MITSUBISHI GALANT GALANT HATCHBACK

WORKSHOP MANUAL E00ZA00BB

FILING INSTRUCTION

Please keep these manual pages in the binder which is keeping the manual [PWDE9211].
File these pages according to the signs "ADDED", "REVISED" and "DELETED" on the "list of effective pages" which are interpreted below.

ADDED: File the pages with this sign additionally in your manual.

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Missing sheets will be supplied upon request.

Pub. No. PWDE9211 - B

MITSUBISHI MOTORS CORPORATION

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7	**B**	**Dec. 1993**	**REVISED**
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55 Heater, Air Conditioner and Ventilation			
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47		Dec. 1992	
48 thru 49	**B**	**Dec. 1993**	**REVISED**
49-1 thru 49-2	**B**	**Dec. 1993**	**ADDED**
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53 thru 56	**B**	**Dec. 1993**	**REVISED**
57 thru 73		Dec. 1992	
74	A	Jun. 1993	REVISED
75 thru 77		Dec. 1992	
78	A	Jun. 1993	REVISED
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93		Dec. 1992	
94	**B**	**Dec. 1993**	**REVISED**
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RJST312007-418
RJST306008-60
RJST212008-1616

E00ZA00AB

MITSUBISHI GALANT GALANT HATCHBACK

WORKSHOP MANUAL

FOREWORD

This Workshop Manual contains procedures for service mechanics, including removal, disassembly, inspection, adjustment, reassembly and installation. Use the following manuals in combination with this manual as required.

TECHNICAL INFORMATION MANUAL	PYDE9203
WORKSHOP MANUAL	
ENGINE GROUP	PWEE □□□□ (Looseleaf edition)
ELECTRICAL WIRING	PHDE9220 (Looseleaf edition)
BODY REPAIR MANUAL	PBDE9210
PARTS CATALOGUE	B608F002A□
	B608F004A□

All information, illustrations and product descriptions contained in this manual are current as at the time of publication. We, however, reserve the right to make changes at any time without prior notice or obligation.

MITSUBISHI MOTORS CORPORATION

 Dec. 1993 PWDE9211-B REVISED

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 or front 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

E00AA00AB

NOTES

HOW TO USE THIS MANUAL

E00AB00AA

SCOPE OF MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

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

SERVICE ADJUSTMENT PROCEDURES

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

INSPECTION

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

DEFINITION OF TERMS

STANDARD VALUE

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

LIMIT

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

REFERENCE VALUE

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

CAUTION

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

INDICATION OF TIGHTENING TORQUE

The tightening torque shown in this manual is a basic value with a tolerance of + 10% except the following cases when the upper and lower limits of tightening torque are given.
(1) The tolerance of the basic value is within + 10%.
(2) Special bolts or the like are in use.
(3) Special tightening methods are used.

MODEL INDICATIONS

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

M/T : Indicates the manual transmission, or models equipped with the manual transmission.
A/T : Indicates the automatic transmission, or models equipped with the automatic transmission.
SOHC :Indicates an engine with the single overhead camshaft, or a model equipped with such an engine.
DOHC : Indicates an engine with the double overhead camshaft, or a model equipped with such an engine
MPI : Indicates the multi-point injection, or engines equipped with the multi-point injection.
DIESEL : Indicates a diesel engine, or models equipped with such an engine.
2WD : Indicates the front wheel-drive vehicles.
4WD : Indicates the 4 wheel-drive vehicles.
4WS : Indicates the 4-wheel steering system or models equipped with the 4-wheel steering system.

EXPLANATION OF MANUAL CONTENTS

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 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.

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.

Indicates (by symbols) where lubrication is necessary.

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 number.

Indicates the page number.

Indicates the group title.

Indicates the section title.

37A-30 STEERING – Power Steering Gear Box

POWER STEERING GEAR BOX

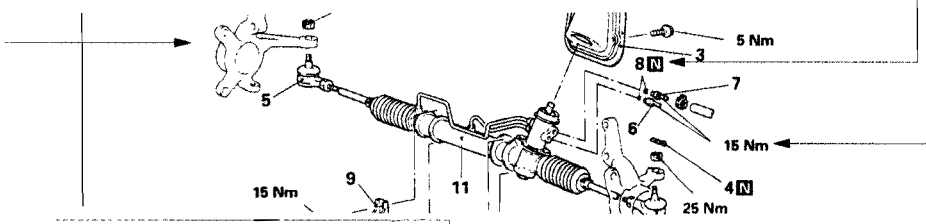
REMOVAL AND INSTALLATION

E37PA-

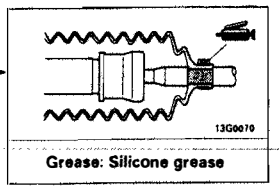
Pre-removal Operation
- Draining of the Power Steering Fluid (Refer to P.37A-12.)

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

Denotes non-reusable part.



Denotes tightening torque.

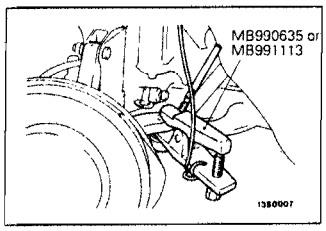


Removal steps
1. Joint assembly and gear box connecting bolt
2. Band
3. Steering cover
4. Split pin
5. Connection for tie-rod end and knuckle
6. Pressure pipe
7. Return pipe

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

SERVICE POINTS OF REMOVAL

E37P8AH

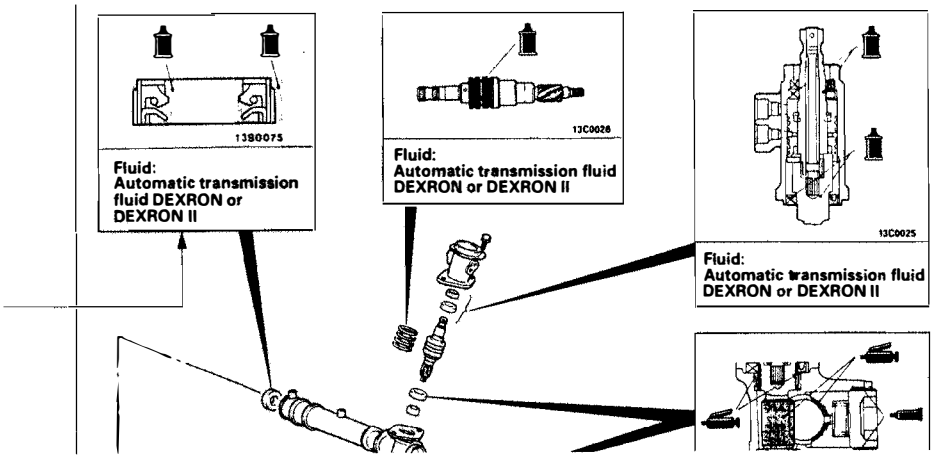


◇A◇ **DISCONNECTION OF TIE-ROD END**

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

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.

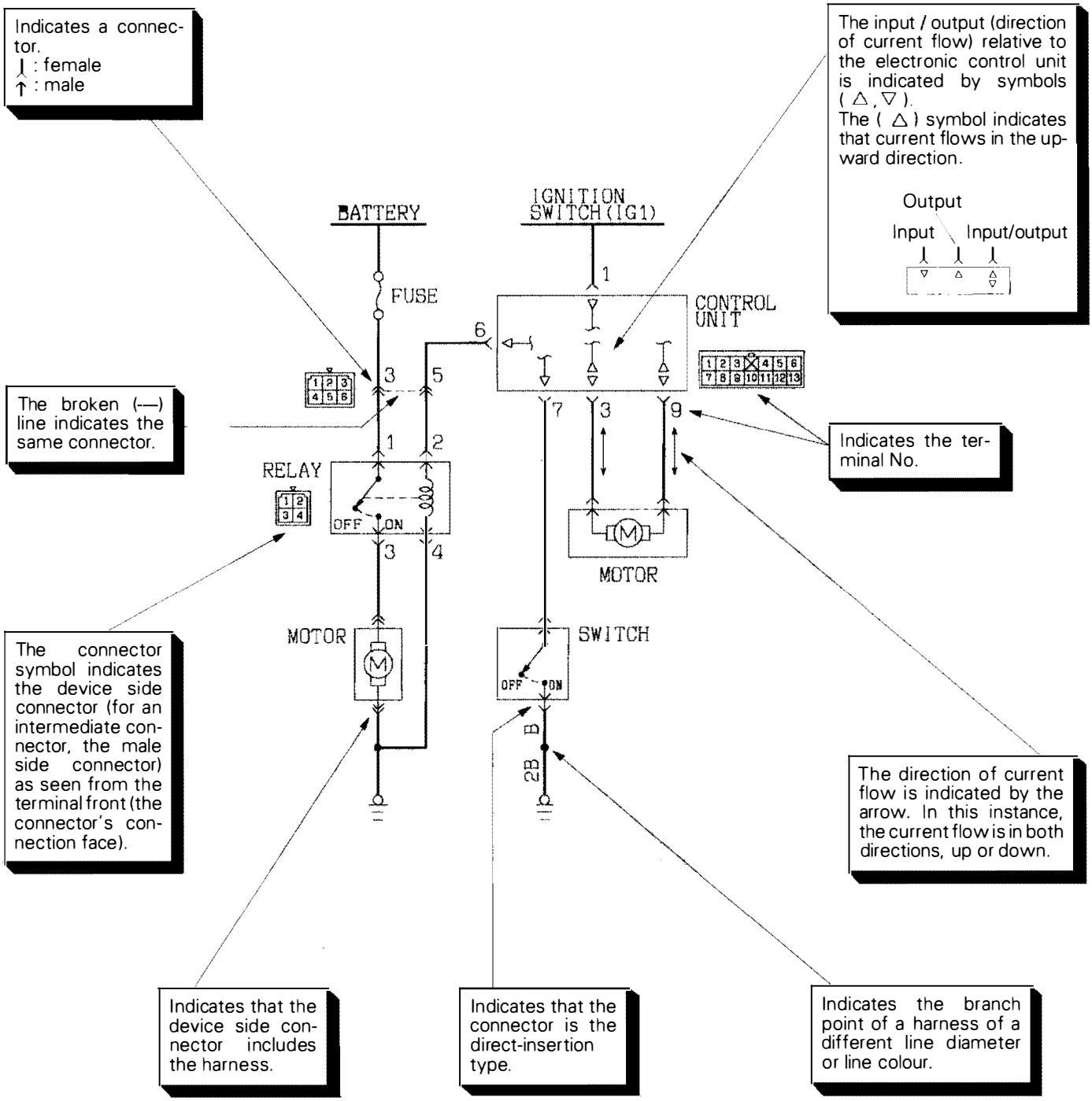
LUBRICATION AND SEALING POINTS



EXPLANATION OF CIRCUIT DIAGRAMS

The symbols used in circuit diagrams are used as described below.

NOTE
For detailed information concerning the reading of circuit diagrams, refer to the separate manual of "ELECTRICAL WIRING".



HOW TO USE TROUBLESHOOTING/INSPECTION SERVICE POINTS

E00AB01AA

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

TROUBLESHOOTING CONTENTS

1. STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

The main procedures for diagnostic troubleshooting are shown.

2. SYSTEM OPERATION AND SYMPTOM VERIFICATION TESTS

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

3. DIAGNOSTIC FUNCTION

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

4. INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

5. NSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

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

6. INSPECTION CHART FOR TROUBLE SYMPTOMS

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

7. INSPECTION PROCEDURE FOR DIAGNOSTIC SYMPTOM

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

8. SERVICE DATA REFERENCE TABLE

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

9. CHECK AT ECU TERMINALS

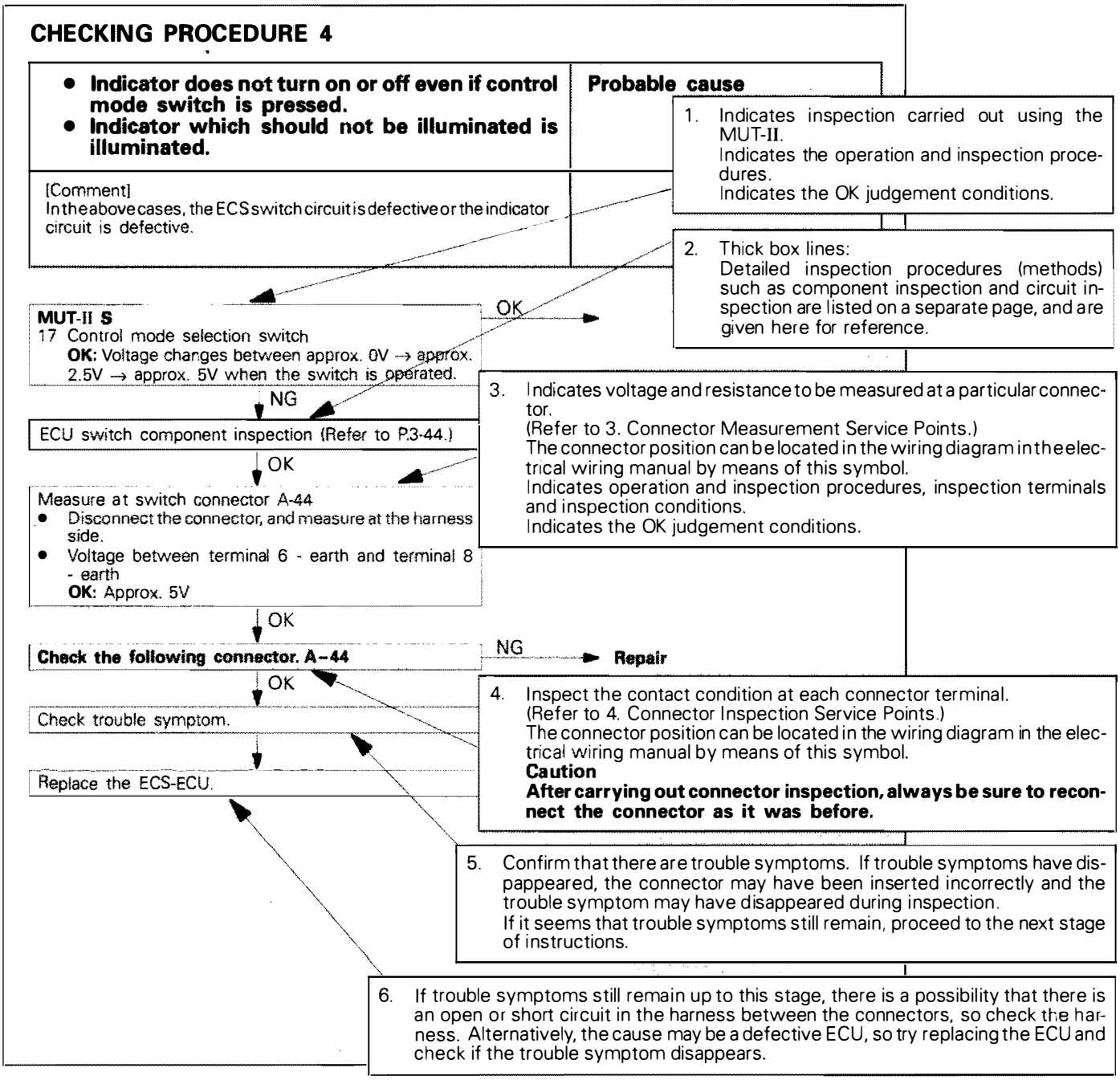
Terminal numbers for the ECU connectors, inspection items and standard values have been provided in this chart as reference information.

10. INSPECTION PROCEDURES USING AN OSCILLOSCOPE

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

HOW TO USE THE INSPECTION PROCEDURES

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



HARNESS INSPECTION

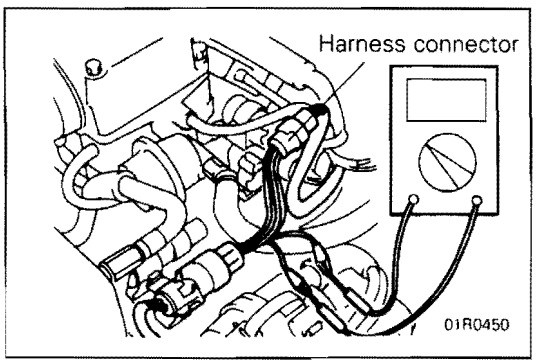
Check for an open or short circuit in the harness between the terminals which were defective according to the connector measurements. Carry out this inspection while referring to the electrical wiring manual. Here, "Check harness between power supply and terminal xx" also includes checking for blown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

MEASURES TO TAKE AFTER REPLACING THE ECU

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

CONNECTOR MEASUREMENT SERVICE POINTS

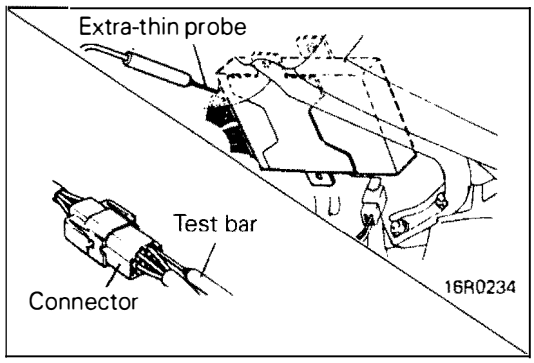
Turn the ignition switch to OFF when connecting and disconnecting the connectors, and turn the ignition switch to ON when measuring if there are no instructions to the contrary.



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

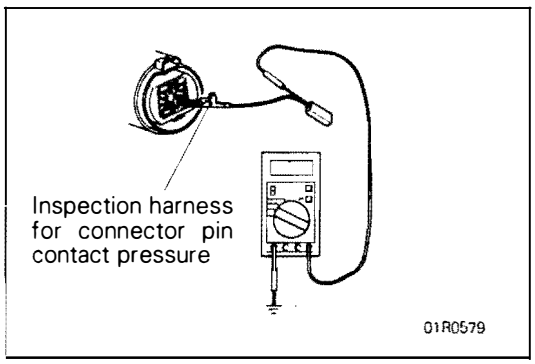
Waterproof Connectors

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



Ordinary (non-waterproof) Connectors

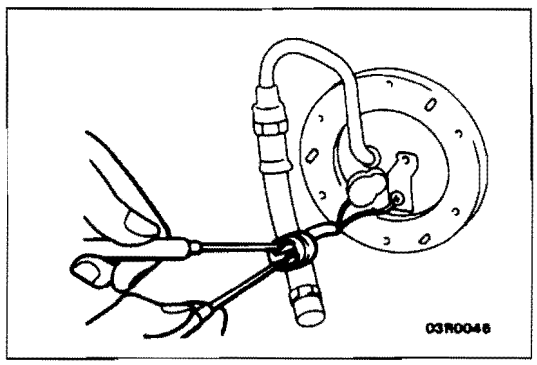
Check by inserting the test bar from the harness side. Note that if the connector (control unit, etc.) is too small to permit insertion of the test bar, it should not be forced; use a special tool (the extra–thin probe in the harness set for checking) for this purpose.



IF INSPECTING WITH THE CONNECTOR DISCONNECTED

<When Inspecting a Female Pin>

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

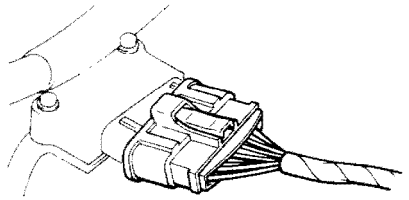


<When Inspecting a Male Pin>

Touch the pin directly with the test bar.

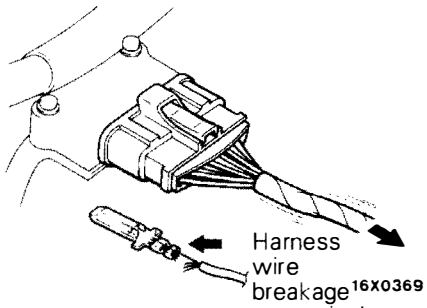
Caution
At this time, be careful not to short the connector pins with the test bars. To do so may damage the circuits inside the ECU.

Connector disconnected or improperly connected

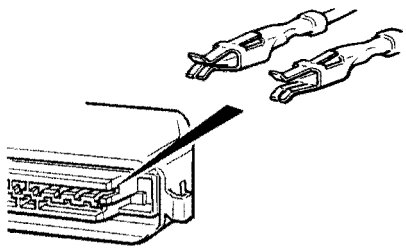


16S0256

Defective connector contact



Low contact pressure

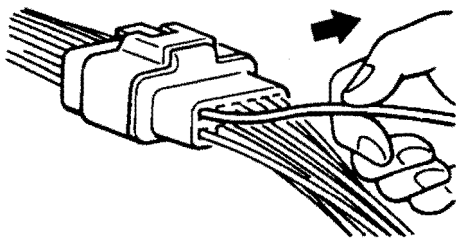


16S0254

CONNECTOR INSPECTION

VISUAL INSPECTION

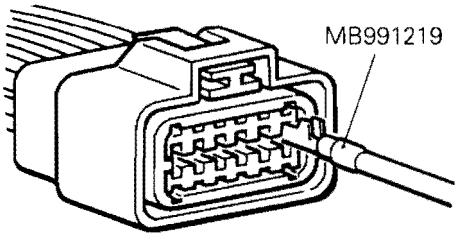
- Connector is disconnected or improperly connected
- Connector pins are pulled out
- Due to harness tension at terminal section
- Low contact pressure between male and female terminals
- Low connection pressure due to rusted terminals or foreign matter lodged in terminals



16R1317

CONNECTOR PIN INSPECTION

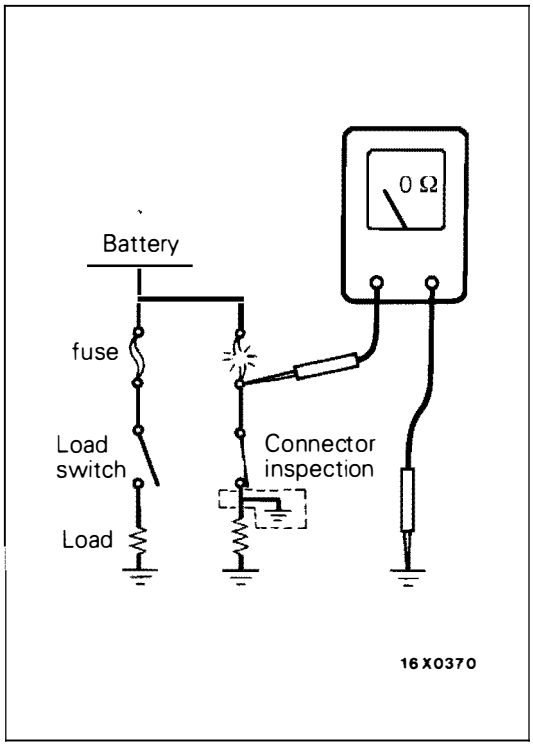
If the connector pin stopper is damaged, the terminal connections (male and female pins) will not be perfect even if the connector body is connected, and the pins may pull out of the reverse side of the connector. Therefore, gently pull the harnesses one by one to make sure that no pins pull out of the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



16R1318

CONNECTOR ENGAGEMENT INSPECTION

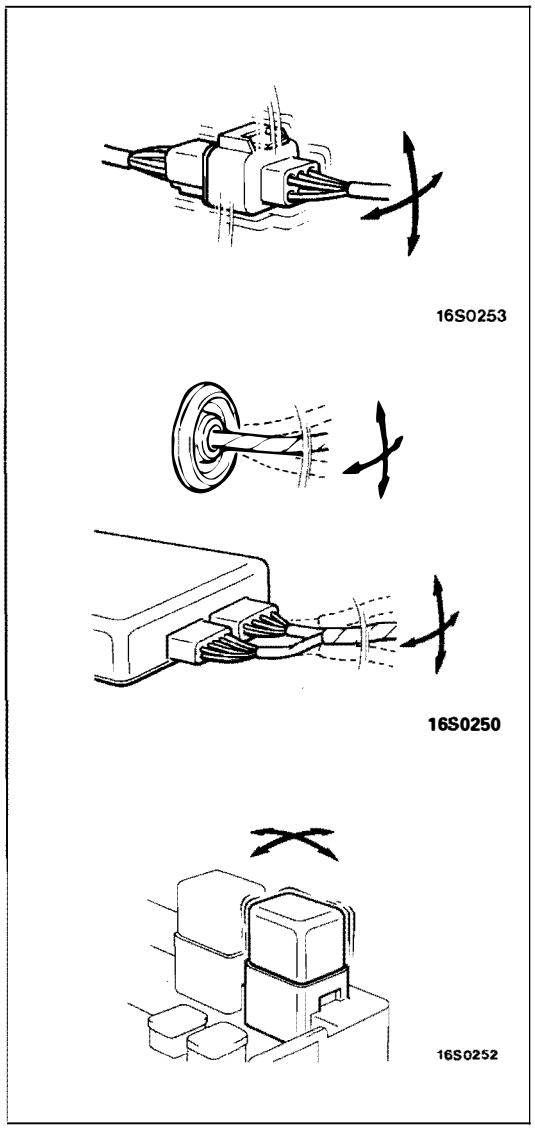
Use the special tool (connector pin connection pressure inspection harness of the inspection harness set) to inspect the engagement of the male pins and female pins. (Pin drawing force : 1 N or more)



INSPECTION SERVICE POINTS FOR A BLOWN FUSE

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

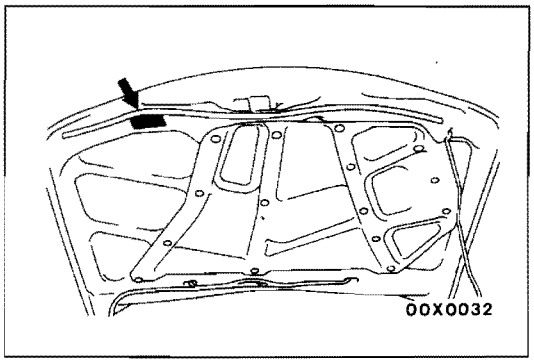
The main causes of a short circuit are the following.
- Harness being clamped by the vehicle body
- Damage to the outer casing of the harness due to wear or heat
- Water getting into the connector or circuitry
- Human error (mistakenly shorting a circuit, etc.)



POINTS TO NOTE FOR INTERMITTENT MALFUNCTIONS

Intermittent malfunctions often occur under certain conditions, and if these conditions can be ascertained, determining the cause becomes simple. In order to ascertain the conditions under which an intermittent malfunction occurs, first ask the customer for details about the driving conditions, weather conditions, frequency of occurrence and trouble symptoms, and then try to recreate the trouble symptoms. Next, ascertain whether the reason why the trouble symptom occurred under these conditions is due to vibration, temperature or some other factor. If vibration is thought to be the cause, carry out the following checks with the connectors and components to confirm whether the trouble symptom occurs.
The objects to be checked are connectors and components which are indicated by inspection procedures or given as probable causes (which generate diagnosis codes or trouble symptoms).
- Gently shake the connector up, down and to the left and right.
- Gently shake the wiring harness up, down and to the left and right.
- Gently rock each sensor and relay, etc. by hand.
- Gently shake the wiring harness at suspensions and other moving parts.

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



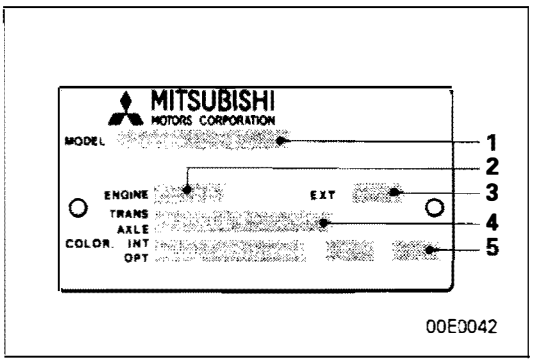
VEHICLE IDENTIFICATION

E00AC00AA

VEHICLE INFORMATION CODE PLATE

LOCATION

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



CODE PLATE DESCRIPTION

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

1. MODEL

E54AS NGMQL6

Model series
Vehicle model

2. ENGINE

6A12

Engine model

3. EXT

CA6

Exterior code

4. TRANSAXLE

F5M31

Transmission model

5. COLOR, INT
OPT

R25 87V 03V

Equipment code
Interior colour code
Body colour code

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

MODELS (Up to 1993 models)

E00AD00AB

<Sedan>

Model Code		Engine model	Transmission model	Fuel supply system
E52A	SNJEQL6/R6	4G93 (1,834 m ℓ)	F5M22 (2WD – 5M/T)	MPI
	SNHEQL6/R6			
	SRHEQL6/R6		F4A22 (2WD – 4A/T)	
E55A	SNJEQL6/R6	4G63 (1,997 m ℓ)	F5M22 (2WD – 5M/T)	
	SNHEQL6/R6			
	SRHEQL6/R6		F4A22 (2WD – 4A/T)	
E54A	SNGMQL6/R6	6A12 (1,999 m ℓ)	F5M31 (2WD – 5M/T)	
	SRGMQL6/R6		F4A23 (2WD – 4A/T)	
E64A	SNGMQL6/R6		F5M31 (2WD – 5M/T)	
	SRGMQL6/R6		F4A23 (2WD – 4A/T)	
E57A	SNJFL6/R6	4D68 (1,998 m ℓ) turbocharger with inter-cooler	F5M31 (2WD – 5M/T)	Fuel injection pump
	SNJFQL6			
	SNHFL6/R6			
	SNHFQL6			
E75A	SNHEQL6/R6	4G63 (1,997 m ℓ)	W5M31 (4WD – 5M/T)	MPI
E88A	SNGMQL6/R6	6G73 (2,497 m ℓ)	W5M33 (4WD – 5M/T)	
E52A	SRHEQL6B	4G93 (1,834 m ℓ)	F4A22 (2WD – 4A/T)	
E55A	SRHEQL6B	4G63 (1,997 m ℓ)		

<Hatchback>

Model Code		Engine model	Transmission model	Fuel supply system
E52A	LNJEQL6/R6	4G93 (1,834 m ℓ)	F5M22 (2WD – 5M/T)	MPI
	LNHEQL6/R6			
	LRHEQL6/R6		F4A22 (2WD – 4A/T)	
E55A	LNJEQL6/R6	4G63 (1,997 m ℓ)	F5M22 (2WD – 5M/T)	
	LNHEQL6/R6			
	LRHEQL6/R6		F4A22 (2WD – 4A/T)	
E54A	LNGMQL6/R6	6A12 (1,999 m ℓ)	F5M31 (2WD – 5M/T)	
	LRGMQL6/R6		F4A23 (2WD – 4A/T)	
E64A	LNGMQL6/R6		F5M31 (2WD – 5M/T)	
	LRGMQL6/R6		F4A23 (2WD – 4A/T)	
E57A	LNJFL6/R6	4D68 (1,998 m ℓ) turbocharger with inter-cooler	F5M31 (2WD – 5M/T)	Fuel injection pump
	LNJFQL6			
	LNHFL6/R6			
	LNHFQL6			
E75A	LNHEQL6/R6	4G63 (1,997 m ℓ)	W5M31 (4WD – 5M/T)	MPI
E88A	LNGMQL6/R6	6G73 (2,497 m ℓ)	W5M33 (4WD – 5M/T)	

MODELS (From 1994 models)

E00AD00AC

<Sedan>

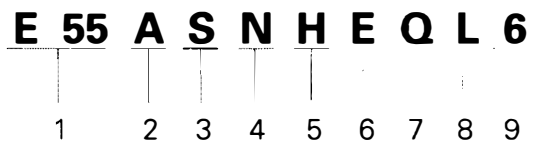
Model Code		Engine model	Transmission model	Fuel supply system
E52A	SNJEQL6/R6	4G93 (1,834 m ℓ)	F5M22 (2WD–5M/T)	MPI
	SNHEQL6/R6			
	SNJESL6			
	SNHESL6			
	SRHEQL6/R6		F4A22 (2WD –4A/T)	
	SRHESL6			
E55A	SNJEQL6/R6	4G63 (1,997 m ℓ)	F5M22 (2WD–5M/T)	
	SNHEQL6/R6			
	SRHEQL6/R6		F4A22 (2WD–4A/T)	
E54A	SNGMQL6/R6	6A12 (1,999 m ℓ)	F5M31 (2WD–5M/T)	
	SRGMQL6/R6		F4A23 (2WD–4A/T)	
E64A	SNGMQL6/R6		F5M31 (2WD–5M/T)	
	SRGMQL6/R6		F4A23 (2WD–4A/T)	
E57A	SNJFL6/R6	4D68 (1,998 m ℓ) turbocharger with inter-cooler	F5M31 (2WD–5M/T)	Fuel injection pump
	SNJFQL6			
	SNHFL6/R6			
	SNHFQL6			
E75A	SNHEQL6/R6	4G63 (1,997 m ℓ)	W5M31 (4WD–5M/T)	MPI
E88A	SNGMQL6/R6	6G73 (2,497 m ℓ)	W5M33 (4WD–5M/T)	
E52A	SRHEQL6B	4G93 (1,834 m ℓ)	F4A22 (2WD–4A/T)	
	SNJEQL6B			
E55A	SRHEQL6B	4G63 (1,997 m ℓ)		

<Hatchback>

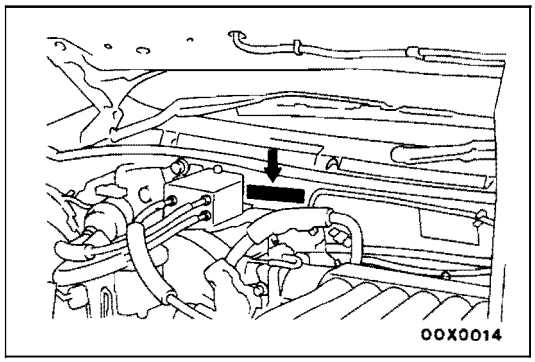
Model Code		Engine model	Transmission model	Fuel supply system
E52A	LNJEQL6/R6	4G93 (1,834 m ℓ)	F5M22 (2WD–5M/T)	MPI
	LNHEQL6/R6			
	LNJESL6			
	LNHESL6			
	LRHEQL6/R6		F4A22 (2WD–4A/T)	
	LRHESL6			
E55A	LNJEQL6/R6	4G63 (1,997 m ℓ)	F5M22 (2WD–5M/T)	
	LNHEQL6/R6			
	LRHEQL6/R6		F4A22 (2WD–4A/T)	
E54A	LNGMQL6/R6	6A12 (1,999 m ℓ)	F5M31 (2WD–5M/T)	
	LRGMQL6/R6		F4A23 (2WD–4A/T)	
E64A	LNGMQL6/R6		F5M31 (2WD–5M/T)	
	LRGMQL6/R6		F4A23 (2WD–4A/T)	
E57A	LNJFL6/R6	4D68 (1,998 m ℓ) turbocharger with inter-cooler	F5M31 (2WD–5M/T)	Fuel injection pump
	LNJFQL6			
	LNHFL6/R6			
	LNHFQL6			
E75A	LNHEQL6/R6	4G63 (1,997 m ℓ)	W5M31 (4WD–5M/T)	MPI
E88A	LNGMQL6/R6	6G73 (2,497 m ℓ)	W5M33 (4WD–5M/T)	

MODEL CODE

E00AD01AA



1. Development order
   E52 – 1800-SOHC
   E55 – 2000-SOHC
   E54 – 2000-DOHC
   E64 – 2000-DOHC-4WS
   E57 – 2000-Diesel
   E75 – 2000-SOHC-4WD
   E88 – 2500-DOHC-4WD
2. Sort
   A – Passenger car
3. Body style
   S – 4-door sedan
   L – 4-door hatchback
4. Transmission type
   N – 5-speed manual transmission
   R – 4-speed automatic transmission
5. Trim level
6. Specified engine feature
   E – MPI-SOHC
   F – Turbocharger with intercooler
   M – MPI-DOHC
7. Exhaust system specification
   Q – With catalytic converter
   None – Without catalytic converter
8. Steering wheel location
   L – Left hand
   R – Right hand
9. Destination
   6 – For Europe



CHASSIS NUMBER

E00AD02AB

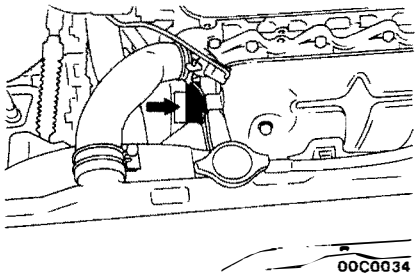
The chassis number is stamped on the toeboard inside the engine compartment.

JMBSNE55APZ000001

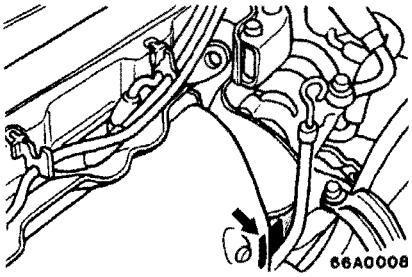
1 2 3 4 5 6 78 9 10 11

1. Asia
2. Japan
3. MITSUBISHI
   A – For Europe, right hand drive
   B – For Europe, left hand drive
4. Body style
   S – 4-door sedan
   L – 4-door hatchback
5. Transmission type
   N – 5-speed manual transmission
   R – 4-speed automatic transmission
6. Development order
   E52 – 1800-SOHC
   E55 – 2000-SOHC
   E54 – 2000-DOHC
   E64 – 2000-DOHC-4WS
   E57 – 2000-Diesel
   E75 – 2000-SOHC-4WD
   E88 – 2500-DOHC-4WD
7. Sort
   A – Passenger car
8. Vehicle type
   E50-GALANT
9. Model year
   P-1993
   R-1994
10. Plant
    Z – Okazaki Plant of Nagoya Motor Vehicle Works
    Y – Ooe Plant of Nagoya Motor Vehicle Works
    U – Mizushima Motor Vehicle Works
11. Serial number

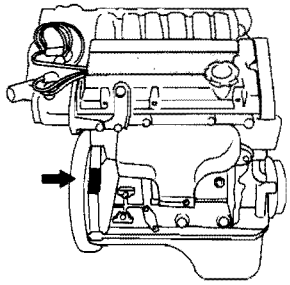
<4G93>



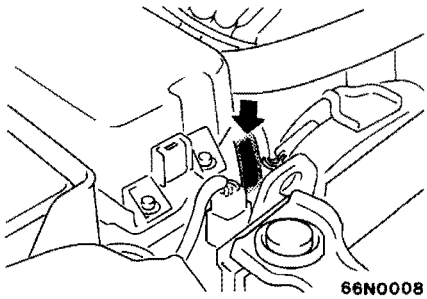
<4G63>



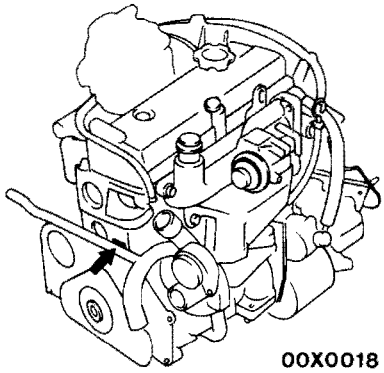
<6A12>



<6G73>



<4D68>



ENGINE MODEL NUMBER

E00AD03AB

1. The engine number is stamped on the engine cylinder block as shown in the illustration.

Engine model	Engine displacement cm^3
4G93	1,834
4G63	1,997
6A12	1,999
6G73	2,497
4D68	1,998

2. The engine serial number is stamped near the engine model number, and the serial number cycles, as shown belows.

<Vehicles with 6G73 built up to May 1993>, <Vehicles without 6G73>

Engine serial number cycling
AA0201 → AA9999 → AB0001 → AY9999 → BA0001 → YY9999

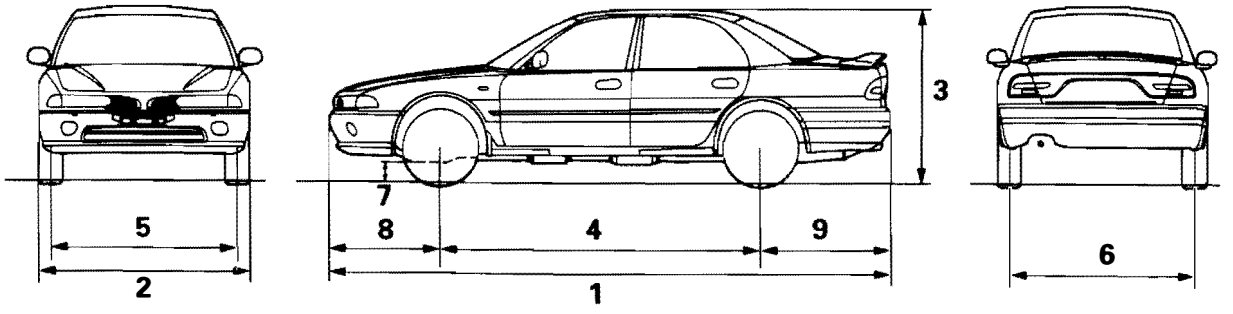
<Vehicles with 6G73 built from June 1993>

Engine serial number cycling
A09990 → A99999 → B00001 → Y99999

MAJOR SPECIFICATIONS

E00AE00AB

Sedan



00X0029

<E52AS>

Items		E52ASNJEQL6 E52ASNJEQR6 E52ASNJESL6 E52ASNJEQL6B	E52ASNHEQL6 E52ASNHEQR6 E52ASNHESL6	E52ASRHEQL6 E52ASRHEQR6 E52ASRHESL6	E52ASRHEQL6B
Dimensions mm					
Overall length	1	4,620			
Overall width	2	1,730			
Overall height (unladen)	3	1,395			
Wheelbase	4	2,635			
Track – front	5	1,510			
Track – rear	6	1,505			
Ground clearance (laden)	7	120			
Overhang – front	8	920			
Overhang – rear	9	1,065			
Weight kg					
Kerb weight		1,170	1,180	1,200	1,190
Gross vehicle weight		1,705	1,705	1,705	1,705
Max. axle weight					
front		920	920	920	900
rear		915	915	915	805
Seating capacity		5			
Engine					
Model		4G93			
Total displacement mℓ		1,834			
Transmission					
Model		F5M22	F5M22	F4A22	F4A22
Type		5-speed manual	5-speed manual	4-speed automatic	4-speed automatic

<E55AS>

Items		E55ASNJEQL6 E55ASNJEQR6	E55ASNHEQL6 E55ASNHEQR6	E55ASRHEQL6 E55ASRHEQR6	E55ASRHEQL6B
Dimensions mm					
Overall length	1	4,620			
Overall width	2	1,730			
Overall height (unladen)	3	1,395			
Wheelbase	4	2,635			
Track – front	5	1,510			
Track – rear	6	1,505			
Ground clearance (laden)	7	120			
Overhang – front	8	920			
Overhang – rear	9	1,065			
Weight kg					
Kerb weight		1,220	1,230	1,250	1,190
Gross vehicle weight		1,760	1,760	1,760	1,705
Max. axle weight					
front		950	950	950	900
rear		940	940	940	805
Seating capacity		5			
Engine					
Model		4G63			
Total displacement m*l*		1,997			
Transmission					
Model		F5M22	F5M22	F4A22	F4A22
Type		5-speed manual	5-speed manual	4-speed automatic	4-speed automatic

<E54AS, E64AS>

Items		E54ASNGMQL6 E54ASNGMQR6	E54ASRGMQL6 E54ASRGMQR6	E64ASNGMQL6 E64ASNGMQR6	E64ASRGMQL6 E64ASRGMQR6
Dimensions mm					
Overall length	1	4,620			
Overall width	2	1,730			
Overall height (unladen)	3	1,395			
Wheelbase	4	2,635			
Track – front	5	1,510			
Track – rear	6	1,505			
Ground clearance (laden)	7	120			
Overhang – front	8	920			
Overhang – rear	9	1,065			

Items	E54ASNGMQL6 E54ASNGMQR6	E54ASRGMQL6 E54ASRGMQR6	E64ASNGMQL6 E64ASNGMQR6	E64ASRGMQL6 E64ASRGMQR6
Weight kg				
Kerb weight	1,270	1,290	1,290	1,310
Gross vehicle weight	1,840	1,840	1,840	1,840
Max. axle weight				
front	1,005	1,005	1,005	1,005
rear	965	965	965	965
Seating capacity	5			
Engine				
Model	6A12			
Total displacement mℓ	1,999			
Transmission				
Model	F5M31	F4A23	F5M31	F4A23
Type	5-speed manual	4-speed automatic	5-speed manual	4-speed automatic

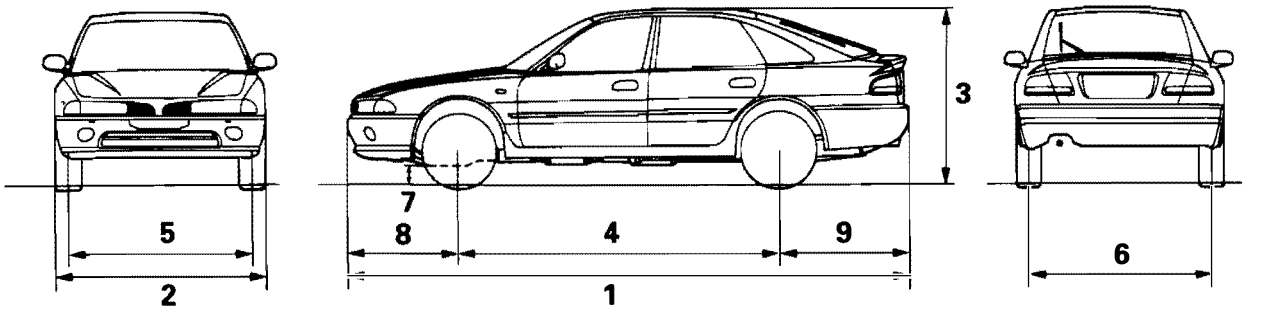
<E57AS>

Items		E57ASNJFL6 E57ASNJFR6	E57ASNHFL6 E57ASNHFR6	E57ASNJFQL6	E57ASNHFQL6
Dimensions mm					
Overall length	1	4,620			
Overall width	2	1,730			
Overall height (unladen)	3	1,395			
Wheelbase	4	2,635			
Track – front	5	1,510			
Track – rear	6	1,505			
Ground clearance (laden)	7	120			
Overhang – front	8	920			
Overhang – rear	9	1,065			
Weight kg					
Kerb weight		1,250	1,260	1,250	1,260
Gross vehicle weight		1,765	1,765	1,765	1,765
Max. axle weight					
front		980	980	980	980
rear		915	915	915	915
Seating capacity		5			
Engine					
Model		4D68			
Total displacement mℓ		1,998			
Transmission					
Model		F5M31			
Type		5-speed manual			

<E75AS, E88AS>

Items		E75ASNHEQL6 E75ASNHEQR6	E88ASNGMQL6 E88ASNGMQR6
Dimensions mm			
Overall length	1	4,620	
Overall width	2	1,730	
Overall height (unladen)	3	1,405	
Wheelbase	4	2,635	
Track – front	5	1,510	
Track – rear	6	1,505	
Ground clearance (laden)	7	130	
Overhang-front	8	920	
Overhang-rear	9	1,065	
Weight kg			
Kerb weight		1,330	1,440
Gross vehicle weight		1,835	1,945
Max. axle weight			
front		965	1,050
rear		1,000	1,025
Seating capacity		5	
Engine			
Model		4G63	6G73
Total displacement m*l*		1,997	2,497
Transmission			
Model		W5M31	W5M33
Type		5-speed manual	5-speed manual

Hatchback



<E52AL>

Items		E52ALNJEQL6 E52ALNJEQR6 E52ALNJESL6	E52ALNHEQL6 E52ALNHEQR6 E52ALNHESL6	E52ALRHEQL6 E52ALRHEQR6 E52ALRHESL6
Dimensions mm				
Overall length	1		4,620	
Overall width	2		1,730	
Overall height (unladen)	3		1,395	
Wheelbase	4		2,635	
Track – front	5		1,510	
Track – rear	6		1,505	
Ground clearance (laden)	7		120	
Overhang – front	8		920	
Overhang – rear	9		1,065	
Weight kg				
Kerb weight		1,210	1,220	1,240
Gross vehicle weight		1,745, 1,720*	1,745, 1,720*	1,745, 1,720*
Max. axle weight				
front		920	920	920
rear		955	955	955
Seating capacity			5	
Engine				
Model			4G93	
Total displacement mℓ			1,834	
Transmission				
Model		F5M22	F5M22	F4A22
Type		5-speed manual	5-speed manual	4-speed automatic

*: Vehicles for Sweden

<E55AL>

Items		E55ALNJEQL6 E55ALNJEQR6	E55ALNHEQL6 E55ALNHEQR6	E55ALRHEQL6 E55ALRHEQR6
Dimensions mm				
Overall length	1		4,620	
Overall width	2		1,730	
Overall height (unladen)	3		1,395	
Wheelbase	4		2,635	
Track – front	5		1,510	
Track – rear	6		1,505	
Ground clearance (laden)	7		120	
Overhang – front	8		920	
Overhang – rear	9		1,065	
Weight kg				
Kerb weight		1,260	1,270	1,290
Gross vehicle weight		1,800, 1,780*	1,800, 1,780*	1,800, 1,780*
Max. axle weight				
front		950	950	950
rear		980	980	980
Seating capacity			5	
Engine				
Model			4G63	
Total displacement mℓ			1,997	
Transmission				
Model		F5M22	F5M22	F4A22
Type		5-speed manual	5-speed manual	4-speed automatic

*: Vehicles for Sweden

<E54AL, E64AL>

Items		E54ALNGMQL6 E54ALNGMQR6	E54ALRGMQL6 E54ALRGMQR6	E64ALNGMQL6 E64ALNGMQR6	E64ALRGMQL6 E64ALRGMQR6
Dimensions mm					
Overall length	1		4,620		
Overall width	2		1,730		
Overall height (unladen)	3		1,395		
Wheelbase	4		2,635		
Track – front	5		1,510		
Track – rear	6		1,505		
Ground clearance (laden)	7		120		
Overhang – front	8		920		
Overhang – rear	9		1,065		

Items	E54ALNGMQL6 E54ALNGMQR6	E54ALRGMQL6 E54ALRGMQR6	E64ALNGMQL6 E64ALRGMQR6	E64ALRGMQL6 E64ALRGMQR6
Weight kg				
Kerb weight	1,310	1,330	1,330	1,350
Gross vehicle weight	1,880, 1,820*	1,880, 1,820*	1,880, 1,840*	1,880, 1,840*
Max. axle weight				
front	1,010	1,010	1,010	1,010
rear	1,000	1,000	1,000	1,000
Seating capacity	5			
Engine				
Model	6A12			
Total displacement mℓ	1,999			
Transmission				
Model	F5M31	F4A23	F5M31	F4A23
Type	5-speed manual	4-speed automatic	5-speed manual	4-speed automatic

*: Vehicles for Sweden

<E57AL>

Items		E57ALNJFL6 E57ALNJFR6	E57ALNHFL6 E57ALNHFR6	E57ALNJFQL6	E57ALNHFQL6
Dimensions mm					
Overall length	1	4,620			
Overall width	2	1,730			
Overall height (unladen)	3	1,395			
Wheelbase	4	2,635			
Track – front	5	1,510			
Track – rear	6	1,505			
Ground clearance (laden)	7	120			
Overhang – front	8	920			
Overhang – rear	9	1,065			
Weight kg					
Kerb weight		1,290	1,300	1,290	1,300
Gross vehicle weight		1,805	1,805	1,805	1,805
Max. axle weight					
front		980	980	980	980
rear		955	955	955	955
Seating capacity		5			
Engine					
Model		4D68			
Total displacement mℓ		1,998			
Transmission					
Model		F5M31			
Type		5-speed manual			

<E75AL, E88AL>

Items		E75ALNHEQL6 E75ALNHEQR6	E88ALNGMQL6 E88ALNGMQR6
Dimensions mm			
Overall length	1	4,620	
Overall width	2	1,730	
Overall height (unladen)	3	1,405	
Wheelbase	4	2,635	
Track – front	5	1,510	
Track – rear	6	1,505	
Ground clearance (laden)	7	130	
Overhang – front	8	920	
Overhang – rear	9	1,065	
Weight kg			
Kerb weight		1,370	1,480
Gross vehicle weight		1,875	1,985
Max. axle weight			
front		970	1,055
rear		1,035	1,060
Seating capacity		5	
Engine			
Model		4G63	6G73
Total displacement mℓ		1,997	2,497
Transmission			
Model		W5M31	W5M33
Type		5-speed manual	5-speed manual

PRECAUTIONS BEFORE SERVICE

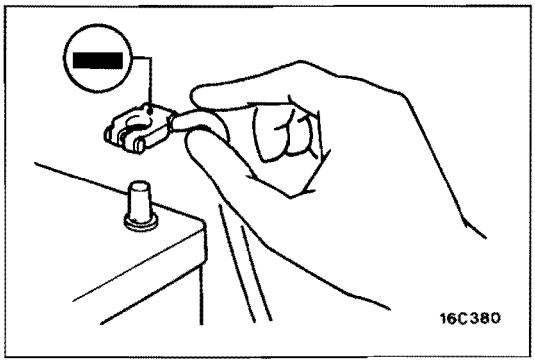
E00AF00AB

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

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

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

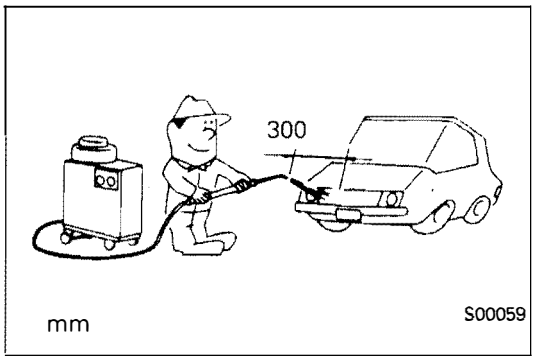
NOTES



SERVICING THE ELECTRICAL SYSTEM

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

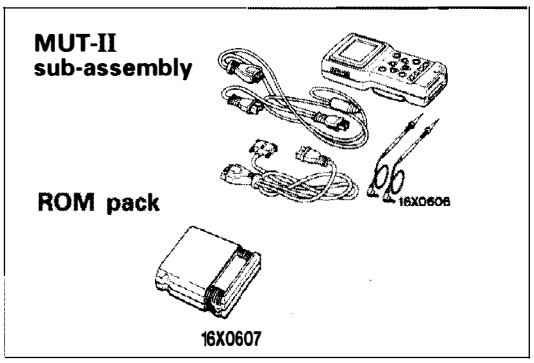
Caution
Before connecting or disconnecting the negative (–) cable, be sure to turn off the ignition switch and the lighting switch.
(If this is not done, there is the possibility of semiconductor parts being damaged.)



VEHICLE WASHING E00AF01AA

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

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



MUT-II E00AF02AA

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

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

IN ORDER TO PREVENT VEHICLES FROM FIRE

E00AF03AA

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

ENGINE OILS

E00AF04AA

Health Warning

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

Recommended Precautions

E00AF04BA

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

Other precautions:

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

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)-AIR BAG

E00AF10AB

GENERAL INFORMATION

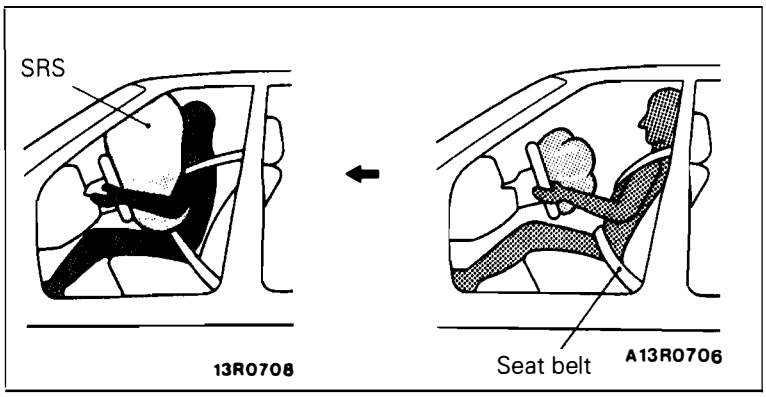
<Vehicles without front passenger's air bag>

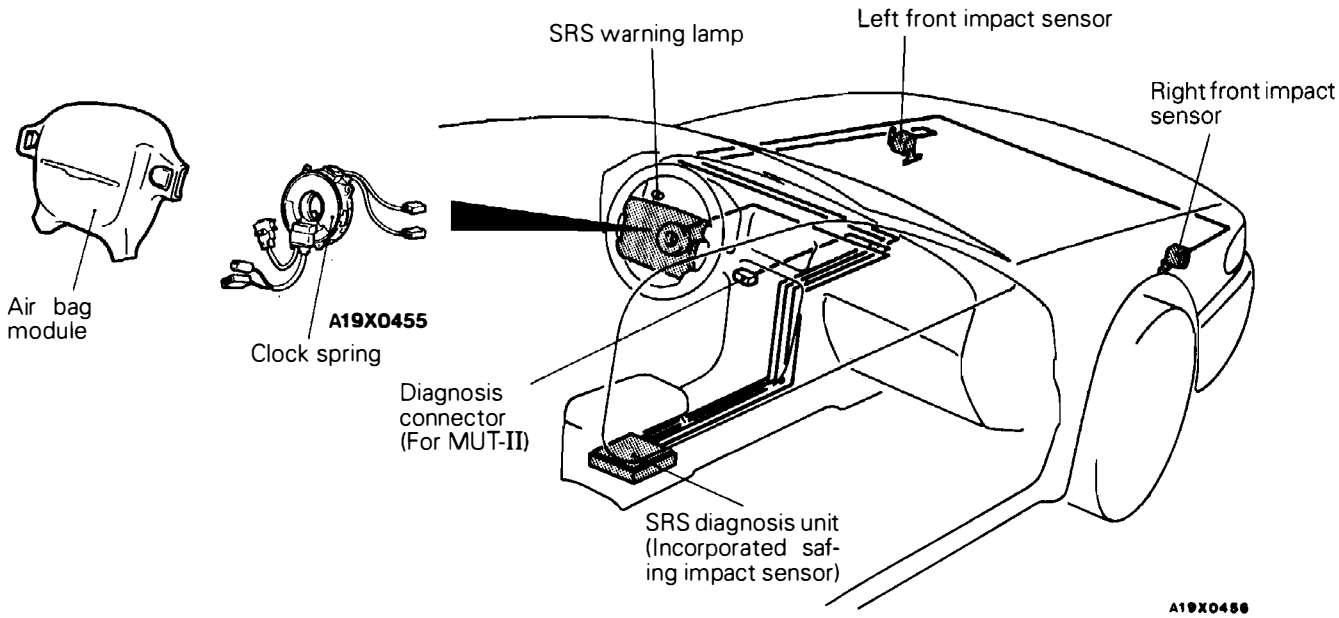
The Supplemental Restraint System (SRS) is designed to supplement the driver's seat belt to help reduce the risk or severity of injury to the driver by activating and deploying an air bag in certain frontal collisions.

The SRS consists of: left front and right front impact sensors one located on the right and left front upper frame (lower); an air bag module located in the centre of the steering wheel, which contains the folded air bag and an inflator unit; the SRS diagnosis unit located under the floor console assembly, which monitors the system, and which contains a safing impact sensor; an SRS warning lamp located on the instrument panel, which indicates the operational status of the SRS; a clock spring interconnection located within the steering column, and wiring.

The SRS is designed so that the air bag will deploy when the safing sensor, plus either or both of the left front and right front impact sensors simultaneously activate while the ignition switch is "ON". That is designed to occur in frontal or near-frontal impacts of moderate to severe force.

Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work. Extreme care must be used when servicing the SRS to avoid injury to the service personnel (by inadvertent deployment of the air bag) or the driver (by rendering the SRS inoperative).

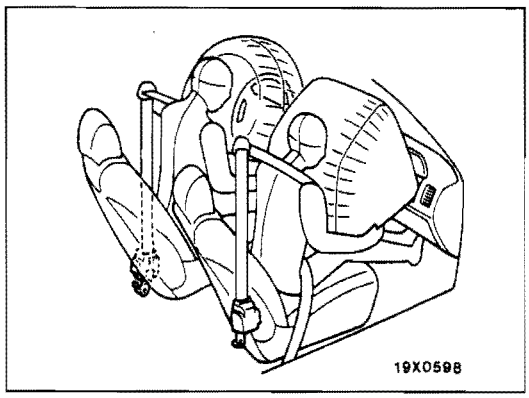


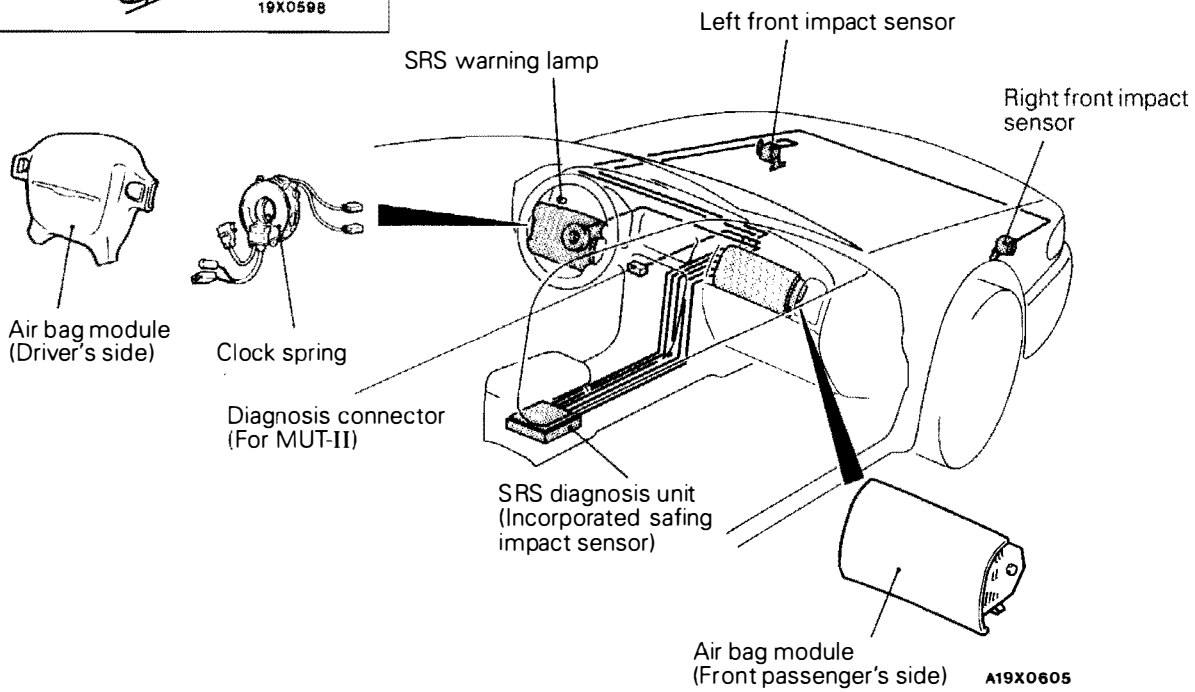


GENERAL INFORMATION

<Vehicles with front passenger's air bag>

The Supplemental Restraint System (SRS) is designed to supplement the driver's and front passenger's seat belts to help reduce the risk or severity of injury to the driver and the front passenger by activating and deploying two air bags in certain frontal collisions.
The SRS consists of: left front and right front impact sensors one located on the right and left front upper frame (lower); air bag modules for the driver located in the centre of the steering wheel and for the front passenger located above the glove box, which contains the folded air bag and an inflator unit; the SRS diagnosis unit located under the floor console assembly, which monitors the system, and which contains a safing impact sensor; an SRS warning lamp located on the instrument panel, which indicates the operational status of the SRS; a clock spring interconnection located within the steering column; 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 "ON". That is designed to occur in frontal or near-frontal impacts of moderate to severe force.
Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work. Extreme care must be used when servicing the SRS to avoid injury to the service personnel (by inadvertent deployment of the air bags) or the driver (by rendering the SRS inoperative).





SRS SERVICE PRECAUTIONS

E00AF11AB

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

   NOTE
   *: Vehicles with front passenger's air bag

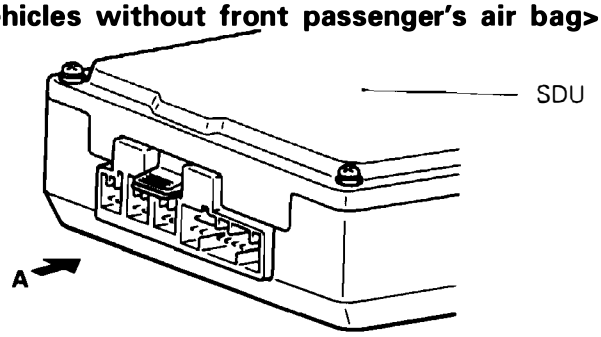
   If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENTS SERVICE procedures in this manual.
4. Do not attempt to repair the wiring harness connectors of the SRS. If any of the connectors are diagnosed as faulty, replace the wiring 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, Colour)	Destination of Harness		Corrective Action
1 2	2 pins, red	Dash wiring harness → Clock spring → Air bag module (Driver's side)		Correct or replace each wiring harness. Replace clock spring
5*1 6*1	2 pins, green	Dash wiring harness → Air bag module (Front passenger's side)		Correct or replace each wiring harness
7 and 8	14 pins, red	–		–
9		Dash wiring harness → Diagnosis connector		Correct or replace each wiring harness
10		Dash wiring harness → Control wiring harness → Dash wiring harness → Ignition switch (ST)		
11		Dash wiring harness → Junction block (fuse No. 4)		
12		Dash wiring harness → Junction block (fuse No. 8)		
13 14		Dash wiring harness → Instrument panel wiring harness → Combination meter (SRS warning lamp)		
15		Dash wiring harness → Front wiring harness → Front impact sensor (+)	RH	Replace with sensor cable*
16			LH	
17		Dash wiring harness → Front wiring harness → Front impact sensor (–)	LH	
18			RH	

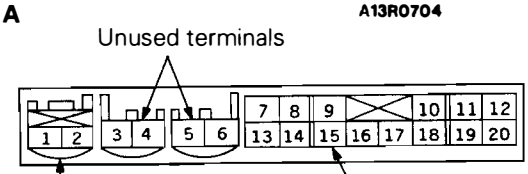
SDU Terminal No.	Harness Connector (No. of Terminals, Colour)	Destination of Harness	Corrective Action
19 20	14 pins, red	Dash wiring harness → Earth	Correct or replace each wiring harness

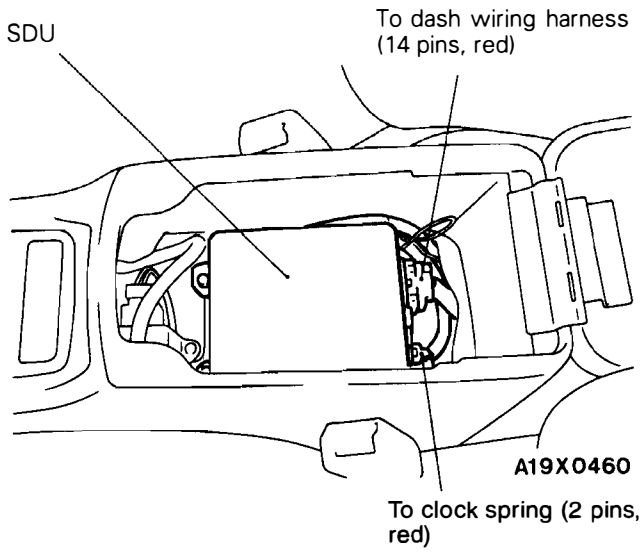
NOTE
(1) *1: Vehicles with front passenger's air bag.
(2) The sensor cable marked with*2 is available as service part.
(3) The sensor cable used as a replacement part is routed along the dash wiring harness and front wiring harness.

<Vehicles without front passenger's air bag>

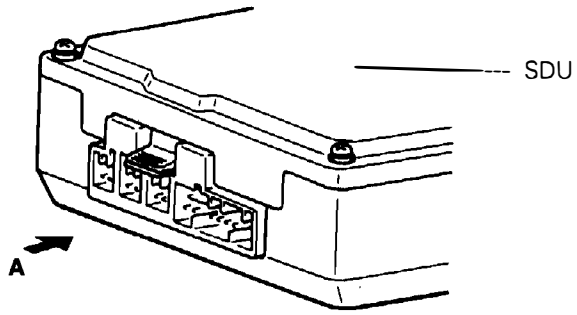


View A A13R0704





<Vehicles with front passenger's air bag>



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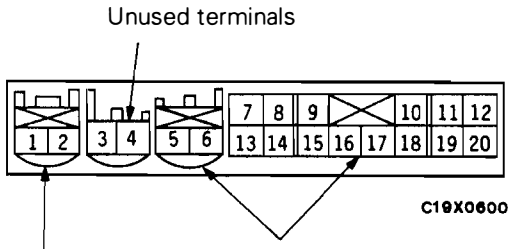
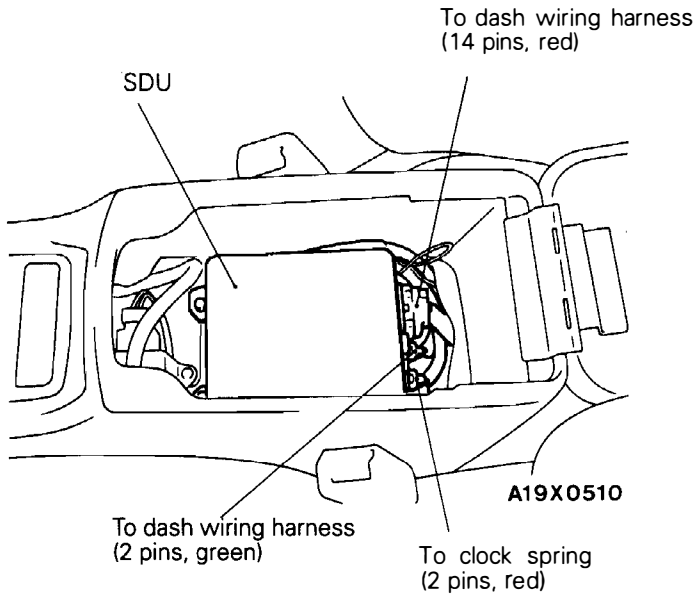
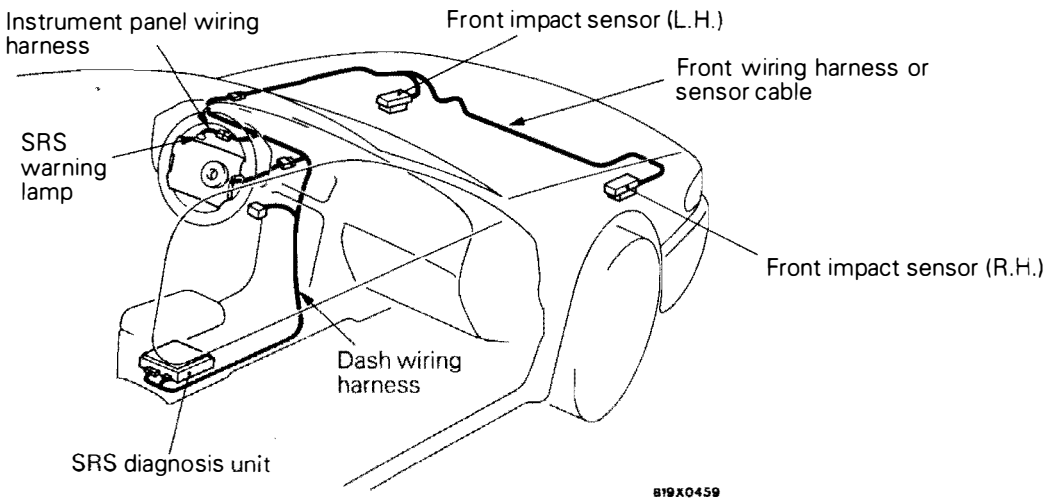
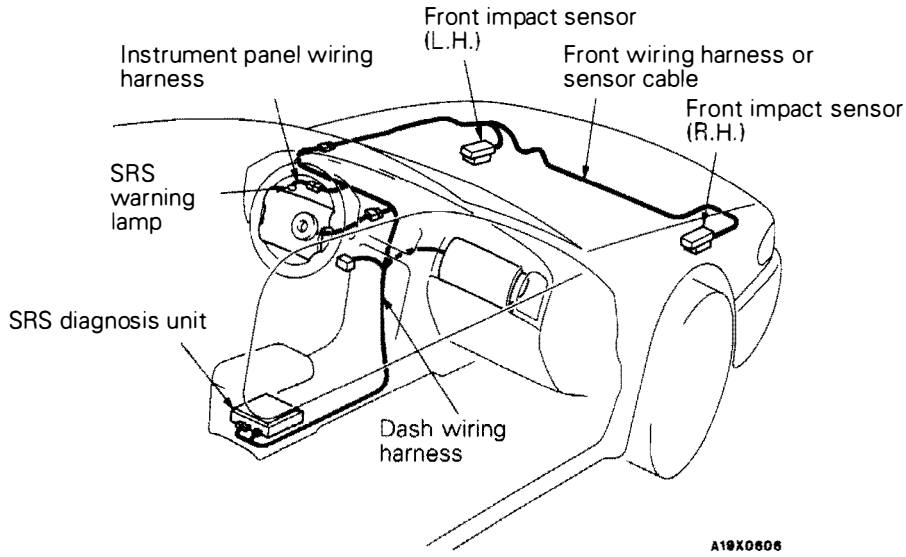




<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



5. **After disconnecting the battery cable, wait 60 seconds or more before proceeding with the following work. The SRS system is designed to retain enough voltage to deploy the air bag for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cables are disconnected.**
6. SRS components should not be subjected to heat over 93°C, so remove the front impact sensors, SRS diagnosis unit, air bag module and clock spring before drying or baking the vehicle after painting. Recheck SRS system operability after re-installing the components.
7. If SDUs which have been manufactured up to Jan., 1994 are connected to wiring harnesses in vehicles manufactured from Feb., 1994, the air bag may be operated by mistake. Consequently, be sure to use only air bags with compatible manufacturing dates.
8. Whenever you finish servicing the SRS, check the SRS warning lamp operation to make sure that the system functions properly. (Refer to GROUP 52B – Troubleshooting.)
9. Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.
10. If you have any questions about the SRS, please contact your local distributor.

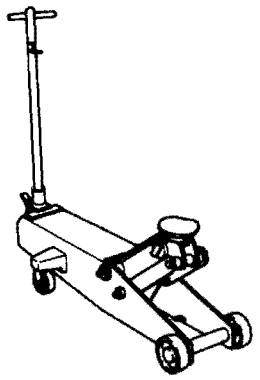
NOTE
SERIOUS INJURY CAN RESULT FROM UNINTENDED AIR BAG DEPLOYMENT, SO USE ONLY THE PROCEDURES AND EQUIPMENT SPECIFIED IN THIS MANUAL.

SUPPORT LOCATIONS FOR LIFTING AND JACKING

E00AG00AA

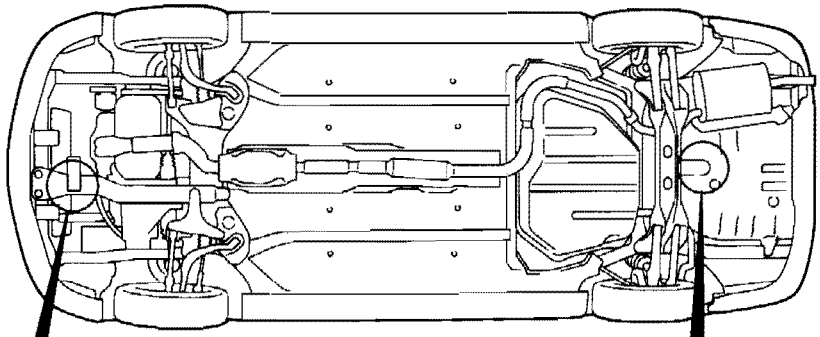
Caution
Do not support the vehicles at locations other than specified supporting points. If do so, this will cause damage, etc..

SUPPORT POSITIONS FOR A GARAGE JACK



00E607

<2WD>



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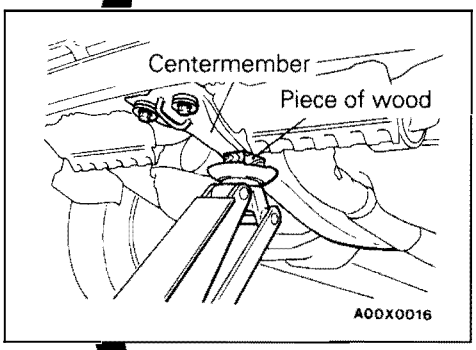
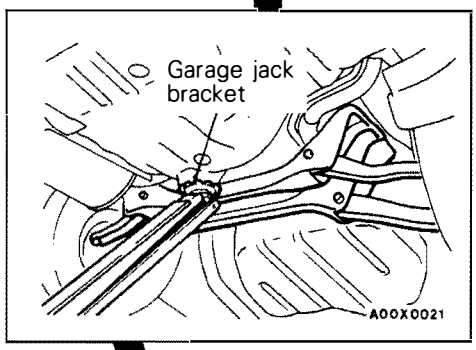
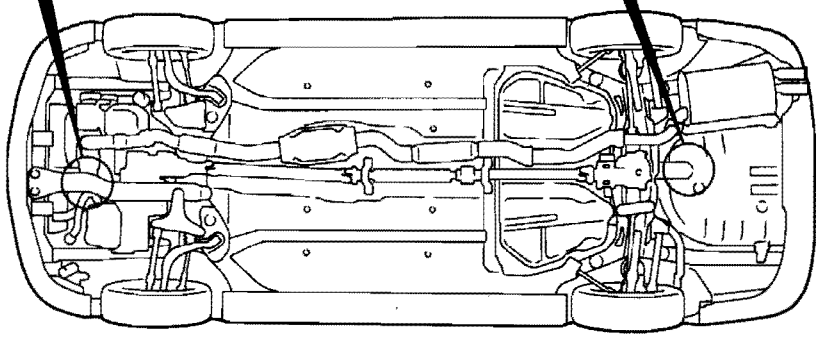




NOTE
The above illustration indicates 2WD vehicles. Support positions for 4WD vehicles are identical.

<4WD>

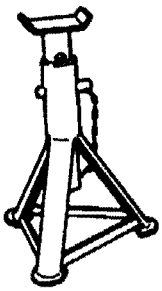


00X0003

SUPPORT POSITIONS FOR AXLE STANDS, A SINGLE-POST LIFT OR DOUBLE-POST LIFT

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

AXLE STANDS



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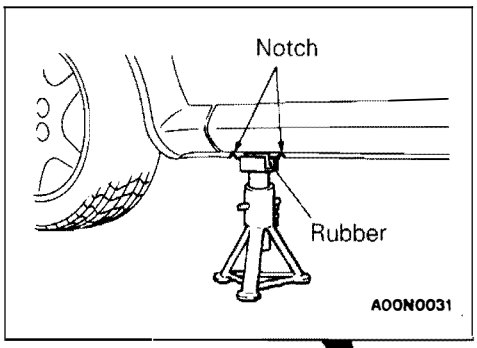
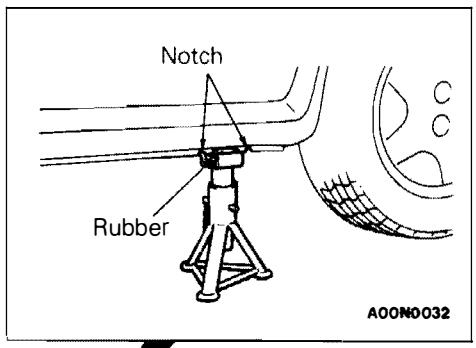
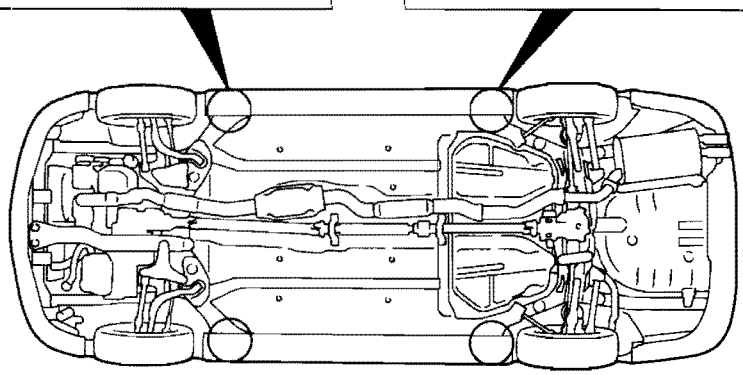
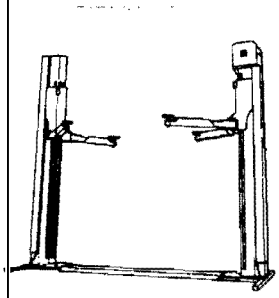






00X0003

DOUBLE-POST LIFT



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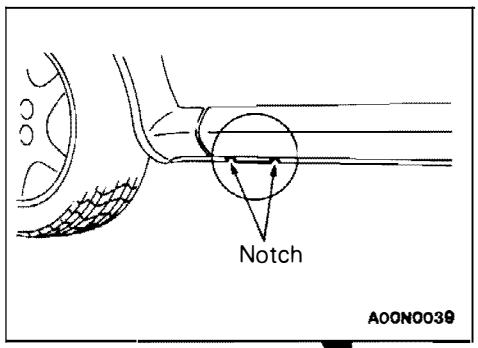

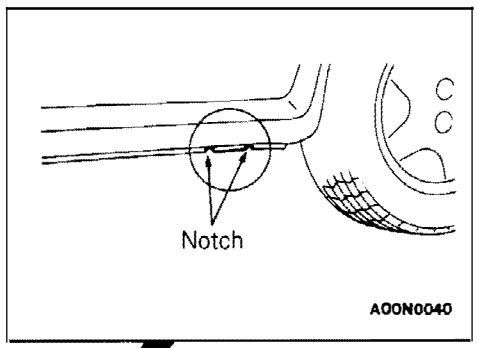

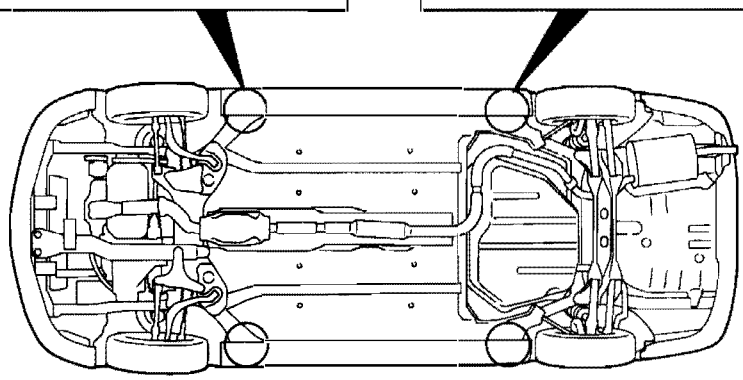

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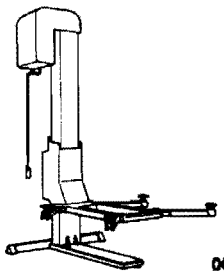
SINGLE-POST LIFT



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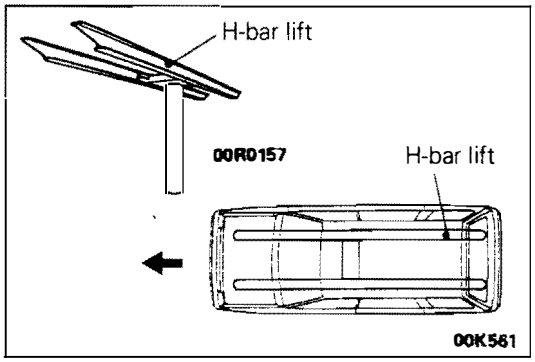
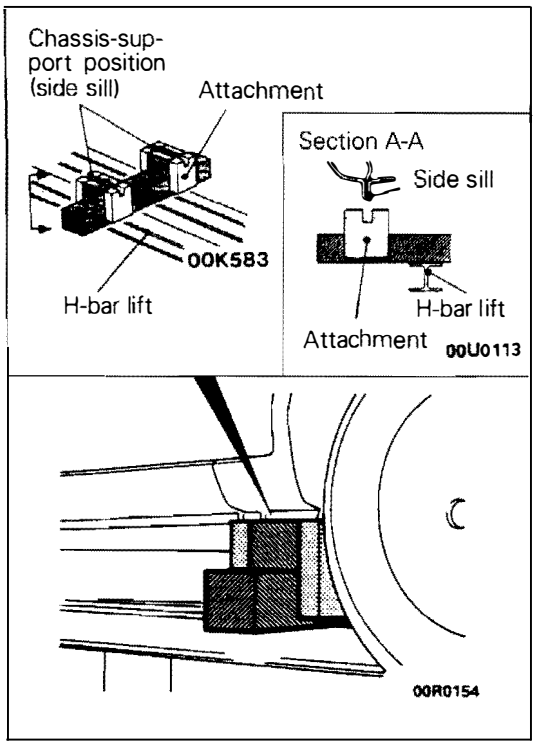




SUPPORT POSITIONS AND SUPPORT METHOD FOR AN H-BAR LIFT E00AG01AA

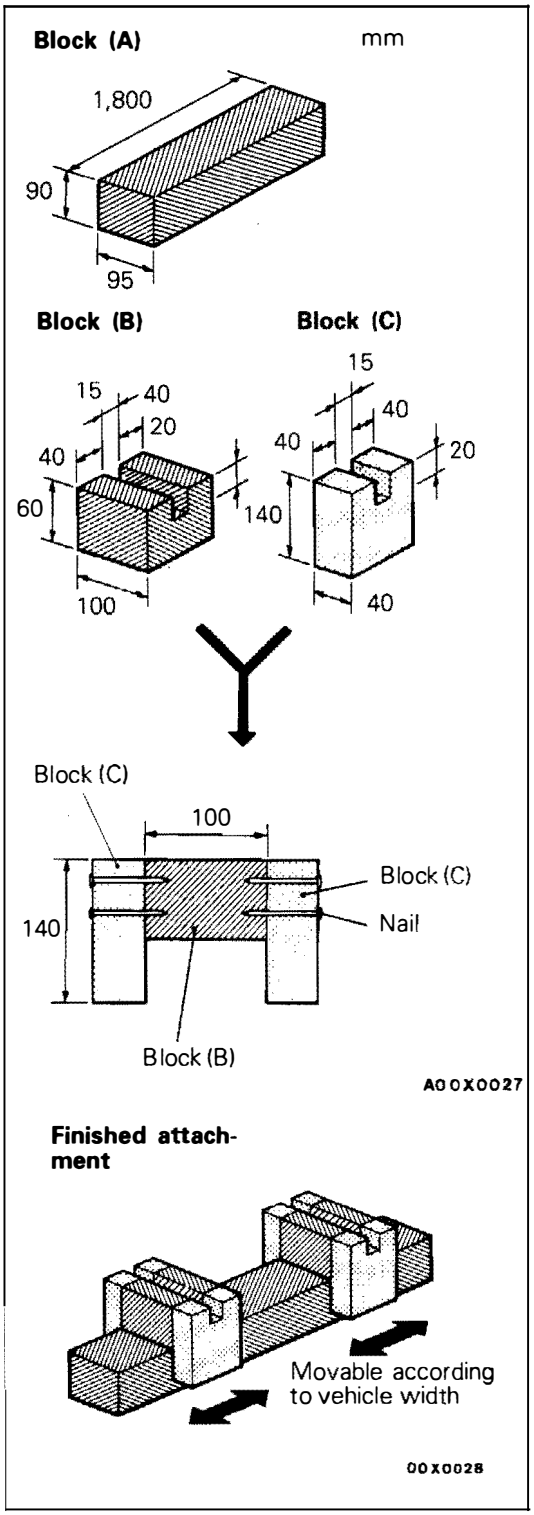
Caution
When service procedures require removing rear suspension, fuel tank, spare tyre and rear bumper, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping of centre of gravity changes.

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

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

   Caution
   If support is at any location other than the designated positions, the body or suspension might be deformed or otherwise damaged, so care should be taken to support only at the correct (designated) positions.

3. Raise the H-bar lift to the height at which the vehicle is slightly raised and check to be sure that the vehicle is correctly and sufficiently secured; then raise the vehicle.



PREPARATION OF "ATTACHMENTS"

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

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

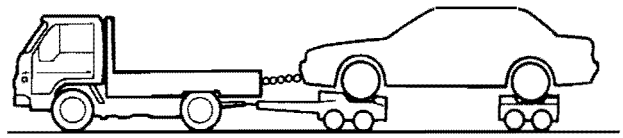
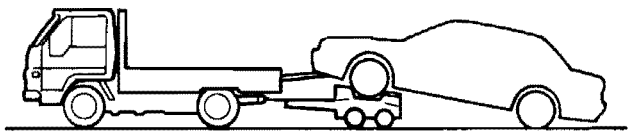
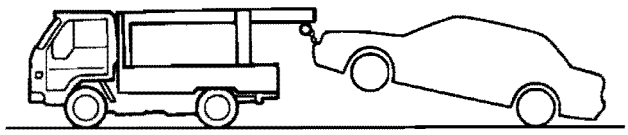
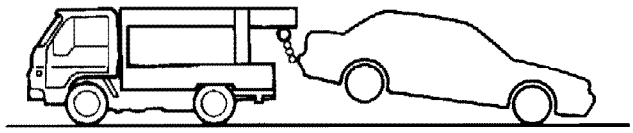
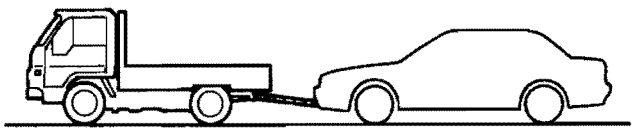
Caution
The wood selected for the blocks must be hard.

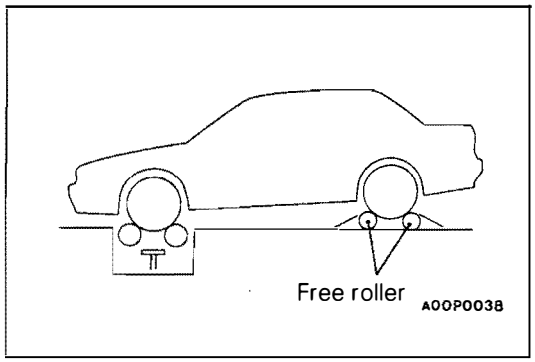
2. For the (B) blocks and (C) blocks, use a saw and chisel or similar tool to make grooves of the dimensions shown in the figure.
3. Make four "ATTACHMENTS" such as shown in the figure nailing (B) and (C) blocks so that each (B) blocks is sandwiches between (C) blocks.

SPECIAL HANDLING INSTRUCTIONS FOR 4WD MODELS

E00AH00AA

TOWING

Towing methods	Remarks
If a tow truck is used Lifting method for 4 wheels – **Good** 	• For 4WD models, the basic principle is that all four wheels are to be raised before towing. • Move the shift lever to 1st (manual transmission) or the selector lever to the "P" position (automatic transmission). • The parking brake should be applied.
Front wheels lifted – **No good** 	• The vehicle must not be towed by placing only its front wheels or only the rear wheels on a rolling dolly, because to do so will result in deterioration of the viscous coupling causing the vehicle to jump forward suddenly.
Front wheels lifted – **No good** 	• If only the front wheels or only the rear wheels are lifted for towing, the bumper will be damaged. In addition, lifting of the rear wheels causes the oil to flow forward, and may result in heat damage to the rear bushing of the transfer, and so should never be done.
Rear wheels lifted – **No good** 	
Towing by rope or cable – **Good**  00S0053	• The front and rear wheels must rotate normaly. • The various mechanisms must function normaly. • Move the shift lever to neutral (manual transmission) or the selector lever to the "N" position (automatic transmission). • The ignition key must be set to "ACC". **Caution** **The towing speed for vehicles with automatic transmission should be 50 km/h or less, and the towing distance should be 50 km or less.**



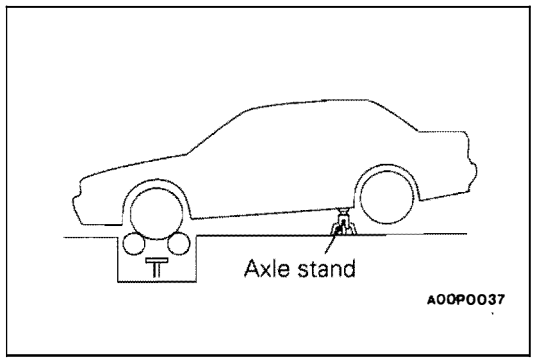
SPEEDOMETER TEST

E00AH01AA

IF A FREE ROLLER IS USED

1. Set the free roller on the floor (at the rear wheels) so that it is aligned with the vehicle's wheelbase and the rear tread.
2. Carefully move the vehicle onto the tester and free roller.
3. Set the speedometer tester in place.
4. Perform the speedometer test.
   For information concerning the measurement speed and the allowable error, refer to GROUP 54 – Meters and Gauges.

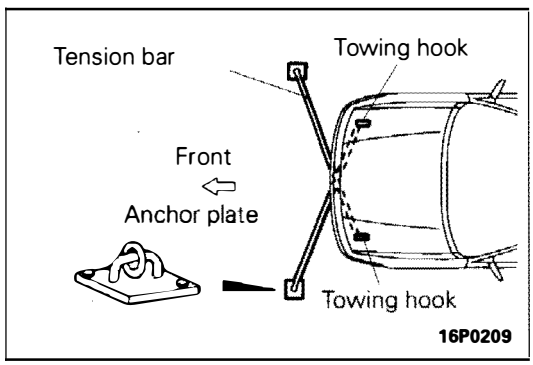
Caution
Do not operate the clutch suddenly, or increase or reduce speed suddenly during the work.



IF THE REAR WHEELS ARE JACKED UP

1. Move the vehicle onto the speedometer tester.
2. Jack up the rear wheels, and place axle stands at the designated part of the side sill.
3. Perform the speedometer test.
   For information concerning the measurement speed and the allowable error, refer to GROUP 54 – Meters and Gauges.

Caution
Do not operate the clutch suddenly, or increase or reduce speed suddenly during the work.

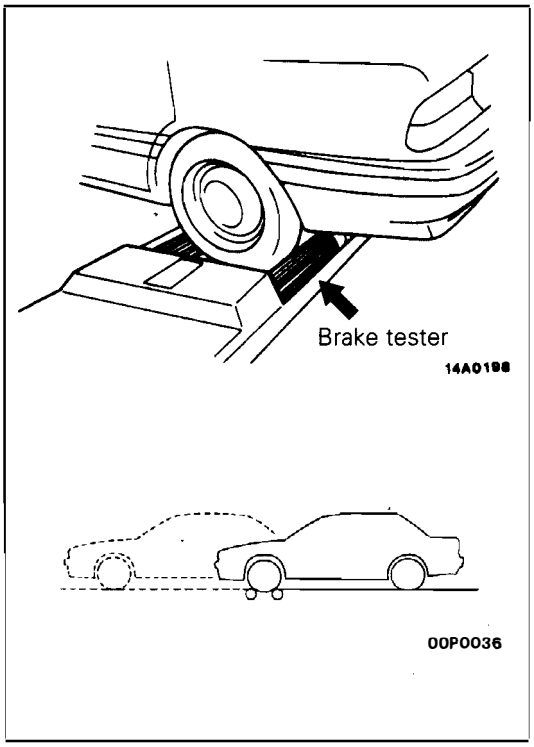


Front wheel side slip

To prevent the front wheels from moving from side to side, attach tension bars to the towing hooks, and secure both ends at anchor plates.

Accident prevention procedures

1. Attach a chain or wire to the rear traction hook. Make sure the end of the wire or chain is secured firmly.
2. Take all other necessary precautions.



BRAKE TEST

E00AH02AA

In order to stabilize the viscous coupling's dragging force, the brake test should always be conducted after the speedometer test.

FRONT WHEEL MEASUREMENTS

1. Place the front wheels on the brake tester.
2. Perform the brake test.

Caution
The rear wheels should remain on the ground.

3. If the brake dragging force exceeds the specified value, jack up the vehicle and manually rotate each wheel to check the rotation condition of each wheel.

NOTE
If the brake dragging force exceeds the specified value, the cause may be the effect of the viscous coupling's dragging force, so jack up the front wheels and check the rotation condition of the wheels in this state for no effect by the viscous coupling's dragging force.

REAR WHEEL MEASUREMENTS

After placing the rear wheels on the brake tester, follow the same procedures as for the front wheel measurements.

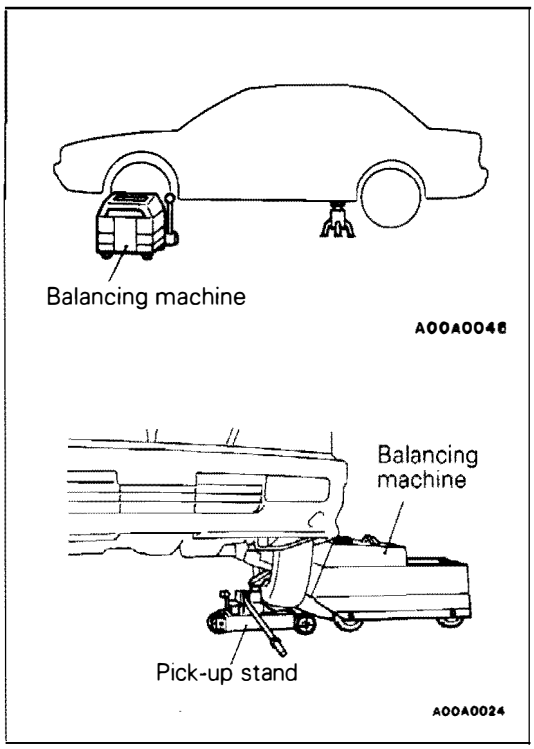
Brake force of 4WD models with VCU

If both front wheels are locked and rear wheel measurement is difficult, the measurement in this condition can be considered to comprise the total.

		Brake force	
Rear wheel	Left/right sum	At 883N pedal depression force	20% or more of rear axle weight
	Left/right difference	8% or less of rear axle weight	
Total		At 883N pedal depression force	50% or more of vehicles weight

or...

Braking-stop distance	At primary velocity of 50 km/h : Within 15.0 m



WHEEL BALANCE

E00AH03AA

FRONT WHEEL MEASUREMENTS

1. Jack up the rear wheels, and place an axle stand at the designated part of the side sill.
2. Jack up the front wheels and set a pick#up stand and balancing machine in place.

Caution
1. **Set so that the front and rear of the vehicle are at the same height.**
2. **Release the parking brake.**
3. **Rotate each wheel manually and check to be sure that there is no dragging.**

3. Use the engine to drive the tyres, and then make the measurement.

Caution
1. **If an error is indicated in the state of engine drive, motor drive can be used concurrently.**
2. **Do not operate the clutch suddenly, or increase or reduce speed suddenly during the work.**

REAR WHEEL MEASUREMENTS

1. Jack up the front wheels, and place an axle stand at the designated part of the side sill.
2. Jack up the rear wheels, and then, after setting a pick#up stand and balancing machine in place, follow the same procedure as for front wheel measurements.

STANDARD PARTS-TIGHTENING-TORQUE TABLE

E00AI00AA

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

Bolt nominal diameter (mm)	Pitch (mm)	Torque Nm		
		Head mark④	Head mark⑦	Head mark⑧
M5	0.8	2.5	5	6
M6	1.0	5	9	10
M8	1.25	12	22	25
M10	1.25	24	44	52
M12	1.25	41	81	96
M14	1.5	72	137	157
M16	1.5	111	206	235
M18	1.5	167	304	343
M20	1.5	226	412	481
M22	1.5	304	559	647
M24	1.5	392	735	853

Flange bolt and nut tightening torque

Bolt nominal diameter (mm)	Pitch (mm)	Torque Nm		
		Head mark④	Head mark⑦	Head mark⑧
M6	1.0	5	10	12
M8	1.25	13	24	28
M10	1.25	26	49	57
M10	1.5	24	44	54
M12	1.25	46	93	103
M12	1.75	42	81	96

Taper thread tightening torque

Thread size	Torque Nm	
	Female thread material: Light alloy	Female thread material: Steel
NPTF 1/6	7	10
PT 1/8	10	18
PT 1/4, NPTF 1/4	25	39
PT 3/8	47	67

NOTE: NPTF is dry seat pipe thread, while PT is pipe thread.

MAIN SEALANT AND ADHESIVE TABLE

E00AJ00AA

Application	Recommended brand
1. Sealants for engine accessories	
(1) Sealing between rocker cover and camshaft bearing cap (4G6 DOHC and 6G7 engines only)	3M ATD Part No. 8660 or equivalent
(2) ● Sealing between semi-circular packing and rocker cover and between semi-circular packing and cylinder head ● Oil pressure switch	3M ATD Part No. 8660 or equivalent
(3) 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
(4) Engine coolant temperature gauge unit (small size, MD091056 only)	3M ATD Part No. 8660 or equivalent
(5) Oil pan (except 4G5 engine)	MITSUBISHI GENUINE Part No. MD970389 or equivalent
(6) Water pump, Thermostat case (4G9, 4G6, 6A1 engine only)	MITSUBISHI GENUINE Part No. MD970389 or equivalent
2. Sealing between glass and weatherstrip	
(1) ● 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
(2) Sealing between laminated glass and weatherstrip	3M ATD Part No. 8509 or equivalent

Application	Recommended brand
3. Adhesion with ribbon sealer ● Waterproof film for door ● Fender panel ● Splash shield ● Mud guard ● Rear combination lamp	3M ATD Part No. 8625 or equivalent
4. Adhesives for interior trim	
(1) Adhesion of polyvinyl#chloride sheet	3M Part No. EC-1368 or equivalent
(2) Adhesion of door weatherstrip to body	3M ATD Part No. 8001 or 3M ATD Part No. 8011 or equivalent
(3) Sealing between grommet or packing and metal seal	3M ATD Part No. 8513 or equivalent
(4) ● Adhesion of headlining and other interior trim materials ● Adhesion of fuel tank to pad	3M Part No. EC-1368 or 3M ATD Part No. 8080 or equivalent
5. Body sealant ● Sealing of sheet metal, drip rail, floor, body side panel, trunk, front panel and the like joints ● Sealing of tailgate hinges	3M ATD Part No. 8531 or 3M ATD Part No. 8646 or equivalent

Application	Recommended brand
6. Chassis sealant	
(1) Sealing of flange surface and threaded portions ● Fuel gauge unit packing	3M ATD Part No. 8082 or equivalent
(2) Sealing of flange surfaces, threaded portions, packing and dust cover ● 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. 8661 or equivalent
(3) Sealing between accelerator arm bracket and toeboard	Drying sealant
(4) Sealant for drum brake shoe hold-down pin and wheel cylinder	3M ATD Part No. 8513 or equivalent
7. Fast bonding adhesive Adhesion of all materials except polyethylene, polypropylene, fluorocarbon resin or other materials with highly absorbent surface	3M ATD Part No. 8121 or equivalent
Application	Recommended brand
8. Anaerobic fast bonding adhesives (1) Fixing of bolts and screws ● Tightening of drive gear to differential case ● Bolts for coupling tilt steering upper column with lower column (2) Fixing of bearing, fan, pulley and gear connections (3) Sealing of small recess or flange surface	3M Stud locking Part No. 4170 or equivalent
9. Undercoat	3M ATD Part No. 8864, No. 8877 or equivalent

ENGINE

CONTENTS

E11ZA00AA

NOTE
THE GROUPS MARKED BY ARE NOT IN THIS MANUAL.

 PWDE9211

NOTES

4G6

CONTENTS

E11DA00AA

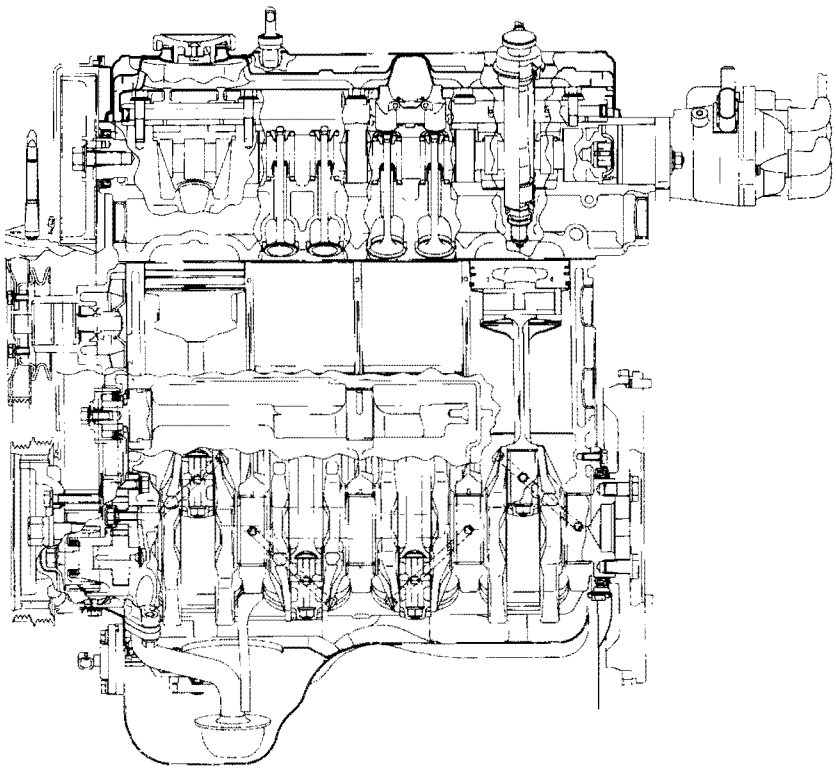
 PWDE9211

GENERAL INFORMATION

E11DB00AA

Items			4G63
Total displacement		mℓ	1,997
Bore × Stroke		mm	85.0 × 88.0
Compression ratio			10.0
Combustion chamber			Pentroof type
Camshaft arrangement			SOHC
Number of valve	Intake		8
	Exhaust		8
Valve timing	Intake		Opening BTDC11°, Closing ABDC53°
	Exhaust		Opening BBDC63°, Closing ATDC21°
Fuel system			Electronic control multipoint fuel injection
Rocker arm			Roller type
Auto-lash adjuster			Equipped
Oil level sensor			Equipped

SECTIONAL VIEW



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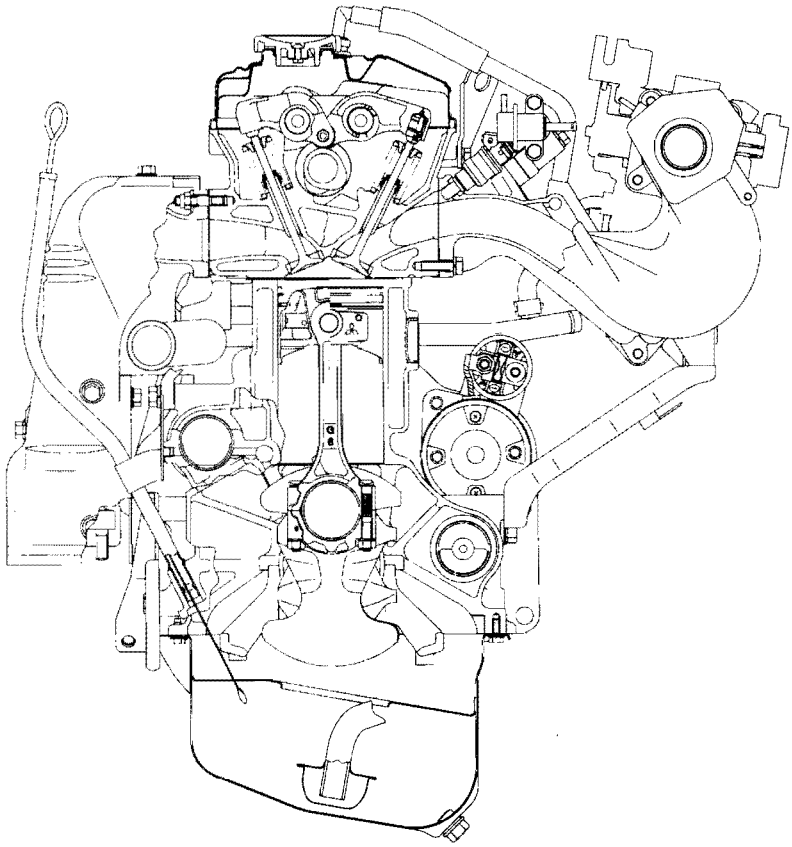

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SERVICE SPECIFICATIONS

E11DC00AA

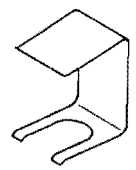
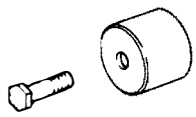
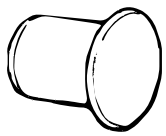
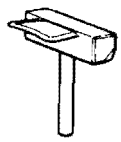
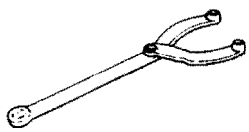
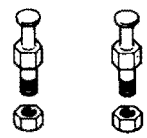
Items		4G63
Standard value		
Drive belt deflection	mm	
Alternator V-ribbed type		
When checked		9.0–11.5
When a new belt is installed		7.5–9.0
When a used belt is installed		10.0
Power steering oil pump		
When checked		5.5–8.0
When a new belt is installed		4.5–5.5
When a used belt is installed		6.0–7.0
A/C compressor		
When checked		Approx. 8.0
When a new belt is installed		5.0–5.5
When a used belt is installed		6.0–7.0
Basic ignition timing		5°± 2° BTDC
Idle speed	r/min.	750 ± 100
Compression pressure	kPa (250–400 r/min.)	1,400
Intake manifold vacuum	kPa	69
Timing belt tension	mm	–
Auto tensioner rod protrusion amount	mm	3.8–4.5
Timing belt tension torque	Nm	3.5
Limit		
Compression pressure	kPa 250–400 r/min.	1,060
Compression pressure difference of all cylinder	kPa	100
Cylinder head bolt shank length	mm	99.4

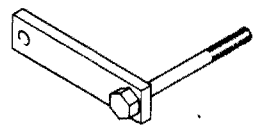
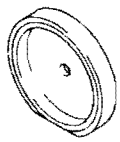
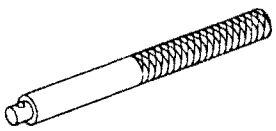
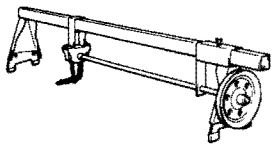
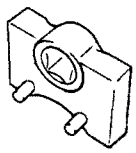
SEALANTS

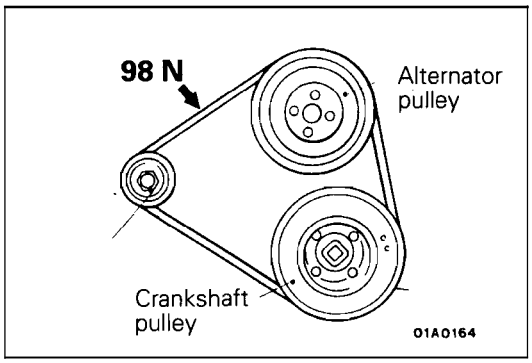
Items	Specified sealant	Remarks
Oil pan and cylinder block	MITSUBISHI GENUINE PART MD997110 or equivalent	
Rocker cover seal and cylinder head seal	3M ATD Part No. 8660 or equivalent	Semi-drying sealant
Thermostat housing	MITSUBISHI GENUINE PART MD970389 or equivalent	
Fly wheel bolt or drive plate bolt	3M Stud locking 4170 or equivalent	

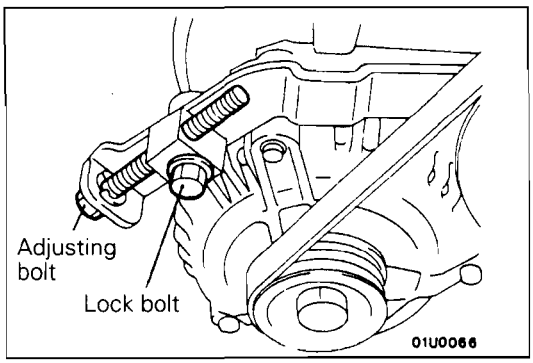
SPECIAL TOOLS

E11DD00AA

Tool	Number	Name	Use
	MD998443	Auto-lash adjuster holder	Supporting of auto-lash adjuster
	MD998713	Camshaft oil seal installer	Press-in of the camshaft oil seal
	MB991193	Plug	Preventing foreign substances from entering transfer <4WD>
	MD998727	Oil pan remover	Removal of the oil pan
	MB990767	End yoke holder	• Supporting of camshaft pulley • Supporting of crankshaft pulley
	MD998719 or MD998754	Crankshaft pulley holder pin	

Tool	Number	Name	Use
	MD998781	Fly wheel stopper	Securing the flywheel <M/T> or drive plate <A/T>
	MD998776	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal
	MB990938	Handle	
	GENERAL SERVICE TOOL MZ203827	Mechanic, hanger, engine	Supporting the engine assembly during removal and installation of the transmission
	MD998767	Tensioner pulley socket wrench	Timing belt tension adjustment





SERVICE ADJUSTMENT PROCEDURES

E11DF00AA

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

ALTERNATOR DRIVE BELT TENSION INSPECTION

Measure drive belt deflection by pulling or pushing at the mid point of the belt between too pulleys with a force of 98 N.

Standard value: 9.0–11.5 mm

ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

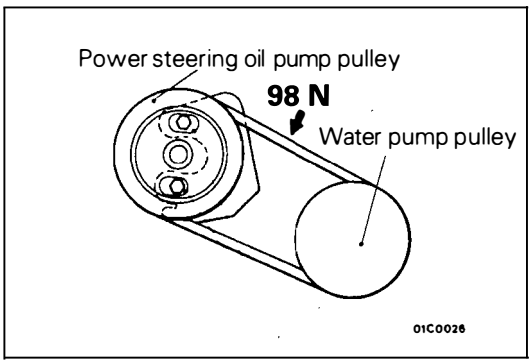
E11DF00BA

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

   Standard value:
   Used belt: 10 mm
   New belt: 7.5–9.0 mm
4. Tighten the lock bolt.

   Tightening torque: 14 Nm
5. Tighten the nut of the alternator pivot bolt.

   Tightening torque: 23 Nm

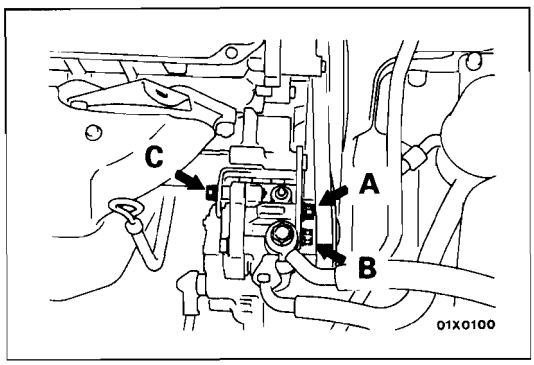


POWER STEERING OIL PUMP DRIVE BELT TENSION INSPECTION

E11DF00CA

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

Standard value: 5.5–8.0 mm



POWER STEERING OIL PUMP DRIVE BELT TENSION ADJUSTMENT

E11DF00DA

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

   Standard value:
   If used belt (with correct tension) is used; 6.0–7.0 mm
   If a new belt is used; 4.5–5.5 mm
3. Tighten fixing bolt (A).

   Tightening torque: 28 Nm

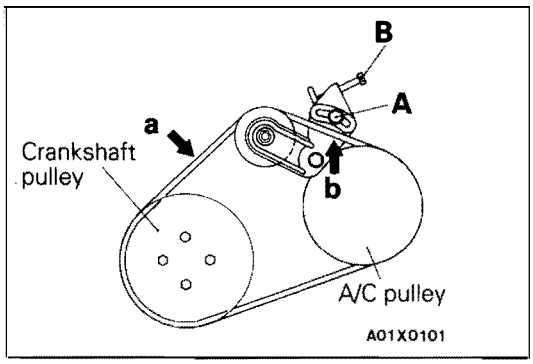
PWDE9211

4. Tighten the remaining fixing bolts (B and C).

Tightening torque: Bolt B 28 Nm
Bolt C 22 Nm

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

Caution
This check should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).



A/C COMPRESSOR DRIVE BELT TENSION INSPECTION

E11DF00EA

Check if the belt deflection amount is at the standard value when the centre of the belt between the pulleys is pushed or pulled at a force of 98 N at (a) or (b) in the illustration.

Standard value: Approx. 8.0 mm

A/C COMPRESSOR DRIVE BELT TENSION ADJUSTMENT

E11DF00FA

1. Loosen tension pulley fixing bolt A.
2. Adjust belt tension with adjusting bolt B.

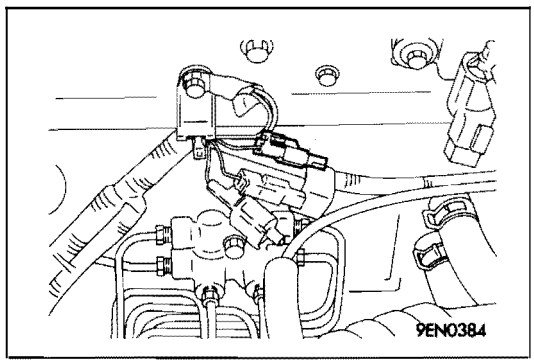
Standard value:
If used belt (with correct tension) is used; 6.0–7.0 mm
If a new belt is used; 5.0–5.5 mm

3. Tighten fixing nut A.

Tightening torque: 23–26 Nm

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

Caution
This check should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).



IGNITION TIMING INSPECTION AND ADJUSTMENT

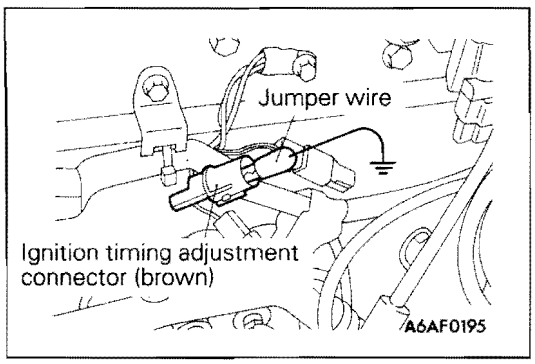
E11DF01AA

1. Before inspection and adjustment set vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral (P range on vehicles with A/T)
2. Insert a paper clip from the harness side into the 1 pin connector as shown in the illustration at left.

3. Connect a primary-voltage-detection type of tachometer to the paper clip.

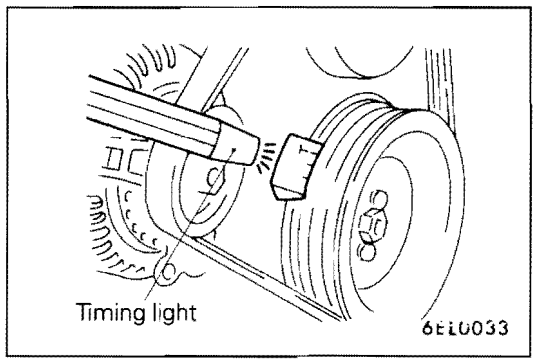
   NOTE
   Do not use the MUT-II.
   If tested with the MUT-II connected to the diagnosis connector, the ignition timing will not be the basic timing but be ordinary timing.
4. Set up a timing light
5. Start the engine and run at idle.
6. Check that engine idle speed is within the standard value.

   Standard value: 750 ± 100 r/min.



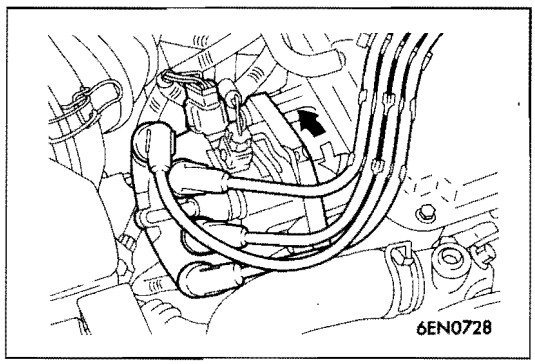
7. Turn the ignition switch to OFF.
8. Remove the waterproof connector from the ignition timing adjustment connector (brown).
9. Connect the jumper wire with the clip to the ignition timing adjustment terminal, and earth this to the body as illustrated.

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



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

    Standard value: 5° ± 2° BTDC



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

    Tightening torque: 12 Nm
14. Stop the engine, remove the jumper wire from the ignition timing adjustment connector (brown), and return the connector to its original condition.
15. Start the engine and check that ignition timing at the standard value.

    Standard value: approx. 10° BTDC

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

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

NOTE
Sealing tape is attached to all vehicles when new.

IDLE SPEED INSPECTION E11DF02AA

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

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

   Curb idle speed: 750 ± 100 r/min.

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

COMPRESSION PRESSURE INSPECTION E11DF03AA

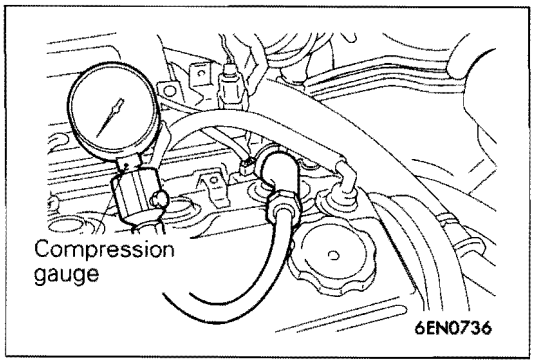
1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
   - Engine coolant temperature: 80–95°C
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral (P range on vehicle with A/T)
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the distributor 6 pin connector.

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

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

Caution

1. **Keep away from the spark plug hole when cranking.**
2. **If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.**



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

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

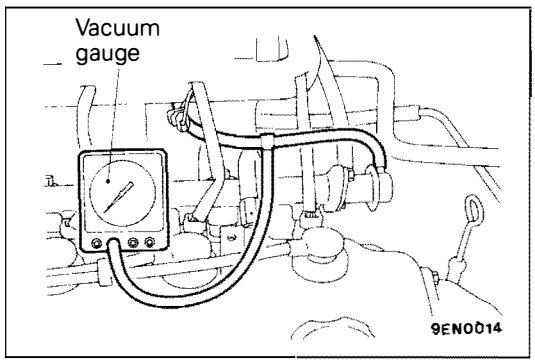
Limit (at engine speed of 250–400 r/min.): min. 1,060 kPa

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

Limit: max. 100 kPa

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (7) and (8).
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
10. Connect the distributor connector.
11. Install the spark plugs and spark plug cables.
12. Use the MUT-II to erase the diagnosis codes.

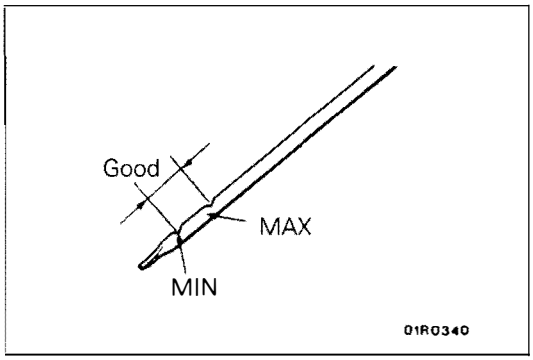
NOTE
This will erase the problem code resulting from the distributor connector being disconnected.



MANIFOLD VACUUM INSPECTION E11DF04AA

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

Standard value: Approx. 69 kPa

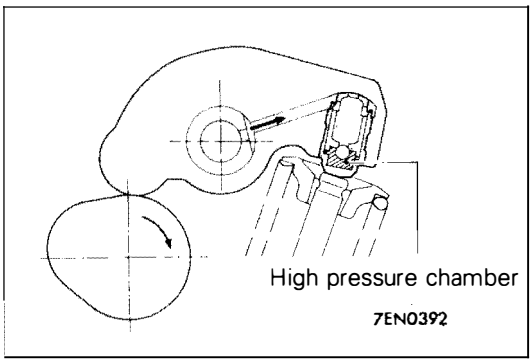


LASH ADJUSTER CHECK E11DF05AA

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

1. Check the engine oil, and if required, refuel or replace it.

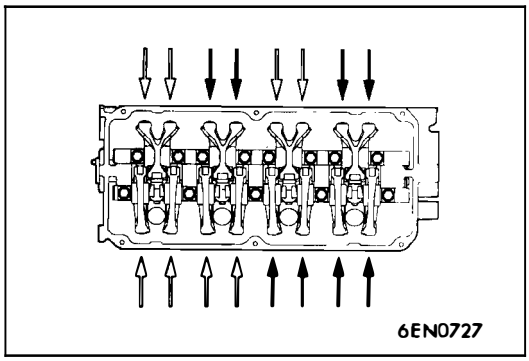
   NOTE
   - If the amount of the engine oil is insufficient, air will be sucked in from the oil strainer and mix in the oil passage.
   - If the amount of the engine oil is more than the specified amount, it will be stirred by the crank to make a lot of air mix in the oil.
   - If the oil is deteriorated,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



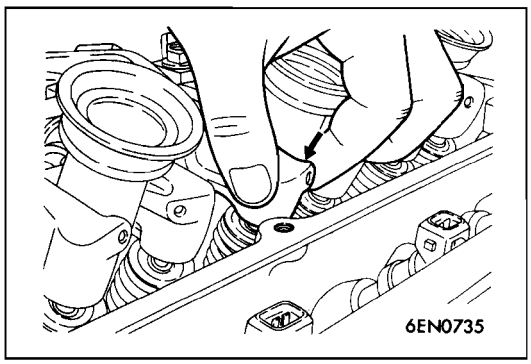
If the air which has mixed in the oil due to the above causes enters the high pressure chamber in the lash adjusters, the air in the high pressure chamber will be pressurized during opening of the valve, which causes the lash adjusters to shrink excessively, and an abnormal noise will be generated when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

2. Start the engine and perform gentle racing several times (less than 10 times.)
   If the abnormal noise stops by racing, the air is bled from the high pressure chamber of the lash adjusters and the function of the lash adjusters is normalized.
   - After raising the engine speed from idling to 3000 r/min. gradually (in 30 seconds), drop the speed gradually (in 30 seconds) to idling.

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



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



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

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

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

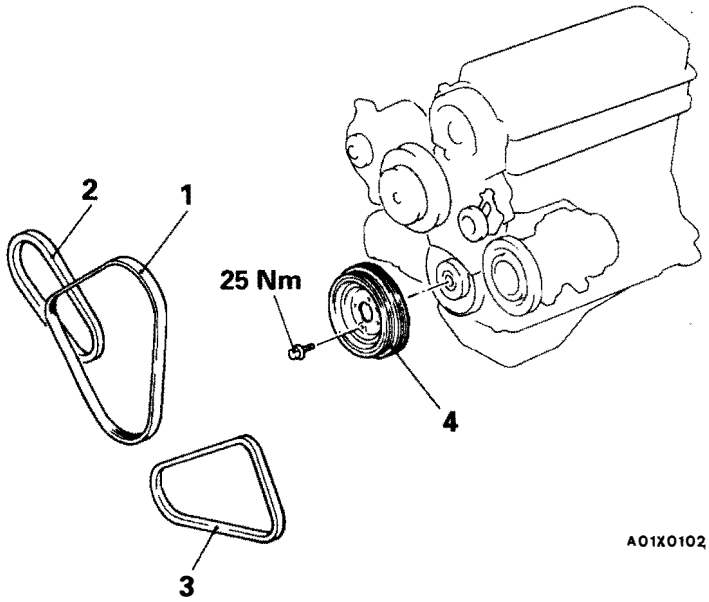
CRANKSHAFT PULLEY

E11DG00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Cover Removal

Post-installation Operation
(1) Drive belt tension adjustment (Refer to P.11D-7.)
(2) Under Cover Installation



Removal steps
1. Drive belt (Alternator)
2. Drive belt (Power steering)
3. Drive belt (A/C)
4. Crankshaft pulley

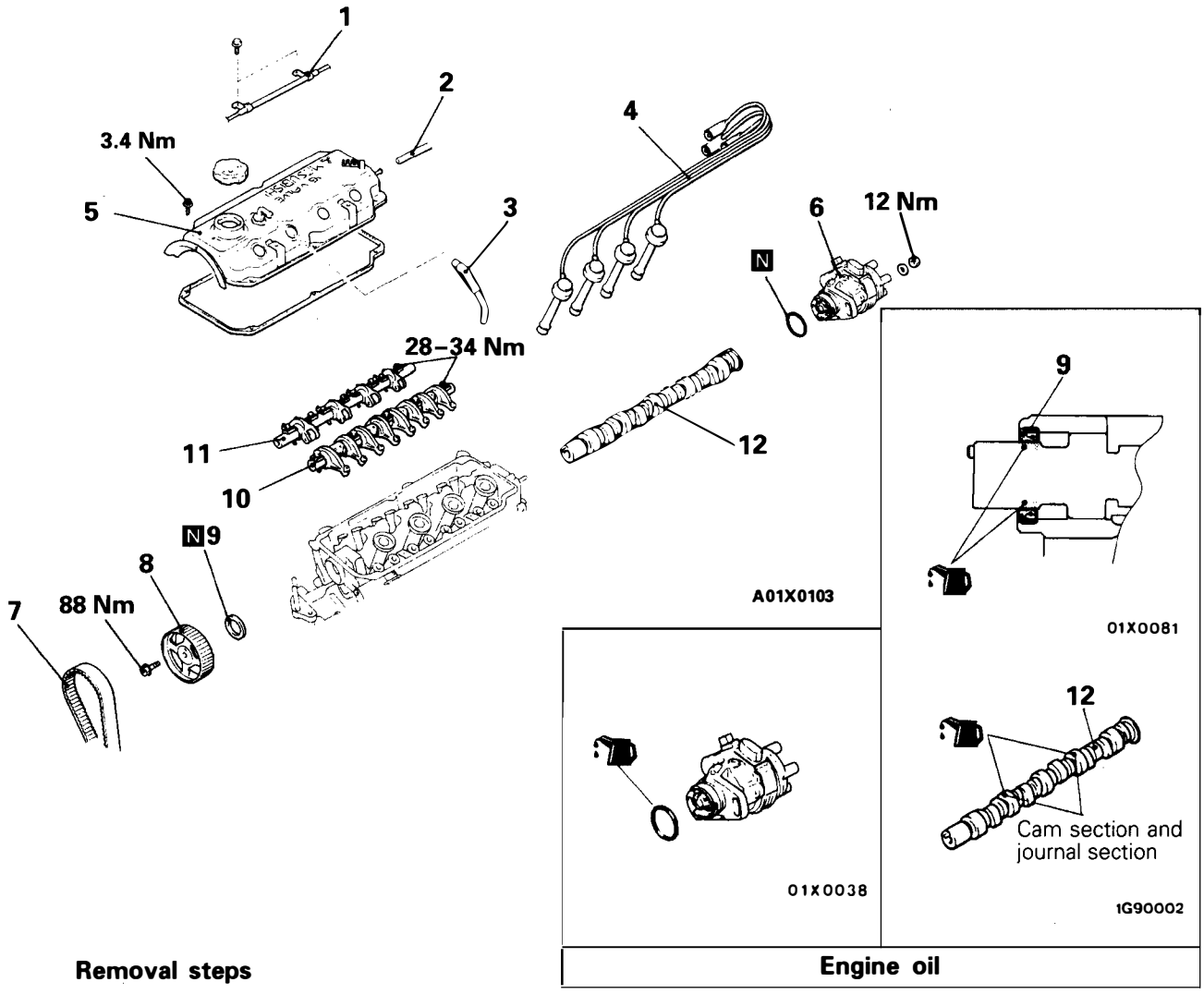
CAMSHAFT AND CAMSHAFT OIL SEAL

E11DH00AA

Pre-removal Operation

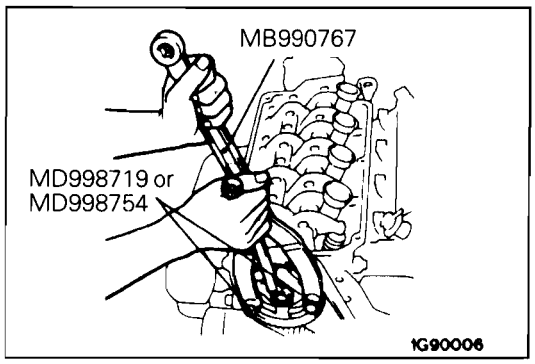
Pre-removal Operation
(1) Battery Removal
(2) Timing Belt Upper Cover Removal (Refer to P.11D-27.)

Post-installation Operation
(1) Timing Belt Upper Cover Installation (Refer to P.11D-27.)
(2) Battery Installation
(3) Engine Adjustment



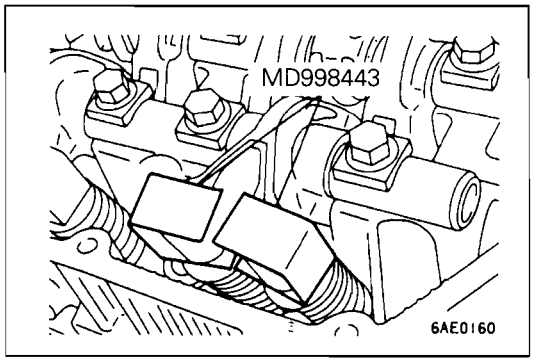
Removal steps

1. Accelerator cable
2. Connection for breather hose
3. Connection for PCV hose
4. Spark plug cable
5. Rocker cover
◆D◆ 6. Distributor
7. Timing belt (Refer to P.11D-27.)
◇A◇ ◆C◆ 8. Camshaft sprocket
◆B◆ 9. Camshaft oil seal
◇B◇ ◆A◆ 10. Rocker arm and shaft assembly (Intake side)
◇B◇ ◆A◆ 11. Rocker arm and shaft assembly (Exhaust side)
12. Camshaft



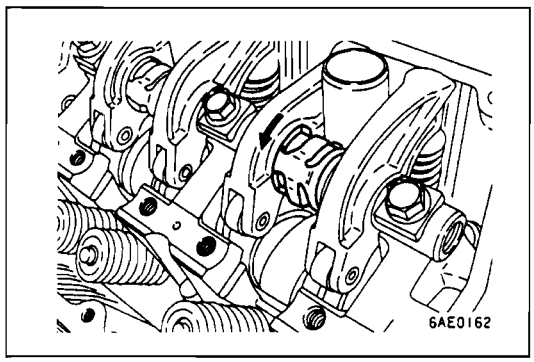
REMOVAL SERVICE POINTS E11DH01AA

〈A〉 CAMSHAFT SPROCKET REMOVAL



〈B〉 ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

Before removing the rocker arm and shaft assembly, install the special tools as shown in the illustration so that the lash adjusters will not fall out.



INSTALLATION SERVICE POINTS E11DH04AA

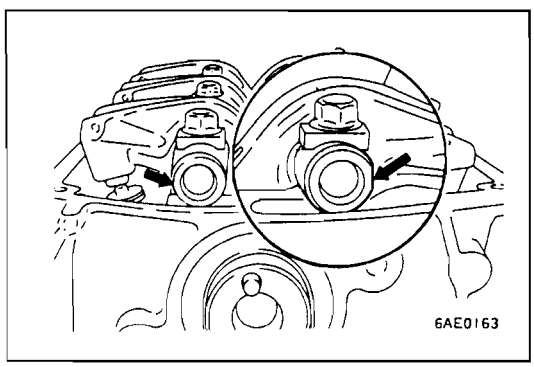
▶A◀ ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

(1) Temporarily tighten the rocker shaft with the bolt so that all rocker arms on the inlet valve side do not push the valves.

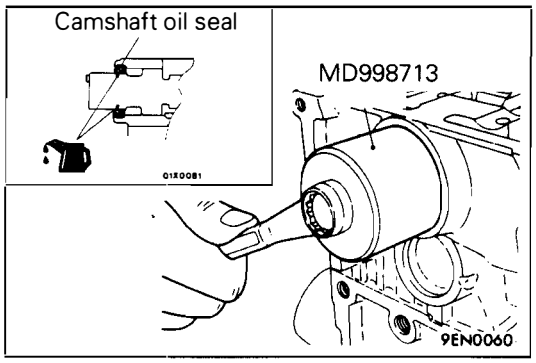
(2) Fit the rocker shaft spring from the above and position it so that it is right angles to the plug guide.

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

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

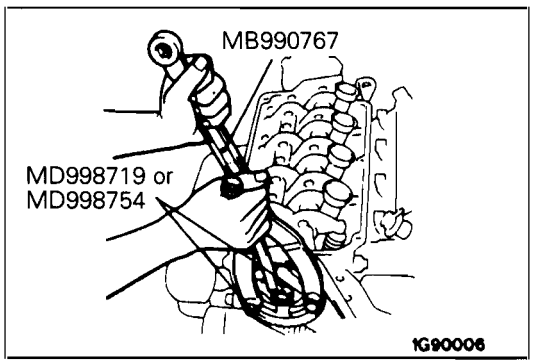


(4) Confirm that the rocker shaft notch is in the direction shown in the diagram.

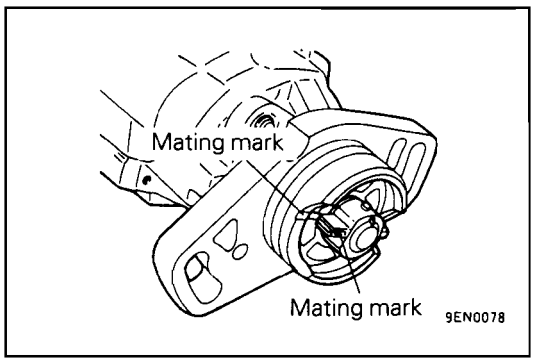


◗B◖ CAMSHAFT OIL SEAL INSTALLATION

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

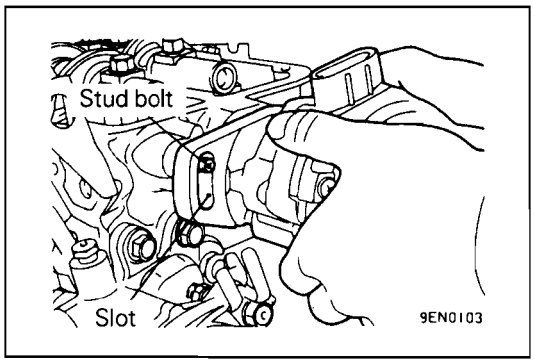


◗C◖ CAMSHAFT SPROCKET INSTALLATION



◗D◖ DISTRIBUTOR INSTALLATION

(1) Turn the crankshaft to bring No. 1 cylinder to the top dead center on compression stroke.
(2) Align the mating marks on the distributor housing with that of the coupling key.



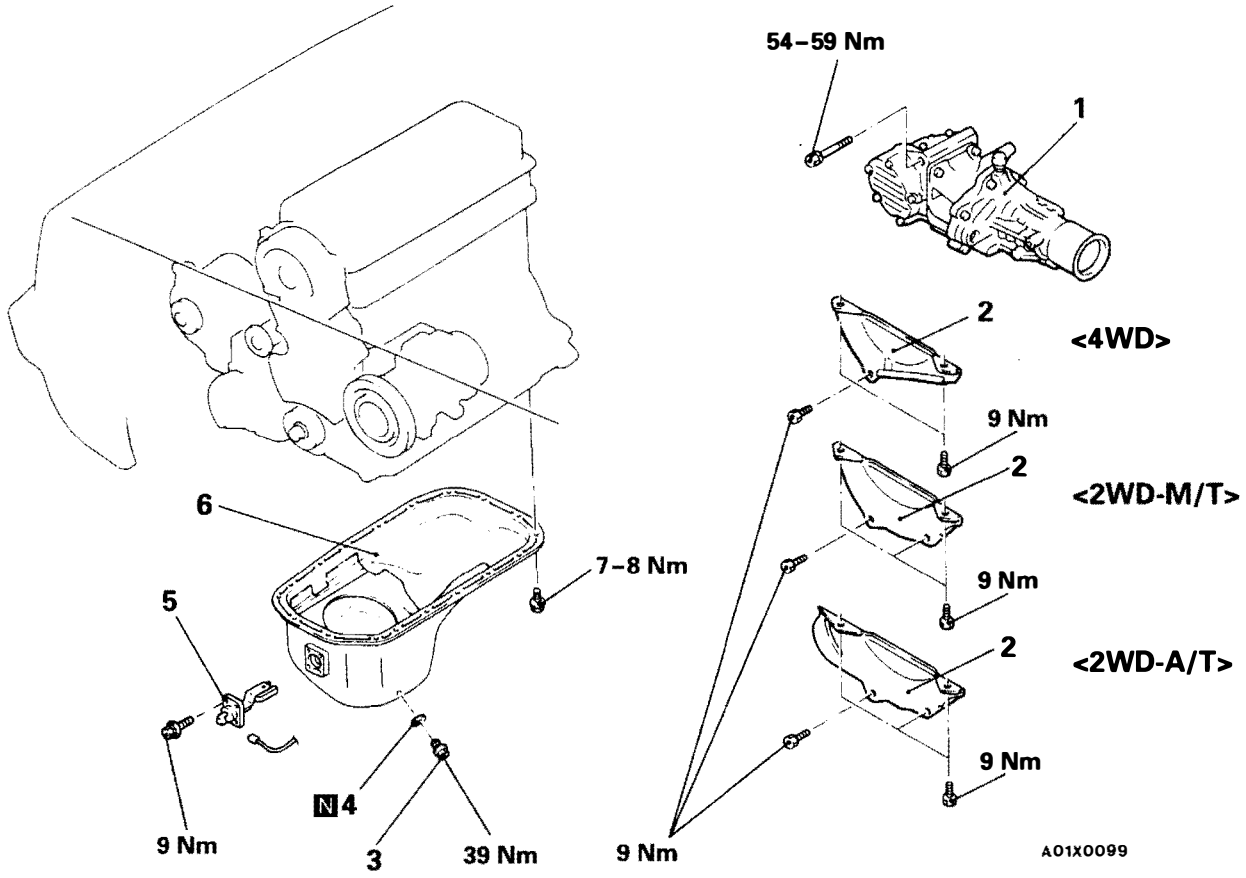
(3) Install the distributor assembly on the engine while aligning the stud bolt used for securing the distributor with the slot in the mounting flange of the distributor.
(4) Check to be sure that the ignition timing is at the standard value. (Refer to P.11D-8.)

OIL PAN

E11DI00AA

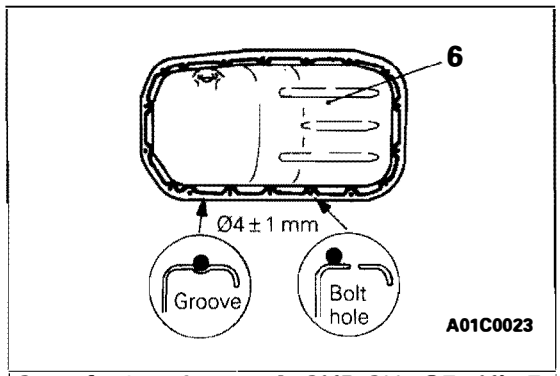
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Oil Draining and Supplying
(2) Oil Level Gauge Removal and Installation
(3) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)

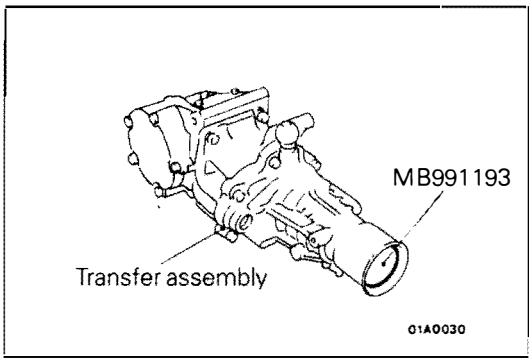


Removal steps

〈A〉 1. Transfer assembly
2. Bell housing cover
3. Drain plug
◆B◆ 4. Gasket
5. Engine oil level sensor
〈B〉◆A◆ 6. Oil pan



Specified sealant: MITSUBISHI GENUINE PART No. MD997110 or equivalent



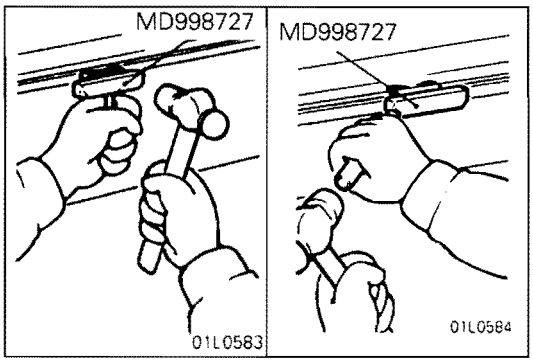
REMOVAL SERVICE POINTS E11DI01AA

◇A◇ TRANSFER ASSEMBLY REMOVAL

(1) Remove the transfer mounting bolts with the propeller shaft still installed.
(2) Insert a flat-tipped screwdriver or similar tool in between the transfer and transmission, and remove the transfer from the centre shaft.
(3) Remove the transfer from the propeller shaft.

Caution
Do not tilt the transfer assembly to the rear, as this will cause the transfer oil to leak out.

(4) After removing the transfer assembly, insert the special tool to prevent the transfer oil from leaking out.
(5) Suspend the propeller shaft from the vehicle chassis with wire, etc.



◇B◇ OIL PAN REMOVAL

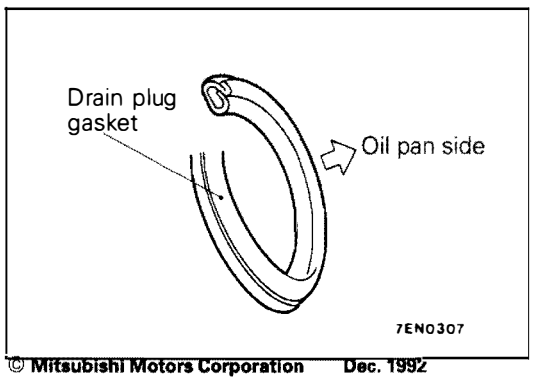
After removing the oil pan mounting bolts, remove the oil pan with the special tool and a brass bar.

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

INSTALLATION SERVICE POINTS E11DI04AA

◆A◆ OIL PAN INSTALLATION

Caution
After cleaning the oil pan mounting bolt holes in the oil seal case, the oil pan should be installed.



◆B◆ GASKET INSTALLATION

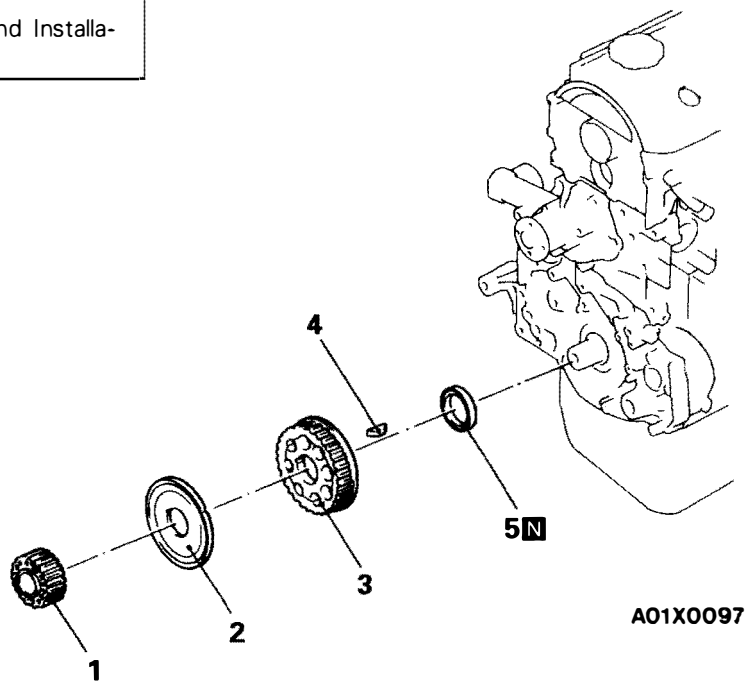
Replace the gasket with a new gasket, and install it in the direction shown in the illustration.

CRANKSHAFT FRONT OIL SEAL

E11DJ00AA

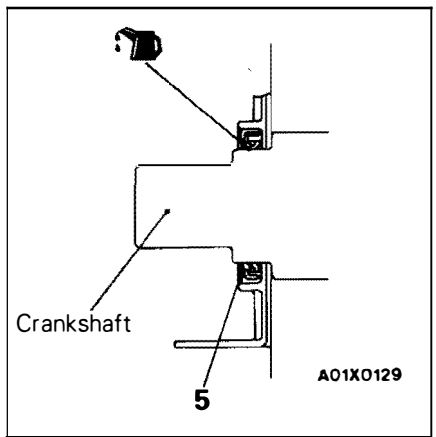
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Timing Belt B Removal and Installation (Refer to P.11D-31.)



A01X0097

Removal steps
1. Crankshaft sprocket
2. Flange
3. Crankshaft sprocket B
4. Key
◆A◆ 5. Crankshaft front oil seal



A01X0129

Engine oil

INSTALLATION SERVICE POINT

E11DJ04AA

◆A◆ CRANKSHAFT FRONT OIL SEAL INSTALLATION

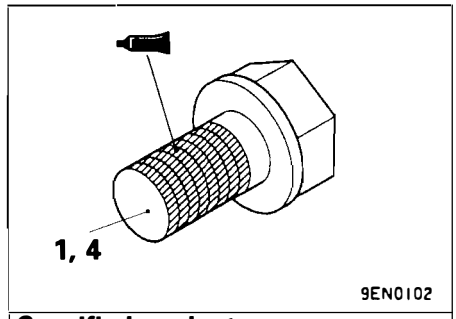
(1) Apply engine oil to the entire circumference of the oil seal lip.
(2) Press-fit the oil seal until it is flush with the oil pump case.

CRANKSHAFT REAR OIL SEAL

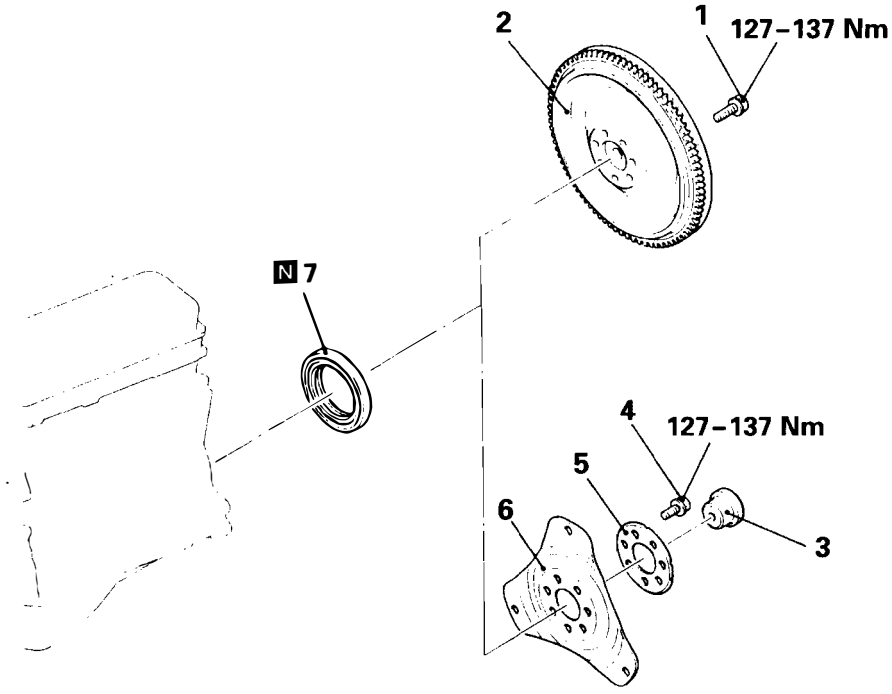
E11DK00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Transmission Assembly Removal and Installation (Refer to GROUP 22, 23 – Transmission Assembly.)
(2) Clutch Cover and Clutch Disc Removal and Installation <M/T>
(3) Oil Pan Removal and Installation (Refer to P.11D-18.)

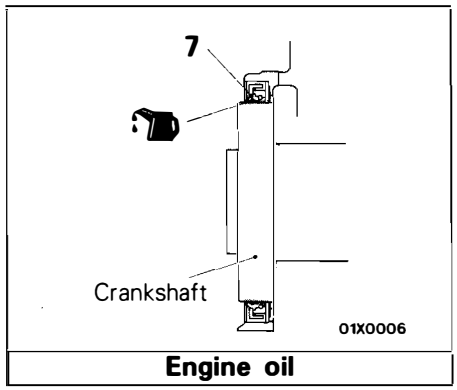


Specified sealant:
3M Stud locking 4170 or equivalent

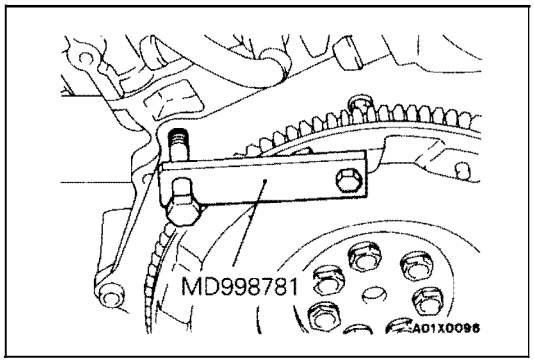


Removal steps

◇A◇ ◆B◆ 1. Flywheel bolt
2. Flywheel
<M/T>
3. Crankshaft bushing
◇A◇ ◆B◆ 4. Drive plate bolt
5. Adapter plate
6. Drive plate
<A/T>
◆A◆ 7. Crankshaft rear oil seal



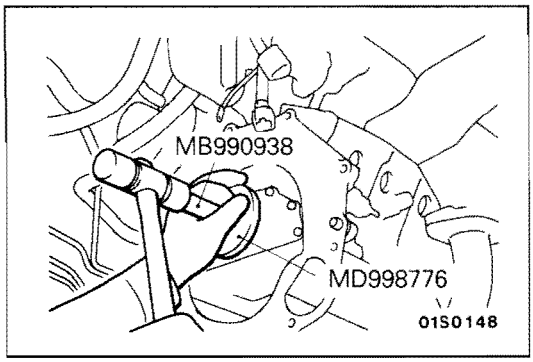
Engine oil



REMOVAL SERVICE POINT E11DK01AA

〈A〉 FLYWHEEL BOLT <M/T>/DRIVE PLATE BOLT REMOVAL

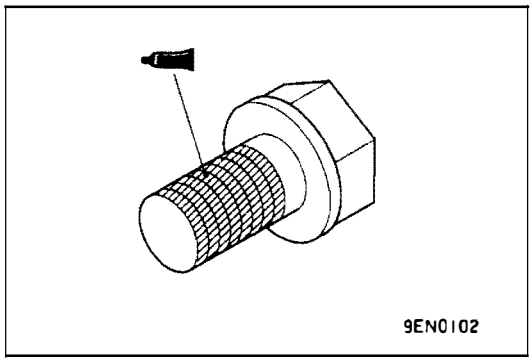
Use the special tool to secure the flywheel or drive plate, and remove the bolt.



INSTALLATION SERVICE POINTS E11DK04AA

◆A◆ CRANKSHAFT REAR OIL SEAL INSTALLATION

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



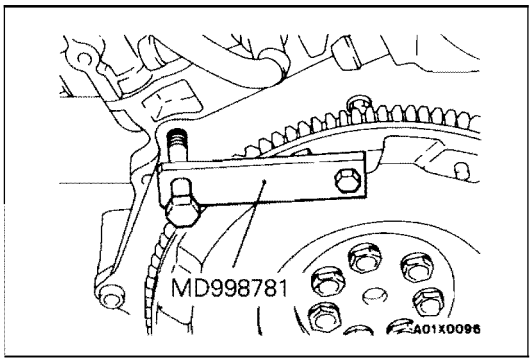
◆B◆ DRIVE PLATE BOLT/FLYWHEEL BOLT INSTALLATION

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

Specified sealant: 3M Stud locking 4170 or equivalent

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

Specified torque: 127–137 Nm



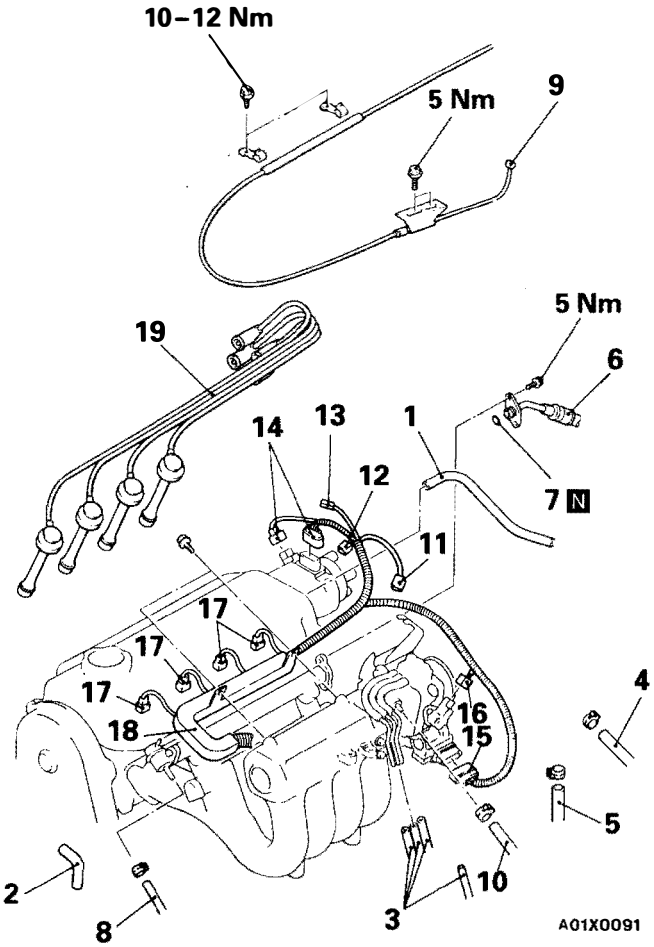
CYLINDER HEAD GASKET

E11DL00AA

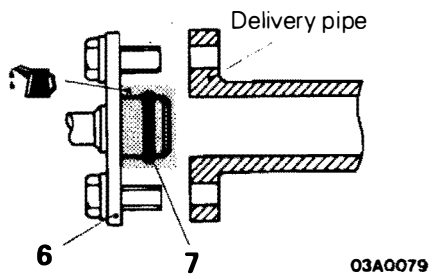
REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Fuel Line and Hose Reduce the Inner Pressure (Refer to GROUP 13A – Service Adjustment Procedures.)
(2) Engine Coolant Draining
(3) Engine Oil Draining
(4) Air Intake Hose Removal (Refer to GROUP 15 – Air Cleaner.)

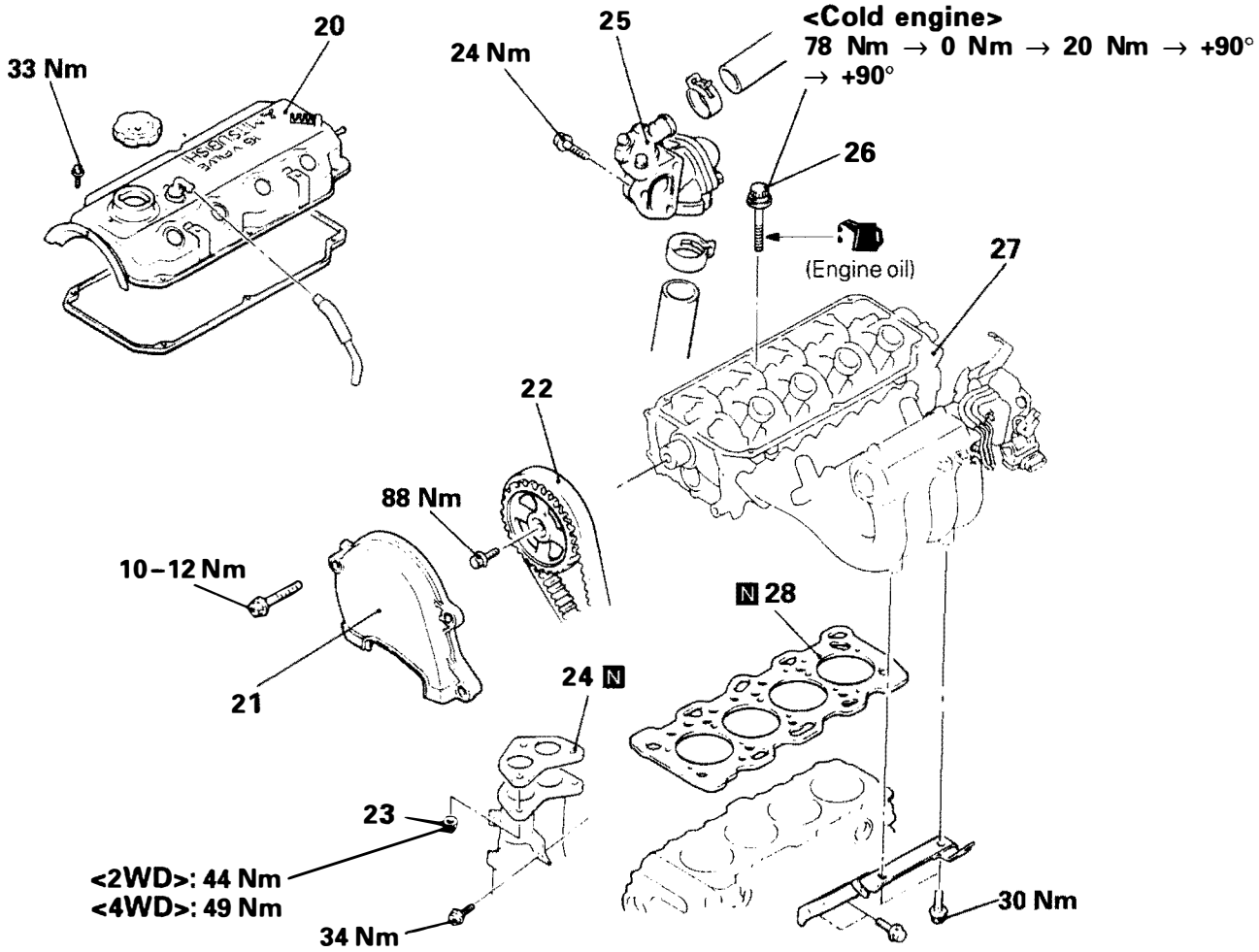
Post-installation Operation
(1) Air Intake Hose Installation (Refer to GROUP 15 – Air Cleaner.)
(2) Engine Oil Refilling
(3) Engine Coolant Refilling
(4) Accelerator Cable Adjusting (Refer to GROUP 13F – Service Adjustment Procedures.)



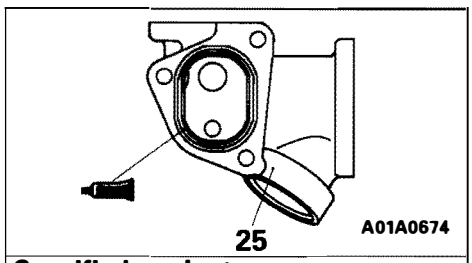
Removal steps
1. Breather hose connection
2. PCV hose
3. Vacuum hose connection
4. Heater hose connection
5. Water hose connection (Throttle body → water inlet fitting)
6. High-pressure fuel hose connection
7. O-ring
8. Fuel return hose connection
9. Accelerator cable connection
10. Brake booster vacuum hose connection
11. Oil pressure switch connector
12. Engine coolant temperature gauge unit connector
13. Engine coolant temperature sensor connector
14. Distributor connector
15. Idle speed control servo connector
16. Throttle position sensor connector
17. Injector connectors
18. Control harness
19. Spark plug cable



Engine oil

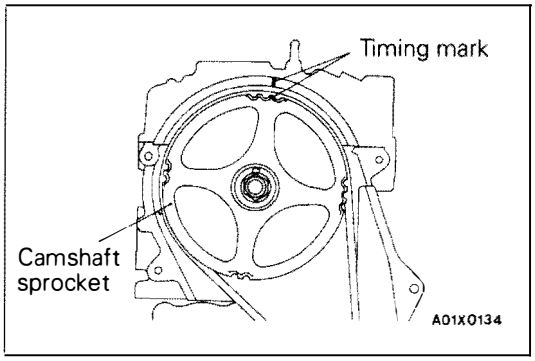


A01X0090



Specified sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent

20. Rocker cover
21. Timing belt upper cover
◇A◇ 22. Camshaft sprocket
23. Self locking nut
24. Gasket
◆C◆ 25. Thermostat housing
◇B◇ ◆B◆ 26. Cylinder head bolt
27. Cylinder head assembly
◆A◆ 28. Cylinder head gasket

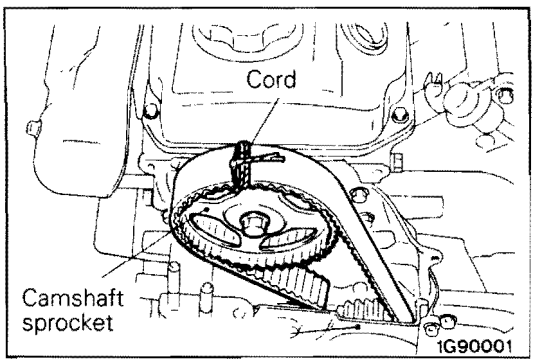


REMOVAL SERVICE POINTS E11DL01AA

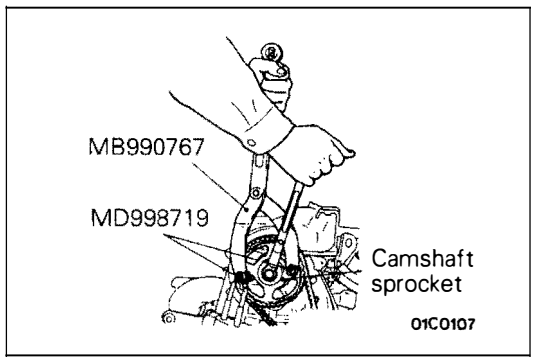
〈A〉 CAMSHAFT SPROCKET REMOVAL

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

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

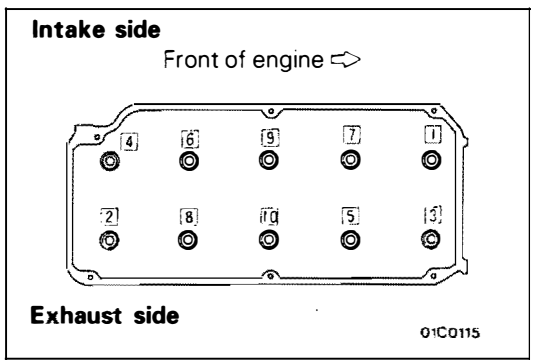


(2) Tie the camshaft sprocket and timing belt with a cord so that the position of the camshaft sprocket will not move with respect to the timing belt.



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

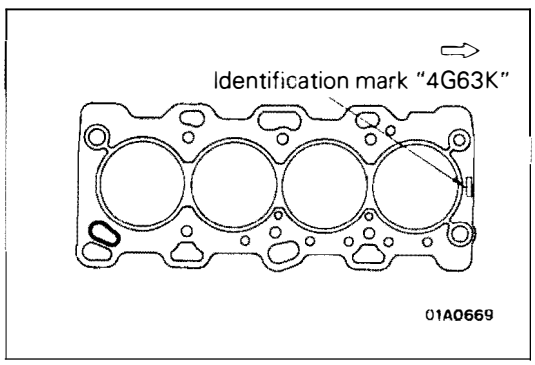
Caution
After removing the camshaft sprocket, be sure not to rotate the crankshaft.



〈B〉 CYLINDER HEAD BOLT REMOVAL

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

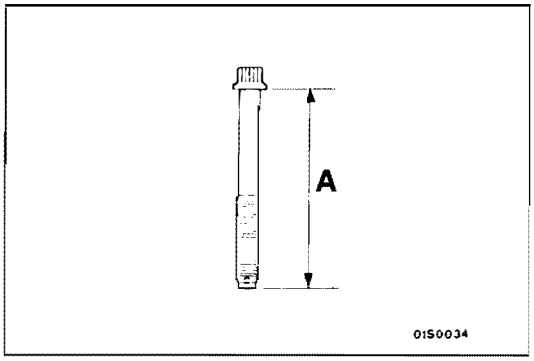
Caution
Because the plug guides cannot be replaced by themselves, be careful not to damage or deform the plug guides when removing the cylinder head bolts.



INSTALLATION SERVICE POINTS E11DL04AA

◆A◆ CYLINDER HEAD GASKET INSTALLATION

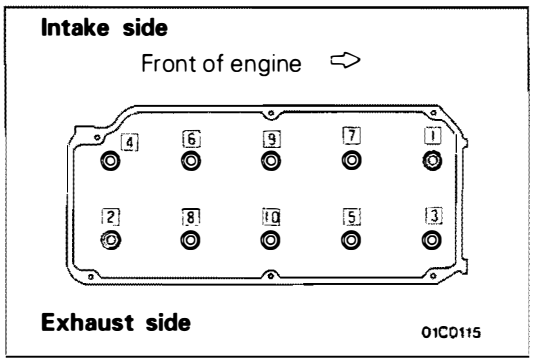
(1) Wipe off all oil and grease from the gasket mounting surface.
(2) Install the gasket to the cylinder block with the identification mark facing upwards.



◆B◆ CYLINDER HEAD BOLT INSTALLATION

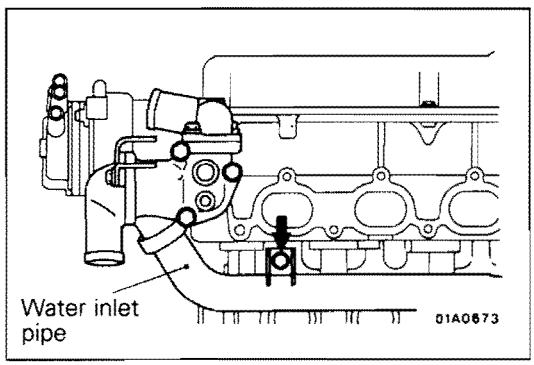
(1) When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

Limit (A): Within 99.4 mm



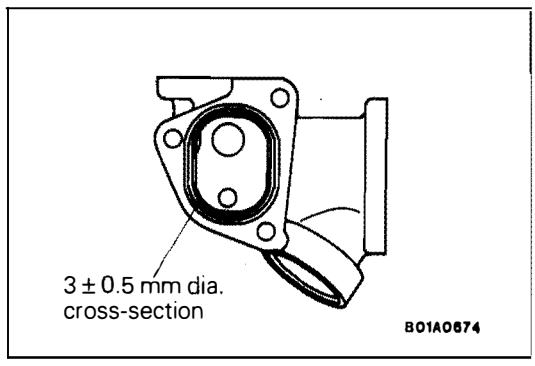
(2) Tighten the bolts by the following procedure.

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



◆C◆ THERMOSTAT HOUSING INSTALLATION

(1) Loosen the water inlet pipe bolt shown in the illustration.



(2) Apply specified sealant to the thermostat case assembly in the places shown in the illustration.

Specified sealant: MITSUBISHI GENUINE PART MD970389

(3) Apply a small amount of water to the O-ring of the water inlet pipe, and then press the thermostat case assembly into the water inlet pipe.
(4) Tighten the thermostat case assembly mounting bolts.
(5) Tighten the water inlet pipe bolts.

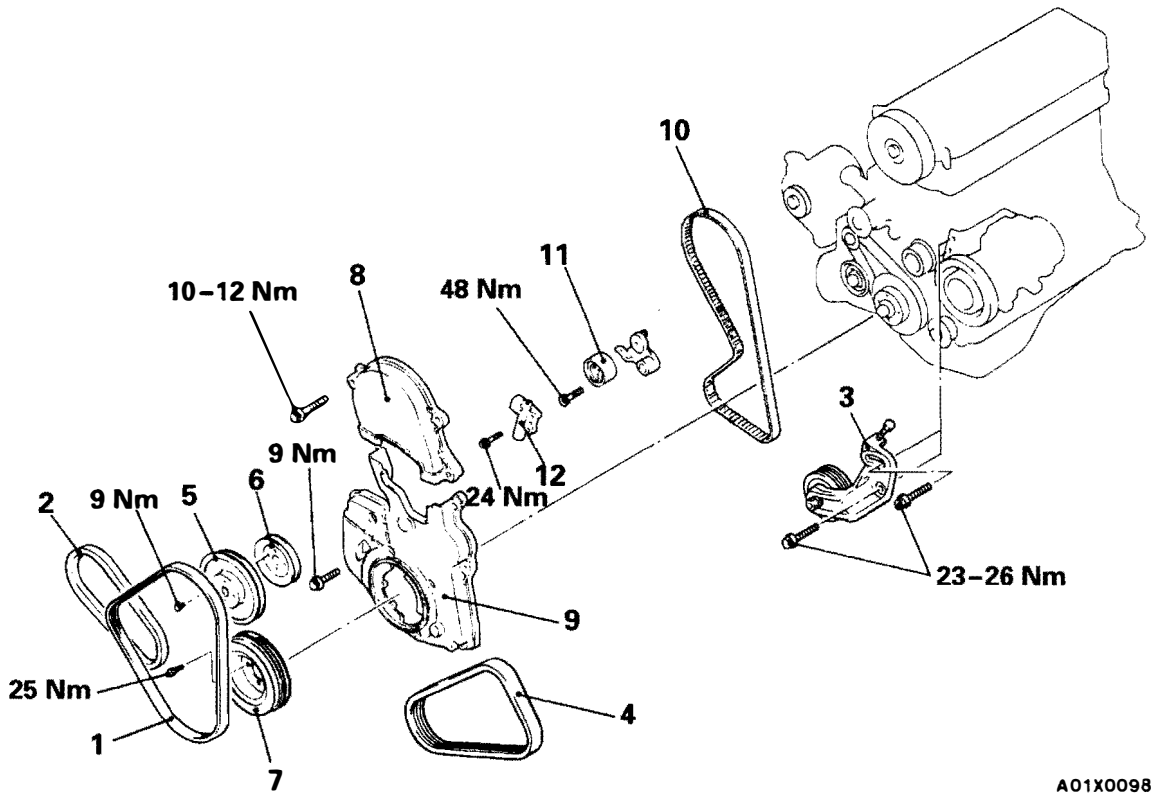
TIMING BELT

E11DM00AA

REMOVAL AND INSTALLATION

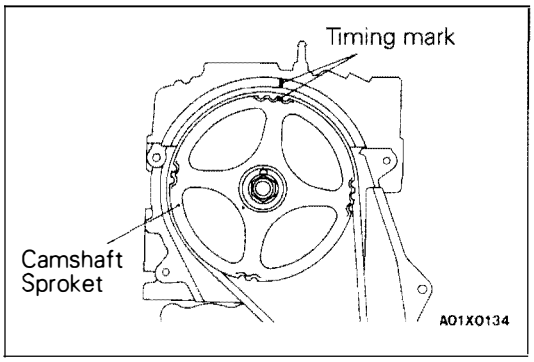
Pre-removal Operation
- Under Cover Removal

Post-installation Operation
(1) Under Cover Installation
(2) Engine Adjustment (Refer to P.11D-8.)



Removal steps

- Drive Belt Tension Adjustment (Refer to P.11D-7.)
1. Drive belt (Alternator)
2. Drive belt (Power steering)
3. Tensioner pulley bracket
4. Drive belt (A/C)
5. Water pump pulley
6. Water pump pulley (Power steering)
7. Crankshaft pulley
◆D◆ 8. Timing belt front upper cover
◆D◆ 9. Timing belt front lower cover
◆C◆ • Timing belt tension adjustment
◇A◇ ◆B◆ 10. Timing belt
11. Tension pulley
◆A◆ 12. Auto tensioner

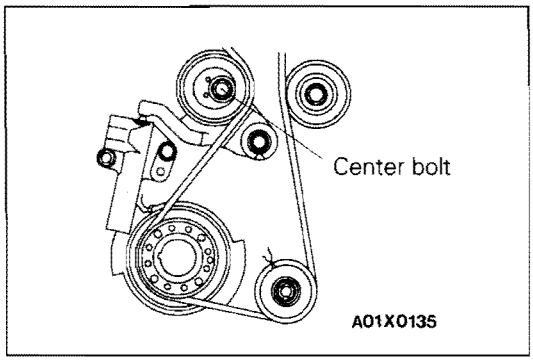


REMOVAL SERVICE POINT E11DM01AA

◇A◇ TIMING BELT REMOVAL

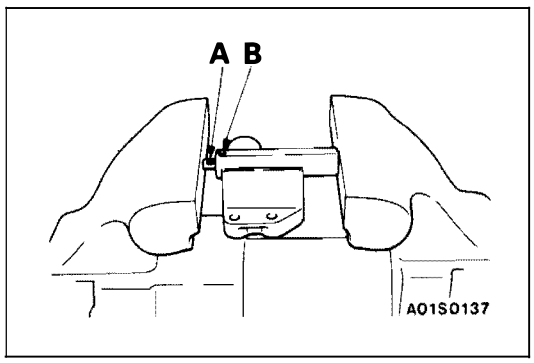
(1) Turn the crankshaft in the forward direction (to the right) to align the camshaft sprocket timing marks.

Caution
The crankshaft should always be turned in the forward direction only.



(2) Loosen the tension pulley centre bolt.
(3) Move the tension pulley to the water pump side, and then remove the timing belt.

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

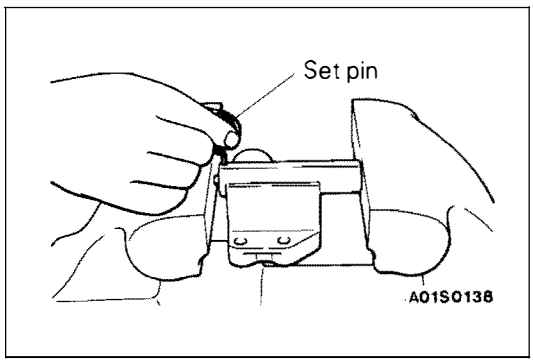


INSTALLATION SERVICE POINTS E11DM04AA

◆A◆ AUTO TENSIONER INSTALLATION

(1) Use a press or vice to gently compress the auto tensioner push rod until pin hole A of the push rod and pin hole B of the tensioner cylinder are aligned.

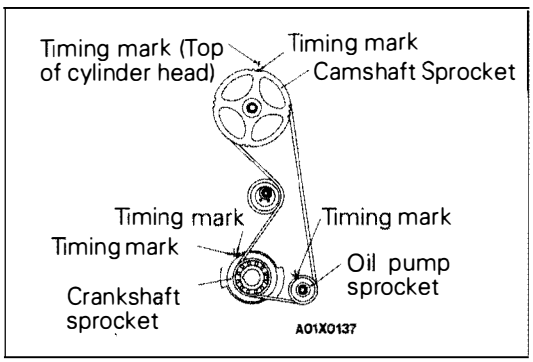
Caution
If the compression speed is too fast, the rod may become damaged, so be sure to carry out this operation slowly.



(2) Once the holes are aligned, insert the set pin.

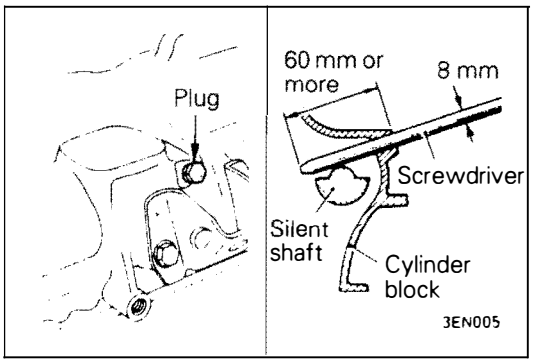
NOTE
When replacing the auto tensioner with a new part, the pin will be in the auto tensioner.

(3) Install the auto tensioner to the engine.

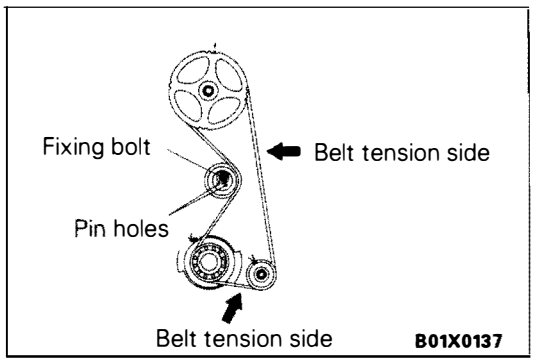


◆B◆ TIMING BELT INSTALLATION

(1) Align the timing marks on the camshaft sprocket, crankshaft sprocket and oil pump sprocket.



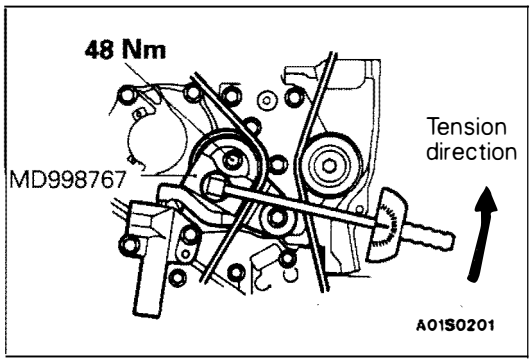
(2) After aligning the timing mark on the oil pump sprocket, remove the cylinder block plug and insert a Phillips screwdriver with a diameter of 8 mm, and check to be sure that the screwdriver goes in 60 mm or more. If the screwdriver will only go in 20 – 25 mm before striking the silent shaft, turn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



(3) Install the belt to the crankshaft sprocket, oil pump sprocket and camshaft sprocket in that order, so that there is no slackness in the belt tension.

Caution
If the timing belt is re-used, install so that the arrow marked on it at time of removal is pointing in the clockwise direction.

(4) Set the tension pulley so that the pin holes are at the top, press the tension pulley lightly against the timing belt, and then provisionally tighten the fixing bolt.
(5) Adjust the timing belt tension.

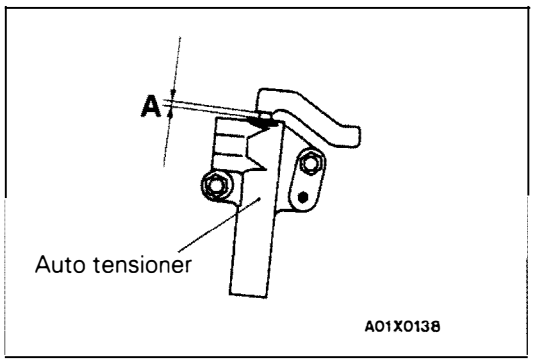


◆C◆ TIMING BELT TENSION ADJUSTMENT

(1) After turning the crankshaft 1/4 of a revolution in the anticlockwise direction, turn it in the clockwise direction until the timing marks are aligned.
(2) Loosen the tension pulley fixing bolt, and then use the special tool and a torque wrench to tighten the fixing bolt to the specified torque while applying tension to the timing belt.

Standard value: 3.5 Nm <Timing belt tension torque>

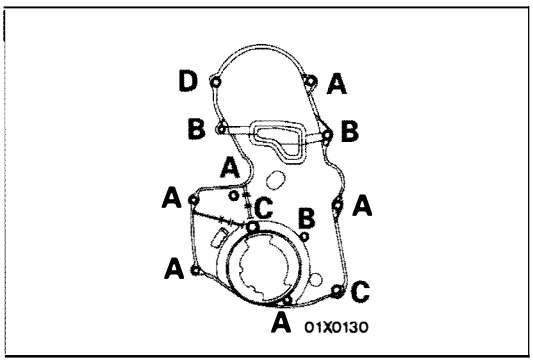
Caution
When tightening the fixing bolt, make sure that the tension pulley does not turn with the bolt.



(3) Turn the crankshaft two revolutions in the clockwise direction so that the timing marks are aligned. After leaving it for 15 minutes, measure the amount of protrusion of the auto tensioner.

Standard value (A): 3.8–4.5 mm

(4) If the amount of protrusion is outside the standard value, repeat the operation in steps (1) to (3).
(5) Check again to be sure that the timing marks of each sprocket are aligned.



◆D◆ TIMING BELT FRONT LOWER COVER/TIMING BELT FRONT UPPER COVER INSTALLATION

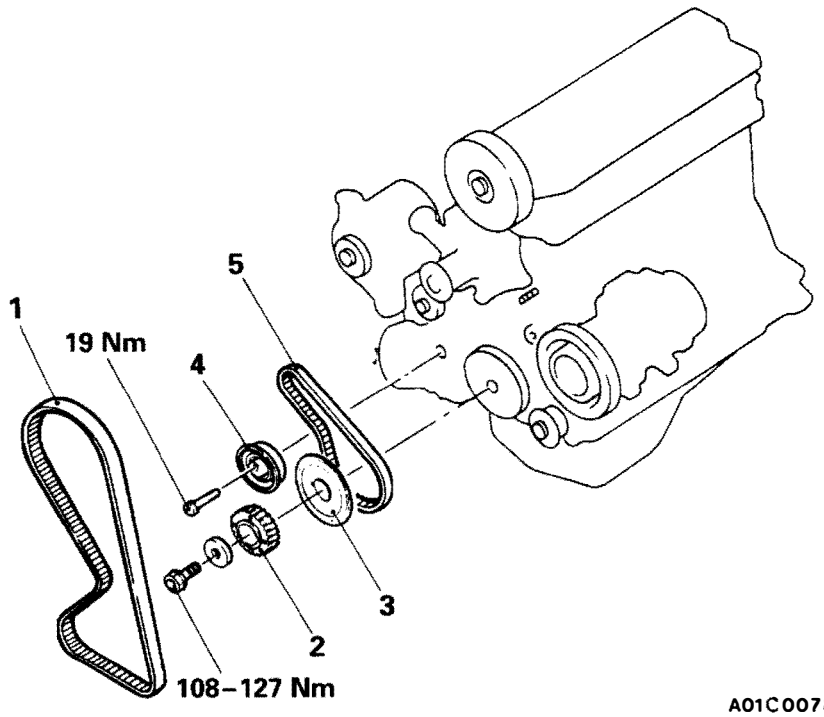
Install the bolts, being careful not to mistake the bolt sizes.
Bolt A: 6 × 18 <Flange bolt>
Bolt B: 6 × 25 <Flange bolt>
Bolt C: 6 × 25 <Washer assembled bolt>
Bolt D: 6 × 50 <Flange bolt>

diameter × length mm

TIMING BELT B

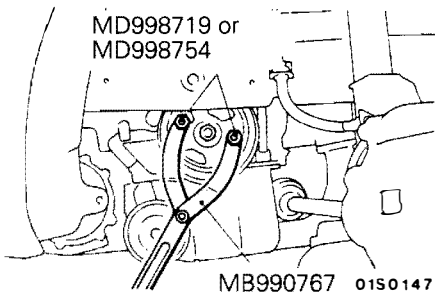
E11DN00AA

REMOVAL AND INSTALLATION



Removal steps

1. Timing belt (Refer to P.11D-27.)
◇A◇ ◆C◆ 2. Crankshaft sprocket
◆B◆ 3. Flange
4. Timing belt B tensioner
◇B◇ ◆A◆ 5. Timing belt B



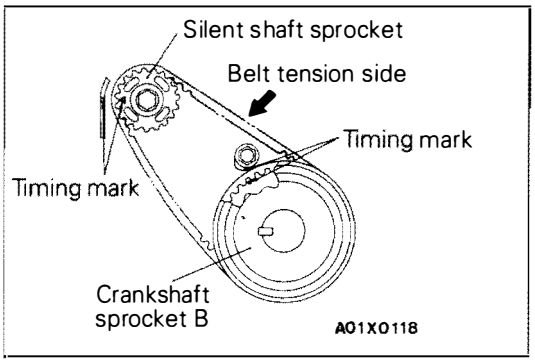
REMOVAL SERVICE POINTS

E11DN01AB

◇A◇ CRANKSHAFT SPROCKET REMOVAL

◇B◇ TIMING BELT B REMOVAL

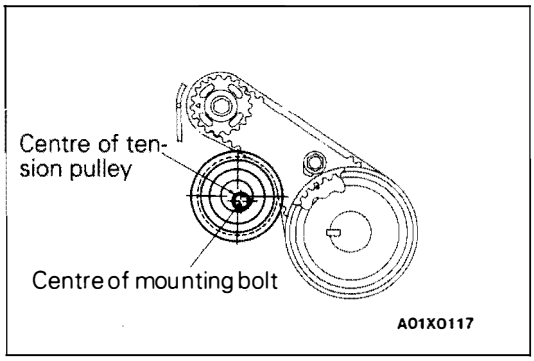
Caution
If timing belt "B" is to be re-used, use chalk to mark it with an arrow on its flat side indicating the turning direction (to the right).



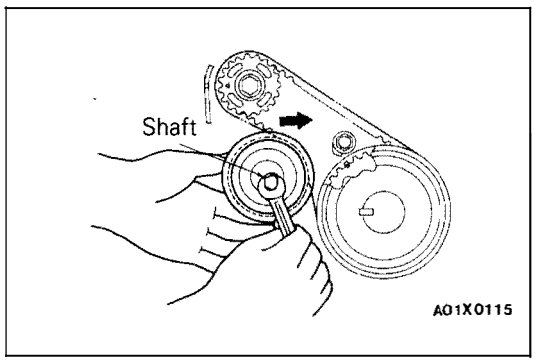
INSTALLATION SERVICE POINTS E11DN04AA

◆A◆ TIMING BELT B INSTALLATION, ADJUSTMENT

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

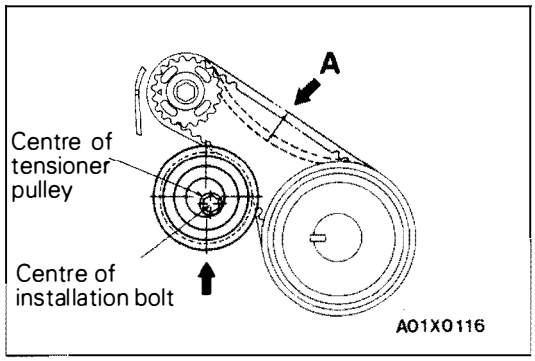


(2) Adjust the tension of timing belt "B" by the following procedure.
1) Temporarily fix the timing belt "B" tensioner such that the centre of the tensioner pulley is to the left and above the centre of the installation bolt, and temporarily attach the tensioner pulley so that the flange is toward the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



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

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

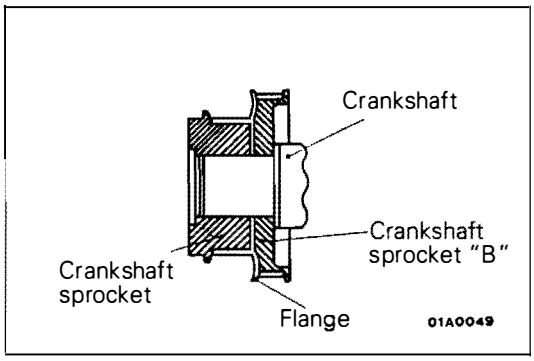


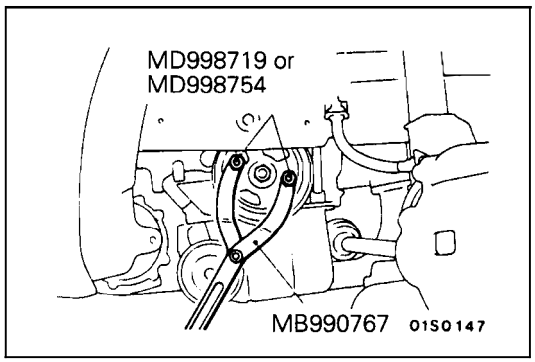
(3) To ensure that the tension is correct, depress the belt (point A) with a finger. If not, adjust.

Standard value: 5–7 mm

◆B◆ FLANGE INSTALLATION

When installing, make sure the direction is correct. See figure.





◗C◖ CRANKSHAFT SPROCKET INSTALLATION

Using the special tool, tighten the bolts to the specified torque.

Specified torque: 108–127 Nm

NOTE
Apply the minimum amount of engine oil to the bearing surface and thread of the crankshaft bolt.

