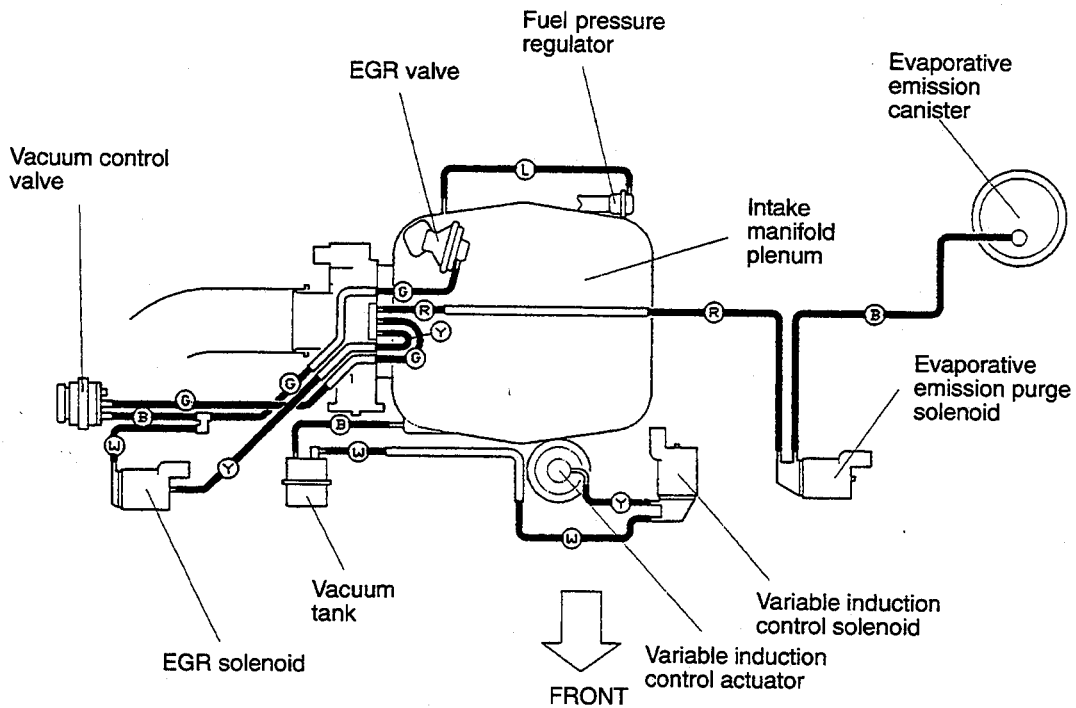
<DOHC (Federal, California – 1994 models)>



- B: Black
- G: Green
- L: Light blue
- R: Red
- W: White
- Y: Yellow

Z7EM0301

<DOHC – California – From 1995 models>

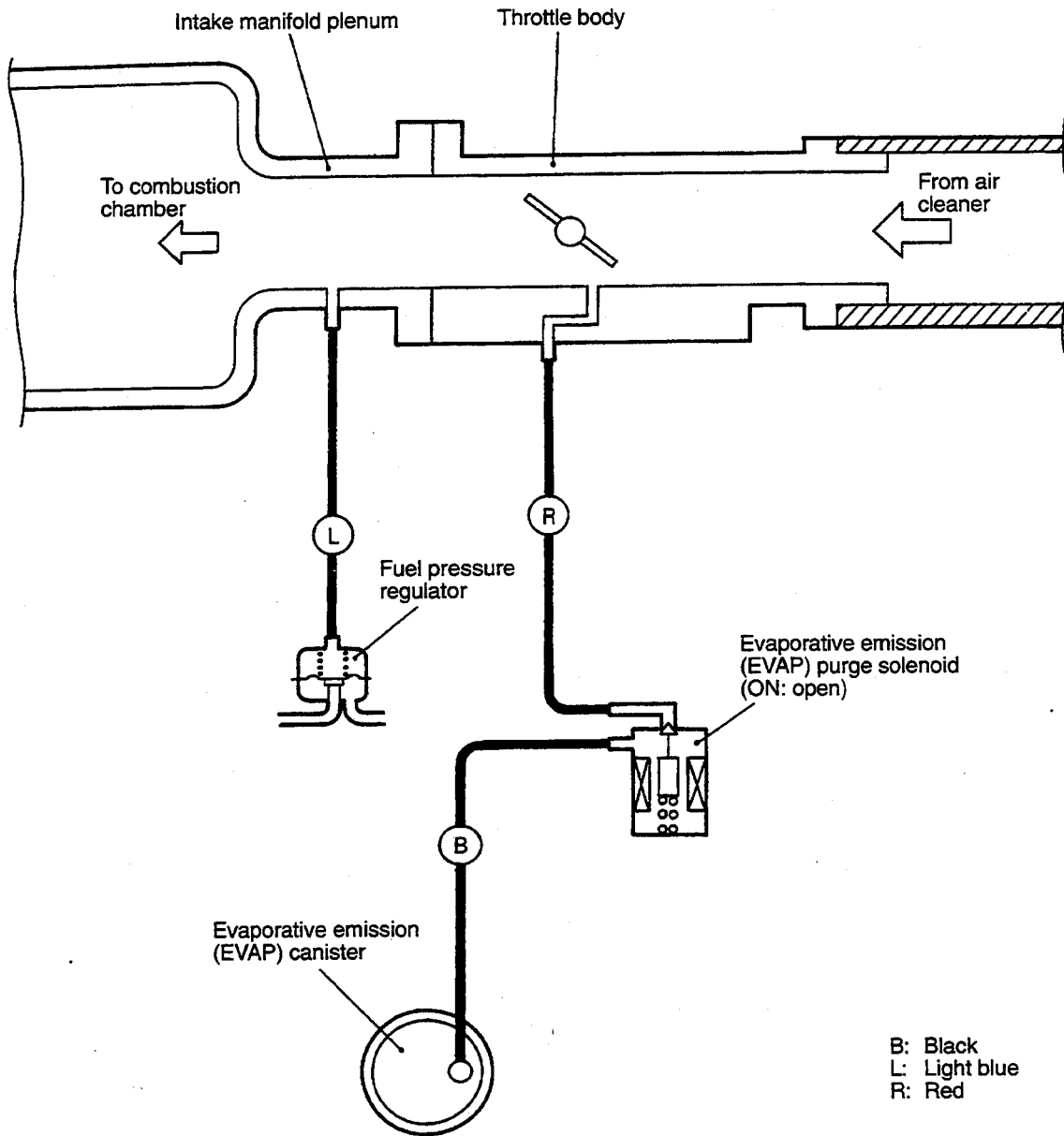


7EM0330

VACUUM CIRCUIT DIAGRAM

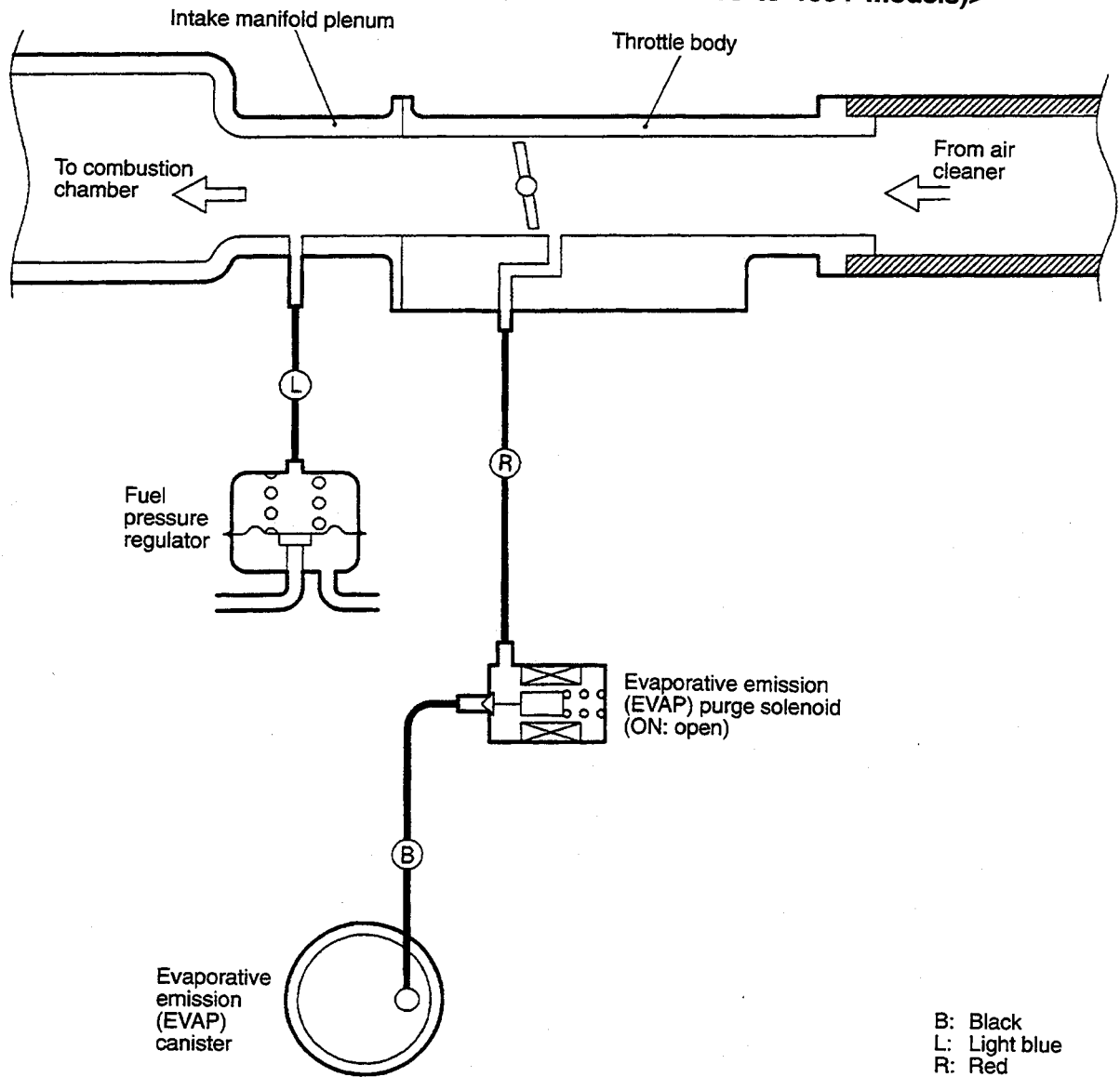
110005848

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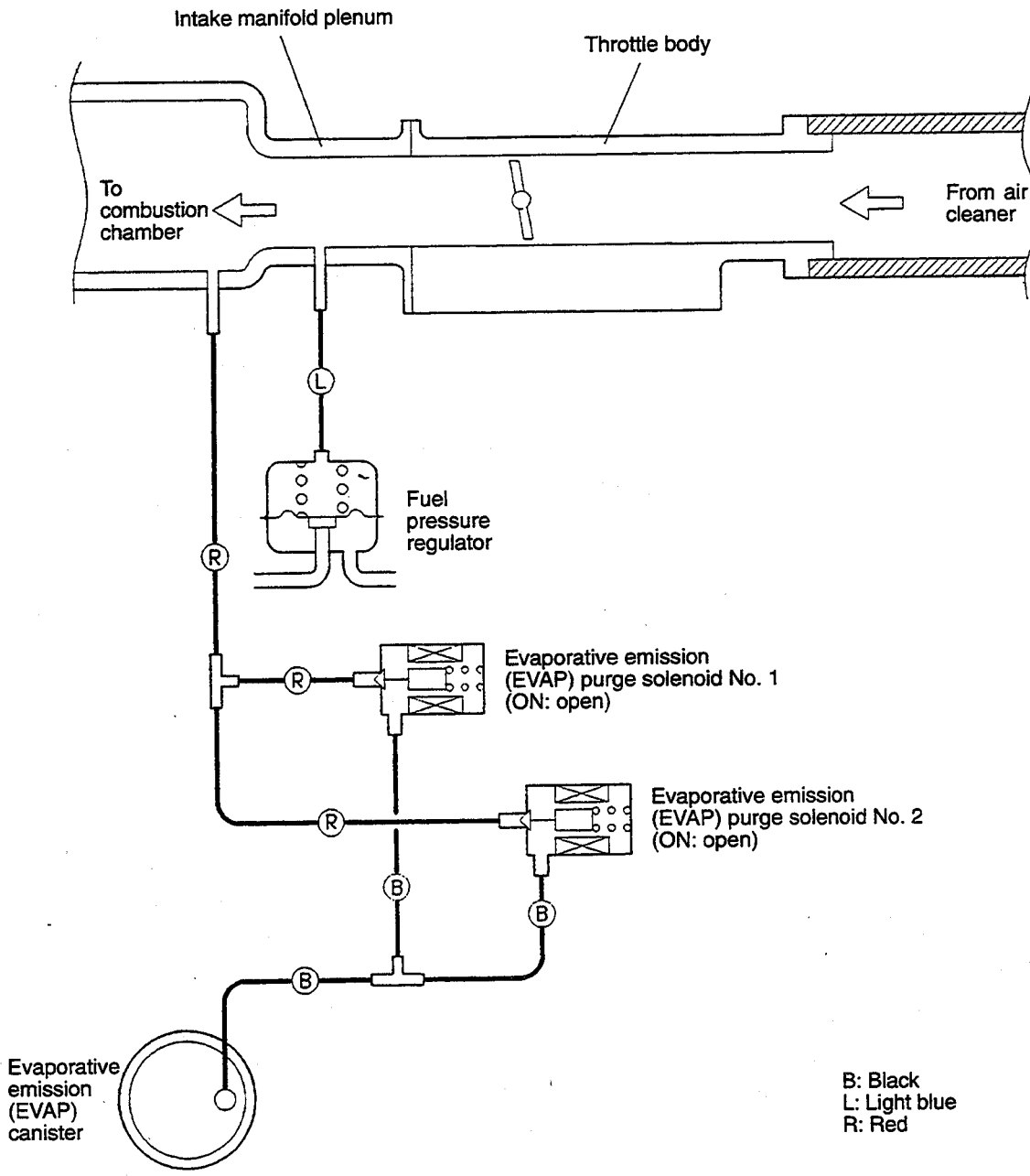
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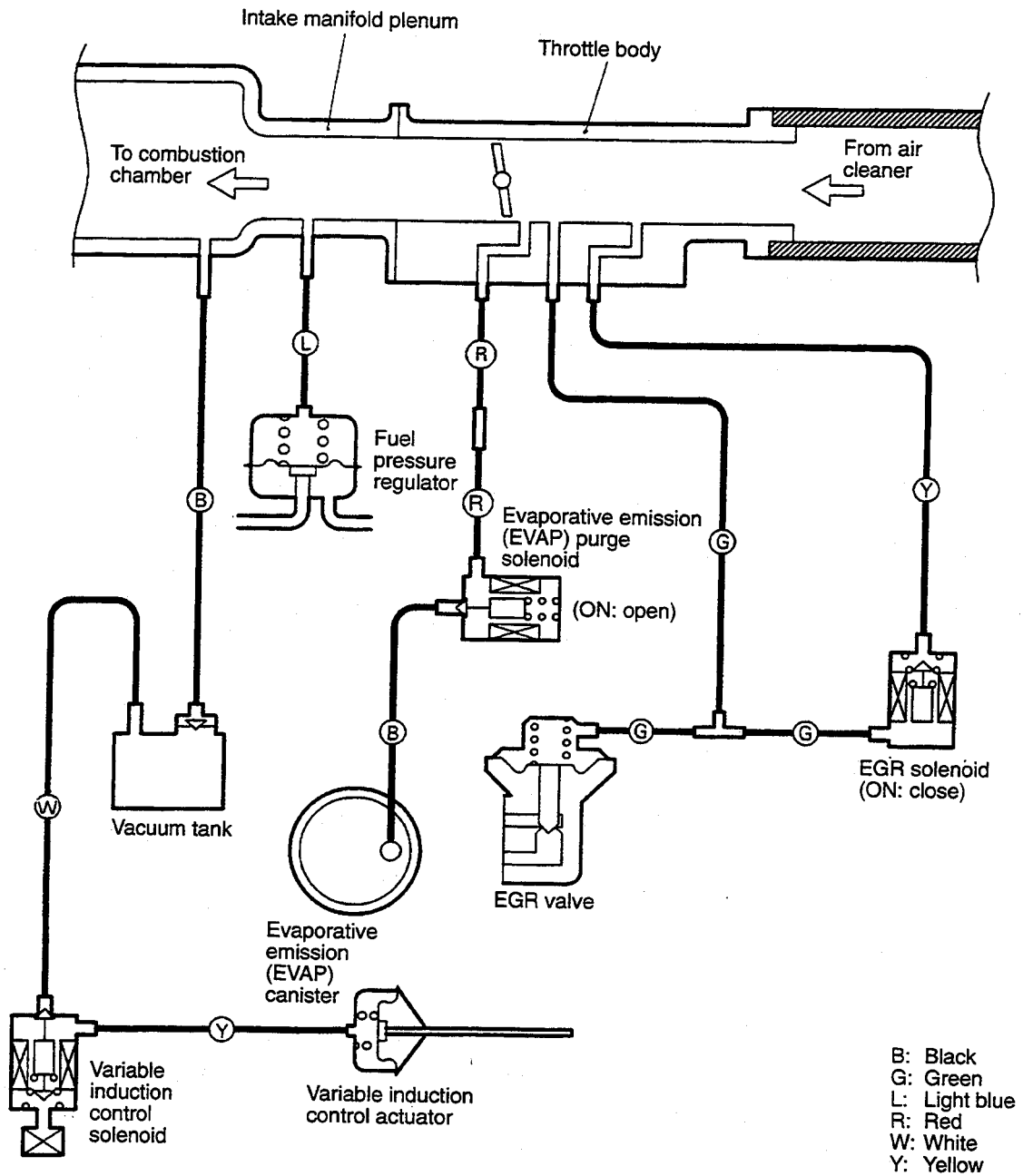
Z7EM0287

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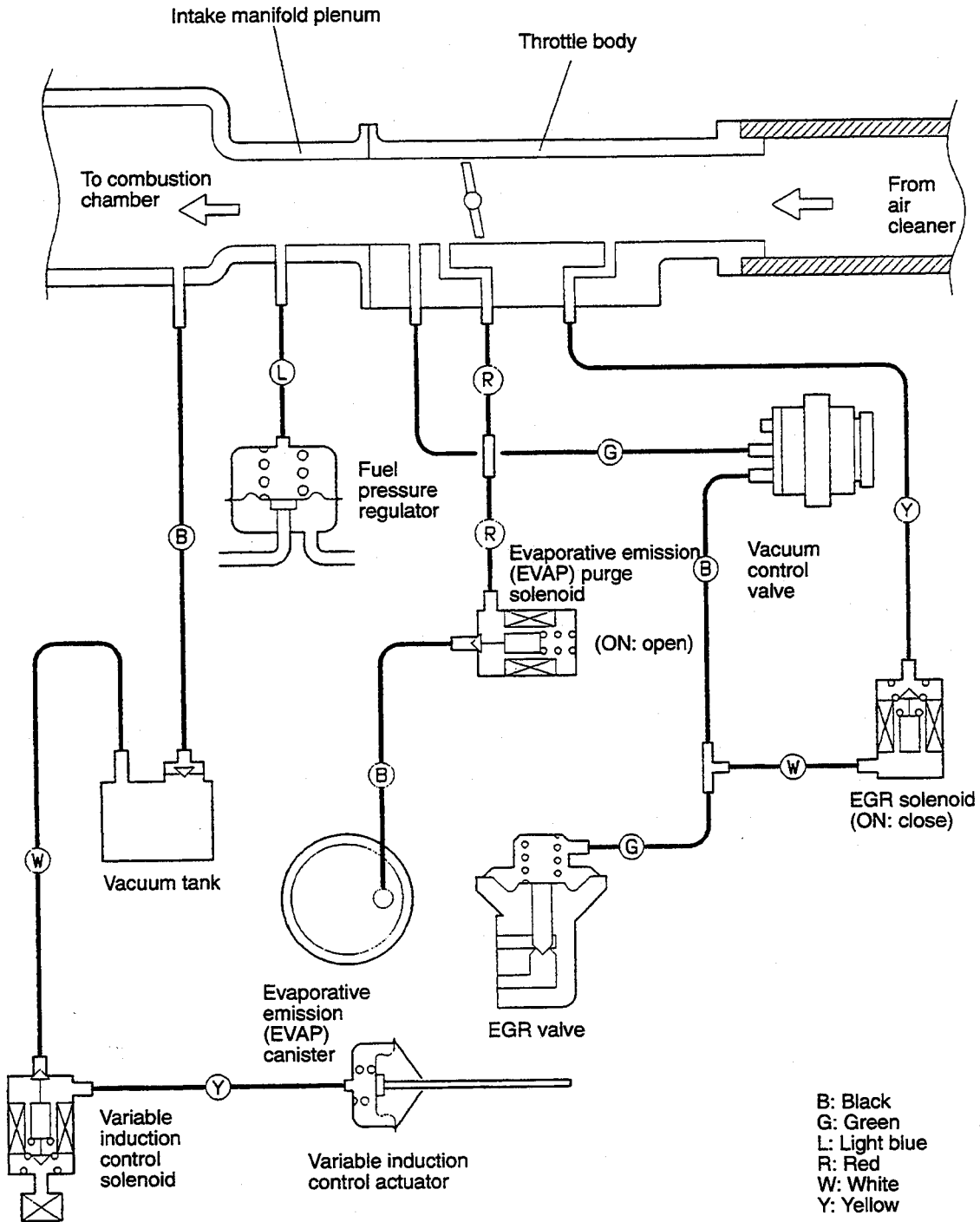
7EM0331

<DOHC (Federal, California – 1994 model)>



Z7EM0302

<DOHC - California From 1995 models>



7EM0332

INSPECTION

110005849

- (1) Referring to the VACUUM HOSES ROUTING, confirm that the vacuum hoses are properly connected.
- (2) Check the hoses for irregularities (disconnection, looseness, etc.) and confirm that there is no breakage or damage.

INSTALLATION

110005850

- (1) When connecting a hose, firmly press it onto the nipple.
- (2) Referring to the VACUUM HOSES ROUTING, connect the hoses correctly.

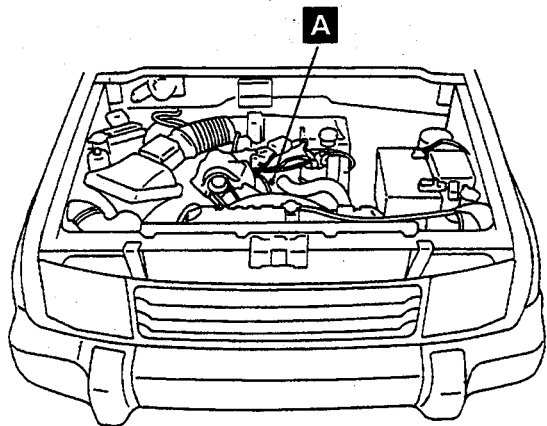
POSITIVE CRANKCASE VENTILATION SYSTEM

COMPONENT LOCATION

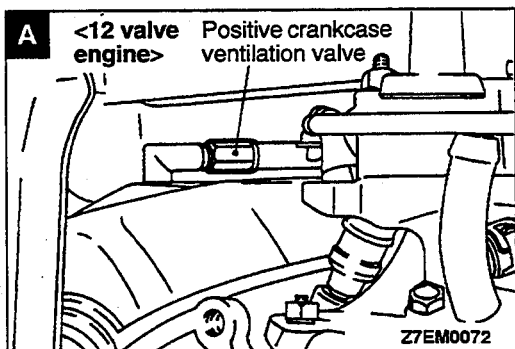
110005851

<SOHC>

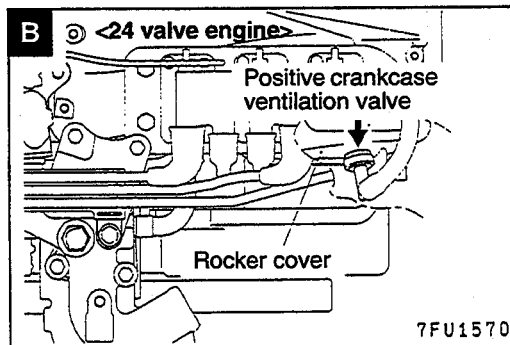
Name	Symbol
Positive crankcase ventilation valve	A



Z 16E0128

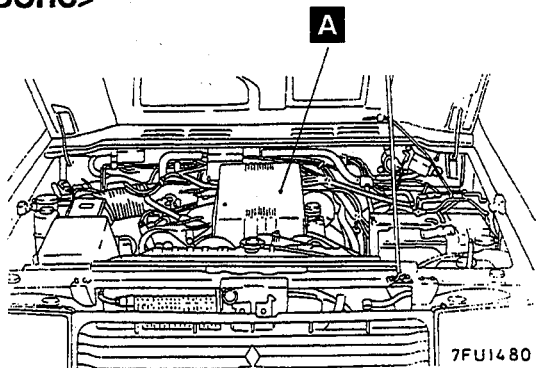


Z7EM0072

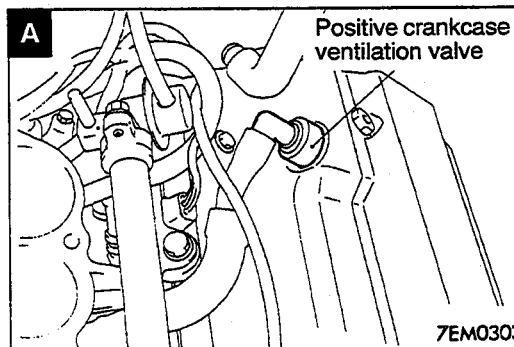


7FU1570

<DOHC>

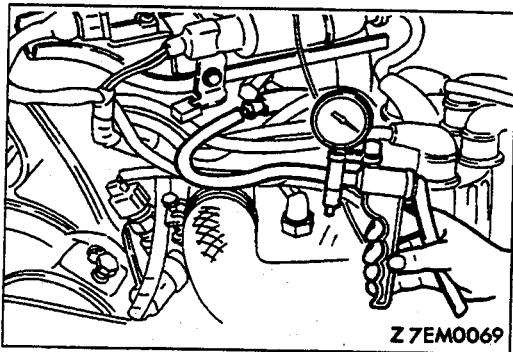


7FU1480



7EM0303

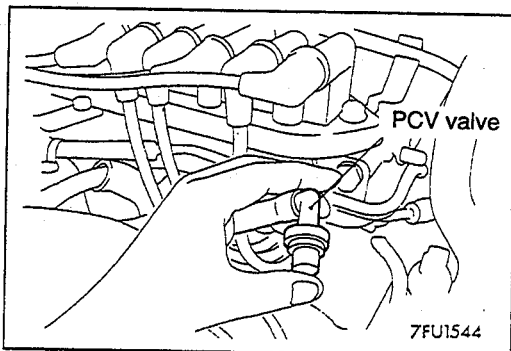
7EM0341

**CRANKCASE VENTILATION SYSTEM**

110005852

INSPECTION <SOHC – 12 valve engine only>

- (1) Disconnect the ventilation hose from the intake manifold plenum, and connect a hand vacuum pump to the ventilation hose.
- (2) At this time, check that there is leakage when negative pressure is applied. If there is no leakage when negative pressure is applied, either clean the positive crankcase ventilation valve or replace it.

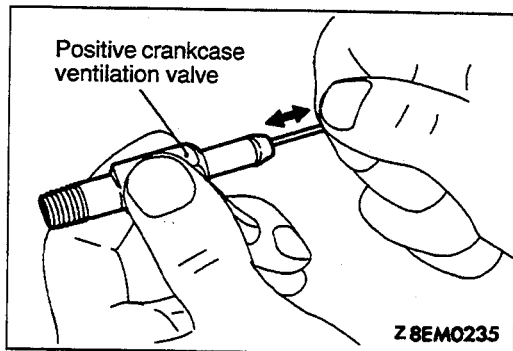
**INSPECTION <SOHC – 24 valve engine>**

- (1) Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve.
- (2) Remove the PCV valve from the rocker cover.
- (3) Reconnect the ventilation hose to the PCV valve.
- (5) Place a finger against the opening of the PCV valve and check that you can feel the negative pressure from the intake manifold.
- (5) Place a finger against the opening of the PCV valve and check that you can feel the negative pressure from the intake manifold.

NOTE

The plunger inside the PCV valve will move back and forth at this time.

- (6) If negative pressure cannot be felt, clean or replace the PCV valve.

**POSITIVE CRANKCASE VENTILATION VALVE**

110005853

INSPECTION <SOHC – 12 valve engine>

- (1) Remove the positive crankcase ventilation valve.
- (2) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.
- (3) If the plunger does not move, the positive crankcase ventilation valve is clogged. Clean it or replace.

REMOVAL

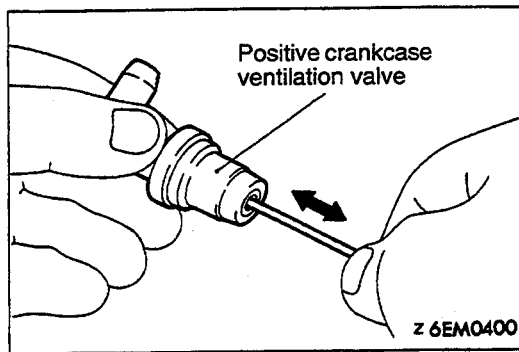
- (1) Remove the intake manifold plenum.
- (2) Remove the positive crankcase ventilation valve.

INSTALLATION

- (1) Install the positive crankcase ventilation valve and tighten it to the specified torque.

Specified tightening torque: 10 Nm (7.2 ft.lbs.)

- (2) Install the intake manifold plenum.



POSITIVE CRANKCASE VENTILATION VALVE

110005854

INSPECTION <DOHC, SOHC – 24 valve engine>

- (1) Remove the intake manifold plenum.
- (2) Remove the positive crankcase ventilation valve from the rocker cover.
- (3) Insert a thin stick into the positive crankcase ventilation valve from the threaded side to check that the plunger moves.
- (4) If the plunger does not move, the positive crankcase ventilation valve is clogged. Clean it or replace.

REMOVAL

- (1) Remove the intake manifold plenum.
- (2) Remove the positive crankcase ventilation valve.

INSTALLATION

- (1) Install the positive crankcase ventilation valve and tighten to specified torque.

Specified tightening torque: 10 Nm (7.2 ft.lbs.)

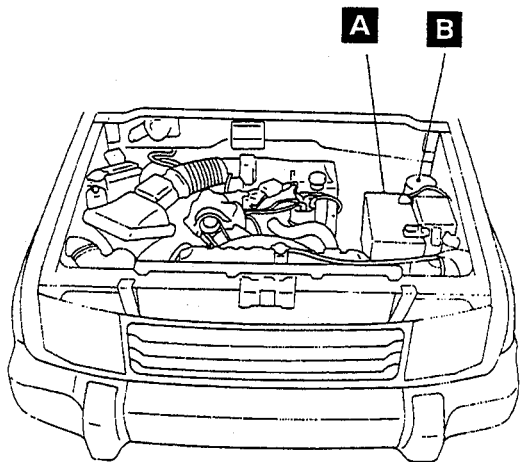
- (2) Install the intake manifold plenum.

EVAPORATIVE EMISSION CONTROL SYSTEM

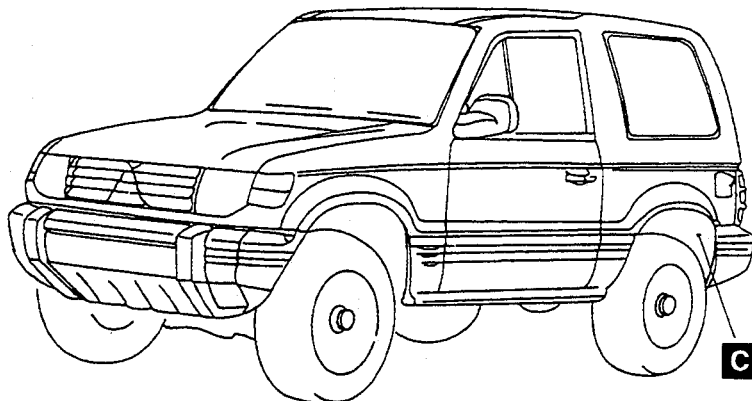
110005855

COMPONENT LOCATION

<SOHC>



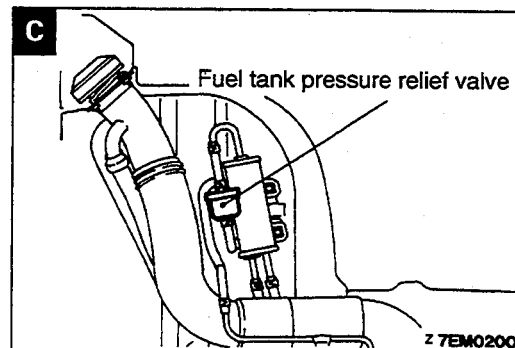
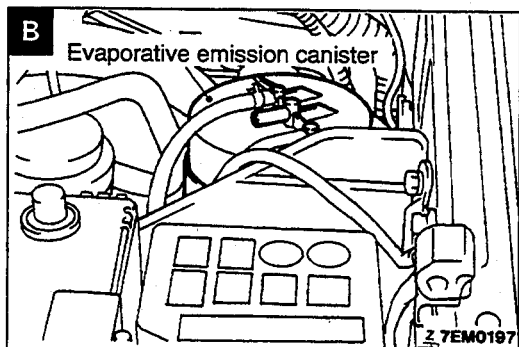
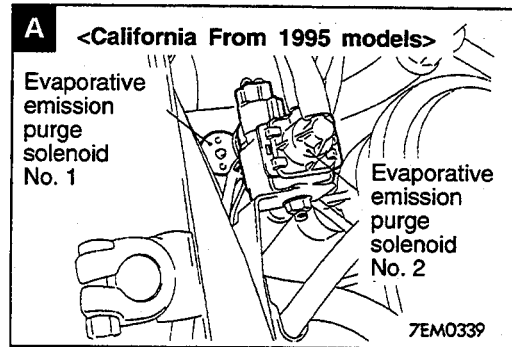
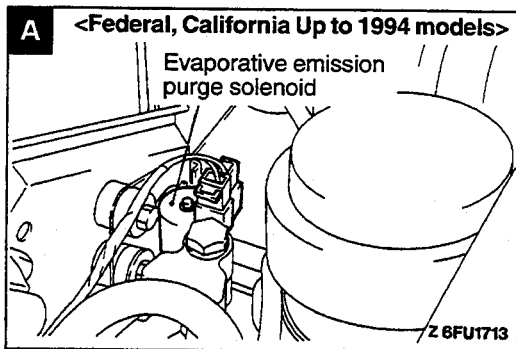
16E0128



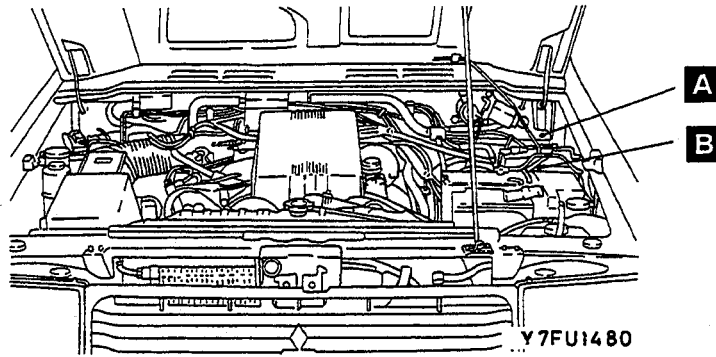
7EM0196

7EM0342

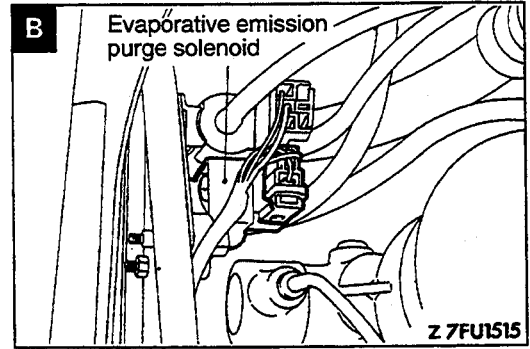
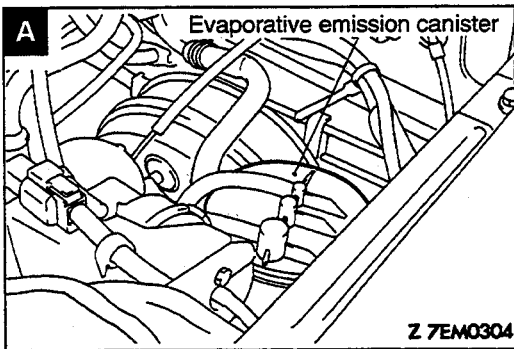
Name	Symbol	Name	Symbol
Evaporative emission canister	B	Fuel tank pressure relief valve	C
Evaporative emission purge solenoid	A		



<DOHC>



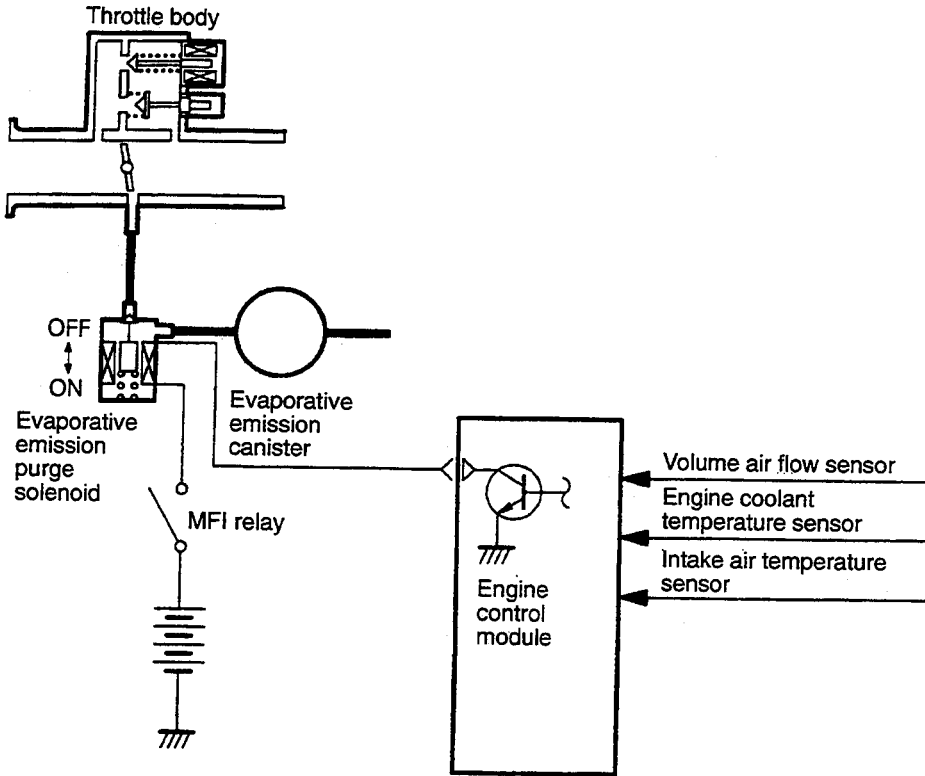
Name	Symbol
Evaporative emission canister	A
Evaporative emission purge solenoid	B



PURGE CONTROL SYSTEM

<SOHC – Up to 1992 models>

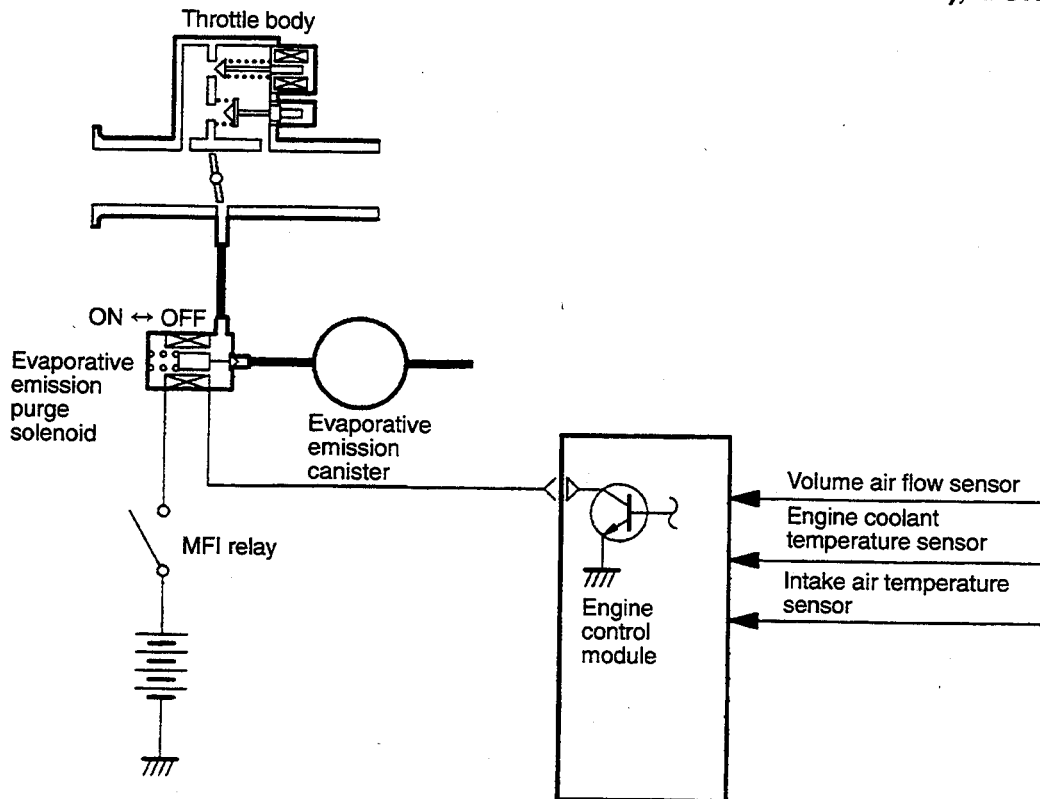
110005856



Z7EM0289

<SOHC – (Federal From 1993 models, California 1993 to 1994 models), DOHC>

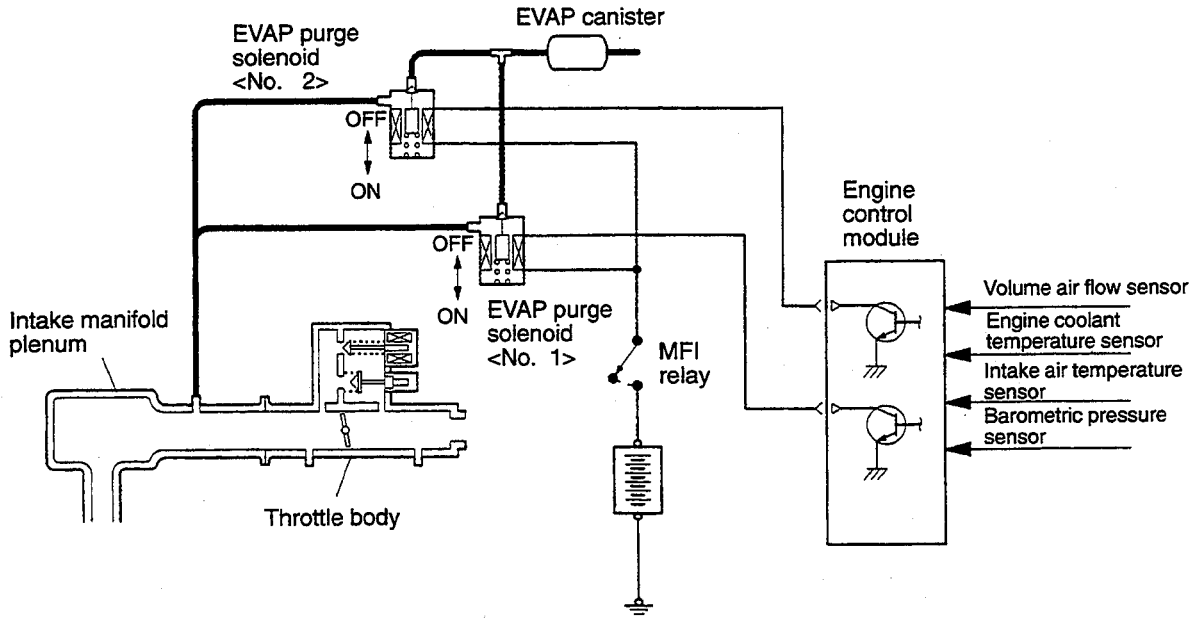
110005856



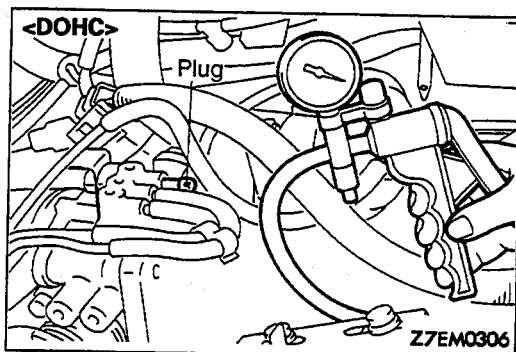
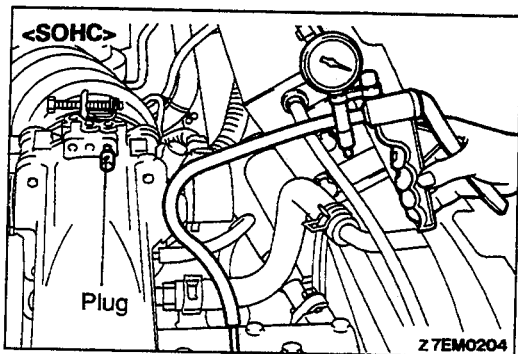
Z7EM0290

TSB Revision

<SOHC – California – 1995 models>



A6EM0468



INSPECTION <DOHC, SOHC (Federal, California Up to 1994 models)>

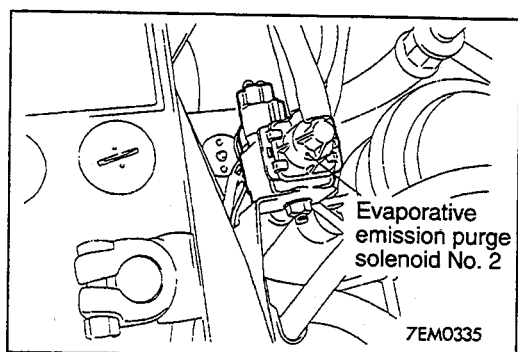
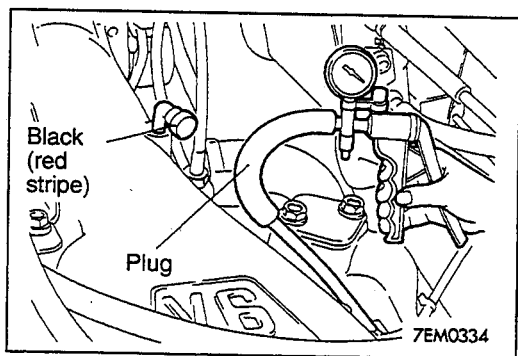
- (1) Disconnect the vacuum hose (red stripe) from the throttle body, and connect a hand vacuum pump to the vacuum hose.
- (2) Plug the nipple from which the vacuum hose was disconnected.
- (3) Under the engine conditions described below, provide a vacuum by using the hand vacuum pump, and then check.

When engine is cold—Coolant temperature: 40°C (104°F) or less

Engine operating condition	Applying negative pressure	Result
Idling	375 mmHg (14 in.Hg)	Vacuum is maintained
3,000 rpm		

When engine is warm—Coolant temperature: 80°C (176°F) or higher

Engine operating condition	Applying negative pressure	Result
Idling	375 mmHg (14 in.Hg)	Vacuum is maintained
Within 3 minutes after engine starts 3,000 rpm	Try applying vacuum	Vacuum leaks
After 3 minutes have passed after engine start 3,000 rpm	375 mmHg (14 in.Hg)	Vacuum will be maintained momentarily, after which it will leak.



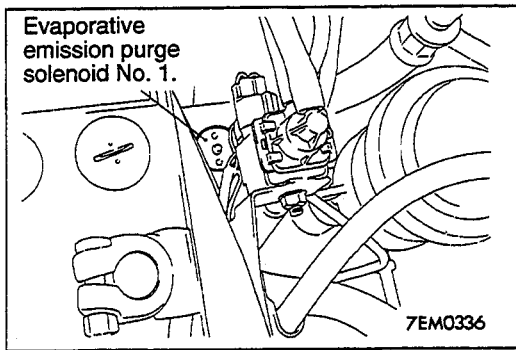
INSPECTION <SOHC – California – From 1995 models>

1. After the engine has warmed up, stop the engine.
2. Disconnect the vacuum hose (red stripes) from the intake air plenum and connect it to a hand vacuum pump.
3. Plug the nipple from which the vacuum hose was removed.

4. Disconnect the connector from evaporative emission purge solenoid No. 2.
5. Apply negative pressure and check the negative pressure condition.

Vacuum	Engine status	Normal condition
400 mmHg (15.7 in.Hg)	Idling	Negative pressure leaks (after a few seconds have passed since the engine was started)

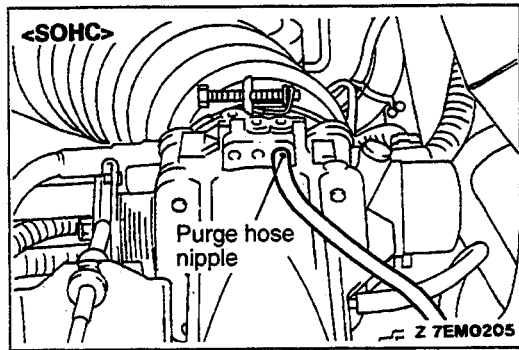
6. Connect the connector to evaporative emission purge solenoid No. 2.



7. Disconnect the connector from evaporative emission purge solenoid No. 1
8. Apply negative pressure and check the negative pressure condition.

Vacuum	Engine status	Normal condition
400 mmHg (15.7 in.Hg)	Idling	Negative pressure is maintained
	3500 rpm	Negative pressure leaks (after a few seconds have passed since the engine was started)

9. Connect the connector to evaporative emission purge solenoid No. 1.



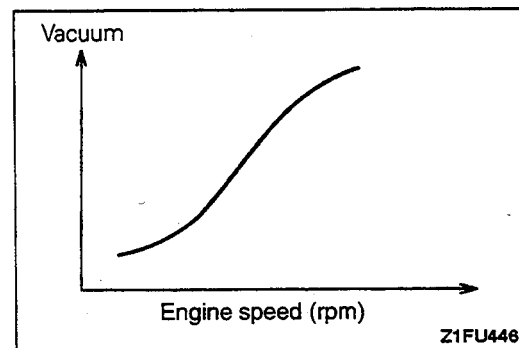
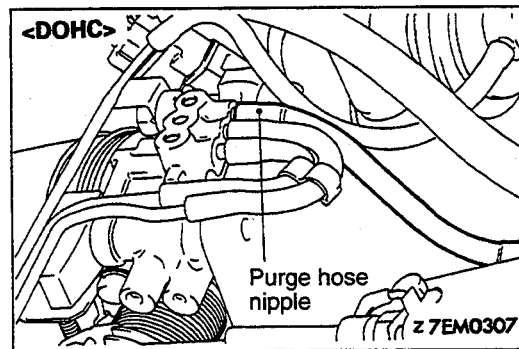
PURGE PORT VACUUM

110005857

INSPECTION <DOHC, SOHC (Federal, California Up to 1994 models)>

Engine coolant temperature: 80–95 °C (176–203 °F)

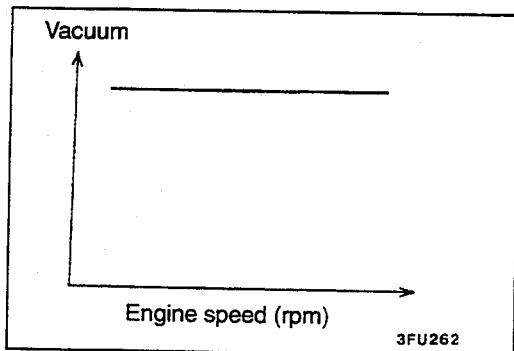
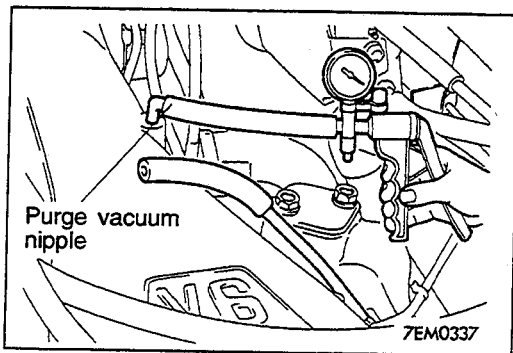
- (1) Disconnect the vacuum hose from the throttle body purge hose nipple and connect a hand vacuum pump to the nipple.



- (2) Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum raises proportionately with the rise in engine speed.

NOTE

If there is a problem with the change in vacuum, it is possible that the throttle body port may be clogged and require cleaning.



INSPECTION <SOHC – California – From 1995 models>

1. Disconnect the vacuum hose (red stripe) from the intake air plenum vacuum nipple and connect a hand vacuum pump to the nipple.

2. Start the engine and check to see that, after raising the engine speed by racing the engine, purge vacuum is kept constant regardless of the increased engine speed.

NOTE

If there is no vacuum created, it is possible that the intake air plenum port may be clogged and require cleaning.

EVAPORATIVE EMISSION PURGE SOLENOID

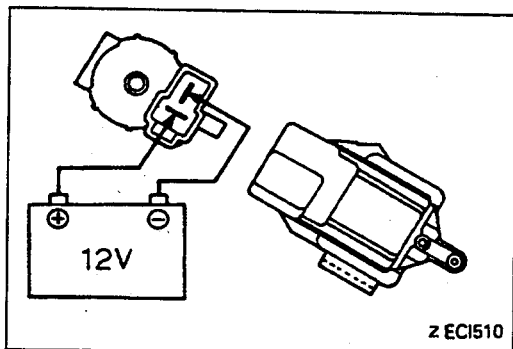
110005858

INSPECTION

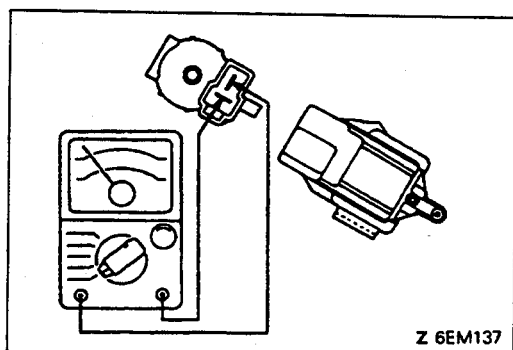
NOTE

When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to the original position.

- (1) Disconnect the vacuum hose (black with red stripe) from the solenoid valve.
- (2) Disconnect the harness connectors.
- (3) Connect a hand vacuum pump to the nipple to which the red-striped vacuum hose was connected.
- (4) Apply a vacuum and check for air-tightness when voltage applied directly to the EGR solenoid and when the voltage is discontinued.

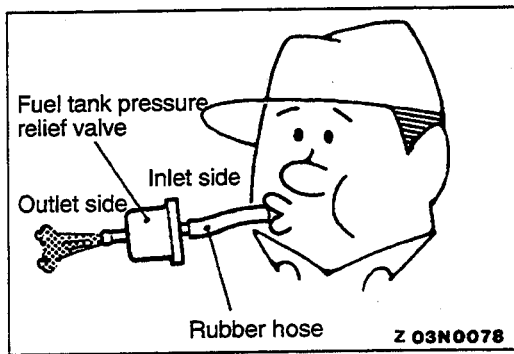


Battery positive voltage	Normal condition
When applied	Negative pressure leaks.
When discontinued	Negative pressure is maintained.



- (5) Measure the resistance between the terminals of the solenoid valve.

Standard value: 36–44 Ω [at 20 °C (68 °F)]

**FUEL TANK PRESSURE RELIEF VALVE** 110005859

Connect a clean rubber hose to the fuel tank pressure relief valve and check the operation.

Inspection procedure	Normal condition
Lightly blow from the inlet (fuel tank) side.	Air passes through after a slight resistance
Lightly blow from the outlet (evaporative emission canister) side	Air passes through.

VOLUME AIR FLOW SENSOR, ENGINE COOLANT TEMPERATURE SENSOR 110005860

Refer to GROUP 13A—On-vehicle Inspection of MFI Components.

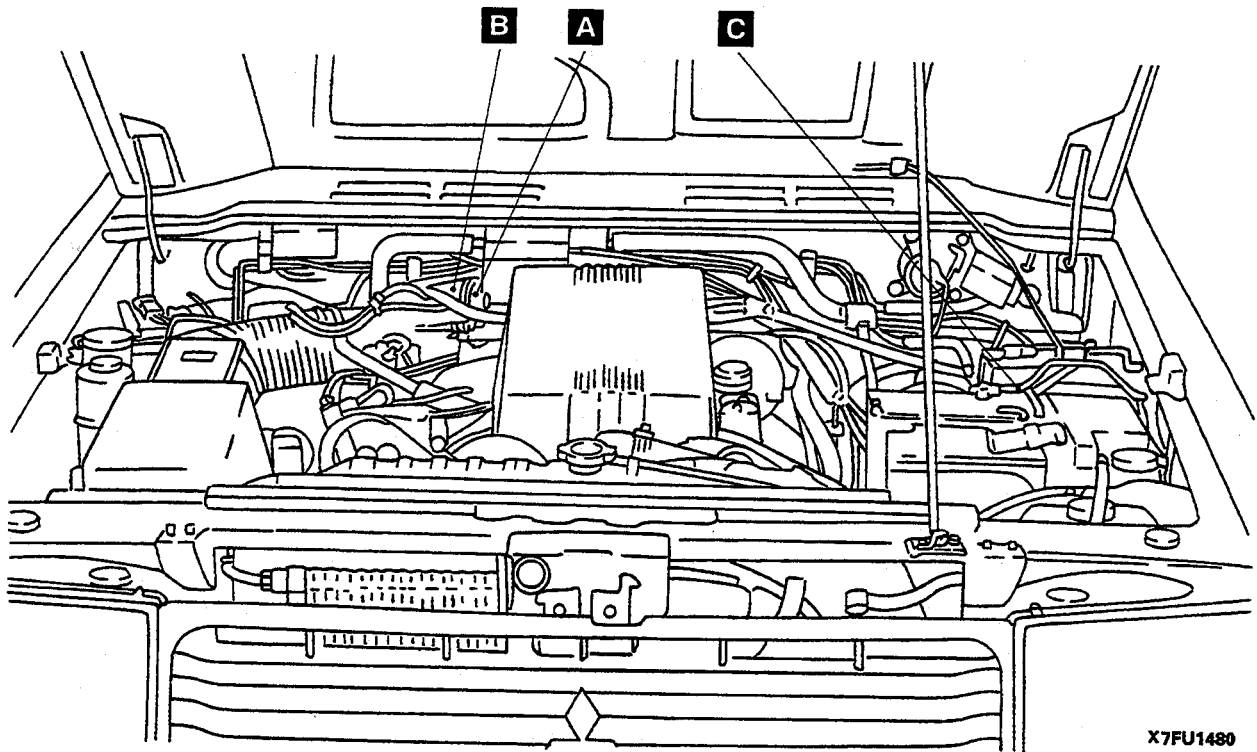
EVAPORATIVE EMISSION CANISTER 110005861

Refer to GROUP 13F – Fuel Line and Vapor Line.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM <DOHC>

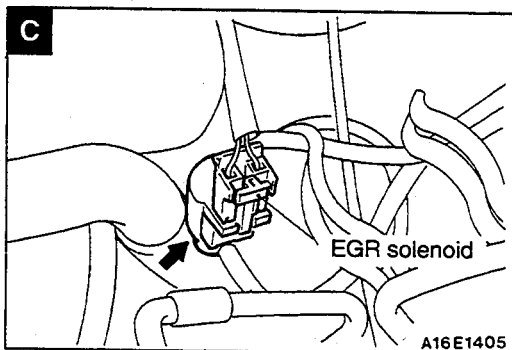
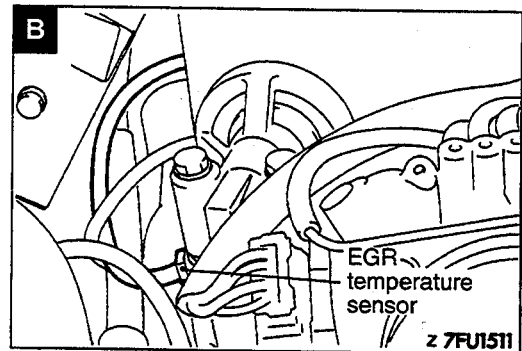
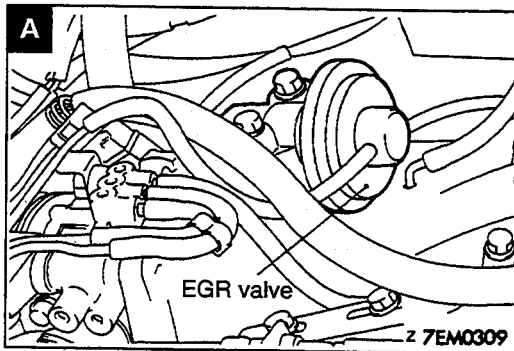
110005862

COMPONENT LOCATION

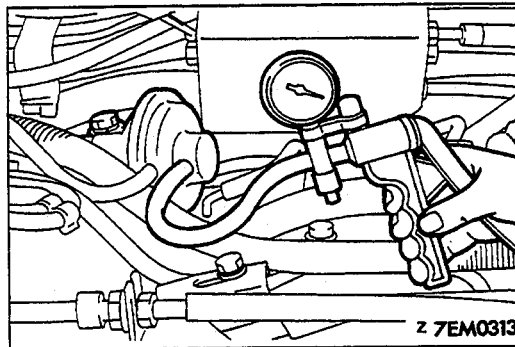
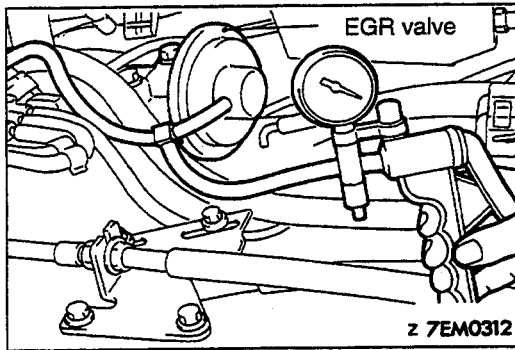


X7FU1480

Name	Symbol
EGR valve	A
EGR temperature sensor	B
EGR solenoid	C



TSB Revision



EGR SYSTEM INSPECTION

110005863

- (1) Disconnect the green striped vacuum hose from the EGR valve, and using a three-way terminal, connect a hand vacuum pump as shown.
- (2) Regarding cold condition [coolant temperature: 20°C (68°F) or less] and warm condition [coolant temperature: 70°C (158°F) or more] of the engine, check the following two points.

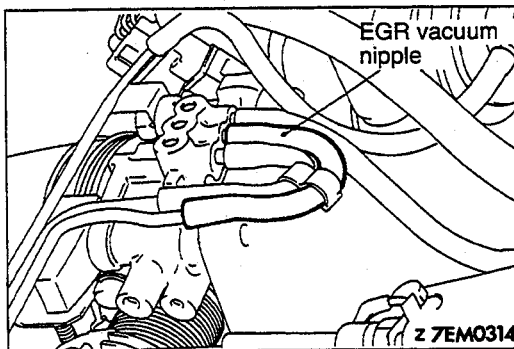
<Cold condition of engine>

Engine operation	Normal state
Race the engine by rapidly press in the accelerator pedal.	The negative pressure does not vary. (Atmospheric pressure)

<Warm condition of engine>

Engine operation	Normal state
Race the engine by rapidly press in the accelerator pedal.	The negative pressure rises to 100 mmHg (3.9 in. Hg) or more.

- (3) Disconnect the three-way terminal, and connect the hand vacuum pump to the EGR valve.
- (4) When a negative pressure of 230 mmHg (9.1 in.Hg) is applied during idling, check that the engine stops or idles unstably.

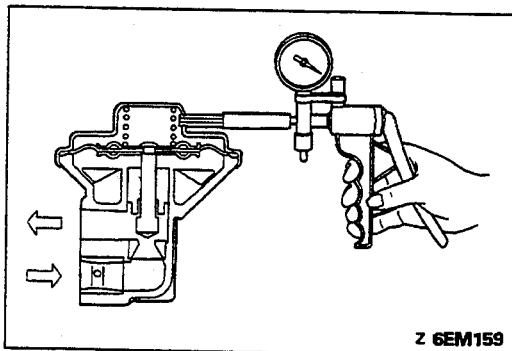
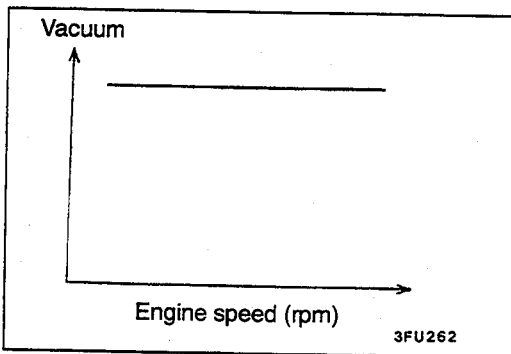
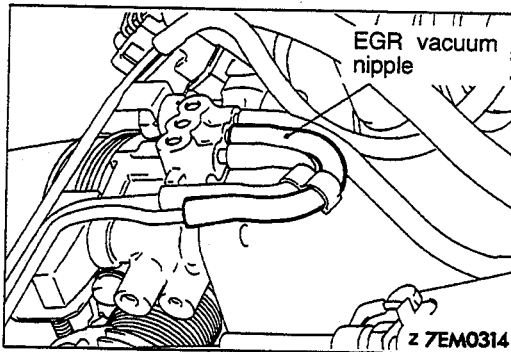
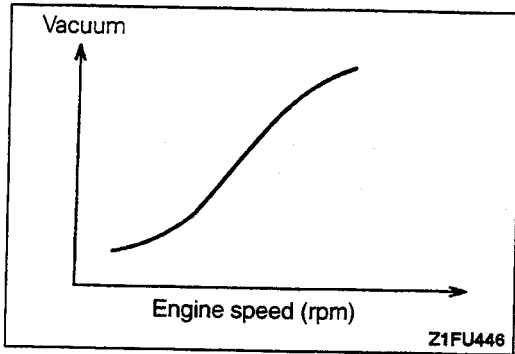


EGR VALVE CONTROL VACUUM CHECK 110005864
INSPECTION <Federal, California 1994 model>

Check Condition

Engine coolant temperature: 80–95°C (176–205°F)

- (1) Disconnect the vacuum hose from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.



- (2) Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum raises proportionately with the rise in engine speed.

NOTE

If there is a problem with the change in vacuum, it is possible that the throttle body port may be clogged and require cleaning.

INSPECTION <California – From 1995 models>

1. Disconnect the vacuum hose (green stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.
2. Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum remains fairly constant.

EGR VALVE

INSPECTION

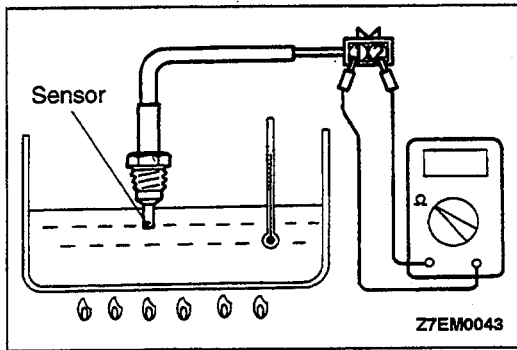
- (1) Remove the EGR valve and check it for sticking, deposit of carbon, etc.
If such condition exists, clean with adequate solvent to ensure tight valve seat contact.
- (2) Connect a hand vacuum pump to EGR valve.
- (3) Apply a vacuum of 500 mmHg (19.7 in.Hg.) and check airtightness.
- (4) Blow in air from one passage of the EGR to check condition as follows.

Applying vacuum	Applying vacuum
30 mmHg (1.2 in.Hg.) or less	Air does not blow through
230 mmHg (9.1 in.Hg.) or more	Air blows through

INSPECTION

Install a new gasket and EGR valve, tighten bolts to specified torque.

Specified tightening torque: 22 Nm (16 ft.lbs.)



EGR TEMPERATURE SENSOR

110005866

INSPECTION

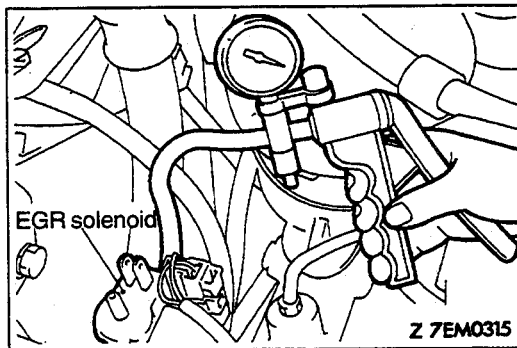
- (1) Remove the EGR temperature sensor.
- (2) Place the EGR temperature sensor in water, and then measure the resistance value between terminals 1 and 2 while increasing the water's temperature. Replace the EGR temperature sensor if there is a significant deviation from the standard value.

Temperature °C(°F)	Resistance kΩ
50 (122)	60–83
100 (212)	11–14

INSTALLATION

Install the EGR temperature sensor and tighten to specified torque.

Specified tightening torque: 11 Nm (8 ft.lbs.)



EGR SOLENOID

110005867

NOTE

When disconnecting the vacuum hose, make an identification mark on it so that it can be reconnected to the original position.

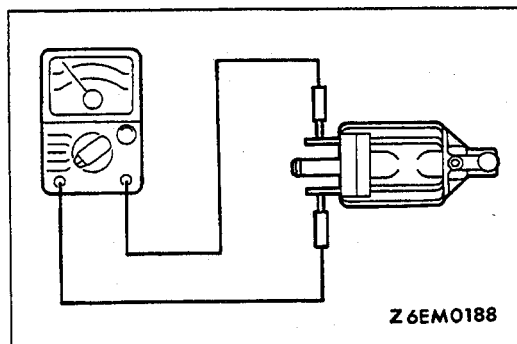
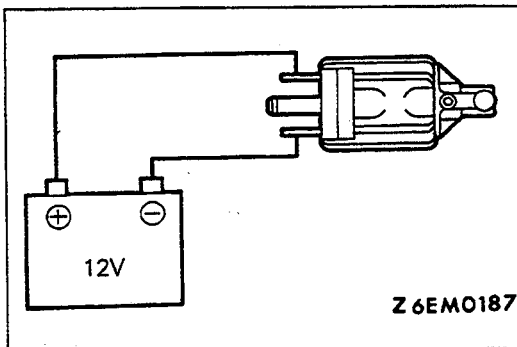
- (1) Disconnect the vacuum hose (yellow and green stripe) from the solenoid valve.
- (2) Disconnect the harness connector.
- (3) Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.

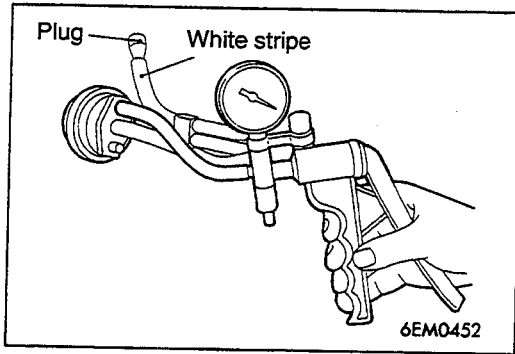
- (4) Apply a vacuum and check for air-tightness when voltage applied directly to the EGR solenoid and when the voltage is discontinued.

Battery voltage	Result
When applied	Vacuum is maintained
When discontinued	Vacuum leaks

- (5) Measure the resistance between the terminals of the solenoid valve.

Standard value: 36–44 Ω [at 20°C (68°F)]





VACUUM CONTROL VALVE INSPECTION

<California From 1995 models>

1. Disconnect the black vacuum hose from the vacuum control valve and connect the hand vacuum pump to the vacuum control valve.
2. Put the blind plug to the removed vacuum hose.
3. Start the engine and run at idle.
4. Check the vacuum condition.

Engine condition	Normal vacuum condition
Idling	Approx. 180 mmHg (7.1 in.Hg)

EXHAUST EMISSION CONTROL SYSTEM

MIXTURE CONTROL SYSTEM

110005868

- To inspect the mixture control system, refer to GROUP 13.
- For detailed information concerning the illumination pattern of the check engine/malfunction indicator lamp and other aspects of the on-board diagnostic, refer to GROUP 13.

CATALYTIC CONVERTER

110005869

REMOVAL AND INSTALLATION

For removal and installation procedures, refer to GROUP 15 – Exhaust Pipe, Muffler and Catalytic Converter.

INSPECTION

Check for damage, cracks or fusion and replace if faulty.

Caution

1. Operation of any type, including idling, should be avoided if engine misfiring occurs. Under this condition temperature, which may cause damage to the catalytic converter or under-body parts of the vehicle.
2. Alteration or deterioration of the ignition or fuel system or any type of operating condition which results in engine misfiring must be corrected to avoid overheating the catalytic converters.
3. Proper maintenance and tuneup according to manufacturer's specifications should be made to correct the conditions as soon as possible.

NOTES

CLUTCH

CONTENTS

110005362

CLUTCH CONTROL	6	SERVICE ADJUSTMENT PROCEDURES	3
CLUTCH MASTER CYLINDER	8	Bleeding	4
CLUTCH PEDAL	5	Clutch Pedal Inspection and Adjustment	3
GENERAL SPECIFICATIONS	2	Inter-lock Switch Inspection and Adjustment	4
LUBRICANTS	2	SERVICE SPECIFICATIONS	2

GENERAL SPECIFICATIONS

110005363

Items	Specifications
Clutch operating method	Hydraulic type
Inside diameter of clutch master cylinder	mm (in.) 15.87 (5/8)
Clutch disc	
Facing size (outside×inside)	mm (in.) 240×160 (9.4×6.3)
Clutch cover assembly	
Type	Diaphragm spring strap drive type
Setting load	N (lbs.) 5500 (1213)
Mounting bolt circle diameter	mm (in.) 276 (10.9)
Clutch release cylinder	
Cylinder bore diameter	mm (in.) 19.05 (3/4)

SERVICE SPECIFICATIONS

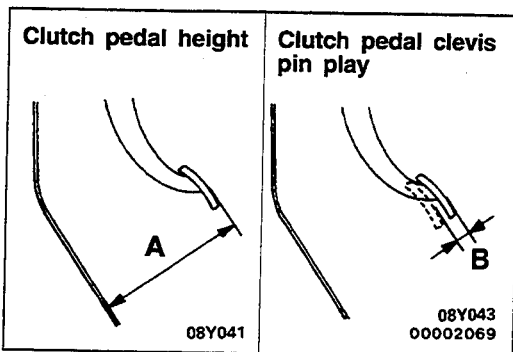
110005364

Items	Specifications
Standard value	
Clutch pedal height	mm (in.) 185.5–190.5 (7.30–7.50)
Clutch pedal clevis pin play	mm (in.) 1–3 (.04–.12)
Clutch pedal play	mm (in.) 6–13 (.24–.51)
Distance between clutch pedal and the toeboard when the clutch is disengaged	mm (in.) 35 (1.4) or more
Clutch pedal full stroke	mm (in.) 145 (5.72)
Clearance between stopper and inter-lock switch when the clutch pedal is fully depressed	mm (in.) 4.5–5.5 (.177–.217)

LUBRICANTS

110005365

Items	Specified lubricants	Quantity
Clutch fluid	DOT 3 or DOT 4 brake fluid	As required
Inner surface of clutch master cylinder and outer circumference of piston assembly		



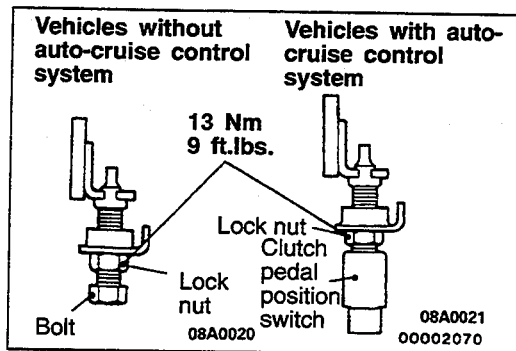
SERVICE ADJUSTMENT PROCEDURES

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

110005366

1. Measure the clutch pedal height (A) from the toeboard and the clutch pedal clevis pin play (B) at the face of the pedal pad.

Standard value (A): 185.5–190.5 mm (7.30–7.50 in.)
Standard value (B): 1–3 mm (.04–.12 in.)



2. If either the clutch pedal height or the clutch pedal clevis pin play are not within the standard value range, adjust as follows:

- (1) For vehicles without auto-cruise control system, turn and adjust the bolt so that the pedal height is at the standard value, and then secure by tightening the lock nut. For vehicles with auto-cruise control system, disconnect the clutch pedal position switch connector and turn the switch for standard clutch pedal height. Then lock with the lock nut.

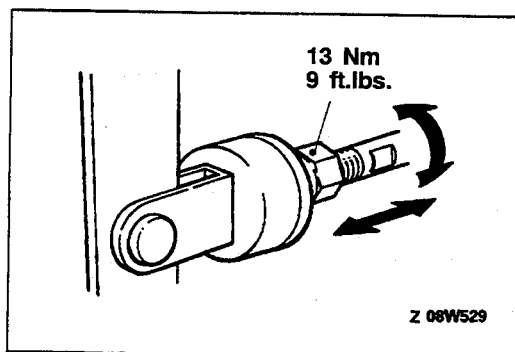
NOTE

When the pedal height is lower than the standard value, loosen the bolt, and then turn the push rod to adjust. After adjusting, tighten the bolt until it reaches the pedal stopper, and then lock with the lock nut.

- (2) Turn the push rod to adjust the clutch pedal clevis pin play to agree with the standard value and then secure the push rod with the lock nut.

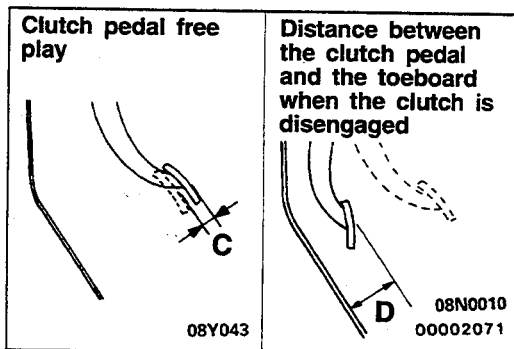
Caution

When adjusting the clutch pedal clevis pin play, be careful not to push the push rod toward the master cylinder.

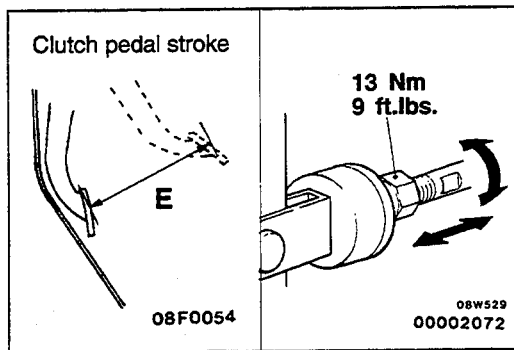


3. After adjusting, check that the clutch pedal play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the toeboard when the clutch is disengaged are within the standard value ranges.

Standard value (C): 6–13 mm (.24–.51 in.)
Standard value (D): 35 mm (1.4 in.) or more



4. If the clutch pedal play (C) and the distance (D) between the clutch pedal and the toeboard when the clutch is disengaged are not at the standard values, it is probably the result of either air in the hydraulic system or a malfunction of the master cylinder or clutch. Bleed the air, or disassemble and check the master cylinder or clutch.



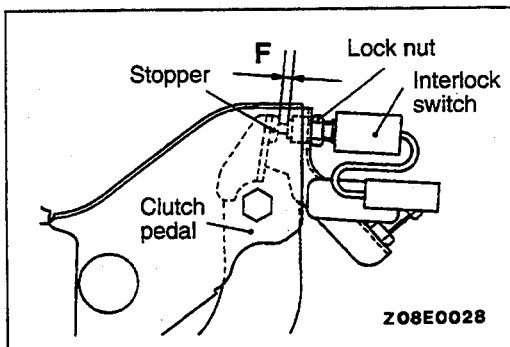
INTER-LOCK SWITCH INSPECTION AND ADJUSTMENT

110005367

- (1) Check and adjust the clutch pedal height. (Refer to P.21-3.)
- (2) Measure the clutch pedal full stroke (E).

Standard value (E): 145 mm (5.72 in.)

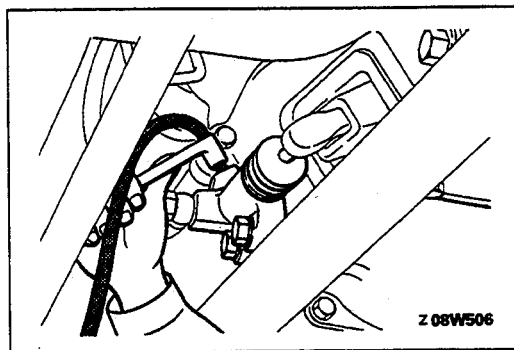
If the clutch pedal full stroke is outside the standard value, adjust by turning the push rod.



- (3) Measure the clearance (F) in the illustration with the clutch pedal fully depressed condition (full stroke).

Standard value (F): 4.5–5.5 mm (.177–.217 in.)

If the clearance is outside the standard value, adjust by loosening the inter-lock switch lock nut and turning the inter-lock switch.



BLEEDING

110005368

Whenever the clutch pipe, the clutch hose, and/or the clutch master cylinder have been removed, or if air is suspected in the clutch lines, bleed the system.

Specified fluid: DOT 3 or DOT 4 brake fluid

Caution

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

CLUTCH PEDAL

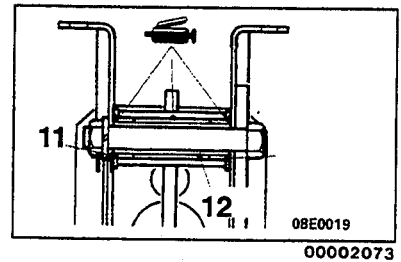
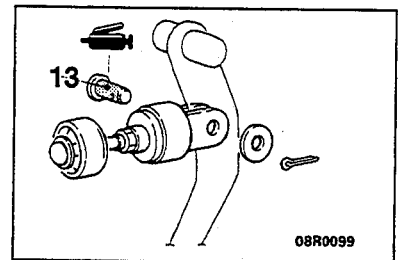
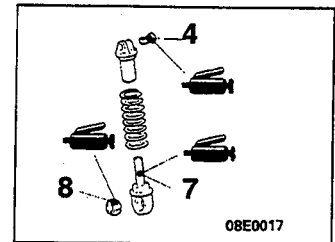
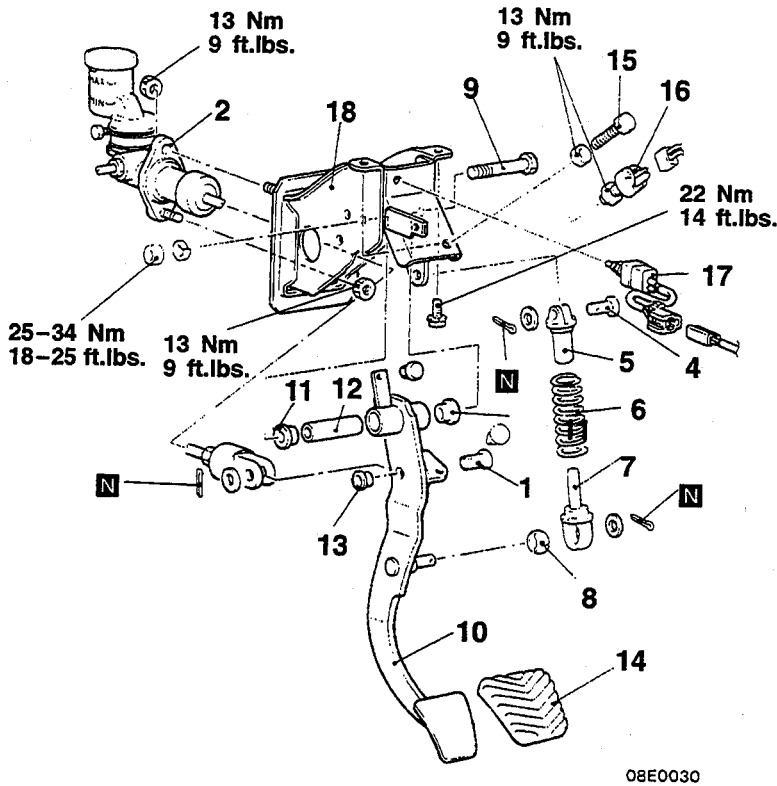
REMOVAL AND INSTALLATION

Pre-removal Operation

- Foot Shower Duct (L.H.) and Lap Cooler Duct A Removal (Refer to GROUP 55 – Ventilators.)

Post-installation Operation

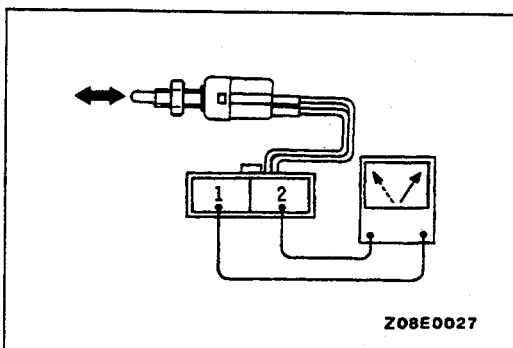
- Foot Shower Duct (L.H.) and Lap Cooler Duct A Installation (Refer to GROUP 55 – Ventilators.)
- Clutch Pedal Adjustment (Refer to P.21-3.)



Removal steps

1. Clevis pin
2. Clutch master cylinder connection
3. Clutch pedal assembly
4. Clevis pin
5. Rod A
6. Turnover spring
7. Rod B
8. Bushing
9. Pedal shaft
10. Clutch pedal

11. Bushings
12. Spacer
13. Bushings
14. Pedal pad
15. Stopper bolt
<Vehicles without cruise control system>
16. Clutch pedal position switch
<Vehicles with cruise control system>
17. Interlock switch
18. Clutch pedal bracket



INSPECTION

- Check the pedal shaft and bushing for wear.
- Check the clutch pedal for bend or torsion.
- Check the turnover spring for damage or deterioration.
- Check the pedal pad for damage or wear.

INTERLOCK SWITCH INSPECTION

- (1) Connect an ohmmeter between terminals (1)–(2).
- (2) If there is continuity when the switch is pressed and no continuity when it is released, then the switch is normal.

CLUTCH CONTROL

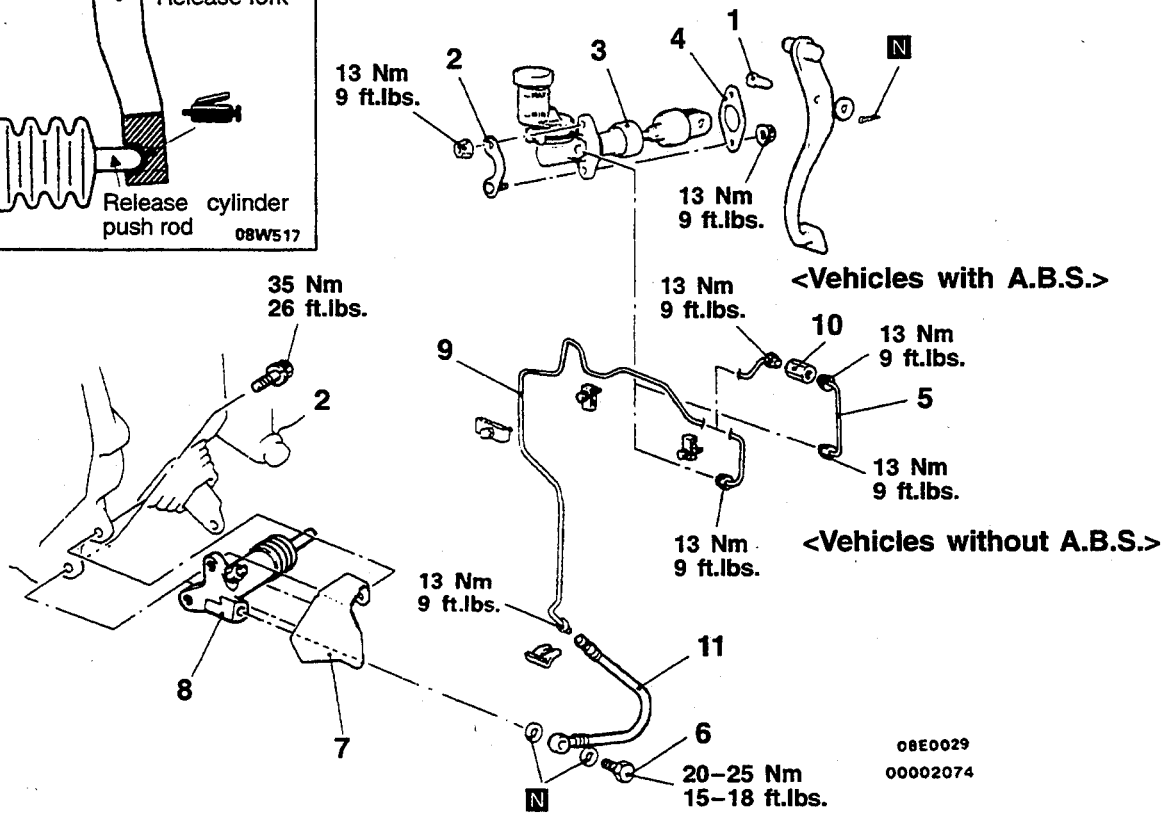
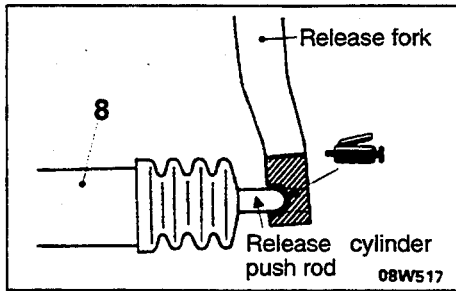
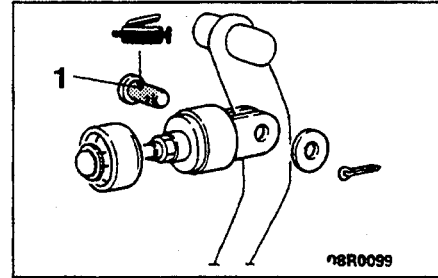
REMOVAL AND INSTALLATION

Pre-removal Operation

- Clutch Fluid Draining

Post-installation Operation

- Clutch Fluid Supplying
- Bleeding (Refer to P.21-4.)



Clutch master cylinder removal steps

- Adjustment of Clutch Pedal (Refer to P.21-3.)
- 1. Clevis pin
- 2. Plate
- 3. Clutch master cylinder
- 4. Sealer
- 5. Clutch pipe A <Vehicles with A.B.S.>

Clutch release cylinder removal steps

- 6. Eye bolt
- 7. Heat protector
- 8. Clutch release cylinder

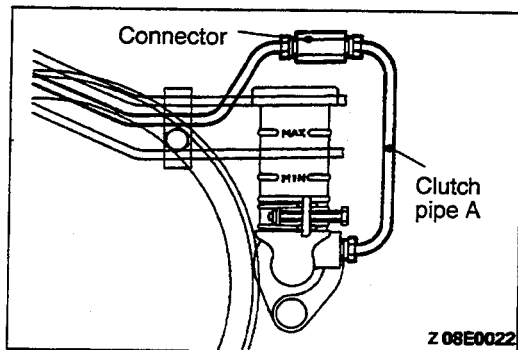
Clutch pipe B, Connector removal

- 9. Clutch pipe B
- 10. Connector <Vehicles with A.B.S.>

Clutch hose removal steps

- 6. Eye bolt
- 11. Clutch hose

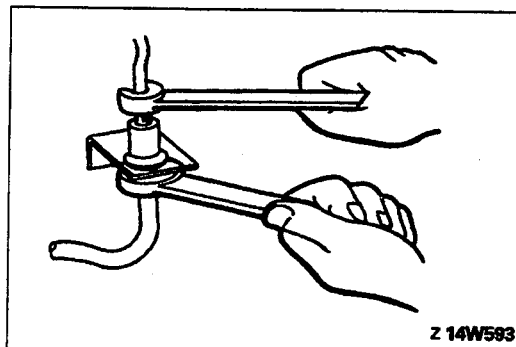
NOTE
A.B.S.: Anti-lock Braking System



REMOVAL SERVICE POINTS

◀A▶ CLUTCH MASTER CYLINDER REMOVAL

For vehicles with ABS, remove the connector and the clutch pipe A assembly, and remove the clutch master cylinder from the vehicle with the clutch pipe still attached.



◀B▶ CLUTCH PIPE B REMOVAL

- (1) Remove the brake booster and link assembly. <Vehicles with Cruise Control>
(Refer to GROUP 35A–Brake Booster and GROUP 13G–Cruise Control.)
- (2) While holding the nut at the clutch hose side, loosen the flare nut of the clutch pipe.

◀C▶ CLUTCH HOSE REMOVAL

While holding the nut at the clutch hose side, loosen the flare nut of the clutch pipe.

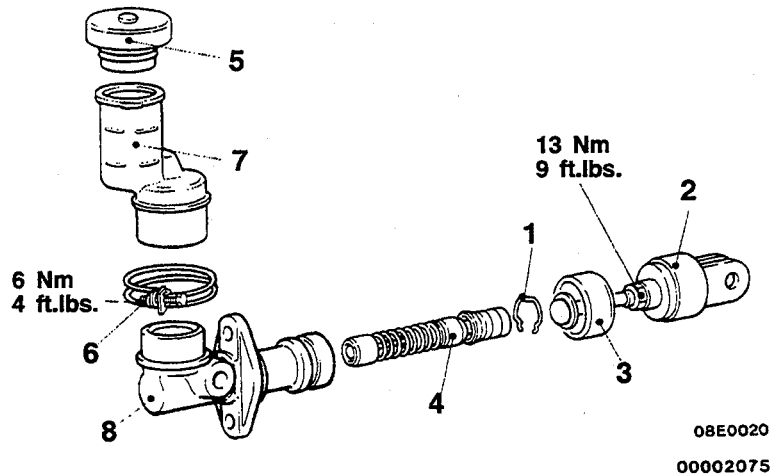
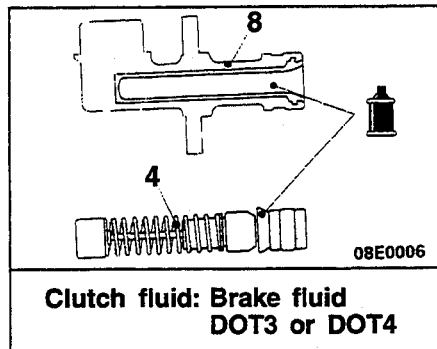
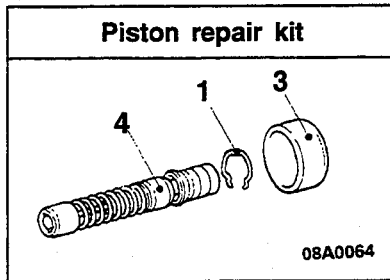
INSPECTION

- Check the master cylinder or clutch hose for fluid leakage.
- Check the clutch hose or pipe for cracks or clogging.

CLUTCH MASTER CYLINDER

DISASSEMBLY AND REASSEMBLY

110005371



Disassembly steps

1. Piston stop ring
2. Damper and push rod
3. Boot
4. Piston assembly

5. Reservoir cap
6. Reservoir band
7. Reservoir
8. Master cylinder body

DISASSEMBLY SERVICE POINT

◀▶ PISTON ASSEMBLY REMOVAL

Caution

1. Do not damage the master cylinder body and piston assembly.
2. Do not disassemble piston assembly.

INSPECTION

- Check the inside cylinder body for rust or scars.
- Check the piston cup for wear or deformation.
- Check the piston for rust or scars.
- Check the clutch tube connection part for clogging.

MANUAL TRANSMISSION

CONTENTS

110005372

CONTROL LEVER ASSEMBLY	9	4WD Operation Detection Switch Check	6
GENERAL SPECIFICATIONS	2	HIGH/LOW Detection Switch Check	6
LUBRICANTS	2	Oil Level Check	5
SEALANTS AND ADHESIVES	2	Oil Replacement	5
SERVICE ADJUSTMENT PROCEDURES	5	Speedometer Cable Replacement	8
Center Differential Lock Detection Switch Check	6	Transfer Oil Seal Replacement	5
2WD/4WD Detection Switch Check	6	SPECIAL TOOLS	3
Center Differential Lock Operation Detection Switch Check	6	TRANSMISSION AND TRANSFER ASSEMBLY	11
4WD Indicator Control Unit Inspection	7	TROUBLESHOOTING	4

GENERAL SPECIFICATIONS

110005373

Items		Specifications
Models		V5MT1
Transmission type		5-speed
Gear ratio	1st	3.918
	2nd	2.261
	3rd	1.395
	4th	1.000
	5th	0.829
	Reverse	3.925
Final gear ratio		4.625
Speedometer gear ratio		25/8
Transfer type		Active Traction 4WD
Gear ratio	High	1.000
	Low	1.925
Drive system	Front wheel	Chain drive
	Rear wheel	Direct drive

LUBRICANTS

110005374

Items	Specified lubricants	Quantity
Transmission	Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4	2.5 dm ³ (2.6 qts.)
Transfer	Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4	2.3 dm ³ (2.4 qts.)
Transfer oil seal lip	Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4	As required

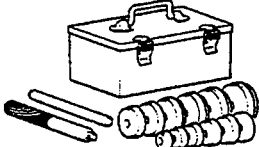
SEALANTS AND ADHESIVES

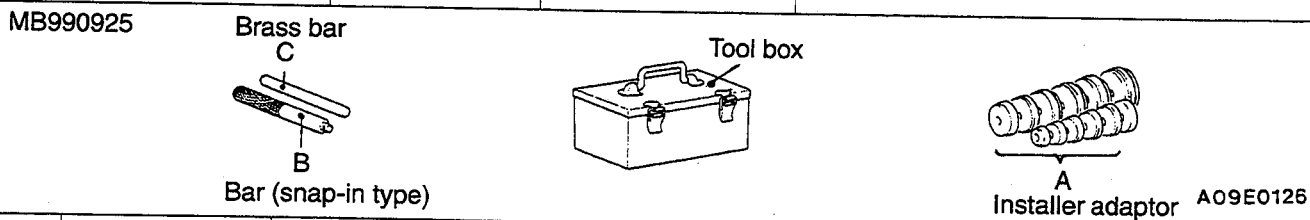
110005375

Items		Specified sealants and adhesives
Outer circumference of speedometer cable grommet		3M ATD Part No. 8001, 8011 or equivalent
Control lever assembly	Control lever gasket	3M ATD Part No. 8663 or equivalent
	Control lever assembly mounting bolt	3M Stud Locking Part No. 4170 or equivalent
Transmission and transfer assembly	Control housing gasket	3M ATD Part No. 8663 or equivalent
	Control housing mounting bolt	3M Stud Locking Part No. 4170 or equivalent

SPECIAL TOOLS

110005376

Tool	Tool number and name	Supersession	Application
	MB990925 Bearing and oil seal installer set	MB990925-01	Installation of oil seal (MB990928, MB990938)

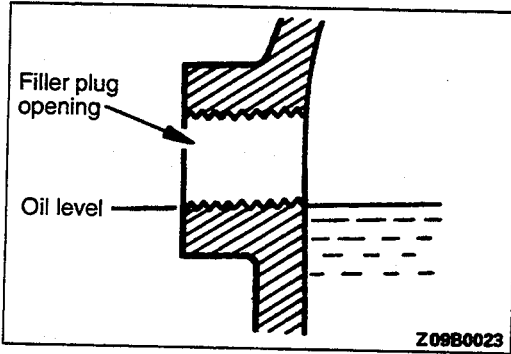


	Contents of new tool (MB990925)	Current tools	O.D. mm (in.)		Contents of new tool (MB990925)	Current tools	O.D. mm (in.)
	A	MB990926	MB990272 MB990658 MB990659		39 (1.54)	A	MB990933
	MB990927	MB990264 MB990680	45 (1.77)		MB990934	MB990766 MB990807	67.5 (2.66)
	MB990928	MB990271 MB990808	49.5 (1.95)		MB990935	MB990133 MB990308 MB990762	71.5 (2.81)
	MB990929	MB990306	51.0 (2.01)		MB990936	MB990718	75.5 (2.97)
	MB990930	MB990283	54.0 (2.13)		MB990937	MB990309	79.0 (3.11)
	MB990931	MB990681 MB990764	57.0 (2.24)	B	MB990938	MB990124	–
	MB990932	MB990263	61.0 (2.40)	C	MB990939	–	–

TROUBLESHOOTING

110005377

Trouble	Cause	Service Operation
Noise, Vibration	The transmission and engine mount is loose or damaged.	Tighten or replace the mount.
	The end play of each shaft is not proper.	Correct the end play.
	Gears are worn or damaged.	Replace the gears.
	The oil grade is improper.	Replace with the specified oil.
	The oil level is low.	Add oil.
	The engine's idling speed is not proper.	Adjust the idling speed.
Oil is leaking	Damaged oil seal or O-ring	Replace the oil seal or O-ring.
Shifting gears is hard or troublesome	Poor meshing or wear of synchronizer ring and gear cones	Repair or replace.
	Fatigued synchronizer spring	Replace the synchronizer ring.
	Incorrect oil grade	Replace with the specified oil.
Gears slip out	Worn gear shift forks or broken poppet spring	Replace the shift forks or poppet spring.
	Excessive clearance between synchronizer hub and sleeve	Replace the synchronizer hub and spring.



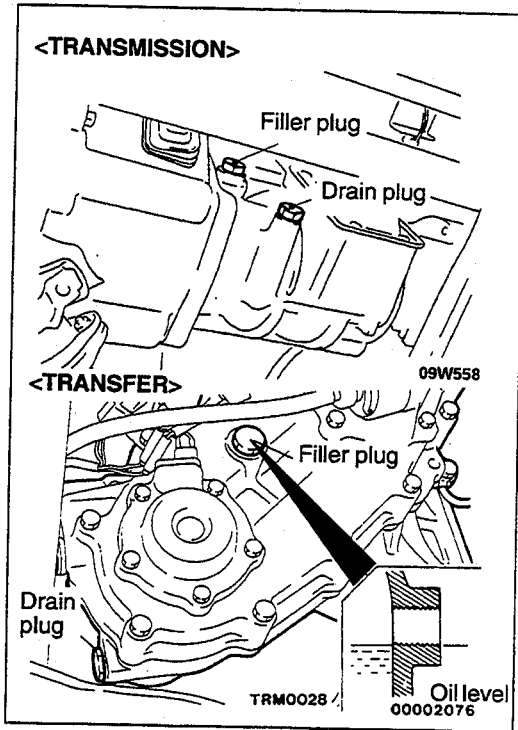
SERVICE ADJUSTMENT PROCEDURES

OIL LEVEL CHECK

110005378

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 noticeable dirty, and that it has a suitable viscosity.



OIL REPLACEMENT

110005379

1. Remove oil filler plug and the oil drain plug.
2. Drain the oil.
3. Tighten the oil drain plug to the specified torque.
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 or 75W-85W conforming to API classification GL-4

Quantity:

Transmission 2.5 dm³ (2.6 qts.)

Transfer 2.3 dm³ (2.4 qts.)

5. Tighten the filler plug to the specified torque.

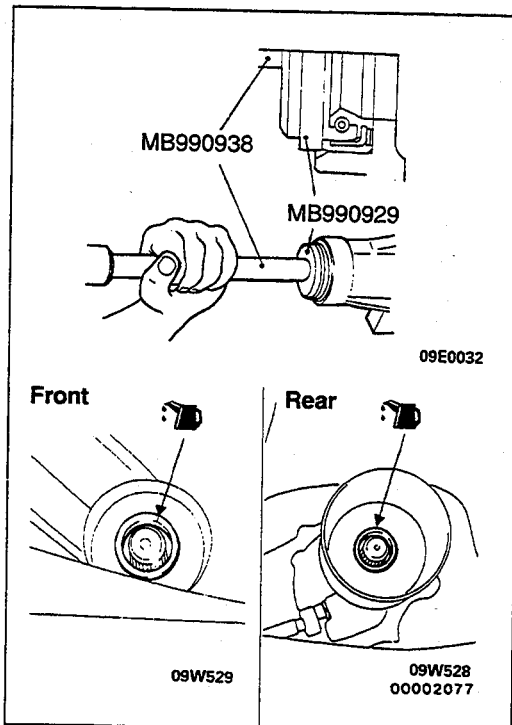
TRANSFER OIL SEAL REPLACEMENT

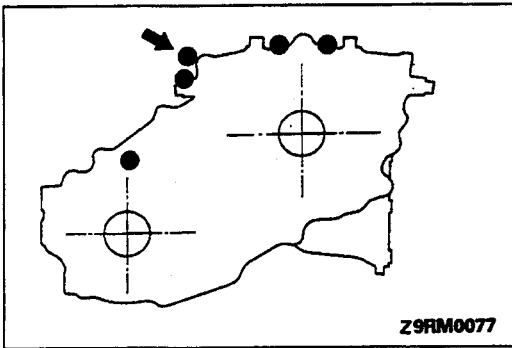
110005380

1. Disconnect the propeller shaft from the transfer. (Refer to GROUP 25-Propeller Shaft.)
2. Using a flat-tip (-) screwdriver, remove the oil seal.
3. Using the special tool, tap the transfer oil seal into the transfer.
Note in illustration the direction of installation of transfer oil seal.
4. Apply a coating of the transmission oil to the lip of the oil seal.

Transmission oil:

Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4

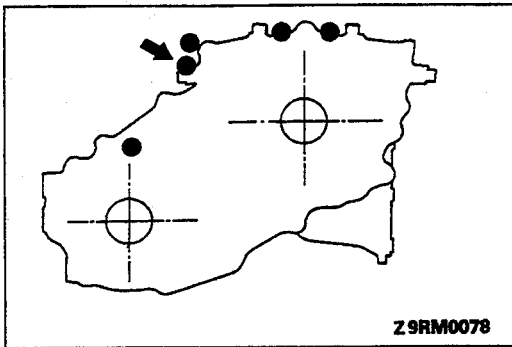




CENTER DIFFERENTIAL LOCK DETECTION SWITCH CHECK 110005381

Check the continuity between the brown connector terminal on the side of the transfer case and the transfer case.

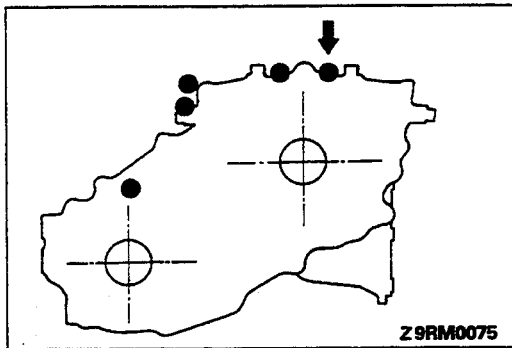
Transfer control lever position	Continuity
4H	No continuity
4HLc	Continuity



2WD/4WD DETECTION SWITCH CHECK 110005382

Check the continuity between the black connector terminal on the side of the transfer case and the transfer case.

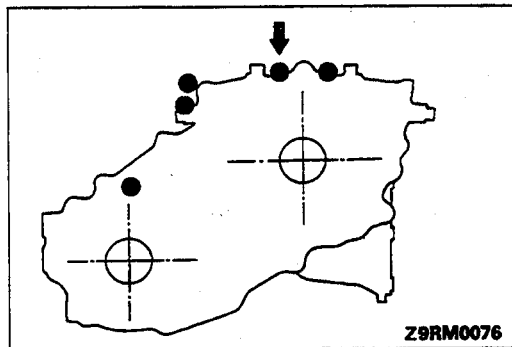
Transfer control lever position	Continuity
2H	Continuity
4H	No continuity



CENTER DIFFERENTIAL LOCK OPERATION DETECTION SWITCH CHECK 110005383

Check the continuity between the brown connector terminal on the top of the transfer case and the transfer case.

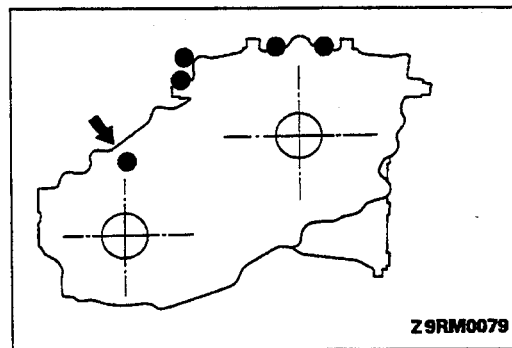
Transfer control lever position	Continuity
4H	No continuity
4HLc	Continuity



4WD OPERATION DETECTION SWITCH CHECK 110005384

Check the continuity between the black connector terminal on the top of the transfer case and the transfer case.

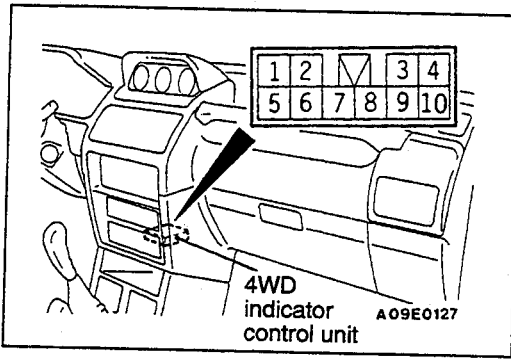
Transfer control lever position	Continuity
2H	No continuity
4H	Continuity



HIGH/LOW DETECTION SWITCH CHECK 110005385

Check the continuity between the white connector terminal on the side of the transfer case and the transfer case.

Transfer control lever position	Continuity
4HLc	Continuity
N (between 4HLc and 4LLc)	No continuity
4LLc	Continuity



4WD INDICATOR CONTROL UNIT INSPECTION

110005386

1. Remove the radio or CD player. (Refer to GROUP 54 – Radio and Stereo.)
2. Remove the 4WD indicator control unit
3. Measure the voltage at the terminals under each condition.
4. Carry out the voltage measurements with the harness disconnected from the control unit. Insert the probe from the rear of the connector and take the measurement between terminal (8) (earth terminal) and the respective terminals.



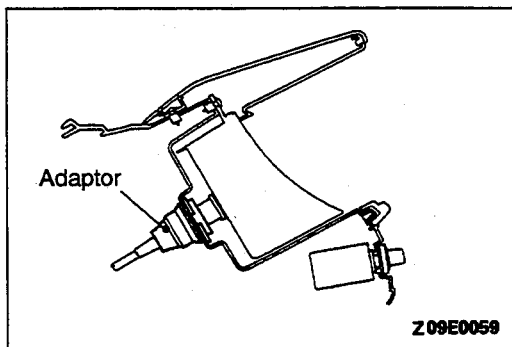
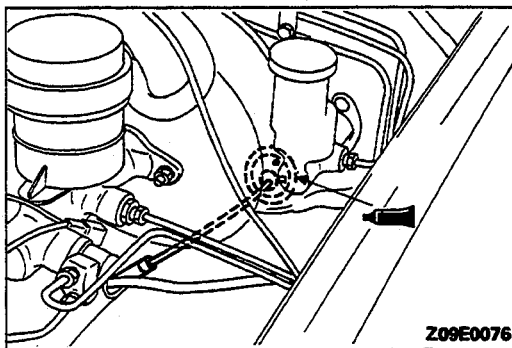
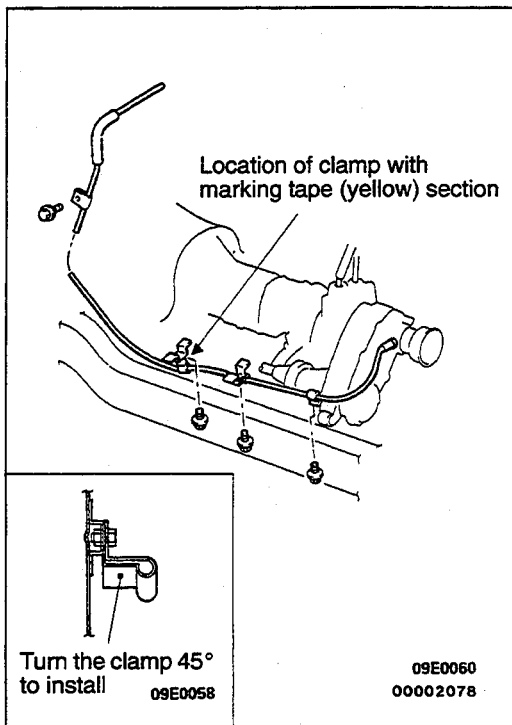
(Control unit side)

Terminal No.	Inspection item		Inspection condition		Terminal voltage	
3	Ignition switch (IG2)		Ignition switch (IG2)		OFF	0 V
					ON	Battery positive voltage
4	Combination meter	Center differential lock indicator lamp	Ignition switch: ON	Transfer lever position	4H	Battery positive voltage
					4HLc	Less than 1.5 V
10	(4WD indicator light)	Front wheel lamp	Ignition switch: ON		In 2WD	0 V
					In 4WD	Battery positive voltage*
9		Rear wheel lamp	Ignition switch: ON	Transfer lever position	N	0 V
					4HLc, 4LLc	Battery positive voltage*
6	Free-wheel engage switch		Ignition switch: ON		In 2WD	Battery positive voltage*
					In 4WD	0 V
1	HIGH/LOW detection switch		Ignition switch: ON	Transfer lever position	N	Battery positive voltage*
					4HLc, 4LLc	0 V
2	4WD operation detection switch		Ignition switch: ON	Transfer lever position	2H	Battery positive voltage*
					4H	0 V
5	Center differential lock detection switch		Ignition switch: ON	Transfer lever position	4H	Battery positive voltage*
					4HLc	0 V
7	Center differential lock operation detection switch		Ignition switch: ON	Transfer lever position	4H	Battery positive voltage*
					4HLc	0 V

NOTE

Battery positive voltage marked with (*) is 1–2V lower than actual battery positive voltage.

TSB Revision



SPEEDOMETER CABLE REPLACEMENT 110005387

<Up to 1993 models>

1. Replace the cable assembly if there is a malfunction.
2. Connect the speedometer cable to the transmission and connect the wiring by the following procedure.
 - (1) Wire the speedometer cable so that the minimum bend radius is 150 mm (5.91 in.) or more.
 - (2) Wire the clamps that have a section with marking tape (yellow) in the locations shown in the illustration.

Caution

Wire the speedometer cable so that it does not interfere with the brake tube.

3. After installing the speedometer cable grommet to the toeboard, apply specified sealant to the outside of the grommet.

Specified sealant: 3M ATD Part No. 8001, 8011 or equivalent

4. Install the adaptor to the speedometer cable, and install the speedometer.

Caution

If the cable connections are not made securely to the speedometer side and to the transmission side, the speedometer indications will not be accurate, and an abnormal noise will develop, so be sure to make the connections securely.

5. After connecting to the speedometer, pull the speedometer cable out from the engine compartment until the cable marking is fully withdrawn from the grommet, to remove all bends from the cable inside the instrument panel.

CONTROL LEVER ASSEMBLY

110005388

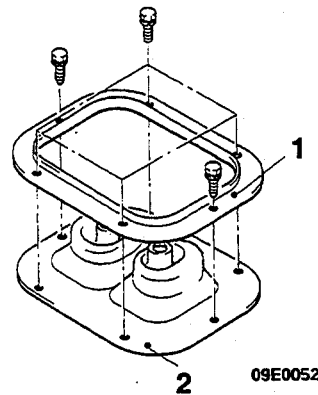
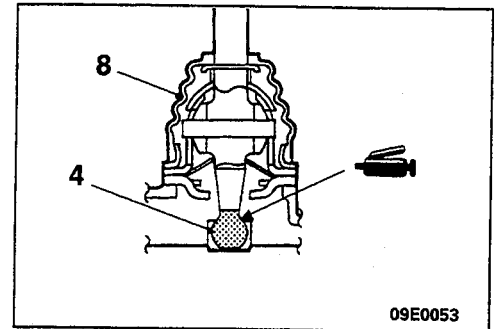
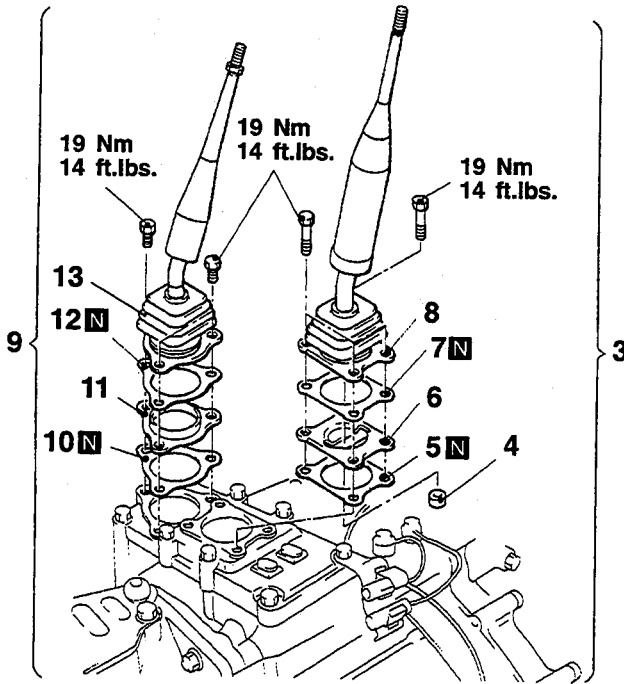
REMOVAL AND INSTALLATION

Pre-removal Operation

- Front Console Assembly Removal (Refer to GROUP 52A – Floor Console.)
- Move the Transmission and Transfer Control Levers to the Following Positions.
Transmission Control Lever: Neutral Position
Transfer Control Lever: 4H (4 wheel drive-high range) Position

Post-installation Operation

- Front Console Assembly Installation (Refer to GROUP 52A – Floor Console.)
- Check the Operation of the Transmission and Transfer Control Levers and the Movement in each Lever Position.



<p>5, 7</p> <p>09E0019</p> <p>Apply the sealant to both sides of the gasket (No. 5 and 7).</p>	<p>10, 12</p> <p>TRM0025</p> <p>Apply the sealant to both sides of the gasket (No. 10 and 12).</p>
<p>Sealant: 3M ATD Part No. 8663 or equivalent</p>	

00002079

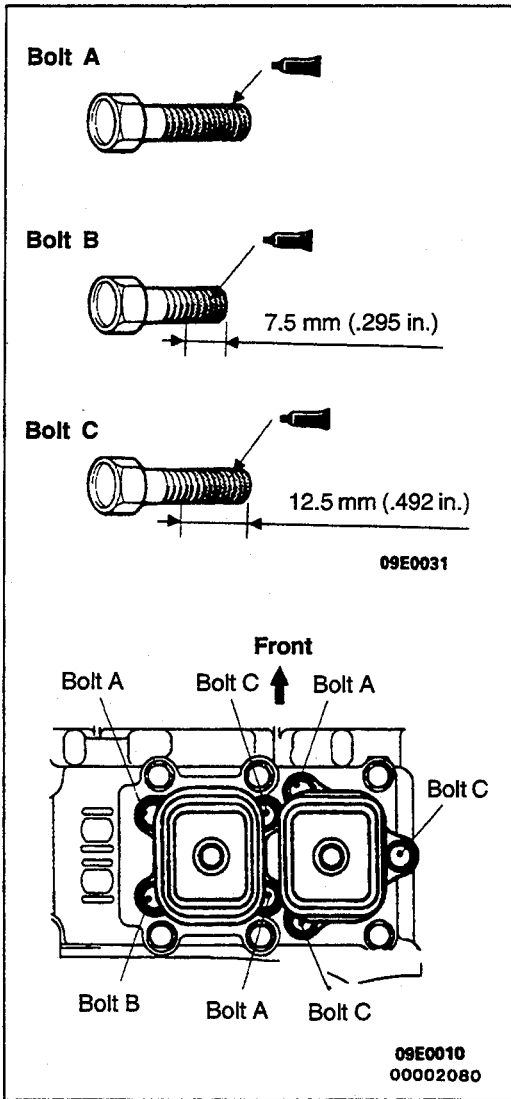
Transmission control lever assembly removal steps

1. Retainer
2. Control lever boot
- ▶A◀ 3. Transmission control lever assembly
4. Control lever bushing
- ▶B◀ 5. Gasket
6. Stopper plate
7. Gasket
8. Transmission control lever

Transfer control lever assembly removal steps

1. Retainer
2. Control lever boot
- ▶A◀ 9. Transfer control lever assembly
10. Gasket
11. Stopper plate
12. Gasket
13. Transfer control lever

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INSTALLATION SERVICE POINTS

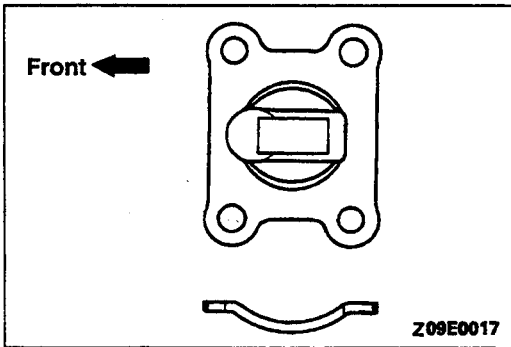
**▶A◀TRANSFER CONTROL LEVER ASSEMBLY/
TRANSMISSION CONTROL LEVER ASSEMBLY
INSTALLATION**

- (1) Remove the adhesive sticking to the lever assembly mounting bolts.
- (2) Use a tap (M8×1.25) 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.
Apply adhesive to the whole thread for bolt A, and to the areas shown in the illustration for bolts B and C.

Specified adhesive: 3M Stud Locking No. 4170 or equivalent

- (4) The dimensions of the mounting bolts vary according to their mounting locations, so do not confuse them when installing.

Bolt	O.D.×Length mm (in.)	Bolt identification
"4"	[4] 8×22 (.3×.9)	<p>"4" D×L L Z09Y512</p>
"4"	[4] 8×18 (.3×.7)	
"4"	[4] 8×23 (.3×.9)	



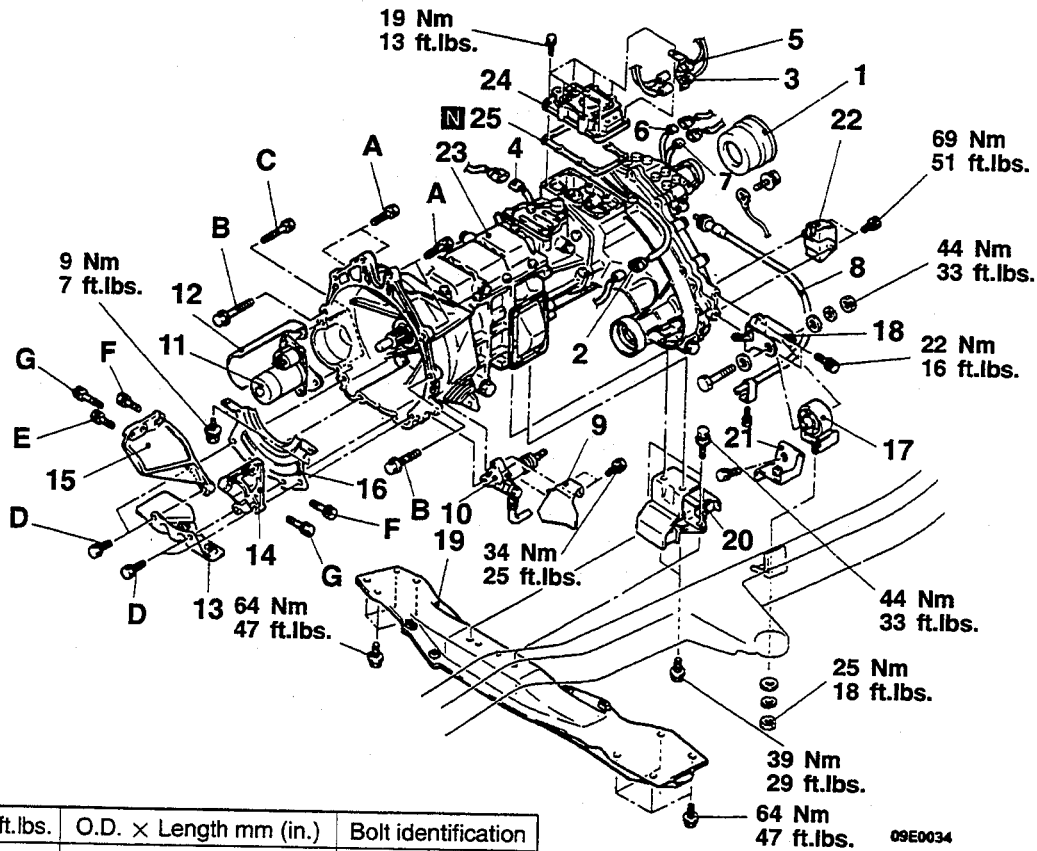
▶B◀STOPPER PLATE INSTALLATION

Install the stopper plate to the transmission control lever in the direction shown in the illustration.

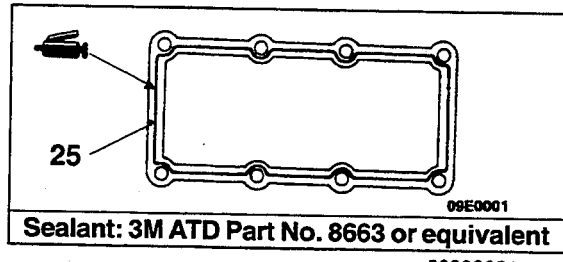
TRANSMISSION AND TRANSFER ASSEMBLY

110005389

REMOVAL AND INSTALLATION



	Nm	ft.lbs.	O.D. × Length mm (in.)	Bolt identification
A	75	54	"7" 12 × 40 (.5 × 1.6)	<p>"7" D × L</p> <p>09Y512</p>
B	90	65	"7" 12 × 55 (.5 × 2.2)	
C	31	22	"7" 10 × 55 (.4 × 2.2)	
D	36	26	"7" 10 × 40 (.4 × 1.6)	
E	75	54	"7" 12 × 35 (.5 × 1.4)	
F	42	30	"7" 10 × 30 (.4 × 1.2)	
G	75	54	"7" 12 × 50 (.5 × 2.0)	



Pre-removal and Post-installation Operation

- Transmission and Transfer Control Lever Assembly Removal and Installation (Refer to P.22-9.)
- Transfer Case Protector Removal and Installation
- Front Exhaust Pipe Removal and Installation
- Transmission Oil and Transfer Oil Draining and Supplying (Refer to P.22-5.)
- Front and Rear Propeller Shaft Removal and Installation (Refer to GROUP 25 – Propeller Shaft.)

Removal steps

1. Dust seal guard
2. HI/LO detection switch connector
3. 2WD/4WD detection switch connector
4. Back-up light switch connector
5. Center differential lock detection switch connector

6. Center differential lock operation detection switch connector
7. 4WD operation detection switch
8. Connection for speedometer cable
9. Heat protector
- ◀A▶ 10. Connection for clutch release cylinder
11. Starter motor
12. Starter cover
13. Heat protector
14. Transmission stay
15. Transmission stay
- ◀B▶ 16. Bell housing cover
17. Transfer roll stopper
18. Transfer mounting bracket
19. No. 2 crossmember
20. Engine mounting rear insulator
21. Transfer case protector bracket
22. Mass damper
- ◀C▶ ▶B▶ ▶A▶ 23. Transmission and transfer assembly
24. Control housing
25. Gasket

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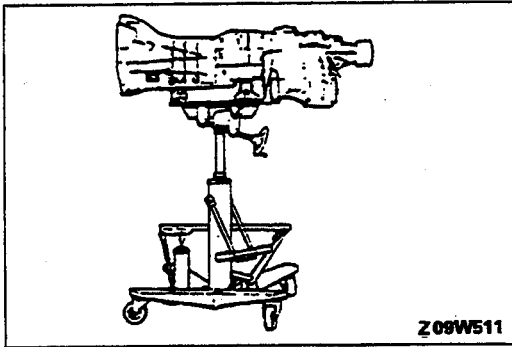
REMOVAL SERVICE POINTS

◀A▶ CLUTCH RELEASE CYLINDER REMOVAL

Remove the clutch release cylinder (with the clutch hose connected to it) from the transmission, and suspend it from the body by using a piece of wire or a similar method.

◀B▶ TRANSFER ROLL STOPPER REMOVAL

Before removing the transfer roll stopper, use a transmission jack to hold the transmission and transfer assembly.

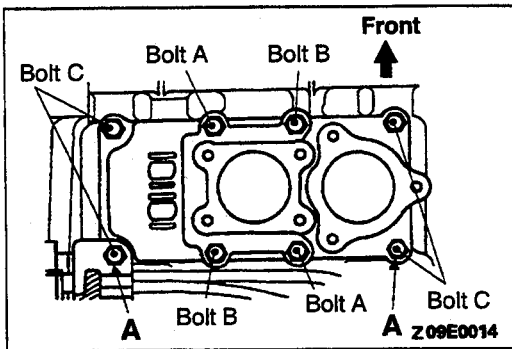


◀C▶ TRANSMISSION AND TRANSFER ASSEMBLY REMOVAL

Caution

When removing the transmission and transfer 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.

- (1) Disconnect the transmission and transfer assembly from the engine by pulling it slowly toward the rear of the vehicle.
- (2) When the transmission and transfer assembly are lowered, tilt the front of the transmission downward and slowly lower forward, while using care to make sure that the rear of the transmission does not interfere with the No. 4 crossmember.



INSTALLATION SERVICE POINTS

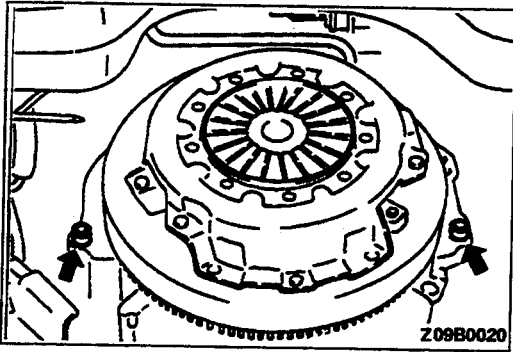
▶A◀ CONTROL HOUSING INSTALLATION

- (1) Remove the adhesive sticking to the control housing mounting bolts at A section.
- (2) Use a tap (M8×1.25) to remove the adhesive sticking to the screw holes at A section.
- (3) Apply specified adhesive to the mounting bolt threads at A section.

Specified adhesive: 3M Stud Locking No. 4170 or equivalent

- (4) The dimensions of the mounting bolts vary according to their mounting locations, so do not confuse them when installing.

Bolt	O.D.×Length mm (in.)	Bolt identification
A	"7" 8×40 (.3×1.6)	
B	"7" 8×40 (.3×1.6) (Reamer bolt)	
C	"7" 8×25 (.3×1.0)	



►B◄ **TRANSMISSION AND TRANSFER ASSEMBLY
INSTALLATION**

On the engine side, there are two centering locations. Make sure that the transmission mounting bolt holes are aligned with them before mounting the transmission and transfer assembly to the engine.

NOTES



AUTOMATIC TRANSMISSION

CONTENTS

110005390

GENERAL INFORMATION	2	Park/Neutral Position Switch Check	47
LUBRICANTS	5	Key Interlock Mechanism Check	49
SEALANTS AND ADHESIVES	6	Selector Lever Operation Check	49
SELECTOR LEVER ASSEMBLY	86	Shift Lock Mechanism Check	50
SERVICE ADJUSTMENT PROCEDURES	44	Speedometer Cable Replacement	51
Adjustment of Park/Neutral Position Switch and Control Cable	48	Throttle Cable Check and Adjustment	45
Automatic Transmission Fluid Change	45	Transfer Oil Inspection and Change	45
Automatic Transmission Fluid Inspection	44	Transfer Oil Seal Replacement	51
Automatic Transmission Fluid Temperature Switch Check	52	2WD/4WD Detection Switch Check	46
Center Differential Lock Detection Switch Check	46	V4AW3 Control Component Check	56
Center Differential Lock Operation Detection Switch Check	46	SERVICE SPECIFICATIONS	5
Converter Stall Test	58	SPECIAL TOOLS	6
E.L.C. 4th Gear Automatic Transmission Control Component Layout	53	TRANSMISSION AND TRANSFER ASSEMBLY	91
4WD Indicator Control Module Check	51	TRANSMISSION CONTROL	82
4WD Operation Detection Switch Check	46	TRANSMISSION FLUID COOLER, HOSES AND PIPES	89
Governor Pressure Test	60	TROUBLESHOOTING <V4AW2>	7
HI/LO Detection Switch Check	46	TROUBLESHOOTING <V4AW3>	13
Hydraulic Pressure Test	59		

GENERAL INFORMATION

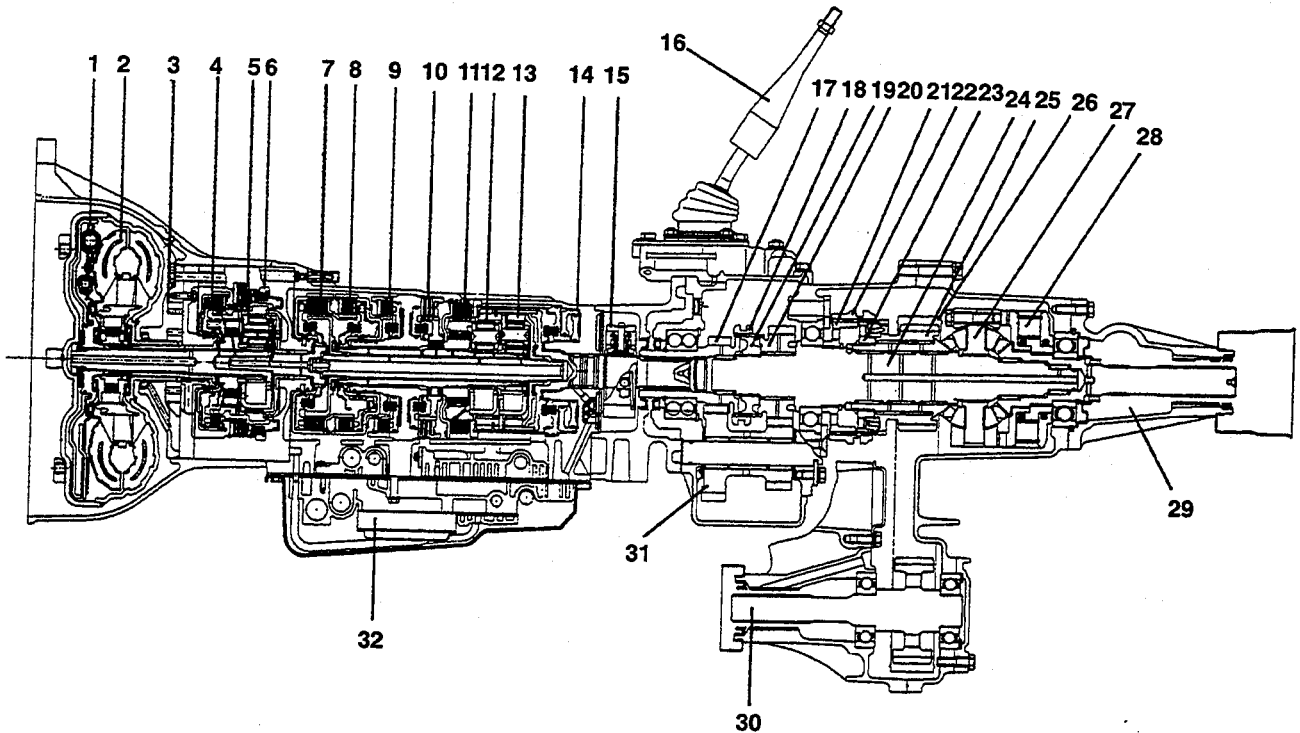
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The automatic transmissions come in two models, namely, V4AW2 and V4AW3.

Items		Specifications	
Model		V4AW2	V4AW3
Torque converter type		With torque converter clutch	With torque converter clutch
Transmission type		4-speed full automatic	Electronically controlled 4-speed full automatic
Control elements	Clutch	Multiple disc type 3 sets	Multiple disc type 3 sets
	Brake	Multiple disc type 4 sets	Multiple disc type 3 sets
	One-way clutch	Sprag type 3 sets	Sprag type 3 sets
Gear ratio	1st gear	2.826	2.804
	2nd gear	1.493	1.531
	3rd gear	1.000	1.000
	4th gear	0.730	0.754
	Reverse	2.703	2.393
Oil pump type		Gear type	Gear type
Oil-cooling system		Air-cooled type and water-cooled type	Air-cooled type and water-cooled type
Transfer type		Active Trac 4WD	Active Trac 4WD
Shift ratios	LOW	1.925	1.925
	HIGH	1.000	1.000
Speedometer gear ratio		V4AW2-7-LEL ... 25/8 V4AW2-7-LFL ... 26/8	V4AW3-7-MGL ... 27/9 V4AW3-7-MHL ... 28/9 V4AW3-7-LIL ... 29/9

SECTIONAL VIEW
V4AW2

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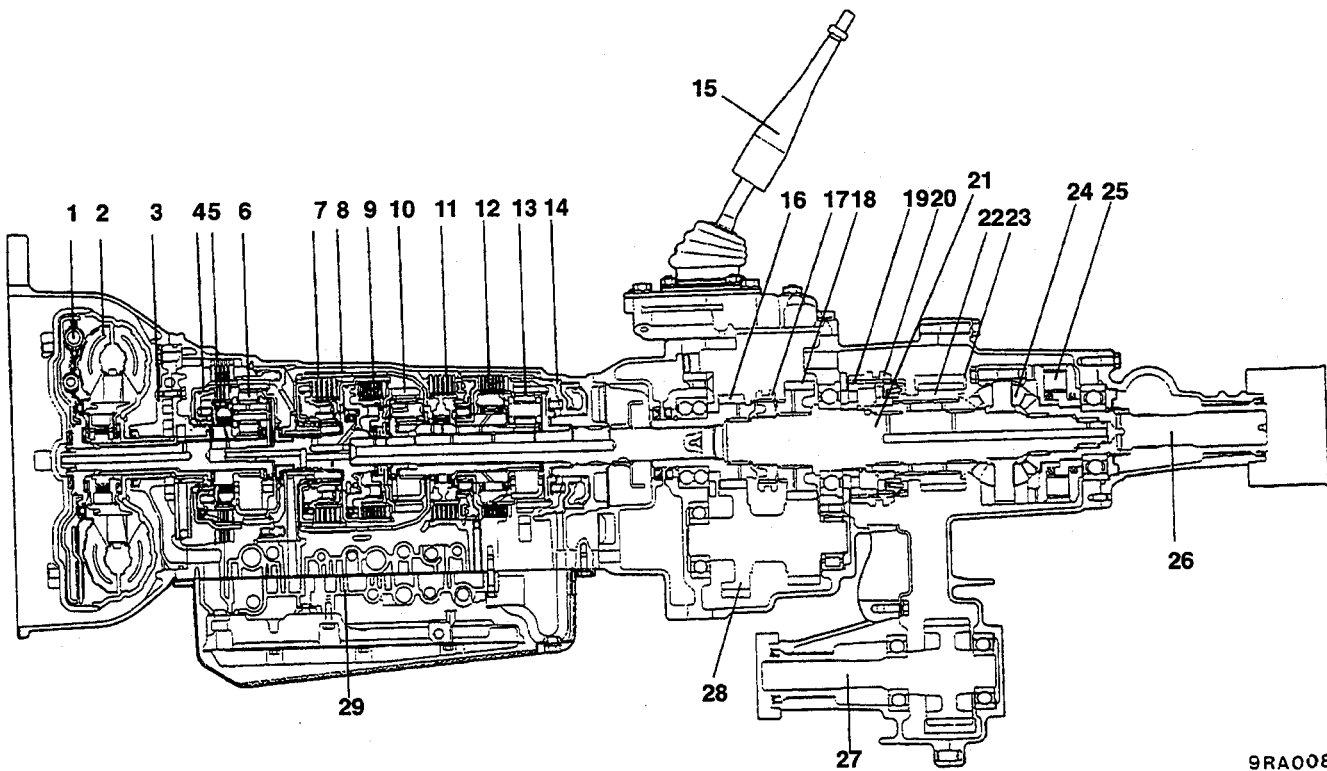
TRA0435

1. Lockup clutch
2. Torque converter
3. Oil pump
4. Overdrive clutch
5. Overdrive brake
6. Overdrive planetary gear
7. Forward clutch
8. Direct clutch
9. Brake No. 1
10. Brake No. 2
11. Brake No. 3
12. Front planetary gear
13. Rear planetary gear
14. Brake No. 3 piston
15. Governor
16. Transfer control lever

17. Input gear
18. High-low sleeve
19. High-low hub
20. Low speed gear
21. Differential lock hub
22. 2WD-4WD synchronizer sleeve
23. 2WD-4WD hub
24. Transfer drive shaft
25. Drive sprocket
26. Chain
27. Center differential
28. Viscous coupling
29. Rear output shaft
30. Front output shaft
31. Counter gear
32. Valve body

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V4AW3



1. Torque converter clutch
2. Torque converter
3. Oil pump
4. Overdrive clutch
5. Overdrive brake
6. Overdrive planetary gear
7. Direct clutch
8. Second coast brake
9. Forward clutch
10. Front planetary gear
11. Second brake
12. First & reverse brake
13. Rear planetary gear
14. First & reverse brake piston
15. Transfer control lever

16. Input gear
17. High-low clutch
18. Low speed gear
19. Differential lock hub
20. 2-4WD synchronizer sleeve
21. Transfer drive shaft
22. Drive sprocket
23. Chain
24. Center differential
25. Viscous coupling
26. Rear output shaft
27. Front output shaft
28. Counter gear
29. Valve body

9RA0085

SERVICE SPECIFICATIONS

110005393

Items		V4AW2	V4AW3
Stall speed (r/min.)		2,100–2,400	2,100–2,600
Governor pressure kPa (psi)	1,000 rpm	140–170 (19.9–24.2)	–
	2,000 rpm	250–290 (35.6–41.2)	–
	3,000 rpm	410–470 (58.3–66.8)	–
Line pressure kPa (psi)	D range When idling	520–600 (74–85)	430–490 (61–70)
	D range During stall	1,100–1,300 (156–185)	1,140–1,390 (162–198)
	R range When idling	790–910 (112–129)	520–620 (74–88)
	R range During stall	1,600–2,000 (228–284)	1,400–1,750 (199–249)
Transmission and transfer assembly	Distance between inner cable stopper and edge of dust cover mm (in.)	0–1 (0–.04)	0–1 (0–.04)

LUBRICANTS

110005394

Items	Specified lubricants	Quantity
Automatic transmission fluid	DIAMOND ATF SP, ATF DEXRON II or equivalent	Approx. 7.2 dm ³ (7.6 qts.) ... V4AW2
	DIAMOND ATF SP, ATF DEXRON II or equivalent	Approx. 8.5 dm ³ (9.0 qts.) ... V4AW3
Transfer oil	Hypoid gear oil SAE 75W-85W conforming to API classification GL-4 or higher	Approx. 2.3 dm ³ (2.4 qts.) ... V4AW2
	Hypoid gear oil SAE 75W-85W conforming to API classification GL-4 or higher	Approx. 2.5 dm ³ (2.4 qts.) ... V4AW3
Transfer control lever assembly O-ring	Hypoid gear oil SAE 75W-85W conforming to API classification GL-4 or higher	Small quantity
Transfer oil seal lip	Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4 or higher	As required
Oil filler pipe O-ring	DIAMOND ATF SP, ATF DEXRON II or equivalent	As required

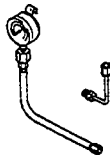

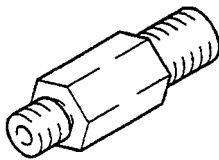
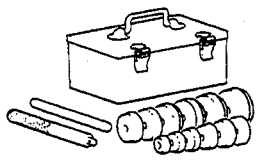

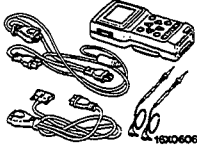

SEALANTS AND ADHESIVES

110005395

Items	Specified sealants and adhesives	
Transmission control	Transfer control lever assembly gasket	3M ATD Part No. 8663 or equivalent
	Stopper plate gasket	3M ATD Part No. 8663 or equivalent
	Transfer control lever assembly mounting bolt	3M Stud Locking No. 4170 or equivalent
Transmission and transfer assembly	Control housing gasket	3M ATD Part No. 8663 or equivalent
	Control housing mounting bolt	3M Stud Locking No. 4170 or equivalent

SPECIAL TOOLS

110005396

Tool	Tool number and name	Supersession	Application
	MD998330 (includes MD998331) Oil pressure gage (3,000 kPa, 427 psi)	MD998330-01	Measurement of oil pressure
	MD999563 (includes MD998331) Oil pressure gage (1,000 kPa, 142 psi)	MD998330-01	
	MD998920 Adapter	MD998920	Connection for oil pressure gage
	MB990925 Bearing and oil seal installer set	MB990925-01	Installation of oil seal MB990938, MB990928 (Refer to GROUP 22 – Special Tools.)
	MB991529 Diagnostic trouble code check terminal	MB991529	Reading the diagnostic trouble codes
	MB991502 Scan tool (MUT-II)	MB991502	Checking of the diagnosis code
 Z16X0807	ROM pack		

TROUBLESHOOTING <V4AW2>

110005397

Automatic transmission malfunctions may be caused by the following conditions:

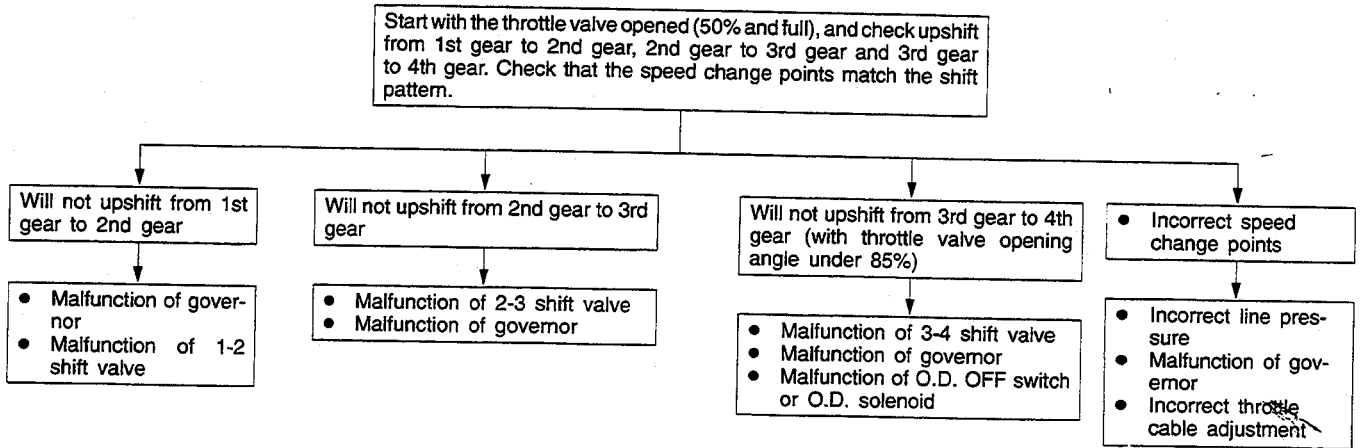
- (1) Improper maintenance and adjustment
- (2) Mechanical malfunctions
- (3) Hydraulic malfunctions
- (4) Poor engine performance

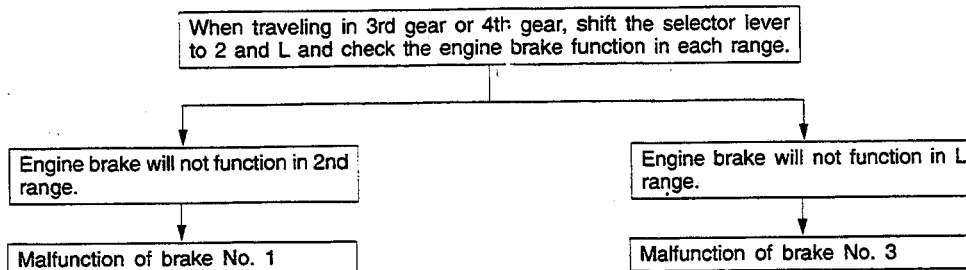
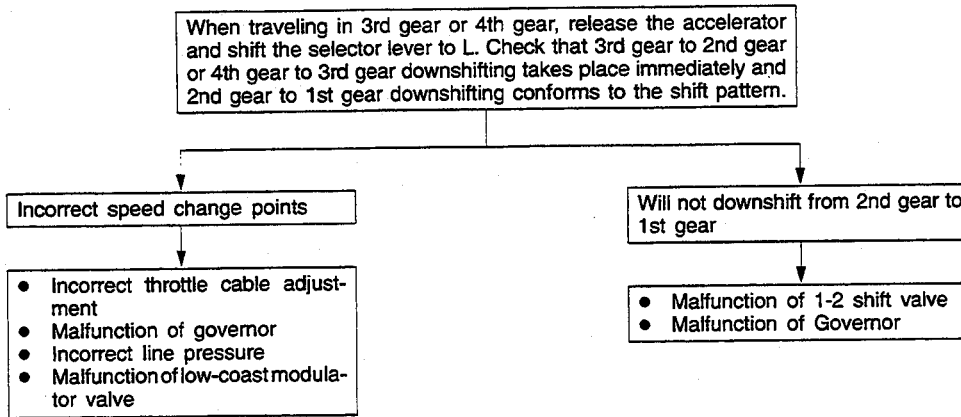
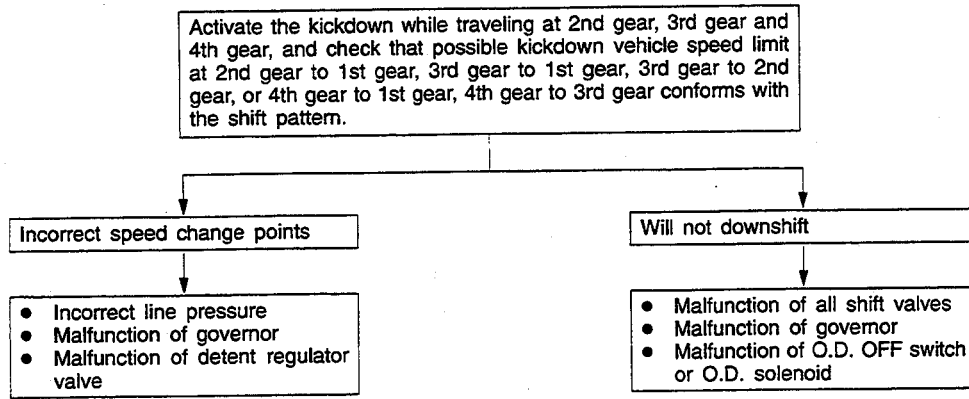
Troubleshooting in the event of any such malfunctions should begin by checking the fluid level, ATF condition, manual linkage adjustment, throttle control cable adjustment and other conditions for which deviation from standards can be readily known. Then, a road test should be carried out to determine 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 carried out for further troubleshooting.

ROAD TEST

Prior to performing the road test, be sure to make basic checks including check and adjustment of fluid level and condition and adjustment of the throttle cable. For the road test, the transfer must be placed in the 2H (2WD-high) position. During the road test, various changes such as slips in transmission and shifting conditions are checked and hence the transmission operation at each shift position must have been checked.

D RANGE TEST





Check for abnormal noise(s) during acceleration and deceleration.
Check for shocks when slipping and changing speed.

Strong shock

- High line pressure
- Malfunction of accumulator
- Malfunction of check ball

Check for abnormal noise(s) or vibration when traveling in 3rd gear or 4th gear.

Strong abnormal noise and vibration

- Incorrect torque converter installation
- Malfunction of oil pump
- Speed change gear wheel not meshing correctly
- Incorrect drive plate installation

NOTE

Abnormal noises and vibrations are often caused by an unbalanced propeller shaft, differential, tire, torque converter, engine etc. Extremely thorough inspection is therefore required.

Check that torque converter clutch ON, OFF and speed change points conforms to the shift pattern.

Torque converter clutch ON, OFF does not conform.

- Malfunction of governor
- Incorrect line pressure

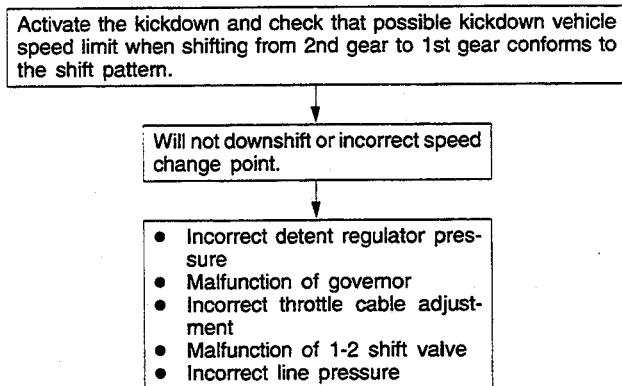
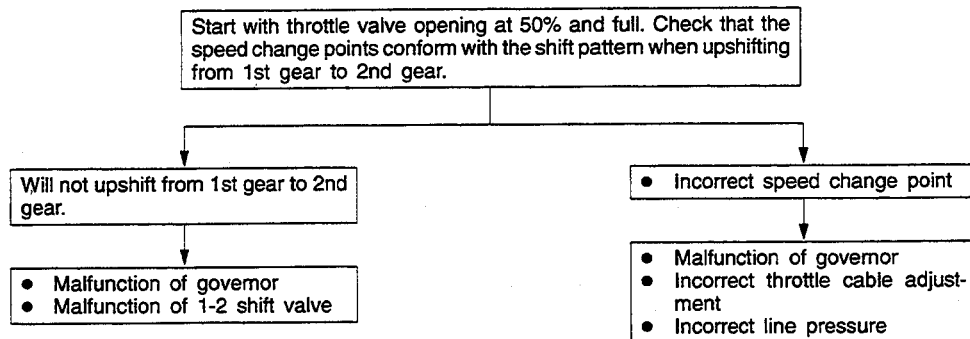
Torque converter clutch does not go ON, OFF.

- Malfunction of torque converter clutch signal valve
- Malfunction of torque converter clutch relay valve
- Malfunction of torque converter clutch

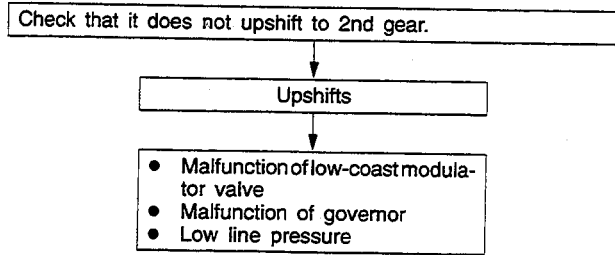
NOTE

- (1) Determine the moment when the torque converter clutch turns on from decreased engine r/min. or by a slight shock back and forth.
- (2) Determine the moment when the torque converter clutch turns off from increased engine r/min..
- (3) Check the lock-up condition by pumping the accelerator slightly. If the engine r/min. rises in accordance with the throttle valve opening angle, the torque converter clutch is off, and if it does not, the clutch is on.
(When the torque converter clutch 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..)

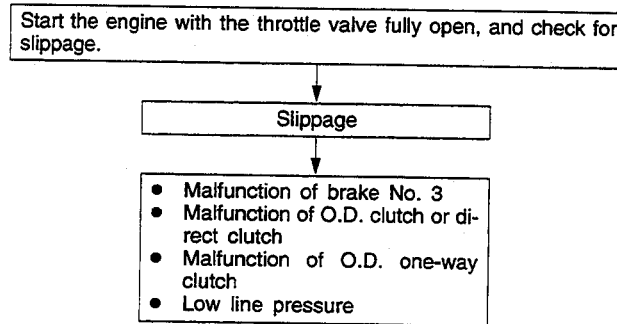
2 RANGE TEST



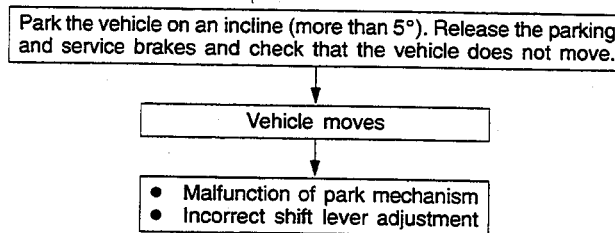
L RANGE TEST



R RANGE TEST

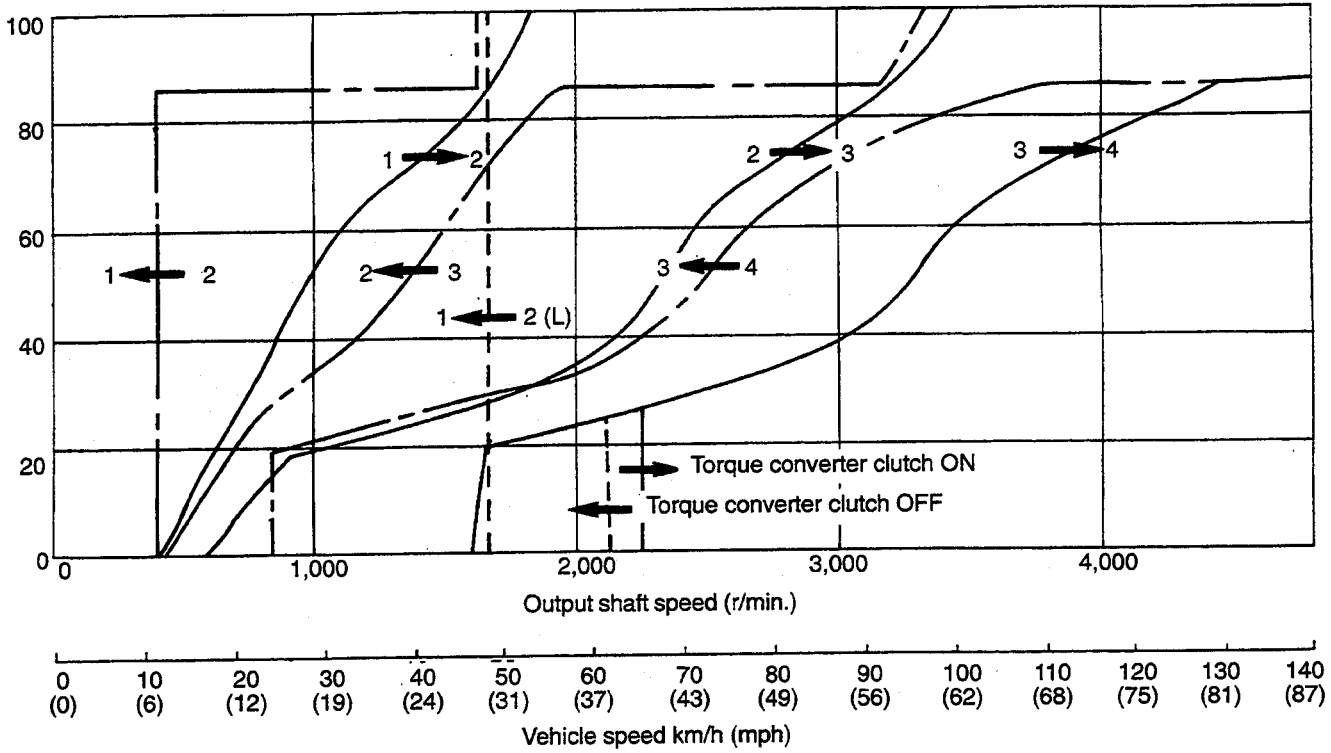


P RANGE TEST



SHIFT PATTERN

Throttle opening angle (%)



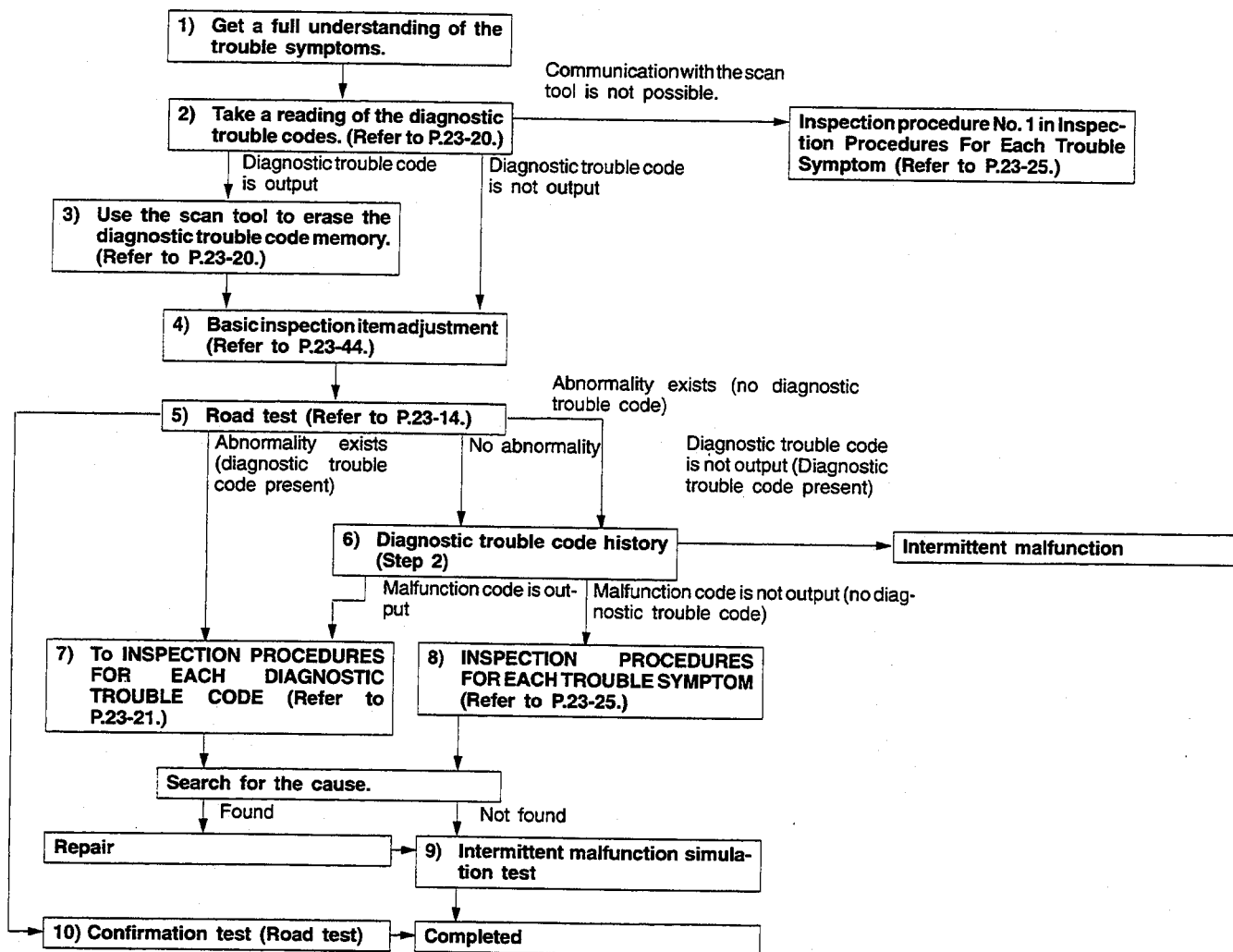
TROUBLESHOOTING <V4AW3>

110005399

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

Malfunctions of the 4 A/T system can be caused by malfunctions or incorrect adjustments of the electronic control system, hydraulic control system or A/T system or a combination of these.

Carry out troubleshooting by the following procedure in order to make effective diagnoses.



- 1) Get a full understanding of the conditions under which the trouble symptoms that the customer is complaining about occur, including frequency of occurrence.
- 2) Use the scan tool to read and make a note of the diagnostic trouble codes (including fail-safe codes). (Refer to P.23-20.)
- 3) Erase the diagnostic trouble codes in order to carry out a road test. (Refer to P.23-20.)
- 4) Carry out adjustment of the basic inspection items (ATF, TPS, park/neutral position switch, throttle cable, etc.). (Refer to P.23-44.)
- 5) Carry out a road test. (Refer to P.23-14.)
Be sure to check that the basic inspection items and all diagnostic trouble codes and conditions of reoccurrence are covered during this test.
- 6) Check that the diagnostic trouble codes which were read before the road test (in step (2) above) are present.
- 7) Determine the probable cause from the Inspection Procedures For Each Diagnostic Trouble Code. (Refer to P.23-21.)
- 8) Determine the probable cause from the Inspection Procedures For Each Trouble Symptom. (Refer to P.23-25.)
- 9) Carry out a intermittent malfunction simulation test. (Refer to GENERAL – How To Use This Manual.)
- 10) After repairs are completed, carry out a road test to check that the malfunction has been repaired.

TSB Revision

ROAD TEST (Transfer Lever Position: 4H Range)

110005400

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page
1	Ignition switch: ON Engine: Stopped	Overdrive switch (1) ON (2) OFF	★ Data List No. 35 (1) O.D. (2) O.D.-OFF	Overdrive switch	Overdrive switch system (P.23-36)
		Pattern select switch (1) Power (2) Hold	★ Data List No. 36 (1) Power (2) Hold	Pattern select switch	Pattern select switch system (P.23-36)
		Selector lever position (1) P (2) R (3) N (4) D (5) 2 (6) L	★ Data List No. 37 (1) P, R, D (2) P, R, D (3) N (4) P, R, D (5) 2 (6) L	Park/neutral position switch	Park/neutral position switch system (P.23-35)
		Brake pedal (1) Depressed (2) Released	★ Data List No. 28 (1) ON (2) OFF	Stop lamp switch	Stop lamp switch system (P.23-37)
2	Ignition switch: ST Engine: Stopped	Engine starting test in P and N positions	Starting should be possible	Starting	Does not move (P.23-27)
					Malfunction of lock-up (P.23-34)
3	Warming up	(1) When engine is cold	★ Data List No. 29 (1) ON (2) OFF	Engine coolant temperature switch	Engine coolant temperature switch system (P.23-37)
		(2) Drive for 15 minutes or more so that the ATF temperature becomes 70–90°C (158–194°F).	★ Data List No. 15 (2) 70–90°C (158–194°F)	Oil temperature sensor	Oil temperature sensor system (P.23-38)
4	Engine: Idling Selector lever position: N	Accelerator pedal (1) Fully closed (2) Depressed (3) Fully open (up to 2 seconds)	★ Data List No. 11 (1) 0–5% (2) Gradually rises (1) (3) 85–100%	TPS	Code No. 11–TPS system (P.23-22)
		Selector lever operation (1) N to D shift (2) N to R shift	Should be no abnormal shifting shocks Time lag should be within 2 seconds	Does not move	Does not move forward or reverse (P.23-27)
					Does not move forward only. (P.23-27)
					Does not reverse only (P.23-28)
Shock	Large shocks (P.23-32)				

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page
5	Engine: Idling (Vehicle stopped) Selector lever position: D Mode selection: Normal	Accelerator pedal (1) Fully closed	★ Data List No. 27 (1) 1st	Shift solenoid No. 1	Code Nos. 41, 42—Shift solenoid No. 1 system (P.23-23)
				Shift solenoid No. 2	Code Nos. 43, 44—Shift solenoid No. 2 system (P.23-24)
6	Selector lever position: D Mode selection: Normal Overdrive: OFF	Engine (1) Idling (Vehicle stopped) (2) Driving at 10 km/h (6 mph) (3) Driving at a constant speed of 50 km/h (31 mph) (20 seconds or more) (4) Driving at a constant speed of 40 km/h (24 mph) with the selector lever in 2 range	★ Data List No. 27 (1) 1st (2) 1st (3) 3rd (4) 2nd	Shift solenoid No. 1	Code Nos. 41, 42—Shift solenoid No. 1 system (P.23-23)
				Shift solenoid No. 2	Code Nos. 43, 44—Shift solenoid No. 2 system (P.23-24)
			★ Data List No. 32 (1) 0 km/h (0 mph) (2) 7–13 km/h (4–8 mph) (3) 42–58 km/h (26–36 mph) (4) 33–47 km/h (20–29 mph)	A/T speed sensor	A/T speed sensor system (P.23-22)
			★ Data List No. 41 (2) ON (3) OFF (4) ON	Shift solenoid No. 1	Code Nos. 41, 42—Shift solenoid No. 1 system (P.23-23)
			★ Data List No. 43 (2) OFF (3) ON (4) ON	Shift solenoid No. 2	Code Nos. 43, 44—Shift solenoid No. 2 system (P.23-24)
			★ Data List No. 47 (2) OFF (3) ON (3) Acceleration should be smooth with no abnormal vibration.	malfunction of lock-up solenoid when shifting	Code Nos. 47, 48—Lock-up solenoid (P.23-24) Shifting point abnormality (P.23-30)
					Slippage (vibration) (P.23-33)
7	Selector lever position: D Mode selection: Normal Overdrive: ON	Engine (1) Driving at a constant speed of 50 km/h (31 mph) (20 seconds or more)	★ Data List No. 27 (1) 4	Shift solenoid No. 1	Code Nos. 41, 42—Shift solenoid No. 1 system (P.23-23)
				Shift solenoid No. 2	Code Nos. 43, 44—Shift solenoid No. 2 system (P.23-24)
			★ Data List No. 41 (1) OFF	Shift solenoid No. 1	Code Nos. 41, 42—Shift solenoid No. 1 system (P.23-23)
			★ Data List No. 43 (1) OFF	Shift solenoid No. 2	Code Nos. 43, 44—Shift solenoid No. 2 system (P.23-24)

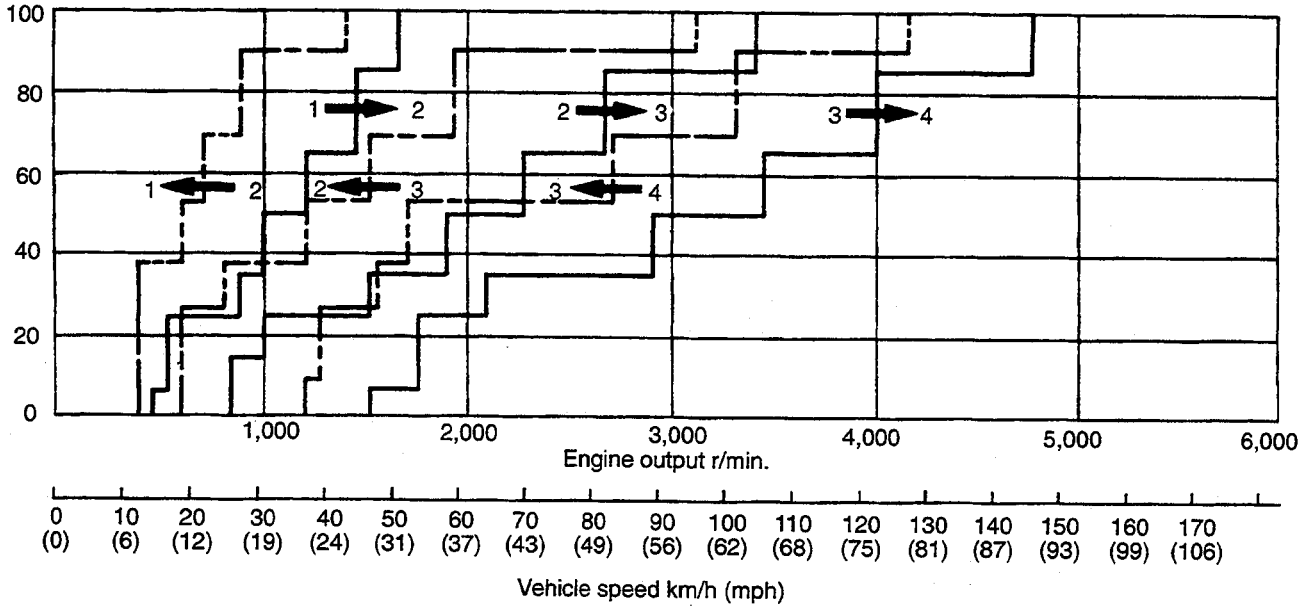
Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page			
8	Selector lever position: D Mode selection: Normal Overdrive: ON • Carry out the same test with the mode selection at POWER and HOLD also.	Monitor scan tool data list Nos. 11, 27 and 32.	(1), (2) and (3) should match the specified output shaft speed (vehicle speed), and there should be no abnormal shocks. For (4), (5) and (6), downshifting should occur immediately after moving the lever.	Abnormality while shifting	Upshifting does not occur (P.23-28)			
		(1) TPS: Accelerate to 4th gear at opening angle of 30%.			Downshifting does not occur (P.23-29)			
		(2) Slowly decelerate to a standstill.			Shifting point abnormality (P.23-30)			
		(3) TPS: Accelerate to 4th gear at opening angle of 50%.			Upshifting occurs spontaneously (P.23-30)			
								Incorrect drive gear position (P.23-31)
						Malfunction while driving	Large shocks (P.23-32)	
		(4) At 50 km/h (30 mph) in 4th gear, turn the overdrive OFF.			Slippage (vibration) (P.23-33)			
		(5) At 50 km/h (30 mph) in 3 range, move the selector lever to 2 range.			Malfunction of lock-up (P.23-34)			
(6) At 20 km/h (12 mph) in 2 range, move the selector lever to L range.		Abnormal engine braking (P.23-34)						

SHIFT PATTERN

110005401

<3.5L engine>
Normal pattern

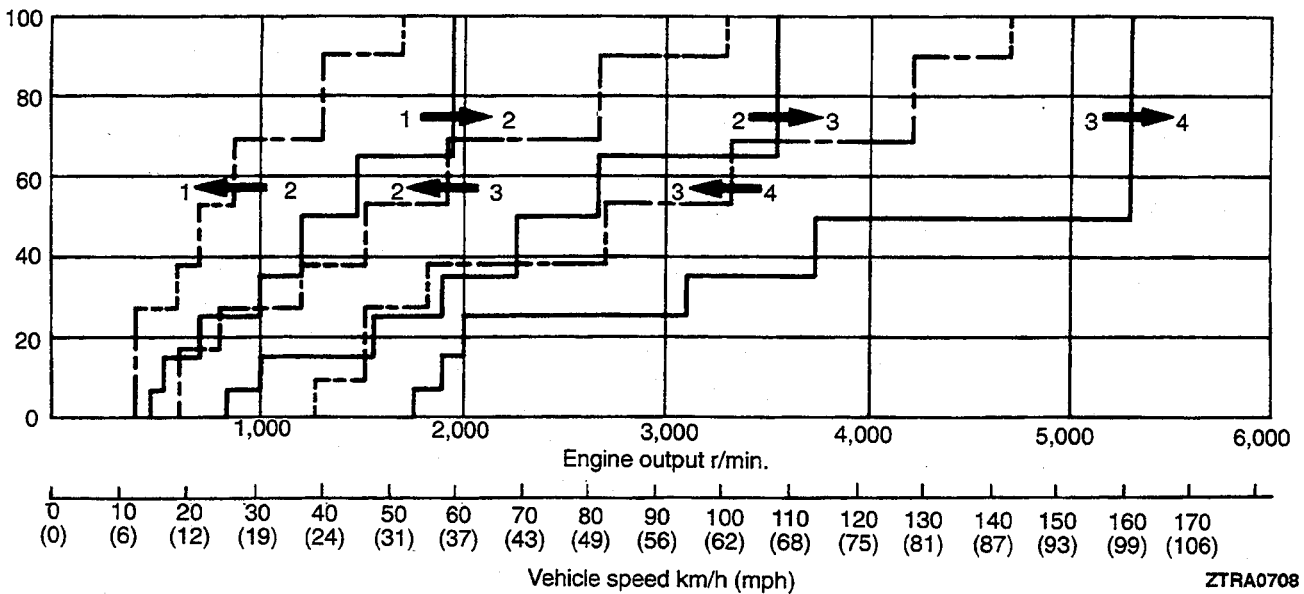
Throttle opening angle (%)



ZTRA0707

Power pattern

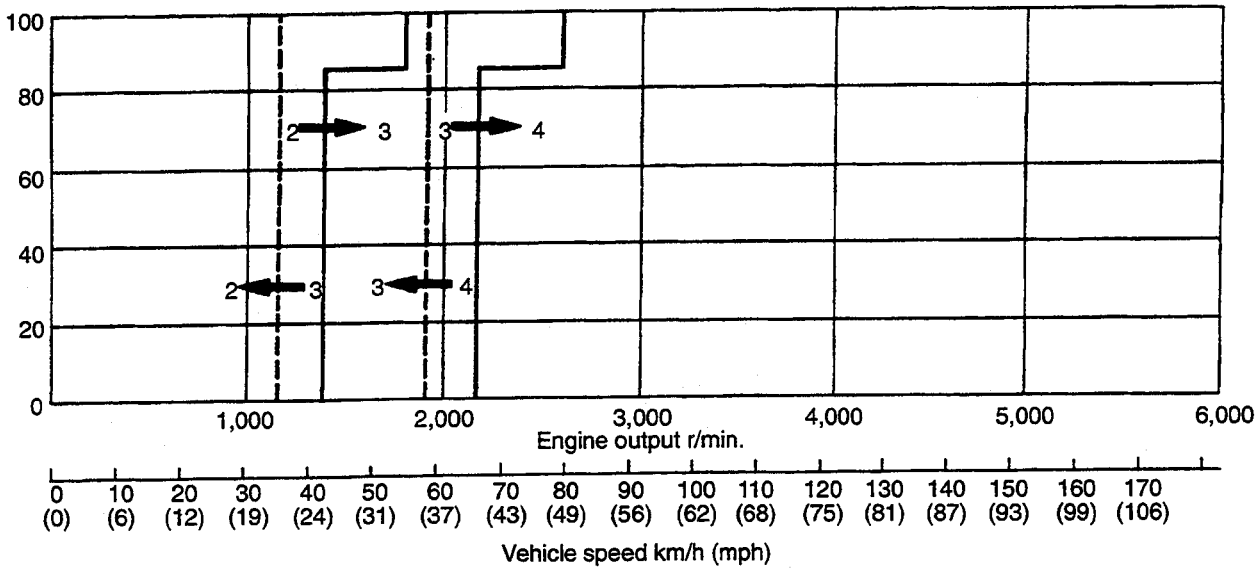
Throttle opening angle (%)



ZTRA0708

Hold pattern

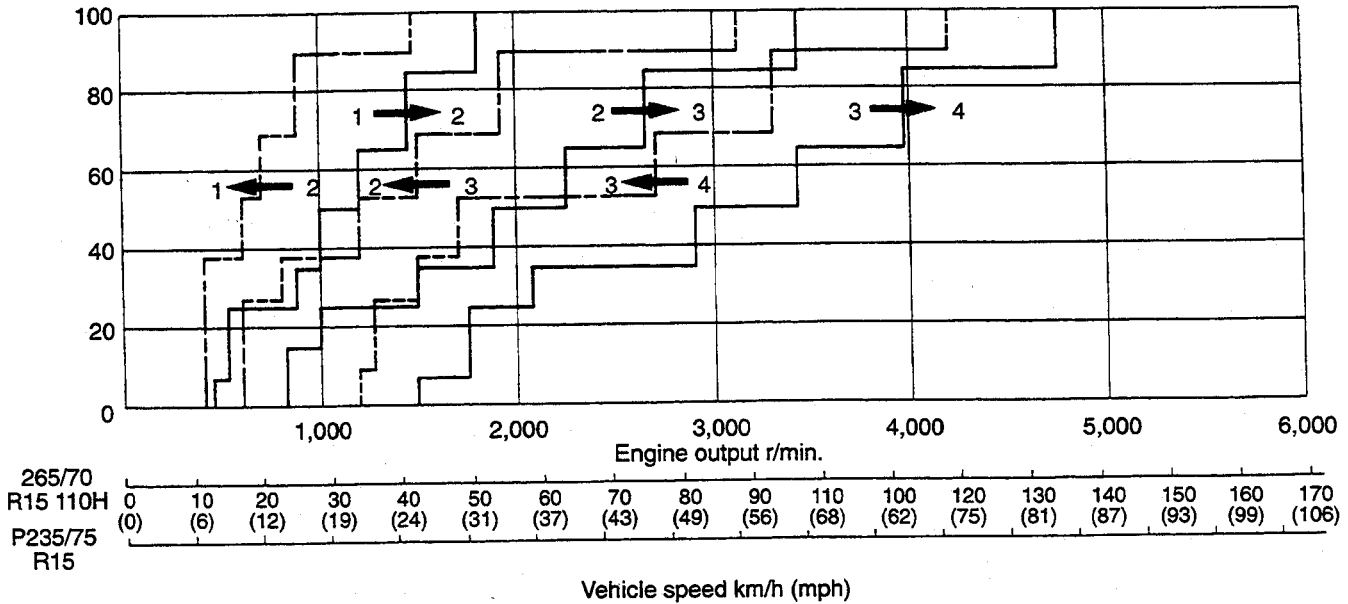
Throttle opening angle (%)



ZTRA0709

<3.0L 24VALVE engine>
Normal pattern

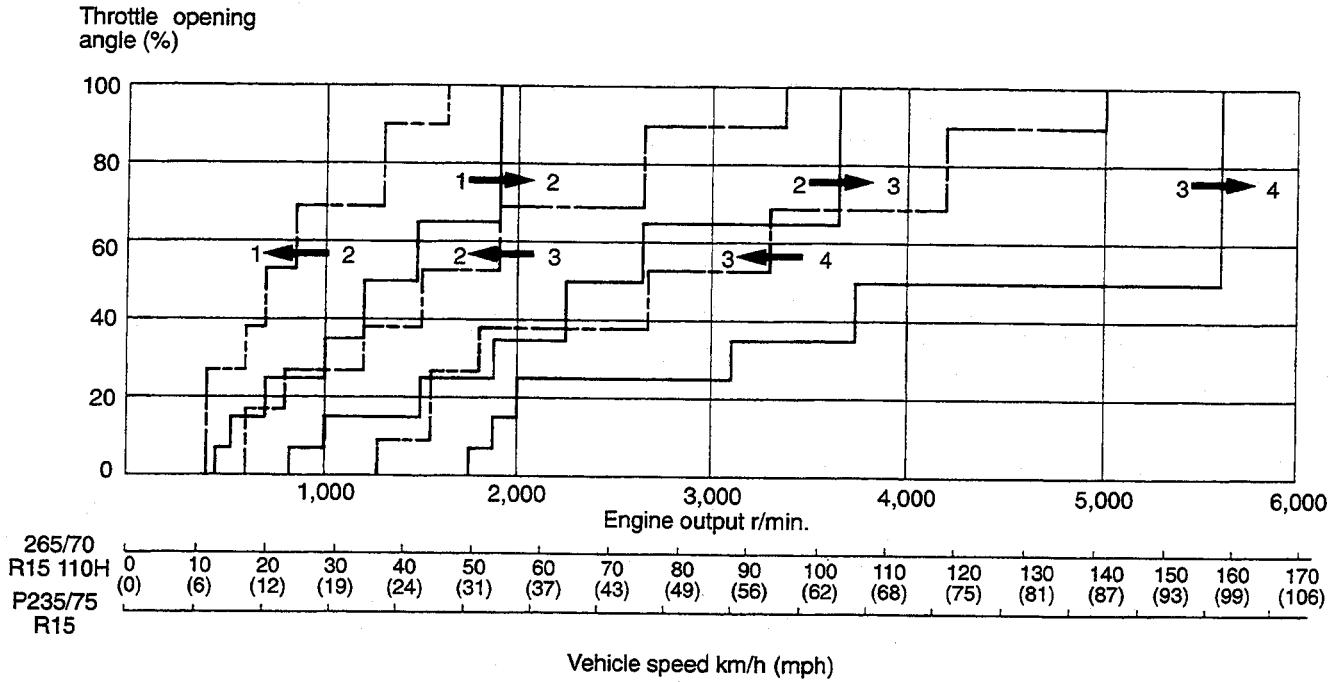
Throttle opening angle (%)



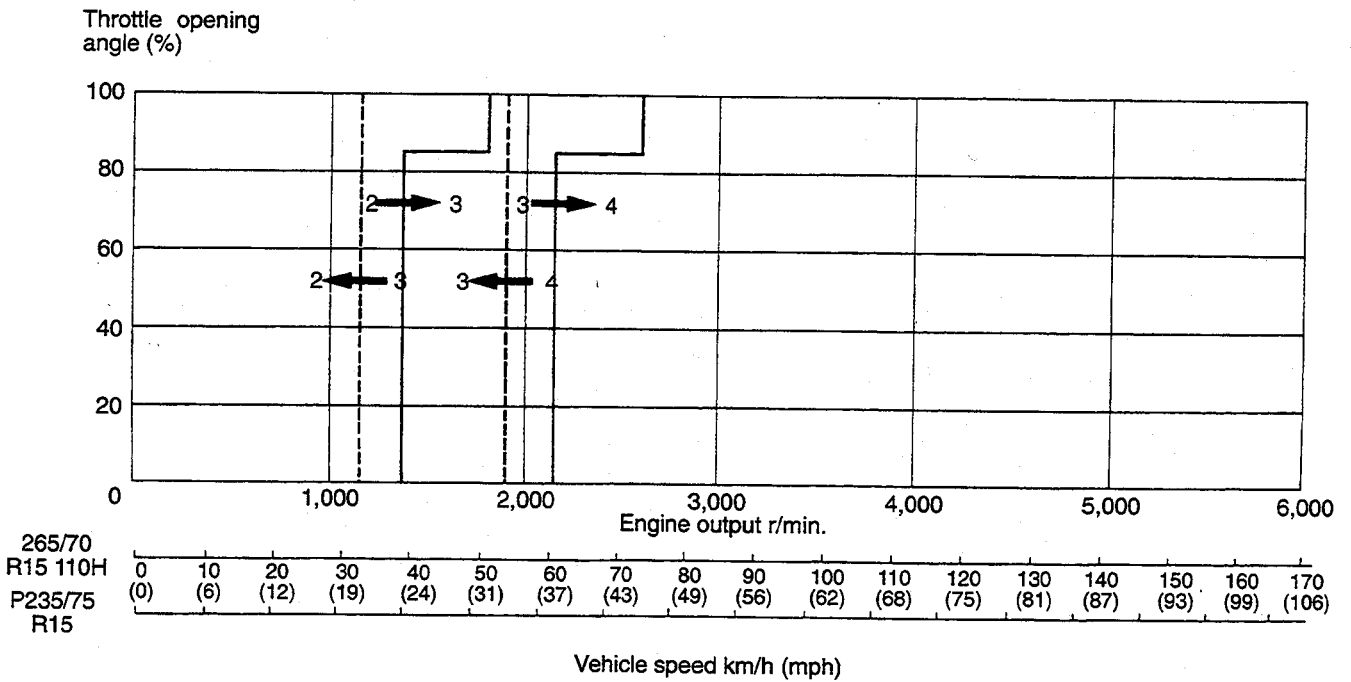
265/70
R15 110H
P235/75
R15

TRA0821

Power pattern



Hold pattern



TSB Revision

DIAGNOSTIC FUNCTIONS

110005402

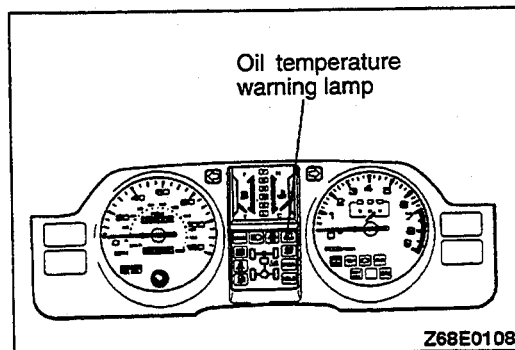
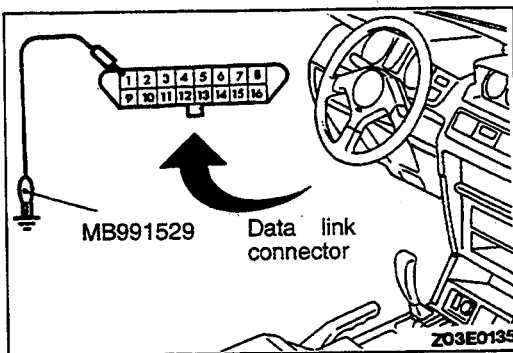
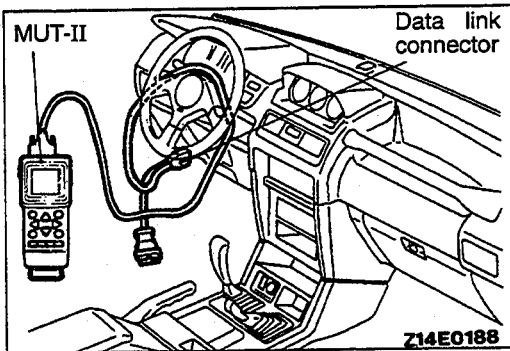
PRECAUTIONS BEFORE SERVICE

- (1) If the battery positive voltage is low, diagnostic trouble codes will not be output. Accordingly, check the battery before carrying out inspection.
- (2) If the battery is disconnected or if the engine control module connector is disconnected, the diagnostic trouble code memory will be erased. Accordingly, the battery should not be disconnected until reading of the diagnostic trouble codes has been completed.

READING THE DIAGNOSTIC TROUBLE CODES**<When using the scan tool>****Caution**

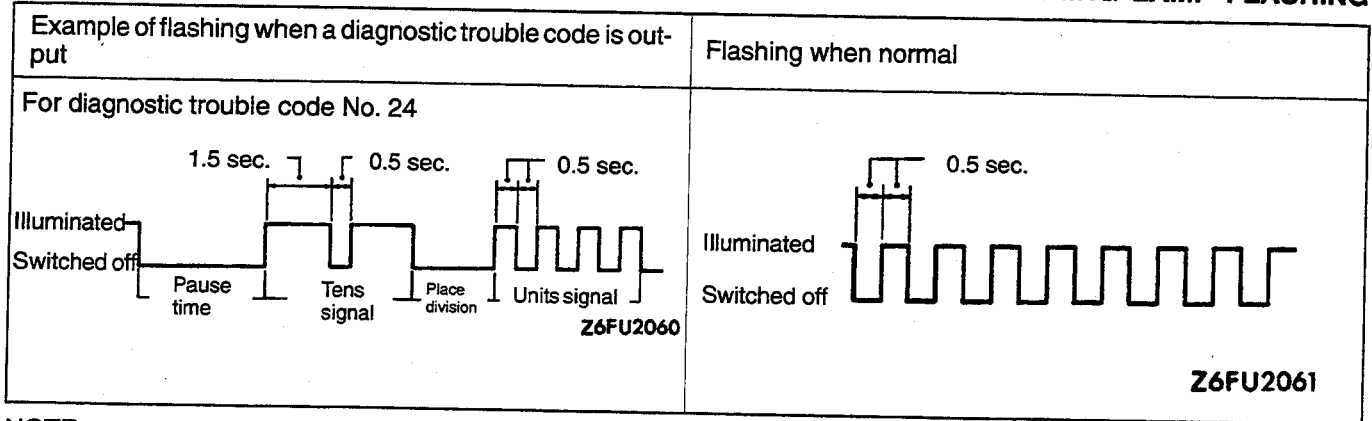
Turn the ignition switch OFF before connecting or disconnecting the scan tool.

- (1) Connect the scan tool to the data link connector.
- (2) Turn the ignition switch to the ON position.
- (3) Take a reading of the diagnostic trouble code output.
- (4) Repair the malfunction location while referring to the Inspection Procedures For Each Diagnostic Trouble Code.
- (5) Turn the ignition switch to OFF and then back to ON again.
- (6) Erase the diagnostic trouble codes.
- (7) Check that the diagnostic trouble code output is normal.

**<When using the oil temperature warning lamp>**

- (1) Use the special tool (diagnostic trouble code check harness) to ground terminal No. 1 of the data link connector.
- (2) Take a reading of the diagnostic trouble codes from the flashing of the oil temperature warning lamp.
- (3) Repair the malfunction location while referring to the Chart Classified by Diagnostic Trouble Codes.
- (4) Erase the diagnostic trouble codes by the following procedure.
 - 1) Turn the ignition switch to OFF.
 - 2) After disconnecting the battery cable from the negative battery terminal for 10 seconds or more, re-connect the cable.
 - 3) Turn the ignition switch to ON, take a reading of the diagnostic trouble code output and check that a normal code is output.
 - 4) After the engine has warmed up, run it at idle for about 10 minutes.

UNDERSTANDING DIAGNOSIS RESULT BY THE OIL TEMPERATURE WARNING LAMP FLASHING



NOTE

Other diagnostic trouble codes also are output by the flashing of the check warning lamp corresponding to the same code numbers as when using the scan tool.

CHART CLASSIFIED BY DIAGNOSTIC TROUBLE CODES

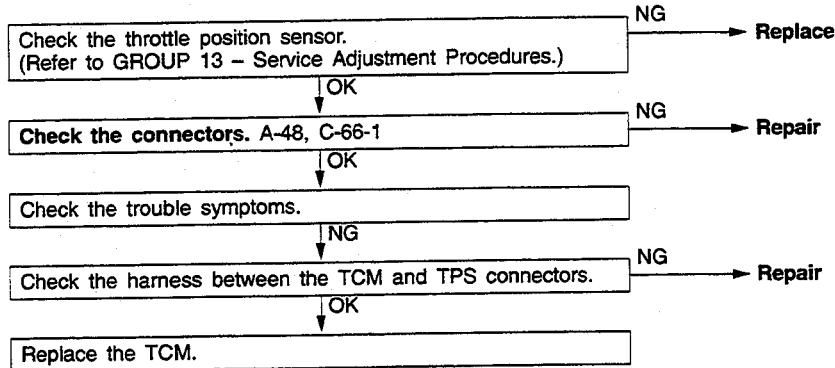
110005403

Code	Diagnostic item		Reference page
11	Throttle position sensor system	Malfunction of sensor Open or short-circuit	P.23-22
32	A/T speed sensor	Open circuit	P.23-22
38	Vehicle speed sensor	Open circuit	P.23-23
41	Shift solenoid No. 1 system	Open circuit	P.23-23
42	Shift solenoid No. 1 system	Short-circuit	P.23-23
43	Shift solenoid No. 2 system	Open circuit	P.23-24
44	Shift solenoid No. 2 system	Short-circuit	P.23-24
47	Lock-up solenoid system	Open circuit	P.23-24
48	Lock-up solenoid system	Short-circuit	P.23-24

TO INSPECTION PROCEDURES FOR EACH DIAGNOSTIC TROUBLE CODE

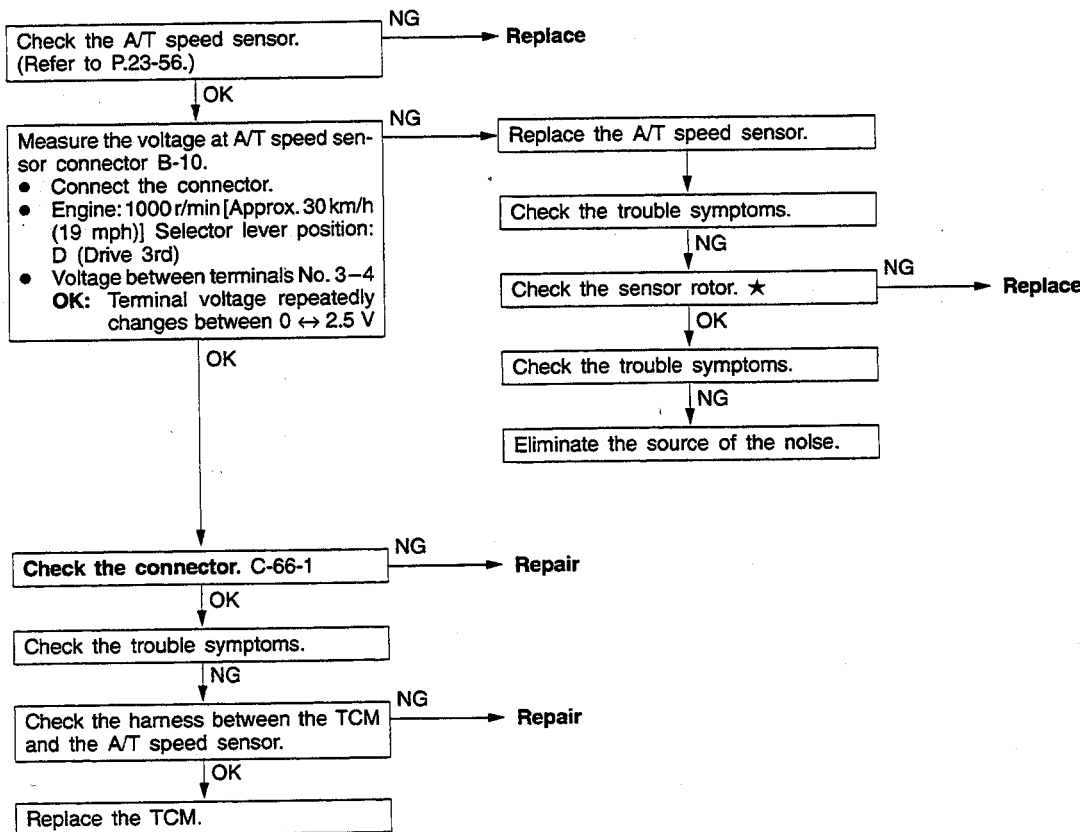
110005404

Code No. 11 Throttle position sensor system	Probable cause
<p>[Comment] If the TPS output becomes 4.95 V or more, TPS output is excessive, and if the TPS output becomes 0.09 V or less, TPS output is insufficient. In both cases, diagnostic trouble code No. 11 is output.</p>	<ul style="list-style-type: none"> ● Malfunction of throttle position sensor ● Malfunction of connector ● Malfunction of TCM

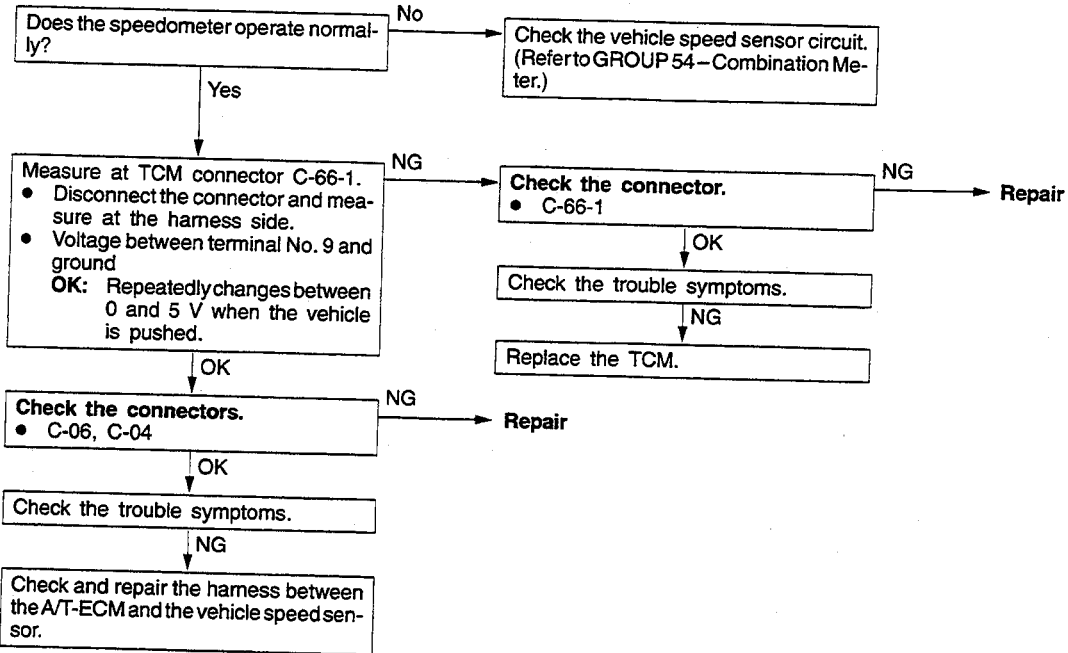


Code No. 32 A/T speed sensor	Probable cause
<p>[Comment] If the vehicle moves 800 m or more while there is no output from the A/T speed sensor during the time that four pulses are input from the vehicle speed sensor, then there is judged to be an open circuit in the A/T speed sensor, and diagnostic trouble code No. 32 is output.</p>	<ul style="list-style-type: none"> ● Malfunction of A/T speed sensor ● Malfunction of connector ● Malfunction of sensor rotor ● Malfunction of TCM ● Noise generated

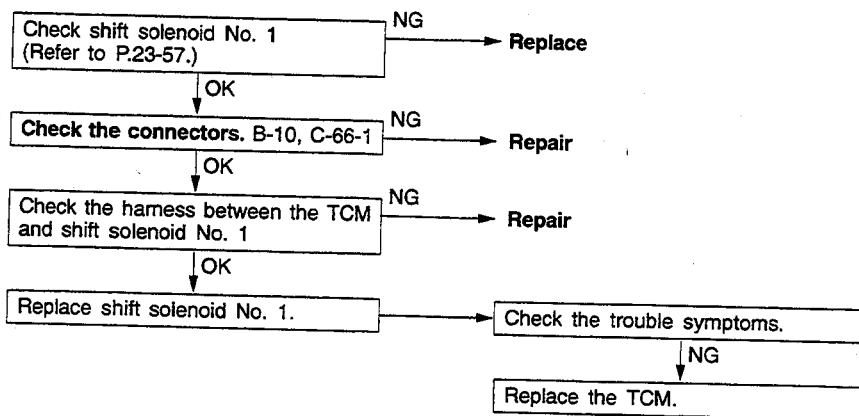
★ : Refer to the Transmission Workshop Manual.



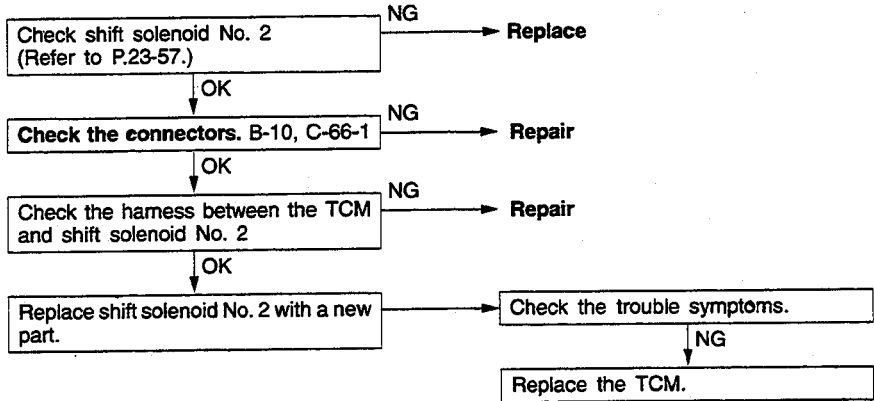
Code No. 38 Vehicle speed sensor system	Probable cause
<p>[Comment] If the vehicle moves 800 m or more while there is no output from the vehicle speed sensor during the time that 13 pulses (when the transfer control lever is at HIGH) or 25 pulses (when the transfer control lever is at LOW) are input from the A/T speed sensor, then there is judged to be an open circuit in the vehicle speed sensor, and diagnostic trouble code No. 38 is output.</p>	<ul style="list-style-type: none"> • Malfunction of vehicle speed sensor • Malfunction of connector • Malfunction of TCM



Code Nos. 41, 42 Shift solenoid No. 1 system	Probable cause
<p>[Comment] If the resistance value of shift solenoid No. 1 is large, there is an open circuit in shift solenoid No. 1 and diagnostic trouble code No. 41 is output. If the resistance value is small, there is a short-circuit in shift solenoid No. 1 and diagnostic trouble code No. 42 is output.</p>	<ul style="list-style-type: none"> • Malfunction of shift solenoid No. 1 • Malfunction of connector • Malfunction of TCM



Code Nos. 43, 44 Shift solenoid No. 2 system	Probable cause
<p>[Comment] If the resistance value of shift solenoid No. 2 is large, there is an open circuit in shift solenoid No. 2 and diagnostic trouble code No. 43 is output. If the resistance value is small, there is a short-circuit in shift solenoid No. 2 and diagnostic trouble code No. 44 is output.</p>	<ul style="list-style-type: none"> ● Malfunction of shift solenoid No. 2 ● Malfunction of connector ● Malfunction of TCM



Code Nos. 47, 48 Lock-up solenoid system	Probable cause
<p>[Comment] If the resistance value of the lock-up solenoid is large, there is an open circuit in the lock-up solenoid and diagnostic trouble code No. 47 is output. If the resistance value is small, there is a short-circuit in the lock-up solenoid and diagnostic trouble code No. 48 is output.</p>	<ul style="list-style-type: none"> ● Malfunction of lock-up solenoid ● Malfunction of connector ● Malfunction of TCM

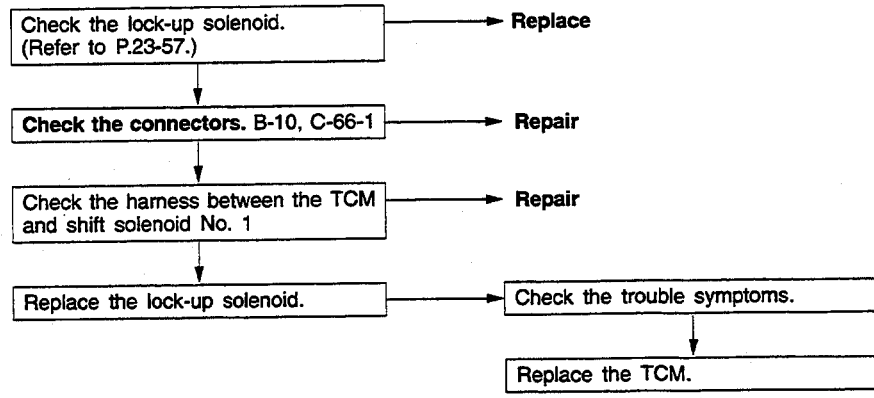


CHART CLASSIFIED BY TROUBLE SYMPTOMS

110005405

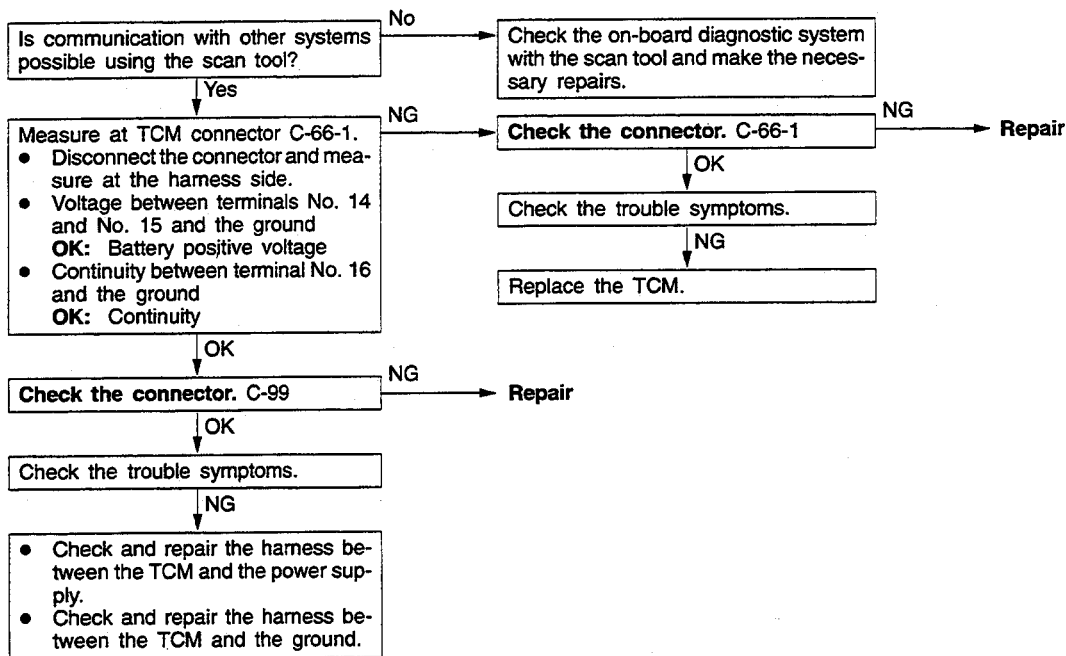
Trouble symptom		Inspection procedure No.	Reference page
Communication with the scan tool is not possible.		1	P.23-26
Does not move	Does not move forward or reverse	2	P.23-27
	Does not move forward only	3	P.23-27
	Does not reverse only	4	P.23-28
Malfunction when shifting	Upshifting does not occur	5	P.23-28
	Downshifting does not occur	6	P.23-29
	Shifting point abnormality	7	P.23-30
	Upshifting occurs spontaneously	8	P.23-30
	Incorrect drive gear position	9	P.23-31
Large shocks		10	P.23-32
Slippage (vibration)		11	P.23-33
Malfunction of lock-up		12	P.23-34
Abnormal engine braking		13	P.23-34
Electronic circuit systems	Park/neutral position switch system	14	P.23-35
	Pattern select switch system	15	P.23-36
	Overdrive switch system	16	P.23-36
	Stop lamp switch system	17	P.23-37
	Engine coolant temperature switch system	18	P.23-37
	Oil temperature sensor system	19	P.23-38

INSPECTION PROCEDURES FOR EACH TROUBLE SYMPTOM

110005406

INSPECTION PROCEDURE 1

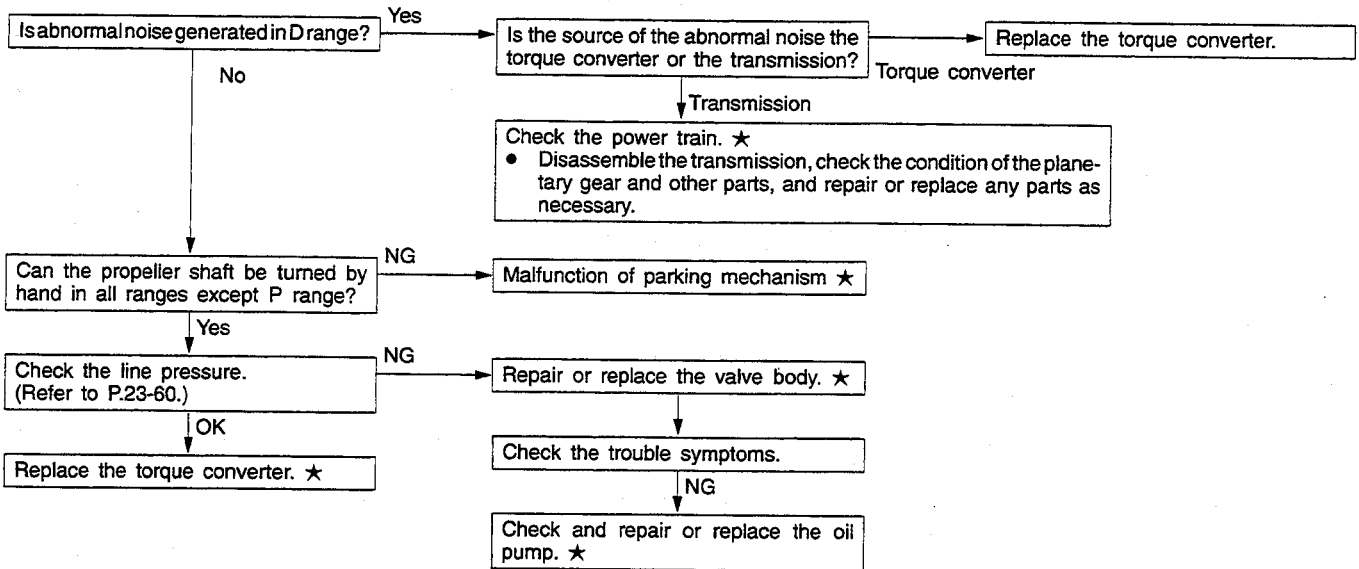
● Communication with the scan tool is not possible.	Probable cause
<p>[Comment] If communication with the scan tool is not possible, the cause is probably a malfunction in the on-board diagnostic system or the TCM is not functioning.</p>	<ul style="list-style-type: none"> ● Malfunction of on-board diagnostic system ● Malfunction of TCM power circuit ● Malfunction of TCM ground circuit ● Malfunction of TCM



INSPECTION PROCEDURE 2

● Does not move forward or reverse	Probable cause
<p>[Comment] When the engine is idling, the vehicle does not move forward or back even if the selector lever is shifted from N to D, 2, L or R. In such cases, the cause is probably abnormal line pressure or a malfunction of the torque converter, oil pump, parking mechanism or the power train.</p>	<ul style="list-style-type: none"> ● Abnormal line pressure ● Malfunction of power train ● Malfunction of oil pump ● Malfunction of valve body ● Malfunction of parking mechanism ● Malfunction of torque converter

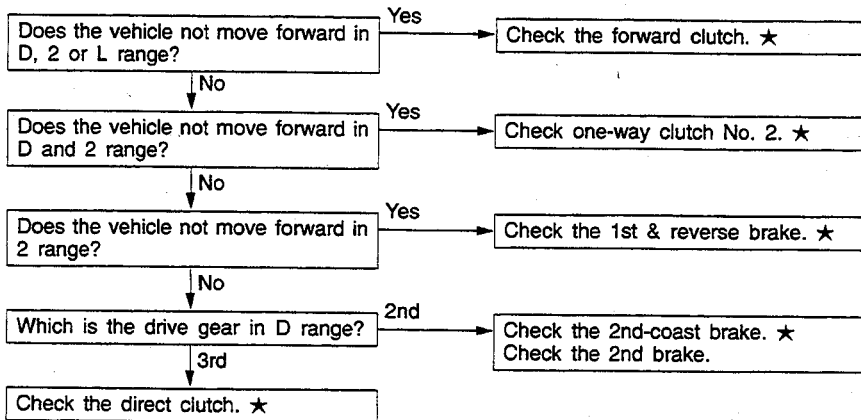
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 3

● Does not move forward only	Probable cause
<p>[Comment] When the engine is idling, the vehicle does not move forward even if the selector lever is shifted from N to D, 2 or L. In such cases, the cause is probably a malfunction of the clutch or brake.</p>	<ul style="list-style-type: none"> ● Malfunction of forward clutch ● Malfunction of direct clutch ● Malfunction of one-way clutch No. 2 ● Malfunction of 2nd-coast brake ● Malfunction of 2nd brake ● Malfunction of 1st & reverse brake

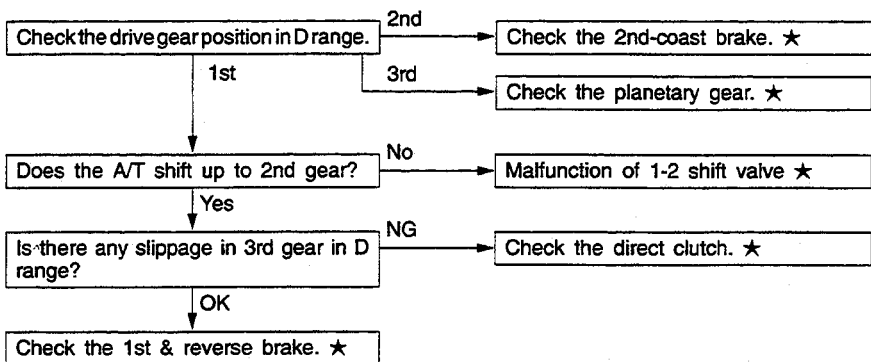
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 4

● Does not reverse only	Probable cause
<p>[Comment] When the engine is idling, the vehicle does not reverse even if the selector lever is shifted from N to R. In such cases, the cause is probably a malfunction of a clutch, brake or the valve body.</p>	<ul style="list-style-type: none"> ● Malfunction of 2nd-coast brake ● Malfunction of direct clutch ● Malfunction of 1st & reverse brake ● Malfunction of valve body ● Malfunction of planetary gear

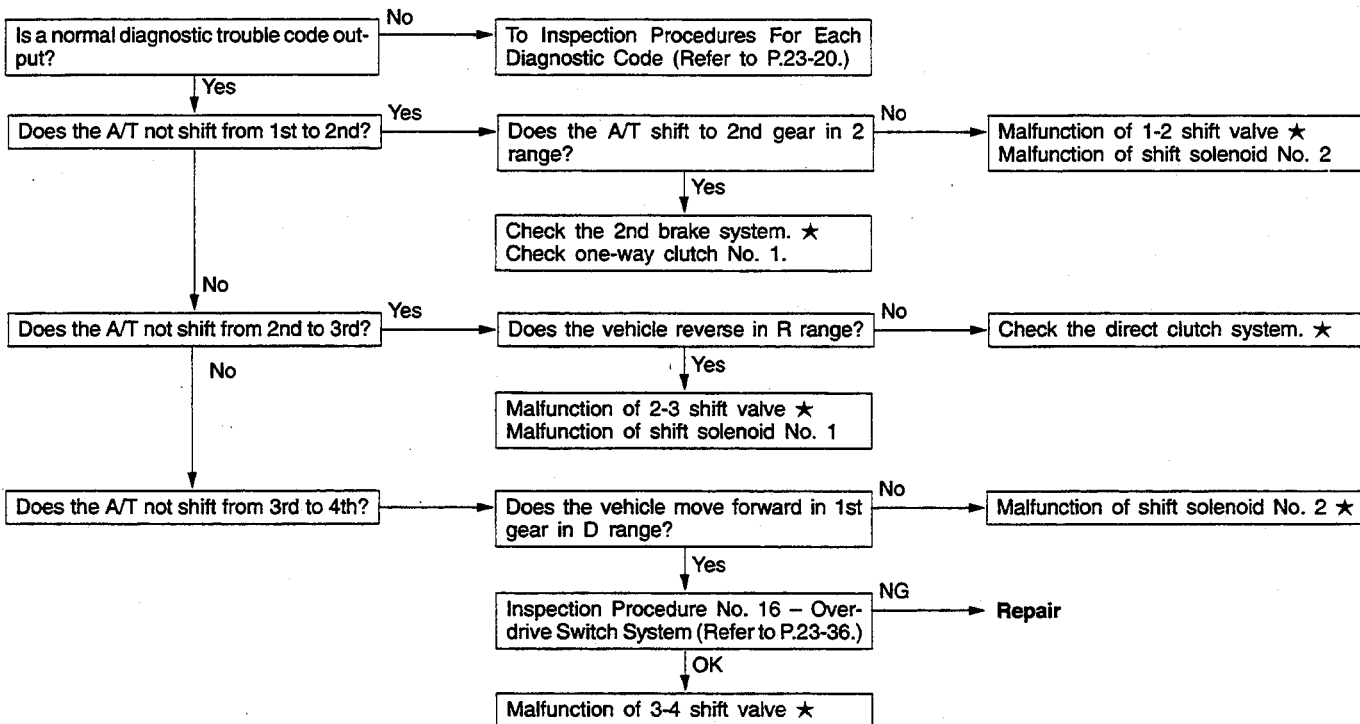
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 5

● Upshifting does not occur	Probable cause
<p>[Comment] Upshifting does not occur under conditions when upshifting should occur. Check shifting from 1st to 2nd, 2nd to 3rd and 3rd to 4th respectively.</p>	<ul style="list-style-type: none"> ● Shift solenoid ● TCM ● Power train internal parts

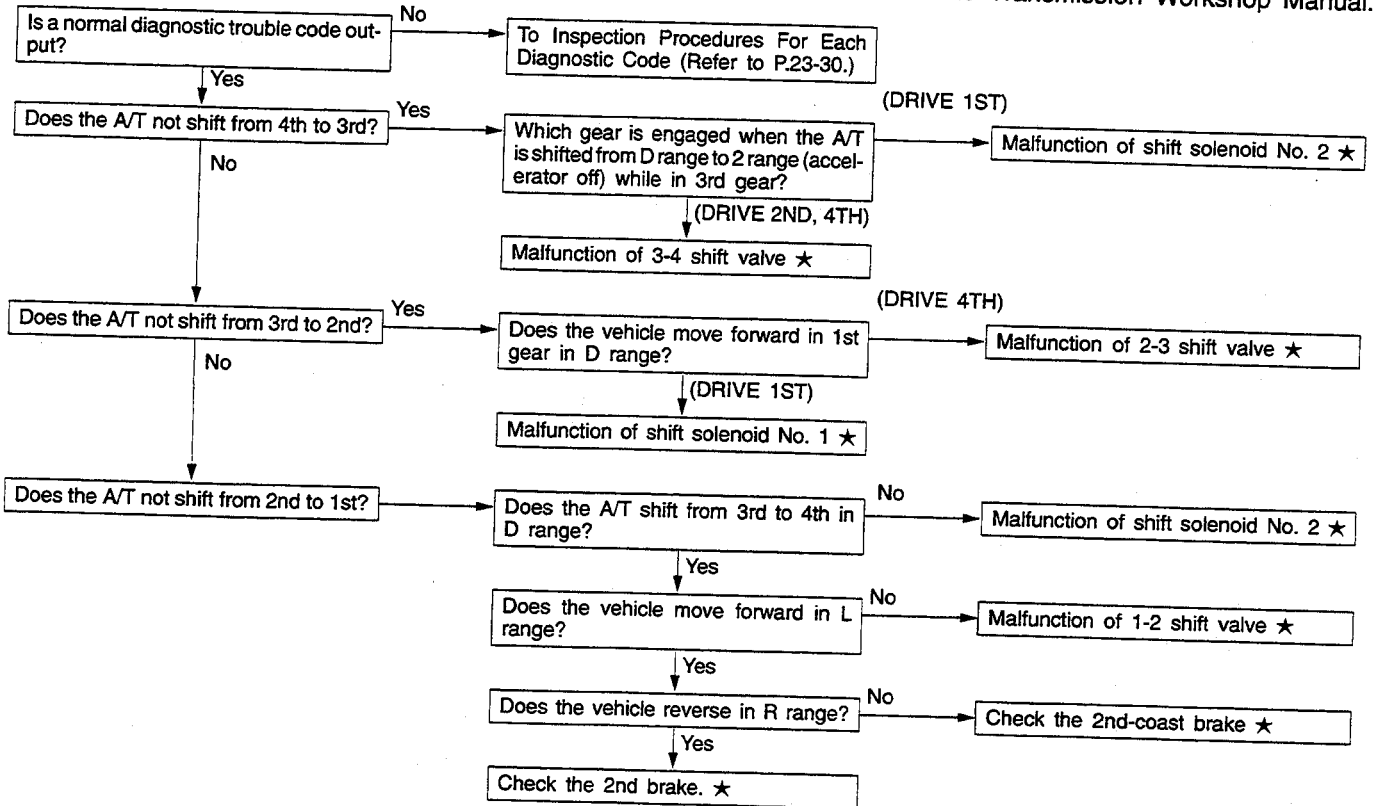
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 6

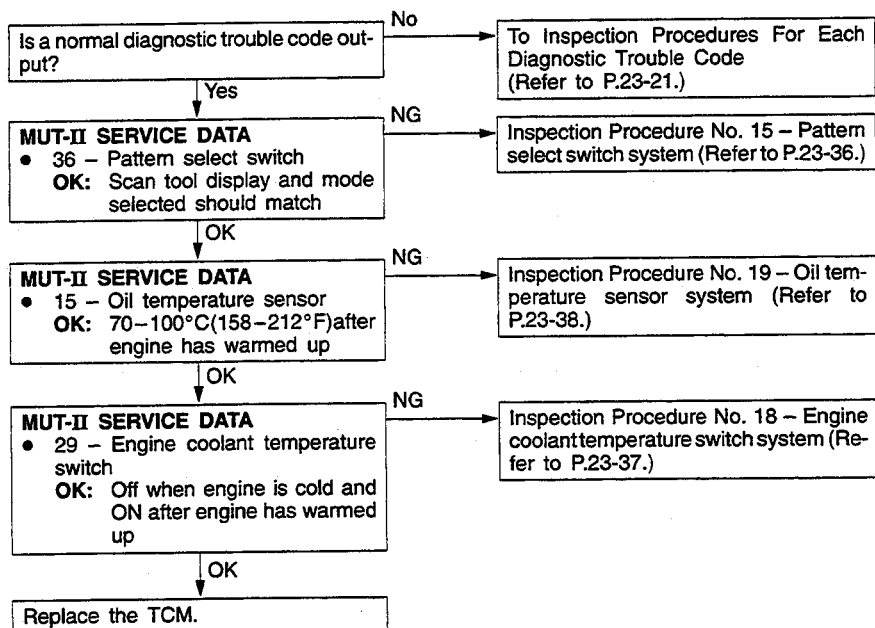
● Downshifting does not occur	Probable cause
[Comment] Downshifting does not occur under conditions when downshifting should occur. Check shifting from 2nd to 1st, 3rd to 2nd and 4th to 3rd respectively.	<ul style="list-style-type: none"> ● Shift solenoid ● TCM ● Power train internal parts

★ : Refer to the Transmission Workshop Manual.



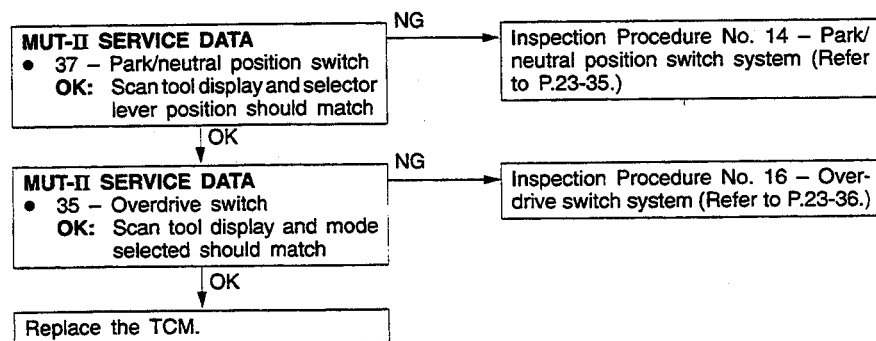
INSPECTION PROCEDURE 7

● Shifting point abnormality	Probable cause
<p>[Comment] Shifting occurs at points which are different from the shift pattern. Note that the shift pattern will vary in different modes and at high oil temperatures.</p>	<ul style="list-style-type: none"> ● Throttle (lever) position sensor ● Vehicle speed sensor (Main) ● Oil temperature sensor ● Pattern select switch ● Engine coolant temperature switch ● TCM



INSPECTION PROCEDURE 8

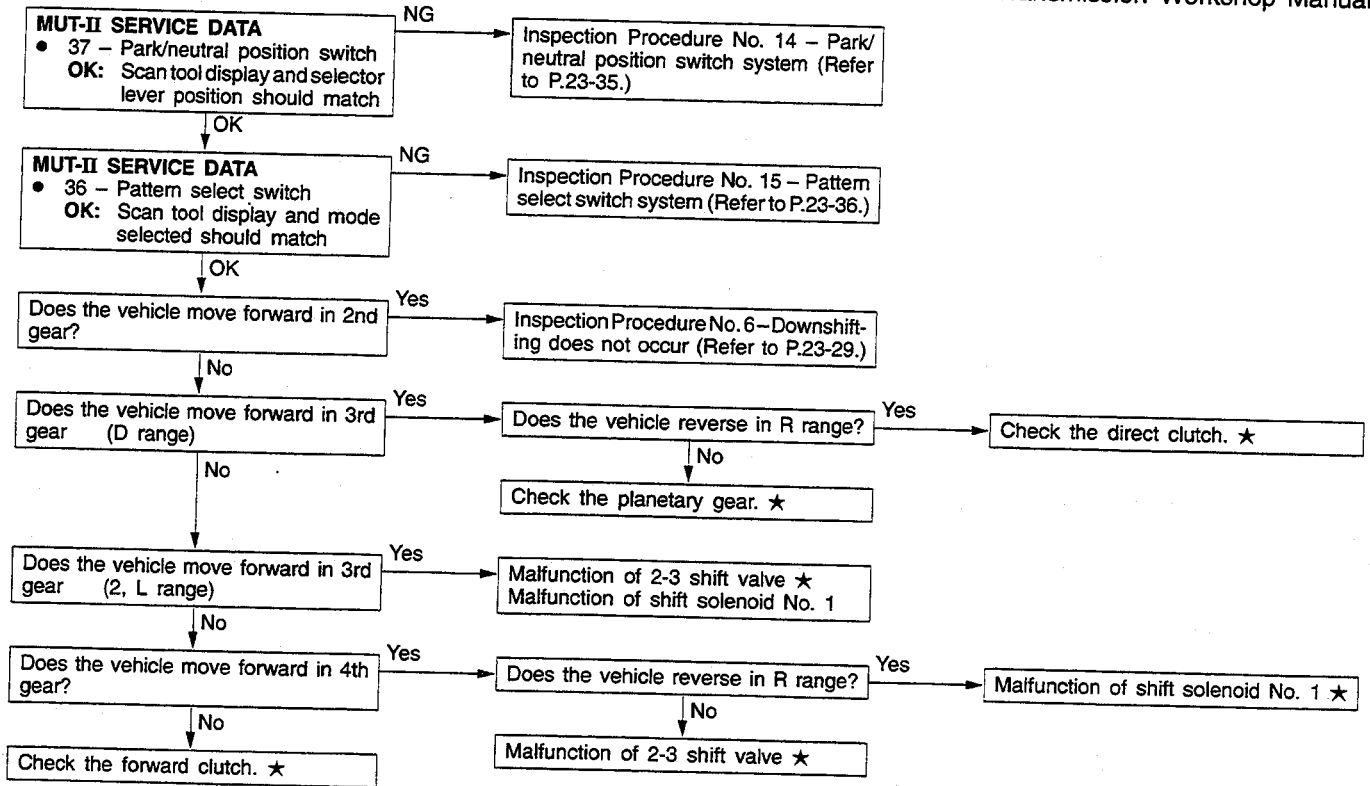
● Upshifting occurs spontaneously	Probable cause
<p>[Comment] Upshifting occurs in ranges where upshifting should not occur, such as when in 2nd gear in L range, 3rd gear in 2 range or 4th gear in D range when the O.D. switch is off.</p>	<ul style="list-style-type: none"> ● Park/neutral position switch ● Overdrive switch ● TCM



INSPECTION PROCEDURE 9

● Incorrect drive gear position	Probable cause
[Comment] Vehicle starts off in 2nd, 3rd or 4th gear when in D range. Often occurs when starting off is not smooth.	<ul style="list-style-type: none"> ● Park/neutral position switch ● Pattern select switch ● Direct clutch ● Planetary gear ● Valve body

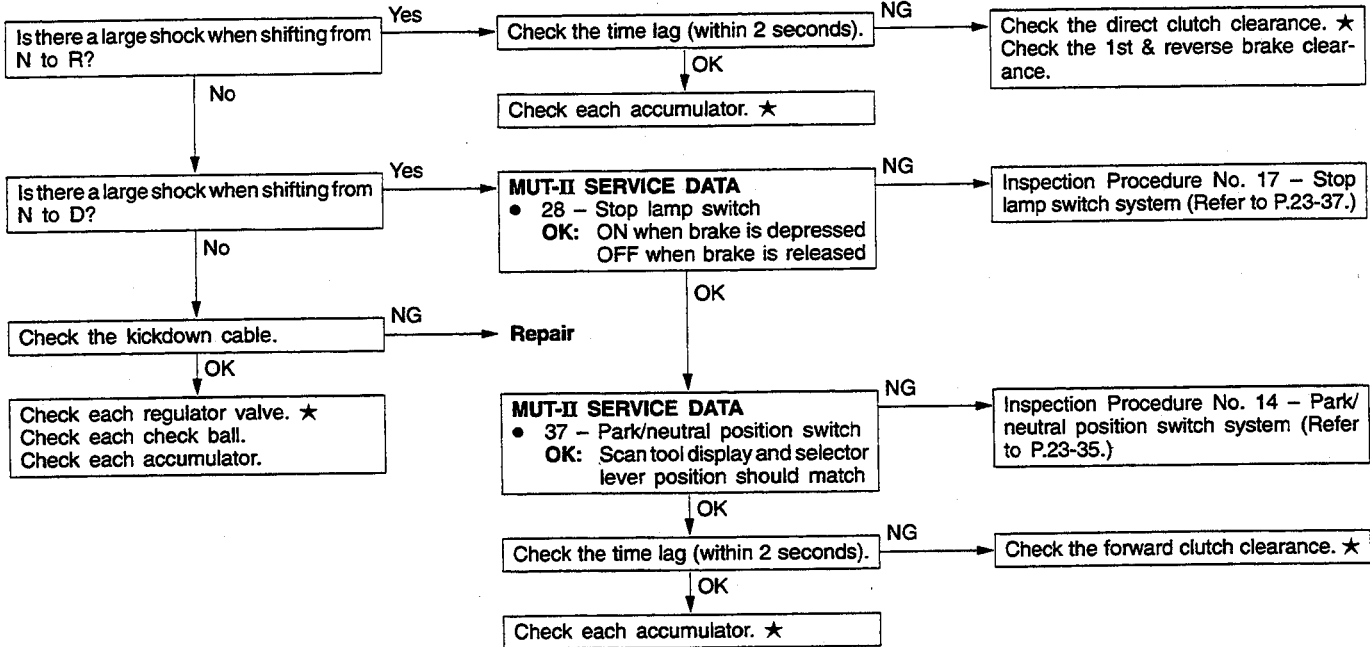
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 10

● Large shocks	Probable cause
[Comment] Shocks accompany shifting from N to D, N to R and during each upshift and downshift.	<ul style="list-style-type: none"> ● Direct clutch ● 1st & reverse brake ● Stop lamp switch ● Park/neutral position switch ● Forward clutch ● Valve body

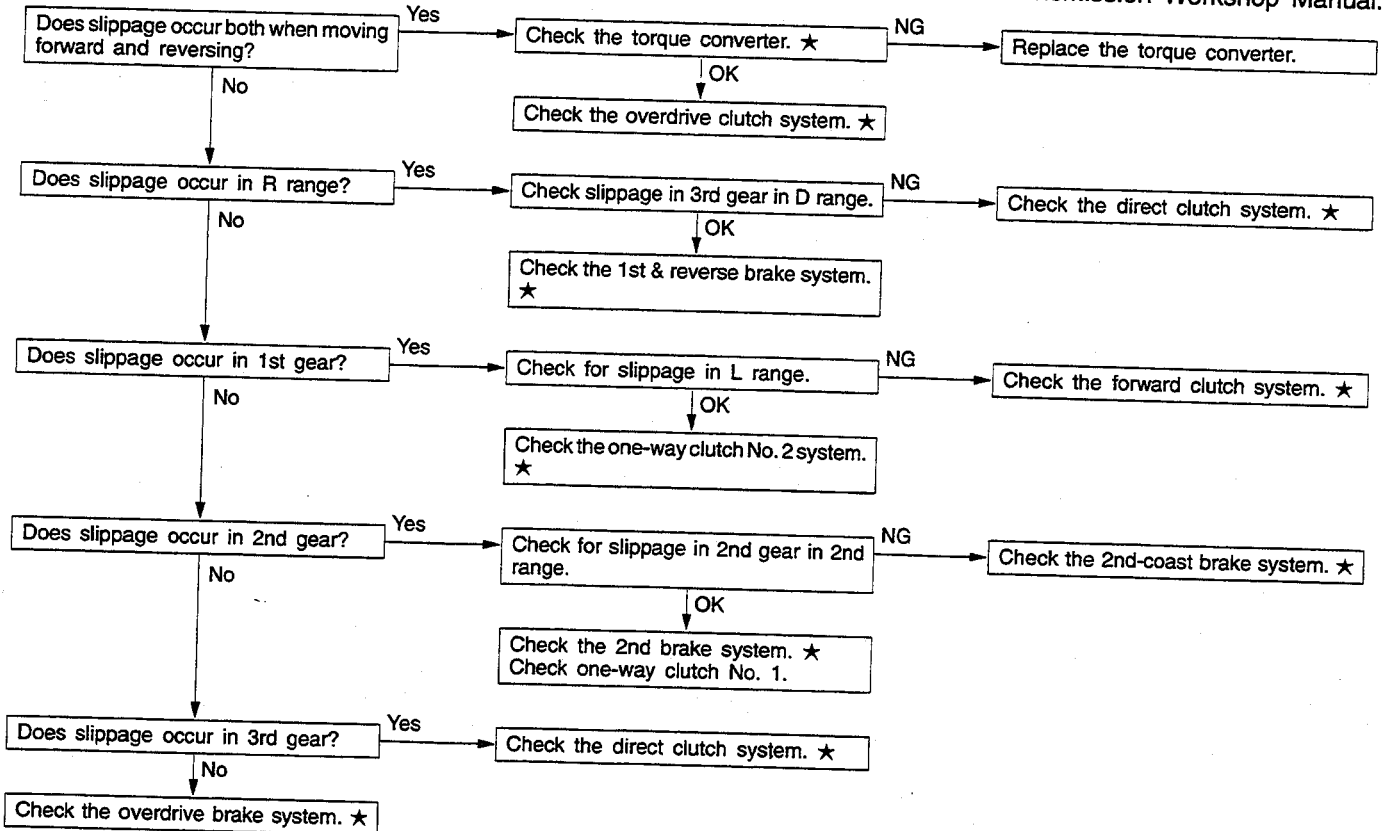
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 11

● Slippage (vibration)	Probable cause
[Comment] Occurs when a clutch or brake does not fully engage due to low hydraulic pressure or a worn facing. Appears as vibration when the problem is slight.	<ul style="list-style-type: none"> ● Torque converter ● Direct clutch ● Forward clutch ● 2nd-coast brake ● 2nd brake ● Overdrive brake

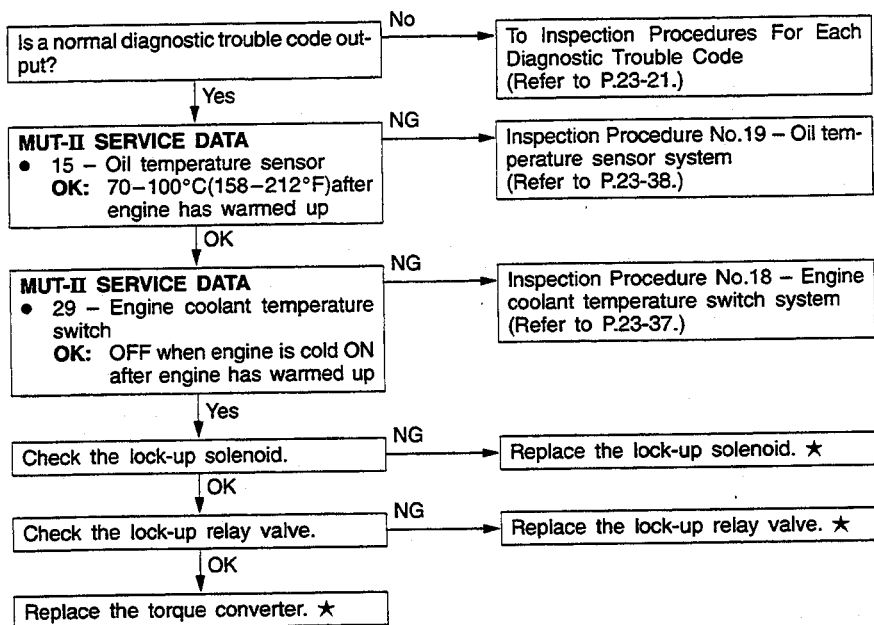
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 12

● Malfunction of lock-up	Probable cause
<p>[Comment] When lock-up does not operate even though in the lock-up range, and also when lock-up is operating and the engine is idling but then stalls.</p>	<ul style="list-style-type: none"> ● Torque converter ● Valve body ● Oil temperature sensor ● Engine coolant temperature switch

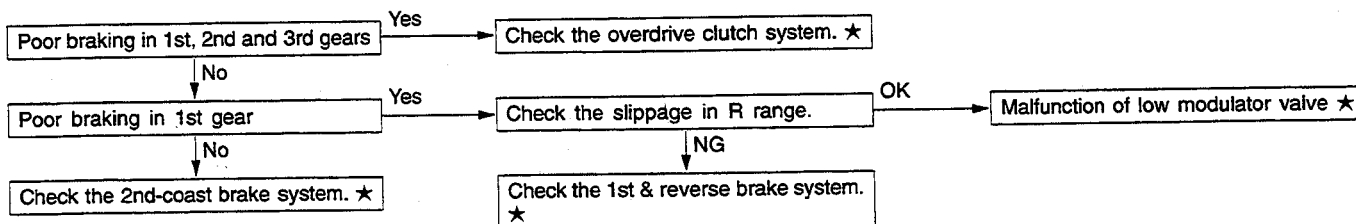
★ : Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 13

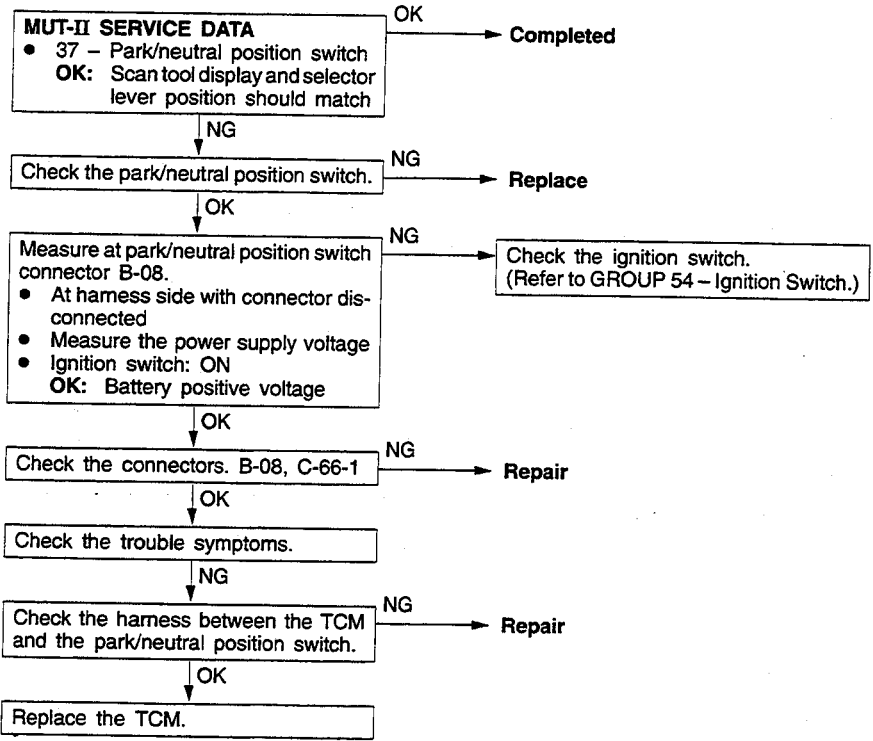
● Abnormal engine braking	Probable cause
<p>[Comment] Engine braking effectiveness is poor after downshifting has occurred.</p>	<ul style="list-style-type: none"> ● Overdrive clutch ● 1st & reverse brake ● 2nd-coast brake ● Valve body

★ : Refer to the Transmission Workshop Manual.



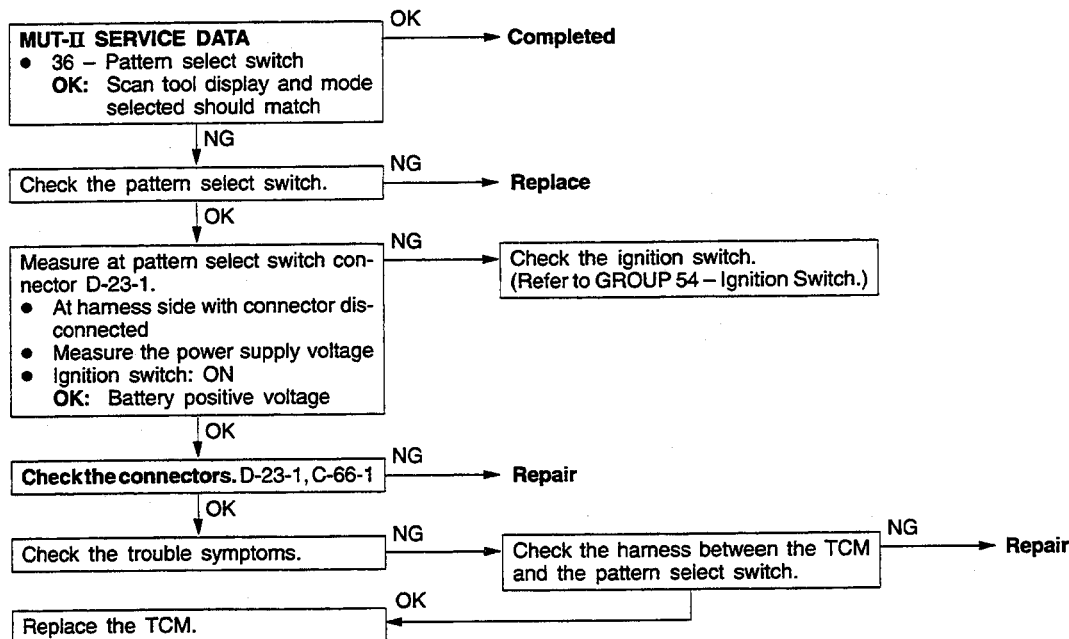
INSPECTION PROCEDURE 14

● Park/neutral position switch system	Probable cause
<p>[Comment] When up shifting to 4th gear does not occur if in D range (OD switch: ON), when lock-up does not operate even though in the lock-up range, and if the engine does not start in P or N range, the cause is probably a problem in the park/neutral position switch system.</p>	<ul style="list-style-type: none"> ● Malfunction of park/neutral position switch ● Malfunction of connector ● Malfunction of TCM



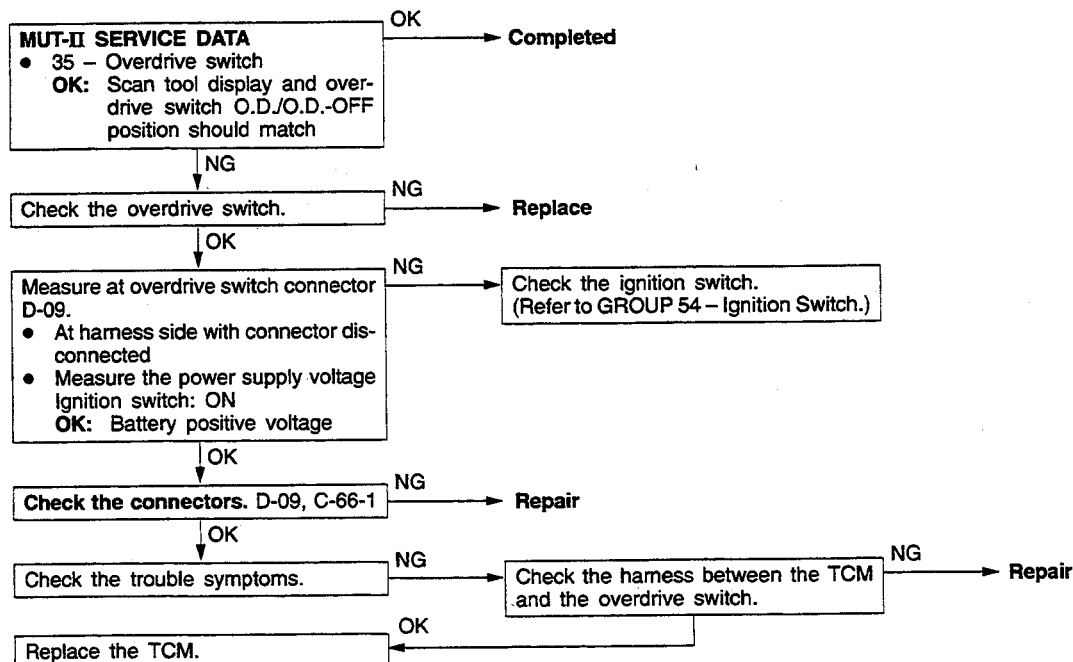
INSPECTION PROCEDURE 15

● Pattern select switch system	Probable cause
<p>[Comment] If the shift pattern does not change when the pattern select switch is operated, the cause is probably a malfunction of the pattern select switch.</p>	<ul style="list-style-type: none"> ● Malfunction of pattern select switch ● Malfunction of connector ● Malfunction of TCM



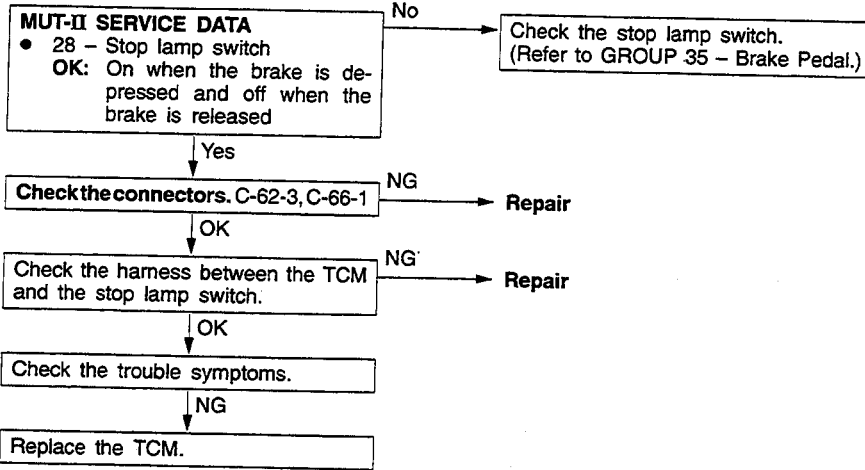
INSPECTION PROCEDURE 16

● Overdrive switch system	Probable cause
<p>[Comment] If downshifting does not occur when overdrive is turned off while driving in 4th gear, or if shifting to 4th gear is not possible, the cause is probably a problem in the overdrive switch system.</p>	<ul style="list-style-type: none"> ● Malfunction of overdrive switch ● Malfunction of connector ● Malfunction of TCM



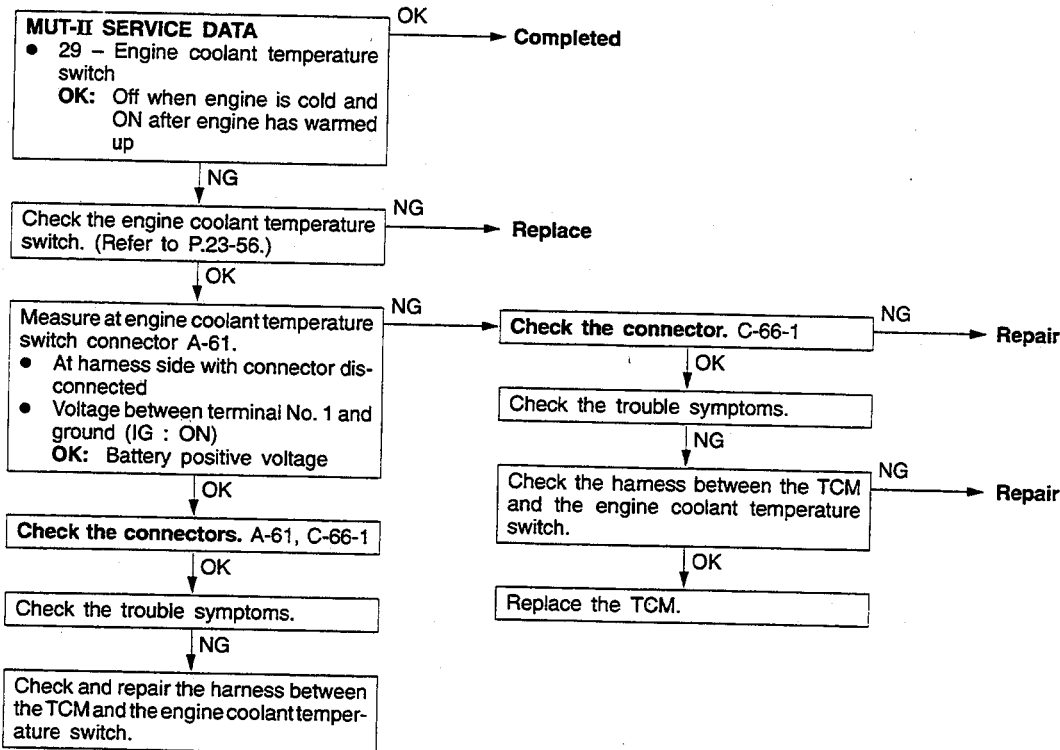
INSPECTION PROCEDURE 17

● Stop lamp switch system	Probable cause
<p>[Comment] If large shocks occur during squat control, the cause is probably a problem with the stop lamp switch.</p>	<ul style="list-style-type: none"> ● Malfunction of stop lamp switch ● Malfunction of connector ● Malfunction of TCM



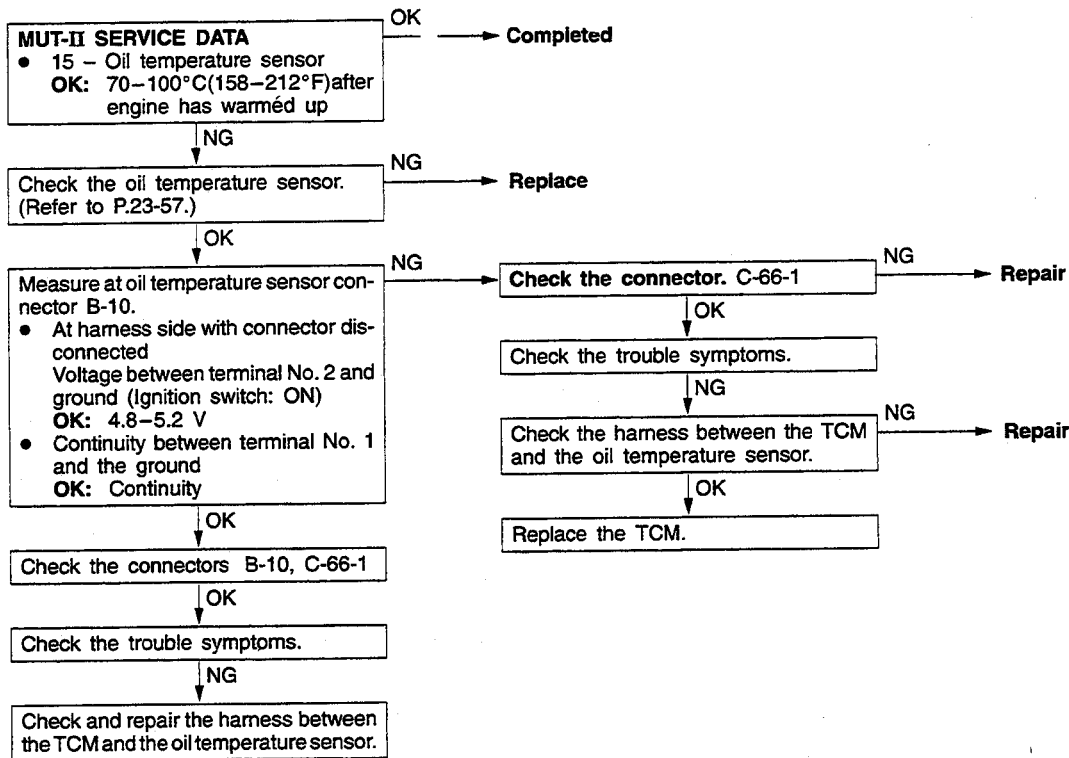
INSPECTION PROCEDURE 18

● Engine coolant temperature switch system	Probable cause
<p>[Comment] If there is insufficient output while the engine is cold, the cause is probably a malfunction of the engine coolant temperature switch.</p>	<ul style="list-style-type: none"> ● Malfunction of engine coolant temperature switch ● Malfunction of connector ● Malfunction of TCM



INSPECTION PROCEDURE 19

● Oil temperature sensor system	Probable cause
<p>[Comment] If the oil temperature warning lamp remains illuminated, the cause is probably a problem with the oil temperature sensor.</p>	<ul style="list-style-type: none"> ● Malfunction of oil temperature sensor ● Malfunction of connector ● Malfunction of TCM



SERVICE DATA REFERENCE TABLE

Item No.	Inspection item	Inspection conditions	Normal value	
11	Throttle position sensor	Accelerator pedal position Engine: Idling Selector lever position: N	Fully closed	0–5%
			Depressed	Gradually rises from the above value
			Fully open (up to 2 seconds)	85–100%
15	Oil temperature sensor	Warming up	Drive for 15 minutes or more so that the ATF temperature becomes 70–90°C (158–194°F).	Gradually rises to 70–90°C (158–194°F)
27	Shift position signal	Accelerator pedal position Engine: Idling (Vehicle stopped) Selector lever position: D Mode selection: Normal	Fully closed	1st
			N to D shift	1st to 3rd to 1st
		Selector lever position: L Mode selection: Normal	Idling (Vehicle stopped)	1st
		Selector lever position: 2 Mode selection: Normal	Idling (Vehicle stopped)	1st
			Driving at 40 km/h (24 mph) (20 seconds or more)	2
27	Shift position signal	Selector lever position: D Mode selection: Normal Overdrive: OFF	Driving at a constant speed of 50 km/h (31 mph) (20 seconds or more)	3rd
		Selector lever position: D Mode selection: Normal Overdrive: ON	Driving at a constant speed of 50 km/h (31 mph) (20 seconds or more)	4th
28	Stop lamp switch	Brake pedal position Ignition switch: ON Engine: Stopped	Depressed	ON
			Released	OFF
29	Engine coolant temperature switch	When engine changes from cold to warm	While engine is cold	OFF
			After engine has warmed up	ON
32	A/T speed sensor*	Selector lever position: D Mode selection: Normal Overdrive: ON	Driving at 30 km/h (19 mph)	25–35 km/h (16–22 mph)
			Driving at 50 km/h (31 mph)	42–58 km/h (26–36 mph)
35	Overdrive switch	Ignition switch: ON Engine: Stopped	Overdrive switch: ON	O.D.
			Overdrive: OFF	O.D.–OFF

* Transfer lever position: 4H Range

Item No.	Inspection item	Inspection conditions	Normal value	
36	Pattern select switch	Ignition switch: ON Engine: Stopped	Pattern select switch Power mode	Power
			Pattern select switch Hold mode	Hold
			Pattern select switch Normal mode	Normal
37	Park/neutral position switch	Ignition switch: ON Engine: Stopped	Selector lever position: P	P, R, D
			Selector lever position: R	P, R, D
			Selector lever position: N	N
			Selector lever position: D	P, R, D
			Selector lever position: 2	2
39	Cruise control-ECM	Selector lever position: D Mode selection: Normal	Auto-cruise control OFF	OFF
			Auto-cruise control ON [climbing at 50 km/h (31 mph)]	ON
41	Shift solenoid No. 1	Selector lever position: D Mode selection: Normal	Driving at 10 km/h (6 mph) (Drive 1st)	ON
			Driving at 50 km/h (31 mph) (Drive 4th)	OFF
43	Shift solenoid No. 2	Selector lever position: D Mode selection: Normal Overdrive: OFF	Driving at 10 km/h (6 mph) (Drive 1st)	OFF
			Driving at 50 km/h (31 mph) (Drive 3rd)	ON
47	Lock-up solenoid	Selector lever position: D Mode selection: Normal Overdrive: ON	Driving at 10 km/h (6 mph) (Drive 1st)	OFF
			Driving at 50 km/h (31 mph) (Drive 4th)	ON

110005408

10. REFERENCE FOR FAIL-SAFE/BACKUP FUNCTIONS

When malfunctions of the main sensors or actuators are detected by the on-board diagnostic, the vehicle is controlled by means of the pre-set control logic to maintain safe conditions for driving.

Malfunctioning item	Control contents during malfunction
A/T speed sensor	When there is an open circuit in the A/T speed sensor, vehicle speed detection is switched to the output from the vehicle speed sensor in the speedometer to maintain vehicle control.
Park/neutral position switch	If there is an open circuit in the N, 2 or L signal line, driving is possible in the case of 2 and L (same as D range) so that control can be performed as if the range is D range, and driving is not possible in N range. If more than one of the 2, L or N signals are input, the order of priority for control is L to 2 to N.
Throttle position sensor	If the output is 0.09 V or less or 4.95 V or more, the throttle is fully closed and gear shifting control is carried out.
Lock-up solenoid	If a problem is detected, lock-up is stopped over the whole range and the solenoid is turned off to prevent the engine from stalling during idling.

Shift solenoid Nos. 1 and 2

If a problem is detected, each solenoid stops operating and is turned off. The gear shifting logic when a problem is detected is given in the table below.

Selector lever position	Normal			If there is a malfunction of solenoid No. 1			If there is a malfunction of solenoid No. 2			If there is a malfunction of solenoid Nos. 1 and 2		
	Gear	S1	S2	Gear	S1	S2	Gear	S1	S2	Gear	S1	S2
D	1	○	X	3		X→○	O/D	1	○	O/D		
	2	○	○			○			○→X			
	3	X	○			○			X			
	O/D	X	X		O/D			X			X	
2	1	○	X	3		X→○	3	1	○	3		
	2	○	○			○			○→X			
	3	X	○			○			X			
L	1	○	X	1		X	1	○		1		
	2	○	○	2		○		○				

○: Energized (ON)
 X: Not energized (OFF)

A/T-ECM TERMINAL VOLTAGE REFERENCE CHART

110005409

Terminal No.	Inspection item	Inspection conditions	Standard value
1	Shift solenoid No. 1	When in 1st or 2nd gear	System voltage
		When in 3rd or 4th gear	0 V
2	Shift solenoid No. 2	When in 2nd or 3rd gear	System voltage
		When in 1st or 4th gear	0 V
3	Lock-up solenoid	When lock-up clutch is operating	System voltage
		When lock-up clutch is not operating	0 V
4	A/T speed sensor ground side	Ignition switch: OFF	0 V
		Ignition switch: ON	2.5 V
5	Park/neutral position switch (N)	Selector lever position: N	System voltage
		Selector lever position: Other than N	0 V
6	Diagnostic output terminal	When scan tool is not connected	System voltage
7	HOLD mode signal	When HOLD mode is selected	System voltage
		When a mode other than HOLD mode is selected	0 V
8	Overdrive switch	Overdrive switch: ON (O.D.)	0 V
		Overdrive switch: OFF (O.D.-OFF)	System voltage
9	Vehicle speed sensor (Sub)	Vehicle: Slowly moving forward	Alternates between 0 ↔ approx. 5 V
10	A/T speed sensor output side	Vehicle: Stopped	Approx. 2.5 V
		Vehicle: Moving forward	Other than 2.5 V
11	Cruise control signal	When cruise control is requested	0 V
		When cruise control is not requested	System voltage
12	Oil temperature sensor	ATF temperature: 120°C (248°F)	Approx. 1.9 V
		ATF temperature: 150°C (302°F)	Approx. 1.1 V
13	Diagnostic test mode control terminal	—	—
14	Power supply	Ignition switch: ON	System voltage
		Ignition switch: OFF	0 V
15	Backup power supply	Ignition switch: OFF	System voltage
16	Ground	Engine: Idling	0 V
17	Stop lamp switch	When brake pedal is depressed	0 V
		When brake pedal is released	System voltage
18	Park/neutral position switch (2)	Selector lever position: 2	System voltage
		Selector lever position: Other than 2	0 V

Terminal No.	Inspection item	Inspection conditions	Standard value
19	Park/neutral position switch (L)	Selector lever position: L	System voltage
		Selector lever position: Other than L	0 V
20	Oil temperature warning lamp	When normal	0 V
		Ignition switch: For 5 seconds after turning ON	System voltage
21	Power mode signal	When POWER mode is selected	System voltage
		When a mode other than POWER mode is selected	0 V
22	—	—	—
23	—	—	—
24	Engine coolant temperature signal	When engine coolant temperature is 30°C (86°F)	System voltage
		When engine coolant temperature is 80°C (176°F)	0 V
25	—	—	—
26	Throttle position sensor	Accelerator pedal: Fully closed	0.3–1.0 V
		Accelerator pedal: Fully open	4.4–5.0 V

SERVICE ADJUSTMENT PROCEDURES

110005410

AUTOMATIC TRANSMISSION FLUID INSPECTION

- (1) Place the vehicle on a level surface.
- (2) Before removing the dipstick, wipe off all dirt from 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 (158–176°F)].
- (5) Move the selector lever to each position in turn to fill the torque converter and hydraulic circuit with fluid. Then place the lever in the N position.
- (6) Check that fluid level is at the HOT level on the oil level gage. If the fluid level is low, add fluid until the level reaches the HOT level.