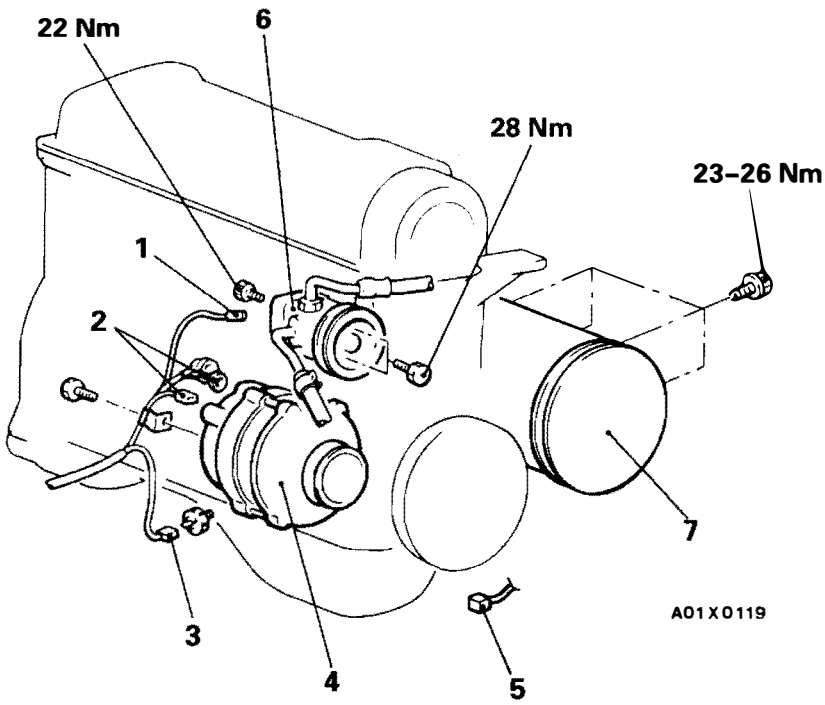
ENGINE ASSEMBLY

E11DO00AA

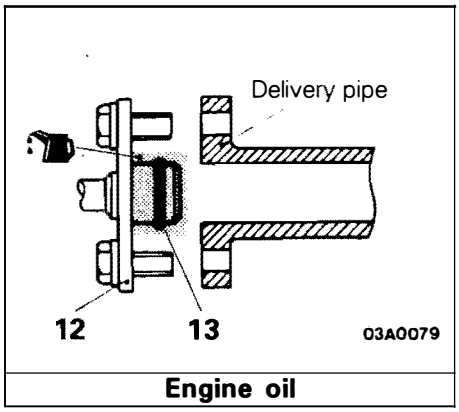
REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Fuel Line Pressure Releasing (Refer to GROUP 13A – Service Adjustment Procedures.)
(2) Hood Removal
(3) Engine coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)
(4) Transmission Assembly Removal (Refer to GROUP 22, 23 – Transmission Assembly.)
(5) Radiator Removal (Refer to GROUP 14 – Radiator.)
(6) Under Cover Removal

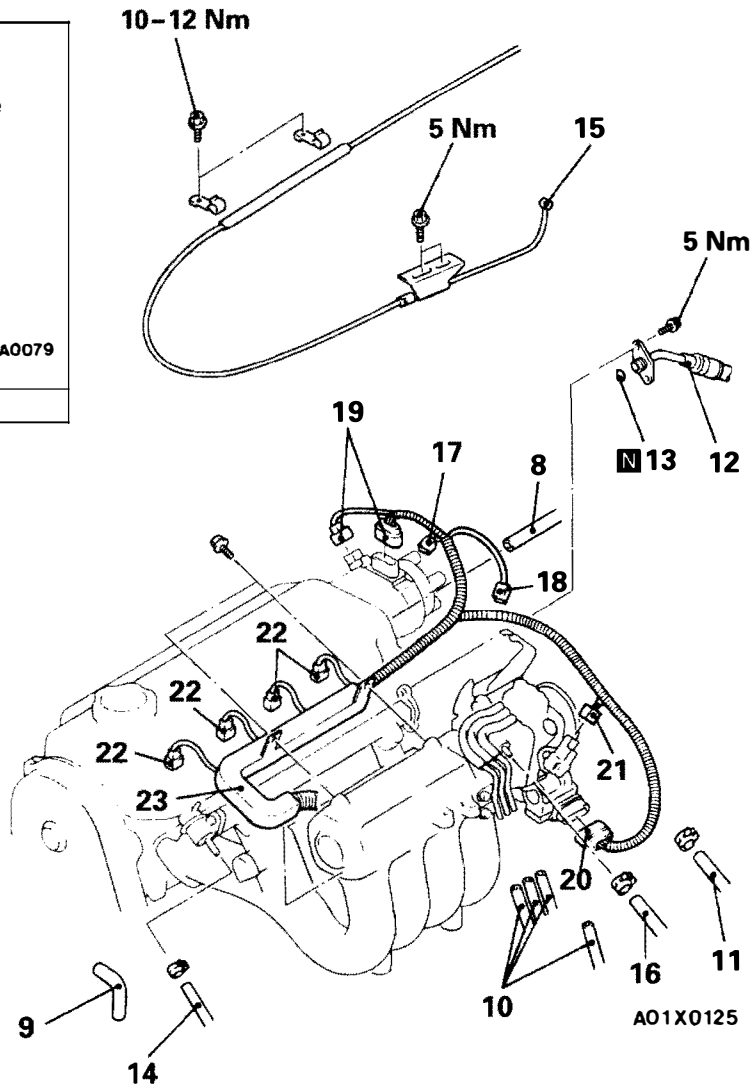
Post-installation Operation
(1) Radiator Installation (Refer to GROUP 14 – Radiator.)
(2) Transmission Assembly Installation (Refer to GROUP 22, 23 – Transmission Assembly.)
(3) Engine coolant Supplying (Refer to GROUP 14 – Service Adjustment Procedures.)
(4) Hood Installation
(5) Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
(6) Under Cover Installation



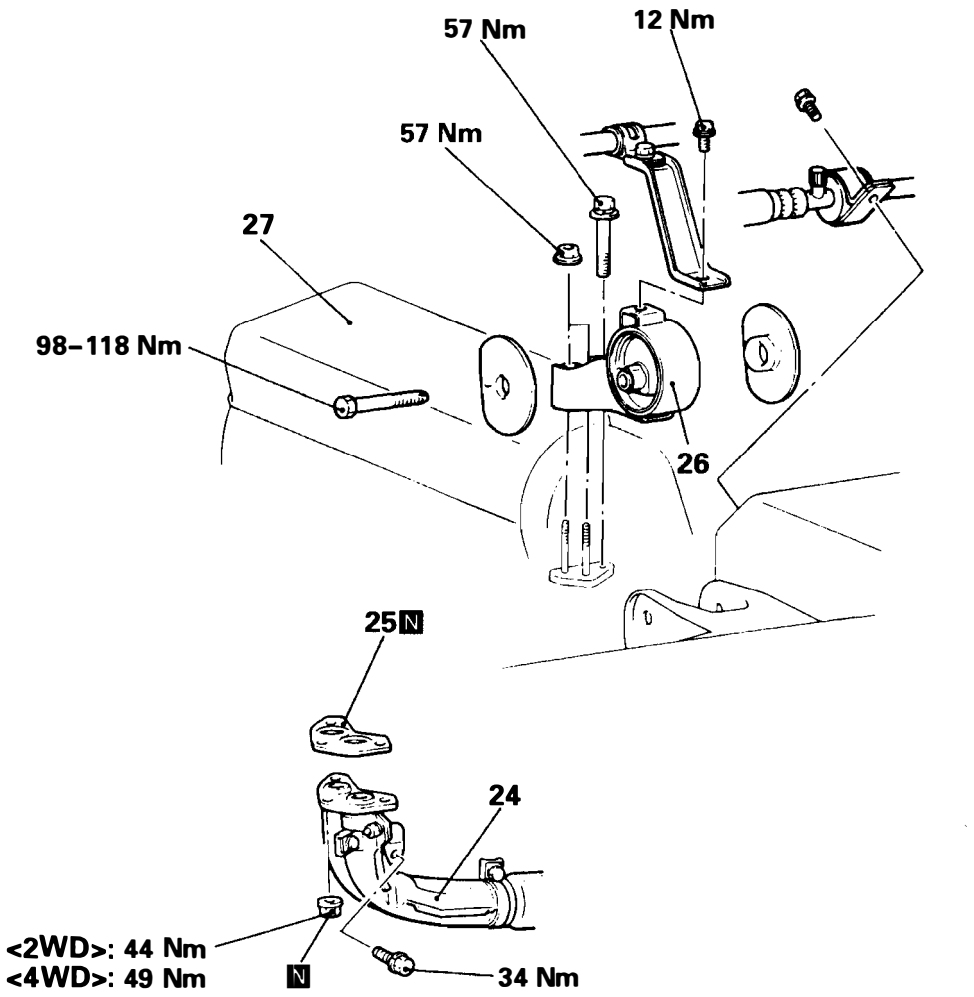
Removal steps
1. Power steering oil pressure switch connector
2. Alternator harness
3. Oil pressure switch connector
4. Alternator (Refer to GROUP 16 – Alternator.)
5. Connection for oil level sensor connector
〈A〉 6. Connection for power steering oil pump
〈B〉 7. Connection for A/C compressor



Engine oil



8. Breather hose connection
9. PCV hose
10. Vacuum hose connection
11. Water hose connection
12. High-pressure fuel hose connection
13. O-ring
14. Fuel return hose connection
15. Accelerator cable connection
16. Brake booster vacuum hose connection
17. Engine coolant temperature gauge unit connector
18. Engine coolant temperature sensor connector
19. Distributor connector
20. Idle speed control servo connector
21. Throttle position sensor connector
22. Injector connectors
23. Control harness



24. Front exhaust pipe connection
25. Gasket
◇C◇ ◆B◆ 26. Engine mount bracket
◇D◇ ◆A◆ 27. Engine assembly

REMOVAL SERVICE POINTS E11D001AA

◇A◇ POWER STEERING OIL PUMP REMOVAL

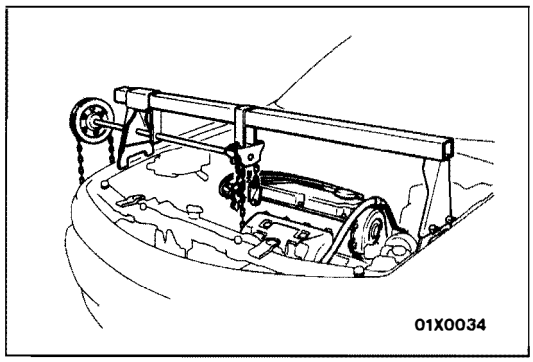
Remove the power steering oil pump from the bracket with the hose attached.

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

◇B◇ A/C COMPRESSOR REMOVAL

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

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



◇C◇ ENGINE MOUNT BRACKET REMOVAL

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

◇D◇ ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS E11D004AA

◆A◆ ENGINE ASSEMBLY INSTALLATION

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

◆B◆ ENGINE MOUNT BRACKET INSTALLATION

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

4G9

CONTENTS

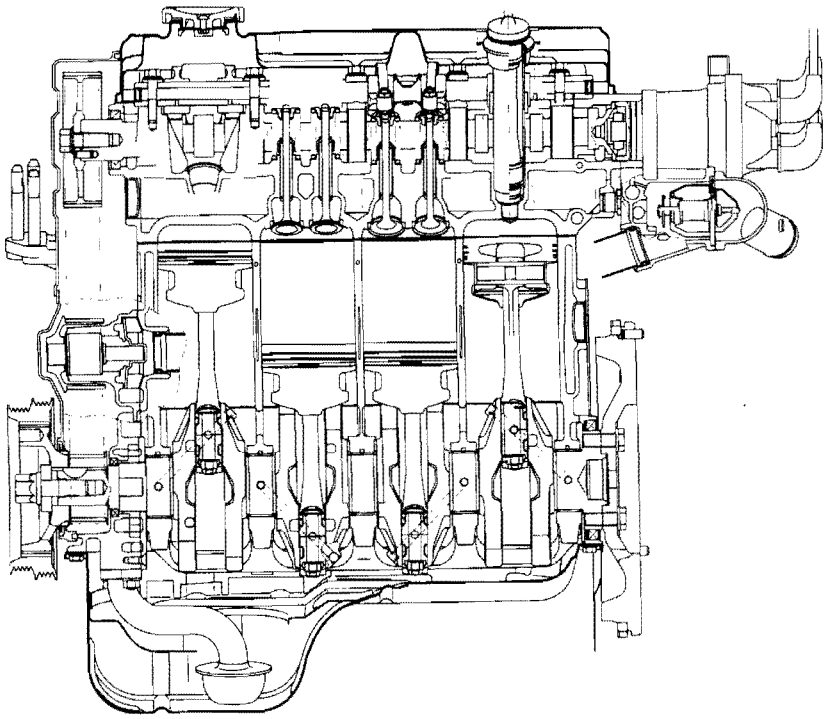
E11EA00AA

GENERAL INFORMATION

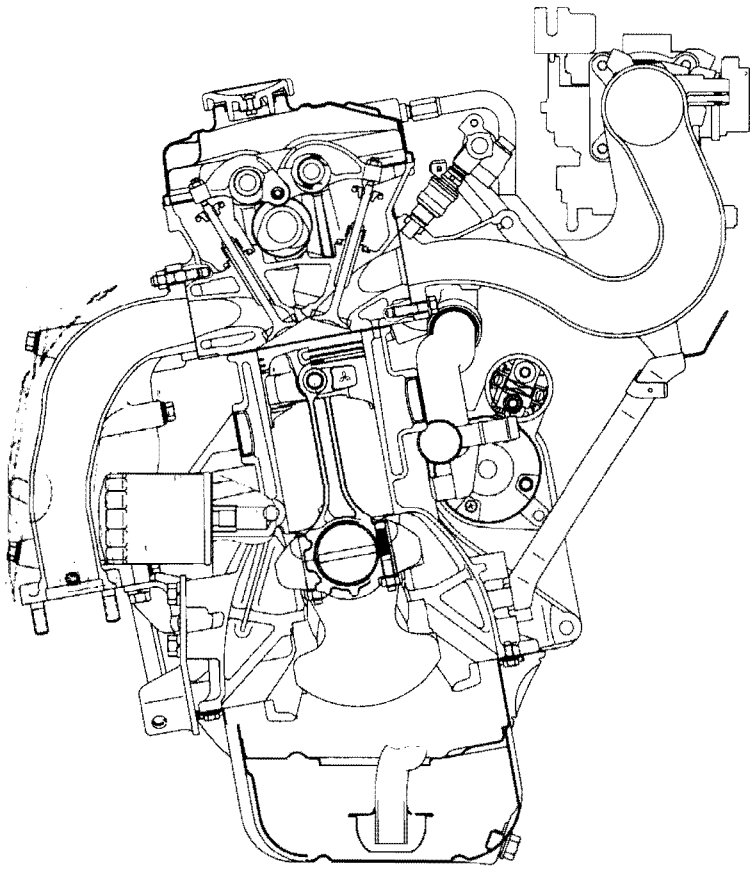
E11EB00AB

Items		4G93
Total displacement	mℓ	1,834
BorexStroke	mm	81.0 x 89.0
Compression ratio		10.0
Combustion chamber		Pentroof type
Camshaft arrangement		SOHC
Number of valve	Intake	8
	Exhaust	8
Valve timing		
<Up to 1993 models>		
	Intake	Opening BTDC 11°, Closing ABDC 61°
	Exhaust	Opening BBDC 55°, Closing ATDC 17°
<From 1994 models>		
Vehicles except those for Germany and Austria		
	Intake	Opening BTDC 11°, Closing ABDC 61°
	Exhaust	Opening BBDC 55°, Closing ATDC 17°
Vehicles for Germany and Austria		
	Intake	Opening BTDC 16°, Closing ABDC 48°
	Exhaust	Opening BBDC 56°, Closing ATDC 8°
Fuel system		Electronic control multipoint fuel injection
Rocker arm		Roller type
Auto-lash adjuster		Not equipped

SECTIONAL VIEW



9EN0104



9EN0105

SERVICE SPECIFICATIONS

E11EC00AA

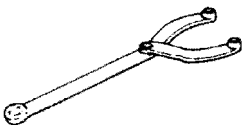
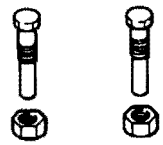
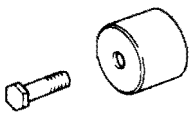
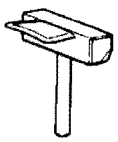
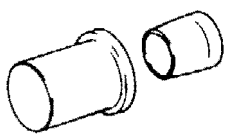
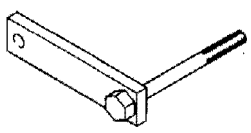
Items		4G93
Standard value		
Drive belt deflection	mm	
Alternator V-ribbed type		
When checked		8.5–12.0
When a new belt is installed		7.0–8.5
When a used belt is installed		9.5
Power steering oil pump <Vehicles without A/C>		
When checked		8.5–13.5
When a new belt is installed		7.5–9.0
When a used belt is installed		9.5–11.5
Power steering oil pump and A/C compressor <Vehicles with A/C>		
When checked		6.8–7.6
When a new belt is installed		5.5–6.0
When a used belt is installed		6.8–7.6
Basic ignition timing		5° ± 2° BTDC
Idle speed	r/min.	800 ±100
Compression pressure (250–400 r/min.)	kPa	1,450
Intake manifold vacuum	kPa	69
Valve clearance (at hot)	mm	
Intake		0.20
Exhaust		0.30
Timing belt tension	mm	33
Clearance between flat surface of timing belt and inside of under cover seal line	mm	Approx. 30
Limit		
Compression pressure (250–400 r/min.)	kPa	1,105
Compression pressure difference of all cylinder	kPa	100
Cylinder head bolt shank length	mm	96.4

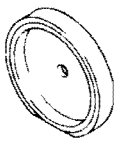
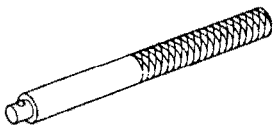
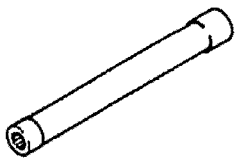
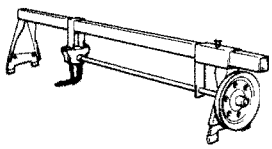
SEALANTS

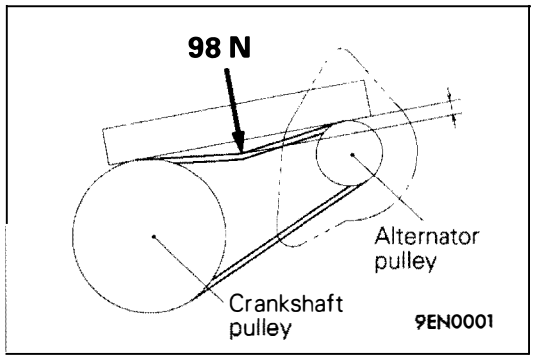
Items	Specified sealant	Remarks
Oil pan Thermostat case	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant
Flywheel bolt or drive plate bolt	3M Stud locking 4170 or equivalent	

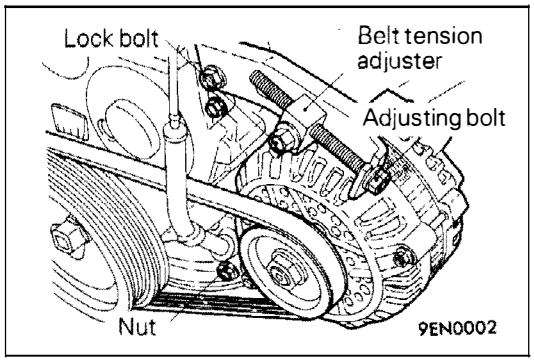
SPECIAL TOOLS

E11ED00AA

Tool	Number	Name	Use
	MB990767	End yoke holder	• Supporting of crankshaft pulley • Supporting of camshaft pulley
	MD998719 or MD998754	Crankshaft pulley holder pin	
	MD998713	Camshaft oil seal installer	Press-fitting the camshaft oil seal
	MD998727	Oil pan remover	Removal of oil pan
	MD998717	Crankshaft front oil seal installer	Press-fitting of crankshaft front oil seal
	MD998781	Fly wheel stopper	Securing the flywheel <M/T> or drive plate

Tool	Number	Name	Use
	MD998776	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal
	MB990938	Handle	
	GENERAL SERVICE TOOL	Cylinder head bolt wrench	Removal and installation of the cylinder head bolt
	GENERAL SERVICE TOOL MZ203827	Mechanic hanger, engine	Supporting the engine assembly during removal and installation of the transmission





SERVICE ADJUSTMENT PROCEDURES

E11EF00AA

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

ALTERNATOR DRIVE BELT TENSION INSPECTION

Measure drive belt deflection by pulling or pushing at the mid point of the belt between two pulleys with a force of 98 N.

Standard value: 8.5–12mm

ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

E11EF00BA

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

   Standard value

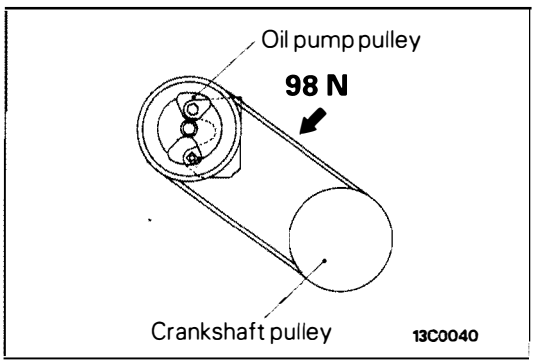
Used belt:	**9.5 mm**
New belt:	**7.0–8.5 mm**

4. Tighten the lock bolt.

   Tighten torque: 23 Nm

5. Tighten the nut of the alternator pivot bolt.

   Tightening torque: 44 Nm



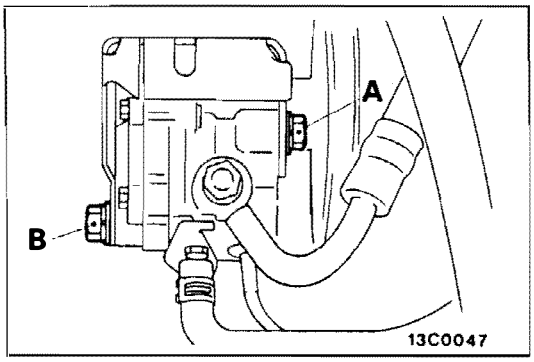
POWER STEERING OIL PUMP BELT TENSION INSPECTION

E11EF00CA

<Vehicles without A/C>

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

Standard value: 8.5–13.5 mm

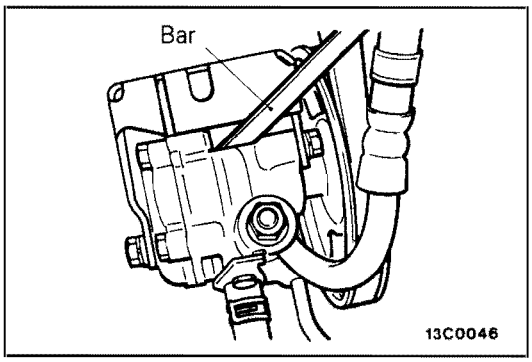


POWER STEERING OIL PUMP BELT TENSION ADJUSTMENT

E11EF00DA

<Vehicle without A/C>

1. Loosen bolts A and B (for holding the oil pump).



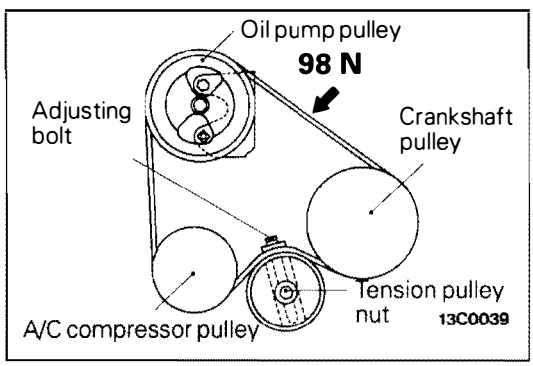
2. Place a bar or similar object against the body of the oil pump, and while manually providing the suitable amount of tension, adjust the amount of flexion of the belt.

Standard value:

If used belt (with correct tension) is used:	**9.5–11.5 mm**
If a new belt is used:	**7.5–9.0 mm**

3. Tighten bolts A and B in that order.
4. Check the amount of flexion of the belt; readjust if necessary.

Caution
The check should be made after turning the engine one time or more in the regular direction of rotation (to the right).



POWER STEERING OIL PUMP AND A/C COMPRESSOR BELT TENSION INSPECTION

E11EF00EA

<Vehicles with A/C>

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

Standard value: 6.8–7.6 mm

POWER STEERING OIL PUMP AND A/C COMPRESSOR BELT TENSION ADJUSTMENT

E11EF00FA

<Vehicles with A/C>

1. Loosen the tension pulley nut.
2. Adjust the belt deflection amount using the adjusting bolt.

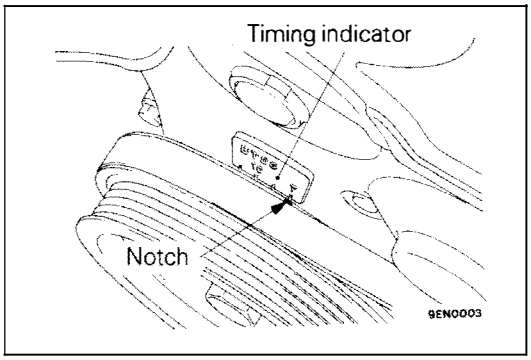
   Standard value:

If used belt (with correct tension) is used:	**6.8–7.6 mm**
If a new belt is used:	**5.5–6.0 mm**

3. Tighten the tension pulley nut.
4. Check the amount of belt deflection and readjust if necessary.

Caution

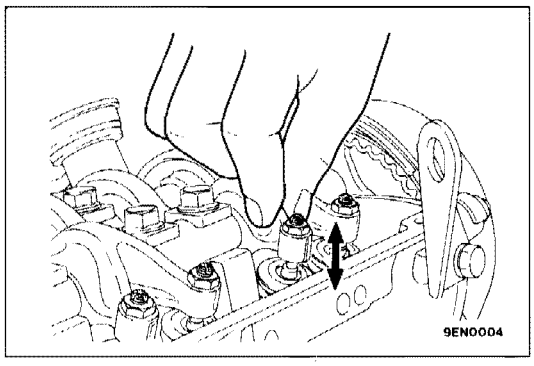
1. **This check should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).**
2. **Check to be sure that the power steering oil pump has been secured in a position near the front of the vehicle. (Refer to GROUP 37A – Oil Pump.)**



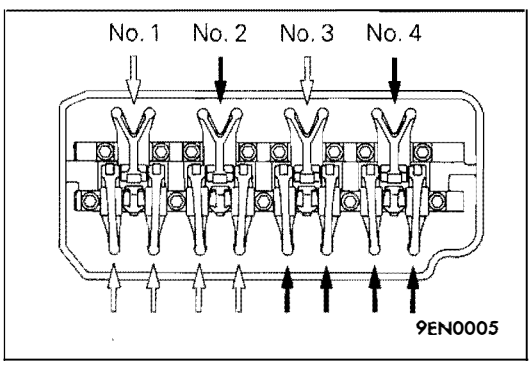
VALVE CLEARANCE INSPECTION AND ADJUSTMENT

E11EF06AA

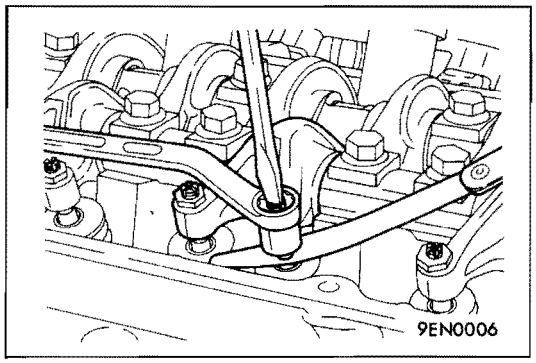
1. Start the engine and allow it to warm up until the engine coolant temperature reaches 80 to 95°C.
2. Remove all spark plugs from the cylinder head for easy inspection.
3. Remove the rocker cover.
4. Turn the crankshaft clockwise until the notch on the pulley is lined up with the "T" mark on the timing indicator.



5. Move the rocker arms on the No. 1 and No. 4 cylinders up and down by hand to determine which cylinder has its piston at the top dead centre on the compression stroke. If both intake and exhaust valve rocker arms have a valve lash, the piston in the cylinder corresponding to these rocker arms is at the top dead centre on the compression stroke.



6. Valve clearance inspection and adjustment can be performed on rocker arms indicated by white arrow ⇩ when the No. 1 cylinder piston is at the top dead centre on the compression stroke, and on rocker arms indicated by solid arrows ⬇ when the No. 4 cylinder piston is at the top dead centre on the compression stroke.



7. Measure the valve clearance.
   If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge while turning the adjusting screw.

   Standard value (hot engine):

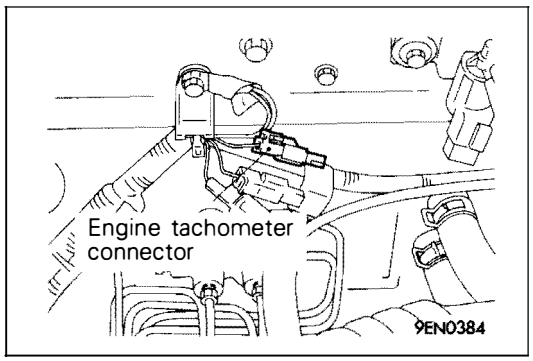
Intake valve:	**0.20 mm**
Exhaust valve:	**0.30 mm**

8. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut to the specified torque.

   Tightening torque: 9 Nm

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

    Tightening torque: 25 Nm



IGNITION TIMING INSPECTION AND ADJUSTMENT

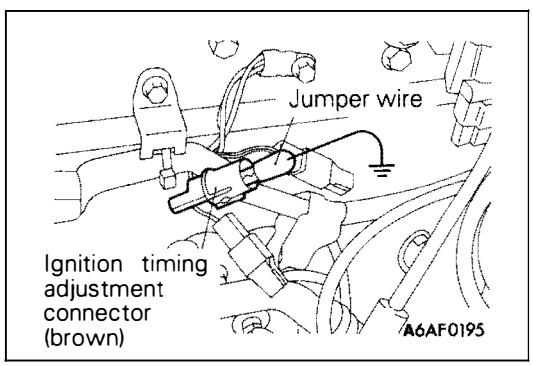
E11EF01AA

1. Before inspection and adjustment, set vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral (P range on vehicles with A/T)
2. Insert a paper clip from the harness side into the 1 pin connector as shown in the illustration at left.
3. Connect a primary-voltage-detection type of tachometer to the paper clip.

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

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

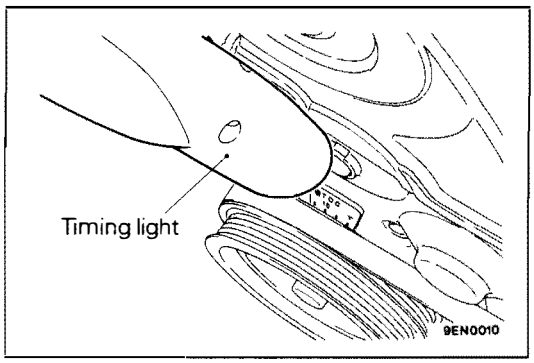
   Standard value: 800 ± 100 r/min.



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

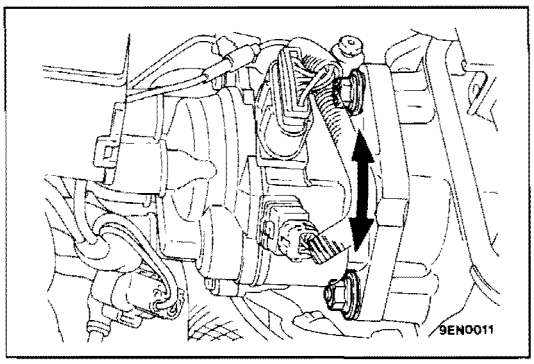
   NOTE
   Earthing this terminal sets the engine to the basic ignition timing.

10. Start the engine and run it at idle.



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

Standard value: 5° ± 2° BTDC



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

Tightening torque: 12 Nm

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

Standard value: Approx. 10° BTDC

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

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

NOTE
Sealing tape is attached to all vehicles when new.

IDLE SPEED INSPECTION E11EF02AA

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

Standard value: 5° ± 2° BTDC

3. After turning the ignition switch to OFF, connect the MUT-II to the diagnosis connector (white).
4. Start the engine and run it at idle.
5. Run the engine at idle for 2 minutes.

6. Check the idle speed. Select item No. 22 and take a reading of the idle speed.

   Curb idle speed: 800±100 r/min.

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

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

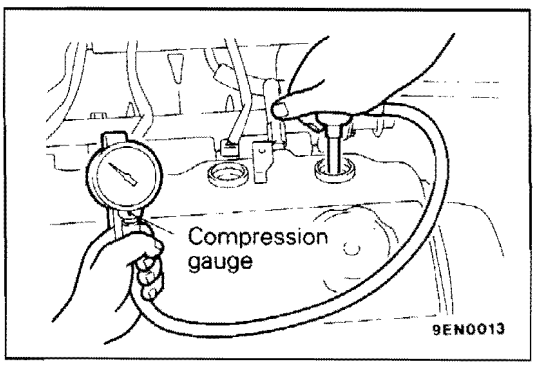
COMPRESSION PRESSURE INSPECTION E11DF03AA

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
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral (P range on vehicle with A/T)
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the distributor 6 pin connector.

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

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

   Caution
   1. Keep away from the spark plug hole when cranking.
   2. If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.



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

   Standard value (at engine speed of 250–400 r/min.): 1,450 kPa

   Limit (at engine speed of 250–400 r/min.): min. 1,105 kPa

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

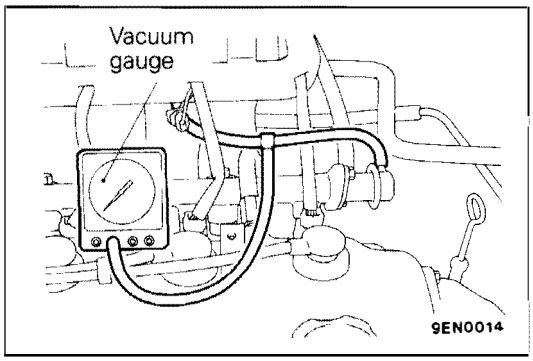
   Limit: max. 100 kPa

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (7) and (8).

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

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

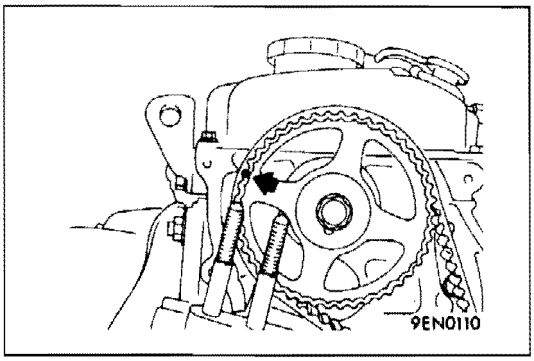
NOTE
This will erase the problem code resulting from the distributor connector being disconnected.



MANIFOLD VACUUM INSPECTION E11DF04AA

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

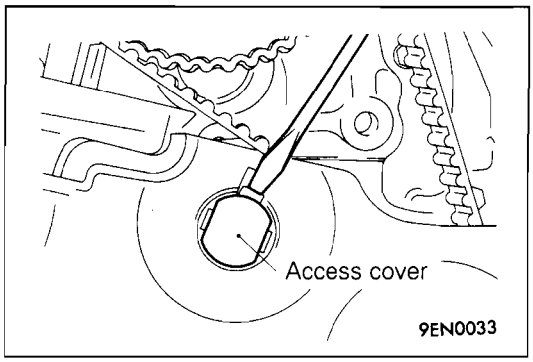
Standard value: Approx. 69 kPa



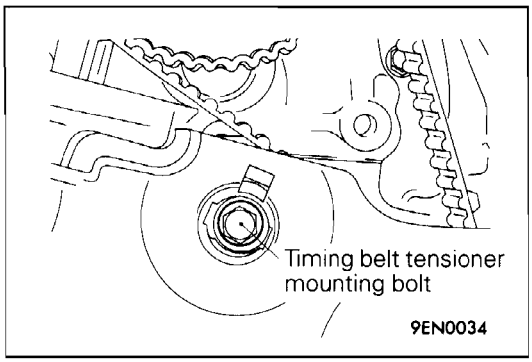
TIMING BELT TENSION ADJUSTMENT E11EF07AA

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

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

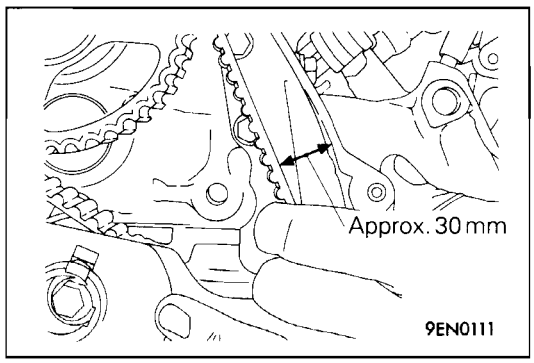


3. Remove the access cover.



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

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



5. Tighten the timing belt tensioner fixing bolt.
6. Check that the clearance between the timing belt and the under cover is at the standard value as shown in the illustration.

Standard value: Approx. 30 mm

7. Install the access cover.
8. Install the timing belt upper cover.

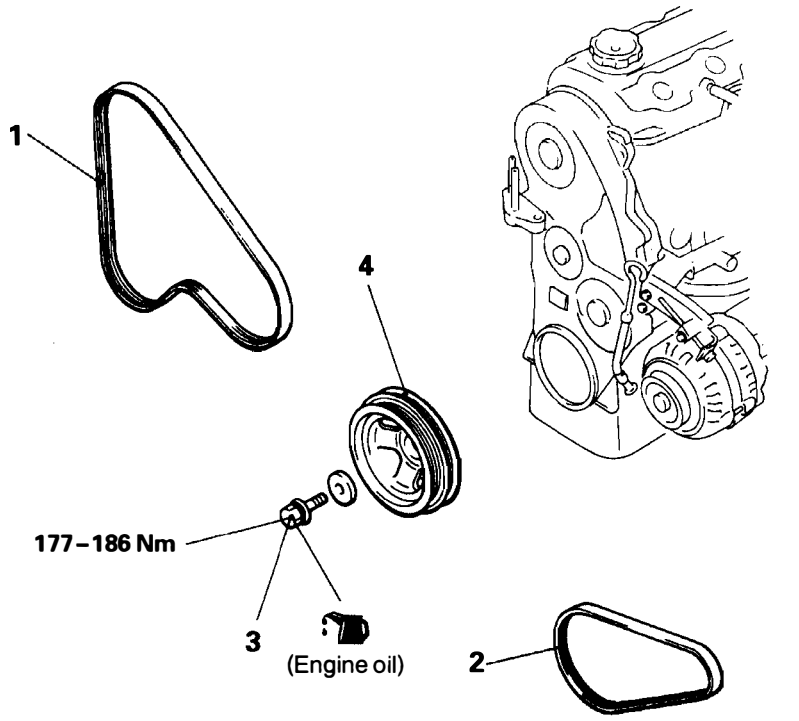
CRANKSHAFT PULLEY

E11EG00AA

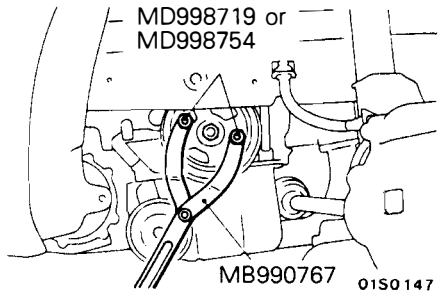
REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Cover Removal

Post-installation Operation
(1) Drive Belt Deflection Adjustment (Refer to P.11E-6.)
(2) Under Cover Installation



Removal steps
1. Drive belt (Power steering and A/C or power steering)
2. Drive belt (Alternator)
◇A◇▶A◀ 3. Crankshaft bolt
◇A◇▶A◀ 4. Crankshaft pulley



REMOVAL AND INSTALLATION SERVICE POINT

E11EG01AA

◇A◇▶A◀CRANKSHAFT BOLT/CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

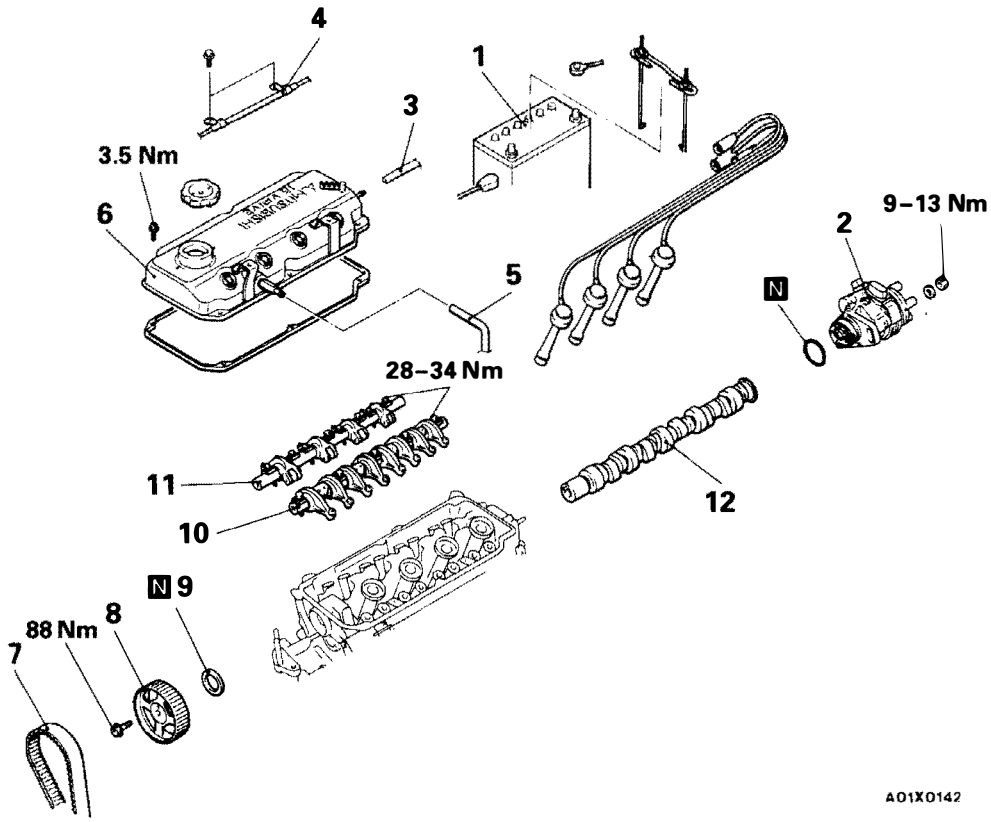
When installing the crankshaft bolt, apply the minimum amount of engine oil to the bearing surface and thread of the bolt.

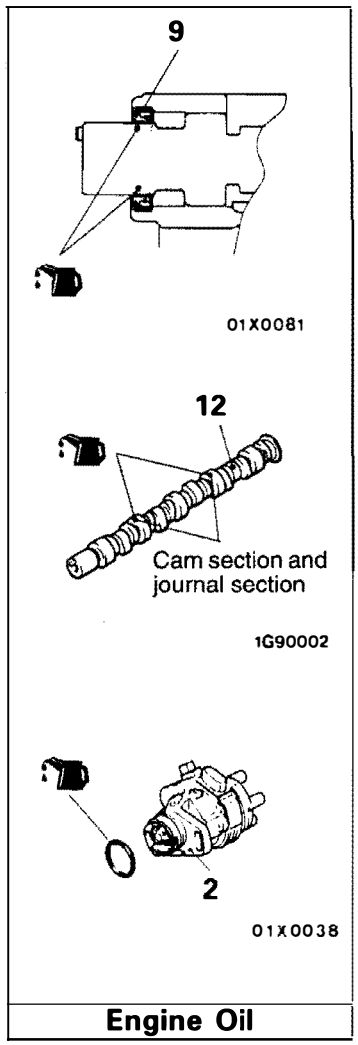
CAMSHAFT, CAMSHAFT OIL SEAL

E11EH00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Timing Belt Upper Cover Removal and Installation

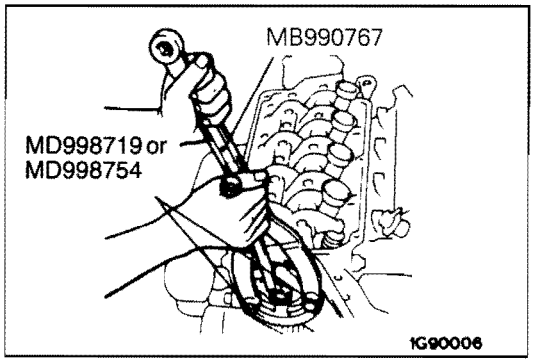




Engine Oil

Removal Steps

1. Battery
◆C◆ 2. Distributor
3. Breather hose
4. Connection for accelerator cable
5. Connection for PCV hose
6. Rocker cover
7. Timing belt
〈A〉 ◆B◆ 8. Camshaft Sprocket
◆A◆ 9. Camshaft Oil Seal
〈B〉 10. Rocker arm and shaft assembly (intake side)
〈B〉 11. Rocker arm and shaft assembly (exhaust side)
12. Camshaft

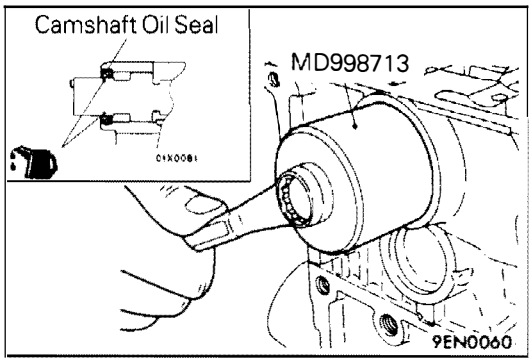


REMOVAL SERVICE POINTS E11EH01AA

〈A〉 CAMSHAFT SPROCKET REMOVAL

〈B〉 ROCKER ARM AND SHAFT ASSEMBLY REMOVAL

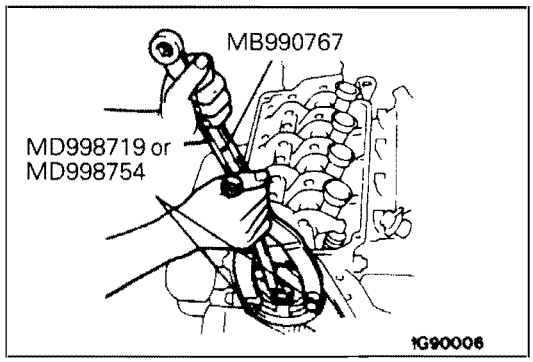
Caution
The rocker arm and shaft assembly should not be disassembled.



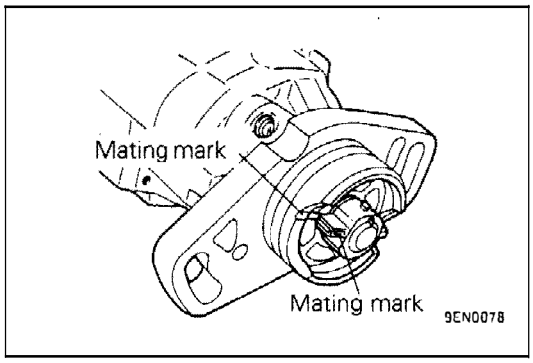
INSTALLATION SERVICE POINTS E11EH04AA

◗A◖ CAMSHAFT OIL SEAL INSTALLATION

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

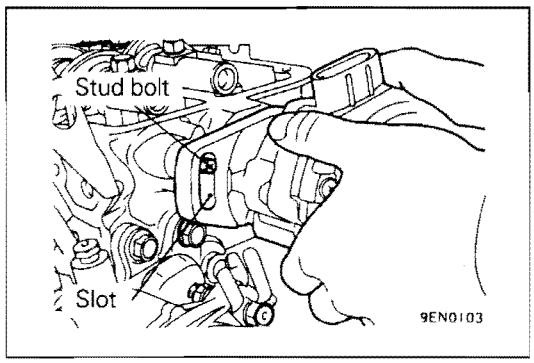


◗B◖ CAMSHAFT SPROCKET INSTALLATION



◗C◖ DISTRIBUTOR INSTALLATION

(1) Turn the crankshaft to bring No. 1 cylinder to the top dead centre on compression stroke.
(2) Align the mating marks on the distributor housing with that of the coupling key.

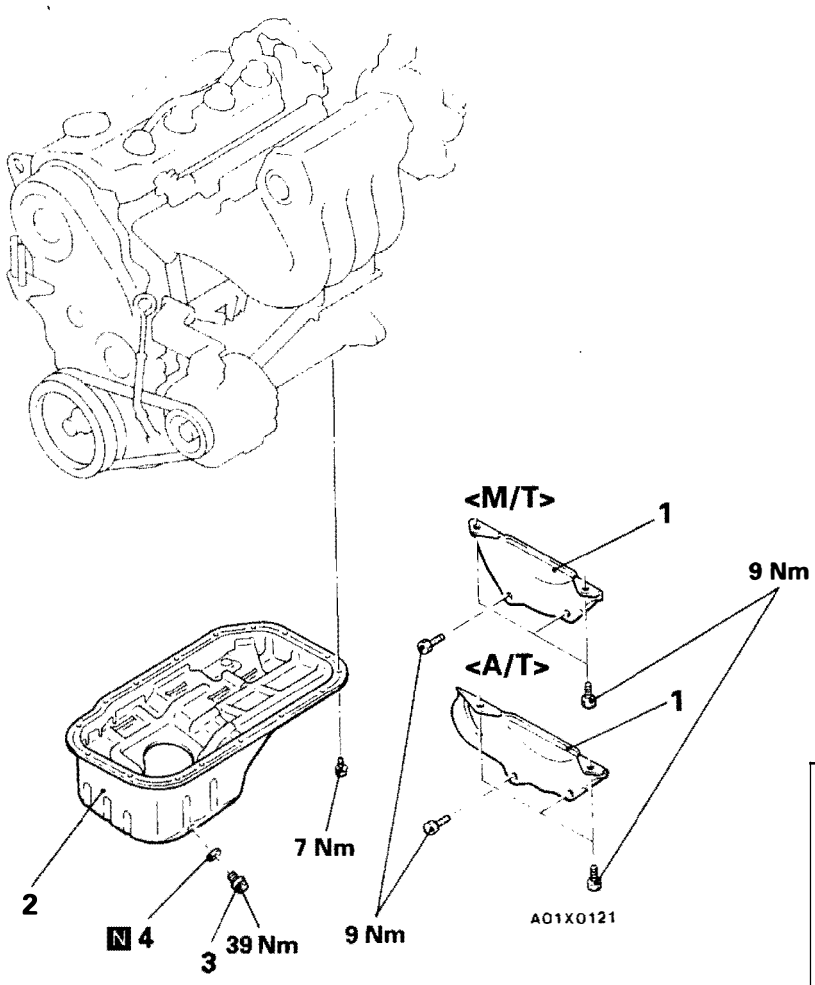


(3)Install the distributor assembly on the engine while aligning the stud bolt used for securing the distributor with the slot in the mounting flange of the distributor.
(4) Check to be sure that the ignition timing is at the standard value. (Refer to P.11E-9.)

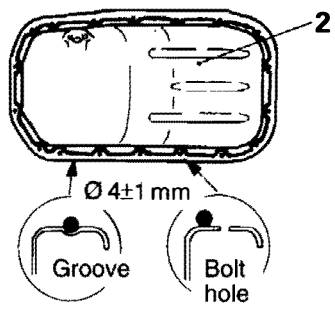
OIL PAN

E11EI00AA

REMOVAL AND INSTALLATION

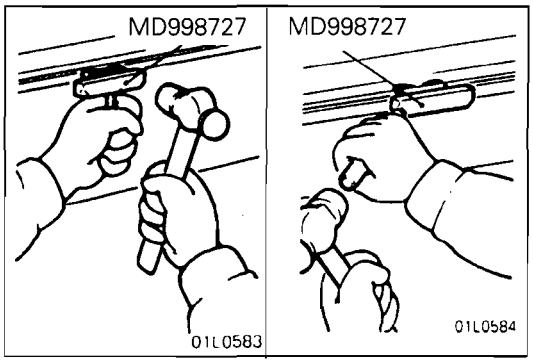


Pre-removal and Post-installation Operations
(1) Under Cover Removal and Installation
(2) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(3) Engine Oil Level Gauge Removal and Insertion



Specified sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent

Removal Steps
1. Bell housing cover
◇A◇ ▶B◀ 2. Oil pan
3. Drain plug
▶A◀ 4. Gasket

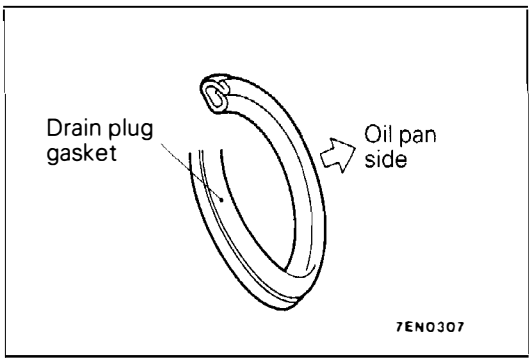


REMOVAL SERVICE POINT E11EI01AA

◇A◇ OIL PAN REMOVAL

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

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



INSTALLATION SERVICE POINT E11EI04AA

◆A◆ GASKET INSTALLATION

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

◆B◆ OIL PAN INSTALLATION

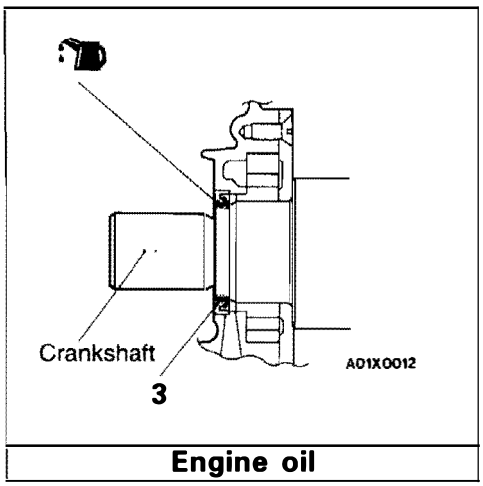
Caution
After cleaning the oil pan mounting bolt holes in the oil seal case, the oil pan should be installed.

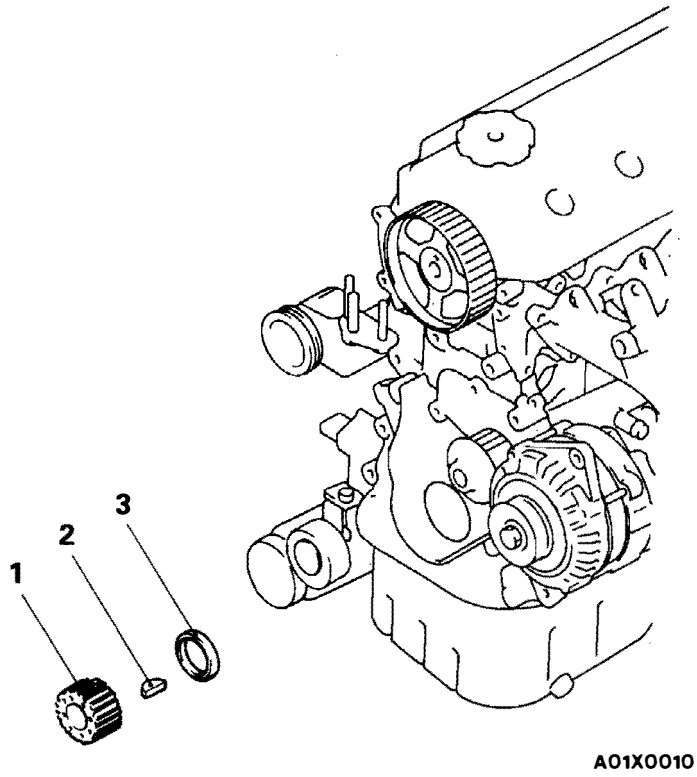
CRANKSHAFT FRONT OIL SEAL

E11EJ00AA

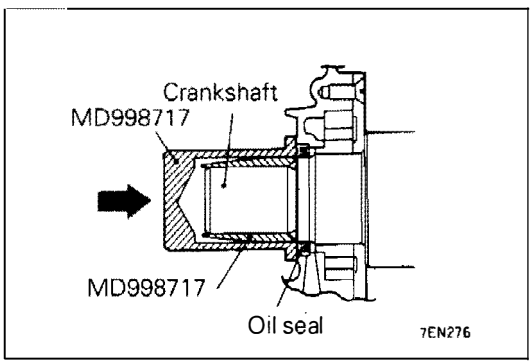
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
- Timing. Belt Removal and Installation (Refer to P.11E-27.)





Removal steps
1. Crankshaft sprocket
2. Key
◆A◆ 3. Crankshaft front oil seal



INSTALLATION SERVICE POINT

E11EJ04AA

◆A◆ CRANKSHAFT FRONT OIL SEAL INSTALLATION

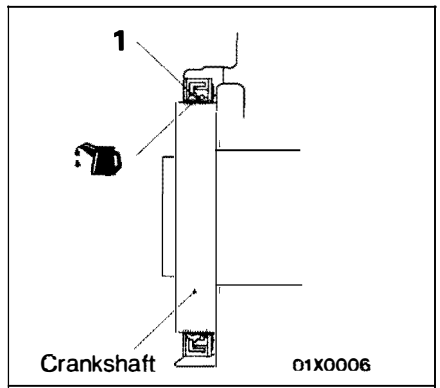
(1) Apply a small amount of engine oil to the entire circumference of the oil seal lip.
(2) Tap the oil seal until it is flush with the oil seal case.

CRANKSHAFT REAR OIL SEAL

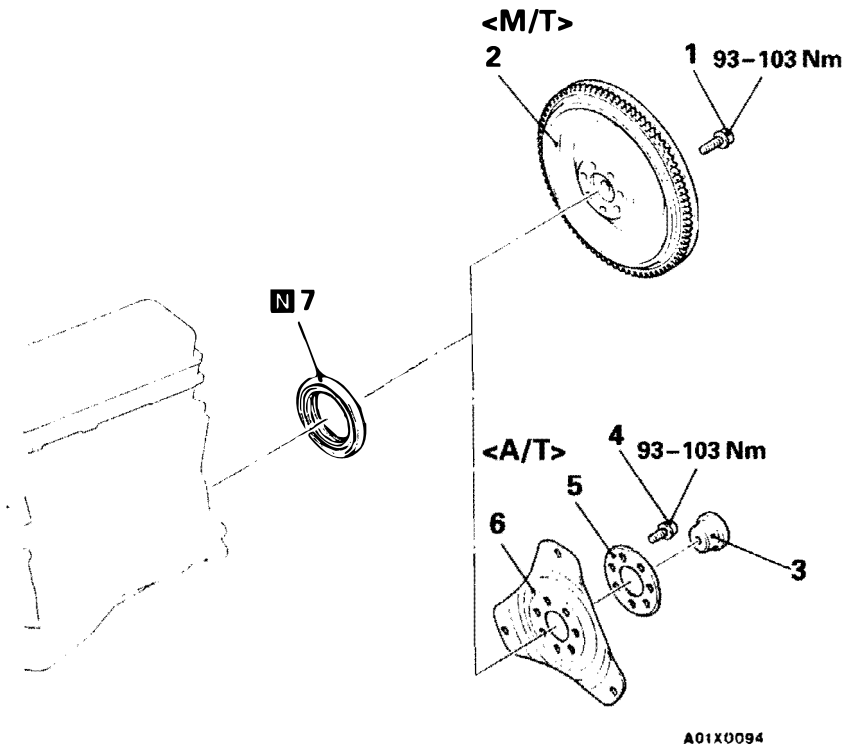
E11EK00AA

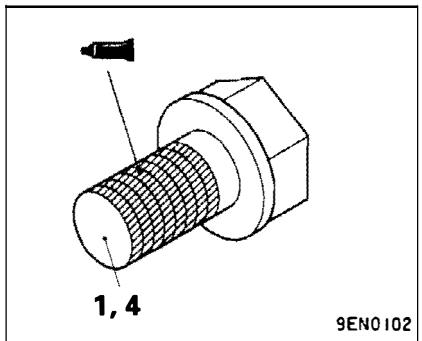
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
(1) Transmission Assembly Removal and Installation (Refer to GROUPS 22 and 23 – Transmission Assembly.)
(2) Clutch Cover and Disc Removal and Installation <M/T>
(3) Oil Pan Removal and Installation (Refer to P.11E-17.)



Engine oil

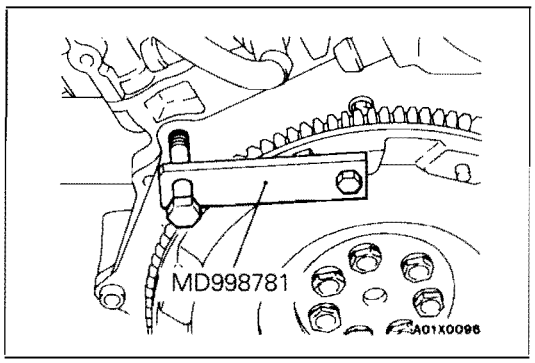




Specified sealant:
3M Stud locking 4170 or equivalent

Removal steps

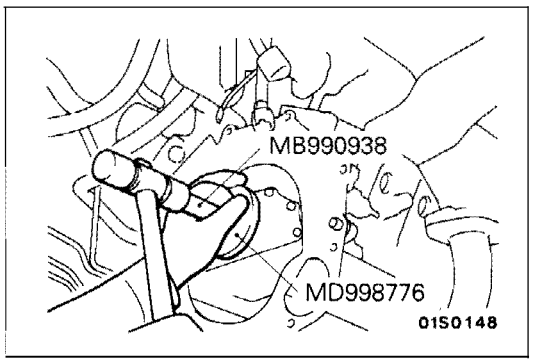
◇A◇ ◆B◆ 1. Fly wheel bolt | <M/T>
2. Fly wheel
3. Crankshaft bushing
◇A◇ ◆B◆ 4. Drive plate bolt | <A/T>
5. Adaptor plate
6. Drive plate
◆A◆ 7. Crankshaft rear oil seal



REMOVAL SERVICE POINT E11DK01AA

〈A〉 FLYWHEEL BOLT/DRIVE PLATE BOLT REMOVAL

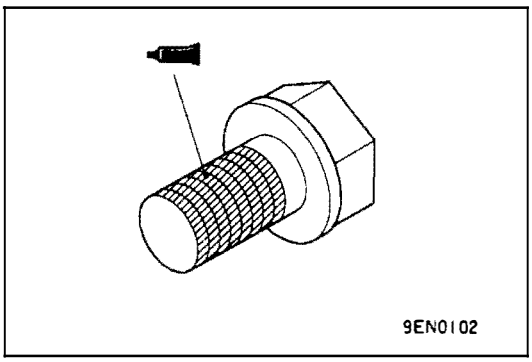
Use the special tool to secure the flywheel or drive plate, and remove the bolt.



INSTALLATION SERVICE POINTS E11EK04AA

◆A◆ CRANKSHAFT REAR OIL SEAL INSTALLATION

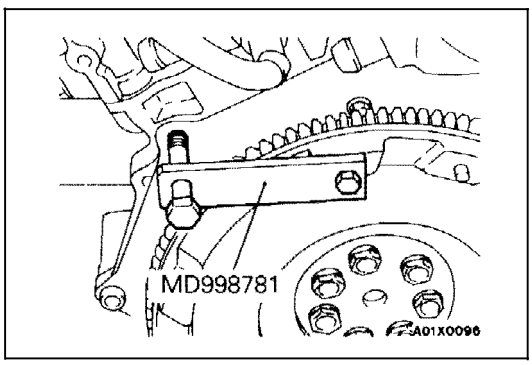
(1) Apply a small amount of engine oil to the entire circumference of the oil seal lip.
(2) Tap in the oil seal as shown in the illustration.



◆B◆ FLYWHEEL BOLT/DRIVE PLATE BOLT INSTALLATION

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

Specified sealant: 3M Stud locking 4170 or equivalent



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

Specified torque : 93–103 Nm

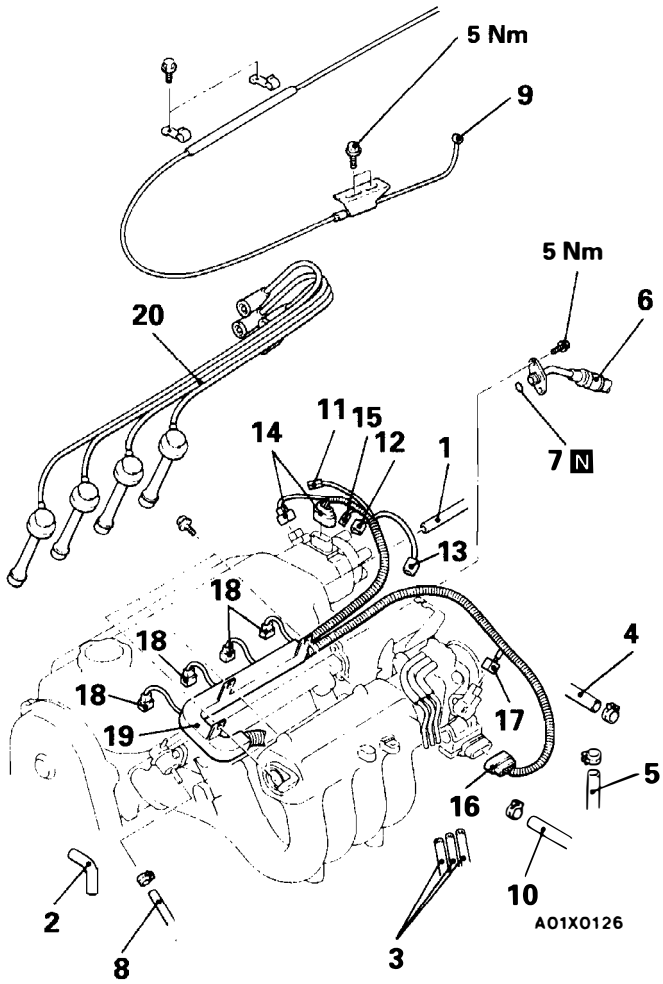
CYLINDER HEAD GASKET

E11EL00AA

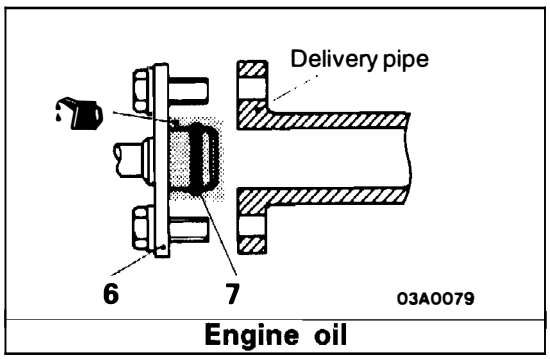
REMOVAL AND INSTALLATION

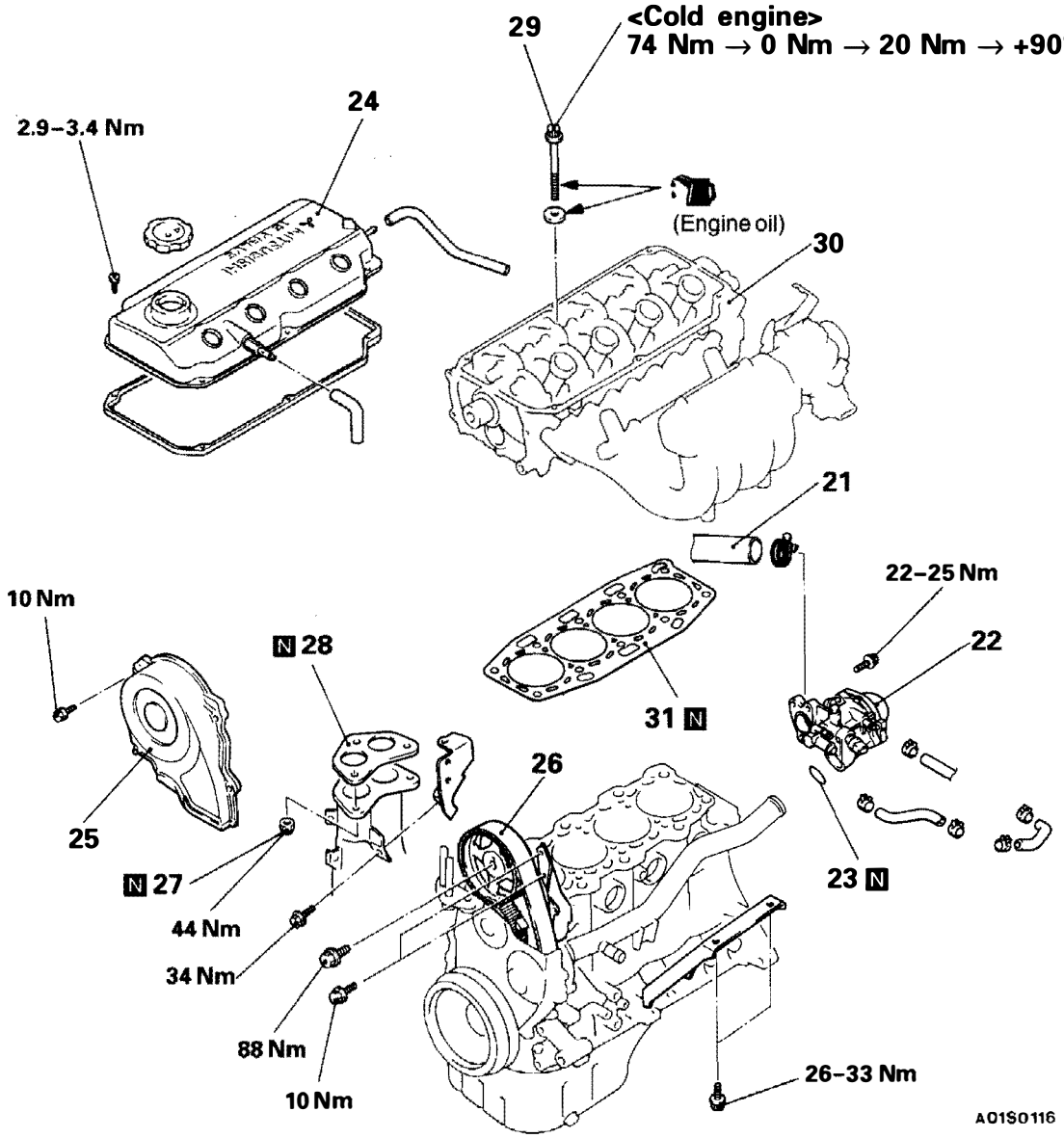
Pre-removal Operation
- Engine Coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)

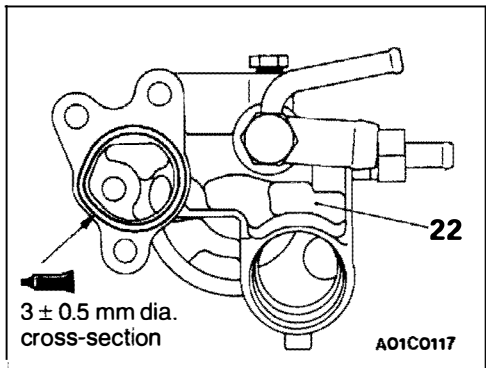
Post-Installation operations
(1) Engine Coolant Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(2) Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)



Removal steps
1. Breather hose connection
2. PCV hose
3. Vacuum hose connection
4. Water hose connection (Thermostat case to Throttle body)
5. Water hose connection (Throttle body to water inlet fitting)
6. High-pressure fuel hose connection
7. O-ring
8. Fuel return hose connection
9. Accelerator cable connection
10. Brake booster vacuum hose connection
11. Oil pressure switch connector
12. Engine coolant temperature gauge unit connector
13. Engine coolant temperature sensor connector
14. Distributor connector
15. Condenser connector
16. Idle speed control servo connector
17. Throttle position sensor connector
18. Injector connectors
19. Control harness
20. Spark plug cable

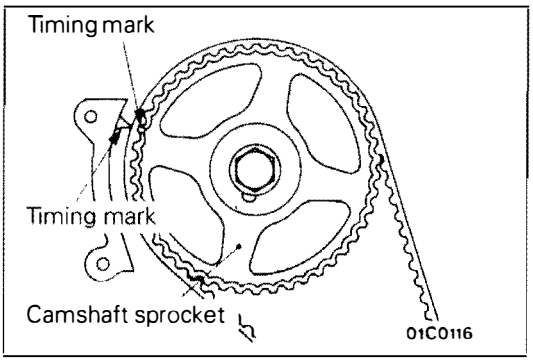






Specified sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent

21. Radiator upper hose connection
◗D◖ 22. Water inlet fitting, thermostat and thermostat case assembly
23. O-ring
24. Rocker cover
25. Timing belt upper cover
◇A◇ ◗C◖ 26. Camshaft sprocket
27. Self-locking nut
28. Gasket
◇B◇ ◗B◖ 29. Cylinder head bolt
30. Cylinder head assembly
◗A◖ 31. Cylinder head gasket

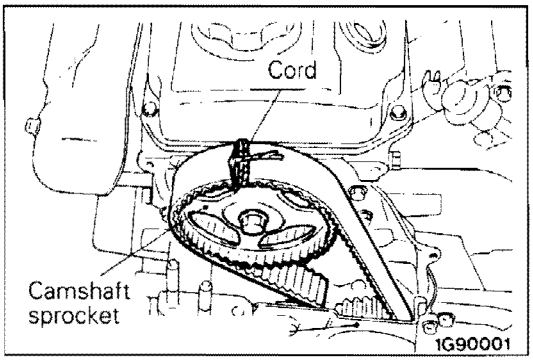


REMOVAL SERVICE POINTS E11EL01AA

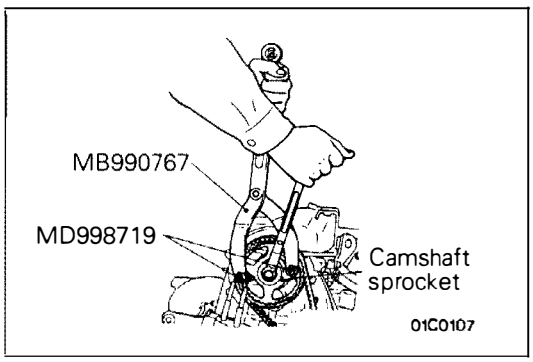
◇A◇ CAMSHAFT SPROCKET REMOVAL

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

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

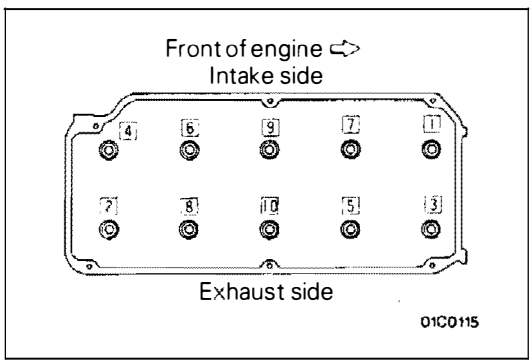


(2) Tie the camshaft sprocket and timing belt with a cord so that the position of the camshaft sprocket will not move with respect to the timing belt.



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

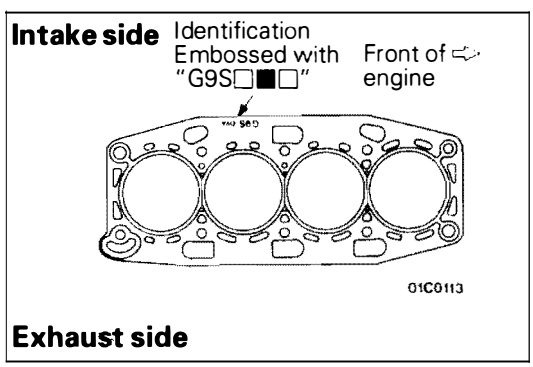
Caution
After removing the camshaft sprocket, be sure not to rotate the crankshaft.



◇B◇ CYLINDER HEAD BOLT REMOVAL

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

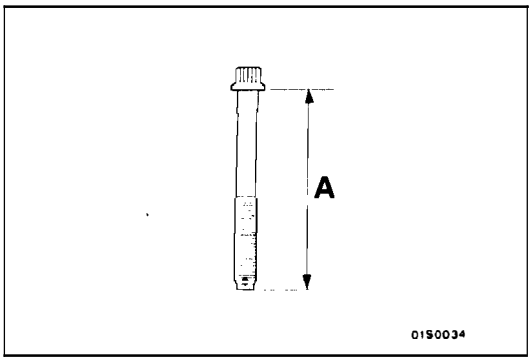
Caution
Because the plug guides cannot be replaced by themselves, be careful not to damage or deform the plug guides when removing the cylinder head bolts.



INSTALLATION SERVICE POINTS E11EL04AA

◆A◆ CYLINDER HEAD GASKET INSTALLATION

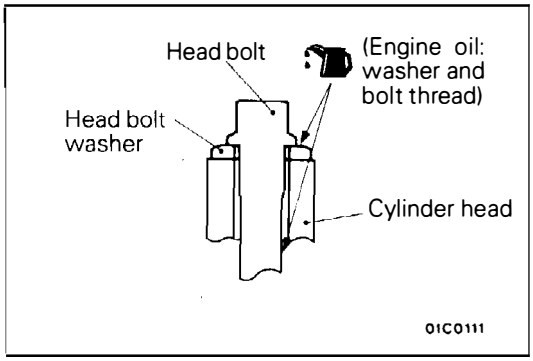
(1) Wipe off all oil and grease from the gasket mounting surface.
(2) Install the gasket to the cylinder block with the identification mark facing upwards.



◗B◖ CYLINDER HEAD BOLT INSTALLATION

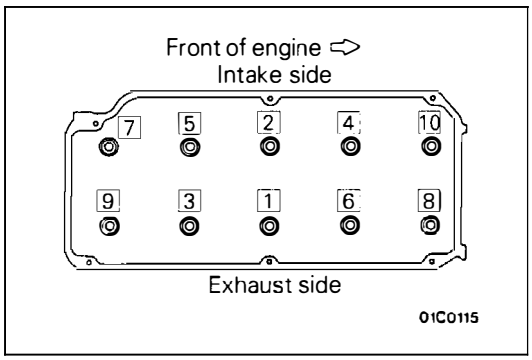
(1) When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

Limit (A): Within 96.4 mm



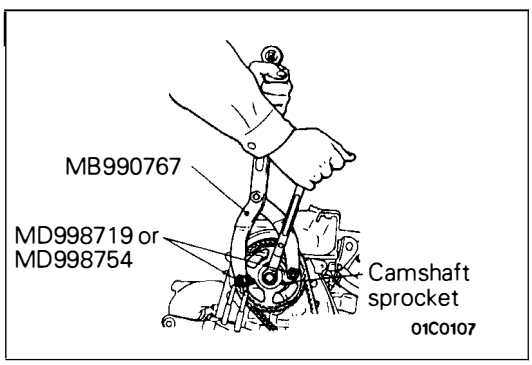
(2) Apply a small amount of engine oil to the thread section and the washer of the cylinder head bolt.

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

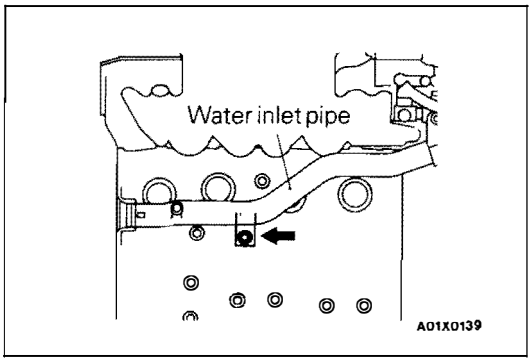


(3) Tighten the bolts by the following procedure.

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

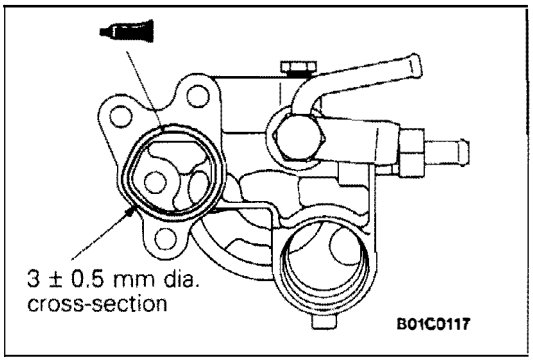


◗C◖ CAMSHAFT SPROCKET INSTALLATION



◆D◆ WATER INLET FITTING/THERMOSTAT/THERMOSTAT CASE ASSEMBLY INSTALLATION

(1) Loosen the water inlet pipe bolt shown in the illustration.



(2) Apply specified sealant to the thermostat case assembly in the places shown in the illustration.

Specified sealant: MITSUBISHI GENUINE PART MD 970389 or equivalent

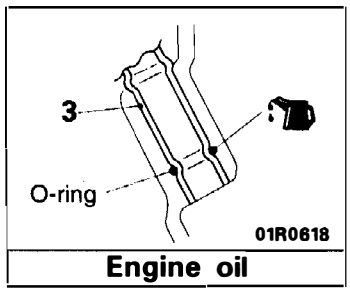
(3) Apply a small amount of water to the O-ring of the water inlet pipe, and then press the thermostat case assembly into the water inlet pipe.
(4) Tighten the thermostat case assembly mounting bolts.
(5) Tighten the water inlet pipe bolts.

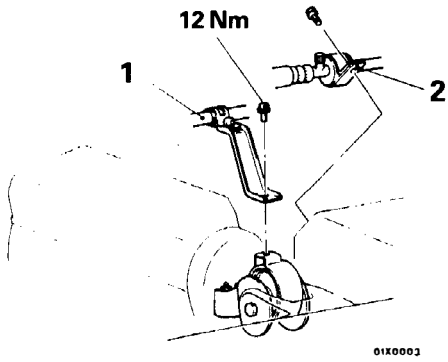
TIMING BELT

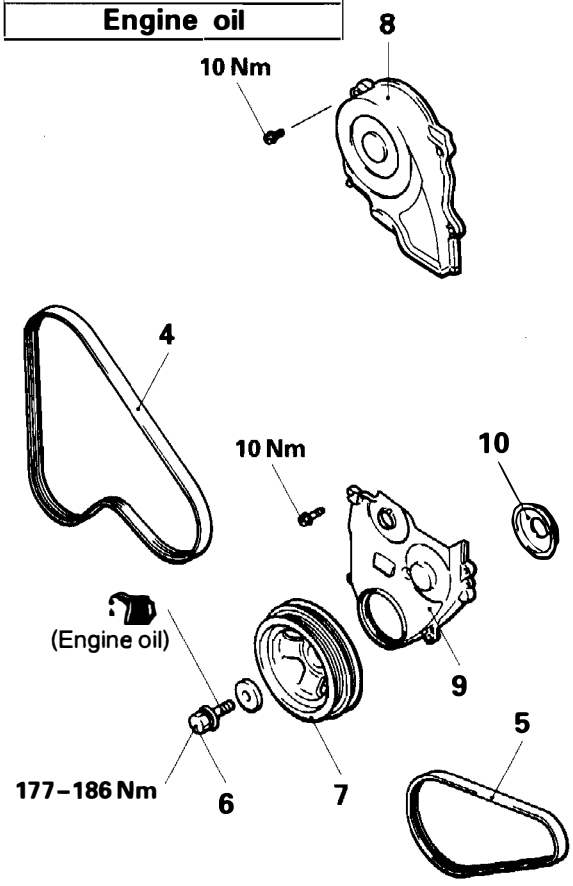
E11EM00AA

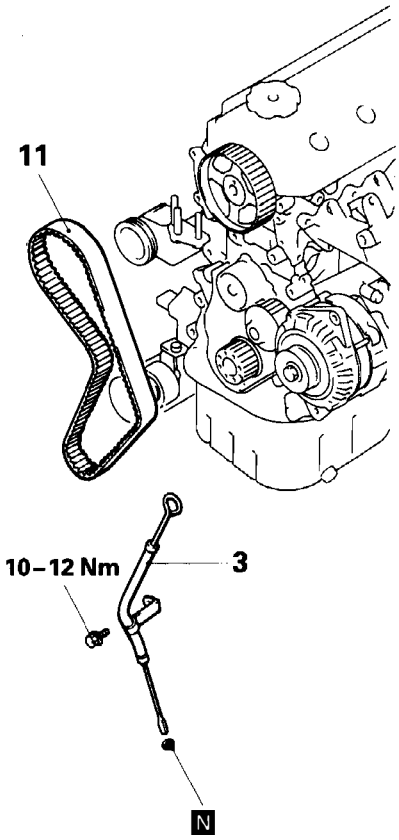
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation





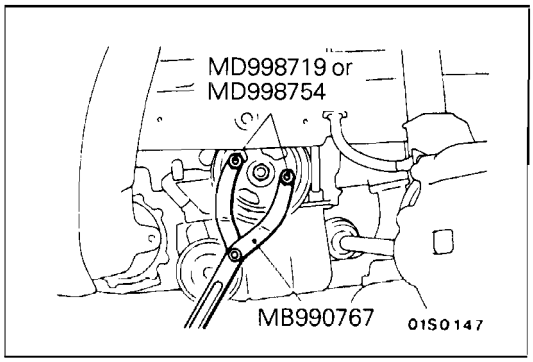




01X0016

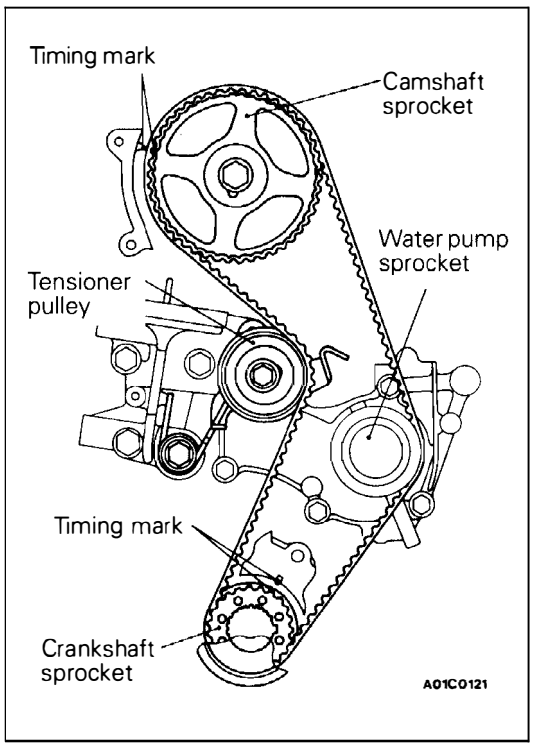
Removal steps

1. Power steering hose clamp
2. A/C hose clamp
3. Oil level gauge assembly
   - Drive belt tension adjustment (Refer to P.11E-6.)
4. Drive belt (for power steering and A/C)
5. Drive belt (for alternator)
◇A◇ ◆D◆ 6. Crankshaft bolt
◇A◇ ◆D◆ 7. Crankshaft pulley
8. Timing belt upper cover
9. Timing belt lower cover
◆C◆ 10. Flange
◆B◆ • Timing belt tension adjustment
◇B◇ ◆A◆ 11. Timing belt



REMOVAL SERVICE POINTS E11EM01AA

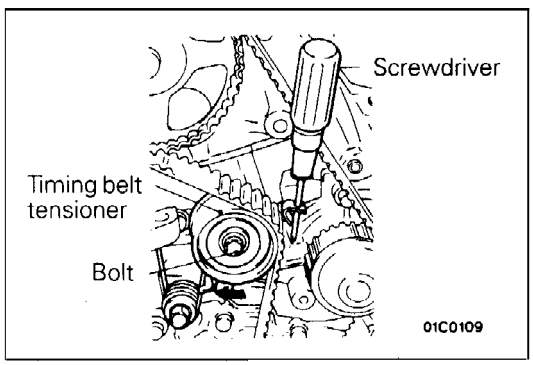
◇A◆ CRANKSHAFT BOLT/CRANKSHAFT PULLEY REMOVAL



◇B◇ TIMING BELT REMOVAL

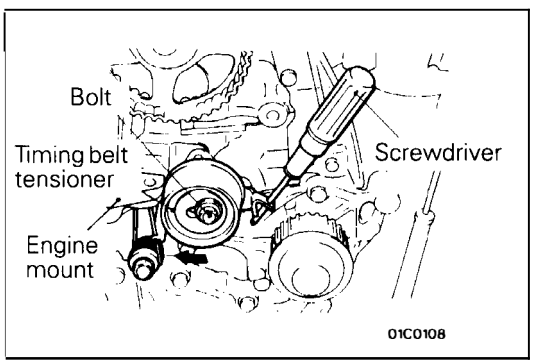
(1) Turn the crankshaft clockwise (right turn) to align each timing mark and to set the No. 1 cylinder at compression top dead centre.

Caution
The crankshaft should always be turned only clockwise.



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

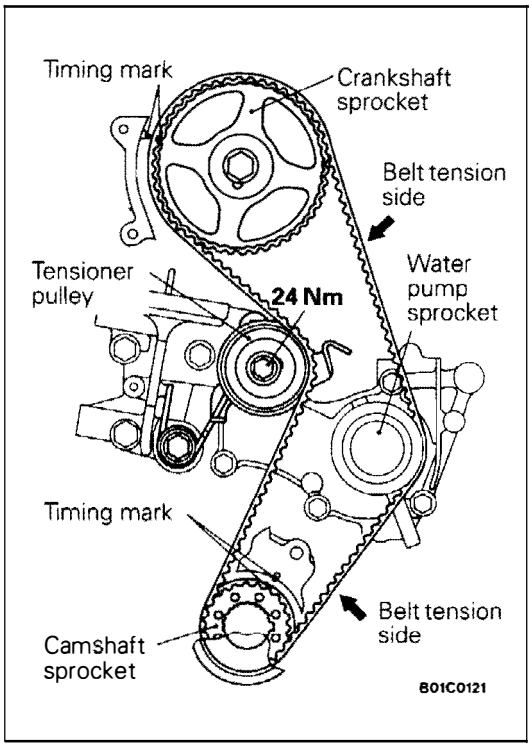
Caution
If the timing belt is to be re-used, use chalk to mark the flat side of the belt with an arrow indicating the direction of rotation (right turn).



INSTALLATION SERVICE POINTS E11EM04AA

◆A◆ TIMING BELT INSTALLATION

(1) With the timing belt tensioner bolt loosened, use a screwdriver to fully turn the timing belt tensioner as close to the engine mount as possible, and then provisionally tighten the tensioner bolt.



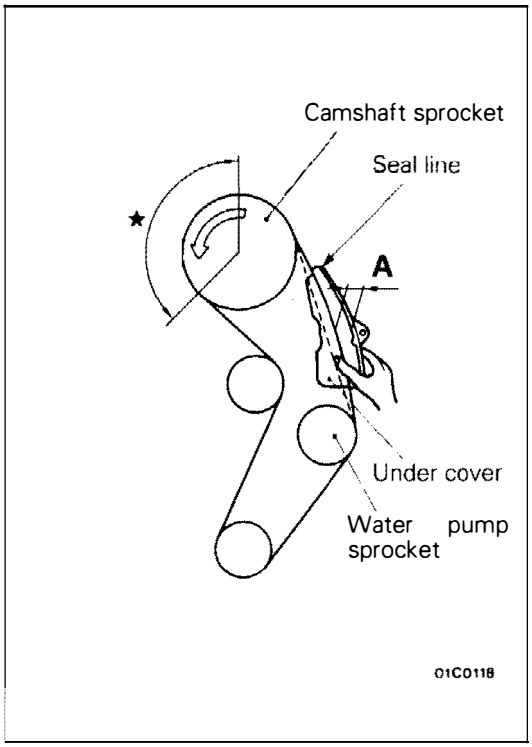
(2) Align each of the camshaft sprocket and the crankshaft sprocket timing marks.
(3) Install the timing belt in the following order, while making sure that the tension side of the belt is not slackened.
(1) Crankshaft sprocket
(2) Water pump sprocket
(3) Camshaft sprocket
(4) Tensioner pulley

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

◆B◆ TIMING BELT TENSION ADJUSTMENT

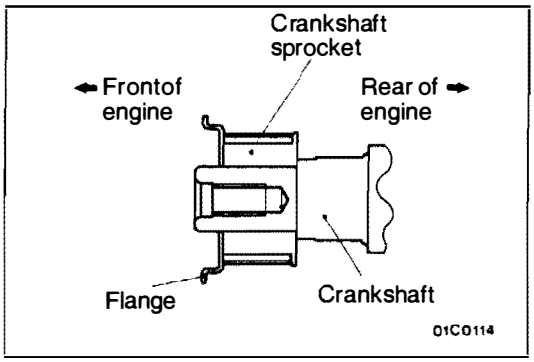
(1) Initially loosen the fixing bolt of the tensioner pulley fixed to the engine mount side by 1/2-1/4 turn, and use the force of the tensioner spring to apply tension to the belt.
(2) Turn the crankshaft in the proper rotation direction (right turn) for two rotations, and recheck to be sure that the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

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



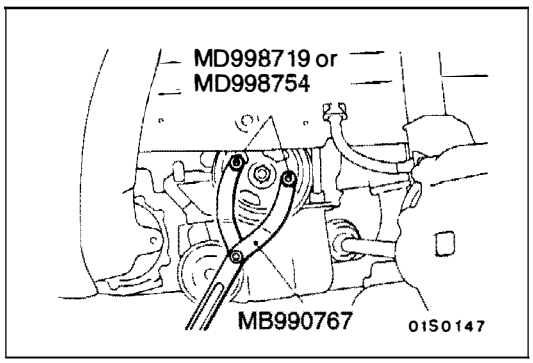
(3) After checking to be sure that no belt teeth in the section marked with ★ are lifted up and that the teeth in each sprocket are engaged, secure the tensioner pulley.
(4) Lastly, lightly clamp the centre of the span between the camshaft sprocket and the water pump sprocket on the belt tension side with your thumb and forefinger as shown in the illustration, and check to be sure that the clearance A between the reverse surface of the belt and the inside of the under cover seal line is at the standard value.

Standard value: Approx. 30 mm



◆C◆ FLANGE INSTALLATION

Install the flange as shown in the illustration.



◆D◆ CRANKSHAFT PULLEY/CRANKSHAFT BOLT INSTALLATION

Apply the minimum amount of engine oil to the bearing surface and thread of the crankshaft bolt.

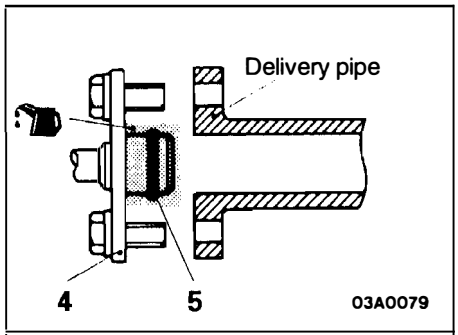
ENGINE ASSEMBLY

E11E000AA

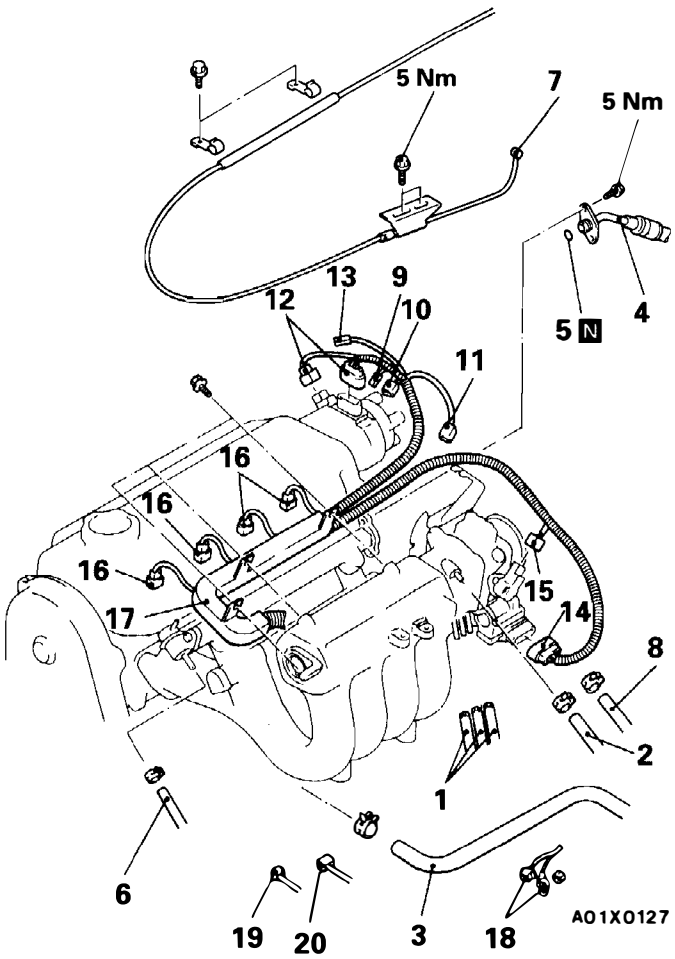
REMOVAL AND INSTALLATION

Pre-removal Operations
(1) Fuel Discharge Prevention (Refer to GROUP – 13A – Service Adjustment Procedures.)
(2) Hood Removal
(3) Left Under Cover Removal
(4) Engine coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)
(5) Transmission Assembly Removal (Refer to GROUPS 22 and 23 – Transmission Assembly.)
(6) Radiator Assembly Removal (Refer to GROUP 14 – Radiator.)

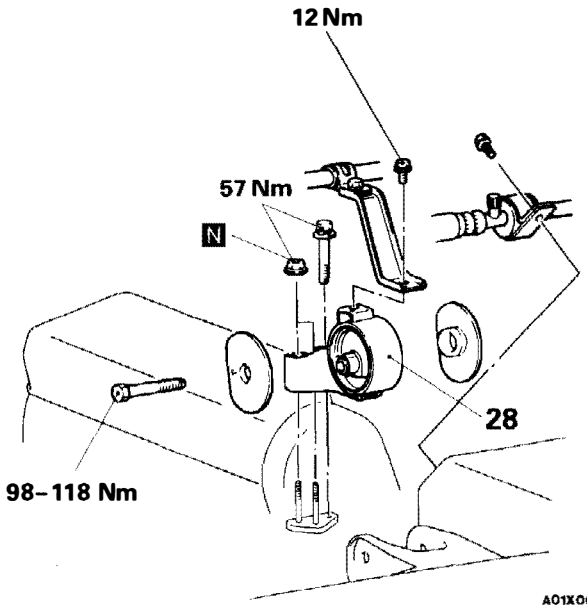
Post-installation Operations
(1) Radiator Assembly Installation (Refer to GROUP 14 – Radiator.)
(2) Transmission Assembly Installation (Refer to GROUPS 22 and 23 – Transmission Assembly.)
(3) Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
(4) Engine coolant Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(5) Drive Belt (For Power Steering and A/C) Tension Adjustment (Refer to P.11E-7.)
(6) Left Under Cover Installation
(7) Hood Installation

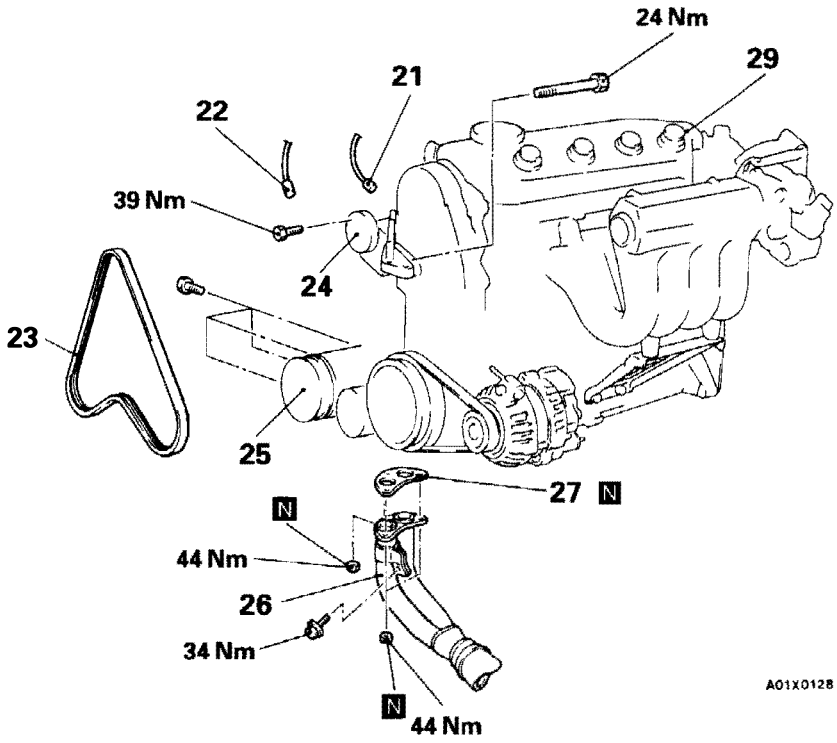


Engine Oil



Removal steps
1. Vacuum hose connection
2. Heater hose connection (Thermostat housing to Heater unit)
3. Heater hose connection (Heater unit to Water inlet pipe)
4. High-pressure fuel hose connection
5. O-ring
6. Fuel return hose connection
7. Accelerator cable connection
8. Brake booster vacuum hose connection
9. Oil pressure switch connector
10. Engine coolant temperature gauge unit connector
11. Engine coolant temperature sensor connector
12. Distributor connector
13. Condenser connector
14. Idle speed control servo connector
15. Throttle position sensor connector
16. Injector connector
17. Control harness
18. Alternator connector
19. Knock sensor connector
20. Oxygen sensor connector





21. Power steering oil pressure switch connector
22. A/C compressor connector
23. Drive belt (power steering, A/C)
◇A◇ 24. Connection for power steering oil pump
◇B◇ 25. Connection for A/C compressor
26. Connection for front exhaust pipe
27. Gasket
◇C◇ ◆B◆ 28. Engine mount bracket
◇D◇ ◆A◆ 29. Engine assembly

REMOVAL SERVICE POINTS E11D001AA

◇A◇ POWER STEERING OIL PUMP REMOVAL

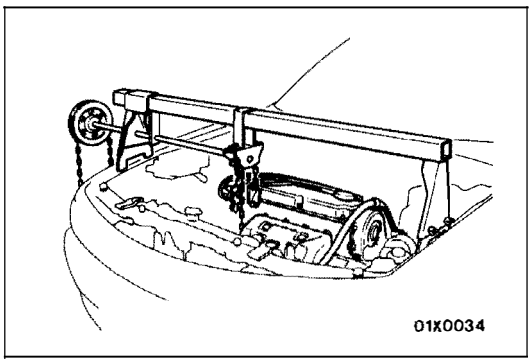
Remove the power steering oil pump from the bracket with the hose attached.

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

◇B◇ A/C COMPRESSOR REMOVAL

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

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



◇C◇ ENGINE MOUNT BRACKET REMOVAL

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

◇D◇ ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS E11D004AA

◆A◆ ENGINE ASSEMBLY INSTALLATION

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

◆B◆ ENGINE MOUNT BRACKET INSTALLATION

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

6G7

CONTENTS

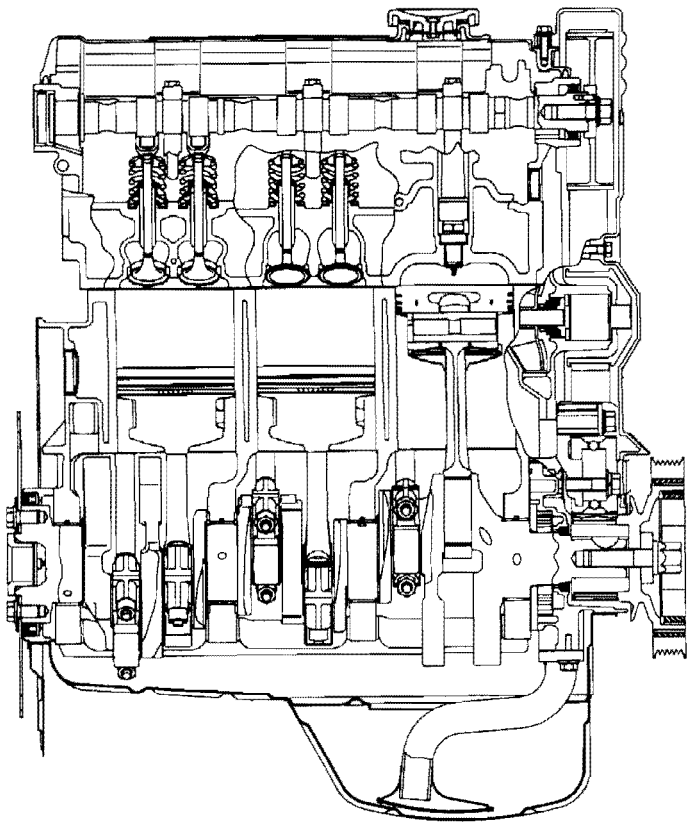
E11FA00AA

GENERAL INFORMATION

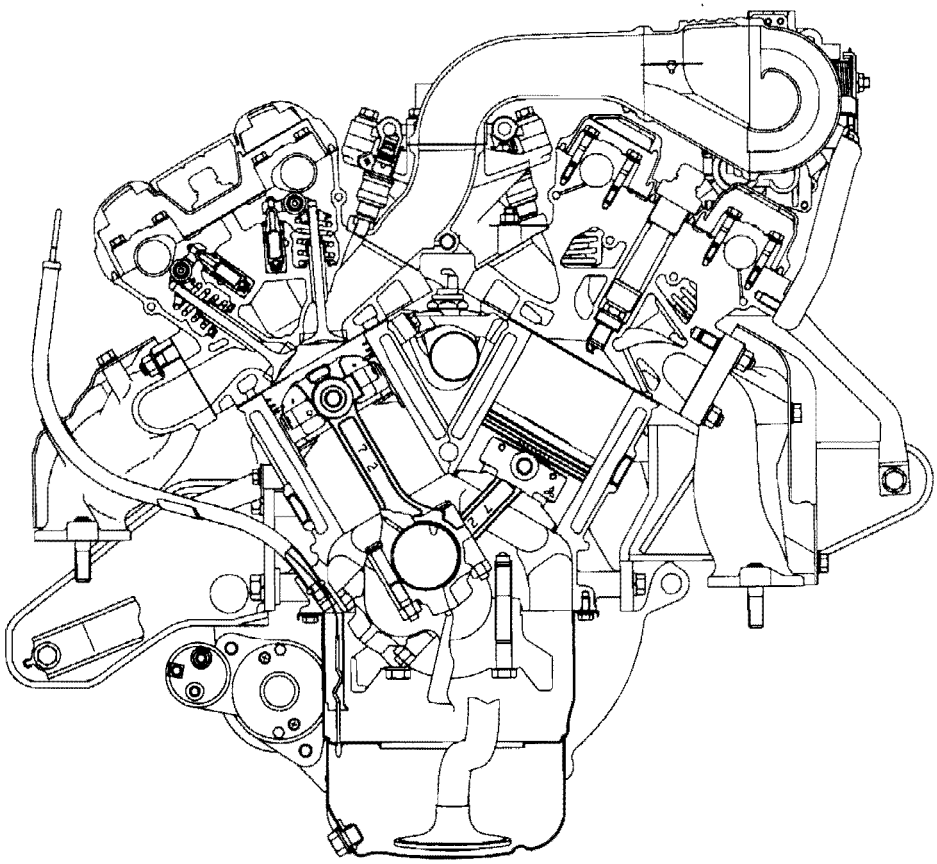
E11FB00AB

Items			6G73
Total displacement		mℓ	2,497
Bore×Stroke		mm	83.5×76.0
Compression ratio			10.0
Combustion chamber			Pentroof type
Camshaft arrangement			DOHC
Number of valve	Intake		12
	Exhaust		12
Valve timing	Intake		Opening BTDC14°, Closing ABDC58°
	Exhaust		Opening BBDC48°, Closing ATDC15°
Fuel system			Electronic control multipoint fuel injection
Rocker arm			Roller type
Auto-lash adjuster			Equipped
Oil level sensor			Equipped

SECTIONAL VIEW



7EN0325



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SERVICE SPECIFICATIONS

E11FC00AA

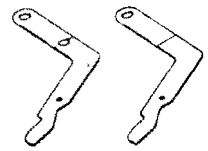
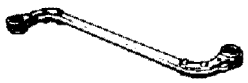
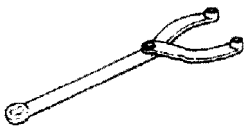
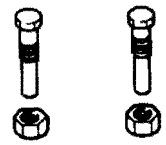
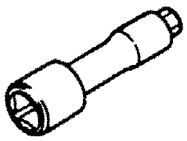
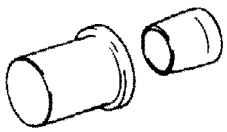
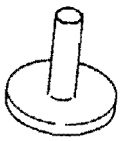
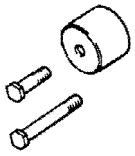
Items		6G73
Standard value		
Drive belt deflection	mm	
Alternator and A/C compressor or alternator		
When checked		4.0–4.5
When a new belt is installed		3.5–4.0
When a used belt is installed		4.0–5.0
Power steering oil pump		
When checked		9.5–13.5
When a new belt is installed		7.5–9.0
When a used belt is installed		10.5–12.5
Basic ignition timing		5°±3° BTDC
Idle speed	r/min.	700±100
Compression pressure		
	kPa (250–400 r/min.)	1,350
Intake manifold vacuum		
	kPa	69
Auto tensioner rod protrusion amount	mm	3.8–4.5
Timing belt tension torque	Nm	10
Limit		
Compression pressure		
	kPa 250–400 r/min.	1,020
Compression pressure difference of all cylinder		
	kPa	100

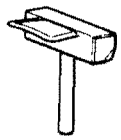
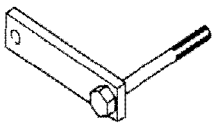
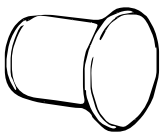
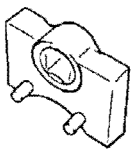
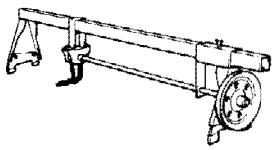
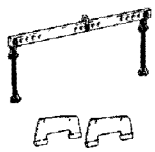
SEALANTS

Items	Specified sealant	Remarks
Rocker cover seal and camshaft bearing cap seal Oil pan	MITSUBISHI GENUINE PART MD997110 or equivalent	Semi-drying sealant
Fly wheel bolt	3M Stud Locking 4170 or equivalent	

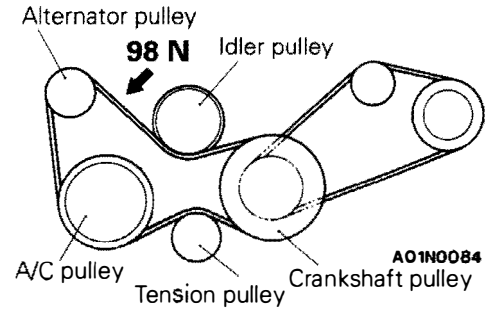
SPECIAL TOOLS

E11FD00AA

Tool	Number	Name	Use
	MD998782	Valve lifter set	Removal of roller rocker arm
	MB991164	Door hinge adjusting wrench	Removal and installation of idler pulley mounting bolt
	MB990767	End yoke holder	• Supporting of crankshaft pulley • Supporting of camshaft pulley
	MD998754	Crankshaft pulley holder pin	
	MD998051	Cylinder head bolt wrench	Removal and installation of the cylinder head bolt
	MD998717	Crankshaft front oil seal installer	Press-in of the crankshaft front oil seal
	MD998718	Crankshaft rear oil seal installer	Press-in of the crankshaft rear oil seal
	MD998761	Camshaft oil seal installer	Press-in of the camshaft oil seal

Tool	Number	Name	Use
	MD998727	Oil pan remover	Removing the oil pan
	MD998781	Fly wheel stopper	Securing the flywheel
	MB991193	Plug	Prevention of oil discharge and prevention of entry of foreign particles
	MD998767	Tension pulley socket wrench	Timing belt tension adjustment
	MD998769	Crankshaft pulley spacer	Turning the crankshaft
	GENERAL SERVICE TOOL MZ203827	Mechanic, hanger, engine	Supporting the engine assembly during removal and installation of the transmission
	MB991453	Engine hanger assembly	

<Vehicles with A/C>



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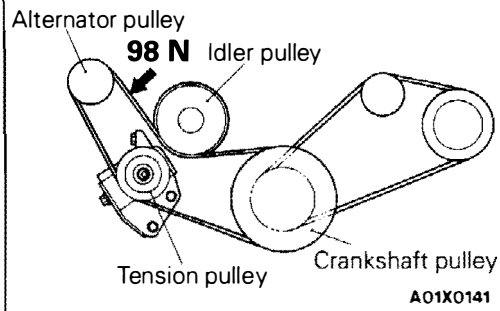

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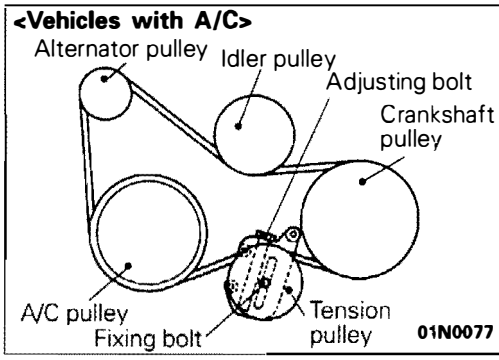

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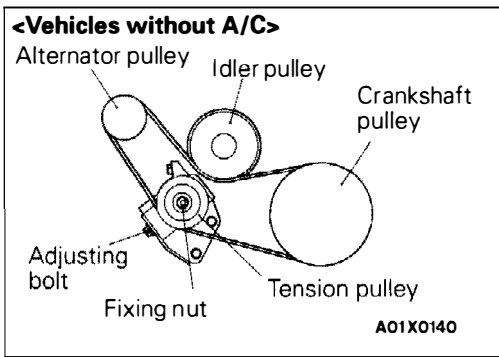


SERVICE ADJUSTMENT PROCEDURES

E11FF00AA

DRIVE BELT INSPECTION AND ADJUSTMENT

ALTERNATOR AND COMPRESSOR OR ALTERNATOR BELT TENSION INSPECTION

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

Standard value: 4.0–4.5 mm

ALTERNATOR AND A/C COMPRESSOR OR ALTERNATOR BELT TENSION

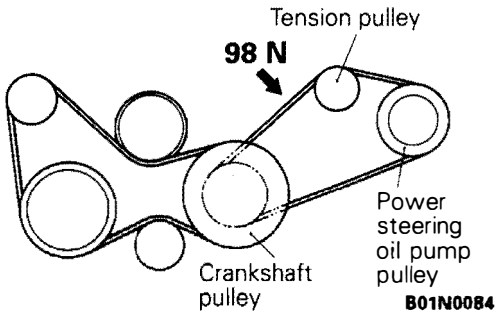
E11FF00BA

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

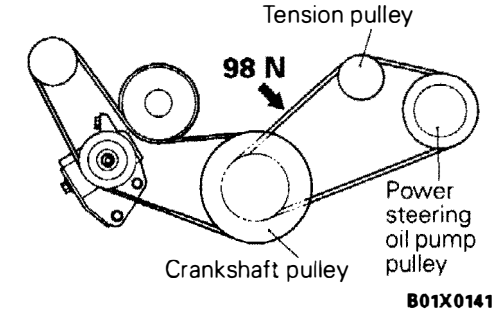
   Standard value:
   If used belt (with correct tension) is used; 4.0–5.0 mm
   If a new belt is used; 3.5–4.0 mm
3. Tighten the tension pulley fixing bolt or fixing nut.
4. Turn the crankshaft in the forward direction (to the right) two revolutions to break in the drive belt.
5. Check the belt tension, and readjust if necessary.

   Caution
   This check should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).

<Vehicles with A/C>



<Vehicles without A/C>

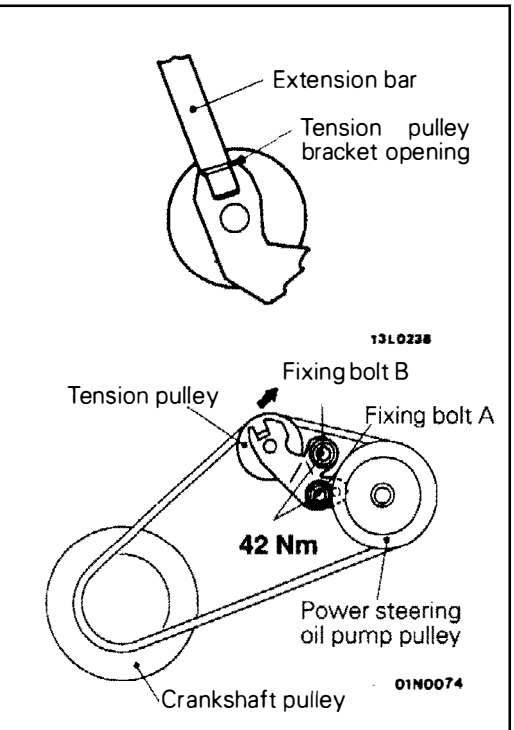


POWER STEERING OIL PUMP BELT TENSION INSPECTION

E11FF00CA

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

Standard value: 9.5–13.5 mm



POWER STEERING OIL PUMP BELT TENSION ADJUSTMENT

E11FF00DA

1. Insert an extension bar (insertion width 12.7 mm) into the opening at the end of the tension pulley bracket.
2. Loosen the tension pulley bracket fixing bolts in the order B, A.
3. Turn the tension pulley bracket to adjust the belt tension.

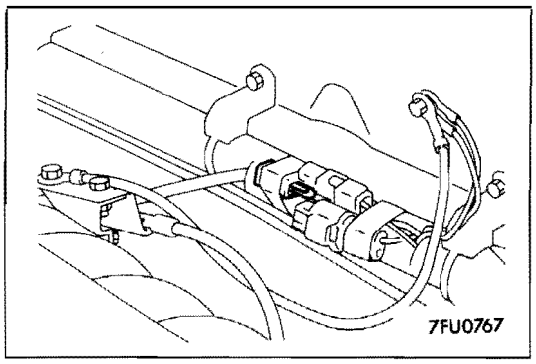
   Standard value:
   If used belt (with correct tension) is used; 10.5–12.5 mm
   If a new belt is used; 7.5–9.0 mm

5. Tighten the tension pulley bracket fixing bolts in the order A, B to the specified torque.

   Specified torque: 42 Nm

5. Turn the crankshaft in the forward direction (to the right) two revolutions to break in the drive belt.
6. Check the belt tension, and readjust if necessary.

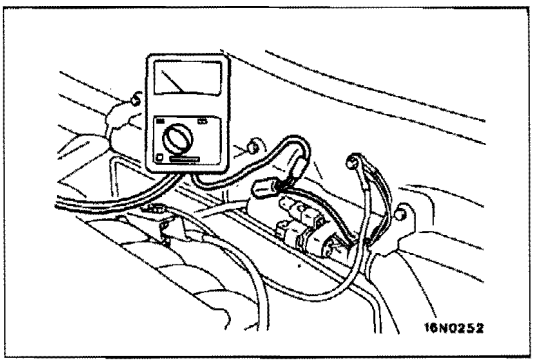
   Caution
   This check should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).



IGNITION TIMING INSPECTION AND ADJUSTMENT

E11FP01AA

1. Before inspection and adjustment set vehicle in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral
2. Insert a paper clip into the 1-pin connector (blue) as shown in the illustration.



3. Connect a primary-voltage-detection type of tachometer to the paper clip.

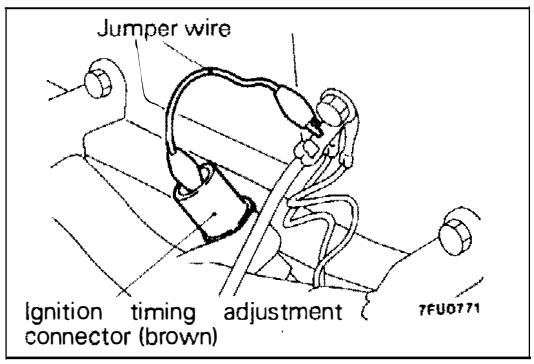
   NOTE
   Do not use the MUT-II tester.
   If tested with the MUT-II tester connected to the diagnosis connector, the ignition timing will not be the basic timing but be ordinary timing.

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

   Standard value: 700±100 r/min.

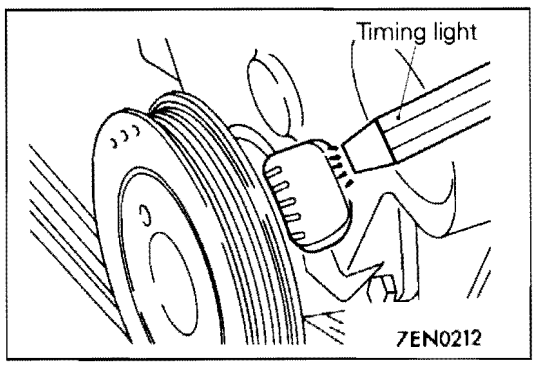
   NOTE
   The engine speed indicated is a third of actual speed. In other words, the reading of the tachometer times 3 is actual speed.

7. Turn the ignition switch to OFF.



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

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



10. Start the engine and run at idle.
11. Check that basic ignition timing is within the standard value.

    Standard value: 5°±3° BTDC

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

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

    Standard value: approx. 15° BTDC

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

IDLE SPEED INSPECTION E11FF02AA

1. Before inspection and adjustment set vehicles in the following condition.
   - Engine coolant temperature: 80–95°C
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral
2. Check the basic ignition timing.

   Standard value: 5°±3°BTDC
3. After turning the ignition switch to OFF, connect the MUT-II tester to the diagnosis connector (white).
4. Start the engine and run it at idle
5. Run the engine at idle for 2 minutes.
6. Check the idle speed. Select item No. 38 and take a reading of the idle speed.

   Curb idle speed: 700±100 r/min.

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

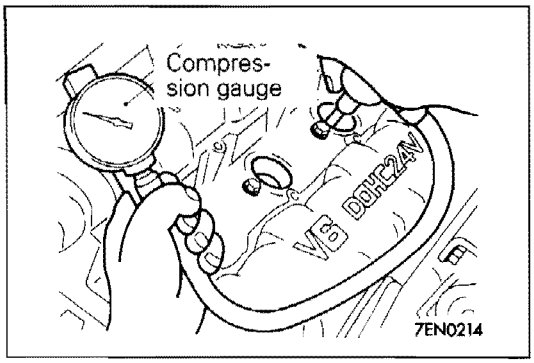
COMPRESSION PRESSURE INSPECTION E11FF03AA

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
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral
2. Disconnect the spark plug cables.
3. Remove all of the spark plugs.
4. Disconnect the crank angle sensor connector.

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

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

Caution
1. **Keep away from the spark plug hole when cranking.**
2. **If compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.**



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

Standard Value (at engine speed of 250–400 r/min.): 1,350 kPa

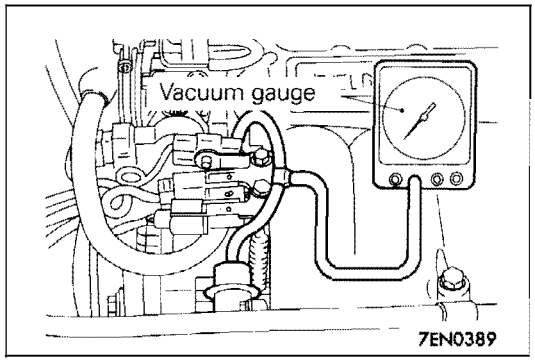
Limit: min. 1,020 kPa

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

Limit: max. 100 kPa

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (7) and (8).
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
10. Connect the crank angle sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the MUT-II to erase the diagnosis codes.

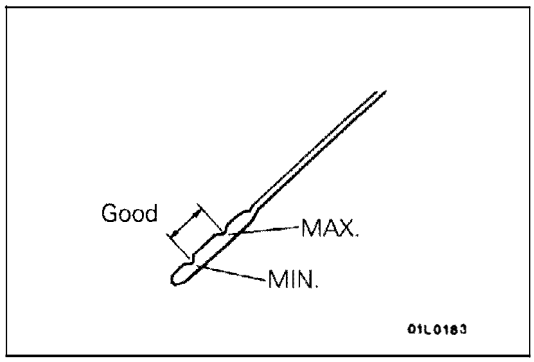
NOTE
This will erase the problem code resulting from the crank angle sensor connector being disconnected.



MANIFOLD VACUUM INSPECTION E11FF04AA

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

Standard value: Approx. 69 kPa

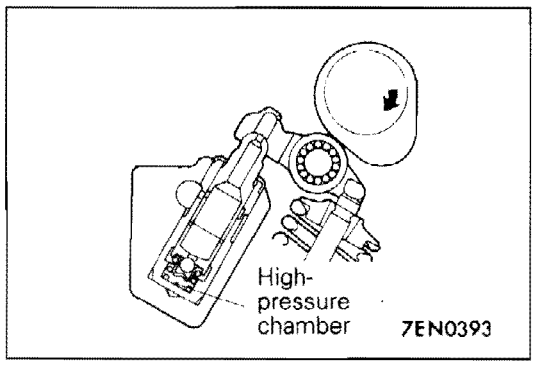


LASH ADJUSTER CHECK E11FF05AA

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

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

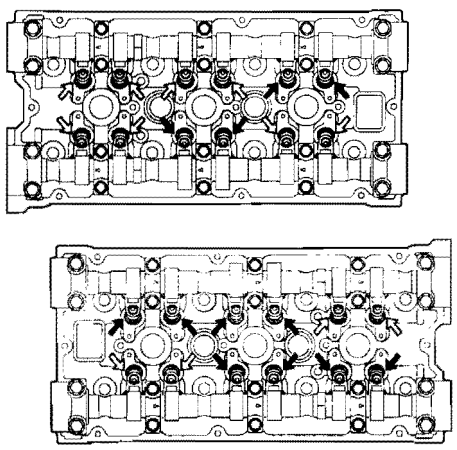
   NOTE
   1. If the oil amount is small, air will be sucked from the oil strainer and mixed in the oil passage.
   2. If the oil amount is excessive, the oil will be stirred by the crank and mixed with a large amount of air.
   3. Air and oil can not be separated easily in the deteriorated oil, and the amount of air mixed in the oil increases.



If such mixed-in air enters the high pressure chamber in the lash adjuster, the air in the high-pressure chamber will be compressed while the valve is opened, the lash adjuster will be excessively compressed and abnormal noise will be produced when the valve is closed.
This is the same phenomenon which occurs when the valve clearance is improperly adjusted to be excessively large.
However, it will return to be normal if the air entrapped in the adjuster is released in this case.

2. Start the engine, and slowly race* it several times (10 times or less).
   If the abnormal noise is eliminated by racing the engine, it means that the air is released from the high-pressure chamber of the lash adjuster and the function of the lash adjuster is returned to normal.
   * Gradually increase the engine speed from the idle speed to 3,000 r/min. (for 30 seconds), and then gradually slow down the engine to the idling speed (for 30 seconds).

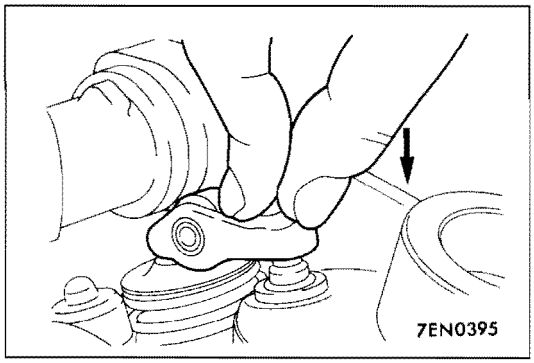
   NOTE
   1. If the vehicle is parked on a slope for a long time, the oil will be sometimes reduced in the lash adjuster, and air will enter the high-pressure chamber when the engine is started.
   2. After the vehicle is parked for a long time, the oil will go out of the oil passage. Since it takes a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



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

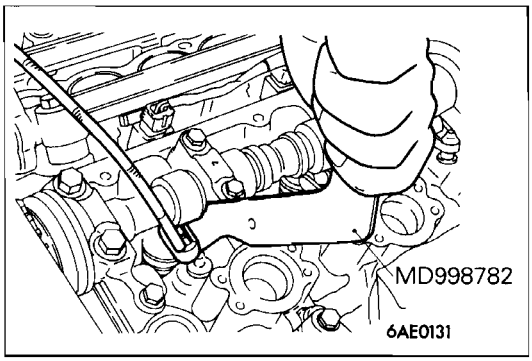
   NOTE
   1. A leak down test can be performed to accurately determine whether the lash adjuster is defective or not.
   2. For the procedures for the leak down test and air bleeding of the lash adjuster, refer to the Engine Workshop Manual.

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

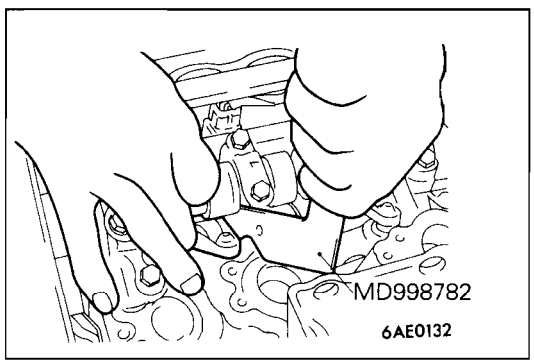


4. Lash adjuster replacement procedure

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



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



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

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

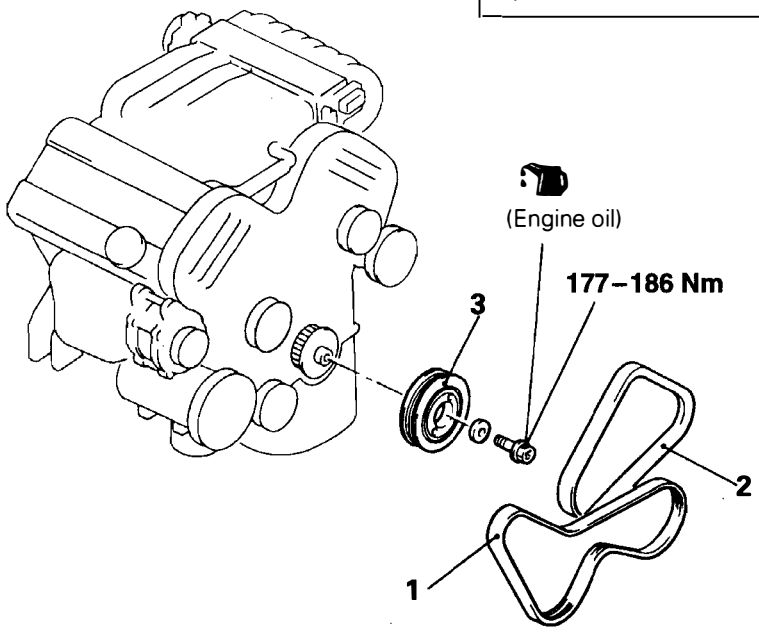
CRANKSHAFT PULLEY

E11FG00AA

REMOVAL AND INSTALLATION

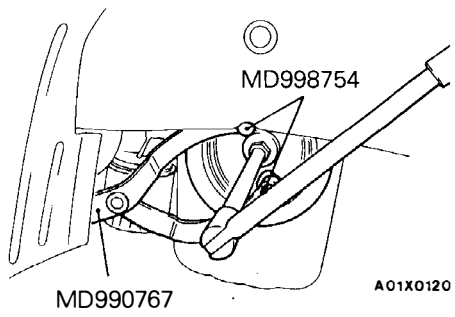
Pre-removal Operation
- Under Cover Removal

Post-installation Operation
(1) Drive Belt Tension Adjustment (Refer to P.11F-7.)
(2) Under Cover Installation



A01N0078

Removal steps
1. Drive belt (Alternator and A/C compressor or alternator)
2. Drive belt (Power steering oil pump)
◇A◇ ◆A◆ 3. Crankshaft pulley



A01X0120

REMOVAL AND INSTALLATION SERVICE POINT

E11FG00AA

◇A◇ ◆A◆ CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

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

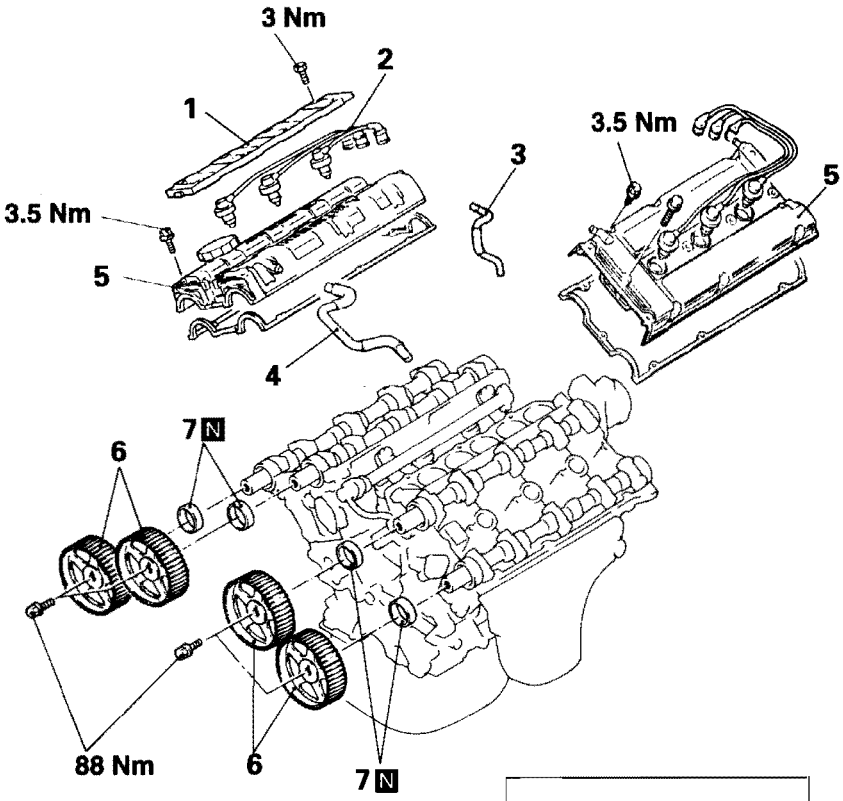
CAMSHAFT OIL SEAL

E11FH00AA

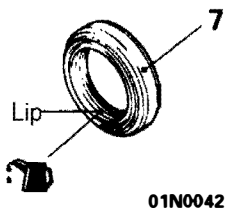
REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Air Intake Plenum Removal
(2) Timing Belt Removal
(Refer to P.11F-26.)

Post-installation Operation
(3) Timing Belt Installation
(Refer to P.11F-26.)
(4) Air Intake Plenum Installation
(5) Accelerator Cable Adjustment
(Refer to GROUP 13F – Service Adjustment Procedures)



Removal steps
1. Center cover
2. Spark plug cable
3. PCV hose
4. Breather hose
◆C◆ 5. Rocker cover
◇A◇ ◆B◆ 6. Camshaft sprocket
◇B◇ ◆A◆ 7. Camshaft oil seal



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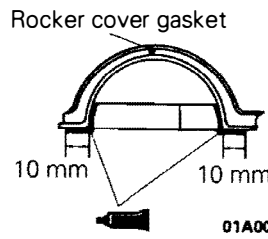
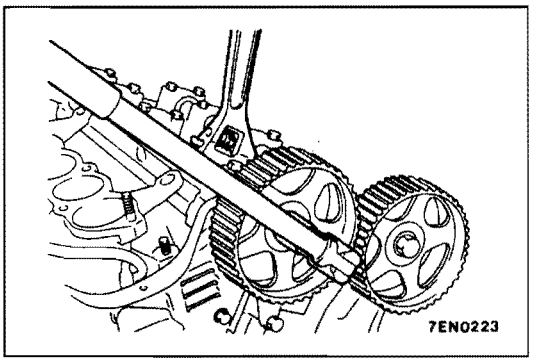


01A0047

Specified sealant:
MITSUBISHI GENUINE PART MD997110 or equivalent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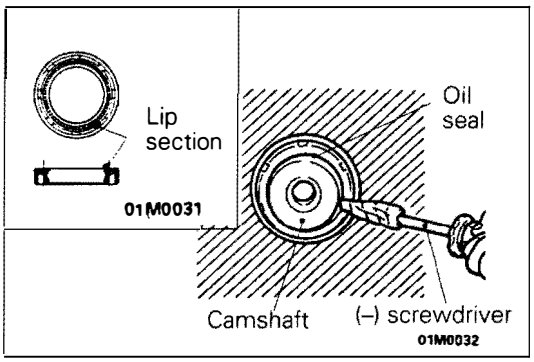
REMOVAL SERVICE POINTS

E11FH01AA

◇A◇ CAMSHAFT SPROCKET REMOVAL

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

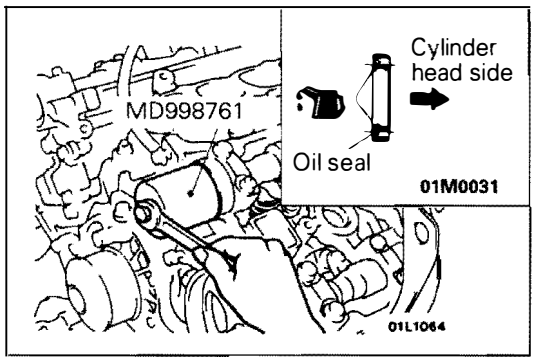
Caution
As the sprocket could become damaged, do not apply the wrench to the camshaft sprocket.



〈B〉 CAMSHAFT OIL SEAL REMOVAL

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

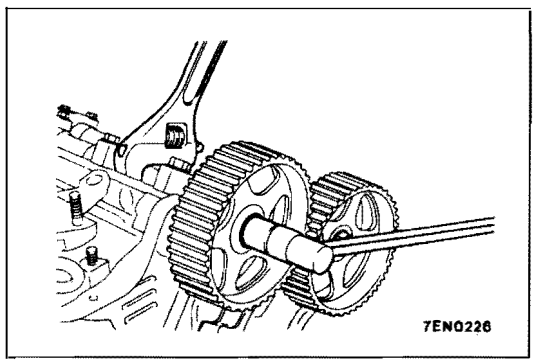
Caution
Be careful not to damage the camshaft and the cylinder head.



INSTALLATION SERVICE POINTS E11FH04AA

▶A◀ CAMSHAFT OIL SEAL INSTALLATION

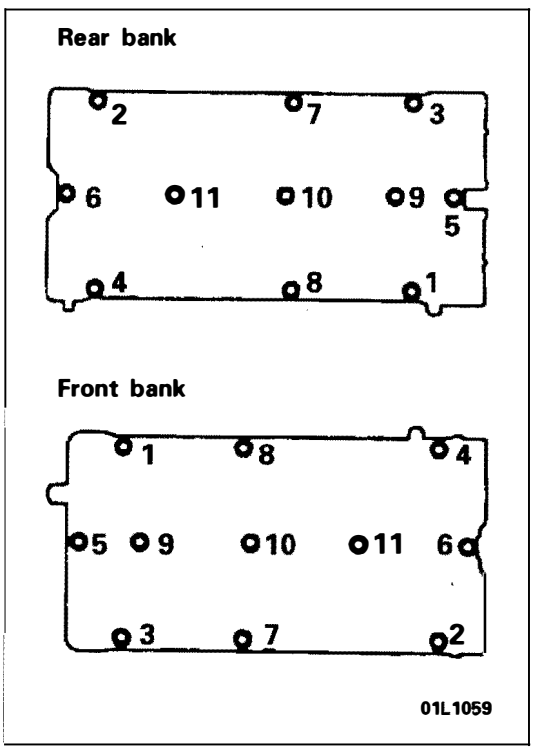
(1) Apply a small amount of engine oil to the oil seal lip and then insert.
(2) Press fitting the oil seal into the cylinder head.



▶B◀ CAMSHAFT SPROCKET INSTALLATION

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

Caution
Do not apply the wrench to the camshaft sprocket, as the sprocket could become damaged.



▶C◀ ROCKER COVER INSTALLATION

Tighten in order of the numbers shown in the illustration.

NOTE
1. The lengths of each bolt are as follows.

Length mm \ Bank	Front	Rear
25	5, 9, 10, 11	6, 9, 10, 11
28	1, 2, 3, 4, 6, 7, 8	1, 2, 3, 4, 7, 8
65	–	5

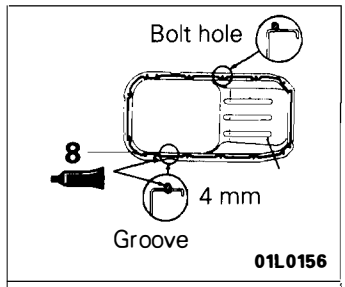
2. The rocker cover mounting bolts for the front and rear banks are identified by their colour.
   Front bank ..... Black
   Rear bank ..... Green

OIL PAN

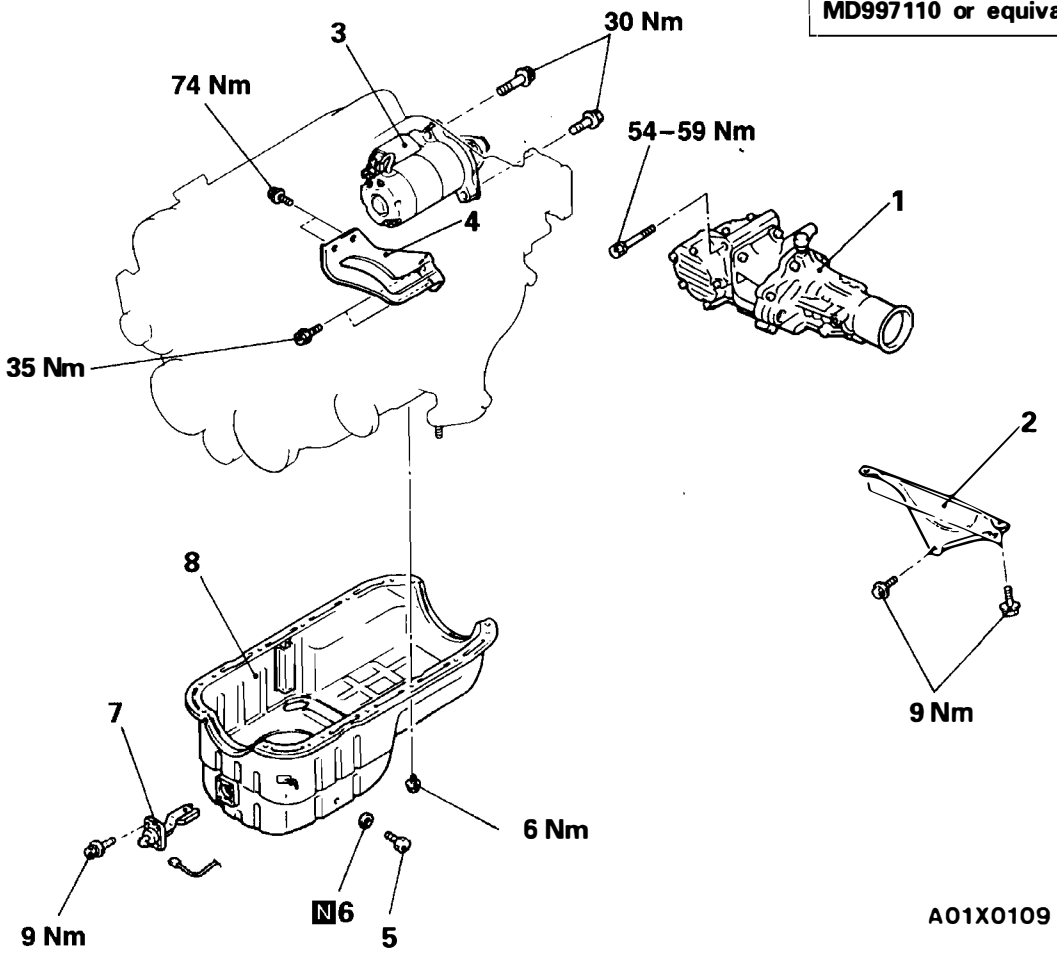
REMOVAL AND INSTALLATION

E11FI00AA

Pre-removal and Post-installation Operation
(1) Engine Oil Draining and Refilling
(2) Oil Level Gauge Removal and Insertion
(3) Under Cover Removal and Installation
(4) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)

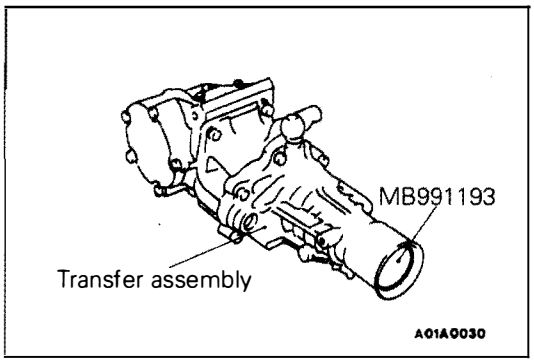


Specified sealant:
MITSUBISHI GENUINE PART MD997110 or equivalent



Removal steps

〈A〉 1. Transfer assembly
2. Bell housing cover
3. Starter motor
4. Transmission right stay
5. Drain plug
◆B◆ 6. Gasket
7. Engine oil level sensor
〈B〉 ◆A◆ 8. Oil pan



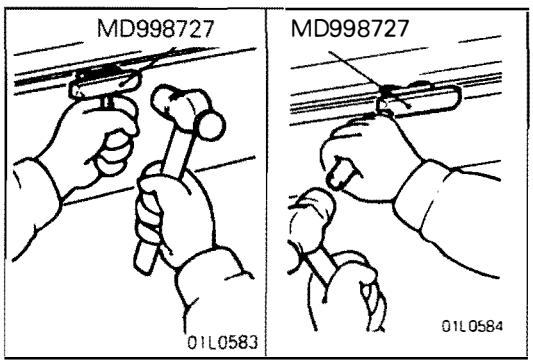
REMOVAL SERVICE POINTS E11DI01AA

◇A◇ TRANSFER ASSEMBLY REMOVAL

(1) Remove the transfer mounting bolts with the propeller shaft still installed.
(2) Insert a flat-tipped screwdriver or similar tool in between the transfer and transmission, and remove the transfer from the center shaft.
(3) Remove the transfer from the propeller shaft.

Caution
Do not tilt the transfer assembly to the rear, as this will cause the transfer oil to leak out.

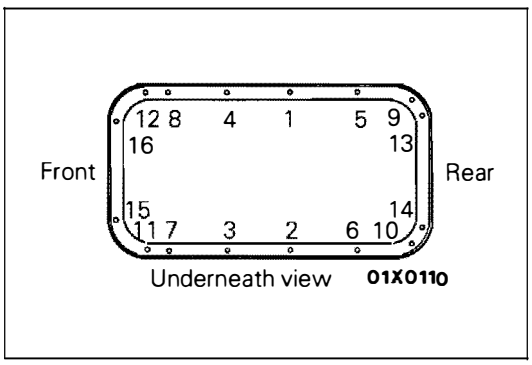
(4) After removing the transfer assembly, insert the special tool to prevent the transfer oil from leaking out.
(5) Suspend the propeller shaft from the vehicle chassis with wire, etc.



◇B◇ OIL PAN REMOVAL

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

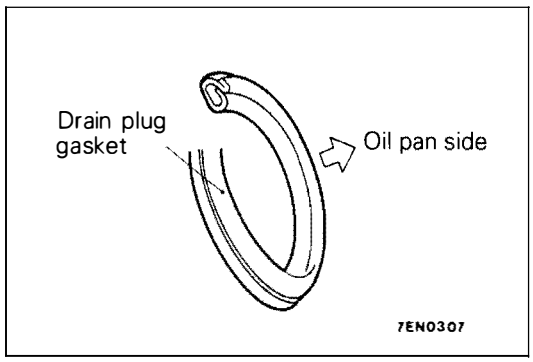
Caution
Perform this slowly to avoid deformation of the oil pan flange.



INSTALLATION SERVICE POINTS E11FI04AA

◆A◆ OIL PAN INSTALLATION

Tighten the bolts in order of the numbers shown in the illustration.



◆B◆ GASKET INSTALLATION

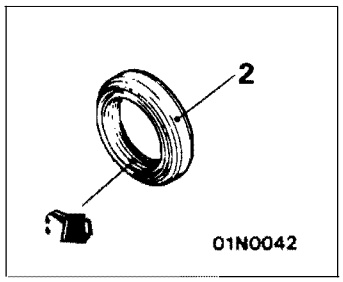
Replace the gasket with a new gasket, and install it in the direction shown in the illustration.

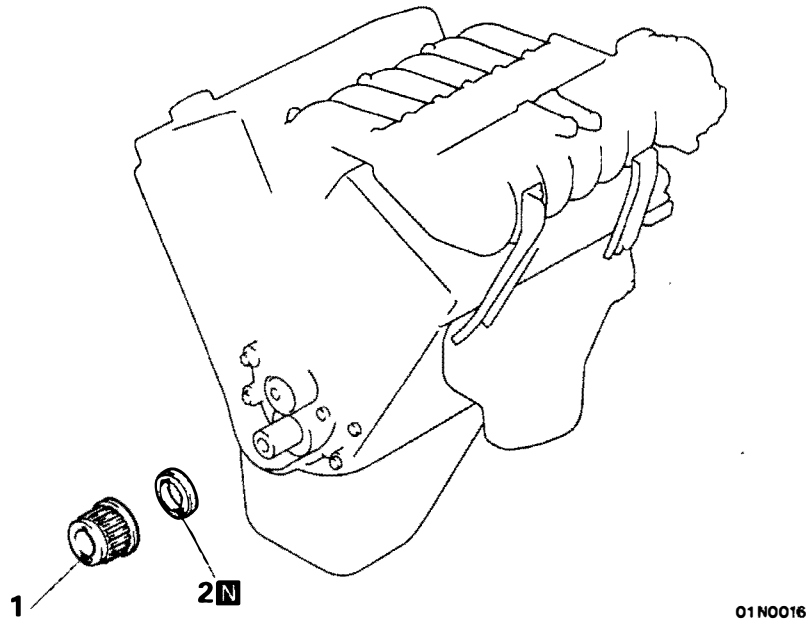
CRANKSHAFT FRONT OIL SEAL

E11FJ00AA

REMOVAL AND INSTALLATION

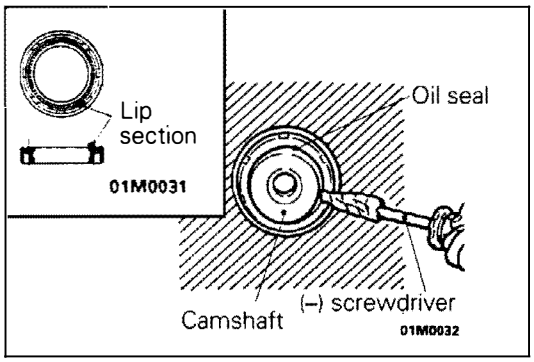
Pre-removal and Post-installation Operation
- Timing Belt Removal and Installation (Refer to P.11F-26.)

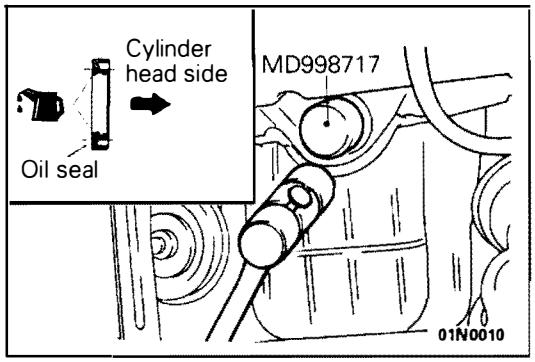




Removal steps

1. Crankshaft sprocket
◇A◇ ◆A◆ 2. Crankshaft front oil seal





REMOVAL SERVICE POINT

E11FJ01AA

◇A◇ CRANKSHAFT FRONT OIL SEAL REMOVAL

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

Caution
Be careful not to damage the crankshaft and the oil pump case.

INSTALLATION SERVICE POINT

E11FJ04AA

◆A◆ CRANKSHAFT FRONT OIL SEAL INSTALLATION

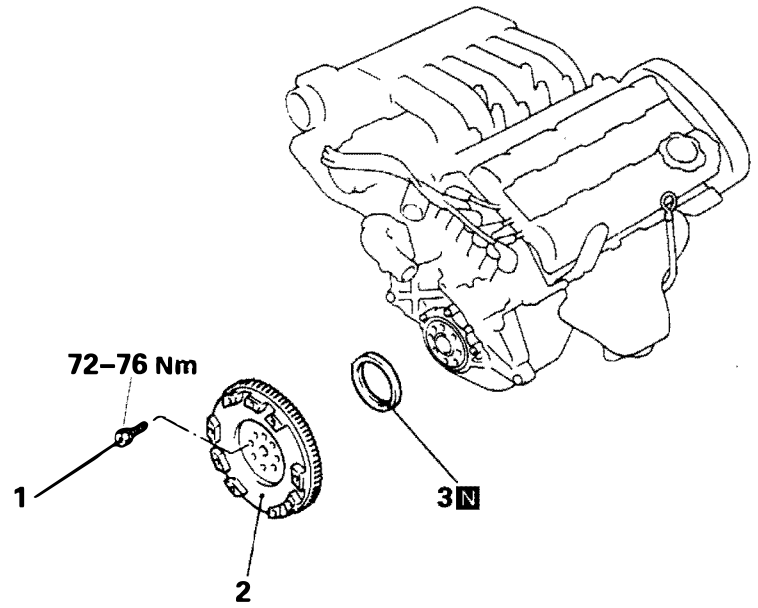
(1) Apply a small amount of engine oil to the oil seal lip and then insert.
(2) Tap the oil seal into the cylinder block.

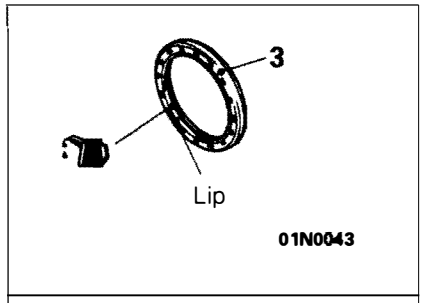
CRANKSHAFT REAR OIL SEAL

E11FK00AA

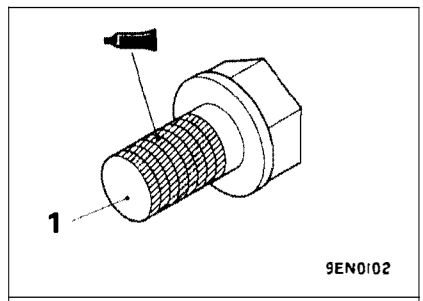
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Transmission assembly (Refer to GROUP 22 – Transmission assembly)





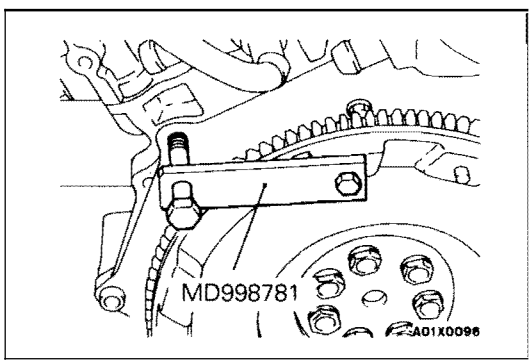
Engine oil



Specified sealant:
3M Stud Locking 4170 or equivalent

Removal steps

〈A〉 〉B〈 1. Flywheel bolt
2. Flywheel
〈B〉 〉A〈 3. Crankshaft rear oil seal

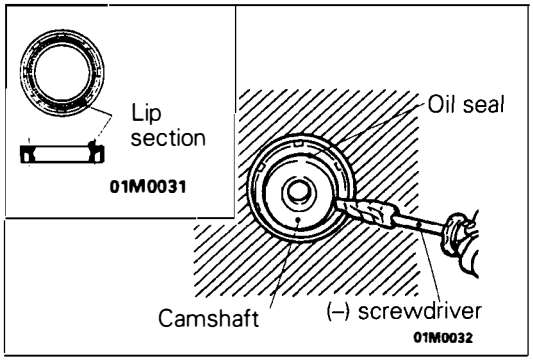


REMOVAL SERVICE POINTS

E11FK01AA

〈A〉 FLYWHEEL BOLT

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

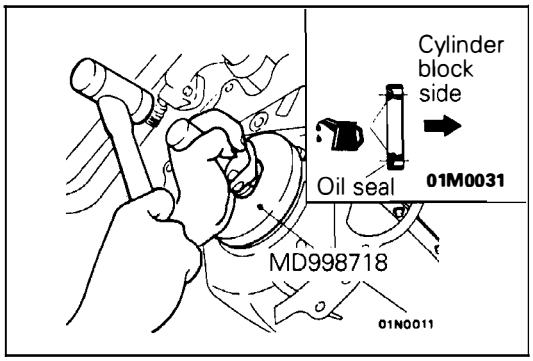


〈B〉 CRANKSHAFT REAR OIL SEAL REMOVAL

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

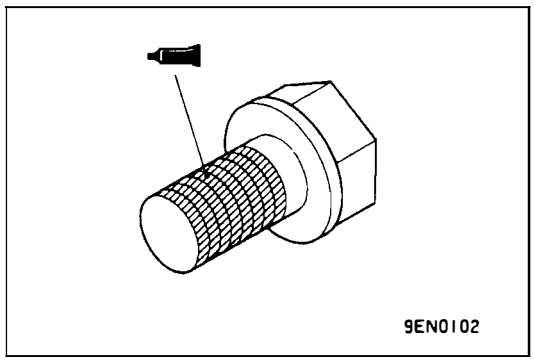
Caution
Be careful not to damage the crankshaft and the oil seal case.

INSTALLATION SERVICE POINTS E11FK04AA



◗A◖ CRANKSHAFT REAR OIL SEAL INSTALLATION

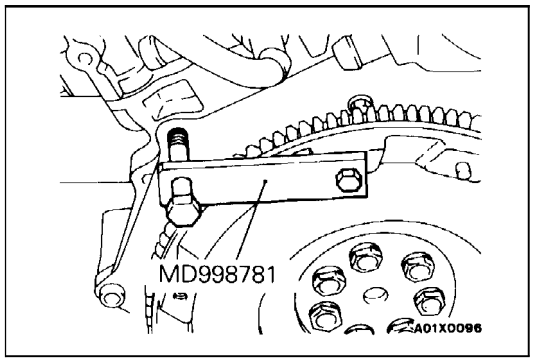
(1) Apply a small amount of engine oil to the entire circumference of the oil seal lip.
(2) Tap in the oil seal as shown in the illustration.



◗B◖ FLYWHEEL BOLT INSTALLATION

(1) Clean off all sealant, oil and other substances which are adhering to the threaded bolts, the crankshaft thread holes and the flywheel.
(2) Apply oil to the bearing surface of the flywheel bolt.
(3) Apply oil to the crankshaft thread holes.
(4) Apply sealant to the threads of the mounting bolts.

Specified sealant: 3M Stud Locking 4170 or equivalent



(5) Use the special tool to secure the flywheel, and then tighten the bolts to the specified torque.

Specified torque: 72–76 Nm

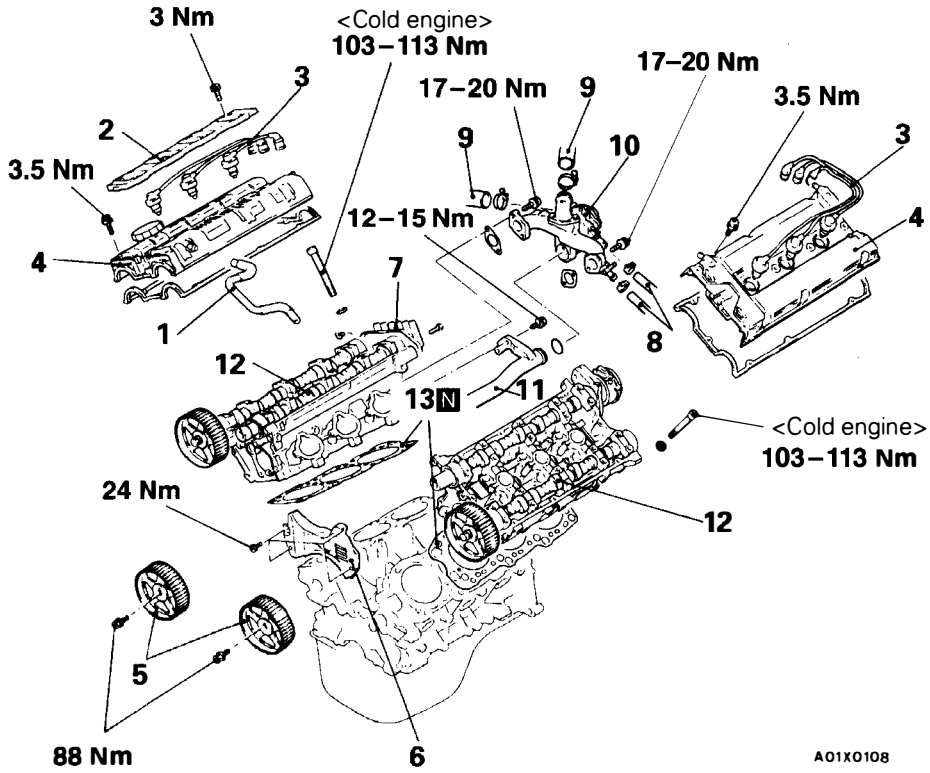
CYLINDER HEAD GASKET

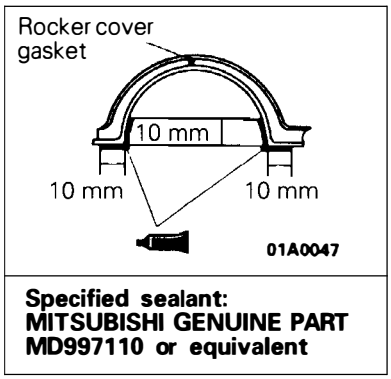
E11FL00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Exhaust Manifold Removal (Refer to GROUP 15 – Exhaust Manifold.)
(2) Engine Coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)
(3) Air Intake Plenum Removal
(4) Intake Manifold Removal
(5) Timing Belt Removal (Refer to P.11F-26.)

Post-installation Operation
(1) Timing Belt Installation (Refer to P.11F-26.)
(2) Intake Manifold Installation
(3) Air Intake Plenum Installation
(4) Exhaust Manifold Installation (Refer to GROUP 15 – Exhaust Manifold.)
(5) Engine Coolant Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(6) Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
(7) Engine Adjustment (Refer to P.11F-9.)

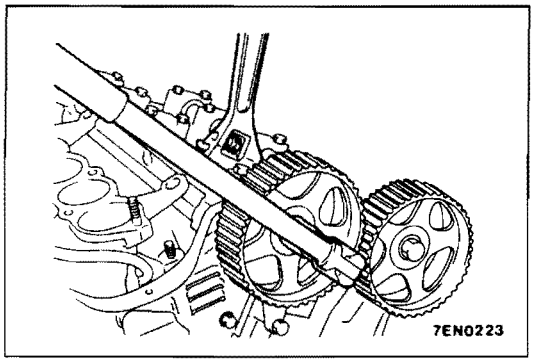




Specified sealant:
MITSUBISHI GENUINE PART MD997110 or equivalent

Removal steps

1. Breather hose
2. Center cover
3. Spark plug cable
◆D◆ 4. Rocker cover
〈A〉 ◆C◆ 5. Intake camshaft sprocket
6. Timing belt rear cover (center)
7. Ignition coil assembly
8. Connection for heater hose
9. Connection for radiator hose
10. Thermostat housing
11. Connection for water inlet pipe
〈B〉 ◆B◆ 12. Cylinder head assembly
◆A◆ 13. Cylinder head gasket



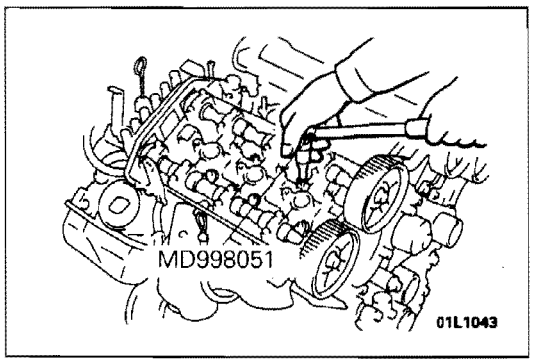
REMOVAL SERVICE POINTS E11FL01AA

〈A〉 INTAKE CAMSHAFT SPROCKET REMOVAL

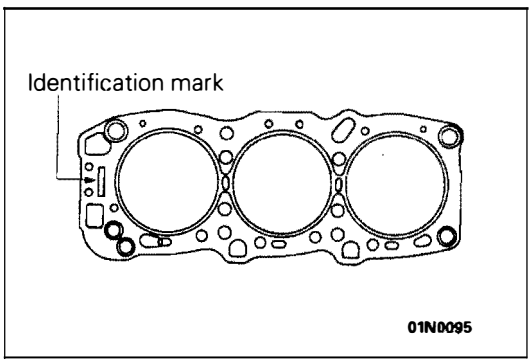
(1) Using a wrench, hold the camshaft at its hexagon and remove the camshaft sprocket bolt.

Caution
Locking the camshaft sprocket with a tool damages the sprocket.

(2) Remove the camshaft sprockets.



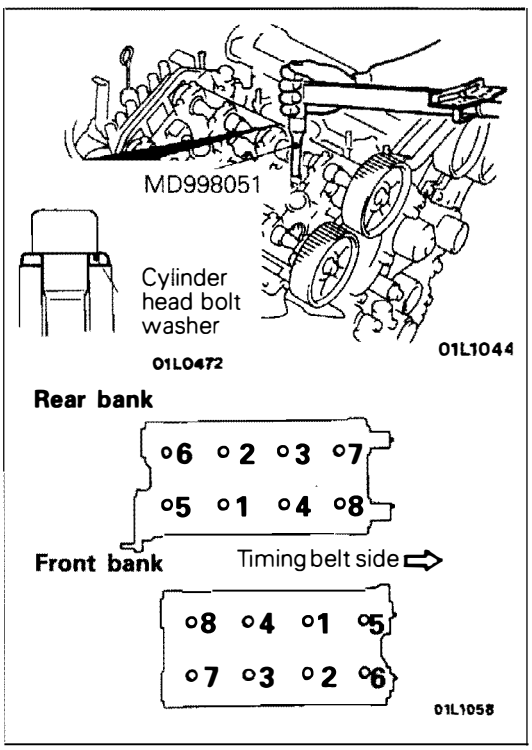
〈B〉 CYLINDER HEAD ASSEMBLY REMOVAL



INSTALLATION SERVICE POINTS E11FL04AA

◆A◆ CYLINDER HEAD GASKET INSTALLATION

(1) Decrease the cylinder head and cylinder block gasket mounting surfaces.
(2) Make sure that the gasket has the proper identification mark for the engine.
(3) Lay the cylinder head gasket on the cylinder block with the identification mark at the front top.



◆B◆ CYLINDER HEAD ASSEMBLY INSTALLATION

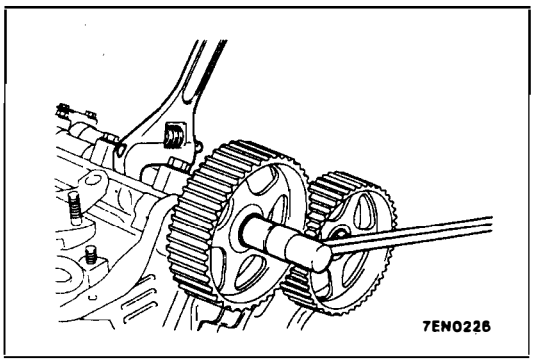
(1) Use a scraper to clean the gasket surface of the cylinder head assembly.

Caution
Take care that no foreign material gets into the cylinder, coolant passages or oil passages.

(2) Using the special tool and a torque wrench, tighten the bolts to the specified torque in the order shown in the illustration. (in two or three cycles)

Specified torque: 103–113 Nm

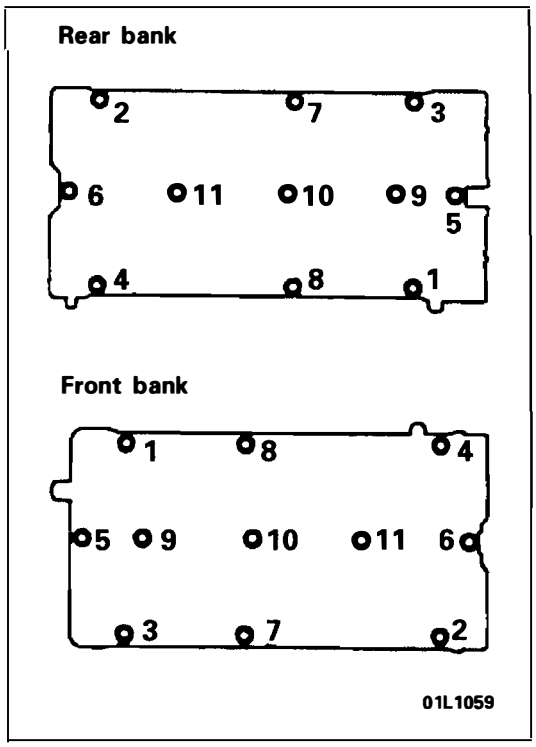
Caution
Install the head bolt washers with shear droop upward as shown in the illustration.



◆C◆ INTAKE CAMSHAFT SPROCKET INSTALLATION

Using a wrench, hole the camshaft at its hexagon and tighten the bolt to specification.

Caution Locking the camshaft sprocket with a tool damages the sprocket.



◆D◆ ROCKER COVER INSTALLATION

Tighten in order of the numbers shown in the illustration.

NOTE

1. The lengths of each bolt are as follows.

Bank / Length mm	Front	Rear
25	5, 9, 10, 11	6, 9, 10, 11
28	1, 2, 3, 4, 6, 7, 8	1, 2, 3, 4, 7, 8
65	–	5

2. The rocker cover mounting bolts for the front and rear banks are identified by their colour.
   Front bank ..... Black
   Rear bank ..... Green

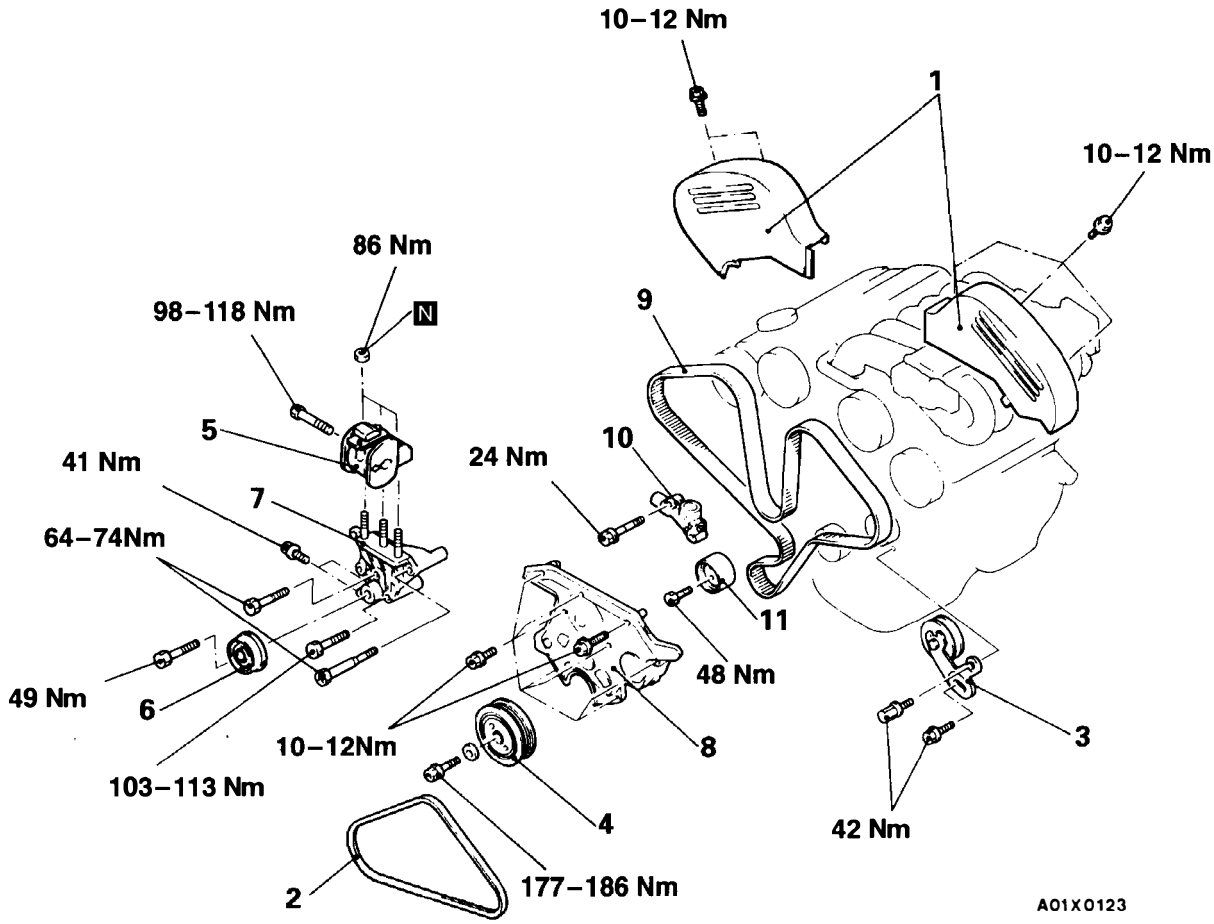
TIMING BELT

E11FM00AA

REMOVAL AND INSTALLATION

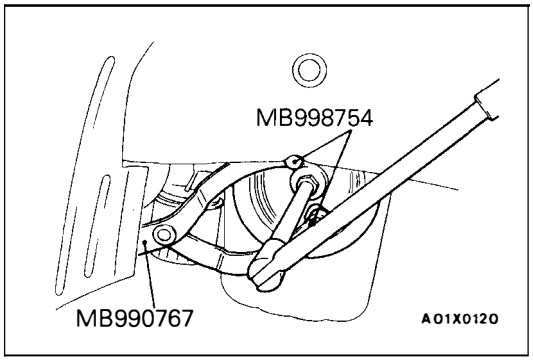
Pre-removal Operation
(1) Jack up the engine and transmission assembly until there is no load on the insulators.
(2) Under Cover (L.H.) Removal
(3) Alternator Removal (Refer to GROUP 16 – Alternator.)

Post-Installation Operations
(1) Alternator Installation (Refer to GROUP 16 – Alternator.)
(2) Under Cover (L.H.) Installation



Removal steps

. . 1. Timing belt upper cover
● Drive belt tension adjustment (Refer to P.11F-7.)
2. Drive belt (power steering)
3. Tension pulley
◇A◇ ◆G◆ 4. Crankshaft pulley
5. Engine mount bracket
◇B◇ ◆F◆ 6. Idler pulley
◇C◇ ◆E◆ 7. Engine support bracket
◆D◆ 8. Timing belt lower cover
◆C◆ ● Timing belt tension adjustment
◇D◇ ◆B◆ 9. Timing belt
◆A◆ 10. Auto tensioner
11. Tension pulley



REMOVAL SERVICE POINTS E11FM01AA

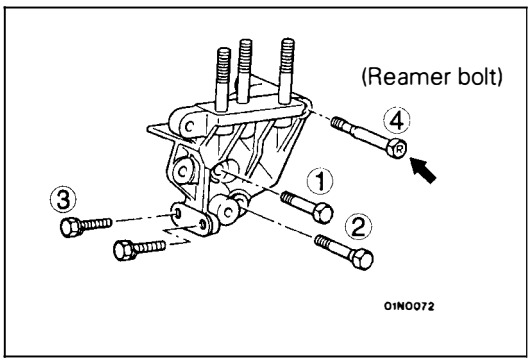
〈A〉 CRANKSHAFT PULLEY REMOVAL

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

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

〈B〉 IDLER PULLEY REMOVAL

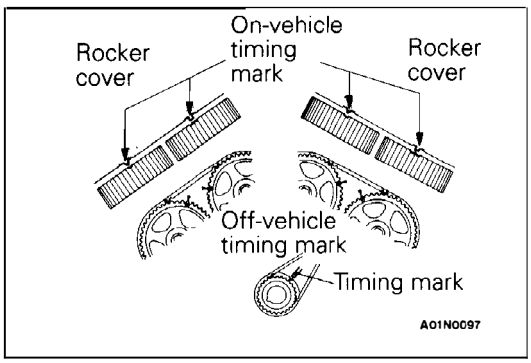
First use the special tool (MB991164) to loosen the idler pulley mounting bolt, and then use a spanner or similar tool to remove the bolt.



〈C〉 ENGINE SUPPORT BRACKET REMOVAL

Remove the engine support bracket in the numbered sequence shown in the illustration.
Spraying lubricant, slowly remove the bolt (reamer bolt) indicated by the arrow.

Caution
Keep in mind that the reamer bolt is sometimes heat seized on the engine support bracket.



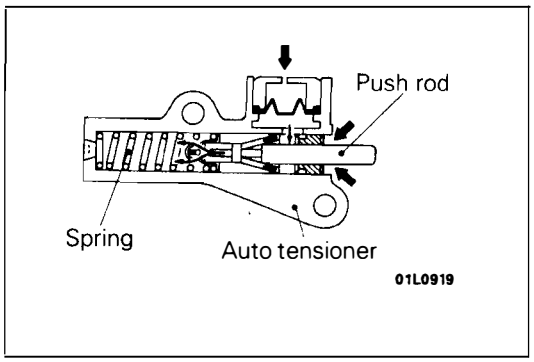
〈D〉 TIMING BELT REMOVAL

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

Caution

1. **The cam of the front bank camshaft lifts the valve by means of the rocker arm, the spring force of the valve will easily turn the sprocket, so be careful not to insert your fingers, etc.**
2. **Water or oil on the belt shorten its life drastically, so the removed timing belt, sprocket and tensioner must be free from oil and water. These parts should not be washed. Replace parts if seriously contaminated.**

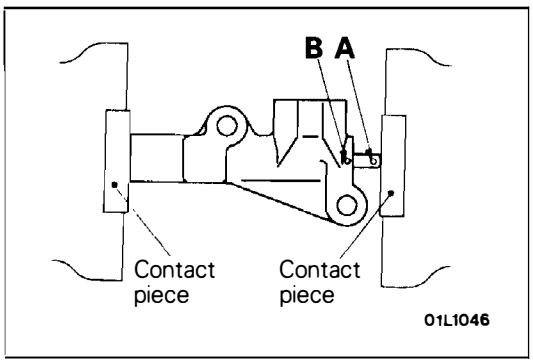
   If there is oil or water on each part check the front case oil seals, camshaft oil seal and water pump for leaks.



INSPECTION E11FM02AA

AUTO TENSIONER

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

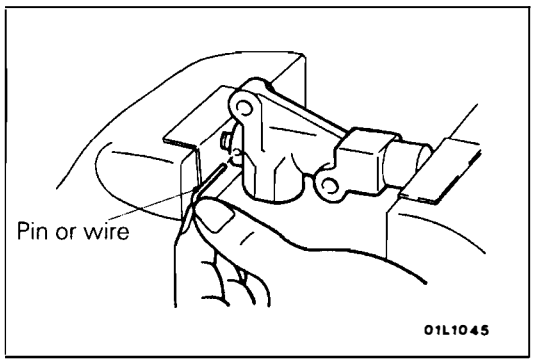


INSTALLATION SERVICE POINTS E11FM04AA

◆A◆ AUTO TENSIONER INSTALLATION

(1) Using a press or vise, compress the push rod of the auto tensioner as slowly as possible and align pin hole A of the push rod and pin hole B of the tensioner cylinder.

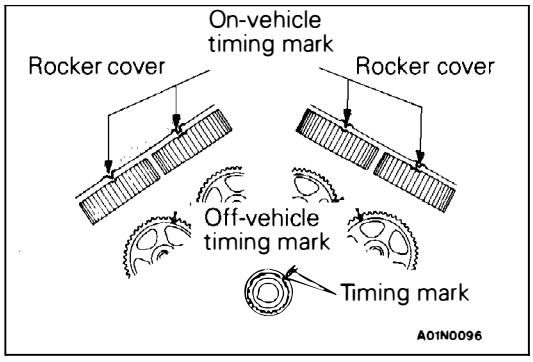
Caution
1. The auto tensioner must be placed at a right angle to the pressing surface of the press or vise.
2. Push in the rod slowly to prevent the push rod from being damaged.



(2) Insert a wire with a diameter of 1.4 mm into the aligned pin 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".

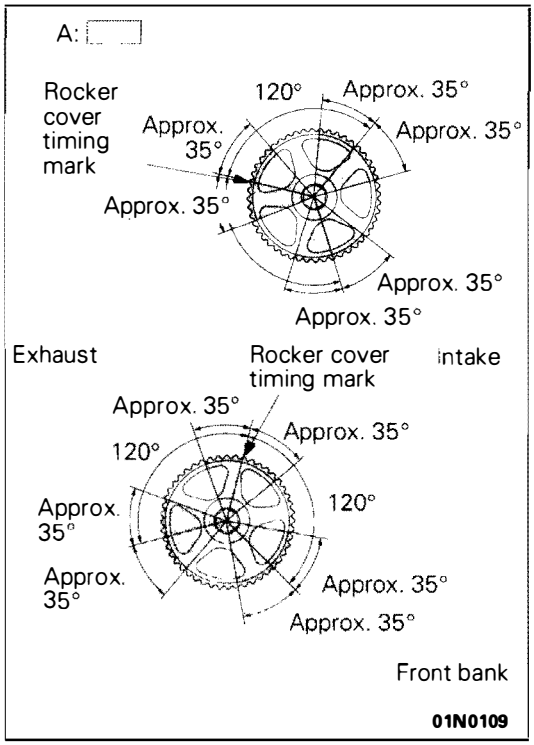
(3) Install the tensioner to engine.



◆B◆ TIMING BELT INSTALLATION

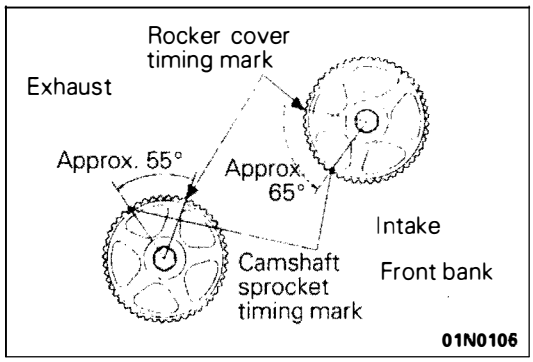
(1) Align the timing marks of each sprocket.
Carry out the following procedure for the front bank camshaft sprocket.
1) Install the crankshaft pulley and turn the crankshaft sprocket timing mark forward 3 teeth to move the piston slightly past No.1 cylinder top dead centre.

Caution
When the camshaft sprocket is turned with No.1 cylinder top dead centre, there is a danger that the valve and piston will interfere.



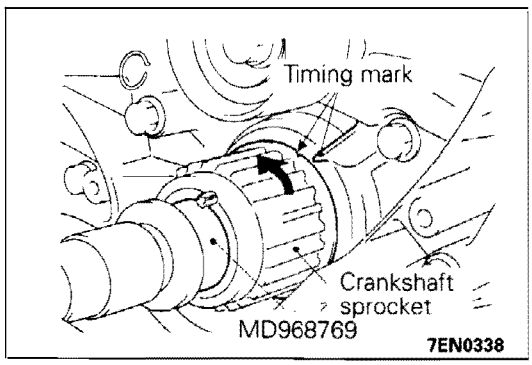
2) Check that the timing marks for the intake and exhaust camshaft sprockets are not within the range of A in the figure at left. If they are within the range of A, turn the camshaft sprocket to move the timing marks as near as possible to the range of A but outside it.

Caution
Within the range of A, the cam of the 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.



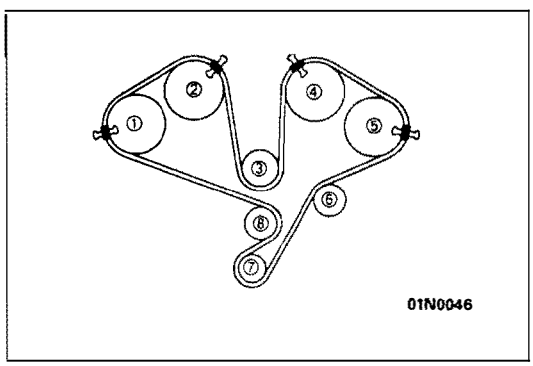
3) After turning either one of the intake and exhaust camshaft sprockets to the position in the diagram at left, to align it with the timing mark, turn the other sprocket to align it as shown in the diagram.

Caution
If the intake and exhaust valves of the same cylinder are lifted at the same times, both valves will interfere with each other, so the intake and exhaust camshaft sprockets should be turned alternately.

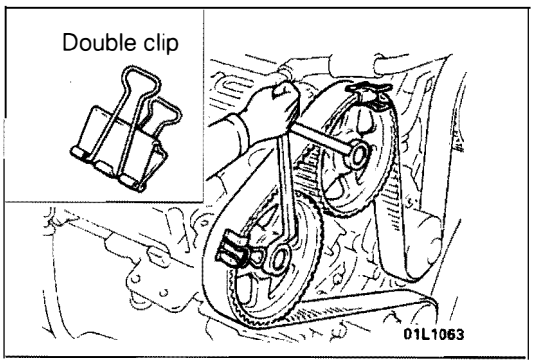


4) Turn the camshaft sprockets clockwise to align them with the timing marks.
If a sprocket is turned too far, turn it back the other way to align it with the timing marks.
5) Align the crankshaft sprocket timing marks.

NOTE
If the crankshaft sprocket timing marks are turned anticlockwise one tooth, working will become easier.

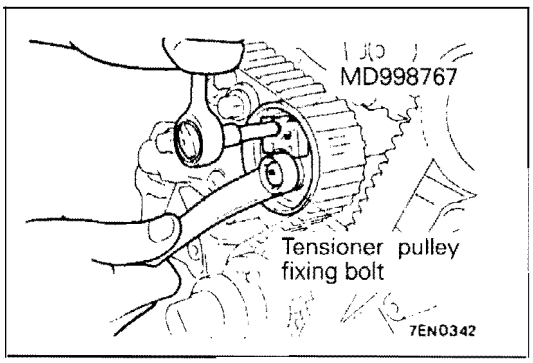


(2) Use double clips to fix the timing belt in the following procedure, to prevent the belt from slacking.
Front bank side exhaust camshaft sprocket → 2. Intake camshaft sprocket → 3. Water pump pulley → 4. Rear bank side intake camshaft sprocket → 5. Exhaust camshaft sprocket → 6. Idler pulley → 7. Crankshaft sprocket → 8. Tensioner pulley.

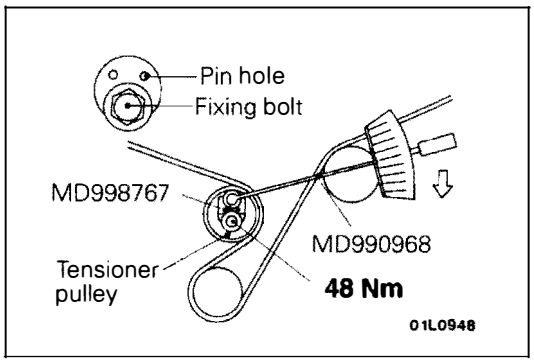


NOTE
As the camshaft sprockets turn easily, use a box wrench to stop them from turning when fitting the timing belt.

Caution
If the timing belt is reused, install so that the arrow marked on it at the time of removal is pointing in the clockwise direction.



(3) Place the tensioner pulley pin hole so that it is towards the top. Press the tensioner pulley onto the timing belt, and provisionally tighten the fixing bolt.
(4) Check that each of the sprocket timing mark is aligned
(5) Remove the 4 double clips.

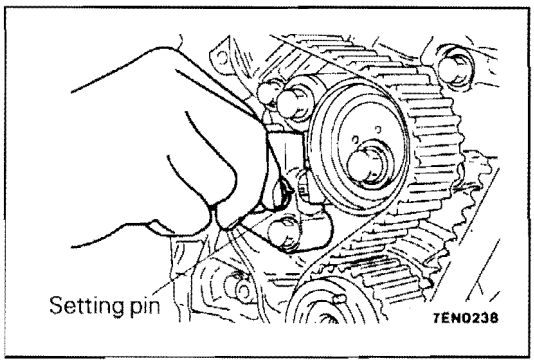


◆C◆ TIMING BELT TENSION ADJUSTMENT

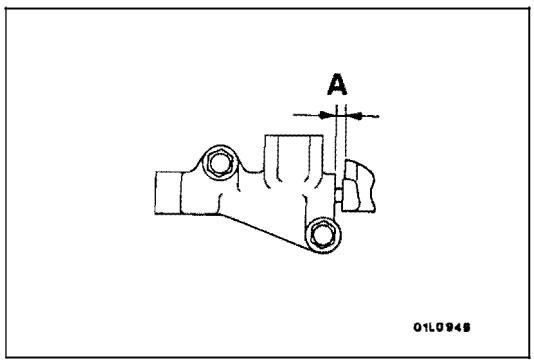
(1) After turning the crankshaft a 1/4 turn anticlockwise, turn it clockwise to the position where the timing marks are aligned.
(2) Next, loosen the center bolt of the tensioner pulley and using the special tool and a torque wrench, apply tension to the timing belt as shown in the illustration; then tighten the center bolt at the specified torque.

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

Specified torque: 10 Nm (tensional torque)



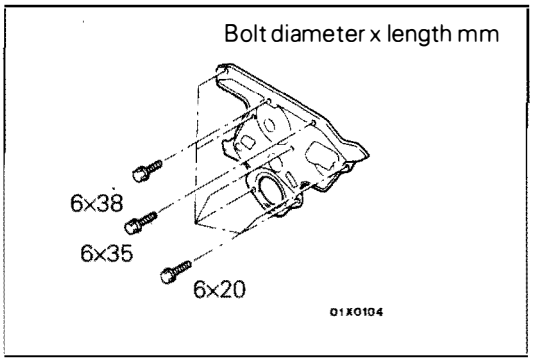
(3) Pull out the auto tensioner setting pin. At this time, check that the setting pin can be pulled out easily.
Turn the crankshaft clockwise 2 turns, and after leaving it in this position for 5 minutes or more, check again that the auto tensioner setting pin can be pulled or inserted easily.



NOTE
If the setting pin cannot be easily inserted, then it is satisfactory if the auto tensioner rod projection amount is within the standard value.

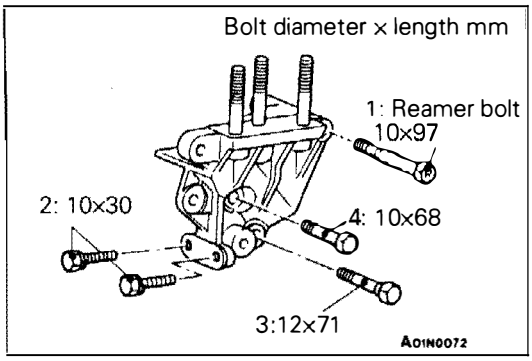
Standard value (A): 3.8–4.5 mm

If it is outside the standard value, repeat the operations in steps 1. to 3.
(4) Check again that each of the sprocket timing marks is aligned.



◆D◆ TIMING BELT LOWER COVER INSTALLATION

The dimensions of the mounting bolts are different, so do be sure to install them correctly.



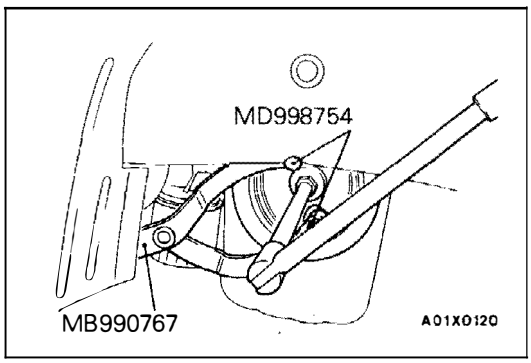
◆E◆ ENGINE SUPPORT BRACKET INSTALLATION

Since the engine support bracket mounting bolts differ in size depending on their locations, install them in the numbered sequence shown in the figure.

Caution
When installing the reamer bolt, tighten it slowly while spraying lubricant on the reamer area.

◆F◆ IDLER PULLEY INSTALLATION

Lastly, use the special tool (MB991164) to securely tighten the idler pulley mounting bolt.



◆G◆ CRANKSHAFT PULLEY INSTALLATION

Caution
Use only the specified special tools, otherwise the pulley damper could be damaged.

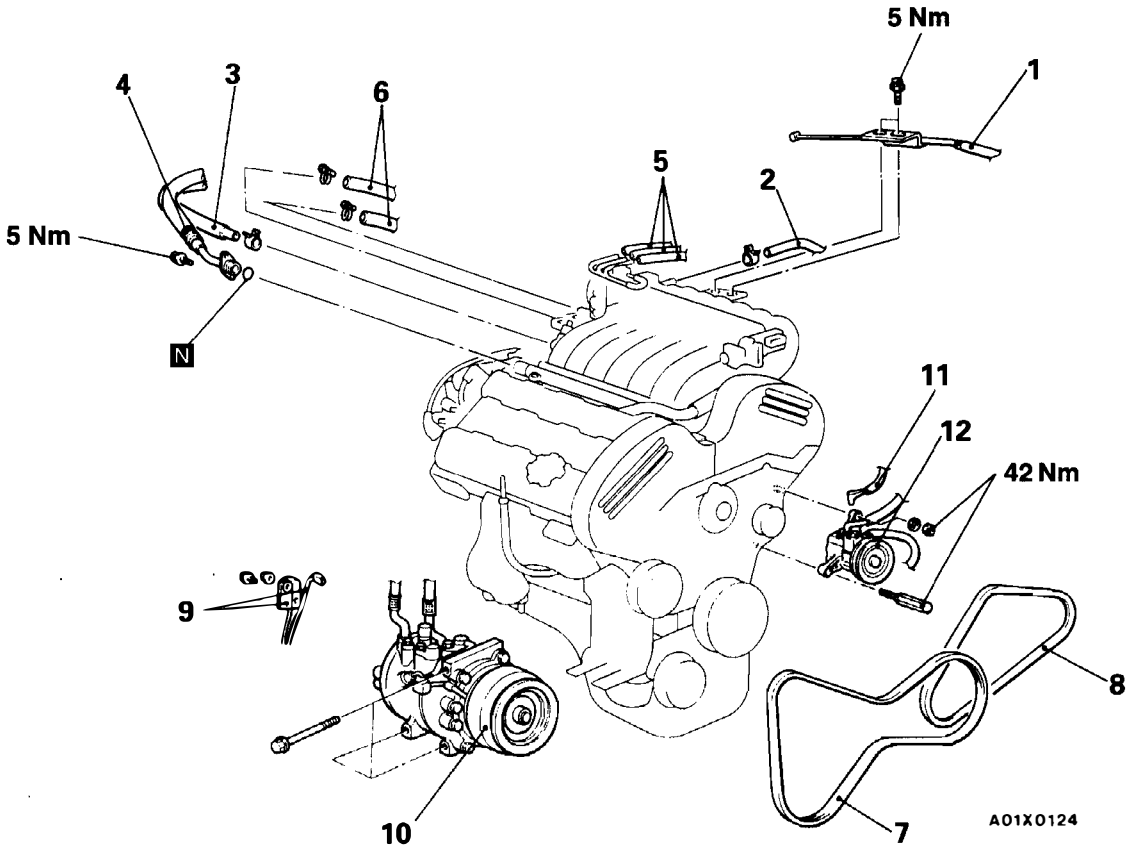
ENGINE ASSEMBLY

E11FO00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Engine Hood Removal (Refer to GROUP 42 – Engine Hood.)
(2) Fuel Line Pressure Releasing (Refer to GROUP 13A – Service Adjustment Procedures.)
(3) Radiator Assembly Removal (Refer to GROUP 14 – Radiator.)
(4) Front Exhaust Pipe Removal (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(5) Transmission Assembly Removal (Refer to GROUP 22 – Transmission Assembly.)

Post-Installation Operations
(1) Transmission Assembly Installation (Refer to GROUP 22 – Transmission Assembly.)
(2) Front Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(3) Radiator Assembly Installation (Refer to GROUP 14 – Radiator.)
(4) Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
(5) Engine Hood Installation (Refer to GROUP 42 – Engine Hood.)

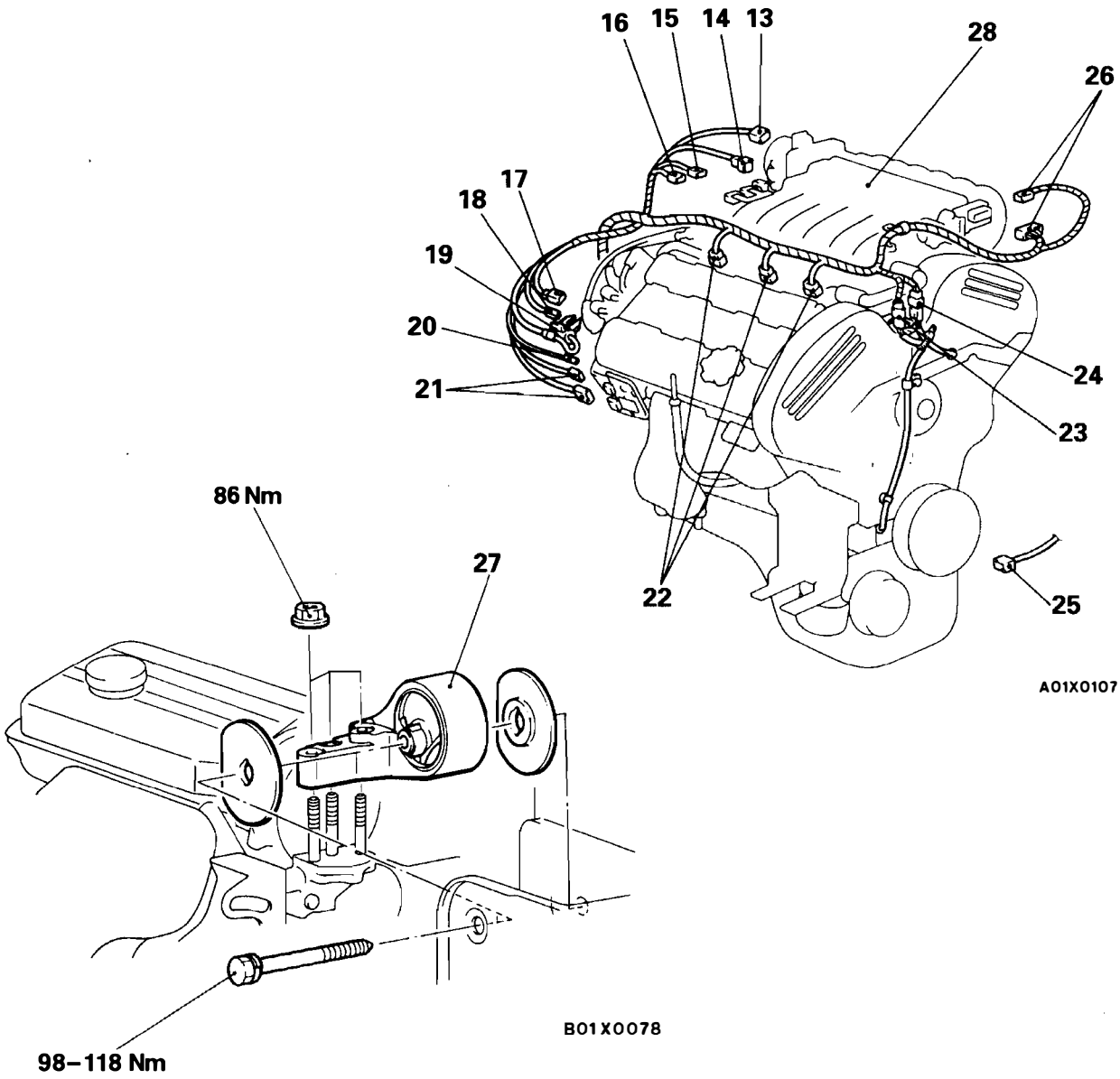


Remove steps
1. Connection for accelerator cable
2. Connection for brake booster vacuum hose
3. Connection for fuel return hose
4. Connection for fuel high pressure hose
5. Connection for purge hose
6. Connection for heater hose

〈A〉
10. Connection for A/C compressor
11. Power steering oil pressure switch connector

〈B〉
12. Connection for power steering oil pump

● Drive belt tension adjustment (Refer to P.11F-7.)
7. Drive belt (Alternator and A/C compressor or alternator)
8. Drive belt (Power steering oil pump)
9. Alternator connector



13. Idle speed control servo connector
14. Throttle position sensor connector
15. Injector harness connector
16. Knock sensor connector
17. Engine coolant temperature gauge unit connector
18. Engine coolant temperature sensor connector
19. Condenser
20. Ignition coil connector
21. Power transistor connector
22. Injector connector
23. Crankshaft angle sensor connector
24. Camshaft angle sensor connector
25. Oil level sensor connector
26. Variable induction motor connector

◇C◇ ◆B◆ 27. Engine mount bracket

◇D◇ ◆A◆ 28. Engine assembly

REMOVAL SERVICE POINTS E11F001AA

◇A◇ A/C COMPRESSOR REMOVAL

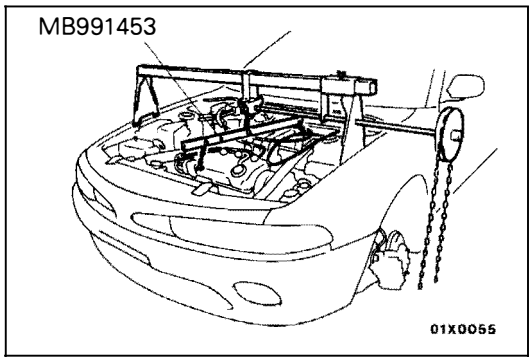
Disconnect the A/C compressor connector and remove the compressor from the compressor bracket with the hose still attached.

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

◇B◇ POWER STEERING OIL PUMP REMOVAL

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

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



◇C◇ ENGINE MOUNT BRACKET REMOVAL

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

◇D◇ ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS E11F004AA

◆A◆ ENGINE ASSEMBLY INSTALLATION

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

◆B◆ ENGINE MOUNT BRACKET INSTALLATION

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

6A1

CONTENTS

E11GA00AA

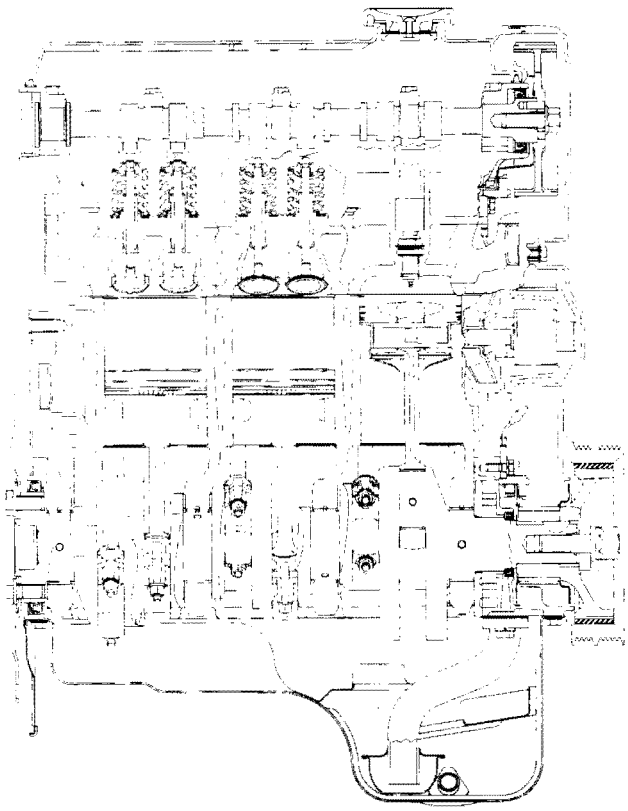
 PWDE9211

GENERAL INFORMATION

E11GB00AA

Items			6A12
Total displacement		mℓ	1,998
Bore × Stroke		mm	78.4 × 69.0
Compression ratio			10.0
Combustion chamber			Pentroof type
Camshaft arrangement			DOHC
Number of valve	Intake		12
	Exhaust		12
Valve timing	Intake		Opening BTDC11°, Closing ABDC53°
	Exhaust		Opening BBDC53°, Closing ATDC15°
Fuel system			Electronic control multipoint fuel injection
Rocker arm			Roller type
Auto-lash adjuster			Equipped
Oil level sensor			Equipped

SECTIONAL VIEW



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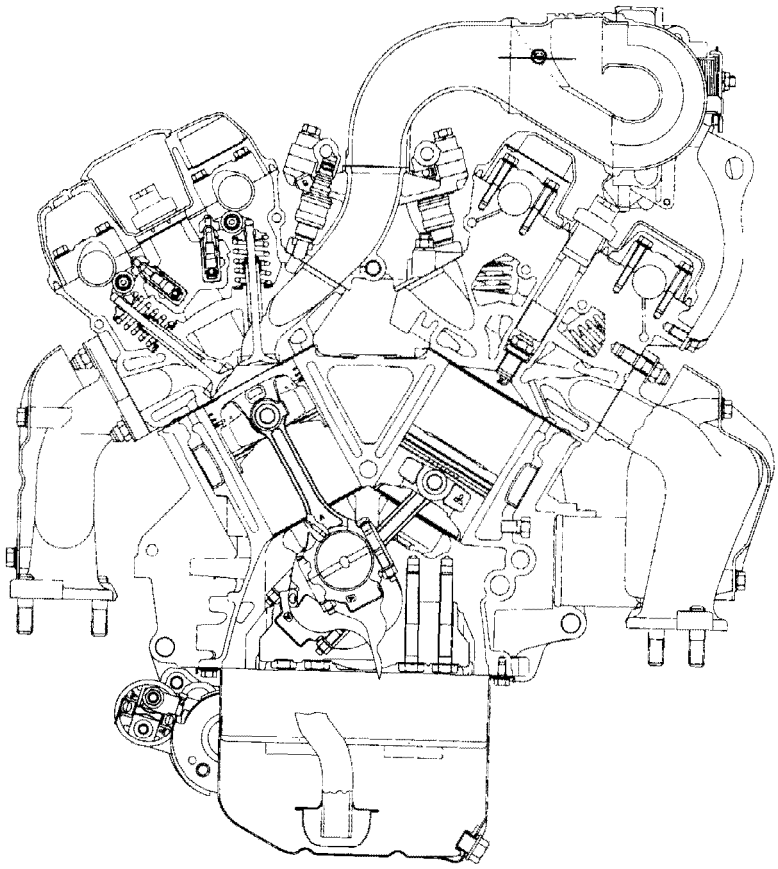


6AE0001

SERVICE SPECIFICATIONS

E11GC00AA

Items		6A12
Standard value		
Drive belt deflection	mm	
Alternator V-ribbed type		
When checked		10.5–14.0
When a new belt is installed		8.5–10.5
When a used belt is installed		11.5–12.5
Power steering oil pump		
<Vehicles without A/C>		
When Checked		8.0–11.5*1, 9.0–12.5*2
When a new belt is installed		6.5–8.0*1, 7.5–9.0*2
When a used belt is installed		9.0–10.5*1, 10.0–11.5*2
Power steering oil pump and A/C compressor		
<Vehicles with A/C>		
When checked		4.8–5.5
When a new belt is installed		4.0–4.5
When a used belt is installed		4.8–5.5
Basic ignition timing		5°±3° BTDC
Idle speed	r/min.	700 ± 100
Compression pressure (at engine speed of 250–400 r/min.)	kPa	1,250
Intake manifold vacuum	kPa	69
Timing belt tensional torque	Nm	3.0
Auto tensioner rod protrusion amount	mm	3.8–4.5
Limit		
Compression pressure (at engine speed of 250–400 r/min.)	kPa	1,050
Compression pressure difference of all cylinder	kPa	100
Cylinder head bolt shank length	mm	96.4

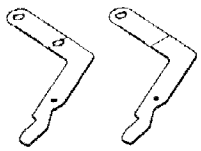
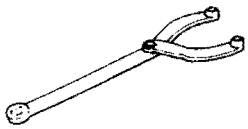
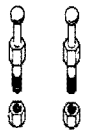
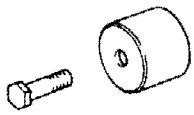
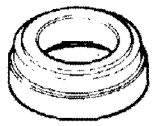
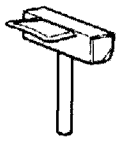
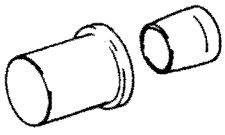
NOTE
*1: 2WS vehicles
*2: 4WS vehicles

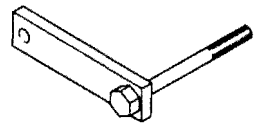
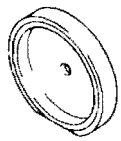
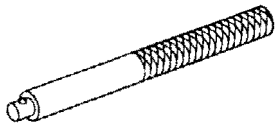
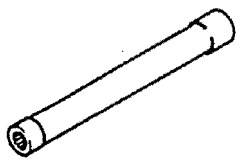
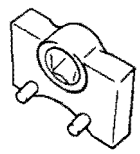
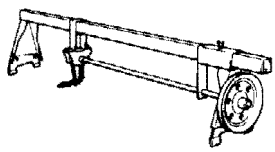
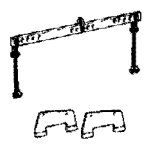
SEALANTS

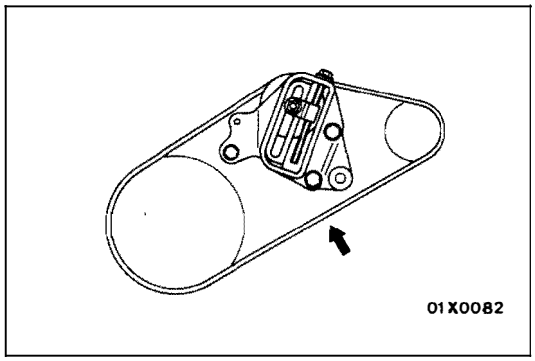
Items	Specified sealants	Remarks
Oil pan	MITSUBISHI GENUINE PART MD970389 or equivalent	Semi-drying sealant
Flywheel bolt <M/T> or drive plate bolt <A/T>	3M Stud locking 4170 or equivalent	
Rocker cover	MITSUBISHI GENUINE PART MD997110 or equivalent	Semi-drying sealant

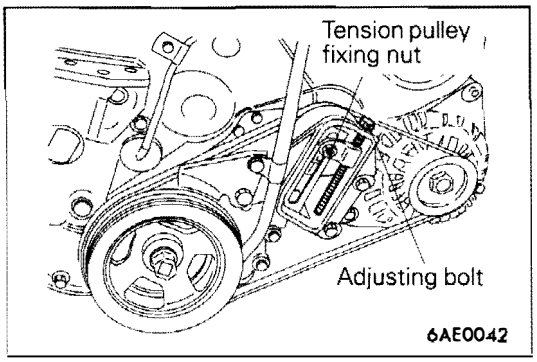
SPECIAL TOOLS

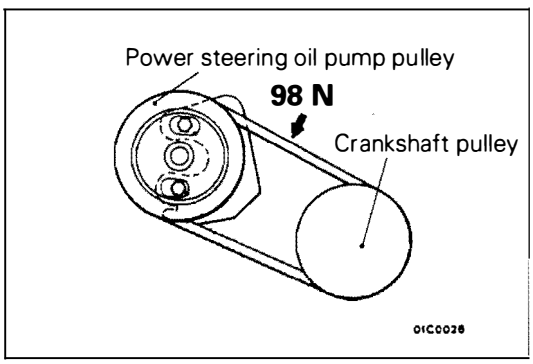
E11GD00AA

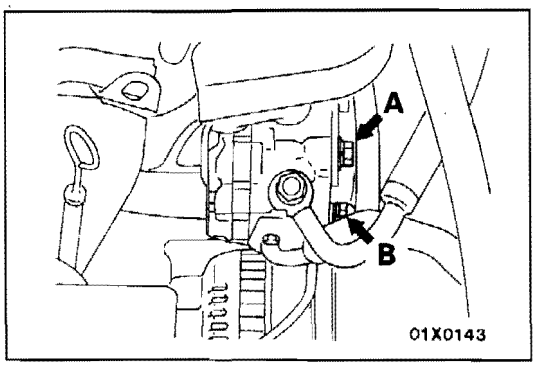
Tool	Number	Name	Use
	MD998782	Valve lifter set	Removal of roller rocker arm
	MB990767	End yoke holder	• Holding the camshaft pulley • Holding the crankshaft pulley
	MD998719 or MD998754	Crankshaft pulley holder pin	
	MD998713	Camshaft oil seal installer	Press-in of the camshaft oil seal
	MD998777	Camshaft oil seal adapter	Press-fitting the camshaft oil seal (rear bank side)
	MD998727	Oil pan remover	Removal of oil pan
	MD998717	Crankshaft front oil seal installer	Press-fitting the crankshaft front oil seal

Tool	Number	Name	Use
	MD998781	Flywheel stopper	Fixing the flywheel or drive plate
	MD998776	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal
	MB990938	Handle	
	GENERAL SERVICE TOOL	Cylinder head bolt wrench	Removing and installing the cylinder head bolt
	MD998767	Tension pulley socket wrench	Timing belt tension adjustment
	MD998716	Crankshaft wrench	Turning the crankshaft
	GENERAL SERVICE TOOL MZ203827	Mechanic, hanger, engine	Supporting the engine assembly during removal and installation of the transmission
	MB991453	Engine hanger assembly	









SERVICE ADJUSTMENT PROCEDURES

E11GF00AA

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

ALTERNATOR DRIVE BELT TENSION INSPECTION

Measure drive belt deflection by pulling or pushing at the mid point of the belt between two pulleys with a force of 100 N.

Standard value: 10.5–14.0 mm

ALTERNATOR DRIVE BELT TENSION ADJUSTMENT

E11GF00BA

1. Loosen the tension pulley fixing nut.
2. Turn the adjusting bolt to adjust the belt tension to the standard value.

   Standard value:
   Used belt: 11.5–12.5 mm
   New belt: 8.5–10.5 mm
3. Tighten the tension pulley fixing nut.

   Tightening torque: 12 Nm

POWER STEERING OIL PUMP BELT TENSION INSPECTION

E11GF00CA

<Vehicles without A/C>

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

Standard value: **8.0–11.5 mm <2WS>**
9.0–12.5 mm <4WS>

POWER STEERING OIL PUMP BELT TENSION ADJUSTMENT

E11GF00DA

<Vehicles without A/C>

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

   Standard value:
   If used belt (with correct tension) is used:
   9.0–10.5 mm <2WS>
   10.0–11.5 mm <4WS>
   If a new belt is used:
   6.5–8.0 mm <2WS>
   7.5–9.0 mm <4WS>
3. Tighten the fixing bolt (A).

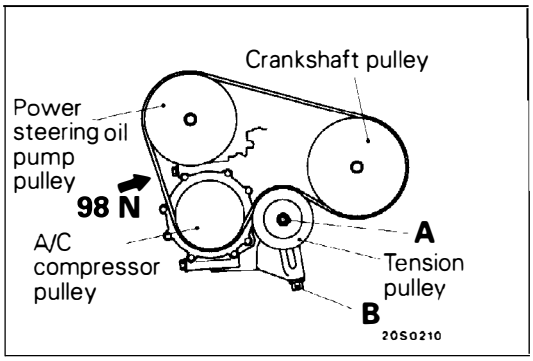
   Tightening torque: 39 Nm

4. Tighten the remaining fixing bolts.

   Tightening torque: 24 Nm

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

   Caution
   1. This checking should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).



POWER STEERING OIL PUMP AND COMPRESSOR BELT TENSION INSPECTION E11GF00EA

<Vehicles with A/C>

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

Standard value: 4.8–5.5 mm

POWER STEERING OIL PUMP AND A/C COMPRESSOR BELT TENSION ADJUSTMENT E11GF00FA

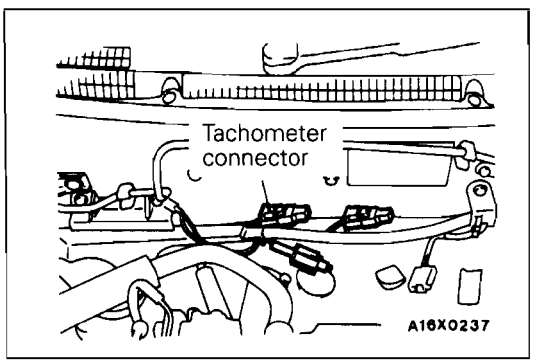
<Vehicles with A/C>

1. Loosen the tension pulley fixing bolt "A".
2. Adjust the belt tension using tension pulley adjusting bolt "B".

   Standard value:
   If used belt (with correct tension) is used: 4.8–5.5 mm
   If a new belt is used: 4.0–4.5 mm

3. Tighten the tension pulley fixing bolt "A".
4. Check the belt deflection amount and readjust if necessary.

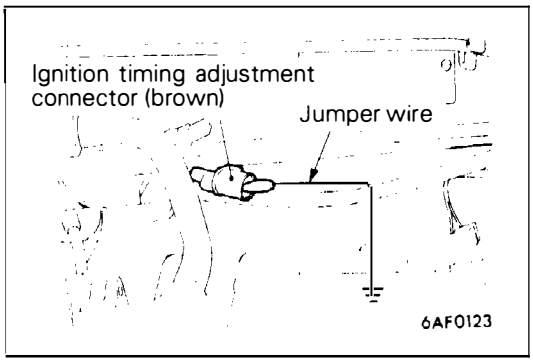
   Caution
   1. This checking should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).
   2. Check to be sure that the power steering oil pump has been secured in a position near the front of the vehicle. (Refer to GROUP 37A – Oil Pump.)



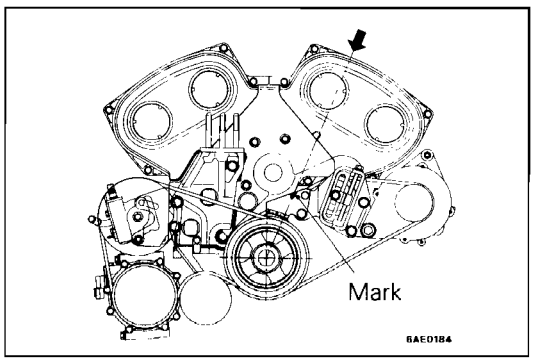
IGNITION TIMING INSPECTION AND ADJUSTMENT E11GF01AA

1. Before inspection and adjustment, set the vehicle to the following condition.
   - Engine coolant temperature: 80 – 95°C
   - Lights, power cooling fan and all accessories: OFF
   - Transmission: Neutral (A/T: P range)
2. Insert a paper clip (Gem clip) into the 1-pin connector (blue) as shown in the illustration at left.

3. Connect a primary voltage detection type tachometer to the paper clip.
   NOTE
   Do not use the MUT-II. When the MUT-II is connected to the diagnosis connector, the ignition timing will not be the basic ignition timing but be ordinary timing.
4. Install the timing light.
5. Start the engine and run it at idle speed.
6. Check that the idle speed is approximately 500 – 900 r/min.
7. Turn the ignition switch to "OFF".



8. Disconnect the waterproof female connector from the ignition timing adjustment connector (brown).
9. Use jumper wire to earth the ignition timing adjustment terminal.
   NOTE
   Earthing the ignition timing adjustment terminal will change the ignition timing to basic ignition timing.
10. Start the engine and run it at idle.



11. Inspect the basic ignition timing from a line that passes through the mark on the timing indicator bracket shown in the illustration and the centre of the crankshaft.

    Standard value: 5° ± 3° BTDC

12. If the idle speed is outside the standard value, inspect the MPI components by referring to GROUP 13A – Trouble-shooting.
13. Stop the engine, disconnect the jumper wire from the ignition timing adjustment connector (brown), and return the connector to its original condition.
14. Start the engine and check to be sure that the ignition timing is at the standard value.

    Standard value: Approx. 10° BTDC

    NOTE
    1. The ignition timing may fluctuate within a range of ± 7°, but this will not be a problem.
    2. At high altitudes, the ignition timing will be advanced a further 5° from the standard value.

IDLE SPEED INSPECTION E11GF02AA

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

   Standard value: 5° ± 3° BTDC

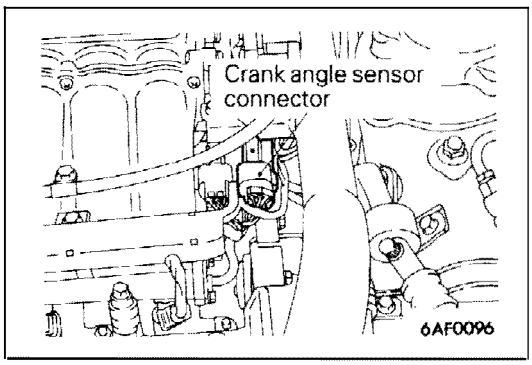
3. After turning the ignition switch to OFF, connect the MUT-II tester to the diagnosis connector (white).
4. Start the engine and run it at idle.
5. Run the engine at idle for 2 minutes.
6. Check the idle speed. Select item No. 38 and take a reading of the idle speed.

   Curb idle speed: 700 ± 100 r/min.

   NOTE
   1. The idle speed is adjusted automatically by the idle speed control (ISC) 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.
7. If the idle speed is outside the standard value, inspect the MPI components by referring to GROUP 13A – Trouble-shooting.

COMPRESSION PRESSURE INSPECTION E11GF03AA

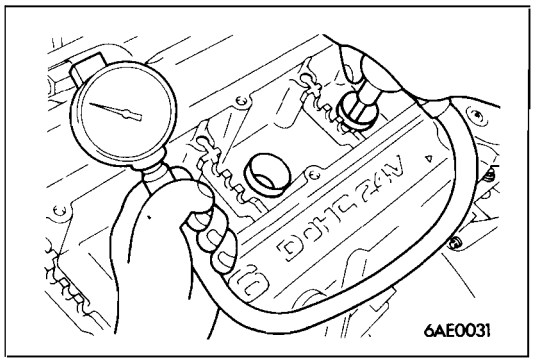
1. Before inspection, check that the engine oil, starter and battery are normal. Also, set the vehicle to the following condition:
   - Engine coolant temperature: 80–95°C
   - Lamps, electric cooling fan and all accessories: OFF
   - Transmission: Neutral (P range on vehicle with A/T)
2. Disconnect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



4. Disconnect the crank angle sensor connector.

   NOTE
   Doing this will prevent the engine control unit from carrying out ignition and fuel injection.
5. Cover the spark plug hole with a shop towel etc., and after the engine has been cranked, check that no foreign material is adhering to the shop towel.

   Caution
   1. **Keep away from the spark plug hole when cranking.**
   2. **If compression is measured with water, oil, fuel etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the spark plug hole, which is dangerous.**



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

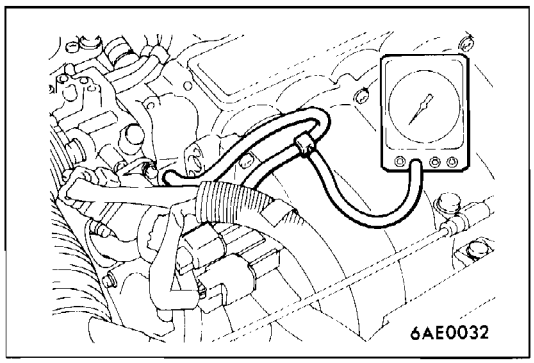
   Standard value (at engine speed of 250–400 r/min.): 1,250 kPa
   Limit: min. 1,050 kPa

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

   Limit: max. 100 kPa

9. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the spark plug hole, and repeat the operations in steps (7) and (8).
   1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
   2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
10. Connect the crank angle sensor connector.
11. Install the spark plugs and spark plug cables.
12. Use the MUT-II to erase the self-diagnosis codes.

    NOTE
    This will erase the problem code resulting from the crank angle sensor connector being disconnected.



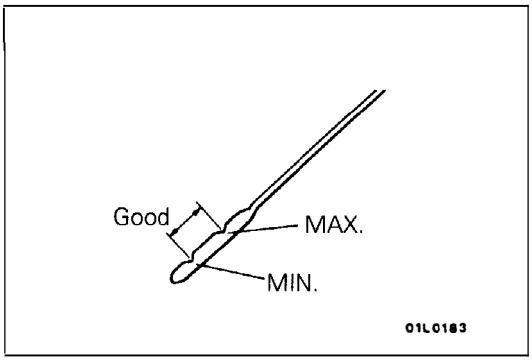
MANIFOLD VACUUM INSPECTION E11GF04AA

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

   Standard value: Approx. 69 kPa

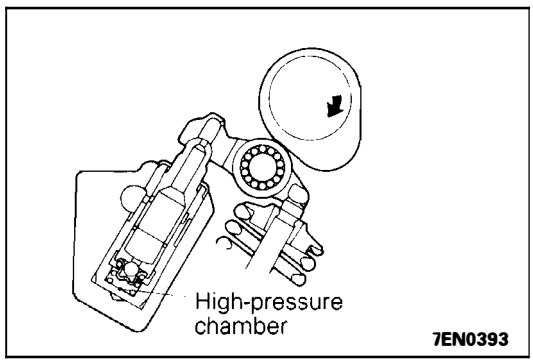
LASH ADJUSTER CHECK E11FF05AA

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



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

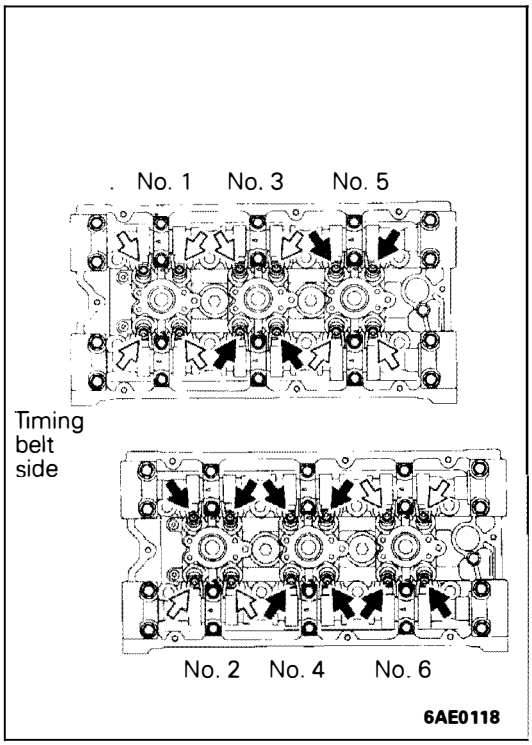
   NOTE
   1. If the oil amount is small, air will be sucked from the oil strainer and mixed in the oil passage.
   2. If the oil amount is excessive, the oil will be stirred by the crank and mixed with a large amount of air.
   3. Air and oil can not be separated easily in the deteriorated oil, and the amount of air mixed in the oil increases.

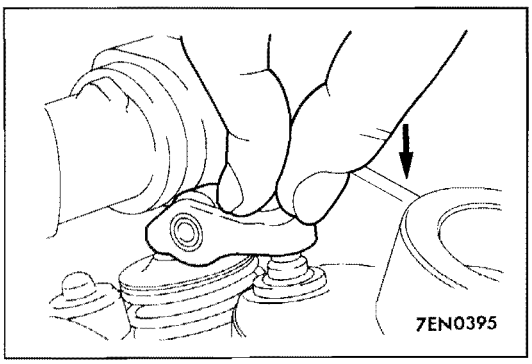


If such mixed-in air enters the high pressure chamber in the lash adjuster, the air in the high-pressure chamber will be compressed while the valve is opened, the lash adjuster will be excessively compressed and abnormal noise will be produced when the valve is closed.
This is the same phenomenon which occurs when the valve clearance is improperly adjusted to be excessively large.
However, it will return to be normal if the air entrapped in the adjuster is released in this case.

2. Start the engine, and slowly race* it several times (10 times or less).
   If the abnormal noise is eliminated by racing the engine, it means that the air is released from the high-pressure chamber of the lash adjuster and the function of the lash adjuster is returned to normal.
   * Gradually increase the engine speed from the idle speed to 3,000 r/min. (for 30 seconds), and then gradually slow down the engine to the idling speed (for 30 seconds).

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





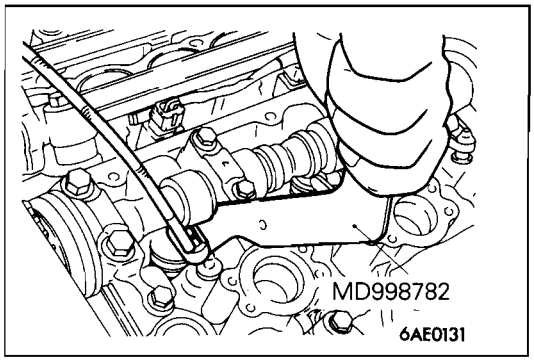
3. If any abnormal noise is not eliminated by racing, check the lash adjuster.
   (1) Stop the engine.
   (2) Set the engine so that cylinder No. 1 is positioned at the top dead center of the compression.
   (3) Press the rocker arm at the area indicated by the ⇦ arrow mark to check whether the rocker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

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

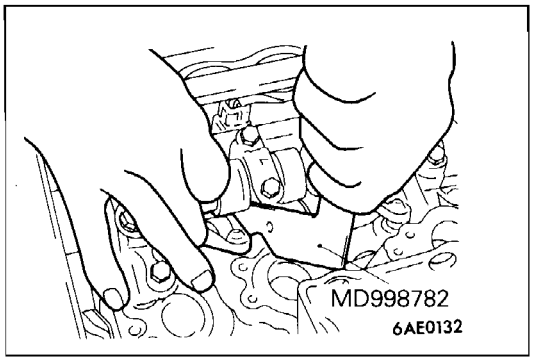
   Moreover, if it is felt to be so hard that the rocker arm is not lowered when it is pressed, the lash adjuster is normal. Check for other causes of the abnormality.

4 Lash adjuster replacement procedure

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



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



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

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

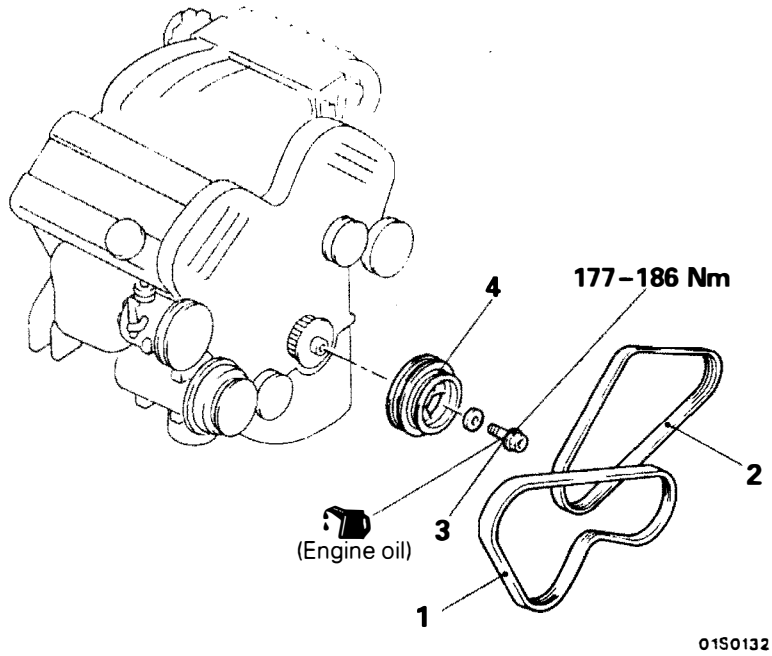
CRANKSHAFT PULLEY

E11GG00AA

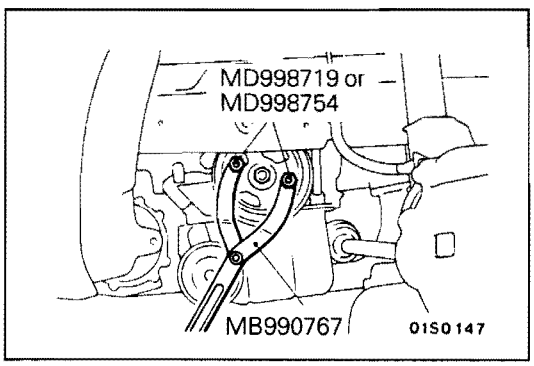
REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Cover Removal

Post-installation Operation
(1) Under Cover Installation
(2) Drive Belt Tension Adjustment (Refer to 11G-7.)



Removal steps
1. Drive belt (Power steering oil pump, or A/C compressor and power steering oil pump)
2. Drive belt (Alternator)
◇A◇ ◆A◆ 3. Crankshaft bolt
◇A◇ ◆A◆ 4. Crankshaft pulley



REMOVAL AND INSTALLATION SERVICE POINT

E11EG01AA

◇A◇◆A◆CRANKSHAFT BOLT/CRANKSHAFT PULLEY REMOVAL AND INSTALLATION

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

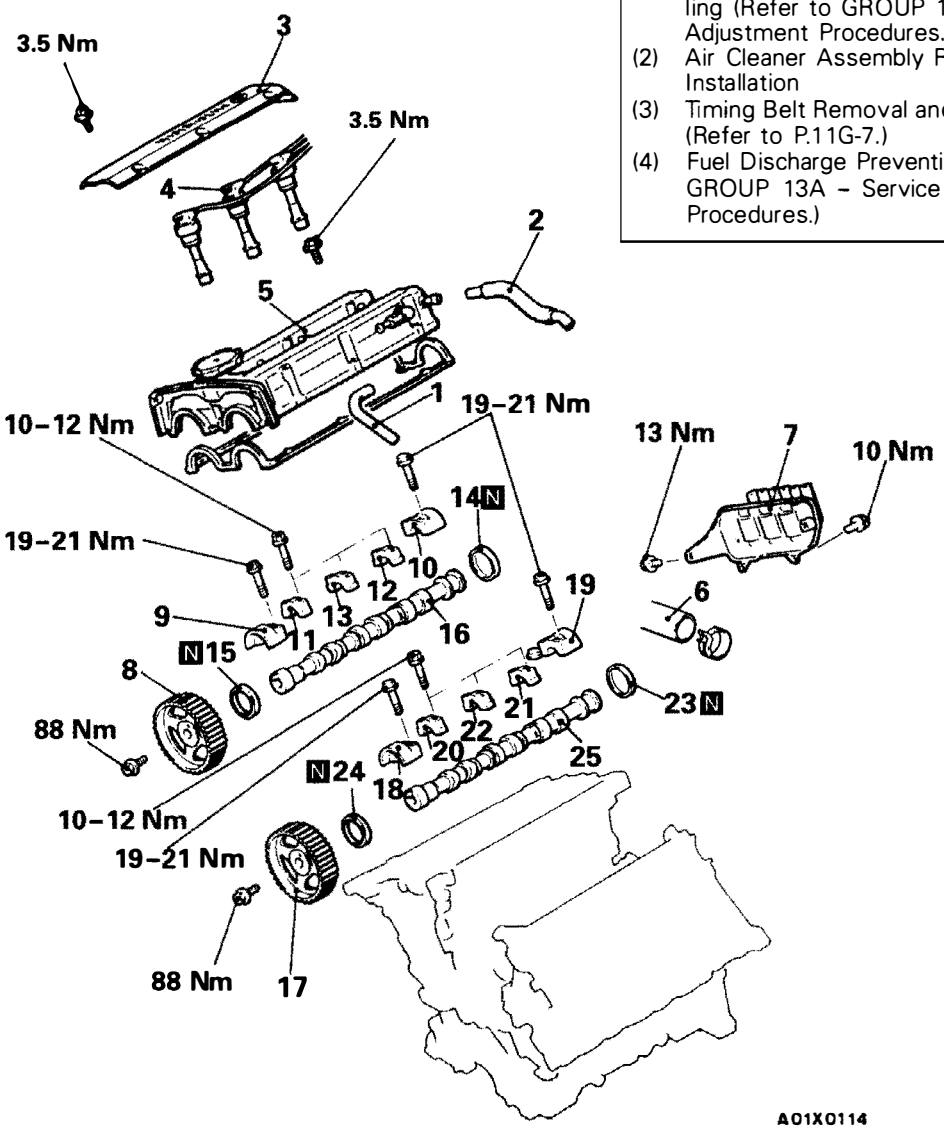
CAMSHAFT, CAMSHAFT OIL SEAL

E11GH00AA

REMOVAL AND INSTALLATION

<Front bank>

Pre-removal and Post-installation Operation
<Front bank>
(1) Engine Coolant Draining and Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(2) Air Cleaner Assembly Removal and Installation
(3) Timing Belt Removal and Installation (Refer to P.11G-7.)
(4) Fuel Discharge Prevention (Refer to GROUP 13A – Service Adjustment Procedures.)

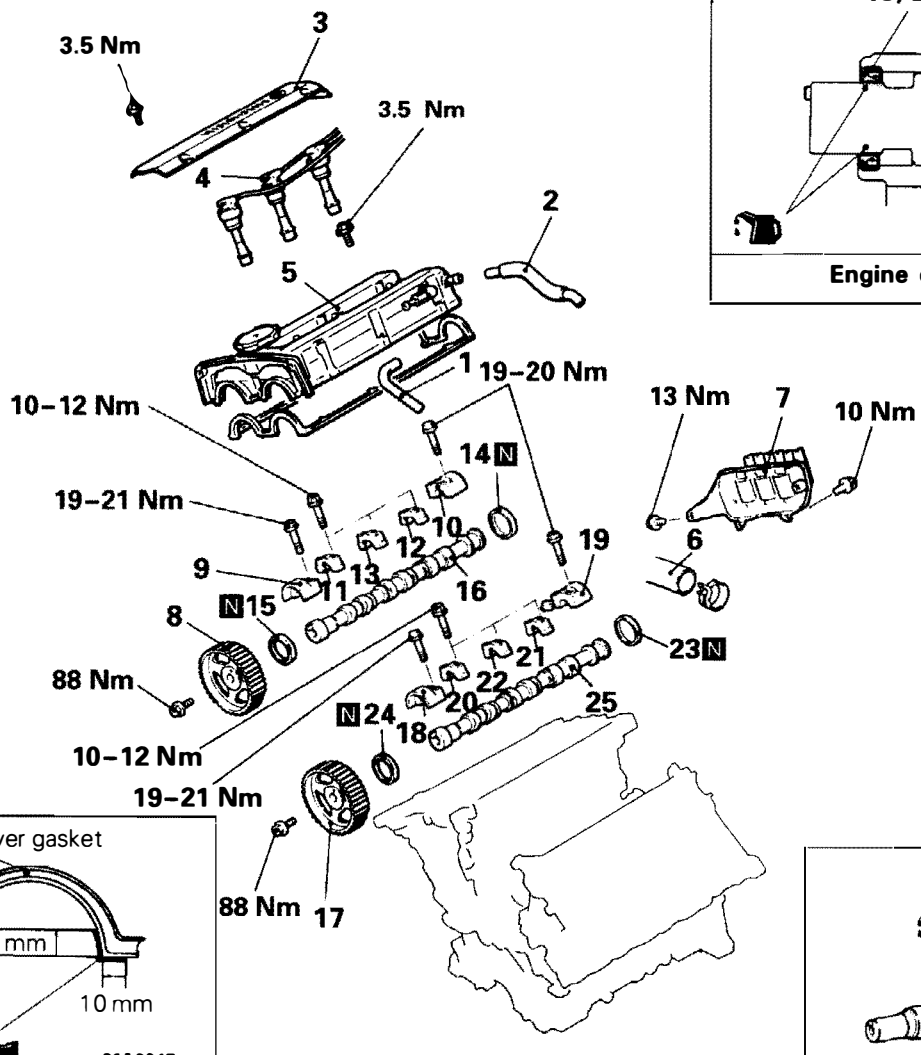


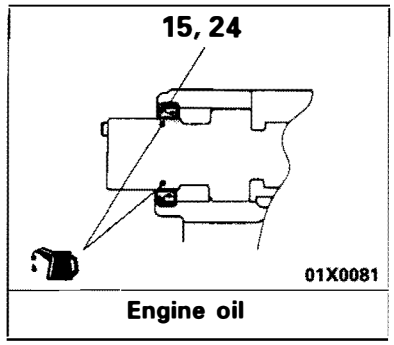
A01X0114

Front bank removal steps

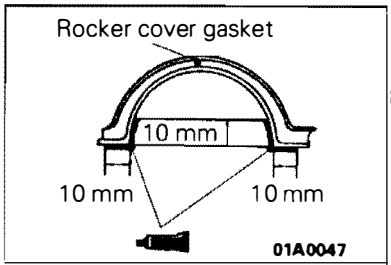
1. PCV hose
2. Blow-by hose
3. Centre cover
4. Spark plug cable
5. Rocker cover
6. Radiator lower hose connection
7. Ignition coil
◇A◇ 8. Camshaft sprocket
9. Bearing cap, front
10. Bearing cap, rear
11. Bearing cap, No. 2
12. Bearing cap, No. 4
13. Bearing cap, No. 3
14. Circular packing
15. Camshaft oil seal
16. Camshaft (exhaust side)
◇A◇ 17. Camshaft sprocket
18. Bearing cap, front
19. Bearing cap, rear
20. Bearing cap, No. 2
21. Bearing cap, No. 4
22. Bearing cap, No. 3
23. Circular packing
24. Camshaft oil seal
25. Camshaft (intake side)

<Front bank>

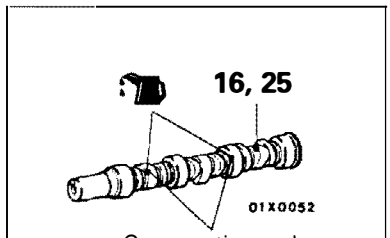




Engine oil



Specified sealant:
MITSUBISHI GENUINE PART MD997110 or equivalent



Cam section and journal section

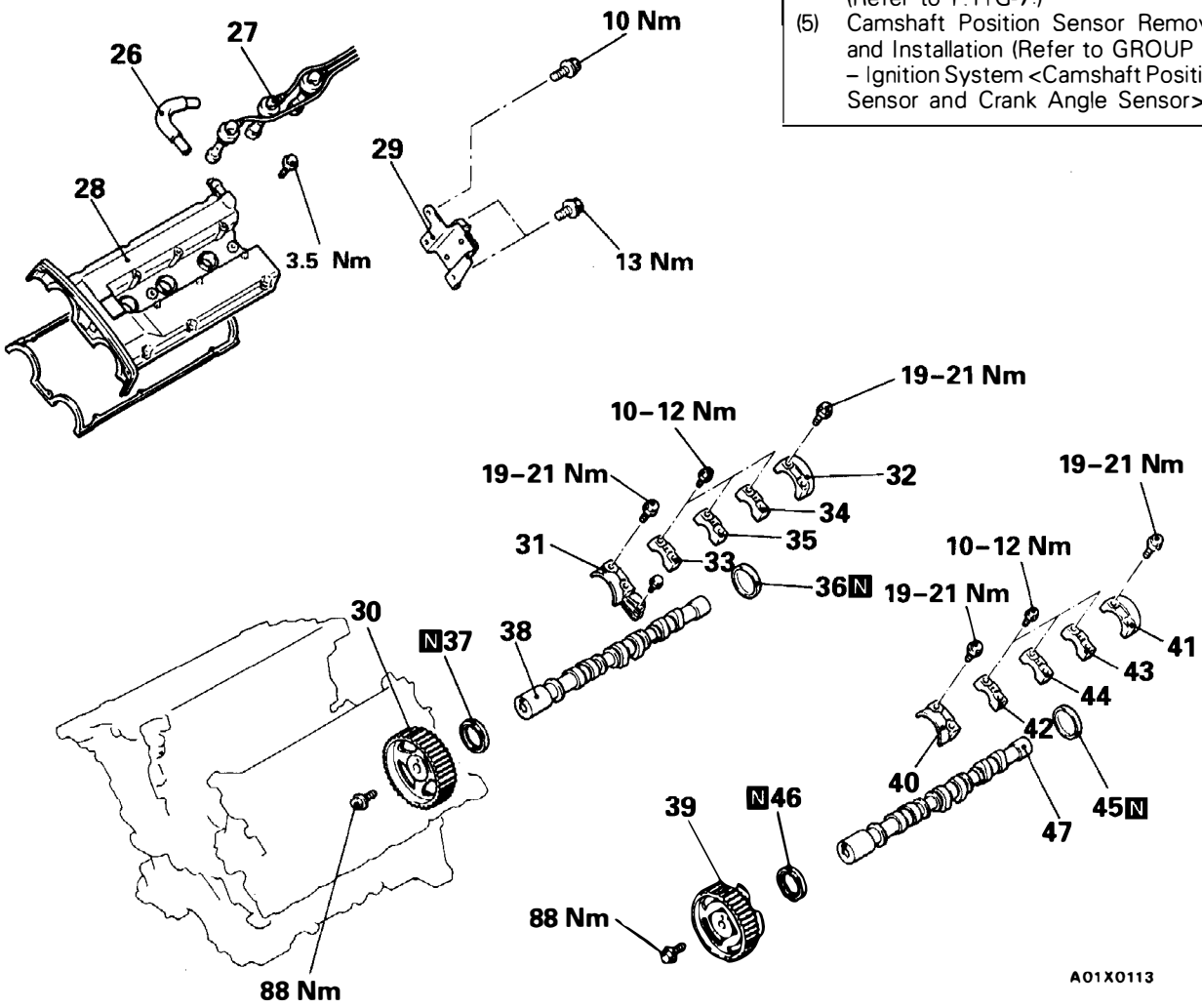
Engine oil

Front bank installation steps

- ◆A◆ 25. Camshaft (intake side)
- ◆B◆ 22. Bearing cap, No. 3
- ◆B◆ 21. Bearing cap, No. 4
- ◆B◆ 20. Bearing cap, No. 2
- ◆B◆ 19. Bearing cap, rear
- ◆B◆ 18. Bearing cap, front
- ◆C◆ 24. Camshaft oil seal
- ◆D◆ 23. Circular packing
- ◆E◆ 17. Camshaft sprocket
- ◆A◆ 16. Camshaft (exhaust side)
- ◆B◆ 13. Bearing cap, No. 3
- ◆B◆ 12. Bearing cap, No. 4
- ◆B◆ 11. Bearing cap, No. 2
- ◆B◆ 10. Bearing cap, rear
- ◆B◆ 9. Bearing cap, front
- ◆C◆ 15. Camshaft oil seal
- ◆D◆ 14. Circular packing
- ◆E◆ 8. Camshaft sprocket
- 7. Ignition coil
- 6. Radiator lower hose connection
- 5. Rocker cover
- 4. Spark plug cable
- 3. Center cover
- 2. Blow-by hose
- 1. PCV hose

<Rear bank>

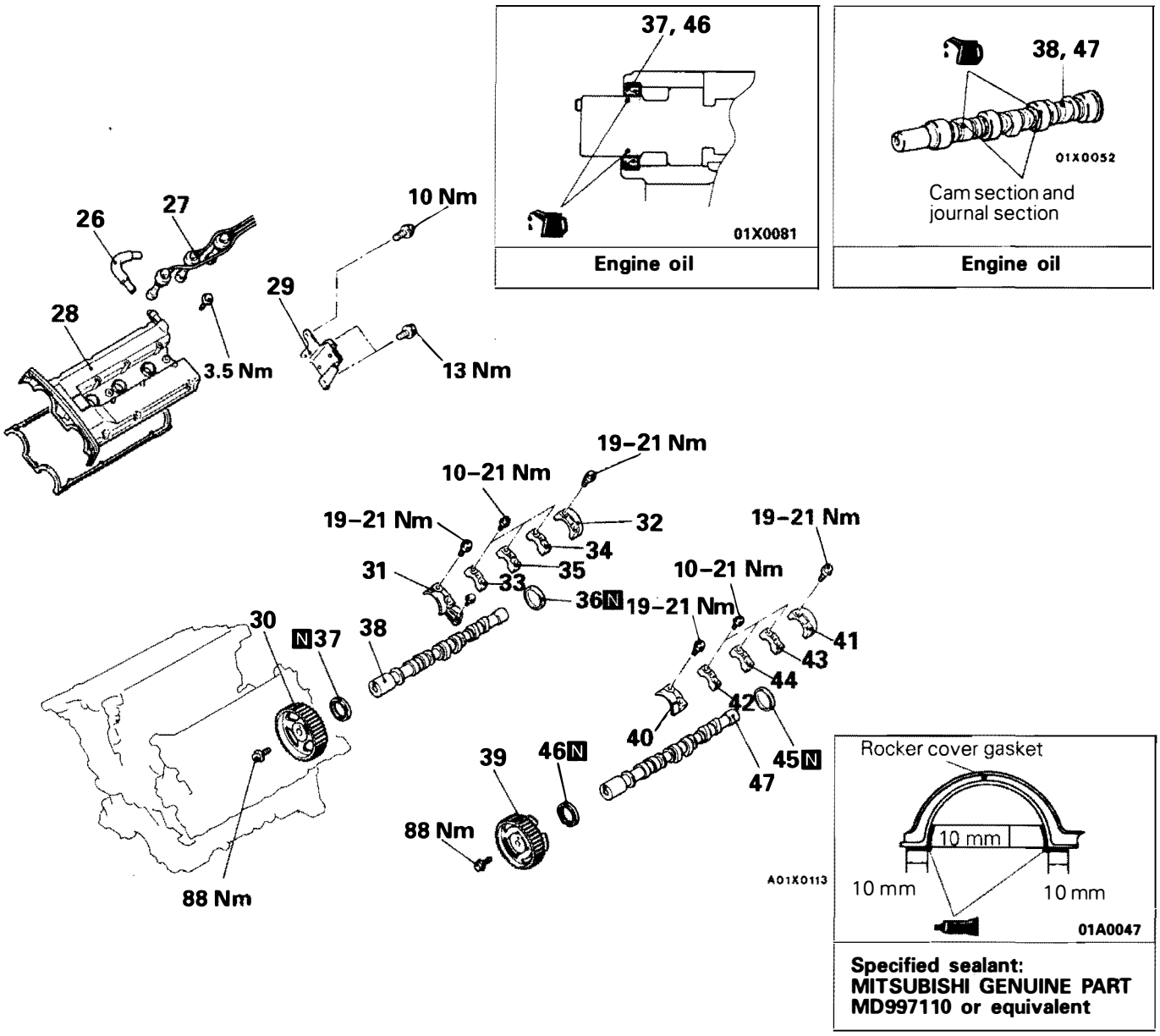
Pre-removal and Post-installation Operation
<Rear bank>
(1) Engine Coolant Draining and Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(2) Air Cleaner Assembly Removal and Installation
(3) Air Intake Plenum Removal and Installation (Refer to GROUP 15 – Intake Manifold.)
(4) Timing Belt Removal and Installation (Refer to P.11G-7.)
(5) Camshaft Position Sensor Removal and Installation (Refer to GROUP 16 – Ignition System <Camshaft Position Sensor and Crank Angle Sensor>)



Rear bank removal steps

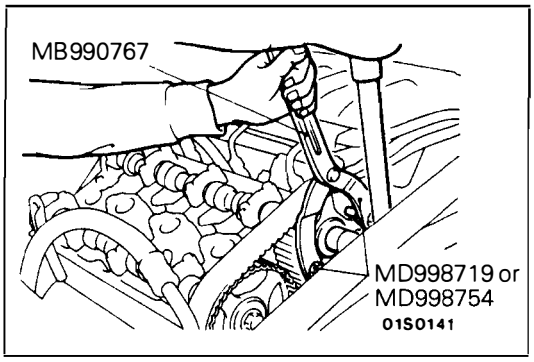
26. Breather hose
27. Spark plug cable
28. Rocker cover
29. Power transistor
30. Camshaft sprocket
31. Bearing cap, front
32. Bearing cap, rear
32. Bearing cap, No. 2
34. Bearing cap, No. 4
35. Bearing cap, No. 3
36. Circular packing
37. Camshaft oil seal
38. Camshaft (intake side)
39. Camshaft sprocket
40. Bearing cap, front
41. Bearing cap, rear
42. Bearing cap, No. 2
43. Bearing cap, No. 4
44. Bearing cap, No. 3
45. Circular packing
46. Camshaft oil seal
47. Camshaft (exhaust side)

<Rear bank>



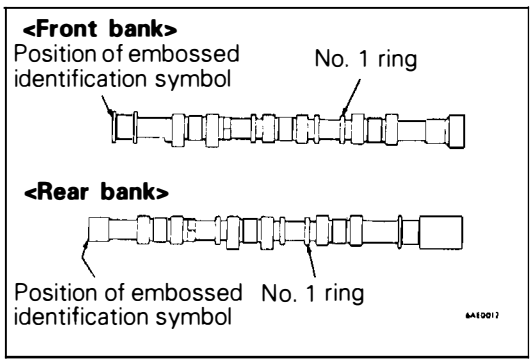
Rear bank installation steps

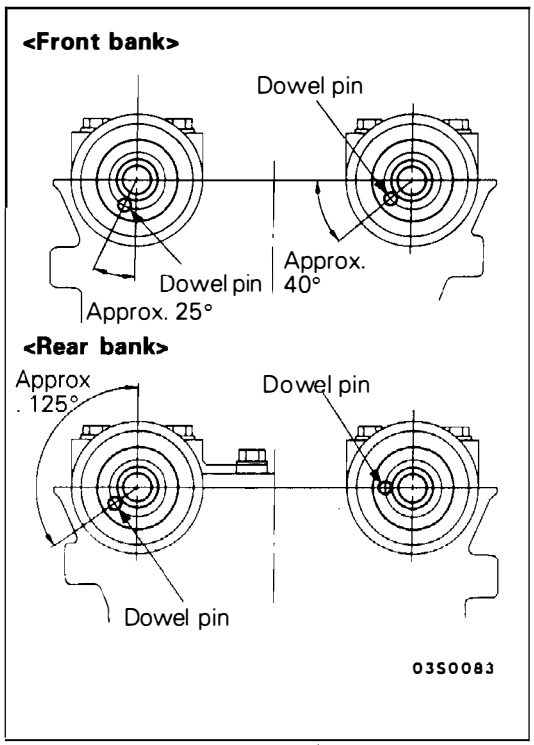
- ◆A◆ 47. Camshaft (exhaust side)
- ◆B◆ 44. Bearing cap, No. 3
- ◆B◆ 43. Bearing cap, No. 4
- ◆B◆ 42. Bearing cap, No. 2
- ◆B◆ 41. Bearing cap, rear
- ◆B◆ 40. Bearing cap, front
- ◆C◆ 46. Camshaft oil seal
- ◆D◆ 45. Circular packing
- ◆E◆ 39. Camshaft sprocket
- ◆A◆ 38. Camshaft (intake side)
- ◆B◆ 35. Bearing cap, No. 3
- ◆B◆ 34. Bearing cap, No. 4
- ◆B◆ 33. Bearing cap, No. 2
- ◆B◆ 32. Bearing cap, rear
- ◆B◆ 31. Bearing cap, front
- ◆C◆ 37. Camshaft oil seal
- ◆D◆ 36. Circular packing
- ◆E◆ 30. Camshaft sprocket
- 29. Power transistor
- 28. Rocker cover
- 27. Spark plug cable
- 26. Breather hose



REMOVAL SERVICE POINT E11GH01AA

〈A〉 CAMSHAFT SPROCKET REMOVAL





INSTALLATION SERVICE POINTS E11GH04AA

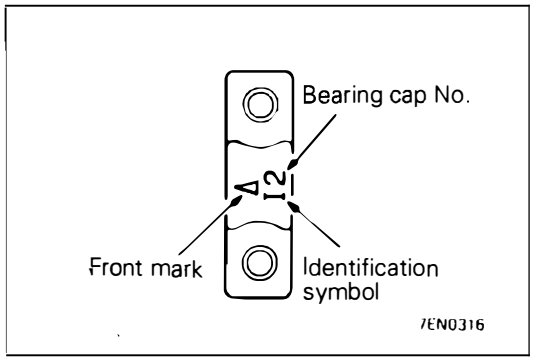
▶A◀ CAMSHAFT INSTALLATION

(1) Check to be sure that the rocker arms are correctly installed to the valves and lash adjusters.
(2) Apply engine oil to the cams and journals of the camshafts.
(3) Install the camshafts to the cylinder head, being careful not to confuse the front and rear banks and the intake and exhaust sides.

NOTE
The intake and exhaust sides can be identified by means of the identification symbols at the rear end of the camshafts and the diameters of the No.1 rings.

	Identification symbol	Diameter of No.1 ring
Camshaft (intake side)	2	30 mm
Camshaft (exhaust side)	B	27 mm

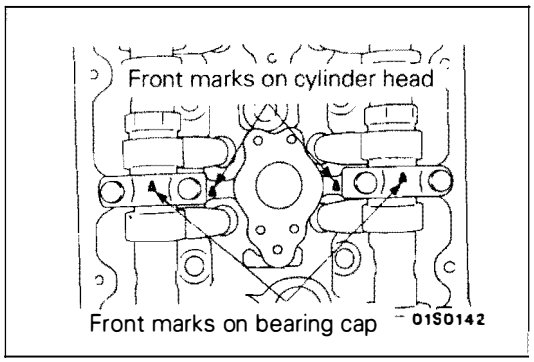
(4) Set the camshaft dowel pins in the positions shown in the illustration.



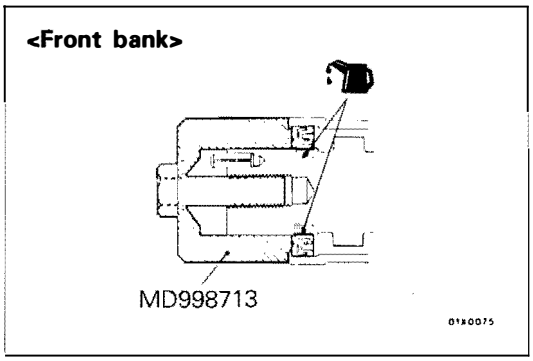
▶B◀ BEARING CAP INSTALLATION

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

Identification symbol: Camshaft (intake side) I
Camshaft (exhaust side) E

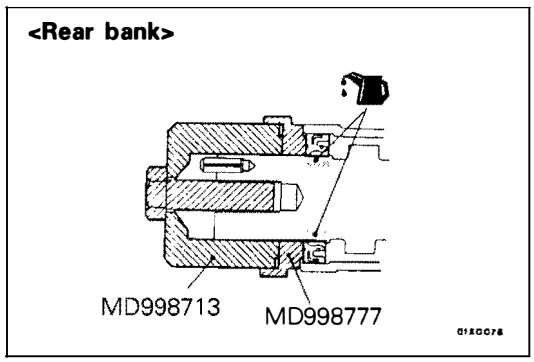


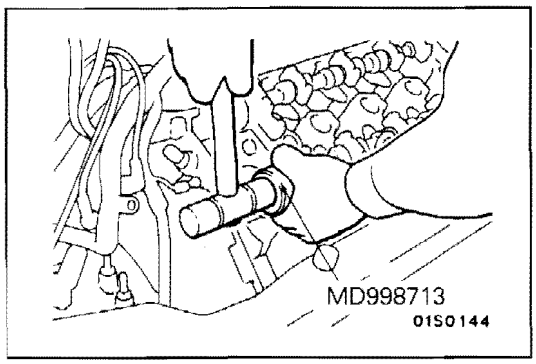
(2) After provisionally tightening the bearing caps in 2 – 3 turns, tighten to the specified torque.



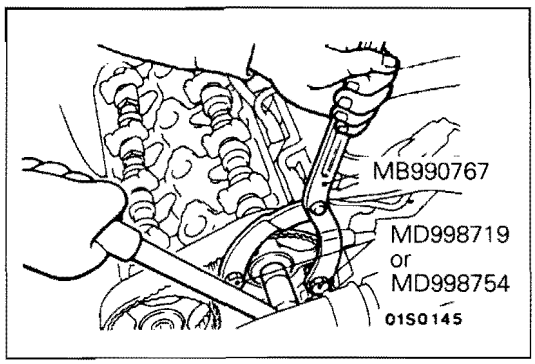
◆C◆ CAMSHAFT OIL SEAL INSTALLATION

(1) Apply engine oil to the entire circumference of the oil seal lip.
(2) Press-fit the oil seal as shown in the illustration.





◆D◆ CIRCULAR PACKING INSTALLATION



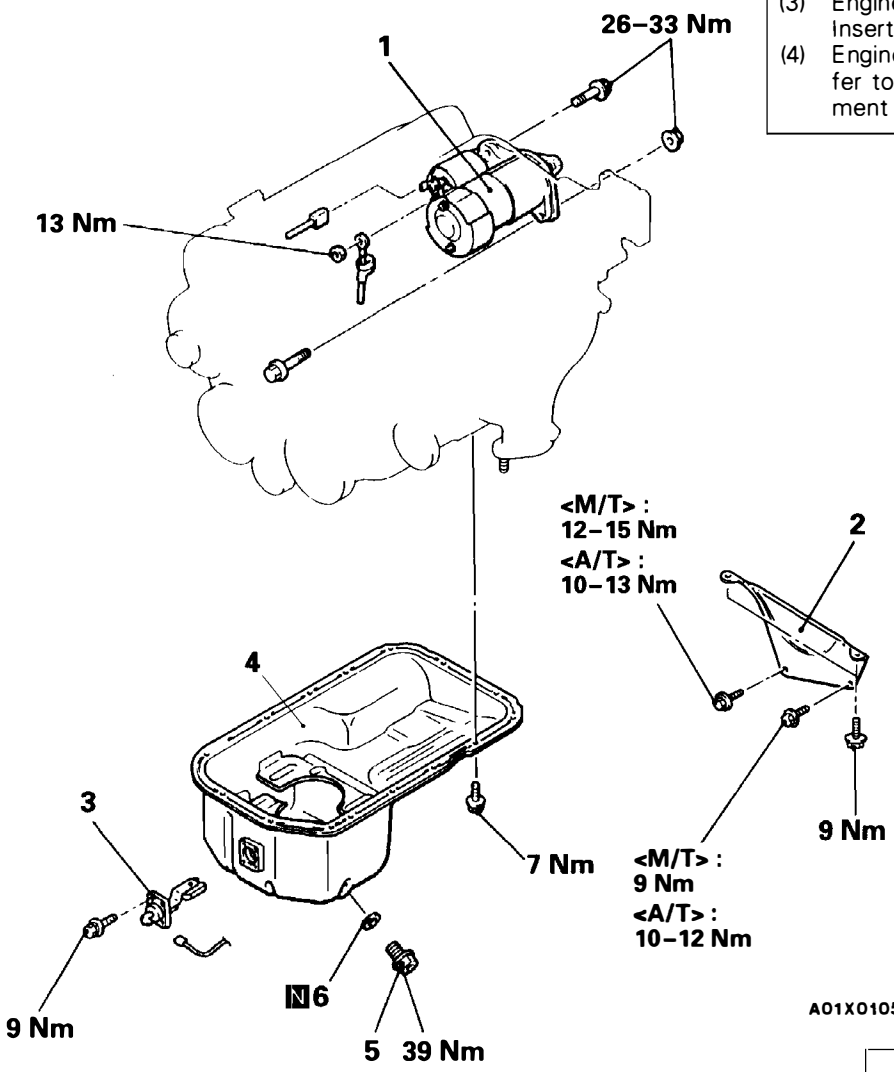
◆E◆ CAMSHAFT SPROCKET INSTALLATION

OIL PAN

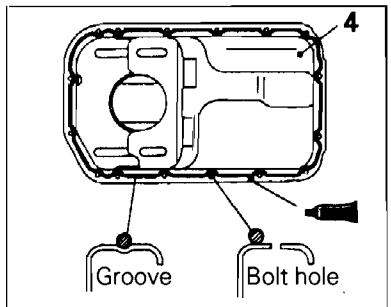
E11GI00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Under Cover Removal and Installation
(2) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(3) Engine Oil Level Gauge Removal and Insertion
(4) Engine Oil Draining and Refilling (Refer to GROUP 12 – Service Adjustment Procedures.)

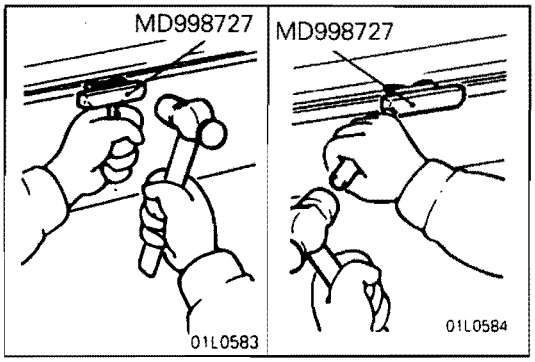


A01X0105



Specified sealant:
MITSUBISHI GENUINE PART
MD970389 or equivalent

Removal steps
1. Starter motor
2. Bell housing cover
3. Engine oil level sensor
◇A◇ ◗B◖ 4. Oil pan
5. Drain plug
◗A◖ 6. Gasket

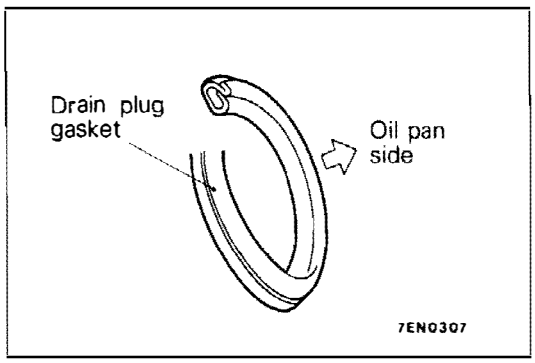


REMOVAL SERVICE POINT E11EM01AA

◇A◇ OIL PAN REMOVAL

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

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



INSTALLATION SERVICE POINTS E11EM04AA

◆A◆ GASKET INSTALLATION

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

◆B◆ OIL PAN INSTALLATION

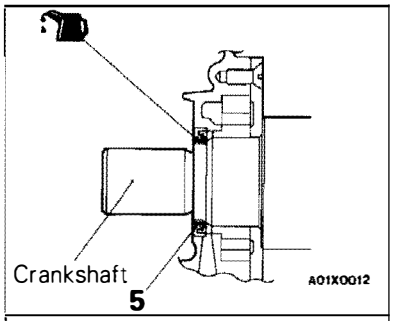
Caution
After cleaning the oil pan mounting bolt holes in the oil seal case, the oil pan should be installed.

CRANKSHAFT FRONT OIL SEAL

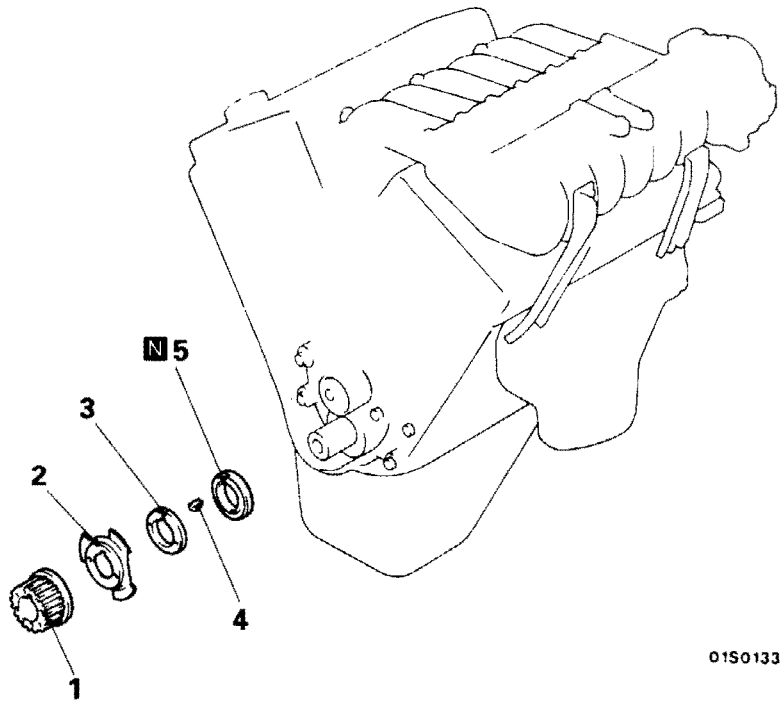
E11GJ00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Timing Belt Removal and Installation (Refer to P.11G-31.)
(2) Crank Angle Sensor Removal and Installation (Refer to GROUP 16 – Ignition System <Camshaft Position Sensor and Crank Angle Sensor>)

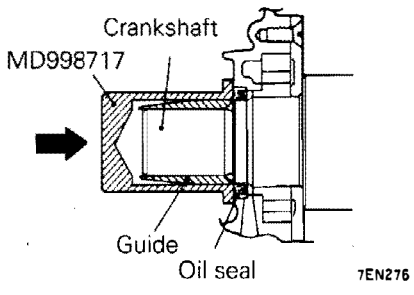


Engine oil



Removal steps

1. Crankshaft sprocket
2. Crankshaft sensing blade
3. Crankshaft spacer
4. Key
◆A◆ 5. Crankshaft front oil seal



INSTALLATION SERVICE POINT

E11GJ04AA

◆A◆ CRANKSHAFT FRONT OIL SEAL INSTALLATION

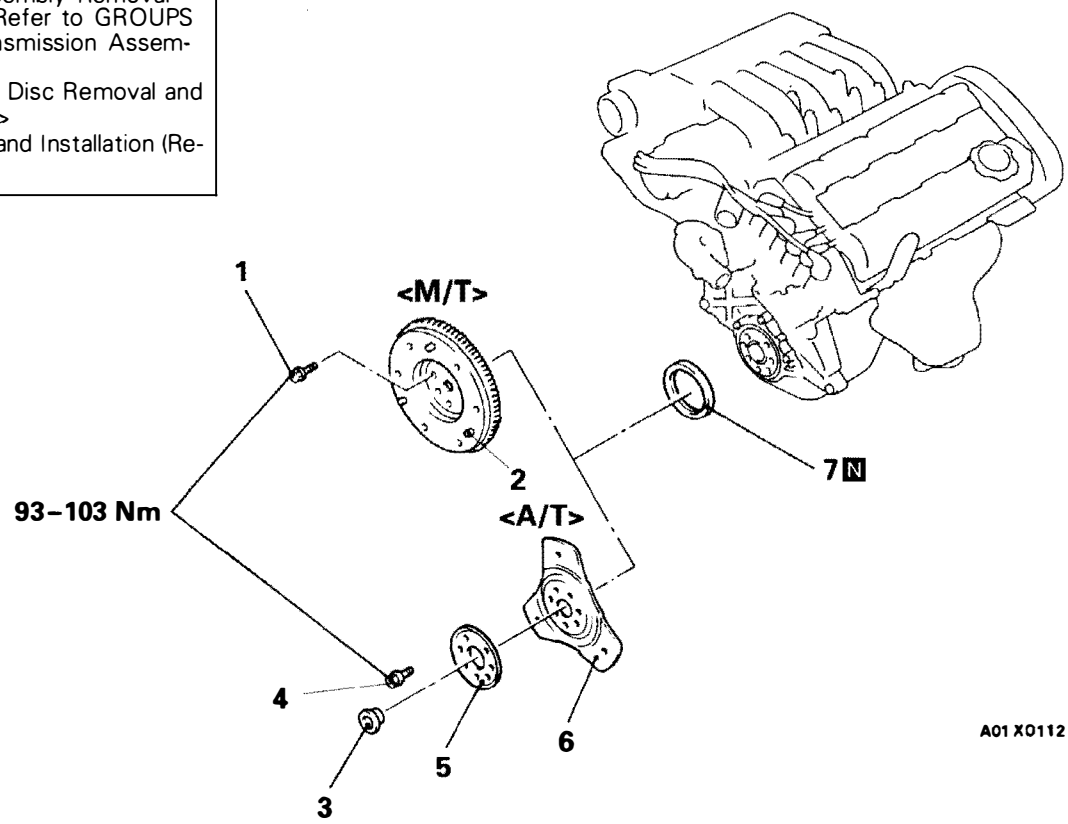
(1) Apply a small amount of engine oil to the entire circumference of the oil seal lip.
(2) Tap the oil seal until it is flush with the oil seal case.

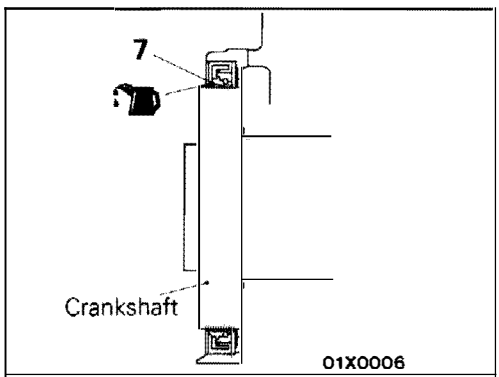
CRANKSHAFT REAR OIL SEAL

E11GK00AA

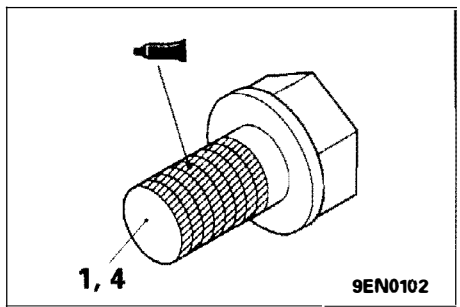
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Transmission Assembly Removal and Installation (Refer to GROUPS 22 and 23 – Transmission Assembly.)
(2) Clutch Cover and Disc Removal and Installation <M/T>
(3) Oil Pan Removal and Installation (Refer to P.11G-22.)





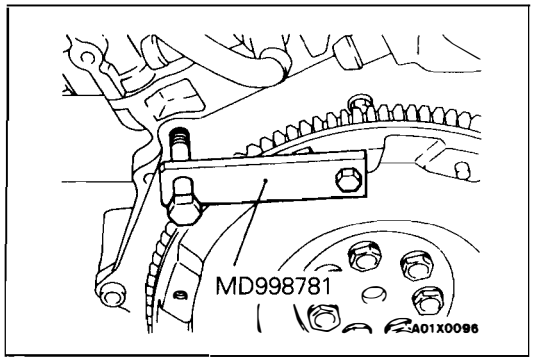
Engine oil



Specified sealant:
3M stud locking 4170 or equivalent

Removal steps

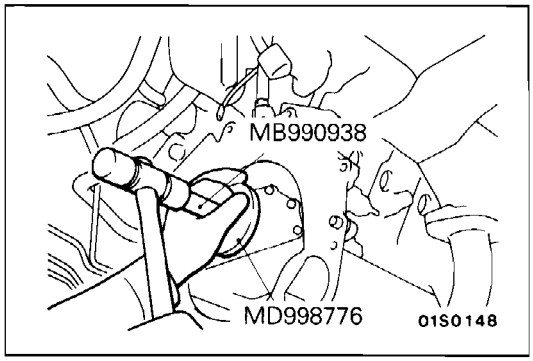
◇A◇ ◆B◆ 1. Flywheel bolt
2. Flywheel } <M/T>
3. Crankshaft bushing
◇A◇ ◆B◆ 4. Drive plate bolt
5. Adaptor plate
6. Drive plate } <A/T>
◆A◆ 7. Crankshaft rear oil seal



REMOVAL SERVICE POINT E11DK01AA

◇A◇ FLYWHEEL BOLT <M/T>/DRIVE PLATE BOLT REMOVAL

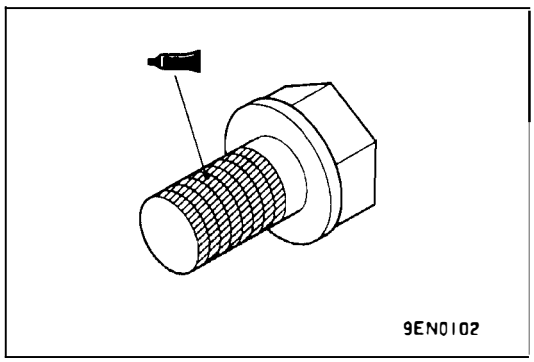
Use the special tool to secure the flywheel or drive plate, and remove the bolt.



INSTALLATION SERVICE POINTS E11GK04AA

◆A◆ CRANKSHAFT REAR OIL SEAL INSTALLATION

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



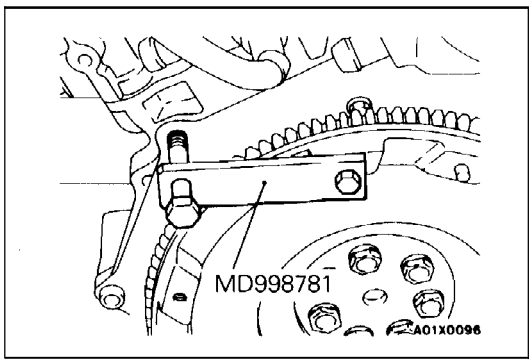
◆B◆ DRIVE PLATE BOLT <A/T> /FLYWHEEL BOLT INSTALLATION

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

Specified sealant: 3M Stud locking 4170 or equivalent

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

Specified torque: 93–103 Nm



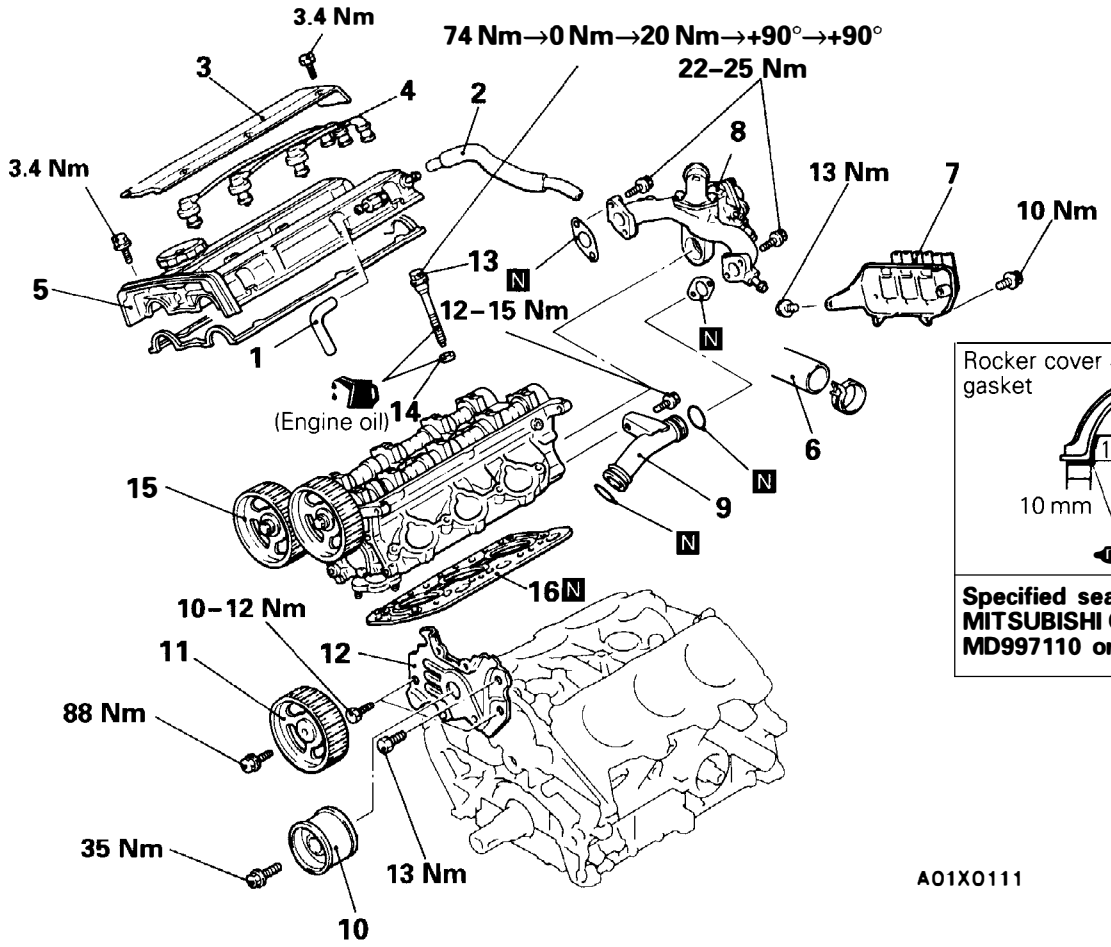
CYLINDER HEAD GASKET

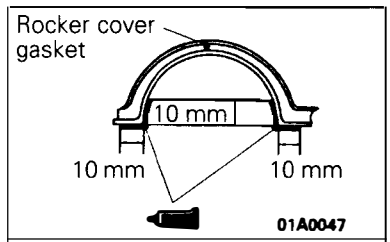
E11GL00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
(1) Engine Coolant Draining and Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(2) Air Cleaner Assembly Removal and Installation
(3) Radiator Assembly Removal and Installation (Refer to GROUP 14 – Radiator.)
(4) Air Intake Plenum and Intake Manifold Removal and Installation (Refer to GROUP 15 – Intake Manifold.)
(5) Timing Belt Removal and Installation (Refer to P.11G-31.)
(6) Fuel Discharge Prevention (Refer to GROUP 13A – Service Adjustment Procedures.)
(7) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)

<Front bank>





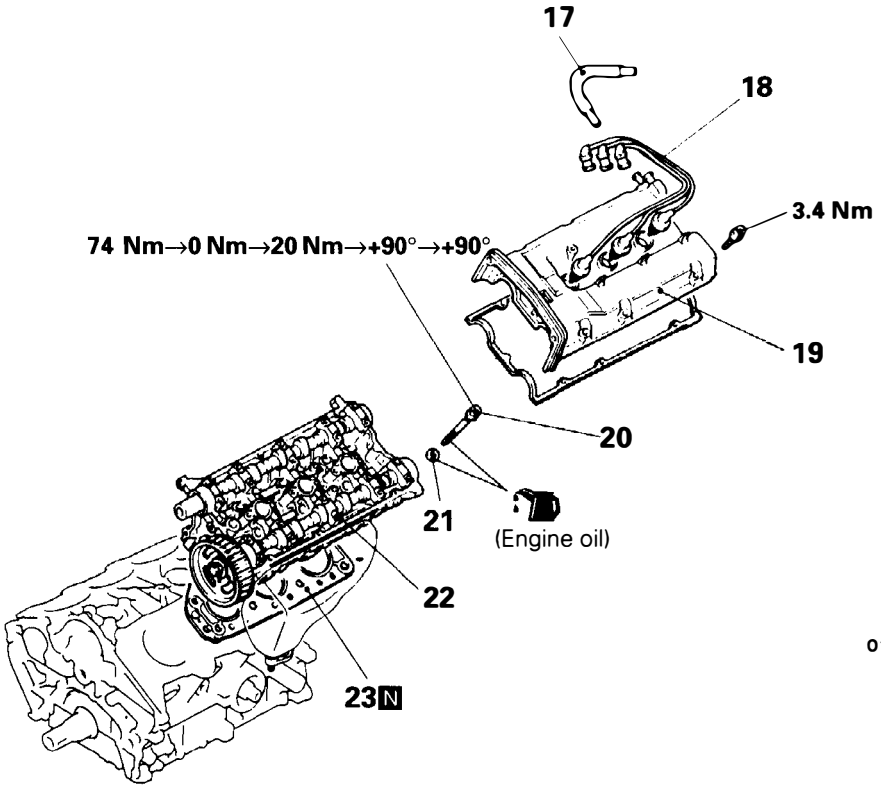
Specified sealant:
MITSUBISHI GENUINE PART MD997110 or equivalent

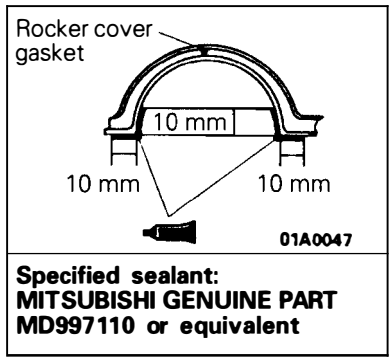
Removal steps

1. PCV hose
2. Blow-by hose
3. Centre cover
4. Spark plug cable
5. Rocker cover
6. Radiator lower hose connection
7. Ignition coil
8. Thermostat case assembly (Refer to GROUP 14 – Water Hoses and Pipes.)
9. Water inlet pipe (Refer to GROUP 14 – Water Hoses and Pipes.)
10. Idler pulley

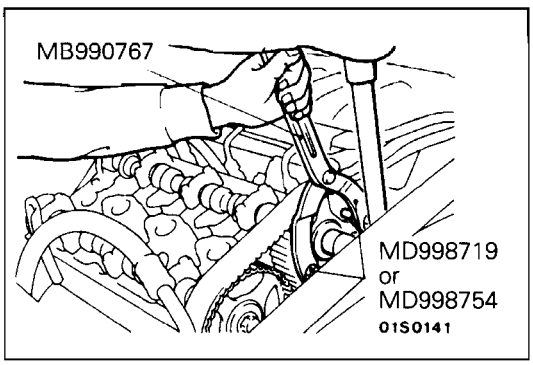
◇A◇ ◆C◆ 11. Camshaft sprocket
12. Timing belt rear centre cover
◇B◇ ◆B◆ 13. Cylinder head bolt
14. Washer
15. Cylinder head assembly
◆A◆ 16. Cylinder head gasket

<Rear bank>



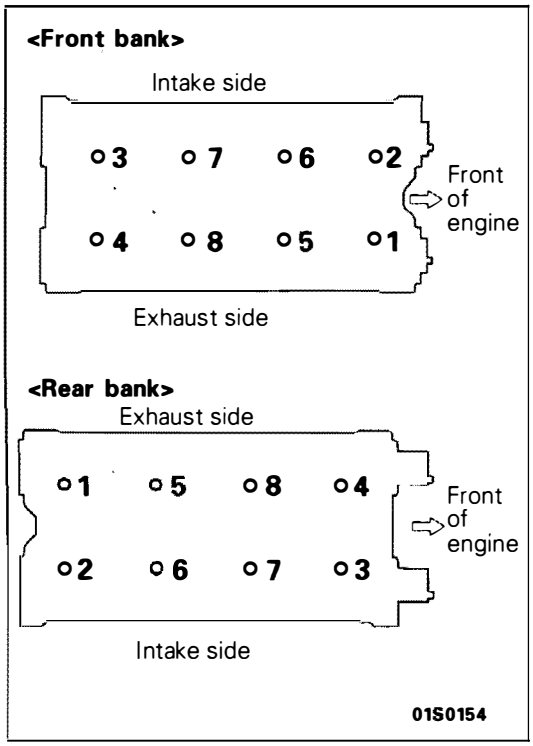


17. Breather hose
18. Spark plug cable
19. Rocker cover
◇B◇ ◆B◆ 20. Cylinder head bolt
21. Washer
22. Cylinder head assembly
◆A◆ 23. Cylinder head gasket



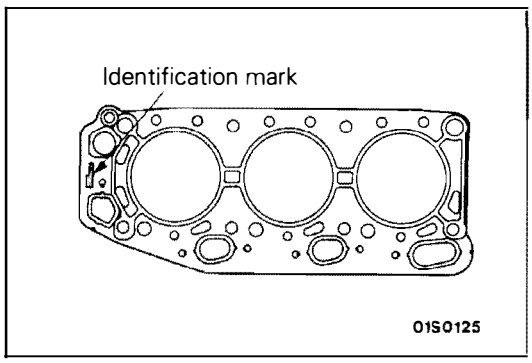
REMOVAL SERVICE POINTS E11GL01AA

◇A◇ CAMSHAFT SPROCKET REMOVAL



◇B◇ CYLINDER HEAD BOLT REMOVAL

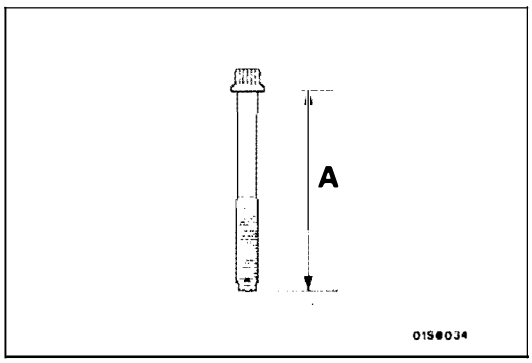
Loosen each of the bolts in 2 or 3 steps (in the order shown in the illustration), and then remove the cylinder head assembly.



INSTALLATION SERVICE POINTS E11GL04AA

◆A◆ CYLINDER HEAD GASKET INSTALLATION

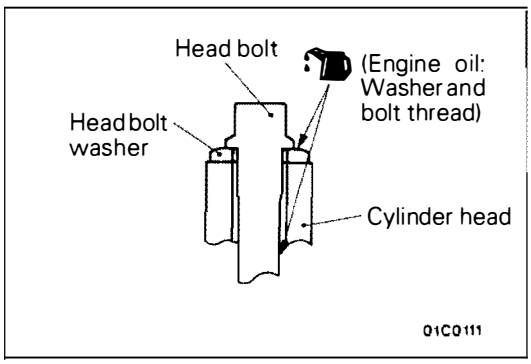
(1) Wipe off all oil and grease from the gasket mounting surface.
(2) Install the gasket to the cylinder block with the identification mark facing upwards.



◆B◆ CYLINDER HEAD BOLT INSTALLATION

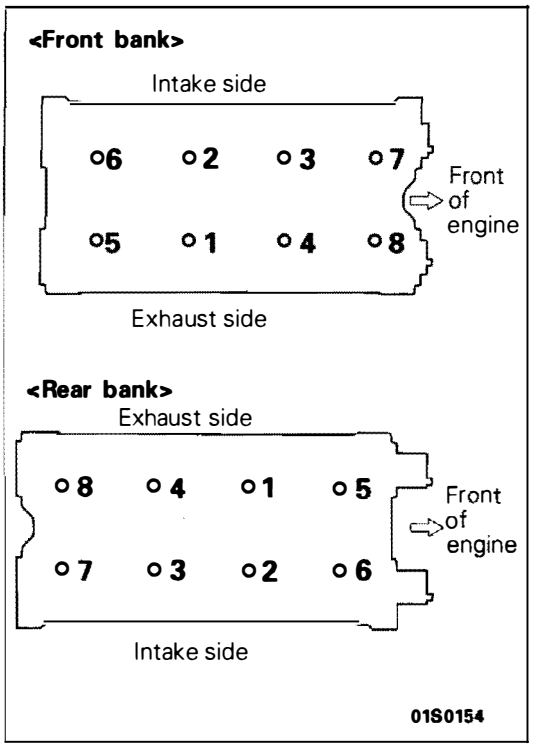
(1) When installing the cylinder head bolts, the length below the head of the bolts should be within the limit. If it is outside the limit, replace the bolts.

Limit (A): Within 96.4 mm



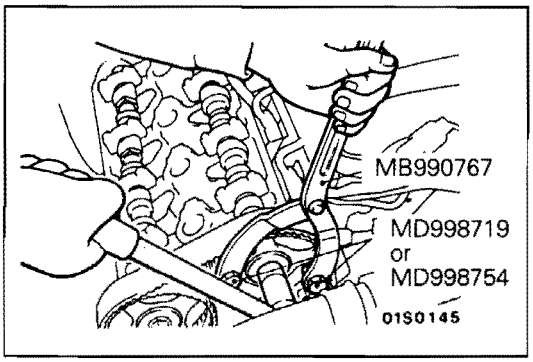
(2) Apply a small amount of engine oil to the thread section and the washer of the cylinder head bolt.

Caution
The head bolt washer should be installed with the shear drop upwards.



(3) Tighten the bolts in the following method:

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



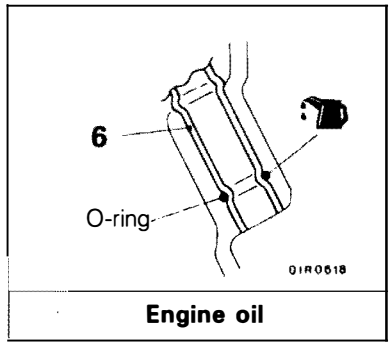
◆C◆ CAMSHAFT SPROCKET INSTALLATION

TIMING BELT

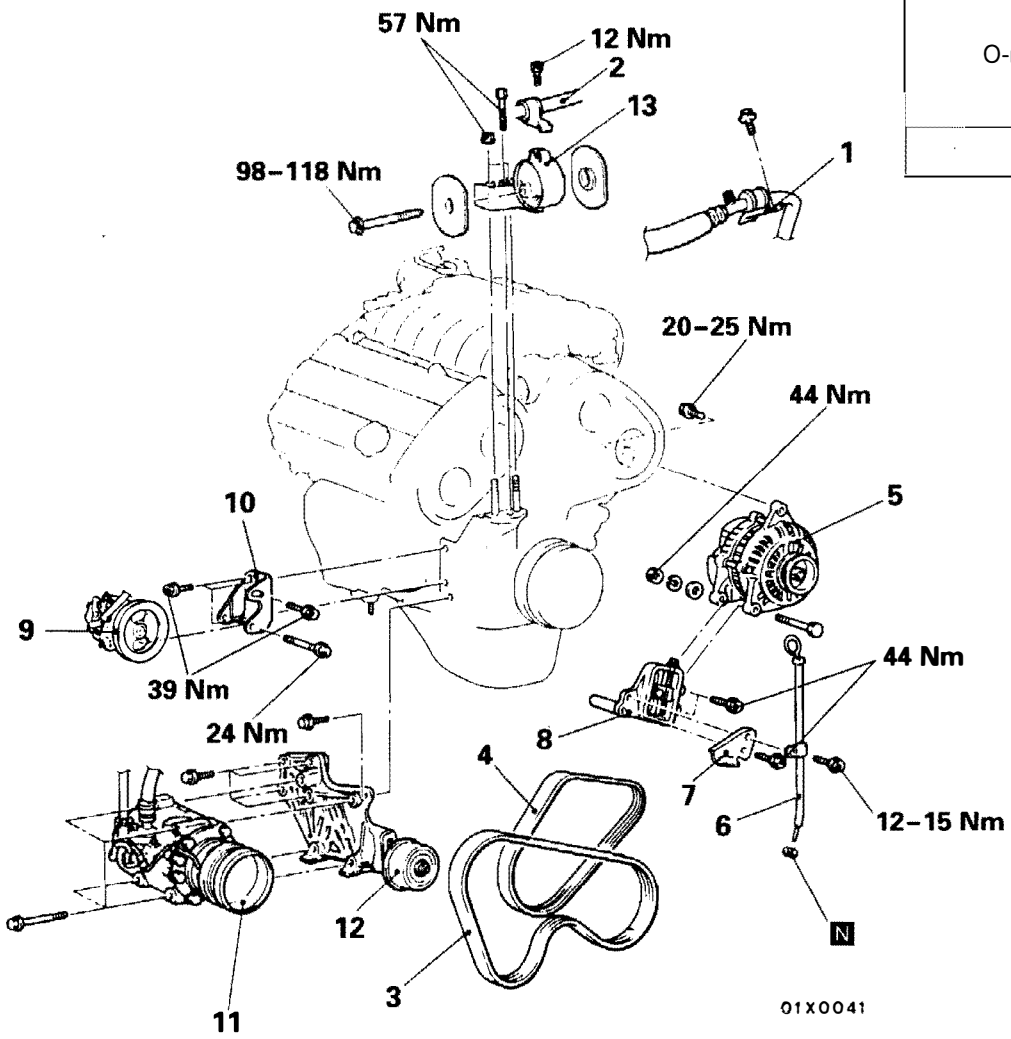
E11GM00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation



Engine oil



Removal steps

1. A/C hose clamp
2. Power steering hose clamp
- Drive belt tension adjustment (Refer to P.11G-7.)

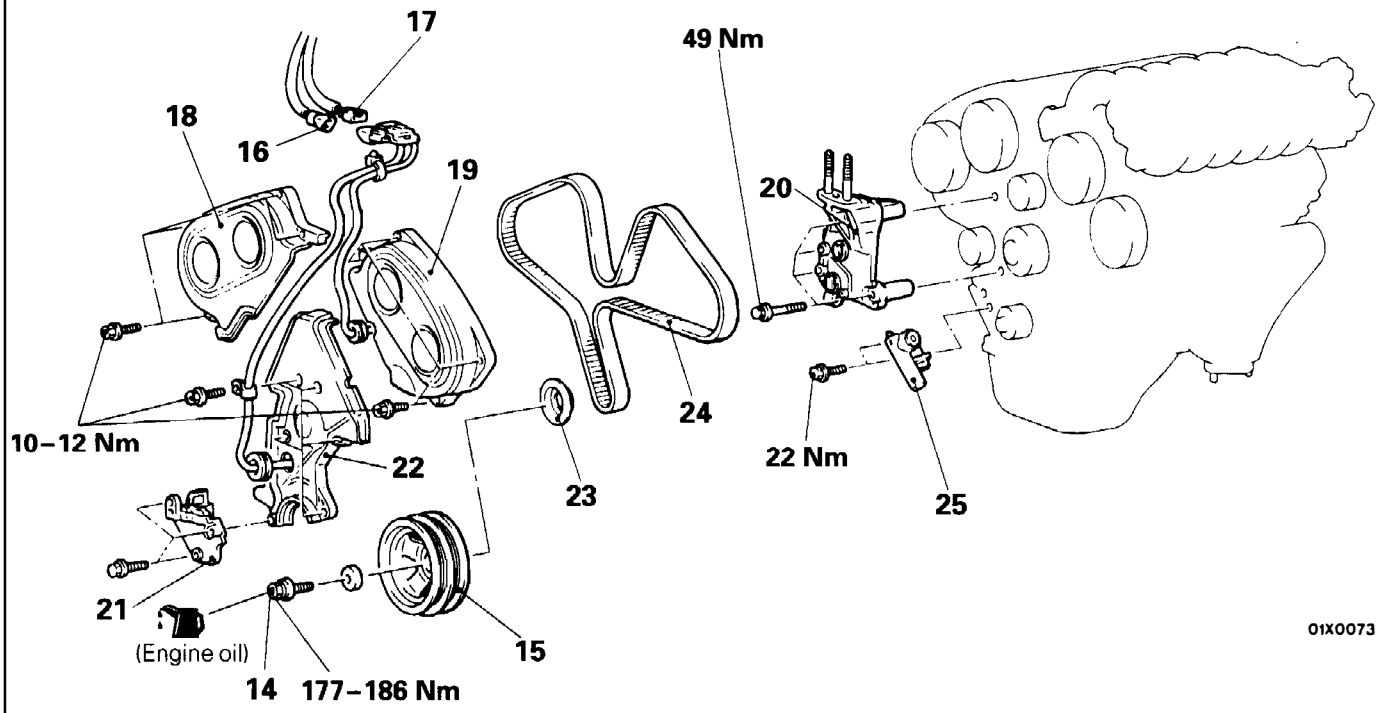
3. Drive belt (Power steering or power steering and A/C)
4. Drive belt (Alternator)
5. Alternator
6. Oil level gauge assembly
7. Timing indicator bracket
8. Tension pulley bracket assembly

〈A〉 9. Power steering oil pump connection

10. Oil pump bracket

〈B〉 11. A/C compressor connection

12. A/C compressor bracket
13. Engine mount bracket



◇C◇ ◆D◆ 14. Crankshaft bolt
◇C◇ ◆D◆ 15. Crankshaft pulley
16. Crank angle sensor connector
17. Camshaft position sensor connector
18. Timing belt cover (front, upper right)
19. Timing belt cover (front, upper left)
20. Engine support bracket
21. Timing belt cover (lower, right)
22. Timing belt cover (front, lower)
23. Flange
◆C◆ ● Timing belt tension adjustment
◇D◇ ◆B◆ 24. Timing belt
◆A◆ 25. Auto tensioner

REMOVAL SERVICE POINTS E11GM01AA

◇A◇ POWER STEERING OIL PUMP REMOVAL

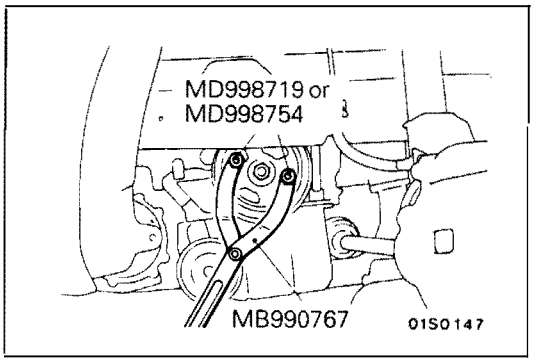
Removal the power steering oil pump from the bracket with the hose attached.

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

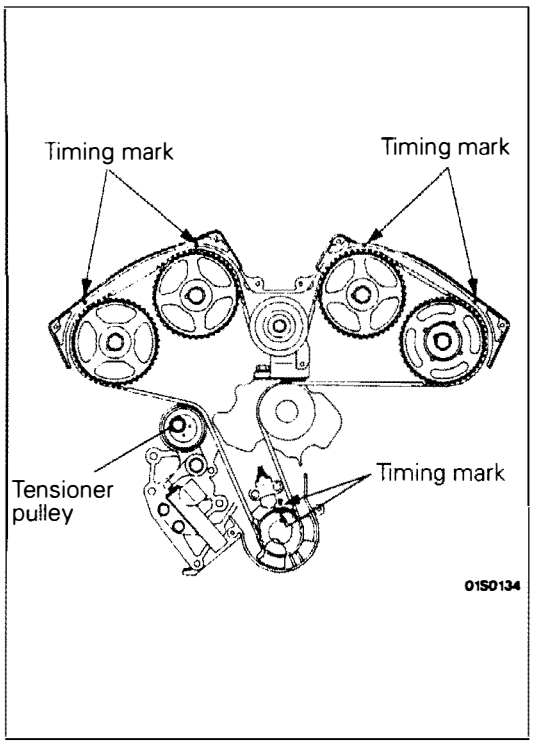
◇B◇ A/C COMPRESSOR REMOVAL

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

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



◇C◇ CRANKSHAFT BOLT/CRANKSHAFT PULLEY REMOVAL



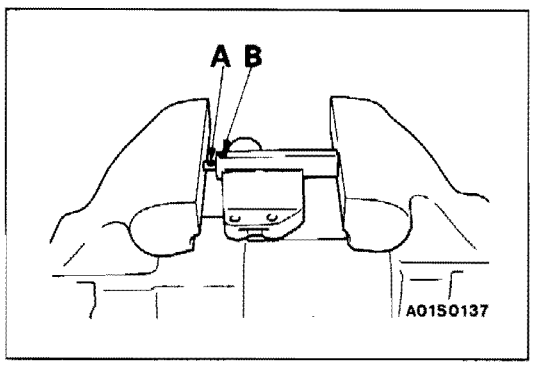
◇D◇ TIMING BELT REMOVAL

(1) Align each of the timing marks.
(2) Loosen the centre bolt of the tension pulley and remove the timing belt.

Caution
If the timing belt is to be reused, use chalk to mark it with an arrow on its flat side indicating the turning direction.

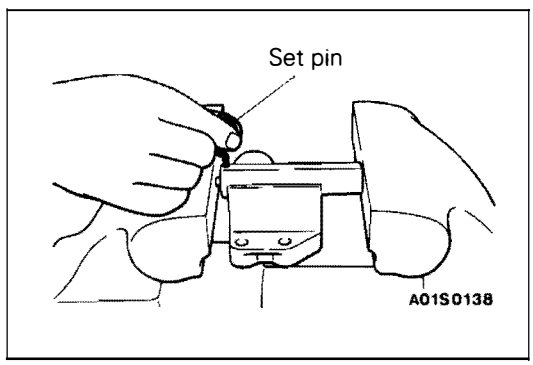
INSTALLATION SERVICE POINTS E11GM04AA

◆A◆ AUTO TENSIONER INSTALLATION



(1) Use a press or vice to gently compress the auto tensioner push rod until pin hole A of the push rod and pin hole B of the tensioner cylinder are aligned.

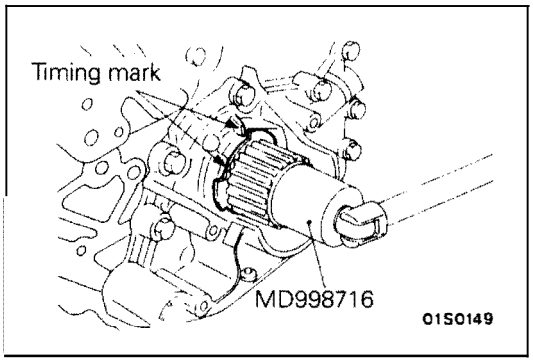
Caution
If the compression speed is too fast, the push rod may become damaged, so be sure to carry out this operation slowly.



(2) Once the holes are aligned, insert the set pin into the holes.

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

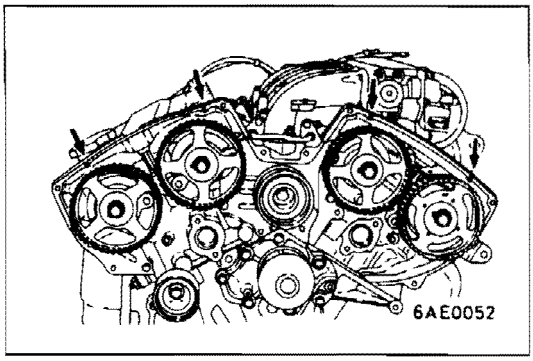
(3) Install the auto tensioner to the engine.



◗B◖ TIMING BELT INSTALLATION

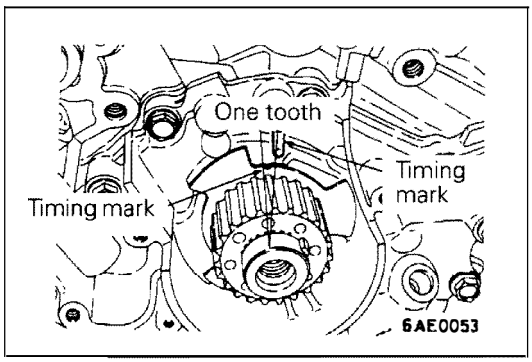
(1) Turn the crankshaft sprocket timing mark forward by 3 teeth to move the piston slightly past No. 1 compression top dead centre.

Caution
If the camshaft is turned when the piston is at No. 1 compression top dead centre, there is a danger that the valve and piston will interfere.

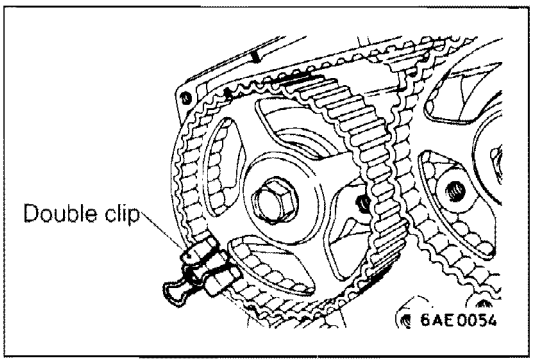


(2) Align the camshaft sprocket timing marks.

Caution
If the sprocket on one side of the front bank is turned one full revolution while the sprocket timing marks on the opposite side of the front bank are aligned, the intake and exhaust valves may cause interference.



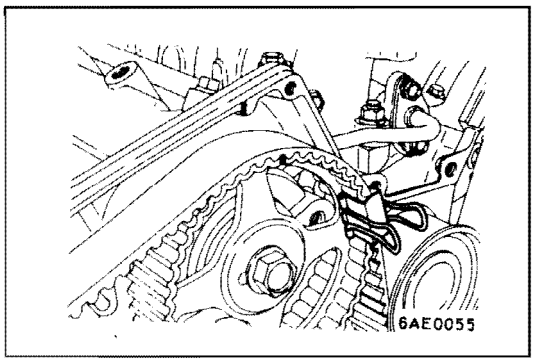
(3) After aligning the crankshaft sprocket timing marks, turn the crankshaft one tooth anticlockwise.



(4) Install the timing belt to the sprockets in the following order.

Caution
The front bank side camshaft sprockets will turn readily because of the spring force being applied, so be careful not to get your fingers caught.

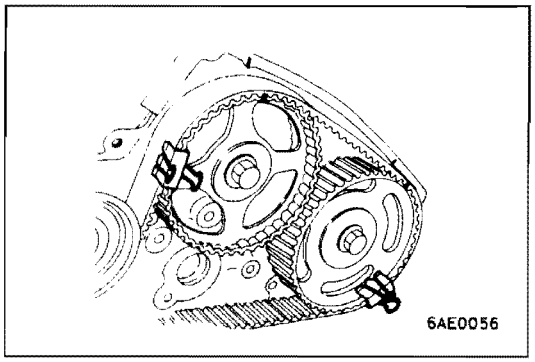
1) Align the timing mark of the front bank side exhaust camshaft sprocket, and clamp the timing belt with a double clip.



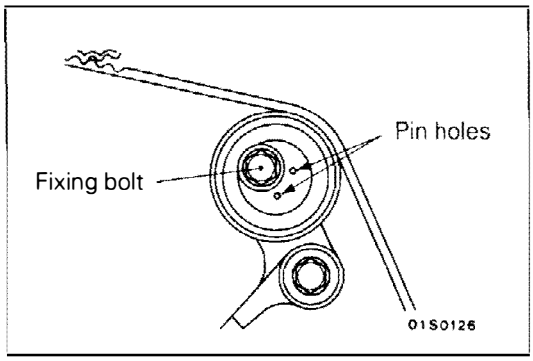
2) Align the timing mark of the intake camshaft sprocket, set the timing belt and clamp it with a double clip at the position shown in the illustration.

Caution
As the camshaft sprockets will turn easily, do not apply too much tension to the timing belt.

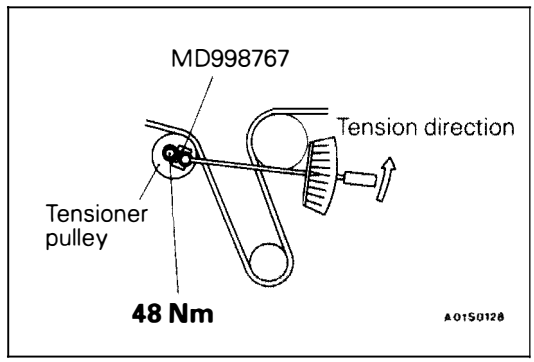
3) Set the timing belt onto the idler pulley.



4) Check to be sure that the timing mark of the rear bank side exhaust camshaft sprocket is aligned, and clamp the timing belt with a double clip.
5) Set the timing belt onto the water pump pulley.
6) Set the timing belt onto the crankshaft sprocket.
7) Set the timing belt onto the tensioner pulley.



(5) Set the tensioner pulley so that the pin holes are at the bottom, press the tensioner pulley lightly against the timing belt, and then provisionally tightener the fixing bolt.
(6) Check to be sure that all of the timing marks are aligned.
(7) Remove all four of the double clips.
(8) Adjust the timing belt tension.

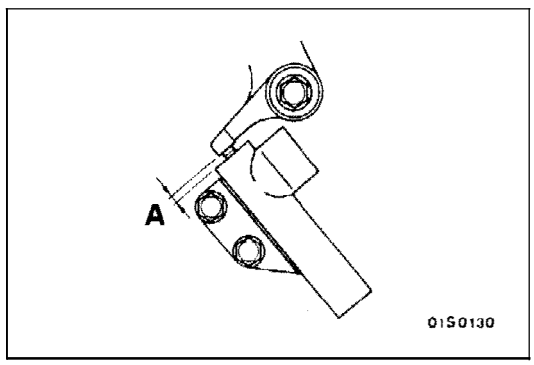


◗C◖ Timing belt tension adjustment

(1) After turning the crankshaft 1/4 of a revolution in the anticlockwise direction, turn it in the clockwise direction until the timing marks are aligned.
(2) Loosen the tensioner pulley fixing bolt, and then use the special tool and a torque wrench to tighten the fixing bolt to the specified torque while applying tension to the timing belt.

Standard value: 3 Nm <Timing belt tension torque>

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

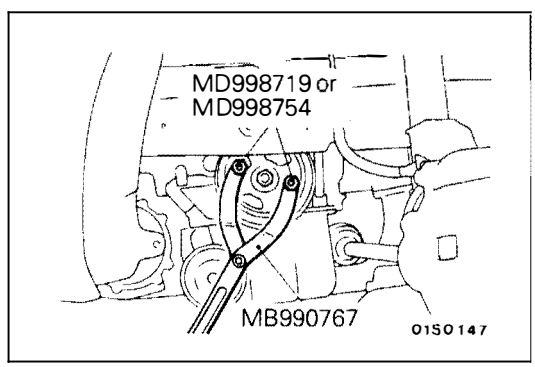


(3) Turn the crankshaft two revolutions in the clockwise direction, and after leaving it for 5 minutes or more, check to be sure that the set pin of the auto tensioner can be removed and inserted easily.

NOTE
If the set pin cannot be inserted easily, the auto tensioner is good if the amount of protrusion of the auto tensioner rod is within the standard value.

Standard value (A): 3.8–4.5 mm

If the amount of protrusion is outside the standard value, repeat the procedure in steps (1) to (3).
(4) Check to be sure that the timing marks of each sprocket are aligned.



◗D◖ CRANKSHAFT PULLEY/CRANKSHAFT BOLT INSTALLATION

(1) Apply the minimum amount of engine oil to the bearing surface and thread of the crankshaft bolt.
(2) Use the special tool to stop the crankshaft pulley from turning, and then install the crankshaft bolt.

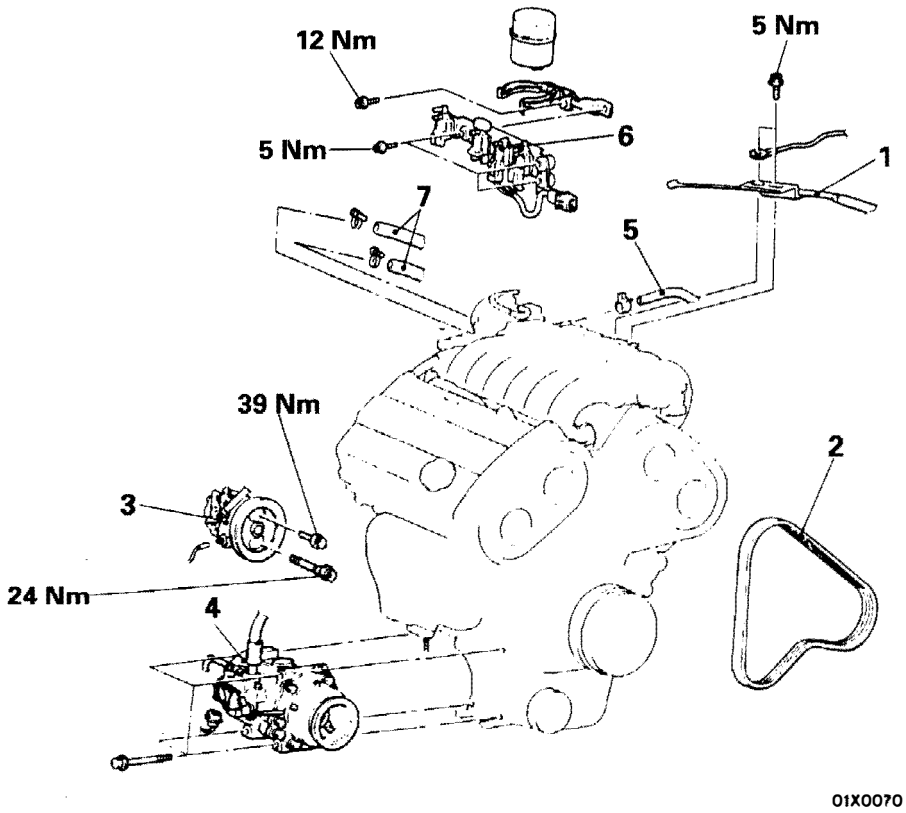
ENGINE ASSEMBLY

E11G000AA

REMOVAL AND INSTALLATION

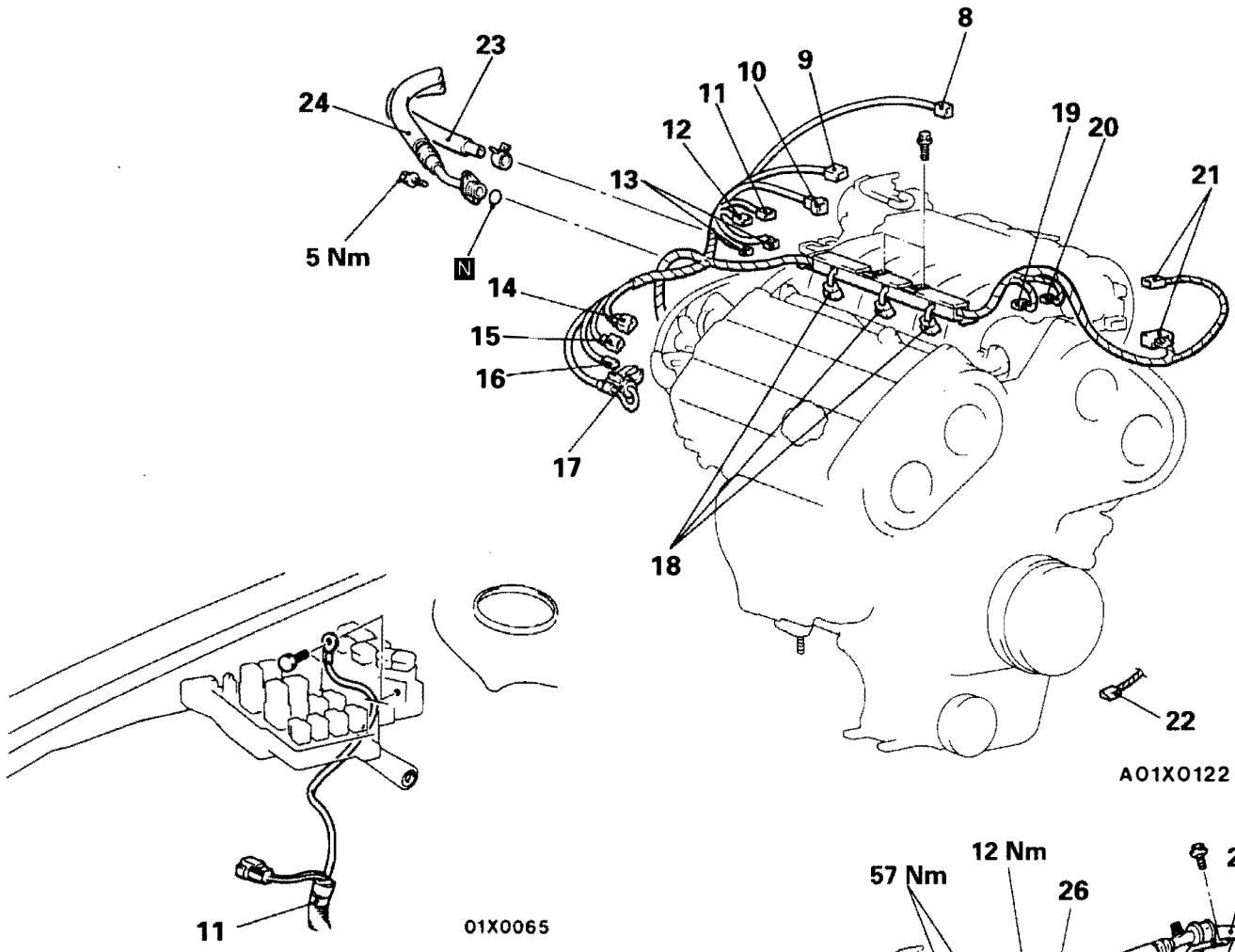
Pre-removal Operation
(1) Hood Removal (Refer to GROUP 42 – Hood.)
(2) Battery Removal
(3) Air Cleaner Assembly Removal
(4) Engine Coolant Draining and Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(5) Radiator Assembly Removal (Refer to GROUP 14 – Radiator.)
(6) Fuel Discharge Prevention (Refer to GROUP 13A – Service Adjustment Procedures.) (10)
(7) Under Cover Removal
(8) Front Exhaust Pipe Removal (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(9) Transmission Assembly Removal (Refer to GROUPS 22 and 23 – Transmission Assembly.)

Post-Installation Operation
(1) Transmission Assembly Installation (Refer to GROUPS 22 and 23 – Transmission Assembly.)
(2) Front Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(3) Radiator Assembly Installation (Refer to GROUP 14 – Radiator.)
(4) Engine Coolant Draining and Refilling (Refer to GROUP 14 – Service Adjustment Procedures.)
(5) Air Cleaner Assembly Removal and Installation
(6) Battery Installation
(7) Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
(8) Hood Installation (Refer to GROUP 42 – Hood.)
(9) Under Cover Installation



01X0070

Removal steps
1. Accelerator cable connection
● Drive belt tension adjustment (Refer to P.11G-7.)
2. Drive belt (for power steering and A/C)
〈A〉 3. Power steering pump connection
〈B〉 4. Connection for A/C compressor
5. Connection for brake booster vacuum hose
6. Solenoid valve bracket
7. Connection for heater hose



8. Accelerator pedal position sensor connector <Vehicles with TCL>
9. Idle speed control servo motor connector
10. Throttle position sensor connector
11. Injector harness connector
12. Detonation sensor connector
13. Power transistor connector
14. Engine coolant temperature sensor connector
15. Engine coolant temperature gauge connector
16. Ignition coil connector
17. Capacitor
18. Injector connector
19. Camshaft position sensor connector
20. Crank angle sensor connector
21. Variable induction control servo motor connector
22. Oil level sensor connector
23. Fuel return hose connection
24. High-pressure fuel hose connection
25. A/C hose clamp
26. Power steering hose clamp

◇C◇ ◆B◆ 27. Engine mount bracket
◇D◇ ◆A◆ 28. Engine assembly

REMOVAL SERVICE POINTS E11D001AA

〈A〉 POWER STEERING OIL PUMP REMOVAL

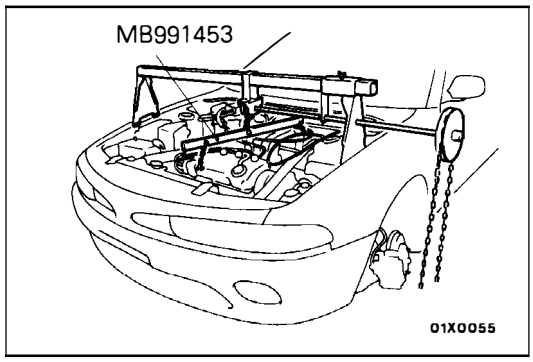
Remove the power steering oil pump from the bracket with the hose attached.

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

〈B〉 A/C COMPRESSOR REMOVAL

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

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



〈C〉 ENGINE MOUNT BRACKET REMOVAL

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

〈D〉 ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS E11D004AA

◆A◆ ENGINE ASSEMBLY INSTALLATION

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

◆B◆ ENGINE MOUNT BRACKET INSTALLATION

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

4D6

CONTENTS

E11JA0011

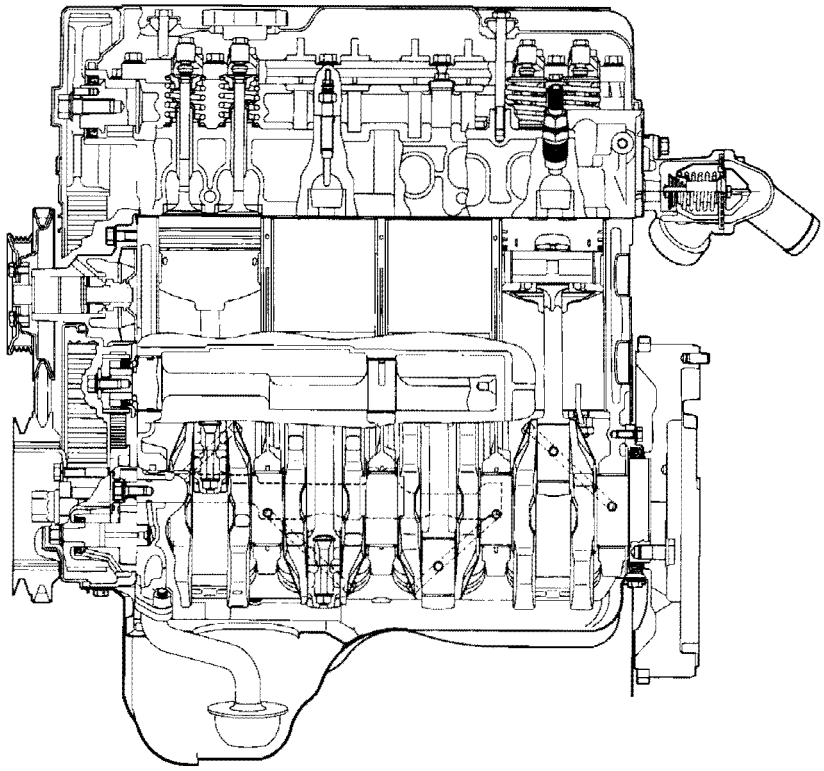
 PWDE9211

GENERAL INFORMATION

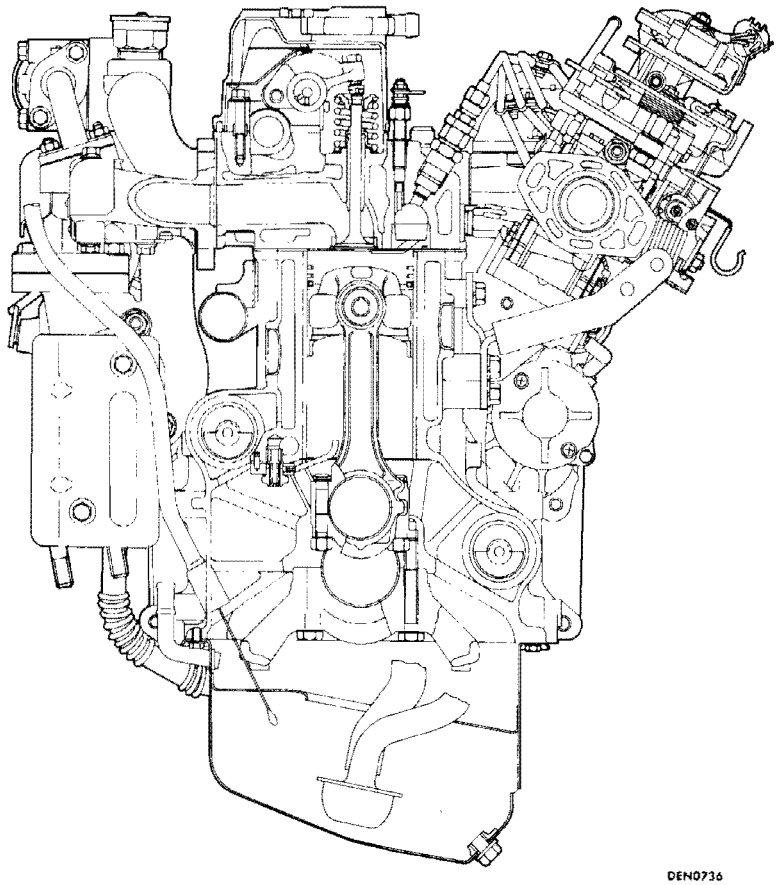
E11JB00AA

Items			4D68
Total displacement		mℓ	1,998
Bore × Stroke		mm	82.7 × 93.0
Compression ratio			22.4
Combustion chamber			Vortex chamber type
Camshaft arrangement			SOHC
Number of valve	Intake		4
	Exhaust		4
Valve timing	Intake		Opening BTDC20°, Closing ABDC48°
	Exhaust		Opening BBDC54°, Closing ATDC22°
Fuel system			Distribution type injection pump
Rocker arm			Roller type
Adjusting screw			Elephant foot type
Oil level sensor			Equipped

SECTIONAL VIEW



DEN0735



DEN0736

SERVICE SPECIFICATIONS

E11JC00AA

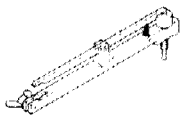
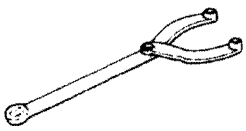
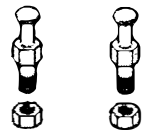
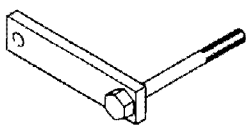
Items		4D68
Standard value		
Drive belt deflection	mm	
Alternator V-ribbed type		
When checked		7.0–10.0
When a new belt is installed		6.0–7.0
When a used belt is installed		8.0–9.0
Power steering oil pump		
When checked		5.5–8.0
When a new belt is installed		4.5–5.5
When a used belt is installed		6.0–7.0
A/C compressor		
When checked		7.0–8.0
When a new belt is installed		5.0–6.0
When a used belt is installed		7.0–8.0
Basic ignition timing		
Injection timing		9° ± 2° ATDC
Idle speed	r/min.	750 ± 100
Compression pressure	kPa (250–400 r/min.)	3,500
Valve clearance (at hot)	mm	
Intake		0.25
Exhaust		0.25
Timing belt tension		4–5
Idle up engine speed	r/min.	850 ± 50
Limit		
Compression pressure	kPa 250–400 r/min.	2,560
Compression pressure difference of all cylinder	kPa	300
Cylinder bolt shank length	mm	119.7

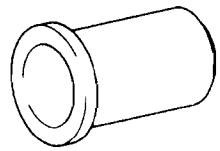
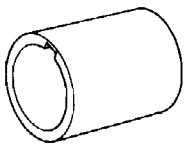
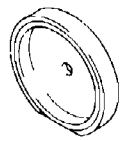
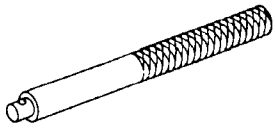
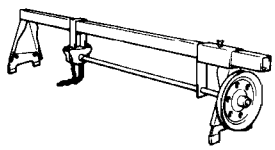
SEALANTS

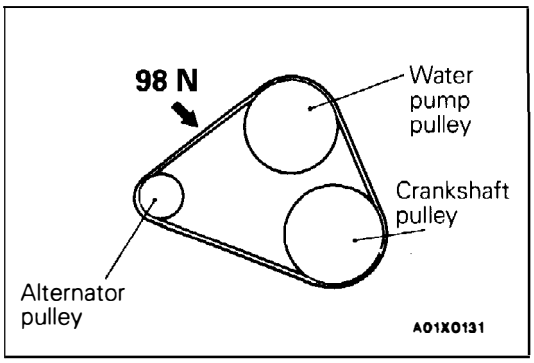
Items	Specified sealant	Remarks
Semi-circular packing and rocker cover seal, and cylinder head seal	3M ATD Part No. 8660 or equivalent	Semi-drying sealant
Oil pan, thermostat case assembly	MITSUBISHI GENUINE PART MD970389 or equivalent	
Flywheel bolt	3M Stud locking 4170 or equivalent	

SPECIAL TOOLS

E11JD00AA

Tool	Number	Name	Use
	MD998389	Prestroke measuring adapter	Adjustment of the injection timing
	MB990767	End yoke holder	• Holding the crankshaft sprocket • Holding the camshaft sprocket
	MD998719 or MD998754	Crankshaft pulley holder pin	
	MD998364	Camshaft oil seal installer	Installing the camshaft oil seal
	MD998727	Oil pan remover	Removal of oil pan
	MD998781	Flywheel stopper	Securing the flywheel

Tool	Number	Name	Use
	MD998382	Crankshaft front oil seal installer	Installing the crankshaft front oil seal
	MD998383	Crankshaft front oil seal guide	
	MD998776	Crankshaft rear oil seal installer	Press-fitting the crankshaft rear oil seal
	MB990938	Handle	
	GENERAL SERVICE TOOL MZ203827	Mechanic hanger, engine	Supporting the engine assembly during removal and installation of the transmission



SERVICE ADJUSTMENT PROCEDURES

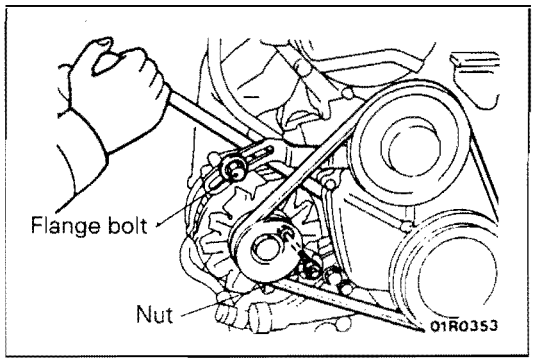
E11JF00AA

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

ALTERNATOR BELT TENSION INSPECTION

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

Standard value: 7.0–10.0 mm



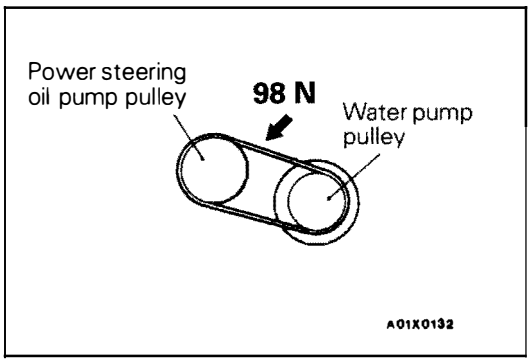
ALTERNATOR BELT TENSION ADJUSTMENT E11JF00BA

1. Loosen the flange bolt and nut that are securing the alternator.
2. Apply a bar to the stator section of the alternator and lever it to adjust the belt deflection amount so that it is at the standard value.

   Standard value:
   If used belt (with correct tension) is used; 8.0–9.0 mm
   If a new belt is used; 6.0–7.0 mm
3. Tighten the flange bolt and nut that were previously loosened to the specified torque.

   Tightening torque:
   Flange bolt; 12–15 Nm
   Nut; 20–25 Nm
4. Check the amount of belt deflection and readjust if necessary.

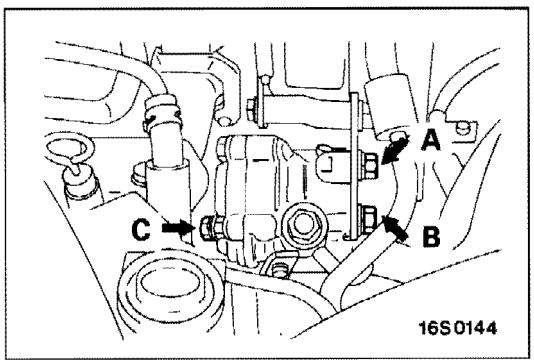
   Caution
   This check should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).



POWER STEERING OIL PUMP BELT TENSION INSPECTION E11DF00CA

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

Standard value: 5.5–8.0 mm



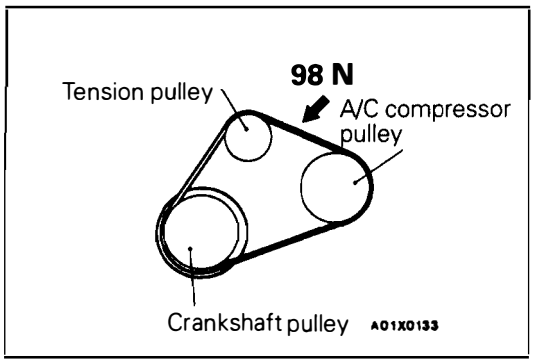
POWER STEERING OIL PUMP BELT TENSION ADJUSTMENT E11JF00DA

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

   Standard value:
   If used belt (with correct tension) is used; 6.0–7.0 mm
   If a new belt is used; 4.5–5.5 mm
3. Tighten the fixing bolts in the order A, B and C.

   Tightening torque: 39 Nm
4. Check the amount of belt deflection and readjust if necessary.

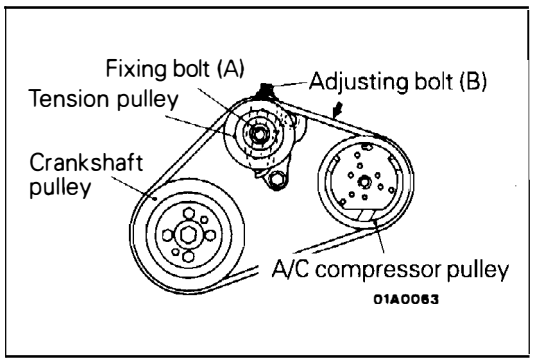
   Caution
   This check should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).



A/C COMPRESSOR BELT TENSION INSPECTION E11JF00EA

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

Standard value: 7.0–8.0 mm



A/C COMPRESSOR BELT TENSION ADJUSTMENT

E11JF00FA

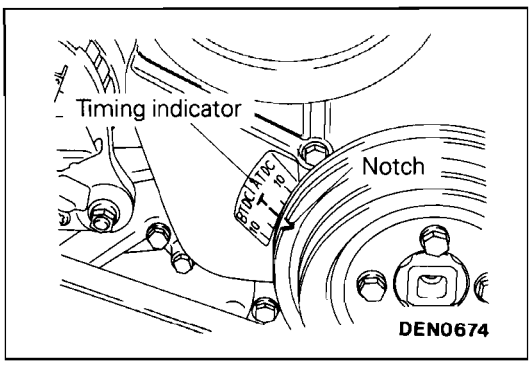
1. Loosen tension pulley fixing bolt A.
2. Adjust belt tension with adjusting bolt B.

   Standard value:
   If used belt (with correct tension) is used; 7.0–8.0 mm
   If a new belt is used; 5.0–6.0 mm
3. Tighten fixing bolt A.
4. Check the amount of belt deflection and readjust if necessary.

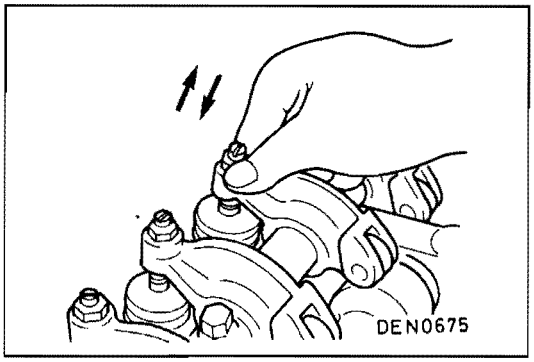
   Caution
   This check should be carried out after turning the crankshaft one full rotation or more in the forward direction (to the right).

VALVE CLEARANCE INSPECTION AND ADJUSTMENT E11JF06AA

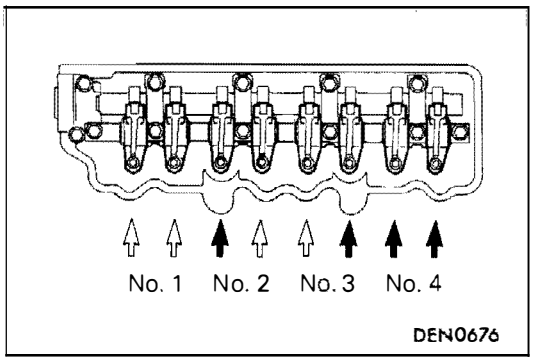
1. Start the engine and allow it to warm up until the engine coolant temperature reaches 80 to 95°C.
2. Remove all glow plugs from cylinder heads for easy inspection. (Refer to GROUP 16–Glow System.)
3. Remove the rocker cover.



4. Turn the crankshaft clockwise until the notch on the pulley is lined up with the "T" mark on the timing indicator.

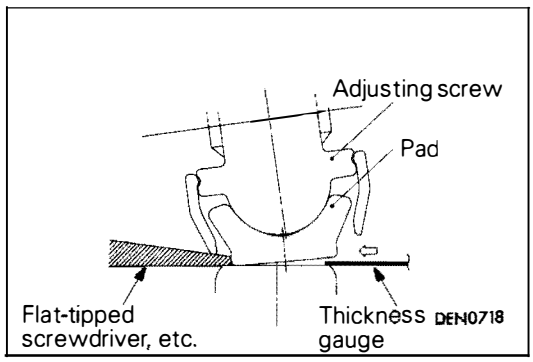


5. Move the rocker arms on the No. 1 and No. 4 cylinders up and down by hand to determine which cylinder has its piston at the top dead centre on the compression stroke. If both intake and exhaust valve rocker arms have a valve lash, the piston in the cylinder corresponding to these rocker arms is at the top dead centre on the compression stroke.

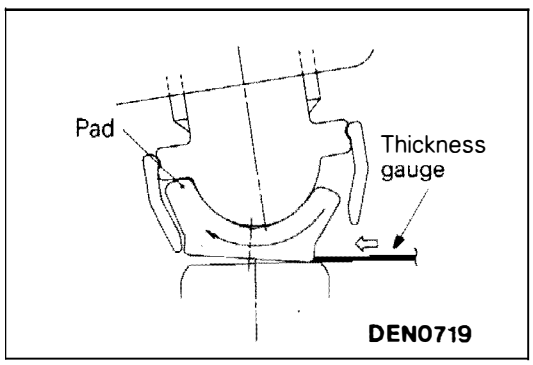


6. Valve clearance inspection and adjustment can be performed on rocker arms indicated by white arrows ⇩ when the No. 1 cylinder piston is at the top dead centre on the compression stroke, and on rocker arms indicated by solid arrows ⬇ when the No. 4 cylinder piston is at the top dead centre on the compression stroke.
7. Measure the valve clearance.

Standard value (hot engine):
Intake valve: 0.25 mm
Exhaust valve: 0.25 mm



NOTE
When inserting the thickness gauge, push the pad from the opposite side from the thickness gauge insertion side with a flat-tipped screwdriver or similar tool to make a gap, and then insert the thickness gauge.

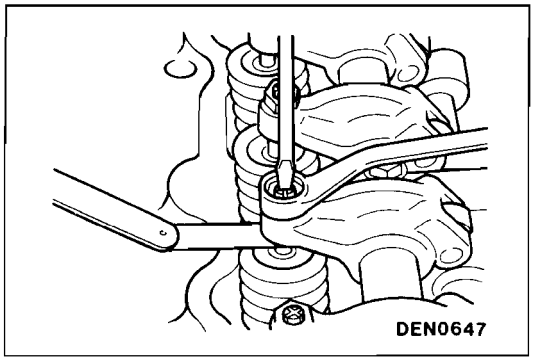


When you try to insert the thickness gauge, if the pad is not pushed with a flat-tipped screwdriver or similar tool and no gap is made, the pad will tilt as shown in the illustration and the thickness gauge will not be able to be inserted.

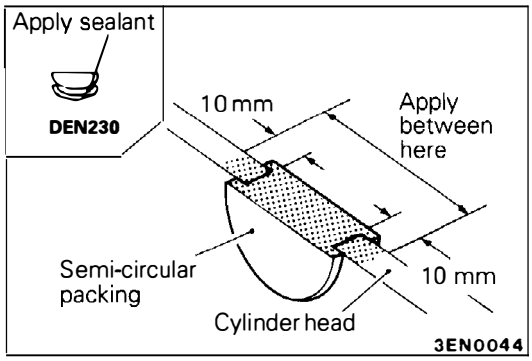
8. If the valve clearance is not as specified, loosen the rocker arm lock nut and adjust the clearance using a thickness gauge while turning the adjusting screw.

Standard value (hot engine):

Intake valve	**0.25 mm**
Exhaust valve	**0.25 mm**



9. While holding the adjusting screw with a screwdriver to prevent it from turning, tighten the lock nut securely.
10. Turn the crankshaft through 360° to line up the notch on the crankshaft pulley with the "T" mark on the timing indicator.
11. Repeat steps (6) and (7) on other valves for clearance adjustment.



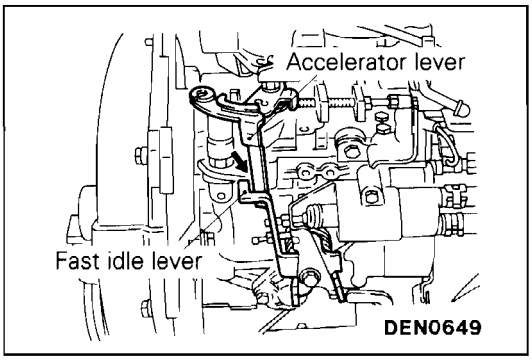
12. Apply a coating of the specified sealant to the semi-circular packing and cylinder head to surfaces.

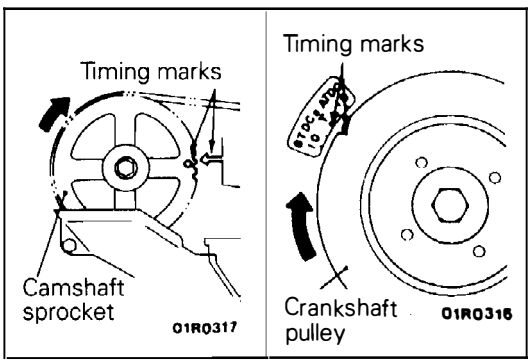
    Specified sealant: 3M ATD Part No. 8660 or equivalent
13. Install the rocker cover.
14. Install the glow plugs and tighten to the specified torque.

    Tightening torque: 18 Nm

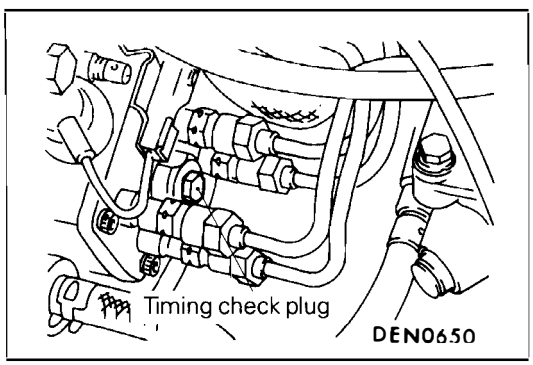
INJECTION TIMING ADJUSTMENT E11JF01AA

1. After warming up the engine, check to be sure that the fast idle lever is separated from the accelerator lever.
2. To make the crankshaft turn more easily, remove the four glow plugs.

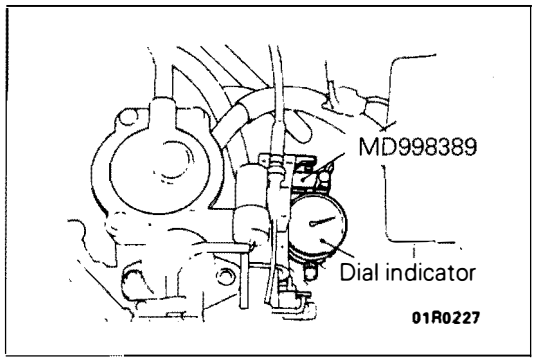




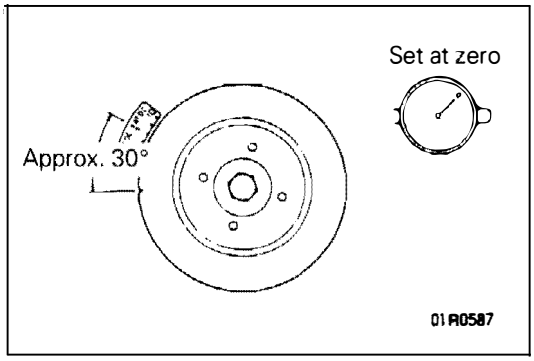
3. Turn the crankshaft clockwise (right turn) to align each timing marks and to set the NO. 1 cylinder at compression top dead centre.



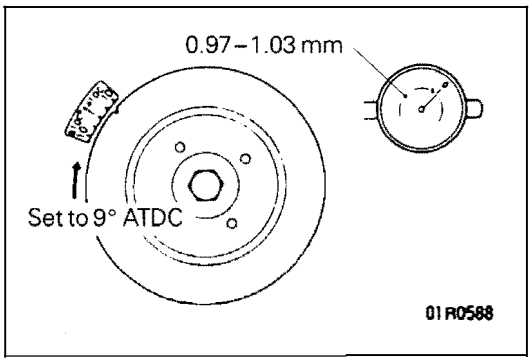
4. Remove the timing check plug installed at the rear of the injection pump.



5. Install the special tool to the rear of the injection pump.
6. Install a dial gauge to the special tool.

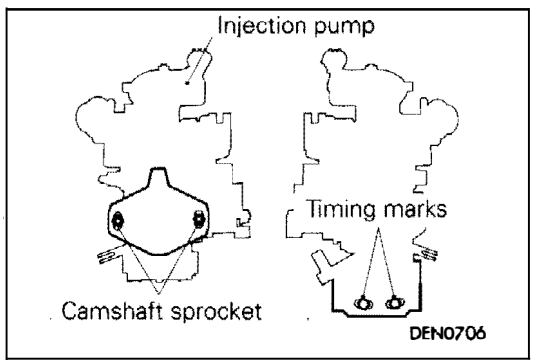


7. Turn the crankshaft clockwise to move the No. 1 cylinder approximately 30° before compression top dead centre.
8. Set the needle of the dial gauge to 0.
9. Check to be sure that the needle doesn't move even if the crankshaft is turned slightly (2–3°) both clockwise and counter clockwise.
10. If the needle moves, the injection pump plunger is lifted, so reset it by turning the crankshaft to a position where the needle doesn't move.

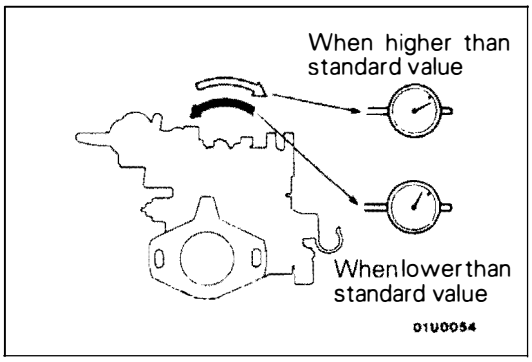


11. Turn the crankshaft pulley clockwise to align the crankshaft pulley notch to 9° ATDC.
12. Take a reading of the value displayed on the dial gauge.

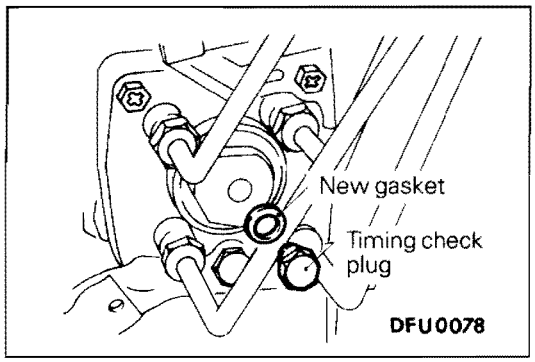
Standard value: 0.97–1.03 mm
(Injection timing: 9° ± 2° ATDC)



13. If the value is outside the standard value, adjust the injection timing by the following procedure.
    (1) Loosen the four injection pipe union nuts on the injection pump side. (Do not remove the union nuts.) When loosening the nuts, hold the delivery valve holders with a spanner so that they don't turn at the same time.
    (2) Loosen the two injection pump mounting nuts and the two injection pump mounting bolts. (Do not remove the nuts and bolts.)



    (3) Tilt the injection pump to the left and right and adjust so that the value displayed on the dial gauges is at the standard value.
    (4) Temporarily tighten the two mounting nuts and bolts of the injection pump.
    (5) Repeat steps (7) to (12) to check if the adjustment has been made correctly.
    (6) Securely tighten the injection pump mounting nuts and bolts.
    (7) Securely tighten the injection pipe union nuts. When tightening the nuts, hold the delivery valve holders with a spanner so that they don't turn at the same time.



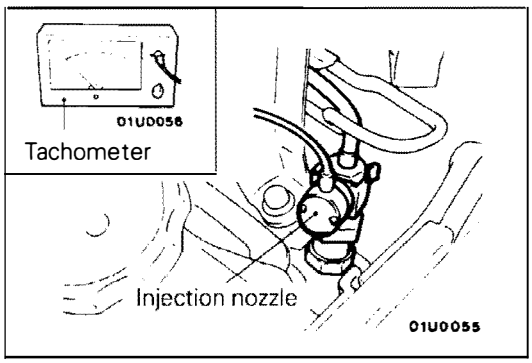
14. Remove the special tool.
15. After replacing the gasket with a new gasket, securely tighten the timing check plug.

ENGINE IDLE SPEED INSPECTION AND ADJUSTMENT

E11JF02AA

NOTE
Carry out inspection and adjustment of the idle speed after checking that the injection timing is normal.

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

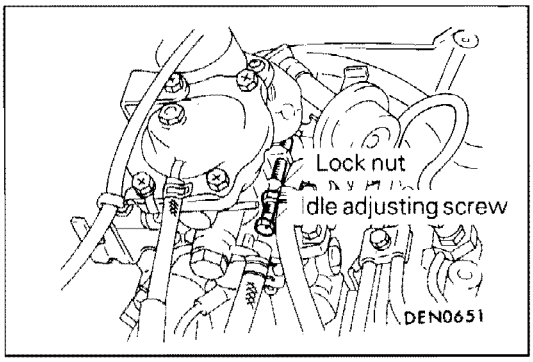


2. Connect a tachometer to the injection nozzle or the injection pipe.

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

3. Check the idle speed.

   Standard value: 750 ± 100 r/min.



4. If the idle speed is outside the standard value, loosen the lock nut on the idle adjusting screw and adjust by turning the idle adjusting screw.
   After adjustment, securely tighten the lock nut.

IDLE-UP MECHANISM INSPECTION AND ADJUSTMENT

E11JF07AA

1. Before inspection, set the vehicle to the following condition.
   - Engine coolant temperature: 80 – 90°C
   - Lights, power cooling fan and all accessories: OFF
   - Transmission: Neutral

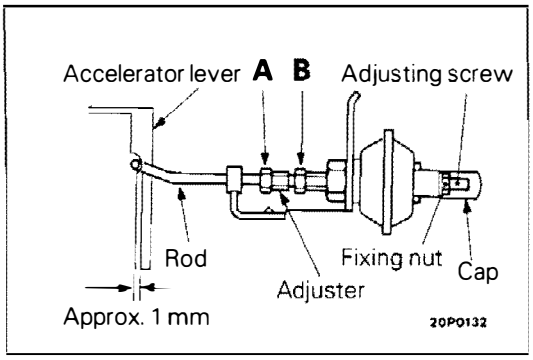
2. Check to be sure that the idle speed is at the standard value.

   Standard value: 750 ± 30 r/min.

   NOTE
   If the idle speed is outside the standard value, adjust the idle speed.

3. Turn the A/C switch to ON and check to be sure that the idle speed is at the standard value when the A/C is operating.

   Standard value: 850 ± 50 r/min.



4. If the idle speed is outside the standard value, adjust by the following procedure.
   (1) Loosen nuts (A) and (B).
   (2) Adjust the end of the vacuum actuator rod using the adjuster so that the rod is at the dimension shown in the illustration.
   (3) Securely tighten nuts (A) and (B).
   (4) After turning the A/C switch to ON to operate the vacuum actuator (idle-up), check to be sure that the rod and accelerator lever are not touching when operation is stopped.
   (5) Turn the A/C switch to ON, remove the cap while idle-up is operating, and loosen the fixing nut.
   (6) Adjust to the standard value using the adjusting screw.

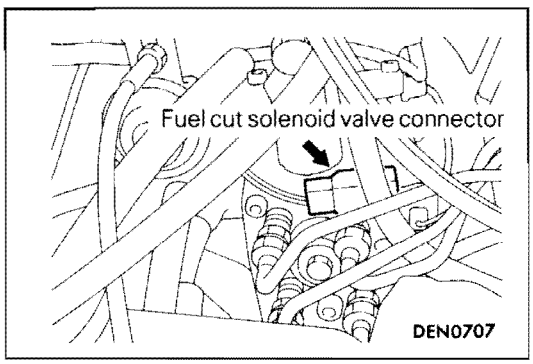
   Standard value: 850 ± 50 r/min.

   (7) Securely tighten the fixing nut and install the cap.

COMPRESSION PRESSURE INSPECTION E11JF03AA

1. Before inspection, check to be sure that the engine oil, starter motor and battery are normal. Also, set the vehicle to the following condition:
   - Engine coolant temperature: 80 – 95°C
   - Lights and all accessories: OFF
   - Transmission: Neutral
2. Remove the glow plug plate and all glow plugs from the cylinder head.
3. Disconnect the connector of the fuel cut solenoid valve.

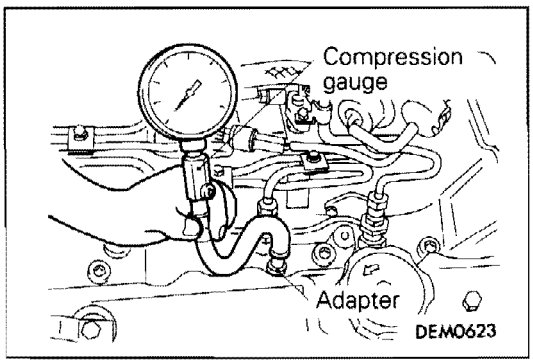
   NOTE
   Doing this will prevent fuel injection from being carried out.



4. Cover the glow plug mounting holes with a rag, etc., and after the engine has been cranked, check that no foreign material is adhering to the rag.

Caution

1. **Keep away from the glow plug mounting holes when cranking.**
2. **The reason for this is that if compression is measured with water, oil, fuel, etc., that has come from cracks inside the cylinder, these materials will become heated and will gush out from the glow plug mounting holes, which is dangerous.**

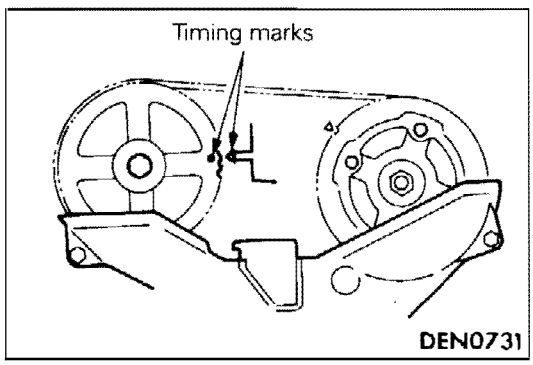


5. Set a compression gauge to one of the glow plug mounting holes.
6. Crank the engine and measure the compression pressure.

   Standard value (with engine speed at 250 r/min.): 3,500 kPa

   Limit (with engine speed at 250 r/min.): Min. 2,560 kPa
7. Measure the compression for all the cylinders, and check that the pressure differences of the cylinders are below the limit.

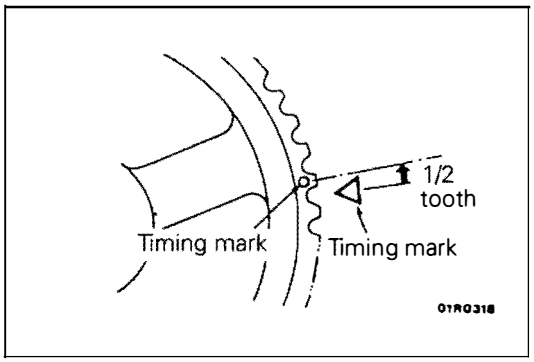
   Limit: Maximum 300kPa
8. If there is a cylinder with compression or a compression difference that is outside the limit, pour a small amount of engine oil through the glow plug mounting holes, and repeat the operations in steps (6) and (7).
   (1) If the compression increases after oil is added, the cause of the malfunction is a worn or damaged piston ring and/or cylinder wall.
   (2) If the compression does not rise after oil is added, the cause is a burnt or defective valve seat, or pressure is leaking from the gasket.
9. Connect the fuel cut solenoid valve connector.
10. Install the glow plugs and the glow plug plate.



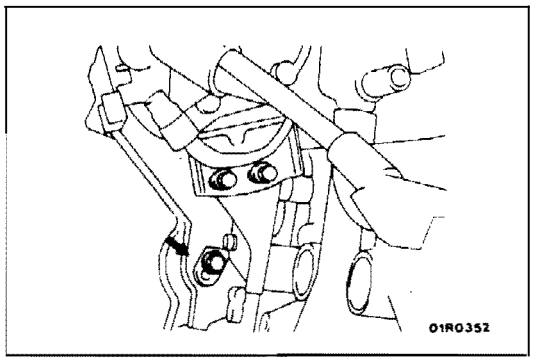
TIMING BELT ADJUSTMENT E11JF04AA

1. Turn crankshaft clockwise to bring No. 1 cylinder piston to top dead centre on compression stroke.

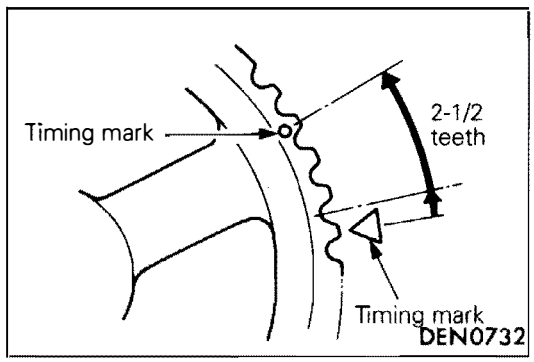
   Caution
   For aligning the timing marks, never turn the crankshaft anticlockwise as it could cause inadequate belt tension.



2. Turn the crankshaft anticlockwise by a distance equivalent to 1/2 tooth of the camshaft sprocket in order to correct looseness of the belt at the idler side.



3. Using a long extension, loosen the installation bolt of the timing belt tension (from the engine rear) by 1/6 to 1/2 turn, taking advantage of the force of the tensioner spring to provide tension to the belt.



4. In addition, turn the crankshaft anticlockwise by a distance equivalent to 2-1/2 teeth.

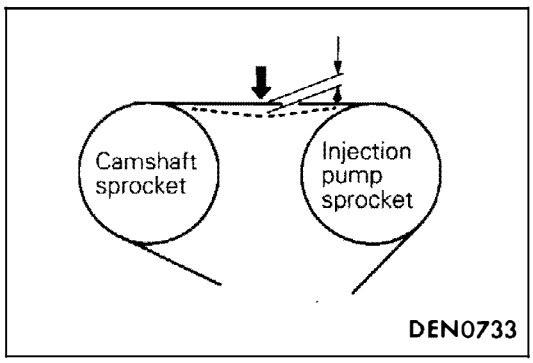
   NOTE
   When the setting is as described above, the camshaft will be slightly past compression top dead centre of the No. 1 cylinder, and the looseness of the timing belt will be at the tension side.

   Caution
   Do not rotate the crankshaft clockwise, because the tensioner side will become stretched and the adjustment will be unsuitable.

5. Tighten the timing belt tensioner at the specified torque.
6. Turn the crankshaft clockwise and align the timing mark.
7. Using the index finger, press between the camshaft sprocket and the injection pump and sprocket, and check whether or not the amount of flexion is within the standard value range or not.

   Standard value range: 4.0–5.0 mm

   If there is a deviation from the standard value range, repeat steps (2) to (5).



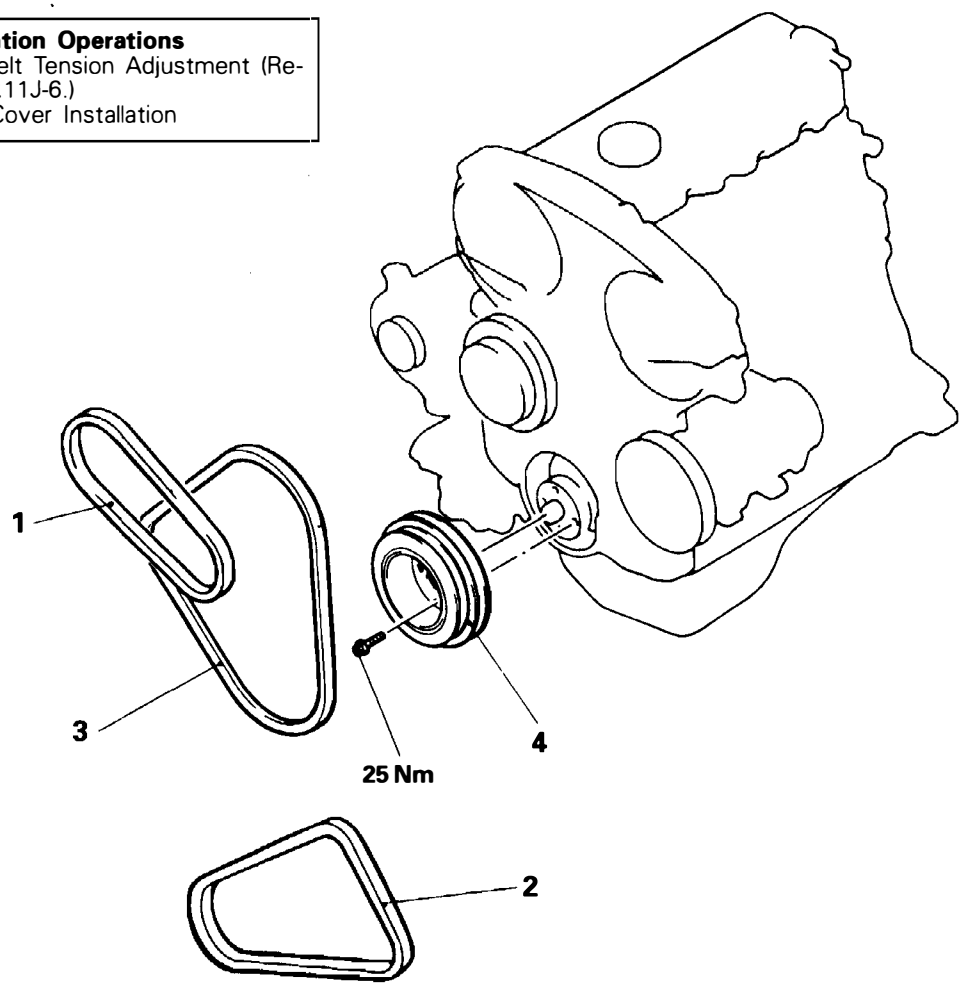
CRANKSHAFT PULLEY

E11JG00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Under Cover Removal

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



01X0020

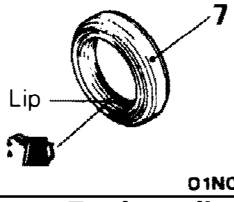
Removal steps
1. Drive belt (Power steering)
2. Drive belt (A/C)
3. Drive belt (Alternator)
4. Crankshaft pulley

CAMSHAFT, CAMSHAFT OIL SEAL

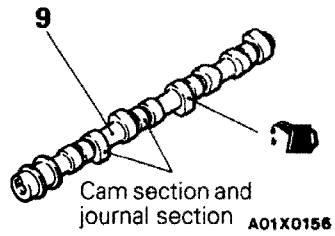
E11JH00AA

REMOVAL AND INSTALLATION

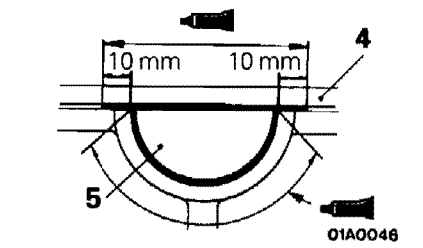
Pre-removal and Post-installation Operations
- Timing Belt Removal and Installation (Refer to P.11J-29.)



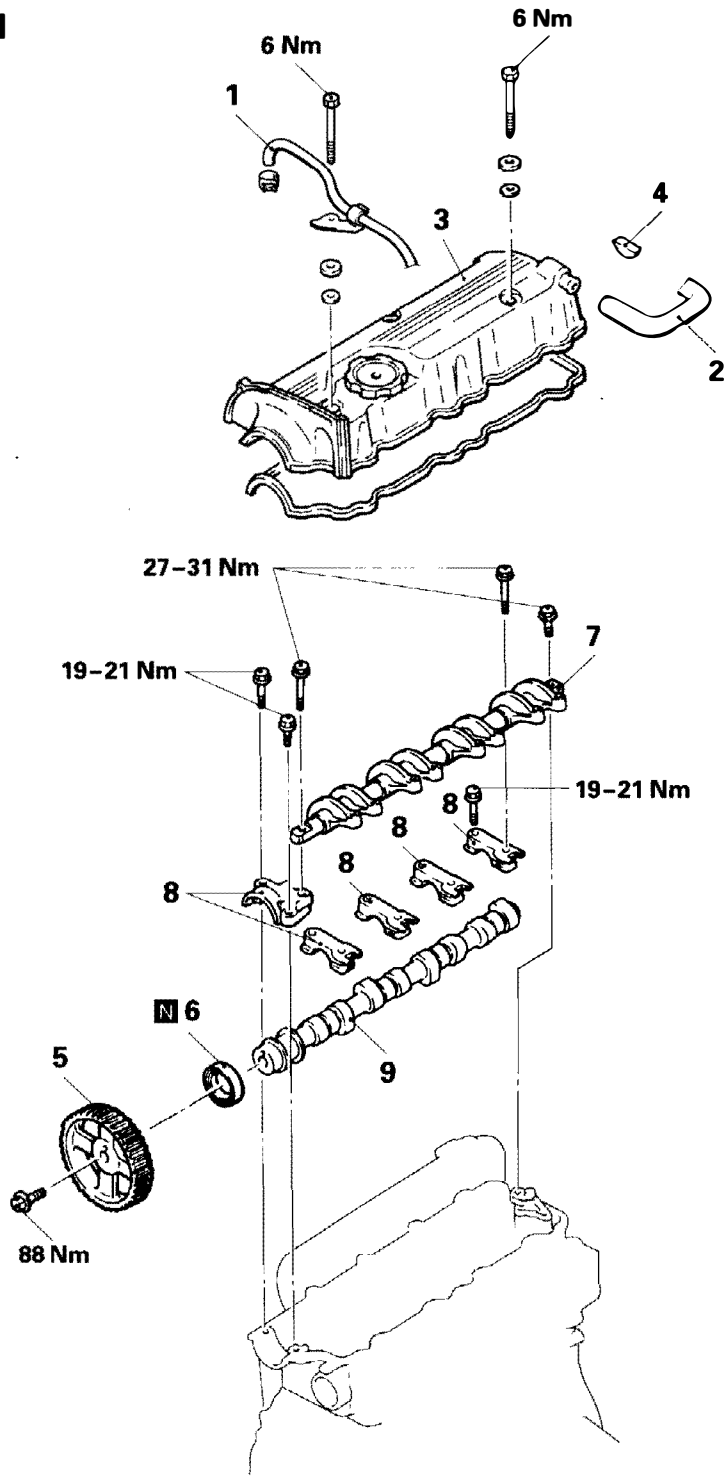
Engine oil



Engine oil



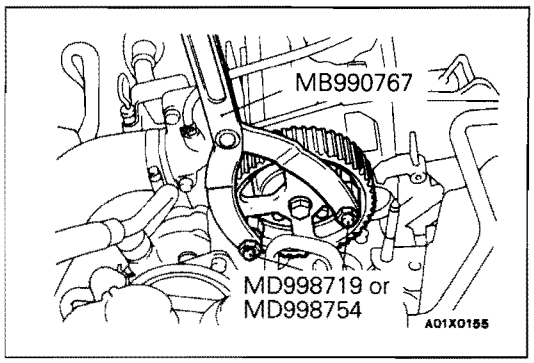
Specified sealant:
3M ATD Part No. 8660 or equivalent



01X0024

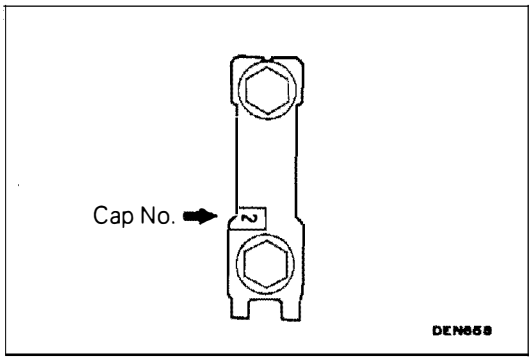
Removal steps

1. Vacuum hose connection (boost compensator)
2. Breather hose connection
3. Rocker cover
4. Semi-circular packing
5. ◇A◇ ◆D◆ Camshaft sprocket
6. ◆C◆ Camshaft oil seal
7. ◆B◆ Rocker arm and shaft assembly
8. ◆A◆ Camshaft bearing cap
9. Camshaft



REMOVAL SERVICE POINT E11JH01AA

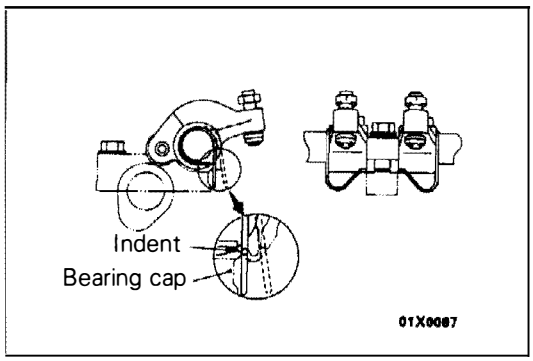
〈A〉 CAMSHAFT SPROCKET REMOVAL



INSTALLATION SERVICE POINTS E11JH04AA

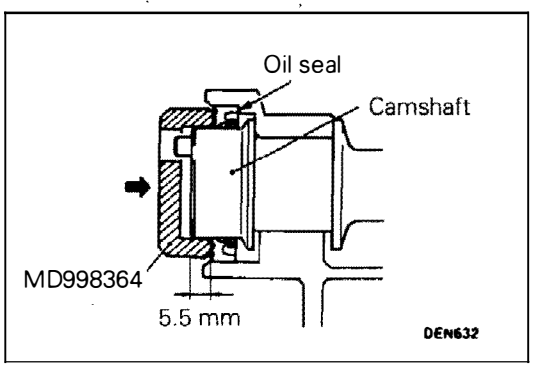
◗A◖ CAMSHAFT BEARING CAP INSTALLATION

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



◗B◖ ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

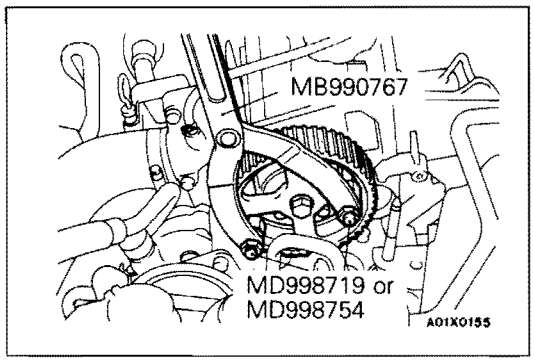
(1) Install the rocker arm and shaft assembly to the bearing caps.
(2) Set the rocker arm springs into the bearing cap indents.
(3) Check the valve clearance and adjust if necessary. (Refer to P.11J-8.)



◗C◖ CAMSHAFT OIL SEAL INSTALLATION

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

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



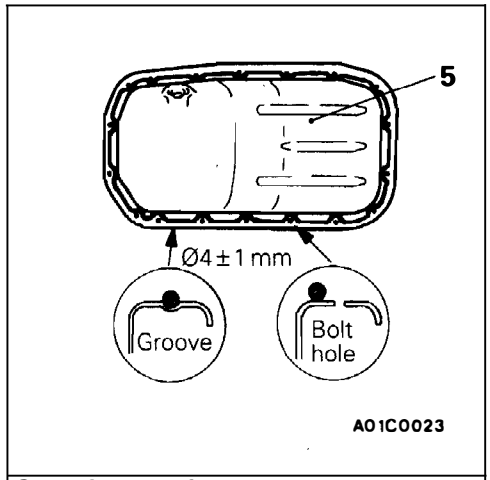
◗D◖ CAMSHAFT SPROCKET INSTALLATION

OIL PAN

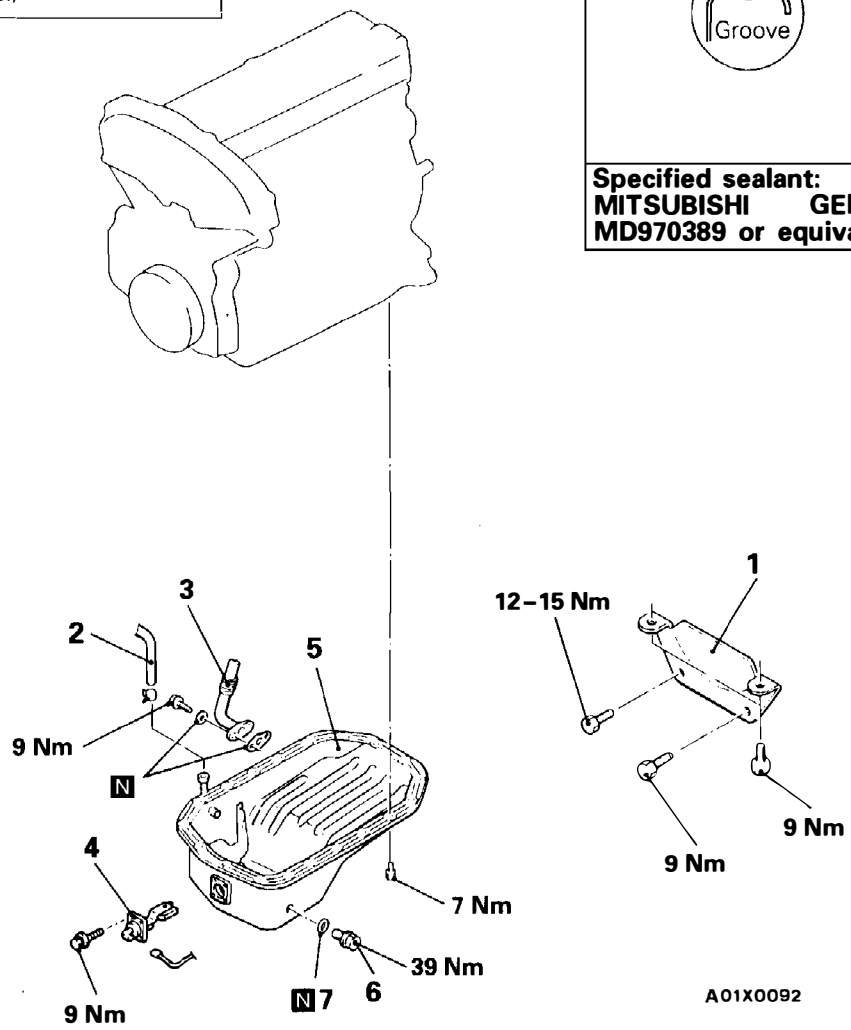
E11JI00AA

REMOVAL AND INSTALLATION

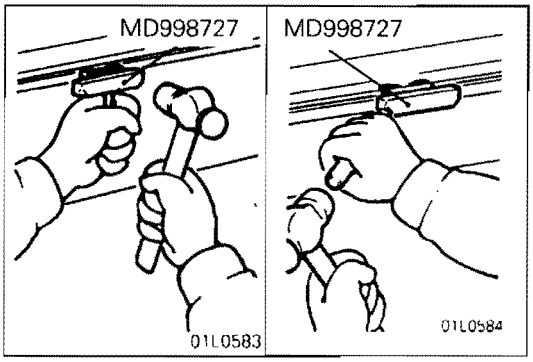
Pre-removal and Post-installation Operations
(1) Under Cover Removal and Installation
(2) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
(3) Engine Oil Level Gauge Removal and Insertion
(4) Engine Oil Draining and Refilling (Refer to GROUP 12 – Service Adjustment Procedures.)



Specified sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent



Removal steps
1. Bell housing cover
2. Oil return hose
3. Oil return pipe
4. Engine oil level sensor
◇A◇ ▶B◀ 5. Oil pan
6. Drain plug
▶A◀ 7. Gasket

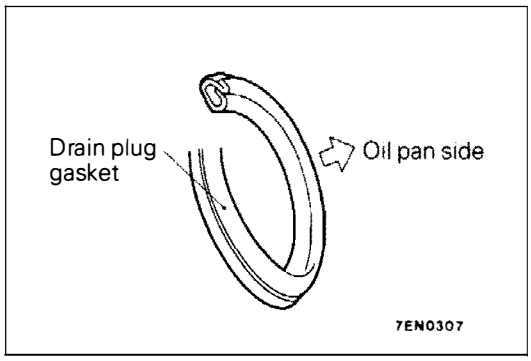


REMOVAL SERVICE POINT E11EI01AA

〈A〉 OIL PAN REMOVAL

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

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



INSTALLATION SERVICE POINTS E11EI04AA

◆A◆ GASKET INSTALLATION

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

◆B◆ OIL PAN INSTALLATION

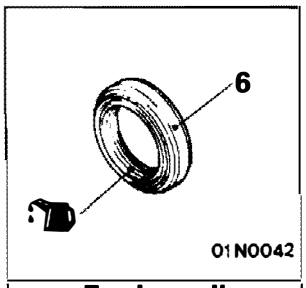
Caution
After cleaning the oil pan mounting bolt holes in the oil seal case, the oil pan should be installed.

CRANKSHAFT FRONT OIL SEAL

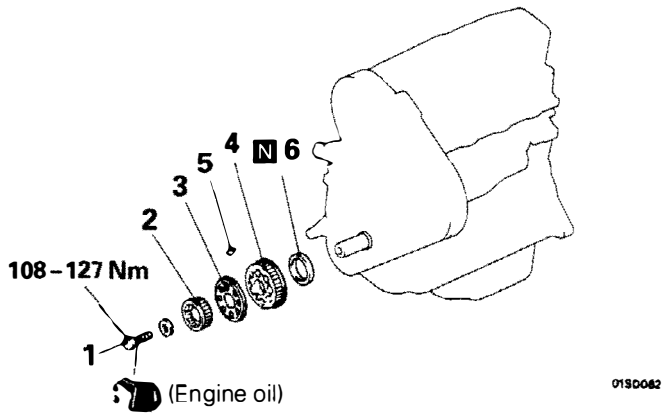
E11JJ00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
- Timing Belt and Timing Belt "B" Removal and Installation (Refer to P.11J-29.)

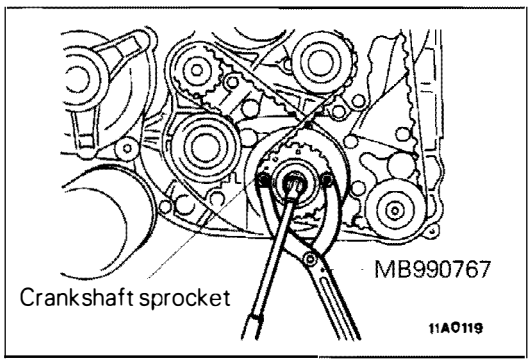


Engine oil



Removal steps

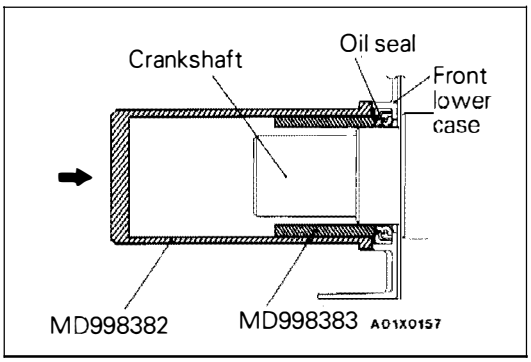
〈A〉 ◆B◆ 1. Crankshaft bolt
〈A〉 ◆B◆ 2. Crankshaft sprocket
3. Flange
4. Crankshaft sprocket B
5. Key
◆A◆ 6. Crankshaft front oil seal



REMOVAL SERVICE POINT

E11JJ01AA

〈A〉 CRANKSHAFT BOLT/CRANKSHAFT SPROCKET REMOVAL

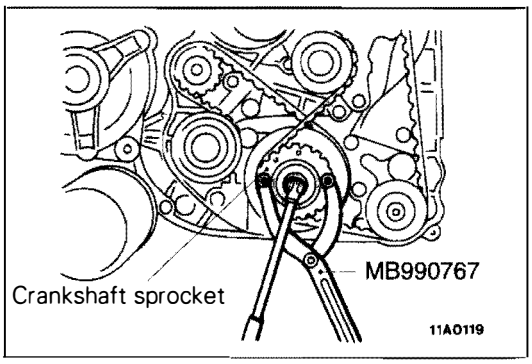


INSTALLATION SERVICE POINTS

E11JJ04AA

◆A◆ CRANKSHAFT FRONT OIL SEAL INSTALLATION

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



◆B◆ CRANKSHAFT SPROCKET/CRANKSHAFT BOLT INSTALLATION

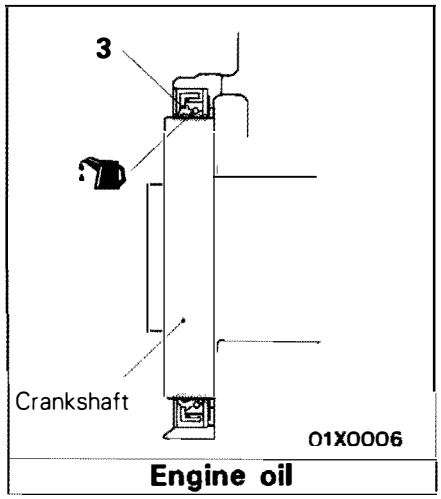
Apply the minimum amount of engine oil to the bearing surface and thread of the crankshaft bolt.

CRANKSHAFT REAR OIL SEAL

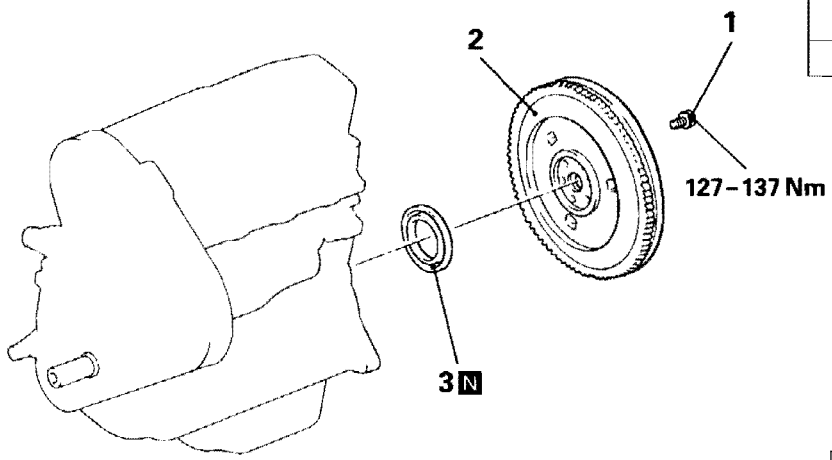
E11JK00AA

REMOVAL AND INSTALLATION

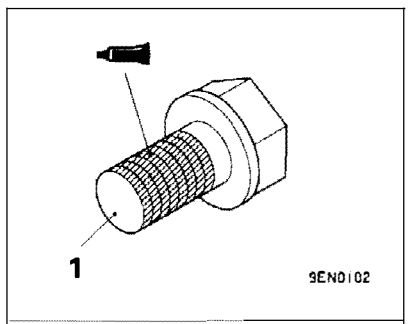
Pre-removal and Post-installation Operations
(1) Transmission Assembly Removal and Installation (Refer to GROUP 22 – Transmission Assembly.)
(2) Clutch Cover and Disc Removal and Installation



Engine oil

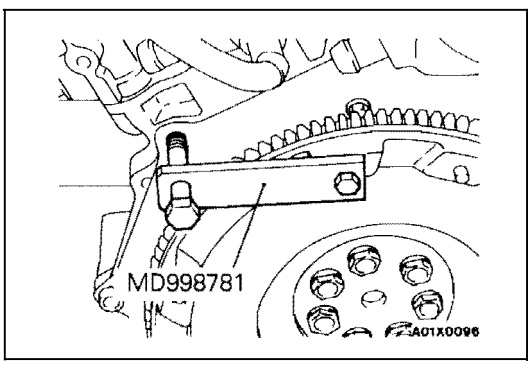


A01X0095



Specified sealant:
3M Stud locking 4170 or equivalent

Removal steps
◇A◇ ◆B◆ 1. Flywheel bolt
2. Flywheel
◆A◆ 3. Crankshaft rear oil seal

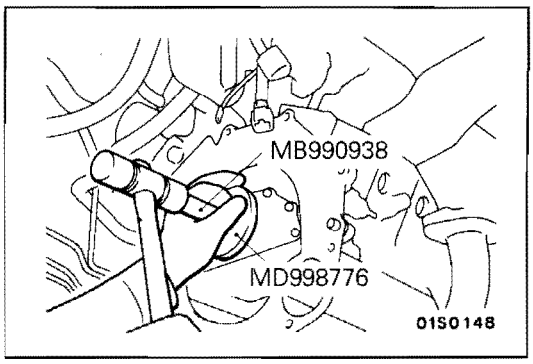


REMOVAL SERVICE POINT

E11JK01AA

◇A◇ FLYWHEEL BOLT REMOVAL

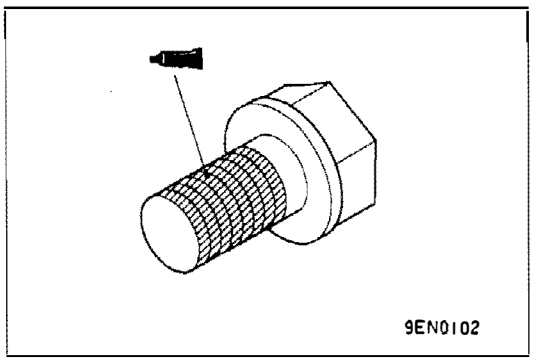
Use the special tool to secure the flywheel and remove the bolt.



INSTALLATION SERVICE POINTS E11JK04AA

◆A◆ CRANKSHAFT REAR OIL SEAL INSTALLATION

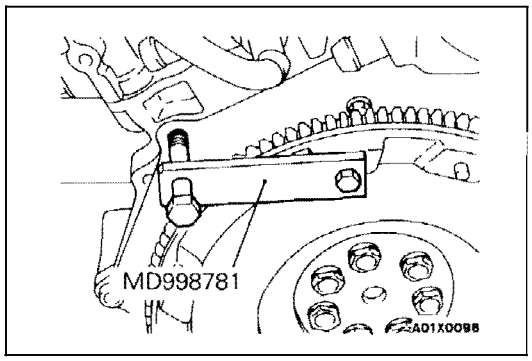
(1) Apply a small amount of engine oil to the entire circumference of the oil seal lip.
(2) Tap in the oil seal as shown in the illustration.



◆B◆ FLYWHEEL BOLT INSTALLATION

(1) Clean off all sealant, oil and other substances which are adhering to the threaded bolts, crankshaft thread holes and the flywheel.
(2) Apply oil to the bearing surface of the flywheel bolt.
(3) Apply oil to the crankshaft thread holes.
(4) Apply sealant to the threaded mounting bolts.

Specified sealant:3M Stud locking 4170 or equivalent



(5) Use the special tool to secure the flywheel and install the bolt.

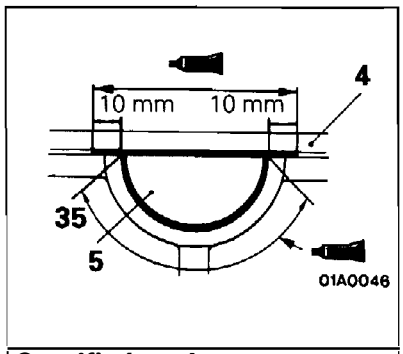
Specified torque: 127–137 Nm

CYLINDER HEAD GASKET

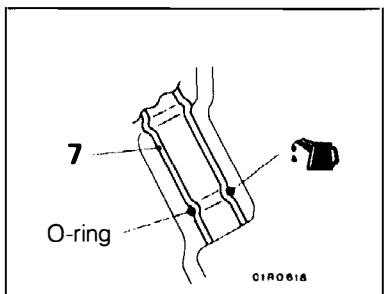
E11JL00AA

REMOVAL AND INSTALLATION

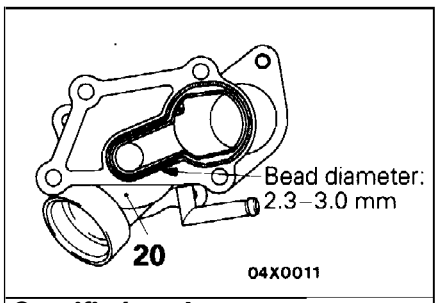
Pre-removal and Post-installation Operations
(1) Engine Coolant Draining and Refilling
(2) Engine Oil Draining and Refilling (Refer to GROUP 12 – Service Adjustment Procedures.)
(3) Air Cleaner Assembly Removal and Installation



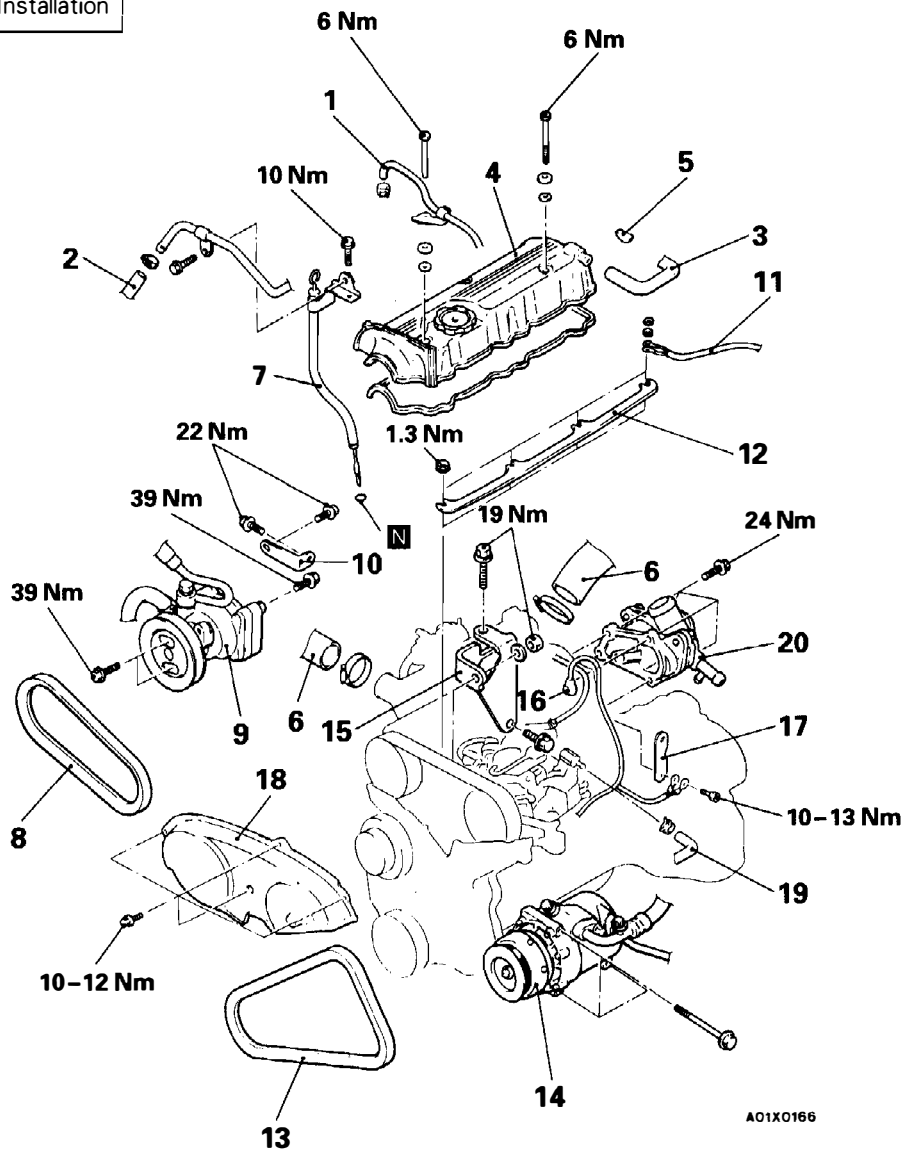
Specified sealant:
3M ATD Part No. 8660 or equivalent



Engine oil

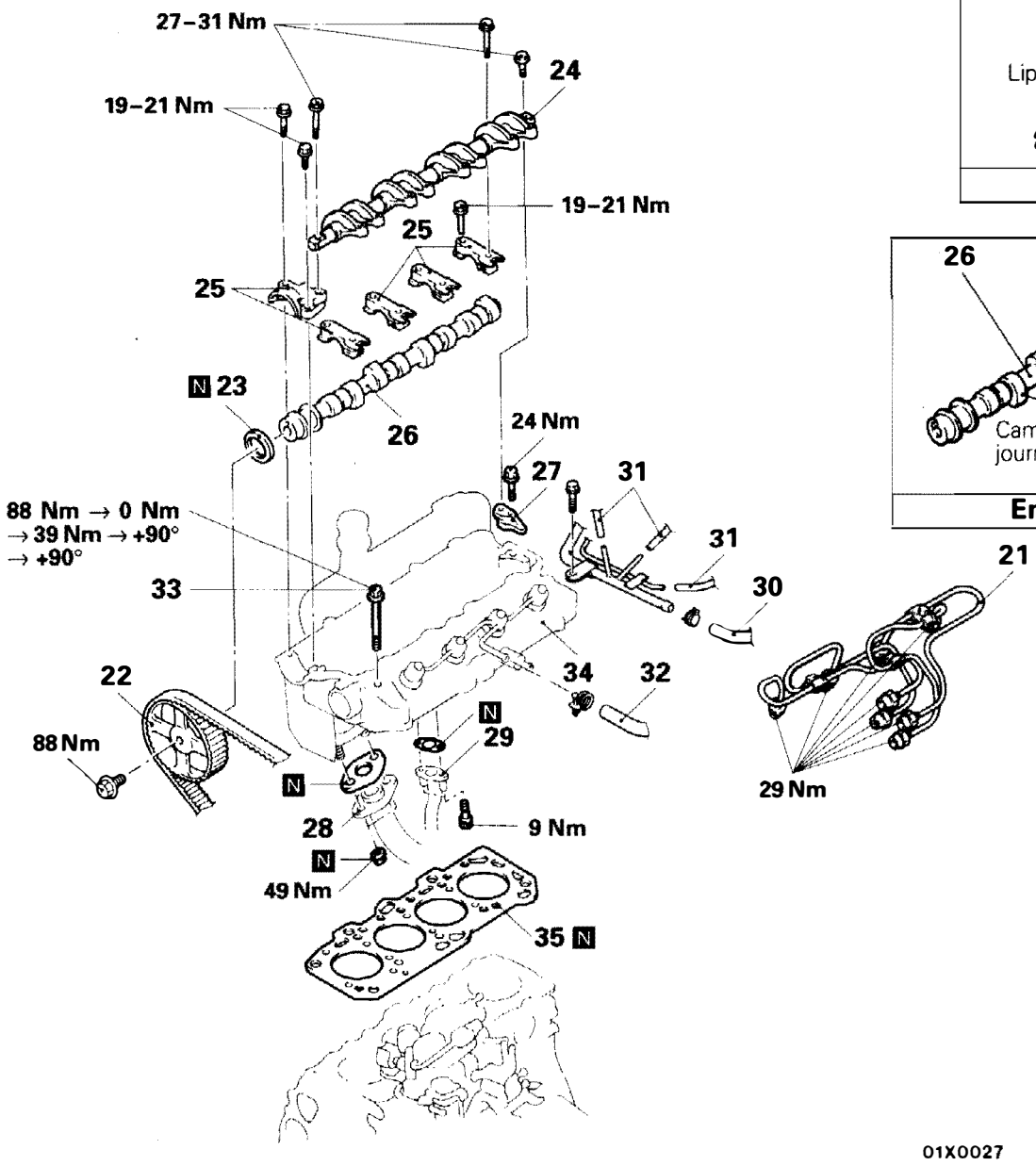


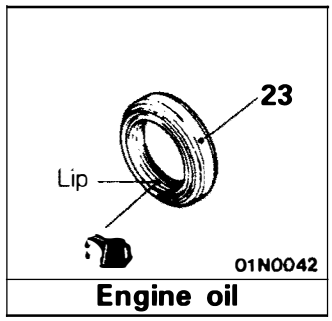
Specified sealant:
MITSUBISHI GENUINE PART MD970389 or equivalent

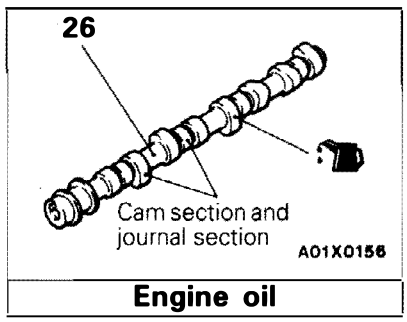


Removal steps

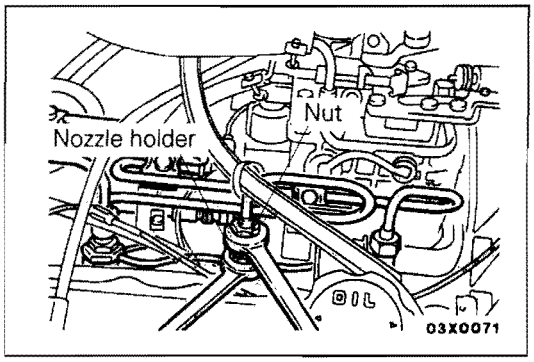
1. Connection for vacuum hose (Boost compensator)
2. Connection for vacuum hose
3. Connection for breather hose
4. Rocker cover
5. Semi-circular packing
6. Connection for air hose
7. Oil level gauge
   - Drive belt tension adjustment (Refer to P.11J-7.)
8. Drive belt (Power steering)
9. Power steering oil pump
10. Power steering oil pump bracket stay
11. Glow plug connector
12. Glow plug plate
13. Drive belt (A/C)
14. A/C compressor
15. Injection pump stay
16. Engine coolant temperature sensor and engine coolant temperature gauge unit connector
17. Engine hanger
18. Timing belt upper cover
19. Connection for water hose
20. Thermostat case assembly (Refer to GROUP 14 – Water Hose Pipe.)