Transmission fluid: DIAMOND ATF SP, ATF DEXRON II or equivalent

NOTE

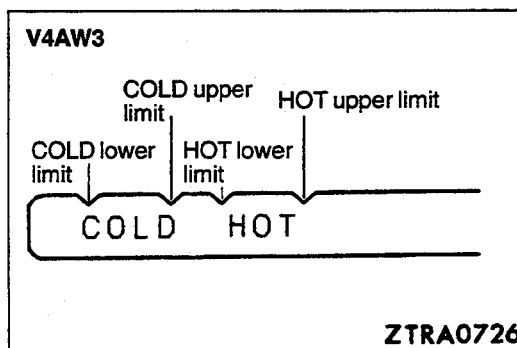
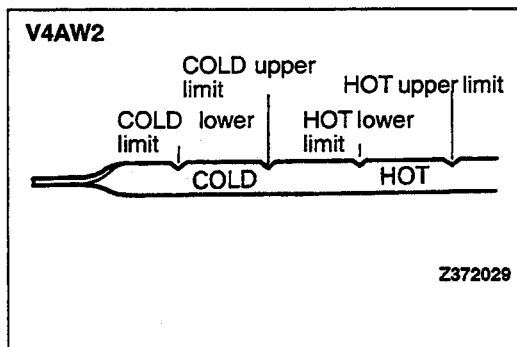
Low fluid level can allow the oil pump to take in air together with fluid, leading to various troubles. Air trapped in hydraulic circuit forms bubbles which make the fluid spongy. This lowers pressure and slows down pressure buildup. If the transmission has too much fluid, gears churn up foam and cause 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.

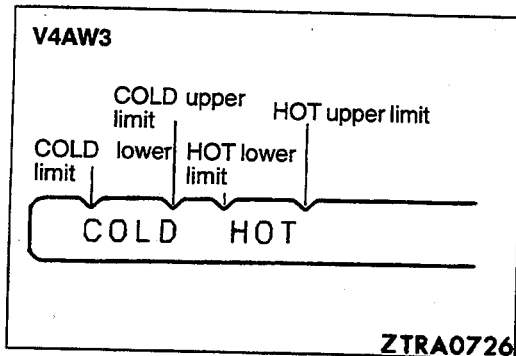
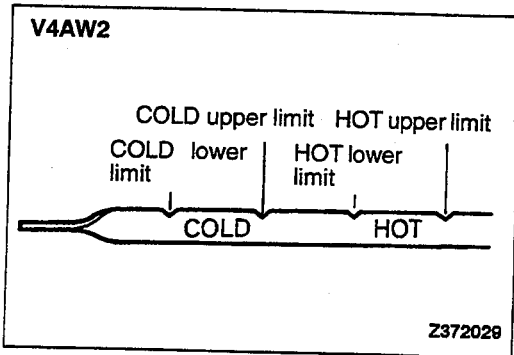
- (7) Check the fluid condition.

NOTE

If the fluid smells burned, it is contaminated with metal powder or friction material particles and hence a complete overhaul of the transmission is needed. Be sure to examine the fluid on the dipstick closely.

- (8) After fluid has been checked, insert the dipstick until it is seated fully to keep out any water and dirt.





AUTOMATIC TRANSMISSION FLUID CHANGE

110005411

Caution

If an ATF change is required due to damage to the transmission, be sure to clean the cooler system.

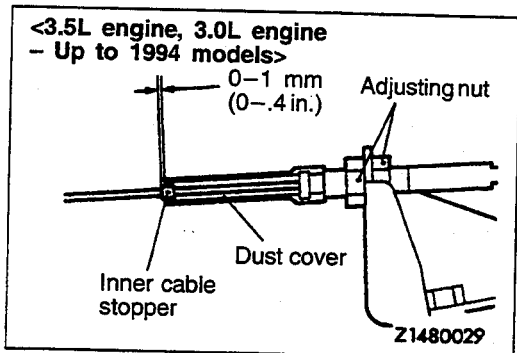
- (1) Raise the vehicle on hoist. Place a drain container with a large opening under the drain plug which is located in the bottom of the oil pan.
- (2) Remove the drain plug to allow the transmission fluid to drain.
- (3) Install the drain plug and new gasket and tighten to 18–23 Nm (13–17 ft.lbs.).
- (4) Refill ATF through the oil level gage hole until its level reaches the COLD lower limit of the oil level gage.
- (5) Start the engine and allow to idle for at least two minutes. Then, with the parking brake and service brake applied, move the selector lever to each position and finally place it in the N or P position.
- (6) After the transmission is warmed up to the normal operating temperature, recheck the fluid level. It must be between the HOT upper limit and HOT lower limit marks.
- (7) Insert the dipstick fully to prevent dirt from entering the transmission.

TRANSFER OIL INSPECTION AND CHANGE

Refer to GROUP 22 – Service Adjustment Procedures.

THROTTLE CABLE CHECK AND ADJUSTMENT

110005412



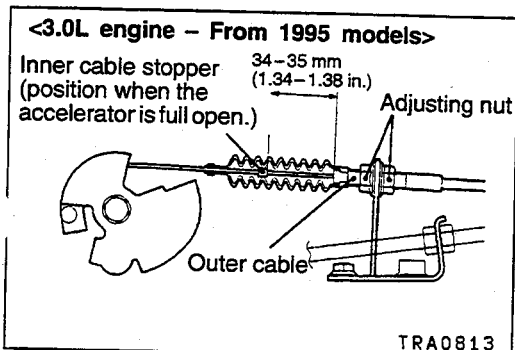
<3.5L engine, 3.0L engine – Up to 1994 models>

- (1) Check for defective or bent throttle lever or throttle cable bracket.
- (2) With the accelerator depressed, check that the distance between the inner cable stopper and dust cover surface is within the standard value.

Standard value: 0–1 mm (0–.4 in.)

- (3) If the distance is outside the standard value, adjust using the adjusting nut.

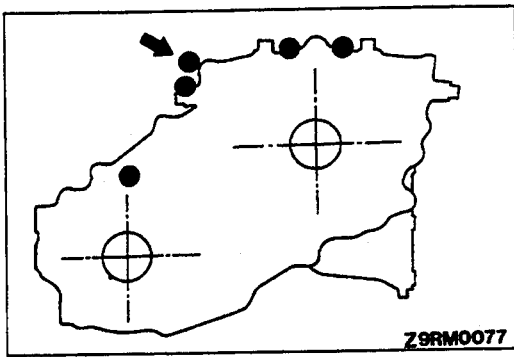
<3.0L engine – From 1995 models>



- (1) Make sure that the throttle lever and the bracket have no transformations.
- (2) Remove the boot at the outer cable so that the inner cable stopper can be seen.
- (3) Measure the dimension between the end of the inner cable stopper and that of the outer cable with throttle lever full open.

Standard value: 34–35 mm (1.34–1.38 in.)

- (4) If the distance is outside the standard value, adjust using the adjusting nut.

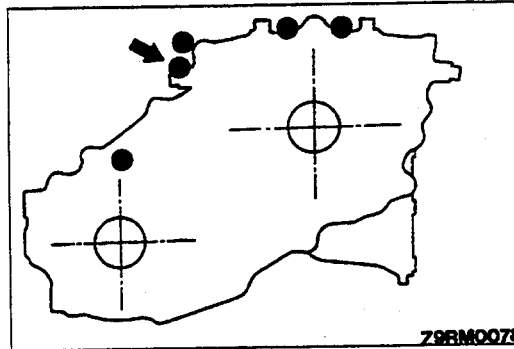


CENTER DIFFERENTIAL LOCK DETECTION SWITCH CHECK

110005413

Check for continuity between the brown connector terminal on the side of the transfer case and the transfer case.

Transfer control lever position	Continuity
4H	No continuity
4HLc	Continuity

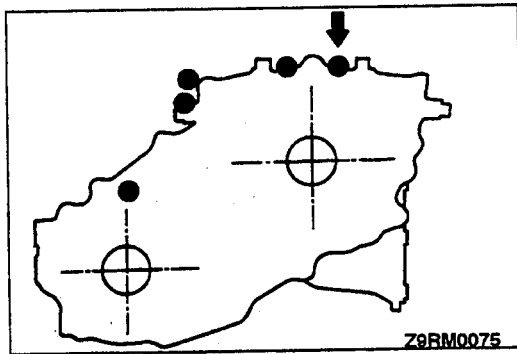


2WD/4WD DETECTION SWITCH CHECK

110005414

Check for continuity between the black connector terminal on the side of the transfer case and the transfer case.

Transfer control lever position	Continuity
2H	Continuity
4H	No continuity

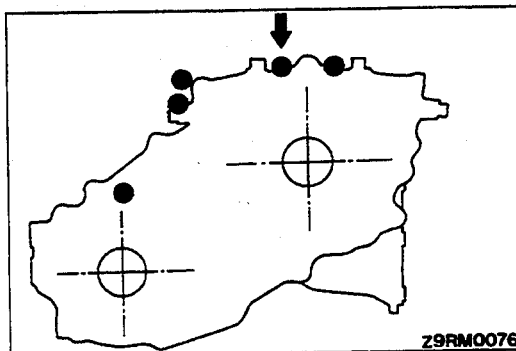


CENTER DIFFERENTIAL LOCK OPERATION DETECTION SWITCH CHECK

110005415

Check for continuity between the brown connector terminal on the top of the transfer case and the transfer case.

Transfer control lever position	Continuity
4H	No continuity
4HLc	Continuity

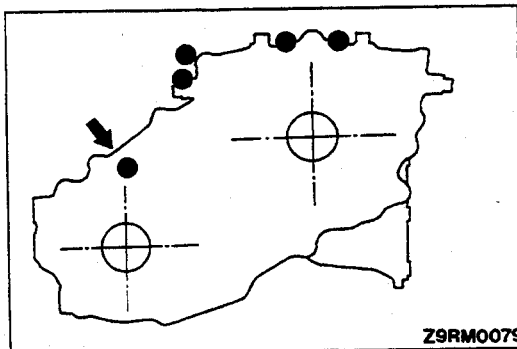


4WD OPERATION DETECTION SWITCH CHECK

110005416

Check for continuity between the black connector terminal on the top of the transfer case and the transfer case.

Transfer control lever position	Continuity
2H	No continuity
4H	Continuity

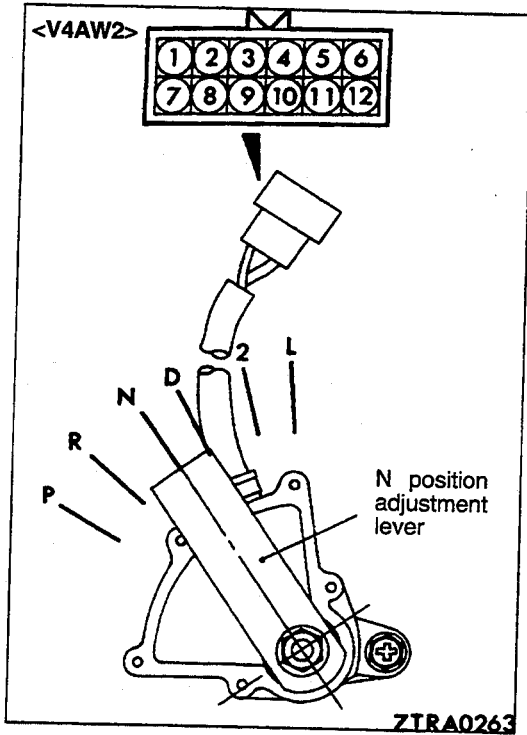


HI/LO DETECTION SWITCH CHECK

110005417

Check for continuity between the white connector terminal on the side of the transfer case and the transfer case.

Transfer control lever position	Continuity
4HLc	Continuity
N (between 4HLc and 4LLc)	No continuity
4LLc	Continuity

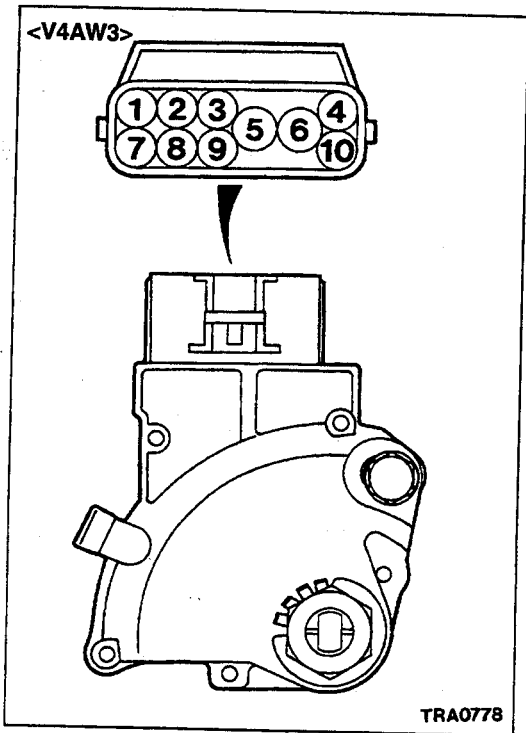


PARK/NEUTRAL POSITION SWITCH CHECK

110005418

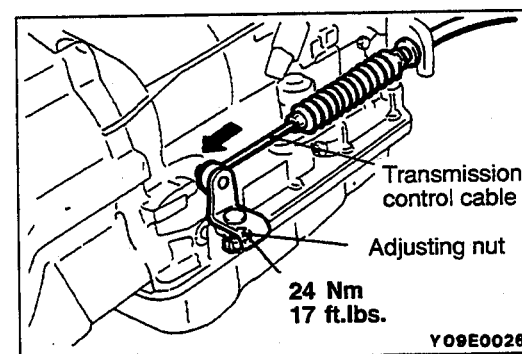
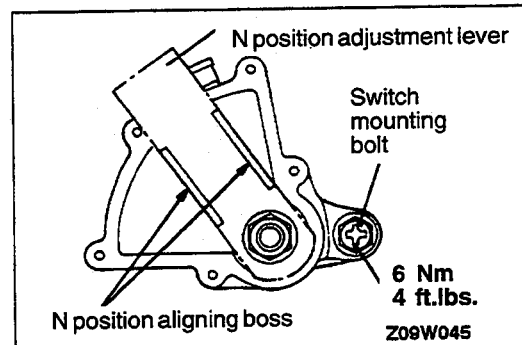
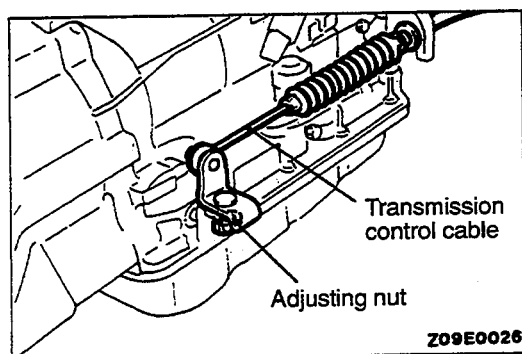
<V4AW2>

Item	Terminal No.									
	1	2	3	4	5	6	7	9	12	
P						○	○	○		
R					○			○		
N				○			○	○	○	
D			○					○		
2	○							○		
L		○						○		



<V4AW3>

Item	Terminal No.									
	1	2	3	5	6	7	8	9	10	
P	○				○	○				○
R	○							○		
N	○				○	○	○			
D	○							○		
2	○		○							
L	○	○								



ADJUSTMENT OF PARK/NEUTRAL POSITION SWITCH AND CONTROL CABLE

110005419

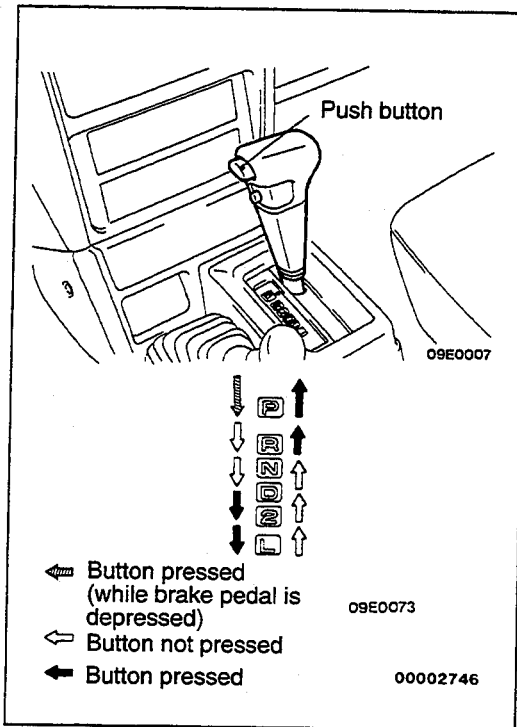
PARK/NEUTRAL POSITION SWITCH

- (1) Move the selector lever to the N position.
- (2) Loosen the adjusting nut of the control cable.
- (3) Loosen the park/neutral position switch mounting bolt.
- (4) Adjust by turning the park/neutral position switch so that the bosses for aligning the N position on the park/neutral position switch are aligned with the N position adjustment lever.
- (5) Tighten the park/neutral position switch mounting bolt to the specified torque.
- (6) Gently pull the end of the transmission control cable in the direction of the arrow and tighten the adjusting nut to the specified torque.
- (7) Check that the selector lever is in the N position.
- (8) Check that each range on the transmission side operates and functions correctly for each position of the selector lever.

CONTROL CABLE

It is possible to confirm whether control cable is properly adjusted by checking whether the park/neutral position switch is performing well.

1. Apply the parking and service brakes fully.
2. Set the selector lever to the R position.
3. Turn the ignition key to the START position.
4. Slowly move the selector lever upward until it clicks as it fits into the notch of the P position. If the starter motor operates when the lever makes a click, P position is correct.
5. Then slowly move the selector lever to the N position by the same procedure as in the preceding paragraph. If the starter motor operates when the selector lever is at the N position, then the N position is correct.
6. Also check that the vehicle doesn't begin to move and the lever doesn't stop between P-R-N-D.
7. The control cable is properly adjusted if, as described above, the starter motor starts in both P range and N range.

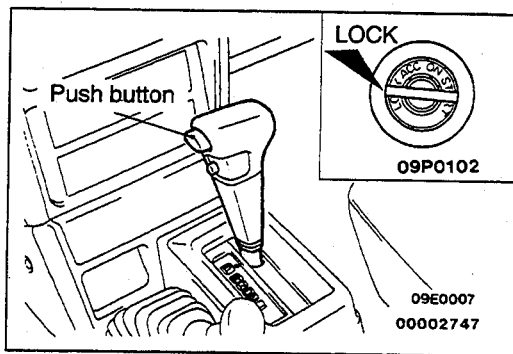


SELECTOR LEVER OPERATION CHECK 110005420

1. Move the selector lever to each position and check that the lever moves smoothly and is controlled. Check that the position indicator is correct.
2. Check that the selector lever can be moved to each position by button operation as shown in the illustration).
3. Start the engine and check that the vehicle moves forward when the selector lever is shifted from N to D, and moves backward when shifted to R.
4. If there is a malfunction of the shift lever, adjust the control cable and selector lever sleeve. Check for worn shift lever assembly sliding parts.

NOTE

To move the selector lever from the P position to any other position, first turn the ignition key to any position other than LOCK and depress the brake pedal.



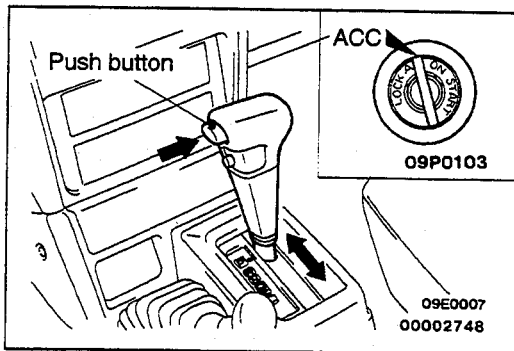
KEY INTERLOCK MECHANISM CHECK 110005421

Completely stop the vehicle and switch off the engine before making the check.

1. Check that the selector lever cannot be moved from the P position to any other position under the following conditions.

At the same time, check that the button cannot be pressed.

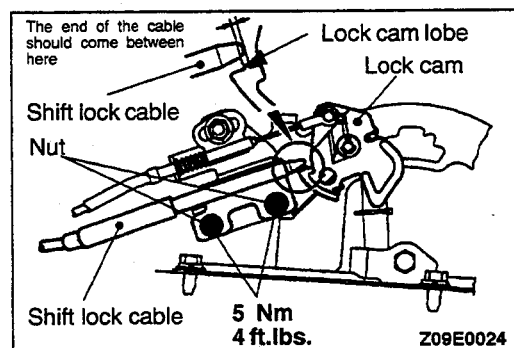
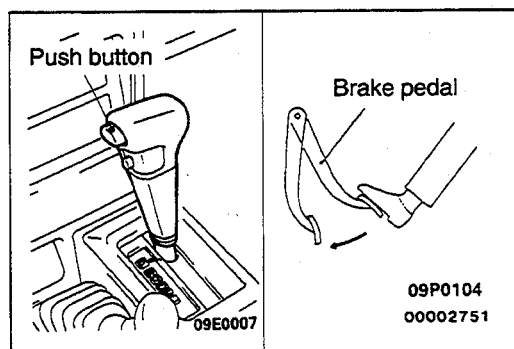
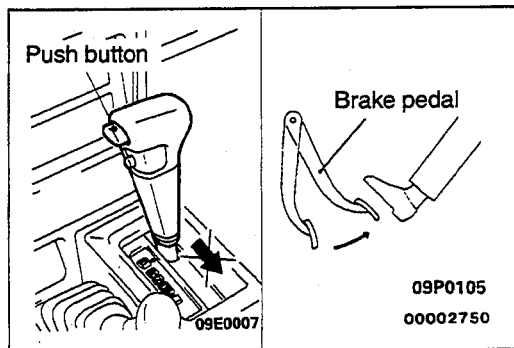
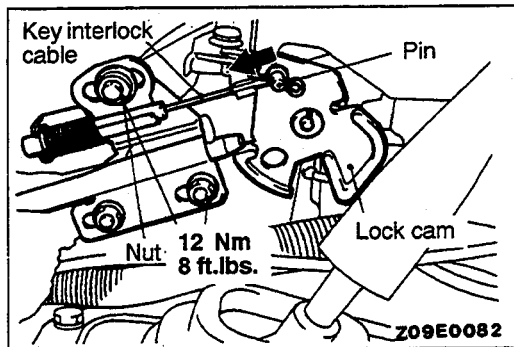
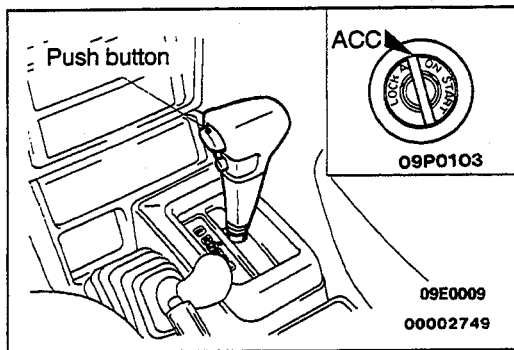
Ignition key position: LOCK or removed
Brake pedal: Depressed



2. Check that the selector lever can be moved smoothly from the position to any other position under the following conditions.

Press the button a few times and check that the selector lever moves smoothly.

Ignition key position: ACC
Brake pedal: Depressed
Button pressed

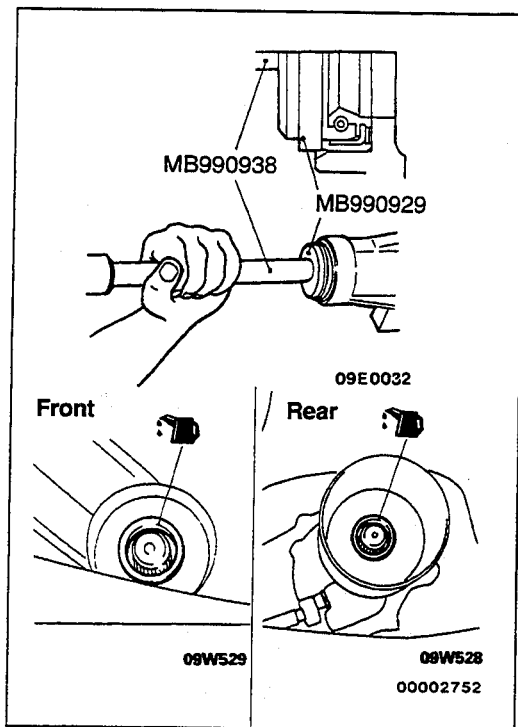


3. Check that the ignition key cannot be turned to the LOCK position at all positions of the selector lever other than P.
Check that the ignition key turns smoothly to the LOCK position when the selector lever is set to the P position and the button is released.
4. If the above checks are not okay, adjust the key interlock cable mechanism as follows.
 - (1) Remove the front console assembly.
 - (2) Move the selector lever to the P position.
 - (3) Turn the ignition key to the LOCK position.
 - (4) Loosen the nut clamping the key interlock cable.
 - (5) Gently push the lock cam until the pin stops in the direction of the arrow (➔), and then tighten the nut to the specified torque to clamp the key interlock cable.
 - (6) Install the front console assembly.

SHIFT LOCK MECHANISM CHECK

110005422

1. Check that the selector lever cannot be moved from the P position to any other position under the following conditions.
Ignition key position: ACC
Brake pedal: Released
Button pressed
2. Check that the selector lever can be moved smoothly from the P position to other position under the following conditions.
Ignition key position: ACC
Brake pedal: Depressed
Button pressed
3. Check that the selector lever can be moved smoothly from the R position to the P position under the following conditions.
Ignition key position: ACC
Brake pedal: Released
Button pressed
4. If the above operations are defective, adjust the shift lock cable mechanism by the following procedure.
 - (1) Remove the front console assembly. (Refer to GROUP 52 – Floor Console.)
 - (2) Move the selector lever to the P position.
 - (3) Loosen the nut clamping the shift lock cable.
 - (4) Adjust the shift lock cable so that the end of the cable (red mark) comes between the lobe of the lock cam, and then tighten the nut to the specified torque to clamp the shift lock cable.
 - (5) Install the front console assembly.



TRANSFER OIL SEAL REPLACEMENT

110005423

1. Disconnect the propeller shaft from the transfer. (Refer to GROUP 25 – Propeller Shaft.)
2. Use a flat-tip (-) screwdriver to remove the oil seal.
3. Use the special tool to tap the transfer oil seal into the transfer. Note the direction of installation of the transfer oil seal shown in the illustration.
4. Apply a coating of transmission oil to the lip of the oil seal.

Transmission oil:

**Hypoid gear oil SAE 75W-90W or
75W-85W conforming API GL-4 or higher**

4WD INDICATOR CONTROL MODULE CHECK

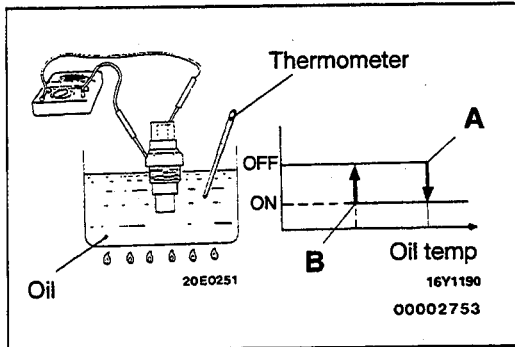
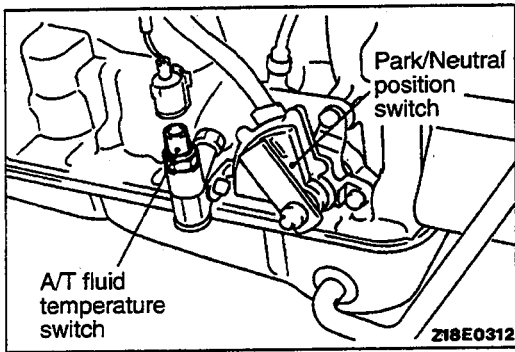
110005424

Refer to GROUP 22 – Service Adjustment Procedures.

SPEEDOMETER CABLE REPLACEMENT

110005425

Refer to GROUP 22 – Service Adjustment Procedures.



AUTOMATIC TRANSMISSION FLUID TEMPERATURE SWITCH CHECK

110005426

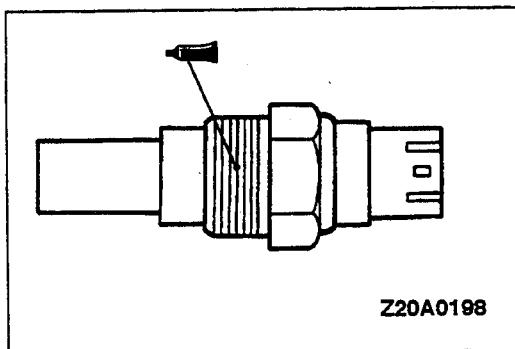
1. Remove the automatic transmission fluid temperature switch from the automatic transmission.

Caution

Use care to prevent foreign materials from entering the automatic transmission fluid temperature switch mounting hole.

2. Immerse the automatic transmission fluid temperature switch in fluid up to the threaded portion as shown in the illustration.
3. Use a circuit tester or similar tool to check the continuity when oil temperature is changed. The switch can be judged to be good if the conditions are within the following ranges.

Item	Temperature °C (°F)
Continuity (temperature at point A)	143–151 (289–304)
No continuity (temperature at point B)	125 (257) or less



4. Apply a small amount of recommended sealant to the thread of the automatic transmission fluid temperature switch.

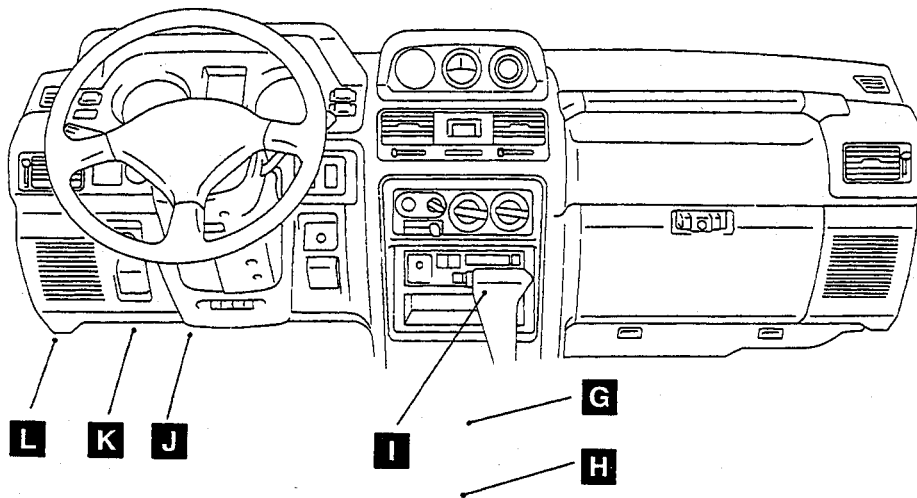
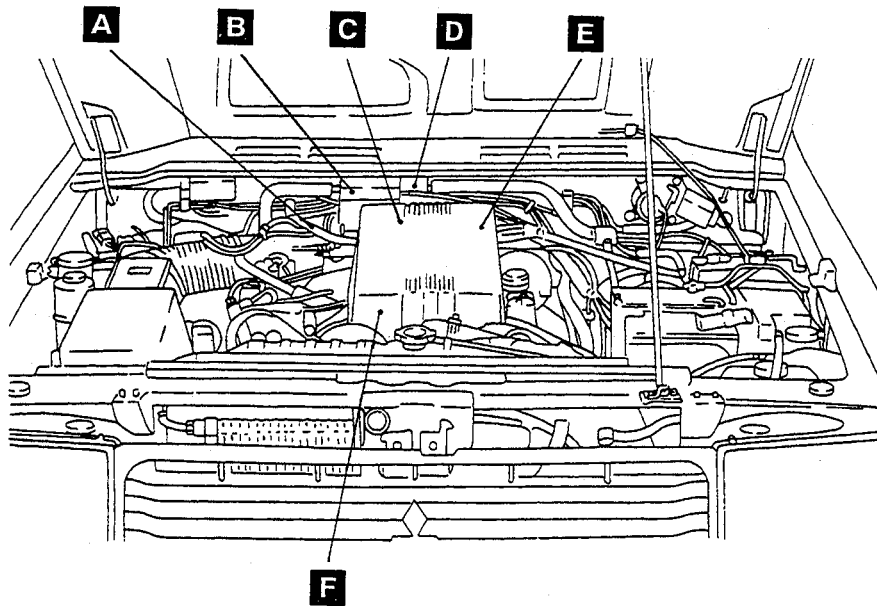
Specified sealant: 3M ATD Part No. 8660 or equivalent

5. Install the automatic transmission fluid temperature switch.
6. Check the quantity of automatic transmission fluid.

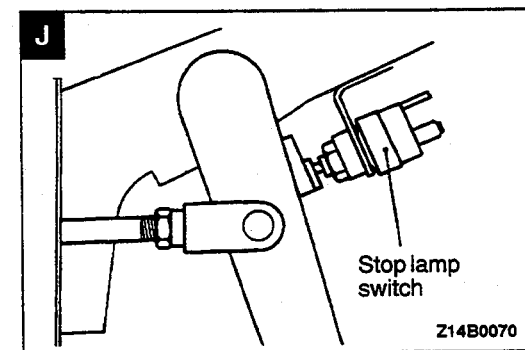
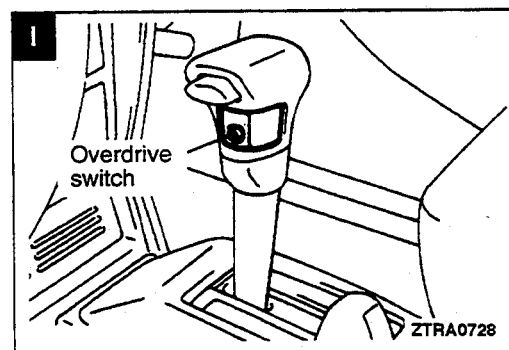
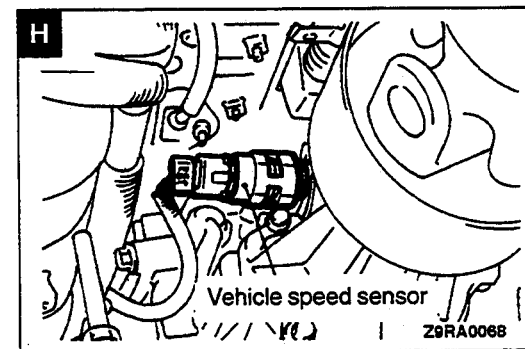
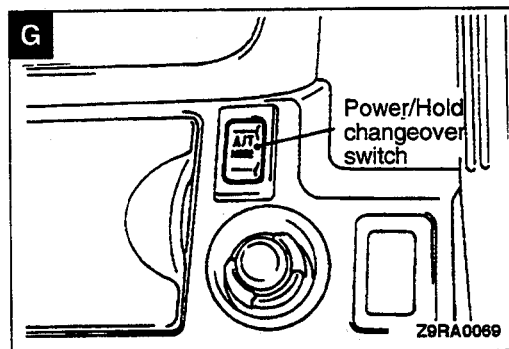
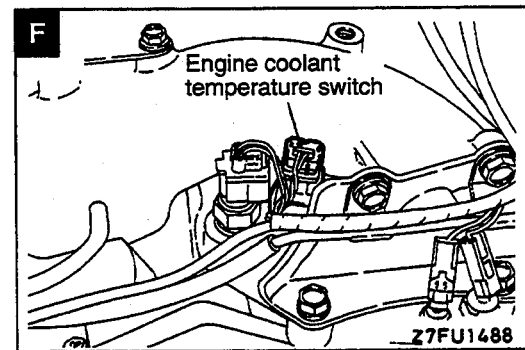
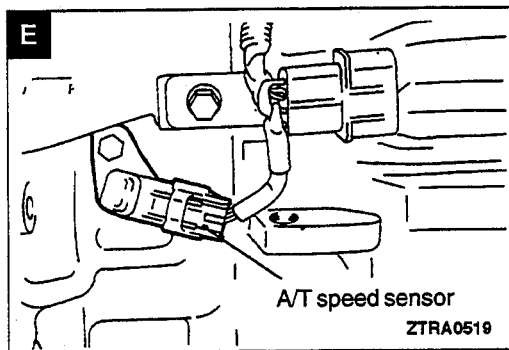
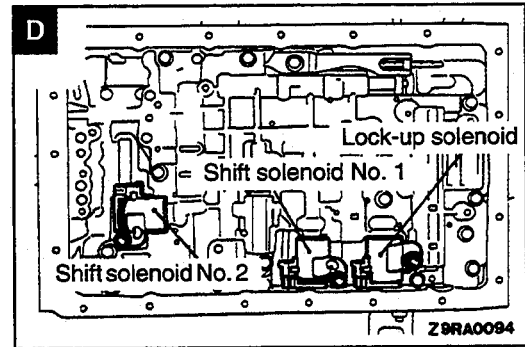
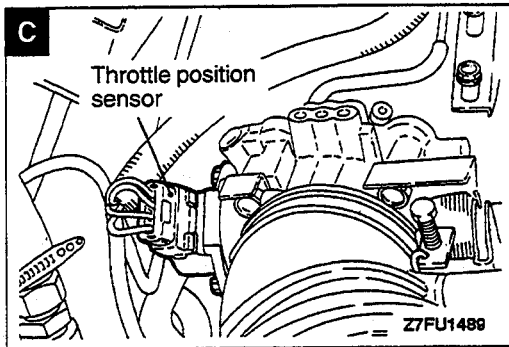
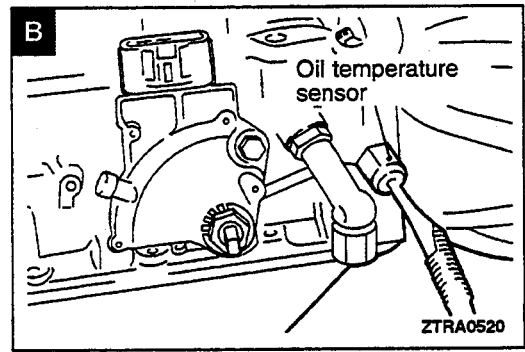
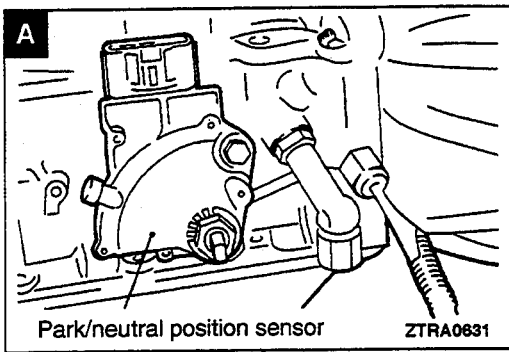
E.L.C. 4TH GEAR AUTOMATIC TRANSMISSION CONTROL COMPONENT LAYOUT
<V4AW3>

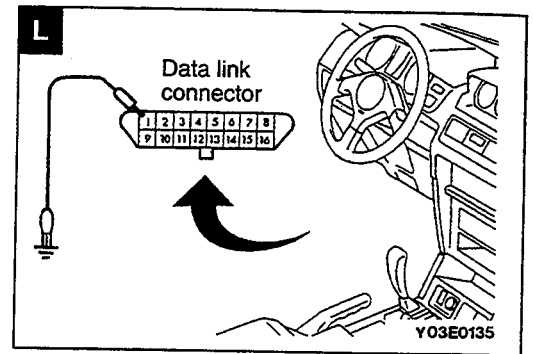
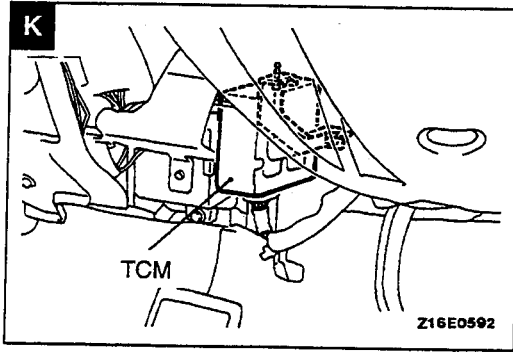
110005427

Name	Symbol	Name	Symbol
A/T speed sensor	E	Pattern select switch	G
Data link connector	L	Solenoids	D
Engine coolant temperature switch	F	Stop lamp switch	J
O.D.-OFF switch	I	TCM	K
Oil temperature sensor	B	Throttle position sensor	C
Park/neutral position sensor	A	Vehicle speed sensor	H



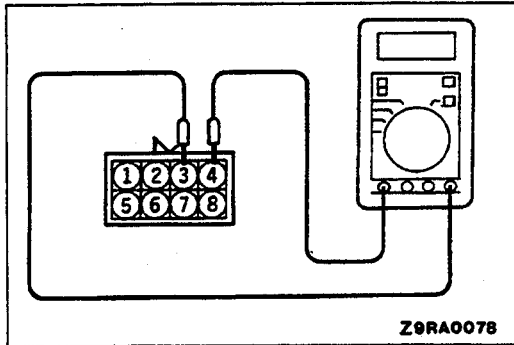
ATRA0833





V4AW3 CONTROL COMPONENT CHECK 110005428**THROTTLE POSITION SENSOR CHECK**

Refer to GROUP 13 – Service Adjustment Procedures.

**A/T SPEED SENSOR CHECK**

110005429

- (1) Disconnect the vehicle speed sensor connector.
- (2) Measure the resistance between terminals No. 3–4 of the sensor-side connector.

Standard value: $620 \pm 60 \Omega$ [at 20°C (68°F)]

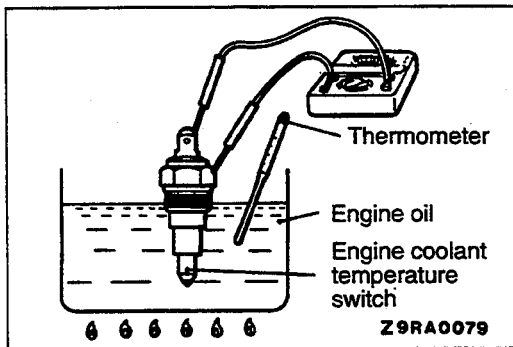
- (3) If the resistance is outside the standard value, replace the vehicle speed sensor.

VEHICLE SPEED SENSOR CHECK

Refer to GROUP 54 – Service Adjustment Procedures.

STOP LAMP SWITCH

Refer to GROUP 35 – Service Adjustment Procedures.

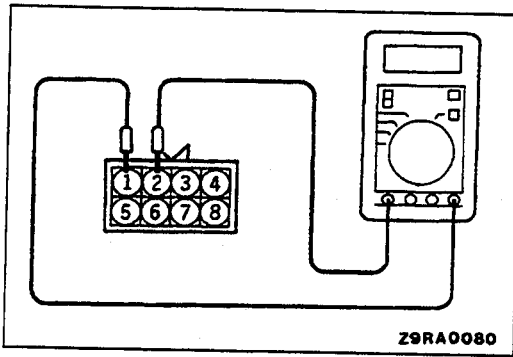
**ENGINE COOLANT TEMPERATURE SWITCH** 110005430

- (1) Disconnect the engine coolant temperature switch connector.
- (2) Check for continuity between the sensor connector terminal and the sensor body.

Standard value:

Oil temperature	Continuity
30°C (86°F)	No continuity
60°C (140°F)	Continuity

- (2) Check for continuity between the sensor connector terminal and the sensor body.



OIL TEMPERATURE SENSOR CHECK

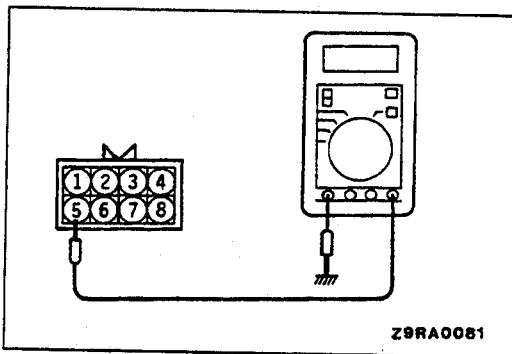
110005431

- (1) Disconnect the oil temperature sensor connector.
- (2) Measure the resistances between terminals No. 1–2 of the oil temperature sensor connector and check that they match the values below.

Standard value:

Oil temperature	Resistance value
25°C (77°F)	10 kΩ
120°C (248°F)	615 Ω

- (3) If the resistance is outside the standard value, replace the oil temperature sensor.



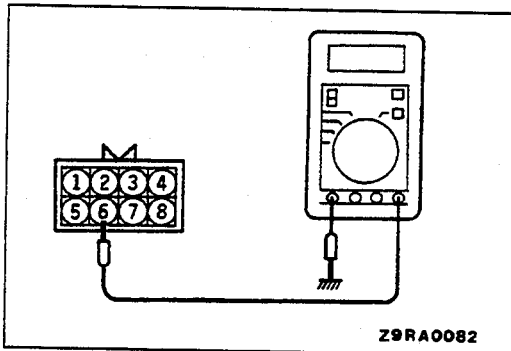
SHIFT SOLENOID NO. 1 CHECK

110005432

- (1) Disconnect the shift solenoid connector.
- (2) Measure the resistance between terminal No. 5 and the ground.

Standard value: 13±2 Ω [at 25°C (77°F)]

- (3) If the resistance is outside the standard value, replace the solenoid assembly.



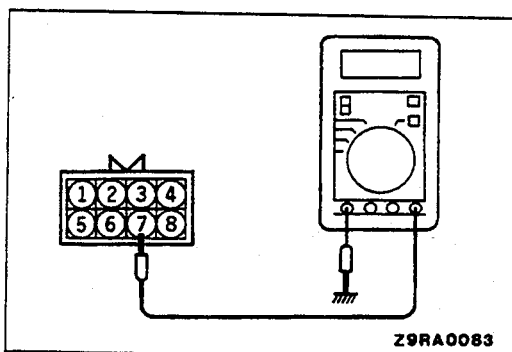
SHIFT SOLENOID NO. 2 CHECK

110005433

- (1) Disconnect the shift solenoid connector.
- (2) Measure the resistance between terminal No. 6 and the ground.

Standard value: 13±2 Ω [at 25°C (77°F)]

- (3) If the resistance is outside the standard value, replace the solenoid assembly.



LOCK-UP SOLENOID CHECK

110005434

- (1) Disconnect the lock-up solenoid connector.
- (2) Measure the resistance between terminal No. 7 and the ground.

Standard value: 13±2 Ω [at 25°C (77°F)]

- (3) If the resistance is outside the standard value, replace the solenoid assembly.

CONVERTER STALL TEST

In this test, the engine maximum speed when the torque converter stalls with the shift lever in the D or R position is measured to check operation of the torque converter, stator 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 [50–80°C (122–176°F)]. The engine coolant temperature should also be at the level after normal operation [80–90°C (176–194°F)].
2. Apply chocks to the rear wheels (right and left).
3. Connect a tachometer.

4. Apply the parking and service brakes fully.
5. Start the engine.
6. With the selector lever in the D position, fully depress the accelerator pedal and take a reading of the engine maximum speed.

**Standard value: 2,100–2,400 rpm (V4AW2)
2,100–2,600 rpm (V4AW3)**

NOTE

When doing so, do not keep the engine running with the throttle fully open for longer than necessary (5 seconds or more). If two or more stall tests are needed, move the selector lever to the N position and run it at idle for at about 1,000 rpm to allow the transmission fluid to cool before another stall test.

7. Move the selector lever to the R position and perform the test as above.

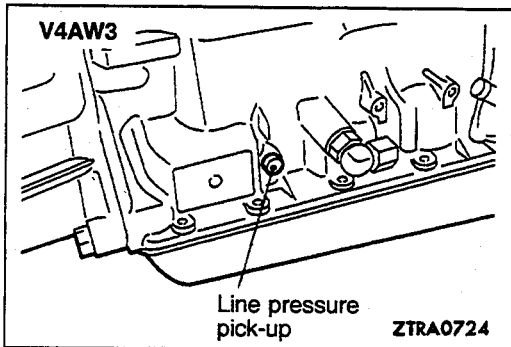
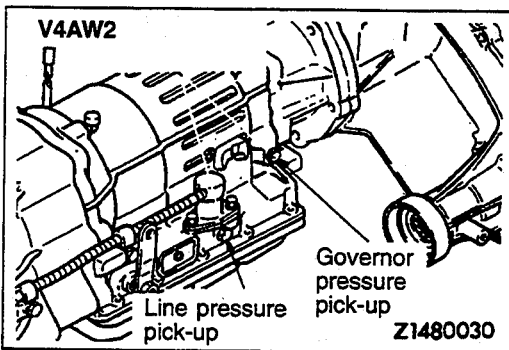
JUDGEMENT OF STALL TEST RESULTS

<V4AW2>

Stall speeds in D and R range are equal to each other but are lower than the standard value.	(1) Engine output is low. (2) Malfunction of stator one-way clutch
Stall speed in D range is higher than the standard value.	(1) O.D. clutch slippage. (2) Malfunction of O.D. one-way clutch (3) Forward clutch slippage (4) Malfunction of one-way clutch No. 2 (5) Low line pressure
Stall speed in R range is higher than the standard value.	(1) O.D. clutch slippage. (2) Malfunction of O.D. one-way clutch (3) Direct clutch slippage (4) Brake No. 3 slipping (5) Low line pressure

<V4AW3>

Stall speeds in each range are equal to each other but are lower than the standard value.	<ul style="list-style-type: none"> (1) Throttle valve is not fully open (2) Insufficient engine output (3) Malfunction of stator one-way clutch (Malfunction of torque converter could be the problem if the stall speed is lower than the standard value by 600 rpm or more)
Stall speeds in each range are equal to each other but are higher than the standard value.	<ul style="list-style-type: none"> (1) Low line pressure (2) Fluid level is not at standard level (insufficient fluid) (3) Malfunction of O.D. one-way clutch
Stall speed in D range is higher than the standard value	<ul style="list-style-type: none"> (1) Forward clutch slippage (2) Malfunction of O.D. one-way clutch (3) Malfunction of one-way clutch No. 2 (4) Low line pressure
Stall speed in R range is higher than the standard value	<ul style="list-style-type: none"> (1) Direct clutch slippage (2) 1st & reverse brake slippage (3) Low line pressure (4) Malfunction of O.D. one-way clutch

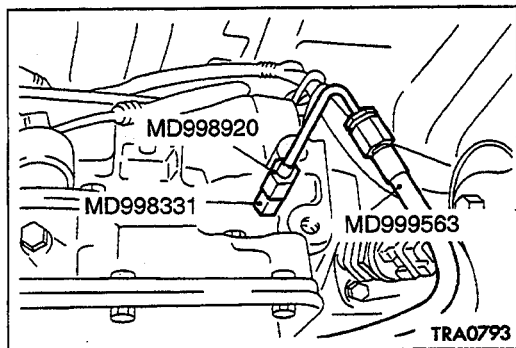


HYDRAULIC PRESSURE TEST

110005436

The hydraulic pressure tests (governor pressure and line pressure tests) are important in determining the causes of transmission failures.

Before conducting these tests, the 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 the correct operating temperatures, [engine coolant water 80–90°C (176–194°F), transmission fluid 70–80°C (158–176°F)].

**GOVERNOR PRESSURE TEST (V4AW2 only)**

110005437

1. Place the vehicle on a chassis dynamometer.
2. Remove the plug from the governor pressure take-off port.
3. Install the special tool as shown in the illustration and then place the meter inside the vehicle.

NOTE

If the adapter interferes with the extension housing, repair the tool as shown in the illustration.

4. Apply the parking brake.
5. Start the engine.
6. Release the parking brake.
7. Move the selector lever to the D position and measure governor pressure at each output shaft rpm.

Standard value:

Output shaft speed (rpm)	Vehicle speed km/h (mph)	Governor pressure kPa (psi)
1,000	28 (17)	140–170 (19.9–24.2)
2,000	56 (35)	250–290 (35.6–41.2)
3,200	90 (56)	410–470 (58.3–66.8)

JUDGEMENT BY GOVERNOR PRESSURE

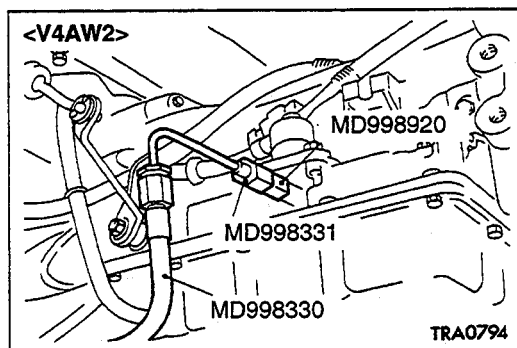
Governor pressure is not within the standard value	<ul style="list-style-type: none"> ● Incorrect line pressure ● Oil leak in governor circuit ● Malfunction of governor
----------------------------------------------------	--------------------------------------------------------------------------------------------------------------------------------------------------------

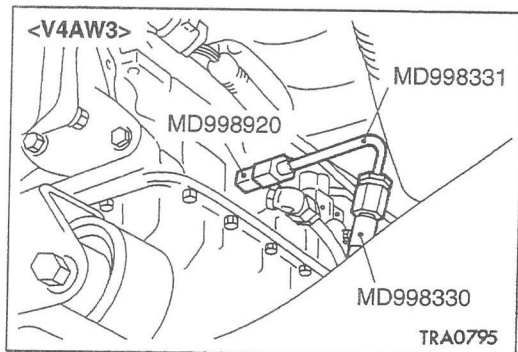
LINE PRESSURE TEST

1. Place the vehicle on a chassis dynamometer.
2. Remove the plug from the line pressure take-off port.
3. Install the special tool as shown in the illustration and then place the meter inside the vehicle.
4. Apply the parking brake.
5. Start the engine.
6. Move the selector lever to the D position.
7. Depress the brake pedal firmly with the left foot and operates the accelerator pedal with the right foot to measure the line pressure at each engine rpm. If the measured pressure is not at the standard pressure, check the adjustment of the throttle cable and readjust if necessary before conducting the test again.
8. Move the selector lever to the R position and test as above.

Standard value:

	Line pressure kPa (psi)	
	D range	R range
At idle	520–600 (74–85)	790–910 (112–129)
At stall	1,100–1,300 (156–185)	1,600–2,000 (228–284)





Standard value:

	Line pressure	
	D range	R range
At idle	430–490 (61–70)	520–620 (74–88)
At stall	1,140–1,390 (162–198)	1,400–1,750 (199–249)

JUDGEMENT BY LINE PRESSURE

<V4AW2>

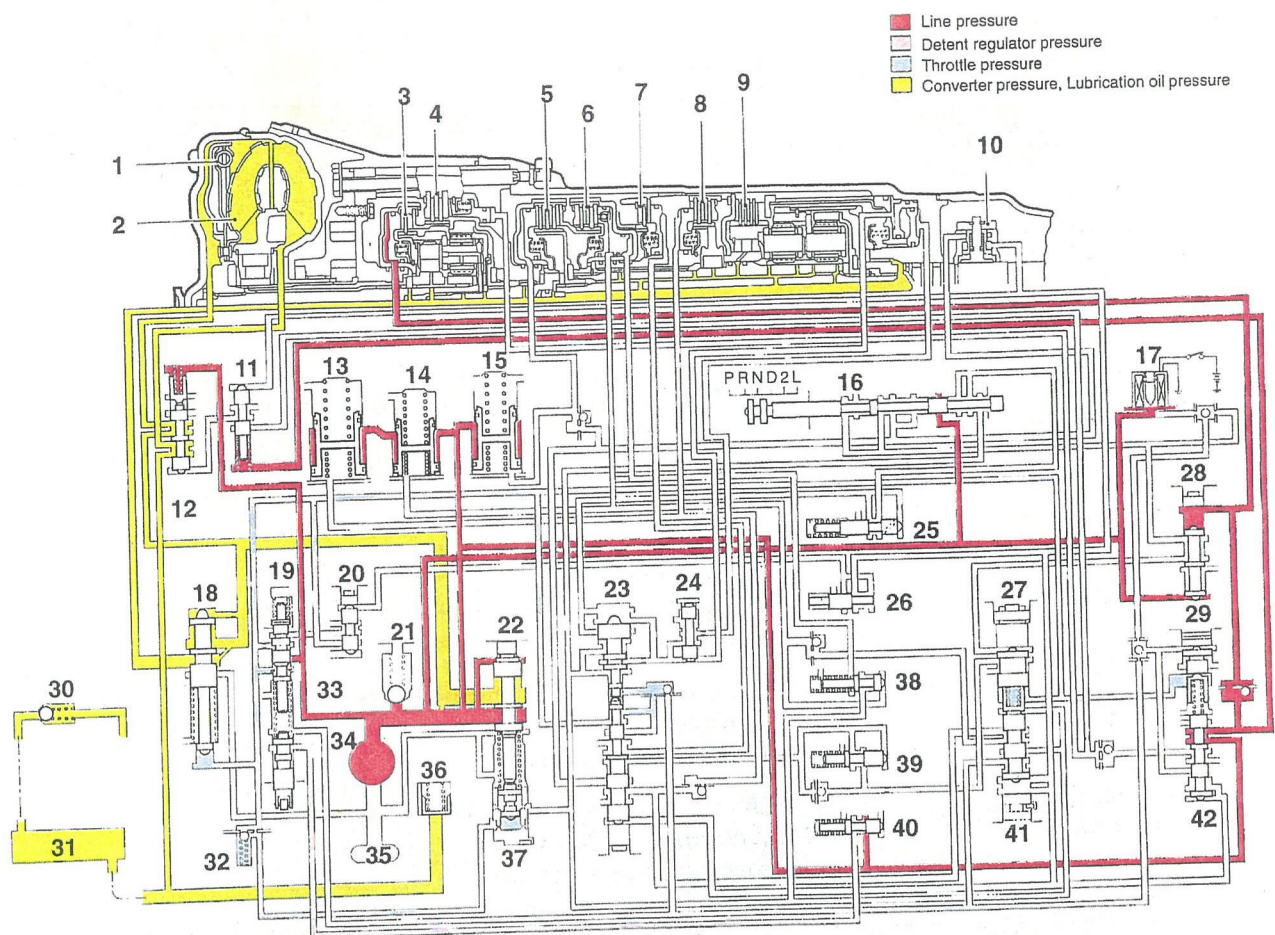
Hydraulic pressure in all ranges is higher than the standard value	(1) Malfunction of regulator valve (2) Malfunction of throttle valve (3) Incorrect throttle cable adjustment
Hydraulic pressure in all ranges is lower than the standard value	(1) Malfunction of oil pump (2) Malfunction of regulator valve (3) Malfunction of throttle valve (4) Incorrect throttle cable adjustment (5) Malfunction of O.D. clutch
Hydraulic pressure in D range is lower than the standard value.	(1) Large fluid leaks in D range hydraulic circuit (2) Malfunction of forward clutch (3) Malfunction of O.D. clutch
Hydraulic pressure in R range is lower than the standard value.	(1) Large fluid leaks in R range hydraulic circuit (2) Malfunction of brake No. 3 (3) Malfunction of direct clutch (4) Malfunction of O.D. clutch

<V4AW3>

Hydraulic pressure in all ranges is higher than the standard value	(1) Malfunction of regulator valve (2) Malfunction of throttle valve (3) Incorrect throttle cable adjustment
Hydraulic pressure in all ranges is lower than the standard value	(1) Malfunction of oil pump (2) Malfunction of regulator valve (3) Malfunction of throttle valve (4) Incorrect throttle cable adjustment (5) Malfunction of O.D. direct clutch
Hydraulic pressure in D range is lower than the standard value	(1) Large fluid leaks in D range hydraulic circuit (2) Malfunction of forward clutch (3) Malfunction of O.D. direct clutch
Hydraulic pressure in R range is lower than the standard value	(1) Large fluid leaks in R range hydraulic circuit (2) Malfunction of 1st & reverse brake (3) Malfunction of direct clutch (4) Malfunction of O.D. direct clutch

HYDRAULIC CIRCUIT <V4AW2>

N (NEUTRAL)

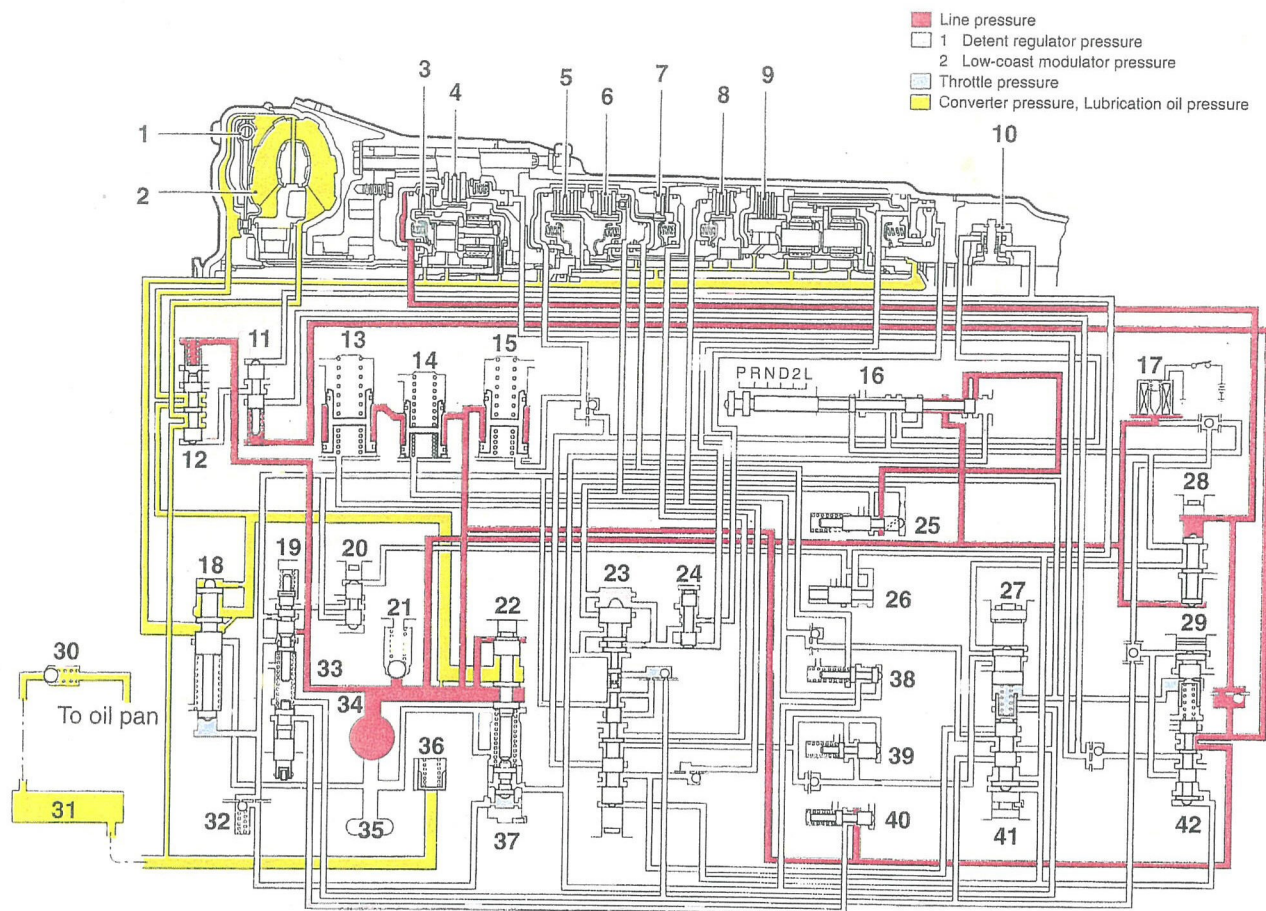


ZTRA0436

1. Lockup 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. Lockup signal valve
12. Lockup relay valve
13. Accumulator B2
14. Accumulator C2
15. Accumulator C1
16. Manual valve
17. OD solenoid valve
18. Secondary regulator valve
19. Throttle valve
20. Cut back valve
21. Pressure relief valve

22. Primary regulator valve
23. Low coast shift valve
24. Plug
25. Low coast modulator valve
26. Plug
27. Intermediate shift valve
28. D-2 down timing valve
29. Third coast shift valve
30. Oil cooler return ball
31. Oil cooler
32. Damping check ball
33. Down-shift plug
34. Oil pump
35. Strainer
36. Oil cooler by-pass valve
37. 1-2 shift valve
38. Reverse clutch sequence valve
39. Intermediate modulator valve
40. Detent regulator valve
41. 2-3 shift valve
42. 3-4 shift valve

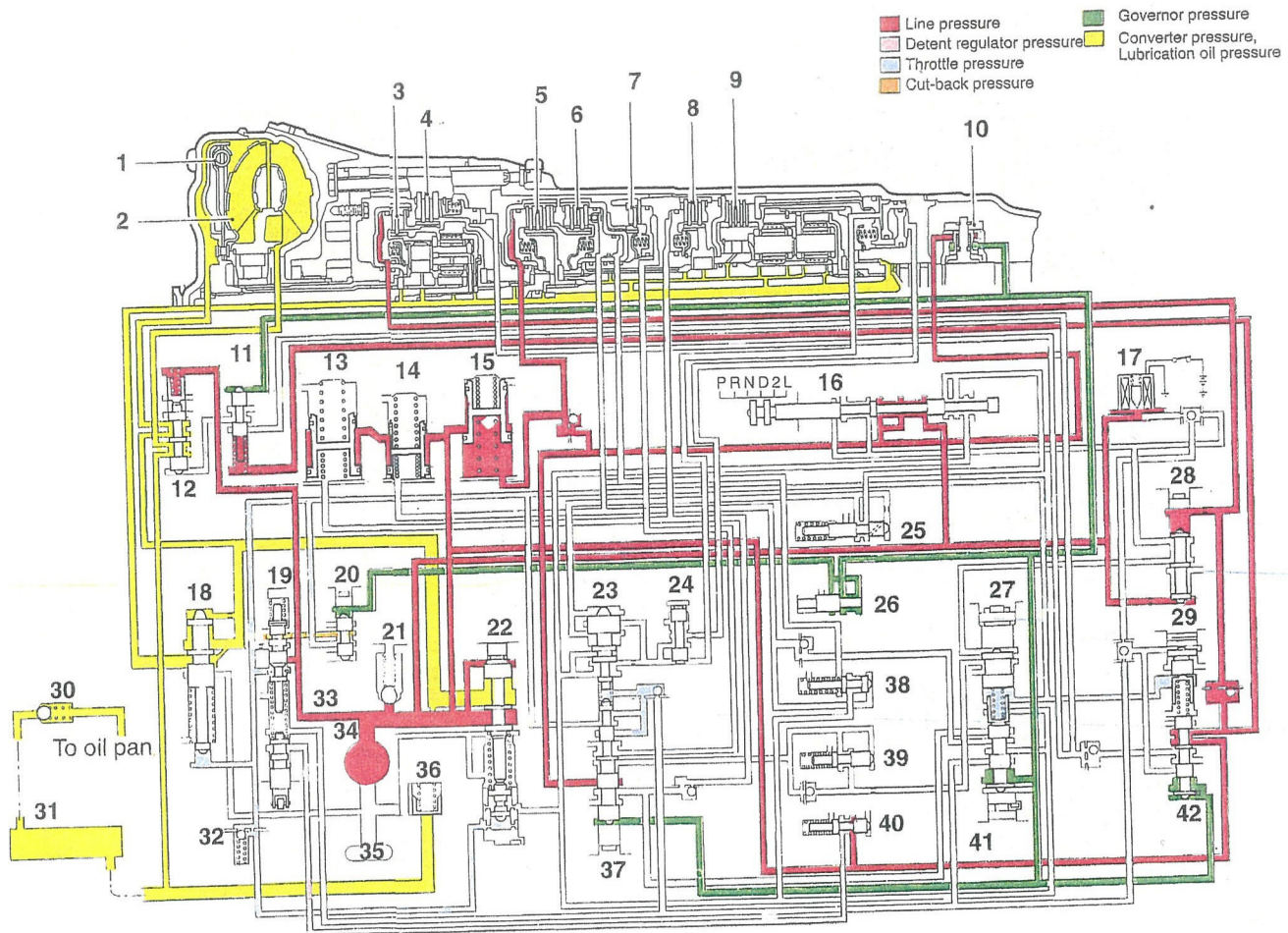
P (PARKING)



Z TRA0437

- | | |
|-------------------------------|-----------------------------------|
| 1. Lockup clutch | 22. Primary regulator valve |
| 2. Torque converter | 23. Low coast shift valve |
| 3. Overdrive clutch | 24. Plug |
| 4. Overdrive brake | 25. Low coast modulator valve |
| 5. Forward clutch | 26. Plug |
| 6. Direct clutch | 27. Intermediate shift valve |
| 7. Brake No. 1 | 28. D-2 down timing valve |
| 8. Brake No. 2 | 29. Third coast shift valve |
| 9. Brake No. 3 | 30. Oil cooler return ball |
| 10. Governor | 31. Oil cooler |
| 11. Lockup signal valve | 32. Damping check ball |
| 12. Lockup relay valve | 33. Down-shift plug |
| 13. Accumulator B2 | 34. Oil pump |
| 14. Accumulator C2 | 35. Strainer |
| 15. Accumulator C1 | 36. Oil cooler by-pass valve |
| 16. Manual valve | 37. 1-2 shift valve |
| 17. OD solenoid valve | 38. Reverse clutch sequence valve |
| 18. Secondary regulator valve | 39. Intermediate modulator valve |
| 19. Throttle valve | 40. Detent regulator valve |
| 20. Cut back valve | 41. 2-3 shift valve |
| 21. Pressure relief valve | 42. 3-4 shift valve |

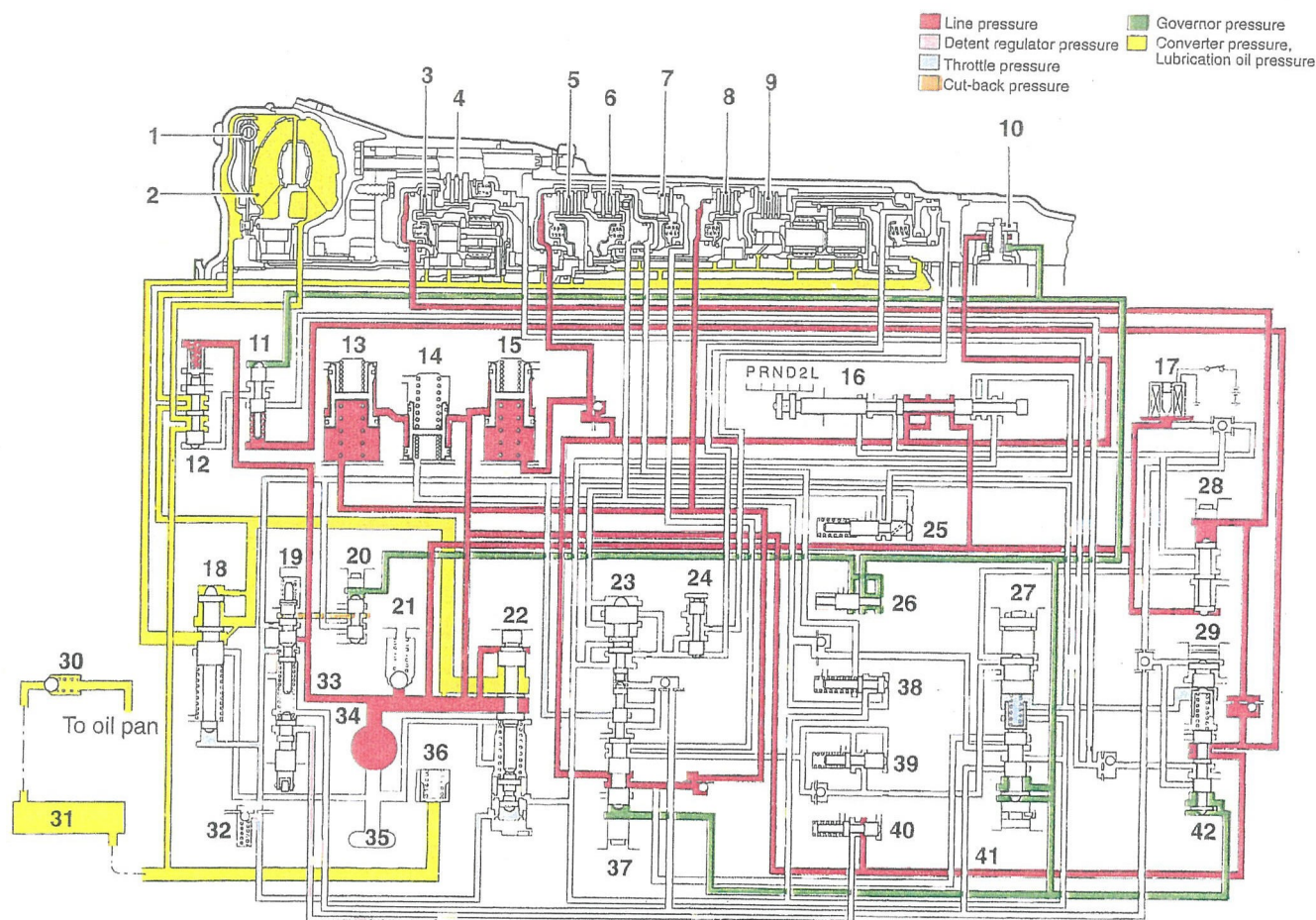
D-1 (DRIVE 1ST)



ZTRAQ438

- | | |
|-------------------------------|-----------------------------------|
| 1. Lockup clutch | 22. Primary regulator valve |
| 2. Torque converter | 23. Low coast shift valve |
| 3. Overdrive clutch | 24. Plug |
| 4. Overdrive brake | 25. Low coast modulator valve |
| 5. Forward clutch | 26. Plug |
| 6. Direct clutch | 27. Intermediate shift valve |
| 7. Brake No. 1 | 28. D-2 down timing valve |
| 8. Brake No. 2 | 29. Third coast shift valve |
| 9. Brake No. 3 | 30. Oil cooler return ball |
| 10. Governor | 31. Oil cooler |
| 11. Lockup signal valve | 32. Damping check ball |
| 12. Lockup relay valve | 33. Down-shift plug |
| 13. Accumulator B2 | 34. Oil pump |
| 14. Accumulator C2 | 35. Strainer |
| 15. Accumulator C1 | 36. Oil cooler by-pass valve |
| 16. Manual valve | 37. 1-2 shift valve |
| 17. OD solenoid valve | 38. Reverse clutch sequence valve |
| 18. Secondary regulator valve | 39. Intermediate modulator valve |
| 19. Throttle valve | 40. Detent regulator valve |
| 20. Cut back valve | 41. 2-3 shift valve |
| 21. Pressure relief valve | 42. 3-4 shift valve |

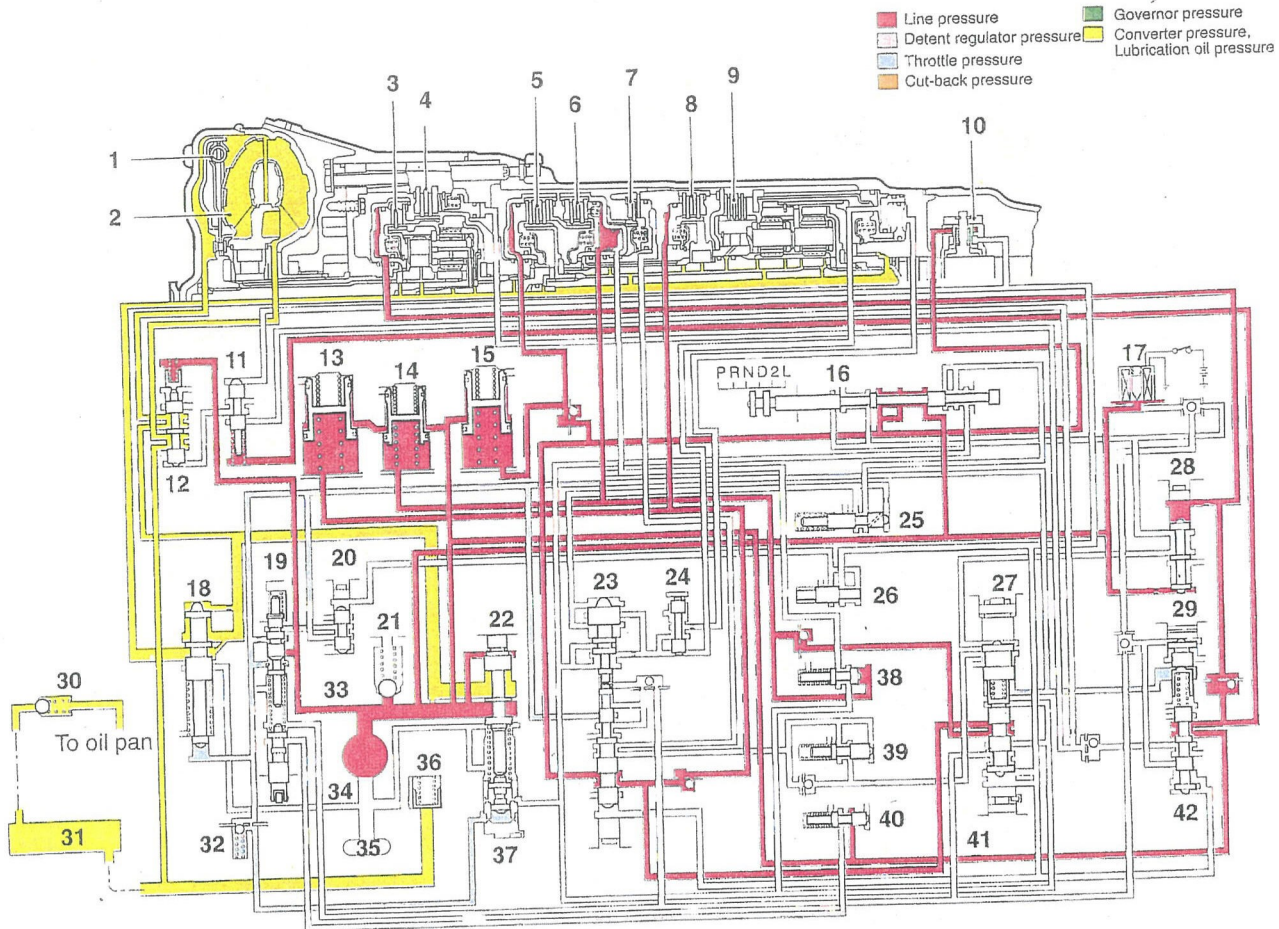
D-2 (DRIVE 2ND)



ZTRA0439

- | | |
|-------------------------------|-----------------------------------|
| 1. Lockup clutch | 22. Primary regulator valve |
| 2. Torque converter | 23. Low coast shift valve |
| 3. Overdrive clutch | 24. Plug |
| 4. Overdrive brake | 25. Low coast modulator valve |
| 5. Forward clutch | 26. Plug |
| 6. Direct clutch | 27. Intermediate shift valve |
| 7. Brake No. 1 | 28. D-2 down timing valve |
| 8. Brake No. 2 | 29. Third coast shift valve |
| 9. Brake No. 3 | 30. Oil cooler return ball |
| 10. Governor | 31. Oil cooler |
| 11. Lockup signal valve | 32. Damping check ball |
| 12. Lockup relay valve | 33. Down-shift plug |
| 13. Accumulator B2 | 34. Oil pump |
| 14. Accumulator C2 | 35. Strainer |
| 15. Accumulator C1 | 36. Oil cooler by-pass valve |
| 16. Manual valve | 37. 1-2 shift valve |
| 17. OD solenoid valve | 38. Reverse clutch sequence valve |
| 18. Secondary regulator valve | 39. Intermediate modulator valve |
| 19. Throttle valve | 40. Detent regulator valve |
| 20. Cut back valve | 41. 2-3 shift valve |
| 21. Pressure relief valve | 42. 3-4 shift valve |

D-3 (DRIVE 3RD)



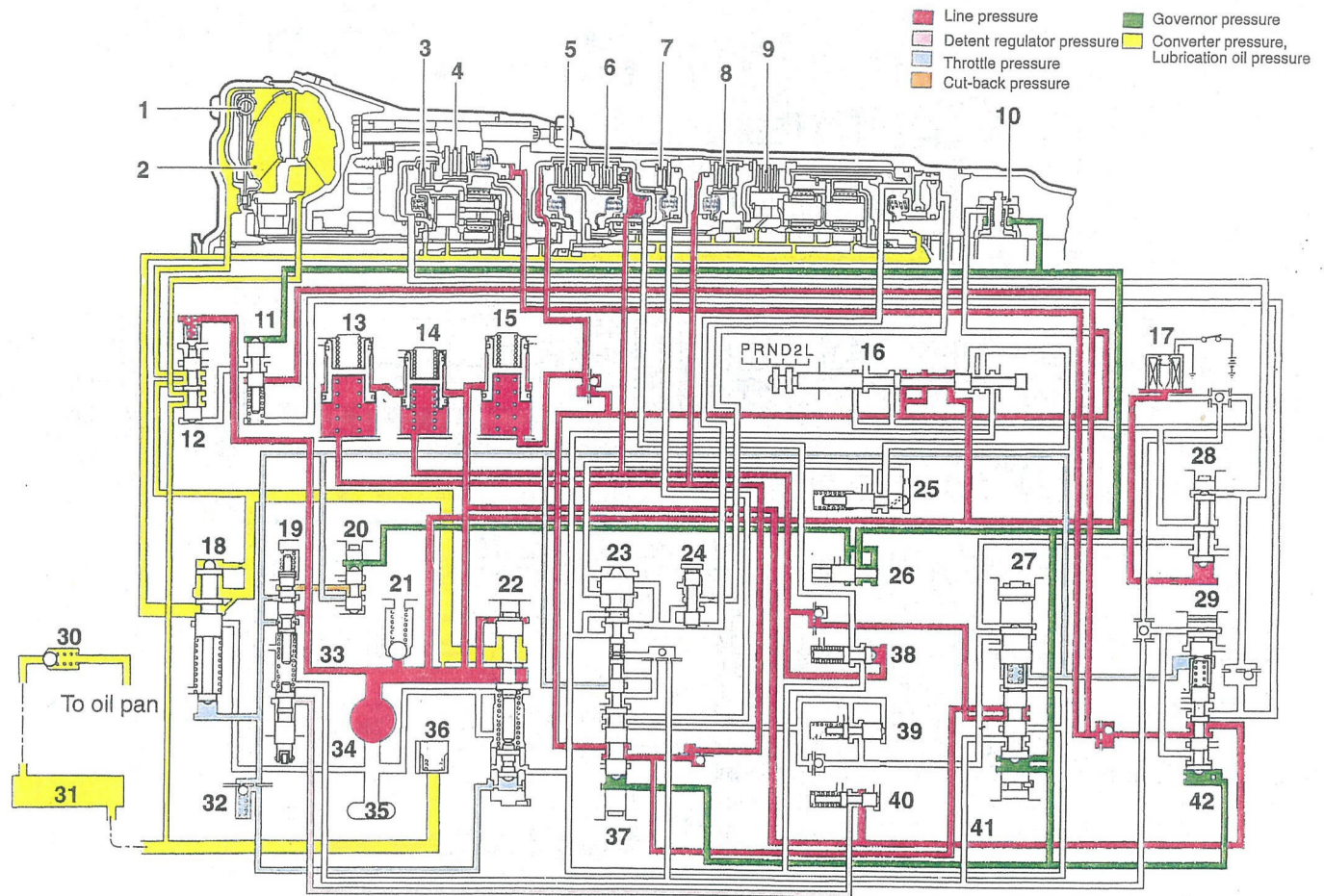
ZTRA0440

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| <ul style="list-style-type: none"> 1. Lockup 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. Lockup signal valve 12. Lockup relay valve 13. Accumulator B2 14. Accumulator C2 15. Accumulator C1 16. Manual valve 17. OD solenoid valve 18. Secondary regulator valve 19. Throttle valve 20. Cut back valve 21. Pressure relief valve | <ul style="list-style-type: none"> 22. Primary regulator valve 23. Low coast shift valve 24. Plug 25. Low coast modulator valve 26. Plug 27. Intermediate shift valve 28. D-2 down timing valve 29. Third coast shift valve 30. Oil cooler return ball 31. Oil cooler 32. Damping check ball 33. Down-shift plug 34. Oil pump 35. Strainer 36. Oil cooler by-pass valve 37. 1-2 shift valve 38. Reverse clutch sequence valve 39. Intermediate modulator valve 40. Detent regulator valve 41. 2-3 shift valve 42. 3-4 shift valve |
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TSB Revision

D-4 (DRIVE 4TH)

TORQUE CONVERTER CLUTCH: OFF



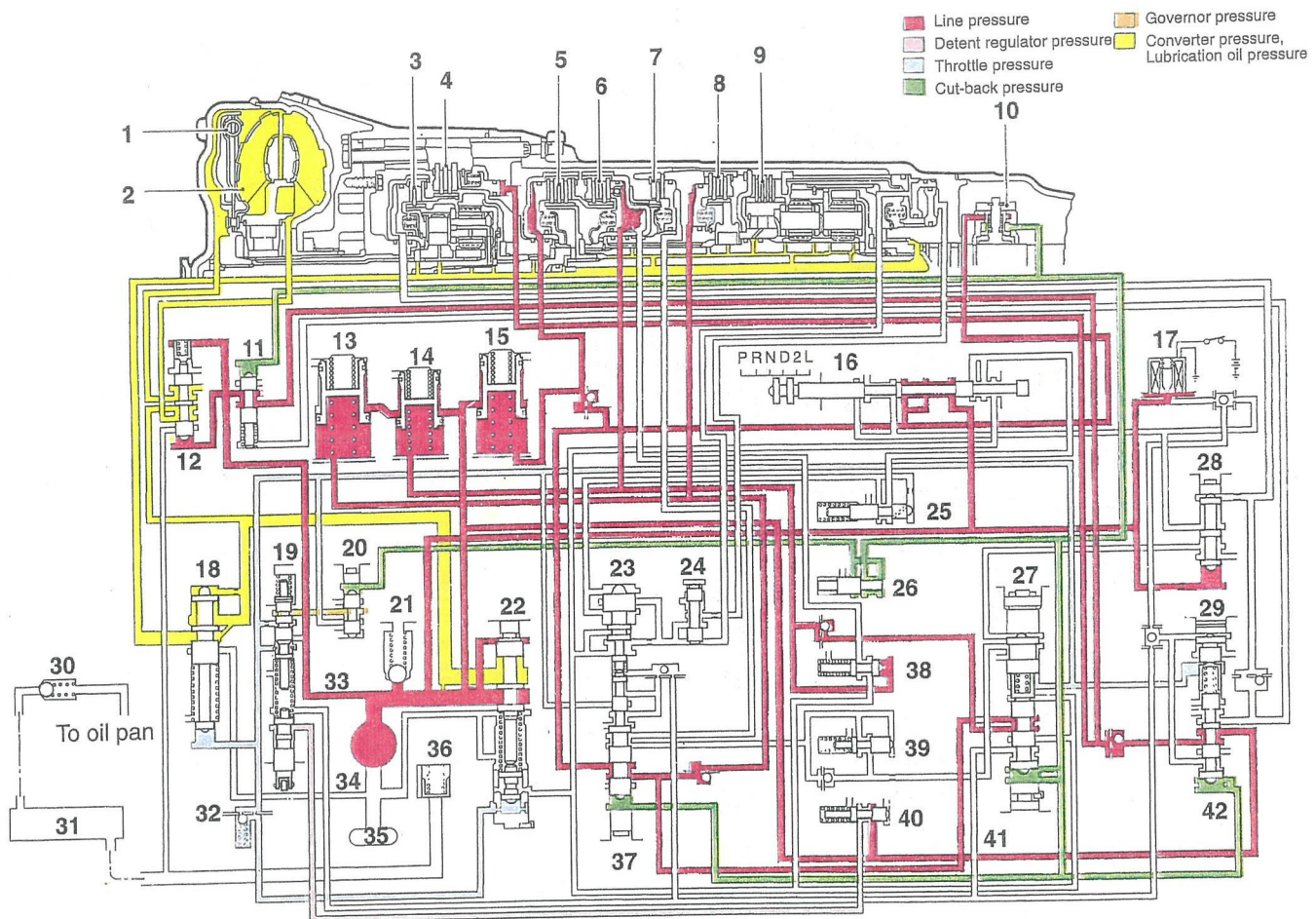
- Line pressure
- Detent regulator pressure
- Throttle pressure
- Cut-back pressure
- Governor pressure
- Converter pressure, Lubrication oil pressure

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> 1. Lockup 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. Lockup signal valve 12. Lockup relay valve 13. Accumulator B2 14. Accumulator C2 15. Accumulator C1 16. Manual valve 17. OD solenoid valve 18. Secondary regulator valve 19. Throttle valve 20. Cut back valve 21. Pressure relief valve | <ul style="list-style-type: none"> 22. Primary regulator valve 23. Low coast shift valve 24. Plug 25. Low coast modulator valve 26. Plug 27. Intermediate shift valve 28. D-2 down timing valve 29. Third coast shift valve 30. Oil cooler return ball 31. Oil cooler 32. Damping check ball 33. Down-shift plug 34. Oil pump 35. Strainer 36. Oil cooler by-pass valve 37. 1-2 shift valve 38. Reverse clutch sequence valve 39. Intermediate modulator valve 40. Detent regulator valve 41. 2-3 shift valve 42. 3-4 shift valve |
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ZTRA0441

D-4 (DRIVE 4TH)

TORQUE CONVERTER CLUTCH: ON

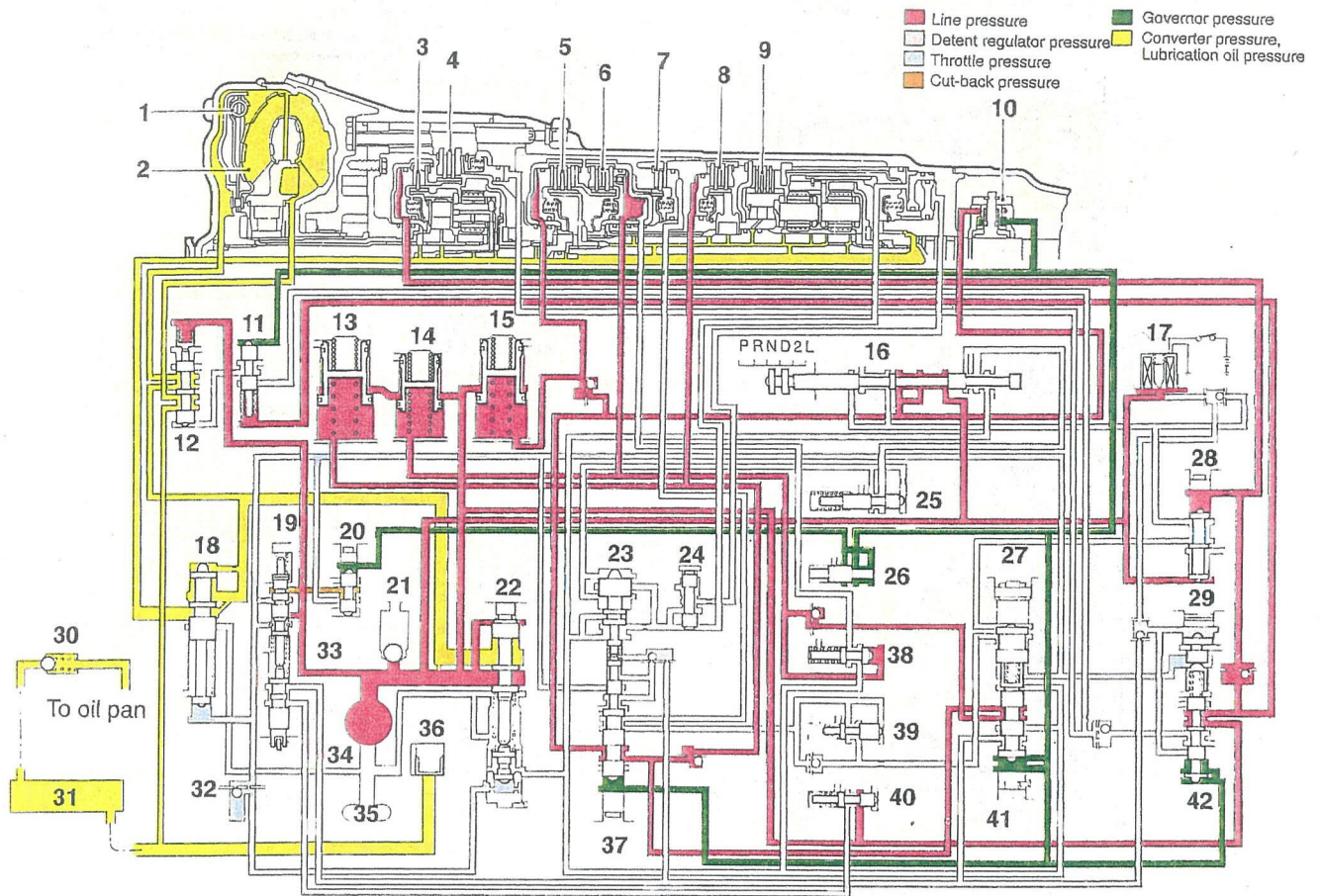


ZTRA0442

1. Lockup 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. Lockup signal valve
12. Lockup relay valve
13. Accumulator B2
14. Accumulator C2
15. Accumulator C1
16. Manual valve
17. OD solenoid valve
18. Secondary regulator valve
19. Throttle valve
20. Cut back valve
21. Pressure relief valve

22. Primary regulator valve
23. Low coast shift valve
24. Plug
25. Low coast modulator valve
26. Plug
27. Intermediate shift valve
28. D-2 down timing valve
29. Third coast shift valve
30. Oil cooler return ball
31. Oil cooler
32. Damping check ball
33. Down-shift plug
34. Oil pump
35. Strainer
36. Oil cooler by-pass valve
37. 1-2 shift valve
38. Reverse clutch sequence valve
39. Intermediate modulator valve
40. Detent regulator valve
41. 2-3 shift valve
42. 3-4 shift valve

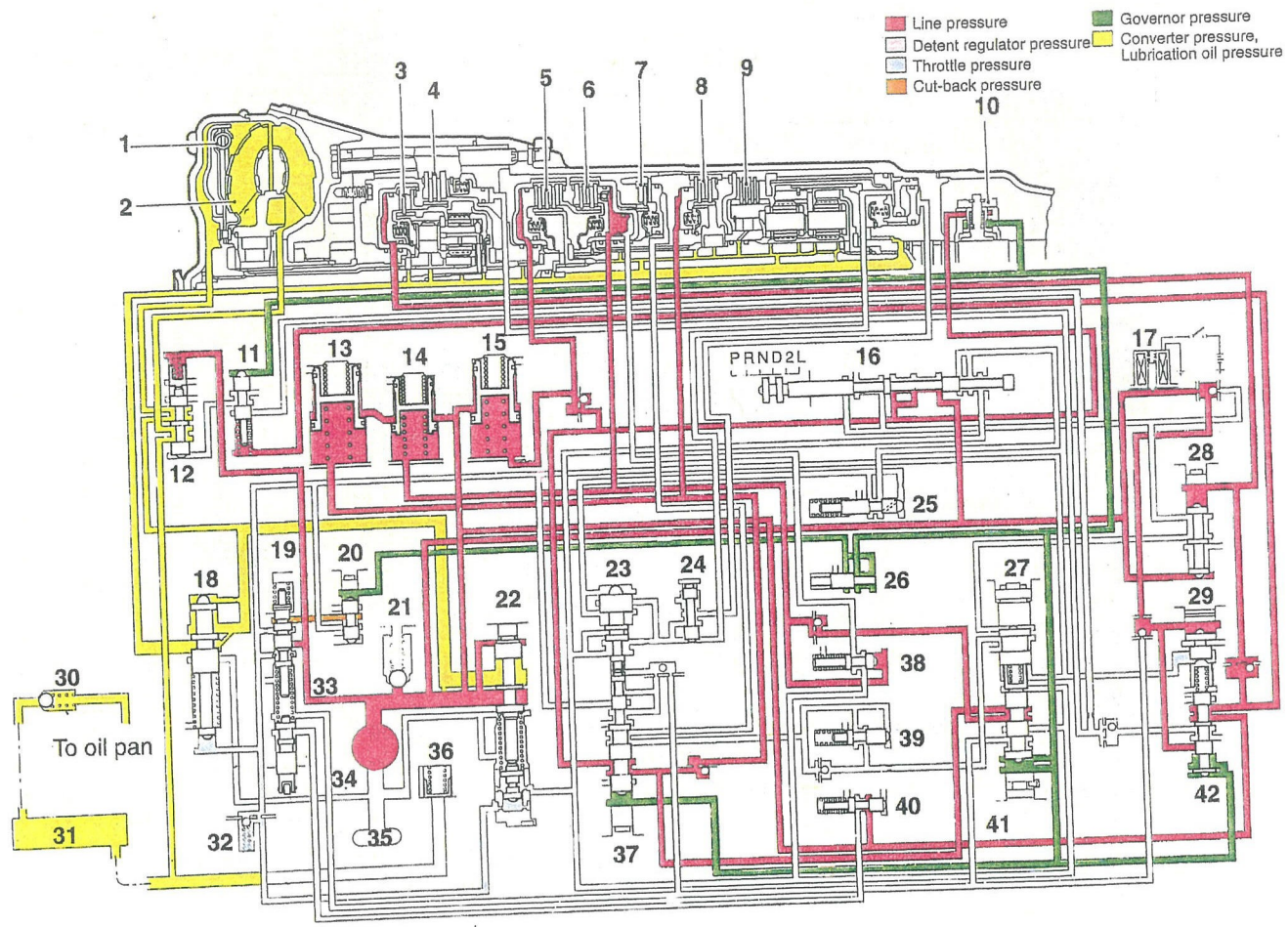
D-K/D (DRIVE KICK DOWN)
4TH → 3RD



ZTRA0443

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Lockup 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. Lockup signal valve 12. Lockup relay valve 13. Accumulator B2 14. Accumulator C2 15. Accumulator C1 16. Manual valve 17. OD solenoid valve 18. Secondary regulator valve 19. Throttle valve 20. Cut back valve 21. Pressure relief valve | <ol style="list-style-type: none"> 22. Primary regulator valve 23. Low shift valve 24. Plug 25. Low coast modulator valve 26. Plug 27. Intermediate shift valve 28. D-2 down timing valve 29. Third coast shift valve 30. Oil cooler return ball 31. Oil cooler 32. Damping check ball 33. Down-shift plug 34. Oil pump 35. Strainer 36. Oil cooler by-pass valve 37. 1-2 shift valve 38. Reverse clutch sequence valve 39. Intermediate modulator valve 40. Detent regulator valve 41. 2-3 shift valve 42. 3-4 shift valve |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

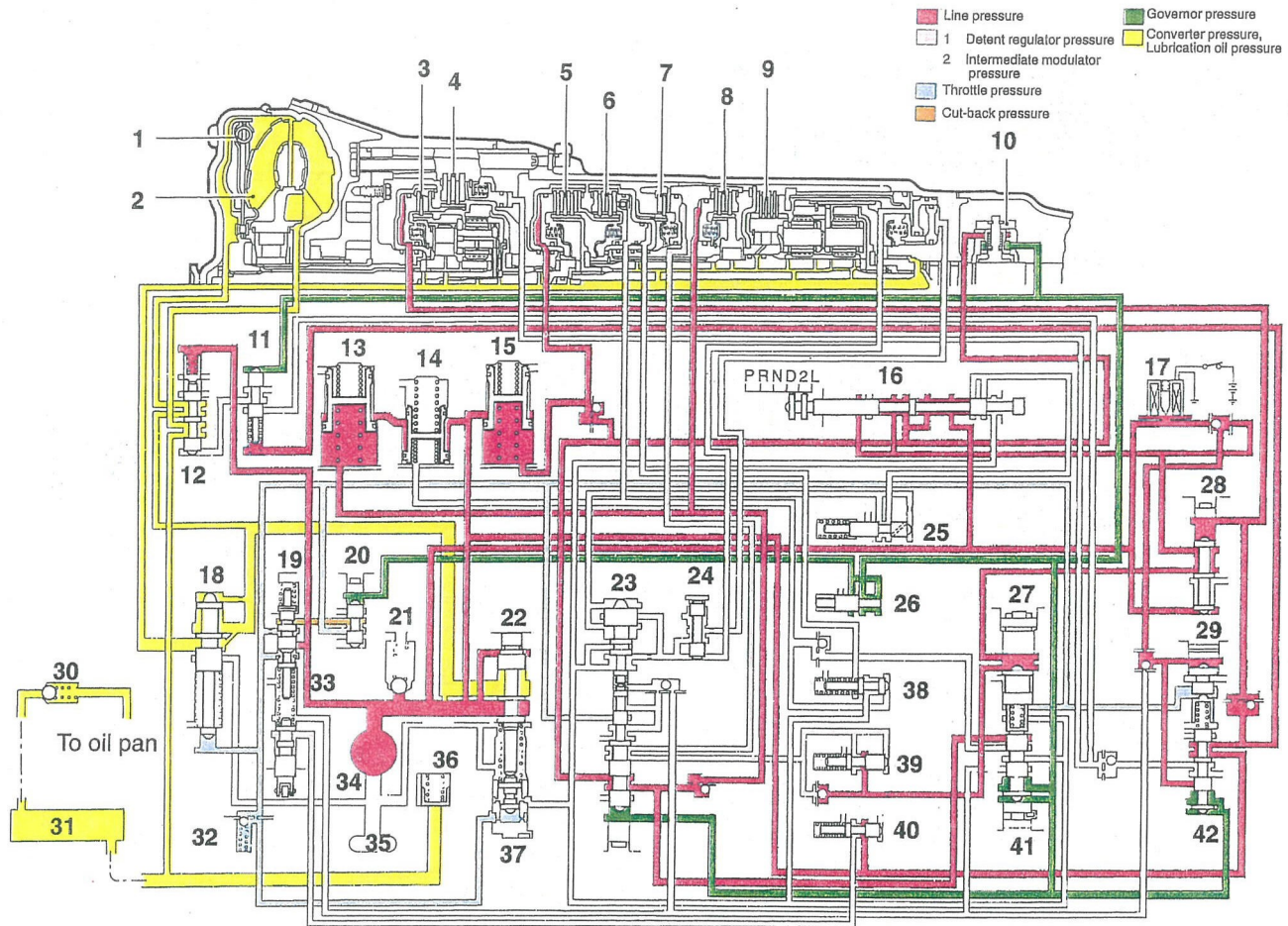
D-3 (DRIVE 3RD)
OVERDRIVE SWITCH: OFF



ZTRA0444

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Lockup 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. Lockup signal valve 12. Lockup relay valve 13. Accumulator B2 14. Accumulator C2 15. Accumulator C1 16. Manual valve 17. OD solenoid valve 18. Secondary regulator valve 19. Throttle valve 20. Cut back valve 21. Pressure relief valve | <ol style="list-style-type: none"> 22. Primary regulator valve 23. Low coast shift valve 24. Plug 25. Low coast modulator valve 26. Plug 27. Intermediate shift valve 28. D-2 down timing valve 29. Third coast shift valve 30. Oil cooler return ball 31. Oil cooler 32. Damping check ball 33. Down-shift plug 34. Oil pump 35. Strainer 36. Oil cooler by-pass valve 37. 1-2 shift valve 38. Reverse clutch sequence valve 39. Intermediate modulator valve 40. Detent regulator valve 41. 2-3 shift valve 42. 3-4 shift valve |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

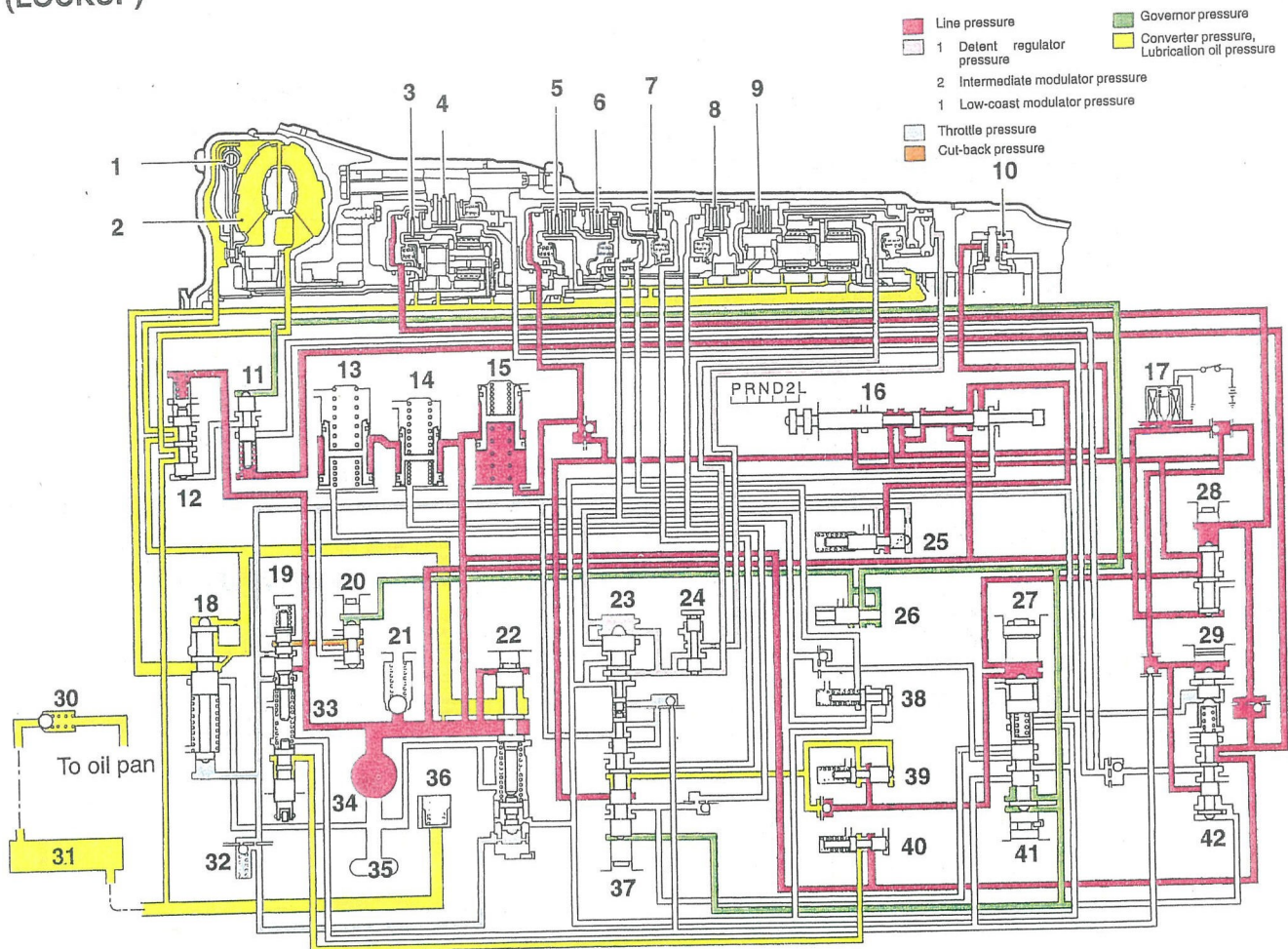
2-2 (SECOND 2ND)



ZTRA0445

- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> 1. Lockup 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. Lockup signal valve 12. Lockup relay valve 13. Accumulator B2 14. Accumulator C2 15. Accumulator C1 16. Manual valve 17. OD solenoid valve 18. Secondary regulator valve 19. Throttle valve 20. Cut back valve 21. Pressure relief valve | <ul style="list-style-type: none"> 22. Primary regulator valve 23. Low coast shift valve 24. Plug 25. Low coast modulator valve 26. Plug 27. Intermediate shift valve 28. D-2 down timing valve 29. Third coast shift valve 30. Oil cooler return ball 31. Oil cooler 32. Damping check ball 33. Down-shift plug 34. Oil pump 35. Strainer 36. Oil cooler by-pass valve 37. 1-2 shift valve 38. Reverse clutch sequence valve 39. Intermediate modulator valve 40. Detent regulator valve 41. 2-3 shift valve 42. 3-4 shift valve |
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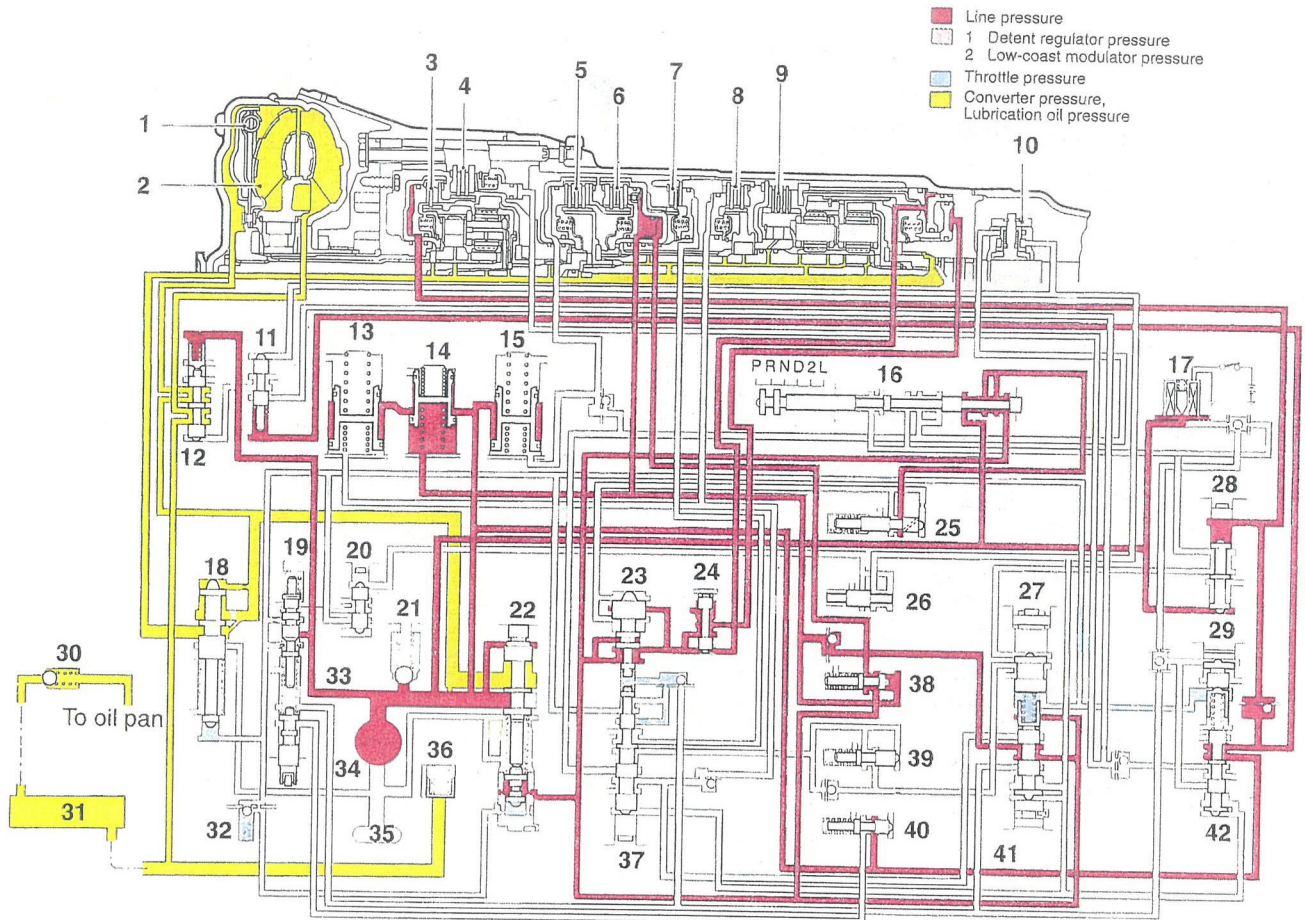
L (LOCKUP)



ZTRA0446

- | | |
|-------------------------------|-----------------------------------|
| 1. Lockup clutch | 22. Primary regulator valve |
| 2. Torque converter | 23. Low coast shift valve |
| 3. Overdrive clutch | 24. Plug |
| 4. Overdrive brake | 25. Low coast modulator valve |
| 5. Forward clutch | 26. Plug |
| 6. Direct clutch | 27. Intermediate shift valve |
| 7. Brake No. 1 | 28. D-2 down timing valve |
| 8. Brake No. 2 | 29. Third coast shift valve |
| 9. Brake No. 3 | 30. Oil cooler return ball |
| 10. Governor | 31. Oil cooler |
| 11. Lockup signal valve | 32. Damping check ball |
| 12. Lockup relay valve | 33. Down-shift plug |
| 13. Accumulator B2 | 34. Oil pump |
| 14. Accumulator C2 | 35. Strainer |
| 15. Accumulator C1 | 36. Oil cooler by-pass valve |
| 16. Manual valve | 37. 1-2 shift valve |
| 17. OD solenoid valve | 38. Reverse clutch sequence valve |
| 18. Secondary regulator valve | 39. Intermediate modulator valve |
| 19. Throttle valve | 40. Detent regulator valve |
| 20. Cut back valve | 41. 2-3 shift valve |
| 21. Pressure relief valve | 42. 3-4 shift valve |

R (REVERSE)



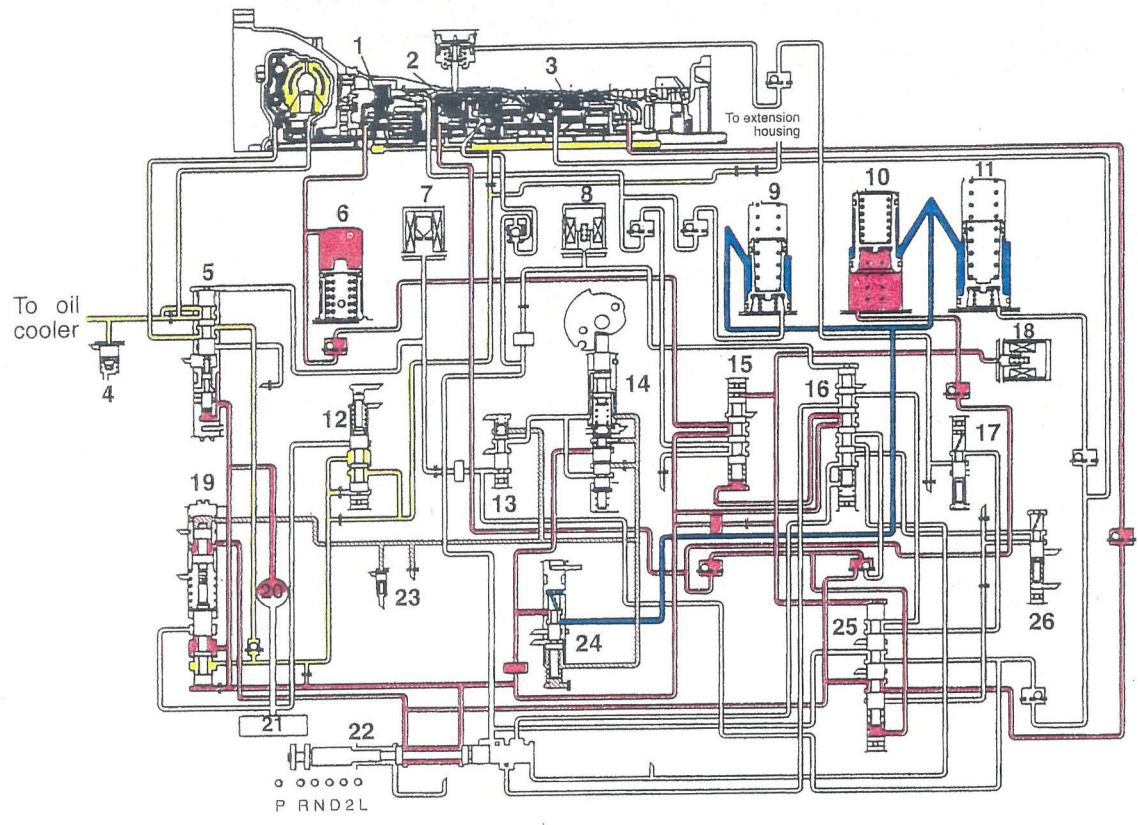
ZTRA0447

- | | |
|-------------------------------|-----------------------------------|
| 1. Lockup clutch | 22. Primary regulator valve |
| 2. Torque converter | 23. Low coast shift valve |
| 3. Overdrive clutch | 24. Plug |
| 4. Overdrive brake | 25. Low coast modulator valve |
| 5. Forward clutch | 26. Plug |
| 6. Direct clutch | 27. Intermediate shift valve |
| 7. Brake No. 1 | 28. D-2 down timing valve |
| 8. Brake No. 2 | 29. Third coast shift valve |
| 9. Brake No. 3 | 30. Oil cooler return ball |
| 10. Governor | 31. Oil cooler |
| 11. Lockup signal valve | 32. Damping check ball |
| 12. Lockup relay valve | 33. Down-shift plug |
| 13. Accumulator B2 | 34. Oil pump |
| 14. Accumulator C2 | 35. Strainer |
| 15. Accumulator C1 | 36. Oil cooler by-pass valve |
| 16. Manual valve | 37. 1-2 shift valve |
| 17. OD solenoid valve | 38. Reverse clutch sequence valve |
| 18. Secondary regulator valve | 39. Intermediate modulator valve |
| 19. Throttle valve | 40. Detent regulator valve |
| 20. Cut back valve | 41. 2-3 shift valve |
| 21. Pressure relief valve | 42. 3-4 shift valve |

HYDRAULIC CIRCUIT <V4AW3>

R (REVERSE)

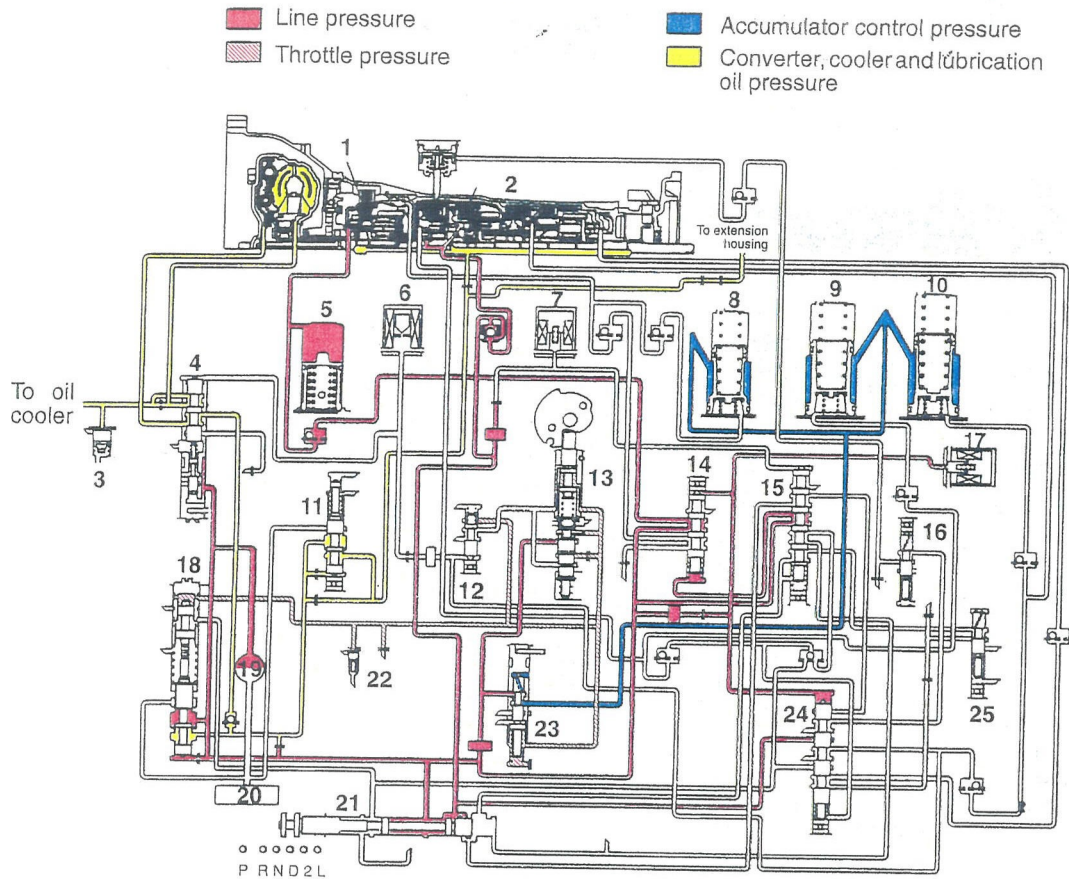
- Line pressure
- Accumulator control pressure
- Converter, cooler and lubrication oil pressure
- Throttle pressure



TRA0735

- | | |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> 1. Overdrive direct clutch 2. Direct clutch 3. 1st & Rev. brake 4. Cooler by-pass valve 5. Torque converter clutch relay valve 6. C0 Accumulator 7. Lockup solenoid 8. Shift solenoid No. 1 9. B0 Accumulator 10. C2 Accumulator 11. B2 Accumulator 12. Secondary regulator valve 13. Cut back valve | <ol style="list-style-type: none"> 14. Throttle valve 15. 3-4 shift valve 16. 2-3 shift valve 17. 2nd coast modulator valve 18. Shift solenoid No. 2 19. Primary regulator valve 20. Oil pump 21. Strainer 22. Manual valve 23. Pressure release 24. Accumulator control valve 25. 1-2 shift valve 26. Low coast modulator valve |
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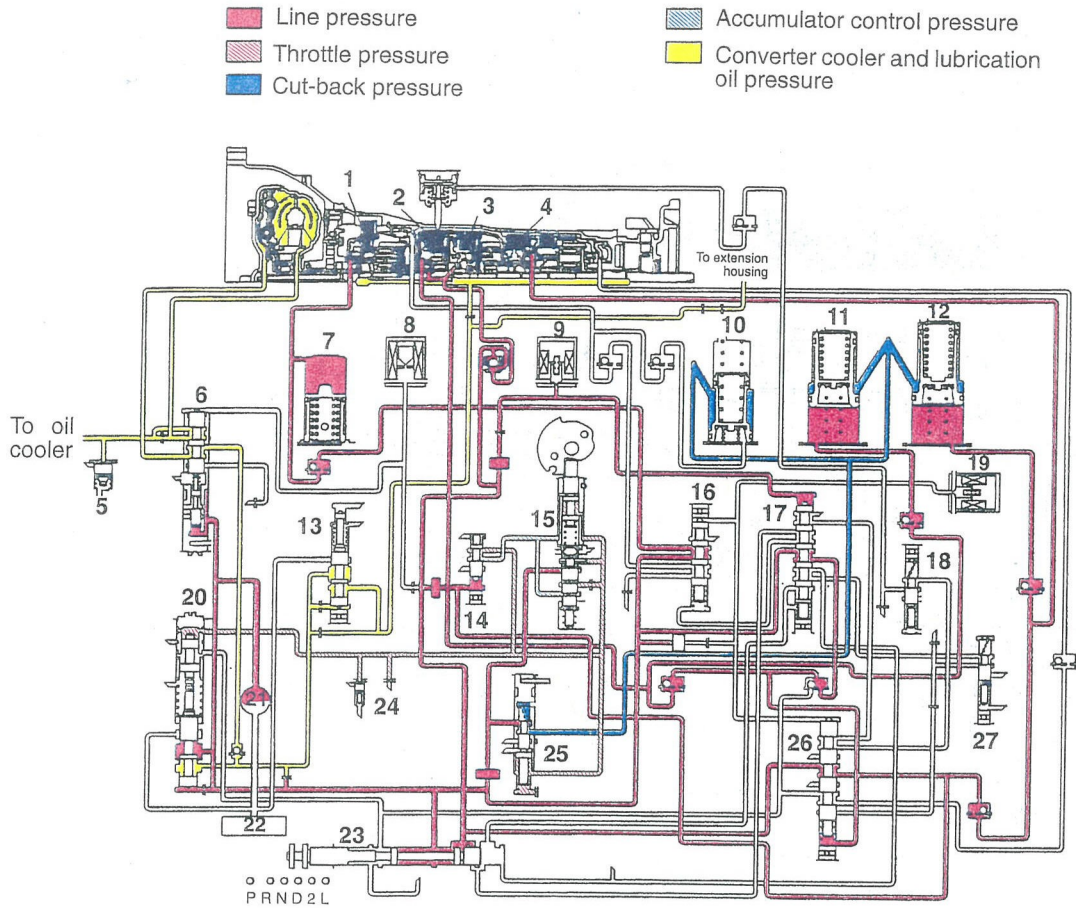
D-1 (DRIVE 1ST)



TRA0736

- | | |
|----------------------------------------|-------------------------------|
| 1. Overdrive direct clutch | 14. 3-4 shift valve |
| 2. Forward clutch | 15. 2-3 shift valve |
| 3. Cooler by-pass valve | 16. 2nd coast modulator valve |
| 4. Torque converter clutch relay valve | 17. Shift solenoid No. 2 |
| 5. C0 Accumulator | 18. Primary regulator valve |
| 6. Lockup solenoid | 19. Oil pump |
| 7. Shift solenoid No. 1 | 20. Strainer |
| 8. B0 Accumulator | 21. Manual valve |
| 9. C2 Accumulator | 22. Pressure release |
| 10. B2 Accumulator | 23. Accumulator control valve |
| 11. Secondary regulator valve | 24. 1-2 shift valve |
| 12. Cut back valve | 25. Low coast modulator valve |
| 13. Throttle valve | |

D-3 (DRIVE 3RD)

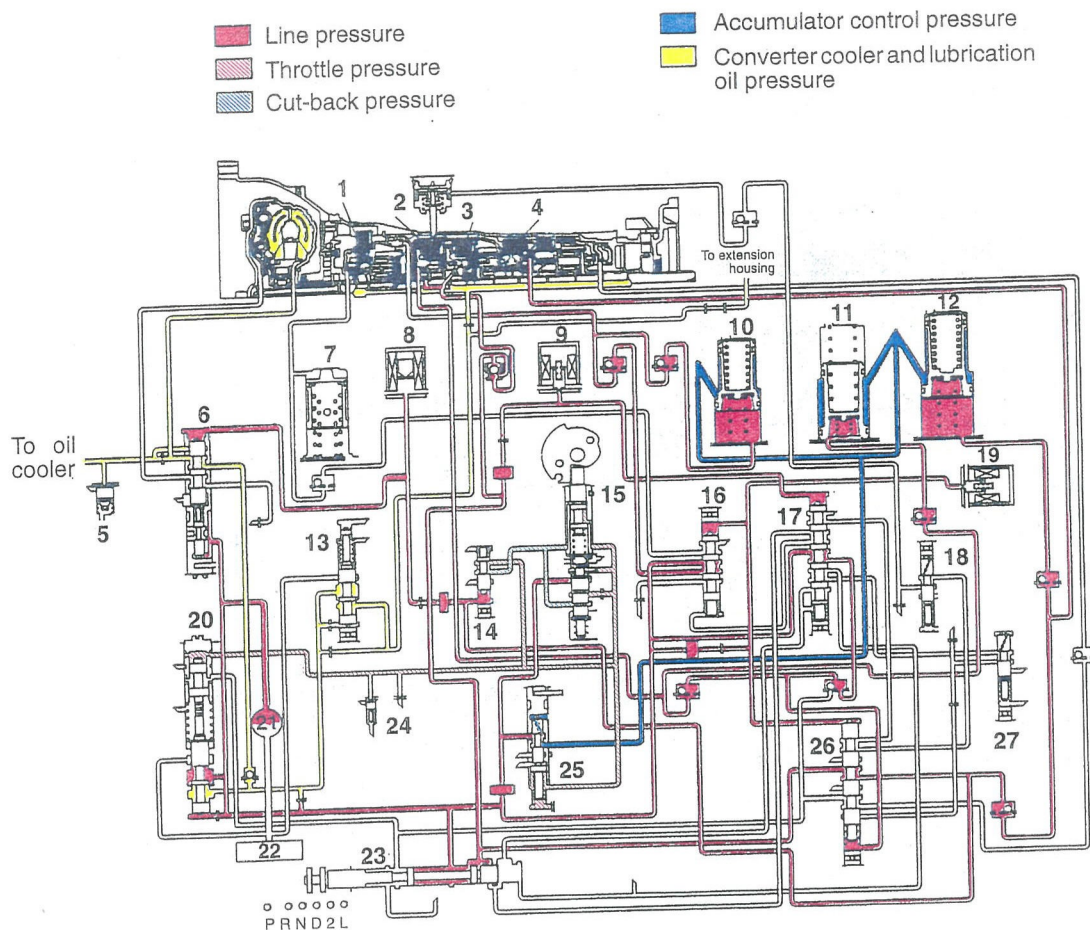


TRA0738

- | | |
|----------------------------------------|-------------------------------|
| 1. Overdrive direct clutch | 15. Throttle valve |
| 2. Direct clutch | 16. 3-4 shift valve |
| 3. Forward clutch | 17. 2-3 shift valve |
| 4. 1st & Rev. brake | 18. 2nd coast modulator valve |
| 5. Cooler by-pass valve | 19. Shift solenoid No. 2 |
| 6. Torque converter clutch relay valve | 20. Primary regulator valve |
| 7. C0 Accumulator | 21. Oil pump |
| 8. Lockup solenoid | 22. Strainer |
| 9. Shift solenoid No. 1 | 23. Manual valve |
| 10. B0 Accumulator | 24. Pressure release |
| 11. C2 Accumulator | 25. Accumulator control valve |
| 12. B2 Accumulator | 26. 1-2 shift valve |
| 13. Secondary regulator valve | 27. Low coast modulator valve |
| 14. Cut back valve | |

TSB Revision

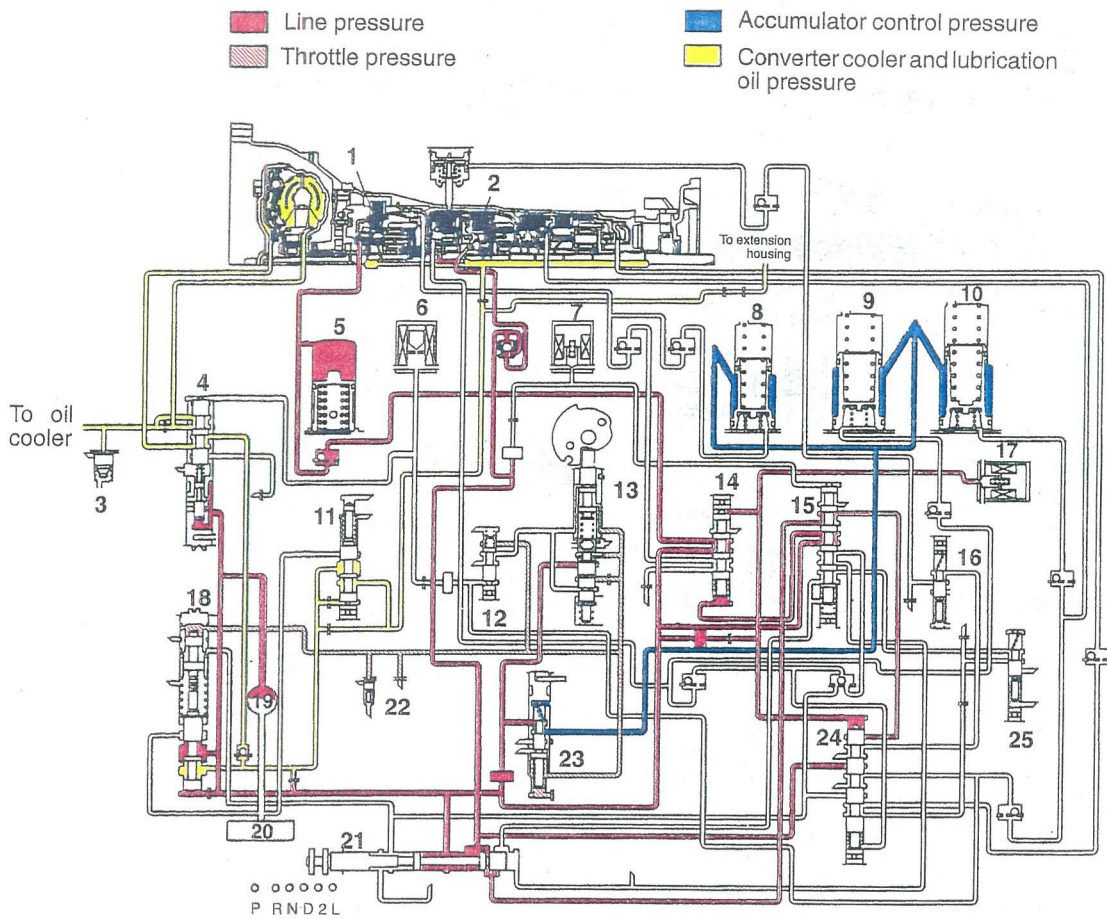
D-4 (DRIVE 4TH) LOCK UP



TRA0739

- | | |
|----------------------------------------|-------------------------------|
| 1. Overdrive direct clutch | 15. Throttle valve |
| 2. Direct clutch | 16. 3-4 shift valve |
| 3. Forward clutch | 17. 2-3 shift valve |
| 4. 1st & Rev. brake | 18. 2nd coast modulator valve |
| 5. Cooler by-pass valve | 19. Shift solenoid No. 2 |
| 6. Torque converter clutch relay valve | 20. Primary regulator valve |
| 7. C0 Accumulator | 21. Oil pump |
| 8. Lockup solenoid | 22. Strainer |
| 9. Shift solenoid No. 1 | 23. Manual valve |
| 10. B0 Accumulator | 24. Pressure release |
| 11. C2 Accumulator | 25. Accumulator control valve |
| 12. B2 Accumulator | 26. 1-2 shift valve |
| 13. Secondary regulator valve | 27. Low coast modulator valve |
| 14. Cut back valve | |

2-1 (SECOND 1ST)



○ ○ ○ ○ ○ ○
P RND2L

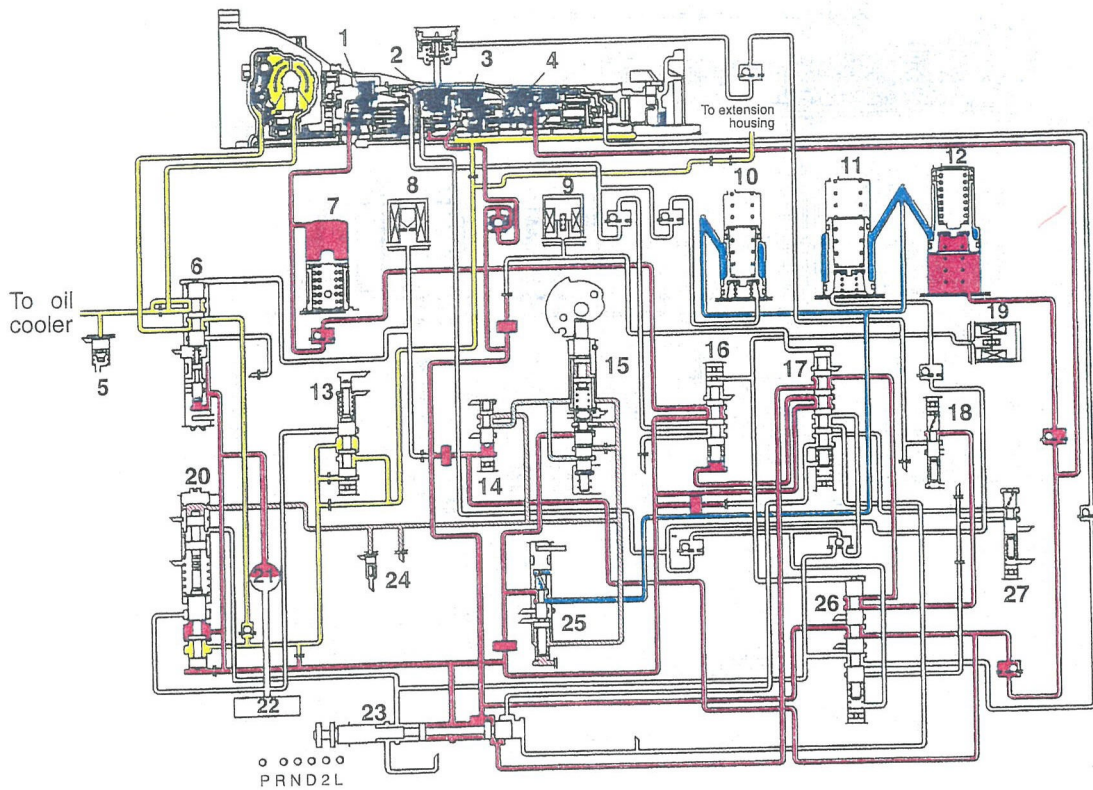
TRA0740

- | | |
|----------------------------------------|-------------------------------|
| 1. Overdrive direct clutch | 14. 3-4 shift valve |
| 2. Forward clutch | 15. 2-3 shift valve |
| 3. Cooler by-pass valve | 16. 2nd coast modulator valve |
| 4. Torque converter clutch relay valve | 17. Shift solenoid No. 2 |
| 5. C0 Accumulator | 18. Primary regulator valve |
| 6. Lockup solenoid | 19. Oil pump |
| 7. Shift solenoid No. 1 | 20. Strainer |
| 8. B0 Accumulator | 21. Manual valve |
| 9. C2 Accumulator | 22. Pressure release |
| 10. B2 Accumulator | 23. Accumulator control valve |
| 11. Secondary regulator valve | 24. 1-2 shift valve |
| 12. Cut back valve | 25. Low coast modulator valve |
| 13. Throttle valve | |

TSB Revision

2-2 (SECOND 2ND)

- Line pressure
- Throttle pressure
- Cut-back pressure
- Accumulator control pressure
- Low & 2nd-coast modulator pressure
- Converter cooler and lubrication oil pressure

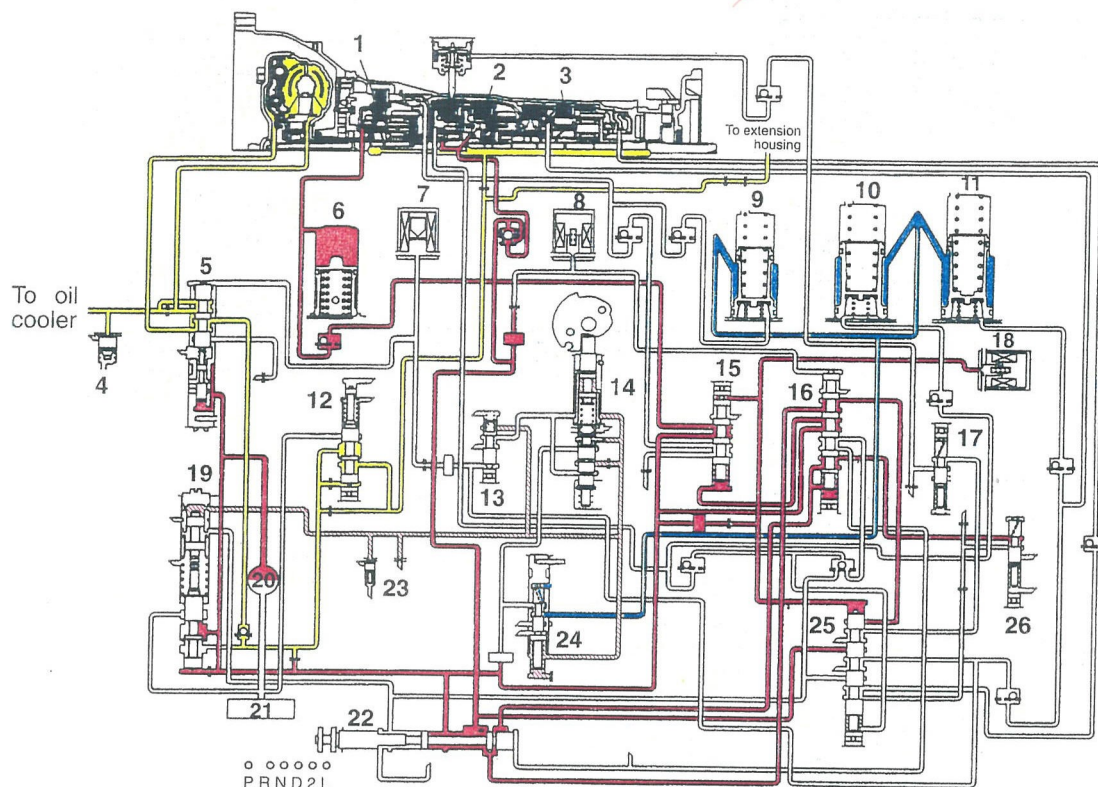


TRA0741

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> 1. Overdrive direct clutch 2. Direct clutch 3. Forward clutch 4. 1st & Rev. brake 5. Cooler by-pass valve 6. Torque converter clutch relay valve 7. C0 Accumulator 8. Lockup solenoid 9. Shift solenoid No. 1 10. B0 Accumulator 11. C2 Accumulator 12. B2 Accumulator 13. Secondary regulator valve 14. Cut back valve | <ul style="list-style-type: none"> 15. Throttle valve 16. 3-4 shift valve 17. 2-3 shift valve 18. 2nd coast modulator valve 19. Shift solenoid No. 2 20. Primary regulator valve 21. Oil pump 22. Strainer 23. Manual valve 24. Pressure release 25. Accumulator control valve 26. 1-2 shift valve 27. Low coast modulator valve |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

L (1ST)

- Line pressure
- Low & 2nd-coast modulator pressure
- Throttle pressure
- Converter cooler and lubrication oil pressure
- Accumulator control pressure



TRA0742

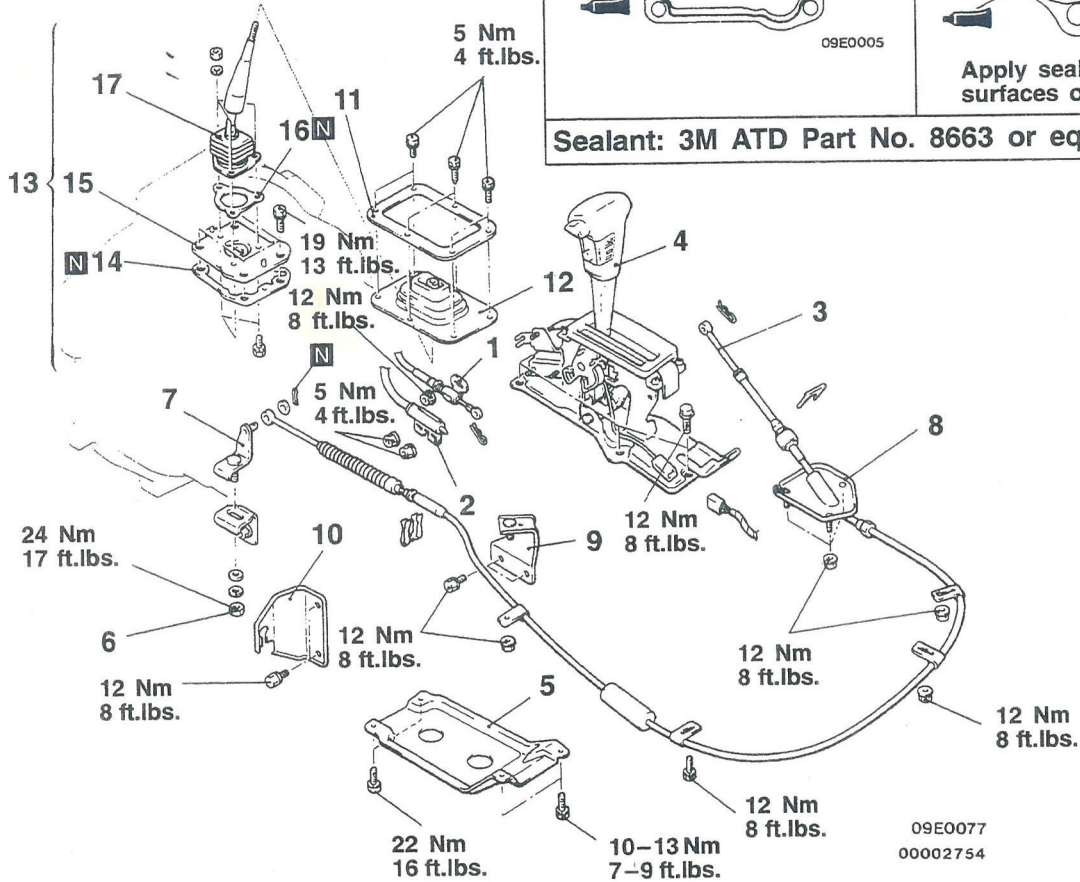
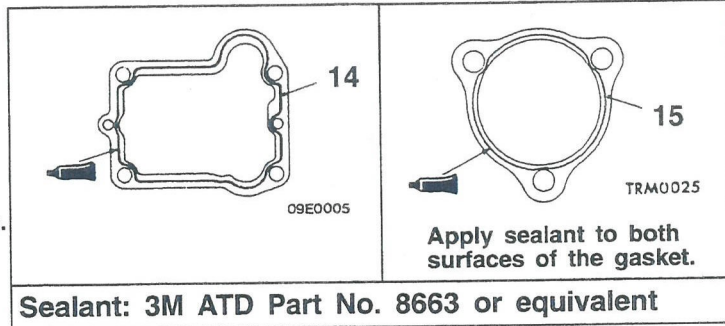
- | | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> 1. Overdrive direct clutch 2. Forward clutch 3. 1st & Rev. brake 4. Cooler by-pass valve 5. Torque converter clutch relay valve 6. C0 Accumulator 7. Lockup solenoid 8. Shift solenoid No. 1 9. B0 Accumulator 10. C2 Accumulator 11. B2 Accumulator 12. Secondary regulator valve 13. Cut back valve | <ul style="list-style-type: none"> 14. Throttle valve 15. 3-4 shift valve 16. 2-3 shift valve 17. 2nd coast modulator valve 18. Shift solenoid No. 2 19. Primary regulator valve 20. Oil pump 21. Strainer 22. Manual valve 23. Pressure release 24. Accumulator control valve 25. 1-2 shift valve 26. Low coast modulator valve |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

**TRANSMISSION CONTROL
REMOVAL AND INSTALLATION**

110005439

Pre-removal and Post-installation Operation

- Front Console Assembly Removal and Installation
(Refer to GROUP 52 – Floor Console.)



09E0077
00002754

Selector lever assembly removal steps

- ▶G◀ 1. Connection for key-interlock cable (Selector lever assembly side)
- ▶F◀ 2. Connection for shift-lock cable (Selector lever assembly side)
- ▶E◀ 3. Connection for transmission control cable (Selector lever assembly side)
- 4. Selector lever assembly

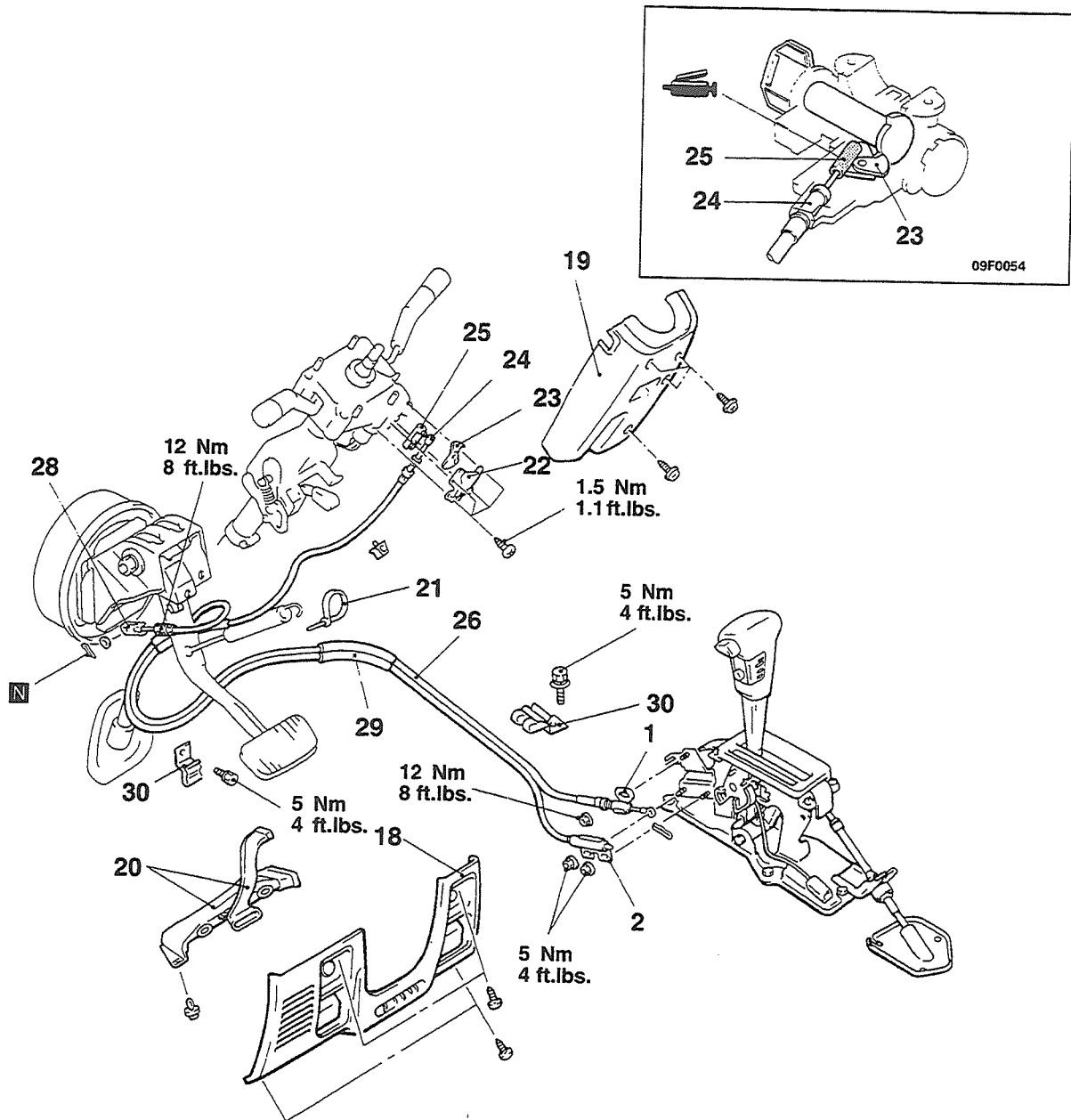
Transmission control cable removal steps

- ▶E◀ 3. Connection for the transmission control cable (Selector lever assembly side)
- 5. Transfer case protector

- 6. Connection for the transmission control cable assembly (transmission side)
- 7. Transmission control upper lever
- 8. Transmission control cable
- 9. Cable bracket
- 10. Cable end bracket

Transfer control lever assembly removal steps

- ▶A▶ ▶D▶ 11. Retainer
- 12. Control lever boot
- 13. Transfer control lever assembly
- 14. Gasket
- 15. Stopper plate
- 16. Gasket
- 17. Transfer control lever



09E0083
00002755

Key-interlock cable removal steps

- ▶G◀ 1. Connection for key-interlock cable (Selector lever assembly side)
- 18. Instrument panel under cover
- 19. Column cover lower
- 20. Foot shower duct (left side) and lap cooler duct A
- ▶C◀ 21. Cable band
- ▶B◀ 22. Cover
- ▶B◀ 23. Cam lever
- ▶B◀ 24. Connection for key-interlock cable (Steering lock assembly side)
- ▶B◀ 25. Slide lever
- 26. Key-interlock cable
- 27. Cable guide
- 30. Clamp

Shift lock cable removal steps

- ▶F◀ 2. Connection for shift lock cable (Selector lever assembly side)
- 18. Instrument panel under cover
- 19. Column cover lower
- 20. Foot shower duct (left side) and lap cooler duct A
- ▶C◀ 21. Cable band
- ▶A◀ 28. Connection for shift lock cable (Brake pedal side)
- 29. Shift lock cable
- 30. Clamp

TSB Revision

REMOVAL SERVICE POINT**◀A▶ TRANSFER CONTROL LEVER ASSEMBLY
REMOVAL**

When removing the transfer control lever assembly, move the transfer control lever to the 2H (2 wheel drive-high range) position.

INSPECTION

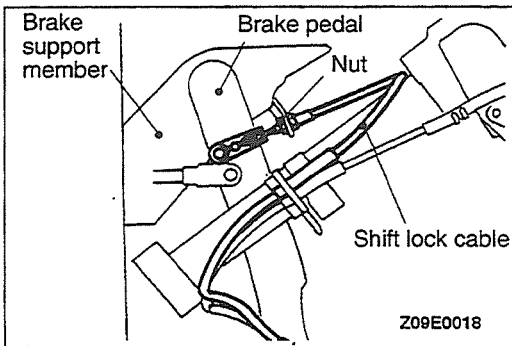
- Check the transmission control cable assembly for function and for damage.
- Check the outer cable (key interlock cable, shift lock cable) for damage and check the spring for breakage and correct tension.
- Check the inner cable (key interlock cable, shift lock cable) for elongation.

INSTALLATION SERVICE POINTS**▶A◀ SHIFT LOCK CABLE CONNECTION
(BRAKE PEDAL SIDE)**

- (1) Install the shift lock cable to the brake pedal, and clamp the brake support member with the nut.
- (2) Route the shift lock cable correctly.

Caution

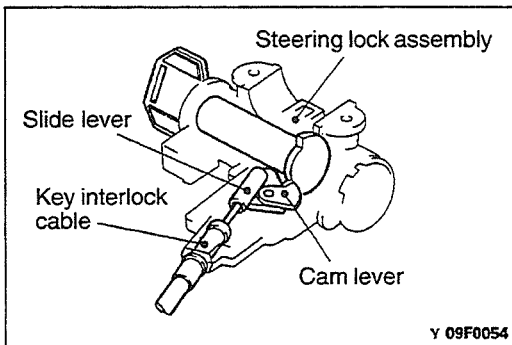
Do not change the routing of the shift lock cable to the selector lever assembly.

**▶B◀ SLIDE LEVER/KEY INTERLOCK CABLE
(STEERING LOCK ASSEMBLY SIDE)/CAM LEVER
INSTALLATION**

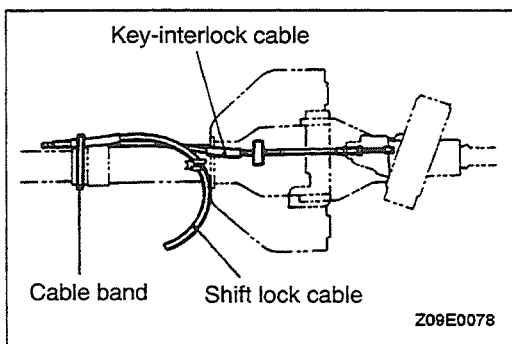
- (1) Place the ignition key at the LOCK position or keep it removed.
- (2) Install the slide lever, key interlock cable and cam lever to the steering lock assembly as shown in the illustration.

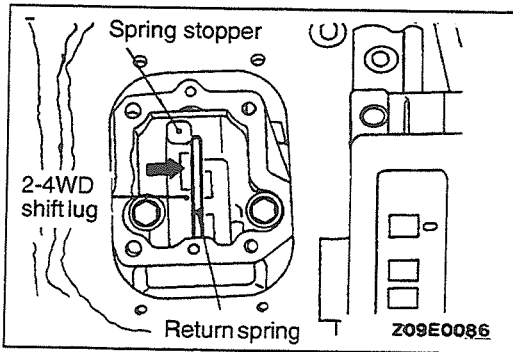
Caution

Do not change the routing of the key interlock cable to the selector lever assembly.

**▶C◀ CABLE BAND INSTALLATION**

Place the shift lock cable and key interlock cable as shown in the illustration, and clamp them with the cable band.



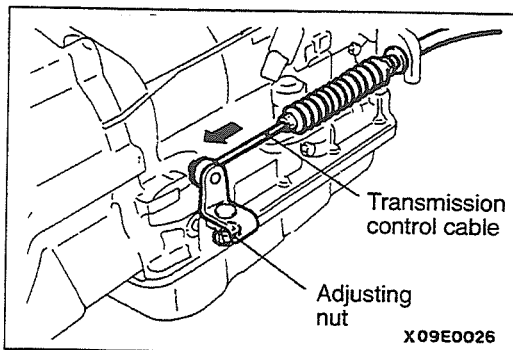


►D◄ TRANSFER CONTROL LEVER ASSEMBLY INSTALLATION

- (1) Remove the adhesive which is sticking to the transfer control lever assembly mounting bolts.
- (2) Use a tap (M8×1.25) to remove the adhesive which is sticking to the screw mounting holes in the transfer control lever assembly.
- (3) Check that the return spring is set to the spring stopper of the 2-4WD shift lug, and then install the control lever in the position shown by the arrow (↙).
- (4) Apply specified adhesive to the threads of the lever assembly mounting bolts, and then tighten the transfer control lever.

Specified adhesive:

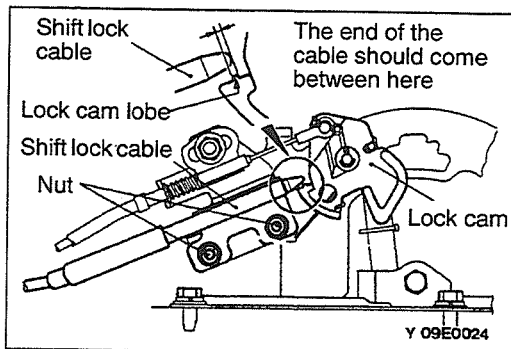
3M Stud Locking No. 4170 or equivalent



►E◄ TRANSMISSION CONTROL CABLE INSTALLATION (SELECTOR LEVER ASSEMBLY SIDE)

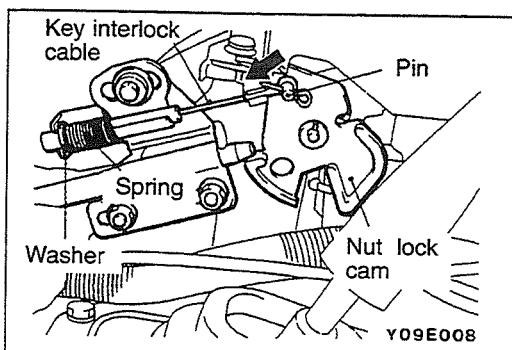
After installing the transmission control cable, adjust it by the following procedure.

- (1) Move the selector lever to the N position.
- (2) Loosen the adjusting nut, gently pull the end of the transmission control cable in the direction of the arrow and then tighten the adjusting nut to the specified torque.



►F◄ SHIFT LOCK CABLE INSTALLATION (SELECTOR LEVER ASSEMBLY SIDE)

- (1) Move the selector lever to the P position.
- (2) Adjust the shift lock cable so that the end of the cable (red mark) is at the position shown in the illustration, and then tighten the nut to the specified torque to clamp the shift lock cable.
- (3) After installing the shift lock cable, check the shift lock mechanism. (Refer to P.23-50.)

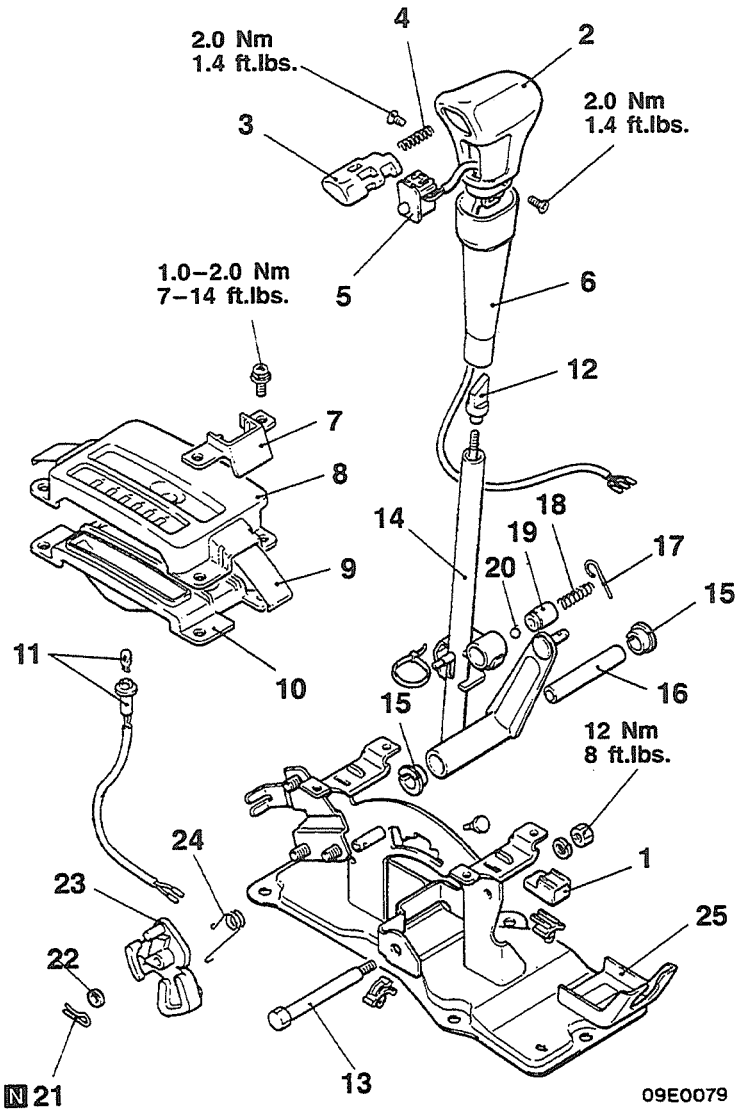
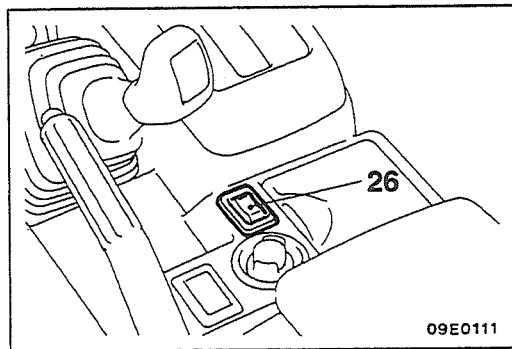
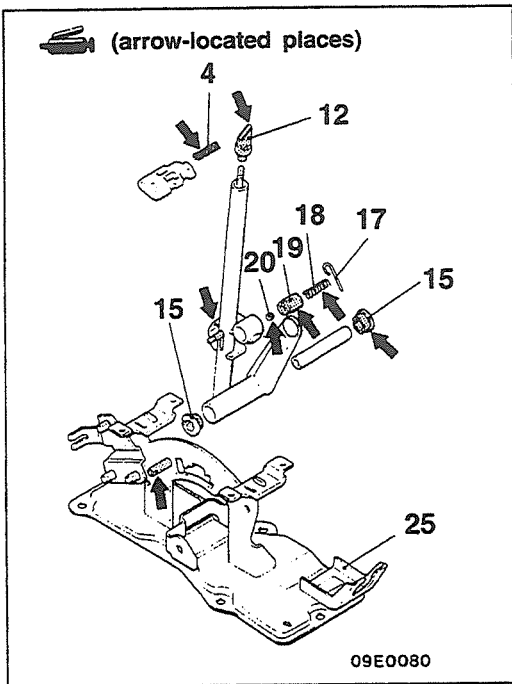


►G◄ KEY INTERLOCK CABLE INSTALLATION (SELECTOR LEVER ASSEMBLY SIDE)

- (1) Move the selector lever to the P position.
- (2) Install the spring and washer that are inserted onto the key interlock cable as shown in the illustration.
- (3) Gently push the lock cam until the pin stops in the direction of the arrow (↘), and then tighten the nut to the specified torque to clamp the key interlock cable.
- (4) After installing the key interlock cable, check the key interlock mechanism. (Refer to P.23-49.)

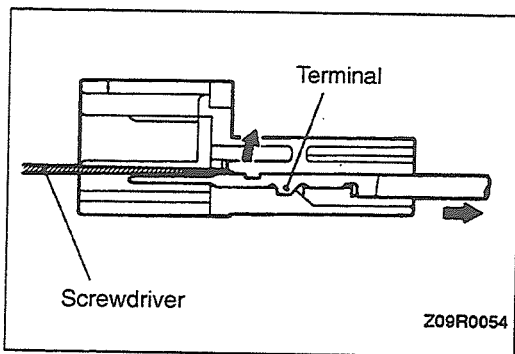
SELECTOR LEVER ASSEMBLY

DISASSEMBLY AND REASSEMBLY



Removal steps

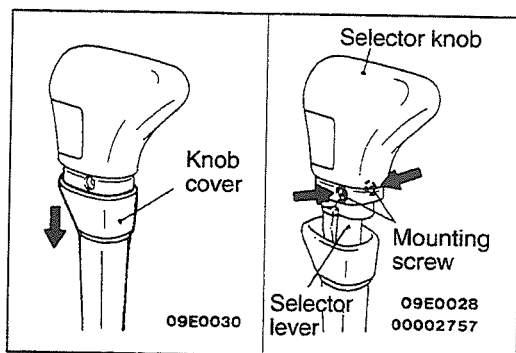
- | | | |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>◀A▶</p> <p>◀B▶</p> <p>◀C▶</p> <p>▶A▶</p> | <ol style="list-style-type: none"> 1. Overdrive switch/position light switch connector case 2. Selector knob 3. Push button 4. Spring 5. Overdrive switch 6. Knob cover 7. Guide 8. Upper panel 9. Slider 10. Lower panel 11. Position indicator light assembly 12. Sleeve 13. Bolt | <ol style="list-style-type: none"> 14. Selector lever assembly 15. Bushing 16. Pipe 17. Pin 18. Spring 19. Support 20. Steel ball 21. Snap pin 22. Washer 23. Lock cam 24. Spring 25. Bracket assembly 26. Pattern select switch (1994 models and after) |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



DISASSEMBLY SERVICE POINTS

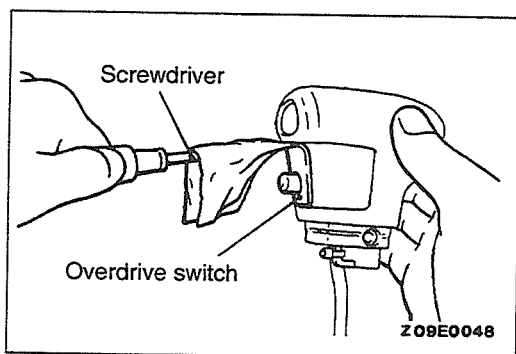
◀A▶ OVERDRIVE SWITCH/POSITION LIGHT SWITCH CONNECTOR CASE REMOVAL

Use a flat-tip (–) screwdriver or similar tool to remove the overdrive switch/position light connector case from the terminal.



◀B▶ SELECTOR KNOB REMOVAL

- (1) Press the knob cover downwards.
- (2) Remove the front and back mounting screws, and then remove the selector knob from the selector lever.



◀C▶ OVERDRIVE SWITCH REMOVAL

Use a flat-tip (–) screwdriver or similar tool to remove the overdrive switch.

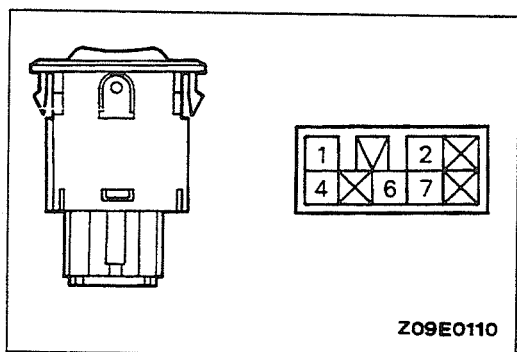
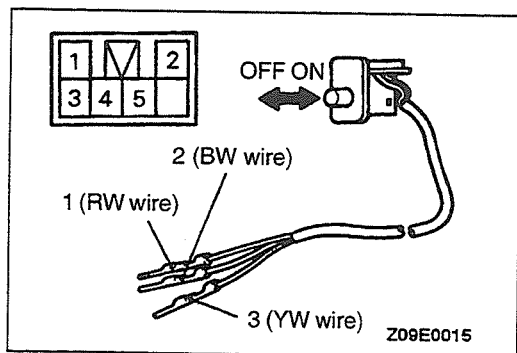
INSPECTION

- Check the detent plate for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.

OVERDRIVE SWITCH

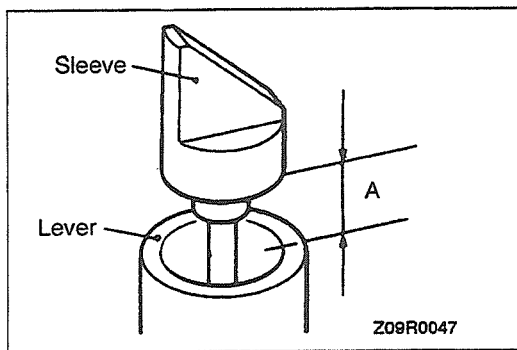
Check for continuity between the terminals when the switch is turned off and on.

Switch position	Terminal		
	3	4	5
O.D. ON	○	○	○
O.D. OFF	○	○	○



Pattern select switch (Vehicles built from 1994)

Switch position	Terminal					
	1	2	6	4		7
HOLD	○	○	○	○	○	○
POWER	○	○	○	○	○	○



REASSEMBLY SERVICE POINTS

▶A◀ SLEEVE INSTALLATION

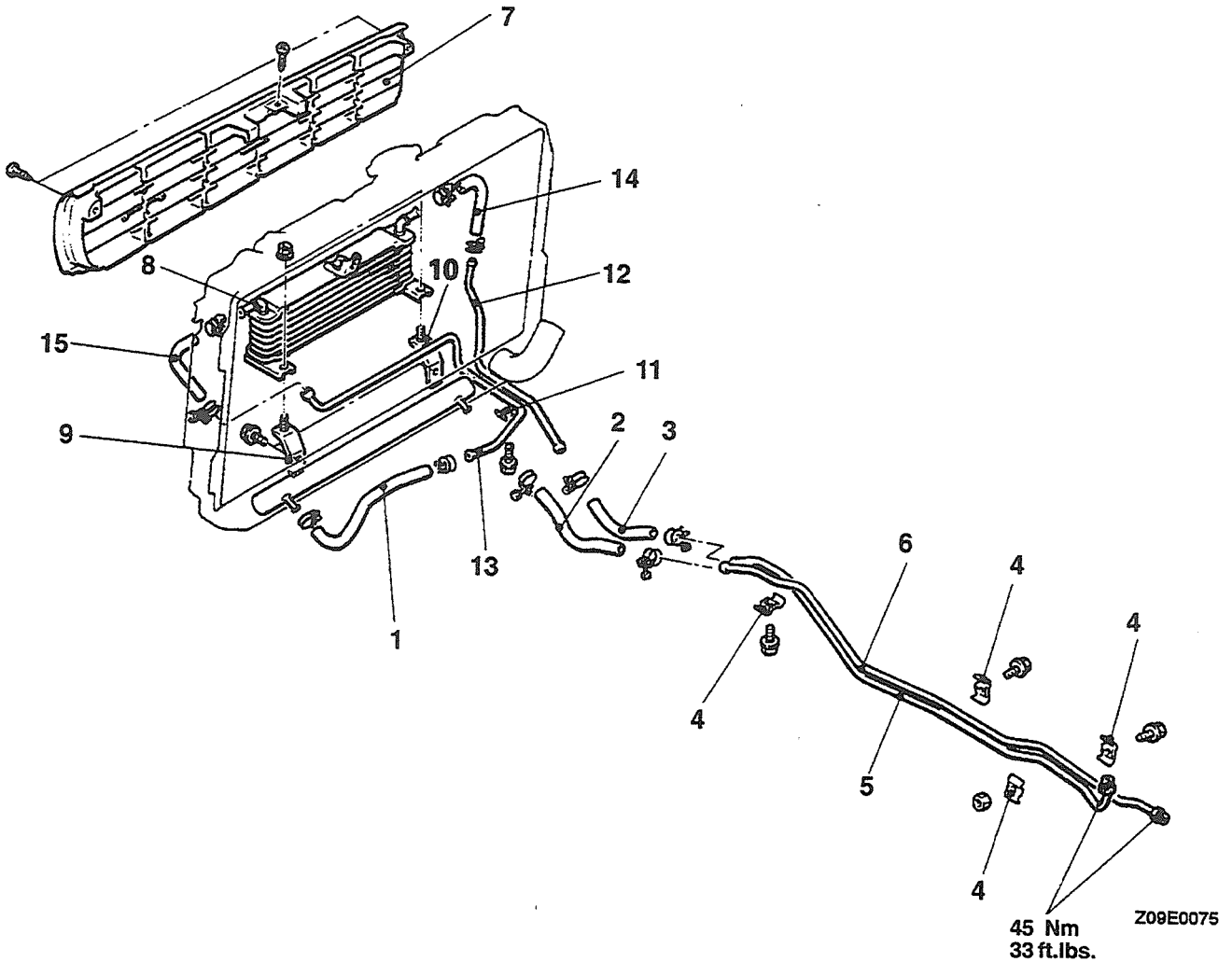
ove the selector lever to the N position and adjust the sleeve by turning it so that the distance A between the sleeve and the tip of the lever is at the standard value.

Standard value (A): 18.2–18.9 mm (.717–.744 in.)

TRANSMISSION FLUID COOLER, HOSES AND PIPES

REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operations**
- Removal and Installation of Under Cover and Under Skid Plate
 - Bleeding and Supplying of Automatic Transmission Fluid. (Refer to P.23-45.)



- ▶C◀ 1. Hose A
- ▶C◀ 2. Hose B
- ▶C◀ 3. Hose C

Feed pipe A and return pipe A removal steps

- ▶B◀ 4. Clamp
- ▶B◀ 5. Feed pipe A
- ▶B◀ 6. Return pipe A

Fluid cooler assembly removal steps

- 7. Radiator grille
- 8. Fluid cooler assembly
- 9. Fluid cooler bracket (L.H.)
- 10. Fluid cooler bracket (R.H.)

Feed pipe B and return pipe B removal steps

- 7. Radiator grille
- ▶A◀ 11. Clamp
- ▶A◀ 12. Feed pipe B
- ▶A◀ 13. Return pipe B

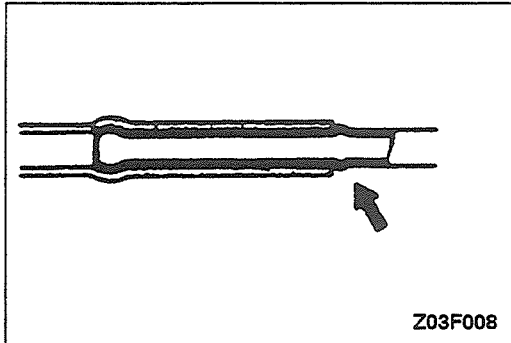
Hose D and hose E removal steps

- 7. Radiator grille
- ▶A◀ 14. Hose D
- ▶A◀ 15. Hose E

TSB Revision

INSPECTION

- Check the hose and pipe for crack, damage and clogging.
- Check for rusted or clogged radiator oil cooler.
- Check the fluid cooler fins for bends, damage or foreign materials.



INSTALLATION SERVICE POINTS

▶A◀ HOSE E/HOSE D/RETURN PIPE B/FEED PIPE B INSTALLATION

When connecting hoses to pipes with a stepped part, insert securely as far as the stepped part.

▶B◀ RETURN PIPE A/FEED PIPE A/CLAMP INSTALLATION

- (1) Provisionally tighten the return pipe A and feed pipe A flare nuts to the transmission and transfer, and after clamping the pipes with each clamp, fully tighten the flare nuts.
Also, tighten all of the clamps, starting with those that are the closest to the transmission and transfer assembly.
- (2) When connecting the pipes to the hoses, insert securely as far as the stepped part.

▶C◀ HOSE C/HOSE B/HOSE A INSTALLATION

When connecting the pipes to the hoses, insert securely as far as the stepped part.

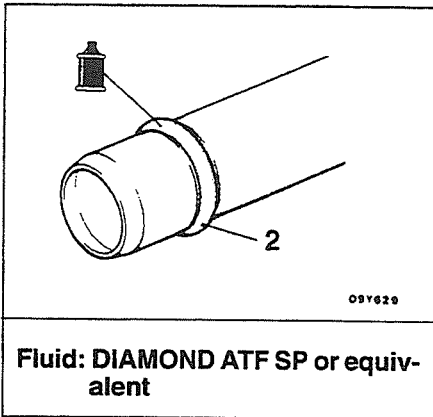
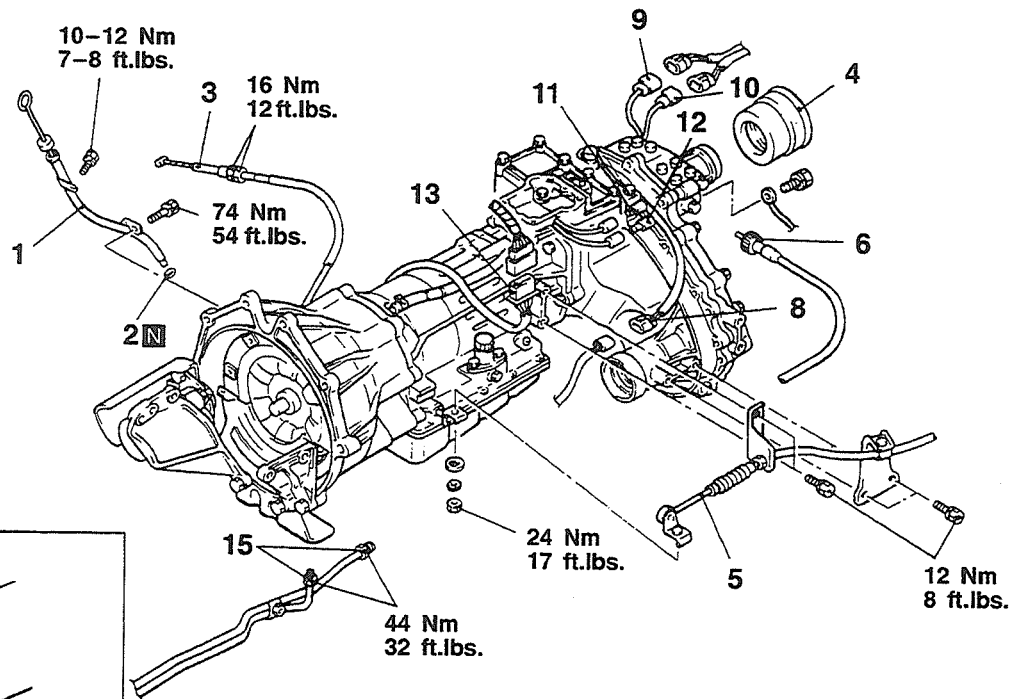
TRANSMISSION AND TRANSFER ASSEMBLY

110005442

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Transfer Control Lever Assembly Removal and Installation (Refer to P.23-82.)
- Transfer Case Protector Removal and Installation
- Front Exhaust Pipe Removal and Installation
- Automatic Transmission Fluid Draining and Supplying (Refer to P.23-45.)
- Transfer Oil Draining and Supplying (Refer to GROUP 22 – Service Adjustment Procedures.)
- Front and Rear Propeller Shaft Removal and Installation (Refer to GROUP 25 – Propeller Shaft.)



09E0040

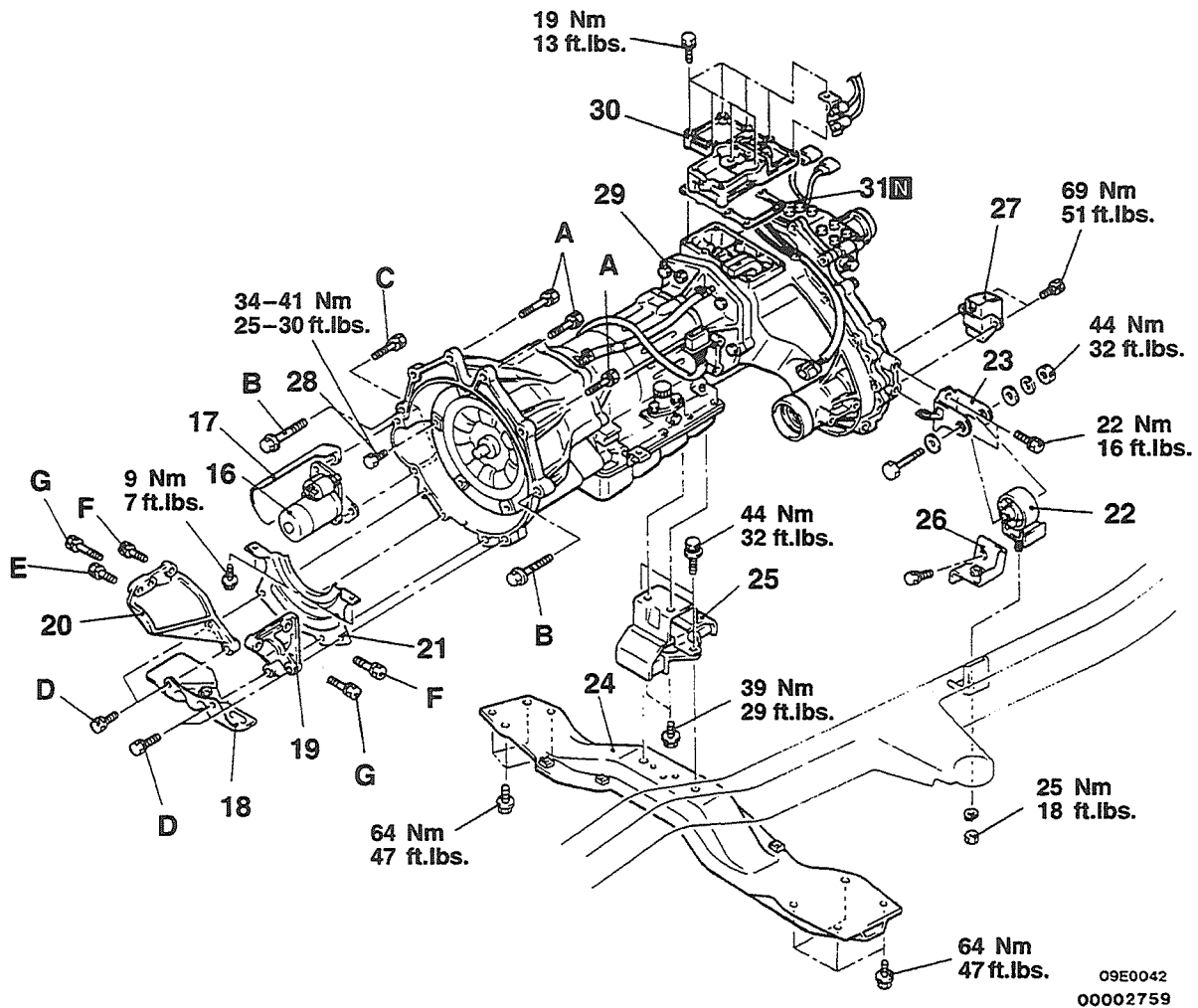
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Removal steps

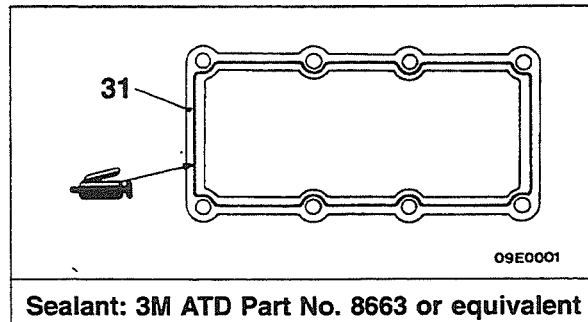
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| <ol style="list-style-type: none"> 1. Fluid filler pipe 2. O-ring ▶D◀ 3. Connection for throttle control cable ▶C◀ 4. Dust seal guard ▶C◀ 5. Connection for transmission control cable 6. Connection for speedometer cable 8. HI/LO detection switch connector 9. 4WD operation detection switch connector | <ol style="list-style-type: none"> 10. Center differential lock operation detection switch connector 11. Center differential lock detection switch connector 12. 2WD/4WD detection switch connector 13. Park/Neutral position switch connector 15. Connection for fluid cooler pipe |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TSB Revision

23-92 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



	Nm	ft.lbs.	O.D.×Length mm (in.)	Bolt identification
A	74	54	"7" 12×40 (.5×1.6)	<p>"7" D X L</p> <p>D</p> <p>L</p> <p>09Y512</p>
B	88	65	"7" 12×55 (.5×2.2)	
C	30	22	"7" 10×55 (.4×2.2)	
D	35	26	"7" 10×40 (.4×1.6)	
E	74	54	"7" 12×35 (.5×1.4)	
F	41	31	"7" 10×30 (.4×1.2)	
G	74	54	"7" 12×30 (.5×2.0)	



- 16. Starter motor
- 17. Starter cover
- 18. Heat protector
- 19. Transmission stay (L.H.)
- 20. Transmission stay (R.H.)
- 21. Bell housing cover
- 22. Transfer roll stopper
- 23. Transfer mounting bracket



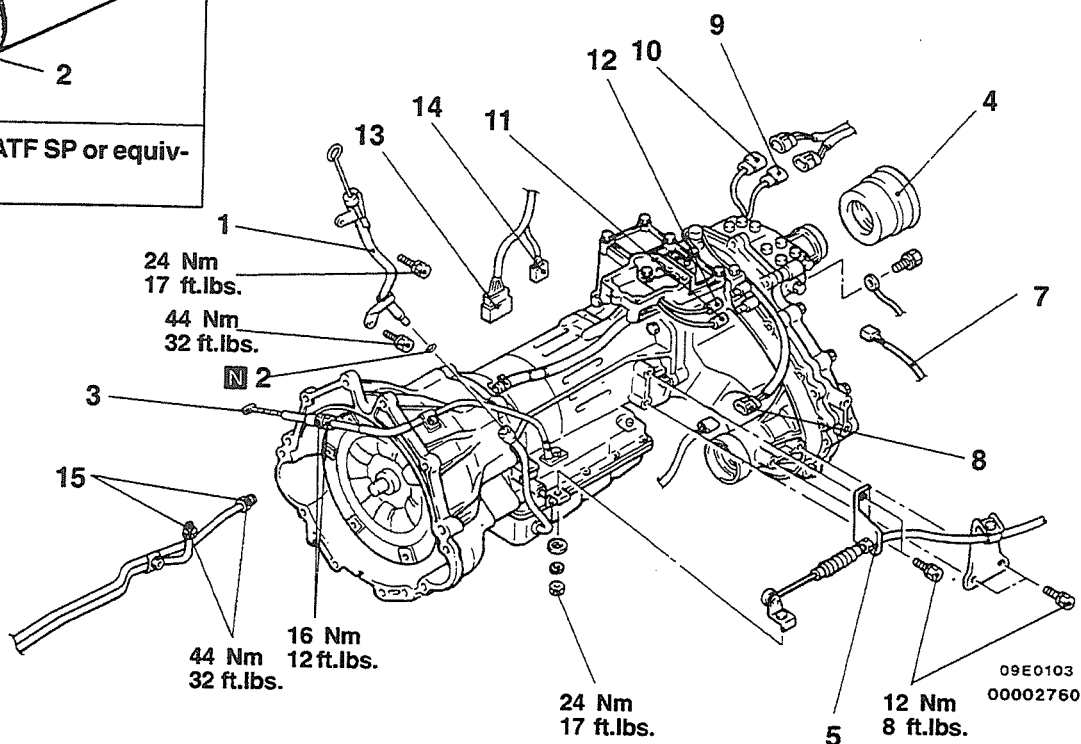
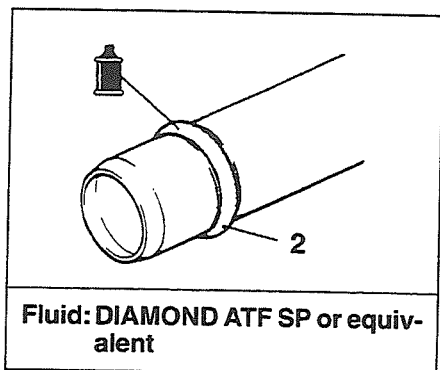
- 24. No. 2 crossmember
- 25. Engine mount rear insulator
- 26. Transfer case protector bracket
- 27. Mass damper
- 28. Torque converter connecting bolt
- 29. Transmission and transfer assembly
- 31. Gasket
- 31. Gasket

TSB Revision

<3.0L-24VALVE engine, 3.5L engine>

Pre-removal and Post-installation Operation

- Transfer Control Lever Assembly Removal and Installation (Refer to P.23-82.)
- Front Exhaust Pipe Removal and Installation
- Automatic Transmission Fluid Draining and Supplying (Refer to P.23-45.)
- Transfer Oil Draining and Supplying (Refer to GROUP 22 – Service Adjustment Procedures.)
- Front and Rear Propeller Shaft Removal and Installation (Refer to GROUP 25 – Propeller Shaft.)

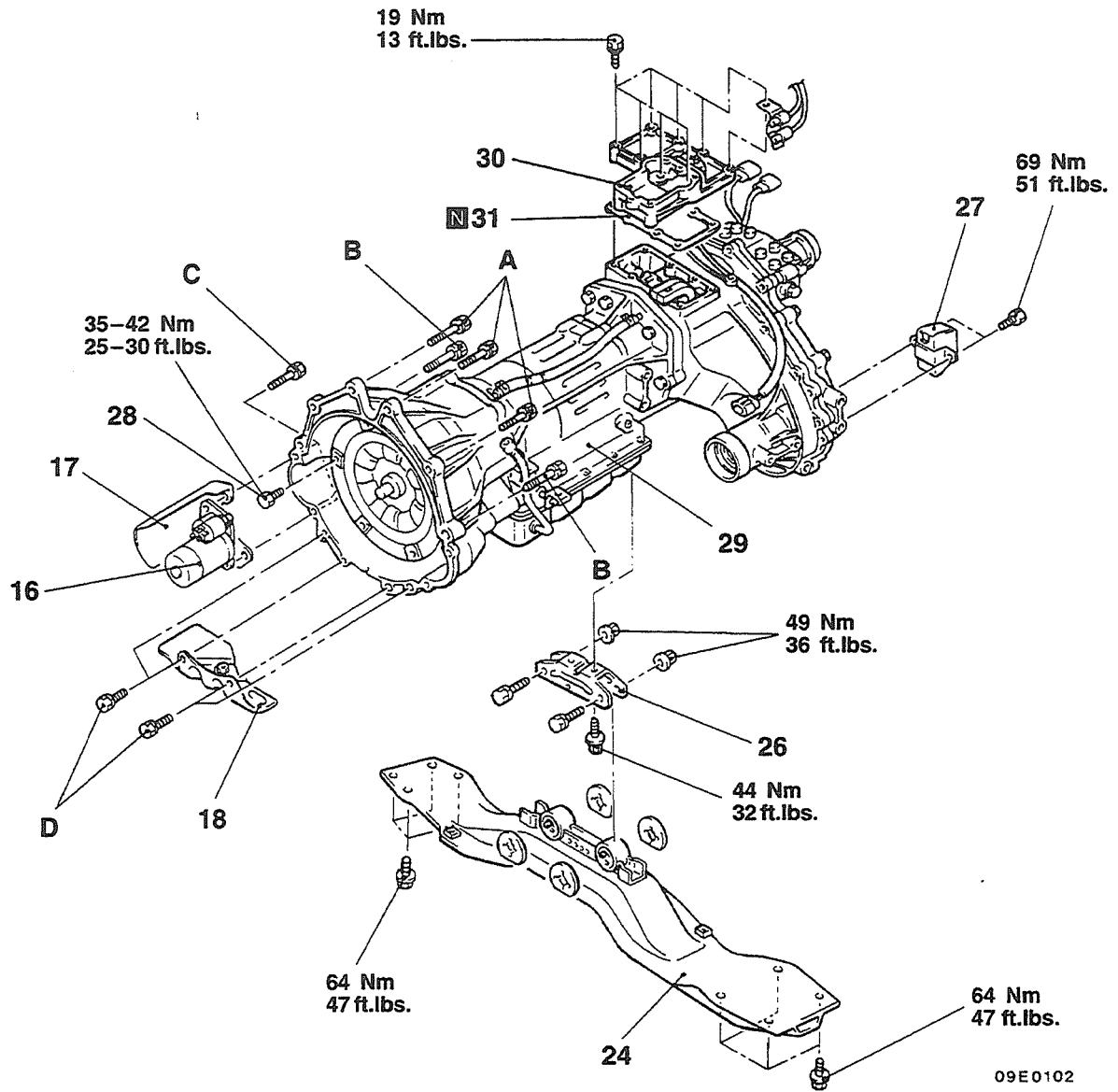


Removal steps

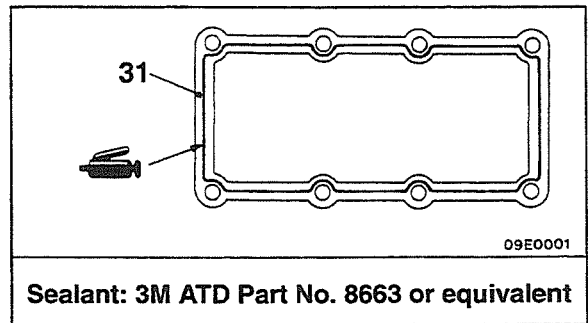
- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> 1. Fluid filler pipe 2. O-ring ▶D▶ 3. Connection for throttle control cable ▶C▶ 4. Dust seal guard 5. Connection for transmission control cable 7. Speed sensor connector 8. HI/LO detection switch connector 9. 4WD operation detection switch connector | <ul style="list-style-type: none"> 10. Center differential lock operation detection switch connector 11. Center differential lock detection switch connector 12. 2WD/4WD detection switch connector 13. Park/Neutral position switch connector 14. Solenoid valve connector 15. Connection for fluid cooler pipe |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TSB Revision

23-94 AUTOMATIC TRANSMISSION – Transmission and Transfer Assembly



	Nm	ft.lbs.	O.D.×Length mm (in.)	Bolt identification
A	74	54	"7" 12×40 (.5×1.6)	"7" D X L.
B	88	65	"7" 12×55 (.5×2.2)	 09Y512
C	30	22	"7" 10×55 (.4×2.2)	
D	35	26	"7" 10×40 (.4×1.6)	



- 16. Starter motor
- 17. Starter cover
- 18. Heat protector
- 24. No. 2 crossmember
- 26. Engine rear mount bracket
- 27. Mass damper

- 28. Torque converter connecting bolt
- 29. Transmission and transfer assembly
- 30. Control housing
- 31. Gasket

TSB Revision

REMOVAL SERVICE POINTS

◀A▶ TRANSFER ROLL STOPPER REMOVAL

Before removing the transfer roll stopper, support the transmission and transfer assembly with a transmission jack.

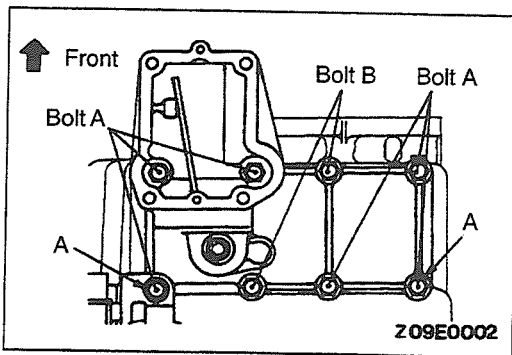
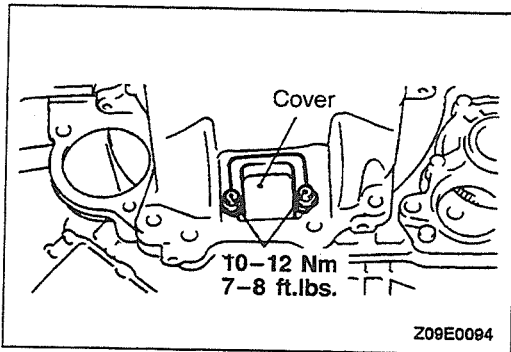
◀B▶ TORQUE CONVERTER CONNECTING BOLT/ TRANSMISSION AND TRANSFER ASSEMBLY REMOVAL

- (1) Remove the cover from the oil pan upper.
- (2) Remove the connecting bolts (6 places) while turning the crankshaft.
- (3) Gently lower the rear section of the transmission and transfer assembly to remove the assembly from the engine.

Caution

When removing the transmission and transfer assembly, push the torque converter over to the transmission and transfer assembly side so it does not remain on the engine side.

- (4) Next, tilt the front section of the transmission and transfer assembly downwards and gently lower it, being careful that the rear section of the transfer does not touch the No. 4 crossmember.



INSTALLATION SERVICE POINTS

▶A◀ CONTROL HOUSING INSTALLATION

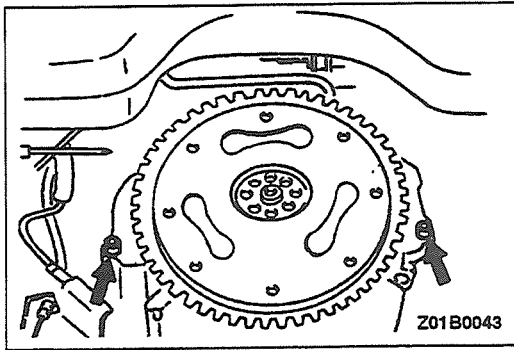
- (1) Remove the adhesive which is sticking to the bolts attached to section A.
- (2) Use a tap (M8×1.25) to remove the adhesive which is sticking to the screw holes (section A).
- (3) Apply specified adhesive to the threads of the mounting bolts (section A).

Specified adhesive:

3M Stud Locking No. 4170 or equivalent

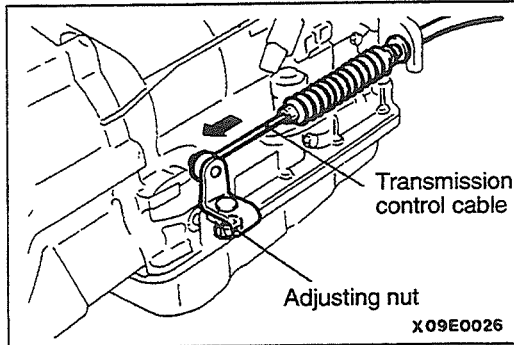
- 4) The dimensions of the mounting bolts vary according to their mounting locations, so do not confuse them when installing.

Bolt to be used	O.D.×Length mm (in.)	Bolt identification
A	"7" 8×25 (.3×1.0)	
B	"7" 8×257(.3×1.0) <Reamer bolt>	



►B◄ TRANSMISSION AND TRANSFER ASSEMBLY INSTALLATION

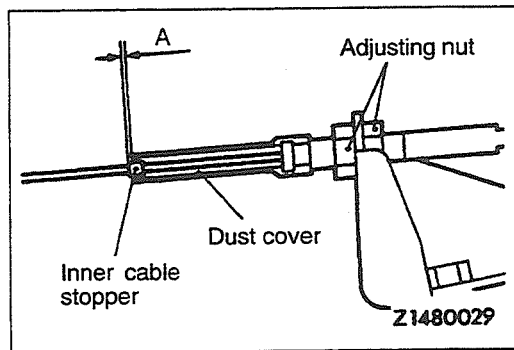
Align the engine transmission mounting bolt holes with the transmission and transfer assembly as shown in the illustration, and then connect the transmission and transfer assembly to the engine.



►C◄ TRANSMISSION CONTROL CABLE INSTALLATION

After installing the transmission control cable, adjust it by the following procedure.

- (1) Move the selector lever to the N position.
- (2) Loosen the adjusting nut, gently pull the end of the transmission control cable in the direction of the arrow and then tighten the adjusting nut to the specified torque.



►D◄ THROTTLE CONTROL CABLE INSTALLATION

After installing the throttle control cable, adjust it by the following procedure.

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 (0–.04 in.)

PROPELLER SHAFT

CONTENTS

110005299

GENERAL SPECIFICATIONS	2	SERVICE SPECIFICATIONS	2
LUBRICANTS	2	SPECIAL TOOLS	2
PROPELLER SHAFT	3	TROUBLESHOOTING	3



GENERAL SPECIFICATIONS

110005300

PROPELLER SHAFT

Items		3.0L-12VALVE engine M/T	3.0L-12VALVE engine A/T	3.0L-24VALVE engine M/T	3.0L-24VALVE engine A/T	3.5L engine
Type		2-joint type	2-joint type	2-joint type	2-joint type	2-joint type
Length (joint to joint)×O.D. mm (in.)	Front propeller shaft	665×50.8 (26.2×2.00)	752×50.8 (29.6×2.00)	665×50.8 (26.2×2.00)	729×50.8 (28.7×2.00)	713×50.8 (28.1×2.00)
	Rear propeller shaft	793×75 (31.2×2.95)	740×75 (29.1×2.95)	793×75 (31.2×2.95)	764×75 (30.0×2.95)	750×75 (29.5×2.95)

UNIVERSAL JOINT

Items		Specifications
Type		Cross type
Lubrication Method		Nipple type
Journal O.D. mm (in.)	Front propeller shaft	14.689 (.5783)
	Rear propeller shaft	18.300 (.7205)

SERVICE SPECIFICATIONS

110005301

Items	Standard value	Limit
Clearance between snap ring and groove wall of yoke mm (in.)	0.06 (.0024) or less	–
Propeller shaft runout mm (in.)	–	0.6 (.024)

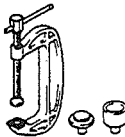

LUBRICANTS

110005302

Item	Specified lubricants
Sleeve yoke	Hypoid Gear Oil API classification GL-4 or higher SAE viscosity 80W, 75W–85W

SPECIAL TOOLS

110005303

Tool	Tool number and name	Supersession	Application
	MB990840 Universal joint remover/installer	MB990840-01	Disassembly and reassembly of universal joint
	MB991410 Collar	–	

TROUBLESHOOTING

110005304

Trouble Symptom	Probable Cause	Remedy
Noise at start	Worn journal bearing	Replace
	Worn sleeve yoke spline	
	Loose propeller shaft installation	Retighten
Noise and vibration at high speed	Unbalanced propeller shaft	Replace
	Incorrect snap ring selection	Adjust the clearance.
	Worn journal bearing	Replace

PROPELLER SHAFT

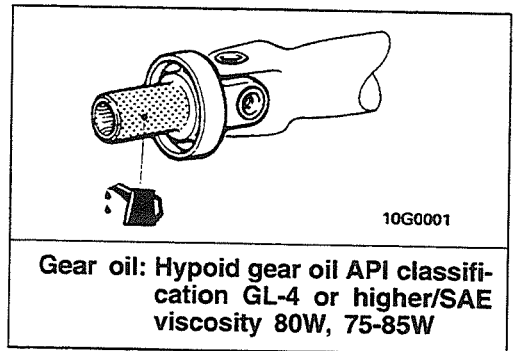
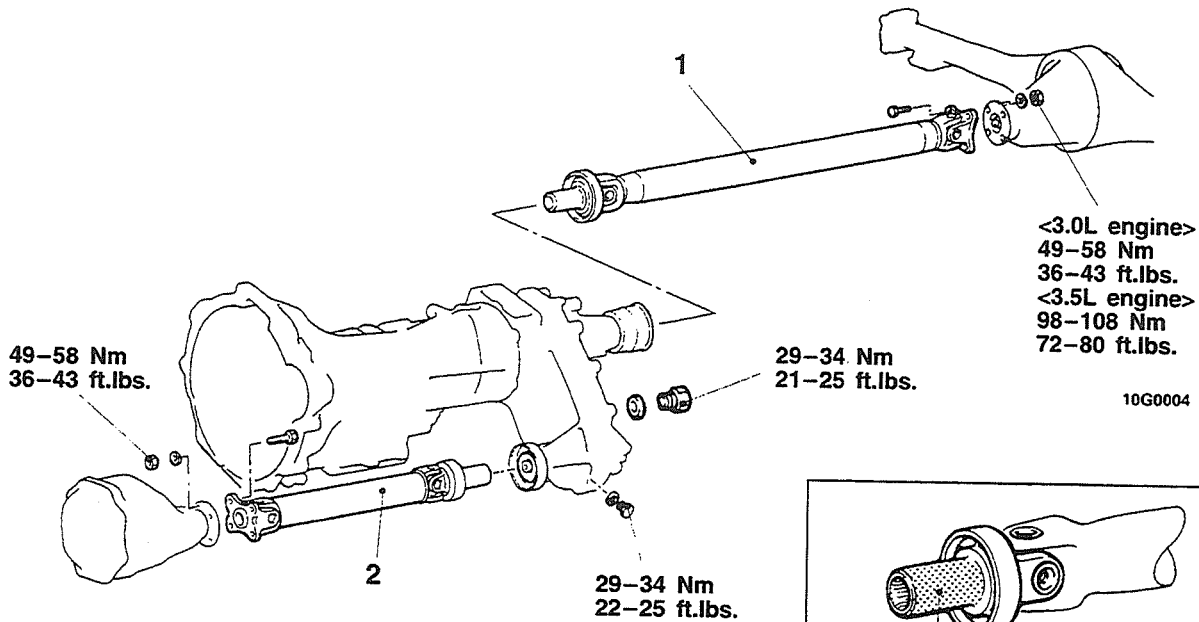
110005305

Pre-removal Operation

- Set the Transfer Shift Lever to "2H".
- Transfer Gear Oil Draining
(M/T: Refer to GROUP 22 – Service Adjustment Procedures.)
(A/T: Refer to GROUP 23 – Service Adjustment Procedures.)

Post-installation Operation

- Transfer Gear Oil Supplying
(M/T: Refer to GROUP 22 – Service Adjustment Procedures.)
(A/T: Refer to GROUP 23 – Service Adjustment Procedures.)



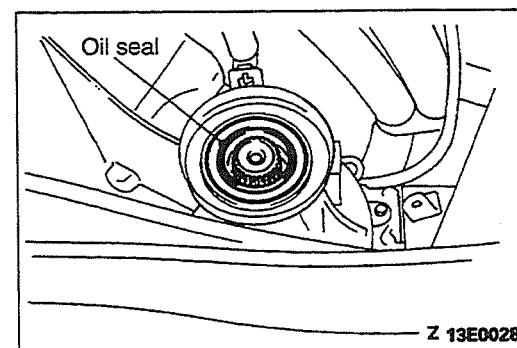
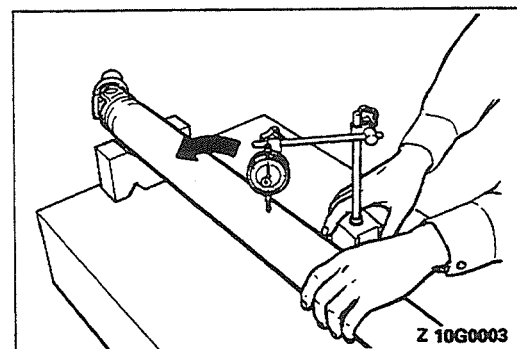
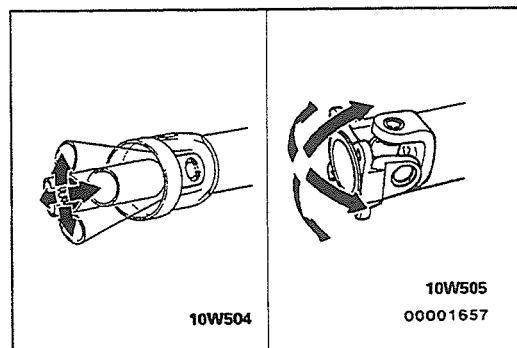
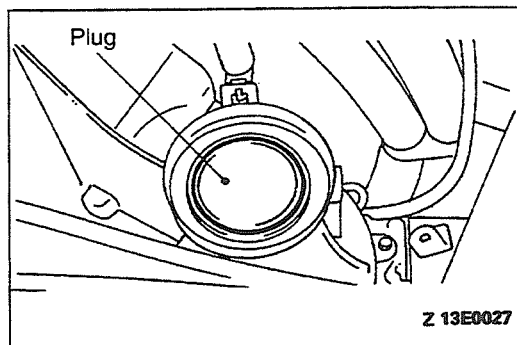
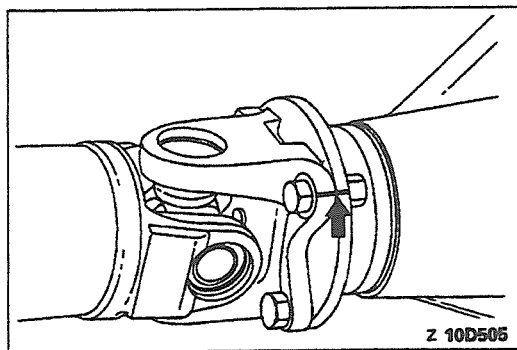
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Removal steps



1. Rear propeller shaft
2. Front propeller shaft

TSB Revision



REMOVAL SERVICE POINTS

◀A▶ REAR PROPELLER SHAFT/FRONT PROPELLER SHAFT REMOVAL

- (1) Make mating marks on the flange yoke and the differential companion flange.
- (2) Use the plug as a cover so that no foreign material gets into the transmission or transfer.

INSPECTION

- Check the universal joints for smooth operation in all directions.
- Check the sleeve 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.

PROPELLER SHAFT RUNOUT

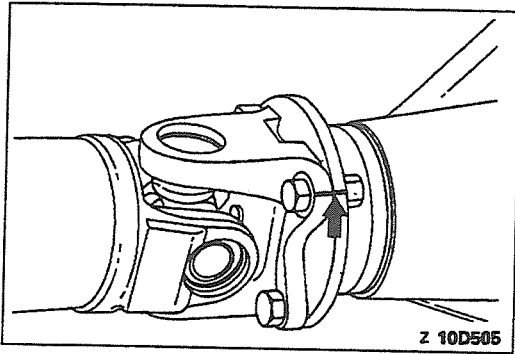
Measure the propeller shaft runout with a dial indicator.

Limit: 0.6 mm (.024 in.)

INSTALLATION SERVICE POINTS

▶A◀ FRONT PROPELLER SHAFT/REAR PROPELLER SHAFT INSTALLATION

- (1) **Caution**
Be careful not to damage the oil seal lip of the transmission and transfer.



(2) Install the propeller shaft to the companion flange so that the mating marks are aligned.

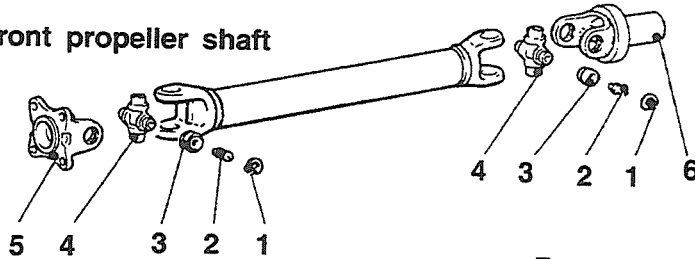
Caution

If the threads of the bolts and nuts are stained with oil or grease, they can become loose. Completely remove oil or grease from the threads before tightening the bolts and nuts.

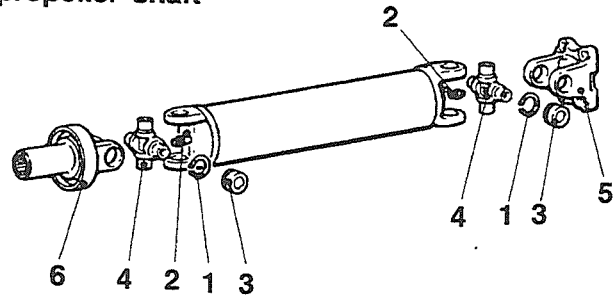
DISASSEMBLY AND REASSEMBLY

110005306

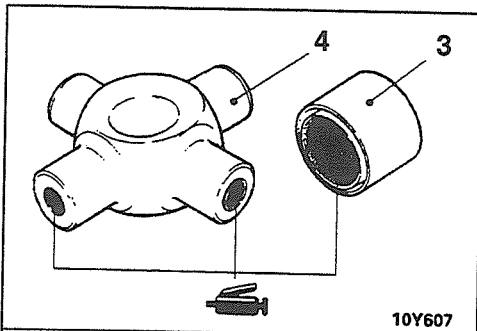
Front propeller shaft



Rear propeller shaft



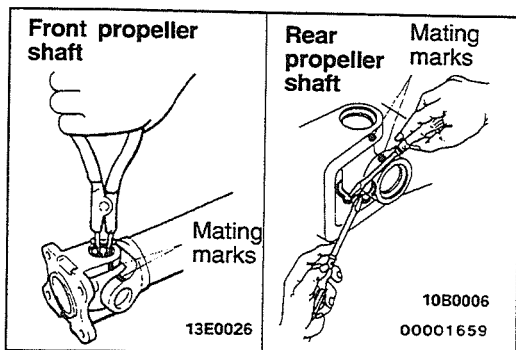
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Caution
Do not apply grease excessively. Otherwise, faulty fitting of bearing caps and errors in the selection of snap rings may result.

Disassembly steps

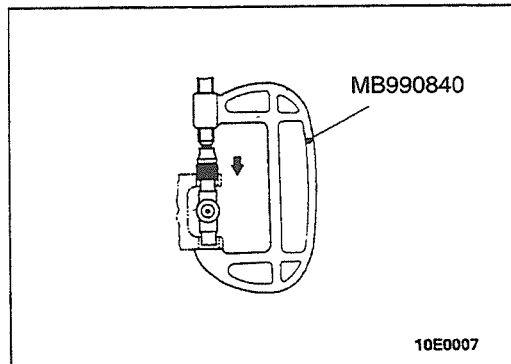
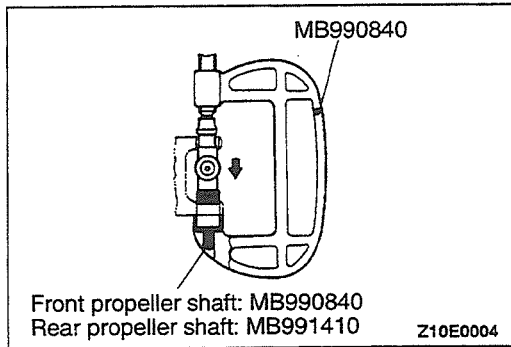
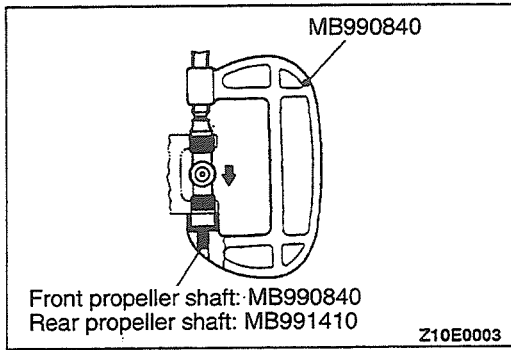
- ◀A▶ ▶B▶ 1. Snap ring
- 2. Grease fitting
- ◀B▶ ▶A▶ 3. Journal bearing
- ▶A▶ 4. Journal
- 5. Flange yoke
- 6. Sleeve yoke



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.

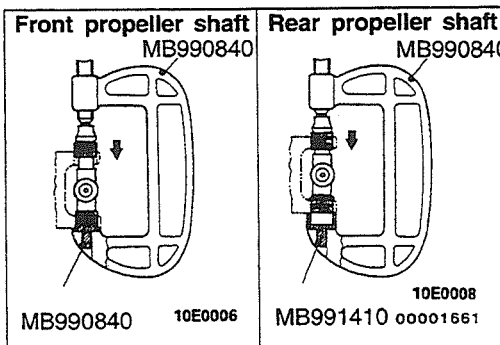
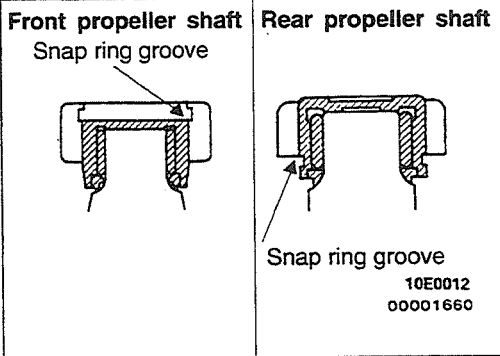
Caution

Do not tap the journal bearings to remove them, as this will upset the balance of the propeller shaft.

REASSEMBLY SERVICE POINTS

▶A◀ JOURNAL/JOURNAL BEARING INSTALLATION

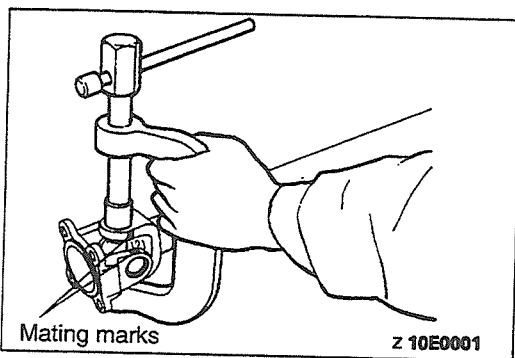
- (1) Fit the journal onto the yoke.
- (2) Use the special tool to press the journal bearing into the yoke until the snap ring groove is fully visible.



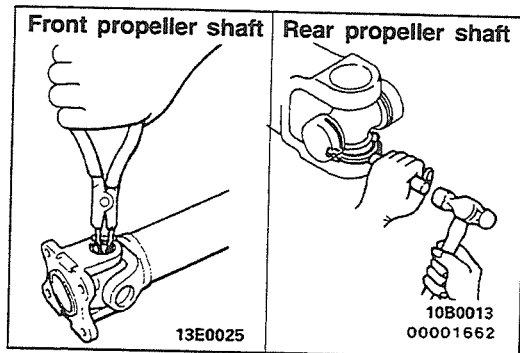
- (3) Use the special tool to press the opposite side journal bearing into the yoke.

Caution

Be careful when pressing the journal bearings, as if they are pressed at an angle, the inside of the journal bearings will be damaged by the journal.

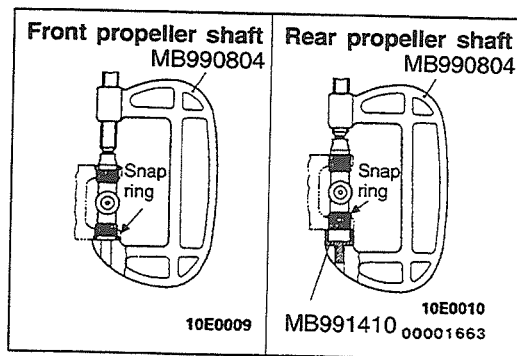


- (4) Align the mating marks on the yoke and propeller shaft, and install the propeller shaft journal bearings in the method described in steps (2) and (3) above.

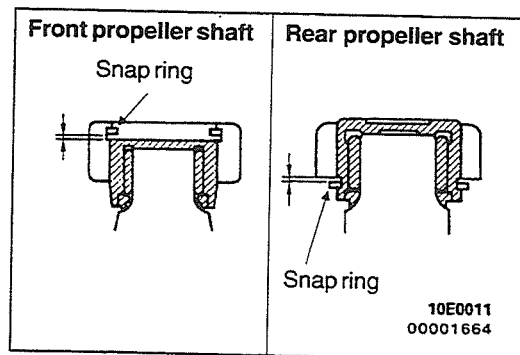


►B◄ SNAP RING INSTALLATION

- (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 toward the snap ring.



- (3) Install the snap ring on the opposite side, and measure the clearance of the snap ring groove with a thickness gage.

Standard value: 0.06 mm (.0024 in.) 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.

Snap ring thickness mm (in.)		Identification color
Front propeller shaft	1.28 (.050)	–
	1.31 (.052)	Yellow
	1.34 (.053)	Blue
	1.37 (.054)	Purple
Rear propeller shaft	1.50 (.059)	–
	1.55 (.061)	Yellow
	1.60 (.063)	Blue
	1.65 (.065)	Purple

FRONT AXLE

CONTENTS

110005307

AXLE HUB	11	SEALANTS AND ADHESIVES	3
DIFFERENTIAL CARRIER	38	SERVICE ADJUSTMENT PROCEDURES	8
DIFFERENTIAL CARRIER AND FREE-WHEELING CLUTCH	30	Differential Carrier Oil Seal Replacement	8
DRIVE SHAFT	19	Drive Shaft End Play Check	8
FREE-WHEELING CLUTCH	32	Front Axle Gear Oil Level Check	8
GENERAL SPECIFICATIONS	2	Front Axle Total Backlash Check	8
INNER SHAFT	26	Solenoid Valve Operation Check	10
KNUCKLE	16	SERVICE SPECIFICATIONS	2
LUBRICANTS	2	SOLENOID VALVE AND VACUUM HOSE	29
		SPECIAL TOOLS	3
		TROUBLESHOOTING	6

GENERAL SPECIFICATIONS

110005308

Items		3.0L-12 VALVE engine – Vehicles without wide fender	3.0L-12 VALVE engine – Vehicles with wide fender	3.0L-24 VALVE engine, 3.5L engine
Front axle hub bearing	Type	Taper roller bearing	Taper roller bearing	Taper roller bearing
Drive shaft	Joint type	Outer	Birfield joint	Birfield joint
		Inner	Double-offset joint	Double-offset joint
Differential	Final drive gear type	Hypoid gear	Hypoid gear	Hypoid gear
	Reduction ratio	4.625	4.875	4.636
	Pinion gear type	2 pinion	2 pinion	2 pinion

SERVICE SPECIFICATIONS

110005309

Items	Standard value	Limit		
Front axle total backlash mm (in.)	–	11 (.43)		
Drive shaft end play mm (in.)	0.4–0.7 (.016–.028)	–		
Solenoid valve resistance [at 20°C (60°F)] Ω	36–46	–		
Front hub play in the axial direction mm (in.)	0.05 (.0020) or less	–		
Front hub turning resistance Nm (in.lbs.) [Spring scale reading N (lbs.)]	0.3–1.3 (2.6–11.3) [5–18 (1.1–4.0)]	–		
Setting of D.O.J. boot length mm (in.)	77–83 (3.03–3.27)	–		
Clutch gear play (bearing end play) mm (in.)	0.05–0.40 (.0020–.0160)	–		
Final drive gear backlash mm (in.)	0.11–0.16 (.0043–.0063)	–		
Drive gear runout mm (in.)	–	0.05 (.0020)		
Differential gear backlash mm (in.)	0–0.076 (0–.0030)	0.2 (.0079)		
Drive pinion rotation torque Nm (in.lbs.)	Without oil seal	With anti-rust agent	0.3–0.5 (2.6–4.3)	–
		with gear oil applies	0.15–0.25 (1.3–2.2)	–
	With oil seal	with anti-rust agent	0.5–0.7 (4.3–6.1)	–
		with gear oil applies	0.35–0.45 (3.1–3.9)	–

LUBRICANTS

110005310

Items	Specified lubricants	Quantity
Front axle gear oil (Front differential)	Hypoid gear oil API classification GL-5 or higher SAE viscosity No. 90, 80W	1.20 dm ³ (1.27 qts.)
D.O.J. boot grease	Repair kit grease	100 g (3.5 oz.)

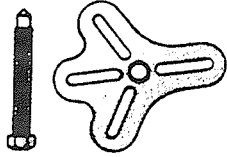
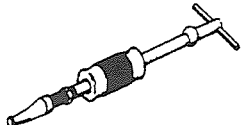
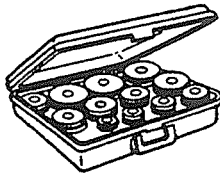
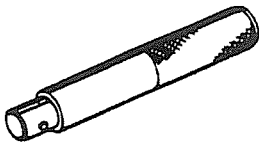
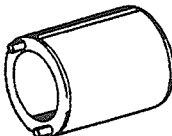
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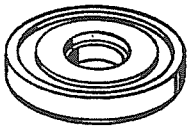

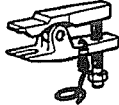
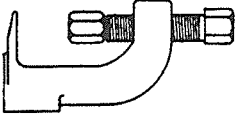

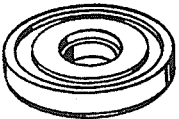
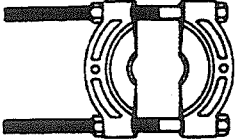
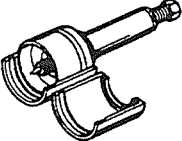

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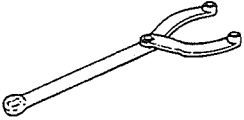



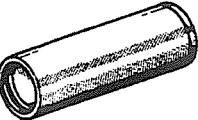
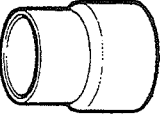

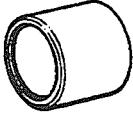
Items	Specified sealants and adhesives
Contact surface of drive flange and front axle hub	3M ATD Part No. 8661, 8663 or equivalent
Contact surface of hub cap and drive flange	
Contact surface of differential cover and differential carrier	
Free-wheeling clutch assembly	
Drive gear threaded hole	3M Stud Locking Part No. 4170 or equivalent

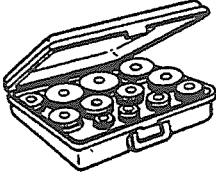
SPECIAL TOOLS

110005312

Tool	Tool number and name	Supersession	Application
	MB990241 Drive shaft attachment	MB990241-01	Insertion of inner shaft assembly (use with MB990211-01)
	MB990211 Sliding hammer	MB990211-01	Removal of housing tube oil seal Insertion of inner shaft assembly (use with MB990241-01)
	MB990925 Bearing and oil seal installer set	MB990925-01	Press-fitting of front axle hub bearing outer race MB990935-01 Press-fitting of drive pinion bearing outer race MB990933-01, MB990934-01, MB990936-01 Press-fitting of differential carrier oil seal MB990934-01 Press-fitting of free wheel clutch oil seal MB990926-01 Press-fitting of free wheel clutch needle bearing MB990927-01
	MB990938 Handle	MB990938-01	Press-fitting of front axle hub bearing outer race Press-fitting of front axle hub oil seal Press-fitting of knuckle needle bearing Press-fitting of knuckle oil seal Press-fitting of housing tube oil seal Press-fitting of differential carrier oil seal Press-fitting of drive pinion bearing outer race Press-fitting of free wheel clutch oil seal Press-fitting of free wheel clutch needle bearing
	MB990954 Lock nut wrench	MB990954-01	Removal and adjustment of lock nut

Tool	Tool number and name	Supersession	Application
	MB990955 Oil seal installer	MB990955-01	Press-fitting of front axle hub oil seal Press-fitting of housing tube oil seal
	MB990811 Side bearing cup remover step plate	MB990811-01	Removal of side bearing inner race
	MB991406 Steering linkage puller		Removal of knuckle Disconnecting the lower ball joint and upper ball joint
	MB990635 Steering linkage puller	MB990635-01	Removal of knuckle Disconnecting the tie rod
	MB990956 Needle bearing installer	MB990956-01	Press-fitting of knuckle needle bearing (use with MB990938-01)
	MB990985 Oil seal installer	MB990985-01	Press-fitting of knuckle oil seal (use with MB990938-01)
	MD998348 Bearing separator	MD998348-01	Removal and press-fitting of inner shaft bearing
	MB990339 Pinion carrier bearing puller	MB990339-01	Removal of side bearing inner race (use with MB990811-01) Removal of drive pinion front bearing inner race
	MIT303173 Insert	MIT303173	

Tool	Tool number and name	Supersession	Application
	MIT44801 Collet set	MIT44801	Removal of side bearing inner race (use with MB990811-01) Removal of drive pinion front bearing inner race
	MB990767 End yoke holder	MB990767-01	Holding of end yoke
	MB990901 Pinion height gage set	MB990901-01	Adjustment of pinion height
	MB990802 Bearing installer	MB990802-01	Press-fitting of drive pinion front bearing inner race Press-fitting of side bearing inner race
	MB990031 Drive pinion oil seal installer	MB990031-01	Press-fitting of drive pinion oil seal
	MIT304180 Handle	MIT304180	
	MB990799 Ball joint dust shield installer	MB990799-01	Press-fitting of free wheel clutch bearing
	MIT310424 Drive pinion oil seal installer	MIT310424	Press-fitting of free wheel clutch oil seal
	MB990890 Rear suspension bushing base	MB990890-01	Press-fitting of free wheel clutch bearing

	MB990925-01	Tool number	Installer disc O.D. mm (in.)
		MB990926-01	39.0 (1.54)
		MB990927-01	45.0 (1.77)
		MB990928-01	49.5 (1.95)
		MB990929-01	51.0 (2.01)
		MB990930-01	54.0 (2.13)
		MB990931-01	57.0 (2.24)
		MB990932-01	61.0 (2.40)
		MB990933-01	63.5 (2.50)
		MB990934-01	67.5 (2.66)
		MB990935-01	71.5 (2.81)
		MB990936-01	75.5 (2.97)
		MB990937-01	79.0 (3.11)

TROUBLESHOOTING

110005313

FREE-WHEELING CLUTCH

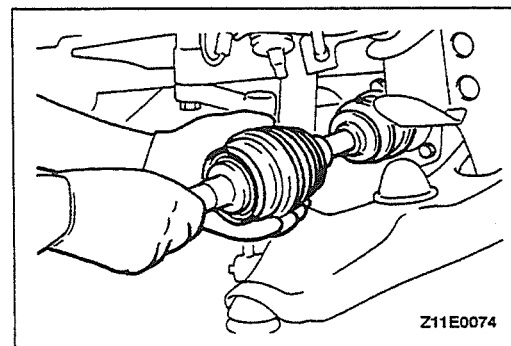
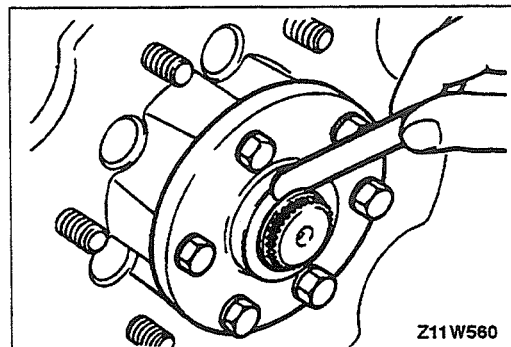
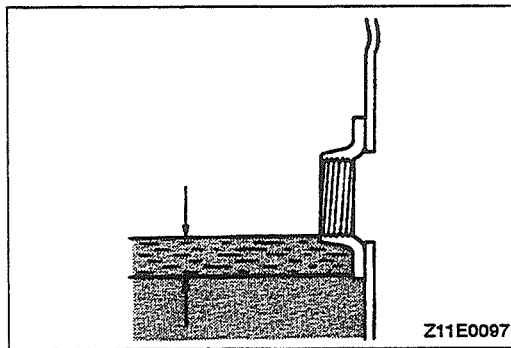
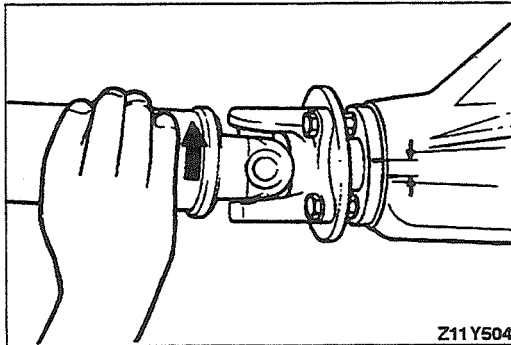
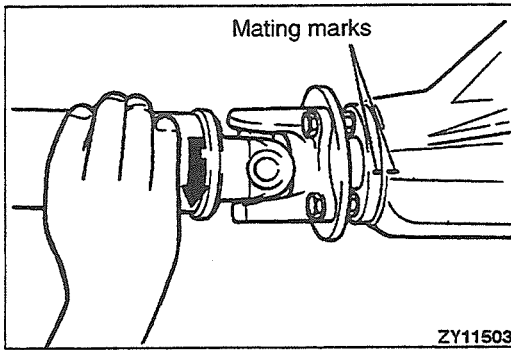
Symptom	Probable cause	Remedy
Does not lock	Negative pressure leakage	Correct or replace vacuum hose
	Vacuum tank damaged	Replace
	Check valve damaged	
	Actuator assembly damaged	
	Shift fork damaged	
	Clutch gear damaged	
	Main shaft damaged	
	Thrust bushing damaged	Retighten attaching bolts
Actuator assembly attaching bolt loose		
Locks but does not become free	Foreign substances on tooth surfaces of main shaft and clutch sleeve	Clean tooth surfaces or replace
	Foreign substances on tooth surfaces of clutch sleeve and clutch gear	

DRIVE SHAFT, INNER SHAFT

Symptom	Probable cause	Remedy
Noise during wheel rotation	Housing tube bent	Replace
	Inner shaft bent	
	Inner shaft bearing worn, pounding	Replace
	Drive shaft assembly worn damaged, bent	Check or replace
Noise due to excessive play of wheel in turning direction	Inner shaft and side gear serration play	Replace
	Drive shaft and side gear serration play	

DIFFERENTIAL

Symptom	Probable Cause	Remedy
Constant noise	Incorrect adjustment of drive gear and drive pinion (poor meshing)	Correct or replace
	Loose, worn or damaged side bearing	Correct or replace
	Loose, worn or damaged drive pinion bearing	Correct or replace
	Worn drive gear or drive pinion	Correct or replace
	Worn side gear thrust washer or pinion shaft	Replace
	Deformed drive gear or differential case	Replace
	Damaged gear	Replace
	Foreign material	Remove the foreign material and check, and replace if necessary.
	No oil	Fill or change
Gear noise while driving	Poor gear engagement	Correct or replace
	Incorrect gear adjustment	Correct or replace
	Incorrect drive pinion preload adjustment	Correct or replace
	Damaged gear	Replace
	Foreign material	Remove the foreign material and check, and replace if necessary.
	Insufficient oil	Fill or change
Gear noise while coasting	Incorrect drive pinion rotation torque adjustment	Correct or replace
	Damaged differential gear	Replace
Bearing noise while driving or coasting	Cracked or damaged drive pinion rear bearing	Replace
Noise while turning	Loose side bearing	Replace
	Damaged side gear, pinion gear or pinion shaft	Replace
Heat	Incorrect differential gear backlash Excessive preload	Adjust
	Insufficient oil	Fill or change
Oil leakage	Clogged vent plug	Clean or replace
	Cover is not tightened Malfunction of seal	Re-tighten, apply sealant or replace the gasket.
	Worn or damaged oil seal	Replace
	Excessive oil	Adjust the oil level.



SERVICE ADJUSTMENT PROCEDURES

110005314

FRONT AXLE TOTAL BACKLASH CHECK

1. If the vehicle vibrates and produces a booming sound due to an imbalance in the drive system, measure the front axle total backlash by the following procedure to see if the differential carrier assembly requires removal.
 - (1) Place the transfer control lever in the "4H" position and drive the vehicle until the 4WD indicator changes from flashing to illuminated.
 - (2) Hold the wheels and place the transfer control lever in the "2H" position.
 - (3) Turn the companion flange clockwise until all play is eliminated, and then align the mating mark on the dust cover with the mating mark on the differential carrier.
 - (4) Turn the companion flange clockwise until all play is eliminated and measure the distance through which the mating marks moved.

Limit: 11 mm (.43 in.)

2. If the backlash exceeds the limit, remove the differential carrier assembly and final drive gear. Then check the differential gear meshing condition and the looseness of the drive shaft or inner shaft splines.

FRONT AXLE GEAR OIL LEVEL CHECK

110005315

Remove the filler plug and check the gear oil level. Check that the gear oil level is not 8 mm (.31 in.) below the bottom of the filler plug hole.

Specified gear oil: Hypoid gear oil API classification GL-5 or higher, SAE viscosity No. 90, 80W [1.20 dm³ (1.27 qts.)]

DRIVE SHAFT END PLAY CHECK

110005316

1. Jack up the vehicle 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. Use a feeler gauge to measure the clearance between the drive flange and the snap ring as shown in the illustration.

Standard value: 0.4–0.7 mm (.016–.028 in.)

5. If the play is outside the standard value, adjust by adding or removing shims.

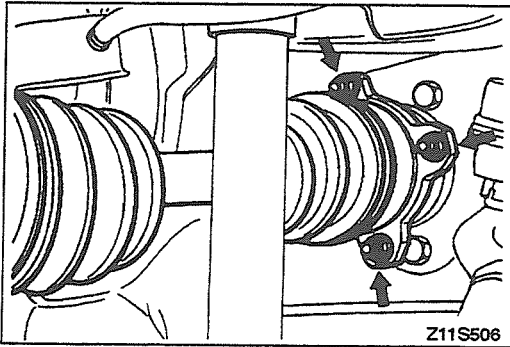
DIFFERENTIAL CARRIER OIL SEAL REPLACEMENT

110005317

1. Remove the under cover.
2. Remove the front hub and knuckle assembly.
3. Remove the left drive shaft.

Caution

When pulling the left drive shaft from the differential carrier assembly, be careful that the drive shaft spline does not damage the oil seal.

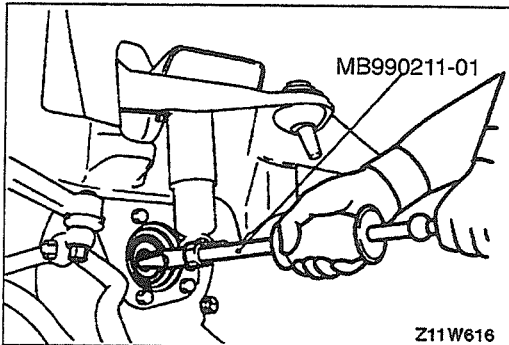


4. Remove the right drive shaft from the inner shaft assembly.
5. After removing the shock absorber (R.H.) lower mounting bolt, remove the inner shaft.

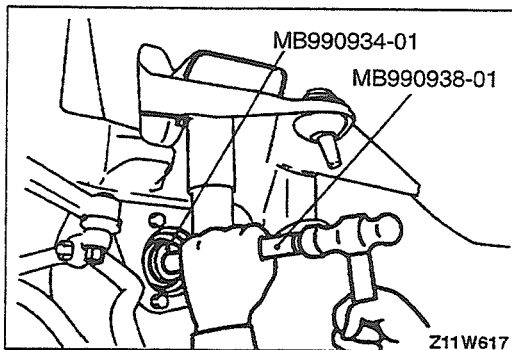
Caution

When pulling the inner shaft out from the differential carrier, be careful that the spline of the inner shaft does not damage the oil seal.

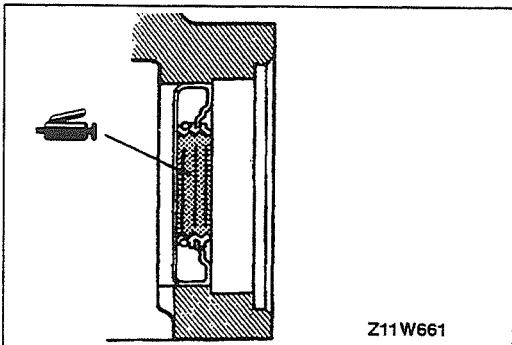
6. Remove the actuator mounting bolt from the housing tube, and then remove the harness from the clamp.
7. Remove the differential mounting bracket (R.H.) and housing tube.
8. Use the special tool to remove the oil seal.



9. Press-fit the oil seal firmly by using the special tools.



10. 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.).

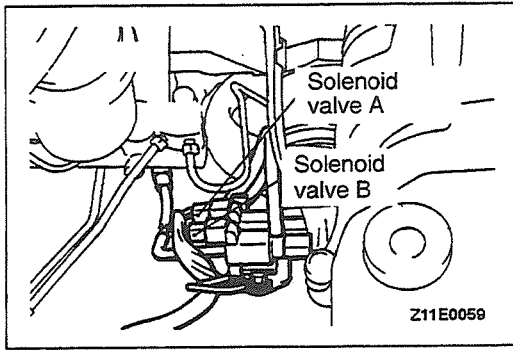


11. Install the inner shaft and drive shaft (R.H.).

Caution

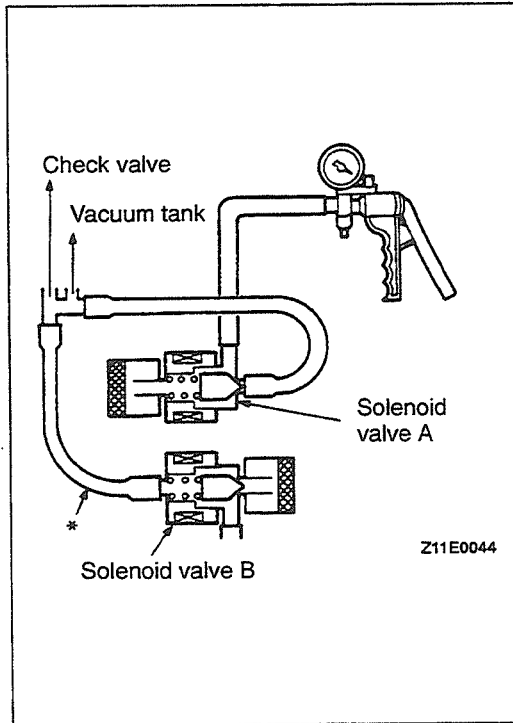
1. Do not damage the lip of the oil seal.
2. The circlip attached to the B.J. side spline of the drive shaft should be replaced with a new clip.

12. Install the actuator and secure the harness with the clamp.
13. Install the shock absorber.
14. Install the hub and knuckle assembly.
15. Install the under cover.

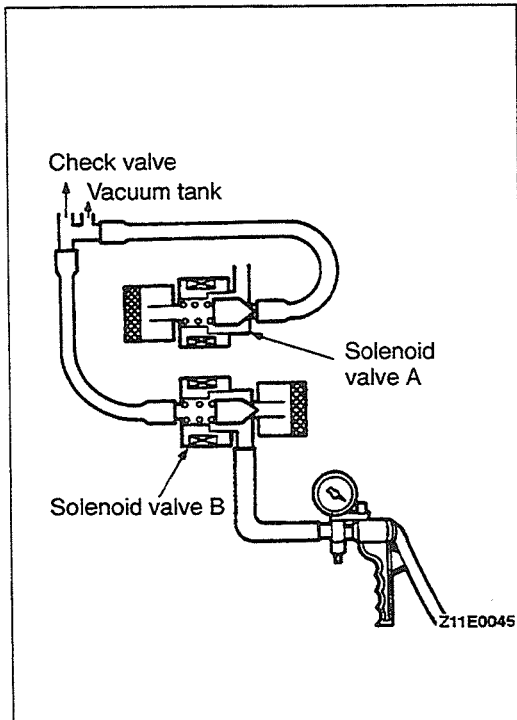


SOLENOID VALVE OPERATION CHECK 110005318

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. Apply negative pressure and carry out the following inspections.
 - (1) Even if the hand pump is operated with no other operation, no negative pressure develops.
 - (2) Even when battery positive voltage is applied to solenoid A, the condition is the same as in (1). But when the vacuum hose of solenoid B is blocked by bending at the * mark, negative pressure is maintained.
 - (3) When battery positive voltage is applied to solenoids A and B, negative pressure is maintained.



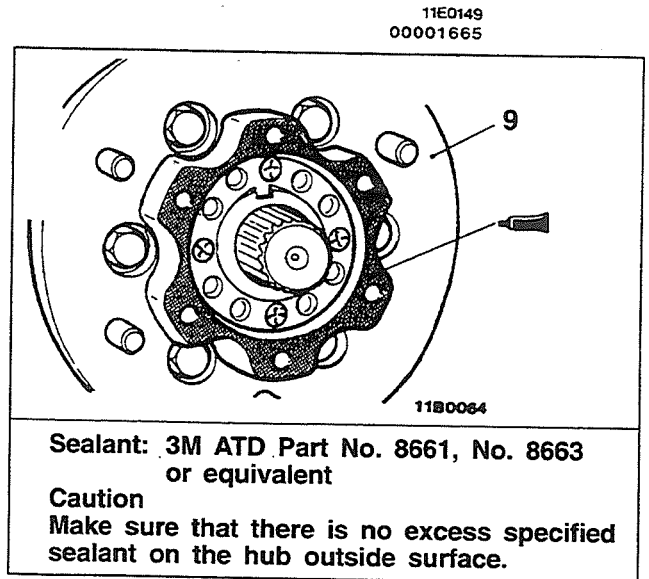
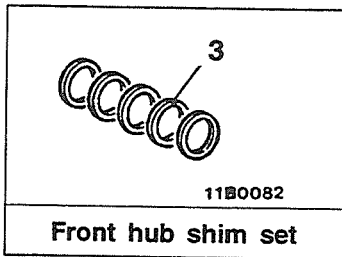
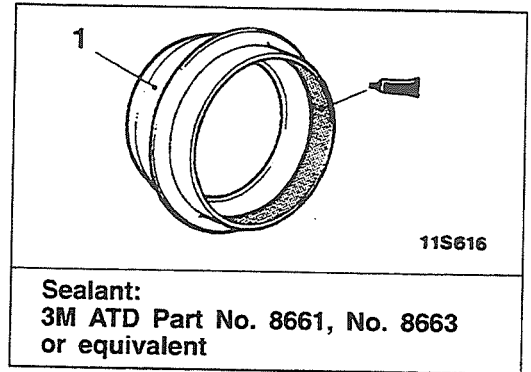
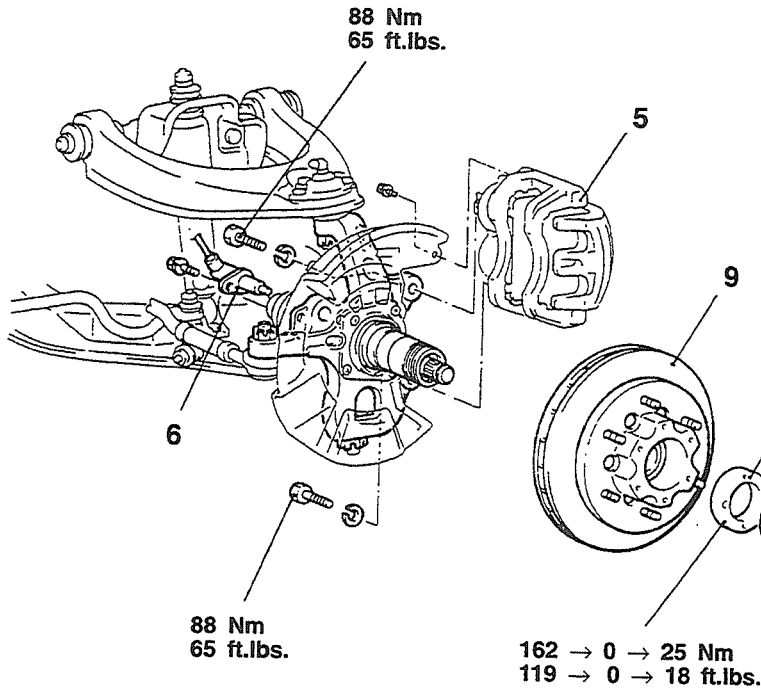
4. Connect the hand vacuum pump to solenoid valve B. Apply negative pressure and carry out the following inspections.
 - (1) With no other operation, negative pressure is maintained.
 - (2) When battery positive voltage is applied to solenoid B, the negative pressure equalizes.
 - (3) When battery positive voltage is applied to solenoid A, the negative pressure equalizes.
5. Measure the resistance of the solenoid valves.

Standard value: 36–46 Ω [at 20°C (68°F)]

AXLE HUB

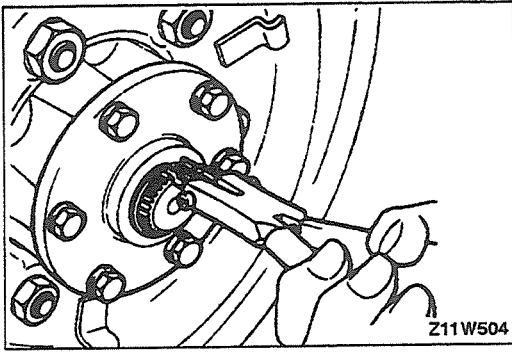
110005319

REMOVAL AND INSTALLATION



Removal steps

- 1. Hub cap
 - Adjustment of drive shaft end play
- 2. Snap ring
- 3. Shim
- 4. Drive flange
- 5. Front brake assembly
- 6. Speed sensor <Vehicles with ABS> (Refer to GROUP 35C – Wheel Speed Sensor.)
- 7. Lock washer
 - Adjustment of wheel bearing preload
- 8. Lock nut
- 9. Front hub assembly



REMOVAL SERVICE POINTS

◀A▶ SNAP RING REMOVAL

Use snap ring pliers to remove the snap ring from the drive shaft.

Caution

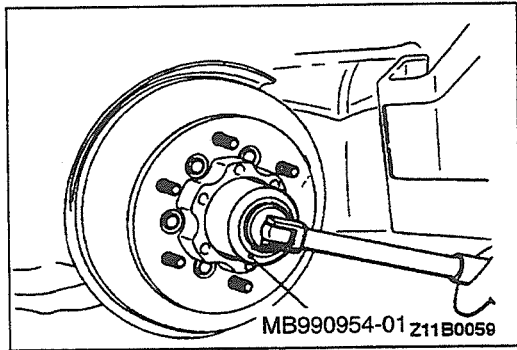
The proper tool for removing and installing the snap ring is a pair of snap ring pliers. Using a screwdriver or other tool can deform or spread the snap ring beyond its yield point. Be sure to use only snap ring pliers for removing and installing this snap ring.

◀B▶ FRONT BRAKE ASSEMBLY REMOVAL

- (1) Remove the front brake assembly with the brake hose connected.
- (2) Use wire to suspend the front brake assembly from the upper arm so that the front brake assembly won't fall.

Caution

Do not twist the brake hose.



◀C▶ LOCK NUT/FRONT HUB ASSEMBLY REMOVAL

- (1) After removing the lock washer, remove the lock nut with the special tool.
- (2) Remove the front hub assembly from the knuckle together with the inner and outer bearings.

INSPECTION

- Check the wheel bearing for seizure, discoloration and rough raceway surface.
- Check the front hub for cracks.
- Check the oil seals for cracks or damage.

INSTALLATION SERVICE POINTS

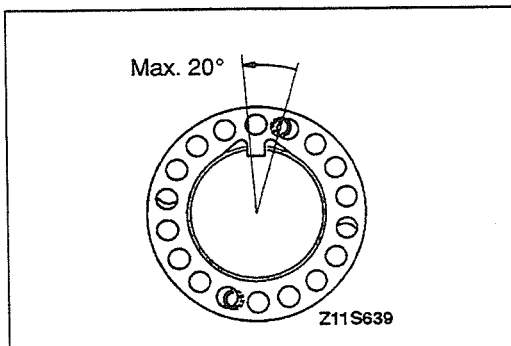
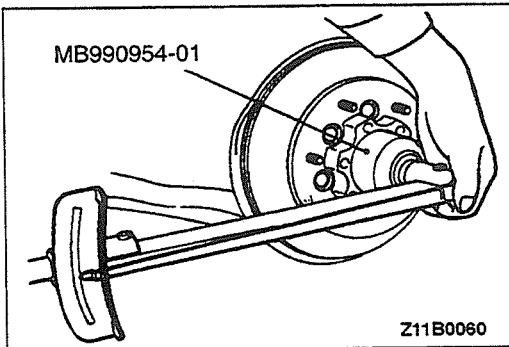
▶A◀ WHEEL BEARING PRELOAD ADJUSTMENT

- (1) Use the special tool to tighten the lock nut by the following procedure.

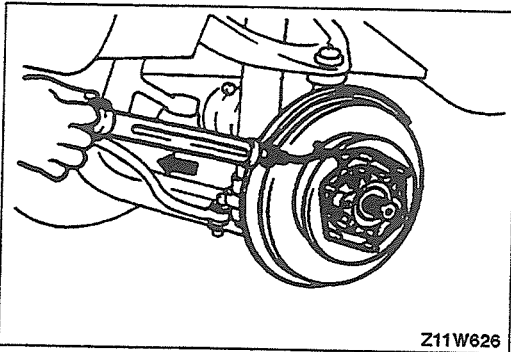
Tighten to 162 Nm (119 ft.lbs.).

Loosen to 0 Nm (0 ft.lbs.).

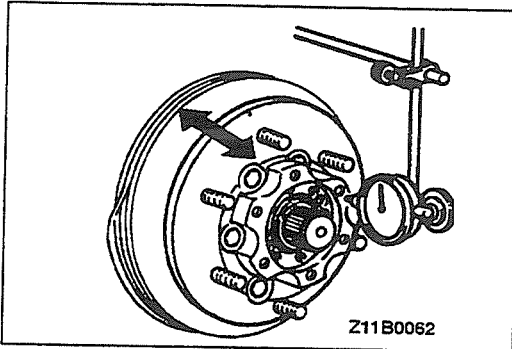
Re-tighten to 25 Nm (18 ft.lbs.)
and then loosen 30–40°



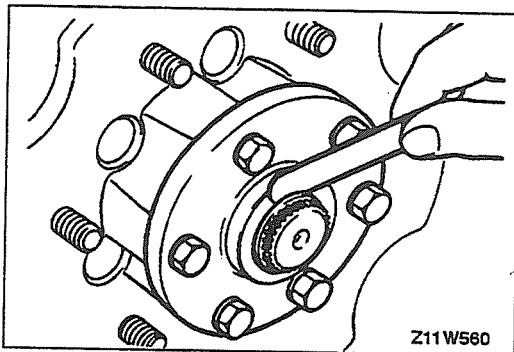
- (2) Install the lock washer. If the lock washer holes are not aligned with the lock nut holes, move the lock nut within a range of not more than 20° until the holes are aligned.



Z11W626



Z11B0062



Z11W560

- (3) Loosen the lock nut approximately 30 to 40 degrees to adjust the front hub's turning resistance and play in the axial direction so that they are at the standard values.

Standard value: 0.3–1.3 Nm (2.6–11.3 in.lbs.)
 [Spring scale reading
 5–18 N (1.1–4.0 lbs.)]

Standard value: 0.05 mm (.0020 in.) or less

NOTE

If adjustment is not possible, the bearing may be incorrectly installed; check and repair if necessary. The lubrication condition should also be checked.

- (4) Install the lock washer. If the lock washer holes are not aligned with the lock nut holes, loosen the lock nut to align them.

►B◄ **DRIVE SHAFT END PLAY ADJUSTMENT**

After installing the shim and snap ring, check the drive shaft end play by the following procedure.

- (1) Install the shim and snap ring to the drive shaft.
- (2) Push the drive shaft in by hand toward the knuckle until they touch.
- (3) Measure the clearance between the drive flange and the shim with a feeler gage as shown in the illustration.

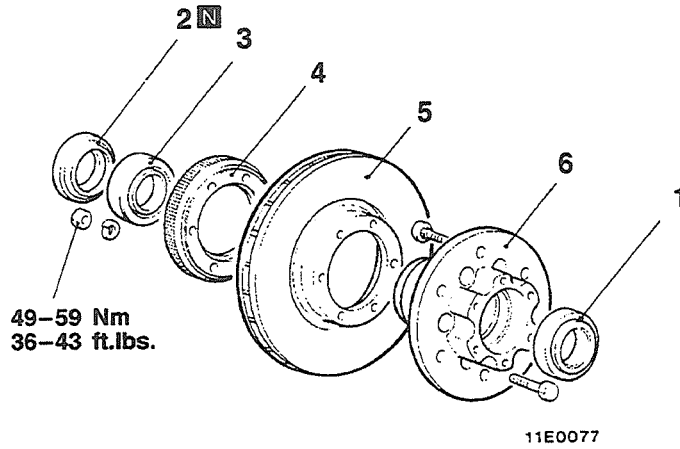
Standard value: 0.4–0.7 mm (.016–.028 in.)

- (4) If the amount of play is outside the standard value, adjust by selecting a shim that will bring the play to the standard value.

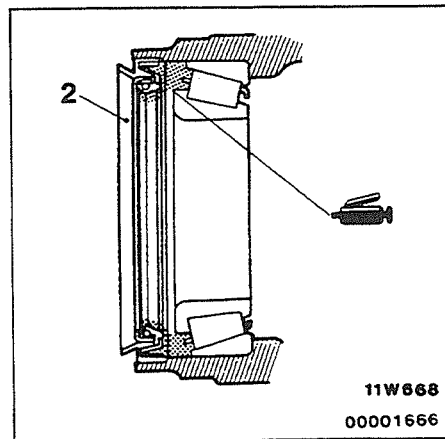
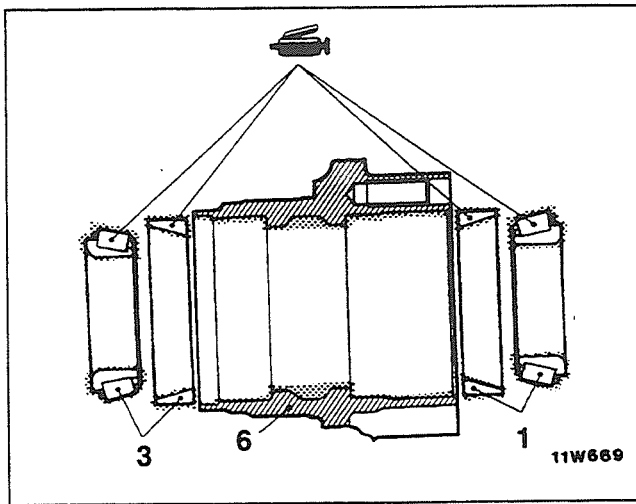
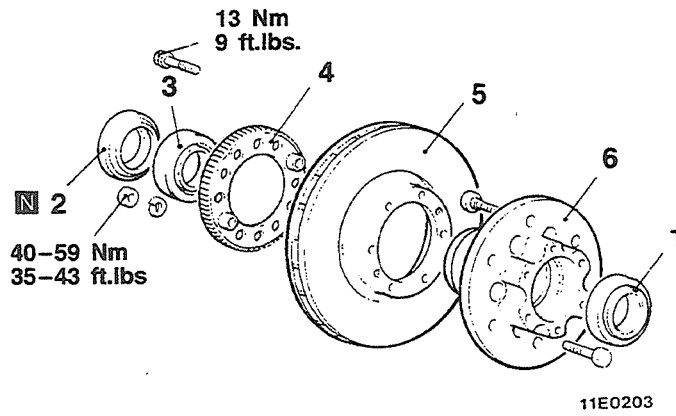
DISASSEMBLY AND REASSEMBLY (Front Axle Hub)

110005320

<Up to 1994 models>



<1995 models and after>

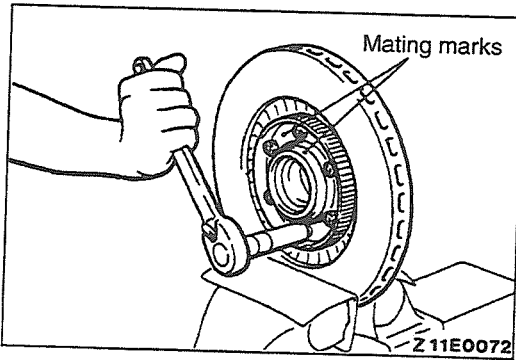


Disassembly steps

- ▶A◀
1. Outer bearing
 2. Oil seal
 3. Inner bearing



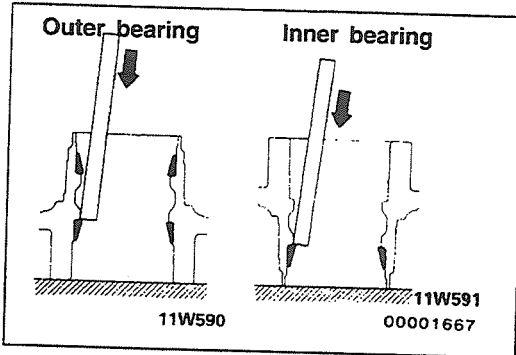
4. Rotor
5. Brake disc
6. Front hub

**DISASSEMBLY SERVICE POINT****◀▶ BRAKE DISC REMOVAL**

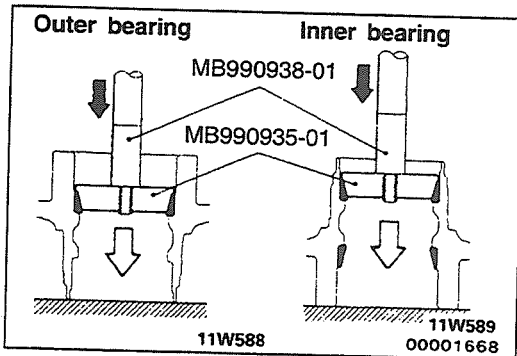
Make mating marks on the brake disc and front hub, and then separate the front hub and brake disc, if necessary.

Caution

Lock the disc in a vise and grip it with a copper or aluminum board.

**BEARING REPLACEMENT**

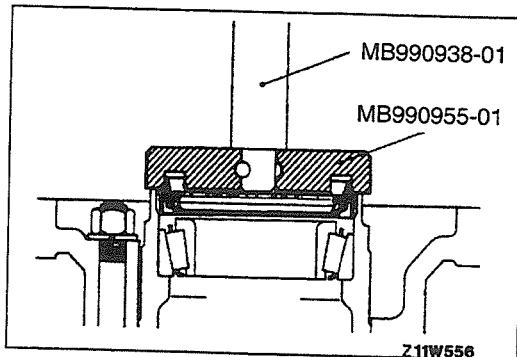
- (1) Wipe off any grease on the inside surface of the front hub.
- (2) Drive out the inner and outer bearing outer races by tapping them uniformly.
- (3) Apply multi-purpose grease to the outside surfaces of the new inner and outer bearing outer races.



- (4) Use the special tools to press-fit the inner and outer bearing outer races.

NOTE

The bearing inner race and bearing outer race should be replaced as an assembly.

**REASSEMBLY SERVICE POINT****▶◀ OIL SEAL INSTALLATION**

- (1) Apply multi-purpose grease to the lip of the oil seal and to the inside surface of the front hub.
- (2) Apply multi-purpose grease to the inner bearing inner race, and then install the inner race to the front hub.
- (3) Use the special tools to press-fit the new oil seal to the front hub until the oil seal is flush with the front hub end face.