◇A◆ ◆G◆ 21. Fuel injection pipe
◇B◇ ◆F◆ 22. Camshaft sprocket
◆E◆ 23. Camshaft oil seal
◆D◆ 24. Rocker arm and shaft assembly
◆C◆ 25. Camshaft bearing cap
26. Camshaft
27. Rocker shaft support
28. Connection for front exhaust pipe
29. Connection for oil return pipe
30. Connection for brake booster vacuum hose
31. Connection for vacuum hose
32. Connection for fuel return hose
◇C◇ ◆B◆ 33. Cylinder head bolt
34. Cylinder head assembly
◆A◆ 35. Cylinder head gasket

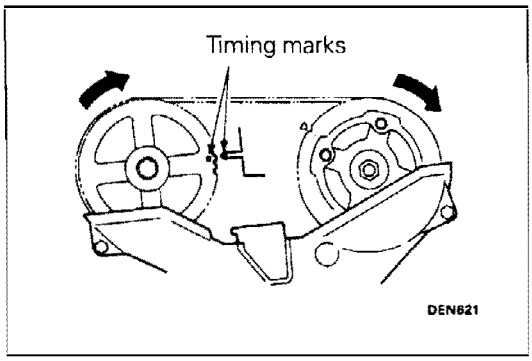


REMOVAL SERVICE POINTS E11JL01AA

◆A◇ FUEL INJECTION PIPE REMOVAL

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

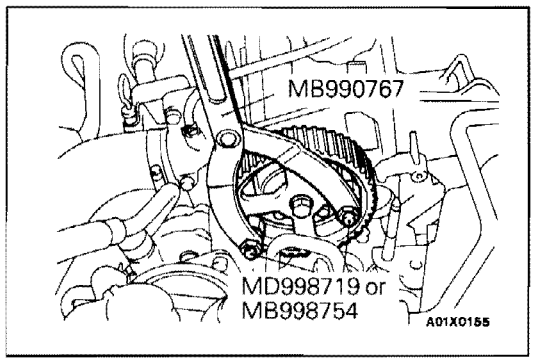
Caution
After disconnecting the injection pipe, plug the opening so that no foreign particles get inside the pump or into the injection nozzle.



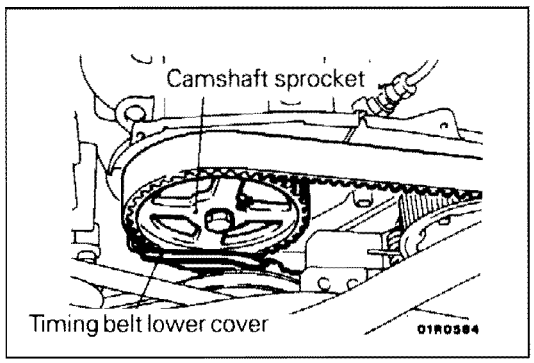
◆B◇ CAMSHAFT SPROCKET REMOVAL

(1) Rotate the crankshaft clockwise and check that the camshaft sprocket's timing mark and the injection sprocket's timing mark are aligned.

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



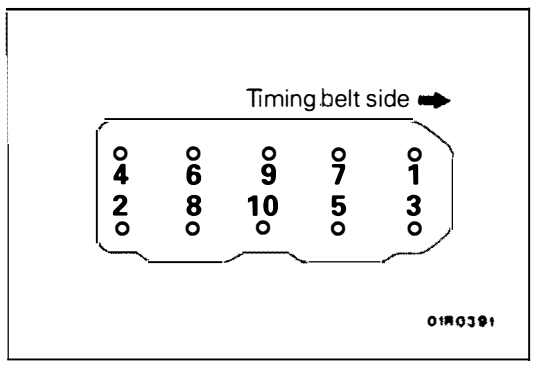
(2) Use the special tool to loosen the camshaft sprocket bolt.



(3) Remove the camshaft sprocket with the timing belt still attached, and place it on the timing belt lower cover.

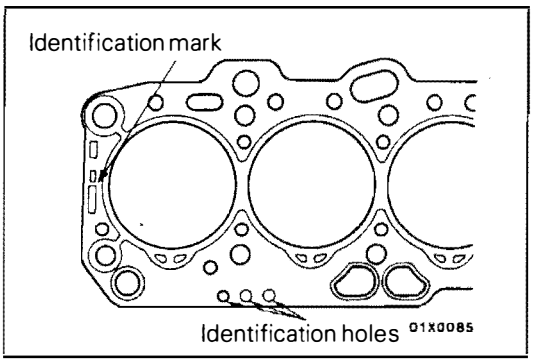
NOTE
At this time, tie the timing belt and camshaft sprocket and also the timing belt and injection pump sprocket together with cord or similar so that they do not become unmeshed.

Caution
The crankshaft should not be turned after the camshaft sprocket has been removed.



◇C◇ CYLINDER HEAD BOLT REMOVAL

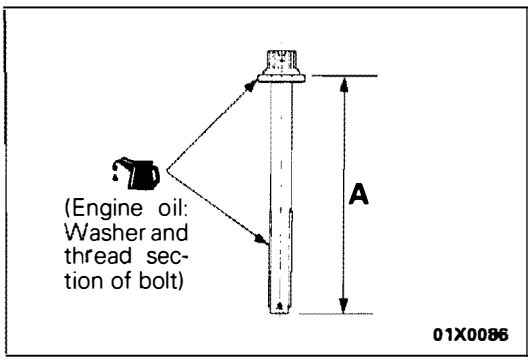
Loosen each of the bolts in 2 or 3 steps (in the order shown in the illustration), and then remove the cylinder head assembly.



INSTALLATION SERVICE POINTS E11JL04AA

◆A◆ CYLINDER HEAD GASKET INSTALLATION

(1) Wipe off any oil or grease from the gasket mounting surface.
(2) Check the number of identification holes on the cylinder head gasket that was removed, and select a cylinder head gasket with the same number of identification holes.
(3) Place the cylinder head gasket on top of the cylinder block so that the identification mark is facing upwards as in the illustration.

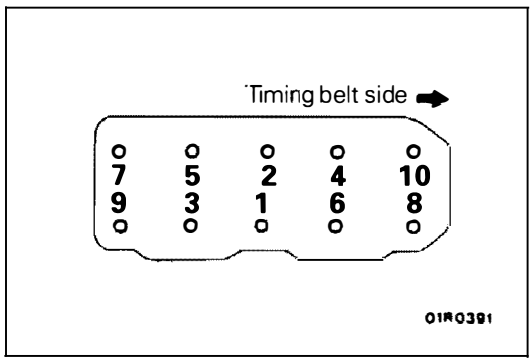


◆B◆ CYLINDER HEAD BOLT INSTALLATION

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

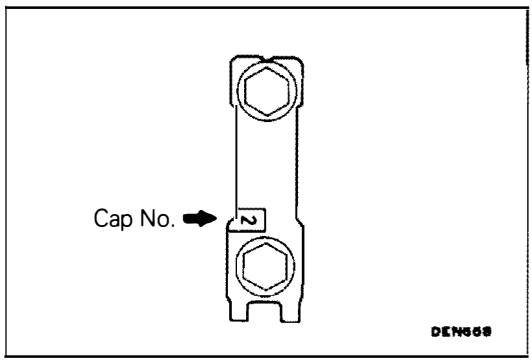
Limit (A): Within 119.7 mm

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



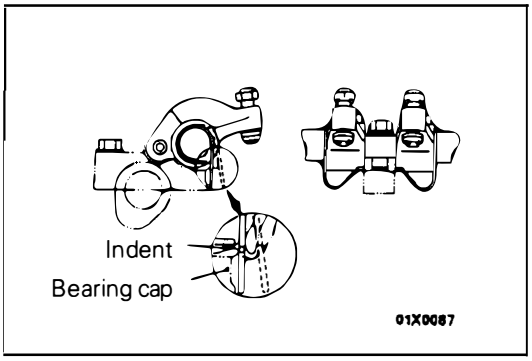
(3) Tighten the bolts in order by the following procedure.

Procedure	Operation contents	Remarks
1	Tighten to 88 Nm	Carry out in the order shown in the illustration
2	Fully loosen	Carry out in the reverse order to that shown in the illustration
3	Tighten to 39 Nm	Carry out in the order shown in the illustration
4	Tighten by 1/4 turn (90°)	Carry out in the order shown in the illustration
5	Tighten by 1/4 turn (90°)	Carry out in the order shown in the illustration



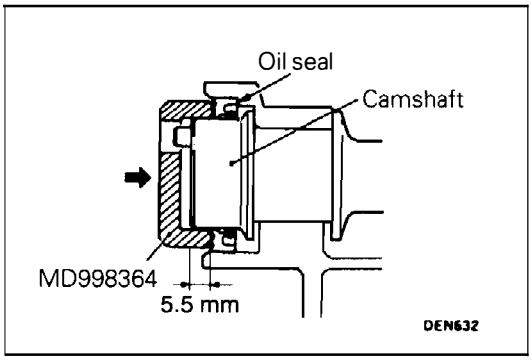
◆C◆ CAMSHAFT BEARING CAP INSTALLATION

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



◆D◆ ROCKER ARM AND SHAFT ASSEMBLY INSTALLATION

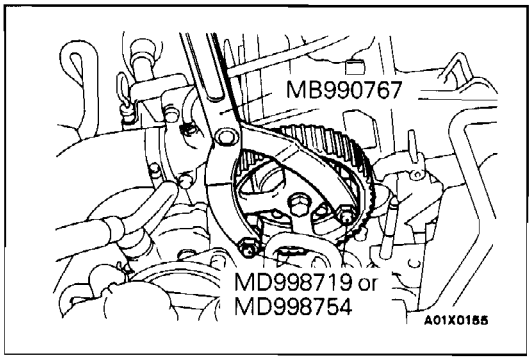
(1) Install the rocker arm and shaft assembly to the bearing caps.
(2) Set the rocker arm springs into the bearing cap indents.
(3) Check the valve clearance and adjust if necessary. (Refer to P.11J-8.)



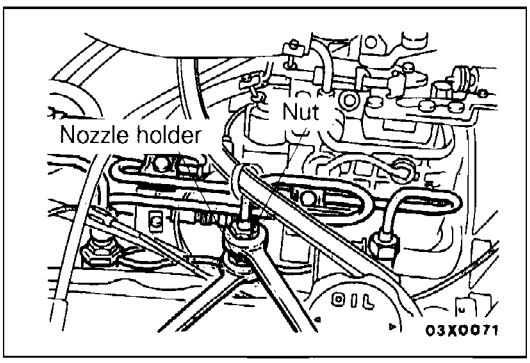
◆E◆ CAMSHAFT OIL SEAL INSTALLATION

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

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



◆F◆ CAMSHAFT SPROCKET INSTALLATION



◆G◆ FUEL INJECTION PIPE INSTALLATION

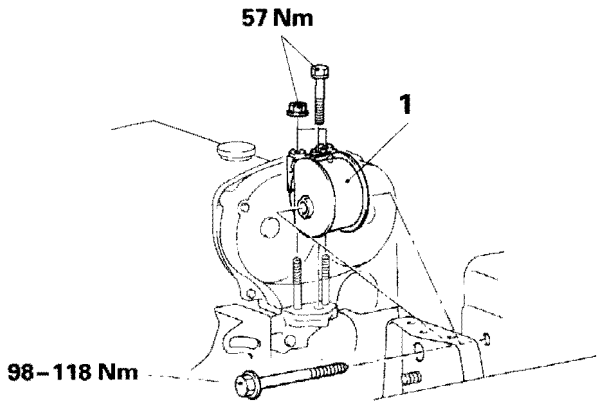
When tightening the nuts at both ends of the fuel injection pipe, hold the other side (pump-side delivery holder, nozzle-side nozzle holder) with a wrench, and tighten the nuts to the specified torque.

TIMING BELT/TIMING BELT B

E11JM00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
- Under Cover Removal and Installation



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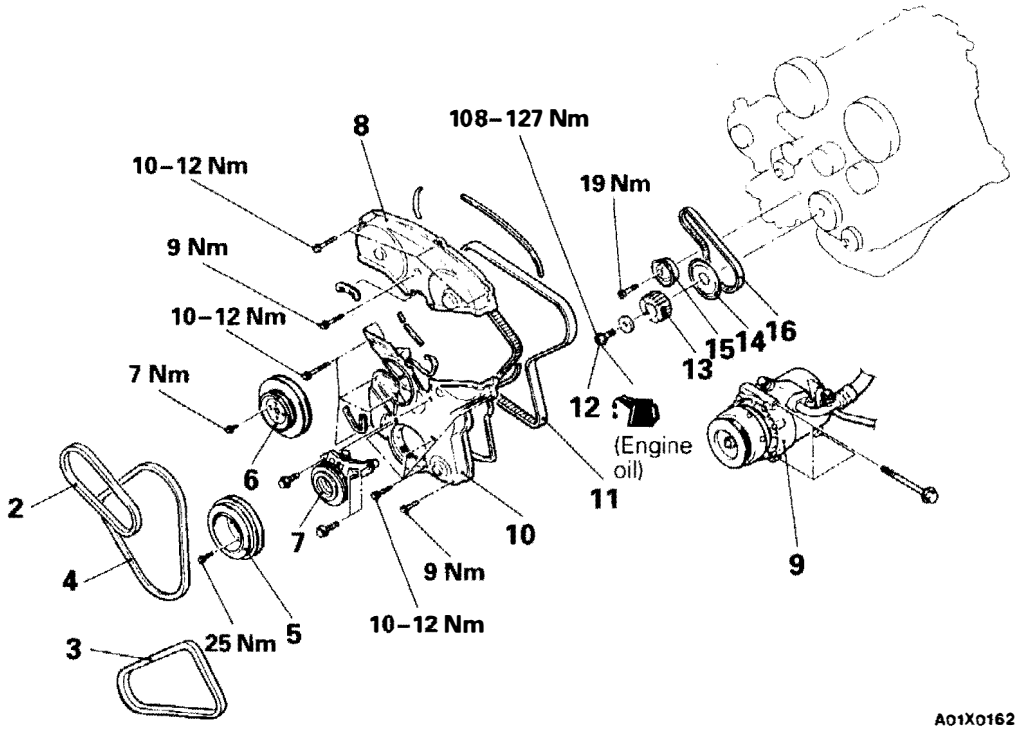

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Timing belt removal steps

1. Engine mount bracket
   - Drive belt tension adjustment (Refer to P.11J-7.)
2. Drive belt (Power steering)
3. Drive belt (A/C)
4. Drive belt (Alternator)
5. Crankshaft pulley
6. Water pump pulley
7. A/C tensioner pulley assembly
8. Timing belt upper cover
9. Connection for A/C compressor
10. Timing belt lower cover

◆D◆ • Timing belt tension adjustment

◇A◇ ◆C◆ 11. Timing belt

Timing belt B removal steps

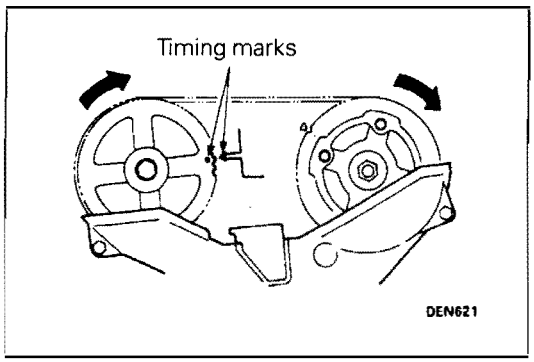
◇B◇ ◆B◆ 12. Crankshaft bolt

◇B◇ ◆B◆ 13. Crankshaft sprocket

◆B◆ 14. Flange

15. Timing belt B tensioner

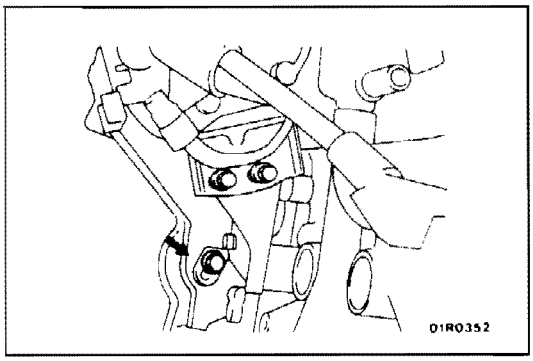
◇B◇ ◆A◆ 16. Timing belt B



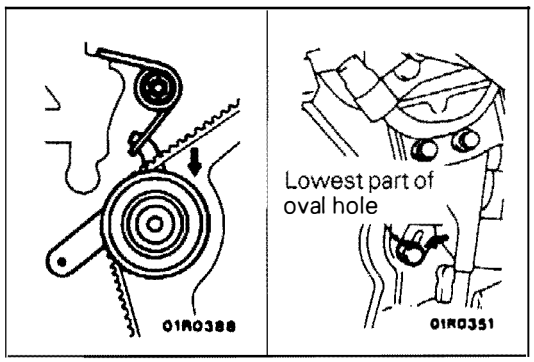
REMOVAL SERVICE POINTS E11JM01AA

〈A〉 TIMING BELT REMOVAL

(1) Align the timing marks.

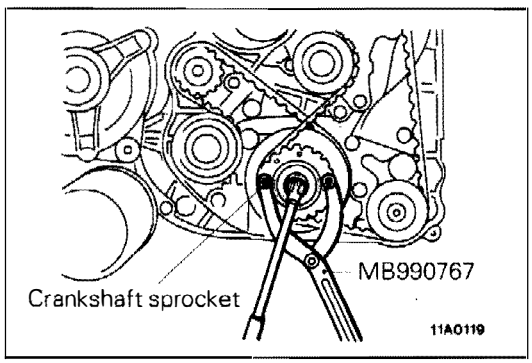


(2) Using a long extension, loosen the installation bolt of the timing belt tensioner (from the engine rear).



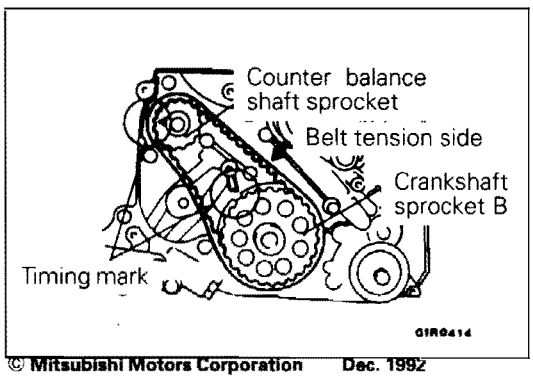
(3) Move the timing belt tensioner downward and loosely tighten the bolt so that the tensioner doesn't return; then remove the timing belt.

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



〈B〉 CRANKSHAFT BOLT/CRANKSHAFT SPROCKET/ TIMING BELT B REMOVAL

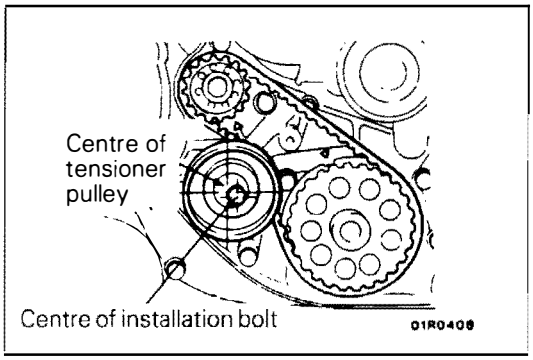
Caution
If the timing belt "B" is to be re-used, use chalk to mark (on its flat side) an arrow indicating the clockwise direction.



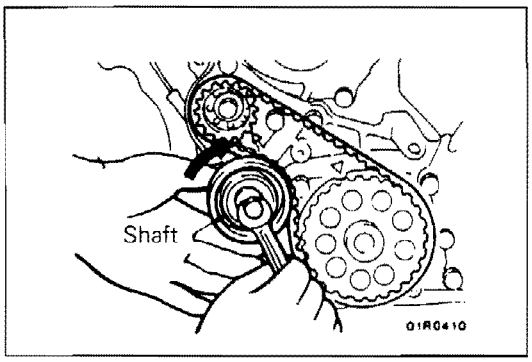
INSTALLATION SERVICE POINTS E11JM04AA

◆A◆ TIMING BELT B INSTALLATION

(1) Install timing belt "B" by the following procedure.
1) Ensure that crankshaft sprocket "B" timing mark and the counter balance shaft sprocket timing mark are aligned.
2) Fit timing belt "B" over crankshaft sprocket "B" and the counter balance shaft sprocket. Ensure that there is no slack in the belt.

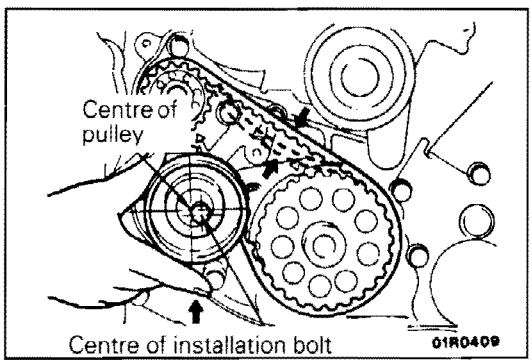


(2) Install timing belt "B" by the following procedure.
1) Temporarily fix the timing belt "B" tensioner such that the centre of the tensioner pulley is to the left and above the centre of the installation bolt, and temporarily attach the tensioner pulley so that the flange is toward the front of the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



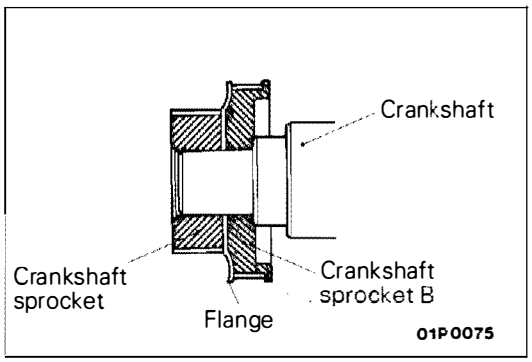
2) Holding the timing belt "B" tensioner up with your finger in the direction of the arrow, place pressure on the timing belt so that the tension side of the belt is taut. Now tighten the bolt to fix the tensioner.

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



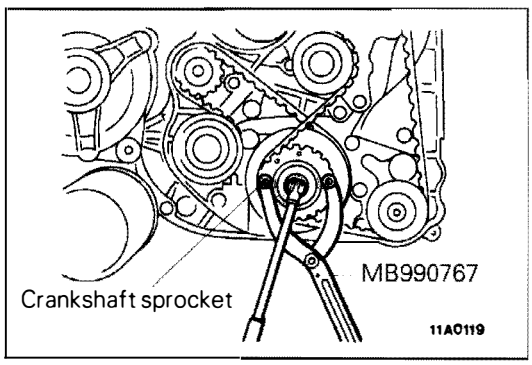
3) Check to ensure that when centre of span on tension side is depressed with index finger in direction of arrow, tension of belt is up to specification.

Standard value: 5–7 mm

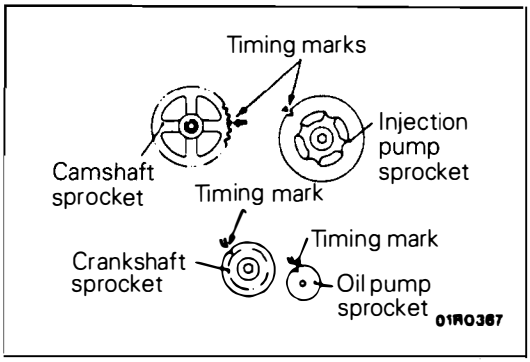


◆B◆ FLANGE/CRANKSHAFT SPROCKET/CRANKSHAFT BOLT INSTALLATION

(1) When installing, be sure the direction is correct.

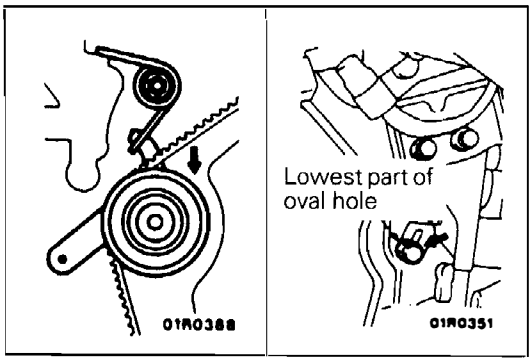


(2) Install the crankshaft sprocket by using the special tool.



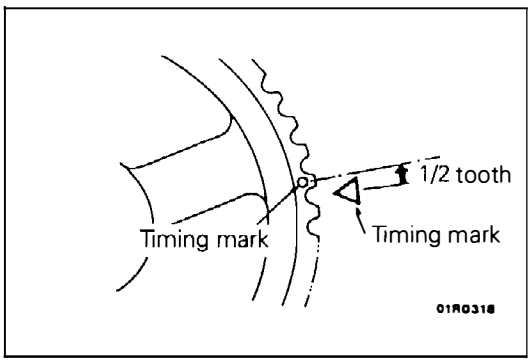
◆C◆ TIMING BELT INSTALLATION

(1) Ensure that the timing marks of the camshaft sprocket, the injection pump sprocket, the crankshaft sprocket, and the oil pump sprocket are all aligned.



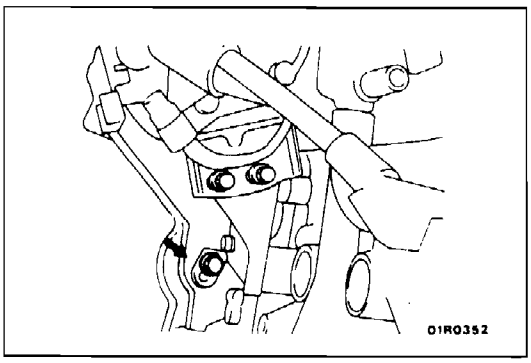
(2) Move the timing belt tensioner downward and loosely tighten the bolt so that the tensioner doesn't return.
(3) Install the timing belt onto the crankshaft sprocket, the timing belt idler, the camshaft sprocket, the injection pump sprocket, and the oil pump sprocket in that order.

Caution
If the timing belt is reused, install so that the arrow marked on it at the time of removal is pointing in the clockwise direction.

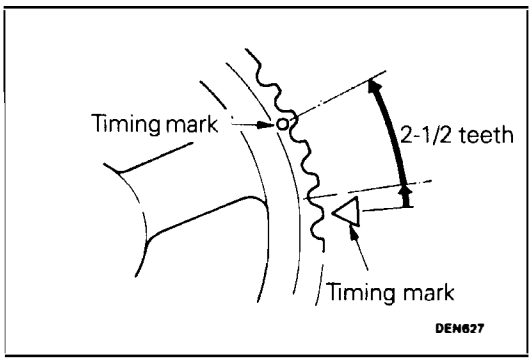


◆D◆ Timing belt tension adjustment

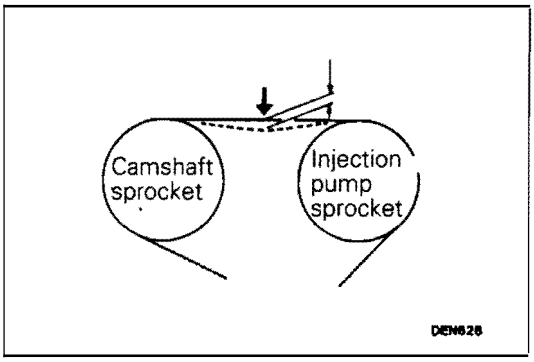
(1) Turn the crankshaft anticlockwise by a distance equivalent to 1/2 tooth of the camshaft sprocket in order to correct looseness at the timing belt idler side.



(2) Loosen (by 1/6 to 1/2 turn) the tensioner installation bolt previously secured provisionally, taking advantage of the force of the tensioner spring to provide tension to the belt.



(3) In addition, turn the crankshaft anticlockwise by a distance equivalent to 2–1/2 teeth.
(4) Tighten the timing belt tensioner at the specified torque.
(5) Turn the crankshaft clockwise and align the timing mark.



(6) Using the index finger, press between the camshaft sprocket and the injection pump and sprocket, and check whether or not the amount of flexion is within the standard value range or not.

Standard value range: 4–5 mm

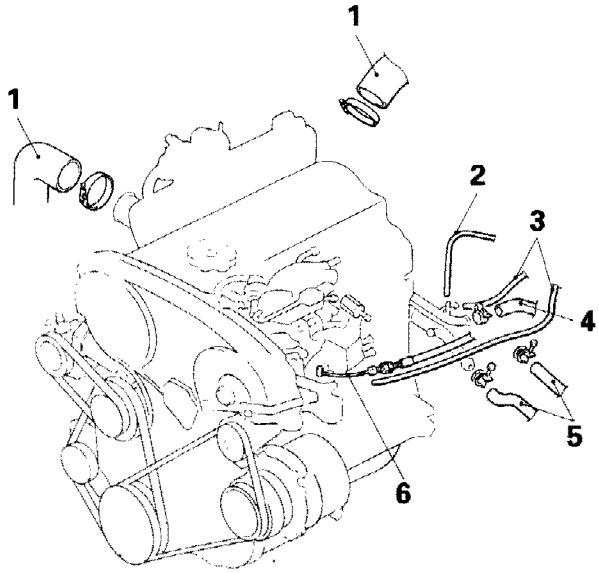
ENGINE ASSEMBLY

E11JO00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Hood Removal (Refer to GROUP 42 – Hood)
(2) Air Cleaner Assembly Removal
(3) Engine Coolant Draining
(4) Radiator Assembly Removal (Refer to GROUP 14 – Radiator)
(5) Under Cover Removal
(6) Transmission Assembly Removal (Refer to GROUP 22 and 23 – Transmission Assembly)
(7) Front Exhaust Pipe Removal (Refer to GROUP 15 – Exhaust Pipe and Muffler)

Post-installation Operation
(1) Transmission Assembly Installation (Refer to GROUP 22 and 23 – Transmission Assembly)
(2) Front Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe Muffler)
(3) Under Cover Installation
(4) Radiator Assembly Installation (Refer to GROUP 14 – Radiator)
(5) (5) Engine Coolant Supplying
(6) Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures)
(7) Air Cleaner Assembly Installation
(8) Hood Installation (Refer to GROUP 42 – Hood)



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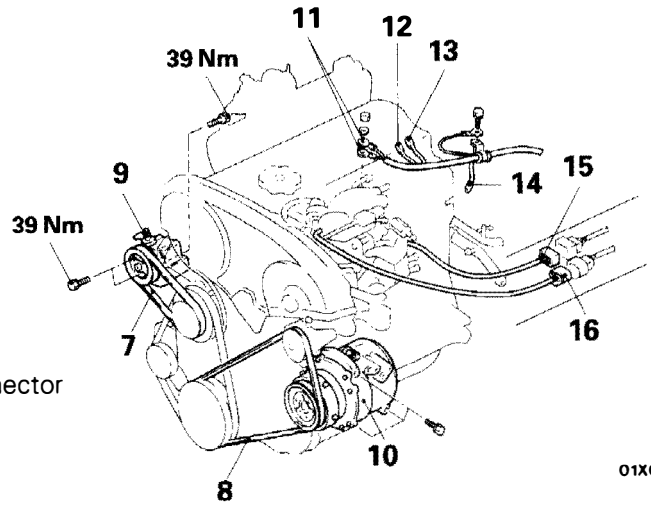
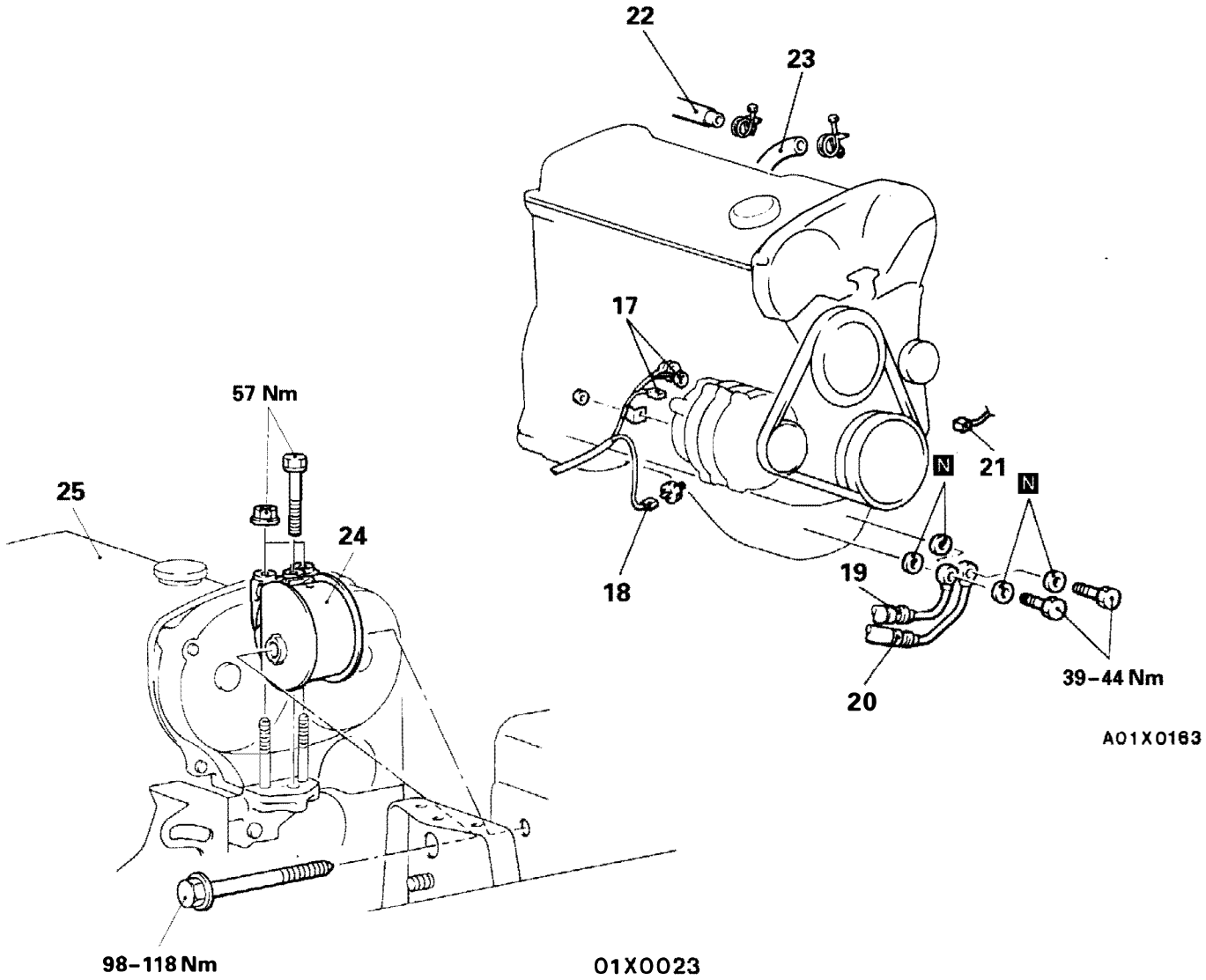
Removal steps
1. Connection for air hose
2. Connection for EGR vacuum hose
3. Connection for vacuum hose (A/C idle-up solenoid valve)
4. Connection for brake booster vacuum hose
5. Connection for heater hose
6. Connection for accelerator cable



01X0019

- Drive belt tension adjustment (Refer to P.11J-7.)
7. Drive belt (Power steering)
8. Drive belt (A/C)
◇A◇ 9. Power steering oil pump
◇B◇ 10. A/C compressor
11. Glow plug connector
12. Lever position switch connector
13. Engine coolant temperature switch connector
14. Thermo switch connector
15. Fuel injection pump harness connector
16. Lever position sensor connector



17. Alternator connector
18. Oil pressure switch connector
19. Engine oil feed hose connection
20. Engine oil return hose connection
21. Connection for oil level sensor connector
22. Connection for fuel main hose
23. Connection for fuel return hose
◇C◇ ◆B◆ 24. Engine mount bracket
◇D◇ ◆A◆ 25. Engine assembly

REMOVAL SERVICE POINTS E11J001AA

◇A◇ POWER STEERING OIL PUMP REMOVAL

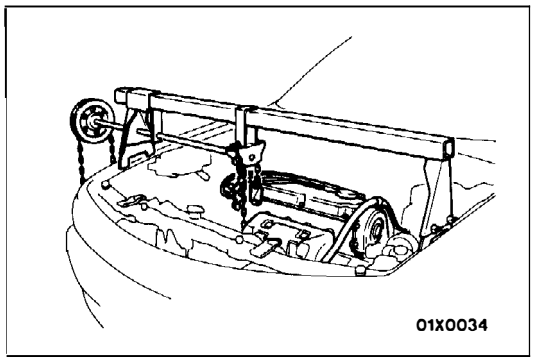
Remove the power steering oil pump from the bracket with the hose attached.

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

〈B〉 A/C COMPRESSOR REMOVAL

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

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



〈C〉 ENGINE MOUNT BRACKET REMOVAL

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

〈D〉 ENGINE ASSEMBLY REMOVAL

After checking that all cables, hoses and harness connectors, etc., are disconnected from the engine, lift the chain block slowly to remove the engine assembly upward from the engine compartment.

INSTALLATION SERVICE POINTS E11JO04AA

▶A◀ ENGINE ASSEMBLY INSTALLATION

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

▶B◀ ENGINE MOUNT BRACKET INSTALLATION

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

LUBRICATION

CONTENTS

E12ZA00AA

GENERAL INFORMATION E12ZB00AA

The lubrication method is a fully force-fed, full-flow filtration type. The oil pump for 4G93, 6A12 and 6G73 engines is a trochoid type which is directly mounted to the crankshaft, and the one for 4G63 and 4D68 engines is a gear type which is driven by the crankshaft via the timing belt.
Furthermore, in 4G63, 6A12, 6G73 and 4D68 engines, the oil level sensor is located in the oil pan, and a system is equipped whereby an indicator gives a warning when the oil level drops.

ENGINE OILS

Health Warning

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

Recommended Precautions

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

Other precautions:

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

LUBRICANTS

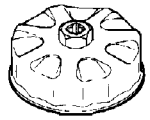
E12ZC00AA

Items	Engine oil (API classification)	Quantity ℓ		
		Oil filter	Oil cooler	Total quantity
4G93	SG	0.3	–	3.8
4G63-2WD, 6A12	SG	0.3	0.1*	4.3
4G63-4WD	SG	0.3	0.1	4.4
4D68	CD or higher	0.8	0.3	5.1
6G73	SG	0.3	0.3	4.6

*: 6A12

SPECIAL TOOL

E12ZD00AA

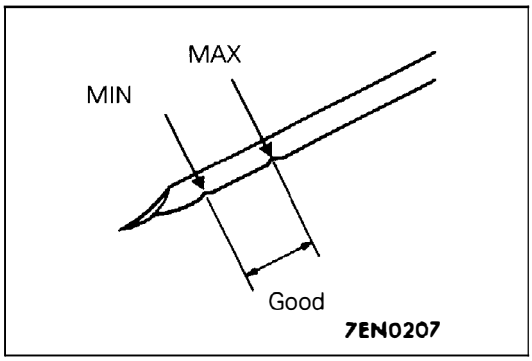
Tool	Number	Name	Use
	MB991396	Oil filter wrench	Removal and installation of engine oil filter <4G93>

SERVICE ADJUSTMENT PROCEDURES

ENGINE OIL INSPECTION

E12ZF00AA

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



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

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

   Specified oil: (API classification)

   <4G93, 4G63, 6A12, 6G73> SG

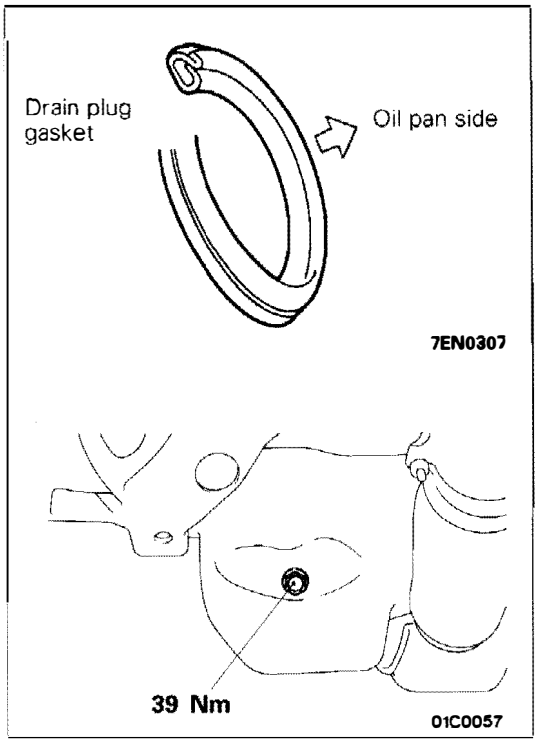
   <4D68> CD or higher

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

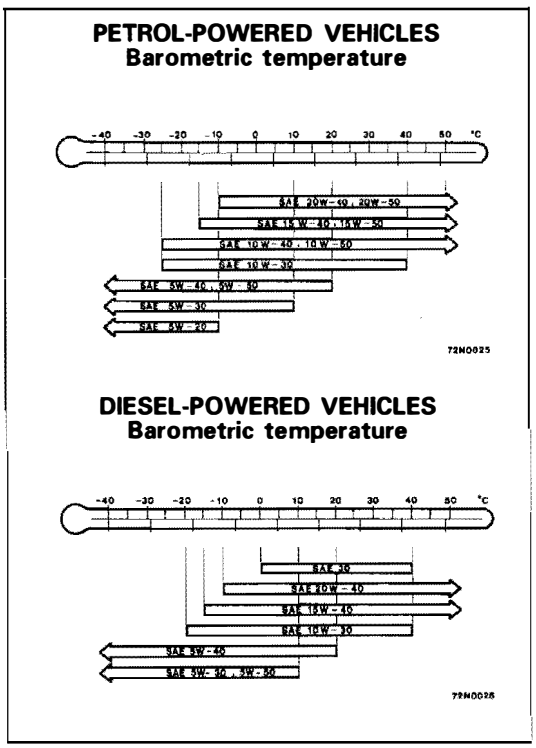
ENGINE OIL REPLACEMENT E12ZF01AA

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

Caution
Use care as oil could be hot.



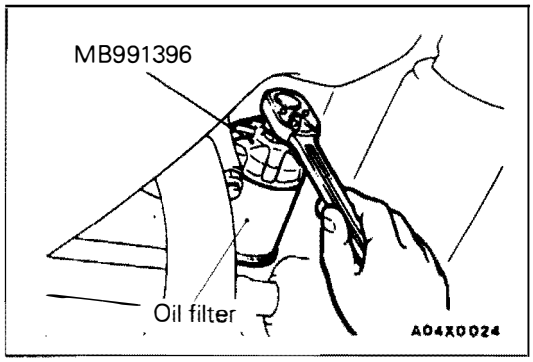
4. Install a new drain plug gasket so that it faces in the direction shown in the illustration, and then tighten the drain plug to the specified torque.



5. Refill with specified quantity of oil.

Items	Specified oil (API classification)	Oil quantity (Includes volume inside oil filter and oil cooler) ℓ
4G93	SG	3.8
4G63-2WD, 6A12	SG	4.3
4G63-4WD	SG	4.4
4D68	CD or higher	5.1
6G73	SG	4.6

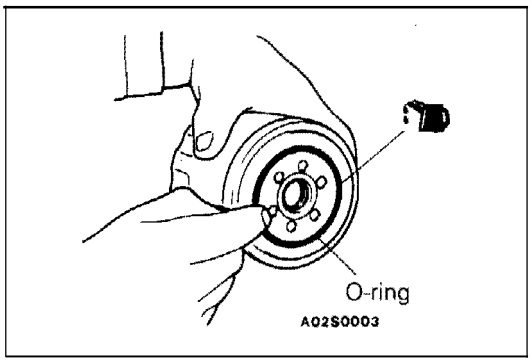
6. Install the engine oil filler cap.
7. Check oil level. (Refer to P.12-3.)



OIL FILTER REPLACEMENT E12ZF02AA

<4G93>

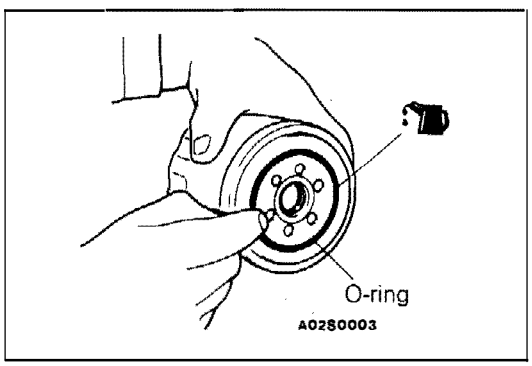
1. After removing the engine oil filler cap, remove the engine oil drain plug to drain the engine oil.
2. Use the special tool to remove the engine oil filter from the underside of the vehicle.
3. Clean the filter bracket side mounting surface.



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

   NOTE
   Tightening torque: 14 Nm

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



<4G63, 6A12, 6G73, 4D68> E12ZF02BA

1. After removing the engine oil filler cap, remove the engine oil drain plug to drain the engine oil.
2. Use an oil filter wrench to remove the engine oil filter.
3. Clean the filter bracket side mounting surface.
4. Apply a small amount of engine oil to the O-ring of the new oil filter.
5. Turn the oil filter by hand to install.

   NOTE
   Tightening torque

   <4G63, 6G73> : 14 Nm

   <6A12> : 17 Nm

   <4D68> : 20 Nm

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

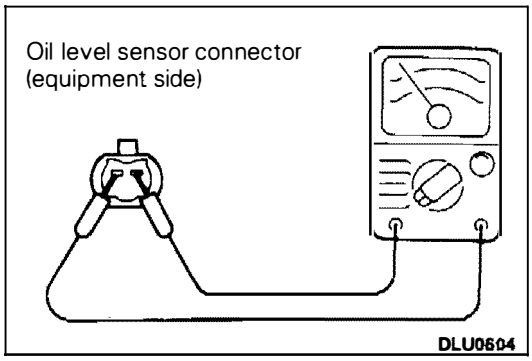
OIL LEVEL SENSOR INSPECTION E12ZF03AA

<Except 4G93>

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

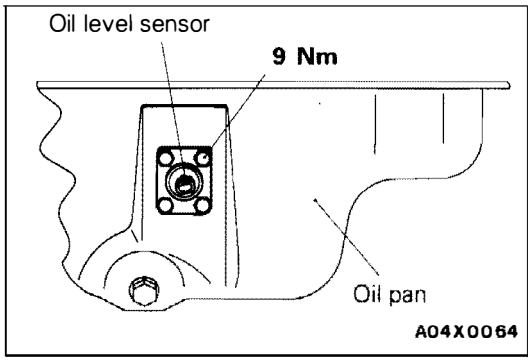
   NOTE
   If the oil level warning lamp does not illuminate, the cause is probably a blown lamp, or a malfunction in the relay.
3. When the engine is started, check that the oil level warning lamp turns off.

   NOTE
   If the oil level warning indicator does not turn off, the cause is probably malfunction in the oil level sensor or in the relay.
4. Disconnect the oil level sensor connector. Check that the oil level warning lamp illuminates after approximately 40 seconds.



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

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



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

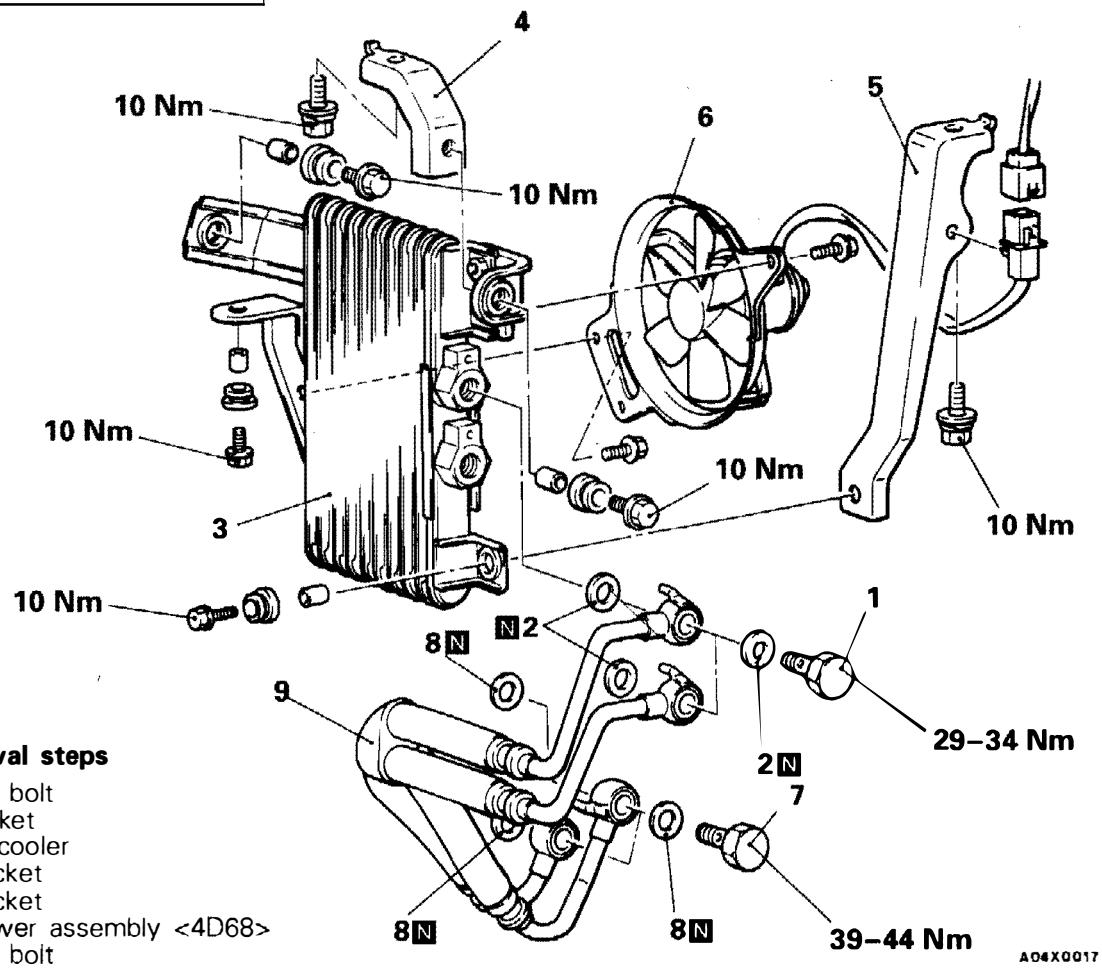
ENGINE OIL COOLER <6G73, 4D68>

REMOVAL AND INSTALLATION

E12ZG00AA

Pre-removal Operation
- Front Bumper Removal (Refer to GROUP 51 – Front Bumper.)

Post-installation Operation
- Front Bumper Installation (Refer to GROUP 51 – Front Bumper.)
- Oil Checking and Supplying



Removal steps

〈A〉 ◗B◖ 1. Eye bolt
2. Gasket
3. Oil cooler
4. Bracket
5. Bracket
6. Blower assembly <4D68>
7. Eye bolt
8. Gasket
◗A◖ 9. Hose assembly

REMOVAL SERVICE POINT

E12ZG01AA

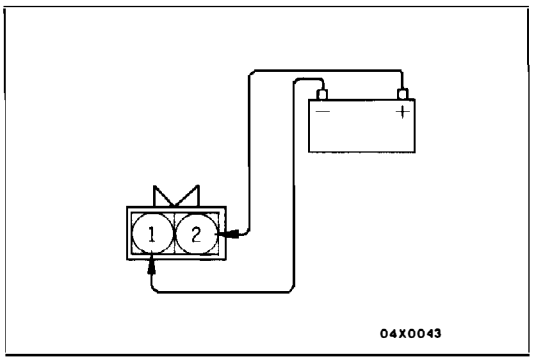
〈A〉 EYE BOLT REMOVAL

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

INSPECTION

E12ZG02AA

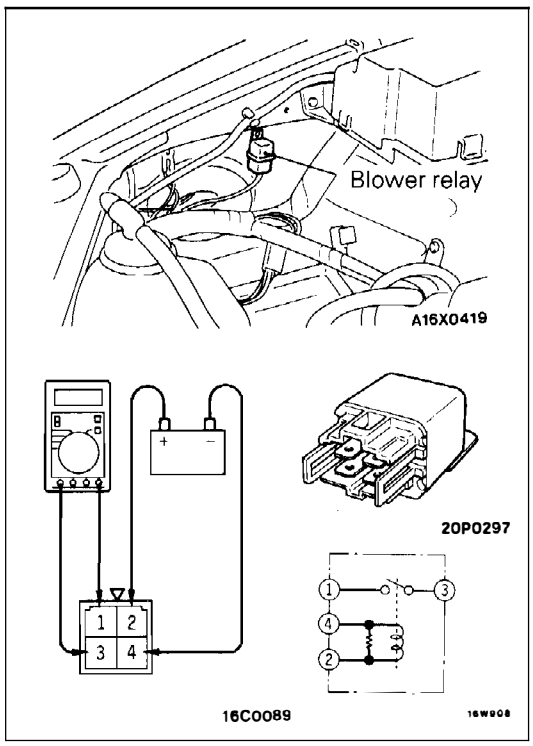
- Check for foreign material between oil cooler fins.
- Check the oil cooler fins for bend or damage.
- Check the oil cooler hoses for crack, damage, clogging or deterioration.
- Check the eye bolts for clogging or deformation.



BLOWER MOTOR <4D68>

E12ZG02BA

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

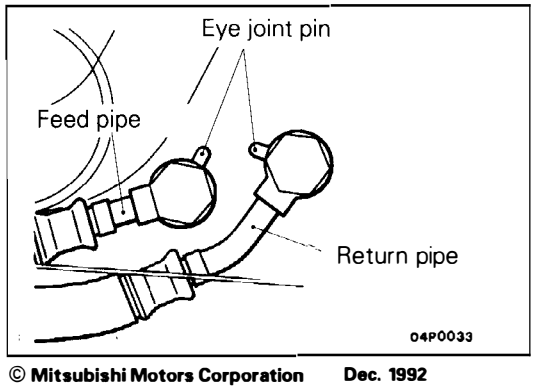


BLOWER RELAY

E12ZG02CA

Terminal / Battery voltage	1	2	3	4
Not supplied		○		○
Supplied	○		○	⊕ ⊖

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



INSTALLATION SERVICE POINTS

E12ZG03AA

◆A◆ HOSE ASSEMBLY INSTALLATION

Insert the eye joint pin into the oil filter bracket hole and install the hose assembly.

◆B◆ EYE BOLT INSTALLATION

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

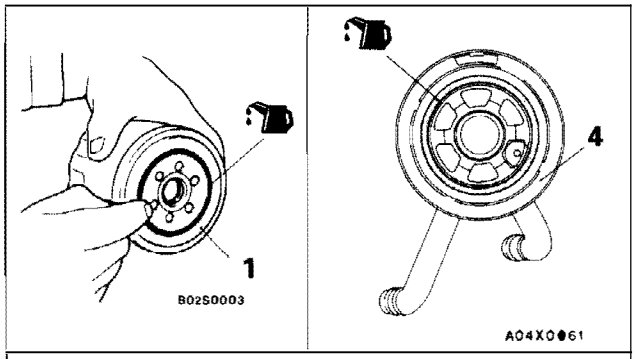
ENGINE OIL COOLER <4G63-4WD, 6A12>

REMOVAL AND INSTALLATION

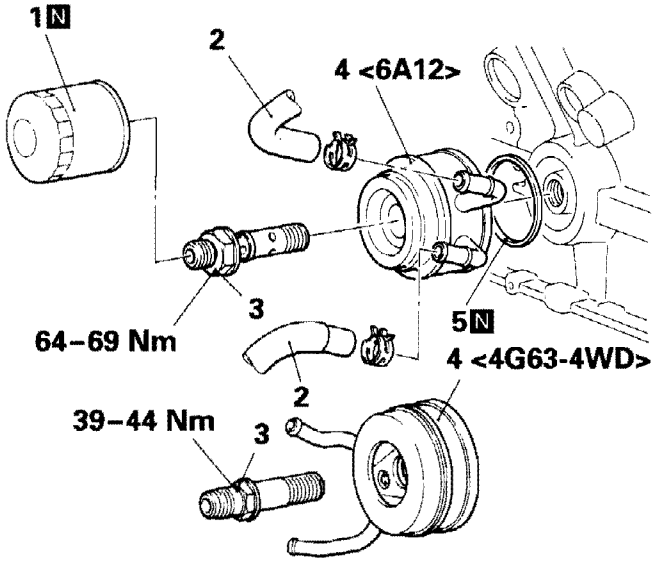
E12ZG06AA

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

Post-installation Operation
- Engine Coolant Supplying (Refer to GROUP 14 – Service Adjustment Procedures.)
- Oil Checking and Supplying



Engine oil

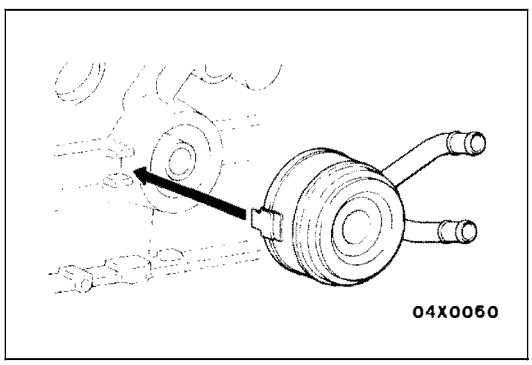


Removal steps
1. Oil filter
2. Water hose connection
3. Oil cooler bolt
- ◆A◆ 4. Engine oil cooler
5. Oil cooler gasket

INSPECTION

E12ZG08AA

- Check the water hoses for crack, damage, clogging or deterioration.
- Check the oil cooler bolt for clogging or deformation.



INSTALLATION SERVICE POINTS

E12ZG09AA

◆A◆ ENGINE OIL COOLER INSTALLATION

Insert the engine oil cooler positioning tab into the cylinder block rib, and tighten it with the oil cooler bolt.

FUEL

CONTENTS

E13ZA00AA

NOTE
Groups that have been shaded are not contained in this manual.

 PWDE9211

NOTES

MULTIPOINT FUEL INJECTION (MPI)

CONTENTS

E13AA00AA

GENERAL INFORMATION

E13AB00AA

The Multi Point Fuel Injection System consists of sensors which detect the engine conditions, the ENGINE ECU which controls the system based on signals from these sensors, and actuators which operate under the control of the ENGINE ECU. The ENGINE ECU carries out activities such as fuel injection control, idle speed control and ignition timing control. In addition, the ENGINE ECU is equipped with several diagnosis modes which simplify trouble-shooting when a problem develops.

FUEL INJECTION CONTROL

E13AB01AA

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

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

Fuel injection is normally carried out once for each cylinder for every two rotations of the crankshaft. The firing order is 1-3-4-2 for 4G93 and 4G63 engines, and 1-2-3-4-5-6 for 6A12 and 6G73 engines. This is called sequential fuel injection. The ENGINE ECU provides a richer air/fuel mixture by carrying out "open-loop" control when the engine is cold or operating under high load conditions in order to maintain engine performance. In addition, when the engine is warm or operating under normal conditions, the ENGINE ECU controls the air/fuel mixture by using the oxygen sensor signal to carry out "closed-loop" control in order to obtain the theoretical air/fuel mixture ratio that provides the maximum cleaning performance from the three way catalyst.

IDLE AIR CONTROL

E13AB02AA

The idle speed is kept at the optimum speed by controlling the amount of air that bypasses the throttle valve in accordance with changes in idling conditions and engine load during idling. The ENGINE ECU drives the idle speed control (ISC) motor to keep the engine running at the pre-set idle target speed in accordance with the engine coolant temperature and air conditioner load. In addition, when the air conditioner switch is turned off and on while the engine is idling, the ISC motor operates to adjust the throttle valve bypass air amount in accordance with the engine load conditions in order to avoid fluctuations in the engine speed.

IGNITION TIMING CONTROL

E13AB03AA

The power transistor located in the ignition primary circuit turns ON and OFF to control the primary current flow to the ignition coil. This controls the ignition timing in order to provide the optimum ignition timing with respect to the engine operating conditions. The ignition timing is determined by the ENGINE ECU from the engine speed, intake air volume, engine coolant temperature and atmospheric pressure.

SELF-DIAGNOSIS FUNCTION

E13AB04AA

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

OTHER CONTROL FUNCTIONS

E13AB05AA

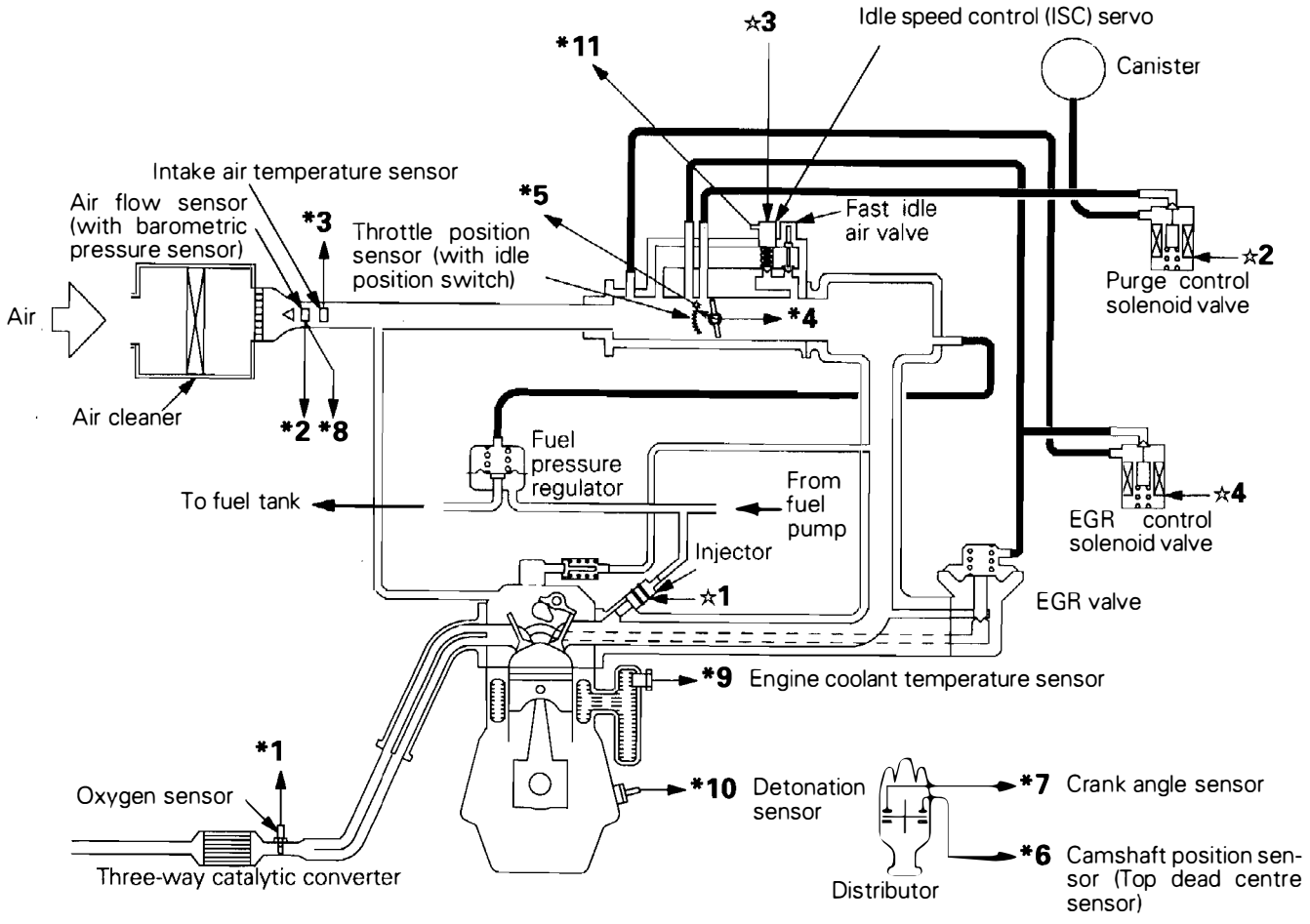
1. Fuel Pump Control
   Turns the fuel pump relay ON so that current is supplied to the fuel pump while the engine is cranking or running.
2. A/C Relay Control
   Turns the compressor clutch of the A/C ON and OFF.
3. Variable Induction Control
   When the engine is running at low engine speed, the induction control valve located in the air intake passage closes to improve intake efficiency due to the intake inertia effect. At high engine speeds, the valve opens to reduce intake resistance.
4. Fan Relay Control
   The revolutions of the radiator fan and condenser fan are controiled in response to the engine coolant temperature and vehicle speed.
5. Traction Control
   Engine output torque is reduced based on signals from the TCL-ECU in response to the conditions under which slipping of the driven wheels and turning of the vehicle occur.
   Furthermore, reduction of output torque is performed by closing the throttle valve and retarding the ignition timing.
6. Purge Control Solenoid Valve Control
   Refer to GROUP 17.
7. EGR Control Solenoid Valve Control
   Refer to GROUP 17.

MULTI POINT FUEL INJECTION SYSTEM DIAGRAM

E13AB06AA

<4G93>

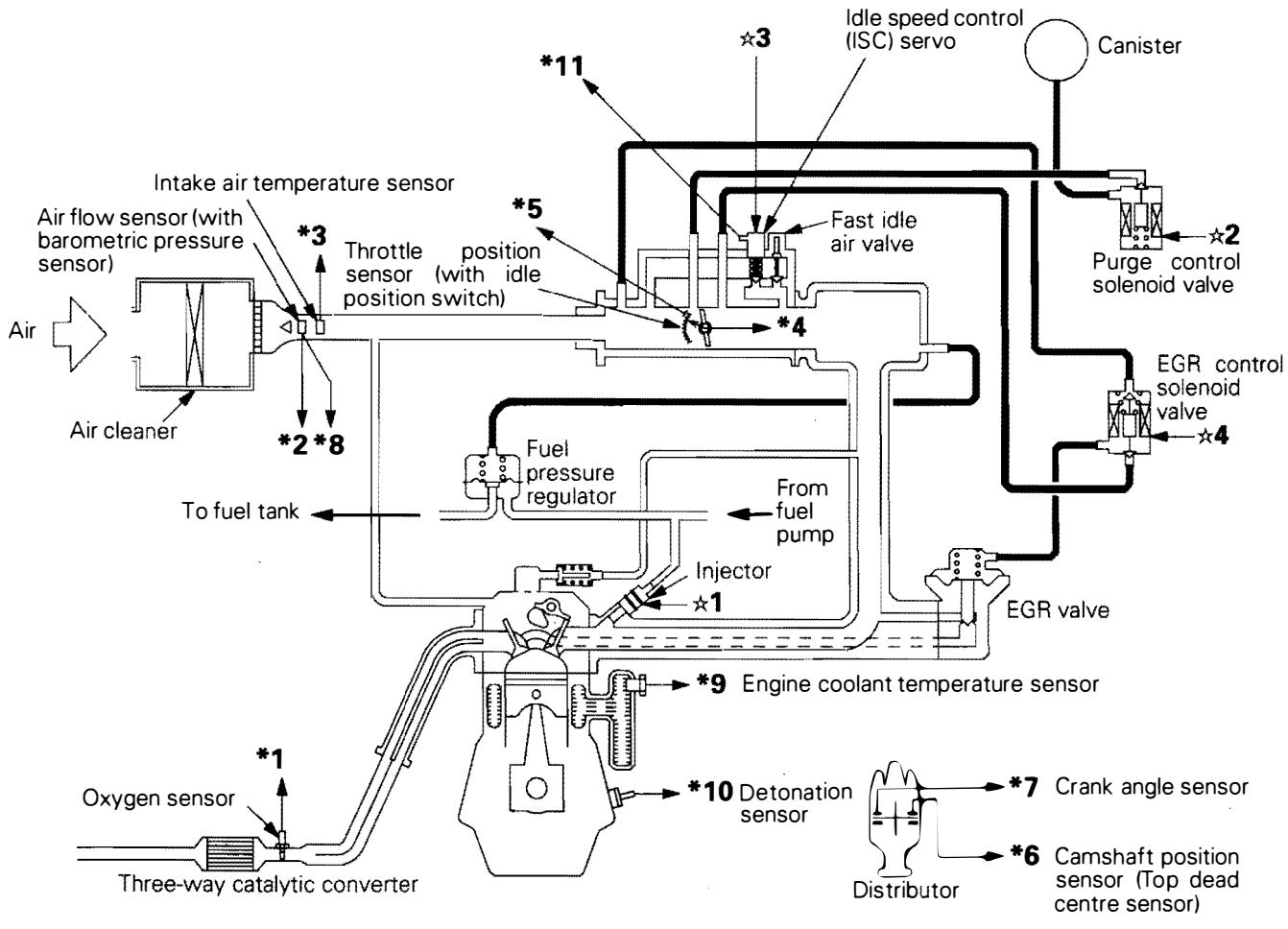
*1 Oxygen sensor *2 Air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Idle position switch *6 Camshaft position sensor (Top dead centre sensor) *7 Crank angle sensor *8 Barometric pressure sensor *9 Engine coolant temperature switch *10 Detonation sensor *11 Servo valve position sensor	● Power supply ● Vehicle speed sensor ● A/C switch ● Inhibitor switch ● Power steering fluid pressure switch ● Ignition switch–ST	⇨	Engine ECU	⇨	☆1 Injector ☆2 Purge control solenoid valve ☆3 Idle speed control servo ☆4 EGR control solenoid valve	● Fuel pump relay ● Control relay ● A/C power relay ● Engine warning lamp ● Diagnosis signal ● Ignition coil, power transistor



9FU0362

<4G63>

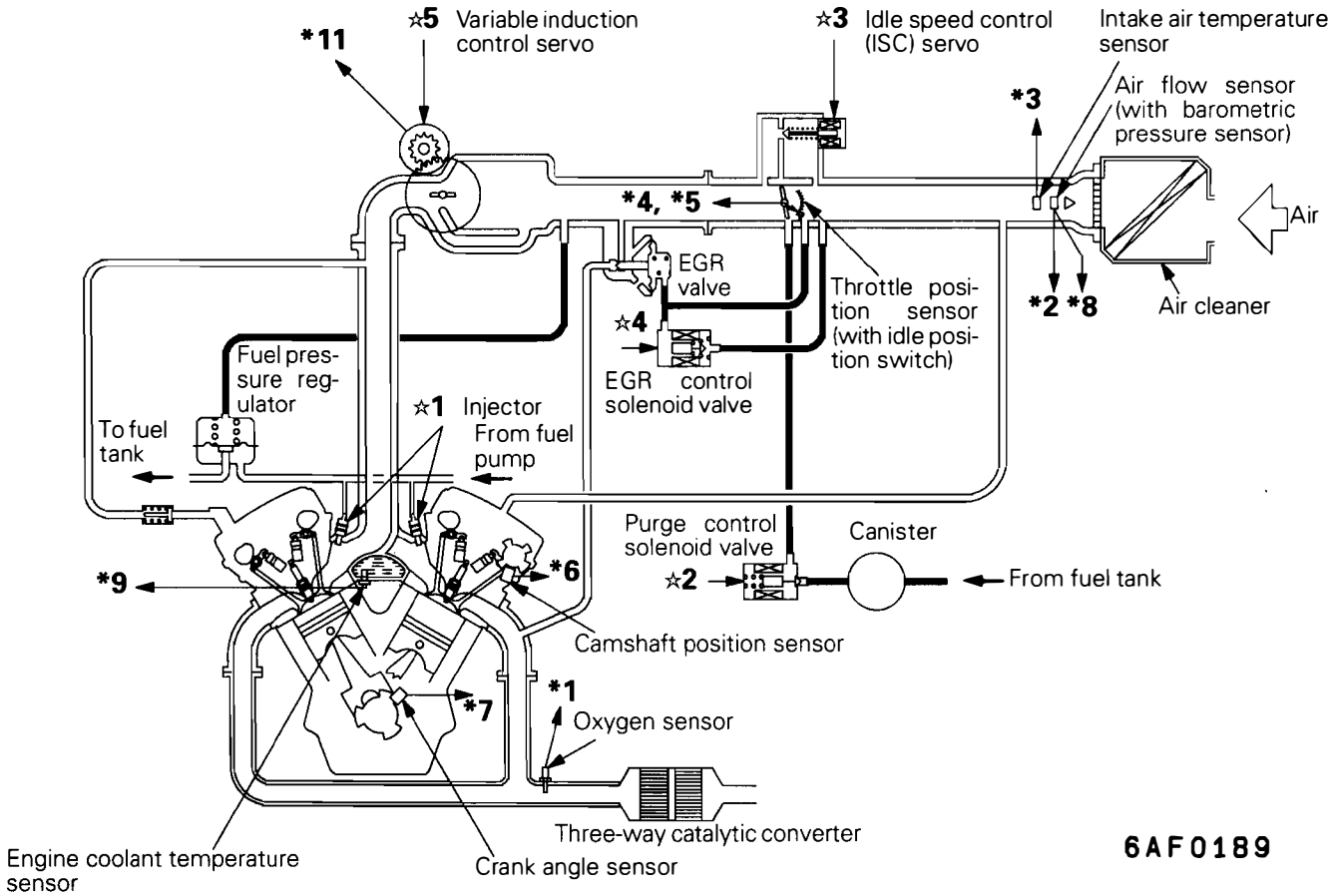
*1 Oxygen sensor *2 Air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Idle position switch *6 Camshaft position sensor (Top dead centre sensor) *7 Crank angle sensor *8 Barometric pressure sensor *9 Engine coolant temperature switch *10 Detonation sensor *11 Servo valve position sensor	• Power supply • Vehicle speed sensor • A/C switch • Inhibitor switch • Power steering fluid pressure switch • Ignition switch–ST • Electric load switch	⇨	Engine ECU	⇨	☆1 Injector ☆2 Purge control solenoid valve ☆3 Idle speed control servo ☆4 EGR control solenoid valve	• Fuel pump relay • Control relay • A/C power relay • Engine warning lamp • Diagnosis signal • Ignition coil, power transistor • Engine /Transmission total control



6FU2037

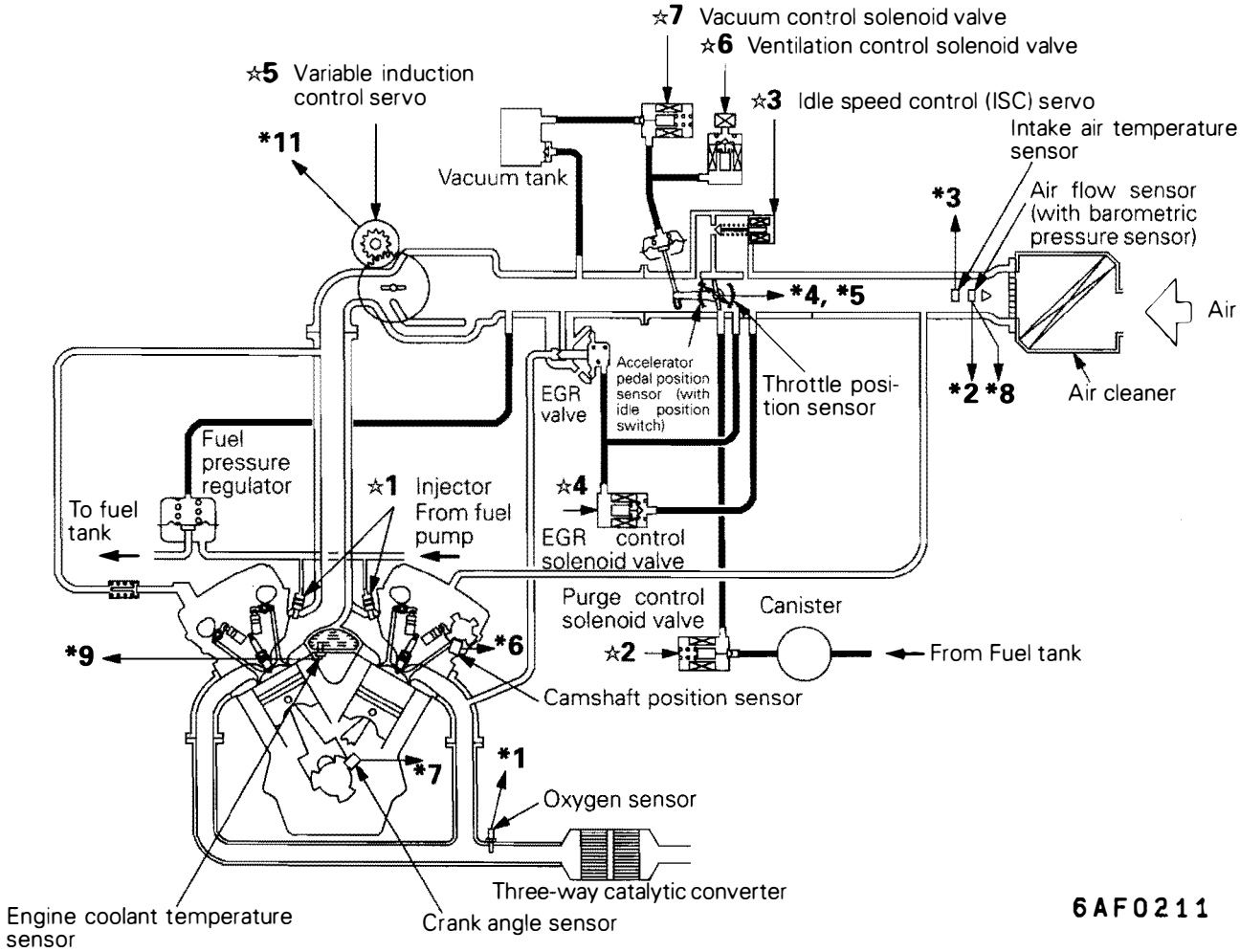
<6A12 without TCL, 6G73>

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



<6A12 with TCL>

*1 Oxygen sensor *2 Air flow sensor *3 Intake air temperature sensor *4 Throttle position sensor *5 Idle position switch *6 Camshaft position sensor *7 Crank angle sensor *8 Barometric pressure sensor *9 Engine coolant temperature switch *10 Detonation sensor *11 Induction control valve position sensor	• Power supply • Vehicle speed sensor • A/C switch • Inhibitor switch • Power steering fluid pressure switch • Ignition switch–ST • Ignition switch–IG • Electric load switch • TCL-ECU	➡ Engine ECU ⇨	☆1 Injector ☆2 Purge control solenoid valve ☆3 Idle speed control servo ☆4 EGR control solenoid valve ☆5 Variable induction control servo ☆6 Ventilation control solenoid valve ☆7 Vacuum control solenoid valve	• Fuel pump relay • Control relay • A/C power relay • Engine warning lamp • Diagnosis signal • Ignition coil, power transistor • Engine/transmission total control • TCL-ECU



GENERAL SPECIFICATIONS

E13AB07AB

<4G93, 4G63>

Items		Specifications
Fuel tank capacity	ℓ	64
Fuel pump		
Type		Electrical, in-tank type
Throttle body		
Throttle bore	mm	
4G93		50
4G63		54
Throttle position sensor		Variable resistor type
Idle speed control servo		DC motor type
		DC motor type by-pass air control system with the Fast Idle Air Valve (FIAV)
Idle position switch		Rotary contact type, within throttle position sensor
Servo valve position sensor		Hall element type
Engine ECU		
Identification model No.		
4G93 <Up to 1993 models>		E2T60671
4G93 <From 1994 models>		E2T60671 (except Germany and Austria)
		E2T60689 (Germany and Austria)
4G63 <2WD-M/T>		E2T60686
4G63 <2WD-A/T>		E2T60673
4G63 <4WD>		E2T60672
Sensors		
Air flow sensor		Karman vortex type
Barometric pressure sensor		Semiconductor type
Intake air temperature sensor		Thermistor type
Engine coolant temperature sensor		Thermistor type
Oxygen sensor		Zirconia type
Vehicle speed sensor		Magnetic resistive element type
Inhibitor switch		Contact switch type
Camshaft position sensor (top dead centre sensor)		Hall element type
Crank angle sensor		Hall element type
Detonation sensor		Piezoelectric type
Power steering fluid pressure switch		Contact switch type
Actuators		
Control relay type		Contact switch type
Injector type and number		Electromagnetic type, 4
Injector identification mark		
4G93		MDH210
4G63		MDH240
EGR control solenoid valve		
4G93		ON/OFF type solenoid valve
4G63		Duty cycle type solenoid valve
Purge control solenoid valve		ON/OFF type solenoid valve
Fuel pressure regulator		
Regulator pressure	kPa	335

<6A12, 6G73>

Items		Specifications
Fuel tank capacity	ℓ	64
Fuel pump		
Type		Electrical, in-tank type
Throttle body		
Throttle bore	mm	60
Throttle position sensor		Variable resistor type
Accelerator pedal position sensor		Variable resistor type
<Vehicles with TCL>		
Idle speed control servo		Stepper motor type Stepper motor type by-pass air control system
Idle position switch <Vehicles without TCL>		Rotary contact type, within throttle position sensor
Idle position switch <Vehicles with TCL>		Rotary contact type, within accelerator pedal position sensor
Engine ECU		
Identification model No.		
6A12 <Vehicles without TCL>		E2T38877
6A12 <Vehicles with TCL>		E2T38878
6G73		E2T38879
Sensors		
Air flow sensor		Karman vortex type
Barometric pressure sensor		Semiconductor type
Intake air temperature sensor		Thermistor type
Engine coolant temperature sensor		Thermistor type
Oxygen sensor		Zirconia type
Vehicle speed sensor		Magnetic resistive element type
Inhibitor switch		Contact switch type
Camshaft position sensor		Hall element type
Crank angle sensor		Hall element type
Detonation sensor		Piezoelectric type
Power steering fluid pressure switch		Contact switch type
Actuators		
Control relay type		Contact switch type
Injector type and number		Electromagnetic type, 6
Injector identification mark		
6A12		MDH145
6G73		BDH182
EGR control solenoid valve		Duty cycle type solenoid valve
Purge control solenoid valve		ON/OFF type solenoid valve
Ventilation control solenoid valve		Duty cycle type solenoid valve
Vacuum control solenoid valve		Duty cycle type solenoid valve
Fuel pressure regulator		
Regulator pressure	kPa	335

SERVICE SPECIFICATIONS

E13AC00AA

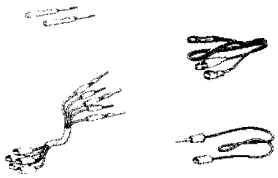
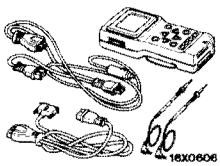
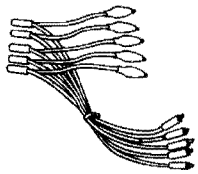
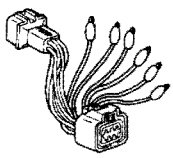
Items		Specifications
Basic ignition timing		
4G93, 4G63		5°± 2° BTDC at curb idle
6A12, 6G73		5°± 3° BTDC at curb idle
Curb idle speed	r/min.	
4G93		800±100
4G63		750±100
6A12, 6G73		700±100
Idle speed when A/C is ON	r/min.	
4G93, 4G63		850 at neutral position
6A12, 6G73		900 at neutral position
Basic idle speed	r/min.	
4G93		800±50
4G63		750±50
6A12, 6G73		700±50
Throttle position sensor adjusting voltage	mmV	
Vehicles without TCL		400–1,000
Vehicles with TCL		580–690
Accelerator pedal position sensor adjusting voltage	mmV	400–1,000
Throttle position sensor resistance	kΩ	3.5–6.5
Accelerator pedal position sensor resistance	kΩ	3.5–6.5
Idle speed control servo coil resistance <6A12, 6G73>	Ω	28–33 (at 20°C)
Intake air temperature sensor resistance	kΩ	
20°C		2.3–3.0
80°C		0.30–0.42
Engine coolant temperature sensor resistance	kΩ	
20°C		2.1–2.7
80°C		0.26–0.36
Oxygen sensor output voltage	V	0.6–1.0
Fuel pressure	kPa	
Vacuum hose disconnection		330–350 at curb idle
Vacuum hose connection		Approx. 270 at curb idle
Injector coil resistance	Ω	13–16 (at 20°C)
EGR control solenoid valve coil resistance	Ω	36–44 (at 20°C)
Purge control solenoid valve coil resistance	Ω	36–44 (at 20°C)
Ventilation solenoid valve coil resistance	Ω	36–44 (at 20°C)
Vacuum solenoid valve coil resistance	Ω	36–44 (at 20°C)

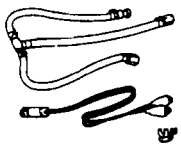
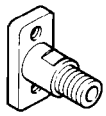
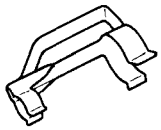
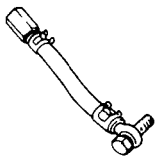
SEALANT

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

SPECIAL TOOLS

E13AD00AA

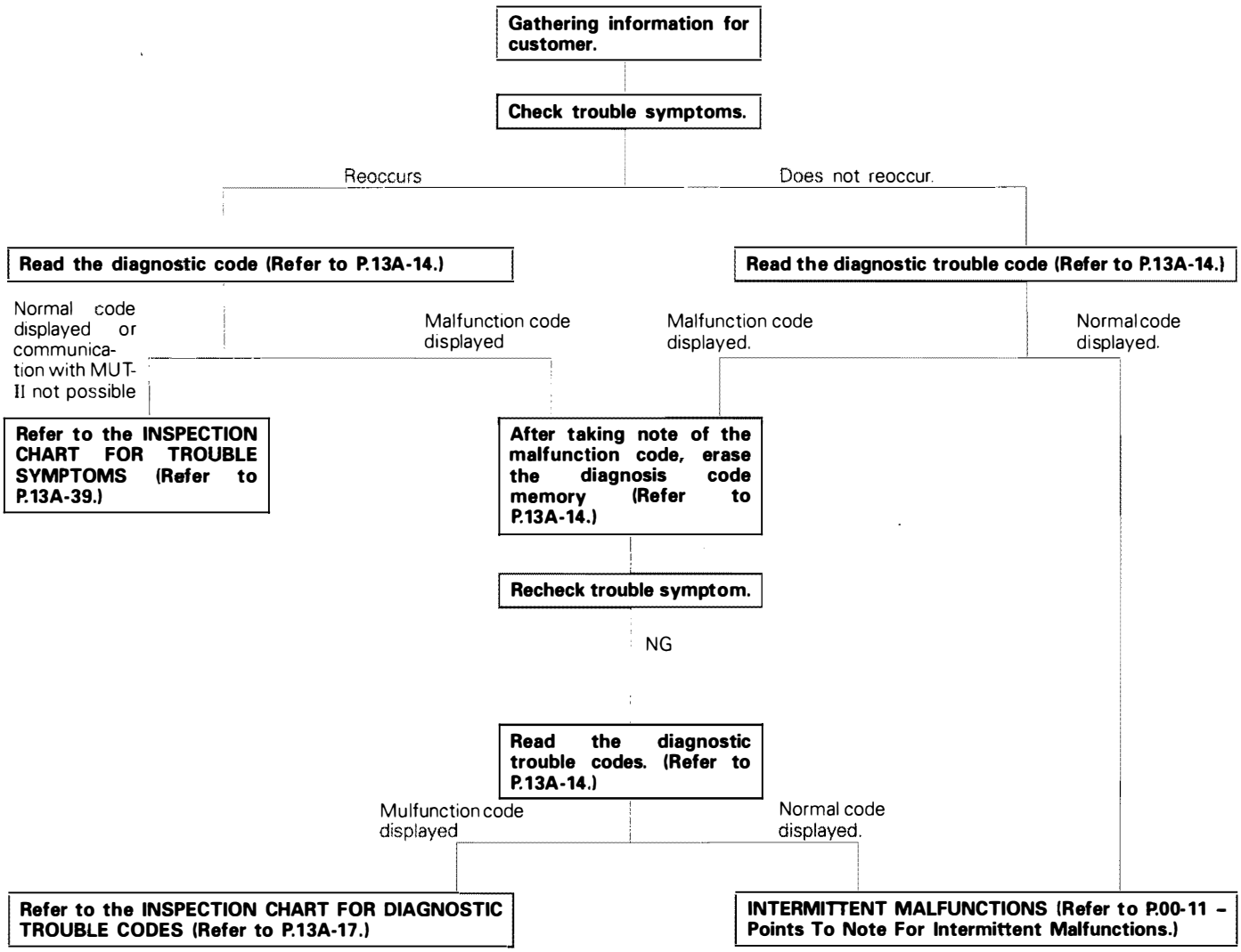
Tool	Number	Name	Use
	MB991223	Inspection test harness set ● Pin contact pressure inspection harness ● Market tester contact probe (for general connectors)	Measurement of terminal voltage
	MB991502	MUT-II sub assembly	● Reading diagnosis code ● MPI system inspection
 16X0607		ROM pack	
	MB991348	Test harness set	● Adjustment of idle position switch, throttle position sensor and accelerator pedal position sensor ● Inspection using an analyzer
	MD998463	Test harness (6 pin, square)	● Inspection of idle speed control servo ● Inspection using an analyzer
	MD998464	Test harness (4 pin, square)	● Inspection of oxygen sensor ● Inspection using an analyzer

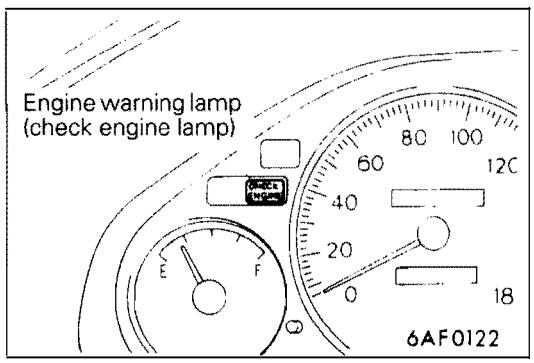
Tool	Number	Name	Use
	MD998478	Test harness (3 pin, triangle)	Inspection using an analyzer
	MD998706	Injector test set	Checking the spray condition of injectors
	MD998741	Injector test adaptor	
	MD998746	Clip	
	MD998709	Adaptor hose	Measurement of fuel pressure
	MD998742	Hose adaptor	

TROUBLESHOOTING

E13AE00AA

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING





DIAGNOSIS FUNCTION

E13AE01AA

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

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

Engine warning lamp inspection items

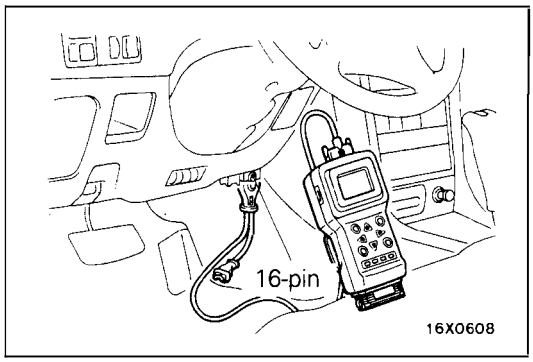
Engine ECU
Oxygen sensor
Air flow sensor
Intake air temperature sensor
Throttle position sensor
Engine coolant temperature sensor
Crank angle sensor
Camshaft position sensor (Top dead centre sensor)
Barometric pressure sensor
Detonation sensor
Ignition timing adjustment signal
Injector
Ignition coil, power transistor <6A12, 6G73>
Vacuum control solenoid valve <TCL>
Ventilation control solenoid valve <TCL>

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

METHOD OF READING AND ERASING DIAGNOSIS CODES

E13AE01AB

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



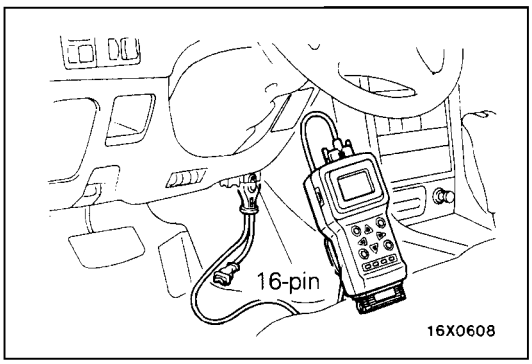
1. Connect the MUT-II to the diagnosis connector (16-pin) at the lower right of the instrument under cover, and take a reading of the diagnosis codes.
2. Repair the malfunction location while referring to the INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES
3. Turn the ignition switch to OFF and then back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

DIAGNOSIS USING DIAGNOSIS 2 MODE <6A12, 6G73>

E13AE01CA

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

   NOTE
   By turning the ignition switch to OFF, the ENGINE ECU will switch the diagnosis mode from DIAGNOSIS 2 mode to DIAGNOSIS 1 mode.
5. Erase the diagnosis codes.



INSPECTION USING MUT-II SERVICE DATA AND ACTUATOR TESTING

E13AE01DA

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

FAIL-SAFE/BACKUP FUNCTION TABLE

E13AE02AA

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

Malfunctioning item	Control contents during malfunction
Air flow sensor	1. Uses the throttle position sensor signal and engine speed signal (crank angle sensor signal) to take readings of the basic injector drive timing and basic ignition timing from the pre-set mapping. 2. Fixes the ISC servo in the appointed position so idle speed control is not performed.
Intake air temperature sensor	Controls as if the intake air temperature is 25°C.
Throttle position sensor (TPS)	No increase in fuel injection amount during acceleration due to the throttle position sensor signal.
Engine coolant temperature sensor	Controls as if the engine coolant temperature is 80°C.
Camshaft position sensor (Top dead centre sensor)	<4G93, 4G63> Injects fuel into the cylinders in the order 1-3-4-2 with irregular timing. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.) <6A12, 6G73> 1. Injects fuel to all cylinders simultaneously. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.) 2. Cuts off the fuel supply 4 seconds after a problem is detected. (However, after the ignition switch is turned to ON, the No. 1 cylinder top dead centre is not detected at all.)
Barometric pressure sensor	Controls as if the barometric pressure is 101 kPa.
Detonation sensor	Switches the ignition timing from ignition timing for super petrol to ignition timing for standard petrol.
Ignition coil, power transistor unit <6A12, 6G73>	Cuts off the fuel supply to cylinders with an abnormal ignition signal.
Servo valve position sensor <4G93, 4G63>	Idle speed control is not performed
Oxygen sensor	Air/fuel ratio feedback control (closed loop control) is not performed
Intake control valve position sensor <6A12, 6G73>	Opens all intake control valves.
Communication wire with transmission control unit <A/T: 4G63, 6A12, 6G73>	Ignition timing is not retarded during transmission gear shifting (overall engine and transmission control).

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

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

E13AE03AA

Caution
The problem code for the ignition timing adjustment signal (No. 36) is output when the circuit for the ignition timing adjustment terminals is shorted to earth. Accordingly, this code is also output when the circuit for the ignition timing adjustment terminals has been earthed. In this case, output of this code does not indicate an abnormality.

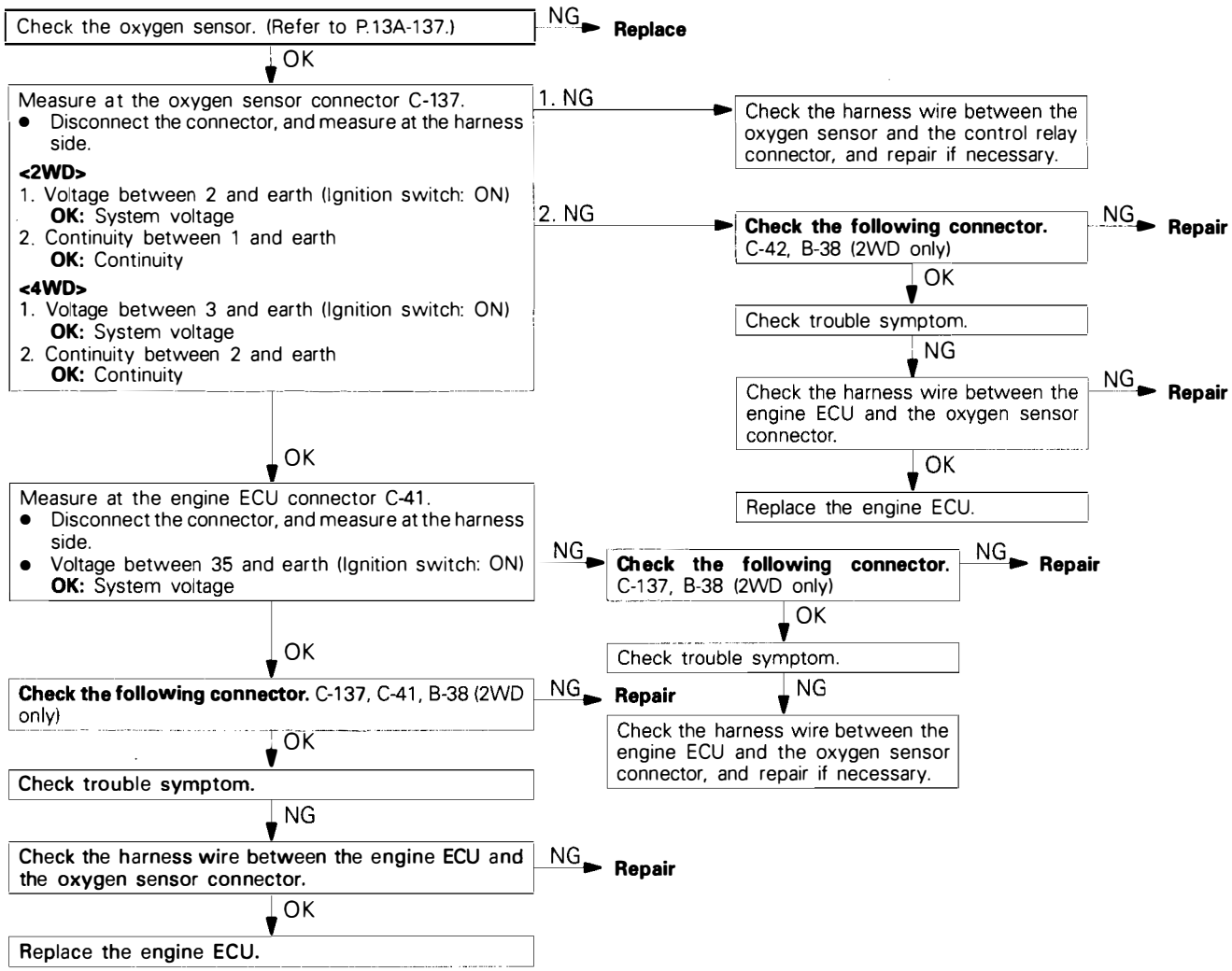
Code No.	Diagnosis item	Reference page
11	Oxygen sensor system	P.13A-18 <4G93, 4G63> P.13A-19<6A12, 6G73>
12	Air flow sensor system	P.13A-20
13	Intake air temperature sensor system	P.13A-21
14	Throttle position sensor system	P.13A-22
21	Engine coolant temperature sensor system	P.13A-23
22	Crank angle sensor system	P.13A-24 <4G93, 4G63> P.13A-25 <6A12, 6G73>
23	Camshaft position sensor system (Top dead centre sensor system)	P.13A-26 <4G93, 4G63> P.13A-27 <6A12, 6G73>
24	Vehicle speed sensor system	P.13A-28
25	Barometic pressure sensor system	P.13A-29
31	Detonation sensor system	P.13A-30
36*	Ignition timing adjustment signal system	P.13A-31
41	Injector system	P.13A-31 <4G93, 4G63> P.13A-32 <6A12, 6G73>
44	Ignition coil and power transistor unit system (for No. 1 and No. 4 cylinders) <6A12, 6G73>	P.13A-33
52	Ignition coil and power transistor unit system (for No. 2 and No. 5 cylinders) <6A12, 6G73>	P.13A-33
53	Ignition coil and power transistor unit system (for No. 3 and No. 6 cylinders) <6A12, 6G73>	P.13A-33
55	Idle speed control (ISC) servo valve position sensor system <4G93, 4G63>	P.13A-34
61	Communication wire with A/T-ECU (torque reduction demand signal wire) system <A/T: 4G63, 6A12, 6G73>	P.13A-35
62	Intake control valve position sensor system <6A12, 6G73>	P.13A-36
71	Vacuum control solenoid valve system <Vehicles with TCL>	P.13A-37
72	Ventilation control solenoid valve system <Vehicles with TCL>	P.13A-38

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

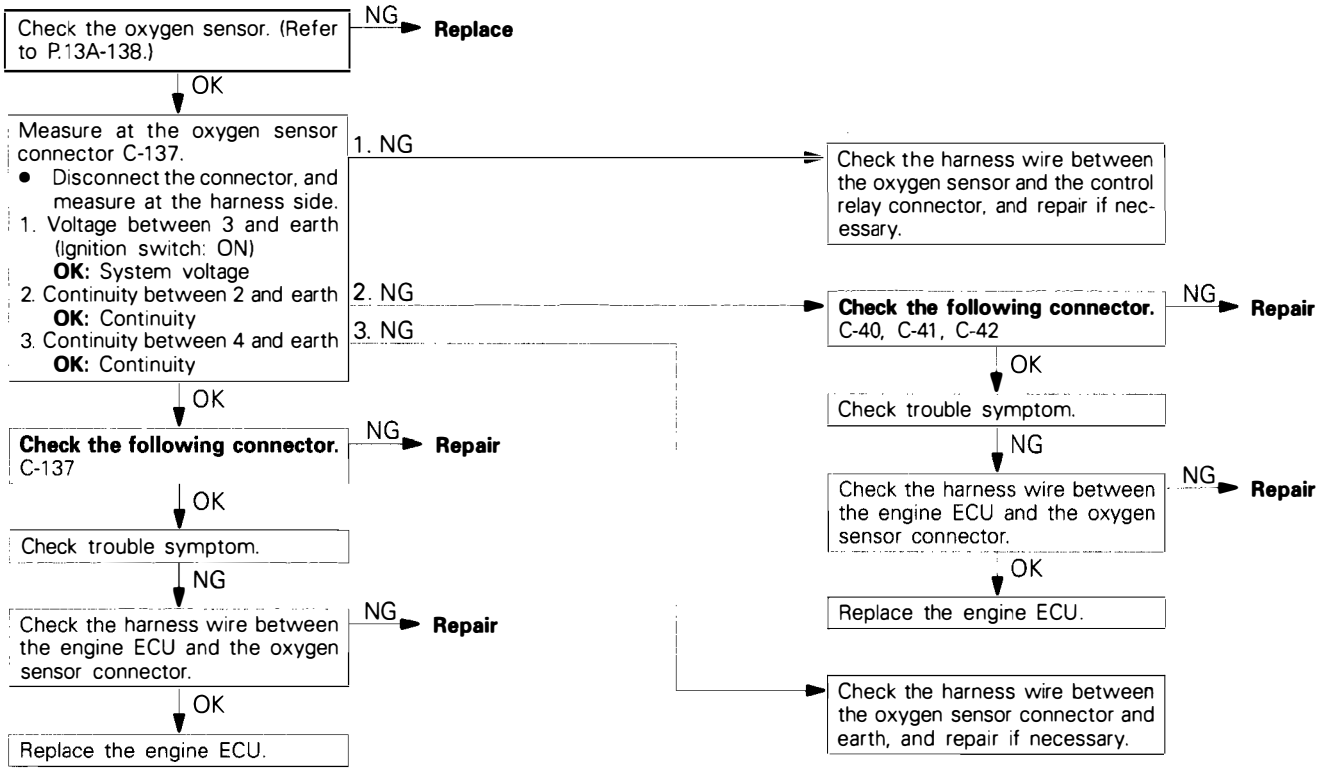
INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

E13AE04AA

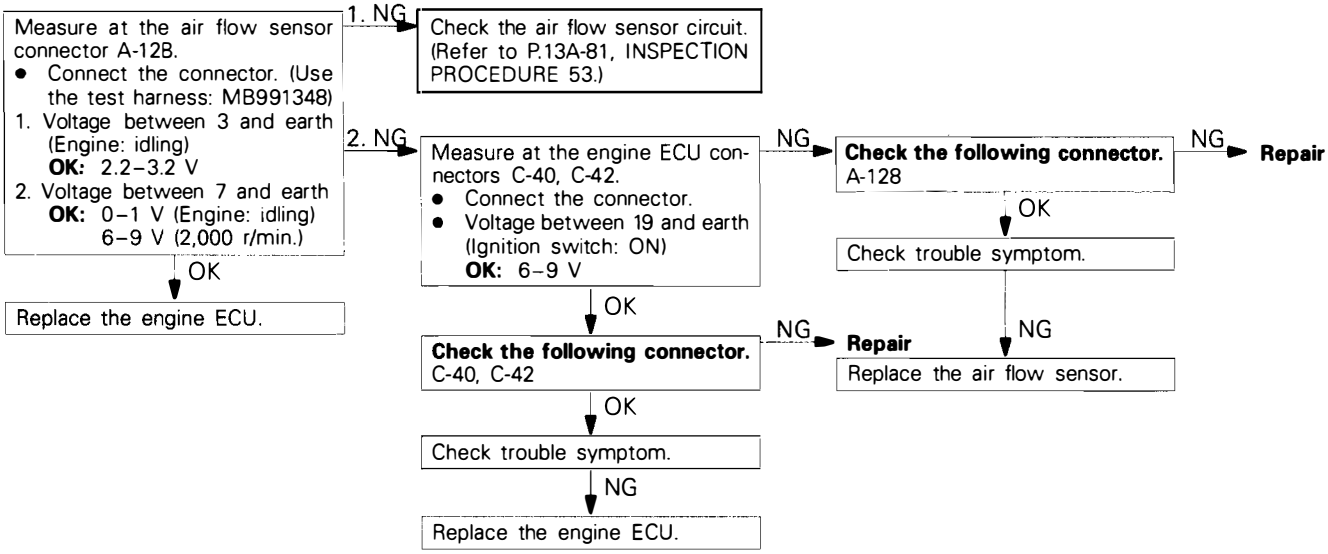
Code No. 11	Oxygen sensor system <4G93, 4G63>	Probable cause
[Comment]	This diagnosis code is output if air/fuel mixture feedback control (closed loop control) is being carried out but the oxygen sensor signal does not change.	• Malfunction of the oxygen sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine ECU



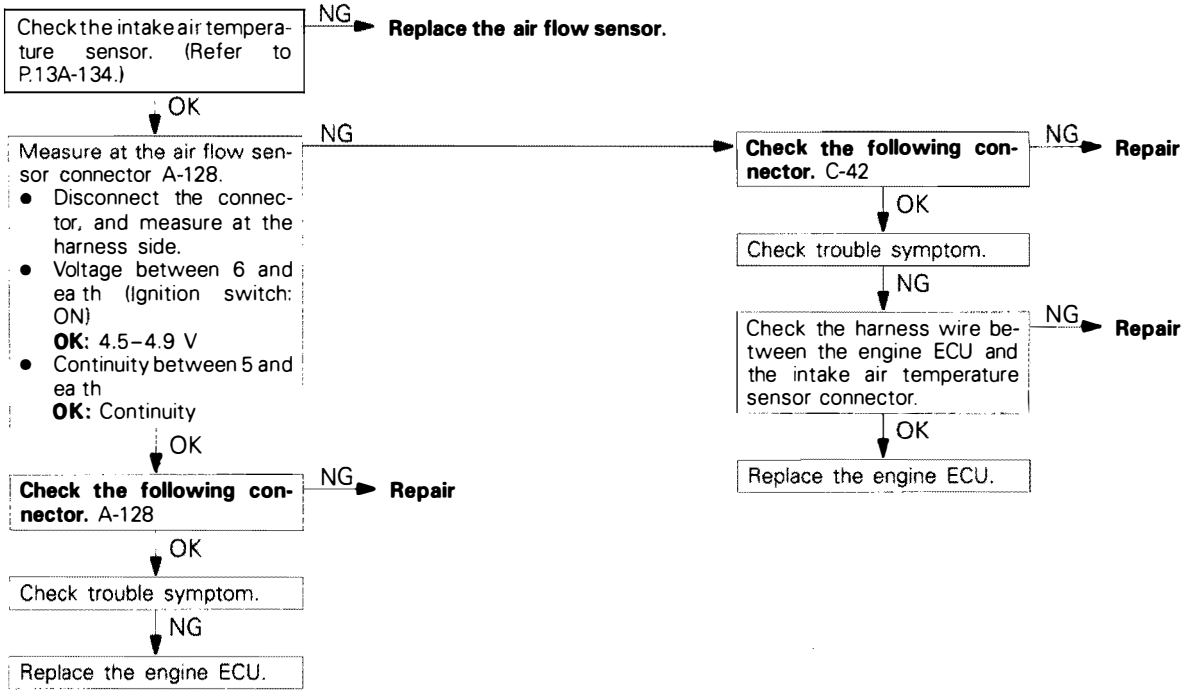
Code No. 11	Oxygen sensor system <6A12, 6G73>	Probable cause
[Comment]	This diagnosis code is output if air/fuel mixture feedback control (closed loop control) is being carried out but the oxygen sensor signal does not change.	• Malfunction of the oxygen sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine ECU



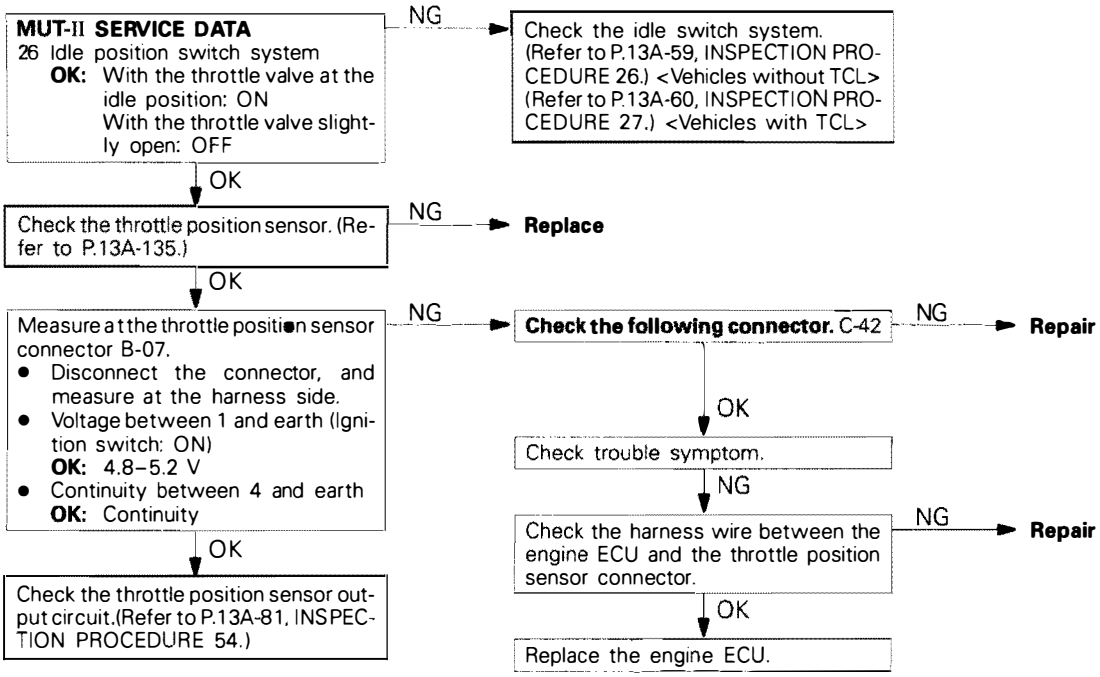
Code No. 12	Air flow sensor(AFS) system	Probable cause
[Comment]	This diagnosis code is output if the engine is running but the air flow sensor signal frequency is 10 Hz or below.	• Malfunction of the air flow sensor • Improper connector contact, open circuit or short-circuited harness wire of the air flow sensor circuit • Malfunction of the engine ECU



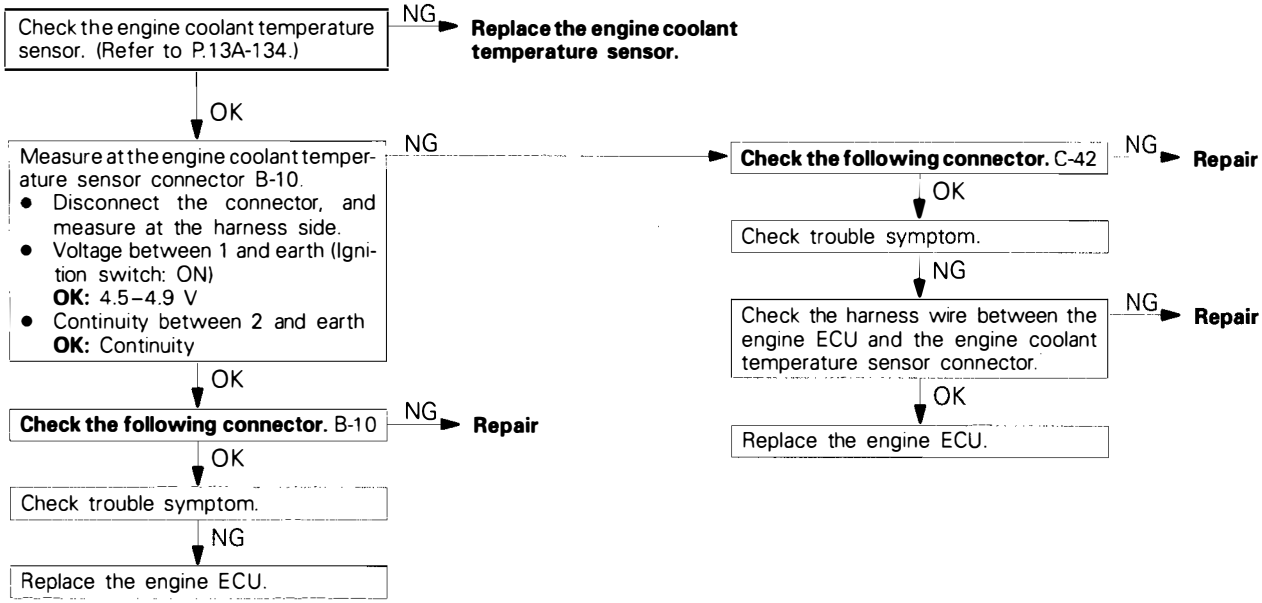
Code No. 13	Intake air temperature sensor system	Probable cause
[Comment]	This diagnosis code is output if the intake air temperature sensor signal voltage is 4.5 V or more, or if it is 0.27 V or less.	• Malfunction of the intake air temperature sensor • Improper connector contact, open circuit or short-circuited harness wire of the intake air temperature sensor circuit • Malfunction of the engine ECU



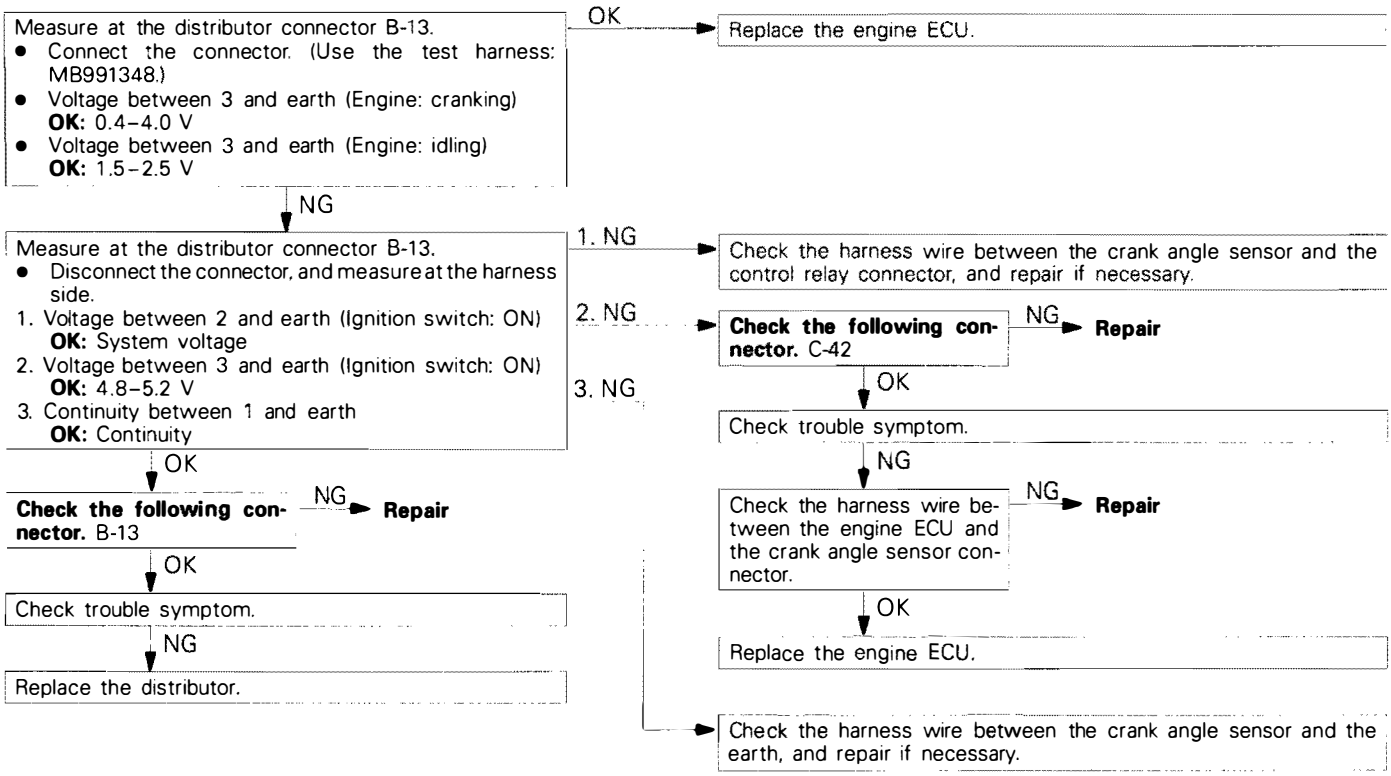
Code No. 14	Throttle position sensor (TPS) system	Probable cause
[Comment]	This diagnosis code is output if the throttle position sensor signal voltage is 0.2 V or less.	• Malfunction of the throttle position sensor or maladjustment • Improper connector contact, open circuit or short-circuited harness wire of the throttle position sensor circuit • Improper "ON" state of idle position switch • Short circuit of the idle position switch signal line • Malfunction of the engine ECU



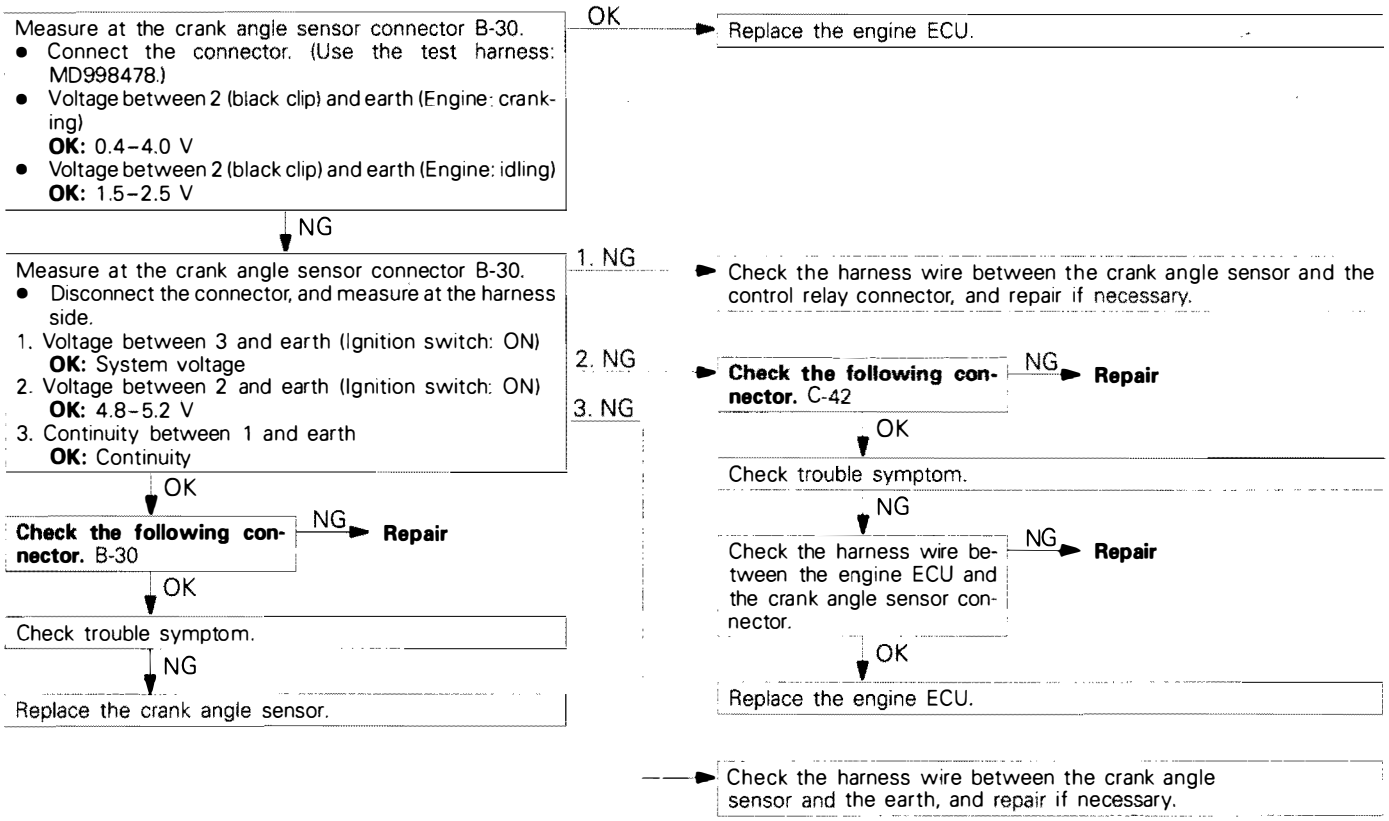
Code No. 21	Engine coolant temperature sensor system	Probable cause
[Comment]	This diagnosis code is output in the following cases: ● If the engine coolant temperature sensor signal voltage is 4.6 V or more, or if it is 0.11 V or less. ● If the engine coolant temperature sensor signal shows a drop in the engine coolant temperature while the engine is running.	● Malfunction of the engine coolant temperature sensor ● Improper connector contact, open circuit or short-circuited harness wire of the engine coolant temperature sensor circuit ● Malfunction of the engine ECU



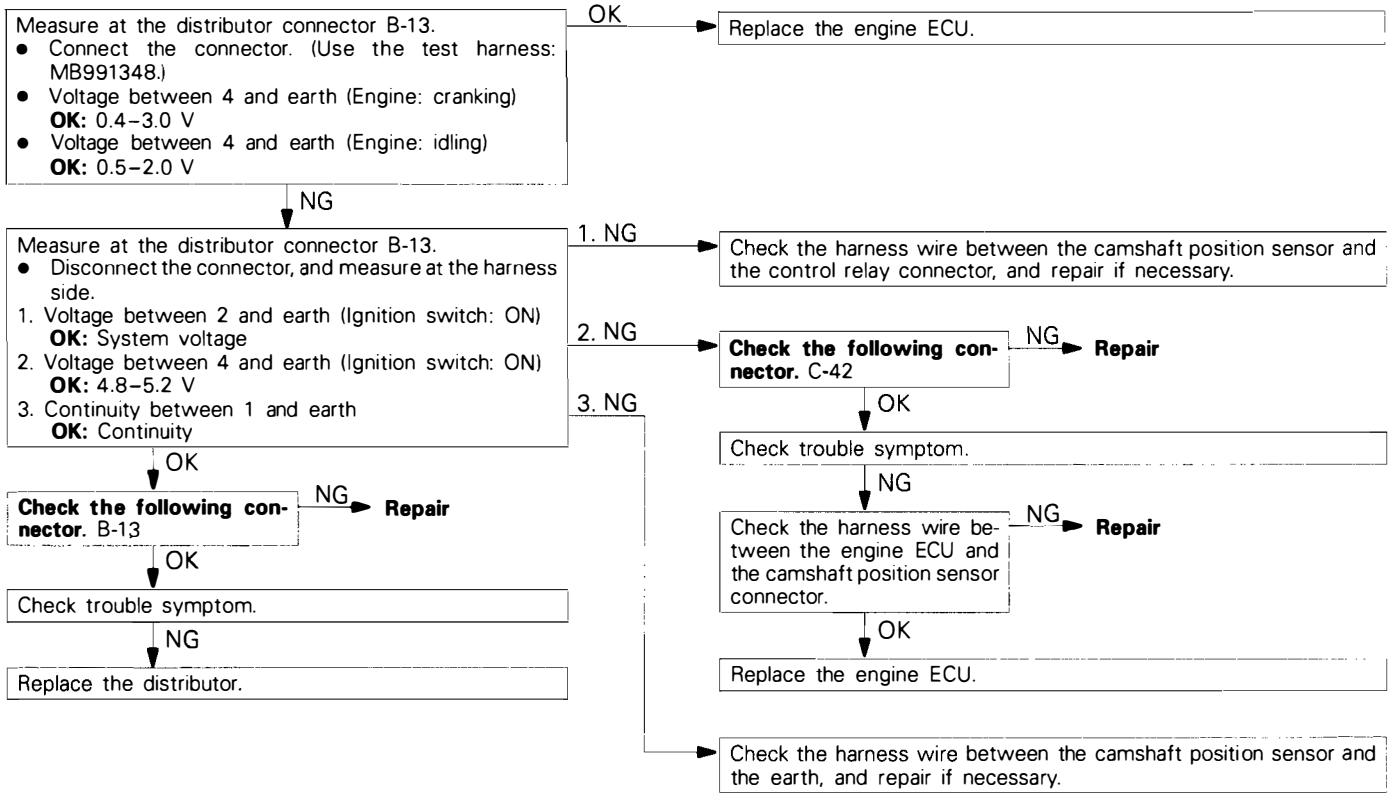
Code No. 22	Crank angle sensor system <4G93, 4G63>	Probable cause
[Comment]	This diagnosis code is output if the engine has been cranking for 4 seconds or more but the crank angle sensor signal voltage does not change (HIGH/LOW).	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness wire of the crank angle sensor circuit • Malfunction of the engine ECU



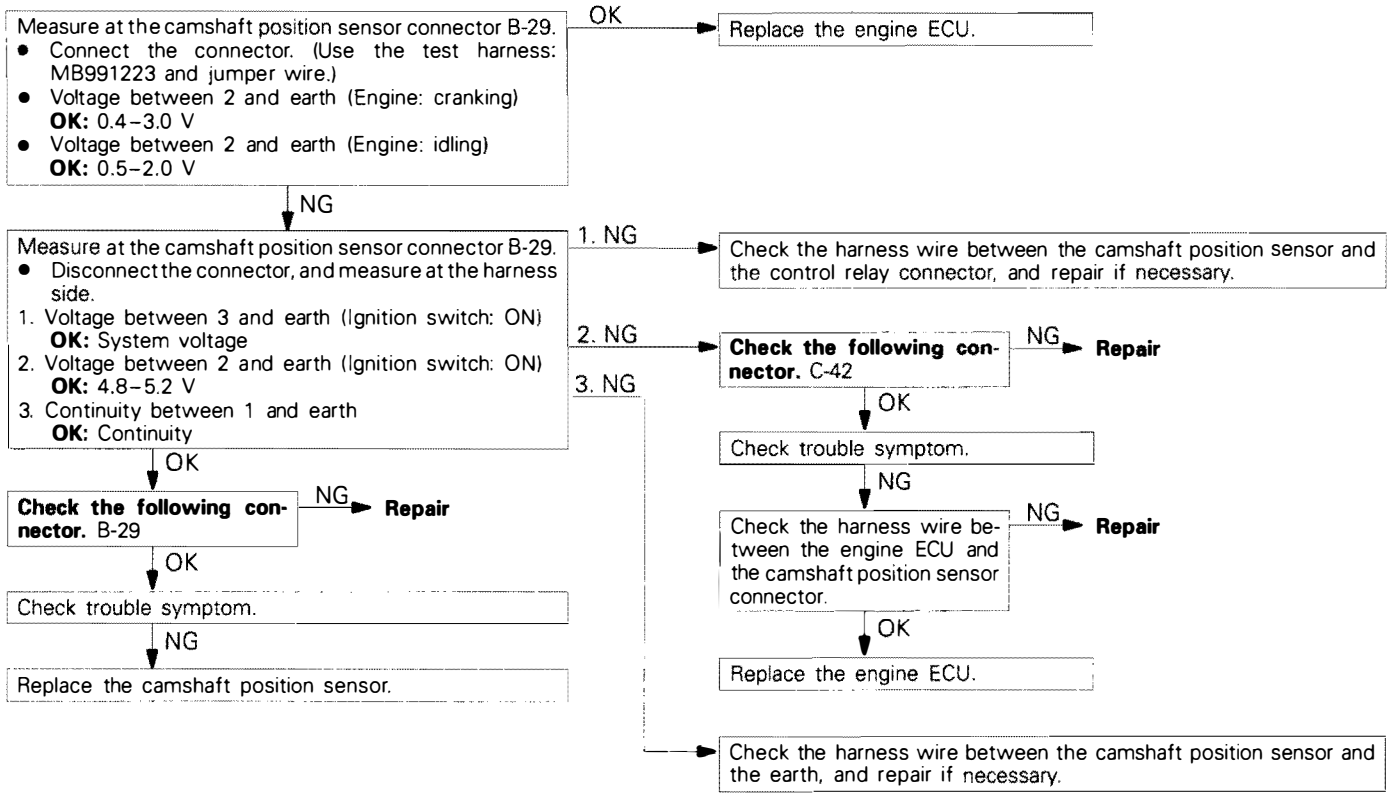
Code No. 22	Crank angle sensor system <6A12, 6G73>	Probable cause
[Comment]	This diagnosis code is output in the following cases: • If the engine has been cranking for 4 seconds or more but the crank angle sensor signal voltage does not change (HIGH/LOW). • If the crank angle sensor signal pattern is abnormal.	• Malfunction of the crank angle sensor • Improper connector contact, open circuit or short-circuited harness wire of the crank angle sensor • Improper connector contact or malfunction of the camshaft position sensor circuit • Malfunction of the engine ECU



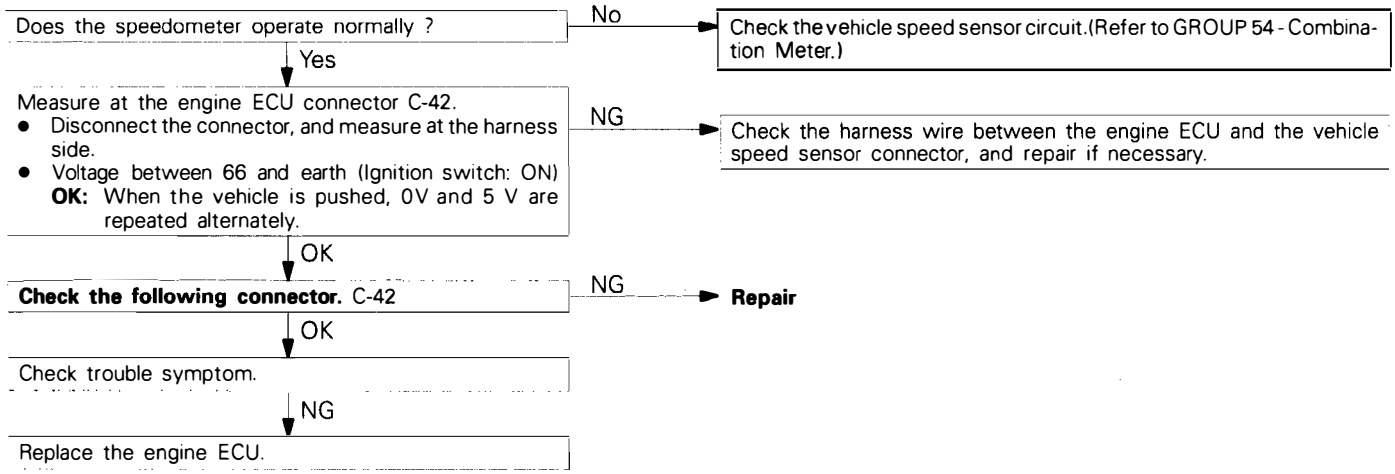
Code No. 23	Camshaft position sensor (Top dead centre sensor) system <4G93, 4G63>	Probable cause
[Comment]	This diagnosis code is output if the engine is running but the top dead center sensor signal voltage does not change (HIGH/LOW).	• Malfunction of the camshaft position sensor • Improper connector contact, open circuit or short-circuited harness wire of the camshaft position sensor circuit • Malfunction of the engine ECU



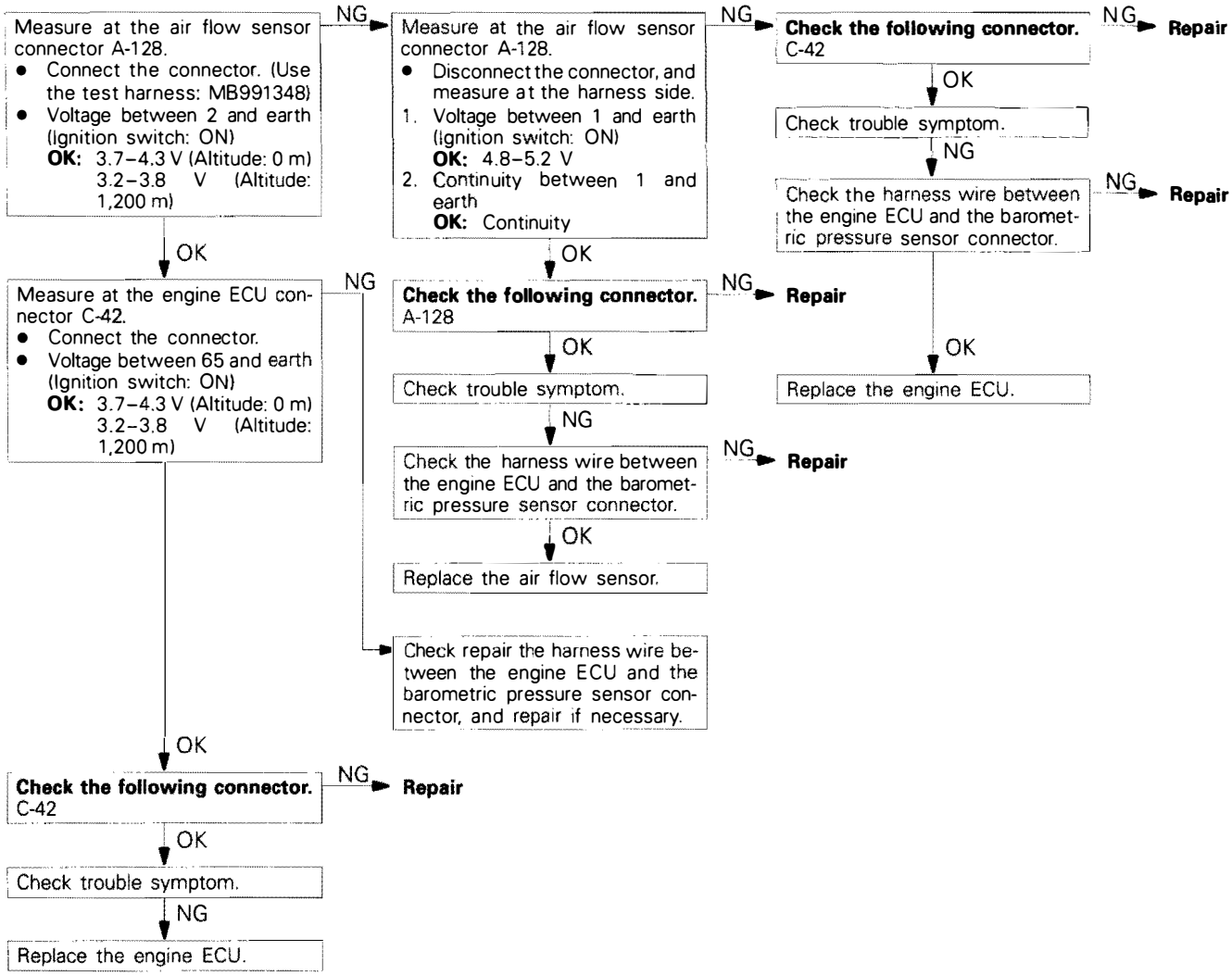
Code No. 23	Camshaft position sensor system <6A12, 6G73>	Probable cause
[Comment]	This diagnosis code is output in the following cases: ● If the engine is running but the camshaft position sensor signal voltage does not change (HIGH/LOW). ● If the camshaft position sensor signal pattern is abnormal.	● Malfunction of the camshaft position sensor ● Improper connector contact, open circuit or short-circuited harness wire of the camshaft position sensor circuit ● Improper connector contact or malfunction of the crank angle sensor ● Malfunction of the engine ECU



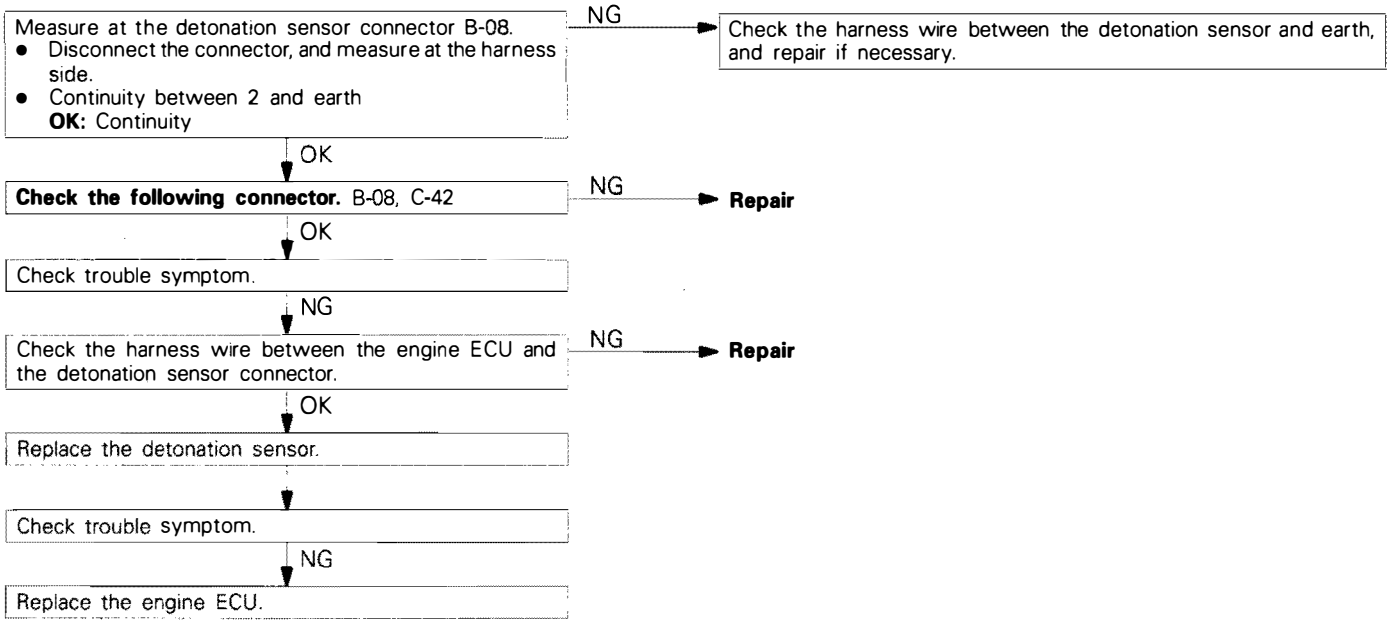
Code No. 24	Vehicle speed switch system	Probable cause
[Comment]	This diagnosis code is output if the engine is accelerating from an engine speed of 3000 r/min or more but the vehicle speed sensor signal voltage does not change (HIGH/LOW).	• Malfunction of the vehicle speed sensor • Improper connector contact, open circuit or short-circuited harness wire of the vehicle speed sensor circuit • Malfunction of the engine ECU



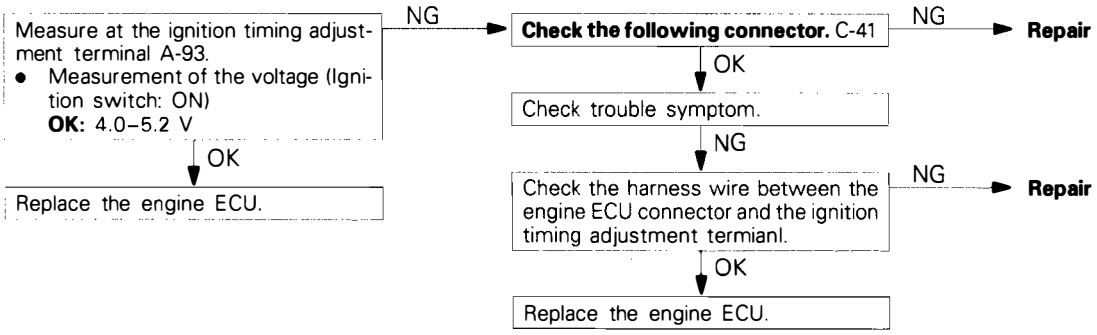
Code No. 25	Barometric pressure sensor system	Probable cause
[Comment]	This diagnosis code is output if the barometric pressure sensor signal voltage is 4.5 V or more, or if it is 0.2 V or less.	• Malfunction of the barometric pressure sensor • Improper connector contact, open circuit or short-circuited harness wire of the barometric pressure sensor circuit • Malfunction of the engine ECU



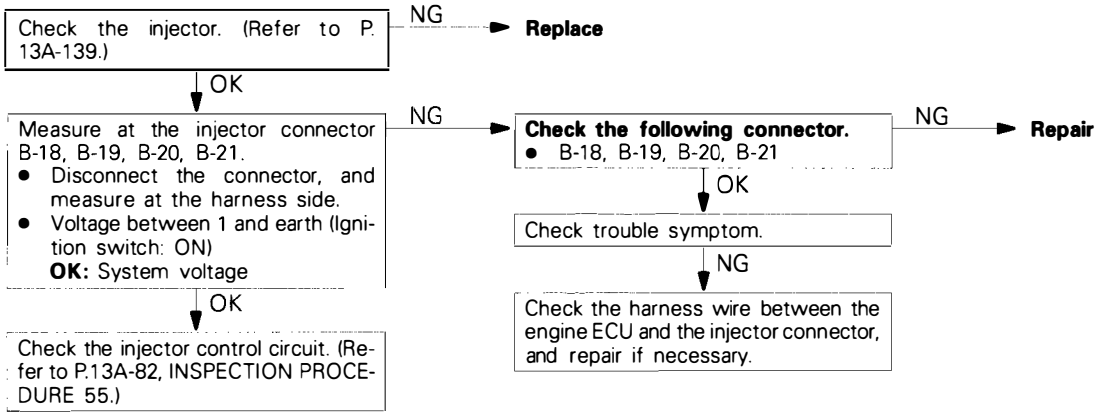
Code No. 31	Detonation sensor system	Probable cause
[Comment]	This diagnosis code is output if the detonation sensor signal voltage is abnormal.	• Malfunction of the detonation sensor • Improper connector contact, open circuit or short-circuited harness wire of the detonation sensor circuit • Malfunction of the engine ECU



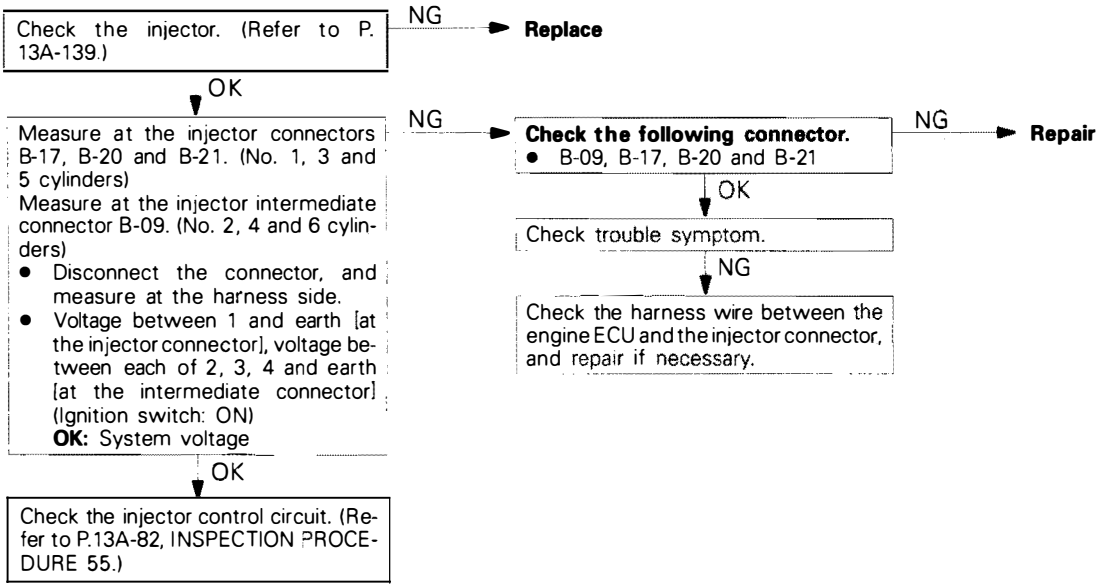
Code No. 36	Ignition timing adjustment signal system	Probable cause
[Comment]	This diagnosis code is output if the ignition timing adjustment signal wire is shorted to earth.	• Short circuit to earth of the ignition timing adjustment signal line • Malfunction of the engine ECU



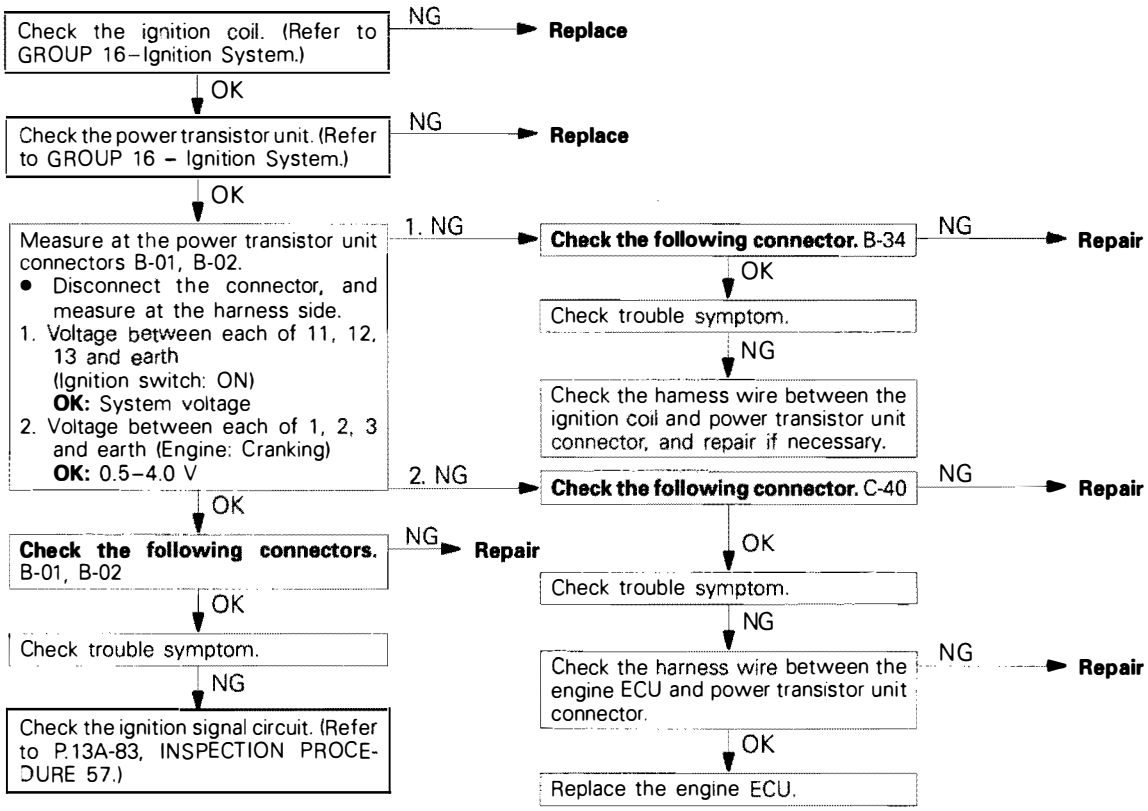
Code No. 41	Injector system <4G93, 4G63>	Probable cause
[Comment]	This diagnosis code is output if the injectors are not driven for a continuous period of 4 seconds or more while the engine is cranking or idling.	• Malfunction of the injector • Improper connector contact, open circuit or short-circuited harness wire of the injector circuit • Malfunction of the engine ECU



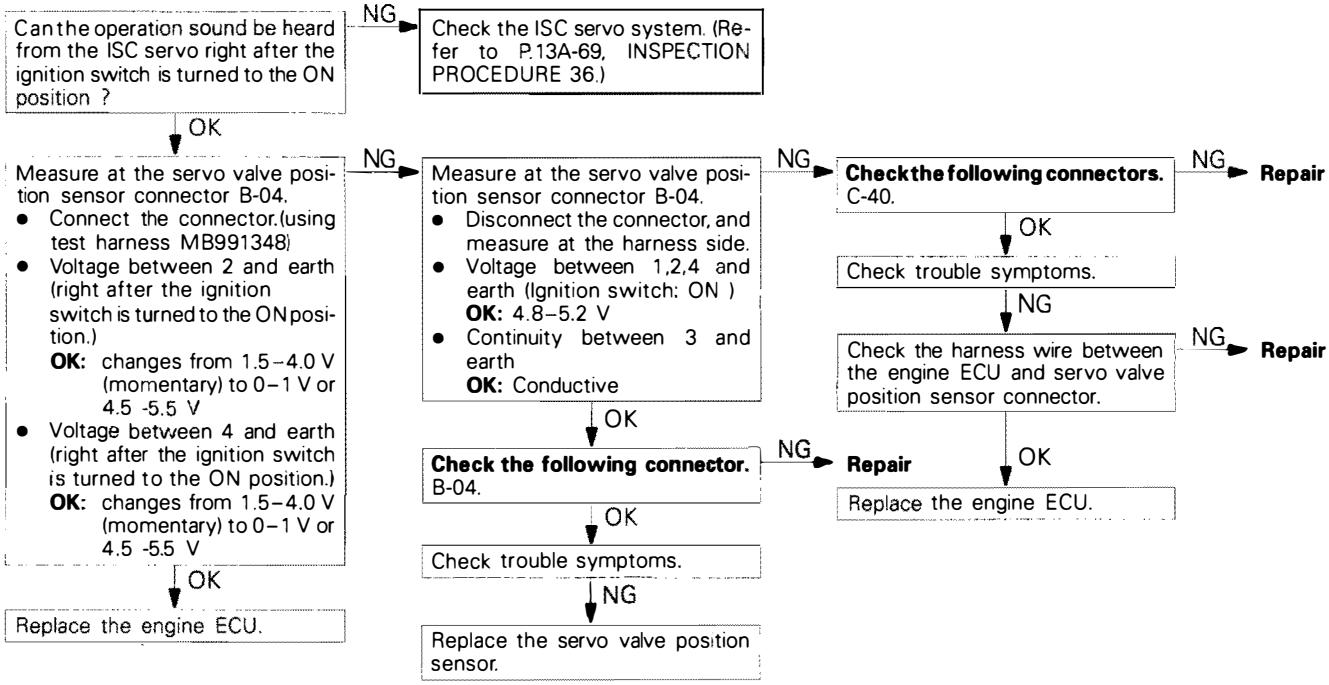
Code No. 41	Injector system <6A12, 6G73>	Probable cause
[Comment]	This diagnosis code is output if the injectors are not driven for a continuous period of 4 seconds or more while the engine is cranking or idling.	• Malfunction of the injector • Improper connector contact, open circuit or short-circuited harness wire of the injector circuit • Malfunction of the engine ECU



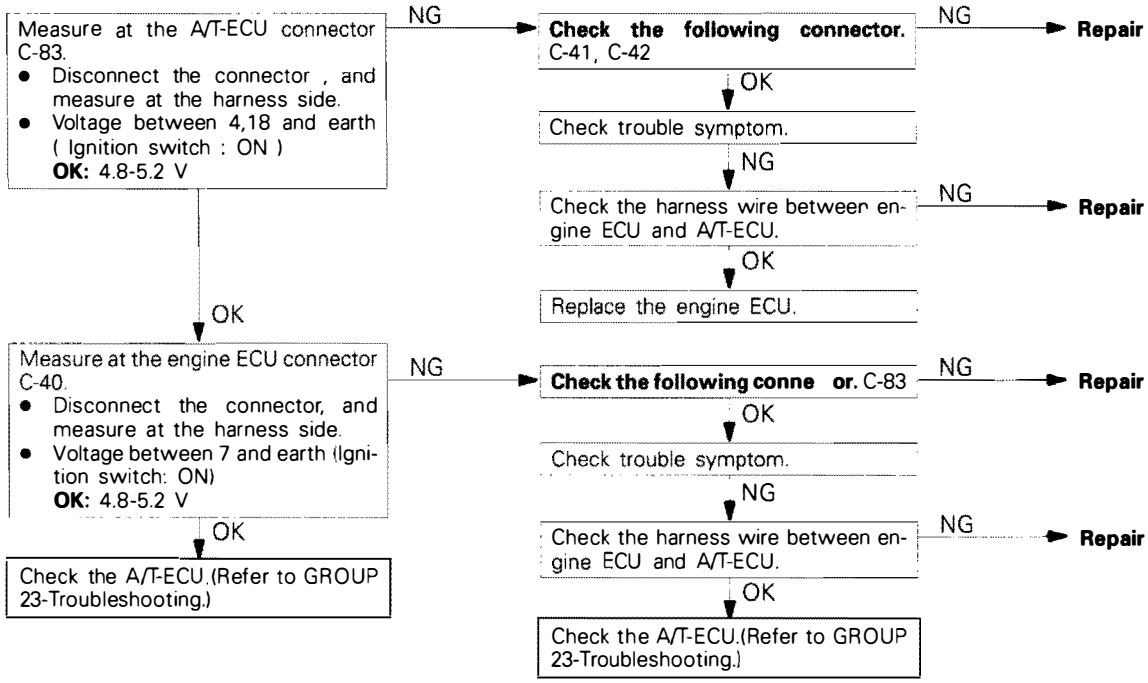
Code No. 44, 52, 53	Ignition coil and power transistor unit system <6A12, 6G73>	Probable cause
[Comment]	This diagnosis code is output if the engine is running but no ignition signal is input (except, however, if no ignition signal is input from any of the cylinders).	• Malfunction of the ignition coil • Improper connector contact, open circuit or short-circuited harness wire of the ignition primary circuit • Malfunction of the power transistor unit • Malfunction of the engine ECU



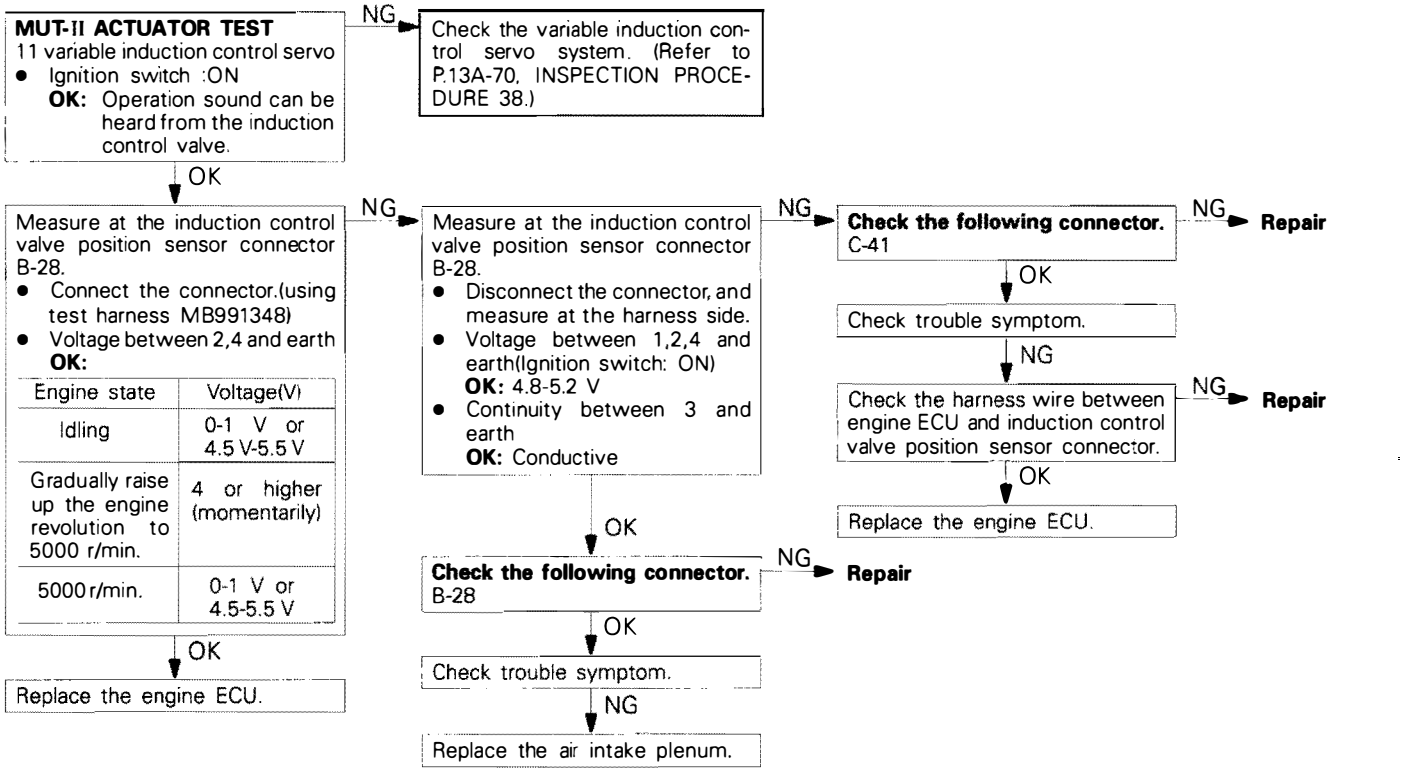
Code No. 55	Servo valve position sensor system <4G93,4G63>	Probable cause
[Comment]	This diagnosis code is output if the idle speed control (ISC) servo motor is driven several times but the servo valve does not arrive at the target position (open).	• Malfunction of servo valve position sensor • Improper connector contact, open circuit or short-circuited harness wire of servo valve position sensor circuit • Malfunction of ISC servo motor (DC motor) • Improper connector contact, open circuit or short-circuited harness wire of ISC servo motor (DC motor) • Malfunction of the ECU



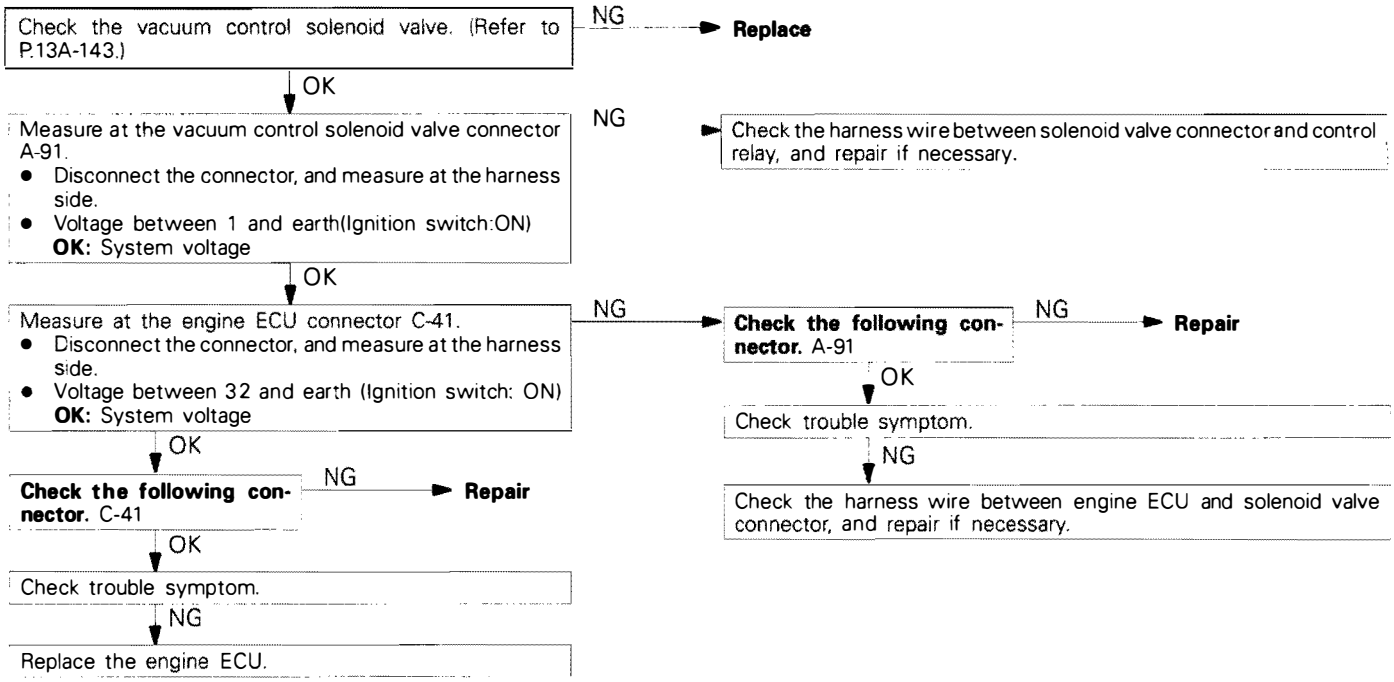
Code No. 61	Total control signal for engine and transmission <A/T: 4G63, 6A12,6G73>	Probable cause
[Comment]	This diagnosis code is output if the engine is running but the torque reduction request signal from the A/T-ECU remains at LOW for several seconds.	• Short-circuit in torque reduction request signal line • Malfunction of A/T-ECU • Malfunction of engine ECU



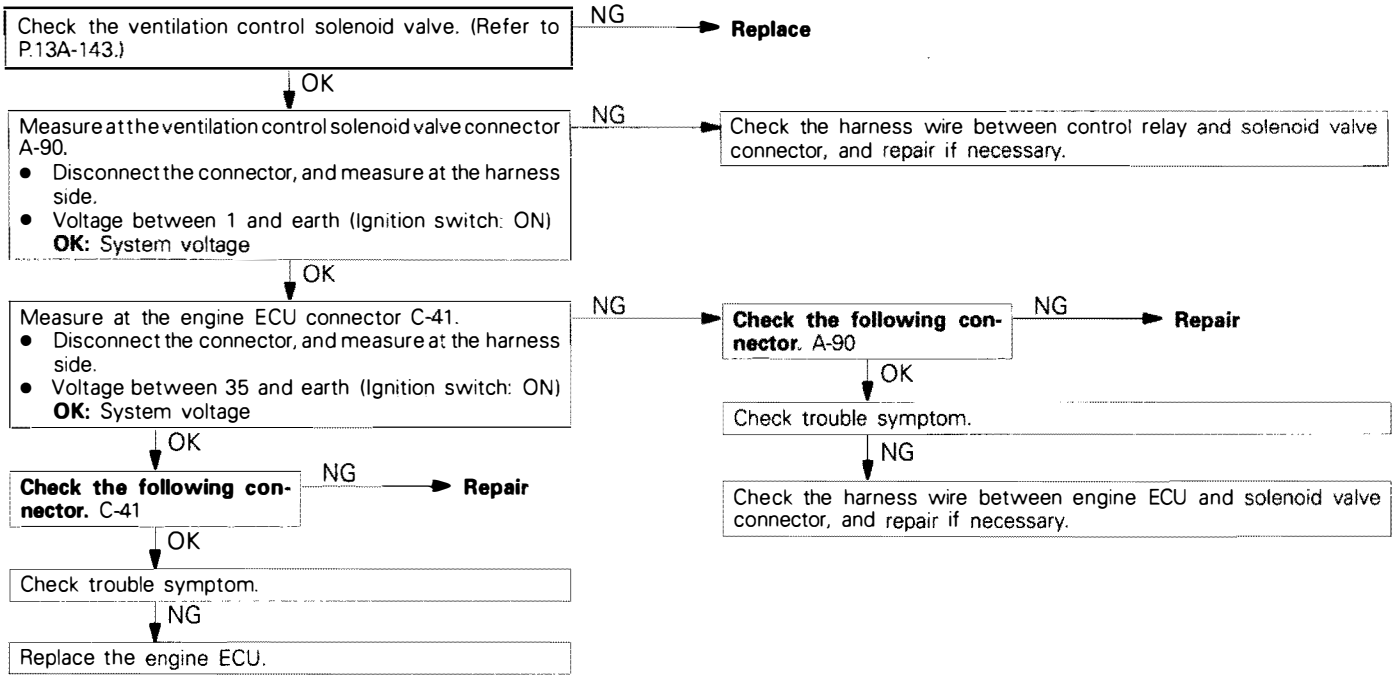
Code No. 62	Variable induction control valve position sensor system <6A12,6G73>	Probable cause
[Comment]	This diagnosis code is output if the intake temperature control servo motor is driven several times but the intake temperature control servo valve does not arrive at the target position (open).	• Malfunction of induction control valve position sensor • Improper connector contact, open circuit or short-circuited harness wire of the induction control valve position sensor • Malfunction of the induction control servo motor (DC motor) • Improper connector contact, open circuit or short-circuited harness wire of the induction control servo motor (DC motor) • Malfunction of the engine ECU



Code No. 71	Vacuum control solenoid valve system <vehicles with TCL>	Probable cause
[Comment]	This diagnosis code is output in the following cases: ● If the vacuum control solenoid valve is being driven but no current is being supplied to the solenoid valve. ● If the vacuum control solenoid valve is not being driven but current is being supplied to the solenoid valve.	● Malfunction of the vacuum control solenoid valve ● Improper connector contact, open circuit or short-circuited harness wire of vacuum control solenoid valve circuit ● Malfunction of the engine ECU.



Code No. 72	Ventilation control solenoid valve system <vehicles with TCL>	Probable cause
[Comment]	This diagnosis code is output in the following cases: ● If the ventilation control solenoid valve is being driven but no current is being supplied to the solenoid valve. ● If the ventilation control solenoid valve is not being driven but current is being supplied to the solenoid valve.	● Malfunction of the ventilation control solenoid valve ● Improper connector contact, open circuit or short-circuited harness wire of ventilation control solenoid valve ● Malfunction of the engine ECU



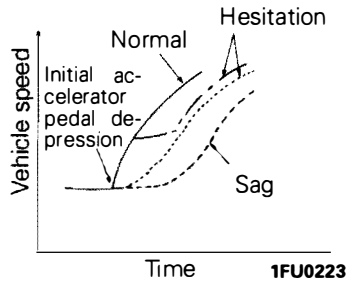
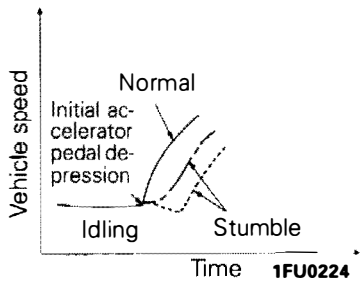
INSPECTION CHART FOR TROUBLE SYMPTOMS

E13AE05AA

Trouble symptom			Inspection procedure No.	Reference page
Communication with MUT-II is impossible.		Communication with all systems is not possible.	1	P.13A-41
		Communication with engine ECU only is not possible.	2	P.13A-41
Engine warning lamp and related parts		The engine warning lamp does not illuminate right after the ignition switch is turned to the ON position.	3	P.13A-42
		The engine warning lamp remains illuminating and never goes out.	4	P.13A-43
Starting		No initial combustion (starting impossible)	5	P.13A-43
		Initial combustion but no complete combustion (starting impossible)	6	P.13A-44
		Long time to start (improper starting)	7	P.13A-45
Idling stability	Improper idling	Unstable idling(Rough idling, hunting)	8	P.13A-46
		Idling speed is high. (Improper idling speed)	9	P.13A-47
		Idling speed is low. (Improper idling speed)	10	P.13A-48
	Improper idling continuity	When the engine is cold, it stalls at idling. (Die out)	11	P.13A-49
		When the engine becomes hot, it stalls at idling. (Die out)	12	P.13A-50
		The engine stalls when starting the car. (Pass out)	13	P.13A-51
		The engine stalls when decelerating.	14	P.13A-51
Driving		Hesitation, sag or stumble	15	P.13A-52
		The feeling of impact or vibration when accelerating	16	P.13A-53
		The feeling of impact or vibration when decelerating	17	P.13A-53
		Poor acceleration	18	P.13A-54
		Surge	19	P.13A-55
		Knocking	20	P.13A-55
Dieseling			21	P.13A-55
Too high CO and HC concentration when idling			22	P.13A-56

PROBLEM SYMPTOMS TABLE (FOR YOUR INFORMATION)

E13AE06AA

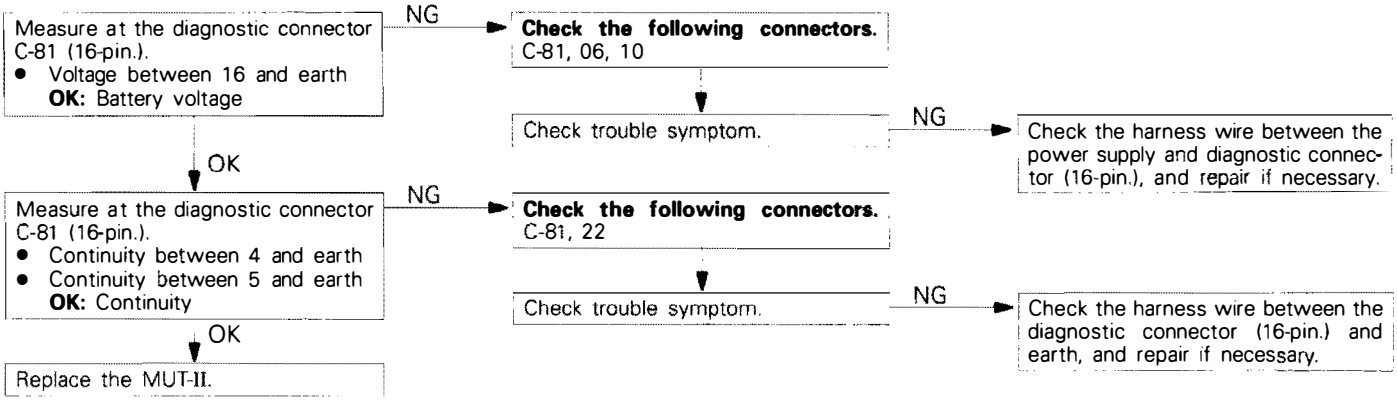
Items		Symptom
Starting	Won't start	The starter is used to crank the engine, but there is no combustion within the cylinders, and the engine won't start.
	Starting problem (initial combustion, then stall) (Starting takes a long time)	There is combustion within the cylinders, but then the engine soon stalls.
		Engine won't start quickly.
Idling stability	Idling instability (Rough idling)	Engine speed doesn't remain constant; changes during idling. 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 idling speed	The engine doesn't idle at the usual correct speed.
	Improper idling continuity Die out Pass out	This non-continuity of idling includes the following elements. (1) Die out... The engine stalls when the foot is taken from the accelerator pedal, regardless of whether the vehicles is moving or not. (2) Pass out... The engine stalls when the accelerator pedal is depressed or while it is being used.
Driving	The engine speed does not rise.	Even if the accelerator pedal is depressed, the engine speed does not rise.
	Hesitation Sag	"Hesitation" is the delay in response of the vehicle speed (engine speed) that occurs when the accelerator is depressed in order to accelerate from the speed at which the vehicle is now traveling, or a temporary drop in vehicle speed (engine speed) during such acceleration. Serious hesitation is called "sag". 
	Poor acceleration	Poor acceleration is inability to obtain an acceleration corresponding to the degree of throttle opening, even though acceleration is smooth, or the inability to reach maximum speed.
	Stumble	Engine speed response is delayed when the accelerator pedal is initially depressed for acceleration from the stopped condition. 
	Shock	The feeling of a comparatively large impact or vibration when the engine is accelerated or decelerated.
	Surge	This is repeated surging ahead during constant speed travel or during variable speed travel.
	Knocking	A sharp sound like a hammer striking the cylinder walls during driving and which adversely affects driving.
Stopping	Run on ("Dieseling")	The condition in which the engine continues to run after the ignition switch is turned to OFF. Also called "Dieseling".

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

E13AE07AA

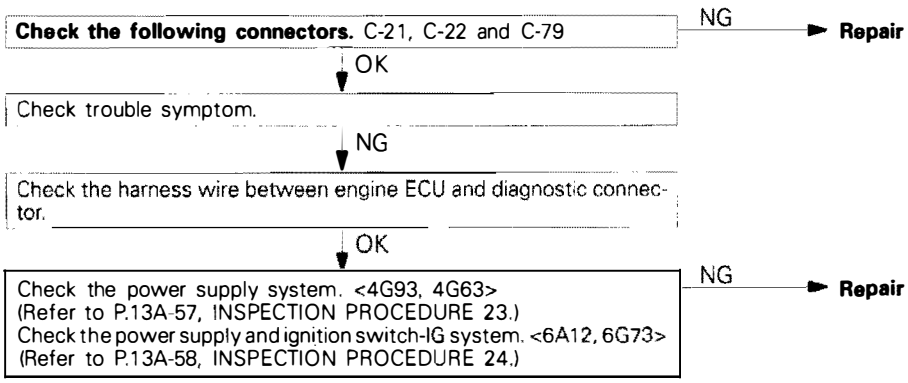
INSPECTION PROCEDURE 1

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



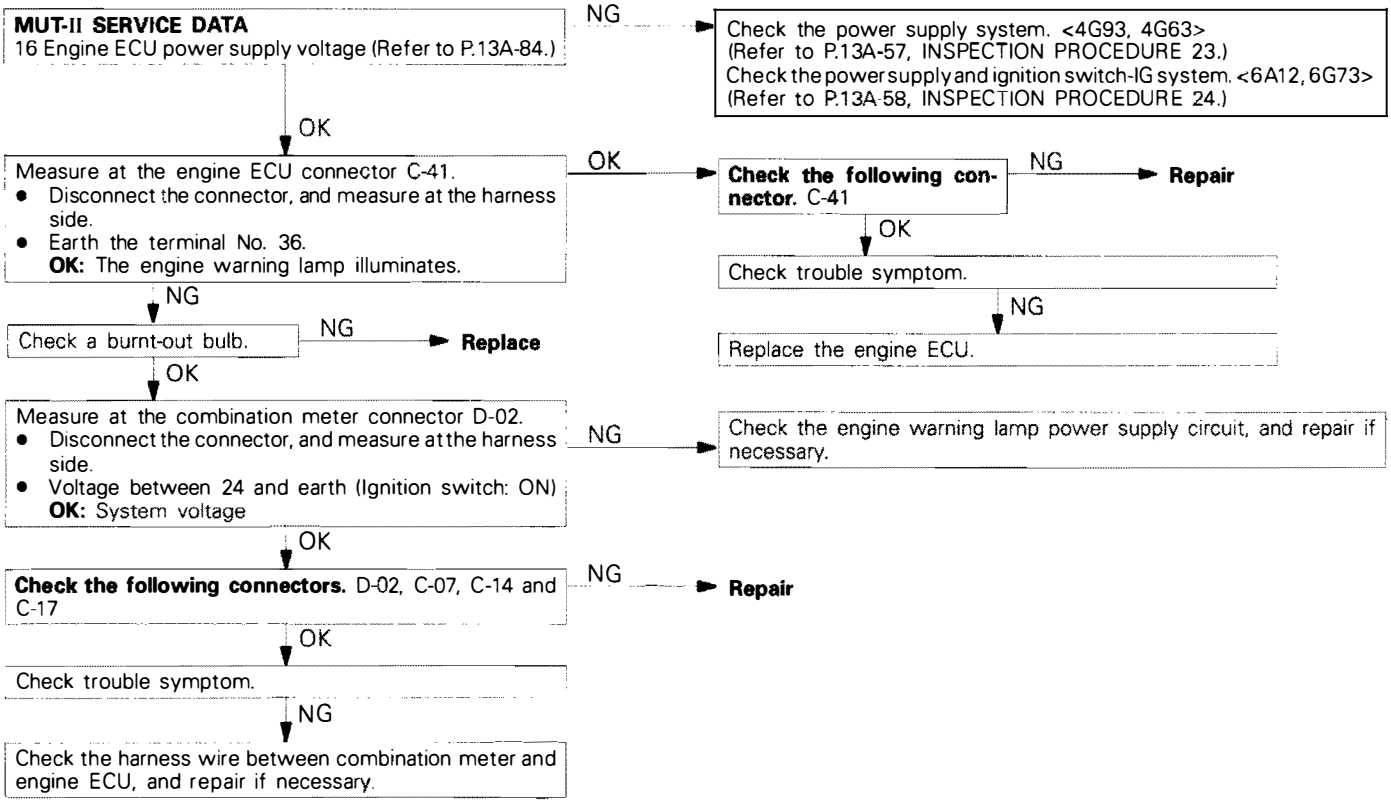
INSPECTION PROCEDURE 2

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



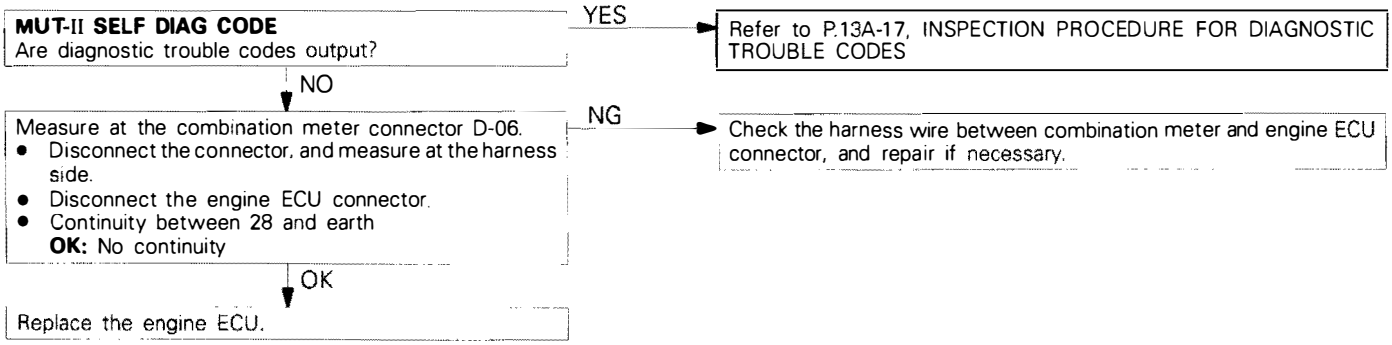
INSPECTION PROCEDURE 3

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



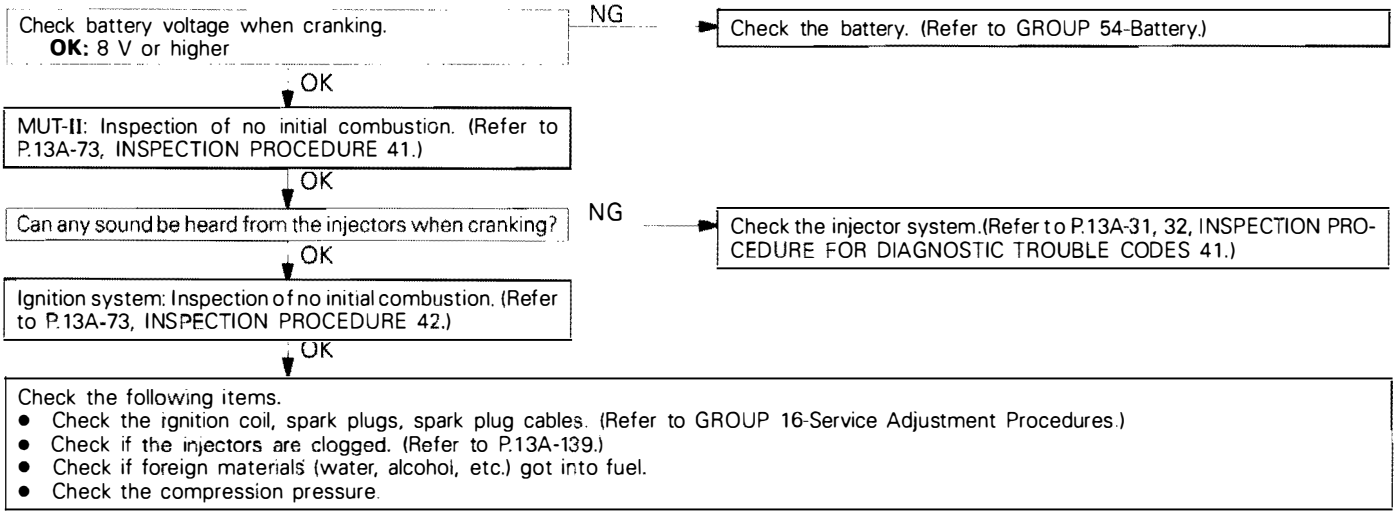
INSPECTION PROCEDURE 4

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



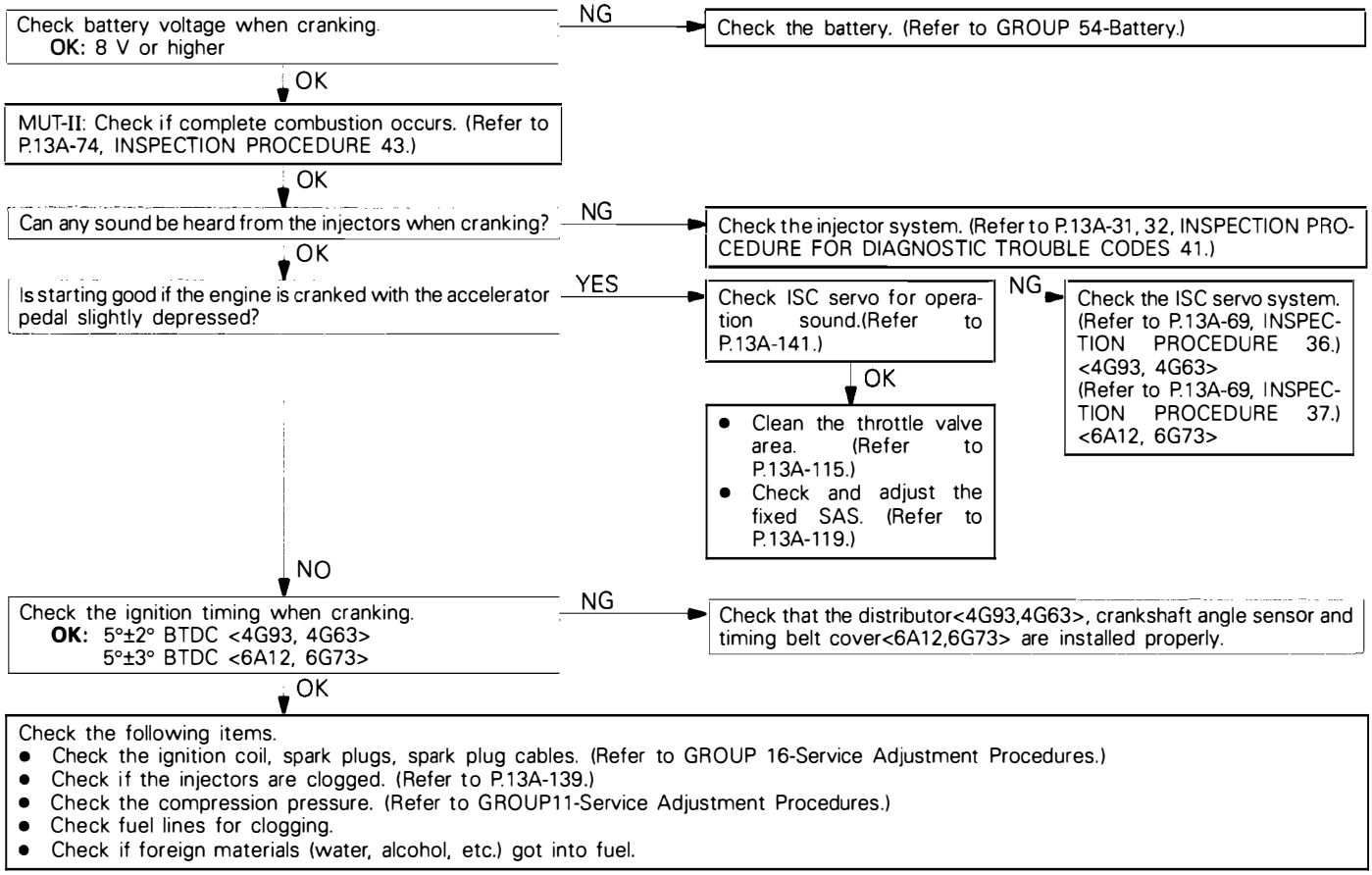
INSPECTION PROCEDURE 5

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



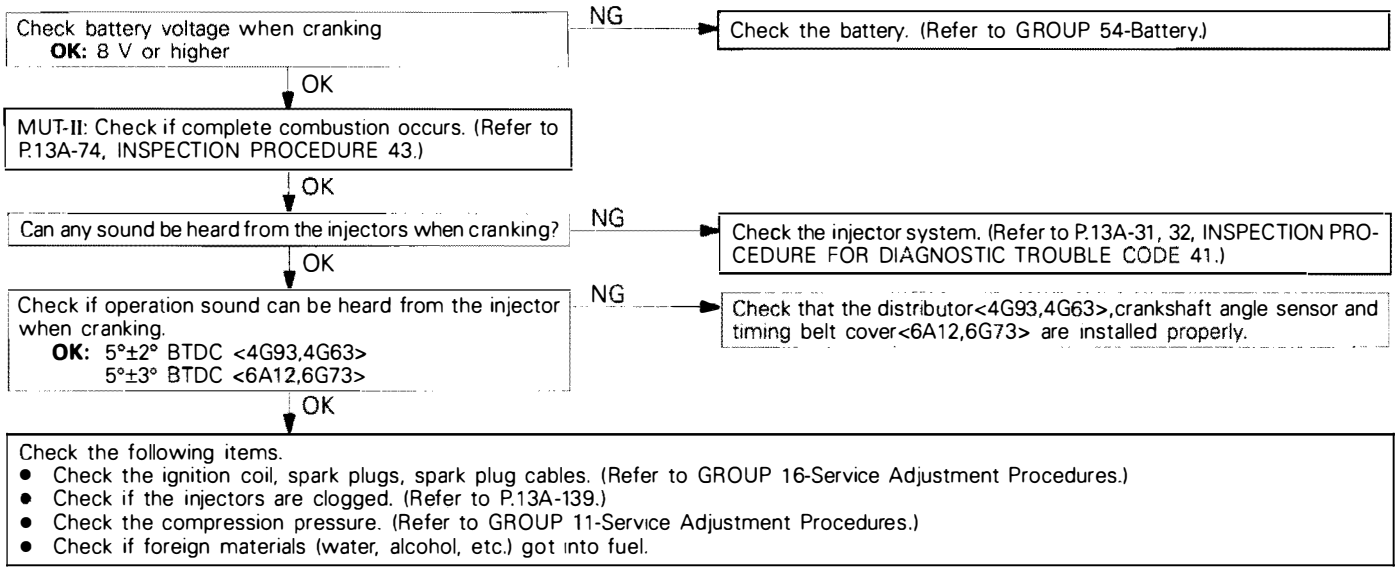
INSPECTION PROCEDURE 6

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



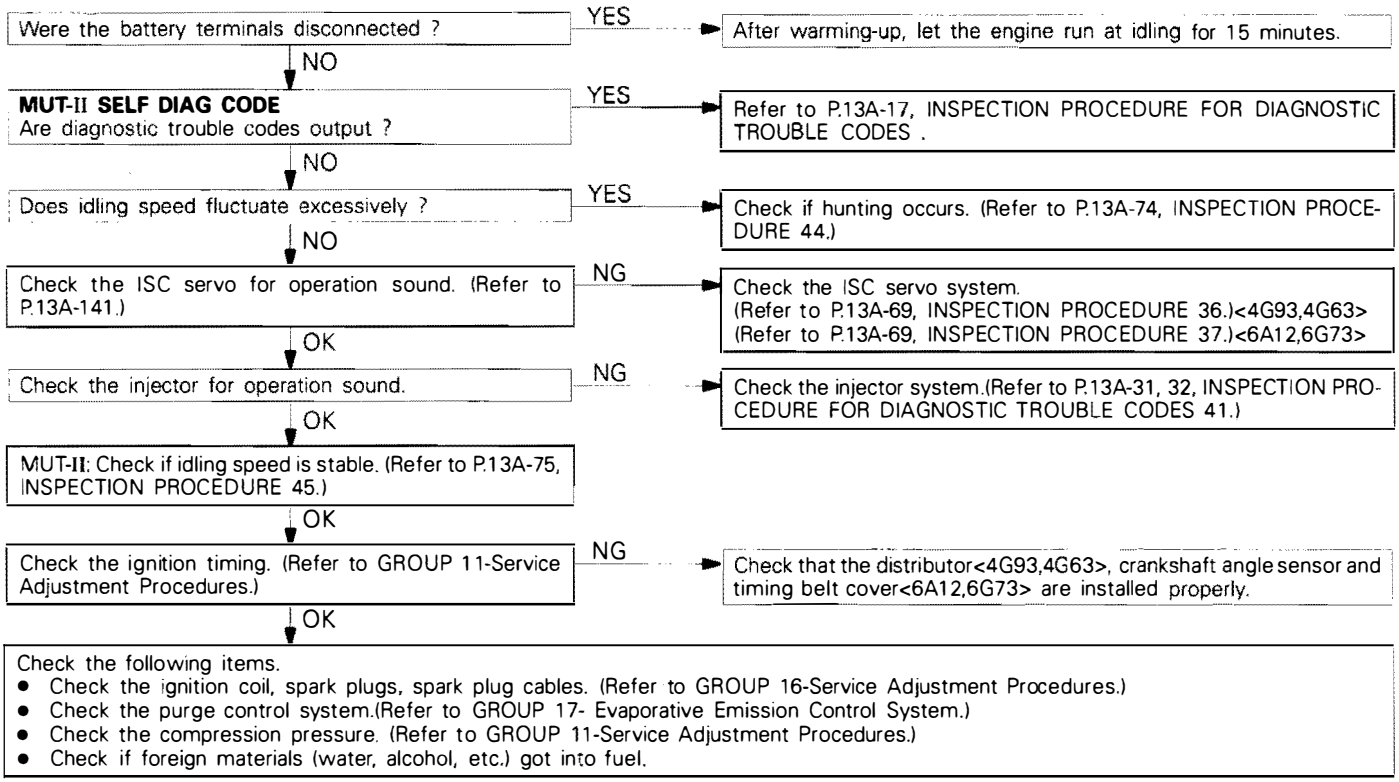
INSPECTION PROCEDURE 7

It takes too long time to start. (Incorrect starting)		Probable cause
[Comment]	In cases such as the above, the cause is probably that the spark is weak and ignition is difficult, the initial mixture for starting is not appropriate, or sufficient compression pressure is not being obtained.	• Malfunction of the ignition system • Malfunction of the injector system • Inappropriate gasoline use • Poor compression



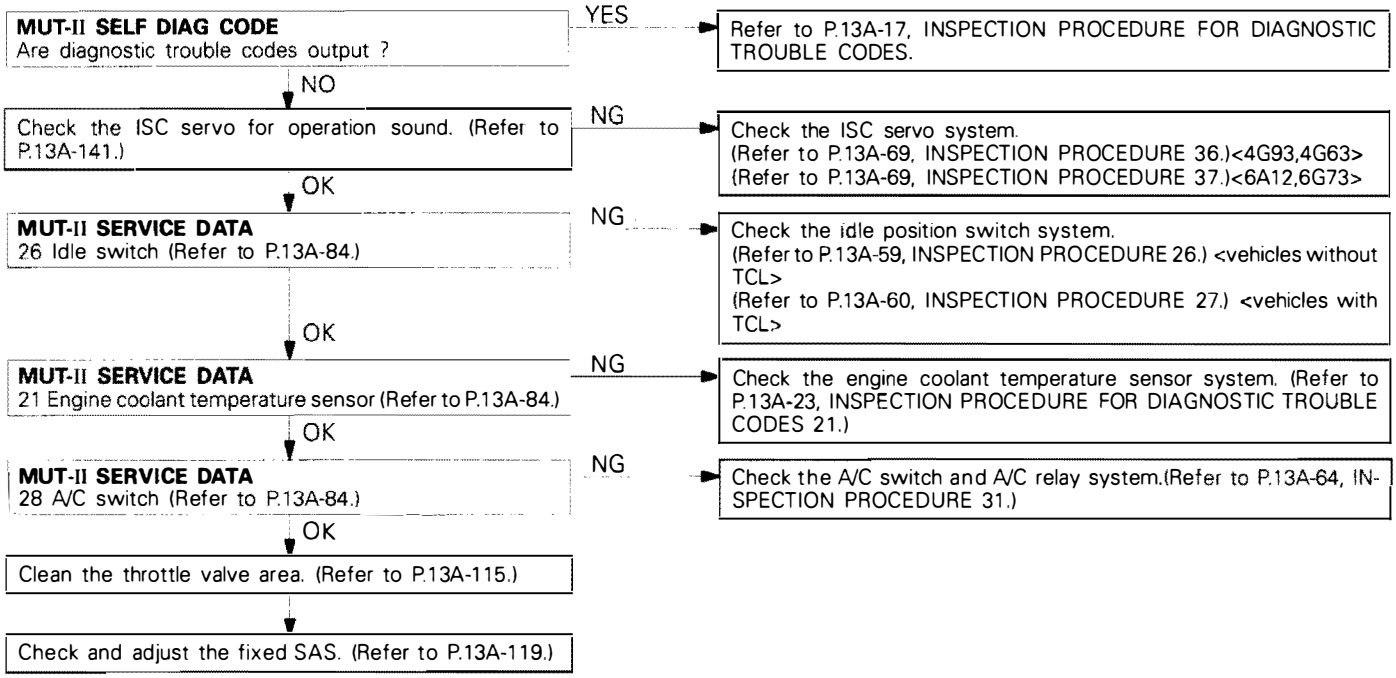
INSPECTION PROCEDURE 8

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



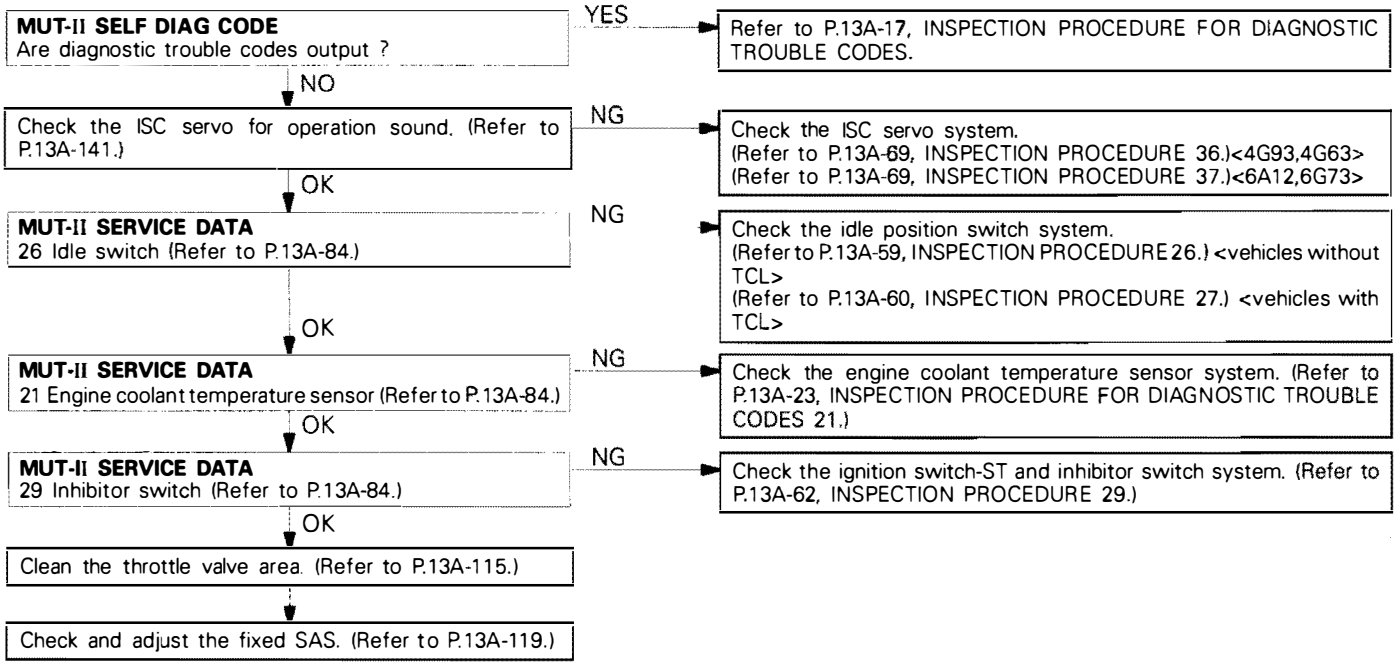
INSPECTION PROCEDURE 9

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



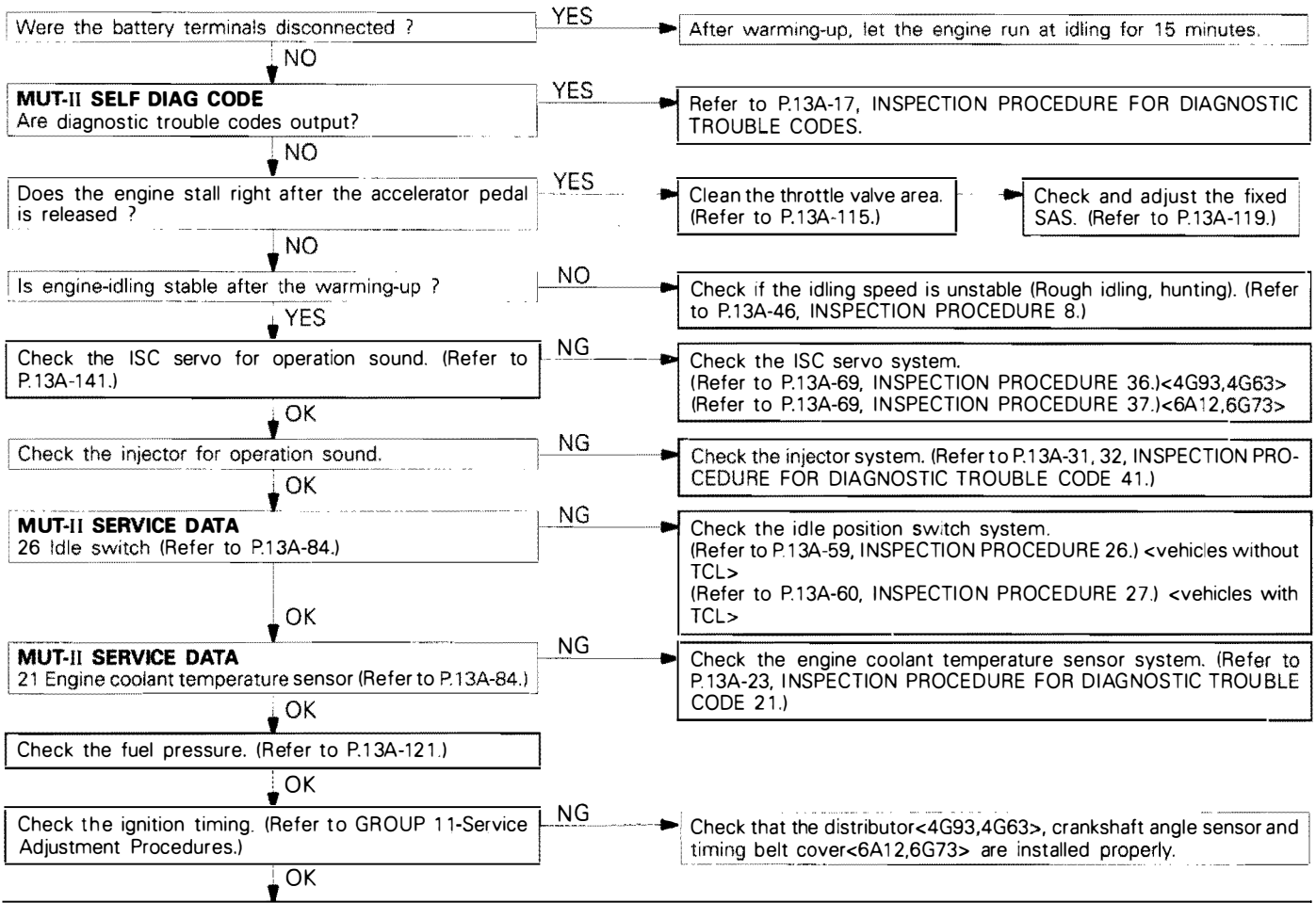
INSPECTION PROCEDURE 10

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



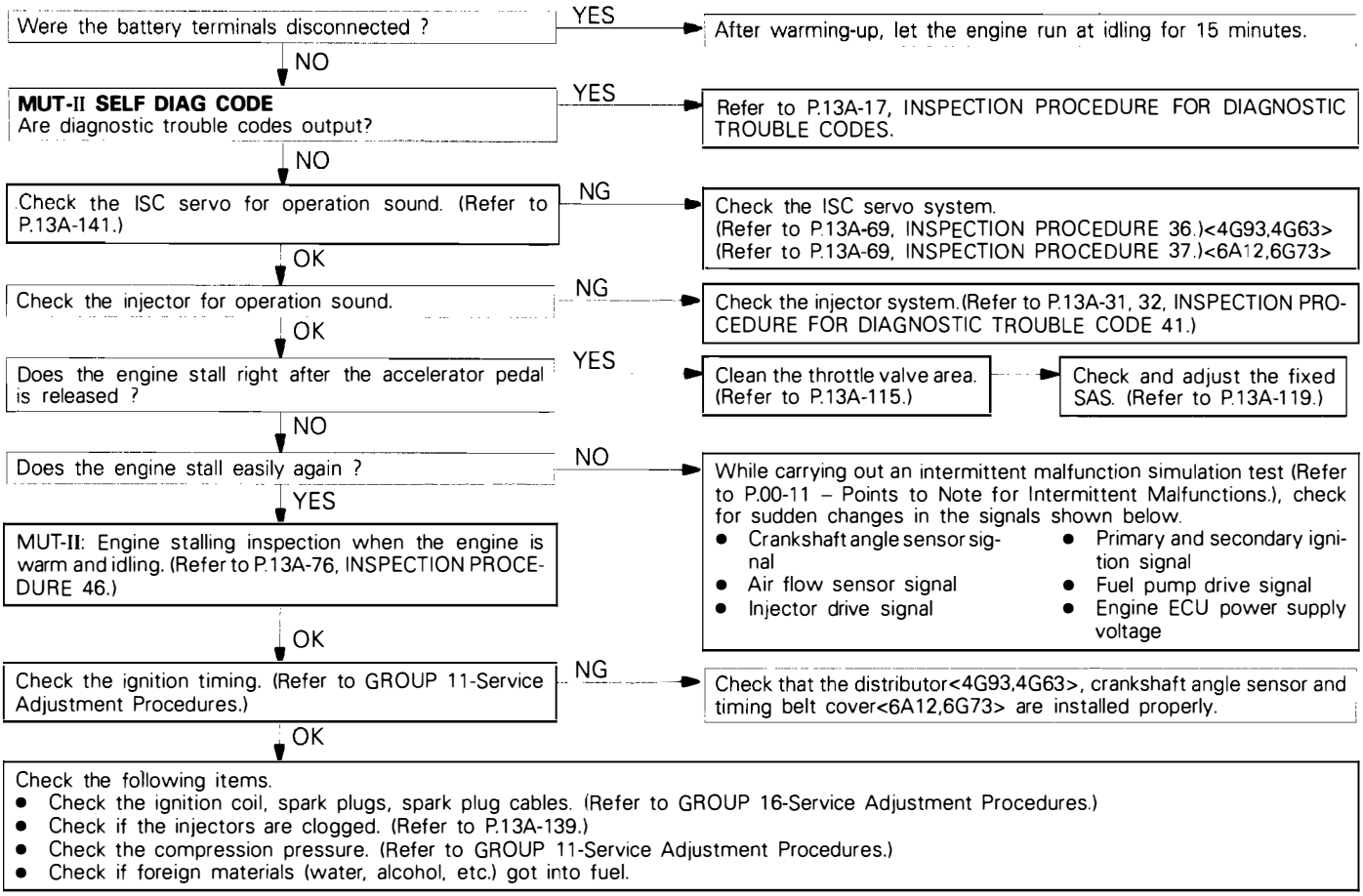
INSPECTION PROCEDURE 11

When the engine is cold, it stalls at idling. (Die out)	Probable cause
[Comment] In such cases as the above, the cause is probably that the air/fuel mixture is inappropriate when the engine is cold, or that the intake air volume is insufficient.	• Malfunction of the ISC servo system • Malfunction of the throttle body • Malfunction of the injector system • Malfunction of the ignition system



INSPECTION PROCEDURE 12

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



INSPECTION PROCEDURE 13

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

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output ?
YES → Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

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

INSPECTION PROCEDURE 14

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

Were the battery terminals disconnected ?
YES → After warming-up, let the engine run at idling for 15 minutes.
NO ↓

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output?
YES → Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

MUT-II SERVICE DATA
26 Idle switch (Refer to P.13A-84.)
NG → Check the idle position switch system.
(Refer to P.13A-59, INSPECTION PROCEDURE 26.) <vehicles without TCL>
(Refer to P.13A-60, INSPECTION PROCEDURE 27.) <vehicles with TCL>
OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-84.)
NG → Check the throttle position sensor system. (Refer to P.13A-22, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 14.)
OK ↓

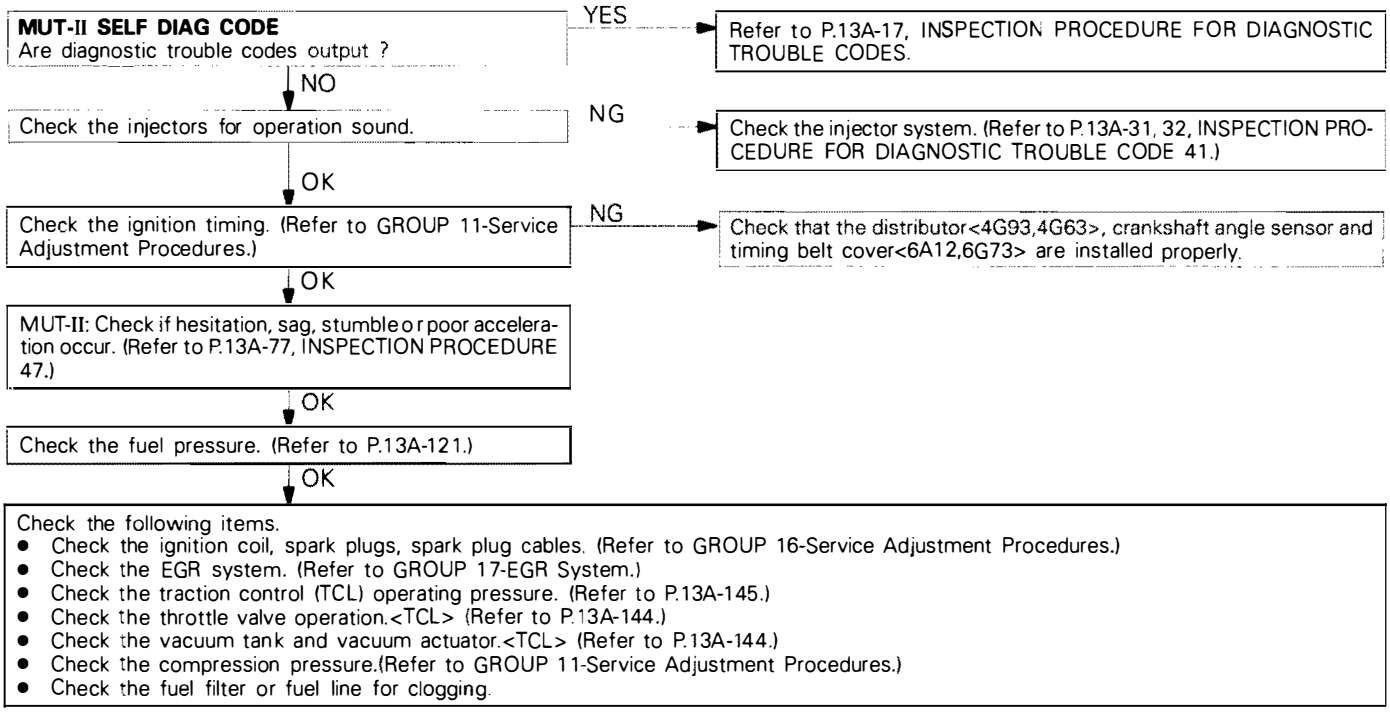
MUT-II SERVICE DATA
45 ISC servo position <6A12,6G73>
55 Servo valve position sensor <4G93,4G63>
- Is the idle speed control (ISC) serbo position drops to 0–2 steps when decerelating (engine r/min. less than 1,000)?

YES → Check the vehicle speed sensor system. (Refer to P.13A-28, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 24.)
NO ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16-Service Adjustment Procedures.)
- Clean the throttle valve area. (Refer to P.13A-115.)
- Check and adjust the fixed SAS. (Refer to P.13A-119.)

INSPECTION PROCEDURE 15

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



INSPECTION PROCEDURE 16

The feeling of impact or vibration when accelerating		Probable cause
[Comment]	In cases such as the above, the cause is probably that there is an ignition leak accompanying the increase in the spark plug demand voltage during acceleration.	• Malfunction of the ignition system

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output ?
YES → Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES .
NO ↓

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

INSPECTION PROCEDURE 17

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

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output ?
YES → Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
NO ↓

Check the ISC servo for operation sound. (Refer to P.13A-141.)
NG → Check the ISC servo system.
(Refer to P.13A-69, INSPECTION PROCEDURE 36.)<4G93,4G63>
(Refer to P.13A-69, INSPECTION PROCEDURE 37.)<6A12,6G73>
OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-84.)
NG → Check the throttle position sensor system. (Refer to P.13A-22, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 14.)
OK ↓

MUT-II SERVICE DATA
26 Idle switch (Refer to P.13A-84.)
NG → Check the idle position switch system.
(Refer to P.13A-59, INSPECTION PROCEDURE 26.) <vehicles without TCL>
(Refer to P.13A-60, INSPECTION PROCEDURE 27.) <vehicles with TCL>
OK ↓

Clean the throttle valve area. (Refer to P.13A-115.)

INSPECTION PROCEDURE 18

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

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output ?
- YES → Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES .
- NO ↓

Check the injectors for operation sound.
- NG → Check the injector system. (Refer to P.13A-31, 32, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES 41.)
- OK ↓

Check the ignition timing. (Refer to GROUP 11- Service Adjustment Procedures.)
- NG → Check that the distributor<4G93,4G63>, crankshaft angle sensor and timing belt cover<6A12,6G73> are installed properly.
- OK ↓

MUT-II: Check if hesitation, sag, stumble or poor acceleration occur. (Refer to P.13A-77, INSPECTION PROCEDURE 47.)
- OK ↓

Check the fuel pressure. (Refer to P.13A-121.)
- OK ↓

Check the following items.
- Check the ignition coil, spark plugs, spark plug cables. (Refer to GROUP 16-Service Adjustment Procedures.)
- Check the traction control (TCL) operating pressure. (Refer to P.13A-145.)
- Check the throttle valve operation.<TCL> (Refer to P.13A-144.)
- Check the vacuum tank and vacuum actuator.<TCL> (Refer to P.13A-144.)
- Check the compression pressure. (Refer to GROUP 11-Service Adjustment Procedures.)
- Check the fuel filter or fuel line for clogging.
- Broken air intake hose
- Clogged air cleaner
- Clogged exhaust system

INSPECTION PROCEDURE 19

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

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output ?
YES → Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
NO ↓
Check the injectors for operation sound.
NG → Check the injector system. (Refer to P.13A-31, 32, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 41.)
OK ↓
Check the ignition timing. (Refer to GROUP 11- Service Adjustment Procedures.)
NG → Check that the distributor<4G93,4G63>, crankshaft angle sensor and timing belt cover<6A12,6G73> are installed properly.
OK ↓
MUT-II: Check if surge occurs.(Refer to P.13A-78, INSPECTION PROCEDURE 48.)
OK ↓
Check the fuel pressure. (Refer to P.13A-121.)
OK ↓

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

INSPECTION PROCEDURE 20

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

MUT-II SELF DIAG CODE
Are diagnostic trouble codes output ?
YES → Refer to P.13A-17, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES.
NO ↓
Does knocking occur when driving with the sensor disconnected?
At this time, use the MUT-II to check if the timing is retarded compared to when the detonation sensor connector is connected.
NO → Check the detonation sensor system. (Refer to P.13A-30, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 31.)
YES ↓

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

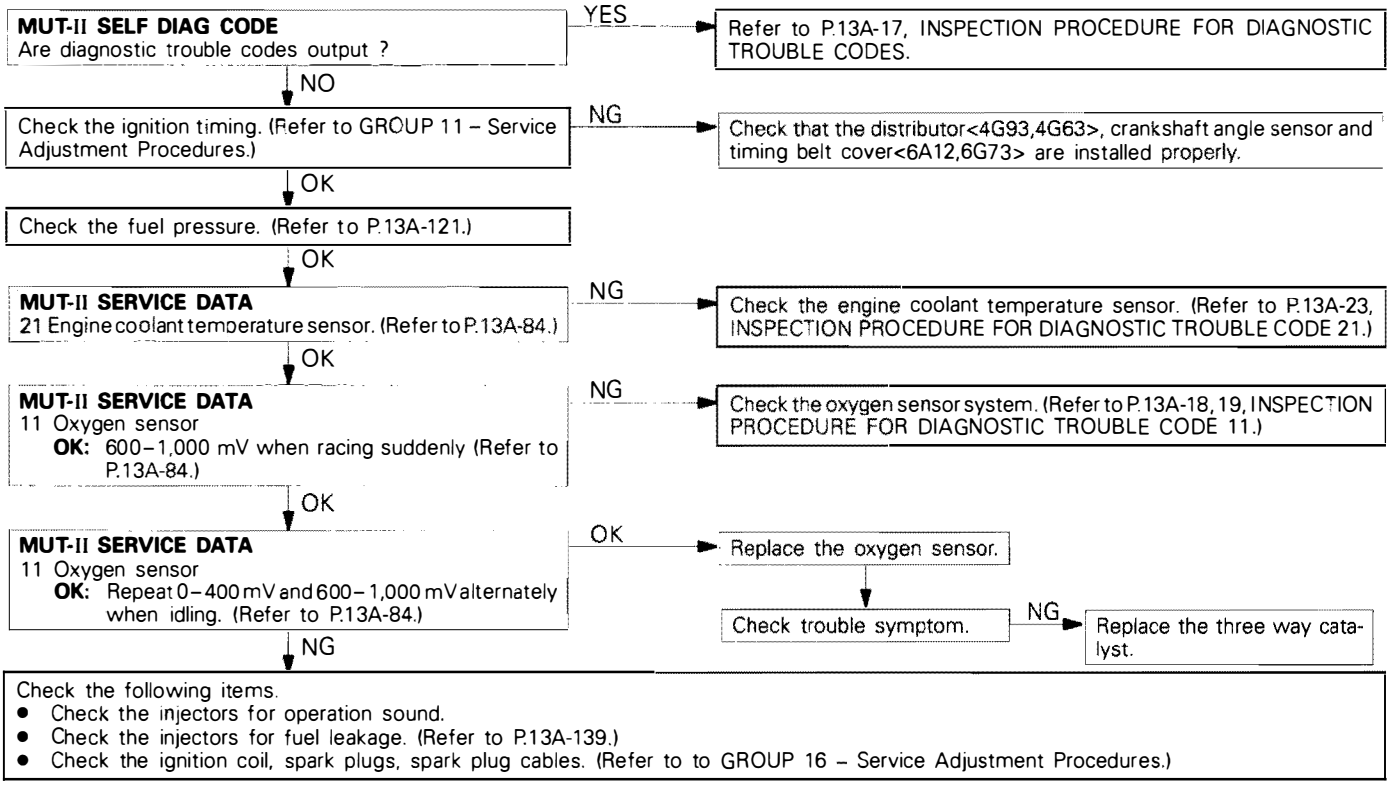
INSPECTION PROCEDURE 21

Dieseling		Probable cause
[Comment]	Fuel leakage from injectors is suspected.	• Fuel leakage from injectors

Check the injectors for fuel leakage. (Refer to P.13A-139.)

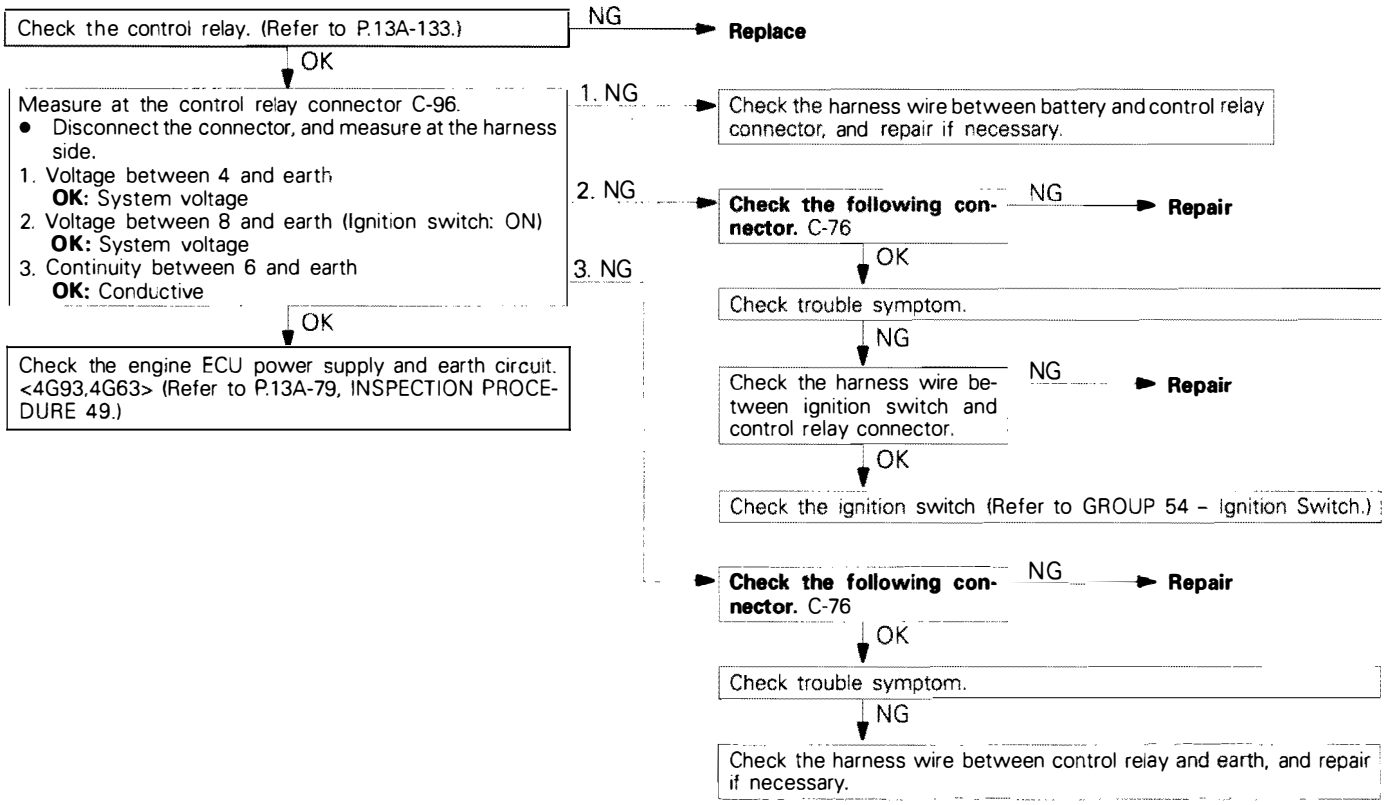
INSPECTION PROCEDURE 22

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



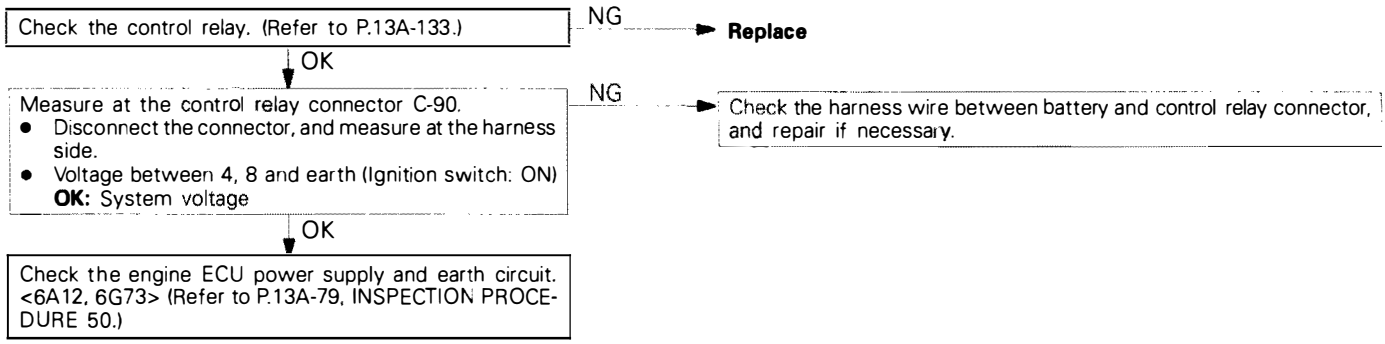
INSPECTION PROCEDURE 23

Power supply system <4G93, 4G63>		Probable cause
[Comment]	While the ignition switch is ON, battery power is supplied to engine ECU, injectors, air flow sensor, etc. through the control relay.	• Malfunction of the control relay • Improper connector contact, open circuit or short-circuited harness wire • Disconnected engine ECU earth wire • Malfunction of the engine ECU



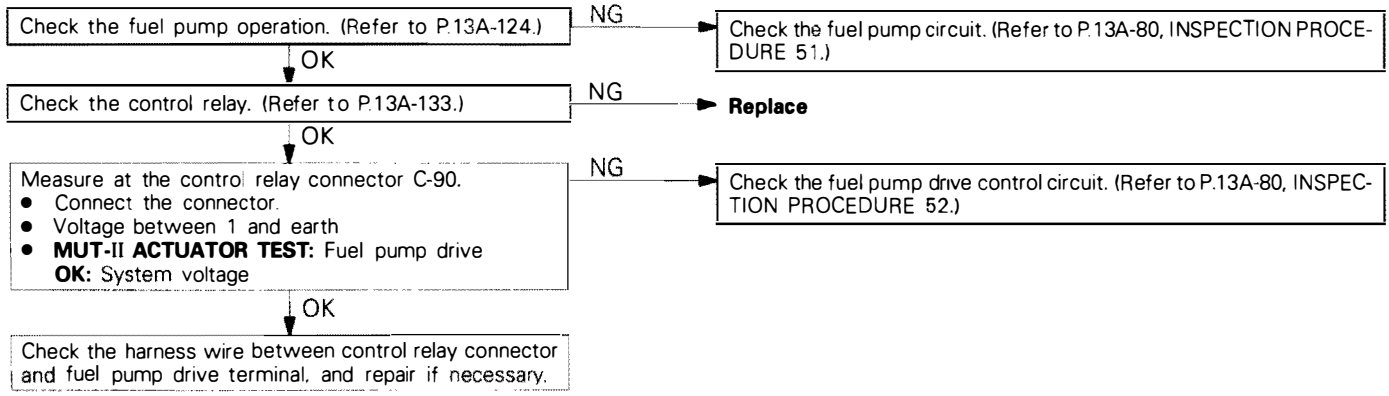
INSPECTION PROCEDURE 24

Power supply system and ignition switch-IG system <6A12,6G73>		Probable cause
[Comment]	When an ignition switch ON signal is input to the engine ECU, the engine ECU turns the control relay ON. This causes battery voltage to be supplied to the engine ECU, injectors and air flow sensor.	• Malfunction of the ignition switch • Malfunction of the control relay • Improper connector contact, open circuit or short-circuited harness wire • Disconnected engine ECU earth wire • Malfunction of the engine ECU



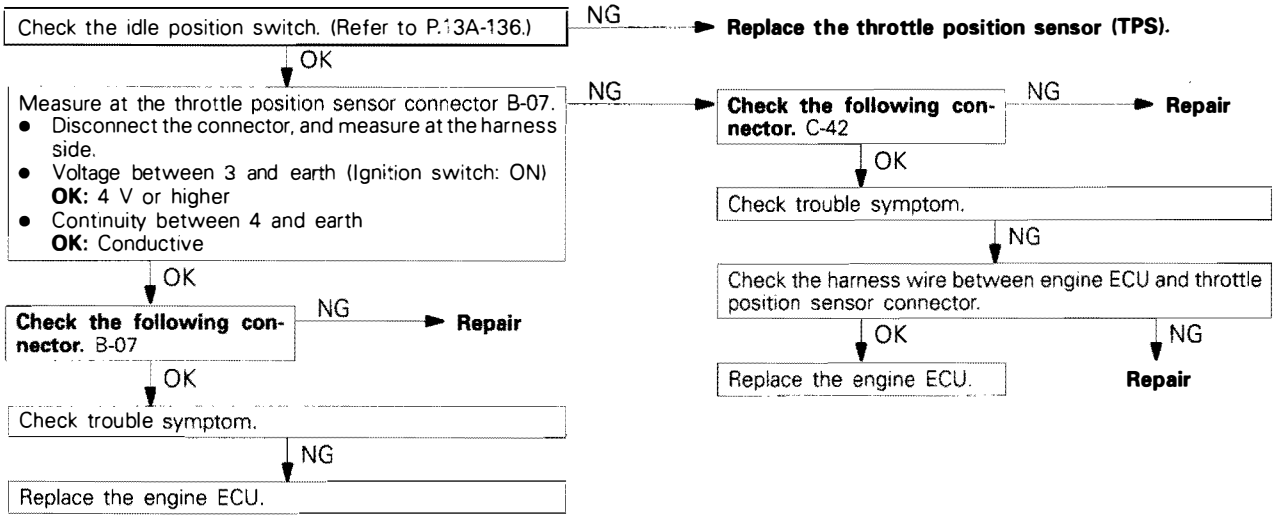
INSPECTION PROCEDURE 25

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



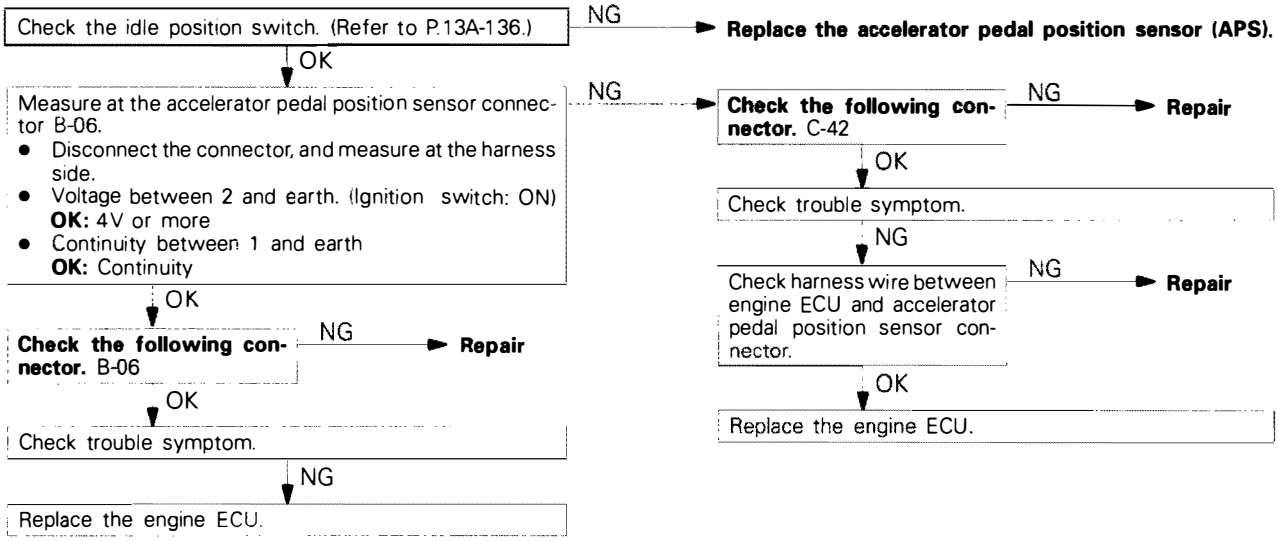
INSPECTION PROCEDURE 26

Idle position switch system <Vehicles without TCL>		Probable cause
[Comment]	The idle position switch inputs the condition of the accelerator pedal, i.e. whether it is depressed or released (HIGH/LOW), to the engine ECU. The engine ECU controls the idle speed control servo based on this input.	• Maladjustment of the accelerator pedal • Maladjustment of the fixed SAS • Maladjustment of the idle position switch and throttle position sensor • Improper connector contact, open circuit or short-circuited harness wire • Malfunction of the engine ECU



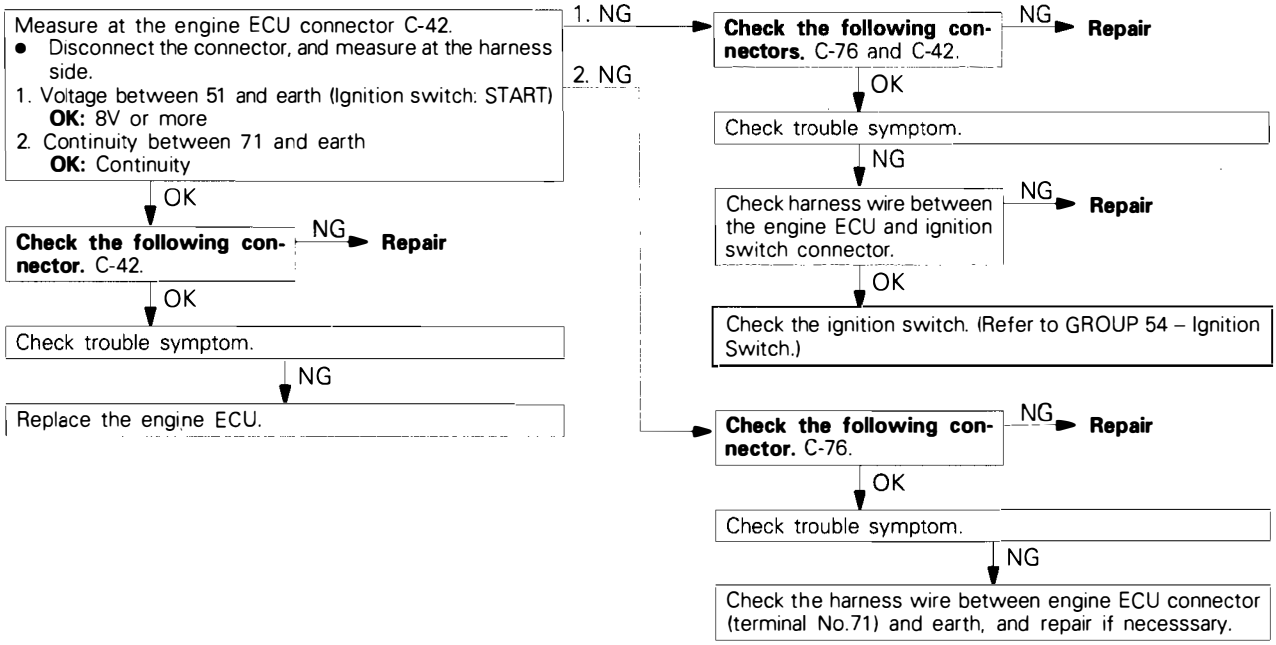
INSPECTION PROCEDURE 27

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



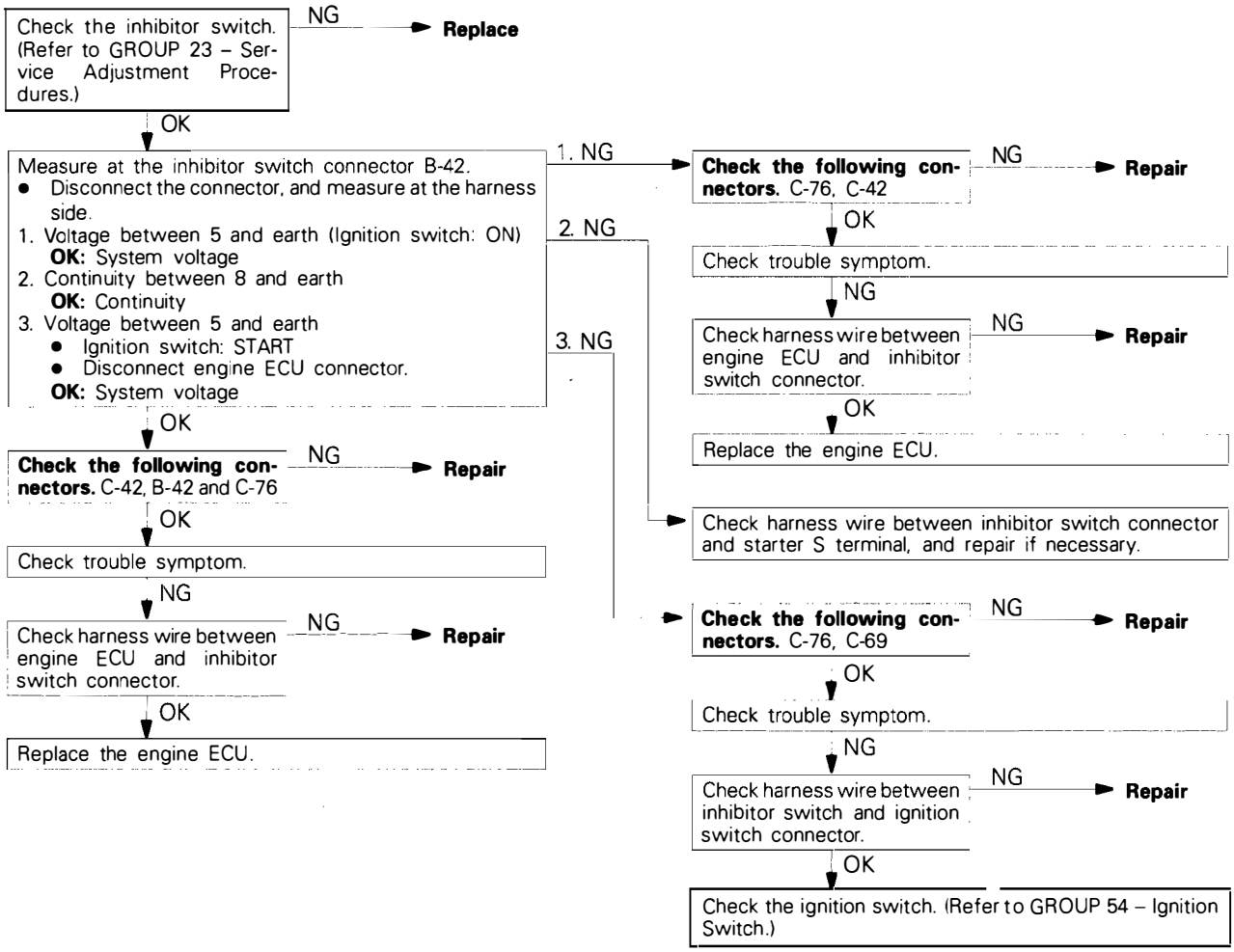
INSPECTION PROCEDURE 28

Ignition switch-ST system		Probable cause
[Comment]	The ignition switch – ST inputs a HIGH signal to the engine ECU while the engine is cranking. The engine ECU controls fuel injection, etc. during starting based on this input.	• Malfunction of ignition switch • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of the engine ECU



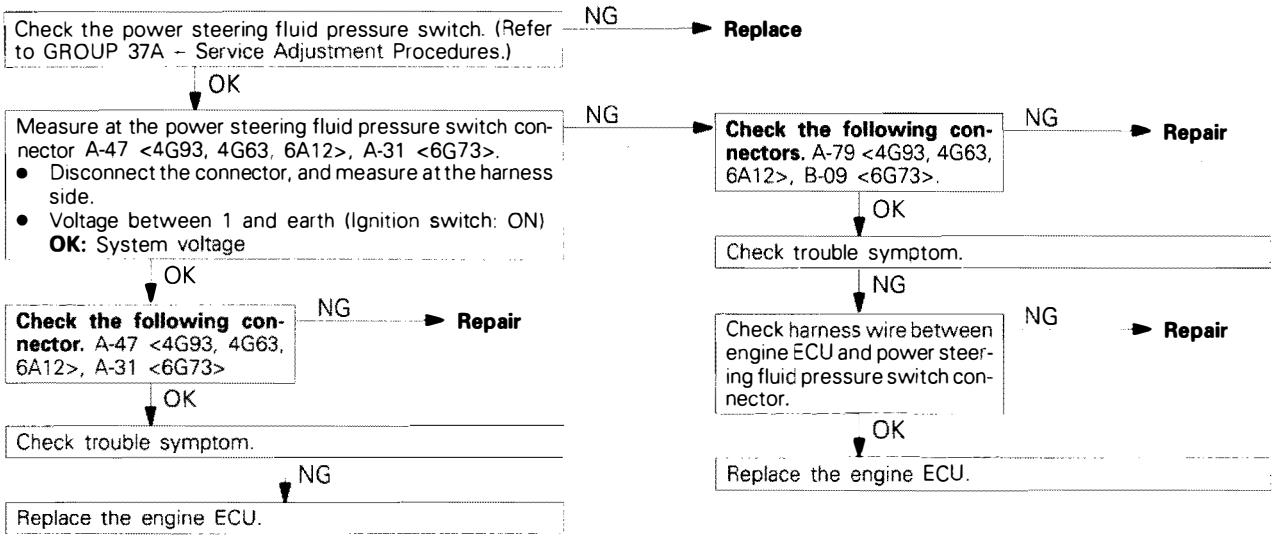
INSPECTION PROCEDURE 29

Ignition switch-ST and inhibitor switch system <A/T>	Probable cause
[Comment] • The ignition switch – ST inputs a HIGH signal to the engine ECU while the engine is cranking. The engine ECU controls fuel injection, etc. during starting based on this input. • The inhibitor switch inputs the condition of the select lever, i.e. whether it is in P or N range or in some other range, to the engine ECU. The engine ECU controls the idle speed control (ISC) servo based on this input.	• Malfunction of ignition switch • Malfunction of inhibitor switch • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of engine ECU.



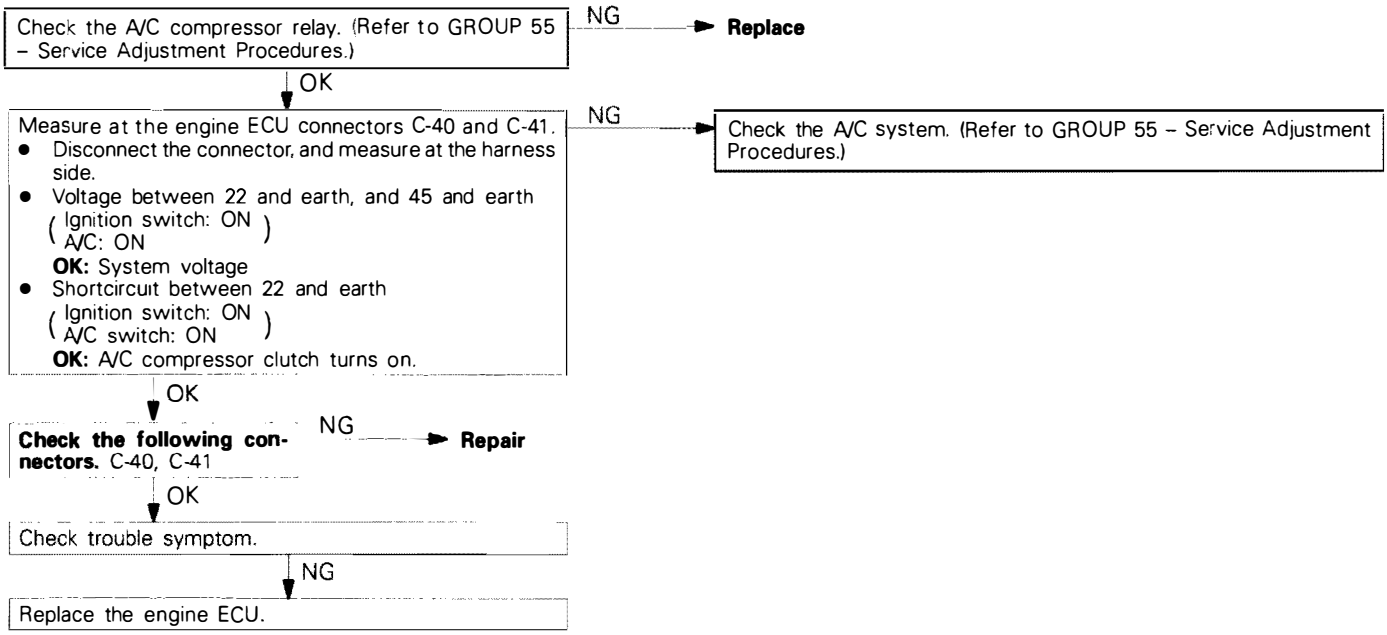
INSPECTION PROCEDURE 30

Power steering fluid pressure switch system		Probable cause
[Comment]	The presence or absence of power steering load is input to the engine ECU. The engine ECU controls the idle speed control (ISC) servo based on this input.	• Malfunction of power steering fluid pressure switch • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of engine ECU



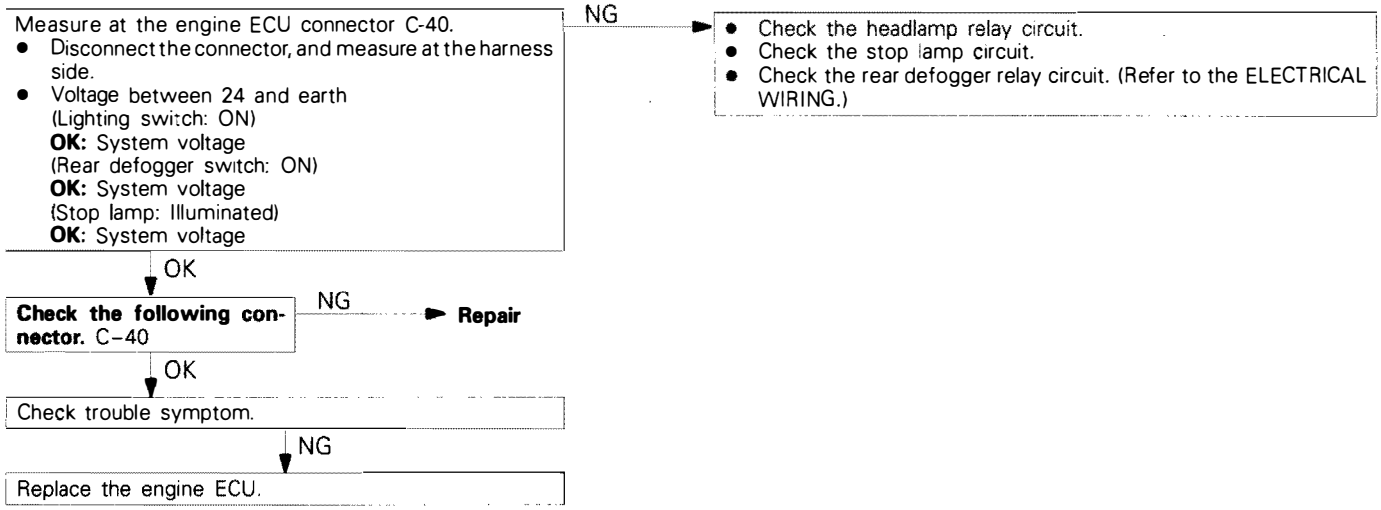
INSPECTION PROCEDURE 31

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



INSPECTION PROCEDURE 32

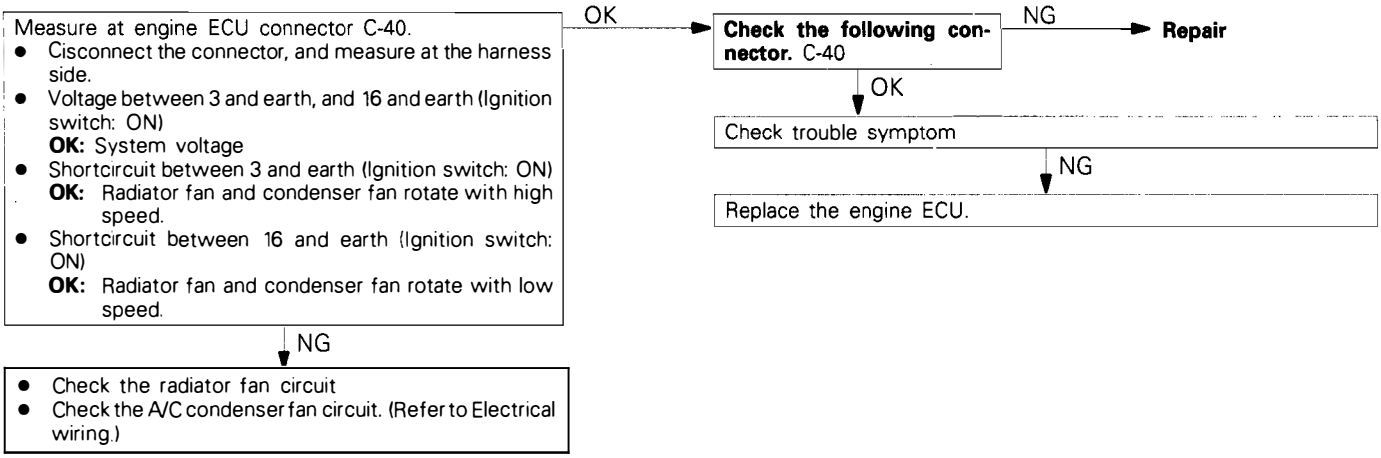
Electric load switch system <4G63, 6A12, 6G73>		Probable cause
[Comment]	During idling, the ON/OFF condition of switches in equipment which have a large electrical load is input to the engine ECU. The engine ECU controls the idle speed control (ISC) servo based on this input.	• Improper connector contact, open circuit or shortcircuited harness wire of headlamp relay circuit • Improper connector contact, open circuit or shortcircuited harness wire of stop lamp circuit • Improper connector contact, open circuit or shortcircuited harness wire of rear defogger relay circuit • Malfunction of engine ECU



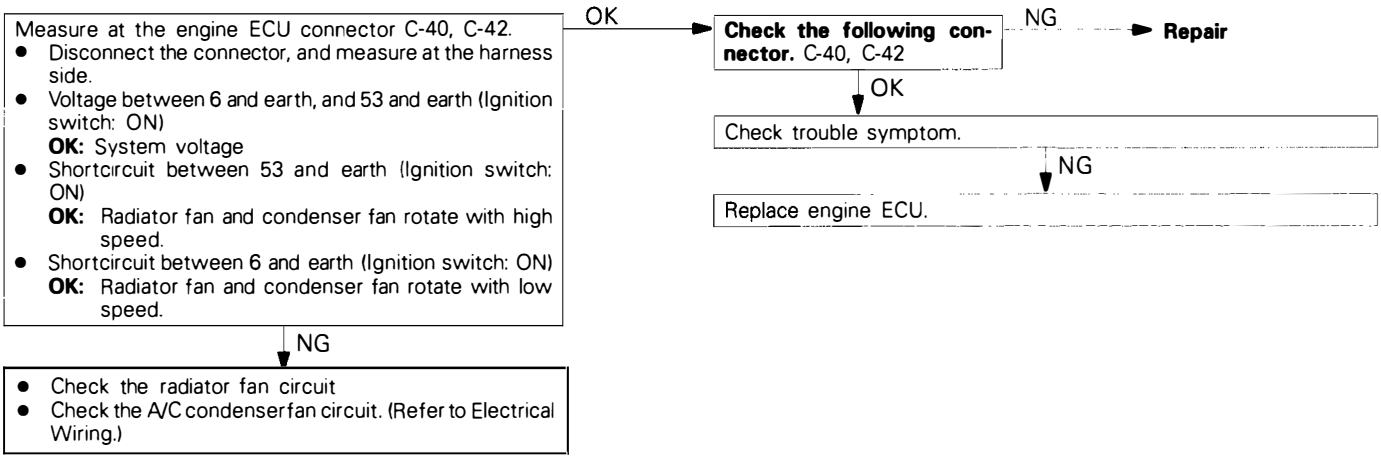
INSPECTION PROCEDURE 33

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

<4G93, 4G63>

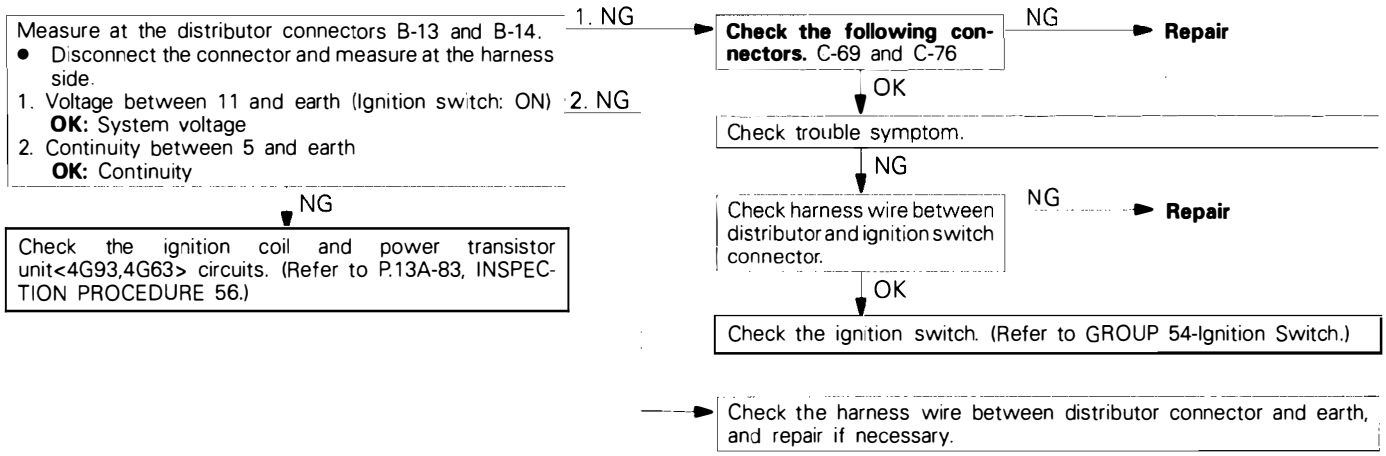


<6A12, 6G73>



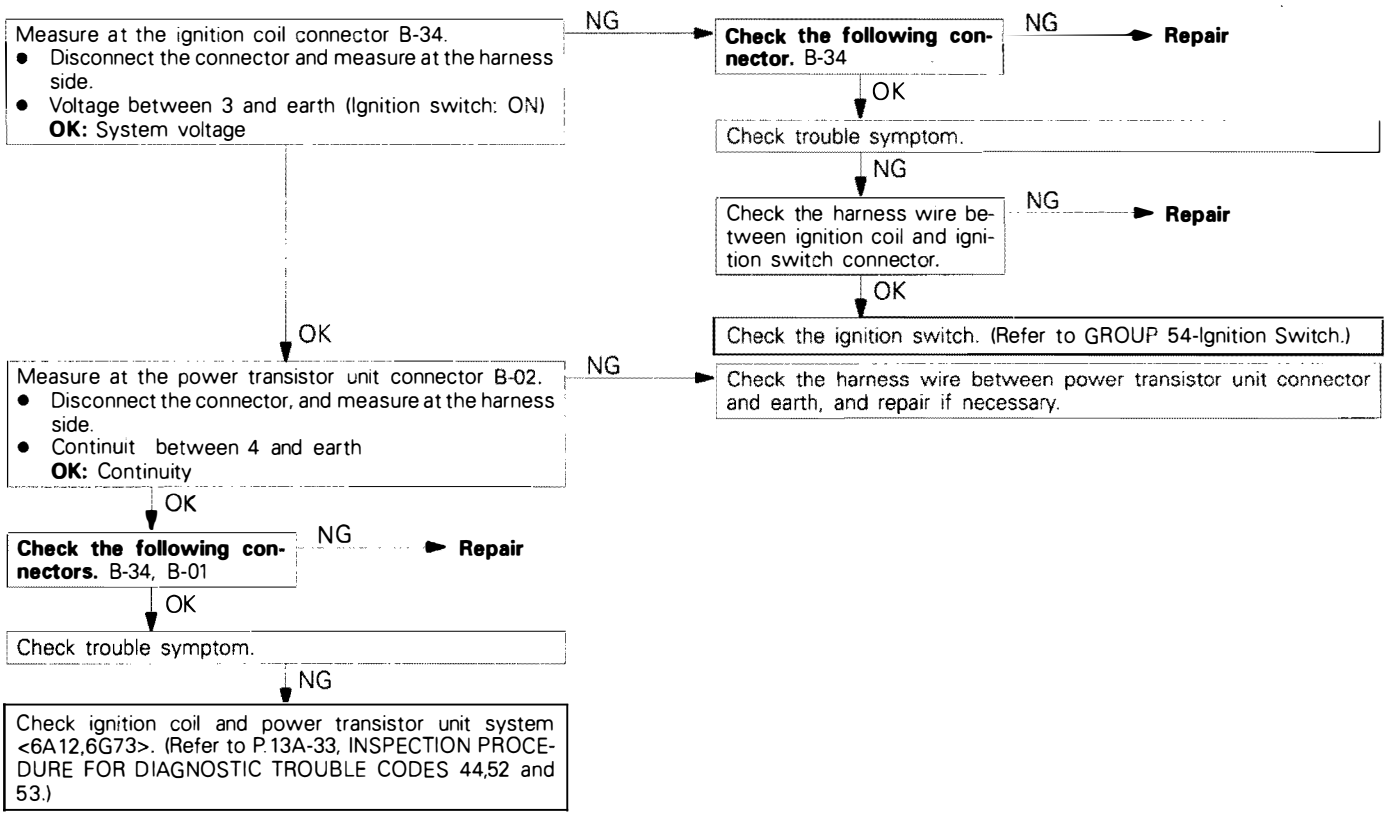
INSPECTION PROCEDURE 34

Ignition circuit system <4G93, 4G63>		Probable cause
[Comment]	The engine ECU interrupts the ignition coil primary current by turning the power transistor inside the engine ECU ON and OFF.	• Malfunction of ignition coil • Malfunction of power transistor unit • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of engine ECU



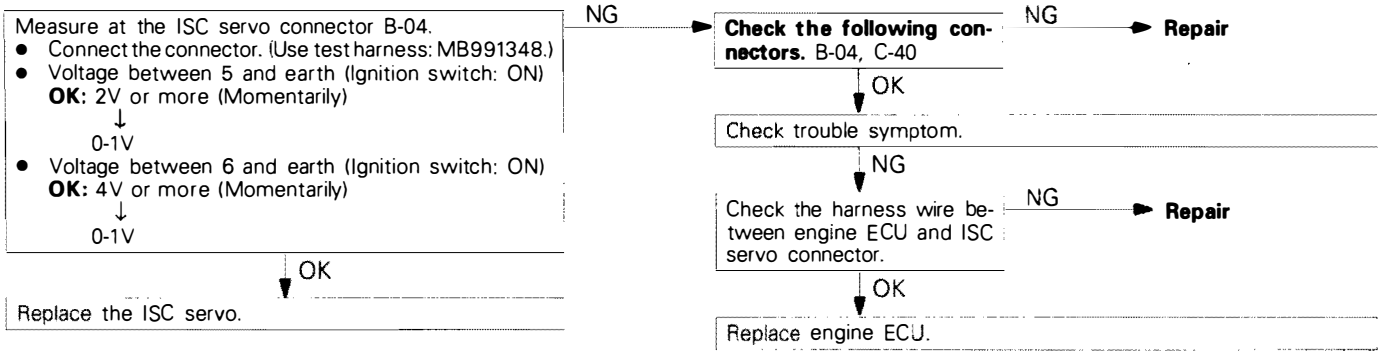
INSPECTION PROCEDURE 35

Ignition circuit system <6A12, 6G73>		Probable cause
[Comment]	The engine ECU interrupts the ignition coil primary current by turning the power transistor inside the engine ECU ON and OFF.	• Malfunction of ignition switch • Malfunction of power transistor unit • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of engine ECU



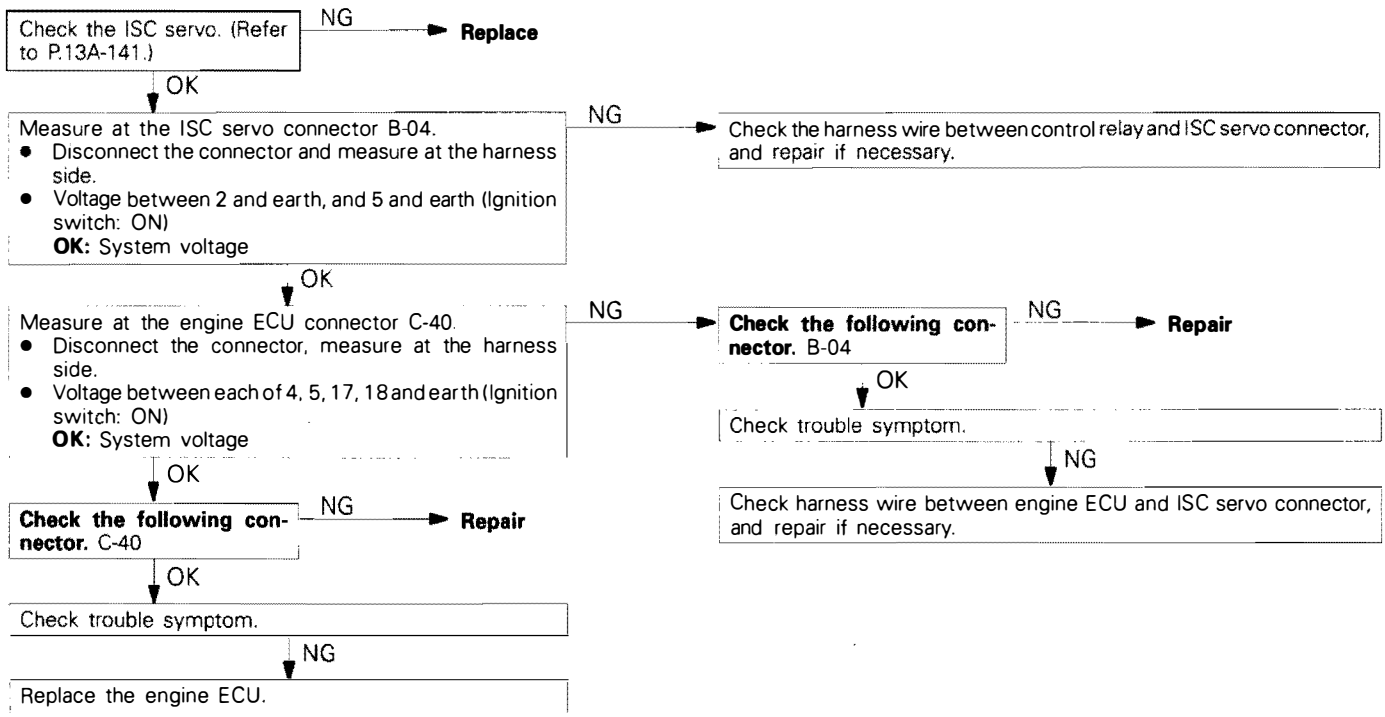
INSPECTION PROCEDURE 36

Idle speed control (ISC) servo (DC motor) system <4G93, 4G63>	Probable cause
[Comment] The engine ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	• Malfunction of ISC servo • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of engine ECU



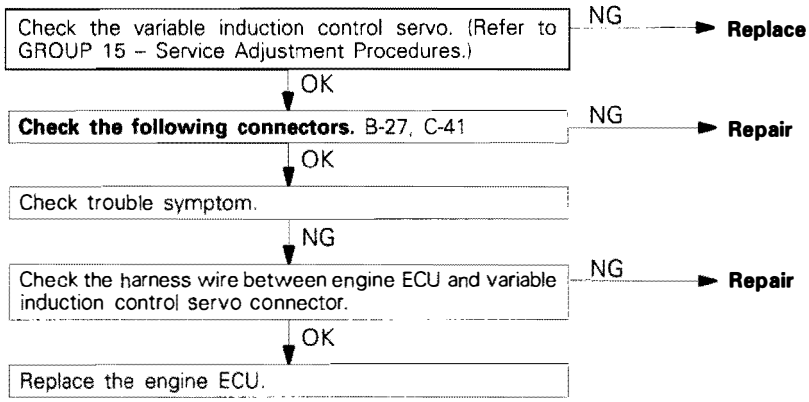
INSPECTION PROCEDURE 37

Idle speed control (ISC) servo (Stepper motor) system <6A12,6G73>	Probable cause
[Comment] The engine ECU controls the intake air volume during idling by opening and closing the servo valve located in the bypass air passage.	• Malfunction of ISC servo • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of engine ECU



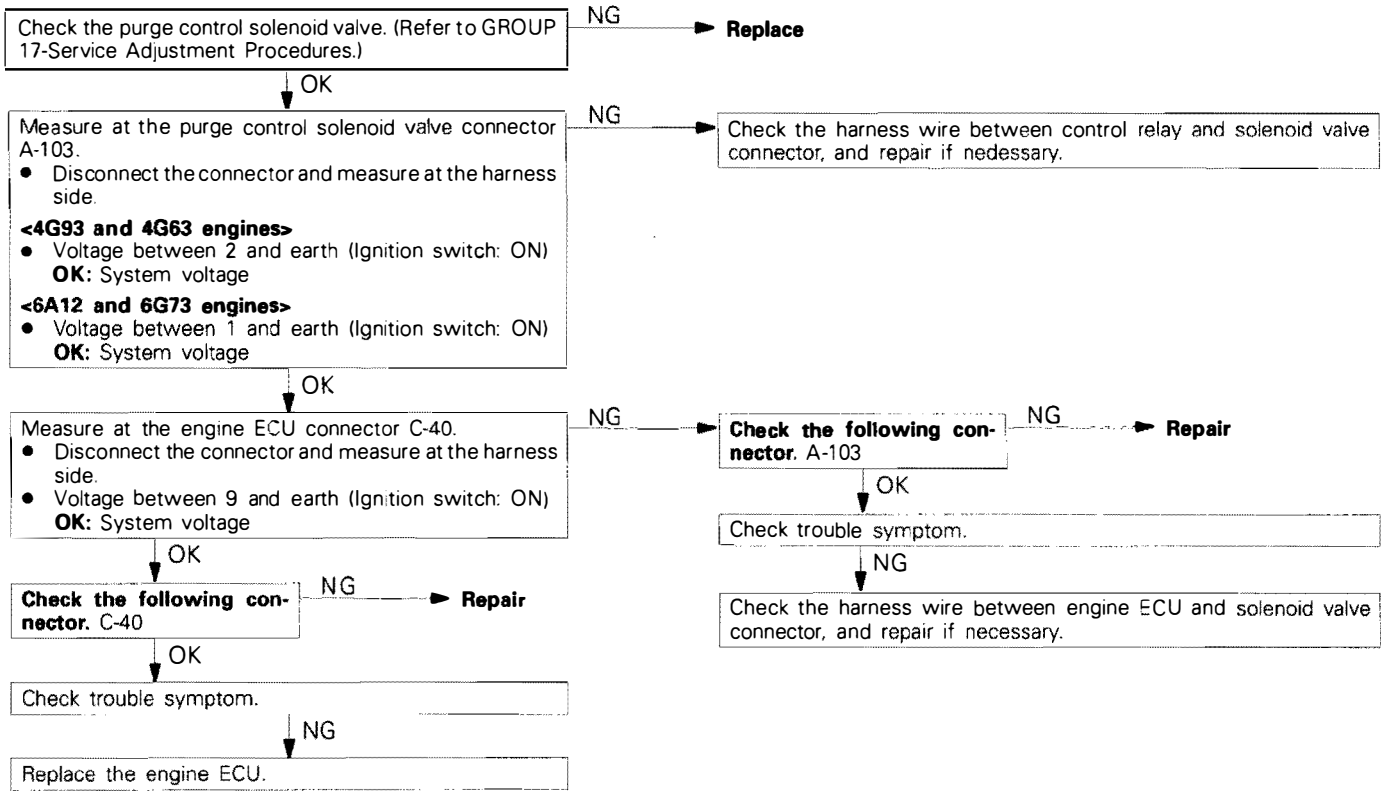
INSPECTION PROCEDURE 38

Variable induction control (VIC) servo (DC motor) system <6A12, 6G73>		Probable cause
[Comment]	The engine ECU opens and closes the intake control valve by the DC motor running in the forward or reverse direction.	• Malfunction of variable induction control servo • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of engine ECU



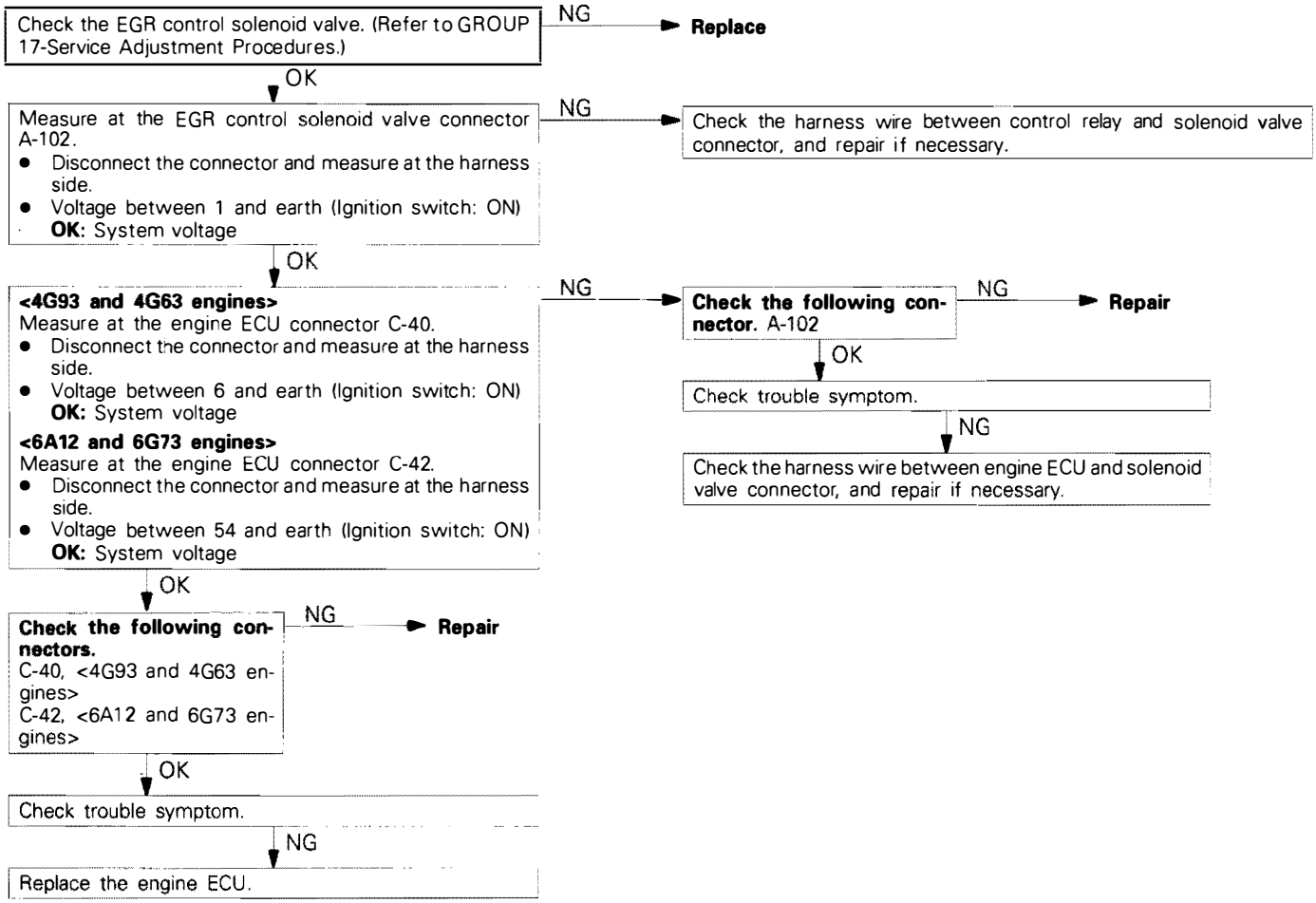
INSPECTION PROCEDURE 39

Purge control solenoid valve system		Probable cause
[Comment]	The purge control solenoid valve controls the purging of air from the canister located inside the intake manifold.	• Malfunction of solenoid valve • Improper connector contact, open circuit or shortcircuited harness wire • Malfunction of engine ECU



INSPECTION PROCEDURE 40

EGR control solenoid valve system		Probable cause
[Comment]	The EGR control solenoid valve controls is controlled by the negative pressure resulting from EGR operation leaking to port "A" of the throttle body.	• Malfunction of solenoid valve • Improper connector contact, open circuit, shortcircuited harness wire • Malfunction of engine ECU



INSPECTION PROCEDURE 41

MUT-II: Inspection of no initial combustion

MUT-II SERVICE DATA
16 voltage of engine ECU power source (Refer to P.13A-84.)
NG → Check the power supply system. <4G93, 4G63> (Refer to P.13A-57, INSPECTION PROCEDURE 23.)
Check the power supply and ignition switch-IG system. <6A12, 6G73> (Refer to P.13A-58, INSPECTION PROCEDURE 24.)
↓ OK

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

MUT-II SELF DIAGNOSIS CODE
Is the SELF DIAGNOSIS CODE displayed ?
Yes → INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES. (Refer to P.13A-17.)
↓ NO

MUT-II SERVICE DATA
22 crank angle sensor
OK: Cranking speed is displayed.
NG → Check the crank angle sensor system. (Refer to P.13A-24, 25, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES 22.)
↓ OK

MUT-II ACTUATOR TEST
07 Fuel pump (Refer to P.13A-93.)
NG → Check the fuel pump system. (Refer to P.13A-58, INSPECTION PROCEDURE 25.)
↓ OK

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-84.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-23, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES 21.)

INSPECTION PROCEDURE 42

Ignition system: Inspection of no initial combustion

<4G93, 4G63>

Does the engine tachometer display the cranking speed?
- Set the tachometer of primary voltage detection type.

NG → Check the ignition circuit system <4G93,4G63> (Refer to P.13A-67, INSPECTION PROCEDURE 34.)
↓ OK

<6A12, 6G73>

Measure at the ignition coil connector B-34.
- Connect the connector. (Use MD998464.)
- To inspect, connect the primary voltage detection-type tachometer to the terminal 1 (red clip), terminal 2 (black clip) and terminal 4 (white clip).

OK: Each terminal displays a speed on the engine tachometer that is 1/3 of the cranking speed.
NG → Check ignition circuit system. <6A12, 6G73> (Refer to P.13A-68, INSPECTION PROCEDURE 35.)
↓ OK

Check the ignition timing when cranking.
OK: 5°±2°BTDC <4G93, 4G63>
5°±3°BTDC <6A12, 6G73>
NG → Check the installation condition of distributor<4G93,4G63>, crank angle sensor and timing belt cover<6A12,6G73>.

INSPECTION PROCEDURE 43

MUT-II: Check if uncomplete conbustion occurs.

MUT-II SELF DIAG CODE
Is the diagnostic trouble code output ?
YES → INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE (Refer to P.13A-17.)
NO ↓

MUT-II ACTUATOR TEST
07 Fuel pump (Refer to P.13A-93.)
NG → Check the fuel pump system. (Refer to P.13A-58, INSPECTION PROCEDURE 25.)
OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-84.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-23, INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODE 21.)
OK ↓

MUT-II SERVICE DATA
Ignition switch-ST (Refer to P.13A-84.)
NG → Check the ignition switch-ST system<M/T>. (Refer to P.13A-61, INSPECTION PROCEDURE 28.)
Check the ignition switch-ST and inhibitor switch system<A/T> (Refer to P.13A-62, INSPECTION PROCEDURE 29.)

INSPECTION PROCEDURE 44

Check if hunting occurs.

Clean the throttle body. (Refer to P.13A-115.)
↓
Check and adjust the fixed SAS (Refer to P.13A-119)
↓
Check trouble symptom.
NG ↓

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

INSPECTION PROCEDURE 45

MUT-II: Check if idling speed is unstable.

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-84.)
- NG → Check the idle position switch system. (Refer to P.13A-59, INSPECTION PROCEDURE 26.) <Vehicles without TCL> (Refer to P.13A-60, INSPECTION PROCEDURE 27.) <Vehicles with TCL>
- OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-84.)
- NG → Check the intake air temperature sensor system.(Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
- OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-84.)
- NG → Check the barometric pressure sensor system. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
- OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-84.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-23, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 21.)
- OK ↓

MUT-II ACTUATOR TEST
08 Purge control solenoid valve (Refer to P.13A-93.)
- NG → Purge control solenoid valve system (Refer to P.13A-71, INSPECTION PROCEDURE 39.)
- OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: 600–1,000 mV during sudden racing
- NG → Check the oxygen sensor system. (Refer to P.13A-18, 19, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 11.)
- OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0–400 mV and 600–1,000 mV during idling
- NG → Check the fuel pressure. (Refer to P.13A-121.)
  - OK → 1. Inspect the intake of air into the air intake system.
    - Broken intake manifold gasket
    - Broken vacuum hose
    - PCV valve dose not operate.
    - Broken air intake hose
    2. Check the injector for clog. (Refer to P.13A-139.)
- OK ↓

MUT-II SERVICE DATA
27 Power steering fluid pressure switch (Refer to P.13A-84.)
- NG → Check the power steering fluid pressure switch system. (Refer to P.13A-63, INSPECTION PROCEDURE 30.)
- OK ↓

MUT-II SERVICE DATA
28 A/C switch (Refer to P.13A-84.)
- NG → Check the A/C switch and A/C relay system. (Refer to P.13A-64, INSPECTION PROCEDURE 31.)
- OK ↓

MUT-II SERVICE DATA
29 Inhibitor switch (Refer to P.13A-84.)
- NG → Check the ignition switch-ST and inhibitor switch system. (Refer to P.13A-62, INSPECTION PROCEDURE 29.)
- OK ↓

MUT-II SERVICE DATA
33 Electrical load switch (Refer to P.13A-84.)
- NG → Check the electrical load switch system. (Refer to P.13A-65, INSPECTION PROCEDURE 32.)
- OK ↓

MUT-II SERVICE DATA
45 ISC Servo position <6A12, 6G73> (Refer to P.13A-84.)
55 Servo valve position sensor <4G93, 4G63> (Refer to P.13A-84.)
- NG → Adjust the basic idle speed. (Refer to P.13A-119.)

INSPECTION PROCEDURE 46

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

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-84.)
NG → Check the idle position switch system. (Refer to P.13A-59. INSPECTION PROCEDURE 26.) <Vehicles without TCL> (Refer to P.13A-60, INSPECTION PROCEDURE 27.) <Vehicles with TCL>
OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-84.)
NG → Check the intake air sensor system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-84.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-84.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-23, INSPECTION PROCEDURE FOR DIAGNOSTIC CODE 21.)
OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 600 – 1,000 mV during sudden racing
NG → Check the oxygen sensor system. (Refer to P.13A-18, 19, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 11.)
OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-121.)
OK → 1. Inspect the intake of air into the air intake system
- Broken intake manifold gasket
- Broken vacuum hose
- PCV valve dose not operate.
- Broken air intake hose

2. Check the injector for clog. (Refer to P.13A-139.)

OK ↓

MUT-II SERVICE DATA
27 Power steering fluid pressure switch (Refer to P.13A-84.)
NG → Check the power steering fluid pressure switch system. (Refer to P.13A-63, INSPECTION PROCEDURE 30.)
OK ↓

MUT-II SERVICE DATA
28 A/C switch (Refer to P.13A-84.)
NG → Check the A/C switch and A/C relay system. (Refer to P.13A-64, INSPECTION PROCEDURE 31.)
OK ↓

MUT-II SERVICE DATA
29 Inhibitor switch (Refer to P.13A-84.)
NG → Check the ignition switch-ST and inhibitor switch system. (Refer to P.13A-62, INSPECTION PROCEDURE 29.)
OK ↓

MUT-II SERVICE DATA
33 Electrical load switch (Refer to P.13A-84.)
NG → Check the electrical load switch system. (Refer to P.13A-65, INSPECTION PROCEDURE 32.)
OK ↓

MUT-II SERVICE DATA
34 Air flow sensor reset signal (Refer to P.13A-84.)
NG → Check the air flow sensor system. (Refer to P.13A-20, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 12.)
OK ↓

MUT-II SERVICE DATA
45 ISC servo position <6A12, 6G73> (Refer to P.13A-84.)
55 Servo valve position sensor <4G93, 4G63> (Refer to P.13A-84.)
NG → Adjust the basic idle speed. (Refer to P.13A-119.)

INSPECTION PROCEDURE 47

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

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-84.)
NG → Check the idle position switch system.
(Refer to P.13A-59, INSPECTION PROCEDURE 26.) <Vehicle without TCL>
(Refer to P.13A-60, INSPECTION PROCEDURE 27.) <Vehicle with TCL>
OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-84.)
NG → Check the intake air temperature sensor system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-84.)
NG → Check the barometric pressure sensor system. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-84.)
NG → Check the engine coolant temperature sensor system. (Refer to P.13A-23, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 21.)
OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-84.)
NG → Check the throttle position sensor system. (Refer to P.13A-22, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 14.)
OK ↓

MUT-II ACTUATOR TEST
10 EGR control solenoid valve (Refer to P.13A-93.)
NG → Check the EGR control solenoid valve. (Refer to P.13A-72, INSPECTION PROCEDURE 40.)
OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 600 – 1,000 mV during sudden racing
NG → Check the oxygen sensor system. (Refer to P.13A-18, 19, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 11.)
OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0 – 400 mV and 600 – 1,000 mV during idling
NG → Check the fuel pressure. (Refer to P.13A-121.)
OK →
1. Inspect the intake of air into the air intake system
   - Broken intake manifold gasket
   - Broken vacuum hose
   - PCV valve dose not operate
   - Broken air intake hose
2. Check the injector for clog. (Refer to P.13A-139.)

OK ↓

MUT-II ACTUATOR TEST
11 Variable induction control servo <6A12,6G73> (Refer to P.13A-93.)
NG → Check the variable induction control servo system. (Refer to P.13A-70, INSPECTION PROCEDURE 38.)
OK ↓

MUT-II ACTUATOR TEST
15 Vacuum control solenoid valve <Vehicle with TCL> (Refer to P.13A-93.)
NG → Check the vacuum control solenoid valve system. (Refer to P.13A-37, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 71.)
OK ↓

MUT-II ACTUATOR TEST
16 Ventilation control solenoid valve <Vehicle with TCL> (Refer to P.13A-93.)
NG → Check the ventilation control solenoid valve system. (Refer to P.13A-38, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 72.)

INSPECTION PROCEDURE 48

MUT-II: Check if surge occurs.

MUT-II SERVICE DATA
26 Idle position switch (Refer to P.13A-84.)
- NG → Check the idle position switch system. (Refer to P.13A-59, INSPECTION PROCEDURE 26.) <Vehicle without TCL> (Refer to P.13A-60, INSPECTION PROCEDURE 27.) <Vehicle with TCL>
- OK ↓

MUT-II SERVICE DATA
13 Intake air temperature sensor (Refer to P.13A-84.)
- NG → Check the intake air temperature sensor system. (Refer to P.13A-21, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 13.)
- OK ↓

MUT-II SERVICE DATA
25 Barometric pressure sensor (Refer to P.13A-84.)
- NG → Check the barometric pressure sensor system. (Refer to P.13A-29, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 25.)
- OK ↓

MUT-II SERVICE DATA
21 Engine coolant temperature sensor (Refer to P.13A-84.)
- NG → Check the engine coolant temperature sensor system. (Refer to P.13A-23, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 21.)
- OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor (Refer to P.13A-84.)
- NG → Check the throttle position sensor system. (Refer to P.13A-22, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 14.)
- OK ↓

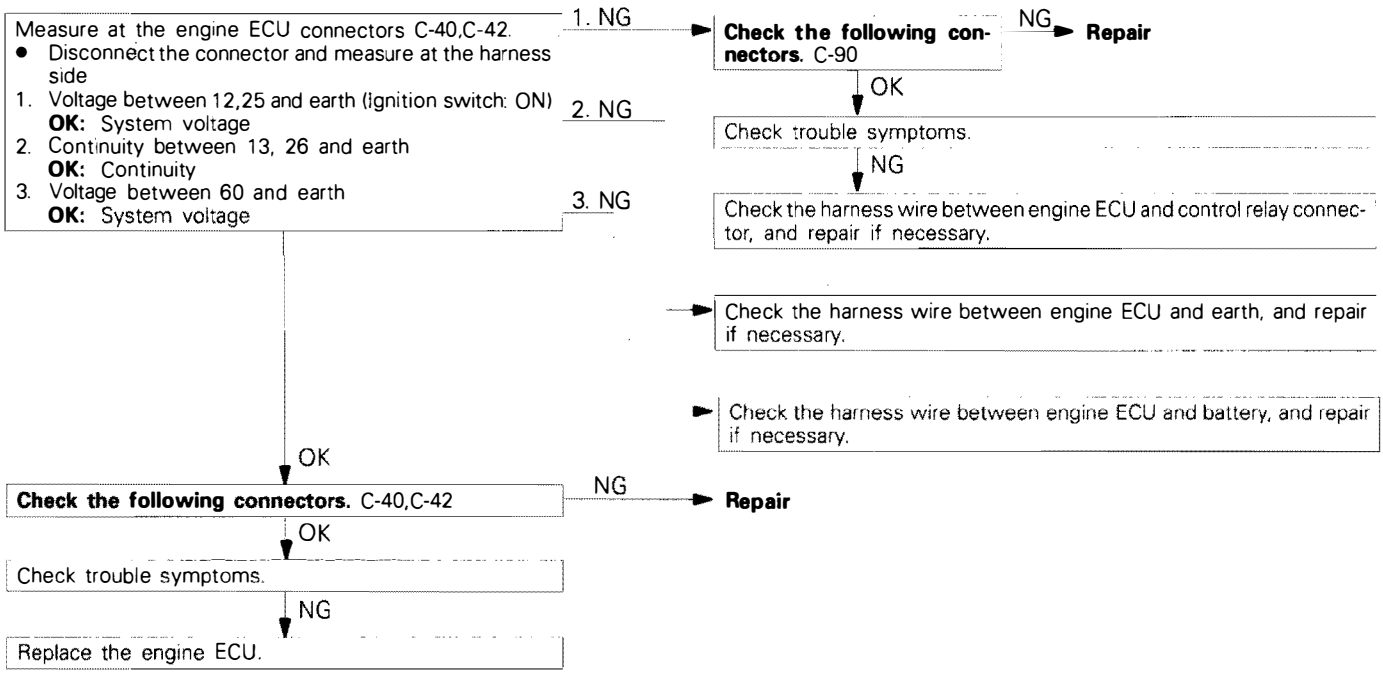
MUT-II ACTUATOR TEST
10 EGR control solenoid valve (Refer to P.13A-93.)
- NG → Check the EGR control solenoid valve. (Refer to P.13A-72, INSPECTION PROCEDURE 40.)
- OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 600–1,000 mV during sudden racing
- NG → Check the oxygen sensor system. (Refer to P.13A-18, 19, INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODE 11.)
- OK ↓

MUT-II SERVICE DATA
11 Oxygen sensor
OK: Changes between 0–400 mV and 600–1,000 mV during idling
- NG → Check the fuel pressure. (Refer to P.13A-121.)
- OK → 1. Inspect the intake of air into the air intake system
  - Broken intake manifold gasket
  - Broken vacuum hose
  - PCV valve dose not operate
  - Broken air intake hose
  2. Check the injector for clog. (Refer to P.13A-139.)

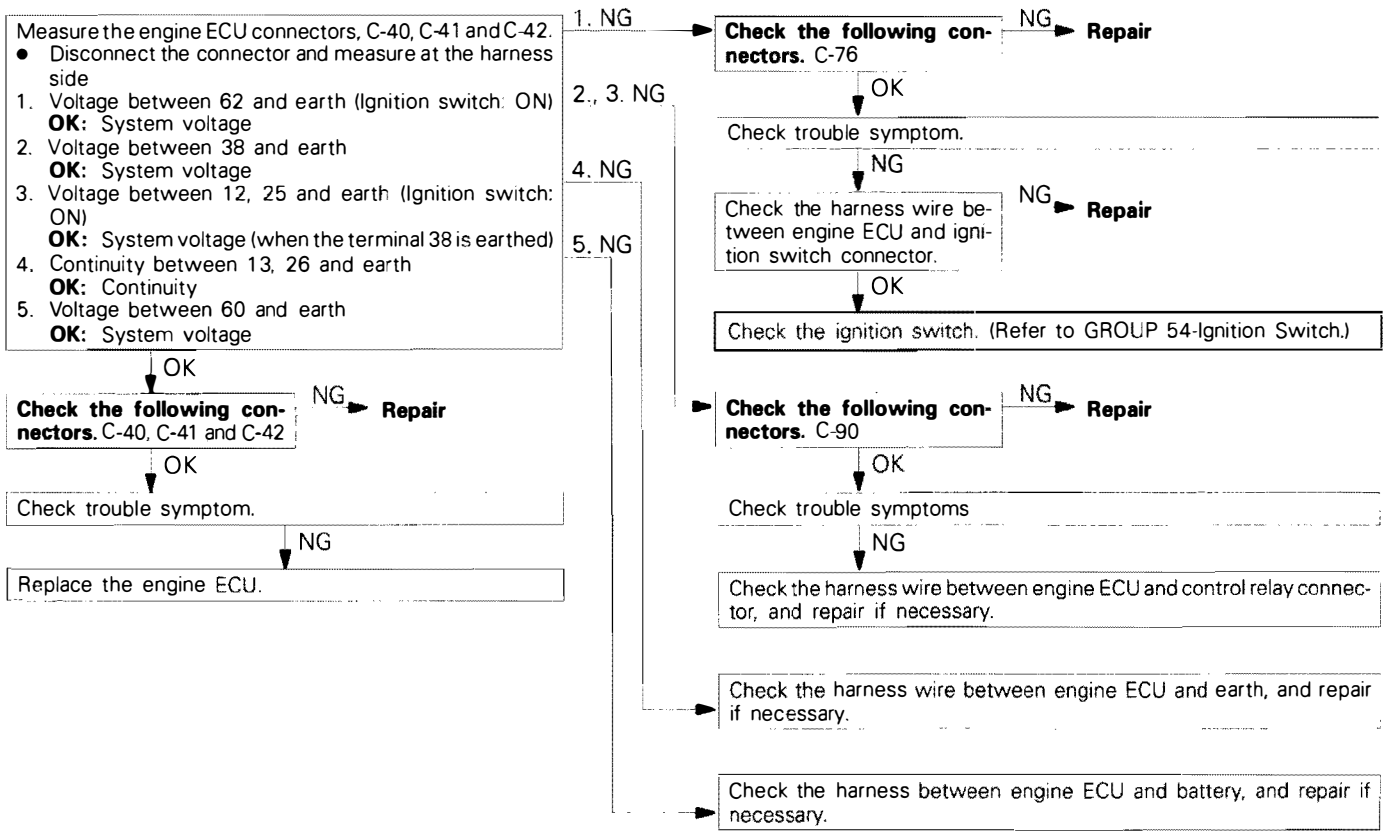
INSPECTION PROCEDURE 49

Check the engine ECU power supply and earth circuit. <4G93,4G63>



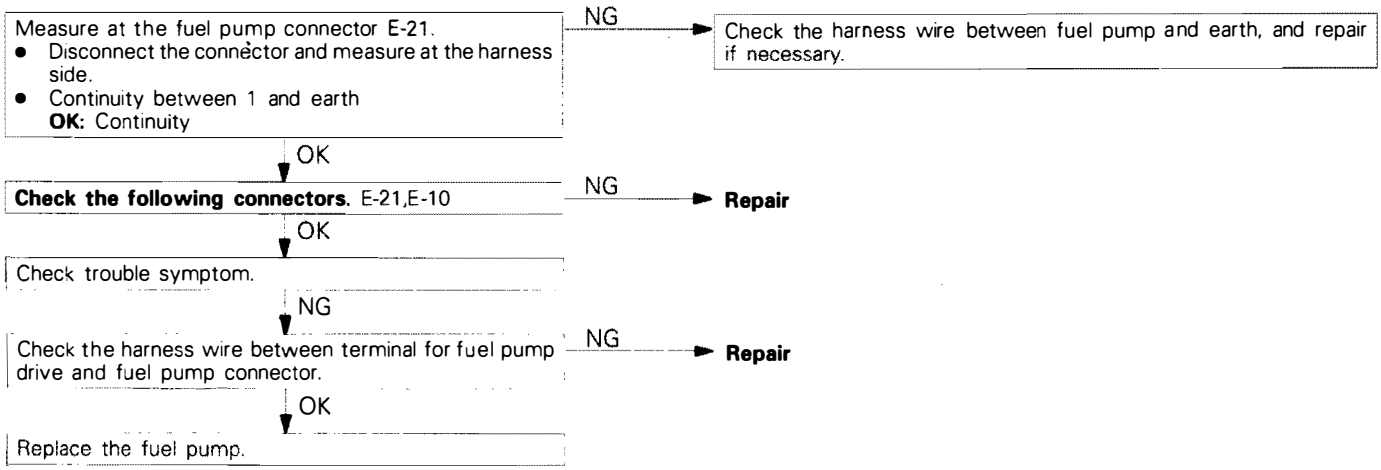
INSPECTION PROCEDURE 50

Check the engine ECU power supply and earth circuit. <6A12, 6G73>



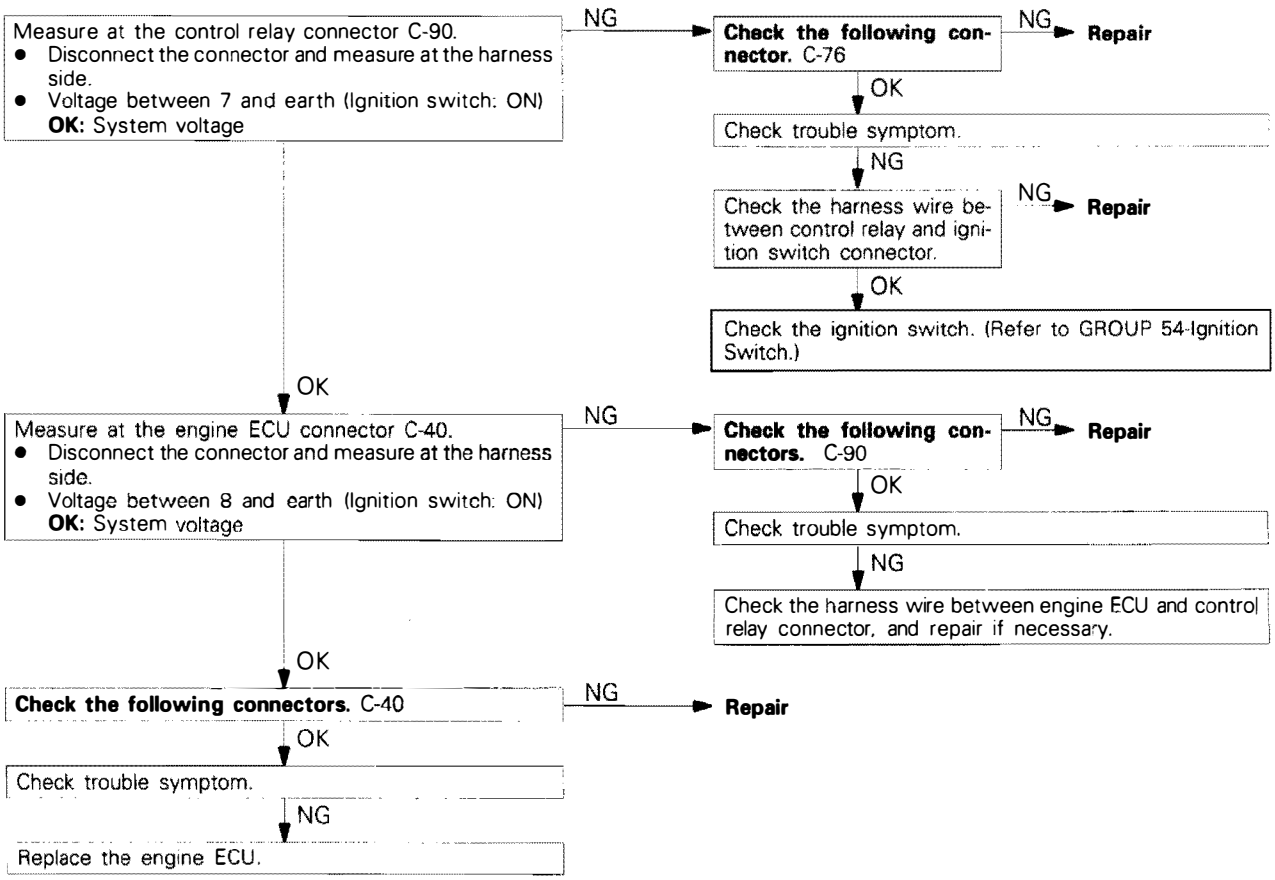
INSPECTION PROCEDURE 51

Check fuel pump circuit.



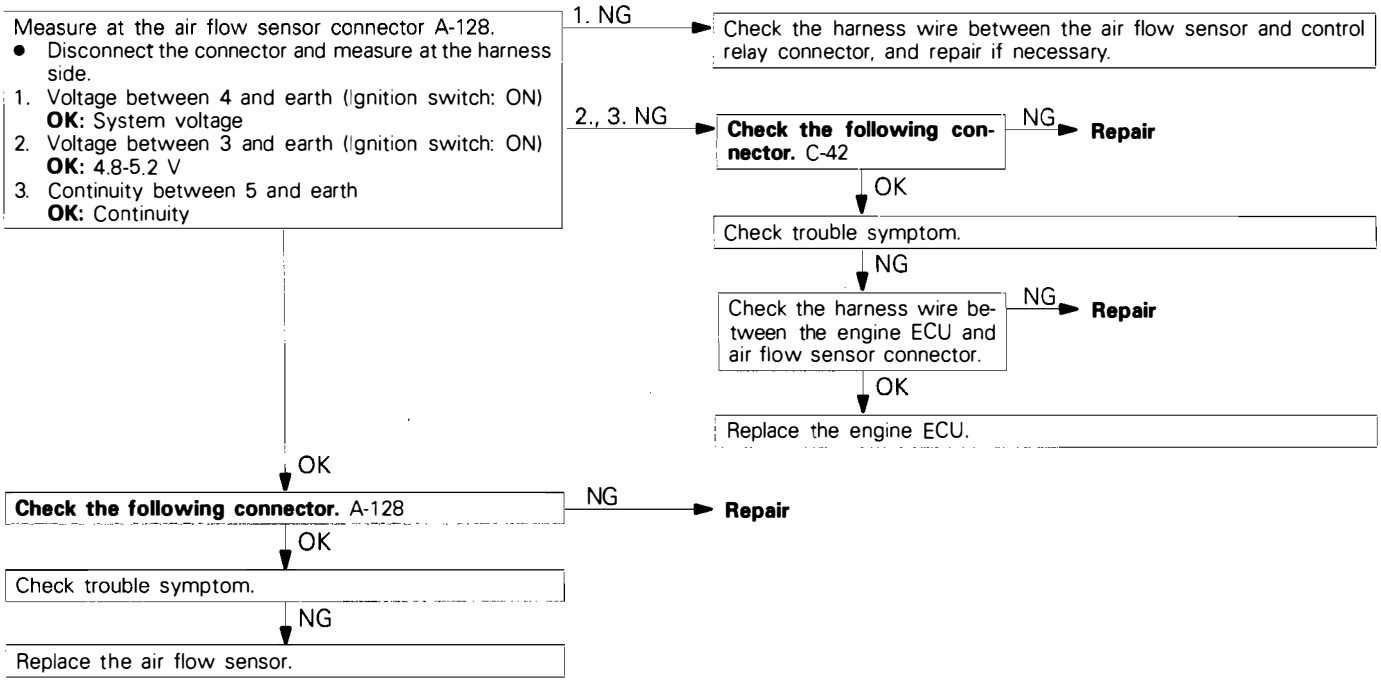
INSPECTION PROCEDURE 52

Check the fuel pump drive control circuit.



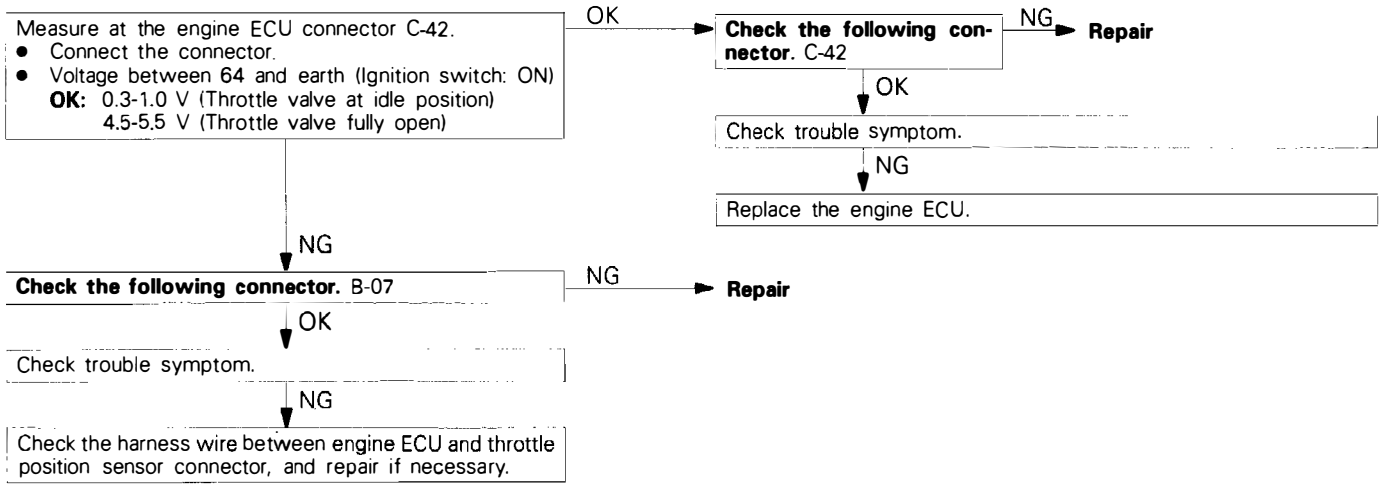
INSPECTION PROCEDURE 53

Check air flow sensor(AFS) control circuit.



INSPECTION PROCEDURE 54

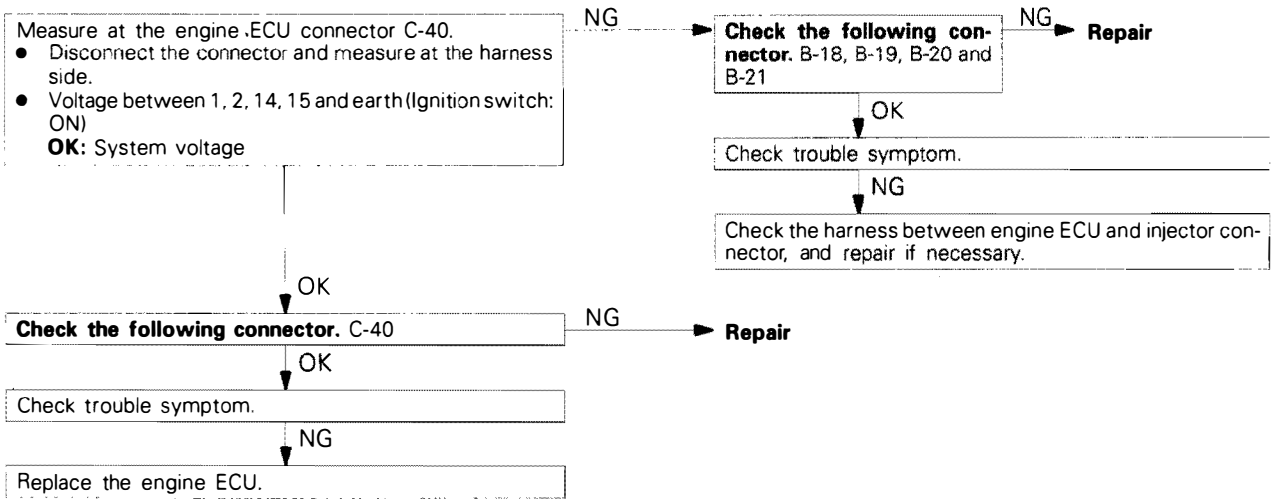
Check throttle position sensor(TPS) output circuit.



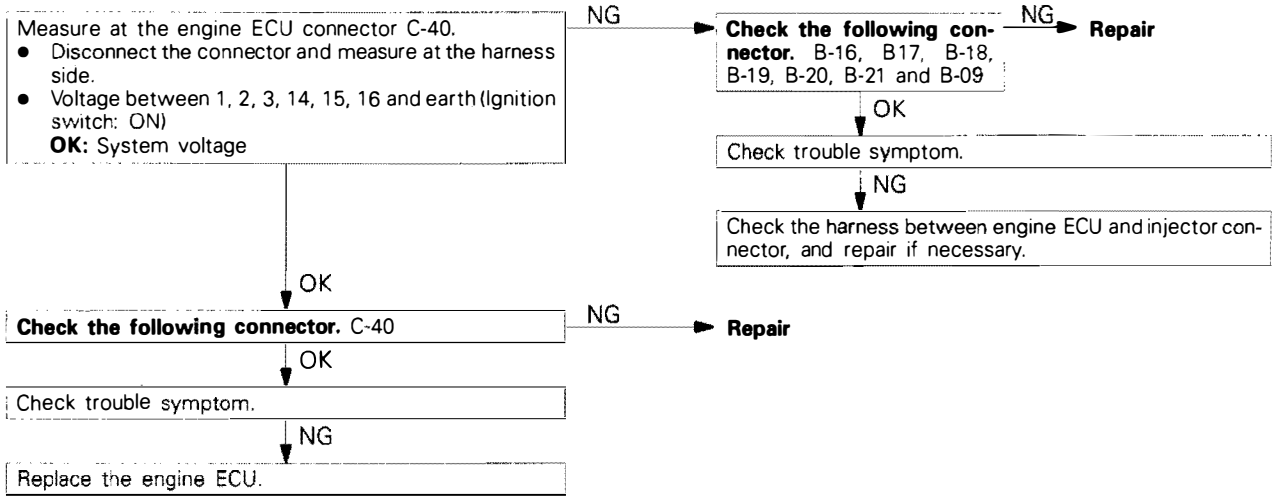
INSPECTION PROCEDURE 55

Check injector control circuit

<4G93, 4G63>

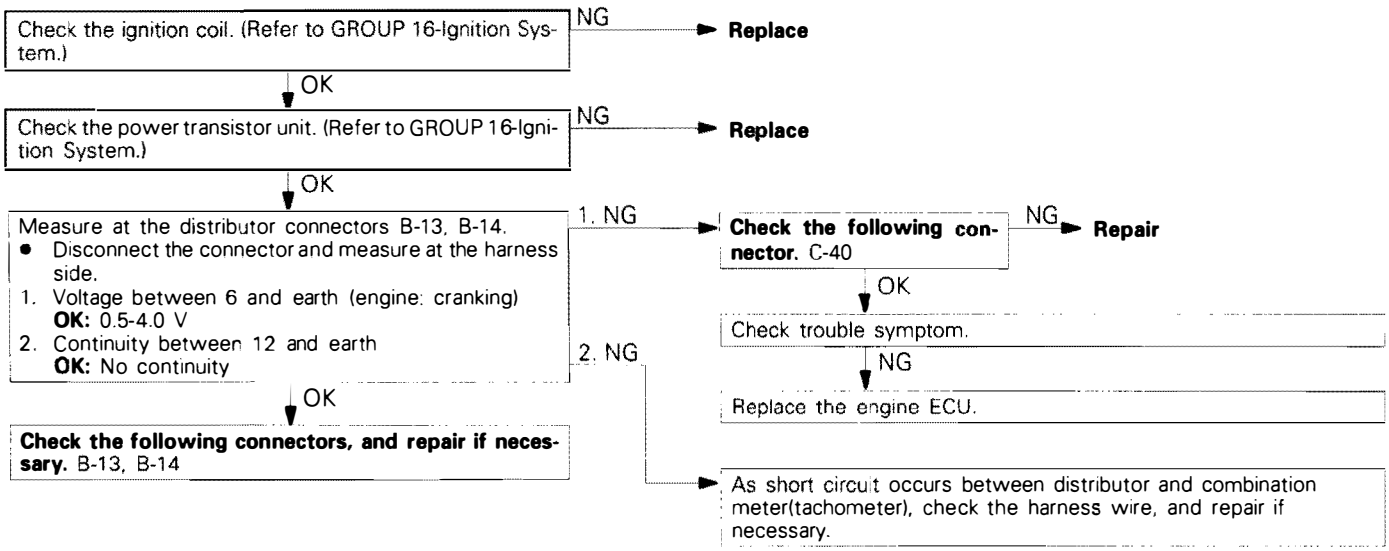


<6A12, 6G73>



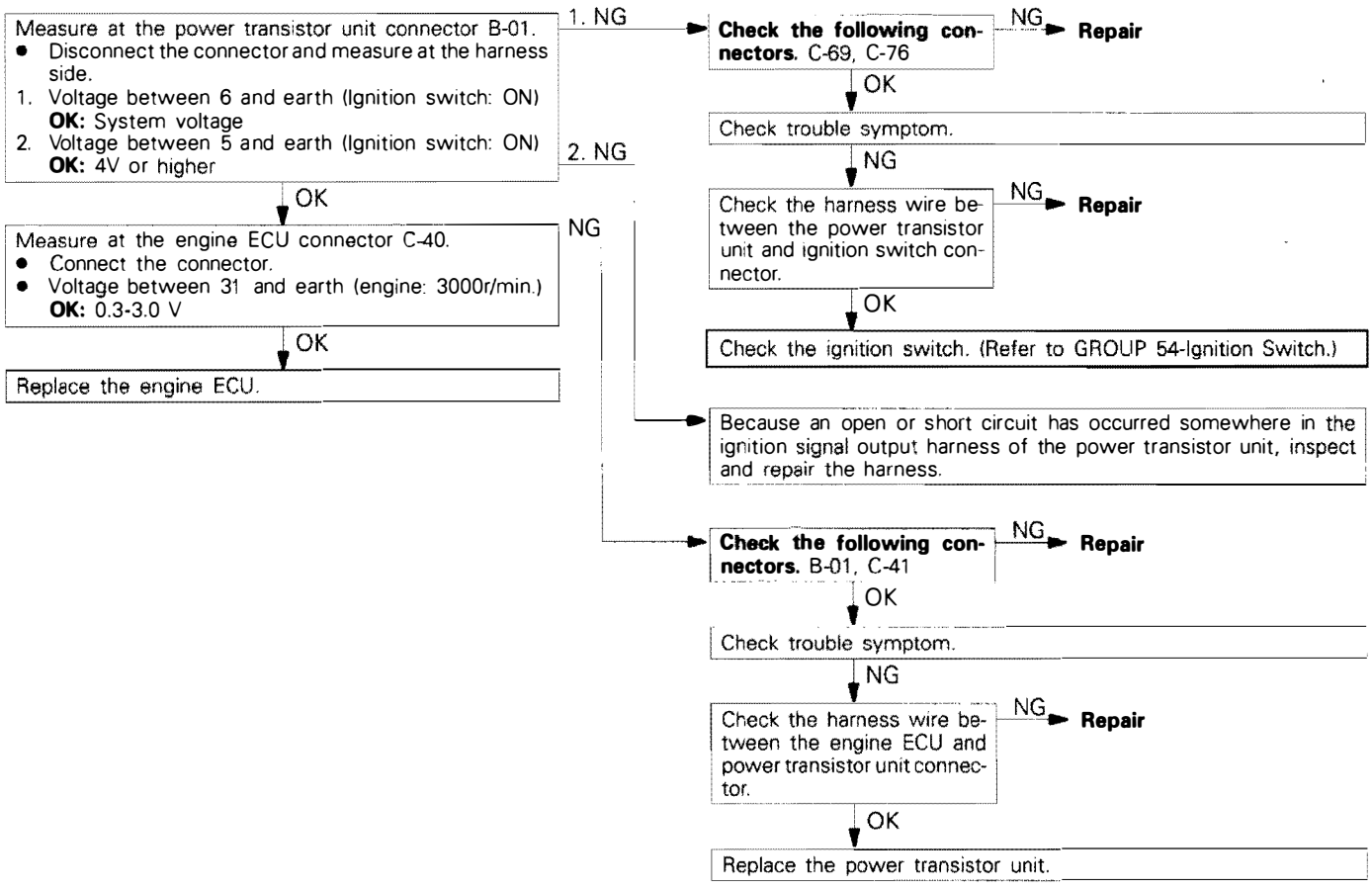
INSPECTION PROCEDURE 56

Check ignition coil and power transistor unit circuit. <4G93, 4G63>



INSPECTION PROCEDURE 57

Check the ignition signal circuit.<6A12, 6G73>



SERVICE DATA REFERENCE TABLE

E13AE08AB

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
11	Oxygen sensor	Engine: After having warmed up (Air/fuel mixture is made leaner when decelerating, and is made richer when racing.)	When at 4,000 r/min, engine is suddenly decelerated	200 mV or less	Code No. 11	P.13A-18 <4G93, 4G63> P.13A-19 <6A12, 6G73>
			When engine is suddenly raced	600–1,000 mV		
		Engine: After having warmed up (The oxygen sensor signal is used to check the air/fuel mixture ratio, and control condition is also checked by the ECU.)	Engine is idling	400 mV or less ↕ (Changes) 600–1,00 mV		
			2,000 r/min.			
12	Air flow sensor *1	• Engine coolant temperature: 80–95°C • Lights, power cooling fan and all accessories: OFF • Transmission: Neutral (A/T: P range)	Engine is idling	27–53 Hz*6, *7 19–45 Hz*8 19–45 Hz <4G63, 6A12, 6G73>	–	–
			2,000 r/min.	55–95 Hz*6, *7 50–90 Hz*8 50–90 Hz <4G63, 6A12, 6G73>		
			Engine is raced	Frequency increases in response to racing		

NOTE
*1: In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10% higher than the standard frequency.
*6: Vehicles with 4G93 engine up to 1993
*7: Vehicles with 4G93 engine except those for Germany and Austria from 1994
*8: Vehicles with 4G93 engine for Germany and Austria from 1994

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
13	Intake air temperature sensor	Ignition switch: ON or with engine running	When intake air temperature is –20°C	–20°C	Code No. 13	P.13A-21
			When intake air temperature is 0°C	0°C		
			When intake air temperature is 20°C	20°C		
			When intake air temperature is 40°C	40°C		
			When intake air temperature is 80°C	80°C		
14	Throttle position sensor <Vehicles without TCL>	Ignition switch: ON	Set to idle position	300–1,000 mV	Code No. 14	P.13A-22
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV		
	Throttle position sensor <Vehicles with TCL>	Ignition switch: ON	Set to idle position	580–690 mV	Code No. 14	P.13A-22
			Gradually open	Increases in proportion to throttle opening angle		
			Open fully	4,500–5,500 mV		

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

NOTE
*1: In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10% higher than the standard frequency.
*2: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
*3: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
*4: In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.
*5: In a new vehicle [driven approximately 500 km or less], the servo valve position is sometimes 20 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
16	Power supply voltage	Ignition switch: ON		System voltage	Procedure No. 23 <4G93, 4G63> Procedure No. 24 <6A12, 6G73>	P.13A-57 <4G93, 4G63> P.13A-58 <6A12, 6G73>
18	Cranking signal (ignition switch-ST)	Ignition switch: ON	Engine: Stopped	OFF	Procedure No. 28 <M/T> Procedure No. 29 <A/T>	P.13A-61 P.13A-62
			Engine: Cranking	ON		
21	Engine coolant temperature sensor	Ignition switch: ON or with engine running	When engine coolant temperature is –20°C	–20°C	Code No. 21	P.13A-23
			When engine coolant temperature is 0°C	0°C		
			When engine coolant temperature is 20°C	20°C		
			When engine coolant temperature is 40°C	40°C		
			When engine coolant temperature is 80°C	80°C		

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

NOTE
*1: In a new vehicle [driven approximately 500 km or less], the air flow sensor output frequency is sometimes 10% higher than the standard frequency.
*2: The injector drive time represents the time when the cranking speed is at 250 r/min or below when the power supply voltage is 11 V.
*3: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
*4: In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.
*5: In a new vehicle [driven approximately 500 km or less], the servo valve position is sometimes 20 steps greater than the standard value.

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
22	Crank angle sensor	• Engine: Cranking • Tachometer: Connected		Engine speeds displayed on the MUT-II and tachometer are identical.	Code No. 22	P.13A-24 <4G93, 4G63> P.13A-25 <6A12, 6G73>
		• Engine: Idling • Idle position switch: ON	When engine coolant temperature is –20°C	1,380–1,580 rpm*6,*7 1,400–1,600 rpm*8 1,280–1,480 rpm <4G63, 6A12, 6G73>		
			When engine coolant temperature is 0°C	1,330–1,530 rpm *6,*7 1,300–1,500 rpm*8 1,220–1,420 rpm <4G63, 6G73> 1,150–1,350 rpm <6A12>		
			When engine coolant temperature is 20°C	1,250–1,450 rpm <4G93> 1,100–1,300 rpm <4G63, 6A12, 6G73>		
			When engine coolant temperature is 40°C	1,000–1,200 rpm <4G93> 950–1,150 rpm <4G63, 6A12, 6G73>		
			When engine coolant temperature is 80°C	700–900rpm <4G93> 650–850rpm <4G63> 600–800rpm <6A12, 6G73>		
25	Barometic pressure sensor	Ignition switch: ON	At altitude of 0 m	760 mmHg	Code No. 25	P.13A-29
			At altitude of 600 m	710 mmHg		
			At altitude of 1,200 m	660 mmHg		
			At altitude of 1,800 m	610 mmHg		

NOTE
*6: Vehicles with 4G93 engine up to 1993
*7: Vehicles with 4G93 engine except those for Germany and Austria from 1994
*8: Vehicles with 4G93 engine for Germany and Austria from 1994

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
26	Idle position switch	Ignition switch: ON Check by operating accelerator pedal repeatedly	Throttle valve: Set to idle position	ON	Procedure No. 26 Procedure No. 27 <with TCL>	P.13A-59 P.13A-60
			Throttle valve: Slightly open	OFF		
27	Power steering fluid pressure switch	Engine: Idling	Steering wheel stationary	OFF	Procedure No. 30	P.13A-63
			Steering wheel turning	ON		
28	A/C switch	Engine: Idling (When A/C switch is ON, A/C compressor should be operating.)	A/C switch: OFF	OFF	Procedure No. 31	P.13A-64
			A/C switch: ON	ON		
29	Inhibitor switch <A/T>	Ignition switch: ON	P or N	P or N	Procedure No. 29	P.13A-62
			D, 2, L or R	D, 2, L or R		
33	Electrical load switch <4G63, 6A12, 6G73>	All accessories: OFF	Lighting switch only: OFF → ON	OFF → ON	Procedure No. 32	P.13A-65
			Rear defogger switch only: OFF → ON	OFF → ON		
			Brake pedal only: Depressed → Released	ON → OFF		
34	Air flow sensor reset signal <6A12, 6G73>	Engine: After having warmed up	Engine is idling	ON	Code No. 12	P.13A-20
			2,000 r/min.	OFF		

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
36	Ignition timing adjustment mode	Engine: Idling	Ignition timing adjustment terminal is earthed	ON	Code No. 36	P.13A-31
			Ignition timing adjustment terminal is disconnected from earth	OFF		
37	Volumetric efficiency	• Engine coolant temperature: 80–95°C • Lights, power cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	15–35%	–	–
			2,000 r/min.	15–35%		
			Engine is suddenly raced	Volumetric efficiency increases in response to racing		
38	Crank angle sensor	• Engine: Cranking [reading is possible at 2,000 r/min or less] • Tachometer: Connected		Engine speeds displayed on the MUT-II and tachometer are identical.	–	–

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
41	Injectors *2	Engine: Cranking	When engine coolant temperature is 0°C (injection is carried out for all cylinders simultaneously)	16–21 ms <4G93, 4G63> 14–19 ms <6A12, 6G73>	–	–
			When engine coolant temperature is 20°C	35–44 ms <4G93> 29–35 ms <4G63> 41–51 ms <6A12, 6G73>		
			When engine coolant temperature is 80°C	9–11 ms		
	Injectors *3	• Engine coolant temperature: 80–95°C • Lights, power cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range)	Engine is idling	2.3–3.5 ms*6, *7 2.0–3.2 ms*8 2.3–3.5 ms<6A12> 2.0–3.2 ms <4G63, 6G73>		
			2,000 r/min.	2.6–3.8 ms*6, *7 1.7–2.9 ms*8 1.8–3.0 ms <4G63> 2.0–3.2 ms <6A12>		
			When engine is suddenly raced	Increases		

NOTE
*2: The injector drive time represents the time when the cranking speed is at 250 r/min. or below when the power supply voltage is 11 V.
*3: In a new vehicle [driven approximately 500 km or less], the injector drive time is sometimes 10% longer than the standard time.
*6: Vehicles with 4G93 engine up to 1993
*7: Vehicles with 4G93 engine except those for Germany and Austria from 1994
*8: Vehicles with 4G93 engine for Germany and Austria from 1994

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
44	Ignition coils and power transistors	• Engine: After having warmed up • Timing light is set. (The timing light is set in order to check actual ignition timing.)	Engine is idling	2–18 °BTDC <4G93>	–	–
			2,000 r/min.	9–29 °BTDC*6,*7 17–37 °BTDC*8 20–40 °BTDC <4G63, 6G73> 15–35 °BTDC <6A12>		
45	ISC (stepper) motor position *4 <6A12, 6G73>	• Engine coolant temperature: 80–95°C • Lights, power cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range) • Idle position switch: ON • Engine: Idling When A/C switch is ON, A/C compressor should be operating	A/C switch: OFF	2–25 STEP	–	–
			A/C switch: OFF → ON	Increases by 10–70 steps		
			• A/C switch: OFF • Select lever: N range → D range	Increases by 5–50 steps		

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

NOTE
*4: In a new vehicle [driven approximately 500 km or less], the step of the stepper motor is sometimes 30 steps greater than the standard value.
*6: Vehicles with 4G93 engine up to 1993
*7: Vehicles with 4G93 engine except those for Germany and Austria from 1994
*8: Vehicles with 4G93 engine for Germany and Austria from 1994

Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
49	A/C relay	Engine: After having warmed up /Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 31	P.13A-64
			A/C switch: ON	ON (Compressor clutch is operating)		
55	ISC servo valve position sensor*5 <4G93, 4G63>	• Engine coolant temperature: 80 – 95°C • Lights, power cooling fan and all accessories: OFF • Transmission: Neutral (A/T : P range) • Idle position switch: ON • Engine: Idling (When A/C switch is ON, A/C compressor should be operating)	A/C switch: OFF	Increases by 2–20 steps	–	–
			A/C switch: OFF → ON	Increases by 8–50 steps		
			• A/C switch: OFF • Select lever: N range → D range	Increases by 3–40 steps		

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

NOTE
*5: In a new vehicle [driven approximately 500 km or less], the servo valve position is sometimes 20 steps greater than the standard value.

ACTUATOR TEST REFERENCE TABLE

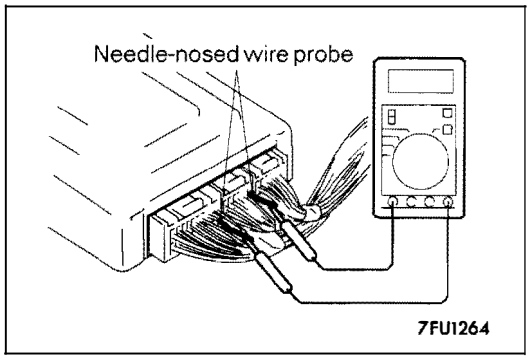
E13AE09AA

Item No.	Inspection item	Drive contents	Inspection contents		Normal condition	Inspection procedure No.	Reference page
01	Injectors	Cut fuel to No. 1 injector	Engine: After having warmed up/Engine is idling (Cut the fuel supply to each injector in turn and check cylinders which don't affect idling.)		Idling condition becomes different (becomes unstable).	Code No. 41	P.13A-31 <4G93, 4G63> P.13A-32 <6A12, 6G73>
02		Cut fuel to No. 2 injector					
03		Cut fuel to No. 3 injector					
04		Cut fuel to No. 4 injector					
05*		Cut fuel to No. 5 injector					
06*		Cut fuel to No. 6 injector					
07	Fuel pump	Fuel pump operates and fuel is recirculated.	• Engine: Cranking • Fuel pump: Forced driving Inspect according to both the above conditions.	Pinch the return hose with fingers to feel the pulse of the fuel being recirculated.	Pulse is felt.	Procedure No. 25	P.13A-58
				Listen near the fuel tank for the sound of fuel pump operation.	Sound of operation is heard.		
08	Purge control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 39	P.13A-71
10	EGR control solenoid valve	Solenoid valve turns from OFF to ON.	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 40	P.13A-72
11*	Variable intake control (VIC) servo	Variable intake control set from fully closed to fully open	Ignition switch: ON		Sound of operation can be heard when solenoid valve is driven.	Procedure No. 38	P.13A-70

NOTE
*: 6A12 and 6G73 engines only

Item No.	Inspection item	Drive contents	Inspection contents	Normal condition	Inspection procedure No.	Reference page
15	Vacuum control solenoid valve <Vehicles with TCL>	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Procedure No.71	P.13A-37
16	Ventilation control solenoid valve <Vehicles with TCL>	Solenoid valve turns from OFF to ON.	Ignition switch: ON	Sound of operation can be heard when solenoid valve is driven.	Procedure No. 72	P.13A-38
17*	Basic ignition timing	Set to ignition timing adjustment mode	Engine: Idling Timing light is set	5°BTDC	–	–
20	Radiator fan (Hi) Condenser fan (Hi)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON	Fan motor operates at high speed.	Procedure No. 33	P.13A-66
21	Radiator fan (Hi) Condenser fan (Low)	Drive the fan motors (radiator and condenser).	Ignition switch: ON A/C switch: ON	Fan motor operates at low speed.	Procedure No. 33	P.13A-66

NOTE
*: 6A12 and 6G73 engines only



CHECK AT THE ENGINE ECU TERMINALS

E13AE09AA

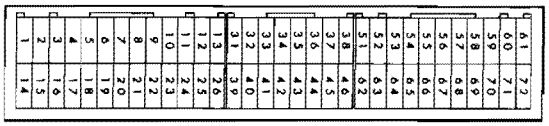
TERMINAL VOLTAGE CHECK CHART

1. Connect a needle-nosed wire probe (test harness: MB991223 or paper clip) to a voltmeter probe.
2. Insert the needle-nosed wire probe into each of the engine control unit 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 unit connectors connected.
   2. You may find it convenient to pull out the engine control unit to make it easier to reach the connector terminals.
   3. The checks can be carried out off the order given in the chart.

   Caution
   Short-circuiting the positive (+) probe between a connector terminal and earth could damage the vehicle wiring, the sensor, engine control unit, or all there. Use care to prevent this!
3. If voltmeter shows any division from standard value, check the corresponding sensor, actuator and related electrical wiring, then repair or replace.
4. After repair or replacement, recheck with the voltmeter to confirm that the repair has corrected the problem.

Engine ECU Connector Terminal Arrangement



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Terminal No. 4G93, 4G63	Terminal No. 6A12, 6G73	Check item	Check condition (Engine condition)	Normal condition
1	1	No. 1 injector	While engine is idling after having warmed up, suddenly depress the accelerator pedal.	From 11–14V, momentarily drops slightly
14	14	No. 2 injector		
2	2	No. 3 injector		
15	15	No. 4 injector		
–	3	No. 5 injector		
–	16	No. 6 injector		
3	53	Fan motor relay (High)	Radiator fan is not operating (engine coolant temperature is 90°C or less)	SV
			Radiator fan is operating at high speed (engine coolant temperature is 105°C or more)	0–3V
16	6	Fan motor relay (Low)	Radiator fan is not operating (engine coolant temperature is 90°C or less)	SV
			Radiator fan is operating at low speed (engine coolant temperature is 90–105°C or more)	0–3V
4	–	Idle speed control motor (Closed)	Ignition switch: Immediately after turning ON	2V or more (Momentarily) → 0–1V
17	–	Idle speed control motor (Open)	Ignition switch: Immediately after turning ON	4V or more (Momentarily) → 0–1V
5	–	Idle speed control servo valve position sensor No. 1	Ignition switch: Immediately after turning ON	1.5–4V (Momentarily) → 0–1V or 4.5–5.5V
18	–	Idle speed control servo valve position sensor No. 2	Ignition switch: Immediately after turning ON	1.5–4V (Momentarily) → 0–1V or 4.5–5.5V

Terminal No.		Check item	Check condition (Engine condition)		Normal condition
4G93, 4G63	6A12, 6G73				
–	4	Stepper motor coil <A1>	Engine: Soon after the warmed up engine is started		SV ↔ 0–3V (Changes repeatedly)
–	17	Stepper motor coil <A2>			
–	5	Stepper motor coil <B1>			
–	18	Stepper motor coil <B2>			
6	54	EGR control solenoid valve	Ignition switch: ON		SV
			While engine is idling, suddenly depress the accelerator pedal.		From SV, momentarily drops
7*	7	Engine/Transmission total control torque reduction execution signal	Engine: Idling at the engine coolant temperature of 50°C or lower		0–1V
			Engine: Idling after engine warming up		1–4V
8	8	Control relay (Fuel pump)	Ignition switch: ON		SV
			Engine: Idle speed		0–3V
9	9	Purge control solenoid valve	Ignition switch: ON		SV
			Running at 3,000r/min. while engine is warming up after having been started.		0–3V
10	10	Power transistor unit (A)	Engine r/min.: 3,000 r/min.		0.3–3.0V
–	11	Power transistor unit (B)			
–	23	Power transistor unit (C)			
11	55	A/C refrigerant intermediate pressure switch	A/C refrigerant pressure (high-pressure side)	1,373 kPa or less	SV
				1,863 kPa or more	0.3–3.0V
12	12	Power supply	Ignition switch: ON		SV
19	19	Air flow sensor reset signal	Engine: Idle speed		0–1V
			Engine r/min.: 3,000 r/min.		6–9V
22	22	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)		SV or momentarily 6V or more → 0–3V
24*	24	Electric load switch	Engine: Idle speed	Turn OFF the lighting switch	0–3V
				Turn ON the lighting switch	SV
25	25	Power supply	Ignition switch: ON		SV
–	31	Engine ignition signal	Engine r/min.: 3,000 r/min.		0.3–3.0V

NOTE
The * symbol indicates applicability only to engine for 4G63.

Terminal No. 4G93, 4G63	Terminal No. 6A12, 6G73	Check item	Check condition (Engine condition)		Normal condition
–	32	Vacuum control solenoid valve <Vehicles with TCL>	Ignition switch: ON		SV
–	33	Air intake control valve position sensor No. 2	Ignition switch: ON		0–1V or 4.5–5.5V
			Engine: Increase gradually the idle speed to 5,000r/min.		0–1V or 4.5–5.5V → 1.5–4V (Momentarily)
–	35	Ventilation control solenoid valve <Vehicles with TCL>	Ignition switch: ON		SV
–	41	Air intake control valve position sensor No. 1	Ignition switch: ON		0–1V or 4.5–5.5V
			Engine: Increase gradually the idle speed to 5,000 r/min.		0–1V or 4.5–5.5V → 1.5–4V (Momentarily)
34	34	Ignition timing adjustment terminal	Ignition switch: ON	Earth the ignition timing adjustment terminal	0–1V
				Remove the earth connection from the Ignition timing adjustment terminal	4.0–5.5V
35	–	Oxygen sensor heater	Engine: Idling after warming up		0–3V
			Engine r/min.: 5,000r/min.		SV
36	36	Engine warning lamp	Ignition switch: OFF → ON		0–3V → 9–13V (After several seconds have elapsed)
37	37	Power steering fluid pressure switch	Engine: Idling after warming up	When steering wheel is stationary	SV
				When steering wheel is turned	0–3V
–	38	Control relay (Power supply)	Ignition switch: OFF		SV
			Ignition switch: ON		0–3V

Terminal No. 4G93, 4G63	Terminal No. 6A12, 6G73	Check item	Check condition (Engine condition)		Normal condition
–	39	Variable induction control servo (Closed)	Engine: Decrease gradually 5,000 r/min. to the idle speed		0–1V → 4V or more (Momentarily)
–	40	Variable induction control servo (Open)	Engine: Increase gradually the idle speed to 5,000 r/min.		0–1V → 4V or more (Momentarily)
45	45	A/C switch	Engine: Idle speed	Turn the A/C switch OFF	0–3V
				Turn the A/C switch ON (A/C compressor is operating)	SV
46*	46	Engine/Transmission total control torque reduction request signal 1	Engine: Idle speed		4.5–5.5V
			During driving and speed-changing after engine warming up		0–1V
59*	59	Engine/Transmission total control torque reduction request signal 2	Engine: Idle speed		0–1V
			During driving and speed-changing after engine warming up		1–5.5V
51	51	Ignition switch-ST	Engine: Cranking		8V or more
52	52	Intake air temperature sensor	Ignition switch: ON	When intake air temperature is 0°C	3.2–3.8V
				When intake air temperature is 20°C	2.3–2.9V
				When intake air temperature is 40°C	1.5–2.1V
				When intake air temperature is 80°C	0.4–1.0V
56	56	Oxygen sensor	Engine: Running at 2,000 r/min. after warmed up (Check using a digital type voltmeter)		0 ↔ 0.8V (Changes repeatedly)
60	60	Backup power supply	Ignition switch: OFF		SV
61	61	Sensor impressed voltage	Ignition switch: ON		4.5–5.5V
–	62	Ignition switch-IG	Ignition switch: ON		SV

NOTE
The * symbol indicates applicability only to engine for 4G63.

Terminal No. 4G93, 4G63	Terminal No. 6A12, 6G73	Check item	Check condition (Engine condition)		Normal condition
63	63	Engine coolant temperature sensor	Ignition switch: ON	When engine coolant temperature is 0°C	3.2–3.8V
				When engine coolant temperature is 20°C	2.3–2.9V
				When engine coolant temperature is 40°C	1.3–1.9V
				When engine coolant temperature is 80°C	0.3–0.9V
64	64	Throttle position sensor <Vehicles without TCL>	Ignition switch: ON	Set throttle valve to idle position	0.3–1.0V
				Fully open throttle valve	4.5–5.5V
		Throttle position sensor <Vehicles with TCL>	Ignition switch: ON	Set throttle valve to idle position	0.4–0.6V
				Fully open throttle valve	4.5–5.5V
65	65	Barometric pressure sensor	Ignition switch: ON	When altitude is 0m	3.7–4.3V
				When altitude is 1,200m	3.2–3.8V
66	66	Vehicle speed sensor	• Ignition switch: ON • Move the vehicle slowly forward		0 ↔ 5V (Changes repeatedly)
67	67	Idle position switch	Ignition switch: ON	Set throttle valve to idle position	0–1V
				Slightly open throttle valve	4V or more
68	68	Camshaft position sensor (top dead centre sensor)	Engine: Cranking		0.4–3.0V
			Engine: Idle speed		0.5–2.0V
69	69	Crank angle sensor	Engine: Cranking		0.4–4.0V
			Engine: Idle speed		1.5–2.5V
70	70	Air flow sensor	Engine: Idle speed		2.2–3.2V
			Engine r/min.: 2000r/min.		
71	71	Inhibitor switch <A/T>	Ignition switch: ON	Set selector lever to P or N	0–3V
				Set selector lever to D, 2, L or R	8–14V

CHECK CHART FOR RESISTANCE AND CONTINUITY BETWEEN TERMINALS

E13AE09BA

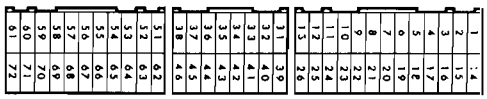
1. Turn the ignition switch to OFF.
2. Disconnect the ENGINE ECU connector.
3. Measure the resistance and check for continuity between the terminals of the ENGINE ECU harness-side connector while referring to the check chart.

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

Caution
If the terminals that should be checked are mistaken, or if connector terminals are not correctly shorted to earth, damage may be caused to the vehicle wiring, sensors, ENGINE ECU and/or ohmmeter.
Use care to prevent this!

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

Engine ECU Harness Side Connector Terminal Arrangement



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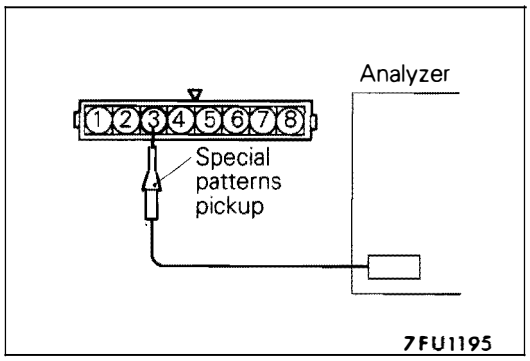
Terminal No.	Inspection item	Normal condition (Check condition)
1–12	No. 1 injector	13–16 Ω (At 20°C)
14–12	No. 2 injector	
2–12	No. 3 injector	
15–12	No. 4 injector	
3–12	No. 5 injector <6A12, 6G73>	
16–12	No. 6 injector <6A12, 6G73>	
4–17	ISC motor <4G93, 4G63>	Continuity
4–12	Stepper motor coil (A1) <6A12, 6G73>	28–33 Ω (At 20°C)
17–12	Stepper motor coil (A2) <6A12, 6G73>	
5–12	Stepper motor coil (B1) <6A12, 6G73>	
18–12	Stepper motor coil (B2) <6A12, 6G73>	

Terminal No.	Inspection item	Normal condition (Check condition)
6–12	EGR control solenoid valve <4G93, 4G63>	36–44 Ω (At 20°C)
9–12	Purge control solenoid valve	36–44 Ω (At 20°C)
13–Body earth	ENGINE ECU earth	Continuity (0Ω)
26–Body earth	ENGINE ECU earth	
32–12	Vacuum control solenoid valve <Vehicles with TCL>	36–44 Ω (At 20°C)
35–12	Ventilation control solenoid valve <Vehicles with TCL>	36–44 Ω (At 20°C)
35–12	Oygen sensor heater <4G93, 4G63>	Approx. 12 Ω (At 20°C)
39–40	Variable induction control (VIC) servo <6A12, 6G73>	5–35 Ω (At 20°C)
52–72	Intake air temperature sensor	5.3–6.7 kΩ (When intake air temperature is 0°C)
		2.3–3.0 kΩ (When intake air temperature is 20°C)
		1.0–1.5 kΩ (When intake air temperature is 40°C)
		0.30–0.42 kΩ (When intake air temperature is 80°C)
54–12	EGR control solenoid valve <6A12, 6G73>	36–44 Ω (At 20°C)
63–72	Engine coolant temperature sensor	5.1–6.5 kΩ (When coolant temperature is 0°C)
		2.1–2.7 kΩ (When coolant temperature is 20°C)
		0.9–1.3 kΩ (When coolant temperature is 40°C)
		0.26–0.36 kΩ (When coolant temperature is 80°C)
67–72	Idle position switch	Continuity (when throttle valve is at idle position)
		No continuity (when throttle valve is slightly open)
71–Body earth	Inhibitor switch <A/T>	Continuity (when select lever is at P or N)
		No continuity (when select lever is at D, 2, L or R)



INSPECTION PROCEDURE USING AN ANALYZER

E13AE10AA

AIR FLOW SENSOR (AFS)

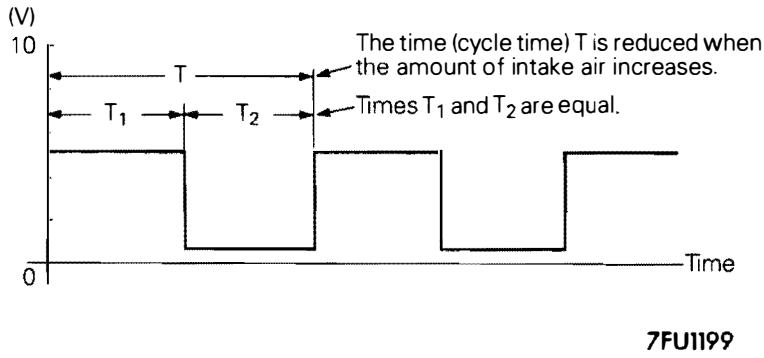
Measurement method

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

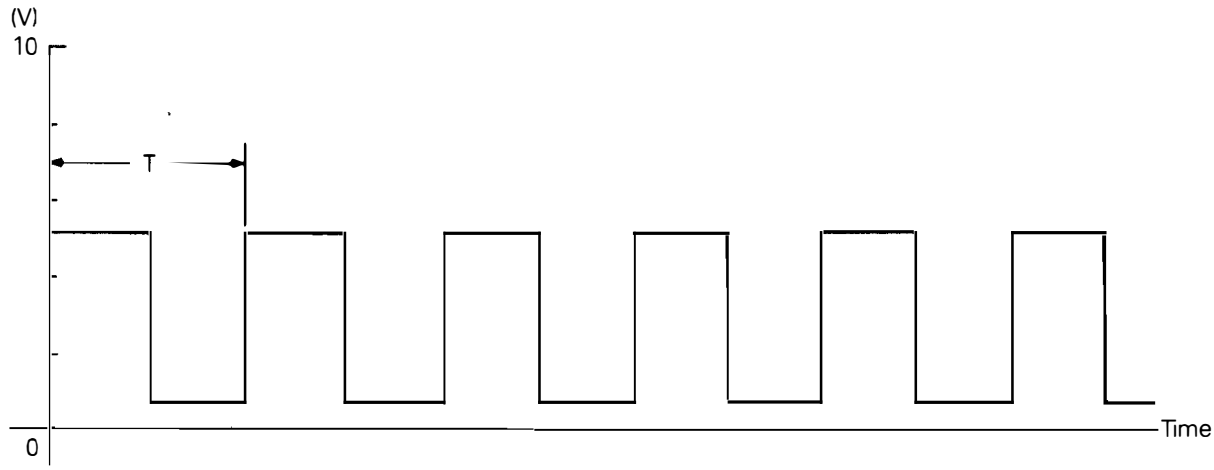
Standard wave pattern

Observation conditions

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



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



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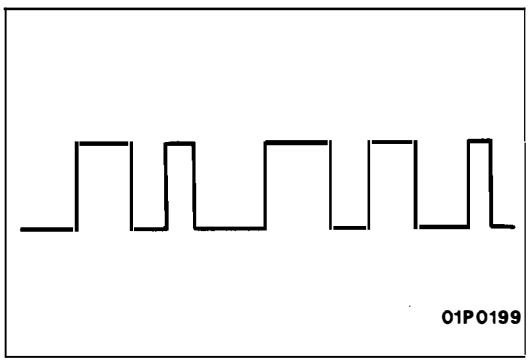
Wave pattern observation points

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



01P0199

Examples of abnormal wave patterns

- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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

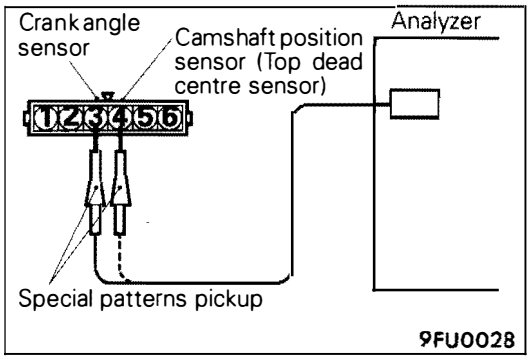
- Example 2

  Cause of problem

  Damaged rectifier or vortex generation column

  Wave pattern characteristics

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



CAMSHAFT POSITION SENSOR (TOP DEAD CENTRE SENSOR) AND CRANK ANGLE SENSOR <4G93, 4G63>

E13AE10BA

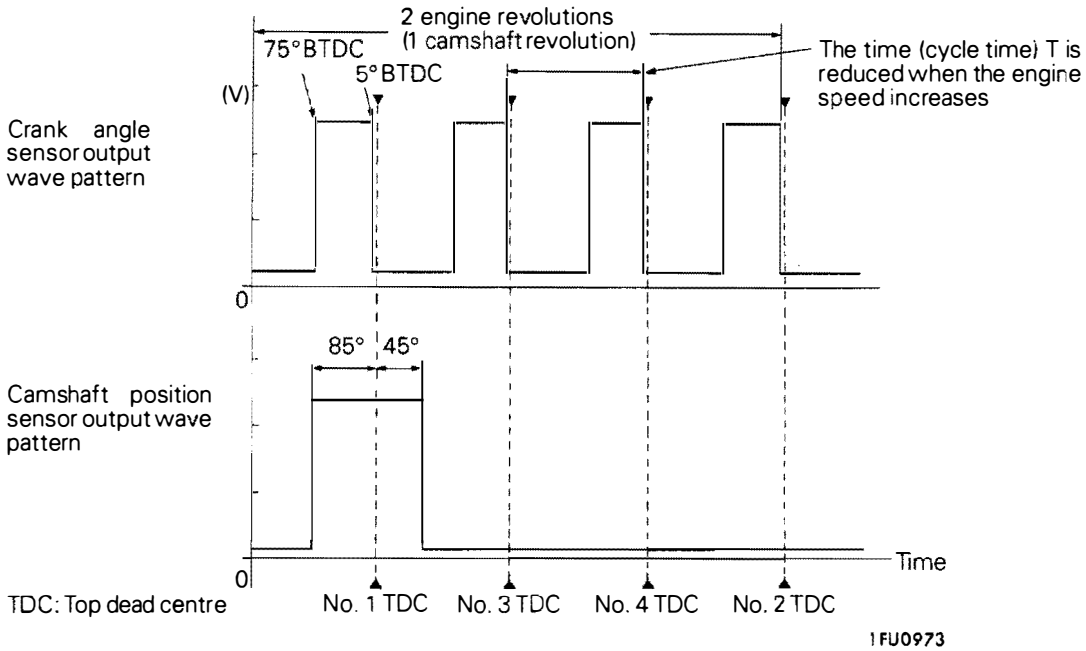
Measurement method

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

Standard wave pattern

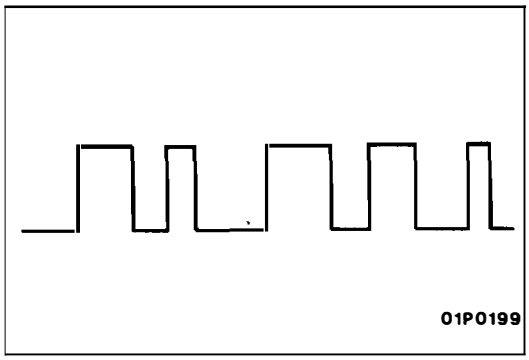
Observation conditions

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



Wave Pattern Observation Points

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



Examples of abnormal wave patterns

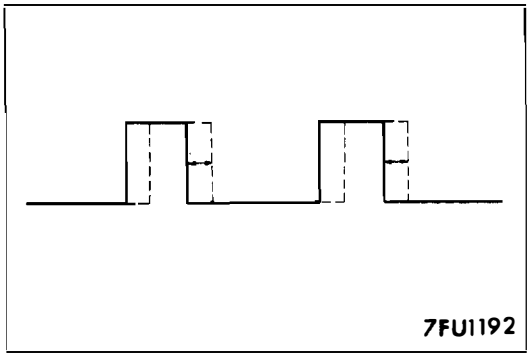
- Example 1

  Cause of problem

  Sensor interface malfunction

  Wave pattern characteristics

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



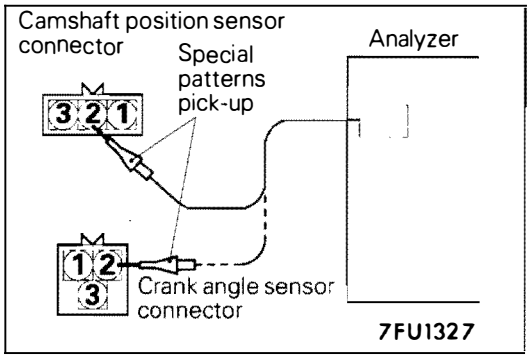
- Example 2

  Cause of problem

  Loose timing belt
  Abnormality in sensor disk

  Wave pattern characteristics

  Wave pattern is displaced to the left or right.



CAMSHAFT POSITION SENSOR AND CRANK ANGLE SENSOR <6A12, 6G73> E13AE10CA

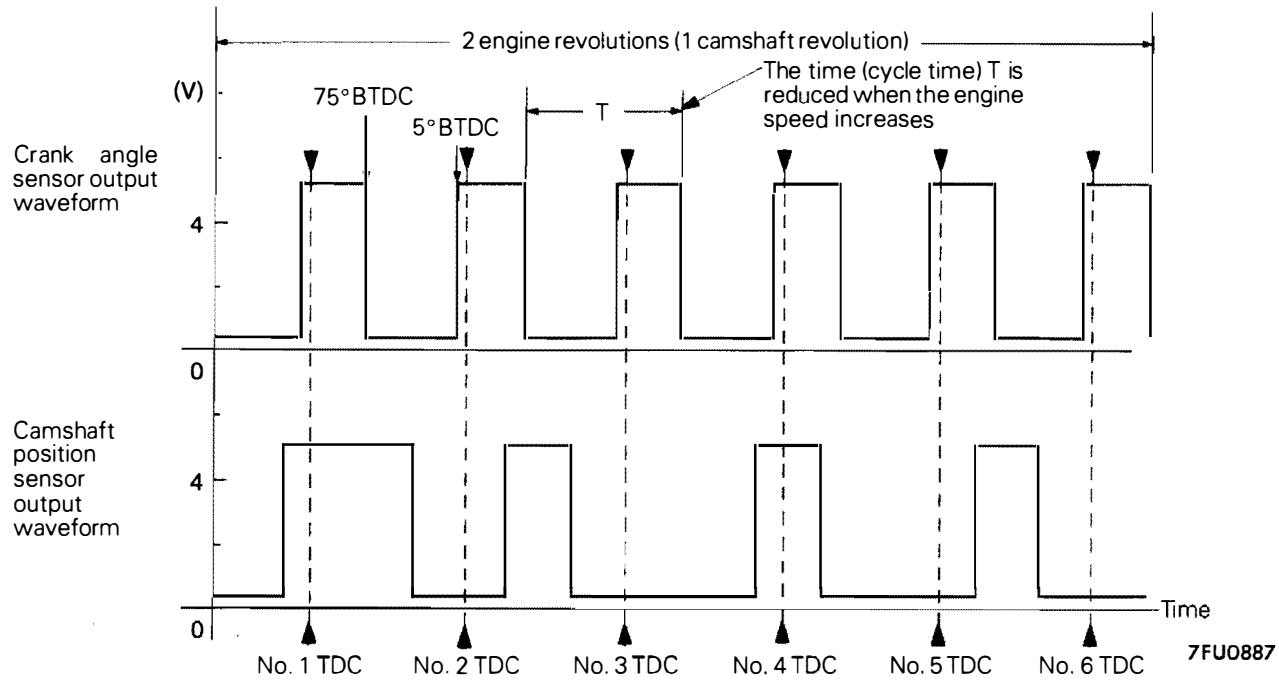
Measurement method

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

Standard wave pattern

Observation conditions

Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine speed	Idle speed

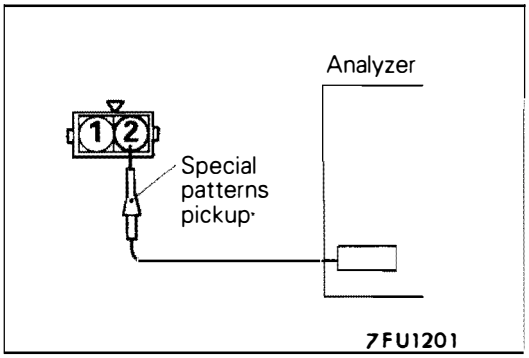


TDC: Top dead centre

Wave Pattern Observation Points

Examples of abnormal wave patterns

Refer to P.13A-105.



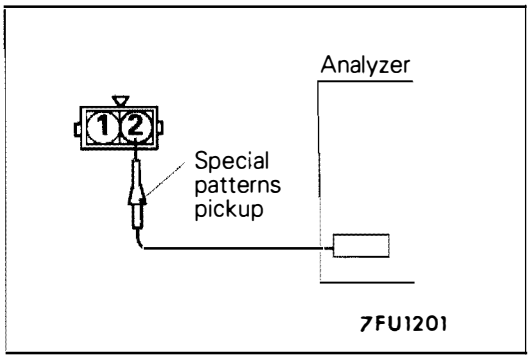
INJECTOR

E13AE10GA

Measurement method

<4G93, 4G63>

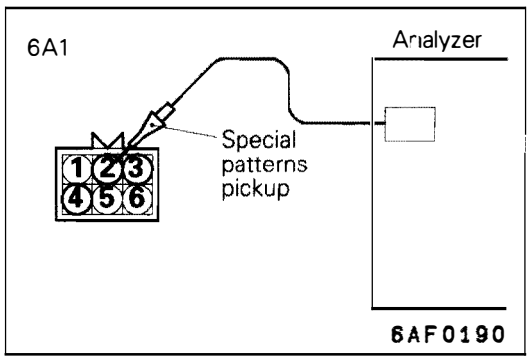
1. Disconnect the injector connector and connect the special tool (test harness: MB991348) in between. (Both the terminal on the engine control unit side and the terminal on the power supply side should be connected.)
2. Connect the analyzer special patterns pickup to the test harness clip on the engine control unit side.



<6A12, 6G73>

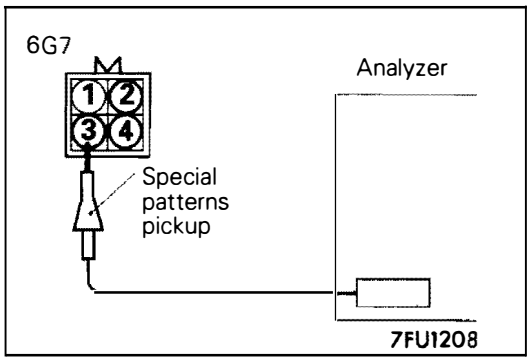
For front bank cylinders (No. 1, No. 3, No. 5)

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

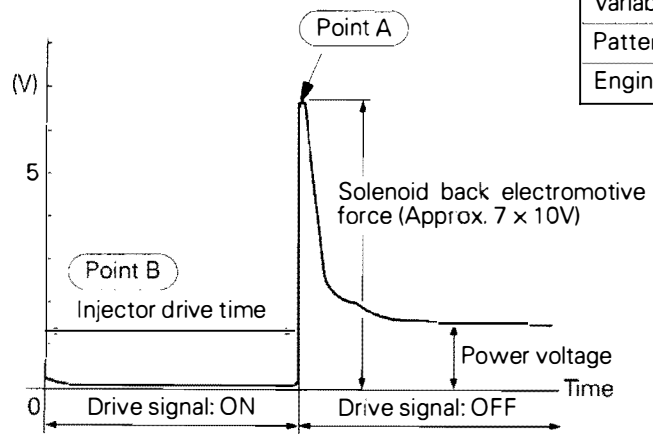


For rear bank cylinders (No. 2, No. 4, No. 6)

1. Disconnect the injector connector for the rear bank and connect the special tool in between.
   6A12: Test harness MD998463
   6G73: Test harness MD998464
2. Connect the analyzer special patterns pickup to the male side connector terminal 2 (black clip on the special tool) to analyze the No. 2 cylinder, connection terminal 3 (blue clip) for No. 4 cylinder, and connection terminal 4 (white clip) for No. 6 cylinder respectively.



Standard wave pattern



7FU1202

Observation conditions

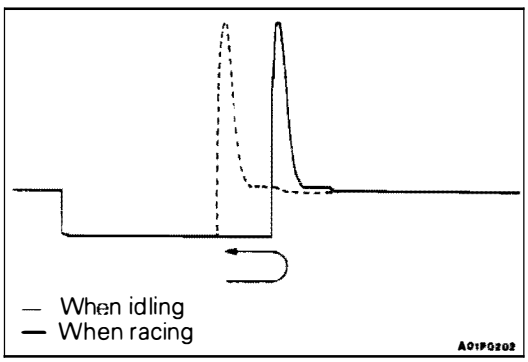
Function	Special patterns
Pattern height	Variable
Variable knob	Adjust while viewing the wave pattern
Pattern selector	Display
Engine r/min.	Idle speed

Wave pattern observation points

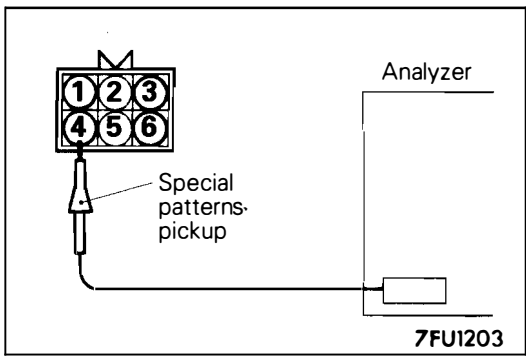
Point A: Height of solenoid back electromotive force

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

Point B: Injector drive time



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



STEPPER MOTOR <6A12, 6G73> E13AE10DA

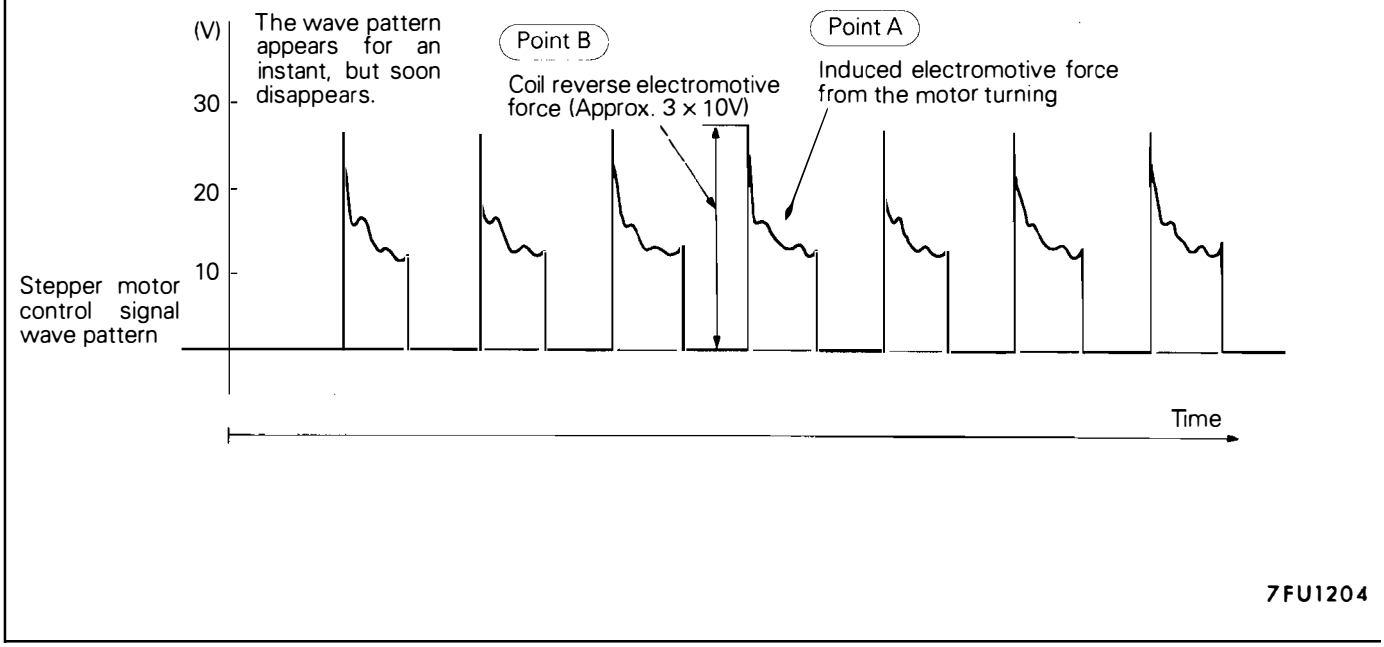
Measurement method

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

Standard wave pattern

Observation conditions

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



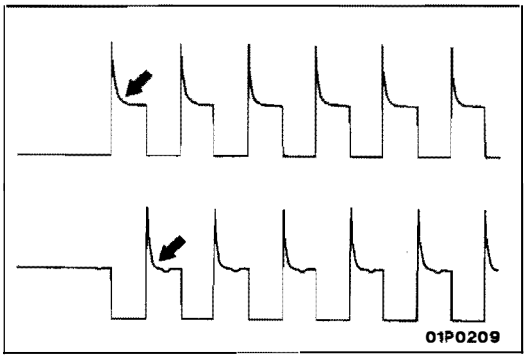
Wave pattern observation points

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

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

Point B: Height of coil reverse electromotive force

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



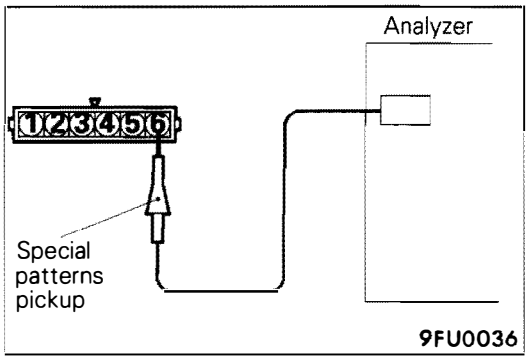
Examples of abnormal wave pattern

Cause of problem

Motor is malfunctioning. (Motor is not operating.)

Wave pattern characteristics

Induced electromotive force from the motor turning does not appear.



IGNITION COIL AND POWER TRANSISTOR <4G93, 4G63>

E13AE10EA

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

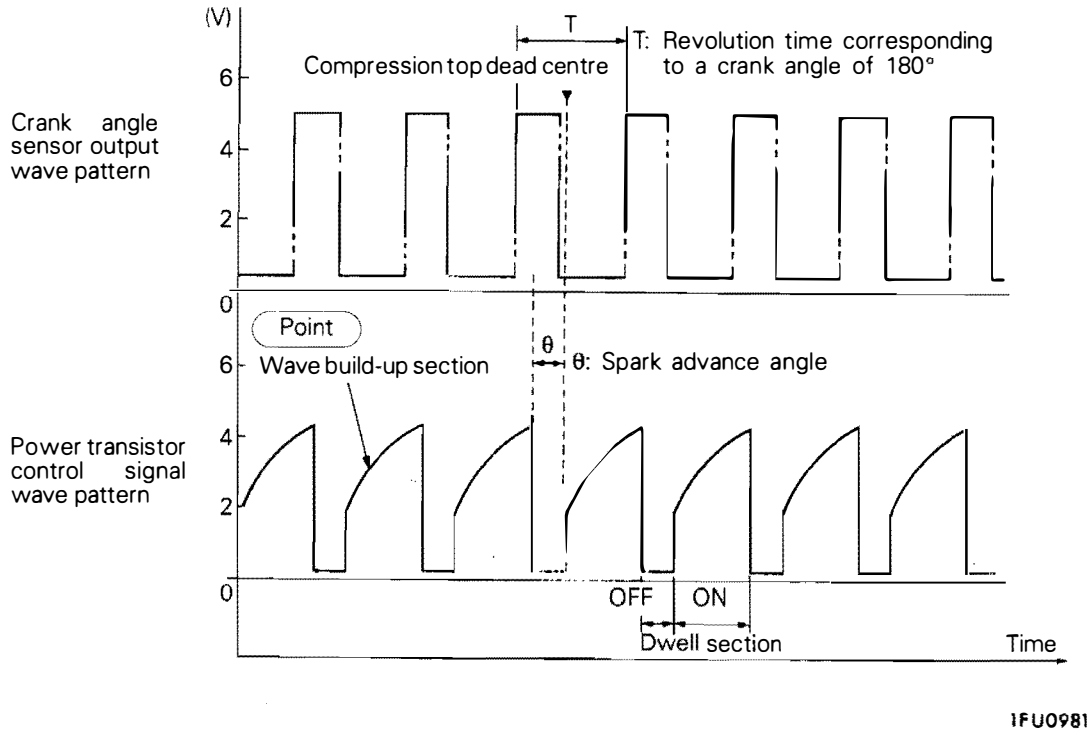
Measurement method

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

Standard wave pattern

Observation condition

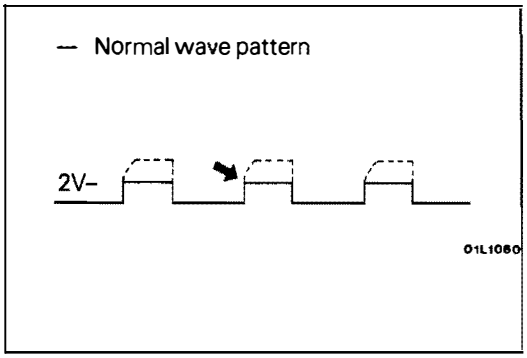
Function	Special patterns
Pattern height	Low
Pattern selector	Display
Engine r/min.	Approx. 1,200 r/min.

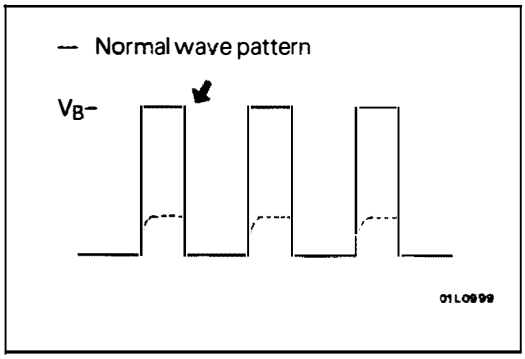


Wave pattern observation points

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

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





Examples of abnormal wave patterns

- Example 1
  Wave pattern during engine cranking

  Cause of problem

  Open-circuit in ignition primary circuit

  Wave pattern characteristics

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

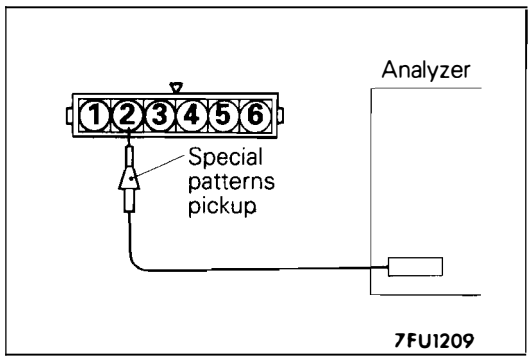
- Example 2
  Wave pattern during engine cranking

  Cause of problem

  Malfunction in power transistor

  Wave pattern characteristics

  Power voltage results when the power transistor is ON.



IGNITION COIL AND POWER TRANSISTOR <6A12, 6G73>

E13AE10FA

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

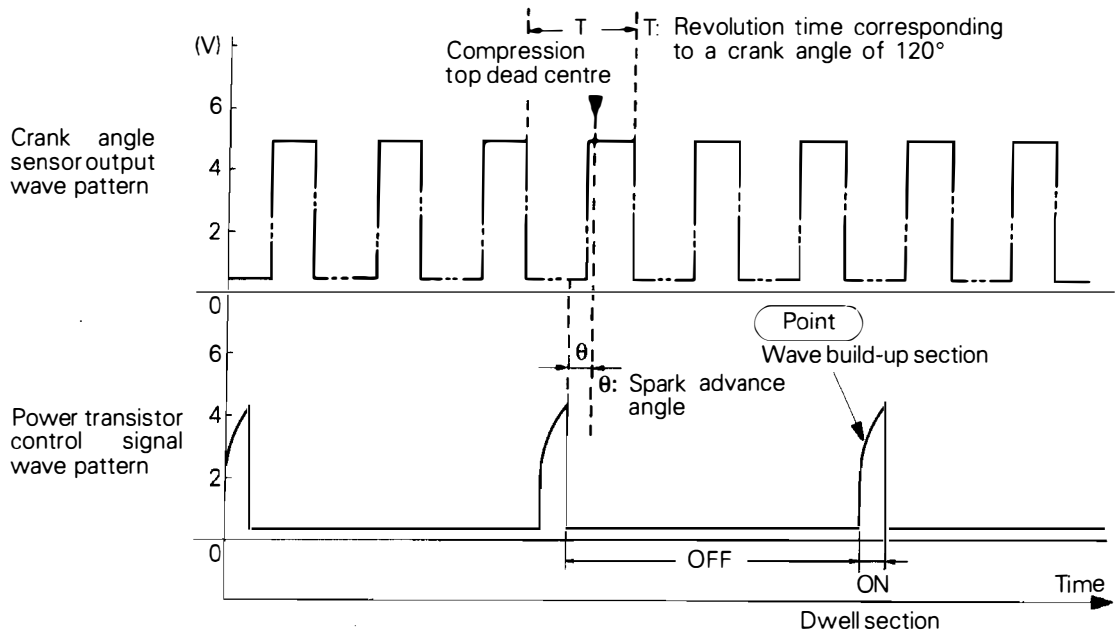
Measurement method

1. Disconnect the power transistor connector, and connect the special tool (test harness: MB991348) in between. (All terminals should be connected.)
2. Connect the analyzer special patterns pickup to the power transistor connector terminal 1 (No. 3 – No. 6), terminal 2 (No. 2 – No. 5) and terminal 3 (No. 1 – No. 4) respectively.

Standard wave pattern

Observation condition

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



Wave pattern observation points

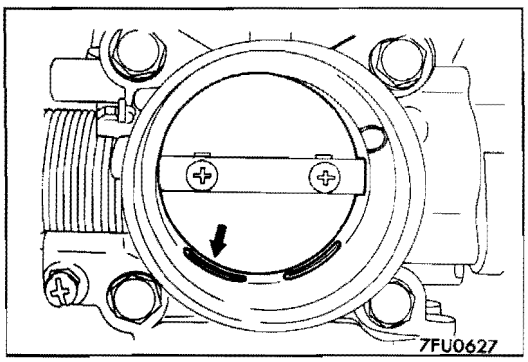
Examples of abnormal wave patterns
Refer to P.13A-113

SERVICE ADJUSTMENT PROCEDURES

E13AF00AA

THROTTLE BODY (THROTTLE VALVE AREA) CLEANING

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

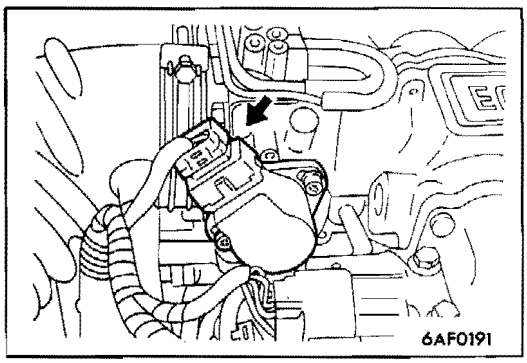


3. Plug the bypass passage inlet of the throttle body.

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

4. Spray cleaning solvent into the valve through the throttle body intake port and leave it for about 5 minutes.
5. Start the engine, race it several times and idle it for about 1 minute. If the idling speed becomes unstable (or if the engine stalls) due to the bypass passage being plugged, slightly open the throttle valve to keep the engine running.
6. If the throttle valve deposits are not removed, repeat steps 4 and 5.
7. Unplug the bypass passage inlet.
8. Attach the air intake hose.
9. Use the MUT-II to erase the self-diagnosis code.
10. Adjust the basic idle speed. (Refer to P.13A-119.)

NOTE
If the engine hunts while idling after adjustment of the basic idle speed, disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it and run the engine at idle for about 15 minutes.

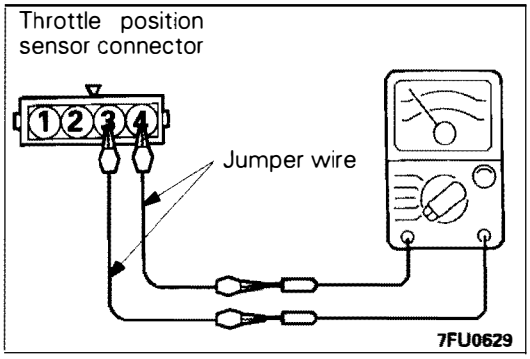


IDLE POSITION SWITCH AND THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles without TCL>

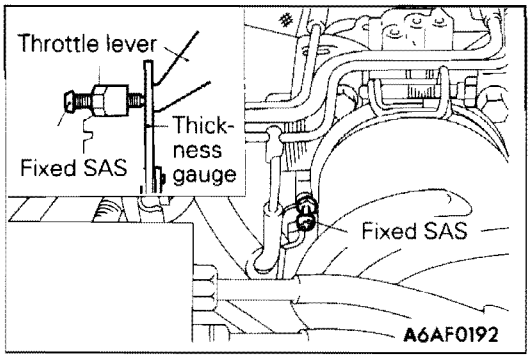
E13AF01AA

NOTE
The illustration is that for the 6A12 engine. The installation angle of the throttle position sensor varies depending on the engine.

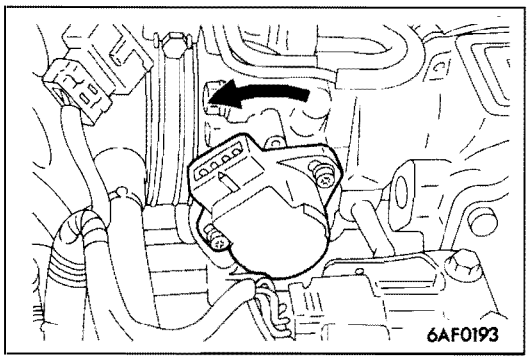
1. Disconnect the connector of the throttle position sensor.



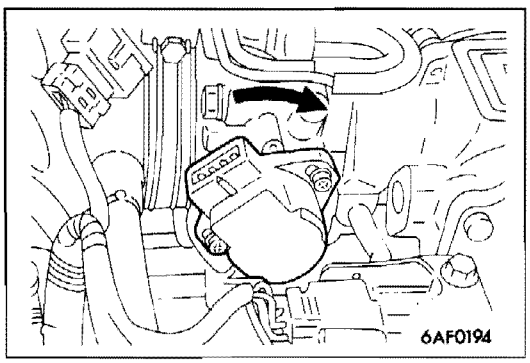
2. Connect an ohmmeter between terminal 3 (Idle position switch) and 4 (sensor earth) by using jumper wires.



3. Insert a thickness gauge with a thickness of 0.65 mm between the fixed SAS and the throttle lever.



4. Loosen the throttle position sensor mounting bolt; then turn the throttle position sensor body fully counter clockwise.
5. In this condition, check for continuity between terminals 3 and 4.



6. Slowly turn the throttle position sensor in the clockwise direction until the point at which continuity between terminals 3 and 4 changes to non-continuity is found. Tighten the throttle position sensor installation bolt at that position.
7. Connect the connector of the throttle position sensor.
8. Connect the MUT-II to the diagnosis connector (16 pin).
9. Turn the ignition switch ON (but do not start the engine).
10. Check the throttle position sensor output voltage.

    Standard value: 400–1,000 mV

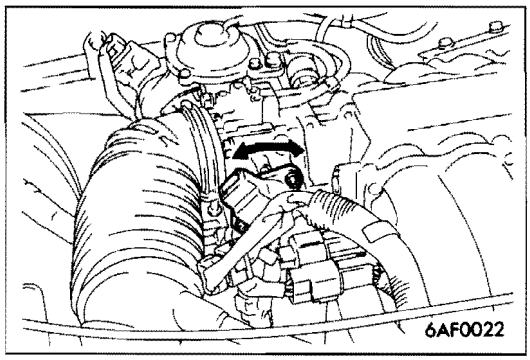
11. If there is a deviation from the standard value, check the throttle position sensor and the related harness.
12. Remove the thickness gauge.
13. Switch OFF the ignition switch.

THROTTLE POSITION SENSOR ADJUSTMENT <Vehicles with TCL>

E13AF02AA

1. Connect the MUT-II to the diagnosis connector (16 pin).
2. Turn the ignition switch ON (but do not start the engine).
3. Check the throttle position sensor output voltage.

   Standard value: 580–690 mV

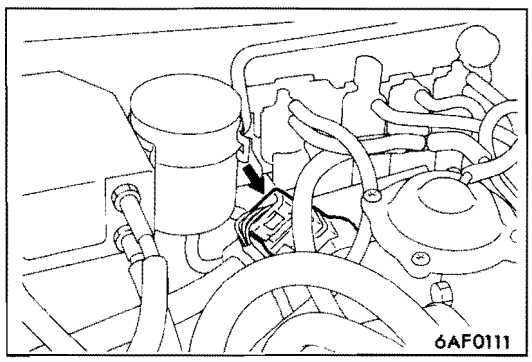


4. If the voltage is outside the standard value, adjust by loosening the throttle position sensor mounting bolts and turning the throttle position sensor body. After adjusting, tighten the bolts securely.
5. Switch OFF the ignition switch.
6. If a diagnosis code is output while adjusting the throttle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

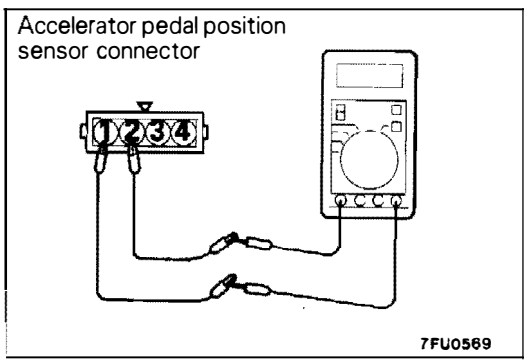
IDLE POSITION SWITCH AND ACCELERATOR PEDAL POSITION SENSOR ADJUSTMENT <Vehicles with TCL>

E13AF03AA

1. Disconnect the connector of accelerator pedal position connector sensor.

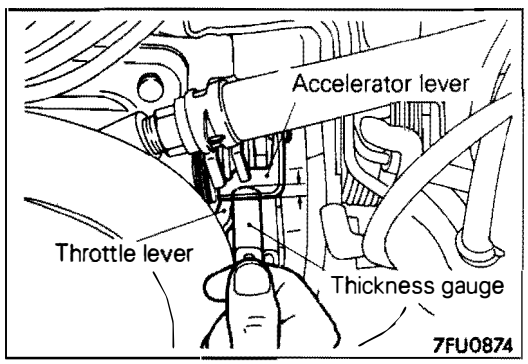


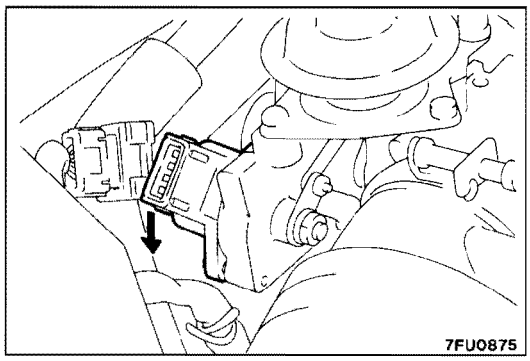
2. Connect an ohmmeter between terminal 2 (idle position switch) and 1 (sensor earth) by using jumper wires.



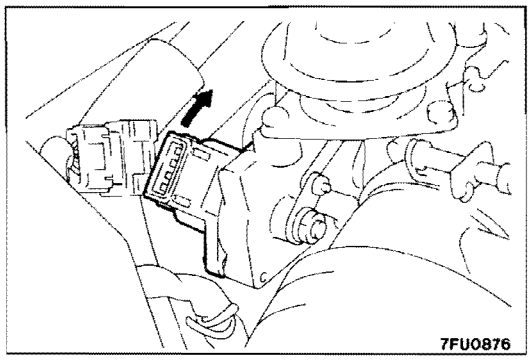
3. Insert a thickness gauge with a thickness of 0.5 mm in between the accelerator lever and throttle lever to a depth of approximately 3 mm.

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





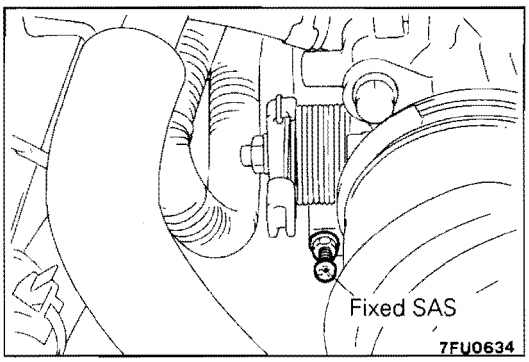
4. Loosen the accelerator pedal position sensor mounting bolt; then turn the accelerator pedal position sensor body fully counter clockwise.
5. In this condition, check for continuity between terminals 1 and 2.



6. Slowly turn the accelerator pedal position sensor in the clockwise direction until the point at which continuity between terminals 1 and 2 changes to non-continuity is found.
   Tighten the accelerator pedal position sensor installation bolt at that position.
7. Connect the connector accelerator pedal position sensor.
8. Connect the MUT-II to the diagnosis connector (12-pin) and select "Traction Control System."
9. Switch ON the ignition switch.
10. Check the accelerator pedal position sensor output voltage.

    Standard value: 400–1,000 mV

11. If the voltage is outside the standard value, check the accelerator pedal position sensor and related harnesses.
12. Remove the thickness gauge.
13. Switch OFF the ignition switch.



FIXED SAS ADJUSTMENT E13AF04AA

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

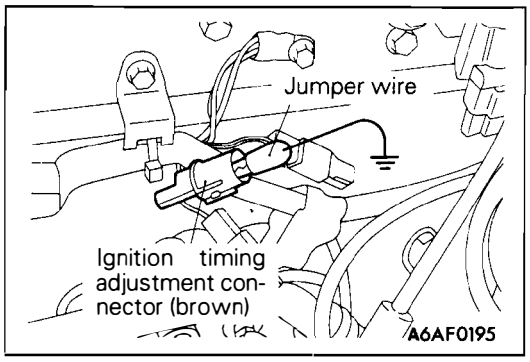
1. Loosen the tension of the accelerator cable sufficiently.
2. Back out the fixed SAS lock nut.
3. Turn the fixed SAS counterclockwise until it is sufficiently backed out, and fully close the throttle valve.
4. Tighten the fixed SAS until the point where the throttle lever is touched (i.e., the point at which the throttle valve begins to open) is found.
   From that point, tighten the fixed SAS 1-1/4 turn.
5. While holding the fixed SAS so that it doesn't move, tighten the lock nut securely.
6. Adjust the tension of the accelerator cable.
7. Adjust the basic idling speed.
8. For vehicles without TCL, adjust the idle position switch and the throttle position sensor (P.13A-115).
   For vehicles with TCL, adjust the throttle position sensor, idle position switch and accelerator pedal position sensor (P.13A-117).

BASIC IDLE SPEED ADJUSTMENT E13AF05AA

NOTE
1. The standard idling speed has been adjusted, by the speed adjusting screw (SAS), by the manufacturer, and there should usually be no need for readjustment.
2. The adjustment, if made, should be made after first confirming that the spark plugs, the injectors, the idle speed control servo, the compression pressure, etc., are all normal.

1. The vehicle should be prepared as follows before the inspection and adjustment.
   - Engine coolant temperature: 80–95°C
   - Lamps, cooling fan and accessories: OFF
   - Transmission: Neutral (A/T for P range)
2. Connect the MUT-II to the diagnosis connector (16-pin)

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

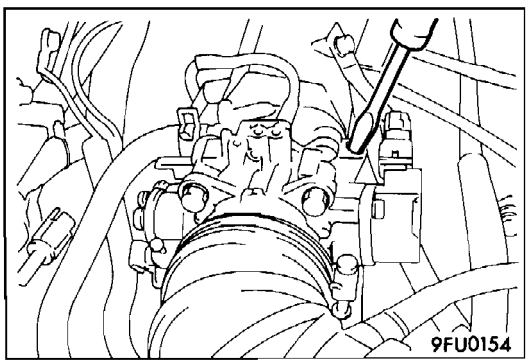


3. Remove the waterproof female connector from the ignition timing adjustment connector.
4. Use a jumper wire to earth the ignition timing adjustment terminal.

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

Standard value: 800 ± 50 r/min. <4G93>
750 ± 50 r/min. <4G63>
700 ± 50 r/min. <6A12, 6G73>

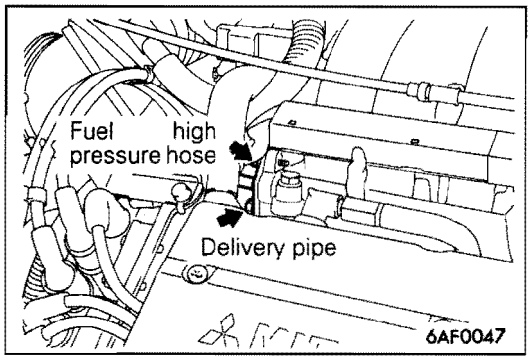
NOTE
1. The engine speed may be 20 to 100 r/min. lower than indicated above for a new vehicle [driven approximately 500 km or less], but no adjustment is necessary.
2. If the engine stalls or the rpm is low even though the vehicle has been driven approximately 500 km or more, it is probable that deposits are adhered to the throttle valve, so clean it. (Refer to P.13A-115.)



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

NOTE
If the idling speed is higher than the standard value range even when the SAS is fully closed, check whether or not there is any indication that the fixed SAS has been moved. If there is an indication that it has been moved, adjust the fixed SAS. If there are no indications that it has been moved, it is possible that there is leakage as a result of deterioration of the fast idle air valve (FIAV) <4G93, 4G63>, and, is so the throttle body should be replaced.

8. Switch OFF the ignition switch.
9. Disconnect the jumper wire from the ignition timing adjustment terminal and return the connector to its original condition.
10. Start the engine again and let it run at idle speed for about 15 minutes; check to be sure that the idling condition is normal.

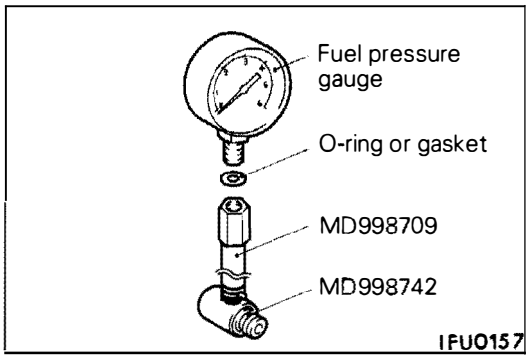


FUEL PRESSURE TEST E13AF06AA

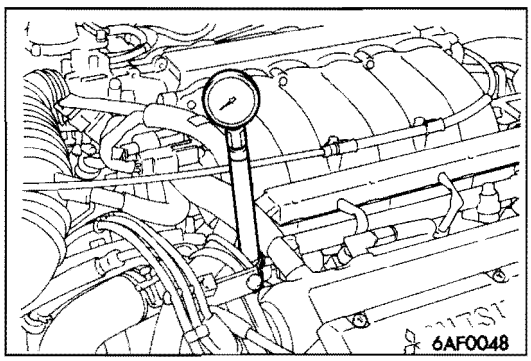
NOTE
The illustration is that for the 6A12 engine.

1. Release residual pressure from the fuel pipe line to prevent fuel gush out. (Refer to P.13A-123.)
2. Disconnect the fuel high pressure hose at the delivery pipe side.

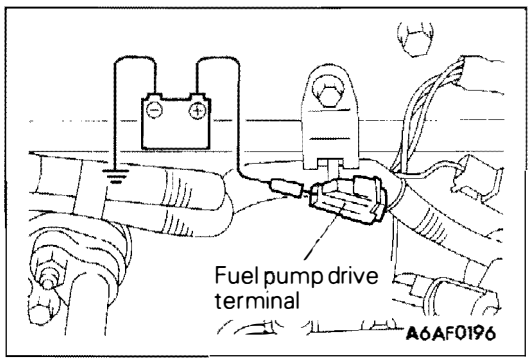
Caution
Cover the hose connection with rags to prevent splash of fuel that could be caused by some residual pressure in the fuel pipe line.



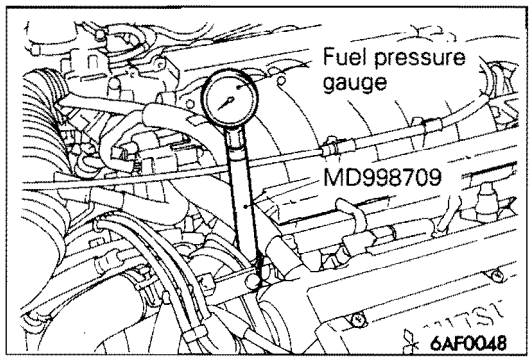
3. Remove the union joint and bolt from the special tool (adapter hose MD998709) and instead attach the special tool (hose adapter MD998742) to the adapter hose.
4. Install a fuel pressure gauge on the adapter hose that was set up in step 3.
   Use a suitable O-ring or gasket between the fuel pressure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



5. Install the special tool, which was set in place in steps 3 and 4 between the delivery pipe and the high pressure hose.
6. Connect the (–) battery terminal.

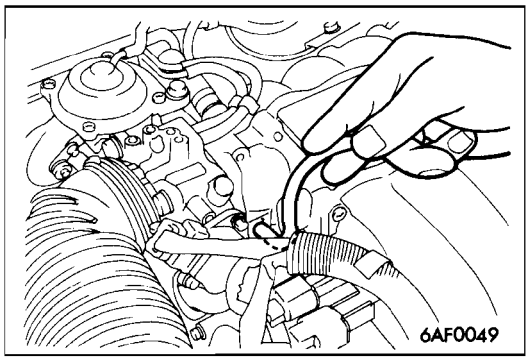


7. Connect the fuel pump drive terminal with the battery (+) terminal using a jumper wire and drive the fuel pump. Under fuel pressure, check the fuel pressure gauge and special tool connections for leaks.
8. Disconnect the jumper wire from the fuel pump drive terminal to stop the fuel pump.
9. Start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



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

Standard value:
Approx. 270 kPa at curb idle



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

    Standard value:
    330–350 kPa at curb idle

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

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

14. If any of fuel pressure measured in steps 9 to 12 is out of specification, troubleshoot and repair according to the table below.

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

15. Stop the engine and check change of fuel pressure gauge reading. Normal if the reading does not drop within 2 minutes. If it does, observe the rate of drop and trouble-shoot and repair according to the table below.

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

16. Release residual pressure from the fuel pipe line. (Refer to P.13A-123.)
17. Remove the fuel pressure gauge and special tool from the delivery pipe.

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

18. Replace the O-ring at the end of the fuel high pressure hose with a new one.
19. Fit the fuel high pressure hose over the delivery pipe and tighten the bolt to specified torque.

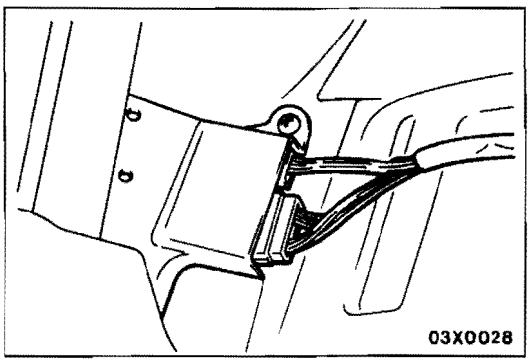
    Tightening torque: 5 Nm

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

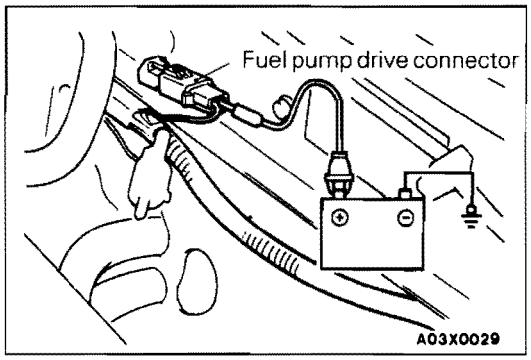
FUEL PUMP CONNECTOR DISCONNECTION (HOW TO REDUCE THE FUEL PRESSURE)

E13AF10AA

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



1. Remove the rear seat cushion. (Refer to GROUP 52A – Seat.)
2. Disconnect the connection between the floor wiring harness and the fuel wiring harness that is under the floor carpet.
3. After starting the engine and letting it run until it stops naturally, turn the ignition switch to OFF.
4. Connect the fuel wiring harness and floor wiring harness.
5. Install the rear seat cushion.



FUEL PUMP OPERATION CHECK E13AF11AA

1. Check the operation of the fuel pump by using the MUT-II to force-drive the fuel pump.
2. If the fuel pump will not operate, check by using the following procedure, and if it is normal, check the drive circuit.
   (1) Turn the ignition switch to OFF.
   (2) When the fuel pump drive connector (black) is attached directly to the battery, check if the sound of the fuel pump operation can be heard.