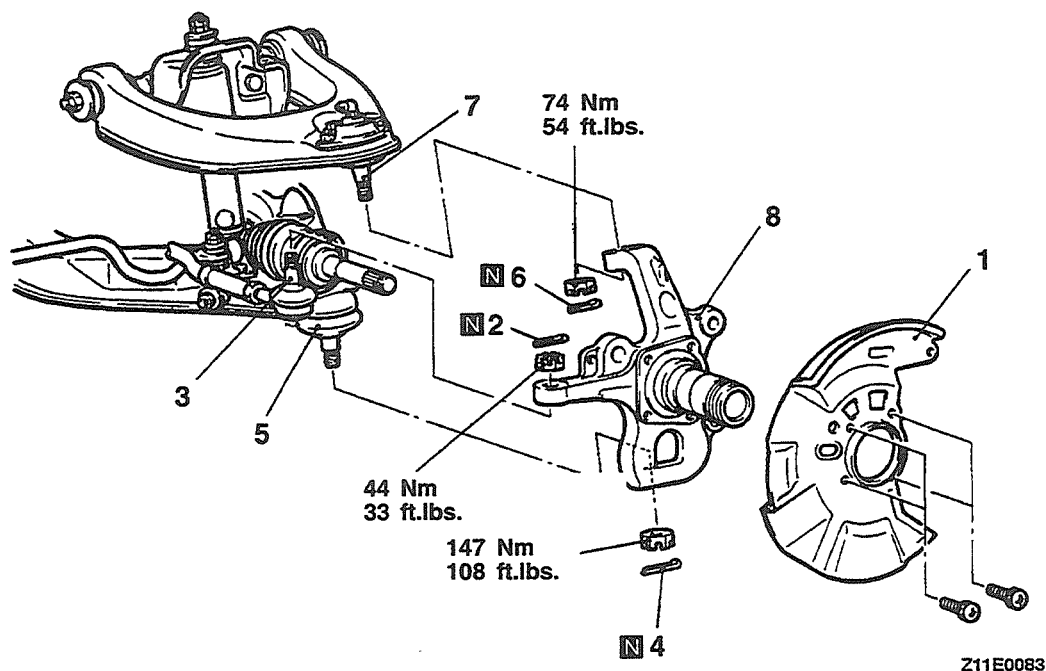
KNUCKLE

110005321

REMOVAL AND INSTALLATION

Pre-removal and post-installation Operation

- Front Hub Removal and Installation
(Refer to P.26-11.)



Removal steps

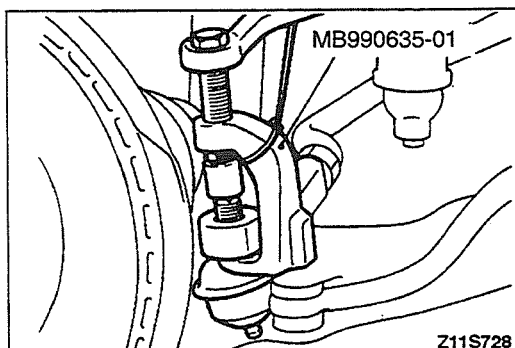
1. Dust cover
2. Cotter pin
3. Connection for tie rod assembly and knuckle
4. Cotter pin
5. Connection for lower ball joint and knuckle

6. Cotter pin
7. Connection for upper ball joint and knuckle
8. Knuckle

◀A▶

◀B▶

◀B▶



REMOVAL SERVICE POINTS

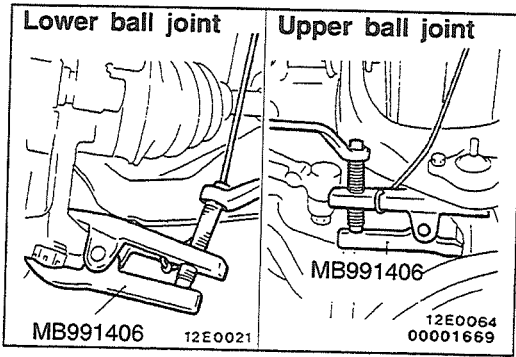
◀A▶ TIE ROD ASSEMBLY AND KNUCKLE DISCONNECTION

Use the special tool to disconnect the tie rod from the knuckle.

Caution

1. Use a cord to bind the special tool closely so that it will not become separated.
2. The nut should only be loosened, not removed.

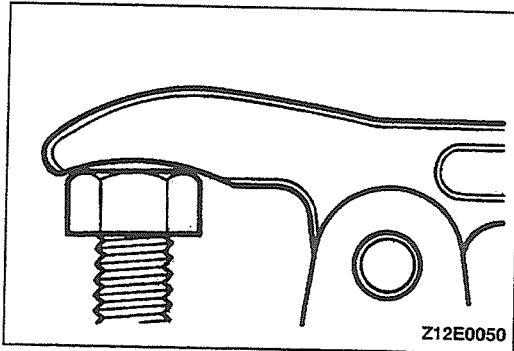
TSB Revision



◀B▶ LOWER BALL JOINT AND KNUCKLE/UPPER BALL JOINT AND KNUCKLE DISCONNECTION

Caution

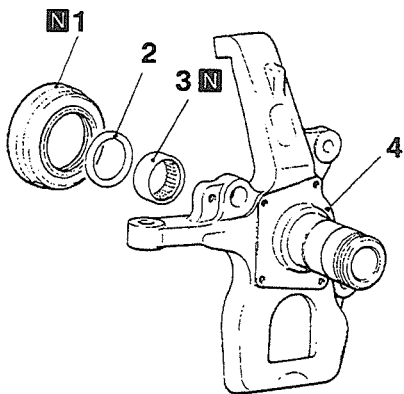
1. Support the lower arm with a jack when removing the knuckle from the lower ball joint or the upper ball joint.
2. After the knuckle has been removed, lower the jack slowly.
3. Use a cord to bind the special tool closely so that it will not become separated.
4. The nut should only be loosened, not removed.
5. Insert the special tool securely.



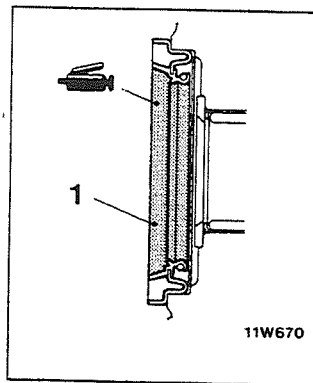
INSPECTION

- Check the needle bearing for wear or damage.
- Check the knuckle for cracks or bends.
- Check the knuckle spindle for wear or pounding.

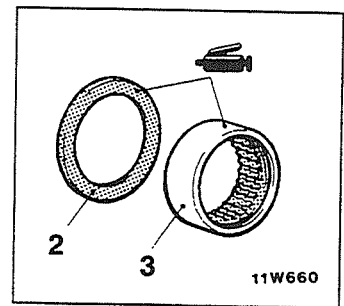
DISASSEMBLY AND REASSEMBLY



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11W670



11W660

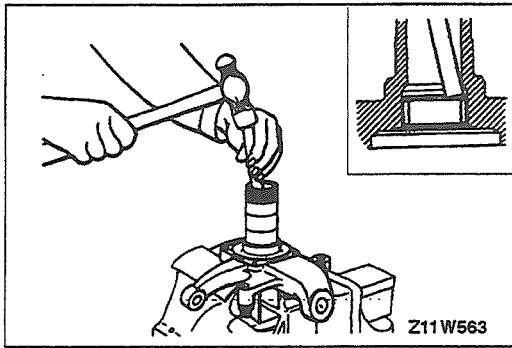
110005322

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Disassembly steps

- ◀C▶ 1. Oil seal
- ◀B▶ 2. Spacer
- ◀A▶ 3. Needle bearing
- 4. Knuckle

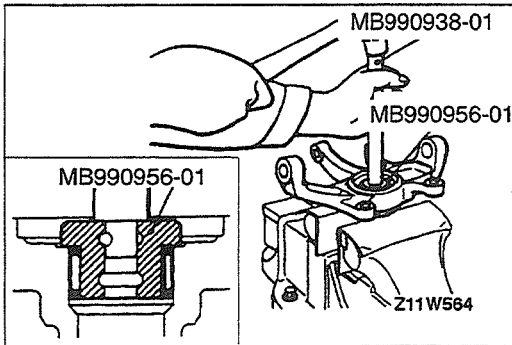
TSB Revision

**DISASSEMBLY SERVICE POINT****◀A▶ NEEDLE BEARING REMOVAL**

- (1) Remove the oil seal and take out the spacer.
- (2) Drive out the needle bearing by tapping the needles uniformly.

Caution

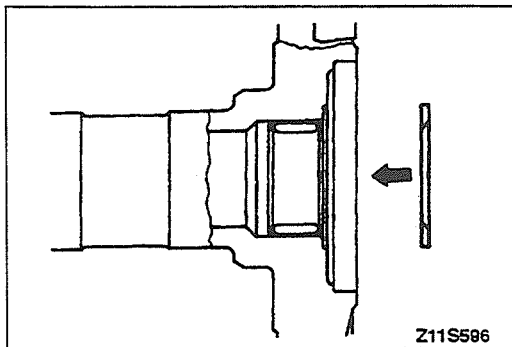
Once removed, the needle bearing must not be reused.

**REASSEMBLY SERVICE POINTS****▶A◀ NEEDLE BEARING INSTALLATION**

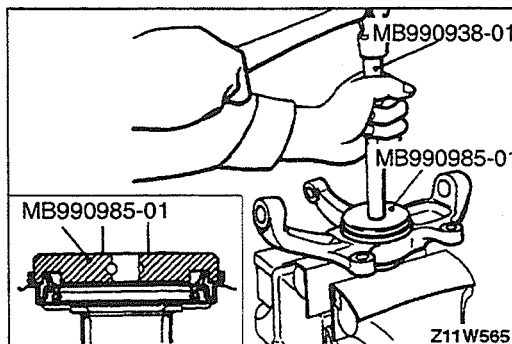
- (1) Apply multi-purpose grease to the roller surface of the new needle bearing.
- (2) Use the special tools to press-fit the needle bearing until it is flush with the knuckle end face.

Caution

Use care to prevent driving the needle bearing too far in.

**▶B◀ SPACER INSTALLATION**

- (1) Apply multi-purpose grease to the knuckle attachment surface of the spacer.
- (2) Install the spacer to the knuckle with the chamfered side toward the center of the vehicle.

**▶C◀ OIL SEAL INSTALLATION**

- (1) Use the special tools to press-fit the new oil seal until it is flush with the knuckle end face.
- (2) Apply multi-purpose grease to the inside and lip of the oil seal.

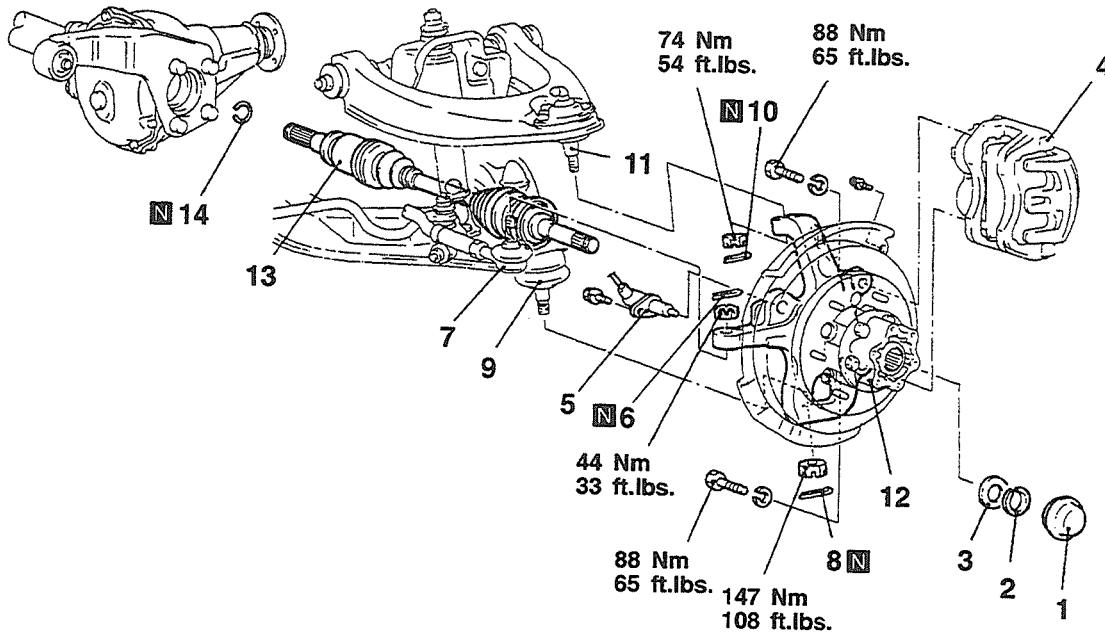
DRIVE SHAFT

110005323

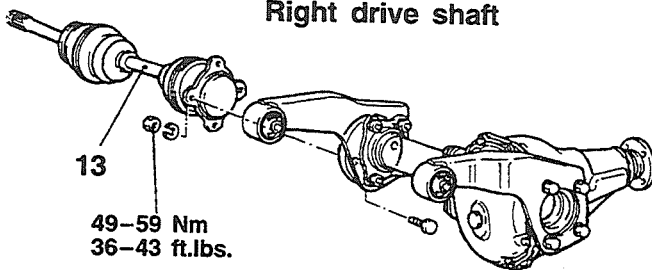
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
 • Under Cover Removal and Installation

Left drive shaft

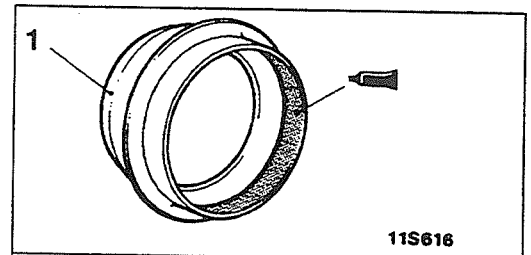


Right drive shaft



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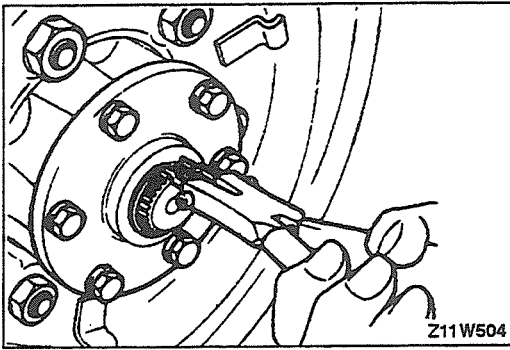


Sealant:
 3M ATD Part No. 8661, No. 8663
 or equivalent

Removal steps

- | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>◀A▶ 1. Hub cap</p> <p>◀B▶ 2. Snap ring</p> <p>3. Shim</p> <p>4. Front brake assembly</p> <p>5. Speed sensor <Vehicles with ABS>
(Refer to GROUP 35C – Wheel Speed Sensor.)</p> <p>◀C▶ 6. Cotter pin</p> <p>7. Connection for tie rod assembly and knuckle</p> | <p>◀D▶ 8. Cotter pin</p> <p>9. Connection for lower ball joint and knuckle</p> <p>◀D▶ 10. Cotter pin</p> <p>11. Connection for upper ball joint and knuckle</p> <p>◀E▶ ▶A▶ 12. Front hub and knuckle assembly</p> <p>13. Drive shaft</p> <p>14. Circlip</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

TSB Revision



REMOVAL SERVICE POINTS

◀A▶ SNAP RING REMOVAL

Use snap ring pliers to remove the snap ring from the drive shaft.

Caution

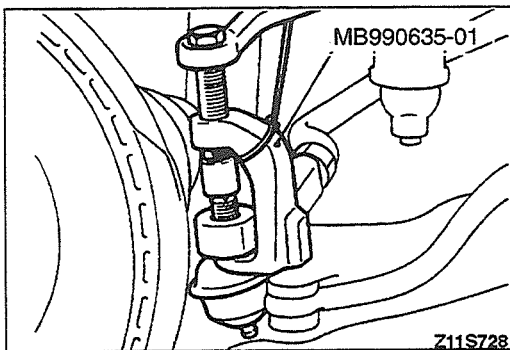
The proper tool for removing and installing the snap ring is a pair of snap ring pliers. Using a screwdriver or other tool can deform or spread the snap ring beyond its yield point. Be sure to use only snap ring pliers for removing and installing this snap ring.

◀B▶ FRONT BRAKE ASSEMBLY REMOVAL

- (1) Remove the front brake assembly with the brake hose connected.
- (2) Use wire to suspend the front brake assembly from the upper arm so that the front brake assembly won't fall.

Caution

Do not twist the brake hose.

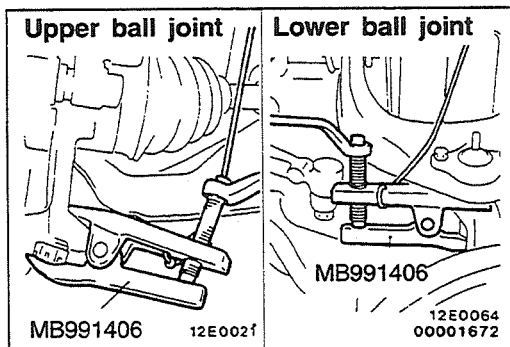


◀C▶ TIE ROD ASSEMBLY AND KNUCKLE DISCONNECTION

Use the special tool to disconnect the tie rod from the knuckle.

Caution

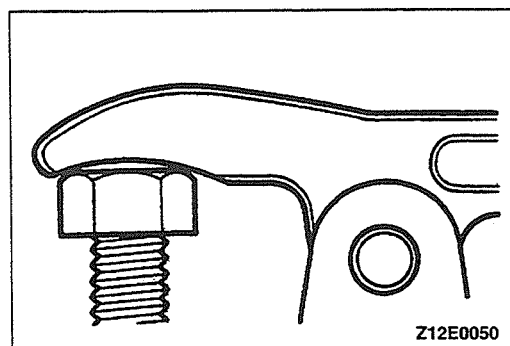
1. Use a cord to bind the special tool closely so that it will not become separated.
2. The nut should only be loosened, not removed.

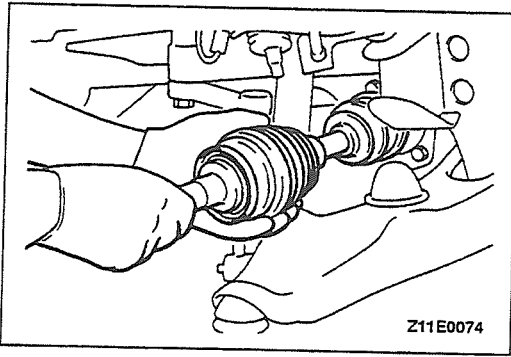


◀D▶ LOWER BALL JOINT AND KNUCKLE/UPPER BALL JOINT AND KNUCKLE DISCONNECTION

Caution

1. Support the lower arm with a jack when removing the knuckle from the lower ball joint or the upper ball joint.
2. After the knuckle has been removed, lower the jack slowly.
3. Use a cord to bind the special tool closely so that it will not become separated.
4. The nut should only be loosened, not removed.
5. Insert the special tool securely.





◀E▶ DRIVE SHAFT REMOVAL

FOR LEFT DRIVE SHAFT

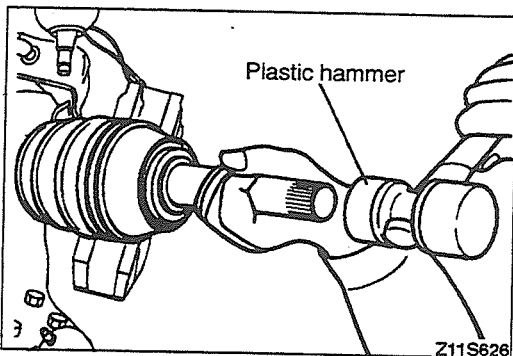
Pull the drive shaft out from the differential carrier.

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 operation of the ball joint and check for excessive looseness.
- Check the boot for wear or damage.
- Check the splines for wear or damage.



INSTALLATION SERVICE POINTS

▶A◀ DRIVE SHAFT INSTALLATION

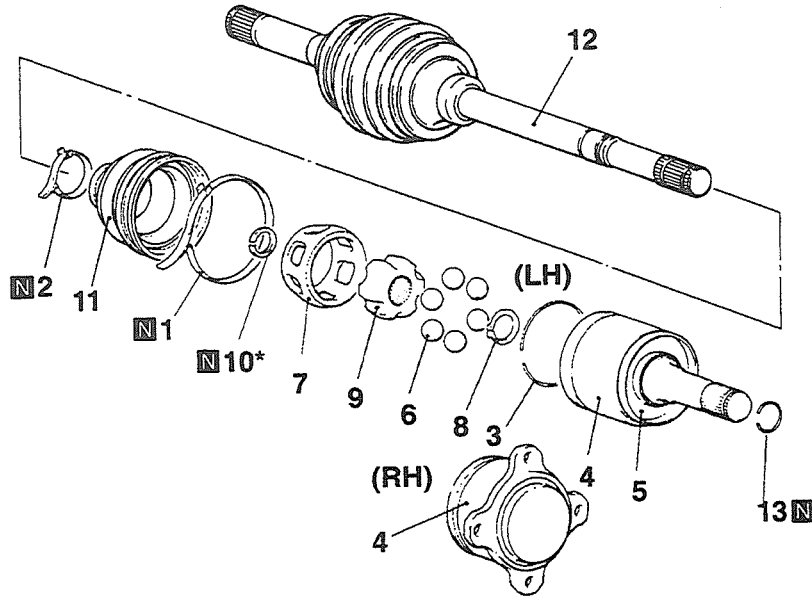
FOR LEFT DRIVE SHAFT

Drive the drive shaft into the differential carrier with a plastic hammer.

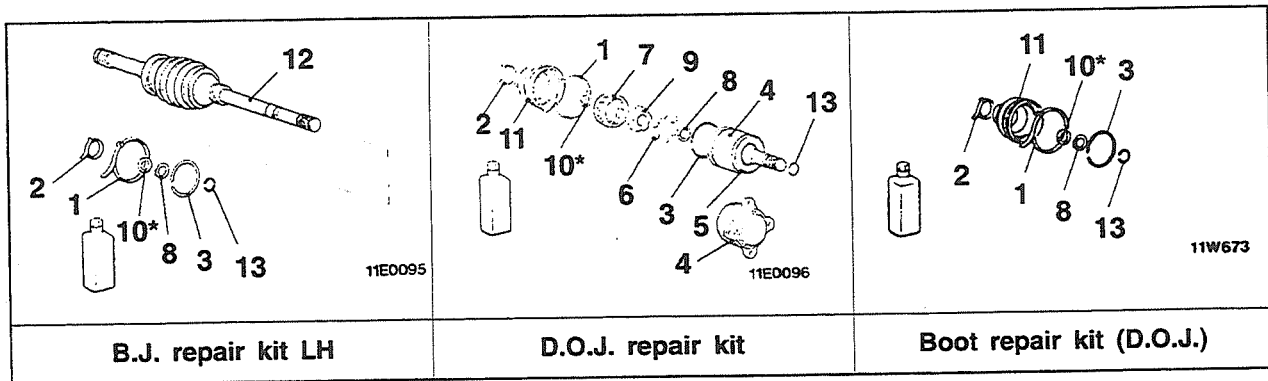
Caution

1. Be careful not to damage the lip of the oil seal.
2. The circlip attached to the B.J. side spline of the drive shaft should be replaced with a new clip.

DISASSEMBLY AND REASSEMBLY



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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
6. Ball
7. D.O.J. cage
8. Snap ring
9. D.O.J. inner race
10. Circlip
11. D.O.J. boot
12. B.J. assembly
13. Circlip



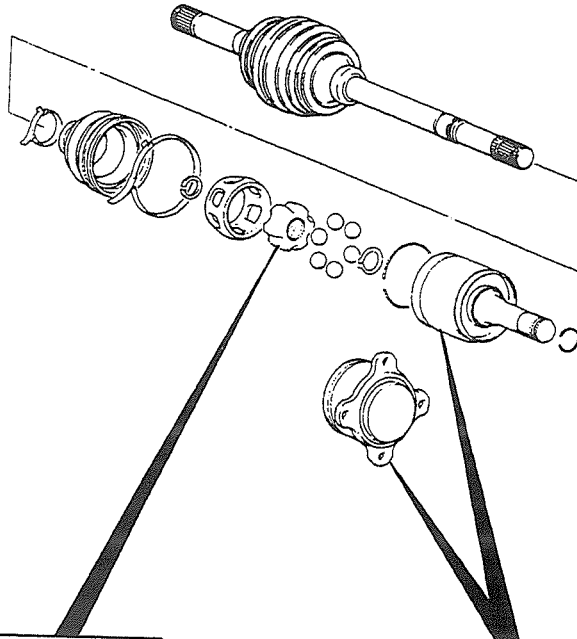
Reassembly steps

12. B.J. assembly
2. D.O.J. boot band (small)
11. D.O.J. boot
1. D.O.J. boot band (large)
7. D.O.J. cage
10. Circlip
9. D.O.J. inner race
8. Snap ring
6. Ball
4. D.O.J. outer race
3. Circlip
13. Circlip
5. Dust cover

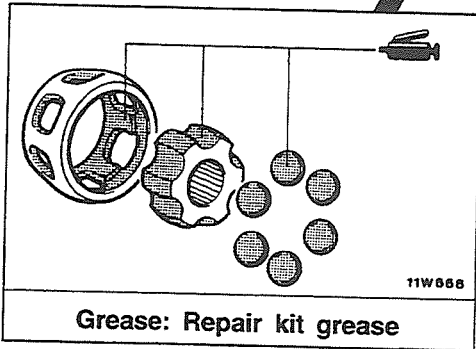


NOTE
*: M/T

LUBRICATION POINTS

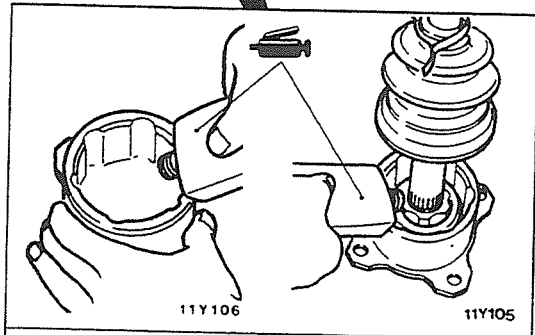


11E0078



11W866

Grease: Repair kit grease



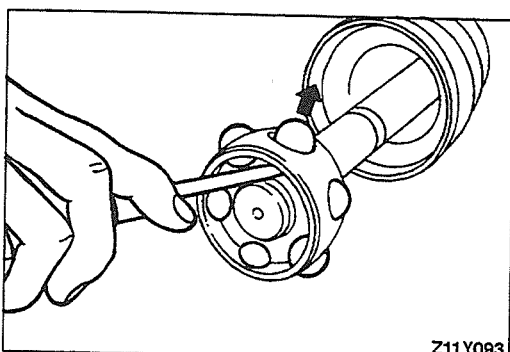
11Y106

11Y105

Grease: Repair kit grease
100 g (3.5 oz.)

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

00001674



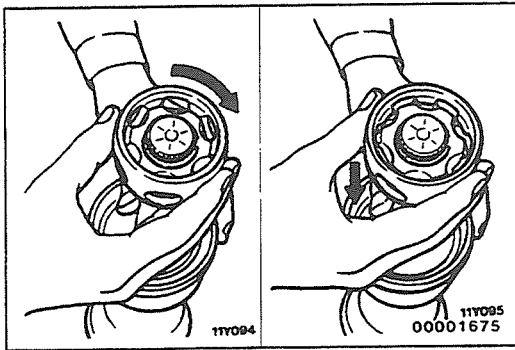
Z11Y093

DISASSEMBLY SERVICE POINTS

◀A▶ BALLS REMOVAL

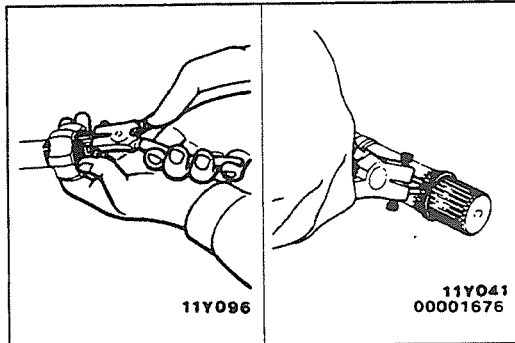
Remove the balls from the D.O.J. cage.

TSB Revision



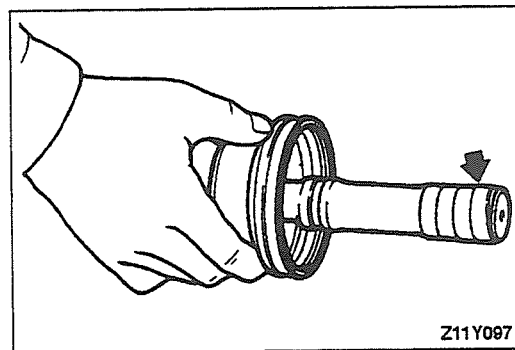
◀B▶ D.O.J. CAGE REMOVAL

Remove the D.O.J. cage from the D.O.J. inner race in the direction of the B.J.



◀C▶ SNAP RING/CIRCLIP REMOVAL

- (1) Use snap ring pliers to remove the snap ring from the drive shaft, and then withdraw the D.O.J. inner race and D.O.J. cage from the drive shaft.
- (2) Use snap ring pliers to remove the circlip from the drive shaft.



◀D▶ D.O.J. BOOT REMOVAL

- (1) Wrap plastic tape around the spline part on the D.O.J. side of the drive shaft so that the D.O.J. boot will not be damaged when it is removed.
- (2) With draw the D.O.J. boot from the drive shaft.

INSPECTION

- Check the drive shaft for bending or wear.
- Check the B.J. for entry of water, foreign materials or rust.
- Check the D.O.J. cage, D.O.J. inner race and balls for rust, wear or damage.
- Check the circlip for damage or deformation.
- Check the D.O.J. outer race for wear or damage.

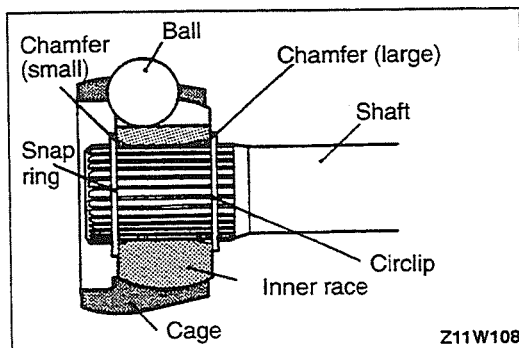
REASSEMBLY SERVICE POINTS

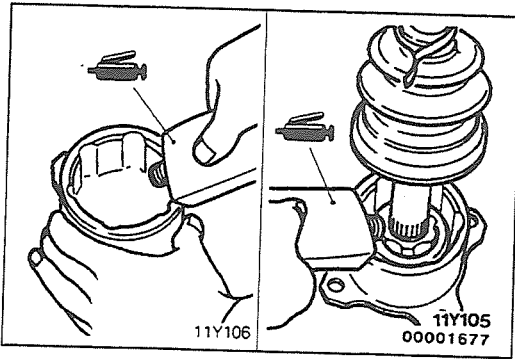
▶A◀ D.O.J. CAGE/D.O.J. INNER RACE/SNAP RING/BALLS INSTALLATION

Install the cage, balls and inner race to the drive shaft, and fit the snap ring securely into the groove in the drive shaft.

Caution

For vehicles with M/T, the inner race should be installed so that the large chamfer on the spline section is on the drive shaft side.





►B◄ D.O.J. OUTER RACE INSTALLATION

- (1) Fill the inside of the D.O.J. outer race and D.O.J. boot with specified grease.

Specified grease: Repair kit grease 100 g (3.5 oz.)

NOTE

The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution

The drive shaft joint uses special grease. Do not mix old and new grease or different types of grease.

- (2) Install the circlip onto the D.O.J. outer race. Place the D.O.J. boot over the D.O.J. outer race, and then use a boot band (small) to secure the boot.

Caution

Do not secure the boot band (large).

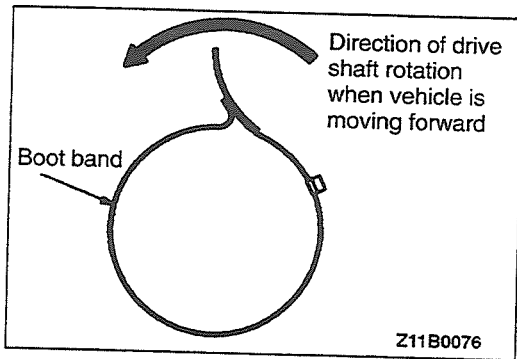
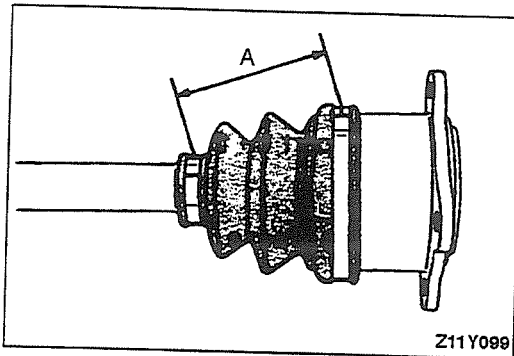
- (3) Secure the drive shaft, and then move the D.O.J. outer race until it is at the position where the D.O.J. boot assembly dimension is at the standard value.

Standard value (A): 77–83 mm (3.03–3.27 in.)

- (4) Remove part of the D.O.J. boot from the D.O.J. outer race to release the air within the boot.
- (5) Secure the boot band (large) on the D.O.J. boot.

Caution

Check that the installation directions of the boot bands are correct.

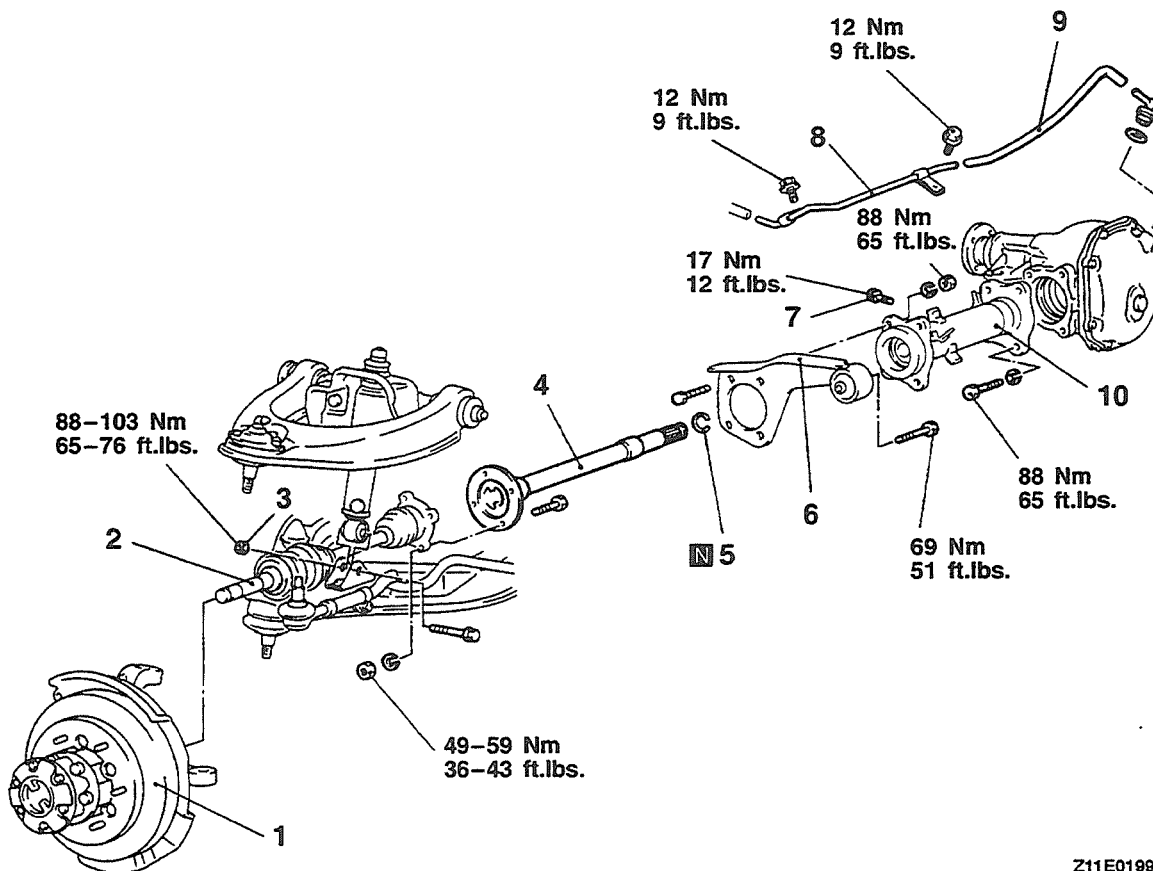


INNER SHAFT

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Under Cover Removal and Installation

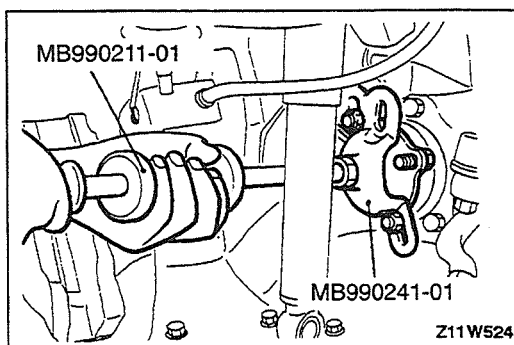


Z11E0199

Removal steps

1. Front hub and knuckle assembly (Refer to P.26-11.)
2. Drive shaft assembly (R.H.) (Refer to P.26-19.)
3. Shock absorber lower mounting bolt and nut
4. Inner shaft
5. Circlip

6. Differential mounting bracket (R.H.)
7. Actuator mounting bolt
8. Breather pipe
<1994 models and after>
9. Breather hose
<1994 models and after>
10. Housing tube



REMOVAL SERVICE POINT

◀A▶ INNER SHAFT REMOVAL

Attach the special tools to the flange of the shaft, and pull the inner shaft out from the front differential carrier.

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.

TSB Revision.

INSPECTION

- Check the inner shaft for bend.
- Check the bearing for wear or discoloration.
- Check the housing tube for cracks.
- Check the dust seal for cracks or damage.

INSTALLATION SERVICE POINT

▶A◀ INNER SHAFT INSTALLATION

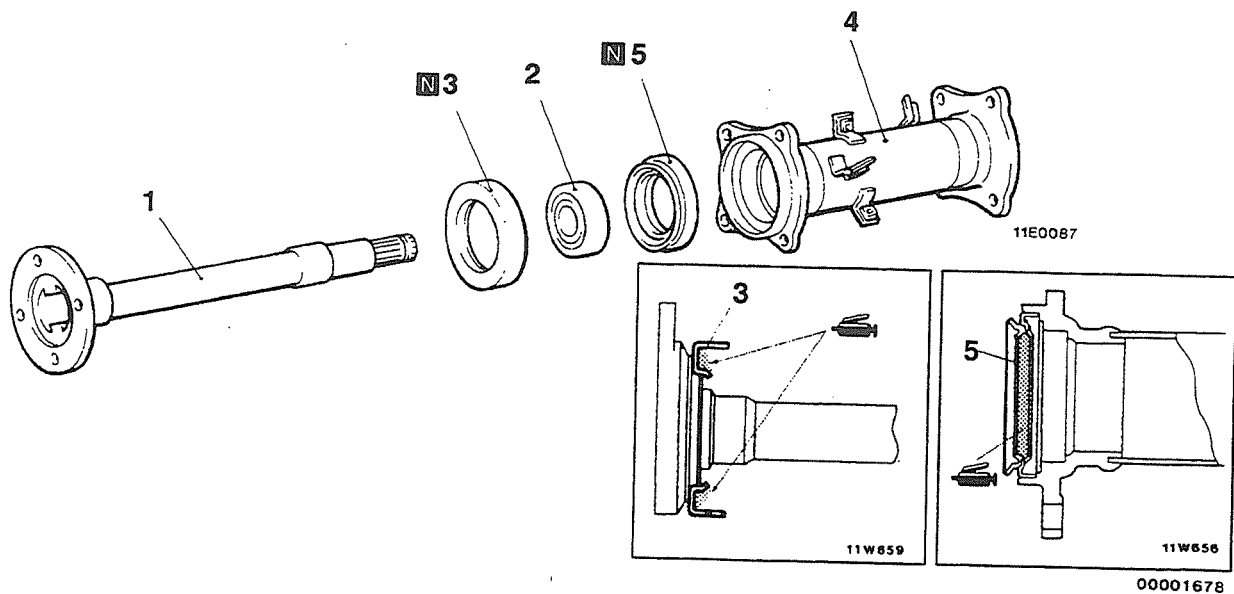
Drive the inner shaft into the front differential carrier by using the special tools (MB990241-01 and MB990211-01).

Caution

Be careful not to damage the lip of the dust seal and oil seal.

DISASSEMBLY AND REASSEMBLY

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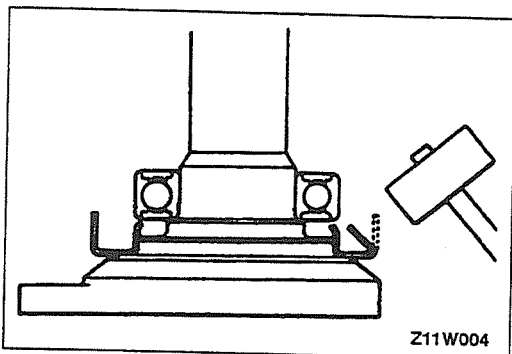


Disassembly steps

1. Inner shaft
2. Bearing

◀A▶ ▶C▶

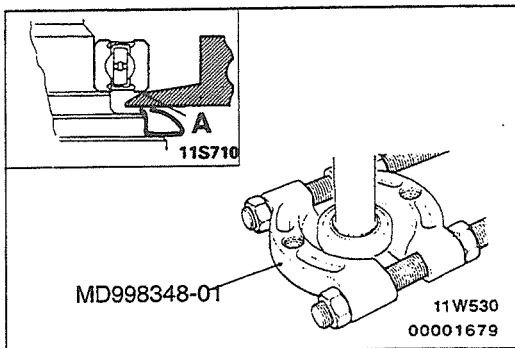
- ▶B▶ 3. Dust cover
4. Housing tube
▶A▶ 5. Dust seal



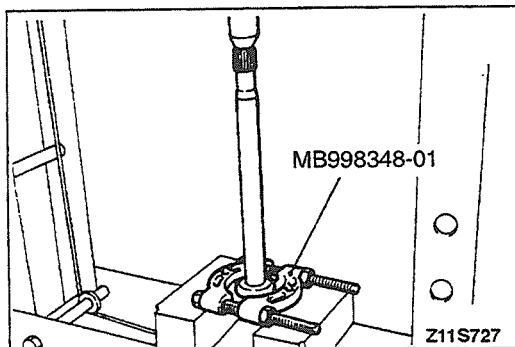
DISASSEMBLY SERVICE POINT

◀A▶ BEARING REMOVAL

- (1) Bend the outside periphery of dust cover inward with a hammer.

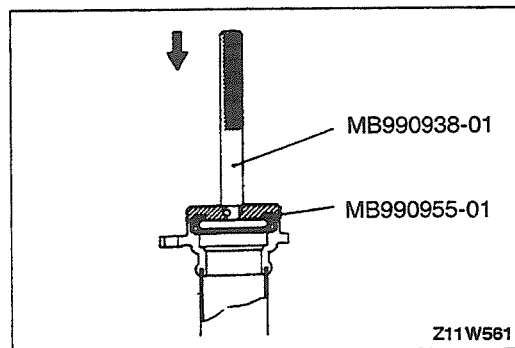


(2) After the special tool has been installed as shown, tighten the nut of the special tool until section "A" of the special tool touches the bearing outer race.



(3) Press out the inner shaft from the bearing.

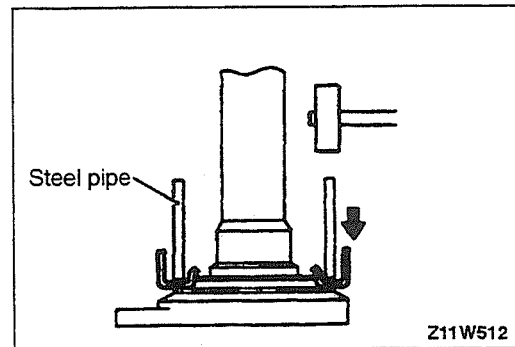
Caution
Do not allow the inner shaft to drop.



REASSEMBLY SERVICE POINTS

▶A◀ DUST SEAL INSTALLATION

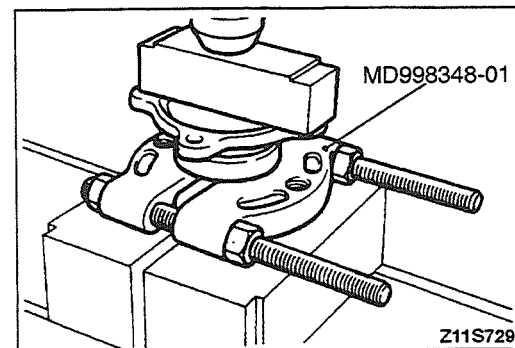
Use the special tools to press-fit the new dust seal into the housing tube until it is flush with the housing tube end face.



▶B◀ DUST COVER INSTALLATION

Use a steel pipe to press-fit a new dust cover onto the inner shaft.

Steel pipe	mm (in.)
Overall length	50 (1.7)
Outer diameter	75 (3.0)
Wall thickness	4 (.2)



▶C◀ BEARING INSTALLATION

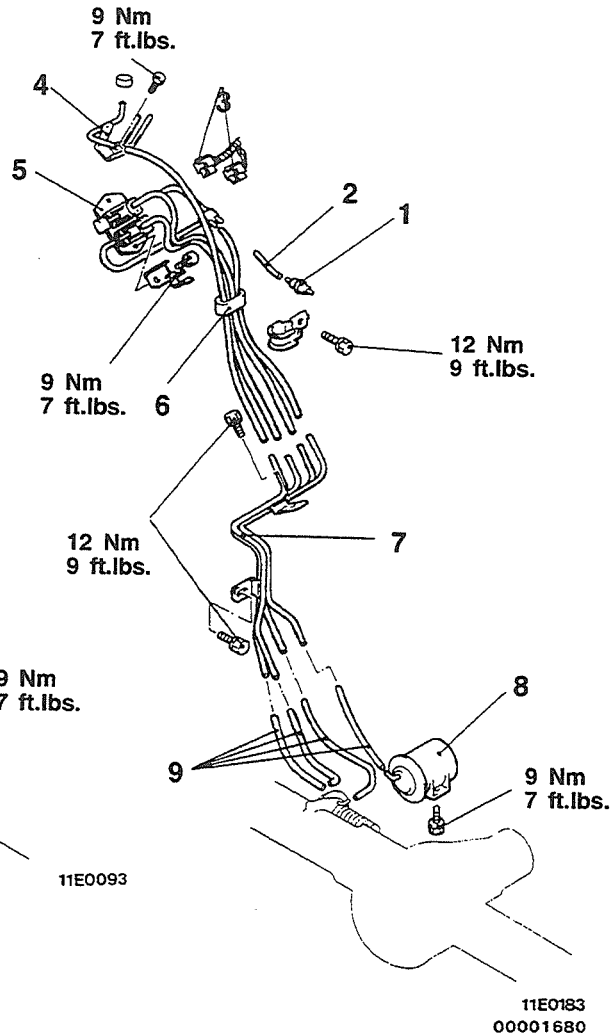
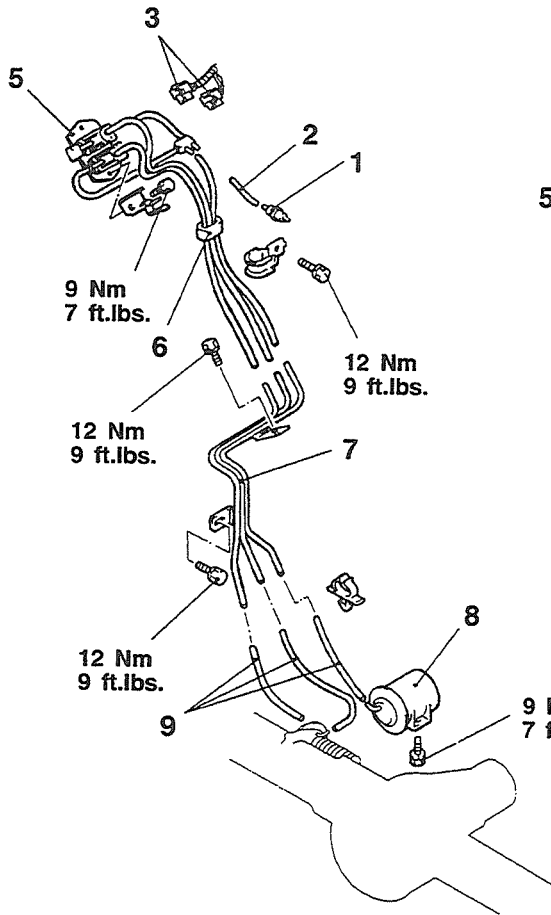
Use the special tool to press-fit the bearing onto the inner shaft.

SOLENOID VALVE AND VACUUM HOSE

REMOVAL AND INSTALLATION

<Up to 1993 models>

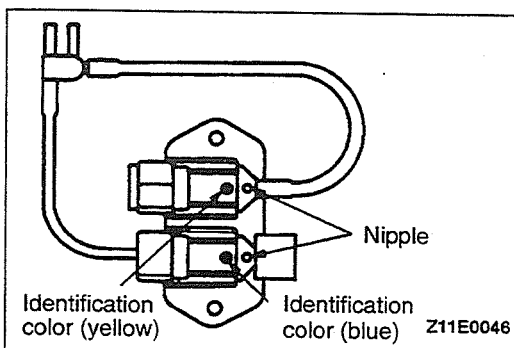
<1994 models and after>



Removal steps

1. Check valve
2. Vacuum hose
3. Solenoid valve connector
4. Vacuum pipe
- ▶B◀ 5. Solenoid valve assembly

- ▶B◀ 6. Vacuum hose
7. Vacuum pipe assembly
8. Vacuum tank
- ▶A◀ 9. Vacuum hose



INSTALLATION SERVICE POINTS

▶A◀ VACUUM HOSE INSTALLATION

Install the vacuum hoses so that the identification colors match those of the pipe assembly and the actuator. Furthermore, there are no identification colors on the vacuum hose at the vacuum tank connection.

▶B◀ VACUUM HOSE/SOLENOID VALVE ASSEMBLY INSTALLATION

Install the vacuum hose and solenoid valve assembly so that the colors of the identification marks are matched.

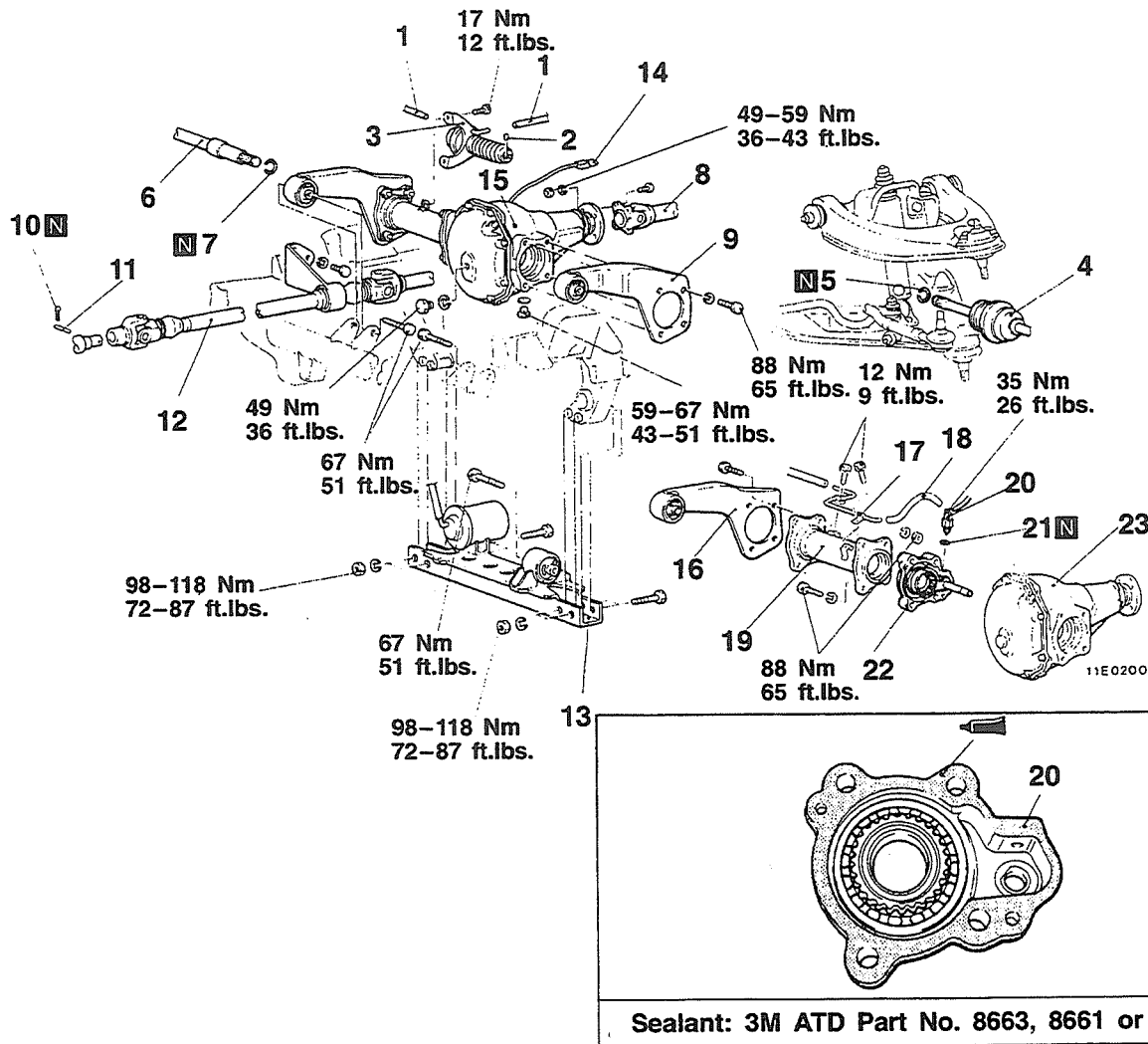
DIFFERENTIAL CARRIER AND FREE-WHEELING CLUTCH

110005328

REMOVAL AND INSTALLATION

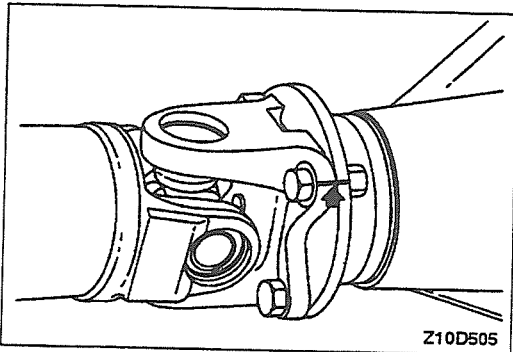
Pre-removal and Post-installation Operations

- Under Cover Removal and Installation
- Gear Oil Draining Supplying (Refer to P.26-8.)



Removal steps

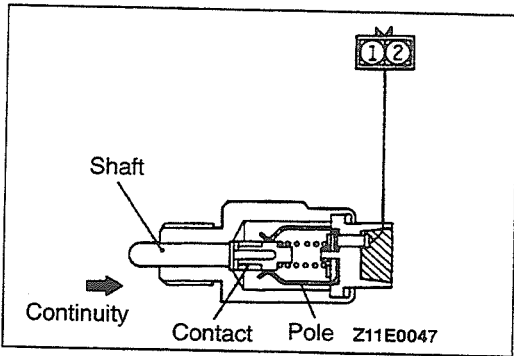
- | | | |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>▶C◀</p> <p>▶A▶ ▶B◀</p> | <ol style="list-style-type: none"> 1. Vacuum hose 2. Pin 3. Actuator assembly 4. Drive shaft (Refer to P.26-19.) 5. Circlip 6. Inner shaft (Refer to P.26-26.) 7. Circlip 8. Connection for front propeller shaft 9. Differential mounting bracket (L.H.) 10. Cotter pin <M/T> 11. Share pin <M/T> 12. Front shaft assembly <M/T> 13. Front suspension crossmember 14. Free-wheeling engage switch connector | <ol style="list-style-type: none"> 15. Front differential carrier assembly, housing tube and differential mounting bracket (R.H.) 16. Differential mounting bracket (R.H.) 17. Breather pipe <1994 models and after> 18. Breather hose <1994 models and after> 19. Housing tube 20. Free-wheeling engage switch 21. Gasket ▶A◀ 22. Free-wheeling clutch assembly 23. Front differential carrier assembly |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



REMOVAL SERVICE POINT

◀A▶ FRONT PROPELLER SHAFT REMOVAL

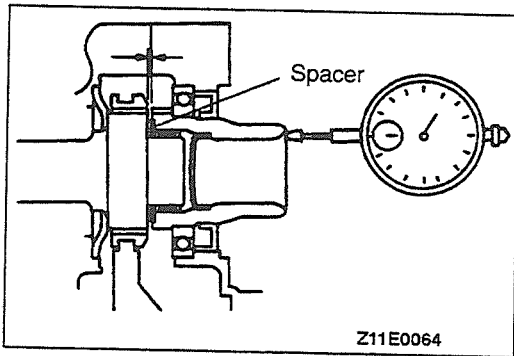
Make mating marks on the flange yoke of the rear propeller shaft and on the companion flange of the differential case.



INSPECTION

FREE-WHEEL ENGAGE SWITCH

The switch is normal if there is continuity when the shaft is pushed in and no continuity when the shaft is released.



INSTALLATION SERVICE POINTS

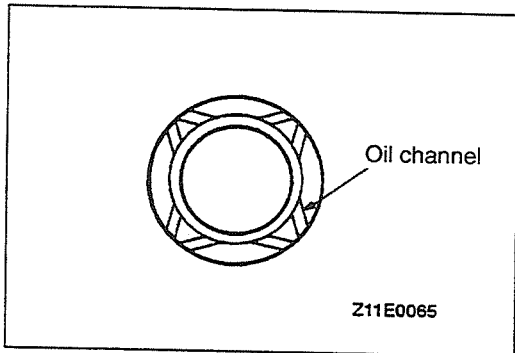
▶A◀ FREE-WHEELING CLUTCH ASSEMBLY INSTALLATION

<Vehicles built up to 1994>

- (1) After installing the free-wheeling clutch assembly, select a spacer so that the clutch gear play (bearing looseness) is within the standard value.

Standard value: 0.05–0.40 mm (.0020–.0160 in.)

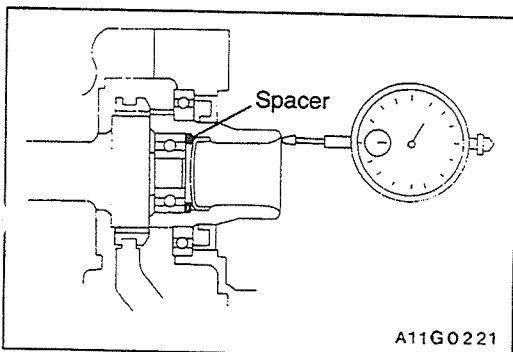
- (2) Install the spacer so that the oil channel side is on the differential gear side.



<Vehicles built up from 1995>

After installing the free-wheeling clutch assembly, select a spacer so that the clutch gear play (bearing looseness) is within the standard value.

Standard value: 0.05–0.30 mm (.0020–.0120 in.)



▶B◀ FRONT PROPELLER SHAFT INSTALLATION

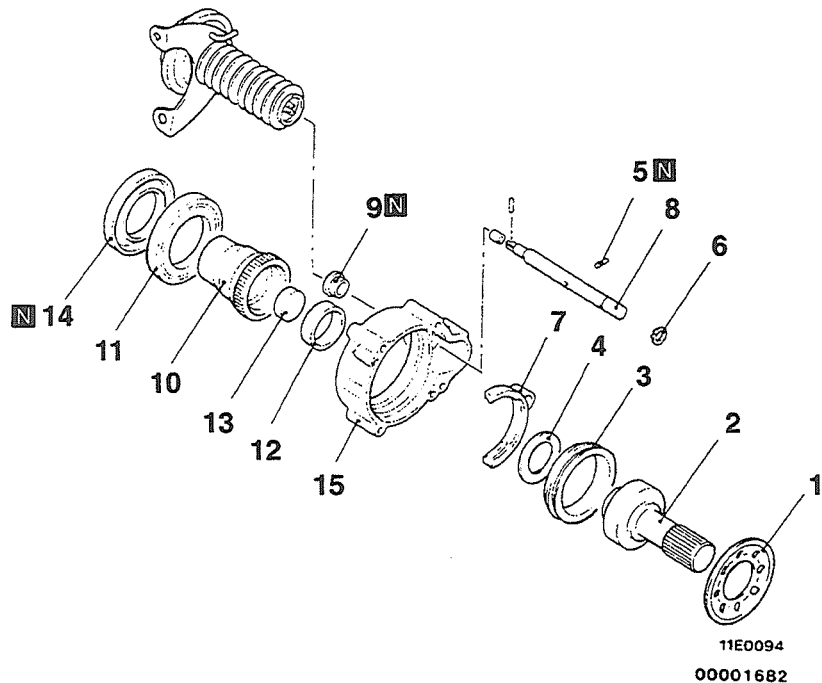
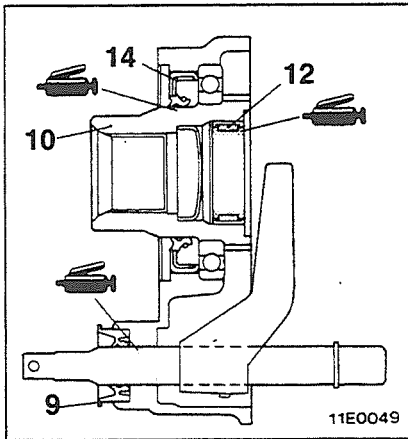
Install the front propeller shaft so that the mating marks on the flange yoke and differential carrier companion flange are aligned.

▶C◀ VACUUM HOSE INSTALLATION

Install the vacuum hoses so that the identification colors match those of the actuator assembly nipples.

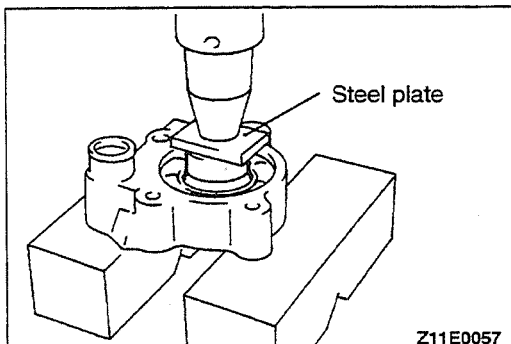
FREE-WHEELING CLUTCH
<VEHICLES BUILT UP TO 1994>
DISASSEMBLY AND REASSEMBLY

110005329



- Removal steps**
- ▶F◀ 1. Thrust bushing
 - 2. Main shaft
 - 3. Clutch sleeve
 - 4. Spacer
 - ▶E◀ 5. Spring pin
 - 6. Snap ring
 - 7. Shift fork
 - 8. Shift rod

- ▶D◀ 9. Oil seal
- ▶D◀ 10. Clutch gear
- ▶D◀ 11. Bearing
- ▶C◀ 12. Needle bearing
- ▶B◀ 13. Cap
- ▶A◀ 14. Oil seal
- 15. Clutch housing

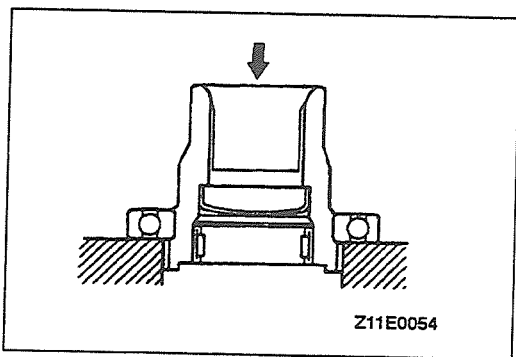


Z11E0057

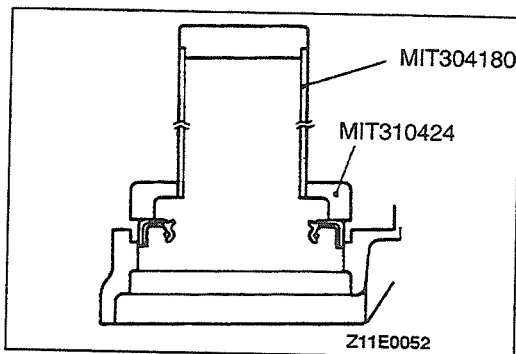
DISASSEMBLY SERVICE POINT

◀A▶ CLUTCH GEAR/BEARING REMOVAL

- (1) Use a press and a steel plate to remove the clutch gear and bearing together.



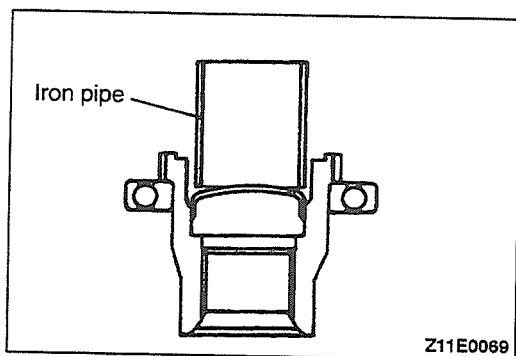
- (2) Use a press to hold the supports against the bearing inner race, and then separate the clutch gear and bearing.



REASSEMBLY SERVICE POINTS

▶A◀ OIL SEAL INSTALLATION

Use the special tool to tap in the oil seal until it is flush with the clutch housing.

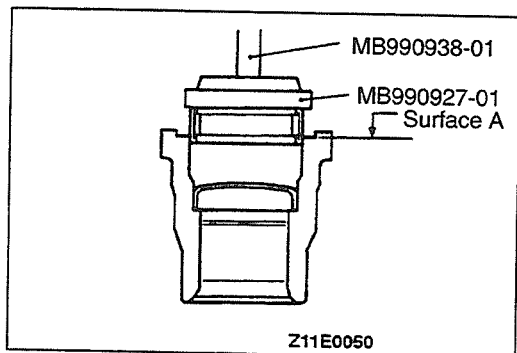


▶B◀ CAP INSTALLATION

Use an iron pipe with an outside diameter of approximately 30–35 mm (1.18–1.38 in.) to push in the sealing cap.

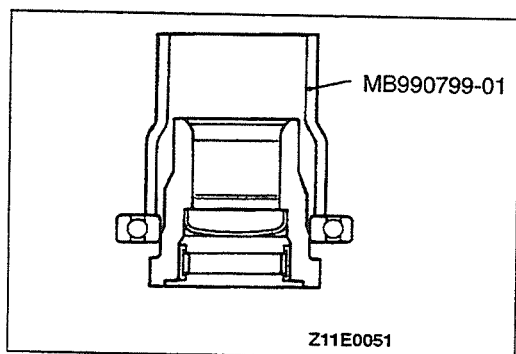
Caution

Be careful not to make a dent in the curved surface of the cylinder cap.



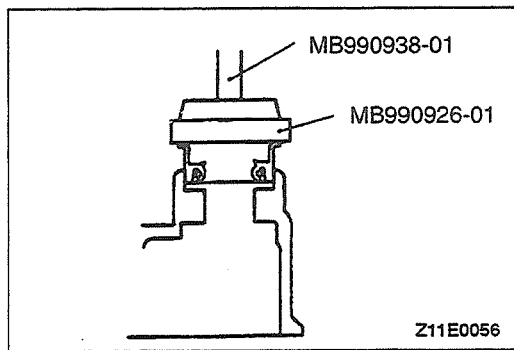
▶C◀ NEEDLE BEARING INSTALLATION

Use the special tools to press-fit the clutch cap until it is flush with surface A of the clutch gear.

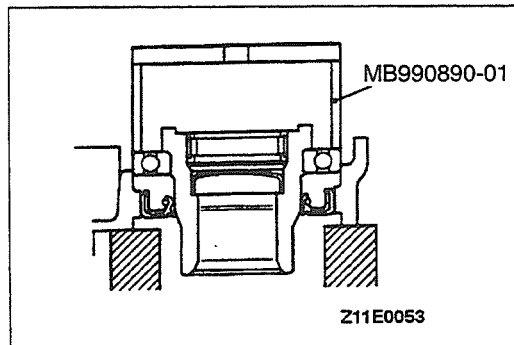


▶D◀ BEARING/CLUTCH GEAR/OIL SEAL INSTALLATION

- (1) Use the special tool to press-fit the bearing onto the shoulder of the clutch gear.



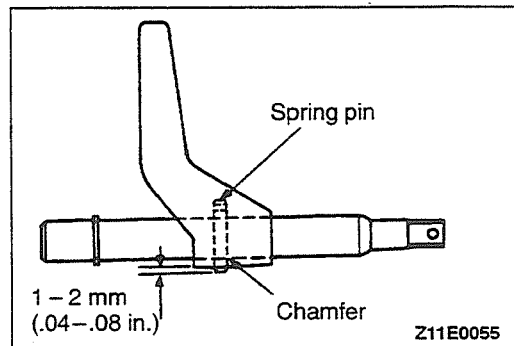
(2) Use the special tool to tap in the oil seal.



(3) Use the special tool to press-fit the bearing into the side of the clutch housing.

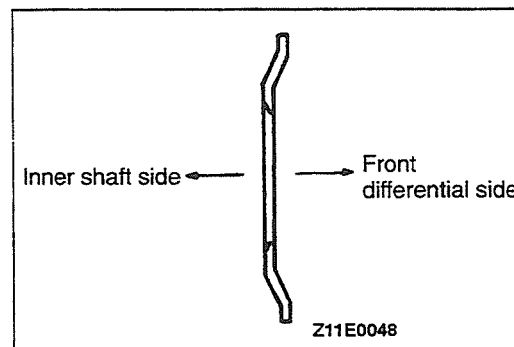
Caution

Place the special tool against the outer race of the bearing.



►E◄ **SPRING PIN INSTALLATION**

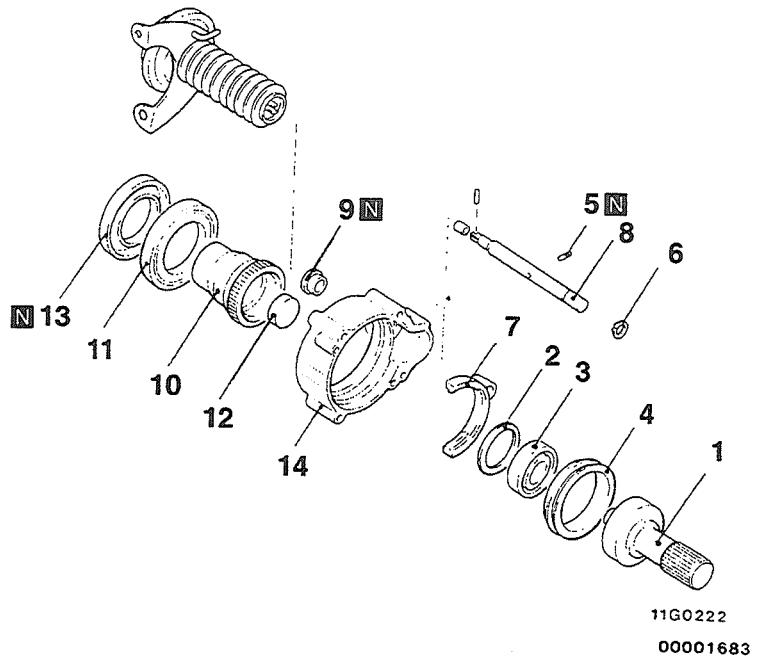
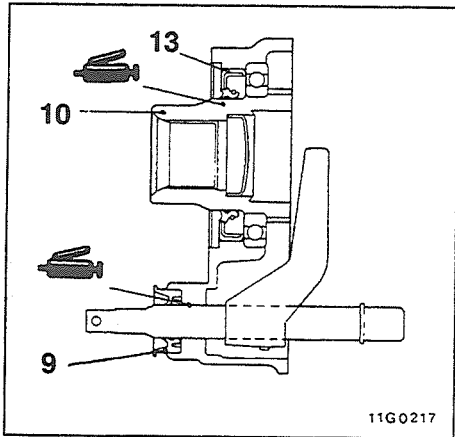
Tap the spring pin from the chamfered side of the shift rod until the projection length is at the length shown in the illustration.



►F◄ **THRUST BUSHING INSTALLATION**

Install the thrust bushing in the direction shown in the illustration.

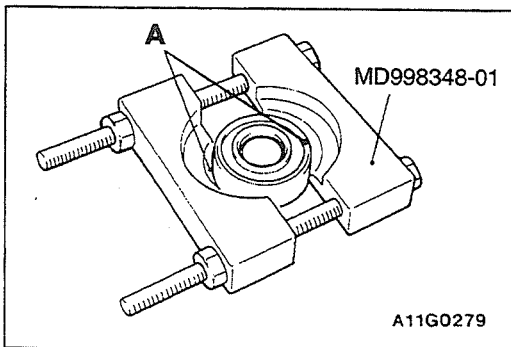
<VEHICLES BUILT FROM 1995>
DISASSEMBLY AND REASSEMBLY



Removal steps

- ◀A▶ 1. Main shaft
- ▶G▶ 2. Spacer
- ◀A▶ ▶F▶ 3. Bearing
- 4. Clutch sleeve
- 5. Spring pin
- ▶E▶ 6. Snap ring
- 7. Shift fork

- ▶D▶ 8. Shift rod
- ▶C▶ 9. Oil seal
- ◀B▶ ▶C▶ 10. Clutch gear
- ▶B▶ ▶C▶ 11. Bearing
- ▶B▶ 12. Cap
- ▶A▶ 13. Oil seal
- 14. Clutch housing

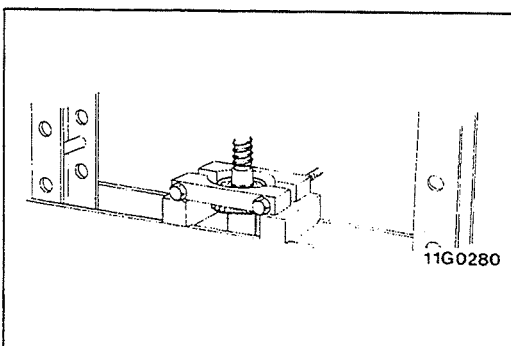


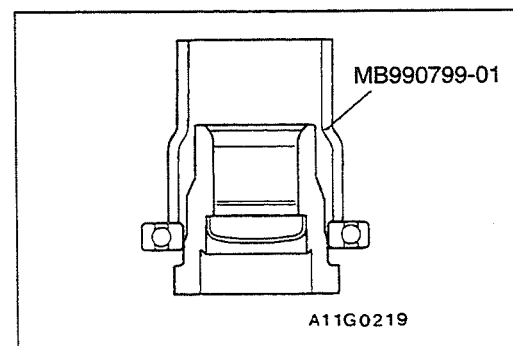
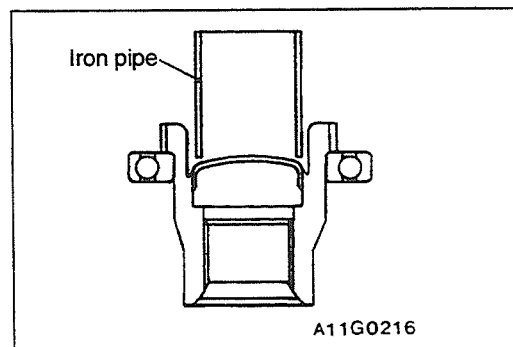
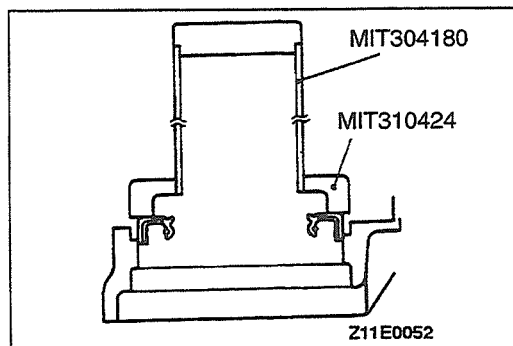
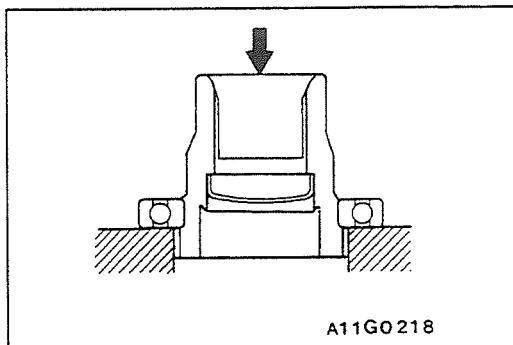
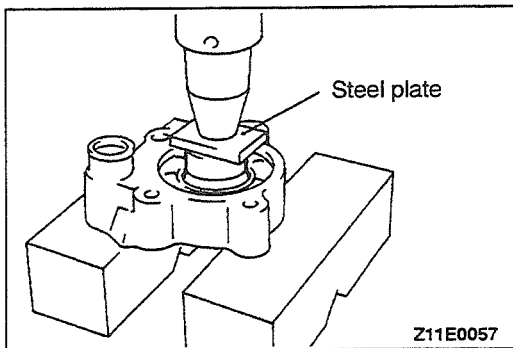
DISASSEMBLY SERVICE POINTS

◀A▶ MAIN SHAFT/BEARING REMOVAL

(1) After assembling the special tool as shown in the illustration, tighten the nut of the special tool so that A section of the special tool contacts the bearing outer race.

(2) Use a press and pull the bearing off the main shaft.





◀B▶ CLUTCH GEAR/BEARING REMOVAL

- (1) Use a press and steel plate to remove the clutch gear and bearing together.

- (2) 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

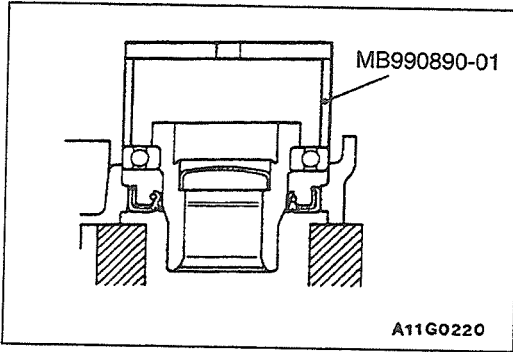
Use an iron pipe with an outside diameter of approximately 30–35 mm (1.18–1.38 in.) to push in the sealing cap.

Caution

Be careful not to make a dent in the curved surface of the cylinder cap.

▶C◀ BEARING/CLUTCH GEAR INSTALLATION

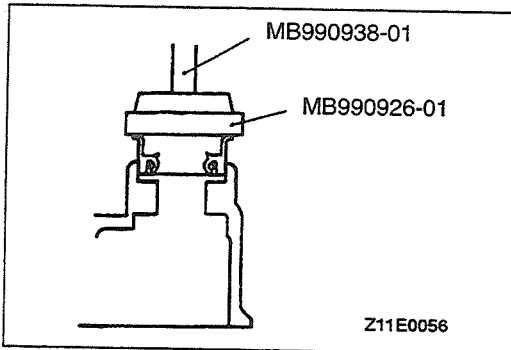
- (1) Use the special tool to press-fit the bearing to the shoulder of the clutch gear.



- (2) Use the special tool to press-fit the bearing to the side of the clutch housing.

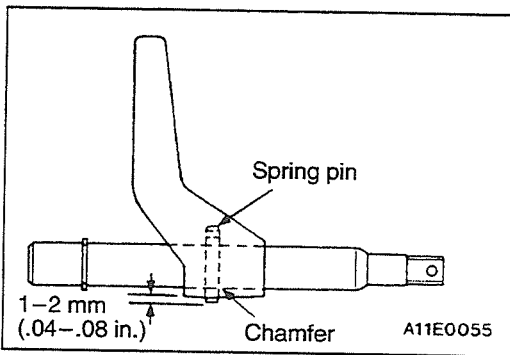
Caution

Place the special tool against the outer race of the bearing.



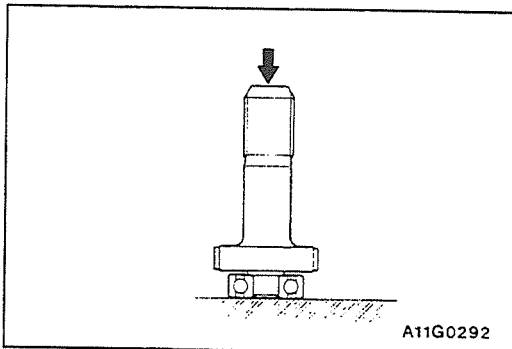
►D◄ **OIL SEAL INSTALLATION**

Use the special tool to tap the oil seal.



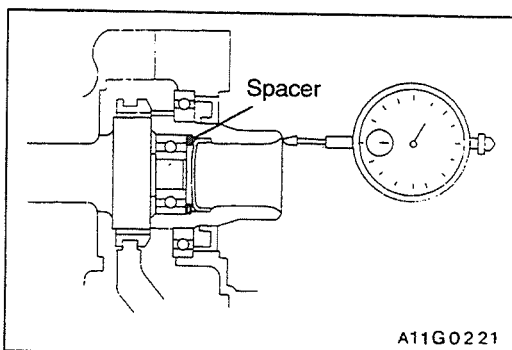
►E◄ **SPRING PIN INSTALLATION**

Tap the spring pin from the chamfered side of the shift rod until the projection length is at the length shown in the illustration.



►F◄ **BEARING INSTALLATION**

Press-fit the bearing as far as the shoulder of the main shaft.



►G◄ **SPACER INSTALLATION**

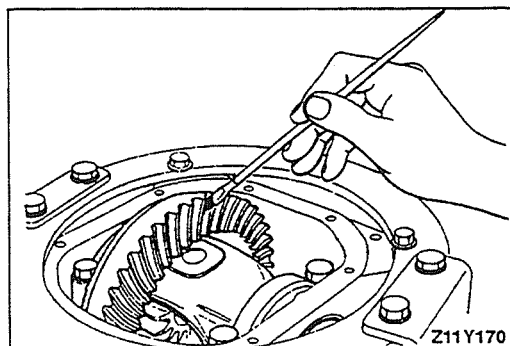
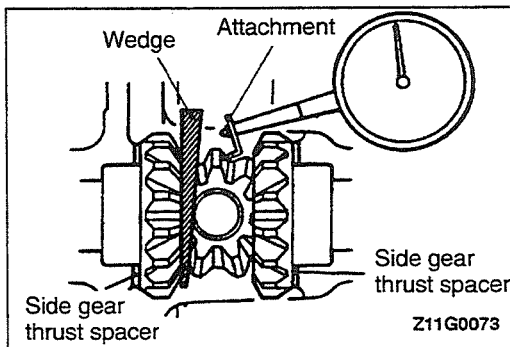
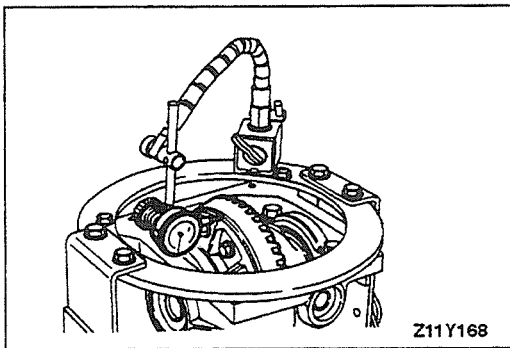
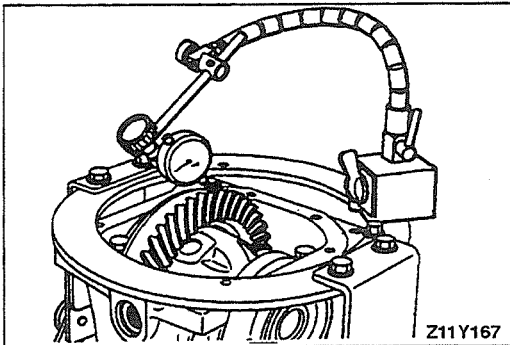
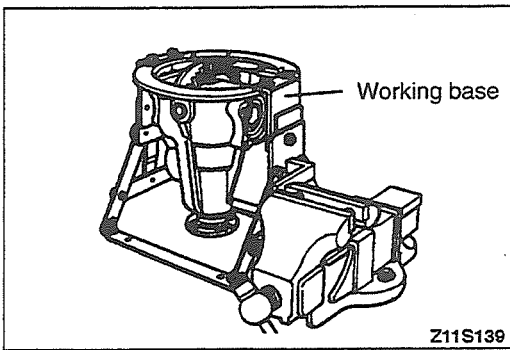
- (1) After installing the free-wheeling clutch assembly, select a spacer so that the clutch gear axial play (bearing looseness) is within the standard value.

Standard value: 0.05–0.30 mm (.0020–.0120 in.)

- (2) If it is outside the standard value, disassemble and select the appropriate spacer again.

NOTE

The thickness of the spacer is different 0.25 mm (.10 in.) each.



DIFFERENTIAL CARRIER

110005331

INSPECTION BEFORE DISASSEMBLY

Remove the cover and gasket. Hold the working base in a vise, and install the differential carrier assembly to it.

FINAL DRIVE GEAR BACKLASH

Check the final drive gear backlash by the following procedure.

- (1) With the drive pinion locked in place, use a dial indicator to measure the final drive gear backlash 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 (.0043–.0063 in.)

- (2) If the backlash is outside the standard value, adjust it by using the side bearing adjustment spacers.

DRIVE GEAR RUNOUT

Check the drive gear runout by the following procedure.

- (1) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

Limit: 0.05 mm (.0020 in.)

- (2) If the runout exceeds the limit, check for incorrect tightening of the drive gear and differential case.

DIFFERENTIAL GEAR BACKLASH

Check the differential gear backlash by the following procedure.

- (1) While locking the side gear with a wedge, use a dial indicator to measure the differential gear backlash on the pinion gear.

NOTE

The measurement should be made for both pinion gears individually.

Standard value: 0.076 mm (.0030 in.) or less

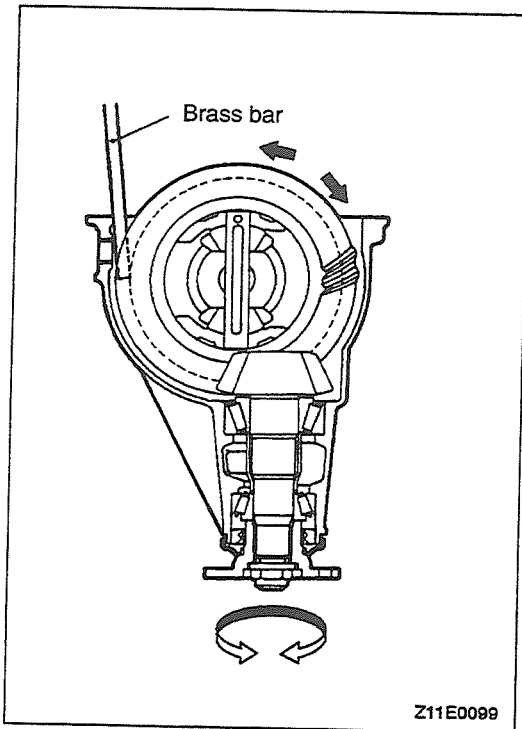
Limit: 0.2 mm (.0079 in.)

- (2) If the backlash exceeds the limit, adjust by using the side gear thrust spacers.

FINAL DRIVE GEAR TOOTH CONTACT

Check the final drive gear tooth contact by the following procedure.

- (1) Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.

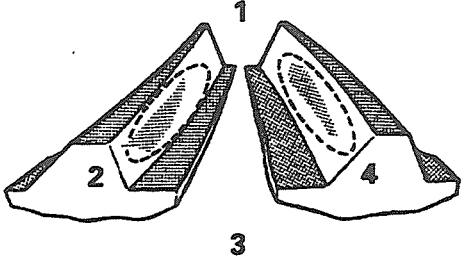
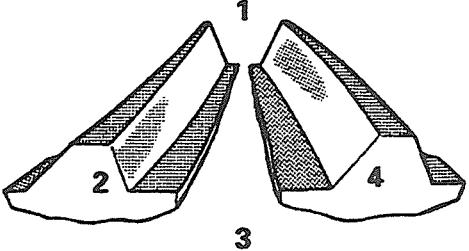
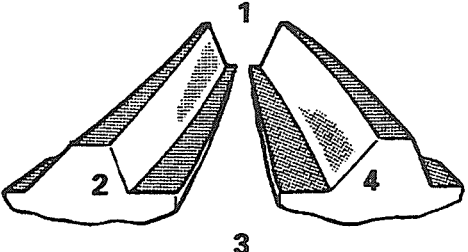
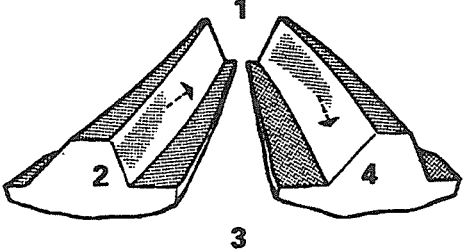
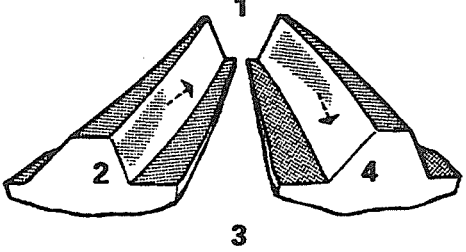


- (2) Insert a brass rod between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the forward direction, and then once in the reverse direction) while applying a load to the drive gear, so that the rotation torque [2.5–3.0 Nm (28–33 in.lbs.)] is 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 of the drive gear and drive pinion.

<p>Standard tooth contact pattern</p> <p>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)</p>	
<p style="text-align: center;">Problem</p>	<p style="text-align: center;">Solution</p>
<p>Tooth contact pattern resulting from excessive pinion height</p>  <p>The drive pinion is positioned too far from the center of the drive gear.</p> <p>Tooth contact pattern resulting from insufficient pinion height</p>  <p>The drive pinion is positioned too far from the center of the drive gear.</p>	 <p>Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the center of the drive gear. Also, for backlash adjustment, position the drive gear farther from the drive pinion.</p>  <p>Decrease the thickness of the pinion height adjusting shim, and position the drive pinion farther from the center of the drive gear. Also, for backlash adjustment, position the drive gear closer to the drive pinion.</p> <p style="text-align: right;">Z11S642</p>

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.

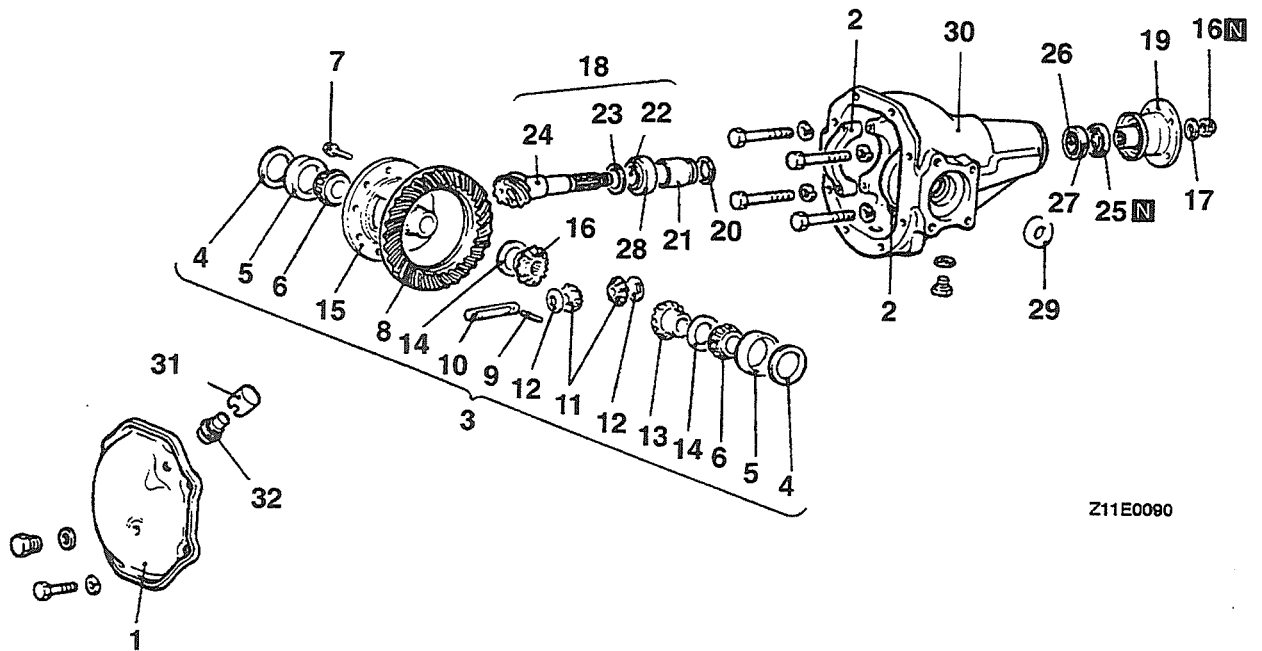
If the correct tooth contact pattern cannot be obtained even after adjustments, the drive gear and the drive pinion must be worn beyond the allowable limit. Replace the gear set.

DISASSEMBLY

110005332

Inspection before Disassembly

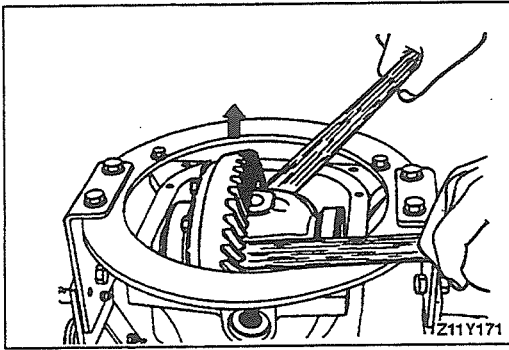
- Final Drive Gear Backlash (Refer to P.26-38)
- Drive Gear Runout (Refer to P.26-38)
- Differential Gear Backlash (Refer to P.26-38)
- Final Drive Gear Tooth Contact (Refer to P.26-38)



Z11E0090

Disassembly steps

- | | | | |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>◀A▶</p> <p>◀B▶</p> <p>◀C▶</p> <p>◀D▶</p> <p>◀E▶</p> | <p>1. Cover</p> <p>2. Bearing cap</p> <p>3. Differential case assembly</p> <p>4. Side bearing adjusting spacer</p> <p>5. Side bearing outer race</p> <p>6. Side bearing inner race</p> <p>7. Bolt (10)</p> <p>8. Drive gear</p> <p>9. Lock pin</p> <p>10. Pinion shaft</p> <p>11. Pinion gear</p> <p>12. Pinion washer</p> <p>13. Side gear</p> <p>14. Side gear thrust spacer</p> <p>15. Differential case</p> <p>16. Companion flange self-locking nut</p> <p>17. Washer</p> | <p>◀F▶</p> <p>◀G▶</p> <p>◀H▶</p> <p>◀H▶</p> | <p>18. Drive pinion assembly</p> <p>19. Companion flange</p> <p>20. Drive pinion rear shim (for preload adjustment)</p> <p>21. Drive pinion spacer</p> <p>22. Drive pinion front bearing inner race</p> <p>23. Drive pinion front shim (for pinion height adjustment)</p> <p>24. Drive pinion</p> <p>25. Oil seal</p> <p>26. Drive pinion rear bearing inner race</p> <p>27. Drive pinion rear bearing outer race</p> <p>28. Drive pinion front bearing outer race</p> <p>29. Oil seal</p> <p>30. Gear carrier</p> <p>31. Plug cover</p> <p>32. Vent plug</p> |
|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



DISASSEMBLY SERVICE POINTS

◀A▶ DIFFERENTIAL CASE ASSEMBLY REMOVAL

Use a hammer handle to take out the differential case assembly.

Caution

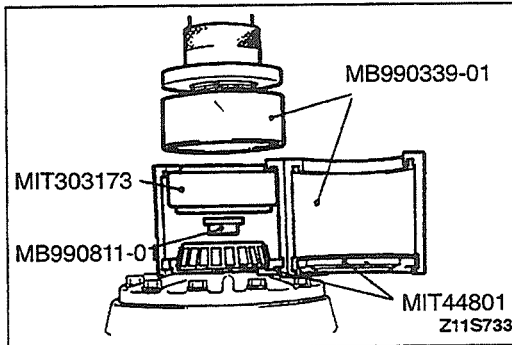
When taking out the differential case assembly, be careful not to drop and damage the side bearing outer races.

NOTE

Keep the right and left side bearings and side bearing adjusting spacers separate in order to be able to distinguish them for reassembly.

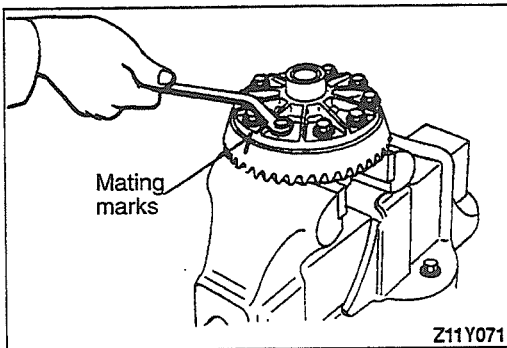
◀B▶ SIDE BEARING INNER RACE REMOVAL

Use the special tools to pull out the side bearing inner races.



◀C▶ DRIVE GEAR REMOVAL

- (1) Make mating marks on the differential case and drive gear.
- (2) Loosen the drive gear mounting bolts in diagonal sequence to remove the drive gear.

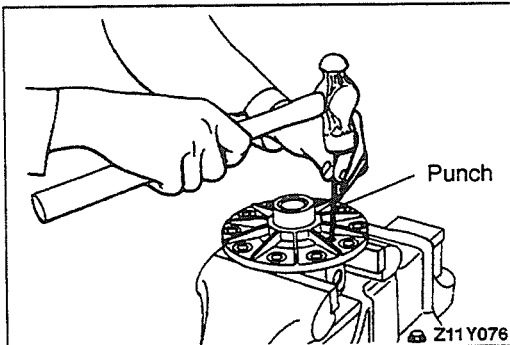


◀D▶ LOCK PIN REMOVAL

Drive out the lock pin with a punch.

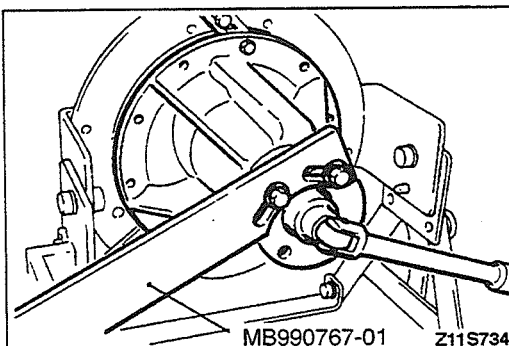
NOTE

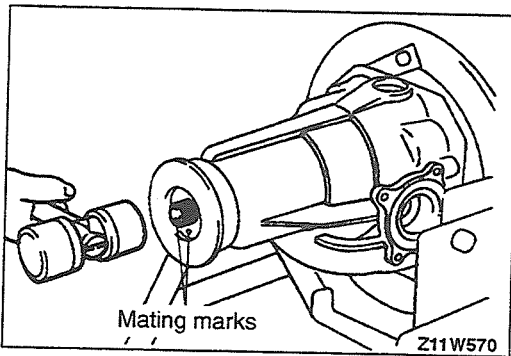
The removed side gears and the left and right side gear thrust spacers should be retained for reassembly.



◀E▶ COMPANION FLANGE SELF-LOCKING NUT REMOVAL

Use the special tool to hold the companion flange, and then remove the companion flange self-locking nut.





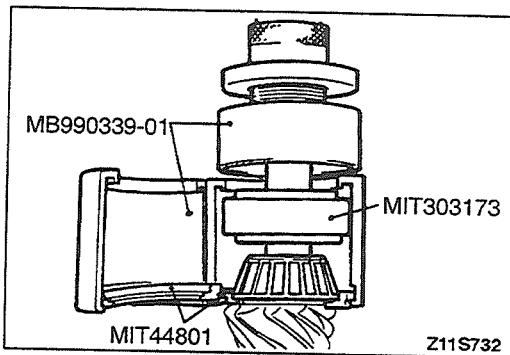
◀F▶ DRIVE PINION ASSEMBLY REMOVAL

- (1) Make mating marks on the drive pinion and companion flange.

Caution

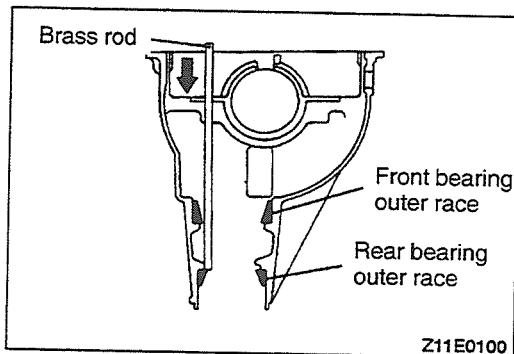
The mating mark made on the companion flange must not be on the coupling surface of the flange yoke and the front propeller shaft.

- (2) Drive out the drive pinion together with the drive pinion spacer and the drive pinion shims.



◀G▶ DRIVE PINION FRONT BEARING INNER RACE REMOVAL

Use the special tools to pull out the front bearing inner race.



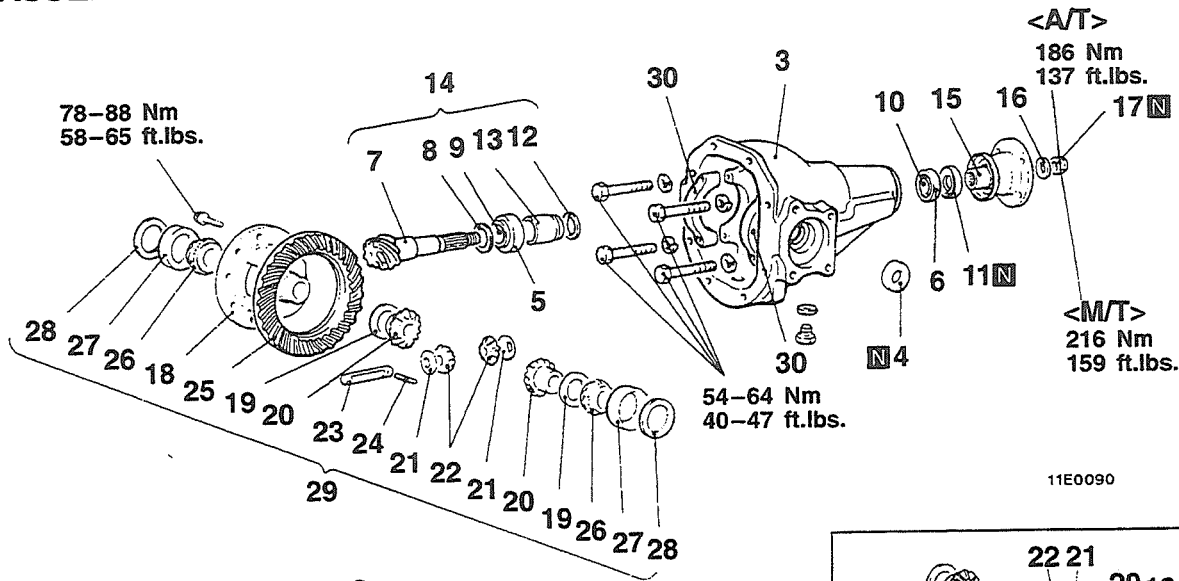
◀H▶ DRIVE PINION REAR BEARING OUTER RACE/DRIVE PINION FRONT BEARING OUTER RACE REMOVAL

- (1) Use the brass rod to drive out the drive pinion rear bearing outer race from the gear carrier.
- (2) Drive out the front bearing outer race in the same manner.

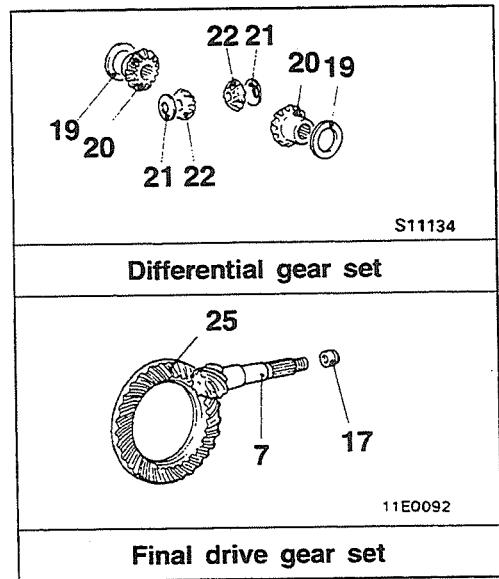
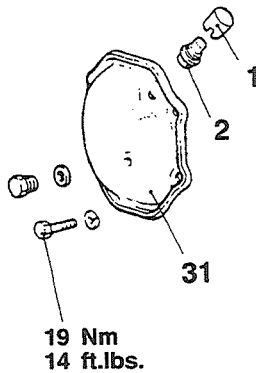
INSPECTION

- Check the companion flange for wear or damage.
- Check the oil seal for wear or deterioration.
- Check the bearings for wear or discoloration.
- Check the gear carrier for cracks.
- Check the drive pinion and drive gear for wear or cracks.
- Check the side gears, pinion gears and pinion shaft for wear or damage.
- Check the side gear spline for wear or damage.

REASSEMBLY



11E0090



S11134

Differential gear set

11E0092

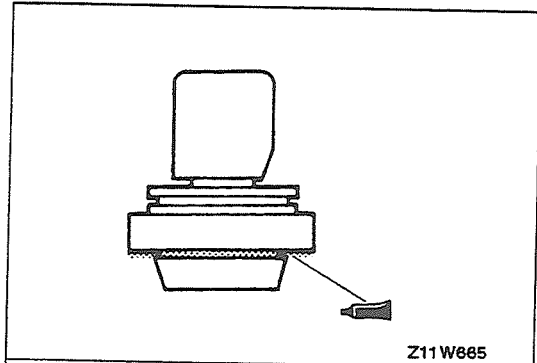
Final drive gear set

00001684

Reassembly steps

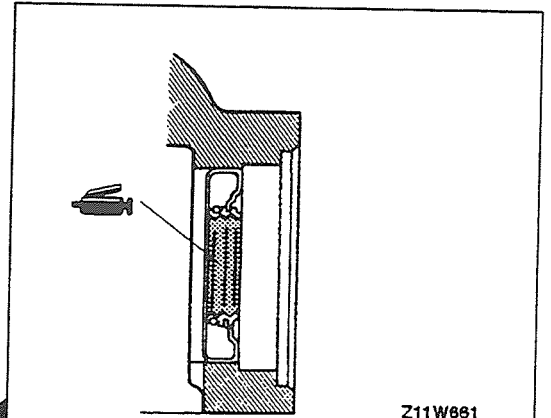
1. Vent plug
2. Plug cover
3. Gear carrier
- ▶A◀ 4. Oil seal
- ▶B◀ 5. Drive pinion front bearing outer race
- ▶B◀ 6. Drive pinion rear bearing outer race
 - Adjustment of pinion height
- ▶C◀ 7. Drive pinion
8. Drive pinion front shim (for pinion height adjustment)
- ▶D◀ 9. Drive pinion front bearing inner race
 - Adjustment of drive pinion rotation torque
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. Companion flange self-locking nut
18. differential case
19. Side gear thrust spacer
20. Side gear
21. Pinion washer
22. Pinion gear
- ▶E◀ ● Adjustment of differential gear backlash
23. Pinion shaft
- ▶F◀ 24. Lock pin
- ▶G◀ 25. Drive gear
- ▶H◀ 26. Side bearing inner race
- ▶H◀ 27. Side bearing outer race
- ▶I◀ ● Adjustment of final drive gear backlash
28. Side bearing adjusting spacer
29. Differential case assembly
30. Bearing cap
31. Cover

LUBRICATION, SEALING AND ADHESION POINTS

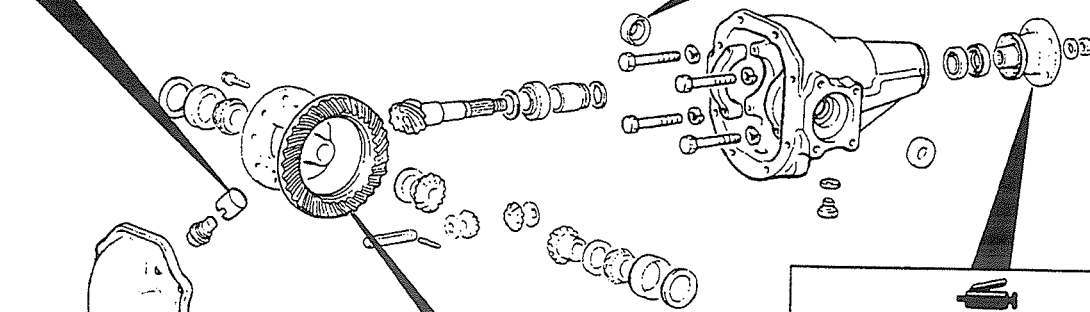


Z11W685

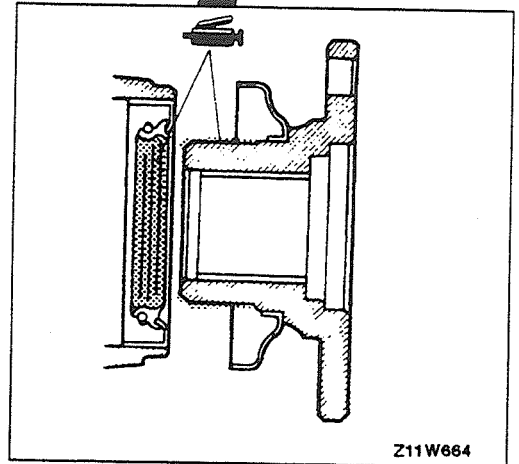
Sealant:
3M ATD Part No. 8661, 8663 or
equivalent



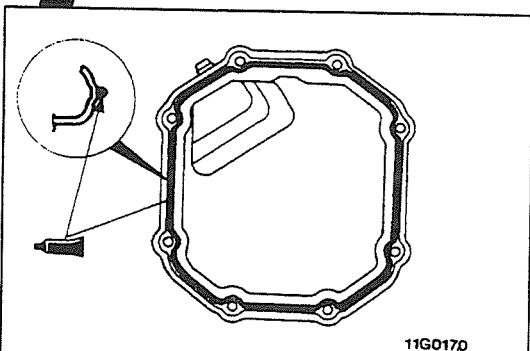
Z11W681



11E0090

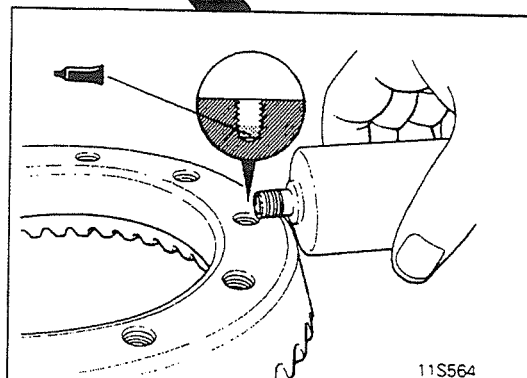


Z11W684



11G0170

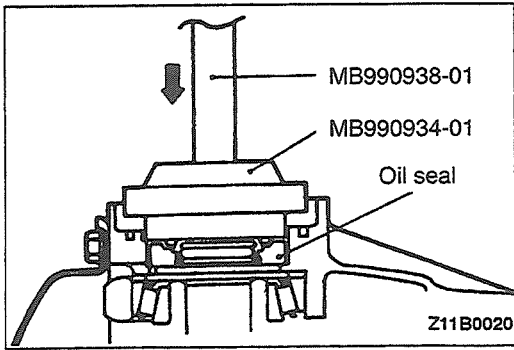
Sealant:
3M ATD Part No. 8661, 8663 or
equivalent



11S564

Adhesive
3M Stud Locking 4170 or equivalent

00001685

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

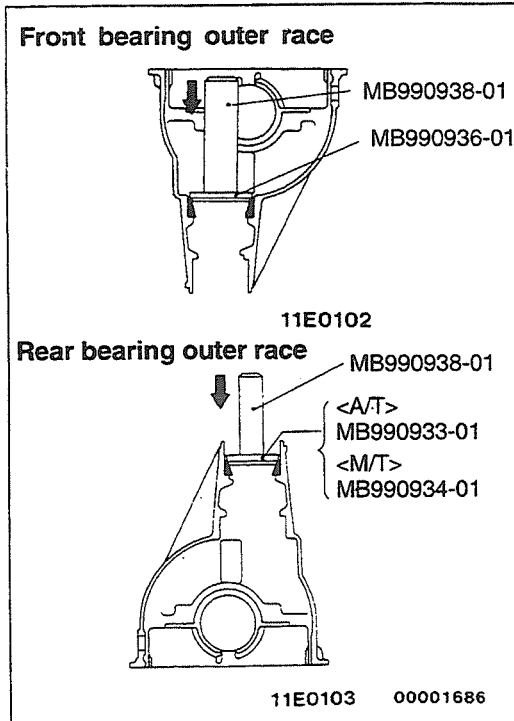
Use the special tool to insert the oil seal, and then apply a thin coat of multi-purpose grease to the lip of the oil seal.

▶B◀ DRIVE PINION FRONT BEARING OUTER RACE/DRIVE PINION REAR BEARING OUTER RACE INSTALLATION

Use the special tools to press-fit the drive pinion front bearing outer races into the gear carrier.

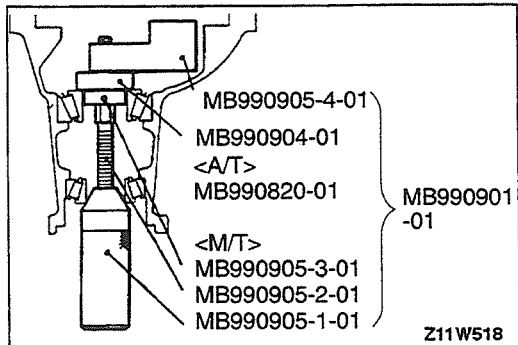
NOTE

Carry out press-fitting carefully so as not to tilt the outer race.

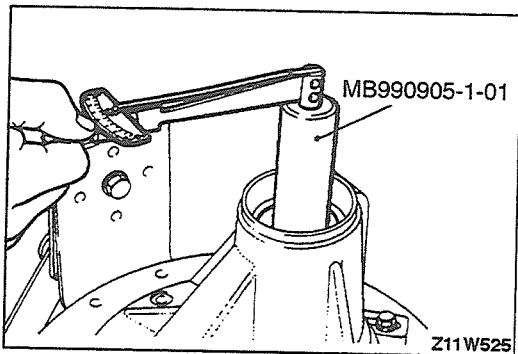
**▶C◀ PINION HEIGHT ADJUSTMENT**

Adjust the drive pinion height by the following procedure.

- (1) Install the special tools and the drive pinion front and rear bearing inner races into the gear carrier in the order shown in the illustration.



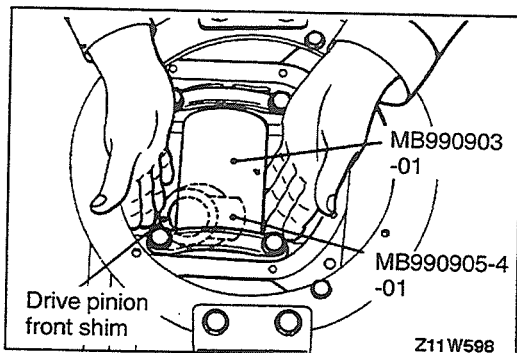
- (2) Tighten the handle of the special tool until the standard value for the drive pinion rotation torque is obtained.



- (3) Use the special tools to measure the drive pinion rotation torque (without the oil seal).

Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.3–0.5 Nm 2.6–4.3 in.lbs.
New/reused	Gear oil applied	0.15–0.25 Nm 1.3–2.2 in.lbs.

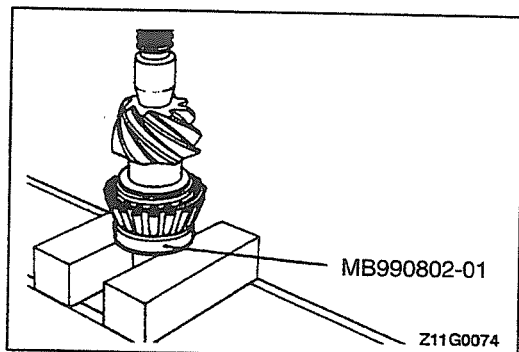


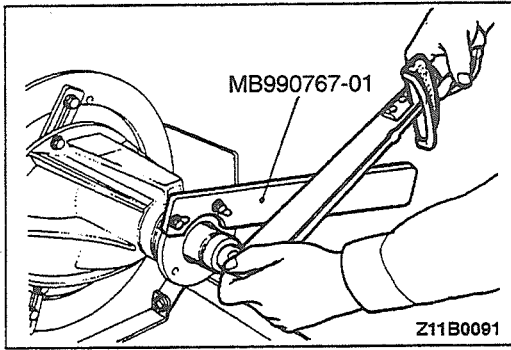
NOTE

1. Gradually tighten the handle of the special tool while checking the drive pinion preload.
 2. Because one rotation cannot be made when the special tool is in contact with the gear carrier, move it a few times and, after seating the bearing, measure the rotation torque.
- (4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion front shim of a thickness which corresponds to the gap between the special tools.

NOTE

1. Be sure to clean the side bearing seat thoroughly. When positioning the special tool, check that the cut-out sections of the special tool are in the position shown in the illustration, and check that the special tool is in close contact with the side bearing seat.
 2. When selecting the drive pinion front shims, keep the number of shims to a minimum.
- (5) Fit the selected drive pinion front shim(s) to the drive pinion, and then use the special tool to press-fit the drive pinion front bearing inner race.





▶D◀ DRIVE PINION ROTATION TORQUE ADJUSTMENT

Adjust the drive pinion rotation torque by the following procedure.

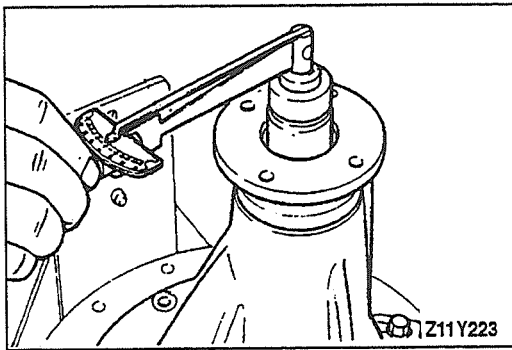
Without oil seal

- (1) Insert the drive pinion into the gear carrier, and then install the drive pinion spacer, drive pinion rear shim, drive pinion rear bearing inner race and companion flange in that order from the front of the carrier.

NOTE

Do not install the oil seal.

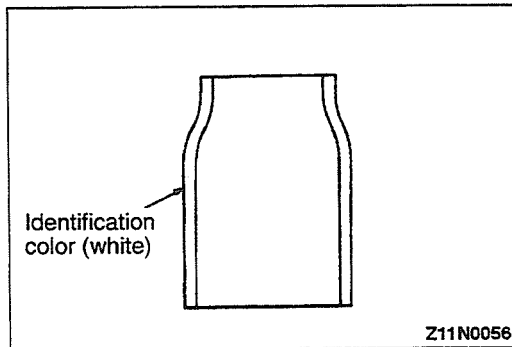
- (2) Use the special tool to tighten the companion flange to the specified torque.



- (3) Use the special tools to measure the drive pinion rotation torque (without the oil seal).

Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.3–0.5 Nm 2.6–4.3 in.lbs.
New/reused	Gear oil applied	0.15–0.25 Nm 1.3–2.2 in.lbs.

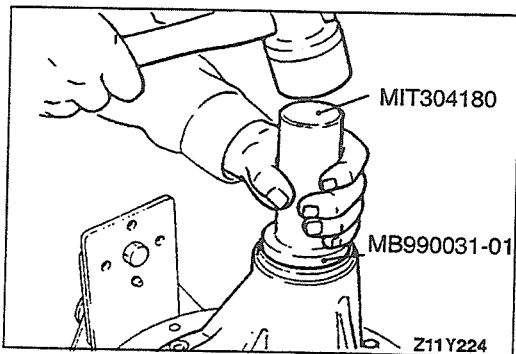


- (4) If the drive pinion rotation torque is not within the standard value range, adjust the preload by replacing the drive pinion front shim(s) or the drive pinion spacer.

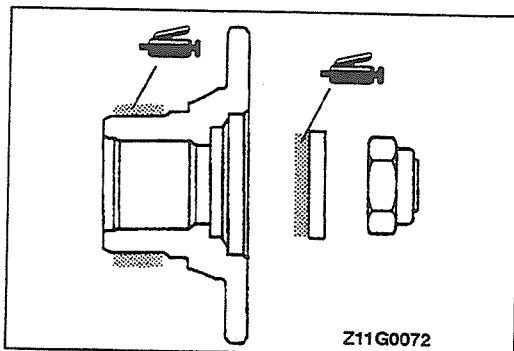
NOTE

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 appropriate drive pinion spacers. Also, select the drive pinion spacer from the following two types.

Item	<A/T>	<M/T>
Height of drive pinion spacer mm (in.)	46.67 (1.837) With identification color	56.67 (2.231) With identification color
	47.01 (1.851) No identification color	57.01 (2.244) No identification color

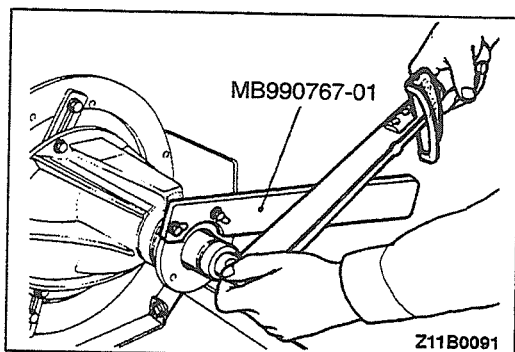


(5) Remove the companion flange and drive pinion again.

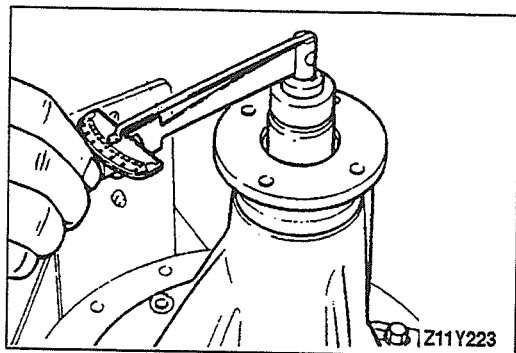


With oil seal

- (1) After setting the drive pinion rear bearing inner race, use the special tool to drive the oil seal into the front lip of the gear carrier.
- (2) Apply multi-purpose grease to the contact surfaces of the companion flange oil seal and the washer companion flange.



- (3) Install the drive pinion assembly and companion flange with the mating marks properly aligned, and then use the special tools to tighten the companion flange self-locking nut to the specified torque.

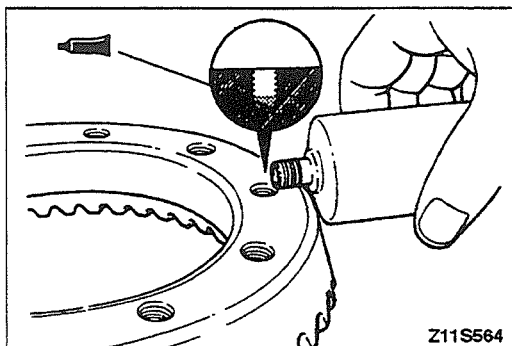
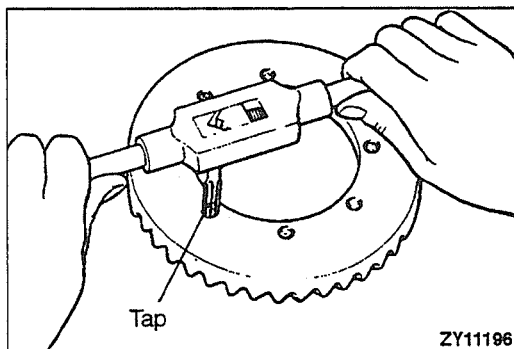
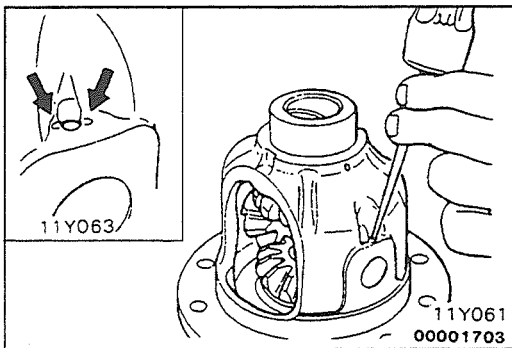
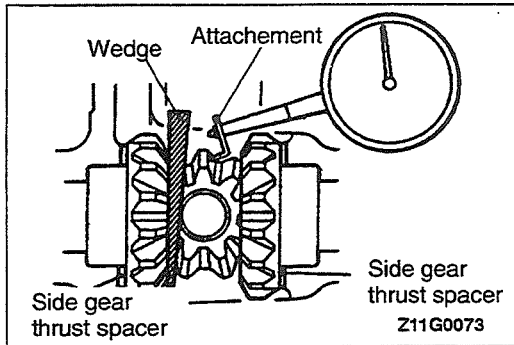
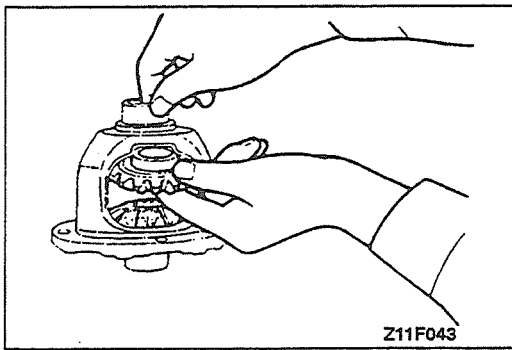


- (4) Use the special tools to measure the drive pinion rotation torque (with the oil seal) to confirm that the drive pinion preload is at the standard value.

Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.5–0.7 Nm 4.3–6.1 in.lbs.
New/reused	Gear oil applied	0.35–0.45 Nm 3.1–3.9 in.lbs.

- (5) If the measured value is not within the standard value range, check for incorrect installation of the oil seal or incorrect tightening of the self-locking nut.



►E◄ DIFFERENTIAL GEAR BACKLASH ADJUSTMENT

- (1) Assemble the side gears, side gear thrust spacers, pinion gears and pinion washers into the differential case.
- (2) Provisionally 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) Use a dial indicator to measure the differential gear backlash on the pinion gear.

Standard value: 0.076 mm (.0030 in.) or less

Limit: 0.2 mm (.0079 in.)

- (5) If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear thrust spacers.
- (6) Measure the differential gear backlash again, and check that it is within the limit.
If adjustment is not possible, replace the side gears and pinion gears as a set.

►F◄ LOCK PIN INSTALLATION

- (1) Align the pinion shaft lock pin hole with the differential case lock pin hole, and then drive in the lock pin.
- (2) Stake the lock pin with a punch at two points.

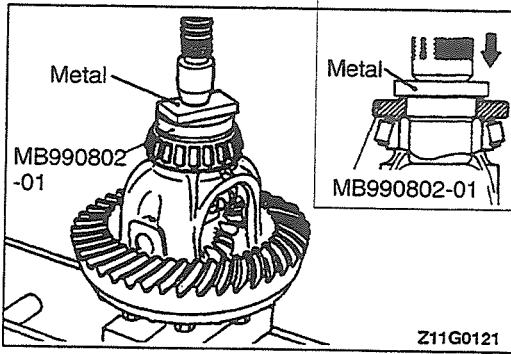
►G◄ DRIVE GEAR INSTALLATION

- (1) Clean the drive gear mounting bolts.
- (2) Remove the adhesive which is adhering to the threaded holes of the drive gear by turning the tap tool (tap M10×1.25), and then clean the threaded holes by applying compressed air.

- (3) Apply specified adhesive to the threaded holes of the drive gear.

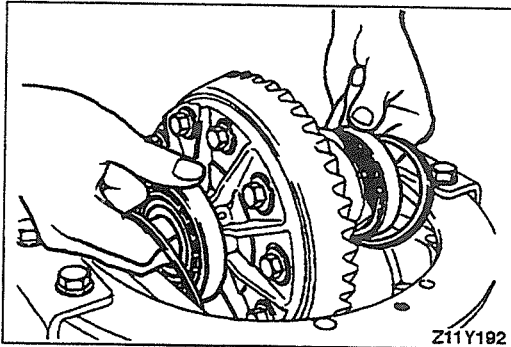
Specified adhesive: 3M Stud Locking Part No. 4170 or equivalent

- (4) Install the drive gear to the differential case so that the mating marks are properly aligned. Tighten the bolts to the specified torque in a diagonal sequence.



▶H◀ **SIDE BEARING INNER RACE INSTALLATION**

Use the special tool to press-fit the side bearing inner races into the differential case.



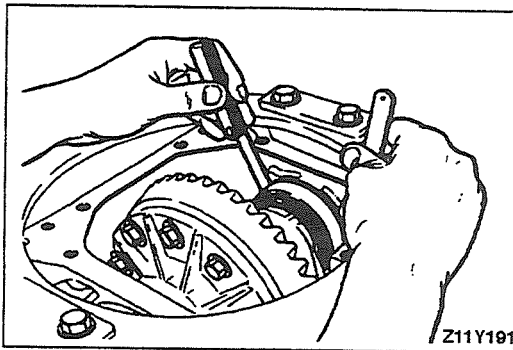
▶I◀ **FINAL DRIVE GEAR BACKLASH ADJUSTMENT**

Adjust the final drive gear backlash by the following procedure.

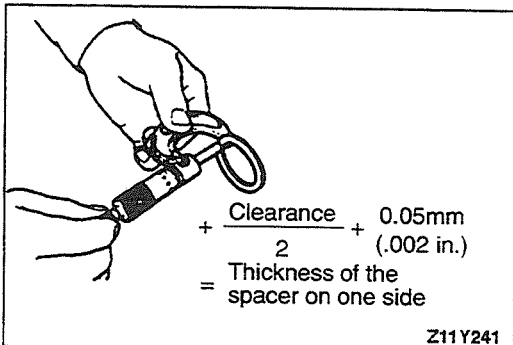
- (1) Install side bearing spacers which are thinner than those removed to the side bearing outer races, and then install the differential case assembly to the gear carrier.

NOTE

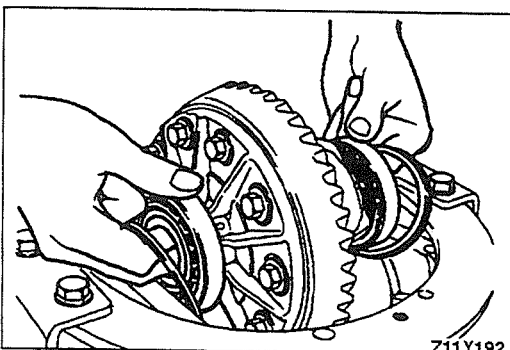
Select side bearing spacers with the same thickness for both the drive pinion side and the drive gear side.



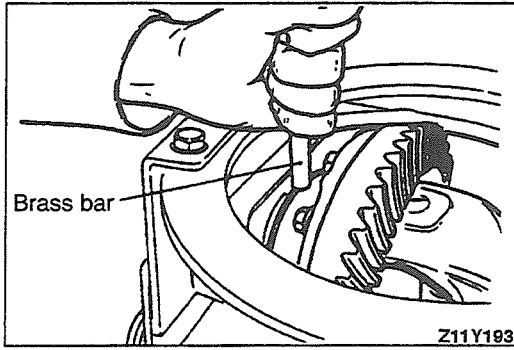
- (2) Push the differential case assembly to one side, and then measure the clearance between the gear carrier and the side bearing adjusting spacer with a feeler gage.



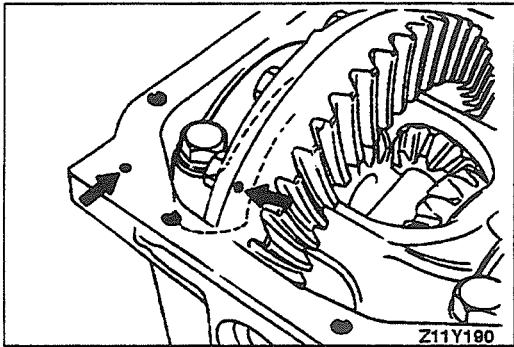
- (3) Measure the thickness of the side bearing adjusting spacers on one side, select two pairs of spacers which correspond to that thickness plus one half of the thickness plus 0.05 mm (.002 in.), and then install one pair each to the drive pinion side and the drive gear side.



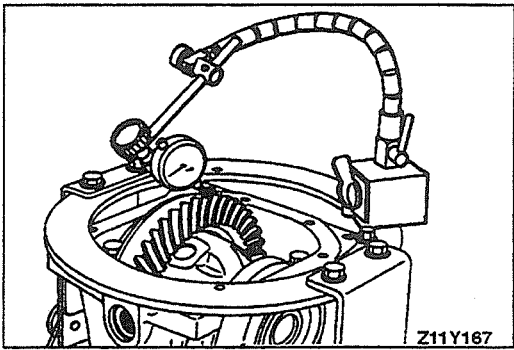
- (4) Install the side bearing adjusting spacers and differential case assembly to the gear carrier as shown in the illustration.



- (5) Tap the side bearing adjusting spacers with a brass bar to press-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.

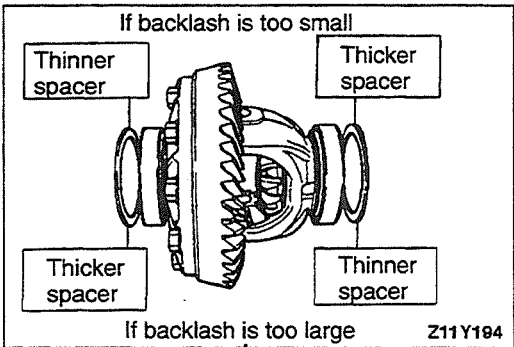


- (7) With the drive pinion locked in place, use a dial indicator to measure the final drive gear backlash on the drive gear.

NOTE

Measure at four points or more on the circumference of the drive gear.

Standard value: 0.11–0.16 mm (.0043–.0063 in.)

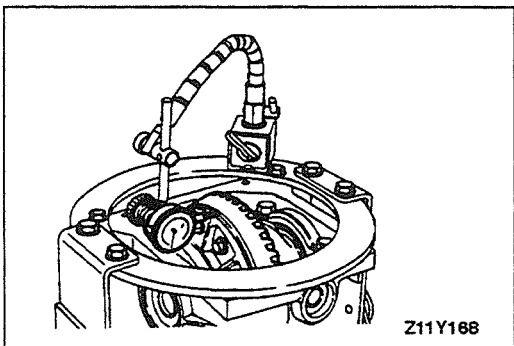


- (8) Change the side bearing adjusting spacers as shown in the illustration, and then adjust the final drive gear backlash between the drive gear and the drive pinion.

NOTE

When increasing the number of side bearing adjusting spacers, use the same number for each side, and use as few spacers as possible.

- (9) Check the tooth contact of the drive gear and drive pinion. If poor contact is evident, carry out adjustment. (Refer to P.26-38.)



- (10) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

Limit: 0.05 mm (.0020 in.)

- (11) If the drive gear runout exceeds the limit, remove the differential case and the drive gears, move them to different positions and then reinstall them.

REAR AXLE

CONTENTS

110005333

AXLE ASSEMBLY	16	Axle Shaft End Play Check	13
AXLE SHAFT	18	Gear Oil Level Check	13
DIFFERENTIAL CARRIER	27	Limited Slip Differential Preload Measurement	13
Differential Case	41	Rear Axle Total Backlash Check	12
GENERAL SPECIFICATIONS	2	Rear Differential Lock Detection Switch Check	15
LUBRICANTS	5	Rear Differential Lock System Air Leakage Check	15
REAR DIFFERENTIAL LOCK	24	SERVICE SPECIFICATIONS	2
SEALANTS AND ADHESIVES	5	SPECIAL TOOLS	5
SERVICE ADJUSTMENT PROCEDURES	12	TROUBLESHOOTING	9
Axle Housing Oil Seal Replacement	14		

GENERAL SPECIFICATIONS

110005334

Items		3.0L-12VALVE engine, vehicles without wide fender	3.0L-12VALVE engine, vehicles with wide fender	3.0L-24VALVE engine	3.5L engine
Axle housing type		Banjo type	Banjo type	Banjo type	Banjo type
Axle shaft	Supporting type	Semi-floating type	Semi-floating type	Semi-floating type	Semi-floating type
Differential	Differential size	No. 7	No. 7	No. 7	No. 7.5
	Reduction gear type	Hypoid gear	Hypoid gear	Hypoid gear	Hypoid gear
	Reduction ratio	4.625	4.875	4.636	4.636
	Pinion gear type	2 pinion or 4 pinion*	2 pinion or 4 pinion*	2 pinion or 4 pinion*	2 pinion or 4 pinion*

NOTE

*: Vehicles with rear differential lock or limited slip differential

SERVICE SPECIFICATIONS

110005335

<Conventional differential>

Items		Standard value	Limit	
Rear axle total backlash mm (in.)		–	5 (.20)	
Axle shaft end play mm (in.)		0.25 (.0098)	–	
Protruding length of stabilizer bar mounting bolt mm (in.)		15–17 (.59–.67)	–	
Press-fitting force of retainer N (lbs.)	Initial press-force	50,000 (11,023)	–	
	Final press-fitting force	100,000–110,000 (22,046–24,251)	–	
Clearance of snap ring and retainer mm (in.)		0.166 (.0065) or less	–	
Final drive gear backlash mm (in.)		0.13–0.18 (.0051–.0071)	–	
Drive gear runout mm (in.)		–	0.05 (.002)	
Differential gear backlash mm (in.)		0.076 (.0030) or less*	0.2 (.0079)*	
Drive pinion rotation torque Nm (in.lbs.)	Without oil seal	With anti-rust agent (new)	0.6–0.9 (5.2–7.8)	–
		With gear oil applied (new or used)	0.4–0.5 (3.5–4.3)	–
	With oil seal	With anti-rust agent (new)	0.85–1.15 (7.4–10.0)	–
		With gear oil applied (new or used)	0.65–0.75 (5.6–6.5)	–

NOTE

*: Vehicles with 3.0L engine

<Limited slip differential>

Items		Standard value	Limit	
Rear axle total backlash mm (in.)		–	5 (.20)	
Axle shaft end play mm (in.)		0.25 (.0098)	–	
Limited slip differential preload Nm (ft.lbs.)		25 (18) or more	–	
Protruding length of stabilizer bar mounting bolt mm (in.)		15–17 (.59–.67)	–	
Press-fitting force of retainer N (lbs.)	Initial press-force	50,000 (11,023)	–	
	Final press-fitting force	100,000–110,000 (22,046–24,251)	–	
Clearance of snap ring and retainer mm (in.)		0.166 (.0065) or less	–	
Final drive gear backlash mm (in.)		0.13–0.18 (.0051–.0071)	–	
Drive gear runout mm (in.)		–	0.05 (.002)	
Drive pinion rotation torque Nm (in.lbs.)	Without oil seal	With anti-rust agent (new)	0.6–0.9 (5.2–7.8)	–
		With gear oil applied (new or used)	0.4–0.5 (3.5–4.3)	–
	With oil seal	With anti-rust agent (new)	0.85–1.15 (7.4–10.0)	–
		With gear oil applied (new or used)	0.65–0.75 (5.6–6.5)	–
Friction plate and friction disc warping (flatness) mm (in.)		–	0.08 (.0031)	
Friction plate and friction disc wear (difference in the thickness of the friction surfaces and the projections) mm (in.)		–	0.1 (.0039)	
Difference in total thickness between the left and right clutch plated mm (in.)		0.05 (.0020) or less	–	
Clearance between spring plate and differential case mm (in.)		0.06–0.20 (.0020–.0079)	–	
Difference between left and right dimensions from back thrust face of pressure ring to end of thrust washer mm (in.)		0.05 (.0020) or less	–	
Clearance between thrust washer and differential case mm (in.)		0.05–0.20 (.0020–.0079)	–	
Clutch plate preload Nm (ft.lbs.)	When equipped with new clutch plates	40–75 (29–54)	–	
	When equipped with old clutch plates	25–75 (29–54)	–	

<Differential with rear differential lock>

Items		Standard value	Limit
Rear axle total backlash mm (in.)		–	5 (.20)
Axle shaft end play mm (in.)		0.25 (.0098)	–
Protruding length of stabilizer bar mounting bolt mm (in.)		15–17 (.59–.67)	–
Press-fitting force of retainer N (lbs.)	Initial press-force	50,000 (11,023)	–
	Final press-fitting force	100,000–110,000 (22,046–24,251)	–
Clearance of snap ring and retainer mm (in.)		0.166 (.0065) or less	–
Rear differential lock air pump pressure kPa (psi)		25–40 (4–6)	–
Final drive gear backlash mm (in.)	6G72 engine	0.13–0.18 (.0051–.0071)	–
	6G74 engine	0.12–0.18 (.0047–.0071)	–
Drive gear runout mm (in.)		–	0.05 (.002)
Drive pinion rotation torque Nm (in.lbs.)	Without oil seal	With anti-rust agent (new)	0.6–0.9 (5.2–7.8)
		With gear oil applied (new or used)	0.4–0.5 (3.5–4.3)
	With oil seal	With anti-rust agent (new)	0.85–1.15 (7.4–10.0)
		With gear oil applied (new or used)	0.65–0.75 (5.6–6.5)
Friction plate and friction disc warping (flatness) mm (in.)		–	0.08 (.0031)*
Friction plate and friction disc wear (difference in the thickness of the friction surfaces and the projections) mm (in.)		–	0.1 (.0039)*
Clearance between friction disc and differential case mm (in.)		0.05–0.20* (.0020–.0079)	–

NOTE

*: Vehicles with 3.0L engine

LUBRICANTS

110005336

Items		Specified lubricant	Quantity dm ³ (qts.)
Rear axle gear oil	Conventional differential and differential with rear differential lock	Hypoid gear oil API classification GL-5 or higher SAE viscosity No. 90, 80W	<3.0L engine> 2.6 (2.75)
	Limited slip differential	Hypoid gear oil MITSUBISHI Genuine Gear Oil Part No. 8149630EX or equivalent	<3.5L engine> 3.2 (3.38)

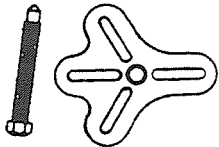
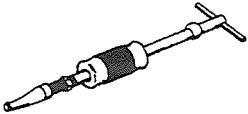

SEALANTS AND ADHESIVES


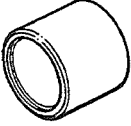

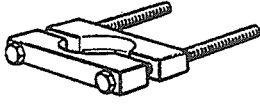
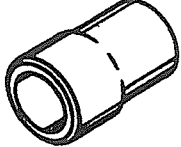
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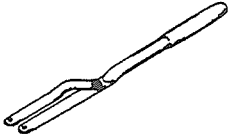
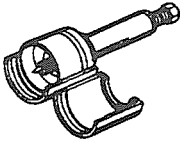



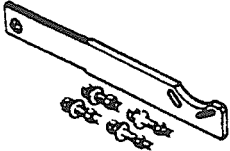



Items	Specified sealants and adhesives
Bearing case	3M ATD Part No. 8661, 8663 or equivalent
Differential carrier mounting surface of axle housing	
Drive gear threaded hole	3M Stud Locking Part No. 4170 or equivalent


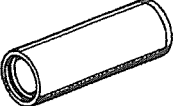

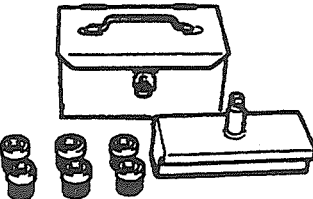

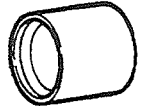
SPECIAL TOOLS

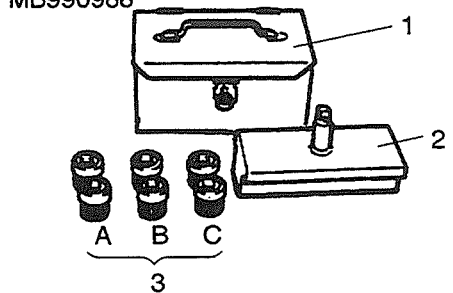
110005338

Tool	Tool number and name	Supersession	Application
	MB990241 Axle puller	MB990241-01	Measuring the limited slip differential preload Removal of axle shaft (use with MB990211-01)
	MB990211 Sliding hammer	MB990211-01	Removal of axle shaft (use with MB990241-01) Removal of axle housing oil seal
	MB990925 Bearing and oil seal installer set (Refer to GROUP 26.)	MB990925-01	Pressing of axle housing oil seal MB990932-01 Pressing of axle shaft oil seal MB990936-01 Pressing of drive pinion rear bearing outer race MB990937-01 Pressing of drive pinion front bearing outer race MB990934-01

Tool	Tool number and name	Supersession	Application
	MB990938 Handle	MB990938-01	Pressing of axle housing oil seal Pressing of axle shaft oil seal Pressing of drive pinion rear bearing outer race Pressing of drive pinion front bearing outer race
	MB990890 Rear suspension bushing race	MB990890-01	Pressing of axle shaft bearing outer race
	MB990861 Rear axle bearing case remover		Removal of axle shaft bearing and bearing case
	MB990560 Rear axle bearing remover		Removal of axle shaft bearing
	MB990799 Axle bearing remover and installer	MB990799-01	Pressing of axle shaft bearing inner race Pressing of axle shaft retainer

Tool	Tool number and name	Supersession	Application
	MB990201 Adjustable wrench	MB990201-01	Removal and adjustment of side bearing nut
	MB990339 Pinion carrier bearing puller	MB990339-01	Removal of side bearing inner race (use with MB990811-01) Removal of drive pinion rear bearing inner race
	MIT303173 Insert	MIT303173	
	MIT44801 Collet set	MIT44801	
	MB990811 Side bearing cup remover step plate	MB990811-01	
	MB990767 End yoke holder	MB990767-01	Holding of companion flange
	MB990901 Pinion height gage set	MB990901-01	Measuring the pinion height
	MIT215838 Aligning adapter	MIT215838	
	MIT215839 Gage disc	MIT215839	

Tool	Tool number and name	Supersession	Application
	MB990802 Bearing installer	MB990802-01	Pressing of drive pinion rear bearing inner race Pressing of side bearing inner race
	MIT304180 Handle	MIT304180	Pressing of drive pinion oil seal
	MIT991168-01 Drive pinion oil seal installer	MIT991168-01	
	MB990988 Side gear holding tool set		Measurement of limited slip differential pre-load Tool C, MB990989 Confirmation of rear differential lock
	MB991535 Side gear holding tool		Confirmation of rear differential lock
	MB991388 Bushing remover base		Pressing of ABS rotor assembly

 MB990988	Tool number		Name	O.D. mm (in.)
	1	MB990551	Box	—
	2	MB990989	Base	—
	3	(MB990990)	Tool A	25 (.98)
(MB990991)		Tool B	28 (1.10)	
(MB990992)		Tool C	31 (1.22)	

TROUBLESHOOTING

110005339

AXLE SHAFT, AXLE HOUSING

Symptom	Probable cause	Remedy
Noise while wheels are rotating	Brake drag	Replace
	Bent axle shaft	
	Worn or scarred axle shaft bearing	
Grease leakage	Worn or damaged oil seal	Replace
	Malfunction of bearing seal	

DIFFERENTIAL (CONVENTIONAL DIFFERENTIAL)

Symptom	Probable cause	Remedy
Constant noise	Improper final drive gear tooth contact adjustment	Correct or replace
	Loose, worn or damaged side bearing	
	Loose, worn or damaged drive pinion bearing	
	Worn drive gear, drive pinion	Replace
	Worn side gear thrust washer or pinion shaft	
	Deformed drive gear or differential case	
	Damaged gear	
	Foreign material	Eliminate the foreign material and check; replace if necessary
No oil	Fill or change	
Gear noise while driving	Poor gear engagement	Correct or replace
	Improper gear adjustment	
	Improper drive pinion preload adjustment	
	Damaged gear	Replace
	Foreign material	Eliminate the foreign material and check; replace the parts if necessary
	Insufficient oil	Fill or change
Gear noise while coasting	Improper drive pinion preload adjustment	Correct or replace
	Damaged gear	Replace
Bearing noise while driving or coasting	Cracked or damaged drive pinion rear bearing	Replace
Noise while turning	Loose side bearing	Replace
	Damaged side gear, pinion gear or pinion shaft	
Heat	Improper gear backlash	Adjust
	Excessive preload	
	Insufficient oil	Fill or change

Symptom	Probable cause	Remedy
Oil leakage	Clogged breather hose	Clean or replace
	Cover tightened not	Retighten, apply sealant, or replace the gasket
	Seal malfunction	
	Worn or damaged oil seal	Replace
	Excessive oil	Adjust the oil level

DIFFERENTIAL (LIMITED-SLIP DIFFERENTIAL AND DIFFERENTIAL WITH REAR DIFFERENTIAL LOCK)

Symptom	Probable cause	Remedy
Abnormal noise during driving or gear changing (*1)	Excessive final drive gear backlash	Adjust
	Insufficient drive pinion preload	
	Excessive differential gear backlash	Adjust or replace
	Worn spline of a side gear	Replace
	Loose spline coupling self-locking nut	Retighten or replace
Abnormal noise when cornering	Damaged differential gears	Replace
	Damaged pinion shaft	
	Nicked and/or abnormal wear of inner and outer clutch plates	
	Poor gear oil	
	Abnormally worn or damaged thrust washer	
	Improper gear oil quantity	Refill or replace
Gear noise (*2)	Improper final drive gear tooth contact adjustment	Adjust or replace
	Incorrect final drive gear backlash	Adjust
	Improper drive pinion preload adjustment	
	Damaged, broken, and/or seized tooth surfaces of the drive gear and drive pinion	Replace
	Damaged, broken, and/or seized drive pinion bearings	
	Damaged broken, and/or seized side bearings	
	Damaged differential case	
	Poor gear oil	
	Improper gear oil quantity	Refill or replace

NOTE

*1: In addition to a malfunction of the differential carrier components, abnormal noise can also be caused by the universal joint of the propeller shaft, the axle shafts, the wheel bearings, etc. Before disassembling any parts, take all possibilities into consideration and confirm the source of the noise.

*2: Noise from the engine, muffler vibration, transmission, propeller shaft, wheel bearings, tires, body, etc., is easily mistaken as being caused by malfunction in the differential carrier components. Be extremely careful and attentive when performing the driving test, etc.

Test methods to confirm the source of the abnormal noise include: coasting, acceleration, constant speed driving, raising the rear wheels on a jack, etc. Use the method most appropriate to the circumstances.

Symptom	Probable cause	Remedy
Gear oil leakage	Worn or damaged front oil seal, or an improperly installed oil seal	Replace
	Damaged gasket	
	Loose spline coupling self-locking nut	Retighten or replace
	Loose filler or drain plug	Retighten or apply adhesive
	Clogged or damaged breather hose	Clean or replace
Seizure (*3)	Improper final drive gear backlash	Adjust
	Excessive drive pinion preload	
	Excessive side bearing preload	
	Improper differential gear backlash	
	Excessive clutch plate preload	
	Improper gear oil	Replace
	Improper gear oil quantity	Refill or replace
Breakdown (*4)	Incorrect final drive gear backlash	Adjust
	Incorrect drive pinion preload	
	Incorrect side bearing preload	
	Excessive differential gear backlash	
	Incorrect clutch plate preload	
	Loose drive gear clamping bolts	Retighten
	Operational malfunction due to overloaded clutch	Avoid excessively rough operation
Limited slip differential does not function (on snow, mud, ice, etc.).	The limited slip device is damaged	Disassemble, check the functioning, and replace the damaged parts

NOTE

*3: In the event of seizure, disassemble and replace the parts involved, and also be sure to check all components for any irregularities and repair or replace as necessary.

*4: In addition to disassembling and replacing the failed parts, be sure to check all components for irregularities and repair or replace as necessary.

REAR DIFFERENTIAL LOCK

110005340

1. Troubleshooting procedures

- (1) Check that there are no cracks or damage in the air hose.
- (2) Check that the connectors for all parts are securely connected and that no fuses are blown.
- (3) Make sure you understand the check contents and the order for troubleshooting in the quick reference table, and check according to the order given.

2. Troubleshooting quick-reference table

- (1) If the result of checking according to the order in the table below shows that there is no abnormality, the cause is probably a malfunction of the control unit.

Order	Check location	Check points	Normal condition	Probable Cause	Remedy
1	Air hose	Check visually	Air doesn't leak.	Air leaking from hose connection	Repair or replace the air hose
2	Rear differential lock switch	Refer to P.27-26.		Switch is defective	Replace the switch
3	Center differential lock operation detection switch	Move the transfer lever to the "4HLc" or "4LLc" position and check the continuity.	Continuity	Switch is defective	Replace the switch
4	Rear differential lock detection switch	Refer to P.27-15.	Continuity	Switch is defective	Replace the switch
5	Air pump	Refer to P.27-25.		Air pump is defective	Replace the air pump
6	Actuator	Refer to P.27-29.		Actuator is defective	Replace the actuator

- (2) Control unit output voltage check
Refer to P.27-25.

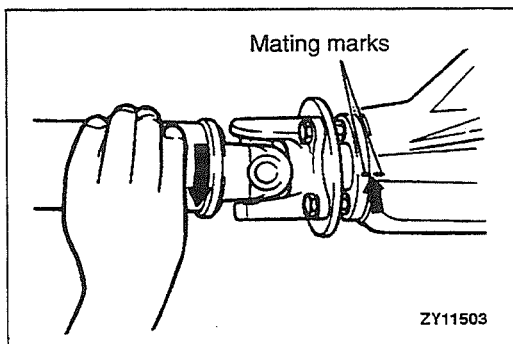
SERVICE ADJUSTMENT PROCEDURES

110005341

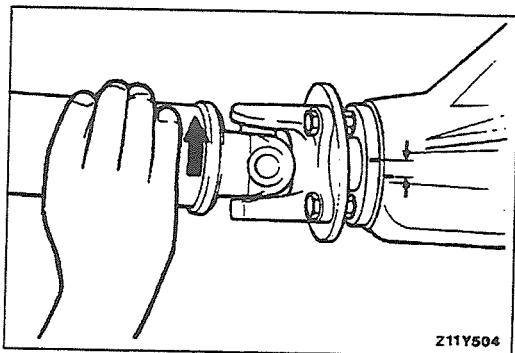
REAR AXLE TOTAL BACKLASH CHECK

If the vehicle vibrates and produces a booming sound due to the an imbalance in the drive system, measure the rear axle total backlash by the following procedure to see if the differential carrier assembly requires removal.

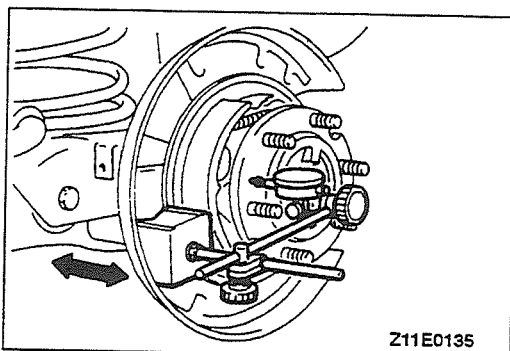
- (1) Park the vehicle on a flat, level surface.
- (2) Place the transmission control lever to the neutral position, and place the transfer control lever to the neutral position. Then pull the parking brake lever and raise the vehicle on a jack.



TSB Revision



- (3) Turn the companion flange clockwise as far as it will go. Make the mating mark 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 distance through which the mating marks moved. If the backlash exceeds the limit, remove the differential carrier assembly and adjust the backlash.
- Limit: 5 mm (.20 in.)**



AXLE SHAFT END PLAY CHECK

110005342

Use a dial indicator to measure the axle shaft end play.

Standard value: 0.25 mm (.0098 in.)

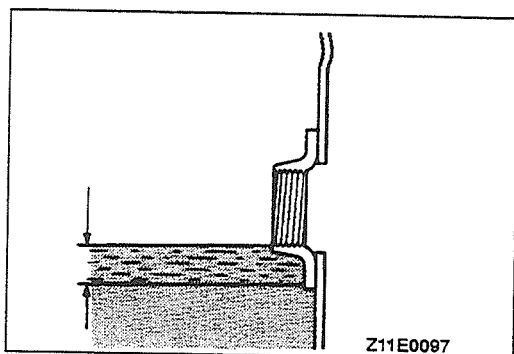
If the axle shaft end play exceeds the standard value, replace the bearing with a new one.

GEAR OIL LEVEL CHECK

110005343

Remove the filler plug and check the oil level.

Check that the gear oil level is not 8 mm (.3 in.) below the bottom of the filler plug hole.



Specified gear oil:

<Conventional differential, Differential with rear differential lock>

Hypoid gear oil API classification GL-5 or higher
SAE viscosity No. 90, 80W

- <Vehicles with 3.0L engine> 2.6 dm³ (2.75 qts.)
- <Vehicles with 3.5L engine> 3.2 dm³ (3.38 qts.)

<Limited slip differential>

Hypoid gear oil MITSUBISHI Genuine Gear Oil Part No. 8149630 EX or equivalent

- <Vehicles with 3.0L engine> 2.6 dm³ (2.75 qts.)
- <Vehicles with 3.5L engine> 3.2 dm³ (3.38 qts.)

LIMITED SLIP DIFFERENTIAL PRELOAD MEASUREMENT

110005344

To measure the preload of the limited slip differential, set the transmission control lever to the neutral position, lock the front wheels and fully release the parking brake.

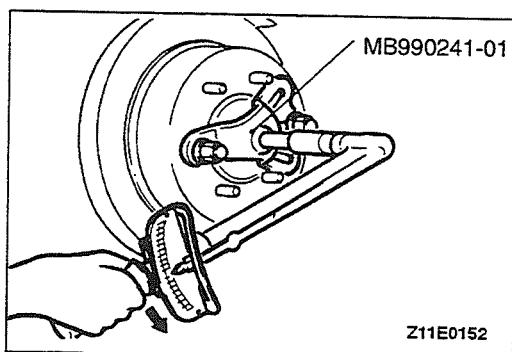
One of the rear wheels should be maintained in contact with the ground surface, and the other should be raised up.

Measure the starting torque at the side on which the wheel is in the raised position by using the following procedures.

- (1) Remove the wheel.
- (2) Mount the special tool to the hub bolts by using the hub nuts.
- (3) Find the limited slip differential preload measuring the axle shaft starting torque in the forward direction with a torque wrench.

Standard value: 25 Nm (18 ft.lbs.) or more

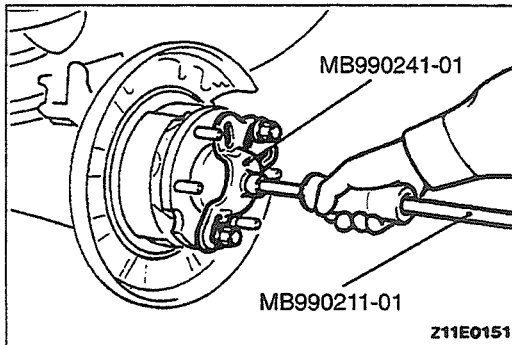
- (4) If the torque is less than the standard value, remove the limited slip differential from the vehicle and disassemble it.



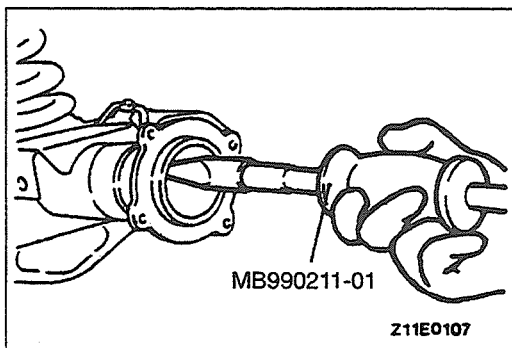
AXLE HOUSING OIL SEAL REPLACEMENT

110005345

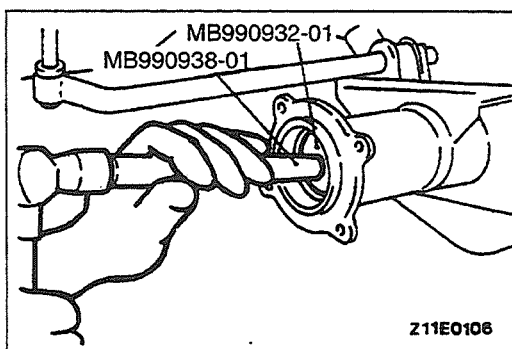
1. Release coupling between parking brake cable and the backing plate.
2. Before disconnecting the brake pipe, drain the brake fluid from the bleeder screw.
3. Remove the nuts securing the backing plate to the axle housing.



4. Pull the rear axle shaft from axle housing. If the rear axle shaft is hard to remove, use the special tools.

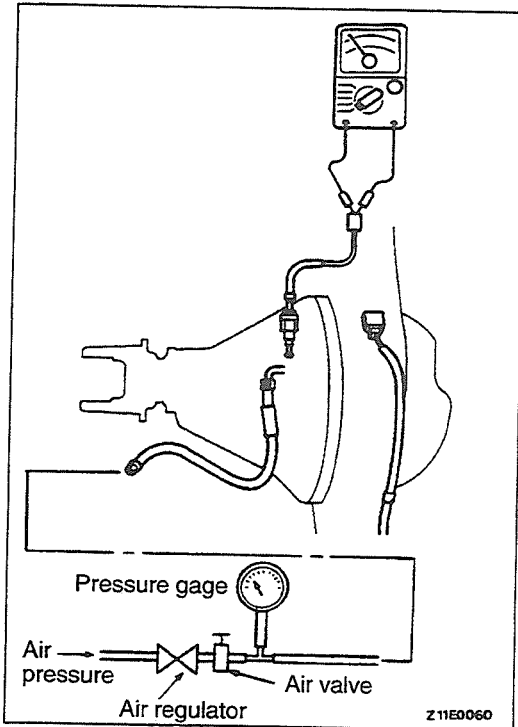


5. Use special tools with hook attached to remove the oil seal.
6. Apply multipurpose grease to the oil seal fitting area of the rear axle housing.



7. Drive the new oil seal into the rear axle housing end by using the special tool.
8. Apply multipurpose grease to the oil seal lip.

9. Install the rear axle shaft.
10. Install the brake tube and perform air bleeding of the brake system from the air bleeder. (Refer to GROUP 35 – Service Adjustment Procedures.)
11. Install the parking brake cable and adjust the parking brake lever stroke. (Refer to GROUP 36 – Service Adjustment Procedures.)



REAR DIFFERENTIAL LOCK DETECTION SWITCH CHECK

110005346

1. Raise up the vehicle.
2. Remove the air pipe and air hose connections.
3. Connect a pressure gauge and air regulator, for adjusting the compressed air pressure, to the air hose.
4. Adjust the compressed air pressure with the air regulator until the pressure gauge shows a pressure of approx. 25 kPa (4 psi.).

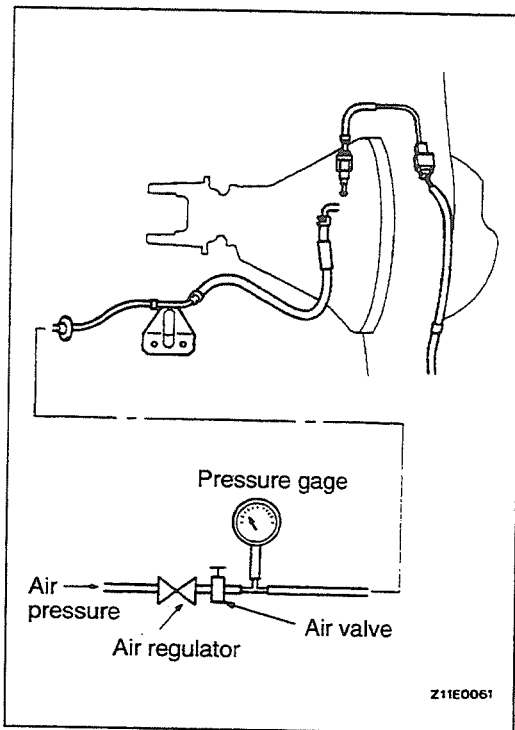
Caution

Do not apply a higher pressure.

5. Hold the wheel on one side of the vehicle stationary, and slowly turn the wheel on the other side.
6. Check for continuity in the rear differential lock detection switch.

When air is supplied	Continuity
When air is released	No continuity

7. If the detection switch is defective, first remove the differential carrier, then remove the detection switch.



REAR DIFFERENTIAL LOCK SYSTEM AIR LEAKAGE CHECK

110005347

1. Remove the rear differential lock air pump and remove the air hose from the air pump. (Refer to P.27-24.)
2. Connect a pressure gauge and air regulator, for adjusting the compressed air pressure to the air hose.
3. Adjust the compressed air pressure with the air regulator until the pressure gauge shows a pressure of approx. 35 kPa (5 psi.).

Caution

Do not apply a higher pressure.

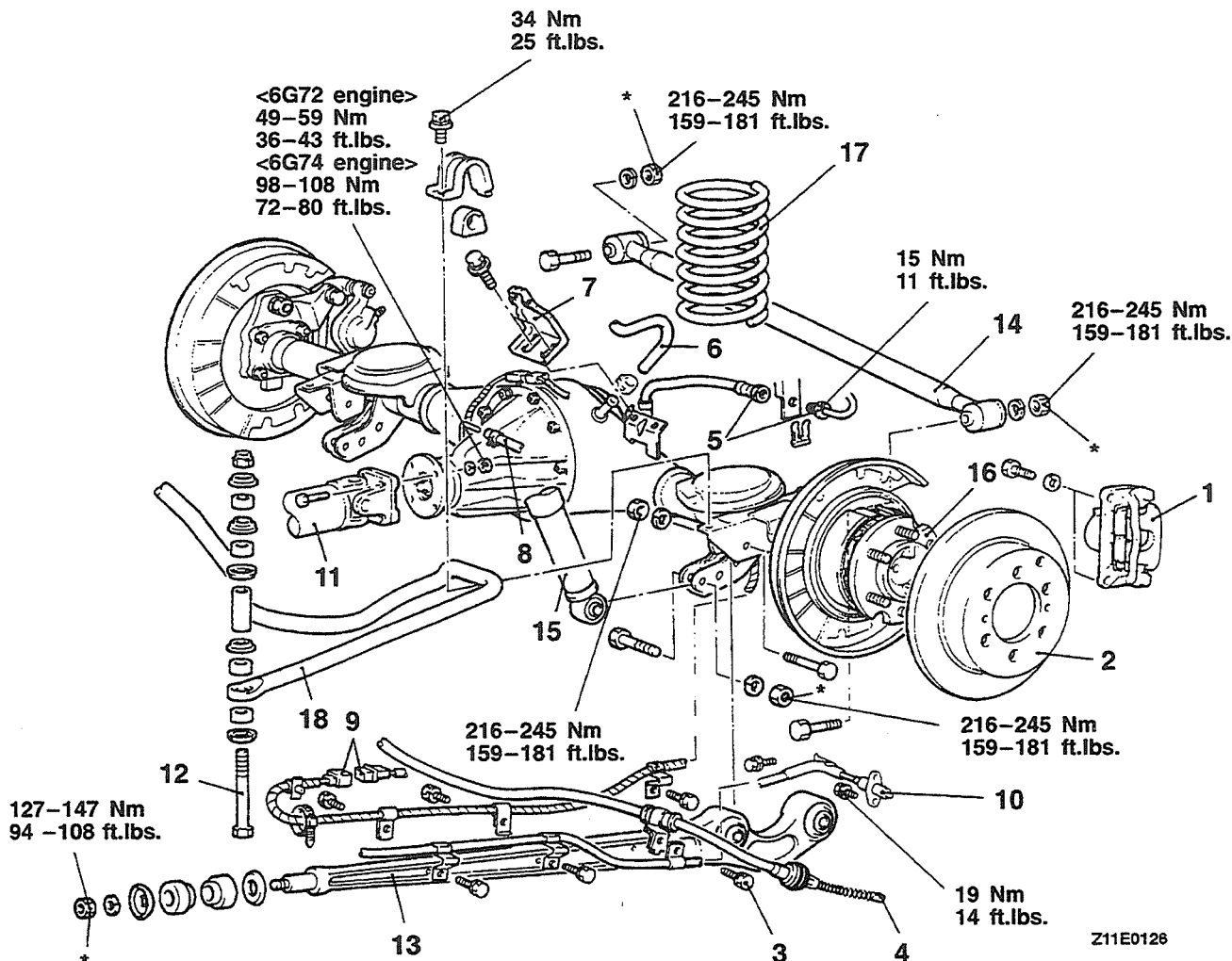
4. Shut off the air valve.
5. If after approximately 10 minutes have passed, the pressure has dropped, it can be concluded that there is no leaking of air from the air hose, etc.

AXLE ASSEMBLY

REMOVAL AND INSTALLATION

Post-installation Operation

- Air Bleeding from Brake Lines (Refer to GROUP 35A – Service Adjustment Procedures.)
- Load Sensing Spring Length Checking and Adjustment (Refer to GROUP 35A – Service Adjustment Procedures.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)



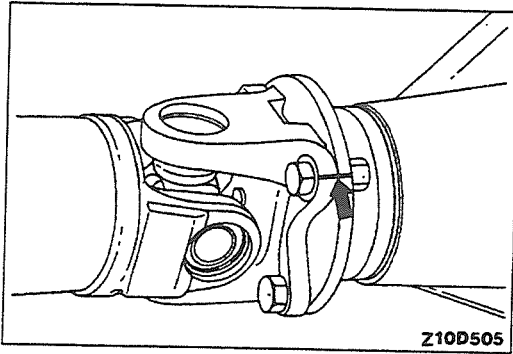
Removal steps

- | | |
|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| 1. Rear brake assembly | 10. Speed sensor <Vehicles with ABS>
(Refer to GROUP 35 – Wheel Speed Sensor.) |
| 2. Brake disc | 11. Rear propeller shaft |
| 3. Parking brake cable or speed sensor attaching bolt | 12. Stabilizer bar installation bolt |
| 4. Connection for parking brake cable end | 13. Lower arm |
| 5. Brake hose connection | 14. Lateral rod |
| 6. Breather hose connection | 15. Shock absorber connection (lower part only) |
| 7. Spring support for load sensing proportioning valve | 16. Axle assembly |
| 8. Hose connection | 17. Coil spring |
| 9. Rear differential lock position harness connector
<Vehicles with rear differential lock> | 18. Stabilizer bar |



NOTE

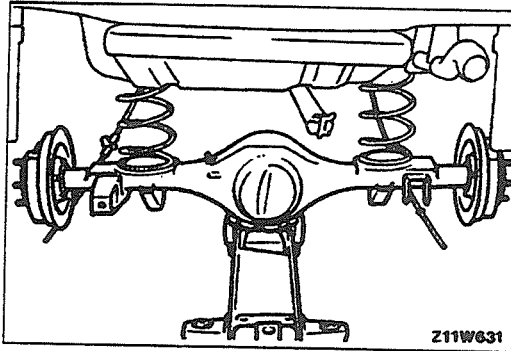
The part with * must be tightened with the vehicle lowered to the ground.



REMOVAL SERVICE POINTS

◀A▶ REAR PROPELLER SHAFT REMOVAL

Make the mating marks on the flange yoke of the rear propeller shaft and on the companion flange of the differential case.



◀B▶ LOWER ARM REMOVAL

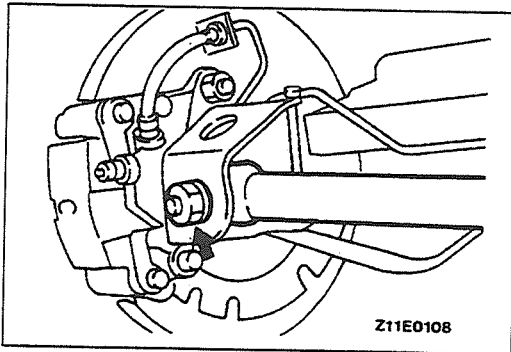
After supporting the axle assembly by floor jacks, remove the lower arm.

◀C▶ AXLE ASSEMBLY REMOVAL

Draw out the axle assembly toward the rear of the vehicle.

Caution

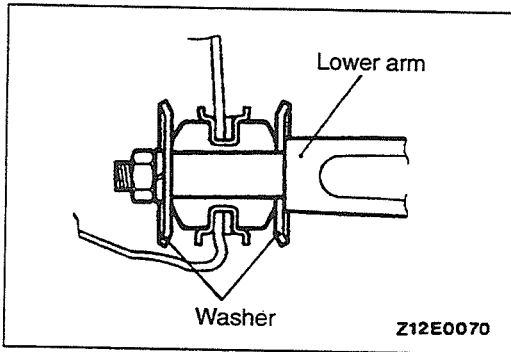
The axle assembly is unsuitable on the jack; be careful not to allow it to fall.



INSTALLATION SERVICE POINTS

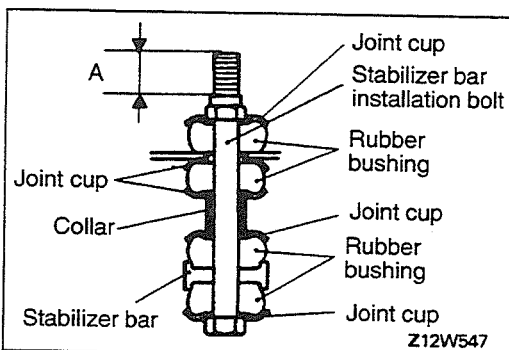
▶A◀ LATERAL ROD INSTALLATION

Install the lateral rod from the axle housing side.



▶B◀ LOWER ARM INSTALLATION

Install the washers (facing as shown in the figure) to the lower arm.



▶C◀ STABILIZER BAR MOUNTING BOLT INSTALLATION

When installing the stabilizer bar to the stabilizer bar bracket, check that the amount of projection of the stabilizer bar installation bolt is within the standard value range.

Standard value (A): 15–17 mm (.59–.67 in.)

▶D◀ REAR PROPELLER SHAFT INSTALLATION

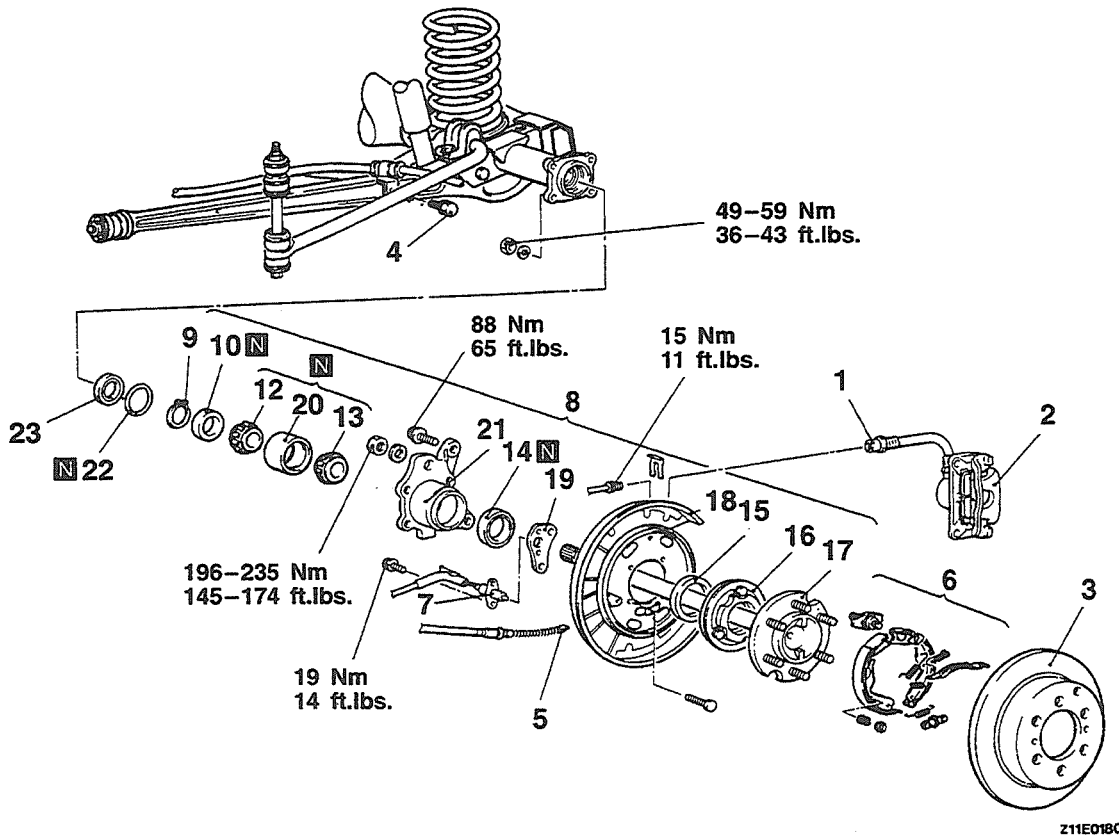
Align the mating marks on the flange yoke and the companion flange to install the rear propeller shaft.

AXLE SHAFT

REMOVAL AND INSTALLATION

Post-installation Operation

- Air Bleeding from Brake Lines (Refer to GROUP 35A – Service Adjustment Procedures.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)



Z11E0180

Removal steps

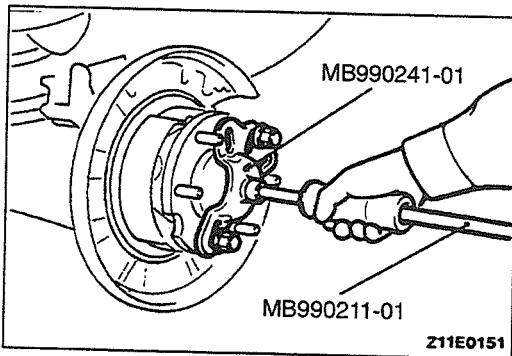
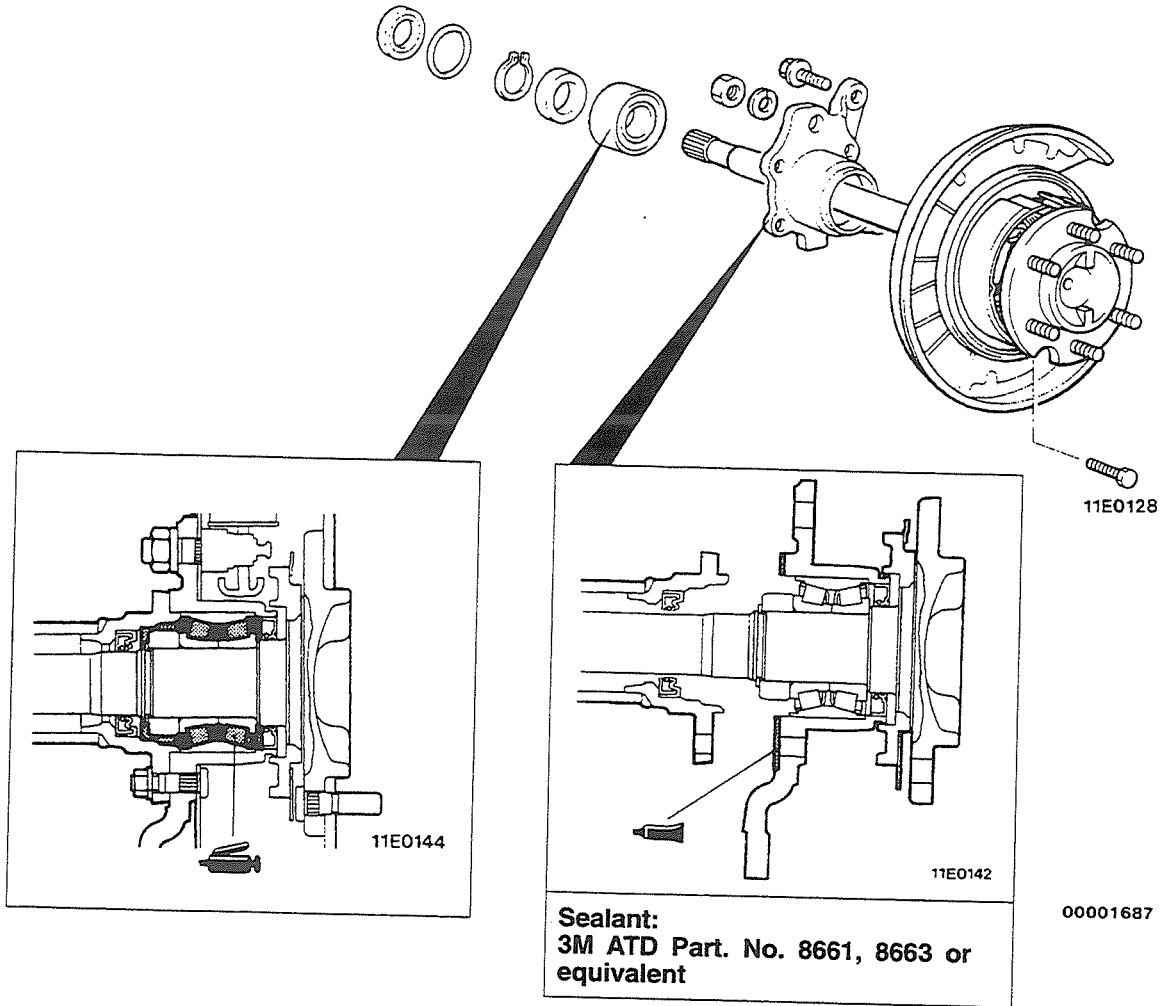
1. Connection for brake pipe
2. Rear brake assembly
3. Brake disc
4. Parking brake cable attaching bolt
5. Parking cable end
6. Parking brake assembly
7. Speed sensor <Vehicles with ABS>
8. Axle shaft assembly
9. Snap ring
10. Retainer
11. Axle shaft sub assembly
(Parts from step 13 to step 17)
12. Bearing inner race (inner)
13. Bearing inner race (outer)
14. Oil seal
15. Dust cover <Vehicles without ABS>
16. Rotor assembly <Vehicles with ABS>
17. Axle shaft
18. Backing plate
19. Speed sensor bracket
<Vehicles with ABS>
20. Bearing outer race
21. Bearing case
22. O-ring
23. Oil seal

Installation steps

- ▶A◀ 23. Oil seal
- ▶A◀ 22. O-ring
- ▶A◀ 21. Bearing case
- ▶B◀ 20. Bearing outer race
- ▶B◀ 19. Sped sensor bracket
<Vehicles with ABS>
- ▶B◀ 18. Backing plate
- ▶B◀ 17. Axle shaft
- ▶C◀ 16. Rotor assembly <Vehicles with ABS>
- ▶C◀ 15. Dust cover <Vehicles with ABS>
- ▶C◀ 13. Bearing inner race (outer)
- ▶D◀ 14. Oil seal
- ▶E◀ 12. Bearing inner race (inner)
- ▶F◀ 10. Retainer
- ▶G◀ 9. Snap ring
8. Axle shaft assembly
7. Speed sensor <Vehicles with ABS>
(Refer to GROUP 35C – Wheel Speed Sensor.)
6. Parking brake assembly (Refer to GROUP 36 – Parking Brake Drum.)
5. Parking cable end
3. Brake disc
2. Rear brake assembly
1. Connection for brake pipe

TSB Revision

LUBRICATION AND SEALING POINTS



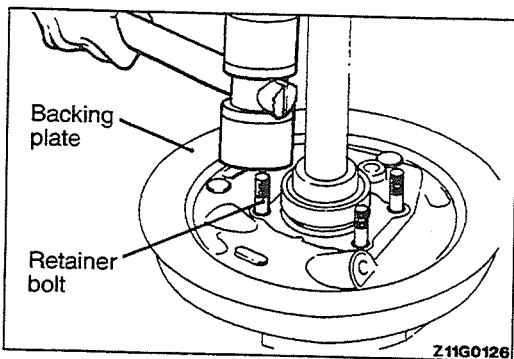
REMOVAL SERVICE POINTS

◀A▶ AXLE SHAFT ASSEMBLY REMOVAL

Pull the rear axle shaft with rear brake assembly attached. If the rear axle shaft is difficult to remove, use the special tools.

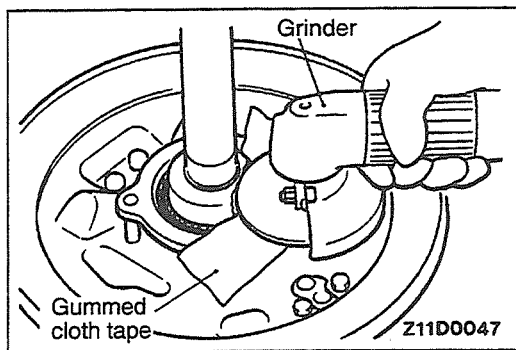
NOTE

Do not damage the oil seal during removal.



◀B▶ RETAINER REMOVAL

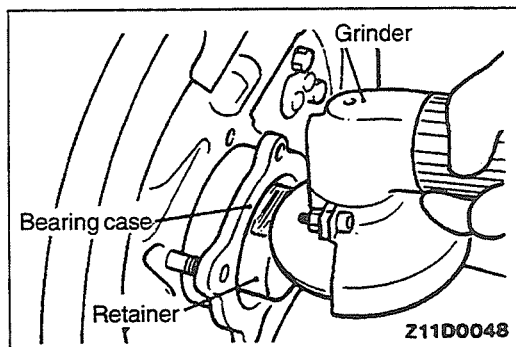
- (1) Remove one retainer bolt from the backing plate.



- (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 ring and the side of bearing become approximately 1.0–2.0 mm (.04–.08 in.) and 2.0 mm (.08 in.) respectively.

Caution

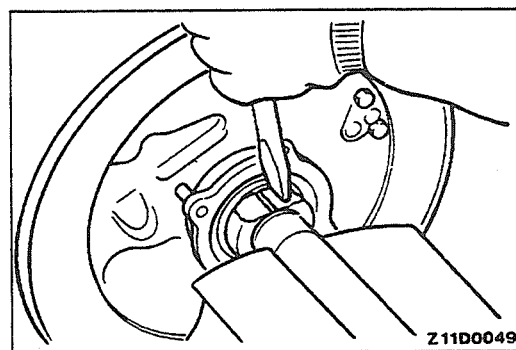
Be careful not to damage the bearing case and the axle shaft.



- (4) Fix the axle shaft and shave off the remaining 2.0 mm (.08 in.) on the side of the bearing of the retainer.

Caution

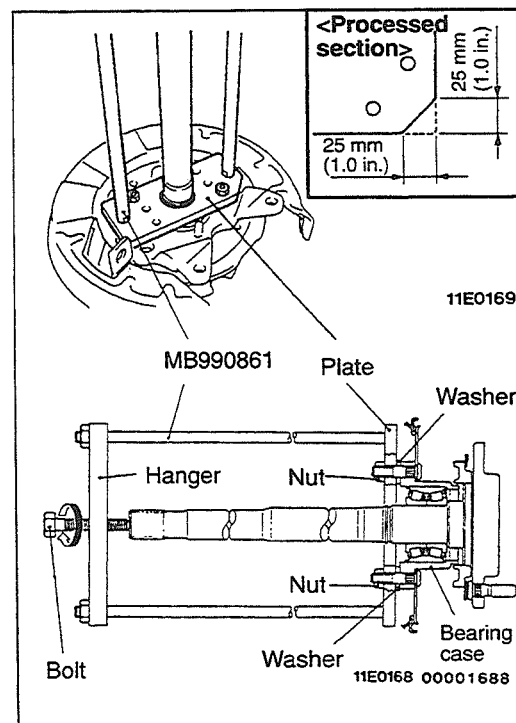
Be careful not to damage the bearing case and the axle shaft.



- (5) Cut in with a chisel the place where the retainer ring has been shaven and remove the retainer.

Caution

Be careful not to damage the axle shaft.

**◀C▶ AXLE SHAFT SUB ASSEMBLY REMOVAL**

- (1) Scrape the plate of the special tool with a grinder or similar tool as shown in the illustration so that there will be no interference between the plate and the bearing case.
- (2) While adjusting the height of the hanger, secure the washers, plate and nuts in order so that the processed plate is as shown in the illustration.

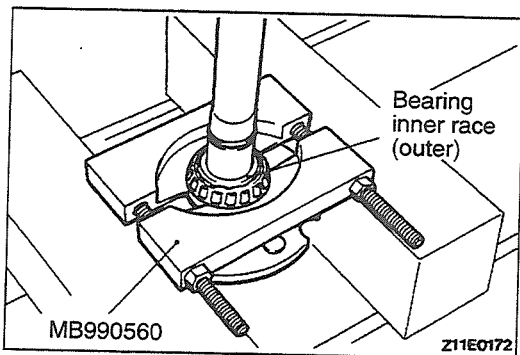
NOTE

The washers are used to eliminate the difference in height of the bearing case so that the plate and the bearing case are parallel.

- (3) Place the end of the bolt against the center of the axle shaft, and then tighten the nuts to remove the axle shaft from the bearing case assembly.

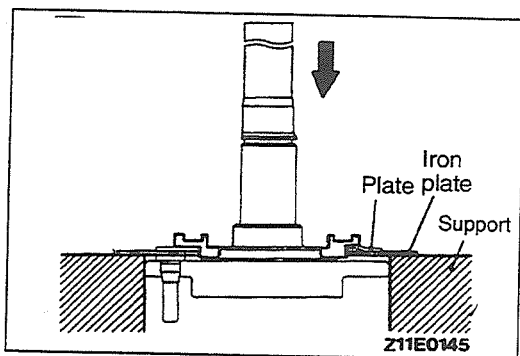
Caution

The hanger and plate must be placed so that they are parallel.



◀D▶ BEARING INNER RACE (OUTER) REMOVAL

Install the special tool as shown in the illustration, and then use a press to remove the bearing inner race (outer) from the axle shaft.

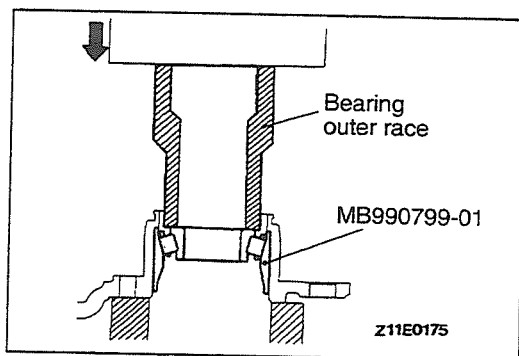


◀E▶ ROTOR ASSEMBLY REMOVAL

Insert an iron plate of approximately 1 mm (.04 in.) thickness between the rotor assembly and the axle shaft, and then use a press to remove the rotor assembly.

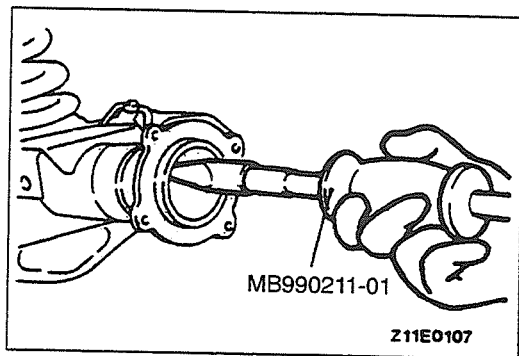
Caution

In order not to bend the rotor assembly plate, place the support in contact with the axle shaft when using the press.



◀F▶ BEARING OUTER RACE REMOVAL

Reinstall the bearing inner race that was removed previously, and then use the special tool and press to remove the bearing outer race.

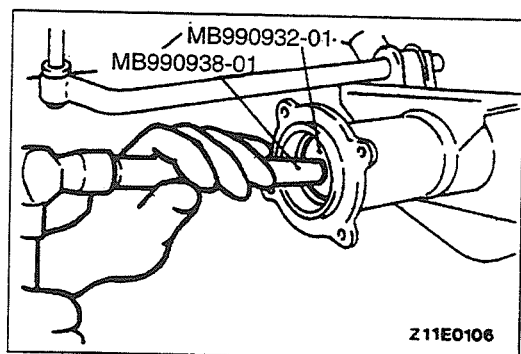


◀G▶ OIL SEAL REMOVAL

Remove the oil seal from the end of rear axle housing using the special tool, if necessary.

INSPECTION

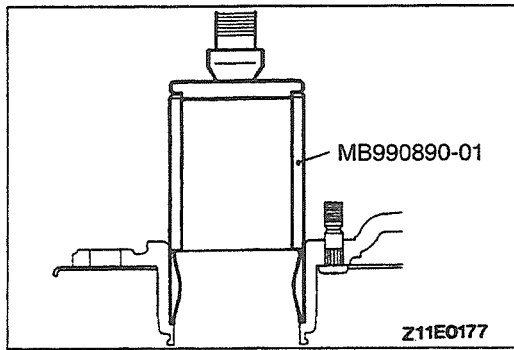
- Check the dust cover for deformation or damage.
- Check the oil seal for damage.
- Check the inner and outer bearings for seizure, discoloration and rough raceway surface.
- Check the axle shaft for cracks, wear and damage.



INSTALLATION SERVICE POINTS

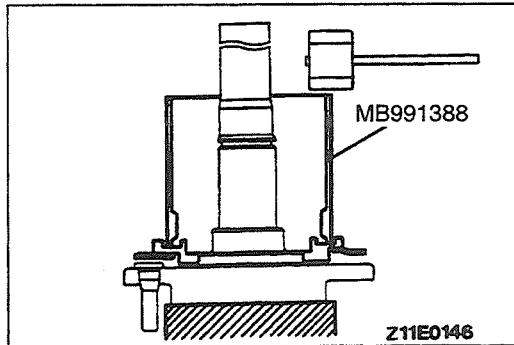
▶A◀ OIL SEAL INSTALLATION

Drive the new oil seal into the rear axle housing end by using the special tools.



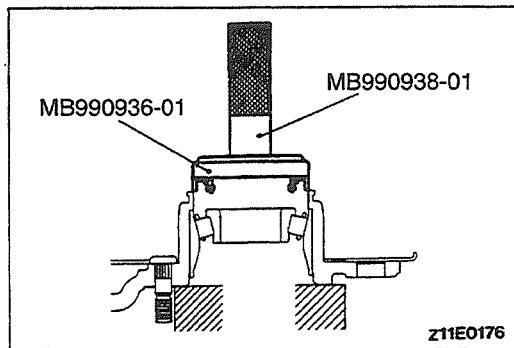
►B◄ BEARING OUTER RACE INSTALLATION

- (1) Apply the multi-purpose grease to the external surface of the bearing outer race.
- (2) Press-fit the bearing outer race into the bearing case by using special tools.



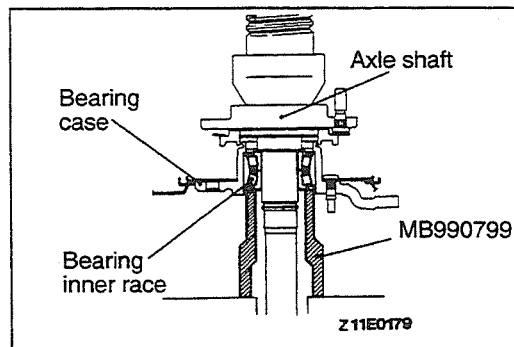
►C◄ ROTOR ASSEMBLY INSTALLATION

- Use the special tool to press-fit the rotor assembly to the rear axle shaft.



►D◄ OIL SEAL INSTALLATION

- (1) Apply multi-purpose grease to the outside of the oil seal.
- (2) Use the special tools to press-fit the oil seal until it is flush with the end of the bearing case.
- (3) Apply multi-purpose grease to the lip of the oil seal.

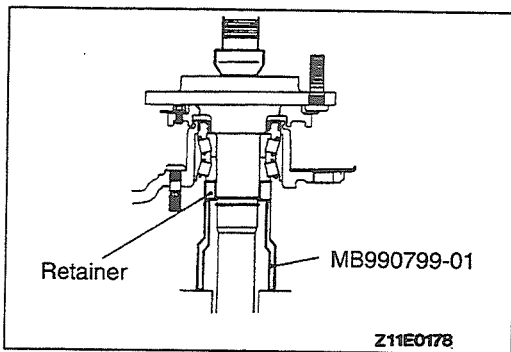


►E◄ BEARING INNER RACE (INNER) INSTALLATION

- (1) Pass the axle shaft through the bearing inner race, the bearing case and the second bearing inner race in that order.
- (2) Use the special tool to press-fit the bearing inner race to the axle shaft.

Caution

1. Both bearing inner race sets should be press-fitted together.
2. The left and right lengths of the axle shaft are different [approx. 7 mm (.28 in.)] in vehicles with rear differential lock. The right side is longer, so be careful when installing.



▶F◀ **RETAINER PRESS-FITTING**

Use the special tool to press-fit the retainer onto 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.

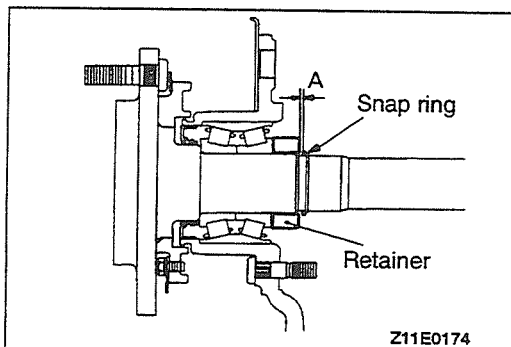
Standard value:

Initial press-fitting force

50,000 N (11,023 lbs.) or more

Final press-fitting force

100,000–110,000 N (22,046–24,251 lbs.)



▶G◀ **SNAP RING INSTALLATION**

- (1) After installing the snap ring, measure the clearance (A) between the snap ring and the retainer with a thickness gage, and check that it is within the standard values.

Standard value (A): 0.166 mm (.0065 in.) or less

- (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 (in.)	Identification color
2.17	(.0854)	–
2.01	(.0791)	Yellow
1.85	(.0728)	Blue
1.69	(.0665)	Purple
1.53	(.0602)	Red

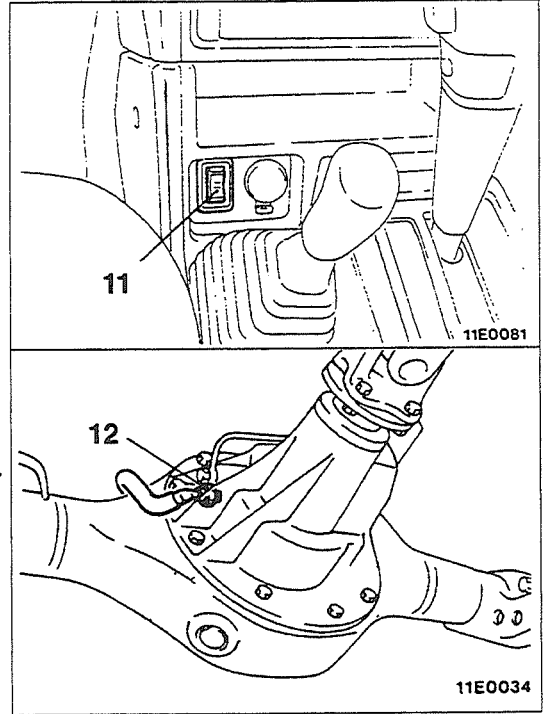
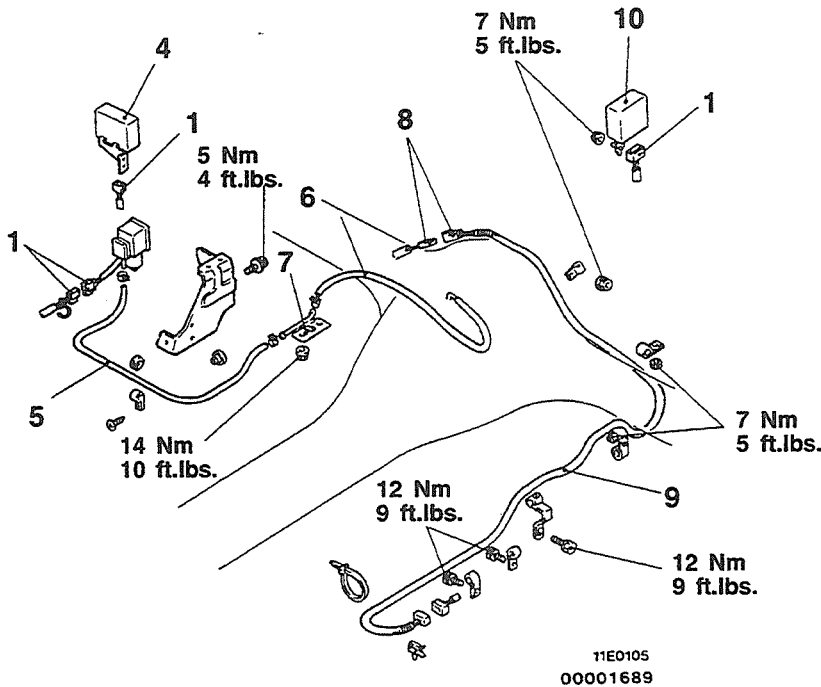
REAR DIFFERENTIAL LOCK

110005350

REMOVAL AND INSTALLATION

Pre-removal and post-installation Operation

- Second Seat Removal and Installation
(Refer to GROUP 52A – Second Seat.)


**Removal steps of rear differential lock air pump and control unit
<Up to 1993 models>**

1. Harness connector
2. Bracket
3. Rear differential lock air pump
4. Rear differential lock control unit
5. Air hose
6. Air hose
7. Hose bracket
8. Harness connector
9. Position harness

**Removal steps of rear differential lock air pump
<1994 models and after>**

1. Harness connector
2. Bracket
3. Rear differential lock air pump
5. Air hose
6. Air hose
7. Hose bracket
8. Harness connector
9. Position harness

**Removal steps of rear differential lock control unit
<1994 models and after>**

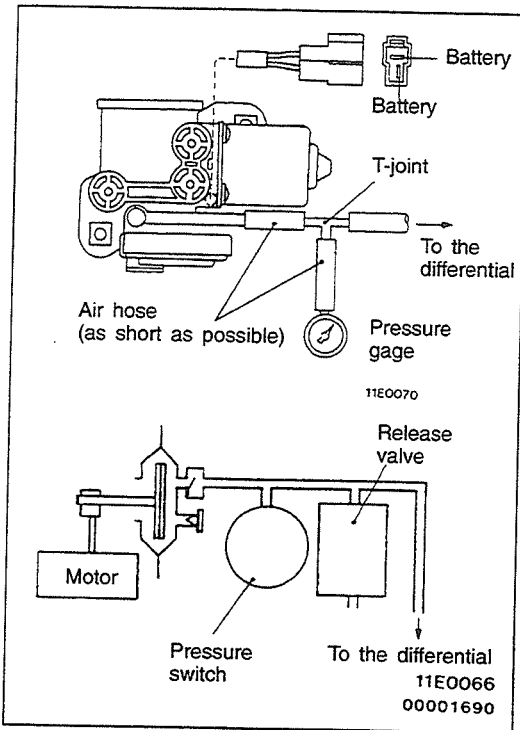
- Quarter trim lower <LH side>
(Refer to GROUP 52A – Trims.)
1. Harness connector
 10. Rear differential lock control unit

Removal steps of rear differential lock switch

11. Rear differential lock switch

Removal steps of rear differential lock detection switch

12. Rear differential lock detection switch
(Refer to P.27-25.)



INSPECTION

REAR DIFFERENTIAL LOCK AIR PUMP

1. Connect the pressure gage to the air pump discharge outlet nozzle, via the air hose and T-joint.
2. Install air hose to the differential.
3. Apply battery positive voltage to the air pump connector.
4. Measure the time between when the pump starts and stops operating, and if it stops within 5 seconds, the pressure switch inside the pump is normal.
5. Measure the pressure 10–20 seconds after the pump has stopped.

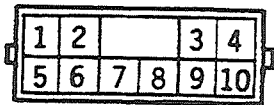
Standard value: 25–40 kPa (4–6 psi.)

If the pressure is within the standard value, the release valve inside the pump is normal.

6. Check that the pump does not begin operating for 5 minutes after it has stopped.
7. If the inspection for 4–6 is normal, then the pump is fully operational.

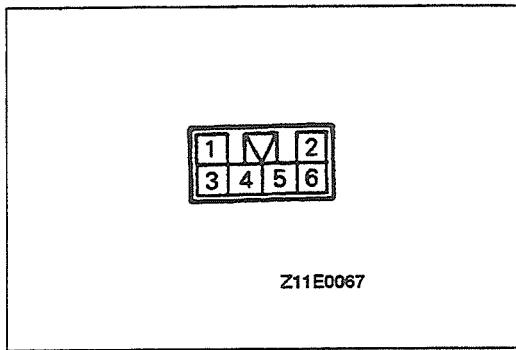
REAR DIFFERENTIAL LOCK CONTROL UNIT

1. Measure the terminal voltages under each condition.
2. With the control unit connected to the harness and the probe inserted into the rear of the harness connector, carry out the voltage measurements between terminal (6) (ground terminal) and each other terminal.



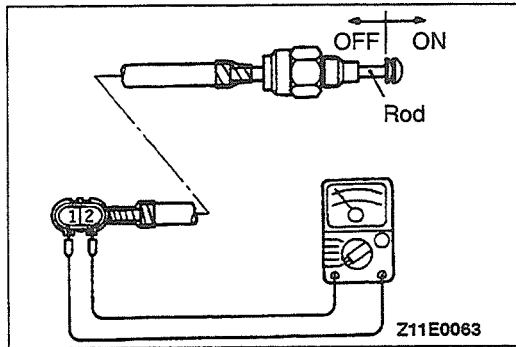
Z11E0068

Terminal No.	Inspection Item	Inspection Condition	Terminal Voltage	
3	Ignition switch (IG1)	Ignition switch (IG1) OFF	0 V	
		ON	Battery positive voltage	
9	Rear differential lock switch	Ignition switch: ON	ON side or OFF side	0 V
1			When in neutral	Battery positive voltage
10	Rear differential lock indicator light	Ignition switch: ON	Rear differential is locked	0 V
			Rear differential is free	Battery positive voltage
2	Vehicle speed reed switch	Select "D" or "1" (1st gear) and drive forward slowly.	5 V	
8	Rear differential lock detection switch	Ignition switch: ON	Rear differential is locked	0 V
			Rear differential is free	Battery positive voltage
4	Rear differential lock air pump	Ignition switch: ON	When filling or holding	Battery positive voltage
			When releasing	0 V
5	Center differential lock operation detection switch	Ignition switch: ON	Center differential is free	Battery positive voltage
			Center differential is locked	0 V



REAR DIFFERENTIAL LOCK SWITCH CONTINUITY

Switch position	Terminal				
	5	3	2	6	1
ON	○	—	○	○—○	
OFF		○	○	○—○	



REAR DIFFERENTIAL LOCK DETECTION SWITCH

1. Connect an ohmmeter to the detection switch connector.
2. The rear differential lock detection switch is in good condition when the rod of the detection switch is pulled, there should be continuity, and when it is returned to its normal position, no continuity.

NOTE

Remove the differential carrier in order to replace the rear differential lock detection switch. (Refer to P.27-26.)

DIFFERENTIAL CARRIER

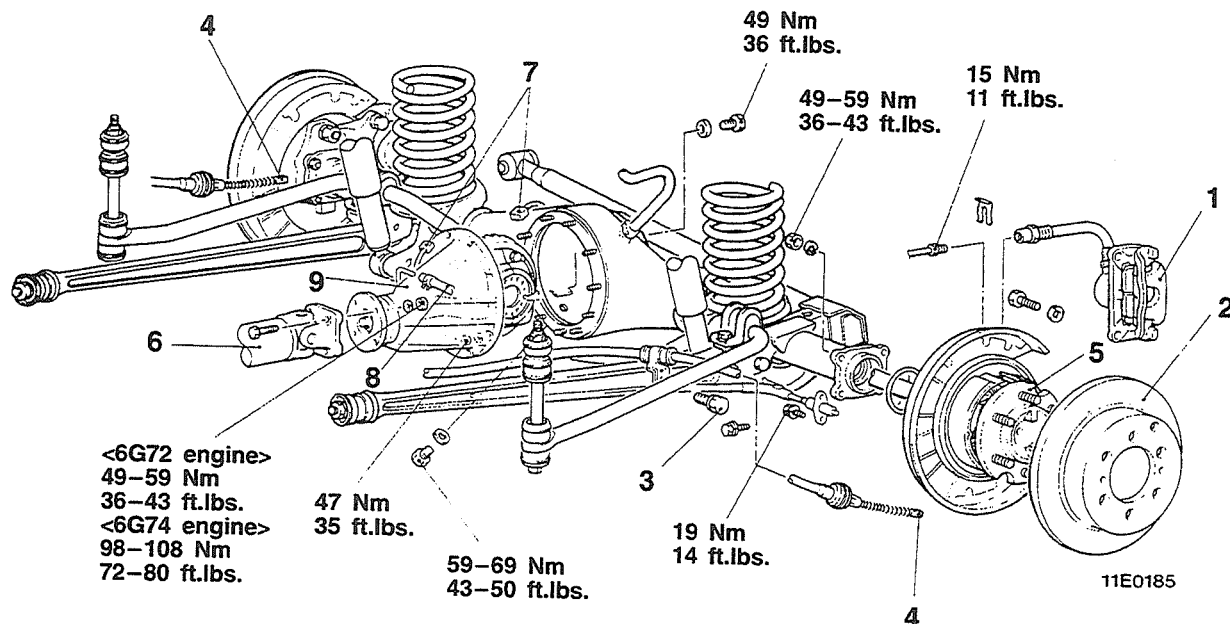
REMOVAL AND INSTALLATION

Pre-removal Operation

- Differential Gear Oil Draining

Post-installation Operation

- Air Bleeding from Brake Lines (Refer to GROUP 35A – Service Adjustment procedures.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP – 36 Service Adjustment Procedures.)
- Differential Gear Oil Filling (Refer to P.27-13.)



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Sealant:
3M ATD Part No. 8661, 8663 or equivalent

NOTE
Apply the specified sealant to the differential carrier mounting surface of the axle housing as shown in the illustrations.

Removal steps

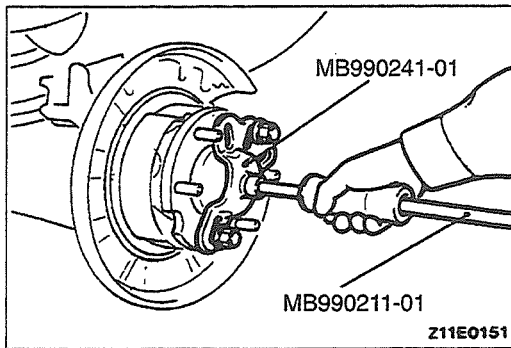
1. Rear brake assembly
2. Brake disc
3. Parking brake cable attaching nut
4. Parking brake cable end
5. Rear axle shaft assembly



6. Rear propeller shaft
7. Rear differential lock position harness connector
8. Hose connection
<Vehicles with rear differential lock>
9. Differential carrier



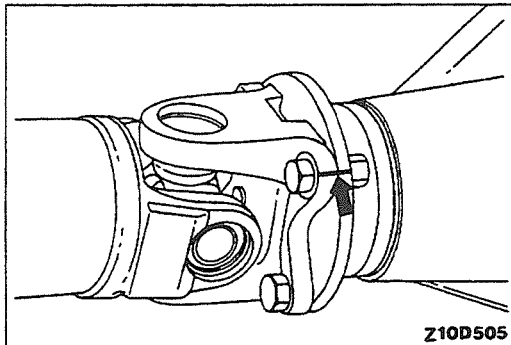
TSB Revision



REMOVAL SERVICE POINTS

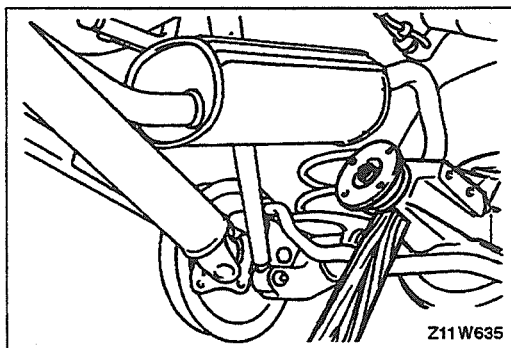
◀A▶ REAR AXLE SHAFT ASSEMBLY REMOVAL

Pull out the right and left axle shafts by about 70 mm (3 in.). If it is difficult to pull out, use the special tools.



◀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.

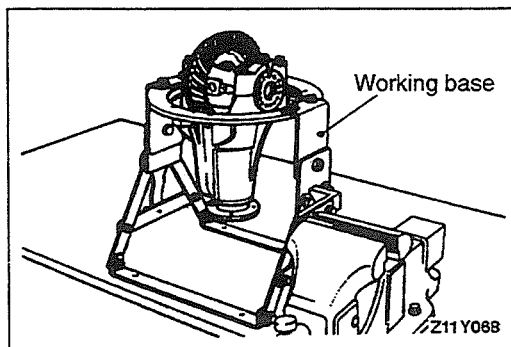


◀C▶ DIFFERENTIAL CARRIER REMOVAL

Remove the mounting nuts and strike the lower part of differential carrier assembly with a piece of timber several times to loosen it, and then remove the assembly.

Caution

1. Do not remove the uppermost nut but keep it loosened all the way to the stud bolt end.
2. Use care not to strike the companion flange.



INSTALLATION SERVICE POINTS

▶A◀ REAR PROPELLER SHAFT INSTALLATION

Align the mating marks on the flange yoke and the companion flange to install the rear propeller shaft.

INSPECTION BEFORE DISASSEMBLY

Hold the working base in a vice, and install the differential carrier to the special tool.

FINAL DRIVE GEAR BACKLASH

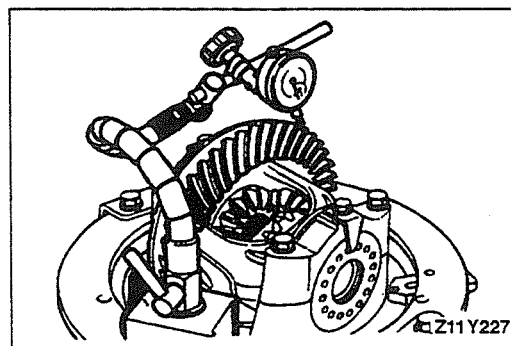
With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

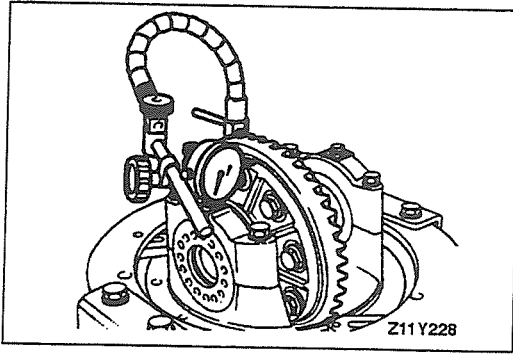
NOTE

Measure at four points or more on the circumference of the drive gear.

Standard value:

- Except 3.5L engine with rear differential lock
0.13–0.18 mm (.0051–.0071 in.)
- 3.5L engine with rear differential lock
0.12–0.18 mm (.0047–.0071 in.)

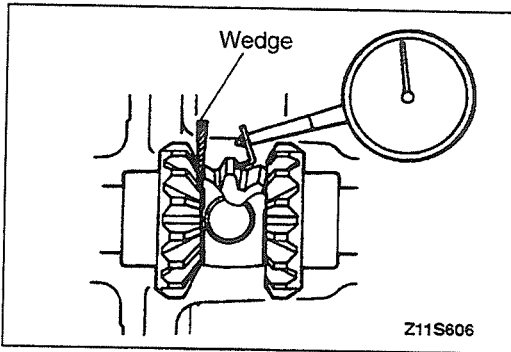




DRIVE GEAR RUNOUT

Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

Limit: 0.05 mm (.002 in.)



DIFFERENTIAL GEAR BACKLASH (3.0L ENGINE WITH CONVENTIONAL DIFFERENTIAL)

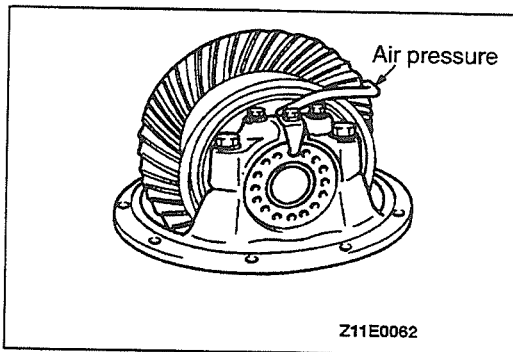
While locking the side gear with the wedge, measure the differential gear backlash with a indicator on the pinion gear.

Standard value: 0.076 mm (.0030 in.) or less

Limit: 0.2 mm (.0079 in.)

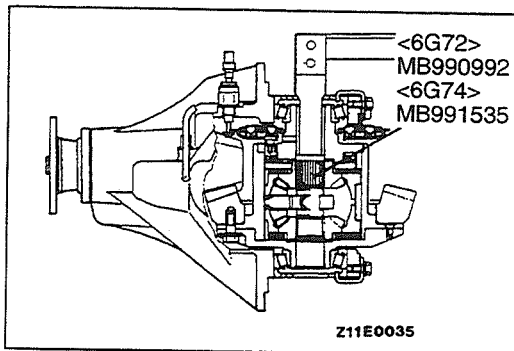
FINAL DRIVE GEAR TOOTH CONTACT

Refer to GROUP 26–Differential Carrier.



REAR DIFFERENTIAL LOCK

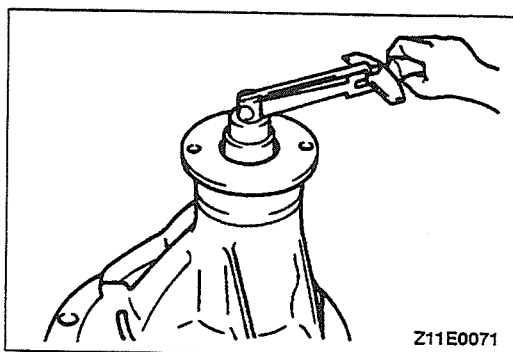
1. Connect an air hose, pressure gage and air regulator, for adjusting the compressed air pressure, to the actuator pipe.
2. Adjust the compressed air pressure with the air regulator until the pressure gage shows a pressure of approximately 25 kPa (4 psi).



3. Use the special tool to gently turn only the side gear of one side of the axle 1/4–1/2 turns.

NOTE

1. The lock will not operate when both side gears turn together, even when air pressure is supplied. The side gear on one side of the axle must be turned so that the clutch will mesh (lock).
2. To unlock, shut supply of air pressure, and gently turn the side gear on one side of the axle 1/4–1/2 turns.



4. Measure the rotation torque of the companion flange, and check the lock condition and free condition of the rear differential.

Rear differential operation	Companion flange Nm (ft.lbs.) [N (lbs.)]
Locked	Doesn't turn at 49 (36) [1,111 (248)]
Free	Turns at less than 49 (36) [1,111 (248)]

DISASSEMBLY

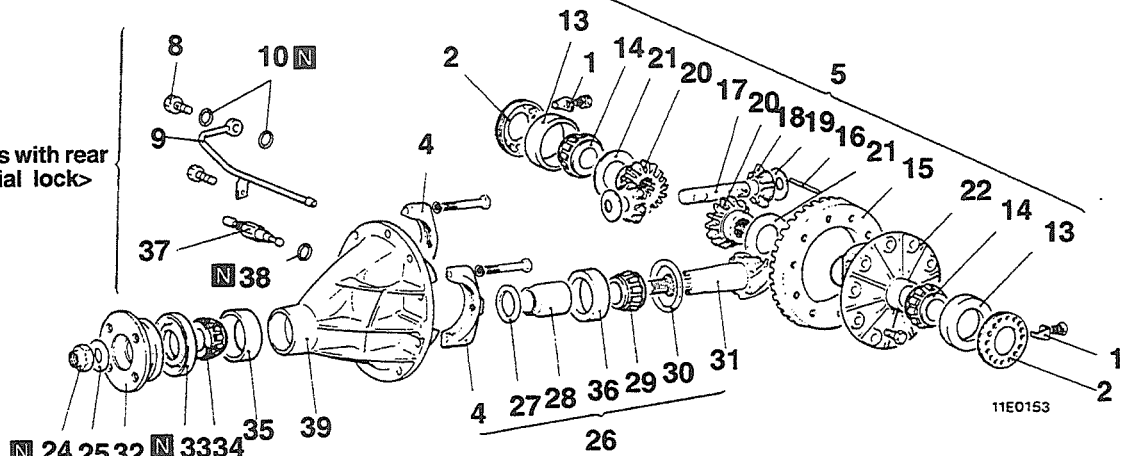
Inspection Before Disassembly

- (1) Final Drive Gear Inspection (Refer to P.27-28.)
- (2) Drive Gear Run-out Inspection (Refer to P.27-29.)

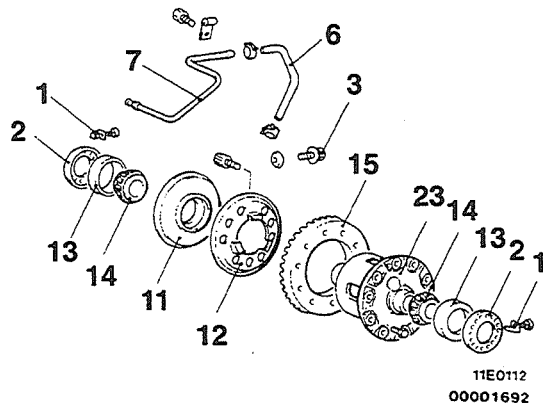
- (3) Differential Gear Backlash Inspection (Refer to P.27-29.)
- (4) Final Drive Gear Tooth Contact Inspection (Refer to P.27-29.)

<3.0L engine with conventional differential>

<Vehicles with rear differential lock>



<Except 3.0L engine with convention differential>

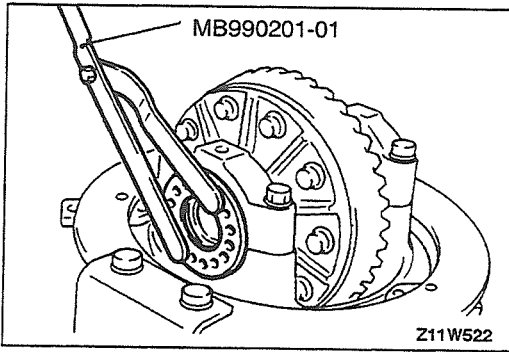


Disassembly steps

- | | | | |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>◀A▶</p> <p>◀B▶</p> <p>◀C▶</p> <p>◀D▶</p> <p>◀E▶</p> | <ul style="list-style-type: none"> 1. Lock plate 2. Side bearing nut 3. Bolt 4. Bearing cap 5. Differential case assembly 6. Hose* 7. Air pipe assembly (A)* 8. Eye bolt* 9. Air pipe assembly (B)* 10. Gasket* 11. Actuator assembly* 12. Pressure plate* 13. Side bearing outer race 14. Side bearing inner race 15. Drive gear 16. Lock pin 17. Pinion shaft 18. Pinion gear 19. Pinion washer 20. Side gear 21. Side gear spacer 22. Differential case | <p>◀F▶</p> <p>◀G▶</p> <p>◀H▶</p> <p>◀I▶</p> <p>◀J▶</p> <p>◀K▶</p> <p>◀L▶</p> | <ul style="list-style-type: none"> 23. Differential case (Refer to P.27-40.) 24. Self-locking nut 25. Washer 26. Drive pinion assembly 27. Drive pinion front shim (For adjusting of drive pinion bearing preload) 28. Drive pinion spacer 29. Drive pinion rear bearing inner race 30. Drive pinion rear shim (For adjusting drive pinion height) 31. Drive pinion 32. Companion flange 33. Oil seal 34. Drive pinion front bearing inner race 35. Drive pinion front bearing outer race 36. Drive pinion rear bearing outer race 37. Rear differential lock detection switch* 38. Gasket* 39. Differential carrier |
|--------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

NOTE

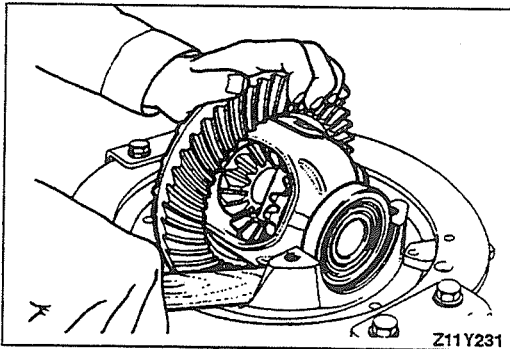
*: Vehicles with rear differential lock



DISASSEMBLY SERVICE POINTS

◀A▶ SIDE BEARING NUT REMOVAL

Use the special tool to remove the side bearing nut.

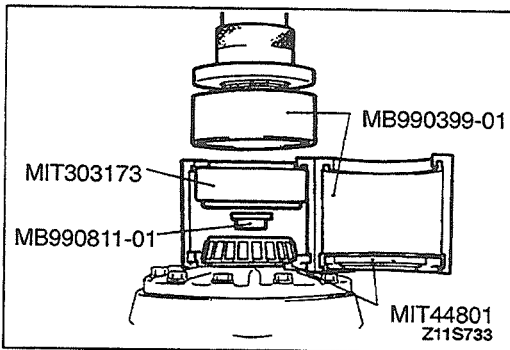


◀B▶ DIFFERENTIAL CASE ASSEMBLY REMOVAL

Use hammer handles to take out the differential case assembly.

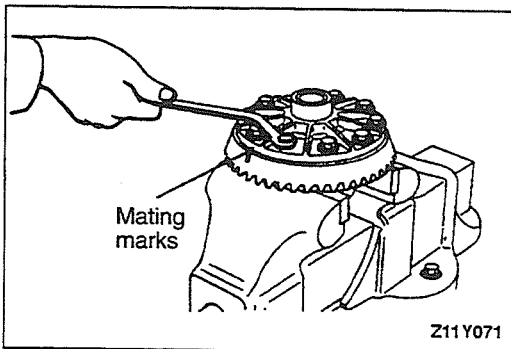
NOTE

Make mating marks on the bearings. Keep the right and left side bearings and side bearing nuts separate in order to be able to distinguish them for reassembly.



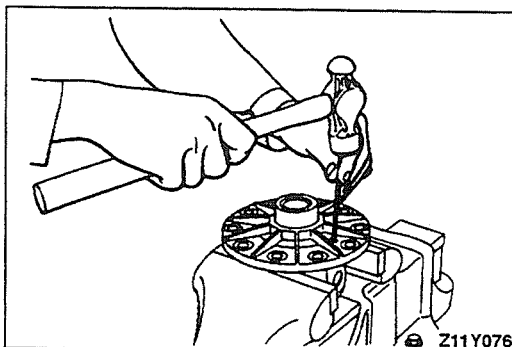
◀C▶ SIDE BEARING INNER RACE REMOVAL

Use the special tools to pull out the side bearing inner races.



◀D▶ DRIVE GEAR REMOVAL

- (1) Make mating marks on the differential case and drive gear.
- (2) Loosen the drive gear mounting bolts in diagonal sequence to remove the drive gear.

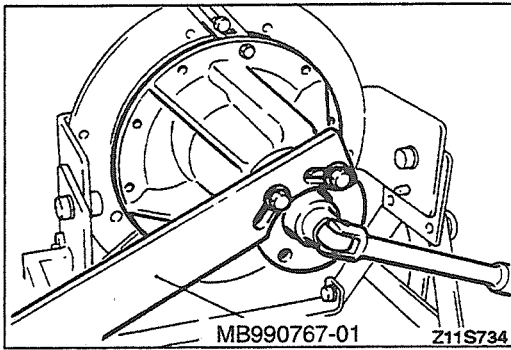


◀E▶ LOCK PIN REMOVAL

Drive out the lock pin with a punch.

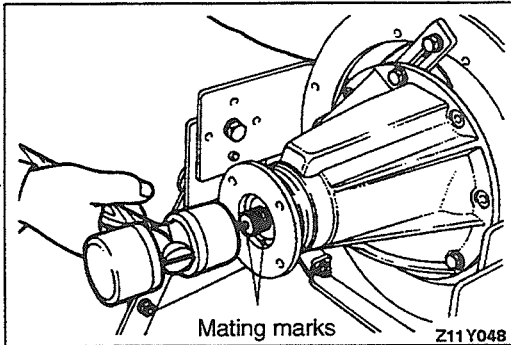
NOTE

The location of the removed side gears and the left and right side gear thrust spacers should be made note of for reassembly.



◀F▶ SELF-LOCKING NUT REMOVAL

Use the special tool to hold the companion flange, and then remove the companion flange self-locking nut.

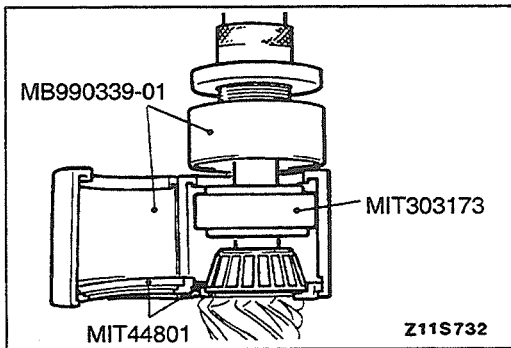


◀G▶ DRIVE PINION ASSEMBLY REMOVAL

- (1) Make mating marks on the drive pinion and companion flange.
- (2) Drive out the drive pinion together with the drive pinion spacer and the drive pinion front shims.

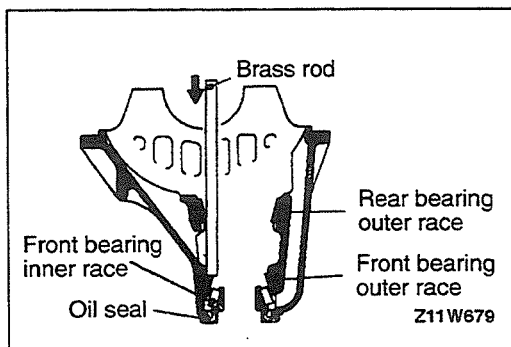
Caution

Do not make mating marks on the contact surfaces of the companion flange and propeller shaft.



◀H▶ DRIVE PINION REAR BEARING INNER RACE REMOVAL

Use the special tools to pull out the drive pinion rear bearing inner race.



◀I▶ OIL SEAL/DRIVE PINION FRONT BEARING INNER RACE/DRIVE PINION FRONT BEARING OUTER RACE/DRIVE PINION REAR BEARING OUTER RACE REMOVAL

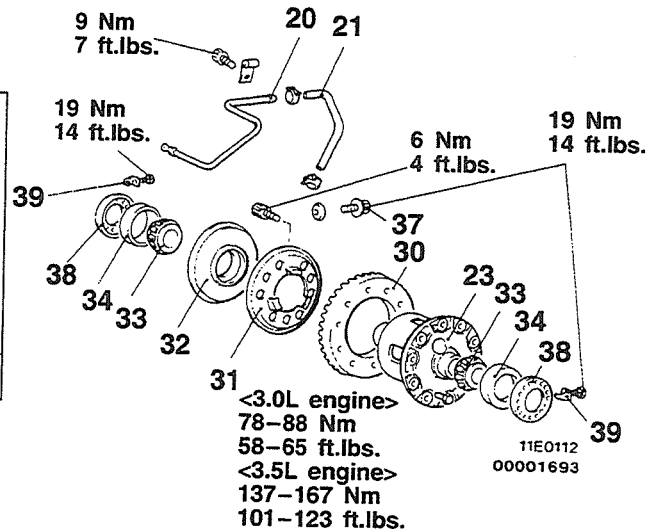
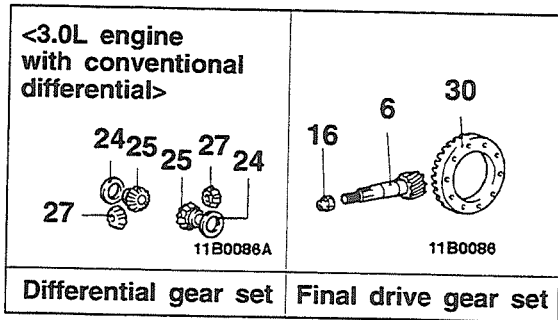
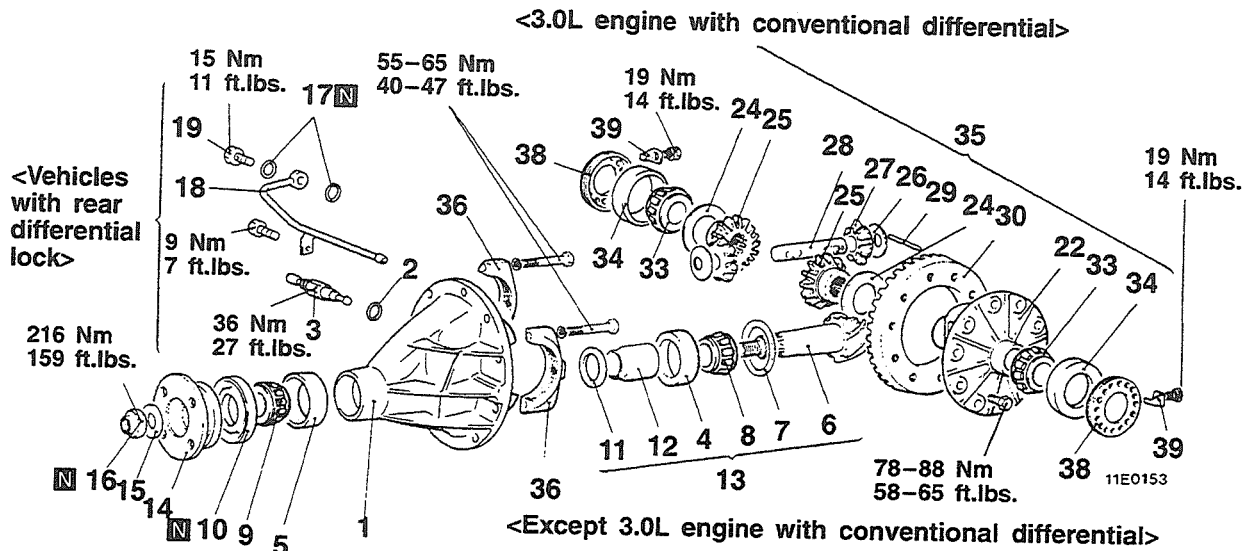
- (1) Use a brass rod to drive out the drive pinion front bearing outer race from the gear carrier together with the drive pinion front bearing inner race and the oil seal.
- (2) Drive out the drive pinion rear bearing outer race in the same manner.

INSPECTION

Wash the disassembled parts in cleaning solvent, dry them using compressed air, and then check the following areas.

- Check the companion flange for wear or damage.
- Check the oil seal for wear or deterioration.
- Check the bearings for wear or discoloration.
- Check the differential case for cracks.
- Check the drive pinion and drive gear for wear or cracks.
- Check the side gears, pinion gears and pinion shaft for wear or damage. <3.0L engine with conventional type>
- Check the side gear spline for wear or damage. <3.0L engine with conventional type>

REASSEMBLY

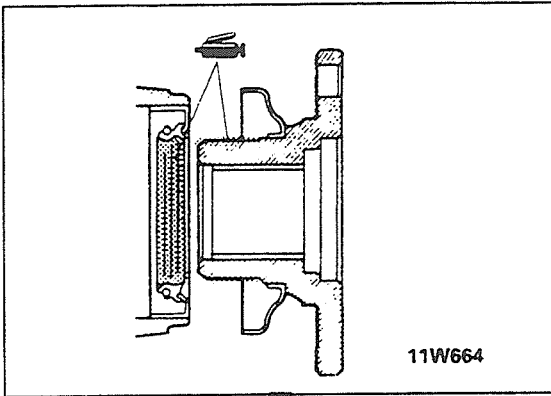


Reassembly steps

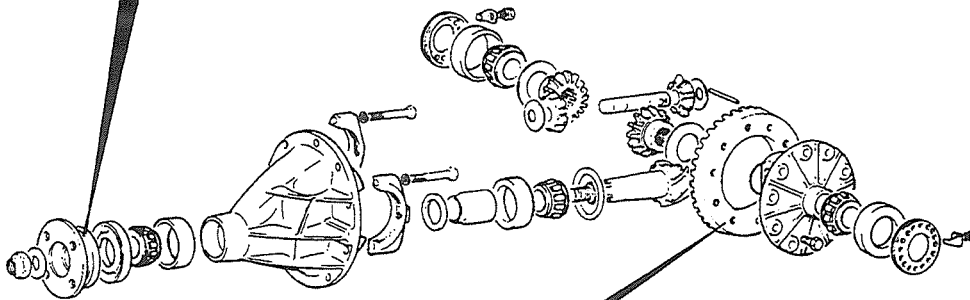
1. Differential carrier
2. Gasket
3. Rear differential lock detection switch
- ▶A◀ 4. Drive pinion rear bearing outer race
- ▶B◀ 5. Drive pinion front bearing outer race
 - Adjustment of drive pinion height
- ▶C◀ 6. Drive pinion
7. Drive pinion rear shim (For adjusting drive pinion height)
8. Drive pinion rear bearing inner race
9. Drive pinion front bearing inner race
10. Oil seal
11. Drive pinion front shim (For adjusting drive pinion bearing preload)
- ▶D◀ 12. Drive pinion spacer
 - Adjustment of drive pinion bearing preload
13. Drive pinion assembly
14. Companion flange
15. Washer
16. Self-locking nut
17. Gasket
18. Air pipe assembly (B)
19. Eye bolt
20. Air pipe assembly (A)*
21. Hose*
22. Differential case
23. Differential case (Refer to P.27-40)
24. Side gear spacer
25. Side gear
26. Pinion washer
27. Pinion gear
- ▶E◀ ● Adjustment of differential gear backlash
28. Pinion shaft
- ▶F◀ 29. Lock pin
- ▶G◀ 30. Drive gear
31. Pressure plate*
- ▶H◀ 32. Actuator assembly*
33. Side bearing inner race
34. Side bearing outer race
35. Differential case assembly
- ▶I◀ 36. Bearing cap
- ▶J◀ ● Adjustment of final drive gear backlash
37. Bolt
38. Side bearing nut
39. Lock plate

NOTE
* : Vehicles with rear differential lock.

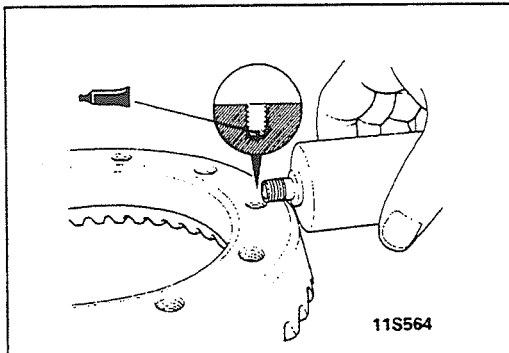
LUBRICATION SEALING AND ADHESION POINTS



<3.0L engine with conventional differential>

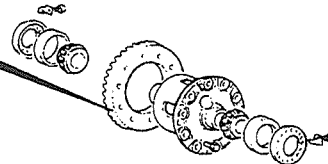


11E0153

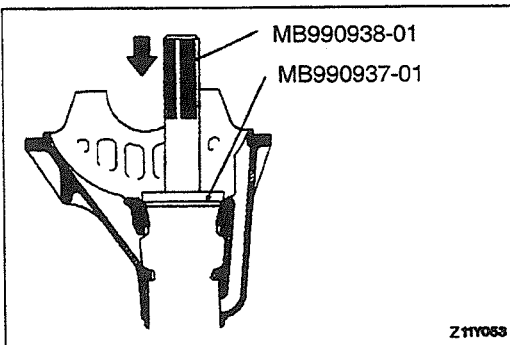


<Except 3.0L engine with conventional differential>

Adhesive:
3M Stud Locking 4170 or equivalent



11E0112
00001694



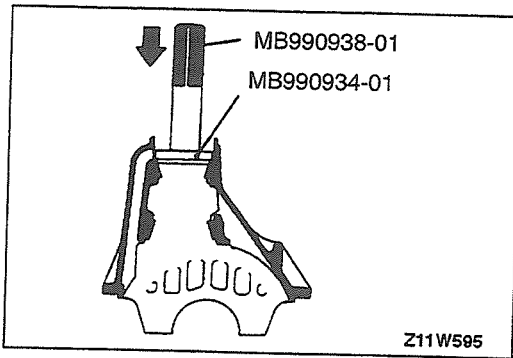
REASSEMBLY SERVICE POINTS

▶A◀ DRIVE PINION REAR BEARING OUTER RACE PRESS-FITTING

Use the special tools to press-fit the drive pinion rear bearing outer race into the gear carrier.

Caution

The bearing outer race must be fitted using a press to avoid tilt and distortion.

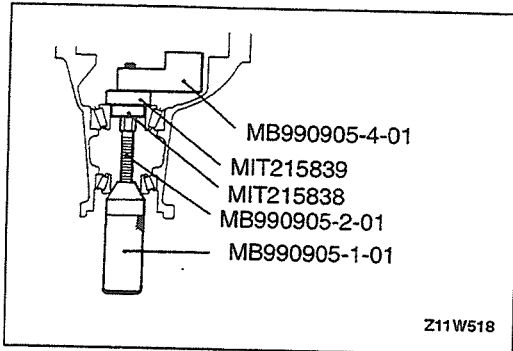


►B◄ DRIVE PINION FRONT BEARING OUTER RACE INSTALLATION

Use the special tools to press-fit the drive pinion front bearing outer race into the gear carrier.

Caution

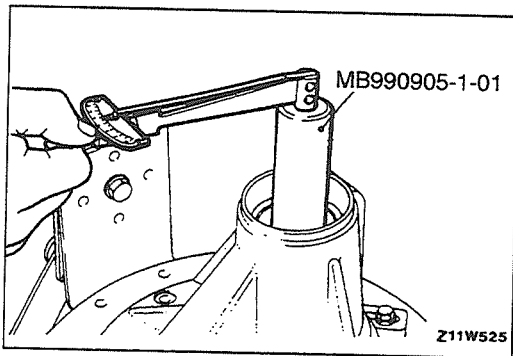
The bearing outer race must be fitted using a press to avoid tilt and distortion.



►C◄ DRIVE PINION HEIGHT ADJUSTMENT

Adjust the drive pinion height by the following procedure.

- (1) Install the special tools and the drive pinion front and rear bearing inner races into the gear carrier in the order shown in the illustration.
- (2) Tighten the handle of the special tool until the standard value for the drive pinion rotation torque is obtained.



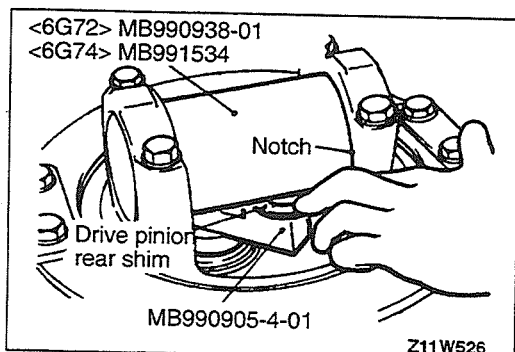
- (3) Measure the drive pinion rotation torque (without oil seal).

Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.6–0.9 Nm 5.2–7.8 in.lbs.
New/reused	Gear oil applied	0.4–0.5 Nm 3.5–4.3 in.lbs.

NOTE

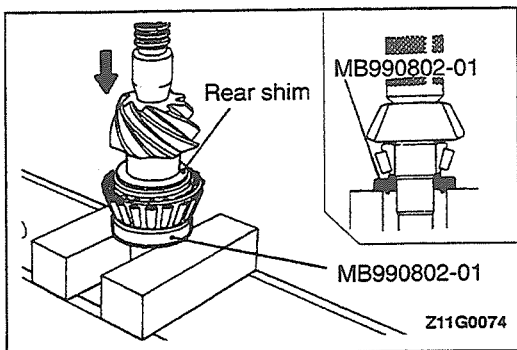
1. Gradually tighten the handle of the special tool while checking the drive pinion rotation torque.
2. The one rotation cannot be made when the special tool is in contact with the gear carrier. So move it a few times and, after seating the bearing, measure the rotation torque.



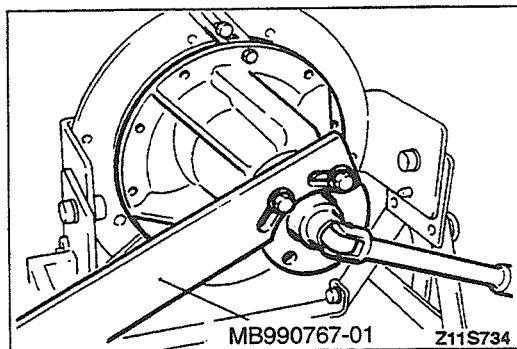
- (4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

NOTE

1. Be sure to clean the side bearing seat thoroughly. When positioning the special tool, check that the cut-out sections of the special tool are in the position shown in the illustration, and also check that the special tool is in close contact with the side bearing seat.
2. When selecting the drive pinion front shims, keep the number of shims to a minimum.



- (5) Fit the selected drive pinion rear shim(s) to the drive pinion, and then use the special tool to press-fit the drive pinion rear bearing inner race.



►D◄ **DRIVE PINION BEARING PRELOAD ADJUSTMENT**

Adjust the drive pinion rotation torque by using the following procedure:

Without oil seal

- (1) Insert the drive pinion front shim(s) between the drive pinion spacer and the drive pinion rear bearing inner race.
- (2) Use the special tools to tighten the companion flange to the specified torque.

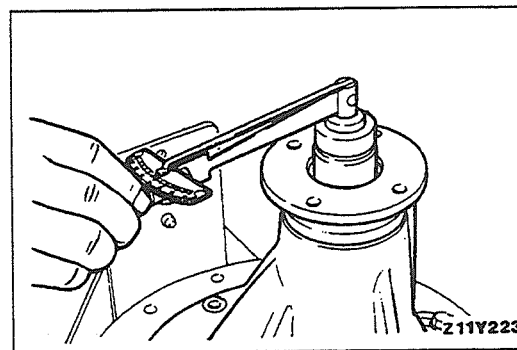
NOTE

Do not install the oil seal.

- (3) Measure the drive pinion rotation torque (without the oil seal).

Standard value:

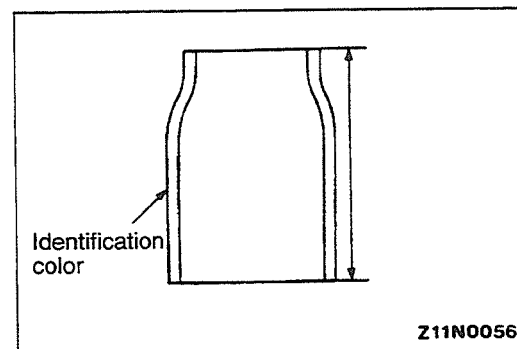
Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.6–0.9 Nm
		5.2–7.8 in.lbs.
New/reused	Gear oil applied	0.4–0.5 Nm
		3.5–4.3 in.lbs.



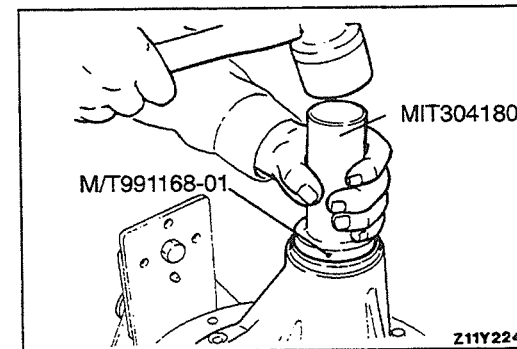
- (4) If the drive pinion rotation torque is not within the standard value range, adjust the rotation torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

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 appropriate drive pinion spacers. Also, select the drive pinion spacer from the following two types.



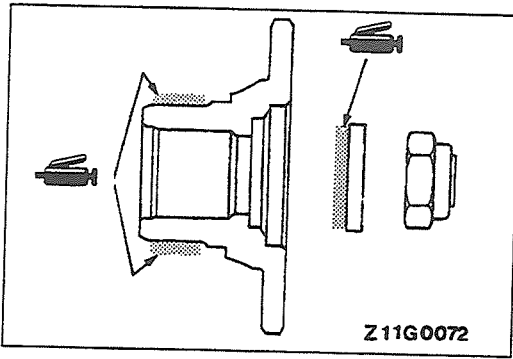
Height of drive pinion spacer	mm (in.)	Identification color
6G72 engine	56.67 (2.231)	–
	57.01 (2.244)	White
6G74 engine	52.50 (2.067)	Yellow
	52.84 (2.080)	Red



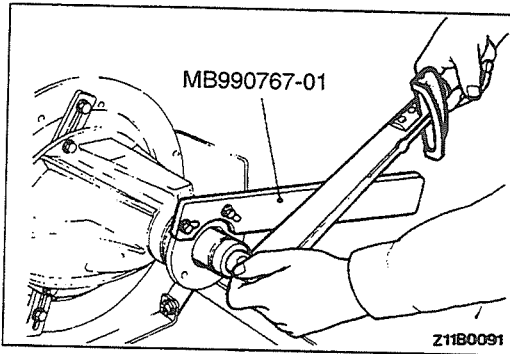
- (5) Remove the companion flange and drive pinion again.

With oil seal

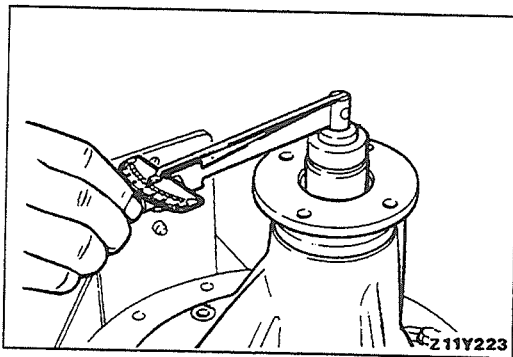
- (1) After setting the drive pinion front bearing inner race, use the special tool to drive the oil seal into the front lip of the gear carrier.



- (2) Apply a thin coat of clean multi-purpose grease to the companion flange contact surfaces of the washer and the oil seal contacting surface before installing the drive pinion assembly.



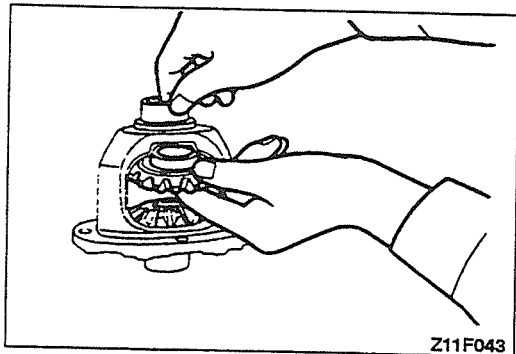
- (3) Install the drive pinion assembly and companion flange with the mating marks properly aligned, and then use the special tools to tighten the companion flange self-locking nut to the specified torque.



- (4) If the drive pinion rotation torque is not within the range of the standard value, adjust the rotation torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

Standard value:

Bearing division	Bearing lubrication	Rotation torque
New	None (With anti-rust agent)	0.85–1.15 Nm 7.4–10.0 in.lbs.
New/reused	Gear oil applied	0.65–0.75 Nm 5.6–6.5 in.lbs.



▶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) Provisionally install the pinion shaft.

NOTE

Do not assemble the thrust block and lock pin yet.

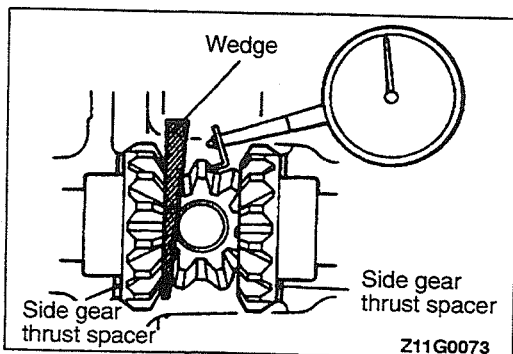
- (3) Insert a wedge between the side gear and the pinion shaft to lock the side gear.
- (4) While locking the side gear with a wedge, use a dial indicator to measure the differential gear backlash on the pinion gear.

Standard value: 0.076 mm (.0030 in.) or less

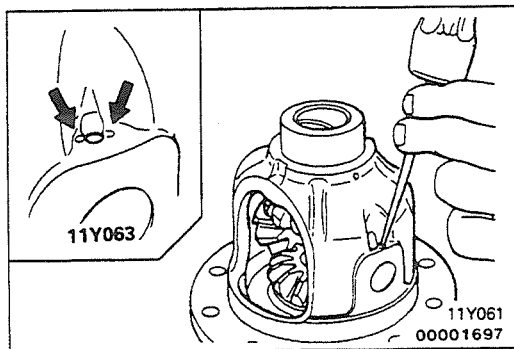
Limit: 0.2 mm (.0079 in.)

NOTE

Measure both pinion gears.

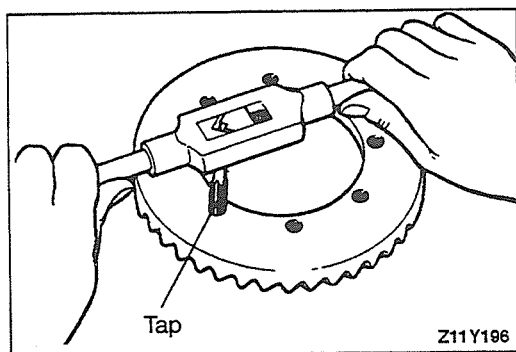


- (5) If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear thrust spacers on both sides.
- (6) Measure the differential gear backlash again, and check that it is within the limit.
If adjustment is not possible, replace the side gears and pinion gears as a set.



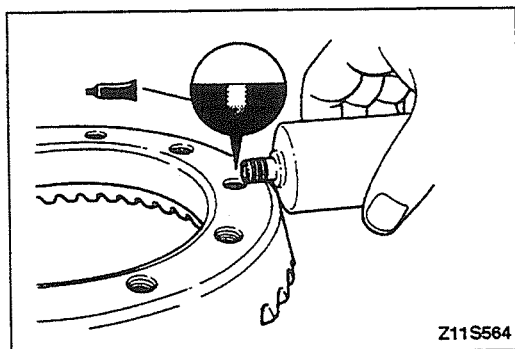
►F◄ LOCK PIN INSTALLATION

- (1) Align the pinion shaft lock pin hole with the differential case lock pin hole, and then 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 mounting bolts.
- (2) Remove the adhesive which is adhering to the threaded holes of the drive gear by turning the tap tool (M10×1.25), and then clean the threaded holes by applying compressed air.

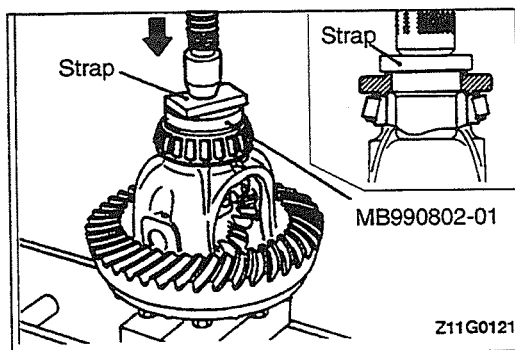


- (3) Apply specified adhesive to the threaded holes of the drive gear.

Specified adhesive:

3M Stud Locking Part No. 4170 or equivalent

- (4) Install the drive gear to the differential case so that the mating marks are properly aligned. Tighten the bolts to the specified torque in a diagonal sequence.

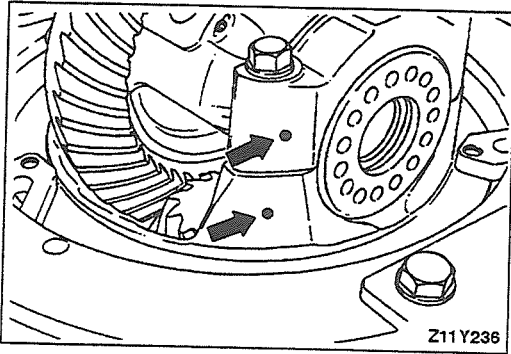


►H◄ SIDE BEARING INNER RACE INSTALLATION

Use the special tool to press-fit the side bearing inner races into the differential case.

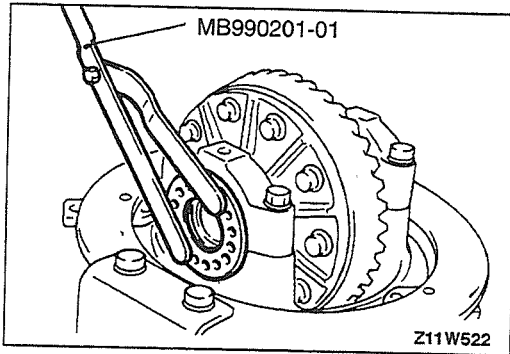
Caution

When only one side bearing inner race is installed, place a load on the differential case only.



▶I◀ BEARING CAP INSTALLATION

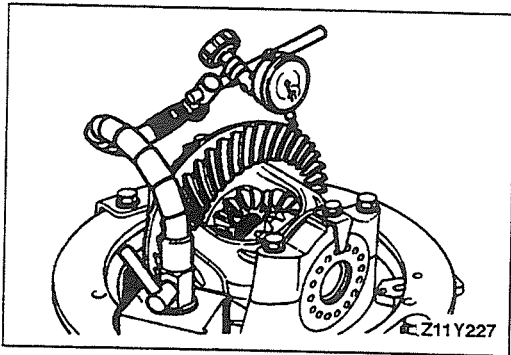
Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.



▶J◀ FINAL DRIVE GEAR BACKLASH ADJUSTMENT

Adjust the final drive gear backlash by the following procedure.

- (1) Use the special tool to provisionally tighten the side bearing nut until it is in the state just before preloading of the side bearing.



- (2) Measure the final drive gear backlash.

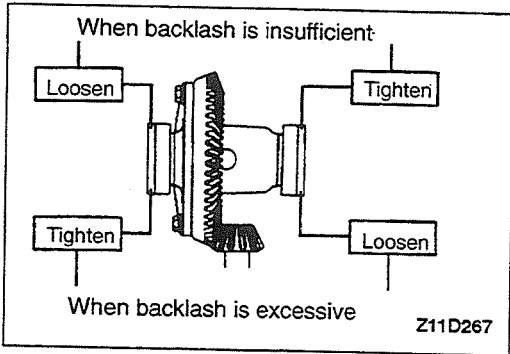
Standard value:

Except 3.5L engine with rear differential lock
0.13–0.18 mm (.0051–.0071 in)

3.5L engine with rear differential lock
0.12–0.18 mm (.0047–.0071 in)

NOTE

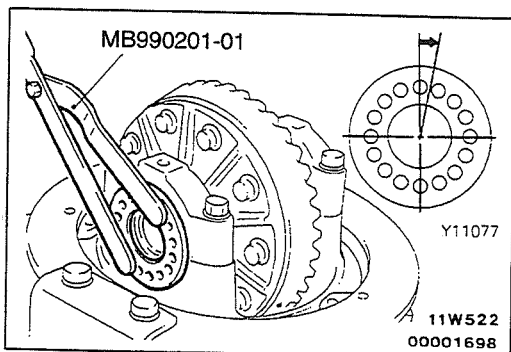
Measure at four points or more on the circumference of the drive gear.



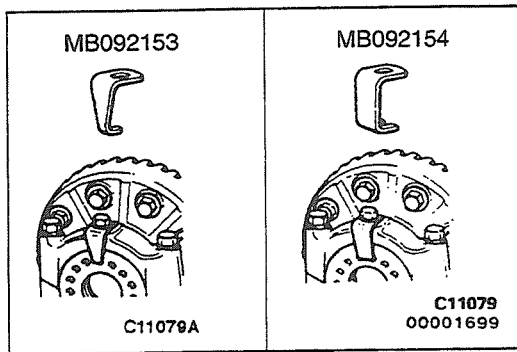
- (3) Use the special tool (MB990201) to adjust the backlash to the standard value by moving the side bearing nut as shown.

NOTE

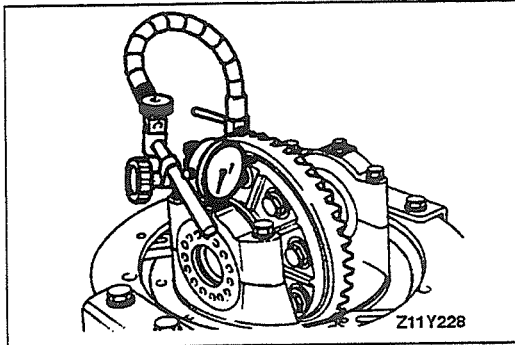
First turn the side bearing nut for loosening, and then turn the side bearing nut for tightening by the same amount.



- (4) Use the special tool to turn both right and left side bearing nuts one half the distance between the centers of two neighboring holes to apply the preload.



- (5) Choose and install the lock plates (two types).
- (6) Check the final drive gear tooth contact. If poor contact is evident, carry out adjustment. (Refer to GROUP 26–Differential Carrier.)



- (7) Measure the drive gear runout.
Limit: 0.05 mm (.0020 in.)
- (8) If the drive gear runout exceeds the limit, remove the differential case and the drive gears, move them to different positions and then reinstall them.

DIFFERENTIAL CASE

DISASSEMBLY AND REASSEMBLY

<Vehicles with 3.0L engine, 3.5L engine with limited slip differential>



Gear oil:

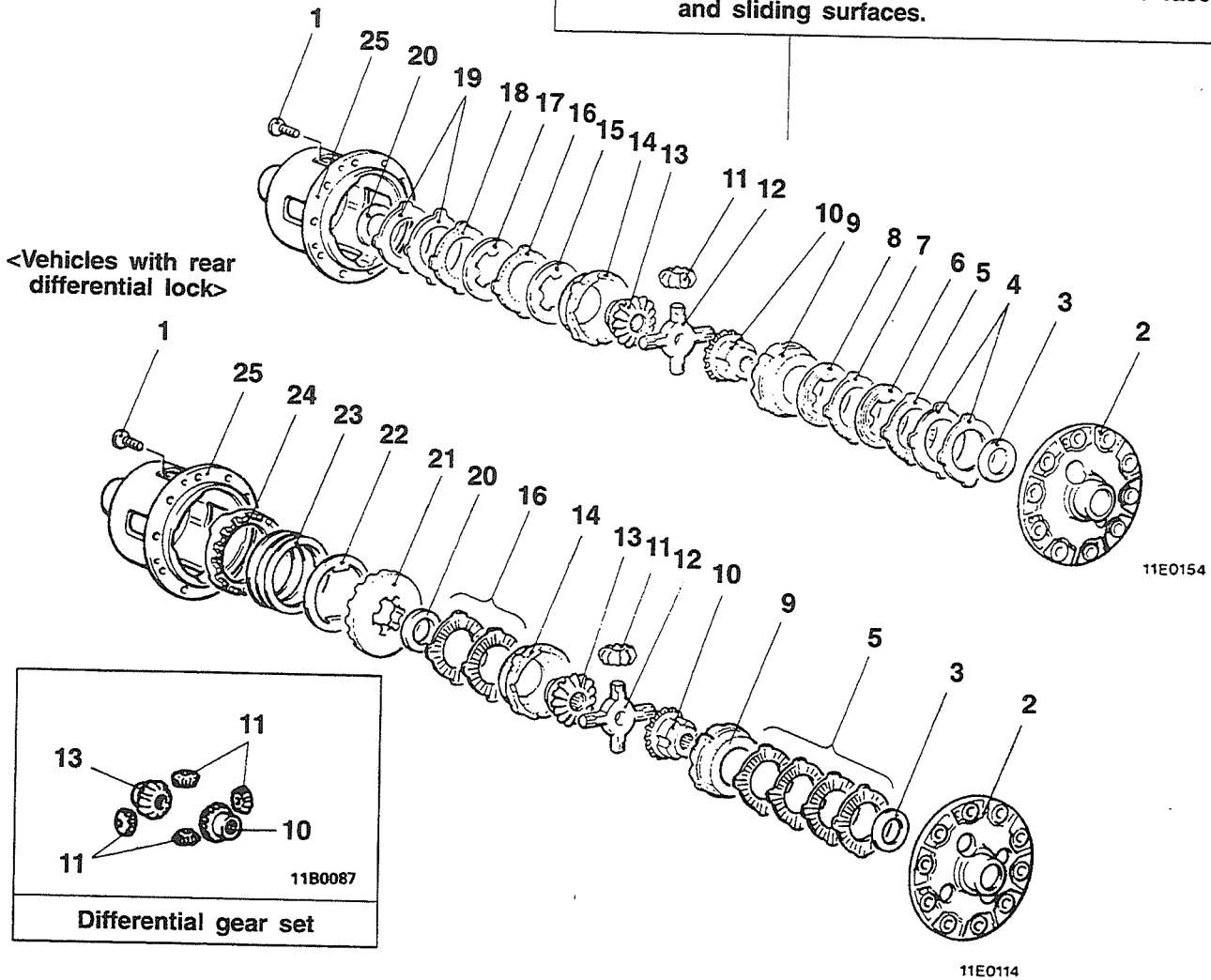
MITSUBISHI Genuine Gear Oil Part No. 8149630EX or equivalent

Caution

Apply the specified gear oil to each component; especially be careful to coat contact surfaces and sliding surfaces.

<Vehicles with limited slip differential>

<Vehicles with rear differential lock>



00001700

Disassembly steps

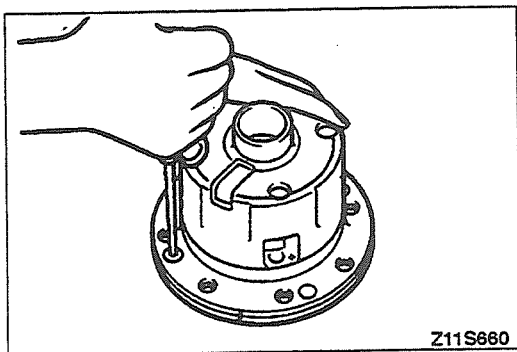


1. Screw
2. Differential case (A)
3. Thrust washer
4. Spring plate
5. Friction plate
6. Friction disc
7. Friction plate
8. Friction disc
9. Pressure ring
10. Side gear
11. Differential pinion gear
12. Differential pinion shaft
13. Side gear



14. Pressure ring
15. Friction disc
16. Friction plate
17. Friction disc
18. Friction plate
19. Spring plate
20. Thrust washer
21. Driven cam
22. Spring washer
23. Spring
24. Drive cam
- Clutch plate friction force adjustment
25. Differential case (B)

TSB Revision



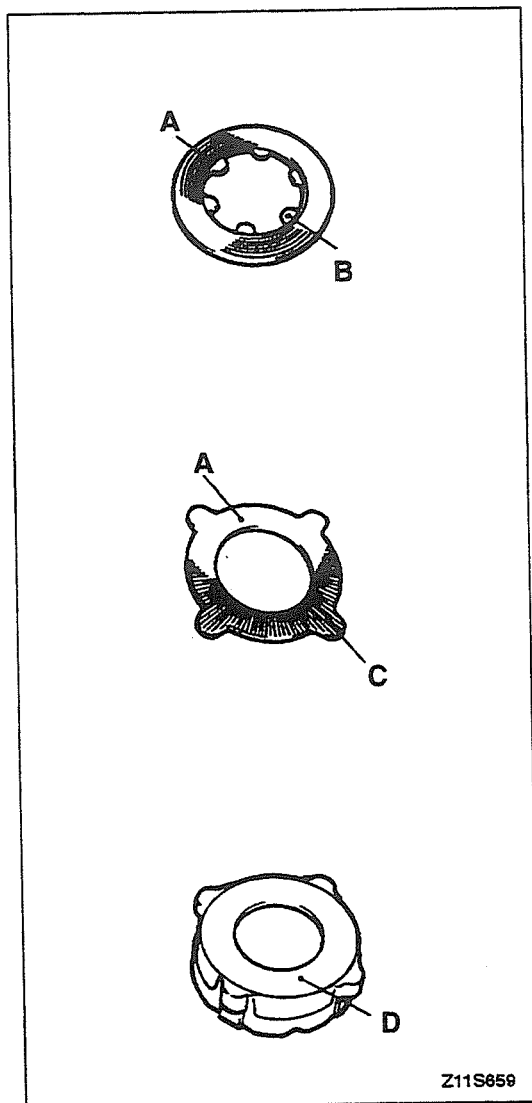
DISASSEMBLY SERVICE POINTS

◀A▶ SCREW REMOVAL

- (1) Loosen the screws of the differential cases (A) and (B) uniformly a little at a time.
- (2) Separate differential case (A) from differential case (B).
- (3) Remove the components from differential case (B).

NOTE

Keep the right and left thrust washers, spring plates, spring discs, friction plates and friction discs separate in order to be able to distinguish them for reassembly.



INSPECTION

CONTACT AND SLIDING SURFACES OF PARTS

- (1) Check the friction plate, friction disc, spring plate and pressure ring.

A. Friction surfaces of friction plate, friction disc and spring plate

If there are any signs of seizure, severe friction or color 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. Six projections on inner circumference of friction disc

If there are nicks and dents, it will cause abnormalities in the clutch pressure. Use an oil stone to repair the parts. If the parts cannot be repaired, replace them.

C. Four projections on outer circumference of friction disc

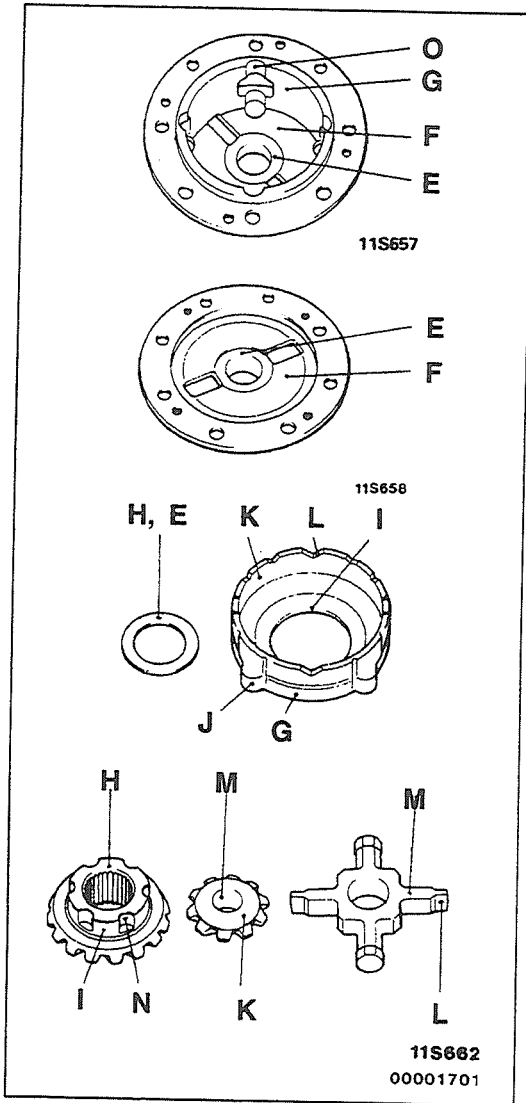
If there are nicks and dents, it will cause abnormalities in the clutch pressure. Use an oil stone to repair the parts. If the parts cannot be repaired, replace them.

D. Friction surface of pressure ring friction disc

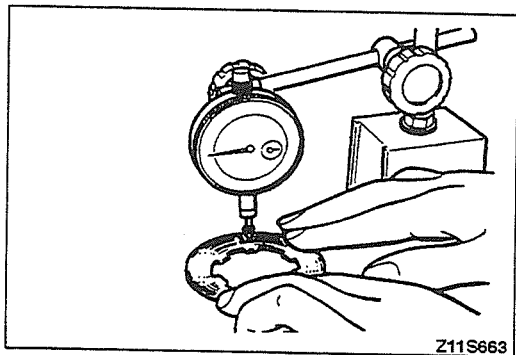
If there are nicks and scratches, repair the part by first grinding with an oil stone and then polishing with rubbing compound on a surface plate.

NOTE

The strong contact on the inner circumference of the friction surface is because of the spring plate. This wear is not abnormal.



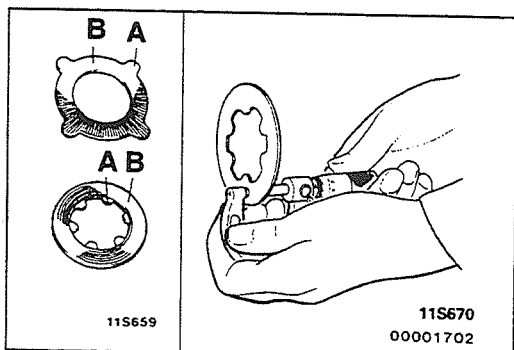
- (2) Inspect the contact and sliding surfaces listed below, and repair any nicks and burrs by using an oil stone.
- E. Sliding surfaces of thrust washer and case
 - F. Spring contacting surface of differential case
 - G. Contact surfaces of outer circumference of pressure ring and inner circumference of differential case
 - H. Sliding surfaces of side gear and thrust washer
 - I. Sliding surfaces of hole in pressure ring and outer circumference of side gear
 - J. Projection on outer circumference of pressure ring
 - K. Spherical surface of differential pinion gear and inner diameter of pressure ring
 - L. V-shaped groove in pressure ring and V-shaped part in pinion shaft
 - M. Outer diameter of pinion shaft and hole of differential pinion gear
 - N. Outer circumference groove of side gear
 - O. Inner circumference groove of differential case



THE FRICTION PLATE AND FRICTION DISC WARPING

Use a dial indicator to measure the amount of warping (flatness) of the friction plate and friction disc on a surface plate by turning the plate or disc.

Limit: 0.08 mm (.0031 in.)



THE FRICTION PLATE AND FRICTION DISC WEAR

- (1) In order to measure the wear, measure the thickness of the friction surfaces and projections of the friction disc and plate, and then find the difference.

Limit: 0.1 mm (.0039 in.)

NOTE

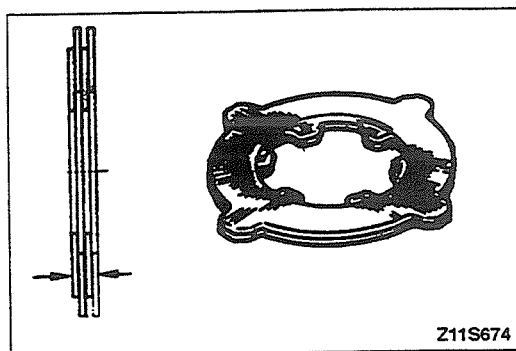
Make the measurements at several different points.

- (2) If the parts are worn beyond the allowable limit, replace them with new parts.

REASSEMBLY SERVICE POINTS

▶◀ CLUTCH PLATE FRICTION FORCE ADJUSTMENT

Before assembly, use the following method to adjust the clearance between the spring plates and the 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.

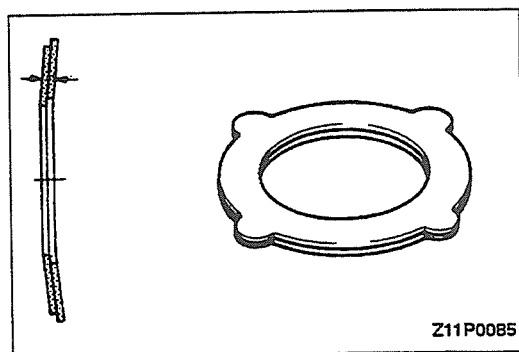


- (1) Arrange the two friction discs and friction plates for each side one on top of the other as shown in the illustration, so that the difference in thickness between the left and right is at the standard value.

Standard value: 0.05 mm (.0020 in.) or less

NOTE

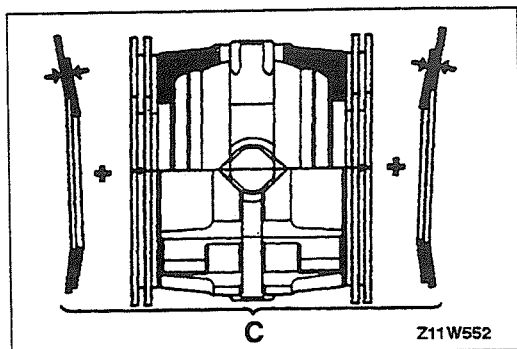
For new parts, there is one type of friction plate [1.75 mm (.0689 in.)] and two types of friction disc [1.75 mm (.0689 in.) and 1.85 mm (.0728 in.)].



- (2) Arrange the two spring plates for each side one on top of the other as shown in the illustration, so that the difference between the left and right thicknesses is minimized.

NOTE

For new parts, there is one type of spring disc and spring plate [1.75 mm (.0689 in.)].



- (3) Assemble the pressure ring's internal components (different pinion shaft and pressure ring) and the friction discs and friction plates, and then measure the overall width as shown in the illustration.

- (4) Calculate the total value (C) of the thickness of the two sets of spring plates plus the value measured in (3) above.

- (5) Obtain the dimension (D) between the spring plate contact surfaces when differential cases (A) and (B) are combined.

$$(D = E + F - G)$$

- (6) Change the thickness of the friction disc so that the clearance (D-C) between the differential case and the spring plate (vehicles with limited slip differential) or friction disc (vehicles with rear differential lock) is at the standard value.

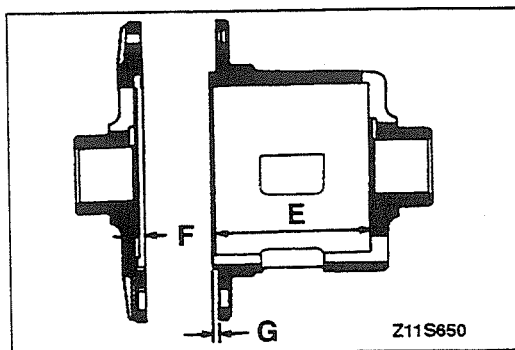
Standard value:

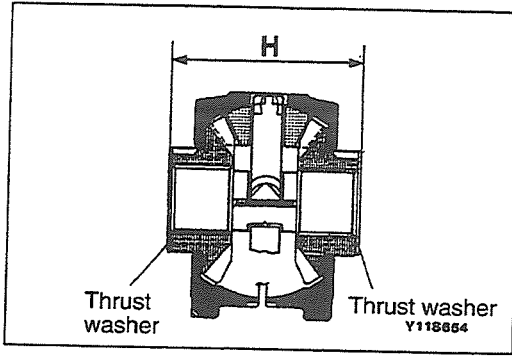
<Vehicles with limited slip differential>

0.06–0.20 mm (.0024–.0079 in.)

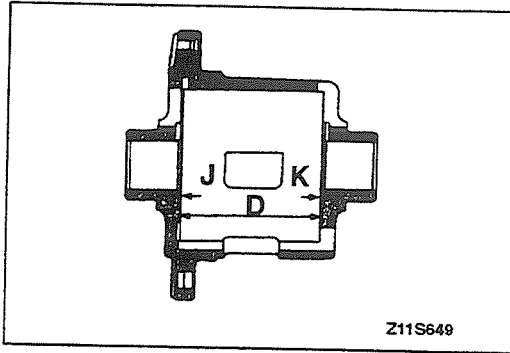
<Vehicles with rear differential lock>

0.05–0.20 mm (.0020–.0079 in.)





- (7) Remove the spring plates, spring discs, friction plates and friction disc.
- (8) Measure the dimension (H) from one end of the thrust washer to the other end.



- (9) Calculate the dimension (I) between the thrust washer contact surfaces when differential cases (A) and (B) are combined.
($I = D + J + K$)

NOTE

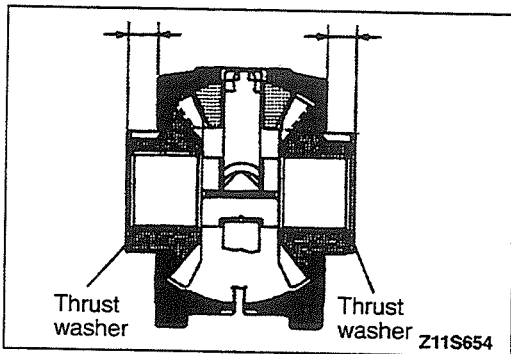
Dimension (D) is the distance between the spring plate contact surfaces when differential cases (A) and (B) are combined. (Refer to P.27-42.)

- (10) Change the thickness of the thrust washer so that the clearance (I–H) between the thrust washer and the differential case is at the standard value.

Standard value: 0.05–0.20 mm (.0020–.0079 in.)

NOTE

There are three sizes of new thrust washers: 1.50 mm (.0591 in.), 1.60 mm (.0630 in.) and 1.70 mm (.0670 in.).

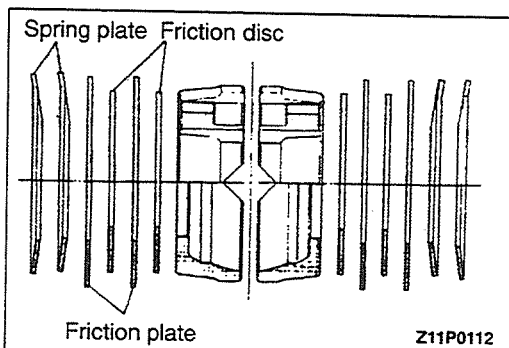


- (11) Insert the thrust washer as shown in the illustration, and then select a thrust washer so that the difference between the left and right dimensions from the pressure ring rear face to the thrust washer end face is at the standard value.

Standard value: 0.05 mm (.0020 in.) or less

NOTE

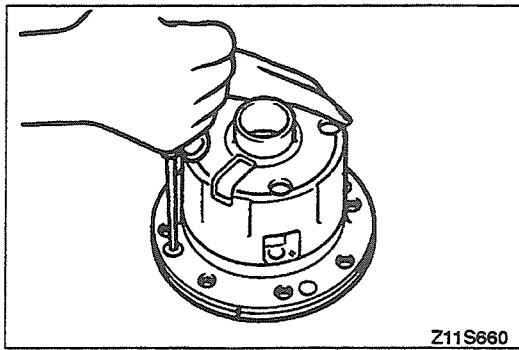
Measure the distance while squeezing the V-shaped groove manually.



- (12) Place each part in differential case (B) as shown in the illustration.

NOTE

Be careful not to insert the friction plates and friction discs in the incorrect order or install the spring plates in the incorrect direction.



Z11S860

►B◄ SCREW INSTALLATION

- (1) Align the mating marks (the same numeral on each case) of differential case (A) and differential case (B).
- (2) Turn the screwdriver slowly several times to tighten the screw so that the cases are in close contact.

NOTE

If the end surfaces of differential case (A) and differential case (B) do not come into close contact even though the screw is tightened, the thrust washer and the spring plate are probably not fitting into the groove correctly, so repeat the reassembly procedure.

- (3) After assembly, use the special tools to measure the starting torque in order to check the frictional force of the clutch plate.

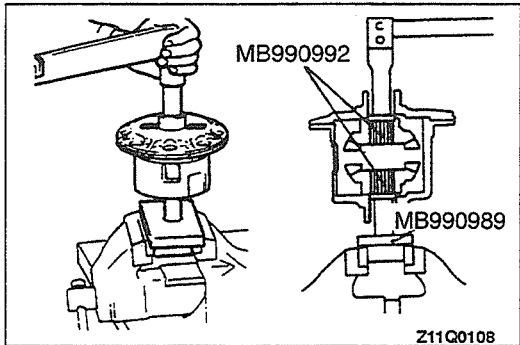
Standard value:

When a new clutch plate is used

40–75 Nm (29–54 ft.lbs.)

When an old clutch plate is used

25–75 Nm (18–54 ft.lbs.)



Z11Q0108

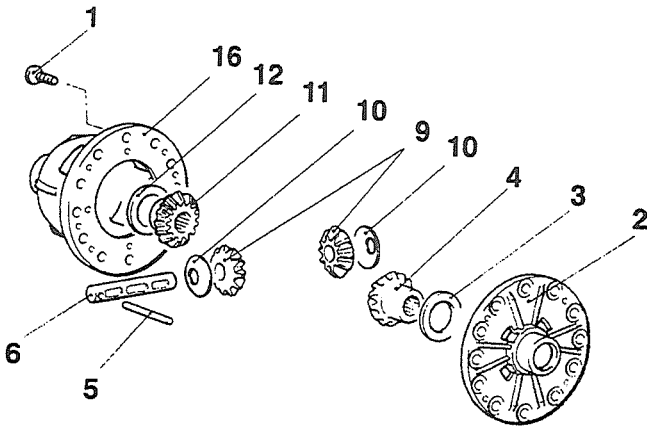
NOTE

Measure the starting torque after rotating the clutch plate slightly. When measuring the torque, do so at the beginning of movement.

DISASSEMBLY AND REASSEMBLY <Vehicles with 6G74 engine>

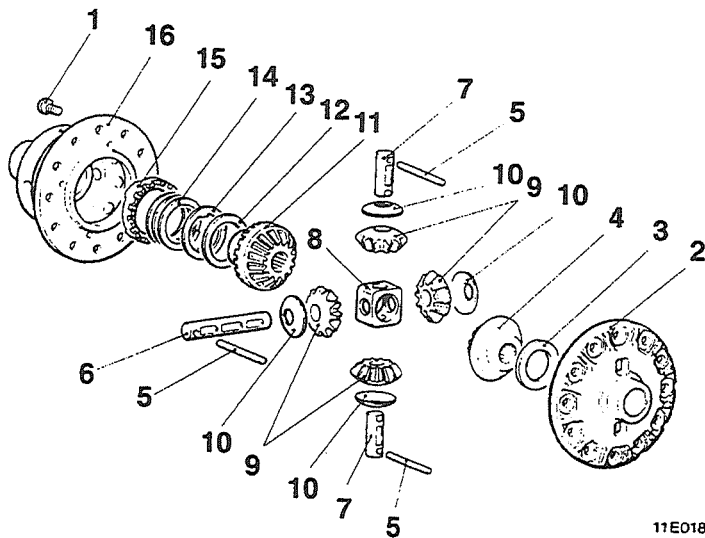
110005354

<Conventional differential>



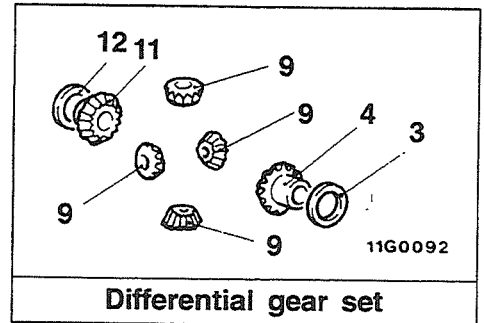
<Rear differential lock>

11E0198



11E0189

00001825



Differential gear set

Disassembly steps

◀A▶

1. Screw
2. Case A
3. Side gear spacer (RH)
4. Side gear (RH)

▶B▶

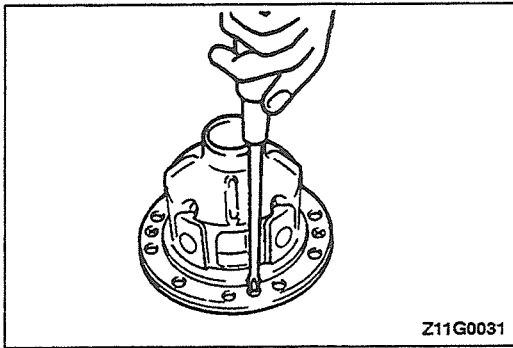
- Backlash adjustment on differential gear case A side

◀B▶

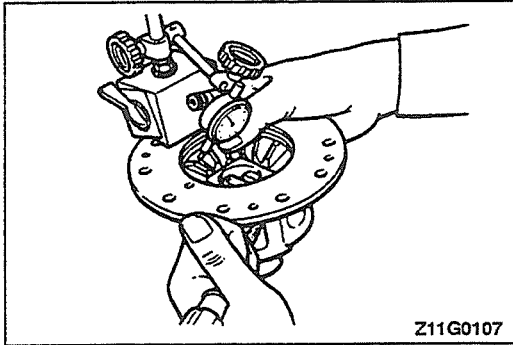
- Differential gear backlash check
5. Lock pin
 6. Pinion shaft-A
 7. Pinion shaft-B
 8. Pinion shaft holder

▶A▶

9. Pinion gear
10. Washer
11. Side gear (LH)
12. Side gear spacer (LH)
13. Spring washer
14. Spring
15. Drive cam
- Backlash adjustment on differential gear case B side
16. Case B



Z11G0031



Z11G0107

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 (RH) and side gear (RH).

NOTE

Check differential gear backlash to determine necessity of disassembling side (RH) 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 (LH) 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:

Conventional differential

0.10–0.25 mm (0.004–0.01 in.)

Rear differential lock

0.15–0.20 mm (0.005–0.008 in.)

- (3) When backlash exceeds the standard value, adjust side gear spacer (LH).

NOTE

If backlash is within the standard value, assure appropriate gear spacer (RH) thickness and assemble differential case assembly.

INSPECTION

Wash the disassembled parts in cleaning solvent, dry them using compressed air, and then check the following areas:

- Check the side gears, pinion gears and pinion shaft for wear or damage.
- Check the side gear spline for wear or damage.

REASSEMBLY SERVICE POINTS

▶A◀ BACKLASH ADJUSTMENT ON DIFFERENTIAL GEAR CASE B SIDE

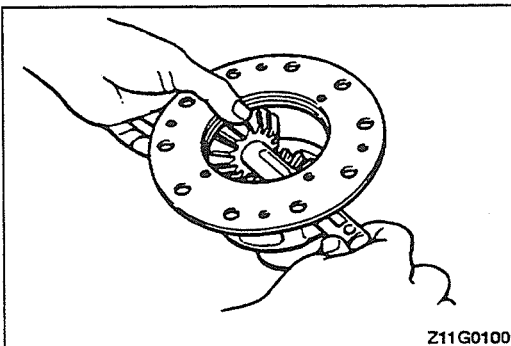
Adjust backlash on differential gear case B side as follows.

- (1) Temporarily install side gear spacer (LH), side gear (LH), washers, 2 pinion gears and pinion shaft A on case B.

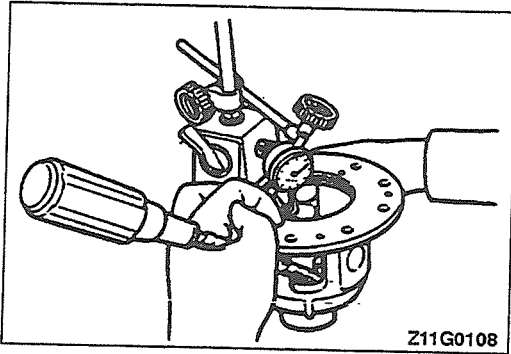
NOTE

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 (LH.)



Z11G0100



- (3) Place dial gauge on unlocked pinion gear and measure differential gear backlash within the standard value.

Standard value:

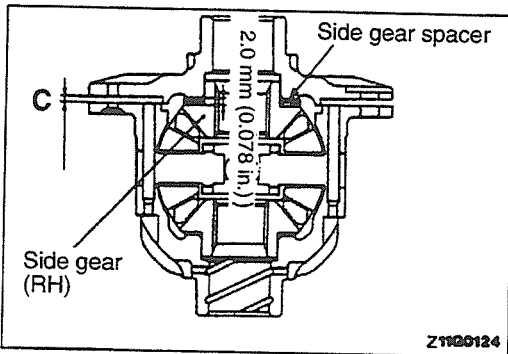
Conventional differential

0.10–0.25 mm (0.004–0.01 in)

Rear differential lock

0.15–0.20 mm (0.005–0.008 in)

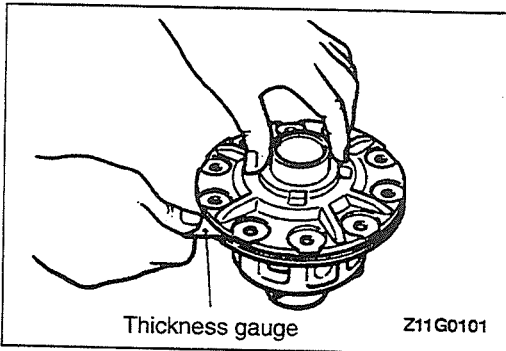
- (4) When backlash exceeds the standard value, adjust with selected side gear spacer (LH).
- (5) Install washers, pinion gears, pinion shaft holder and pinion shaft-A and B. Lock with the lock pin through case B.



►B◄ **BACKLASH ADJUSTMENT ON DIFFERENTIAL GEAR CASE A SIDE**

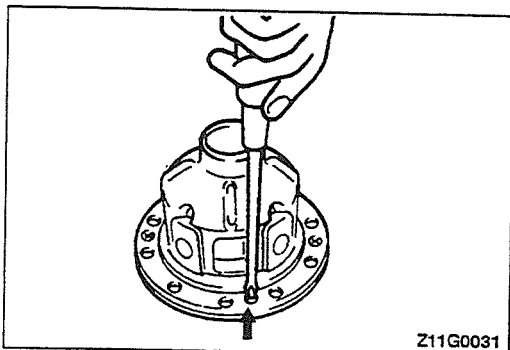
Adjust backlash as follows.

- (1) Install side gear (RH) and 2 side gear spacers [1.0 mm (0.039 in.) 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 (RH) thickness (D) as follows:

$$D = 2.0 \text{ mm (0.078 in.)} - [C + 0.2 \text{ mm (0.008 in.)}]$$
- (4) Choose spacer with a thickness nearest D in (3) and adjust differential gear backlash on the right side.



- (5) Match the match marks and assemble cases A and B.
- (6) Assure smooth rotation of inner shaft.

NOTES



WHEEL AND TIRE

CONTENTS

110005355

GENERAL SPECIFICATIONS	2	SERVICE SPECIFICATIONS	2
SERVICE ADJUSTMENT PROCEDURES	4	TROUBLESHOOTING	3
Tire Inflation Pressure Check	4		
Tire Wear Check	4		
Wheel Runout Check	4		



31-2 WHEEL AND TIRE – General Specifications/Service Specifications

GENERAL SPECIFICATIONS

110005356

Items		Vehicles without wide fender	Vehicles with wide fender <3.0L engine>	
Tire size		P235/75R15 105S	31×10.50R15 LT	265/70R15 110H
Wheel type		Steel type Aluminum type*	Aluminum type	Aluminum type
Wheel size		15×6JJ	15×7JJ	15×7JJ
Amount of wheel offset mm (in.)		33 (1.29)	10 (.39)	10 (.39)
P.C.D. mm (in.)		139.7 (5.5)	139.7 (5.5)	139.7 (5.5)
Tire inflation pressure kPa (psi)	Front	180 (26)	210 (30)	180 (26)
	Rear	240 (35)	275 (40)	200 (29)

Items		Vehicles with wide fender <3.5L engine>	
Tire size		265/70R15 110H	31×10.50R15 LT
Wheel type		Aluminum type	Aluminum type
Wheel size		15×7JJ	15×7JJ
Amount of wheel offset mm (in.)		10 (.39)	10 (.39)
P.C.D. mm (in.)		139.7 (5.5)	139.7 (5.5)
Tire inflation pressure kPa (psi)	Front	180 (26)	210 (30)
	Rear	220 (32)	310 (45)

NOTE

- * indicates options.
- P.C.D. (Pitch Circle Diameter) indicates the pitch circle diameter of the wheel installation holes.

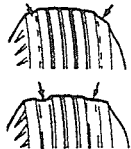
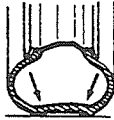
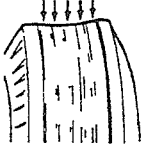
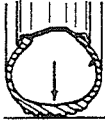
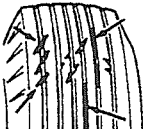
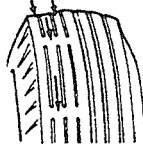
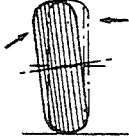
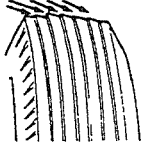
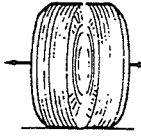

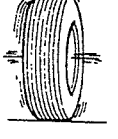
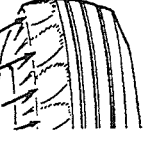
SERVICE SPECIFICATIONS

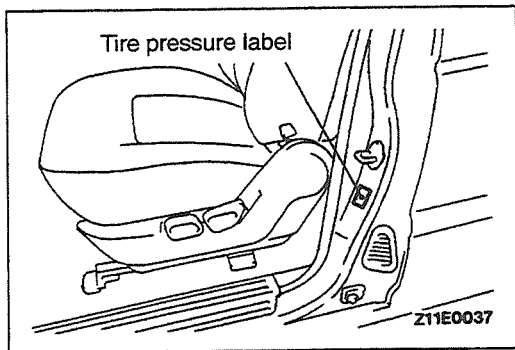
110005357

Items			Standard value	Limit
Wheel nut tightening torque Nm (ft.lbs.)			98–118 (72–87)	–
Wheel runout mm (in.)	Radial	Aluminum wheels	–	1.0 (.039)
		Steel wheels	–	1.2 (.047)
	Lateral	Aluminum wheels	–	1.0 (.039)
		Steel wheels	–	1.2 (.047)
Tread depth of tire mm (in.)			–	1.6 (.06)

TROUBLESHOOTING

110005358

Trouble Symptom	Probable Cause		Remedy	
Rapid wear at shoulders	 <p>11X0109</p>	Under-inflation or lack of rotation	 <p>11X0116</p>	Adjust the tire pressure.
Rapid wear at center	 <p>11X0110</p>	Over-inflation or lack of rotation	 <p>11X0117</p>	
Cracked treads	 <p>11X0111</p>	Under-inflation		Adjust the tire pressure.
Wear on one side	 <p>11X0112</p>	Excessive camber	 <p>11X0118</p>	Check the camber.
Feathered edge	 <p>11X0113</p>	Incorrect toe-in	 <p>11X0119</p>	Adjust the toe-in.
Bald spots	 <p>11X0114</p>	Unbalanced wheel	 <p>11X0120</p>	Adjust the unbalanced wheels.
Scalloped wear	 <p>11X0115</p>	Lack of rotation of tires or worn or out-of-alignment suspension		Rotate the tires. Check the front suspension alignment.

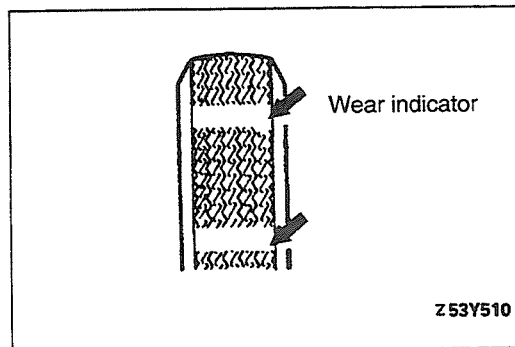


SERVICE ADJUSTMENT PROCEDURES

TIRE INFLATION PRESSURE CHECK

110005359

Check the inflation pressure of the tires. If it is not within the standard value, adjust it.



TIRE WEAR CHECK

110005360

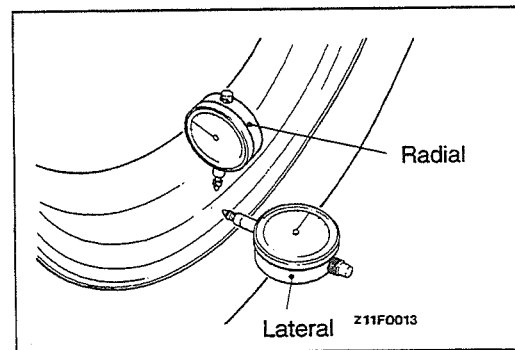
Measure the tread depth of the tires.

Limit: 1.6 mm (.06 in.)

If the remaining tread depth is less than the limit, replace the tire.

NOTE

When the tread depth of the tire is reduced to 1.6 mm (.06 in.) or less, the wear indicator will appear.



WHEEL RUNOUT CHECK

110005361

Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, use a dial indicator to measure the wheel runout.

Limit:

Items	Aluminum wheels	Steel wheels
Radial	1.0 mm (.039 in.)	1.2 mm (.047 in.)
Lateral	1.0 mm (.039 in.)	1.2 mm (.047 in.)

If the wheel runout exceeds the limit, replace the wheel.

POWER PLANT MOUNT

CONTENTS

110005088

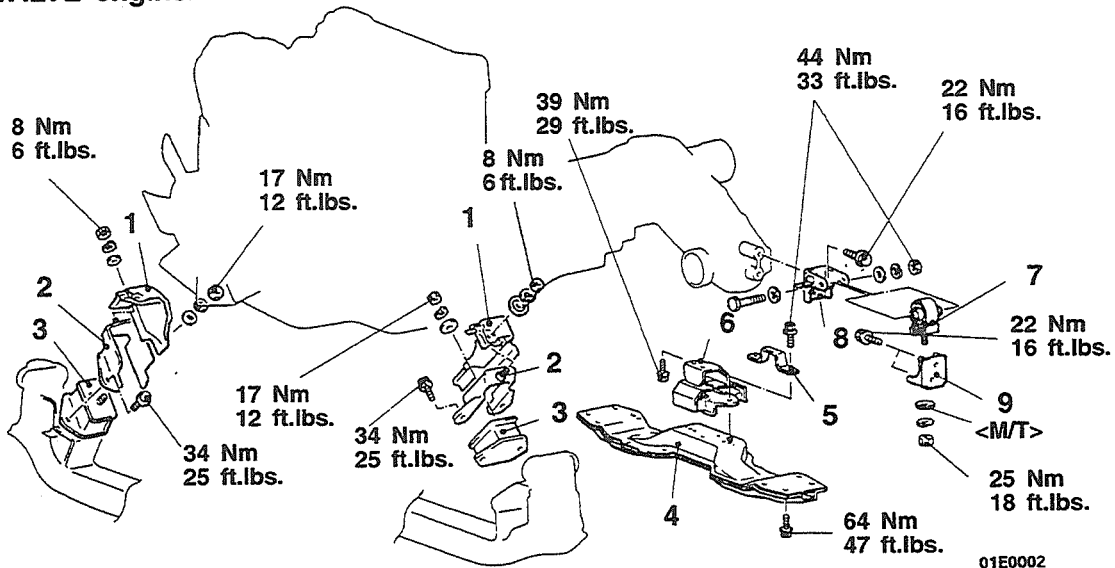
ENGINE MOUNTING	2	FRONT DIFFERENTIAL MOUNTING	4
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ENGINE MOUNTING
REMOVAL AND INSTALLATION

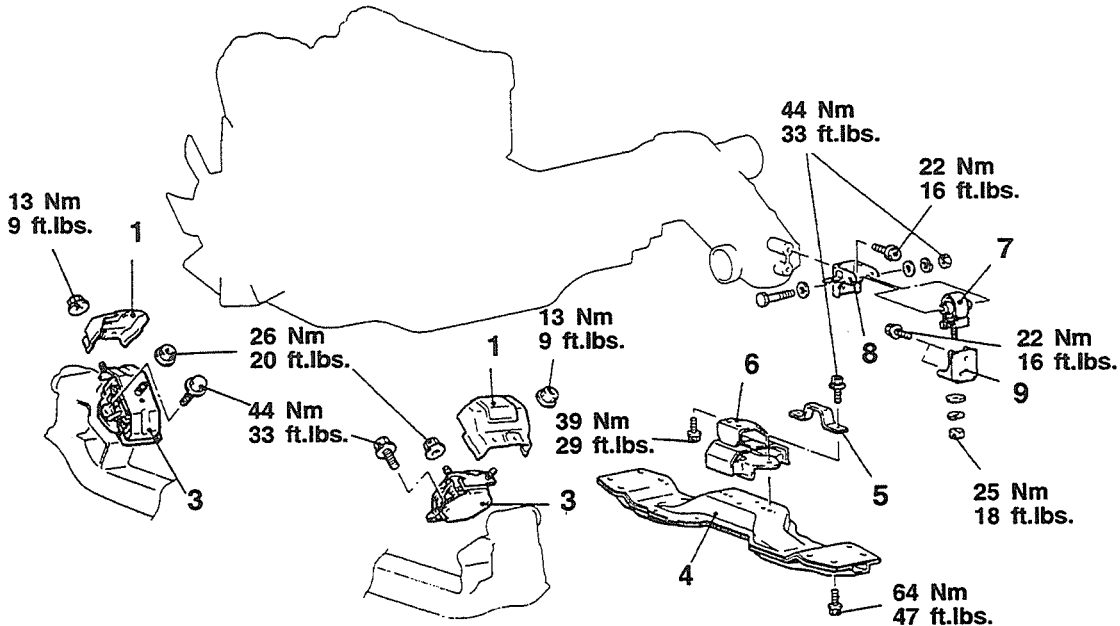
110005089

<3.0L-12VALVE engine>



01E0002

<3.0L-24VALVE engine M/T>



01E0149
00002082

Removal steps of front engine mount

- Removal of Engine Assembly
(Refer to GROUP 11 – Engine Assembly.)
- 1. Heat protector
- 2. Front insulator stopper
- 3. Engine support front insulator

Removal steps of rear engine mount

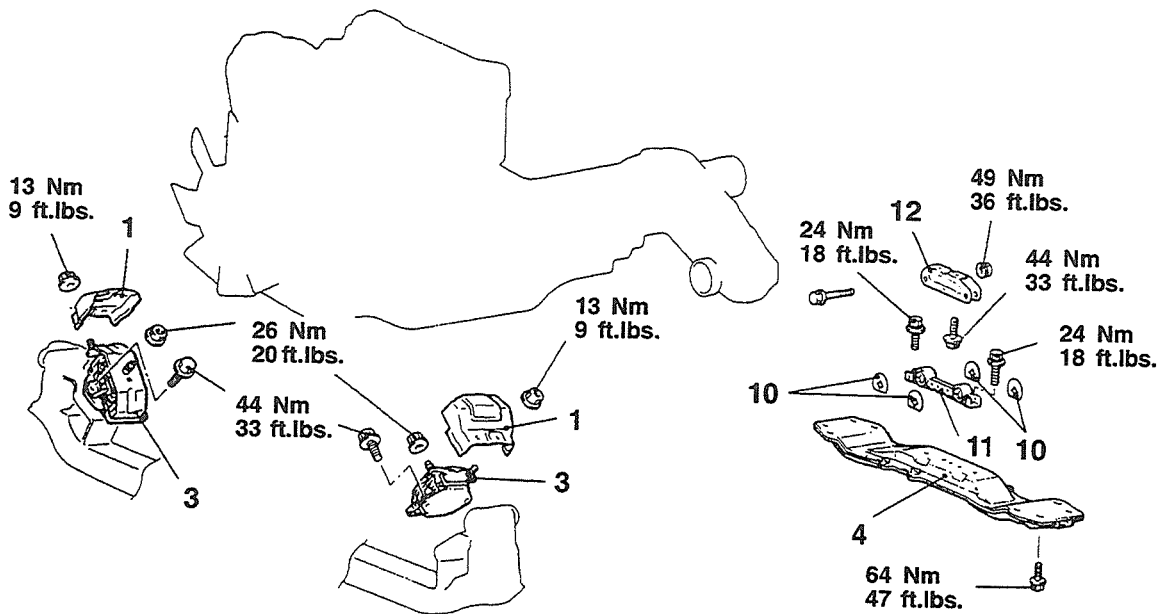
- 4. No. 2 crossmember
- 5. Stopper
- 6. Engine support rear insulator

Removal steps of transfer roll stopper

- 7. Transfer support insulator
- 8. Transfer mounting bracket
- 9. Transfer support bracket



<3.0L-24VALVE engine A/T, 3.5L engine>



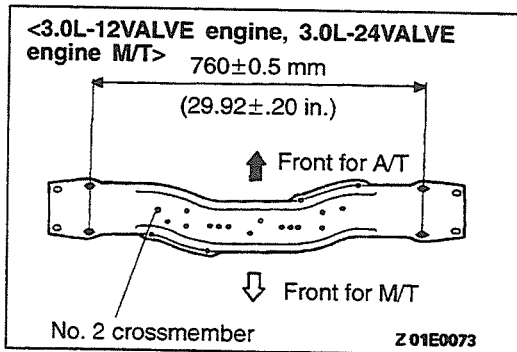
A01E0150

Removal steps of front engine mount

- Removal of Engine Assembly (Refer to GROUP 11 – Engine Assembly.)
- 1. Heat protector
- 3. Engine support front insulator

Removal steps of rear engine mount

- 4. No. 2 crossmember
- 10. Stopper
- 11. Engine support rear insulator
- 12. Engine support rear bracket



INSPECTION

- Check the insulators for cracks, separation or deformation.
- Check the front insulator stoppers for deformation.
- Check the insulators for cracks, separation or deformation.
- Check the transfer mounting bracket for deformation or corrosion. <3.0L-12 VALVE engine, 3.0L-24 VALVE engine M/T>
- Check the transfer support bracket for deformation or corrosion. <3.0L-12 VALVE engine, 3.0L-24 VALVE engine M/T>
- Check the No. 2 crossmember for deformation or corrosion.

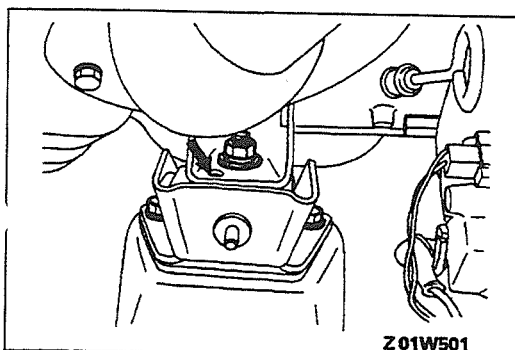
SERVICE POINTS OF INSTALLATION

◀A▶ INSTALLATION OF ENGINE SUPPORT FRONT INSULATOR <3.0L-12VALVE engine>

Check that the location boss and hole are aligned.

Caution

Do not distort the rubber portions, and never stain the rubber portions with fuel or oil.

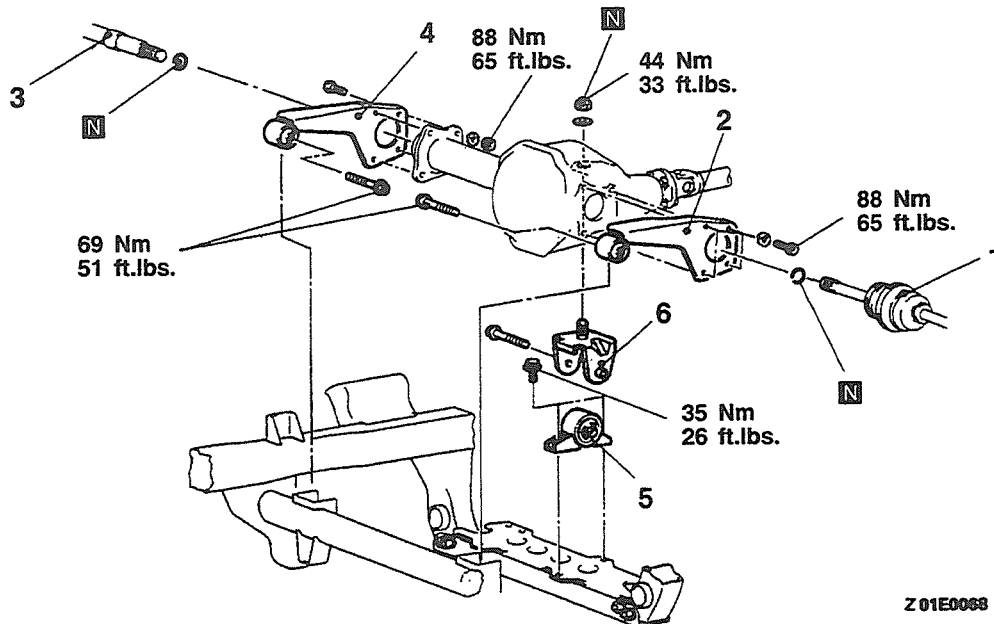


FRONT DIFFERENTIAL MOUNTING

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Under Cover and Under Skid Plate Removal and Installation



Z 01E0068

Removal steps

1. Knuckle and drive shaft assembly (Refer to GROUP 26 – Knuckle, Drive Shaft.)
2. Differential mounting bracket (L.H.)

3. Inner shaft (Refer to GROUP 26 – Inner Shaft.)
4. Differential mounting bracket (R.H.)
5. Differential mounting bracket
6. Differential support bracket

REMOVAL SERVICE POINTS

◀A▶ **DIFFERENTIAL MOUNTING BRACKET (L.H.)/DIFFERENTIAL MOUNTING BRACKET (R.H.)/DIFFERENTIAL MOUNTING BRACKET REMOVAL**

While supporting the differential carrier with a jack, remove the differential mounting bracket.

NOTE

Support the differential carrier with a jack until the differential mounting bracket is installed.

INSPECTION

- Check the differential mounting brackets for deformation or damage.
- Check the differential support bracket for deformation or damage.
- Check insulators for cracks, separation or deformation.

FRONT SUSPENSION

CONTENTS

110005091

FRONT SUSPENSION 33A

**ELECTRONICALLY-CONTROLLED
SUSPENSION (ECS) 33B**

**ELECTRONICALLY-CONTROLLED
SUSPENSION (ACTIVE PREVIEW ECS) ... 33C**

NOTE

The tinted sections are not included in this manual.



FRONT SUSPENSION

CONTENTS

110005092

CONTROL SWITCH	22	SERVICE SPECIFICATIONS	2
CONTROL UNIT	22	SHOCK ABSORBER AND UPPER ARM	11
GENERAL SPECIFICATIONS	2	Ball Joint Dust Cover Replacement	12
LOWER ARM	14	SPECIAL TOOLS	3
Lower Arm Bushing Replacement	15	STABILIZER BAR <1994 MODELS AND	
Lower Ball Joint Dust Cover Replacement	26	AFTER>	20
SEALANTS AND ADHESIVES	3	STABILIZER BAR <UP TO 1993	
SERVICE ADJUSTMENT PROCEDURES	9	MODELS>	19
Front Wheel Alignment Inspection and		TORSION BAR	17
Adjustment	9	TROUBLESHOOTING	4

33A-2 FRONT SUSPENSION – General Specifications/Service Specifications

GENERAL SPECIFICATIONS

110005093

SUSPENSION TYPE

Items	Specification
Suspension system	Independent, double wishbone with torsion bar and telescopic shock absorber

TORSION BAR

Items	Specifications
Length×O.D. mm (in.)	1277.5×26.2 (50.295×1.031) <3.0L-12VALVE engine> 1307.5×26.4 (51.476×1.039) <3.0L-24VALVE engine, 3.5L engine>
Spring constant (wheel position) N/mm (lbs./in.)	25 (140)

SHOCK ABSORBER

Items	Vehicles without remote-controlled variable shock absorbers	Vehicles with remote-controlled variable shock absorbers
Type	Hydraulic, cylindrical, double-acting type with low-pressure nitrogen gas	Hydraulic, cylindrical, double-acting type with low-pressure nitrogen gas
Max. length mm (in.)	345 (13.6)	345 (13.6)
Min. length mm (in.)	225 (8.9)	230 (9.1)
Stroke mm (in.)	120 (4.7)	115 (4.5)
Damping force [at 0.3 m/sec (0.9 ft./sec.)] N (lbs.)	Expansion	2,450 (540)
	Contraction	1,500 (331)
		Hard: 3,150 (694) Medium: 2,350 (518) Soft: 1,700 (375)
		Hard: 1,600 (353) Medium: 1,250 (276) Soft: 850 (187)

SERVICE SPECIFICATIONS

110005094

Items	Standard value	Limit	
Toe-in	At the center of tire tread mm (in.)	3.5±3.5 (.14±.14)	—
	At the rim of disc wheel mm (in.)	1.8±1.8 (.07±.07)	—
	Toe-in angle (per wheel)	0°–0°17'	—
	Toe-out angle on turn (inner wheel when outer wheel is at 20°)	21°56'	—

Items		Standard	Limit
Camber		0°40'±30'	—
Caster		3°00'±1°00'	—
Kingpin inclination		14°52'	—
Upper ball joint starting torque	Nm (in.bl.)	0.8–3.5 (7–30)	—
Shock absorber attaching dimension	mm (in.)		
	Normal shock absorber	1–2 (.04–.08)	—
	Remote-controlled variable shock absorber	1.5–2.5 (.06–.10)	—
Lower ball joint end play	mm (in.)	—	0.3 (.012)
Anchor arm attaching dimension	mm (in.)	138 (5.43)	—
Clearance between bump stopper and bump stopper bracket	mm (in.)	21–23 (.83–.91)	—
Stabilizer attaching bolt end attaching dimension	mm (in.)	8–9 (.31–.35)	—
Stabilizer link ball joint starting torque	Nm (in.bl.)	1.7–3.1 (15–27)	—

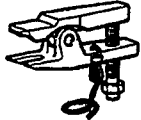
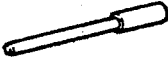

SEALANTS AND ADHESIVES


110005095

Items	Specified sealant
Upper ball joint dust cover to upper ball joint groove	3M ATD Part No. 8661 or equivalent

SPECIAL TOOLS

110005096

Tool	Tool number and name	Supersession	Application
	MB991406 Steering linkage puller		Removal of ball joints and knuckle
	MB990883 Arbor	MB990883-01	Removal and press-fitting of lower arm bushing
	MB991522 Torsion bar bushing remover and installer		Removal and press-fitting of the bushing

Tool	Tool number and name	Supersession	Application
	MB990326 Preload socket	General service tool	Measurement of the stabilizer link breakaway torque

TROUBLESHOOTING
 <Remote controlled variable shock absorbers>

110005097

THE TROUBLESHOOTING CHART SELECTION

Check the malfunction symptoms according to the following flow chart, and inspect according to the inspection chart.

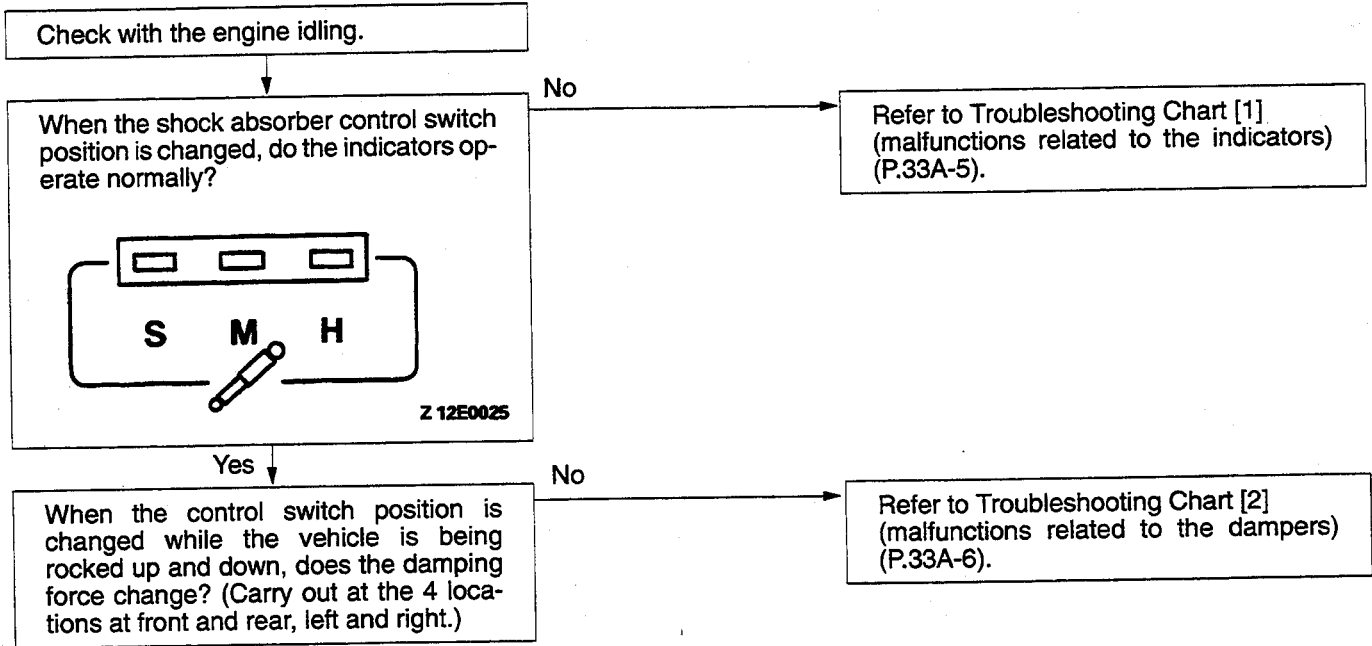


CHART CLASSIFIED BY TROUBLE SYMPTOM

110005098

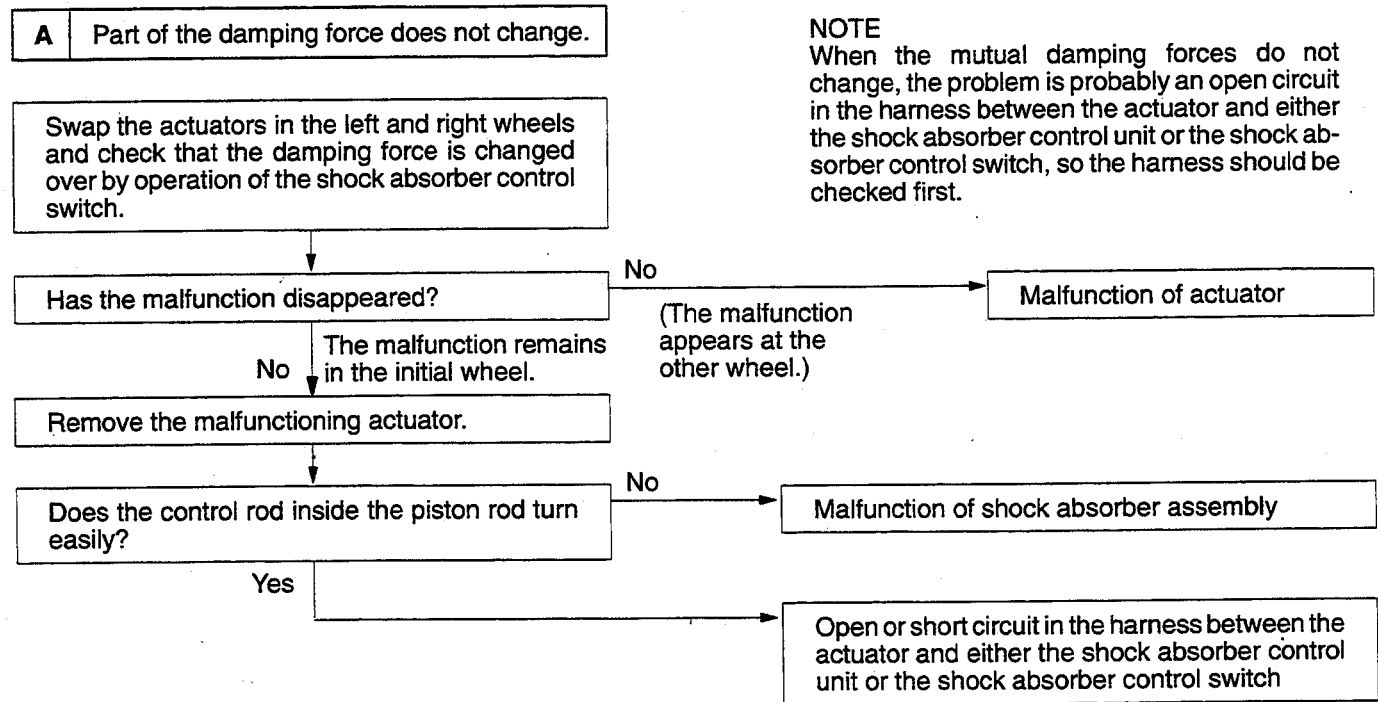
TROUBLESHOOTING CHART [1] (MALFUNCTIONS RELATED TO THE INDICATORS)

Trouble Symptom	Inspection	Normal condition	Probable Cause
Even when switched to S (Soft) mode, the indicator does not illuminate.	(1) Disconnect the shock absorber control switch connector and ground harness connector terminal (4).	The indicator illuminates.	<ul style="list-style-type: none"> • Open circuit in fuse No. 11 in the junction block • Malfunction of light-emitting diode • Open circuit in the harness between the combination meter and either the junction block or the shock absorber control switch
	(2) Disconnect the shock absorber control switch connector and check for continuity between switch connector terminals (4) – (2) when the switch is set to S (Soft).	Continuity	<ul style="list-style-type: none"> • Malfunction of shock absorber control switch
	(3) When the results of inspection items (1) and (2) are normal	—	<ul style="list-style-type: none"> • Open circuit in the harness between the control switch and the ground • Incorrect ground connection
Even when switched to M (Medium) mode, the indicator does not illuminate.	(1) Disconnect the shock absorber control switch connector and ground harness connector terminal (5).	The indicator illuminates.	<ul style="list-style-type: none"> • Open circuit in fuse No. 11 in the junction block • Malfunction of light-emitting diode • Open circuit in the harness between the combination meter and either the junction block or the shock absorber control switch
	(2) Disconnect the shock absorber control switch connector and check for continuity between switch connector terminals (5) – (2) when the switch is set to M (Medium).	Continuity	<ul style="list-style-type: none"> • Malfunction of shock absorber control switch
	(3) When the results of inspection items (1) and (2) are normal	—	<ul style="list-style-type: none"> • Open circuit in the harness between the shock absorber control switch and the ground • Incorrect ground connection

Trouble Symptom	Inspection	Normal condition	Probable Cause
Even when switched to H (Hard) mode, the indicator does not illuminate.	(1) Disconnect the shock absorber control switch connector and ground harness connector terminal (6).	The indicator illuminates.	<ul style="list-style-type: none"> • Open circuit in fuse No. 11 in the junction block • Malfunction of light-emitting diode • Open circuit in the harness between the combination meter and either the junction block or the shock absorber control switch
	(2) Disconnect the shock absorber control switch connector and check for continuity between switch connector terminals (6) – (2) when the switch is set to H (Hard).	Continuity	<ul style="list-style-type: none"> • Malfunction of shock absorber control switch
	(3) When the results of inspection items (1) and (2) are normal	–	<ul style="list-style-type: none"> • Open circuit in the harness between the shock absorber control switch and the ground • Incorrect ground connection

TROUBLESHOOTING CHART [2] (MALFUNCTIONS RELATED TO THE DAMPERS)

110005099



B Damping force for all wheels does not change over.

Disconnect the shock absorber control unit connector.

When the ignition switch is turned to ON, does a voltage of approximately 12 V show between harness connector terminal (4) of the shock absorber control unit and the ground?

No

Open circuit in the harness between the shock absorber control unit and the junction block

Yes

Is there continuity between harness connector terminal (1) of the shock absorber control unit and the ground?

No

Open circuit in the harness between the shock absorber control unit and the ground

Yes

Is there normal continuity between shock absorber control unit harness connector terminal (3) and the ground, terminal (7) and the ground and terminal (2) and the ground?

No

Open circuit in the harness between the shock absorber control unit and the shock absorber control switch

<When normal>

Terminal	Mode		
	S (Soft)	M (Medium)	H (Hard)
No. 3	Continuity	No continuity	No continuity
No. 7	No continuity	Continuity	No continuity
No. 2	No continuity	No continuity	Continuity

Yes

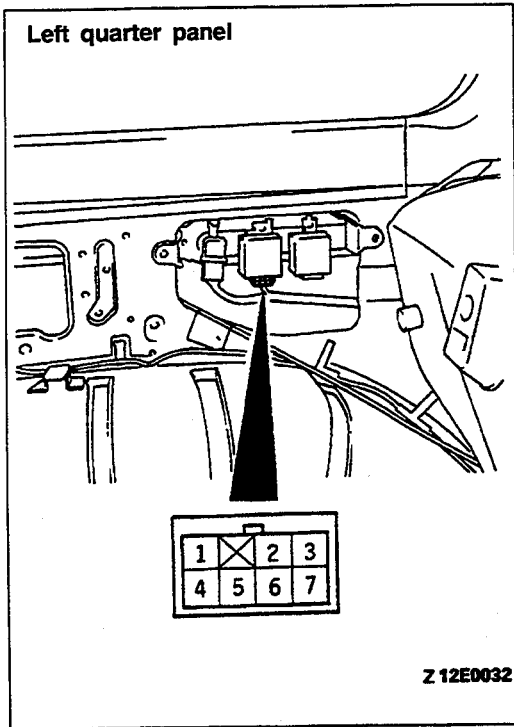
When 12 V is applied to harness connector terminal (6) of the shock absorber control unit, does the damping force change over?

No

Open or short circuit in the harness between the actuator and either the shock absorber control unit or the shock absorber control switch

Yes

Incorrect shock absorber control unit connection, or malfunction of shock absorber control unit



SHOCK ABSORBER CONTROL UNIT SIGNAL CIRCUIT INSPECTION

110005100

- (1) Disconnect the shock absorber control unit connector, and inspect the connector at the harness side.

B+: Battery Positive Voltage

Terminal No.	Connection destination	Measurement	Tester connection	Check condition	Standard	
1	Ground	Continuity	(1)– Ground	Constantly	Continuity	
2	Shock absorber control switch (Hard)	Continuity	(2)– Ground	Shock absorber control switch condition	S (Soft mode)	No continuity
					M (Medium mode)	No continuity
					H (Hard mode)	Continuity
7	Shock absorber control switch (Medium)	Continuity	(7)– Ground	Shock absorber control switch condition	S (Soft mode)	No continuity
					M (Medium mode)	Continuity
					H (Hard mode)	No continuity
3	Shock absorber control switch (Soft)	Continuity	(3)– Ground	Shock absorber control switch condition	S (Soft mode)	Continuity
					M (Medium mode)	No continuity
					H (Hard mode)	No continuity
4	Power supply	Voltage	(4)– Ground	Ignition switch	OFF	0 V
					ON	B+

- (2) Connect the shock absorber control unit and inspect.

Terminal No.	Connection destination	Measurement	Tester connection	Check condition	Standard
6	Shock absorber actuator	Voltage	(6)– Ground	5 seconds after operating the shock absorber control switch	Approx. 12 V
				Conditions except above	0 V

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SERVICE ADJUSTMENT PROCEDURES

FRONT WHEEL ALIGNMENT INSPECTION AND ADJUSTMENT

110005101

TOE-IN

1. Measure the toe-in.

Standard value:

At the center of tire tread
 3.5 ± 3.5 mm (.14 \pm .14 in.)

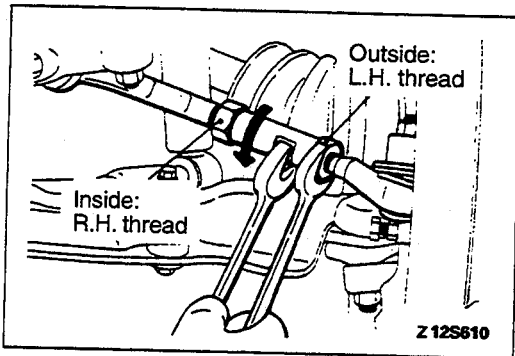
At the rim of disc wheel
 1.8 ± 1.8 mm (.07 \pm .07 in.)

Toe angle (per wheel) 0°–0° 17'

2. If the toe-in is not within the standard value, adjust the toe-in by turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

Caution

The difference between the left and right tie rods should not exceed 5 mm (.2 in.).



3. After adjusting, use a turning radius gage to confirm that the steering wheel turning angle is within the standard value range. (Refer to GROUP 37A.)

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 tow-out angle on turns in addition to the wheel alignment.

Conduct this test on the left turn as well as on the right turn.

Standard value: 21° 56' (inner wheel when outer wheel at 20°)

CAMBER

Standard value: 0° 40' \pm 30'
 (Left/right deviation within 30')

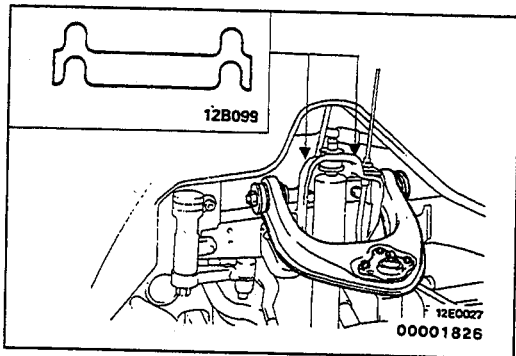
1. Adjust the camber by increasing or decreasing the thickness of the adjusting shim provided between the upper arm shaft and the crossmember.

NOTE

- Standard thickness of the shim is 4 mm (.16 in.).
- The number of shims is three or less.

Camber adjustment shim (yellow plating)

Part number	Thickness	mm (in.)
MB176288	1.0	(.039)
MB176289	2.0	(.079)



CASTER**Standard value: $3^{\circ}00' \pm 1^{\circ}$** **(Left/right deviation within 30')****NOTE**

1. Caster is pre-set at the factory and cannot be adjusted.
2. If the caster is not within the standard value, replace bent or damaged parts.

KINGPIN INCLINATION**Standard value: $14^{\circ}52'$** **SIDE SLIP**

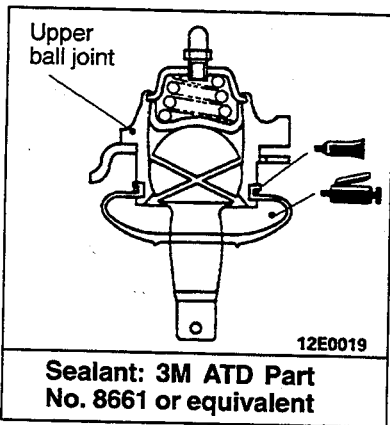
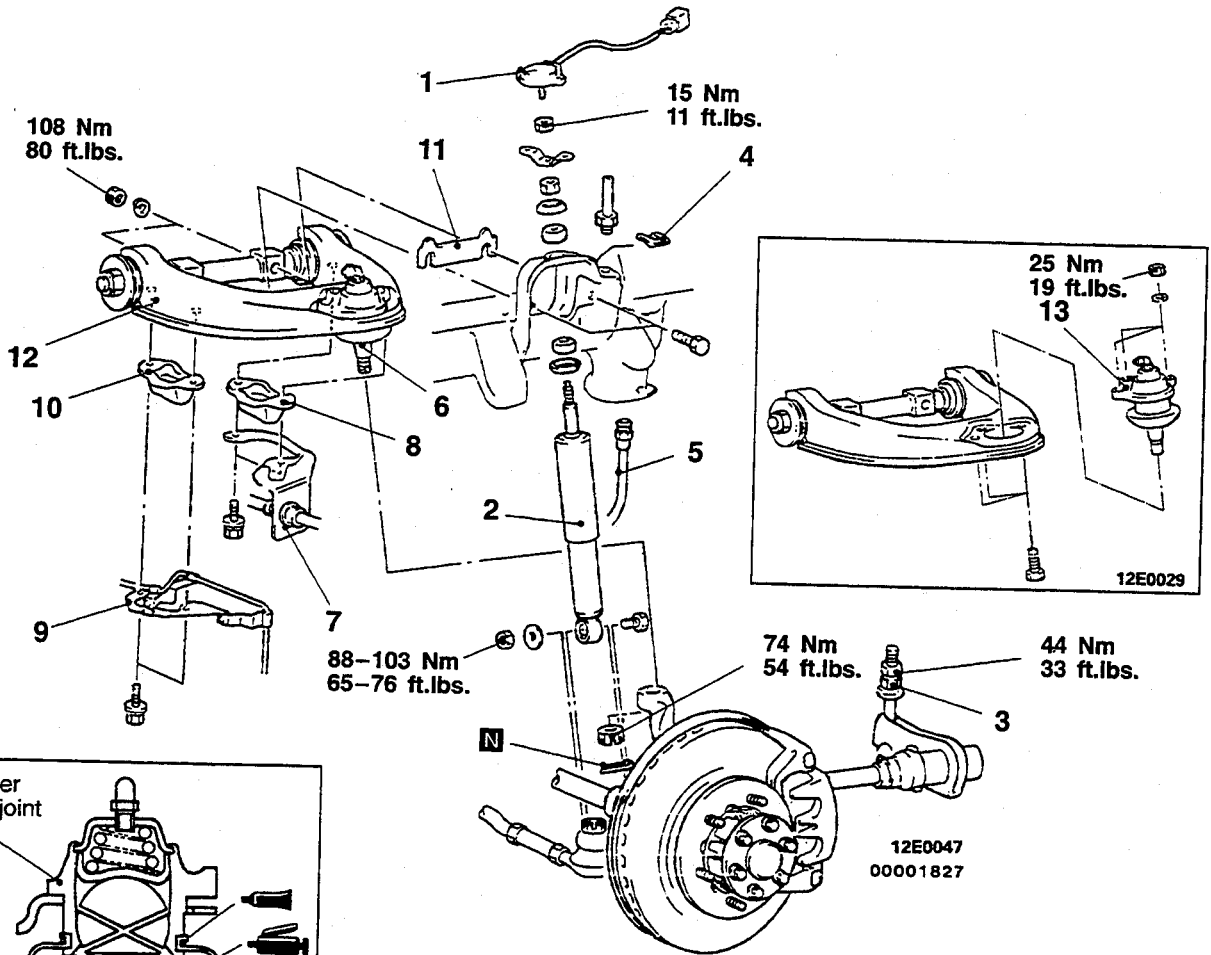
Measure the side slip with a side slip tester.

Standard value: 0 ± 3 mm ($0 \pm .12$ in.)

SHOCK ABSORBER AND UPPER ARM REMOVAL AND INSTALLATION

Post-installation Operation

- Wheel Alignment Inspection and Adjustment (Refer to P.33A-9.)
- Brake line bleeding (Refer to GROUP 35 – Service Adjustment Procedures.)



Shock absorber removal steps

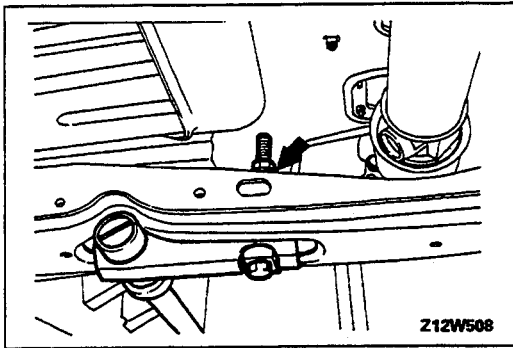
- ◀B▶ 1. Actuator (Vehicles with remote controlled variable shock absorbers)
- ▶B▶ 2. Shock absorber

Upper arm removal steps

- Bump stopper and bump stopper bracket clearance adjustment (Refer to P.33A-18.)
- ▶A▶ 3. Anchor arm assembly adjusting nut
4. Hose clip

5. Brake hose connection
6. Connection for upper ball joint and knuckle
7. Brake hose support
8. Rebound stopper
9. Speed sensor bracket (Vehicles with A.B.S.)
10. Rebound stopper
11. Shim
- ▶A▶ 12. Upper arm
13. Upper ball joint

TSB Revision



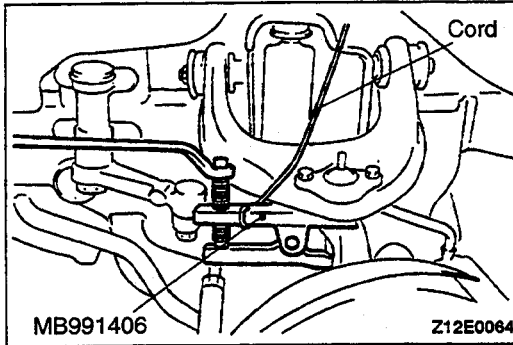
REMOVAL SERVICE POINTS

◀A▶ ANCHOR ARM ASSEMBLY ADJUSTING NUT LOOSENING

Loosen the anchor bolt of the torsion bar all the way.

NOTE

When the anchor arm assembly adjusting nut is loosened, use a jack to support the lower arm of the side to be loosened to make the work easier.

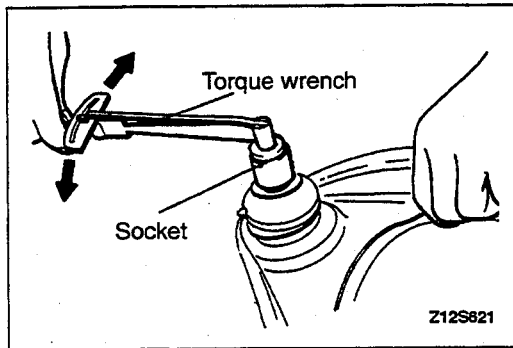


◀B▶ UPPER BALL JOINT AND KNUCKLE DISCONNECTION

Use the special tool to disconnect the upper arm ball joint from the knuckle.

Caution

1. Be sure to tie the cord of the special tool to the nearby part.
2. The nut should only be loosened, not removed.



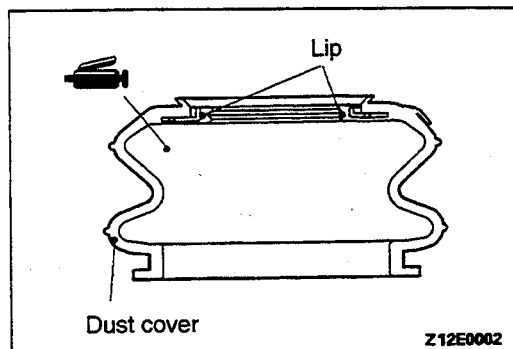
INSPECTION

UPPER BALL JOINT STARTING TORQUE CHECK

1. Measure the upper ball joint starting torque with a torque wrench.

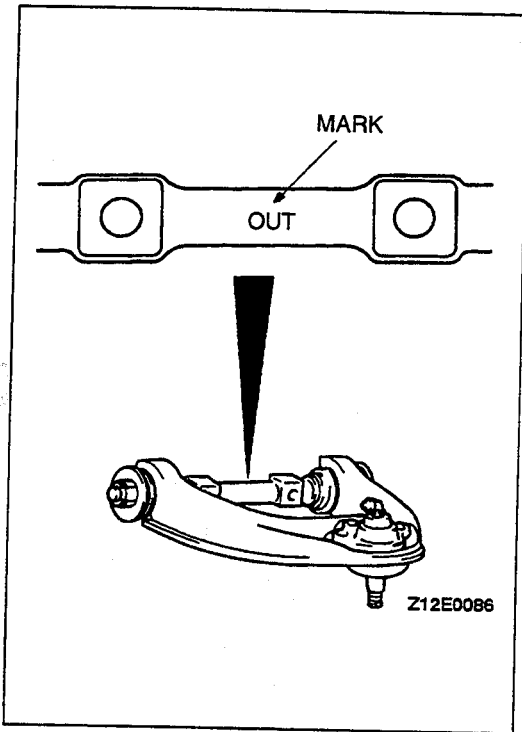
Standard value: 0.8–3.5 Nm (7–30 in.lbs.)

2. If the upper ball joint starting torque is outside the standard value, replace the upper ball joint.



BALL JOINT DUST COVER REPLACEMENT

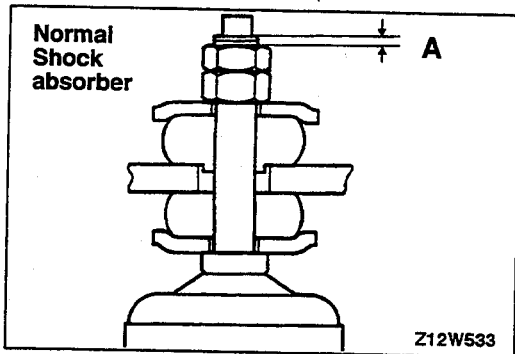
1. Remove the dust cover.
2. Apply multi-purpose grease to both the interior of dust cover and the upper ball joint.



INSTALLATION SERVICE POINTS

**▶A◀ UPPER ARM INSTALLATION
<1994 MODELS AND AFTER>**

Install the upper arm so that the "OUT" mark on the upper arm shaft is facing toward the outside of the vehicle.

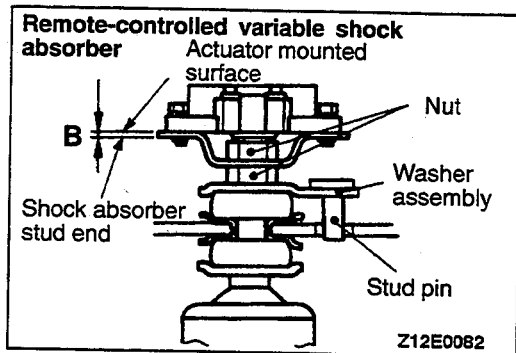


▶B◀ SHOCK ABSORBER/ACTUATOR (VEHICLES WITH REMOTE CONTROLLED VARIABLE SHOCK ABSORBER) INSTALLATION

Tighten the shock absorber installation nut so that the dimensions shown in the illustration (A and B) are at the standard values.

Standard value A: 1–2 mm (.04–.08 in.)

B: 1.5–2.5 mm (.06–.10 in.)



Caution

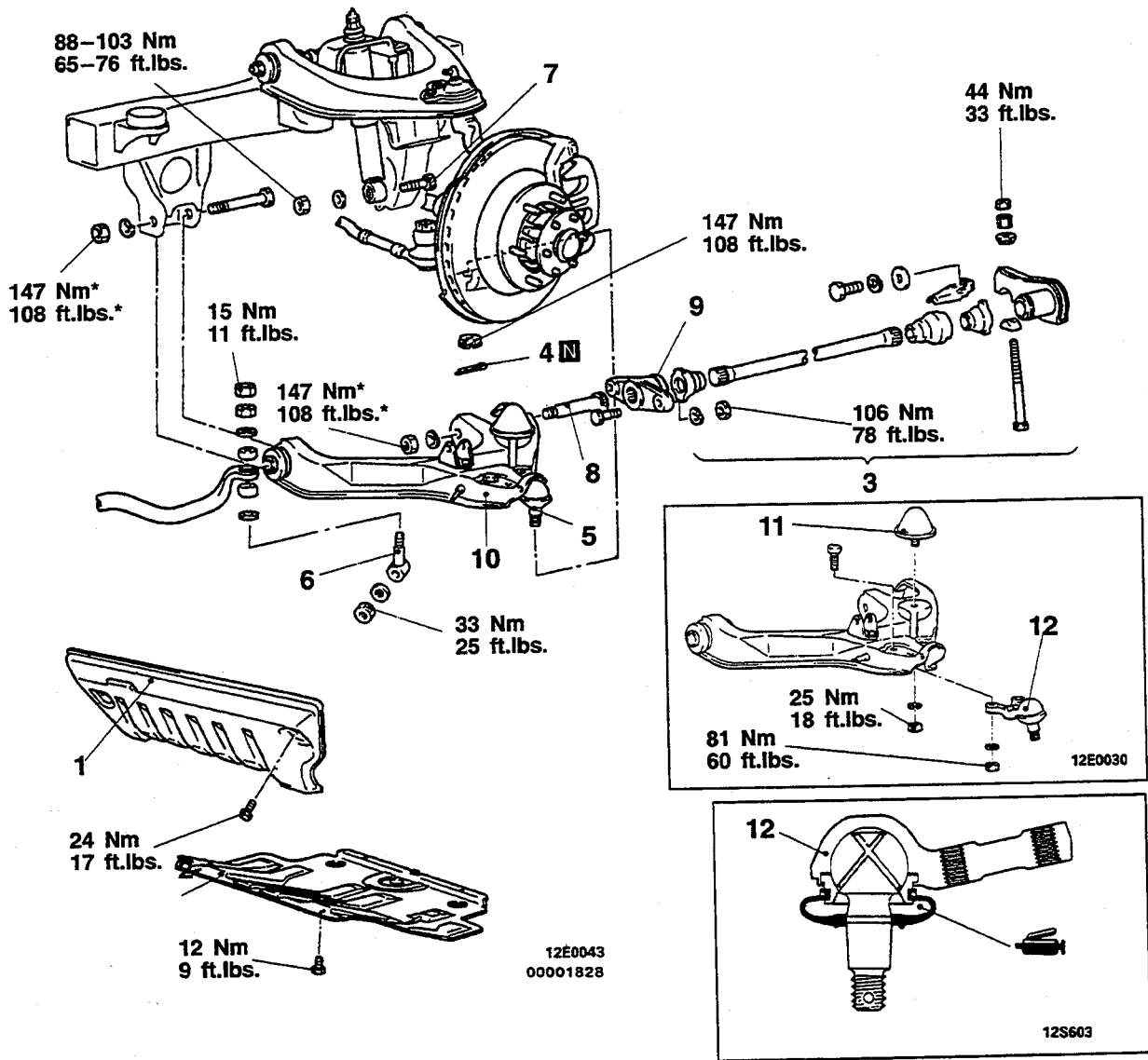
When tightening the nut, be careful not to bend the stud pin of the washer assembly.

LOWER ARM

REMOVAL AND INSTALLATION

Post-installation Operation

- Wheel Alignment Inspection and Adjustment (Refer to P.33A-9.)



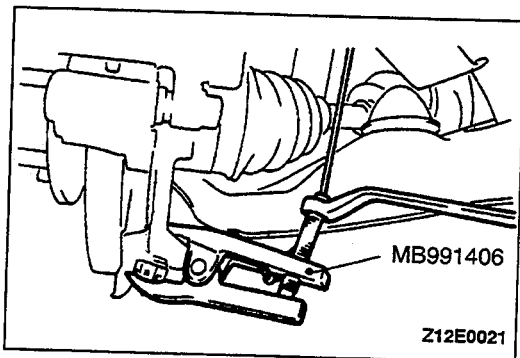
Removal steps

1. Under skid plate
2. Under cover
 - Bump stopper and bump stopper bracket clearance adjustment (Refer to P.33A-18.)
3. Torsion bar (Refer to P.33A-17.)
4. Split pin
5. Connection for lower ball joint and knuckle
6. Stabilizer link assembly (Refer to P.33A-19, 20.)

7. Shock absorber mounting bolts
8. Lower arm shaft
9. Anchor arm B
10. Lower arm
11. Bump stopper
12. Lower ball joint

NOTE

*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.



REMOVAL SERVICE POINT

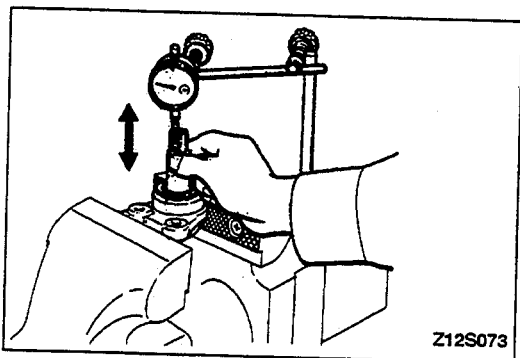
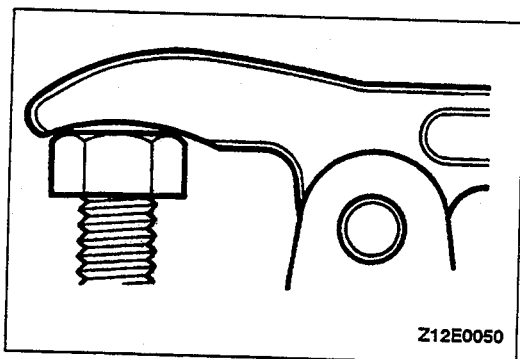
◀A▶ LOWER BALL JOINT AND KNUCKLE DISCONNECTION

Use the special tool to disconnect the lower arm ball joint from the knuckle.

Caution

1. Be sure to tie the cord of the special tool to the nearby part.
2. The nut should only be loosened, not removed.

3. Insert the special tool securely.



INSPECTION

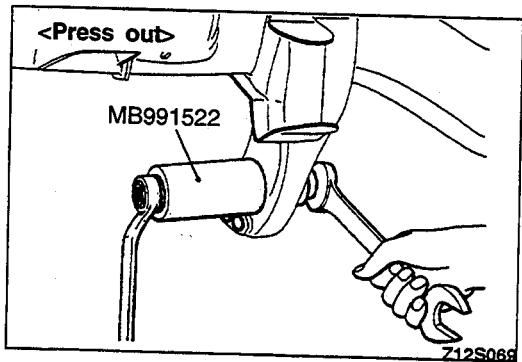
LOWER BALL JOINT END PLAY

Check the lower ball joint end play by the following procedure.

1. Use a dial indicator to measure the lower ball joint end play.

Limit: 0.3 mm (.012 in.)

2. If the lower ball joint end play exceeds the service limit, replace the lower ball joint.

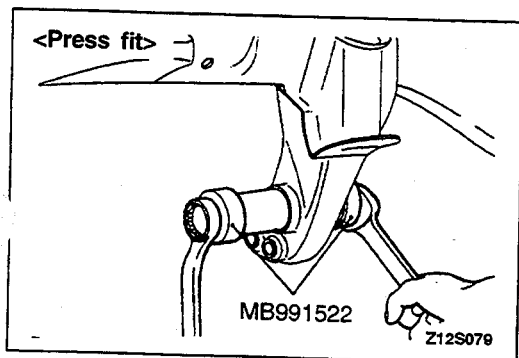


LOWER ARM BUSHING (A) REPLACEMENT

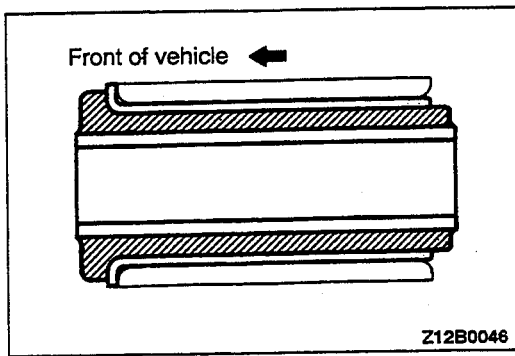
1. Using the special tool, remove the bushing A from the bracket.

NOTE

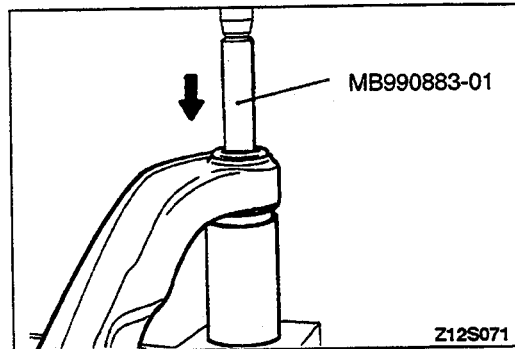
When removing the left hand bushing A detach the differential carrier.



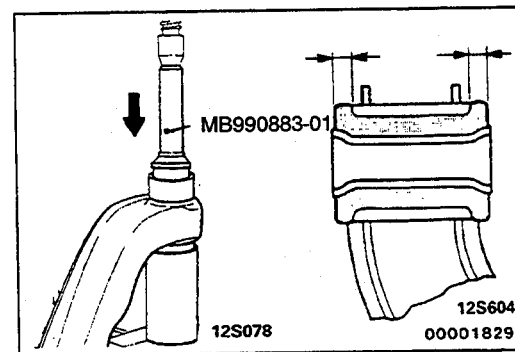
2. Using the special tool, press-fit the bushing A into the bracket.

**NOTE**

Bushing (A) should be installed so that it faces as shown in the illustration.

**LOWER ARM BUSHING (B) REPLACEMENT**

1. Use the special tools to remove bushing (B) from the lower arm.



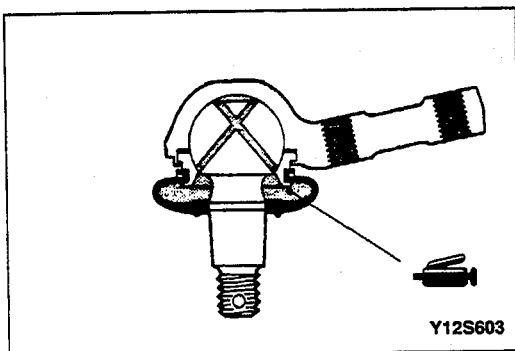
2. Coat bushing (B) and the lower arm with soap solution, and then use the special tool to press-fit bushing (B) into the lower arm, taking care not to twist or tilt bushing (B).

NOTE

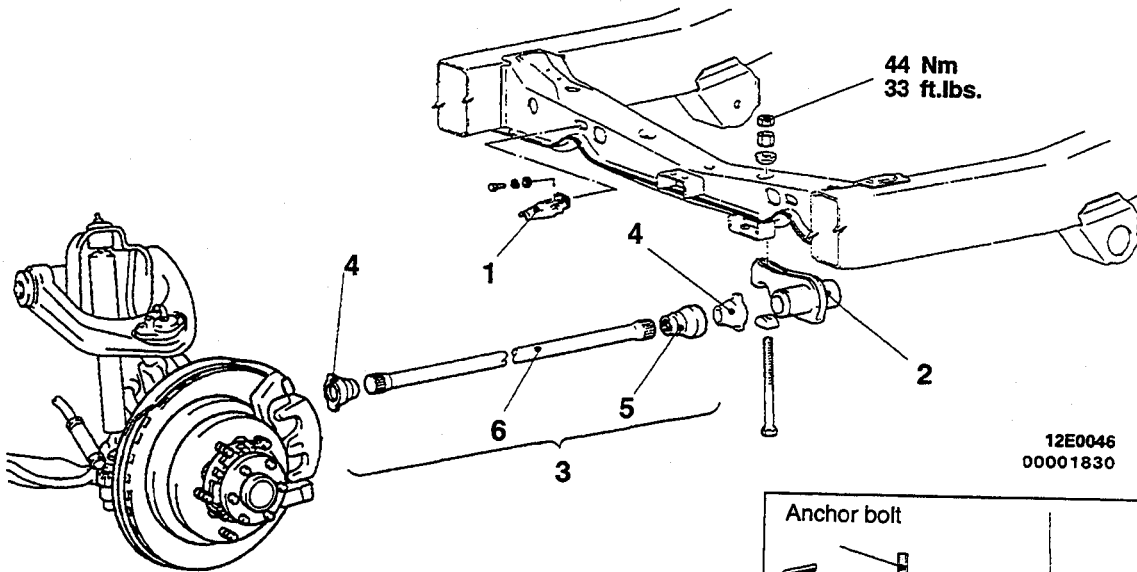
Press-fit the bushing again from the opposite side to equalize bushing projections at both ends.

LOWER BALL JOINT DUST COVER REPLACEMENT

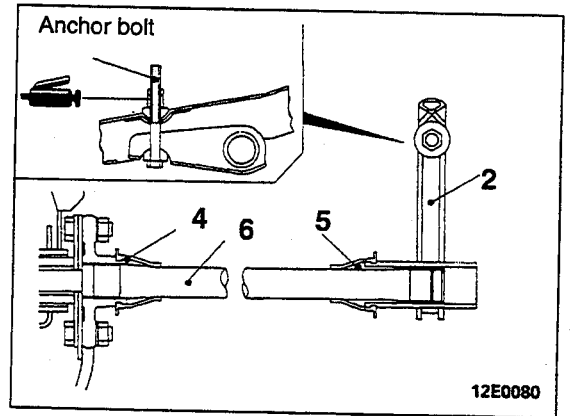
1. Apply multi-purpose grease to the inside of the dust cover and the lower ball joint.
2. Secure the dust cover to the lower ball joint with a ring.



TORSION BAR
REMOVAL AND INSTALLATION



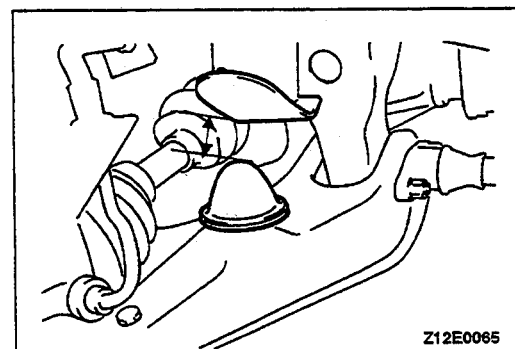
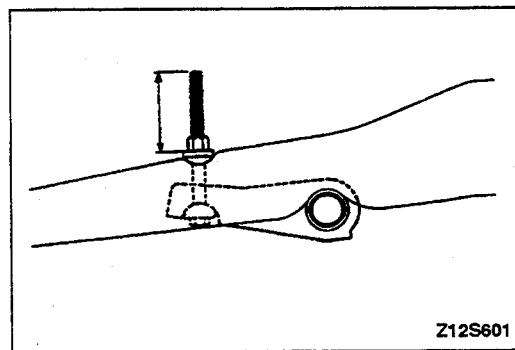
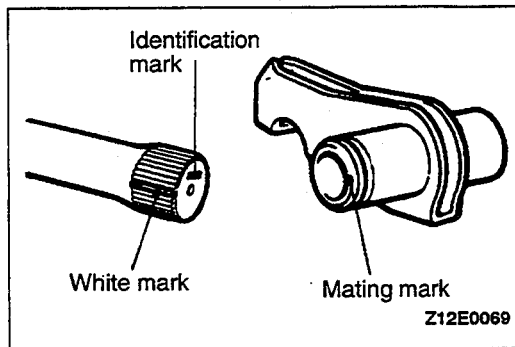
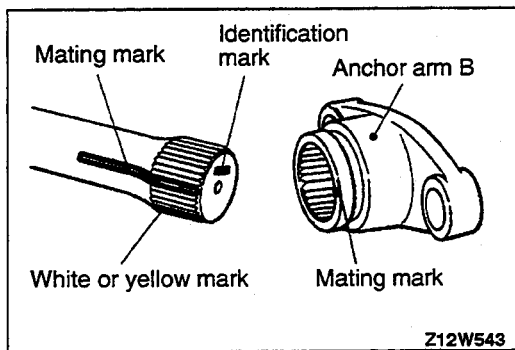
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Removal steps

- B◄
1. Heat protector (right side only)
 - Bump stopper and bump stopper bracket clearance adjustment
 2. Anchor arm assembly

- A◄
3. Torsion bar assembly
 4. Dust covers
 5. Heat cover (right side only)
 6. Torsion bar



INSTALLATION SERVICE POINTS

▶A◀ TORSION BAR ASSEMBLY INSTALLATION

- (1) Check the identification marks at the end of the left and right shock absorbers.
R → for right side
L → for left side

- (2) When installing the torsion bar, align the white mark on the serrated section of the torsion bar with the mating mark on the anchor arm.

▶B◀ BUMP STOPPER AND BUMP STOPPER BRACKET CLEARANCE ADJUSTMENT

- (1) Tighten the adjusting nut until the protruding length of the anchor bolt is 80 mm (3.15 in.) or less.

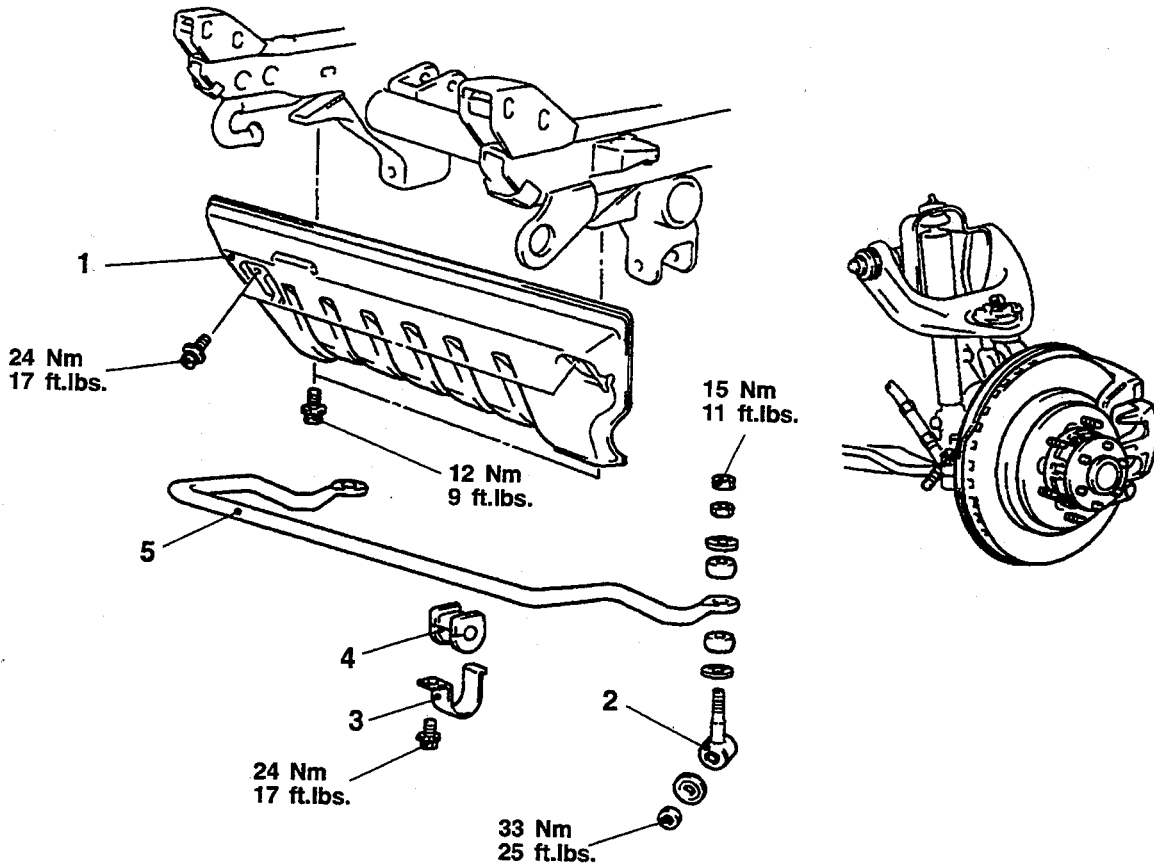
- (2) With the vehicle in an unladen condition, measure the distance from the bump stopper to the bump stopper bracket to check if it is at the standard value.

Standard value: 21–23 mm (.83–.91 in.)

- (3) If outside the standard value, adjust the anchor bolt with the adjusting nut.

STABILIZER BAR <UP TO 1993 MODELS>

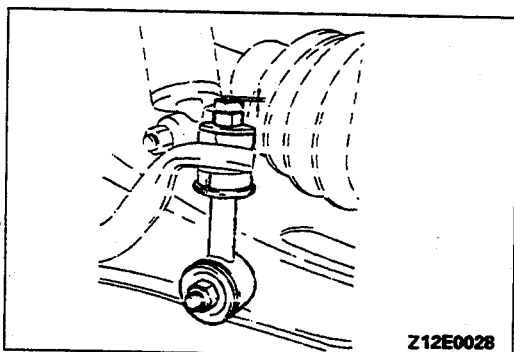
REMOVAL AND INSTALLATION



Removal steps

- ▶A◀
1. Under skid plate
 2. Stabilizer link assembly
 3. Clamp
 4. Bushing
 5. Stabilizer bar

Z12E0044



Z12E0028

INSTALLATION SERVICE POINT

▶A◀ STABILIZER LINK ASSEMBLY INSTALLATION

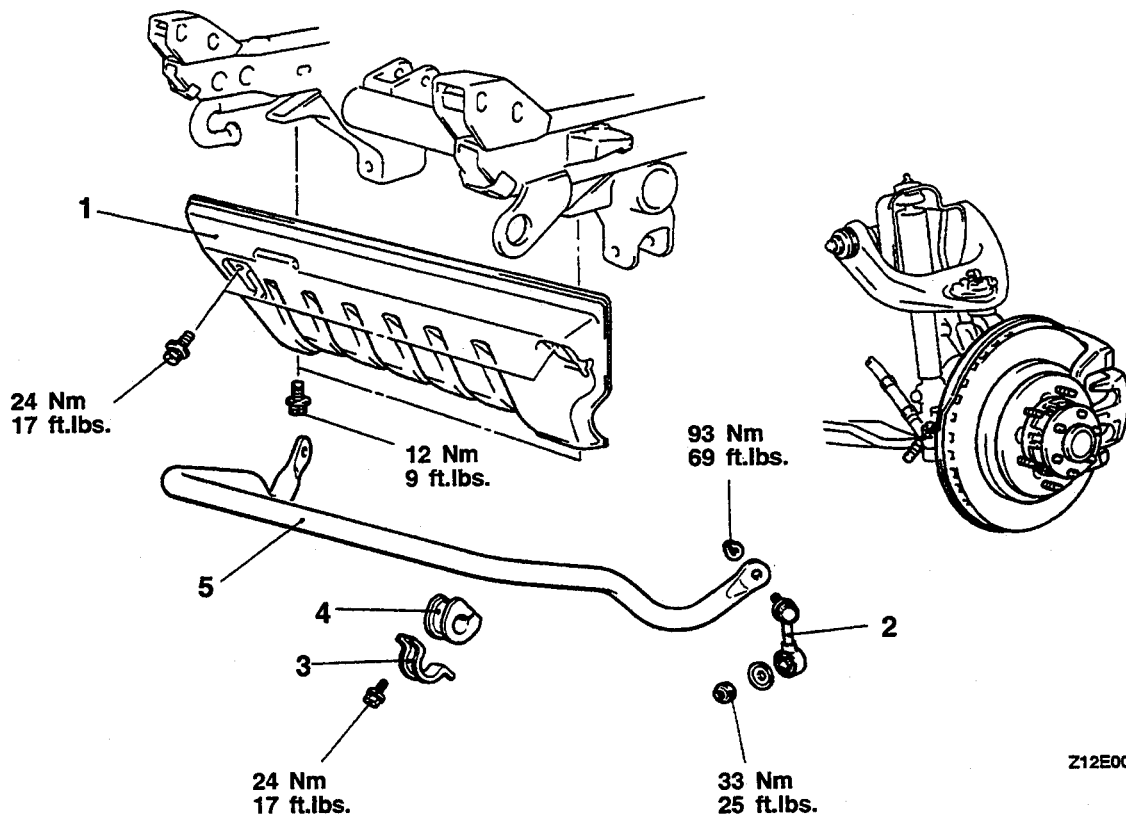
Tighten the adjusting nut so that the dimensions shown in the illustration are at the standard values.

Standard value: 4–5 mm (.16–.20 in.)

STABILIZER BAR <1994 MODELS AND AFTER>

110005106

REMOVAL AND INSTALLATION



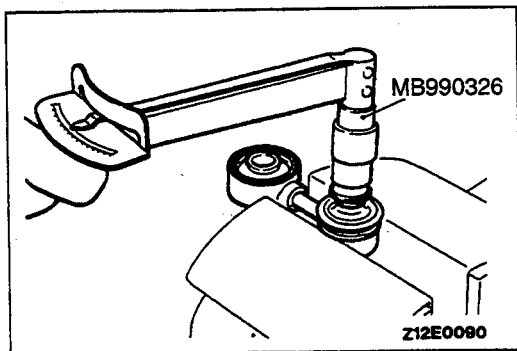
Z12E0087

Removal steps

1. Under skid plate
2. Stabilizer link assembly
3. Stabilizer bar bracket



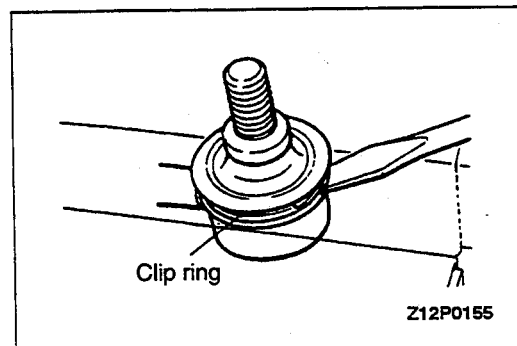
4. Bushing
5. Stabilizer bar



INSPECTION

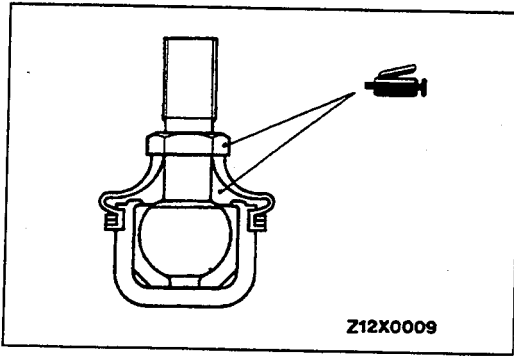
STABILIZER LINK BALL JOINT FOR STARTING TORQUE CHECK

Standard value: 1.7–3.1 Nm (15–27 in.lbs.)

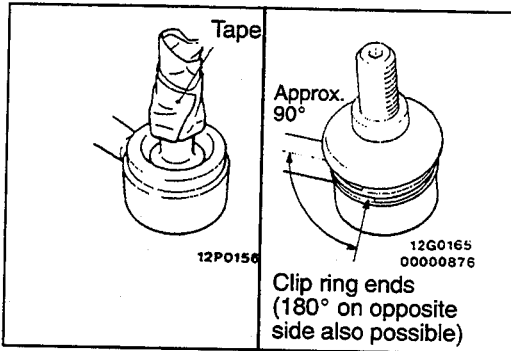


BALL JOINT DUST COVER REPLACEMENT

- (1) Remove the clip ring and the dust cover.



(2) Apply multi-purpose grease to the lip and inside of the dust cover.

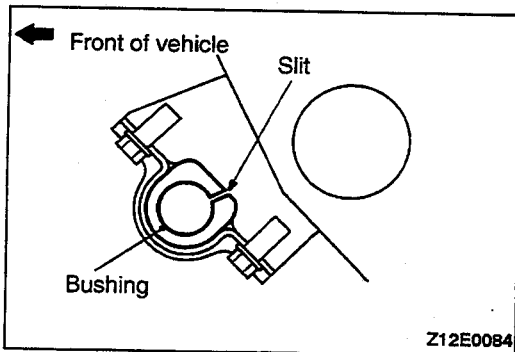


(3) Use vinyl tape to tape the stabilizer link where shown in the illustration, and then install the dust cover to the stabilizer link.

(4) Secure the dust cover with the clip ring.

NOTE

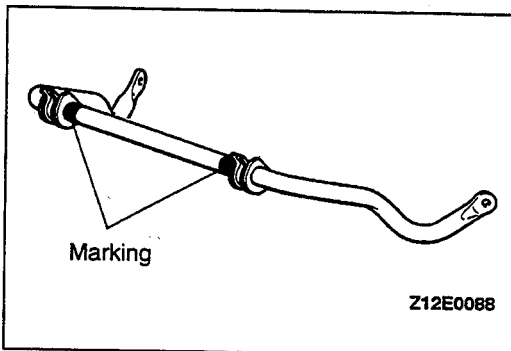
When installing the clip ring, align it so that its ends are located at a 90° angle from the axis of the stabilizer link.



INSTALLATION SERVICE POINTS

▶A◀ BUSHING INSTALLATION

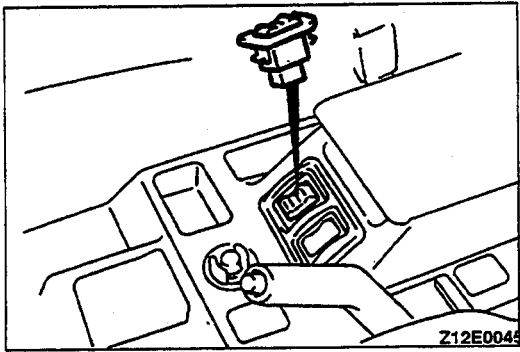
Install the bushing so that the slit is in the position shown in the illustration.



▶B◀ STABILIZER BAR BRACKET INSTALLATION

Position the stabilizer bar so that the marking on the stabilizer bar and the edge of the bracket becomes the reference value, and then tighten the stabilizer bar bracket mounting bolt.

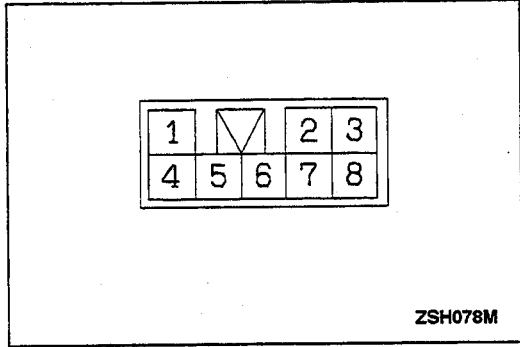
Reference value: Approx. 10 mm (.39 in.)



Z12E0045

CONTROL SWITCH REMOVAL AND INSTALLATION

110005107



ZSH078M

INSPECTION

Operate the switch and check the continuity between the terminals.

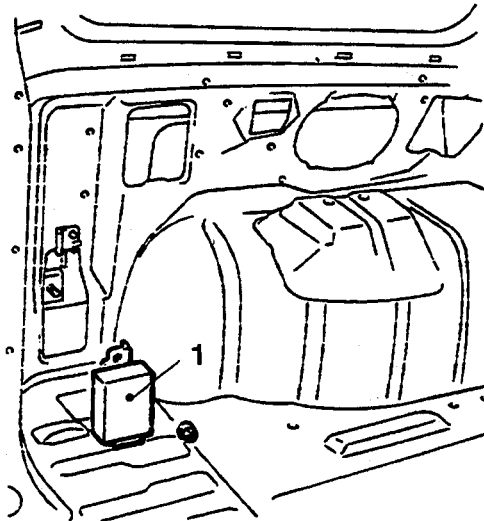
Switch position	Terminal					
	4	5	6	2	7	1
H (Hard)			○—○			
M (Medium)		○—○		○—○		
S (Soft)	○—○			○—○		

CONTROL UNIT

110005108

REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operation**
- Quarter Trim Lower Removal and Installation (Refer to GROUP 52A – Trims.)



Z12E0031

1. Control unit

INSPECTION


Refer to TROUBLESHOOTING.

REAR SUSPENSION

CONTENTS

110005109

COIL SPRING AND AXLE BUMPER	8	SHOCK ABSORBER AND LATERAL ROD ...	6
GENERAL SPECIFICATIONS	2	Lateral Rod Bushing Replacement	7
LOWER ARM	4	SPECIAL TOOLS	3
Lower Arm Rear Bushing Replacement	4	STABILIZER BAR	
SERVICE ADJUSTMENT PROCEDURES	3	<1994 MODELS AND AFTER>	10
Rear Wheel Alignment	3	<UP TO 1993 MODELS>	9
SERVICE SPECIFICATIONS	2	TROUBLESHOOTING	3



34-2 REAR SUSPENSION – General Specifications/Service Specifications

GENERAL SPECIFICATIONS

110005110

SUSPENSION TYPE

Items	Specifications
Suspension system	Coil spring type 3-link rigid axle suspension

COIL SPRING

Items	Specifications
Wire dia.×O.D.×free length mm (in.)	14.2 to 15.8×160.2 to 161.8×404.5 (.56 to .62×6.31 to 6.37×15.93)
Coil spring identification color	Green×1
Spring constant N/mm (lbs./in.)	27 to 39 (151 to 218)

SHOCK ABSORBER

Items	Vehicles without remote-controlled variable shock absorbers	Vehicles with remote-controlled variable shock absorbers
Max. length mm (in.)	457 (18.0)	457 (18.0)
Min. length mm (in.)	297 (11.7)	297 (11.7)
Stroke mm (in.)	160 (6.3)	160 (6.3)
Damping force [at 0.3 m/sec. (0.9 ft./sec.)] N (lbs.)	Expansion	2,450 (540)
	Contraction	1,300 (287)
		Hard: 3,350 (739) Medium: 2,450 (540) Soft: 1,750 (386)
		Hard: 1,650 (364) Medium: 1,300 (287) Soft: 900 (198)

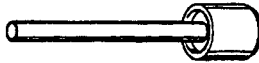
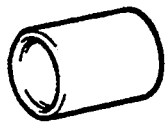
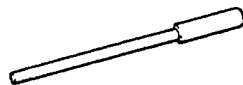
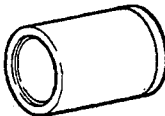
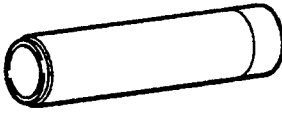

SERVICE SPECIFICATIONS

110005111

Items	Standard value
Toe-in mm (in.)	0 (Non-adjustable)
Camber	0° (Non-adjustable)
Protruding length of stabilizer bar mounting bolt mm (in.)	15–17 (.59–.67)
Protruding length of shock absorber mounting bolt mm (in.)	1–2 (.04–.08)
Distance between actuator mounting surface and shock absorber stud end mm (in.)	1.5–2.5 (.06–.10)

SPECIAL TOOLS

110005112

Tool	Tool number and name	Supersession	Application
	MB991293 Rear suspension bushing arbor		Removal and installation of lower arm rear bushing
	MB990891 Bushing remover installer base		
	MB991318 Lower arm bushing arbor		
	MB990971 Bushing remover installer base		
	MB991411 Rear wheel bearing and hub installer joint		
	MB990650 Lower arm bushing arbor		Removal and installation of lateral rod bushing

TROUBLESHOOTING

Refer to GROUP 33A—Troubleshooting.

110005113

SERVICE ADJUSTMENT PROCEDURES

110005114

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 (0 in.)
Camber 0°

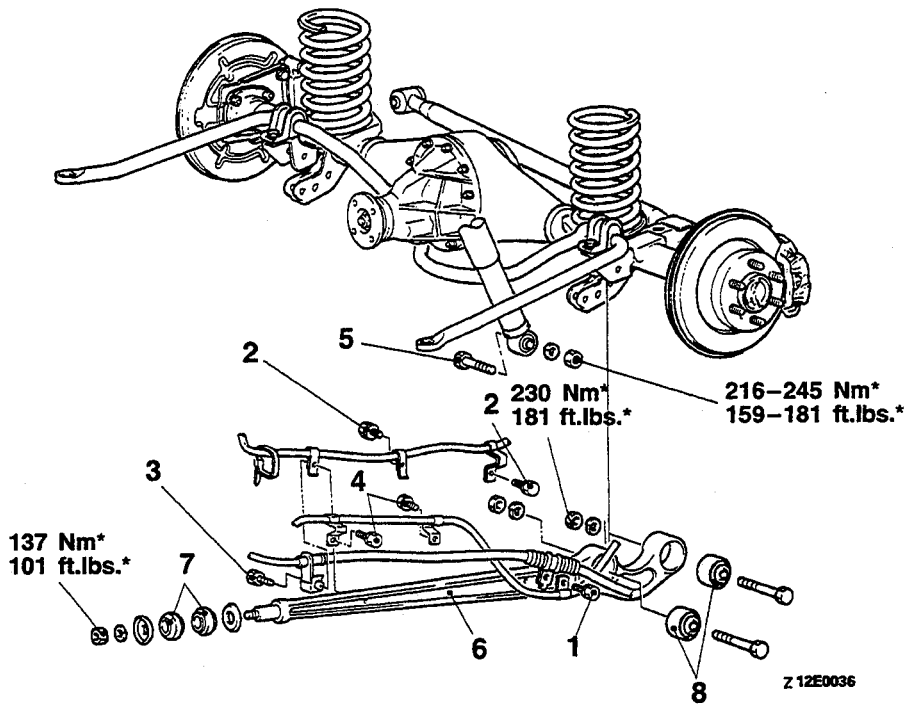
NOTE

Toe-in and camber are set at the factory and cannot be adjusted.

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LOWER ARM

REMOVAL AND INSTALLATION



Removal steps

1. Parking brake cable attaching bolt
2. Rear differential lock position harness attaching bolt
3. Parking brake cable attaching bolt
4. Rear sensor attaching bolt (Vehicles with A.B.S.)
5. Shock absorber mounting bolts (lower side)

- ▶A◀
6. Lower arm
 7. Lower arm front bushing
 8. Lower arm rear bushing

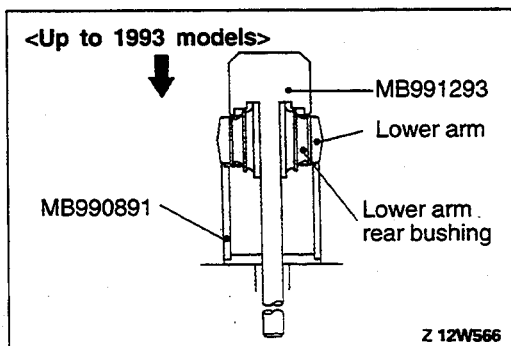
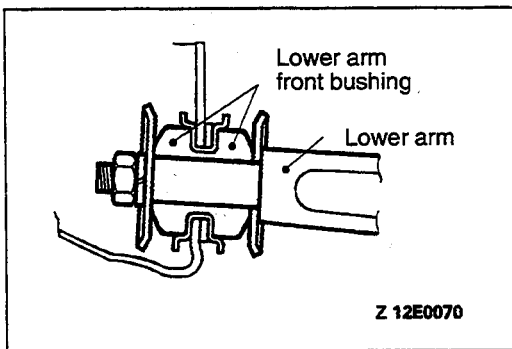
NOTE

*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

INSTALLATION SERVICE POINT

▶A◀ **LOWER ARM FRONT BUSHING INSTALLATION**

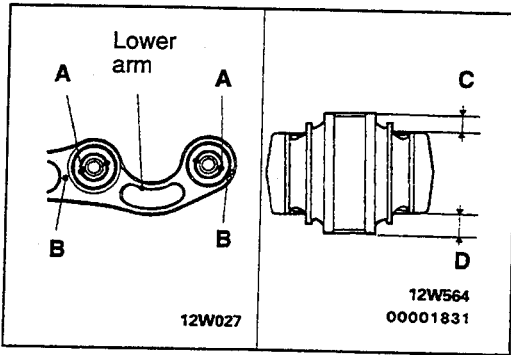
Install the lower arm front bushing so that its direction will be as shown in the illustration.



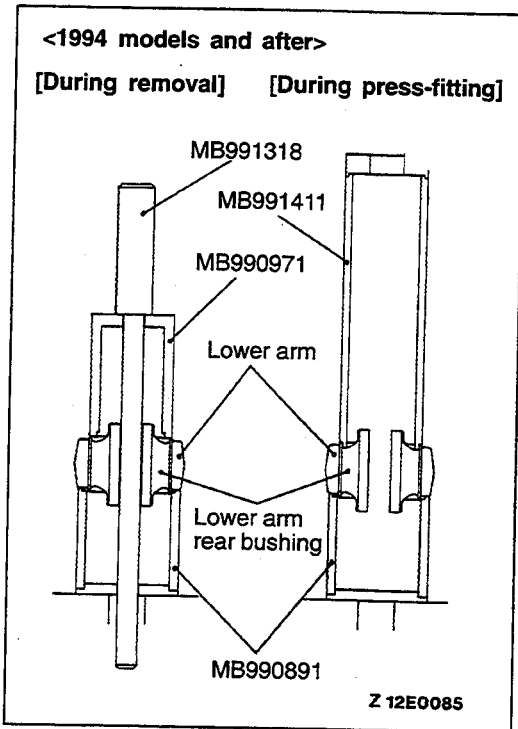
LOWER ARM REAR BUSHING REPLACEMENT

<Up to 1993 models>

- (1) Use the special tools to drive out the bushing.



- (2) Align, as shown in the figure, the marked location (B) of the lower arm and the hole part (A) of the lower arm rear bushing, and then, by using the special tool, press the lower arm rear bushing onto the lower arm. Check that the difference between the projecting lengths (C-D) is within 1 mm (.04 in.)



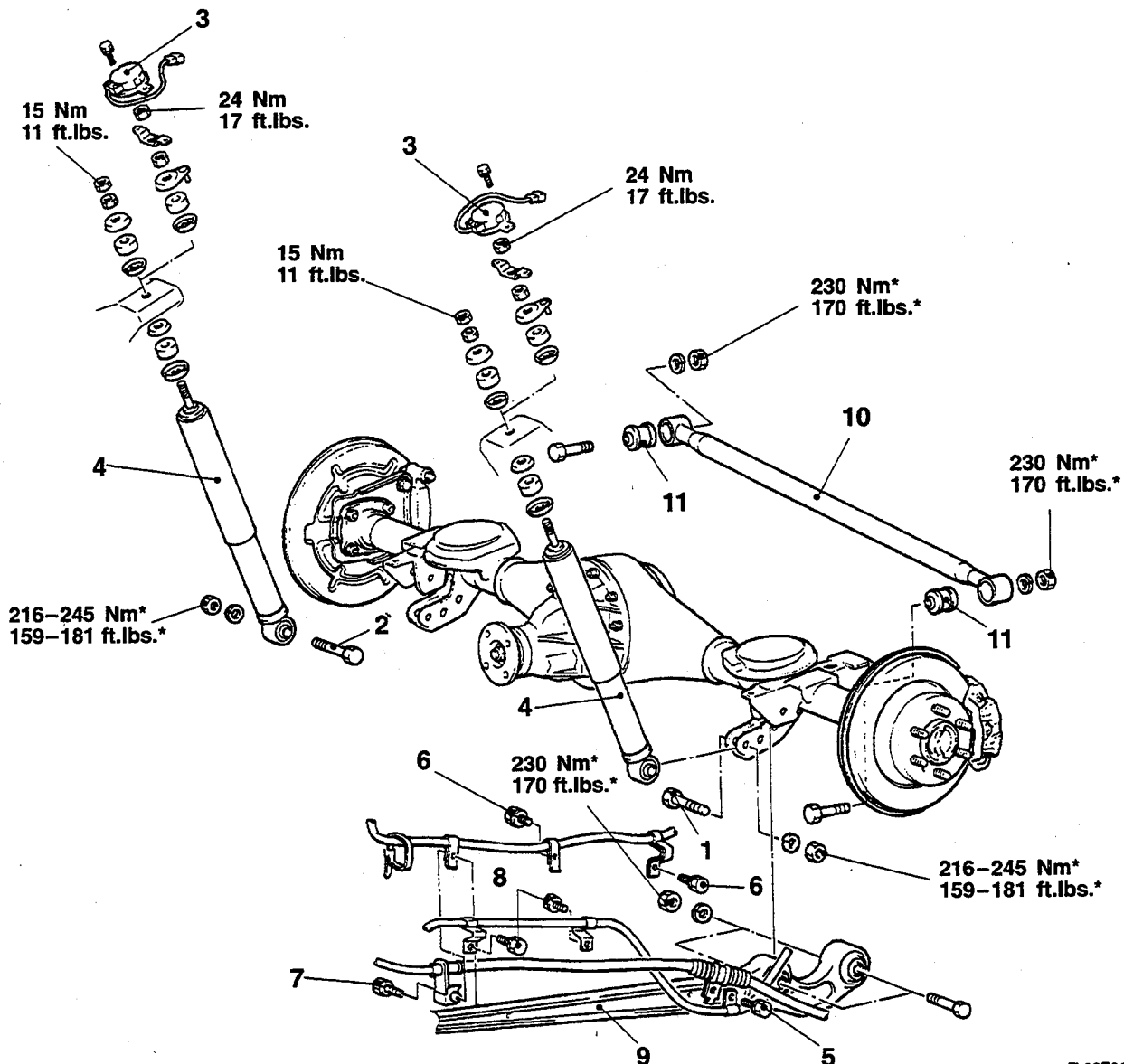
<1994 models and after>

Use the special tool to replace the lower arm rear bushing.

SHOCK ABSORBER AND LATERAL ROD

110005116

REMOVAL AND INSTALLATION



Z 12E0038

Shock absorber removal steps

1. Shock absorber mounting bolt (lower left side)
2. Shock absorber mounting bolt (lower right side)
- ▶▶ 3. Actuator (Vehicles with remote-controlled variable shock absorbers)
- ▶▶ 4. Shock absorber

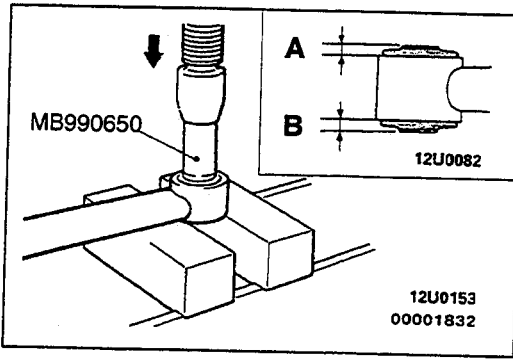
Lateral rod removal steps

1. Shock absorber mounting bolt (lower left side)
5. Parking brake cable attaching bolt (LH side)

6. Rear differential lock position harness attaching bolt
7. Parking brake cable attaching bolt (LH side)
8. Rear sensor attaching bolt (Vehicles with A.B.S.)
9. Lower arm
10. Lateral rod
11. Lateral rod bushing

NOTE

*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.



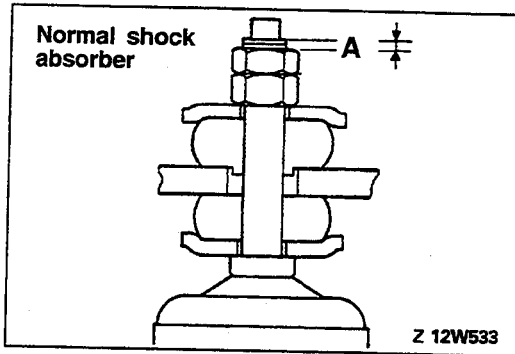
LATERAL ROD BUSHING REPLACEMENT

- (1) Use the special tool to drive out and press in the lateral rod bushing.
- (2) Be careful that the difference (A – B) in bushing projection distances does not exceed the following value.

$$A - B = 0 \pm 1.0 \text{ mm } (0 \pm .04 \text{ in.})$$

Caution

When pressing in the bushing, apply a sufficient amount of liquid soap to the inside of the lateral rod eyes and the rubber area of the bushing.



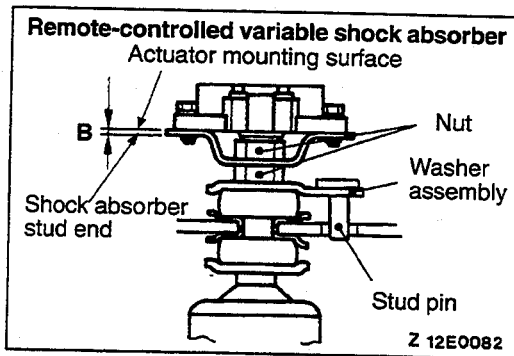
INSTALLATION SERVICE POINT

▶A◀ SHOCK ABSORBER/ACTUATOR (VEHICLES WITH REMOTE CONTROLLED VARIABLE SHOCK ABSORBERS) INSTALLATION

Tighten the nut so that the values shown in the figure (A and B) are at the standard values.

Standard value (A): 1–2 mm (.04–.08 in.)

(B): 1.5–2.5 mm (.06–.10 in.)



Caution

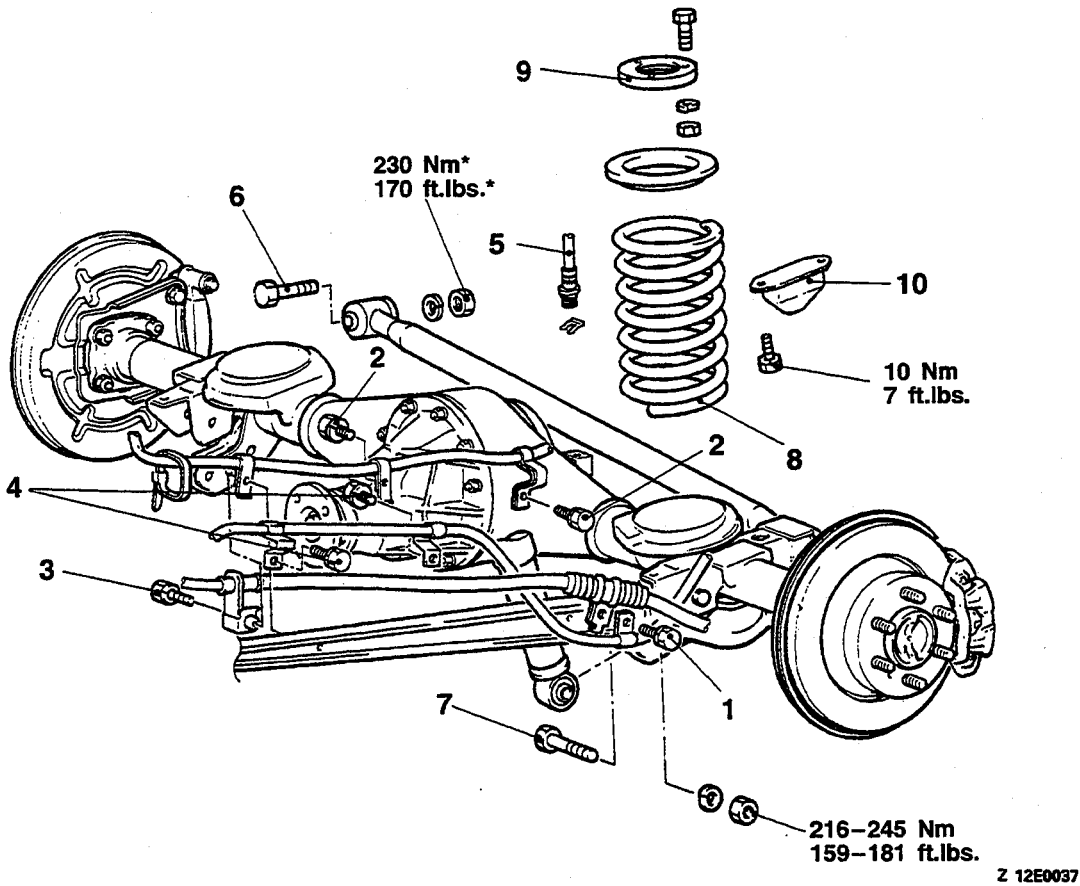
When tightening the nut, be careful not to bend the stud pin of the washer assembly.

COIL SPRING AND AXLE BUMPER

REMOVAL AND INSTALLATION

Post-installation Operation

- Brake Fluid Filling and Air Bleeding (Refer to GROUP 35A – Service Adjustment Procedures.)



Removal steps

1. Parking brake cable attaching bolt
2. Rear differential lock position harness attaching bolt
3. Parking brake cable attaching bolt
4. Rear sensor attaching bolt (Vehicles with A.B.S.)
5. Brake hose connection
6. Lateral rod mounting bolt (body side only)

7. Shock absorber mounting bolt (lower side only)
8. Coil spring
9. Rear spring pad
10. Helper rubber



NOTE

*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

REMOVAL SERVICE POINT

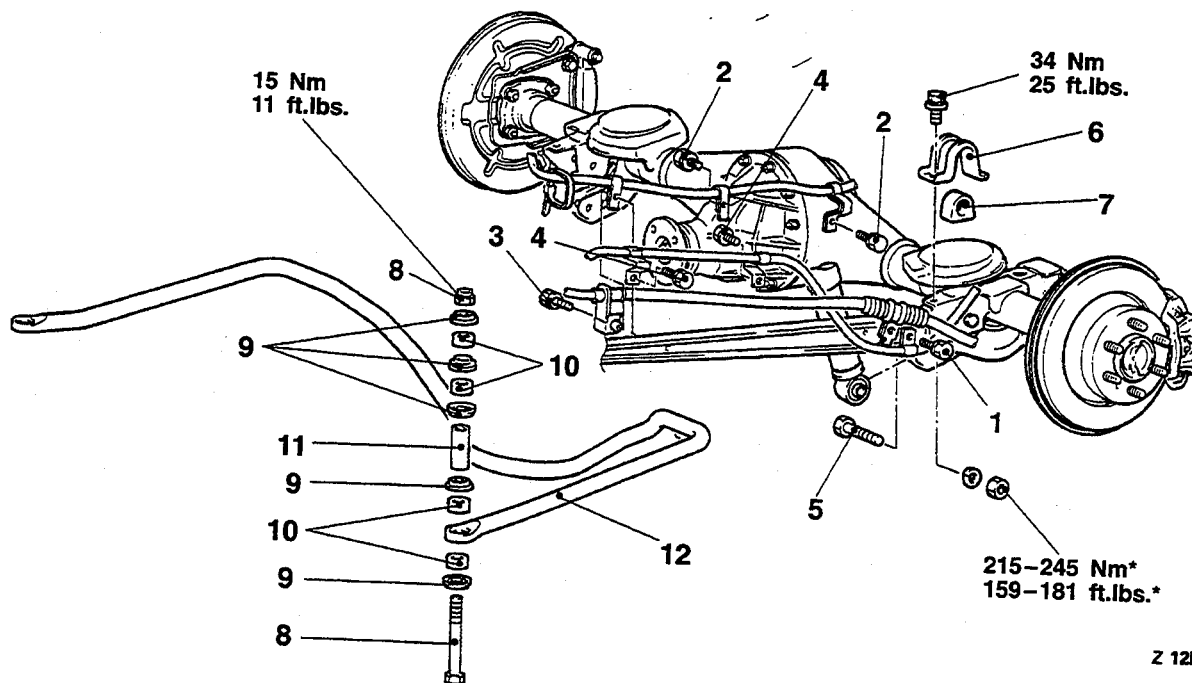
◀A▶ COIL SPRING REMOVAL

Slowly lower the jack supporting the axle housing, and remove the coil spring and rear spring pad.

STABILIZER BAR <UP TO 1993 MODELS>

REMOVAL AND INSTALLATION

110005118



Z 12E0035

Removal steps

1. Parking brake cable attaching bolt
2. Rear differential lock position harness attaching bolt
3. Parking brake cable attaching bolt
4. Rear sensor attaching bolt (Vehicles with A.B.S.)
5. Shock absorber mounting bolts (lower side)
6. Bracket C
7. Bushing B

- ▶A◀ 8. Stabilizer bar mounting bolt and nut
- 9. Joint cup
- 10. Rubber bushing
- 11. Collar
- 12. Stabilizer bar

NOTE

*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

REMOVAL SERVICE POINT

◀A▶ **STABILIZER BAR REMOVAL**

Slowly lower the jack, and remove the stabilizer bar to the vehicle right side.

Caution

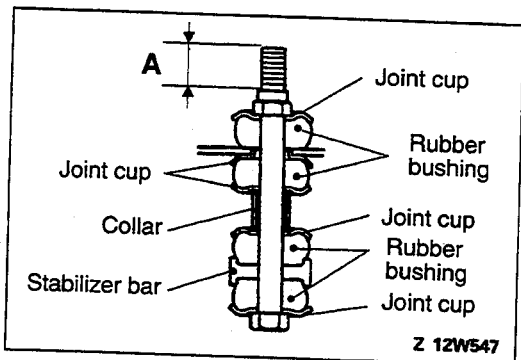
When lowering the jack, take care not to damage the rear brake pipe between the main brake pipe and the rear axle housing.

INSTALLATION SERVICE POINT

▶A◀ **STABILIZER BAR MOUNTING BOLT AND NUT INSTALLATION**

- (1) To install the stabilizer bar, assemble the joint cups and rubber bushings by the order and the certain direction as shown in the figure.
- (2) Install the nut on the stabilizer bar mounting bolt to the specified dimensions.

Standard value (A): 15-17 mm (.59-.67 in.)



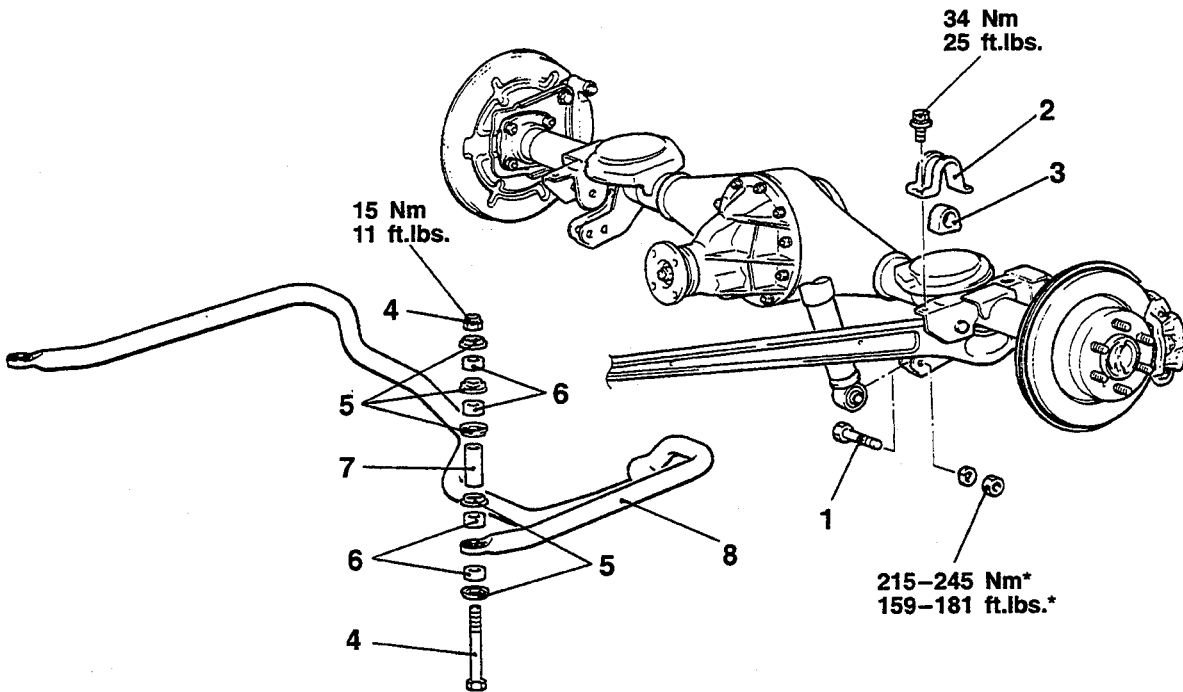
Z 12W547

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STABILIZER BAR <1994 MODELS AND AFTER>

110005119

REMOVAL AND INSTALLATION



Z 12E0089

Removal steps

1. Shock absorber mounting bolts (lower side)
2. Bracket C
3. Bushing B
- ▶A◀ 4. Stabilizer bar mounting bolt and nut
5. Joint cup

6. Rubber bushing
7. Collar
8. Stabilizer bar

NOTE

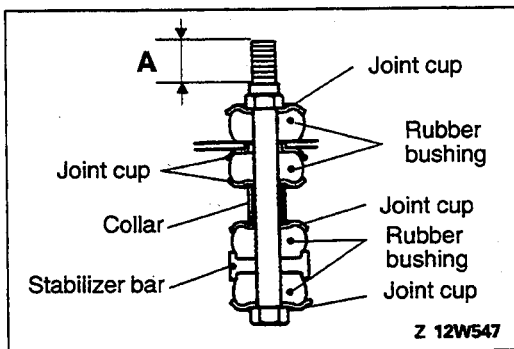
*: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

INSTALLATION SERVICE POINT

▶A◀ **STABILIZER BAR MOUNTING BOLT AND NUT INSTALLATION**

- (1) To install the stabilizer bar, assemble the joint cups and rubber bushings by the order and the certain direction as shown in the figure.
- (2) Install the nut on the stabilizer bar mounting bolt to the specified dimensions.

Standard value (A): 15–17 mm (.59–.67 in.)



Z 12W547

SERVICE BRAKES

CONTENTS

110005589


BASIC BRAKE SYSTEM 35A

ANTI-LOCK BRAKING SYSTEM (ABS)
<2WD> 35B

ANTI-LOCK BRAKING SYSTEM (ABS)
<AWD> 35C

REAR ANTI-LOCK BRAKING SYSTEM
(REAR ABS) 35D

NOTE
The tinted sections are not included in this manual.





BASIC BRAKE SYSTEM

CONTENTS

110005590

BRAKE LINE	24	Brake Pedal Inspection and Adjustment	6
BRAKE PEDAL	17	Check Valve Operation Check	7
FRONT DISC BRAKE	25	Disc Brake Pad Check	10
GENERAL SPECIFICATIONS	2	Front Brake Disc Runout Check	12
LUBRICANTS	3	Front Brake Disc Runout Correction	13
MASTER CYLINDER AND BRAKE BOOSTER	19	Front Brake Disc Thickness Check	13
REAR DISC BRAKE	30	Front Disc Brake Pad Replacement and Brake Drag Check	10
SEALANTS	3	Front Disc Brake Rotor Inspection	12
SERVICE ADJUSTMENT PROCEDURES	6	Load Sensing Proportioning Valve Function Test	8
Bleeding	9	Load Sensing Spring Length Check and Adjustment	8
Brake Booster Operating Test	6	Rear Brake Disc Runout Check	15
Brake Drum Inside Diameter Check	16	Rear Brake Disc Runout Correction	15
Brake Fluid Level Sensor Check	7	Rear Brake Disc Thickness Check	15
Brake Lining and Brake Drum Contact Check	16	Rear Disc Brake Pad Check and Replacement	13
Brake Lining Thickness Check	16	SERVICE SPECIFICATIONS	2
		TROUBLESHOOTING	4

35A-2 BASIC BRAKE SYSTEM – General Specifications/Service Specifications

GENERAL SPECIFICATIONS

110005591

Items		Specifications
Master cylinder	Type	Tandem Type (with level sensor)
	I.D. mm (in.)	23.8 (15/16)
Brake booster	Type	Vacuum Type, tandem
	Effective dia. of power cylinder mm (in.)	205+230 (8+9)
	Boosting ratio	6.0
Proportioning valve type		Load sending proportioning type
Front brakes	Type	Floating caliper, dual pistons, ventilated disc (M-R57W)
	Disc effective dia. x thickness mm (in.)	228x24 (8.98x.94)
	Wheel cylinder I.D. mm (in.)	42.8 (1 11/16)x2
	Lining thickness mm (in.)	10 (.39)
	Clearance adjustment	Automatic
Rear brakes	Type	Floating caliper, single piston, solid disc (M-R59S)
	Disc effective dia. x thickness mm (in.)	272x18 (10.71x.71)
	Wheel cylinder I.D. mm (in.)	42.8 (1 11/16)
	Lining thickness mm (in.)	9 (.354)
	Clearance adjustment	Automatic

SERVICE SPECIFICATIONS

110005592

Items		Standard value	Limit	
Brake pedal height mm (in.)		186–191 (7.3–7.5)	–	
Brake pedal to toeboard clearance mm (in.)		100 (3.94) or more	–	
Brake pedal free play mm (in.)		3–8 (.12–.32)	–	
Load sensing spring length mm (in.)		224–228 (8.8–9.0)	–	
Load sensing proportioning valve output pressure MPa (psi)	When load sensing spring length is 226.7mm (8.9 in.)	Input pressure at 10 (1,422)	6.14–7.04 (873.3–1,001.3)	–
		Input pressure at 18 (2,560)	7.94–9.24 (1,129.3–1,314.2)	–
	When load sensing spring length is 257.7mm (10.1 in.)	Input pressure at 18 (2,560)	13.1–15.1 (1,863.3–2,147.7)	–

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BASIC BRAKE SYSTEM – Service Specifications/Lubricants/Sealants **35A-3**

Items		Standard valve	Limit
Booster push rod to master cylinder piston clearance mm (in.)		0.65–0.90 (.026–.035)	–
Brake dragging force N (lbs.) [Brake dragging torque] Nm (ft.lbs.)		57 (13) or less [4 (3)] or less	–
Pad thickness mm (in.)	Front	10.0 (.39)	2.0 (.079)
	Rear	9.0 (.35)	–
Disc thickness mm (in.)	Front <3.0L engine>	24 (.94)	22.4 (.882)
	Front <3.5L engine>	27 (1.06)	25.4 (1.0)
	Rear	18 (.71)	16.4 (.646)
Brake disc runout mm (in.)	Front	–	0.1 (.0039)
	Rear	–	0.08 (.0031)
Hub end play mm (in.)		–	0.25 (.0098)
Lining thickness mm (in.)		6.5 (.256)	4.5 (.177)
Brake drum inside diameter mm (in.)		197 (7.756)	198 (7.795)

LUBRICANTS

110005593

Items	Specified lubricants
Brake fluid	DOT 3 or DOT 4
Brake piston boot inner surfaces	Repair kit grease
Lock pin boot inner surfaces	
Guide pin boot inner surfaces	

SEALANTS

110005594

Items	Specified sealants
Thread part of fitting	3M ATD Part No. 8661, 3M ATD Part No. 8663 or equivalent

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TROUBLESHOOTING

110005595

Trouble Symptom	Probable Cause	Remedy
Vehicle pulls to one side when brakes are applied	Grease or oil on pad	Replace
	Poor pad contact	Correct
Insufficient braking power	Low or deteriorated brake fluid	Refill or change
	Air in brake system	Bleed the air.
	Vapor lock caused by dragging of the pad	Correct
	Grease or oil on pad	Replace
	Poor pad contact	Correct
	Malfunction of brake booster	Correct
	Clogged brake line	Correct
	Malfunction of proportioning valve	Replace
Increased pedal stroke (Reduced pedal to floorboard clearance)	Air in brake system	Bleed the air.
	Worn pad	Replace
	Excessive push rod to master cylinder clearance	Adjust
	Malfunction of master cylinder	Replace
Brake drag	Incomplete release of parking brake	Correct
	Incorrect parking brake adjustment	Adjust
	Worn brake pedal return spring	Replace
	Lack of lubrication in sliding parts	Lubricate
	Improper push rod to master cylinder clearance	Adjust
	Malfunction of master cylinder piston return spring	Replace
	Clogged master cylinder return port	Correct
Scraping or grinding noise when brakes are applied	Worn brake pad	Replace
	Caliper to wheel interference	Correct or replace
	Interference between dust cover and disc	Correct or replace
	Bent brake backing plate	Correct or replace
	Cracked brake disc	Correct or replace

Trouble Symptom	Probable Cause	Remedy
Squealing, groaning or chattering noise when brakes are applied	Missing or damaged brake pad anti-squeak shim	Replace
	Worn or scored brake discs and pads	Correct or replace
	Burred or rusted calipers	Clean or deburr
	Incorrect brake pedal or booster push rod	Adjust
Squealing noise when brakes are not applied	Bent or loose backing plate	Replace
	Dust cover or brake disc contact	Correct
	Rusted, stuck	Lubricate or replace
	Worn, damaged or insufficiently lubricated wheel bearings	Lubricate or replace
	Improper positioning of pads in caliper	Correct
	Improper installation of support mounting to caliper body	Correct
	Poor return of brake booster or master cylinder or wheel cylinder	Replace
Groaning, clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove stones, etc.
	Loose wheel nuts	Re-tighten
	Failure of pad shim	Replace
	Worn, damaged or insufficiently lubricated wheel bearings	Lubricate or replace

SERVICE ADJUSTMENT PROCEDURES

110005596

BRAKE PEDAL INSPECTION AND ADJUSTMENT

1. Measure the brake pedal height (A) as shown in the illustration.

Standard value (A): 186–191 mm (7.3–7.5 in.)

2. Start the engine, depress the brake pedal with approximately 500 N (110 lbs.) of force, and measure the clearance between the brake pedal and the floorboard.

Standard value (C): 100 mm (3.94 in.) or more

3. While the engine is stopped, depress the brake pedal two or three times. After thus eliminating the negative pressure in the brake booster, press the pedal down by hand, and confirm that the free play (B) is within the standard value range.

Standard value (B): 3–8 mm (.12–.31 in.)

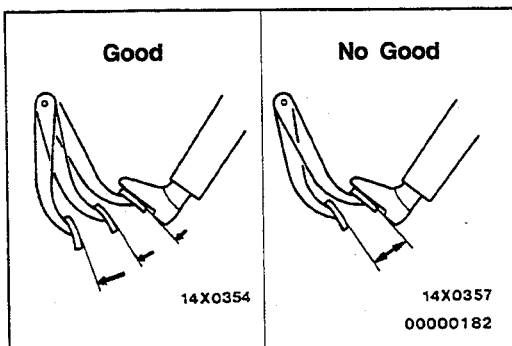
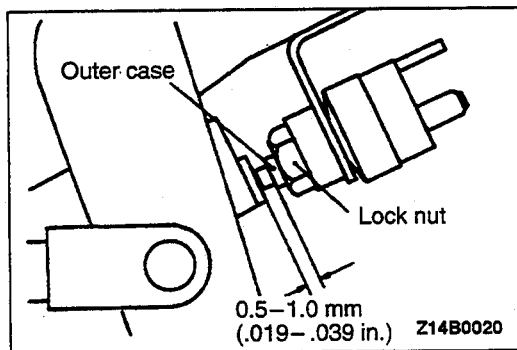
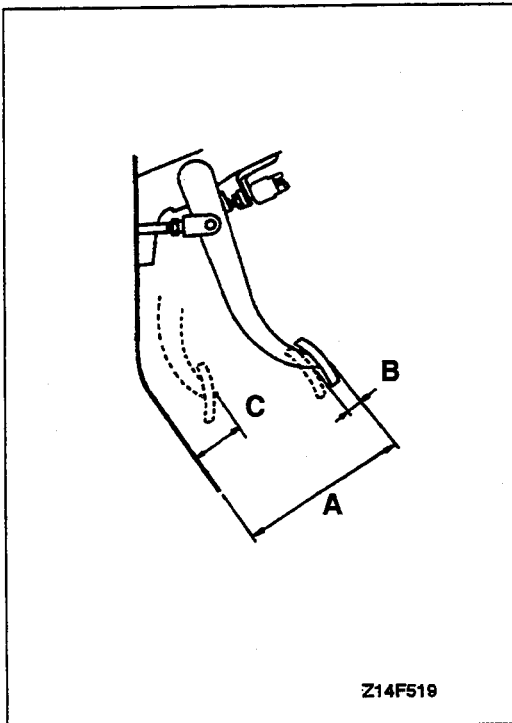
4. Adjust the brake pedal height.

- (1) Loosen the lock nut to sufficiently loosen the stop light switch.
- (2) Adjust the brake pedal height by turning the operating rod with pliers (with lock nut loosened).
- (3) After turning the stop light switch until it contacts the pedal stop (until immediately before the brake pedal begins to move), turn the stop light switch back 1/2 to 1 revolution and secure with a lock nut.

Caution

Check that the stop light is not illuminated when the brake pedal is not depressed.

5. For vehicles with automatic transmission, check the shift-lock mechanism. (Refer to GROUP 23–Transmission Control.)

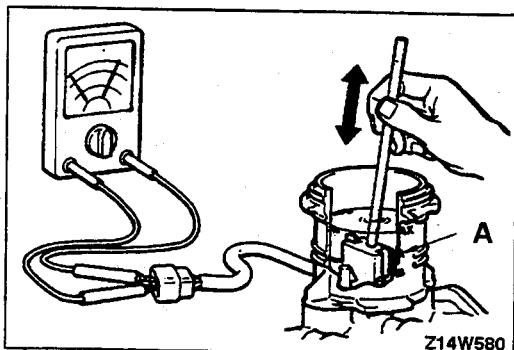
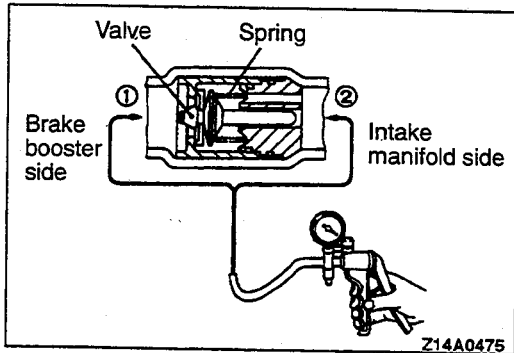
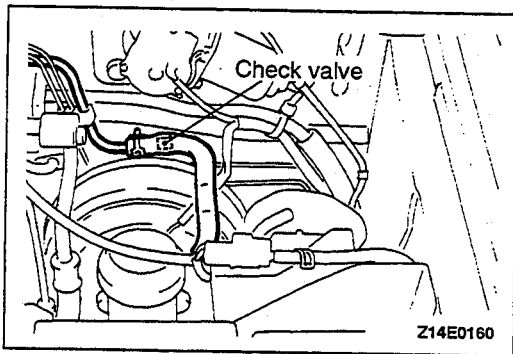
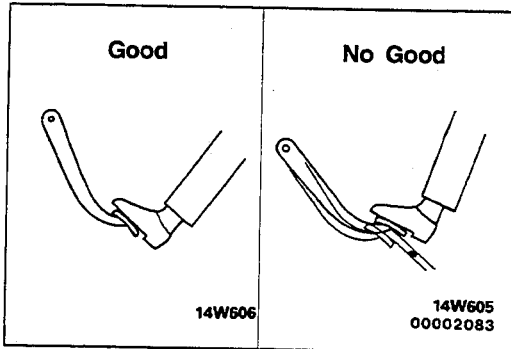
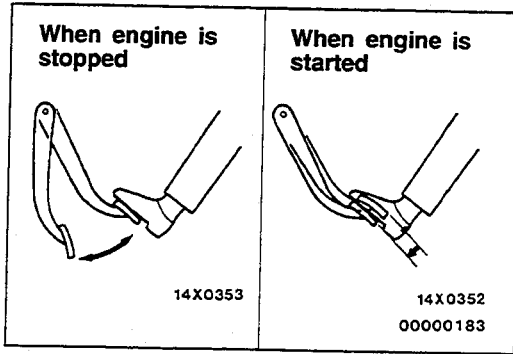


BRAKE BOOSTER OPERATING TEST

110005597

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, then there is a malfunction of the booster.



2. While the engine is stopped, depress the brake pedal several times. Then depress the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, there is a malfunction of the booster.

3. While the engine is running, depress the brake pedal and then stop the engine. Keep the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition. If the pedal rises, there is a malfunction of the booster. If the above three tests are okay, the booster performance can be judged to be okay. If any above three test is not okay, there is a malfunction of the check valve, vacuum hose or booster.

CHECK VALVE OPERATION CHECK

110005598

When checking the check valve, keep the check valve inserted into the vacuum hose.

1. Disconnect the vacuum hose.

NOTE

The check valve is press-fitted inside the vacuum hose.

2. Use a vacuum pump to check the operation of the check valve.

Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side (1)	Negative pressure is created and maintained.
Connection at the engine side (2)	Negative pressure is not created.

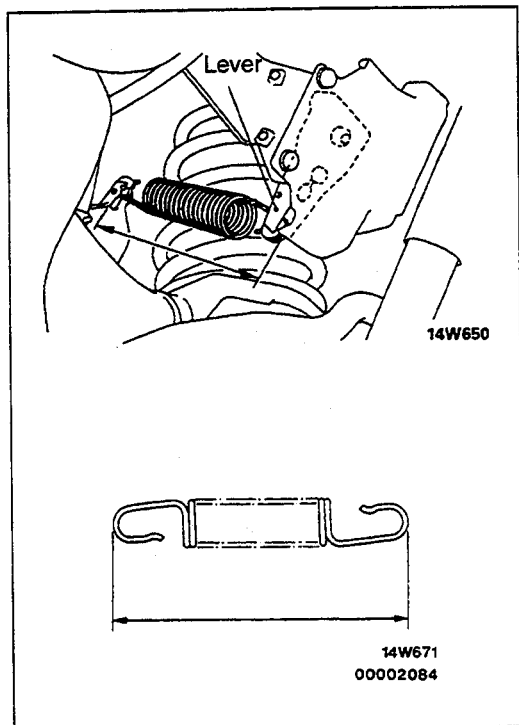
Caution

If there is a malfunction of the check valve, replace it together with the vacuum hose as an assembly.

BRAKE FLUID LEVEL SENSOR CHECK

110005599

The brake fluid sensor is in good condition if there is no continuity when the float surface is above A and if there is continuity when the float surface is below A.



LOAD SENSING SPRING LENGTH CHECK AND ADJUSTMENT

110005600

1. Park the vehicle on a level ground. The vehicle should be unloaded and supported only by wheels.

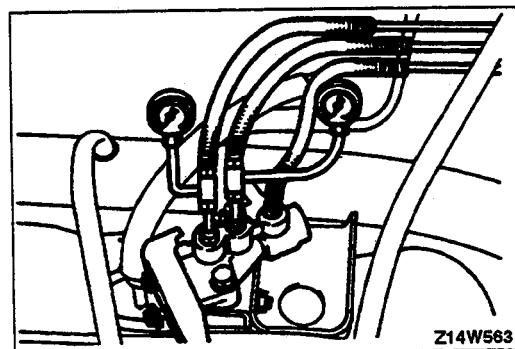
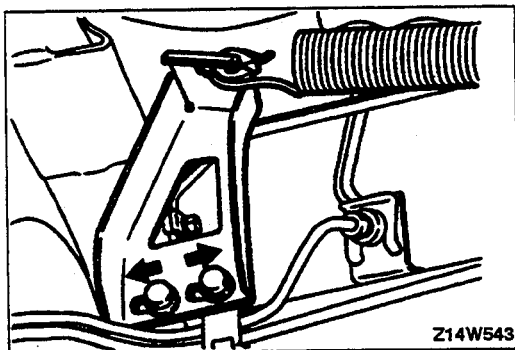
Caution

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 the length of the spring (the length between its ends) shown in the illustration is at the standard value.

Standard value: 224–228 mm (8.8–9.0 in.)

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

110005601

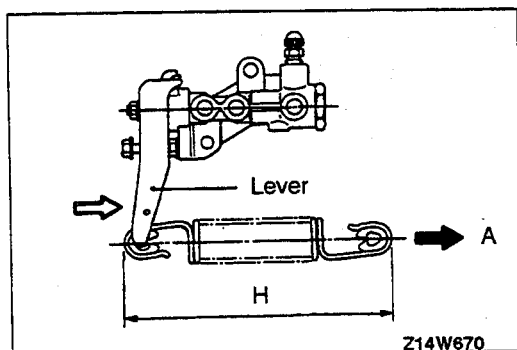
1. Connect pressure gages to the input and output ports of the load sensing proportioning valve. Bleed the system.

2. Disconnect the spring at the support side.
3. 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 illustration (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 that the output fluid pressure is within the standard value at this time.



Standard value:

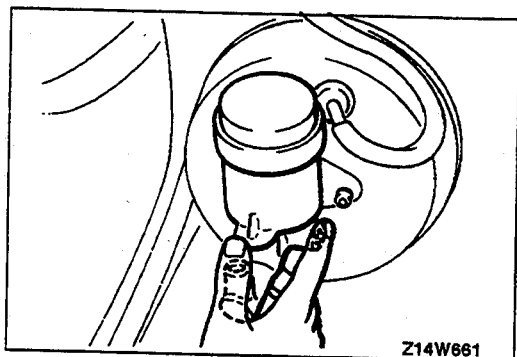
Items	Spring length H mm (in.)	Input fluid pressure MPa (psi)	Output fluid pressure MPa (psi)
Specifications	226.7 (8.9)	10 (1,422)	6.14–7.04 (873.3–1,001.3)
		18 (2,560)	7.94–9.24 (1,129.3–1,314.2)

4. In the same manner as in step 3., check that the output fluid pressure is within the standard value when the spring length H is the dimension noted below relative to the load-sensing proportioning valve input fluid pressure.

Standard value:

Items	Spring length H mm (in.)	Input fluid pressure MPa (psi)	Output fluid pressure MPa (psi)
Specifications	257.7 (10.1)	18 (2,560)	13.1–15.1 (1,863.3–2,147.7)

5. After making the check, install the spring. Disconnect the pressure gages from the load-sensing proportioning valve and bleed the air.



BLEEDING

110005602

Caution

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

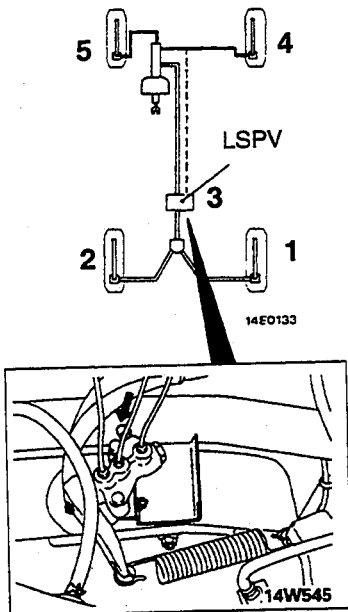
Specified brake fluid: DOT 3 or DOT 4

MASTER CYLINDER AIR BLEEDING

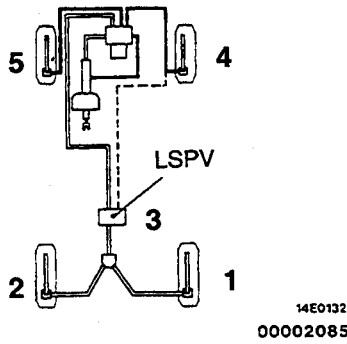
If there is no brake fluid in the master cylinder, bleed air from the master cylinder by the following procedure.

- (1) Supply brake fluid to the reservoir tank.
- (2) Depress and hold the brake pedal.
- (3) another person should then plug the outlet of the master cylinder with a finger.
- (4) In the condition in step (3), release the brake pedal.
- (5) Repeat steps (2) to (4) three or four times so as to supply brake fluid inside the master cylinder.

Vehicles without ABS



Vehicles with ABS



BRAKE PIPE LINE AIR BLEEDING

Bleed the brake system in the sequence shown in the illustration.

Furthermore, for vehicles with ABS, start the engine before bleeding the air.

Caution

When supplying brake fluid for vehicles with ABS, the filter should be installed to the master cylinder reserve tank.

DISC BRAKE PAD CHECK

110005603

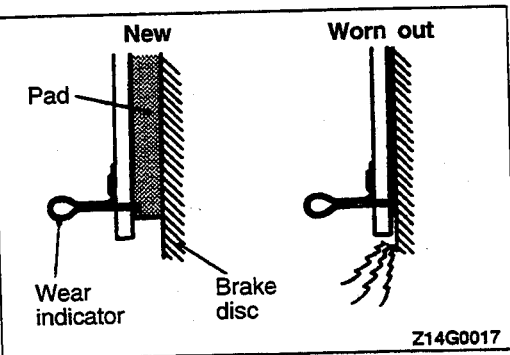
Check the brake pad thickness through the caliper body check port.

Standard value: 10.0 mm (.39 in.)
Limit: 2.0 mm (.079 in.)

Replace the brake pads on both sides if the wear exceeds the limit value. Replace both left and right brake pads at the same time.

NOTE

The brake pads have been equipped with wear indicator, so that when the brake pad thickness reaches 2 mm (.08 in.), the wear indicator touches the brake disc and produces a warning squeaking sound.



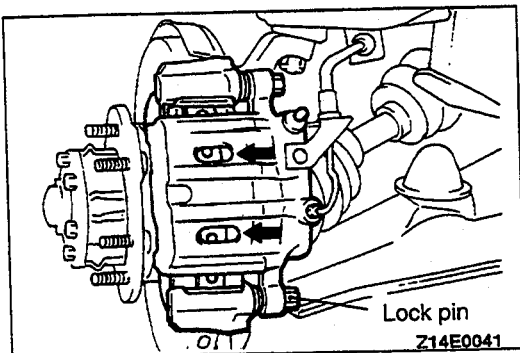
FRONT DISC BRAKE PAD REPLACEMENT AND BRAKE DRAG CHECK

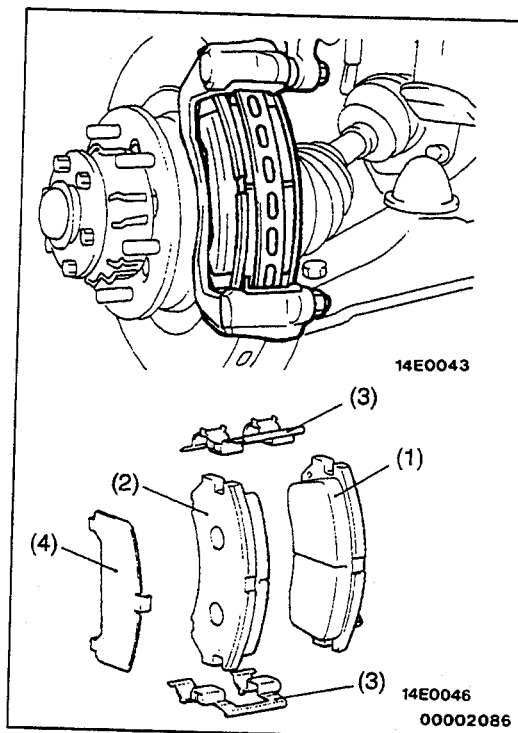
110005604

1. Remove the lock pin, and then lift up the caliper assembly and secure it with wire.

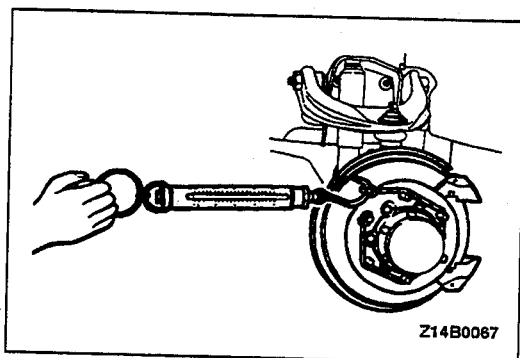
Caution

Do not wipe off the special grease that is on the lock pin or allow it to contaminate the lock pin.





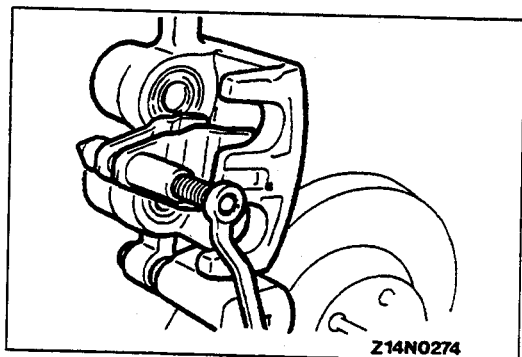
2. Remove the following parts from the caliper support.
 - (1) Pad and wear indicator assembly
 - (2) Pad assembly
 - (3) Clip
 - (4) Outer shim



3. In order to measure the dragging force of the disc brakes after installation of the brake pads, use a spring balance to measure the rotational sliding resistance of the hub in the forward direction with the pads removed.
4. Securely attach the pad clip to the caliper support.

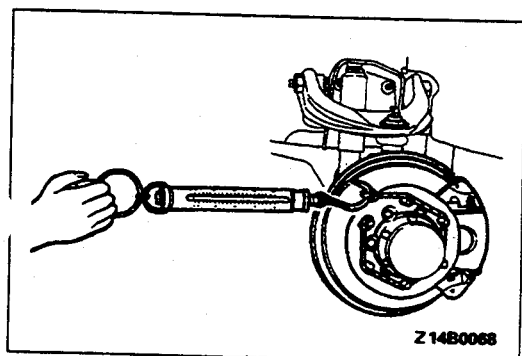
Caution

Do not deposit grease or other dirt on pad or brake disc friction surfaces.



5. Clean the piston and press the piston into the cylinder. Be careful that the piston boot does not become caught when lowering the caliper assembly and installing the lock pin.
6. Start the engine and, after strongly depressing the brake pedal 2-3 times, stop the engine.
7. Turn the brake disc forward 10 times.
8. Use a spring balance to measure the rotational sliding resistance of the hub in the forward direction.
9. Calculate the dragging force of the disc brakes (the difference between the values measured in steps (8) and (3)).

Standard value: 57 N (13 lbs.) or less



10. If the dragging force exceeds the standard value, disassemble and clean the piston. Check for corrosion or a worn piston seal, and check the sliding condition of the lock pin sleeve and guide pin sleeve.

FRONT DISC BRAKE ROTOR INSPECTION

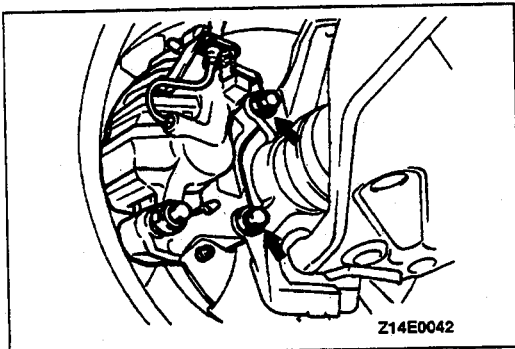
110005605

Caution

When servicing disc brakes, it is necessary to exercise caution to keep the disc brakes within the allowable service values in order to maintain normal brake operation.

Before re-finishing or re-processing the brake disc surface, the following conditions should be checked.

Inspection Items	Remarks
Scratches, rust, saturated lining materials and wear	If the vehicle is not driven for a certain period, the sections of the discs that are not in contact with the 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).
Runout or drift	Excessive runout or drift of the discs will increase the pedal depression resistance due to piston knock-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause inset or warping.



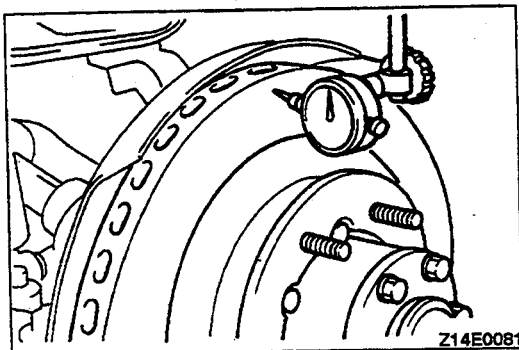
FRONT BRAKE DISC RUNOUT CHECK

110005605

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 gage approximately 5 mm (.2 in.) from the outer circumference of the brake disc, and measure the runout of the disc.

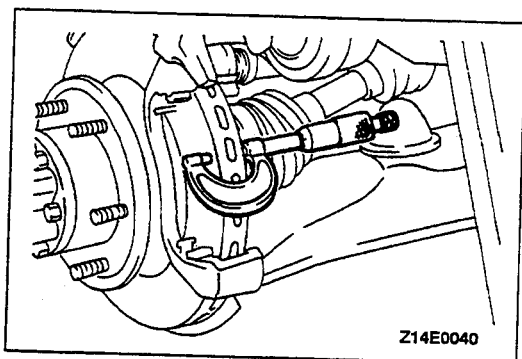
Limit: 0.1 mm (.0039 in.)



FRONT BRAKE DISC RUNOUT CORRECTION

110005607

1. If the runout of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the runout again. (Refer to P.35-45.)
2. If the runout cannot be corrected by changing the phase of the brake disc, replace the disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).



FRONT BRAKE DISC THICKNESS CHECK

110005608

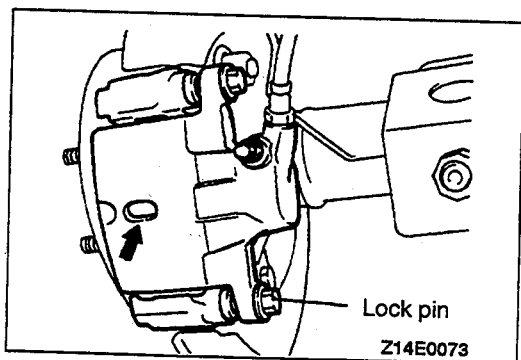
1. Inspect the disc surface for grooves, cracks, and rust. Clean the disc thoroughly and remove all rust.
2. Using a micrometer, measure disc thickness at eight positions, approximately 45° apart and 10 mm (.39 in.) in from the outer edge of the disc.

Standard value: 24 mm (.94 in.) <3.0L engine>
27 mm (1.06 in.) <3.5L engine>

Limit: 22.4 mm (.882 in.) <3.0L engine>
25.4 mm (1.0 in.) <3.5L engine>

The difference between any thickness measurements should not be more than 0.015 mm (.0006 in.)

3. Replace the discs and pad assembly for both left and right sides of the vehicle if they are worn beyond the specified limit.
4. If thickness variation exceeds the specification, replace the disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).



REAR DISC BRAKE PAD CHECK AND REPLACEMENT

110005609

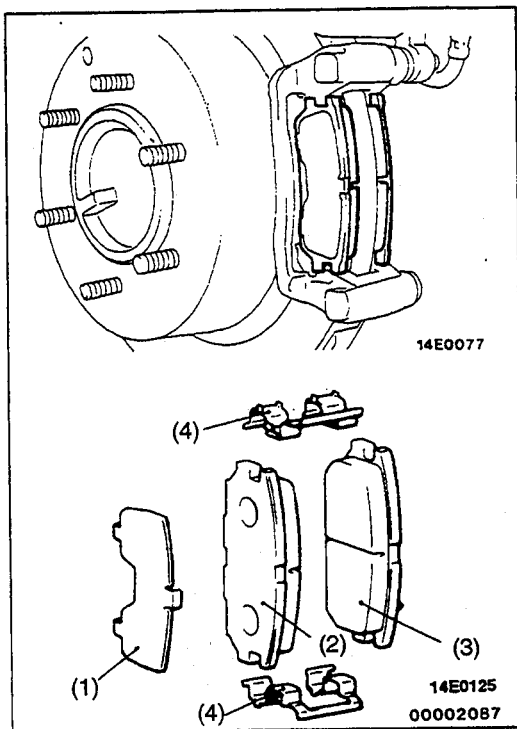
1. Check the brake pad thickness through the caliper body check port.

Standard value: 9.0 mm (.35 in.)

Limit: 2.0 mm (.079 in.)

Caution

1. When the limit is exceeded, replace the pads at both sides, and also replace 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 both pads, check the sliding condition of the piston, lock pin sleeve and guide pin sleeve.

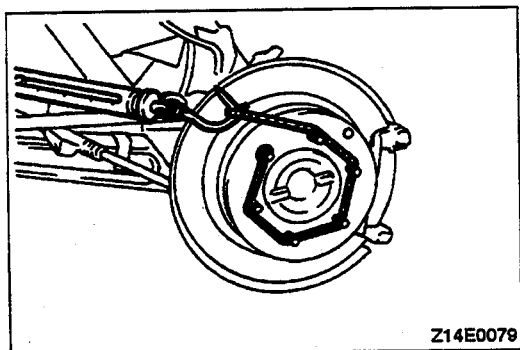


2. Remove lock pin. Lift caliper assembly and retain with wires.

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 the caliper support.
 - (1) Outer shim
 - (2) Pad assembly
 - (3) Pad and wear indicator assembly
 - (4) Clip



4. In order to measure the dragging force of the disc brakes after installation of the brake pads, use a spring balance to measure the rotational sliding resistance of the hub in the forward direction with the pads removed.

NOTE

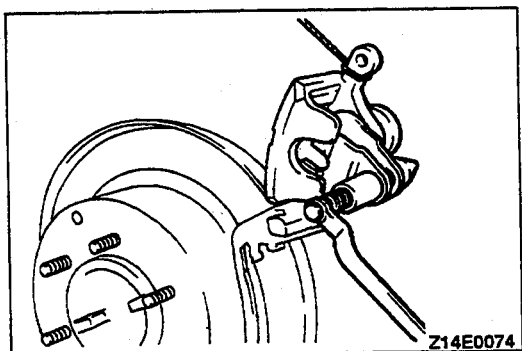
To secure the disc to the hub, tighten the nuts.

5. Securely attach the pad clip to the caliper support.

Caution

Do not deposit grease or other dirt on pad or brake disc friction surfaces.

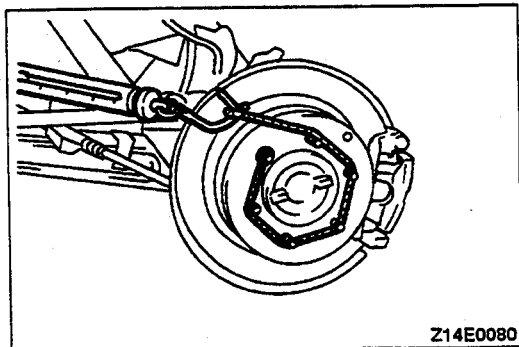
6. Clean the piston and press the piston into the cylinder. Be careful that the piston boot does not become caught when lowering the caliper assembly and installing the lock pin.
7. Start the engine and, after strongly depressing the brake pedal 2-3 times, stop the engine.
8. Turn the brake disc forward 10 times.

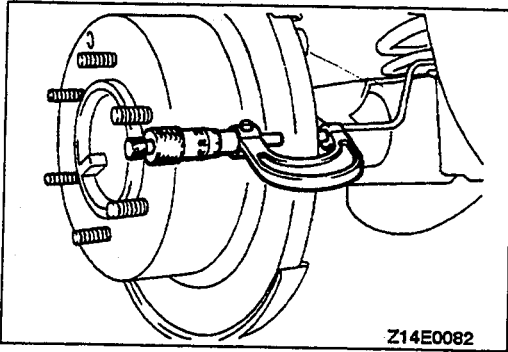


9. Use a spring balance to measure the rotational sliding resistance of the hub in the forward direction.
10. Calculate the dragging force of the disc brakes (the difference between the values measured in steps (9) and (4)).

Standard value: 57 N (13 lbs.) or less

11. If the dragging force 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 sleeve and guide pin sleeve.





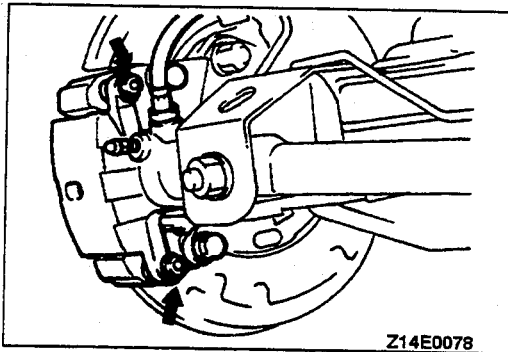
REAR BRAKE DISC THICKNESS CHECK 110005610

1. Remove dirt and rust from the brake disc surface.
2. Measure the disc thickness at 4 locations or more.

Standard value: 18.0 mm (.71 in.)

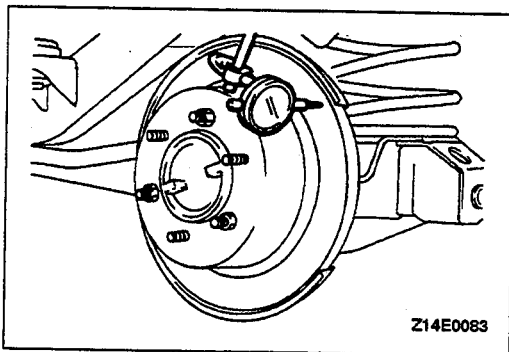
Limit: 16.4 mm (.646 in.)

Replace the discs and pad assembly for both left and right sides of the vehicle if they are worn beyond the specified limit.



REAR BRAKE DISC RUNOUT CHECK 110005611

1. Remove the caliper support, raise the caliper assembly, and secure it by using a wire, etc.

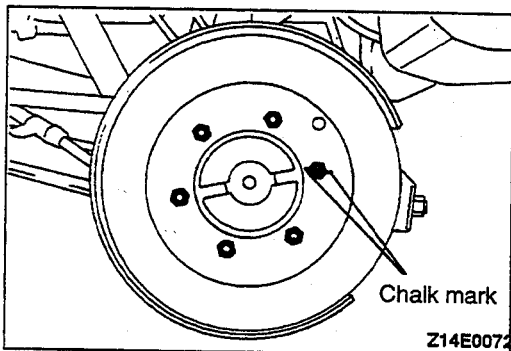


2. Place a dial gage approximately 5 mm (.2 in.) from the outer circumference of the brake disc, and measure the runout of the disc.

Limit: 0.08 mm (.0031 in.)

NOTE

To secure the disc to the hub, tighten the nuts.



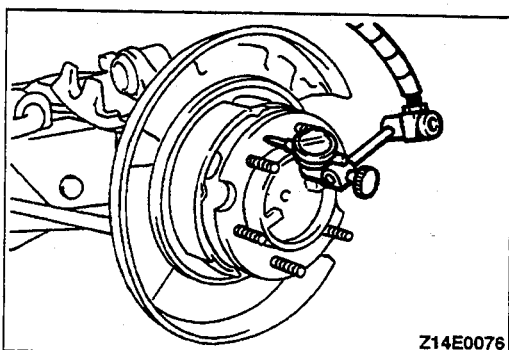
REAR BRAKE DISC RUNOUT CORRECTION 110005612

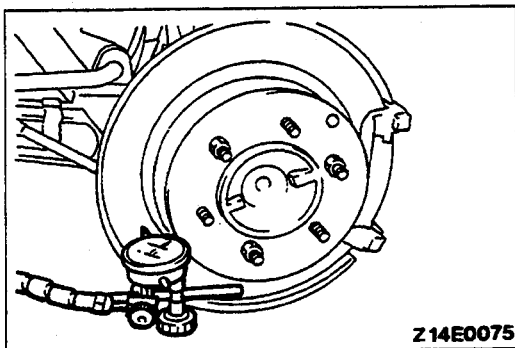
1. If the runout of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and axle shaft and then measure the runout again.

(1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which runout is greatest.

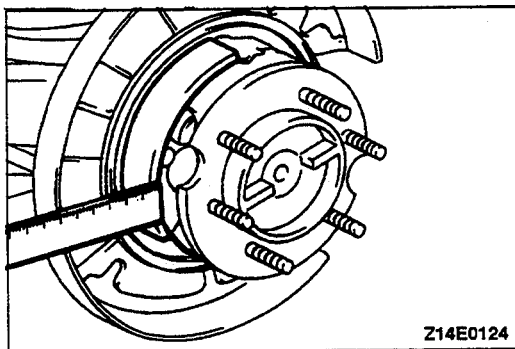
- (2) Remove the brake disc, connect a dial gage, and then move the hub in the axial direction and measure the play.

Limit: 0.25 mm (.0098 in.) or less





Z14E0075



Z14E0124

- (3) If the play does not exceed the limit specification, install the brake disc at a different phase, and then check the runout of the brake disc again.
2. If the runout cannot be corrected by changing the phase of the brake disc, replace the disc.

BRAKE LINING THICKNESS CHECK

110005613

1. Remove the rear brake assembly and secure it with wire.
2. Remove the brake drum.
3. Measure the wear of the brake lining at the place worn the most.

Standard value: 6.5 mm (.256 in.)

Limit: 4.5 mm (.177 in.)

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 GROUP 36–Parking Brake Drum.

Caution

1. Whenever the shoe and lining assembly is replaced, replace both R.H. and L.H. assemblies as a set to prevent the vehicle 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

110005614

1. Remove the rear brake assembly and secure it with wire.
2. Remove the brake drum.
3. Measure the inside diameter of the brake drum at two or more locations.

Standard value: 197 mm (7.756 in.)

Limit: 198 mm (7.795 in.)

4. Replace brake drums and shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.

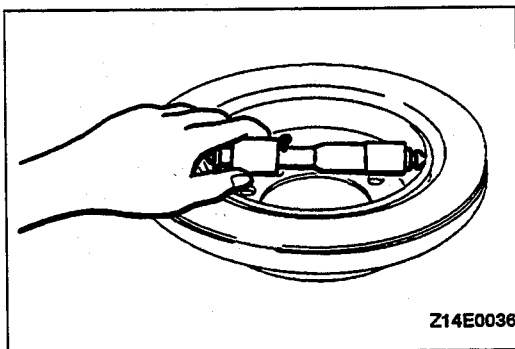
BRAKE LINING AND BRAKE DRUM CONTACT CHECK

110005615

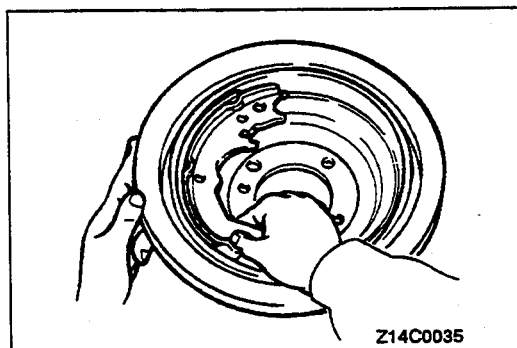
1. Remove the rear brake assembly and secure it with wire.
2. Remove the brake drum.
3. Remove the shoe and lining assembly, refer to GROUP 36–Parking Brake Drum.
4. Chalk the inner surface of the brake drum and rub against the shoe and lining assembly.
5. Replace the shoe and lining assembly or the brake drums if there is a very irregular contact area.
6. For information concerning the procedures for installation of the shoe and lining assembly, refer to GROUP 36–Parking Brake Drum.

NOTE

Wipe off chalk after check.



Z14E0036



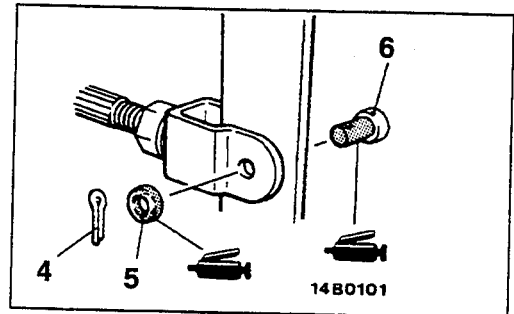
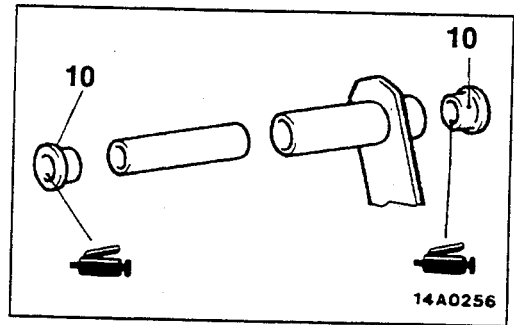
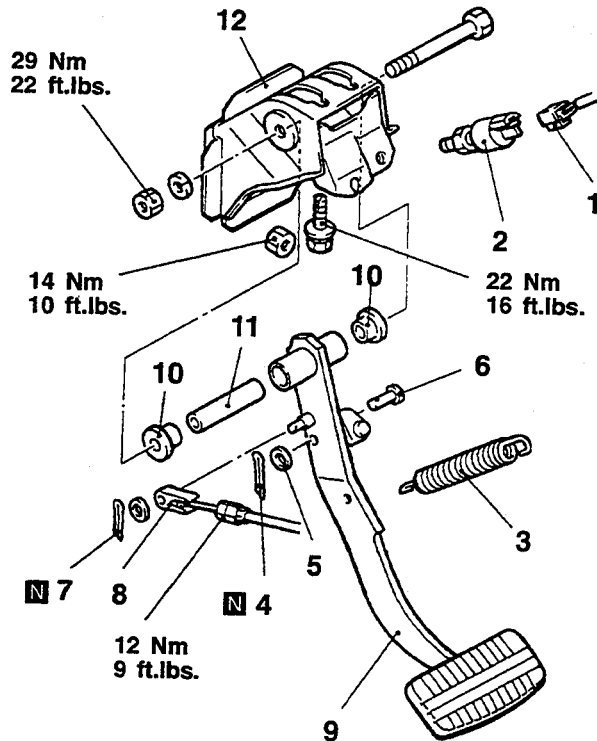
Z14C0035

BRAKE PEDAL

REMOVAL AND INSTALLATION

Post-installation Operation

- Brake Pedal Adjustment (Refer to P.35A-6.)
- Shift Lock Cable Adjustment (Refer to GROUP 23 – Transmission Control)



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00002088

Stop light switch removal steps

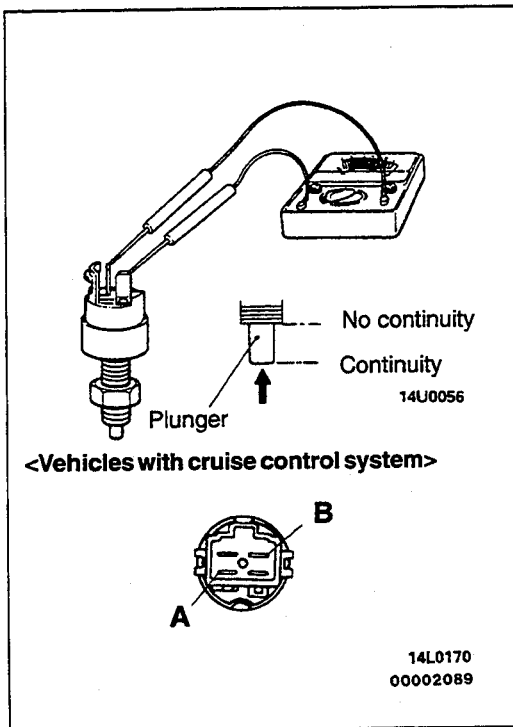
1. Stop light switch connector
2. Stop light switch

Pedal support member removal steps

2. Stop light switch
9. Brake pedal
12. Pedal support member

Brake pedal removal steps

3. Return spring
4. Cotter pin
5. Washer
6. Clevis pin
7. Cotter pin
8. Shift lock cable connection
9. Brake pedal
10. Bushing
11. Spacer
12. Pedal support member



INSPECTION

- Check the bushing for wear.
- Check the brake pedal for bend or twisting.
- Check the brake pedal return spring for damage.

STOP LIGHT SWITCH

The stop light switch is in good condition if there is no continuity when the plunger is pressed in, and if there is continuity when the plunger is released outward.

For models equipped with cruise control system, check for continuity at stop light switch connectors A and B.

MASTER CYLINDER AND BRAKE BOOSTER

110005617

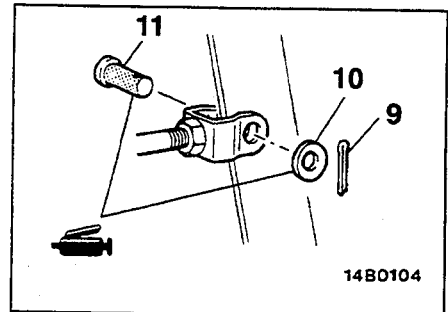
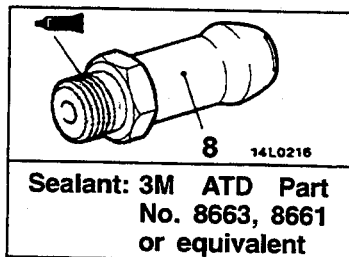
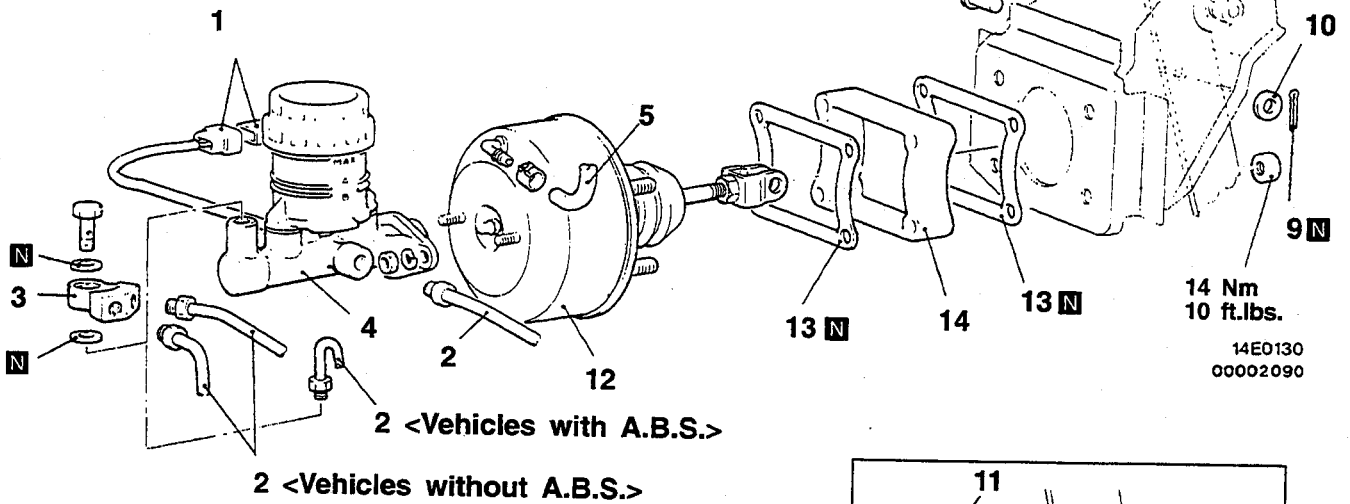
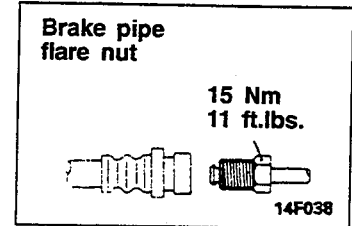
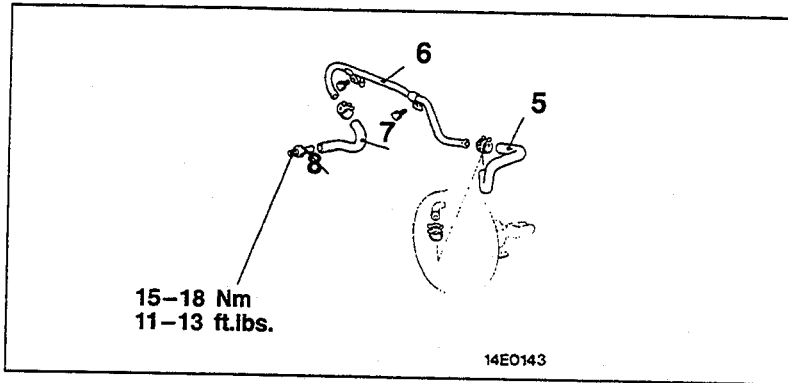
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Bleeding (Refer to P.35A-9.)
- Brake Pedal Adjustment (Refer to P.35A-6.)

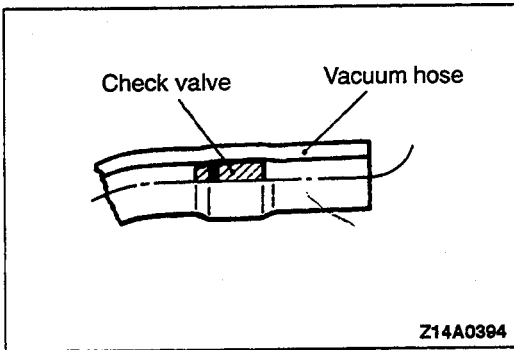


Master cylinder removal steps

1. Brake fluid level sensor connector
 2. Brake pipe
 3. Connector <Vehicles without ABS>
 4. Master cylinder
- Clearance check and adjustment between primary piston and push rod

Brake booster removal steps

4. Master cylinder
5. Vacuum hose (with built-in check valve)
6. Vacuum pipe
7. Vacuum hose
8. Fitting
9. Cotter pin
10. Washer
11. Clevis pin
12. Brake booster
13. Spacer
14. Sealant

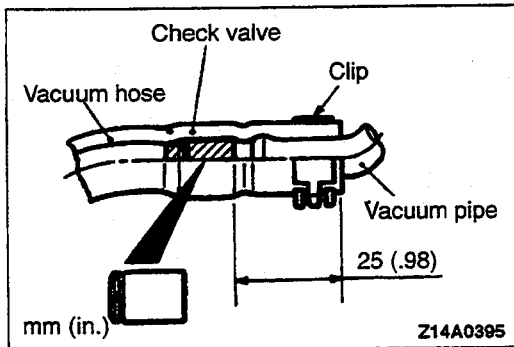


REMOVAL SERVICE POINTS

◀A▶ VACUUM HOSES WITH CHECK VALVE REMOVAL

NOTE

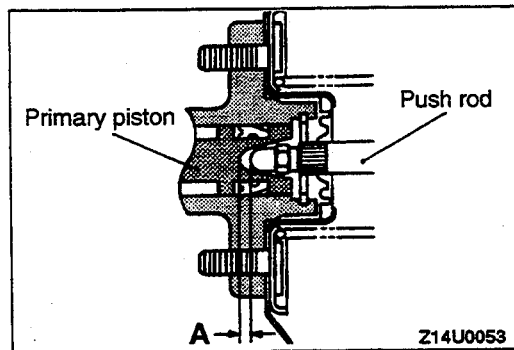
Since the check valve is fitted to the vacuum hose, replace the check valve as an assembly unit together with the vacuum hose if there is a malfunction of the check valve.



INSTALLATION SERVICE POINTS

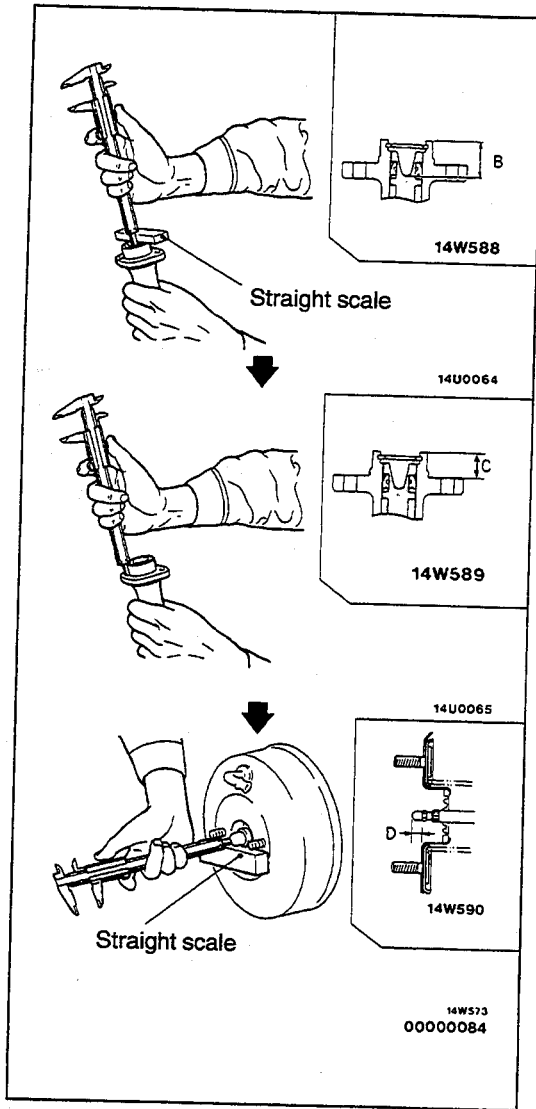
▶A◀ VACUUM HOSE/VACUUM PIPE /VACUUM HOSE WITH CHECK VALVE INSTALLATION

- (1) The vacuum hose at the engine should be securely connected until it contacts the hexagonal edge of the fitting, and then should be secured by the hose clip.
- (2) Attach the vacuum hose so that it may be inserted to the dimension shown in the illustration.



▶B◀ CLEARANCE BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON ADJUSTMENT

Adjust the clearance (A) between the brake booster push rod and primary piston as follows:



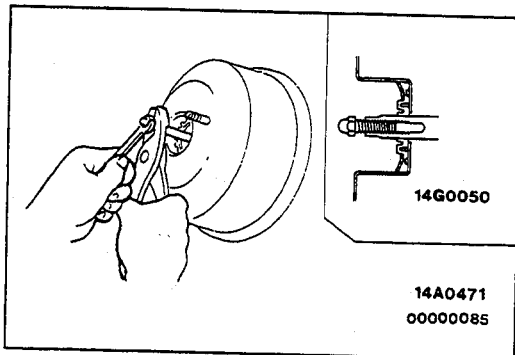
Calculate clearance A from measurements B, C and D.

$$A=B-C-D$$

Standard value: 0.65–0.90 mm (.026–.035 in.)

NOTE

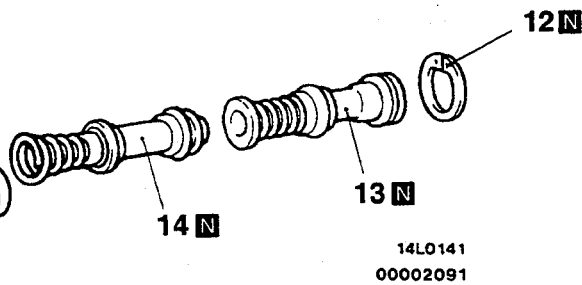
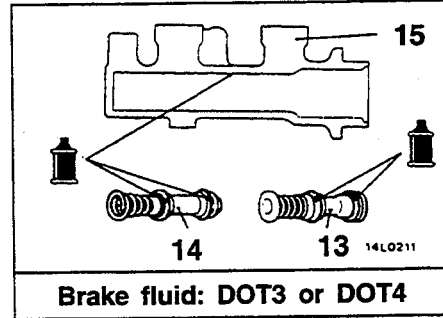
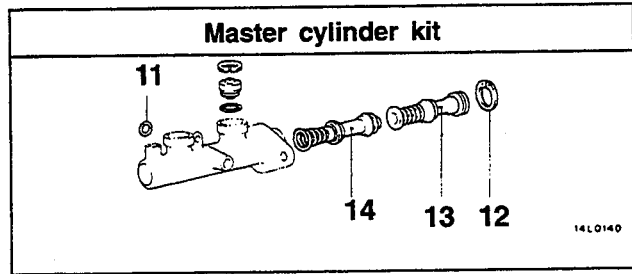
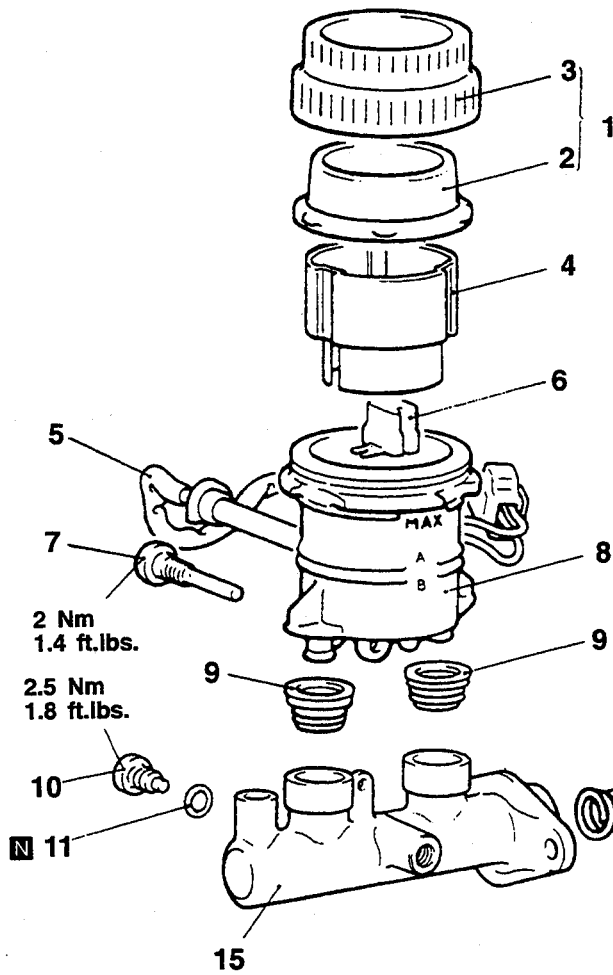
When brake booster negative pressure (–93.3 kPa [700 mmHg, 27.6 in.Hg] is applied, clearance value will become 0.05–0.30 mm (.0020–.012 in.).



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.

DISASSEMBLY AND REASSEMBLY

110005618



Disassembly steps

1. Reservoir cap assembly
2. Diaphragm
3. Reservoir cap
4. Filter <Vehicles with ABS>
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt
8. Reservoir tank
9. Reservoir seal
10. Piston stopper bolt



11. Gasket
12. Stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body

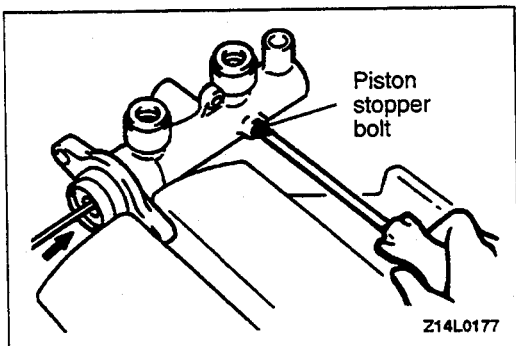
Caution

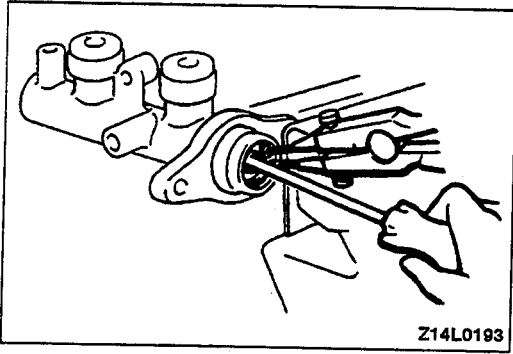
Do not disassemble the secondary and primary piston assembly.

DISASSEMBLY SERVICE POINTS

◀A▶ PISTON STOPPER BOLT REMOVAL

Remove the piston stopper bolt, while depressing the piston.





◀B▶ STOPPER RING REMOVAL

Remove the piston stopper ring, while depressing the piston.

BRAKE LINE

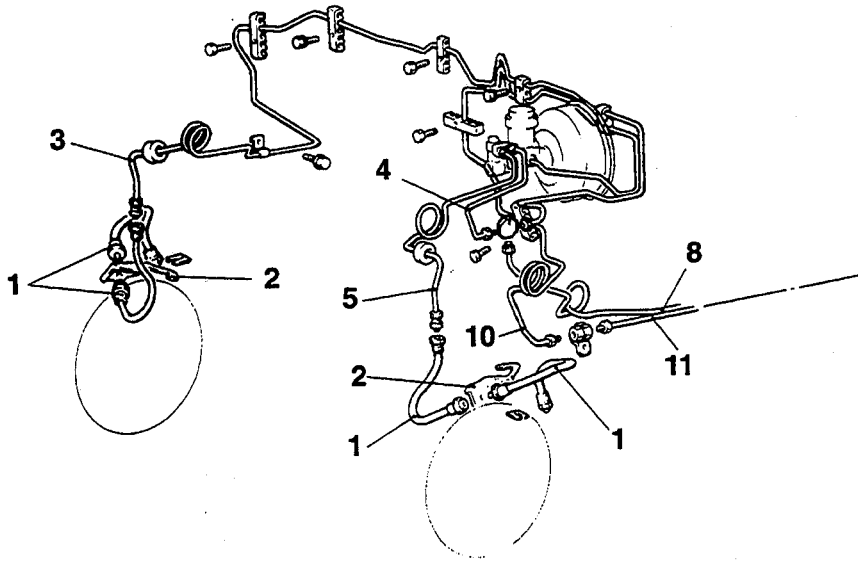
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Bleeding (Refer to P.35A-9.)

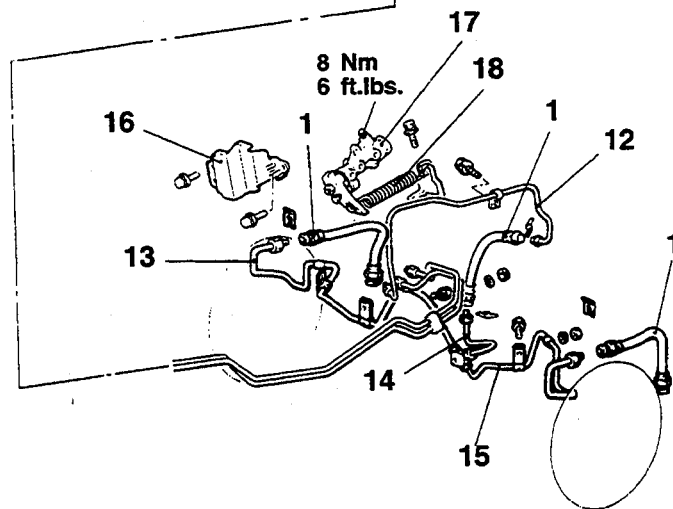


Flare nut

15 Nm
11 ft.lbs.



14F038



14E0150
00002092

1. Brake hose
2. Brake hose support
3. Brake pipe (front, R.H.)
4. Brake pipe (front, R.H. 1)
5. Brake pipe (front, L.H.)
8. Brake pipe (floor)
10. Brake pipe (main 1)
11. Brake pipe (main 2)
12. Brake pipe (main 3)
13. Brake pipe (rear, R.H.)

14. Brake pipe (rear, center)
15. Brake pipe (rear, L.H.)
16. Protector
17. Load sending proportioning valve
18. Load sending spring

Caution

Do not disassemble the load sending proportioning valve because its performance depends on the load of the spring.

FRONT DISC BRAKE

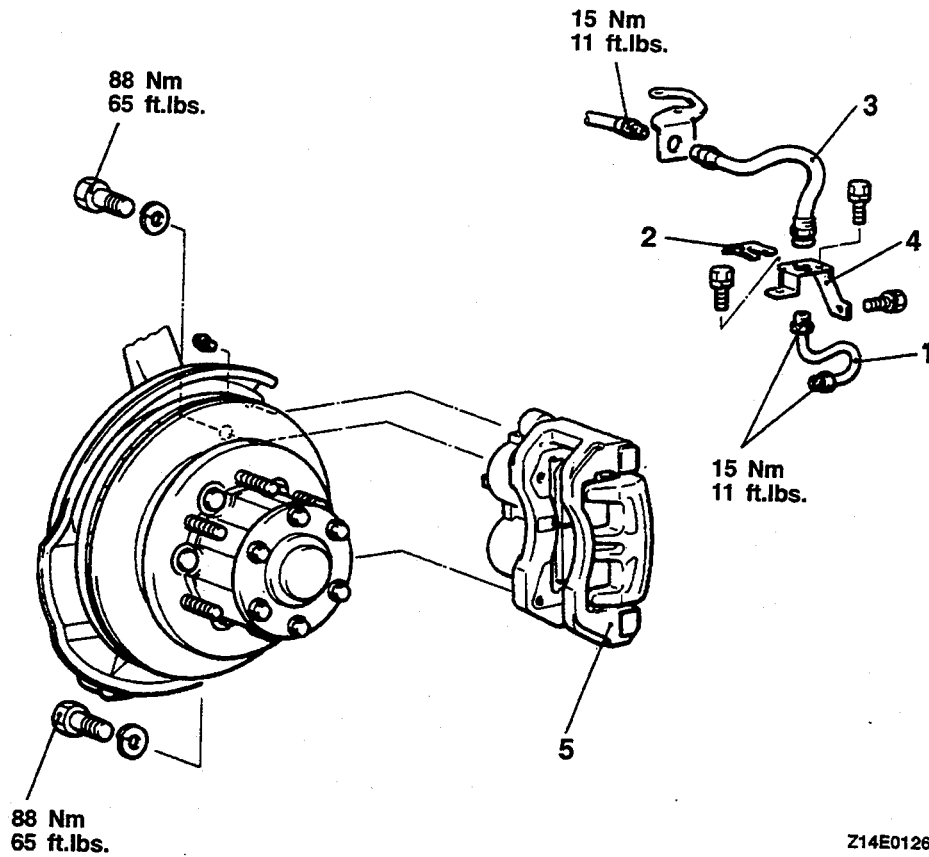
REMOVAL AND INSTALLATION

Pre-Removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Bleeding (Refer to P.35A-9.)

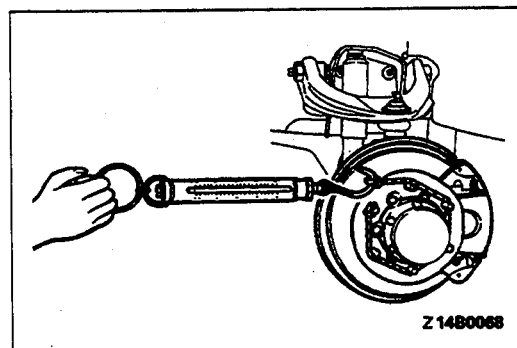
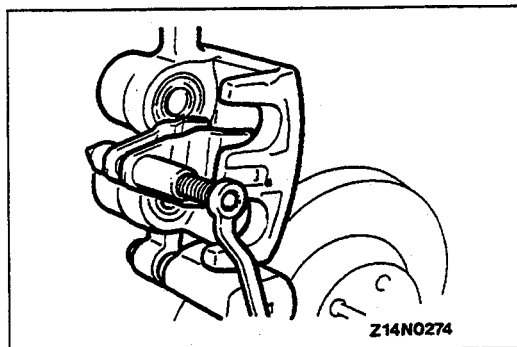
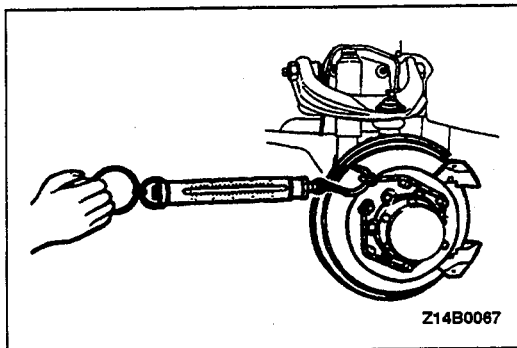


Z14E0126

Removal steps

1. Brake pipe
2. Clip
3. Brake hose
4. Brake hose bracket
5. Front brake assembly





INSTALLATION SERVICE POINTS

▶◀ FRONT BRAKE ASSEMBLY INSTALLATION

After installation of the brake assembly, measure the dragging force of the disc brakes by the following procedure.

(1) With the brake assembly removed, use a spring balance to measure the rotational sliding resistance of the hub in the forward direction.

(2) After installing the caliper support to the knuckle, use a piston expander to expand the piston, and then install the caliper body.

(3) Start the engine and, after strongly depressing the brake pedal 2-3 times, stop the engine.

(4) Turn the brake disc forward 10 times.

(5) Use a spring balance to measure the rotational sliding resistance of the hub in the forward direction.

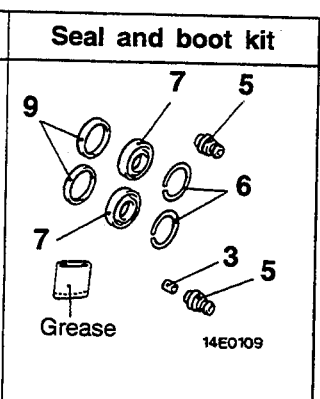
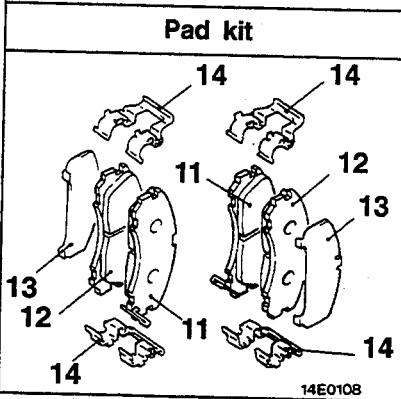
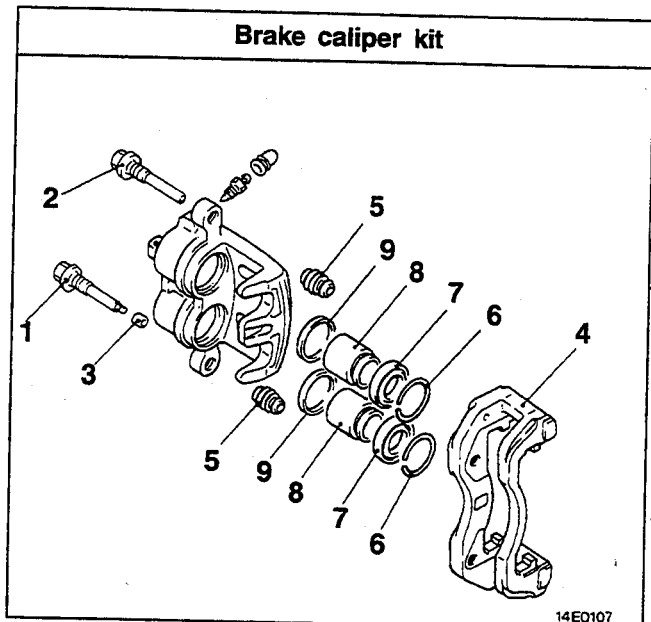
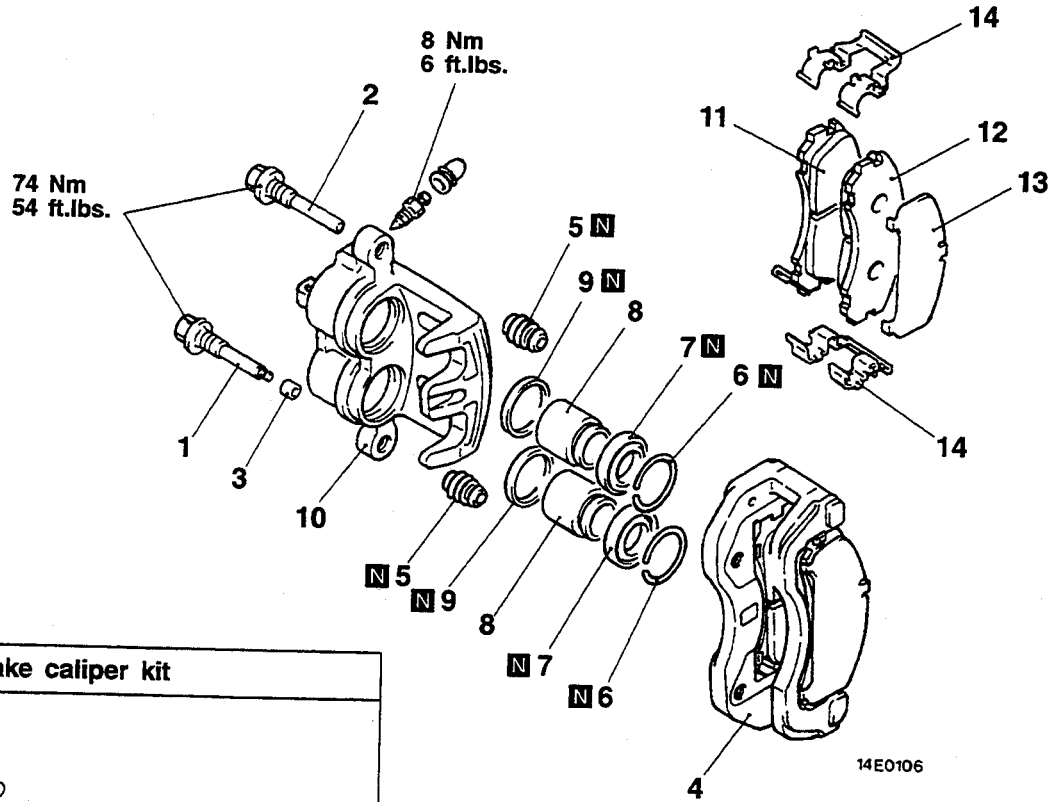
(6) Calculate the dragging force of the disc brakes [the difference between the values measured in steps (5) and (1)].

Standard value: 57 N (13 lbs.) or less

(7) If the dragging force exceeds the standard value, disassemble piston and clean the piston. Check for corrosion or worn piston seal.

DISASSEMBLY AND REASSEMBLY

110005621



00002093

Caliper assembly disassembly steps



1. Lock pin
2. Guide pin
3. Bushing
4. Caliper support (Pad, clip and shim)
5. Pin boot
6. Boot ring
7. Piston boot
8. Piston
9. Piston seal
10. Caliper body



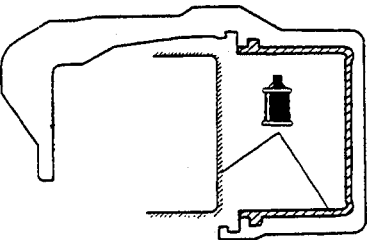
Pad assembly disassembly steps



1. Lock pin
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

TSB Revision

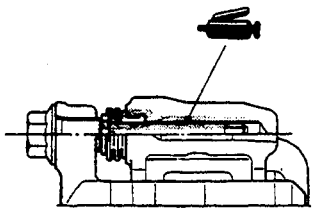
LUBRICATION POINTS



14E0131

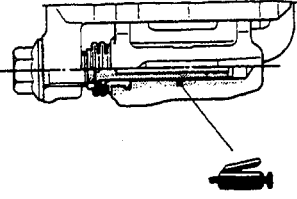
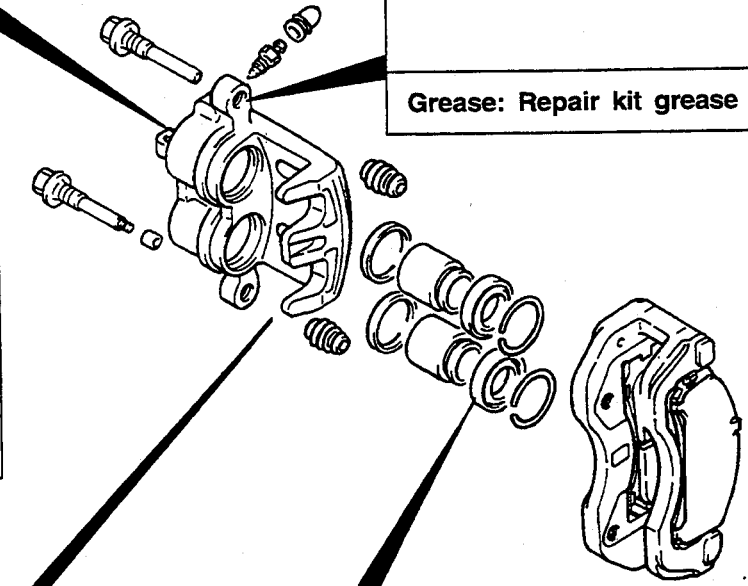
Caution
Special grease has been applied to the inside of the seal and boot kit, so this grease should not be wiped off.

Brake fluid: DOT3 or DOT4



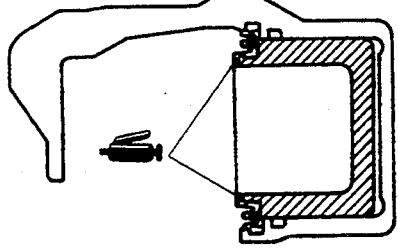
14A0541

Grease: Repair kit grease (orange)



14A0541

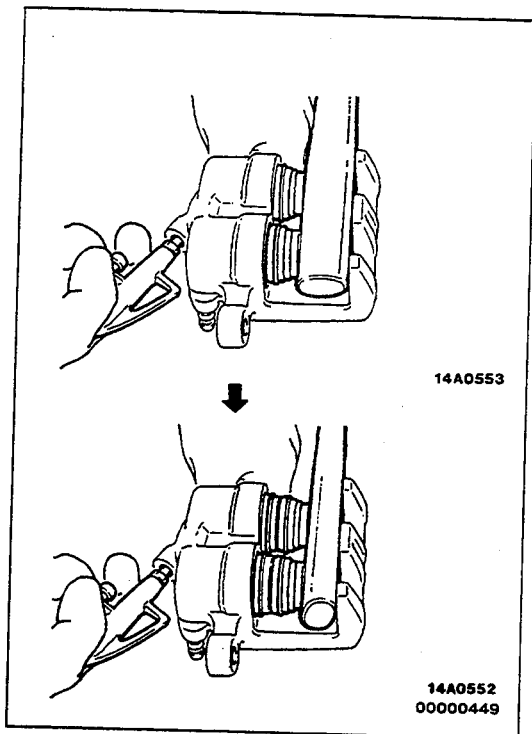
Grease: Repair kit grease (orange)



14L0128

Grease: repair kit grease (orange)

00002251



DISASSEMBLY SERVICE POINTS

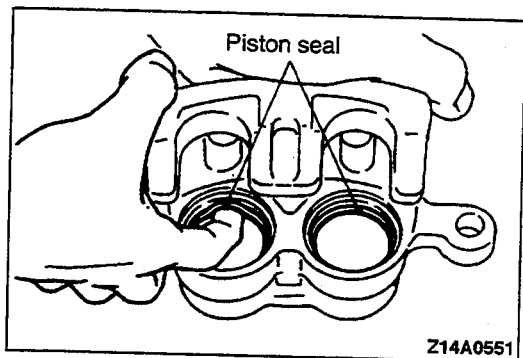
◀A▶ PISTON BOOT/PISTON REMOVAL

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▶ REMOVAL OF PISTON SEAL

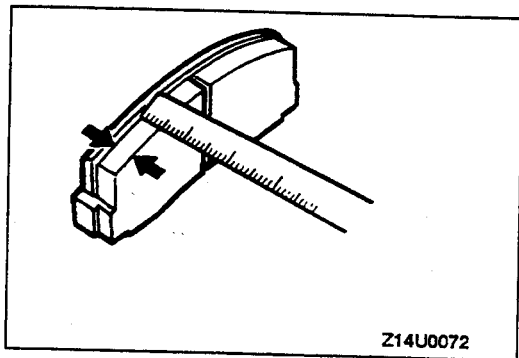
- (1) Remove piston seal with finger tip.

Caution

Do not use a screwdriver or other tools in order to prevent damage to the inner cylinder.

- (2) Clean the piston surface and the inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT 3 or DOT 4



INSPECTION

PAD WEAR

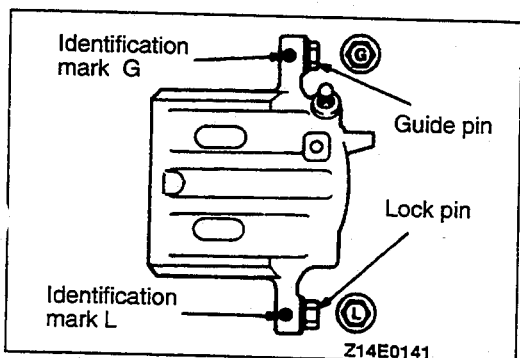
Measure the thickness at the thinnest and worn area of the pad. Replace the pad assembly when the pad thickness is less than the limit value.

Standard value: 10.0 mm (.39 in.)

Limit: 2.0 mm (.079 in.)

Caution

1. If the limit is exceeded, replace the pads at both sides, and also replace 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 parts.



INSTALLATION SERVICE POINT

▶A◀ GUIDE PIN/LOCK PIN INSTALLATION

Install the guide pin and lock pin as shown in the illustration so that each head mark of the guide pin and the lock pin matches the indication mark (G or L) located on the caliper body.

REAR DISC BRAKE

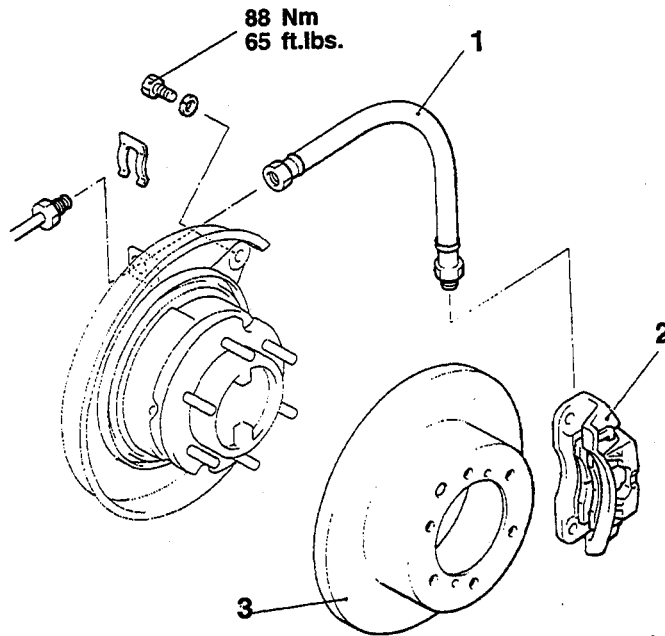
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Bleeding (Refer to P.35A-9.)



Flare nut

15 Nm
11 ft.lbs.



14E0116

00002252

Removal steps

- ▶A◀
1. Brake hose connection
 2. Rear brake assembly
 3. Brake disc

INSPECTION

BRAKE DISC

- Check the disc for wear. (Refer to P.35A-15.)
- Check the disc for runout. (Refer to P.35A-15.)
- Check the disc for damage.

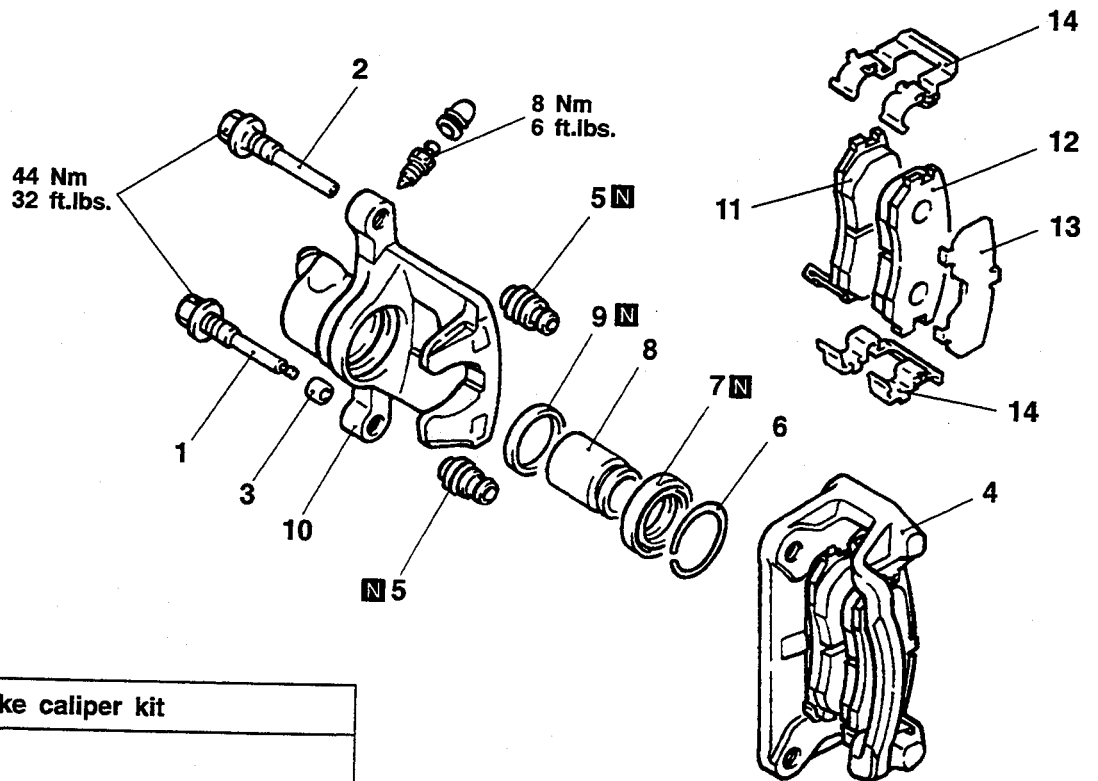
INSTALLATION SERVICE POINT

▶A◀ REAR BRAKE ASSEMBLY INSTALLATION

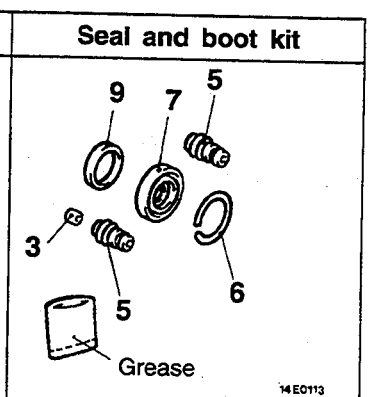
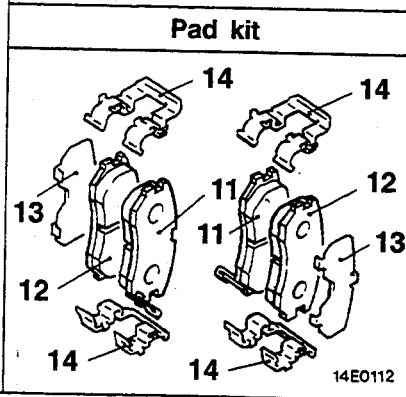
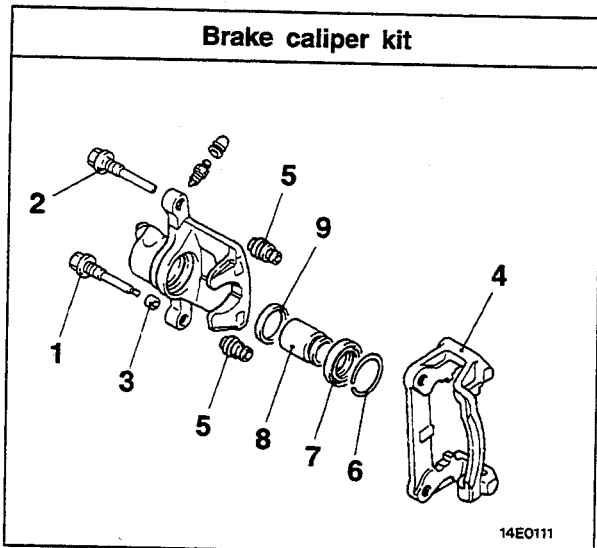
Install the rear brake assembly by the same procedure as that for the front brake assembly. (Refer to P.35A-26.)

DISASSEMBLY AND REASSEMBLY

110005623



14E0110



00002253

Caliper assembly disassembly steps



1. Lock pin
2. Guide pin
3. Bushing
4. Caliper support (Pad, clip and shim)
5. Pin boot
6. Boot ring
7. Piston boot
8. Piston
9. Piston seal
10. Caliper body

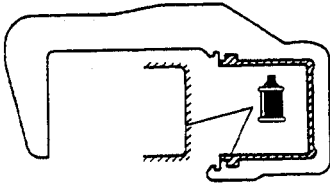
Pad assembly disassembly steps



1. Lock pin
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



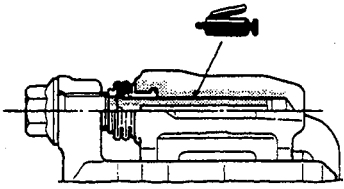
LUBRICATION POINTS



14E0121

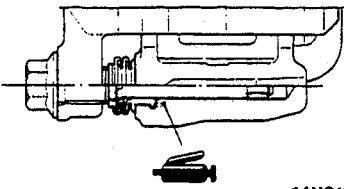
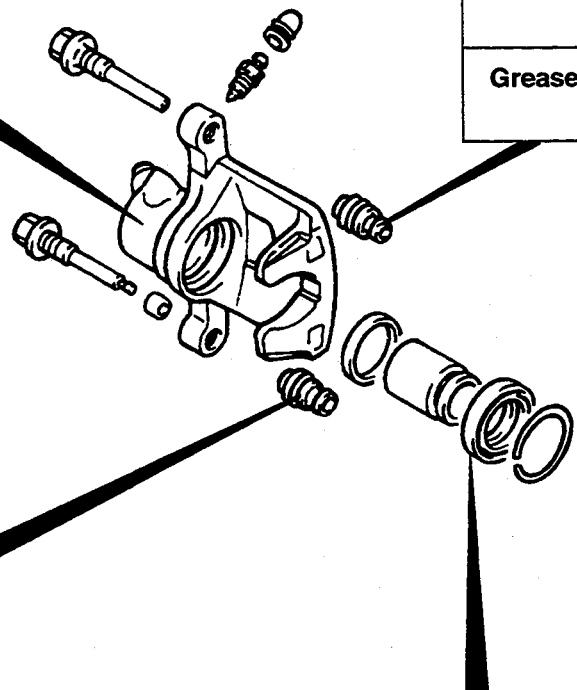
Caution
Special grease has been applied to the inside of the seal and boot kit, so this grease should not be wiped off.

Brake fluid: DOT3 or DOT4



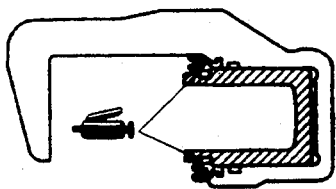
14N0121

Grease: Repair kit grease (orange)



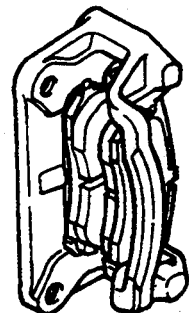
14N0121

Grease: Repair kit grease (orange)



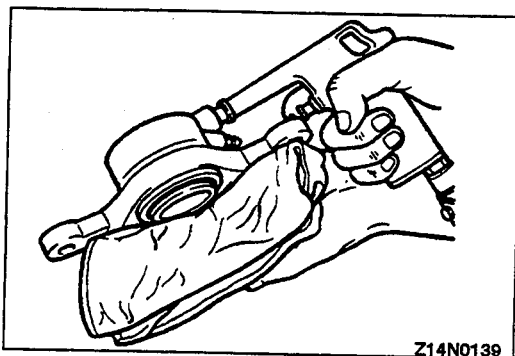
14LD128

Grease: Repair kit grease (orange)



14E0110

00002254



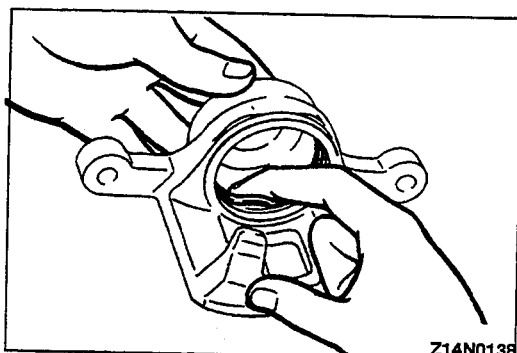
Z14N0139

DISASSEMBLY SERVICE POINTS

◀A▶ PISTON BOOT/PISTON REMOVAL

Protect the caliper body with a cloth, and then blow compressed air through the brake hose to remove the piston boot and the piston.

Caution
Blow compressed air gently.



Z14N0138

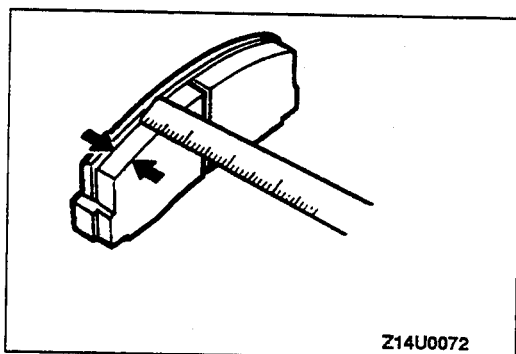
◀B▶ PISTON SEAL REMOVAL

- (1) Remove the piston seal with your finger tip.

Caution
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

- (2) Clean the piston surface and the inner cylinder with trichloroethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT 3 or DOT 4



Z14U0072

INSPECTION

PAD WEAR

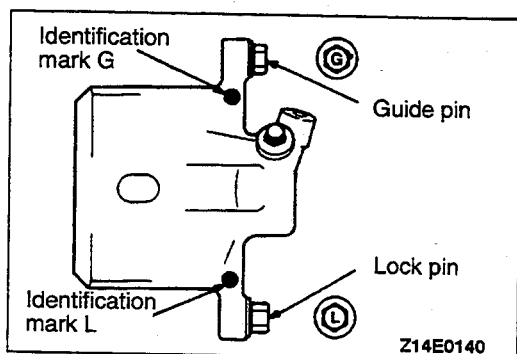
Measure the thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

Standard value: 9.0 mm (.35 in.)

Limit: 2.0 mm (.079 in.)

Caution

1. If the limit is exceeded, replace the pads at both sides, and also replace 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 parts.



Z14E0140

REASSEMBLY SERVICE POINTS

▶A◀ GUIDE PIN/LOCK PIN INSTALLATION

Install the guide pin and lock pin as shown in the illustration so that each head mark of the guide pin and the lock pin matches the indication mark (G or L) located on the caliper body.

NOTES



ANTI-LOCK BRAKING SYSTEM (ABS) <AWD>

CONTENTS

110005624

BRAKE LINE <Up to 1994 models>	73	Motor Operation Check	69
BRAKE LINE <1995 models and after>	74	Solenoid Valve Check	69
ELECTRONIC CONTROL UNIT	80	Valve Relay and Motor Relay Check <Up to 1994 models>	71
GENERAL SPECIFICATIONS	2	Wheel Speed Sensor Output Voltage Measurement	65
G-SENSOR	76	SERVICE SPECIFICATIONS	2
HYDRAULIC UNIT	75	SPECIAL TOOLS	2
SERVICE ADJUSTMENT PROCEDURES	65	TROUBLESHOOTING <Up to 1994 models>	3
ABS Power Relay Check <Up to 1993 models>	70	TROUBLESHOOTING <1995 models and after>	44
ABS Relay Box Check	72	WHEEL SPEED SENSOR	77
G-sensor Output Voltage Check	70		
Hydraulic Unit Check	67		

Refer to GROUP 35A for the following items.

BRAKE LINE (BASIC BRAKE SYSTEM)
BRAKE PEDAL
FRONT DISC BRAKE
GENERAL SPECIFICATIONS
LUBRICANTS
**MASTER CYLINDER AND BRAKE
 BOOSTER**
REAR DISC BRAKE
SEALANTS
SERVICE ADJUSTMENT PROCEDURES
 Bleeding
 Brake Booster Operating Test
 Brake Drum Inside Diameter Check
 Brake Fluid Level Sensor Check
 Brake Lining and Brake Drum Contact Check
 Brake Lining Thickness Check
 Brake Pedal Inspection and Adjustment

Check Valve Operation Check
 Disc Brake Pad Check
 Front Brake Disc Run-out Check
 Front Brake Disc Run-out Correction
 Front Brake Disc Thickness Check
 Front Disc Brake Pad Replacement
 and Brake Drag Check
 Front Disc Brake Rotor Inspection
 Load Sensing Proportioning Valve Function
 Test
 Load Sensing Spring Length Check and
 Adjustment
 Rear Brake Disc Run-out Check
 Rear Brake Disc Run-out Correction
 Rear Brake Disc Thickness Check
 Rear Disc Brake Pad Check and Replacement
SERVICE SPECIFICATIONS
TROUBLESHOOTING

GENERAL SPECIFICATIONS

110005625

Items		Specifications
Rotor teeth <Up to 1994 models>	Front	110
	Rear	110
Rotor teeth <1995 models and after>	Front	47
	Rear	47
Speed sensor type		Magnet coil type



SERVICE SPECIFICATIONS

110005626

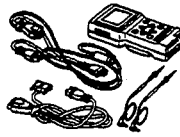

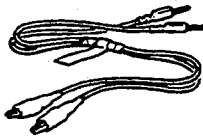
Items		Standard value
Hydraulic unit solenoid valve internal resistance Ω <UP to 1994 models>		1.0–1.3
Hydraulic unit solenoid valve internal resistance Ω <1995 models and after>	OUT	3.8
	IN	8.2
Speed sensor's internal resistance $k\Omega$	Front	0.9–1.1
	Rear	1.3–2.1
Speed sensor insulation resistance $k\Omega$		100 or more
G sensor output voltage V <Up to 1993 models>	When G sensor is installed and vehicle is stationary	2.5 ± 0.44
	When G sensor is held with the arrow facing downwards	0.3–0.7
G sensor output voltage V <1994 models and after>	When G sensor is installed and vehicle is stationary	2.5 ± 0.12
	When G sensor is held with the arrow facing downwards	3.4–3.6

SPECIAL TOOLS

110005627

Tool	Tool number and name	Supersession	Application
	MB991341 Scan tool (Multi-use tester <MUT> sub assembly)		Up to 1993 models For checking A.B.S.
	ROM pack (For the number, refer to GROUP 00 – Precautions Before Service.)		Up to 1993 models For checking A.B.S.

TSB Revision

Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool (MUT-II)		All models For checking A.B.S.
 Z16X0607	ROM pack		All models For checking A.B.S.
	MB991529 Diagnostic trouble code check harness		For checking A.B.S. when using a voltmeter

TROUBLESHOOTING <UP TO 1994 MODELS>

110005628

PARTICULAR PHENOMENA OF THE ANTI-LOCK BRAKING SYSTEM

Models equipped with the anti-lock braking system (ABS) may exhibit one or more of the following phenomena from time to time, but none of these are abnormal.

- (1) A pulsing feeling in the brake pedal, or vibration of the body or the steering wheel, when the anti-lock braking system is activated by sudden braking or by braking on a slippery road surface. Actually, this phenomenon is an indication that the ABS is functioning normally.
- (2) When the vehicle speed reaches approximately 8 km/h (5 mph) after the engine is started and the vehicle starts off (for the first time), a whining motor noise may be heard from the engine compartment if the vehicle is traveling in a quiet place, but this noise is simply the result of a self-check being made of the ABS operation.

TROUBLESHOOTING METHODS

Problems related to the ABS can be classified into two general categories: problems in the electrical system and those in the hydraulic system.

For problems in the electrical system, the diagnostic test mode is built into the electronic control unit (ECU). This mode causes the ABS warning light to illuminate as a warning to the driver. In this instance, checks can be carried out using the scan tool and an oscilloscope.

Problems in the hydraulic system (poor braking, etc.) can be located in the same way as for ordinary brakes. However, it is necessary to determine whether the problem is related to ordinary brake components or to the ABS components. To make this check, use the scan tool.

HOW TO USE THE TROUBLESHOOTING FLOW CHART

- (1) Following the flow chart, first refer to the illumination pattern of the ABS warning light, and next note the diagnostic trouble code and inspect the brake operation.
- (2) Follow the inspection charts listed in the "Remedy" column to carry out an inspection. In each inspection chart, [Comment] and (Hint) are listed for troubleshooting reference.

NOTE

ECU: Electronic control unit

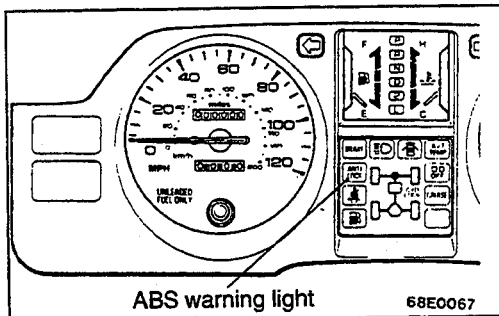
Check the trouble symptoms by the following procedure, and inspect according to the instructions.

Before the engine starts, does the ABS warning light illuminate?

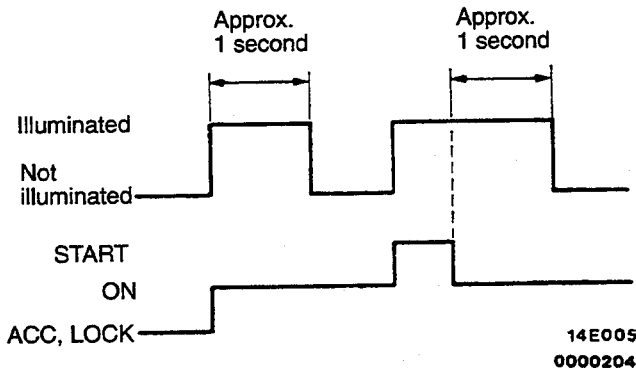
- (1) When the ignition switch is at ON, the ABS-ECU causes the ABS warning light to illuminate for approximately 1 second (during this time, the initial check is carried out), and then the light switches off.
- (2) When the ignition switch is at START, power to the ABS-ECU is cut, and because the valve

relay turns OFF, the ABS warning light remains illuminated.

- (3) When the ignition switch is turned from START back to ON, the ABS warning light illuminates for approximately 1 second (during this time, the initial check is carried out again), and then the light switches off.



ABS warning light
Ignition key

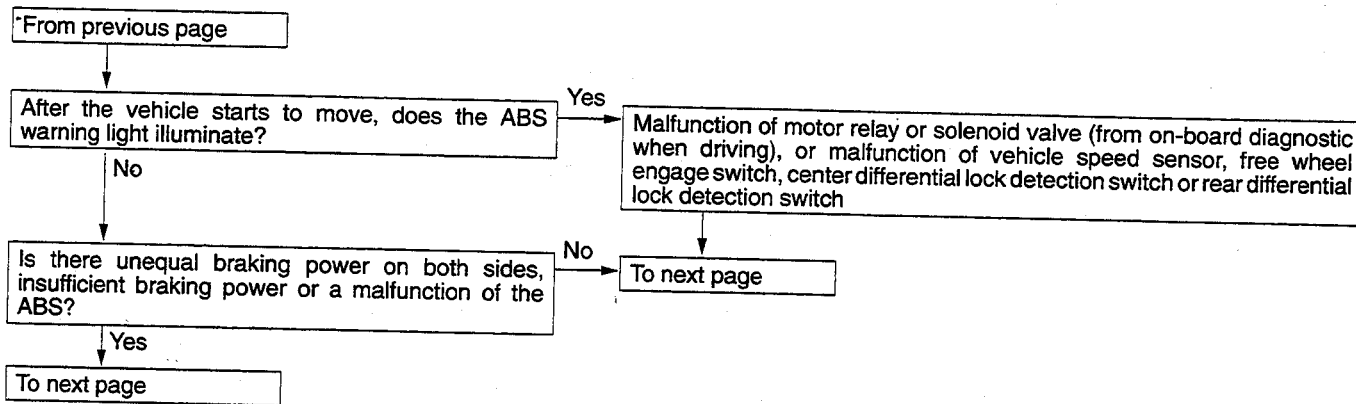


Yes → To next page

No ↓

No.	Trouble Symptom	Probable Cause	Remedy
1	<p>The ABS warning light does not illuminate at all.</p> <p>ABS warning light: Illuminated (Not illuminated)</p> <p>Ignition key: ON</p> <p>ACC, LOCK</p> <p>Z14A0590</p>	<ul style="list-style-type: none"> • ABS warning light bulb failure. • Open circuit in the ABS warning light power circuit (including blown fuse) 	<p>Inspect according to Flow Chart A. (Refer to P.35C-12.)</p>
2	<p>When the ignition switch is turned to ON, the ABS warning light remains illuminated.</p> <p>ABS warning light: Illuminated (Not illuminated)</p> <p>Ignition key: ON</p> <p>ACC, LOCK</p> <p>Z14A0591</p>	<ul style="list-style-type: none"> • Fail safe function is operated by the ABS-ECU on-board diagnostic. • Short-circuit in the ABS-ECU warning light drive circuit • Malfunction of ABS-ECU 	<p>Inspect according to Flow Chart B. (Refer to P.35C-15.)</p>

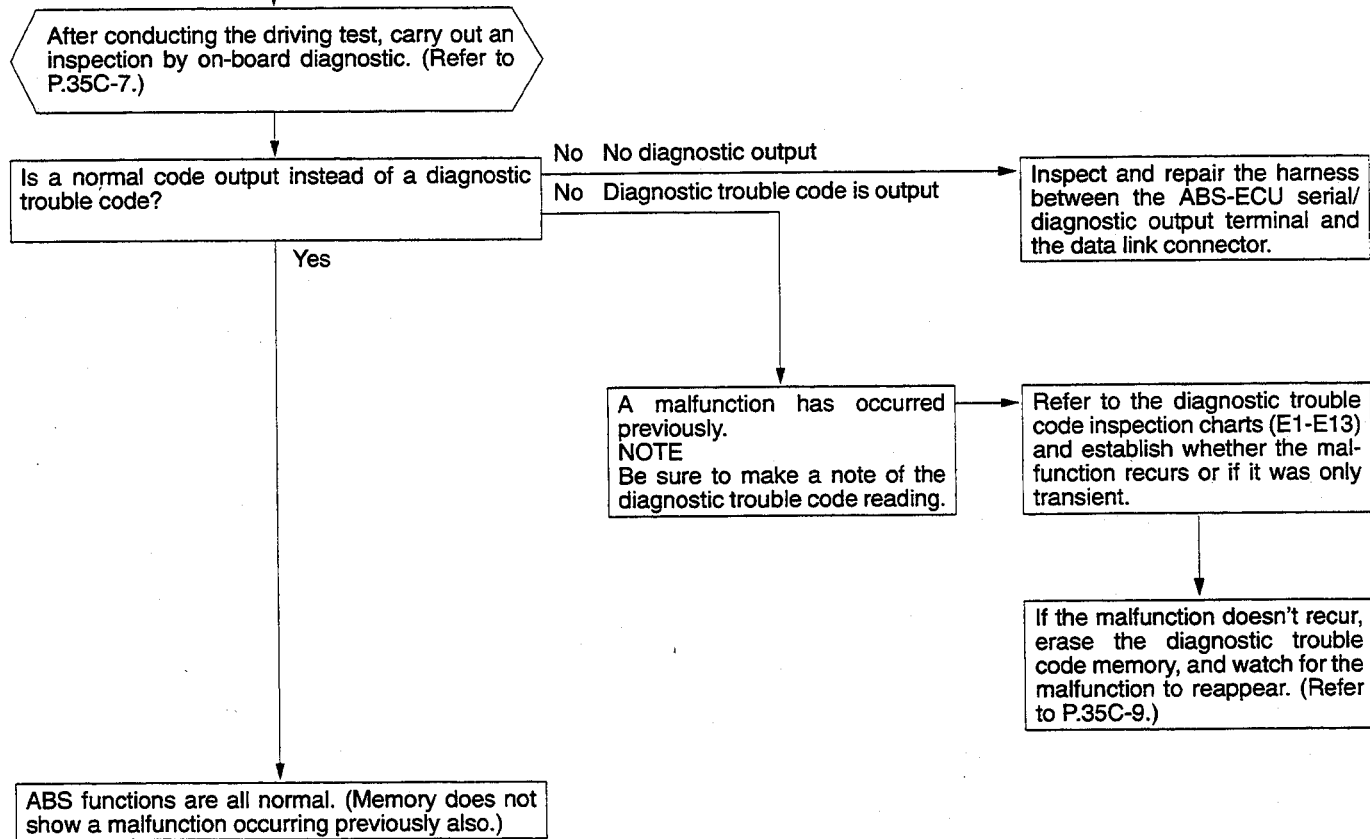
No.	Trouble Symptom	Probable Cause	Remedy
3	<p>When the ignition switch is turned to START, the ABS warning light does not illuminate.</p> <p>Z14E0055</p>	<ul style="list-style-type: none"> • Malfunction of valve relay • Open circuit in the harness between the ABS warning light and the hydraulic unit • Open circuit in the harness between the hydraulic unit and the ground 	<p>Inspect according to Flow Chart C. (Refer to P.35C-19.)</p>
4	<p>After the ignition switch is turned to ON, the ABS warning light flashes twice, and when the ignition switch is turned to START, the ABS warning light illuminates. When returned to ON, the light flashes once, and then switches off. (The flashing when the key is turned to ON occurs simultaneously with the operation noise from the valve relay.)</p> <p>Z14E0056</p>	<ul style="list-style-type: none"> • Open circuit in the harness in the ABS-ECU warning light drive circuit • Malfunction of ABS-ECU 	<p>Inspect according to Flow Chart D. (Refer to P.35C-20.)</p>

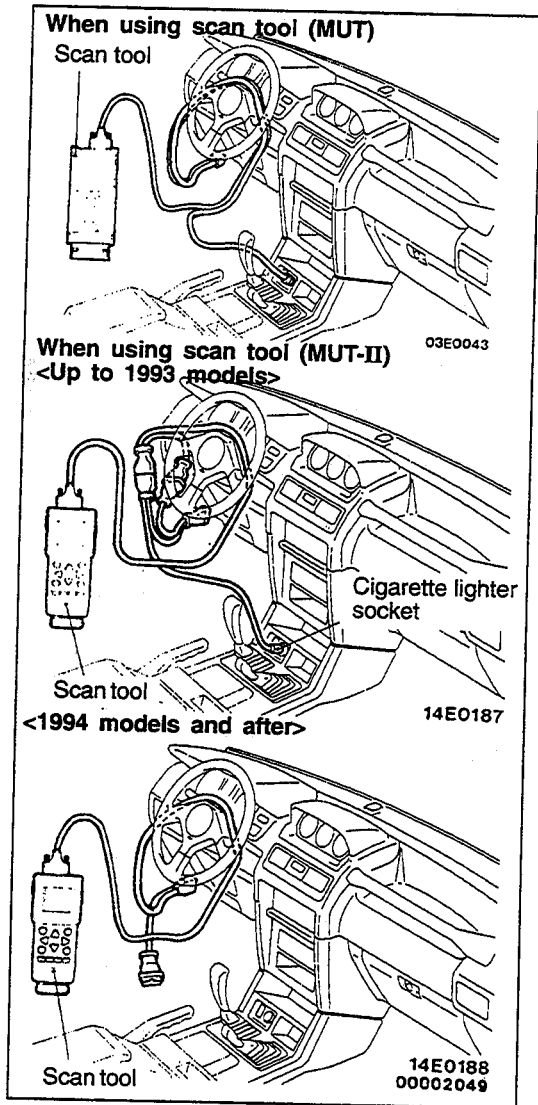


From previous page

Trouble Symptom	Probable Cause	Remedy
Unequal braking power Insufficient braking power	<ul style="list-style-type: none"> Blocked pressure circuit inside the hydraulic unit Mechanical lock in the hydraulic unit solenoid valve 	Follow the hydraulic unit operation inspection (refer to P.35C-46) and replace the hydraulic unit if necessary. If the hydraulic unit is normal, inspect the components of the normal brake.
Decline in ABS function	<ul style="list-style-type: none"> Blocked pressure circuit inside the hydraulic unit Malfuction of hydraulic unit solenoid valve 	
ABS operates even when not carrying out sudden braking (ABS operating vibration starts to be felt)	<ul style="list-style-type: none"> Insufficient wheel speed sensor output voltage (sensor is defective, excessive clearance between the sensor and rotor, or rotor is chipped) Malfuction of ABS-ECU 	Inspect the wheel speed sensor (refer to P.35C-44), and replace the sensor or adjust the sensor clearance if necessary. If the problem occurs frequently even though the sensor is normal, then replace the ABS-ECU.

From previous page





INSPECTION BY DIAGNOSTIC TEST MODE

110005629

WHEN USING THE SCAN TOOL [MULTI-USE TESTER (MUT) <Up to 1993 models> OR MUT-II <All models>]

1. Turn the ignition key to ACC and connect the scan tool as shown in the illustration.

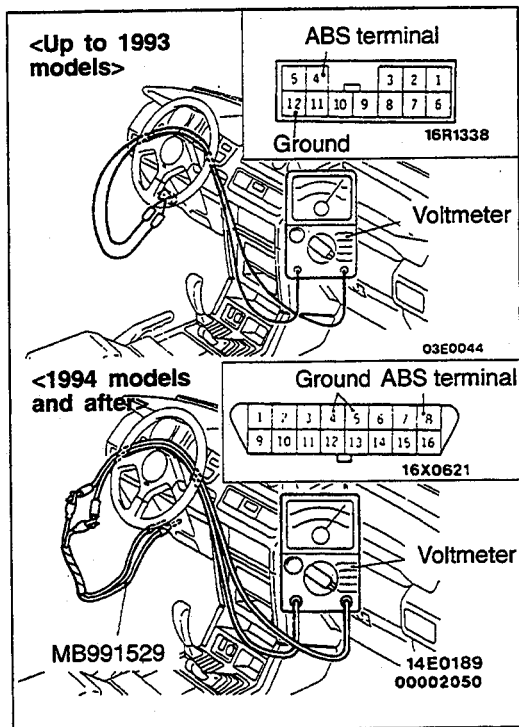
Caution

Turn the ignition switch OFF before connecting or disconnecting the scan tool.

2. Start the engine, and select the ABS system.
3. Read and make a note of the on-board diagnostic output codes.
If the ABS-ECU and scan tool cannot communicate, inspect the harness between data link connector and the ABS-ECU power circuit or the ABS-ECU.
4. Momentarily erase the diagnostic trouble code memory. (Refer to P.35C-9.)
If the memory cannot be erased, the function is being stopped by a malfunction that is currently displaying a diagnostic trouble code. If the memory can be erased, then the malfunction was only temporary, or it is a malfunction that can only be detected while driving.
5. If the diagnostic trouble code is not erased, or if the ABS function is stopped by a repeated driving test and a diagnostic trouble code is output, inspect according to the diagnostic trouble code inspection charts (E-1 – E-13).