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

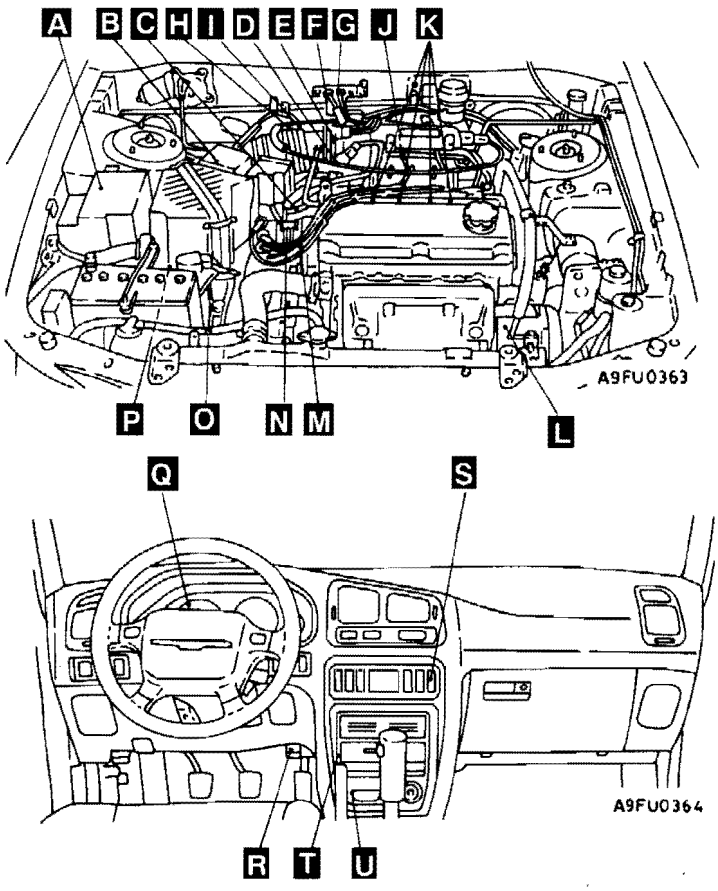
   (3) Check the fuel pressure by pinching the fuel hose with the fingertips.

ON-VEHICLE INSPECTION OF MPI COMPONENTS

COMPONENT LOCATION <4G93, 4G63>

E13AG00AA

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



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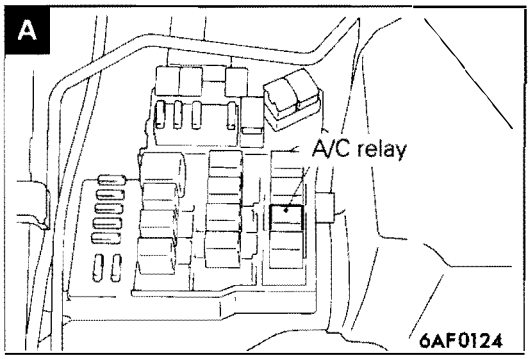

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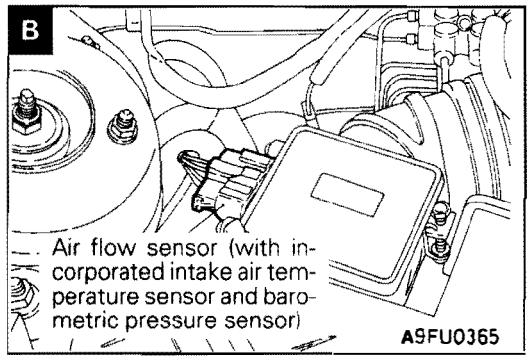

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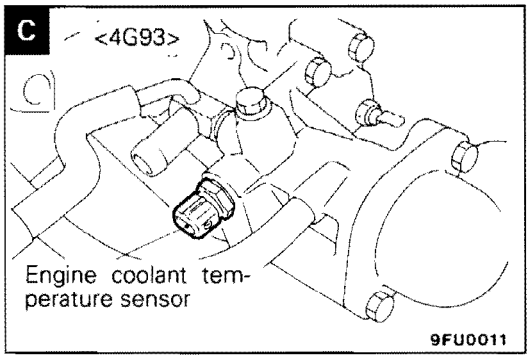

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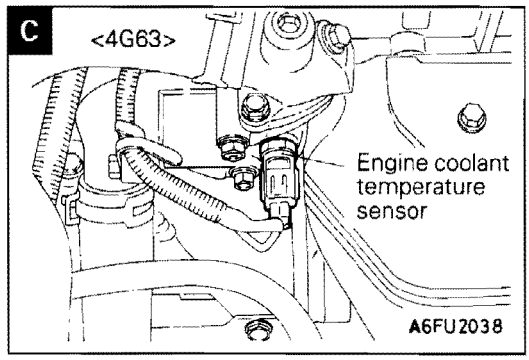

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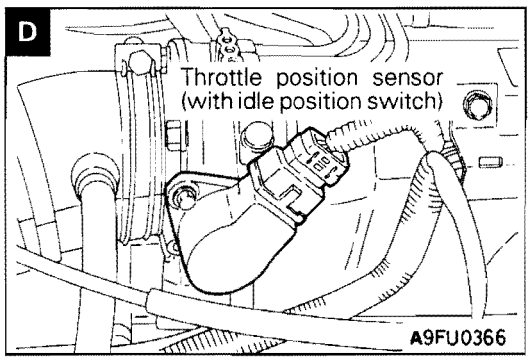

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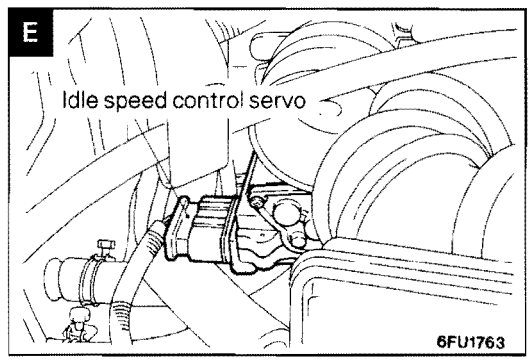

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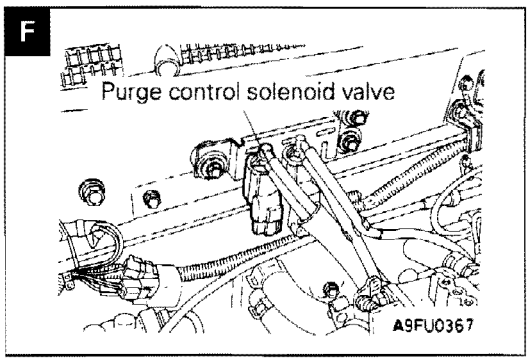

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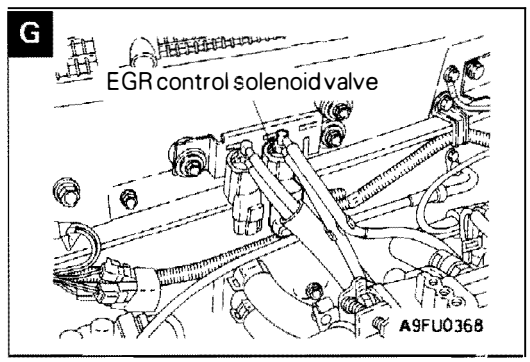

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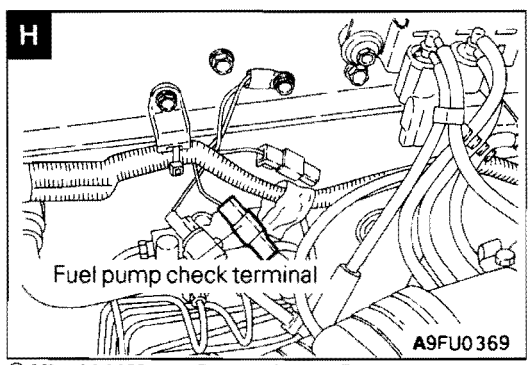

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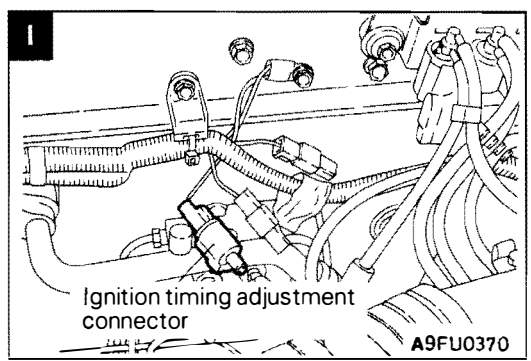

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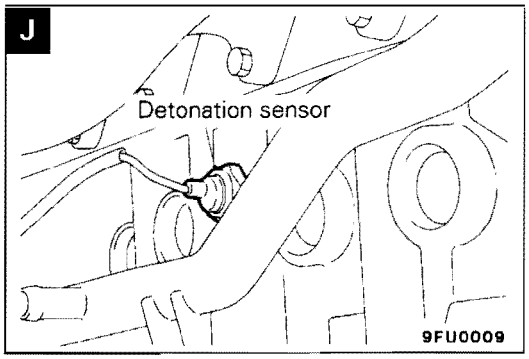

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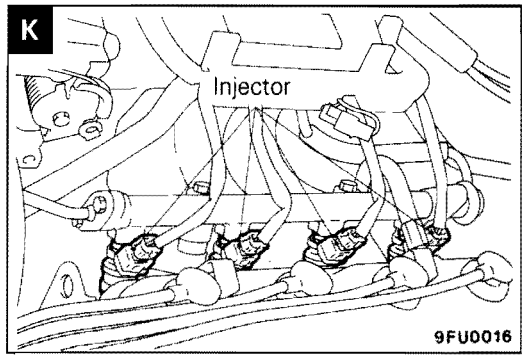

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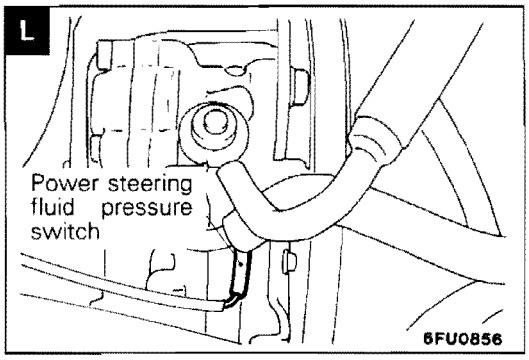

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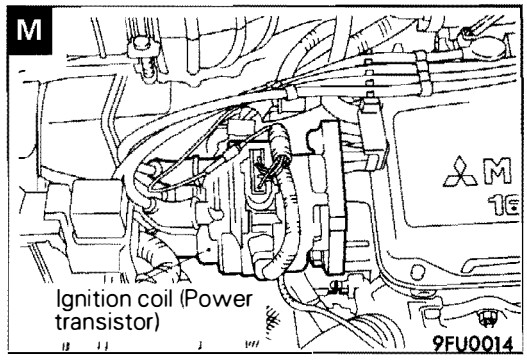

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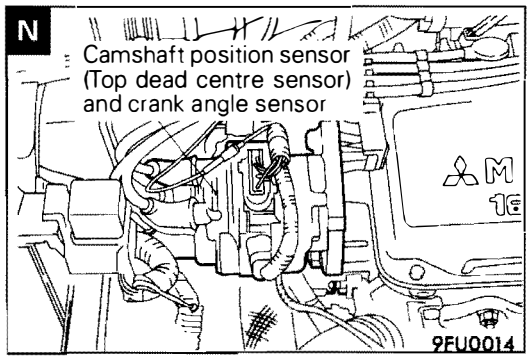

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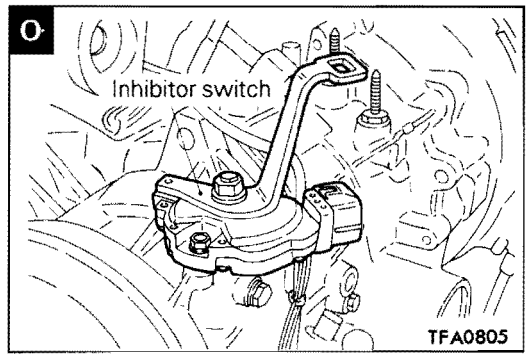

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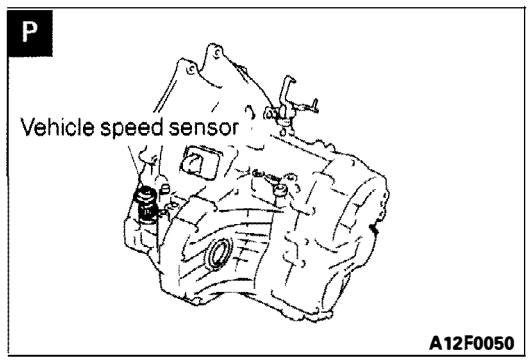

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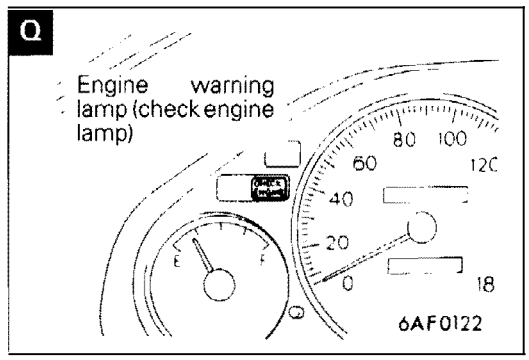

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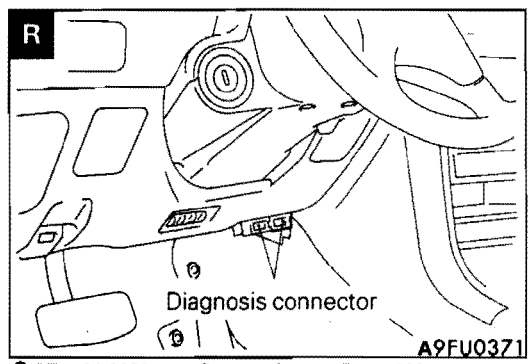

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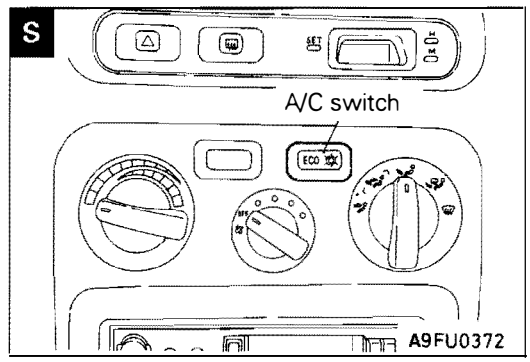

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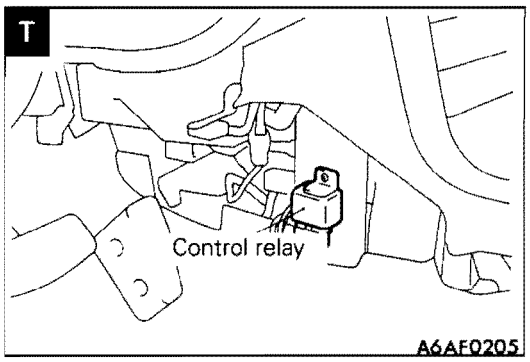

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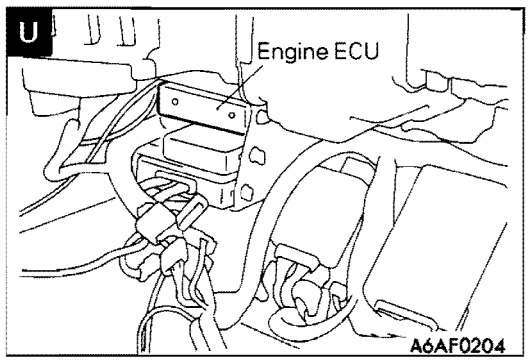

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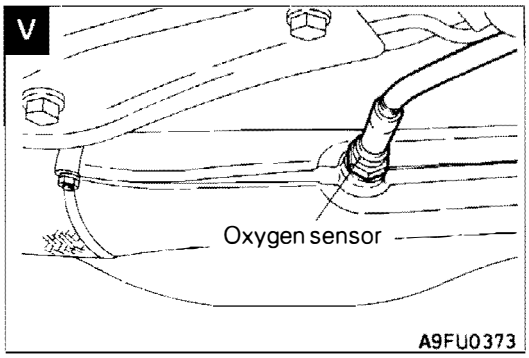
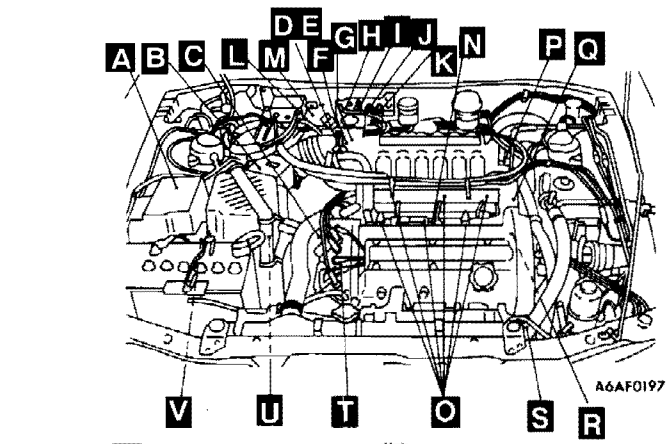
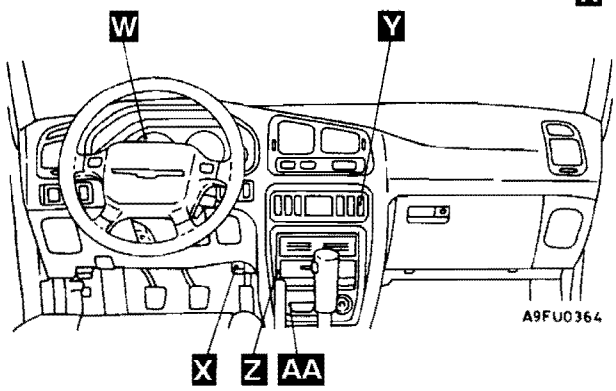


COMPONENT LOCATION <6A12, 6G73>

E13AG008A

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





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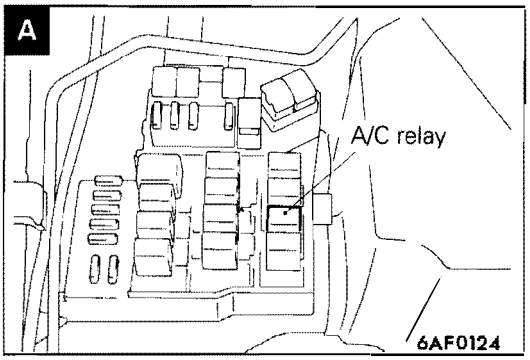

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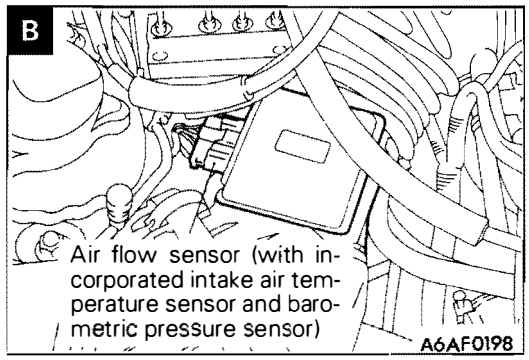

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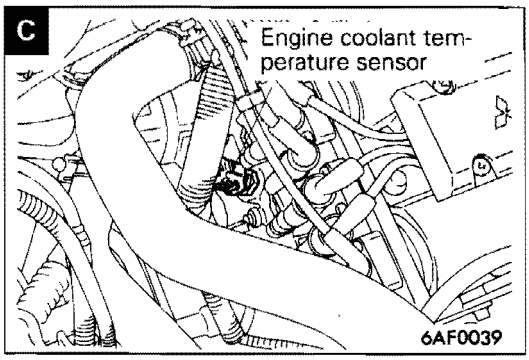

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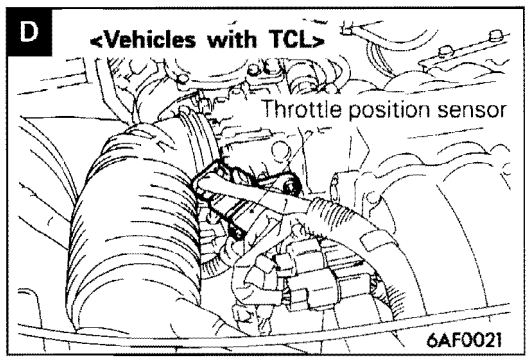

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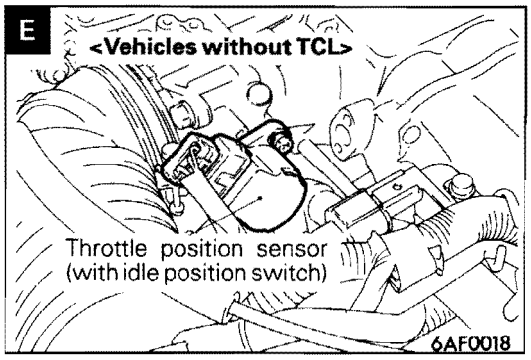

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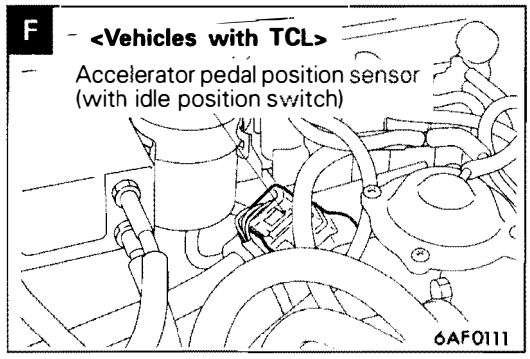

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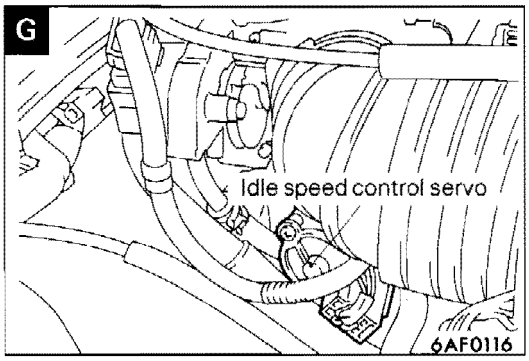

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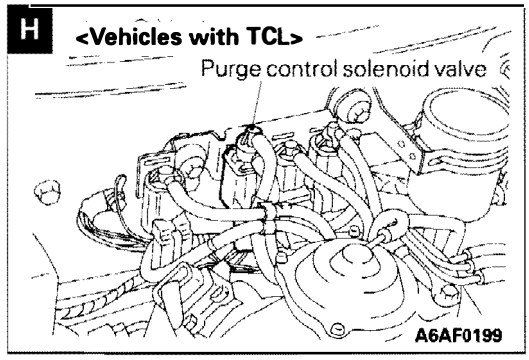

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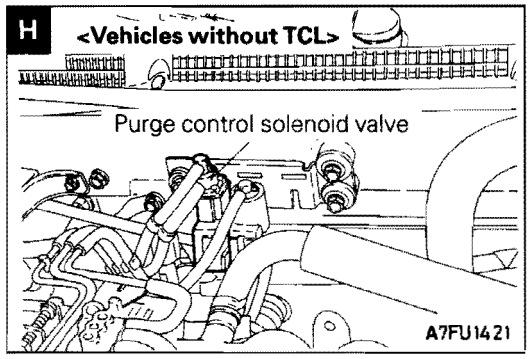

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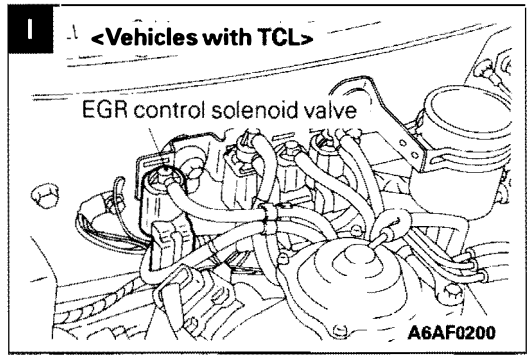

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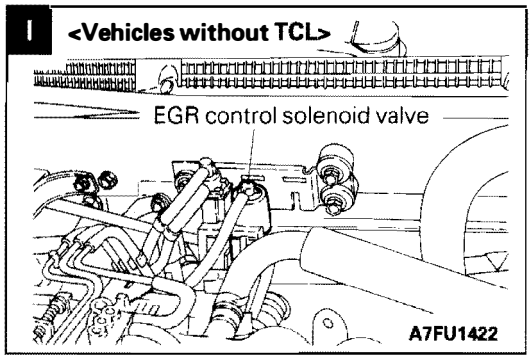

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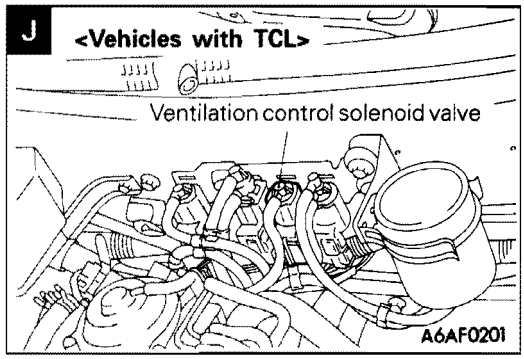

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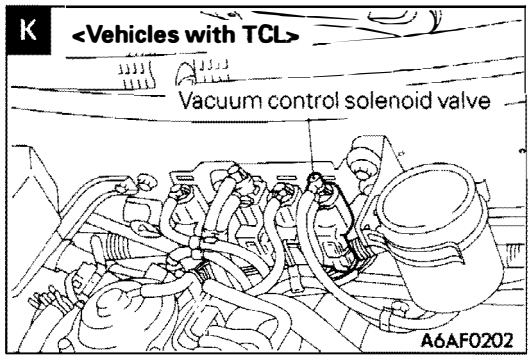

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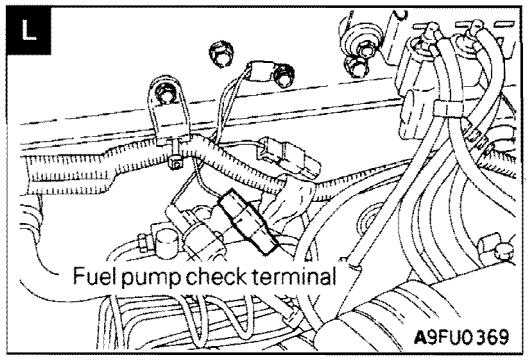

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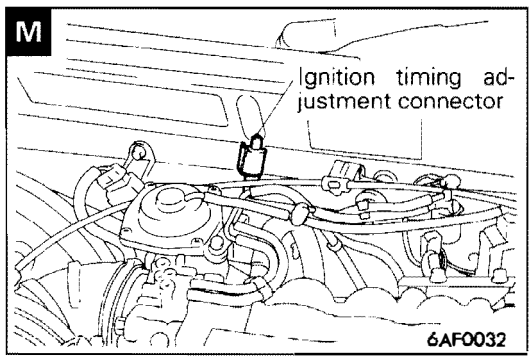

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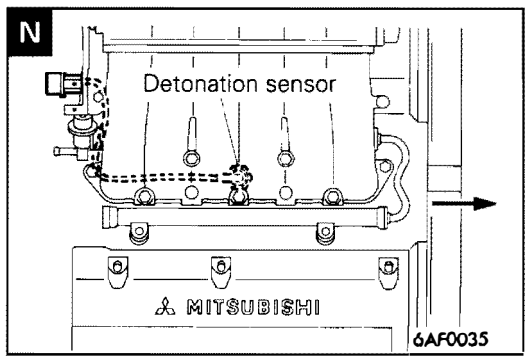

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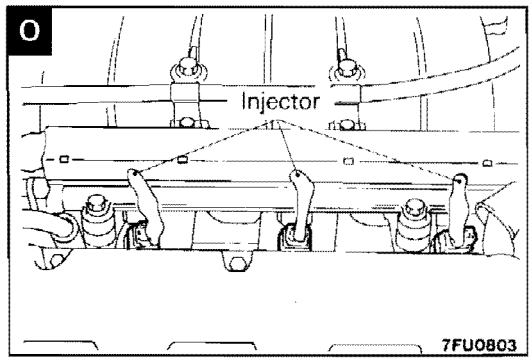

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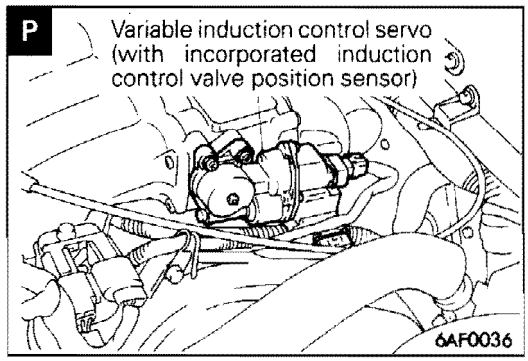

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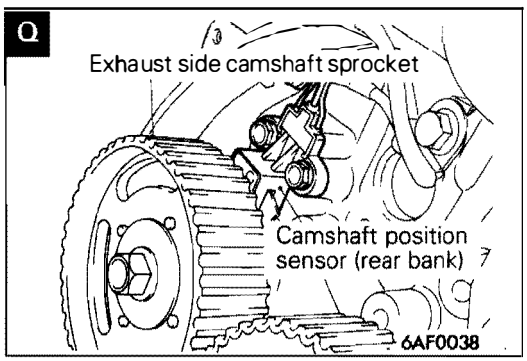

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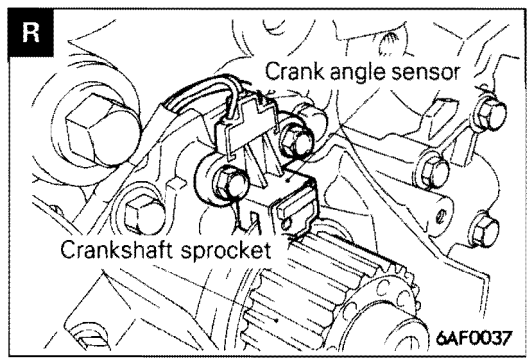

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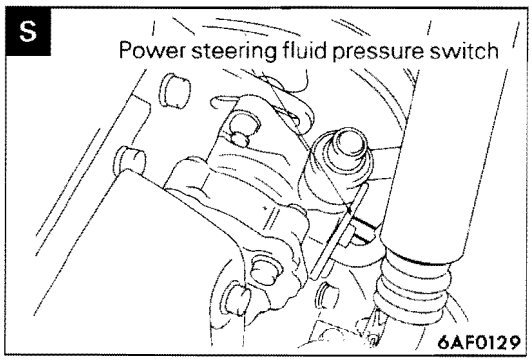

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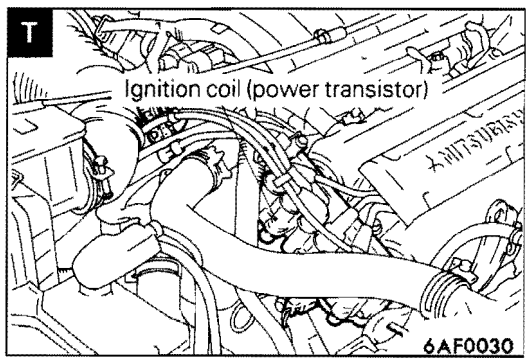

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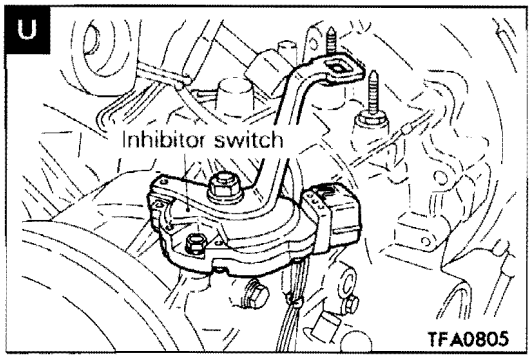

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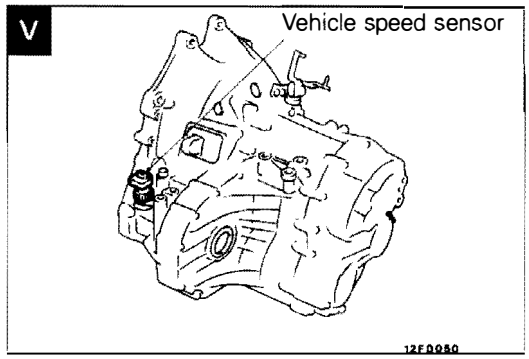

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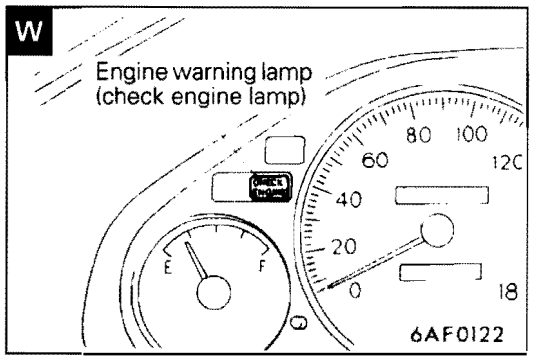

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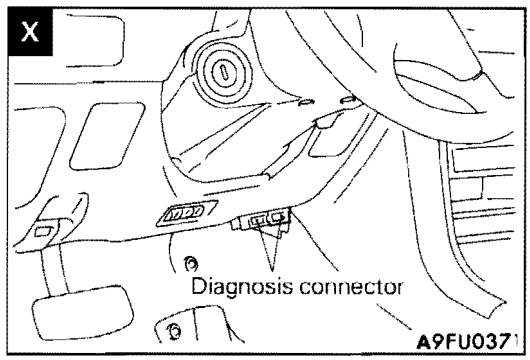

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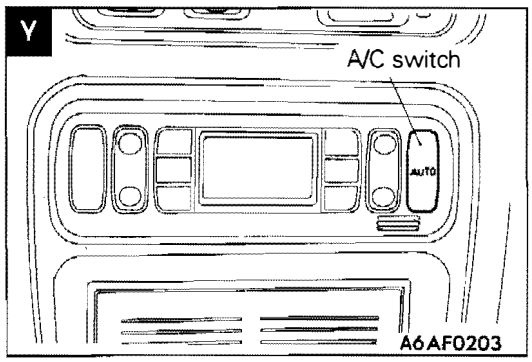

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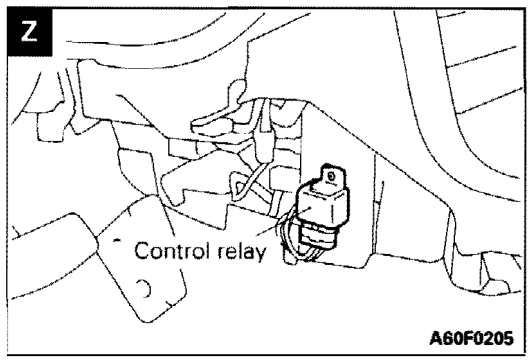
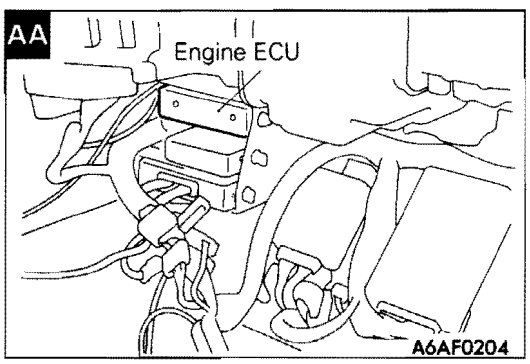
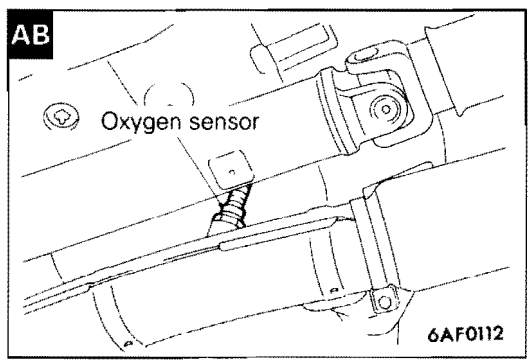
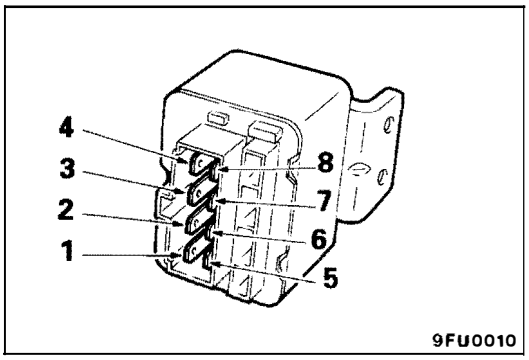


AA



AB

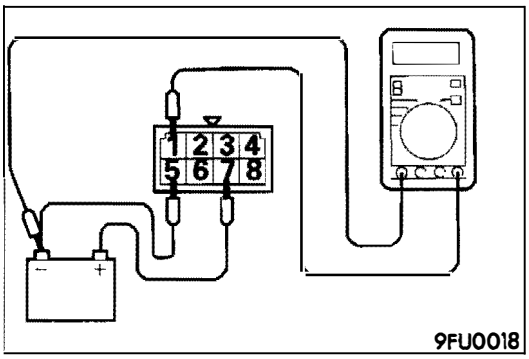




CONTROL RELAY INSPECTION E13AG01AA

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

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

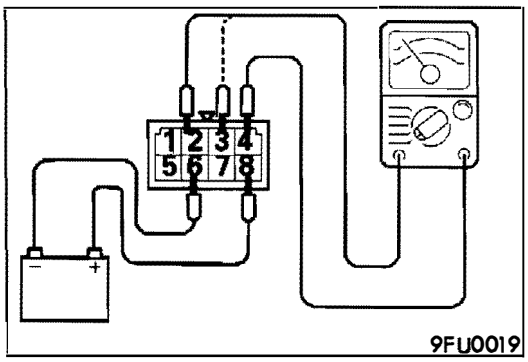


3. Use jumper leads to connect control relay terminal 7 to the battery (+) terminal and terminal 5 to the battery (–) terminal.

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

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

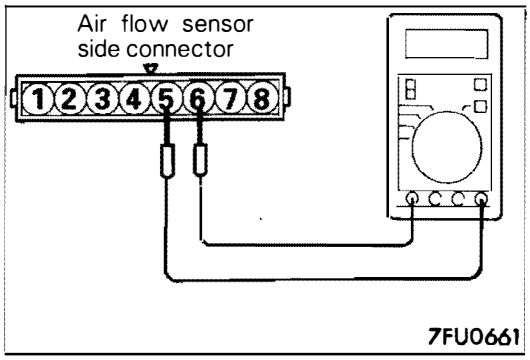
Jumper lead	Voltage at terminal 1
Connected	S V
Disconnected	0 V



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

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

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

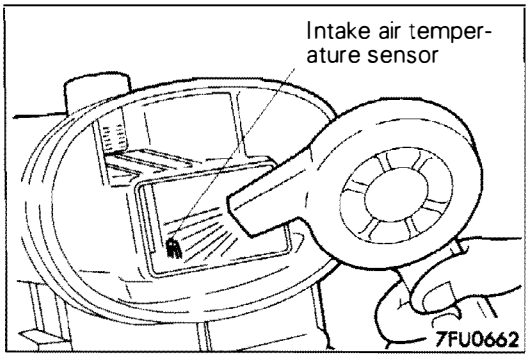


INTAKE AIR TEMPERATURE SENSOR INSPECTION

E13AG02AA

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

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



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

Temperature (°C)	Resistance (kΩ)
Higher	Smaller

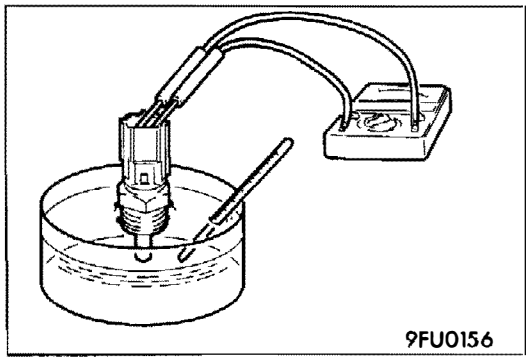
4. If the value deviates from the standard value or the resistance remains unchanged, replace the air flow sensor assembly.

ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

E13AG03AA

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

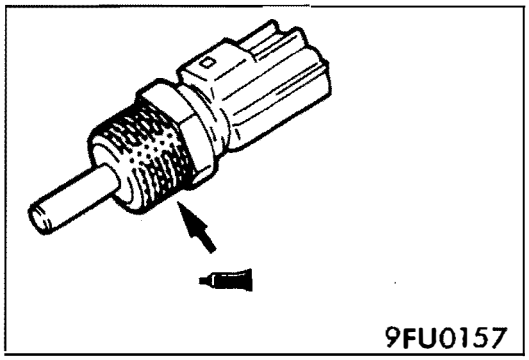
1. Remove engine coolant temperature sensor from the intake manifold.



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

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

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



INSTALLATION

1. Apply sealant threaded portion.

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

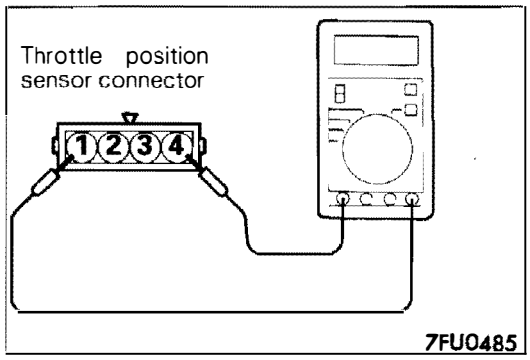
2. Install engine coolant temperature sensor and tighten it to specified torque.

   Sensor tightening torque: 30 Nm

3. Fasten harness connectors securely.

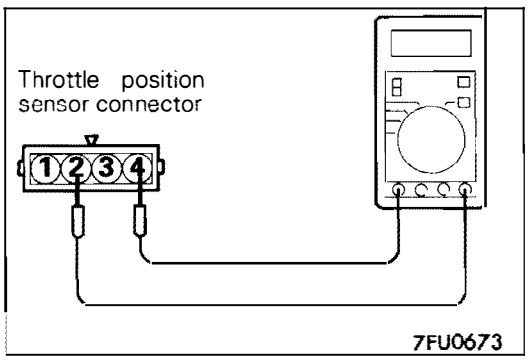
THROTTLE POSITION SENSOR INSPECTION

E13AG04AA



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

   Standard value: 3.5–6.5 kΩ

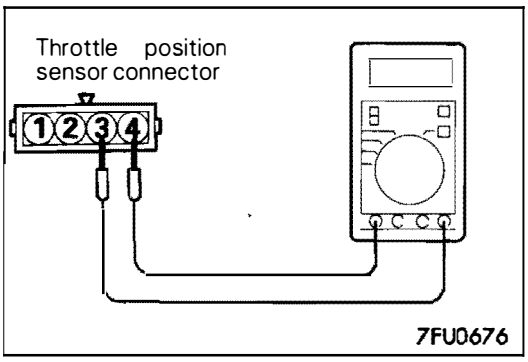


3. Measure the resistance between the throttle position sensor side connector terminal 2 and terminal 4.

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

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

   NOTE
   For the throttle position sensor adjustment procedure, refer to P.13A-115, 117.



IDLE POSITION SWITCH INSPECTION

E13AG05AA

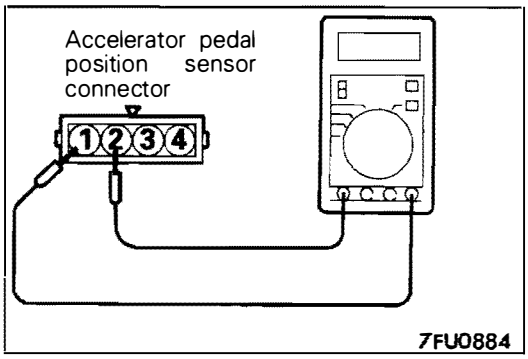
<Vehicles without TCL>

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

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

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

   NOTE
   After replacement, the idle position switch and throttle position sensor should be adjusted. (Refer to P.13A-115.)



<Vehicles with TCL>

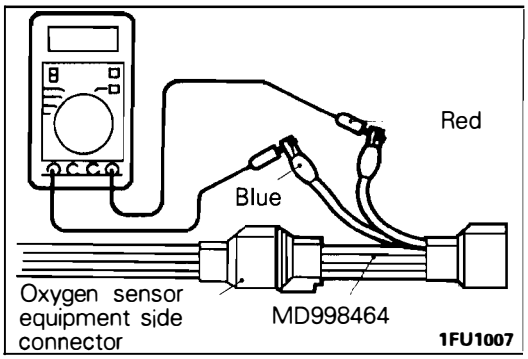
E13AG05BA

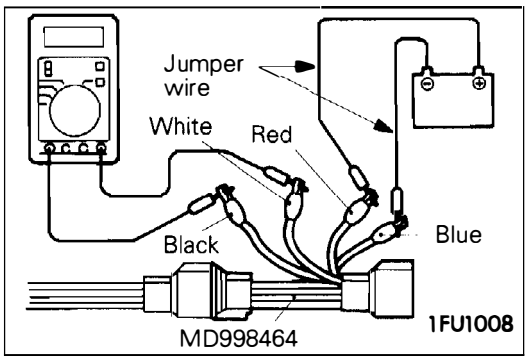
1. Disconnect the accelerator pedal position sensor connector.
2. Check the continuity between the accelerator pedal position sensor connector side terminal 1 and terminal 2.

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

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

   NOTE
   After replacement, the idle position switch and accelerator pedal position sensor should be adjusted. (Refer to P.13A-117.)





OXYGEN SENSOR INSPECTION E13AG06AA

<4G93, 4G63-2WD>

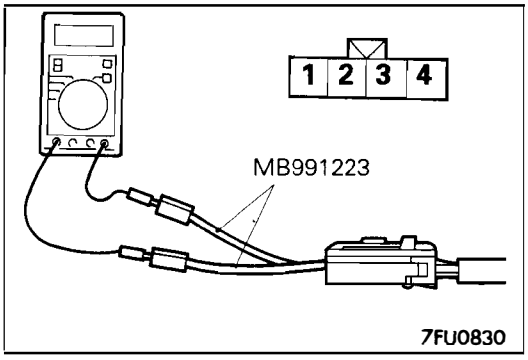
1. Disconnect the oxygen sensor connector and connect the special tool (test harness) to the connector on the oxygen sensor side.
2. Make sure that there is continuity (Approx. 12 Ω at 20°C) between terminal 2 (red clip of special tool) and terminal 4 (blue clip of special tool) on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.
5. Use the jumper wires to connect terminal 2 (red clip) of the oxygen sensor connector to the battery (+) terminal and terminal 4 (blue clip) to the battery (–) terminal.

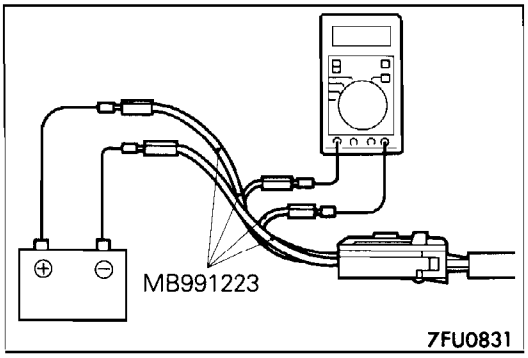
   Caution
   Be very careful when connecting the jumper wires; incorrect connection can damage the oxygen sensor.
6. Connect a digital voltage meter between terminal 1 (black clip) and terminal 3 (white clip).
7. While repeatedly racing the engine, measure the oxygen sensor output voltage.

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

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

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





<4G63-4WD, 6A12, 6G73> E13AG06BA

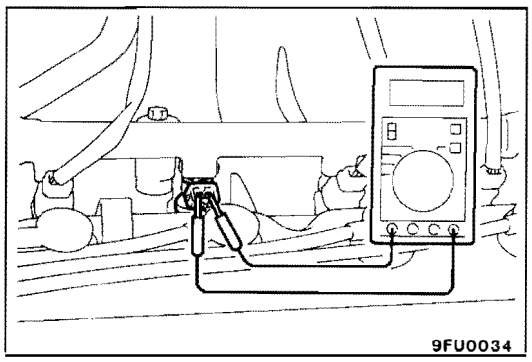
1. Disconnect the oxygen sensor connector and connect the special tool (test harness set) to the connector on the oxygen sensor side.
2. Make sure that there is continuity [approx. 12 Ω at 20°C] between terminal 3 and terminal 4 on the oxygen sensor connector.
3. If there is no continuity, replace the oxygen sensor.
4. Warm up the engine until engine coolant is 80°C or higher.
5. Use the jumper wires to connect terminal 3 of the oxygen sensor connector to the battery (+) terminal and terminal 4 to the battery (–) terminal.

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

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

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

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



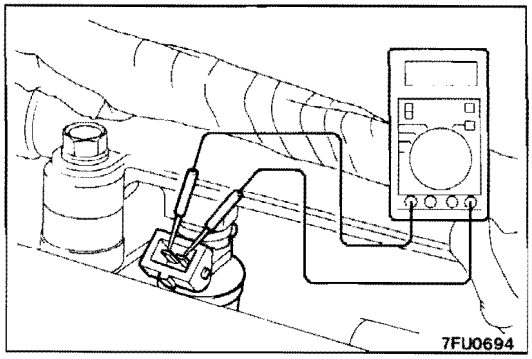
INJECTOR INSPECTION E13AG07AA

Measurement of Resistance between Terminals

<4G93, 4G63>

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

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

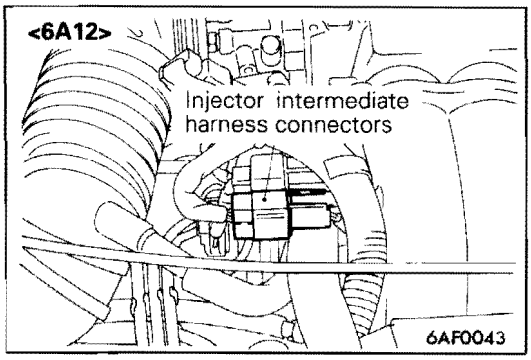


<6A12, 6G73>

- Front bank side (No. 1, No. 3 and No. 5 cylinders)

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

   Standard value: 13–16 Ω (at 20°C)

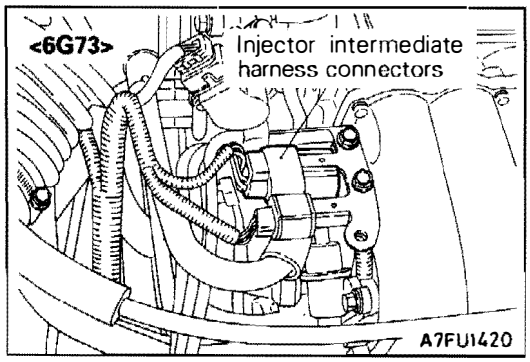


- Rear bank side (No. 2, No. 4 and No. 6 cylinders)

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

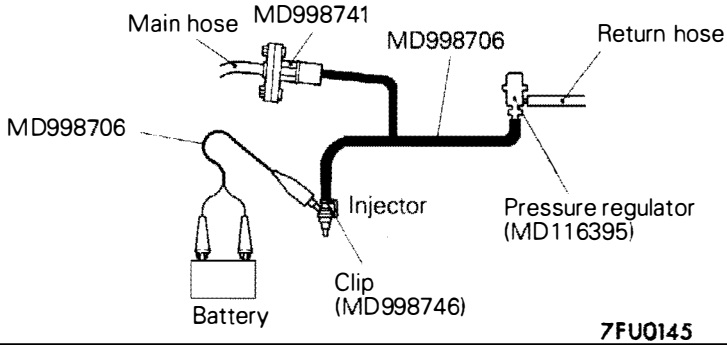
   Standard value: 13–16 Ω (at 20°C)

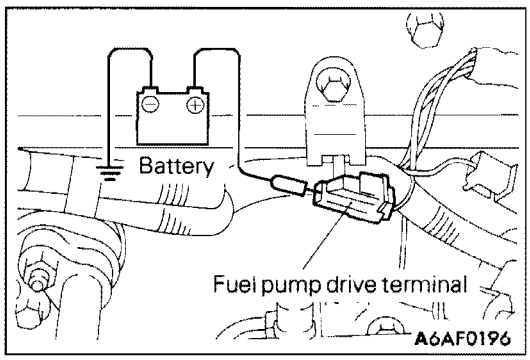
Injector	Measurement probe
No. 2 cylinder	1–2
No. 4 cylinder	1–3
No. 6 cylinder	1–4



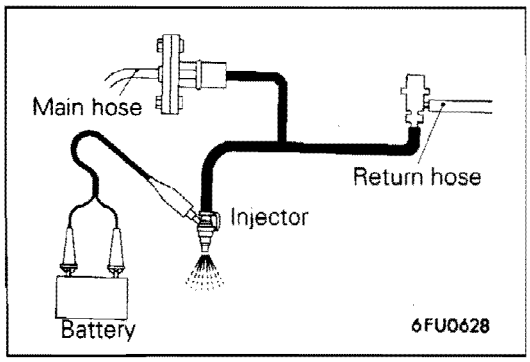
Checking the Injection Condition

1. Following the steps below, bleed out the residual pressure within the fuel pipe line to prevent flow of the fuel. (Refer to P.13A-123.)
2. Remove the injector.
3. Arrange the special tool (injector test set), adaptor, fuel pressure regulator and clips as shown in the illustration below.

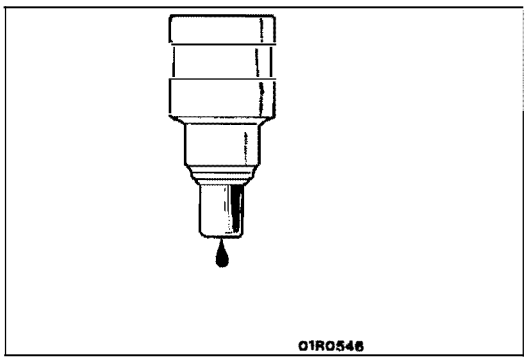




4. Connect the battery's negative (–) terminal.
5. Apply battery voltage to the fuel pump drive terminal (black) and activate the fuel pump.



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



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

   Standard value: 1 drop or less per minute

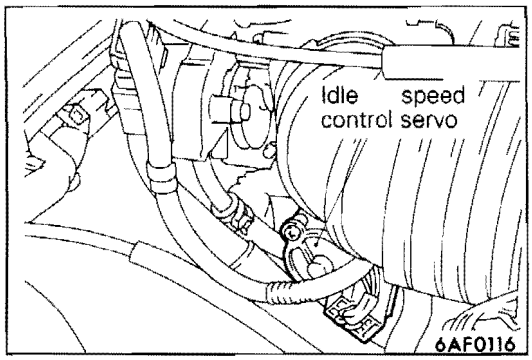
8. Activate the injector without activating the fuel pump; then, when the spray emission of fuel from the injector stops, disconnect the special tool and restore it to its original condition.

IDLE SPEED CONTROL (ISC) SERVO (DC MOTOR) INSPECTION <4G93, 4G63>

E13AG08AA

Use a sound scope to check if the sound of the idle speed control servo operating can be heard immediately after the ignition switch is turned to "ON".

NOTE
If the sound of the servo operating cannot be heard, check the motor drive circuit and the idle speed control servo motor.



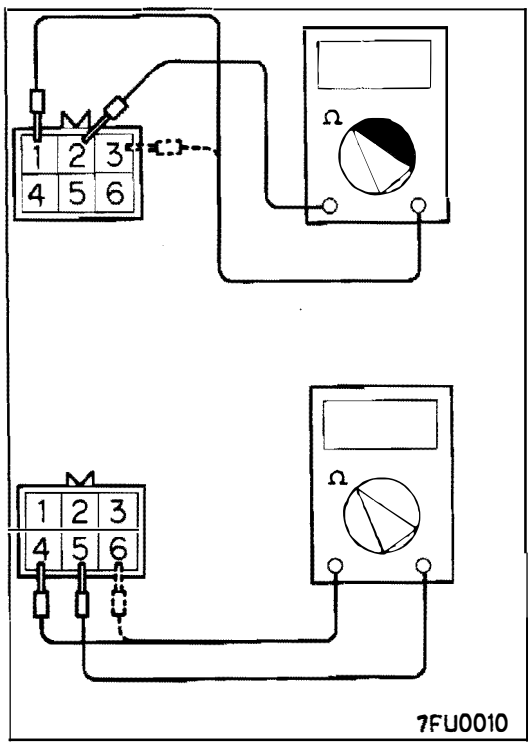
IDLE SPEED CONTROL (ISC) SERVO (STEPPER MOTOR) INSPECTION <6A12, 6G73>

E13AG08BA

Checking the Operation Sound

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

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

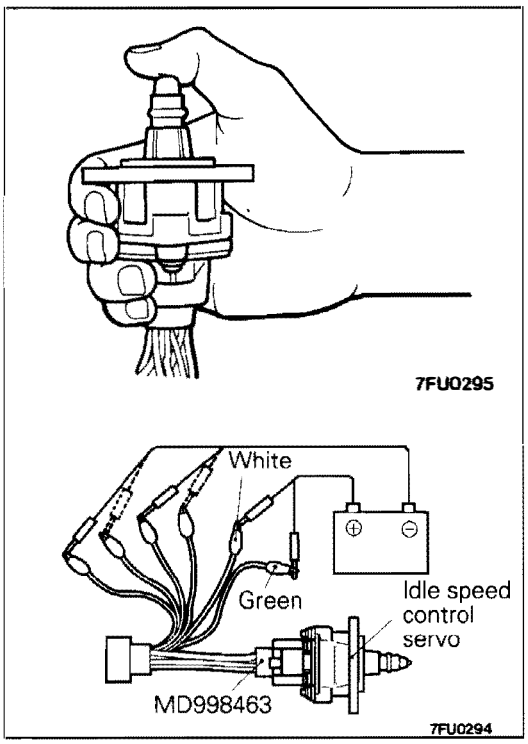


Checking the Coil Resistance

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

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

   Standard value: 28–33 Ω at 20°C



Operational Check

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

PURGE CONTROL SOLENOID VALVE INSPECTION

E13AG09AA

Refer to GROUP 17 – Evaporative Emission Control System.

EGR CONTROL SOLENOID VALVE INSPECTION

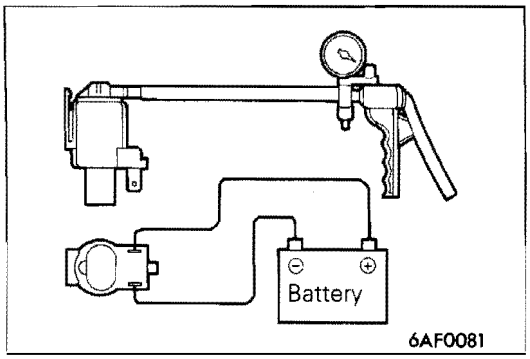
E13AG10AA

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

VENTILATION CONTROL SOLENOID VALVE INSPECTION <Vehicles with TCL> E13AG11AA

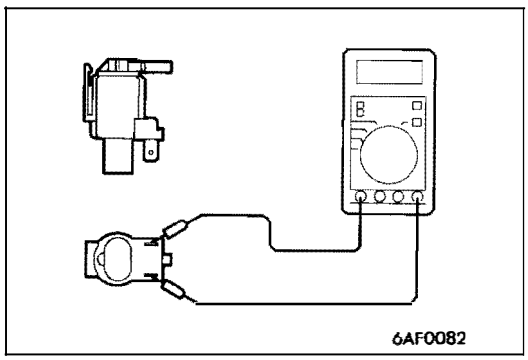
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

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



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

Battery voltage	Normal condition
Applied	Vacuum maintained
Not applied	Vacuum leaks



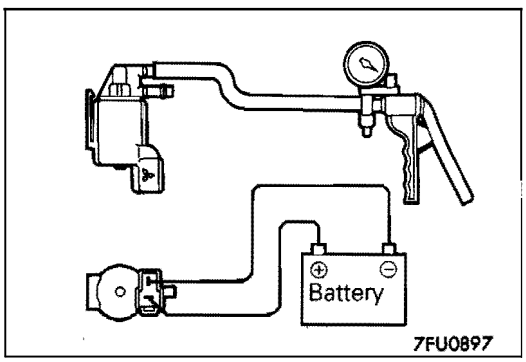
5. Measure the resistance between the terminals of the solenoid valve.

Standard value: 36–44 Ω (at 20°C)

VACUUM CONTROL SOLENOID VALVE INSPECTION <Vehicles with TCL> E13AG12AA

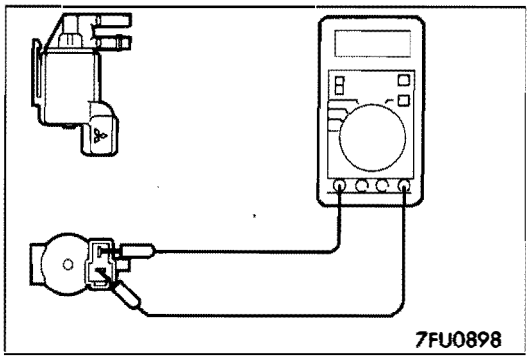
NOTE
When disconnecting the vacuum hose always make a mark so that it can be reconnected at orginal position.

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



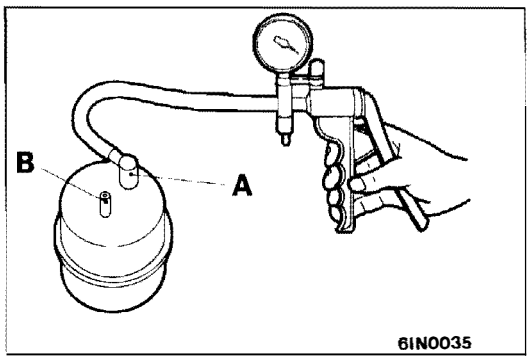
3. Connect a hand vacuum pump to the nipple to which the blue-striped vacuum hose was connected.
4. Check air-tightness by applying a vacuum with voltage applied directly from the battery to the solenoid valve and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained



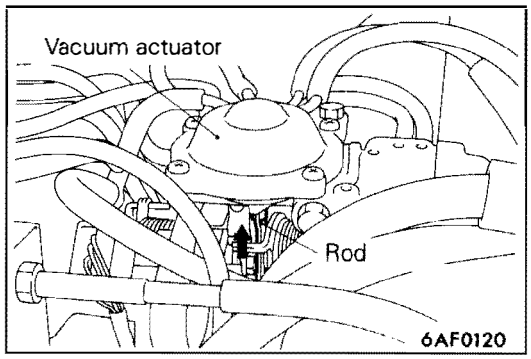
5. Measure the resistance between the terminals of the solenoid valve.

Standard value: 36–44 Ω (at 20°C)



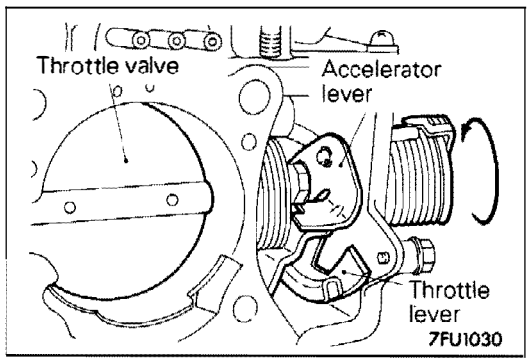
VACUUM TANK INSPECTION E13AG13AA

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



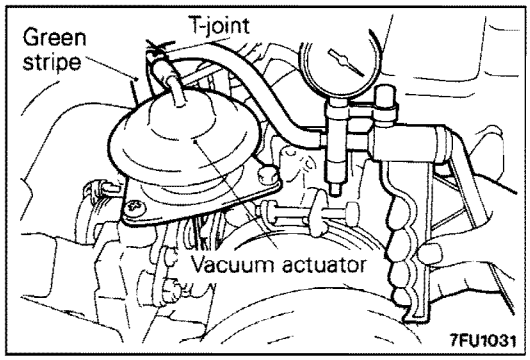
VACUUM ACTUATOR INSPECTION E13AG14AA

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



THROTTLE VALVE OPERATION CHECK E13AG15AA

1. Check that the throttle valve opens and closes smoothly (throttle lever moves) according to the opening and closing of the accelerator lever.
2. If the throttle valve does not open and close smoothly, there might be a deposit on the throttle valve, so clean the throttle body. (Refer to page 13A-115.)



NEGATIVE PRESSURE CHECK DURING TRACTION CONTROL OPERATION E13AG16AA

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

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

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

INJECTOR <4G9, 4G6>

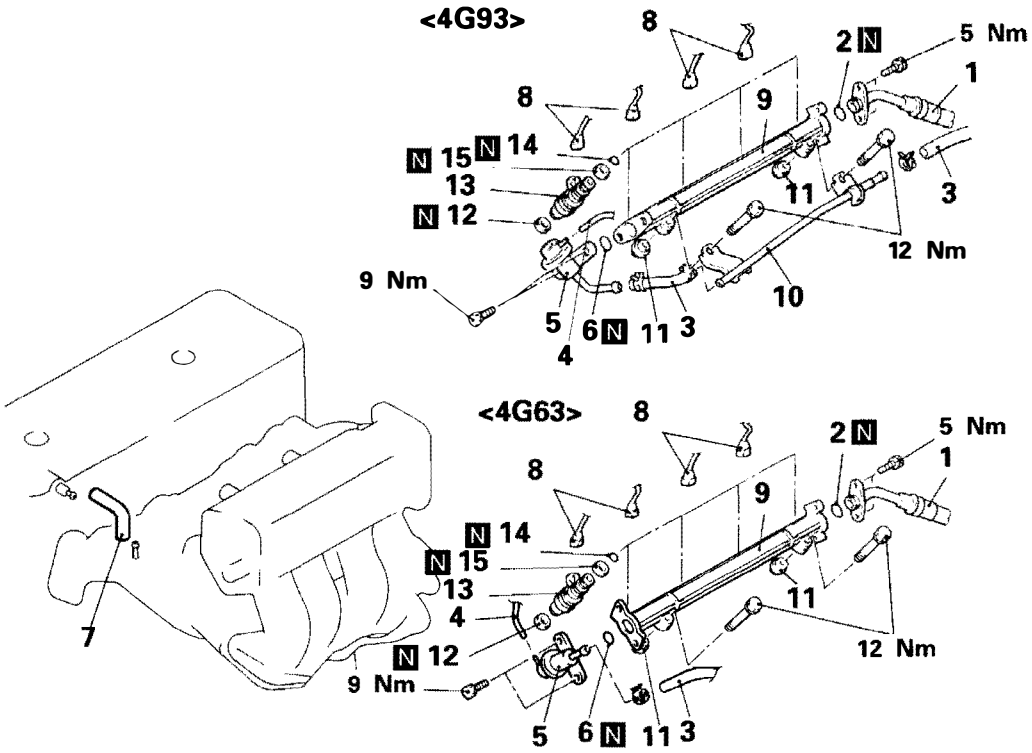
E13AH00AA

REMOVAL AND INSTALLATION

<4G93, 4G63>

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-124.)

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



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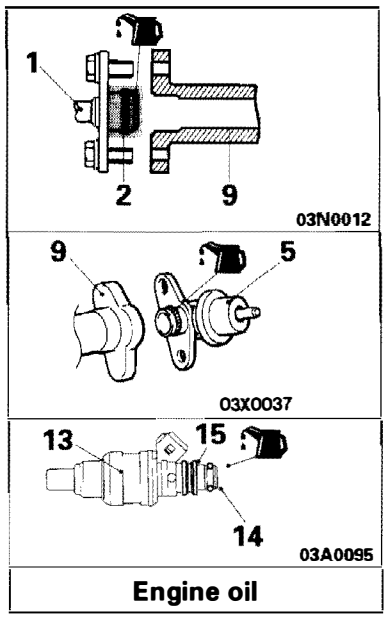


Engine oil

Removal steps

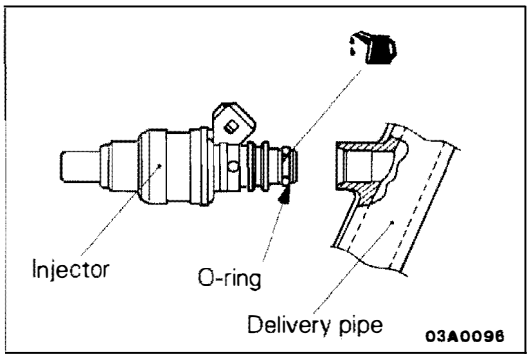
1. Fuel pressure hose connection
2. O-ring
3. Fuel return hose connection
4. Vacuum hose connection
◗B◖ 5. Fuel pressure regulator
6. O-ring
7. PCV hose
8. Injector connectors
◇A◇ 9. Delivery pipe
10. Return pipe <4G93>
11. Insulators
12. Insulators
◇A◇ ◗A◖ 13. Injectors
14. O-rings
15. Grommets

REMOVAL SERVICE POINTS E13AH01AA

◇A◇ DELIVERY PIPE / INJECTOR REMOVAL

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

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



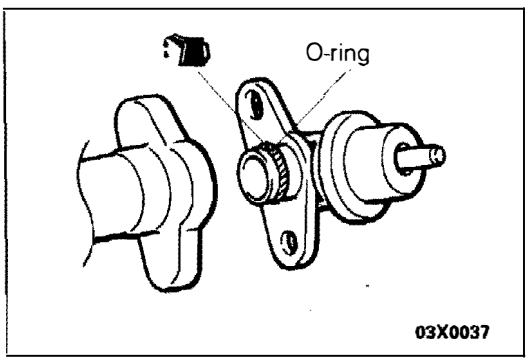
INSTALLATION SERVICE POINTS E13AH04AA

◆A◆ INJECTOR INSTALLATION

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

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

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



◆B◆ FUEL PRESSURE REGULATOR INSTALLATION

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

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

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

Specified tightening torque : 9 Nm

INJECTOR <6A1, 6G7>

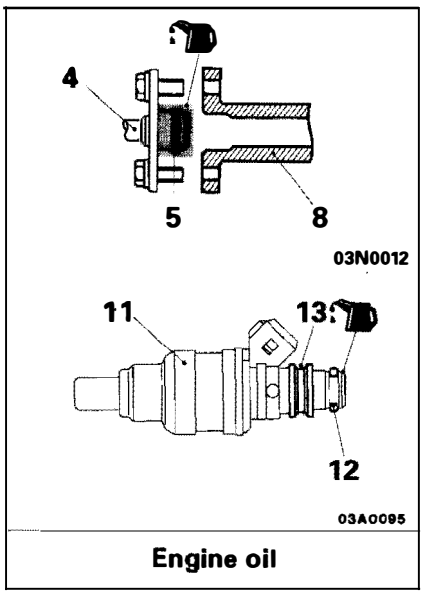
E13AH10AA

REMOVAL AND INSTALLATION

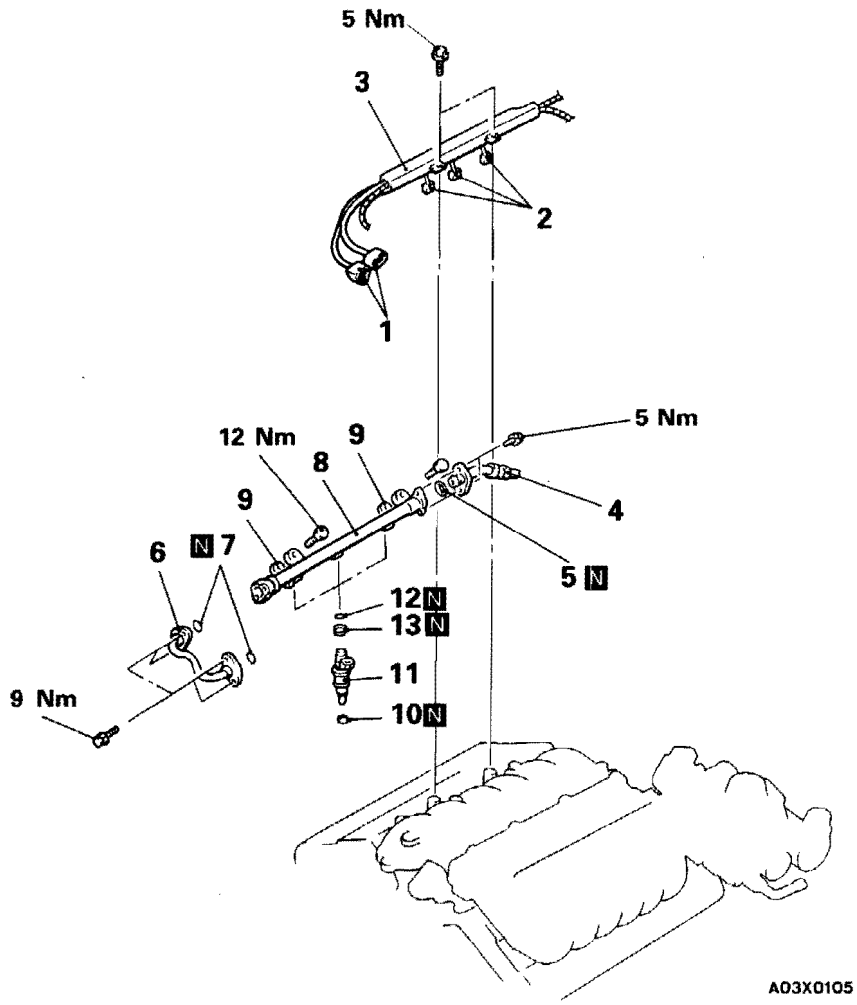
<6A12, 6G73 – Front bank side>

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-124.)

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



Engine oil



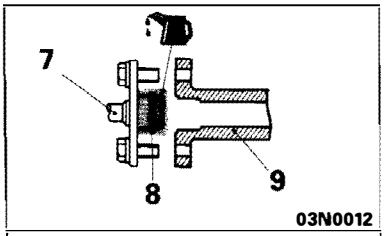
Removal steps

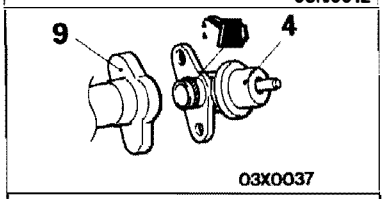
1. Crank angle sensor connector
2. Injector connectors
3. Control wiring harness
4. Fuel pressure hose connection
5. O-ring
6. Fuel pipe
7. O-rings
◇A◇ 8. Delivery pipe (Refer to P.13A-147.)
9. Insulators
10. Insulators
◇A◇ ▶A◀ 11. Injectors (Refer to P.13A-147.)
12. O-rings
13. Grommets

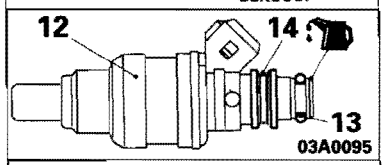
<6A12, 6G73 – Rear bank side>

Pre-removal Operation
- Fuel Discharge Prevention (Refer to P.13A-124.)

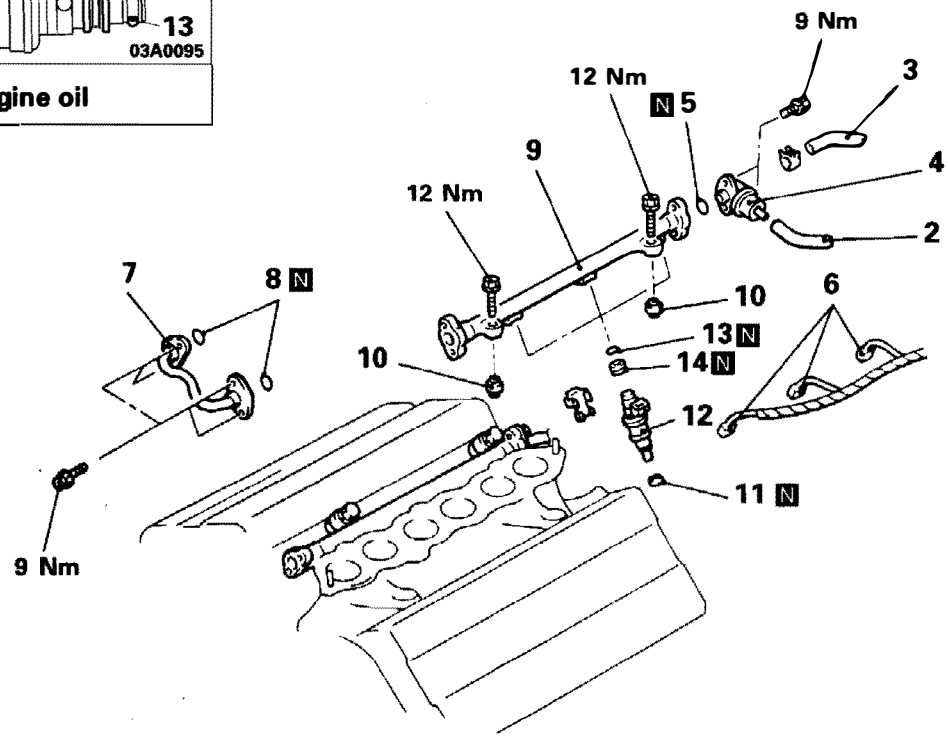
Post-installation Operation
(1) Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
(2) Fuel Leakage Inspection







Engine oil



Removal steps

1. Air intake plenum (Refer to GROUP 15 – Intake Manifold.)
2. Vacuum hose connection
3. Fuel return hose connection
◗B◖ 4. Fuel pressure regulator (Refer to P.13A-147.)
5. O-ring
6. Injector connectors
7. Fuel pipe
8. O-rings
◇A◇ 9. Delivery pipe (Refer to P.13A-147.)
10. Insulators
11. Insulators
◇A◇◗A◖ 12. Injectors (Refer to P.13A-147.)
13. O-rings
14. Grommets

DIESEL FUEL

CONTENTS

E13EA00AA

GENERAL INFORMATION

E13EB00AA

The fuel is drawn out of the fuel tank by means of the feed pump which is built into the fuel injection pump. It then passes through the fuel filter and is fed to the injection pump.
The fuel is pressurised by the feed pump, and this fuel pressure is controlled by the regulating valve which is built into the pump. Then, the fuel is compressed by the plunger and injected from the nozzles at high pressure in accordance with the injection sequence.
Engine speed (fuel injection amount) control is carried out by means of a centrifugal-type governor using a flyweight.
Fuel injection timing control is carried out by a hydraulic timer. The hydraulic timer operates by the fuel pressure inside the pump chamber. This pressure is controlled by the regulating valve.

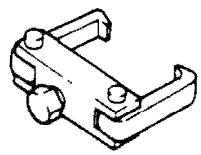
SERVICE SPECIFICATIONS

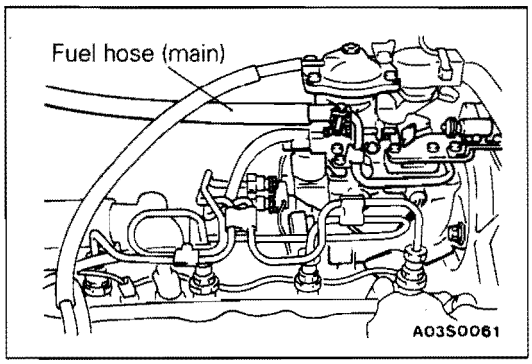
E13EC00AA

Items		Specifications
Fuel cut solenoid valve coil resistance	Ω	9–12
Fuel injection initial pressure	kPa	11,768–12,749

SPECIAL TOOL

E13ED00AA

Tool	Number	Name	Use
	MD998388	Injection pump sprocket puller	Removal of sprocket from drive shaft of injection pump



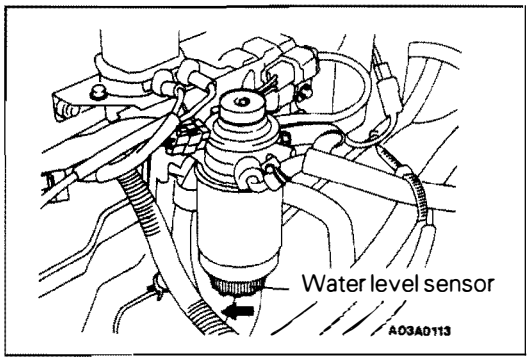
SERVICE ADJUSTMENT PROCEDURES

E13EF00AA

FUEL DISCHARGE PREVENTION

1. Remove the connection between the fuel hose (main) and the fuel injection pump.

   NOTE
   The fuel hose should be plugged.
2. Start the engine and let it run until it stops by itself.

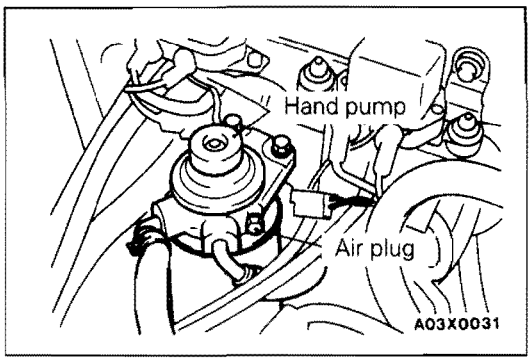


EVACUATION OF WATER FROM FUEL FILTER

E13EF01AA

Water is in the filter when fuel filter warning lamp lights. Evacuate water by the following procedures.

1. Loosen water level sensor
2. Drain water with hand pump. Finger-tighten drain plug.

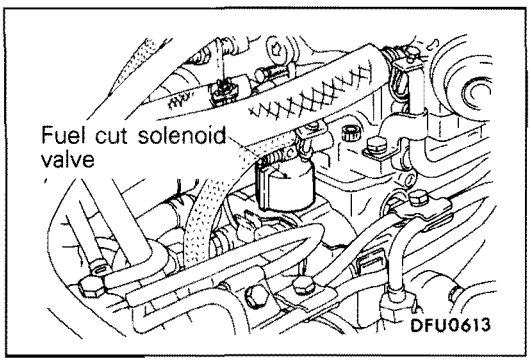


EVACUATION OF AIR FROM FUEL LINE E13EF02AA

Evacuate air after following services.

- When fuel is drained and re-filled for service.
- When fuel filter is replaced.
- When main fuel line is removed.

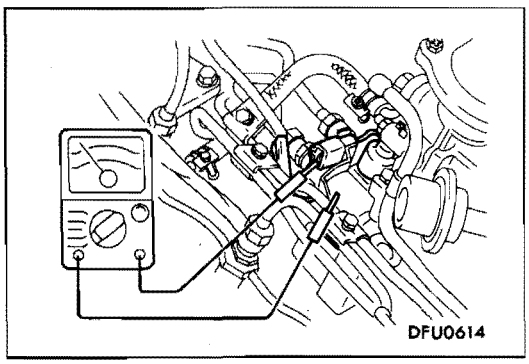
1. Loosen fuel filter air plug.
2. Place rags around air plug hole. Operate hand pump repeatedly until no bubbles come from plug hole. Tighten air plug.
3. Repeat until hand pump operation becomes stiff.



FUEL INJECTION PUMP INSPECTION E13EF03AA

INSPECTION OF FUEL CUT SOLENOID VALVE OPERATION

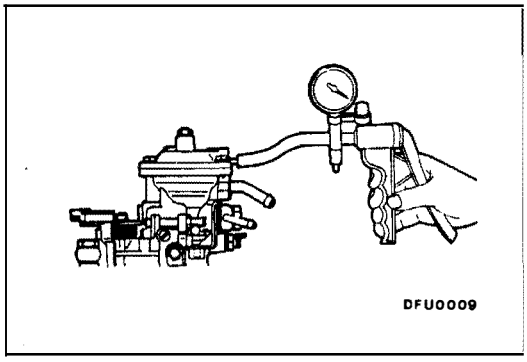
When a sound scope is held against the fuel cut solenoid valve and the ignition switch is turned to "ON", check that the sound of the valve operating can be heard.



INSPECTION OF FUEL CUT SOLENOID VALVE COIL RESISTANCE E13EF03BA

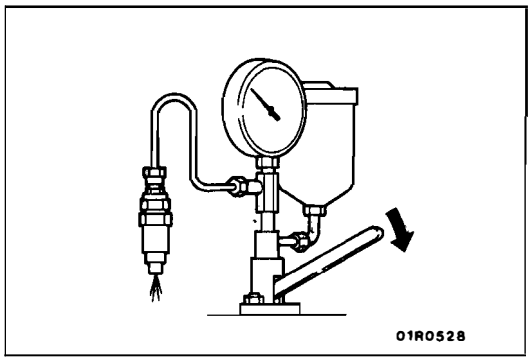
Measure the resistance between the fuel cut solenoid valve terminal and the ignition pump body.

Standard value: 9–12Ω



BOOST COMPENSATOR INSPECTION E13EF03CA

1. Connect a hand pump (pressurization type) to the nipple of the boost compensator.
2. Apply 30 kPa of pressure and check to be sure that the pressure is maintained.



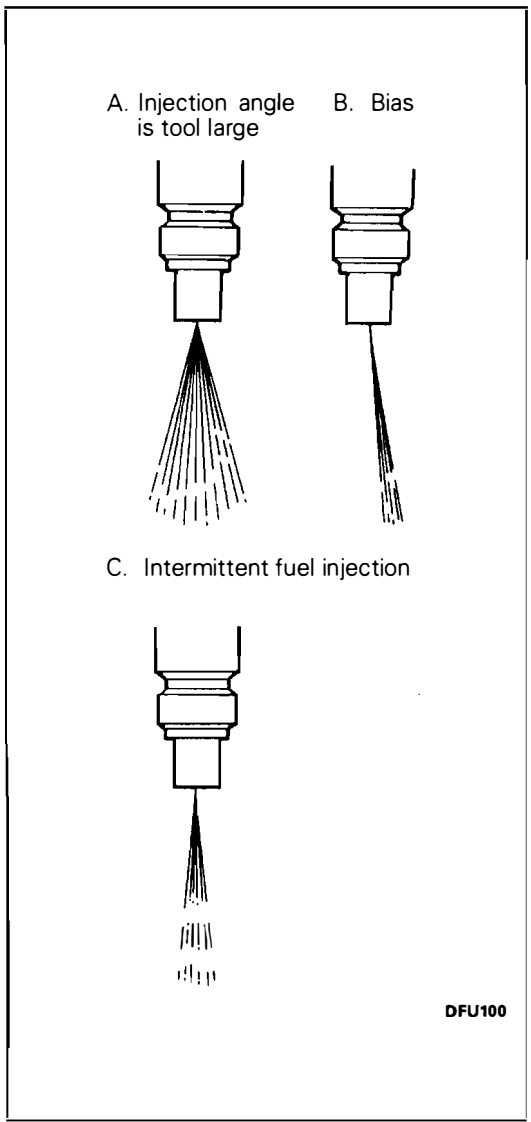
INJECTION NOZZLE INSPECTION AND ADJUSTMENT E13EF04AA

Caution
Never touch the injection spray that is injected from the nozzle.

FUEL INJECTION INITIAL PRESSURE INSPECTION

1. Install the injection nozzle to a nozzle tester.
2. Move the lever of the nozzle tester 2–3 times to inject fuel and to bleed the air.
3. Gently press down the lever of the nozzle tester, and take a reading of the indication value on the pressure gauge at the point where the needle slowly rises and then suddenly drops.

   Standard value (Fuel injection initial pressure): 11,768–12,749 kPa

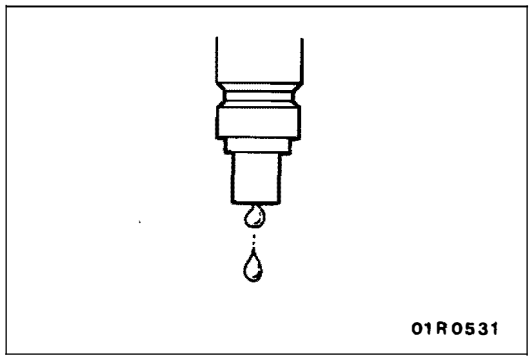


4. If the fuel injection initial pressure is outside the standard value, disassemble the nozzle holder to clean it, and then change the thickness of the shim to adjust the fuel injection initial pressure.

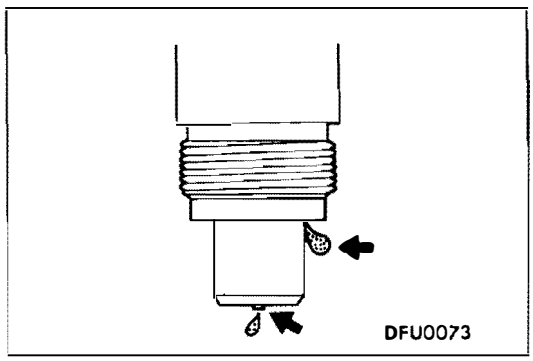
   NOTE
   1. For disassembly, reassembly and adjustment of the nozzle holder, refer to the Engine Workshop Manual.
   2. There are 11 shims for adjustment, with thicknesses in the range 1.20–1.70 mm.
   3. When the shim thickness is increased by 0.1 mm, the fuel injection initial pressure increases by 1,471 kPa.

INJECTION SPRAY CONDITION INSPECTION E13EF04BA

1. Move the lever of the nozzle tester rapidly (4–6 times per second) to eject the fuel continuously. Check to be sure that the injection spray comes out evenly in a cone shape (injection spray angle is 15°). The injection spray patterns shown in the illustration at left are wrong.



2. Check to be sure that no fuel drips after injection is completed.
3. If there are any drips, disassemble the nozzle, clean it and reinspect, or replace the nozzle.



NOZZLE FUEL-TIGHT INSPECTION E13EF04CA

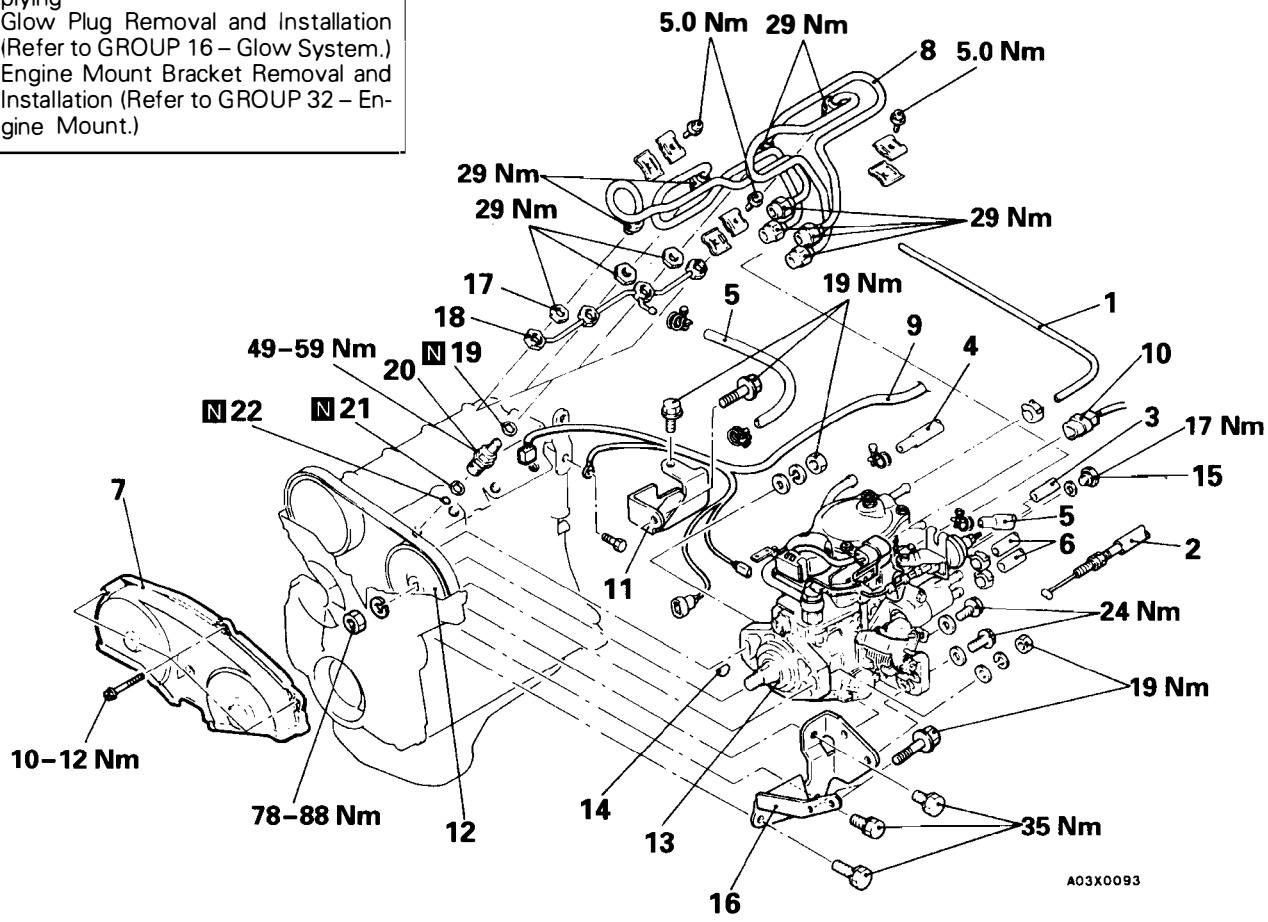
1. Gently raise the lever of the nozzle tester until the pressure inside the nozzle (value displayed on pressure gauge) becomes 9,870–10,787 kPa, and after holding this pressure for approximately 10 seconds, check to be sure that there are no fuel leaks from the nozzle.
2. If there are any leaks, disassemble the injection nozzle, clean it and re-inspect, or replace the nozzle.

FUEL INJECTION PUMP AND NOZZLE

E13EG00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
<Fuel Injection Pump>
(1) Engine Coolant Draining and Supplying
(2) Glow Plug Removal and Installation (Refer to GROUP 16 – Glow System.)
(3) Engine Mount Bracket Removal and Installation (Refer to GROUP 32 – Engine Mount.)



Fuel injection pump removal steps

- Accelerator cable adjustment (Refer to P.13F-8.)

1. Vacuum hose connection
2. Accelerator cable connection
3. Vacuum hose connection
4. Fuel main hose connection
5. Fuel return hose connection
6. Water hose connection
7. Timing belt upper cover

◇A◇ ◆D◆ 8. Fuel injection pipe

9. Fuel injection pump harness
10. Lever position sensor connector
11. Fuel injection pump stay upper

◇B◇ 12. Fuel injection pump sprocket

◇B◇ 13. Fuel injection pump

14. Key
15. Timing check plug
16. Fuel injection pump stay lower

Fuel injection nozzle removal steps

5. Fuel return hose connection

◇A◇ ◆D◆ 8. Fuel injection pipe

◇C◇ ◆C◆ 17. Nut

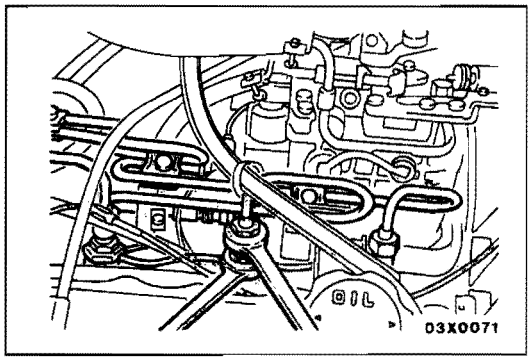
◇C◇ ◆C◆ 18. Fuel return pipe

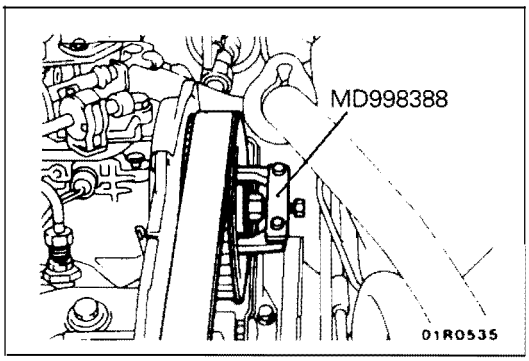
19. Fuel return pipe gasket

◇D◇ ◆B◆ 20. Fuel injection nozzle

◆A◆ 21. Holder gasket

◆A◆ 22. Nozzle gasket





REMOVAL SERVICE POINTS E13EG01AA

◇A◇ FUEL INJECTION PIPE REMOVAL

When loosening the nuts at both ends of the fuel injection pipe, use a spanner or similar tool to hole the connected component: the delivery holder (at the pump end) and the hexagonal nut of the fuel return pipe.

Caution
After disconnecting the injection pipe, be sure to use a plug so that foreign material, etc. does not get into the pump.

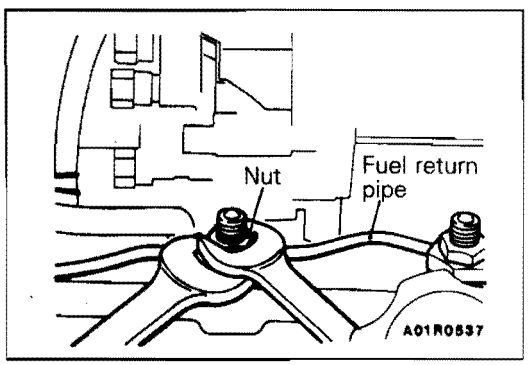
◇B◇ FUEL INJECTION PUMP SPROCKET/FUEL INJECTION PUMP REMOVAL

(1) After removing the nut, install the special too to the injection pump sprocket.
(2) Turn crankshaft clockwise to bring No. 1 cylinder piston to top dead center on compression stroke.
(3) Pull the injection pump sprocket off from the pump's drive shaft.
(4) Place the injection pump sprocket (with the timing belt attached) inside the timing belt front lower cover.

Caution
1. When removing the sprocket, care must be taken not to subject the pump drive shaft to an impact.
2. Take care not to apply excessive or unnecessary force (such as excessive twisting, bending, etc.) to the timing belt.
3. After removal, the crankshaft should not be turned.

(5) Remove the fuel injection pump.

Caution
When holding the injection pump, do not hold the accelerator lever or the fast idle lever.
Also, do not attempt to remove these levers, because to do so will result in a malfunction of the performance of the injection pump.

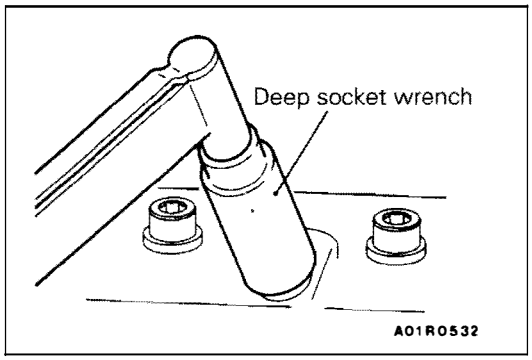


◇C◇ NUT/ FUEL RETURN PIPE REMOVAL

(1) While using a spanner or similar tool to hold the hexagonal nut of the fuel return pipe, remove the nut.

Caution
If an attempt is made to loosen the nut without first holding the fuel return pipe, the pipe may be broken or otherwise damaged.

(2) Disconnect the fuel return pipe.

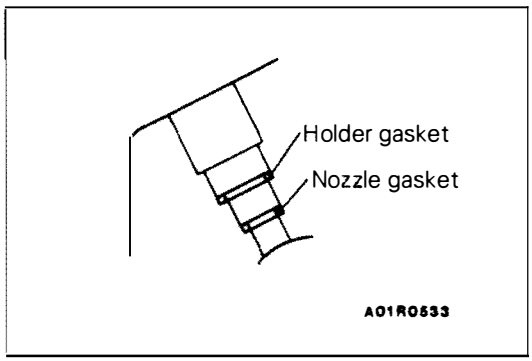


◇D◇ FUEL INJECTION NOZZLE REMOVAL

Using a deep socket wrench, remove the injection nozzle

Caution

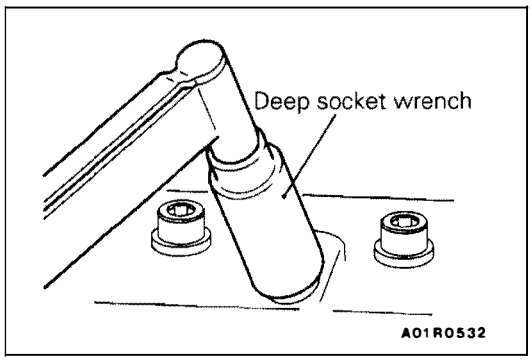
1. **Make a mark on the removed injection nozzle (the cylinder No.).**
2. **Use a cap to prevent foreign material, etc. from entering the injection nozzle hole.**



INSTALLATION SERVICE POINTS E13EG04AA

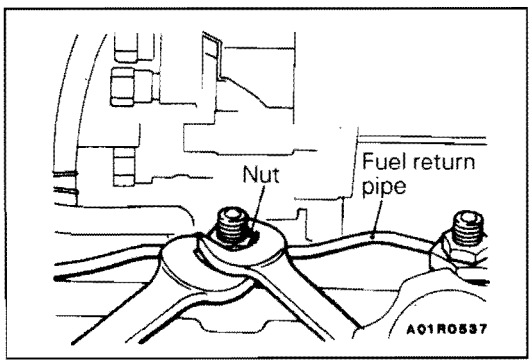
◆A◆ NOZZLE GASKET/HOLDER GASKET INSTALLATION

Clean the cylinder head's injection nozzle hole, and insert a new gasket.



◆B◆ FUEL INJECTION NOZZLE INSTALLATION

Using a deep-socket wrench, tighten the fuel injection nozzle at the specified torque.

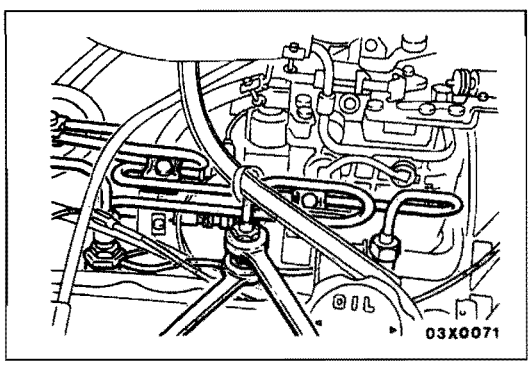


◆C◆ FUEL RETURN PIPE/NUT INSTALLATION

While holding the hexagonal nut of the fuel return pipe with a spanner or similar tool, tighten the nut at the specified torque.

Caution

If an attempt is made to tighten the nut without first holding the fuel return pipe, the pipe may be broken or otherwise damaged.



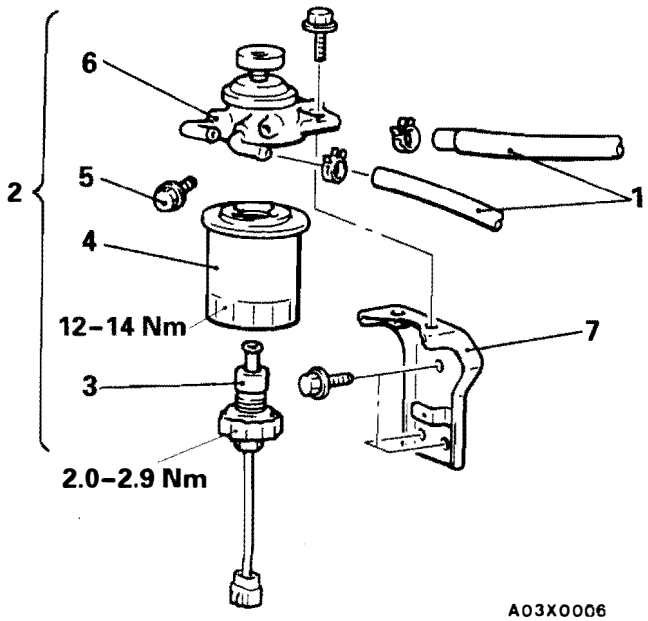
◆D◆ FUEL INJECTION PIPE INSTALLATION

When tightening the nuts at both ends of the fuel injection pipe, use a spanner or similar tool to hold the connected component: the delivery holder (at the pump end) and the hexagonal nut of the fuel return pipe, and tighten at the specified torque.

FUEL FILTER

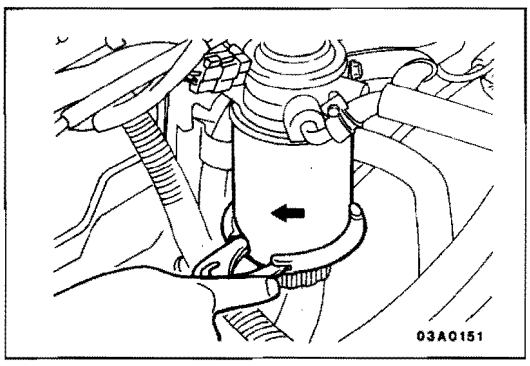
E13EH00AA

REMOVAL AND INSTALLATION



Removal steps

▶A◀ 1. Main hose connection
2. Fuel filter
3. Water level sensor
4. Fuel filter cartridge
5. Breather screw
6. Fuel filter pump
7. Fuel filter bracket



INSPECTION

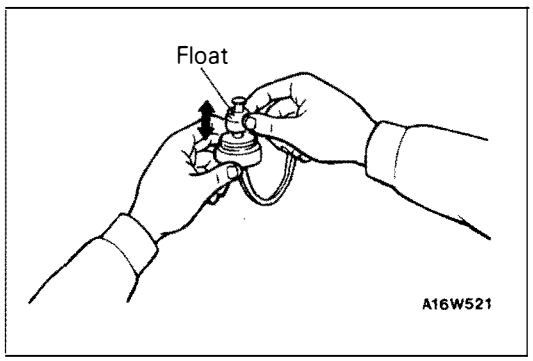
E13EH02AA

FUEL FILTER REPLACEMENT

(1) Remove the fuel tank cap to release the pressure inside the fuel tank.
(2) Disconnect the water level sensor connector.
(3) Use an oil filter wrench to remove the fuel filter cartridge from the fuel filter pump body.

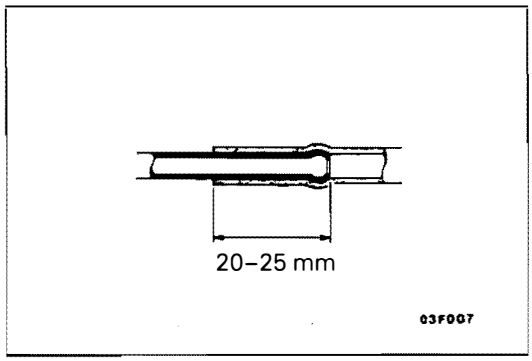
Caution
Cover with a rag to prevent fuel from spraying out.

(4) After installing a new filter, bleed all air from the fuel line.
(5) Start the engine, and check that there are no fuel leakages.



WATER LEVEL SENSOR E13EH02BA

Connect the circuit tester to the water level sensor connector. The water level sensor is operating correctly if there is continuity when the float is raised and no continuity when it is lowered.



INSTALLATION SERVICE POINT E13EH04AA

◆A◆ FUEL MAIN HOSE INSTALLATION

If the pipe has a stepped part, connect securely up to the stepped part. If the pipe has no stepped part, insert so that the inserted portion is 20–25 mm long.

FUEL SUPPLY AND ENGINE CONTROL

CONTENTS

E13FA00AA

 PWDE9211

FUEL TANK

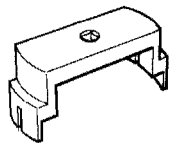
E13FB00AA

GENERAL INFORMATION

(1) The fuel tank is located under the floor of the rear seats to provide increased safety and a wider luggage space.
(2) A fuel cut-off valve has been adopted to prevent fuel from leaking out in the event of a collision.
(3) A plastic fuel tank has been adopted in 4WD vehicles to reduce weight, increase tank capacity and improve anti-corrosion effectiveness.

SPECIAL TOOL

E13FD00AA

Tool	Number	Name	Use
	MB991480	Tank cap wrench	Installation of tank cap <4WD>

FUEL TANK

E13FG00AB

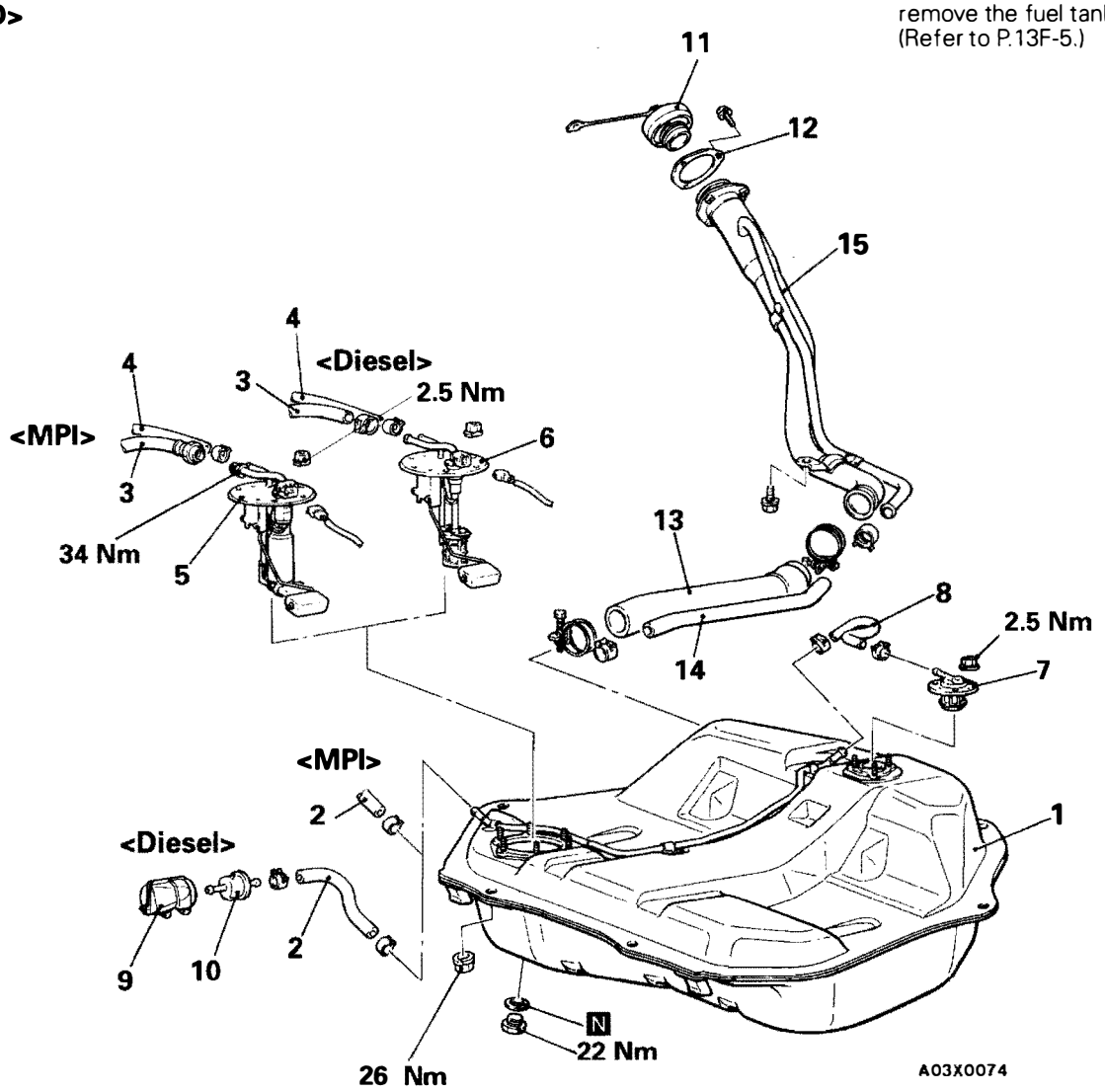
REMOVAL AND INSTALLATION (Up to 1993 models)

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

Post-installation Operation
- Refilling the Fuel.
- Checking for Fuel Leaks

NOTE
When replacing the fuel gauge unit and pump assembly or the fuel gauge unit and pipe assembly only, it is possible to work from the service holes underneath the rear seat cushion without having to remove the fuel tank.
(Refer to P.13F-5.)

<2WD>



Removal steps

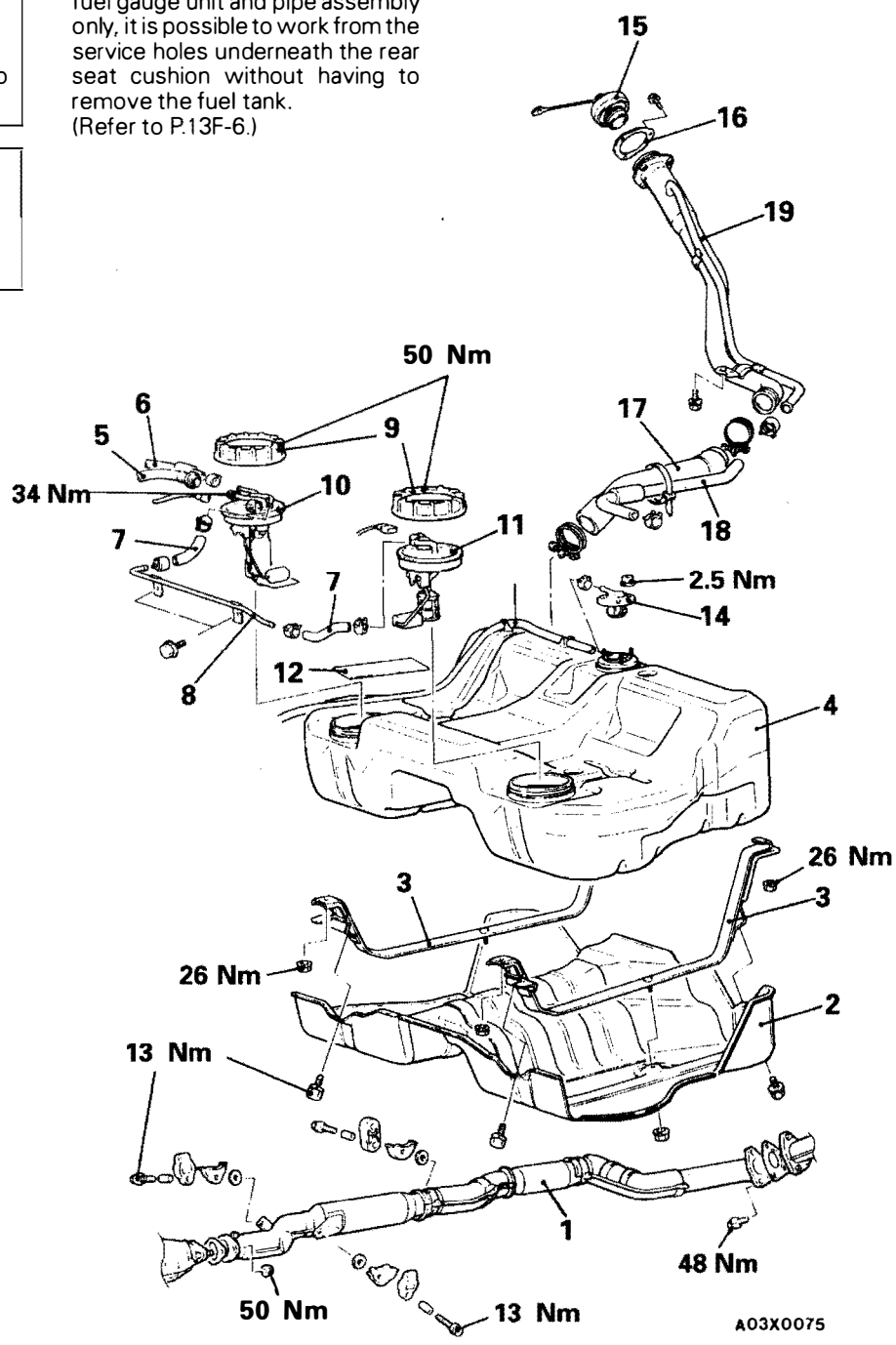
1. Fuel tank
2. Vapor hose
3. High-pressure fuel hose
4. Return hose
5. Fuel gauge unit and pump assembly
6. Fuel gauge unit and pipe assembly
7. Fuel cut-off valve assembly
8. Vapor hose
9. Breather case
10. 2-way valve
11. Fuel filler cap
12. Packing
13. Filler hose
14. Vapor hose
15. Fuel filler neck assembly

<4WD>

Pre-removal Operation
- Draining the Fuel.
- Reduce the Inner Pressure of Fuel Line and Hose. (Refer to GROUP 13A – Service Adjustment Procedures.)
- Removal of Propeller Shaft. (Refer to GROUP 25 – Propeller Shaft.)

Post-installation Operation
- Installation of Propeller Shaft. (Refer to GROUP 25 – Propeller Shaft.)
- Refilling the Fuel.
- Checking for Fuel Leaks.

NOTE
When replacing the fuel gauge unit and pump assembly or the fuel gauge unit and pipe assembly only, it is possible to work from the service holes underneath the rear seat cushion without having to remove the fuel tank.
(Refer to P.13F-6.)



Removal Steps

1. Center exhaust pipe
2. Protector
3. Band
4. Fuel tank
5. High-pressure fuel hose
6. Return hose
7. Suction hose
8. Pipe
◆A◆ 9. Cap
10. Fuel gauge unit and pump assembly
11. Fuel gauge unit and pipe assembly
12. Tape
13. Vapor hose
14. Fuel cut-off valve assembly
15. Fuel filler cap
16. Packing
17. Filler hose
18. Vapor hose
19. Fuel filler neck assembly

REMOVAL AND INSTALLATION (From 1994 models)

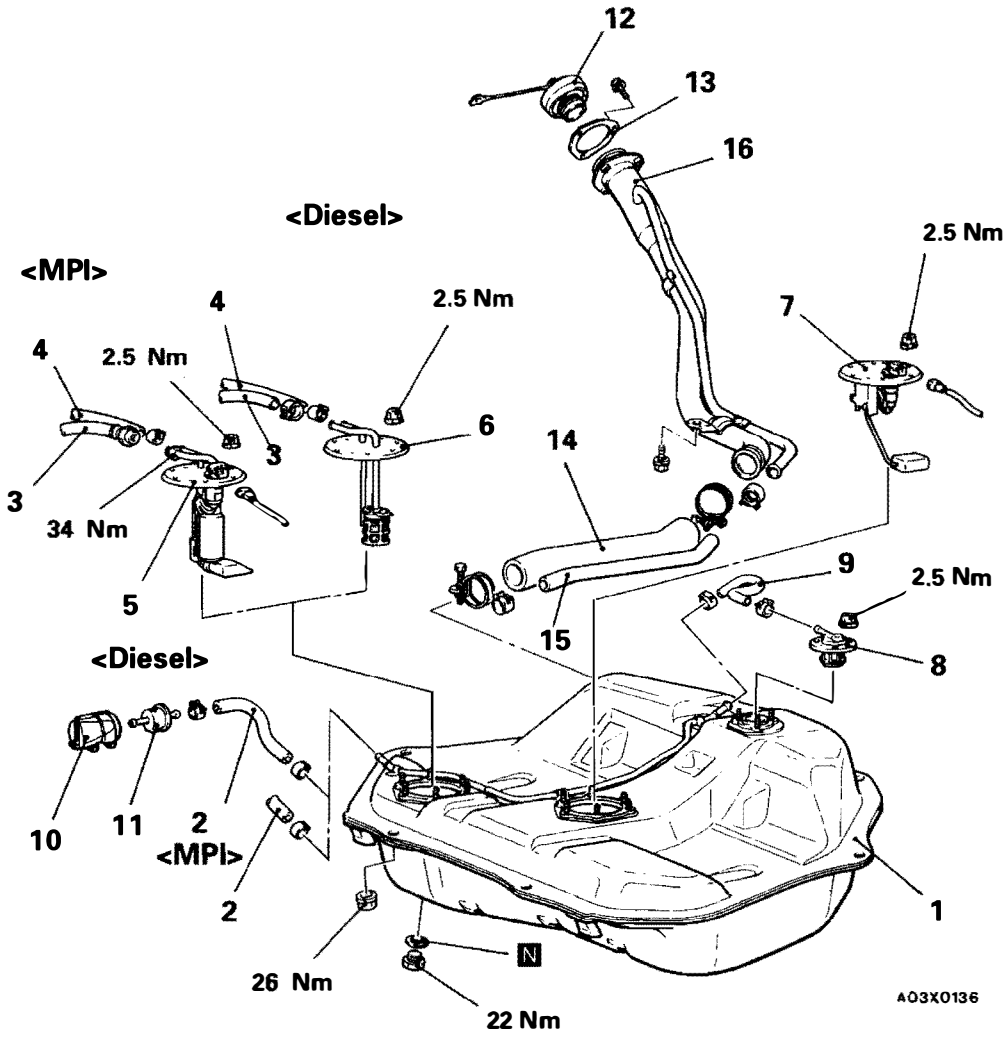
E13FG00AC

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

Post-installation Operation
- Refilling the Fuel.
- Checking for Fuel Leaks

NOTE
When replacing the fuel gauge unit, the pump assembly or the pipe assembly only, it is possible to work from the service holes underneath the rear seat cushion without having to remove the fuel tank.
(Refer to P.13F-5.)

<2WD>



Removal steps

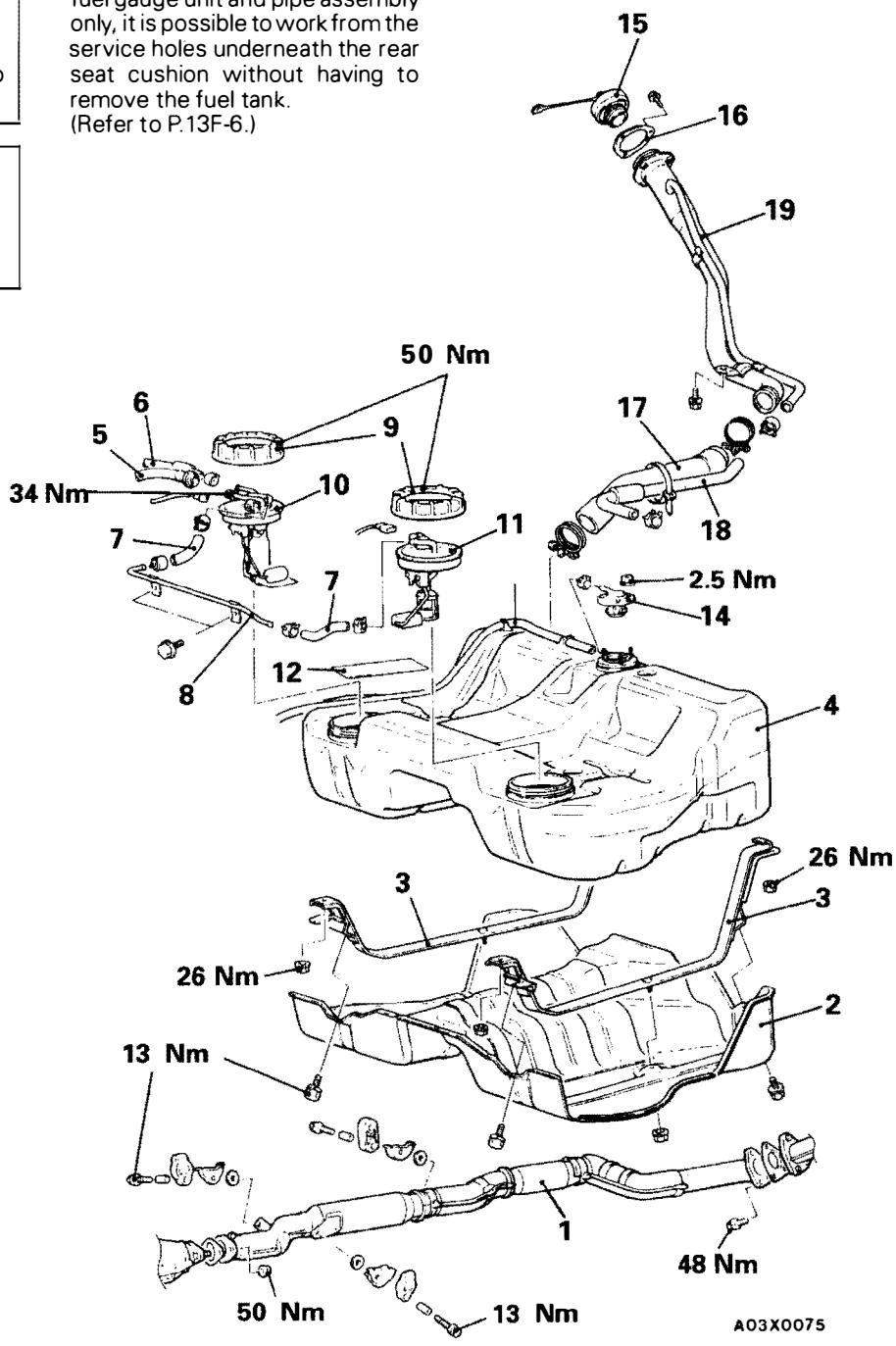
1. Fuel tank
2. Vapor hose
3. High-pressure fuel hose
4. Return hose
5. Pump assembly
6. Pipe assembly
7. Fuel gauge unit assembly
8. Fuel cut-off valve assembly
9. Vapor hose
10. Breather case
11. 2-way valve
12. Fuel filler cap
13. Packing
14. Filler hose
15. Vapor hose
16. Fuel filler neck assembly

<4WD>

Pre-removal Operation
- Draining the Fuel.
- Reduce the Inner Pressure of Fuel Line and Hose. (Refer to GROUP 13A – Service Adjustment Procedures.)
- Removal of Propeller Shaft. (Refer to GROUP 25 – Propeller Shaft.)

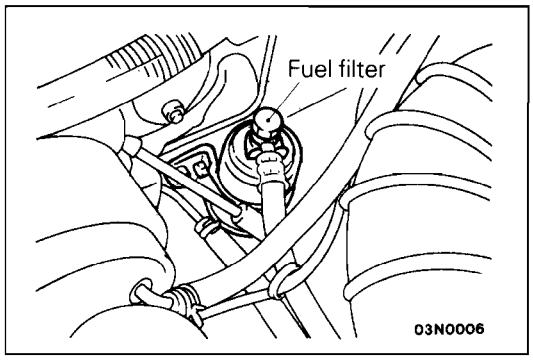
Post-installation Operation
- Installation of Propeller Shaft. (Refer to GROUP 25 – Propeller Shaft.)
- Refilling the Fuel.
- Checking for Fuel Leaks.

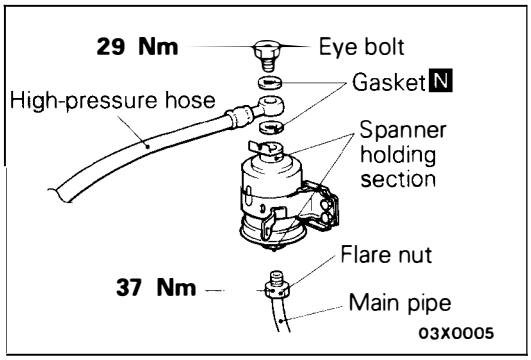
NOTE
When replacing the fuel gauge unit and pump assembly or the fuel gauge unit and pipe assembly only, it is possible to work from the service holes underneath the rear seat cushion without having to remove the fuel tank.
(Refer to P.13F-6.)

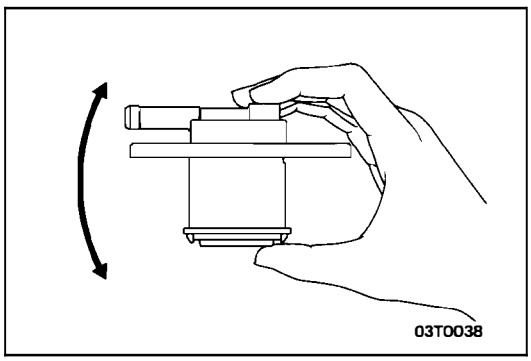


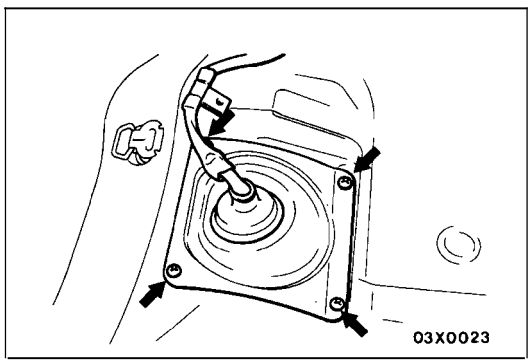
Removal Steps

1. Center exhaust pipe
2. Protector
3. Band
4. Fuel tank
5. High-pressure fuel hose
6. Return hose
7. Suction hose
8. Pipe
◆A◆ 9. Cap
10. Fuel gauge unit and pump assembly
11. Fuel gauge unit and pipe assembly
12. Tape
13. Vapor hose
14. Fuel cut-off valve assembly
15. Fuel filler cap
16. Packing
17. Filler hose
18. Vapor hose
19. Fuel filler neck assembly









INSPECTION (Up to 1993 models) E13FG02AB

FUEL FILTER REPLACEMENT <MPI>

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

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

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

FUEL CUT OFF VALVE E13FG02BA

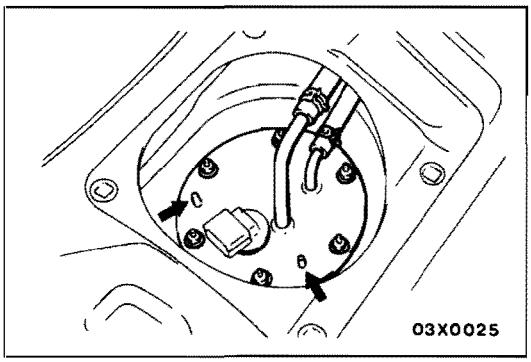
If the sound of the float valve moving (knocking sound) can be heard when the valve assembly is gently shaken up and down, then the valve is okay.

FUEL GAUGE UNIT AND PIPE ASSEMBLY REPLACEMENT E13FG02CA

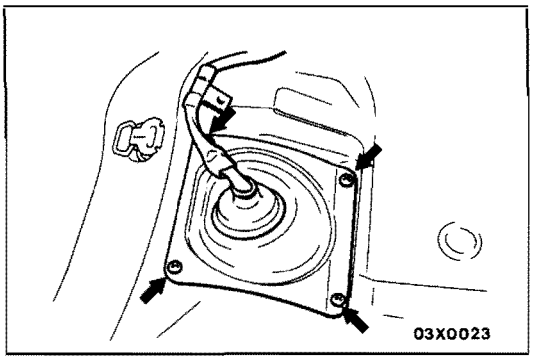
<2WD-Diesel>

(1) Remove the rear seat cushion: (Refer to GROUP 52A – Seat.)
(2) Remove the protector.
(3) Disconnect the connector from the fuel gauge unit and pipe assembly, and then remove the main hose from the pipe.
(4) Remove the mounting nut and then remove the fuel gauge unit and pipe assembly.
(5) When installing the fuel gauge unit and pipe assembly, tilt the float at the end to the left and insert into the fuel tank.

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



(6) Align the packing positioning projections (locations indicated by arrows) with the holes in the fuel gauge unit and pipe assembly to position the packing.



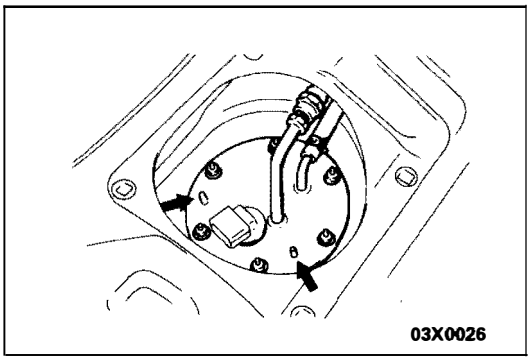
FUEL GAUGE UNIT AND PUMP ASSEMBLY REPLACEMENT

E13FG02DA

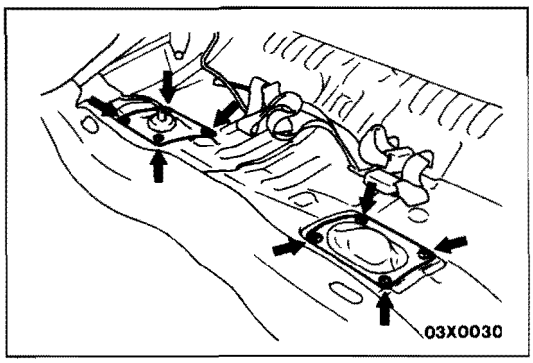
<2WD-MPI>

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

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



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



<4WD>

E13FG02DB

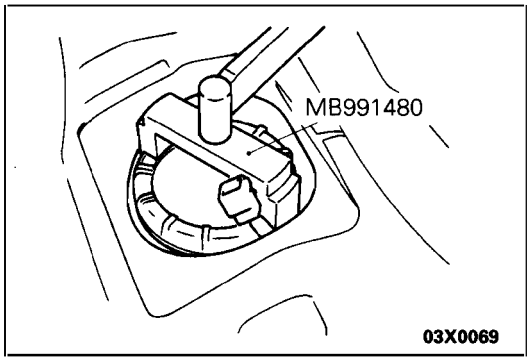
(1) Remove the rear seat cushion. (Refer to GROUP 52A – Seat.)
(2) Remove the protector.
(3) Bleed the residual pressure from inside the fuel pipe line to prevent the fuel from spraying out. (Refer to GROUP 13A – Service Adjustment Procedures.)
(4) Disconnect the hose and connector connections, and then remove the fuel gauge unit and pump assembly.

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

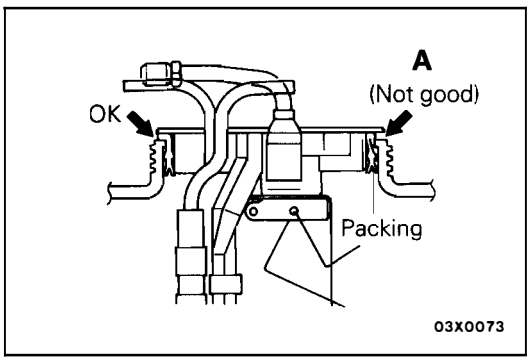
NOTE
If the packing is damaged or deformed, replace with new packing.

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

Caution
Do not tilt the fuel gauge unit and pump assembly when installing.



(7) After applying soapy water to the outside thread of the fuel tank, install the cap and use the special tool to tighten it to the specified torque.

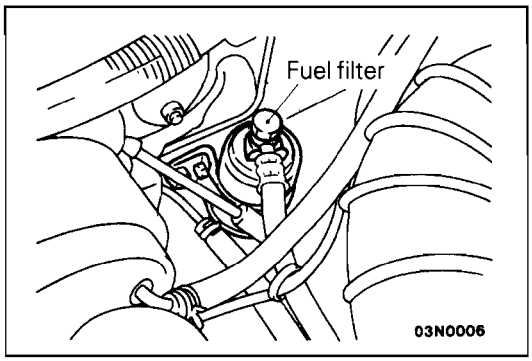


Caution
The packing should not be folded over as shown by (A) in the illustration.

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

FUEL GAUGE INSPECTION E13FG02EA

Refer to GROUP 54 – Combination Meter.

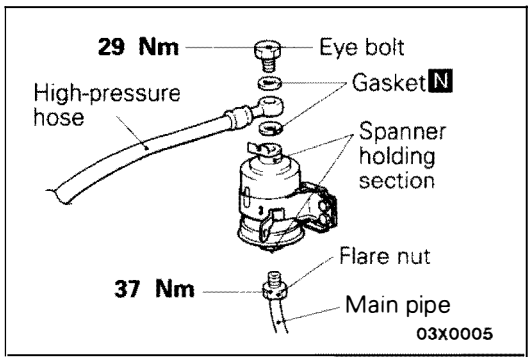


INSPECTION (From 1994 models) E13FG02AC

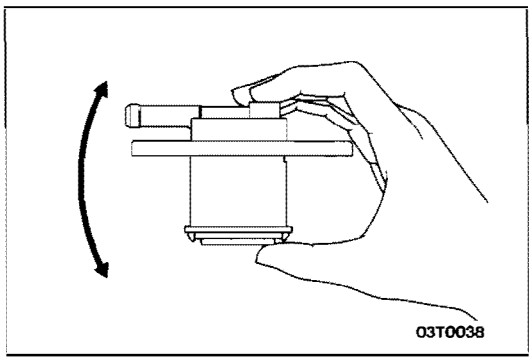
FUEL FILTER REPLACEMENT <MPI>

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

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

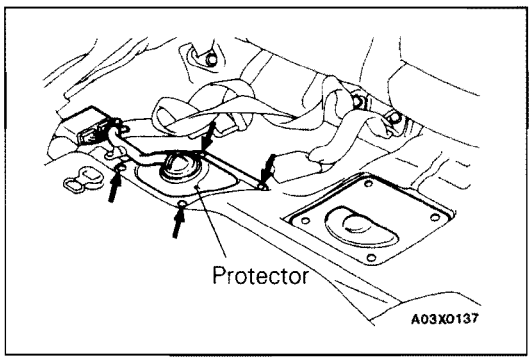


(4) Hold the fuel filter with a spanner and loosen the flare nut. Then disconnect the main pipe connection.
(5) Remove the fuel filter.
(6) When installing the fuel filter, use a new gasket, and tighten the flare nut of the high-presure hose and the main pipe to the specified torque.
(7) After installation,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



FUEL CUT OFF VALVE E13FG02BA

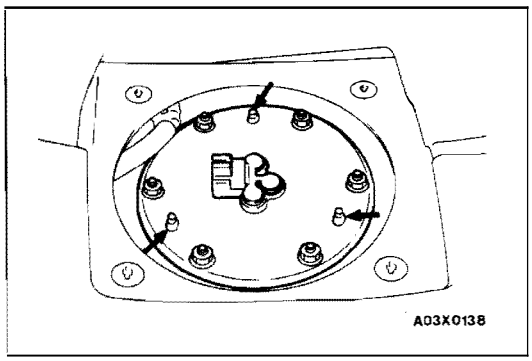
If the sound of the float valve moving (knocking sound) can be heard when the valve assembly is gently shaken up and down, then the valve is okay.



FUEL GAUGE UNIT ASSEMBLY REPLACEMENT E13FG02DB

<2WD>

<2WD>
(1) Remove the rear seat cushion: (Refer to GROUP 52A – Seat.)
(2) Remove the protector.
(3) Disconnect the connector from the fuel gauge unit.

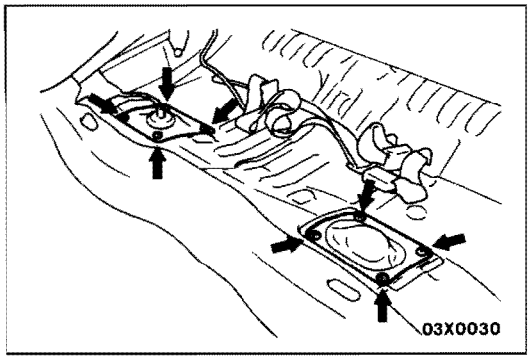


(4) Remove the mounting nut and then remove the fuel gauge unit.
(5) When installing the fuel gauge unit, tilt the float at the end to the left and insert into the fuel tank.

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

(6) Align the packing positioning projections (locations indicated by arrows) with the holes in the fuel gauge unit.

<4WD> E13FG02DB



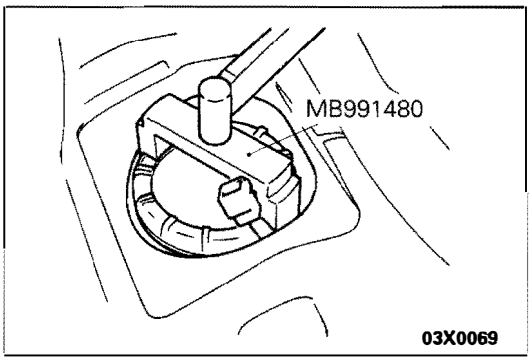
(1) Remove the rear seat cushion. (Refer to GROUP 52A – Seat.)
(2) Remove the protector.
(3) Bleed the residual pressure from inside the fuel pipe line to prevent the fuel from spraying out. (Refer to GROUP 13A – Service Adjustment Procedures.)
(4) Disconnect the hose and connector connections, and then remove the fuel gauge unit and pump assembly.

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

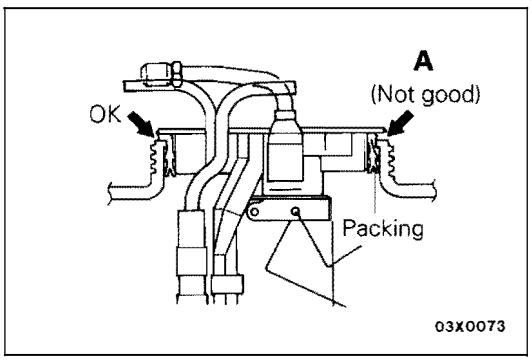
NOTE
If the packing is damaged or deformed, replace with new packing.

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

Caution
Do not tilt the fuel gauge unit and pump assembly when installing.



(7) After applying soapy water to the outside thread of the fuel tank, install the cap and use the special tool to tighten it to the specified torque.

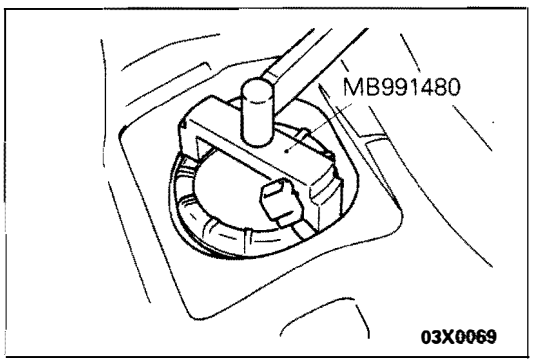


Caution
The packing should not be folded over as shown by (A) in the illustration.

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

FUEL GAUGE INSPECTION E13FG02EA

Refer to GROUP 54 – Combination Meter.



INSTALLATION SERVICE POINT E13FG04AA

◆A◆ CAP INSTALLATION

ACCELERATOR CABLE AND PEDAL

E13FB01AA

GENERAL INFORMATION

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

SERVICE SPECIFICATIONS

E13FC01AA

Items	Specifications
Standard value	
Accelerator cable play mm	
<4G93, 4G63, 6A12, 6G73, 4D68-M/T>	1–2
<4D68-A/T>	3–5

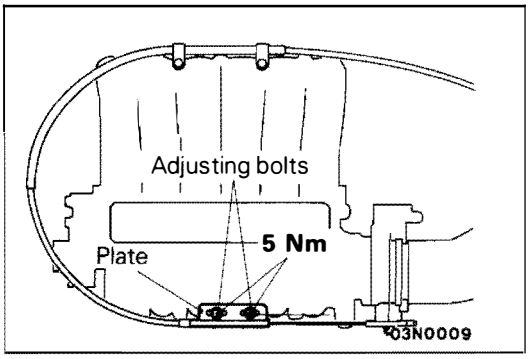
SERVICE ADJUSTMENT PROCEDURES

E13FF00AA

ACCELERATOR CABLE INSPECTION AND ADJUSTMENT

<MPI>

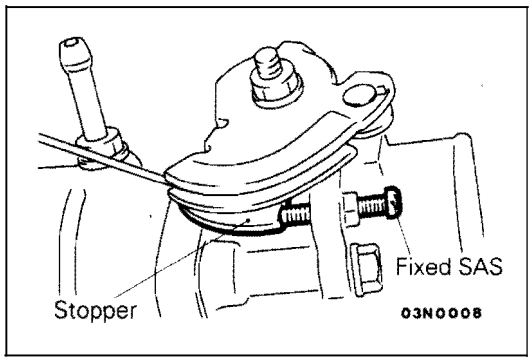
1. Turn A/C and lamps OFF.
   Inspect and adjust at no load.
2. Warm engine until stabilized at idle.
3. Confirm idle speed is at prescribed r/min.
4. Stop engine (ignition switch OFF).
5. Confirm there are no sharp bends in accelerator cable.
6. Check inner cable for correct slack.
7. If there is too much slack or no slack, adjust play by the following procedures.
   (1) Turn the ignition switch to the ON position (without starting the engine) and leave in that condition for approximately 15 seconds in order to initialize the ISC motor.



(2) Loosen the adjusting bolt to release the cable.
(3) After moving the plate to the position immediately before the throttle lever starts to move, move the plate back towards the throttle body by the standard value amount only to bring the accelerator cable play to the standard value.

Standard value: 1–2 mm

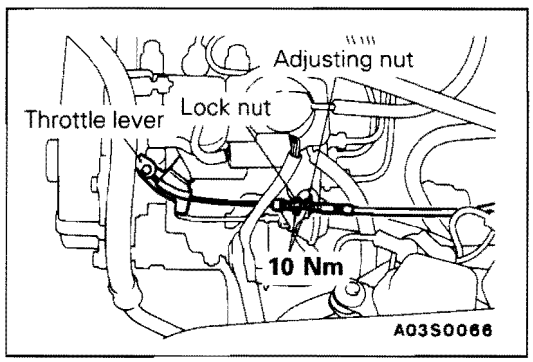
(4) Tighten the adjusting bolts to the specified torque.



8. Adjust accelerator cable play and confirm throttle lever stopper touches the fixed SAS.

<Diesel> E13FF00BA

1. Turn the A/C and all lamps OFF so that there is no electrical load when inspecting.
2. Warm the engine until the engine idling speed becomes stable.
3. Check that the engine idling speed is at the specified value.
4. Stop the engine and turn the ignition switch to OFF.
5. Check that there are no sharp bends in the accelerator cable.
6. Check the amount of play in the inner cable.



7. If there is excessive play in the inner cable.
   (1) Loosen the adjusting nut and fully close the throttle lever.
   (2) Tighten the adjusting nut until immediately before the throttle lever starts to move.
   (3) By loosening the adjusting nut one turn for vehicles with M/T and three turns for vehicles with A/T, the accelerator cable play will be brought to the standard value.

   Standard value: <M/T> 1–2 mm
   <A/T> 3–5 mm

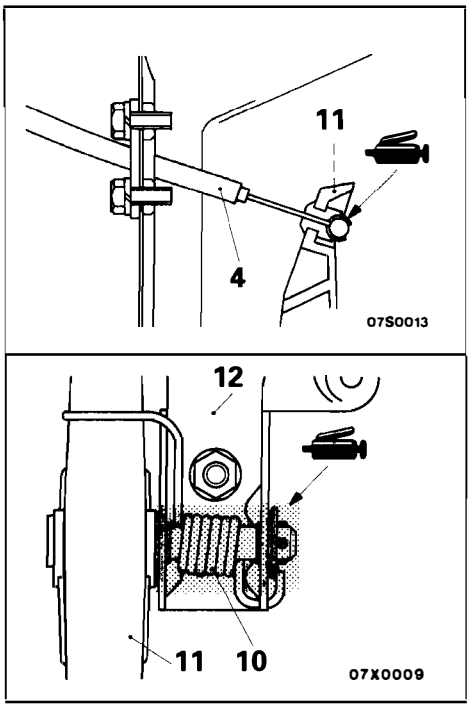
   (4) Fix the adjusting nut with the lock nut.
   (5) After adjusting, check that the throttle lever is touching the idle adjusting screw (stopper).

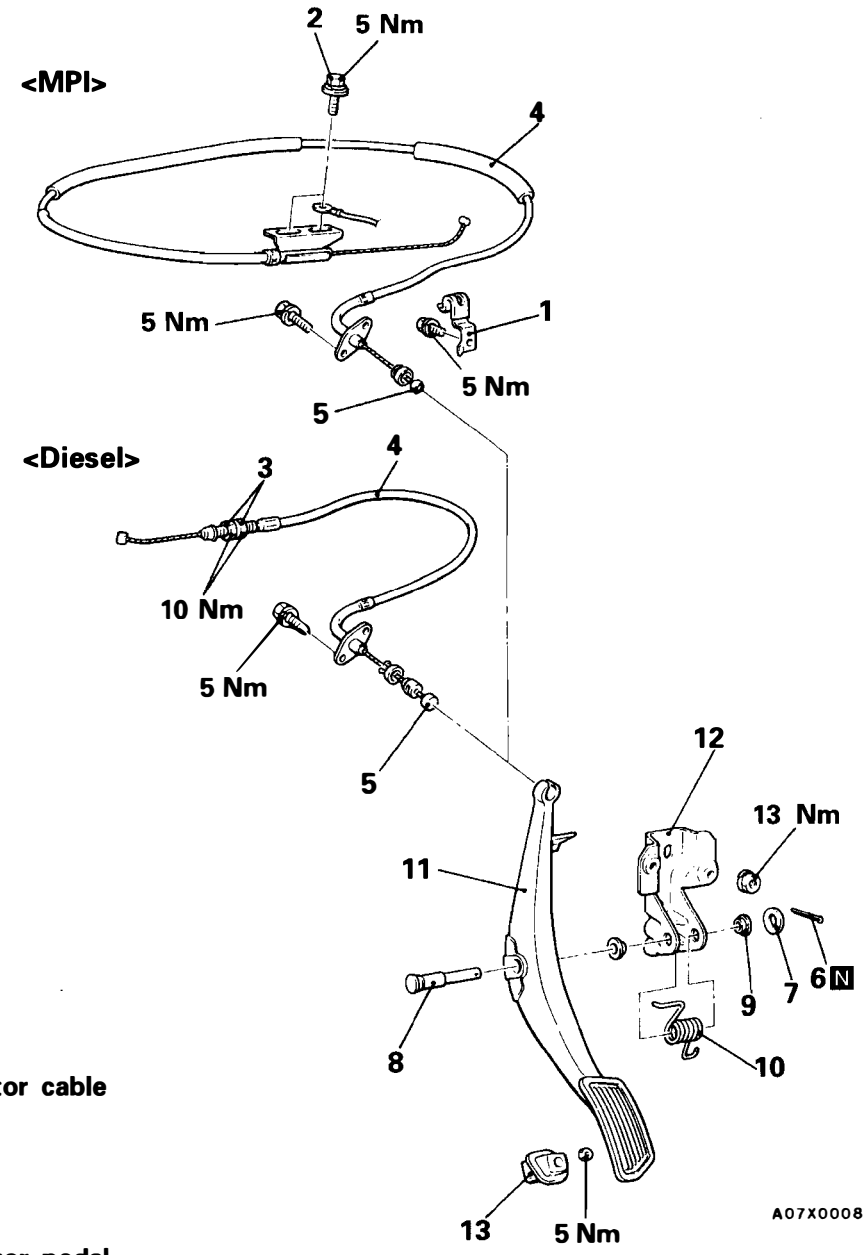
ACCELERATOR CABLE AND PEDAL

E13FH00AA

REMOVAL AND INSTALLATION <L.H. DRIVE VEHICLES>

Post-installation Operation
- Adjusting the Accelerator Cable (Refer to P.13F-8.) .





Removal steps of accelerator cable

1. Clip
2. Adjusting bolts
3. Adjusting nuts
4. Accelerator cable

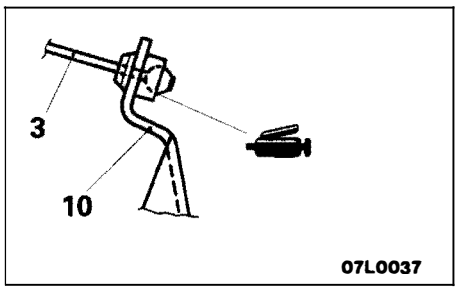
Removal steps of accelerator pedal

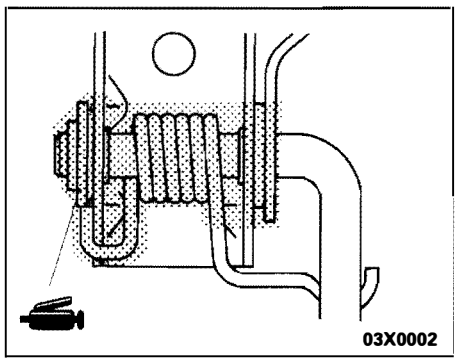
5. Accelerator cable connection
6. Split pin
7. Washer
8. Accelerator pedal pin
9. Bushing
10. Spring
11. Accelerator pedal arm
12. Accelerator pedal bracket
13. Accelerator pedal stopper

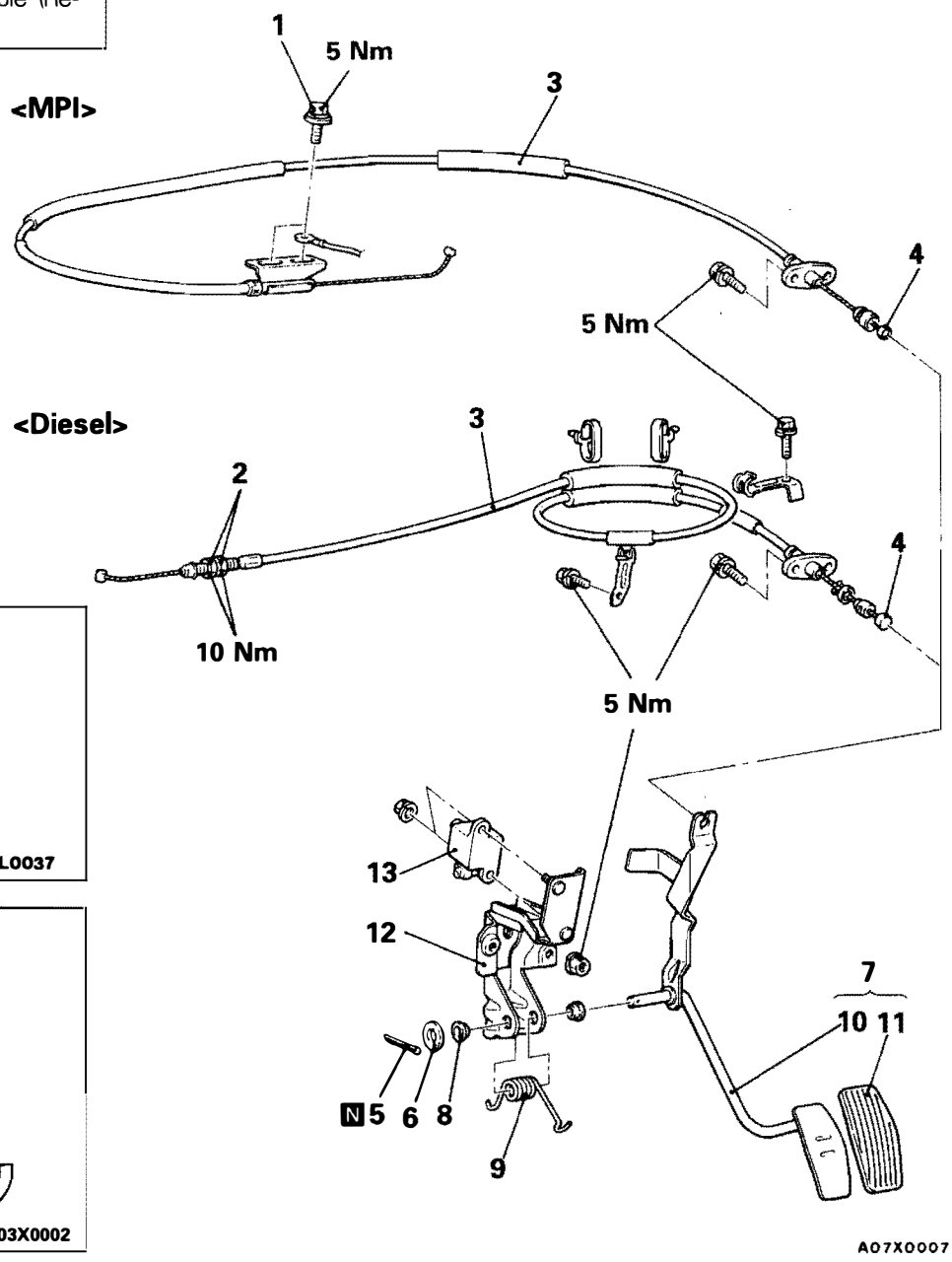
REMOVAL AND INSTALLATION <R.H.DRIVE VEHICLES>

E13FH00BA

Post-installation Operation
- Adjusting the Accelerator Cable (Refer to P.13F-8.)







Removal steps of accelerator cable
1. Adjusting bolts
2. Adjusting nuts
3. Accelerator cable

Removal steps of accelerator pedal
4. Accelerator cable connection
5. Split pin
6. Washer
7. Accelerator pedal assembly
8. Bushing
9. Spring
10. Accelerator arm
11. Pedal pad
12. Accelerator pedal bracket
13. Wide open throttle switch <A/T>

AUTO-CRUISE CONTROL SYSTEM

CONTENTS

E13GA00BA

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) – AIR BAG

(1) An SRS air bag for the driver's side is optional equipment in this vehicle.
(2) The SRS includes the following components: impact sensors, SRS diagnosis unit, SRS warning lamp, air bag module, clock spring, 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 (*).

WARNING!

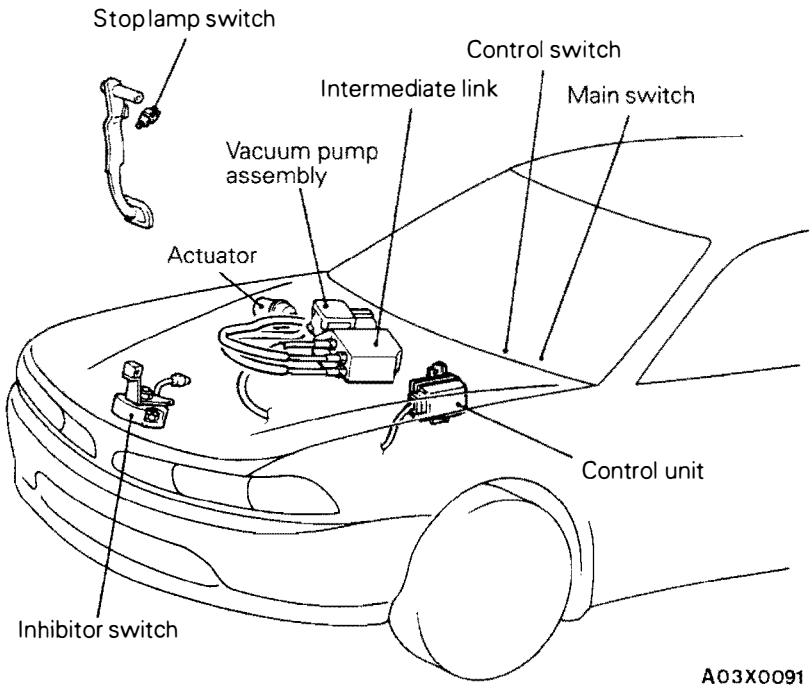
(1) Improper service or maintenance of any component of the SRS, or any SRS-related component, can lead to personal injury or death to service personnel (from inadvertent firing of the air bag) or to the driver (from rendering the SRS inoperative).
(2) Service or maintenance of any SRS component or SRS-related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

 Jun. 1993 PWDE9211-A REVISED

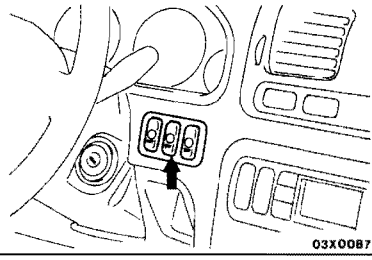
GENERAL INFORMATION

E13GB00AA

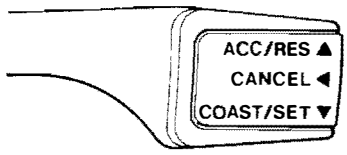
By using the auto-cruise control, the drive can drive at the speed he/she likes (in a range of approximately 40–200 km/h) without depressing the accelerator pedal.



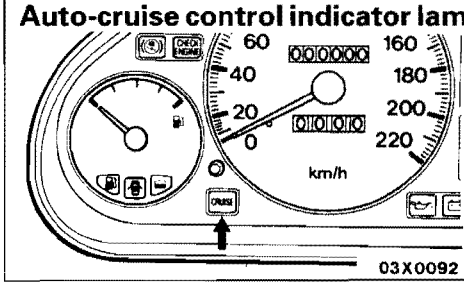
Main switch



Control switch



Auto-cruise control indicator lamp



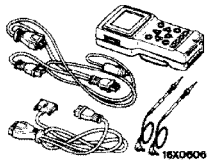
SERVICE SPECIFICATIONS

E13GC00AA

Items		Specifications
Standard Value		
Accelerator cable play	mm	
M/T		0 – 1
A/T		2 – 3
Throttle cable play	mm	1 – 2
Auto-cruise control cable play	mm	1 – 2

SPECIAL TOOLS

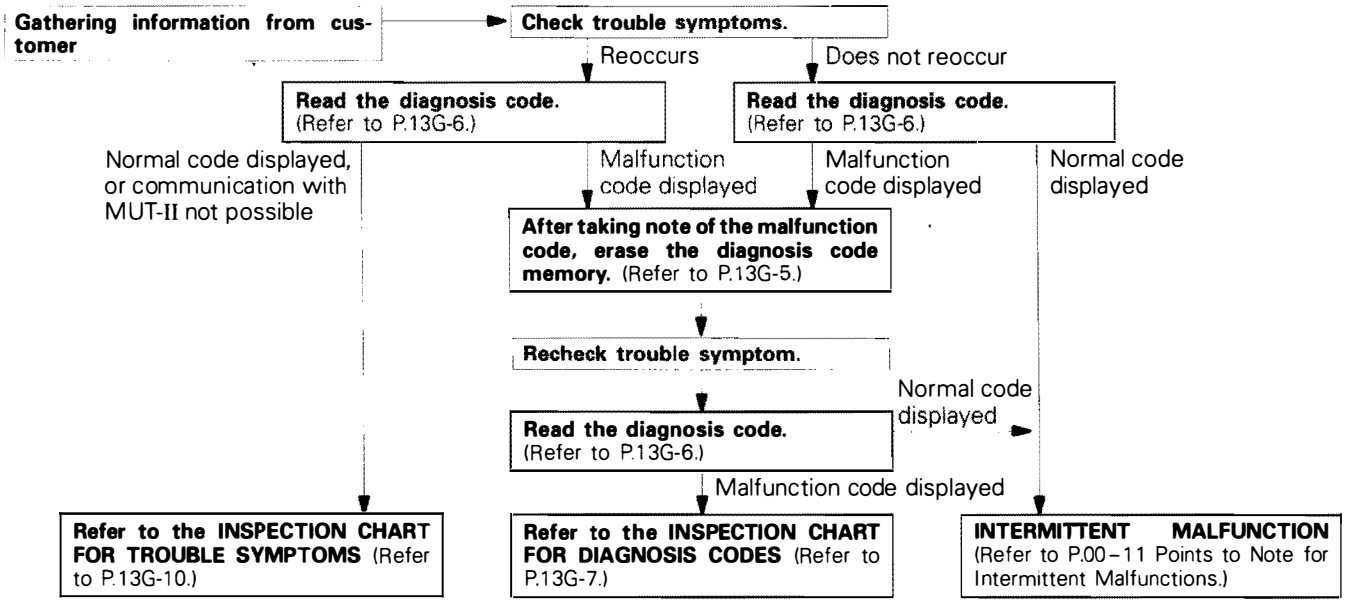
E13GD00AA

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Reading diagnosis code • Auto-cruise control system inspection
 16X0607		ROM Pack	

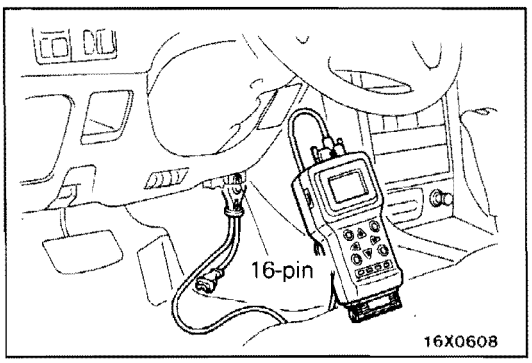
TROUBLESHOOTING

E13GE00AA

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



NOTE
Before carrying out trouble diagnosis, check to be sure that all of the following items are normal.
1. Is the vacuum hose installed correctly, and is the hose not damaged?
2. Is the routing of all cables normal?
3. Do the link assembly and all cables move smoothly?
4. Is the play of each cable at the standard value?

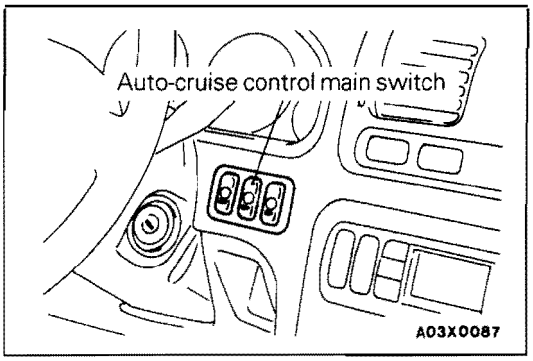


DIAGNOSTIC FUNCTION

E13GE01AA

METHOD OF READING THE DIAGNOSIS CODES

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

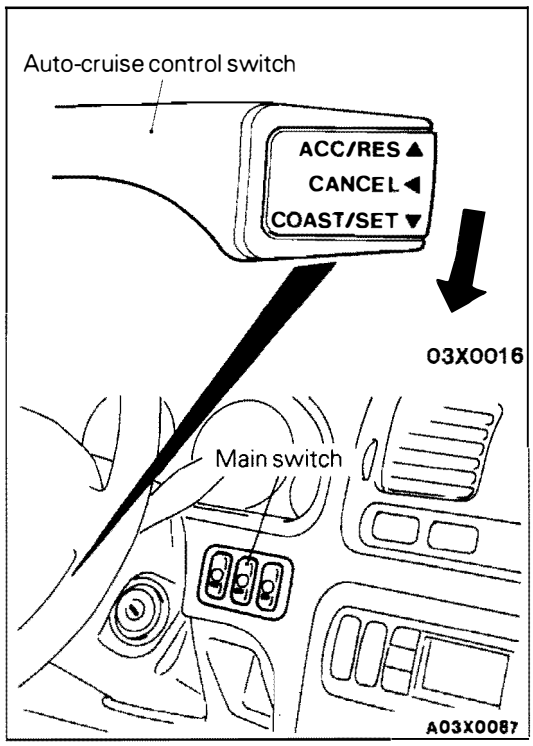


2. With the ignition switch in the ON position, turn the auto-cruise control main switch to ON and take a reading of the diagnosis codes.

METHOD OF ERASING THE DIAGNOSTIC TROUBLE CODES E13GE02AA

The diagnosis codes can be erased by disconnecting the (–) cable from the battery for 10 seconds or more and then re-connecting it, or by the following procedure.

1. Turn the ignition switch to ON.
2. With the SET switch at the ON position, turn the main switch to ON, and within 1 second after this, turn the RESUME switch to ON.
3. With the SET switch once more at the ON position, turn the stop lamp switch ON for a continuous period of 5 seconds or more.



INPUT SWITCH CODE INSPECTION METHOD E13GE03AA

1. Connect the MUT-II to the diagnosis connector (16-pin) underneath the instrument under cover. (Refer to P.13G-4.)
2. With the ignition switch in the ON position, turn the cruise control SET switch to the ON position.
3. Within 1 second after turning the cruise control main switch to ON, turn the cruise control RESUME switch to ON.
4. Operate each switch listed in the input inspection table and take a reading of the input switch codes with the MUT-II.

Input Inspection Table

Code No.	Input operation	Operation judgement
21	SET switch ON	Auto-cruise control-ECU judges that SET switch is ON
22	RESUME switch ON	Auto-cruise control-ECU judges that RESUME switch is ON
23	Stop lamp switch (ON when brake pedal depressed)	Auto-cruise control-ECU judges that stop lamp switch is ON
24	Vehicle speed signal	Auto-cruise control-ECU judges that vehicle speed is 40 km/h or higher
25		Auto-cruise control-ECU judges that vehicle speed is lower than 40 km/h
26	• Clutch switch <M/T> (ON when clutch pedal depressed) • Inhibitor switch <A/T> (ON when select lever in N range)	Auto-cruise control-ECU judges that clutch switch <M/T> or inhibitor switch <A/T> is ON
27	CANCEL switch ON	Auto-cruise control-ECU judges that CANCEL switch is ON
28	Throttle position sensor signal	Auto-cruise control-ECU judges that throttle position sensor voltage is 1.5 V or more
29	Idle switch	Auto-cruise control-ECU judges that idle switch is OFF

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

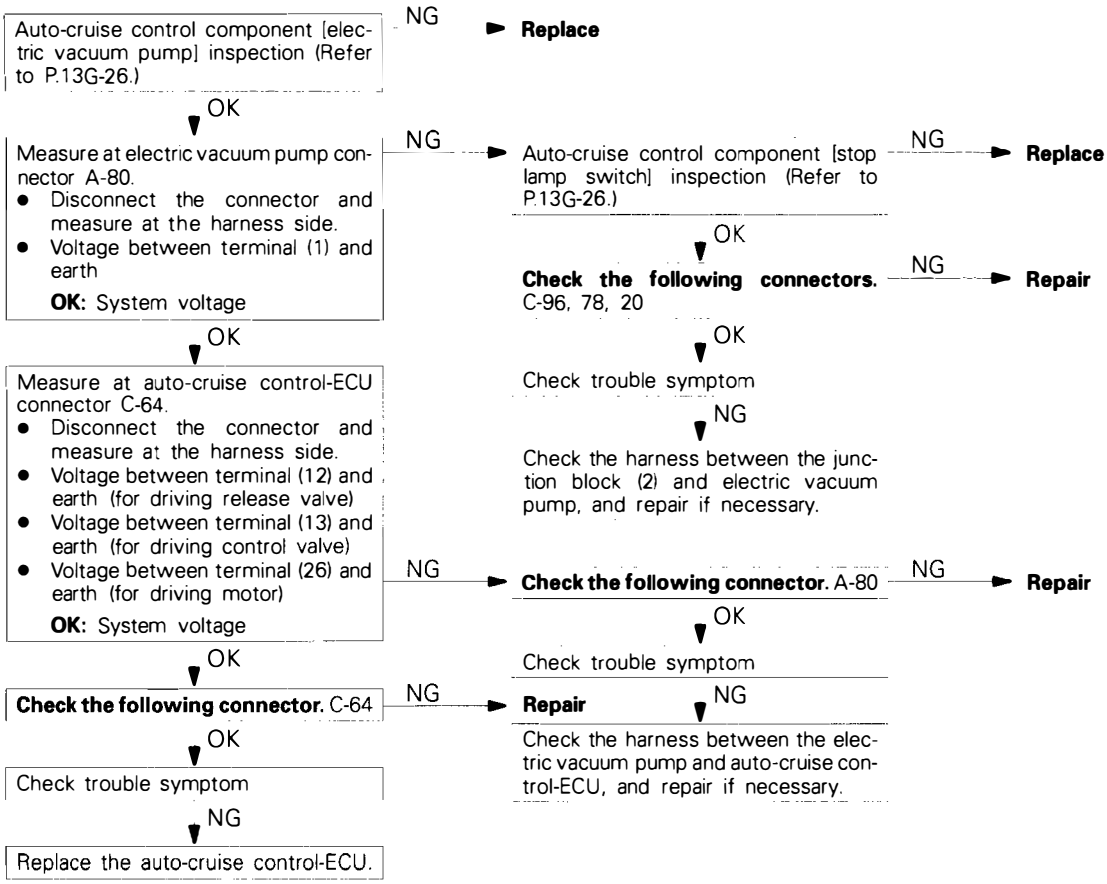
E13GE04AA

Code No.	Diagnostic item	Reference page
11	Electric vacuum pump drive system	P.13G-7
12	Vehicle speed sensor system	P.13G-8
15	Auto-cruise control switch	P.13G-8
16	Auto-cruise control-ECU	P.13G-8
17	Throttle position sensor system <Vehicles without TCL> or accelerator pedal position sensor system <Vehicles with TCL>	P.13G-9

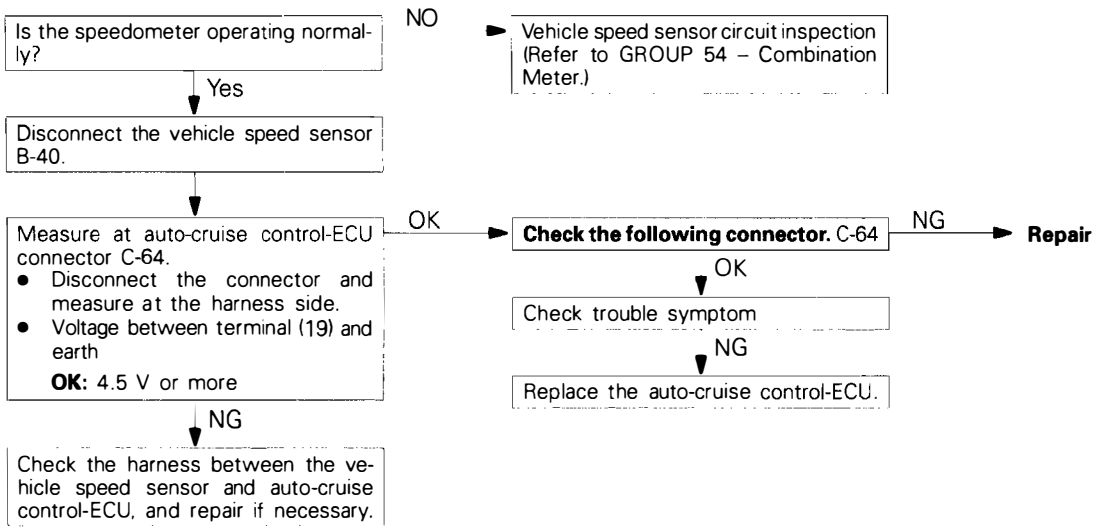
INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

E13GE05AA

Code No.11	Electric vacuum pump drive system	Probable cause
[Comment]	This diagnosis code is output if the release valve, control valve and motor drive signals from the electric vacuum pump are not input to the auto-cruise control-ECU.	• Malfunction of the electric vacuum pump • Malfunction of the stop lamp switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



Code No.12	Vehicle speed signal system	Probable cause
[Comment]	This diagnosis code is output if the vehicle speed signals from the vehicle speed sensor are not input to the auto-cruise control-ECU when the vehicle speed is 40 km/h or more.	• Malfunction of the vehicle speed sensor • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



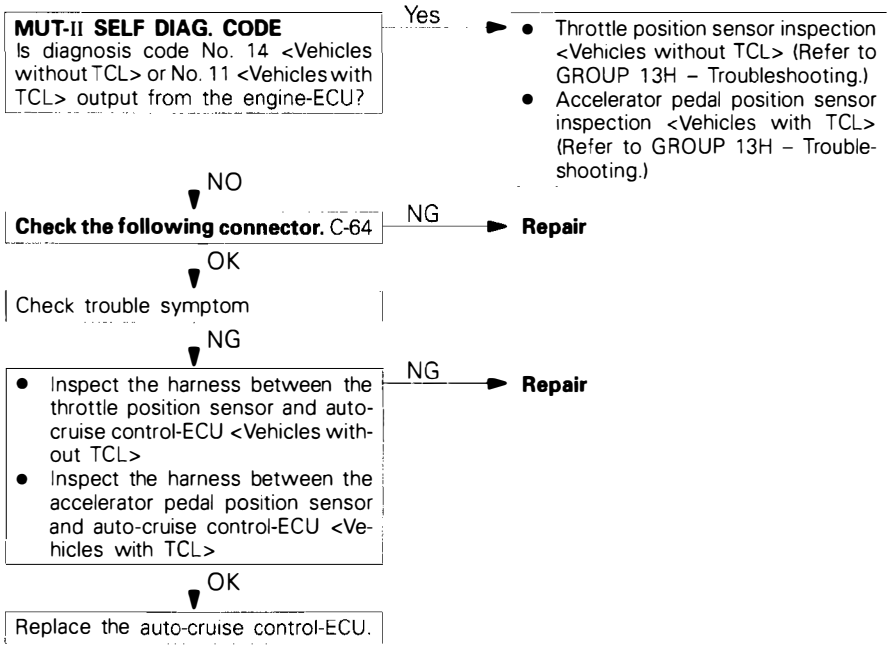
Code No.15	Auto-cruise control switch	Probable cause
[Comment]	This diagnosis code is output if the cruise control RESUME switch, SET switch or CANCEL switch remains ON.	• Malfunction of the auto-cruise control switch

Replace the auto-cruise control switch.

Code No.16	Auto-cruise control-ECU	Probable cause
[Comment]	This diagnosis code is output if there is an abnormality in the CANCEL hold circuit or the microprocessor monitor circuit in the auto-cruise control-ECU.	• Malfunction of the auto-cruise control-ECU

Replace the auto-cruise control-ECU.

Code No.17	Throttle position sensor system <Vehicles without TCL> or accelerator pedal position sensor system <Vehicles with TCL>	Probable cause
[Comment]	This diagnosis code is output if a voltage of 1.5 V or more when the idle switch is ON or 0.2 V or less when the idle switch is OFF is output for a continuous period of 4 seconds or more.	• Malfunction of the throttle position sensor <Vehicles without TCL> • Malfunction of the accelerator pedal position sensor <Vehicles with TCL> • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

E13GE06AA

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	P.13G-10
	Communication with auto-cruise control-ECU only is not possible.	2	P.13G-11
Input switch inspection using the MUT-II is not possible. (However, diagnosis inspection is possible.)		3	P.13G-12
Auto-cruise control is not cancelled.	Even if brake pedal is depressed	4	P.13G-13
	Even if clutch pedal is depressed <M/T>	5	P.13G-14
	Even if select lever is set to N range <A/T>	6	P.13G-14
	Even if CANCEL switch is set to ON	7	P.13G-15
The diagnosis result displayed on the MUT-II is normal even though auto-cruise control cannot be set.		8	P.13G-15
Auto-cruise control cannot be set.		9	P.13G-16
Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		10	P.13G-17
Even though auto-cruise control main switch is ON, switch indicator lamp does not illuminate. (However, auto-cruise control is normal.)		11	P.13G-17
Auto-cruise control main switch illumination lamp does not illuminate.		12	P.13G-18
Auto-cruise control indicator lamp inside combination meter does not illuminate. (However, auto-cruise control is normal.)		13	P.13G-18

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

E13GE07AA

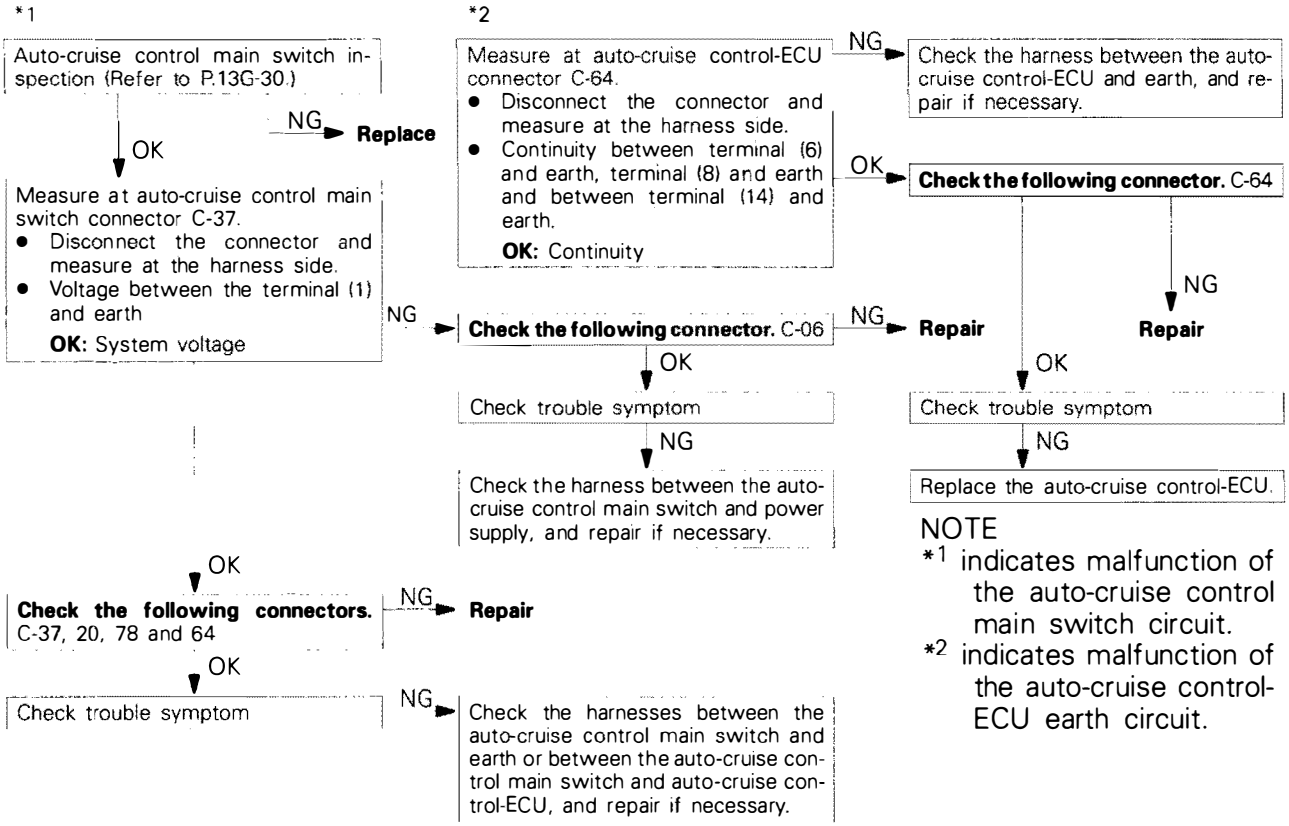
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting

Inspection Procedure 2

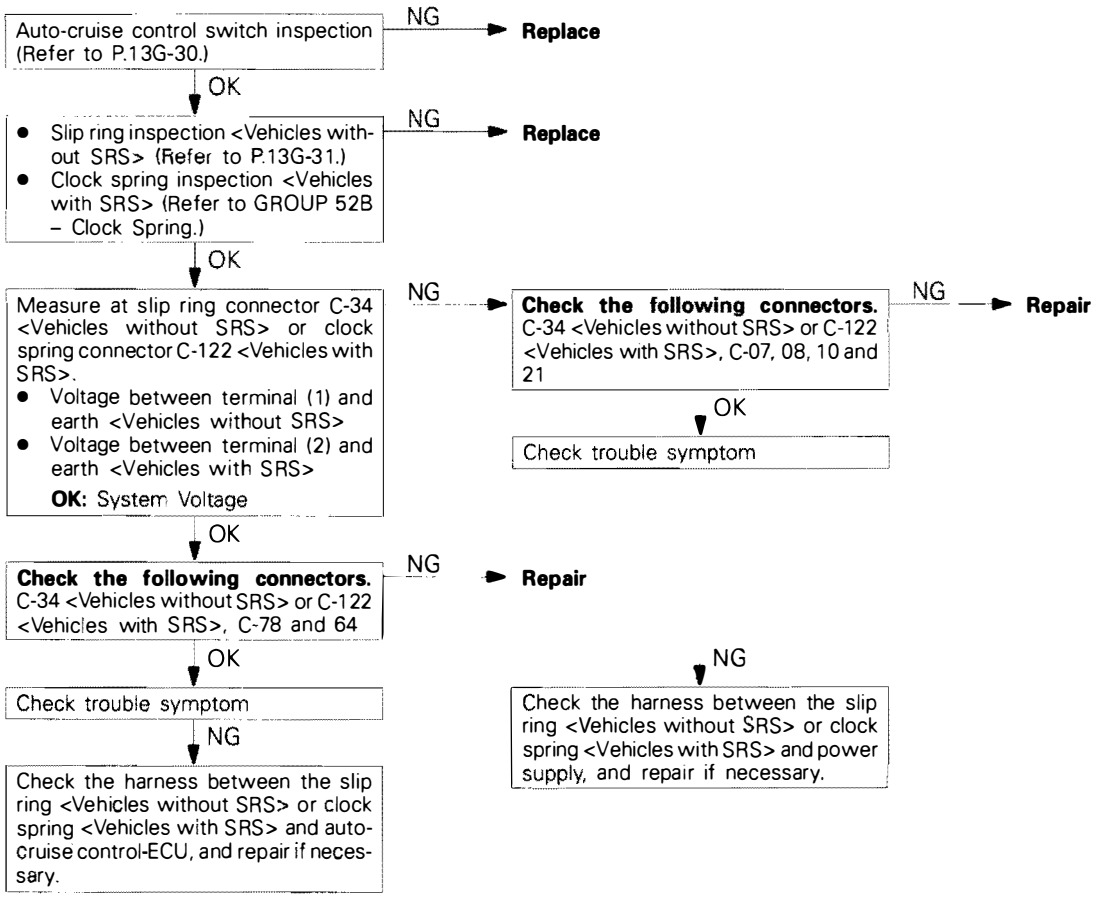
Communication with MUT-II is not possible. (Communication with auto-cruise control-ECU only is not possible.)		Probable cause
[Comment]	The cause is probably a malfunction of auto-cruise control main switch circuit or a malfunction of auto-cruise control-ECU earth circuit.	• Malfunction of the auto-cruise control main switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



NOTE
*1 indicates malfunction of the auto-cruise control main switch circuit.
*2 indicates malfunction of the auto-cruise control-ECU earth circuit.

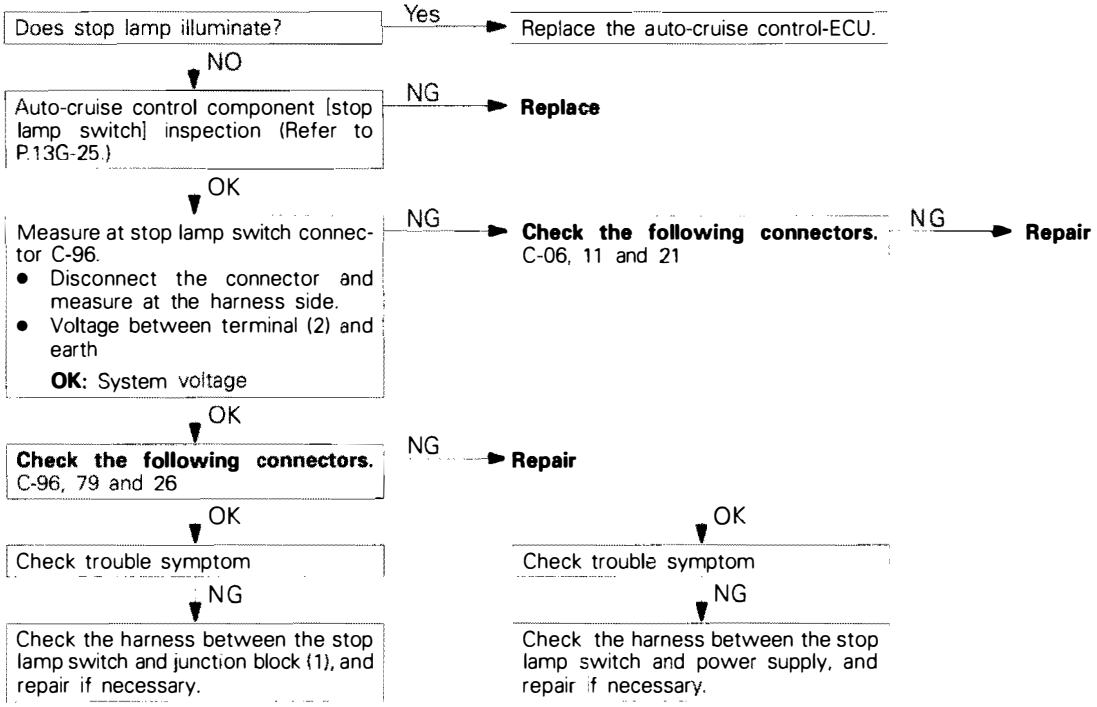
Inspection Procedure 3

Input switch inspection using the MUT-II is not possible. (However, diagnosis inspection is possible.)		Probable cause
[Comment]	The cause is probably a malfunction of auto-cruise control switch circuit system.	• Malfunction of the auto-cruise control switch • Malfunction of the slip ring <Vehicles without SRS> • Malfunction of the clock spring <Vehicles with SRS> • Malfunction of the connector • Malfunction of the harness



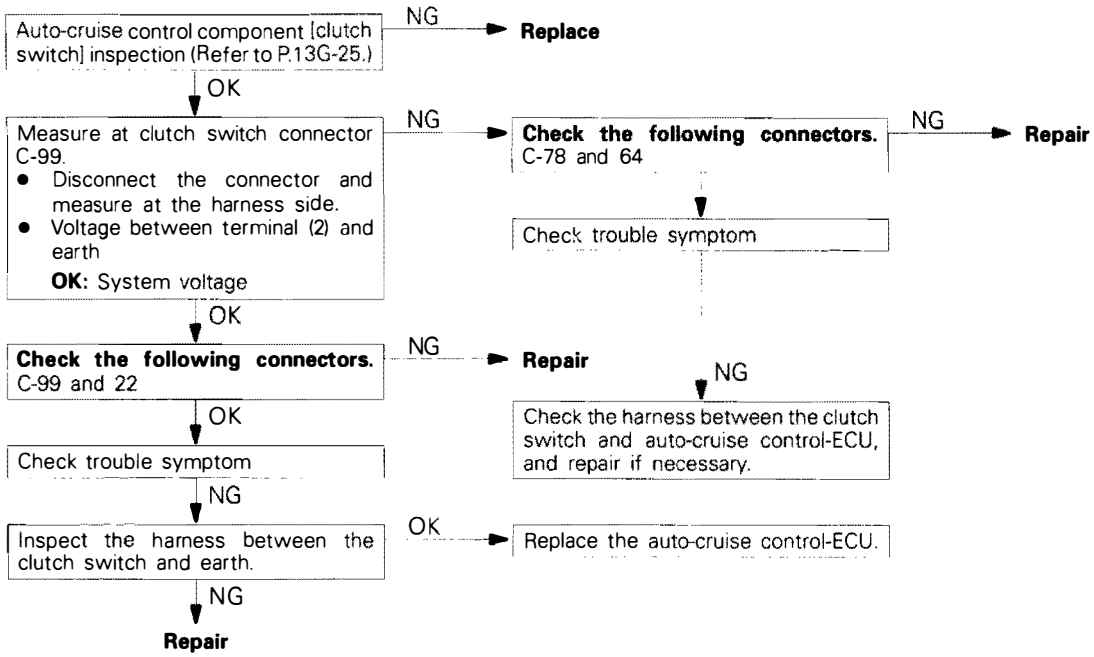
Inspection Procedure 4

Even if brake pedal is depressed, auto-cruise control is not cancelled.	Probable cause
[Comment] The cause is probably a malfunction of stop lamp switch or a malfunction of stop lamp circuit.	• Malfunction of the stop lamp switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



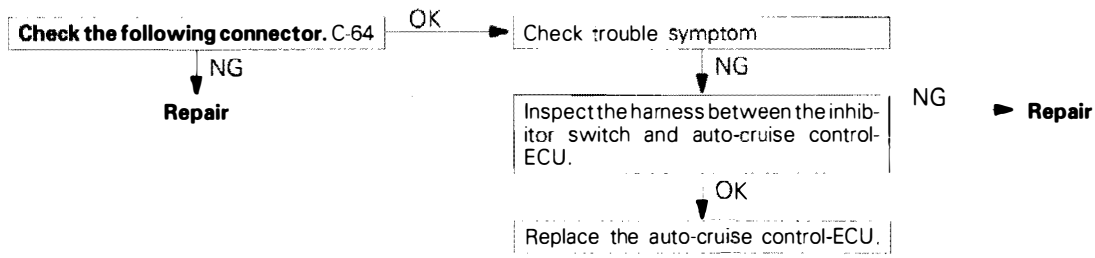
Inspection Procedure 5

Even if clutch pedal is depressed, auto-cruise control is not cancelled. <M/T>	Probable cause
[Comment] The cause is probably a malfunction of clutch switch or clutch circuit.	• Malfunction of the clutch switch • Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



Inspection Procedure 6

Even if select lever is set to N range, auto-cruise control is not cancelled. <A/T>	Probable cause
[Comment] The cause is probably an open-circuit in the output signal circuit in N range.	• Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



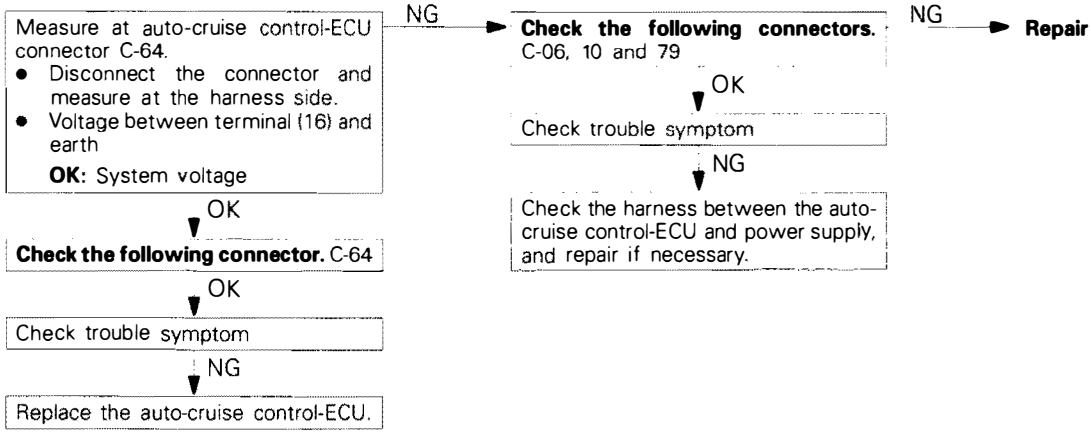
Inspection Procedure 7

Even if auto-cruise control CANCEL switch is set to ON, auto-cruise control is not cancelled.		Probable cause
[Comment]	The cause is probably an open-circuit in the circuit inside the CANCEL switch.	• Malfunction of the auto-cruise control-ECU

Replace the auto-cruise control switch.

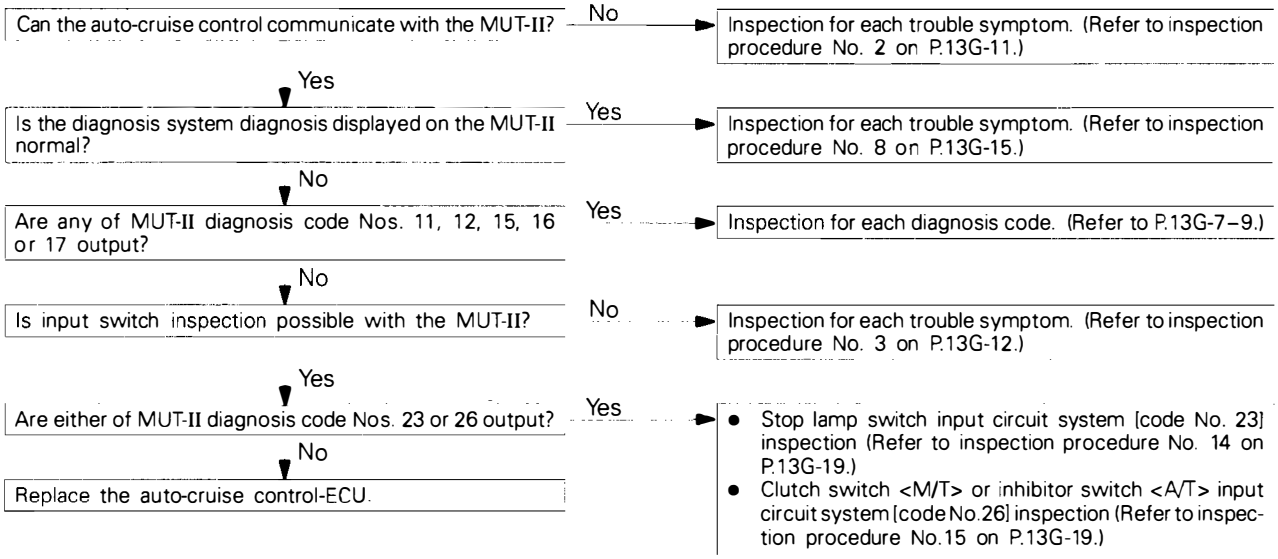
Inspection Procedure 8

The diagnosis result displayed on the MUT-II is normal even though auto-cruise control cannot be set.		Probable cause
[Comment]	Because of an open-circuit in the battery backup circuit system, the fail-safe function prevents diagnosis codes from being memorised and displayed even though auto-cruise control is cancelled.	• Malfunction of the connector • Malfunction of the harness • Malfunction of the auto-cruise control-ECU



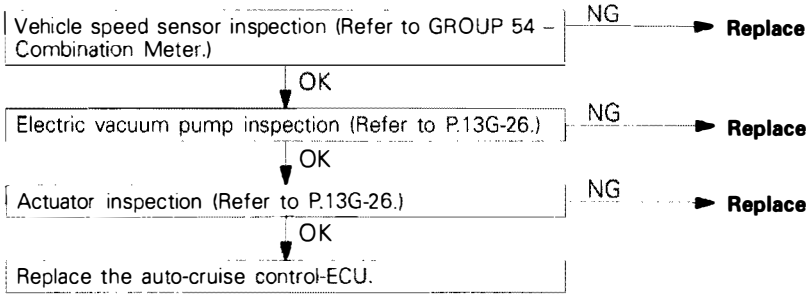
Inspecton Procedure 9

Auto-cruise control cannot be set.		Probable cause
[Comment]	The cause is probably that the fail-safe function is cancelling auto-cruise control. In this case, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes. The MUT-II can also be used to check if the circuits of each input switch are normal or not by inspecting the input switch codes.	• Malfunction of the auto-cruise control main switch • Malfunction of the auto-cruise control switch • Malfunction of the slip ring <Vehicles without SRS> • Malfunction of the clock spring <Vehicles with SRS> • Malfunction of the harnesses or connectors • Malfunction of the clutch switch <M/T> • Malfunction of the auto-cruise control-ECU



Inspection Procedure 10

Hunting (repeated acceleration and deceleration) occurs at the set vehicle speed.		Probable cause
[Comment]	The cause is probably a malfunction of vehicle speed sensor or incorrect vacuum in the electric vacuum pump or actuator.	• Malfunction of the vehicle speed sensor • Malfunction of the electric vacuum pump • Malfunction of the actuator • Malfunction of the auto-cruise control-ECU



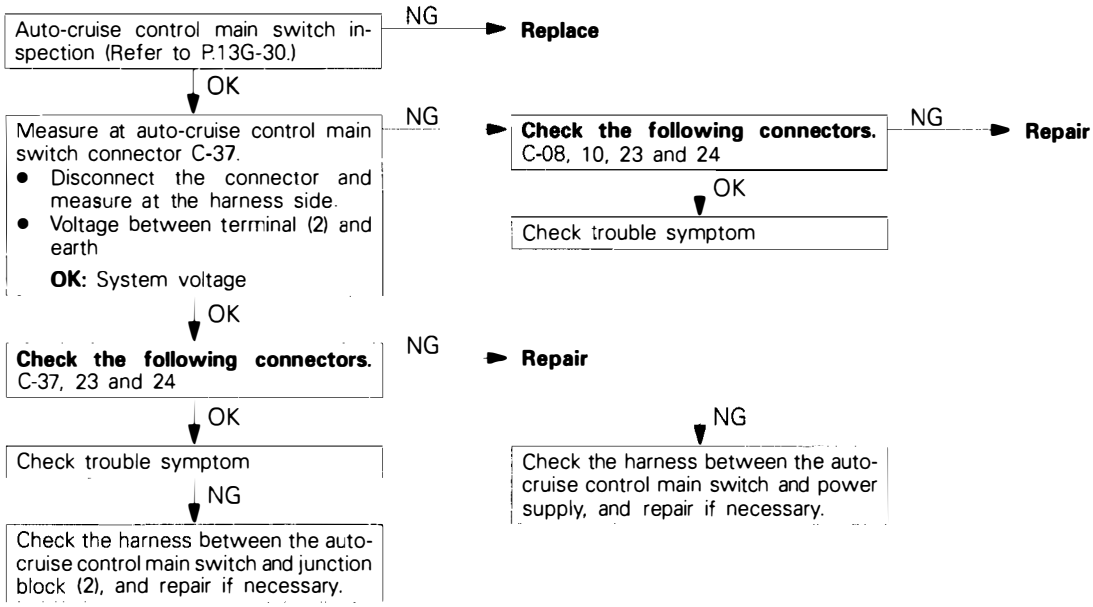
Inspection Procedure 11

Even though auto-cruise control main switch is ON, switch indicator lamp does not illuminate. (However, auto-cruise control is normal.)		Probable cause
[Comment]	Blown bulb in auto-cruise control main switch	• Malfunction of the auto-cruise control main switch

Replace the auto-cruise control main switch.

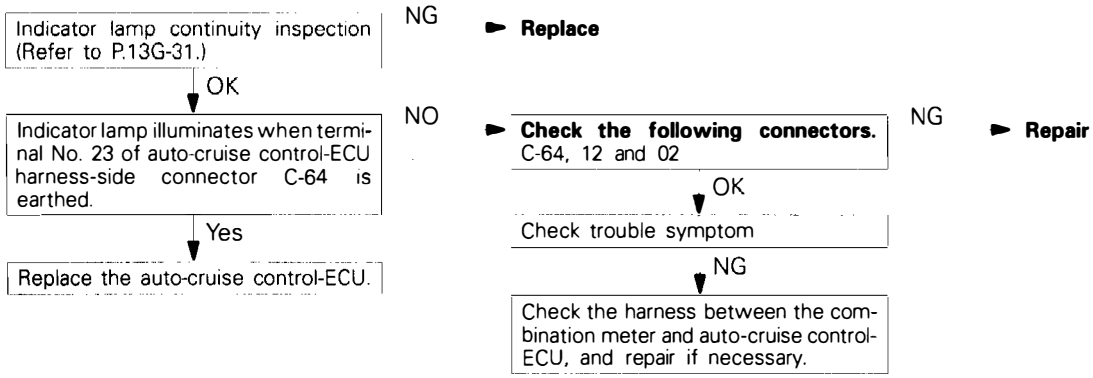
Inspection Procedure 12

Auto-cruise control main switch illumination lamp does not illuminate.	Probable cause
[Comment] The cause is probably a malfunction of auto-cruise control main switch or a malfunction of harness or connector.	• Malfunction of the auto-cruise control main switch • Malfunction of the connector • Malfunction of the harness



Inspection Proccedure 13

Auto-cruise control indicator lamp inside combination meter does not illuminate. (However, auto-cruise control is normal.)	Probable cause
[Comment] The cause is probably a malfunction of valve or a malfunction of connector or harness.	• Malfunction of the valve • Malfunction of the harness • Malfunction of the connector • Malfunction of the auto-cruise control-ECU



Inspection Procedure 14

Stop lamp switch input circuit system inspection (Code No. 23)

Check the following connectors. C-06, 11, 26, 21 and 64 — NG → **Repair**

↓ OK

Check trouble symptom — NG → Check the harness between junction block (2) and auto-cruise control-ECU, and repair if necessary.

Inspection Procedure 15

Clutch switch <M/T> or inhibitor switch <A/T> input circuit system inspection (Code No. 26)

<M/T>

Auto-cruise control component [clutch switch] inspection (Refer to P.13G-25.) — NG → **Replace**

<A/T>

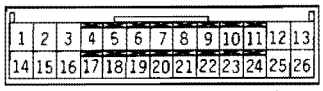
Check the harness between auto-cruise control-ECU and power supply.

↓ OK

Check trouble symptom — NG → Check the harness between junction block (2) and auto-cruise control-ECU, and repair if necessary.

CHECK AT THE ECU TERMINALS

E13GE08AA



03X0097

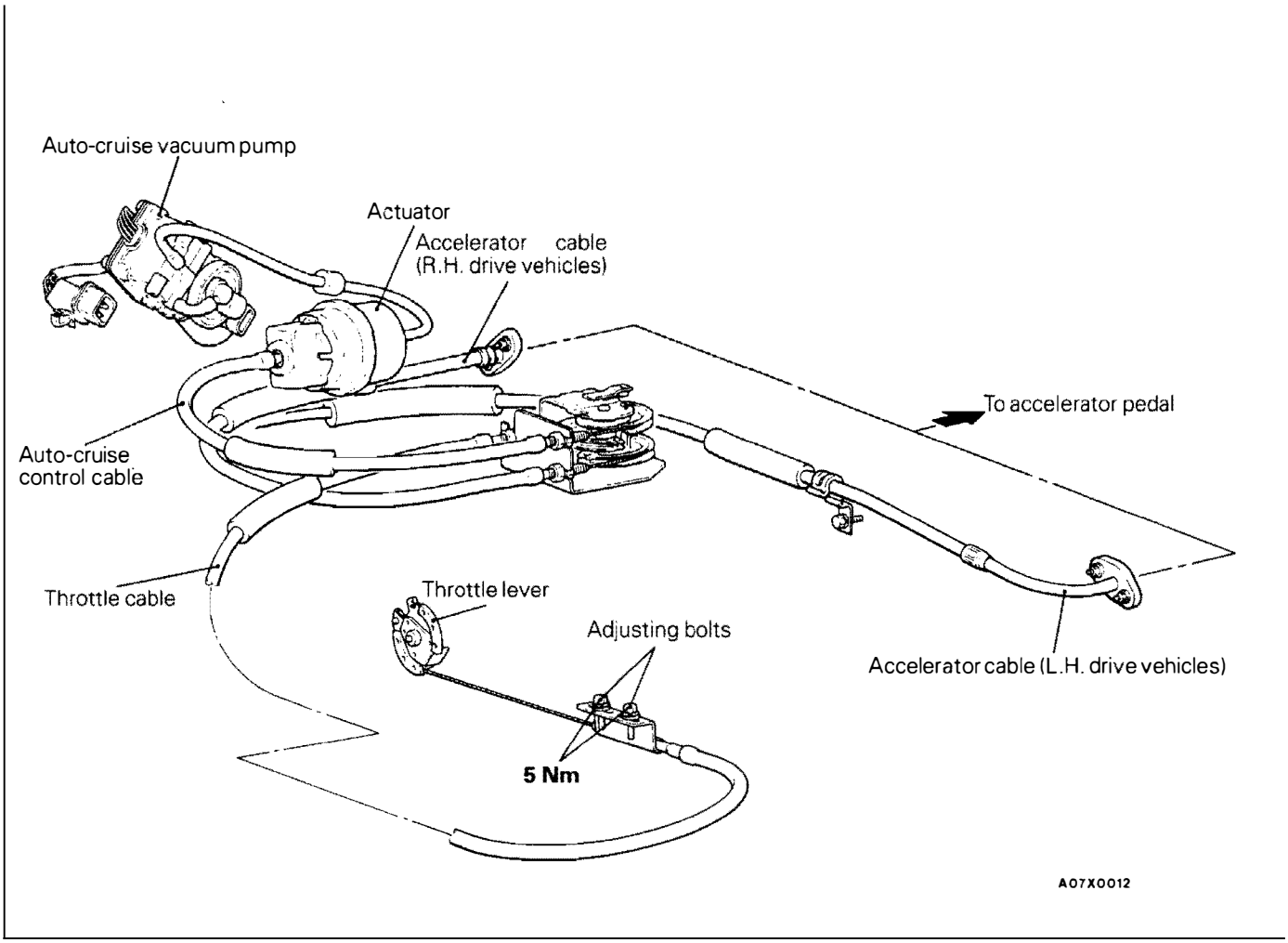
Terminal No.	Check item	Check conditions		Normal condition
1	Clutch switch input <M/T>	When pedal is not depressed	When clutch switch is OFF	System voltage
		When pedal is depressed	When clutch switch is ON	0V
	Inhibitor switch input <A/T>	When select lever is in a position other than N range	When inhibitor switch is OFF	5V
		When select lever is in N range	When inhibitor switch is ON	0V
2	ECU power supply	When ignition switch is ON		System voltage
3	Power supply for OD signal control <A/T>	At any time		System voltage
4	Idle switch output	When accelerator pedal is depressed	When idle switch is OFF	4.5–5.5V
		When accelerator pedal is not depressed	When idle switch is ON	0V
5	Throttle position sensor input	When accelerator pedal is fully depressed		4.0–5.5V
		When accelerator pedal is released		0.5–0.7V
6	Earth	At any time		Continuity
8	Earth	At any time		Continuity
9	Accelerator pedal switch input <A/T>	When accelerator pedal is depressed	When accelerator pedal switch is OFF	0V
		When accelerator pedal is not depressed	When accelerator pedal switch is ON and vehicle is driving at constant speed	System voltage
			When accelerator pedal switch is ON and engine is idling	0V
10	OD control output <A/T>	When OD switch is ON		System voltage
		When OD switch is OFF		0V
11	OD switch input <A/T>	When OD switch is ON		System voltage
		When OD switch is OFF		0V
12	Electric vacuum pump release valve and control valve input	When driving at constant speed using the SET switch	Release valve closed	0V
13			Control valve closed	0V
12		When accelerating with the RESUME switch while driving at constant speed	Release valve closed	0V
13			Release valve closed	0V
12		When decelerating with the SET switch while driving at constant speed	Release valve closed	0V
13			Control valve open	System voltage
12		When cancelling constant-speed driving with the CANCEL switch	Release valve open	System voltage
13			Control valve open	System voltage

Terminal No.	Check item	Check conditions		Normal condition
14	Earth	At any time		Continuity
15	Stop lamp switch input	When brake pedal is depressed	When stop lamp switch is ON	System voltage
		When brake pedal is not depressed	When stop lamp switch is OFF	0V
16	ECU backup power supply	At any time		System voltage
18	Auto-cruise control switch input	When SET switch is pressed	When SET switch is ON	3V
		When SET switch is not pressed	When SET switch is OFF	0V
		When RESUME switch is pressed	When RESUME switch is ON	6V
		When RESUME switch is not pressed	When RESUME switch is OFF	0V
		When CANCEL switch is pressed	When CANCEL switch is ON	System voltage
		When CANCEL switch is not pressed	When CANCEL switch is OFF	0V
19	Vehicle speed sensor input	When vehicle is moved forwards and backwards, sensor turns ON and OFF repeatedly.	When sensor is ON	0V
			When sensor is OFF	4.5 V or more
20	ACC power supply	When ignition switch is in ACC position		System voltage
23	Indicator lamp input (inside combination meter)	When driving at constant speed	When indicator lamp is illuminated	0V
		When constant-speed driving is cancelled	When indicator lamp is switched off	System voltage
24	Diagnosis control input	When ignition switch is ON		4V or more
26	Electric vacuum pump motor input	When driving at constant speed using the SET switch	Motor stopped	System voltage
		When accelerating with the RESUME switch while driving at constant speed	Motor running	0V
		When decelerating with the SET switch while driving at constant speed	Motor stopped	System voltage
		When cancelling constant-speed driving with the CANCEL switch	Motor stopped	System voltage

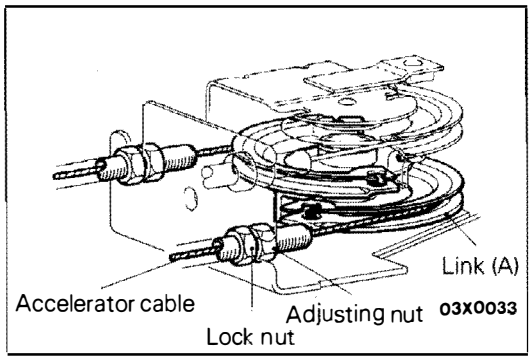
SERVICE ADJUSTMENT PROCEDURES

E13GF00AA

AUTO-CRUISE CONTROL CABLE INSPECTION AND ADJUSTMENT



1. Remove the link protector. (Refer to P.13G-27.)
2. Check the slack in each of the inner cables in the accelerator cable, auto-cruise control cable and throttle cable. If the slack in an inner cable is excessive, or if there is no play, loosen the adjusting bolts and the nuts in the throttle lever and each link, to release the throttle lever and each link. (The bolts and nuts should not be removed.)



ACCELERATOR CABLE

E13GF00BA

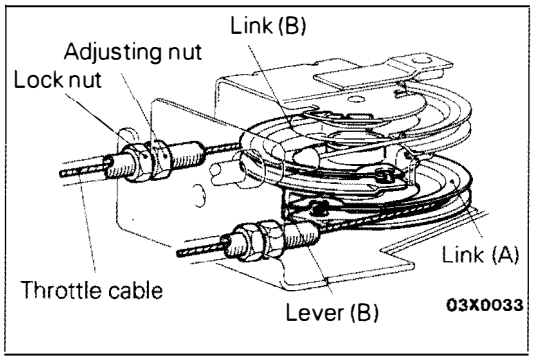
1. Rotate the intermediate link A in the direction shown in the diagram, and while keeping it touching the stopper, tighten the adjusting nut in the direction to lessen the inner cable play of the accelerator cable. Then unscrew the adjusting nut the specified number of turns just before the intermediate link A begins to move.

   Amount to unscrew the adjusting nut:

   <M/T> Approx. half a turn (inner cable play 0–1 mm)

   <A/T> Approx. 2 turns (inner cable play 2–3 mm)

2. Fix the accelerator cable with the lock nut.



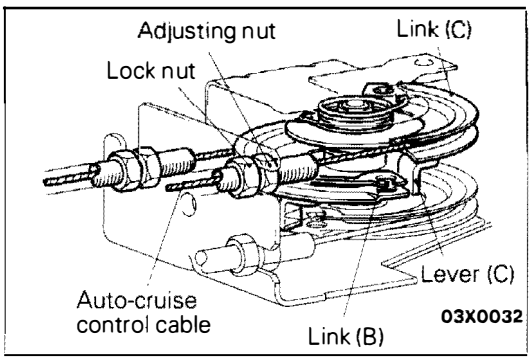
THROTTLE CABLE

E13GP00CA

1. Tighten the adjusting nut in the direction to lessen the inner cable paly of the throttle cable. At the position where the intermediate link B lever touches the intermediate link A unscrew the adjusting nut the specified number of turns.

   Amount to unscrew the adjusting nut:
   Approx. 1 turn (inner cable play 1–2 mm)

2. Fix the throttle cable with the lock nut.
3. Tighten the throttle lever-side adjusting bolt to the specified torque.



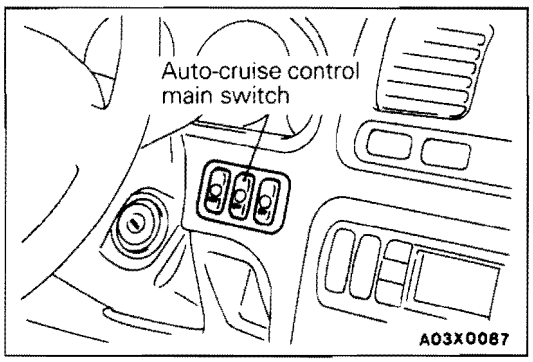
AUTO-CRUISE CONTROL CABLE

E13GF00DA

1. Tighten the adjusting nut in the direction to lessen the inner cable play of the auto-cruise control cable. At the position where teh intermediate link C lever touches the intermediate link B, unscrew the adjunsting nut the specified number of turns.

   Amount to unscrew the adjusting nut:
   Approx. 1 turn (inner cable play 1–2 mm)

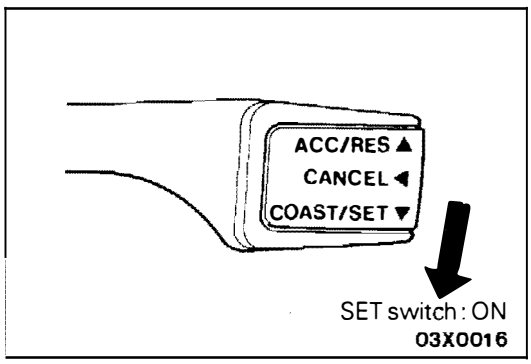
2. Fix the auto-cruise control cable with the lock nut.



AUTO-CRUISE CONTROL MAIN SWITCH CHECK

E13GF01AA

1. Turn the ignition key to ON
2. Check to be sure that the indicator lamp within the switch illuminates when the main switch is switched ON.



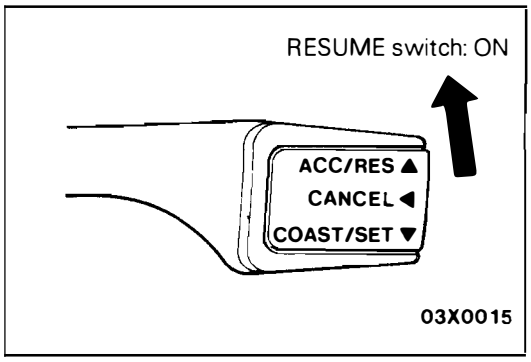
AUTO-CRUISE CONTROL SWITCH CHECK

E13GP02AA

AUTO-CRUISE CONTROL SETTING CHECK

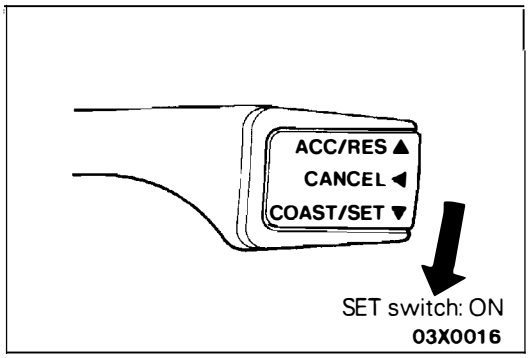
1. Switch ON the main switch.
2. Drive at the desired speed within the range of approximately 40–200 km/h
3. Switch ON the SET switch.
4. Check to be sure that when the switch is released the speed is the desired constant speed.

   NOTE
   If the vehicles speed decreases to approximately 15 km/h below the set speed because of climbing a hill for example, the auto-cruise control will be cancelled.



SPEED-INCREASE SETTING CHECK E13GF03AA

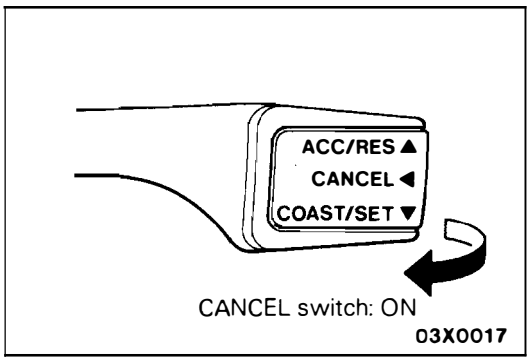
1. Set to the desired speed.
2. Switch ON the RESUME switch.
3. Check to be sure that acceleration continues while the switch is hold, and that when it is released the constant speed at the time when it was released becomes the driving speed.



SPEED REDUCTION SETTING CHECK E13GF04AA

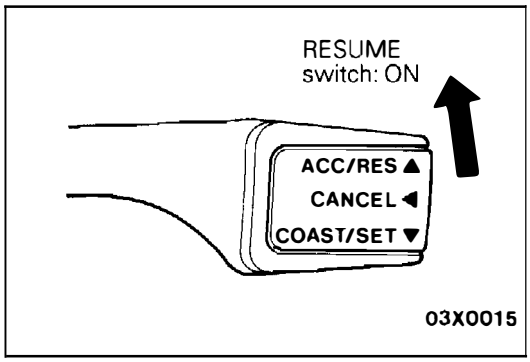
1. Set to the desired speed.
2. Switch ON the SET switch.
3. Check to be sure that deceleration continues while the switch is pressed, and that when it is released the constant speed at the time when it was released becomes the driving speed.

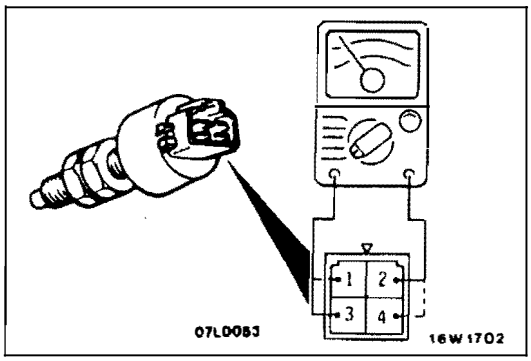
NOTE
When the vehicle speed reaches the low limit [approximately 40 km/h] during deceleration, the auto-cruise control will be cancelled.



CHECK OF RETURN TO THE SET SPEED BEFORE CANCELLATION AND AUTO-CRUISE CONTROL CANCELLATION E13GF05AA

1. Set the auto-cruise speed control.
2. When any of the following operations are performed while at constant speed during auto-cruise control, check if normal driving is resumed and deceleration occurs.
   (1) Switch ON the CANCEL switch.
   (2) The brake pedal is depressed.
   (3) The clutch pedal is depressed. (M/T)
   (4) The selector lever is moved to the "N" range. (A/T)
3. At a vehicle speed of 40 km/h or higher, check if when the RESUME switch is switched ON, vehicle speed returns to the speed before auto-cruise control driving was cancelled, and constant speed driving occurs.
4. When the main switch is turned to OFF while driving at constant speed, check if normal driving is resumed and deceleration occurs.





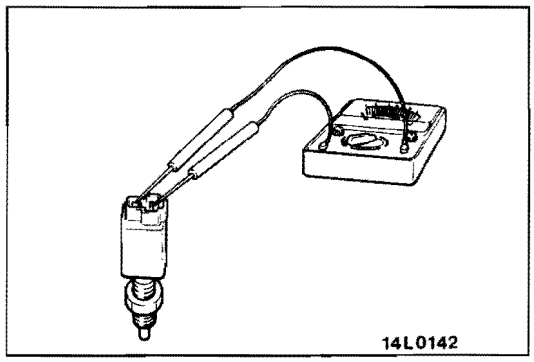
AUTO-CRUISE CONTROL COMPONENT INSPECTION E13GF06AA

STOP LAMP SWITCH

1. Disconnect the connector.
2. Check for continuity between the terminals of the switch.

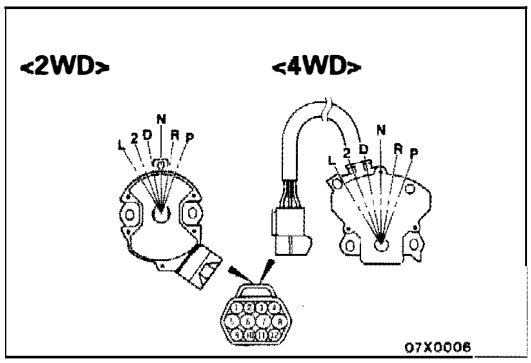
Switch / Terminal / Measurement conditions	For stop lamp circuit		For auto-cruise control circuit	
	2	3	1	4
When brake pedal depressed.	○	○		
When brake pedal not depressed.			○	○

NOTE
○—○ indicates that there is continuity between the terminals.



CLUTCH SWITCH <M/T> E13GF07AA

1. Remove the clutch switch connector.
2. Check if there is continuity between the clutch switch terminals while the clutch pedal is depressed, and if there is no continuity when the clutch pedal is released.



INHIBITOR SWITCH ("N" POSITION) E13GF08AA

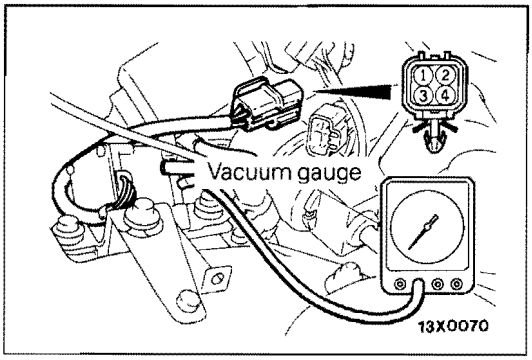
1. Disconnect the connector.
2. Check to be sure that there is continuity between connector terminals 5 and 8 when the selector lever is moved to the "N" range.

THROTTLE POSITION SENSOR E13GF09AA

Refer to GROUP 13A – Service Adjustment Procedures.

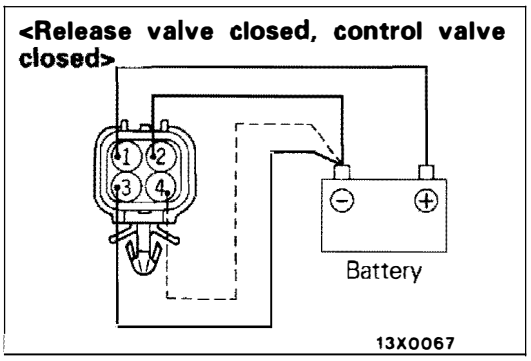
ACCELERATOR PEDAL POSITION SENSOR <TCL> E13GF10AA

Refer to GROUP 13A – Service Adjustment Procedures.

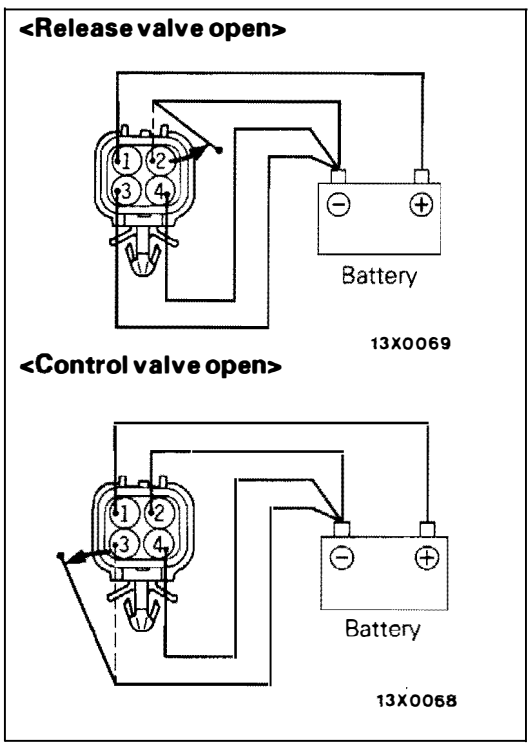


AUTO-CRUISE VACUUM PUMP E13GF11AA

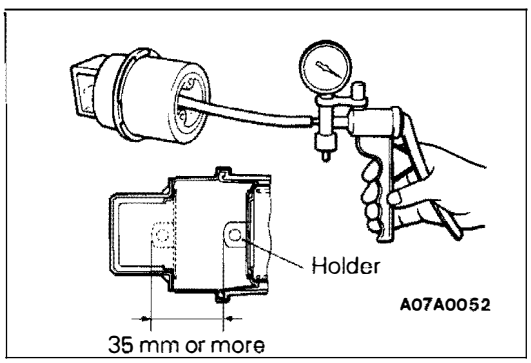
1. Disconnect the vacuum hose from the electric vacuum pump and connect a vacuum gauge to the vacuum pump.
2. Disconnect the electric vacuum pump connector.



3. Connect terminal (1) to the battery (+) terminal, and connect terminals (2) and (3) to the battery (–) terminal.
4. Check to be sure that the vacuum gauge shows a reading of 53 kPa or more when terminal (4) is connected to the battery (–) terminal.



5. In this condition, check to be sure that the vacuum gauge shows a 20 kPa or less when terminals (2) and (3) are disconnected from the battery.



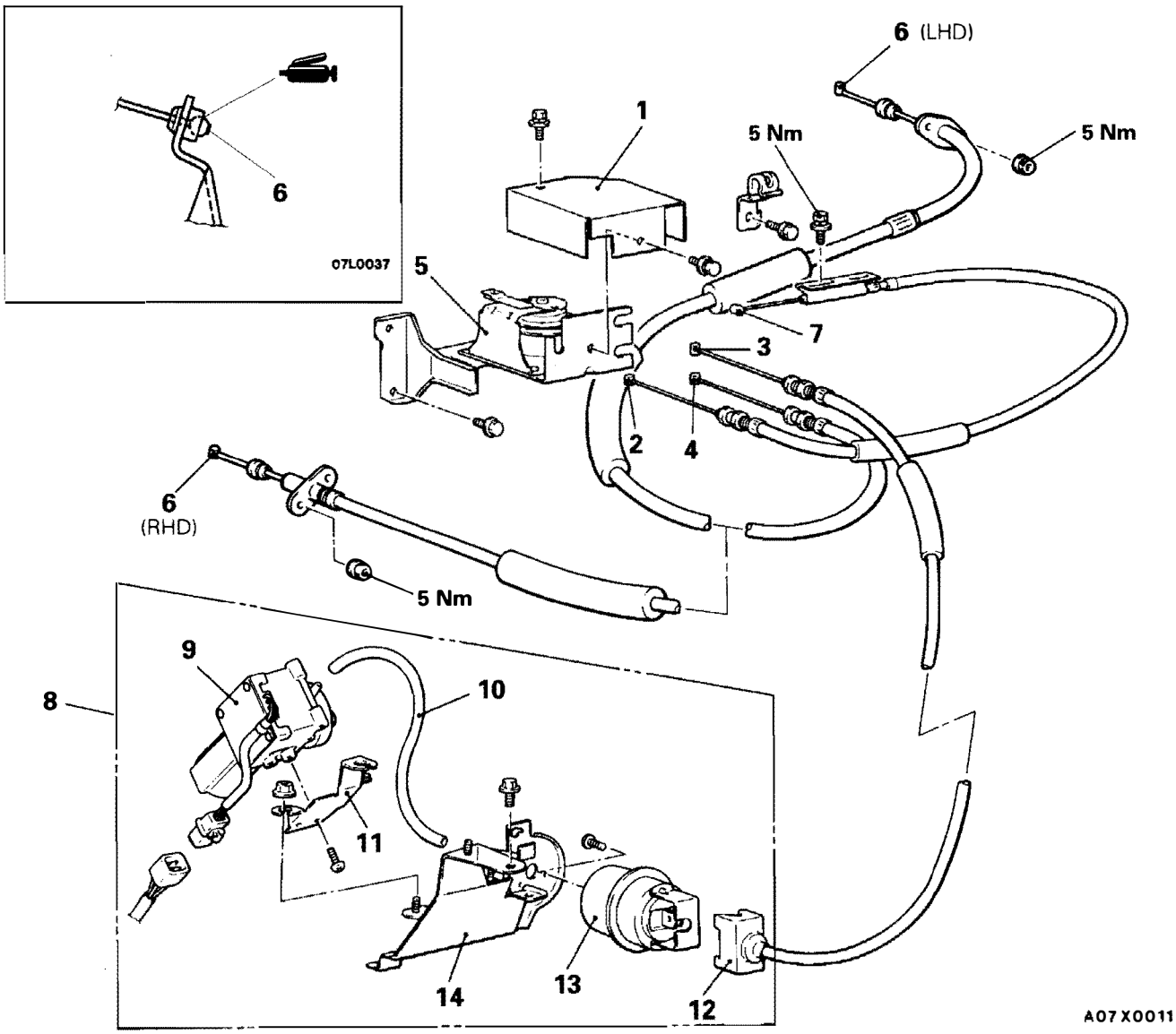
ACTUATOR INSPECTION E13GF12AA

1. Remove the actuator.
2. Apply negative pressure to the actuator with the vacuum pump and check that the holder moves more than 35 mm. In addition, check that there is no change in the position of the holder when negative pressure is maintained in that condition.
3. First install the actuator and then inspect and adjust the auto-cruise control cable (Refer to P.13G-22.)

AUTO-CRUISE CONTROL

E13GG00AA

REMOVAL AND INSTALLATION



Link assembly removal steps

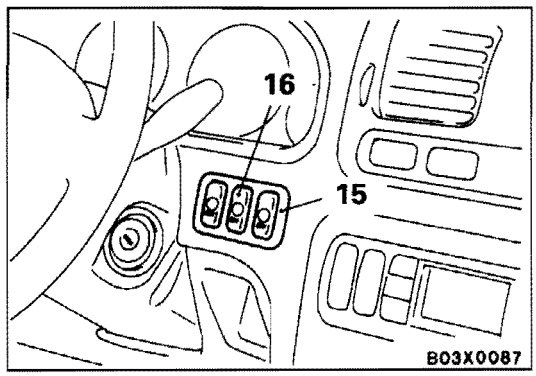
1. Link protector
2. Throttle cable connection
3. Auto-cruise control cable connection
4. Accelerator cable connection
5. Link assembly
6. Accelerator cable connection
7. Throttle cable connection

Actuator removal steps

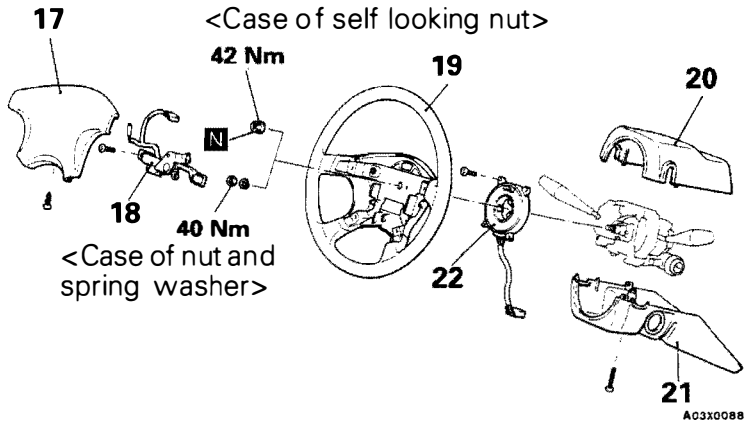
8. Auto-cruise actuator assembly
9. Auto-cruise vacuum pump assembly
10. Vacuum hose
11. Pump bracket
12. Auto-cruise control cable connection
13. Actuator
14. Actuator bracket

Main switch removal steps

15. Instrument panel switch
16. Main switch

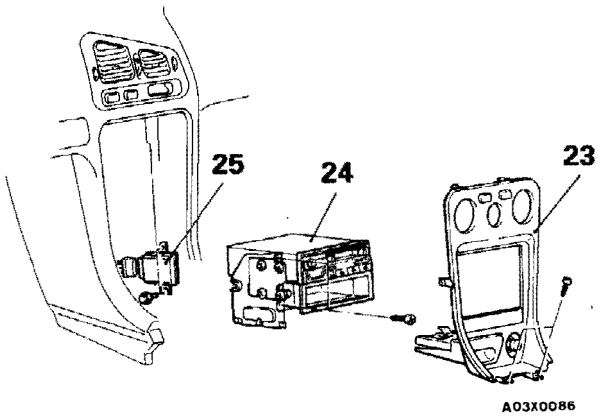


CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



Control switch removal steps

17. Horn pad
18. Control switch
19. Steering wheel
20. Steering column upper cover
21. Steering column lower cover
    - Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
22. Slip ring

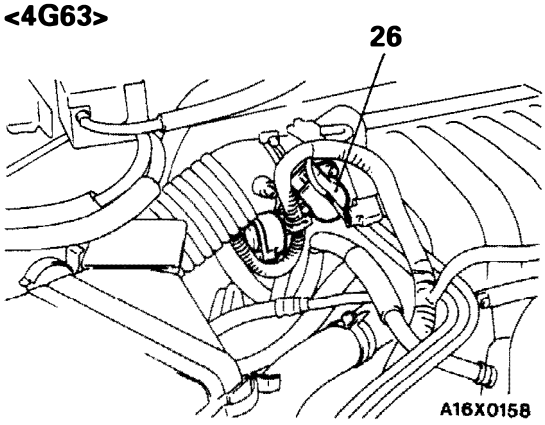


Control unit removal steps

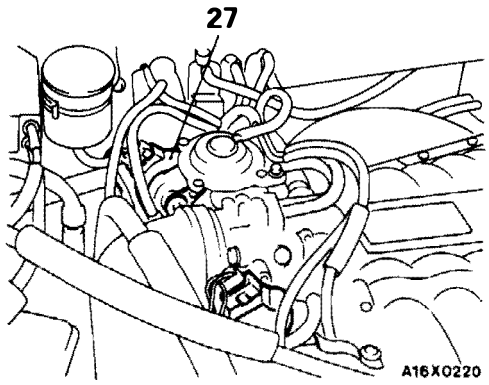
- Shift lever panel (Refer to GROUP 52A – Floor Console.)

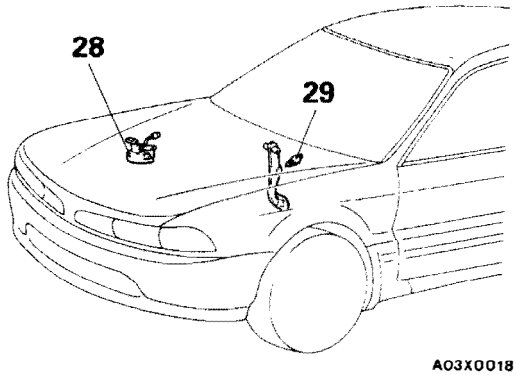
23. Center console panel
24. Radio and tape player
25. Control unit

<4G63>



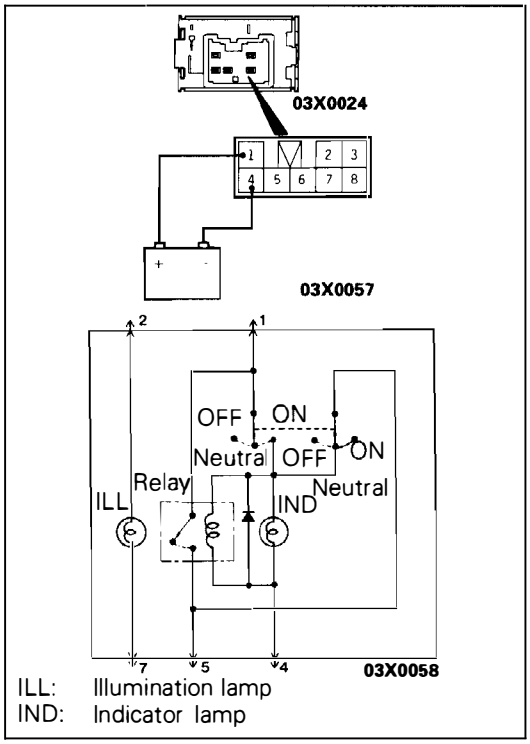
<6A12, 6G73>





Sensor removal steps

26. Throttle position sensor
27. Accelerator pedal position sensor <TCL>
28. Inhibitor switch <A/T>
29. Stop lamp switch



ILL: Illumination lamp
IND: Indicator lamp

INSPECTION E13GG02AA

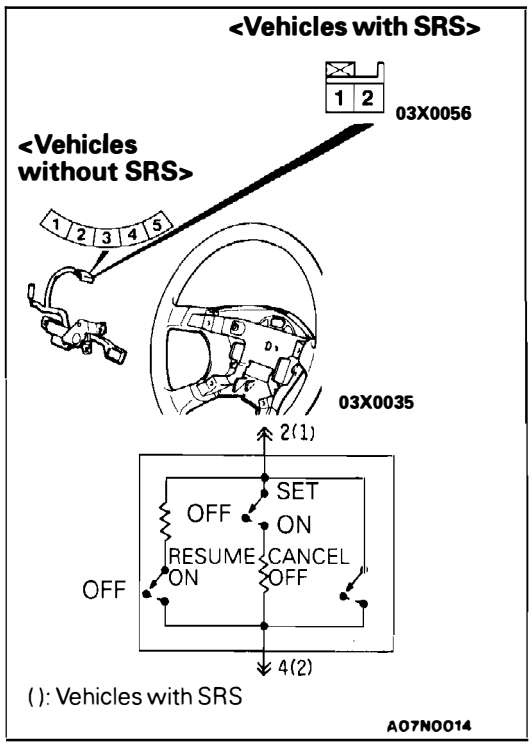
AUTO-CRUISE CONTROL MAIN SWITCH

(1) Operate the switch and check for continuity between the terminals

Switch position \ Terminal	7	ILL	2	1	4	5
OFF	○	○	○			
Neutral	○	○	○		○	○
ON	○	○	○	○		○

NOTE
○—○ indicates that there is continuity between the terminals.

(2) When the battery (+) side is connected to terminal 1 and the (–) side is connected to terminal 4, and the main switch is turned to ON, check if battery voltage is output between terminal 5 and the earth until the main switch is turned to OFF.
Next, when the main switch is turned to OFF, check if the battery voltage that was output between terminal 5 and the earth becomes 0V.

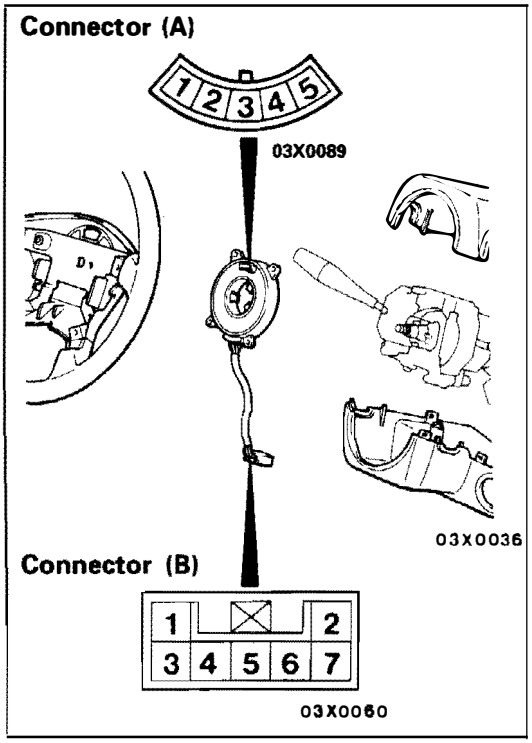


( ): Vehicles with SRS
A07N0014

AUTO-CRUISE CONTROL SWITCH E13GG02BA

Measure the resistance between the terminals when each of the SET, RESUME and CANCEL switches is pressed. If the values measured at this time correspond to those in the table below, then there is no problem.

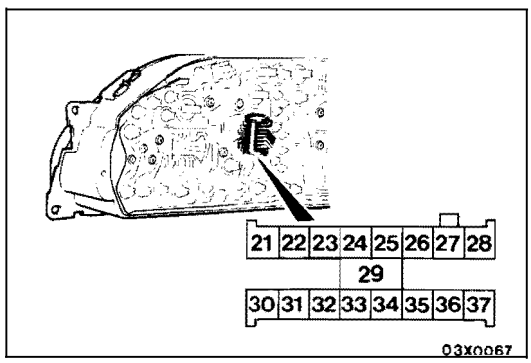
Switch position	Resistance between terminals
Switch OFF	Non continuity
CANCEL switch ON	Approx. 0 Ω
RESUME switch ON	Approx. 820 Ω
SET switch ON	Approx. 2,700 Ω



SLIP RING E13GG02CA

Terminal No. / Terminal used	Connector (A) 1	2	3	4	5	Connector (B) 1	2	3	6	7
ACC power supply				○	○	○				
Earth	○									○
Auto-cruise control		○							○	
Horn					○		○			

NOTE
(1) ○—○ indicates that there is continuity between the terminals.
(2) Check to be sure that there is no change in continuity when the steering wheel is turned.
(3) For vehicles with SRS, refer to GROUP 52B – Clock Spring.



AUTO-CRUISE CONTROL INDICATOR LAMP E13GG02DA

(1) Remove the combination meter. (Refer to GROUP 54 – Combination meter.)
(2) Check the continuity between terminals (24) and (33). If there is no continuity, replace the auto-cruise control indicator lamp.

FUZZY TRACTION CONTROL (FUZZY TCL)

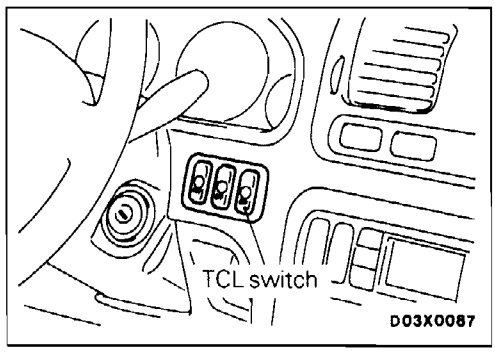
CONTENTS

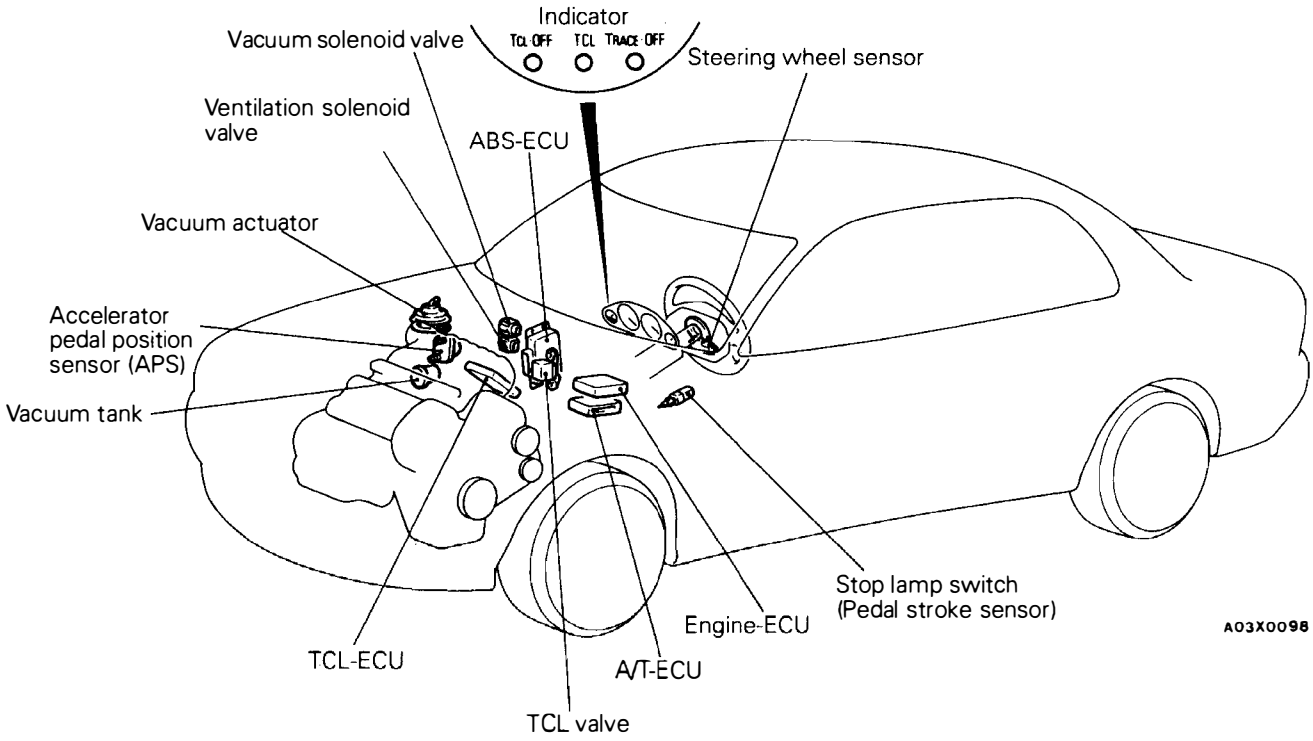
E13HA00AA

GENERAL INFORMATION

E13HB00AA

A new fuzzy shift control has been added to the conventional TCL system (slip control and trace control), providing further improvements in steering performance and stability for climbing and descending roads and winding roads.

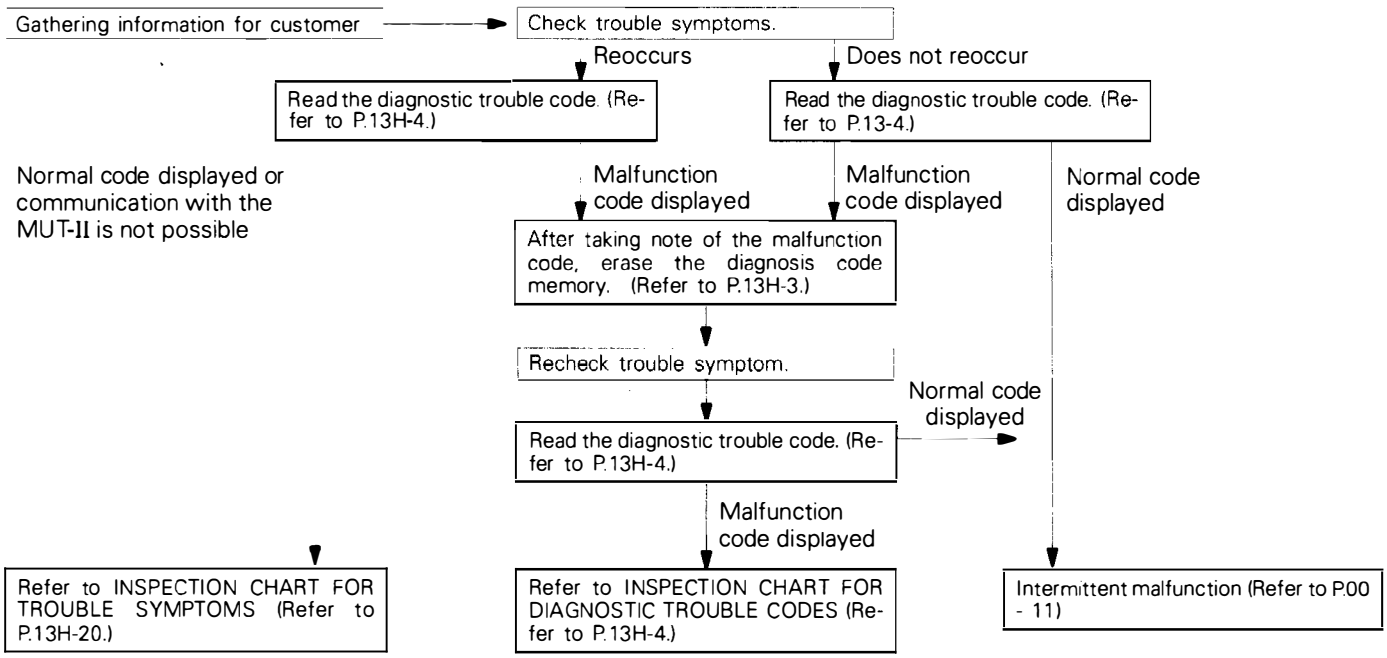




TROUBLESHOOTING

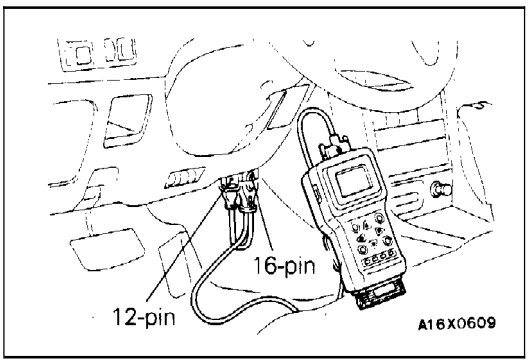
E13HE00AA

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



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

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



DIAGNOSTIC FUNCTION

E13HE01AA

METHOD OF READING THE DIAGNOSTIC TROUBLE CODES

Connect the MUT-II to diagnosis connector S underneath the instrument under cover and take a reading of the diagnosis codes.

METHOD OF ERASING THE DIAGNOSTIC TROUBLE CODES

E13HE01BA

When using the MUT-II

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

When not using the MUT-II

After disconnecting the battery cable from the battery (–) terminal for 10 seconds or more, reconnect the cable.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

E13HE02AA

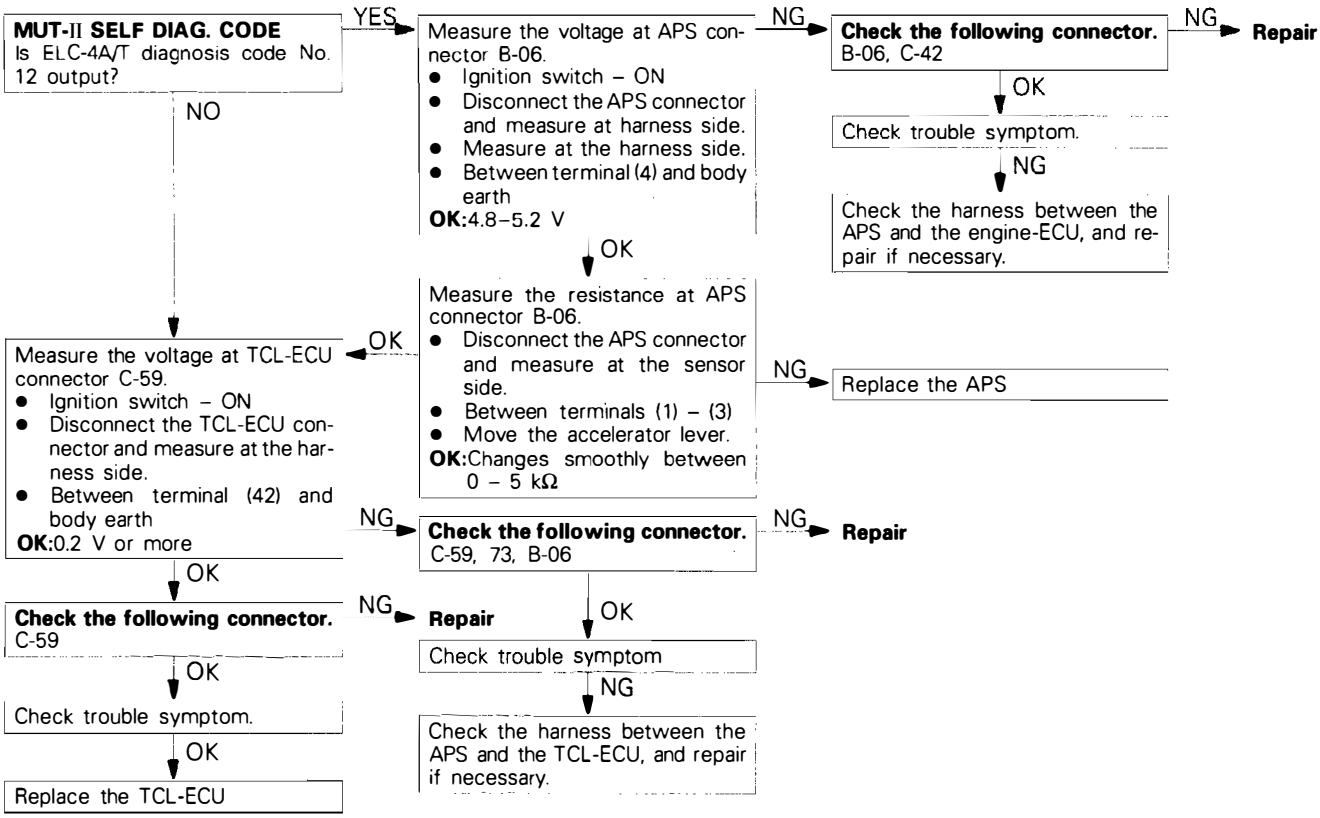
Code No.	Diagnostic item	Reference page
11	APS circuit system	P.13H-5
12	APS or TPS circuit system	P.13H-6
13	TPS circuit system	P.13H-7
23	Stop lamp switch circuit system	P.13H-7
24	TCL switch circuit system	P.13H-8
26	Igniton switch (IG2) circuit system	P.13H-8
27	TCL-ECU power supply voltage circuit (engine control relay circuit) system	P.13H-9
31	Front right wheel speed sensor circuit system	P.13H-10
32	Front left wheel speed sensor circuit system	P.13H-10
33	Rear right wheel speed sensor circuit system	P.13H-11
34	Rear left wheel speed sensor circuit system	P.13H-11
35	Rear wheel speed sensor circuit system (1)	P.13H-11
36	Rear wheel speed sensor circuit system (2)	P.13H-12
37	ABS-ECU communication circuit system	P.13H-12
41	Steering angular velocity sensor (ST-1) circuit system (open circuit)	P.13H-13
42	Steering angular velocity sensor (ST-2) circuit system (open circuit)	P.13H-13
43	Steering angular velocity sensor (ST-N) circuit system (open circuit)	P.13H-13
44	Steering angular velocity sensor circuit system	P.13H-14
45	Steering angular velocity sensor (ST-N) circuit system (open circuit)	P.13H-15
54	1st detection switch circuit system	P.13H-16
55	1st detection switch or back-up lamp switch circuit system	P.13H-17
66	Brake control command fail	P.13H-17
71	Engine-ECU communication circuit system	P.13H-18
72	Engine-ECU circuit system	GROUP 13A*1
73		
74	A/T-ECU communication circuit system	P.13H-18
75	A/T circuit (shift control solenoid valve) system	GROUP 23*2
76	ABS circuit system	P.13H-19

NOTE
*1 : Inspect according to fuel troubleshooting.
*2 : Inspect according to automatic transmission troubleshooting.

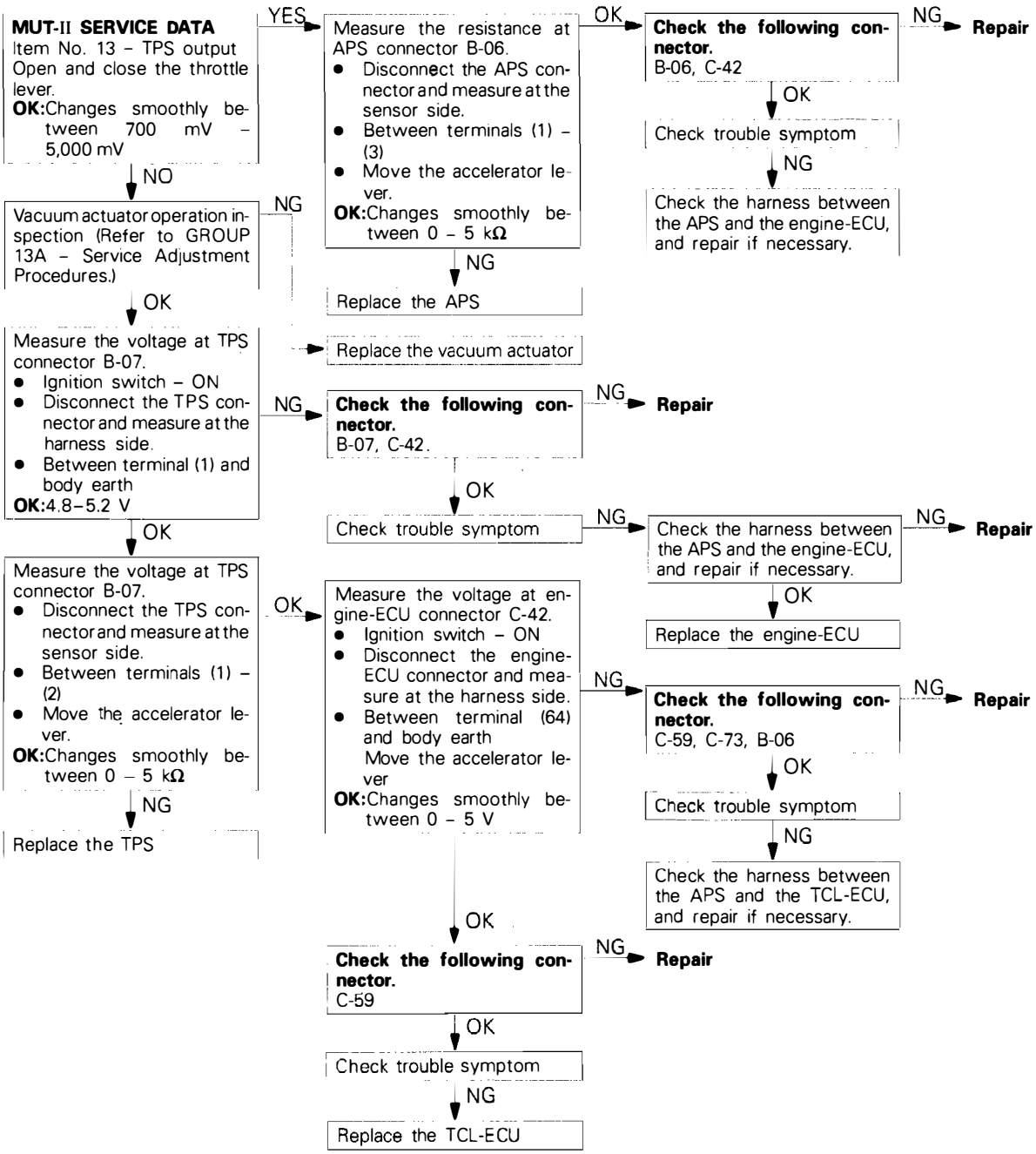
INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

E13HE03AA

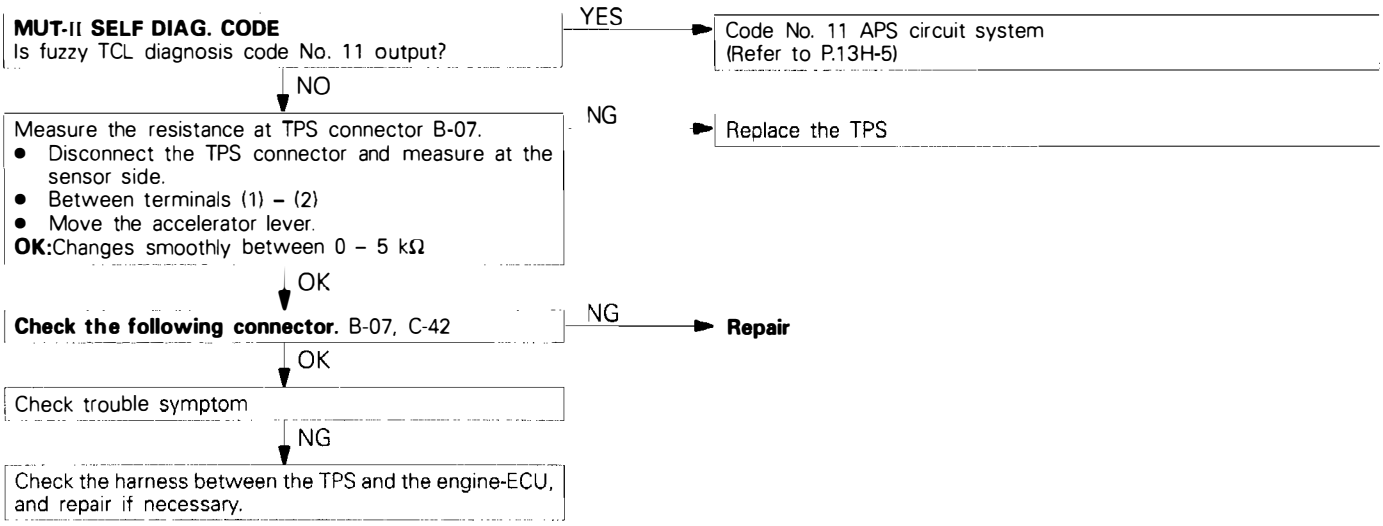
Code No. 11	APS circuit system	Probable cause
[Comment]	This diagnosis code is output if the APS output voltage is less than 0.2 V due to an open circuit or other malfunction in the APS circuit. The APS power supply and earth are supplied from the engine-ECU, and the output signal is used by the A/T-ECU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



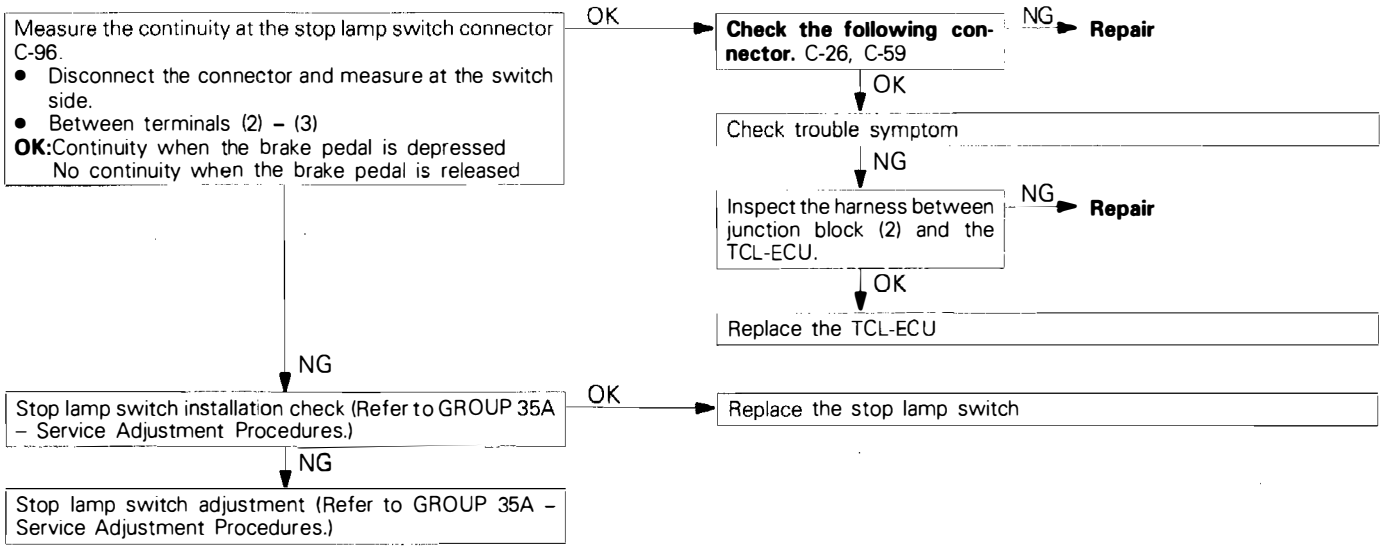
Code No. 12	APS or TPS circuit system	Probable cause
[Comment]	This diagnosis code is output if the APS opening angle is 20° or more greater than the TPS opening angle because of a short in the APS, an open circuit in the TPS or sticking of the vacuum actuator. As this detection condition can be applicable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



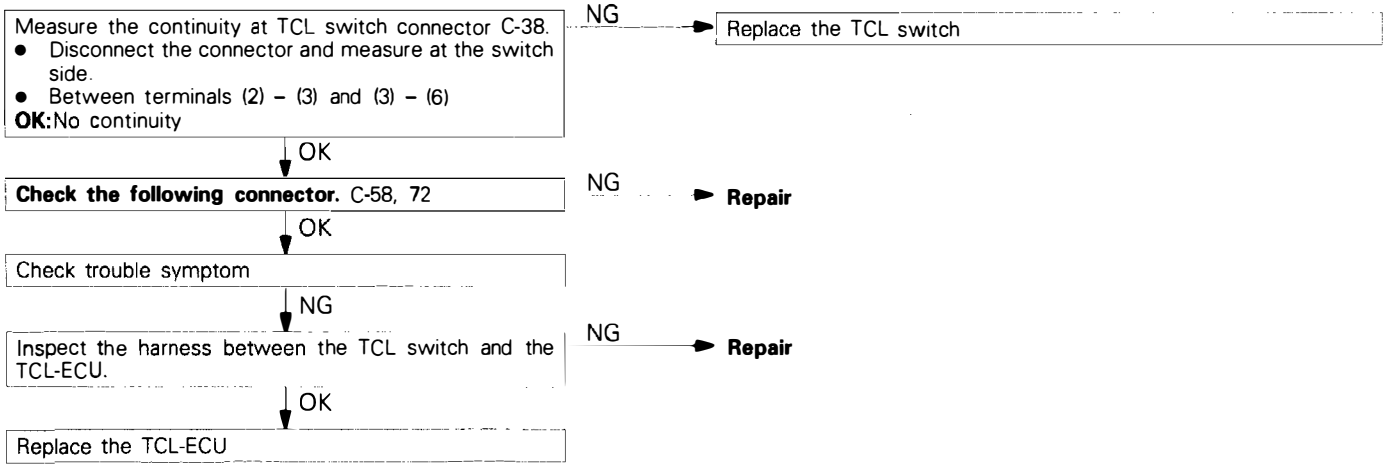
Code No.13	TPS system	Probable cause
[Comment]	This diagnosis code is output if the TPS opening angle is 20° or more greater than the APS opening angle because of a short in the TPS or an open circuit in the APS. If there is an open circuit in the APS, diagnosis code No. 11 is output first. Accordingly,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



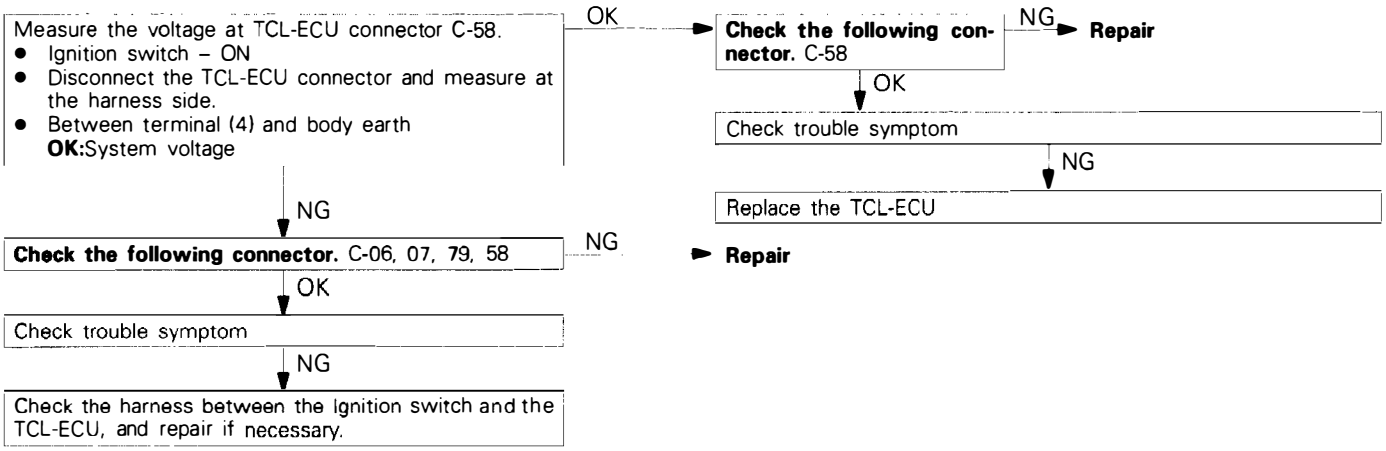
Code No. 23	Stop lamp switch circuit system	Probable cause
[Comment]	This diagnosis code is output if the stop lamp switch remains ON for a continuous period of 15 minutes or more, or for a continuous period of 1 minute or more when driving at a speed of 10 km/h or more, because of a short circuit or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



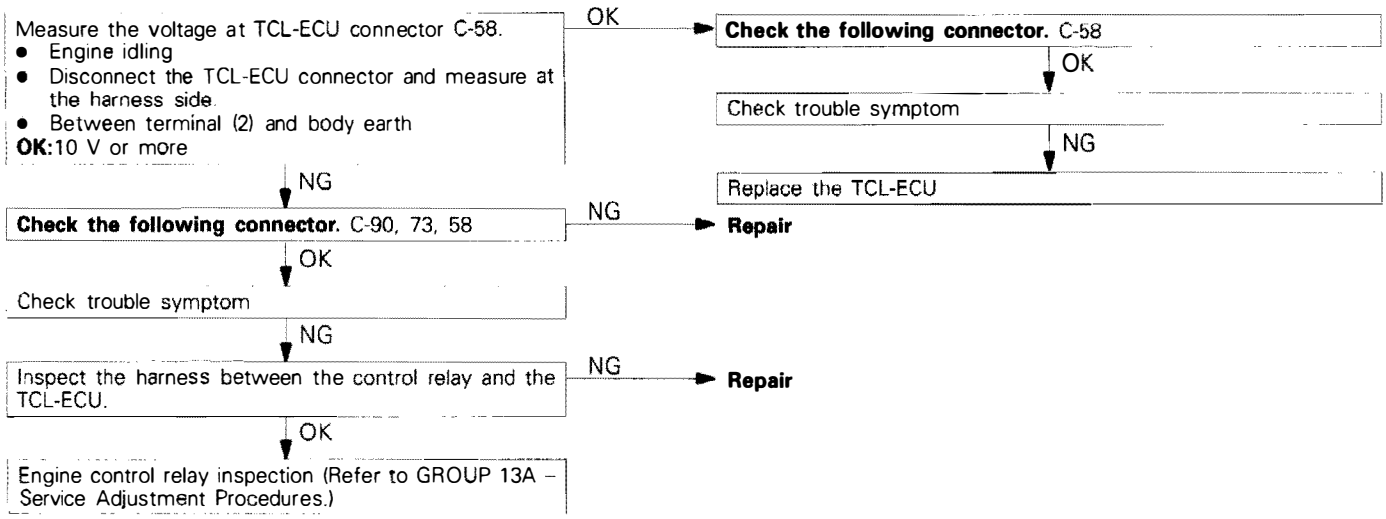
Code No.24	TCL switch circuit system	Probable cause
[Comment]	This diagnosis code is output if signals are input simultaneously from both the TCL-OFF and TCL-ON positions because of a short circuit in the TCL switch circuit.	• Malfunction of the TCL switch • Malfunction of harness or connector • Malfunction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



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

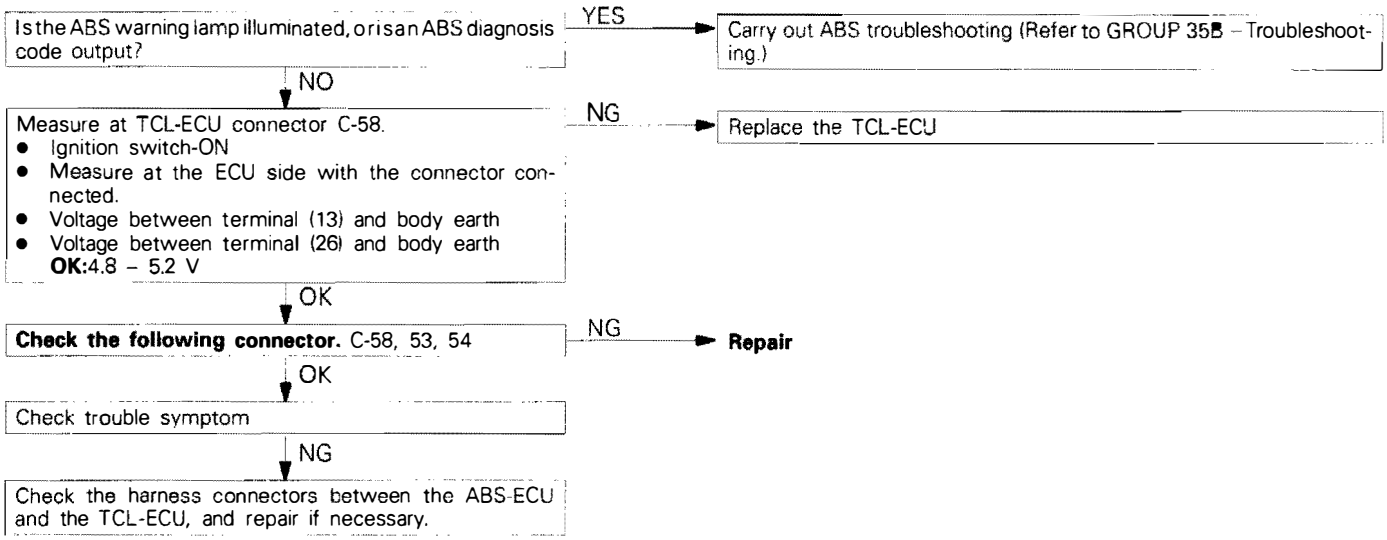


Code No. 27	TCL-ECU power supply voltage circuit (engine control relay circuit) system	Probable cause
[Comment]	This diagnosis code is output if the TCL-ECU power supply voltage (engine control relay supply voltage) is lower than the specified value. If the voltage returns to the specified value or greater,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



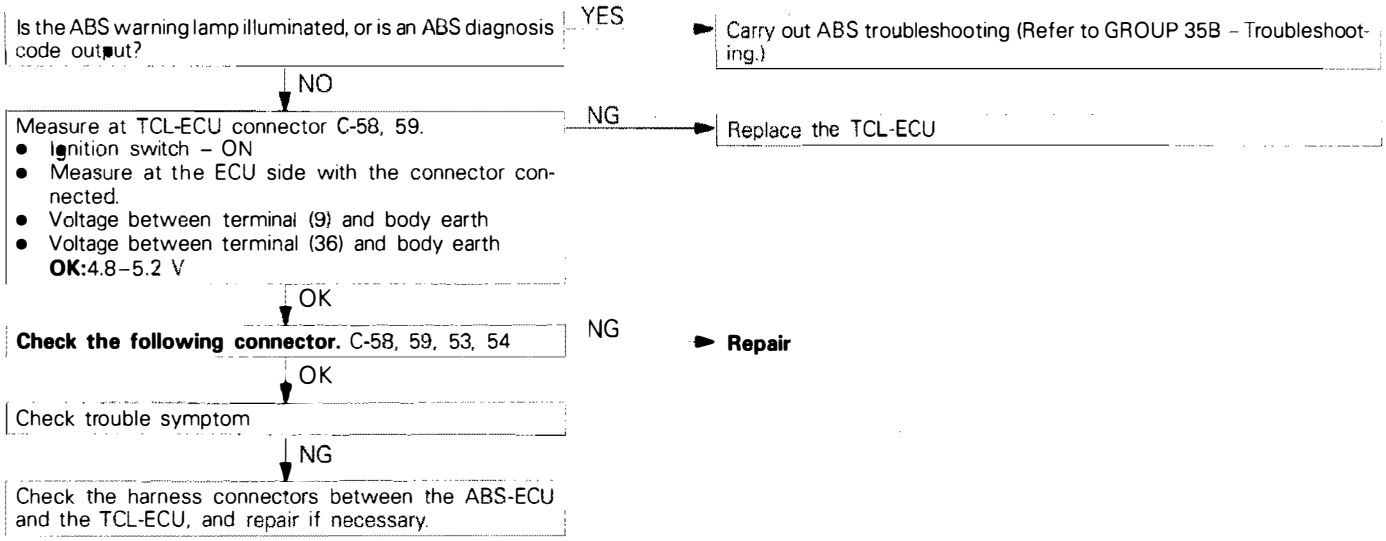
Code No. 31	Front right wheel speed sensor circuit system	Probable cause
Code No. 32	Front left wheel speed sensor circuit system	
[Comment] These diagnosis codes are output if a pulse (from the front wheels) indicates that the difference between the front wheels and the rear wheels is 8km/h or more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

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

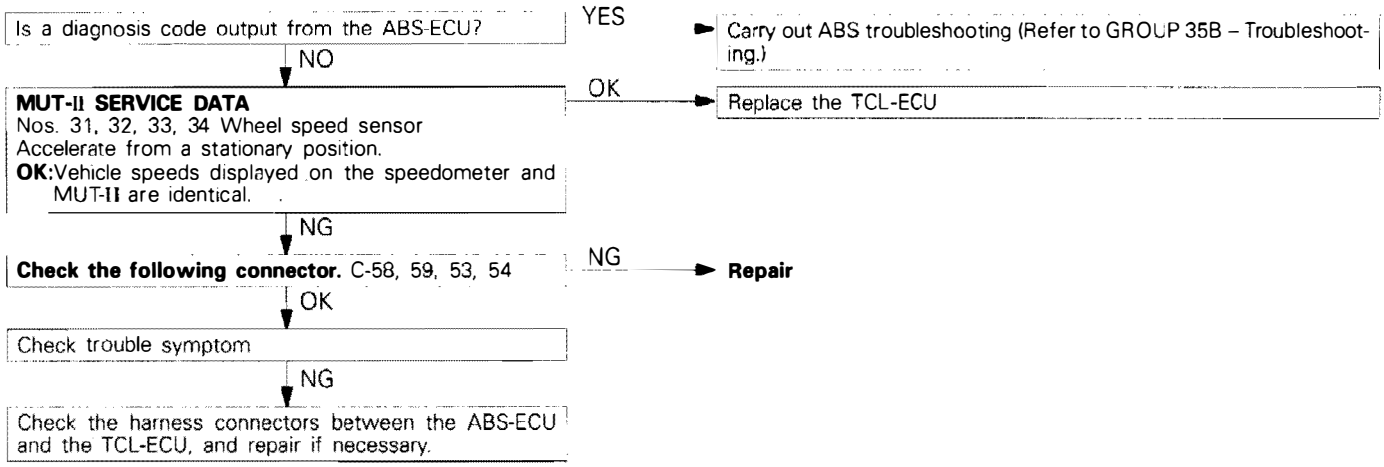


Code No. 33	Rear right wheel speed sensor circuit system	Probable cause
Code No. 34	Rear left wheel speed sensor circuit system	
[Comment] These diagnosis codes are output if a pulse (from the wheels on one side of rear) indicates that the difference between the left wheel and the right wheel is 8km/h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

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

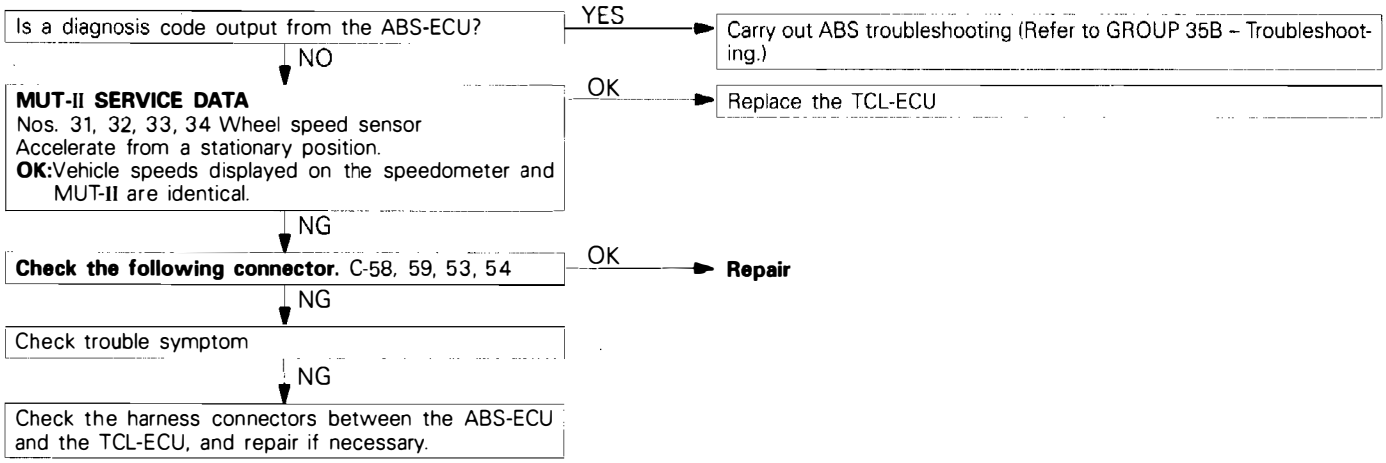


Code No. 35	Rear wheel speed sensor circuit system (1)	Probable cause
[Comment] This diagnosis code is output if the pulse signal from a rear wheel sensor is momentarily interrupted (0.02 sec.) because of a transient open circuit in a rear wheel speed sensor. Furthermore, this code is always output at the same time as either code No. 33, 34 or 76.		• Malfunction of rear wheel speed sensor • Malfunction of harness or connector • Malfunction of ABS-ECU

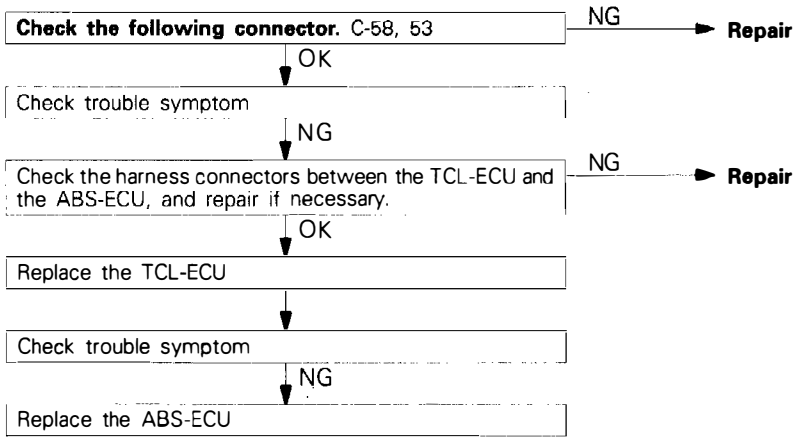


Code No. 36	Rear wheel speed sensor circuit system (2)	Probable cause
[Comment]	This diagnosis code is output if a rear wheel speed sensor abnormality is judged when the turning speed of both rear wheels is 0 km/h for 20 seconds or more while fuzzy TCL is operating.	• Malfunction of rear wheel speed sensor • Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of ABS-ECU

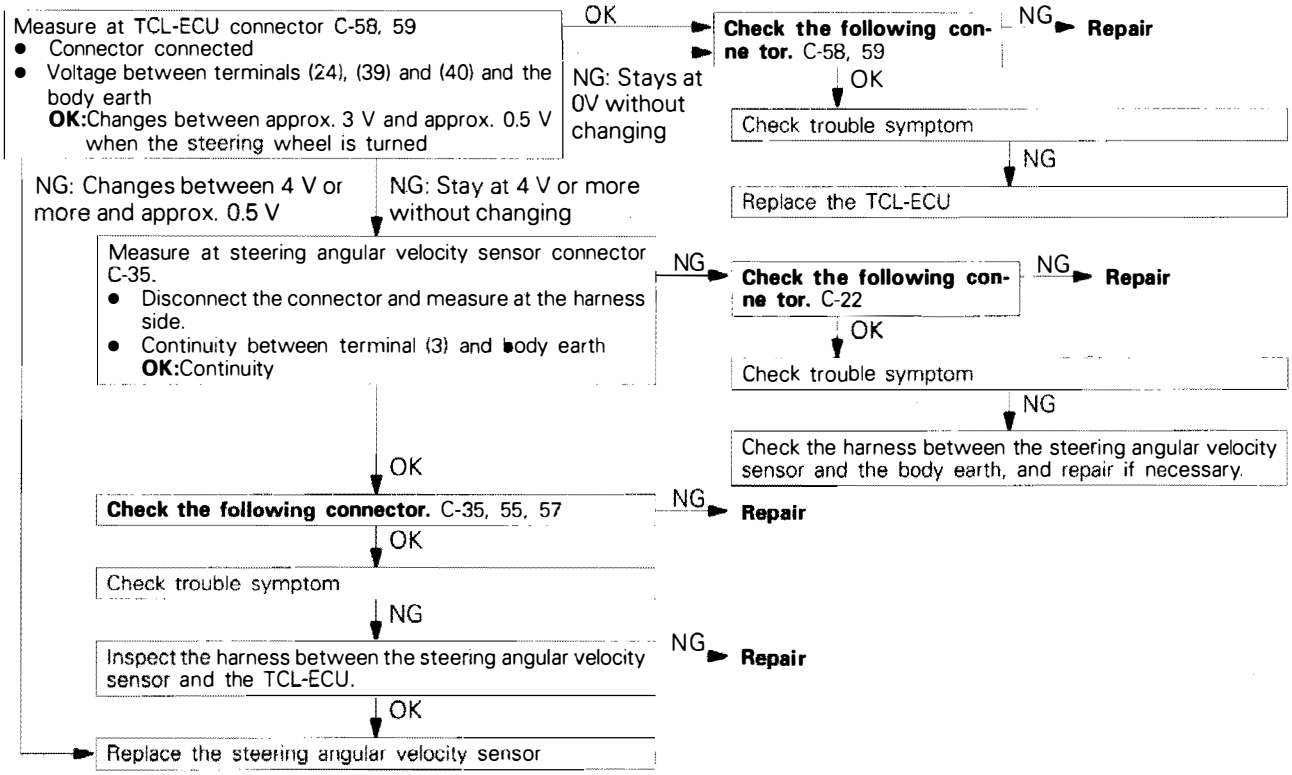
NOTE
(1) If the front wheels only are turning while the rear wheels are stationary (wheel slip), the TCL indicator will start flashing after 20 seconds, and the system will be isolated.
(2) When these diagnosis codes are output, erase the diagnosis code memory after carrying out repairs, and then carry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



Code No. 37	ABS-ECU communication circuit system	Probable cause
[Comment]	This diagnosis code is output if an error is detected in the communication contents because of a malfunction due to an open or short circuit in the serial communication circuit between the TCL-ECU and the ABS-ECU, or because of a malfunction of the ECU or defective shielding of the shield wire.	• Malfunction of harness or connector • Malfunction of TCL-ECU • Malfunction of ABS-ECU

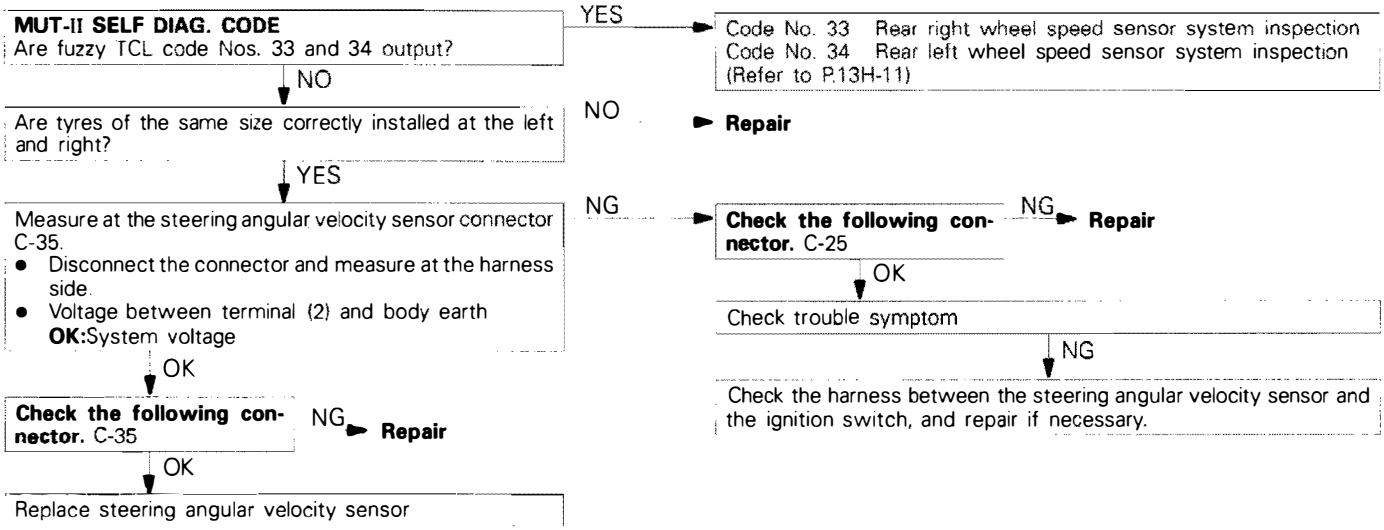


Code No. 41	Steering angular velocity sensor (ST-1) circuit system (open circuit)	Probable cause
Code No. 42	Steering angular velocity sensor (ST-2) circuit system (open circuit)	
Code No. 43	Steering angular velocity sensor (ST-N) circuit system (open circuit)	
[Comment] These diagnosis codes are output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

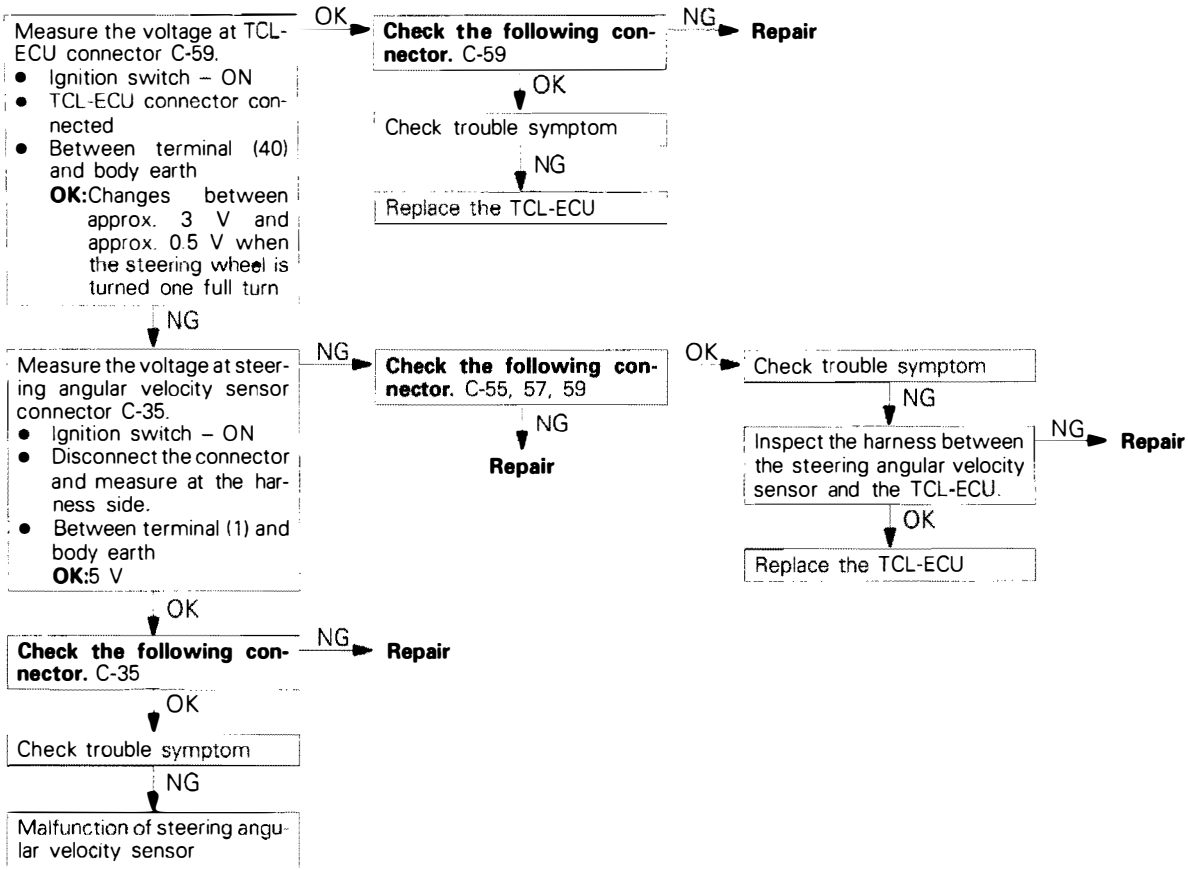


Code No. 44	Steering angular velocity sensor circuit system	Probable cause
[Comment]	This diagnosis code is output if it is judged that there is an abnormality in the steering angular velocity sensor power supply circuit when the steering angle is less than 10° under the following condition (when no steering signal is input at all).	• Malfunction of harness or connector • Malfunction of steering angular velocity sensor • Malfunction of TCL-ECU
(Condition)	When the vehicle speed is 20 – 60 km/h and the difference between the left and right rear wheel speed sensors is 1 km/h or more.	

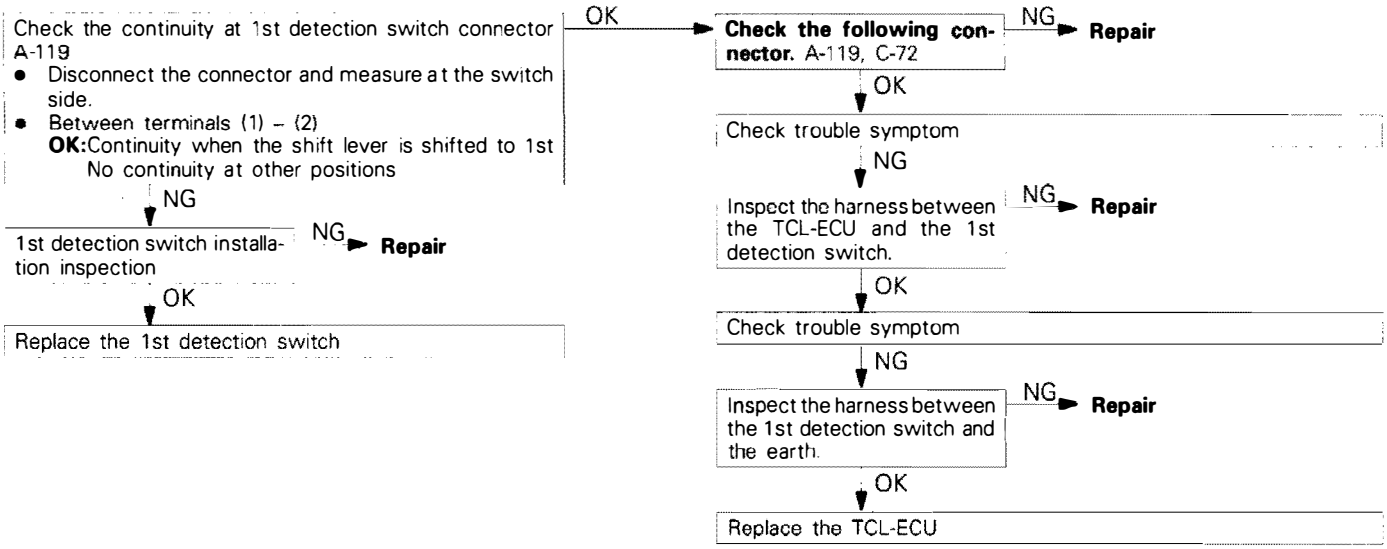
NOTE
Even if the steering angular velocity sensor is normal, this code may be output if left and right tyres of different diameters are being used while driving.



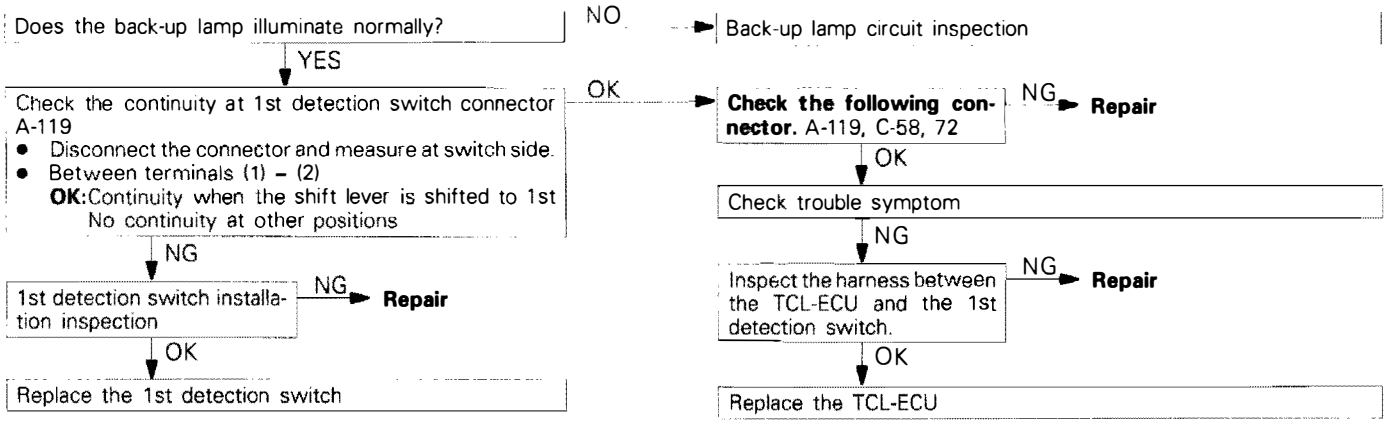
Code No. 45	Steering angular velocity sensor (ST-N) circuit system (open circuit)	Probable cause
[Comment]	This diagnosis code is output if it is considered that there is an abnormality in the steering angular velocity sensor (ST-N) circuit system when the straight-ahead position is continuously detected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



Code No. 54	1st detection switch circuit system	Probable cause
[Comment]	This diagnosis code is output if there is a defective 1st detection switch, or if conditions where the 1st detection switch is OFF (when shifted in any range other than 1 range) because of an open circuit in the 1st detection switch circuit, engine and transmission conditions are those for 1 range or driving at 40 km/h or more continue for 1 minute or more. This diagnosis code is also output if driving continues with the clutch pedal half-depressed in 2 or 3 range.	• Malfunction of 1st detection switch • Malfunction of harness or connector • Malfunction of TCL-ECU



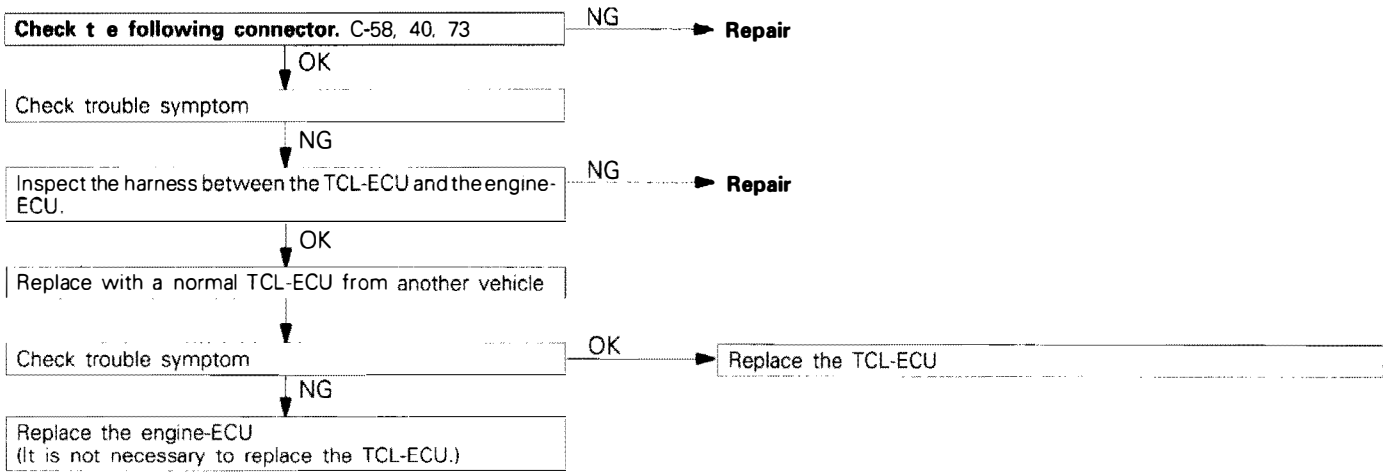
Code No. 55	1st detection switch or back-up lamp switch circuit system	Probable cause
[Comment]	This diagnosis code is output if both the 1st detection switch and the back-up lamp switch are ON simultaneously for a continuous period of 3 seconds or more because of a short circuit in the 1st detection switch or back-up lamp switch.	• Malfunction of 1st detection switch • Malfunction of back-up lamp switch • Malfunction of harness or connector



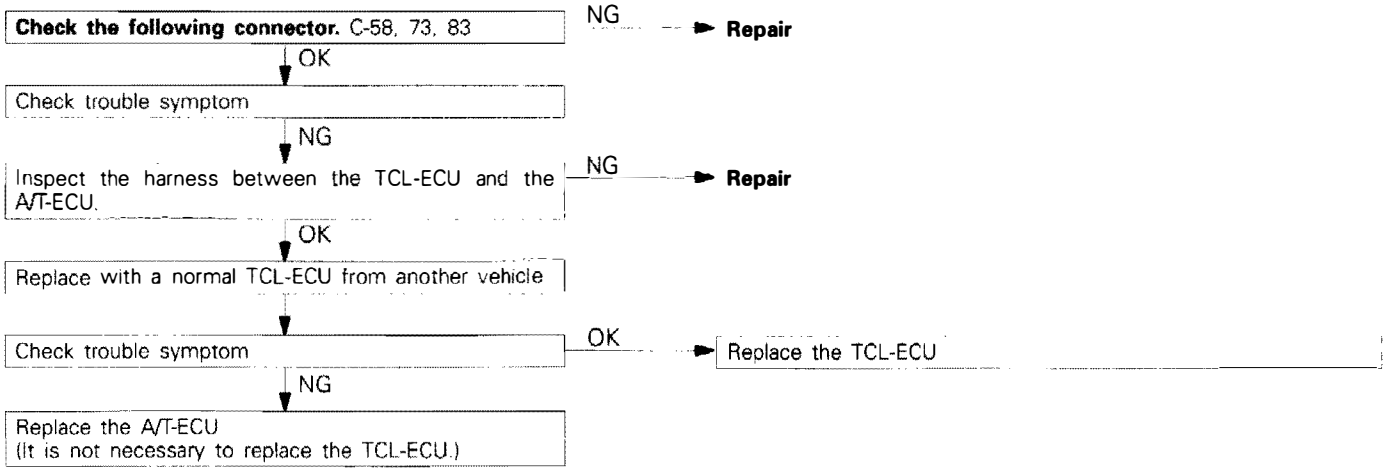
Code No. 66	Abnormality in communication data to the ABS-ECU (Brake control command)	Probable cause
[Comment]	This diagnosis code is output if an error is detected in the brake control command signal from the TCL-ECU to the ABS-ECU.	• Malfunction TCL-ECU

If this diagnosis code is output, replace the TCL-ECU.

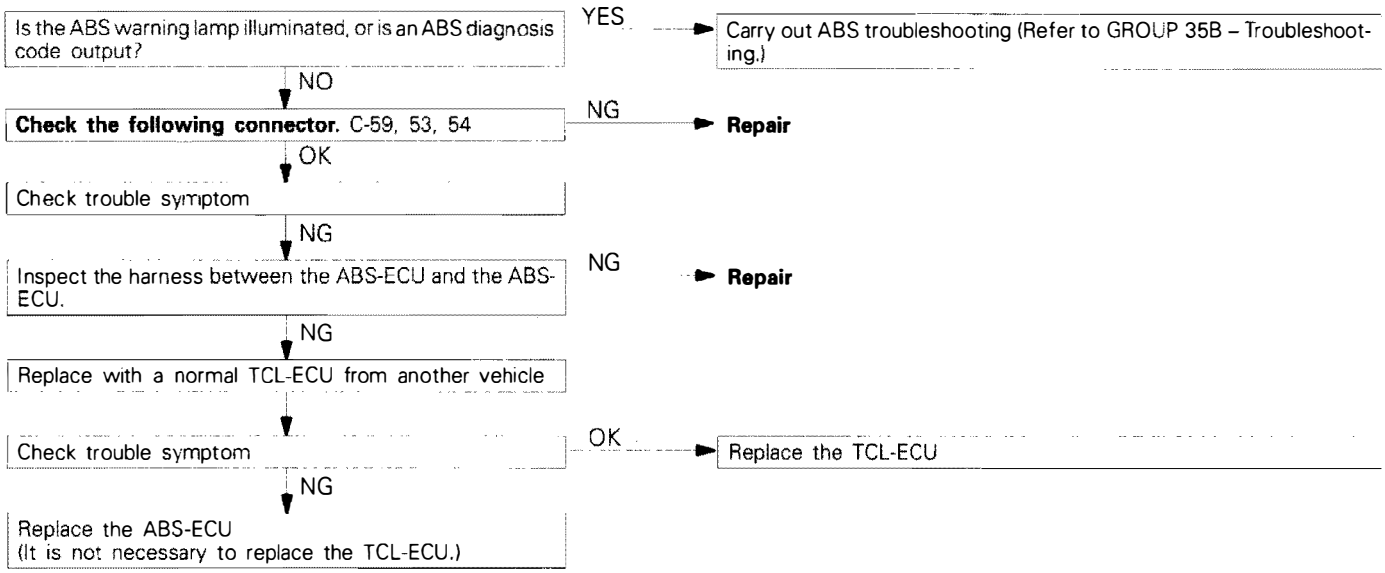
Code No. 71	Engine-ECU communication circuit system	Probable cause
[Comment]	This diagnosis code is output if an error is detected in the communication contents because of an open or short circuit in the serial communication circuit between the TCL-ECU and the engine-ECU, a malfunction of ECU and a defective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



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



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



INSPECTION CHART FOR TROUBLE SYMPTOMS

E13HE04AA

	Trouble symptom	Inspection procedure No.	Reference page
Communication with the MUT-II is not possible.	Communication with all systems is not possible.	1	P.13H-20
	Communication with TCL-ECU only is not possible.	2	P.13H-21
Malfunction of TCL indicator lamp display	None of the TCL indicator lamps (TCL OFF, TCL, TRACE OFF) illuminate when the ignition switch is ON.	3	P.13H-21
	One of the TCL indicator lamps does not illuminate when the ignition switch is ON (at least one lamp does illuminate).	4	P.13H-22
	TCL OFF indicator lamp remains illuminated even after the engine is started.	5	P.13H-22
	TCL OFF indicator lamp flashes after the engine is started.		
	TCL remains illuminated even after the engine is started.	6	P.13H-23
	TCL OFF and TRACE OFF indicator lamps do not switch even if the TCL switch is continuously pressed to the OFF side while the engine is idling.	7	P.13H-23
Malfunction of TCL operation	TCL illuminates in the TCL operation range, but torque is not reduced.	8	P.13H-24
Poor starting Poor acceleration	Engine output is reduced in the TCL non-operation range (TCL indicator lamp does not illuminate) and starting and acceleration performance is poor.		

INSPECTION PROCEDURES FOR EACH TROUBLE SYMPTOM

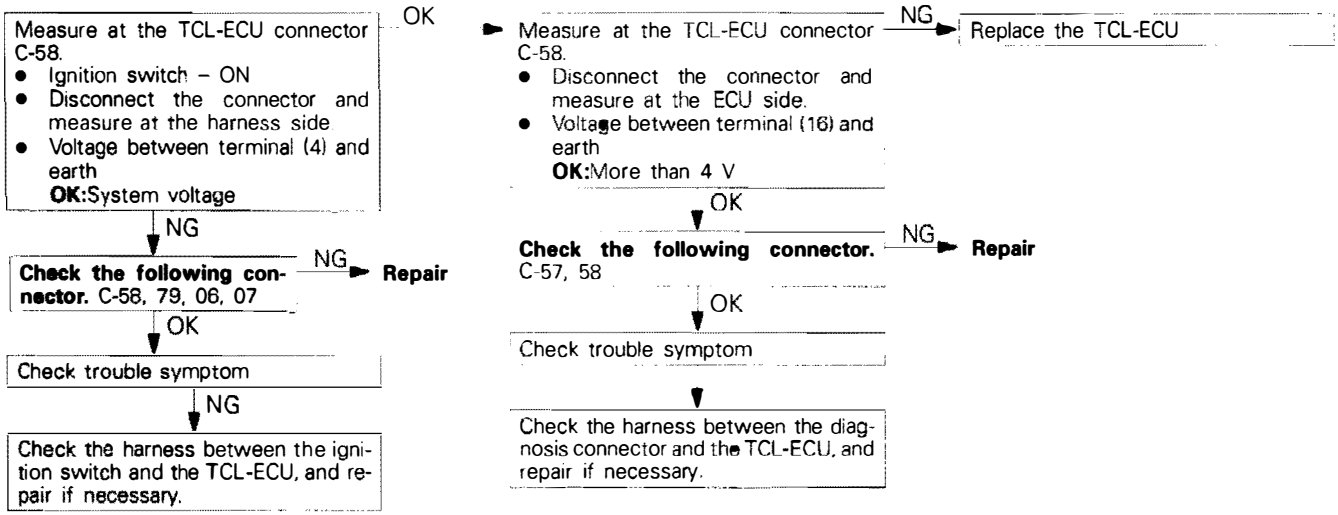
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting

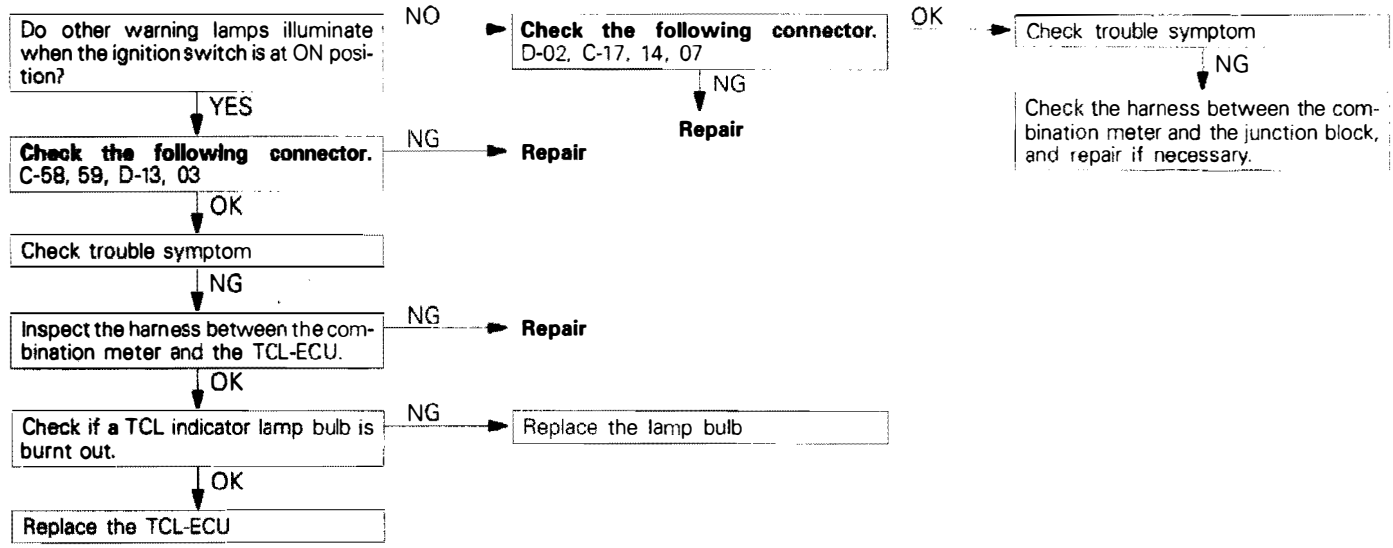
Inspection Procedure 2

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



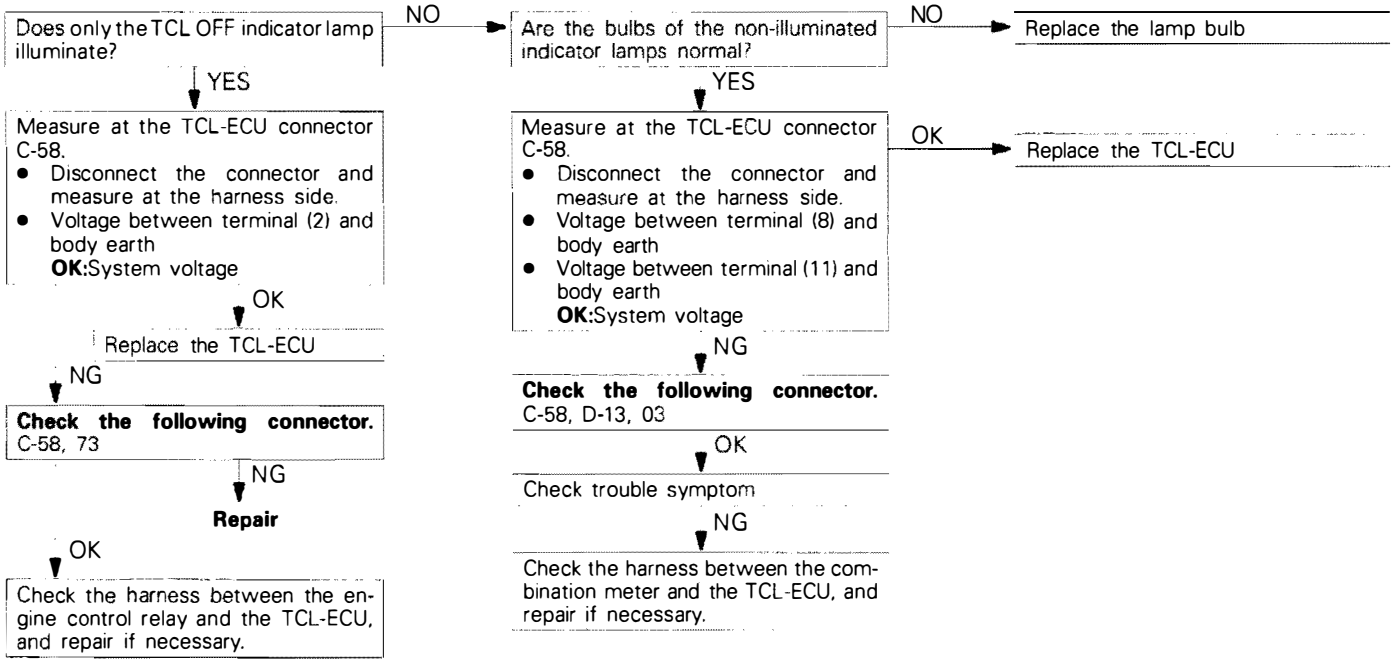
Inspection Procedure 3

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



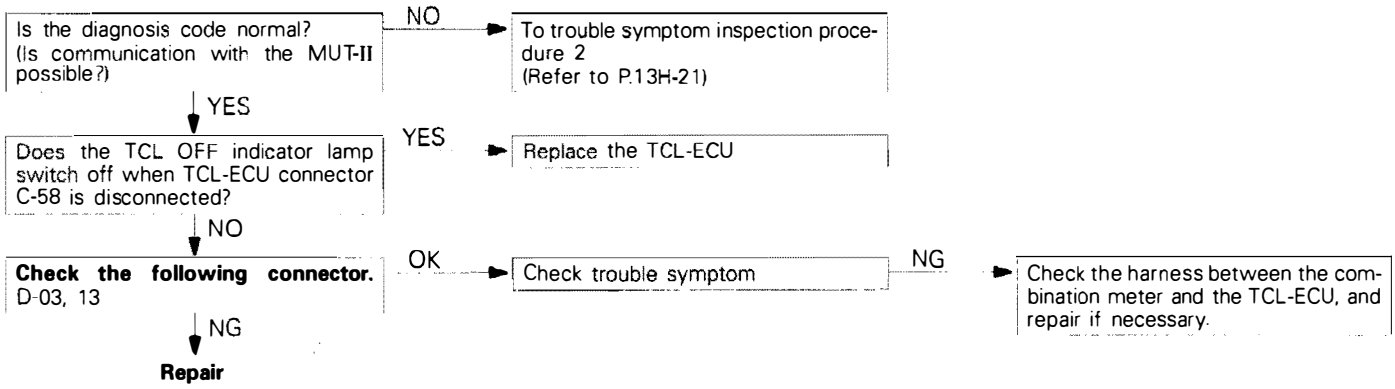
Inspection Procedure 4

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



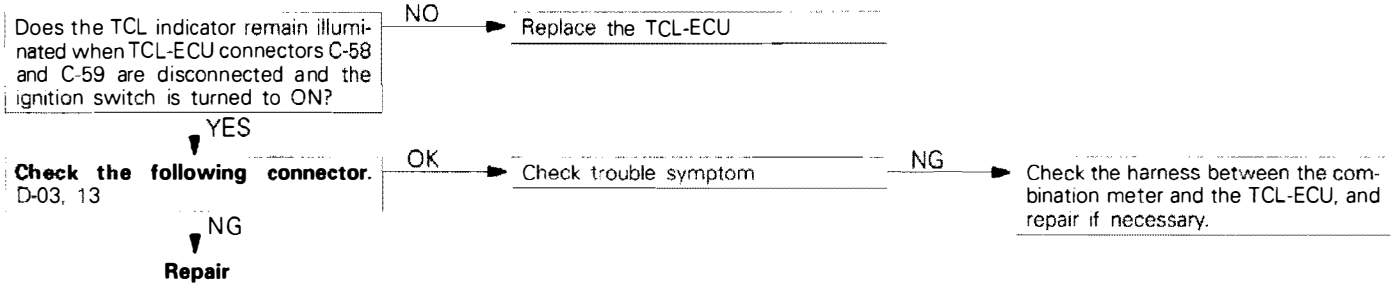
Inspection Procedure 5

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



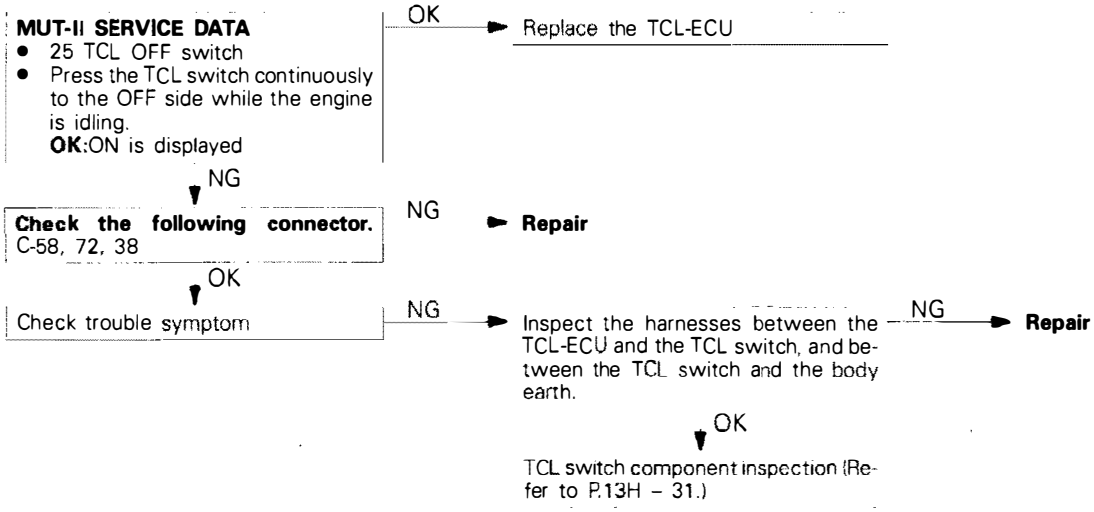
Inspection Procedure 6

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



Inspection Procedure 7

• TCL OFF and TRACE OFF indicator lamps do not switch even if the TCL switch is continuously pressed to the OFF side while the engine is idling. [Comment] TRACE OFF and TCL OFF illuminate alternately each time the TCL switch is pressed. If the indicator lamps do not switch alternately when the switch is operated, there is a malfunction in the switch, switch circuit or in the TCL-ECU.	Probable cause • Malfunction of harness or connector • Malfunction of TCL switch • Malfunction of TCL-ECU



Inspection Procedure 8

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

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

- Vacuum solenoid valve operation inspection
- Ventilation solenoid valve operation inspection
- Disconnected or mis-connected vacuum hose inspection
- Throttle link operation inspection
- Vacuum tank inspection
- Air cleaner element blockage inspection

} (Refer to GROUP 13A – Service Adjustment Procedures.)

SERVICE DATA REFERENCE TABLE

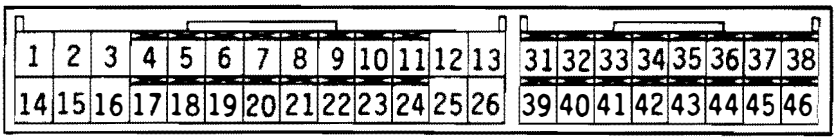
E13HE05AA

No.	Check item	Check condition		Normal condition
11	APS	Accelerator pedal position Ignition switch: ON Selector lever position: N	Fully closed	400–1,000 V
			Depressed	Gradually rises from the above value
			Fully open	4,500–5,500 V
13	TPS	Accelerator pedal position Ignition switch: ON Selector lever position: N	Fully closed	400–1,000 mV
			Depressed	Gradually rises from the above value
			Fully open	4,500–5,500 mV
15	Inhibitor switch <A/T>	Ignition switch: ON	Selector lever: P position	P, N
			Selector lever: R position	R
			Selector lever: N position	P, N
			Selector lever: D position	D
			Selector lever: 2 position	2
			Selector lever: L position	L
16	Back-up lamp switch (M/T)	Shift lever position Ignition switch: ON	R position	ON
			Other than R position	OFF
17	O D switch <A/T>	Ignition switch: ON	OD switch: ON	OD – ON
			OD switch: OFF	OD – OFF
21	Idle switch	Accelerator pedal position Ignition switch: ON	Depressed	OFF
			Released	ON
22	Ignition switch	Ignition switch: ON		ON
		Ignition switch: OFF		OFF
23	Stop lamp switch	Brake pedal position Ignition switch: ON	Depressed	ON
			Released	OFF
24	TCL-ON switch	TCL-ON switch operation Ignition switch: ON	Pressed	ON
			Released	OFF
25	TCL-OFF switch	TCL-OFF switch operation Ignition switch: OFF	Pressed	ON
			Released	OFF
27	ECU power supply voltage	Ignition switch: ON		System voltage
29	Engine model	Ignition switch: ON		S4 or D4 displayed
31	Front right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
32	Front left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
33	Rear right wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h

No.	Check item	Check condition		Normal condition
34	Rear left wheel speed sensor	Engine running Selector lever position: D	Vehicle stopped	0 km/h
			Driving at 40 km/h	40 km/h
43	Steering straight-ahead position	Steering wheel position Ignition switch: ON	Straight-ahead position	ON
			Turned 90°	OFF
44	Steering angle	Steering wheel position Ignition switch: ON	Turned 90° to the right	R 90deg
			Turned 90° to the left	L 90deg
45	Steering straight-ahead point learning	Steering wheel position Ignition switch: ON	Immediately after battery is connected	OFF
			Immediately after city driving	ON
51	Slip control	TCL switch: ON Driving on low frictional resistance road	TCL indicator lamp illuminated	ON
			TCL indicator lamp switched off	OFF
52	Trace control	TCL switch: ON Driving on winding road	TCL indicator lamp illuminated	ON
			TCL indicator lamp switched off	OFF
53	Fuzzy shift control	Driving on steep downward slope	A/T mode selection switch: AUTO	ON
			A/T mode selection switch: HOLD	OFF
54	1st detection switch (M/T)	Shift lever position	1st position	ON
			Other than 1st position	OFF
56	Differentiation of TCL-ECU for 4WS or 2WS	Ignition switch: ON		4WS or 2WS displayed
61	Front right wheel brake control	TCL switch: ON Driving on low frictional resistance road	Control operating	ON
			Control not operating	OFF
63	Front left wheel brake control	TCL switch: ON Driving on low frictional resistance road	Control operating	ON
			Control not operating	OFF
77	Brake control negation	Ignition switch: ON	Brake pedal depressed	ON
			Brake pedal released	OFF
78	Stop lamp switch (Pedal stroke sensor)	Brake pedal position Ignition switch: ON	Depressed	ON
			Released	OFF

CHECK AT ECU TERMINALS

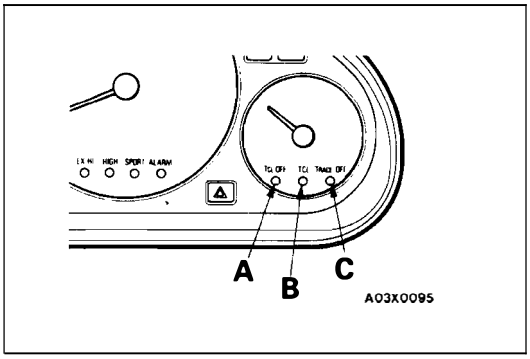
E13HE06AA



03X0101

Terminal No.	Check item	Measurement condition	Normal condition
1	Earth	At all times	Continuity
2	ECU power supply	Ignition switch: ON	System voltage
3	ABS-ECU serial communication	Engine: Idling	Other than 0 V
4	Ignition switch (IG2)	Ignition switch: ON	System voltage
5	A/T-ECU serial communication	Engine: Idling	Other than 0 V
6	Data transmission to 4WS or ECS	–	–
8	TRACE OFF indicator	Ignition switch: ON TCL-ON condition	System voltage
		Ignition switch: ON TRACE-OFF condition	0 V
9	Rear left wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Changes between 0 V and approx. 5 V
10	Engine-ECU data transmission	Engine: Idling	0 V
11	TCL indicator	Ignition switch: ON TCL-ON condition	0 V
		Ignition switch: ON TCL-OFF condition	System voltage
13	Front right wheel speed sensor	Engine: Idling Vehicle slowly moving forward	Changes between 0 V and approx. 5 V
14	Earth	At all times	Continuity
15	ECU back-up power supply	Ignition switch: OFF	System voltage
16	Diagnosis control	–	–
17	TCL-ON switch	Ignition switch: ON TCL switch: Pressed to ON side	0 V
		Ignition switch: ON TCL switch: Release	System voltage
18	1st detection switch input <M/T>	Ignition switch: ON Shift lever in 1 position	0 V
		Ignition switch: ON Shift lever in position other than 1 position	System voltage
19	TCL-OFF switch	Ignition switch: ON TCL-ON condition	0 V
		Ignition switch: ON TCL-OFF condition	System voltage
20	Clutch switch input <M/T>	Ignition switch: ON Clutch pedal depressed	0 V
		Ignition switch: ON Clutch pedal released	System voltage

Terminal No.	Check item	Measurement condition	Normal condition
21	Diagnosis data input	When normal	Flashes between 0 V and approx. 5 V
23	Engine-ECU serial communication	Engine: Idling	Other than 0 V
24	Steering angular velocity sensor ST1 input	Ignition switch: ON Steering wheel turned slowly	Flashes between 0 V and approx. 3 V
26	Front left wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Flashes between 0 V and approx. 5 V
31	TCL-OFF indicator	Ignition switch: ON TCL-ON condition	System voltage
		Ignition switch: ON TCL-OFF condition	0 V
34	Stop lamp switch (pedal stroke sensor) input	Ignition switch: ON Brake pedal depressed	System voltage
		Ignition switch: ON Brake pedal released	0 V
35	Back-up lamp switch input (M/T)	Ignition switch: ON Shift lever in R position	System voltage
		Ignition switch: ON Shift lever in position other than R position	0 V
36	Rear right wheel speed sensor input	Engine: Idling Vehicle slowly moving forward	Flashes between 0 V and approx. 5 V
39	Steering angular velocity sensor ST2 input	Ignition switch: ON Steering wheel turned slowly	Flashes between 0 V and approx. 3 V
40	Steering angular velocity sensor STN input	Engine: Idling Steering wheel in straight-ahead position	0.5 V or less
		Engine: Idling Steering wheel turned 90° from straight-ahead position	2.5–3.5 V
42	APS output	Ignition switch: ON Accelerator pedal fully open	4.5–5.5 V
		Ignition switch: ON Accelerator pedal fully closed	0.4–1.0 V
43	ABS fail signal	During ABS fail	0 V
		When ABS is normal	System voltage
46	Earth	At all times	Continuity



SERVICE ADJUSTMENT PROCEDURES

E13HF00AA

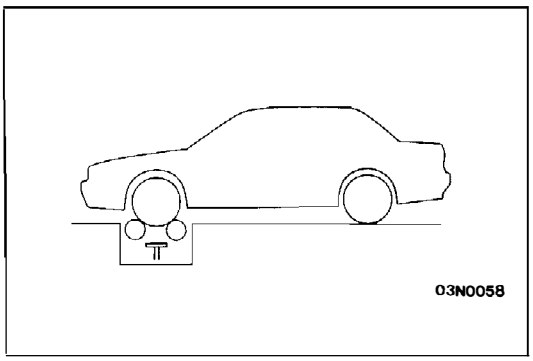
SYSTEM INSPECTION USING THE TCL INDICATOR LAMPS

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

TCL switch mode	Inspection conditions	Indicator lamp		
		TCL OFF	TCL	TRACE OFF
Switch does not operate	Turn the ignition key to the ON position.	O	O	O
	Start the engine	X	X	X
TRACE OFF mode (press once to OFF)	Engine is idling	–	–	O
TCL OFF mode (press once more to OFF)		O	–	–
TCL ON mode	When the engine is idling, turn the steering wheel at least one and a half revolutions.	No illumination	–	–
	Drive the vehicle at 30 km/h for 2 minutes or more.	No illumination	–	–

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

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



TCL OPERATION INSPECTION

E13HF01AA

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

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

Caution
Inspection should be completed within 20 seconds after the accelerator pedal was depressed. If it takes longer than 20 seconds, the TCL system function will stop and the engine speed will gradually increase.

STOP LAMP SWITCH (PEDAL STROKE SENSOR) INSPECTION E13HF02AA

Refer to GROUP 35B – Service Adjustment Procedures.

WHEEL SPEED SENSOR INSPECTION E13HF03AA

Refer to GROUP 35B – Service Adjustment Procedures.

CLUTCH SWITCH INSPECTION E13HF04AA

Refer to GROUP 21 – Service Adjustment Procedures.

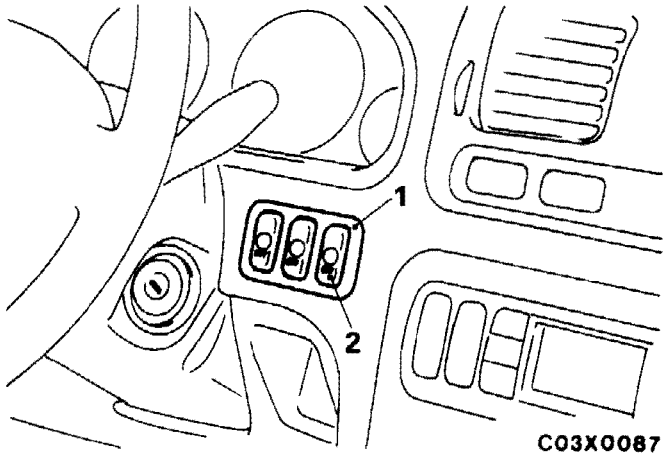
TCL SWITCH

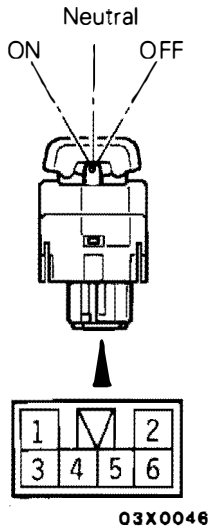
E13HG00AA

REMOVAL AND INSTALLATION

Removal steps

1. Instrument panel switch assembly
2. TCL switch





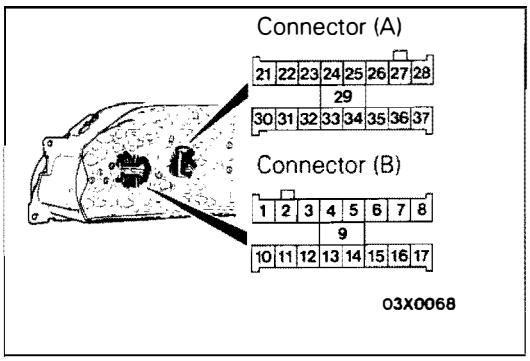
INSPECTION

E13HG02AA

Operate the switch and check for continuity between the terminals.

Switch position \ Terminal	1	2	3	6	4		5
ON			○—○				
Neutral					○	○	○
OFF		○—○					

NOTE
○—● indicates that there is continuity between the terminals.



TCL INDICATOR LAMP

E13HH02AA

INSPECTION

(1) Remove the combination meter. (Refer to GROUP 54 – Combination Meter.)

(2) Inspect the continuity between each of the terminals.

Connector terminal / Indicator lamp	Connector (A) 24	Connector (B) 1	Connector (B) 8	Connector (B) 9
TCL	○—○	○		
TCL OFF	○—○		○	
TRACE OFF	○—○			○

NOTE
○—○ indicates that there is continuity between the terminals.

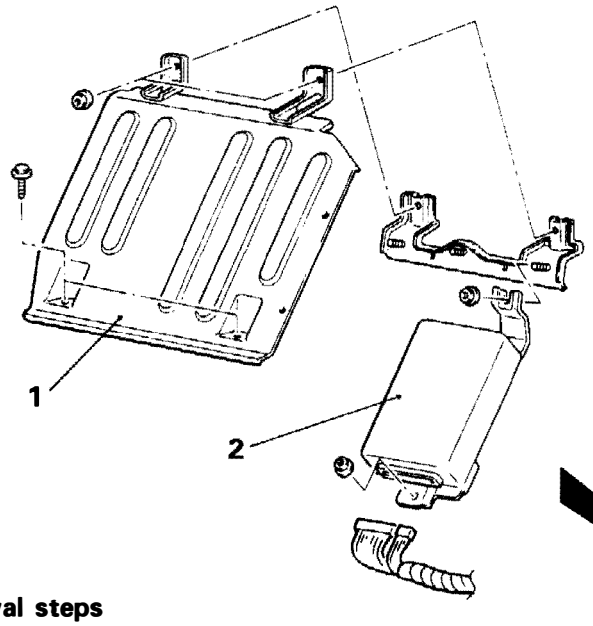
(3) If there is no continuity, replace the indicator lamp.

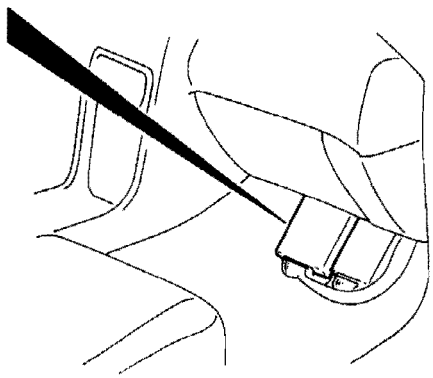
TCL-ECU

E13HI00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operations
(1) Under Cover Removal and Installation
(Refer to GROUP 52A – Instrument Panel.)
(2) Cowl Side Trim (L.H.) and Front Scuff Plate Removal and Installation
(Refer to GROUP 52A – Trims.)





Removal steps
1. Control unit cover
2. TCL-ECU

A03X0096

COOLING

CONTENTS

E14ZA00AA

 PWDE9211

GENERAL INFORMATION

E14ZB00AA

The cooling system is designed to keep every part of the engine at appropriate temperature in whatever condition the engine may be operated.
The cooling method is of the water-cooled, pressure forced circulation type in which the water pump pressurizes coolant and circulates it throughout the engine. If the coolant temperature exceeds the prescribed temperature, the thermostat opens to circulate the coolant through the radiator as well so that the heat absorbed by the coolant may be radiated into the air.
The water pump is of the centrifugal type and is driven by the timing belt or drive belt from the crankshaft.
The radiator is the corrugated fin, down flow type and is cooled by the electrical radiator fan.

Items		Specifications
Radiator		
Performance	kJ/h	
M/T		
<4G93>		157,395
<4G63-2WD, 6A12>		188,791
<4G63-4WD, 6G73, 4D68>		200,093
A/T		
<4G93>		157,395
<4G63>		188,791
<6A12>		200,093
Automatic transmission oil cooler		
<4G93, 4G63>		6,195
<6A12>		6,405

SERVICE SPECIFICATIONS

E14ZC00AA

Items		Specifications
Standard value		
Thermostat		
Valve opening temperature of thermostat	°C	82 <4G93, 4G63, 6A12, 6G73> 76.5 <4D68>
Full-opening temperature of thermostat	°C	95 <4G93, 4G63, 6A12, 6G73> 90 <4D68>
Radiator		
Range of coolant antifreeze concentration	%	30–60
Radiator cap		
High pressure valve opening pressure	kPa	75–105
Limit		
Radiator cap		
High pressure valve opening pressure	kPa	65

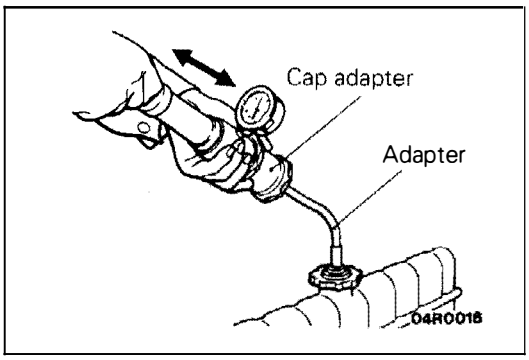
LUBRICANTS

E14ZC00AA

Items	Quantity ℓ
Engine coolant HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	
<4G93, 6A12>	6.0
<4G63, 6G73>	7.0
<4D68>	8.0

SEALANT

Items	Specified sealant	Remarks
Cylinder block drain plug	3M Nut Locking Part No. 4171 or equivalent	Drying sealant
Water pump <4G93, 6A12>	Mitsubishi Genuine Parts No. MD970389 or equivalent	Semi-Drying sealant
Thermostat case <4G93, 4G63, 4D68>	Mitsubishi Genuine Parts No. MD970389 or equivalent	Semi-Drying sealant



SERVICE ADJUSTMENT PROCEDURES

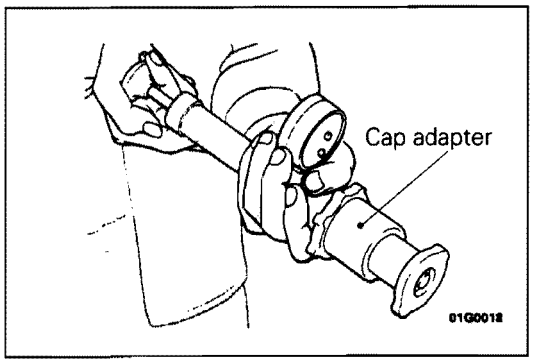
E14ZF00AA

COOLANT LEAK CHECKING

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

   Caution
   1. **Be sure to completely clean away any moisture from the places checked.**
   2. **When the tester is taken out, be careful not to spill any coolant from it.**
   3. **Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.**

2. If there is leakage, repair or replace the appropriate part.



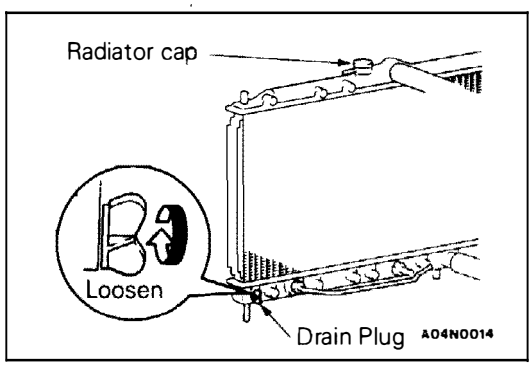
RADIATOR CAP VALVE OPENING PRESSURE

E14ZF01AA

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

   Limit: 65 kPa
   Standard value: 75–105 kPa
3. Replace the radiator cap if the reading does not remain at or above the limit.

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

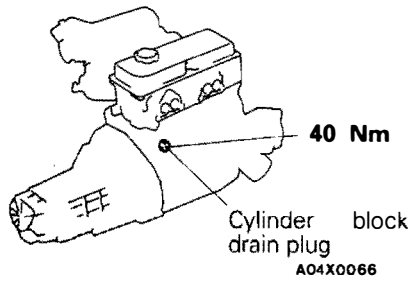


COOLANT REPLACEMENT

E14ZF02AA

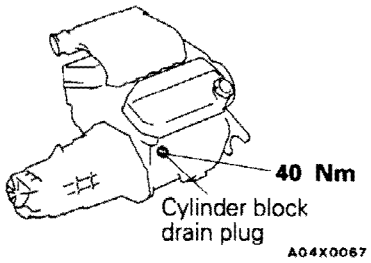
1. Drain the engine coolant by removing the drain plug and then the radiator cap.

<4G93, 4G63, 4D68>

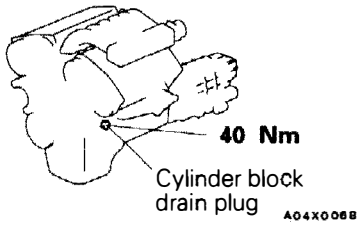


<6A12, 6G73>

Front bank



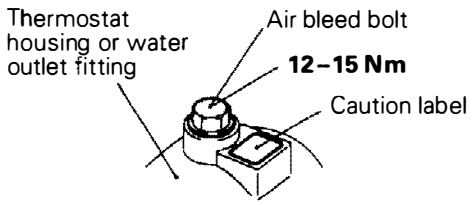
Rear bank



2. Remove the drain plug from the cylinder block to drain the engine coolant.
3. Open the air bleed bolt. <Except 6G73>
4. Remove the reserve tank to drain the engine coolant.
5. When the engine coolant has drained, pour in water from the radiator cap to clean the engine coolant line.
6. Coat the thread of the cylinder block drain plug with the specified sealant and tighten to the specified torque.

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

7. Securely tighten the radiator drain plug.
8. Install the reserve tank.



9. Fill the radiator until the engine coolant flows from the air bleed bolt section, and then close the air bleed bolt.
10. Slowly pour the engine coolant into the mouth of the radiator until the radiator is full, and pour also into the reserve tank up to the FULL line.

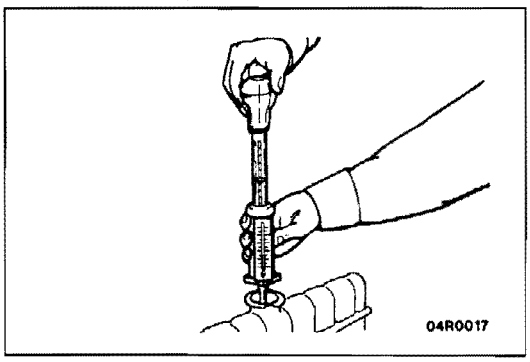
    Recommended antifreeze:
    HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT

    Quantity

<4G93, 6A12>	**6.0 ℓ**
<4G63, 6G73>	**7.0 ℓ**
<4D68>	**8.0 ℓ**

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

11. Install the radiator cap securely.
12. Start the engine and warm the engine until the thermostat opens. (Touch the radiator hose with your hand to check that warm water is flowing.)
13. After the thermostat opens, race the engine at 3,000 r/min 3 times.
14. After the engine is stopped, wait until the engine has cooled down, and then remove the radiator cap to check the level of the liquid. If the level is low, repeat the operation from step 11.
    Lastly, if the level does not drop, fill the condense tank with coolant up to the FULL line.



CONCENTRATION MEASUREMENT E14ZF03AA

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

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

RECOMMENDED ANTIFREEZE

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

Caution

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

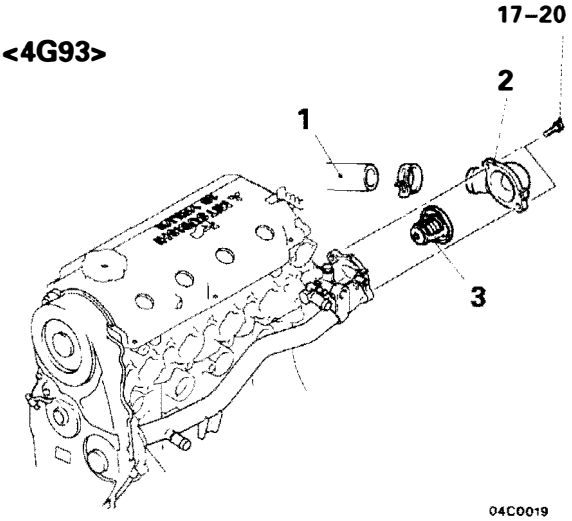
THERMOSTAT

E14ZG00AA

REMOVAL AND INSTALLATION

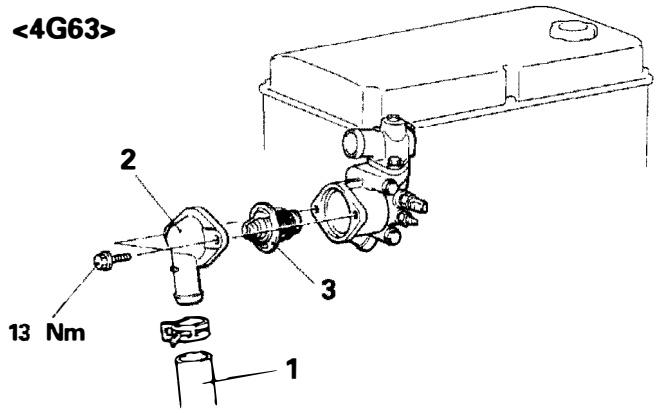
Pre-removal and Post-installation Operation
- Engine Coolant, Draining and Supplying (Refer to P.14-4.)

<4G93>



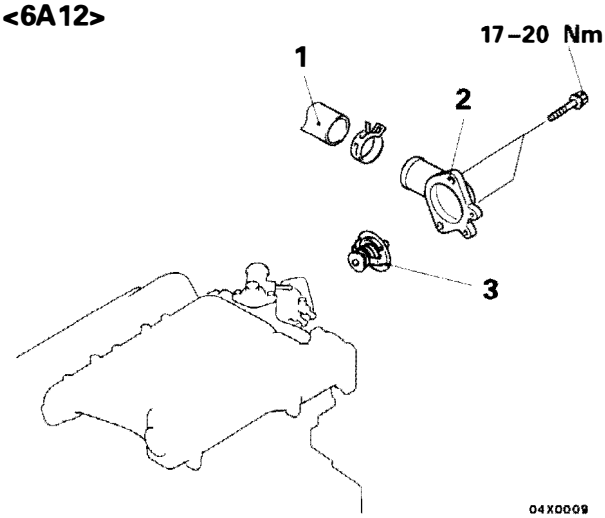
04C0019

<4G63>



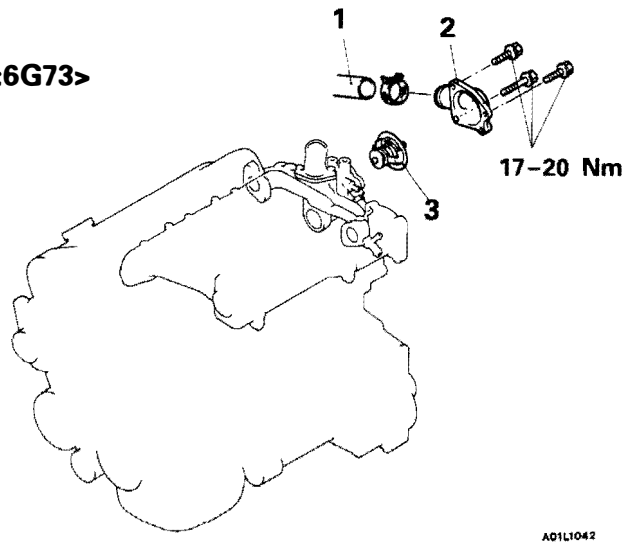
A04A0211

<6A12>



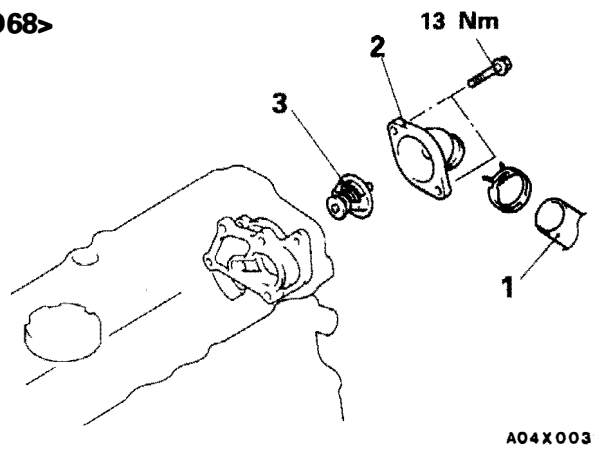
04X0009

<6G73>



A01L1042

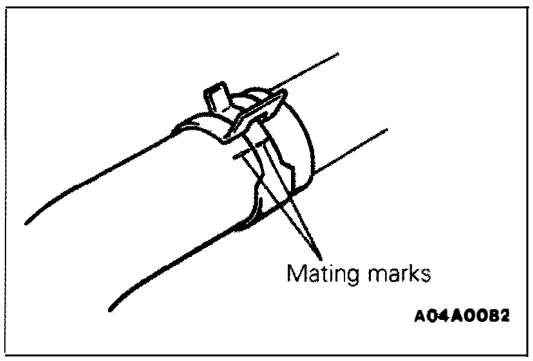
<4D68>



A04X0031

Removal steps

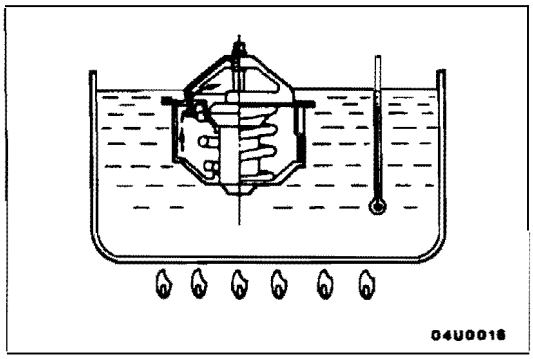
〈A〉 ◆B◆ 1. Radiator lower hose connection
2. Water outlet fitting
◆A◆ 3. Thermostat



REMOVAL SERVICE POINT E14ZG01AA

〈A〉 RADIATOR LOWER HOSE DISCONNECTION

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

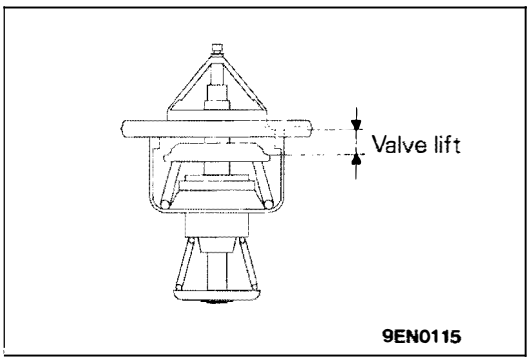


INSPECTION E14ZG02AA

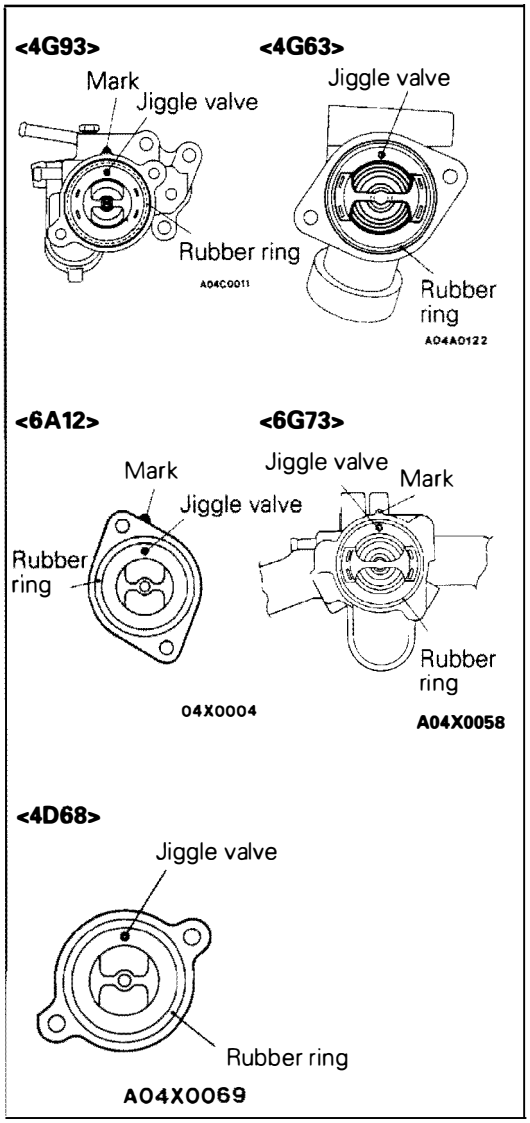
THERMOSTAT INSPECTION

Immerse the thermostat in water, and heat the water while stirring. Check that the thermostat valve opening and fully open temperatures.

Standard value:
Valve opening temperature:
82°C <4G93, 4G63, 6A12, 6G73>
76.5°C <4D68>
Full-opening temperature:
95°C <4G93, 4G63, 6A12, 6G73>
90°C <4D68>



NOTE
1. Measure valve height when fully closed. Calculate lift by measuring the height when fully open.
2. If valve opens even a little at normal temperature, the thermostat should be replaced.
3. If there is any serious warping, visible damage or breakage, the thermostat should be replaced.
4. Remove any rust or deposits if present.

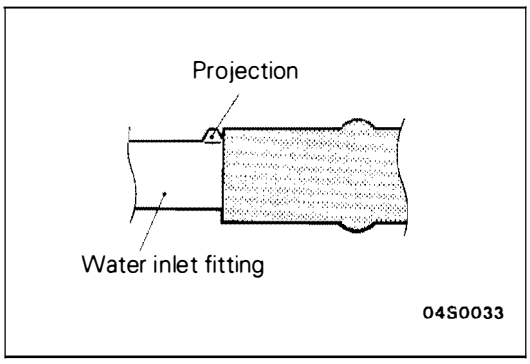


INSTALLATION SERVICE POINTS E142G04AA

◆A◆ THERMOSTAT INSTALLATION

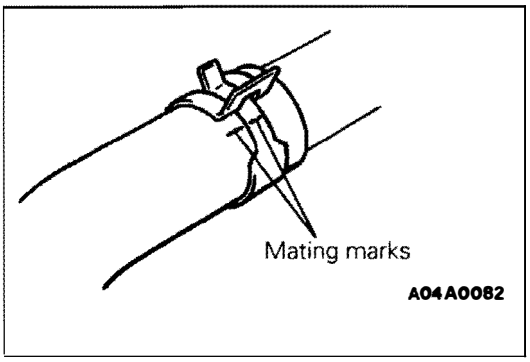
Install the thermostat so that the jiggle valve is facing straight up and is aligned with the mark on the thermostat case as shown in the illustration.

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



◆B◆ RADIATOR LOWER HOSE CONNECTION

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



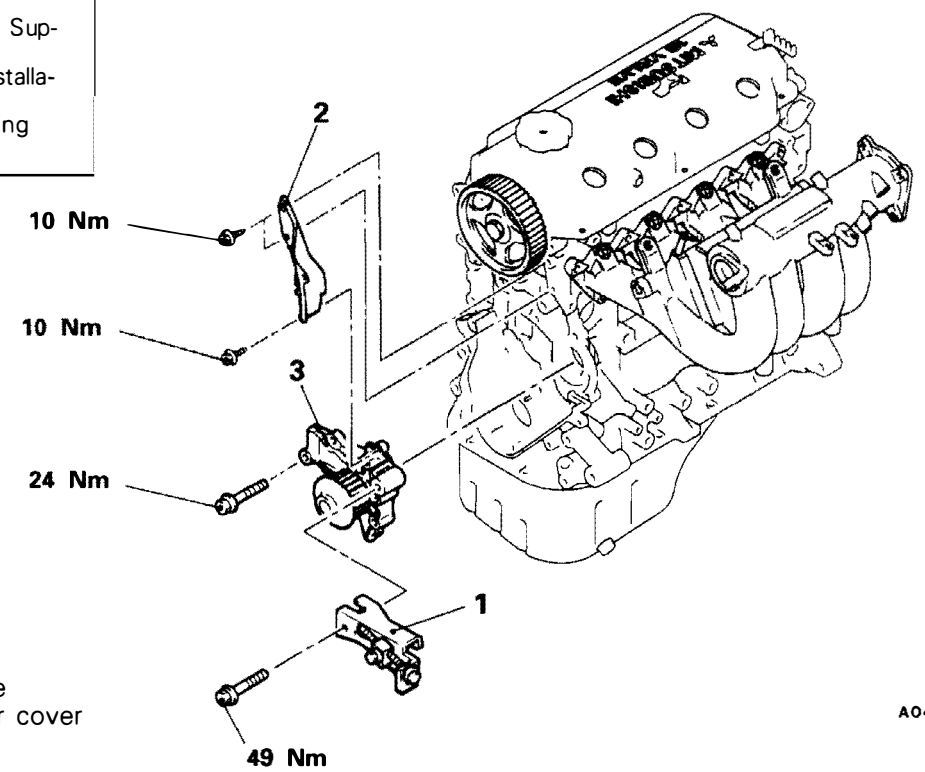
(2) Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

WATER PUMP <4G93>

E14ZH00AA

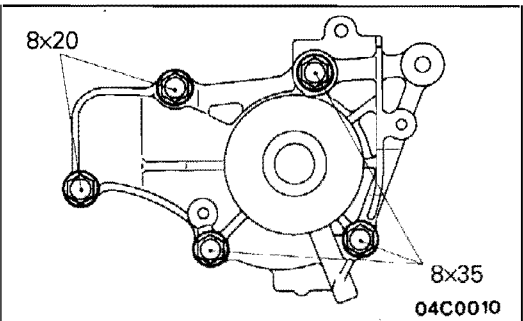
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-4.)
- Timing Belt Removal and Installation (Refer to GROUP 11E - Timing Belt.)

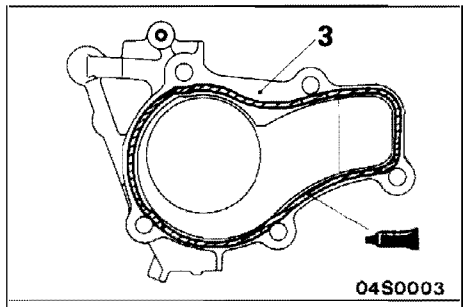


A04X0045

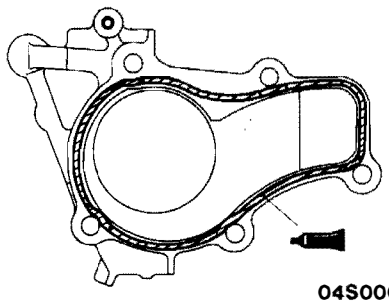
Removal steps
1. Alternator brace
2. Timing belt rear cover
◆A◆ 3. Water pump



Bolt diameter×length: mm



Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent



(Bead diameter: 2.4 – 3.0 mm)

INSTALLATION SERVICE POINT

E14ZH01AA

◆A◆ WATER PUMP INSTALLATION

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

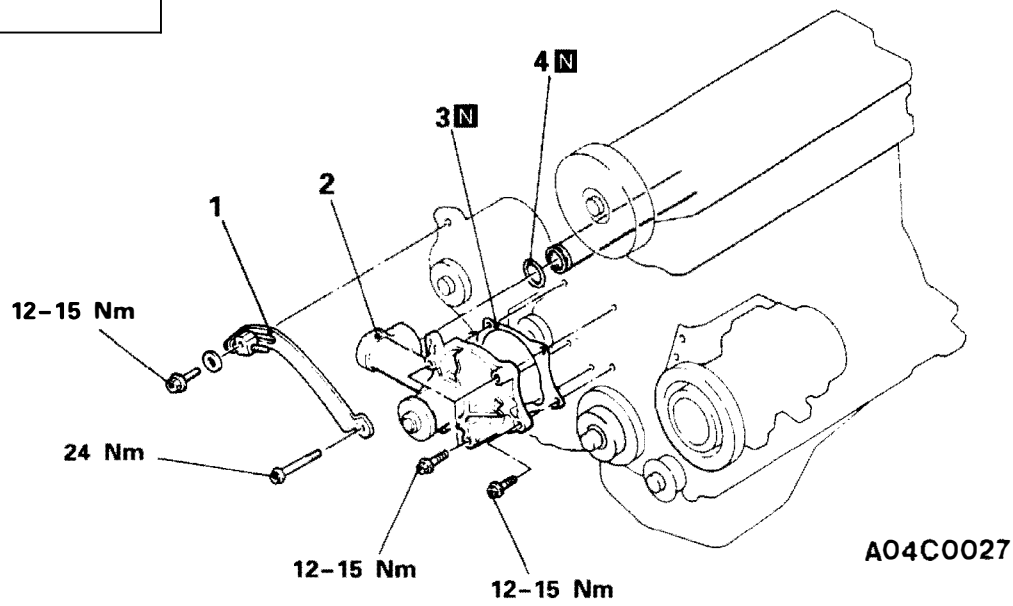
Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent

WATER PUMP <4G63>

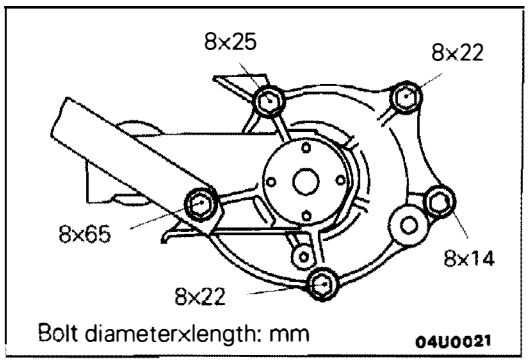
E14ZH10AA

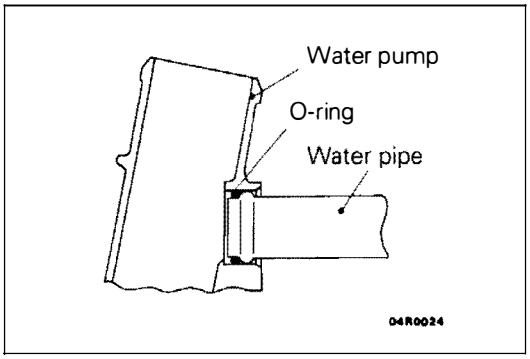
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine. Coolant Draining and Supplying (Refer to P.14-4.)
- Drive Belt Removal and Installation (Refer to GROUP 11D – Timing Belt.)



Removal steps
1. Alternator brace
2. Water pump
3. Water pump gasket
◆A◆ 4. O-ring





INSTALLATION SERVICE POINT

E14ZH11AA

◆A◆ O-RING INSTALLATION

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

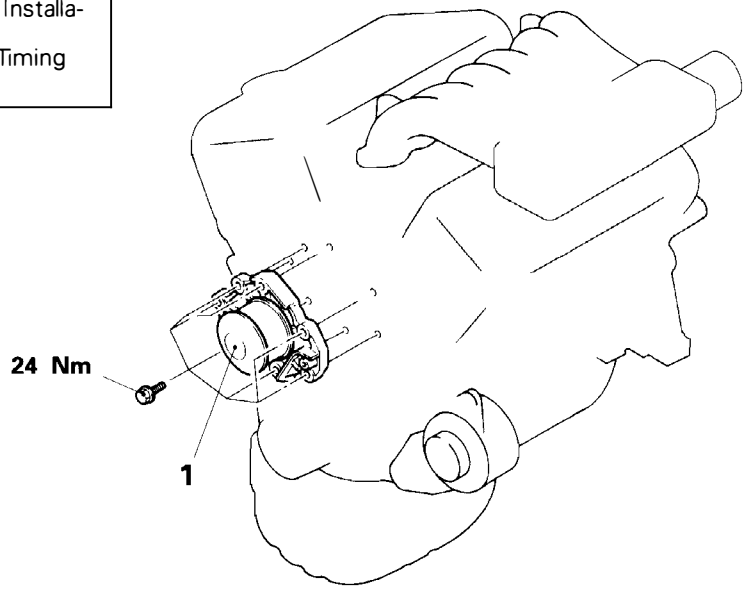
Caution
1. **Care must be taken not to permit engine oil or other greases to adhere to the O-ring.**
2. **When inserting the pipe, check to be sure that there is no sand, dirt, etc. on its inner surface.**

WATER PUMP <6A12>

E14ZH20AA

REMOVAL AND INSTALLATION

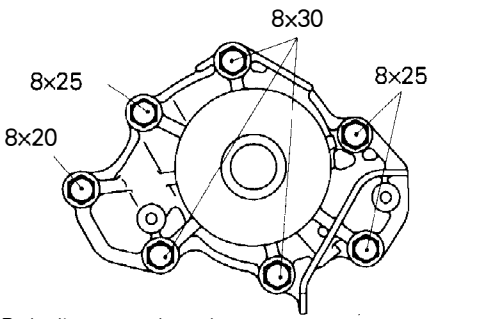
Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-4.)
- Timing Belt Removal and Installation (Refer to GROUP 11G – Timing Belt.)

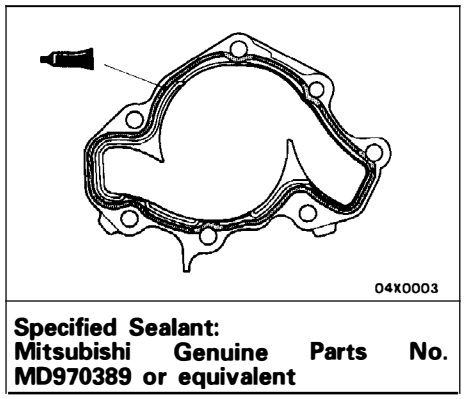


01X0001

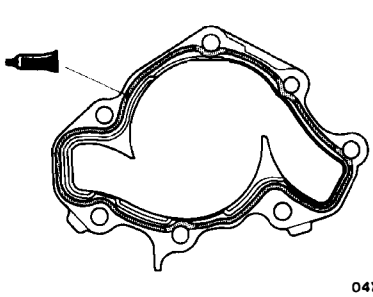
Removal steps

◆A◆ 1. Water pump





Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent



(Bead diameter: 2.4–3.0 mm)

INSTALLATION SERVICE POINT

E14ZH01AA

◆A◆ WATER PUMP INSTALLATION

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

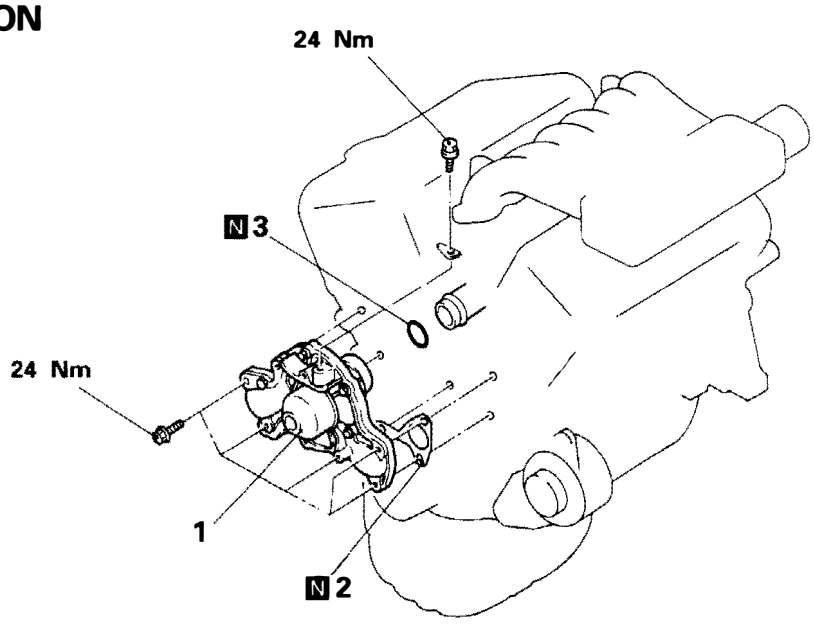
Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent

WATER PUMP <6G73>

E14ZH30AA

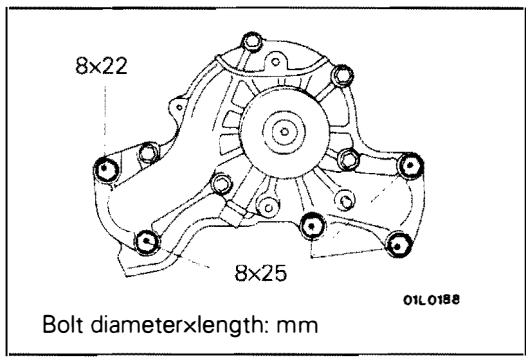
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-4.)
- Timing Belt Removal and Installation (Refer to GROUP 11F – Timing Belt.)

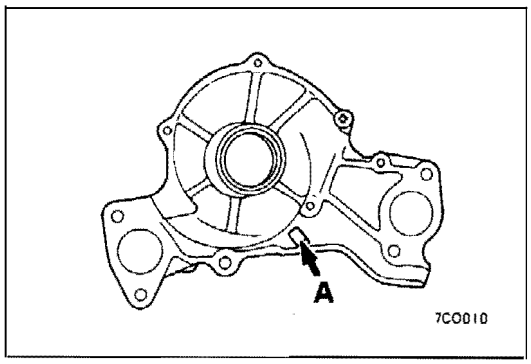


A01N0003

Removal steps
1. Water pump
2. Gasket
◆A◆ 3. O-ring



Bolt diameter×length: mm

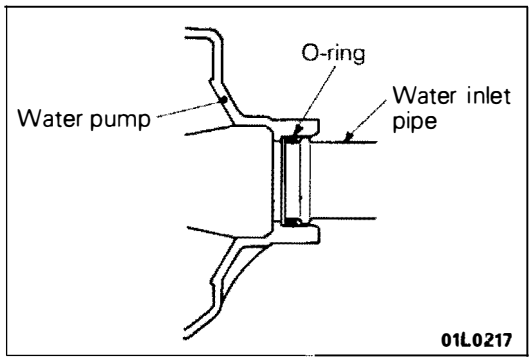


INSPECTION

E14ZH32AA

WATER PUMP

If any of the following irregularities are observed, replace the water pump as an assembly.
1. Damage or crack on the water pump body.
2. Water leakage. With improper sealing, a water leakage mark may be observed around hole A.



INSTALLATION SERVICE POINT

E14ZH34AA

◆A◆ O-RING INSTALLATION

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

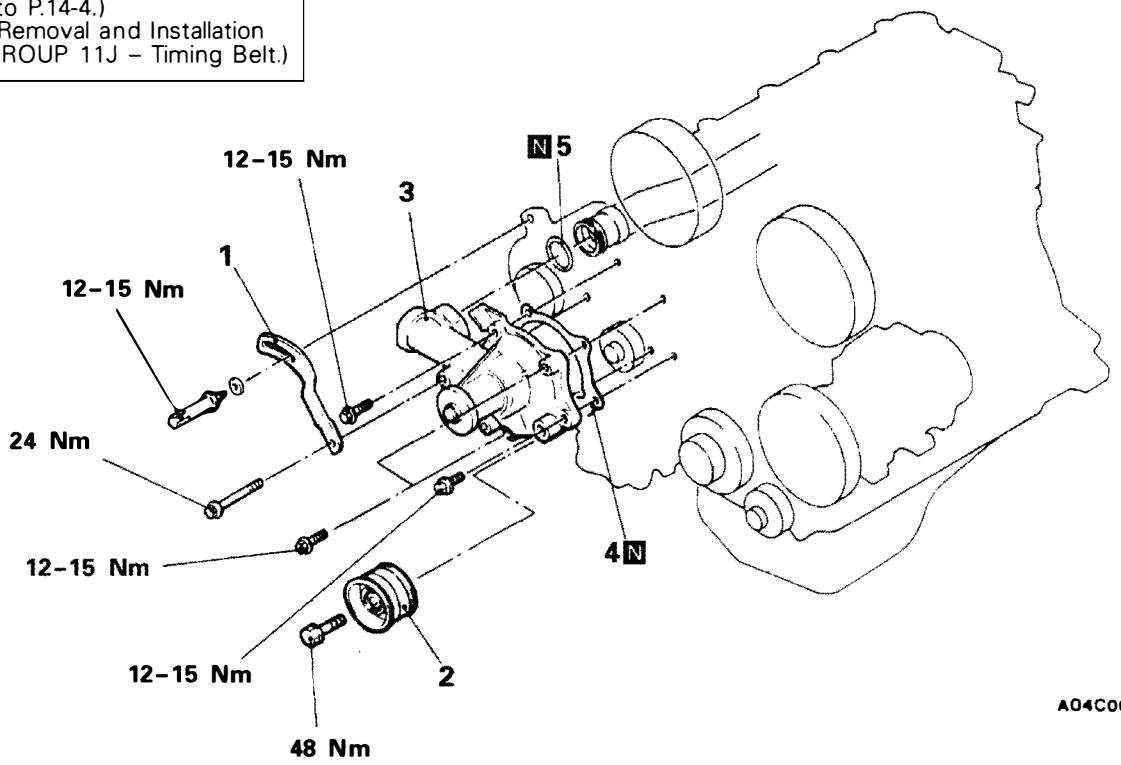
Caution
Care must be taken not to permit engine oil or other greases to adhere to the O-ring.

WATER PUMP <4D68>

E14ZH20AA

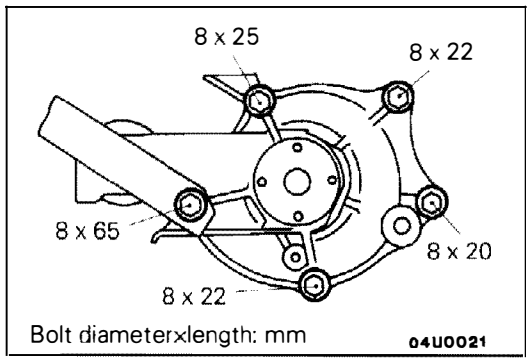
REMOVAL AND INSTALLATION

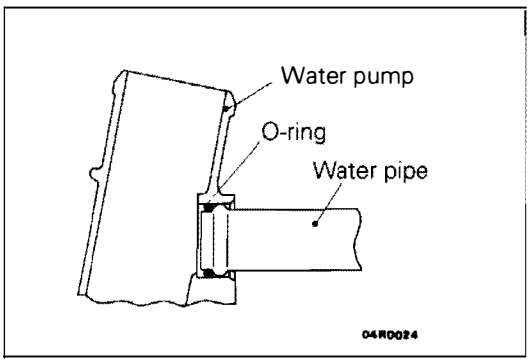
Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-4.)
- Drive Belt Removal and Installation (Refer to GROUP 11J – Timing Belt.)



A04C0044

Removal steps
1. Alternator brace
2. Timing belt idler
3. Water pump
4. Water pump gasket
◆A◆ 5. O-ring





INSTALLATION SERVICE POINT

E14ZH11AA

◆A◆ O-RING INSTALLATION

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

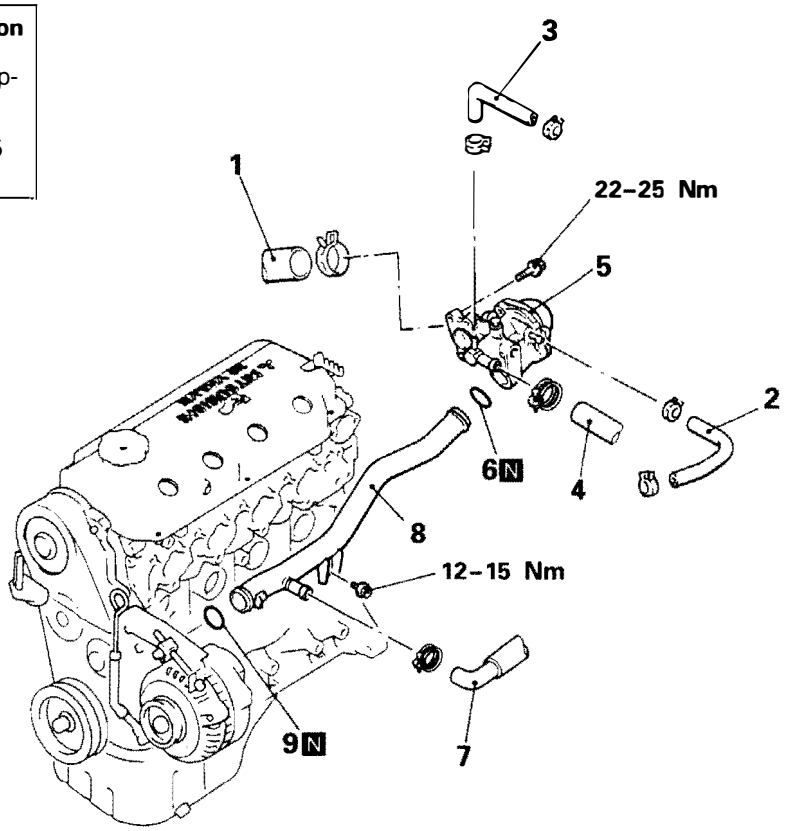
Caution
1. **Care must be taken not to permit engine oil or other greases to adhere to the O-ring.**
2. **When inserting the pipe, check to be sure that there is no sand, dirt, etc. on its inner surface.**

WATER HOSE AND WATER PIPE <4G93>

E14ZI00AA

REMOVAL AND INSTALLATION

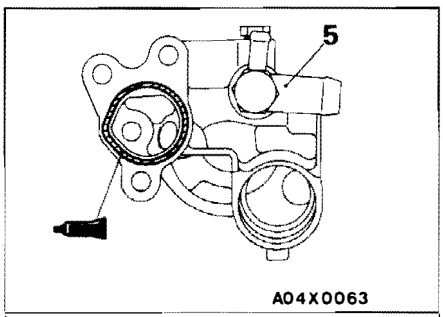
Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-4.)
- Intake Manifold Removal and Installation (Refer to GROUP 15 – Intake Manifold <4G93>.)



A04X0048

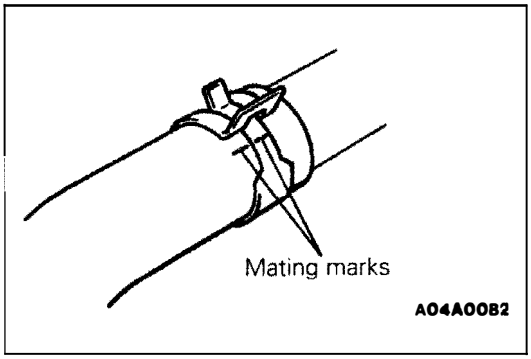
Removal steps

〈A〉 ◆C◆ 1. Radiator lower hose connection
2. Water hose
3. Water hose
4. Heater hose connection
◆B◆ 5. Thermostat case assembly
◆A◆ 6. O-ring
7. Heater hose connection
8. Water inlet pipe assembly
◆A◆ 9. O-ring



A04X0063

Specified Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent



A04A0082

REMOVAL SERVICE POINT

E14ZI01AA

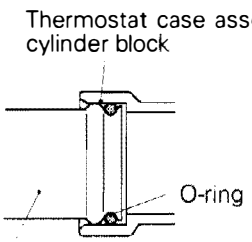
〈A〉 RADIATOR LOWER HOSE DISCONNECTION

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

INSPECTION E14ZI02AA

WATER PIPE AND HOSE INSPECTION

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

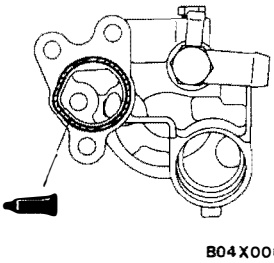


INSTALLATION SERVICE POINTS E14ZI04AA

◆A◆ O-RING INSTALLATION

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

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

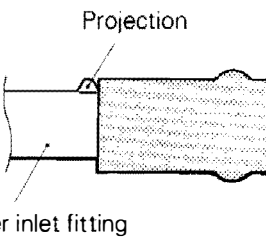


(Bead diameter: 2.4–3.0 mm)

◆B◆ THERMOSTAT CASE ASSEMBLY INSTALLATION

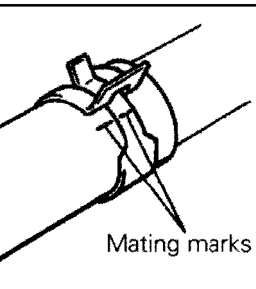
Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent



◆C◆ RADIATOR LOWER HOSE CONNECTION

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



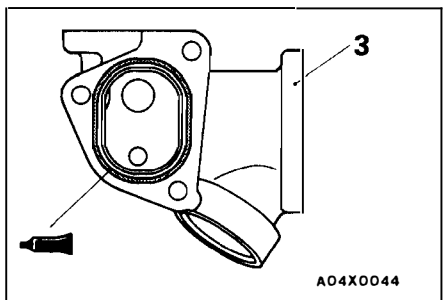
(2) Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

WATER HOSE AND WATER PIPE <4G63>

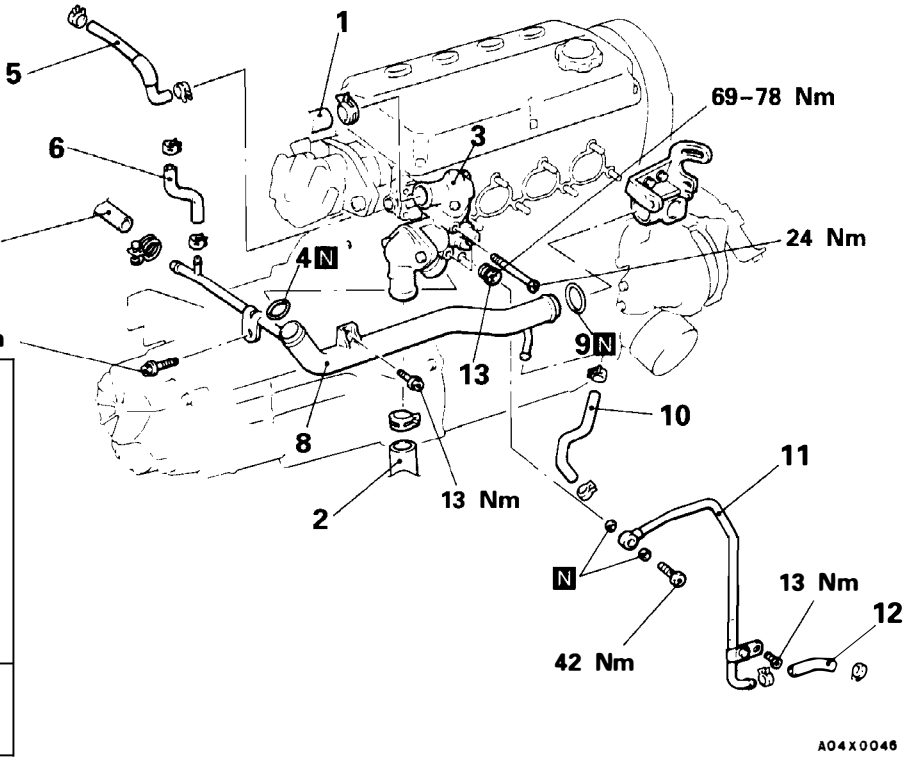
E14ZI10AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P. 14-4.)
- Air Cleaner Removal and Installation
- Exhaust Manifold Removal and Installation (Refer to GROUP 15 – Exhaust Manifold <4G63>.)

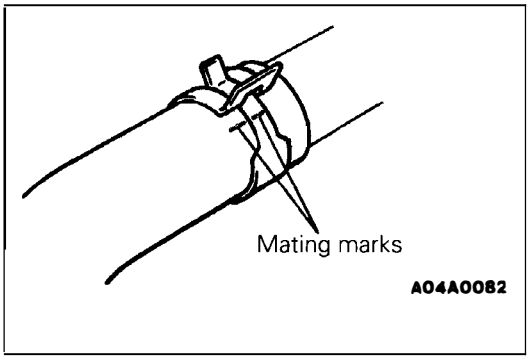


Specified Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent



Removal steps

〈A〉 ◗C◖ 1. Radiator upper hose connection
〈A〉 ◗C◖ 2. Radiator lower hose connection
◗B◖ 3. Thermostat case assembly
◗A◖ 4. O-ring
5. Water hose
6. Water hose
7. Heater hose connection
8. Water inlet pipe assembly
◗A◖ 9. O-ring
10. Water hose
11. Water pipe assembly } <4WD>
12. Water hose
13. Joint



REMOVAL SERVICE POINT

E14ZI11AA

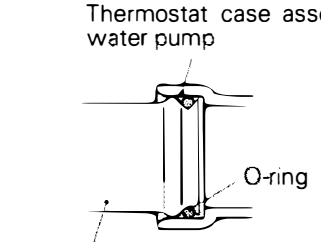
〈A〉 RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

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

INSPECTION E14ZI02AA

WATER PIPE AND HOSE INSPECTION

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

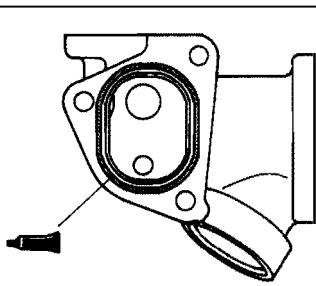


INSTALLATION SERVICE POINTS E14ZI14AA

◆A◆ O-RING INSTALLATION

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

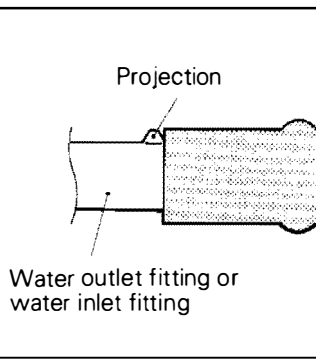
Caution
Care must be taken not to permit engine oil or other greases to adhere to the O-ring.



◆B◆ THERMOSTAT CASE ASSEMBLY INSTALLATION

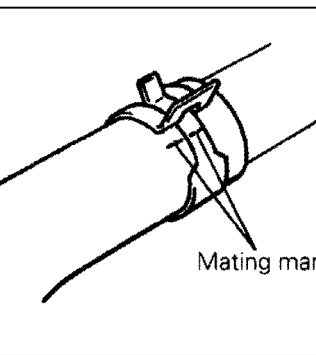
Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent



◆C◆ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION

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



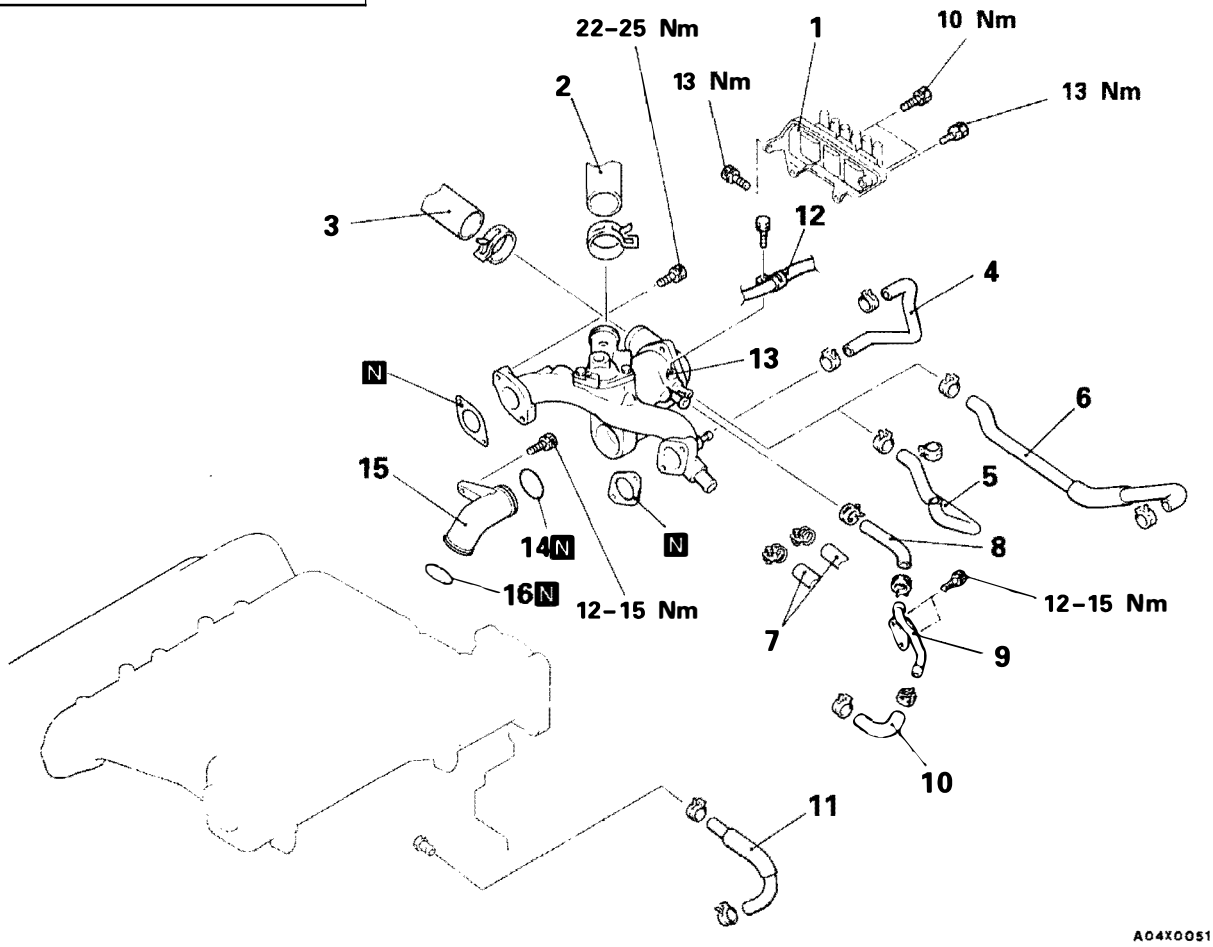
(2) Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

WATER HOSE AND WATER PIPE <6A12>

E14ZI20AA

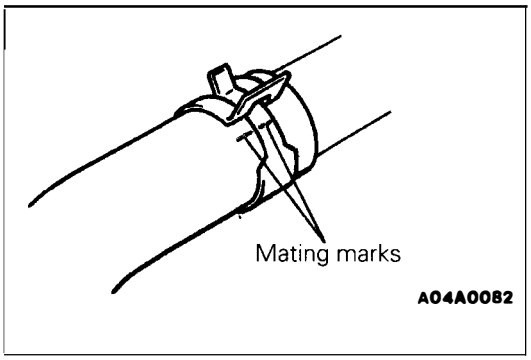
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-4.)
- Air Cleaner Removal and Installation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



Removal steps

1. Ignition coil
◇A◇ ◆B◆ 2. Radiator upper hose connection
◇A◇ ◆B◆ 3. Radiator lower hose connection
4. Water hose
5. Water hose <Vehicles without TCL>
6. Water hose <Vehicles with TCL>
7. Heater hose connection
8. Water hose
9. Water pipe assembly
10. Water hose
11. Water hose
12. Fuel return hose connection
13. Thermostat case assembly
◆A◆ 14. O-ring
15. Water inlet pipe assembly
◆A◆ 16. O-ring



REMOVAL SERVICE POINT E14ZI11AA

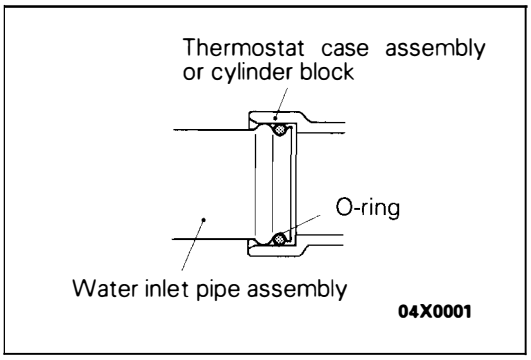
〈A〉 RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

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

INSPECTION E14ZI02AA

WATER PIPE AND HOSE INSPECTION

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

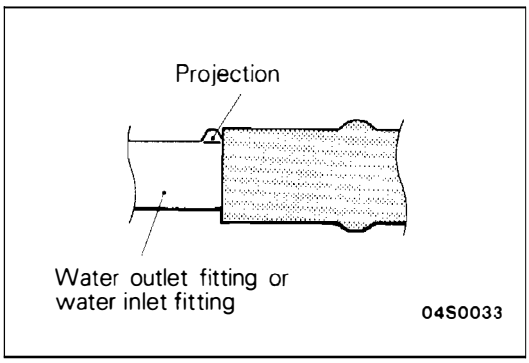


INSTALLATION SERVICE POINTS E14ZI24AA

◆A◆ O-RING INSTALLATION

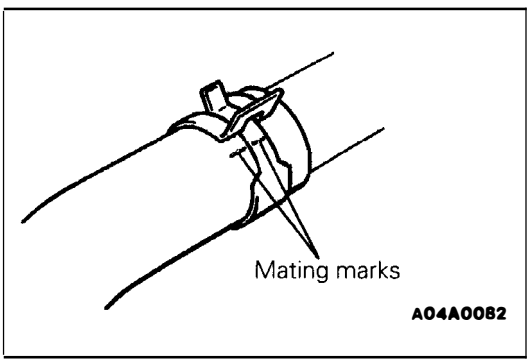
Insert the O-ring to the water inlet pipe, and coat the outer circumference of the O-ring with water.