NOTE

The codes below are output as diagnostic trouble codes according to the vehicle's condition, even when the ABS system is normal. These codes are output only for a current malfunction, and if the vehicle's condition returns to normal, diagnostic trouble code will be erased automatically.

**WHEN USING A VOLTMETER**

1. With the engine idling, take a reading of the voltage output pattern between the ABS terminal of the data link connector and the ground, as shown in the illustration at left.

NOTE

- When the serial/diagnostic terminal is open, output can be read by the voltmeter.

2. Momentarily erase the diagnostic trouble code memory. (Refer to P.35C-9.)

If the memory cannot be erased, the function is being stopped by a problem that is currently displaying a diagnostic trouble code. If the memory can be erased, then the problem was only temporary, or it is a problem that can only be detected while driving.

3. If the diagnostic trouble code is not erased, or if the ABS function is stopped by a repeated driving test and a diagnostic trouble code is output, inspect according to the diagnostic trouble code inspection chart.

NOTE

Diagnostic trouble code No. 16 (abnormal battery positive voltage) is output as a diagnostic trouble code according to the vehicle's condition, even when the ABS system is normal.

This code is output only for a current problem, and if the vehicle's condition returns to normal, then the diagnostic trouble code will be automatically erased.

METHOD OF ERASING THE DIAGNOSTIC TROUBLE CODE MEMORY

110005630

Caution

When repairs are completed, the diagnostic trouble code memory should be erased. When the ABS-ECU function is stopped, the diagnostic trouble code memory cannot be erased. So the function should be continuing while inspecting and repairing.

WHEN USING THE SCAN TOOL

1. Erase the memory with the scan tool.

NOTE

After erasing the memory, a command cannot be received from the scan tool. When checking diagnostic trouble codes, momentarily stop and restart the engine, and then reactivate the scan tool.

2. Check the diagnostic trouble codes to check that the memory has been erased.

WHEN NOT USING THE SCAN TOOL

1. Disconnect the negative battery terminal for 10 seconds or more.
2. Check the diagnostic trouble codes to check that the memory has been erased.

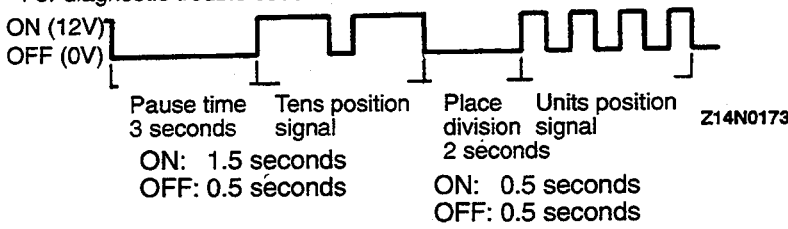

DIAGNOSTIC TROUBLE CODE REFERENCE TABLE

110005631

DIAGNOSTIC RESULT DISPLAY METHOD WHEN USING THE SCAN TOOL

Diagnostic trouble code No.	Name of inspection chart or remedy	Reference page	Diagnostic trouble code No.	Name of inspection chart or remedy	Reference page
11	E-1	P.35C-21	27	E-7	P.35C-30
12			31	E-8	P.35C-32
13			32	E-9	P.35C-33, P.35C-36
14			33	E-10	P.35C-39
15	E-2	P.35C-22	41	E-11	P.35C-41
16	E-4	P.35C-25, P.35C-26	43		
21	E-3	P.35C-23	45		
22			51	E-12	P.35C-42
23			53	E-13	P.35C-43
24			63	Replace the ABS-ECU.	-
25	E-5	P.35C-27	64		
26	E-6	P.35C-28			

DIAGNOSTIC RESULT DISPLAY METHOD WHEN USING A VOLTMETER

Example of diagnostic trouble code voltage pattern	Normal voltage pattern
<p>For diagnostic trouble code No. 24</p>  <p>ON (12V) OFF (0V)</p> <p>Pause time 3 seconds Tens position signal ON: 1.5 seconds OFF: 0.5 seconds</p> <p>Place division signal ON: 0.5 seconds OFF: 0.5 seconds</p> <p>Units position signal ON: 0.5 seconds OFF: 0.5 seconds</p> <p>Z14N0173</p>	 <p>ON (12V) OFF (0V)</p> <p>Z14N0174</p> <p>Continuous ON, OFF signals at intervals of 0.5 seconds</p>

NOTE
Other diagnostic trouble codes also are output as voltage patterns corresponding to the same code numbers as when using the scan tool.

DIAGNOSTIC TROUBLE CODE DISPLAY METHOD 110005632

All problem codes that are in memory are displayed.

- NOTE**
- (1) Diagnostic trouble code No. 16 (abnormally low or abnormally high voltage) is only displayed when there is a current problem. (Past occurrences are not recorded in memory.)
 - (2) Even if identical codes are output continuously, the code is only displayed one time.

SERVICE DATA INSPECTION TABLE 110005633

The following items can be read by the scan tool from the ABS-ECU input data.

Service data item No.	Service data item	Display units
11	Front right wheel speed	km/h
12	Front left wheel speed	km/h
13	Rear right wheel speed	km/h
14	Rear left wheel speed	km/h
16	ABS-ECU power voltage	V
25	ON/OFF condition of free wheel engage switch	ON/OFF
26	ON/OFF condition of center differential lock detection switch	ON/OFF
27	ON/OFF condition of rear differential lock detection switch	ON/OFF
32	G sensor output voltage	V
33	ON/OFF condition of stop light switch	ON/OFF

ACTUATOR TEST FUNCTION

110005634

The following force-activation of the actuator can be carried out by using the scan tool. By using this function, function checking of the hydraulic unit can be done without the need for special devices such as a hydraulic unit checker (MB991131).

NOTE

- (1) When the ABS-ECU function is stopped, actuator testing cannot be carried out.
- (2) Actuator testing can be carried out only when the vehicle is stopped.
- (3) During actuator testing, if the maximum vehicle wheel speed reaches 10 km/h (6 mph), the test will be canceled.
- (4) During actuator testing, the ABS warning light illuminates and ABS control is interrupted.

ACTUATOR TEST SPECIFICATIONS

110005635

No.	Driving objective		Driving pattern	
01	Solenoid valves and pump motors for each corresponding channel in the hydraulic unit	Solenoid valve for front left wheel		<p>Z14E0048</p>
02		Solenoid valve for front right wheel		
03		Solenoid valve for rear wheels		

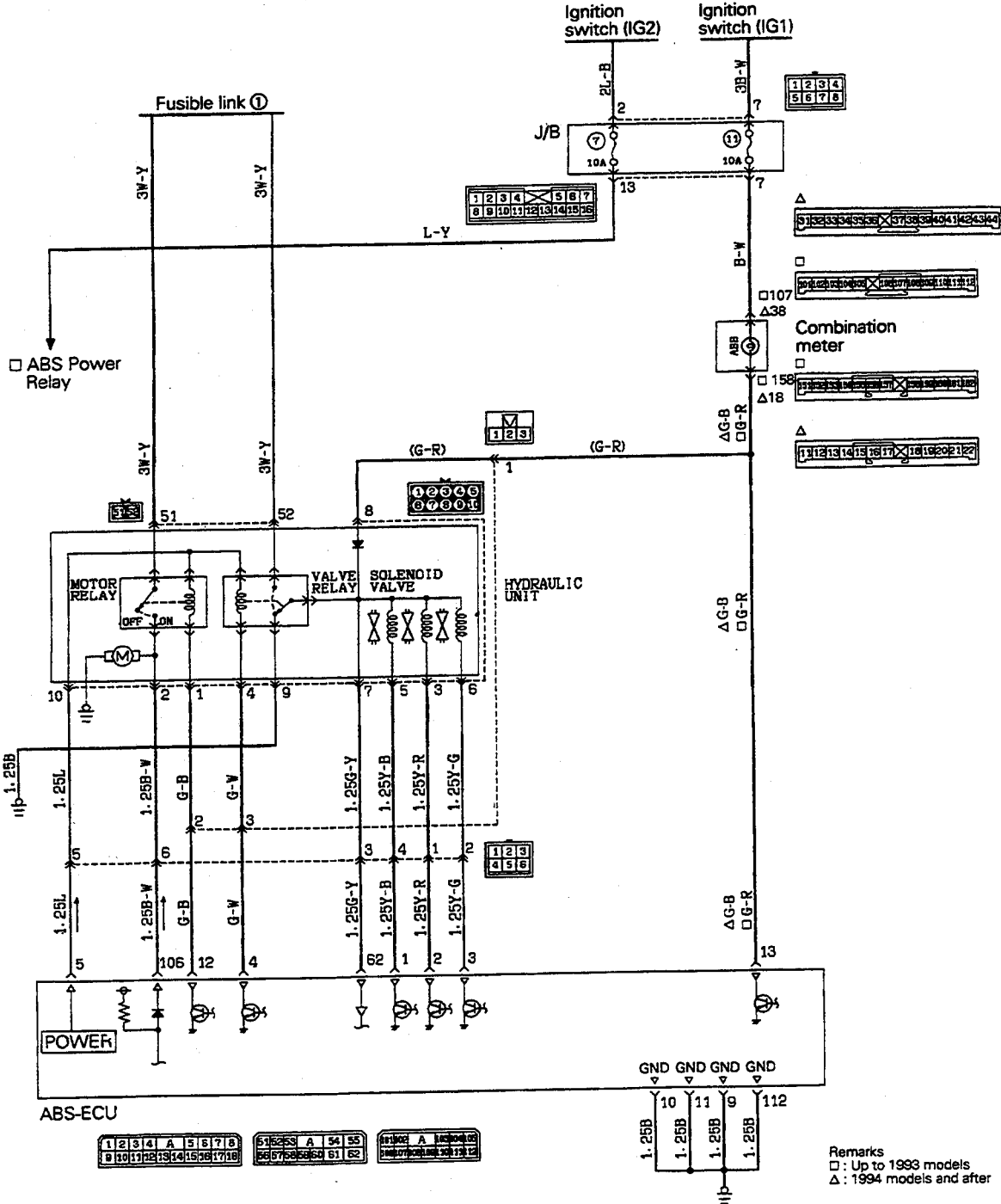
A ABS warning light does not illuminate at all

[Comment]

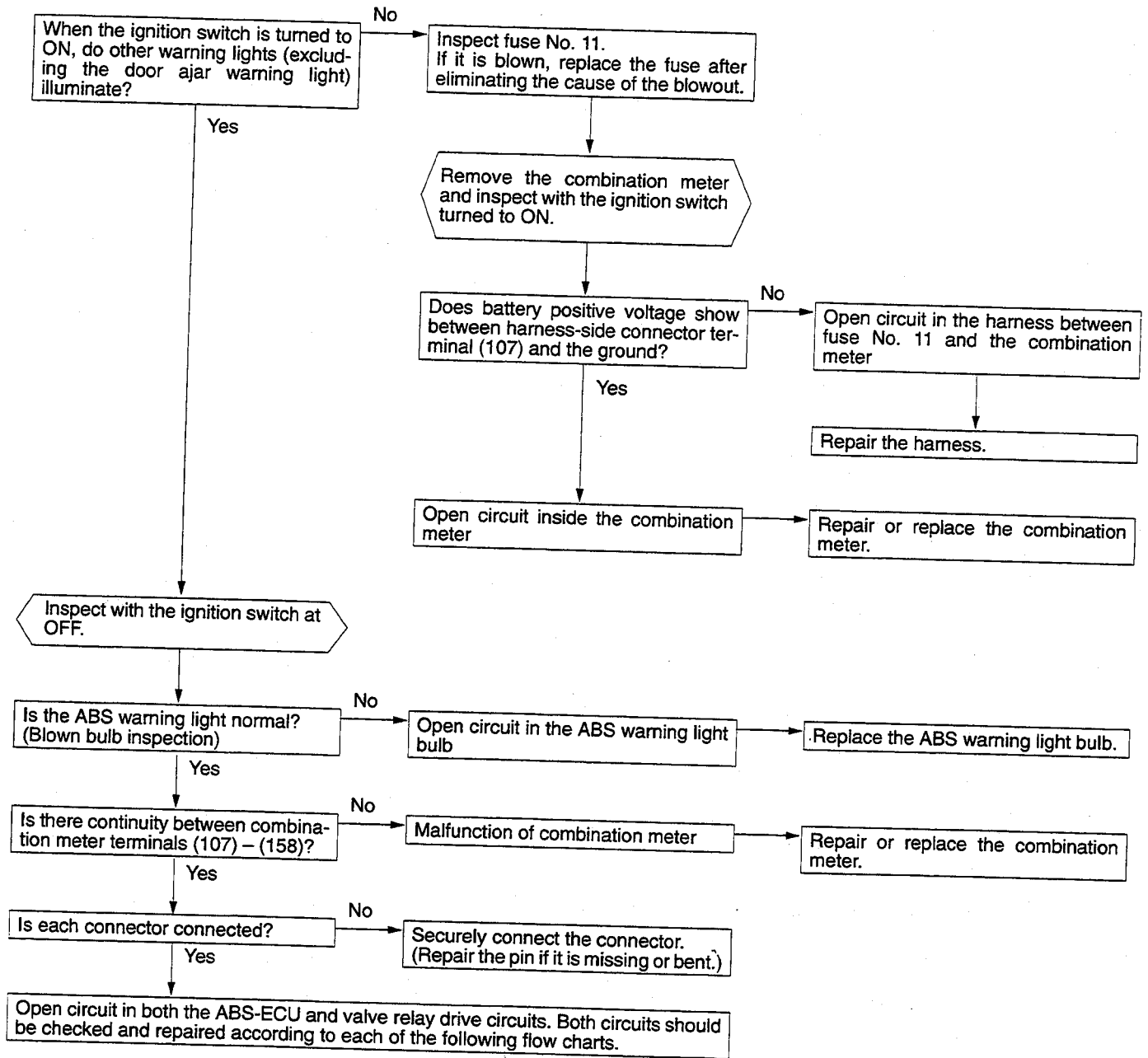
When the light does not illuminate at all, there is a strong possibility that there is a malfunction of the ABS warning light or the power supply.

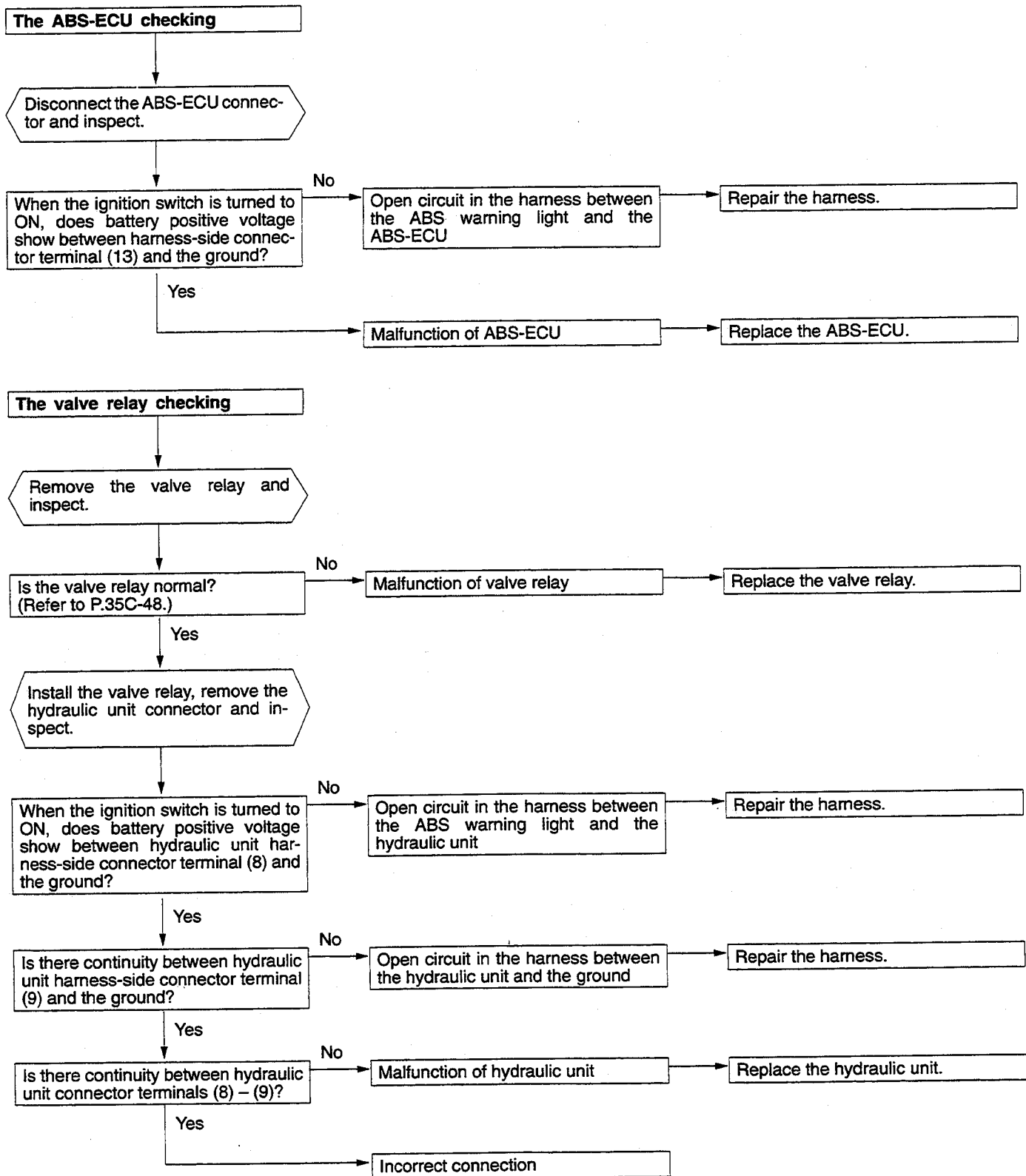
(Hint)

If other warning lights also do not illuminate, it is probably because of the blown fuses.



Remarks
 □ : Up to 1993 models
 Δ : 1994 models and after





NOTE
 For inspection sections marked by *, pay attention to the polarity of the diodes. (Refer to the circuit diagram on P.35C-12.)

B When the ignition switch is turned to ON, the ABS warning light remains illuminated.

[Comment]

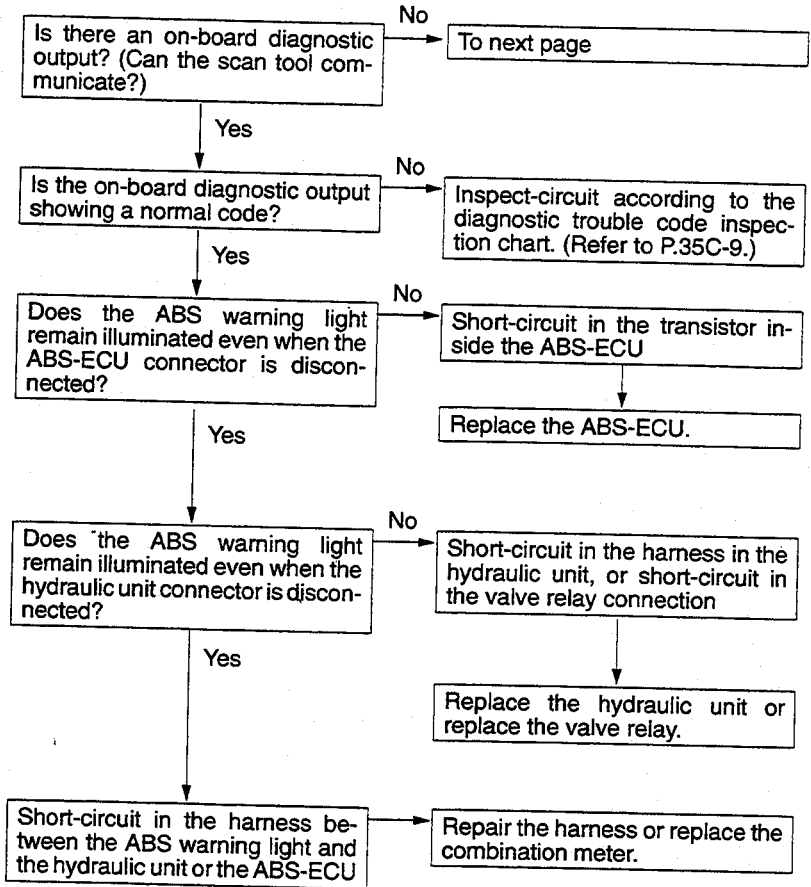
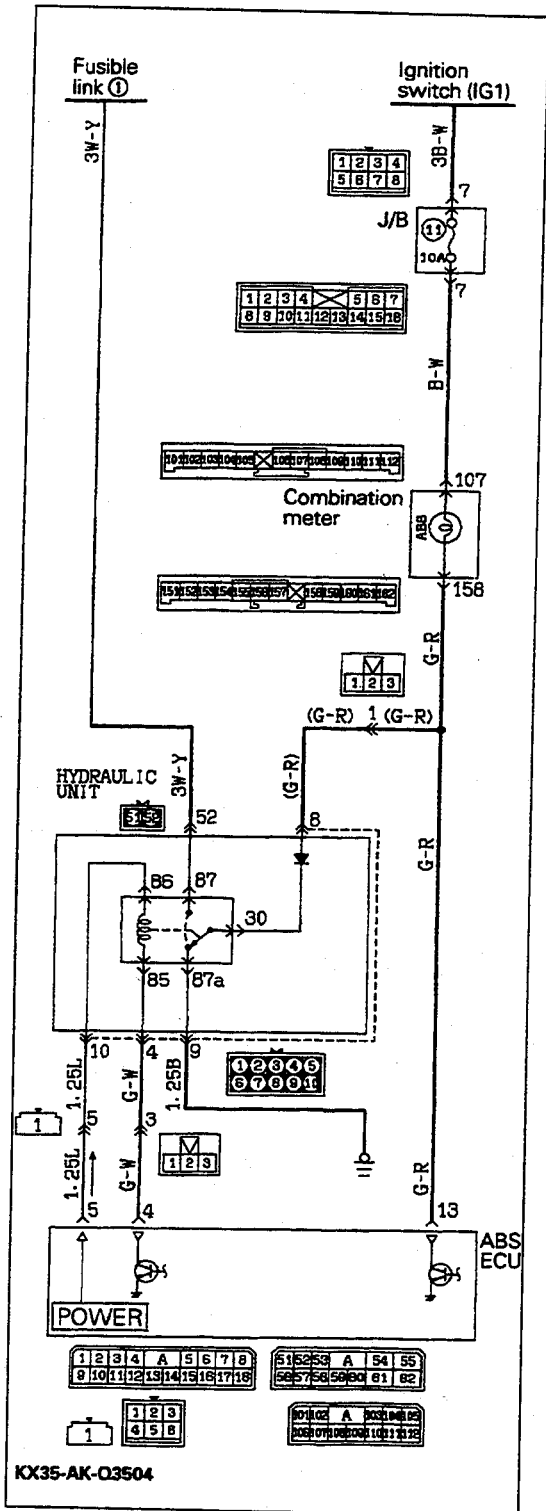
This symptom occurs when the ABS-ECU is not functioning due to an open circuit, etc., in the ABS-ECU power circuit, when the fail-safe function is operating to isolate the system, or when there is a short-circuit in the warning light drive circuit.

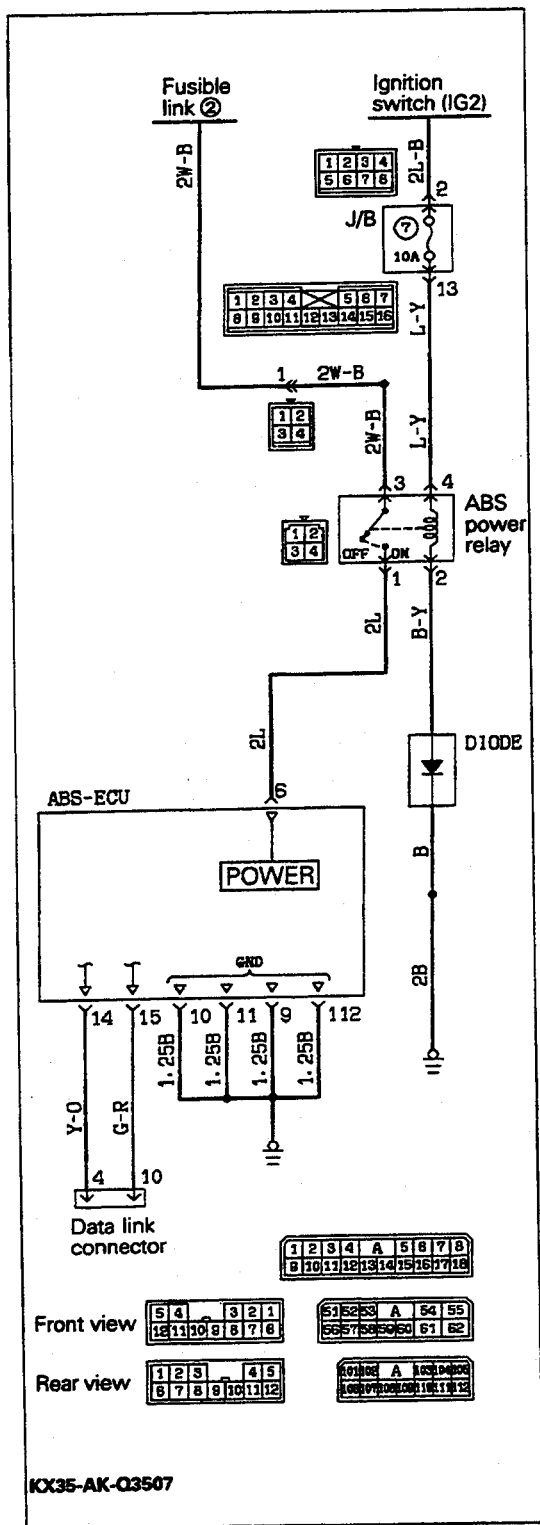
(Hint)

Check the diagnostic output, and if there is no output voltage, or the scan tool and the ABS-ECU cannot communicate, then there is a high possibility that power is not being supplied to the ABS-ECU.

Caution

- If no diagnostic trouble code is output, there is a high possibility that the fail-safe function is operating. In this case, to check if there is a current problem, the memory should be temporarily erased, and a test run should be carried out.





```

    graph TD
      Start[From previous page] --> Q1{Can other electronically-controlled systems communicate with the scan tool?}
      Q1 -- No --> A1[Malfunction of scan tool  
Repair or reinspect]
      Q1 -- Yes --> Q2{Is fuse No. 7 normal?}
      Q2 -- No --> A2[Replace the fuse after eliminating the cause of the blowout.]
      Q2 -- Yes --> Q3{Does the power relay operate normally? (Refer to P.35C-48.)}
      Q3 -- No --> A3[Malfunction of power relay  
Replace the power relay.]
      Q3 -- Yes --> S1{{Disconnect the ABS-ECU connector, and inspect the connector at the harness side.}}
      S1 --> Q4{When the ignition switch is turned to ON, does battery positive voltage show between harness-side connector terminal (6) and the ground?}
      Q4 -- No --> A4[Open circuit in the harness between the power relay and the ABS-ECU  
Repair the harness.]
      Q4 -- Yes --> Q5{Is there continuity among the harness-side connector terminals (9), (10), (11) and (12) and the ground?}
      Q5 -- No --> A5[Open circuit in the ABS-ECU ground line  
Repair the harness.]
      Q5 -- Yes --> Q6{Is there continuity between harness-side connector terminals (14) and (15) and the data link connector terminals (4) and (10)?}
      Q6 -- No --> A6[Open circuit in the harness between the data link connector and the ABS-ECU  
Repair the harness.]
      Q6 -- Yes --> A7[Malfunction of ABS-ECU  
Replace the ABS-ECU.]
  
```

<1994 MODELS AND AFTER>

[Comment]

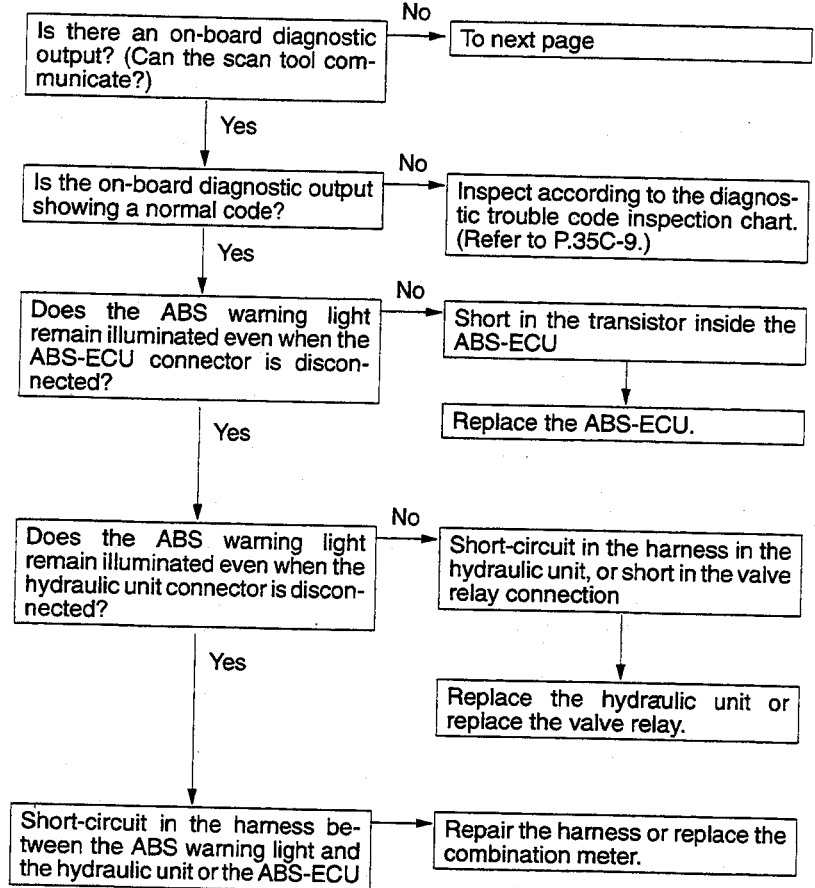
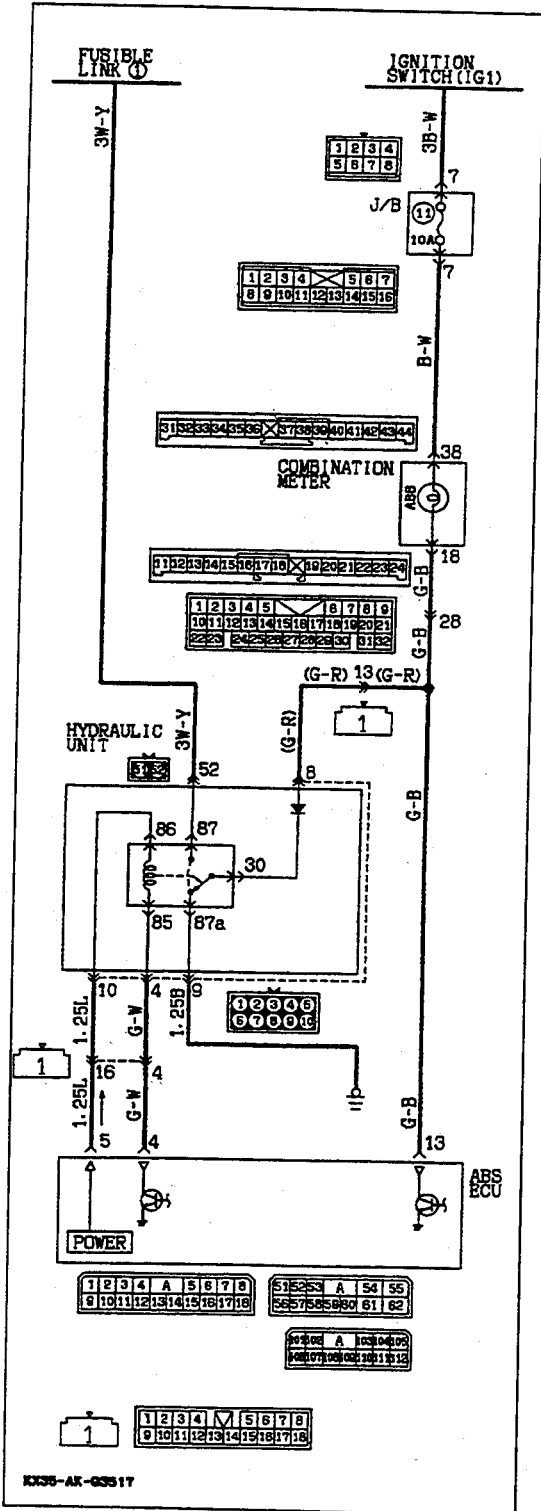
This symptom occurs when the ABS-ECU is not functioning due to an open circuit, etc., in the ABS-ECU power circuit, when the fail-safe function is operating to isolate the system, or when there is a short-circuit in the warning light drive circuit.

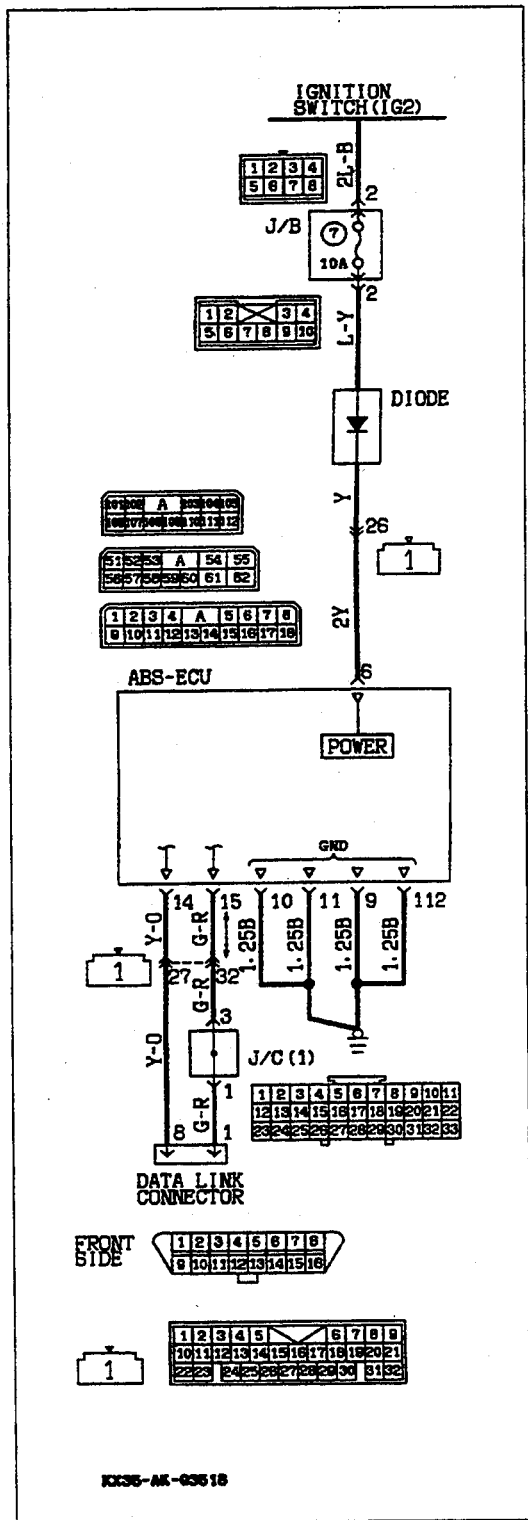
(Hint)

Check the diagnostic output, and if there is no output voltage, or the scan tool and the ABS-ECU cannot communicate, then there is a high possibility that power is not being supplied to the ABS-ECU.

Caution

- If no diagnostic trouble code is output, there is a high possibility that the fail-safe function is operating. In this case, to check if there is a current problem, the memory should be temporarily erased, and a test run should be carried out.





KC35-AK-036 18

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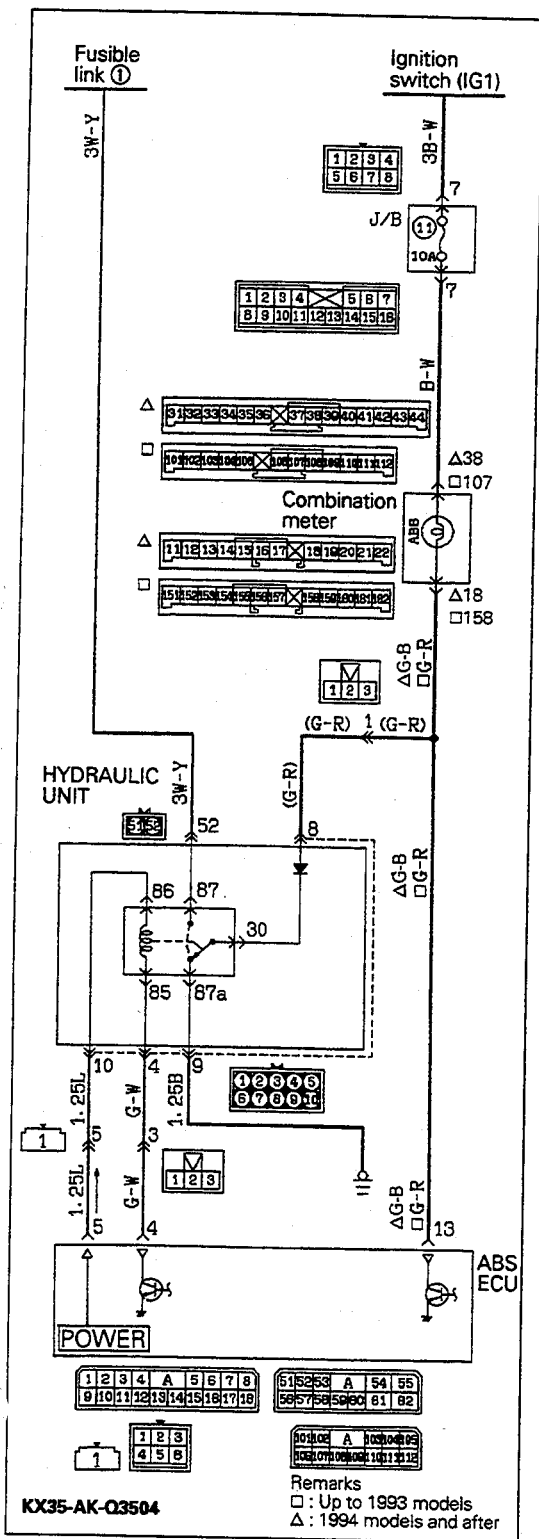
    graph TD
      Start[From previous page] --> Q1{Can other electronically-controlled systems communicate with the scan tool?}
      Q1 -- No --> R1[Malfunction of scan tool  
Repair or reinspect]
      Q1 -- Yes --> Q2{Is fuse No. 7 normal?}
      Q2 -- No --> R2[Replace the fuse after eliminating the cause of the blowout.]
      Q2 -- Yes --> I1{{Disconnect the ABS-ECU connector, and inspect the connector at the harness side.}}
      I1 --> Q3{When the ignition switch is turned to ON, does battery positive voltage show between harness-side connector terminal (6) and the ground?}
      Q3 -- No --> R3[Broken harness wire between the Ignition switch IG2 and the ABS-ECU.]
      R3 --> R4[Repair the harness.]
      Q3 -- Yes --> Q4{Is there continuity among the harness-side connector terminals (9), (10), (11) and (12) and the ground?}
      Q4 -- No --> R5[Open circuit in the ABS-ECU ground line]
      R5 --> R6[Repair the harness.]
      Q4 -- Yes --> Q5{Is there continuity between the harness-side connector terminals (14) and (15) and the data link connector terminals (8) and (1)?}
      Q5 -- No --> R7[Open circuit in the harness between the data link connector and the ABS-ECU]
      R7 --> R8[Repair the harness.]
      Q5 -- Yes --> R9[Malfunction of ABS-ECU]
      R9 --> R10[Replace the ABS-ECU.]
  
```

C When ignition switch is turned to START, ABS warning light switches off

[Comment]

The ABS-ECU uses the power to the IG2 which is cut when the ignition switch is turned to START. The ABS warning light uses IG1 power which is not cut even when the ignition switch is turned to START. Accordingly, because the power to the

ABS-ECU is stopped when the ignition switch is at START, the valve relay turns OFF. At this time, if the warning light does not illuminate, the cause is a problem in the light illumination circuit in the valve relay.



```

    graph TD
        Start([ (1) Remove fuse No. 7 of the junction block.  
(2) Disconnect the hydraulic unit connector and inspect. ]) --> Q1{When the ignition switch is turned to ON, does battery positive voltage show between harness-side connector terminal (8) and the ground?}
        Q1 -- No --> R1[Open circuit in the harness between the hydraulic unit and the ABS warning light]
        Q1 -- Yes --> Q2{Is there continuity between harness-side connector terminal (9) and the ground?}
        Q2 -- No --> R2[Open circuit between the hydraulic unit and the ground]
        Q2 -- Yes --> Q3{Is there continuity between hydraulic unit connector terminals (8) - (9)?}
        Q3 -- No --> R3[Malfunction of valve relay, or open circuit in the harness inside the hydraulic unit]
        Q3 -- Yes --> Q4{When the valve relay is removed, is there continuity between terminals (87a) - (30)?}
        Q4 -- No --> R4[Malfunction of valve relay]
        Q4 -- Yes --> R5[Malfunction of hydraulic unit harness]
        R4 --> R6[Replace the valve relay.]
        R5 --> R7[Replace the harness.]
    
```

NOTE

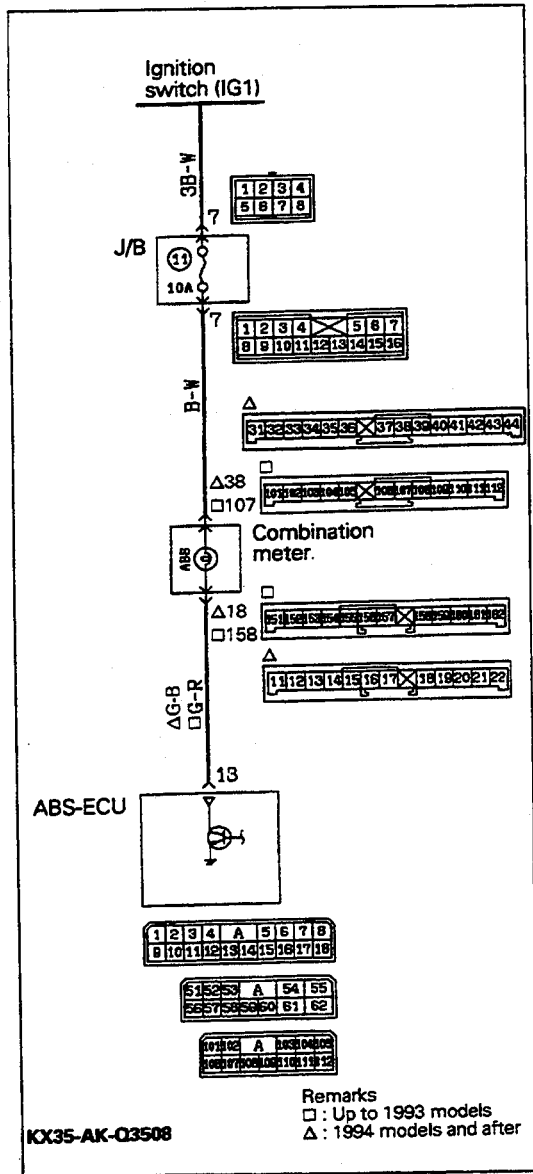
For inspection sections marked by *, pay attention to the polarity of the diodes. (Refer to the circuit diagram.)

D The ABS warning light flashes twice after the ignition switch is turned to ON. The light illuminates when the ignition switch is turned to START, and when the switch is returned to ON, the light flashes once.

[Comment]

The ABS-ECU causes the ABS warning light to illuminate during the initial check (approx. 1 second). During the initial check, the valve relay changes from OFF to ON → OFF → ON, and if

there is an open circuit in the harness between the ABS-ECU and the ABS warning light, the light will illuminate only when the valve relay is OFF because of a valve relay test, etc.



(1) Disconnect the hydraulic unit connector.
 (2) Disconnect the ABS-ECU connector and inspect the connector at the harness side.

When the ignition switch is turned to ON, does battery positive voltage show between terminal (13) and the ground?

No → Open circuit in the harness between the ABS warning light and the ABS-ECU → Repair the harness.

Yes → Malfunction of ABS-ECU → Replace the ABS-ECU.

E-1 When diagnostic trouble code No. 11, 12, 13 or 14 is displayed

[Comment]

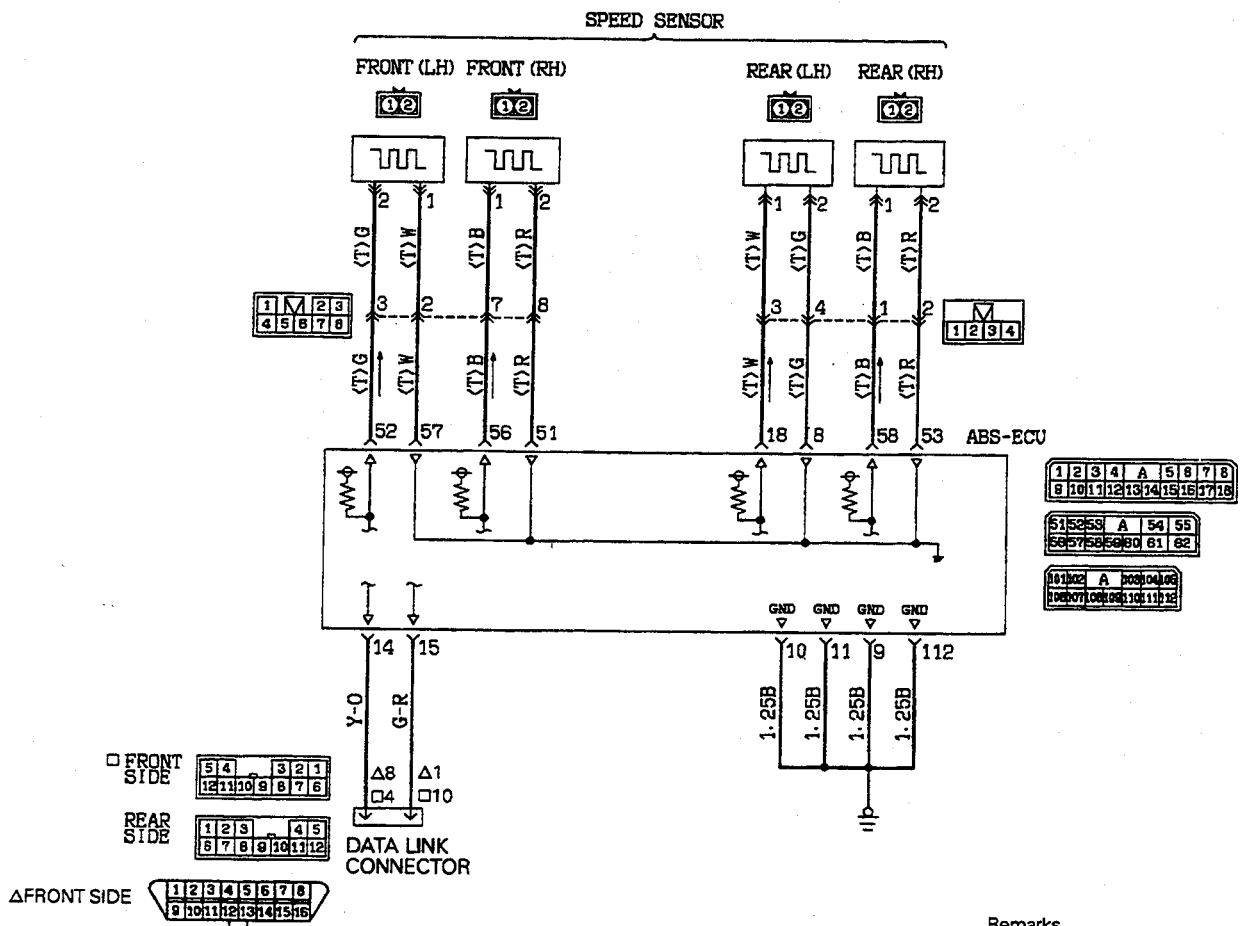
These codes are displayed when there is a broken (+) wire or (-) wire detected by the ABS-ECU hardware circuit in one of the vehicle speed sensors.

(Hint)

Apart from an open circuit in a vehicle speed sensor, the cause could also be an intermittent break in a sensor harness or an incorrect harness connection, so check these also.

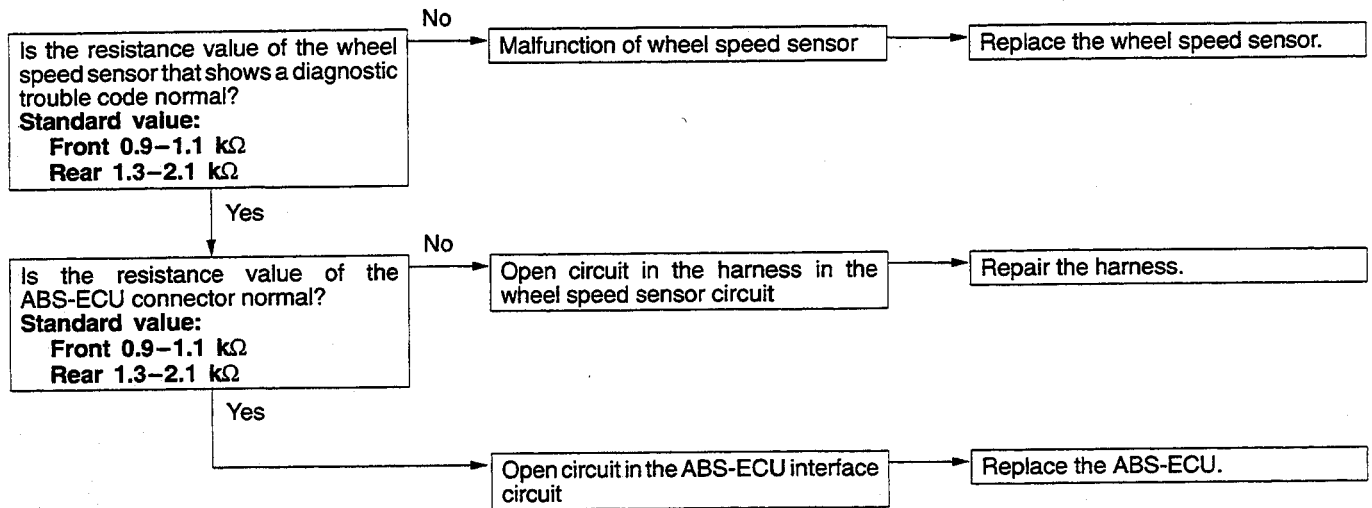
NOTE

1. If there is an incorrect contact, inspect the sensor cable by lightly flexing and stretching it.
2. If there is no current problem, a normal value will result even if a problem is detected. So when the malfunction in the sensor circuit indicated cannot be discovered, momentarily turn the ignition switch to OFF, and carry out another driving test. At this time, replace the ABS-ECU only if the same diagnostic trouble code is output. After this, if the code does not reappear, there is a problem with the ABS-ECU interface. (For a problem that is difficult to reproduce, there is a possibility that the code will recur even when the ABS-ECU is replaced.)



KX35-AK-Q3509

Remarks
 □ : Up to 1993 models
 Δ : 1994 models and after



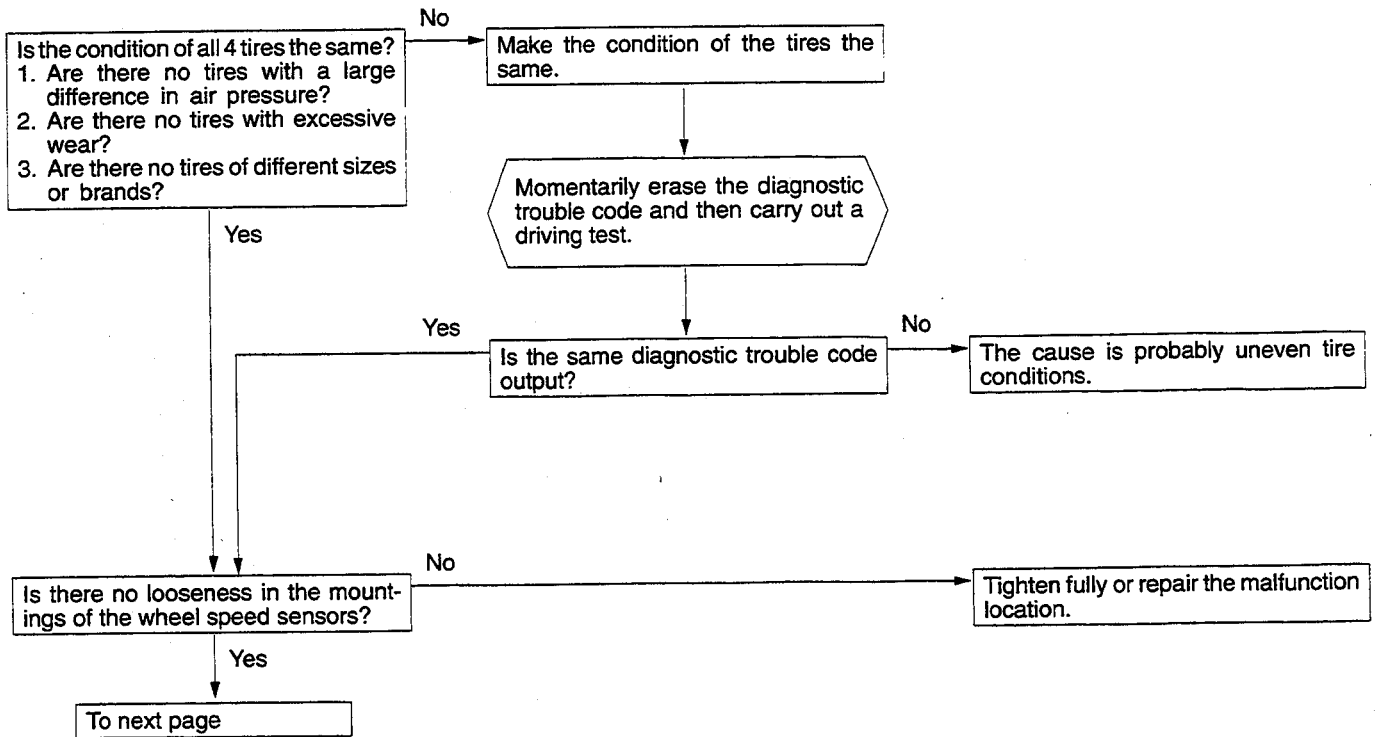
E-2 When diagnostic trouble code No. 15 is displayed

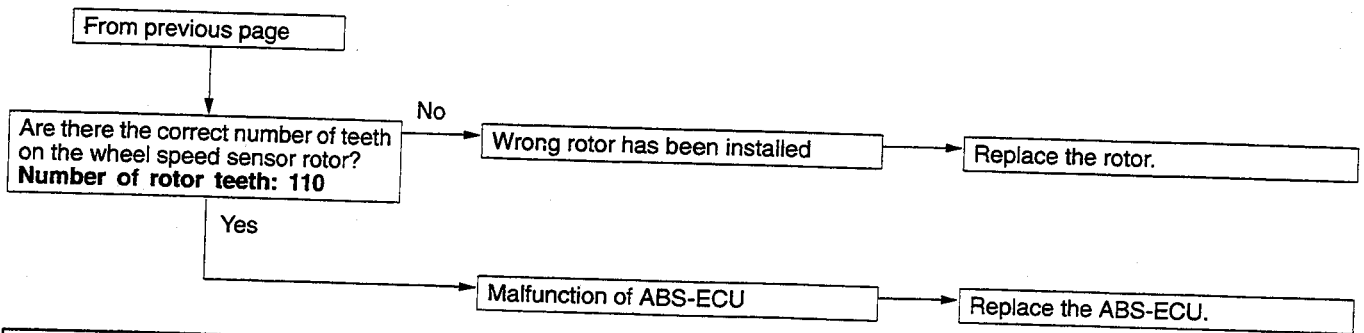
[Comment]

This diagnostic trouble code is output when any one of the wheel speed sensor output signals during driving is abnormal.

(Hint)

The cause of the abnormal wheel speed sensor output could be noise in the sensor signal from a loose wheel speed sensor.





E-3 When diagnostic trouble code No. 21, 22, 23 or 24 is displayed

[Comment]

These diagnostic trouble codes are displayed when an open circuit cannot be verified, and when the vehicle speed reaches 8 km/h (5 mph) or more, no pulses are input.

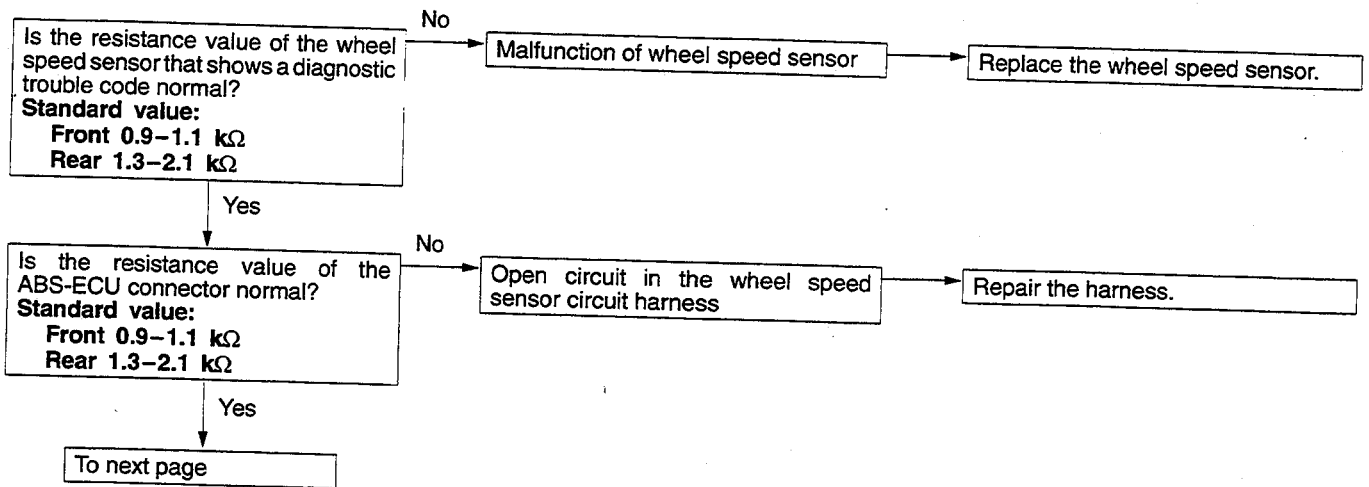
(Hint)

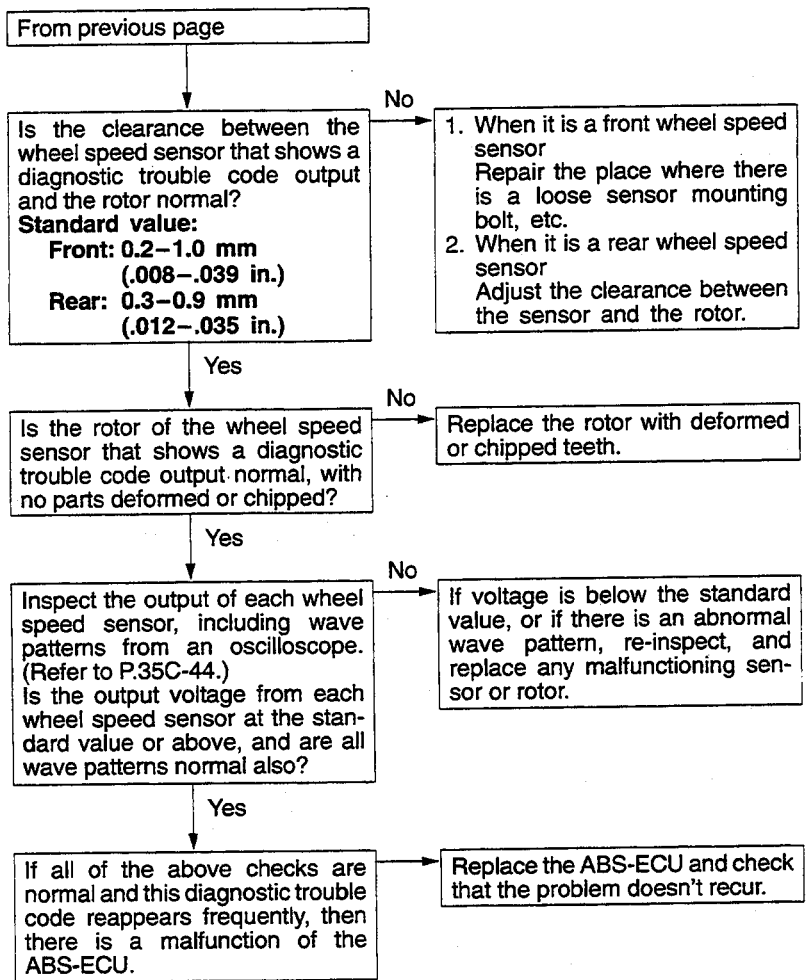
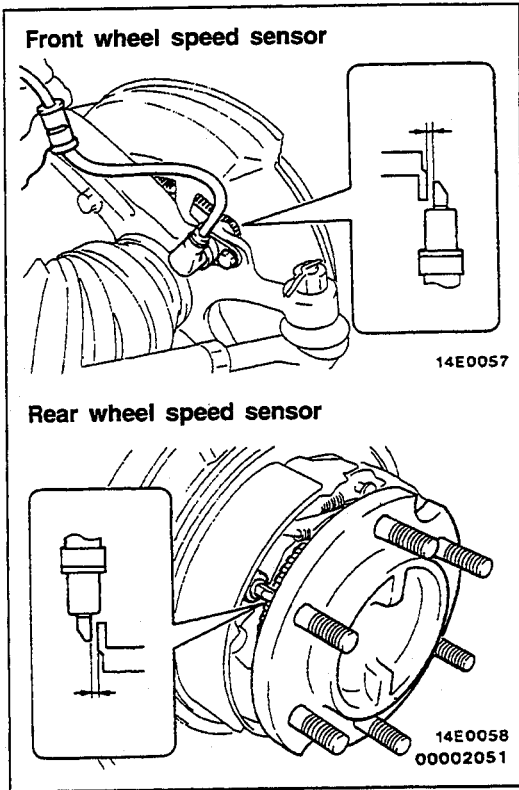
The cause is likely to be either a short-circuit between the sensor harnesses, a short-circuit between the sensor (+) wire and the body or an excessive sensor gap.

NOTE

(1) If there is an incorrect contact, inspect the sensor cable by lightly flexing and stretching it.

(2) If there is no current problem, a normal value will result even if a problem is detected, so when the malfunction in the sensor circuit indicated cannot be discovered, momentarily erase the diagnostic trouble code and turn the ignition switch to OFF, and carry out another driving test. At this time, replace the ABS-ECU only if the same diagnostic trouble code is output. After this, if the code does not reappear, there is a problem with the ABS-ECU interface. (For a problem that is difficult to reproduce, there is a possibility that the code will recur even when the ABS-ECU is replaced.)





E-4 When diagnostic trouble code No. 16 is displayed

<UP TO 1993 MODELS>

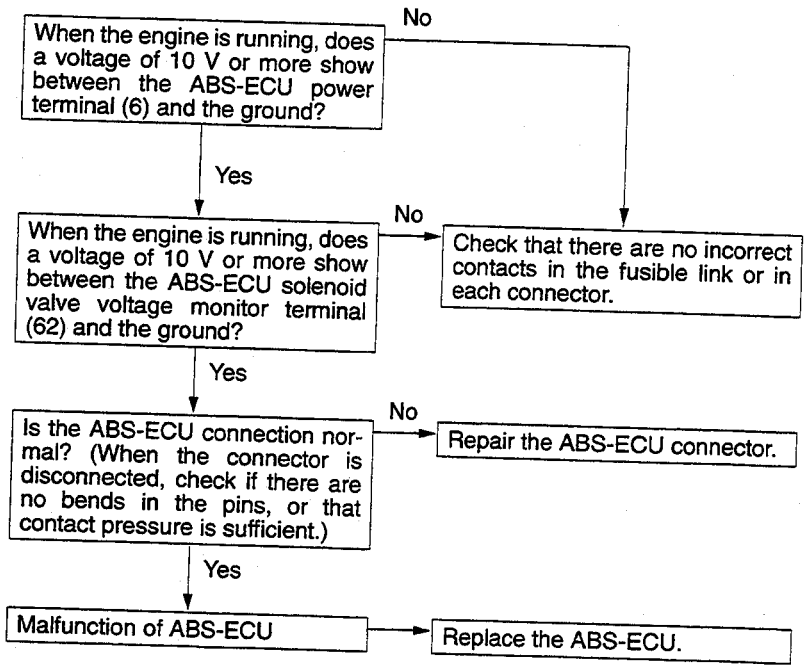
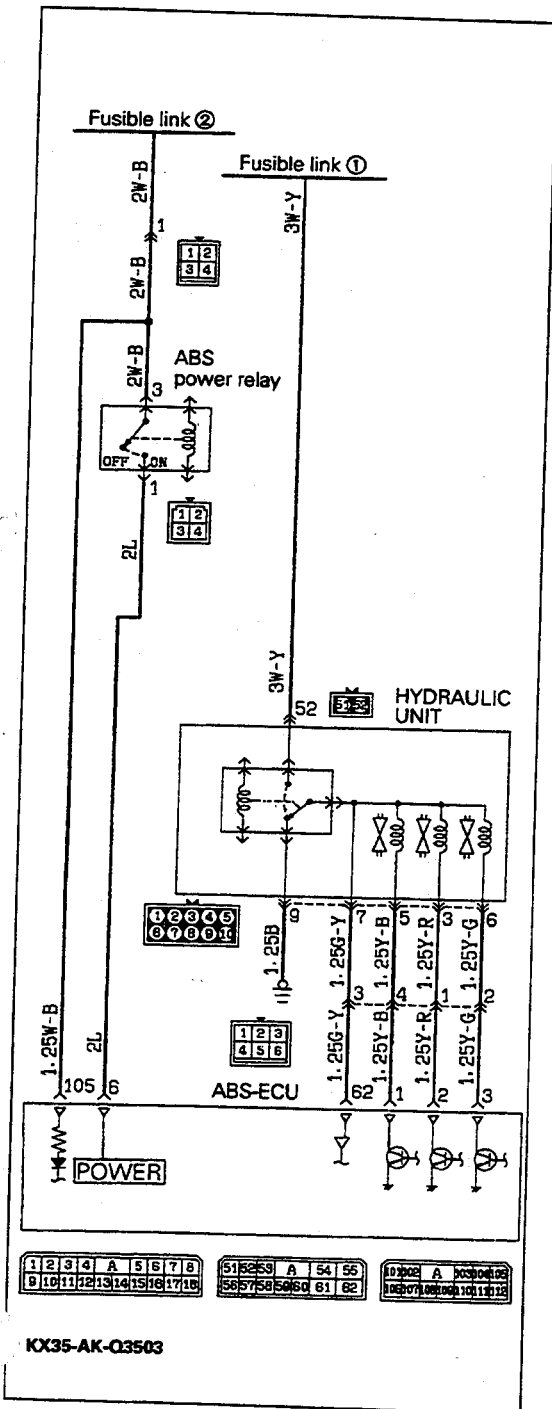
[Comment]

This indicates that the ABS-ECU power voltage or the solenoid valve power voltage is lower than the standard value.

If the voltage returns to standard voltage or above, this diagnostic trouble code will not be output.

Caution

If the battery positive voltage drops during inspection, this code will be output as a current problem, and correct diagnostic of the problem cannot be made. Before carrying out the following inspection, check the battery, and charge it if necessary.



KX35-AK-Q3503

E-4 When diagnostic trouble code No. 16 is displayed

<1994 MODELS AND AFTER>

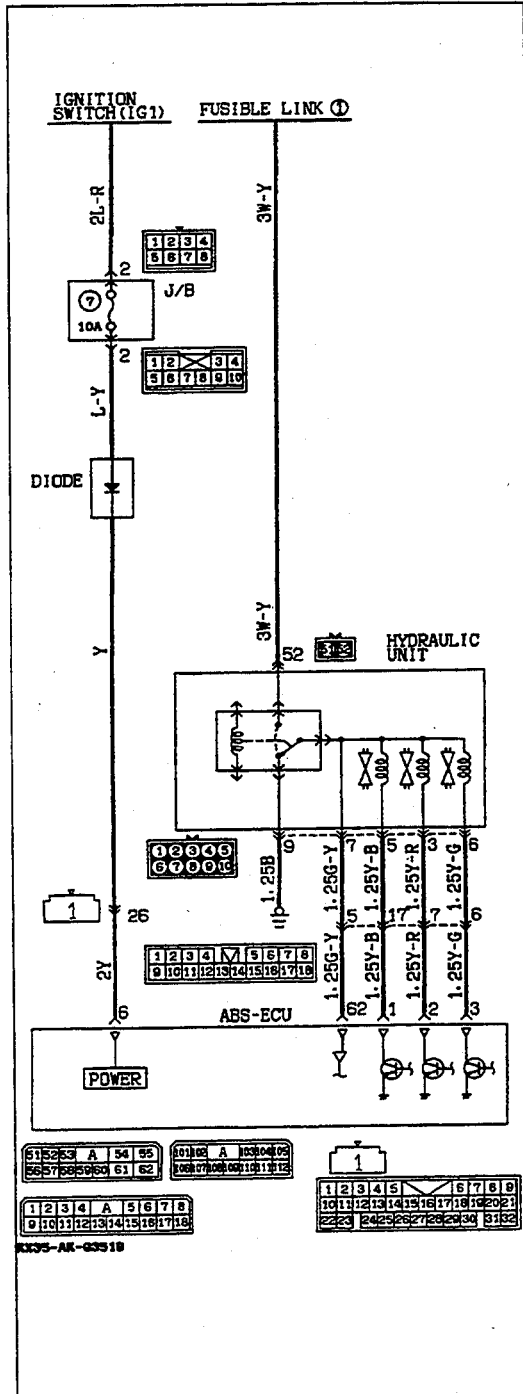
[Comment]

This indicates that the ABS-ECU power voltage or the solenoid valve power voltage is lower than the standard value.

If the voltage returns to standard voltage or above, this diagnostic trouble code will not be output.

Caution

If the battery positive voltage drops during inspection, this code will be output as a current problem, and correct diagnostic of the problem cannot be made. Before carrying out the following inspection, check the battery, and charge it if necessary.



```

    graph TD
      Q1[When the engine is running, does a voltage of 10 V or more show between the ABS-ECU power terminal (6) and the ground?]
      Q2[When the engine is running, does a voltage of 10 V or more show between the ABS-ECU solenoid valve voltage monitor terminal (62) and the ground?]
      Q3[Is the ABS-ECU connection normal? (When the connector is disconnected, check if there are no bends in the pins, or that contact pressure is sufficient.)]
      A1[Malfunction of ABS-ECU]
      A2[Replace the ABS-ECU.]
      A3[Repair the ABS-ECU connector.]
      A4[Check to be sure that there are no incorrect contacts in the fusible link or in each connector.]

      Q1 -- No --> A4
      Q1 -- Yes --> Q2
      Q2 -- No --> A4
      Q2 -- Yes --> Q3
      Q3 -- No --> A3
      Q3 -- Yes --> A1
      A1 --> A2
    
```

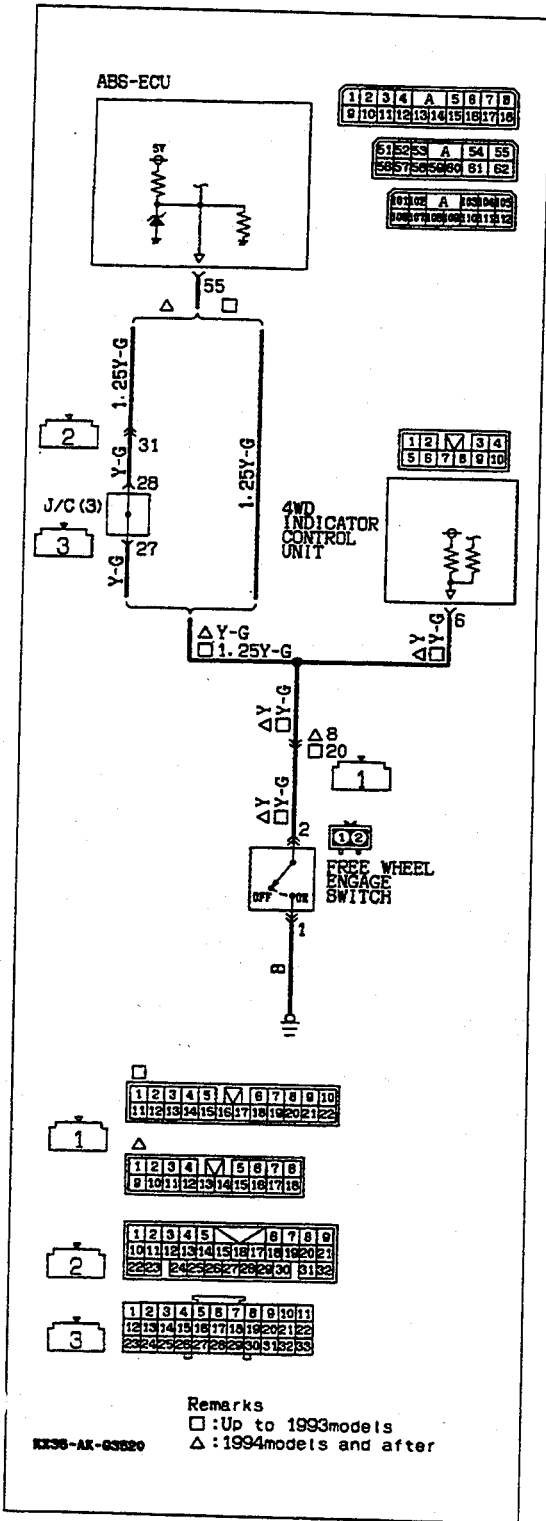
E-5 When diagnostic trouble code No. 25 is displayed

[Comment]

This diagnostic trouble code is output by the ABS-ECU when there is an open circuit in the harness or a malfunction of the 4WD indicator circuit in the free-wheel engage switch (thick wire in center of circuit diagram).

(Hint)

When this diagnostic trouble code is output, and also none of the 4WD indicator lights (excluding the rear differential light) are illuminated, the cause is likely to be the power circuit in the 4WD indicator control unit.



```

    graph TD
        Q1{Is the operation of the 4WD indicator light (center differential light) normal?}
        Q1 -- No --> A1[Open circuit in the harness (thick wire) between the 4WD indicator control unit and the free-wheel indicator switch, or malfunction of the power circuit of the 4WD indicator control unit or of the 4WD indicator control unit]
        Q1 -- Yes --> P1{{Inspect with the engine running.}}
        P1 --> Q2{When the ABS-ECU connector is disconnected, is the voltage between harness-side connector terminal (55) and the ground normal?}
        Q2 -- No --> A2[Open circuit in the harness (thick wire) between the ABS-ECU and the free-wheel engage switch]
        Q2 -- Yes --> B1[Malfunction of ABS-ECU]
        B1 --> C1[Replace the ABS-ECU.]
        A2 --> D1[Repair the harness.]
    
```

E-6 When diagnostic trouble code No. 26 is displayed

[Comment]

This diagnostic trouble code is output by the ABS-ECU in the following cases:

- Open circuit in the harness (thick wire) in the center differential lock detection switch system
- At a vehicle speed of 15 km (9 mph) or higher, the free-wheel engage switch is OFF and the center differential lock switch is ON for a continuous period of 5 seconds or more (Combination switch signal abnormality)
- When there is a malfunction of the 4WD indicator circuit

(Hint)

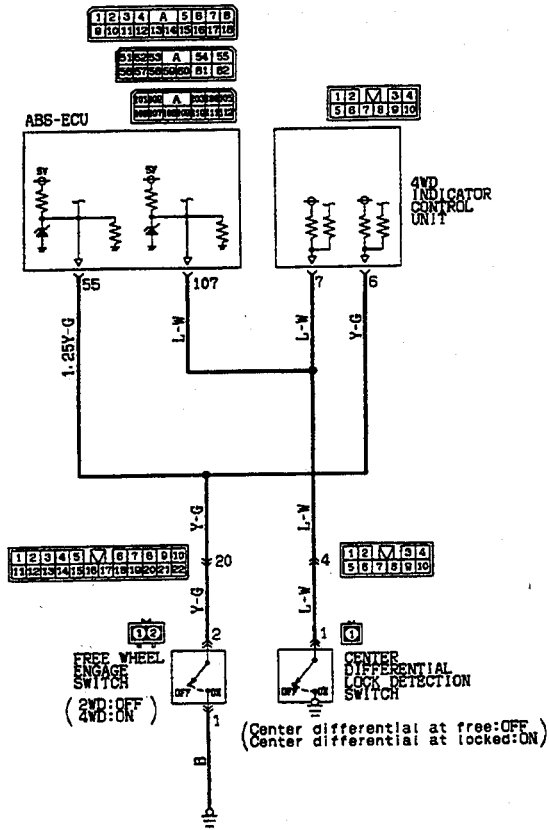
1. A combination switch signal abnormality occurs at the following times:

- Open circuit in the harness (thick wire) in the free-wheel engage switch system or malfunction of the switch (stays OFF)
- Short-circuit in the harness (thick wire) in the center differential lock switch system or malfunction of switch (stays ON)

The above malfunctions are also affected by the 4WD indicator, so it might be the case that the malfunction is caused by a trouble symptom in the 4WD indicator.

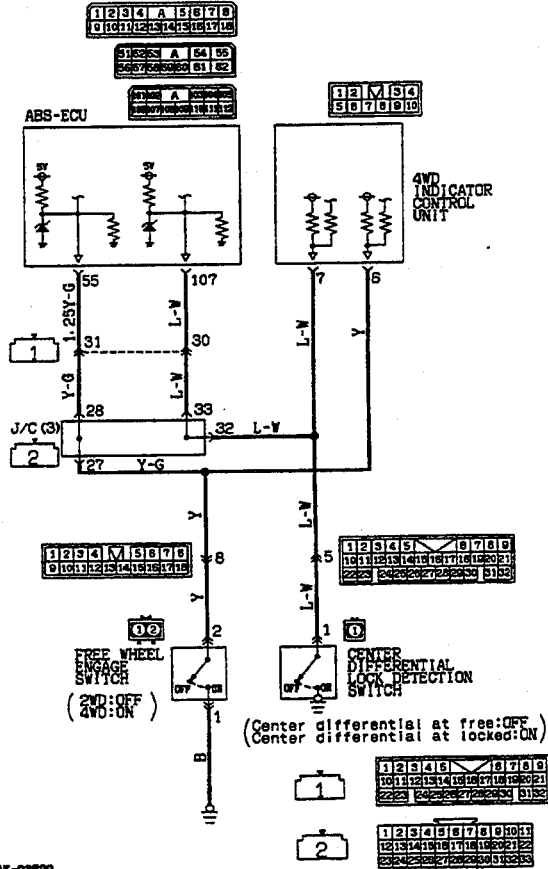
2. When this diagnostic trouble code is output, and also none of the 4WD indicator lights (excluding the rear differential light) are illuminated, the cause is likely to be the power circuit in the 4WD indicator-ECU.

<Up to 1993models>



K336-AK-03021

<1994models and after>



K336-AK-03022

Does the 4WD indicator operate normally? No

Yes

Trouble Symptom	Probable Cause	Remedy
Even when the transfer shift lever is in the "4H" position, the 4WD front wheel indicator light does not illuminate.	Open circuit in the harness between the 4WD indicator-ECU and the free-wheel engage switch, or open circuit between the free-wheel engage switch and the ground	Repair the harness.
	Malfunction of free wheel engage switch	Replace the switch.
Even when the transfer shift lever is in the "4H" position, the 4WD center differential light does not illuminate.	Open circuit in the harness between the 4WD indicator-ECU and the center differential lock switch	Repair the harness.
	Open circuit in the 4WD indicator-ECU circuit	Replace the 4WD indicator-ECU.
4WD indicator center differential light illuminates regardless of the position of the transfer shift lever	Short-circuit in the harness in the center differential lock detection switch circuit	Repair the harness.
	Malfunction of center differential lock detection switch	Replace the switch.
	Short-circuit of ABS-ECU circuit	Replace the ABS-ECU.
	Short-circuit of 4WD indicator-ECU circuit	Replace the 4WD indicator-ECU.
No indicator is illuminated	Malfunction of power circuit in 4WD indicator-ECU	Repair the harness.
	Malfunction of 4WD indicator-ECU	Replace the 4WD indicator-ECU.

NOTE

When checking a short in the ABS-ECM circuit, disconnect the ABS-ECM connector and check if the 4WD indicator returns to normal. If it returns to normal, then there is a malfunction of the ABS-ECU. Furthermore, if the ABS-ECU is normal, then there is a malfunction of the 4WD indicator-ECU.

When the ABS-ECU connector is disconnected, is the voltage between harness-side connector terminal (107) and the ground normal?
When center differential is locked:
 0 V
When center differential is free:
 Battery positive voltage

No

Malfunction of ABS-ECU

Replace the ABS-ECU.

Open circuit in the harness between the ABS-ECU and the center differential detection lock switch

Repair the harness.

TSB Revision

E-7 When diagnostic trouble code No. 27 is displayed

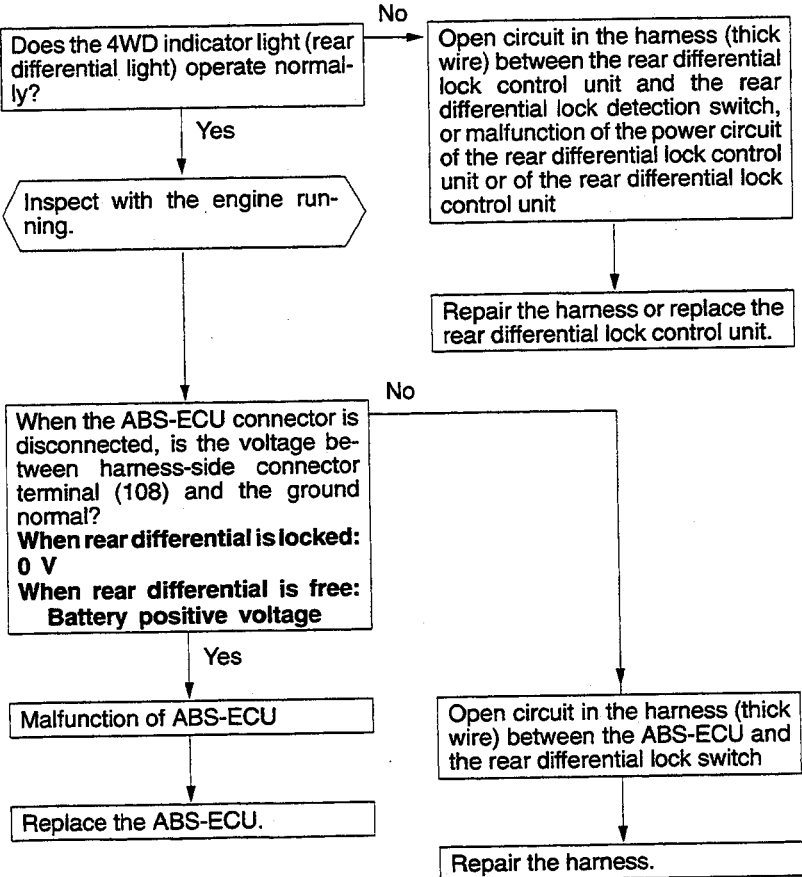
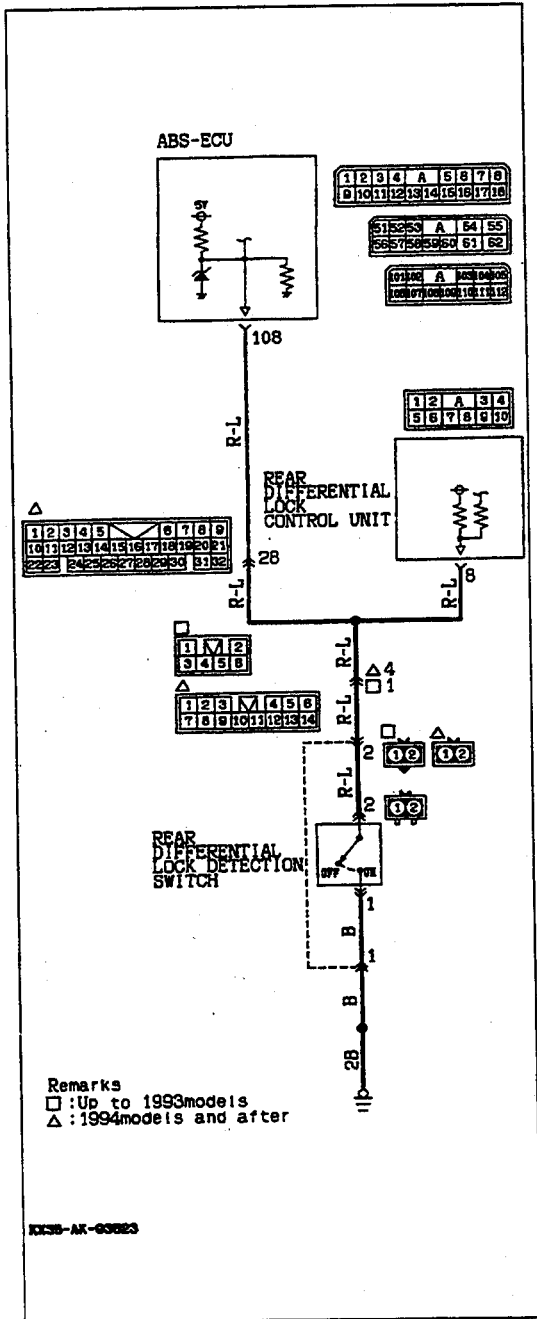
<Vehicles with rear differential lock>

[Comment]

This diagnostic trouble code is output by the ABS-ECU when there is an open circuit in the harness or a malfunction of the rear differential lock circuit (thick wire in circuit diagram) in the rear differential lock detection switch system.

[Hint]

When this diagnostic trouble code is output, and also none of the 4WD indicator lights (rear differential light) are illuminated, the cause is likely to be the power circuit in the 4WD indicator control unit.

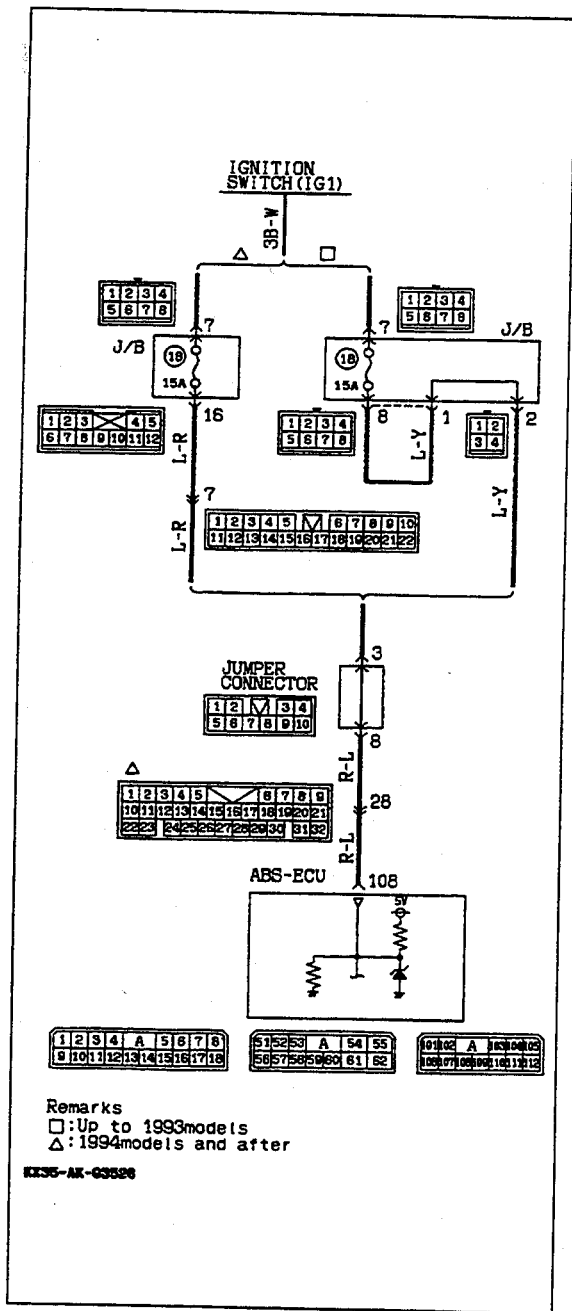


E-7 When diagnostic trouble code No. 27 is displayed

<Vehicles without rear differential lock>

[Comment]

For vehicles without rear differential lock, battery positive voltage is applied to ABS-ECU terminal (108). This diagnostic trouble code is output when this line is interrupted.



```

    graph TD
      Q1[Is fuse No. 18 normal?] -- No --> A1[Replace the fuse after eliminating the cause of the blowout.]
      Q1 -- Yes --> B1{{Disconnect the ABS-ECU connector and inspect with the engine running.}}
      B1 --> Q2[Does battery positive voltage show between ABS-ECU harness-side connector (108) and the ground?]
      Q2 -- No --> A2[Open circuit in the harness between the power relay and the ABS-ECU]
      A2 --> B2[Repair the harness.]
      Q2 -- Yes --> A3[Malfunction of ABS-ECU]
      A3 --> B3[Replace the ABS-ECU.]
  
```

Remarks
 □: Up to 1993 models
 △: 1994 models and after

KCS5-AK-03526

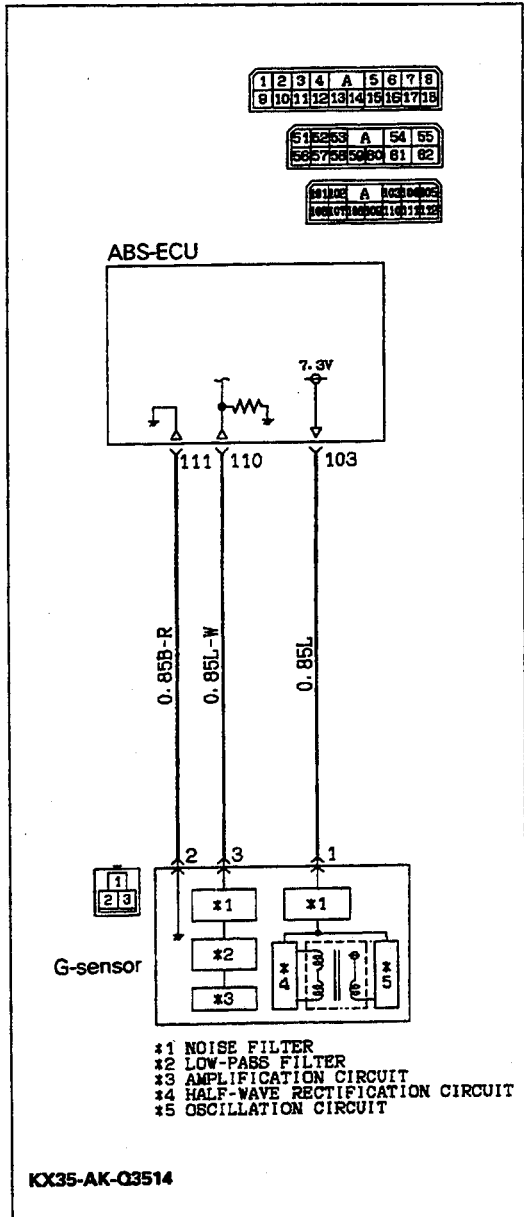
E-8 When diagnostic trouble code No. 31 is displayed

[Comment]

This code is displayed when there is an abnormality in the G sensor power voltage (including a short circuit in the G sensor power harness).

(Hint)

If there is a short circuit in the G sensor power harness, code No. 32 will be output at the same time as this code.



```

    graph TD
      Q1{Is diagnostic trouble code No. 32 also output at the same time.}
      Q1 -- No --> R1[Malfunction of ABS-ECU]
      R1 --> A1[Replace the ABS-ECU.]
      Q1 -- Yes --> S1{{Inspect with the ignition switch at ACC.}}
      S1 --> Q2{When the G sensor connector is disconnected, is there continuity between harness-side connector terminal (1) and the ground?}
      Q2 -- No --> R2[Malfunction of G sensor circuit]
      R2 --> A2[Replace the G sensor.]
      Q2 -- Yes --> Q3{When the ABS-ECU connector and the G sensor connector are disconnected, is there continuity between the G sensor harness-side connector terminal (1) and the ground?}
      Q3 -- No --> R3[Malfunction of ABS-ECU]
      R3 --> A3[Replace the ABS-ECU.]
      Q3 -- Yes --> R4[Short-circuit in the harness between the ABS-ECU and the G sensor]
      R4 --> A4[Repair the harness.]
    
```

E-9 When diagnostic trouble code No. 32 is displayed

<UP TO 1993 MODELS>

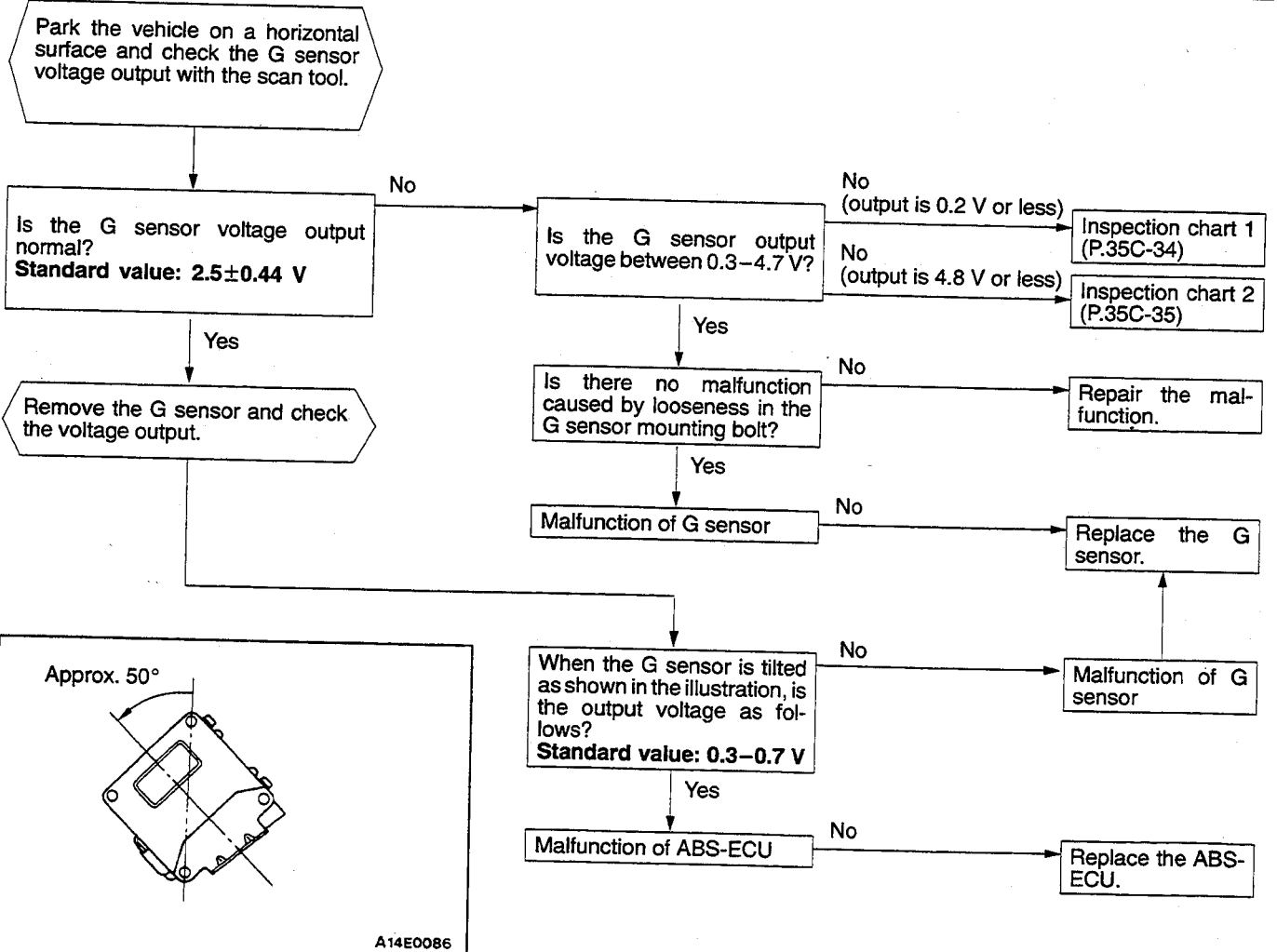
[Comment]

This diagnostic trouble code is output when there is an abnormality in the G sensor voltage output. This code is also output when there is an open circuit or short-circuit in the G sensor power or signal harness or an open circuit in the ground line.

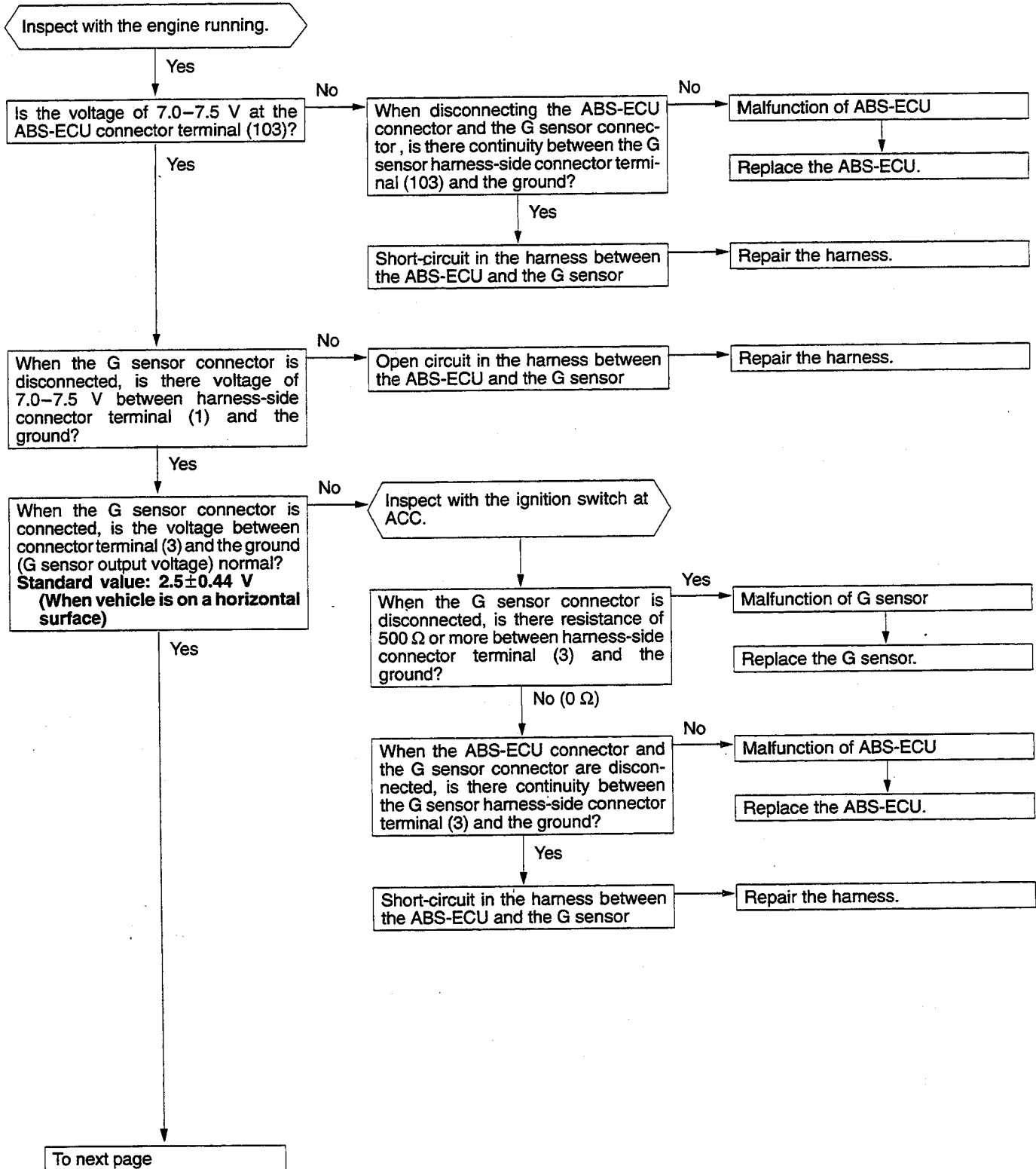
(Hint)

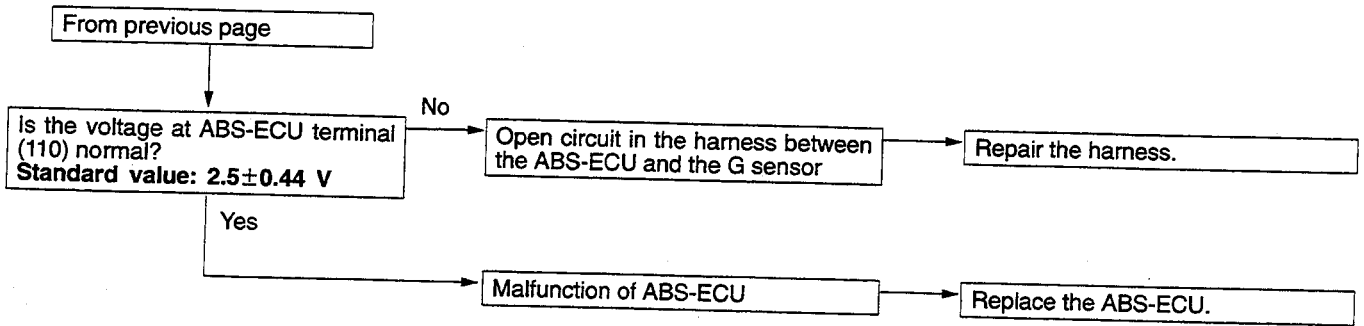
Malfunctions can be distinguished by the G sensor output voltage read by the scan tool service data.

G sensor output voltage (when vehicle is on a horizontal surface)	Main problem location
2.5±0.44 V	Normal
0.2 V or less	Open or short circuit in the power harness or signal harness
4.8 V or more	Open circuit in the ground line
Other than the above	Malfunction of G sensor (including incorrect installation)

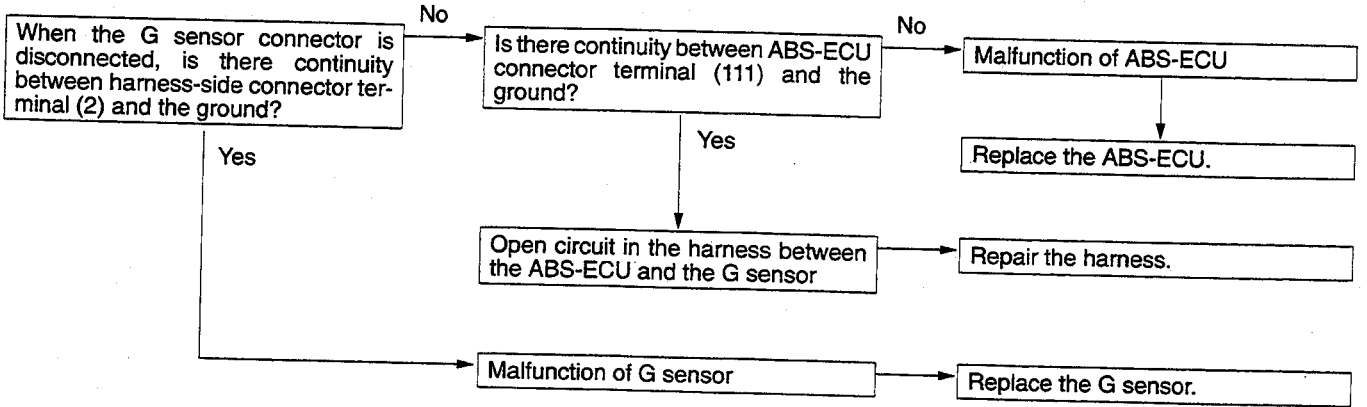


Inspection Chart 1





Inspection Chart 2



E-9 When diagnostic trouble code No. 32 is displayed

<1994 MODELS AND AFTER>

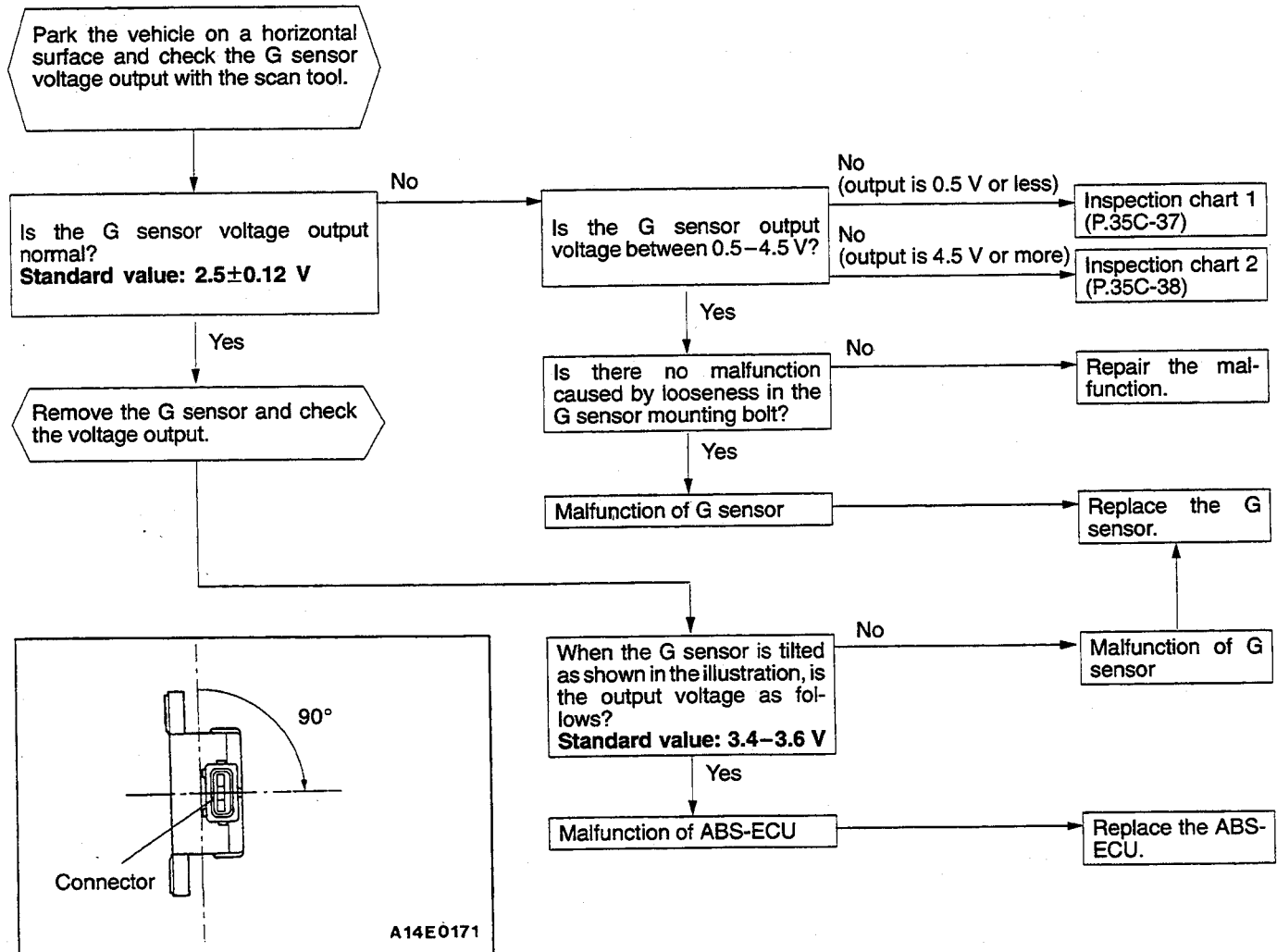
[Comment]

This diagnostic trouble code is output when there is an abnormality in the G sensor voltage output. This code is also output when there is an open circuit or short-circuit in the G sensor power or signal harness or an open circuit in the ground line.

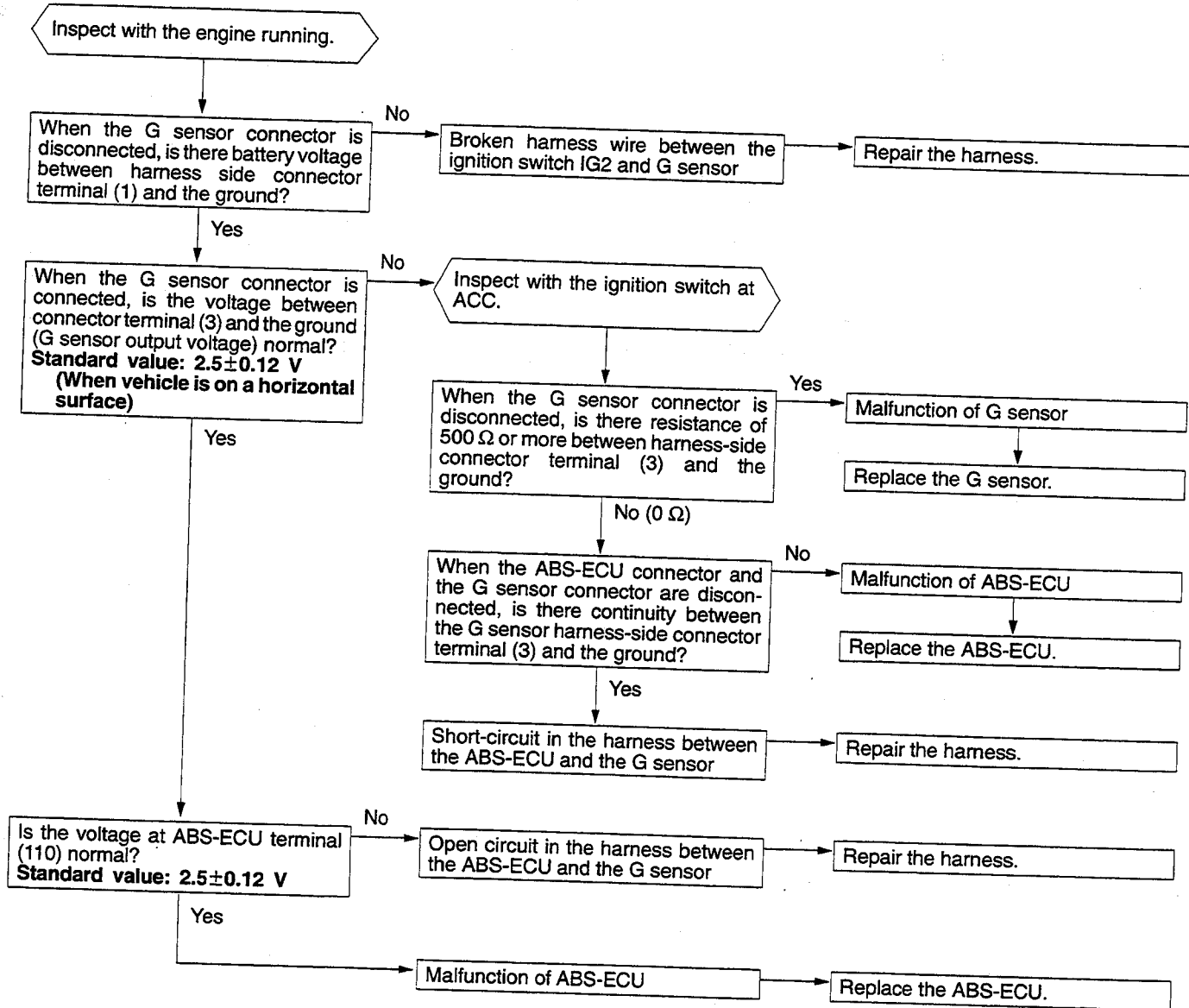
(Hint)

Malfunctions can be distinguished by the G sensor output voltage read by the scan tool service data.

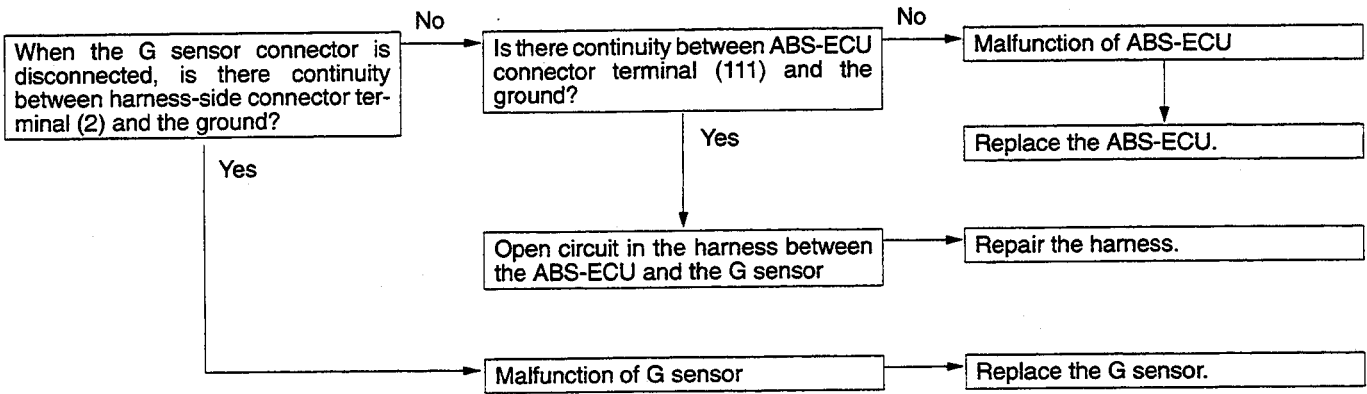
G sensor output voltage (when vehicle is on a horizontal surface)	Main problem location
2.5±0.12 V	Normal
0.5 V or less	Open circuit or short-circuit in the power harness or signal harness
4.5 V or more	Open circuit in the ground line
Other than the above	Malfunction of G sensor (including incorrect installation)



Inspection Chart 1



Inspection Chart 2



E-10 When diagnostic trouble code No. 33 is displayed

<UP TO 1993 MODELS>

[Comment]

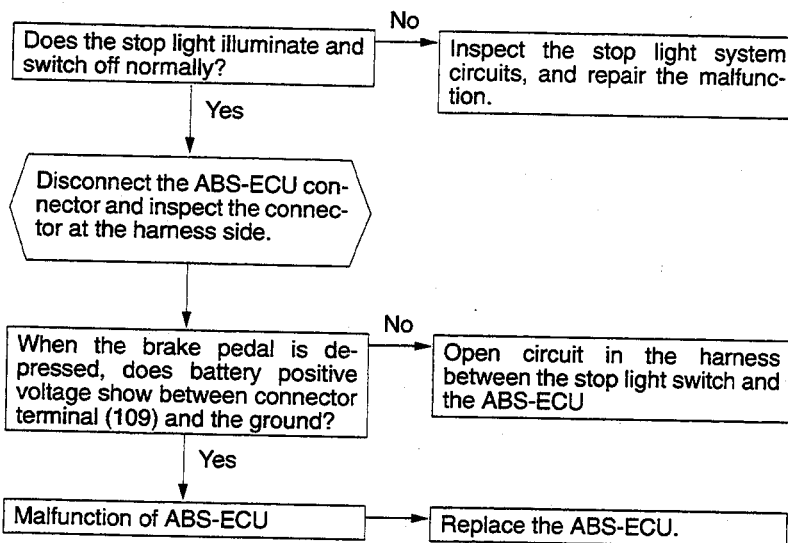
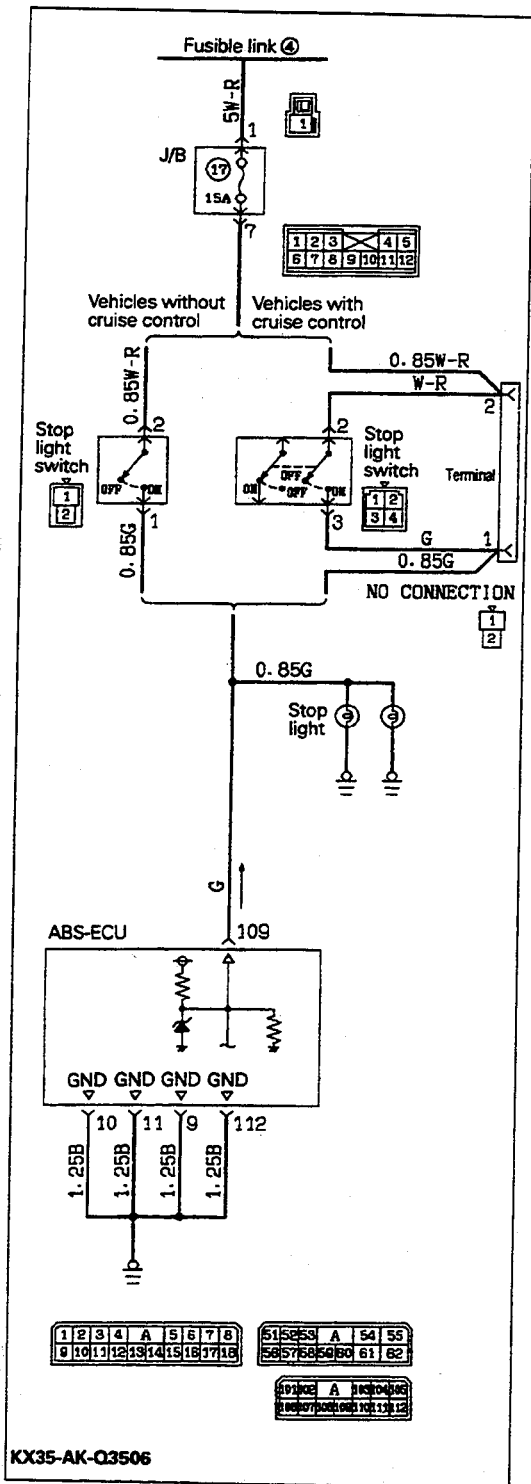
This diagnostic trouble code is output by the ABS-ECU in the following cases:

- Problem with the stop light switch being ON (even though the ABS is not operating, the stop light is continuously diagnosed as being ON for a continuous period of 15 minutes or more.)

- Open circuit in the harness in the stop light switch system

(Hint)

If the stop light illuminates and switches off normally, then there is an open circuit in the harness in the stop light switch input circuit or a malfunction of the ABS-ECU circuit.



KX35-AK-Q3506

TSB Revision

E-10 When diagnostic trouble code No. 33 is displayed

<1994 MODELS AND AFTER>

[Comment]

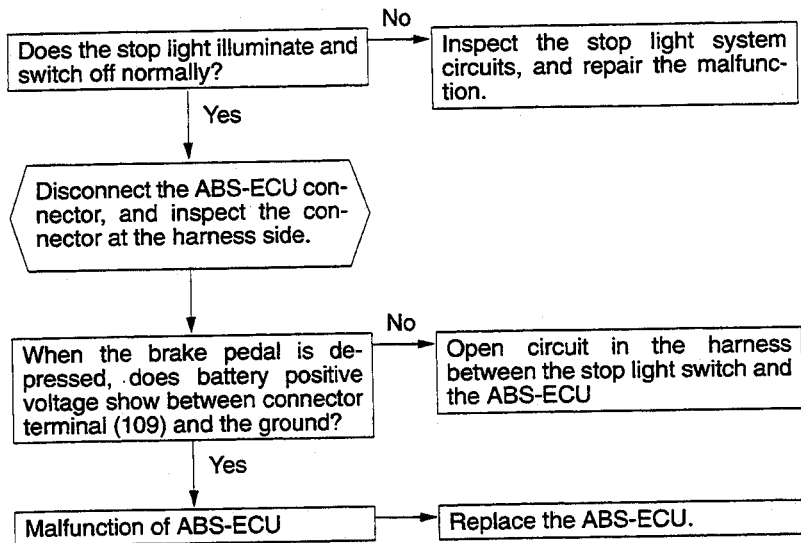
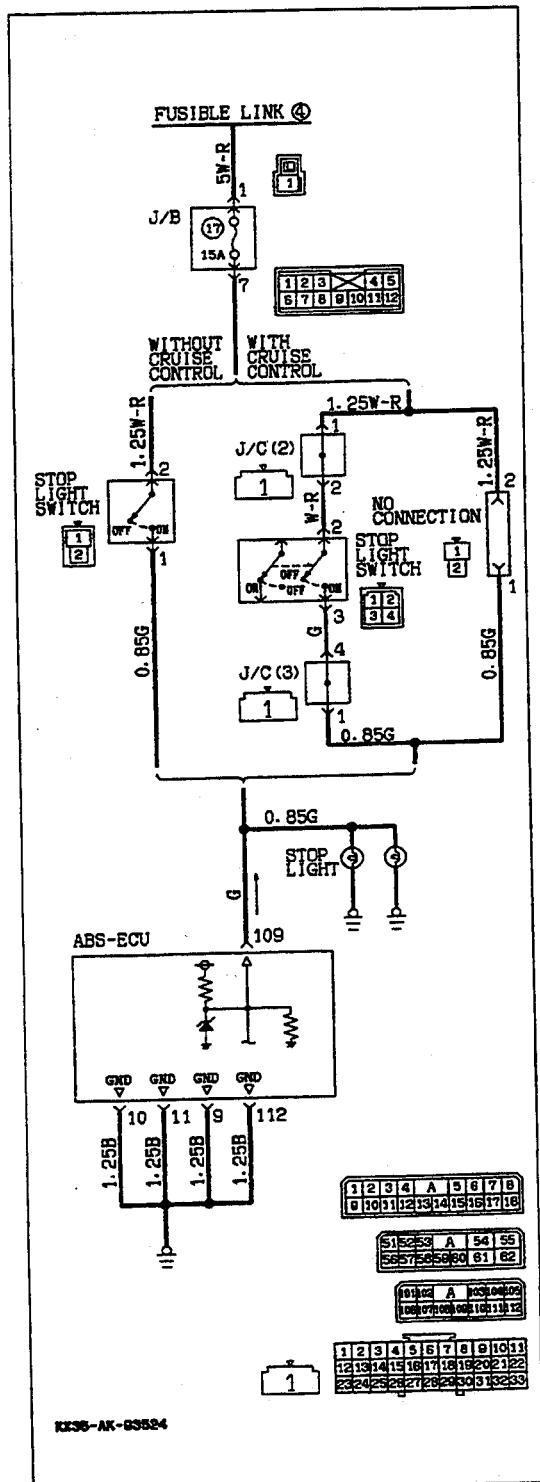
This diagnostic trouble code is output by the ABS-ECU in the following cases:

- Problem with the stop light switch being ON (even though the ABS is not operating, the stop light is continuously diagnosed as being ON for a continuous period of 15 minutes or more.)

- Open circuit in the harness in the stop light switch system

(Hint)

If the stop light illuminates and switches off normally, then there is an open circuit in the harness in the stop light switch input circuit or a malfunction of the ABS-ECU circuit.

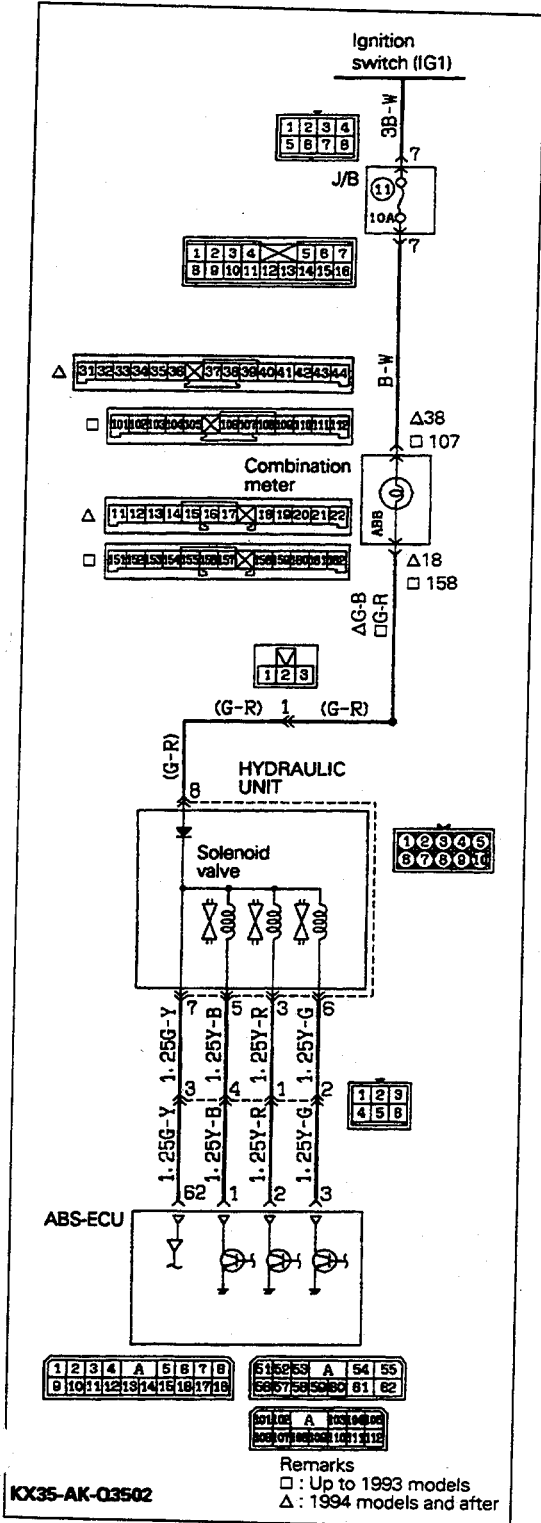


E-11 When diagnostic trouble code No. 41, 43 or 45 is displayed

[Comment]

The ABS-ECU normally monitors the solenoid valve drive circuit. If there is no current flowing to the solenoid even when the solenoid valve is ON, or the current continues to flow to the solenoid even

when the solenoid is OFF, the ABS-ECU diagnoses an open circuit or short-circuit in the solenoid coil or an open circuit or short-circuit in the harness, and this diagnostic trouble code is output.



```

    graph TD
      A[Remove the hydraulic unit 10-pin connector and inspect the connector at the harness side.] --> B{Is the resistance value of the solenoid valve within the standard value range?  
Standard value: 1.0-1.3 Ω}
      B -- No --> C[Replace the hydraulic unit.]
      B -- Yes --> D[Connect the hydraulic unit 10-pin connector, disconnect the ABS-ECU connector and inspect.]
      D --> E{If the resistance value of the solenoid valve that shows a diagnostic trouble code is measured at the ABS-ECU connector, is the value within the standard range?  
Standard value: 1.0-1.3 Ω}
      E -- No --> F[Open circuit in the harness wire or short-circuit in the solenoid valve that has a resistance value outside the standard value range]
      F --> G[Repair the harness.]
      E -- Yes --> H[Malfunction of ABS-ECU]
      H --> I[Replace the ABS-ECU.]
    
```

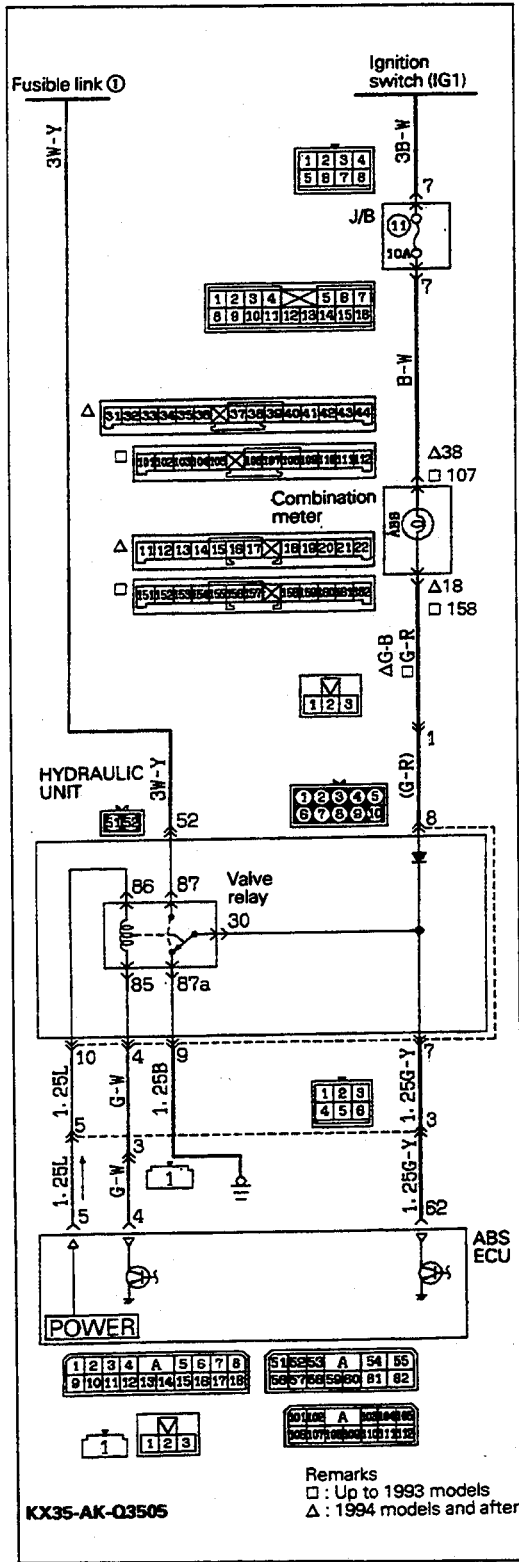
KX35-AK-Q3502

E-12 When diagnostic trouble code No. 51 is displayed

[Comment]

With the ignition switch ON, the valve relay is switched ON and OFF during the initial check, and the ABS-ECU compares the signal to the valve relay and the voltage in the valve power monitor

line to check if the valve relay is operating. Normally, the valve relay is ON, so if power is not being supplied to the valve power monitor line, this diagnostic trouble code is output.



```

    graph TD
      Start[Remove the valve relay and inspect.] --> Q1{When the valve relay unit is inspected, are the results as follows?}
      Q1 -- No --> R1[Malfunction of valve relay]
      R1 --> A1[Replace the valve relay.]
      Q1 -- Yes --> A2[Replace the valve relay and remove the hydraulic unit connector.]
      A2 --> Q2{When the ignition switch is turned to ON, does battery positive voltage show between hydraulic unit harness-side connector terminal (52) and the ground?}
      Q2 -- No --> R2[Open circuit in the hydraulic unit power harness]
      R2 --> A3[Repair the harness.]
      Q2 -- Yes --> Q3{Is there continuity between hydraulic unit connector terminals (8) - (7)?}
      Q3 -- No --> R3[Malfunction of hydraulic unit harness]
      R3 --> A4[Repair the harness or replace the hydraulic unit.]
      Q3 -- Yes --> A5[Connect the hydraulic unit connector and disconnect the ABS-ECU connector.]
      A5 --> Q4{Does a resistance value of 60-120 Ω show between harness-side connector terminals (5) - (4)?}
      Q4 -- No --> R4[Malfunction of harness between the ABS-ECU and the hydraulic unit]
      R4 --> A6[Repair the harness.]
      Q4 -- Yes --> Q5{When the ignition switch is turned to ON, does battery positive voltage show between hydraulic unit harness-side connector terminal (62) and the ground?}
      Q5 -- No --> R5[Malfunction of harness between the ABS-ECU and the hydraulic unit]
      R5 --> A7[Repair the harness.]
      Q5 -- Yes --> R6[Malfunction of ABS-ECU]
      R6 --> A8[Replace the ABS-ECU.]
  
```

E-13 When diagnostic trouble code No. 53 is displayed

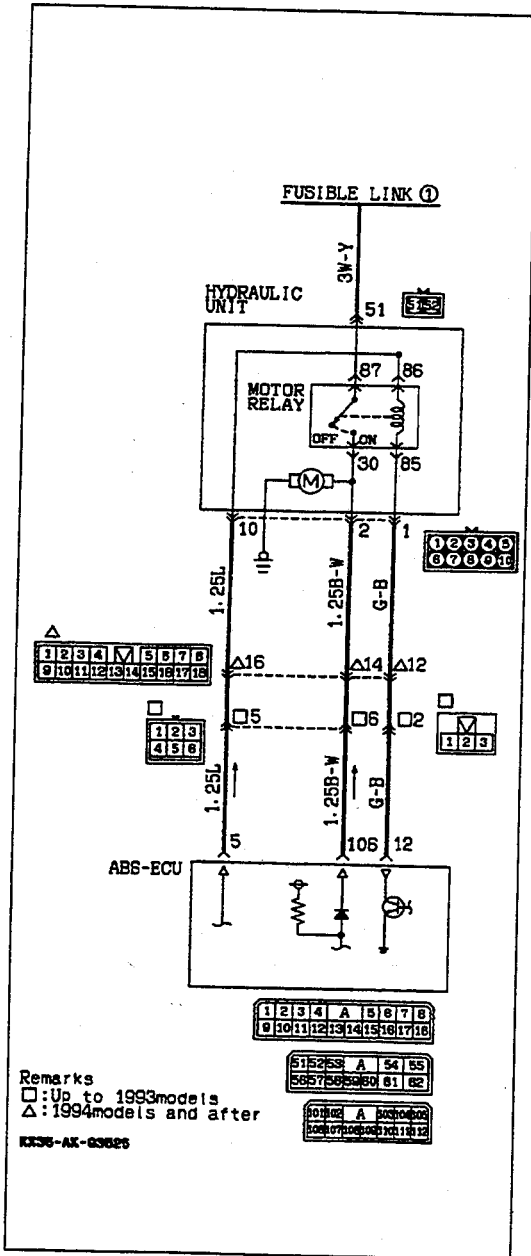
[Comment]

This code is output by the ABS-ECU when the motor relay or motor is as follows:

- Motor relay does not operate
- Motor will not work due to some problem
- Motor will not work because the ground is not secure
- Motor will not stop

(Hint)

Momentarily turn the ignition switch to OFF, and after releasing the fail-safe mechanism, carry out an actuator test with the scan tool. If the sound of the motor working is heard during the scan tool actuator test, there is an open or short-circuit in the motor monitor line.

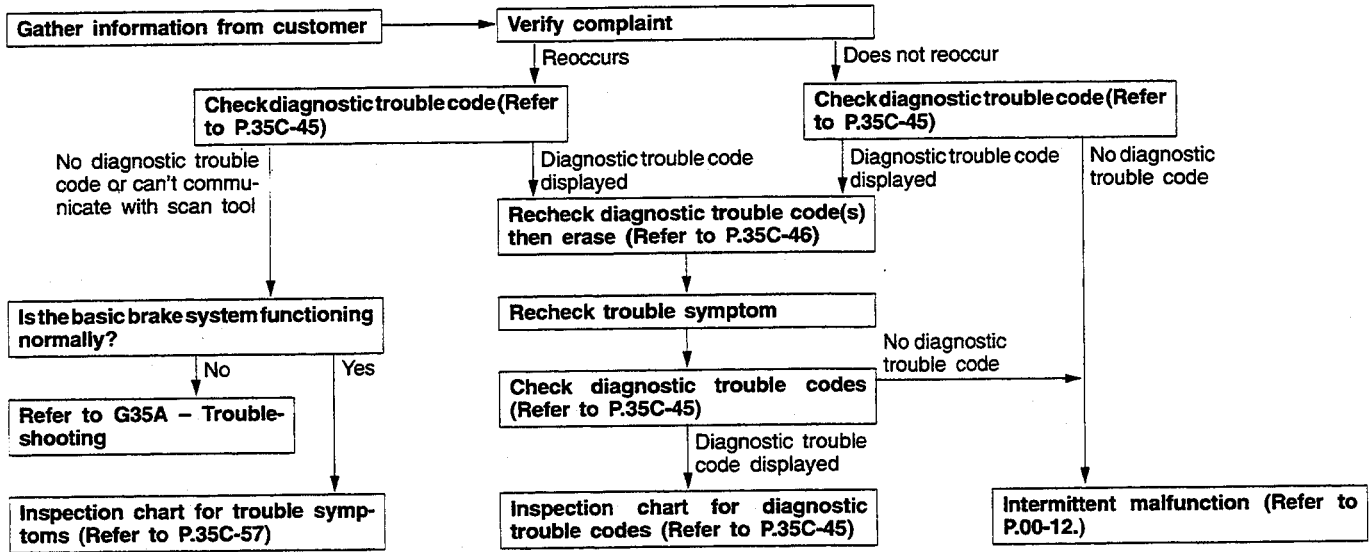


```

    graph TD
        Q1[When carrying out a forced actuation test with the scan tool, can the sound of the motor working be heard?] -- Yes --> A1[Open circuit or short-circuit in the motor monitor line]
        A1 --> R1[Repair the harness between the hydraulic unit and the ABS-ECU.]
        Q1 -- No --> R2[Remove the motor relay]
        R2 --> Q2[When the motor relay is inspected, are the results as follows?  
● (85)-(86): Resistance value 30-60 Ω  
● (30)-(87): No continuity  
Battery positive voltage applied between terminals (85)-(86)  
● (30)-(87): Continuity]
        Q2 -- No --> A2[Malfunction of motor relay]
        A2 --> R2
        Q2 -- Yes --> Q3[Is the pump motor ground connected properly?]
        Q3 -- No --> A3[Connect to the ground.]
        Q3 -- Yes --> R3[Install the motor relay and remove the hydraulic unit connector.]
        R3 --> Q4[Does battery positive voltage show between harness-side connector terminal (51) and the ground?]
        Q4 -- No --> A4[Open circuit in the pump motor power circuit]
        A4 --> R4[Repair the harness.]
        Q4 -- Yes --> R5[Connect the hydraulic unit connector and disconnect the ABS-ECU connector.]
        R5 --> Q5[Is there a resistance of 30-60 Ω between harness-side connector terminals (5) - (12)?]
        Q5 -- No --> A5[Malfunction of harness between the ABS-ECU and the hydraulic unit]
        Q5 -- Yes --> Q6[Is there a resistance of 0.1-0.3 Ω between harness-side connector terminal (106) and the ground?]
        Q6 -- No --> A6[Repair the harness.]
        Q6 -- Yes --> A7[Malfunction of ABS-ECU]
        A7 -- No --> R5
    
```

TROUBLESHOOTING <1995 models and after>

DIAGNOSTIC TROUBLESHOOTING FLOW

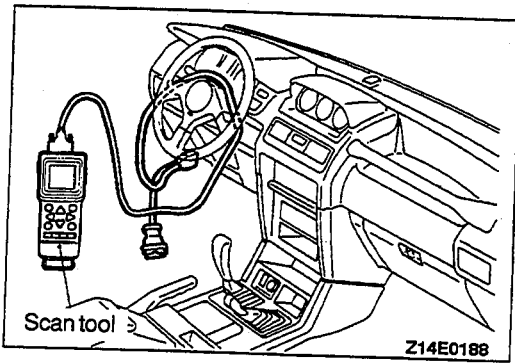


NOTES WITH REGARD TO DIAGNOSIS

The condition listed in the following table are considered normal.

Condition	Explanation of condition
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this is because the system operation check is being performed. This is considered normal.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operating (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being overconfident.

Diagnosis detection condition depends on a diagnostic trouble code. So, when rechecking a trouble symptom, be sure to satisfy the condition listed in the "Comments" column of the inspection procedure for diagnostic trouble codes.



DIAGNOSTIC FUNCTION

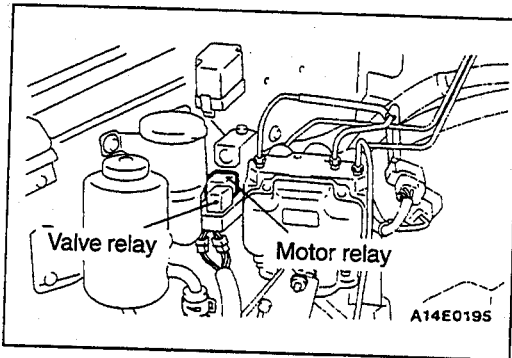
DIAGNOSTIC CODES CHECK

With the Scan Tool (MUT-II)

Connect the scan tool (MUT-II) to the diagnosis connector (16-pin), then check diagnostic codes.

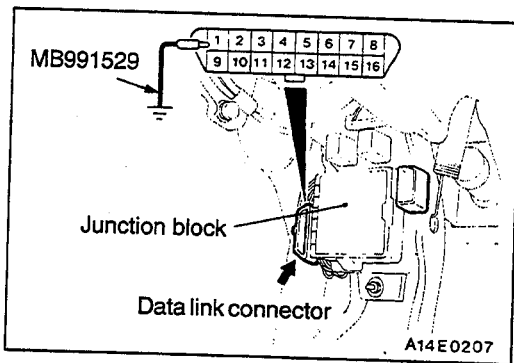
Caution

Turn the ignition switch off before connecting or disconnecting the scan tool.



Without the Scan Tool (MUT-II)

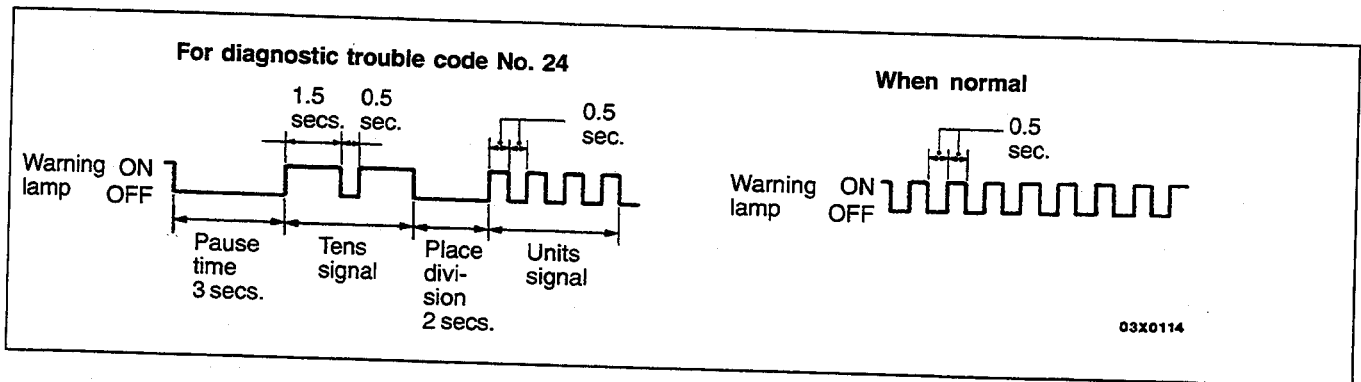
1. Turn the ignition switch off and then remove the valve relay.



2. Use the special tool to ground data link connector terminal (1).
3. Turn the ignition switch to ON and then take a reading of the diagnostic trouble codes from the flashing of the ABS warning lamp.

NOTE

The diagnostic trouble code No. 51 (indicating an open or short circuit in the valve relay) will be always output although there is no open or short circuit. That is because the valve relay is removed.



4. After remedying the problems indicated by the diagnostic trouble codes, disconnect the diagnostic trouble code check harness and install the valve relay. Then turn the ignition switch to ON again and check the ABS warning light. (Refer to P.35C-57.) If an abnormality occurs during checking, a problem with the valve relay system may be present. (Refer to P.35C-55.)

ERASING DIAGNOSTIC CODES**With the Scan Tool (MUT-II)**

Connect the scan tool to the diagnosis connector (16-pin), then erase the diagnostic codes.

Without the Scan Tool (MUT-II)

Removing the battery cable from the battery (-) terminal for 10 seconds or more, then reconnect the cable.

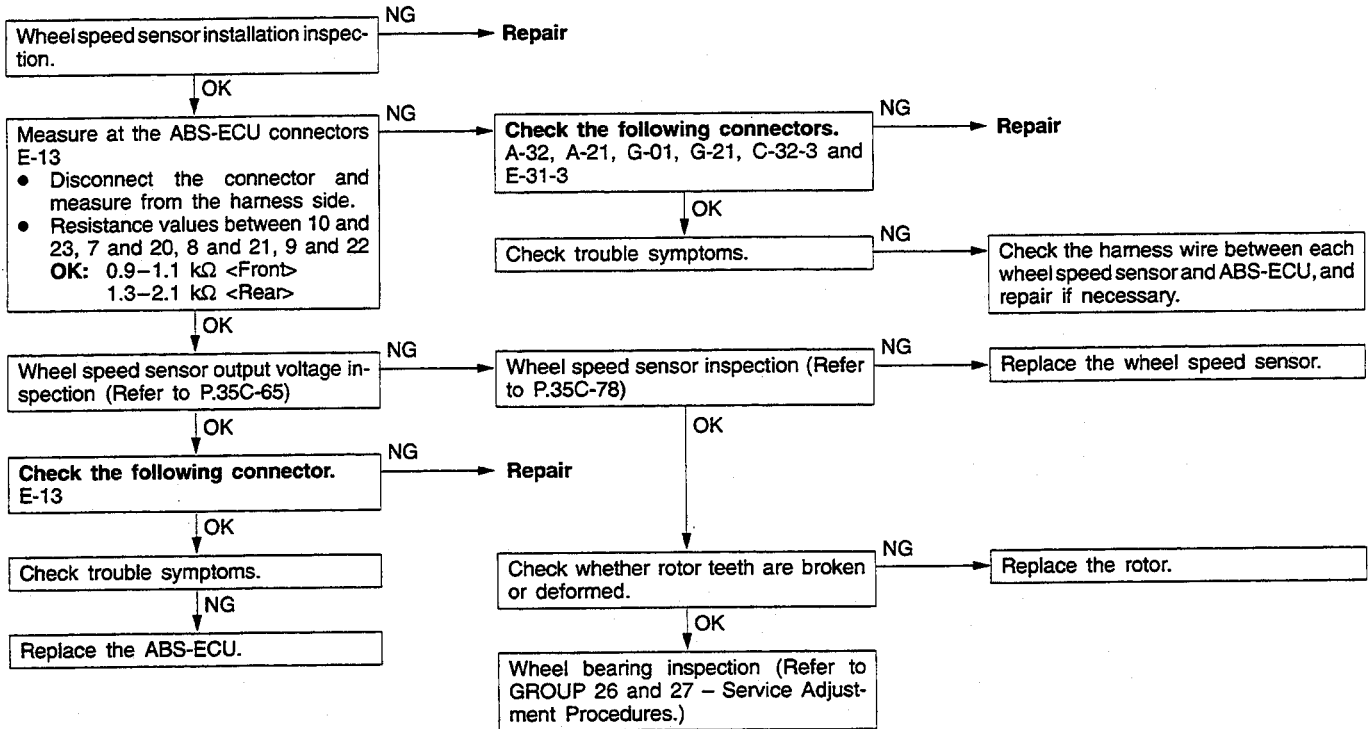
INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

Inspect according to the inspection chart that is appropriate for the malfunction code.

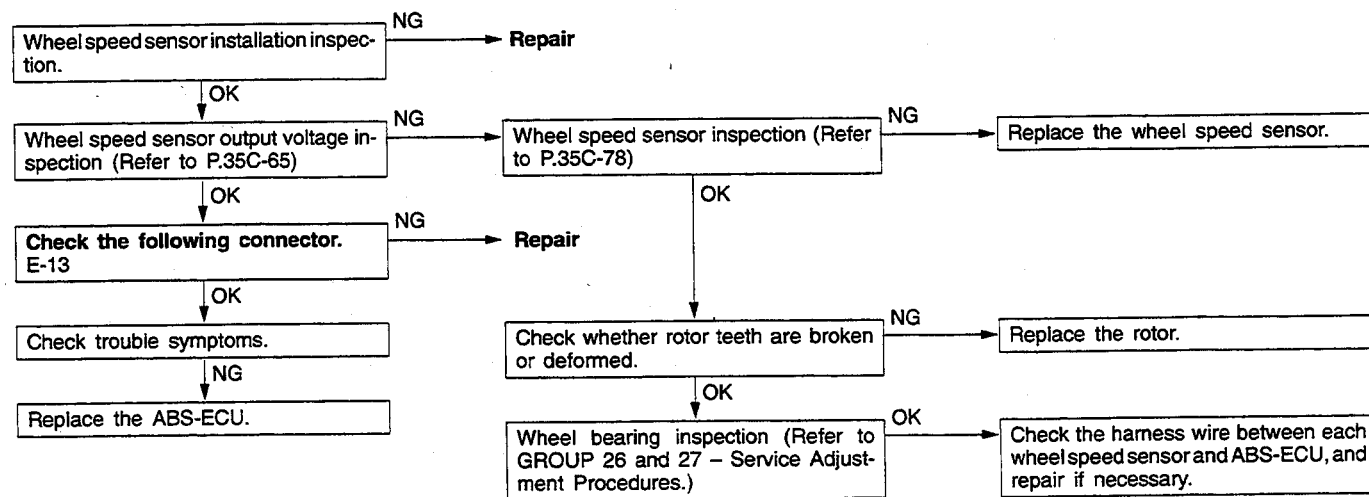
Diagnosis code no.	Inspection item	Diagnosis content	Reference page
11	Front right wheel speed sensor	Open circuit	P.35C-48
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Defective output signal	P.35C-48
16	Power supply system		P.35C-49
21	Front right wheel speed sensor	Short circuit	P.35C-49
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-50
26	Center differential lock detection switch		P.35C-51
27	Rear differential lock detection switch		P.35C-52
32	G-sensor system		P.35C-53
33	Stop light switch system		P.35C-53
41	Front right solenoid valve	P.35C-54	P.35C-54
42	Front left solenoid valve		
43	Rear solenoid valve		
51	Valve relay		P.35C-55
53	Motor relay, motor		P.35C-56
63	Replace the ABS-ECU		-
64	Replace the ABS-ECU		-

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

Code No.11, 12, 13, 14 Wheel speed sensor open circuit	Probable cause
<p>[Comment] A sensor is open-circuited in the positive or negative line.</p>	<ul style="list-style-type: none"> ● Malfunction of wheel speed sensor ● Malfunction of wiring harness or connector ● Malfunction of ABS-ECU



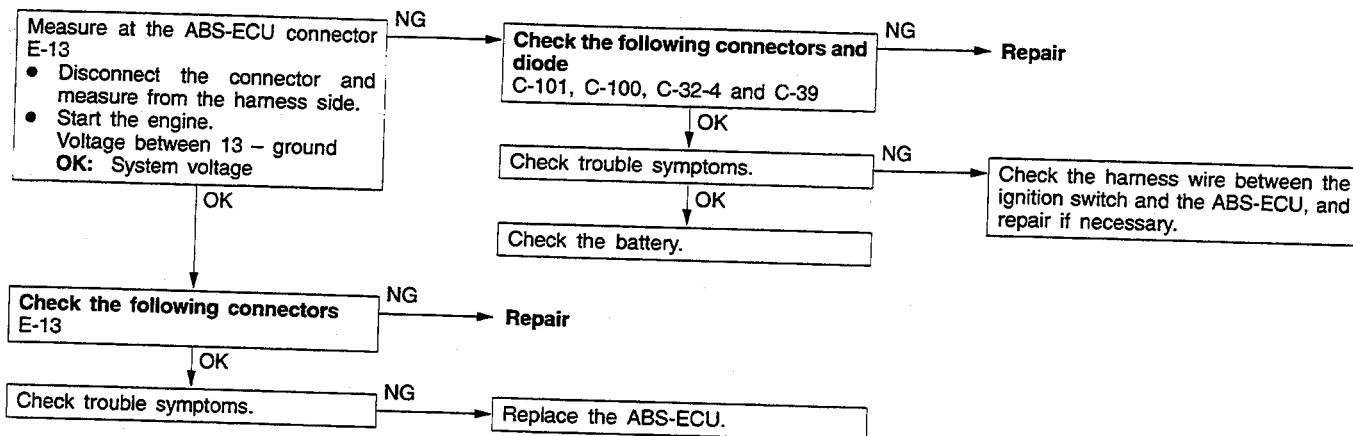
Code No.15 Wheel speed sensor (Defective output signal)	Probable cause
<p>[Comment] A malfunction (other than an open or short-circuit) is detected in the output signal from a wheel speed sensor while driving.</p>	<ul style="list-style-type: none"> ● Improper installation of wheel speed sensor ● Malfunction of wheel speed sensor ● Malfunction of rotor ● Malfunction of wheel bearing ● Malfunction of wiring harness or connector ● Malfunction of ABS-ECU



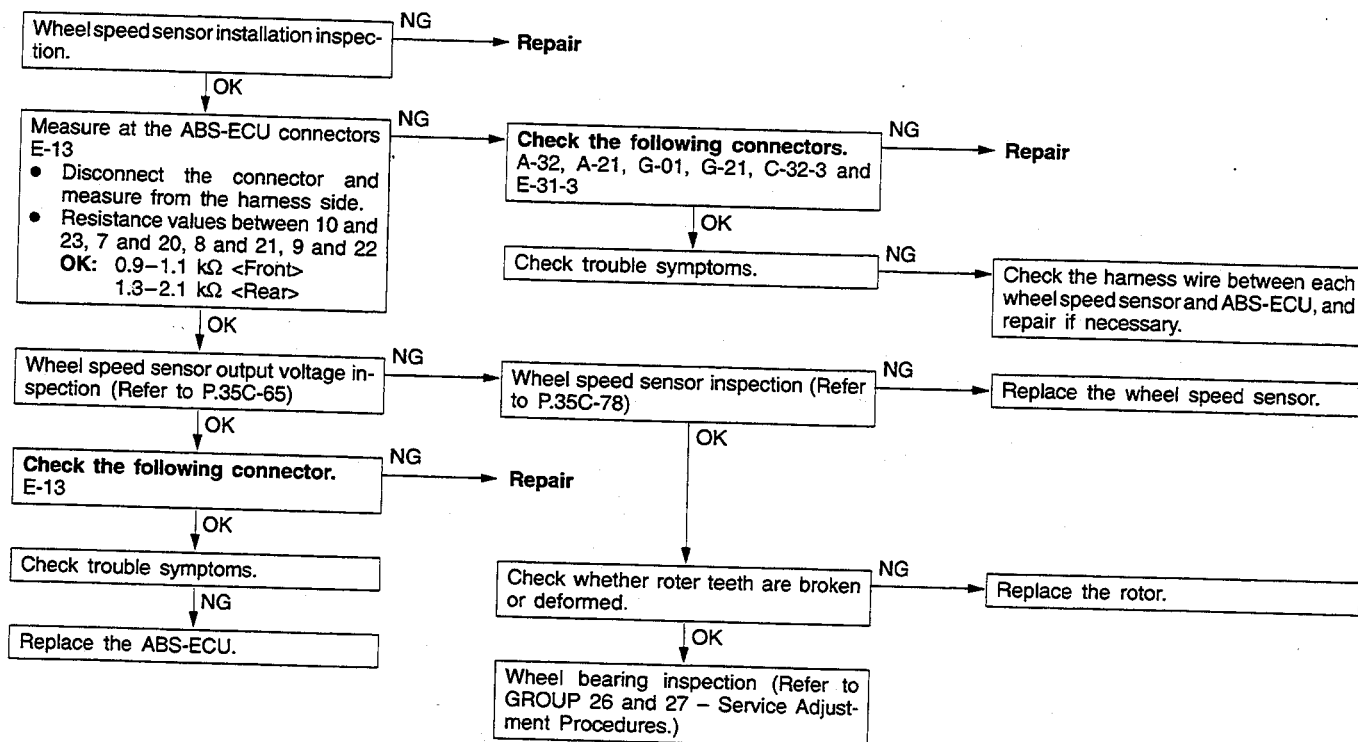
Code No.16 Power supply system	Probable cause
<p>[Comment] The voltage of the ABS-ECU power supply does not meet the specified value. If the voltage returns to the specified value, this code is no longer output.</p>	<ul style="list-style-type: none"> • Malfunction of wiring harness or connector. • Malfunction of ABS-ECU

Caution

If the battery voltage drops or rises during inspection, this code will be output as a current problem, and correct diagnosis of the problem cannot be made. Before carrying out the following inspection, check the battery level, and refill it if necessary.

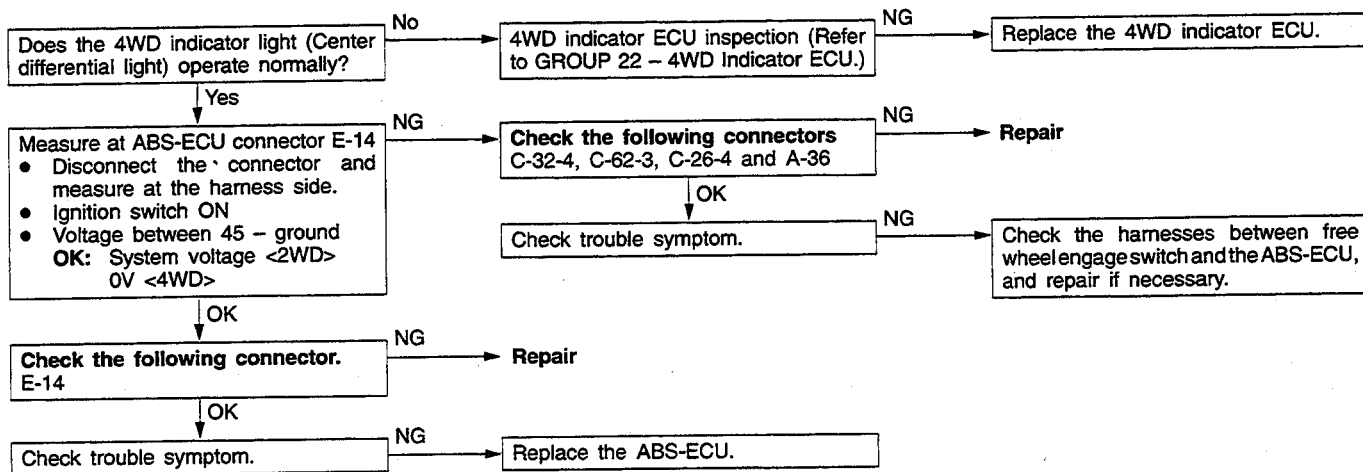


Code No.21, 22, 23, 24 Wheel speed sensor short circuit	Probable cause
<p>[Comment] The above codes are output in the following cases.</p> <ul style="list-style-type: none"> • An open circuit cannot be found out, but a wheel speed sensor does not output any signal when driving at 8 km/h or higher. • As the sensor output drops due to a malfunctioning sensor or a warped rotor, anti-lock control is continuously carried out. 	<ul style="list-style-type: none"> • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

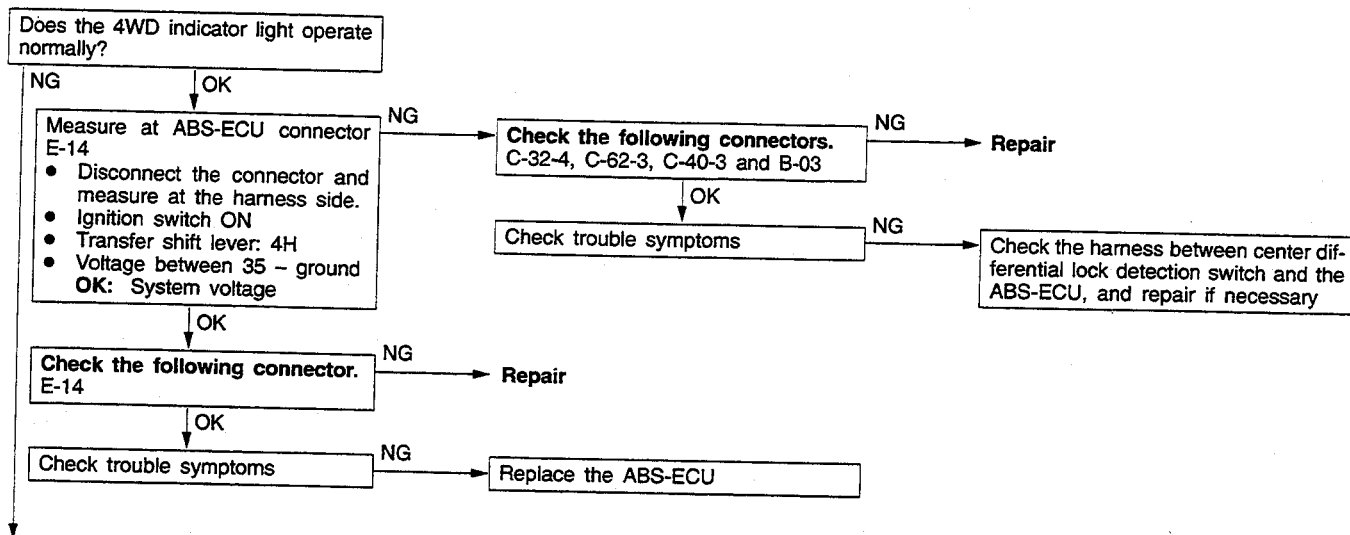


TSB Revision

Code No.25 Free wheel engage switch	Probable cause
[Comment] There is an open circuit in the free-wheeling engage switch system.	<ul style="list-style-type: none"> ● Malfunction of wiring harness or connector ● Malfunction of 4WD indicator ECU ● Malfunction of ABS-ECU



Code No.26 Centre differential lock detection switch	Probable cause
<p>[Comment] The above codes are output in the following cases.</p> <ul style="list-style-type: none"> There is an open circuit in the center differential lock detection switch system. The free wheel engage switch remains off and the center differential lock detection switch remains on at a vehicle speed of 15 km/h or more for 5 seconds or more. 	<ul style="list-style-type: none"> Malfunction of wiring harness or connector Malfunction of free wheel engage switch Malfunction of 4WD indicator ECU Malfunction of center differential lock detection switch Malfunction of ABS-ECU

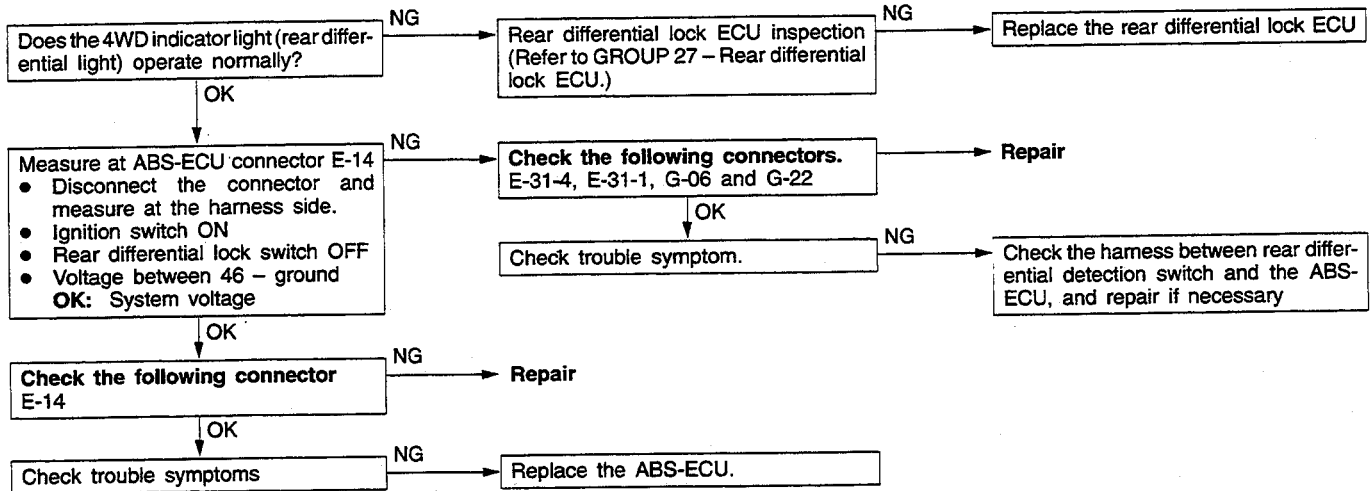


Trouble symptom	Main cause	Remedy
Even when the transfer shift lever is in the "4H" position, the 4WD front wheel indicator light does not illuminate.	Broken harness wire between the 4WD indicator ECU and the free-wheel engage switch, or broken earth wire from the free-wheel engage switch.	Repair the harness
	Free wheel engage switch is defective	Replace the switch
Even when the transfer shift lever is in the "4H" position, the 4WD center differential light does not illuminate.	Broken harness wire between the 4WD indicator ECU and the center differential lock switch	Repair the harness
	Broken wire in the 4WD indicator ECU circuit	4WD indicator ECU inspection (Refer to GROUP 22 – 4WD Indicator ECU.)
4WD indicator center differential light illuminates regardless of the position of the transfer shift lever	Short in the harness wire in the center differential lock detection switch circuit	Repair the harness
	Center differential lock detection switch is defective	Replace the switch
	Short inside the ABS-ECU circuit	Replace the ABS-ECU
	Short inside the 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 circuit	Repair the harness
	4WD indicator ECU is defective	4WD indicator ECU inspection (Refer to GROUP 22 – 4WD Indicator ECU.)

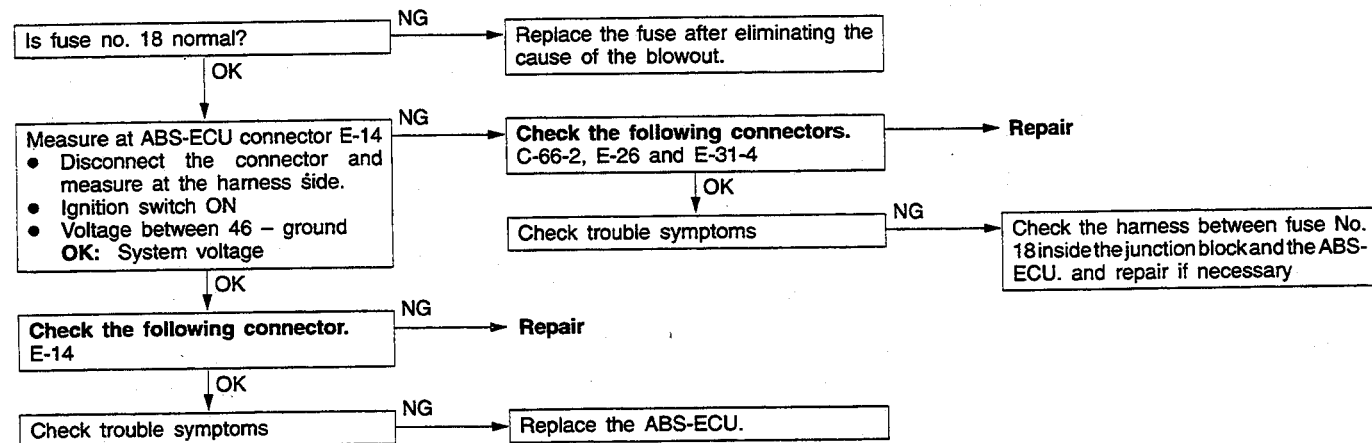
NOTE

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.

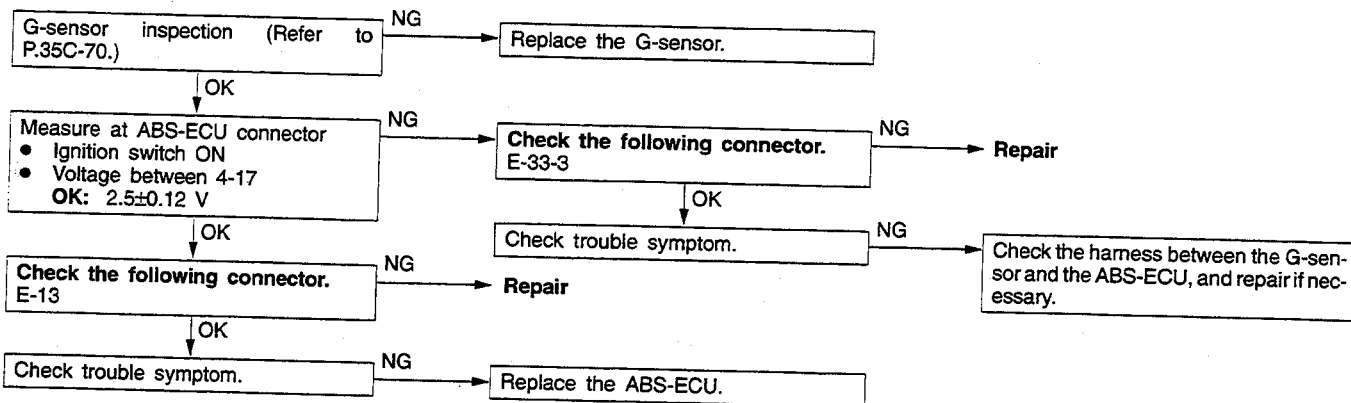
Code No.27 Rear differential lock detection switch <Vehicles with rear differential lock>	Probable cause
[Comment] There is an open circuit in the rear differential lock detection switch system.	<ul style="list-style-type: none"> ● Malfunction of wiring harness or connector ● Malfunction of rear differential lock ECU ● Malfunction of ABS-ECU



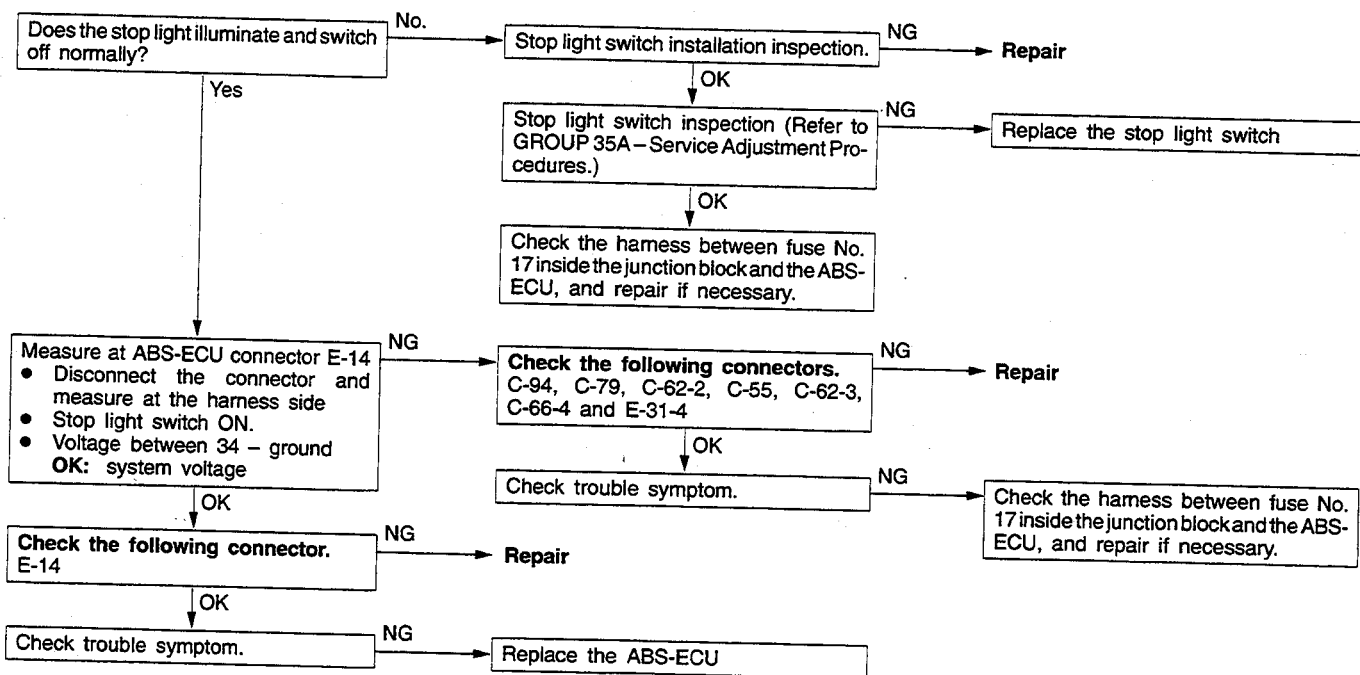
Code No.27 Rear differential lock detection switch <Vehicles without rear differential lock>	Probable cause
[Comment] For vehicles without rear differential lock, battery positive voltage is applied to the ABS-ECU terminal no. 46. This diagnostic trouble code is output when this line is interrupted.	<ul style="list-style-type: none"> ● Malfunction of wiring harness or connector ● Malfunction of ABS-ECU



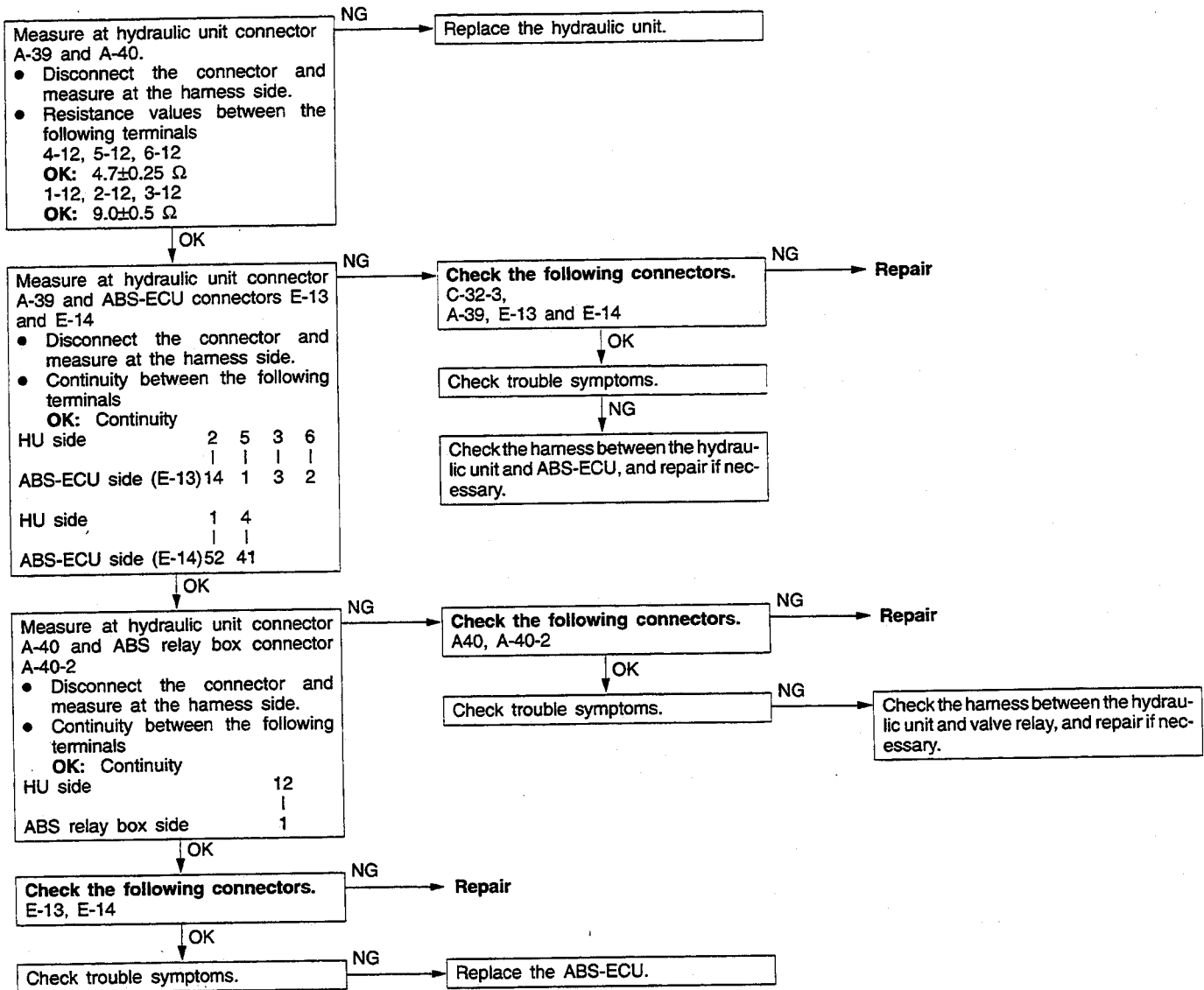
Code No.32 G-sensor system	Probable cause
<p>[Comment] The above codes are output in the following case.</p> <ul style="list-style-type: none"> • The G sensor output is less than 0.5 V or more than 4.5 V. • There is an open or short circuit in the G sensor system. 	<ul style="list-style-type: none"> • Malfunction of G-sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Code No.33 Stop light switch system	Probable cause
<p>[Comment] The above codes are output in the following cases.</p> <ul style="list-style-type: none"> • The stop light switch can not be turned off. (the stop light switch stays on for 15 minutes or more even though the ABS is not operating) • There is an open circuit in the stop light switch system. 	<ul style="list-style-type: none"> • Malfunction of stop light switch • Malfunction of harness or connector • Malfunction of ABS-ECU



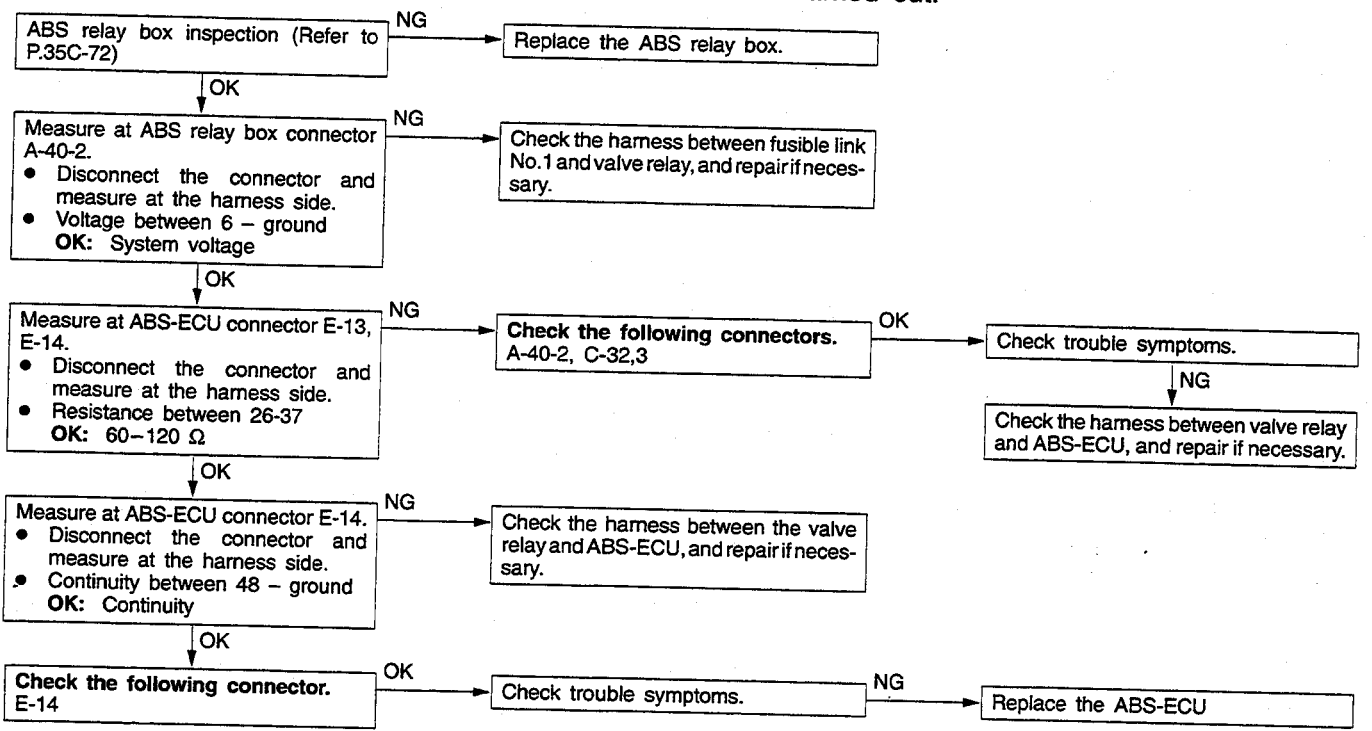
Code No.41, 42, 43 solenoid valve	Probable cause
<p>[Comment] The ABS-ECU always monitors the solenoid drive circuit and judge that there is an open or short circuit in the solenoid coils in the following cases. No current is being supplied to a solenoid even though that solenoid is on. Current continues to be supplied to a solenoid even though that solenoid is off.</p>	<ul style="list-style-type: none"> ● Malfunction of wiring harness ● Malfunction of hydraulic unit ● Malfunction of ABS-ECU



Code No.51 Valve relay	Probable cause
<p>[Comment] When the ignition switch is turned to ON, the ABS-ECU switches the valve relay off and on to check it as the initial check. The valve relay is normally on. So, if power is not being supplied to the relay, the ABS-ECU will judge that the valve relay is defective.</p>	<ul style="list-style-type: none"> ● Malfunction of valve relay ● Malfunction of wiring harness or connector ● Malfunction of ABS-ECU ● Malfunction of hydraulic unit

NOTE

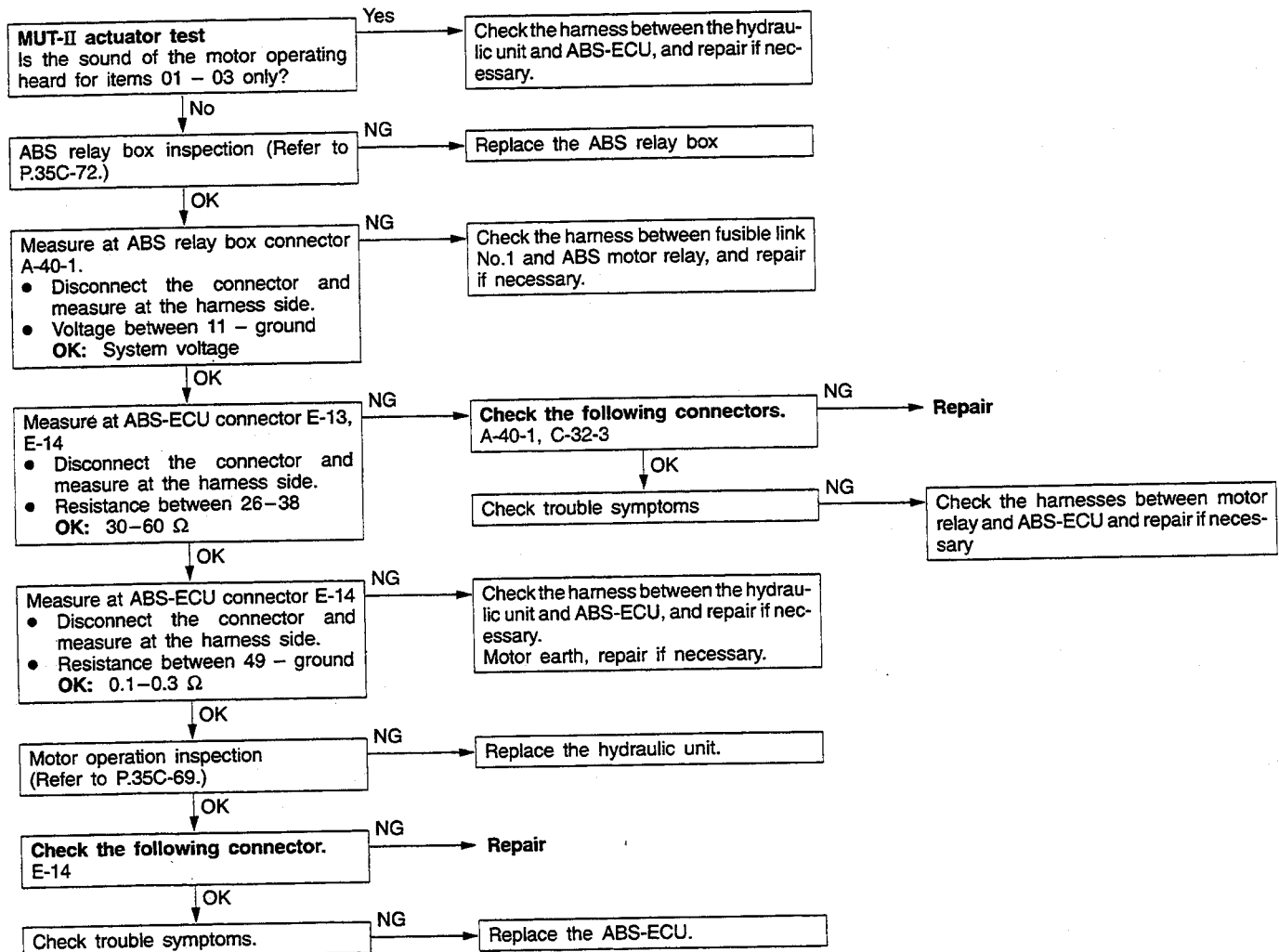
Whenever reading the diagnostic trouble codes using the ABS warning light (P.35C-45), this diagnostic trouble code will be output. That is because the valve relay has been removed. Repair all locations indicated by other diagnostic trouble codes, and then connect the valve relay connector. When the ABS warning light still indicates No.51 even after that, a malfunction in the valve relay system may be present. So, the following checks should then be carried out.

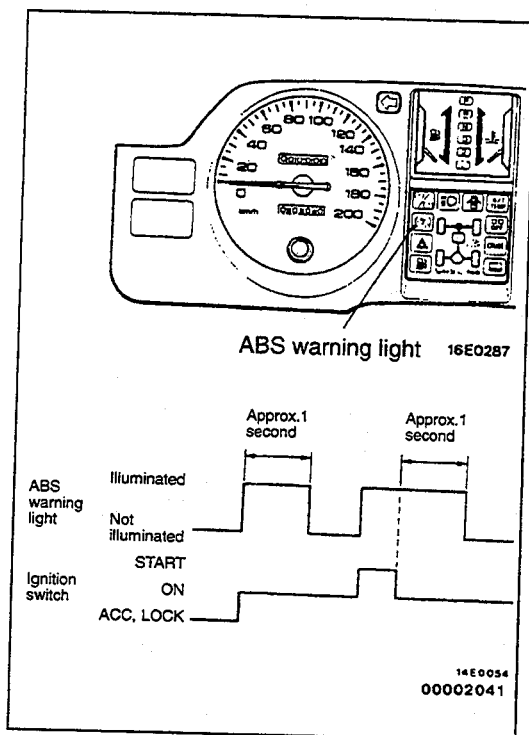


Code No.53 Motor relay, motor	Probable cause
<p>[Comment]</p> <p>The above codes are output in the following cases.</p> <ul style="list-style-type: none"> • When the motor relay is on but no signal is input to the motor monitor line (motor does not run, etc.) • When the motor relay is off and a signal is input to the motor monitor line for 5 seconds or more (motor does not stop, etc.) • When the motor relay does not work 	<ul style="list-style-type: none"> • 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 LIGHT INSPECTION

110005644

- Check that the ABS warning light illuminates as follows.
1. When the ignition key is turned to ON, the ABS warning light illuminates for approximately 1 second and then switches off.
 2. When the ignition key is turned to START, the ABS warning light remains illuminated.
 3. When the ignition key is turned from START back to ON, the ABS warning light illuminates for approximately 1 second and then stays switched off.
 4. If the illumination is other than the above, check the diagnosis codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	P.35C-58
	Communication with ABS only is not possible.	2	P.35C-58
When the ignition key is turned to "ON" (engine stopped), the ABS warning light does not illuminate.		3	P.35C-59
After the engine starts, the light remains illuminated.		4	P.35C-59
When the ignition key is turned to "START", the ABS warning light does not illuminate.		5	P.35C-60
After the ignition key is turned to "ON", the ABS warning light blinks twice, and when turned to "START", it illuminates. When returned to "ON", the light flashes once, and then switches off.		6	P.35C-60
Faulty ABS operation	Unequal braking power on both sides	7	P.35C-61
	Insufficient braking power	7	P.35C-61
	ABS operates under normal braking conditions	7	P.35C-61
	ABS operates before vehicle stops under normal braking conditions	7	P.35C-61
	Large brake pedal vibration (Caution 2.)	-	-

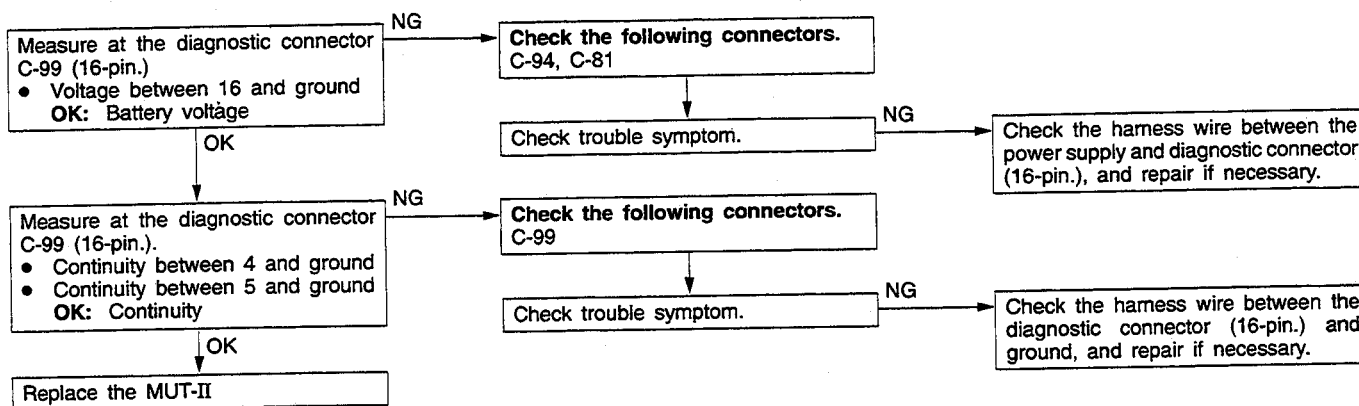
Caution

1. If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate even though sudden braking is not being applied. Because of this, When getting information from the customer, check if the problem occurred while driving under such conditions as these.
2. During ABS operation, changes in the feeling of the brake pedal (vibration may occur or pedal may not be able to be depressed). Such changes are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

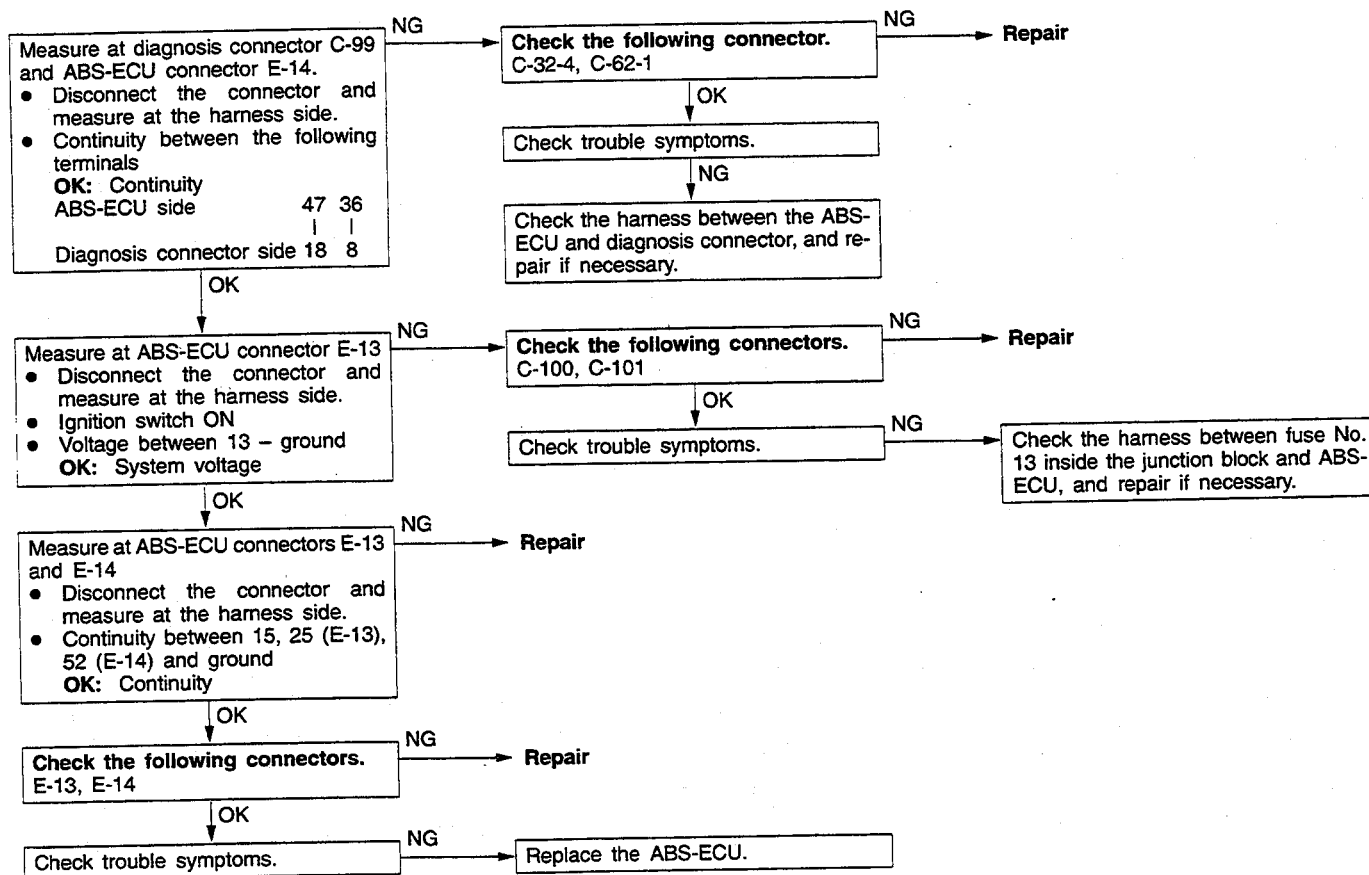
Inspection Procedure 1

Communication with MUT-II is not possible. (Communication with all system is not possible.)	Probable cause
[Comment] The reason is probably a defect in the power supply system (including earth) for the diagnosis line.	<ul style="list-style-type: none"> • Malfunction of connector • Malfunction of harness



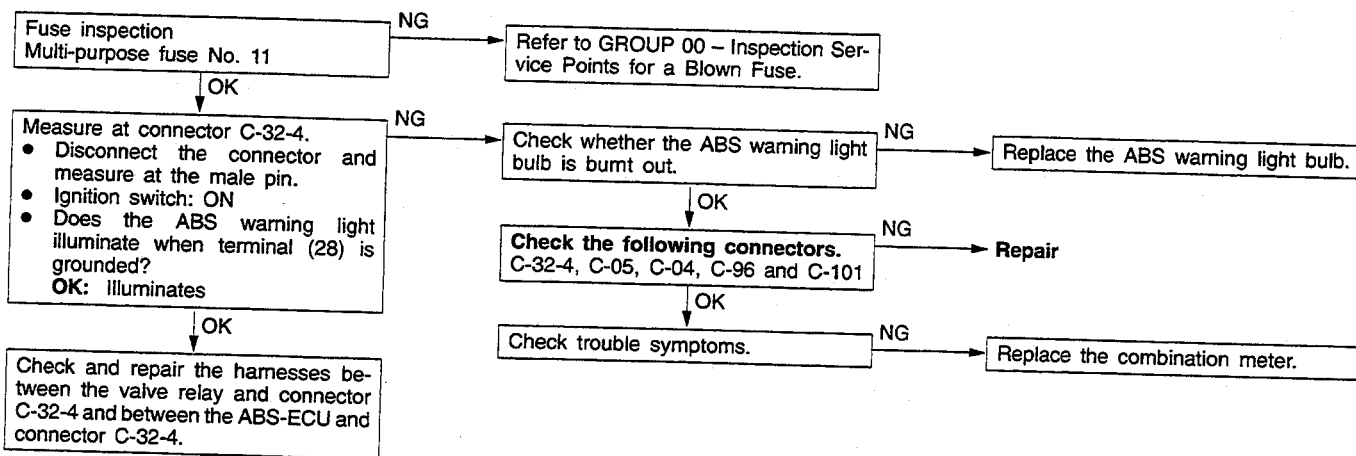
Inspection Procedure 2

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.	<ul style="list-style-type: none"> • Blown fuse • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Inspection Procedure 3

When ignition key is turned to "ON" (engine stopped), ABS warning light does not illuminate	Probable cause
<p>[Comment] When power is supplied to the ABS-ECU, the valve relay turns from off to on, off and back to on again as an initial check. Because of this, the ABS warning light will illuminate twice when the valve relay is off even if there is a problem with the circuit between the ABS warning light and the ABS-ECU. Accordingly, if the light does not illuminate, the cause is probably one of the following items. An open circuit in the light power supply circuit A blown light bulb An open circuit in both the circuit between the ABS warning light and the ABS-ECU and in the circuit between the ABS warning light and the valve relay</p>	<ul style="list-style-type: none"> • Blown fuse • Burnt out ABS warning light bulb • Malfunction of wiring harness or connector

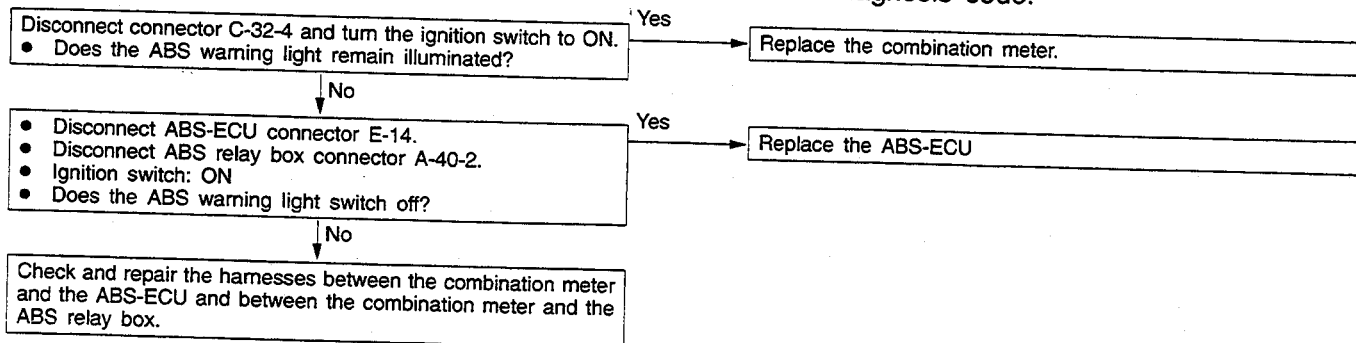


Inspection Procedure 4

Even after the engine is started, the ABS warning light remains illuminated.	Probable cause
<p>[Comment] A short-circuit in the ABS warning light illumination circuit may be present.</p>	<ul style="list-style-type: none"> • Malfunction of combination meter • Malfunction of ABS-ECU • Malfunction of wiring harness

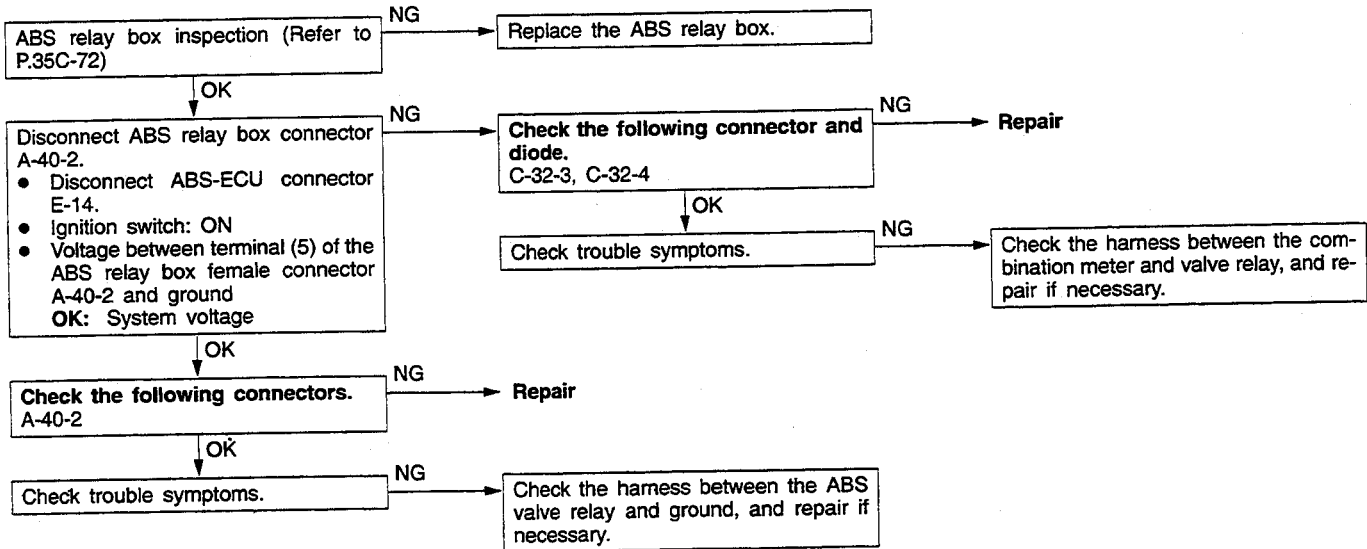
NOTE

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.



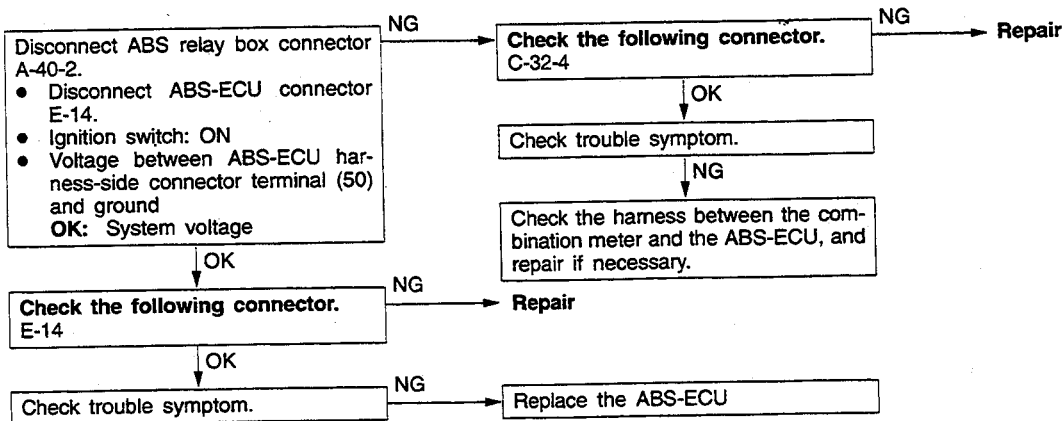
Inspection Procedure 5

<p>When ignition key is turned to “START”, ABS warning light does not illuminate.</p>	<p>Probable cause</p>
<p>[Comment] The ABS-ECU uses the power supply which is turned off when the ignition switch is turned to START. The ABS warning light uses the power supply which is not turned off when the ignition switch is turned to START. Accordingly, when the ignition switch is at START, the power supply to the ABS-ECU is turned off and the valve relay is also turned off. So, when the ABS warning light does not illuminate at this time, the light illumination circuit in the valve relay system is defective.</p>	<ul style="list-style-type: none"> • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



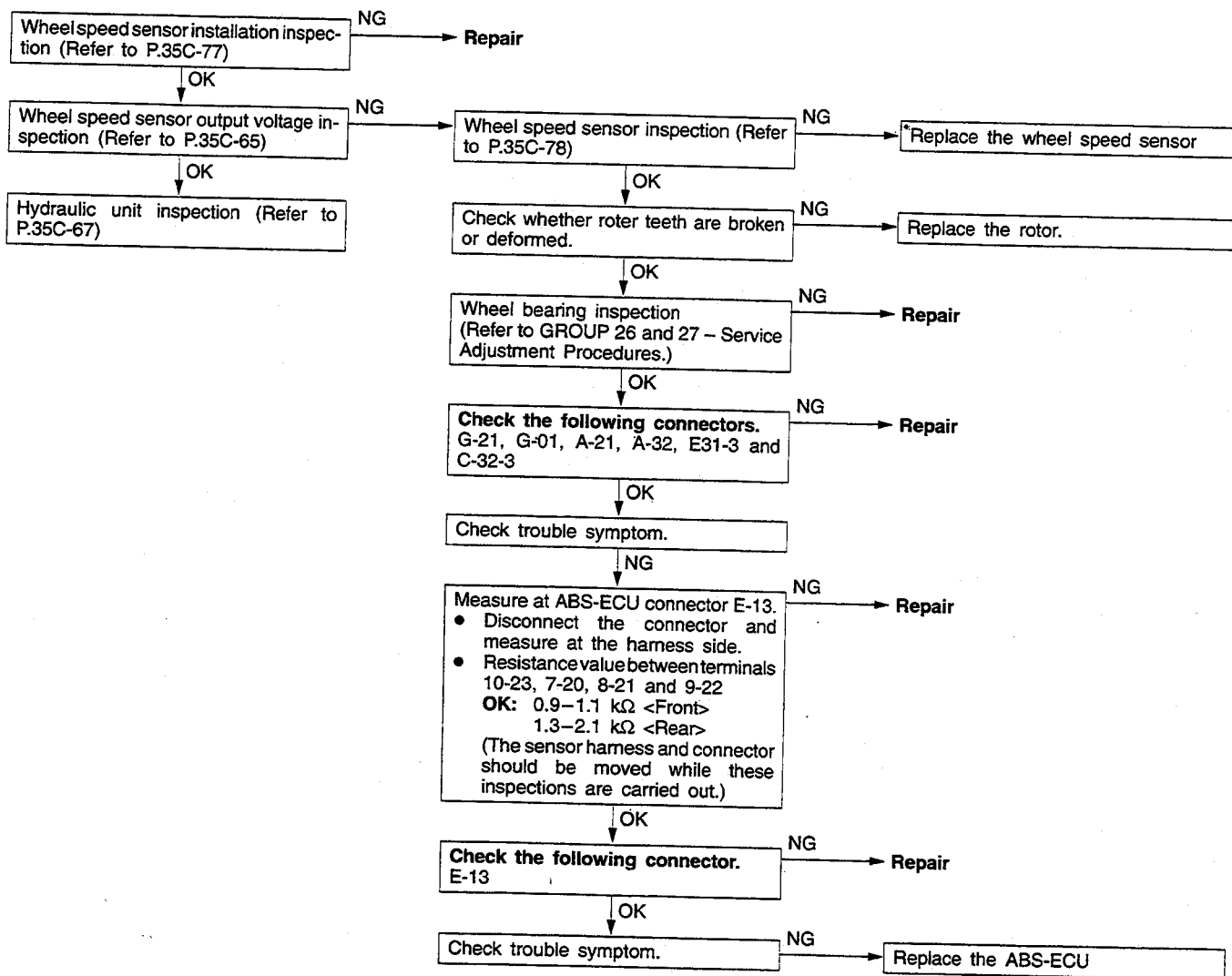
Inspection Procedure 6

<p>The ABS warning light flashes twice after the ignition key is turned to “ON”. The light illuminates when the ignition key is turned to “START”, and when the key is returned to “ON”, it flashes once.</p>	<p>Probable cause</p>
<p>[Comment] The ABS-ECU causes the ABS warning light to illuminate during the initial check (approx. 1 second). During the initial check, the valve relay turns from off to on, off and back to on again, and if there is an open circuit in the harness between the ABS-ECU and the ABS warning light, the light will illuminate only when the valve relay is OFF because of a valve relay test, etc.</p>	<ul style="list-style-type: none"> • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Inspection Procedure 7

Break operation is abnormal	Probable cause
<p>[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.</p>	<ul style="list-style-type: none"> ● 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 INSPECTION TABLE

110005646

The following items can be read by the scan tool from the ABS-ECU input data.

1. When the system is normal

Item No.	Inspection Item	Inspection Conditions	Normal Judgement Value
11	Front-right wheel speed sensor	When vehicle is being driven	Vehicle speeds displayed on the speedometer and scan tool 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	9–16 V
25	Free wheel engage switch	During 4WD	ON
		During 2WD	OFF
26	Center differential lock detection switch	When transfer lever is at 4HLC	ON
		When transfer lever is at 4H	OFF
27	Rear differential lock detection switch	When switch is on	ON
		When switch is off	OFF
32	G sensor output voltage	When vehicle is stationary	2.5±0.12 V
		When vehicle is being driven	Display value fluctuates with a mean value of 2.5 V.
33	Stop light switch	When brake pedal is depressed	ON
		When brake pedal is released	OFF

2. When system is isolated by the ABS-ECU

When the functioning of the ABS-ECU has been stopped by the on-board diagnostics, the scan tool display data will be different from actual conditions.

ACTUATOR TEST INSPECTION TABLE

110005647

The following actuators can be force-activated using the scan tool.

NOTE

- If the functioning of the ABS-ECU has been stopped, actuator testing cannot be carried out.
- Actuator testing is only possible when the vehicle is stationary. If the vehicle speed during actuator testing exceeds 10 km/h (6 mph), forced actuation will be canceled.

ACTUATOR TEST SPECIFICATIONS

No.	Driving objective		Driving pattern	
01	Solenoid valve and pump motors for each corresponding channel in the hydraulic unit	Solenoid valve for front left wheel	Increase in pressure Steady pressure Reduction in pressure ON OFF	
02		Solenoid valve for front right wheel		
03		Solenoid valve for rear wheels		

Z14E0048

TERMINAL VOLTAGE CHART

TERMINAL VOLTAGE CHART

1. Measure the voltages between terminals (12), (25) and (42) (ground terminals) and each respective terminal.
2. The terminal layouts are shown in the illustrations below.



14W0042

Connector Terminal No.	Name of Signal	Inspection Condition	Normal Condition	
1	Output from front-left hydraulic unit solenoid (from wheel cylinder)	Ignition switch : ON (When solenoid is off approximately 1 second after engine is started)	System voltage	
2	Output from rear hydraulic unit solenoid (from wheel cylinder)			
3	Output from rear hydraulic unit solenoid (to wheel cylinder)			
4	G sensor signal	Ignition switch : ON	2.5 ± 0.12 V (Horizontal condition)	
13	ABS-ECU power supply	Ignition switch : ON	System voltage	
		Ignition switch: START	0 V	
14	Output from front-left hydraulic unit solenoid (to wheel cylinder)	Ignition switch : ON (When solenoid is off approximately 1 second after engine is started)	System voltage	
17	G sensor ground	At all times	0 V	
26	Relay power supply output	Ignition switch : ON	System voltage	
32	Memory power supply	At all times	System voltage	
34	Stop light switch input	Ignition switch : ON	Stop light switch ON	System voltage
			Stop light switch OFF	1 V or less
35	Center differential lock detection switch input	Ignition switch : ON	Transfer lever: 4H	System voltage
			Transfer lever: 4Lc	1 V or less
36	MUT-II	When scan tool is connected	Serial communication with scan tool	
		When scan tool is not connected	1 V or less	
37	Valve relay output	Ignition switch : ON	When relay is on approximately 1 second after engine is started	2 V or less
			When system is normal and relay is off	System voltage
38	Motor relay output	Ignition switch : ON (approximately 1 second after engine is started)	When motor is on	2 V or less
			When motor is off	System voltage
39	Idle-up solenoid (negative side)	Ignition switch : ON (When motor is on approximately 1 second after engine is started)	2 V or less	

Connector Terminal No.	Name of Signal	Inspection Condition		Normal Condition
41	Output from front-right hydraulic unit solenoid (from wheel cylinder)	Ignition switch : ON (When solenoid is off approximately 1 second after engine is started)		System voltage
43	Idle-up solenoid (positive side)	Ignition switch : ON When motor is on approximately 1 second after engine is started)		System voltage
45	Free wheel engage switch input	Ignition switch : ON	During 4WD	System voltage
			During 2WD	1 V or less
46*1	Ignition switch	Ignition switch : ON		System voltage
		Ignition switch: START		0 V
46*2	Rear differential lock detection switch input	Ignition switch : ON	Rear differential lock switch: ON	0 V
			Rear differential lock switch: OFF	System voltage
47	Diagnostic selection input	When scan tool is connected		0 V
		When scan tool is not connected		Approx. 12 V
48	Valve relay monitor input	Ignition switch : ON		System voltage
49	Motor monitor	Ignition switch : ON (approximately 1 second after engine is started)	When motor is on	System voltage
			When motor is off	0.5 V or less
50	ABS warning light output	Ignition switch : ON	When light is switched off	System voltage
			When light is illuminated	0–2 V
52	Output from front-right hydraulic unit solenoid (to wheel cylinder)	Ignition switch : ON (When solenoid is off approximately 1 second after engine is started)		System voltage

Note

(1)*1: Vehicles without rear differential lock.

(2)*2: Vehicles with rear differential lock.

RESISTANCE AND CONTINUITY BETWEEN HARNESS-SIDE CONNECTOR TERMINALS

110005648

- Turn the ignition switch off and disconnect the ABS-ECU connector before measuring resistance and checking continuity.
- Measure resistance and check continuity between the terminals indicated in the table below.
- The terminal layouts are shown in the illustrations below.

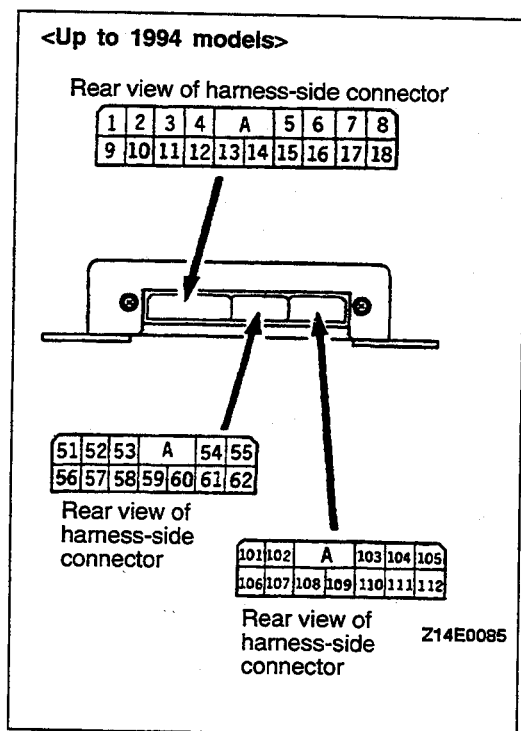
1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26

31	32	33	34	35	36	37	38	39	40	41
42	43	44	45	46	47	48	49	50	51	52

14W0043

Connector Terminal No.	Name of Signal	Normal Condition
1 – Ground	Front-left solenoid (from wheel cylinder)	4.7±0.25 Ω
2 – Ground	Rear solenoid (from wheel cylinder)	4.7±0.25 Ω
3 – Ground	Rear solenoid (to wheel cylinder)	9.0±0.5 Ω
7 – 20	Front-left wheel speed sensor (positive wire)	0.9–1.1 kΩ

Connector Terminal No.	Name of Signal	Normal Condition
8 – 21	Rear-right wheel speed sensor (positive wire)	1.3–2.1 kΩ
9 – 22	Rear-left wheel speed sensor (positive wire)	1.3–2.1 kΩ
10 – 23	Front-right wheel speed sensor (positive wire)	0.9–1.1 kΩ
14 – Ground	ABS-ECU ground	Continuity
15 – Ground		
25 – Ground		
39 – 43	Idle-up solenoid	33–39 Ω
41 – Ground	Front-right solenoid (from wheel cylinder)	4.7±0.25 kΩ
42 – Ground	ABS-ECU ground	Continuity
48 – Ground	Valve relay monitor input	Continuity
49 – Ground	Motor monitor	Continuity
52 – Ground	Front-right solenoid (to wheel cylinder)	9.0±0.25 kΩ



SERVICE ADJUSTMENT PROCEDURES

110005650

WHEEL SPEED SENSOR OUTPUT VOLTAGE MEASUREMENT

1. Check that the clearance between the wheel speed sensor and the rotor is within the standard value.
2. Raise up the wheels and release the parking brake.
3. Disconnect the ABS-ECU connector and inspect the connector at the harness side.

Caution

Be sure to remove the connector double lock and insert the probe into the harness side. Inserting it into the terminal side will result in a bad connection.

4. Rotate the wheel by hand to be measured at approximately 1/2–1 rotations per second and check the output voltage using a voltmeter (AC mV range) or an oscilloscope.

<Terminal No.>

Up to 1994 models

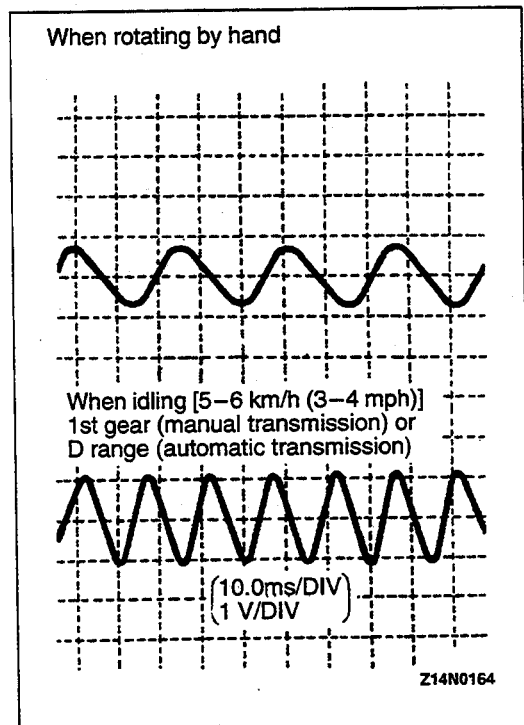
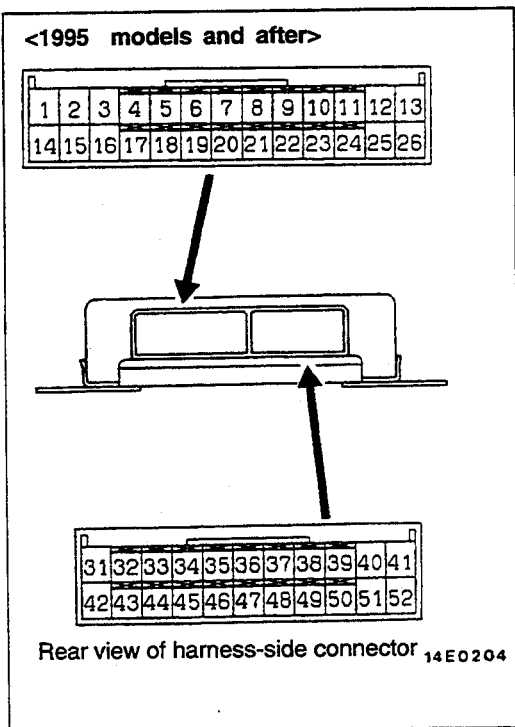
Polarity	Front L.H.	Front R.H.	Rear L.H.	Rear R.H.
+	52	51	8	53
-	57	56	18	58

1995 models and after

Polarity	Front L.H.	Front R.H.	Rear L.H.	Rear R.H.
+	7	10	9	8
-	20	23	22	21

Output voltage:

When measuring with a voltmeter: 70 mV or more
 When measuring with an oscilloscope: 200 mVp-p or more



- If the output voltage is lower than the above values, the reason could be as follows:
 - Excessive clearance between the wheel speed sensor pole piece and the rotor
 - Malfunction of wheel speed sensor
 Adjust the wheel speed sensor or replace if necessary.
- Next, to observe the output of the wheel speed sensors, move the transfer shift lever to the "4H" position, and the transmission control lever to the "1" (M/T vehicles) or "D" position (A/T vehicles), and rotate the wheels.

NOTE

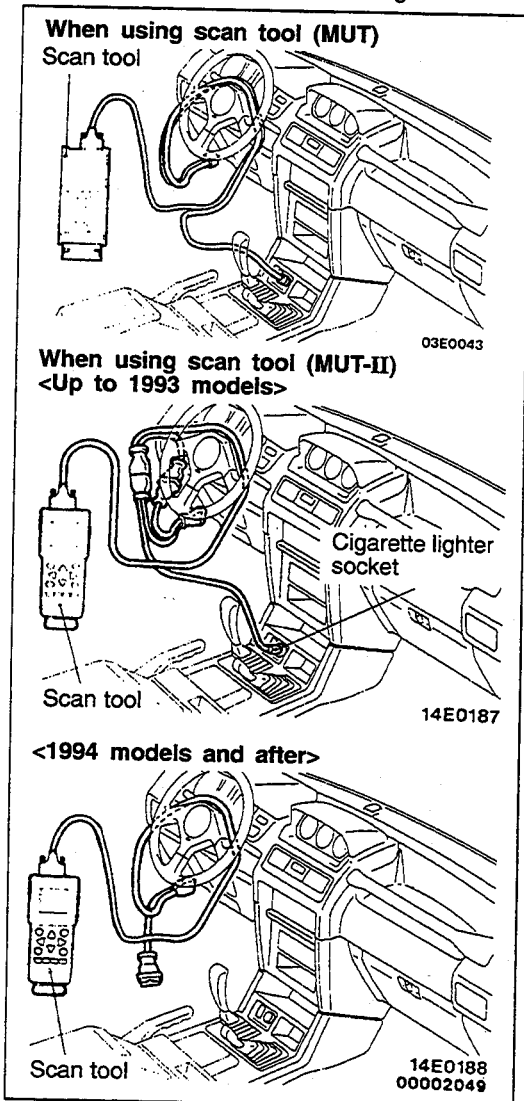
- Check the connection of the sensor harness and connector before using the oscilloscope.
- The wave form measurements can also be taken while the vehicle is actually moving.
- The output voltage will be small when the wheel speed is low, and similarly it will be large when the wheel speed is high.

WAVE OBSERVATION POINTS

Trouble Symptom	Cause	Suggested remedy
Wave amplitude is too small, or doesn't appear at all	Malfunction of wheel speed sensor	Replace the sensor.
	Wrong clearance between the pole piece and rotor	Adjust the clearance.
Excessive variation in the wave amplitude (However, if the lowest amplitude occurs at 200 mVp-p, there is no problem.)	Excessive runout or eccentricity in the axle hub	Replace the hub.
Noise or interference in the wave pattern	Open circuit in the sensor	Replace the sensor.
	Open circuit in the harness	Repair the harness.
	Incorrect wheel speed sensor installation	Install the sensor correctly.
	Eccentric rotor or broken rotor teeth	Replace the rotor.

NOTE

As the wheel speed sensor harness moves in conjunction with the movement of the front and rear suspension, the wires might break while driving on rough roads, but may have continuity while driving on normal roads. Accordingly, when measuring the wave pattern of the wheel speed sensor output voltage, shake the sensor harness to simulate the special conditions of a rough road.



HYDRAULIC UNIT CHECK

110005651

1. Jack up the vehicle and support it on axle stands.
2. Release the parking brake and feel the drag force (drag torque) on each wheel brake.
3. Connect the scan tool to the data link connector.

Caution

Turn the ignition switch off before connecting or disconnecting the scan tool.

4. After checking that the selector lever is in neutral, start the engine.

Caution

At this time, check that the ABS warning light illuminates for a brief period before turning off. If it doesn't turn off, refer to ANTI-LOCK BRAKING SYSTEM TROUBLESHOOTING on P.35C-3.

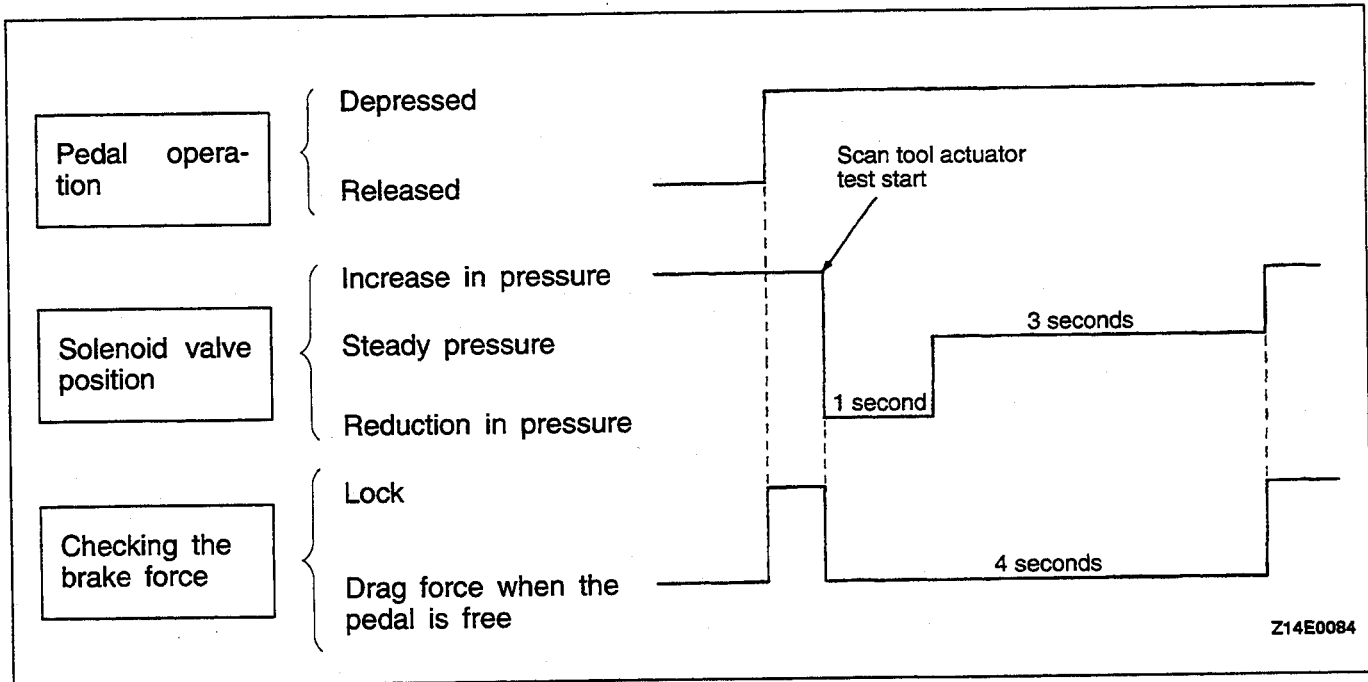
5. Depress the brake pedal to lock the wheels.
6. Select the item number on the scan tool actuator test for the wheel to be inspected.

Item No.	Drive object	
01	Front left wheel	Solenoid valve and pump monitor in the hydraulic unit corresponding to each wheel at left
02	Front right wheel	
03	Rear wheels	

- Use the scan tool to force-drive the actuator, and turn the wheel by hand to check the change in braking force when the brake pedal is depressed. The result should be as shown in the following illustration.

NOTE

- When the scan tool is used and the ABS system is selected, the ABS system will switch to scan tool mode and the ABS warning light will illuminate.
- When the ABS function has been interrupted by the fail-safe, the scan tool actuator testing cannot be used.



- If a different result is obtained when checking, correct it by following the procedure in the "Diagnostic Table for Simple Inspection" below.

Diagnostic Table for Simple Inspection

Diagnostic		Cause and remedy	
Normal	Problem	Cause	Suggested remedy
After locking for a 4-second period, the braking force will release.	The wheel will not lock even when the pedal is depressed.	Blockage in the brake line outside the hydraulic unit	Inspect the brake line and clean
		Blockage in the oil pressure circuit in the hydraulic unit	Replace the hydraulic unit.
	Braking force does not release.	Hydraulic unit brake pipes are incorrectly connected	Connect correctly
		Malfunction of hydraulic unit solenoid valve	Replace the hydraulic unit.

110005652

SOLENOID VALVE CHECK

Measure the resistance between terminals

Standard value:

<Up to 1994 models>

Solenoid	Measurement Terminals	Resistance Between Terminals
Front (right side)	8-5	1.0-1.3 Ω
Front (left side)	8-3	
Rear	8-6	

<1995 models and after>

Solenoid	Measurement Terminals	Resistance Between Terminals
To front wheel cylinder (right side)	12-4	4.7±0.25 Ω
To front wheel cylinder (left side)	12-5	
To rear wheel cylinder	12-6	9.0±0.5 Ω
From front wheel cylinder (right side)	12-1	
From front wheel cylinder (left side)	12-2	
From rear wheel cylinder	12-3	

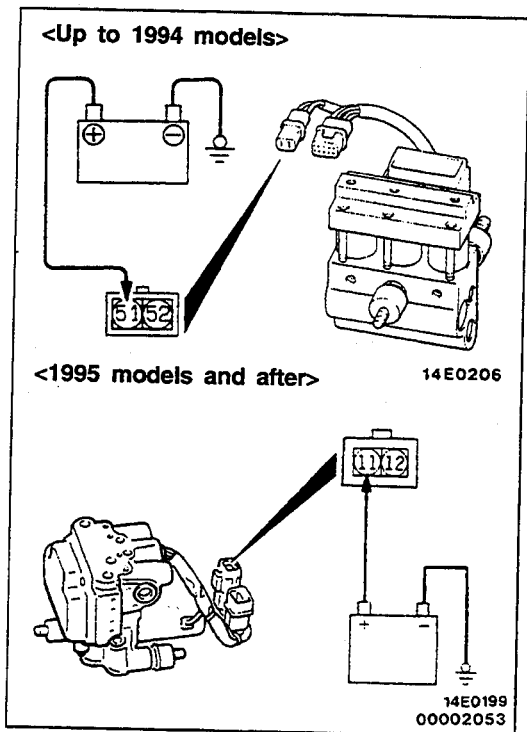
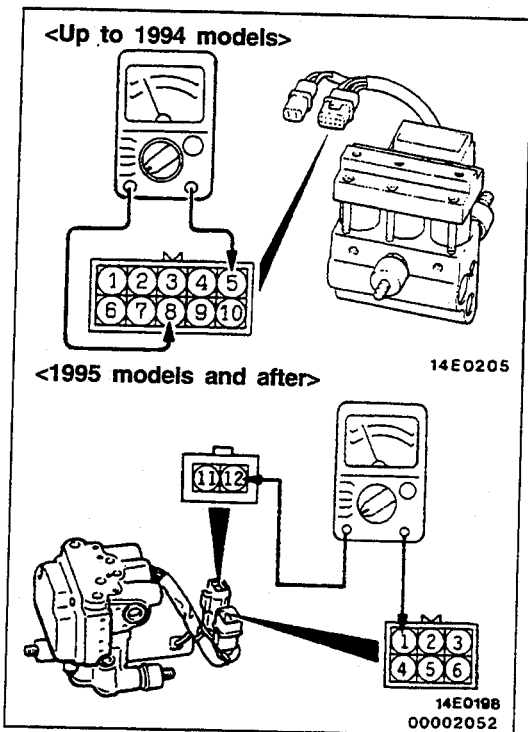
MOTOR OPERATION CHECK

110005653

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.



G-SENSOR OUTPUT VOLTAGE CHECK 110005654

1. Unload the vehicle and move it to a horizontal surface.
2. Connect the scan tool to the data link connector.

Caution

Turn the ignition switch off before connecting or disconnecting the scan tool.

3. Start the engine.

Caution

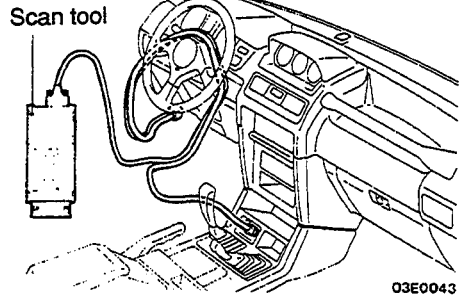
At this time, check to be sure that the ABS warning light illuminates for a brief period before turning off. If it does not turn off, refer to ANTI-LOCK BRAKING SYSTEM TROUBLESHOOTING on P.35C-3.

4. Check that the G sensor output voltage is within the standard value range.

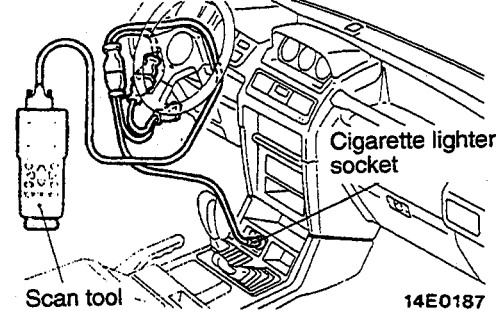
Standard value: 2.5 ± 0.44 V <Up to 1993 models>
 2.5 ± 0.12 V <1994 models and after>

5. If the G sensor output voltage is not within the standard value range, check the installation condition of the G sensor. If there is a loose bolt, deformation of the G sensor bracket, etc., carry out a repair. If the problem is not repairable, replace the G sensor.

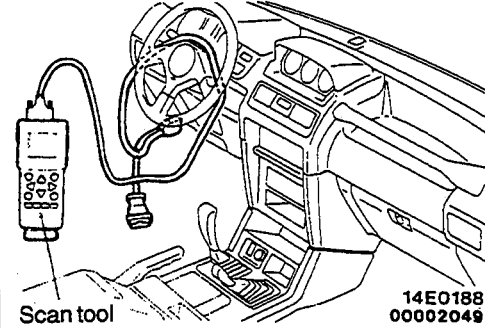
When using scan tool (MUT)



When using scan tool (MUT-II)
<Up to 1993 models>



<1994 models and after>



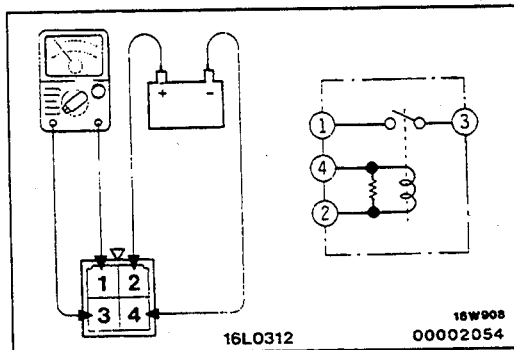
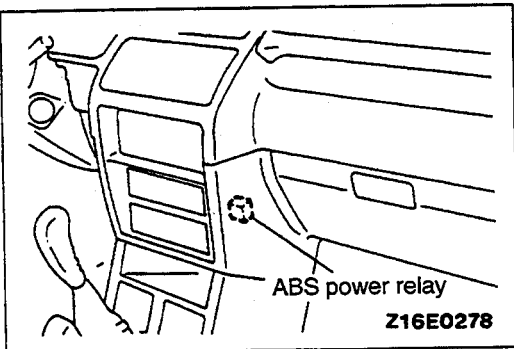
ABS POWER RELAY CHECK <UP TO 1993 MODELS>

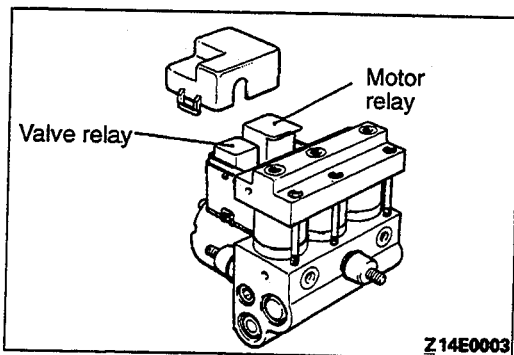
110005655

1. Remove the ABS power relay.

2. Connect the battery to terminal (2) and check the continuity between the terminals when terminal (4) is grounded.

Power is supplied	Terminals (1)–(3)	Continuity
Power is not supplied	Terminals (1)–(3)	No continuity
	Terminals (2)–(4)	Continuity

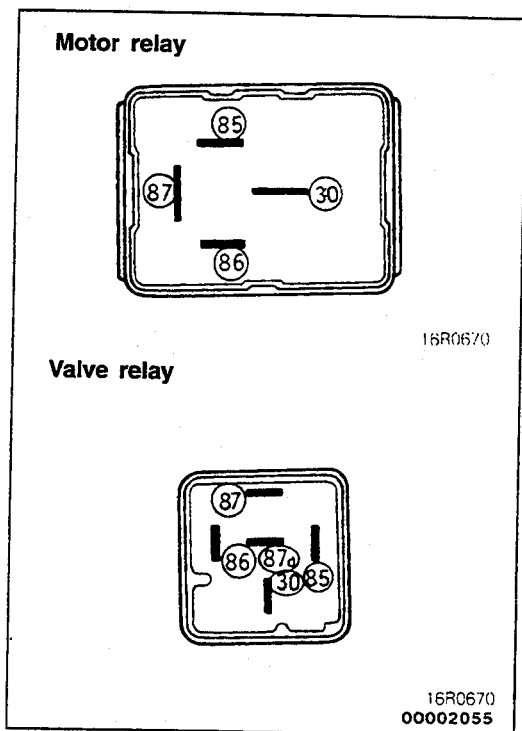




VALVE RELAY AND MOTOR RELAY CHECK
<Up to 1994 models>

110005656

1. Remove the motor relay and valve relay from the hydraulic unit.



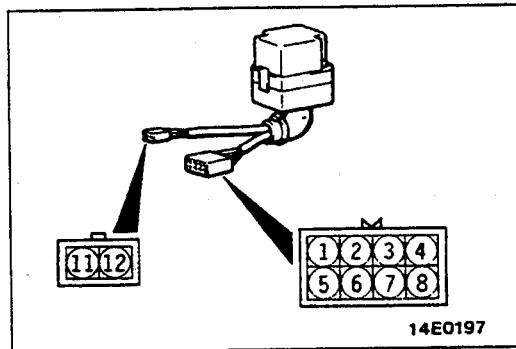
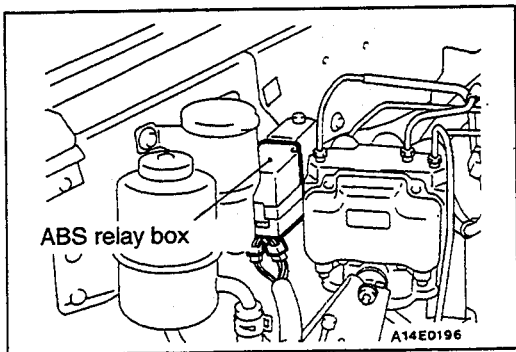
2. Check that there is continuity between terminals when there is no current flow at each relay and when there is current flow.

MOTOR RELAY

When no current flows	Between terminals (85)–(86)	30–60 Ω
	Between terminals (30)–(87)	No continuity (∞ Ω)
When current flows between terminals (85)–(86)	Between terminals (30)–(87)	Continuity (approx. 0 Ω)

VALVE RELAY

When no current flows	Between terminals (85)–(86)	60–120 Ω
	Between terminals (30)–(87a)	Continuity (approx. 0 Ω)
	Between terminals (30)–(87)	No continuity (∞ Ω)
When current flows between terminals (85)–(86)	Between terminals (30)–(87a)	No continuity (∞ Ω)
	Between terminals (30)–(87)	Continuity (approx. 0 Ω)



ABS RELAY BOX (WITH BUILT-IN MOTOR RELAY AND VALVE RELAY) CHECK <1995 models and after>

110005657

Disconnect the ABS relay box connector and check the continuity between the terminals of the ABS relay box-side connector when current is flowing and when current is not flowing.

When no current flows	Between terminals (7) – (4)	30–60 Ω
	Between terminals (7) – (8)	60–120 Ω
	Between terminals (11) – (12)	No continuity ($\infty \Omega$)
	Between terminals (6) – (2)	No continuity ($\infty \Omega$)
	Between terminals (5) – (2)	Continuity (approx. 0 Ω)
When current flows between terminals (7) – (4)	Between terminals (11) – (12)	Continuity (approx. 0 Ω)
When current flows between terminals (7) – (8)	Between terminals (5) – (2)	No continuity ($\infty \Omega$)
	Between terminals (6) – (2)	Continuity (approx. 0 Ω)

BRAKE LINE <UP TO 1994 MODELS>

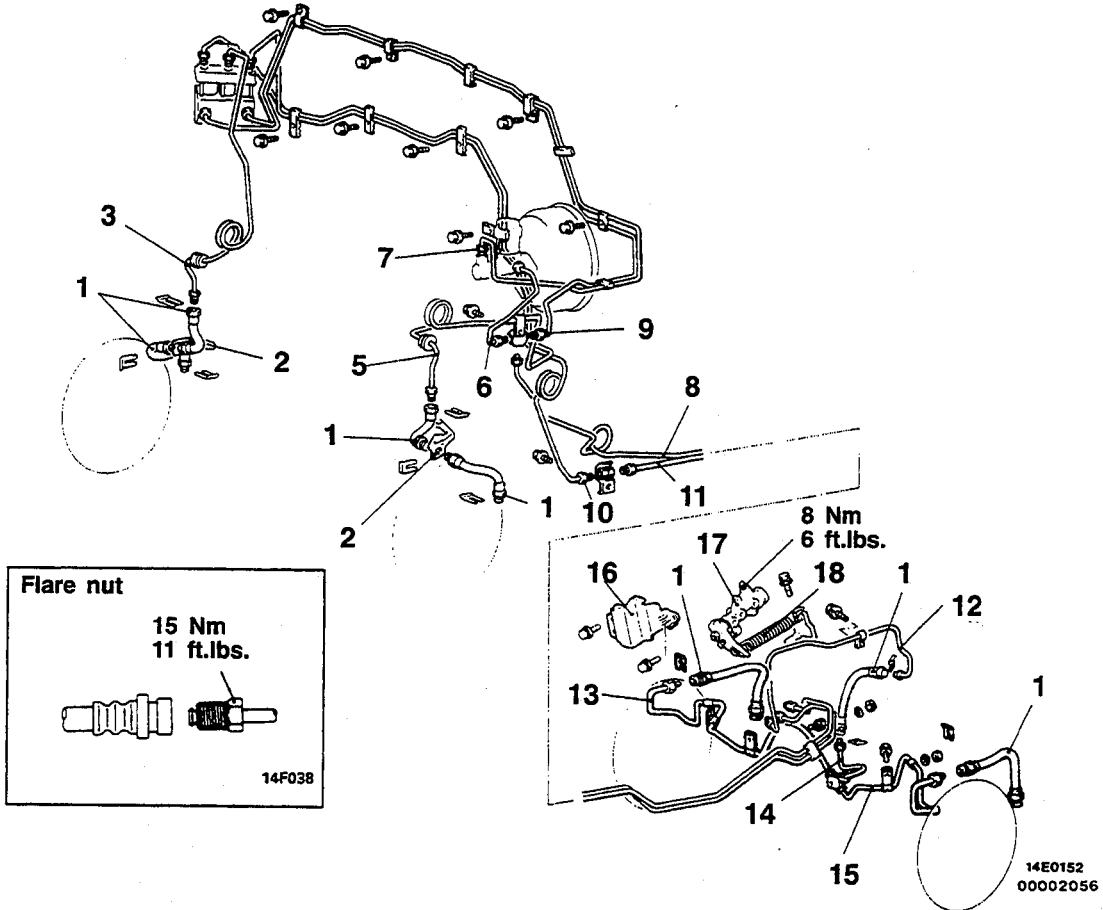
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

Post-installation Operation

- Brake Fluid Supplying
- Bleeding (Refer to P.35A-9.)

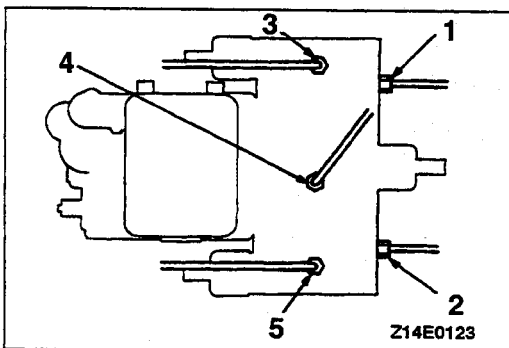


- 1. Brake hose
- 2. Brake hose support
- 3. Brake pipe (front, R.H.)
- 5. Brake pipe (front, L.H.)
- 6. Brake pipe (A)
- 7. Brake pipe (B)
- 8. Brake pipe (floor)
- 9. Brake pipe (floor 1)
- 10. Brake pipe (main 1)
- 11. Brake pipe (main 2)
- 12. Brake pipe (main 3)

- 13. Brake pipe (rear, R.H.)
- 14. Brake pipe (rear, center)
- 15. Brake pipe (rear, L.H.)
- 16. Protector
- 17. Load sensing proportioning valve
- 18. Load sensing spring

Caution

Do not disassemble the load sensing proportioning valve because its performance depends on the set load of the spring.



INSTALLATION SERVICE POINT

BRAKE PIPES TO HYDRAULIC UNIT INSTALLATION

Install the brake pipes as shown in the illustration.

- 1. From master cylinder to hydraulic unit (to the rear brake)
- 2. From master cylinder to hydraulic unit (to the front brake)
- 3. From hydraulic unit to rear brake
- 4. From hydraulic unit to front brake (LH)
- 5. From hydraulic unit to front brake (RH)

BRAKE LINE <1995 MODELS AND AFTER>

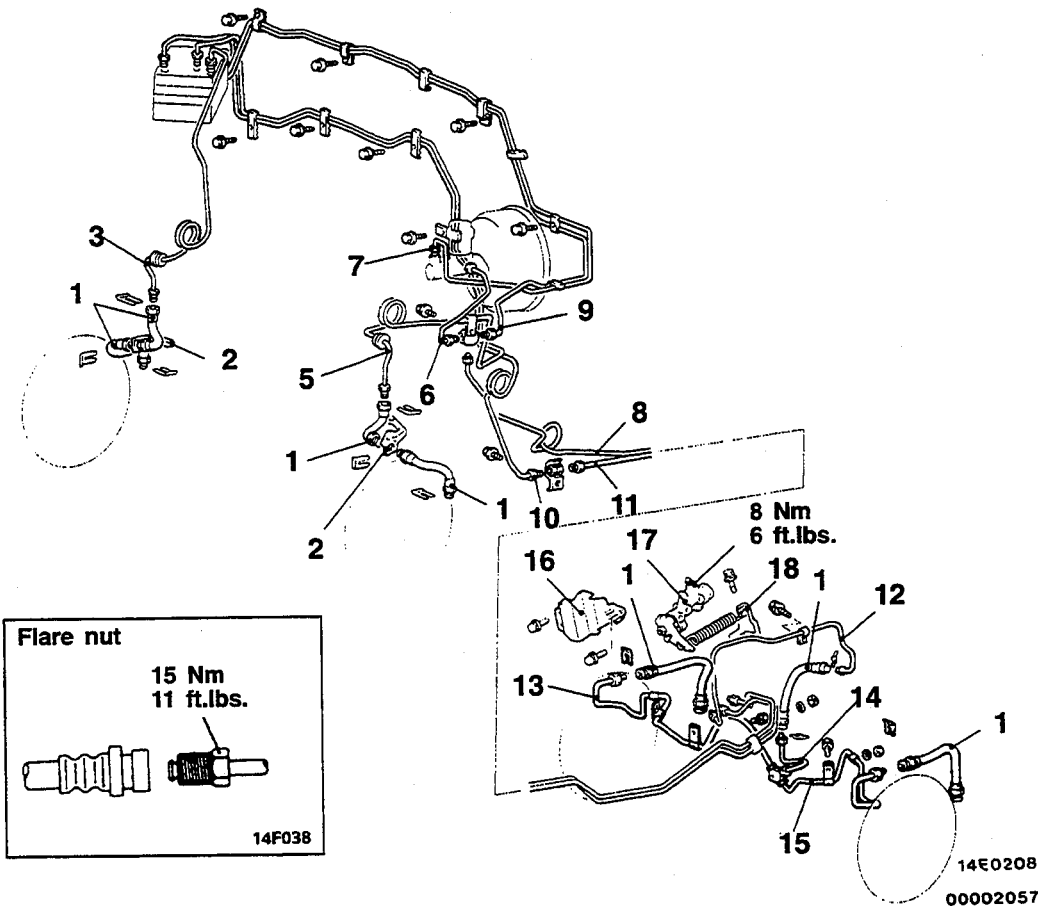
REMOVAL AND INSTALLATION

Pre-removal Operation

- Brake Fluid Draining

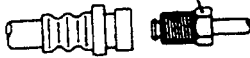
Post-installation Operation

- Brake Fluid Supplying
- Bleeding (Refer to P.35A-9.)



Flare nut

15 Nm
11 ft.lbs.



14F038

1. Brake hose
2. Brake hose support
3. Brake pipe (front, R.H.)
5. Brake pipe (front, L.H.)
6. Brake pipe (A)
7. Brake pipe (B)
8. Brake pipe (floor)
9. Brake pipe (floor 1)
10. Brake pipe (main 1)
11. Brake pipe (main 2)
12. Brake pipe (main 3)

13. Brake pipe (rear, R.H.)
14. Brake pipe (rear, center)
15. Brake pipe (rear, L.H.)
16. Protector
17. Load sensing proportioning valve
18. Load sensing spring

Caution

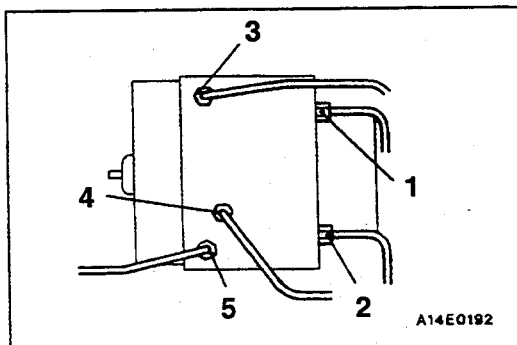
Do not disassemble the load sensing proportioning valve because its performance depends on the set load of the spring.

INSTALLATION SERVICE POINT

BRAKE PIPES TO HYDRAULIC UNIT INSTALLATION

Install the brake pipes as shown in the illustration.

1. From master cylinder to hydraulic unit (to the rear brake)
2. From master cylinder to hydraulic unit (to the front brake)
3. From hydraulic unit to rear brake
4. From hydraulic unit to front brake (LH)
5. From hydraulic unit to front brake (RH)



A14E0192

TSB Revision

HYDRAULIC UNIT

REMOVAL AND INSTALLATION

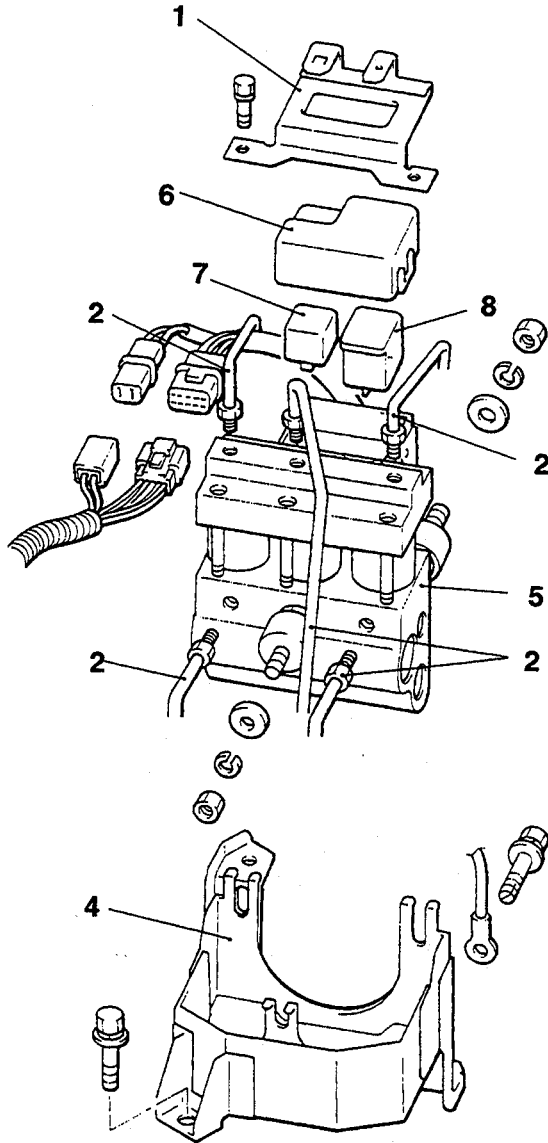
Pre-removal Operation

- Brake Fluid Draining

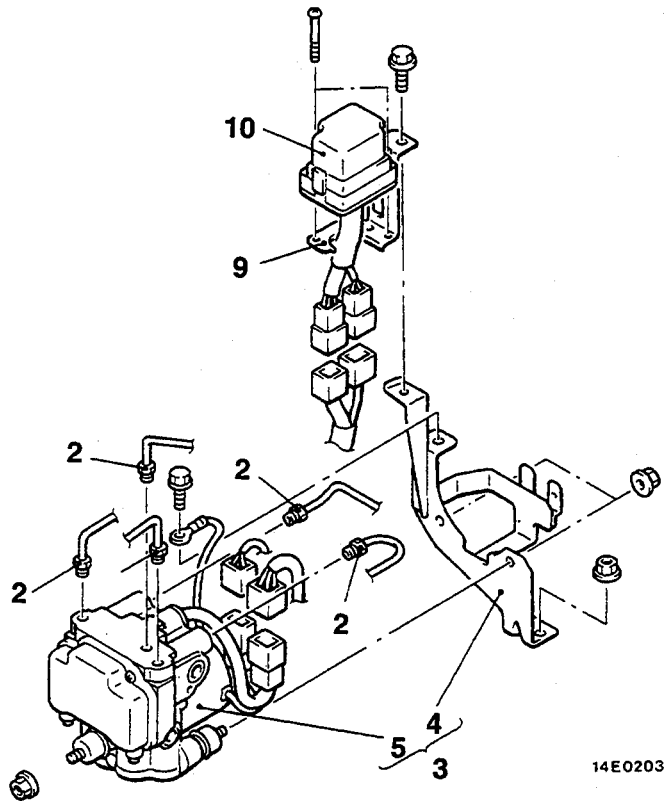
Post-installation Operation

- Brake Fluid Supplying
- Bleeding (Refer to P.35A-9.)
Checking by Using the Scan Tool
(Up to 1994 models: Refer to P.35C-7.)
(1995 models and after: Refer to P.35C-45.)

<Up to 1994 models>



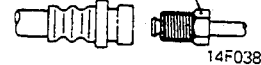
<1995 models and after>



14E0203

Flare nut

15 Nm
11 ft.lbs.



14F038

14E0068

00002058

Hydraulic unit removal steps

1. Connector bracket
2. Brake pipe
3. Hydraulic unit assembly
4. Hydraulic unit bracket
5. Hydraulic unit

6. Relay box cover
7. Valve relay
8. Motor relay
9. Relay box bracket
10. ABS relay box

TSB Revision

REMOVAL SERVICE POINTS

◀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 shocks.
4. The hydraulic unit must not be turned upside down or laid on its side.

G SENSOR

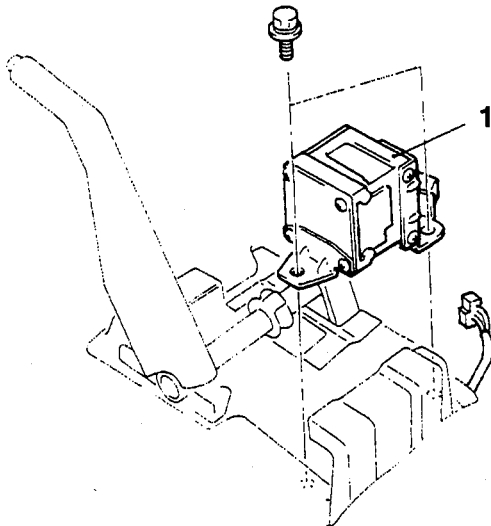
110005661

REMOVAL AND INSTALLATION

Pre-removal and Post-installation
Operation

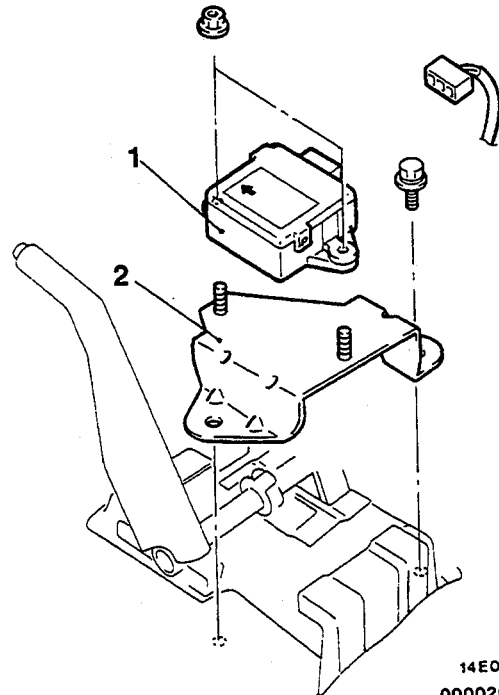
- Floor Console Removal and Installation
(Refer to GROUP 52A – Floor Console.)

<Up to 1993 models>



14E0062

<1994 models and after>

14E0200
00002059

Removal steps

1. G sensor
2. G sensor bracket

Caution

When removing the G sensor, take care not to drop it or subject it to severe impact.

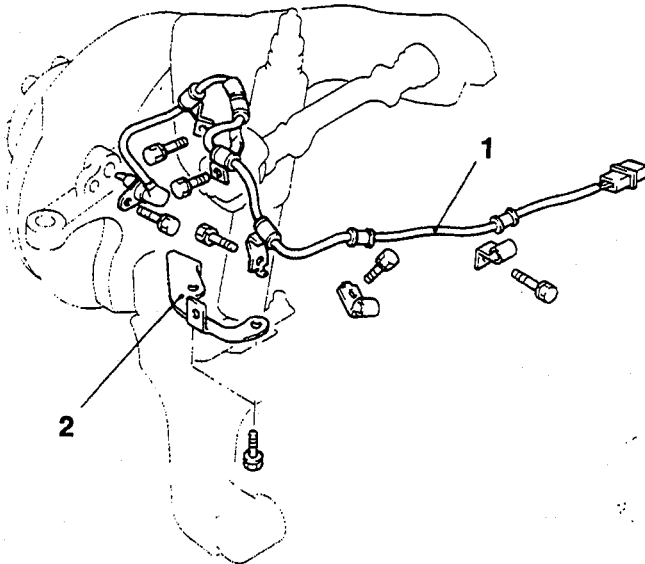
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WHEEL SPEED SENSOR REMOVAL AND INSTALLATION

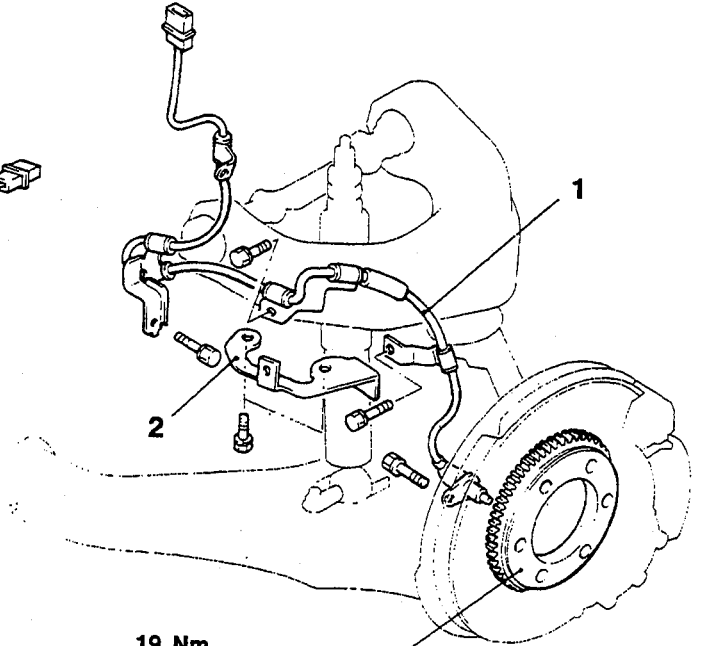
Post-installation Operation

- Anti-Lock Braking System Checking
(Refer to P.35C-65)

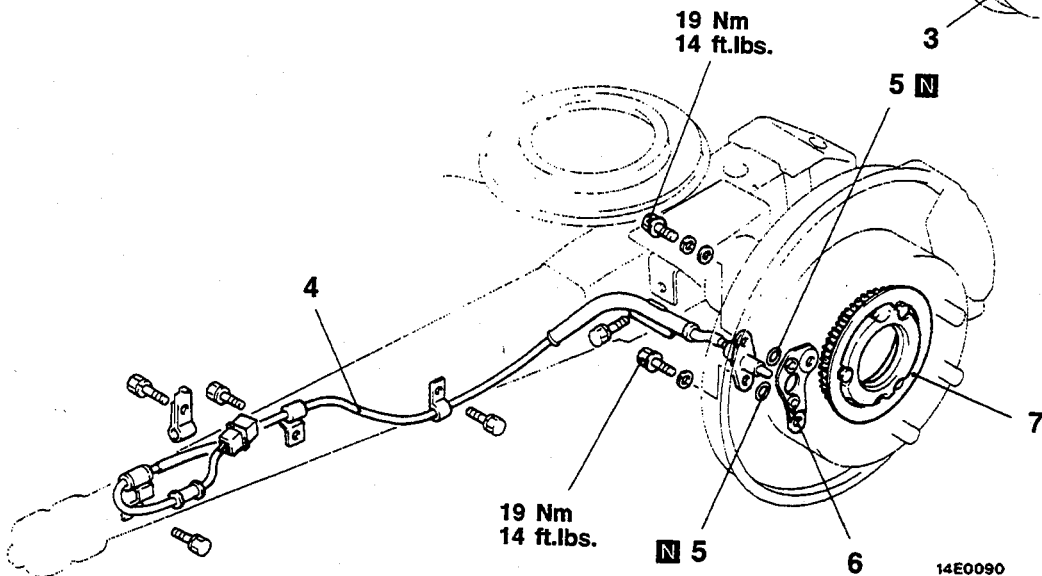
Front-RH



Front-LH



Rear



14E0092

14E0090 00002060

Front speed sensor removal steps



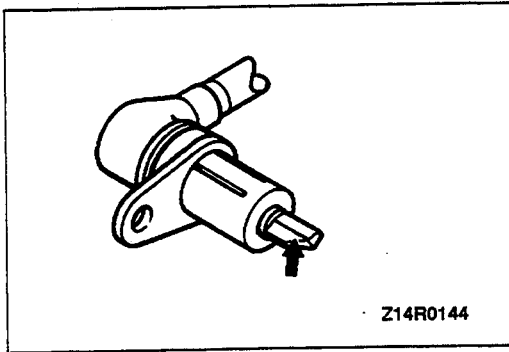
1. Front speed sensor
2. Harness bracket
3. Front rotor
(Refer to GROUP 26 – Axle Hub.)

Rear speed sensor removal steps



4. Rear speed sensor
5. Sealant
6. Sensor bracket (Refer to GROUP 27 – Axle shaft.)
7. Rear rotor (Refer to GROUP 27 – Axle shaft.)

TSB Revision



REMOVAL SERVICE POINTS

◀A▶ FRONT SPEED SENSOR/ REAR SPEED SENSOR REMOVAL

Caution

Be careful when handling the pole piece at the tip of the speed sensor and the toothed edge of the rotor so as not to damage them by striking against other parts.

INSPECTION

SPEED SENSOR

- (1) Check whether any metallic foreign material has adhered to the pole piece at the speed sensor tip, and, if so, remove it.
Also check whether the pole piece is damaged, and, if so, replace it with a new one.

NOTE

The pole piece can become magnetized because of the magnet built into the speed sensor, so that metallic foreign material easily adheres to it. Moreover, the pole piece may not be able to sense correctly the wheel rotation speed if it is damaged.

- (2) Measure the resistance between the speed sensor terminals.

Standard value:

Front: 0.9–1.1 k Ω

Rear: 1.3–2.1 k Ω

If the internal resistance of the speed sensor is not within the standard value, replace it with a new speed sensor.

- (3) Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

Standard value: 100 k Ω or more

If the speed sensor insulation resistance is outside the standard value range, replace with a new speed sensor.

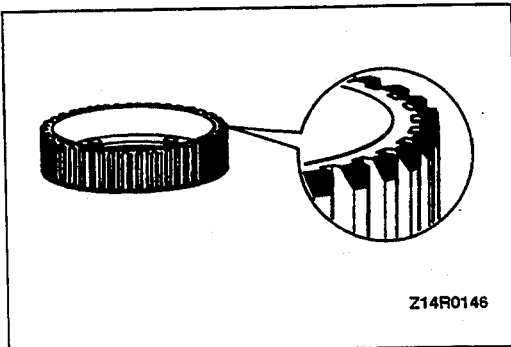
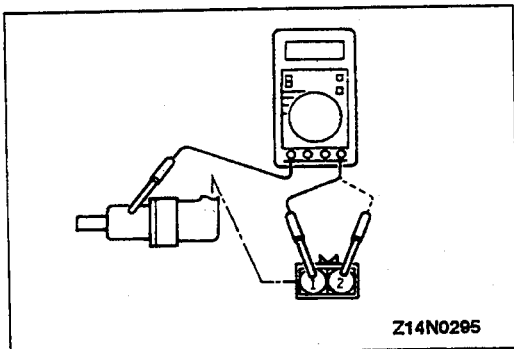
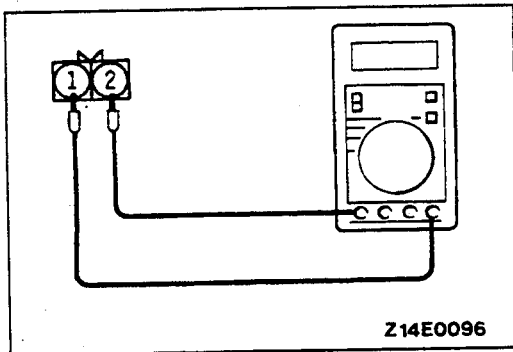
- (4) Check the speed sensor cable for breakage, damage or disconnection; replace with a new one if a problem is found.

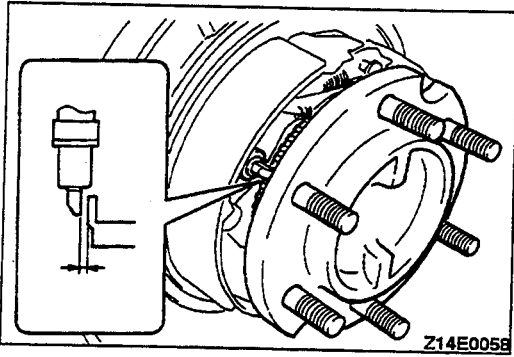
NOTE

When checking for cable damage, remove the cable clamp part from the body and then bend and pull the cable near the clamp.

TOOTHED ROTOR

Check whether the rotor teeth are broken or deformed, and, if so, replace the rotor.



**INSTALLATION SERVICE POINTS****►A◄ REAR SPEED SENSOR INSTALLATION**

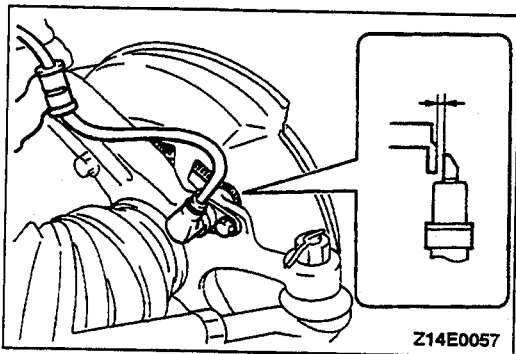
Insert a feeler gage into the space between the speed sensor's pole piece and the rotor's toothed surface and then tighten the speed sensors at the position where the clearance is at the standard value.

Standard value: 0.3–0.9 mm (.012–.035 in.)

NOTE

Check that there is no contact between the speed sensor's pole piece and the rotor's toothed surface when the rear hub assembly is slowly rotated one time.

If there is contact, it is probable that the rotor or the rear hub is installed incorrectly, recheck installation.

**►B◄ FRONT SPEED SENSOR INSTALLATION**

Insert a feeler gage into the space between the speed sensor's pole piece and the rotor's toothed surface, and check to be sure that the clearance at all points is at the standard value.

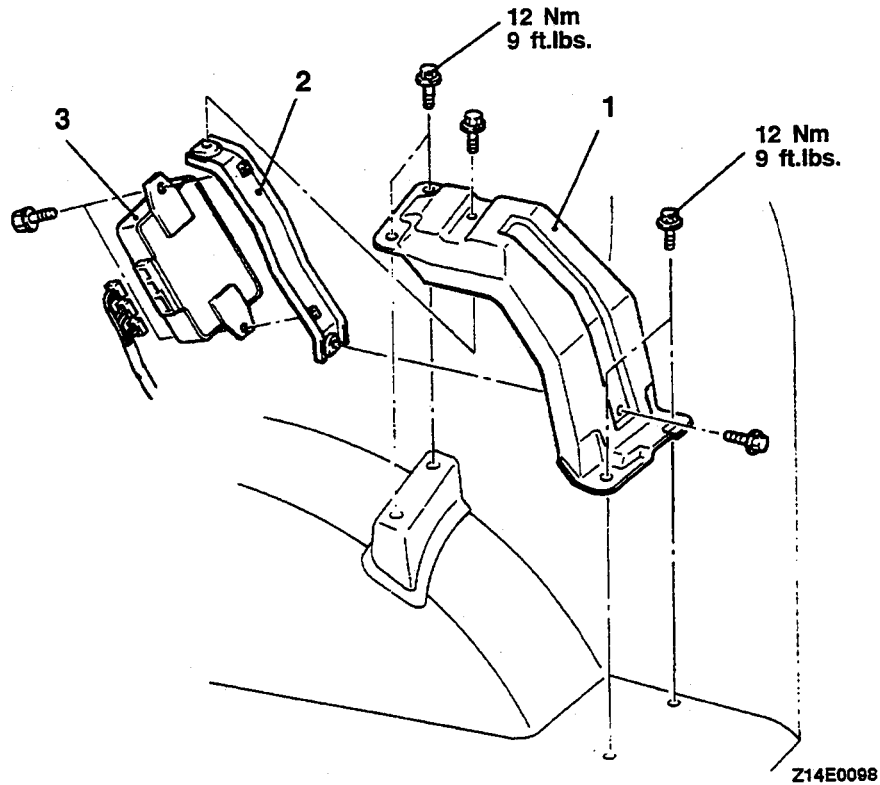
Standard value: 0.2–1.0 mm (.008–.039 in.)

NOTE

If the clearance between the speed sensor's pole piece and the rotor's toothed surface is not within the standard value range, it is probable that the rotor is incorrectly installed, so re-check installation.

ELECTRONIC CONTROL UNIT

110005663

REMOVAL AND INSTALLATION**Removal steps**

- Third seat
<Vehicles with optional third seat>
(Refer to GROUP 52A – Third seat.)
- Quarter trim, lower
(Refer to GROUP 52A – Trim.)
- 1. Bracket (A)
- 2. Bracket
- 3. Electronic control unit

PARKING BRAKES

CONTENTS

110005120

LUBRICANTS	2	SERVICE ADJUSTMENT PROCEDURES	2
PARKING BRAKE CABLE	5	Lining Running-in	3
PARKING BRAKE DRUM	7	Parking Brake Lever Stroke Inspection and Adjustment	2
PARKING BRAKE LEVER	4	Parking Brake Switch Check	3
SEALANT	2	SERVICE SPECIFICATIONS	2
		TROUBLESHOOTING	2



SERVICE SPECIFICATIONS

110005121

Items	Standard value
Parking brake lever stroke	4–6 notches

LUBRICANTS

110005122

Items	Specified lubricant
Backing plate	Brake grease SAE J310, NLGI No. 1
Shoe and lining assembly	
Adjuster	

SEALANT

110005123

Items	Specifications
Both sides of sealer	3M ATD Part No. 8661, 8663 or equivalent
Shoe hold-down pin	3M ATD Part No. 8513 or equivalent
Backing plate	

TROUBLESHOOTING

110005124

Trouble Symptom	Probable Cause	Remedy
Brake drag	Incomplete release of parking brake	Correct
	Incorrect parking brake adjustment	Adjust
Insufficient parking brake function	Worn brake lining	Replace
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable routing
	Grease or oil on lining surface	Replace
	Parking brake cable sticking	Replace

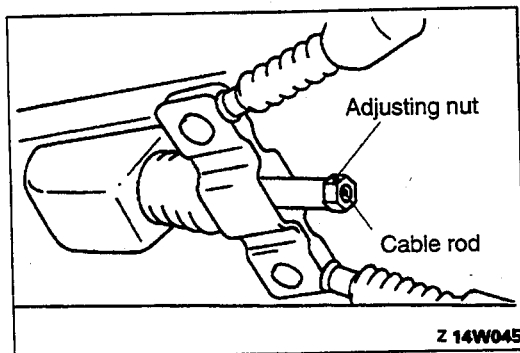
SERVICE ADJUSTMENT PROCEDURES

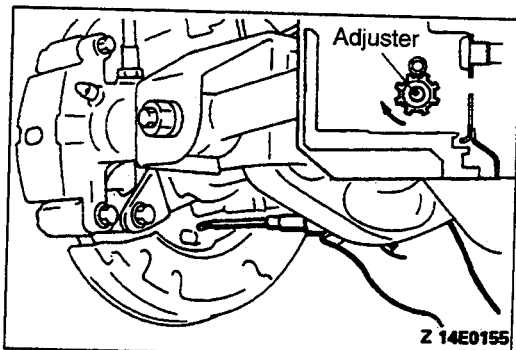
PARKING BRAKE LEVER STROKE INSPECTION AND ADJUSTMENT

110005125

Standard value: 4–6 notches

If the parking brake lever stroke is not within the standard value range, make adjustment by the following procedures.
 (1) Loosen the adjuster to slacken the parking brake cable.

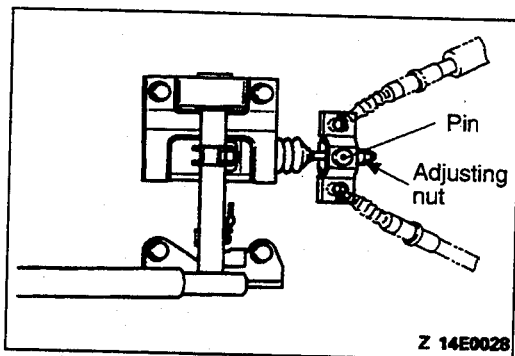




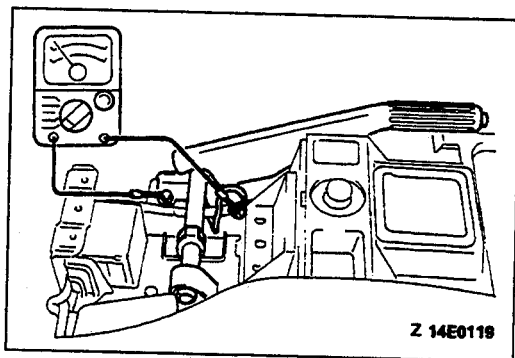
- (2) Remove the adjustment hole plug, and then use a flat-tip (-) screwdriver to turn the adjuster in the direction of the arrow (the direction which expands the shoe) so that the disc will not rotate.
- (3) Return the adjuster 3–4 notches in the direction opposite to the direction of the arrow.
- (4) 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 within the standard value.



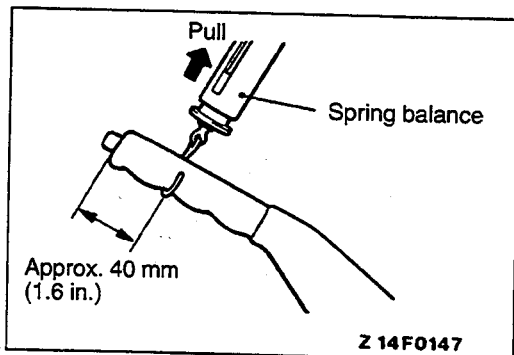
- (5) After making the adjustment, check that there is no play between the adjusting nut and the pin. Also check that the adjusting nut is securely held at the nut holder.
- (6) After adjusting the lever stroke, jack up the rear of the vehicle.
- (7) With the parking brake lever in the released position, turn the rear wheel to confirm that the rear brakes are not dragging.



PARKING BRAKE SWITCH CHECK

110005126

- (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

110005127

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 scale onto the center of the parking brake lever grip and pull it with a force of 98–147 N (22–33 lbs.) in a direction perpendicular to the handle.
- (3) Drive the vehicle at a constant speed of 35–50 km/h (22–31 mph) for 100 meters (328 ft).
- (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.

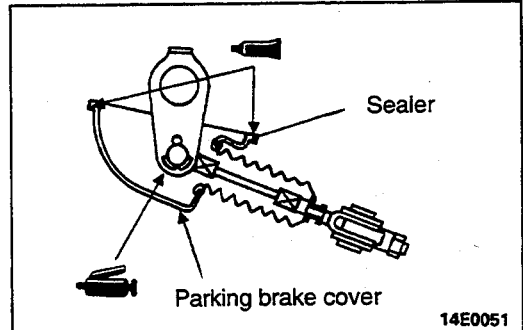
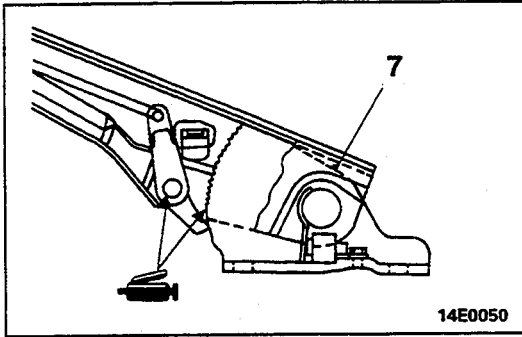
**PARKING BRAKE LEVER
REMOVAL AND INSTALLATION**

Pre-removal Operation

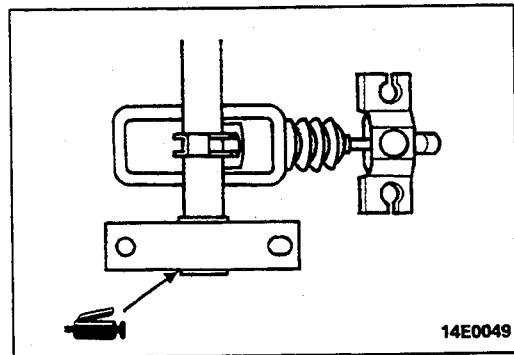
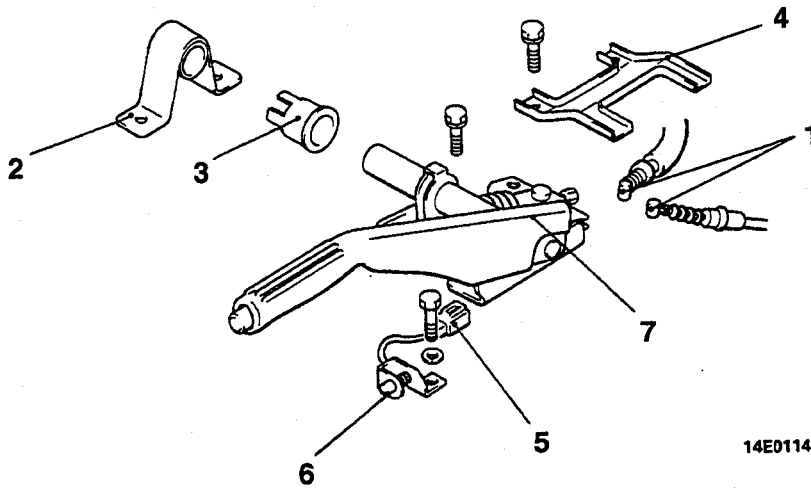
- Floor Console Assembly Removal
(Refer to GROUP 52A – Floor Console.)

Post-installation Operation

- Parking Brake Lever Stroke Adjustment
(Refer to P.36-2.)
- Floor Console Assembly Installation
(Refer to GROUP 52A – Floor Console.)



**Sealant: 3M ATD Part No. 8661, 8663
or equivalent**



00001861

Removal steps

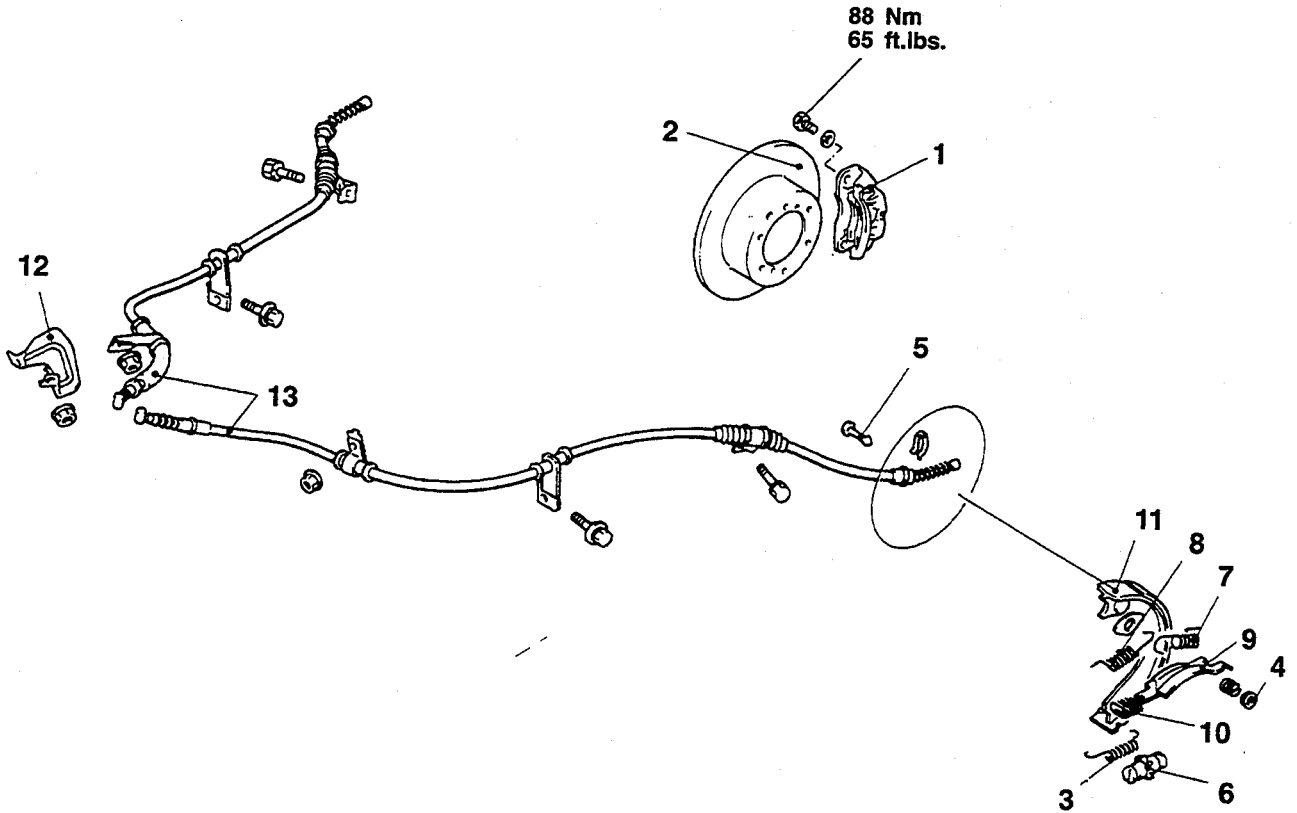
1. Connection for parking brake cable
2. Parking brake stay
3. Bushing
4. Parking brake shaft cover

5. Parking brake switch connector
6. Parking brake switch
7. Parking brake lever

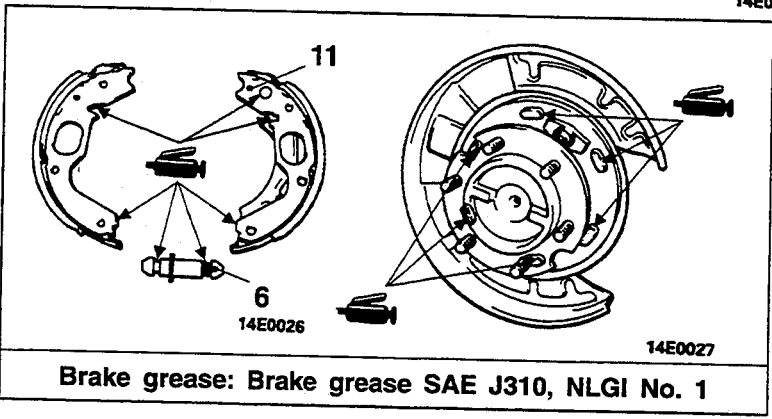
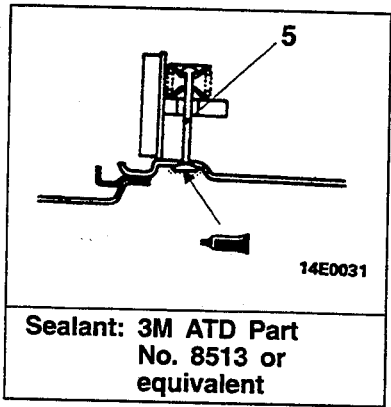
PARKING BRAKE CABLE REMOVAL AND INSTALLATION

Post-installation Operation

- Parking Brake Lever Stroke Adjustment (Refer to P.36-2.)



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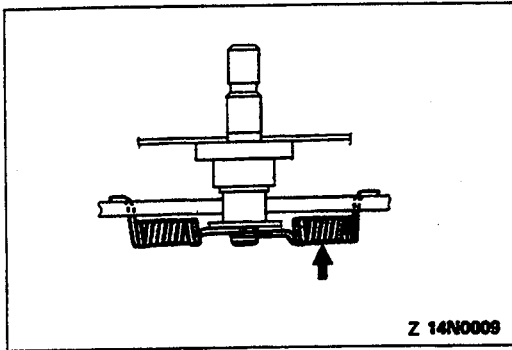


Removal steps

1. Rear brake assembly
2. Rear brake disc
3. Adjusting wheel spring
4. Shoe hold-down cup
5. Shoe hold-down pin
6. Adjuster
7. Anchor to shoe spring

8. Anchor to shoe spring
9. Strut
10. Strut to shoe spring
11. Shoe and lining assembly
12. Heat protector
13. Parking brake cable

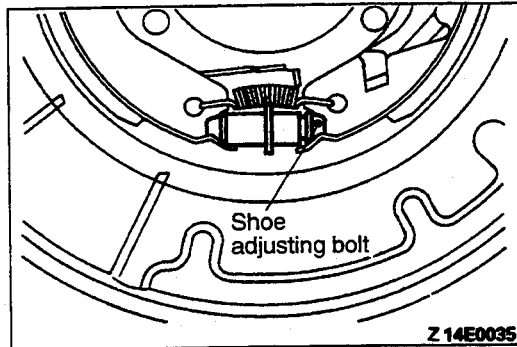
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INSTALLATION SERVICE POINTS

▶A◀ ANCHOR TO SHOE SPRING INSTALLATION

The load on the respective anchor to shoe springs is different, so the spring indicated by the arrow has been painted for identification.

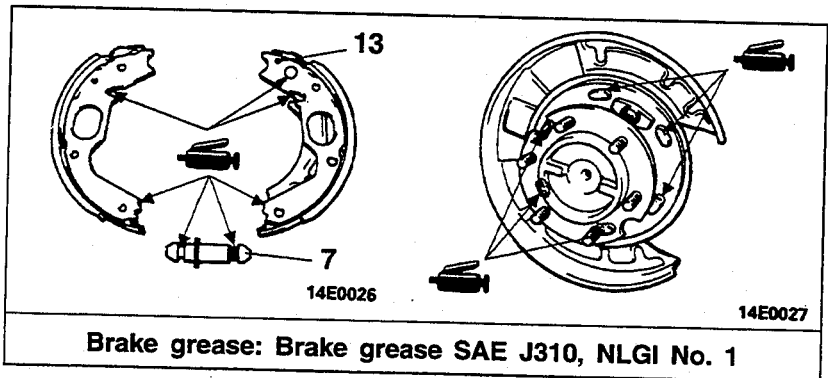
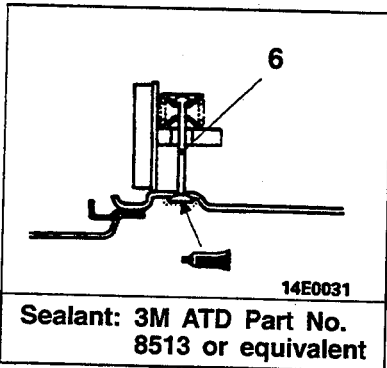
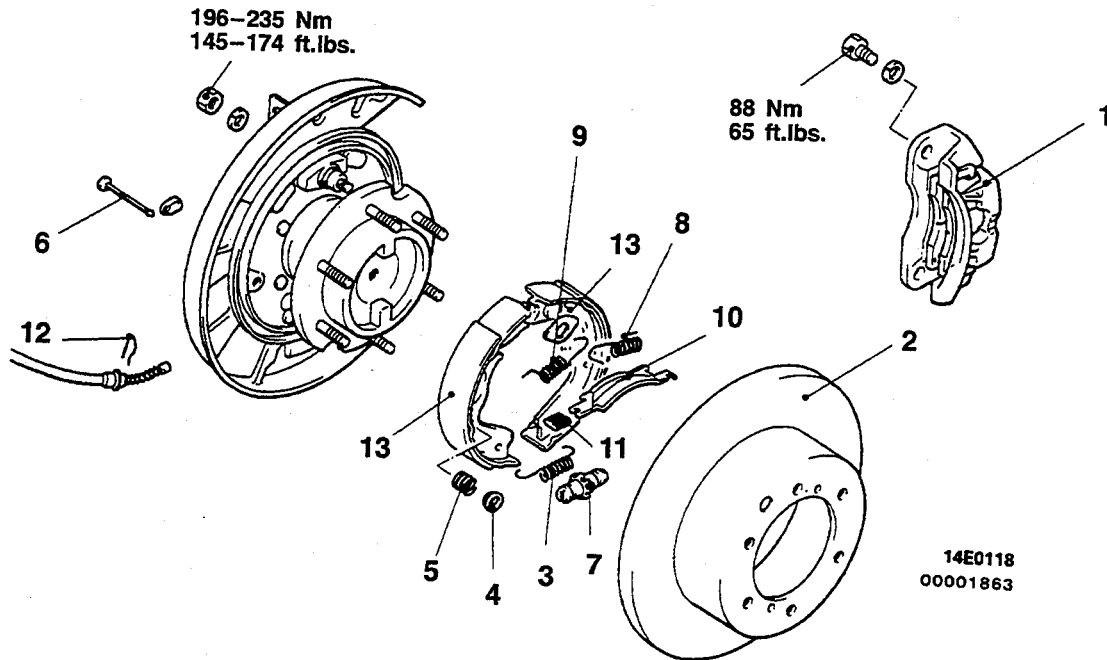


▶B◀ ADJUSTER INSTALLATION

Install the adjuster so that the shoe adjusting bolt for the left-hand wheel is towards the rear of the vehicle, and the shoe adjusting bolt for the right-hand wheel is towards the front of the vehicle.

**PARKING BRAKE DRUM
REMOVAL AND INSTALLATION**

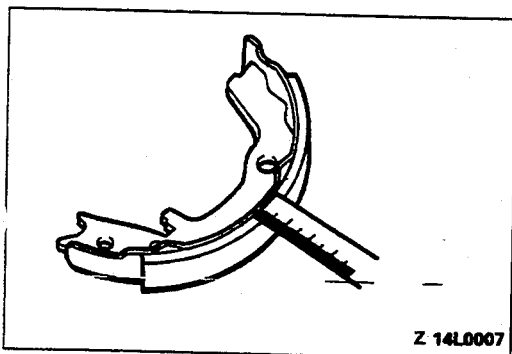
110005130



Removal steps

- 1. Rear brake assembly
- 2. Rear brake disc
- 3. Adjusting wheel spring
- 4. Shoe hold-down cup
- 5. Shoe hold-down spring
- 6. Shoe hold-down pin
- ▶B◀ 7. Adjuster

- ▶A◀ 8. Anchor to shoe spring
- ▶A◀ 9. Anchor to shoe spring
- 10. Strut
- 11. Strut to shoe spring
- 12. Clip
- 13. Shoe and lining assembly



INSPECTION

UNUSUAL WEAR OF THE BRAKE LINING AND BRAKE DRUM

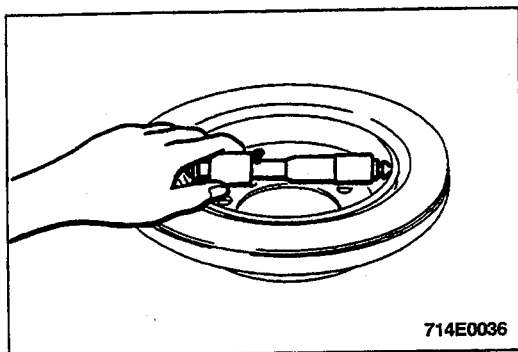
- (1) Measure the thickness of the brake lining at several places.

Standard value: 6.5 mm (.256 in.)

Limit: 4.5 mm (.177 in.)

Caution

Replace the brake shoes if the thickness of the brake lining is the limit value or less.



714E0036

- (2) Measure the brake disc drum inner diameter at two or more places.

Standard value: 197 mm (7.756 in.)

Limit: 198 mm (7.795 in.)

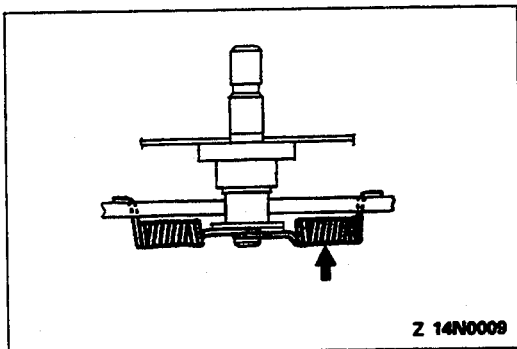
Caution

Replace if the brake disc drum inner diameter is the limit value or more.

INSTALLATION SERVICE POINTS

▶A◀ ANCHOR TO SHOE SPRING INSTALLATION

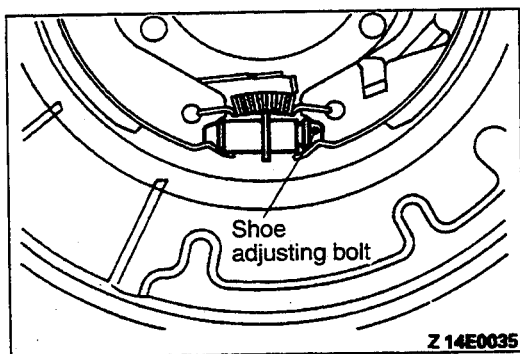
The load on the respective anchor to shoe springs is different, so the spring indicated by the arrow has been painted for identification.



Z 14N0009

▶B◀ ADJUSTER INSTALLATION

Install the adjuster so that the shoe adjusting bolt for the left-hand wheel is towards the rear of the vehicle, and the shoe adjusting bolt for the right-hand wheel is towards the front of the vehicle.



Z 14E0035

STEERING

CONTENTS

110005131

STEERING 37A

4-WHEEL STEERING SYSTEM (4WS) 37B

4-WHEEL STEERING SYSTEM
(ACTIVE 4WS) 37C

NOTE

The tinted sections are not included in this manual.





STEERING

CONTENTS

110005132

GENERAL SPECIFICATIONS	2	Steering Angle Check	9
LUBRICANTS	3	Steering Gear Backlash Check	7
POWER STEERING GEAR BOX*	22	Steering Wheel Centering	8
POWER STEERING OIL PUMP	32	Steering Wheel Free Play Check	7
SEALANTS AND ADHESIVES	3	Steering Wheel Return (to Center) Check	10
SERVICE ADJUSTMENT PROCEDURES	7	Tie Rod End Ball Joint Starting Torque Check	8
Air Bleeding	12	SERVICE SPECIFICATIONS	2
Ball Joint End Play Check	7	SPECIAL TOOLS	3
Drive-Belt Tension Check	11	STEERING COLUMN AND SHAFT*	15
Fluid Level Check	11	STEERING HOSES	37
Fluid Replacement	12	STEERING LINKAGE	39
Oil Pump Pressure Test	13	TROUBLESHOOTING	5
Power Steering Pressure Switch Check	14		
Stationary Steering Effort Check	10		

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

WARNING!

- (1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).
- (2) 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) and GROUP 00 – Maintenance Service 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 light, 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 SPECIFICATIONS

110005133

Items	Specifications	
Steering wheel diameter mm (in.)	390 (15.35)	
Power steering gear box	Steering gear type	Ball and nut, torsion bar type (integral type)
	Steering gear ratio	16.4–18.0
Oil Pump	Oil pump type	Vane type
	Displacement cm ³ /rev. (cu.in./rev.)	9.6 (.59)

SERVICE SPECIFICATIONS

110005134

Items	Standard value	Limit	
Steering wheel free play mm (in.)	–	50 (1.97)	
Steering gear backlash mm (in.)	–	0.5 (.020)	
Ball joint end play mm (in.)	–	1.5 (.059)	
Steering angle	Inner wheel	32° 40' ₋₃	–
	Outer wheel	29° 45'	–
Stationary steering effort N (lbs.)	37 (8.2)	–	
Drive belt tension mm (in.) <3.0L-12VALVE engine>	When checked	9.0–14.5 (.354–.571)	–
	When an old belt is installed	10.0 (.394)	–
	When a new belt is installed	8.0 (.315)	–
Drive belt tension mm (in.) <3.0L-24VALVE engine>	When checked	10.5–14.5 (.413–.571)	–
	When an old belt is installed	11.5–13.5 (.452–.531)	–
	When a new belt is installed	9.5–11.5 (.374–.452)	–
Drive belt tension mm (in.) <3.5L engine>	When checked	13.0–17.0 (.512–.669)	–
	When an old belt is installed	14.0–16.0 (.551–.630)	–
	When a new belt is installed	11.0–13.0 (.433–.512)	–
Oil pump pressure MPa (psi) <3.0L-12VALVE engine>	Oil pump relief pressure	7.35–8.04 (1,067–1,166)	–
	Pressure under no-load conditions	0.78–0.98 (114–142)	–
	Steering gear retention hydraulic pressure	7.35–8.04 (1,067–1,166)	–
Oil pump pressure MPa (psi) <3.0L-24VALVE engine, 3.5L engine>	Oil pump relief pressure	8.31–9.00 (1,205–1,305)	–
	Pressure under no-load conditions	0.78–0.98 (114–142)	–
	Steering gear retention hydraulic pressure	8.31–9.00 (1,205–1,305)	–
Pressure switch activation oil pressure MPa (psi)	OFF→ON	1.47–1.96 (213–284)	–
	ON→OFF	0.69–1.18 (100–171)	–
Backlash between ball groove of rack piston and balls mm (in.)	–	0.05 (.0020)	

Items	Standard value	Limit
Mainshaft end play mm (in.)	0.03 (.0012) or less	—
Cross-shaft end play mm (in.)	0.05 (.0020)	—
Mainshaft total starting torque Nm (in.lbs.)	0.45–1.25 (4–11)	—
Clearance between oil pump drive shaft and pump body mm (in.)	—	0.1 (.004)
Gap between vane and rotor groove mm (in.)	—	0.06 (.0024)
Ball joint starting torque Nm (in.lbs.)	Tie rod end	1–3 (8.9–26)
	Idler arm	0.5–2.0 (4–17)
Idler arm turning torque Nm (in.lbs.)	0.3–2.0 (3–17)	—
Spring balance reading N (lbs.)	2.3–15.4 (.5–33.9)	—

LUBRICANTS

110005135

Items	Specified lubricant	Quantity
Power steering fluid	MITSUBISHI PLUS ATF/Automatic transmission fluid "DEXRON" or "DEXRON II"	1.06 dm ³ (1.12 qts.)
Power steering gear box	Bearing, O-ring and oil seal MITSUBISHI PLUS ATF/Automatic transmission fluid "DEXRON" or "DEXRON II"	As required
Oil pump	Flow control valve and O-ring	As required
	Friction surface of rotor, vane, cam ring and pump cover	

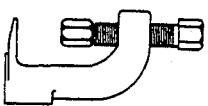
SEALANTS AND ADHESIVES

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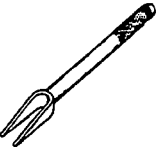
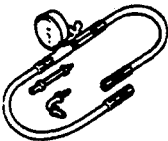
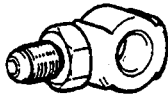
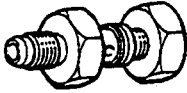
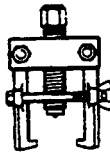
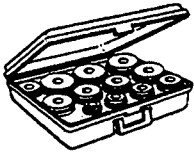


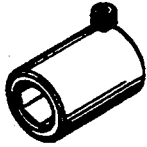
Items	Specifications
Steering column cover assembly installation hole	3M ATD Part No. 8663 or equivalent
Dash panel cover installation surface	
Tie-rod end dust cover installation surface	
Inside of steering column lower pipe bearing	3M Stud Locking Part No. 4170 or equivalent
Connecting the steering column upper and steering column lower (nut side)	
Steering column upper bearing	3M ATD Part No. 8001 or equivalent

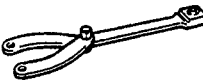

SPECIAL TOOLS

110005137

Tool	Tool number and name	Supersession	Application
	MB990635 Steering linkage puller	MB990635-01	Disconnecting the tie rod and knuckle

TSB Revision

Tool	Tool number and name	Supersession	Application
	MB990778 Ball joint remover	MB990778-01	Disconnecting the pitman arm and relay rod Disconnecting the idler arm and relay rod
	MB990662 Oil pressure gage	MB990662-01	Measuring the oil pump pressure
	MB990993 Oil pressure gage adapter (pump side)	MB990993-01	
	MB990994 Oil pressure gage adapter (hose side)	MB990994-01	
	MB990809 Pitman arm puller	MB990809-01	Removing the pitman arm
	MB990925 Bearing and oil seal installer set	MB990925-01	Installing the oil seal and ball bearing (Refer to GROUP 26.) MB990928-01, MB990926-01
	MB990938 Handle	MB990938-01	
	MB991203 Oil seal and bearing installer		
	MB990228 Preload socket	MB990228-01	Measuring the main shaft total starting torque

Tool	Tool number and name	Supersession	Application
	MB991367 Special spanner		Removing and installing the lock nut
	MB991394 Pin set		

TROUBLESHOOTING

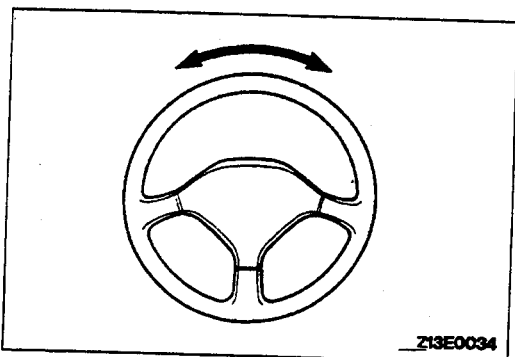
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Trouble Symptom	Probable Cause	Remedy
Excessive play of steering wheel	Excessive play in steering gear box	Repair
	Loose steering gear mounting bolts	Retighten
	Loose or worn stud of tie rod end	Retighten or replace as necessary.
Difficult steering wheel operation (insufficient power assist)	Loose belt	Adjust the belt tension.
	Damaged belt	Replace the belt.
	Low fluid level	Refill with fluid.
	Air in fluid line	Bleed the system.
	Twisted or damage hoses	Correct the hose routing or replace the hoses.
	Fluid leakage	Check the fluid leakage.
	Malfunction of gear box	Check and replace the gear box if necessary.
Malfunction of oil pump	Check the oil pump pressure and repair the oil pump.	
Rattling noise	Loose installation of oil pump or gear box	Retighten the oil pump or gear box.
	Interference around column or between pressure hose and other parts	Correct or replace the pressure hose and the parts around the column.
	Abnormal noise inside gear box and oil pump	Replace the gear box or oil pump.
Shrill noise	Air sucked into oil pump	Check the oil level and hose clips, bleed the system or replace the oil pump.
	Oil pump seizure	Replace the oil pump.
Squealing noise	Loose belt	Adjust the belt tension.
	Oil pump seizure	Replace the oil pump.

Trouble Symptom	Supersession	Application
Hissing noise	Air sucked into oil pump	Check the oil level and hose clips or bleed the system.
	Damage to the olive of the gear box port section	Replace the gear box.
	Malfunction of return hose	Replace the hose.
Whistling noise	Malfunction of gear box port section	Replace the gear box.
Droning noise	Loose mounting bolt on oil pump or oil pump bracket	Retighten the pump bracket or pump mounting bolt.
	Poor condition of oil pump body*	Replace the oil pump.
Squeaking noise	Malfunction of steering stopper contact	Check and adjust the steering stopper.
	Interference of wheel with vehicle body	Adjust the steering angle.
	Malfunction of gear box	Replace the gear box.
Vibration**	Air suction	Bleed the system.
	Malfunction of gear box	Replace the gear box.
Oil leakage from hose connection	Improperly tightened flare nut	Repair or replace
	Incorrectly inserted hose	
	Improperly clamped hose	
Oil leakage from hose assembly	Damaged or clogged hose Malfunction of hose connector	Replace
Oil leakage from oil reservoir	Improperly welded pipe	Weld the pipe or replace.
	Overflow	Bleed the system or adjust the oil level.
Oil leakage from oil pump	Malfunction of oil pump housing	Replace the oil pump.
	Malfunction of O-ring and/or oil seal	Replace the O-ring and oil seal.
Oil leakage from gear box	Malfunction of gear box housing (including leakage from air hole)	Replace the gear box.
	Malfunction of O-ring and/or oil seal	Replace the O-ring and oil seal.

NOTE

- * A slight "beat noise" is produced by the oil pump; this is not a malfunction. (This noise occurs particularly when a stationary steering effort is made.)
- ** A slight vibration may be felt when the stationary steering effort is made due to the condition of the road surface. To check whether the vibration actually exists or not, test-drive the vehicle on a dry concrete or asphalt surface. Moreover, a very slight amount of vibration is not a malfunction.



SERVICE ADJUSTMENT PROCEDURES

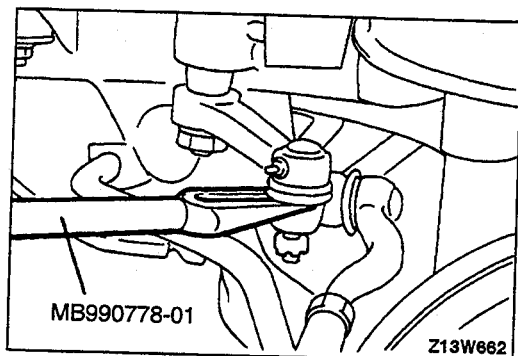
STEERING WHEEL FREE PLAY CHECK 110005139

1. When the engine is stopped and the steering wheel is in the straight-ahead position, apply a force of 5N (1.1 lbs.) to the steering wheel in the peripheral direction. Measure the play on the circumference of the steering wheel.

Standard value: 26.6 mm (1.05 in.) or less

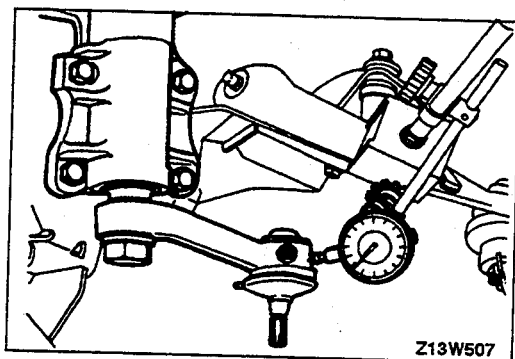
Limit: 50 mm (1.97 in.)

2. If the measured value exceeds the repair limit, check the steering gear backlash and linkage ball joint end play.



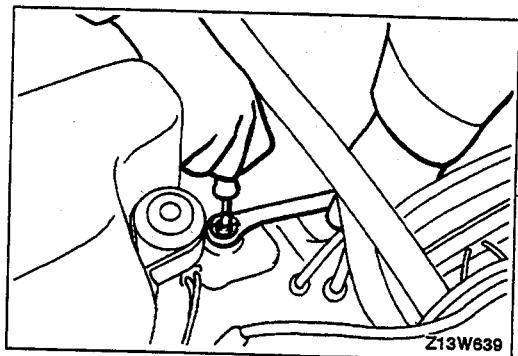
STEERING GEAR BACKLASH CHECK 110005140

1. Jack up the vehicle front and hold the steering wheel in the straight-ahead position.
2. Use the special tool to disconnect the pitman arm from the relay rod.



3. Use a dial indicator to measure the steering gear backlash at the pitman arm top end.

Limit: 0.5 mm (.020 in.)



4. If the measured value exceeds the limit, screw in the steering gear box adjusting bolt until the steering wheel play is within the standard value range.

Caution

1. Be sure to make the adjustment with the steering wheel in the straight-ahead position.
2. If the adjusting bolt is overtightened, more steering effort will be required, and return of the wheel will be adversely affected.

BALL JOINT END PLAY CHECK 110005141

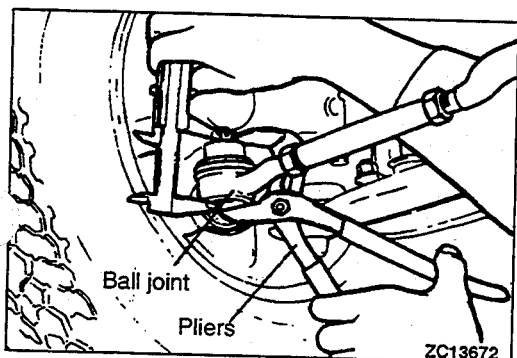
1. Hold the ball joint with pliers.
2. Set a caliper gage as shown in the illustration at left and measure the displacement with the ball stud compressed.

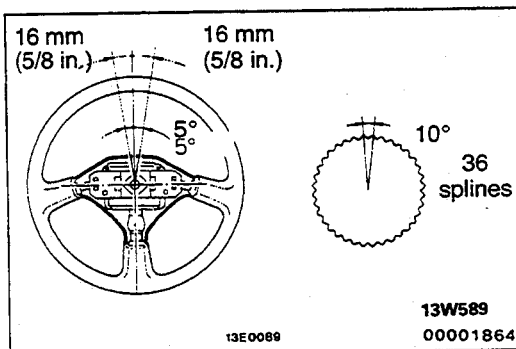
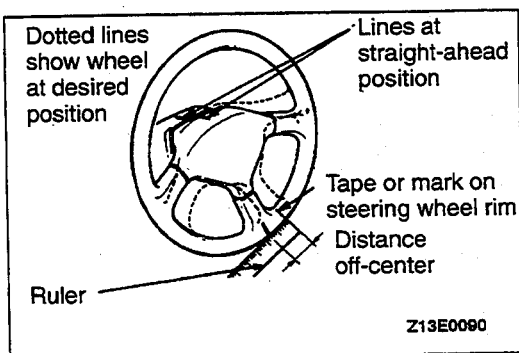
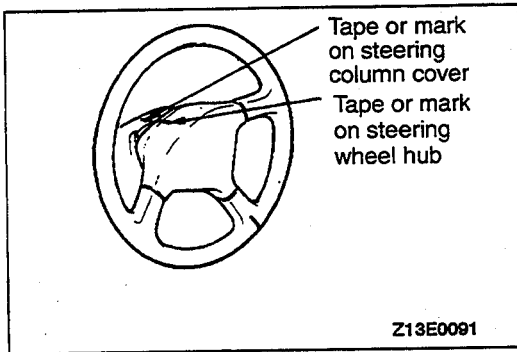
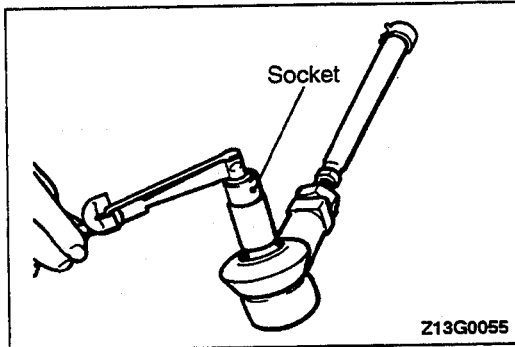
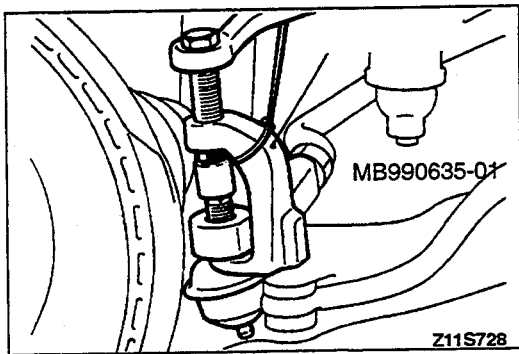
Limit: 1.5 mm (.059 in.)

3. If the measured displacement is over the limit, replace the ball joint.

NOTE

Even if the measured displacement is within the limit, check the ball joint starting torque.





TIE ROD END BALL JOINT STARTING TORQUE CHECK

110005142

1. Use the special tool to disconnect the tie rod from the knuckle.

Caution

1. Use cord to bind the special tool closely so it won't become separated.
2. The nut should only be loosened, not removed.

2. Move the ball joint stud several times and install the nut to the stud.
Measure the ball joint starting torque.

Standard value: 1–3 Nm (9–26 in.lbs.)

3. If the starting torque exceeds the standard value, replace the tie rod end.
4. If the starting torque is less than the standard value, check for play or ratcheting in the ball joint. If these are not found, the ball joint is still serviceable.

STEERING WHEEL CENTERING

110005143

SIMPLIFIED STEERING WHEEL CENTERING

DETERMINING OFF CENTER OF STEERING WHEEL

1. Take along chalk or tape and a ruler for the road test.
2. Drive straight ahead on an uncambered level surface.
3. When the vehicle's wheels are pointing straight ahead, mark the steering wheel hub and column cover with a chalk or tape line.
4. Stop the vehicle and align the marks on the hub and column cover.
5. Place a tape strip or mark on the steering wheel rim.
6. Hold a ruler next to the rim as shown in the illustration.
7. Record the distance the strip or mark on the rim has moved. This is how far the steering wheel is off center. If it is more than 16 mm (5/8 in.) of center, it can be centered by indexing it ten degrees toward the center.

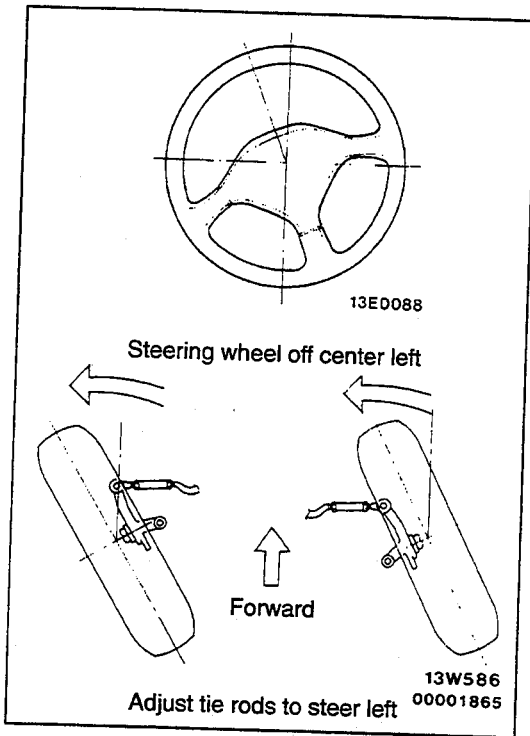
INDEXING STEERING WHEEL TO CENTER IT

The steering wheel shaft has 36 splines, allowing the steering wheel to be indexed in ten-degree increments.

1. Remove the steering wheel.
2. Without disturbing the position of the steering wheel shaft, re-install the wheel as near to the straight-ahead position as possible.

PRECISION STEERING WHEEL CENTERING

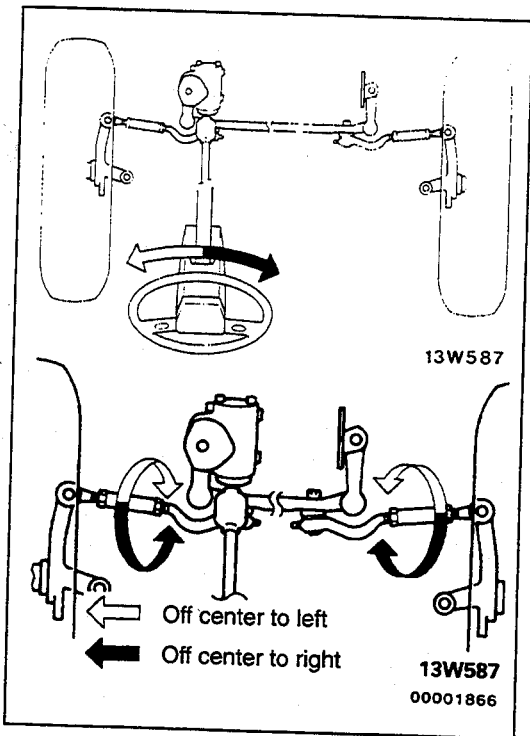
The tie rods are usually adjusted to steer the front wheels in the same direction that the steering wheel is off center. If the steering wheel is off center to the left, center it by adjusting the tie rods to make the front wheels steer toward the left, and vice versa.



1. Hold the tie rods with a wrench while loosening the locking nuts at least 1/4 turn.
2. Hold the tie rod end with a wrench and turn the tie rod the desired number of turns. Adjust both tie rods equally in the same direction to center the steering wheel.

NOTE

By turning the tie rods 1/6 of a turn, an adjustment of 2° (at the steering wheel center) or 6 mm (.25 in.) (at the steering wheel rim) can be made.



STEERING ANGLE CHECK

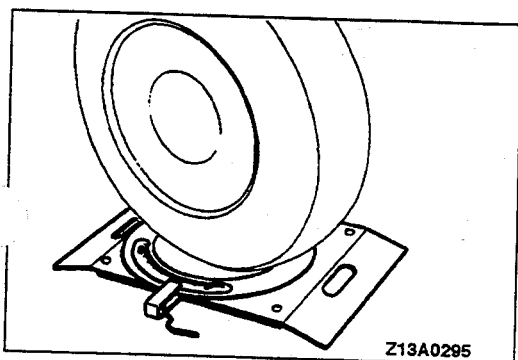
110005144

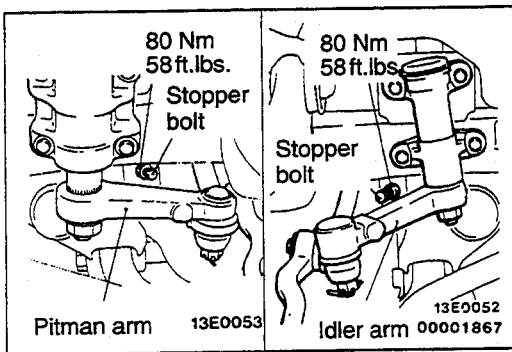
1. Place the front wheel on a turning radius gage and measure the steering angle.

Standard value:

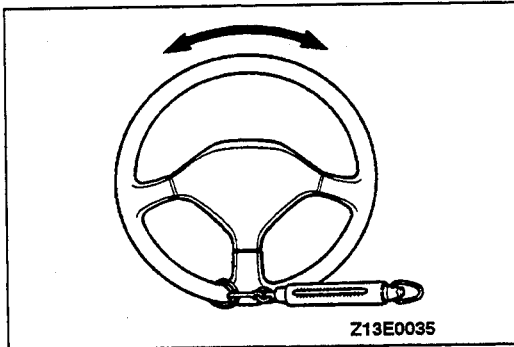
Inner wheel 32° 40' 0" -3"

Outer wheel 29° 45'





- If the steering angle is outside the standard value, check the toe-in (refer to GROUP 33A—Service Adjustment Procedures), and then adjust the steering angle with the stopper bolt.



STATIONARY STEERING EFFORT CHECK

110005145

- Place the vehicle on a level surface and set the steering wheel to the straight-ahead position.
- Set the engine speed to 1,000 rpm.

Caution

After checking the engine rpm., there must be a return to the standard idling rpm.

- Measure the tangential force with a spring balance by turning the steering wheel clockwise and counter clockwise one and a half turns.

Standard value: 37 N (8.21 lbs.) or less

- If the stationary steering effort exceeds the standard value, check for belt slackness, damage, insufficient oil, air mixed into oil, collapsed or twisted hoses, etc., and repair if found.

STEERING WHEEL RETURN (TO CENTER) CHECK

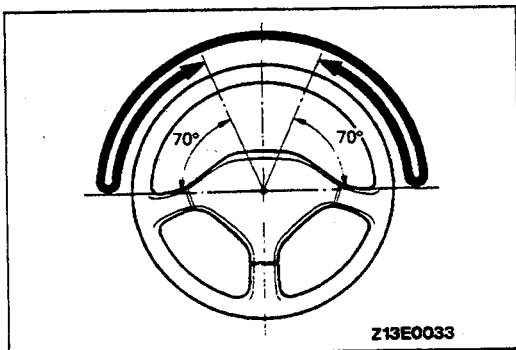
110005146

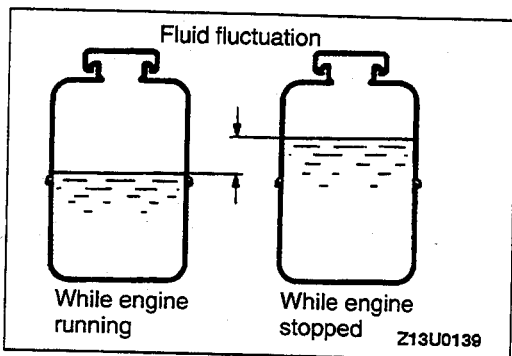
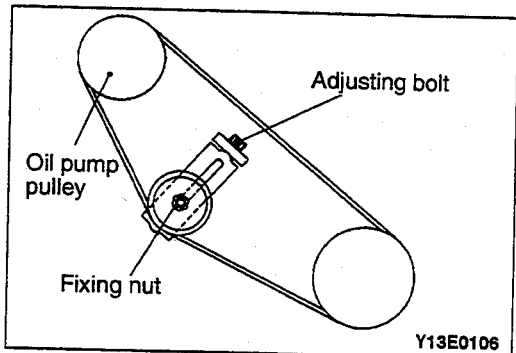
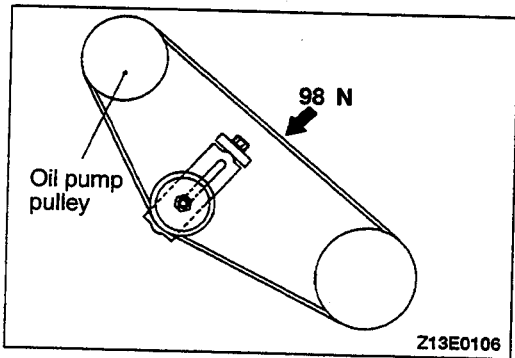
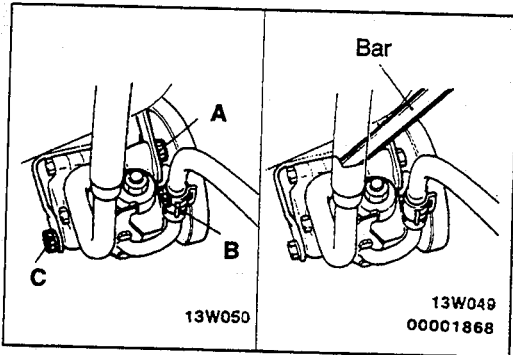
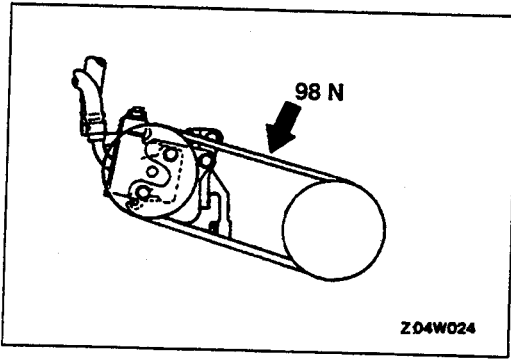
To check the return of the steering wheel to the center, carry out a road test and check the following points.

- Make gentle and sharp turns and check that there is no appreciable difference in steering effort and return to center between right and left turns.
- Drive at a speed of about 35 km/h (22 mph), turn the steering wheel 90° clockwise or counterclockwise, and release the wheel a second or two later. If the wheel returns more than 70°, the return may be considered good.

NOTE

When the steering wheel is turned abruptly, momentary hard steering might result, but this does not mean a problem. It is caused by low oil pump delivery during idling.





DRIVE-BELT TENSION CHECK

110005147

<3.0L-12VALVE engine>

1. Measure the deflection of the V belt when it is subjected to a force of 98 N (22 lbs.) in the place shown in the illustration.

Standard value:

		mm (in.)
When checked	mm (in.)	9.0–14.5 (.354–.571)
When an old belt is installed	mm (in.)	10.0 (.394)
When a new belt is installed	mm (in.)	8.0 (.315)

2. If the belt deflection is outside the standard value, adjust by the following procedure.
 - (1) Loosen oil pump fixing bolts A, B and C.
 - (2) Adjust the amount of belt deflection by setting a bar against the body of the oil pump and tightening the belt by hand to the appropriate amount.
 - (3) Tighten the fixing bolts A, B and C in that order.

<3.0L-24VALVE engine, 3.5L engine>

1. Measure the flexion of the V belt when it is subjected to a force of 98 N (22 lbs.) in the place shown.

Standard value:

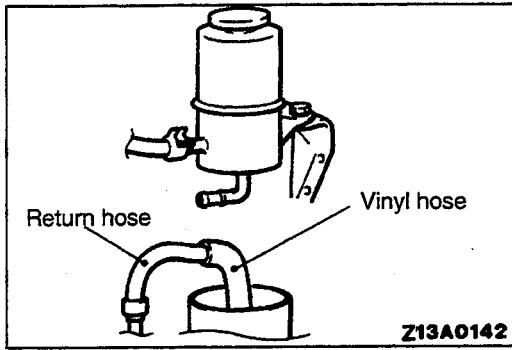
	mm (in.)	
Item	3.0L-24VALVE engine	3.5L engine
When checked	mm (in.)	10.5–14.5 (.413–.571)
When an old belt is installed	mm (in.)	13.0–17.0 (.512–.669)
When a new belt is installed	mm (in.)	11.0–13.0 (.433–.512)

2. If the flexion value is outside the standard value, adjust by the following procedure.
 - (1) Loosen tension pulley fixing nut.
 - (2) Adjusting belt tension with adjusting bolt.
 - (3) Tighten the fixing bolt.

FLUID LEVEL CHECK

110005148

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 (122–140°F).
2. With the engine running, turn the wheel all the way to the left and right several times.
3. Check the fluid in the oil reservoir for foaming or milkiness.
4. Check the difference of the fluid level when the engine is stopped and while it is running. If the fluid level changes considerably, air bleeding should be carried out.



FLUID REPLACEMENT

110005149

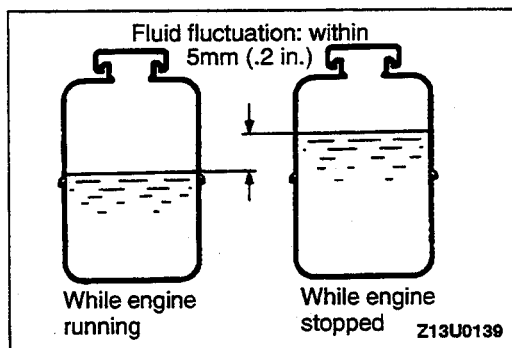
Check for contamination in the fluid reservoir. Foamy or cloudy fluid should be replaced.

1. Remove the reservoir cap.
2. Disconnect the return hose from the reservoir tank and remove the fluid.
3. Disconnect the high tension cable.
4. Run the engine intermittently several times with the starting motor to remove the fluid from the gear box.
5. Attach the return hose and fill with the specified automatic transmission fluid.

Specified fluid:

MITSUBISHI PLUS ATF/"DEXRON" or "DEXRON II" Automatic transmission fluid

6. Bleed the system and check the fluid pressure.



AIR BLEEDING

110005150

Check the stationary steering effort. If it is different from the standard value, there is probably air in the system, so bleed the system.

1. Check that the reservoir is filled up.
2. Jack up the front wheels.
3. Disconnect the high tension cable.
4. While turning the steering wheel completely to the right and to the left, turn the engine over by means of the starting motor. Repeat this several times.

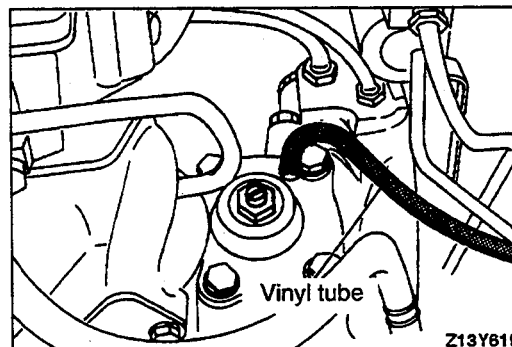
Caution

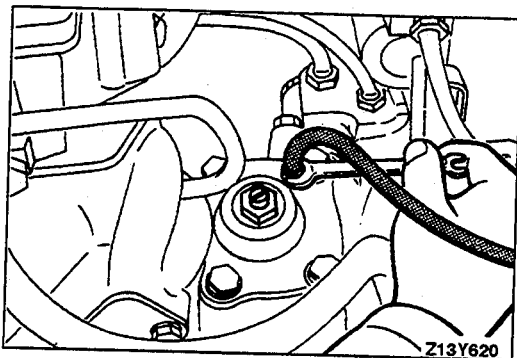
Do not carry out bleeding with the engine running, high speed rotation of the oil pump mixes air into the power steering fluid, making it impossible to thoroughly bleed the system.

5. Lower the front wheels.
6. Connect one end of a vinyl tube of suitable length to the breather plug of the gear box, and place its other end in a container.
7. Start the engine and run it at idle.
8. Loosen the breather plug, and then turn the steering wheel completely to the right and left continuously until air bubbles no longer appear in the fluid coming out of the tube.

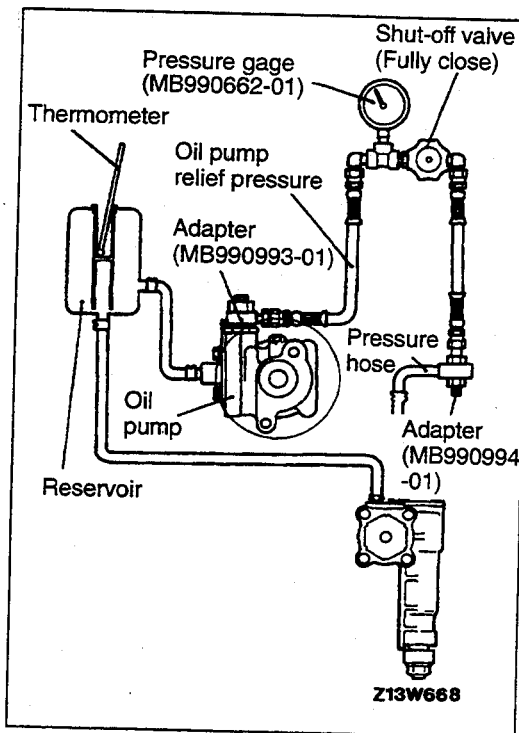
Caution

Do not hold the steering completely to the left or right for 10 seconds or more.





9. After bleeding, tighten the breather plug. Check the fluid level, and refill if necessary.
10. When turning the steering wheel right and left fully, check that the fluid level variation is less than 5 mm (.2 in.)



OIL PUMP PRESSURE TEST

110005151

OIL PUMP RELIEF PRESSURE CHECK

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C (122–140°F).
3. Start the engine and idle it at 1,000±100 rpm.
4. Fully close the shut-off valve of the pressure gage and measure the oil pump relief pressure to confirm that it is within the standard value range.

Standard value:

<3.0L-12VALVE engine>

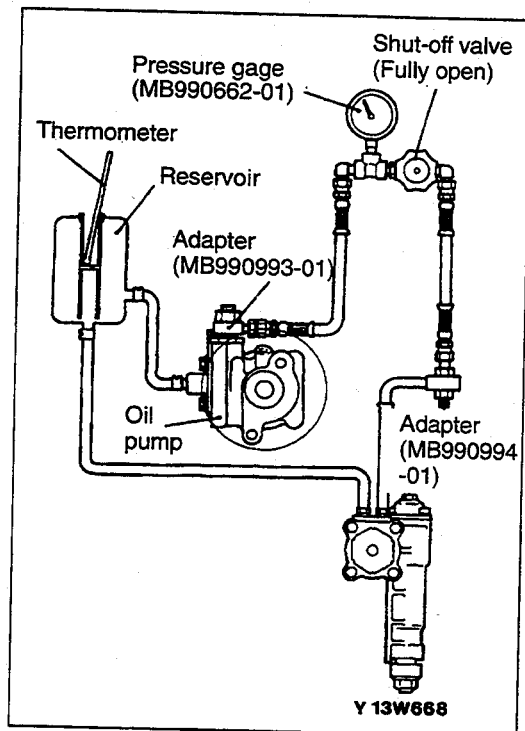
7.35–8.04 MPa (1,067–1,166 psi.)

<3.0L-24VALVE engine, 3.5L-engine>

8.31–9.00 MPa (1,205–1,305 psi.)

Caution

Pressure gage shut off valve must not remain closed for more than 10 seconds.



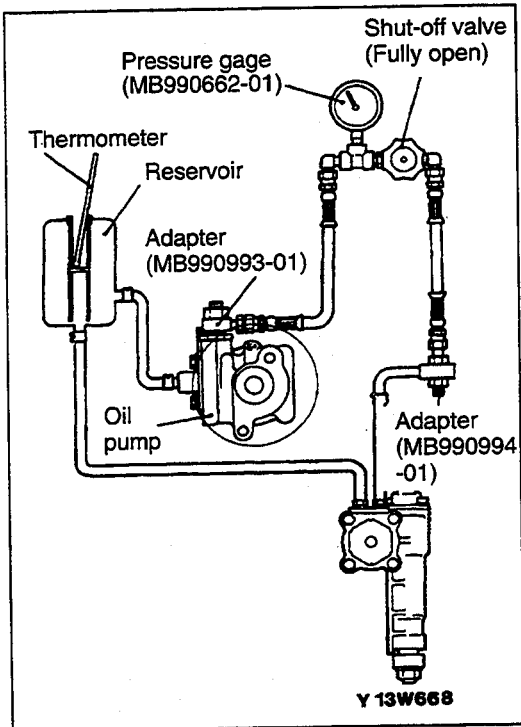
5. If it is not within the standard value, overhaul the oil pump.
6. Remove the special tools, and then tighten the pressure hose to the specified torque.
7. Bleed the system.

PRESSURE CHECK 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 raises to approximately 50–60°C (122–140°F).
3. Start the engine and idle it at 1,000±100 rpm.
4. Check that the hydraulic pressure is at the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gage.

Standard value: 0.78–0.98 MPa (114–142 psi.)

5. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
6. Remove the special tools, and then tighten the pressure hose to the specified torque.
7. Bleed the system.



STEERING GEAR RETENTION HYDRAULIC PRESSURE CHECK

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C (122–140°F).
3. Start the engine and idle it at 1,000±100 rpm.
4. Fully open the shut-off valve of the pressure gage.
5. Turn the steering wheel all the way to the left or right, and then check that the retention hydraulic pressure is at the standard value.

Standard value:

<3.0L-12VALVE engine>

7.35–8.04 MPa (1,067–1,166 psi.)

<3.0L-24VALVE engine, 3.5L-engine>

8.31–9.00 MPa (1,205–1,305 psi.)

6. If the pressure is not within the standard value, overhaul the steering gear box, and then re-measure the fluid pressure.
7. Remove the special tools, and then tighten the pressure hose to the specified torque.
8. Bleed the system.

POWER STEERING PRESSURE SWITCH CHECK

110005152

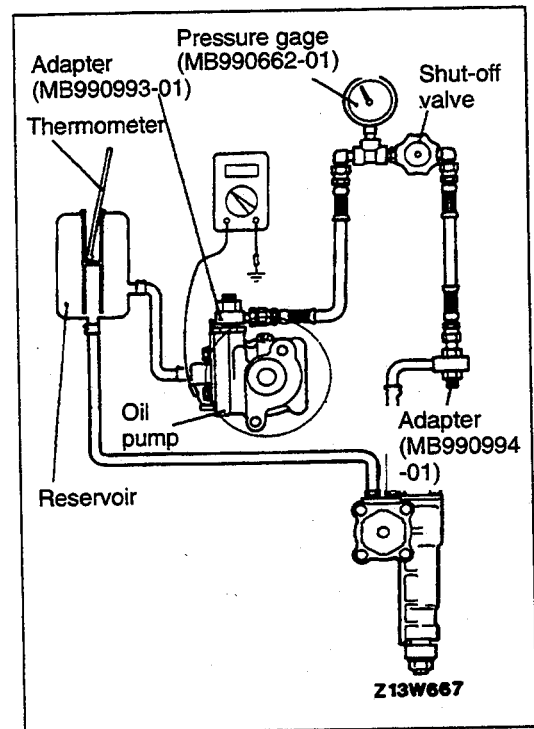
1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C (122–140°F).
3. The engine should be idling.
4. Disconnect the connector for the oil-pressure switch, and connect an ohmmeter.
5. Gradually close the shut-off valve of the pressure gage and increase the hydraulic pressure, and then check that the hydraulic pressure that activates the switch is at the standard value.

Standard value: 1.47–1.96 MPa (213–284 psi.)

6. Gradually open the shut-off valve and reduce the hydraulic pressure, and then check that the hydraulic pressure that deactivates the switch is at the standard value.

Standard value: 0.69–1.18 MPa (100–171 psi.)

7. Remove the special tools, and then tighten the pressure hose to the specified torque.
8. Bleed the system.



STEERING COLUMN AND SHAFT

REMOVAL AND INSTALLATION

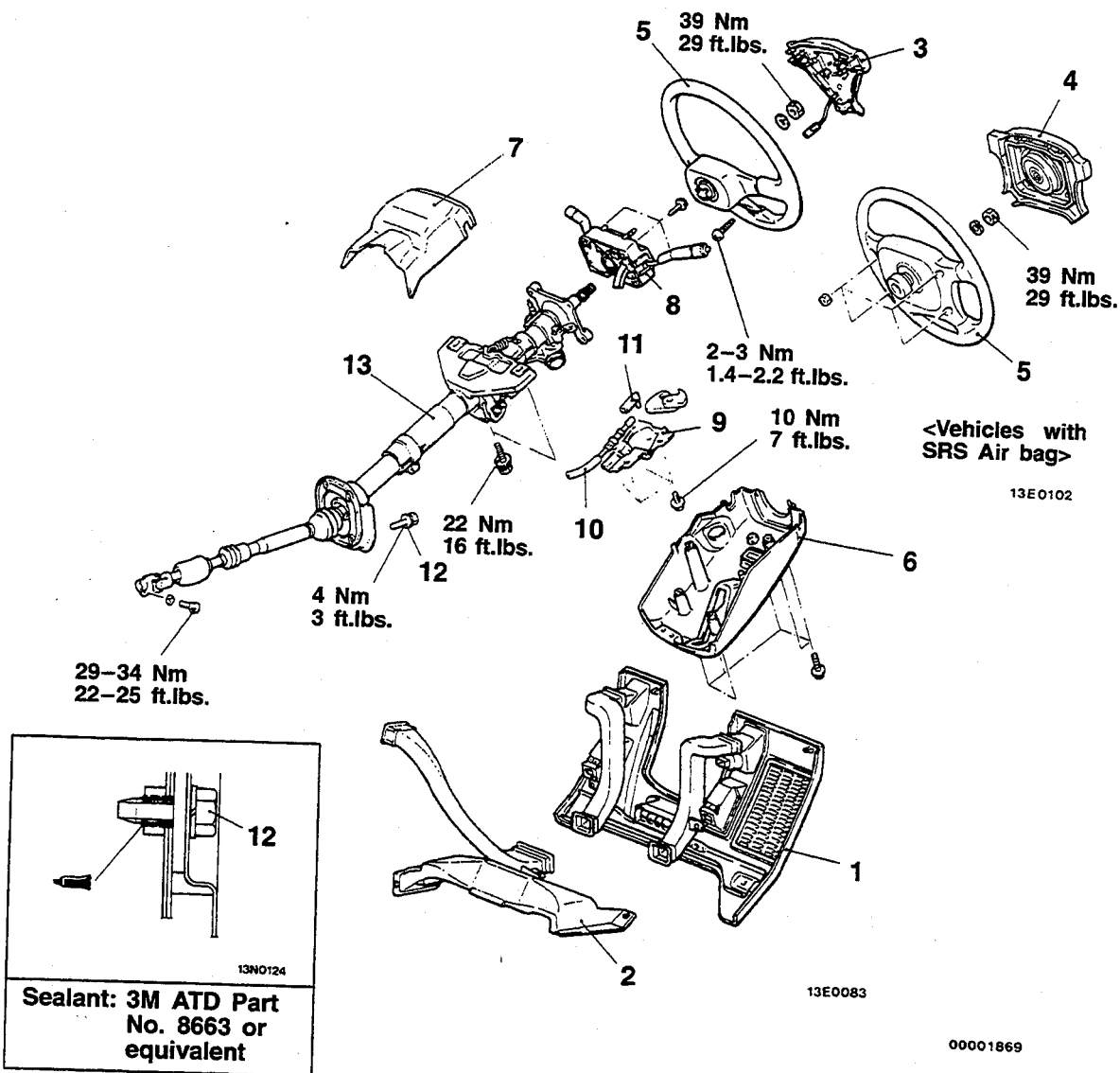
110005153

CAUTION: SRS

Before removal of air bag module, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock spring.

Post-installation Operation

- Steering Wheel Position with Wheels Straight Ahead Checking



Removal steps

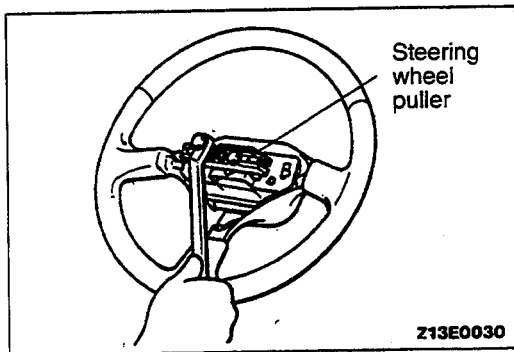
- Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
- Lap cooler duct and foot shower duct (Refer to GROUP 55 – Ventilators.)
- Horn pad
- Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)



- Steering wheel
- Lower column cover
- Upper column cover
- Column switch
- Cover <A/T> (Refer to GROUP 23 – Transmission Control.)
- Key interlock cable <A/T> (Refer to GROUP 23 – Transmission Control.)
- Slide lever <A/T> (Refer to GROUP 23 – Transmission Control.)
- Cover attaching bolt



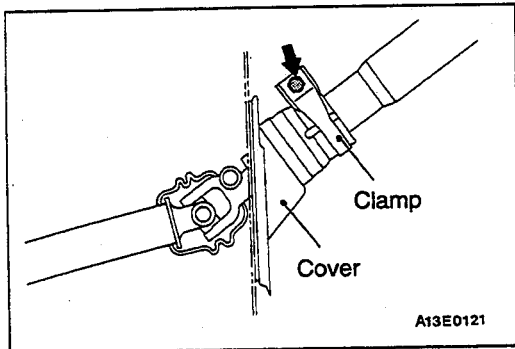
- Steering column and shaft assembly

**REMOVAL SERVICE POINT****◀A▶ STEERING WHEEL REMOVAL**

Use a steering wheel puller to remove the steering wheel.

Caution

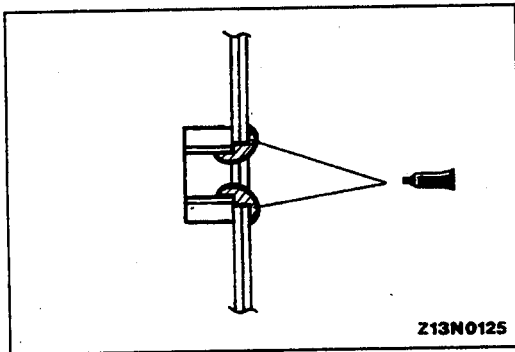
Do not hammer on the steering wheel to remove it; doing so may damage the collapsible mechanism.

**INSTALLATION SERVICE POINT****▶A◀ STEERING COLUMN AND SHAFT ASSEMBLY INSTALLATION**

When installing the steering column and shaft assembly to the vehicle body, the bolt indicated by the arrow should never be loosened.

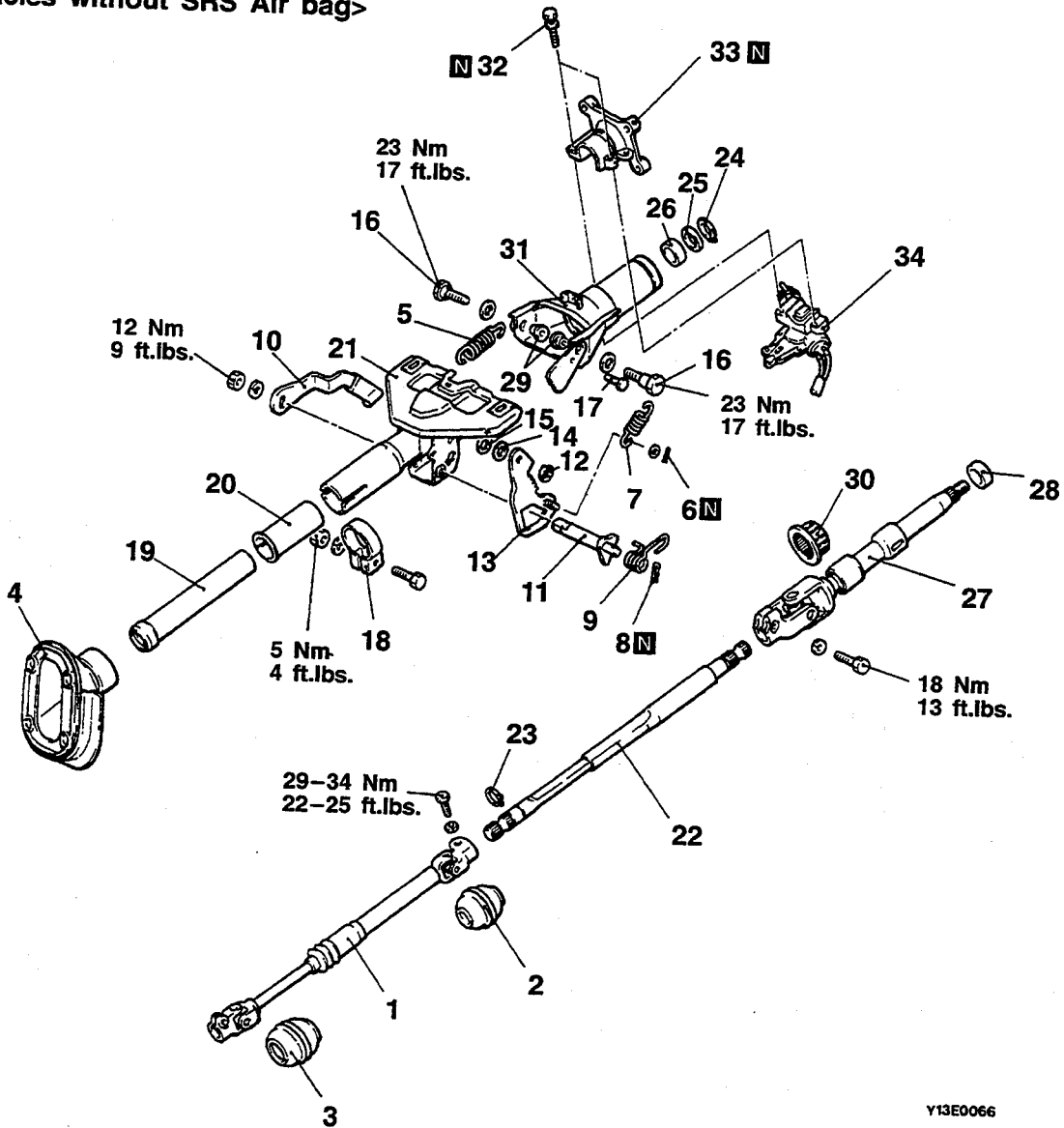
▶B◀ COVER ATTACHING BOLT INSTALLATION

Before installing the bolt, apply specified sealant to the toeboard mounting hole.



DISASSEMBLY AND REASSEMBLY

<Vehicles without SRS Air bag>



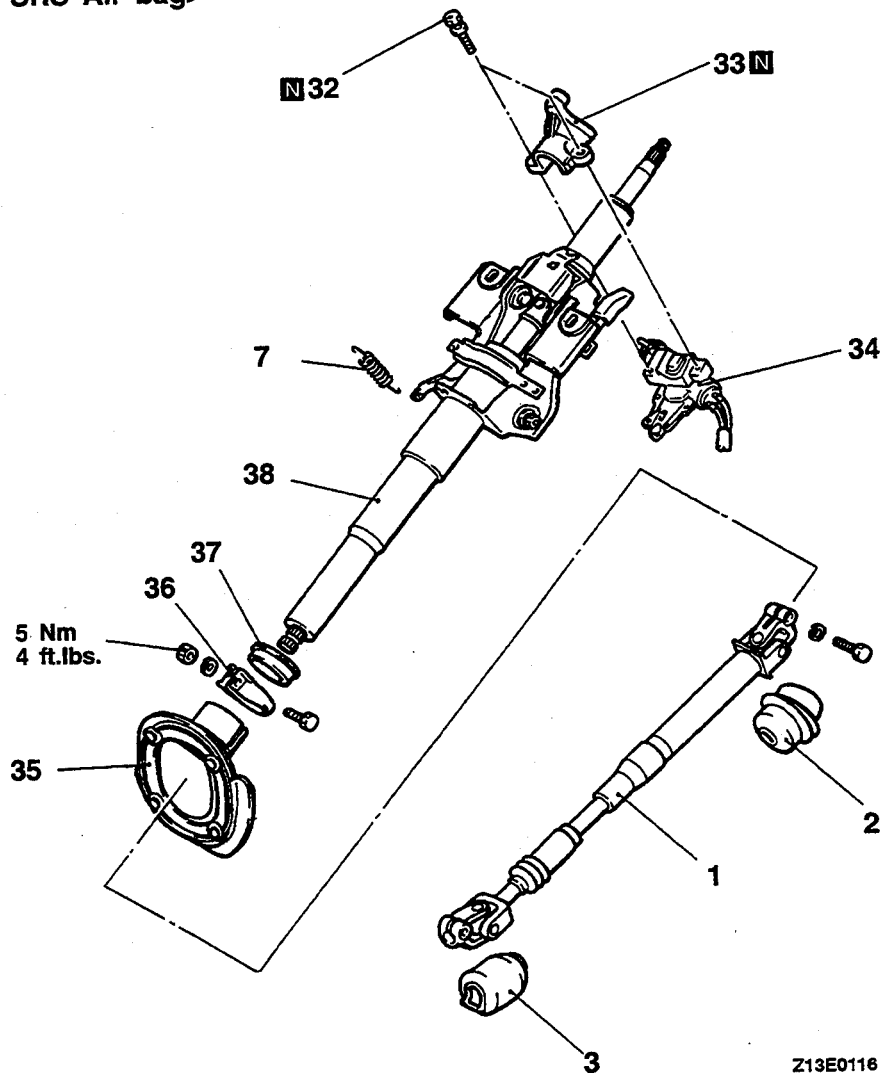
Y13E0066

Disassembly steps

- | | | | |
|-----|-------------------|-----|-----------------------------|
| ▶F◀ | 1. Joint assembly | ▶D◀ | 18. Clamp |
| | 2. Upper boot | ▶D◀ | 19. Lower pipe |
| | 3. Lower boot | | 20. Steering column bushing |
| | 4. Cover assembly | ▶C◀ | 21. Steering column, lower |
| | 5. Return spring | | 22. Steering shaft, lower |
| | 6. Split pin | | 23. Snap ring |
| | 7. Return spring | ◀B▶ | 24. Snap ring |
| | 8. Split pin | | 25. Stopper |
| | 9. Return spring | | 26. Bearing spacer |
| | 10. Tilt lever | | 27. Steering shaft, upper |
| | 11. Shaft | | 28. Bearing spacer |
| | 12. Snap ring | | 29. Bushing |
| | 13. Lock plate | | 30. Bearing |
| | 14. Washer | | 31. Steering column, upper |
| | 15. Wave washer | ▶B◀ | 32. Special bolt |
| ◀A▶ | 16. Bolt | ▶B◀ | 33. Steering lock bracket |
| ▶E◀ | 17. Clevis pin | ▶B◀ | 34. Steering lock cylinder |

TSB Revision

<Vehicles with SRS Air bag>



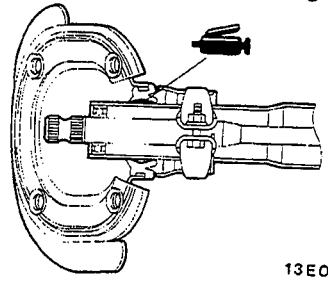
Z13E0116

Disassembly steps

- ▶F◀ 1. Joint assembly
- ▶F◀ 2. Upper boot
- ▶F◀ 3. Lower boot
- ▶F◀ 7. Return spring
- ▶B◀ 32. Special bolt
- ▶B◀ 33. Steering lock bracket
- ▶B◀ 34. Steering lock cylinder
- ▶A◀ 35. Cover assembly
- ▶A◀ 36. Clamp
- ▶A◀ 37. Bush
- ▶A◀ 38. Steering column assembly

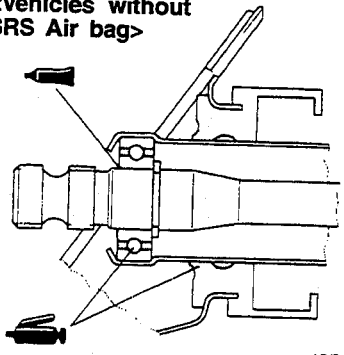
LUBRICATION, SEALING AND ADHESION POINTS

<Vehicles with SRS Air bag>



13E0110

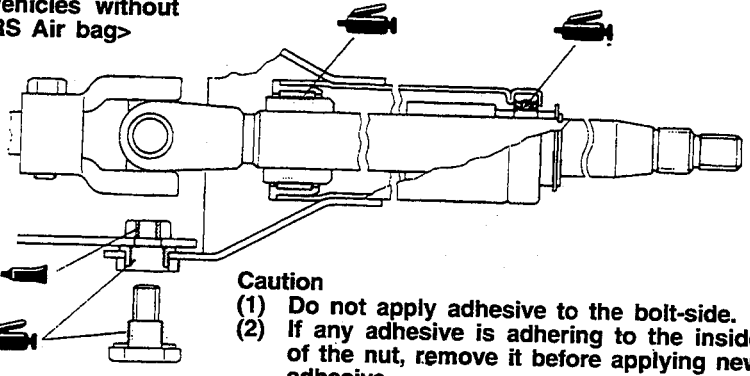
<Vehicles without SRS Air bag>



13E0018

Adhesive: 3M Stud Locking Part No. 4170 or equivalent

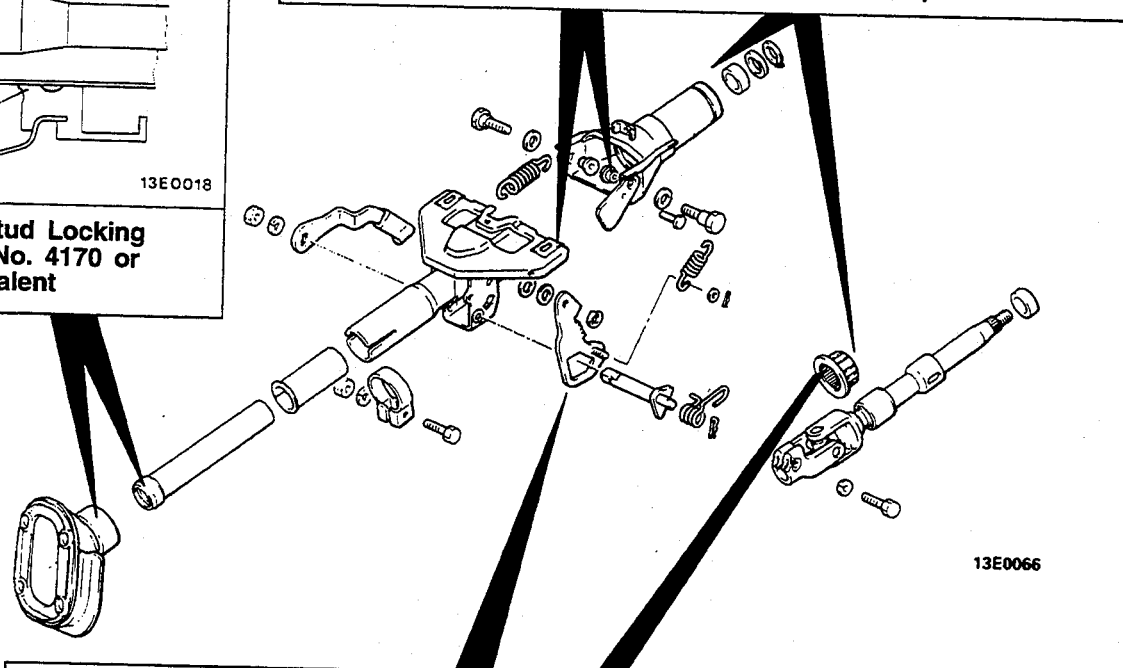
<Vehicles without SRS Air bag>



Caution
 (1) Do not apply adhesive to the bolt-side.
 (2) If any adhesive is adhering to the inside of the nut, remove it before applying new adhesive.

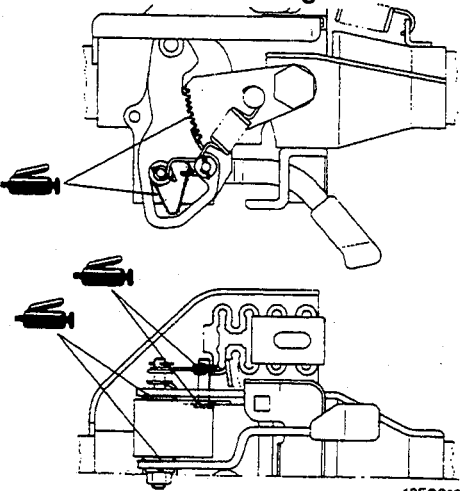
13E0017

Adhesive: 3M Stud Locking Part No. 4170 or equivalent



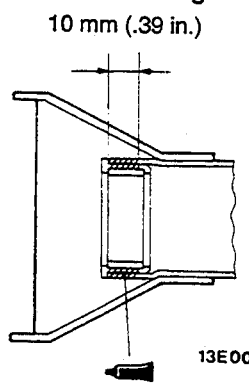
13E0066

<Vehicles without SRS Air bag>



13E0016

<Vehicles with SRS Air bag>
 10 mm (.39 in.)

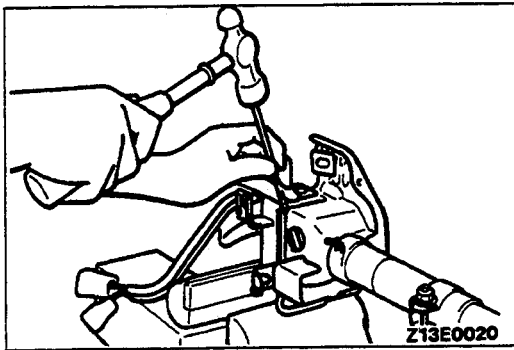


13E0041

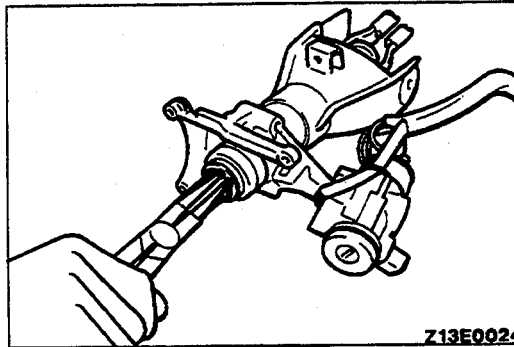
Adhesive: 3M ATD Part No. 8001 or equivalent

00001870

TSB Revision

**DISASSEMBLY SERVICE POINTS****◀A▶ CLEVIS PIN REMOVAL**

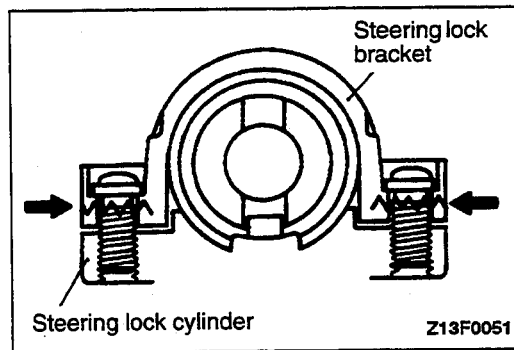
Knock the clevis pin out from the inside of the steering column.

**◀B▶ SNAP RING REMOVAL**

Use snap ring pliers to remove the snap ring from the steering shaft upper, and then take out the steering shaft upper from the bottom of the steering column upper.

NOTE

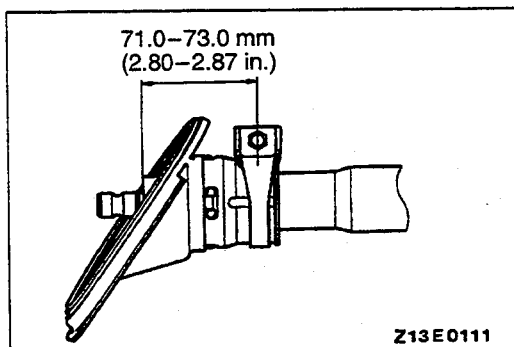
Release the steering lock to extract steering shaft upper.

**◀C▶ STEERING LOCK BRACKET/STEERING LOCK CYLINDER REMOVAL**

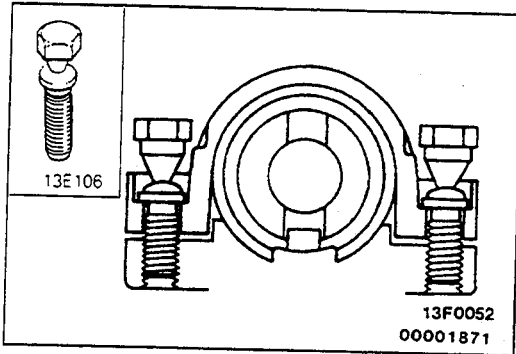
If it is necessary to remove the steering lock cylinder, use a hacksaw to cut the special bolts at the steering lock bracket side.

INSPECTION

- Check the steering shaft for play and round movement.
- Check the joints for play, damage, or rough movement.
- Check the boots and cover assembly for damage.

**REASSEMBLY SERVICE POINTS****▶A◀ CLAMP/COVER ASSEMBLY INSTALLATION**

Install the clamp to the steering column assembly as shown in the illustration.

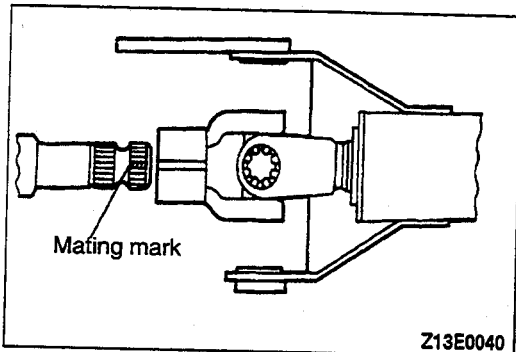


►B◄ STEERING LOCK CYLINDER/STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION

- (1) When installing the steering lock and steering lock bracket to the column tube, temporarily install the steering lock so that it is aligned with the column boss.
- (2) After checking that the lock works properly, tighten the special bolts until the heads twist off.

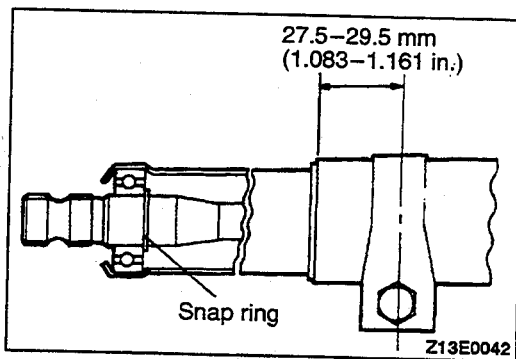
Caution

The steering lock bracket and bolts must be replaced with new ones when the steering lock is installed.



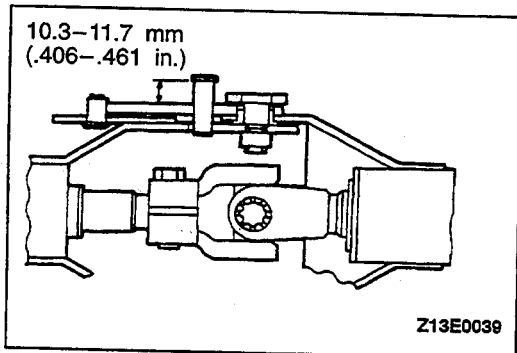
►C◄ STEERING SHAFT, LOWER INSTALLATION

When installing, align the mating mark on the steering shaft lower with the groove on the steering shaft upper yoke.



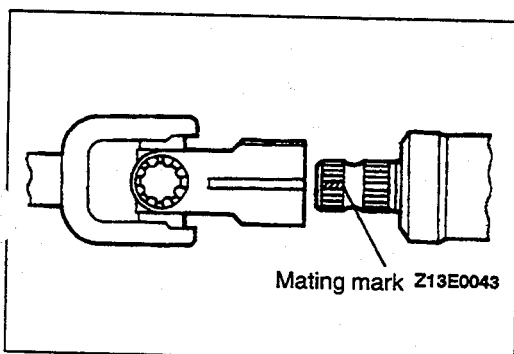
►D◄ LOWER PIPE/CLAMP INSTALLATION

- (1) Insert the lower pipe into the steering column lower until the bearing touches the snap ring on the steering shaft lower.
- (2) Install the clamp in the position shown in the illustration.



►E◄ CLEVIS PIN INSTALLATION

Insert the clevis pin by tapping it until the protruding length is as shown in the illustration.



►F◄ JOINT ASSEMBLY INSTALLATION

When installing, align the groove on the joint yoke with the mating mark on the steering shaft lower.

POWER STEERING GEAR BOX

REMOVAL AND INSTALLATION

CAUTION: SRS

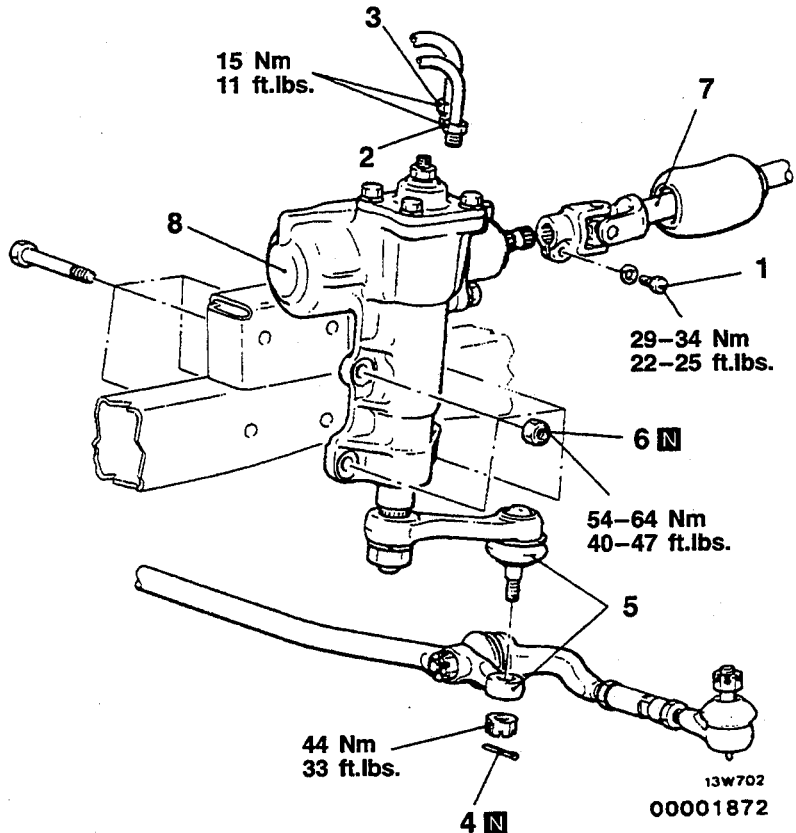
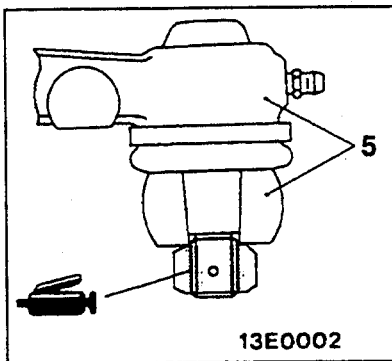
For vehicles with SRS, before removal of steering gear box, refer to GROUP 52B – SRS, center front wheels and remove ignition key. Failure to do so may damage SRS clock spring and render SRS system inoperative, risking serious driver in jury.

Pre-removal Operation

- Power Steering Fluid Draining (Refer to P.37A-11.)

Post-installation Operation

- Power Steering Fluid Supplying (Refer to P.37A-11.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-12.)



Removal steps

1. Bolt
2. Connection for pressure hose
3. Connection for return hose
4. Split pin



5. Connection for relay rod and pitman arm

6. Self-locking nuts

7. Connection for joint assembly



8. Power steering gear box

REMOVAL SERVICE POINT

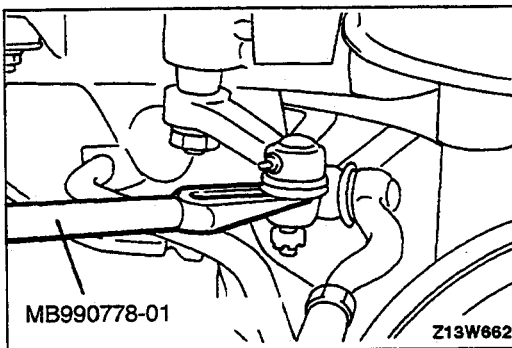
◀A▶ RELAY ROD AND PITMAN ARM DISCONNECTION

Disconnect the pitman arm from the relay rod by using the special tool.

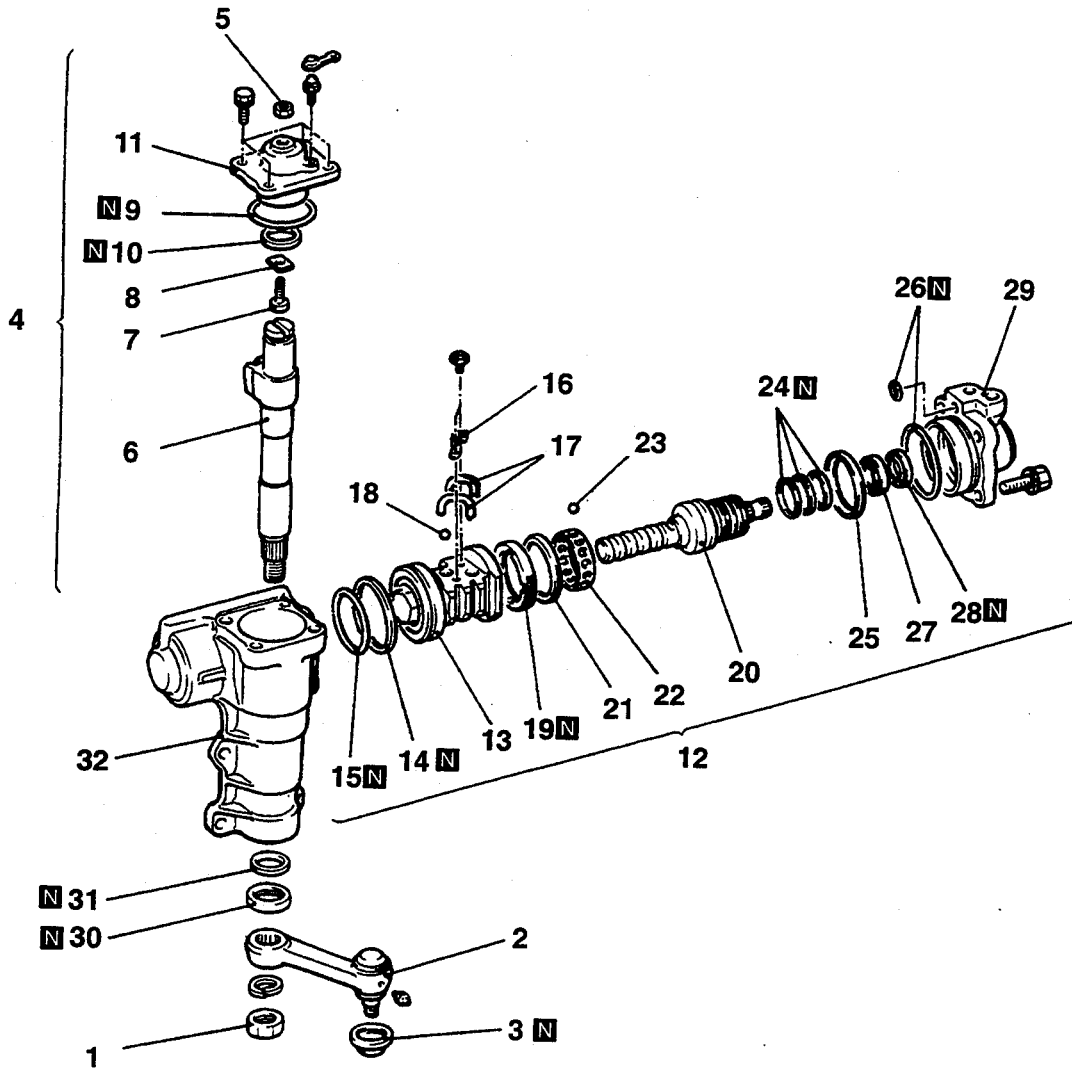
INSTALLATION SERVICE POINT

▶A◀ POWER STEERING GEAR BOX INSTALLATION

Install the power steering gear box to the frame after inserting the power steering gear box mainshaft into the joint assembly.



DISASSEMBLY



Z13W703

Disassembly steps

◀A▶

1. Jam nut

◀B▶

2. Pitman arm
3. Dust cover
4. Side cover and cross-shaft assembly

◀C▶

5. Adjusting bolt lock nut
6. Cross-shaft
7. Adjusting bolt
8. Adjusting plate
9. O-ring

◀D▶

10. Y-packing
11. Side cover
12. Main shaft and valve assembly
13. Rack piston
14. Seal ring
15. O-ring
16. Circulator holder

◀E▶

17. Circulator

◀F▶

18. Ball

◀F▶

19. Lock nut

◀F▶

20. Main shaft

◀F▶

21. Bearing race

◀G▶

22. Cage

23. Ball

24. Seal ring

25. Bearing race

26. O-ring

27. Bearing

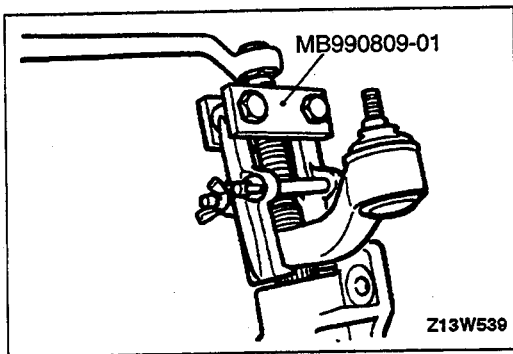
28. Oil seal

29. Valve housing

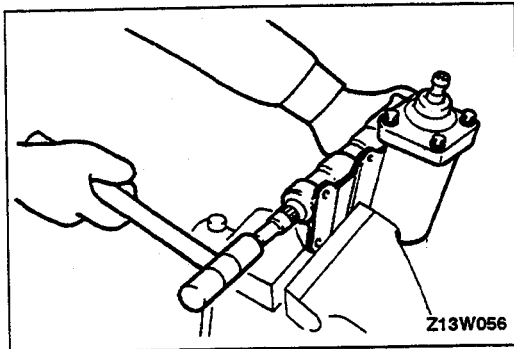
30. Oil seal

31. Y-packing

32. Gear box housing

**DISASSEMBLY SERVICE POINTS****◀A▶ PITMAN ARM REMOVAL**

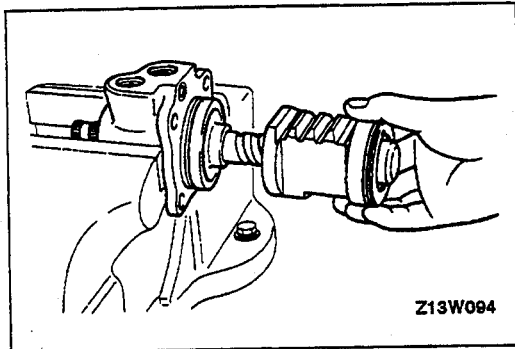
Use the special tool to remove the pitman arm from the gear box assembly.

**◀B▶ SIDE COVER AND CROSS-SHAFT ASSEMBLY REMOVAL**

With the mainshaft and cross-shaft placed in the straight-ahead position, tap the bottom of the cross-shaft with a plastic hammer to take out the cross-shaft together with the side cover.

◀C▶ Y-PACKING REMOVAL

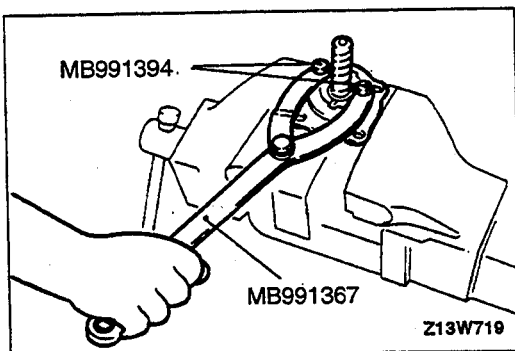
Do not remove the Y-packing at the rear of the needle bearing unless there is fluid leakage from the threads of the adjusting bolt. If there is leakage, replace the Y-packing with a new one.

**◀D▶ RACK PISTON REMOVAL**

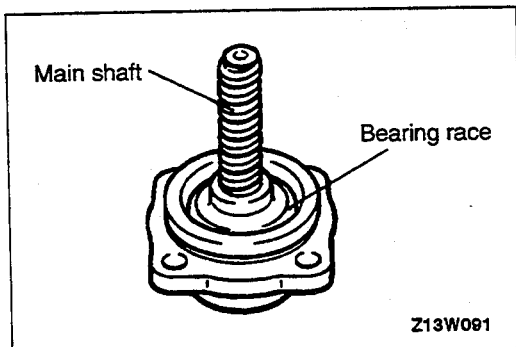
Remove the rack piston from the mainshaft by turning it counterclockwise.

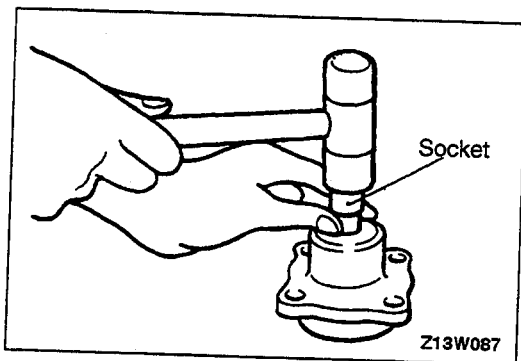
Caution

Be careful not to lose the 26 balls inside the rack piston.

◀E▶ LOCK NUT REMOVAL**◀F▶ MAIN SHAFT/BEARING RACE/CAGE/BALL REMOVAL**

When removing the main shaft, remove it while pressing the bearing race so that the balls do not come out.



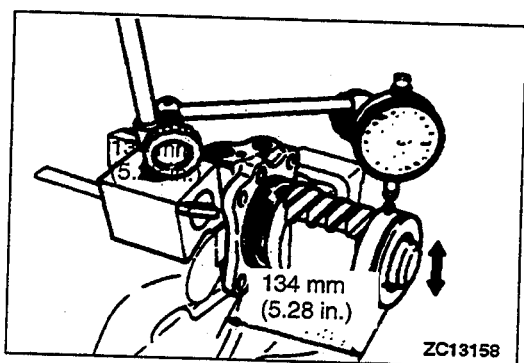


◀G▶ BEARING/OIL SEAL REMOVAL

Use a socket remove the oil seal and the bearing from the valve housing simultaneously.

INSPECTION

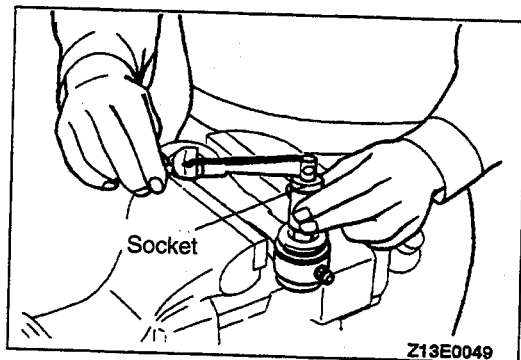
- Check the mainshaft for wear and damage.
- Check the tooth surfaces of the cross shaft and the rack piston for wear and damage.
- Check the contact part of adjusting bolt for uneven wear.
- Check the dust cover and the oil seal for wear and damage.
- Check the O-rings for damage.



1. BACKLASH BETWEEN BALL GROOVE OF RACK PISTON AND BALLS

Set the rack piston to the position shown in the illustration, and then use a dial gage to measure the backlash.

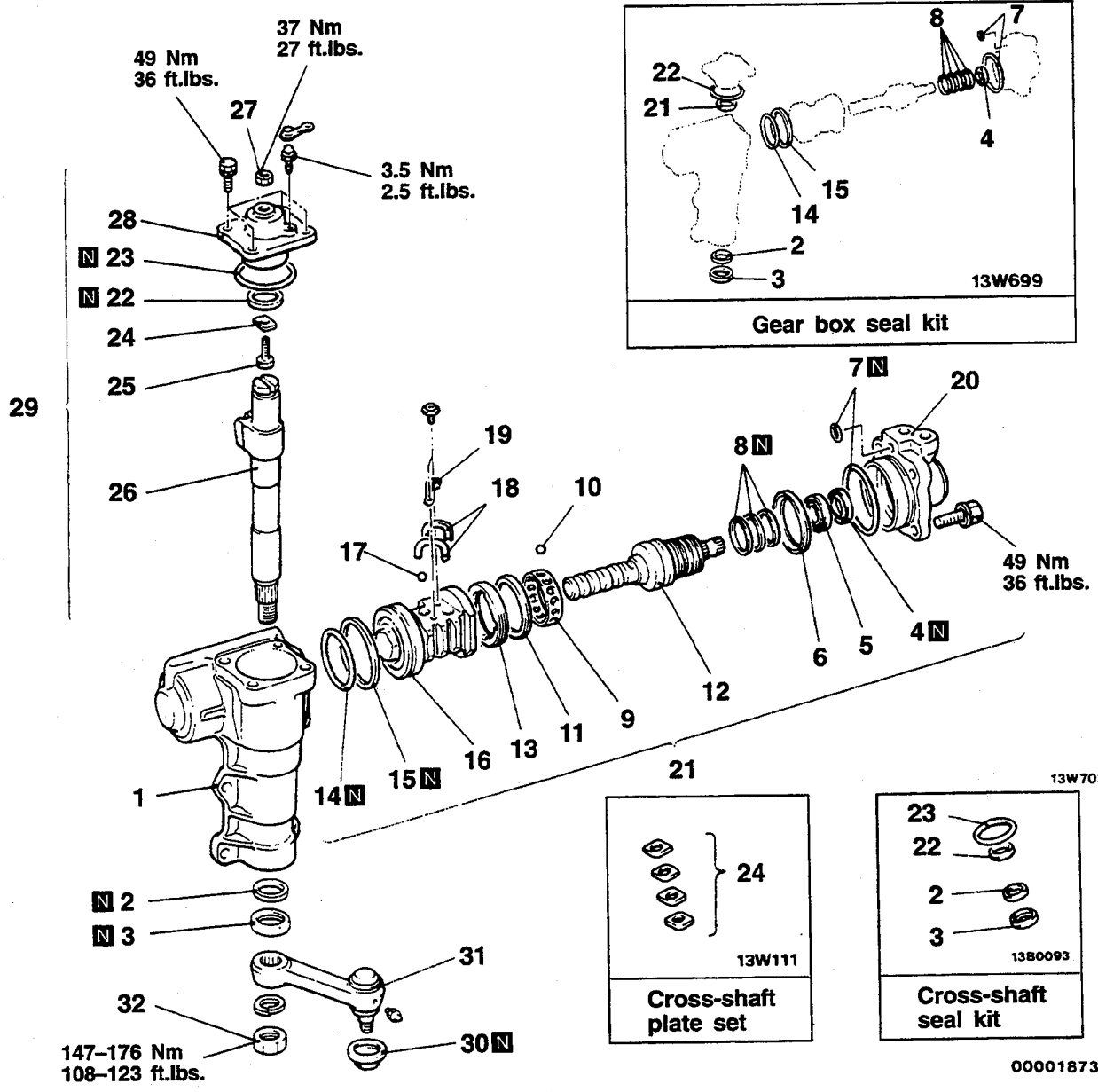
Limit: 0.05 mm (.0020 in.)



2. PITMAN ARM BALL JOINT STARTING TORQUE

Standard value: 1–3 Nm (9–26 in.lbs.)

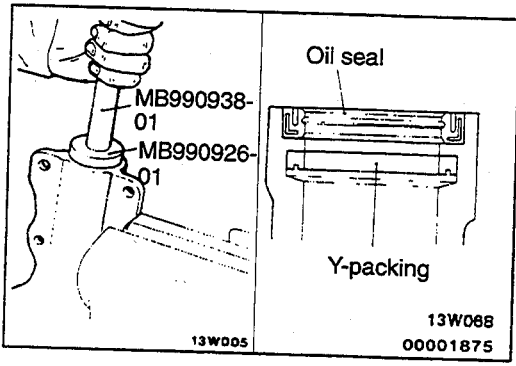
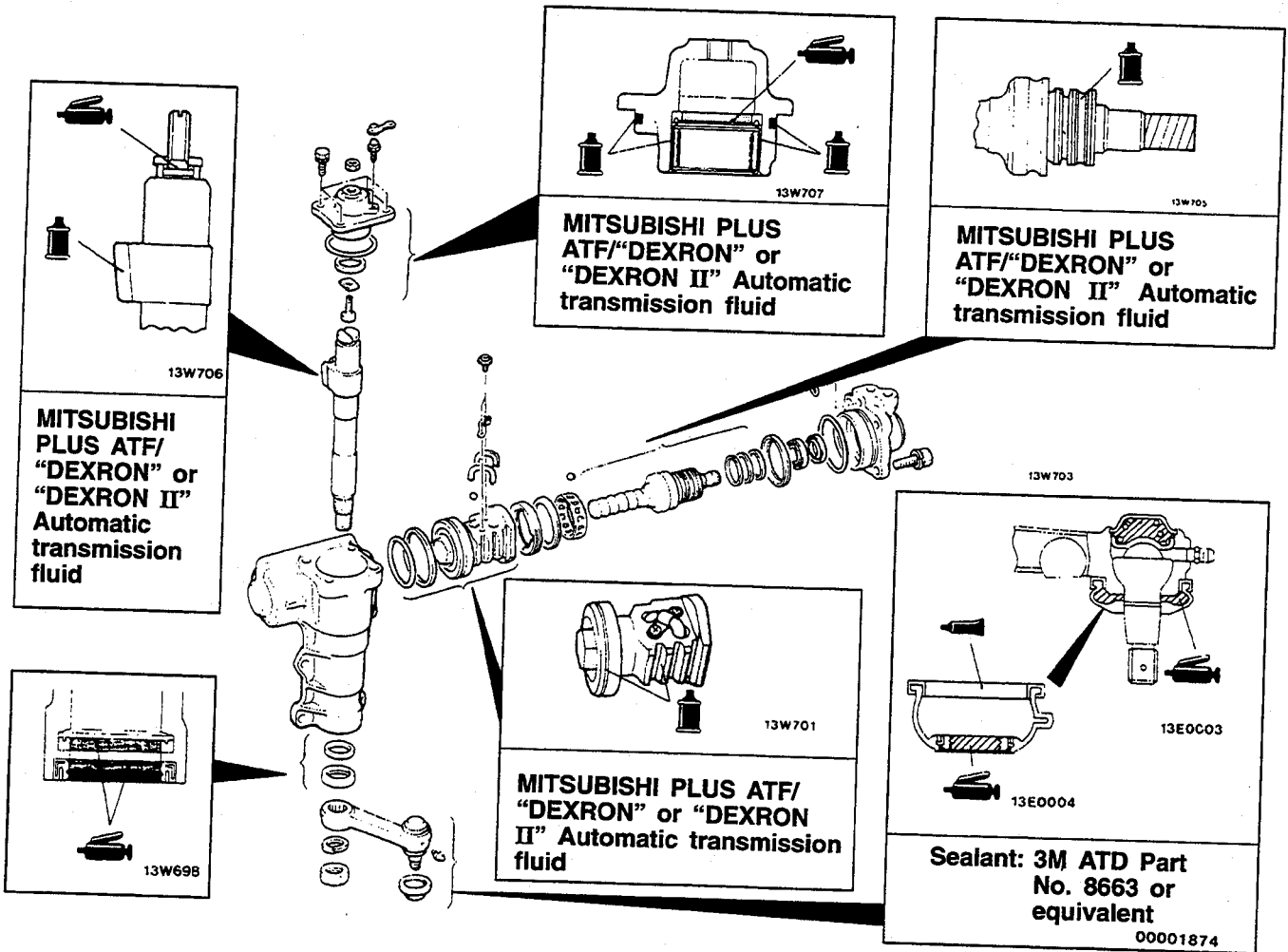
REASSEMBLY



Reassembly steps

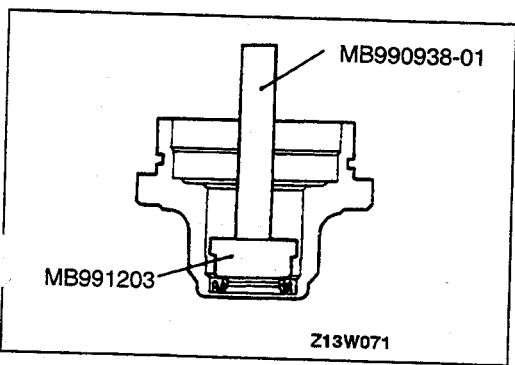
- 1. Gear box housing
- ▶A◀ 2. Y-packing
- ▶A◀ 3. Oil seal
- ▶B◀ 4. Oil seal
- ▶C◀ 5. Bearing
- 6. Bearing race
- 7. O-ring
- ▶D◀ 8. Seal ring
- ▶E◀ 9. Cage
- ▶E◀ 10. Ball
- ▶E◀ 11. Bearing race
- ▶E◀ 12. Main shaft
- ▶F◀ 13. Lock nut
- ▶G◀ 14. O-ring
- ▶H◀ 15. Seal ring
- ▶H◀ 16. Rack piston
- ▶H◀ 17. Ball
- 18. Circulator
- 19. Circulator holder
- ▶I◀ 20. Valve housing
- ▶I◀ 21. Main shaft and valve assembly
- ▶I◀ 22. Y-packing
- ▶I◀ 23. O-ring
- ▶J◀ 24. Adjusting plate
- ▶J◀ 25. Adjusting bolt
- ▶K◀ 26. Cross-shaft
- ▶K◀ 27. Adjusting bolt lock nut
- 28. Side cover
- ▶L◀ 29. Side cover and cross-shaft assembly
- ▶M◀ • Main shaft total starting torque adjustment
- 30. Dust cover
- ▶N◀ 31. Pitman arm
- 32. Jam nut

LUBRICATION AND SEALING POINTS



REASSEMBLY SERVICE POINTS
▶A◀ Y-PACKING/OIL SEAL INSTALLATION

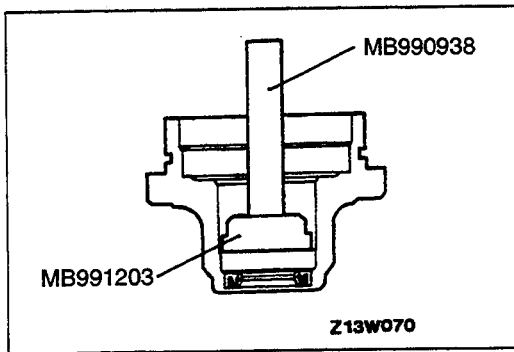
- (1) Install the Y-packing facing the direction shown in the illustration.
- (2) Use the special tool to press-fit the oil seal to the gearbox housing so that it faces in the direction shown in the illustration.



▶B◀ OIL SEAL INSTALLATION

Apply specified automatic transmission fluid to the outside of the oil seal, and then use the special tools to press the oil seal into the valve housing.

Specified fluid:
MITSUBISHI PLUS ATF/“DEXRON” or “DEXRON II” Automatic transmission fluid

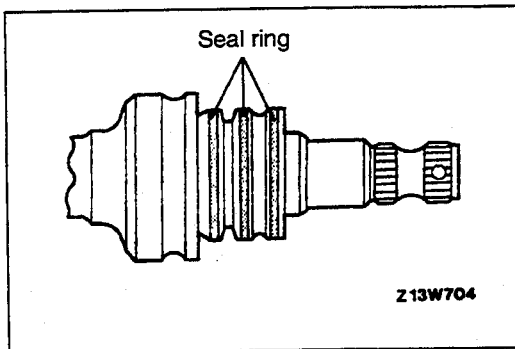


►C◄ BEARING INSTALLATION

Apply specified automatic transmission fluid to the outside of the bearing, and then use the special tools to press the bearing into the valve housing.

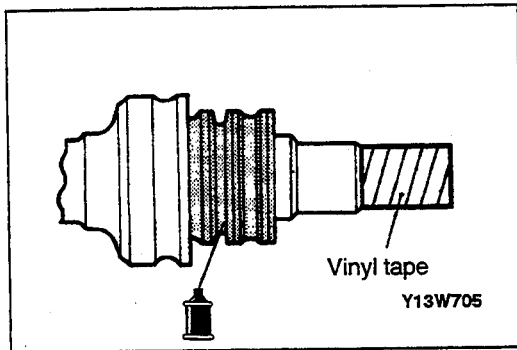
Specified fluid:

MITSUBISHI PLUS ATF/“DEXRON” or “DEXRON II” Automatic transmission fluid



►D◄ SEAL RING INSTALLATION

When installing the seal ring, press it firmly into the valve groove.



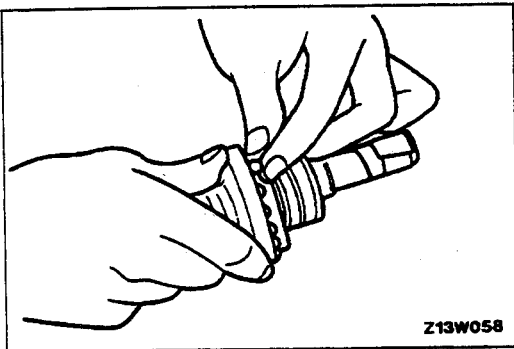
►E◄ GAGE/BALL/BEARING RACE/MAIN SHAFT INSTALLATION

- (1) Apply specified automatic transmission fluid to the valve body.

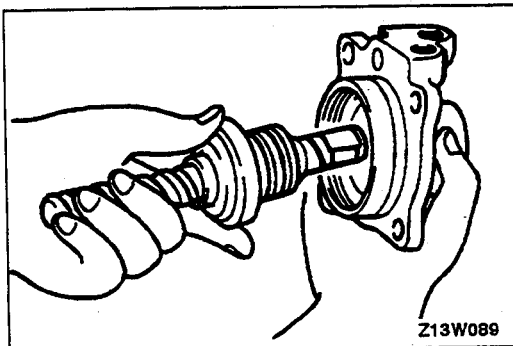
Specified fluid:

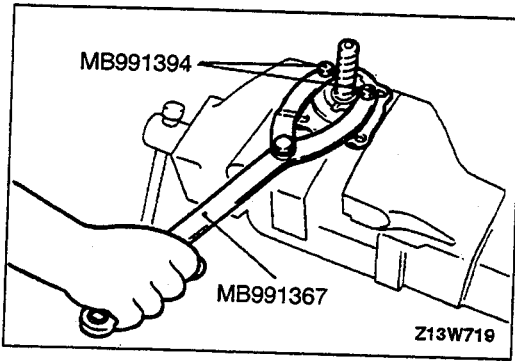
MITSUBISHI PLUS ATF/“DEXRON” or “DEXRON II” Automatic transmission fluid

- (2) Wrap vinyl tape around the serrated part so that the oil seal won't be damaged when the valve body is installed to the valve housing.
- (3) Install the valve body to the valve housing.
- (4) Align the cage's hole and the channel in the main shaft, and insert two or three balls.
- (5) Insert the remainder of the balls into the cage's hole while pressing the ball with the bearing race.



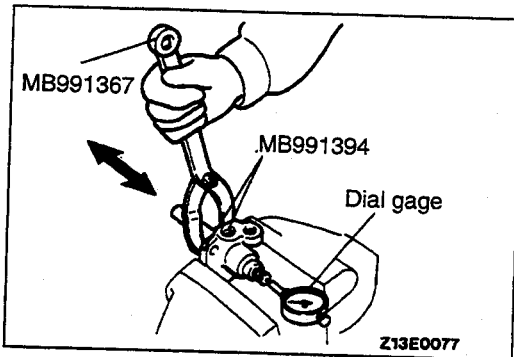
- (6) When installing the main shaft, connect it to the valve housing while pressing the bearing race so that the balls do not come out.





►F◄ LOCK NUT INSTALLATION

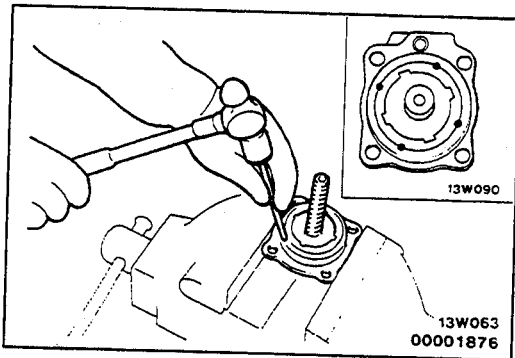
Use the special tool to tighten carefully until the lock nut contacts the bearing race.



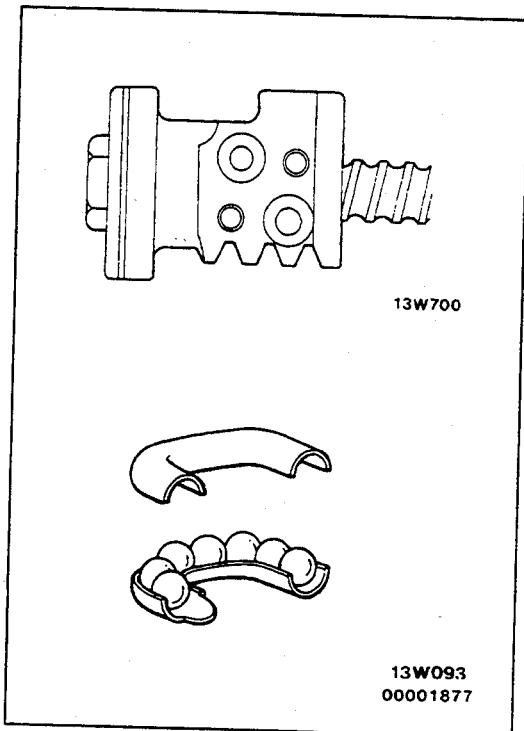
►G◄ MAIN SHAFT END PLAY ADJUSTMENT

- (1) Adjust the play by tightening the lock nut gradually so that the mainshaft end play will meet the range of standard value.

Standard value: 0.03 mm (.0012 in.) or less



- (2) Use a punch to crimp the circumference of the lock nut in order to secure the lock nut.
- (3) Check that the mainshaft rotates smoothly.



►H◄ RACK PISTON INSTALLATION

- (1) Install the rack piston until it comes in contact with the edge of the main shaft.
- (2) Rotate the main shaft to align the ball raceway with the 19-ball insertion hole.

NOTE

The balls must be inserted so that there is no clearance between them.

- (3) Set the remaining seven balls in the circulator, and install the circulator to the rack piston.

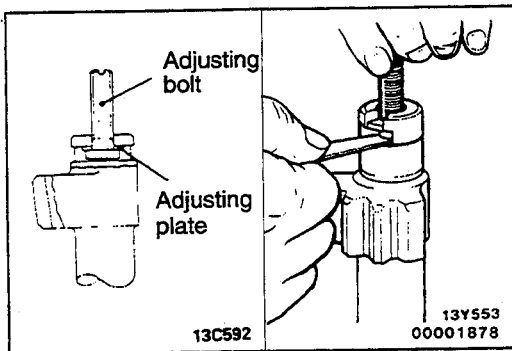
►I◀ VALVE HOUSING INSTALLATION

- (1) Apply specified automatic transmission fluid to the seal ring of the rack piston.

Specified fluid:

mitsubishi PLUS ATF/Automatic transmission fluid "DEXRON" or "DEXRON II"

- (2) Insert the valve housing.
- (3) Rotate the main shaft until the rack piston moves to the neutral position (center).



►J◀ ADJUSTING PLATE/ADJUSTING BOLT INSTALLATION

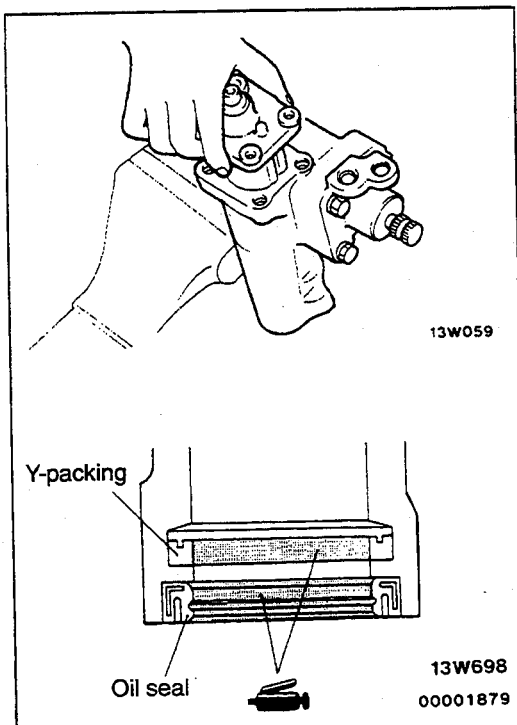
- (1) Install the adjusting plate so that the beveled part is facing downward.
- (2) Use a feeler gage to measure the clearance between the adjusting bolt and the cross-shaft.

Standard value: 0–0.05 mm (0–.002 in.)

- (3) If the clearance is exceeded the standard value, replace with a suitable adjusting plate.

►K◀ CROSS-SHAFT/ADJUSTING BOLT LOCK NUT INSTALLATION

Install the cross-shaft to the side cover, and then temporarily tighten the adjusting bolt lock nut.



►L◀ SIDE COVER AND CROSS-SHAFT ASSEMBLY INSTALLATION

Install the side cover assembly (with the cross-shaft) to the gear box.

NOTE

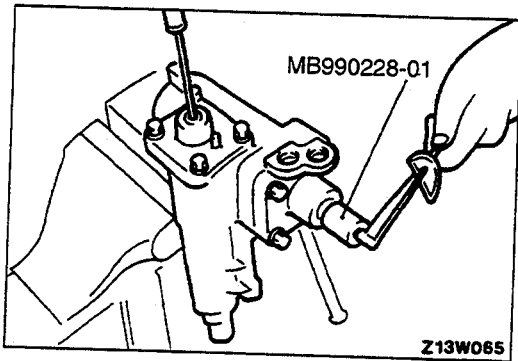
Apply specified automatic transmission fluid to the teeth and shaft areas of the rack piston, and apply multipurpose grease to the oil seal lip.

Specified fluid:

mitsubishi PLUS ATF/Automatic transmission fluid "DEXRON" or "DEXRON II"

Caution

Do not rotate the side cover during installation. Take care not to damage the cross-shaft oil seal.



►M◄ **MAIN SHAFT TOTAL STARTING TORQUE ADJUSTMENT**

- (1) Use the special tool to measure the main shaft total starting torque while turning the adjusting bolt.

Standard value: 0.45–1.25 Nm (4–11 in.lbs.)

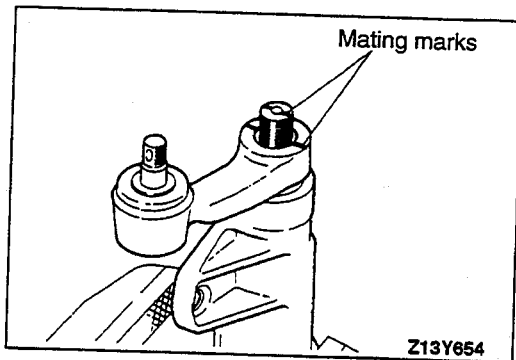
Caution

Adjust by turning the adjusting bolt so that the starting torque at the center position of the rack piston is approximately 0.2 Nm (2 in.lbs.) higher than the values at the both ends of the rack piston.

- (2) Tighten the adjusting bolt lock nut to the specified torque.

►N◄ **PITMAN ARM INSTALLATION**

Install the pitman arm to the gear box so that the mating marks are aligned.



POWER STEERING OIL PUMP

REMOVAL AND INSTALLATION

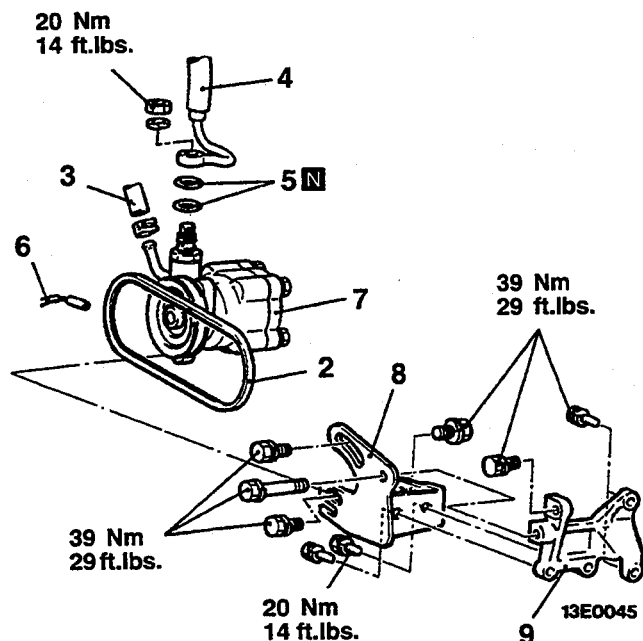
Pre-removal Operation

- Power Steering Fluid Draining (Refer to P.37A-11.)

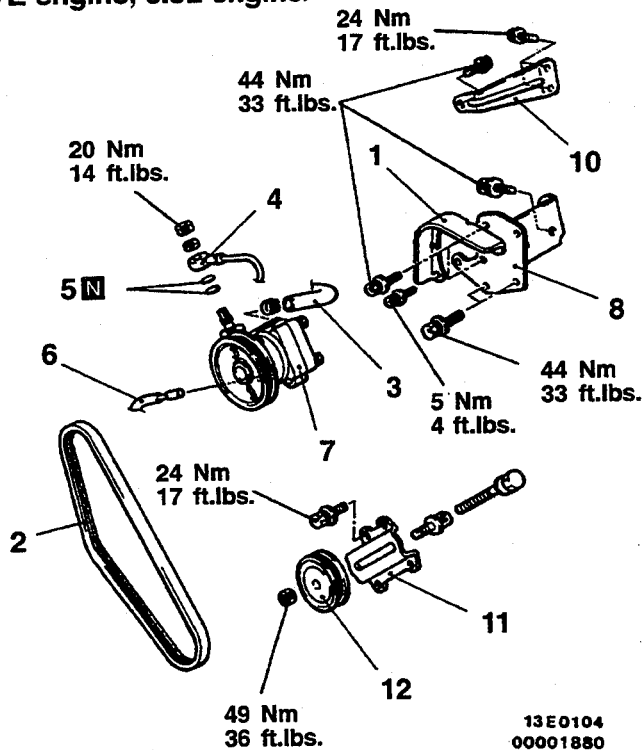
Post-installation Operation

- Power Steering Fluid Supplying (Refer to P.37A-11.)
- V-belt Tension Adjusting (Refer to P.37A-11.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-12.)
- Oil Pump Pressure Check (Refer to P.37A-13.)

<3.0L-12VALVE engine>



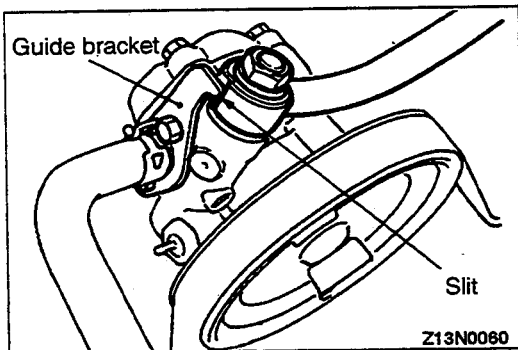
<3.0L-24VALVE engine, 3.5L engine>



Removal steps

1. Oil pump pulley cover
2. Belt
3. Suction hose
4. Pressure hose
5. O-ring
6. Pressure switch connector <Except 3.0L-12VALVE engine M/T>

7. Oil pump
8. Oil pump bracket
9. Oil pump mounting bracket
10. Oil pump stay <3.5L engine>
11. Oil pump belt tensioner bracket
12. Oil pump belt tension pulley



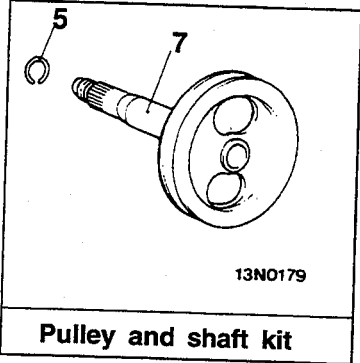
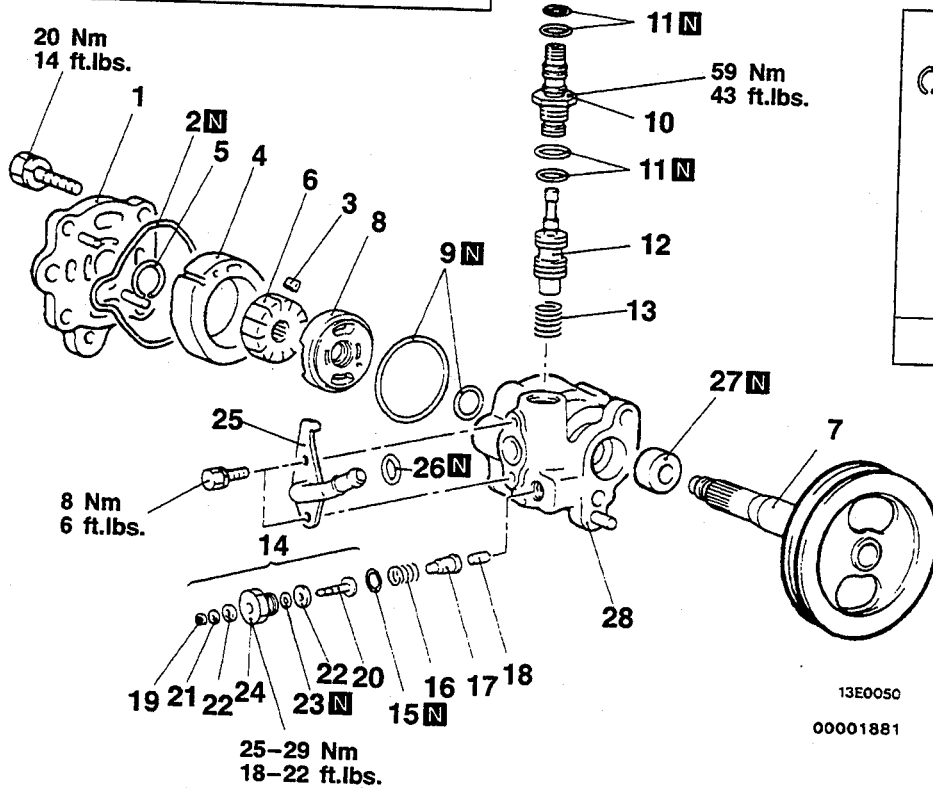
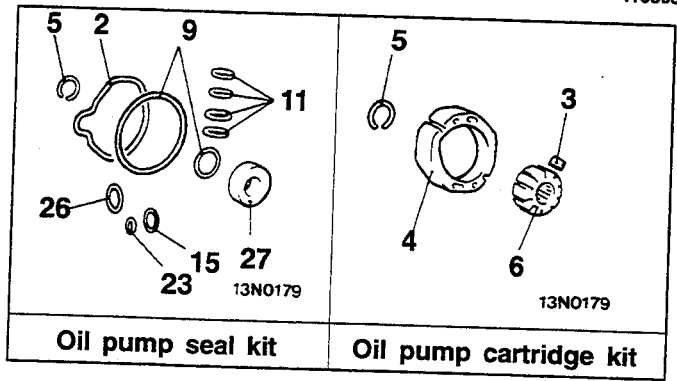
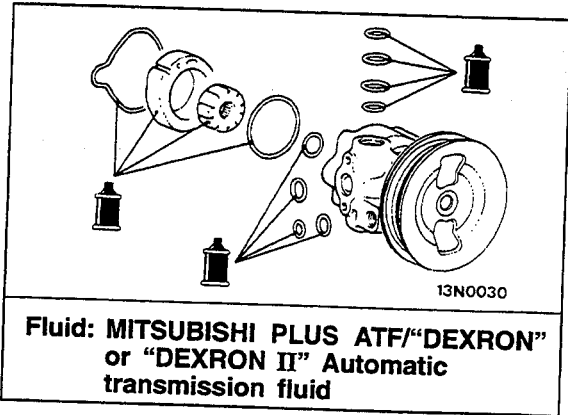
INSTALLATION SERVICE POINT

◀A▶ PRESSURE HOSE INSTALLATION

Connect the pressure hose so that its slit part contacts the oil pump's guide bracket.

DISASSEMBLY AND REASSEMBLY

110005158



Disassembly steps

- 1. Pump cover
- 2. O-ring
- 3. Vanes
- 4. Cam ring
- 5. Snap ring
- 6. Rotor
- 7. Pulley assembly
- 8. Side plate
- 9. O-ring
- 10. Connection
- 11. O-ring
- 12. Flow control valve
- 13. Flow control spring
- 14. Terminal assembly*

- 15. O-ring*
- 16. Spring*
- 17. Plunger*
- 18. Piston rod*
- 19. Snap ring*
- 20. Terminal*
- 21. Washer*
- 22. Insulator*
- 23. O-ring*
- 24. Plug*
- 25. Suction connector
- 26. O-ring
- 27. Oil seal
- 28. Oil pump body

NOTE

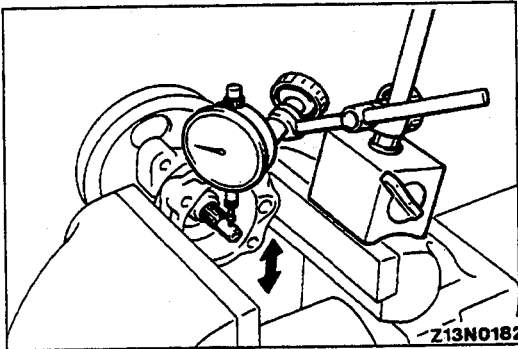
*: Except 3.0L-12VALVE engine M/T

Caution

Do not disassemble the flow control valve.

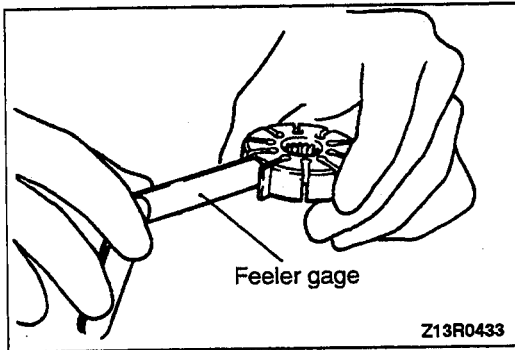
INSPECTION

- Check the flow control valve for clogging.
- Check the pulley assembly for wear or damage.
- Check the grooves of the rotor and the vane for “stepped” wear.
- Check the contact surface of cam ring and vanes for “stepped” wear.
- Check the vanes for damage.

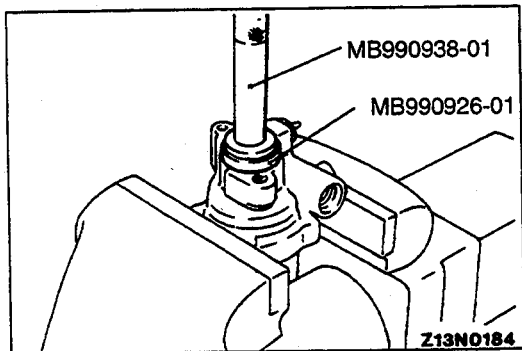
**CLEARANCE BETWEEN SHAFT AND PUMP BODY**

- (1) Place the dial gage against the end of the pulley assembly's shaft.
- (2) Move the pulley assembly up and down and measure the play.

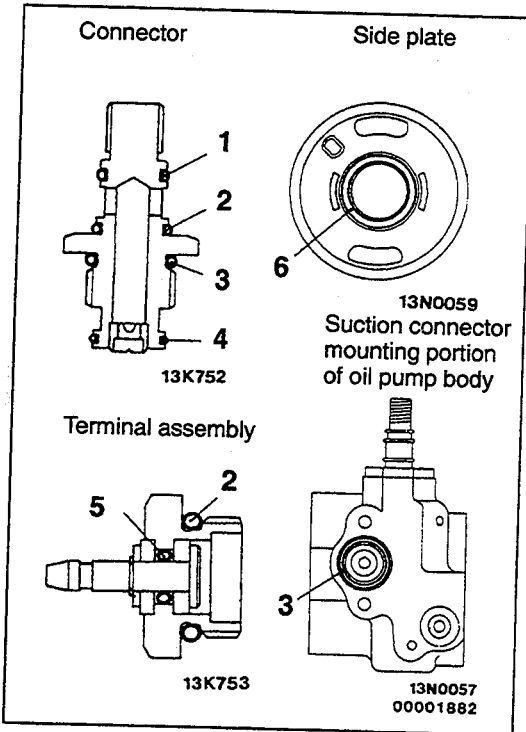
Limit: 0.1 mm (.004 in.)

**GAP BETWEEN VANE AND ROTOR GROOVE**

Limit: 0.06 mm (.0024 in.)

**REASSEMBLY SERVICE POINTS**

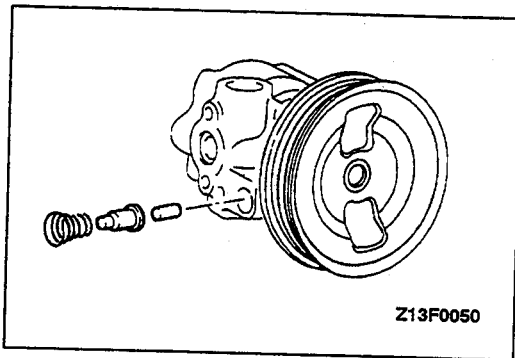
▶A◀ OIL SEAL INSTALLATION



►B◄ O-RINGS INSTALLATION

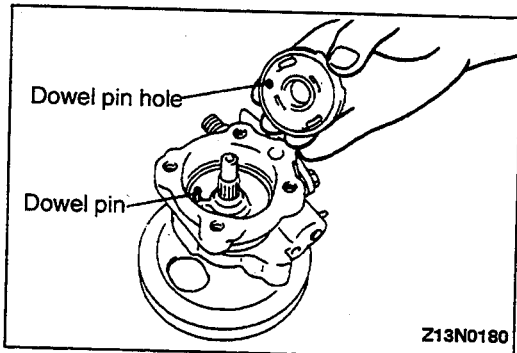
Apply specified automatic transmission fluid to the O-rings and install them.

No.	I.D×Width mm (in.)
1	11×1.9 (.433×.075)
2	13×1.9 (.512×.075)
3	17.8×2.4 (.701×.094)
4	13.5×1.5 (.531×.059)
5	3.8×1.9 (.150×.074)
6	16.8×2.4 (.661×.094)



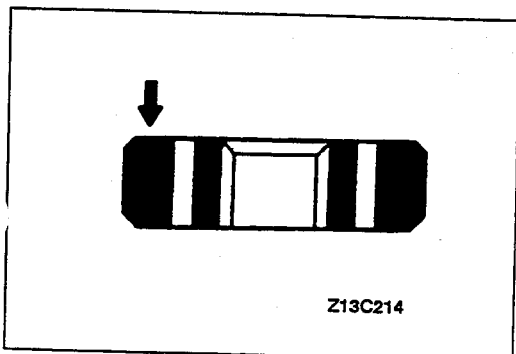
►C◄ SPRING INSTALLATION

Fit the spring to the oil pump body with the larger-diameter end at the terminal assembly side.



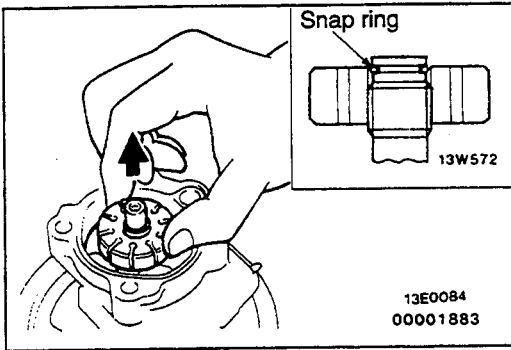
►D◄ SIDE PLATE INSTALLATION

Line up the dowel pin hole of the side plate with the dowel pin of the pump body when installing the side plate.



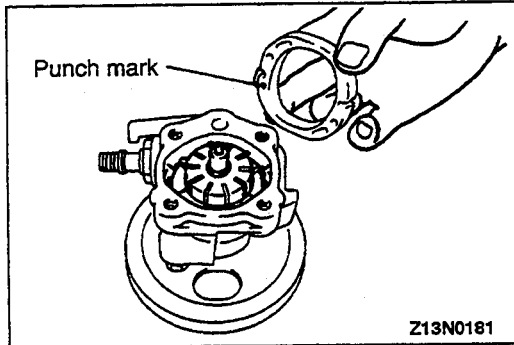
►E◄ ROTOR INSTALLATION

Install the rotor to the pulley assembly so that the rotor's punch mark is at the pump cover side.



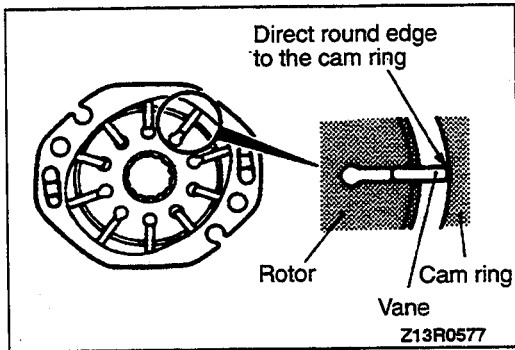
▶F◀ SNAP RING INSTALLATION

After installation of the snap ring, lift the rotor and check that the snap ring has entered the countersunk part.



▶G◀ CAM RING INSTALLATION

Install the cam ring with the punch mark facing the side plate.



▶H◀ VANES INSTALLATION

Install the vanes to the rotor, being careful not to mistake the installation direction.

STEERING HOSES

REMOVAL AND INSTALLATION

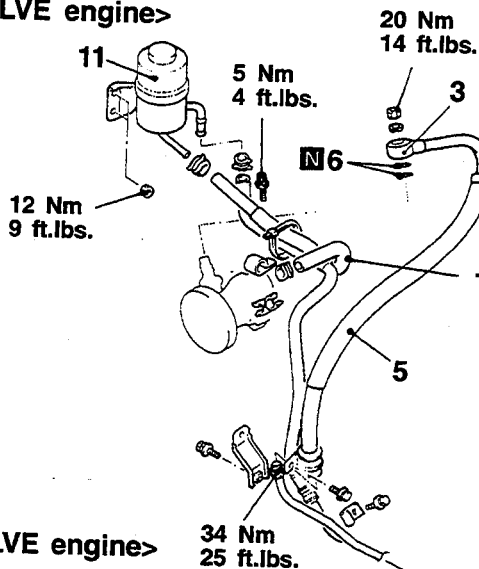
Pre-removal Operation

- Power Steering Fluid Draining (Refer to P.37A-11.)

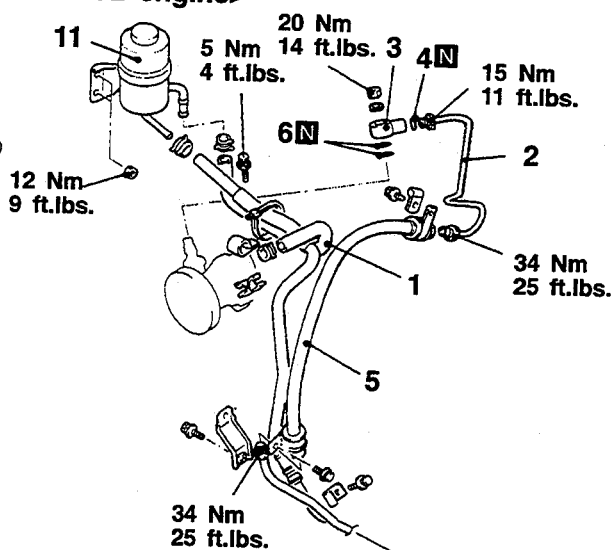
Post-installation Operation

- Power Steering Fluid Supplying (Refer to P.37A-11.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-12.)

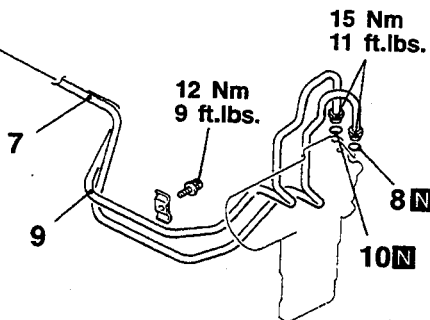
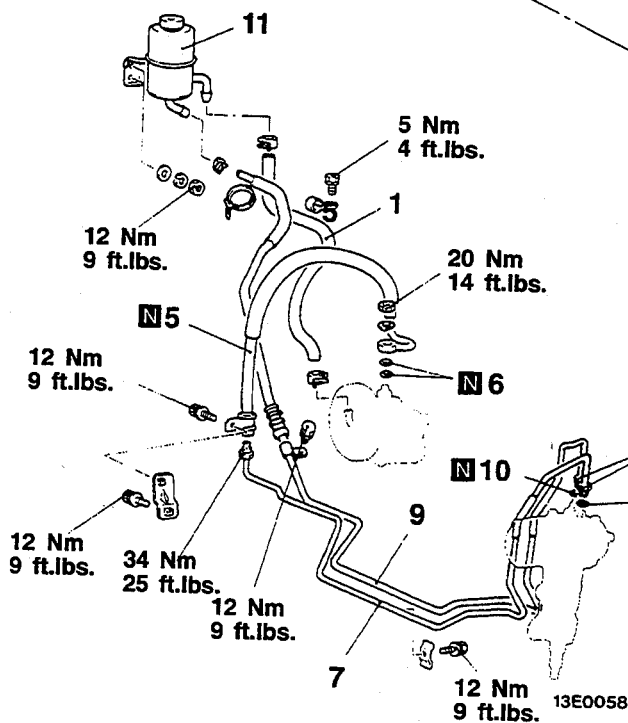
<3.0L-24VALVE engine>



<3.5L engine>



<3.0L-12VALVE engine>



13E0120
00001884

13E0058

Removal steps

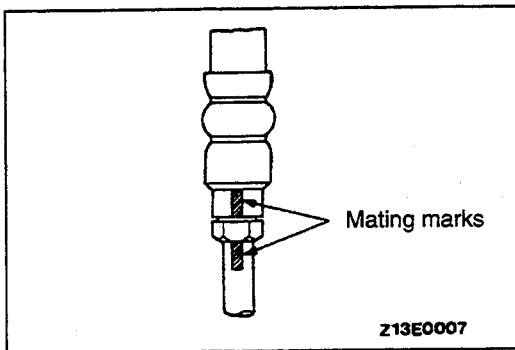
1. Suction hose
2. Pressure pipe A
3. Joint assembly
4. O-ring
5. Pressure hose
6. O-ring

- ▶A◀
7. Pressure pipe
 8. O-ring
 9. Return pipe
 10. O-ring
 11. Oil reservoir

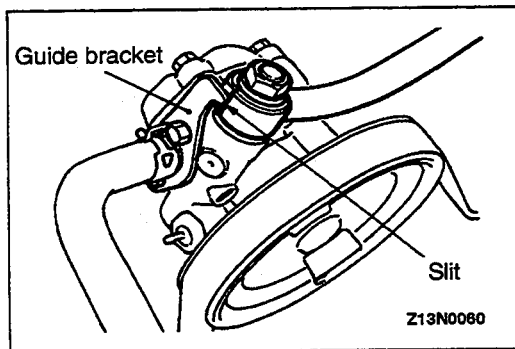
TSB Revision

INSTALLATION SERVICE POINT**▶A◀ PRESSURE PIPE/PRESSURE HOSE
INSTALLATION**

- (1) Install so that the pressure pipe and pressure hose mating marks are aligned.



- (2) Connect the pressure hose so that its slit part contacts the oil pump guide bracket.

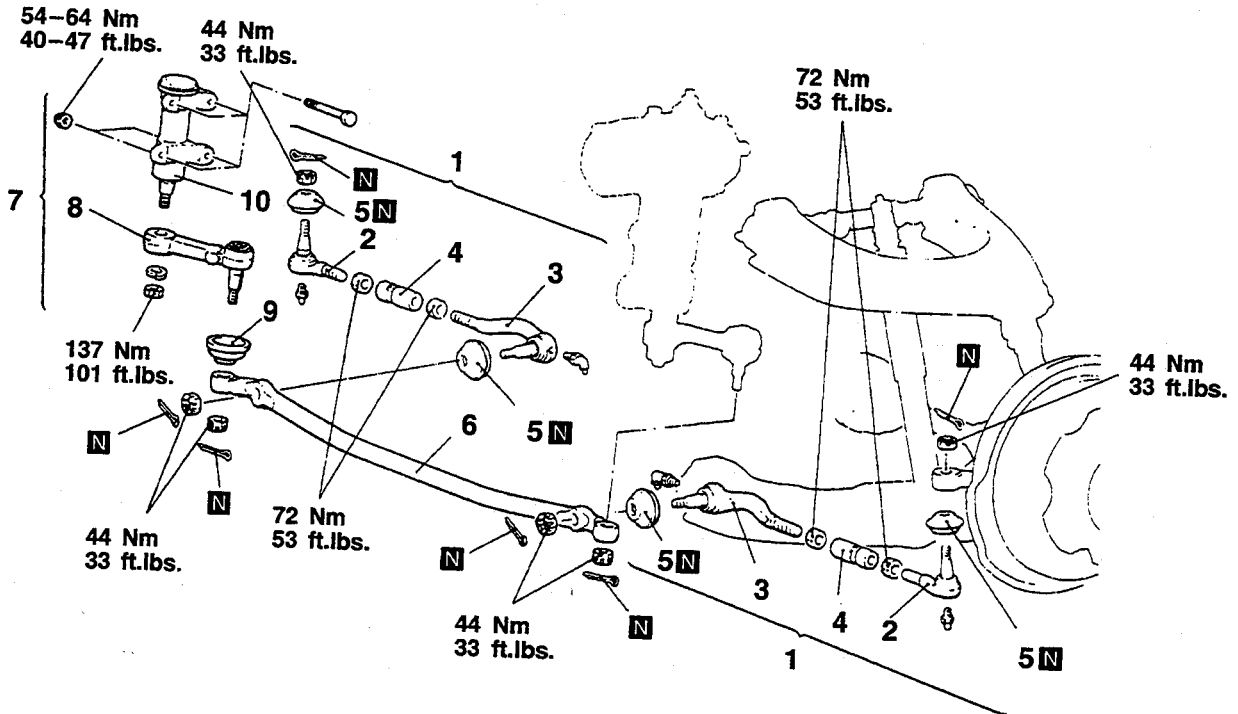
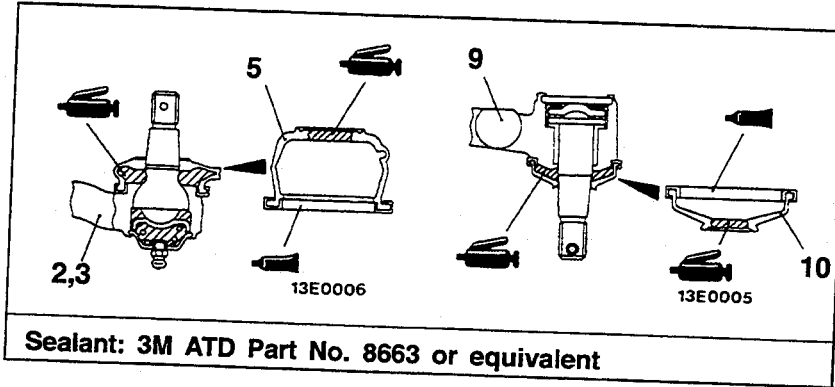


STEERING LINKAGE

REMOVAL AND INSTALLATION

Post-installation Operation

- Adjustment of the Front Wheel Alignment (Toe-in)
(Refer to GROUP 33A – Service Adjustment Procedures.)



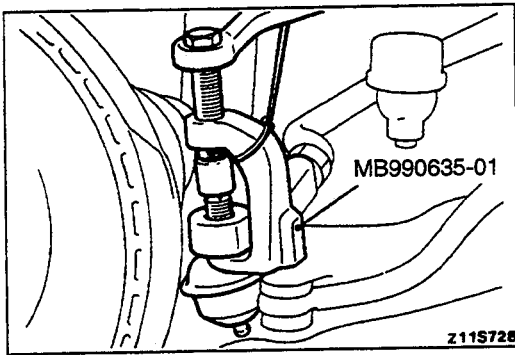
13E0073
00001885

Removal steps

1. Tie rod assembly
2. Tie rod end, outer
3. Tie rod end, inner
4. Pipe
5. Dust cover

6. Relay rod
7. Idler arm (complete)
8. Idler arm
9. Dust cover
10. Idler arm support

TSB Revision



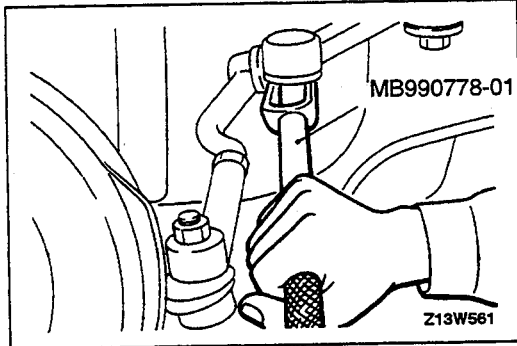
REMOVAL SERVICE POINTS

◀A▶ TIE ROD ASSEMBLY DISCONNECTION

Use the special tool to disconnect the tie rod ends, and then remove the tie rod assembly.

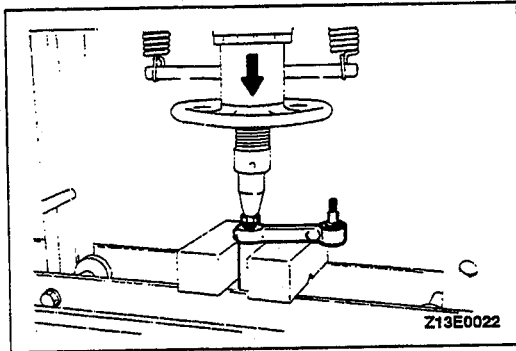
Caution

1. Use cord to bind the special tool closely so it won't become separated.
2. The nut should only be loosened, not removed.



◀B▶ RELAY ROD DISCONNECTION

Use the special tool to disconnect the connecting portions of the idler arm and the steering gear box, and then remove the relay rod.



◀C▶ IDLER ARM REMOVAL

Use a bench press to remove the idler arm.

Caution

The nut should only be loosened, not removed.

INSPECTION

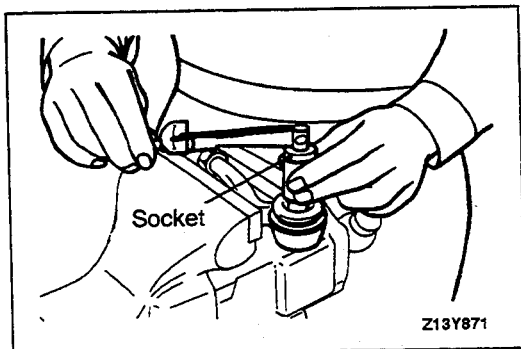
- Check the idler arm support for damage and deformation.
- Check the idler arm for damage and deformation.
- Check the dust covers for damage and cracks.
- Check the tie rods for damage and deformation.
- Check the relay rod for bends and damage.
- Check the grease nipples for clogging and looseness.

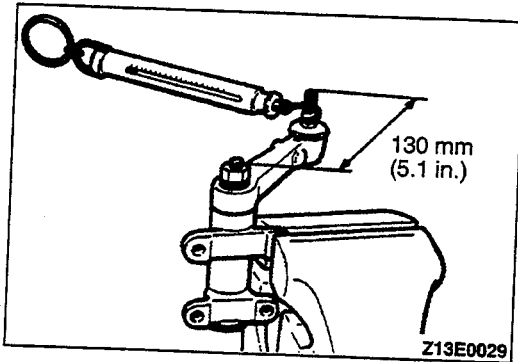
BALL JOINT STARTING TORQUE CHECK

Standard value:

Tie rod end 1–3 Nm (9–26 in.lbs.)

Idler arm 0.5–2.0 Nm (4–17 in.lbs.)

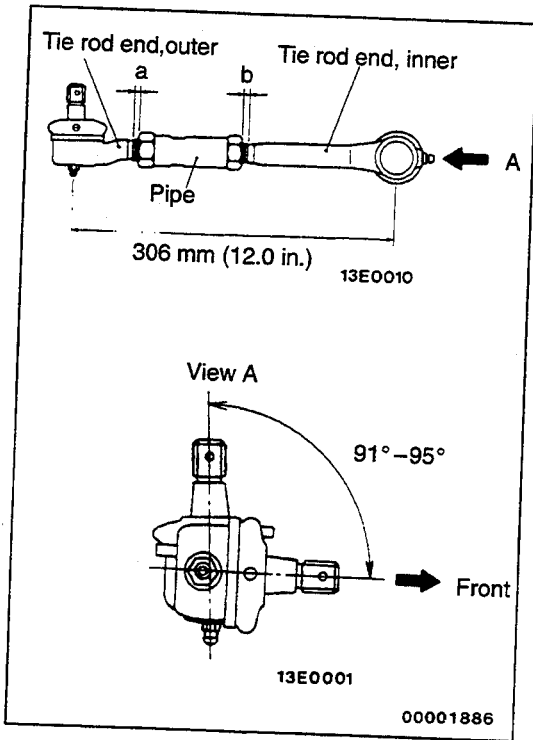




IDLER ARM STARTING TORQUE CHECK

Standard value:

0.3–2.0 Nm (3–17 in.lbs.)
[2.3–15.4 N (.5–33.9 lbs.)]



INSTALLATION SERVICE POINTS

▶A◀ PIPE/TIE ROD END, INNER/TIE ROD END, OUTER INSTALLATION

- (1) Install the tie rod assembly so that the dimension is as shown in the illustration.

NOTE

The illustration at left shows the left-side tie rod assembly. The right-side tie rod assembly is symmetrical to the left-side assembly.

- (2) Adjust the pipe so that the difference between dimensions a and b is 1.5 mm (.059 in.) or less, and then provisionally tighten the lock nut.

NOTE

Fully tighten the lock nut after the tie rod assembly is installed to the body and the toe-in has been adjusted.

NOTES

BODY

CONTENTS

110005161

BACK DOOR ASSEMBLY	41	SEALANTS AND ADHESIVES	4
BACK DOOR HANDLE AND LATCH	43	SERVICE ADJUSTMENT PROCEDURES	9
BACK DOOR TRIM AND WATERPROOF FILM	42	Back Door Adjustment	10
BACK DOOR WINDOW GLASS	23	Door Inside Handle Play Adjustment	10
BODY MOUNTING	12	Door Outside Handle Play Check	10
DOOR ASSEMBLY	25	Door Window Glass Adjustment	10
DOOR GLASS AND REGULATOR	30	Front and Rear Door Adjustment	9
DOOR HANDLE AND LATCH	33	Fuel Filler Door Adjustment	9
DOOR TRIM AND WATERPROOF FILM	27	Hood Adjustment	9
FENDER	15	Water Test	11
FUEL FILLER DOOR	14	SERVICE SPECIFICATIONS	3
GENERAL SPECIFICATIONS	2	SPECIAL TOOLS	4
HOOD	13	SUNROOF	44
KEYLESS ENTRY SYSTEM	37	TROUBLESHOOTING	5
QUARTER WINDOW GLASS	21	WINDOW GLASS	16
		WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP	40
		WINDSHIELD	18

GENERAL SPECIFICATIONS

110005162

Items		Specifications	
Hood	Type	Rear hinged, front opening type	
Front door	Construction	Front hinged, sash construction	
	Regulator system	Wire type	
	Locking system	Pin-fork type	
Rear door	Construction	Front hinged, sash construction	
	Regulator system	Wire type	
	Locking system	Pin-fork type	
Back door	Construction	Right hinged, sash construction	
	Locking system	Pin-fork type	
Glass	Installation method	Windshield glass	Adhesive type
		Back door window glass	Adhesive type
	Thickness mm (in.)	Windshield glass	5.3 (.21)
		Quarter window glass	4.0 (.16)
		Front door glass	3.5 (.14)
		Rear door glass	3.5 (.14)
		Back door window glass	3.5 (.14)
Sunroof glass	5.0 (.20)		
Frame type		Ladder type	
Power window motor	Type	Permanent magnet type (built-in circuit breaker)	
	Revolutions under no load rpm	75 or more	
	Revolutions under load [At 1 Nm (.72 ft.lbs.)] rpm	65–95	
	Revolutions under load [At 2 Nm (1.45 ft.lbs.)] rpm	50–80	
	Bound current A	34 or less	
	Direction of rotation	Clockwise and anti-clockwise	
Sunroof motor	Type	DC ferrite (with built-in circuit breaker)	
	Speed at no load rpm	155–195	
	Speed at load [At 2 Nm (1.45 ft.lbs.)] rpm	110–150	
	Bound current A	35 or less	
	Turning direction	Both clockwise and anti-clockwise	

Items		Specifications
Power window main switch	Type	Automatic reset type
	Rated load current (Lock switch) A	25
	Rated load current (Power window switch) A	10
Power window sub switch	Type	Automatic reset type
	Rate load current A	10
Power window relay	Maximum contact current A	20
	Rated coil current A	0.2 or less
	Voltage drop between terminals (At 12 V and the rated load current) V	0.3 or less
Door lock control unit	Effective voltage V	10–16
	Current consumption (when not in operation) mA	3 or less
Door Lock power relay	Range of voltage used V	10–16
	Rated load current (at 13.5 V) A	10
	Rated coil current A	0.2 or less
	Voltage drop between terminals V	0.2 or less
Front door lock actuator	Bound current (at 12 V) A	2.5–4.5
	Operator voltage range V	9–15
	*Tripping time (at 12 V) Second	5–30
Rear door lock actuator	Bound current (at 12 V) A	2.5–4.5
	Operator voltage range V	9–15
	*Tripping time (at 12 V) Second	5–30

NOTE

*Tripping time is the time consumed until current reaches 0.5 A after power connection.

SERVICE SPECIFICATIONS

110005163

Items		Standard value
Door inside handle play	mm (in.)	4–10 (.16–.39)
Door outside handle play mm (in.)	Front and rear door	3–12 (.12–.47)
	Back door	2–8 (.08–.31)
Slipping force of motor clutch	N (lbs.)	39–49 (9–11)
Sunroof sliding resistance	N (lbs.)	196 (44)

TSB Revision


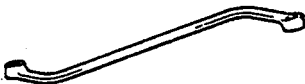
SEALANTS AND ADHESIVES

110005164

Items	Specified sealants and adhesives
Screen drip Sunroof glass weatherstrip	3M ATD Part No. 8001, 3M ATD Part No. 8011 or equivalent
Fender panel Splash shield Waterproof film	3M ATD Part No. 8625 or equivalent
Windshield glass Rear window glass	3M Super Fast Urethan Auto Glass Sealant Part No. 8609 or equivalent
	3M Super Fast Urethan Primer Part No. 8608 or equivalent
Sunroof glass weatherstrip	3M ATD Part No. 8513 or equivalent
	3M ATD Part No. 8509 or equivalent
Rail end cover	3M ATD Part No. 8531, 8646 or equivalent

SPECIAL TOOLS

110005165

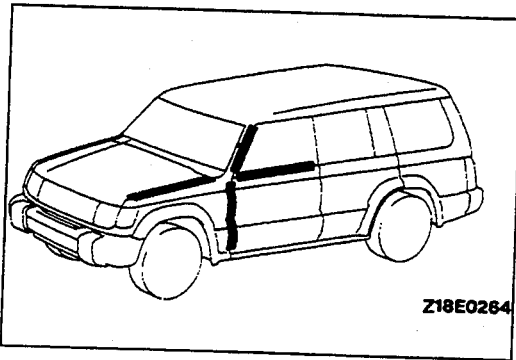
Tool	Tool number and name	Supersession	Application
	MB990449 Window moulding remover		Removal of window moulding
	MB990900-01 Door adjusting wrench		Adjustment of door fit

TROUBLESHOOTING

HOOD, GLASS, DOORS AND SUNROOF

Trouble Symptom		Probable Cause	Remedy
Hood	Incorrect closure	Striker and latch not properly aligned	Adjust the alignment.
	Difficult locking and unlocking	Striker and latch not properly aligned	Adjust the alignment.
	Uneven body clearance	Incorrectly installed hood or trunk lid	Adjust the installation of the hood or the trunk lid.
	Uneven height	Incorrect hood bumper or trunk lid bumper height	Adjust the hood bumper or the trunk lid bumper height.
Window glass	Water leak through windshield	Malfunction of seal	Apply sealant.
		Incorrect body flange	Correct
	Water leak through door window glass	Incorrect window glass installation	Adjust the position.
		Gap at upper window glass	Adjust the position.
	Water leak through quarter window	Malfunction of seal	Apply sealant.
		Incorrect body flange	Correct
	Water leak through rear window	Malfunction of seal	Apply sealant.
		Incorrect body flange	Correct
Front/rear/back doors	Malfunction of door window	Incorrect window glass installation	Adjust the position.
		Damaged or defective regulator	Correct or replace
	Water leak through door edge	Cracked or defective weatherstrip	Replace
	Water leak from door center	Clogged drain hole	Remove the foreign material.
		Damaged waterproof film or poor film contact	Correct or replace
	Door is hard to open	Incorrect latch or striker adjustment	Adjust
	Door does not open or close completely	Incorrect door installation	Adjust the position.
		Malfunction of door check strap	Correct or replace
		Door check strap and hinge requires grease	Apply grease
	Uneven body clearance	Incorrect door installation	Adjust the position.
	Wind noise around door	Weatherstrip not holding firmly	Adjust the fit of the door.
		Incorrectly installed weatherstrip	Repair or replace
		Incorrectly closed door	Adjust
		Incorrect door fit adjustment	Adjust

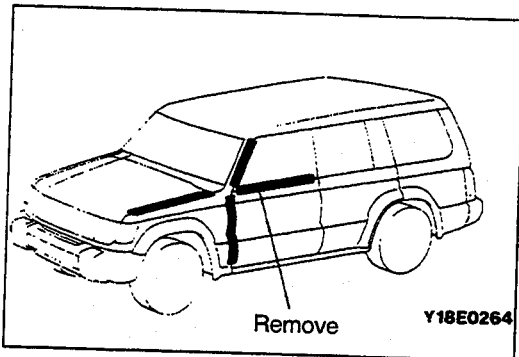
Trouble Symptom		Probable Cause	Remedy
Front/ rear/ back doors	Wind noise around door	Incorrect clearance between door glass and door weatherstrip holder	Adjust
		Deformed door	Repair or replace
Sunroof	Water leaks	Dust accumulated in drainage of housing assembly	Keep dust out of the inside of the drain hose
		Clogged drain hose	Blow air into the drain hose to remove the dust.
		Broken or dislocated drain hose, or failed or cracked clip	Check the hose installation and the flange contact.
		Worm roof lid weatherstrip	Replace
		Excessive roof lid-to-body clearance or incorrectly fitted weatherstrip	Adjust
	Wind noise	Loose or deformed deflector	Re-tighten or replace
	Roof lid makes noise when moved	Foreign material lodged in guide rail	Check the drive cable and guide rails for foreign material.
		Loose guide rails and lid	Re-tighten
	Motor runs but lid does not move or moves only halfway	Foreign material lodged in guide rail	Check the drive cable and guide rails for foreign material.
		Incorrect engagement of motor pinion with drive cable	Check for loose motor installation or a damaged pinion.
		Decrease in clutch slipping force of motor	Adjust or replace
		Increased lid sliding resistance or interference of lid with drive cables, weatherstrip, etc. due to incorrect adjustment of lid	Adjust or replace
	Noise in motor (clutch slipping noise made in motor when lid is fully opened or closed is not unusual noise.)	Incorrect engagement of motor pinion with drive cable	Check the pinion installation and re-tighten the motor.
		Worn or damaged motor pinion bearing	Replace the motor assembly.
		Worn or deformed drive cable	Replace



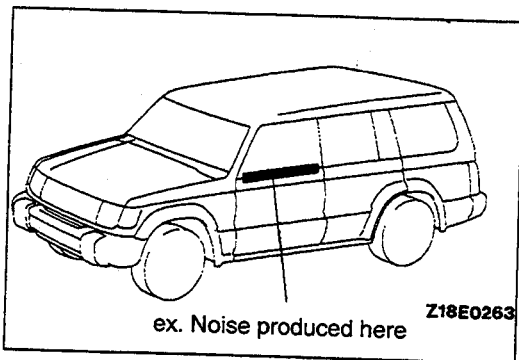
HOW TO LOCATE WIND NOISE

110005167

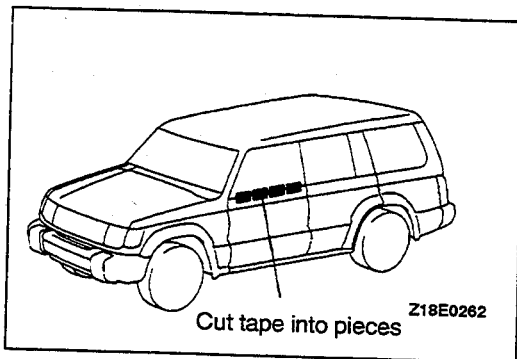
- (1) Attach cloth tape to a place which might conceivably be the source of wind noise, such as panel seams, projections, moulding seams, glass and body seams, etc.
- (2) Then carry out a road test in order to determine that the places not covered by tape are not sources of wind noise.



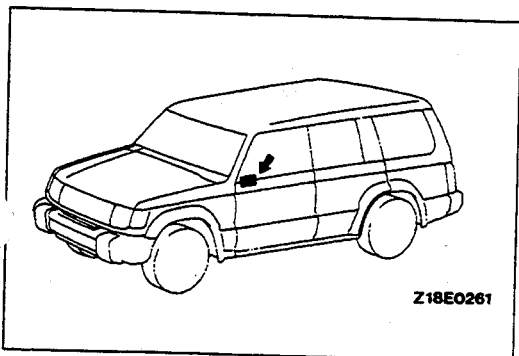
- (3) Then remove the strips of tape one by one, carrying out a road test after each is removed, until the wind noise source is found.



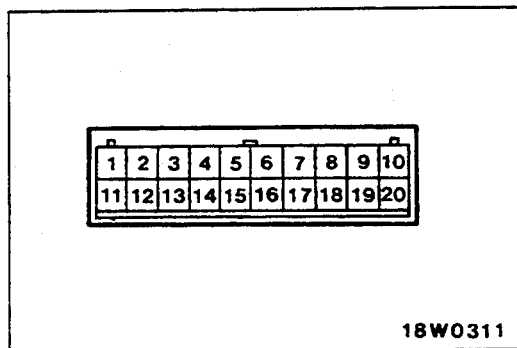
- (4) If such a place is found, cover it again and continue with the procedure to determine if there are any other noise sources.
- (5) If no others are found, the last remaining tape is the only source.



- (6) Cut the remaining piece of tape into smaller pieces, attach it again as it was before, and then remove the pieces one by one in the same way so as to narrow down the source.



- (7) Check that wind noise occurs when the last remaining tape is removed, and that noise does not occur when it is re-attached.
- (8) When the source(s) of the wind noise is finally located, attach butyl tape, body sealer or similar material to obstruct this source as much as possible.

**KEYLESS ENTRY CONTROL UNIT INSPECTION** 110005168

- (1) Remove the combination meter.
(Refer to GROUP 54 – Combination Meter.)
- (2) Disconnect the amplifier and inspect the connector on the wire harness side as shown in the chart below.

Terminal No.	Signal	Conditions		Terminal voltage
2	Door switch	Dome light switch: Door	Door open (Door switch: ON)	0V
			Door shut (Door switch: OFF)	12V
6	Door-lock actuator (Driver side)	LOCK		5V (Pulse output*)
		UNLOCK		0V
8	Key reminder switch	ON (Key removed)		0V
		OFF (Key installed)		5V (Pulse output*)
9	Keyless entry control unit power source	Ignition switch (ACC)		Battery positive voltage
10	Keyless entry control unit power source	Always		Battery positive voltage
11	Dome light	All doors closed (Door switch: OFF)	Dome light switch: OFF or ON	0V
			Dome light switch: Door	Battery positive voltage
12	Door lock control unit and door lock relay	LOCK		0V
		UNLOCK		Battery positive voltage
13	Door lock control unit	LOCK		Battery positive voltage
		UNLOCK		0V
14	Door lock relay	LOCK		Battery positive voltage
		UNLOCK		0V
20	Ground	-		0V

NOTE

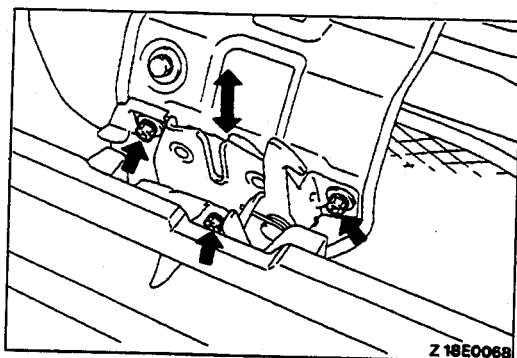
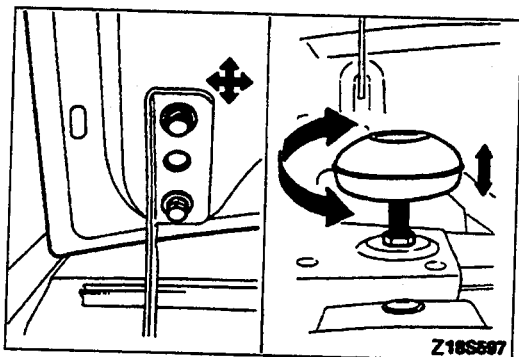
* : Use an oscilloscope. When using the tester, 0–0.03V is indicated repeatedly.

SERVICE ADJUSTMENT PROCEDURES

HOOD ADJUSTMENT

110005169

1. Loosen the hood mounting bolts, and then adjust the hood by moving it so that the clearance is equal on all sides.
2. Turn the hood bumpers and adjust the height of the hood.

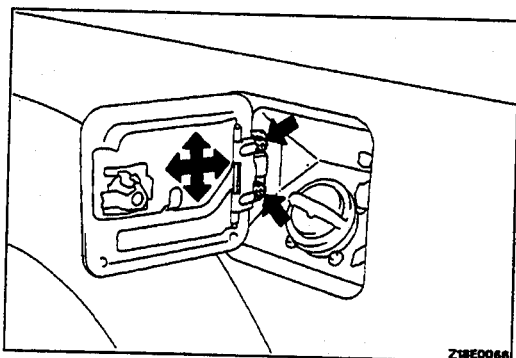


3. Loosen the hood latch mounting bolts, and move the hood latch to adjust the attachment between the hood latch and hood striker.

FUEL FILLER DOOR ADJUSTMENT

110005170

Loosen the fuel filler door mounting screw and adjust the fuel filler door so that the clearance around the fuel filler door is even without any height differences.



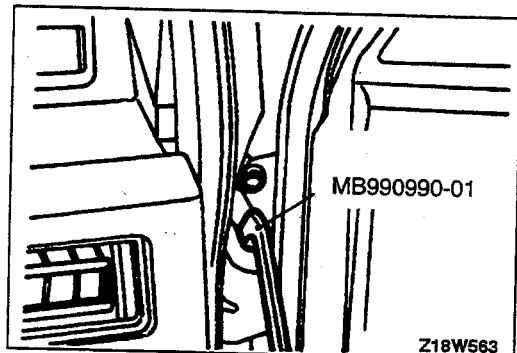
FRONT AND REAR DOOR ADJUSTMENT

110005171

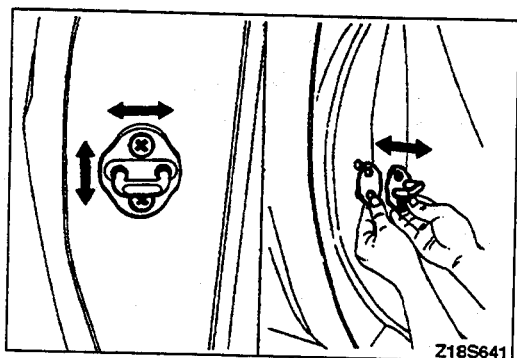
1. Use the special tool to loosen the hinge mounting bolts on the body side, and then adjust the clearance around the door so that it is uniform on all sides.

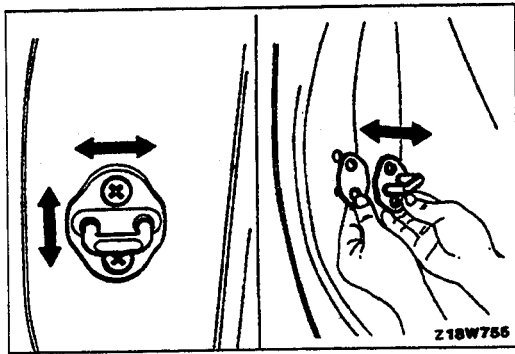
Caution

Attach protection tape to the fender edges where the hinge is installed.



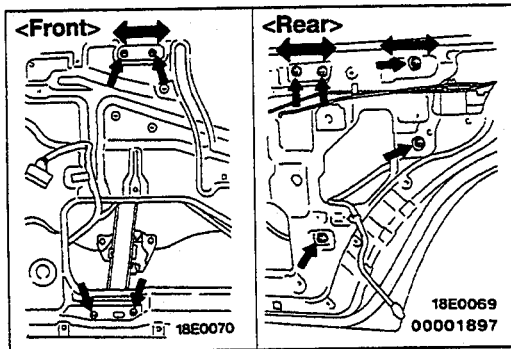
2. When replacing the door, loosen the hinge mounting bolts on the door side and adjust the alignment of the fender panel with the front door panel.
3. Loosen the door striker mounting screws to adjust the alignment of the door panel.
4. Increase or decrease the number of shims and move the striker to adjust the engagement of the striker with the door latch.



**BACK DOOR ADJUSTMENT**

110005172

1. Adjust the fit of the door panel to the body by loosening the striker mounting screws and moving the striker.
2. Adjust the linking of the striker and the door latch by increasing or decreasing the thickness of the striker shim.

**DOOR WINDOW GLASS ADJUSTMENT**

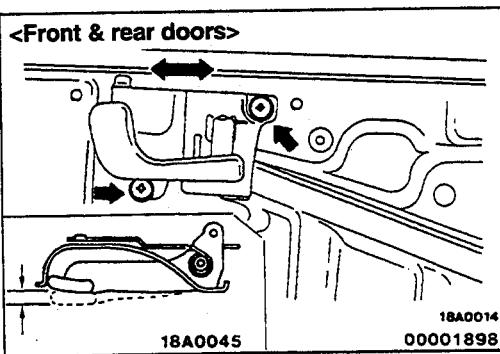
110005173

Check that the door window glass runs smoothly in the door glass channel when the glass is fully raised and lowered. If it does not, adjust by the following procedure.

1. Remove the door trim and waterproof film. (Refer to P.42-27.)
2. Loosen the window regulator assembly mounting bolts and move the upper attachment back and forward to adjust the tilt of the glass.
3. Loosen the rear door center sash mounting bolt, and adjust the front-to-back position of the glass.

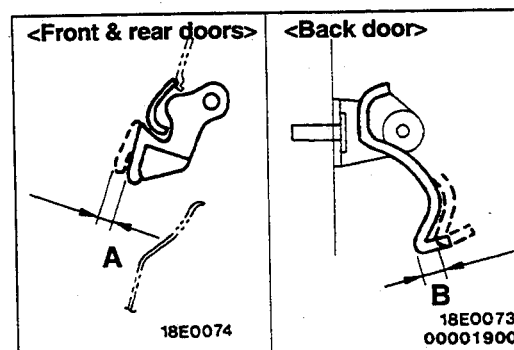
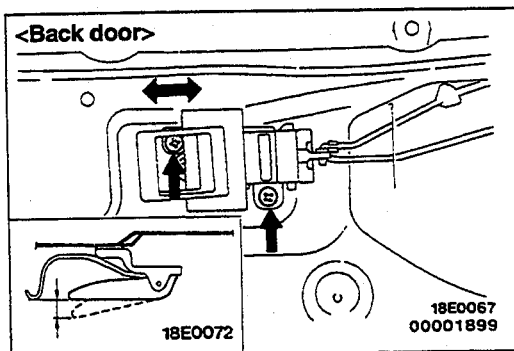
DOOR INSIDE HANDLE PLAY ADJUSTMENT

110005174



1. Remove the door trim and waterproof film. (Refer to P.42-27.)
2. Move the door inside handle installation position back and forth to adjust so that the inside handle play allowance is at the standard value.

Standard value: 4–10 mm (.16–.39 in.)

**DOOR OUTSIDE HANDLE PLAY CHECK**

110005175

If the door outside handle play is not at the standard value, check the door outside handle or door latch assembly, and replace if necessary.

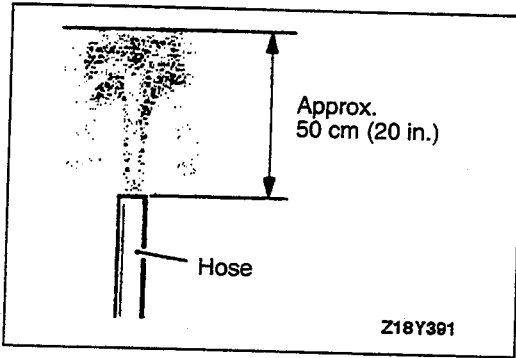
Standard value

(A): 3–12 mm (.12–.47 in.)

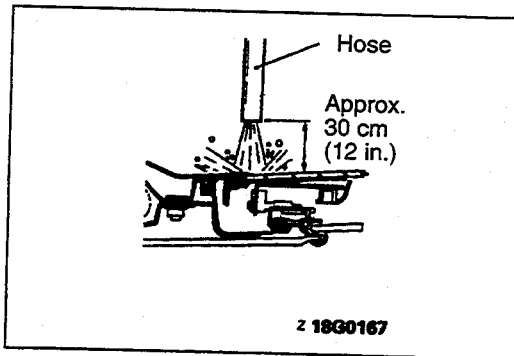
(B): 2–8 mm (.08–.31 in.)

110005176

WATER TEST



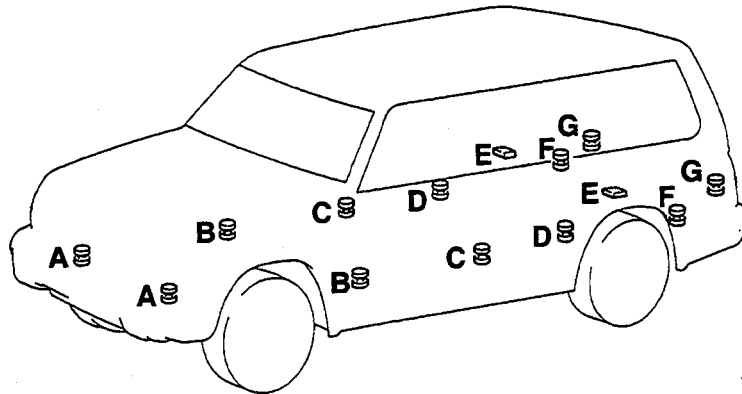
1. Fully close the sunroof.
2. Hold the hose upward and adjust the water fountain height to about 50 cm (20 in.).



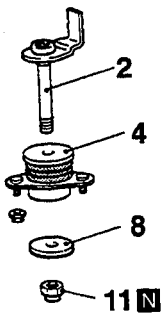
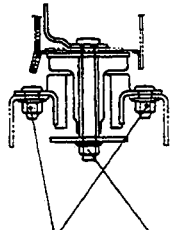
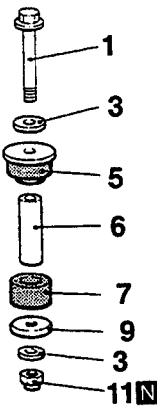
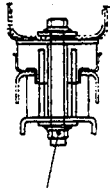
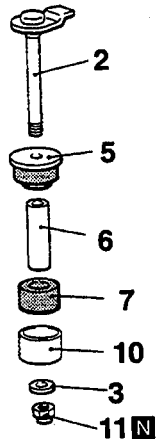
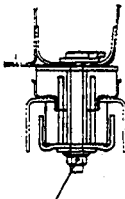
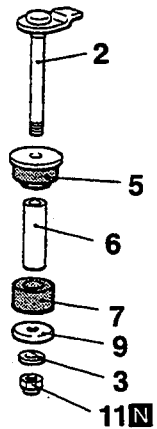
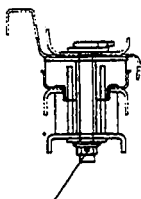
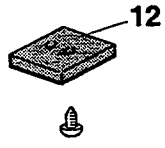
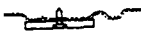
3. Pour water over the roof from about 30 cm (12 in.) above the roof for more than 5 minutes.
4. While pouring water, check for leaks around the sunroof.
5. In the event of leakage, check the drain hose, weatherstrip contact, etc.

BODY MOUNTING

REMOVAL AND INSTALLATION



18E0077
00001901

A	B, C	D, F	G	E <Up to 1993 models>
  <p>24 Nm 47 Nm 17 ft.lbs. 35 ft.lbs.</p>	  <p>47 Nm 35 ft.lbs.</p>	  <p>47 Nm 35 ft.lbs.</p>	  <p>47 Nm 35 ft.lbs.</p>	 <p>18E0259</p>  <p>18E0258</p>

- 1. Special bolt
- 2. Mounting bolt
- 3. Plain washer
- 4. Body mounting rubber
- 5. Body mounting rubber A
- 6. Spacer

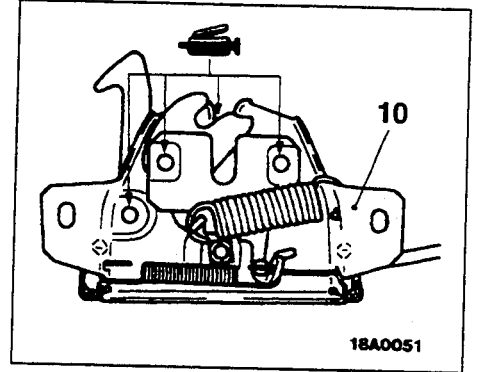
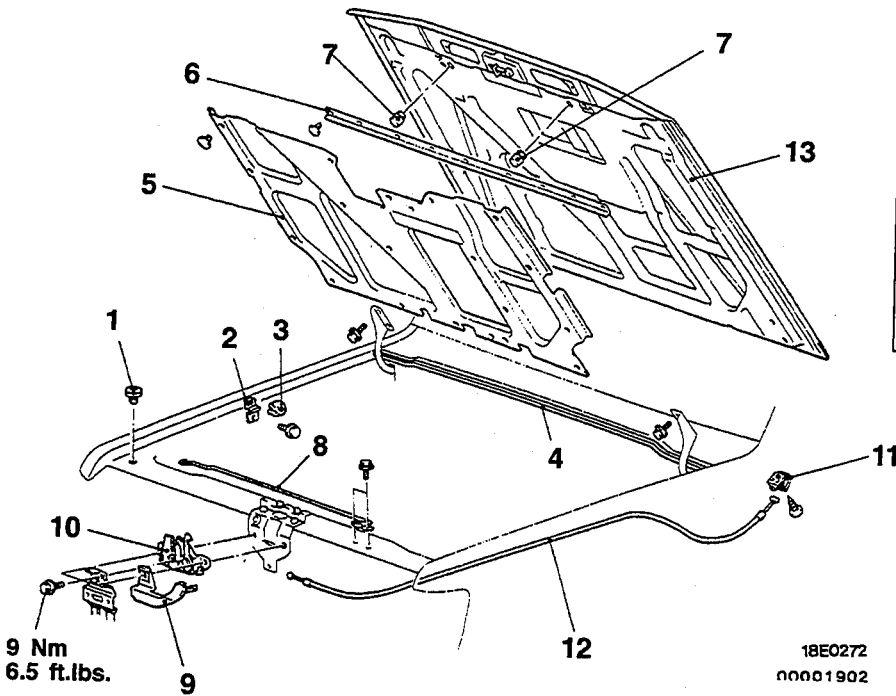
- 7. Body mounting rubber B
- 8. Plate
- 9. Washer
- 10. Body mount stopper
- 11. Self locking nut
- 12. Body shim

HOOD

REMOVAL AND INSTALLATION

110005178

Hood Post-installation Operation
 • Hood Adjustment (Refer to P.42-9.)



- ▶◀
- 1. Hood bumper
 - 2. Hood bumper bracket
 - 3. Damper
 - 4. Hood rear weatherstrip
 - 5. Hood heat protector
 - 6. Hood front weatherstrip
 - 7. Bumper
 - 8. Hood support rod

Hood latch and hood lock release cable removal steps

- Radiator grille
- 9. Hood cable protector
- 10. Hood latch
- 11. Hood lock release handle
- 12. Hood lock release cable

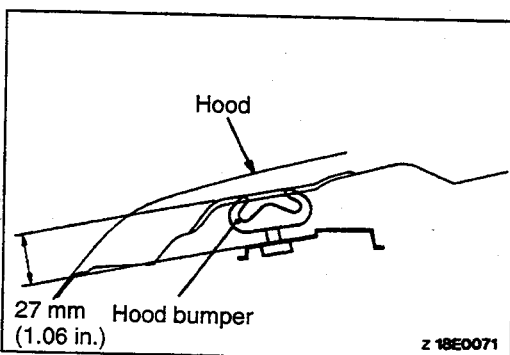
Hood removal steps

- Washer tube (Refer to GROUP 51 – Front Wiper and Washer)
- 13. Hood

INSTALLATION SERVICE POINTS

▶◀ **HOOD BUMPER INSTALLATION**

Install the hood bumper as shown in the illustration.



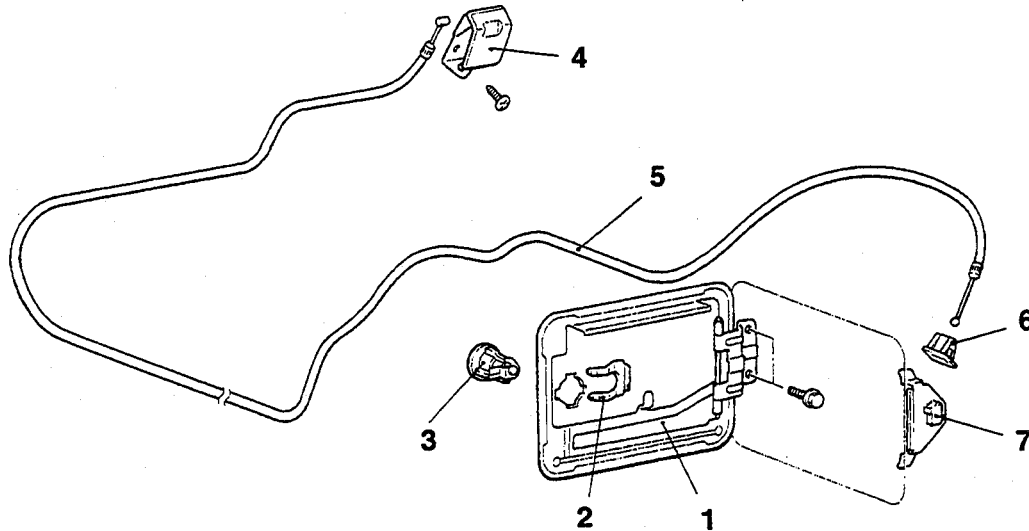
27 mm Hood bumper
(1.06 in.)

FUEL FILLER DOOR

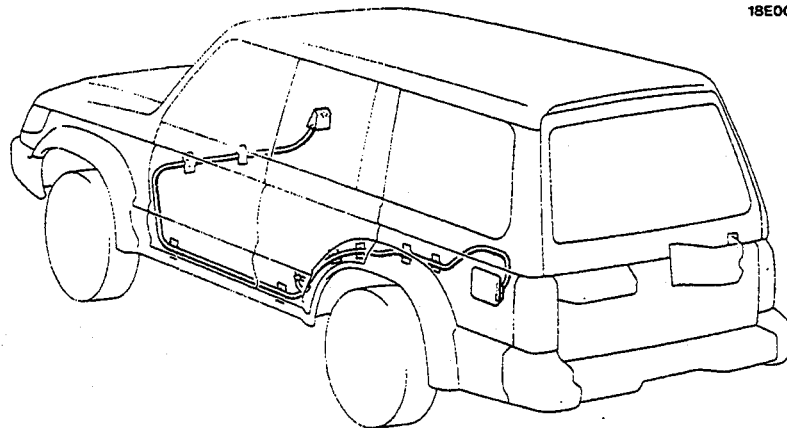
REMOVAL AND INSTALLATION

110005179

- Fuel Filler Door Post-installation Operation**
- Fuel Filler Door Adjustment (Refer to P.42-9.)



18E0059



18E0265

00001903

1. Fuel filler door

Lock cylinder assembly removal steps

2. Retainer
3. Lock cylinder assembly

Fuel filler door lock release cable removal steps

- Center pillar trim (LH)
(Refer to GROUP 52A – Trims.)
- Front rail cover (LH)
(Refer to GROUP 52A – Trims.)
- Rear rail cover (LH)
(Refer to GROUP 52A – Trims.)
- Quarter trim (LH)
(Refer to GROUP 52A – Trims.)
- 4. Fuel filler door lock release handle
- 5. Fuel filler door lock release cable
- 6. Cable holder

Fuel filler door hook removal steps

5. Connection for fuel filler door lock release cable
7. Fuel filler door hook

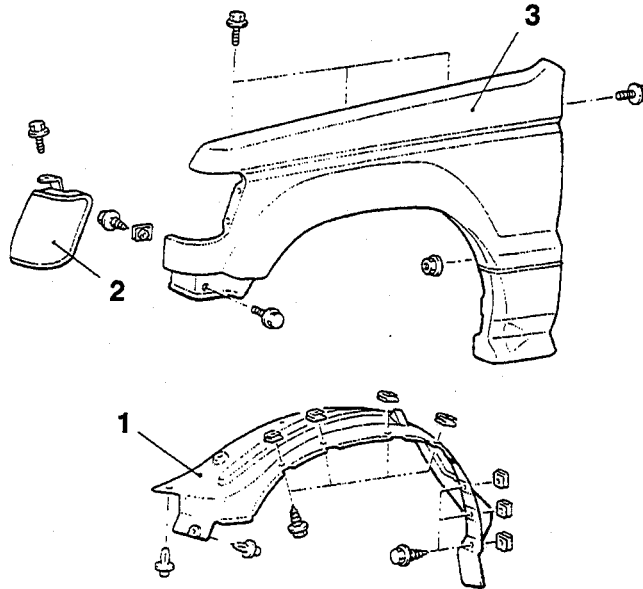
FENDER

REMOVAL AND INSTALLATION

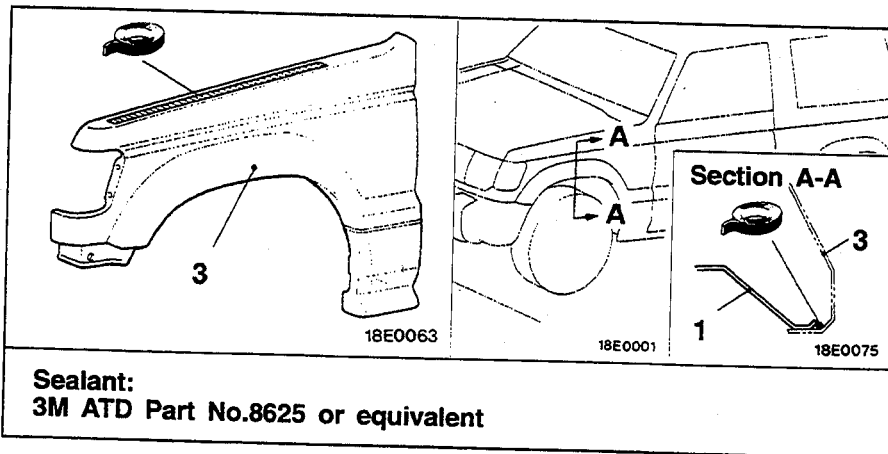
110005180

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

- Front Mud Guard and Wide Fender (Refer to GROUP 51 – Garnish and Moulding.)



18E0062



Sealant:
3M ATD Part No.8625 or equivalent

00001904

Removal steps

1. Splash shield
2. Front turn signal light
 - Front bumper (Refer to GROUP 51 – Front Bumper.)
3. Front fender panel

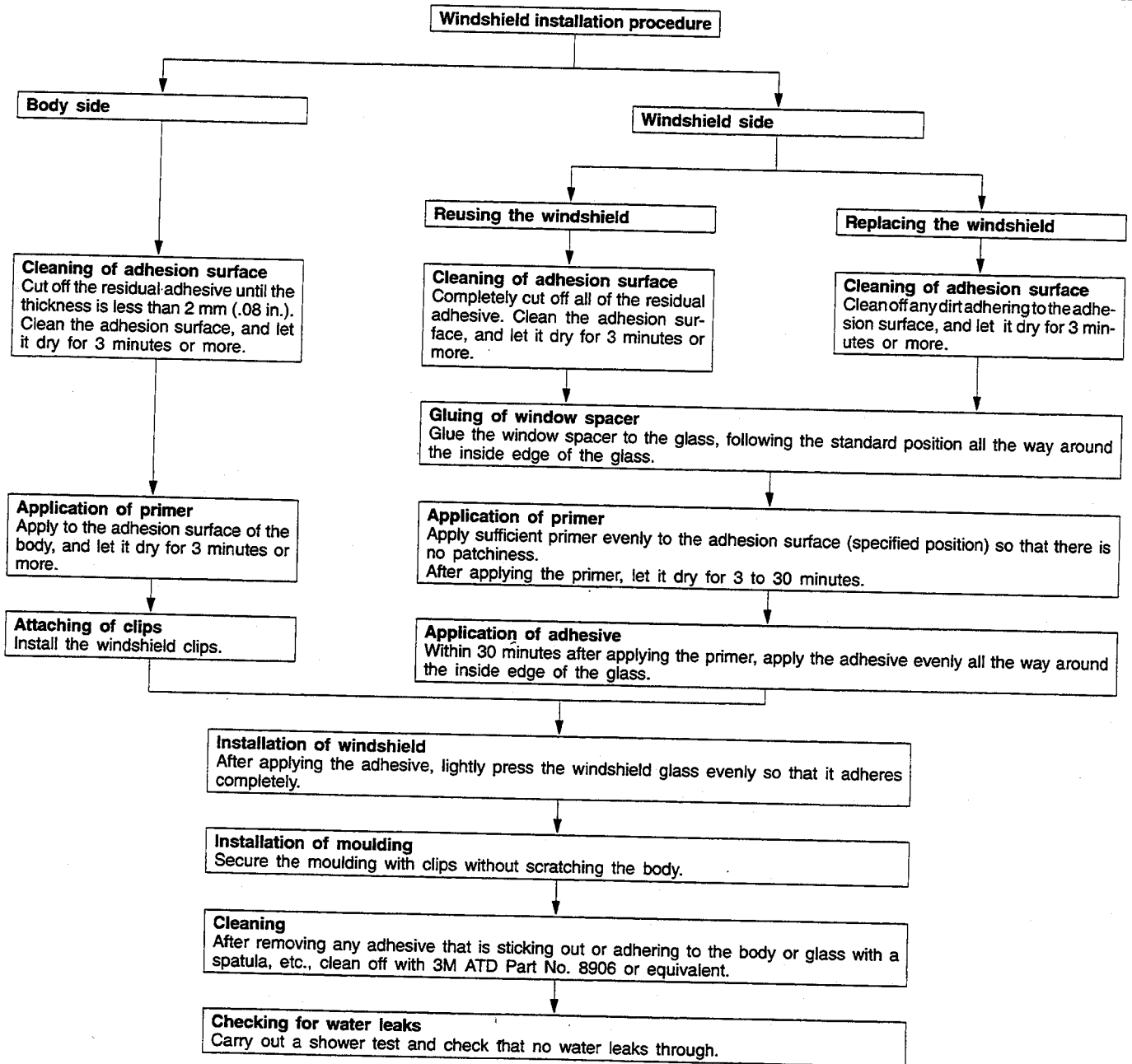
TSB Revision

WINDOW GLASS**GENERAL**

For bonding of the windshield and rear window glass, a single-liquid urethane adhesive is used.
ADHESIVE AND RESERVE ITEMS

Adhesive and Reserve Items		Applications	Quantity
Adhe- sive	3M SUPER FAST URETHAN 8609	–	One cartridge
	3M SUPER FAST URETHAN PRIMER 8608	–	As required
Re- serve Items	Wire (dia.x.length)	for cutting adhesive	Five pieces of wire 0.6 mm×1 m (.02 in.×3.3 ft.)
	Adhesive gun	for adhesive application	One
	3M ATD Part No. 8906	for cleaning jointing surfaces	As required
	Wiping rags	–	As required
	Sealer	for prevention of water leaks and gathering after adhesive application	As required
	Glass holder	–	Two
	Windshield moulding (Service Part)	–	One
	Window dam (Service Part)	–	As required

WORKING PROCESS



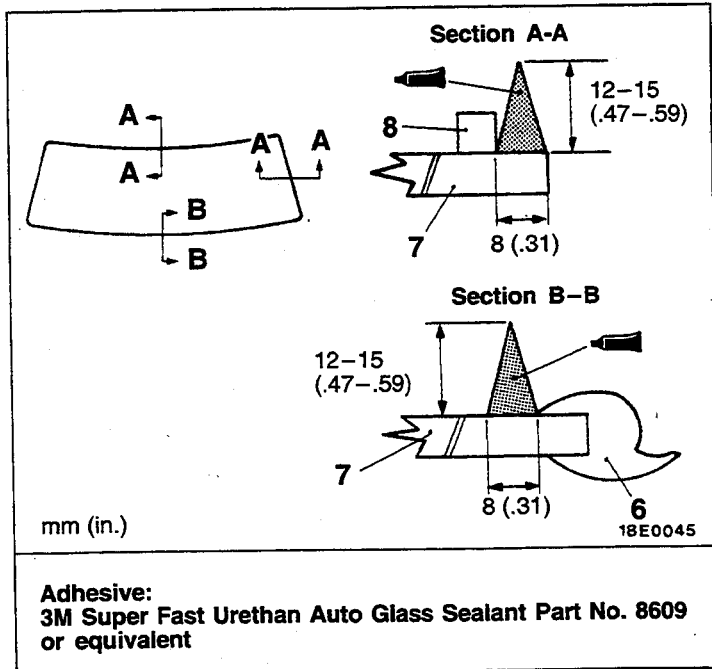
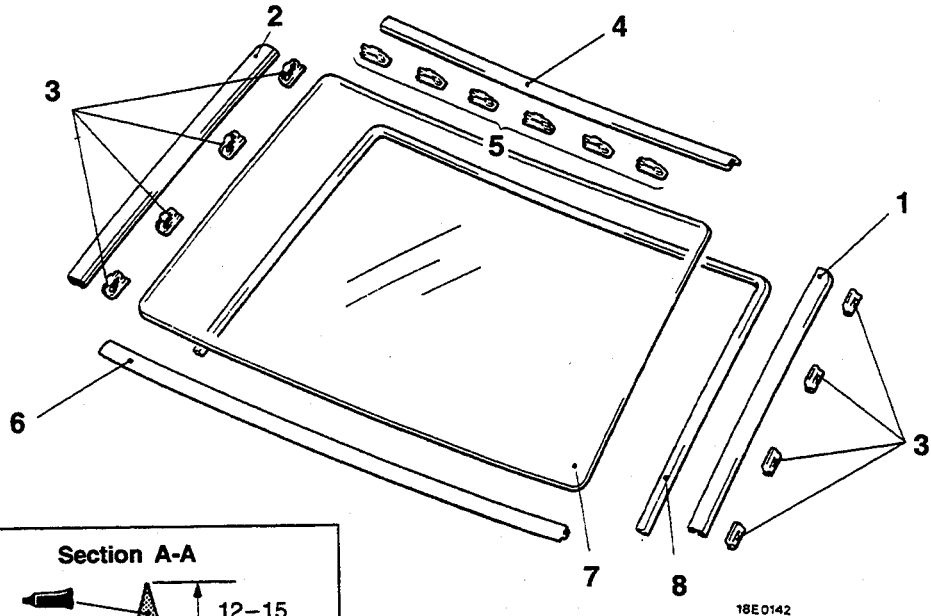
WINDSHIELD

REMOVAL AND INSTALLATION

110005183

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

- Instrument Panel (Refer to GROUP 52A – Instrument Panel.)
- Front Pillar Trim (Refer to GROUP 52A – Trims.)
- Front Deck Garnish (Refer to GROUP 51 – Garnish and Moulding.)



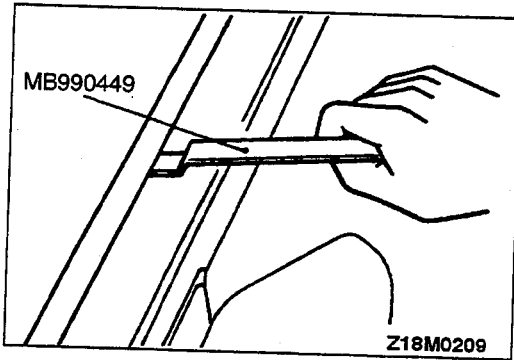
Removal steps



1. Windshield side moulding (LH)
2. Windshield side moulding (RH)
3. Windshield clip
4. Windshield upper moulding



5. Windshield clip
6. Windshield lower moulding
7. Windshield glass
8. Window spacer



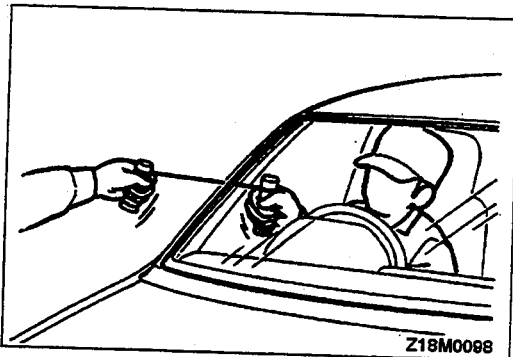
REMOVAL SERVICE POINTS

◀A▶ WINDSHIELD SIDE MOULDING (L.H.)/WINDSHIELD SIDE MOULDING (R.H.)/WINDSHIELD UPPER MOULDING REMOVAL

Use the special tool to lever out each moulding.

Caution

Mouldings that become warped should not be re-used.

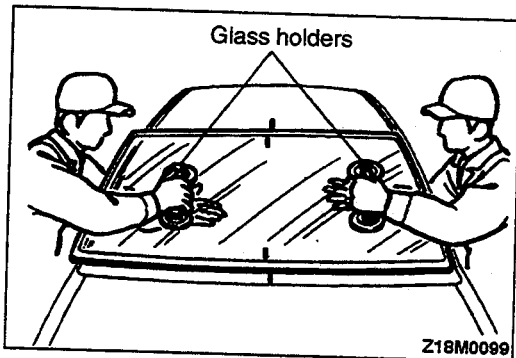


◀B▶ WINDSHIELD GLASS REMOVAL

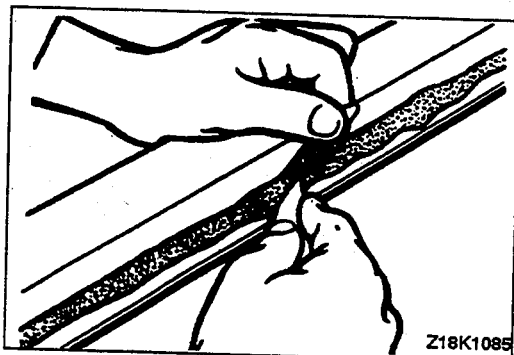
- (1) To protect the body (paint surface), apply cloth tape to all body areas around the installed windshield glass.
- (2) Use a sharp-pointed drill to make a hole in the windshield glass adhesive.
- (3) Pass wire from the inside of the vehicle through the hole.
- (4) Pull the wire alternately from the inside and outside along the windshield glass to cut the adhesive.

Caution

Do not let the wire touch the edge of the windshield glass.



- (5) Make mating marks on the windshield glass and body.
- (6) Use the glass holders to remove the windshield glass.



- (7) Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm (.08 in.) around the entire circumference of the body flange.
- (8) Finish the flange surfaces so that they are smooth.

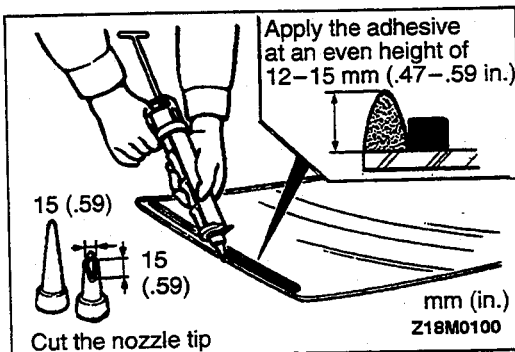
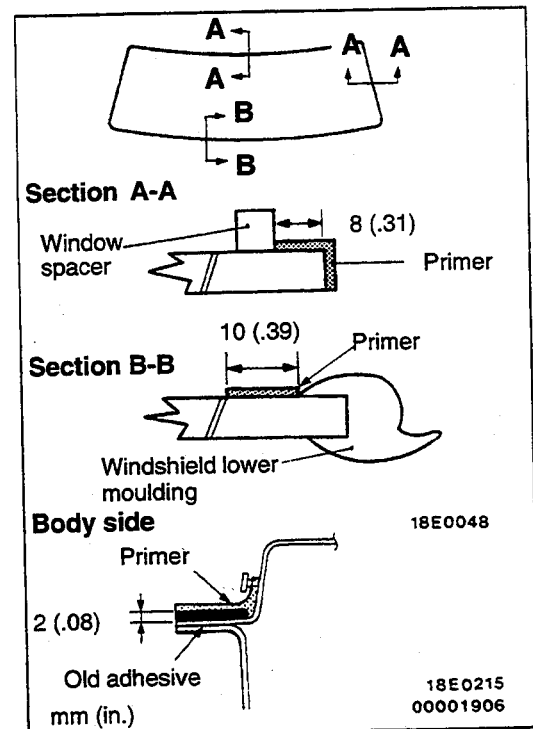
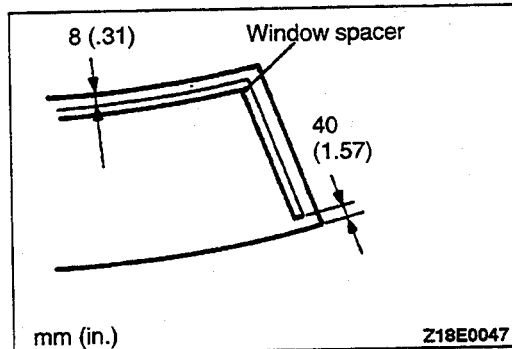
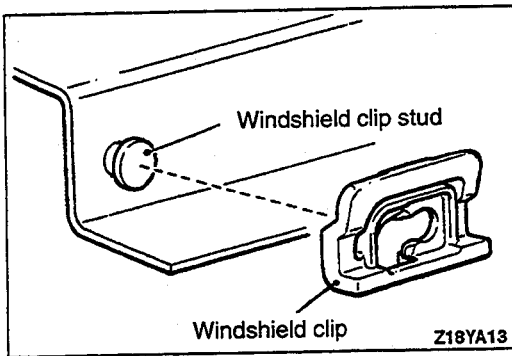
Caution

1. Be careful not to remove more adhesive than is necessary.
2. Be careful also not to damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with repair paint or anti-rust agent.

- (9) When reusing the glass, remove the adhesive and window spacer chips still adhering to the window glass, and clean with 3M ATD Part No. 8906 or equivalent.
- (10) Clean the body side in the same way.

Caution

Let the cleaned places stand for 3 minutes or more, and carry out the next procedures after they have dried. Also, do not touch any surface that has been cleaned.



WINDSHIELD CLIP STUD REPAIR

If the T-studs are broken, use a drill to make holes 3 mm (.12 in.) in diameter in the T-studs, fill the holes with adhesive, and then use screws to mount the window moulding clips.

Caution

After installing the clips, apply anti-rust solvent to the screw heads to protect them from rust.

INSTALLATION SERVICE POINTS

▶A◀ WINDOW SPACER INSTALLATION

After cleaning the window spacer adhesion surface of the windshield glass with 3M ATD Part No. 8906 or equivalent to remove all grease, etc., attach the window spacer as shown in the illustration.

◀B▶ WINDSHIELD GLASS/WINDSHIELD LOWER MOULDING INSTALLATION

- (1) When replacing the glass, provisionally set the glass against the body, and put mating marks on the glass and body where they match.
- (2) Install the windshield lower moulding onto the windshield glass.
- (3) Soak a sponge in the primer, and apply evenly to the glass and the body in the places shown in the illustration.

Specified primer:

3M Super Fast Urethan Primer Part No. 8608 or equivalent

Caution

1. The primer strengthens the adhesive strength, so be sure to apply it evenly around the entire circumference. Also, a too thick application will cause lowering of the adhesive strength.
 2. Do not touch the coated surface.
- (4) After applying the primer, let it dry for 3 to 30 minutes.

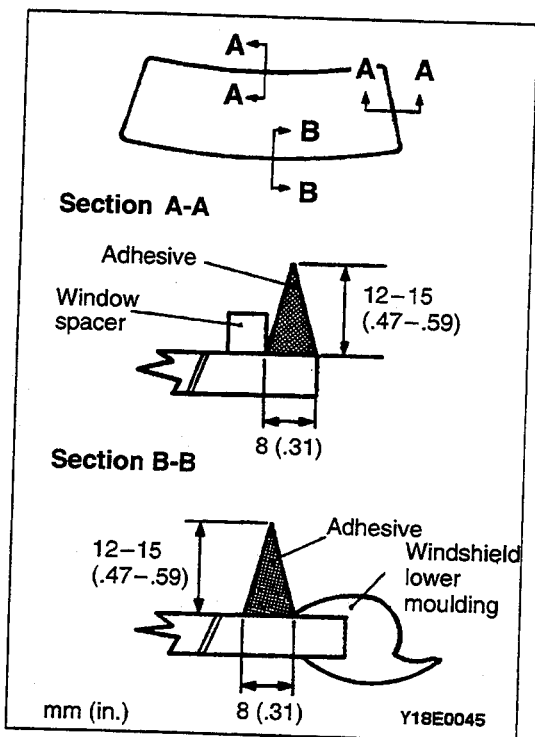
- (5) Within 30 minutes after applying the primer, fill the sealant gun with adhesive and apply the adhesive evenly around the entire circumference of the windshield.

Specified adhesive:

3M Super Fast Urethan Auto Glass Sealant Part No. 8609 or equivalent

NOTE

Cut the nozzle tip of the sealant gun into a V shape to facilitate adhesive application.



- (6) Match up the mating marks on the glass and the body, and lightly press the windshield glass evenly so that it adheres completely.
- (7) After removing any adhesive that is sticking out or adhering to the body or glass with a spatula, etc., clean off with 3M ATD Part No. 8906 or equivalent. After completion of this operation (after installing the glass), place it somewhere where it will not be disturbed, until the adhesive sets.

Caution
If heat is applied with an infra-red lamp to shorten the setting time, keep the surface temperature of the adhesive below 100°C.

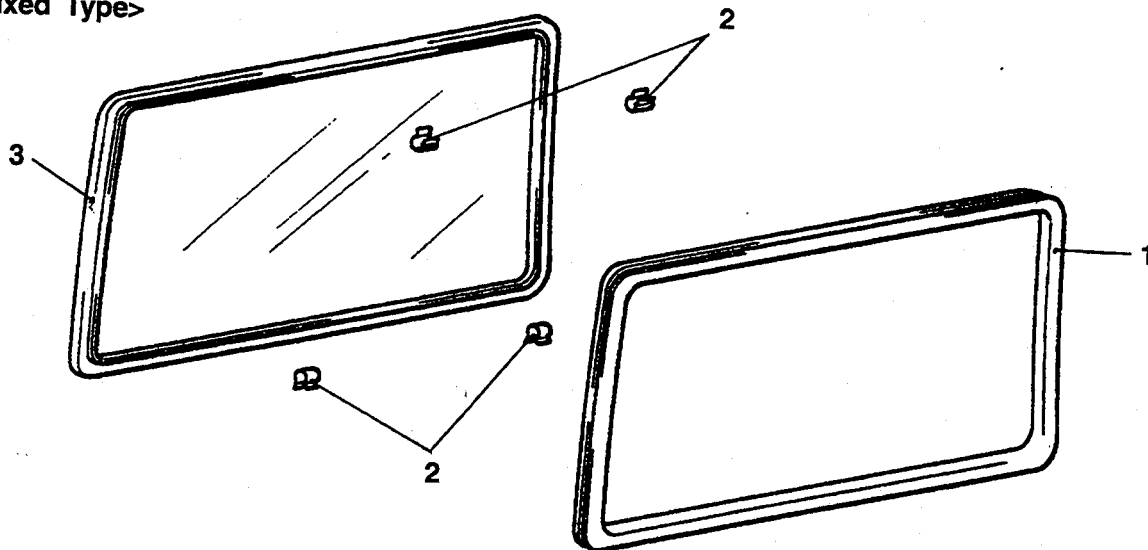
- (8) After attaching the windshield glass to the body, let it stand for 30 minutes or more, and then test for water leakage.

- Caution**
1. If moving the vehicle, it should be done gently.
 2. When testing for water leakage, do not pinch the end of the hose to spray the water.

QUARTER WINDOW GLASS REMOVAL AND INSTALLATION

110005184

<Fixed Type>

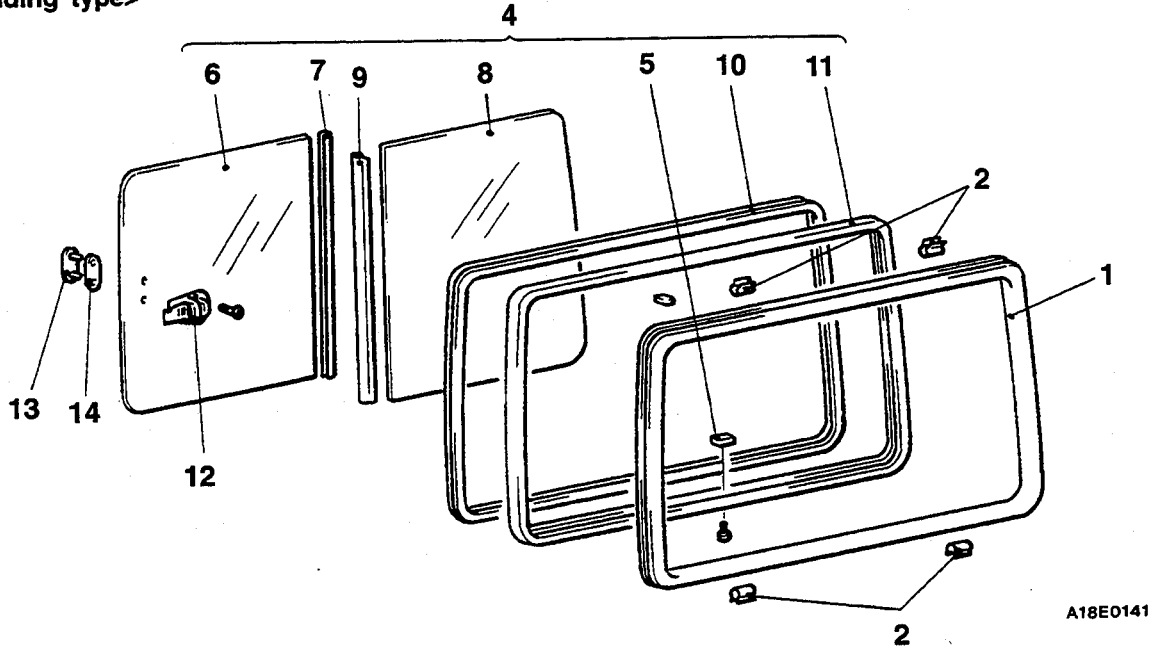


Z18E0140

Quarter window glass removal steps

- Quarter upper trim (Refer to GROUP 52A – Trims.)
1. Opening trim
 2. Clip
 3. Quarter window glass assembly

<Sliding type>



Quarter window glass removal steps

- Quarter upper trim
(Refer to GROUP 52A – Trims.)
- 1. Opening trim
- 2. Clip
- 4. Quarter window glass and frame assembly
- 5. Glass stopper
- 6. Quarter window glass (A)
- 7. Edge trim

◀A▶

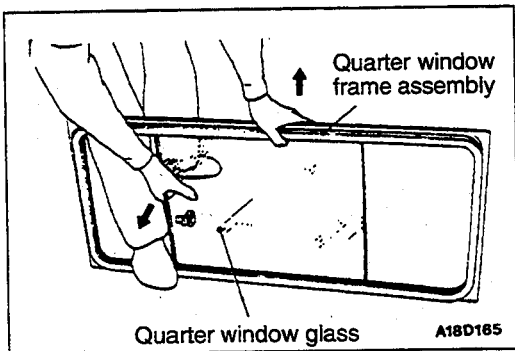
- 8. Quarter window glass (B)
 - 9. Seal rubber
 - 10. Runchannel
 - 11. Quarter window frame assembly
- Slide glass lock removal steps**
- 12. Slide glass lock
 - 13. Connector
 - 14. Packing

◀A▶

REMOVAL SERVICE POINTS

◀A▶ **QUARTER WINDOW GLASS (A)/QUARTER WINDOW GLASS (B) REMOVAL**

Remove the glass by moving the glass to the centre and widening the middle section of the quarter window frame assembly.

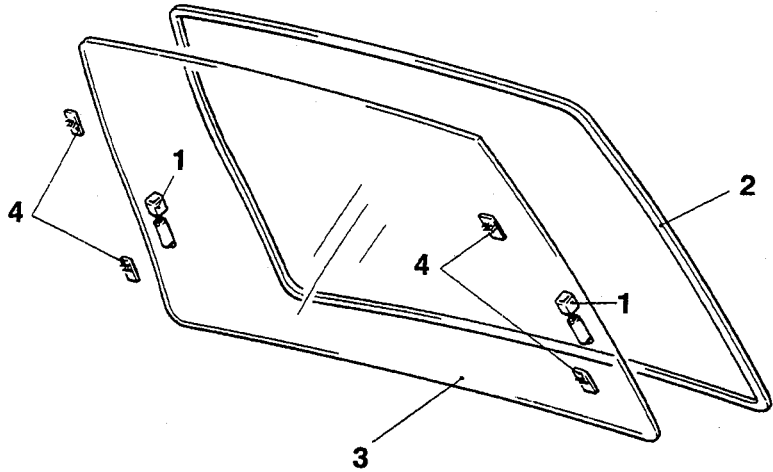


BACK DOOR WINDOW GLASS

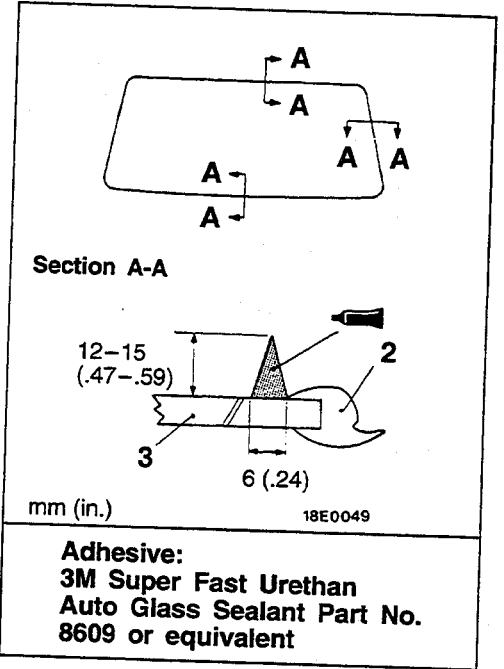
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Removal and Installation of Back Door Upper Trim (Refer to P.42-42.)



18E0304



Section A-A

mm (in.)

18E0049

Adhesive:
3M Super Fast Urethan
Auto Glass Sealant Part No.
8609 or equivalent

00001907

Removal steps

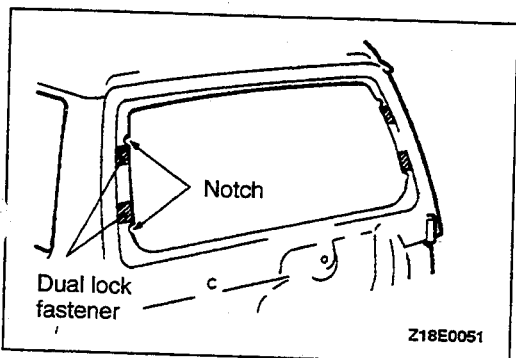
1. Defogger terminal
2. Back door window glass moulding

3. Back door window glass
4. Dual lock fastener

REMOVAL SERVICE POINT

◀A▶ BACK DOOR WINDOW GLASS REMOVAL

Remove in the same way as for the windshield glass. (Refer to P.42-18.)



Z18E0051

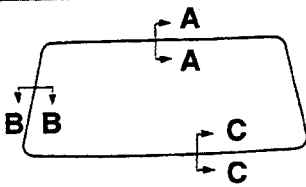
INSTALLATION SERVICE POINTS

◀A▶ DUAL LOCK FASTENER INSTALLATION

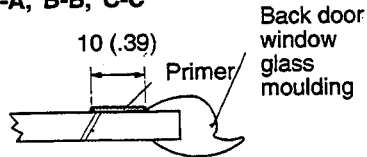
Attach the dual lock fasteners so that the fastener ends are aligned with the notches on the body.

◀▶ BACK DOOR WINDOW GLASS/BACK DOOR WINDOW GLASS MOULDING INSTALLATION

Install in the same way as for the windshield glass. (Refer to P. 42-18.)



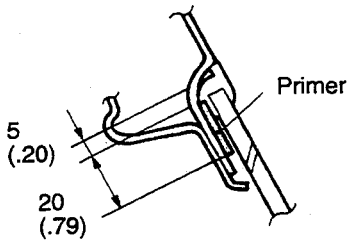
<Application of primer>
Section A-A, B-B, C-C



Back door window glass moulding

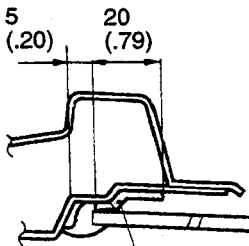
Body side
Section A-A

18E0044



18E0295

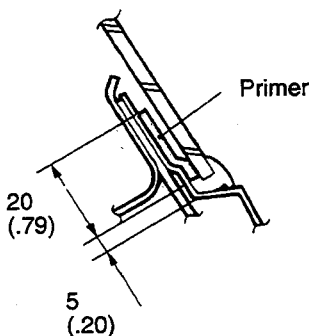
Section B-B (Also paint the right side)



Section C-C

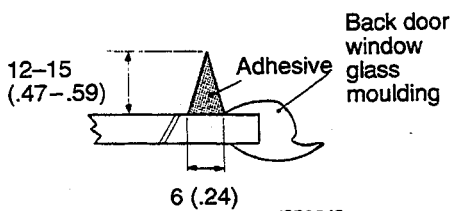
Primer

18E0296



18E0294

<Application of adhesive>
Section A-A, B-B, C-C



Back door window glass moulding

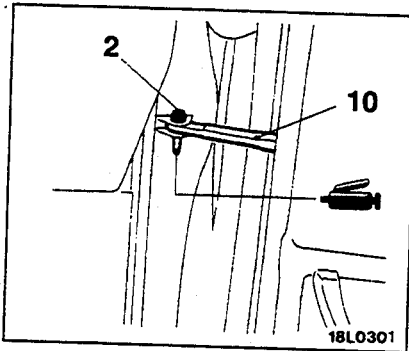
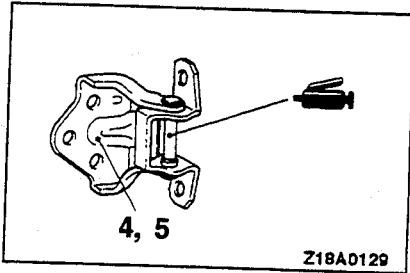
18E0049

00001908

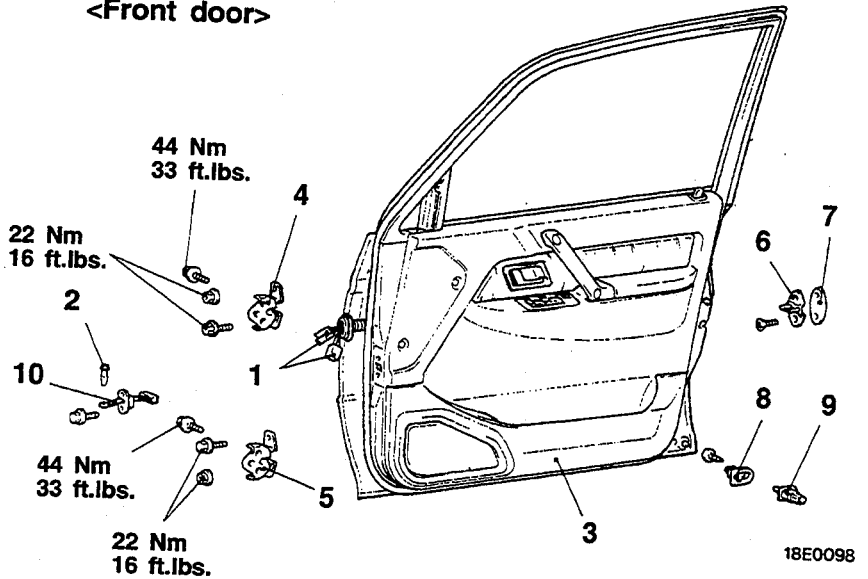
DOOR ASSEMBLY

REMOVAL AND INSTALLATION

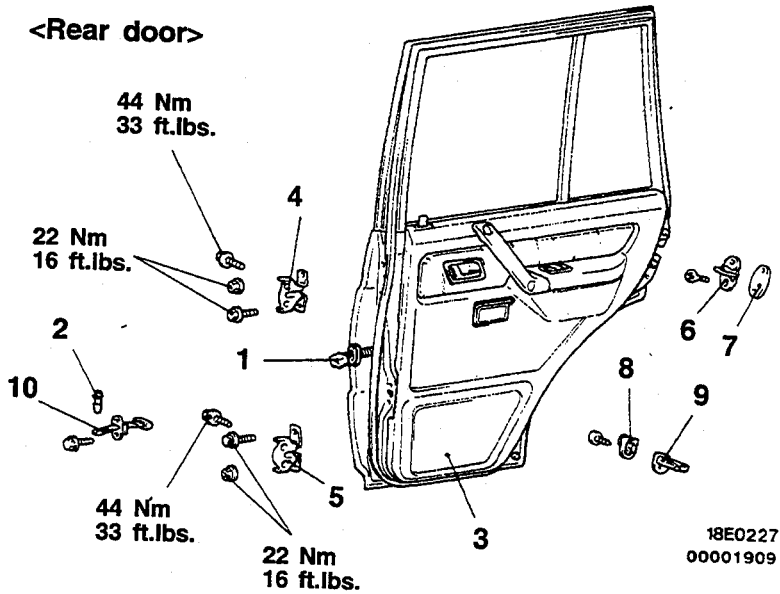
Door Post-installation Operation
 • Door Adjustment (Refer to P.42-9.)



<Front door>



<Rear door>



Door removal steps

1. Door harness connector
2. Spring pin
3. Door assembly
4. Door upper hinge
5. Door lower hinge



Striker removal steps

6. Striker
7. Striker shim

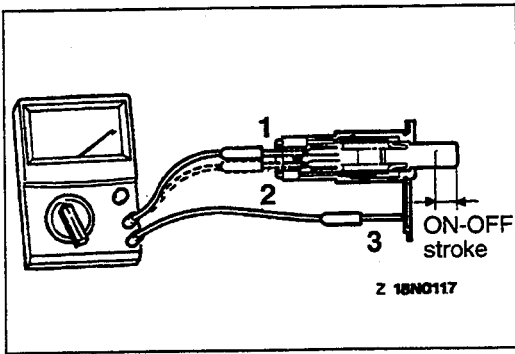
Door switch removal steps

8. Door switch cap
9. Door switch

Door check strap removal steps

- Door trim
 - Waterproof film (Refer to P.42-27.)
2. Spring pin
 10. Door check strap





INSPECTION

DOOR SWITCH

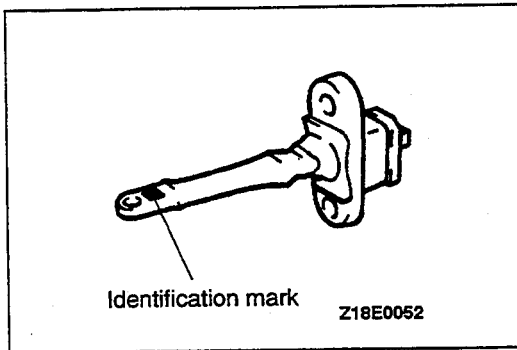
Operate the switch and check the continuity between the terminals.

<Type 1>

Switch position	Terminal		
	1	2	3
Open (ON)	○	○	○
Depressed (OFF)			

<Type 2>

Switch position	Terminal	
	2	3
Open (ON)	○	○
Depressed (OFF)		

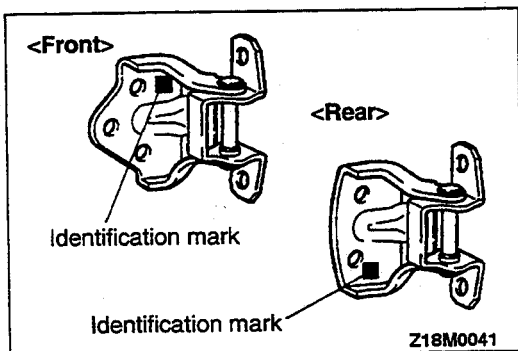


INSTALLATION SERVICE POINTS

▶A◀ DOOR CHECK STRAP INSTALLATION

Install the door check so that the identification marks shown below are facing upwards.

Place of application		Identification mark
R.H.	Front door	PR
	Rear door	OR
L.H.	Front door	PL
	Rear door	QL



▶B◀ DOOR LOWER HINGE/DOOR UPPER HINGE INSTALLATION

The door hinges depend on their locations, so check the identification marks before installation.

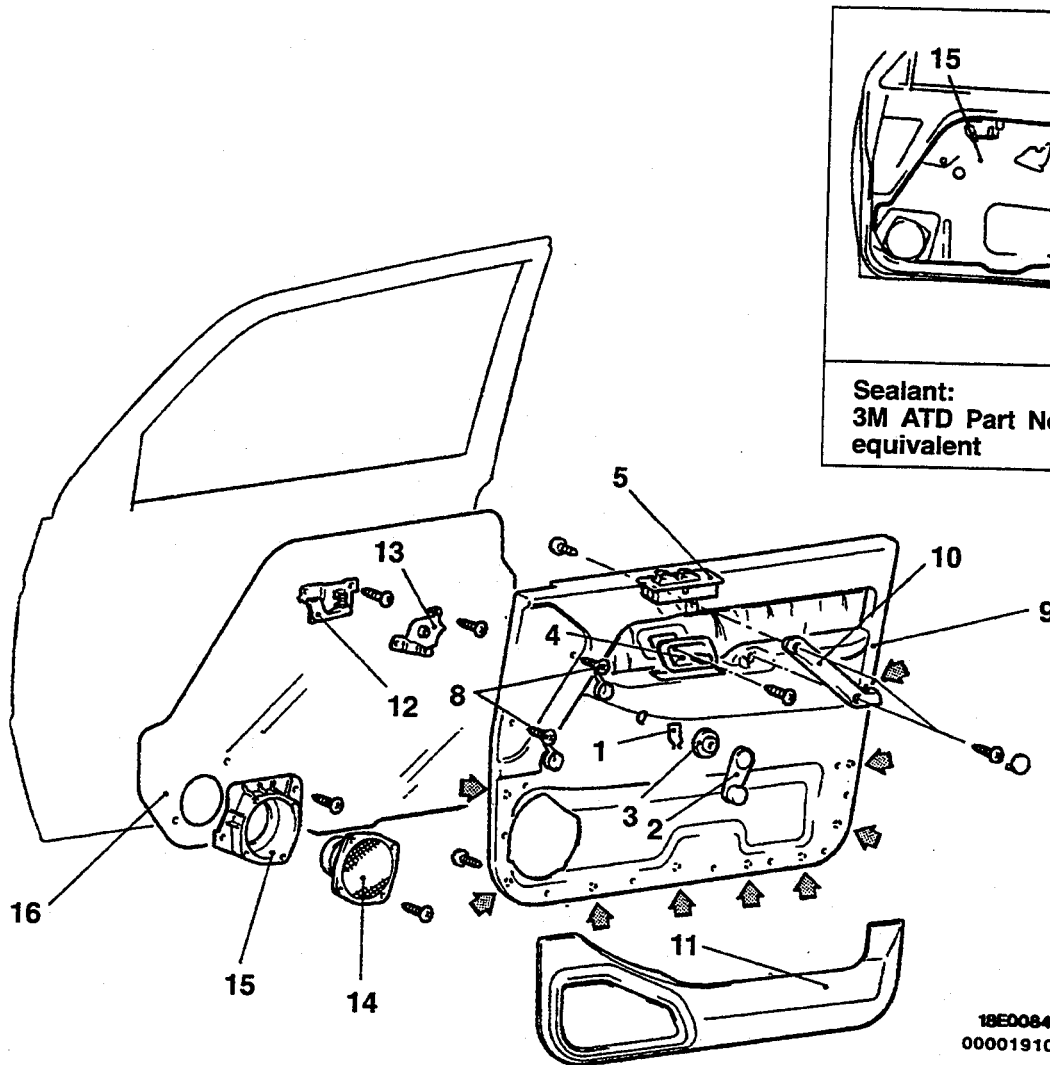
Place of application		Identification mark	
Front door	Upper hinge	F	
	Lower hinge	E	
Rear door	R.H.	Upper hinge	X
		Lower hinge	Z
	L.H.	Upper hinge	W
		Lower hinge	Y

DOOR TRIM AND WATERPROOF FILM

REMOVAL AND INSTALLATION

<Front door>

110005187



Sealant:
3M ATD Part No. 8625 or
equivalent

18E0084
00001910

NOTE

◀ : Indicates the clip positions

Removal steps

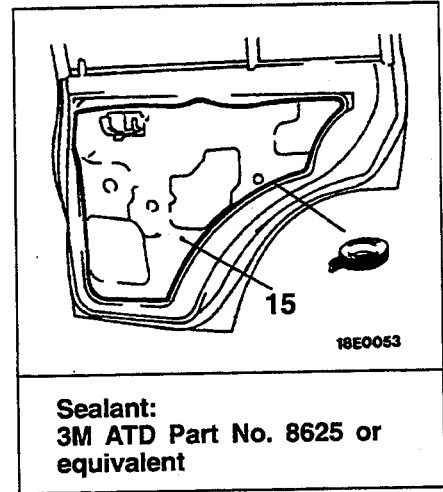
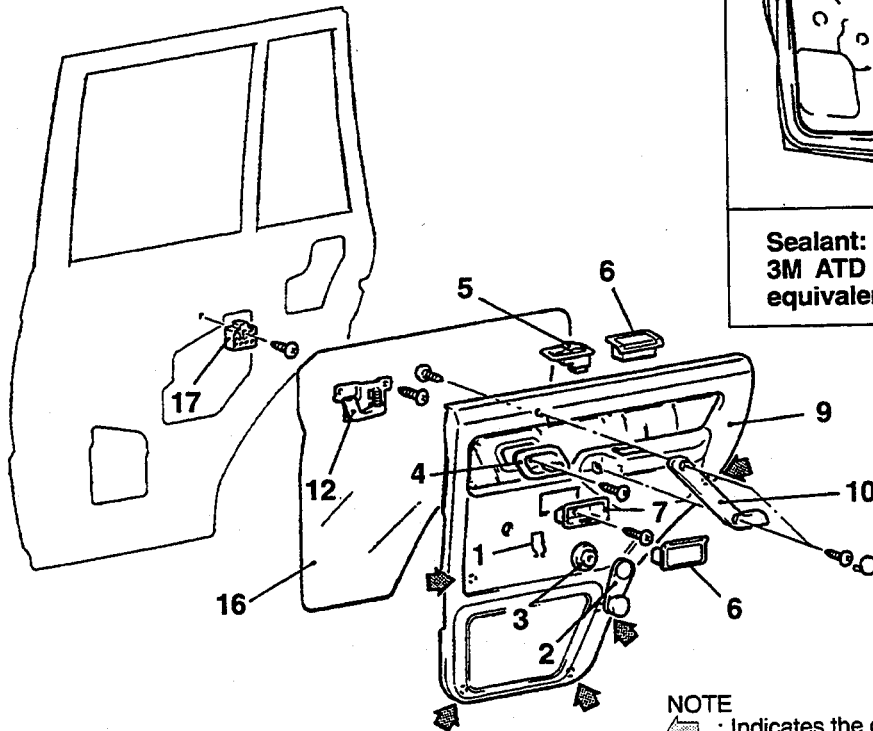
◀A▶


1. Clip
2. Regulator handle
3. Escutcheon
4. Inside handle cover
5. Power window switch

◀B▶ ▶A▶

8. Screw or clip
9. Door trim
10. Door grip
11. Door pocket
12. Inside handle
13. Armrest bracket
14. Speaker
15. Speaker cover
16. Waterproof film

<Rear door>



NOTE
 : Indicates the clip positions

18E0083
 00001911

Removal steps

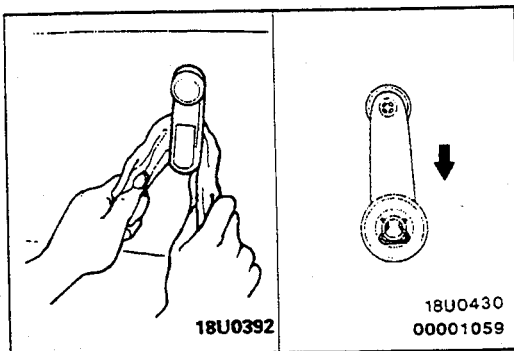
◀A▶

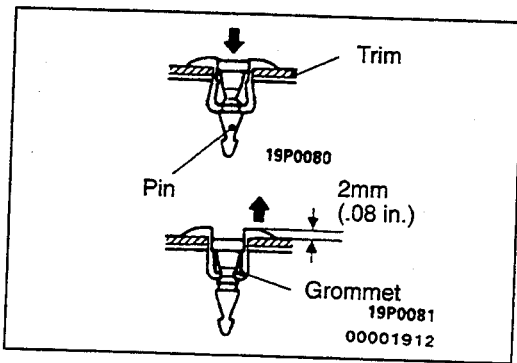
1. Clip
2. Regulator handle
3. Escutcheon
4. Inside handle cover
5. Power window switch
6. Ashtray
7. Ashtray bracket
9. Door trim
10. Door grip
12. Inside handle
16. Waterproof film
17. Screw grommet

REMOVAL SERVICE POINTS

◀A▶ **CLIP REMOVAL**

Remove the clip by using a rag, and then remove the regulator handle.



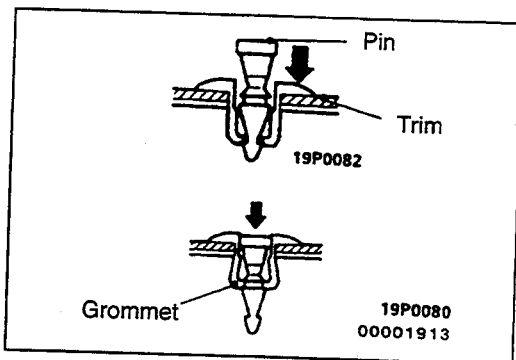


◀B▶ CLIP REMOVAL

- (1) Use a cross-tip (+) screwdriver to push inward the pin (at the centre of the trim clip) to a depth of about 2 mm (.08 in.).
- (2) Pull the trim clip outward to remove it.

Caution

Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, pushed too far.



INSTALLATION SERVICE POINT

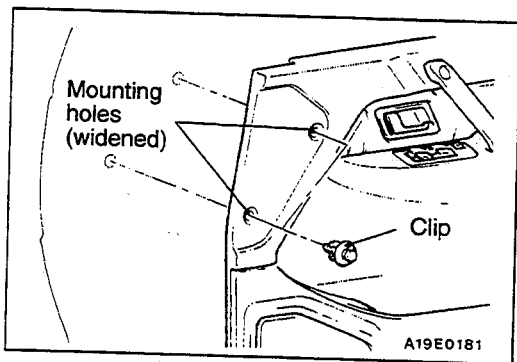
▶A◀ SCREW OR CLIP INSTALLATION

- (1) With the pin pulled out, insert the trim clip into the hole in the trim.
- (2) Push the pin inward until the pin's head is flush with the grommet.
- (3) Check whether the trim is secure.

NOTE

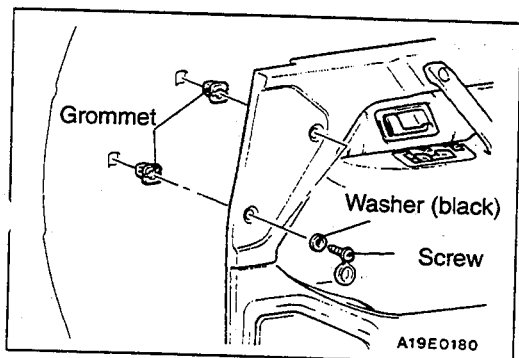
Two types of door panel and door trim are available. Identify the type from the table below, and install by the following procedure.

Item	Door panel and door trim type	
	Type A	Type B
Door panel	Round hole 8 mm (.31 in.)	Square hole 10×12 mm (.39×.47 in.)
Door trim	Round hole 11 mm (.43 in.)	Round hole 6 mm (.24 in.)
Securing method	Clip	Cap assembled screw



- When installing the type B door trim to the type A door panel

- 1) Use a drill or similar tool to widen the mounting holes [6 mm (.24 in.) dia.] in the door trim to 11 mm (.43 in.) in diameter.
- 2) Secure using clips.



When installing the type A door trim to the type B door panel

- 1) Insert grommet into the square mounting holes in the door panel.
- 2) Tighten using black washers and screws, and then cover the screws with the caps.

DOOR GLASS AND REGULATOR

REMOVAL AND INSTALLATION

110005188

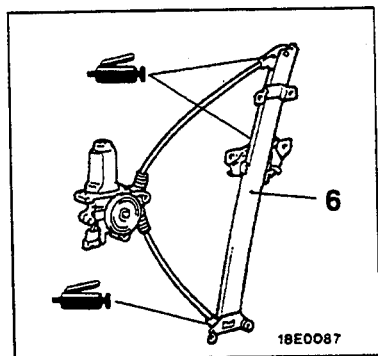
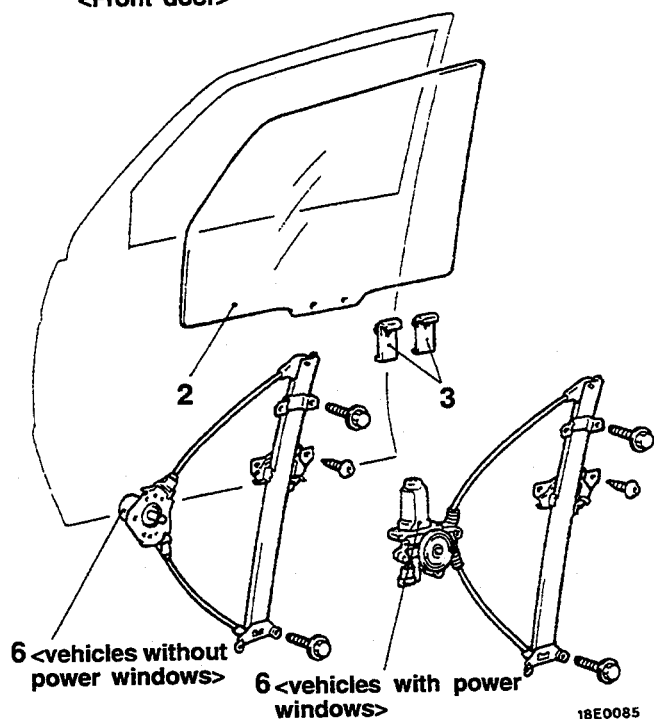
Pre-removal Operation

- Door Trim and Water proof Film Removal (Refer to P.42-27.)

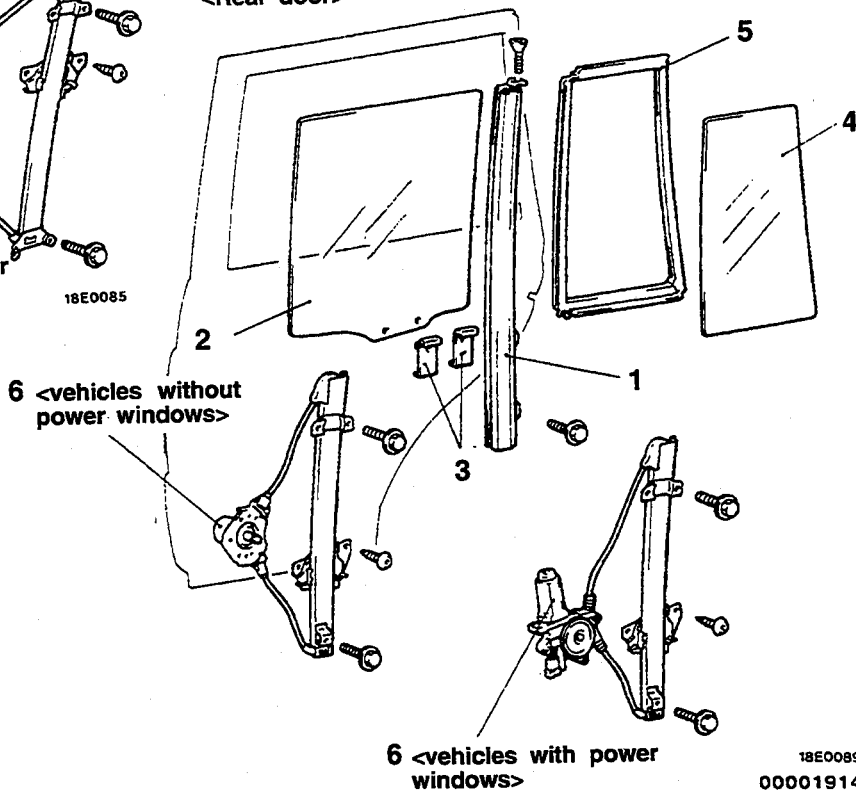
Post-installation Operation

- Door Window Glass Adjustment (Refer to P.42-10.)
- Door Trim and Water proof Film Installation (Refer to P.42-27.)

<Front door>



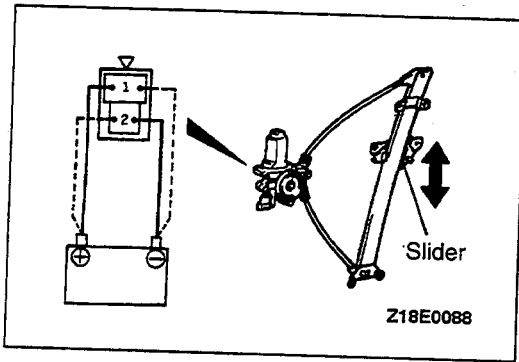
<Rear door>



Removal steps

- Rear door belt line moulding (Refer to P.42-40.)
- 1. Rear door center sash
- 2. Door window glass

- 3. Door glass holder
- 4. Stationary window glass
- 5. Stationary window weatherstrip
- 6. Window regulator assembly



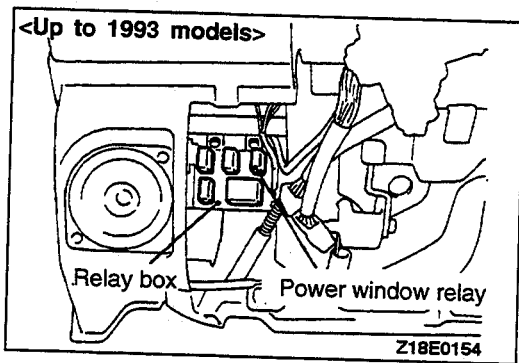
INSPECTION

POWER WINDOW MOTOR

- (1) Check that the slider moves smoothly when the battery is directly connected to the motor terminals.
- (2) Check that the slider moves in the opposite direction when the battery is connected with the polarities reversed.

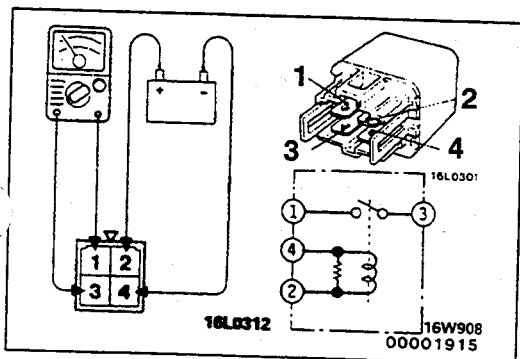
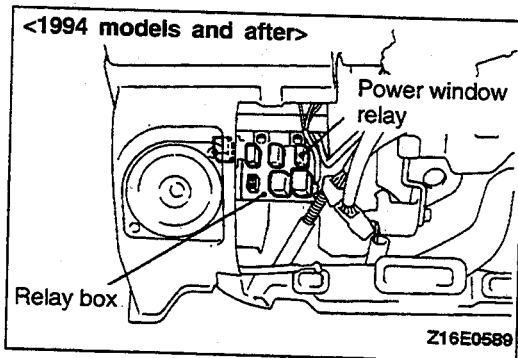
CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR)

- (1) Press the UP switch to fully close the window glass, and continue to press the switch for 10 seconds.
- (2) At the moment that the UP switch is released, press the DOWN switch. The circuit breaker can be considered good if at this time the door window glass begins to open within 60 seconds.



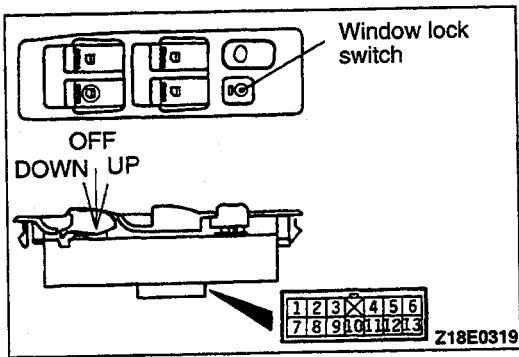
POWER WINDOW RELAY

- (1) Remove the power window relay from the relay box.



- (2) Check for continuity between the terminals.

When there is no current	Between terminals (2)–(4)	Continuity
	Between terminals (1)–(3)	No continuity
When there is current (between terminals (2)–(4))	Between terminals (1)–(3)	Continuity

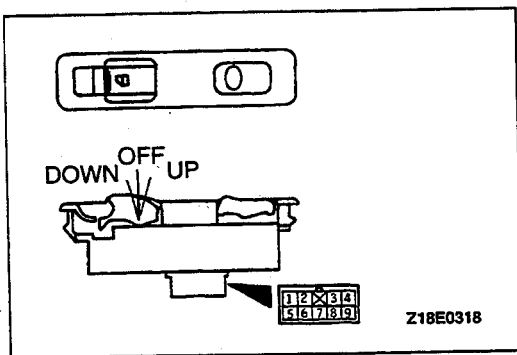


POWER WINDOW SWITCH

Operate the switch and check the continuity between the terminals.

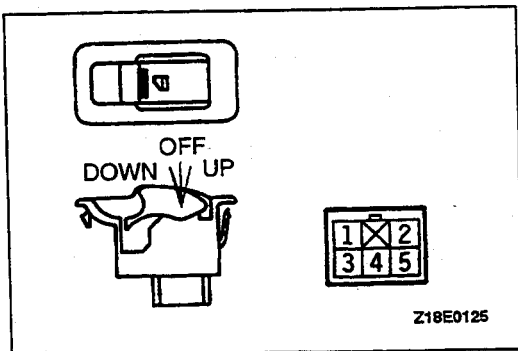
Main Switch

Terminal	Power window switch (normal)			Power window switch (lock)		
	UP	OFF	DOWN	UP	OFF	DOWN
Front (Driver's side)	9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	2	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	8	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Front (Passenger's side)	9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	1	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	7	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rear (R.H.)	9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	5	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	12	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rear (L.H.)	9	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	4	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	11	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	13	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



Sub-switch <Type 1>

Terminal	Sub-switch		
	UP	OFF	DOWN
Sub-switch	1	<input type="radio"/>	<input type="radio"/>
	2	<input type="radio"/>	<input type="radio"/>
	5	<input type="radio"/>	<input type="radio"/>
	6	<input type="radio"/>	<input type="radio"/>
	7	<input type="radio"/>	<input type="radio"/>



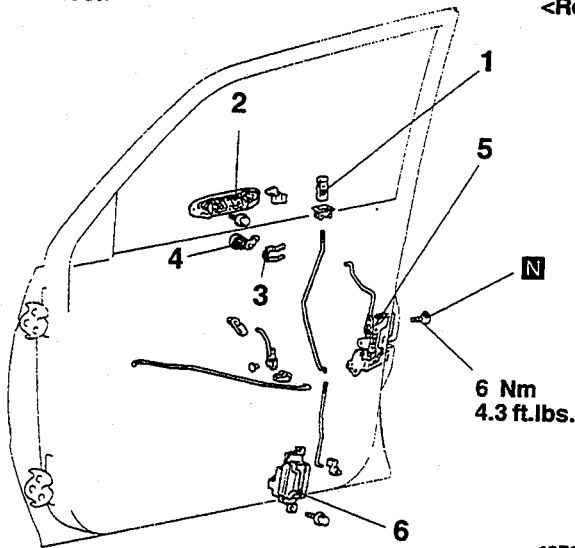
Sub-switch <Type 2>

Terminal	Sub-switch		
	UP	OFF	DOWN
Sub-switch	1	<input type="radio"/>	<input type="radio"/>
	2	<input type="radio"/>	<input type="radio"/>
	3	<input type="radio"/>	<input type="radio"/>
	4	<input type="radio"/>	<input type="radio"/>
	5	<input type="radio"/>	<input type="radio"/>

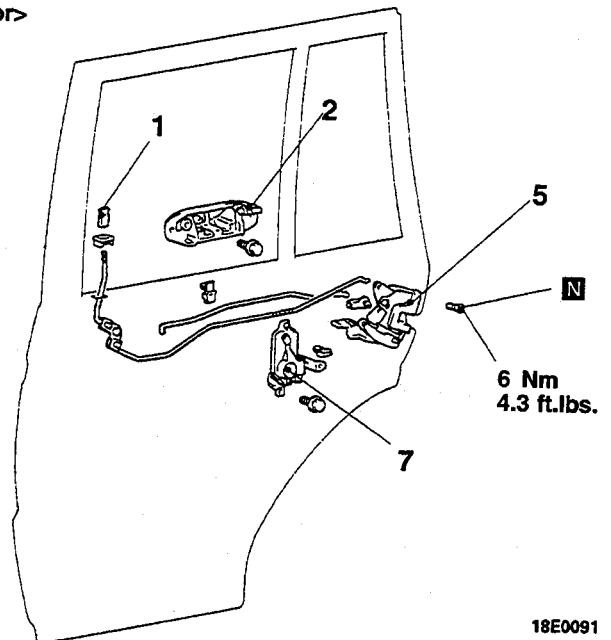
DOOR HANDLE AND LATCH REMOVAL AND INSTALLATION

110005189

<Front door>

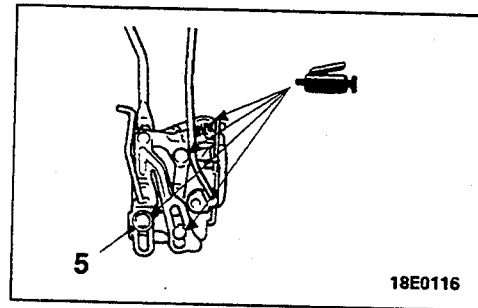
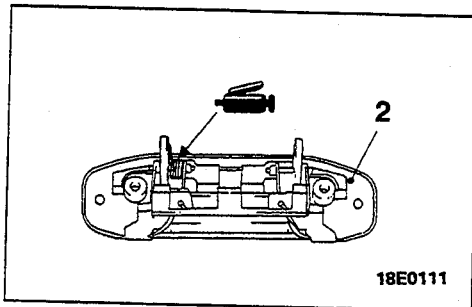


<Rear door>



18E0094

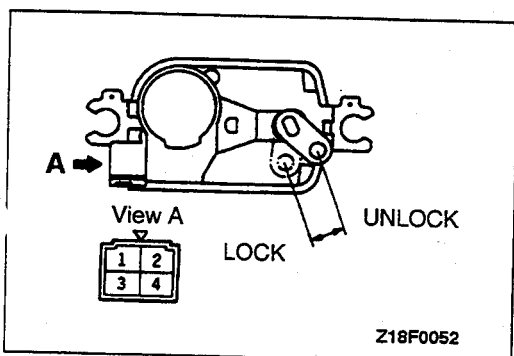
18E0091
00001916



Removal steps

- Door trim (Refer to P.42-27.)
- Waterproof film (Refer to P.42-27.)
- Door outside handle play inspection (Refer to P.42-10.)
- 1. Inside lock knob
- 2. Door outside handle

- 3. Retainer
- 4. Door lock key cylinder
- 5. Door latch assembly
- 6. Front door lock actuator
- 7. Rear door lock actuator



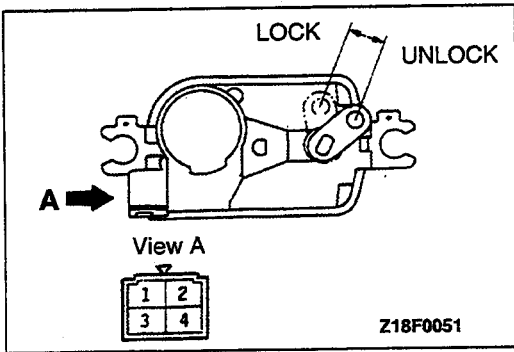
INSPECTION

FRONT DOOR LOCK ACTUATOR

<L.H.>

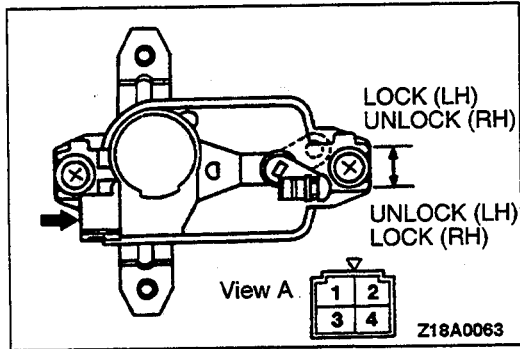
- (1) After setting the rod to the LOCK position and applying battery positive voltage to terminal (1), check if the rod moves to the UNLOCK position when terminal (3) is grounded.
- (2) After setting the rod to the UNLOCK position and applying battery positive voltage to terminal (3), check if the rod moves to the LOCK position when terminal (1) is grounded.

TSB Revision



<R.H.>

- (1) After setting the rod to the LOCK position and applying battery positive voltage to terminal (3), check if the rod moves to the UNLOCK position when terminal (1) is grounded.
- (2) After setting the rod to the UNLOCK position and applying battery positive voltage to terminal (1), check if the rod move to the LOCK position when terminal (3) is grounded.



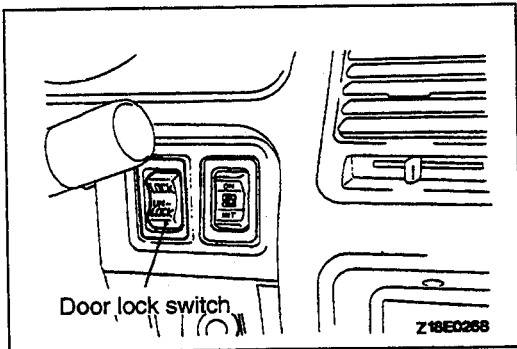
REAR DOOR LOCK ACTUATOR

<L.H.>

- (1) After setting the rod to the LOCK position and applying battery positive voltage to terminal (3), check if the rod moves to the UNLOCK position when terminal (1) is grounded.
- (2) After setting the rod to the UNLOCK position and applying battery positive voltage to terminal (1), check if the rod moves to the LOCK position when terminal (3) is grounded.

<R.H.>

- (1) After setting the rod to the LOCK position and applying battery positive voltage to terminal (1), check if the rod moves to the UNLOCK position when terminal (3) is grounded.
- (2) After setting the rod to the UNLOCK position and applying battery positive voltage to terminal (3), check if the rod moves to the LOCK position when terminal (1) is grounded.



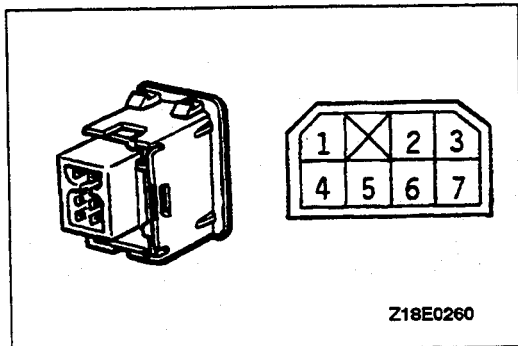
DOOR LOCK SWITCH [Up to 1992 models]

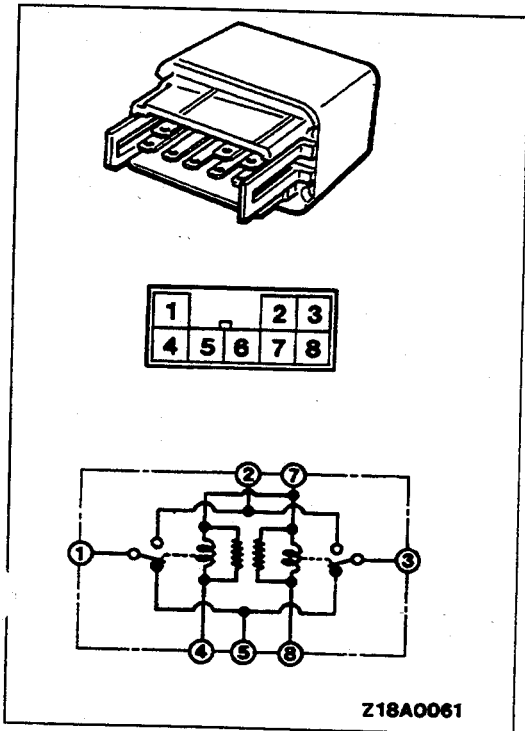
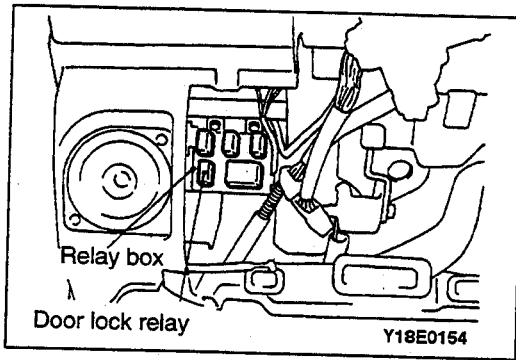
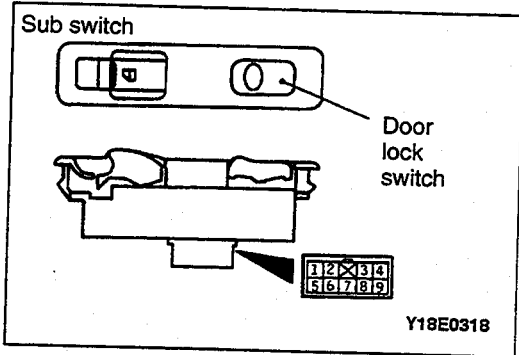
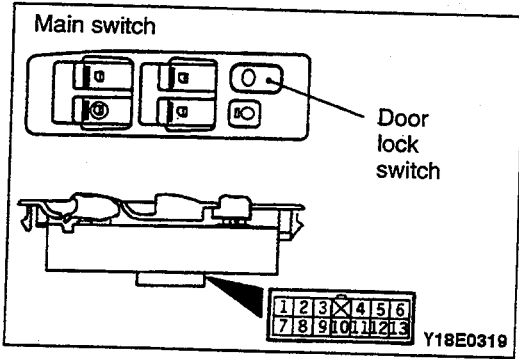
- (1) Remove the door lock switch from the instrument panel.
- (2) Operate the switch and check the continuity between the terminals.

Switch position	Terminal					
	2	3	7	1	*	4
LOCK	○	○		○	⊕	○
OFF				○	⊕	○
UNLOCK	○		○	○	⊕	○

NOTE

*: Illumination light





DOOR LOCK SWITCH [From 1993 models]

- (1) Remove the power window switch from the front door.
- (2) Operate the switch and check the continuity between the terminals.

Main switch

Terminal	Switch position		
	LOCK	OFF	UNLOCK
3	○		
6			○
13	○		○

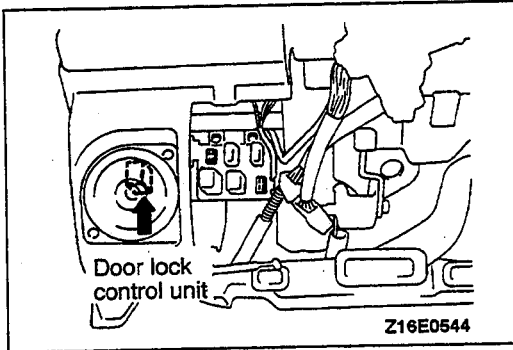
Sub-switch

Terminal	Switch position		
	LOCK	OFF	UNLOCK
3			○
8	○		
9	○		○

DOOR LOCK RELAY

- (1) Remove the door lock relay from the relay box.
- (2) Check for continuity between the terminals under the conditions described below.

Battery positive voltage	Terminal							
	1	2	3	4	5	7	8	
Continuity with no voltage	○		○	○	○		○	
Continuity with voltage	○	○		⊖	⊖	⊕	⊖	



DOOR LOCK CONTROL UNIT <1994 models and after>

- (1) Remove the instrument under cover. (Refer to GROUP 52A – Instrument Panel.)
- (2) Remove the door lock control unit from the relay box.

- (3) Apply battery voltage to terminals (8).
- (4) Perform the following check.

- 1) With terminals (4), (5) and (7) grounded, Connect a needle-type circuit tester between terminal (3) and the ground, and after switching it to the DCV range, and check if the needle moves at the instant when the connection at terminal (5) or (7) is removed.
- 2) With terminals (4) and (5) grounded, Connect a needle-type circuit tester between terminal (3) and the ground, and after switching it to the DCV range, and check if the needle moves at the instant when the connection at terminal (7) is grounded.
- 3) With terminal (4) grounded, Connect a needle-type circuit tester between terminal (3) and the ground, and after switching it to the DCV range, and check if the needle doesn't move when terminal (7) is grounded.

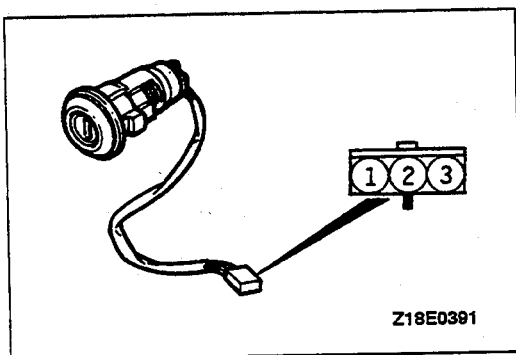
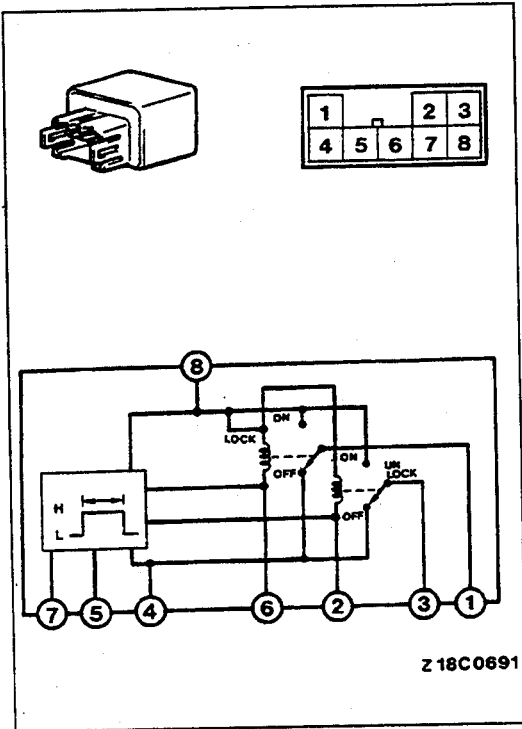
- (5) Also, check if there is a voltage of 12V between terminal (6) and the ground, and between terminal (2) and the ground.

NOTE

The reason why the needle of the circuit tester moves in (4) above is because battery voltage appears between terminals (1) and (3) and the ground for approximately 0.5 seconds.

DOOR LOCK KEY CYLINDER SWITCH <1994 models and after>

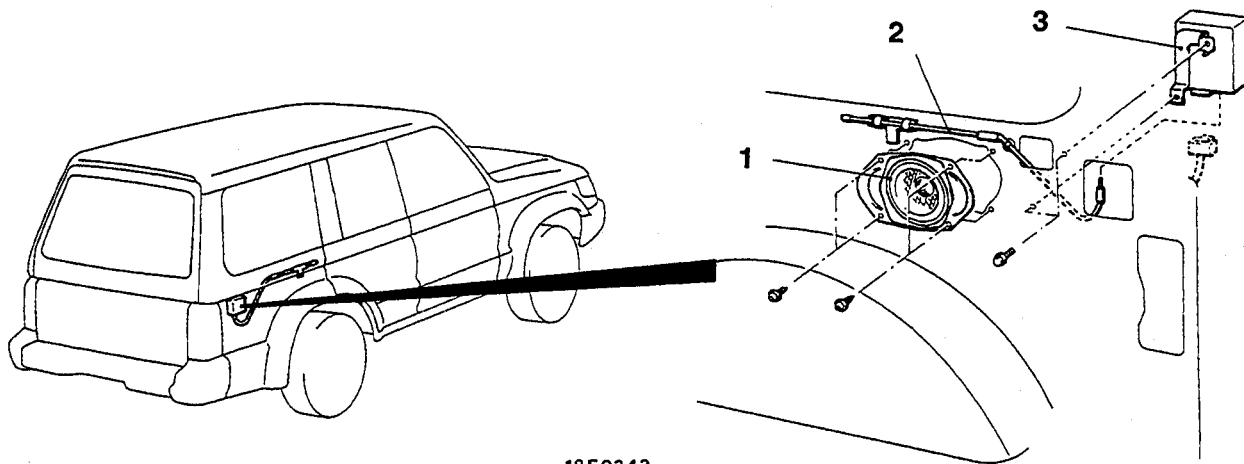
Switch position	Terminal		
	1	2	3
LOCK	○	○	
OFF			
UNLOCK		○	○



KEYLESS ENTRY SYSTEM

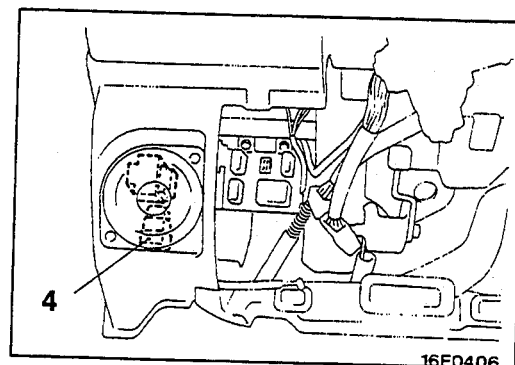
REMOVAL AND INSTALLATION

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18E0342
00001917

18E0362



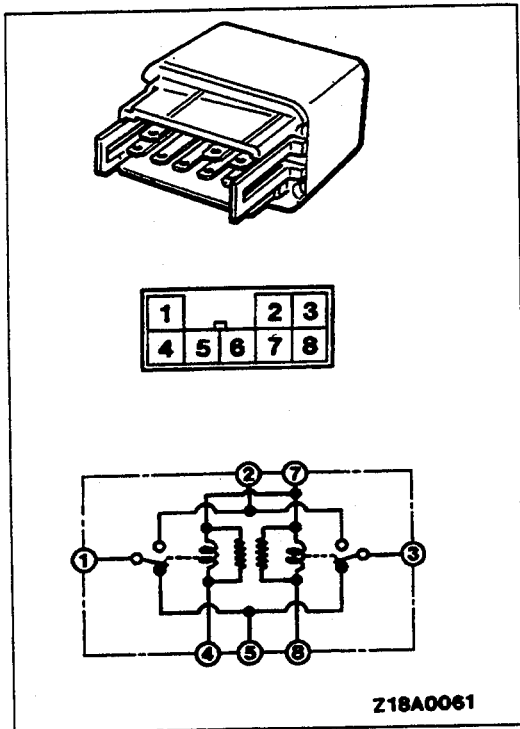
16E0406

Keyless entry control unit removal steps

- Quarter trim lower
(Refer to GROUP 52A – Trims.)
- Third seat belt retractor
<Vehicles with third seat>
(Refer to GROUP 52A – Third Seat belt)
- 1. Rear speaker and speaker cover
- 2. Antenna
- 3. Keyless entry control unit

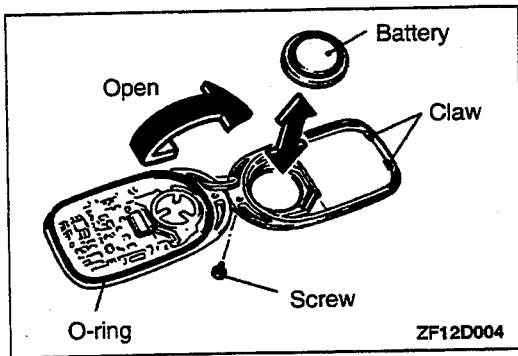
Door lock relay removal steps

- Instrument under cover
(Refer to GROUP 52A – Instrumental Panel.)
- 4. Door lock relay



**INSPECTION
DOOR LOCK RELAY**

Battery voltage	Terminal							
	1	2	3	4	5	6	7	8
Continuity with no voltage	○		○	○			○	○
Continuity with voltage	○	○		⊖	⊖	⊖	⊕	⊕



HOW TO REPLACE A BATTERY OF THE TRANSMITTER

110005191

1. Remove the set screw to remove the battery from the transmitter.
 2. Install a battery with its (+) side face-down.
- Battery required for replacement: Coin type battery CR2032**
3. Insert the claw first, and with care not to displace the O-ring, assemble the transmitter.

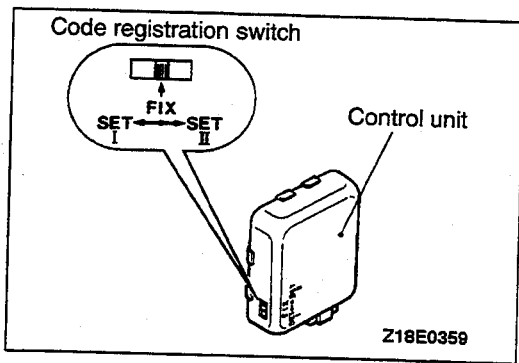
NOTE

- (1) Do not let water or dust stick to the inside of the transmitter when its open. Also, do not touch the precision electronic device.
- (2) If the O-ring is displaced during the assembly of the transmitter, water or dust penetrates in it, causing trouble.

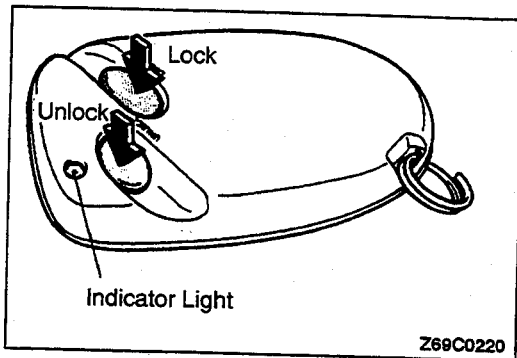
METHOD OF REGISTERING A CRYPTOGRAPHIC CODE

110005192

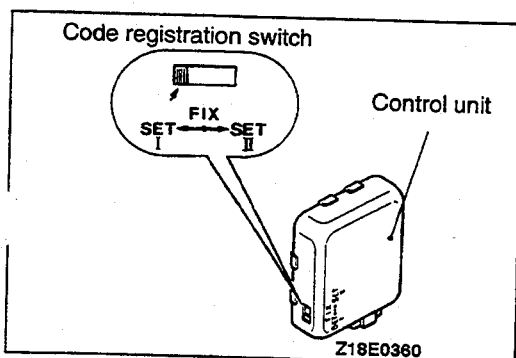
Since the transmitter is memorized by each individual code, it is necessary to register a code on EEPROM in the control unit if the transmitter or control unit is replaced, or cause of the trouble is presumed to be due to faulty registration of the code. Since two different codes at the most can be memorized in the memory space of EEPROM, the old code will become unable to be used if the following registration operation is repeated twice. Meanwhile, register a code after confirming that an ordinary door lock function can be worked through key operation.



- (1) Set the code registration switch of the control unit to SET I (registration mode side).



- (2) Push the LOCK or UNLOCK switch of transmitter.



- (3) Set the code registration switch of the control unit to FIX (operation mode) side.
- (4) Confirm that the keyless entry system operates normally. The registration is completed, if operates normally. If not, repeat (1) – (3).

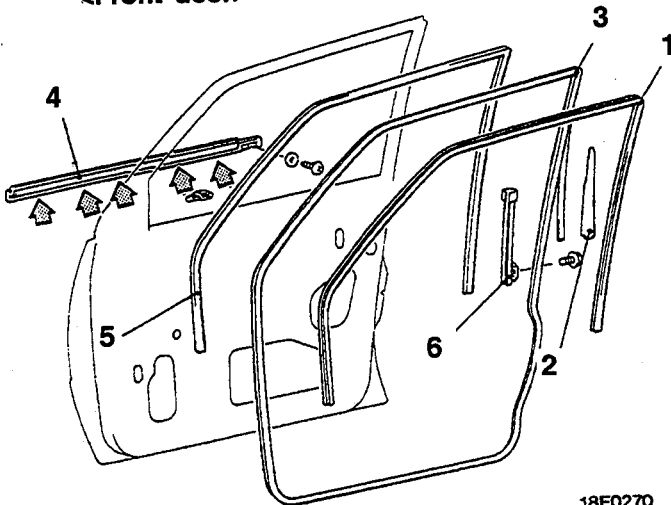
NOTE

- 1 Confirm that after a code has been registered the registration switch is surely set to FIX.
- 2 In case there are two transmitters, register a code on SET II side in the same manner as SET I.

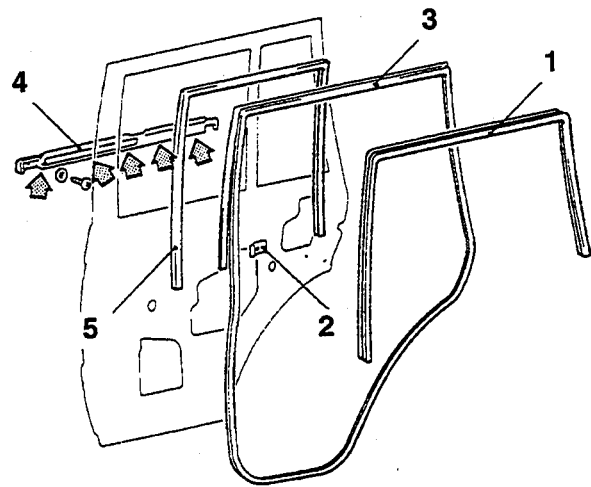
WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP

REMOVAL AND INSTALLATION

<Front door>



<Rear door>



18E0270

18E0269
00001918

NOTE

: Indicates the clip positions

1. Door inner opening weatherstrip
Door outer opening weatherstrip removal steps

2. Weatherstrip protector
3. Door outer opening weatherstrip

Belt line moulding removal steps

- Door mirror (Refer to GROUP 51 – Outside Mirror.)
- 4. Belt line moulding

Window glass runchannel removal steps

- Door window glass (Refer to P.42-30.)
- 5. Window glass runchannel
- 6. Lower rear sash



REMOVAL SERVICE POINT

◀▶ DOOR OUTER OPENING WEATHERSTRIP REMOVAL

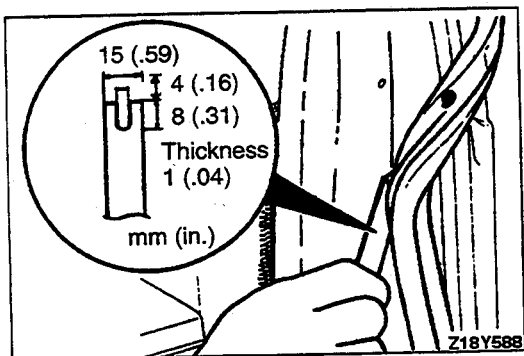
Make a tool as shown in the illustration to remove the door opening weatherstrip.

INSTALLATION SERVICE POINT

▶▶ DOOR OUTER OPENING WEATHERSTRIP INSTALLATION

The clip color identifies the left and right weatherstrips, so be sure to use the colors so as to install correctly.

Identification color	Applicable side
White	Left door
Brown	Right door

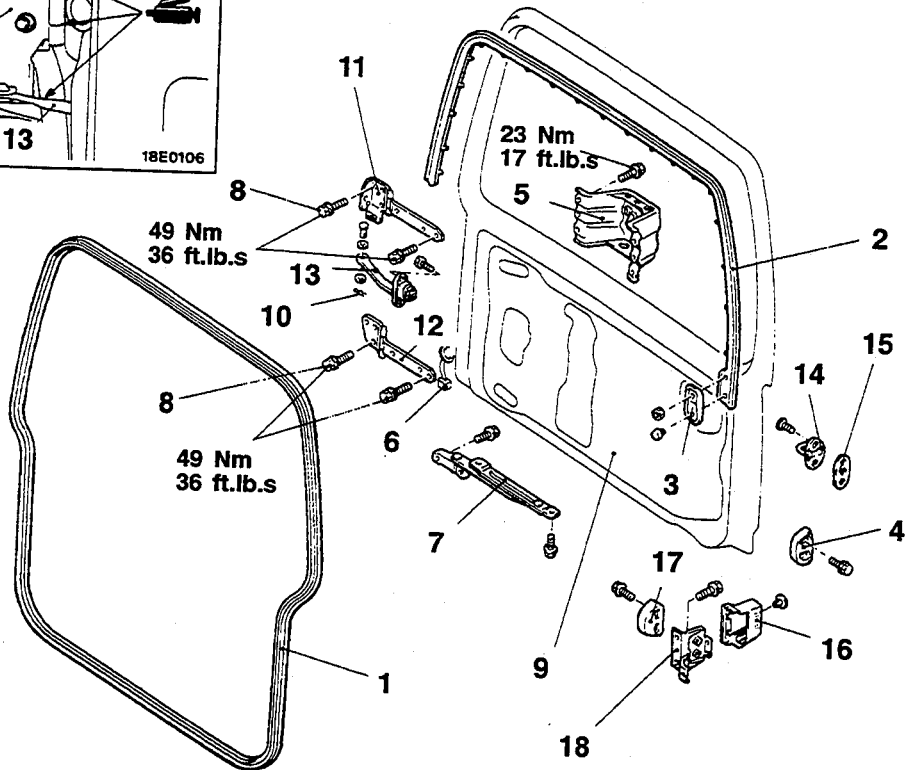
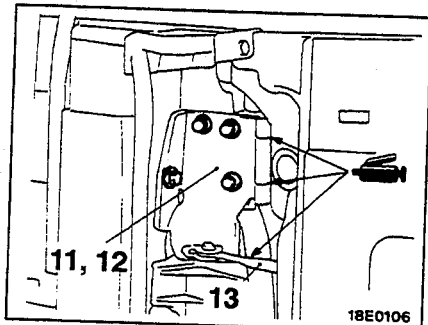


BACK DOOR ASSEMBLY

REMOVAL AND INSTALLATION

Back Door Post-installation Operation

- Back Door Adjustment (Refer to P.42-10.)



1. Inner opening weatherstrip
2. Outer opening weatherstrip
3. Weatherstrip plate
4. Bumper rubber
5. Spare tyre carrier

Back door removal steps

6. Harness connector
7. Back door stopper
8. Hinge attaching bolt
9. Back door

Hinge removal steps

- Back door trim (Refer to P.42-42.)
- Waterproof film (Refer to P.42-42.)
- 9. Back door
- 10. Split pin
- 11. Upper hinge
- 12. Lower hinge

Door check strap removal steps

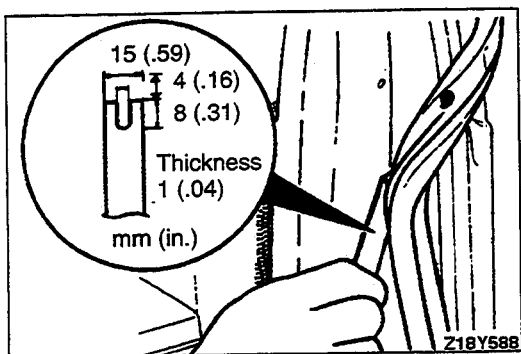
- Back door trim (Refer to P.42-42.)
- Waterproof film (Refer to P.42-42.)
- 10. Split pin
- 13. Door check strap

Striker removal steps

14. Striker
15. Shim

Back door bumper bracket removal steps

16. Back door bumper cover
17. Back door bumper female
- Rear combination light
18. Back door bumper bracket



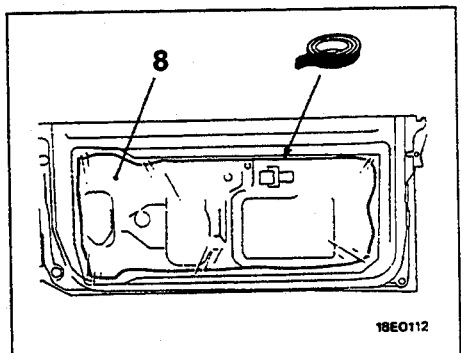
REMOVAL SERVICE POINT

◀▶ OUTER OPENING WEATHERSTRIP REMOVAL

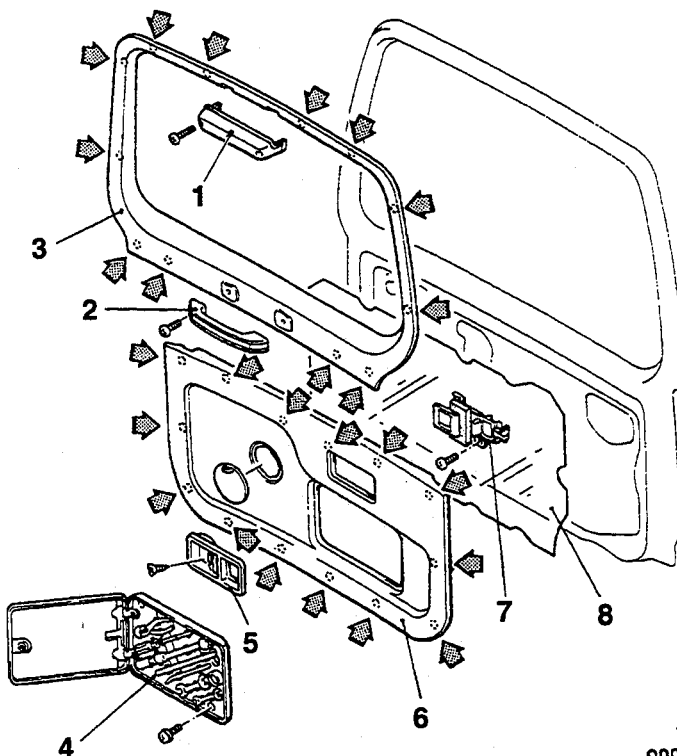
Make a tool as shown in the illustration to remove the outer opening weatherstrip.

BACK DOOR TRIM AND WATERPROOF FILM REMOVAL AND INSTALLATION

110005195



Sealant:
3M ATD Part No. 8625 or
equivalent



NOTE

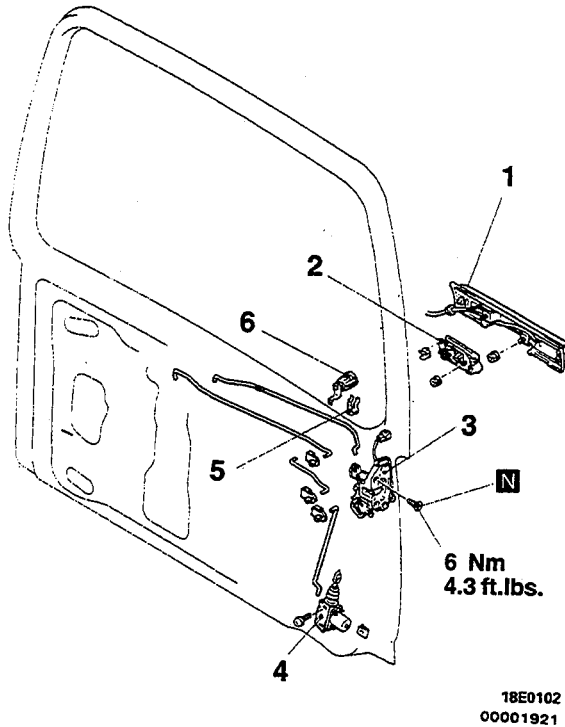
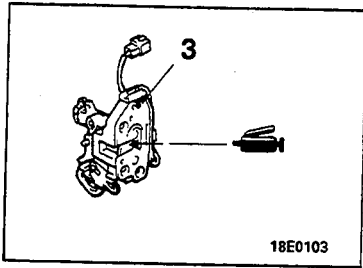
◀▶ : Indicates the clip positions

Removal steps

1. Cover
2. Door pull handle
3. Back door upper trim
4. Tool box lid assembly
5. Inside handle cover
6. Back door trim
7. Inside handle
8. Waterproof film

BACK DOOR HANDLE AND LATCH

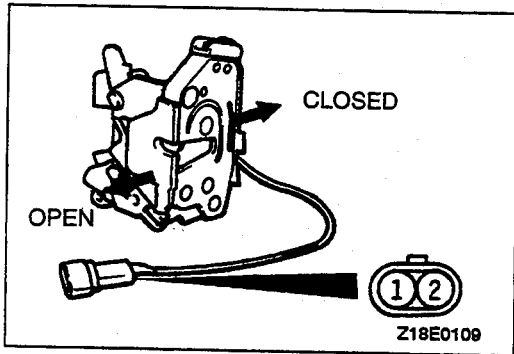
REMOVAL AND INSTALLATION



Removal steps

- Back door trim (Refer to P.42-42.)
 - Waterproof film (Refer to P.42-42.)
 - Door outside handle play inspection (Refer to P.42-10.)
1. License plate light garnish

2. Door outside handle
3. Back door latch assembly
4. Back door lock actuator
5. Retainer
6. Back door key cylinder

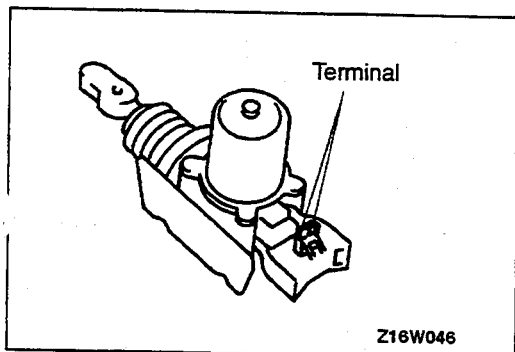


INSPECTION

LATCH SWITCH

Check the continuity between the terminals when the latch is moved.

Latch position	Terminal	
	1	2
OPEN	○	○
CLOSED		



BACK DOOR LOCK ACTUATOR

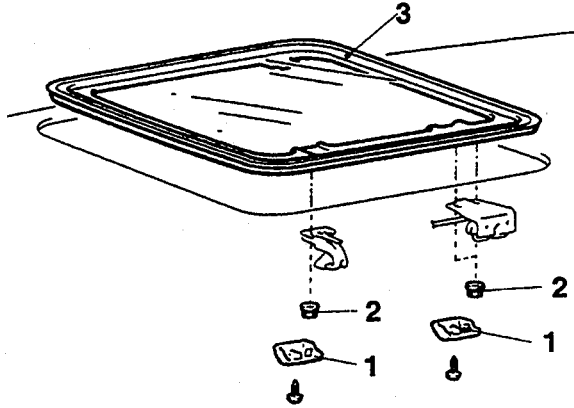
Connect the battery to the actuator terminal, and check that the shaft operates. If the shaft moves in the opposite direction when the connection polarity is changed, the actuator can be considered normal.

SUNROOF

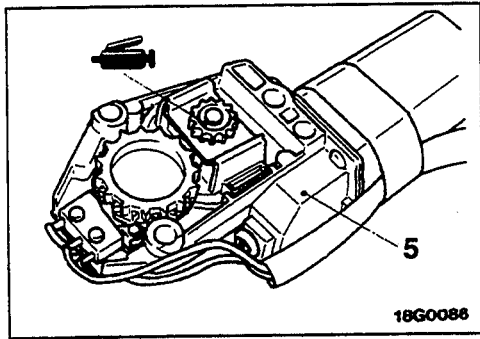
REMOVAL AND INSTALLATION

Post-installation Operation

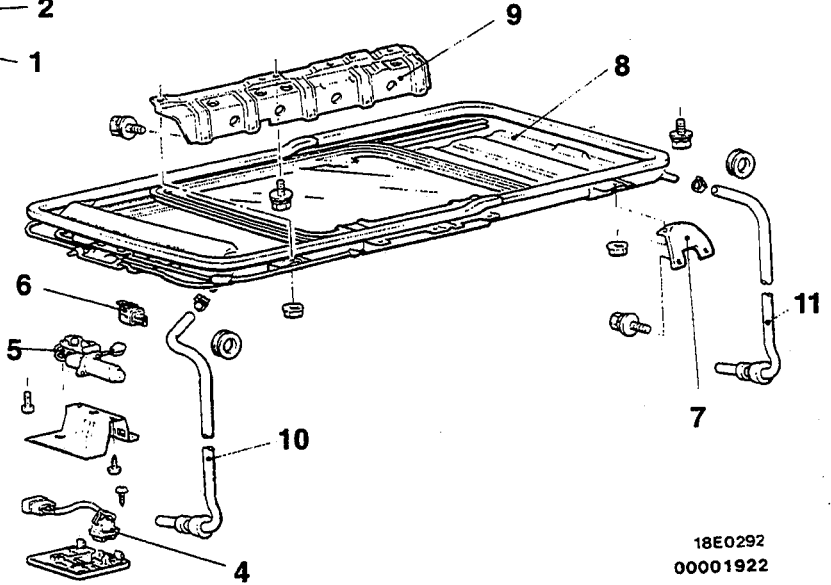
- Water Test (Refer to P.42-11.)



18W148



18G0086



18E0292
00001922

Sunroof glass removal steps

1. Decoration cover
2. Nuts
3. Sunroof glass assembly

Sunroof assembly removal steps

4. Sunroof switch
- Headlining
(Refer to GROUP 52A – Headlining.)
5. Motor assembly
6. Control unit
7. Rear set bracket
8. Sunroof assembly
9. Front set bracket
10. Front drain hose
11. Rear drain hose



REMOVAL SERVICE POINTS

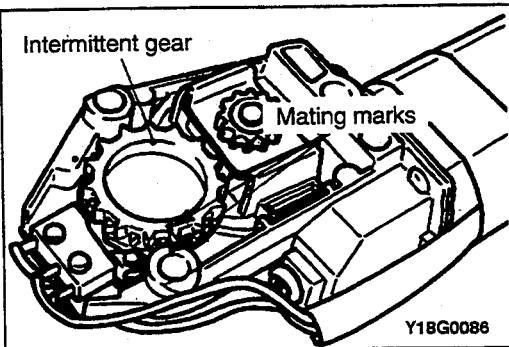
◀A▶ MOTOR ASSEMBLY REMOVAL

- (1) Close the sunroof fully and remove the motor.

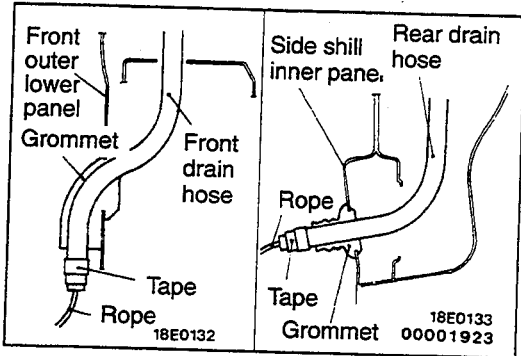
NOTE

If the sunroof does not move, make mating marks on the roof lid and the guide rail.

- (2) Make mating marks on the motor intermittent gear and bracket.

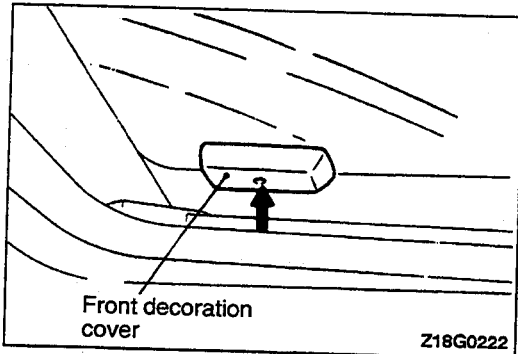


Y18G0086



◀B▶ FRONT DRAIN HOSE/REAR DRAIN HOSE REMOVAL

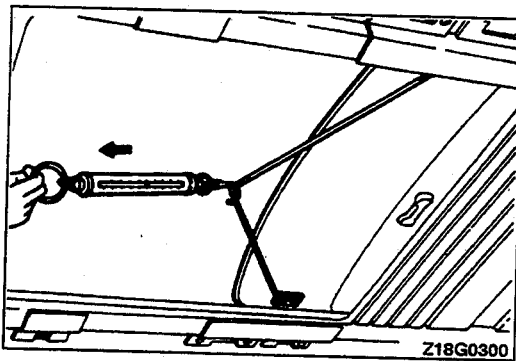
Tie a rope to the end of the drain hose, wind a tape around it so that there is no unevenness, and pull the drain hose into the inside of the passenger compartment.



INSPECTION

SUNROOF SLIDING RESISTANCE

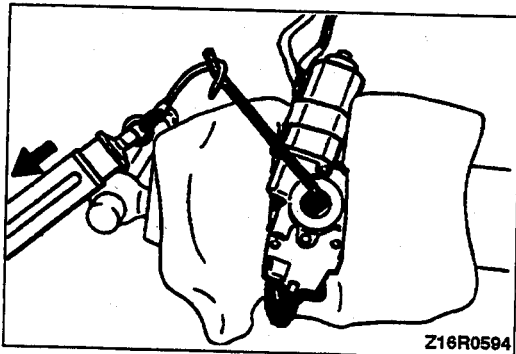
- (1) Remove the front decoration covers.
- (2) Remove the front guide front nut.
- (3) Remove the motor assembly.
- (4) Fasten the string.



- (5) Measure the sunroof drive resistance with a spring scale.

Standard value: 196 N (44 lbs.) or less

- (6) If the resistance exceeds the standard value, check the following.
 - 1) Guide rail installation
 - 2) Defective or worn guide bracket
 - 3) Seized drive cable
 - 4) Malfunction of drive tube



CLUTCH SLIP FORCE

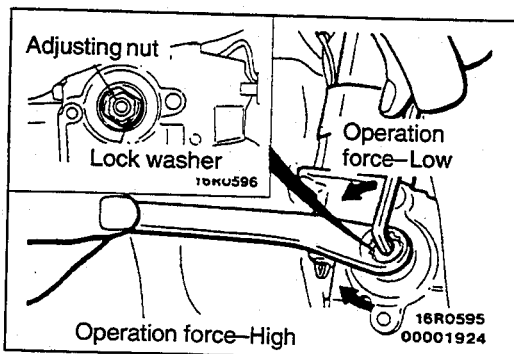
Check the sliding force of the clutch by the following procedure.

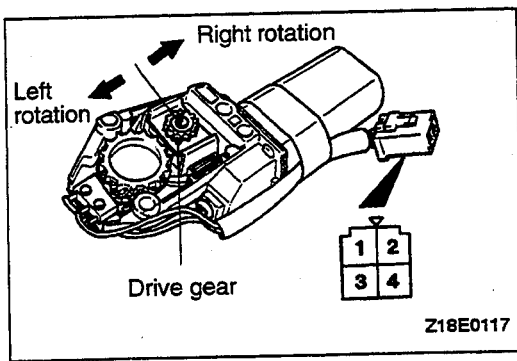
- (1) Place the hexagonal wrench from the special tools into hexagonal socket of the motor drive shaft, and use a spring balance to measure the force when the motor clutch starts to slip.

Standard value: 39–49 N (9–11 lbs.)

Caution

1. Keep the spring balance to the wrench at a right angle.
2. Always use the wrench in the special tools, or the value for the clutch sliding force will be different.
- (2) If the clutch sliding force is not within the standard value, turn the motor adjusting nut to the left or right to adjust.
- (3) After adjusting, tighten the adjusting nut securely with the lock washer.

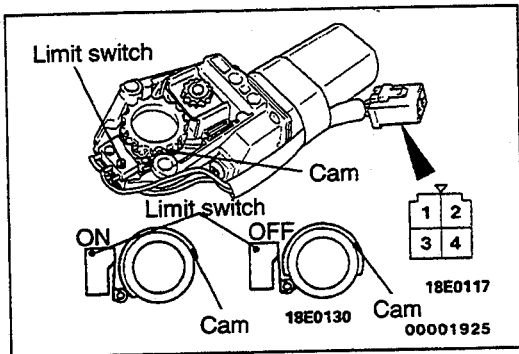




MOTOR

Check the direction of rotation of the drive gear when the connector is connected to the battery.

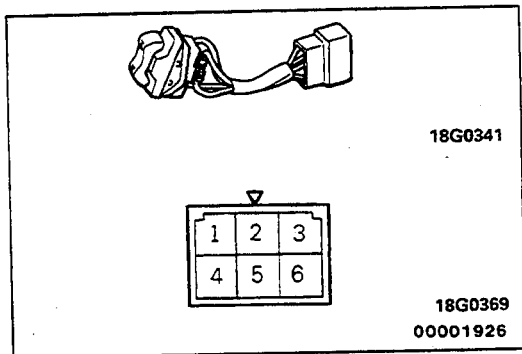
Terminal (1)	Terminal (3)	Drive gear rotation direction
+	-	Right
-	+	Left



LIMIT SWITCH

Turn over the motor and check the continuity at each of the limit switch terminals.

Switch	Terminal	
	2	4
ON		
OFF	○	○



SUNROOF SWITCH

Operate the sunroof switch and check the continuity between the terminals.

Switch	Terminal				
	1	2	3	5	6
OPEN	○	○	○	○	○
OFF		○	○	○	○
CLOSED	○	○	○	○	

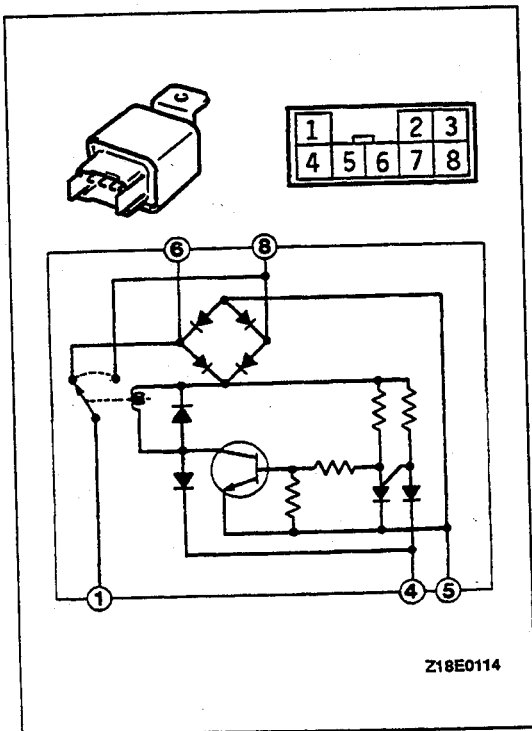
CONTROL UNIT

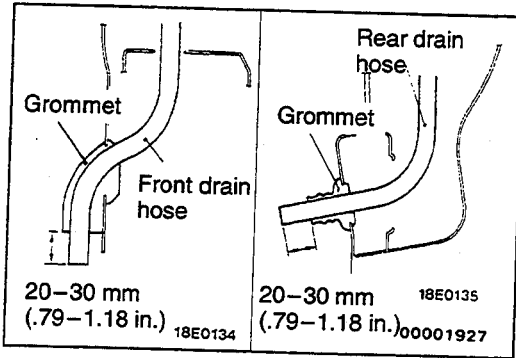
Check for continuity between the terminals under the conditions described below.

Battery positive voltage	Terminal				
	1	8	6	5	4
When there is no current	○	+	+	-	+
When there is current	○	+	-	+	

NOTE

⊕ — ⊖ indicate that there is continuity when the positive battery terminal is connected to the tester plus terminal, and the negative battery terminal is connected to the tester minus terminal.

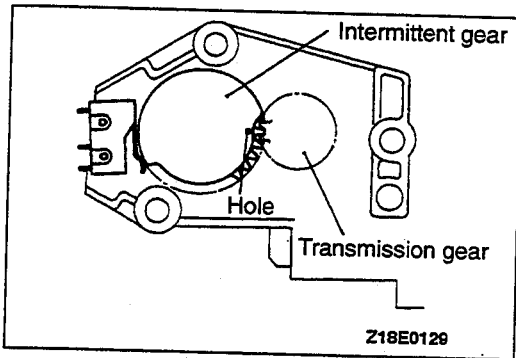
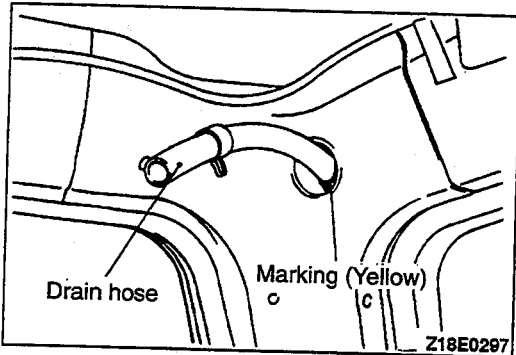




INSTALLATION SERVICE POINTS

►A◄ REAR DRAIN HOSE/FRONT DRAIN HOSE INSTALLATION

- (1) Tie the rope that was used during removal to the end of the drain hose, and wind tape around it so that there is no unevenness.
- (2) Pull the rope to pull the drain hose through.
- (3) Pull the drain hose until the protruding length from the grommet is as shown in the illustration.
- (4) Align the rear drain hose (R.H.) with the body hole so that the hose marking is at the bottom.

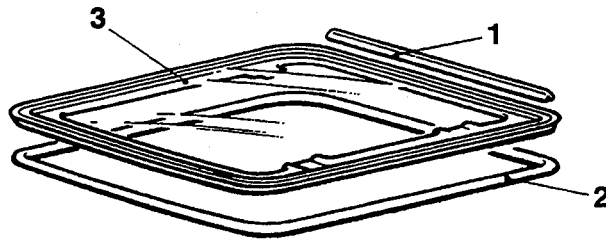


►B◄ MOTOR ASSEMBLY INSTALLATION

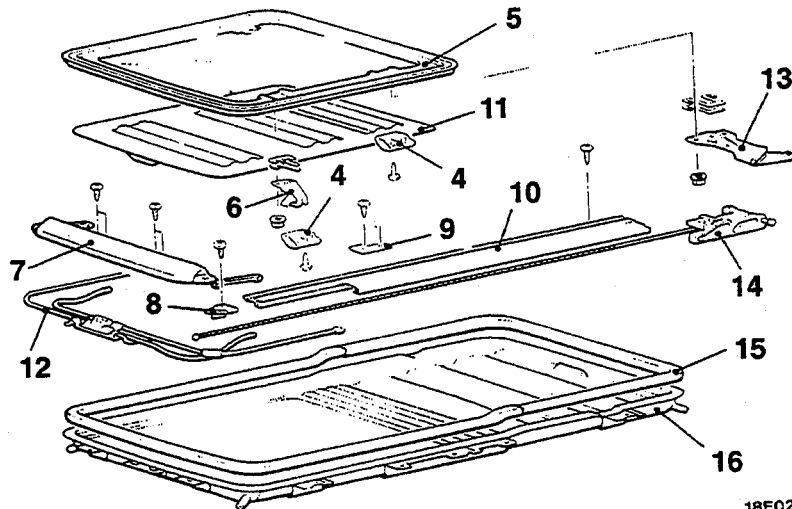
When replacing the motor assembly, open the sunroof glass approximately 200 mm (7.9 in.), set the hole of the intermittent gear so that it is aligned between the teeth of the motor assembly transmission gear, and then install the motor assembly.

DISASSEMBLY AND REASSEMBLY

110005198



18W937

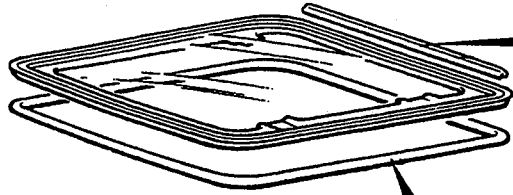
18E0251
00001949**Sunroof glass disassembly steps**

1. Screen drip
2. Weatherstrip
3. Sunroof glass

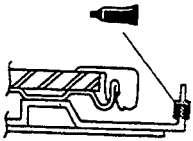
Sunroof assembly disassembly steps

4. Decoration cover
5. Sunroof glass assembly
6. Front guide bracket
7. Deflector assembly
8. Rail end cover
9. Set plate
10. Guide rail assembly
11. Sun shade
12. Drive tube
13. Lifter assembly
14. Slider assembly
15. Sealing tape
16. Housing assembly

LUBRICATION AND SEALING POINTS

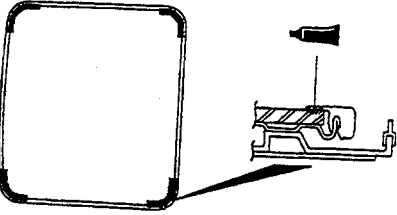


18W937




18W946

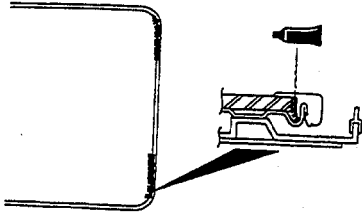
Adhesive:
3M ATD Part No. 8001,
or 3M ATD Part No. 8011,
or equivalent




18W942

 : Adhesive application locations

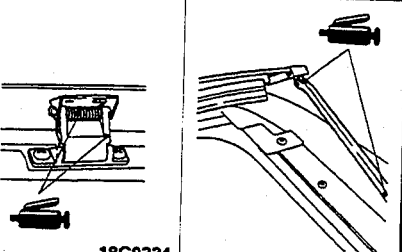
Adhesive:
3M ATD Part No. 8001 or 3M ATD
Part No. 8011, or equivalent



18W943

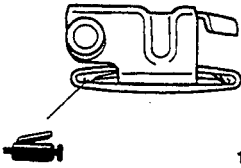
 : Sealant application locations

Sealant: 3M ATD Part No. 8531
or 3M ATD Part No.
8509, or equivalent

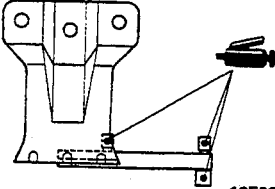


18G0224

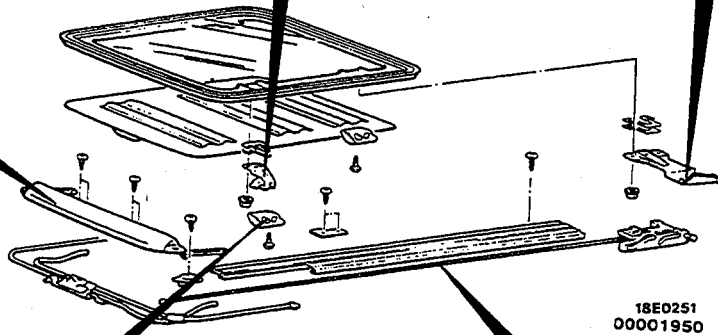
18G0227



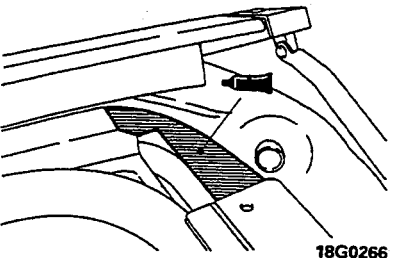
18E0250



18E0249

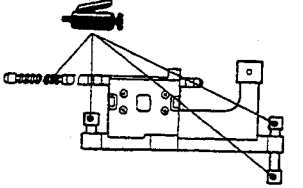


18E0251
00001950



18G0266

Sealant: 3M ATD Part No. 8531 or
3M ATD Part No. 8646,
or equivalent



18E0248


NOTES

EXTERIOR

CONTENTS

110005199

DOOR MIRROR	25	REAR BUMPER	6
FRONT BUMPER	4	REAR WIPER AND WASHER	17
GARNISHES AND MOULDINGS	7	SEALANTS AND ADHESIVES	3
GENERAL SPECIFICATIONS	2	SERVICE SPECIFICATIONS	3
HEADLIGHT WASHER	22	WINDSHIELD WIPER AND WASHER	13



GENERAL SPECIFICATIONS

110005200

Windshield wiper motor

Items		Specifications
Revolution speed at load of 1 Nm (0.72 ft.lbs.) rpm	Low speed	48±4
	High speed	70±7
Nominal torque Nm (ft.lbs.)		21 (15)
No-load current A		3.7 or less

Windshield wiper blade

Items		Specifications
Wiping angle	Driver's side	85°
	Passenger's side	109°
Wiper blade length mm (in.)	Driver's side	475 (18.7)
	Passenger's side	475 (18.7)

Windshield washer motor and pump

Items		Specifications
Motor type		Direct current ferrite magnet type
Pump type		Centrifugal type
Power consumption A		4 or less
Time of continuous use sec.	With washer fluid	Max. 60
	Empty operation	Max. 20
Nozzle jet pressure kPa (psi)		110 (15.6) or more
Tank capacity dm ³ (qts.)		3.0 (3.1) or more

Rear wiper motor

Items		Specifications
Revolution speed at load of 0.6 Nm (0.43 ft.lbs.) rpm		38±5
Nominal torque Nm (ft.lbs.)		10 (7)

Rear wiper blade

Items		Specifications
Wiping angle		102°
Wiper blade length mm (in.)		375 (14.8)

Rear window washer motor and pump

Items		Specifications
Motor type		Direct current ferrite magnet type
Pump type		Centrifugal type
Power consumption A		3.8 or less
Time of continuous use sec.	With washer fluid	Max. 60
	Empty operation	Max. 20
Nozzle jet pressure kPa (psi)		120 (17) or more
Tank capacity dm ³ (qts.)		1.4 (1.5) or more

Intermittent wiper relay

Items	Specifications
Intermittent interval sec.	8±2

Headlight washer motor and pump

Items	Specifications
Motor type	Direct current ferrite magnet type
Pump type	Centrifugal type
Rated current A	21 or less
Nozzle injection pressure kPa (psi)	180 (25.6) or more
Tank capacity dm ³ (qts.)	3.7 (3.9) or more

Check valve

Items	Specifications
Valve opening and closing pressure kPa (psi)	50–110 (7.1–15.6)

Headlight washer relay

Items	Specifications
Timer operation time sec.	0.33

SERVICE SPECIFICATIONS

110005201

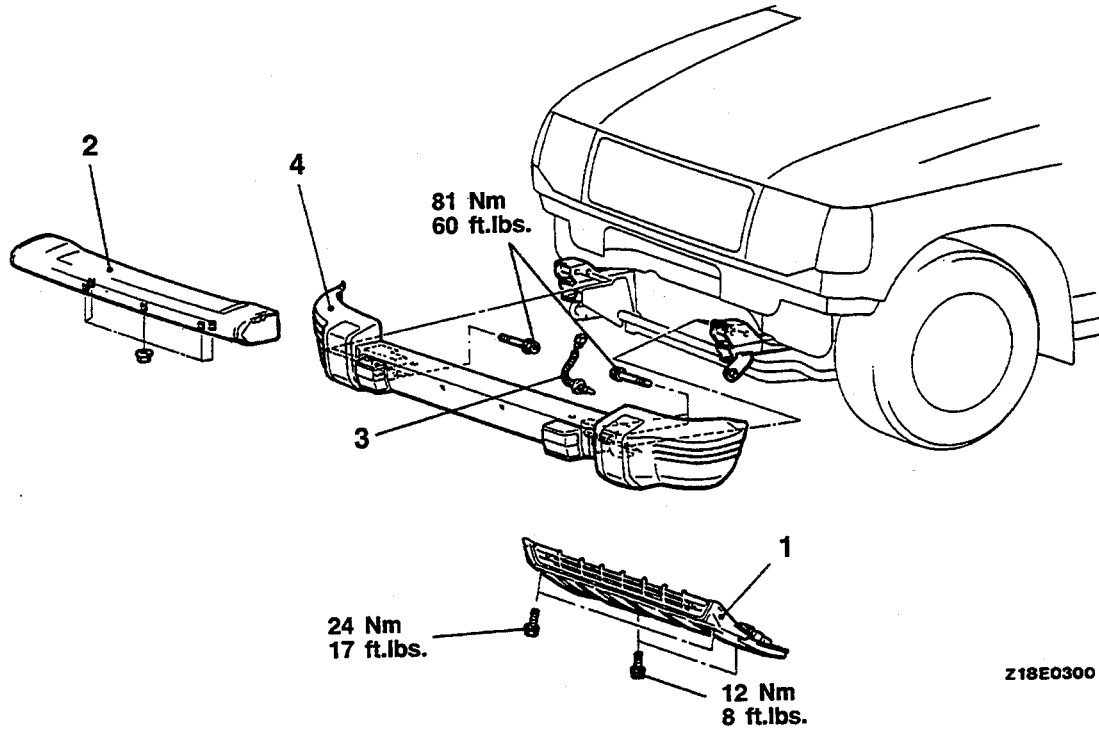
Items	Standard value
Windshield wiper blade installation position mm (in.)	Driver's side 25–35 (.98–1.38)
	Passenger's side 35–45 (1.38–1.77)
Rear wiper blade installation position mm (in.)	65–75 (2.56–2.95)

SEALANTS AND ADHESIVES

110005202

Items	Specifications
Back door lower garnish	3M ATD Part No. 6382 or equivalent
Back door corner garnish	
License plate garnish	
Side garnish	
Wide fender	

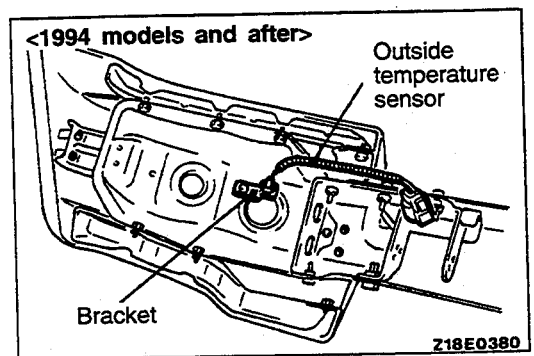
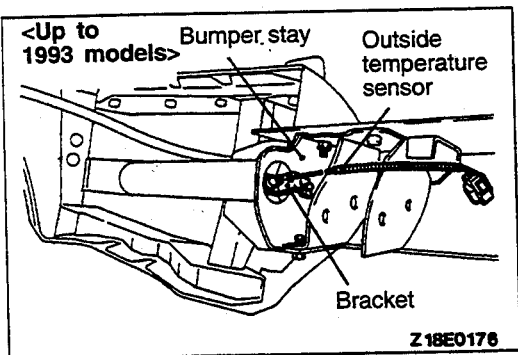
FRONT BUMPER REMOVAL AND INSTALLATION



Z18E0300

Removal steps

1. Skid plate
2. Bumper garnish
3. Outside temperature sensor
<Vehicles with Multi-meter>
- ▶A◀ 4. Bumper assembly



INSTALLATION SERVICE POINT

▶A◀ **BUMPER ASSEMBLY INSTALLATION**

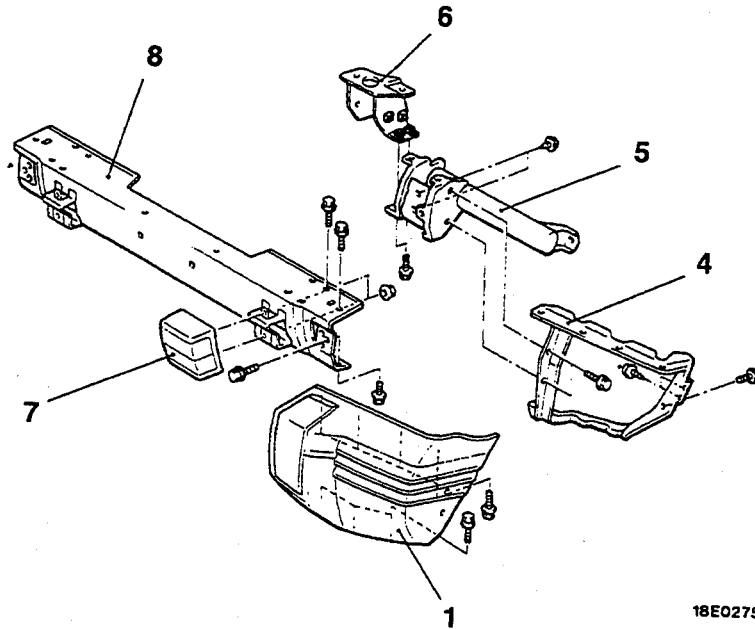
<Vehicles with Multi-meter>

When installing the bumper assembly, insert the sensor section of the outside temperature sensor into the bracket hole installed.

DISASSEMBLY AND REASSEMBLY

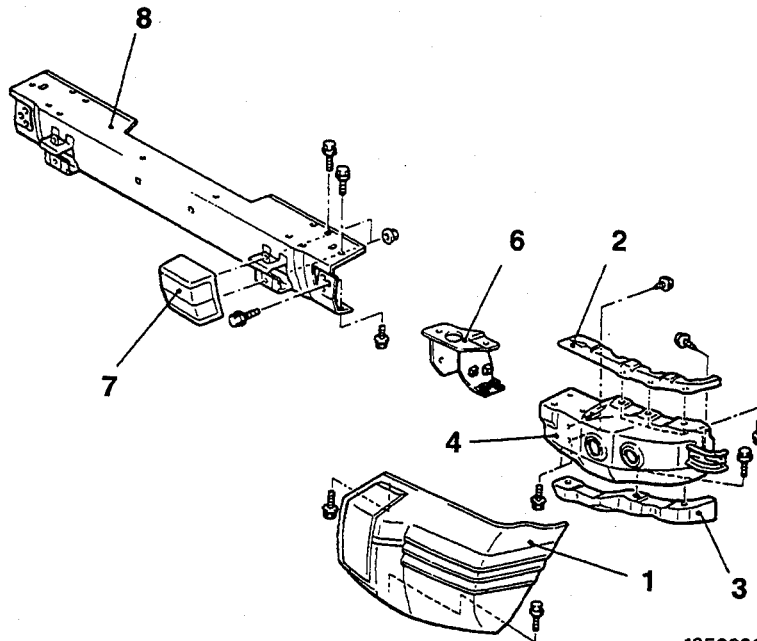
110005204

<Up to 1993 models>



18E0275

<1994 models and after>



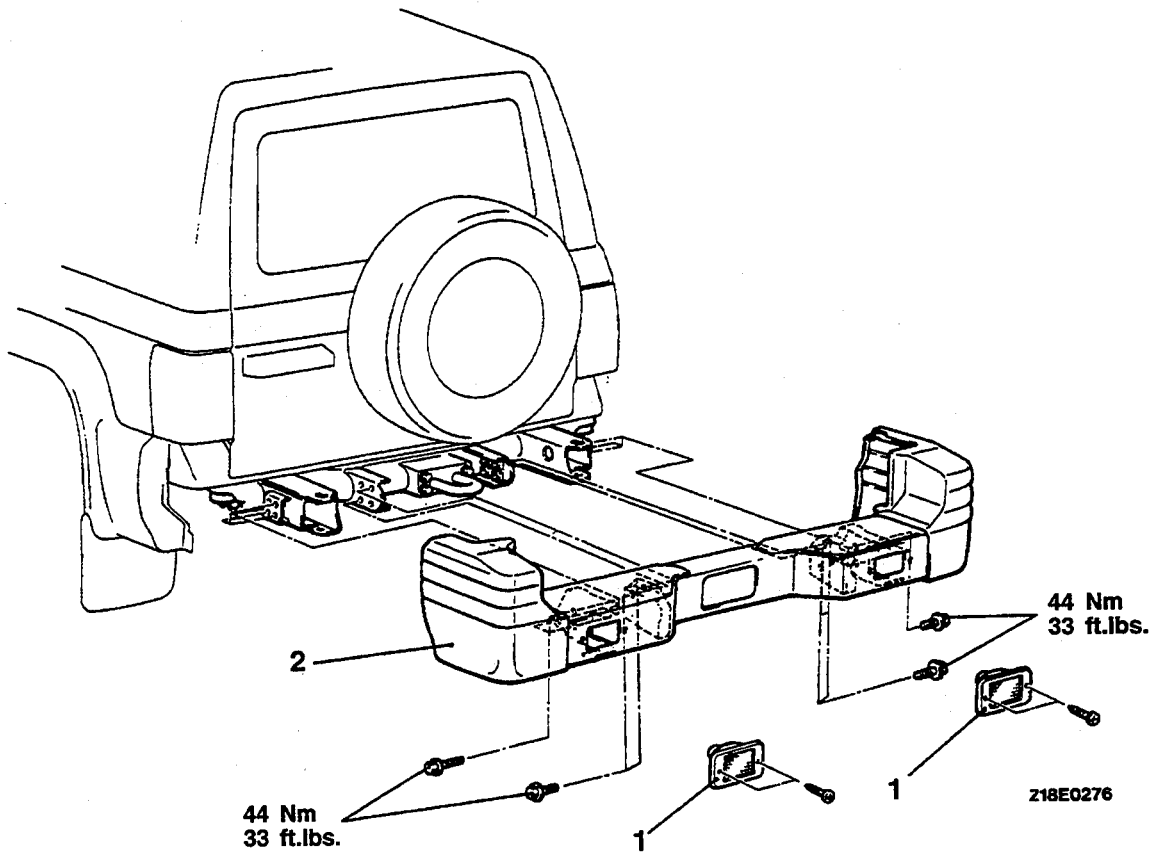
18E0390
00001951

Disassembly steps

1. Bumper side face
2. Bumper side upper reinforcement
3. Bumper side lower reinforcement
4. Bumper side reinforcement
5. Bumper stay
6. Bumper mount bracket
7. Bumper guard
8. Bumper center face

TSB Revision

REAR BUMPER REMOVAL AND INSTALLATION

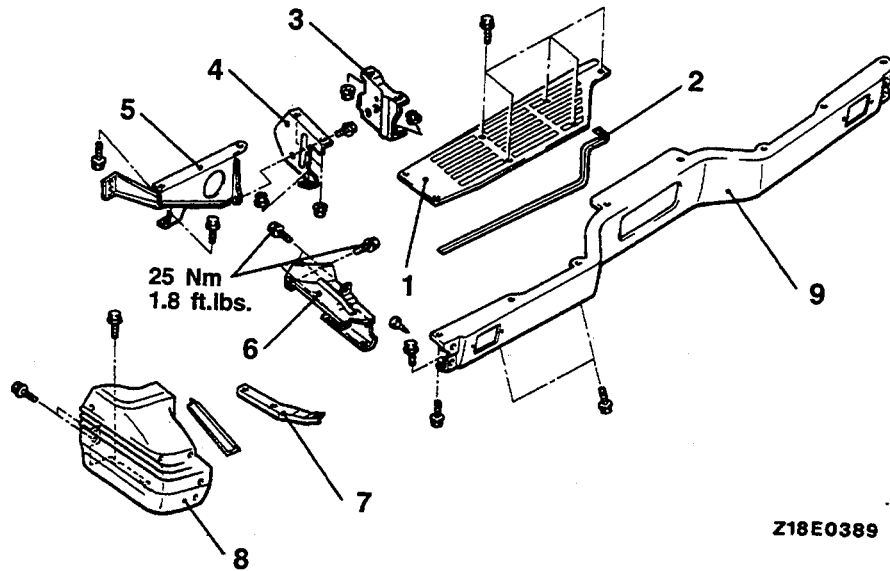


Removal steps

1. Back-up lights
2. Bumper assembly

DISASSEMBLY AND REASSEMBLY

110005206



Z18E0389

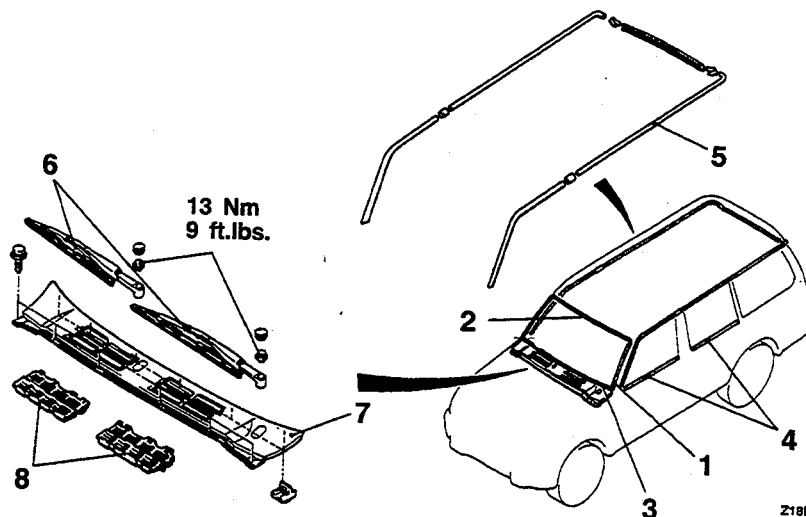
Removal steps

- | | |
|-------------------------|------------------------------------|
| 1. Bumper step plate | 6. Bumper side upper reinforcement |
| 2. Weatherstrip | 7. Bumper side lower reinforcement |
| 3. Bumper stay A | 8. Bumper side face |
| 4. Bumper stay B | 9. Bumper center face |
| 5. Bumper reinforcement | |

GARNISHES AND MOULDINGS

**EXCEPT SIDE GARNISH AND WIDE FENDER
REMOVAL AND INSTALLATION**

110005207

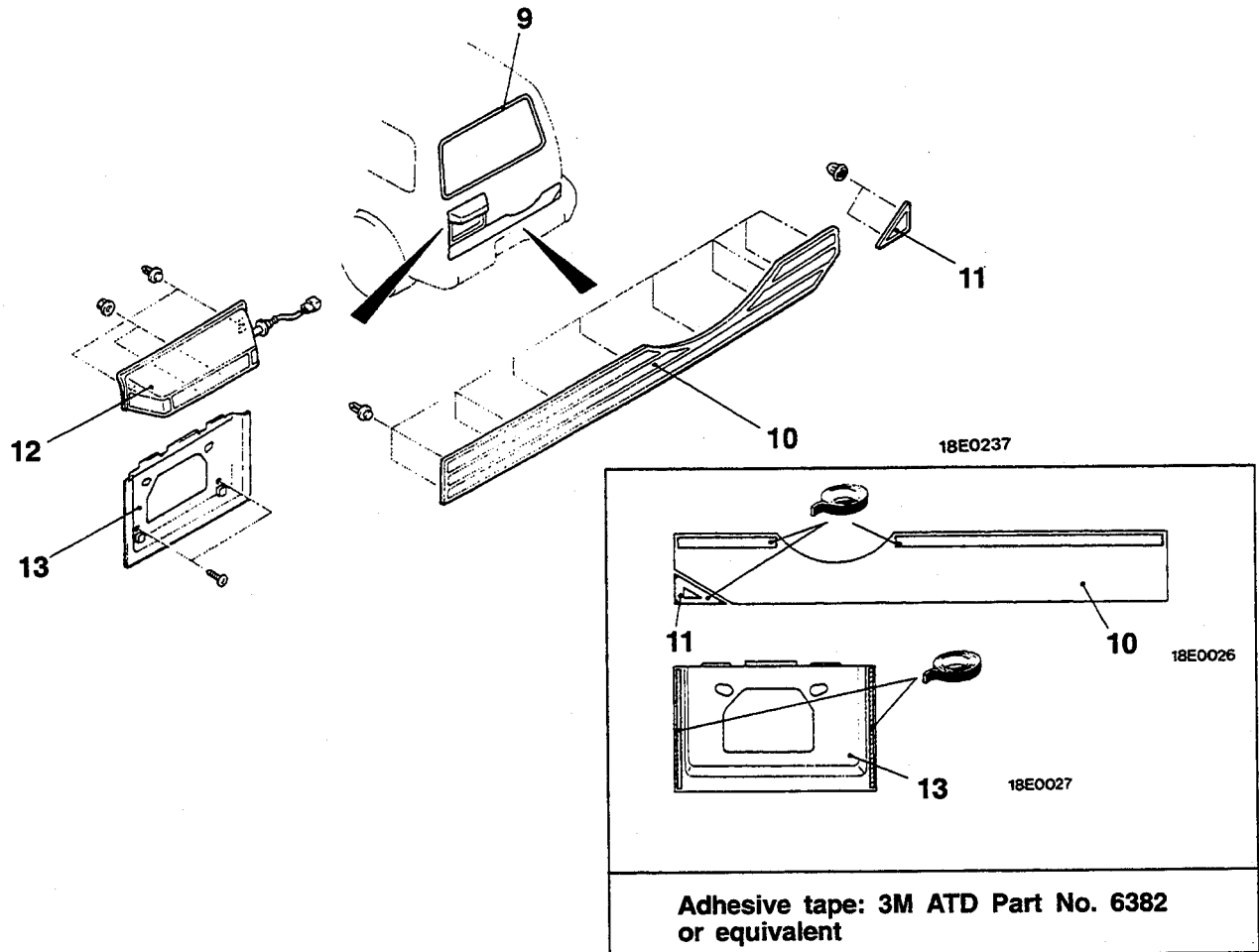


Z18E0235

1. Windshield side moulding [Refer to GROUP 42–Windshield.]
2. Windshield upper moulding [Refer to GROUP 42–Windshield.]
3. Windshield lower moulding [Refer to GROUP 42 – Windshield.]
4. Belt line moulding [Refer to GROUP 42–Window Opening Weatherstrip.]
5. Drip moulding

Removal steps of front deck garnish

- Hood [Refer to GROUP 42–Hood.]
- 6. Wiper arm assembly
- 7. Front deck garnish
- 8. Air intake garnish



00001952

- 9. Back door window glass moulding
[Refer to GROUP 42 – Back Door Window Glass.]
- 10. Back door lower garnish
- 11. Back door corner garnish

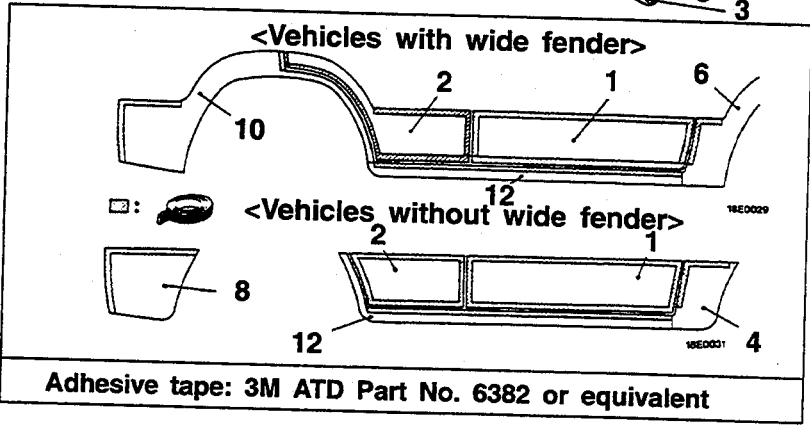
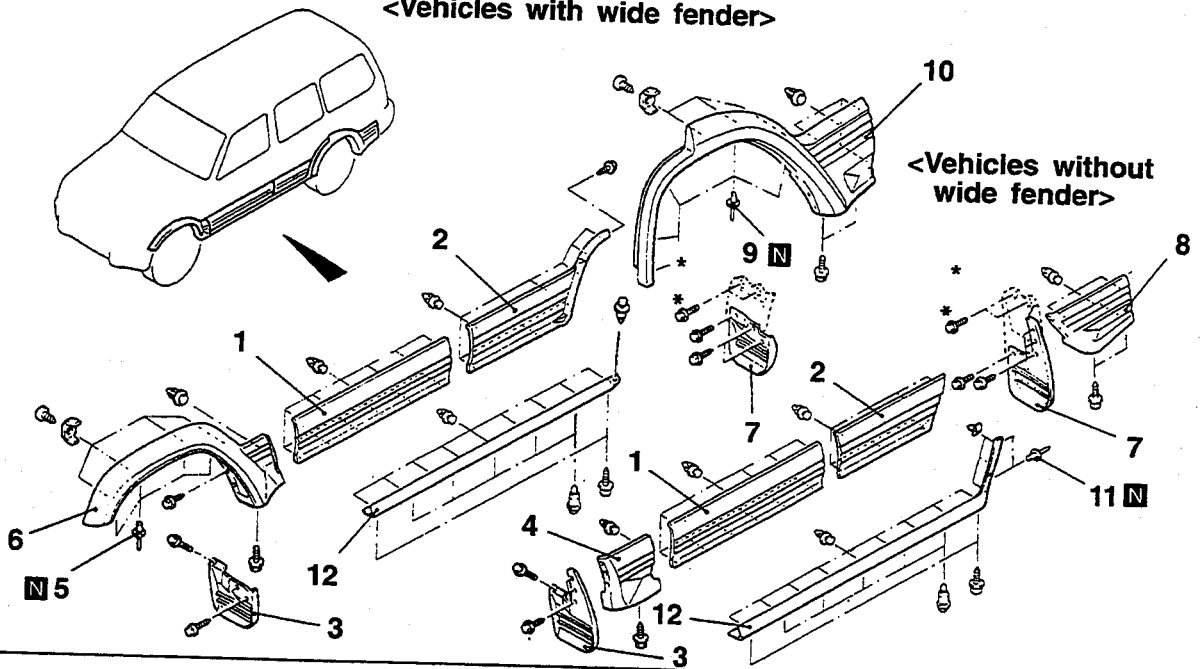
License light garnish removal steps

- Back door trim [Refer to GROUP 42 – Back Door Trim and Waterproof Film.]
- 12. License light garnish
- 13. License plate garnish

**SIDE GARNISH AND WIDE FENDER
REMOVAL AND INSTALLATION**

110005208

<Vehicles with wide fender>



18E0017
00001953

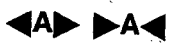
Adhesive tape: 3M ATD Part No. 6382 or equivalent

Front door side garnish removal



1. Front door side garnish

Rear door side garnish removal



2. Rear door side garnish

Fender side garnish removal steps



3. Front mud guard
4. Fender side garnish

Front flare removal steps

- Splash shield (Refer to GROUP 42-Fender.)



5. Blind rivet
6. Front flare

Rear quarter side garnish removal steps



7. Rear mud guard
8. Rear quarter side garnish

Rear flare removal steps



7. Rear mud guard
9. Blind rivet
10. Rear flare

Side sill garnish removal steps



- <Vehicles without wide fender>
4. Fender side garnish
 11. Blind rivet
 12. Side sill garnish

Side sill garnish removal steps

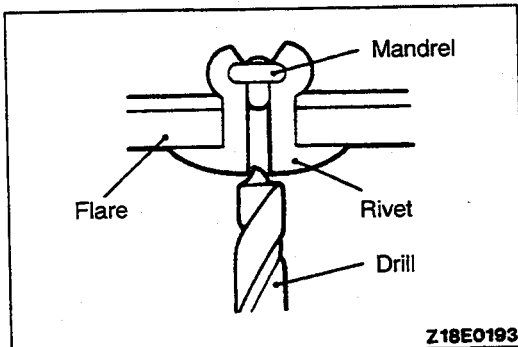
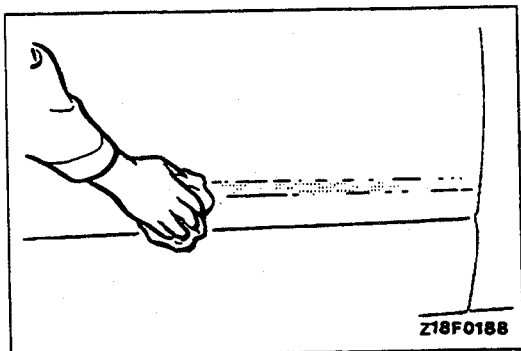
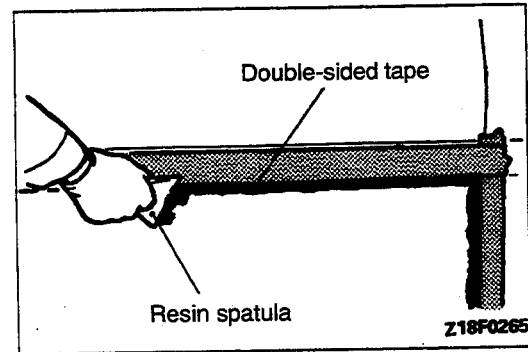
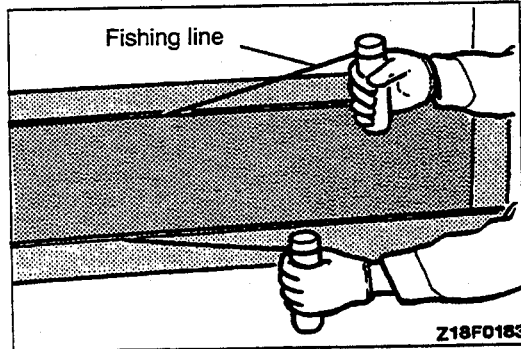
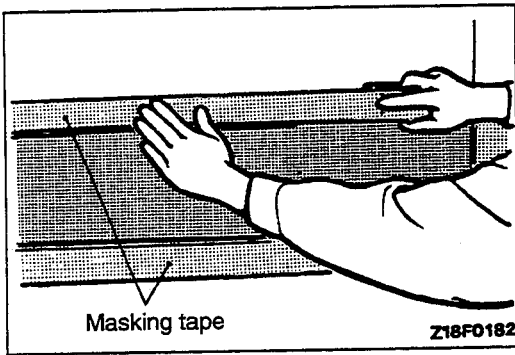


- <Vehicles with wide fender>
6. Front flare
 12. Side sill garnish

NOTE

Mounting bolts with * marks indicate R.H. side only.

TSB Revision



REMOVAL SERVICE POINTS

◀A▶ FRONT DOOR SIDE GARNISH/REAR DOOR SIDE GARNISH/FENDER SIDE GARNISH/FRONT FLARE/REAR QUARTER SIDE GARNISH/REAR FLARE/SIDE SILL GARNISH REMOVAL

(1) Apply masking tape to the outside circumference of each side garnish.

(2) Insert a fishing line [$\phi 0.8$ mm (.03 in.)] between the body and the side garnish, and pull both ends alternately to cut the adhesive to remove the side garnish.

(3) Pull the section of the side garnish with the clips toward you to remove the clips.

Caution

1. When reusing the side garnish, remove by pulling the fishing line along the edge of the body so as not to damage the edge of the side garnish.

2. If the adhesive is difficult to remove, heat it to 40°C (104°F).

(4) Scrape off the double-sided adhesive tape with a resin spatula.

(5) Tear off the masking tape.

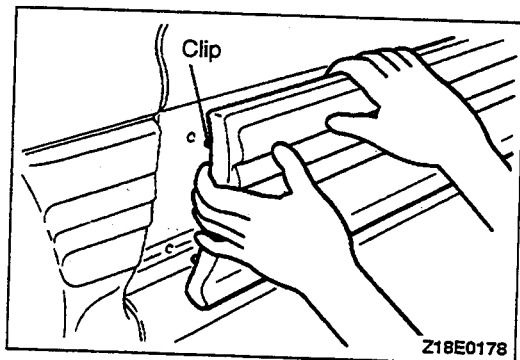
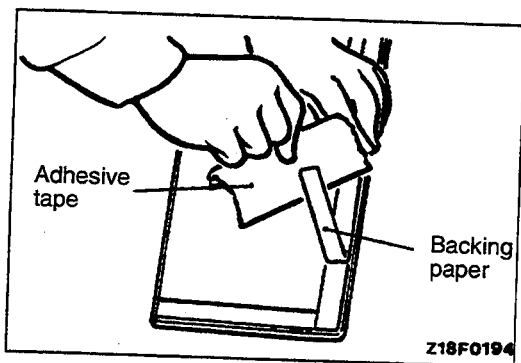
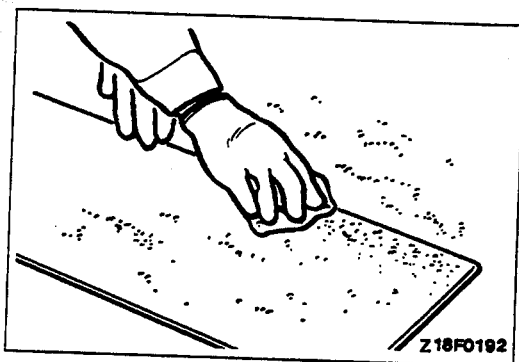
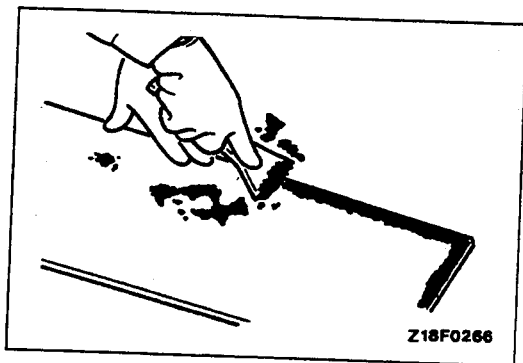
(6) Wipe off application surface of body with clean cloth dampened with degreaser (3M ATD Part No. 8906 or equivalent).

NOTE

After wiping the surface, leave it as it is to let the degreaser evaporate.

◀B▶ BLIND RIVETS REMOVAL

Use a drill [$\phi 4.0$ – 5.5 mm (.16–.22 in.)] to break the rivet by drilling a hole, and remove the blind rivet.



INSTALLATION SERVICE POINTS

▶A◀ SIDE SILL GARNISH/REAR FLARE/REAR QUARTER SIDE GARNISH/FRONT FLARE/FENDER SIDE GARNISH/REAR DOOR SIDE GARNISH/FRONT DOOR SIDE GARNISH INSTALLATION

- Attachment of double-sided tape to each side garnish (when reusing)

(1) Scrape off the double-sided adhesive tape with a resin spatula or gasket scraper.

(2) Use a cloth moistened with degreaser (3M ATD Part No. 8906 or equivalent) to wipe the side garnish clean.

(3) Attach specified double-sided adhesive tape to each side garnish.

Specified adhesive:

3M ATD Part No. 6382 or equivalent

(4) Heat the adhesive surface of the both-side tape on the side garnish to about 40–60°C (104–140°F).

- Each side garnish installation

(1) Tear off the double-sided tape backing paper.

NOTE

If you attach part of the adhesive tape to the edge of the backing paper, it will be easy to tear off.

(2) Install the side garnish so that the clips match the body holes.

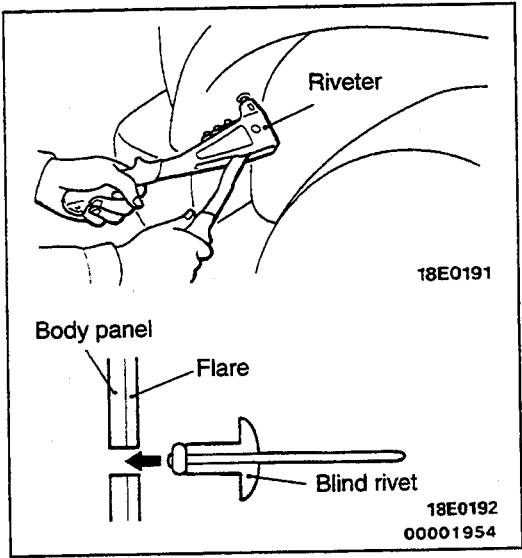
NOTE

If the double-sided adhesive tape is difficult to affix during winter, etc., warm the bonding surfaces of the body and the side garnishes to approx. 40–60°C (104–140°F) before affixing the tape.

(3) Firmly press in the side garnish.

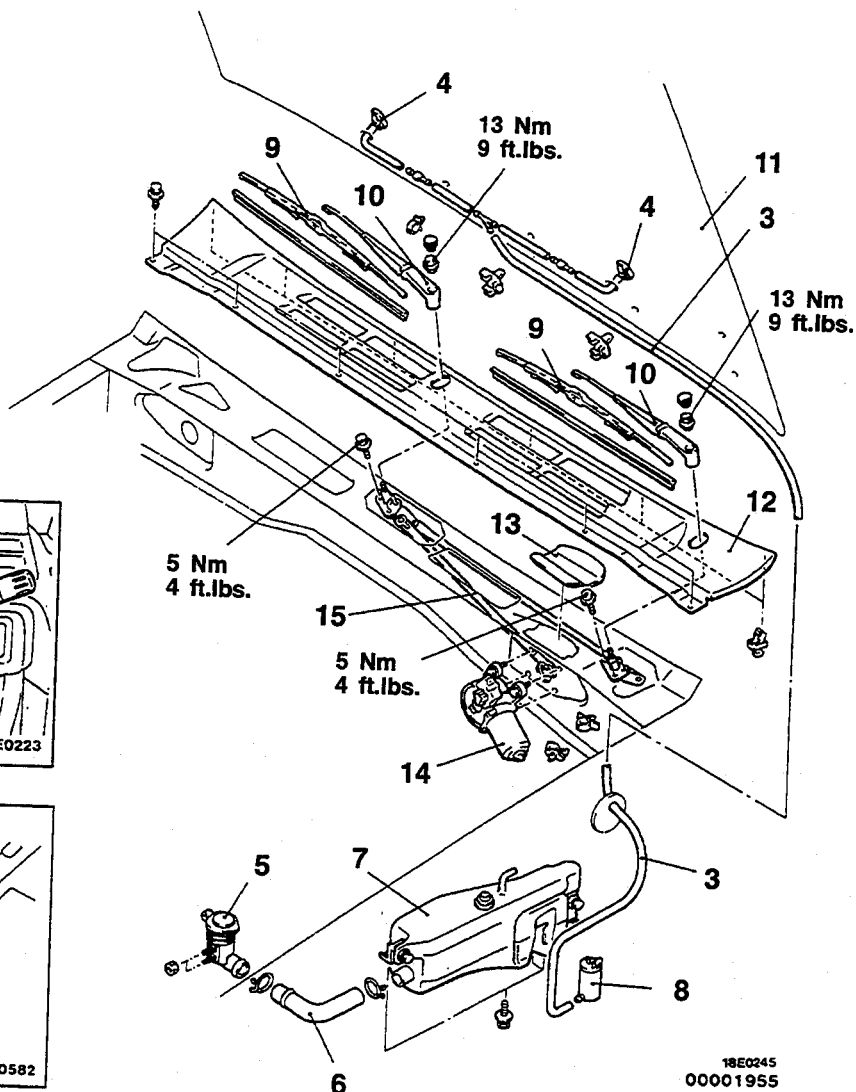
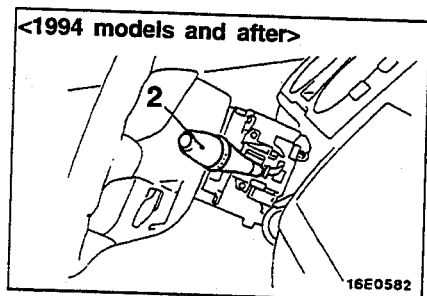
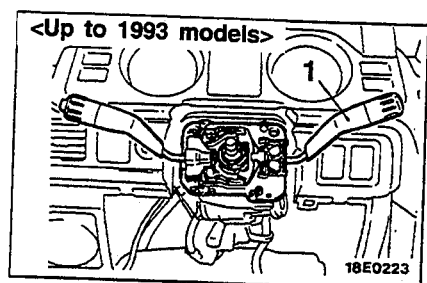
►B◄ **BLIND RIVETS INSTALLATION**

Use a riveter to connect the blind rivet.



WINDSHIELD WIPER AND WASHER REMOVAL AND INSTALLATION

110005209



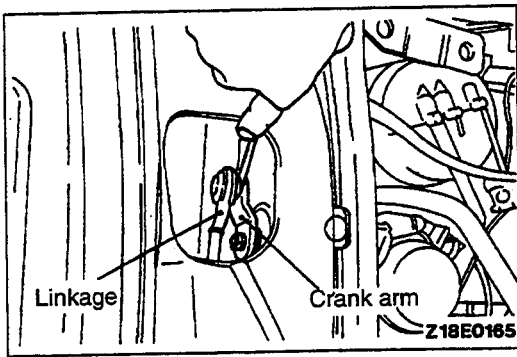
1. Column switch (with built-in wiper and washer switch, and wiper relay)
[Refer to GROUP 54 – Column Switch.]
2. Wiper and washer switch
[Refer to P.51-15.]
3. Washer tube
4. Washer nozzle
9. Wiper blade
10. Wiper arm
14. Wiper motor

Washer tank removal steps

- Splash shield (Refer to GROUP 42 –Fender.)
- Washer fluid draining
- 3. Washer tube
- 5. Cap
- 6. Hose
- 7. Washer tank assembly
- 8. Washer motor

Linkage removal steps

- ▶A◀ 10. Wiper arm
- ▶A◀ 11. Hood
- ▶A◀ 12. Front deck garnish
- ▶A◀ 13. Hole cover
- ▶A◀ 14. Wiper motor
- ▶A◀ 15. Linkage



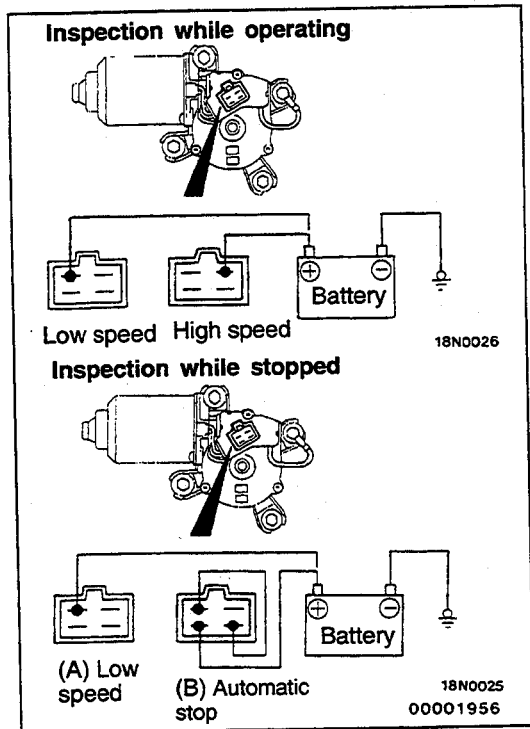
REMOVAL SERVICE POINT

◀A▶ WIPER MOTOR REMOVAL

Loosen the wiper motor assembly mounting bolts, and then remove the wiper motor assembly. Disconnect the linkage and the motor assembly, and then remove the linkage.

Caution

Because the installation angle of the crank arm and the motor has been set, do not remove them unless it is necessary to do so. If they must be removed, remove them only after marking their mounting positions.



INSPECTION

WIPER MOTOR

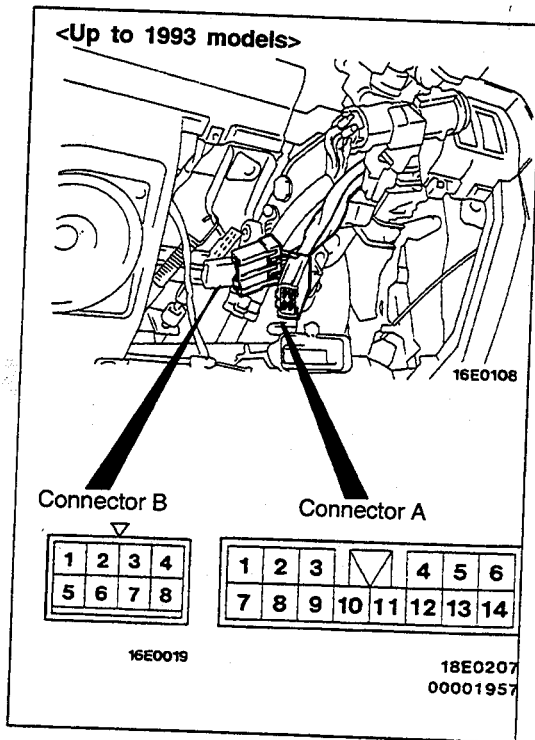
Check the wiper motor the wiring harness connector disconnected and with the wiper motor remaining installed to the body.

Wiper Motor at low speed and at high Speed Operation

Connect a battery to the wiper motor as shown in the illustration and inspect the motor operation at low speed and at 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 operating at low speed, it stops at the automatic stop position.



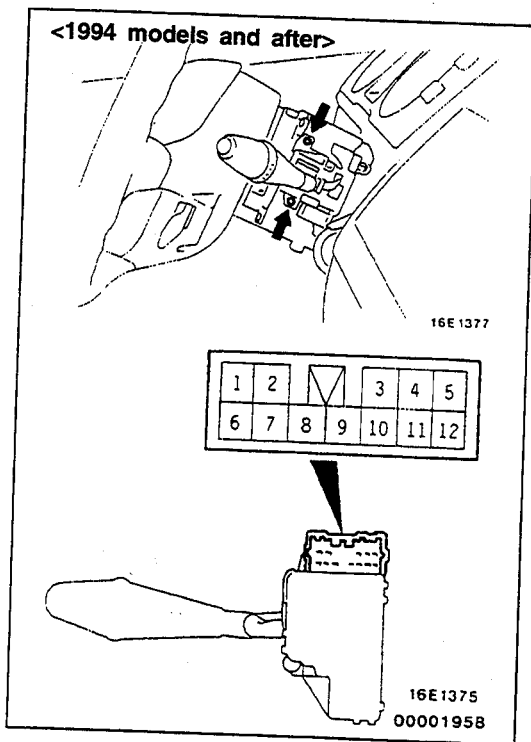
COLUMN SWITCH

Wiper and Washer Switch

<Up to 1993 models>

Disconnect the column switch connector and check the continuity between the terminals for each switch.

Connector		A	B			
Terminal		5	3	4	7	8
Wiper switch	OFF		○		○	
	1 (LO)		○			○
	2 (HI)			○		○
Washer switch	ON	○				○



<1994 models and after>

- (1) Remove the column cover lower.
- (2) Remove the column cover upper.
- (3) Loosen the screw indicated by the arrow in the illustration, and then remove the wiper and washer switch.
- (4) Operate the switch and check the continuity between the terminals.

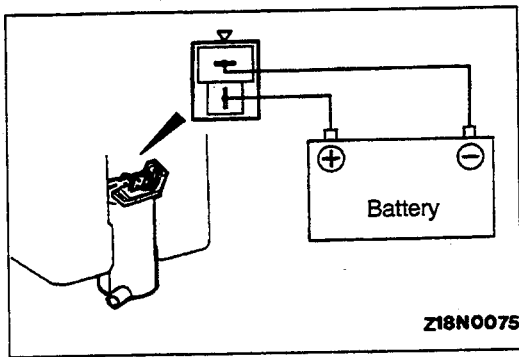
Switch position		Terminal				
		6	7	8	9	10
Wiper switch	OFF		○	○		
	1 (LO)			○		○
	2 (HI)				○	○
Washer switch	ON	○				○

Intermittent Wiper Relay (Intermittent Operation Inspection)

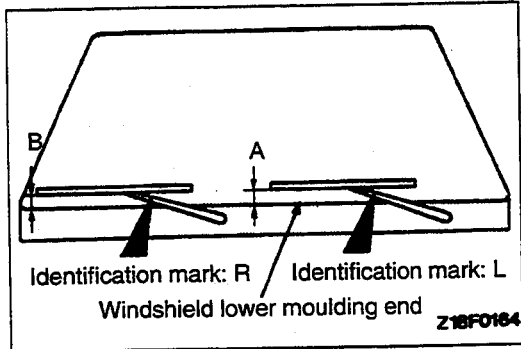
- (1) Connect the column switch connector.
- (2) Turn the ignition switch to ACC.
- (3) Inspect the intermittent operation time when the wiper switch is turned to INT.

Vehicles without variable intermittent control
approx. 3–6 seconds

Vehicles with variable intermittent control
FAST Approx. 3 seconds
SLOW Approx. 12 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 illustration, check that the water squirts out strongly.

**INSTALLATION SERVICE POINT****▶A◀ WIPER ARM/WIPER BLADE INSTALLATION**

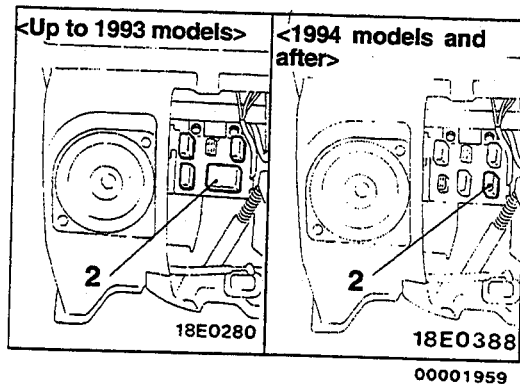
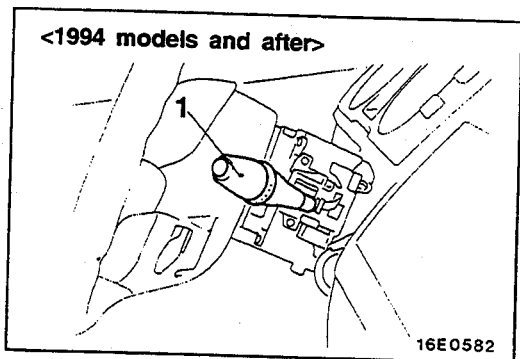
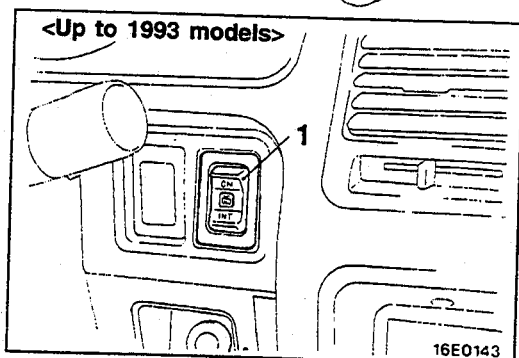
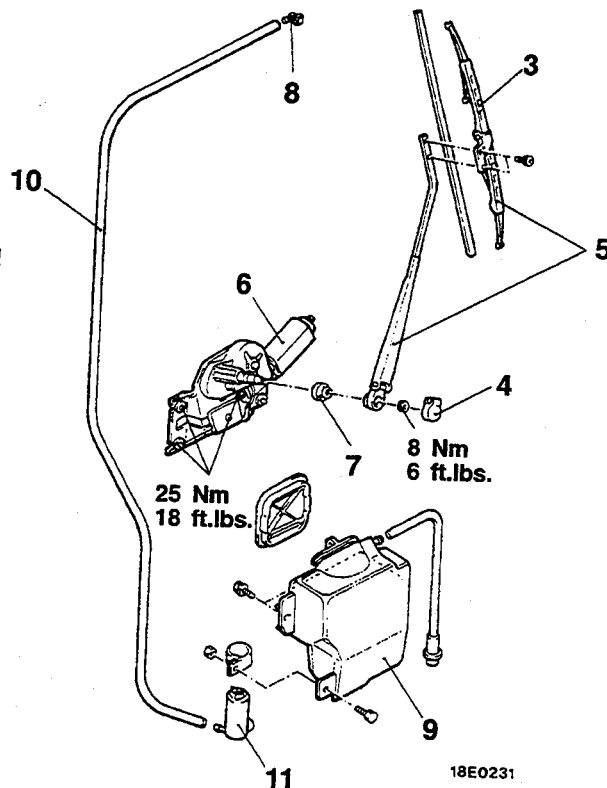
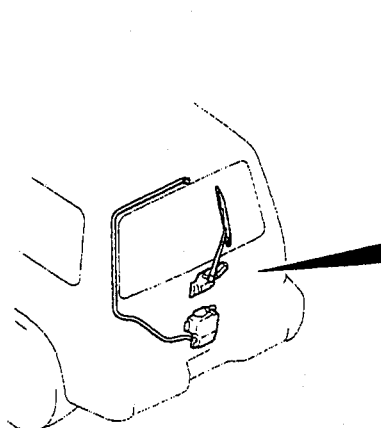
- (1) The movements of the left and right wiper arms are different, so check the identification marks.
- (2) Install the wiper blade in the specified position (standard value) as shown the illustration.

Standard value**(A): 25–35 mm (.98–1.38 in.)****(B): 35–45 mm (1.38–1.77 in.)**

REAR WIPER AND WASHER

REMOVAL AND INSTALLATION

110005210



1. Rear wiper and washer switch
(Refer to P.51-18.)
<1994 models and after>
3. Wiper blade
8. Washer nozzle

Rear intermittent wiper relay removal steps

- Instrument under cover
(Refer to GROUP 52A-Instrument Panel.)
2. Rear intermittent wiper relay

Wiper motor removal steps

- ▶B◀
4. Cover
 5. Wiper arm and blade assembly
 - Back door trim (Refer to GROUP 42-Back Door Trim and Waterproof Film.)

- ▶A◀
6. Wiper motor and bracket assembly
 7. Grommet

Washer tank and motor removal steps

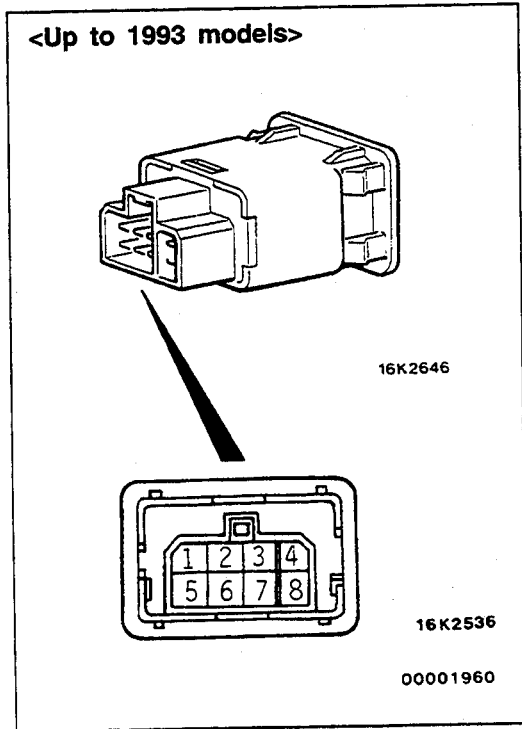
- Back door trim (Refer to GROUP 42-Back Door Trim and Waterproof Film.)
- 9. Washer tank assembly
- Washer fluid draining
- 10. Washer tube
- 11. Washer motor

INSPECTION

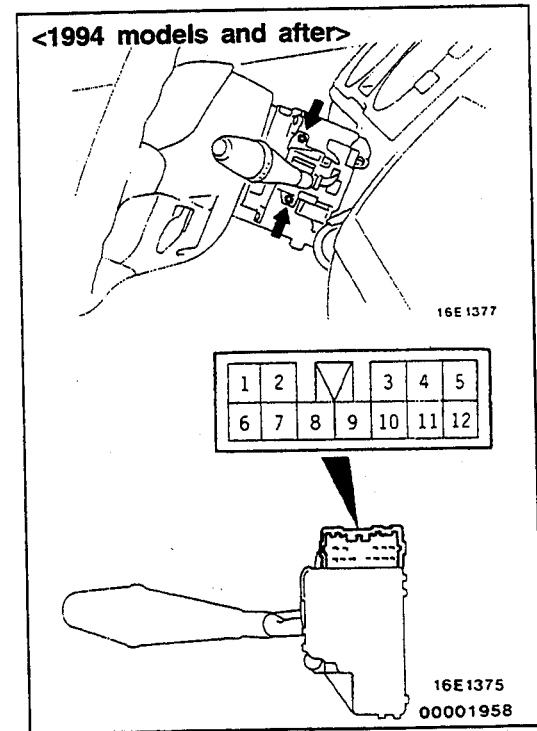
REAR WIPER AND WASHER SWITCH

<Up to 1993 models>

Operate the switch and check the continuity between the terminals.



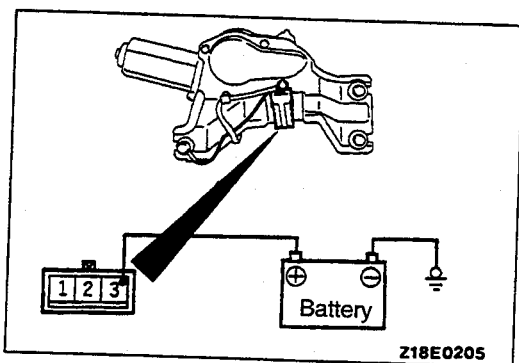
Switch position		Terminal							
		1	2	3	4	5	6	7	8
Wiper switch	ON		○						○
	OFF				○				○
	INT	○			○			○	
Washer switch	ON		○	○					
	OFF								
Illumination light							○	○	○



<1994 models and after>

- (1) Remove the column cover lower.
- (2) Remove the column cover upper.
- (3) Loosen the screw indicated by the arrow in the illustration, and then remove the rear wiper and washer switch.
- (4) Operate the switch and check the continuity between the terminals.

Switch position		Terminal			
		2	3	4	10
Wiper switch	OFF				
	INT		○		○
	ON			○	○
Washer switch	ON	○			○

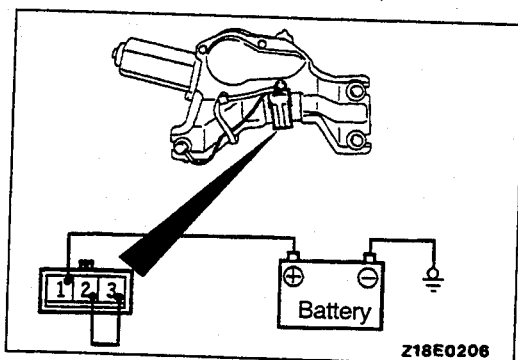


WIPER MOTOR

Disconnect the wiring harness connector, and then check the wiper motor with it installed to the body.

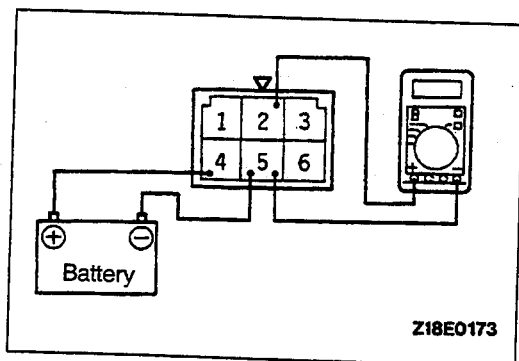
Wiper Motor Operation

Connect a battery to the wiper motor as shown in the illustration and inspect the motor operation.



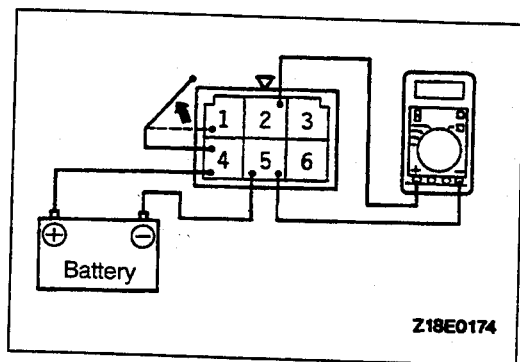
Wiper Motor at Stop Position Operation

- (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 operating, it stops at the automatic stop position.

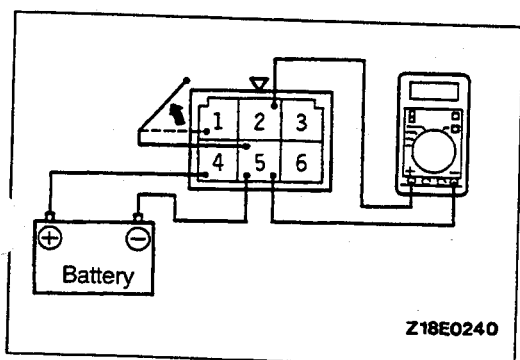


REAR INTERMITTENT WIPER RELAY <Up to 1993 models>

- (1) Connect the (+) terminal of the voltmeter to terminal (2), and the (-) terminal to terminal (5).
- (2) Check that battery positive voltage shows when the positive battery terminal is connected to terminal (4) and the negative battery terminal is connected to terminal (5).



- (3) Under the conditions in (2) above, after shorting terminals (1) and (4) for approximately 2 seconds, remove the short connection between these terminals.



- (4) Next, short terminal (1) and terminal (5). Check that the voltage shown on the voltmeter at this time is 0 V.
- (5) After terminal (1) and terminal (5) have been shorted for approximately 8 seconds, check if there is battery positive voltage at terminal (2).

REAR INTERMITTENT WIPER RELAY <1994 MODELS AND AFTER>**1. REAR WIPER AND WASHER FUNCTION CHECK**

- (1) Connect the (+) terminal of the voltmeter to terminal (2) and the (-) terminal to terminal (7).
- (2) Check that battery voltage shows when the battery (+) terminal is connected to terminal (4), (8) and the battery (-) terminal is connected to terminal (7).

2. REAR INTERMITTENT WIPER FUNCTION CHECK

- (1) Connect the (+) terminal of the voltmeter to terminal (2) and the (-) terminal to terminal (7).
- (2) Check that battery voltage shows at approximately 8-second intervals when the positive battery terminal is connected to terminals (4) and (5) and the negative battery terminal is connected to terminal (7).

3. REAR WIPER ON-FUNCTION CHECK

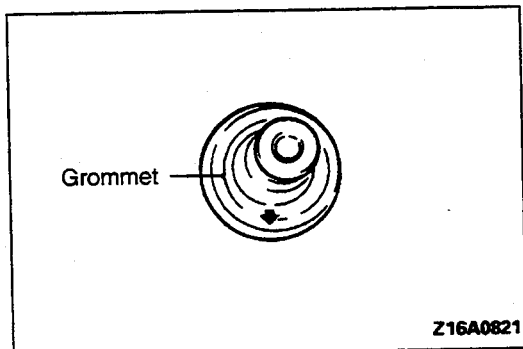
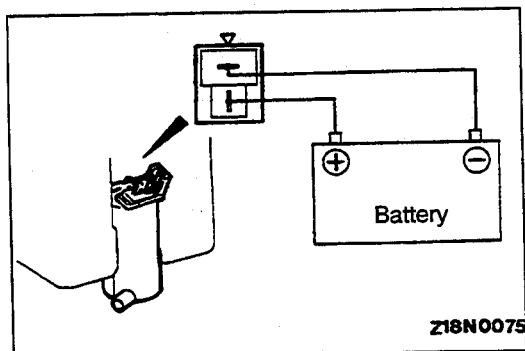
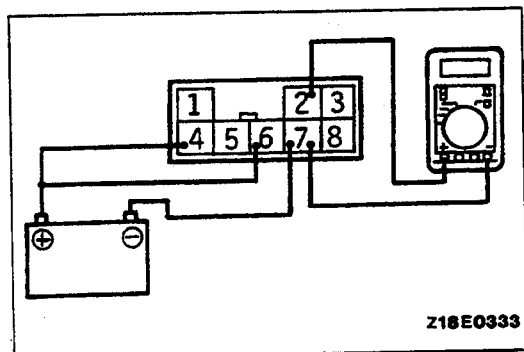
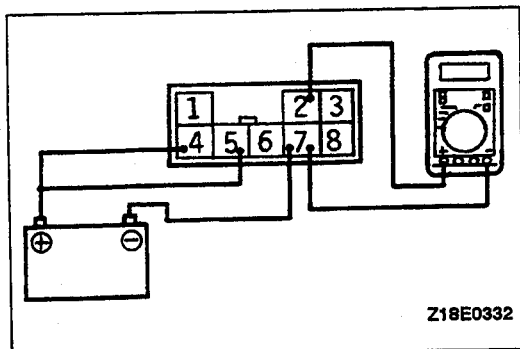
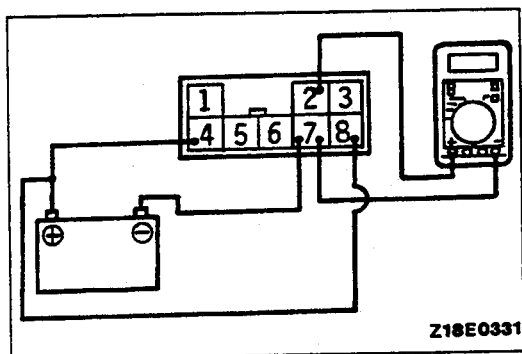
- (1) Connect the (+) terminal of the voltmeter to terminal (2) and the (-) terminal to terminal (7).
- (2) Check the battery voltage shows when the battery (+) terminal is connected to terminal (4), (6) and the battery (-) terminal is connected to terminal (7).

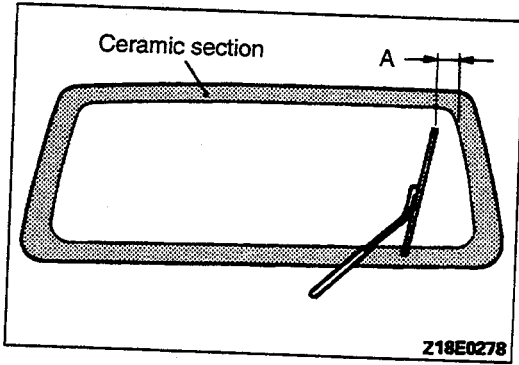
WASHER MOTOR

- (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 illustration, check that the water squirts out strongly.

INSTALLATION SERVICE POINTS**▶A◀ GROMMET INSTALLATION**

Install the grommet so that the arrow points downwards.





▶◀ **WIPER ARM AND BLADE ASSEMBLY
INSTALLATION**

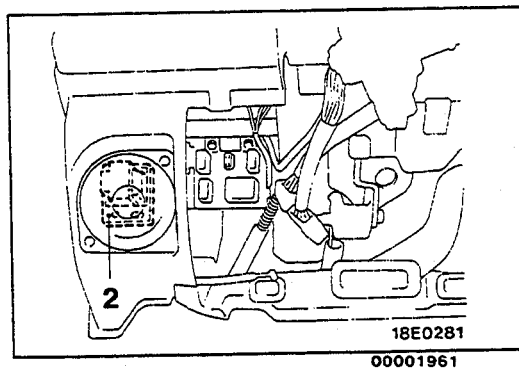
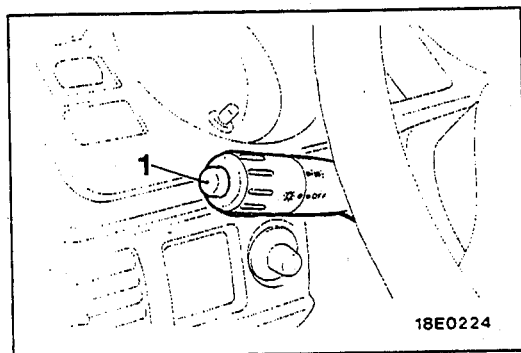
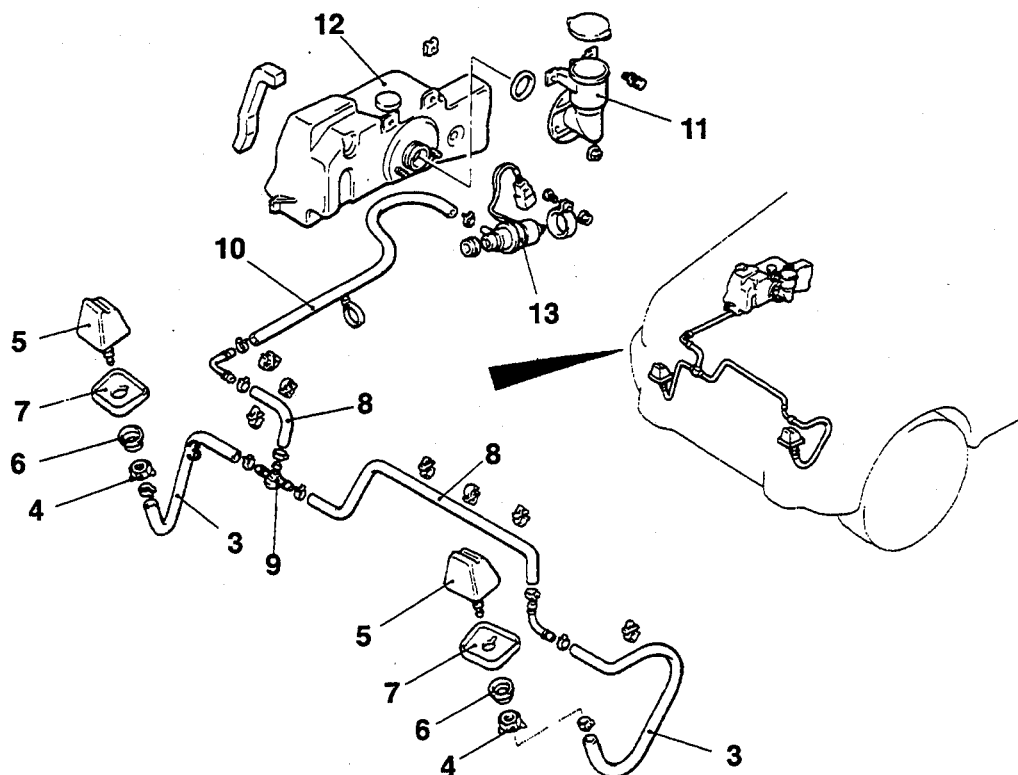
Install the wiper blade so that the tip stops at the standard position (standard value).

Standard value (A): 65–75 mm (2.56–2.95 in.)

HEADLIGHT WASHER

REMOVAL AND INSTALLATION

110005211



Headlight washer switch removal

1. Headlight washer switch
(Refer to GROUP 54 – Column Switch.)
<Up to 1993 models>
(Refer to P.51-23.)
<1994 models and after>

Nozzle and check valve removal steps

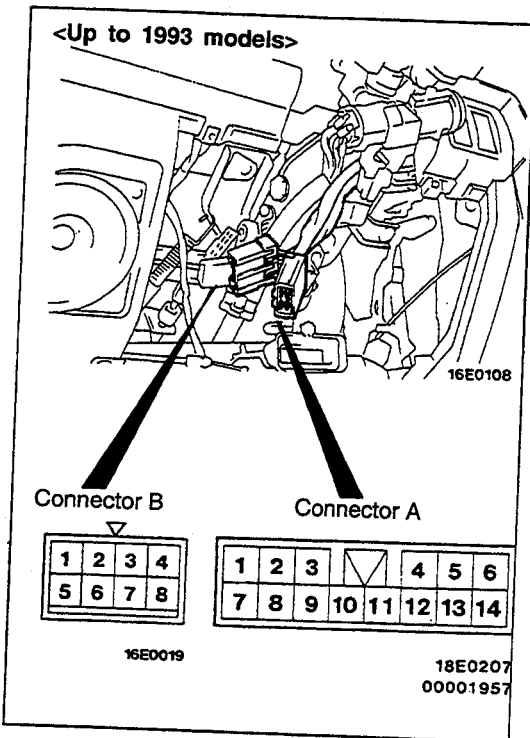
- Front bumper (Refer to P.51-4.)
- Washer fluid draining
- 3. Washer hose
- 4. Nut
- 5. Nozzle
- 6. Collar
- 7. Nozzle base
- 8. Washer hose
- 9. Check valve

Headlight washer relay removal steps

- Instrument under cover
(Refer to GROUP 52A–Instrument Panel.)
- 2. Headlight washer relay

Washer tank removal steps

- Splash shield [RH]
(Refer to GROUP 42–Fender.)
- Front combination light
(Refer to GROUP 54–Lighting System.)
- Washer fluid draining
- 10. Washer hose
- 11. Cap
- 12. Washer tank assembly
- 13. Washer motor

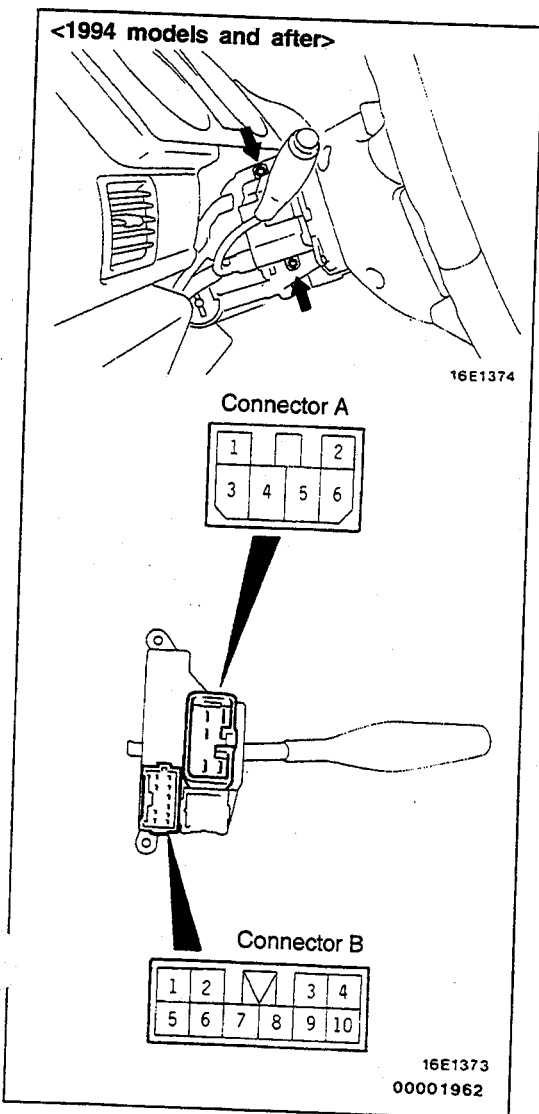


INSPECTION
HEADLIGHT WASHER SWITCH

<Up to 1993 models>

Disconnect the column switch connector and check the continuity between the terminals for each switch.

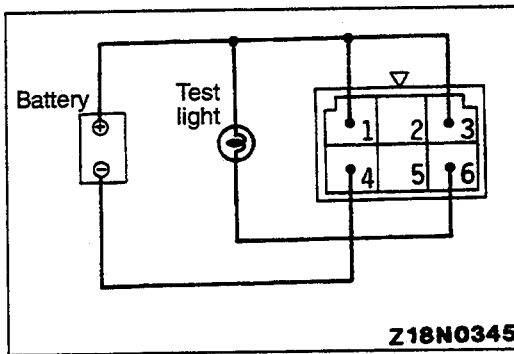
Switch position	Connector A terminal	Connector B terminal
	OFF	4
ON		



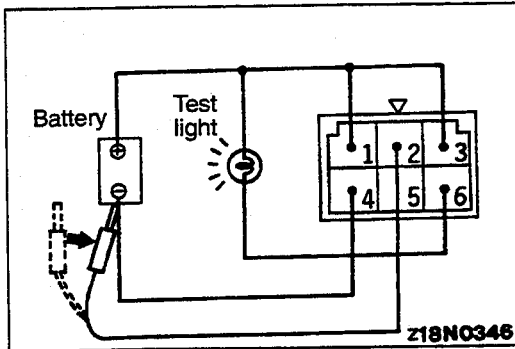
<1994 models and after>

- (1) Remove the column cover lower.
- (2) Remove the column cover upper.
- (3) Loosen the screw indicated by the arrow in the illustration, and then remove the headlight washer switch.
- (4) Disconnect the column switch connector and check the continuity between the terminals for each switch.

Switch position	Connector A terminal	Connector B terminal
	OFF	1
ON		

**HEADLIGHT WASHER RELAY**

- (1) Connect the battery and test light to the relay as shown in the illustration.

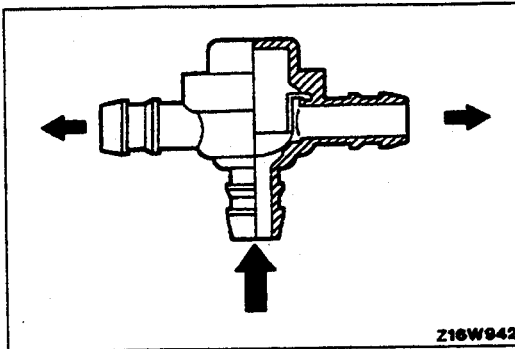


- (2) The relay is normal if the light illuminates for approximately 0.3 second upon connection of terminal (2) to the negative battery terminal.

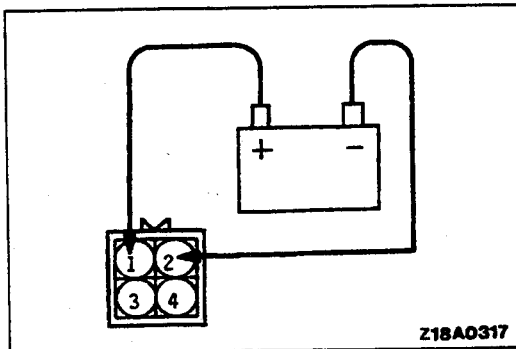
CHECK VALVE

Apply pressure to the inlet of the check valve to check its opening pressure.

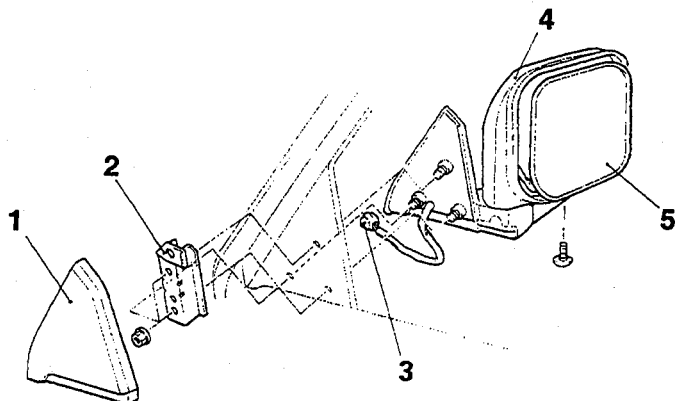
Opening pressure: 50–110 kPa (7.1–15.6 psi)

**HEADLIGHT WASHER MOTOR**

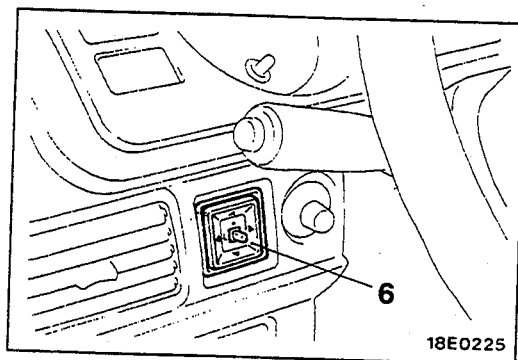
- (1) With the washer motor installed to the washer tank, fill the washer tank with water.
- (2) Connect the positive battery cable to terminal (2) and the negative battery cable to terminal (1), and then check that the washer motor runs and water is injected.



DOOR MIRROR REMOVAL AND INSTALLATION



18E0171



18E0225

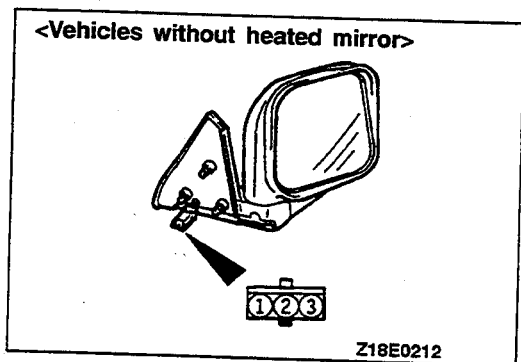
00001963

Door mirror removal steps

1. Delta cover inner
2. Inner cover bracket
3. Harness connector
4. Door mirror
5. Mirror

Remote controlled mirror switch removal

6. Remote controlled mirror switch

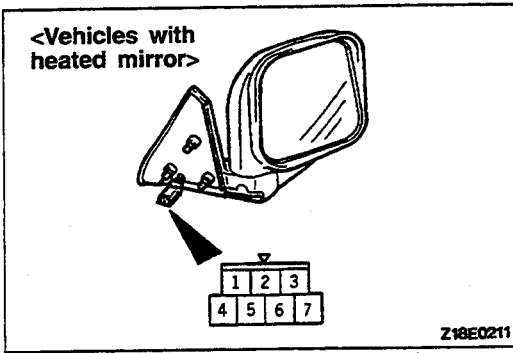


INSPECTION

REMOTE CONTROLLED MIRROR ASSEMBLY <Vehicles without heated mirror>

Check that the mirror moves as described in the table when each terminal is connected to the battery.

Battery connection terminals			Mirror operation
1	2	3	
⊖	-----	⊕	Up
⊕	-----	⊖	Down
⊕	-----	⊖	Left
⊖	-----	⊕	Right



<Vehicles with heated mirror>

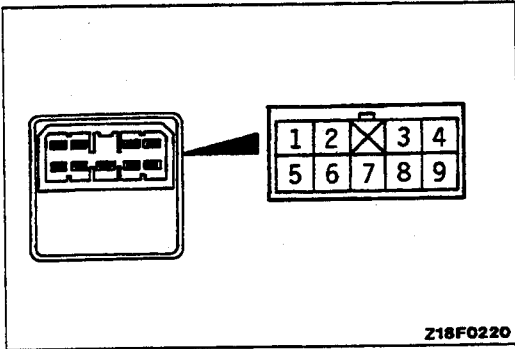
1. Check to be sure that the mirror moves as described in the table when each terminal is connected to the battery.

Battery connection terminals			Mirror operation
5	6	7	
⊖ - - - -	- - - - -	- - - - ⊕	Up
⊕ - - - -	- - - - -	- - - - ⊖	Down
⊕ - - - -	- - - - ⊖		Left
⊖ - - - -	- - - - ⊕		Right

2. Check if there is continuity between terminals (1) and (4).

REMOTE CONTROLLED MIRROR SWITCH

Operate the switch and check the continuity between the terminals.



Direction	Left side					Right side				
	Terminal									
	3	4	6	7	8	2	4	6	7	9
UP		○	○	○	○	○	○	○	○	
DOWN		○	○	○	○	○	○	○	○	
LEFT	○	○	○	○			○	○	○	○
RIGHT	○	○	○	○			○	○	○	○

INTERIOR AND SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

110005213

INTERIOR	52A
SUPPLEMENTAL RESTRAINT SYSTEM (SRS)	52B





INTERIOR

CONTENTS

110005214

FLOOR CONSOLE*	6	SECOND SEAT	18
FRONT SEAT	12	SECOND SEAT BELT	22
FRONT SEAT BELT	20	THIRD SEAT	19
GENERAL SPECIFICATIONS	2	THIRD SEAT BELT	23
HEADLINING	11	TRIMS	8
INSTRUMENT PANEL*	2		

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 (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) and GROUP 00 – Maintenance Service before beginning any service or maintenance of any component of the SRS or any SRS-related component.

NOTE

The SRS includes the following components: SRS diagnosis unit, SRS warning light, 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 SPECIFICATIONS



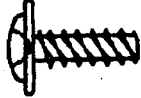





110005215

Items	Specifications	
Suspension seat	Suspension mechanism	Coil spring type with shock absorber
	Up-and-down movement stroke mm (in.)	50 (2.0)
	Body weight adjustment kg (lbs.)	60–100 (132–220)
	Seat height adjustment	3 steps

INSTRUMENT PANEL

110005216

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 (D×L) mm (in.)	Color	Shape
Tapping screw	A	5×12 (.20×.47)	–	
	B	5×16 (.20×.62)	–	
	C	5×16 (.20×.62)	Black	
	D	5×20 (.20×.79)	Black	
	E	5×20 (.20×.79)	Black	
	F	4×10 (.16×.39)	Black	
	G	5×12 (.20×.47)	–	
	H	5×16 (.20×.62)	–	
	I	5×20 (.20×.79)	–	
	J	5×25 (.20×.98)	–	
Washer assembled screw	K	5×12 (.20×.47)	–	
	L	5×20 (.20×.79)	Black	
Washer assembled screw	M	8×20 (.31×.79)	–	
Machine screw	N	4×12 (.16×.47)	Black	
Cap installed screw	O	5×16 (.20×.62)	–	
Nut	P	6 (.24)	–	

Z19N0001

D=Thread diameter
L=Effective thread length

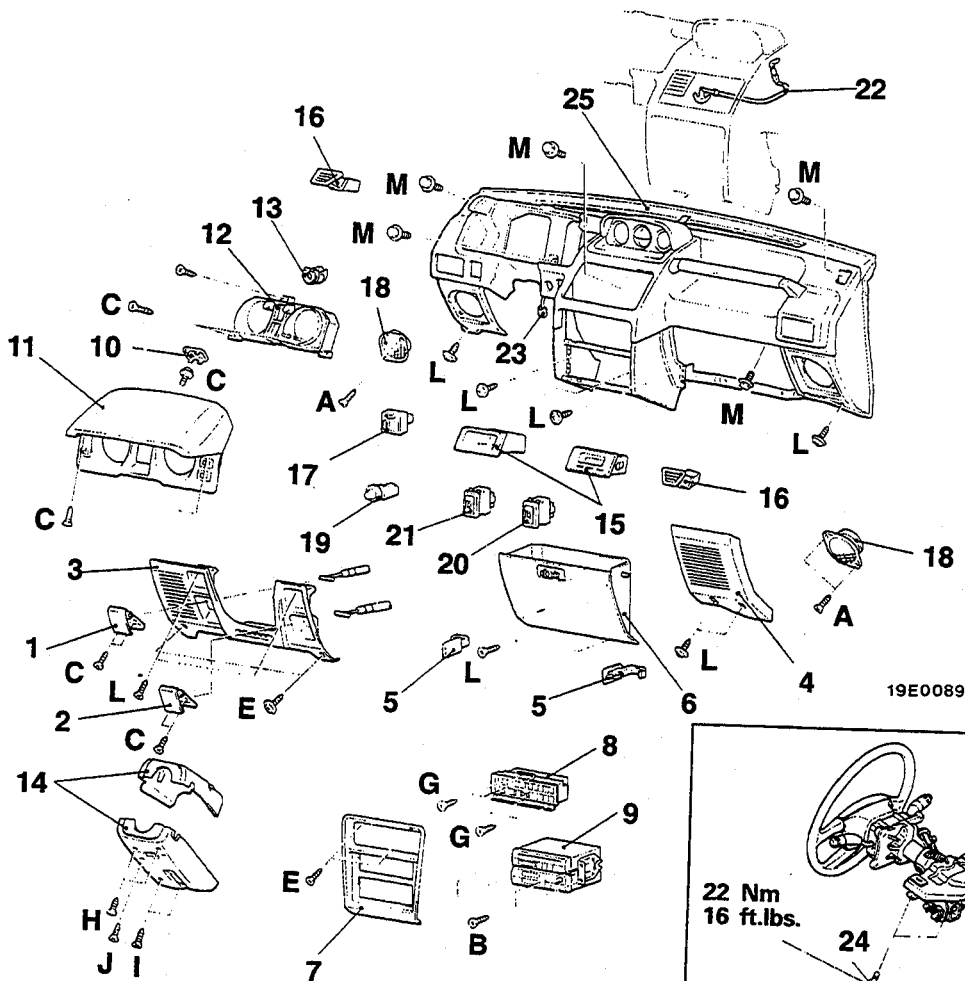
REMOVAL AND INSTALLATION

Caution: SRS

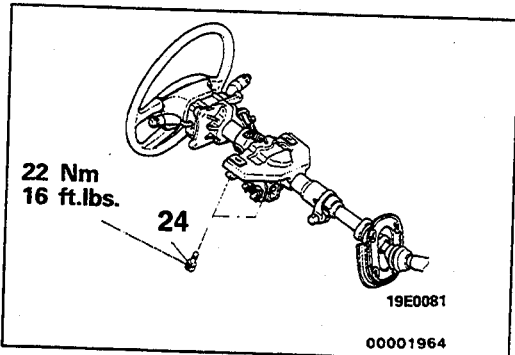
When removing and installing the floor console assembly, don't allow any impact or shock to the SRS diagnosis unit

Pre-removal and Post-installation Operation

- Floor Console Assembly Removal and Installation (Refer to P.52A-6.)



19E0089

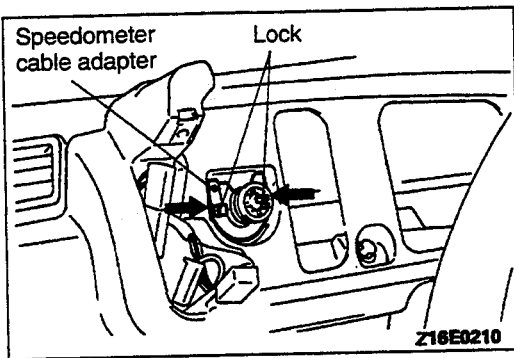


Removal steps

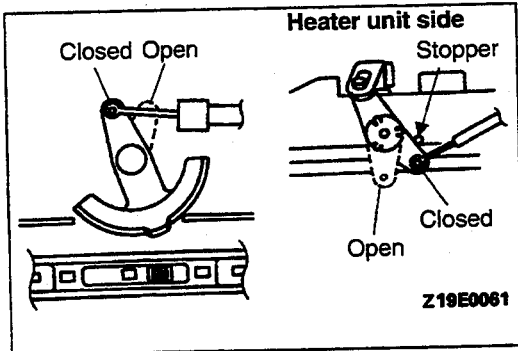
1. Hood lock release handle
2. Fuel filler door lock release handle
3. Instrument under cover
4. Instrument corner cover
5. Glove box stopper
6. Grove box assembly
7. Center panel A
8. Heater control assembly
9. Radio and tape player
10. Meter hood plug
11. Meter bezel assembly
12. Combination meter
13. Speedometer cable adapter <Up to 1993 models>

14. Column cover
15. Clock or clock plug
16. Side defroster garnish
17. Door mirror control switch
18. Front speaker
19. Rheostat
20. Rear wiper and washer switch
21. Door lock switch
- ▶A◀ 22. Ventilation control wire
23. Harness connector
24. Steering column installation bolts
25. Instrument panel assembly

TSB Revision

**REMOVAL SERVICE POINT****◀A▶ SPEEDOMETER CABLE ADAPTER REMOVAL**
◀Up to 1993 models▶

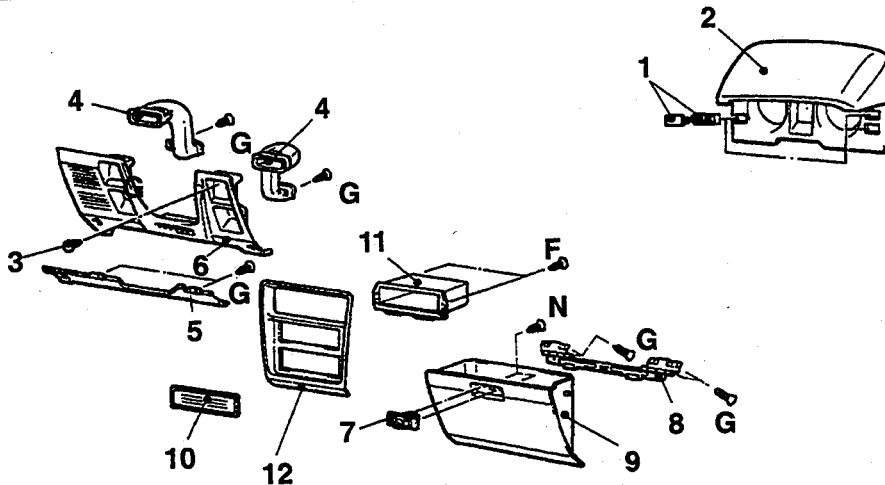
- (1) Disconnect the speedometer cable at the transmission end of the cable.
- (2) Remove the lock of the speedometer cable adapter from the instrument panel.
- (3) Pull the speedometer cable slightly toward vehicle interior, and then remove the speedometer cable adapter.

**INSTALLATION SERVICE POINT****▶A◀ VENTILATION CONTROL WIRE INSTALLATION**

- (1) Set the cool air bypass dial to the closed position.
- (2) Close the cool air bypass lever at the heater unit side (lever is lightly hit against the stopper).
- (3) Install the ventilation control wire and secure it with the clip.

DISASSEMBLY AND REASSEMBLY

110005217



Z19E0059

Meter bezel assembly disassembly steps

1. Switch or plug
2. Meter bezel

Instrument under cover disassembly steps

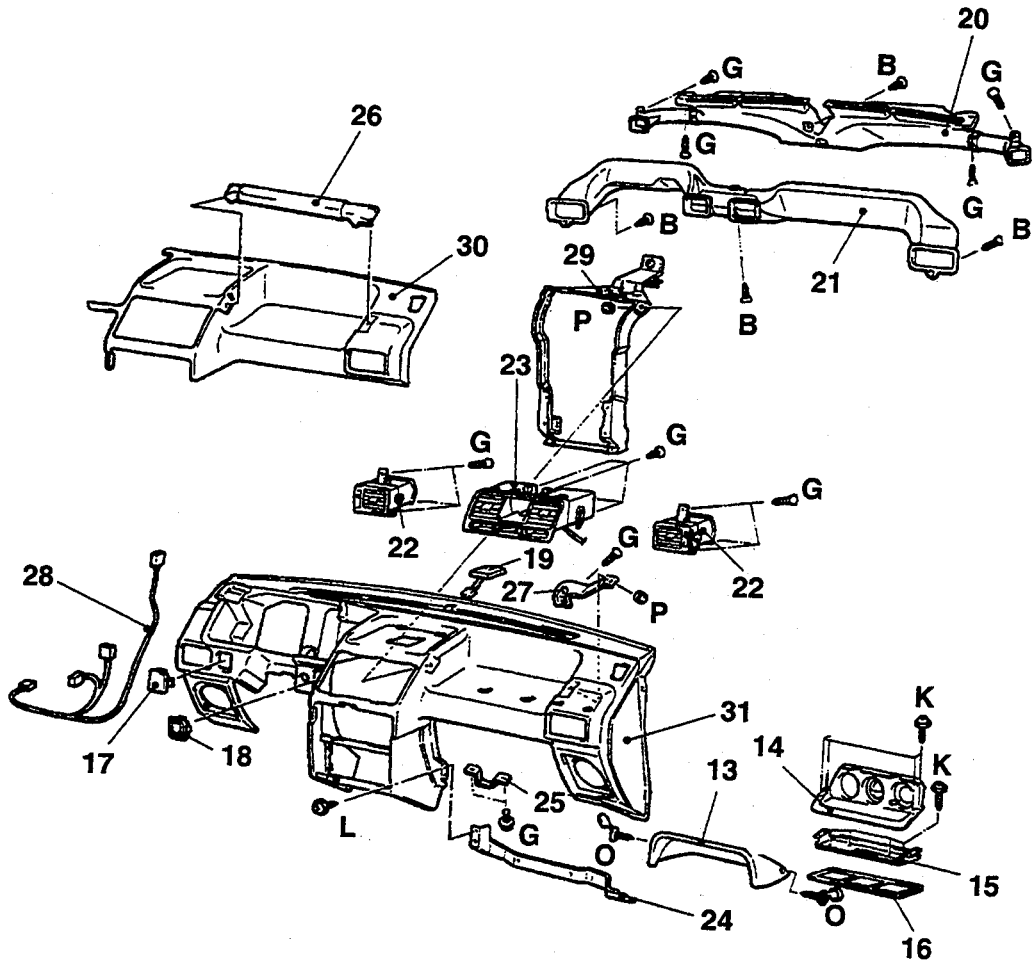
3. Plug
4. Lap heater duct
5. Instrument under cover frame
6. Instrument under cover

Glove box assembly disassembly steps

7. Glove box lock
8. Glove box hinge
9. Glove box

Centre panel A disassembly steps

10. Radio plug
11. Box
12. Centre panel A



Y19E0059

Instrument panel assembly disassembly steps

- 13. Meter hood
- 14. Multi meter
- 15. Meter bracket
- 16. Instrument panel mat
<Vehicles without multi meter>
- 17. Plug
- 18. Hole cover
- 19. Geomagnetic sensor
- 20. Side defroster duct and defroster nozzle assembly
- 21. Distribution duct
- 22. Side air outlet
- 23. Center air outlet
- 24. Glove box frame
- 25. Glove box striker
- 26. Assist grip
- 27. Assist grip bracket
- 28. Instrument panel wiring harness
- 29. Instrument panel reinforcement
- 30. Instrument panel pad
- 31. Instrument panel

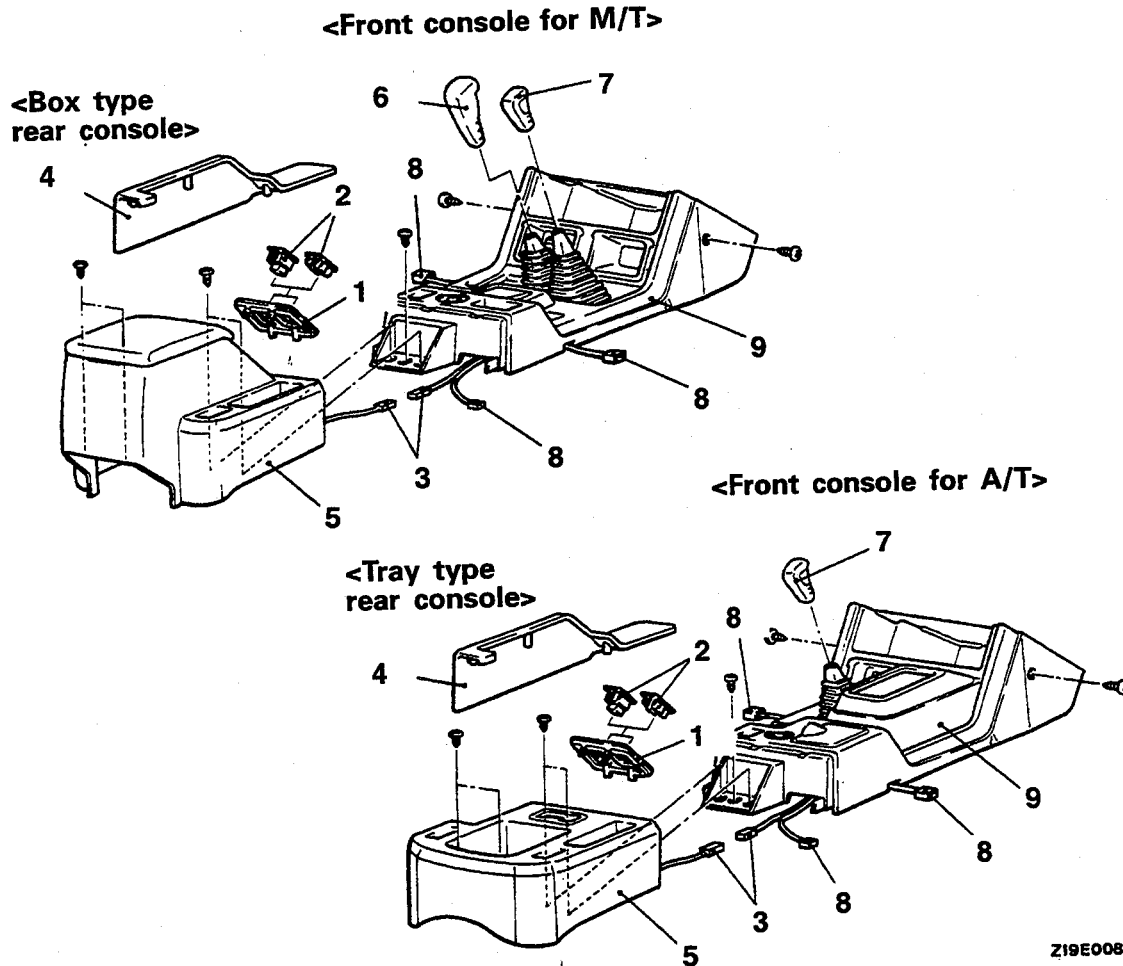
FLOOR CONSOLE

REMOVAL AND INSTALLATION

110005218

Caution: SRS

When removing and installing the floor console assembly, don't allow any impact or shock to the SRS diagnosis unit

**Removal steps**

1. Switch panel
2. Suspension control switch or hole cover
3. Rear console harness connector
4. Side panel A

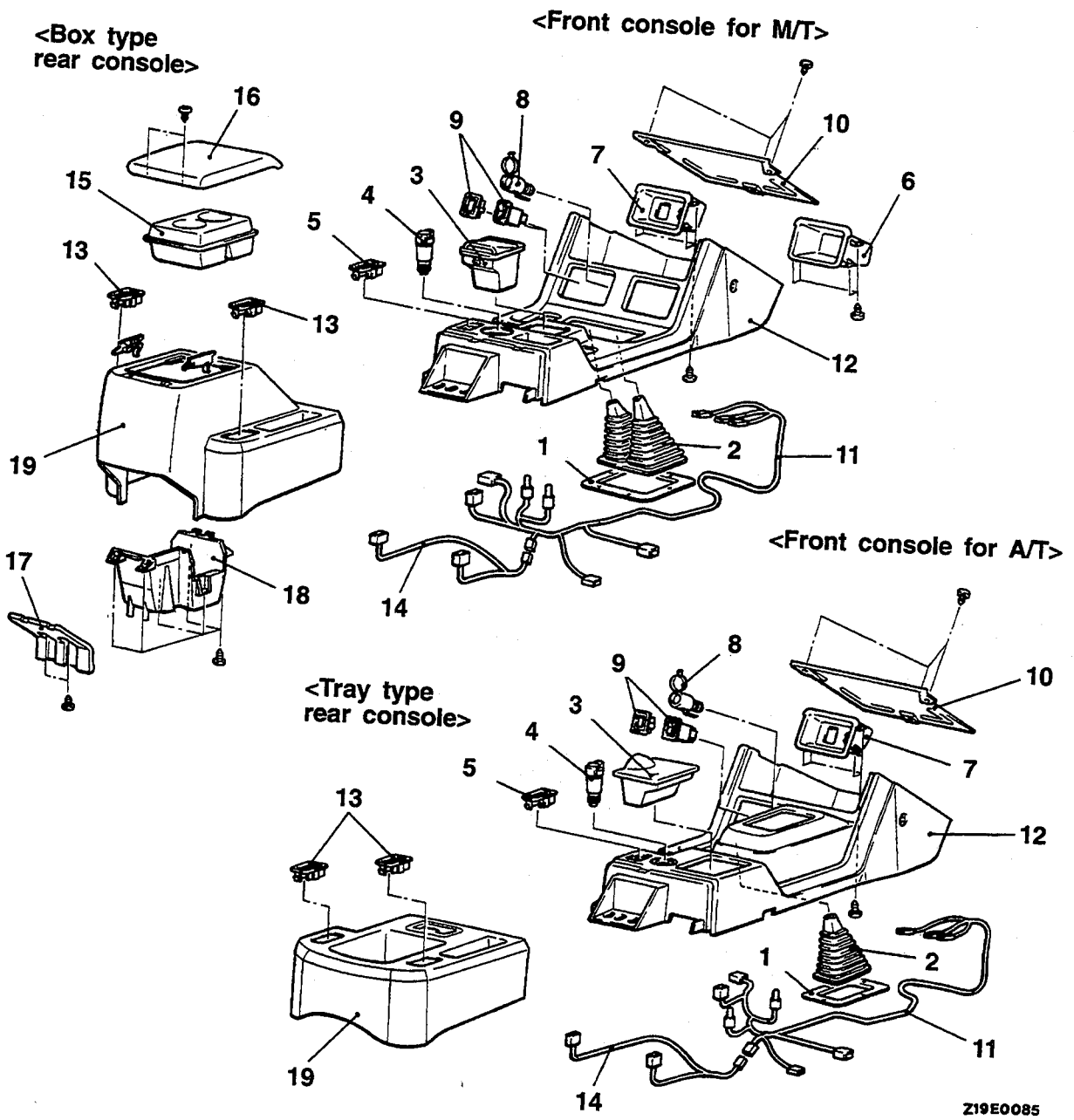
5. Rear console assembly
6. M/T shift lever knob
7. Transfer shift lever knob
8. Floor console harness connector
9. Front console assembly

**REMOVAL SERVICE POINT****◀A▶ FRONT CONSOLE ASSEMBLY REMOVAL**

When removing the A/T front console assembly, set the A/T selector lever to "L".

DISASSEMBLY AND REASSEMBLY

110005219



<Front console for A/T>

<Tray type rear console>

<Box type rear console>

<Front console for M/T>

Front console assembly disassembly steps

1. Boot reinforcement
2. Boot
3. Ashtray
4. Cigarette lighter
5. Hole cover
6. Box
7. Plate
8. Accessory socket
9. Rear differential lock switch or hole cover
10. Front console cover
11. Floor console wiring harness
12. Front console

Rear console assembly disassembly steps

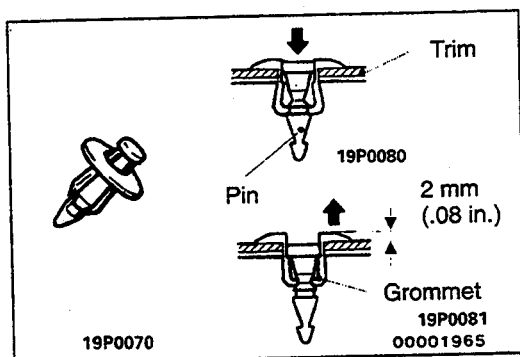
13. Hole cover
14. Rear console wiring harness
15. Cup holder
16. Lid assembly
17. Rear console cover
18. Box
19. Rear console

Z19E0085

TRIMS

TRIM CLIP REMOVAL/INSTALLATION PROCEDURES

The type of clip shown in the illustration, which is used for the installation of trim, should be removed and installed by the following procedures described below.

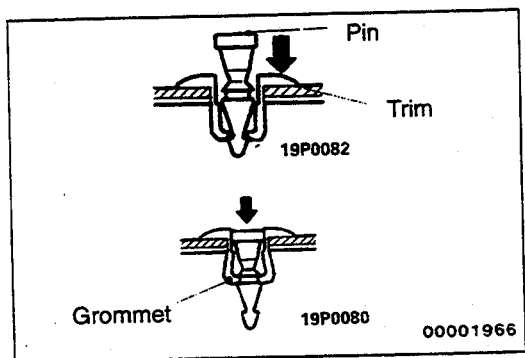


REMOVAL

- (1) Use a cross-tip (+) screwdriver to push inward the pin (at the center of the trim clip) to a depth of about 2 mm (.08 in).
- (2) Pull the trim clip outward to remove it.

Caution

Do not push the pin inward more than necessary because it may damage the grommet or cause the pin to fall in.

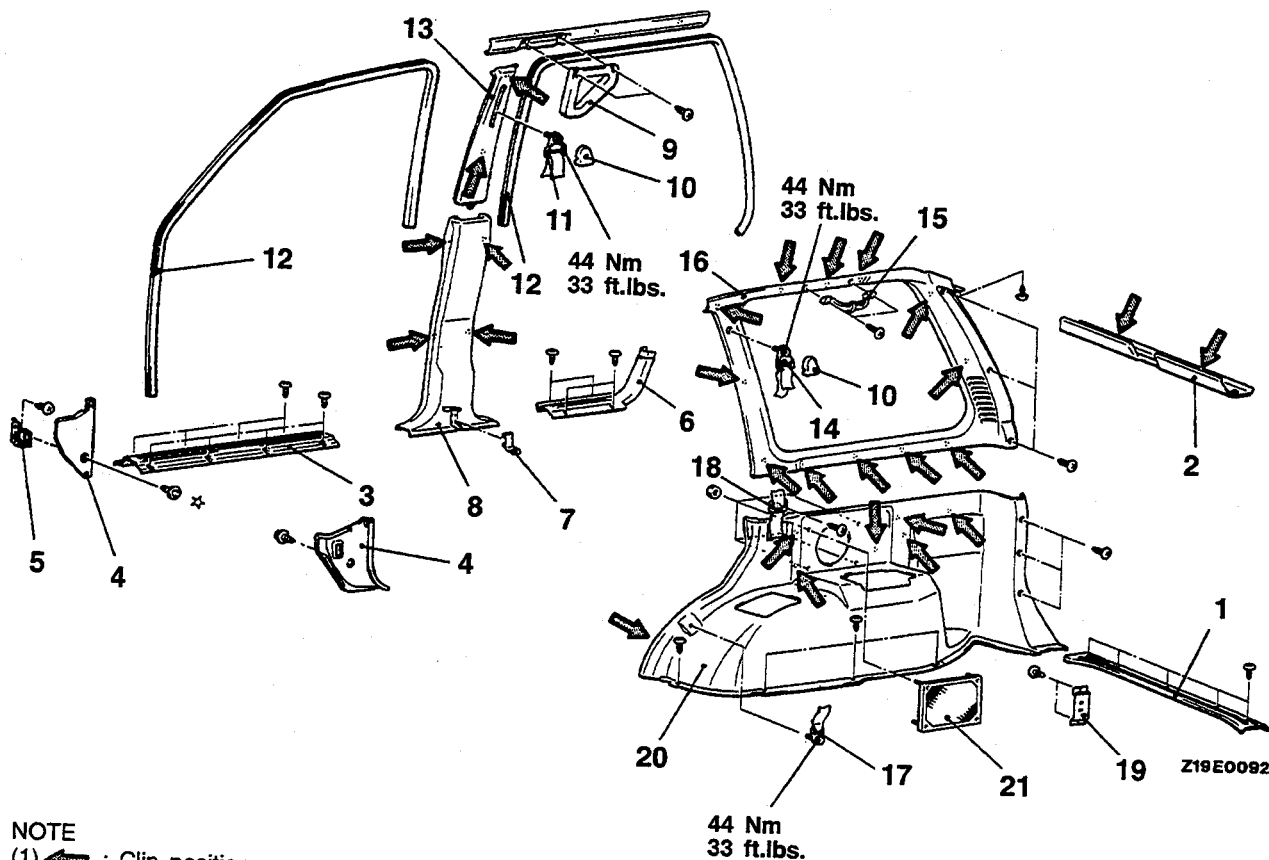


INSTALLATION

- (1) With the pin pulled out, insert the trim clip into the hole in the trim.
- (2) Push the pin inward until the pin's head is flush with the grommet.
- (3) Check whether the trim is secure.

REMOVAL AND INSTALLATION

110005221



NOTE

- (1) ← : Clip position
- (2) ☆ : Refer to trim clip removal/installation procedures (P.52A-8)

- 1. Rear trimming plate
- 2. Rear roof rail trim

Cowl side trim removal steps

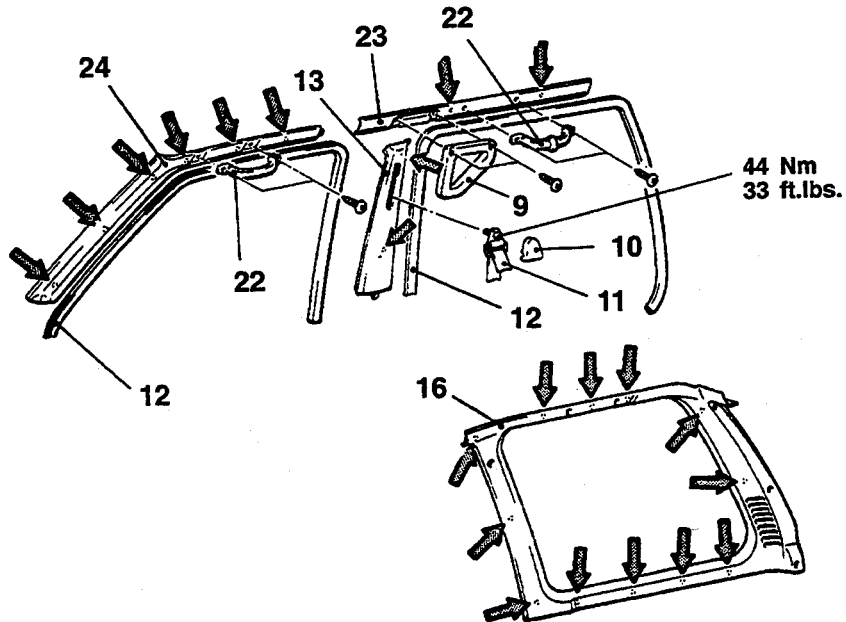
- 3. Front scuff plate
- 4. Cowl side trim
- 5. Cowl side bracket <RH side only>

Center pillar trim removal steps

- 3. Front scuff plate
- 6. Rear scuff plate
- 7. Belt anchor cover
- 8. Center pillar trim lower
- 9. Grip
- 10. Sash guide cover
- 11. Front seat belt sash guide
- 12. Door inner opening weatherstrip
- 13. Center pillar trim upper

Quarter trim removal steps

- 2. Rear roof rail trim
- 10. Sash guide cover
- 14. Rear seat belt sash guide
- 15. Assist grip
- 16. Quarter trim upper
 - 1. Rear trimming plate
- 17. Rear seat belt anchor plate
- 18. Rear seat belt garnish
- 19. Cargo lamp bracket <LH side>
- 20. Quarter trim lower
- 21. Speaker garnish



Z19E0094

NOTE

← : Clip position

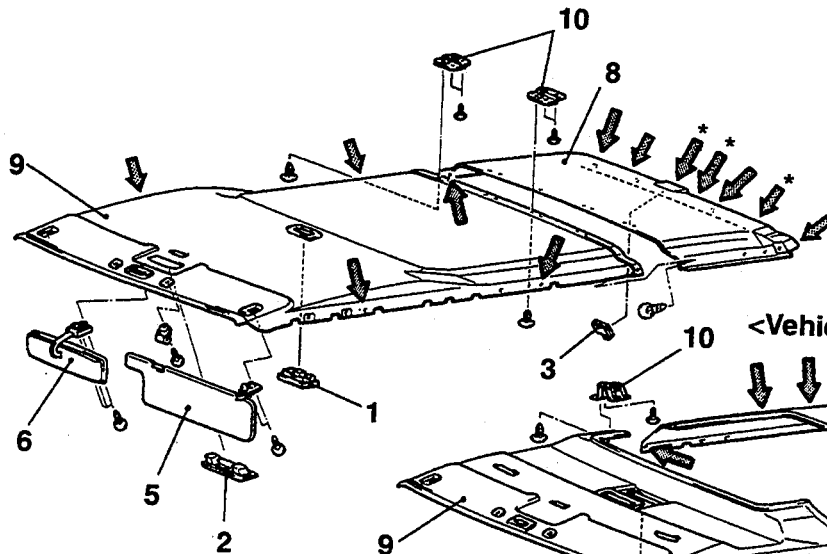
Front pillar trim, side roof rail trim removal steps

9. Grip
10. Sash guide cover
11. Front seat belt sash guide
12. Door inner opening weatherstrip
13. Center pillar trim upper
16. Quarter trim upper
22. Assist grip
23. Side roof rail trim
24. Front pillar trim

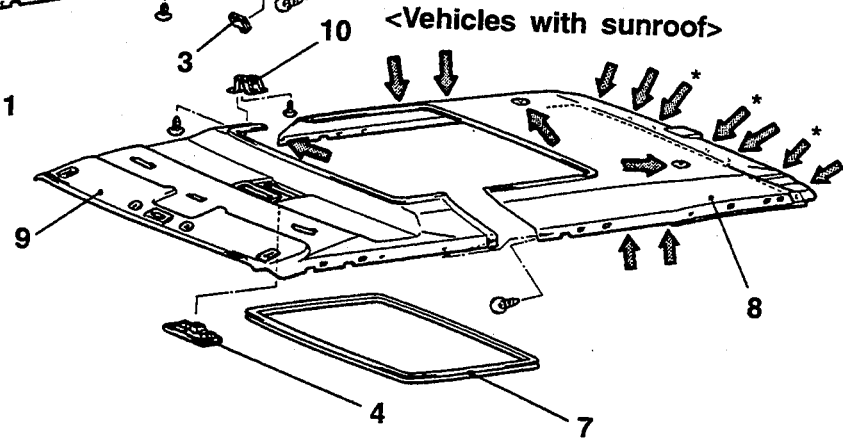
HEADLINING

REMOVAL AND INSTALLATION

<Vehicles without sunroof>



<Vehicles with sunroof>



NOTE

- (1) : Clip position
- (2) * : Vehicles with partial trim

Removal steps
<Vehicles without sunroof>

1. Room lamp
2. Map lamp
3. Luggage compartment lamp
5. Sunvisors
6. Inside rear view mirror
- Rear roof rail trim (Refer to P.52A-9, 10.)
- Quarter trim upper (Refer to P.52A-9, 10.)
- Center pillar trim upper (Refer to P.52A-9, 10.)
- Side roof rail trim (Refer to P.52A-9, 10.)
- Front pillar trim (Refer to P.52A-9, 10.)
8. Rear headlining
9. Front headlining
10. Joint bracket

Z19E0090

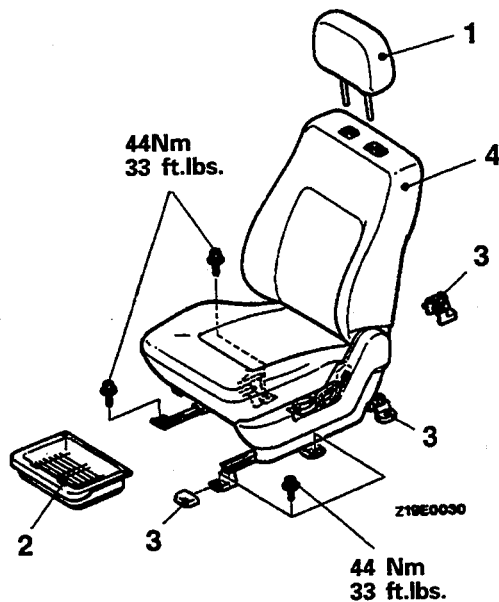
Removal steps
<Vehicles with sunroof>

1. Room lamp
2. Map lamp
3. Luggage compartment lamp
4. Sunroof switch
5. Sunvisors
6. Inside rear view mirror
- Rear roof rail trim (Refer to P.52A-9, 10.)
- Quarter trim upper (Refer to P.52A-9, 10.)
- Center pillar trim upper (Refer to P.52A-9, 10.)
- Side roof rail trim (Refer to P.52A-9, 10.)
- Front pillar trim (Refer to P.52A-9, 10.)
7. Headlining trim
8. Rear headlining
9. Front headlining
10. Joint bracket

FRONT SEAT

REMOVAL AND INSTALLATION

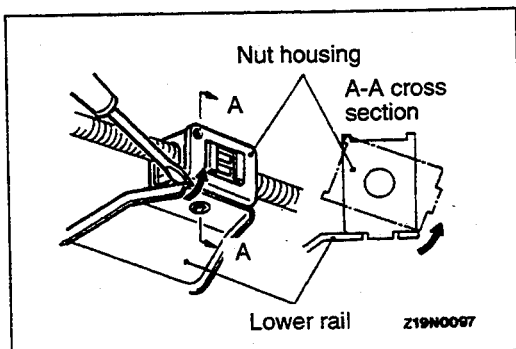
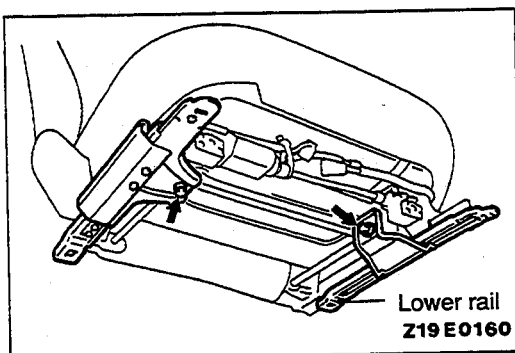
110005223



1. Headrest
2. Seat under tray <passenger's side only, except Van>

Front seat assembly removal steps

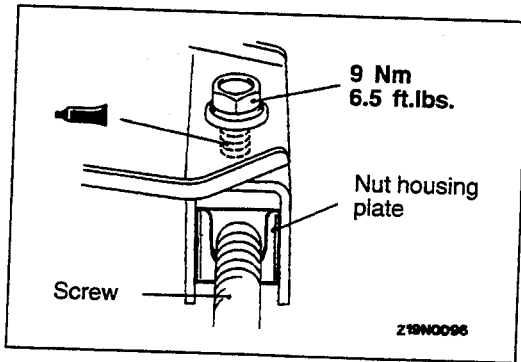
- | | |
|-----|------------------------|
| ▶B◀ | 3. Seat anchor covers |
| ▶A◀ | 4. Front seat assembly |



FRONT SEAT ASSEMBLY WHEN THERE IS A MALFUNCTION IN THE POWER SEAT SLIDE MECHANISM REMOVAL AND INSTALLATION POINTS

If removal of the seat mounting bolt is impossible when there is a malfunction in the slide motor or the side switch and the seat cannot slide, remove and install the front seat assembly by the following procedure.

- (1) Remove the seat cushion assembly.
(Refer to P.52-16.)
- (2) Remove the power seat relay box.
(Refer to P.52-16.)
- (3) Remove the bolts below the seat cushion as shown in the illustration.
- (4) Insert a flat-tipped screwdriver in between the lower rail and the nut housing, and detach the nut housing from the lower rail hole and turn it.
- (5) Slide the seat, and remove the seat mounting bolts.

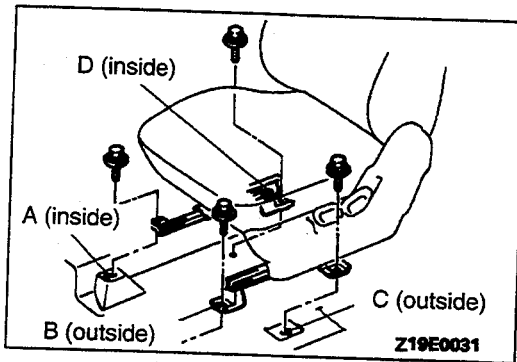


- (6) When reusing the power height adjuster assembly, apply specified adhesive to the mounting bolt, and tighten to the specified torque.

Specified adhesive: 3M Stud Locking Part No. 4170 of equivalent

Caution

Match to the left and right nut housing positions.



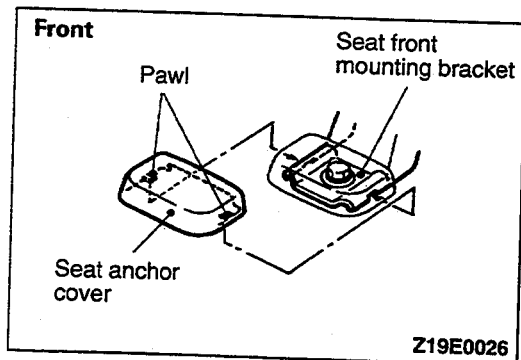
INSTALLATION SERVICE POINTS

▶A◀ FRONT SEAT ASSEMBLY INSTALLATION

- (1) Install the lower rail so that it matches the left and right front seat mounting hole positions, and lock both sides of the seat adjustor.
- (2) Temporarily tighten the seat mounting bolts in the order A, B, C, and D, and then tighten them to the specified torque.
- (3) After installing the front seat assembly, check that the seat moves backward and forwards smoothly, and that the seat adjuster locks on both sides in all lock positions.

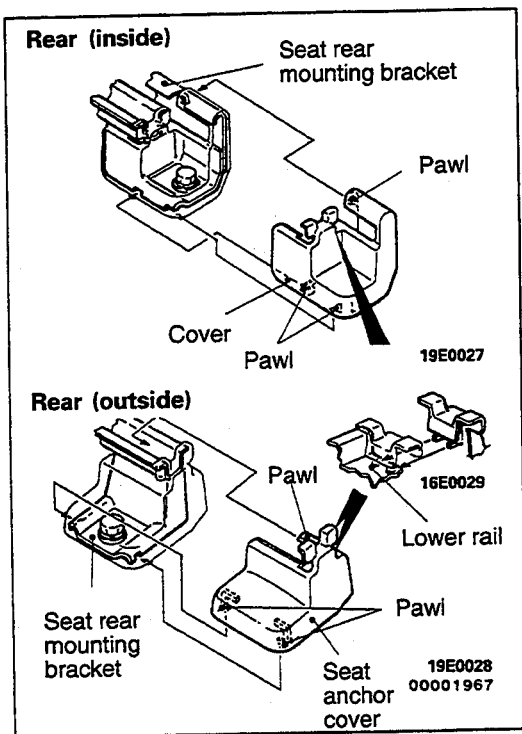
NOTE

The illustration shows the driver's side seat.



▶B◀ SEAT ANCHOR COVER INSTALLATION

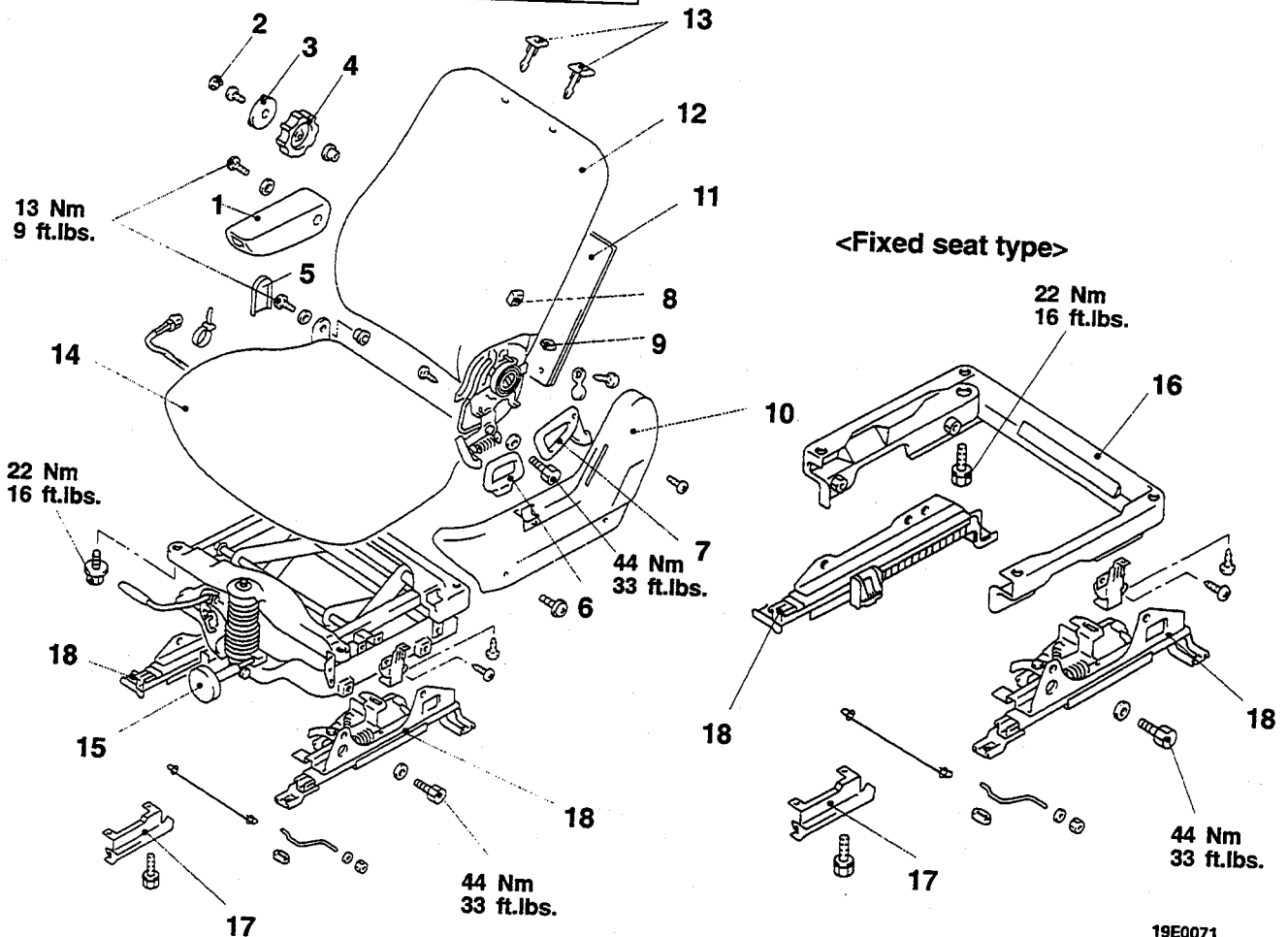
- (1) Press down the front seat anchor cover from the top of the seat front mounting bracket, and hang the anchor cover tab on the bracket.



- (2) Insert the rear seat anchor cover from the rear of the seat rear mounting bracket, and hang the anchor cover tab on the bracket while inserting into the lower rail.

DISASSEMBLY AND REASSEMBLY <MANUAL SEAT>

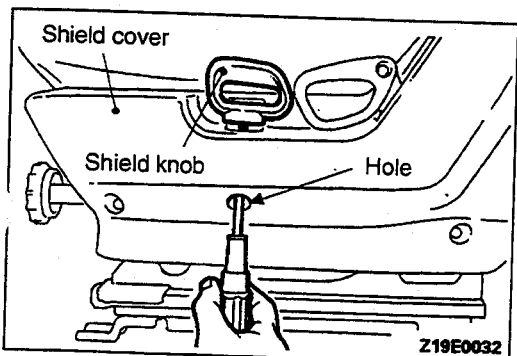
Pre-removal and Post-installation Operation
 • Front Inner Seat Belt Assembly Removal and Installation (Refer to P.52A-20.)



Disassembly steps

1. Armrest assembly
2. Side support lever cap
3. Side support lever
4. Lumber support lever
5. Free hinge protector
6. Slide knob
7. Reclining knob
8. Reclining memory knob
9. Walk-in knob

10. Shield cover
11. Back pocket assembly
12. Seatback assembly
13. Headrest guide
14. Seat cushion assembly
15. Suspension assembly
16. Leg assembly
17. Under tray bracket
18. Seat adjuster



DISASSEMBLY SERVICE POINT

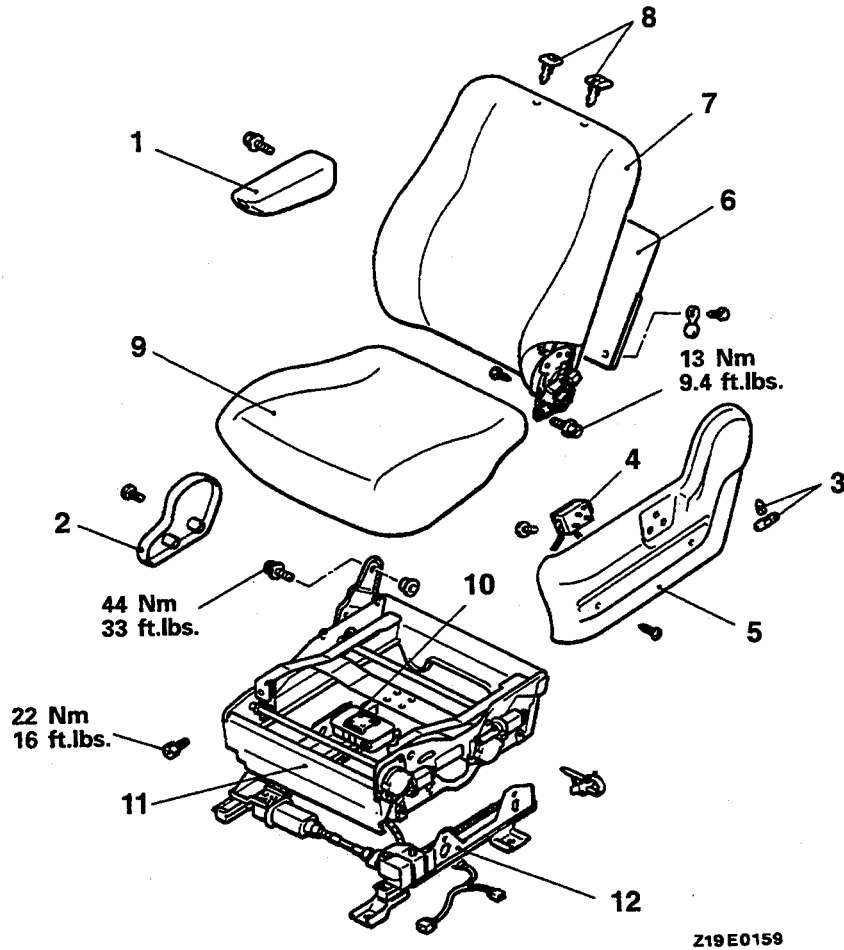
<A> SLIDE KNOB REMOVAL

Pass a screwdriver through the shield cover hole and remove the slide knob mounting screw.

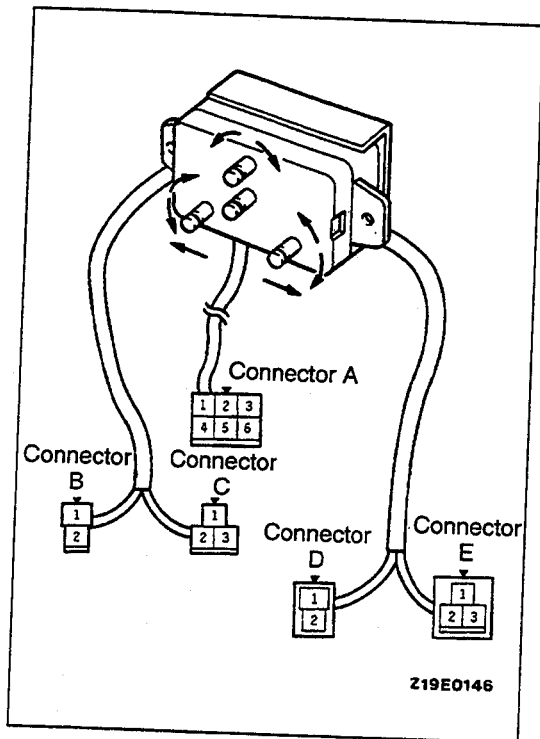
DISASSEMBLY AND REASSEMBLY <POWER SEAT>

Pre-removal and Post-installation Operation

- Front Inner Seat Belt Assembly Removal and Installation (Refer to P.52A-20.)

**Disassembly steps**

- | | |
|-------------------------|--------------------------|
| 1. Armrest assembly | 7. Seatback assembly |
| 2. Free hinge protector | 8. Headrest guide |
| 3. Power seat lever | 9. Seat cushion assembly |
| 4. Power seat switch | 10. Power seat relay box |
| 5. Shield cover | 11. Leg assembly |
| 6. Back pocket assembly | 12. Power seat adjuster |



INSPECTION

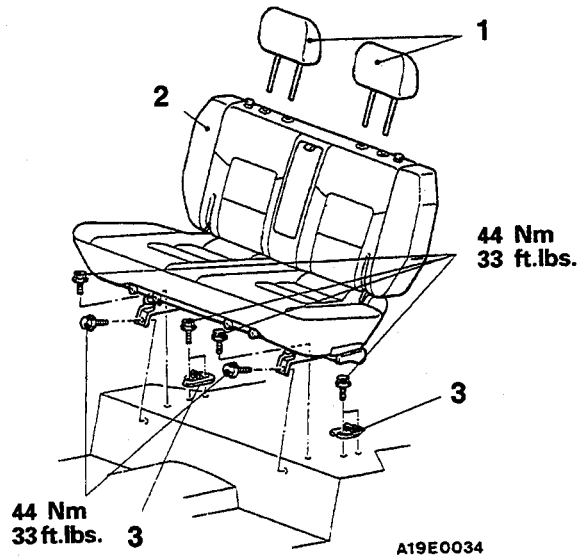
POWER SEAT SWITCH

Operate the power seat switch and check for continuity.

Switch Position		Connector A terminal						Connector B terminal		Connector C terminal			Connector D terminal		Connector E terminal			
		1	2	3	4	5	6	1	2	1	2	3	1	2	1	2	3	
Reclining switch	Forward	○	—	○														
	Backward	○	—				○											
Slide switch	Forward	○	○															
	Backward	○	—			○												
Height switch (Front)	Up	○	—					○	—	○								
	Down	○	—				○		○	—	○							
Height switch (Rear)	Up	○	—									○	—	○				
	Down	○	—									○	—	○	○	○		
All switches	OFF		○	○	○	○	○		○					○				

**SECOND SEAT
REMOVAL AND INSTALLATION**

110005226



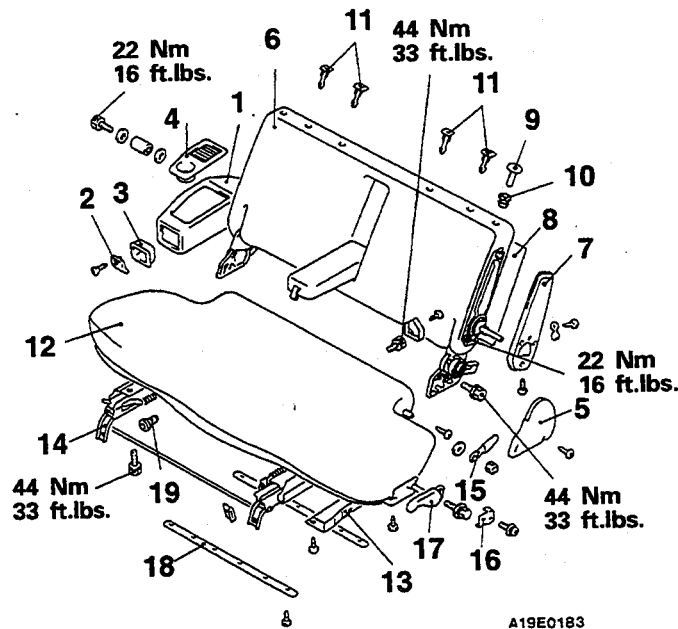
Removal steps

1. Headrest

2. Rear seat assembly
3. Striker

DISASSEMBLY AND REASSEMBLY

110005227



Disassembly steps

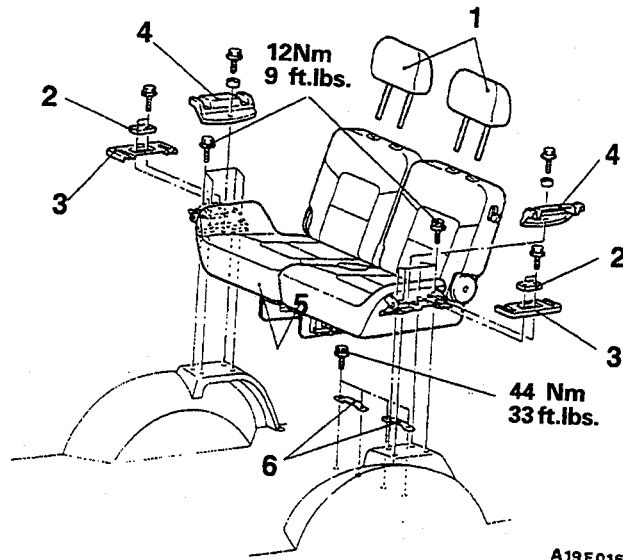
1. Side back assembly
2. Seat back knob
3. Seat back garnish
4. Seat back tray
5. Reclining cover
6. Seat back assembly
7. Rail cover
8. Seat back trim
9. Knob
10. Knob guide

11. Headrest guide
12. Seat cushion assembly
13. Slide leg cover
14. Seat adjuster
15. Full flat knob
16. Cover
17. Knob
18. Cushion trim moulding
19. Headrest guide

THIRD SEAT

REMOVAL AND INSTALLATION

110005228



A19E0162

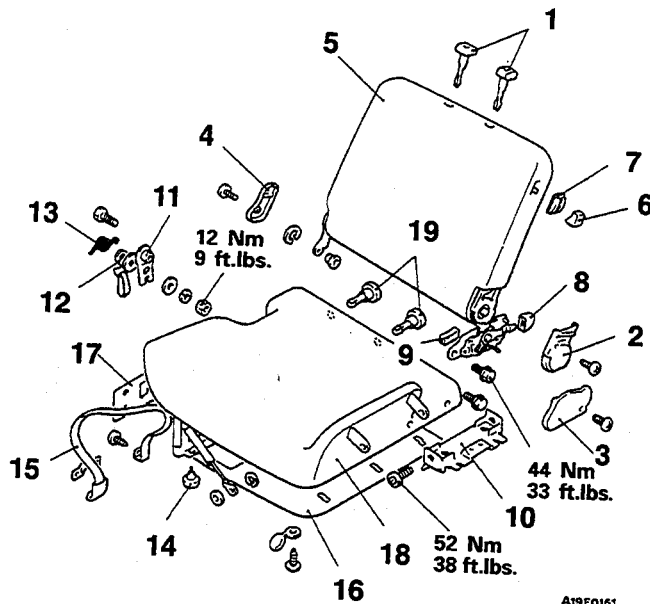
Removal steps

1. Headrest
2. Damper
3. Seat anchor cover (A)

4. Seat anchor cover (B)
5. Third seat assembly
6. Striker

DISASSEMBLY AND REASSEMBLY

110005229



A19E0161

Disassembly steps

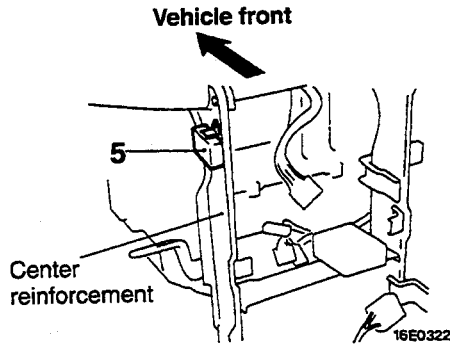
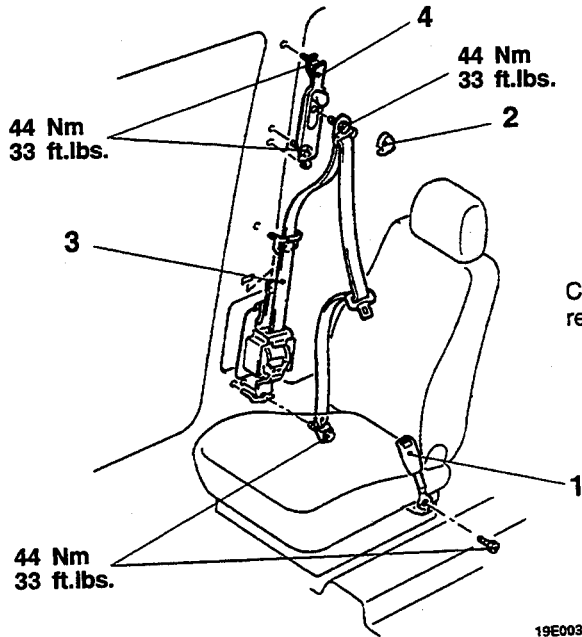
1. Headrest guide
2. Reclining cover
3. Reclining cushion cover
4. Free hinge protector
5. Seat back assembly
6. Knob
7. Garnish
8. Full flat knob
9. Seat belt protector

10. Attaching bracket
11. Lock plate
12. Catch assembly
13. Torsion spring
14. Bumper
15. Strap assembly
16. Back trim
17. Cushion side trim
18. Seat cushion assembly

TSB Revision

**FRONT SEAT BELT
REMOVAL AND INSTALLATION**

110005230



19E0038
00001969

- ▶C◀ 1. Inner seat belt assembly
Removal steps
- 2. Sash guide cover
 - Center pillar trim, lower (Refer to P.52A-9.)
 - Center pillar trim, upper (Refer to P.52A-9.)
- ▶B◀ 3. Outer seat belt assembly
- ▶A◀ 4. Adjustable seat belt anchor

Buzzer assembly removal steps

- Instrument panel assembly (Refer to P.52A-3.)
- 5. Buzzer assembly (built-in seat belt warning timer)

INSPECTION

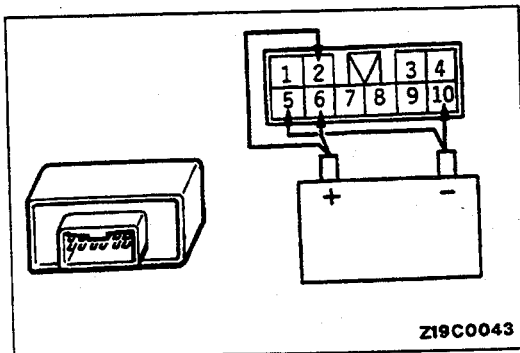
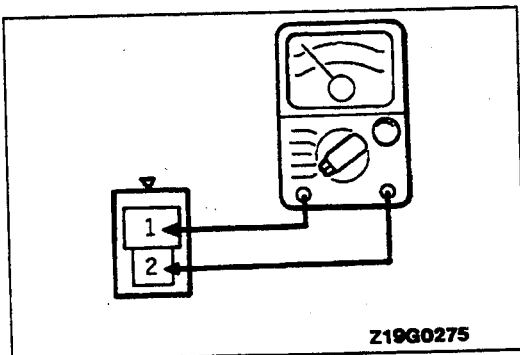
BUCKLE SWITCH

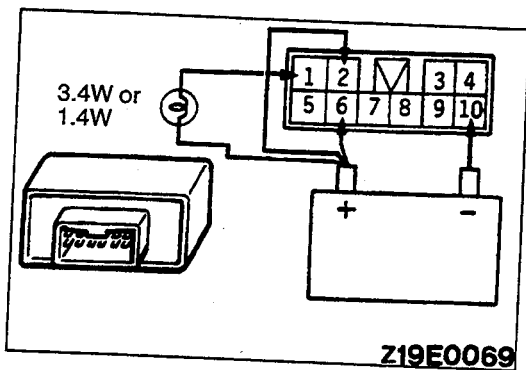
- (1) Disconnect the buckle switch connector.
- (2) Check the continuity between the terminals.

Terminal	1	2
Buckle unlock	○	○
Buckle lock		

BUZZER

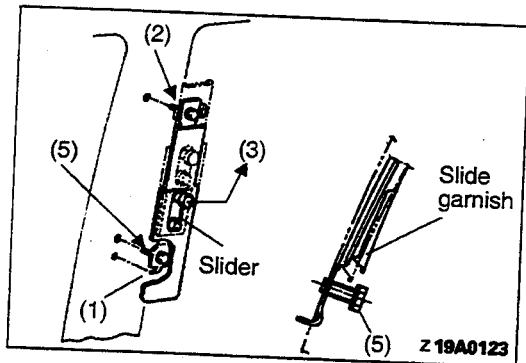
- (1) Apply battery positive voltage between terminals (2), (6) and (10).
- (2) Check that the buzzer sounds intermittently when terminal (5) is grounded.





SEAT BELT WARNING TIMER

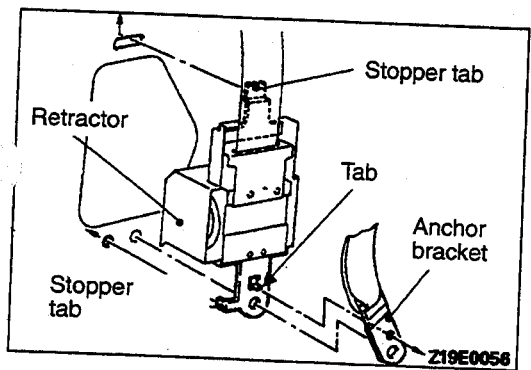
- (1) Apply battery positive voltage between terminals (2) – (10).
- (2) Connect a bulb between terminal (1) and the positive battery terminal.
- (3) Check that the bulb illuminates for 6 seconds when the terminal (6) is connected to the positive battery terminal.



INSTALLATION SERVICE POINT

▶A◀ ADJUSTABLE SEAT BELT ANCHOR INSTALLATION

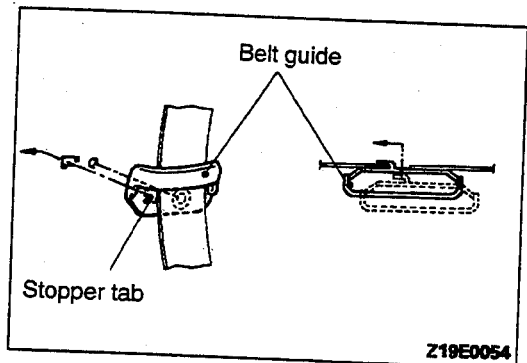
- (1) Securely fit the tab of the adjustable seat belt anchor into the hole in the center pillar.
- (2) Provisionally tighten the installation bolt at the upper side.
- (3) Lock the slider at the uppermost position.
- (4) Raise the slide garnish to the upper side.
- (5) Tighten the lower side mounting bolt to the specified torque.
- (6) Lower the slide garnish and slider, and tighten the upper side mounting bolt to the specified torque.



▶B◀ OUTER SEAT BELT ASSEMBLY INSTALLATION

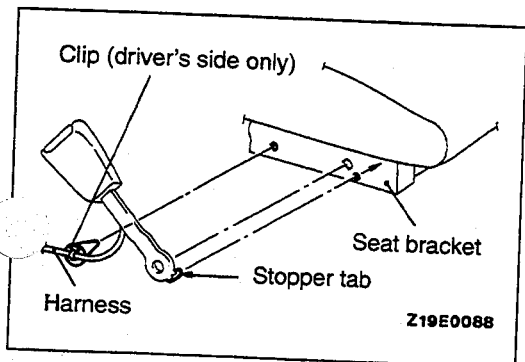
- (1) Securely insert the retractor stopper tab into the body hole.
- (2) Securely insert the retractor bracket tab into the anchor bracket hole.

- (3) Securely insert the belt guide tab into the body hole.



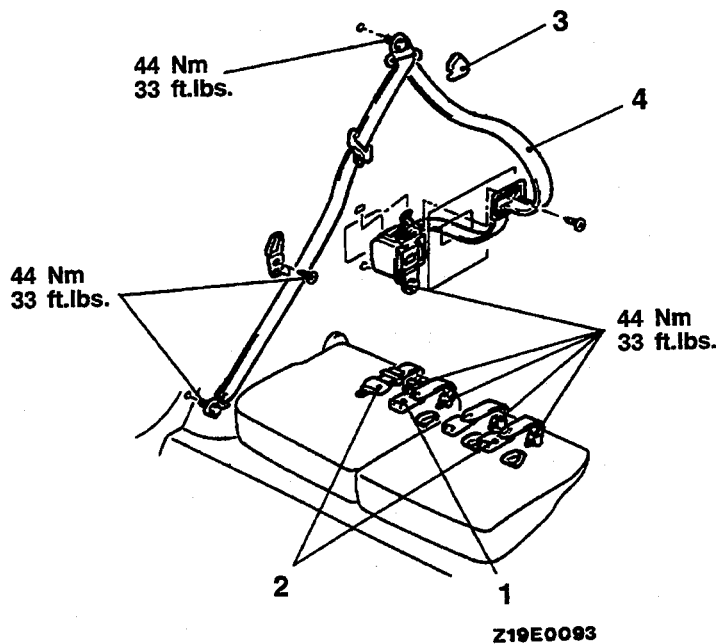
▶C◀ INNER SEAT BELT ASSEMBLY INSTALLATION

Securely insert the stopper tab into the seat bracket hole.



SECOND SEAT BELT REMOVAL AND INSTALLATION

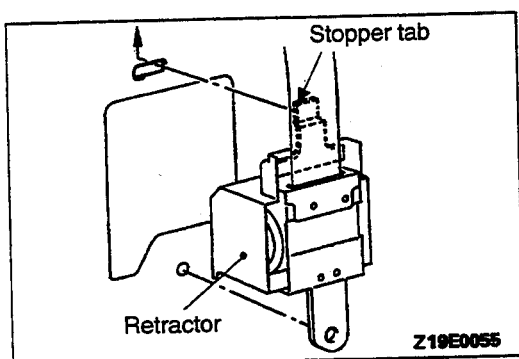
110005231



1. Inner seat belt assembly
2. Center seat belt assembly

Outer seat belt assembly removal steps

3. Sash guide cover
- Quarter trim lower (Refer to P.52A-9.)
- ▶◀ 4. Outer seat belt assembly



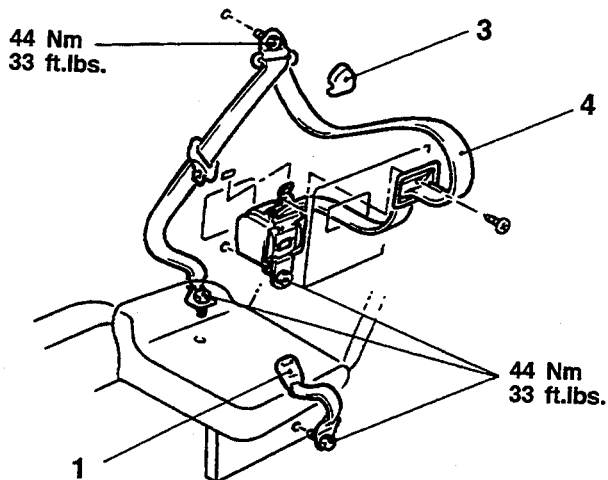
INSTALLATION SERVICE POINT

▶◀ OUTER SEAT BELT ASSEMBLY INSTALLATION

Securely insert the retractor stopper tab into the body hole.

**THIRD SEAT BELT
REMOVAL AND INSTALLATION**

110005232



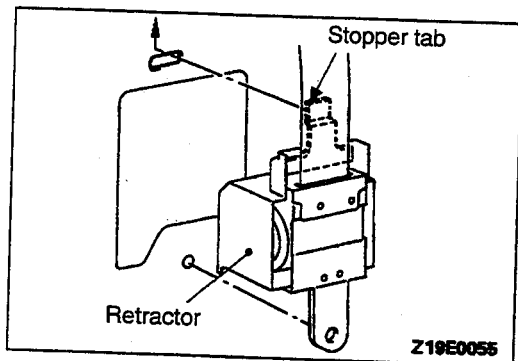
Z19E0040

1. Inner seat belt assembly

Outer seat belt assembly removal steps

3. Sash guide cover
• Quarter trim, lower
(Refer to P.52A-9.)

▶A◀ 4. Outer seat belt assembly



INSTALLATION SERVICE POINT

▶A◀ **OUTER SEAT BELT ASSEMBLY INSTALLATION**

Securely insert the retractor stopper tab into the body hole.

NOTES

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

110005233

AIR BAG MODULE DISPOSAL PROCEDURES	51	Introduction	2
Deployed Air Bag Module Disposal	54	Schematic	7
Undeployed Air Bag Module Disposal	51	Warning/Caution Labels	4
AIR BAG MODULE AND CLOCK SPRING	45	MAINTENANCE	36
COMPONENT SERVICE	39	POST-COLLISION DIAGNOSIS	36
FRONT IMPACT SENSORS	40	SPECIAL TOOLS	17
GENERAL INFORMATION	2	SERVICE PRECAUTIONS	15
Circuit Diagram	12	SERVICE SPECIFICATIONS	16
Component Location	14	SRS DIAGNOSIS UNIT (SDU)	42
Configuration Diagrams	8	TEST EQUIPMENT	17
Connector Construction	10	TROUBLESHOOTING	18
Construction Diagram	3		

CAUTION

- Carefully read and observe the information in the **SERVICE PRECAUTIONS** (P.52B-15.) Prior to any service.
- For information concerning troubleshooting or maintenance, always observe the procedures in the **Troubleshooting** (P.52B-19.) or the **Maintenance** (P.52B-36.) sections respectively.
- If any SRS components are removed or replaced in connection with any service procedures, be sure to follow the procedures in the **INDIVIDUAL COMPONENT SERVICE** section (P.52B-39.) for the components involved.
- If you have any questions about the SRS, please contact your local distributor.

GENERAL INFORMATION

INTRODUCTION

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

The SRS consists of: left front and right front impact sensors (located on the right and left radiator support panel); air bag module (located in the center of the steering wheel). Module contains a folded air bag and an inflator unit. The SRS also contains: an SRS Diagnosis Unit with safing impact sensor (located in front of the shift lever); and SRS warning light to indicate the operational status of the SRS (located on the instrument panel); clock spring (located on the instrument panel); and wiring.

The SRS is designed so that the air bags will deploy when the safing sensor, plus either or both of the left front and right front impact sensors simultaneously activate while the ignition switch is in the ON position. These sensors are designed to be activated in frontal or near-frontal impacts of moderate to severe force.

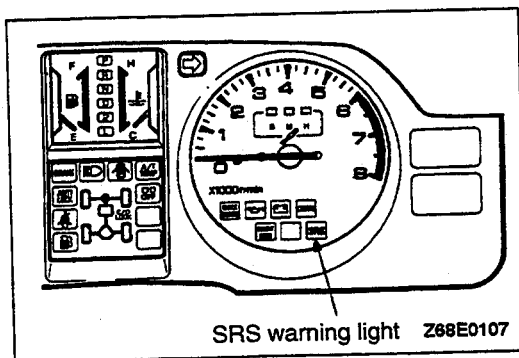
Only authorized service personnel should work on or around SRS components. Those personnel should read this manual carefully before starting such work. Extreme care must be used when servicing the SRS to avoid injury to service personnel (by inadvertent deployment of the air bag) or vehicle occupant (by rendering the SRS inoperative).

ON-BOARD DIAGNOSTIC/SRS WARNING LIGHT FUNCTION

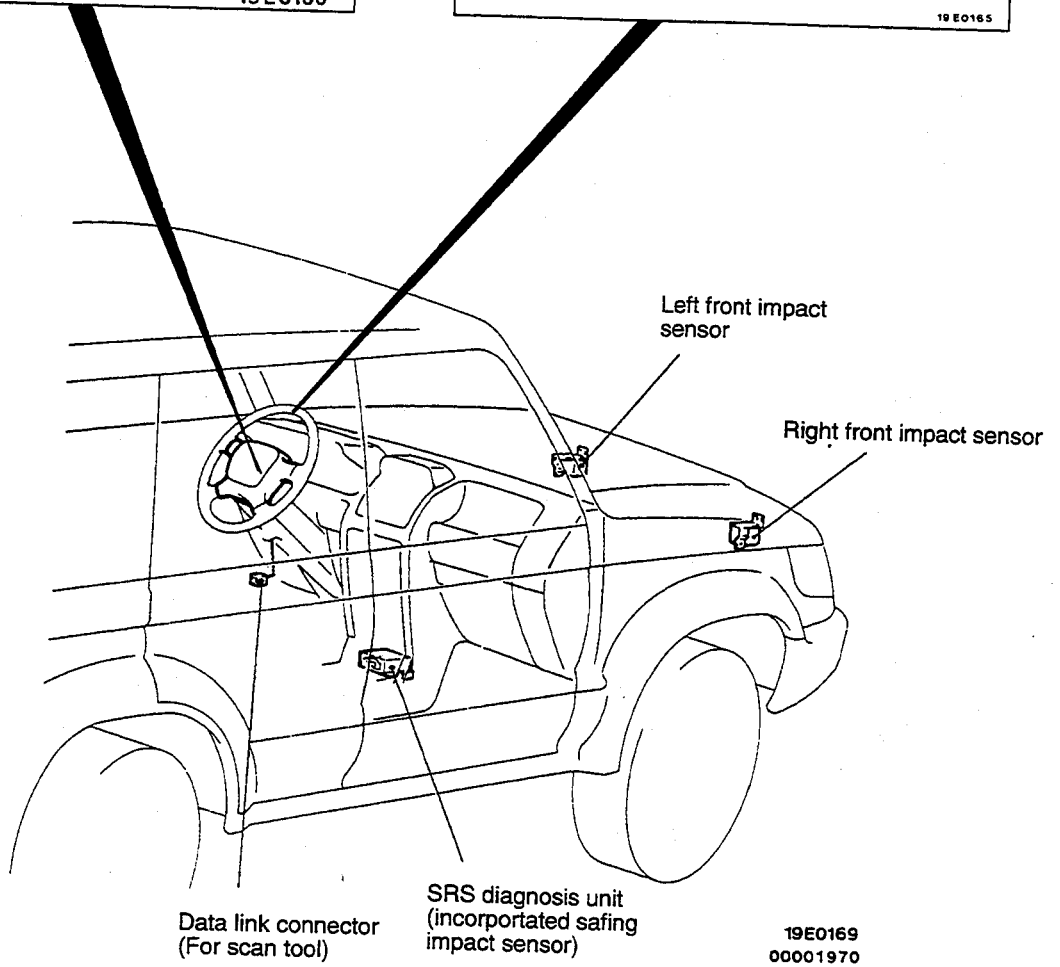
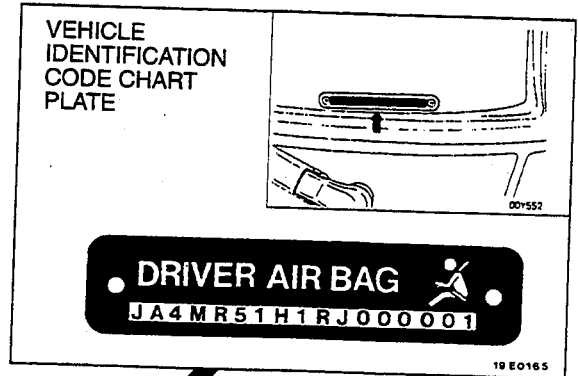
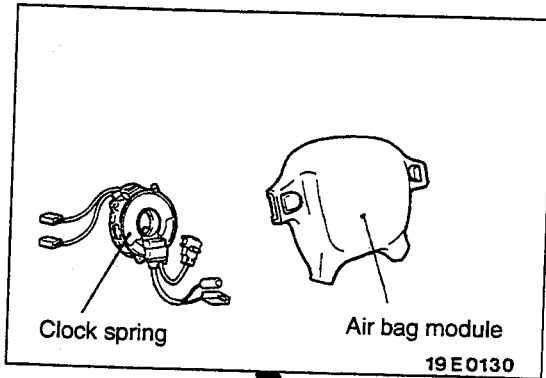
The diagnosis unit monitors the SRS system and stores data concerning any detected faults in the system. When the ignition key is in "ON" or "START" position, the SRS warning light should illuminate for about 7 seconds and then turn off. That indicates that the SRS system is in operational order. If the SRS warning light does any of the following, immediate inspection by an authorized dealer is needed.

- (1) The SRS warning light does not illuminate as described above.
- (2) The SRS warning light stays on for more than 7 seconds.
- (3) The SRS warning light illuminates while driving.

If a vehicle's SRS warning light is in any of these three conditions when brought in for inspection, the SRS system must be inspected, diagnosed and serviced in accordance with this manual.



CONSTRUCTION DIAGRAM

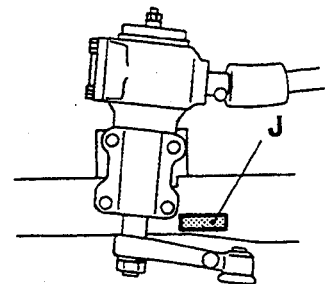
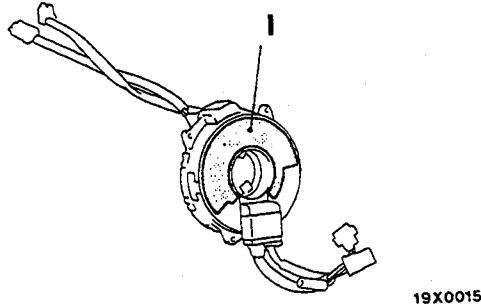
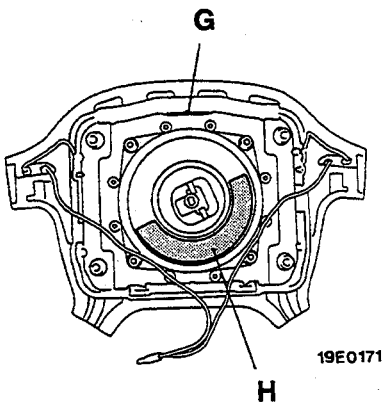
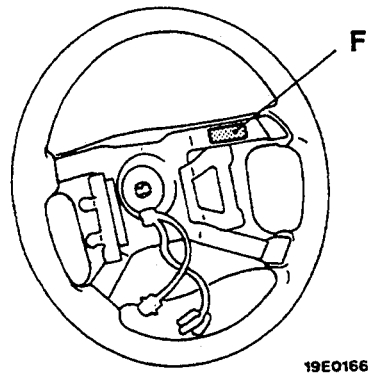
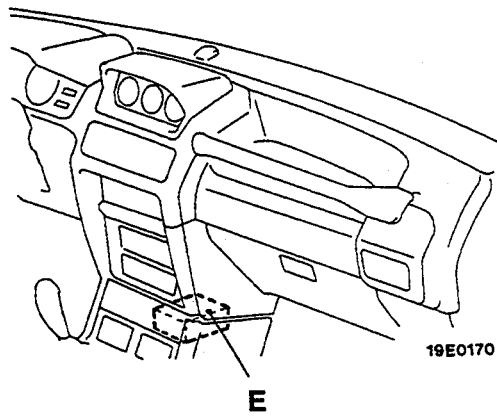
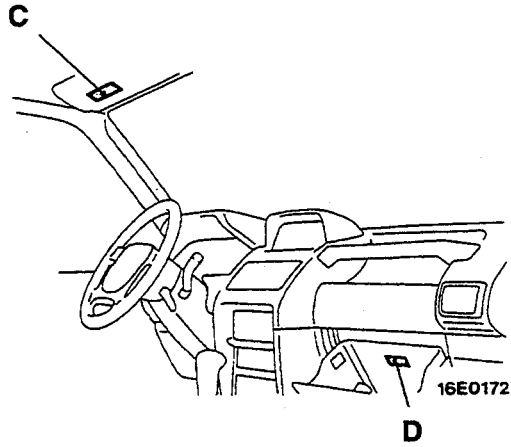
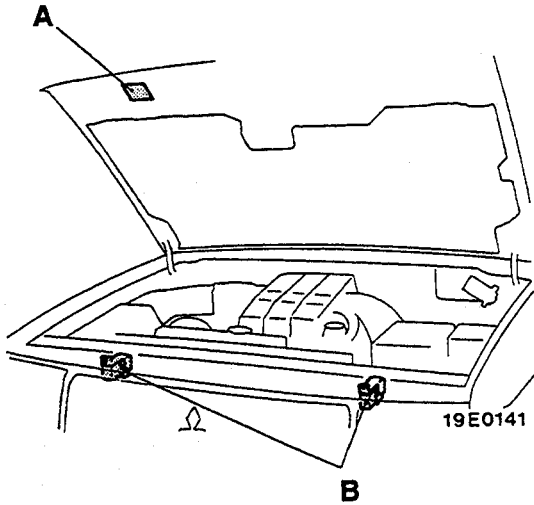


NOTE
This construction diagram displays the general view of the SRS components. For details, refer to "Schematic" (P.52B-7), "Configuration Diagrams" (P.52B-8) and "Circuit Diagram" (P.52B-12).

WARNING/CAUTION LABELS

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.



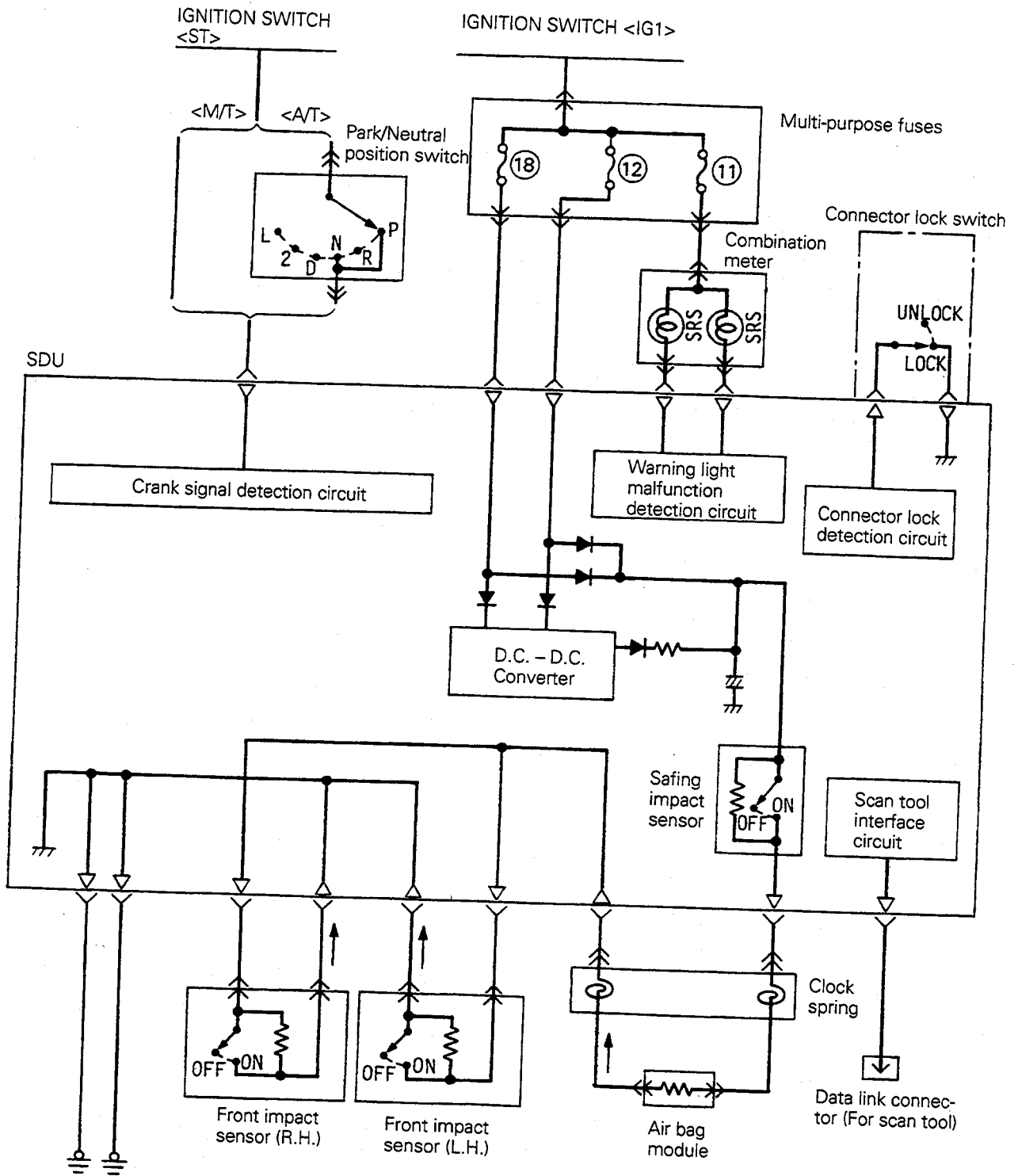
19E0140
00001971

Label contents

A	<p>WARNING This vehicle has an air bag system. Refer to service manual before servicing or disassembling underhood components. Read the "SRS" section of manual for important instructions. Improper service procedures can result in the air bag firing or becoming inoperative, possibly leading to injury.</p>	<p>Read the "SRS" section of your owner's manual before driving for important information about operation and service of the air bag system. When you are going to discard your gas generator or vehicle, please see your MITSUBISHI dealer.</p>
B	<p>CAUTION: SRS Read service manual. Do not drop. Do not tamper or disassemble.</p>	<p>E CAUTION: SRS diagnosis unit This unit cannot be repaired. If defective, remove and replace entire unit per service manual instructions. Do not disassemble or tamper. See service manual for handling and storage instructions. Do not drop: keep dry. Failure to follow instructions could render air bag inoperative and result in driver injury.</p>
C	<p>CAUTION This vehicle has an air bag for the driver as a supplemental restraint system (SRS). YOU MUST ALWAYS WEAR YOUR SEATBELT, EVEN WITH AN AIR BAG.</p> <ul style="list-style-type: none"> ● Air bag is not designed to inflate in roll overs or in rear, side or low-speed frontal crashes. ● Air bag inflates powerfully and in a moment. If you're too close to an inflating air bag, it could seriously injure you. Seatbelts help keep you in position for air bag inflation in a crash. ● Before driving read label inside the glove box; if the "SRS" light comes on while you are driving, or does not come on when you first start the vehicle, see your dealer for service. 	<p>F CAUTION: SRS Before replacing steering wheel, read service manual, center front wheels and align SRS clock spring neutral marks. Failure to do so may render SRS system inoperative, risking serious driver injury.</p>
D	<p>AIR BAG SYSTEM INFORMATION This vehicle has an air bag system which will supplement the seatbelt in certain frontal collisions. The air bag is not a substitute for the seatbelt in any type of collision. The driver and all other occupants should wear seatbelts at all times. WARNING! If the "SRS" warning light does not illuminate for several seconds when the ignition key is turned to "ON" or the engine is started, or if the warning light stays on while driving, take the vehicle to your nearest authorized dealer immediately. Also, if the vehicle's front end is damaged or if the air bag has deployed, take the vehicle for service immediately. The air bag system must be inspected by an authorized dealer ten years after the vehicle manufacture date shown on the certification label located on the left front door -latch post or door frame.</p>	<p>G WARNING: SRS This air bag module cannot be repaired. Do not disassemble or tamper. Do not perform diagnosis. Do not touch with electrical test equipment or probes. Refer to service manual for further instructions, and for special handling, storage and disposal procedures. Tampering or mishandling can result in injury.</p>

Label contents	
H	<p>Danger! Poison. Keep out of the reach of children.</p> <p>Contains sodium azide and potassium nitrate contents are poisonous and extremely flammable. Contact with acid, water, or heavy metals may produce harmful and irritating gases or explosive compounds. Do not dismantle, incinerate, bring into contact with electricity or store at temperatures exceeding 200°F.</p> <p>First aid: If contents are swallowed induce vomiting. For eye contact flush eye with water for 15 minutes. If gases from acid or water contact are inhaled, seek fresh air. In every case, get prompt medical attention.</p> <p>For additional information, see material safety data sheet (MSDS) for this product.</p>
	<p>I</p> <p>CAUTION: SRS clock spring This is not a repairable part. Do not disassemble or tamper. If defective, remove and replace entire unit per service manual instructions. Before replacement, read service manual, center front wheels and align neutral marks. Failure to follow instructions may render SRS system inoperative, risking serious driver injury.</p>
	<p>J</p> <p>CAUTION: SRS Before removal of steering gearbox, read service manual, 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.</p>

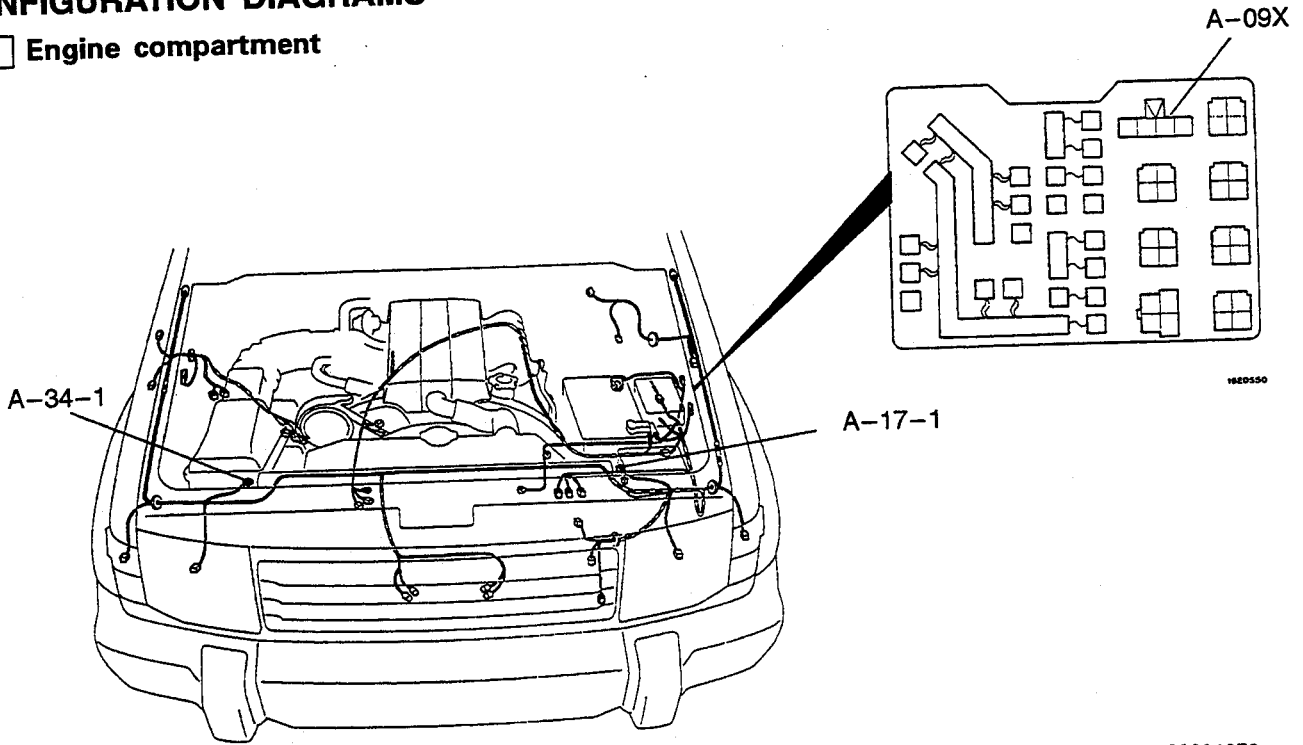
SCHEMATIC



Z19E0168

CONFIGURATION DIAGRAMS

A Engine compartment

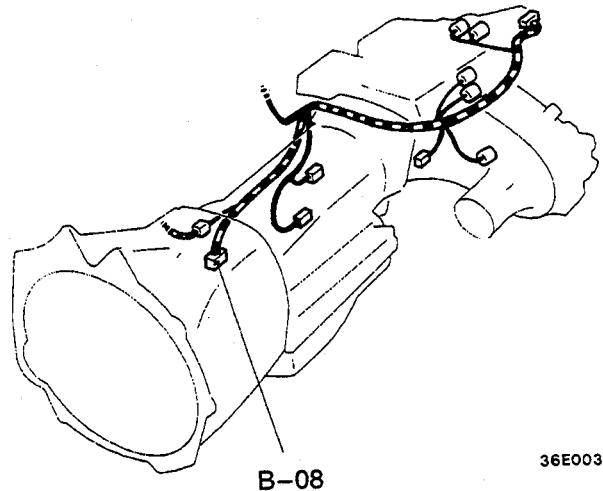
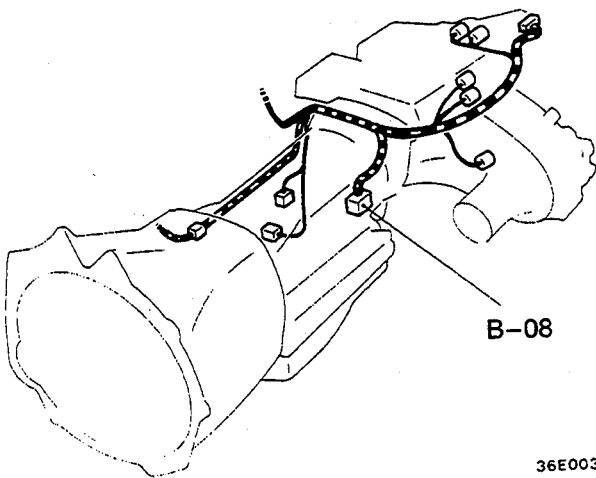


- A-09X IOD or strage connector
- A-17-1 Front impact sensor (L.H.)
- A-34-1 Front impact sensor (R.H.)

B Engine and transmission

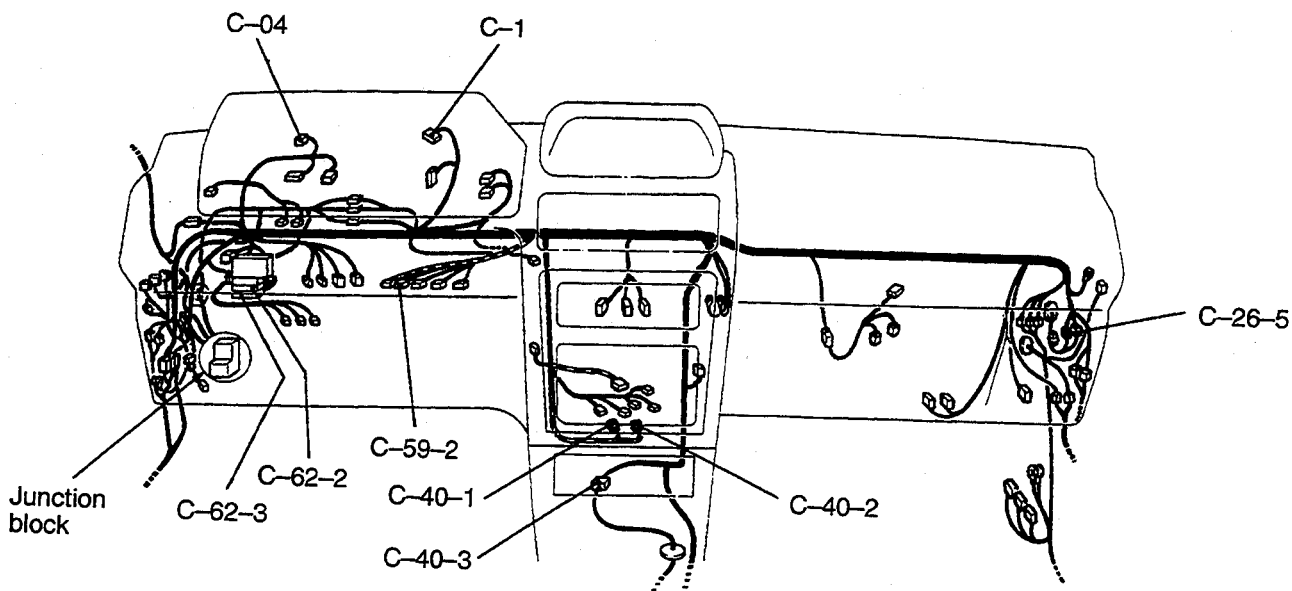
<3.0L-12VALVE engine>

<3.0L-24VALVE engine, 3.5L engine>



B-08 Park/Neutral position switch <A/T>

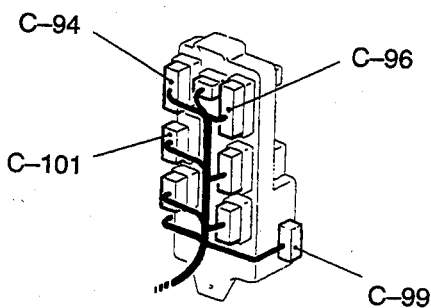
C Dash panel



- C-4 Combination meter
- C-11 Combination meter
- C-26-5 Front wiring harness and dash wiring harness combination
- C-40-1 Connectors to SRS Diagnosis Unit (2-pin red connector)
- C-40-2 Connectors to SRS Diagnosis Unit (14-pin red connector)
- C-40-3 Dash wiring harness and transmission wiring harness combination

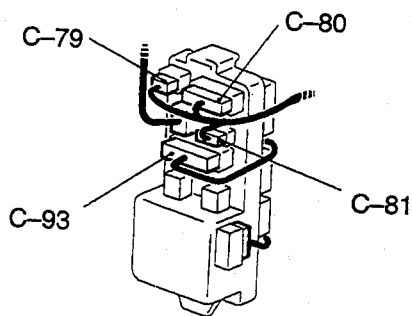
- Z36E0041
- C-59-2 Clock spring
 - C-62-2 J/C (2)
 - C-62-3 J/C (3)

JUNCTION BLOCK
Front side view



36E0039

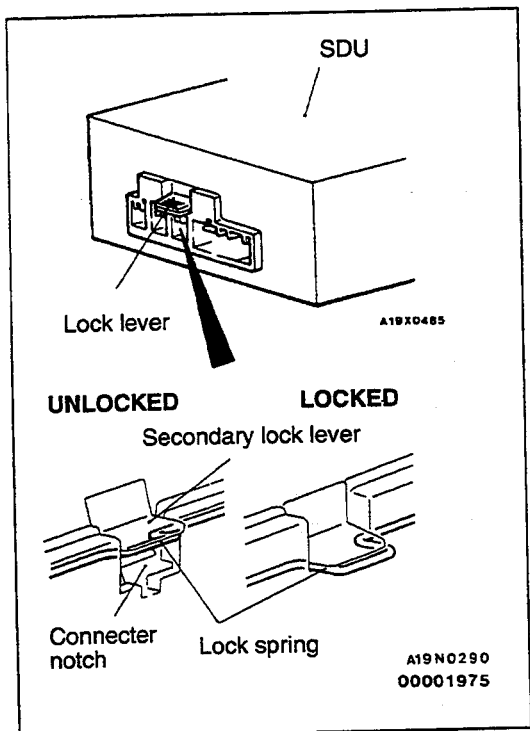
Rear side view



36E0040
00001974

- C-79 Front wiring harness and junction block
- C-80 Front wiring harness and junction block
- C-81 Front wiring harness and junction block

- C-93 Dash wiring harness and junction block
- C-94 Dash wiring harness and junction block
- C-96 Dash wiring harness and junction block
- C-99 Data link connector (For scan tool)
- C-101 Dash wiring harness and junction block



CONNECTOR CONSTRUCTION

The connector of the SRS diagnosis unit has a double lock mechanism, fit verification mechanism and connector shorting mechanism.

DOUBLE LOCK MECHANISM

The mechanism is composed of two mechanisms: each connector of the SRS diagnosis unit is locked to the connector of the harness, then these connectors (of the four harnesses) are locked with the secondary lock lever mounted on the connector of the SRS diagnosis unit side.

The secondary lock lever locking is done as the lock spring fits in the notch of the connector.

The operating principle is described below.

When Connectors Are To Be Fitted

- (1) The SRS diagnosis unit and harness side connectors are connected. (Primary lock)
- (2) The secondary lock lever mounted to the SRS diagnosis unit side connector, is manually pressed down until a click is heard indicating that the connectors have been locked. (Secondary lock)

If the harness and SRS diagnosis unit connectors do not properly fit, the secondary lock lever side projection and the harness side connector projection interfere with each other, making it impossible to lock the connectors.

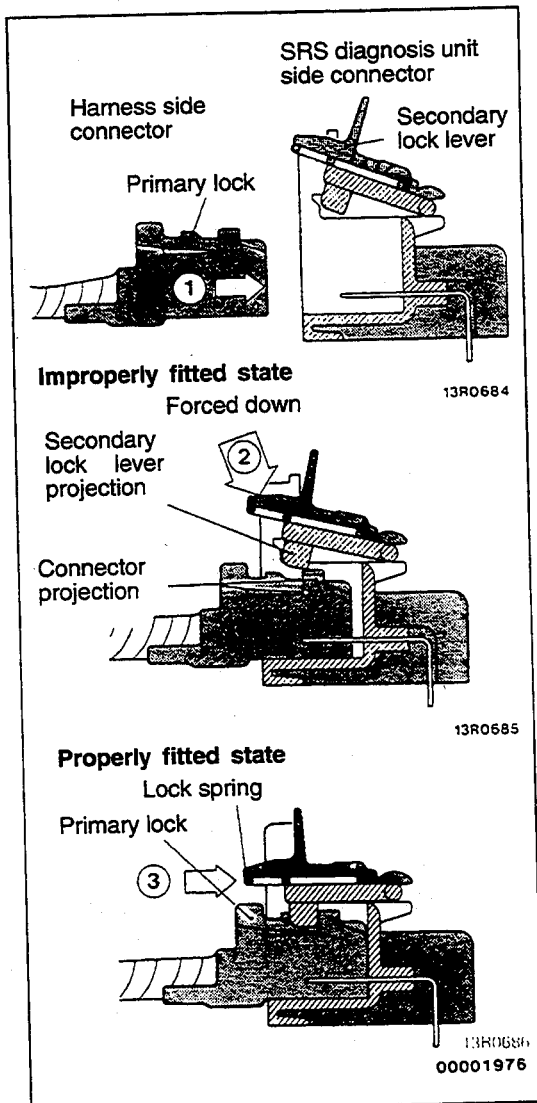
When Connectors Are Unlocked

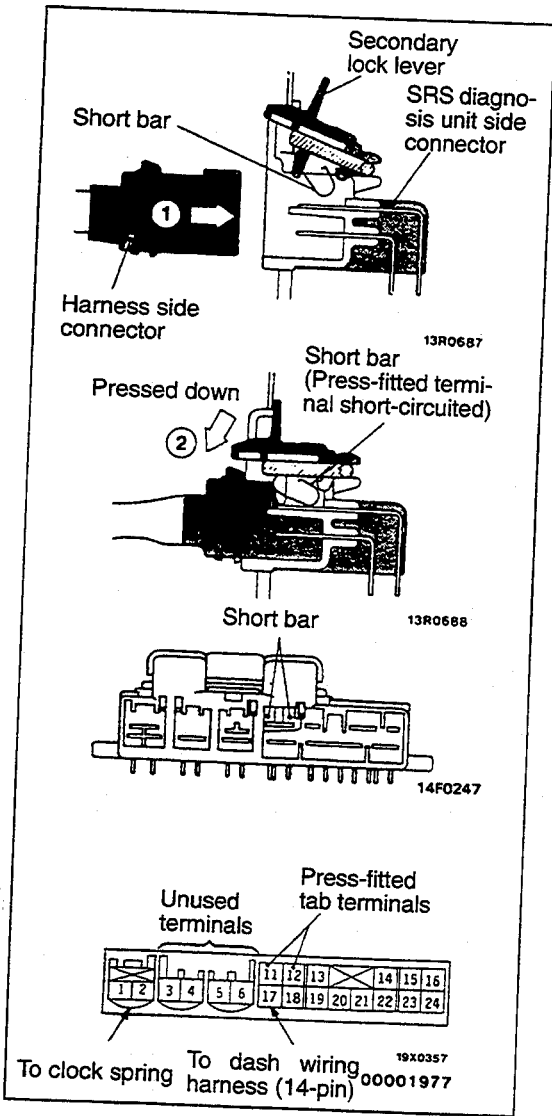
- (1) Press in the lock spring with a flat tip (–) screwdriver to disengage the lock spring from the notch area of the connector, and release the lock (secondary lock) of the secondary lock lever.

Caution

Forced removal of the connector without releasing the secondary lock lever will result in a damaged lock lever.

- (2) Press the primary lock of each of the harness side connectors and remove the harness side connector.





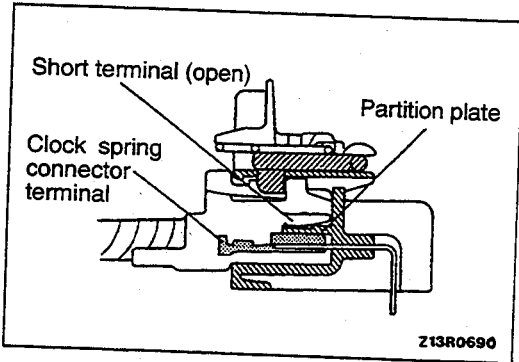
FIT VERIFICATION MECHANISM

The mechanism is used to electrically check the engagement of the connector between the SRS diagnosis unit and the body wiring harness. The operating principle is described below.

- (1) Securely connect the SRS diagnosis unit and harness side connectors and press the secondary lock lever down to lock the connectors.
- (2) At this time, the short bar provided on the rear surface of the secondary lock lever produces a short circuit across terminals No. 11 and 12 of the SRS diagnosis unit. The SRS diagnosis unit supplies monitoring current to the circuit to electrically verify that the connectors have been locked.

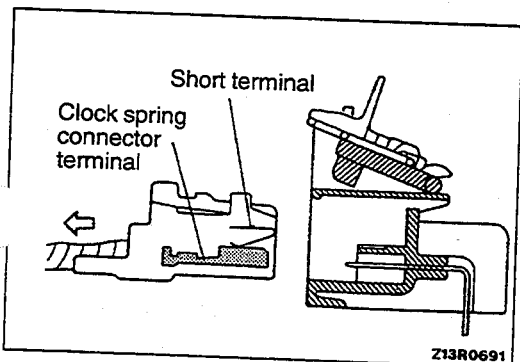
CONNECTOR SHORTING MECHANISM

The mechanism is designed for prevention of accidental ignition of the inflator when the clock spring connector (for the squib circuit) is removed from the SRS diagnosis unit. The operating principle is described below.



When Connectors Are Fitted

When the SRS diagnosis unit and clock spring connectors are coupled, the circuit between the short terminals and clock spring connector terminals is kept in the OFF state by the partition plate provided in the connector of the SRS diagnosis unit.



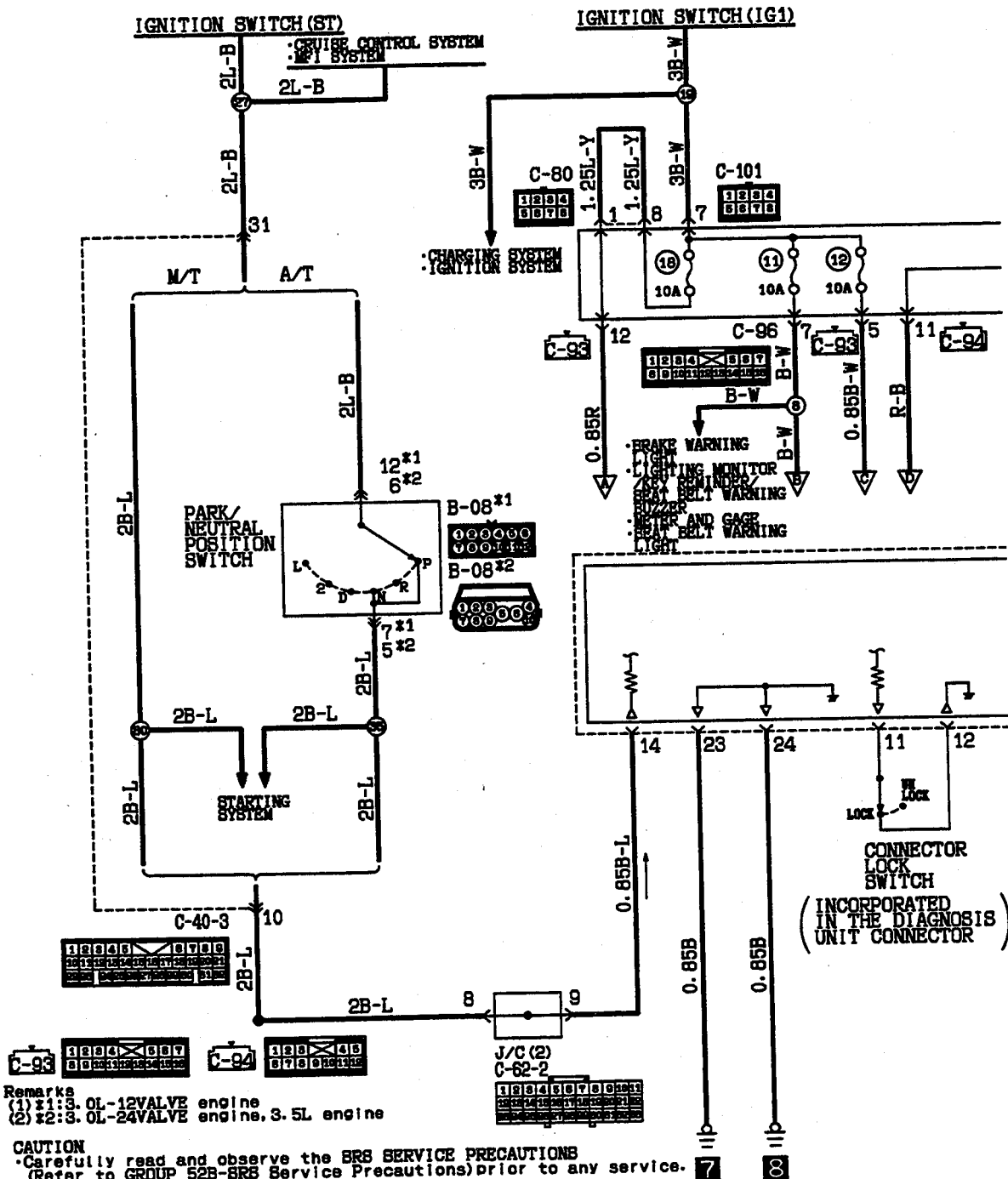
When Connectors Are Disconnected

When the clock spring connectors are disconnected from the SRS diagnosis unit, the partition plate between the short terminals and clock spring connector terminals is removed. As a result, a short circuit is formed between the two poles of the clock spring connector terminals to prevent generation of a potential difference (current) between the squib terminals.

CIRCUIT DIAGRAM

CAUTION

1. Do not repair, splice or modify SRS wiring (except for specific repairs to the body wiring harness shown on page 52B-15; replace wiring if necessary, after reading and following all precautions and procedures in this manual.
2. Do not use an analog ohmmeter to check SRS wiring or components; use only special tools and digital multi-meter shown on page 52B-17.



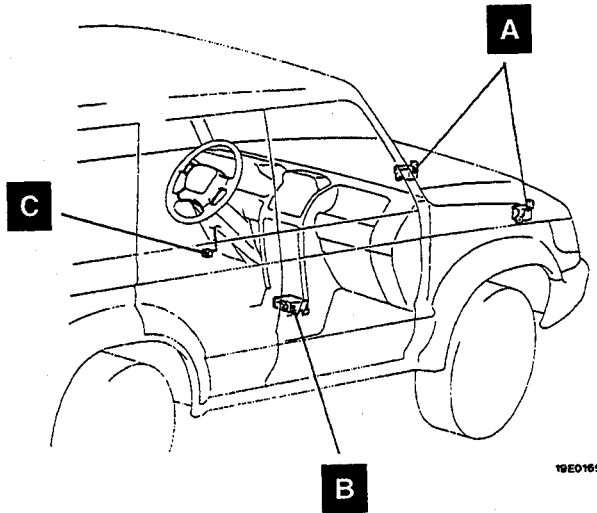
Remarks
 (1) x1: 3.0L-12VALVE engine
 (2) x2: 3.0L-24VALVE engine, 3.5L engine

CAUTION
 Carefully read and observe the SRS SERVICE PRECAUTIONS
 (Refer to GROUP 52B-88S Service Precautions) prior to any service.

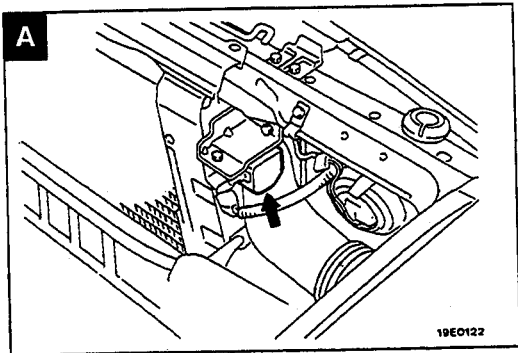
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COMPONENT LOCATION

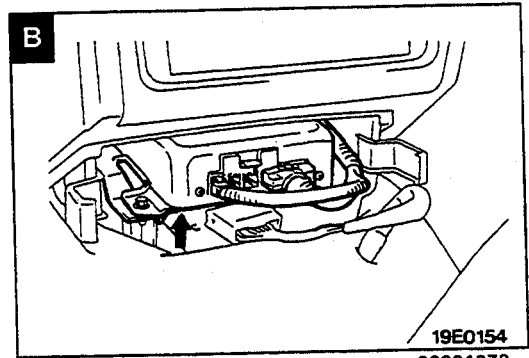
Name	Symbol	Name	Symbol
Data link connector	C	SRS diagnosis unit	B
Front impact sensor	A		



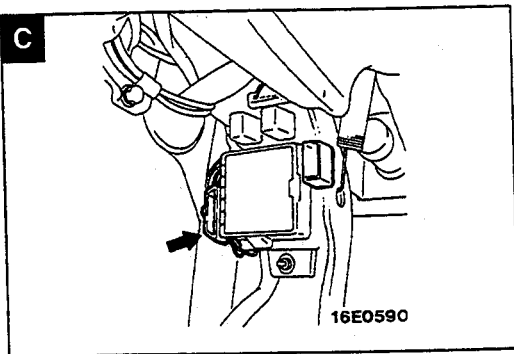
19E0169



19E0122



19E0154
00001978



16E0590

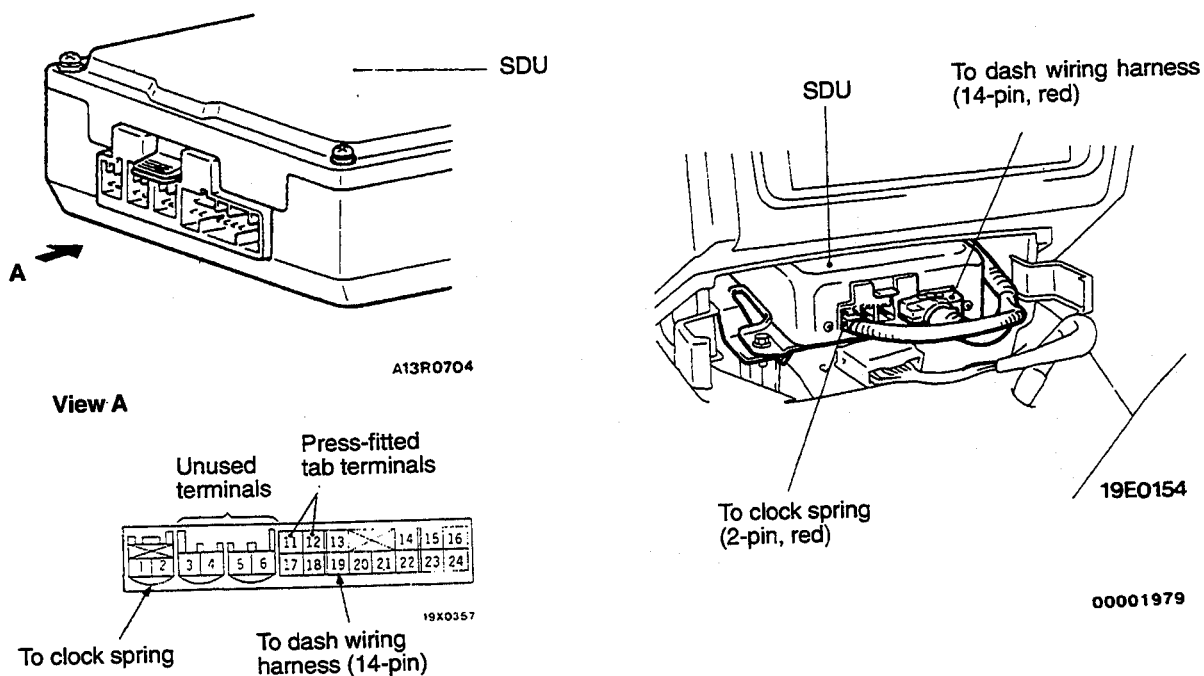
SERVICE PRECAUTIONS

1. In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment on or near SRS components, except those specified on P.52B-17.
Never use an analog ohmmeter.
3. Never Attempt to Repair the Following Components:
 - Front Impact Sensors
 - SRS Diagnosis Unit (SDU)
 - Clock Spring
 - Air Bag Module
 If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the COMPONENT SERVICE procedures in this manual, starting at page 52B-39.
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.

SDU Terminal No.	Harness Connector (No. of Terminals, Color)	Destination of Harness	Corrective Action
1	2 pins, red	Dash wiring harness → Clock spring	Correct or replace each wiring harness Replace clock spring
2			
13	14 pins, red	Dash wiring harness → Diagnosis connector	Correct or replace each wiring harness
14		Dash wiring harness → Control wiring harness → Dash wiring harness → Ignition switch (ST)	
15		Dash wiring harness → Junction block (fuse No. 18)	
16		Dash wiring harness → Junction block (fuse No. 12)	
17		Dash wiring harness → Instrument panel wiring harness → SRS warning light	
18			
20		Dash wiring harness → Front wiring harness → Front impact sensor (LH)	Replace with sensor cable*
21			
19		Dash wiring harness → Front wiring harness → Front impact sensor (RH)	
22			
23			
24		Dash wiring harness → Ground	Correct or replace dash wiring harness

NOTE

- (1) The sensor cable marked with* is available as service part.
- (2) The sensor cable used as a replacement part is routed along the front wiring harness.



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 (200°F), 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, check the SRS warning light operation to make sure that the system functions properly. (Refer to P.52B-2.)
8. Make certain that the ignition switch is OFF when the scan tool 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.

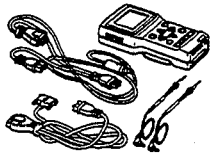

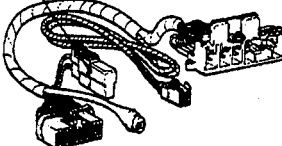
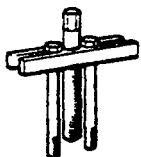
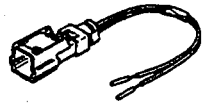
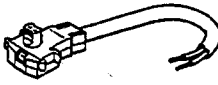
SERVICE SPECIFICATIONS

110005236

Items		Standard value
Front impact sensor resistance	Ω	2,000 ± 20
Clock spring resistance	Ω	less than 0.4


SPECIAL TOOLS

110005237

Tool	Tool number and name	Supersession	Application
	MB991502 Scan tool (MUT-II)	MB991502	<ul style="list-style-type: none"> • Reading diagnostic trouble codes • Erasing diagnostic trouble codes • Reading trouble period • Reading erase times [Refer to MUT-II OPERATING INSTRUCTIONS]
 Z16X0607	ROM pack		
Resistor (3 Ω) 	MB991349 SRS Check Harness		<ul style="list-style-type: none"> • Checking the SRS electrical circuitry with a digital multi-meter NOTE SRS check harness is used on various Diagnostic Tests. For details, refer to DIAGNOSTIC SEQUENCE (P.52B-20 – P.52B-35.)
	MB990803 Steering wheel puller	General service tool	Removal of steering wheel
 Z13R0732	MB686560 SRS AIR BAG ADAPTER HARNESS A	General service tool	Deployment of air bag module inside the vehicle
 Z13R0751	MB628919 SRS AIR BAG ADAPTER HARNESS B	General service tool	Deployment of air bag module outside the vehicle

TEST EQUIPMENT

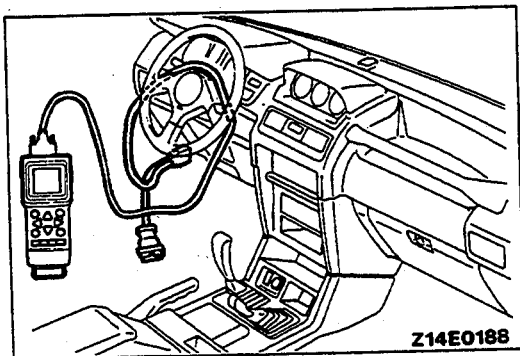
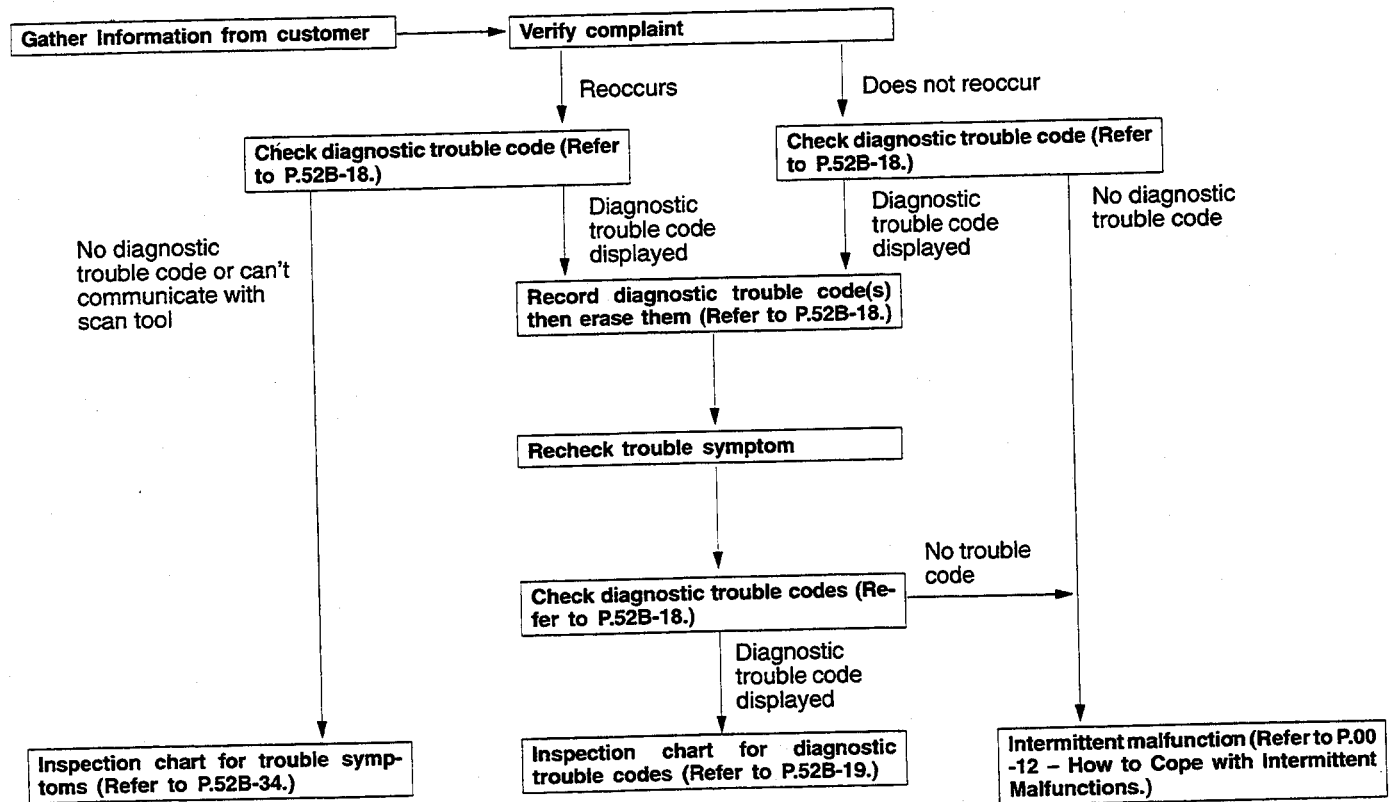
110005238

Tool	Name	Use
 Z13R0746	Digital multi-meter Use a multi-meter for which the maximum test current is 2 mA or less at the minimum range of resistance measurement	Checking the SRS electrical circuitry with SRS Check Harness

TSB Revision

TROUBLESHOOTING

DIAGNOSTIC TROUBLESHOOTING FLOW



DIAGNOSTIC FUNCTION

110005240

DIAGNOSTIC TROUBLE CODES CHECK

Connect the scan tool to the data link connector then check diagnostic trouble codes.

Caution

Turn the ignition switch off before connecting or disconnecting the scan tool.

ERASING DIAGNOSTIC TROUBLE CODES

Connect the scan tool to the data link connector then erase the diagnostic trouble codes.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

Inspect according to the inspection chart that is appropriate for the malfunction code.

Code No.	Diagnostic item	Reference page	
11	Front impact sensor system	P. 52B-20	
12			
13			
21	Air bag module (squib) system	P. 52B-22	
22			
31	SDU system	P. 52B-24	
32			
33* ²	Cranking signal system	P. 52B-25	
34* ²	Connector lock system	P. 52B-26	
41* ^{1,2}	IG ₁ (A) power circuit system	P. 52B-27	
42* ^{1,2}	IG ₁ (B) power circuit system	P. 52B-28	
43	SRS warning light drive circuit system	Light does not illuminate * ²	P. 52B-30
		Light does not switch off	P. 52B-31
44	SDU warning light drive circuit system	P. 52B-32	
45	SDU non-volatile memory (EEPROM) and A/D converter system	P. 52B-33	

NOTE

- *¹: For diagnostic trouble codes marked with *, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, the diagnostic trouble code will be automatically erased, and the SRS warning light will return to normal.
- *²: If the vehicle has a discharged battery it will store the fault codes 41 or 42. When these diagnostic trouble codes are displayed, check the battery.

INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSTIC TROUBLE

110005242

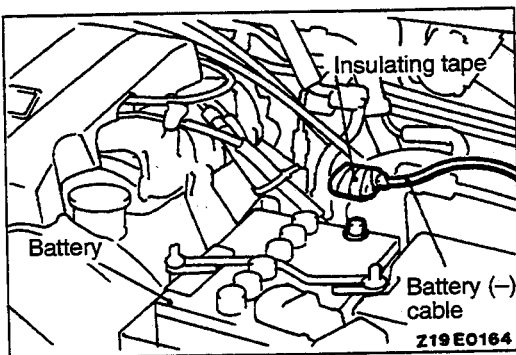
Code No.11, 12 or 13 Front impact sensor system	Probable cause
<p>[Comment]</p> <p>(1) These diagnostic trouble codes are output if there is abnormal resistance between the input terminals of the SDU front impact sensor. Refer to table 1 for the conditions for output of each diagnostic trouble code.</p> <p>(2) Diagnostic trouble codes 11, 12 and 13 are sometimes generator in combination with diagnostic trouble codes relating to the air bag module (squib)(code Nos. 21, 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. Refer to table 2 for the relationships between these codes.</p>	<ul style="list-style-type: none"> • Malfunction of front impact sensor • Malfunction of harnesses or connectors • Malfunction of SDU

TABLE 1: CONDITIONS FOR OUTPUT OF EACH DIAGNOSTIC TROUBLE CODE

Code No.	Trouble Symptom
11	<ul style="list-style-type: none"> • Short in front impact sensor or harness short • Short in front impact sensor or air bag module (squib) harnesses leading to the vehicle body ground • Short in front impact sensor or air bag module (squib) harnesses leading to the power supply
12	<ul style="list-style-type: none"> • Open circuit in either left or right front impact sensor or open harness • Short in front impact sensor or air bag module (squib) harnesses leading to the power supply
13	<ul style="list-style-type: none"> • 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

TABLE 2: FAILURE MODE COMBINATIONS

Failure modes		Front impact sensor short	Front impact sensor open circuit (1 sensor)	Front impact sensor open circuit (2 sensors)
	Air bag module (squib)	Short	11 or 21	12 or 21
	Open circuit	11 or 22	12 or 22	13 or 22

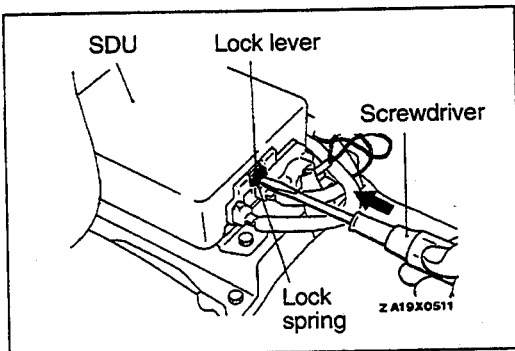


1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal.

Caution

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-16.)

2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)



3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.

Inspection of front impact sensor (Refer to P.52B-41.) NG → Replace

OK

SRS check harness (MB991349)

Resistor (3 Ω)

Measure at SRS check harness connector (5).

- Disconnect SDU connector C-40-2.
- Connect SRS check harness connector (3)
- Resistance between terminals (15) – (18)
OK: 2,000±20 Ω
- Resistance between terminals (16) – (17)
OK: 2,000±20 Ω
- Continuity between terminals (15), (16), (17) and (18) and the ground
OK: No continuity

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

Z19X0468

NG → Repair

Check the following connectors.
C-40-2, C-26-5, A-17-1, A-34-1

OK

Check trouble symptom

NG

Inspect harness between SDU and front-impact sensor.

NG

Replace the sensor harness.

OK

Inspect the air bag module (squib) system (Refer to P.52B-22.)

OK

Replace the SDU.

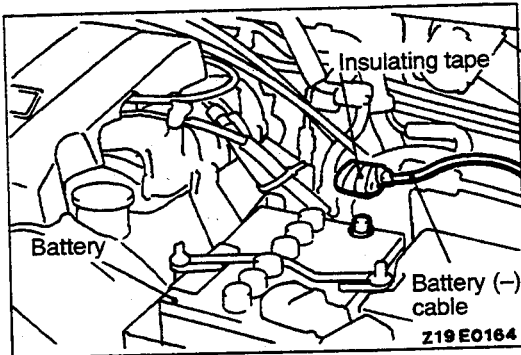
Code No.21 or 22 Air bag module (squib) system	Probable cause
<p>[Comment]</p> <p>(1) These diagnostic trouble codes are output if there is abnormal resistance between the input terminals of the air bag module (squib). Refer to table 1 for the conditions for output of each diagnostic trouble code.</p> <p>(2) Diagnostic trouble codes 21 and 22 are sometimes generated in combination with diagnostic trouble 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. Refer to table 2 for the relationships between these codes.</p>	<ul style="list-style-type: none"> ● Malfunction of clock spring ● Malfunction of harnesses or connectors ● Malfunction of air bag module (squib) ● Malfunction of SDU

TABLE 1: CONDITIONS FOR OUTPUT OF EACH DIAGNOSTIC TROUBLE CODE

Code No.	Trouble Symptom
21	<ul style="list-style-type: none"> ● Short in air bag module (squib) or harness short ● Short in clock spring ● Short in air bag module (squib) or front impact sensor harnesses leading to the power supply
22	<ul style="list-style-type: none"> ● Open circuit in air bag module (squib) or open harness ● Open circuit in clock spring ● Malfunction of connector contact ● Short in air bag module (squib) or front impact sensor harnesses leading to the power supply

TABLE 2: FAILURE MODE COMBINATIONS

Failure modes	Front impact sensor short	Front impact sensor open circuit (1 sensor)	Front impact sensor open circuit (2 sensors)
Air bag module (squib)	Short	11 or 21	12 or 21
	Open circuit	11 or 22	12 or 22



1. 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-16.)

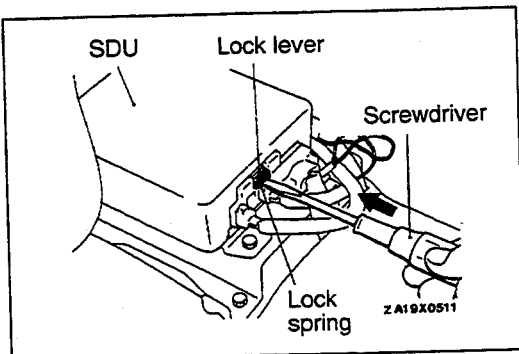
2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)

3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.



Inspect clock spring (Refer to P.52B-38.)

NG → Replace

OK ↓

SCAN TOOL DIAGNOSTIC TROUBLE CODE

- Connect clock spring connector C-40-1.
- Connect SRS check harness connector (1)
- Erase diagnostic trouble code memory

Are code Nos. 21 and 22 output?

NG → Check the following connectors. C-40-1 and C-59-2

OK ↓

Check trouble symptom

NG ↓

Replace the air bag module (squib).

Yes ↓

SCAN TOOL DIAGNOSTIC TROUBLE CODE

- Connect clock spring connector C-59-2.
- Disconnect SDU connector C-40-1.
- Connect SRS check harness connector (1)
- Erase diagnostic trouble code memory

Are code Nos. 21 and 22 output?

No → Check the harness between the SDU and clock spring, and repair if necessary.

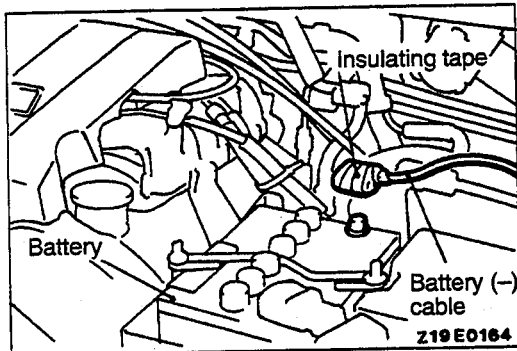
Yes ↓

Inspect the front impact sensor system (Refer to P.52B-41.)

OK ↓

Replace the SDU.

Code No. 31 or 32 SDU system	Probable cause
<p>[Comment] These diagnostic trouble 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 diagnostic trouble code Nos. 41 and 42 are being output due to a drop in battery voltage, code No. 32 will not be detected.</p>	<ul style="list-style-type: none"> • Malfunction of front impact sensor • Malfunction of SDU

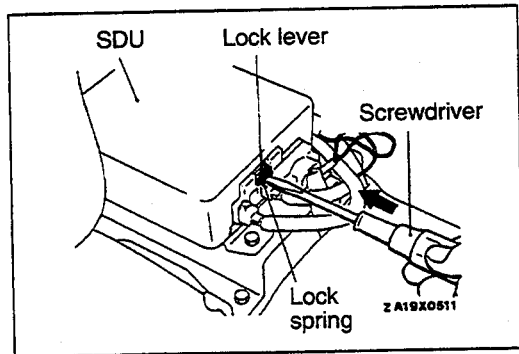


1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal.

Caution

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-16.)

2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)



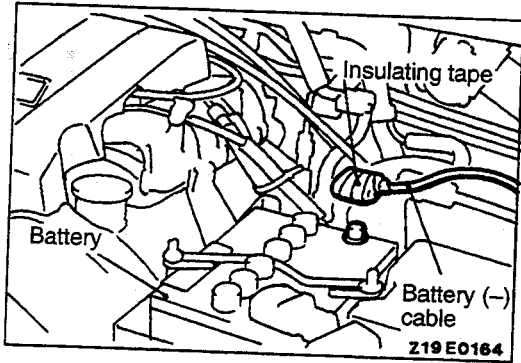
3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

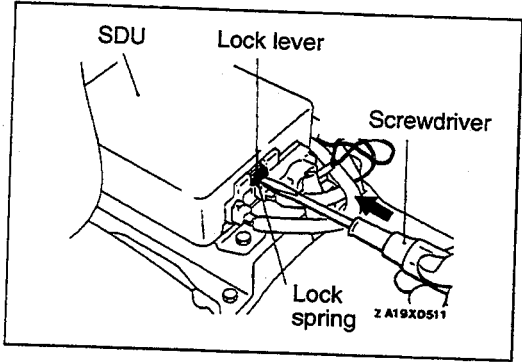
4. Disconnect the red 14-pin connector from the SDU. The capacitor inside the SDU is probably defective, so replace the SDU. However, code No. 32 could also be a result of a short in the front impact sensor, so inspection of the front impact sensor system should also be carried out. (Refer to P.52B-20.)

Code No. 33 Cranking signal system	Probable cause
<p>[Comment] The cranking signal is provided in order to prevent mistaken detection of power supply voltage drops at the IG1 terminal during cranking. This diagnostic trouble 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 for a continuous period of 5 ± 0.2 seconds (except when cranking), diagnostic trouble code No. 33 will be automatically erased, and the SRS warning light will switch off.</p>	<ul style="list-style-type: none"> • Malfunction of harnesses or connectors • Malfunction of SDU



1. 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-16.)



2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)

3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.

Resistor (3 Ω)
SRS check harness (MB991349)
Z19X0469

Measure at SRS check harness connector (5).

- Disconnect SDU connector C-40-2.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)
OK: Continuity

```

    graph TD
      A[NG] --> B[Check the following connectors.  
• C-40-2]
      B -- NG --> C[Repair]
      B -- OK --> D[Check trouble symptoms]
      D -- NG --> E[Check the harness wire between each, SDU and ground, and repair if necessary.]
  
```

Resistor (3 Ω)
SRS check harness (MB991349)
Z19X0471

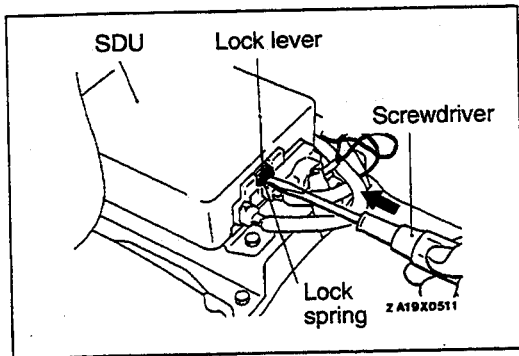
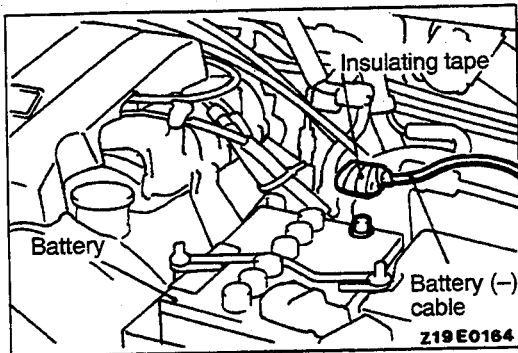
Measure at SRS check harness connector (5).

- Ignition switch ON
- Voltage between terminal (10) and ground
OK: 0 V

```

    graph TD
      A[NG] --> B[Check the harness between the SDU and ignition switch (ST), and repair if necessary.]
      B --> C[OK]
      C --> D[Replace the SDU]
  
```

Code No. 34 Connector lock system	Probable cause
<p>[Comment] This diagnostic trouble 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 for a continuous period of 5 ± 0.2 seconds, diagnostic trouble code No. 34 will be automatically erased, and the SRS warning light will switch off.</p>	<ul style="list-style-type: none"> • Malfunction of connectors • Malfunction of SDU



1. 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-16.)

2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)

3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.

Is the SDU engagement detection mechanism operating correctly?

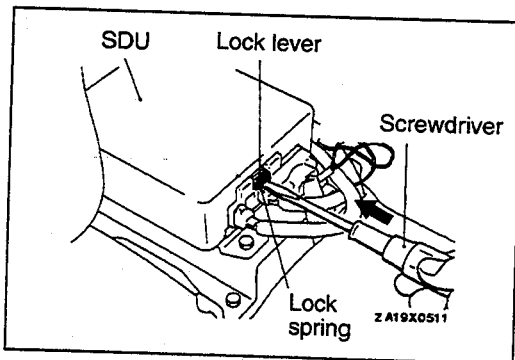
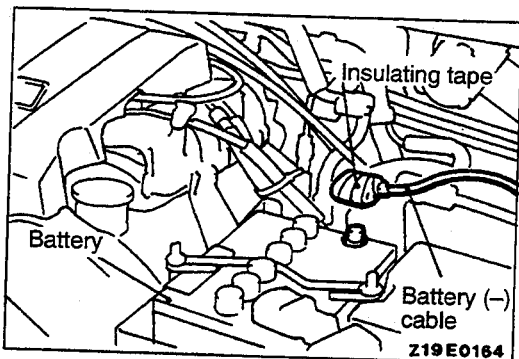
No.

Insert the connector securely and lower the lock lever to lock the connector.

Yes

Replace the SDU

Code No. 41 IG ₁ (A) power circuit system	Probable cause
<p>[Comment] This diagnostic trouble code is output if the voltage between the IG₁ (A) terminal and the ground is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, diagnostic trouble code No. 41 will be automatically erased, and the SRS warning light will switch off.</p>	<ul style="list-style-type: none"> • Malfunction of harnesses or connectors • Malfunction of SDU



1. 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-16.)

2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)

3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.

Resistor (3 Ω)
 SRS check harness (MB991349)

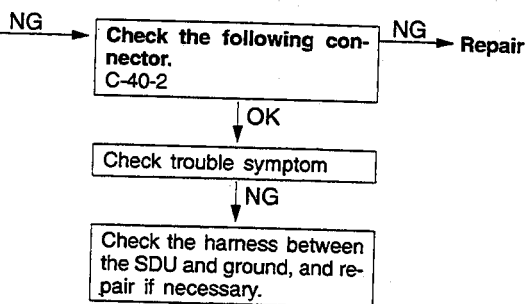
Measure at SRS check harness connector (5).

- Disconnect SDU connector C-40-2.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)

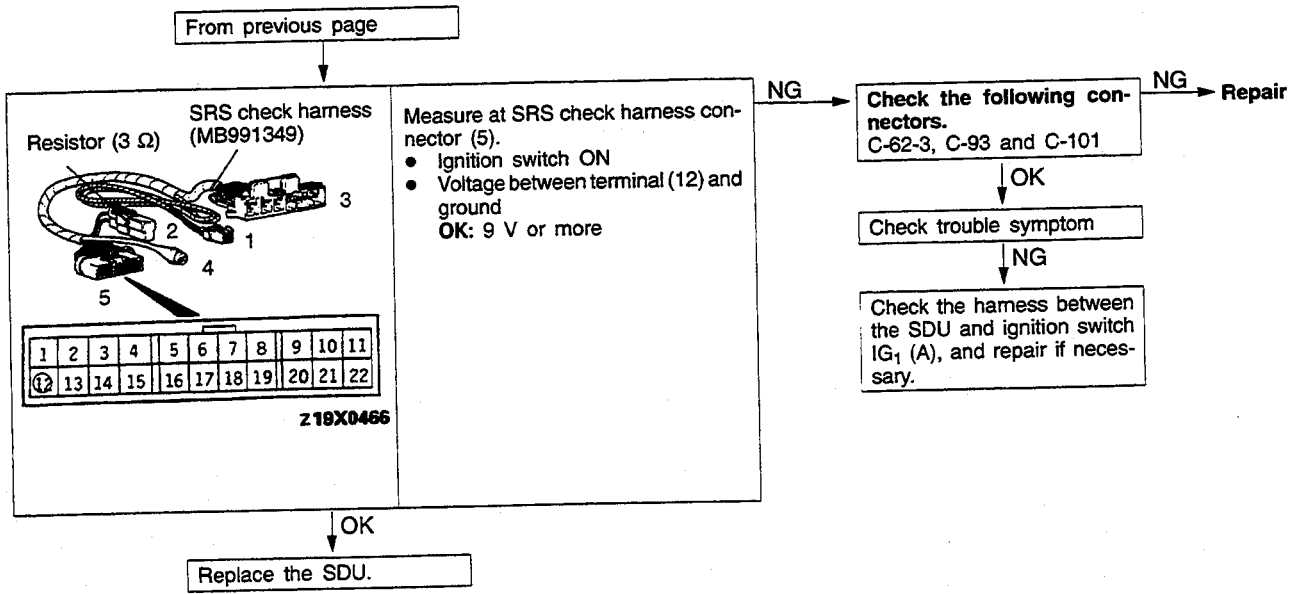
OK: Continuity

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

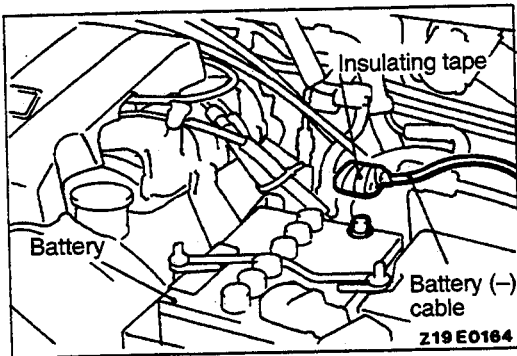
Z19X0469



OK
 To next page



Code No. 42 IG ₁ (B) power circuit system	Probable cause
<p>[Comment]</p> <p>This diagnostic trouble code is output if the voltage between the IG₁ (B) terminal and the ground is lower than the specified value for a continuous period of 5 seconds or more.</p> <p>However, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, diagnostic trouble code No. 41 will be automatically erased, and the SRS warning light will switch off.</p>	<ul style="list-style-type: none"> • Malfunction of harnesses or connectors



1. 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-16.)

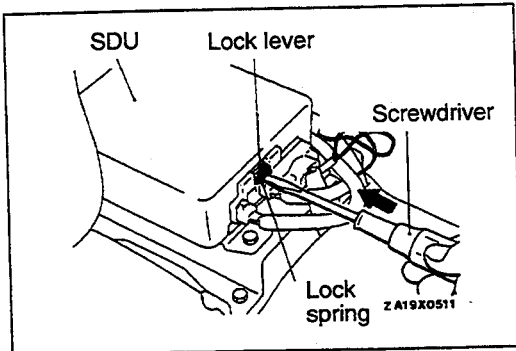
2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)

3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.



Resistor (3 Ω) SRS check harness (MB991349)

1 2 3 4 5

3

5

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

Z19X0489

Measure at SRS check harness connector (5).

- Disconnect SDU connector C-40-2.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)

OK: Continuity

NG → Check the following connector. C-40-2 → NG → Repair

OK ↓

Check trouble symptom

NG ↓

Check the harness between the SDU and ground, and repair if necessary.

Resistor (3 Ω) SRS check harness (MB991349)

1 2 3 4 5

3

5

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

Z19X0472

Measure at SRS check harness connector (5).

- Ignition switch: ON
- Voltage between the terminal (11) and ground.

OK: 9 V or more

NG → Check the following connectors. C-80, C-93 and C-101 → NG → Repair

OK ↓

Check trouble symptom

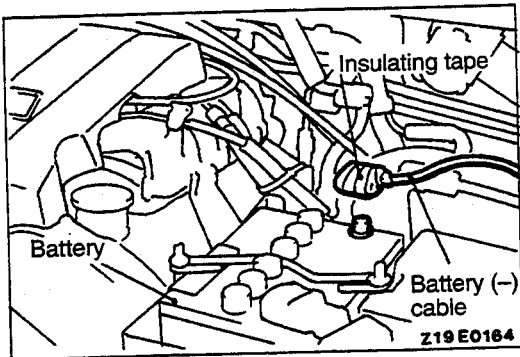
NG ↓

Check the harness between the SDU and ignition switch IG₁ (B), and repair if necessary.

OK ↓

Replace the SDU.

Code No. 43 SRS warning light drive circuit system (Light does not illuminate.)	Probable cause
<p>[Comment] This diagnostic trouble code is output when an open circuit occurs for a continuous period of 5 seconds while the SDU is monitoring the SRS warning light and the light is OFF (transistor OFF). However, if this code is output due to an open circuit, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, this diagnostic trouble code will be automatically erased, and the SRS warning light will return to normal.</p>	<ul style="list-style-type: none"> ● Malfunction of harnesses or connectors ● Blown bulb ● Malfunction of SDU ● Malfunction of combination meter



1. 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-16.)

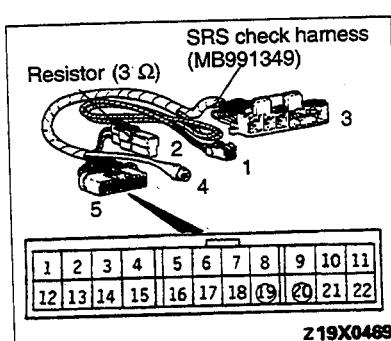
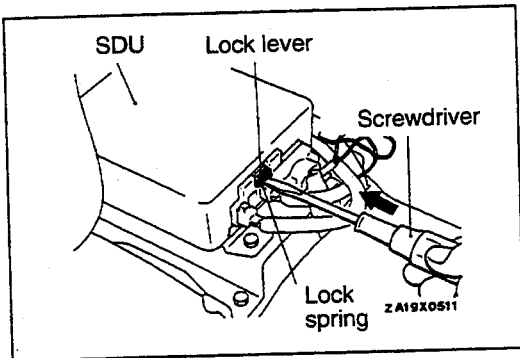
2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)

3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

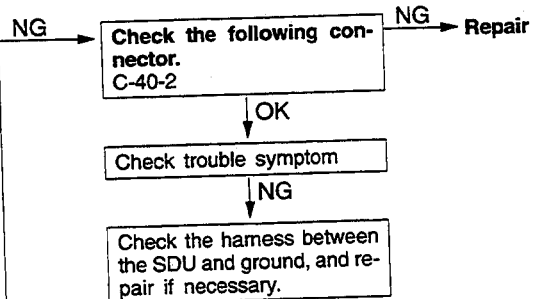
4. Disconnect the red 14-pin connector from the SDU.



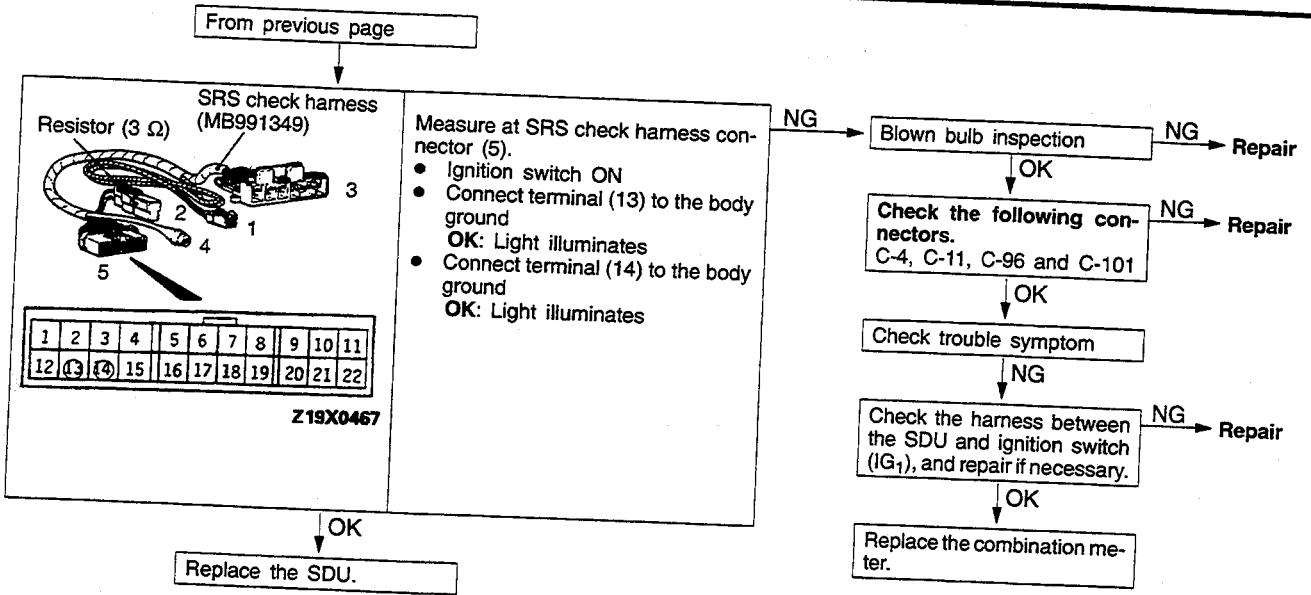
Measure at SRS check harness connector (5).

- Disconnect SDU connector C-40-2.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)

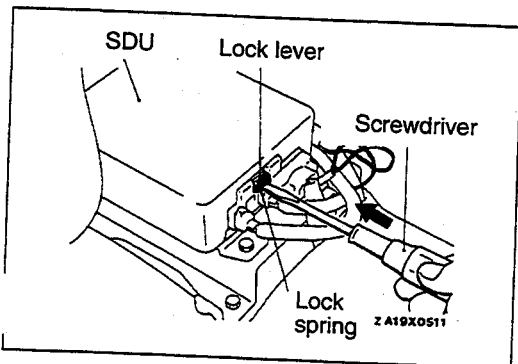
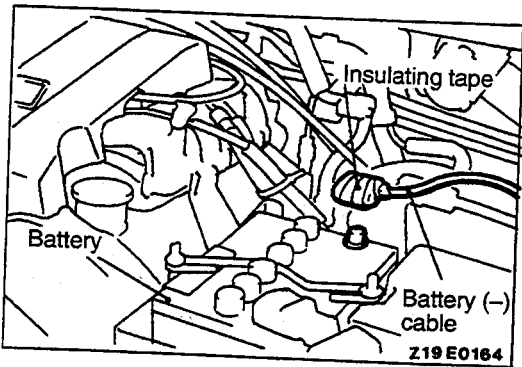
OK: Continuity



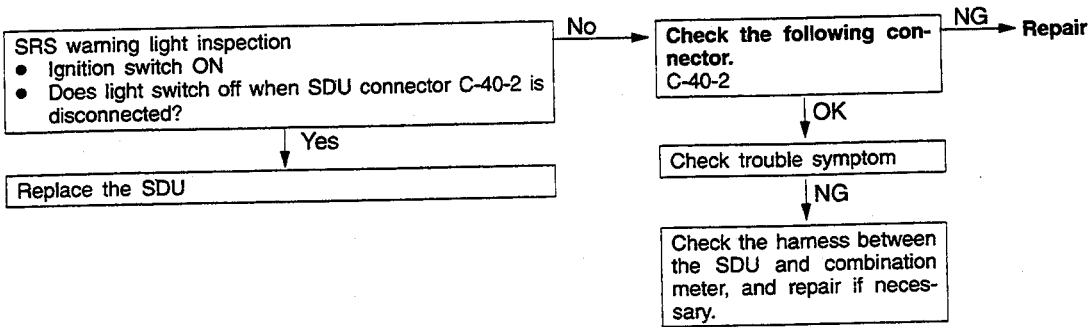
OK
To next page



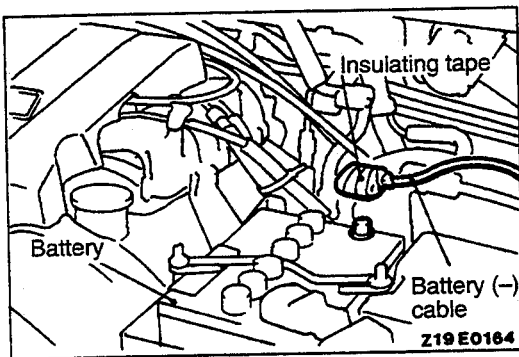
Code No. 43 SRS warning light drive circuit system (Light does not switch off.)	Probable cause
<p>[Comment]</p> <p>This diagnostic trouble code is output when a short to ground occurs in the harness between the light and the SDU while the SDU is monitoring the SRS warning light and the light is ON.</p>	<ul style="list-style-type: none"> • Malfunction of harnesses or connectors • Malfunction of SDU



1. 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-16.)
2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)
3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.
Caution
 1. Do not use excessive force to raise the lock lever (green).
 2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).
4. Disconnect the red 14-pin connector from the SDU.



Code No. 44 SRS warning light drive circuit system	Probable cause
[Comment] This diagnostic trouble code is output when a short occurs in the light drive circuit or a malfunction of the output transistor inside the SDU is detected while the SDU is monitoring the SRS warning light drive circuit.	<ul style="list-style-type: none"> • Malfunction of harnesses or connectors • Malfunction of SDU

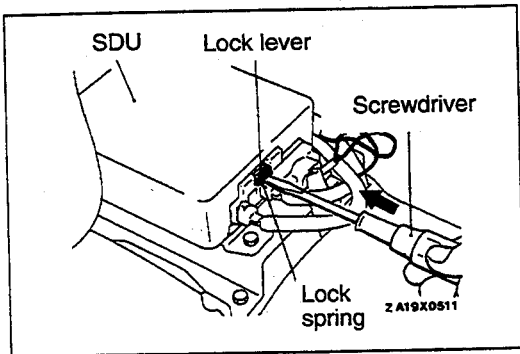


1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal.

Caution

Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-16.)

2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)



3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.

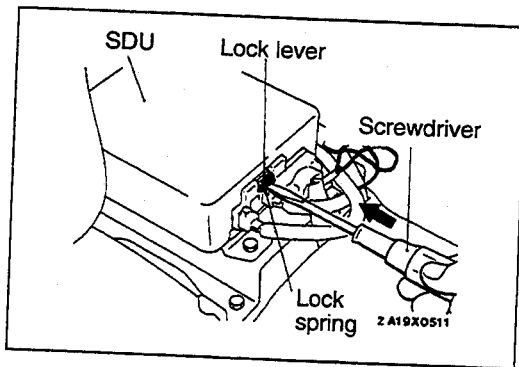
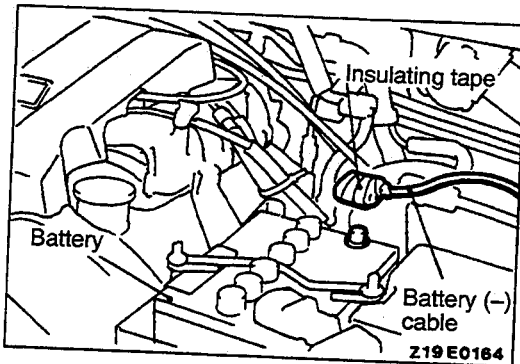
If the results of inspection of the SRS warning light drive circuit system (refer to P.52B-31.) are normal, the transistor inside the SDU is probably defective, so replace the SDU.

Code No. 45 SDU non-volatile memory (EEPROM) and A/D converter system**[Comment]**

This diagnostic trouble code is output if there is a malfunction in the SDU non-volatile memory (EEPROM) or A/D converter.

Probable cause

- Malfunction of SDU



1. 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-16.)

2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)

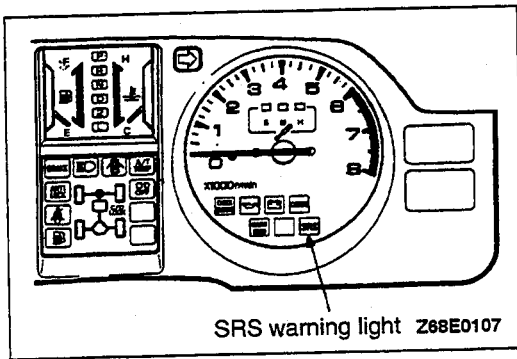
3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.

The SDU non-volatile memory (EEPROM) or A/D converter is probably defective, so replace the SDU.



SRS WARNING LIGHT INSPECTION

110005243

1. Check to be sure that the SRS warning light illuminates when the ignition switch is in the ON position.
2. Check to be sure that it illuminates for approximately 7 seconds and then switches off.
3. If the above is not the case, inspect the diagnostic trouble codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

110005244

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection Procedure No.	Reference page
Communication with scan tool is not possible.	Communication with all systems is not possible.	1	P. 52B-34
	Communication is not possible with SRS only	2	P. 52B-34
When the ignition key is turned to "ON" (engine stopped), the SRS warning light does not illuminate.		Refer to diagnostic trouble code No. 43.	P. 52B-30
After the ignition switch is turned to ON, the SRS warning light is still on after approximately 7 seconds have passed.		Refer to diagnostic trouble code No. 43.	P. 52B-31

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

110005245

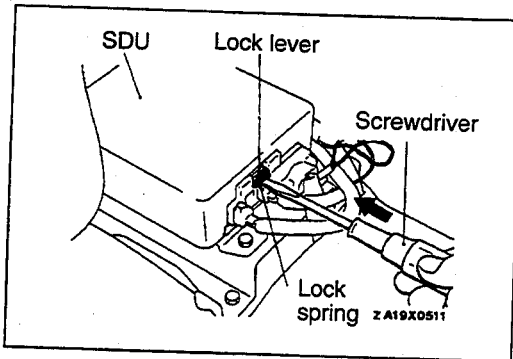
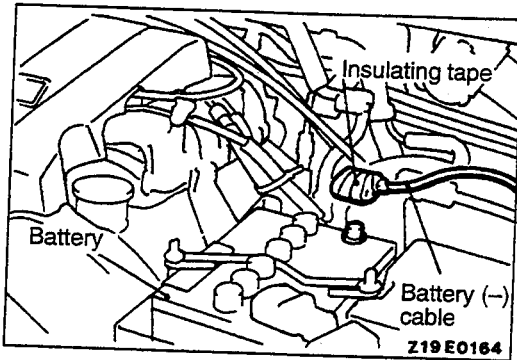
INSPECTION PROCEDURE 1

Communication with scan tool is not possible. (Communication with all systems is not possible)	Probable cause
[Comment] The cause is probably in the power supply system (including ground circuit) of the diagnostic line.	<ul style="list-style-type: none"> • Malfunction of connectors • Malfunction of harness

Refer to GROUP 13A – Troubleshooting

INSPECTION PROCEDURE 2

Communication with scan tool is not possible. (Communication is not possible with SRS only)	Probable cause
[Comment] If communication is not possible with the SRS only, the cause is probably an open circuit in the on-board diagnostic output circuit of the SRS or in the power circuit (including ground circuit).	<ul style="list-style-type: none"> • Malfunction of harnesses or connectors • Malfunction of SDU



1. 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-16.)

2. Remove the floor console assembly. (Refer to GROUP 52A – Floor Console.)

3. Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion).

4. Disconnect the red 14-pin connector from the SDU.

Resistor (3 Ω)
SRS check harness (MB991349)
Z19X0469

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

Measure at SRS check harness connector (5).

- Disconnect SDU connector C-40-2.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)
OK: Continuity

NG → Check the following connector. C-40-2 → NG → Repair

OK → Check trouble symptom → NG → Check the harness between the SDU and ground, and repair if necessary.

Resistor (3 Ω)
SRS check harness (MB991349)
Z19X0470

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

Measure at SRS check harness connector (5).

- Disconnect SDU connector C-40-2.
- Connect SRS check harness connector (3)
- Voltage between the terminal (11) and ground.
OK: 9 V or more
- Voltage between the terminal (12) and ground.
OK: 9 V or more

NG → Check the following connectors. C-80, C-93, C-101 and C-62-3 → 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.

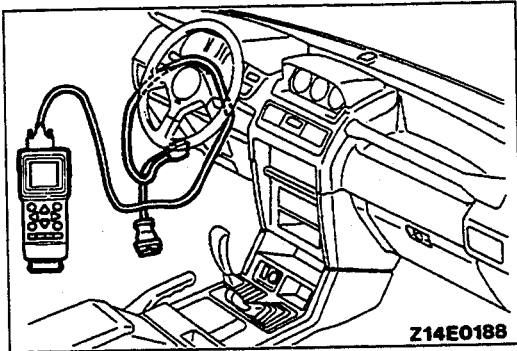
Inspect the harness between the SDU and data link connector. NG → Repair

OK → Replace the SDU

MAINTENANCE

110005246

The SRS must be inspected by an authorized dealer 10 years after the car manufacture date. (Refer to GROUP 00 – Maintenance Service.)

**POST-COLLISION DIAGNOSIS**

110005247

To inspect and service the SRS after a collision (whether or not the air bags has deployed), perform the following steps.

SRS DIAGNOSIS UNIT MEMORY CHECK

N52BF11AA

1. Connect the scan tool to the data link connector then check diagnosis codes.

Caution

Turn the ignition switch off before connecting or disconnecting the scan tool.

2. Read (and write down) all displayed diagnostic trouble codes. (Refer to P.52B-19.)

NOTE

If the battery power supply has been disconnected or disrupted by the collision, the scan tool 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 the memory was erased) using the scan tool.

NOTE

- Maximum stored period: 9999 minutes (approximately 7 days)
- Maximum number of times to be stored: 250

4. Erase the diagnostic trouble codes then wait 45 seconds or more, read and write down all displayed diagnostic trouble codes. (Refer to P.52B-19.)

REPAIR PROCEDURE

110005248

When air bag deploys from collision.

1. Replace the following parts with new ones.
 - Front impact sensors (Refer to P.52B-40.)
 - SRS diagnosis unit (SDU)(Refer to P.52B-42.)
 - Air bag modules (Refer to P.52B-45.)
2. Check the following parts and replace if there is an abnormality.
 - Clock spring (Refer to P.52B-45.)
 - Steering wheel, steering column and intermediate joint (Refer to P.52B-39 or GROUP 37A – Steering wheel and Shaft.)
3. Check harnesses for binding, connectors for damage, poor connections, and terminals for deformities. (Refer to P.52B-15.)

When air bag does not deploy in low-speed collision.

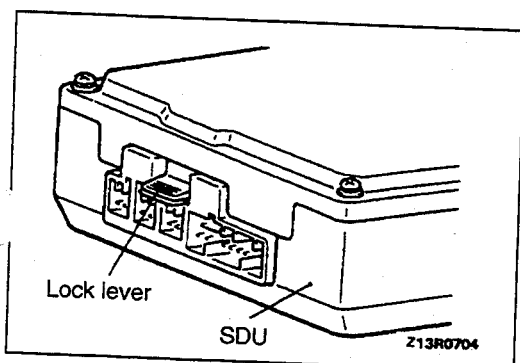
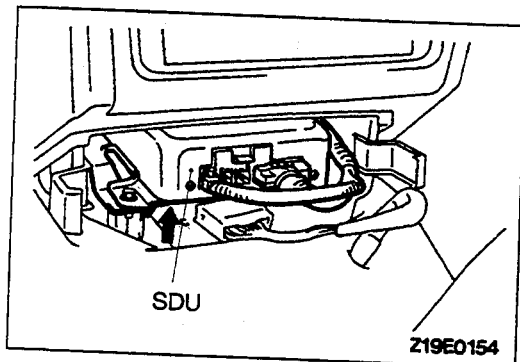
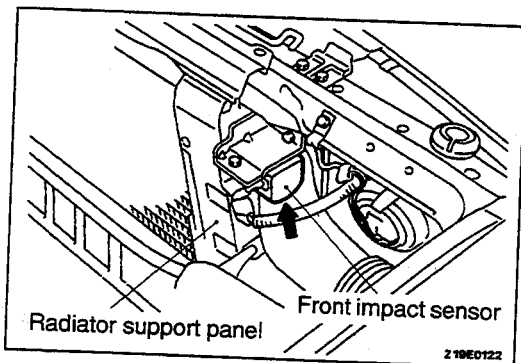
Check the SRS components.

If the SRS components are showing any visible damage such as dents, cracks, or deformation, replace them with new ones. Concerning parts removed for inspection, replacement with new parts and cautionary points for working, refer to appropriate COMPONENT SERVICE, P.52B-39.

FRONT IMPACT SENSORS

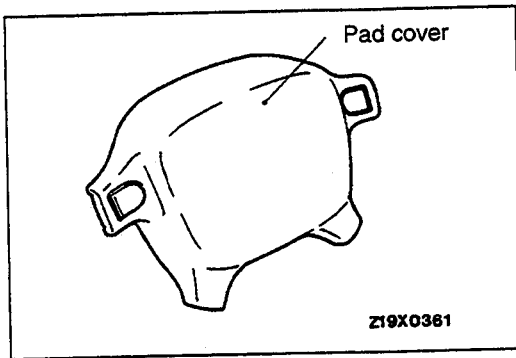
110005249

1. Check radiator support panel for deformities or rust.
2. Check front impact sensor for dents, cracks deformities or rust.
3. Check sensor harnesses for binds, connectors for damage, and terminals for deformities.

**SRS DIAGNOSIS UNIT (SDU)**

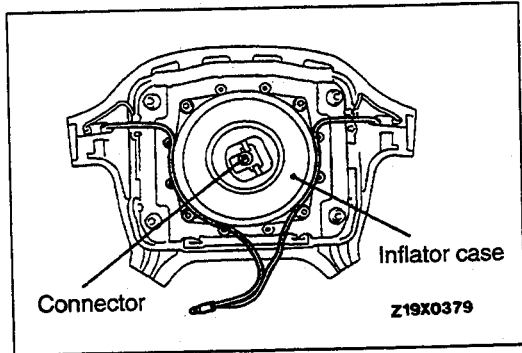
110005250

1. Check SDU case and brackets for dents, cracks or deformities.
2. Check connectors and lock lever for damage, and terminals for deformities.

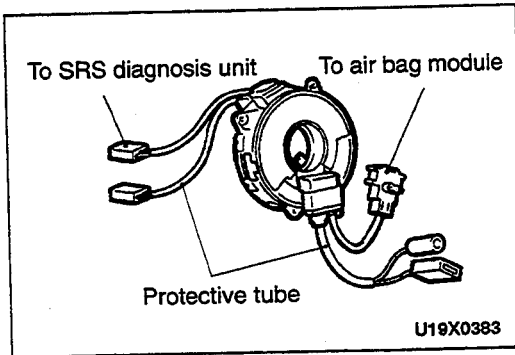
**AIR BAG MODULE**

110005251

1. Check pad cover for dents, cracks or deformities.

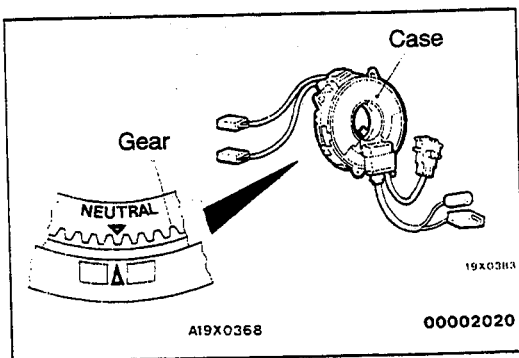


2. Check for connector damage, deformed terminal, and binding harness.
3. Check air bag inflator case for dents, cracks or deformities.
4. Install air bag module to steering wheel to check fit or alignment with the wheel.

**CLOCK SPRING**

110005252

1. Check clock spring connectors and protective tube for damage, and terminals for deformities.



2. Visually check the case and the gear for damage.

STEERING WHEEL, STEERING COLUMN AND INTERMEDIATE JOINT

110005253

1. Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformities.
2. Install air bag module to check fit or alignment with steering wheel.
3. Check steering wheel for noise, binding, difficult operation, or excessive free play.

HARNESS CONNECTOR (BODY AND FRONT WIRING HARNESS)

110005254

Check for binding harness, connector damage, poor connections, and deformed terminals. (Refer to P.52B-15.)

COMPONENT SERVICE

110005255

If the SRS components are to be removed or replaced as a result of maintenance, troubleshooting, etc., follow each procedure. (P.52B-40 – P.52B-50.)

Caution

1. SRS components should not be subjected to heat over 93°C (200°F), so remove the front impact sensors, SRS diagnosis unit, air bag modules and clock spring before drying or baking the vehicle after painting. Recheck SRS system operability after re-installing them.
2. If the SRS components are removed for the purpose of inspection, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.

FRONT IMPACT SENSORS

110005256

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

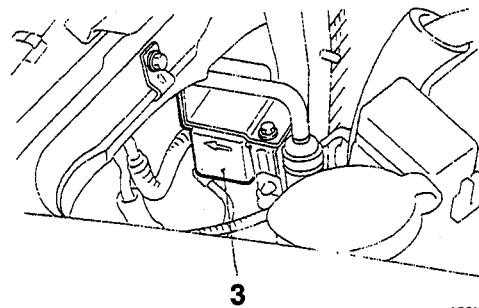
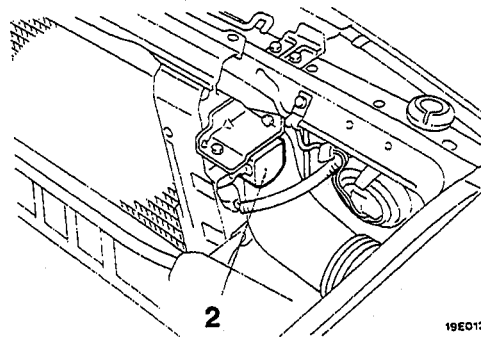
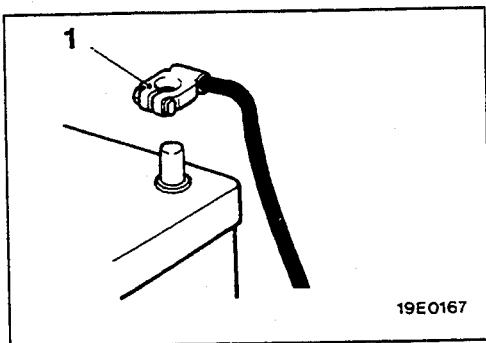
- to be dented, cracked, deformed or rusted, replace it with a new one
3. Replace sensors with new ones after the air bags have deployed.

REMOVAL AND INSTALLATION

110005256

Pre-removal Operation

- Turn the ignition key to the "LOCK" position.



00002021

Removal steps

- Post-installation inspection
- ◀A▶ 1. Connection of the negative (-) battery cable to the battery
- ◀B▶ ▶A▶ 2. Front impact sensor (R.H.)

- Reserve tank
- ◀B▶ ▶A▶ 3. Front impact sensor (L.H.)
- Post-installation inspection

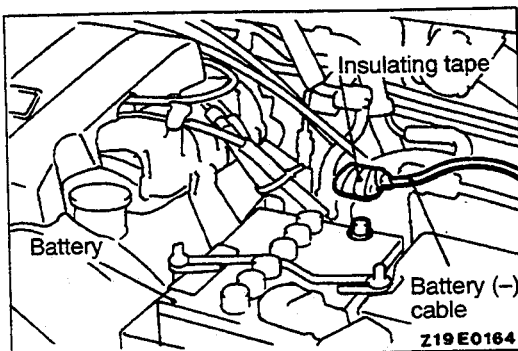
REMOVAL SERVICE POINTS

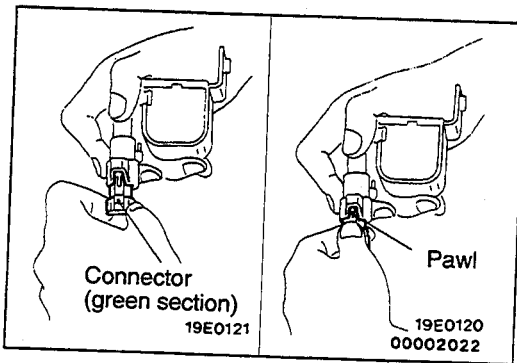
◀A▶ **DISCONNECTION OF THE NEGATIVE (-) BATTERY CABLE FROM THE BATTERY**

Disconnect the negative battery cable from the battery and tape the terminal.

Caution

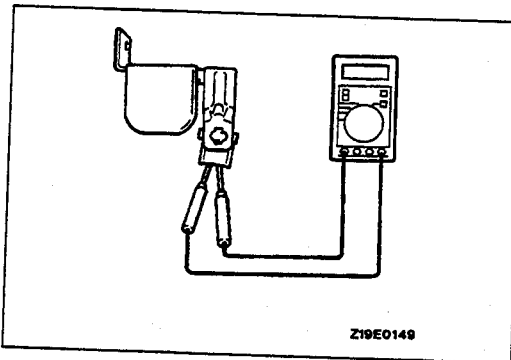
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P.52B-16.)





◀B▶ REMOVAL OF FRONT IMPACT SENSOR (R.H.)/FRONT IMPACT SENSOR (L.H.)

- (1) Slide the connector (green section) to release the lock.
- (2) Push down the pawl, and then disconnect the connector.



INSPECTION

- (1) Check upper frame and sensor brackets for deformities or rust.
- (2) Check sensor harness for binds, connectors for damage, and terminals for deformities.
- (3) Check for dents, cracks, deformation or rust of the front impact sensor.

Caution

If a dent, crack, deformation or rust is detected, replace with a new sensor.

- (4) Measure the resistance between terminals and check whether it is within the standard value.

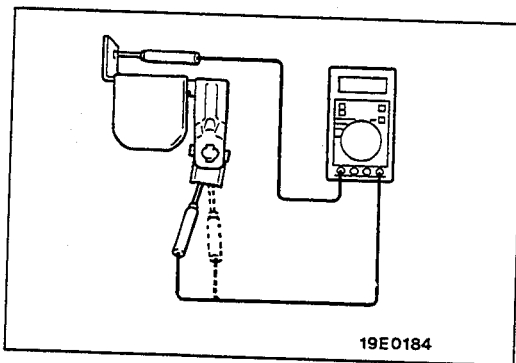
Standard value: 2,000 + 20 Ω

Caution

Always replace the sensor with a new one if the resistance is not within the standard value.

- (5) Check for continuity between the terminals and the brackets.

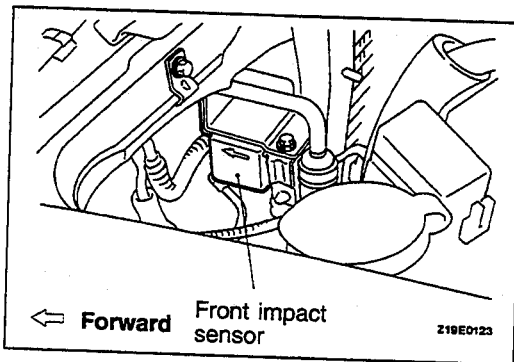
If there is continuity, the sensor insulation is defective, and so the sensor should be replaced with a new one.



INSTALLATION SERVICE POINTS

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")



▶A◀ FRONT IMPACT SENSOR (L.H.)/FRONT IMPACT SENSOR (R.H.) INSTALLATION

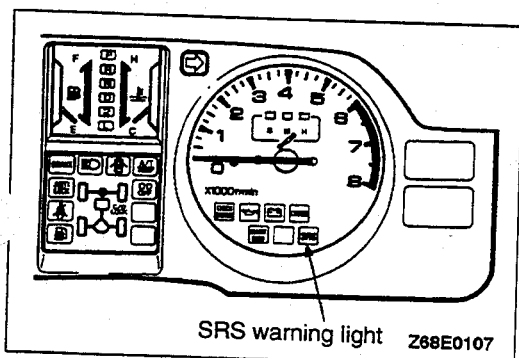
- (1) Securely connect the connector.
- (2) Set the front impact sensor towards the front of the vehicle as shown by the arrow in the illustration, and install it securely.

Caution

The SRS may not activate properly if a front impact sensor is not installed properly, which could result in the SRS system not operating properly during a collision.

POST-INSTALLATION INSPECTION

Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the "SRS" warning light illuminate for about 7 seconds, turn OFF and then remain OFF for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-34.



SRS DIAGNOSIS UNIT (SDU)

Caution

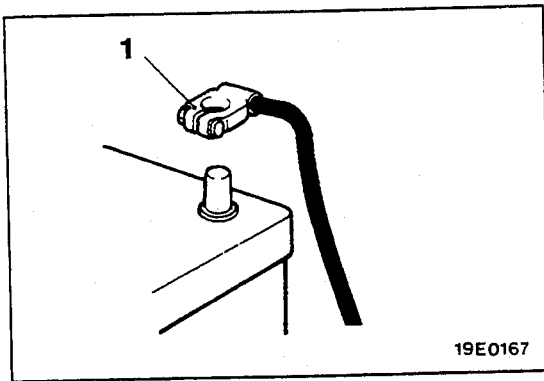
1. Never attempt to disassemble or repair the SDU. If faulty, replace it.
2. Do not drop or subject the SDU to impact or vibration. If dents, cracking, deformation, or rust are discovered on the SDU, replace it with a new SDU. Discard the old one.

3. After deployment of the air bags, 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-17.

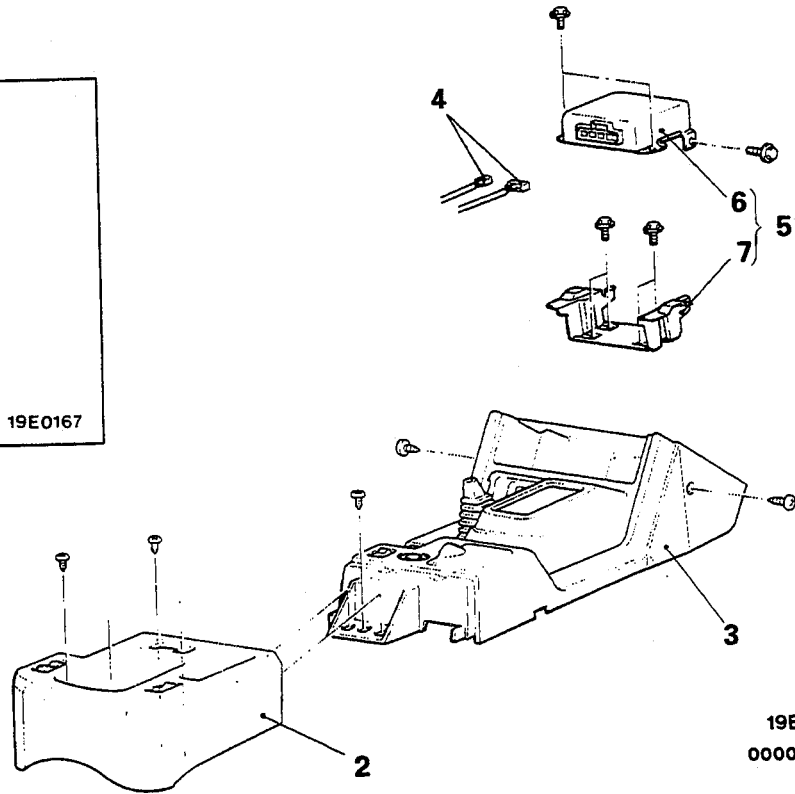
REMOVAL AND INSTALLATION

Pre-removal Operation

- Turn the ignition key to the "LOCK" position.



19E0167

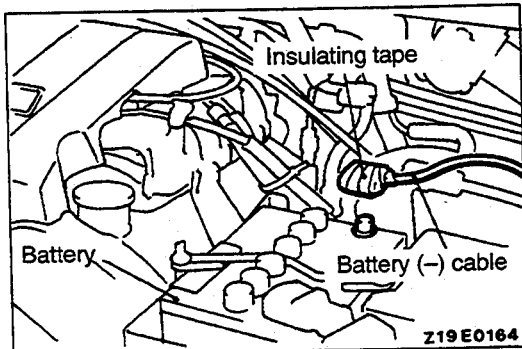


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Removal steps

- Post-installation inspection
- 1. Connection of the negative (-) battery cable
- 2. Rear console assembly
- 3. Front console assembly

- ▶B▶▶B◀ 4. Connection of the SDU and each harness connector
- ▶A◀ 5. SRS diagnosis unit assembly
- 6. SRS diagnosis unit (SDU)
- 7. Bracket



Z19E0164

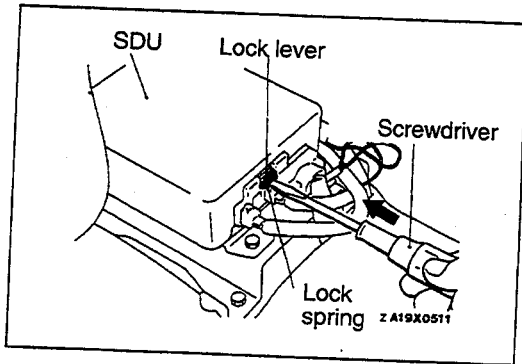
SERVICE POINTS OF REMOVAL

▶A▶ DISCONNECTION OF THE NEGATIVE (-) BATTERY CABLE FROM THE BATTERY

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-16.)



◀B▶ DISCONNECTION OF THE SDU AND EACH HARNESS CONNECTOR

- (1) Place a flat-tipped (-) screwdriver against the lock spring (metal portion) of the SDU connector lock lever, and push the spring horizontally toward the inside of the unit.

Caution

1. Do not use excessive force to raise the lock lever (green).
2. Do not insert the screwdriver into the gap between the lock lever (green) and the lock spring (metal portion.)

- (2) While pushing the locks of each connector downward, 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 deformities.
- Check connectors and lock lever for damage, and terminals for deformities.

Caution

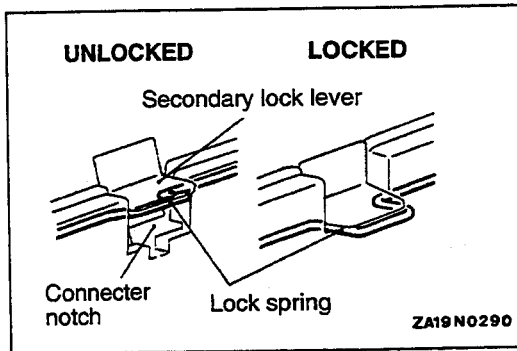
If a dent, cracks, deformation or rust is discovered, replace the SDU with a new one.

NOTE

For checking of the SDU other than described above, refer to the section concerning troubleshooting. (Refer to P.52B-17.)

SERVICE POINTS OF INSTALLATION**▶A◀INSTALLATION OF SRS DIAGNOSIS UNIT (SDU)****Caution**

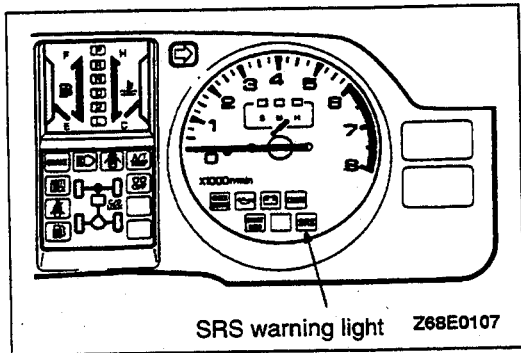
The SRS may not activate if SDU is not installed properly, which could result in the SRS system not operating properly in a collision.

**▶B◀CONNECTION OF THE SDU AND EACH HARNESS CONNECTOR**

After connecting each harness connector securely and correctly to the SDU, be sure to press down the lock lever of the SDU.

POST INSTALLATION INSPECTION

Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the "SRS" warning light illuminated for about 7 seconds, turn OFF and then remain OFF for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-34.)



AIR BAG MODULE AND CLOCK SPRING

Caution

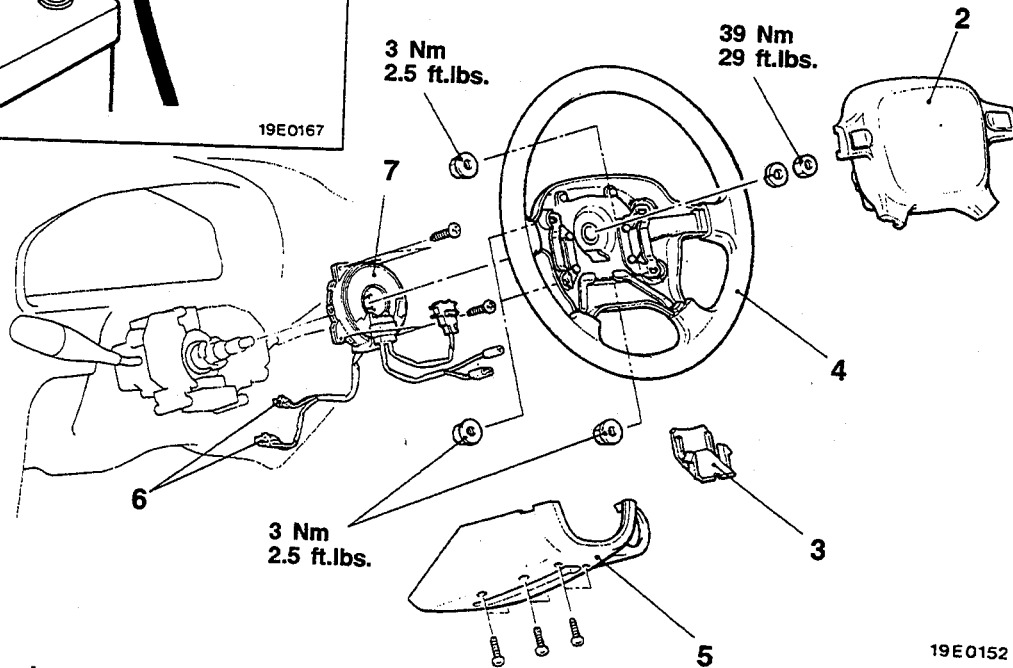
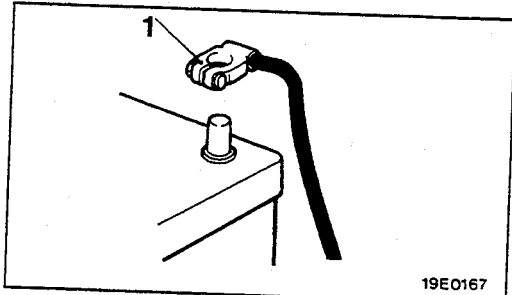
1. Never attempt to disassemble or repair the air bag module or clock spring. If faulty, replace it.
Do not drop the air bag module or clock spring or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust are detected.
2. The air bag module should be stored on a flat surface and placed so that the pad surface is facing upward.

4. Do not place anything on top of the air bag modules.
5. Do not expose the air bag module to temperature over 93°C (200°F).
6. After deployment of an air bag, replace the clock spring with a new one.
7. Wear gloves and safety glasses when handling an air bag that has deployed.
8. An undeployed air bag module should only be disposed of in accordance with the procedures P.52B-51 – P.52B-54.

REMOVAL AND INSTALLATION

Pre-removal Operation

- After setting the steering wheel and the front wheels, to the straight ahead position, remove the ignition key.



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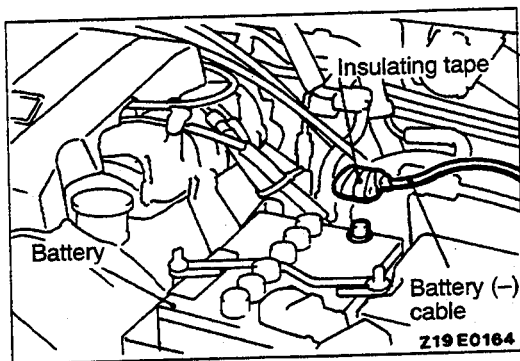
Clock spring removal steps

- ▶E◀ ● Post-installation inspection
- ◀A▶ ▶E◀ 1. Connection of the negative (-) battery cable to the battery
- ◀B▶ ▶D◀ 2. Air bag module
- ◀C▶ ▶C◀ 3. Cap
- ▶B◀ ▶D◀ 4. Steering wheel
- ▶A◀ ▶C◀ 5. Column cover lower
- ▶B◀ ▶A◀ 6. Clock spring and body wiring harness connection
- ▶B◀ ▶A◀ 7. Clock spring
- ▶A◀ ● Pre-installation inspection

Air bag module removal steps

- ▶E◀ ● Post-installation inspection
- ◀A▶ ▶E◀ 1. Connection of the negative (-) battery cable to the battery
- ◀B▶ ▶D◀ 2. Air bag module

TSB Revision



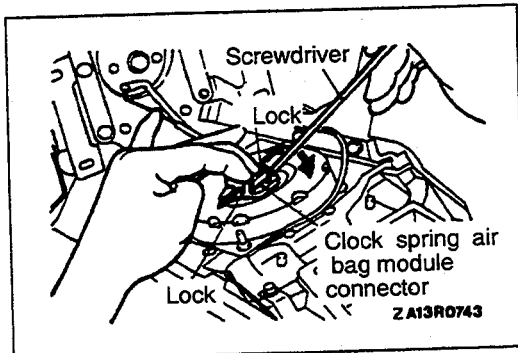
REMOVAL SERVICE POINTS

◀A▶ DISCONNECTION OF THE NEGATIVE (-) BATTERY CABLE FROM THE BATTERY

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-16.)

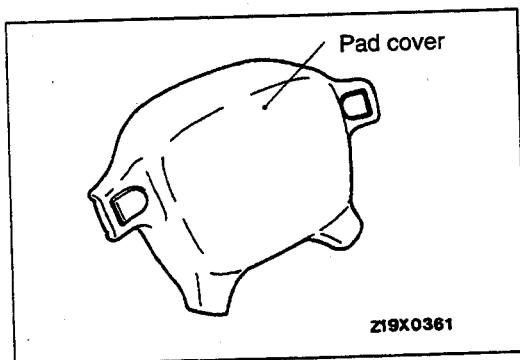


◀B▶ AIR BAG MODULE REMOVAL

- (1) Remove the air bag module mounting nut using a socket wrench from the back side.
- (2) 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 the connector gently.

Caution

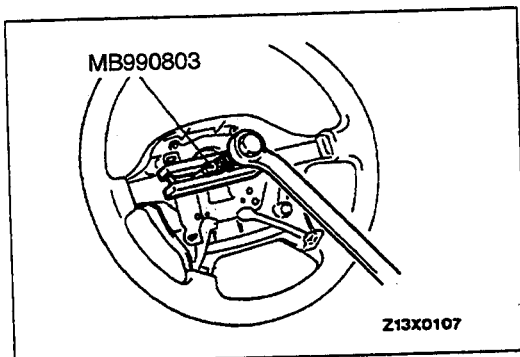
1. Wait disconnection the air bag module-clock spring connector, take not to apply excessive force to it.
2. The removed air bag module should be stored in a clean, dry place with the pad cover face up.



◀C▶ STEERING WHEEL REMOVAL

Caution

Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.

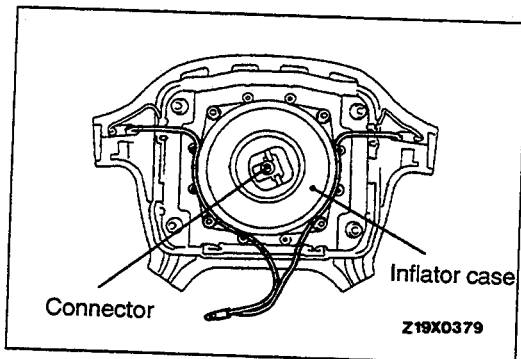


INSPECTION**AIR BAG MODULE**

If any improper part is found during the following inspection, replace the air bag module with a new one. Dispose of the old one according to the specified procedure. (Refer to P.52B-51.)

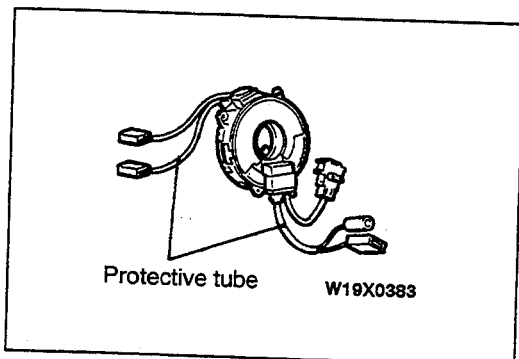
Caution

Never attempt to measure the circuit resistance of the air bag module (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bag deployment will result in serious personal injury.



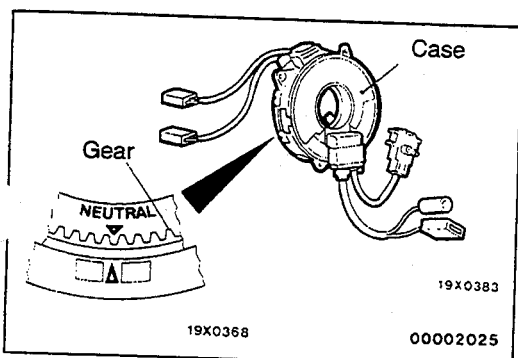
- (1) Check pad cover for dents, cracks or deformities.
- (2) Check the air bag module for dents, cracking or deformation.
- (3) Check hooks and connectors for damage, terminals for deformities, and harness for binds.
- (4) Check air bag inflator case for dents, cracks or deformities.

- (5) Install the air bag module on the steering wheel to check alignment with the wheel.

**CLOCK SPRING**

If, as result of the following checks, even one abnormal point is discovered, replace the clock spring with a new one.

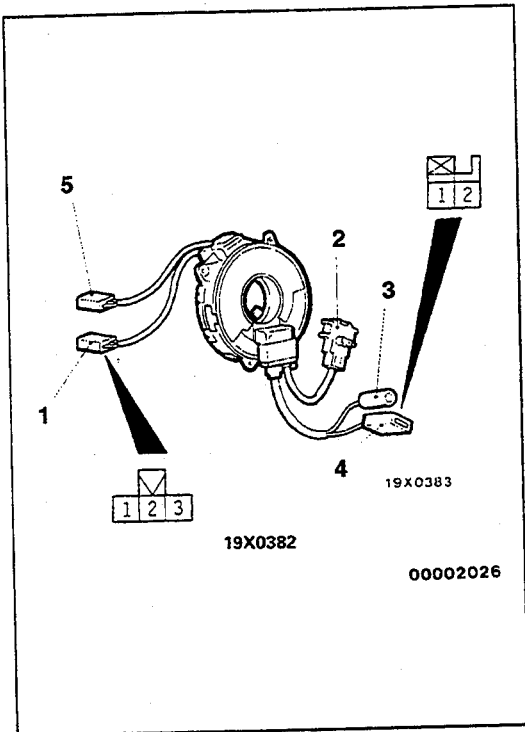
- (1) Check connectors and protective tube for damage, and terminals for deformities.



- (2) Visually check the case and the gears for damage.

(3) Check for continuity between the No.1 connector of the clock spring and connectors No.3 and 4

No.1 connector			No.3 connector	No.4 connector	
Terminal 1	Terminal 2	Terminal 3		Terminal 1	Terminal 2
○			○	○	○
To auto-cruise control unit	To ACC power	To horn relay	To horn switch	To auto-cruise control switch	



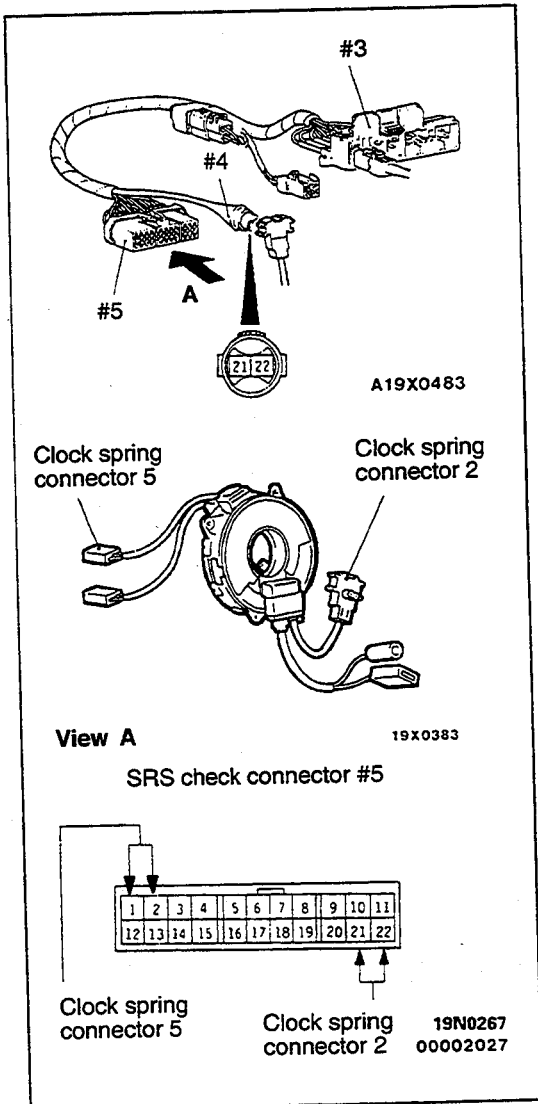
(4) Check of resistance between the terminals.
 a. Join the No. 2 connector and No. 5 connector of the clock spring to connector # 4 and connector # 3, respectively, of the SRS Check Harness.

NOTE

When joining SRS Check Harness connector # 4, align its white paint with the hollow portion of the No.2 connector of the clock spring.

b. Check for continuity between terminal 1 and terminal 22, and terminal 2 and terminal 21, of SRS Check Harness connector # 5, using a digital multi-meter.

Standard value: less than 0.4 Ω



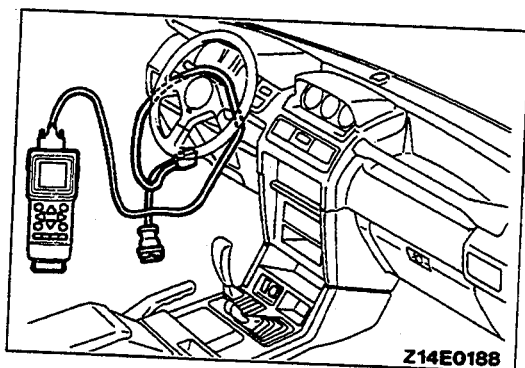
INSTALLATION SERVICE POINTS**►A◄ PRE-INSTALLATION INSPECTION**

- (1) When installing the new air bag module and clock spring, refer to “INSPECTION”

Caution

Dispose of an air bag module only according to the specified procedure. (Refer to P.52B-51.)

- (2) Connect the battery (–) terminal.

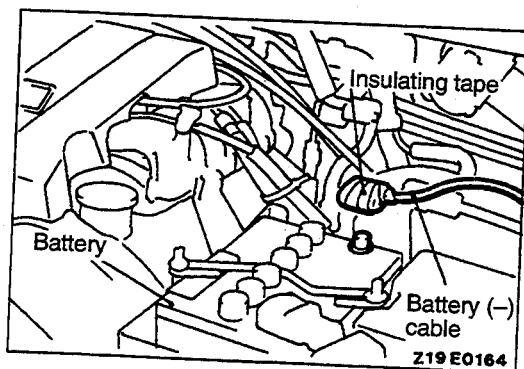


- (3) Connect the scan tool to the data link connector then check diagnostic codes.

Caution

Turn the ignition switch off before connecting or disconnecting the scan tool.

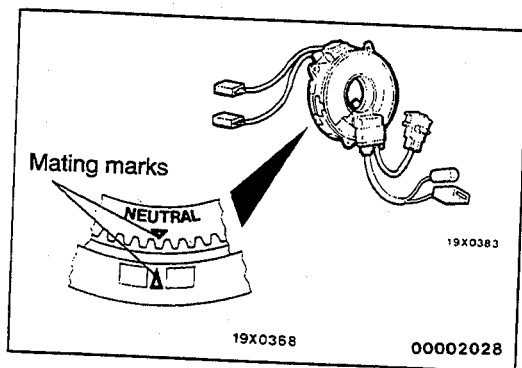
- (4) Turn the ignition key to the “ON” position.
 (5) Conduct diagnostic test mode using the scan tool to ensure entire SRS operates properly, except open circuit of air bag module (diagnostic trouble code No. 22, 25). (Refer to P.52B-22.)



- (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-16.)

**►B◄ CLOCK SPRING INSTALLATION**

Align the mating mark and “NEUTRAL” position indicator of the clock spring, and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch.

Caution

If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS.

►C◄ STEERING WHEEL INSTALLATION

- (1) Before installing the steering wheel, be sure to first turn the vehicle's front wheels to the straight-ahead position and align the mating mark and "NEUTRAL" position indicator of the clock spring.

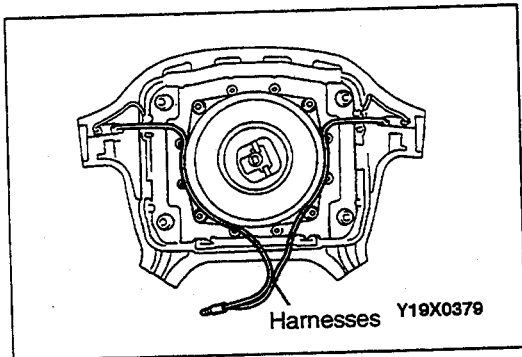
Caution

Be sure when installing the steering wheel, that the harness of the clock spring down not become caught or tangled.

- (2) After tightening, turn the steering wheel all the way in both directions to confirm that steering is normal.

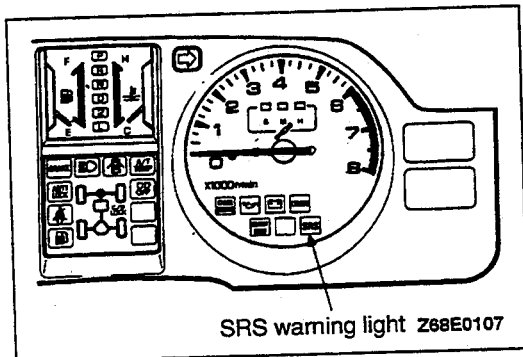
►D◄ AIR BAG MODULE INSTALLATION

Route the horn switch harnesses as shown in the illustration, and then install the air bag module without clamping the harnesses.



►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 light illuminate for about 7 seconds, turn OFF and then remain OFF for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-34.)



AIR BAG MODULE DISPOSAL PROCEDURES

110005259

Before either disposing of a vehicle equipped with an air bag, or prior to disposing of the air bag module,

be sure to first follow the procedures described below to deploy the air bag.

UNDEPLOYED AIR BAG MODULE DISPOSAL

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Caution

1. If the vehicle is to be scrapped, or otherwise disposed of, deploy the air bag inside the vehicle. If the vehicle will continue to be operated and only the air bag module is to be disposed of, deploy the air bag outside the vehicle.
2. Since a large amount of smoke is produced when the air bag is 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 bag is 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

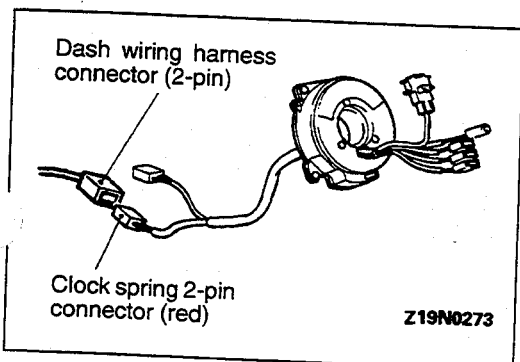
110005261

(when disposing 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

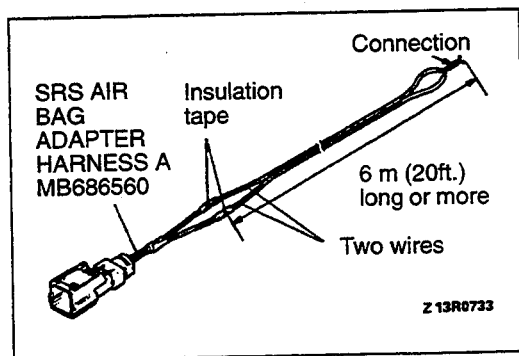
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-16.)



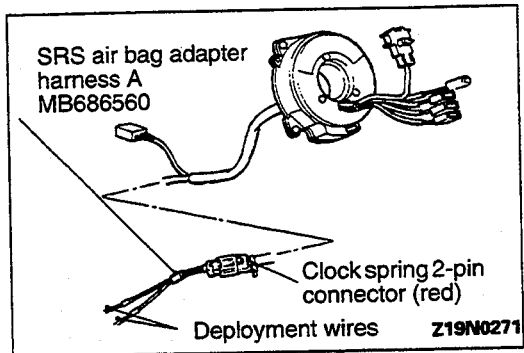
- (3) Remove the steering column cover lower.
- (4) Remove the connection between the clock spring 2-pin connector (red) and the dash wiring harness connector.

NOTE

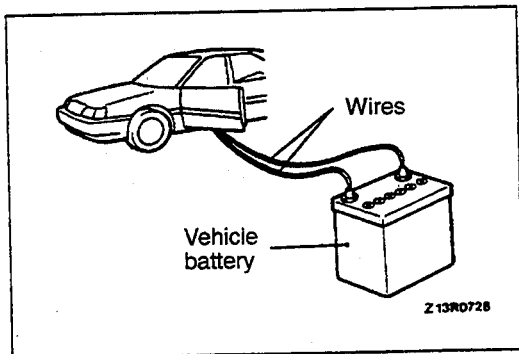
If the clock spring connector is disconnected from the dash wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.



- (5) Connect two wires, each six meters (20 feet) 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) 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. Wear safety glasses, suitable ear protection.
 2. The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air Bag Module Disposal Procedures (P.52B-54.) 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. (Refer to P.52B-54.)

DEPLOYMENT OUTSIDE THE VEHICLE

110005262

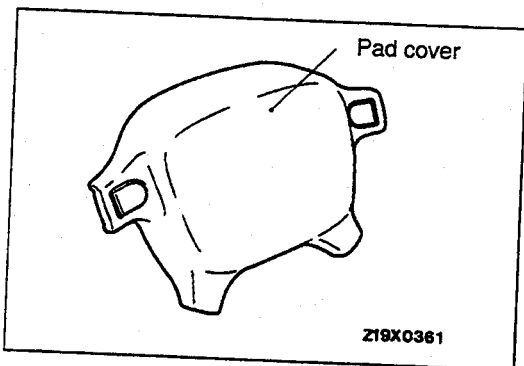
Caution

1. Should be carried out in a wide, flat area at least 6 m (20 feet) away from obstacles and other people.
2. Do not perform deployment outside, if a strong wind is blowing, and if there is even a slight breeze, the air bag module should be placed and deployed downwind from the battery.

- (1) Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle

Caution

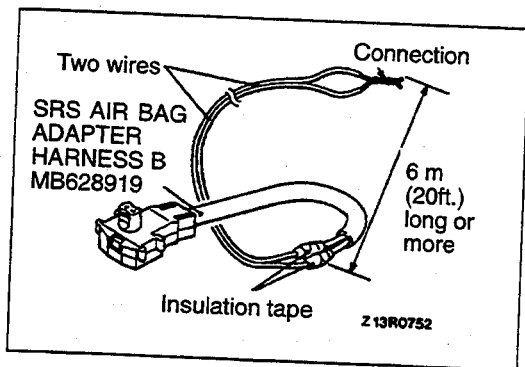
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P.52B-16.)



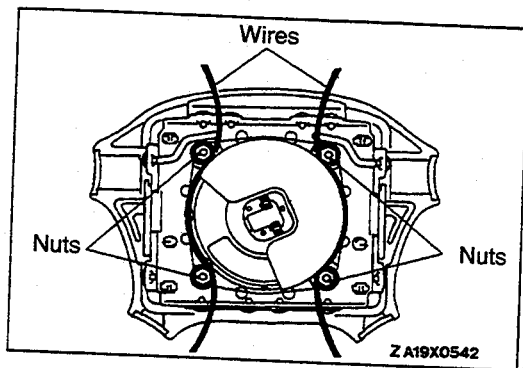
- (2) Remove the air bag module from the vehicle. (Refer to P.52B-45.)

Caution

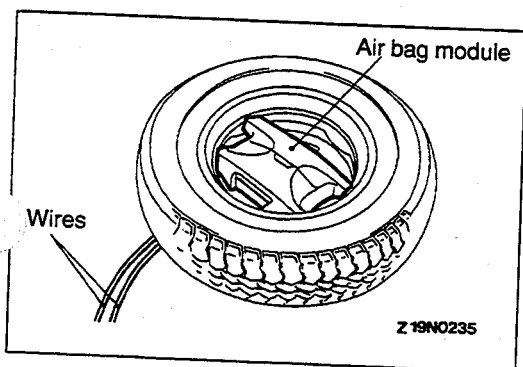
The air bag module should be stored on a flat surface and placed so that the pad cover face up. Do not place anything on top of it.



- (3) Connect two wires, each six meters (20 feet) 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.



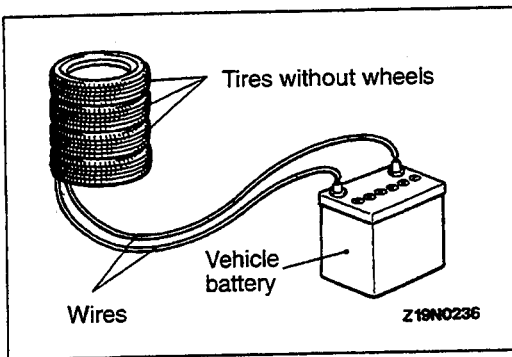
1. Install nuts that are no longer needed to the four bolts on the rear side of the air bag module, and tie on some thick wire to secure to the wheel.
2. Take the SRS air bag adaptor harness B that is connected to the wires, pass it beneath the old tire wheel assembly, and connect it to the air bag module.



3. Insert the air bag module into the wheel, and secure it with wires that are tied to the bolt holes, the air bag should face 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.



4. Place three old tires, without wheels, on top of the tire secured to the air bag module.
5. 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 vehicle) to deploy the air bag.

Caution

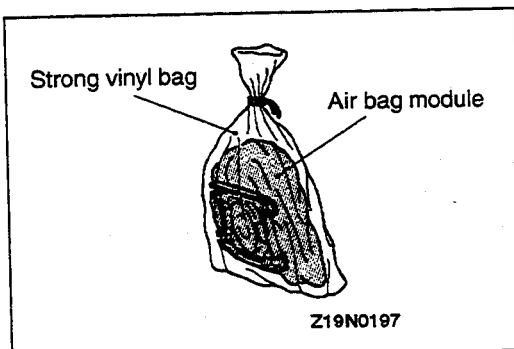
1. Before deployment, check carefully to be sure that no one is nearby.
2. The inflator will be quite hot immediately following deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it. Although not poisonous, do not inhale gas from air bag deployment. See Deployed Air 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.
6. Dispose of the air bag module after deployment according to the Deployed Air Bag Module Disposal Procedures.

DEPLOYED AIR BAG MODULE DISPOSAL

110005263

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 handling 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.

HEATER, AIR CONDITIONING AND VENTILATION

CONTENTS

110005264

AIR CONDITIONING	11	Idle-up Operation Check	32
AIR CONDITIONING CONTROL UNIT	35	Performance Test	28
AIR CONDITIONING ENGINE COOLANT		Power Relay Check	32
TEMPERATURE SWITCH	36	Refrigerant Leak Repair Procedure	30
AIR CONDITIONING SWITCH	32	Test Procedures	18
COMPRESSOR AND TENSION PULLEY .	40	SERVICE SPECIFICATIONS	11
CONDENSER AND CONDENSER		TROUBLESHOOTING	13
FAN MOTOR	37	HEATER	2
EVAPORATOR	33	BLOWER ASSEMBLY	7
GENERAL SPECIFICATIONS	11	GENERAL SPECIFICATIONS	2
LUBRICANTS	12	HEATER CONTROL ASSEMBLY	3
REFRIGERANT LINE	38	HEATER UNIT*	6
SAFETY PRECAUTIONS	16	SERVICE ADJUSTMENT PROCEDURES ..	3
SEALANT	12	Power Relay Check	3
SERVICE ADJUSTMENT PROCEDURES .	18	SERVICE SPECIFICATIONS	2
Charging <Vehicles using R-12>	20	TROUBLESHOOTING	2
Charging <Vehicles using R-134a>	24	VENTILATORS (AIR OUTLET)	10
Compressor Drive Belt Adjustment	20	VENTILATORS	
Compressor Noise	31	(INSTRUMENT PANEL AND FLOOR)*	9
Handling Tubing and Fittings	30		

WARNING 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 (from rendering the SRS inoperative.)
- (2) Service or maintenance of any SRS component or SRS-related component must be performed only by an authorized MITSUBISHI dealer.
- (3) MITSUBISHI dealer personnel must thoroughly review this manual, and especially its GROUP 52B - Supplemental Restraint System (SRS) and GROUP 00 - Maintenance Service 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 light, air bag module, clock spring and interconnecting wiring. Other SRS-related components that may have to be removed or installed in connection with SRS service or maintenance are indicated in the table of contents by an asterisk (*).

HEATER

110005265

GENERAL SPECIFICATIONS

Items	Specifications
Type	Three-way-flow full-air-mix system
Performance	kJ/h (kcal/h,B.T.U./h) 16,744 (4,000, 15,873)

SERVICE SPECIFICATIONS

110005266

Items	Standard value	
Resistance value of resistor (for blower motor assembly) Ω	Between terminals 2 – 4	1.96 ± 7%
	Between terminals 1 – 2	0.95 ± 7%
	Between terminals 2 – 3	0.33 ± 7%

TROUBLESHOOTING

110005267

Symptom	Probable cause	Remedy
Improper heat	Obstructed floor outlets	Correct
	Changeover dampers improperly adjusted or binding	Correct
	Obstructed heater hoses	Replace
	Improperly adjusted control cables	Adjust
	Partially plugged heater core	Clean or replace
No ventilation even when mode selection lever is operated	Incorrect adjustment of changeover dampers	Adjust
	Incorrect installation mode selection control wire	Adjust
	Ducts are incorrectly incompletely connected, crushed, bent or clogged.	Repair or replace

SERVICE ADJUSTMENT PROCEDURES

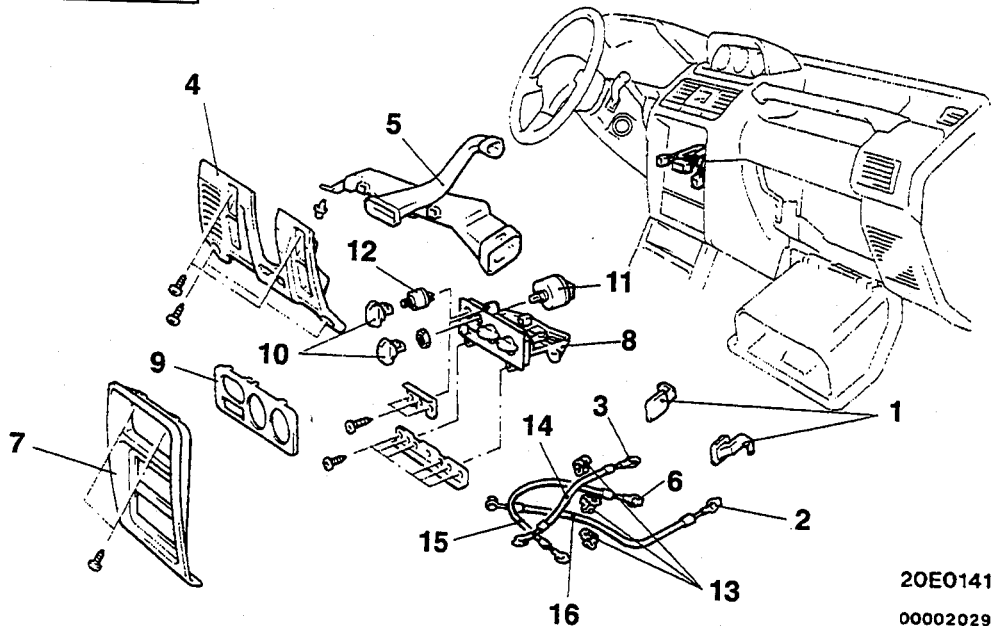
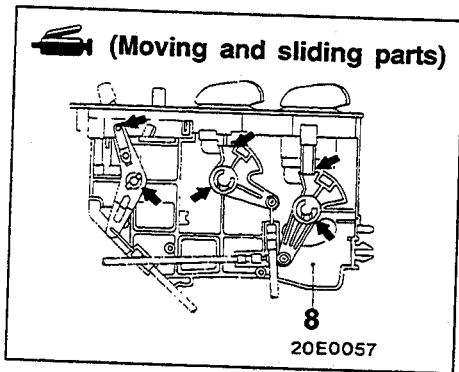
110005268

POWER RELAY CHECK

- (1) Remove the heater relay from the junction box.
- (2) Use an ohmmeter to check for continuity between the terminals.

HEATER CONTROL ASSEMBLY REMOVAL AND INSTALLATION

110005269

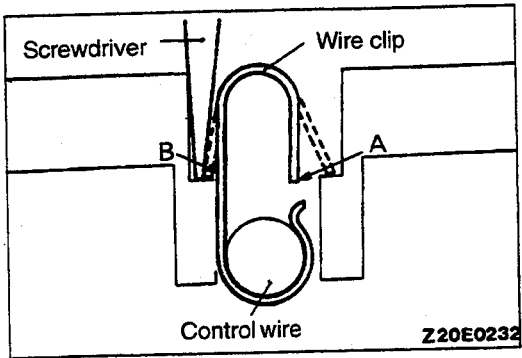


20E0141
00002029

Removal steps

- | | | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>▶C◀ 1. Stopper</p> <p>▶B◀ 2. Connection for air selection control wire</p> <p>▶B◀ 3. Connection for temperature control wire</p> <p>▶A◀ 4. Instrument under cover</p> <p>▶A◀ 5. Lap cooler duct A and foot shower duct (L.H.)</p> <p>▶A◀ 6. Connection for mode selection control wire</p> <p>7. Center panel</p> | <p>◀A▶</p> | <p>8. Heater control assembly</p> <p>9. Bezel</p> <p>10. Knob</p> <p>11. Blower switch</p> <p>12. Air conditioning switch <Vehicles with air conditioning></p> <p>13. Wire clip</p> <p>14. Temperature control wire</p> <p>15. Mode selection control wire</p> <p>16. Air selection control wire</p> |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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REMOVAL SERVICE POINT

◀A▶ WIRE CLIP REMOVAL

Remove the wire clip by inserting a screwdriver in the position shown in the illustration and pushing the wire clip in directions A and B.

INSPECTION

BLOWER SWITCH

Operate the switch and use an ohmmeter to check for continuity between the terminals.

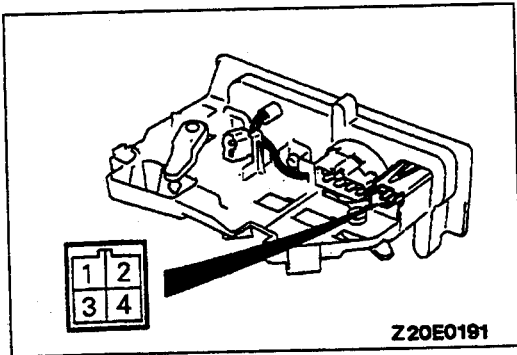
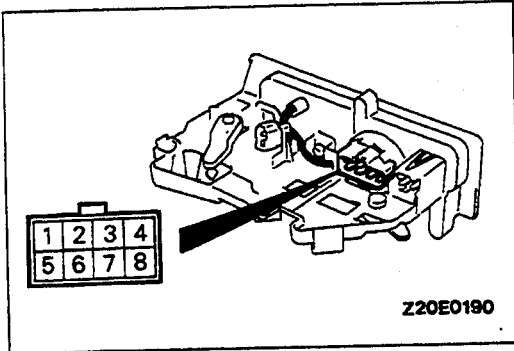
Switch position	Terminal No.							
	5	3	6	2	7	8	1	4
(LO) •	○—○					○—○		
(ML) •	○—○	○				○—○		
(MH) ●	○	○—○	○			○—○	○—○	
(HI) ●	○	○—○	○—○	○		○—○	○—○	○

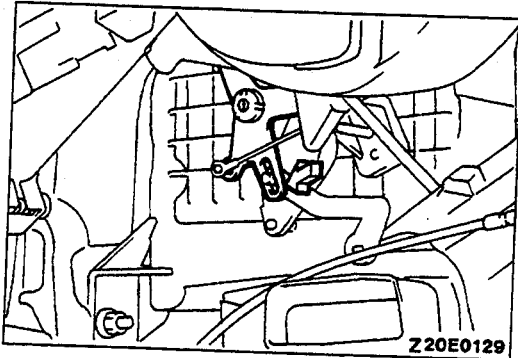
AIR CONDITIONING SWITCH

<Vehicles with air conditioning>

Operate the switch and use an ohmmeter to check for continuity between the terminals.

Switch position	Terminal No.		
	1	3	4
ECONO	○—○	○	
A/C	○	○—○	○



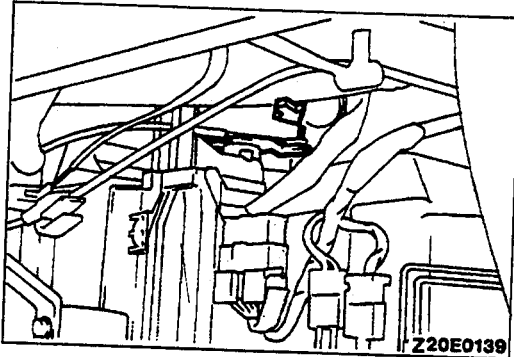


INSTALLATION SERVICE POINTS

▶A◀ MODE SELECTION CONTROL WIRE (HEATER UNIT SIDE) INSTALLATION

Connect the mode selection control wire to the mode selection damper lever by following the steps below.

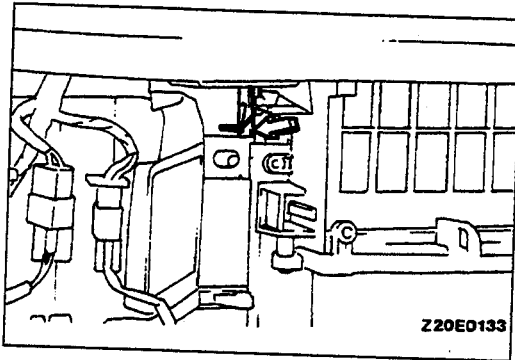
- (1) Move the mode selection lever to the defroster position.
- (2) With the air selection damper lever pressed inward in the direction indicated by the arrow, connect the inner cable of the mode selection control wire to the end of the mode selection lever, and then use a clip to secure the outer cable.



▶B◀ TEMPERATURE CONTROL WIRE (HEATER UNIT SIDE) INSTALLATION

Connect the temperature control wire to the blend air damper lever by following the steps below.

- (1) Move the temperature control lever to the far right position (HOT position).
- (2) With the blend air damper lever pressed completely downward in the direction indicated by the arrow, connect the inner cable of the temperature control wire to the end of the blend air damper lever, and then use a clip to secure the outer cable.



▶C◀ AIR SELECTION CONTROL WIRE (BLOWER CASE SIDE) INSTALLATION

Connect the air selection control wire to the air selection damper lever by following the steps below.

- (1) Move the air selection control lever to the recirculation position.
- (2) With the air selection damper lever pressed inward in the direction indicated by the arrow, connect the inner cable of the air selection lever, and then use a clip to secure the outer cable.

HEATER UNIT

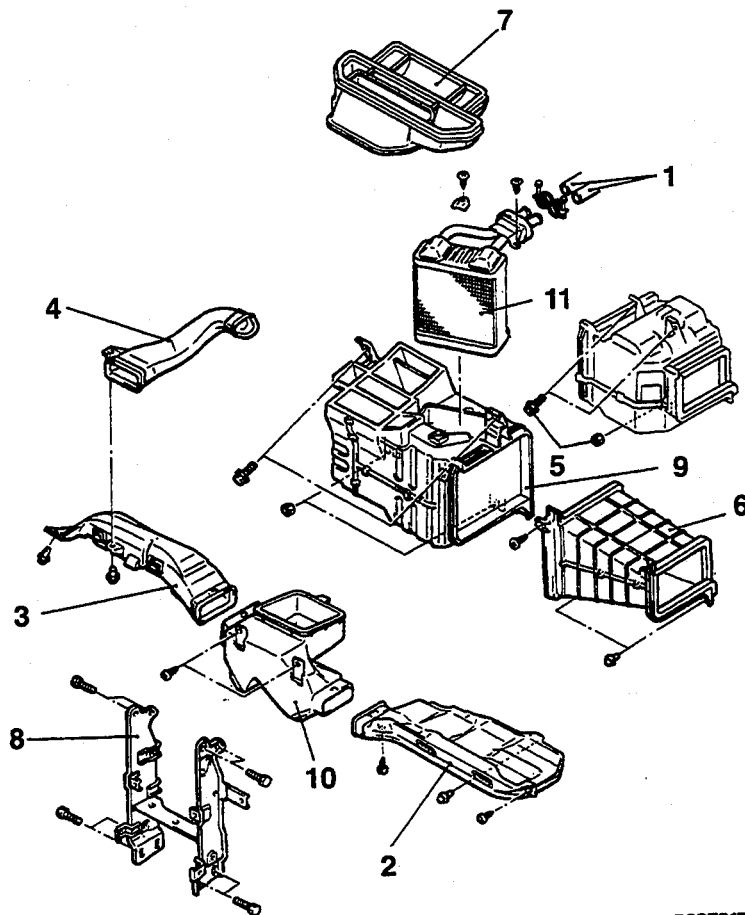
REMOVAL AND INSTALLATION

CAUTION: SRS

When installing or removing the instrument panel, don't allow any impact or shock to the SRS diagnosis unit.

Pre-removal and Post-installation Operation

- Coolant Draining and Supplying
- Instrument Panel Removal and Installation (Refer to GROUP 52A – Instrument Panel.)



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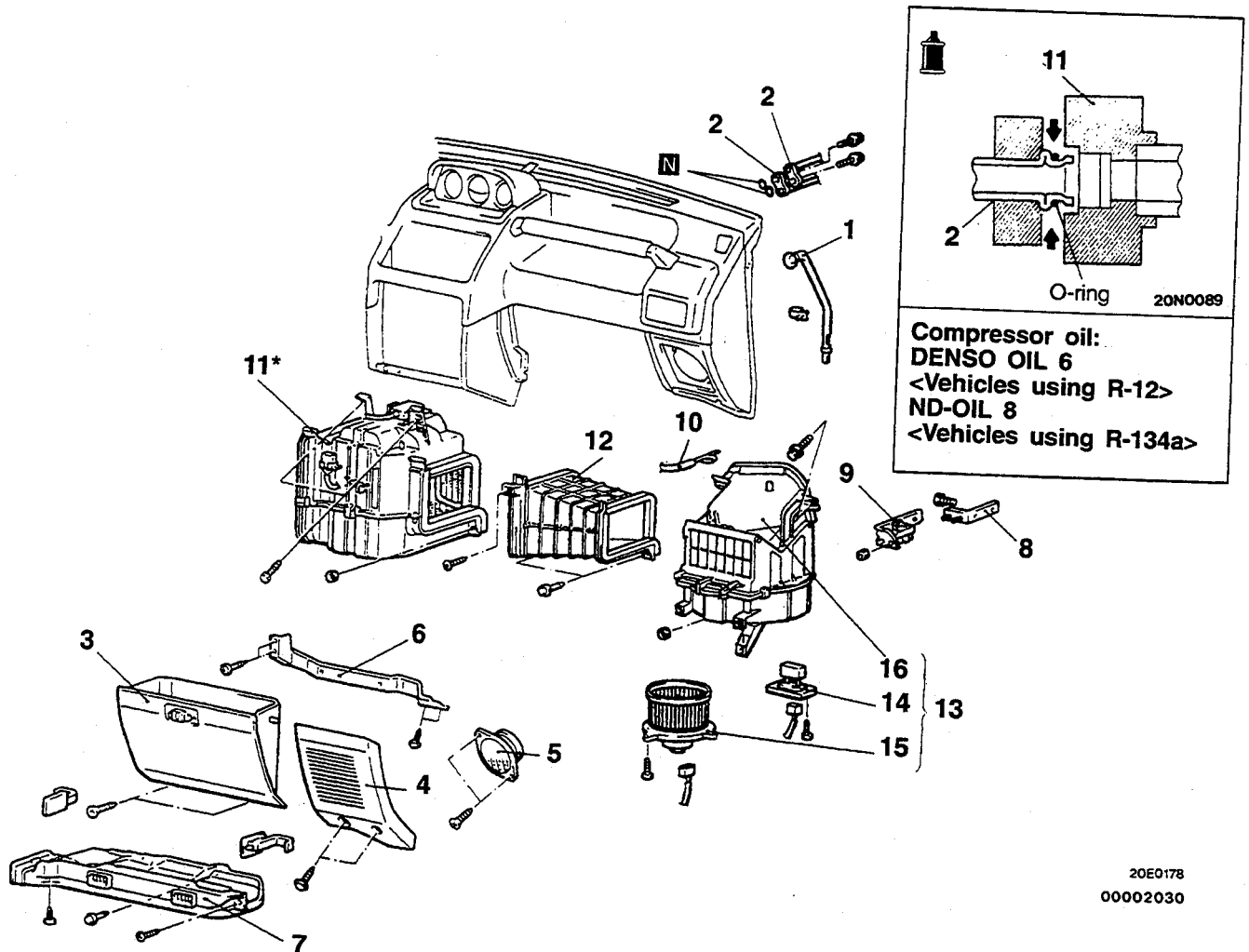
Removal steps

1. Water hoses connection
2. Foot shower duct (RH)
3. Foot shower duct (LH)
4. Lap cooler duct A
5. Evaporator mounting bolt and nut <Vehicles with A/C>
6. Joint duct <Vehicles without A/C>
7. Center duct assembly
8. Center reinforcement
9. Heater unit
10. Foot distribution duct
11. Heater core

INSPECTION

- Check the operation of dampers and link mechanism.
- Check the heater core for clogging and water leakage.

BLOWER ASSEMBLY REMOVAL AND INSTALLATION



Compressor oil:
DENSO OIL 6
 <Vehicles using R-12>
ND-OIL 8
 <Vehicles using R-134a>

O-ring 20N0089

20E0178
00002030

Removal steps

- Refrigerant Discharging and Charging
 Refer to P.55-20, 22.
 <Vehicles using R-12>
 Refer to P.55-24, 27.
 <Vehicles using R-134a>
- 1. Drain hose <Vehicles with air conditioning>
- 2. Liquid pipe and suction hose connection <Vehicles with air conditioning>
- 3. Glove box
- 4. Speaker garnish
- 5. Speaker
- 6. Lower frame
- 7. Foot shower duct (R.H.)
- 8. Engine control relay assembly
- 9. Bracket
- ▶▲ 10. Air selection control wire connection
- 11. Evaporator <Vehicles with air conditioning>

- 12. Duct joint <Vehicles without air conditioning>
- 13. Blower assembly
- 14. Resistor
- 15. Blower motor assembly
- 16. Blower case assembly

Blower motor assembly removal steps

- 7. Foot shower duct (R.H.)
- 13. Blower motor assembly

Resistor removal steps

- 7. Foot shower duct (R.H.)
- 14. Resistor

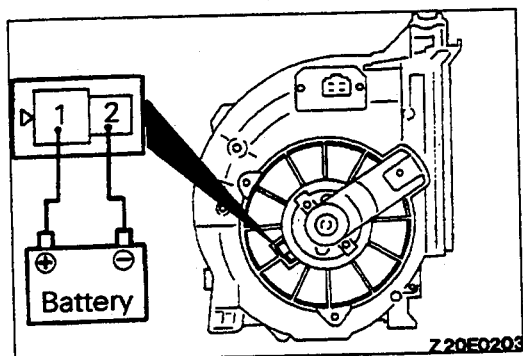
NOTE

* indicates vehicles with air conditioning

TSB Revision

INSPECTION

- Check for bending or abnormal deflection of the rotating shaft of the blower motor assembly.
- Check for damage to the fan.
- Check for damage to the blower case.
- Check the operation of the inside/outside air selection damper, and check for damage.

**BLOWER MOTOR ASSEMBLY**

- (1) Connect the blower motor terminals directly to the battery and check that the blower motor operates smoothly.
- (2) Next, reverse the polarity and check that the blower motor operates smoothly in the reverse direction.

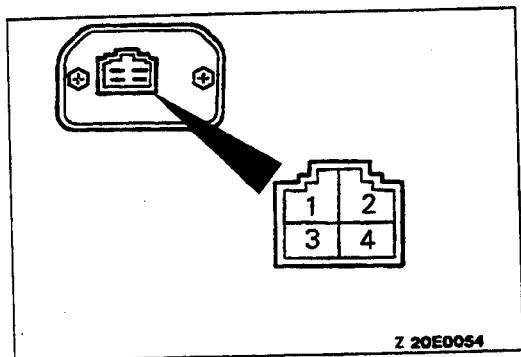
RESISTOR

Use an ohmmeter to measure the resistance between the terminals indicated below.

The condition can be considered satisfactory if the value measured at this time is equivalent to the standard value.

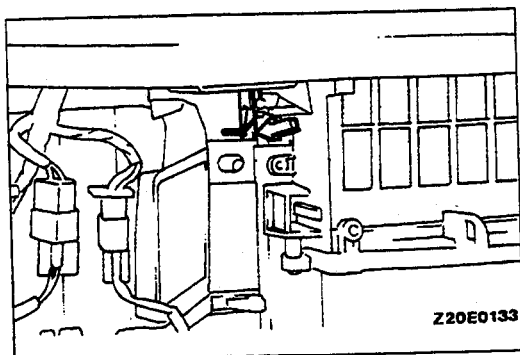
Standard value

Measurement terminals	Standard value Ω
Between terminals (2)–(4)	Approx. $1.96 \pm 7\%$
Between terminals (1)–(2)	Approx. $0.95 \pm 7\%$
Between terminals (2)–(3)	Approx. $0.33 \pm 7\%$

**INSTALLATION SERVICE POINT****▶A◀ AIR SELECTION CONTROL WIRE INSTALLATION**

Connect the air selection control wire to the air selection damper lever by following the steps below.

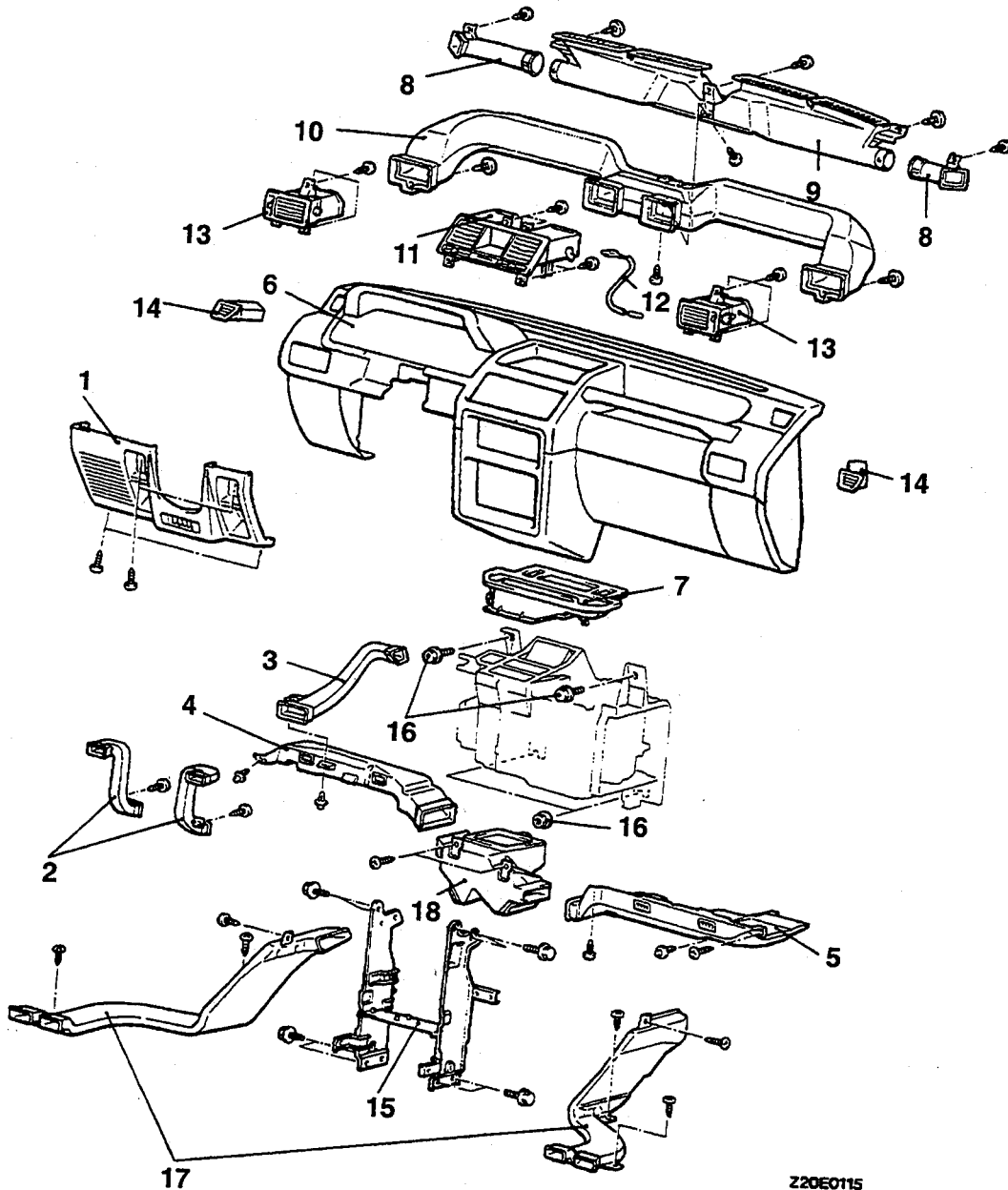
- (1) Move the air selection control lever to the recirculation position.
- (2) With the air selection damper lever pressed inward in the direction indicated by the arrow, connect the inner cable of the air selection control wire to the end of the air selection lever, and then use a clip to secure the outer cable.



VENTILATORS (INSTRUMENT PANEL AND FLOOR)

REMOVAL AND INSTALLATION

CAUTION: SRS
When installing or removing the instrument panel, don't allow any impact or shock to the SRS diagnosis unit.



Z20E0115

Removal steps

1. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
2. Lap cooler duct B
3. Lap cooler duct A
4. Foot shower duct (LH)
5. Foot shower duct (RH)
6. Instrument Panel (Refer to GROUP 52A – Instrument Panel.)
7. Center duct assembly
8. Side defroster duct
9. Defroster nozzle
10. Distribution duct
11. Center outlet assembly
12. Ventilation control wire
13. Side outlet assembly
14. Side defroster grille
15. Center reinforcement
16. Heater unit mounting bolts and nuts
17. Rear heater duct
18. Foot distribution duct



TSB Revision

REMOVAL SERVICE POINT

◀A▶ REAR HEATER DUCT REMOVAL

Remove the front seat, front scuff plate and cowl side trim, and after taking out the floor carpet, remove the rear heater duct.
(Refer to GROUP 52A – Seats and Trims.)

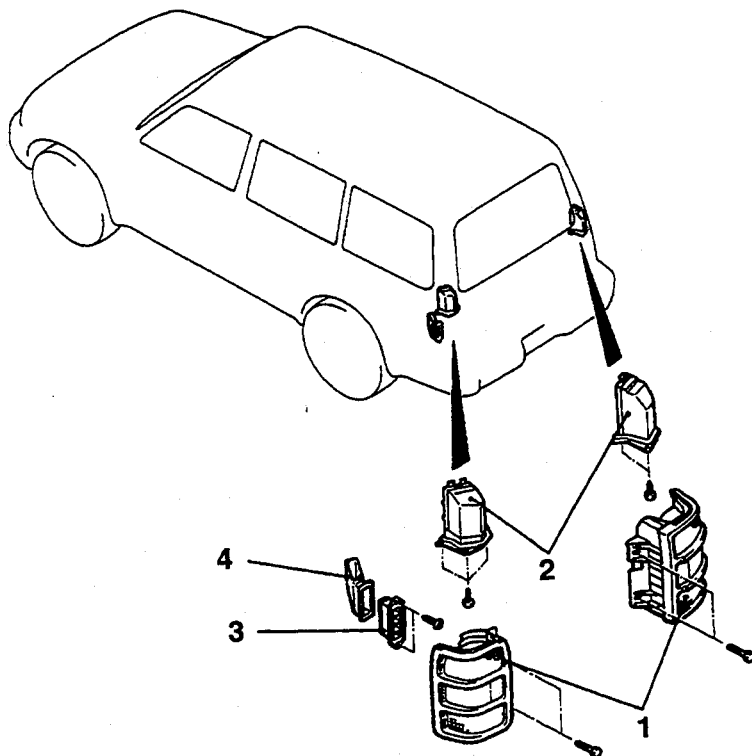
INSTALLATION SERVICE POINT

▶A◀ REAR HEATER DUCT INSTALLATION

After installing the duct, replace the floor carpet and install the front seat, front scuff plate and cowl side trim. (Refer to GROUP 52A – Seats and Trims.)

**VENTILATORS (AIR OUTLET)
REMOVAL AND INSTALLATION**

110005273



Z20E0113

Removal steps

1. Rear combination light
(Refer to GROUP 54 – Rear Combination Light.)

2. Rear ventilator duct assembly
3. Air outlet garnish assembly
4. Air outlet duct

TSB Revision

AIR CONDITIONING

110005274

GENERAL SPECIFICATIONS

Items		Vehicles using R-12	Vehicles using R-134a
Compressor	Model	10PA 15 Inclined-plate type	10PA 15 Inclined-plate type
	No. of cylinders and displacement cm ³	10 cylinders: 155.3	10 cylinders: 155.3
	Compressor oil cm ³	DENSO oil 6 : 80±20	ND – oil 8 : 80±20
	High pressure relief valve kPa (psi)	Open: 3,160–4,220 (449–600) Close: 2,756 (400)	Open: 3,432–4,138 (498–600) Close: 2,756 (400)
Protective equipment	Cycling clutch switch °C (°F)	OFF: 1.0 (22)	OFF: 1.0 (22)
		ON: 4.5 (39)	ON: 4.5 (39)
Dual pressure switch	Low-pressure side kPa (psi)	OFF: 210±20 (30±3)	OFF: 196±20 (28±3)
		Differential: 25 (3.6) or less	Differential: 25 (3.6) or less
	High-pressure side	OFF: 2,700±200 (384±28)	OFF: 3,138±196 (455±28)
		ON: 2,100±200 (299±28)	ON: 2,549±196 (370±28)
Air conditioning engine coolant temperature switch °C (°F)		OFF: 115±3 (239±4)	OFF: 115±3 (239±4)
		ON: 108 (226)	ON: 108 (226)
Freezer prevention	Air thermo sensor °C (°F)	OFF: 3 (37)	OFF: 3 (37)
		ON: 4 (39)	ON: 4 (39)
	Fusible plug (Burn out temperature) °C (°F)	103±(217±5)	–
	Refrigerant and quantity gr (oz.)	R-12: 800 (28)	R-134a: 600–650 (21–23)

SERVICE SPECIFICATIONS

110005275

Items	Standard value
Air conditioning engine coolant temperature switch °C (°F)	112–118 (234–244) or more
Idle speed r/min.	700±100
Idle-up speed r/min.	900±100
Clutch clearance mm (in.)	0.35–0.65 (.0138–.0256)

LUBRICANTS

110005276

Items		Specified lubricants	Quantity cm ³
Each connection of refrigerant line	Vehicles using R-12	DENSO OIL 6	As required
	Vehicles using R-134a	ND-OIL 8	As required
Compressor refrigerant unit lubricant	Vehicles using R-12	DENSO OIL 6	80
	Vehicles using R-134a	ND-OIL 8	80

SEALANT

Items	Specified sealant and adhesive
Air conditioning engine coolant temperature switch thread part	3M Nut Locking Part No. 4171 or equivalent

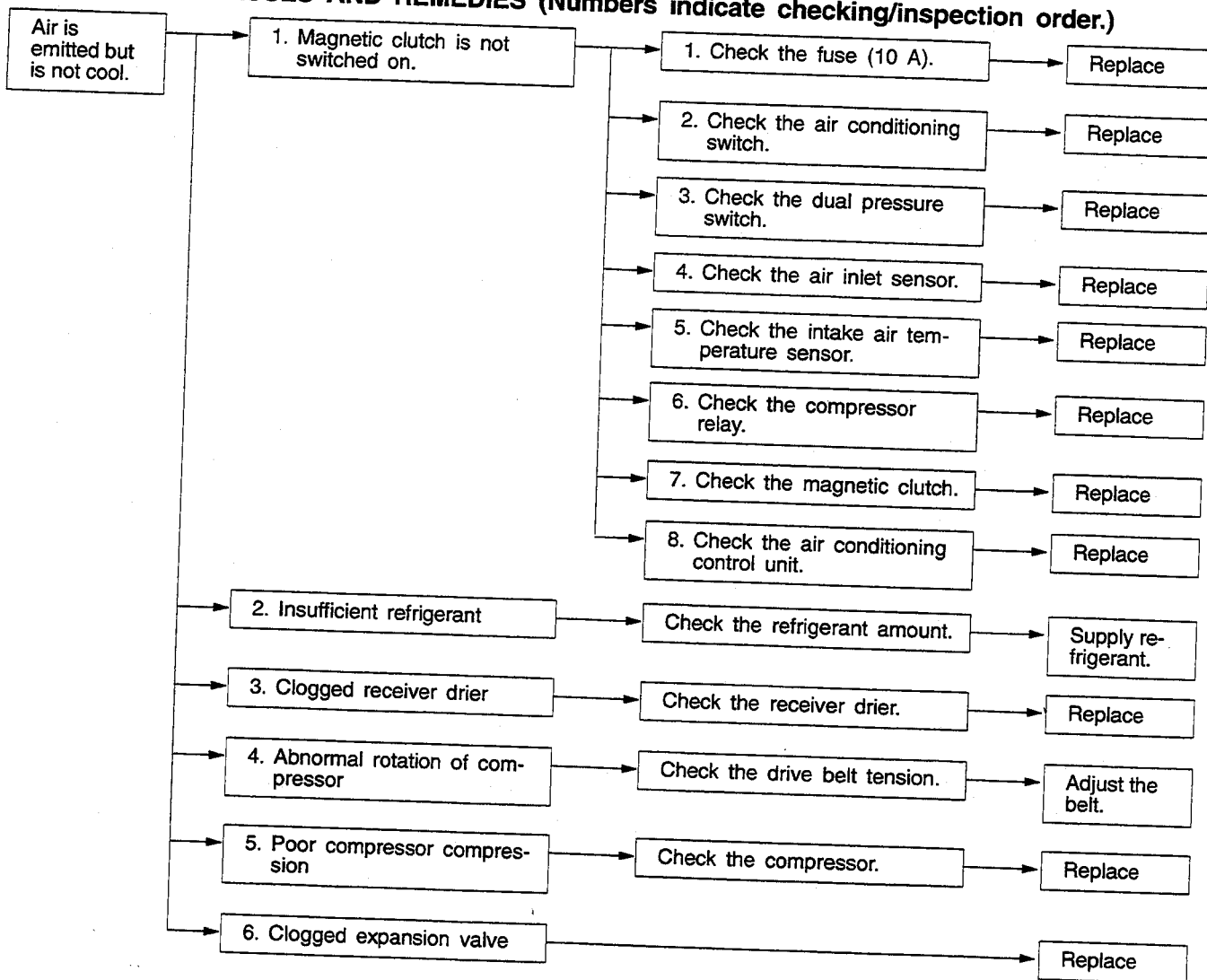
110005278

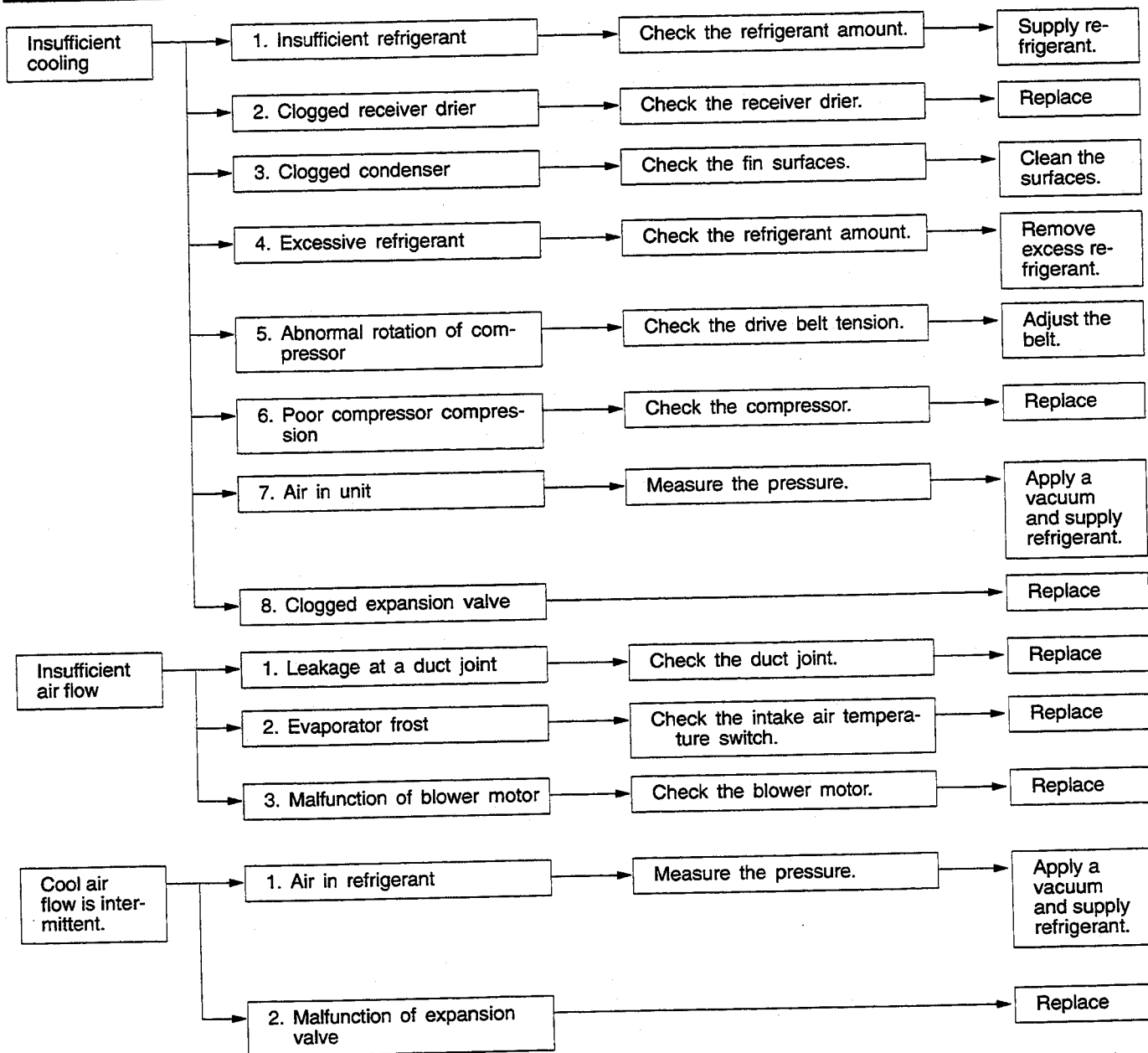
TROUBLESHOOTING

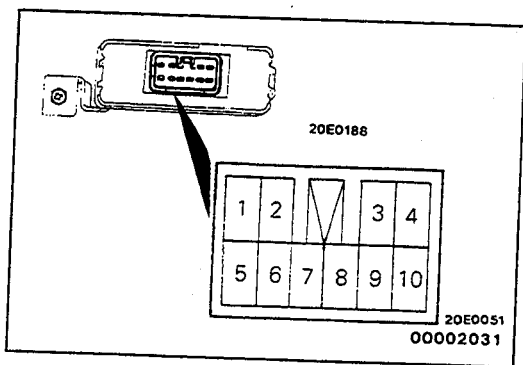
Before replacing or repairing air conditioning components, first determine if the malfunction is due to the refrigerant charge, air flow or compressor. The following diagnostic charts have been developed as a quick reference for determining the cause

of the malfunction. If these charts do not satisfactorily describe the problem, refer to the appropriate section for a more detailed explanation. After correcting the malfunction, check the complete system to assure that performance is satisfactory.

MALFUNCTION CAUSES AND REMEDIES (Numbers indicate checking/inspection order.)







TROUBLESHOOTING HINTS

Air Conditioning Control Unit Inspection

Disconnect the amplifier and inspect the connector at the wire harness side as shown in the chart below.

Test Conditions:

- (1) Ignition switch: ON
- (2) Air conditioning switch: ON
- (3) Temperature control lever: MAX. COOL
- (4) Blower switch: HI

Terminal No.	Signal	Conditions	Terminal voltage
1	Air conditioning output	When all conditions for the compressor to turn on are satisfied	Battery positive voltage
3	Air conditioning switch: A/C	Air conditioning switch: A/C	Battery positive voltage
4	Air inlet sensor (+)	Ignition switch, blower switch and air conditioning switch: ON	5.5 V
5	Air conditioning switch: ECONO or A/C	Air conditioning switch: ECONO or A/C	Battery positive voltage
6	Lever position switch	At all times	0 V
7	Air conditioning control unit ground	At all times	0 V
8	Intake air temperature sensor (-)	Terminals (10)-(8) [when the temperature of evaporator outlet portion is 25°C (37°F)]	3.6 V
9	Air inlet sensor (-)	Terminals (4)-(9) [when the temperature of evaporator inlet portion is 25°C (77°F)]	1.5 V
10	Intake air temperature sensor (+)	Ignition switch, blower switch and air conditioning switch: ON	5.5 V

SAFETY PRECAUTIONS

<Vehicles using R-12>

R-12 refrigerant is a chlorofluorocarbon (CFC) that can contribute to the depletion of the ozone layer in the upper atmosphere.

Ozone filters out harmful radiation from the sun. To assist in protecting the ozone layer, Mitsubishi Motor Sales of America recommends that a R-12 refrigerant recycling device that meets SAE standard J1991 be used.

Contact an automotive service equipment supplier for refrigerant recycling equipment that is available in your area.

The refrigerant used in all air conditioning is R-12. It is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of -29.8°C (-21.7°F) at atmospheric pressure, it will be a vapor at all normal temperatures and pressures. The vapor is heavier than air, nonflammable and nonexplosive. It is nonpoisonous except when it is in direct contact with an open flame. It is noncorrosive except when combined with water. The following precautions must be observed when handling R-12.

Caution

Wear safety goggles when servicing the refrigeration system.

R-12 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 air conditioning 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 it out. R-12 is rapidly absorbed by the oil. Next, splash the eyes with plenty of cold water. Call your doctor immediately even if irritation has ceased after treatment.

Caution

Do not heat R-12 above 52°C (125.6°F).

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 which is not over 52°C (125.6°F) is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that could raise the temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

Caution

Keep R-12 containers upright when charging the system.

When metering R-12 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

Always work in a well-ventilated room.

Good ventilation is vital in the working area. Although R-12 vapor is normally nonpoisonous, contact with an open flame can cause the vapor to become very poisonous.

A poisonous gas is produced when using the flame-type leak detector. Avoid inhaling the fumes from the leak detector.

Caution

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.

<Vehicles using R-134a>

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 Sales of America recommends an R-134a refrigerant recycling device.

Refrigerant R-134a is transparent and colorless in both the liquid and vapor state. Since it has a boiling point of -29.8°C (-21.7°F), at atmospheric pressure, it will be a vapor at all normal temperatures and pressures. The vapor 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 air conditioning 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 it out. R-134a is rapidly absorbed by the oil. Next splash the eyes with plenty of cold water. Call your doctor immediately even if irritation has ceased after treatment.

Caution

Do not heat R-134a above 40°C (104°F).

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 (104°F) is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that could raise the temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

Caution

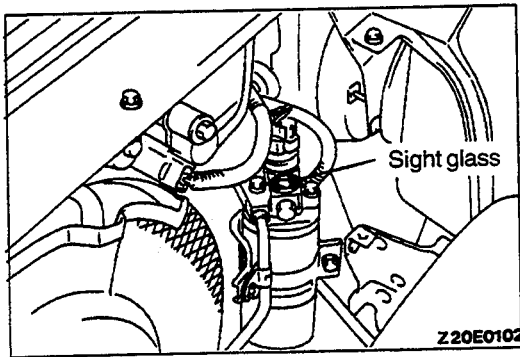
Keep R-134a containers upright when charging the system.

When metering R-134a into the refrigeration system, keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

Caution

1. **The leak detector for R-134a should be used to check for refrigerant gas leaks.**
2. **Do not allow liquid refrigerant to touch bright metal.**

Refrigerant will tarnish bright metal and chrome surfaces, and in combination with moisture can severely corrode all metal surfaces.



SERVICE ADJUSTMENT PROCEDURES

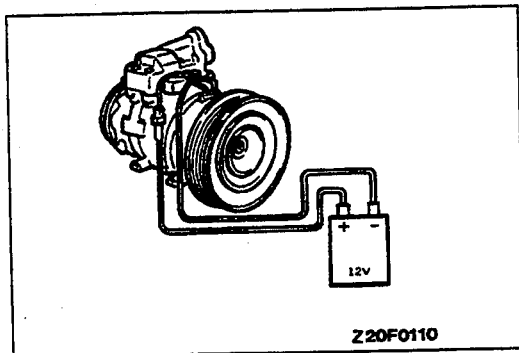
TEST PROCEDURES

110005280

SIGHT GLASS REFRIGERANT LEVEL TEST

The sight glass is a refrigerant level indicator. To check the refrigerant level, clean the sight glass and start the vehicle engine. Push the air conditioning 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 charged with some refrigerant.



MAGNETIC CLUTCH

- (1) Disconnect the wiring to the magnetic clutch.
- (2) Connect the positive battery terminal directly to the wiring 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

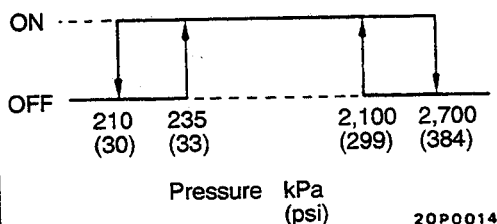
To Test the Receiver Drier

- (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 blocked. Replace the receiver drier.

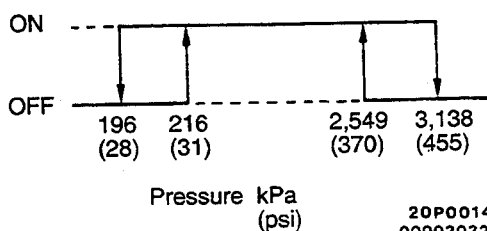
DUAL PRESSURE SWITCH (LOW PRESSURE SWITCH)

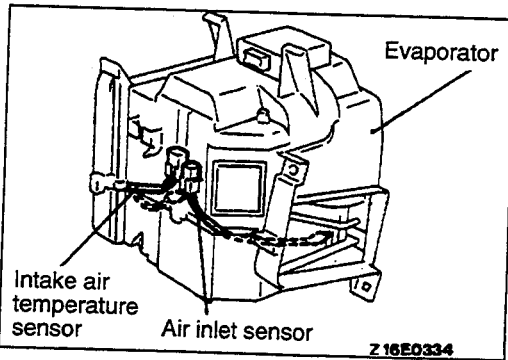
- (1) Turn back the adaptor valve handle all the way and install it to the low pressure side service valve.
- (2) With the gage manifold low pressure service valves closed, connect the gage manifold high pressure side charging hose to the adaptor valve.
- (3) Tighten the adaptor valve handle and open the service valve.
- (4) If there is continuity between the dual pressure switch terminals when the low pressure side pressure is at the level shown in the illustration at left when the dual pressure switch is on, the switch is functioning normally. If not, replace the switch.

Dual pressure switch <Vehicles using R-12>



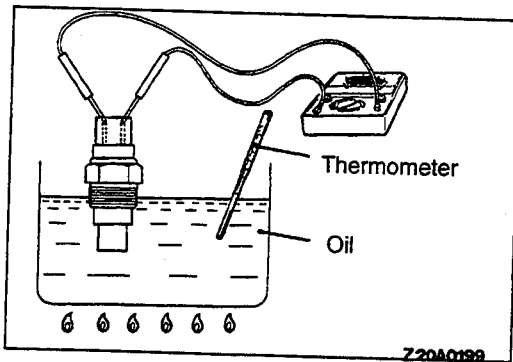
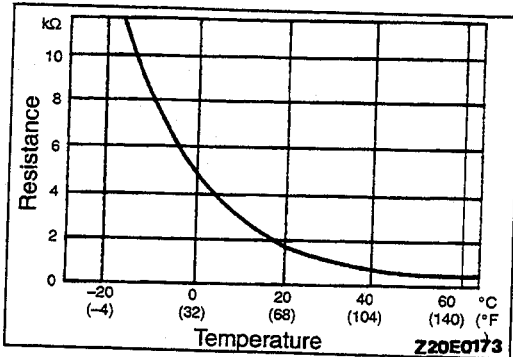
<Vehicles using R-134a>





INTAKE AIR TEMPERATURE SENSOR AND AIR INLET SENSOR

- (1) Disconnect the sensors connector at the evaporator case and then use an ohmmeter to measure the resistance. If the resistance is within 10% of the value on the characteristic curve, the sensor is functioning normally.
- (2) If the sensor is normal, there is a malfunction of the air conditioning control unit, and it should be replaced.



AIR CONDITIONING ENGINE COOLANT TEMPERATURE SWITCH

- (1) Dip the air conditioning engine coolant temperature switch in oil and heat the oil with a gas burner or similar item.
- (2) When the oil temperature reaches the standard value, check that there is no continuity between the switch terminals.

Standard value: 112–118°C (234–244°F)

COMPRESSOR DRIVE BELT ADJUSTMENT 110005281

Refer to GROUP 11 – Service Adjustment Procedures.

CHARGING <Vehicles using R-12>

110005282

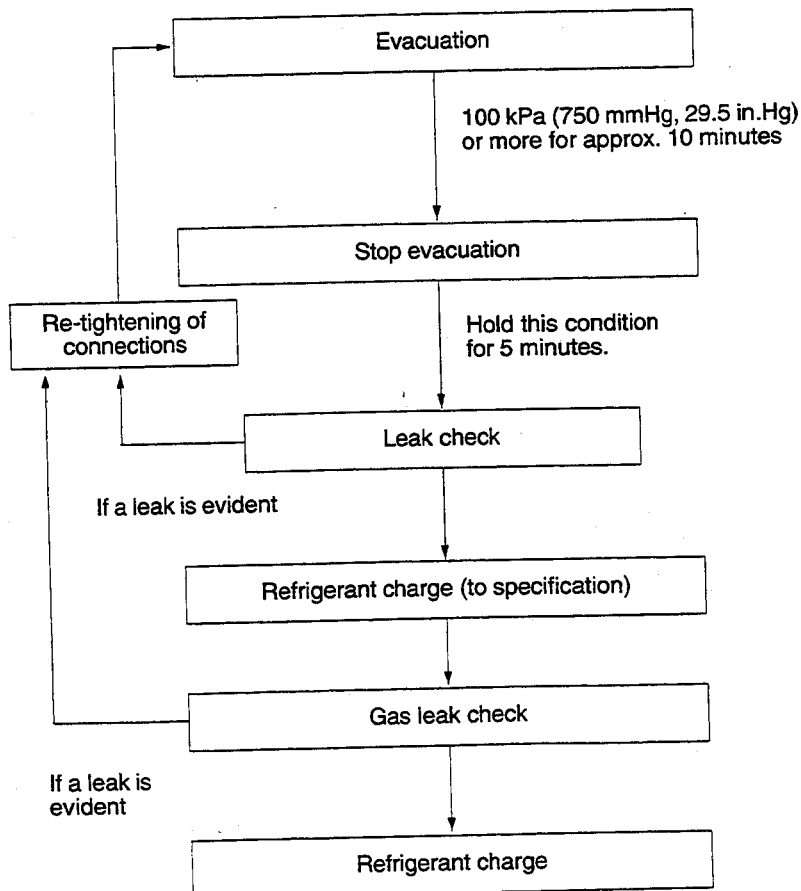
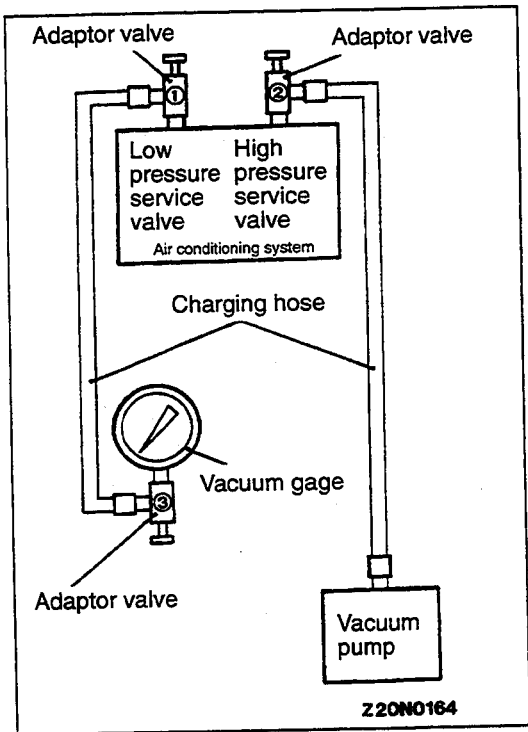
CHARGING THE SYSTEM

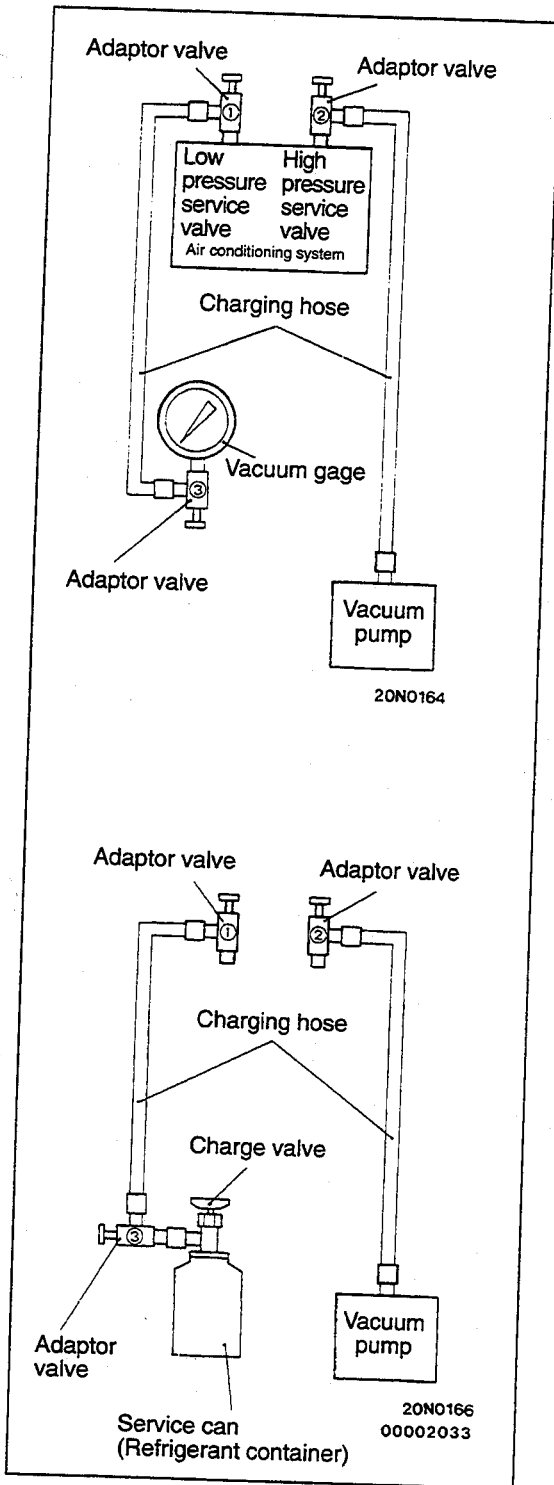
- (1) With the handle of adaptor valves 1 and 2 turned back all the way (valve closed), install adaptor valves 1 and 2 to each high and low pressure service valve.

NOTE

The high and low pressure service valves are attached to the compressor.

- (2) Tighten the handle of adaptor valves 1 and 2 (valve open).
- (3) Connect the charging hose to adaptor valves 1 and 2.
- (4) With the handle of adaptor valve 3 tightened (valve open), install adaptor valve 3 to the low pressure charging hose.
- (5) Install the vacuum gage to adaptor valve 3.
- (6) Install the vacuum pump to the high pressure charging hose.





- (7) Start up the vacuum pump.
- (8) Evacuate to a vacuum reading of 100 kPa (29.5 in.Hg) or higher (takes approx. 10 minutes).

Caution

The vacuum reading should always be made with the vacuum gage in an upright position, otherwise the reading will be erratic.

- (9) Turn the handle of adaptor valve 2 back all the way (valve closed).
- (10) Stop the vacuum pump and allow to stand for 5 minutes.
- (11) Check for leaks. (Good if the vacuum is held.)
- (12) With the handle of the charge valve turned back all the way (valve open), install the charge valve.
- (13) With the handle of adaptor valve 3 turned back all the way (valve closed), remove the vacuum gage and install the service can.
- (14) Tighten the handle of the charge valve (valve closed) to puncture the service can.
- (15) Turn the handle of charge valve back (valve open) and tighten the handle of adaptor valve 3 (valve open) to charge the system with refrigerant.
- (16) If the refrigerant is not drawn in, turn the handle of adaptor valve 1 back all the way (valve closed).
- (17) Use a leak detector to check for gas leaks.
- (18) Start the engine.
- (19) Operate the air conditioning and set it to the lowest temperature (MAX. COOL).
- (20) Fix the engine speed at 1,500 r/min.
- (21) Tighten the handle of adaptor valve 1 fully (valve open) to charge the required volume of refrigerant.

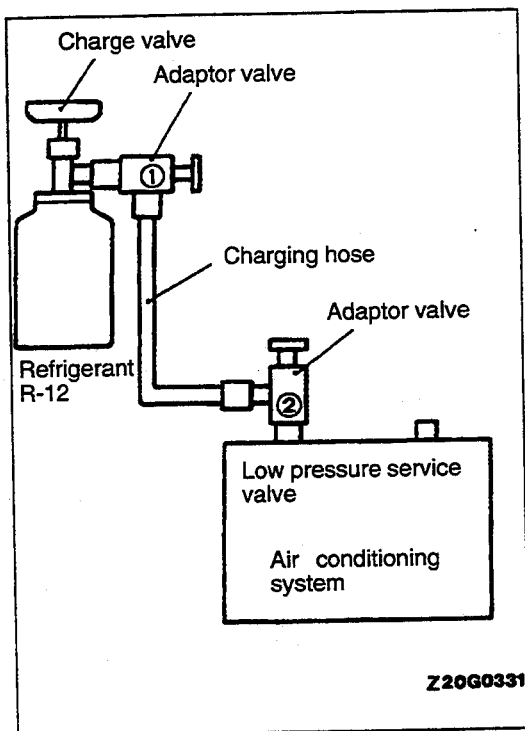
Caution

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.

- (22) After charging with refrigerant, turn the handle of adaptor valve 1 back all the way (valve closed).
- (23) Tighten the charge valve handle (valve closed).
- (24) Remove adaptor valves 1 and 2 from the high and low pressure service valves.
- (25) Remove the service can.

NOTE

If the service can is not emptied completely, keep the charge valve and adaptor valve 1 and 3 closed for the next charging.



CORRECTING LOW REFRIGERANT LEVEL

When the service can is used

- (1) Install the charge valve to the service can with its handle turned back all the way (valve open).
- (2) Install to the charge valve with adaptor valve 1 tightened (valve open).
- (3) Install the charging hose to adaptor valve 1.
- (4) Turn back the handle of adaptor valve 2 all the way (valve closed) to install the charging hose.
- (5) Tighten the handle of charge valve (valve closed) to puncture the service can.
- (6) Turn back the handle of the charge valve all the way to open the valve (valve open), operate the handle of adaptor valve 2 to remove the air.
- (7) Install adaptor valve 2 to the low pressure side service valve.

Caution

Never use the high pressure side as this may cause refrigerant to flow back, causing rupturing of the service can and charging hose.

- (8) Start the engine.
- (9) Operate the air conditioning and set it to the lowest temperature (MAX. COOL).
- (10) Fix the engine speed at 1,500 r/min.
- (11) Tighten the handle of adaptor valve 2 (valve open) and charge refrigerant checking level with the sight glass.
- (12) After working, make certain that the handle of adaptor valve 2 is turned back all the way (valve closed) and then remove adaptor valve 2.

NOTE

If the service can is not emptied completely, keep the charge valve and adaptor valve 1 and 2 closed for the next charging.

When the refrigerant recovery and recycling unit is used

Use a refrigerant recycling unit to charge the refrigerant.

NOTE

Refer to the refrigerant recovery and recycling unit instruction manual for operation of the unit.

DISCHARGING THE SYSTEM

Use the refrigerant recovery unit to discharge refrigerant gas from the system.

NOTE

Refer to the refrigerant recovery and recycling unit instruction manual for operation of the unit.

SUPPLYING OF OIL IN THE AIR CONDITIONING SYSTEM

Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.

When a 10PA15 compressor is installed at the factory, it contains 80 cm³ (2.7 fl.oz.) of refrigerant oil. 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: DENSO OIL 6

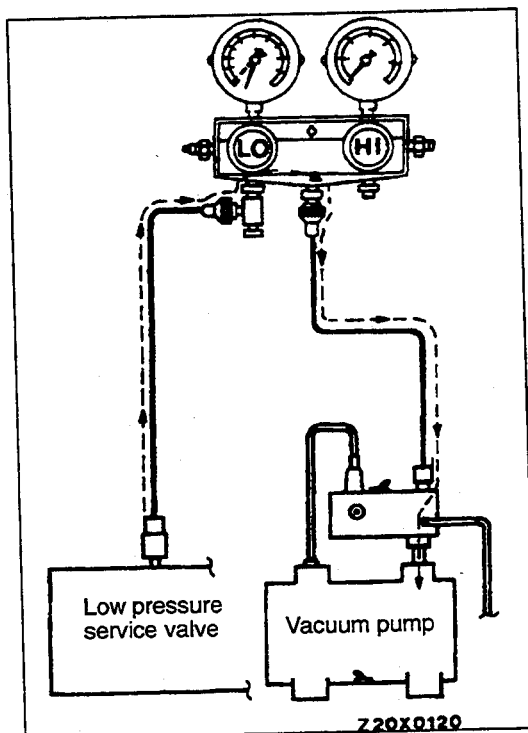
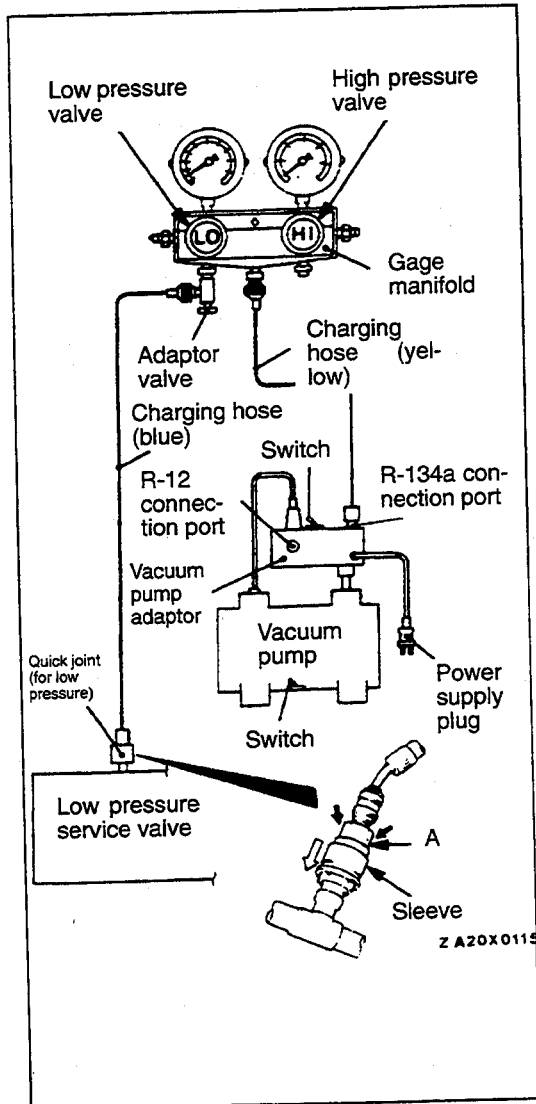
Quantity

Condenser: 30 cm³ (1.0 fl.oz.)

Evaporator: 60 cm³ (2.0 fl.oz.)

Suction hose: 10 cm³ (.3 fl.oz.)

Receiver: 10 cm³ (.3 fl.oz.)

**CHARGING <Vehicles using R-134a>**

110005283

1. With the handles turned back all the way (valves closed), install the adaptor valve to the low-pressure side of the gage 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 compressor.

Caution

1. Use tools that are designed for R-134a.
2. 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.
5. Close the high and low pressure valves of the gage 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 gage 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 air conditioning compressor to carry out evacuation.

13. Evacuate to a vacuum reading of 100 kPa (29.5 in.Hg) or higher (takes approx. 10 minutes).
14. Turn the vacuum pump adaptor switch OFF and allow to stand it for 5 minutes.

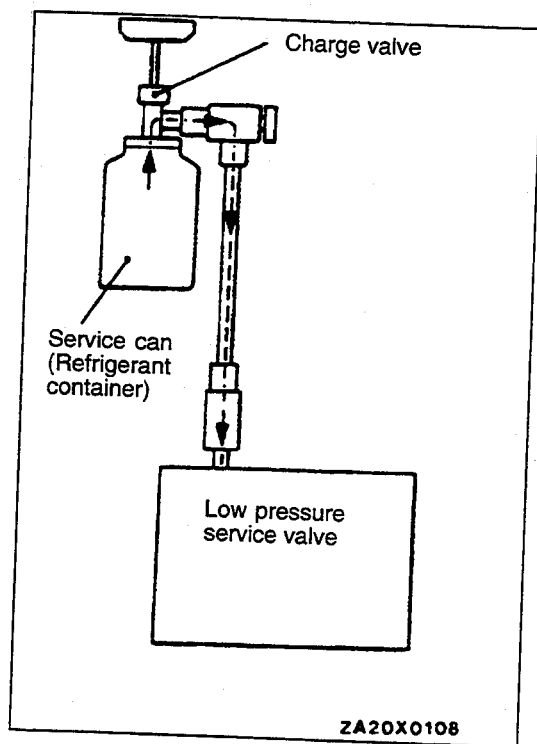
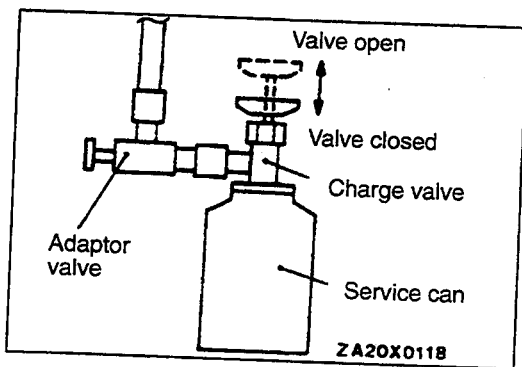
Caution

Do not operate the compressor in the vacuum condition, as damage may occur.

15. Carry out a leak test. (Good if the negative pressure does not drop.)

Caution

If the negative pressure is lost, check for loose connections. Then, repeat the evacuation procedure from step 12. If the negative pressure is still lost, add 1 lb of refrigerant and then use an R-134a compatible leak detector to check the system.



16. With the handle turned back all the way (valve open), install the charge valve to the service can.
17. Turn the handle of the adaptor valve back all the way (valve closed), remove it from the gage manifold and install the service can.
18. Tighten the handle of the charge valve (valve closed) to puncture the service can.

19. Turn the handle of the charge 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. Use a leak detector to check for gas leaks. If a gas leak is detected, re-tighten the connections, and then repeat the charging procedure from evacuation in step (12).

Caution

A leak detector designed for R-134a should be used.

22. Start the engine.
23. Operate the air conditioning and set it 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.

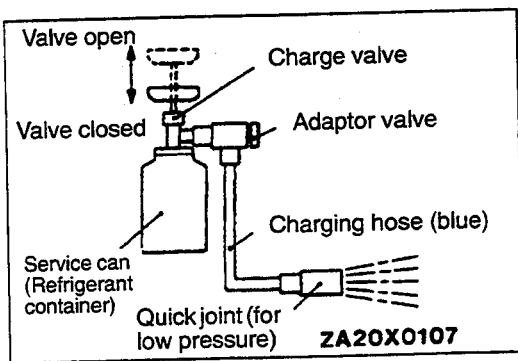
Caution

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 charge valve handle (valved closed). Disconnect 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 charge valve and adaptor valve closed for the next charging.



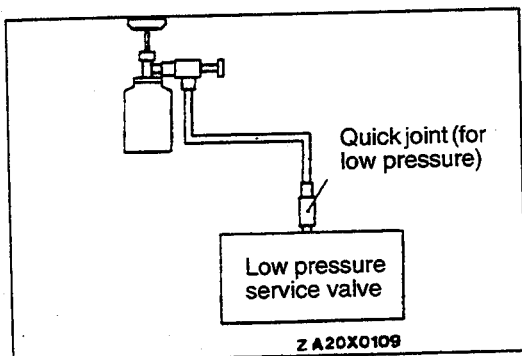
CORRECTING LOW REFRIGERANT LEVEL WHEN THE SERVICE CAN IS USED

1. Install the charge valve with the handle turned all the way out (valve open) of the service can.
2. Install the adaptor valve with the handle turned all the way back (valve closed) to the charge 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 closed), and pierce the service can.
6. Turn the handle of the adaptor valve to bleed the air.

7. Connect the quick joint (for low pressure) to the low pressure service valve.

NOTE

The low-pressure service valve should be connected to the compressor.



8. Start the engine.
9. Operate the air conditioning and set it to the lowest temperature (MAX. COOL).
10. Fix the engine speed at 1,500 r/min.
11. Tighten the handle of the adaptor valve (valve open), and replenish refrigerant while checking the quantity through the sight glass.

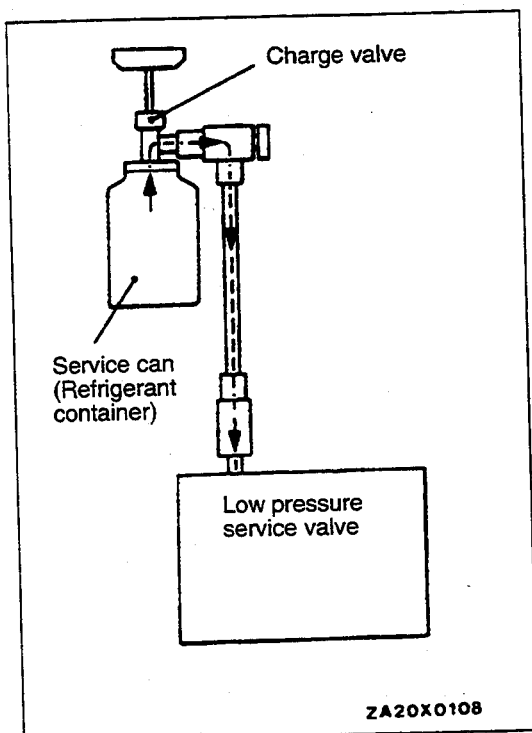
Caution

If the service can is inverted, liquid refrigerant may be drawn into the compressor, damaging it by liquid compression. Keep the service can upright to ensure that refrigerant is charged in gas state.

12. After replenishing is completed, turn the handle of the adaptor valve all the way back (valve closed), and disconnect the quick joint.

NOTE

If any refrigerant is remaining in the service can, close the adaptor valve and save the refrigerant for another vehicle. Do not release into the atmosphere.



METHOD USING A REFRIGERANT RECOVERY AND RECYCLING UNIT

Use the refrigerant recovery and recycling unit to refill with refrigerant.

NOTE

Refer to the refrigerant recovery and recycling unit instruction manual for operation of the unit.

DISCHARGING THE SYSTEM

Use the refrigerant recovery unit to discharge refrigerant gas from the system.

NOTE

Refer to the refrigerant recovery and recycling unit instruction manual for operation of the unit.

SUPPLYING OF OIL IN THE AIR CONDITIONING SYSTEM

Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.

When a 10PA15 compressor is installed at the factory, it contains 80 cm³ (2.7 fl.oz.) of refrigerant oil. 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: ND-OIL 8

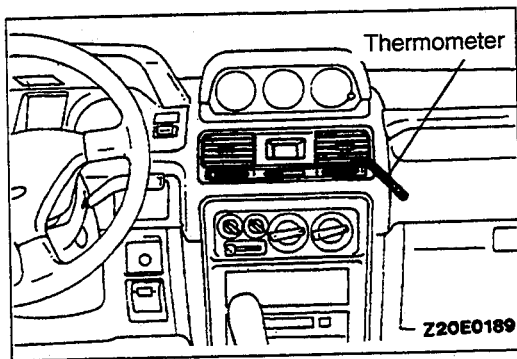
Quantity:

Evaporator: 40 cm³ (1.4 fl.oz.)

Condenser: 40 cm³ (1.4 fl.oz.)

Suction hose: 10 cm³ (.3 fl.oz.)

Receiver: 10 cm³ (.3 fl.oz.)

**PERFORMANCE TEST****<Vehicles using R-12>**

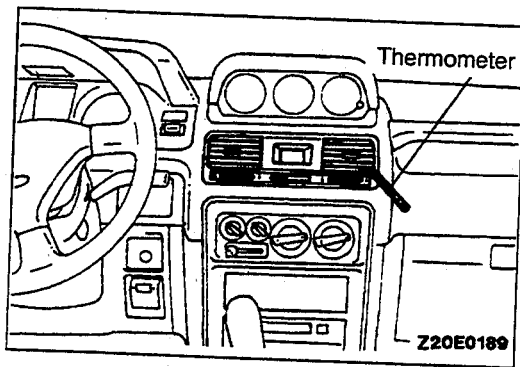
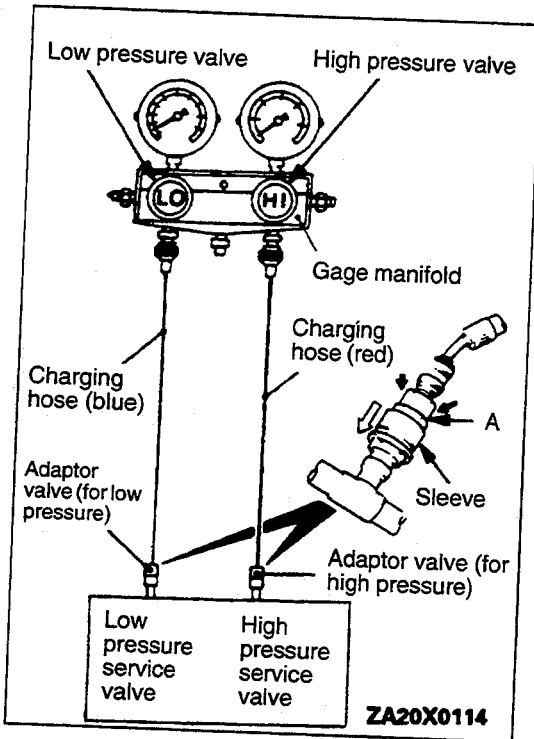
- (1) The vehicle to be tested should be in a place that is not in direct sunlight.
- (2) Connect a tachometer.
- (3) Turn back the handle of the adaptor valve (valve closed) and install the adaptor valves to the high pressure and low pressure service valves.
- (4) Connect the gage manifold to the adaptor valves.
- (5) Tighten the handle of the adaptor valves (valve open).
- (6) Start the engine.
- (7) Set the air conditioning controls as follows:
 Air conditioning switch: A/C – ON
 Mode selection: Face position
 Temperature control lever: MAX. COOL
 Air selection: Recirculation position
 Blower switch: HI (Fast) position
- (8) Adjust the engine speed to 1,000 r/min with the air conditioning compressor clutch engaged.
- (9) Engine should be warmed up with doors and windows closed and the hood open.
- (10) Insert a thermometer into the center air conditioning outlet and run the engine for 20 minutes.
- (11) Note the discharge air temperature.

NOTE

If the clutch cycles, take the reading before the clutch disengages.

Performance Temperature Chart

Garage ambient temperature °C (°F)	21 (70)	26.7 (80)	32.2 (90)	37.8 (100)	43.3 (110)
Discharge air temperature °C (°F)	3.0–6.0 (37.4–42.8)	3.0–7.0 (37.4–44.6)	3.5–7.5 (38.3–45.5)	4.0–8.0 (39.2–46.4)	4.5–8.5 (40.1–47.3)
Compressor discharge pressure kPa (psi)	980–1,230 (139.4–174.9)	1,050–1,300 (149.3–184.9)	1,130–1,380 (160.7–196.3)	1,270–1,580 (180.6–224.7)	1,330–1,740 (189.2–247.5)
Compressor suction pressure kPa (psi)	120–220 (17.1–31.3)	120–230 (17.1–32.7)	130–240 (18.5–34.1)	150–270 (21.3–38.4)	170–280 (24.2–39.8)



<Vehicles using R-134a>

- (1) The vehicles to be tested should be in a place that is not in direct sunlight.
- (2) Close the high and low pressure valves of the gage 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 gage manifold.
- (4) Connect 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 should be connected to the receiver and 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) Start the engine.
- (7) Set the air conditioning controls as follows:
 Air conditioning switch: A/C – ON position
 Mode selection: Face position
 Temperature control lever: MAX. COOL
 Air selection: Recirculation position
 Blower switch: HI (Fast) position
- (8) Adjust the engine speed to 1,000 r/min with the air conditioning compressor clutch engaged.
- (9) The engine should be warmed up with doors and windows closed.
- (10) Insert a thermometer into the center air conditioning outlet and run the engine for 20 minutes.
- (11) Note the discharge air temperature.

NOTE

If the clutch cycles, take the reading before the clutch disengages.

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Compressor discharge pressure kPa (psi)	961–1,402 (139–203)	1,029–1,471 (149–213)	1,108–1,549 (161–225)	1,245–1,745 (181–253)	1,304–1,902 (189–276)
Compressor suction pressure kPa (psi)	98–216 (14–31)	98–226 (14–33)	108–235 (16–34)	137–265 (20–38)	157–275 (23–40)

REFRIGERANT LEAK REPAIR PROCEDURE¹¹⁰⁰⁰⁵²⁸⁵**Lost Charge**

If the system has lost all charge due to a leak:

- (1) Evacuate the system. (Refer to the evacuation procedure.)
- (2) Charge the system with approximately one pound of refrigerant.
- (3) Check for leaks.
- (4) Discharge the system.
- (5) Repair the leaks.
- (6) Replace the 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 the 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 the low refrigerant level.

HANDLING TUBING AND FITTINGS¹¹⁰⁰⁰⁵²⁸⁶

Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed. The system must be completely discharged before opening any fitting or connection in the refrigeration system. Open fittings with caution even after the system has been discharged. If any pressure is noticed as a fitting is loosened, allow trapped pressure to bleed off very slowly.

Never attempt to re-bend formed lines to fit. Use the correct line for the installation you are servicing. A good rule for the flexible hose lines is keep the radius of all bends at least 10 times the diameter of the hose. Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so that they are at least 80 mm (3 in.) 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. Use the same type of O-rings in all plumbing connections. These O-rings are not reusable.

COMPRESSOR NOISE

110005287

When investigating an air conditioning related noise, you must first know the conditions when the noise occurs. These conditions are weather, vehicle speed, in gear or in neutral, engine temperature or any other special conditions. Noises that develop during air conditioning 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. Check the accessory drive belt tension (power steering, generator or air pump). 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 inside the compressor.

Adjustment Procedures

- (1) Select a quiet area for testing. Duplicate conditions as much as possible. Switch the compressor on and off several times to clearly identify the compressor noise.

To duplicate high ambient conditions (high head pressure), restrict air-flow through condenser. Install manifold gage set to make sure discharge pressure does not exceed 2,070 kPa (300 psi).

- (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 the refrigerant hoses for rubbing or interference that could cause abnormal noise.
- (4) Check the refrigerant amount. (Refer to "Charging the System.")
- (5) Recheck the compressor noise by the same procedure as given in step 1.
- (6) If noise still exists, loosen the compressor mounting bolts and re-tighten to the specified torque. Repeat step 1.
- (7) If noise continues, replace the compressor and repeat step 1.

POWER RELAY CHECK

110005288

- (1) Remove the condenser fan motor relay and compressor relay from the relay box at the left of the engine compartment.
- (2) Use an ohmmeter to check for continuity between the terminals.

IDLE-UP OPERATION CHECK

110005289

- (1) Before inspection, set the vehicle to the following condition:
 - Engine coolant temperature: 80–90°C (176–194°F)
 - Lights and all accessories: OFF
 - Transmission: Neutral (N or P for vehicles with A/T)
 - Steering wheel: Straight forward position
- (2) Check that the idling speed is at the standard value.

Standard value: 700±100 r/min.**NOTE**

There is no necessity to make an adjustment, because the idling speed is automatically adjusted by the idle air control (IAC) system. If, however, there occurs a deviation from the standard value for some reason, check the Idle Air Control (IAC) system.

- (3) Check that the idling speed becomes the standard value when the air conditioning switch is switched on and the air conditioning is activated.

Standard value: 900±100 r/min.**NOTE**

There is no necessity to make an adjustment, because the idling speed is automatically adjusted by the Idle Air Control (IAC) system. If however, there occurs a deviation from the standard value for some reason, check the Idle Air Control (IAC) system.

AIR CONDITIONING SWITCH

110005290

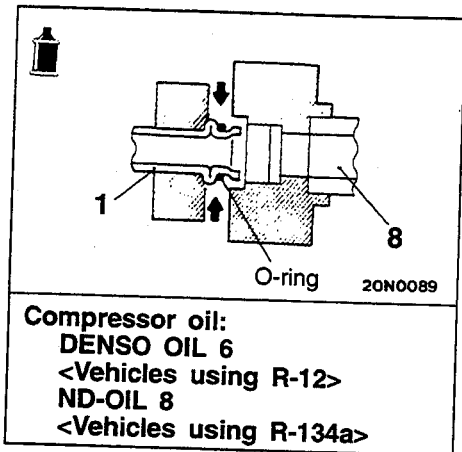
Refer to Heater Control Assembly for the removal, installation and inspection procedures for the air conditioning switch.

EVAPORATOR

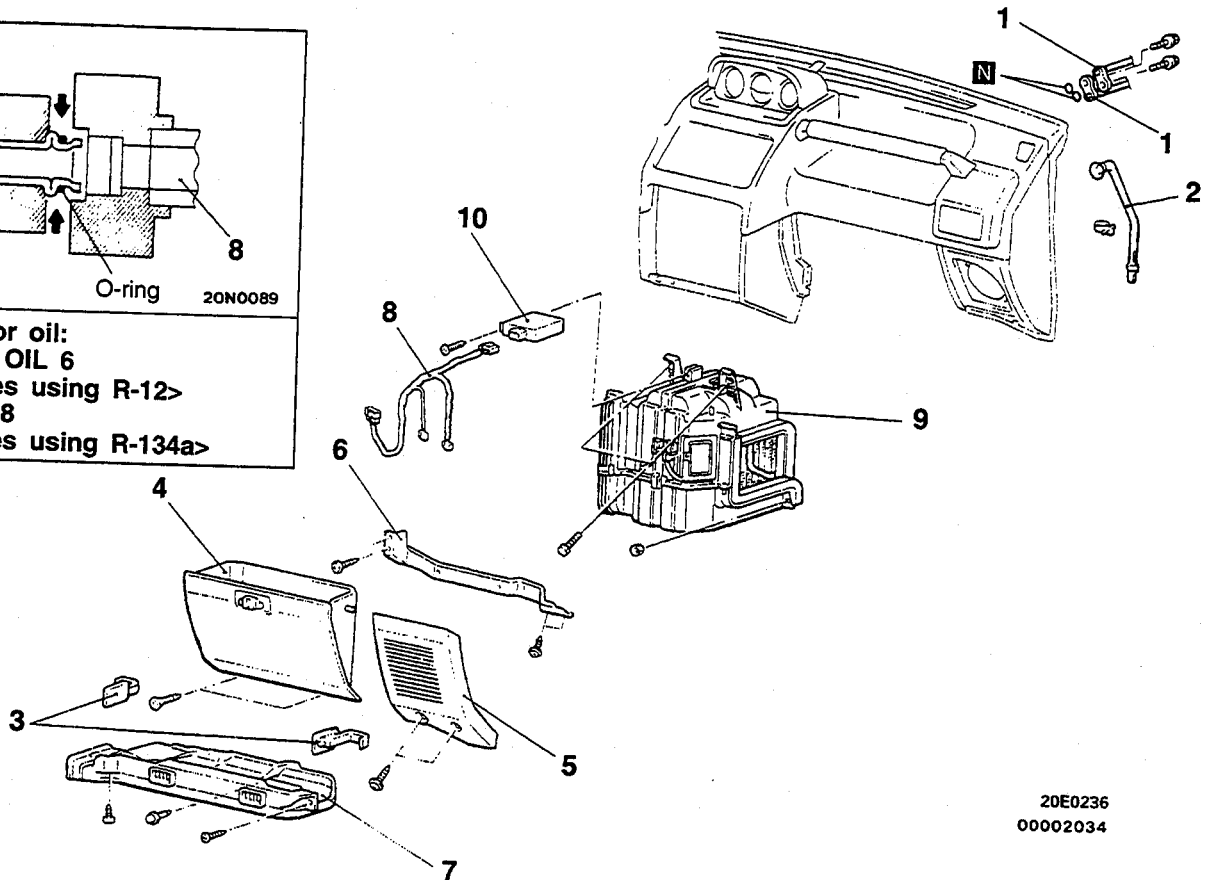
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations

- Refrigerant Discharging and Charging
(Refer to P.55-20, 22. <Vehicles using R-12>
Refer to P.55-24, 27. <Vehicles using R-134a>)



Compressor oil:
DENSO OIL 6
<Vehicles using R-12>
ND-OIL 8
<Vehicles using R-134a>



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00002034

Removal steps

1. High pressure pipe/low pressure hose connection
2. Drain hose
3. Stopper
4. Glove box
5. Speaker garnish

6. Lower frame
7. Foot shower duct (R.H.)
8. Air conditioning wiring harness
9. Front evaporator
10. Air conditioning control unit



INSPECTION

- Check for damage to the evaporator fin part.
- Check for damage or collapse of the drain hose.
- Check for peeling or cracking of the insulator.

INSTALLATION SERVICE POINTS

▶◀ EVAPORATOR INSTALLATION

When replacing the evaporator with new one, refill the evaporator with a specified amount of compressor oil and install it to the vehicle.

<Vehicles using R-12>

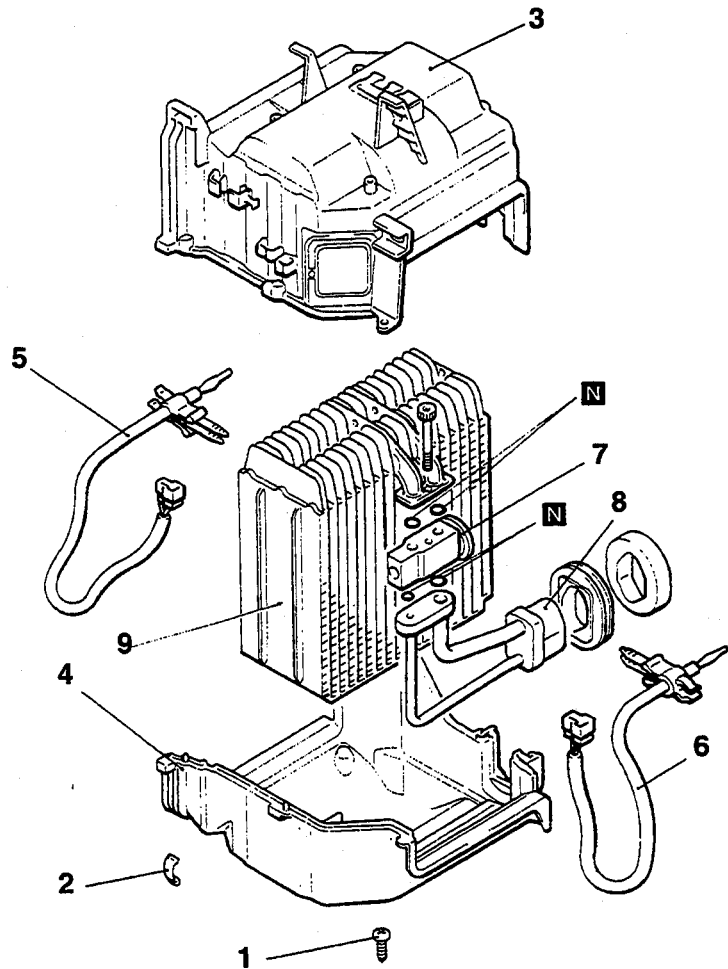
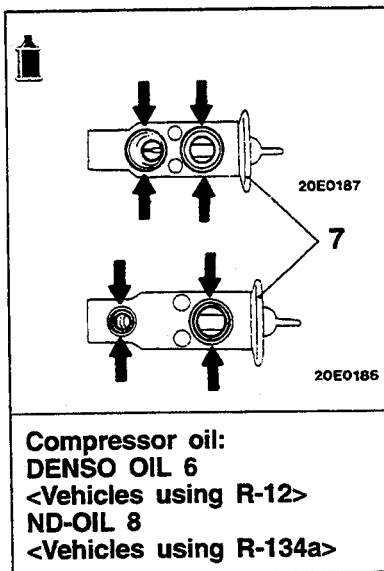
Compressor oil: DENSO OIL 6
Quantity: 60 cm³ (2.0 fl.oz.)

<Vehicles using R-134a>

Compressor oil: ND-OIL 8
Quantity: 40 cm³ (1.4 fl.oz.)

DISASSEMBLY AND REASSEMBLY

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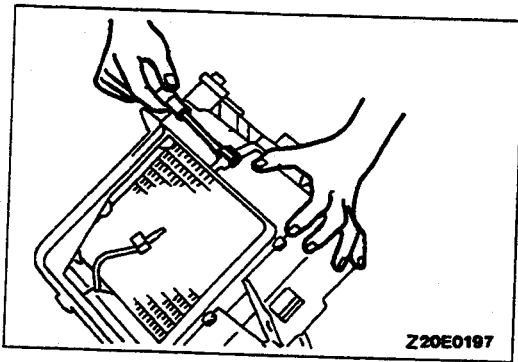


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00002035

Disassembly steps

1. Screw
2. Clip
3. Evaporator case (upper)
4. Evaporator case (lower)
5. Air thermo sensor

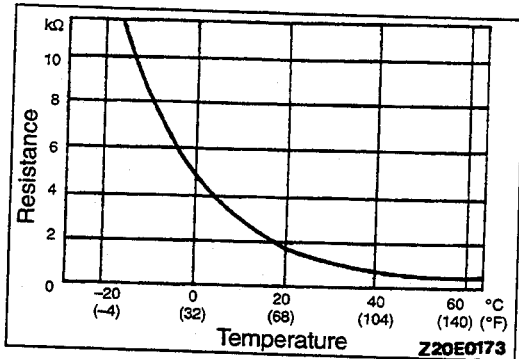
6. Air inlet sensor
7. Expansion valve
8. Low pressure/high pressure pipe
9. Evaporator



DISASSEMBLY SERVICE POINT

◀▶ CLIPS REMOVAL

Remove the clips with a flat-tip screwdriver covered with a shop towel to prevent damage to case surfaces.



INSPECTION

INTAKE AIR TEMPERATURE SENSOR AND AIR INLET SENSOR

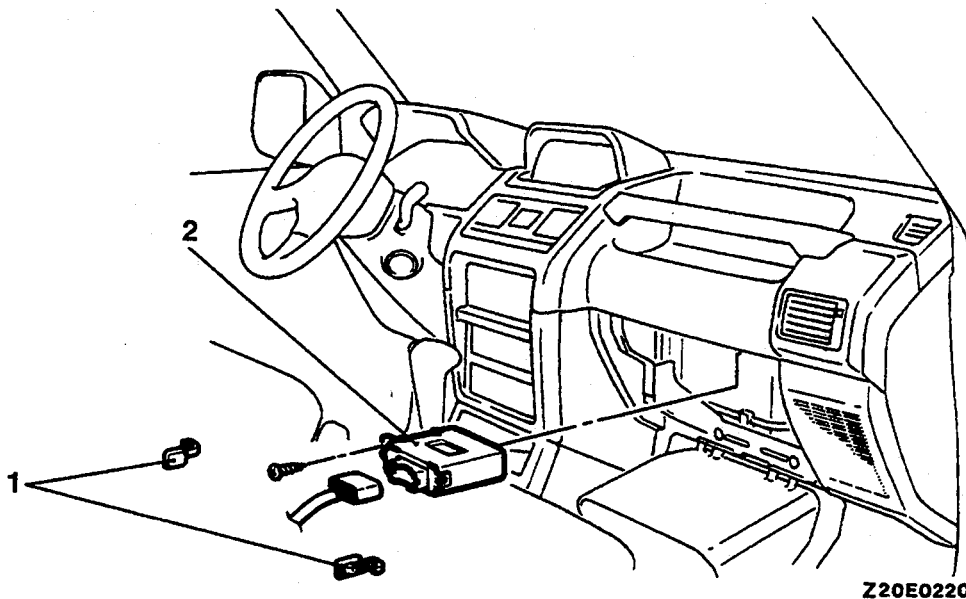
When the resistance value between the sensor terminals is measured under two or more temperature conditions, the resistance value should be close to the values shown in the graph.

NOTE

The temperature conditions when testing should not exceed the range of the characteristic curve in the graph.

**AIR CONDITIONING CONTROL UNIT
REMOVAL AND INSTALLATION**

110005293



Removal steps

1. Stopper
2. Air conditioning control unit

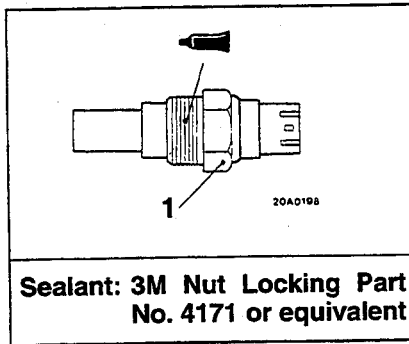
AIR CONDITIONING ENGINE COOLANT TEMPERATURE SWITCH

110005294

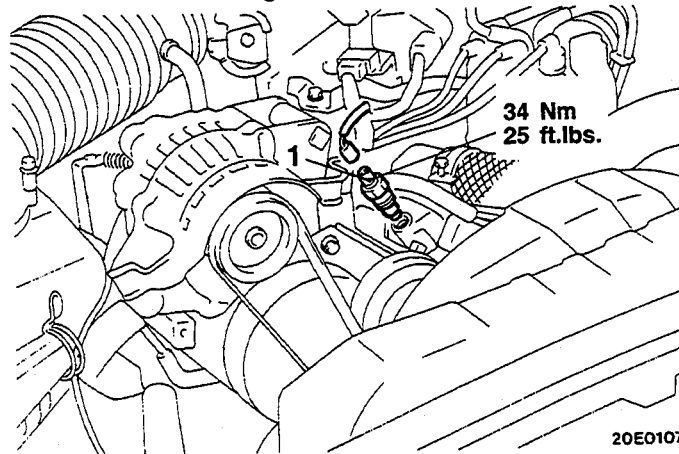
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

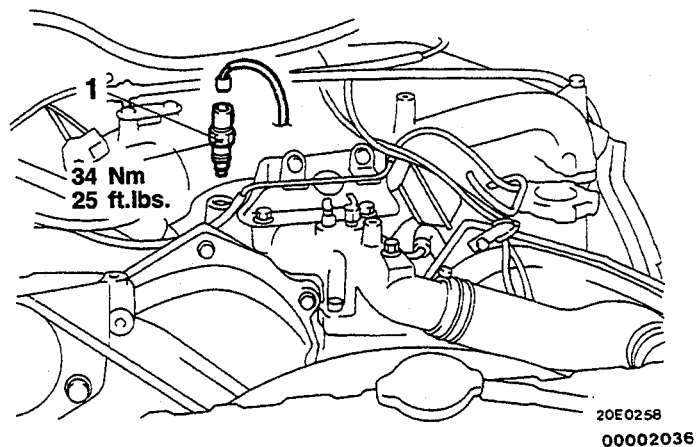
- Engine Coolant Draining and Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)



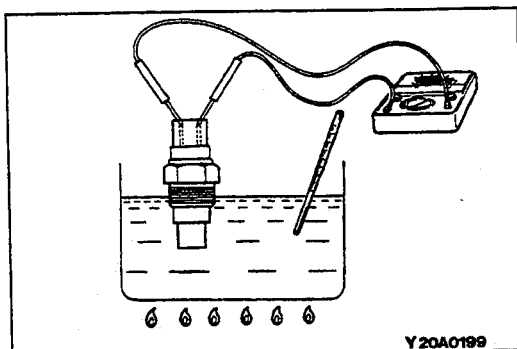
<3.0L-12VALVE engine>



<3.5L engine – Up to 1994 models>



1. Air conditioning engine coolant temperature switch



INSPECTION

AIR CONDITIONING ENGINE COOLANT TEMPERATURE SWITCH

- (1) Dip the air conditioning engine coolant temperature switch in oil and heat the oil with a gas burner or similar item.
- (2) When the oil temperature reaches the standard value, check that there is no continuity between the switch terminals.

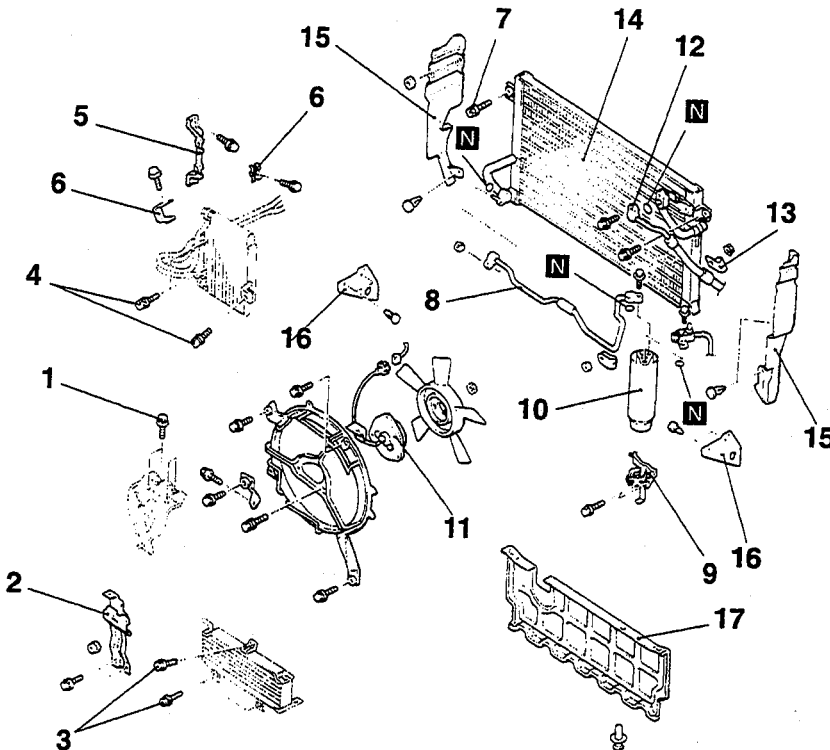
Standard valve: 112–118°C (233–244°F) or more

CONDENSER AND CONDENSER FAN MOTOR

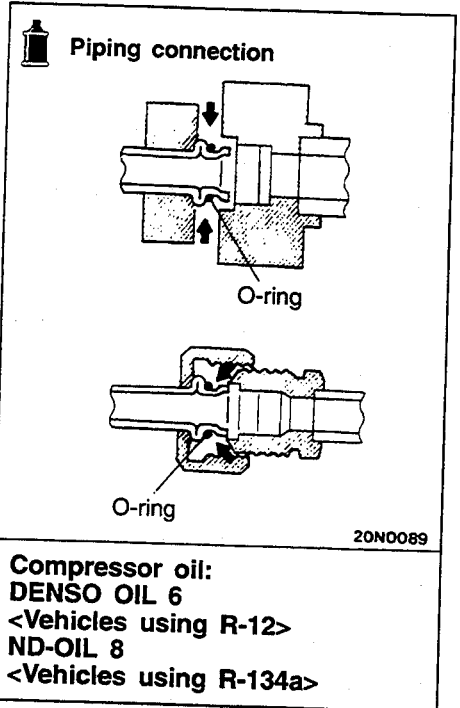
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation

- Refrigerant Discharging and Charging (Refer to P.55-20, 22 <Vehicles using R-12>) (Refer to P.55-24,27 <Vehicles using R-134a>)
- Radiator Grille Removal and Installation



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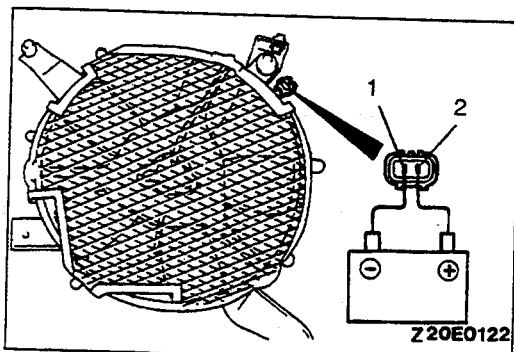


20N0089

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Removal steps

1. Hood latch bracket assembly mounting bolt
2. Hood latch stay
3. Transmission oil cooler mounting bolt <A/T>
4. Engine oil cooler mounting bolt
5. Engine oil cooler bracket
6. Bracket
7. Condenser mounting bolt
8. High pressure pipe A
9. Receiver bracket
10. Receiver
11. Condenser fan motor
12. Connection for high pressure hose
13. High pressure hose bracket
14. Condenser
15. Headlight side seal
16. Frame side seal
17. Under seal



Z20E0122

INSPECTION

- Check the condenser fan for crushing or other damage.
- Check the condenser's high-pressure hose and pipe installation parts for damage or deformation.
- Check the condenser fan shroud for damage.

INSPECTION OF CONDENSER FAN MOTOR

When battery voltage is applied to the terminal (2) and terminal (1) is earthed, check that the condenser fan motor turns.

TSB Revision

INSTALLATION SERVICE POINTS

▶A◀ CONDENSER INSTALLATION

When replacing the condenser with a new one, refill the condenser with a specified amount of compressor oil and install it (to the vehicle).

<Vehicles using R-12>

Compressor oil: **DENSO OIL 6**
Quantity: 30 cm³ (1.0 fl.oz.)

<Vehicles using R-134a>

Compressor oil: **ND-OIL 8**
Quantity: 40 cm³ (1.4 fl.oz.)

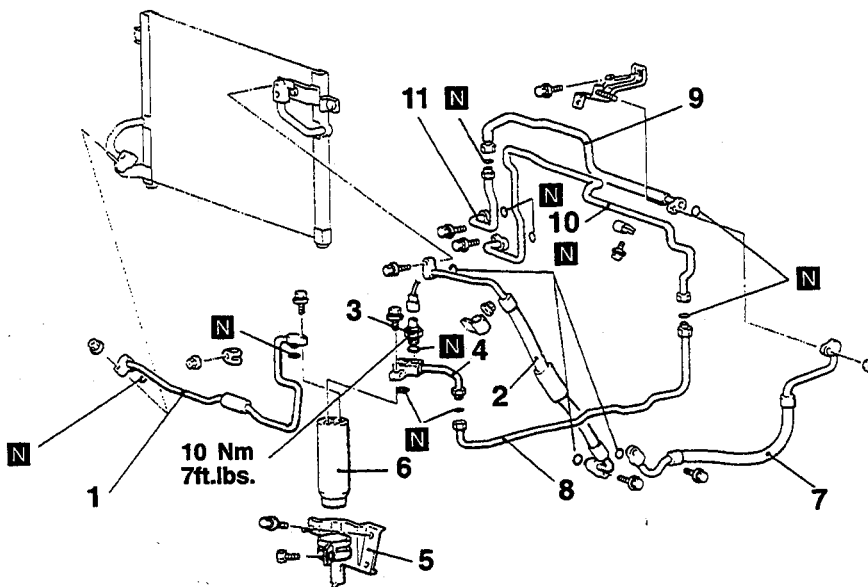
REFRIGERANT LINE

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REMOVAL AND INSTALLATION

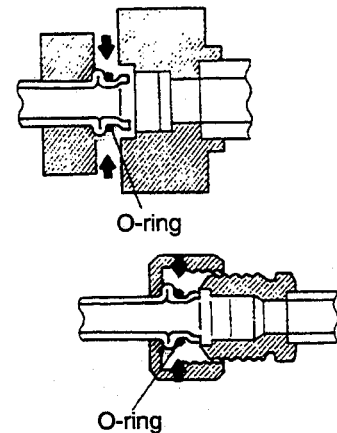
Pre-removal and Post-installation Operation

- Refrigerant Discharging and Charging (Refer to P.55-20,22 <Vehicles using R-12>) (Refer to P.55-24, 27 <Vehicles using R-134a>)



20E0163

Piping connection



20N0089

Compressor oil:
DENSO OIL 6
<Vehicles using R-12>
ND-OIL 8
<Vehicles using R-134a>

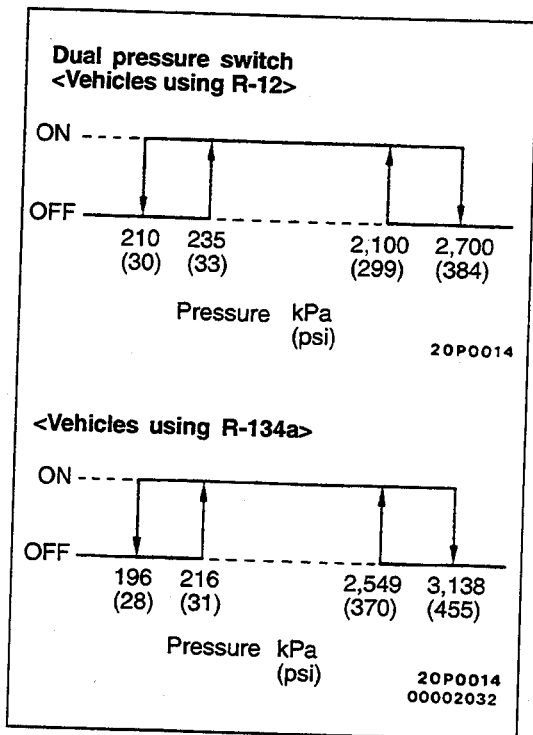
00002038

Removal steps

1. High pressure pipe A
2. High pressure hose
3. Dual pressure switch
4. High pressure pipe B
5. Receiver bracket
6. Receiver
7. Suction hose



8. High pressure pipe C
- Link bracket <Vehicle with cruise control> (Refer to GROUP 13G – Cruise Control.)
9. Suction pipe A
10. High pressure pipe D
11. Suction pipe B



INSPECTION

DUAL PRESSURE SWITCH (LOW PRESSURE SWITCH)

- (1) Turn back the adaptor valve handle all the way and install it to the low pressure side service valve.
- (2) With the gage manifold low pressure service valves closed, connect the gage manifold high pressure side charging hose to the adaptor valve.
- (3) Tighten the adaptor valve handle and open the service valve.
- (4) If there is continuity between the dual pressure switch terminals when the low pressure side pressure is at the level shown in the illustration at left when the dual pressure switch is on, the switch is functioning normally. If not, replace the switch.

INSTALLATION SERVICE POINTS

▶A◀ SUCTION HOSE/RECEIVER INSTALLATION

When replacing the suction hose or the receiver with new ones, refill them with a specified amount of compressor oil, and then install each of them.

Compressor oil:

DENSO OIL 6 <Vehicles using R-12>
ND-OIL 8 <Vehicles using R-134a>

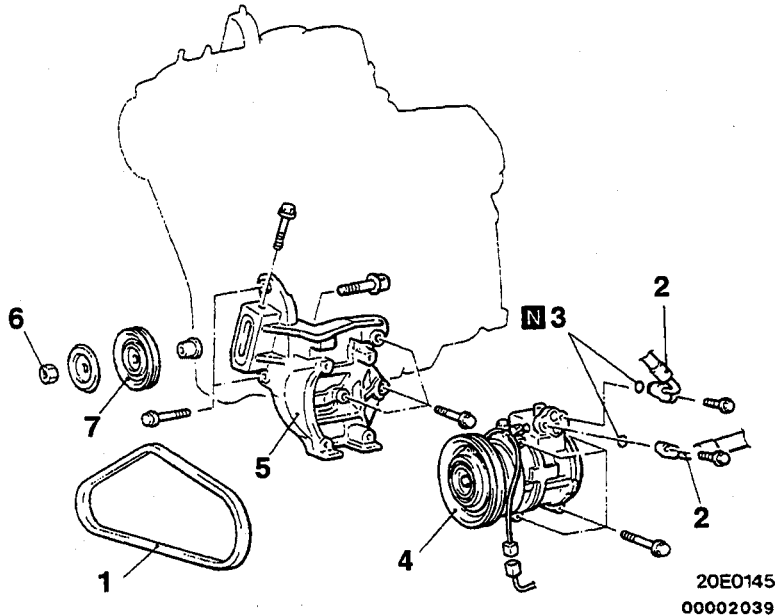
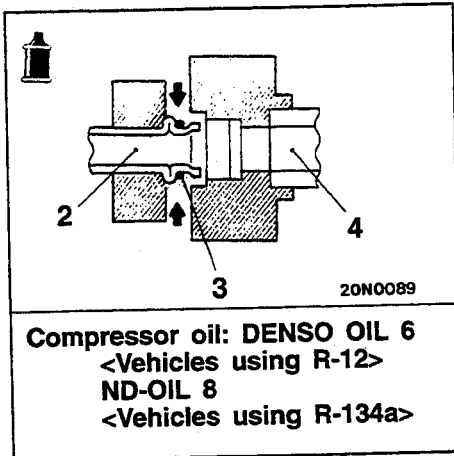
Quantity:

Suction hose: 10 cm³ (.3 fl.oz.)
Receiver: 10 cm³ (.3 fl.oz.)

COMPRESSOR AND TENSION PULLEY

REMOVAL AND INSTALLATION

- Pre-removal and Post-installation Operation**
- Battery and Battery Tray Removal and Installation
 - Radiator Shroud Cover Removal and Installation



Compressor removal steps

- Refrigerant Discharging and Charging (Refer to P.55-20, 22<Vehicles using R-12>.) (Refer to P.55-24, 27 <Vehicles using R-134a>.)
 - Compressor Drive Belt Adjustment (Refer to GROUP 11A, 11B – Service Adjustment Procedures.)
1. Compressor drive belt
 2. Connection of high-pressure
 3. O-ring
 4. Compressor
 5. Compressor bracket



Tension pulley removal steps

- Compressor Drive Belt Adjustment (Refer to GROUP 11A, 11B – Service Adjustment Procedures.)
1. Compressor drive belt
 6. Tension pulley mounting nut
 7. Tension pulley

INSTALLATION SERVICE POINTS**▶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 ($X \text{ cm}^3$) of oil inside the removed compressor.
- (2) Wipe away the amount of oil calculated according to the following formula from the new compressor, and then install the new compressor.

$$\text{New compressor oil amount: } 80 \text{ cm}^3 - X \text{ cm}^3 = Y \text{ cm}^3$$

NOTE

- (1) $Y \text{ cm}^3$ indicates the amount of oil in the refrigerant line, the condenser, the cooling unit, etc.
- (2) When replacing the following parts at the same time as the compressor, subtract the rated oil amount of each part from $Y \text{ cm}^3$ and discharge this amount from the new compressor.

<Vehicles using R-12>

Compressor oil: DENSO OIL 6

Quantity:

Evaporator: 60 cm^3 (2.0 fl.oz.)

Condenser: 30 cm^3 (1.0 fl.oz.)

Suction hose: 10 cm^3 (.3 fl.oz.)

Receiver: 10 cm^3 (.3 fl.oz.)

<Vehicles using R-134a>

Compressor oil: ND-OIL 8

Quantity:

Evaporator: 40 cm^3 (1.4 fl.oz.)

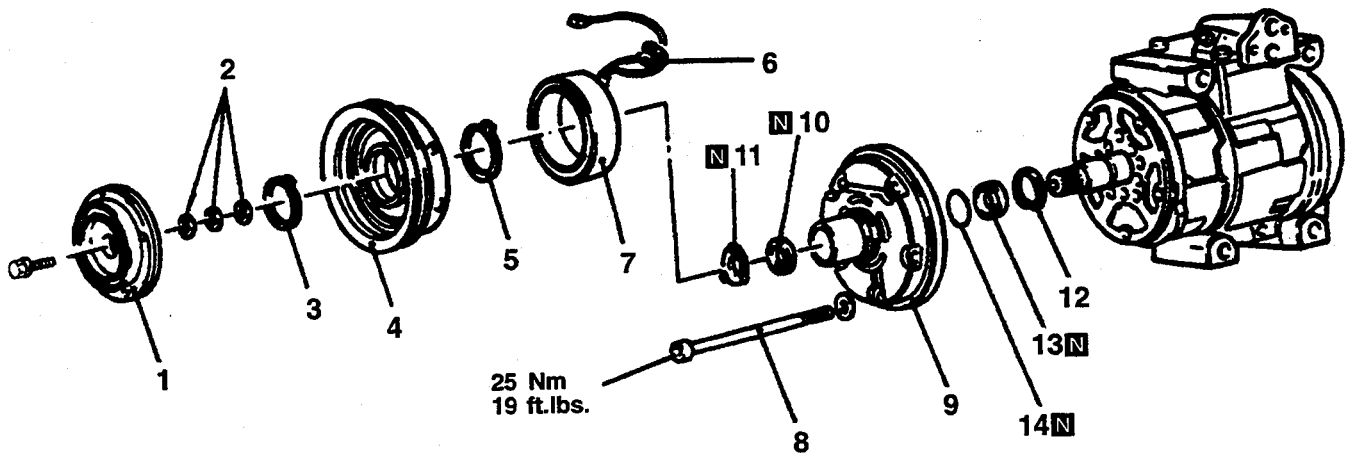
Condenser: 40 cm^3 (1.4 fl.oz.)

Suction hose: 10 cm^3 (.3 fl.oz.)

Receiver: 10 cm^3 (.3 fl.oz.)

DISASSEMBLY AND REASSEMBLY

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Z20W856

Magnetic clutch disassembly steps

- ◀A▶ ▶D▶ ● Adjustment of clutch clearance
 1. Clutch hub
 2. Shims
 3. Snap ring
 4. Rotor assembly
 5. Snap ring
 6. Ground terminal
 7. Clutch coil
- ▶C▶

Compressor front housing and shaft seal disassembly steps

- ▶C▶ ▶B▶ 8. Through bolt
 9. Front housing
 10. Felt
 11. Felt holder
 12. Snap ring
 13. Shaft seal
 14. O-ring
- ▶D▶
- ▶E▶ ▶A▶

DISASSEMBLY SERVICE POINTS

◀A▶ CLUTCH HUB REMOVAL

- (1) Secure the compressor in a vise.
- (2) If the clutch hub cannot be pulled off by hand, screw in a completely-threaded bolt with a thread length of 8 mm (.315 in.) to raise the clutch hub so it can be removed.

◀B▶ ROTOR ASSEMBLY REMOVAL

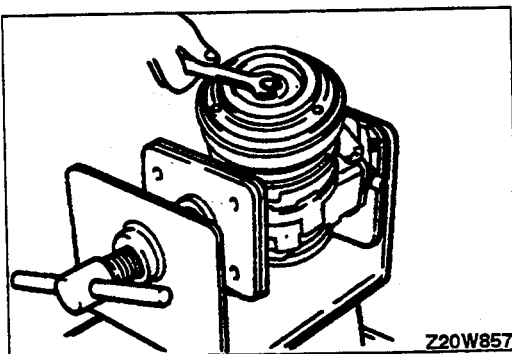
Use a plastic hammer to lightly tap the rotor off the shaft.

◀C▶ THROUGH BOLT REMOVAL

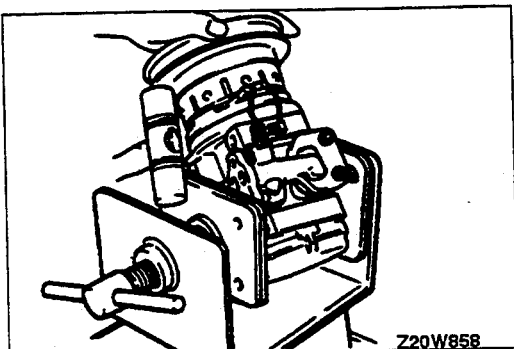
Remove the through bolt after first securing the rear housing of the compressor by placing it in a vise.

Caution

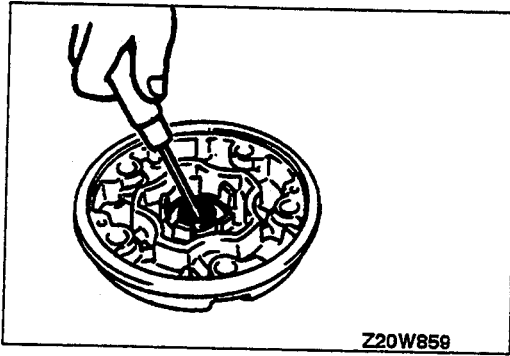
If the through bolt is removed without first doing so, the rear housing will become uncoupled and compressor oil will escape.



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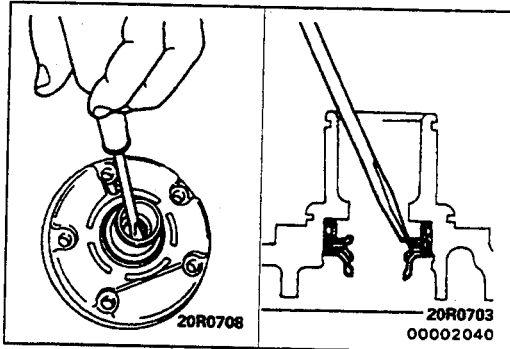


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◀D▶ FELT REMOVAL

Use a flat-tip (–) screwdriver to remove the felt from the front housing.

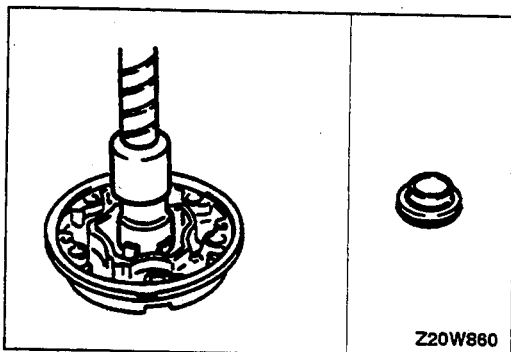


◀E▶ SHAFT SEAL REMOVAL

Use a flat-tip (–) screwdriver to remove the shaft seal from the front housing.

INSPECTION

- Check the surface of the clutch hub for scoring or bluing.
- Check the surface of the rotor for scoring or bluing.
- Check the sealing surfaces for cracks, scratches and deformation.
- Check the front housing for cracks or scoring on the sealing surfaces.
- Check the compressor shaft for scoring.



REASSEMBLY SERVICE POINTS

▶A▶ SHAFT SEAL INSTALLATION

- (1) Lubricate the shaft seal with specified compressor oil.

Specified compressor oil:

DENSO OIL 6 <Vehicles using R-12>

ND-OIL 8 <Vehicles using R-134a>

- (2) Set the shaft seal to the front housing so that the projection side of the center ring is at the shaft seal side.

- (3) Use a 21 mm (.83 in.) socket to install the shaft seal.

▶B▶ FRONT HOUSING INSTALLATION

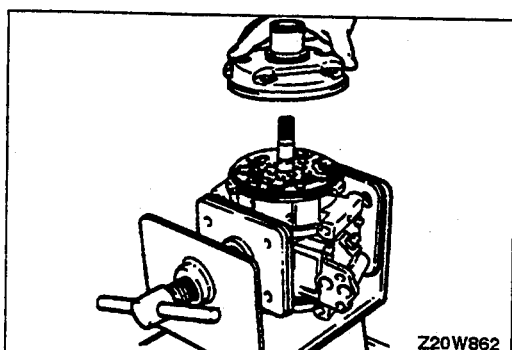
- (1) Apply specified compressor oil to the shaft.

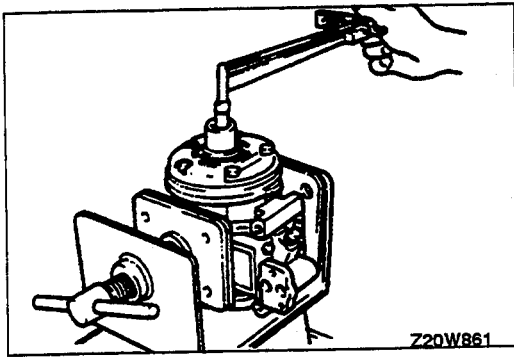
Specified compressor oil:

DENSO OIL 6 <Vehicles using R-12>

ND-OIL 8 <Vehicles using R-134a>

- (2) Install the front housing, taking care not to damage the lip part of the shaft seal.

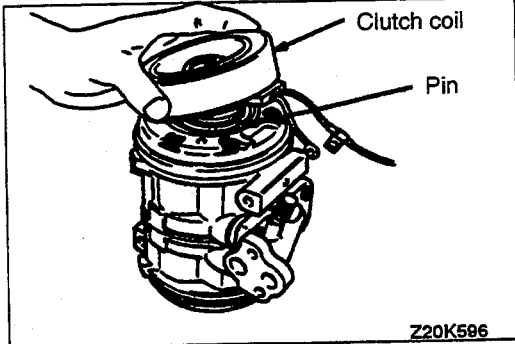




- (3) Mount the bolt on the shaft, and then measure the shaft starting torque.

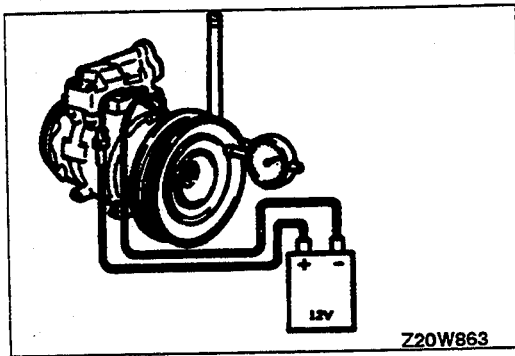
Standard value: 4.9 Nm (43 in.lbs.) or less

- (4) Remove the bolt from the shaft.



▶C◀ CLUTCH COIL INSTALLATION

The clutch coil must be aligned with the pin in the compression housing.



▶D◀ CLUTCH CLEARANCE ADJUSTMENT

- (1) Connect the magnetic clutch to the battery.
- (2) The clutch hub will be attracted to and fit closely to the rotor.
- (3) Use a shim(s) to adjust so that the amount of movement of the clutch hub is as described below.

**Standard value: 0.35–0.65 mm
(.0138–.0256 in.)**

- (4) Turn the rotor by hand to confirm that it rotates freely.

A

ABS	
POWER RELAY, Check	35C-70-I
RELAY BOX, Check	35C-72-I
ACCELERATOR	
CABLE	13F-14-I
Inspection and Adjustment	13F-3-I
PEDAL	13G-14-I
ACCESSORY SOCKET	54-99-II
AIR BAG	
MODULE	52B-45-I
Deployed Disposal Procedures	52B-54-I
Disposal Procedures	52B-51-I
Undeployed, Disposal	52B-51-I
AIR CLEANER ELEMENT, Maintenance	00-54-I
AIR CONDITIONING	
COMPRESSOR	55-40-I
COMPRESSOR CLUTCH RELAY	
On-vehicles Inspection	
<SOHC-12VALVE engine>	13A-84-I
<SOHC-24VALVE engine, DOHC>	13A-152-I
CONDENSER	55-37-I
CONDENSER FAN MOTOR	55-37-I
CONTROL UNIT	55-35-I
ENGINE COOLANT TEMPERATURE SWITCH	55-36-I
EVAPORATOR	55-33-I
REFRIGERANT LINE	55-38-I
SWITCH	55-32-I
On-vehicles Inspection	
<SOHC-12VALVE engine>	13A-84-I
<SOHC-24VALVE engine, DOHC>	13A-152-I
TENSION PULLEY	55-40-I
AIR LEAKAGE, Rear differential System Check	27-15-I
ANTENNA	
Motor	54-142-II
Whip	54-142-II
FEEDER CABLE	54-142-II
ANTI-LOCK BRAKING SIGNAL	
On-vehicles Inspection	
<SOHC-12VALVE engine>	13A-104-I
<SOHC-24VALVE engine, DOHC>	13A-193-I
ANTI-LOCK BRAKING SYSTEM	Refer to ABS
AUTOMATIC TRANSMISSION	
Maintenance	00-61-I
FLUID Change	23-45-I
Inspection	23-44-I
Temperature Switch Check	23-52-I
AXLE BUMPER	34-8-I
AXLE HOUSING OIL SEAL	27-14-I
AXLE HUB, Front	26-11-I
AXLE SHAFT	27-18-I

B

BACK DOOR	42-41-I
Adjustment	42-10-I
HANDLE	42-43-I
LATCH	42-43-I
TRIM	42-42-I
WATERPROOF FILM	42-42-I
WINDOW DEFOGGER	54-146-II
WINDOW DEFOGGER, Adjustment	54-146-II
WINDOW GLASS	42-23-I
BALL JOINT	
Tie Rod End, Starting Torque Check	37A-8-I
DUST COVER, Replacement	33A-26-I
SEALS, Maintenance	00-64-I

GREASE FITTING, Maintenance	00-64-I
BAROMETRIC PRESSURE SENSOR	
On-vehicles Inspection	
<SOHC-12VALVE engine>	13A-62-I
<SOHC-24VALVE engine, DOHC>	13A-131-I
BASIC IDLE SPEED, Adjustment	13A-39-I
BATTERY	54-2-II
Adjustment	54-2-II
BLOWER	55-7-I
BODY MOUNTING	42-12-I
BRAKE	
Disc, Front	35A-25-I
Disc, Rear	35A-30-I
BOOSTER	35A-19-I
Operating Test	35A-6-I
DISC	
Front, Rotor Inspection	35A-12-I
Rear, Run-out Check	35A-15-I
Rear, Run-out Correction	35A-15-I
Rear, Thickness Check	35A-15-I
DRAG, Check	35A-10-I
DRUM	
Contact Check with Brake Lining	35A-16-I
Inside Diameter Check	35A-16-I
Parking	36-7-I
FLUID LEVEL SENSOR, Check	35A-7-I
HOSES, Maintenance	00-64-I
LEVER, Parking	36-4-I
Stroke Inspection and Adjustment	36-2-I
LINE	
<Basic Brake System>	35A-24-I
<Anti-lock Brake System>	35C-73, 74-I
LINING	
Contact Check with Brake Drum	35A-16-I
Thickness Check	35A-16-I
Running-in	36-3-I
PAD	
Disc, check	35A-10-I
Disc, Front Replacement	35A-10-I
Disc, Rear, Check and Replacement	35A-13-I
PEDAL	35A-17-I
PEDAL, Inspection and Adjustment	35A-6-I
BUMPER	
Axle	34-8-I
Front	51-4-I
Rear	51-6-I

C

CAMSHAFT	
OIL SEAL	
<3.0L-12VALVE engine>	11A-16-I
<3.0L-24VALVE engine>	11A-46-I
<3.5L engine>	11B-17-I
POSITION SENSOR	
On-vehicles Inspection	
<SOHC-12VALVE engine>	13A-70-I
<SOHC-24VALVE engine, DOHC>	13A-139-I
CASSETTE PLAYER	54-140-II
CATALYTIC CONVERTER	
<3.0L-12VALVE engine>	15-10-I
<3.0L-24VALVE engine For Federal>	15-10-I
<3.0L-24VALVE engine For California>	15-11-I
<3.5L engine>	15-12-I
CD PLAYER	54-140-II
CENTER DIFFERENTIAL LOCK	
DETECTION SWITCH	
Check <A/T>	23-46-I
Check <M/T>	22-6-I

OPERATION SWITCH			
Check <A/T>	23-46-I		
Check <M/T>	22-6-I		
CHARGING SYSTEM	16-2-II		
Generator Output Line Voltage Drop Test	16-7-II		
Output Current Test	16-8-II		
Regulated Voltage Test	16-10-II		
Wave Pattern Inspection Using an Analyzer	16-11-II		
CHECK VALVE, Operation Check	35A-7-I		
CIGARETTE LIGHTER	54-95-II		
CLOCK	54-103-II		
CLOCK SPRING	52B-45-I		
CLOSED THROTTLE POSITION SWITCH			
Adjustment	13A-42-I		
On-vehicle Inspection			
<SOHC-12VALVE engine>	13A-68-I		
<SOHC-24VALVE engine, DOHC>	13A-137-I		
CLUTCH			
Free-wheeling	26-32-I		
CONTROL	21-6-I		
MASTER CYLINDER	21-8-I		
PEDAL	21-5-I		
Inspection and Adjustment	21-3-I		
RELAY, Air Conditioning Compressor			
On-vehicles Inspection			
<SOHC-12VALVE engine>	13A-84-I		
<SOHC-24VALVE engine, DOHC>	13A-152-I		
COIL SPRING	34-8-I		
COLUMN SWITCH <Up to 1993 models>	54-88-II		
COMBINATION LIGHT			
Front	54-84-II		
Rear	54-85-II		
COMBINATION METER	54-42-II		
COMPRESSION PRESSURE, Check			
<3.0L-12VALVE engine>	11A-9-I		
<3.0L-24VALVE engine>	11A-40-I		
<3.5L engine>	11B-10-I		
COMPRESSOR	55-40-I		
Noise Adjustment	55-31-I		
DRIVE BELT, Adjustment	55-20-I		
CONDENSER	55-37-I		
FAN MOTOR	55-37-I		
CONTROL CABLE, Adjustment	23-48-I		
CONTROL LEVER	22-9-I		
CONTROL MODULE			
Engine, Power Ground On-vehicles Inspection			
<SOHC-12VALVE engine>	13A-52-I		
<SOHC-24VALVE engine, DOHC>	13A-122-I		
Engine, Terminal Voltage On-vehicles Inspection			
<SOHC-12VALVE engine>	13A-108-I		
<SOHC-24VALVE engine, DOHC>	13A-199-I		
CONTROL SWITCH <Front Suspension>	33A-22-I		
CONTROL UNIT			
ABS	35C-80-I		
Air Conditioning	55-35-I		
4WD Indicator, Check	23-51-I		
4WD Indicator, Inspection	22-7-I		
Suspension	33A-22-I		
COOLANT			
Engine, Leak Check	14-4-I		
Engine, Maintenance	00-62-I		
Engine, Replacement	00-62-I		
COOLING FAN	14-7-I		
CRANKCASE VENTILATION SYSTEM	17-12-I		
Maintenance	00-54-I		
CRANKSHAFT			
OIL SEAL			
Front<3.0L-12VALVE engine>	11A-18-I		
<3.0L-24VALVE engine>	11A-48-I		
<3.5L engine>	11B-19-I		
Rear <3.0L-12VALVE engine>	11A-19-I		
<3.0L-24VALVE engine>	11A-49-I		
<3.5L engine>	11B-20-I		
POSITION SENSOR			
On-vehicles Inspection			
<SOHC-12VALVE engine>	13A-74-I		
<SOHC-24VALVE engine, DOHC>	13A-142-I		
CRUISE CONTROL			
CABLES, Inspection and Adjustment	13G-26-I		
INDIVIDUAL PARTS, Inspection	13G-30-I		
MAIN SWITCH, Inspection	13G-28-I		
SWITCH, Inspection	13G-29-I		
CURB IDLE SPEED, Inspection			
<3.0L-12VALVE engine>	11A-7-I		
<3.0L-24VALVE engine>	11A-37-I		
<3.5L engine>	11B-8-I		
CYLINDER HEAD GASKET			
<3.0L-12VALVE engine>	11A-23-I		
<3.0L-24VALVE engine>	11A-55-I		
<3.5L engine>	11B-26-I		
D			
DEFOGGER, Back Door Window	54-146-II		
Adjustment	54-146-II		
RELAY	54-152-II		
SWITCH	54-151-II		
TIMER	54-153-II		
DIFFERENTIAL			
Limited Slip, Preload Measurement	27-13-I		
CARRIER			
Front Axle	26-30-I		
Rear Axle	27-27-I		
CARRIER OIL SEAL, Replacement	26-8-I		
LOCK, Rear	27-24-I		
LOCK SYSTEM, Rear, Air Leakage Check	27-15-I		
MOUNTING, Front	32-4-I		
DIMMER SWITCH <1994 models and after>	54-90-II		
DISC BRAKE			
Front	35A-25-I		
Rear	35A-30-I		
PAD			
Check	35A-10-I		
Maintenance	00-63-I		
DISTRIBUTOR	16-63-II		
CAP, Maintenance	00-57-I		
ROTOR, Maintenance	00-57-I		
DOOR	42-25-I		
Back	42-41-I		
Back, Adjustment	42-10-I		
Front, Adjustment	42-9-I		
Fuel Filler, Adjustment	42-9-I		
Rear, Adjustment	42-9-I		
GLASS	42-30-I		
HANDLE	42-33-I		
HANDLE, Back	42-43-I		
LATCH	42-33-I		
LATCH, Back	42-43-I		
MIRROR	51-25-I		
OPENING WEATHERSTRIP	42-40-I		
REGULATOR	42-30-I		
TRIM	42-27-I		
TRIM, Back	42-42-I		
WATERPROOF FILM	42-27-I		
WATERPROOF FILM, Back	42-42-I		
WINDOW GLASS, Adjustment	42-10-I		
DRIVE BELT			
Compressor, Adjustment <Air Conditioning>	55-20-I		

- Maintenance 00-58-I
Tension Check <Power Steering> 37A-11-I
Tension Inspection and Adjustment
<3.0L-12VALVE engine> 11A-5-I
<3.0L-24VALVE engine> 11A-35-I
<3.5L engine> 11B-6-I
- DRIVE SHAFT**
Front Axle 26-19-I
End Play Check 26-8-I
- BOOTS, Maintenance** 00-64-I
- DUST COVER**
Ball Joint, Replacement 33A-26-I
Lower Ball Joint, Replacement 33A-26-I
- E**
- EGR**
SOLENOID, On-vehicle Inspection <DOHC> 13A-191-I
SYSTEM 17-23-I
TEMPERATURE SENSOR, On-vehicle Inspection
<DOHC> 13A-157-I
VALVE 00-57-I
- ELECTRICAL LOAD SWITCH <DOHC>** 13A-155-I
ELECTRONIC CONTROL UNIT <ABS> 35C-80-I
- EMISSION CONTROL SYSTEM**
Crankcase, Maintenance 00-54-I
Evaporative, Maintenance 00-55-I
- ENGINE**
<3.0L-12VALVE engine> 11A-2-I
<3.0L-24VALVE engine> 11A-31-I
<3.5L engine> 11B-2-I
- CONTROL MODULE POWER GROUND**
On-vehicles Inspection
<SOHC-12VALVE engine> 13A-52-I
<SOHC-24VALVE engine, DOHC> 13A-122-I
- CONTROL MODULE TERMINAL VOLTAGE**
On-vehicles Inspection
<SOHC-12VALVE engine> 13A-108-I
<SOHC-24VALVE engine, DOHC> 13A-199-I
- MOUNTING** 32-2-I
- ENGINE COOLANT**
Leak Check 14-4-I
Maintenance 00-62-I
Replacement 00-62-I
- TEMPERATURE GAGE UNIT** 14-15-I
TEMPERATURE SENSOR 14-15-I
TEMPERATURE SENSOR On-vehicles Inspection
<SOHC-12VALVE engine> 13A-64-I
<SOHC-24VALVE engine, DOHC> 13A-133-I
- TEMPERATURE SWITCH**
Cooling 14-15-I
Air Conditioning 55-36-I
- ENGINE OIL**
Maintenance 00-59-I
- COOLER <3.0L-12VALVE engine>** 11A-30-I
<3.0L-24VALVE engine> 11A-63-I
<3.5L engine> 11B-36-I
- OIL FILTER, Maintenance** 00-59-I
- EVAPORATIVE EMISSION**
CANISTER, Maintenance 00-56-I
CONTROL SYSTEM 17-15-I
CONTROL SYSTEM Maintenance 00-55-I
PURGE SOLENOID On-vehicles Inspection
<SOHC-12VALVE engine> 13A-102-I
<SOHC-24VALVE engine, DOHC> 13A-185, 187, 189-I
- EVAPORATOR** 55-33-I
- EXHAUST**
MANIFOLD <3.0L-12VALVE engine> 15-7-I
<3.0L-24VALVE engine> 15-8-I
- PIPE
<3.5L engine> 15-9-I
<3.0L-12VALVE engine> 15-10-I
<3.0L-24VALVE engine For Federal> 15-10-I
<3.0L-24VALVE engine For California> 15-11-I
<3.5L engine> 15-12-I
- EXHAUST EMISSION CONTROL SYSTEM** 17-27-I
EXHAUST GAS RECIRCULATION SYSTEM Refer to EGR
EXHAUST SYSTEM, Maintenance 00-65-I
- F**
- FAN, Cooling** 14-7-I
FAN MOTOR, Condenser 55-37-I
FEEDER CABLE, Antenna 54-142-II
FENDER 42-15-I
FIXED ENGINE SPEED ADJUSTING SCREW,
Adjustment 13A-44-I
FLOOR CONSOLE 52A-6-I
FLUID COOLER, Transmission 23-89-I
FLUID HOSES, Transmission 23-89-I
FLUID PIPE, Transmission 23-89-I
4WD INDICATOR CONTROL UNIT
Check 23-51-I
Inspection 22-7-I
4WD OPERATION DETECTION SWITCH
Check <A/T> 23-46-I
Check <M/T> 22-6-I
FREE-WHEELING CLUTCH 26-32-I
FRONT IMPACT SENSORS 52B-40-I
- FUEL**
FILLER DOOR, Adjustment 42-9-I
HOSES, Maintenance 00-54-I
LINE 13F-10-I
LINE, Internal Pressure Reducing 13F-3-I
PRESSURE, Test On-vehicles Inspection
<SOHC-12VALVE engine> 13A-105-I
<SOHC-24VALVE engine, DOHC> 13A-194, 196-I
PUMP 13F-5-I
Operation Check 13F-4-I
On-vehicles Inspection
<SOHC-12VALVE engine> 13A-53-I
<SOHC-24VALVE engine, DOHC> 13A-123-I
SYSTEM, Maintenance 00-54-I
- FUEL TANK** 13F-6-I
FILLER DOOR 42-14-I
- G**
- GARNISHES** 51-7-I
GENERATOR 16-13-II
GEOMAGNETIC SENSOR 54-48-II
GLASS
Back Door Window 42-23-I
Door 42-30-I
Door Window, Adjustment 42-10-I
Quarter Window 42-21-I
Window 42-16-I
- G-SENSOR**
ABS 35C-76-I
Output Voltage Check <ABS> 35C-70-I
- H**
- HAZARD LIGHT SWITCH** 54-86-II
HEADLIGHT 54-84-II
HEADLIGHT WASHER 51-22-I
HEATED OXYGEN SENSOR
On-vehicles Inspection

<SOHC-12VALVE engine>	13A-86-I
<SOHC-24VALVE engine-DOHC engine-For Federal>	13A-159-I
<SOHC-24VALVE engine-For California>	13A-161-I
<DOHC engine For California>	13A-164-I
HEATER UNIT	55-6-I
HI/LO DETECTION SWITCH	
Check <A/T>	23-46-I
Check <M/T>	22-6-I
HIGH MOUNTED STOP LIGHT	54-86-II
HIGH TENSION CABLE, Spark Test	
<3.0L-12VALVE engine>	16-38-II
HOOD	42-13-I
ALIGNMENT, Adjustment	42-9-I
HORN	54-91-I
HYDRAULIC UNIT	
ABS	35C-75-I
Check <ABS>	35C-67-I
I	
IDLE AIR CONTROL MOTOR	
On-vehicles Inspection	
<SOHC-12VALVE engine>	13A-93-I
<SOHC-24VALVE engine, DOHC>	13A-171-I
IDLE MIXTURE, Inspection	
<3.0L-12VALVE engine>	11A-8-I
<3.0L-24VALVE engine>	11A-38-I
<3.5L engine>	11B-9-I
IDLE SPEED	
Basic, Adjustment	13A-35-I
Curb, Inspection	
<3.0L-12VALVE engine>	11A-7-I
<3.0L-24VALVE engine>	11A-37-I
<3.5L engine>	11B-8-I
IDLE-UP OPERATION, Check	55-32-I
IGNITION	
CABLES, Maintenance	00-57-I
COIL, On-vehicle Inspection	
<SOHC-12VALVE engine>	13A-98-I
<SOHC-24VALVE engine>	13A-173-I
<DOHC>	13A-178-I
POWER TRANSISTOR, On-vehicle Inspection	
<SOHC-12VALVE engine>	13A-98-I
<SOHC-24VALVE engine>	13A-173-I
<DOHC>	13A-178-I
SWITCH	54-4-II
IG, On-vehicle Inspection	
<SOHC-12VALVE engine>	13A-49-I
<SOHC-24VALVE engine, DOHC>	13A-119-I
ST (A/T), On-vehicle Inspection	
<SOHC-12VALVE engine>	13A-78-I
ST, On-vehicle Inspection	
<SOHC-24VALVE engine, DOHC>	13A-146-I
ST (M/T), On-vehicle Inspection	
<SOHC-12VALVE engine>	13A-76-I
SYSTEM	
<3.0L-12VALVE engine>	16-51-II
<3.0L-24VALVE engine>	16-55-II
<3.5L engine>	16-59-II
Inspection, Primary voltage wave pattern	16-46-I
Secondary voltage wave pattern	16-39-II
TIMING	
Inspection	
<3.0L-12VALVE engine>	11A-6-I
<3.0L-24VALVE engine>	11A-36-I
<3.5L engine>	11B-7-I

Adjustment <3.0L-12VALVE engine>	11A-6-I
IMPACT SENSORS, Front	52B-40-I
INDIVIDUAL PARTS, Cruise Control, Inspection	13G-30-I
INJECTORS, On-vehicle Inspection	
<SOHC-12VALVE engine>	13A-89-I
<SOHC-24VALVE engine, DOHC>	13A-167-I
INNER SHAFT	26-26-I
INSIDE TEMPERATURE SENSOR	54-48-II
INSTRUMENT PANEL	52A-2-I
INTAKE AIR TEMPERATURE SENSOR	
On-vehicles Inspection	
<SOHC-12VALVE engine>	13A-60-I
<SOHC-24VALVE engine, DOHC>	13A-129-I
INTAKE MANIFOLD	
<3.0L-24VALVE engine, 3.5L engine>	15-5-I
INTAKE MANIFOLD, Vacuum Inspection	15-2-I
INTER-LOCK SWITCH, Inspection and Adjustment	21-4-I

J

JOINTS, Propeller Shaft, Maintenance	00-65-I
--------------------------------------------	---------

K

KEY INTER-LOCK MECHANISM, Check	23-49-I
KEYLESS ENTRY SYSTEM	42-37-I
KNOCK SENSOR, On-vehicle Inspection <DOHC>	13A-153-I
KNUCKLE	26-16-I

L

LASH ADJUSTER, Check	
<3.0L-12VALVE engine>	11A-11-I
<3.0L-24VALVE engine>	11A-41-I
<3.5L engine>	11B-12-I
LATCH	
Back Door	42-43-I
Door	42-33-I
LATERAL ROD	34-6-I
LATERAL ROD BUSHING, Replacement	34-7-I
LIGHT	
Front Combination	54-84-II
License Plate	54-85-II
Rear Combination	54-85-II
Stop, High Mounted	54-86-II
LIGHTER, Cigarette	54-98-II
LIGHTING SYSTEM	54-49-II
Adjustment	54-49-II
LIMITED SLIP DIFFERENTIAL, Preload Measurement	27-13-I
LINING RUNNING-IN	36-3-I
LOAD SENSING PROPORTIONING VALVE, Function Test	35A-8-I
LOAD SENSING SPRING, Length Check and Adjustment	35A-8-I
LOWER ARM	
Front Suspension	33A-14-I
Rear Suspension	34-4-I

M

MASTER CYLINDER	35A-19-I
MASTER CYLINDER, Clutch	21-8-I
MIRROR, Door	51-25-I
MOTOR RELAY, Check <ABS>	35C-69-I
MOULDINGS	51-7-I
MUFFLER <3.0L-12VALVE engine>	15-10-I
<3.0L-24VALVE engine For Federal>	15-10-I
<3.0L-24VALVE engine For California>	15-11-I
<3.5L engine>	15-12-I

MULTI-METER 54-45-II

O

OIL

COOLER <3.0L-12VALVE engine> 11A-30-I
 <3.0L-24VALVE engine> 11A-63-I
 <3.5L engine> 11B-36-I
 FILTER, Engine, Maintenance 00-59-I
 PAN <3.0L-12VALVE engine> 11A-21-I
 PAN AND OIL SCREEN
 Lower<3.0L-24VALVE engine> 11A-51-I
 <3.5L engine> 11B-22-I
 Upper and Oil Screen <3.0L-24VALVE engine> 11A-53-I
 <3.5L engine> 11B-24-I
 PRESSURE SWITCH, Power Steering, Check 37A-14-I
 PUMP
 Power Steering 37A-32-I
 Power Steering, Pressure Test 37A-13-I
 SCREEN <3.0L-12VALVE engine> 11A-21-I
 <3.0L-24VALVE engine> 11A-51-I
 <3.5L engine> 11B-22-I
 OUTSIDE TEMPERATURE SENSOR 54-48-II

P

PARKING BRAKE

CABLE 36-5-I
 DRUM 36-7-I
 LEVER 36-4-I
 LEVER, Stroke Inspection and Adjustment 36-2-I
 SWITCH, Check 36-3-I

PARK/NEUTRAL POSITION SWITCH

Adjustment 23-48-I
 Check 23-47-I
 On-vehicles Inspection
 <SOHC-12VALVE engine> 13A-78-I
 <SOHC-24VALVE engine, DOHC> 13A-141-I

POSITIVE CRANKCASE VENTILATION VALVE,
Maintenance

..... 00-54-I

POWER GROUND, Engine Control Module

On-vehicles Inspection
 <SOHC-12VALVE engine> 13A-52-I
 <SOHC-24VALVE engine, DOHC> 13A-122-I

POWER STEERING

FLUID

Level Check 37A-11-I
 Replacement 37A-12-I

GEAR BOX 37A-22-I

OIL PRESSURE SWITCH, Check 37A-14-I

OIL PUMP 37A-32-I

OIL PUMP, Pressure Test 37A-13-I

PRESSURE SWITCH

On-vehicles Inspection
 <SOHC-12VALVE engine> 13A-82-I
 <SOHC-24VALVE engine, DOHC> 13A-150-I

Q

QUARTER WINDOW GLASS 42-21-I

R

RADIATOR 14-6-I

RADIATOR CAP, Pressure Test 14-5-I

RADIO 54-106-II

RADIO AND TAPE PLAYER 54-106-II

REAR AXLE

Maintenance 00-65-I

Total Backlash Check 27-12-I

REAR AXLE OIL (LSD), Maintenance 00-65-I

REAR COMBINATION LIGHT 54-85-II

REAR DIFFERENTIAL LOCK 27-15-I

DETECTION SWITCH, Check 27-15-I

SYSTEM, Air Leakage Check 27-15-I

REAR WASHER 51-17-I

REAR WIPER 51-17-I

REFRIGERANT

Leak Repair Procedure 55-30-I

CHARGING<Vehicles using R-12> 55-20-I

<Vehicles using R-134a> 55-24-I

LINE 55-38-I

REGULATOR, Door 42-30-I

RELAY Box, Check <ABS> 35C-72-I

RHEOSTAT 54-87-II

RUNCHANNEL, Window Glass 42-40-I

S

SEAT

Front 52A-12-I

Second 52A-18-I

Third 52A-19-I

SEAT BELT

Front 52A-20-I

Second 52A-22-I

Third 52A-23-I

SELECTOR LEVER

Operation Check 23-86-I

SENSOR

Barometric Pressure Refer to B

Brake Fluid Level Refer to B

Camshaft Position Refer to C

Crankshaft Position Refer to C

EGR Temperature 13A-157-I

Engine Coolant Temperature Refer to E

Engine Coolant Temperature 14-15-I

Front Impact 52B-40-I

G <ABS> 35C-76-I

G, Output Voltage Check <ABS> 35C-70-I

Geomagnetic 54-48-II

Intake Air Temperature Refer to I

Inside Temperature 54-48-II

Knock, On-vehicle Inspection <DOHC> 13A-153-I

Outside Temperature 54-48-II

Throttle Position Refer to T

Vehicle Speed Refer to V

Volume Air Flow Refer to V

Wheel Speed <ABS> 35C-77-I

Wheel Speed, Output Voltage Measurement <ABS> 35C-65-I

SERVO, Idle Air Control, On-vehicle Inspection

<SOHC-12VALVE engine> 13A-93-I

<SOHC-24VALVE engine, DOHC> 13A-171-I

SHIFT LOCK MECHANISM, Check

..... 23-50-I

SHOCK ABSORBER

Front Suspension 33A-11-I

Rear Suspension 34-6-I

SOCKET, Accessory

..... 54-99-II

SOLENOID

EGR Refer to E

Evaporative Emission Purge Refer to E

Variable Induction Control 13A-183-I

SOLENOID VALVE

Front Axle 26-29-I

Front Axle, Operation Check 26-10-I

SPARK PLUG

Test <3.0L-12VALVE engine> 16-38-II

Maintenance	00-56-I
SPARK PLUG CABLE, Test <3.0L-12VALVE engine>	16-38-II
SPEAKER	54-141-II
SPEED SENSOR	
Wheel <ABS>	35C-77-I
Wheel, Output Voltage Measurement <ABS>	35C-65-I
SPEEDOMETER CABLE	
Replacement <A/T>	23-51-I
Replacement <M/T>	22-8-I
SRS	
Circuit Diagram	52B-12-I
Component Location	52B-14-I
Configuration Diagrams	52B-8-I
Connector Construction	52B-10-I
Construction Diagrams	52B-3-I
Diagnosis Unit (SDU)	52B-42-I
Maintenance	00-66-I, 52B-36-I
Post-collision Diagnosis	52B-36-I
Schematic	52B-7-I
Service Precautions	52B-15-I
Warning/caution Labels	52B-4-I
STABILIZER BAR	
Front Suspension	33A-19, 20-I
Rear Suspension	34-9, 10-I
STARTER MOTOR	16-23-II
STARTING SYSTEM	16-19-II
STEERING	
Angle Check	37A-9-I
Stationary Steering Effort Check	37A-10-I
COLUMN	37A-15-I
GEAR, Backlash Check	37A-7-I
HOSES	37A-37-I
LINKAGE	37A-39-I
LINKAGE SEALS, Maintenance	00-64-I
SHAFT	37A-15-I
WHEEL	
Centering Adjustment	37A-8-I
Return to Center Check	37A-10-I
STOP LIGHT, High Mounted	54-36-II
SUNROOF	42-44-I
SWITCH	
Air Conditioning	Refer to A
Center Differential Lock	Refer to C
Closed Throttle Position	Refer to C
Column <Up to 1993 models>	54-88-II
Control <Suspension>	33A-22-I
Cruise Control, Inspection	13G-29-I
Defogger	54-151-II
Dimmer <1994 models and after>	54-90-II
Electrical Load <DOHC>	13A-155-I
Engine Coolant Temperature <A/C>	55-36-I
Engine Coolant Temperature <Cooling>	14-15-I
4WD Operation Detection	Refer to F
Hazard Light	54-86-II
HI/LO Detection	Refer to H
Ignition	54-6-II
Ignition-IG	Refer to I
Ignition-ST	Refer to I
Inter-lock, Inspection and Adjustment	21-1-I
Lighting <1994 models and after>	54-49-II
Main, Cruise Control, Inspection	13G-28-I
Park/Neutral Position	Refer to P
Parking Brake, Check	36-3-I
Passing <1994 models and after>	54-90-II
Power Steering Pressure	Refer to P
Power Steering Oil Pressure, Check	37A-14-I
Rear Differential Lock Detection, Check	27-15-I
Turn-signal Light <1994 models and after>	54-90-II
2WD/4WD Detection, Check <A/T>	23-46-I

2WD/4WD Detection, Check <M/T>	22-6-I
--------------------------------	--------

T

THERMOSTAT	
<3.0L-12VALVE engine>	14-9-I
<3.0L-24VALVE engine, 3.5L engine>	14-11-I
THERMOSWITCH	14-15-I
THROTTLE BODY (THROTTLE VALVE AREA), Cleaning	13A-42-I
THROTTLE POSITION SENSOR	
Adjustment	13A-42-I
On-vehicle Inspection	
<SOHC-12VALVE engine>	13A-66-I
<SOHC-24VALVE engine, DOHC>	13A-135-I
TIE ROD END BALL JOINT, Starting Torque Check	37A-8-I
TIMER, Defogger	54-153-II
TIMING BELT	
Engine <3.0L-12VALVE engine>	11A-26-I
<3.0L-24VALVE engine>	11A-58-I
<3.5L engine>	11B-30-I
Maintenance	00-57-I
Tension Adjustment <3.0L-12VALVE engine>	11A-10-I
TIRE, Wear Check	31-4-I
TORSION BAR	33A-17-I
TRANSFER	
A/T	23-91-I
M/T	22-11-I
Maintenance	00-62-I
TRIM	
Back Door	42-42-I
Door	42-27-I
Interior	52A-8-I
TURN-SIGNAL LIGHT SWITCH <1994 models and after>	54-90-II
2WD/4WD DETECTION SWITCH	
Check <A/T>	23-46-I
Check <M/T>	22-6-I

U

UPPER ARM	33A-11-I
-----------	----------

V

VACUUM HOSE	
Emission Control	17-3-I
Front Axle	26-29-I
VALVE RELAY, Check <ABS>	35C-71-I
VAPOR LINE	13F-10-I
VARIABLE INDUCTION CONTROL	
SOLENOID, On-vehicles Inspection <DOHC>	13A-183-I
SOLENOID INSPECTION	15-3-I
SYSTEM INSPECTION	15-3-I
VEHICLE SPEED SENSOR, On-vehicle Inspection	
<SOHC-12VALVE engine>	13A-80-I
<SOHC-24VALVE engine, DOHC>	13A-148-I
VENTILATORS	
Air Outlet	55-10-I
Instrument Panel and Floor	55-9-I
VOLUME AIR FLOW SENSOR	
On-vehicles Inspection	
<SOHC-12VALVE engine>	13A-56-I
<SOHC-24VALVE engine, DOHC>	13A-126-I

W

WASHER	
Headlight	51-22-I
Rear	51-17-I
Windshield	51-13-I

WATER PUMP	14-13-I
WATERPROOF FILM	
Back Door	42-42-I
Door	42-27-I
WEATHERSTRIP, Door Opening	42-40-I
WHEEL	
Runout Check	31-4-I
ALIGNMENT	
Front, Inspection and Adjustment	33A-9-I
Rear Adjustment	34-3-I
SPEED SENSOR	
ABS	35C-77-I
Output Voltage Measurement <ABS>	35C-65-I
WINDOW GLASS	42-16-I
WINDOW GLASS	
Back Door	42-23-I
Door, Adjustment	42-10-I
Quarter	42-21-I
WINDOW GLASS RUNCHANNEL	42-40-I
WINDSHIELD	42-18-I
WASHER	51-13-I
WIPER	51-13-I
WIPER	
Rear	51-17-I
Windshield	51-13-I



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