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



◆B◆ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION

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



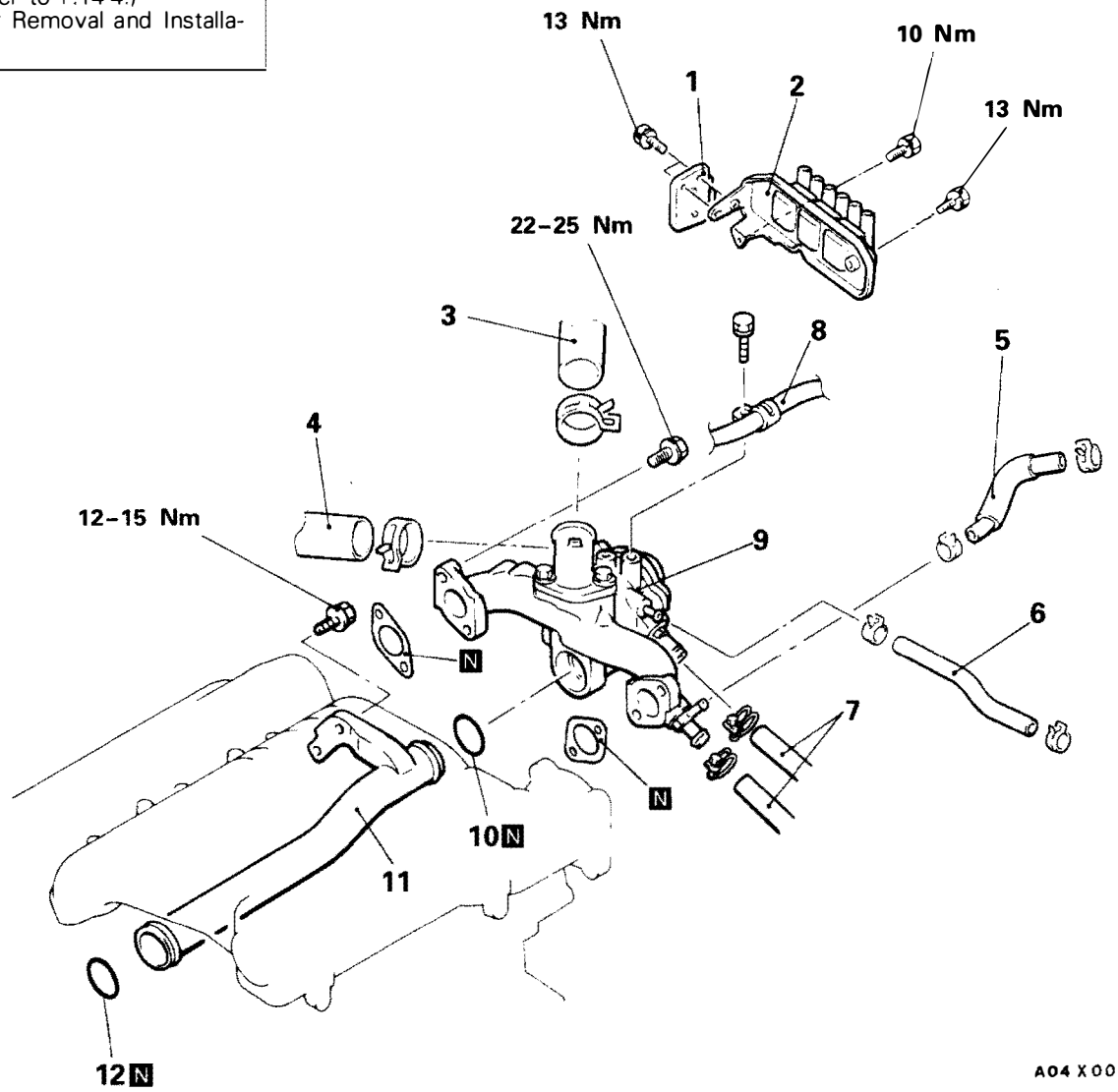
(2) Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

WATER HOSE AND WATER PIPE <6G73>

E14ZI30AA

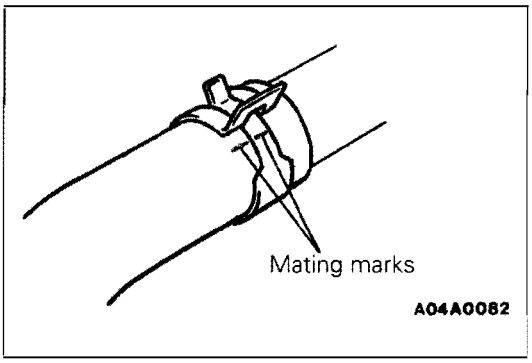
REMOVAL AND INSTALLATION

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



Removal steps

1. Power transistor assembly
2. Ignition coil
◇A◇ ◆B◆ 3. Radiator upper hose connection
◇A◇ ◆B◆ 4. Radiator lower hose connection
5. Water hose
6. Water hose
7. Heater hose connection
8. Fuel return hose connection
9. Thermostat case assembly
◆A◆ 10. O-ring
11. Water inlet pipe assembly
◆A◆ 12. O-ring



REMOVAL SERVICE POINT E14ZI11AA

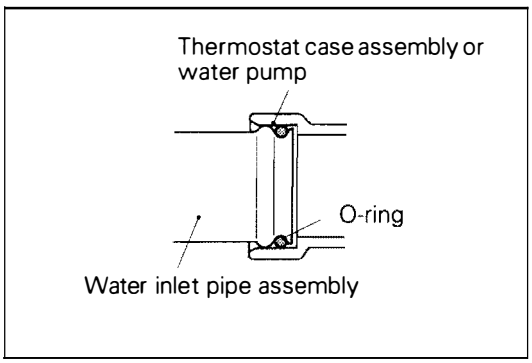
〈A〉 RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

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

INSPECTION E14ZI02AA

WATER PIPE AND HOSE INSPECTION

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

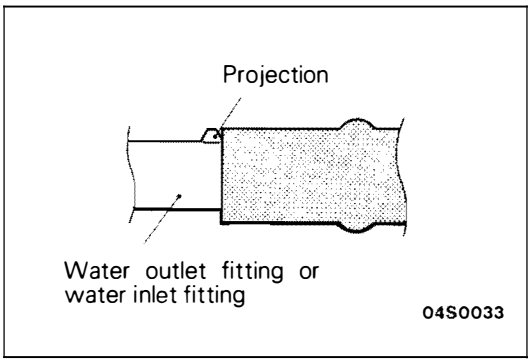


INSTALLATION SERVICE POINTS E14ZI24AA

◆A◆ O-RING INSTALLATION

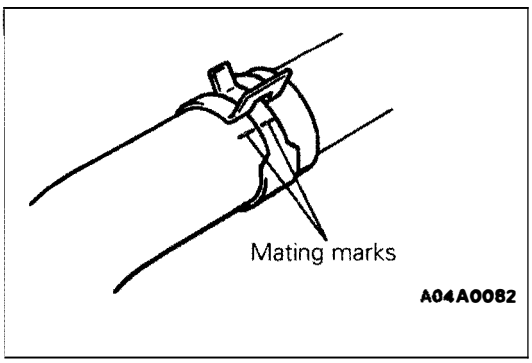
Insert the O-ring to the water inlet pipe, and coat the outer circumference of the O-ring with water.

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



◆B◆ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION

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



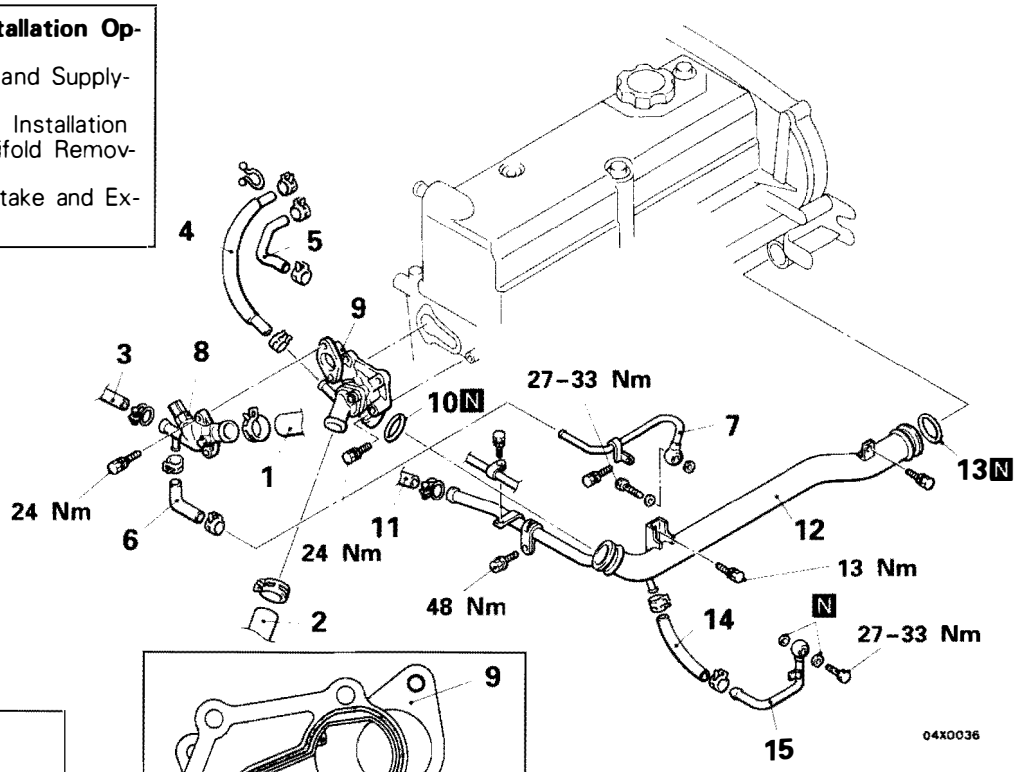
(2) Align the mating marks on the radiator hose and hose clamp, and then connect the radiator hose.

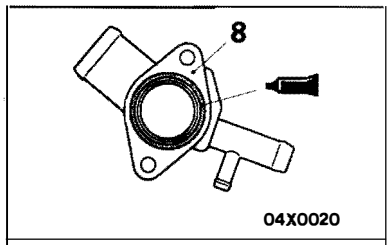
WATER HOSE AND WATER PIPE <4D68>

E14ZI40AA

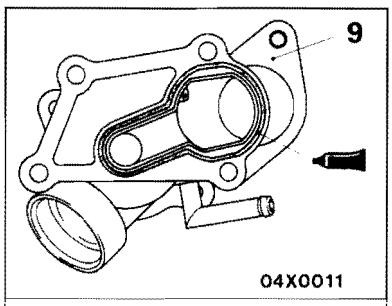
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to P.14-4.)
- Air Cleaner Removal and Installation
- Intake and Exhaust Manifold Removal and Installation (Refer to GROUP15 – Intake and Exhaust Manifold)





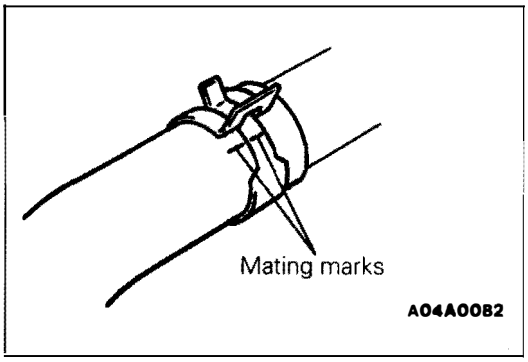
Specified Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent



Specified Sealant:
Mitsubishi Genuine Parts No. MD970389 or equivalent

Removal steps

〈A〉 ◆C◆ 1. Radiator upper hose connection
〈A〉 ◆C◆ 2. Radiator lower hose connection
3. Heater hose connection
4. Water hose
5. Water hose
6. Water hose
7. Water pipe assembly (A)
◆B◆ 8. Water outlet fitting
◆B◆ 9. Thermostat case assembly
◆A◆ 10. O-ring
11. Heater hose connection
12. Water inlet pipe assembly
◆A◆ 13. O-ring
14. Water hose
15. Water pipe assembly (B)



REMOVAL SERVICE POINT

E14ZI11AA

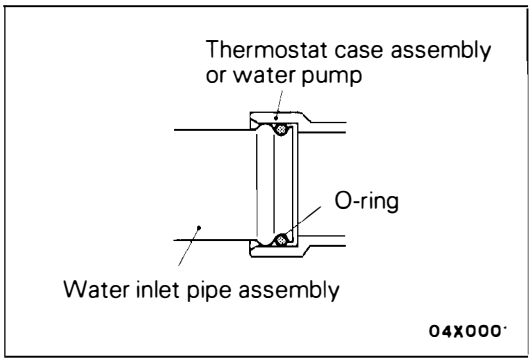
〈A〉 RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

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

INSPECTION E14ZI02AA

WATER PIPE AND HOSE INSPECTION

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

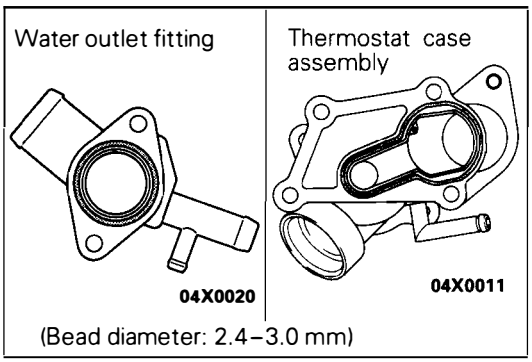


INSTALLATION SERVICE POINTS E14ZI44AA

◗A◖ O-RING INSTALLATION

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

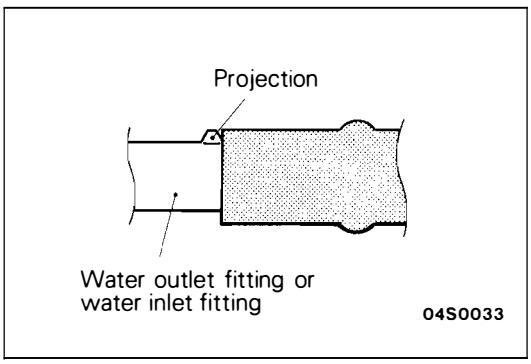
Caution
Care must be taken not to permit engine oil or other greases to adhere to the O-ring.



◗B◖ THERMOSTAT CASE ASSEMBLY/WATER OUTLET FITTING INSTALLATION

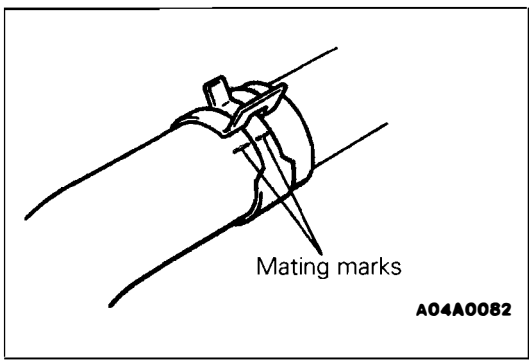
Squeeze out the sealant from the tube evenly and apply it so that there is not too much sealant and no places without sealant.

Specified Sealant: Mitsubishi Genuine Parts No. MD970389 or equivalent



◗C◖ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION

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



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

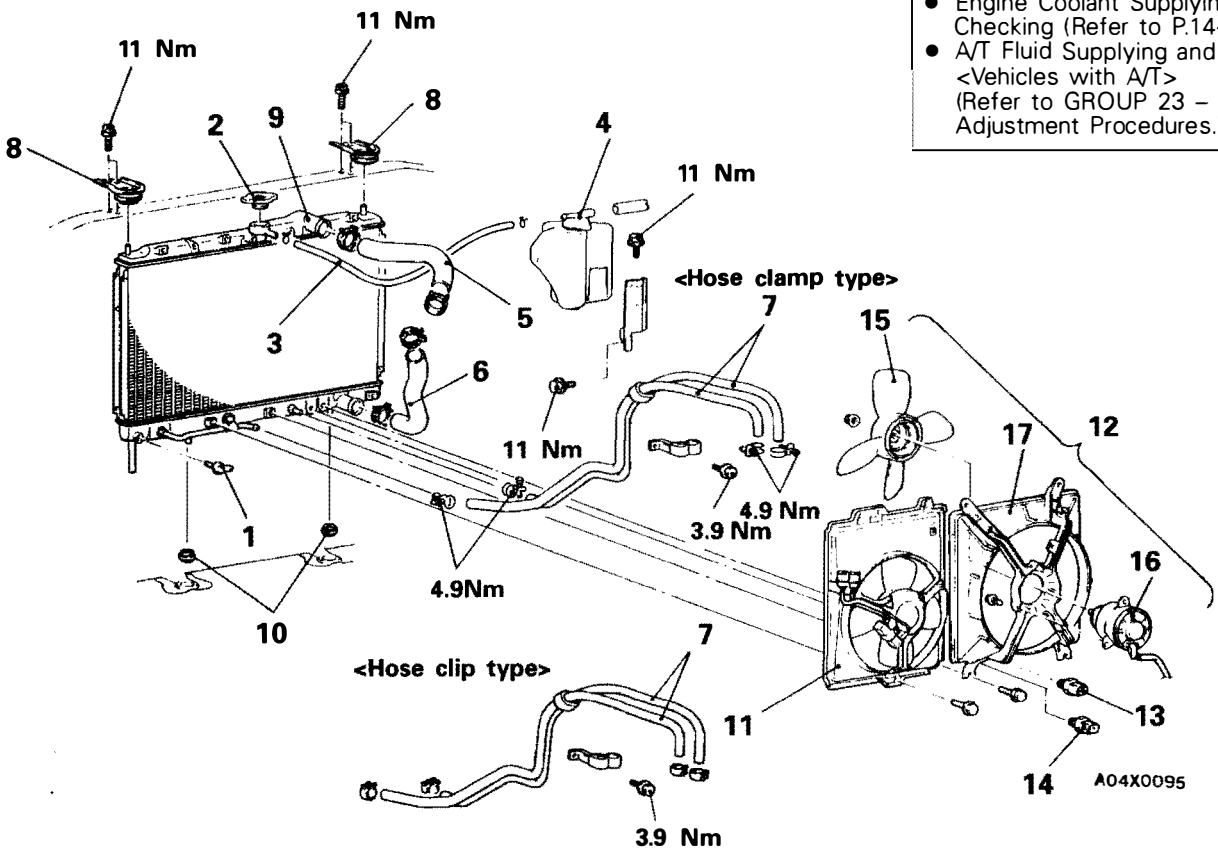
RADIATOR

E14ZJ00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Engine Coolant Draining (Refer to P.14-4.)

Post-installation Operation
- Engine Coolant Supplying and Checking (Refer to P.14-4.)
- A/T Fluid Supplying and Checking <Vehicles with A/T> (Refer to GROUP 23 – Service Adjustment Procedures.)

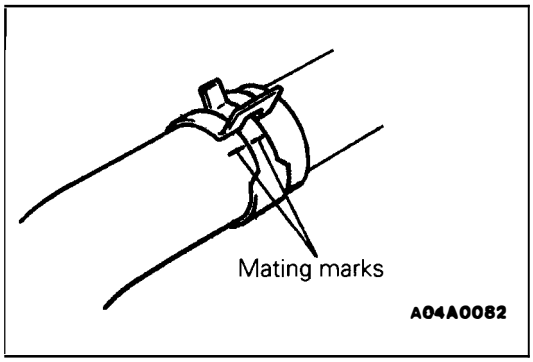


Radiator removal steps

1. Drain plug
2. Radiator cap
3. Overflow tube
4. Reserve tank
〈A〉 〈A〉 5. Radiator upper hose
〈A〉 〈A〉 6. Radiator lower hose
〈B〉 7. Transmission fluid cooler hose <Vehicles with A/T>
8. Upper insulator
9. Radiator assembly
10. Lower insulator
11. Condenser fan motor assembly <Vehicles with A/C (Except 6G73)>
12. Radiator fan motor assembly
13. Engine coolant temperature switch (For radiator fan) <4D68>
14. Engine coolant temperature switch (For condenser fan) <4D68>
15. Fan
16. Radiator fan motor
17. Shroud

Radiator fan motor removal steps

1. Drain plug
2. Radiator cap
〈A〉 〈A〉 5. Radiator upper hose
11. Condenser fan motor assembly <Vehicles with A/C>
12. Radiator fan motor assembly
15. Fan
16. Radiator fan motor
17. Shroud



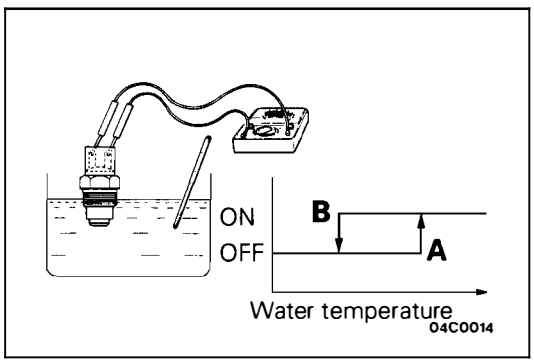
REMOVAL SERVICE POINT E14ZJ01AA

〈A〉 RADIATOR UPPER HOSE/RADIATOR LOWER HOSE DISCONNECTION

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

〈B〉 TRANSMISSION FLUID COOLER HOSE REMOVAL

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



INSPECTION E14ZJ02AA

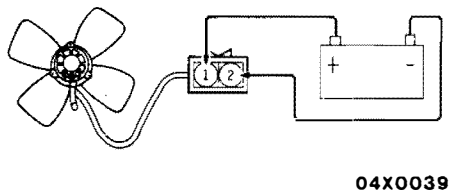
ENGINE COOLANT TEMPERATURE SWITCH CHECK <4D68>

(1) Immerse the engine coolant temperature switch into warm water or engine oil as shown in the illustration.
(2) Check the continuity with a circuit tester as the temperature of the liquid changes, and the condition is normal if it is within the following ranges.

Standard value:

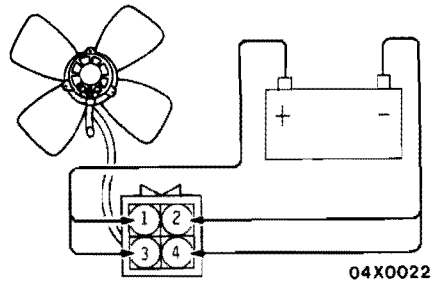
Items	For radiator fan	For condenser fan
Temperature at point A (OFF→ON)	81°C–89°C	96°C–104°C
Temperature at point B (ON→OFF)	77°C	92°C

<4G93, 4G63-2WD, 6A12–M/T>



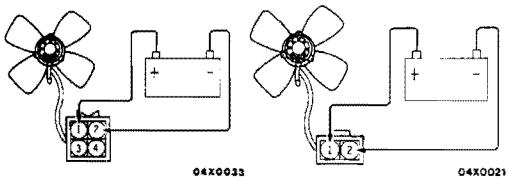
04X0039

<4G63-4WD, 6A12–A/T, 6G73>

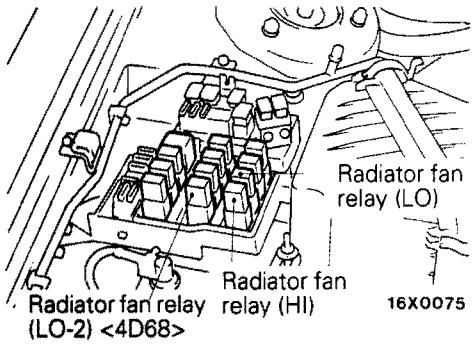


04X0022

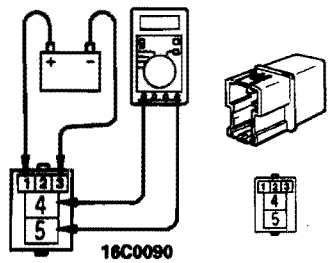
<4D68>



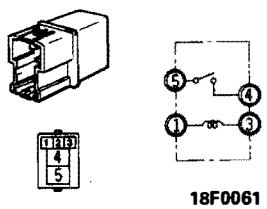
04X0033 04X0021



16X0075



16C0090



18F0061

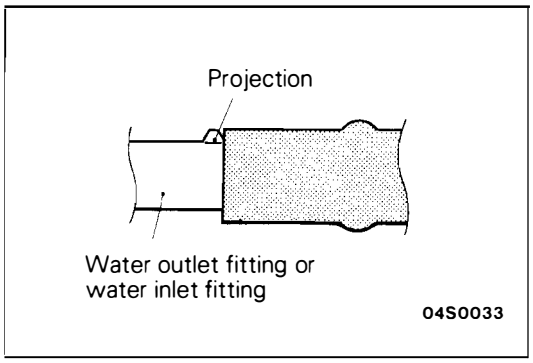
RADIATOR FAN MOTOR INSPECTION E14ZJ02BA

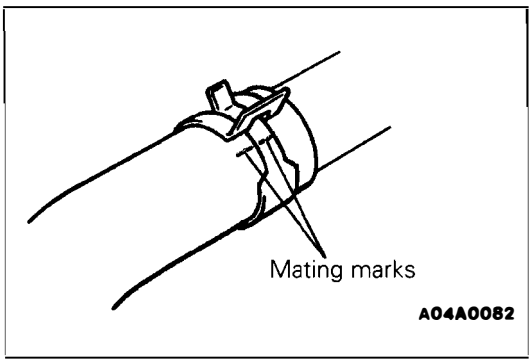
(1) Check to be sure that the radiator fan rotates when battery voltage is applied between terminals (as shown in the figure).
(2) Check to see that abnormal noises are not produced, while motor is turning.

RADIATOR FAN RELAY CHECK E14ZJ02CA

Terminal / Battery voltage	1	3	4	5
Not supplied	○	○		
Supplied	⊕	⊖	○	○

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





INSTALLATION SERVICE POINTS E14ZJ04AA

◆A◆ RADIATOR LOWER HOSE/RADIATOR UPPER HOSE CONNECTION

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

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

INTAKE AND EXHAUST

CONTENTS

E15ZA00AA

GENERAL INFORMATION

E15ZB00AA

The intake manifold is made of an aluminium alloy, and the shape provides an increased intake inertia effect and has a good volumetric efficiency.
The 6A12 and 6G73 engines have two air intake ports in the intake manifold. A variable induction control system is provided, whereby one of the air intake ports is opened and closed by means of a valve in order to increase the intake inertia effect from low speeds to high speeds.
The exhaust pipe is divided into three parts: the front pipe, the center pipe, and the main muffler.

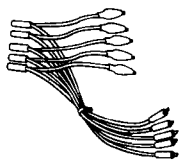
SERVICE SPECIFICATIONS

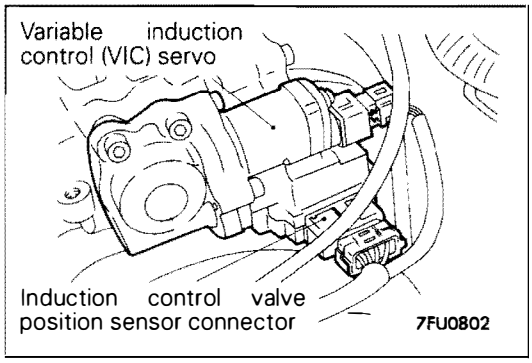
E15ZC00AA

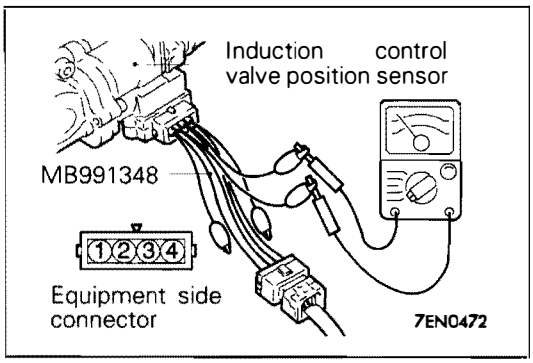
Items	Standard value	Limit
Intake manifold and air intake plenum		
Distortion of the installation surface mm	0.15 or less	0.2
Turbocharger <4D68>		
Waste gate actuator activation pressure kPa	Approx. 65	–

SPECIAL TOOL

E15ZD00AA

Tool	Number	Name	Use
	MB991348	Test harness set	Inspection of variable induction control system (connection for induction control valve position sensor connector)





SERVICE ADJUSTMENT PROCEDURES

E15ZF00AA

VARIABLE INDUCTION CONTROL SYSTEM INSPECTION <6A12, 6G73>

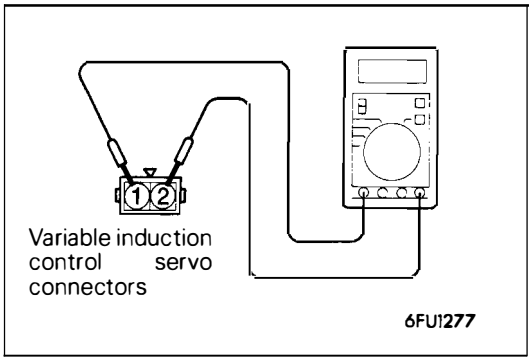
SYSTEM INSPECTION

1. Disconnect the induction control valve position sensor connector.
2. Connect the special tool (test harness set) between the disconnected connectors. (All terminals should be connected.)
3. Connect a circuit tester between terminal 2 and terminal 3 of the induction control valve position sensor and measure the voltage. In addition, measure the voltage between terminal 3 and terminal 4 in the same way.

Standard value:

Engine condition	Voltage[V]
Idle	0–1 or 4.5–5.5
Engine speed gradually increases to 5,000 r/min.	1.5–4.0 (momentarily)
5,000 r/min.	0–1 or 4.5–5.5

4. If the voltages are outside the standard values, inspect the induction control valve position sensor, variable induction control (VIC) servo and the related harness.



VARIABLE INDUCTION CONTROL SERVO INSPECTION

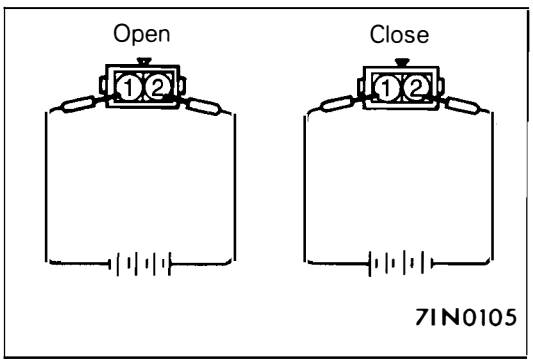
E15ZF00BA

1. Disconnect the variable induction control servo connectors.
2. Disconnect the air intake hose from the throttle body.
3. Check the variable induction control servo coil for continuity.

Standard value:

Measured terminal	Continuity
Between terminals 1 and 2	Present (5–35 Ω: 20°C)

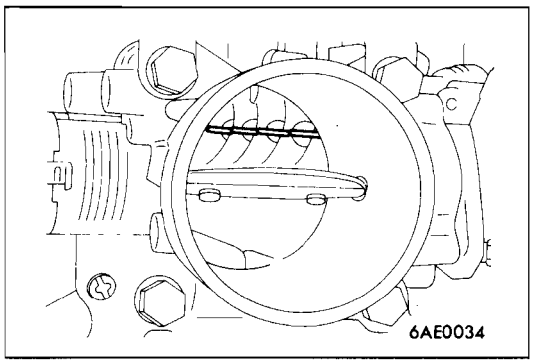
4. Fully open the throttle valve.



5. Make sure that when DC 6V is applied to terminals 1 and 2 of the variable induction control servo connector, the induction control valve opens and closes smoothly.

   Caution
   Be sure to apply a voltage of not higher than DC 6V to the variable induction control servo connector terminals since application of high voltage may lock the servo gears.

6. If outside the standard value, or if the variable induction valve does not open and close smoothly, replace the air intake plenum assembly.



INTAKE MANIFOLD VACUUM INSPECTION

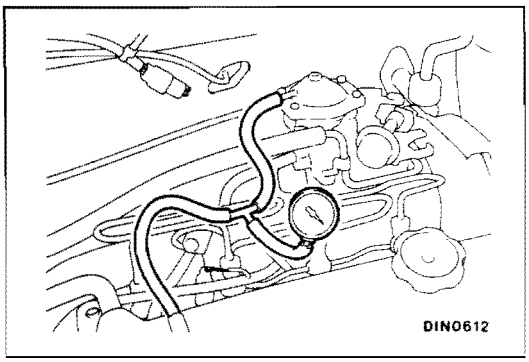
E15ZF01AA

Refer to GROUP 11G, 11F – Service Adjustment Procedures.

TURBOCHARGER SUPERCHARGING INSPECTION <4D68>

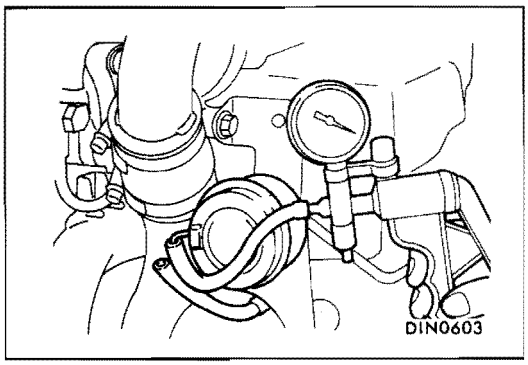
E15ZF02AA

Caution
Conduct the driving test in a location where driving at full acceleration can be done with safety. Two persons should be in the vehicle when the test it conducted; the person in the passenger seat should read the indications shown by the pressure meter.



1. Remove the boost compensator hose from the fuel injection pump, and install a pressure gauge as shown in the illustration.
2. Drive at full-throttle acceleration in second gear and then measure the supercharging when the engine speed in about 3,000 r/min.
   When the indicated supercharging does not become positive pressure, check the following items.
   - Malfunction of the waste gate actuator.
   - Leakage of supercharging pressure.
   - Malfunction of the turbocharger

   When the indicated supercharging is 75 kPa or more, supercharging control may be faulty therefore check the followings.
   - Disconnection or cracks of the waste gate actuator rubber hose.
   - Malfunction of the waste gate actuator.
   - Malfunction of the waste gate valve.



WASTE GATE ACTUATOR INSPECTION <4D68>

E15ZF03AA

1. Connect a manual pump (pressure-application type) to nipple A.
2. While gradually applying pressure, check the pressure that begins to activate (approx. 1 mm stroke) the waste gate actuator rod.

   Standard value: Approx. 77 kPa

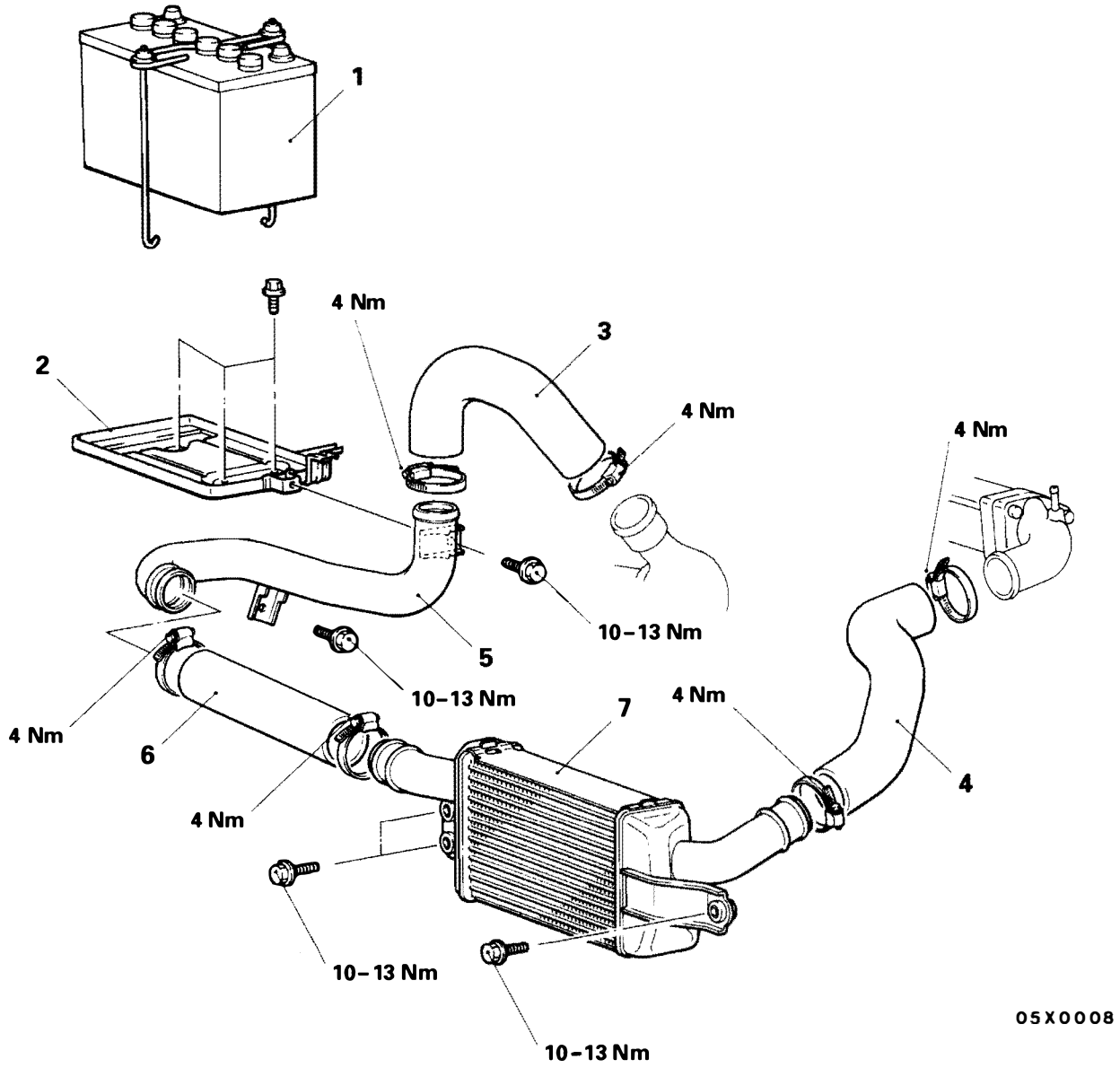
   Caution
   In order to avoid damage to the diaphragm, do not apply a pressure of 109 kPa or higher.
3. If there is a significant deviation from the standard value, check the actuator or the waste gate valve: replace if necessary.

INTERCOOLER <4D68>

E15ZG00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-Installation Operation
- Headlamp Removal
  (Refer to GROUP 54 – Headlamp)



Removal steps

1. Battery
2. Battery tray
3. Air hose (A)
4. Air hose (C)
5. Air pipe
6. Air hose (B)
7. Intercooler assembly

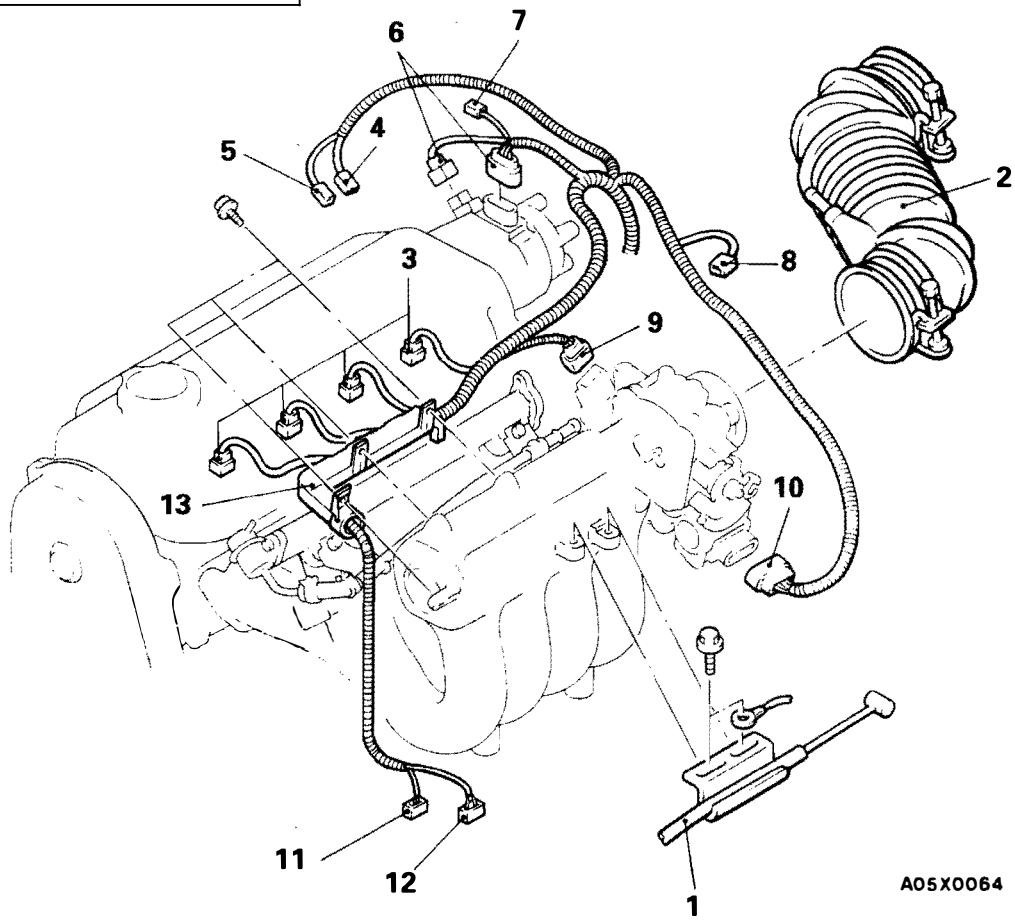
INTAKE MANIFOLD <4G93>

E15ZH00AA

REMOVAL AND INSTALLATION

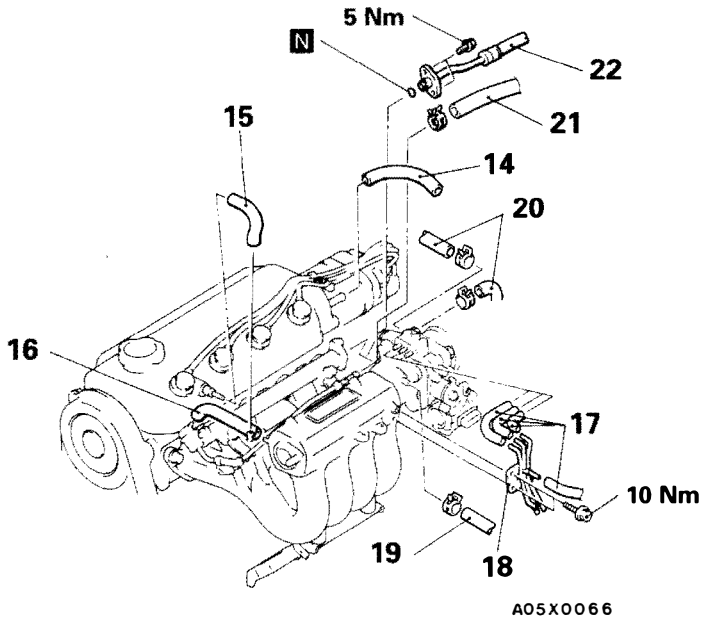
Pre-removal Operation
- Coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)
- Residual Fuel Pressure Releasing (Refer to GROUP 13F – Service Adjustment Procedures.)

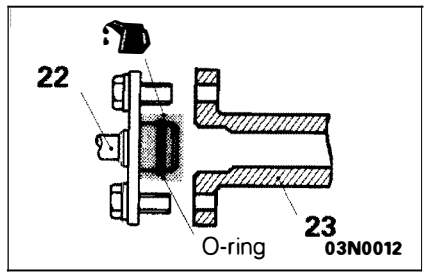
Post-installation Operation
- Coolant Supplying (Refer to GROUP 14 – Service Adjustment Procedures.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)

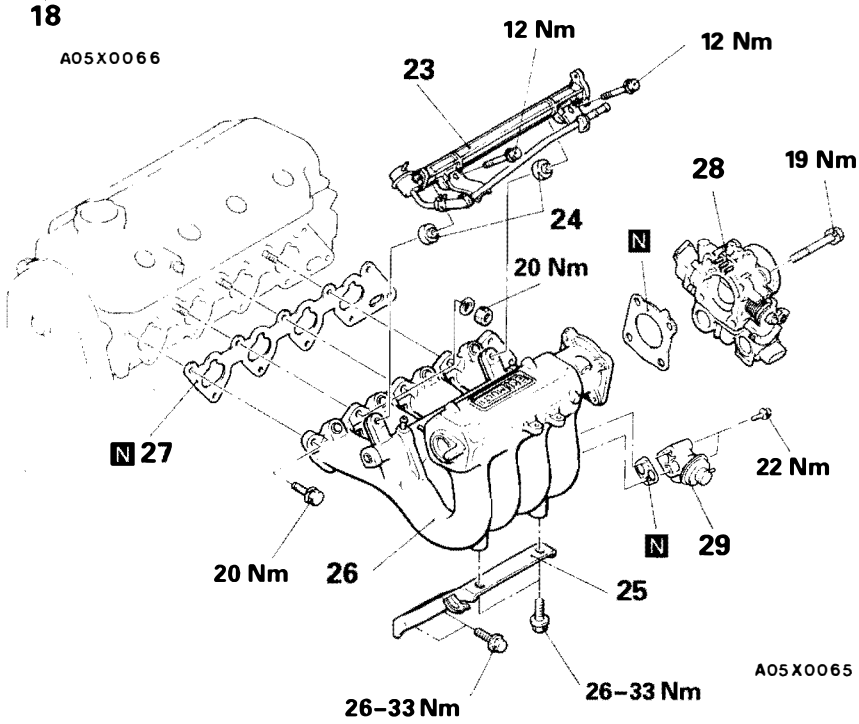


Removal steps

1. Accelerator cable connection
2. Air intake hose
3. Injector connector
4. Water temperature gauge connector
5. Oil pressure switch connector
6. Distributor connector
7. Condenser connector
8. Water temperature sensor connector
9. TPS connector
10. ISC connector
11. Detonation sensor connector
12. Oxygen sensor connector
13. Control wiring harness







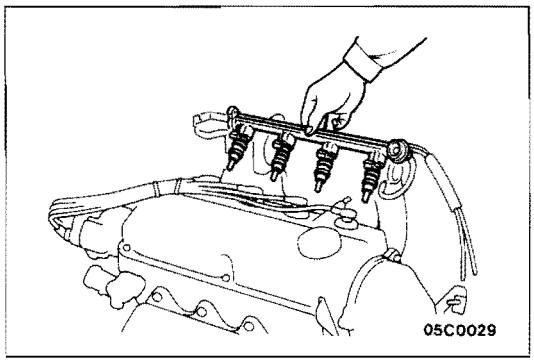
14. Breather hose connection
15. PCV hose connection
16. Vacuum hose
17. Vacuum hose connection
18. Vacuum pipe
19. Brake booster vacuum hose connection
20. Heater hose connection
21. Vacuum hose
◇A◇ 22. High-pressure fuel hose connection
◇B◇ 23. Delivery pipe, injector and pressure regulator assembly
24. Insulator
25. Intake manifold stay
26. Intake manifold
27. Intake manifold gasket
28. Throttle body
29. EGR valve

REMOVAL SERVICE POINTS E15ZH01AA

⟨A⟩ HIGH PRESSURE FUEL HOSE DISCONNECTION

Relieve pressure in the fuel pipe line to prevent fuel outflow. (Refer to GROUP 13A – Service Adjustment Procedures.)

Caution
Cover fuel pipe line with rag after relieving pressure as certain pressure may still remain.



⟨B⟩ DELIVERY PIPE, FUEL INJECTOR AND PRESSURE REGULATOR REMOVAL

Remove delivery pipe with fuel injector and pressure regulator on.

Caution
Do not drop injector when removing delivery pipe.

INSPECTION E15ZH02AA

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

INTAKE MANIFOLD E15ZH02BA

1. Check for damage or cracking of any part.
2. Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
3. Using a straight edge and a thickness gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm or less

Limit: 0.2 mm

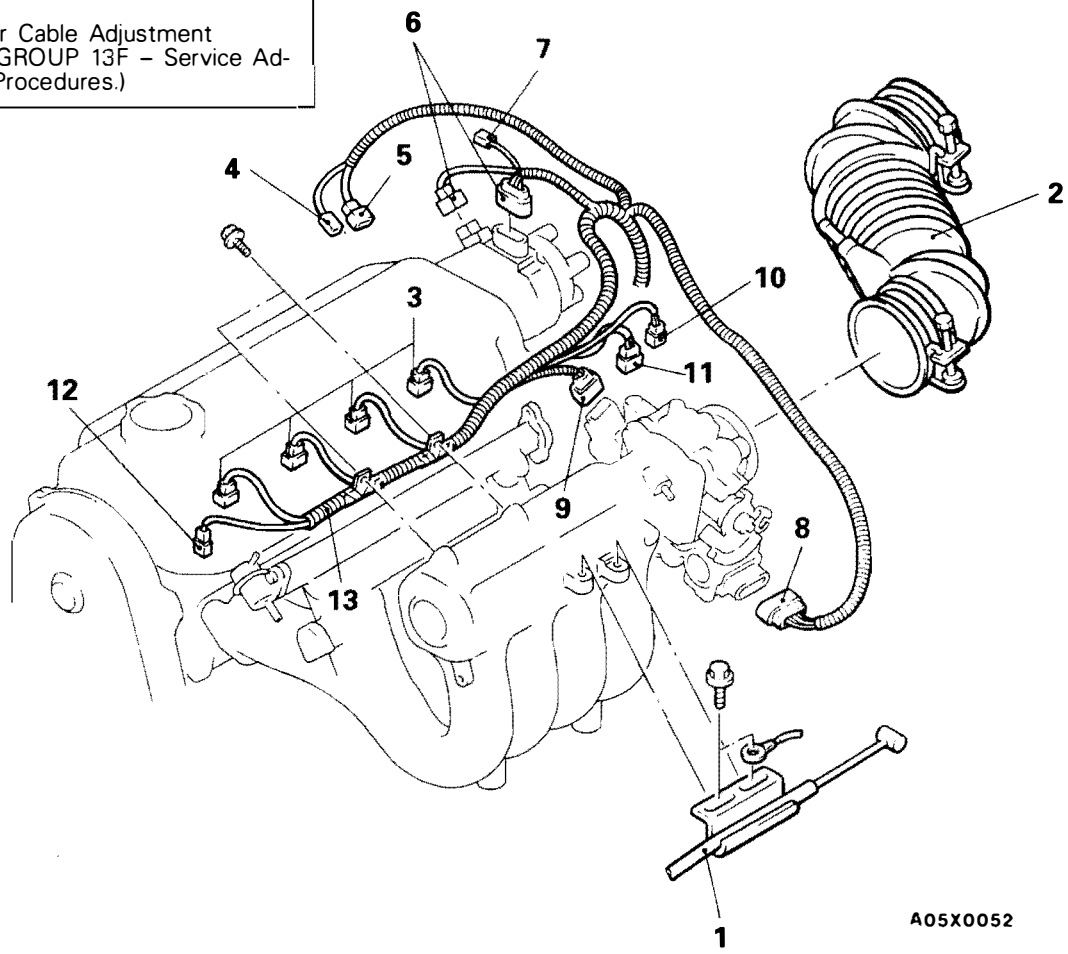
INTAKE MANIFOLD <4G63>

E15ZH10AA

REMOVAL AND INSTALLATION

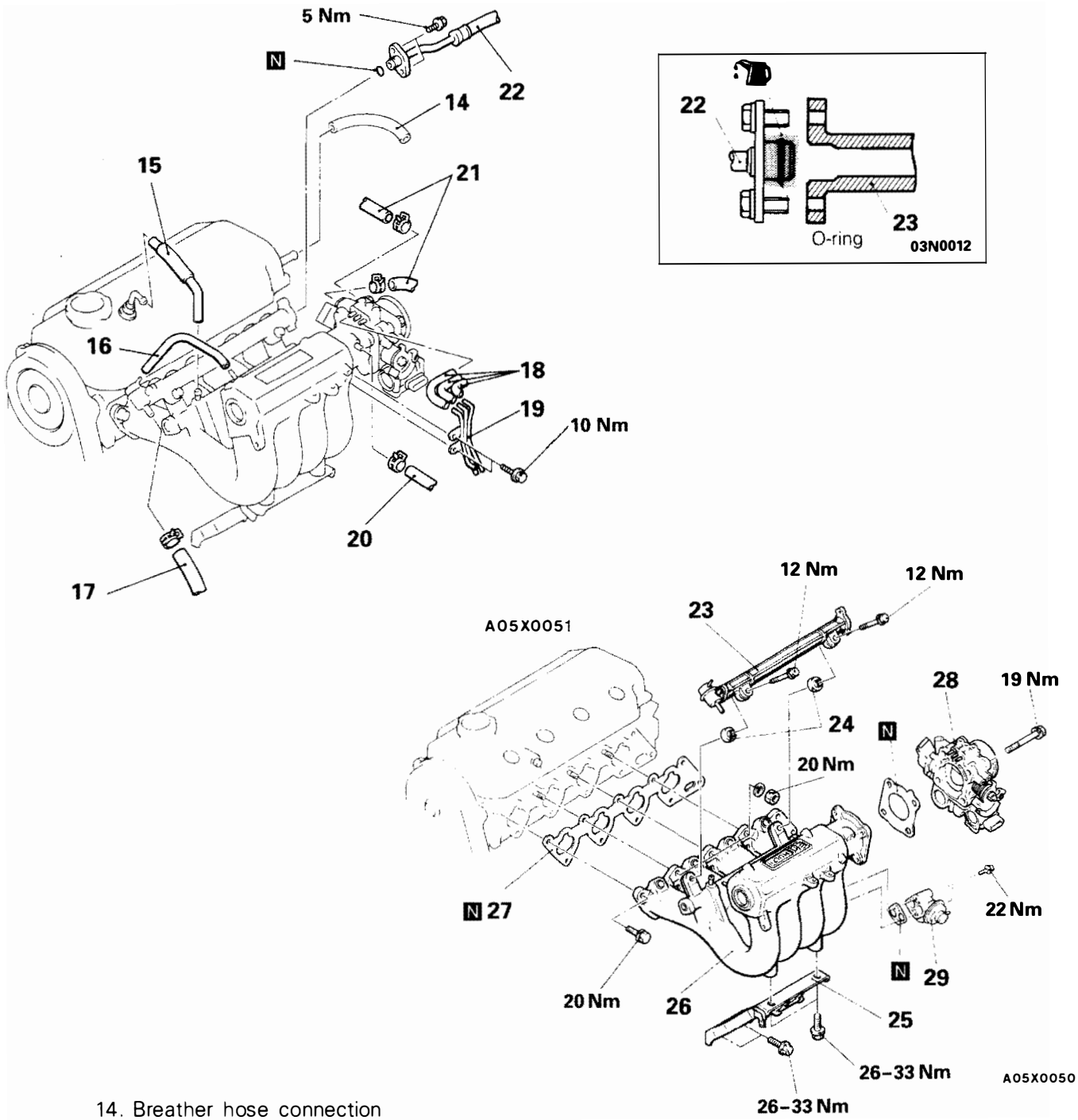
Pre-removal Operation
- Coolant Draining (Refer to GROUP 14 – Service Adjustment Procedures.)
- Residual Fuel Pressure Releasing (Refer to GROUP 13F – Service Adjustment Procedures.)

Post-installation Operation
- Coolant Supplying (Refer to GROUP 14 – Service Adjustment Procedures.)
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)



Removal steps

1. Accelerator cable connection
2. Air intake hose
3. Injector connector
4. Water temperature gauge connector
5. Water temperature sensor connector
6. Distributor connector
7. Condenser connector
8. ISC connector
9. TPS connector
10. Detonation sensor connector
11. Oxygen sensor connector
12. A/C compressor connector
13. Control wiring harness



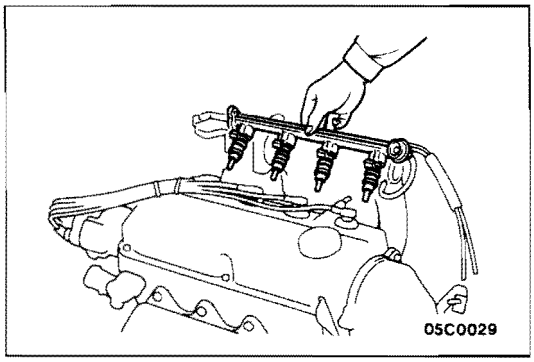
14. Breather hose connection
15. PCV hose connection
16. Vacuum hose
17. Fuel return hose connection
18. Vacuum hose connection
19. Vacuum pipe
20. Brake booster vacuum hose connection
21. Heater hose connection
〈A〉 22. High-pressure fuel hose connection
〈B〉 23. Delivery pipe, injector and pressure regulator assembly
24. Insulator
25. Intake manifold stay
26. Intake manifold
27. Intake manifold gasket
28. Throttle body
29. EGR valve

REMOVAL SERVICE POINTS E15ZH01AA

〈A〉 HIGH PRESSURE FUEL HOSE DISCONNECTION

Relieve pressure in the fuel pipe line to prevent fuel outflow. (Refer to GROUP 13A – Service Adjustment Procedures.)

Caution
Cover fuel pipe line with rag after relieving pressure as certain pressure may still remain.



〈B〉 DELIVERY PIPE, FUEL INJECTOR AND PRESSURE REGULATOR REMOVAL

Remove delivery pipe with fuel injector and pressure regulator cn.

Caution
Do not drop injector when removing delivery pipe.

INSPECTION E15ZH02AA

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

INTAKE MANIFOLD E15ZH02BA

1. Check for damage or cracking of any part.
2. Check for obstruction of the negative pressure (vacuum) outlet port, and for obstruction of the water passage or gas passage.
3. Using a straight edge and a thickness gauge, check for distortion of the cylinder head installation surface.

Standard value: 0.15 mm or less

Limit: 0.2 mm

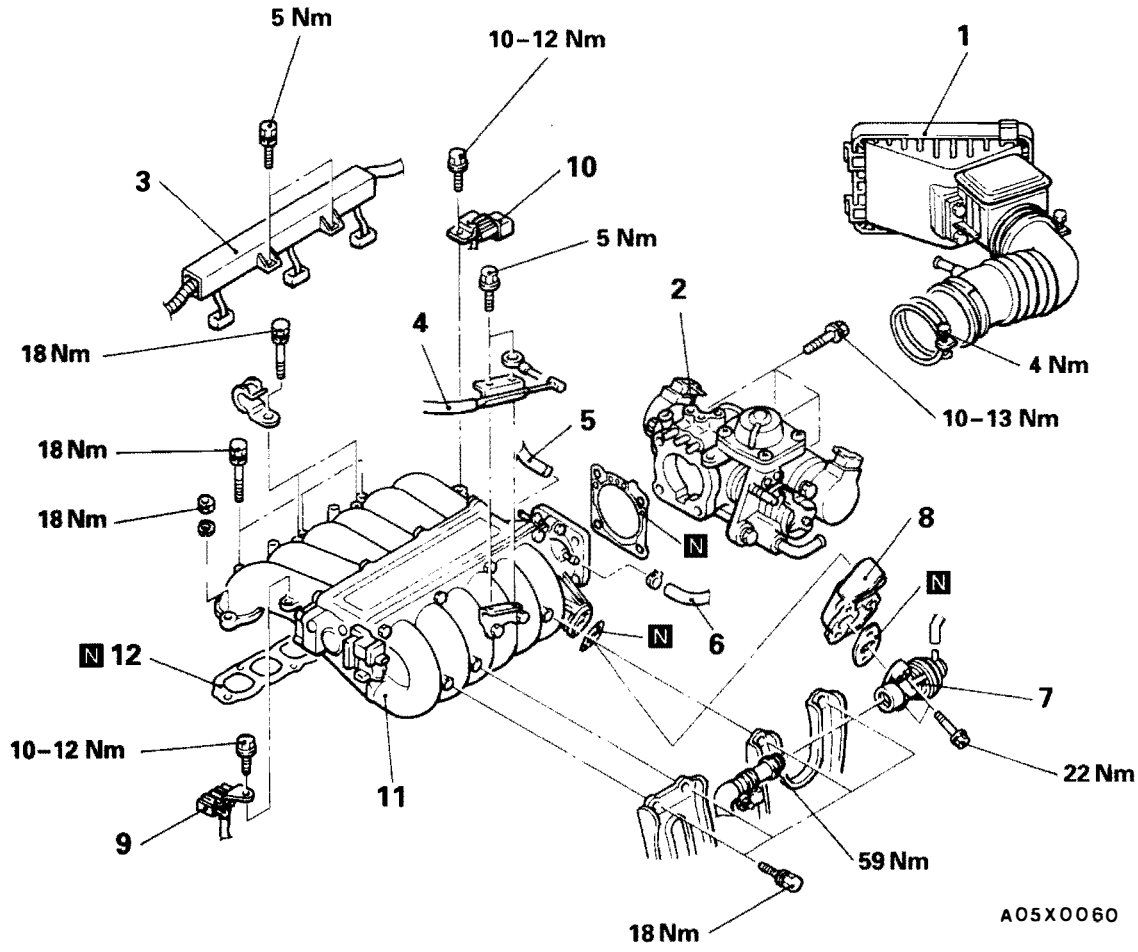
INTAKE MANIFOLD <6A12, 6G73>

E15ZH20AA

REMOVAL AND INSTALLATION

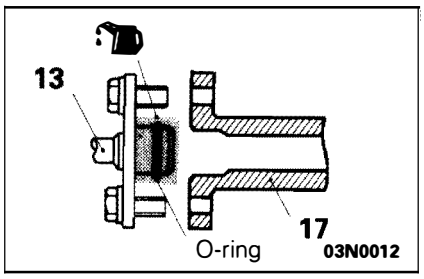
Pro-removal Operation
- Fuel Discharge Prevention (Refer to GROUP 13A – Service Adjustment Procedures.)

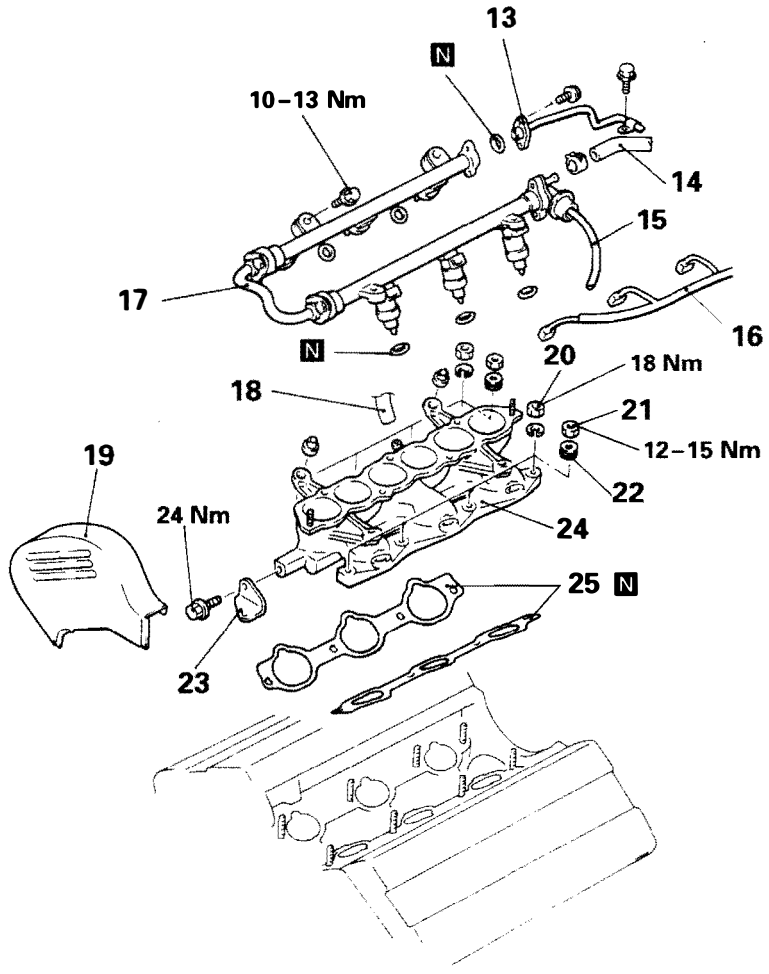
Post-installation Operation
- Accelerator Cable Adjustment (Refer to GROUP 13F – Service Adjustment Procedures.)
- Auto-cruise Control Cable Adjustment (Refer to GROUP 13G – Service Adjustment Procedures.)
- Fuel Leakage Checking



Removal steps

1. Air cleaner assembly
◇A◇ 2. Throttle body assembly
3. Injector connection
4. Accelerator cable connection
5. Connection for fuel pressure regulator vacuum hose
6. Brake booster vacuum hose connection
7. EGR valve
8. EGR passage <6G73>
9. Crank angle sensor connection <6A12>
10. Detonation sensor connection
11. Air intake plenum
◆C◆ 12. Air intake plenum gasket





13. High-pressure fuel hose connection
14. Fuel return hose connection
15. Vacuum hose connection
16. Injector connection
17. Delivery pipe (with injector)
18. PCV hose
19. Timing belt upper cover <6G73>
20. Intake manifold mounting nuts <6A12>
◆B◆ 21. Intake manifold mounting nuts
22. Coned disc spring assembly } <6G73>
23. Bracket
24. Intake manifold
◆A◆ 25. Intake manifold gasket

REMOVAL SERVICE POINT E15ZH21AA

〈A〉 THROTTLE BODY ASSEMBLY REMOVAL

Disconnect the throttle body assembly with hoses from the air intake plenum.

NOTE
Secure the removed throttle body assembly in a place where it will not be a hindrance to removal and installation of the air intake plenum.

INSPECTION E15ZH02AA

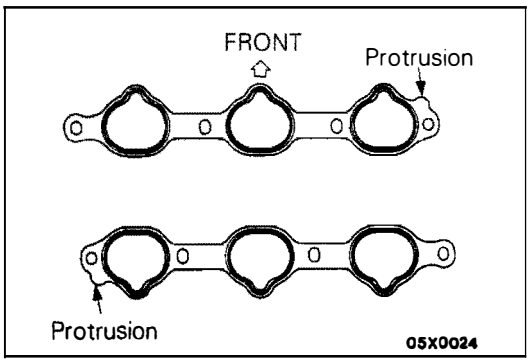
Check the following points; replace the part if a problem is found.

AIR INTAKE PLENUM, INTAKE MANIFOLD E15ZH02CA

1. Check for damage or cracking of any part.
2. Clogging of the negative pressure (vacuum) outlet port, or clogging of the gas passages.
3. Check deflection of installation surface with straight edge and thickness gauge.

Standard value: 0.15 mm or less

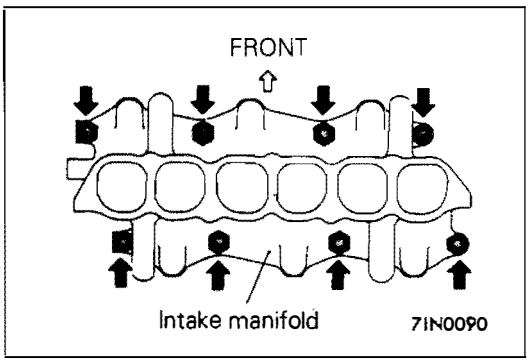
Limit: 0.2 mm



INSTALLATION SERVICE POINTS E15ZH24AA

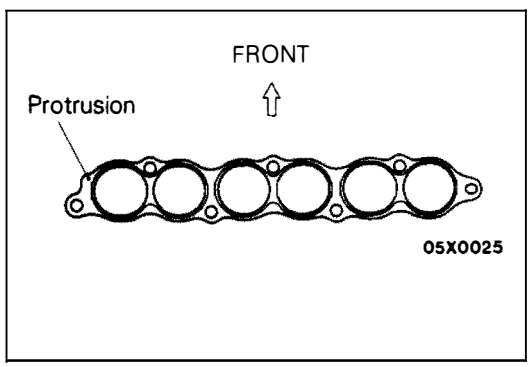
◆A◆ INTAKE MANIFOLD GASKET INSTALLATION

Install with gasket protrusions in the position illustrated.



◆B◆ INTAKE MANIFOLD MOUNTING NUT INSTALLATION

Tighten the intake manifold mounting nuts one bank after the other by the following procedure.
(1) Tighten the nuts in the front bank to 3 to 5 Nm
(2) Tighten the nuts in the rear bank to 12 to 15 Nm
(3) Tighten the nuts in the front bank to 12 to 15 Nm
(4) Repeat steps (2) and (3) one more time respectively.



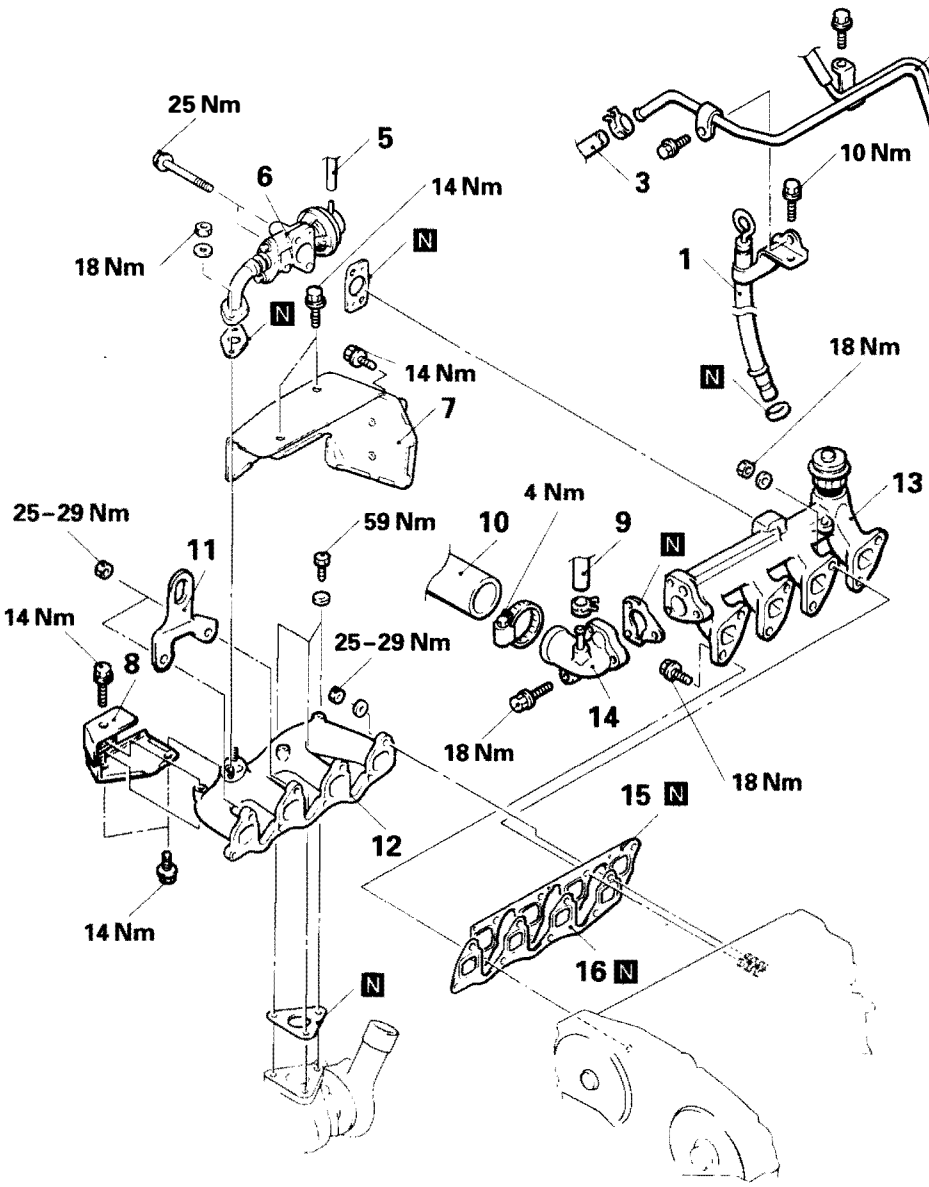
◆C◆ AIR INTAKE PLENUM GASKET INSTALLATION

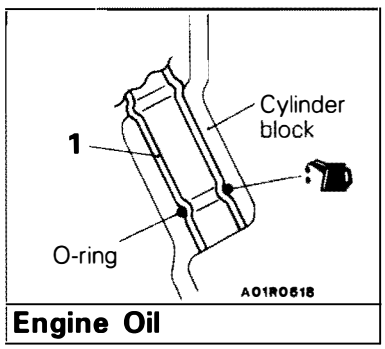
Install with gasket protrusions in the position illustrated.

INTAKE AND EXHAUST MANIFOLD <4D68>

E15ZH30AA

REMOVAL AND INSTALLATION





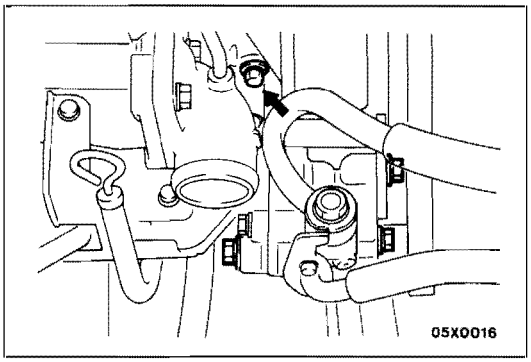
Engine Oil

05X0029

Removal steps

1. Oil level gauge guide assembly
2. Vacuum hose connection
3. Brake booster vacuum hose connection
4. Vacuum pipe
5. Vacuum hose connection
6. EGR valve assembly
7. Heat protector (A)
8. Heat protector (B)
9. Vacuum hose connection
10. Air hose connection
11. Engine hanger

◇A◇ ◆A◆ 12. Exhaust manifold
◇A◇ ◆A◆ 13. Intake manifold
14. Air inlet fitting
15. Intake manifold gasket
16. Exhaust manifold gasket

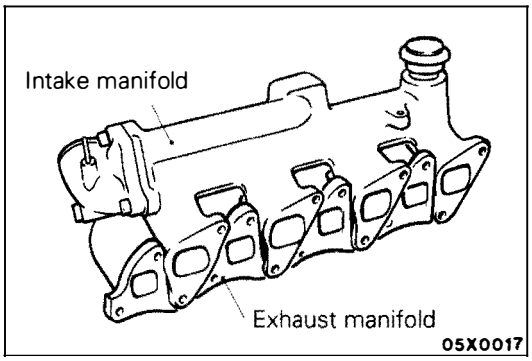


REMOVAL SERVICE POINT E15ZH31AA

◇A◇ EXHAUST MANIFOLD/INTAKE MANIFOLD REMOVAL

Follow the procedures described below in order to remove the bolt shown in the figure, and then remove the bolt.
(1) Remove the power steering oil pump's drive-belt.
(2) Remove the power steering installation bolt, and then remove the power steering oil pump (with the hose attached) from the oil pump bracket.

NOTE
Place the power steering oil pump in the proper position.



(3) Remove the intake manifold and exhaust manifold at the same time in the condition shown in the illustration.

INSPECTION E15ZH02AA

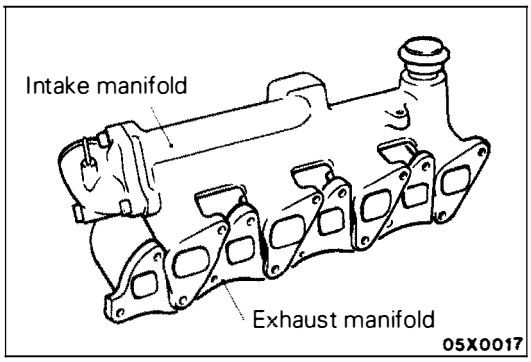
Check the following points; replace the part if a problem is found.

INTAKE AND EXHAUST MANIFOLD E15ZH02DA

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

Standard value: 0.15 mm or less

Limit: 0.2 mm



INSTALLATION SERVICE POINT E15ZH34AA

◆A◆ INTAKE MANIFOLD/EXHAUST MANIFOLD INSTALLATION

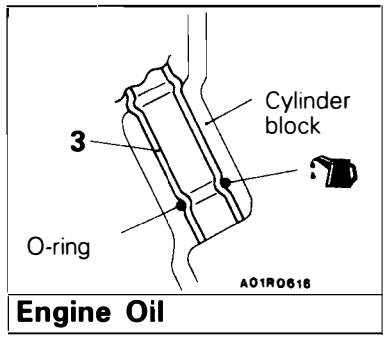
Install the intake manifold and exhaust manifold at the same time in the condition shown in the illustration.

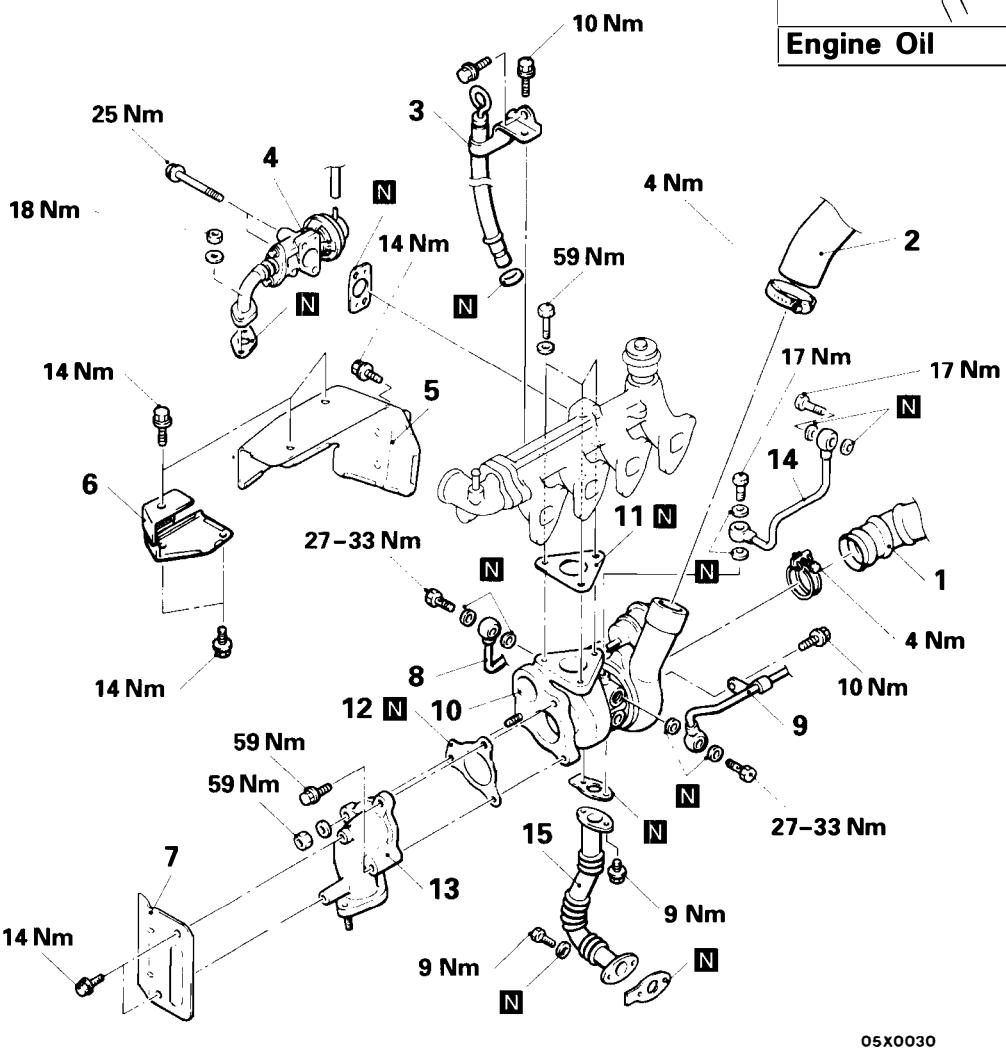
TURBOCHARGER

E15ZI00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Engine Coolant Draining and Supplying (Refer to GROUP 14 – Service Adjustment Procedures.)
- Front Exhaust Pipe Removal and Installation (Refer to P.15-29.)
- Engine Oil Draining and Supplying





Removal steps

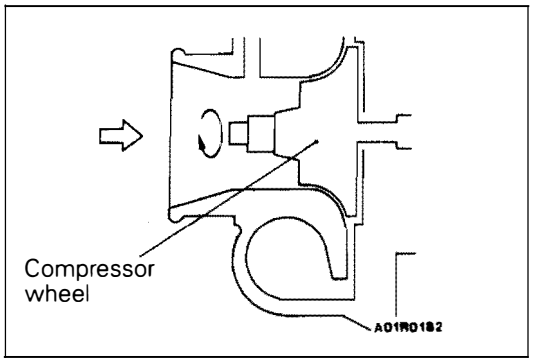
1. Air intake hose connection
2. Air hose connection
3. Oil level gauge guide assembly
4. EGR valve assembly
5. Heat protector (A)
6. Heat protector (B)
7. Heat protector (C)
8. Connection for water pipe assembly B
9. Connection for water pipe assembly A

◆B◆ 10. Turbocharger assembly

11. Gasket (A)

◆A◆ 12. Gasket (B)

13. Exhaust fitting
14. Oil pipe assembly
15. Oil return pipe



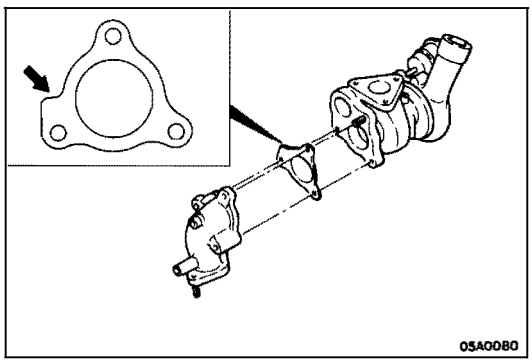
INSPECTION E15ZI02AA

TURBOCHARGER ASSEMBLY CHECK

1. Visually check the turbine wheel and the compressor wheel for cracking or other damage.
2. Check whether the turbine wheel and the compressor wheel can be easily turned by hand.
3. Check for oil leakage from the turbocharger assembly.
4. Check whether or not the waste gate valve remains open. If any problem is found, replace the part after disassembly.

OIL PIPE ASSEMBLY AND OIL-RETURN PIPE CHECK E15ZI02BA

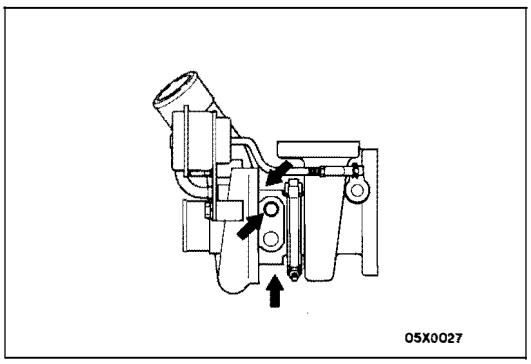
Check the oil pipe and oil-return pipe for clogging, bending, or other damage. If there is clogging, clean it.



INSTALLATION SERVICE POINTS E15ZI04AA

◆A◆ GASKET (B) INSTALLATION

When installing gasket (B), be sure that it is installed to face in the correct direction.



◆B◆ TURBOCHARGER ASSEMBLY INSTALLATION

(1) Clean the alignment surfaces shown in the illustration.
(2) Supply clean engine oil through the oil pipe installation hole of the turbocharger assembly.

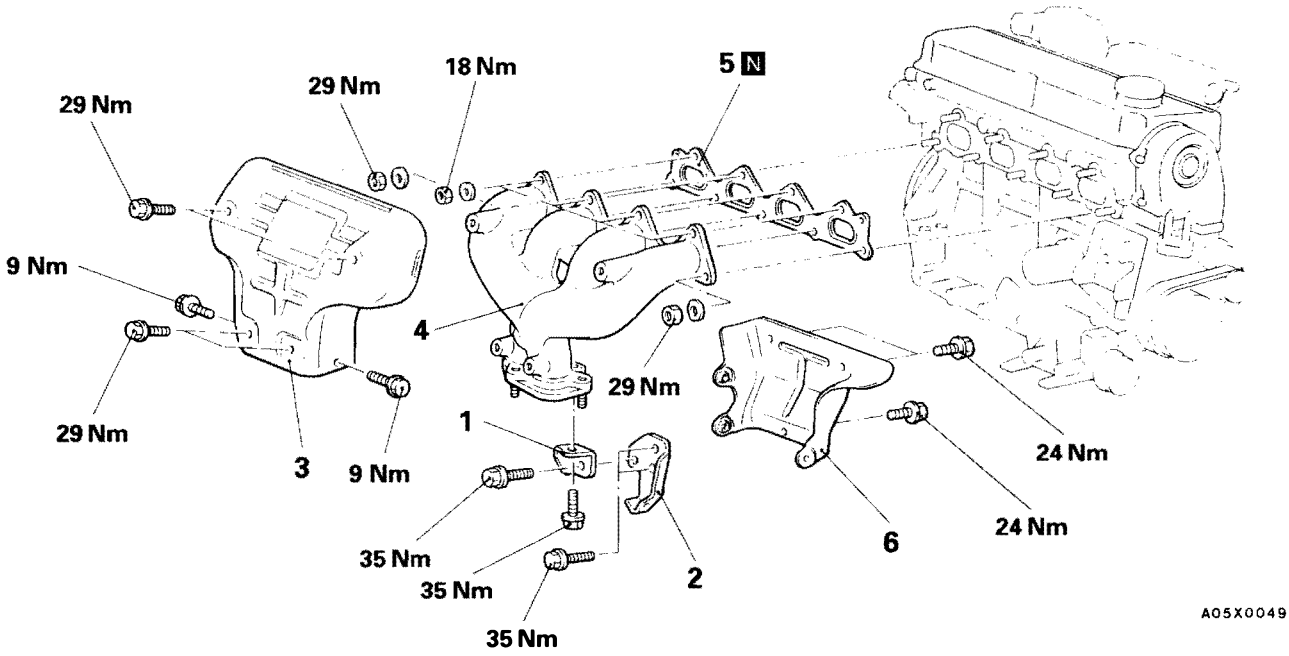
Caution
When cleaning, take care that no foreign material gets into the engine coolant or oil passages hole.

EXHAUST MANIFOLD <4G93>

E15ZJ00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to P.15-25.)



Removal steps

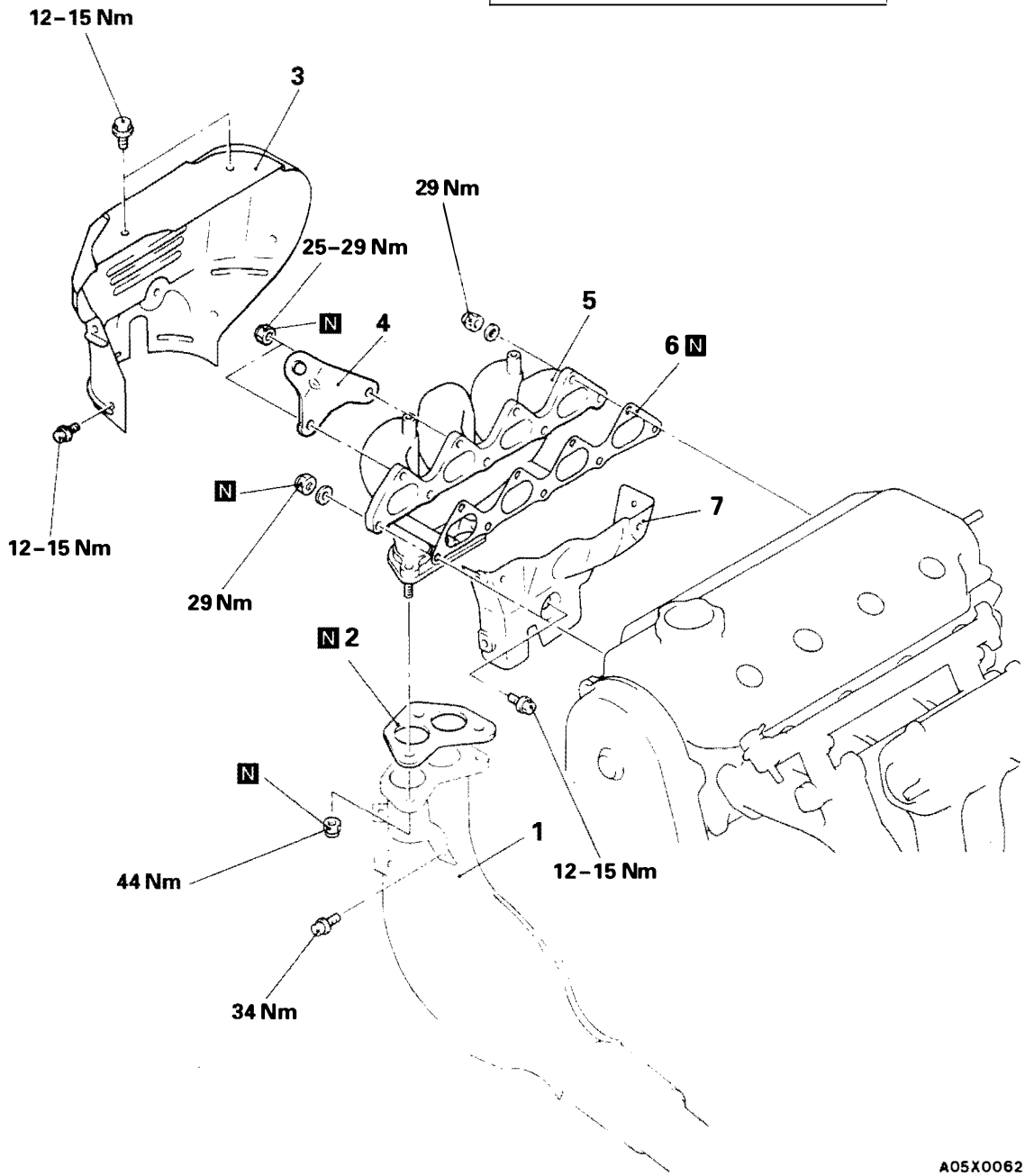
1. Exhaust manifold bracket (B)
2. Exhaust manifold bracket (A)
3. Exhaust manifold cover (A)
4. Exhaust manifold
5. Exhaust manifold gasket
6. Exhaust manifold cover (B)

EXHAUST MANIFOLD <4G63>

E15ZJ10AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



Removal steps

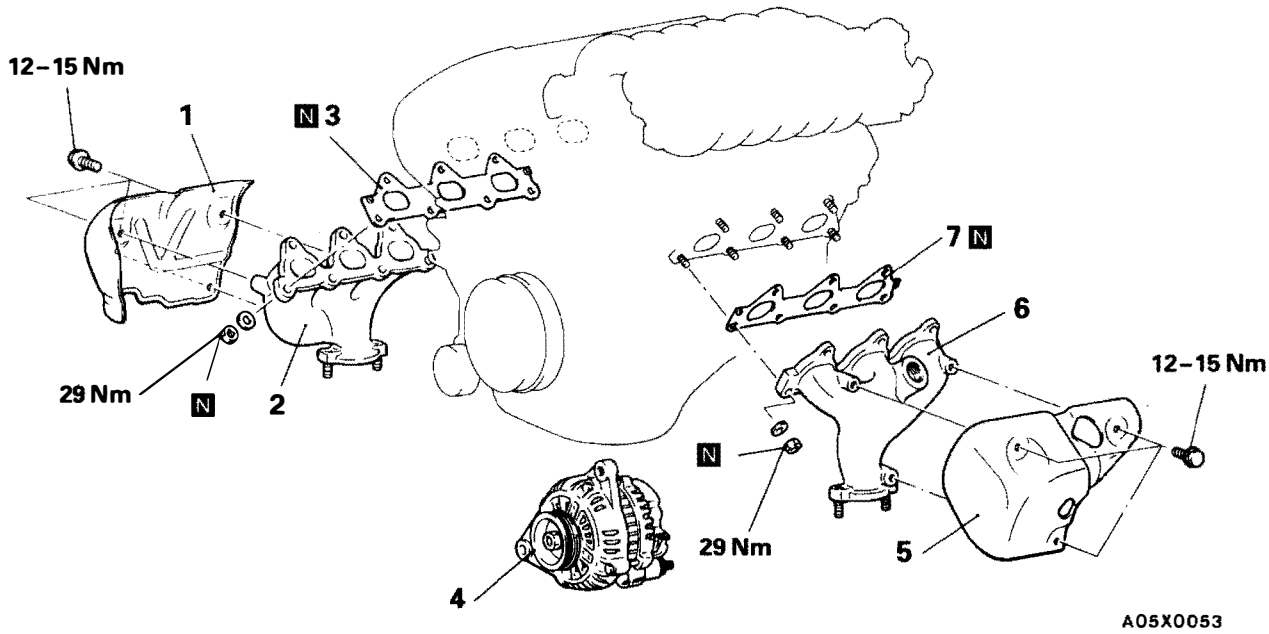
1. Front exhaust pipe connection
2. Gasket
3. Exhaust manifold cover (A)
4. Engine hanger
5. Exhaust manifold
6. Exhaust manifold gasket
7. Exhaust manifold cover (B)

EXHAUST MANIFOLD <6A12>

E15ZJ20AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation
- Front Exhaust Pipe Removal and Installation (Refer to P.15-27.)



Removal steps

Front bank side
1. Heat protector
2. Exhaust manifold
3. Gasket

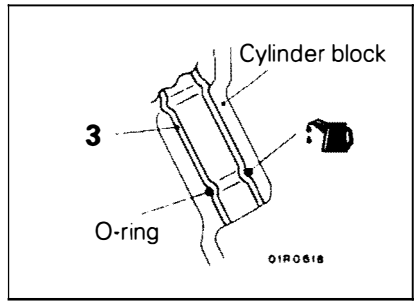
Rear bank side
4. Alternator (Refer to GROUP 16 – Charging System.)
5. Heat protector
6. Exhaust manifold
7. Gasket

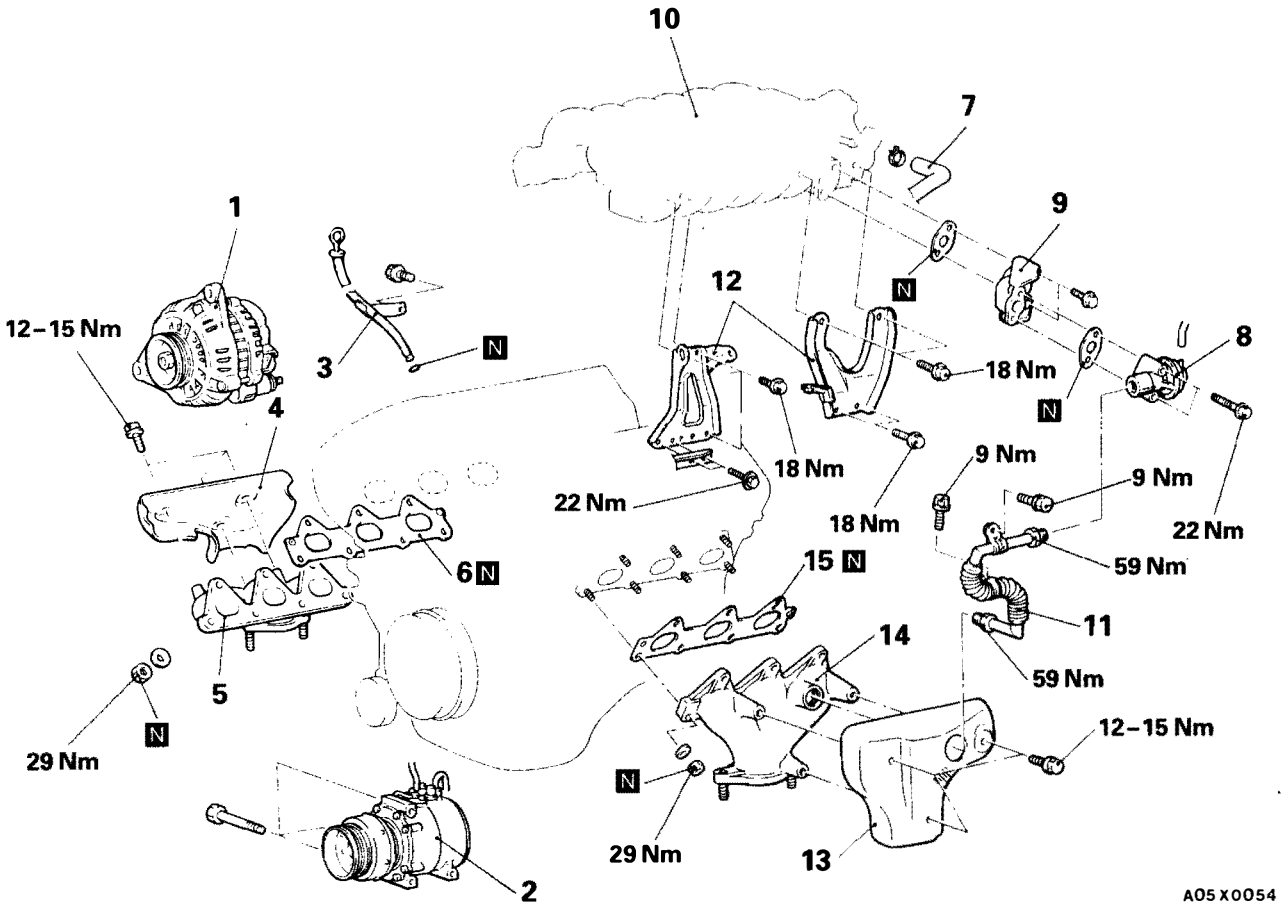
EXHAUST MANIFOLD <6G73>

E15ZJ30AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Exhaust Pipe Removal and Installation (Refer to P.15-28.)





Removal steps

Front bank side

1. Alternator (Refer to GROUP 16 – Charging System.)
2. ⟨A⟩ Compressor <Vehicles with A/C>
3. Oil level gauge guide
4. Heat protector
5. Exhaust manifold
6. Gasket

Rear bank side

7. Brake booster vacuum hose connection
8. EGR valve
9. EGR passage
10. ⟨B⟩ Air intake plenum (Refer to P.15-13.)
11. EGR pipe assembly
12. Air intake plenum stay
13. Heat protector
14. Exhaust manifold
15. Gasket

REMOVAL SERVICE POINT E15ZJ31AA

〈A〉 COMPRESSOR REMOVAL

Remove the air conditioning compressor from the bracket with the hoses still attached.

NOTE
Move the compressor to a place where it will not be an obstruction.

〈B〉 AIR INTAKE PLENUM REMOVAL

NOTE
Shift the air intake plenum slightly to keep enough space for removal of the exhaust manifold.

INSPECTION E15ZJ32AA

EXHAUST MANIFOLD

Check for damage or cracking of any part.

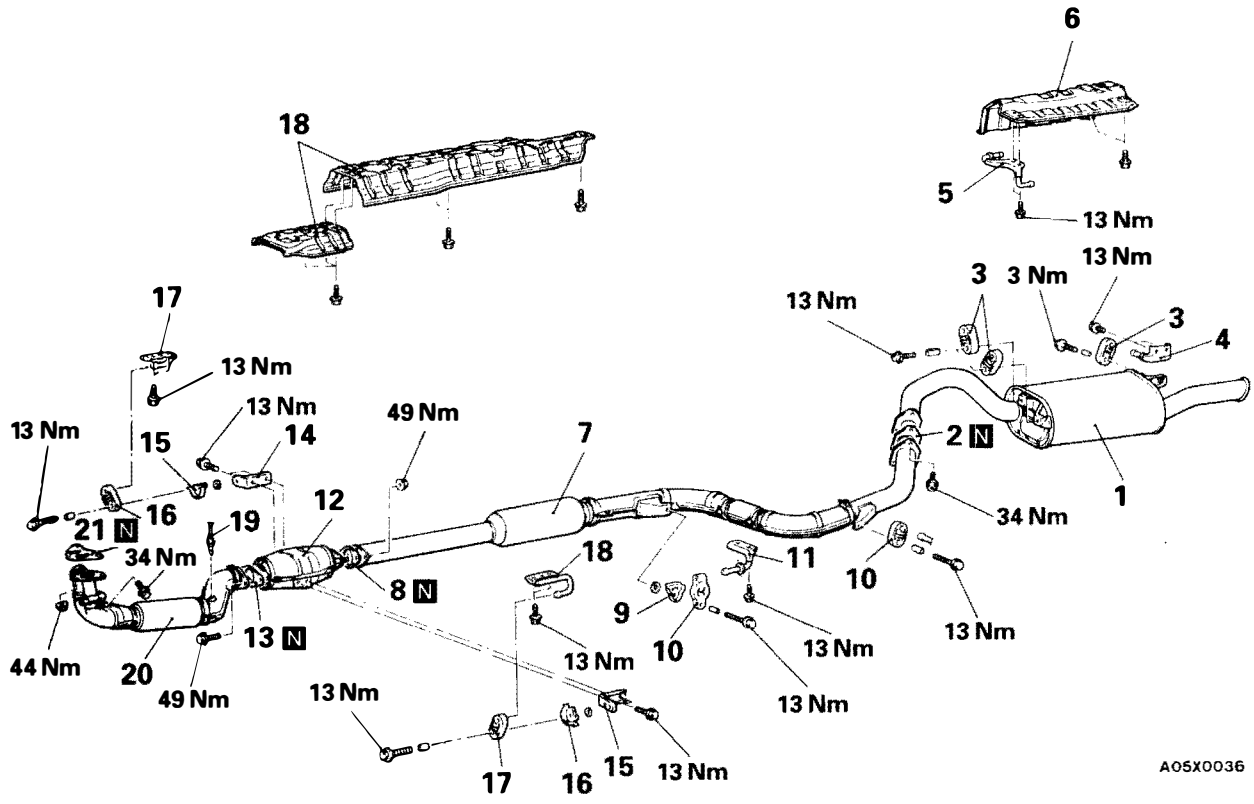
EXHAUST PIPE AND MAIN MUFFLER

E15ZK00AA

REMOVAL AND INSTALLATION

<4G93, 4G63-2WD>

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



Main muffler removal steps
1. Main muffler assembly
2. Gasket
3. Hanger
4. Tail hanger
5. Rear hanger
6. Rear floor heat protector panel

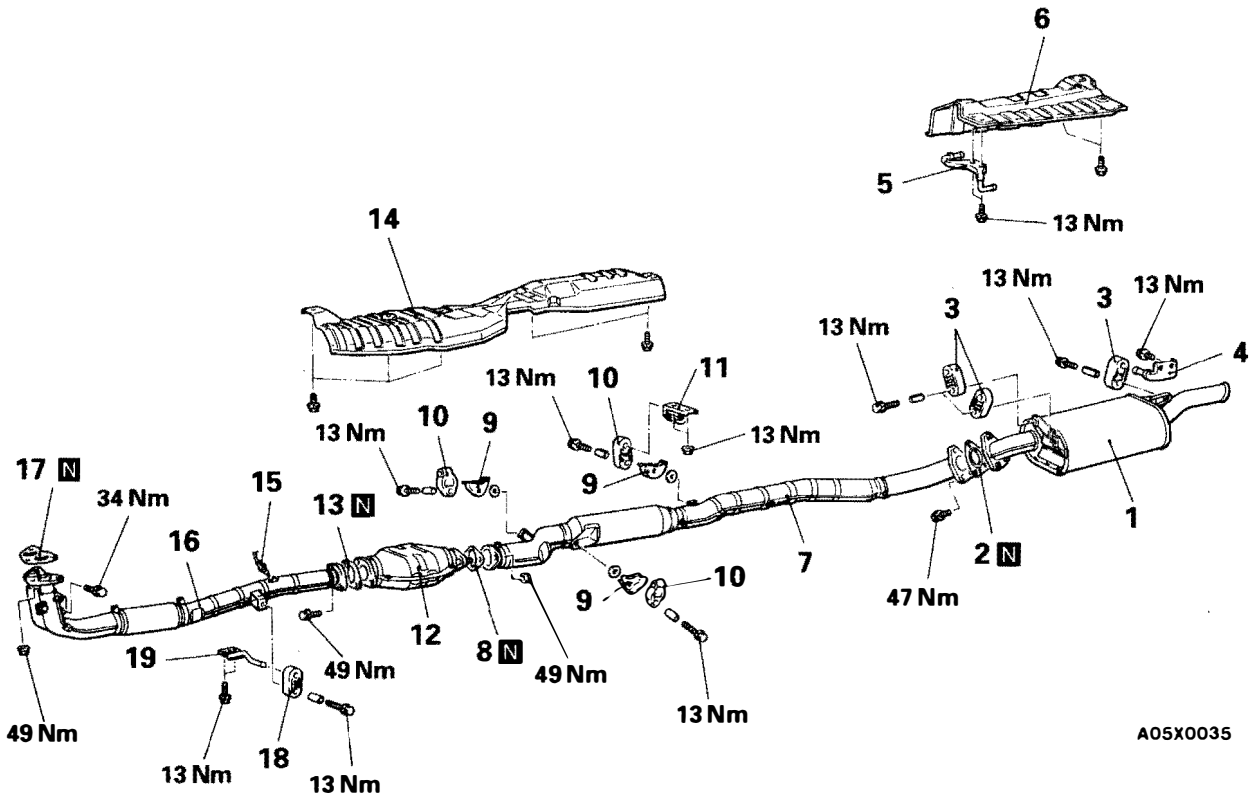
Center exhaust pipe removal steps
7. Center exhaust pipe
8. Gasket
9. Hanger protector
10. Hanger
11. Hanger bracket

Catalytic converter removal steps
12. Catalytic converter
13. Gasket
14. UCC bracket
15. Hanger protector
16. Hanger
17. Front hanger
18. Front floor heat protector panel

Front exhaust pipe removal steps
19. Oxygen sensor
20. Front exhaust pipe
21. Gasket

<4G63-4WD>

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



Main muffler removal steps
1. Main muffler assembly
2. Gasket
3. Hanger
4. Tail hanger
5. Rear hanger
6. Rear floor heat protector panel

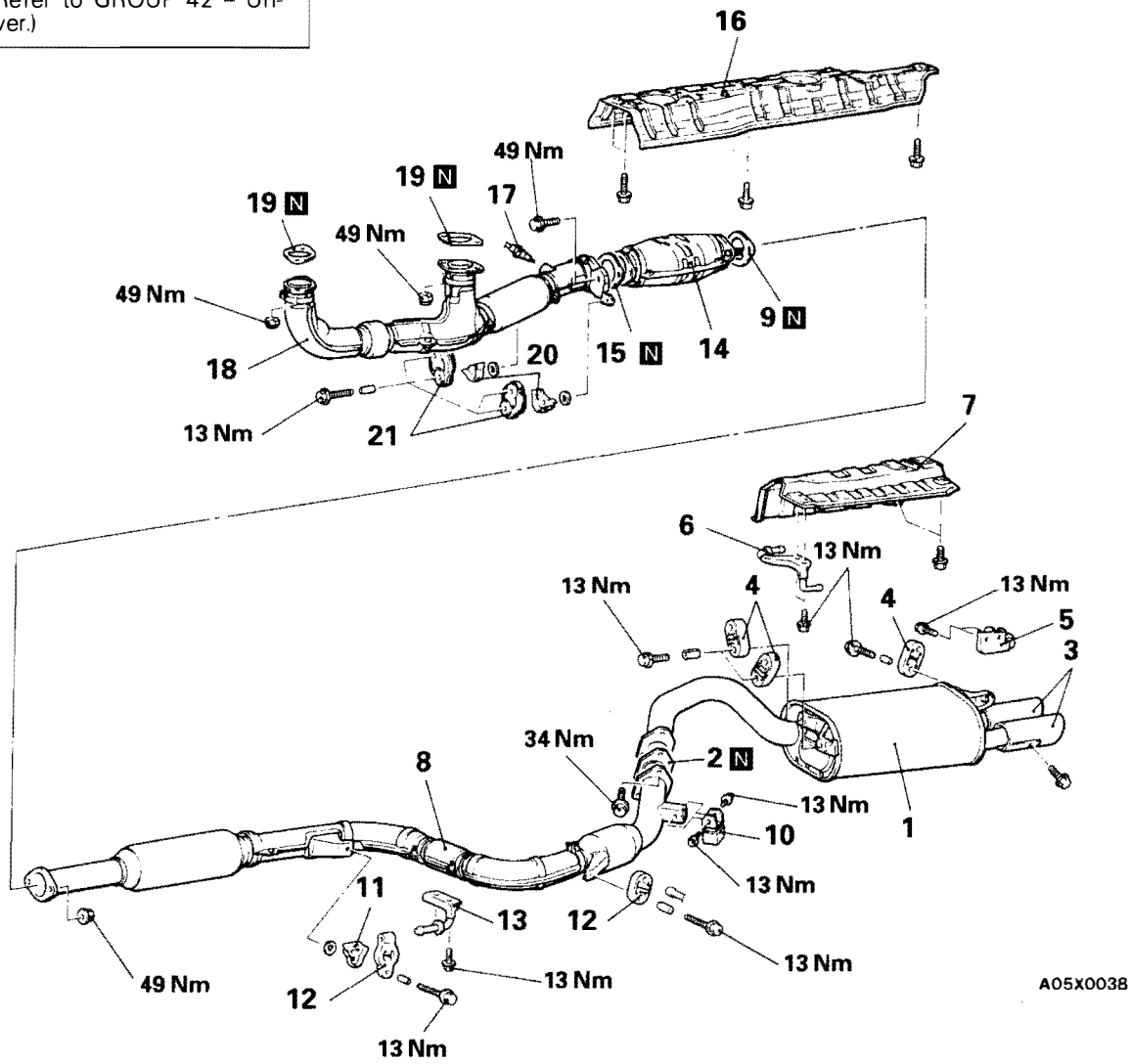
Center exhaust pipe removal steps
7. Center exhaust pipe
8. Gasket
9. Protector
10. Hanger
11. Center hanger

Catalytic converter removal steps
12. Catalytic converter
13. Gasket
14. Front floor heat protector panel

Front exhaust pipe removal steps
15. Oxygen sensor
16. Front exhaust pipe
17. Gasket
18. Hanger
19. Front hanger

<6A12>

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



Main muffler removal steps
1. Main muffler assembly
2. Gasket
3. Muffler cutter
4. Hanger
5. Tail hanger
6. Rear hanger
7. Rear floor heat protector panel

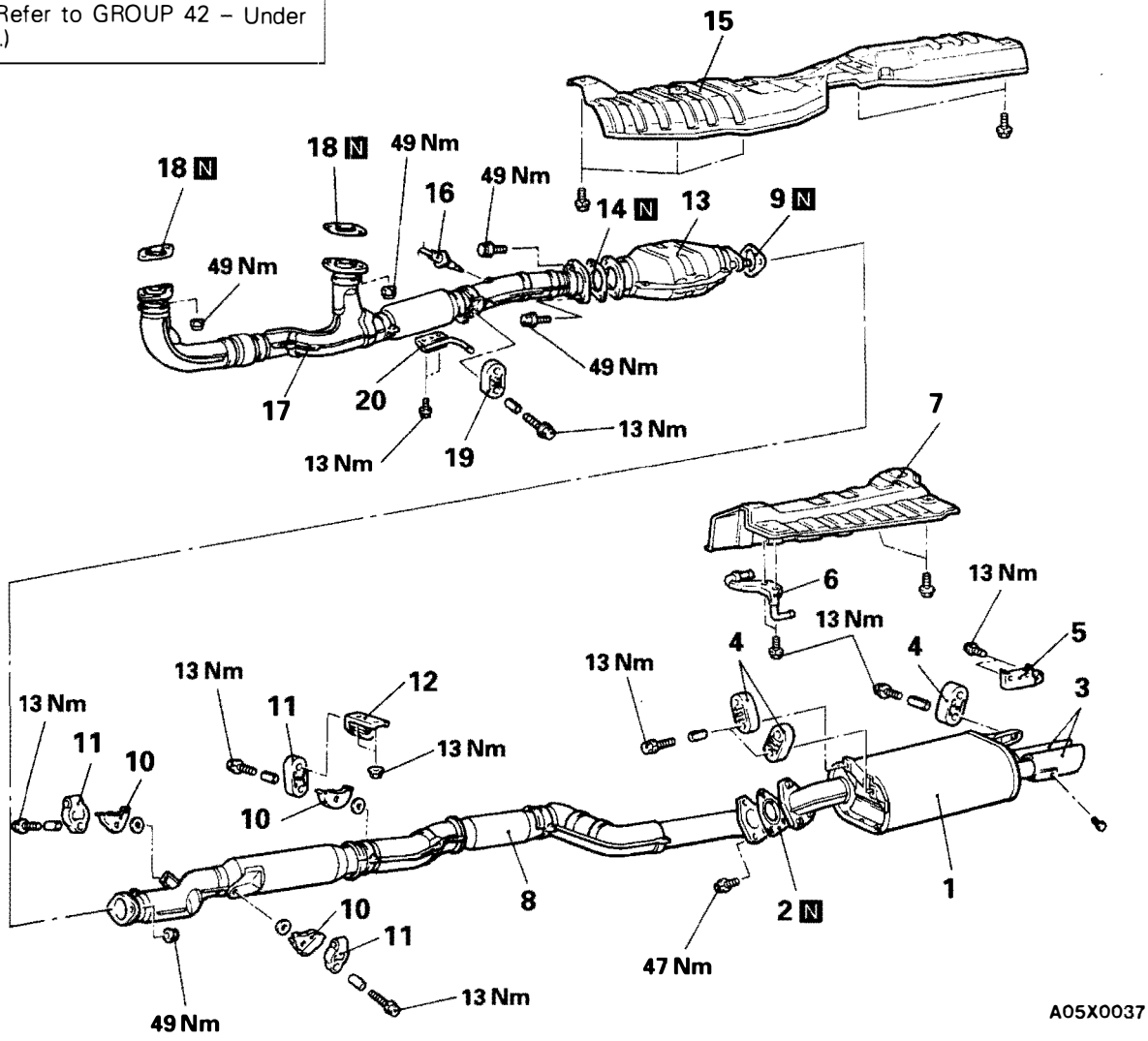
Center exhaust pipe removal steps
8. Center exhaust pipe
9. Gasket
10. Dumper
11. Hanger protector
12. Hanger
13. Hanger bracket

Catalytic converter removal steps
14. Catalytic converter
15. Gasket
16. Front floor heat protector panel

Front exhaust pipe removal steps
17. Oxygen sensor
18. Front exhaust pipe
19. Gasket
20. Protector
21. Hanger

<6G73>

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



Main muffler removal steps
1. Main muffler assembly
2. Gasket
3. Muffler cutter
4. Hanger
5. Tail hanger
6. Rear hanger
7. Rear floor heat protector panel

Center exhaust pipe removal steps
8. Center exhaust pipe
9. Gasket
10. Protector
11. Hanger
12. Center hanger

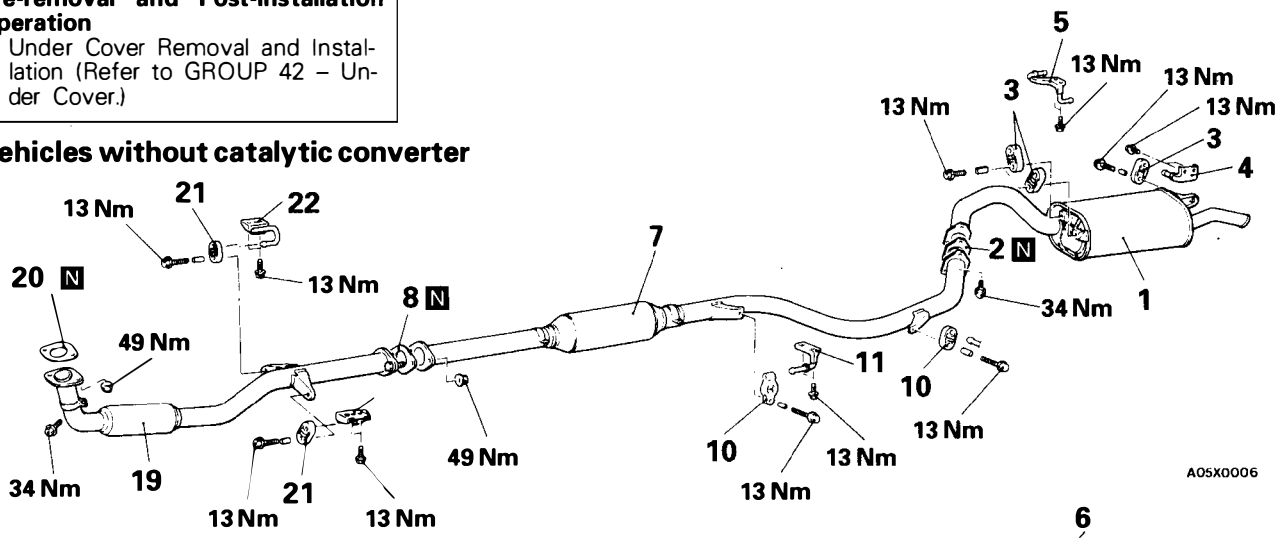
Catalytic converter removal steps
13. Catalytic converter
14. Gasket
15. Front floor heat protector panel

Front exhaust pipe removal steps
16. Oxygen sensor
17. Front exhaust pipe
18. Gasket
19. Hanger
20. Front hanger

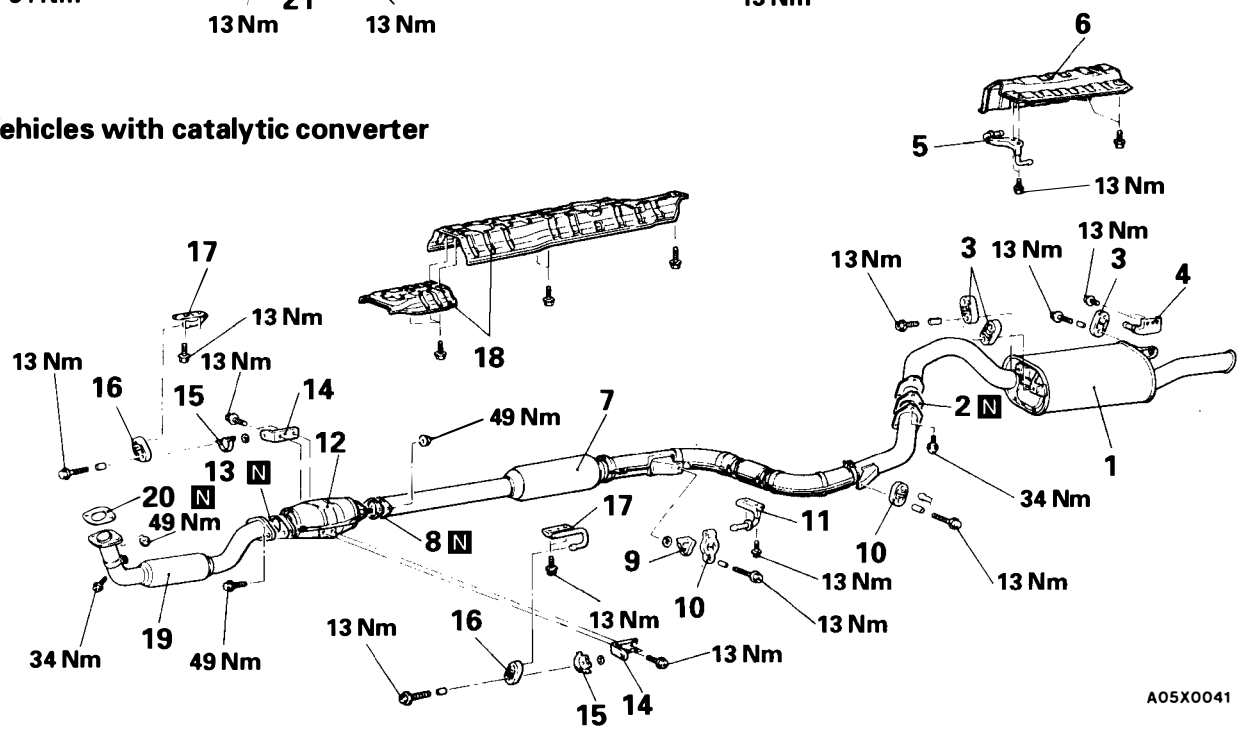
<4D68>

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)

Vehicles without catalytic converter



Vehicles with catalytic converter



Main muffler removal steps
1. Main muffler assembly
2. Gasket
3. Hanger
4. Tail hanger
5. Rear hanger
6. Rear floor heat protector panel

Center exhaust pipe removal steps
7. Center exhaust pipe
8. Gasket
9. Hanger protector
10. Hanger
11. Hanger bracket

Catalytic converter removal steps
12. Catalytic converter
13. Gasket
14. UCC bracket
15. Hanger protector
16. Hanger
17. Front hanger
18. Front floor heat protector panel

Front exhaust pipe removal steps
19. Front exhaust pipe
20. Gasket
21. Hanger
22. Front hanger

EMISSION CONTROL

CONTENTS

E17AA00AA

 PWDE9211

EMISSION CONTROL <MPI>

E17AB00AA

GENERAL INFORMATION

The emission control system consists of the following subsystems:
- Crankcase emission control system
- Evaporative emission control system
- Exhaust gas recirculation (EGR) system
- Three-way catalytic converter

Items	Name	Specification
Crankcase emission control system	Positive crankcase ventilation (PCV) valve	Variable flow type (Purpose: HC reduction)
Evaporative emission control system	Canister	Equipped
	Purge control solenoid valve	ON/OFF type solenoid valve (Purpose: HC reduction)
Exhaust emission control system	Air-fuel ratio control device–MPI system	Oxygen sensor feedback type (Purpose: CO, HC, NOx reduction)
	Exhaust gas recirculation system EGR valve EGR control solenoid valve	Single type ON/OFF type solenoid valve (Purpose: NOx reduction)
	Catalytic converter	Monolith type (Purpose: CO, HC, NOx reduction)

EMISSION CONTROL DEVICE REFERENCE TABLE

Emission control system / Related parts	Crankcase emission control system	Evaporative emission control system	Air fuel ratio control system	Catalytic converter	Exhaust emission control system	Reference page for each part inspection
PCV valve	×					17-12
Purge control solenoid valve		×				17-15
MPI system component		×	×			Fuel (Group13A)
Catalytic converter				×		17-28
EGR valve					×	17-23
EGR control solenoid valve					×	17-24

SERVICE SPECIFICATIONS

E17AC00AA

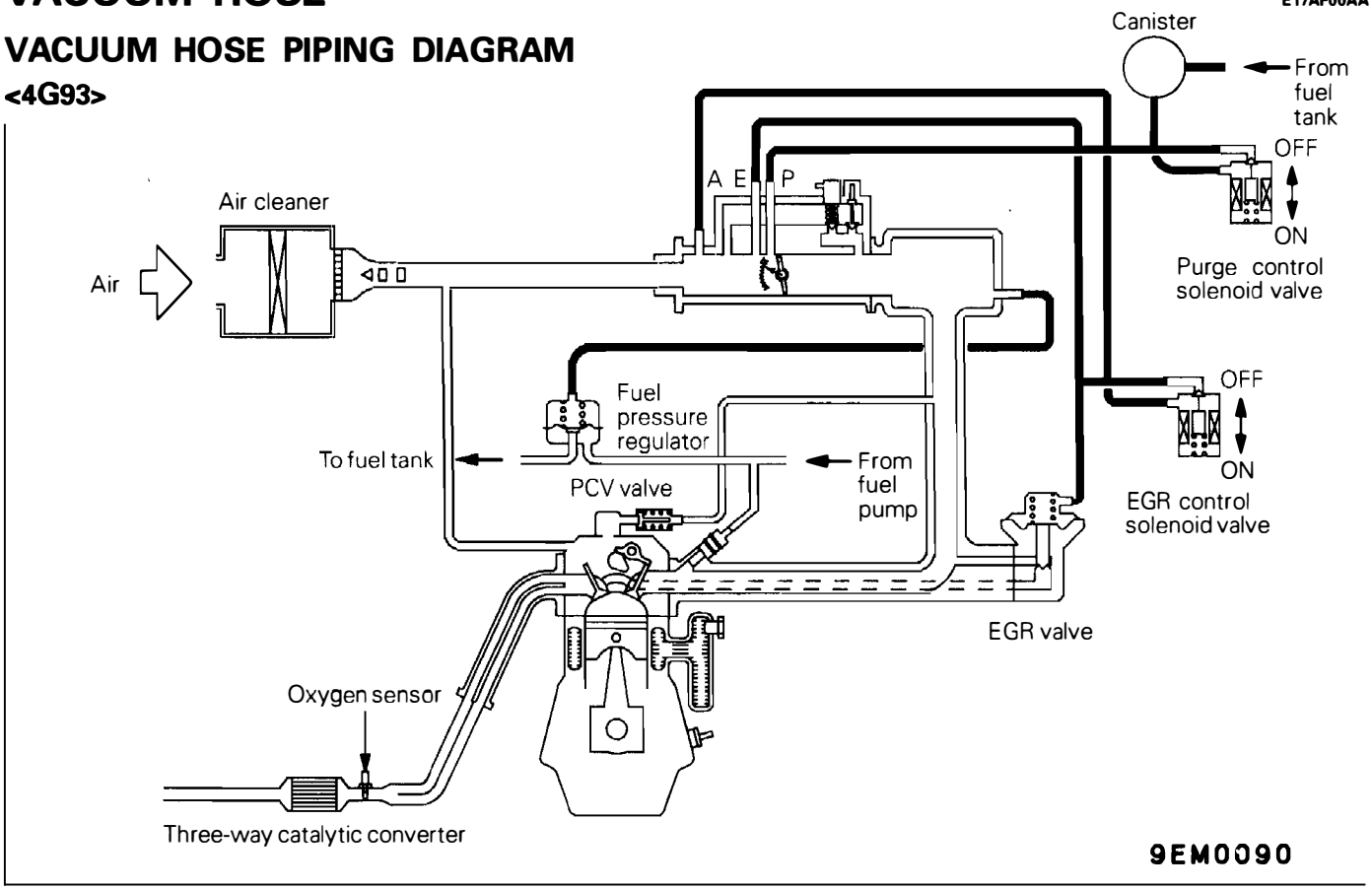
Items	Specification
Purge control solenoid valve coil resistance (at 20°C) Ω	36–44
EGR control solenoid valve coil resistance (at 20°C) Ω	36–44

VACUUM HOSE

E17AF00AA

VACUUM HOSE PIPING DIAGRAM

<4G93>



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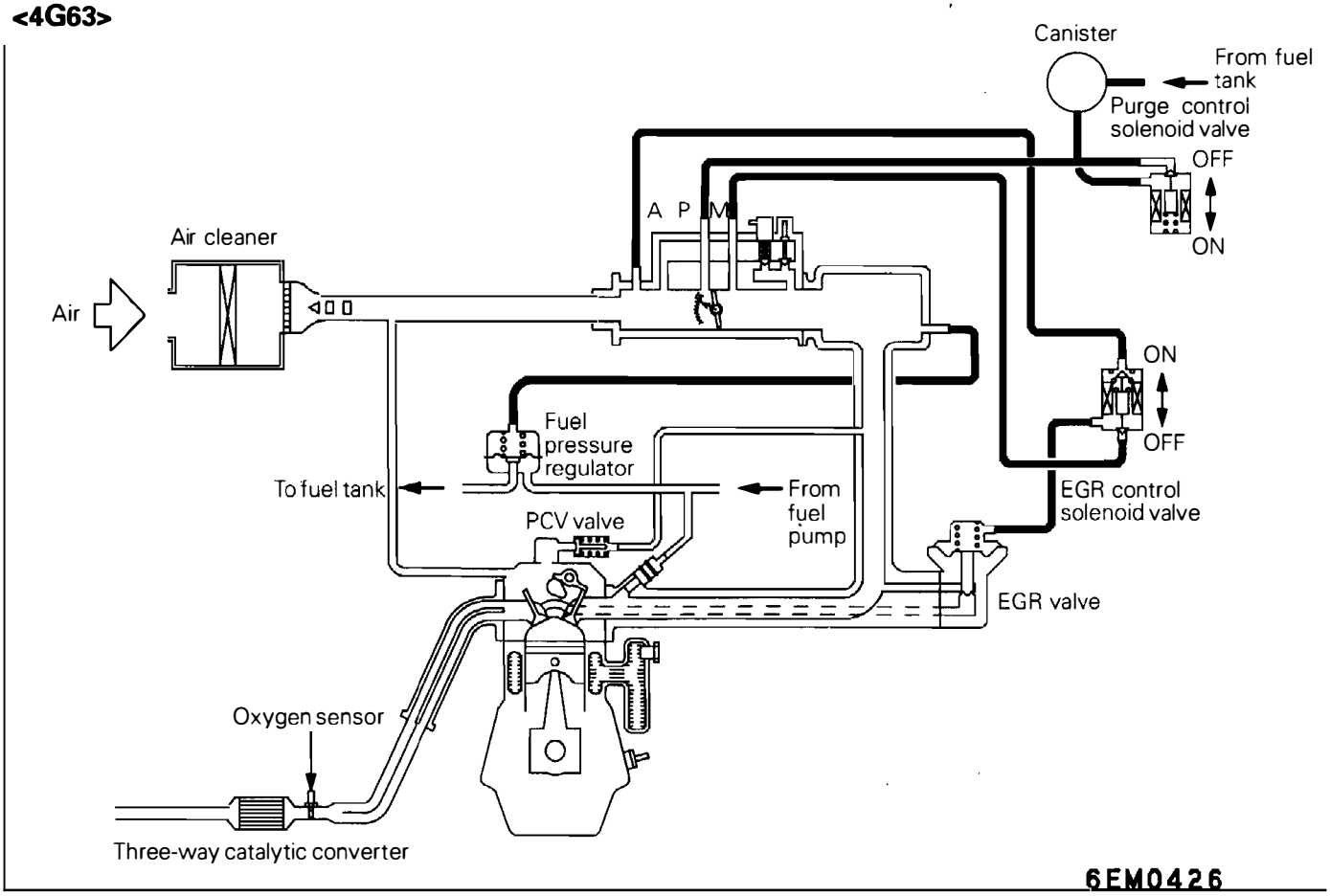
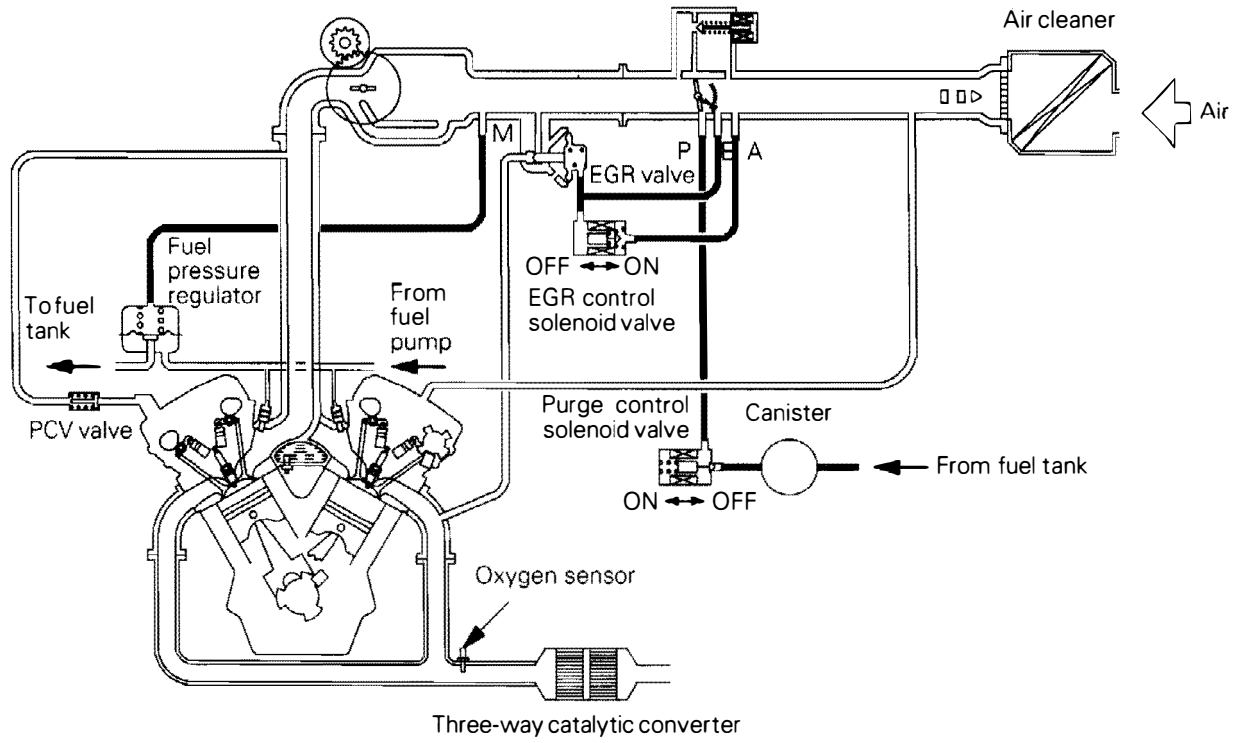


<6A12-Vehicles without TCL, 6G73>



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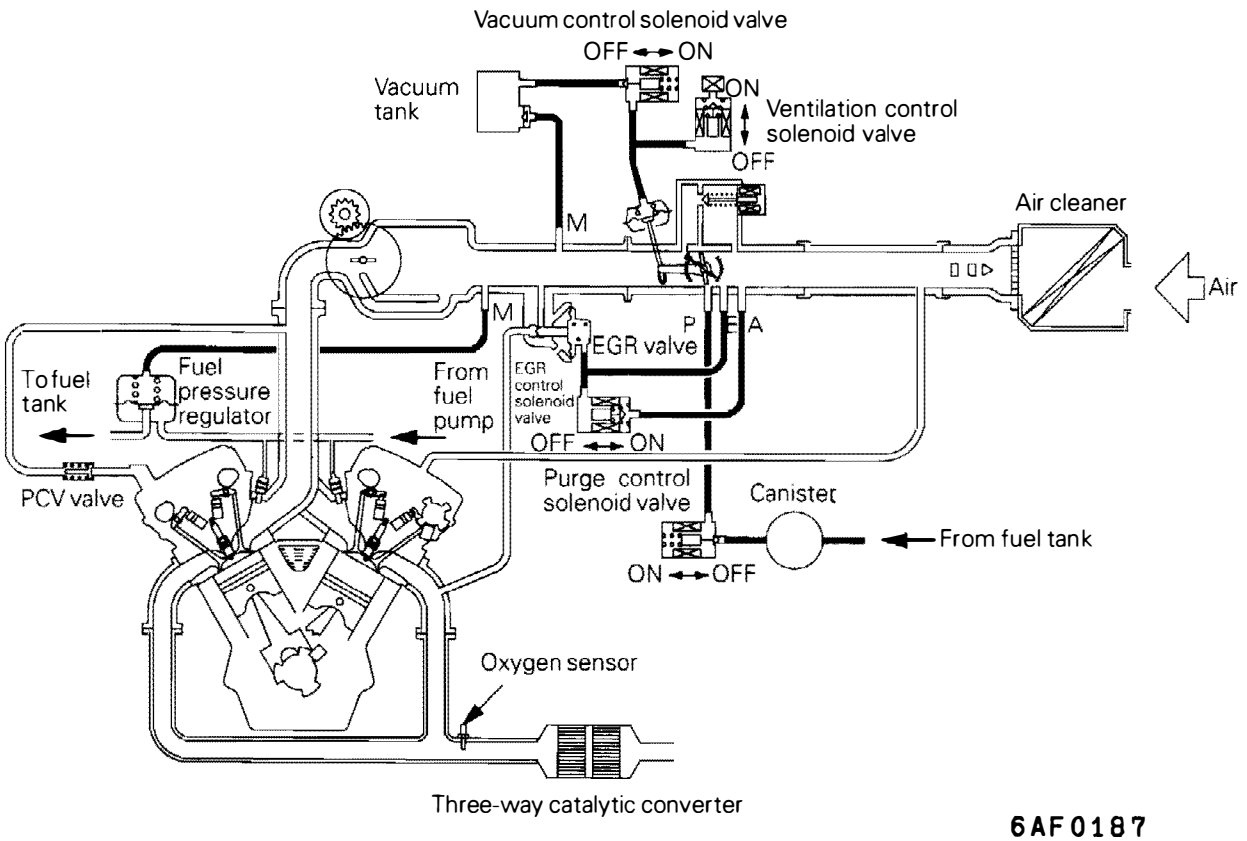
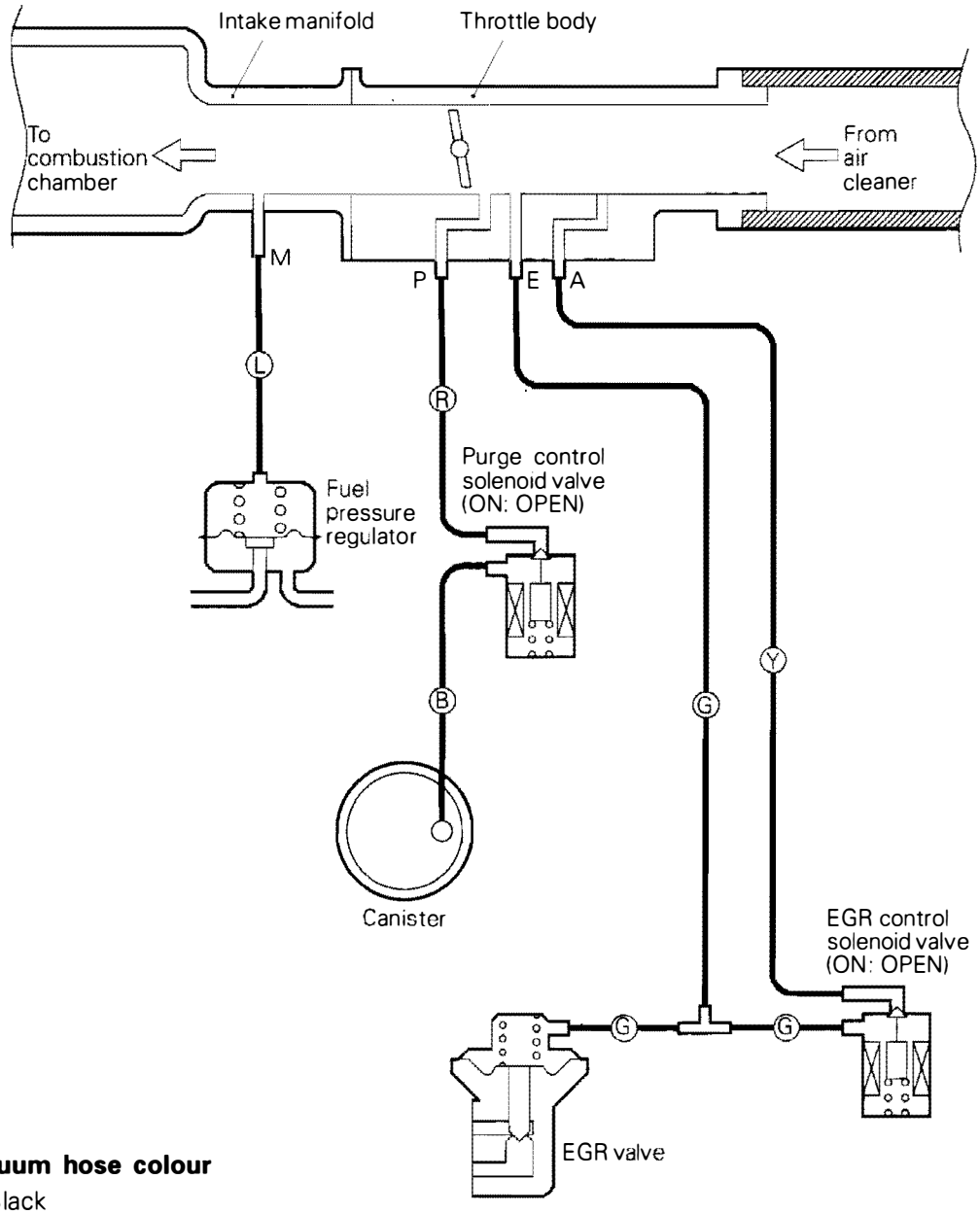


VACUUM CIRCUIT DIAGRAM

<4G93>



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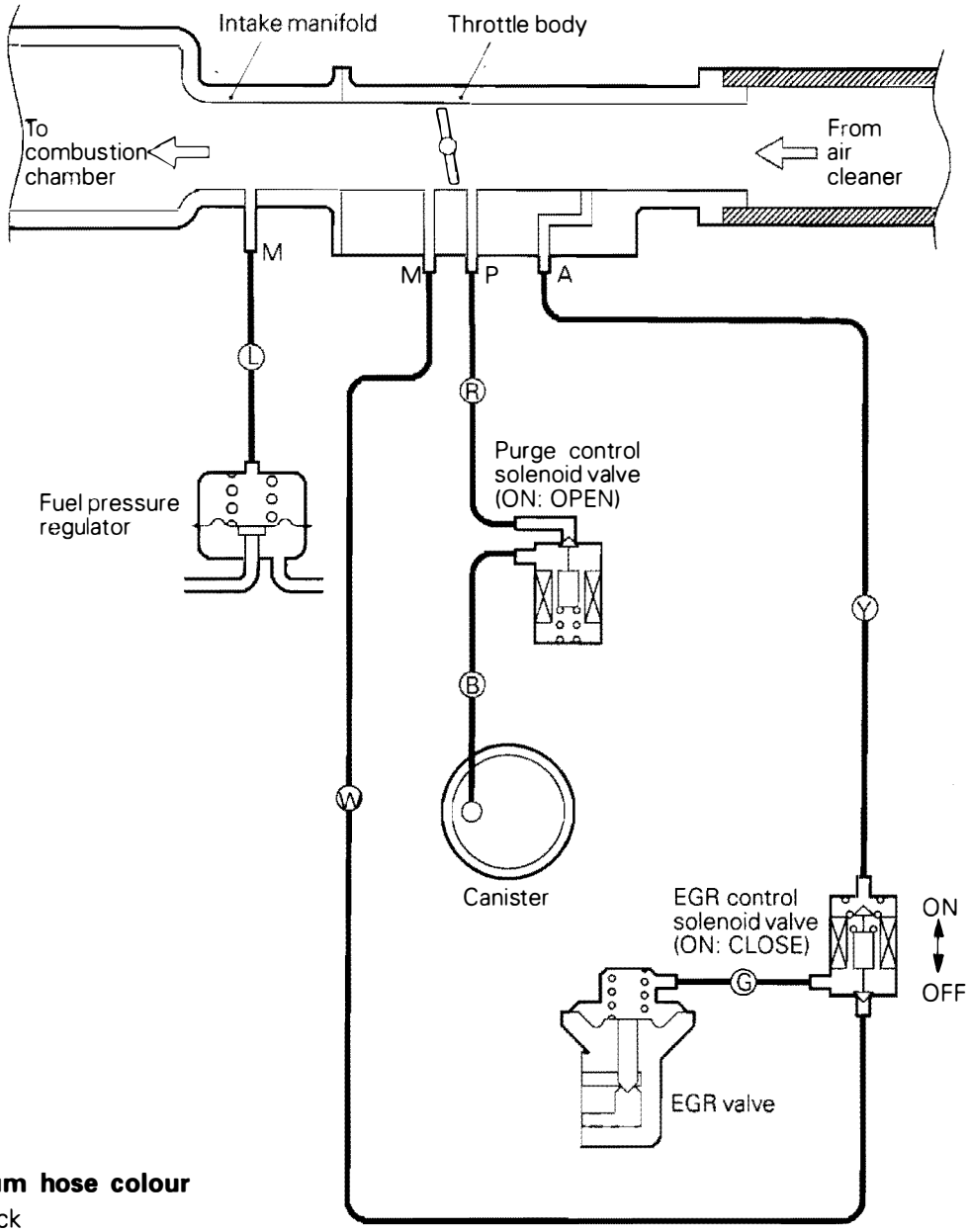
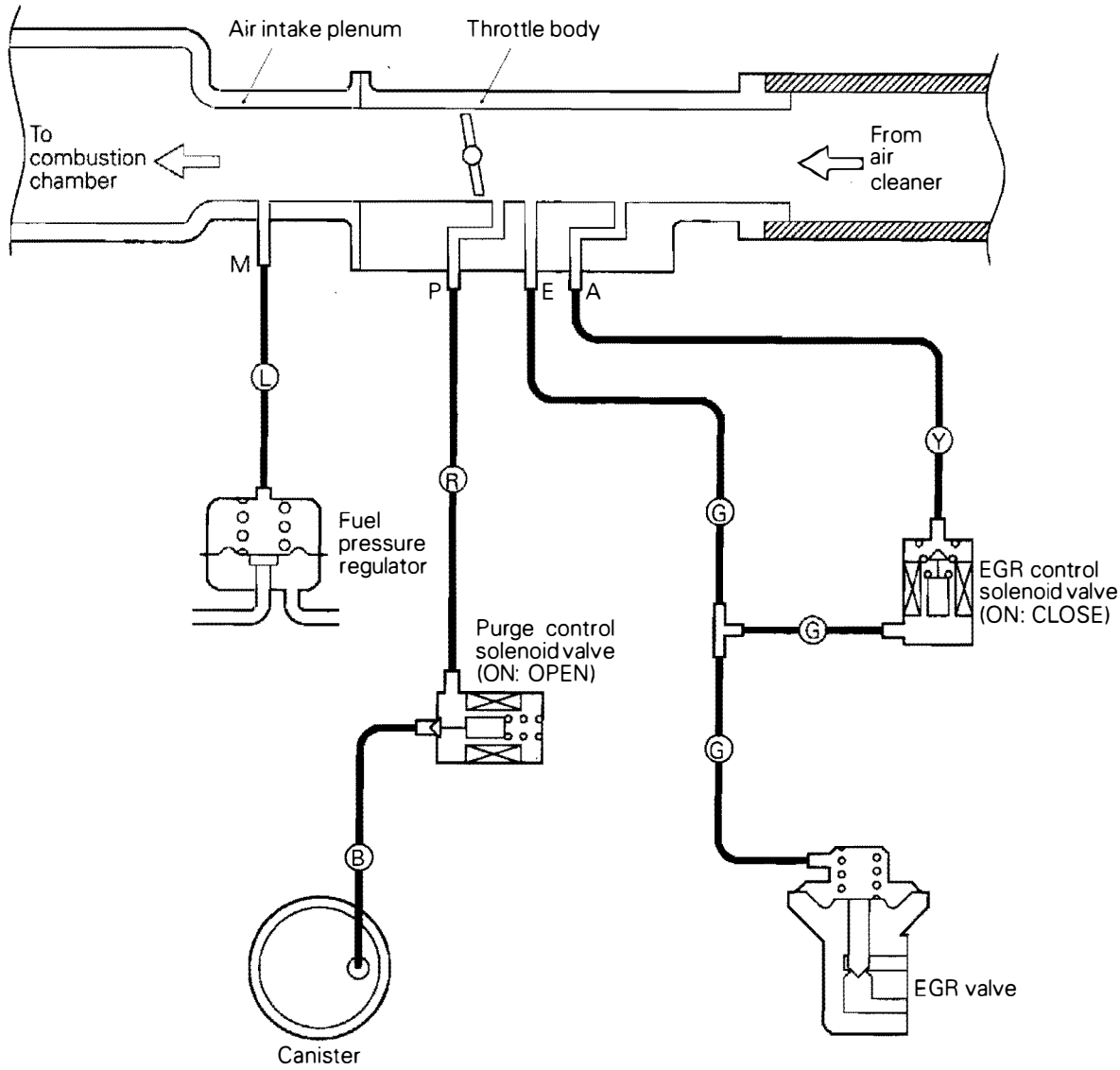


Vacuum hose colour

B: Black
G: Green
L: Light blue
R: Red
W: White
Y: Yellow

<6A12–Vehicles without TCL, 6G73>

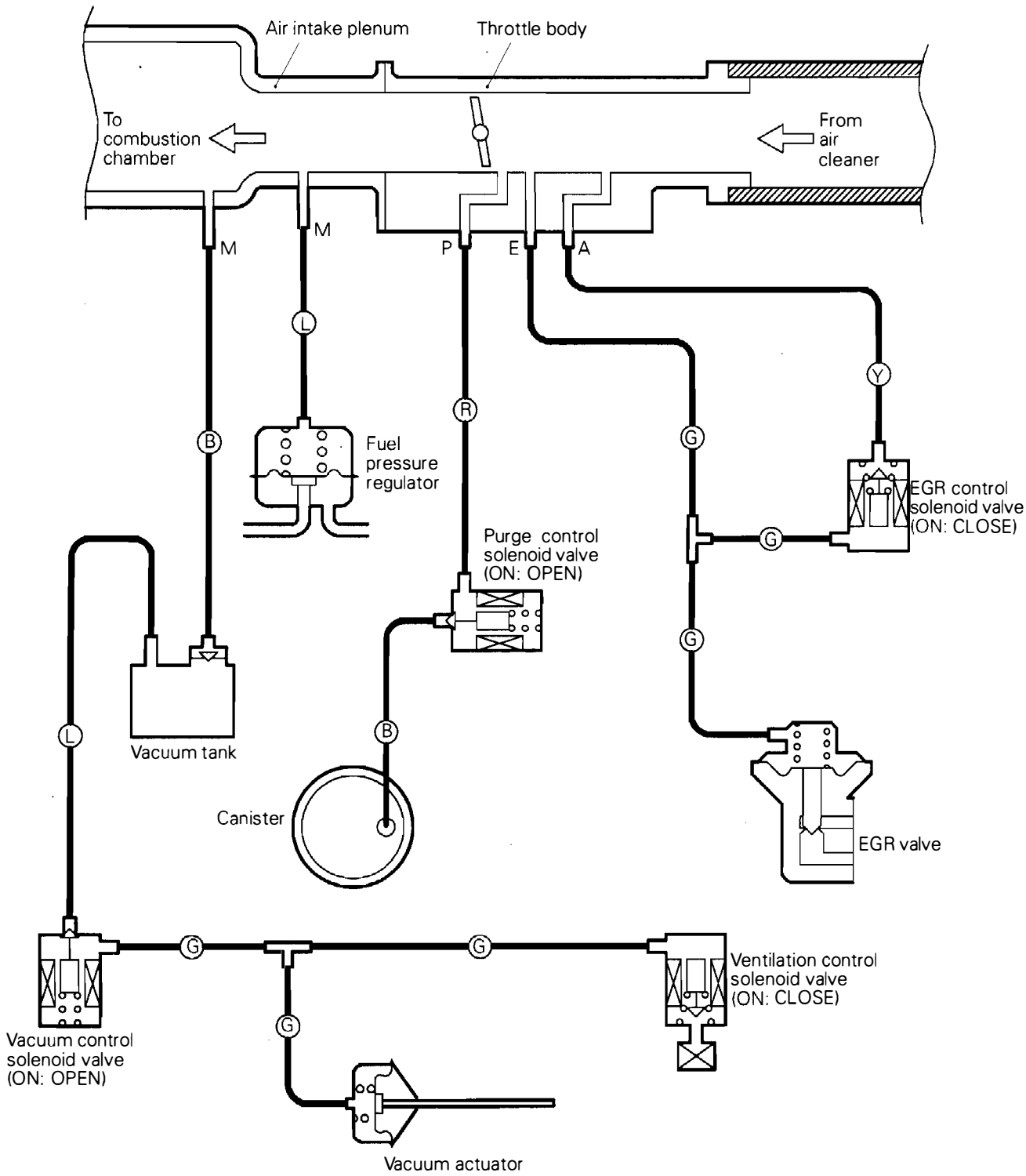


Vacuum hose colour

B:Black
G: Green
L: Light blue
R: Red
Y: Yellow

7EM0276

<6A12–Vehicles with TCL>



Vacuum hose colour

G: Green
Y: Yellow
L: Light blue
R: Red
B: Black

7EM0274

INSPECTION

1. Using the piping diagram as a guide, check to be sure that the vacuum hoses are correctly connected.
2. Check the connection condition of the vacuum hoses, (removed, loose, etc.) and check to be sure that there are no bends or damage.

INSTALLATION

1. When connecting the vacuum hoses, they should be securely inserted onto the nipples.
2. Connect the hoses correctly, using the vacuum hose piping diagram as a guide.

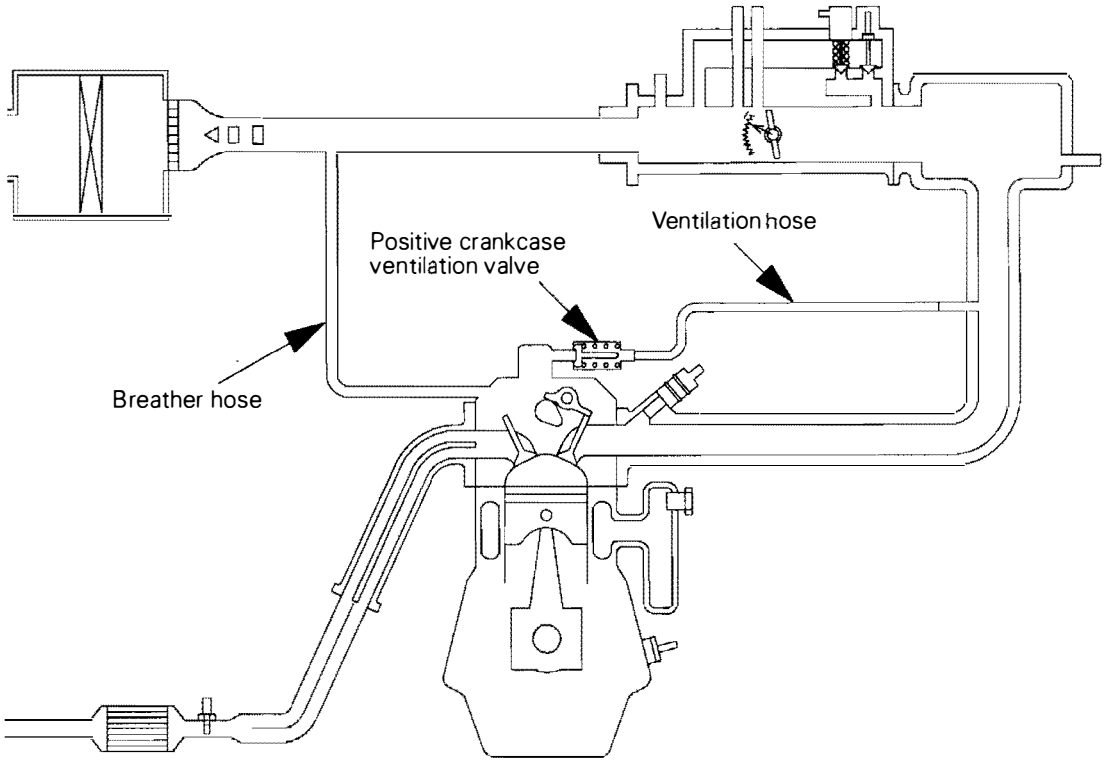
CRANKCASE EMISSION CONTROL SYSTEM

E17AF01AA

GENERAL INFORMATION

The crankcase emission control system is a system for preventing the escape of blow-by gases from inside the crankcase into the atmosphere.
Fresh air is sent from the air cleaner into the crankcase through the breather hose to be mixed with the blow-by gases inside the crankcase.
The blow-by gas inside the crankcase is drawn into the intake manifold through the positive crankcase ventilation valve.

The positive crankcase ventilation valve is designed to lift the plunger according to the intake manifold vacuum so as to regulate the flow of blow-by gas properly.
In other words, the blow-by gas flow is regulated during low load engine operation to maintain engine stability, while the flow is increased during high load operation to improve the ventilation performance.



NOTE
The illustration shows the system in the 4G93 engine.

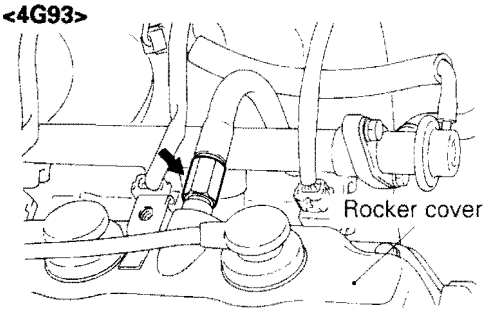
9EM0092

COMPONENT LOCATION

E17AF01BA

Positive crankcase ventilation valve

<4G93>



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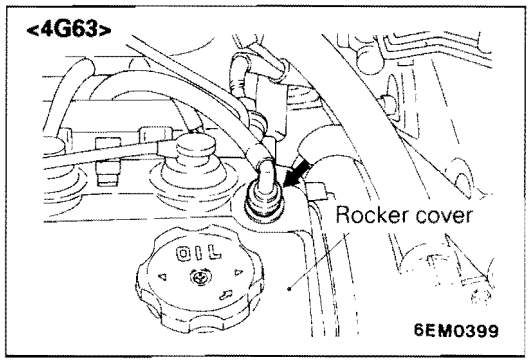

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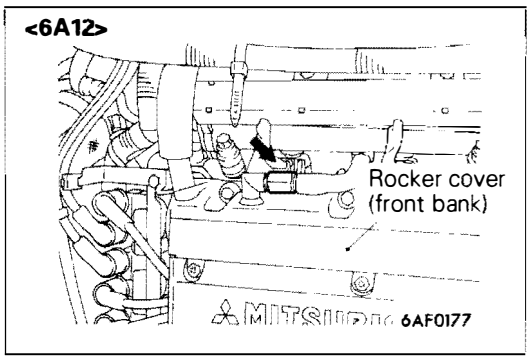

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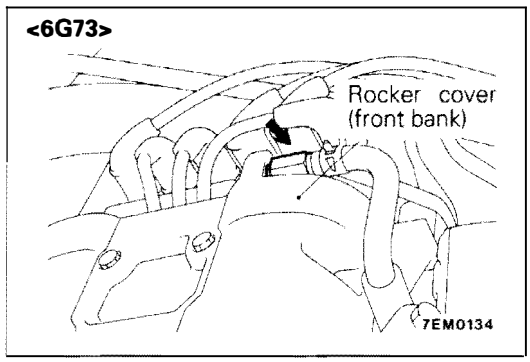


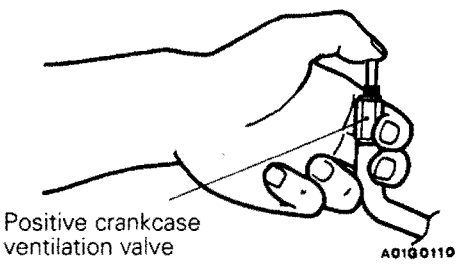
POSITIVE CRANKCASE VENTILATION SYSTEM

E17AF01CA

System Inspection

1. Remove the ventilation hose from the positive crankcase ventilation valve.
2. Remove the positive crankcase ventilation valve from the rocker cover.
3. Reinstall the positive crankcase ventilation valve at the ventilation hose.
4. Start the engine and run at idle.

<4G93, 6A12, 6G73>



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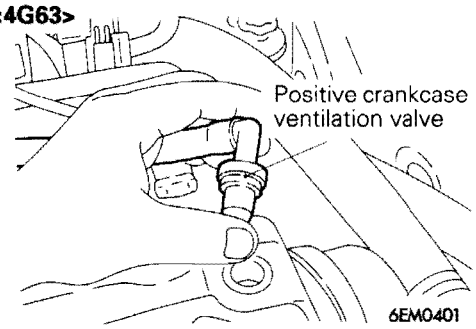
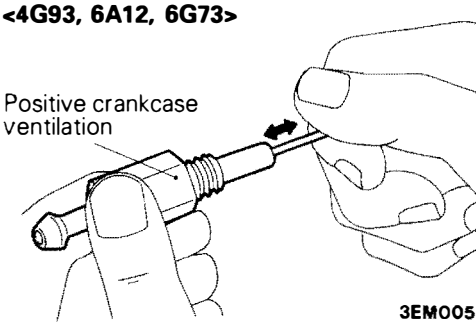


<4G93, 6A12, 6G73>



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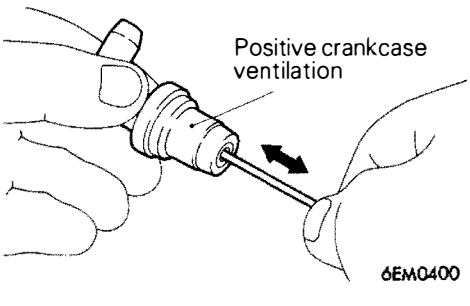


5. Place a finger at the opening of the positive crankcase ventilation valve and confirm that vacuum of the intake manifold is felt.

   NOTE
   At this moment, the plunger in the positive crankcase ventilation valve moves forward and backward.

6. If vacuum is not felt, clean the positive crankcase ventilation valve or replace it.

PCV Valve Inspection

1. Insert a thin rod into the positive crankcase ventilation valve from the side shown in the illustration (rocker cover installation side), and move the rod back and forth to confirm that the plunger moves.
2. If the plunger does not move, there is a clogging in the positive crankcase ventilation valve. In this case, clean or replace the valve.

Installation <4G93, 6A12, 6G73>

Install positive crankcase ventilation valve and tighten to specified torque.

Specified torque: 10 Nm

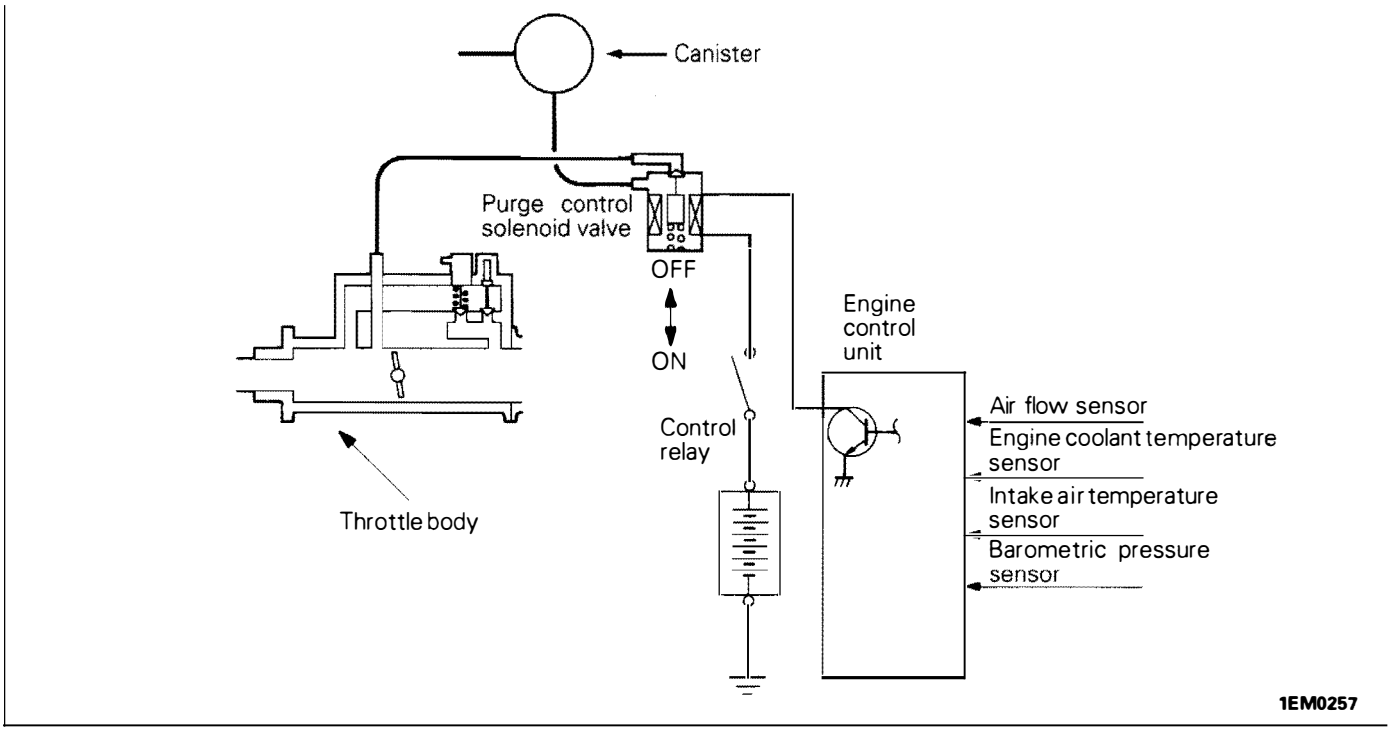
EVAPORATIVE EMISSION CONTROL SYSTEM

E17AF02AA

GENERAL INFORMATION

The evaporative emission control system prevents fuel vapors generated in the fuel tank from escaping into the atmosphere.
Fuel vapors from the fuel tank flow through the fuel tank pressure control valve and vapor pipe/hose to be stored temporarily in the canister.
When the vehicle is in operation, fuel vapors stored in the canister flow through the purge solenoid and purge port and go into the intake manifold to be sent to the combustion chamber.

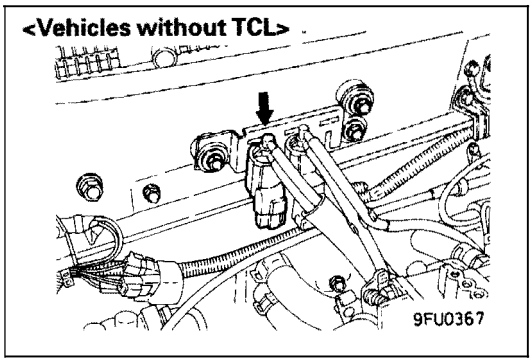
When the engine coolant temperature is low or when the intake air quantity is small (when the engine is at idle, for example), the engine control unit brings the purge solenoid into the OFF state to shut off the fuel vapor flow to the intake manifold. This does not only insure the driveability when the engine is cold or running under low load but also stabilize the emission level.

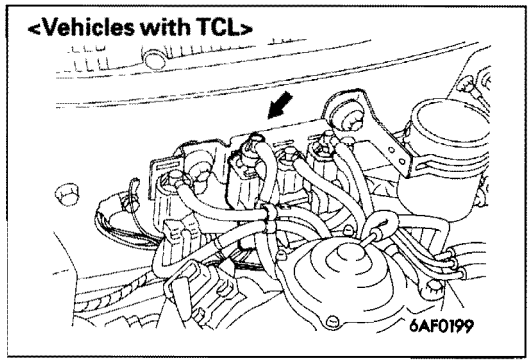


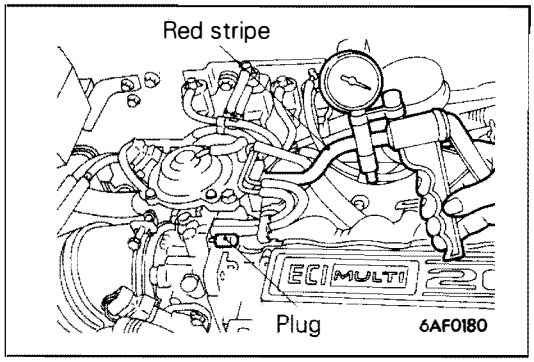
COMPONENT LOCATION

E17AF02BA

Purge control solenoid valve







PURGE CONTROL SYSTEM

E17AF02CA

System Inspection

1. Disconnect the vacuum hose (red stripes) from the throttle body and connect it to a hand vacuum pump.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold and hot, apply a vacuum while the engine is idling, and check the condition of the engine and the vacuum.

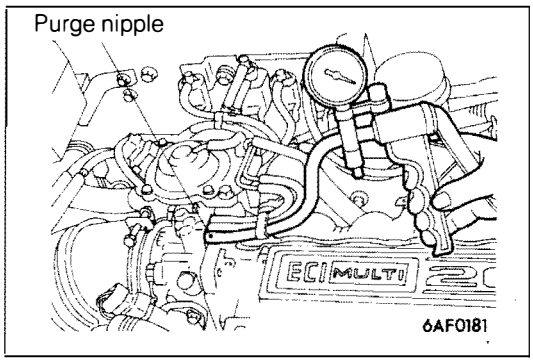
When engine is cold
(Engine coolant temperature: 40°C or less)

Vacuum	Engine status	Normal condition
53 kPa	3,000 r/min.	Vacuum is maintained

When engine is hot
(Engine coolant temperature: 80°C or higher)

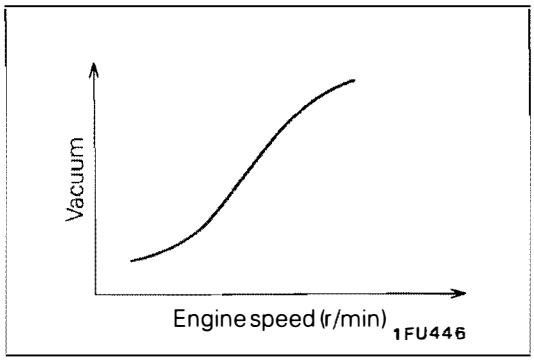
Vacuum	Engine status	Normal condition
53 kPa	Idling	Vacuum is maintained
	3,000 r/min.	Vacuum will leak for approximately 3 minutes after the engine is started.
		After 3 minutes have elapsed, the vacuum will be maintained momentarily, after which it will again leak.*

NOTE
* The vacuum will leak continuously if the atmospheric pressure is approximately 77 kPa or less, or the temperature of the intake air is approximately 50°C or higher.



Purge Port Vacuum Inspection

1. Disconnect the vacuum hose (red stripe) from the throttle body purge vacuum nipple and connect a hand vacuum pump to the nipple.



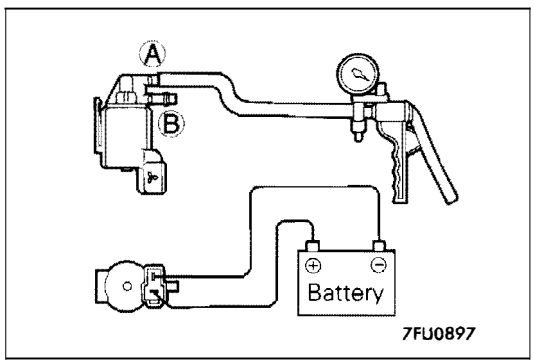
2. Start the engine and check to see that, after raising the engine speed by racing the engine, purge vacuum raises proportionately with the rise in engine speed.

   NOTE
   If there is a problem with the change in vacuum, it is possible that the throttle body purge port may be clogged and require cleaning.

Purge Control Solenoid Valve Inspection

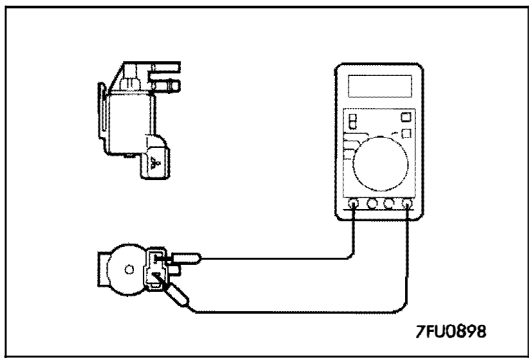
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

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



3. Connect a hand vacuum pump to nipple (A) of the solenoid valve (refer to the illustration at left).
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the purge control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained

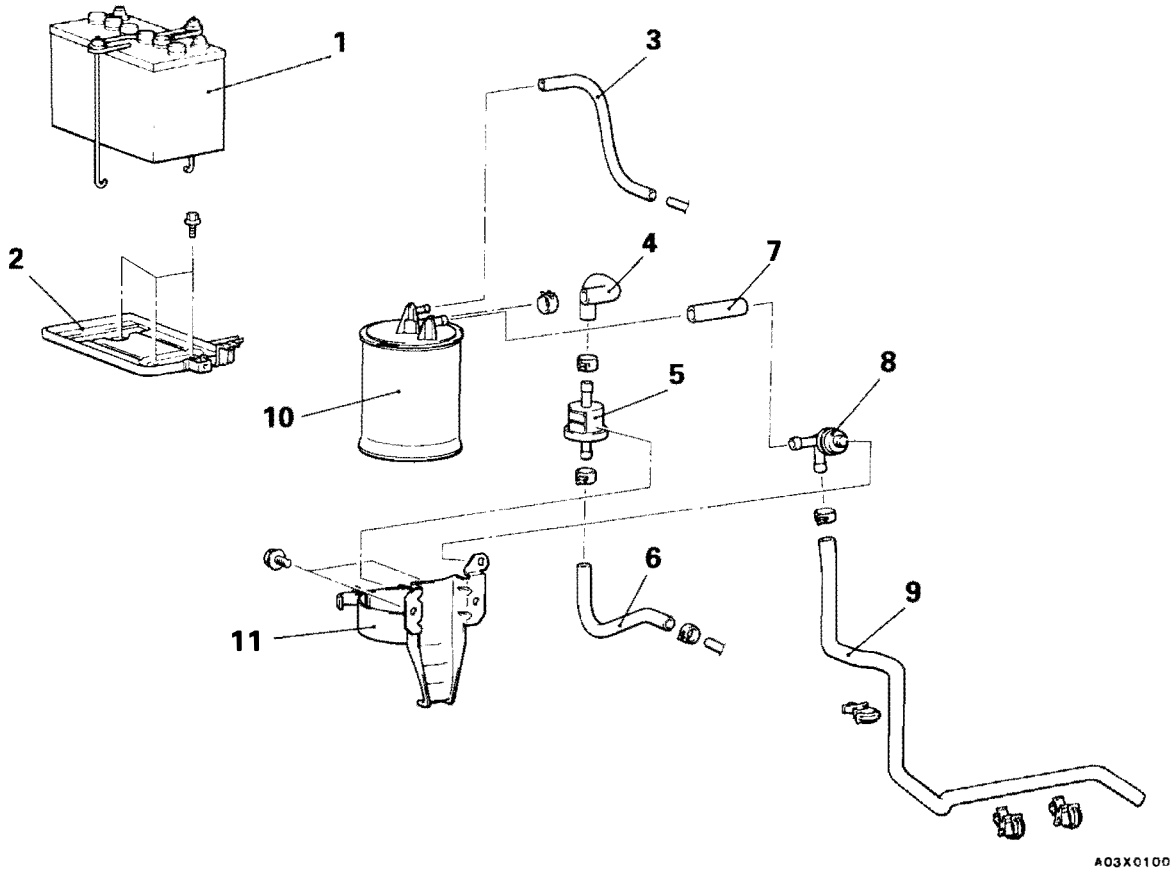


5. Measure the resistance between the terminals of the solenoid valve.

   Standard value: 36–44 Ω (at 20°C)

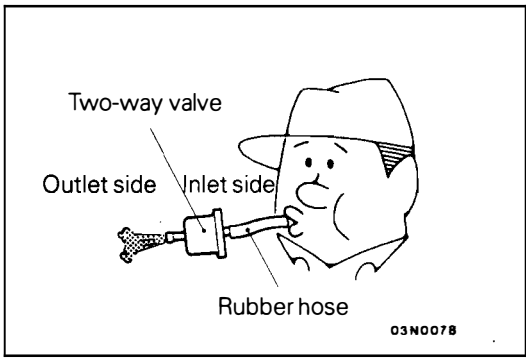
CANISTER/TWO-WAY VALVE
REMOVAL AND INSTALLATION

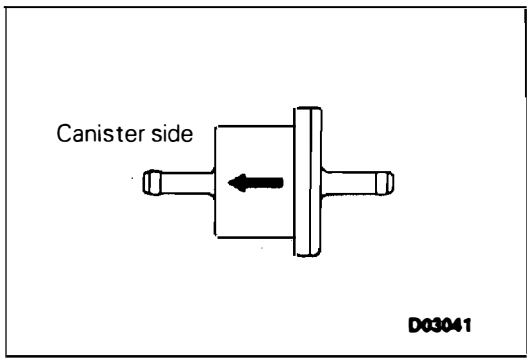
E17AF02DA



Removal steps

1. Battery
2. Battery tray
3. Vapor hose
4. Vapor hose
◆A◆ 5. Two-way valve
6. Vapor hose
7. Vapor hose
8. Breather valve
9. Vapor hose
10. Canister
11. Canister holder assembly





INSPECTION

E17AF02EA

TWO-WAY VALVE SIMPLE CHECK

Attach a clean hose and check the operation of the two-way valve.

Inspection procedure	Normal condition
Lightly blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance
Lightly blow from outlet side	Air passes through

INSTALLATION SERVICE POINT

E17AF02FA

◆A◆ TWO-WAY VALVE INSTALLATION

Install so that the installation direction of the two-way valve is correct.

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

E17AF03AA

GENERAL INFORMATION

The exhaust gas recirculation (EGR) system lowers the nitrogen oxide (NOx) emission level. When the air/fuel mixture combustion temperature is high, a large quantity of nitrogen oxides (NOx) is generated in the combustion chamber. Therefore, this system recirculates part of emission gas from the exhaust port of the cylinder head to the combustion chamber through the intake manifold to decrease the air/fuel mixture combustion temperature, resulting in reduction of NOx.
The EGR flow rate is controlled by the EGR valve so as not to decrease the driveability.

OPERATION

When the engine coolant temperature is low, when the engine is at idle or when a wide open throttle operation is performed, the EGR valve is kept closed, achieving no EGR.

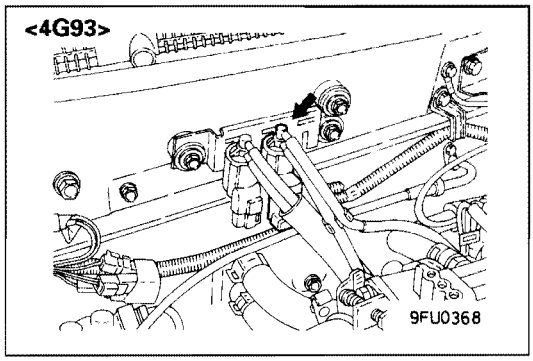
In normal vehicle operation performed after warming up of the engine, the EGR valve is opened to carry out EGR.

COMPONENT LOCATION

E17AF03BA

EGR control solenoid valve

<4G93>



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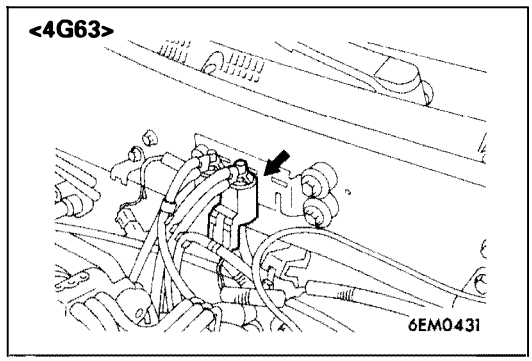
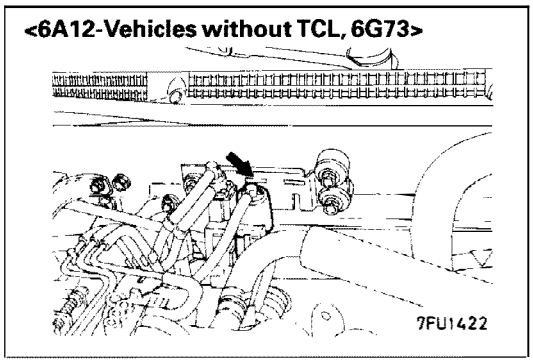


<6A12-Vehicles without TCL, 6G73>



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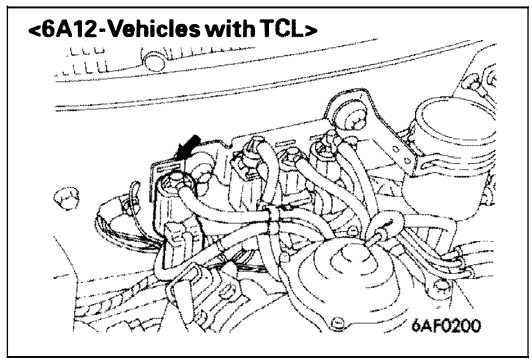
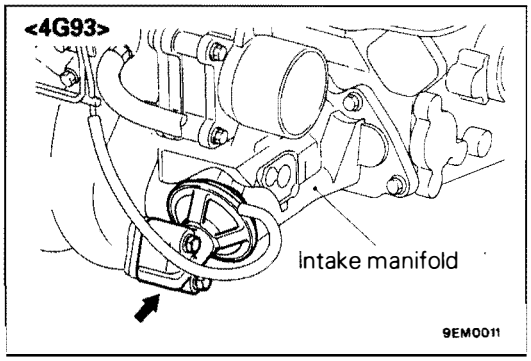


EGR valve

<4G93>



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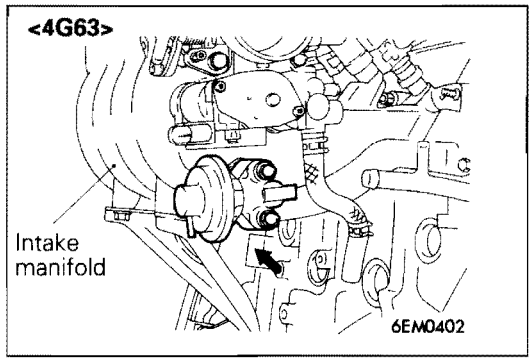
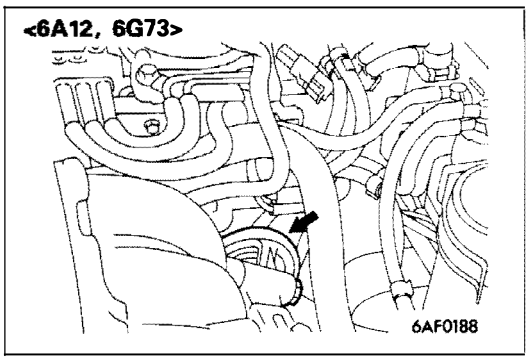


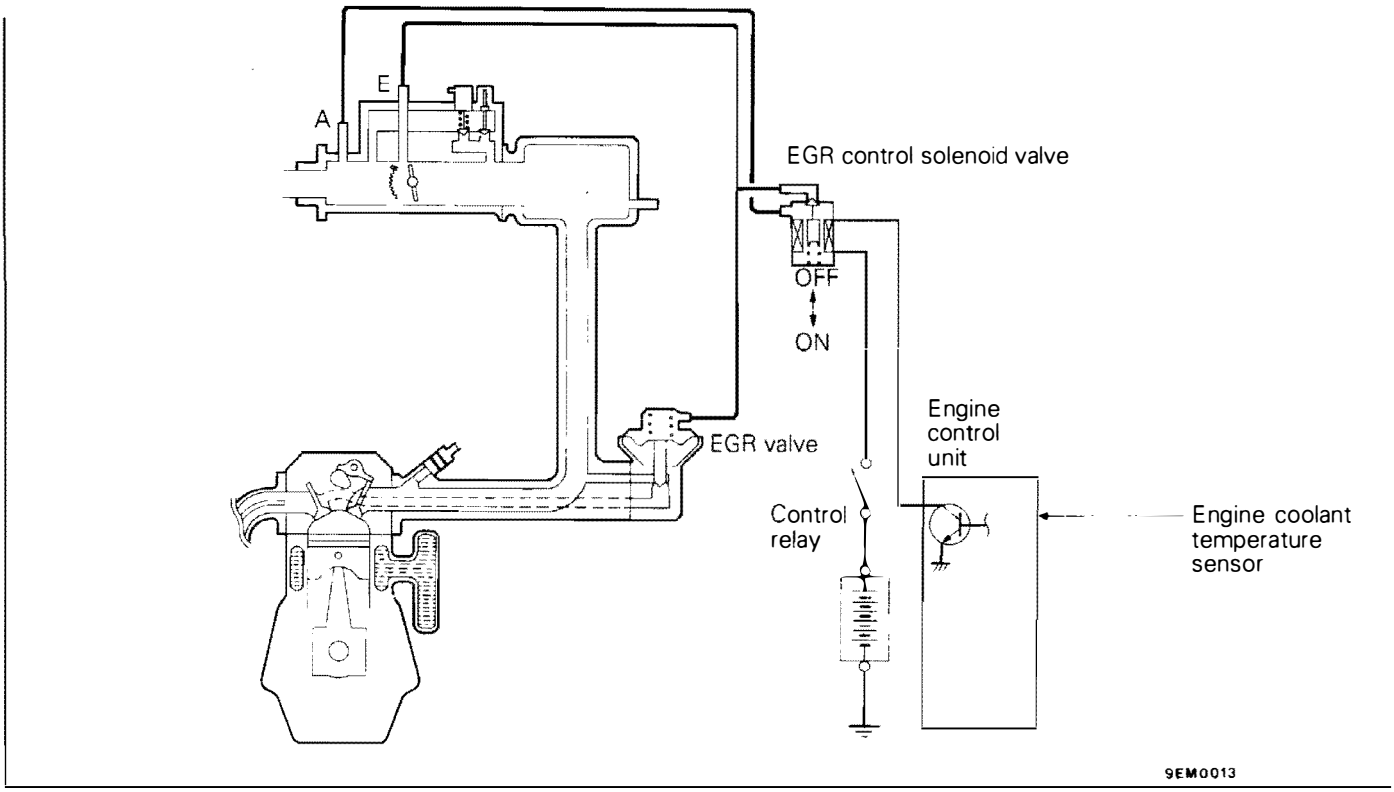
<6A12, 6G73>



EXHAUST GAS RECIRCULATION (EGR) CONTROL SYSTEM E17AF03CA

SYSTEM INSPECTION <4G93, 6A12, 6G73>

<4G93>



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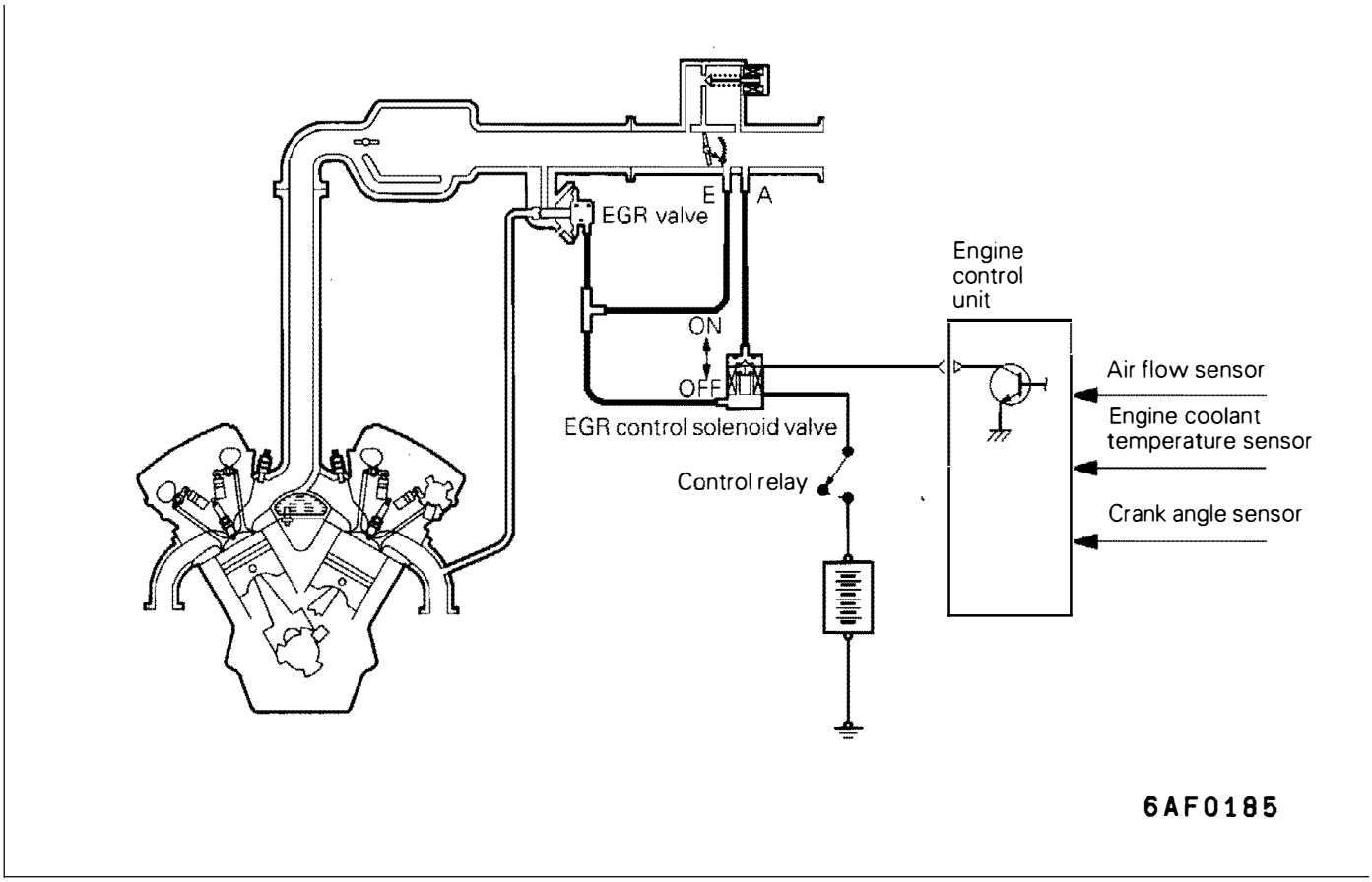
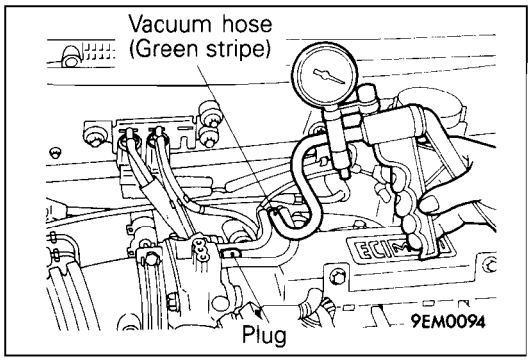




1. Disconnect the vacuum hose (green stripe) from the throttle body, and connect a hand vacuum pump to the vacuum hose.
2. Plug the nipple from which the vacuum hose was removed.
3. When the engine is cold and hot, apply a vacuum while the engine is idling, and check the condition of the engine and the vacuum.

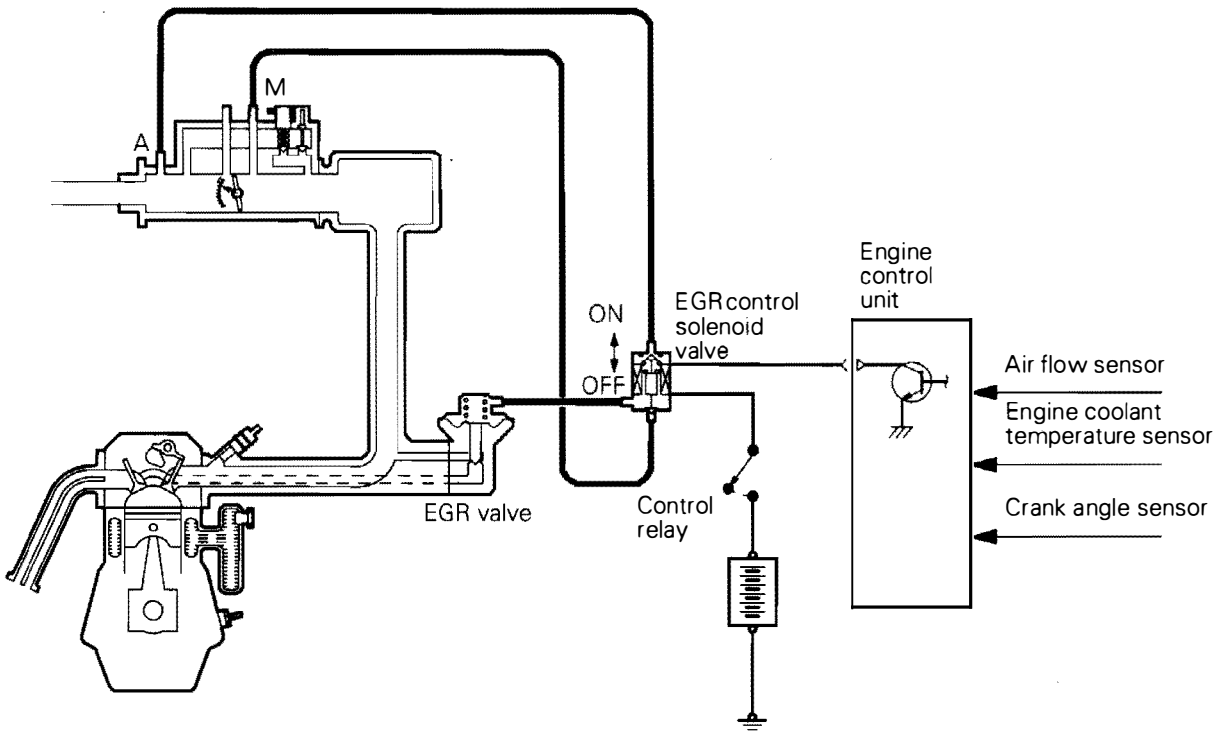
When engine is cold
(Engine coolant temperature: 40°C or less)

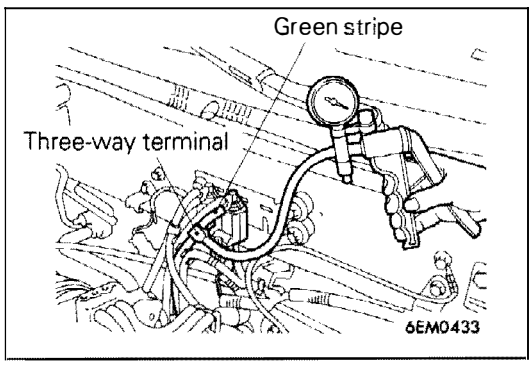
Hand vacuum pump	Normal condition	
	Engine	Vacuum
Vacuum is applied	No change	Vacuum leaks

When engine is hot
(Engine coolant temperature: 80°C or higher)

Hand vacuum pump	Normal condition	
	Engine	Vacuum
5.3 kPa of vacuum is applied	No change	Vacuum is maintained
26 kPa of vacuum is applied	Engine stalls or the idling becomes unstable	

SYSTEM INSPECTION <4G63>

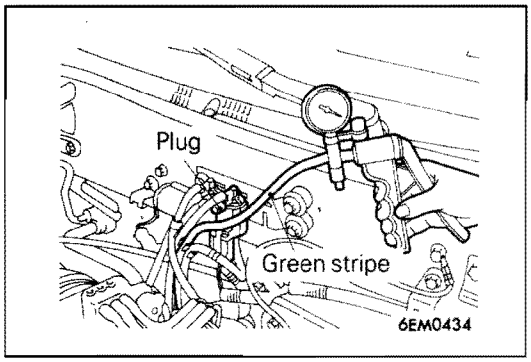




1. Disconnect the vacuum hose (green stripe) from the EGR control solenoid valve, and then connect a hand vacuum pump via the three-way terminal.
2. Regarding the engine in cold and hot conditions, check the condition of vacuum when a rapid racing has been performed by opening the throttle valve quickly.

When engine is cold
(Engine coolant temperature: 20°C or less)

Throttle valve	Normal vacuum condition
Open quickly	No vacuum will generate (remained as barometric pressure).



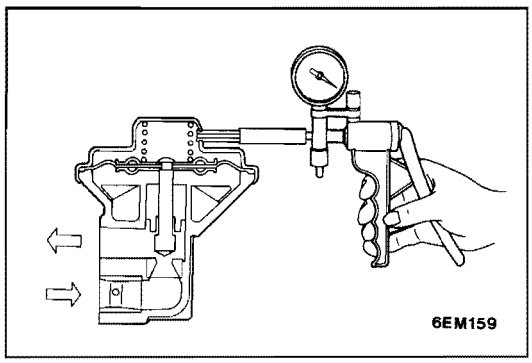
When engine is hot
(Engine coolant temperature: 80°C or higher)

Throttle valve	Normal vacuum condition
Open quickly	It will momentarily rise over 13 kPa

3. Disconnect the three-way terminal.
4. Connect the hand vacuum pump to the vacuum hose (green stripe).
5. Check whether the engine stalls or the idling is unstable when a vacuum of 30 kPa or higher is applied during idling.

EGR Valve Inspection

1. Remove the EGR valve and inspect for sticking, carbon deposits, etc. If found, clean with a suitable solvent so that the valve seats correctly.



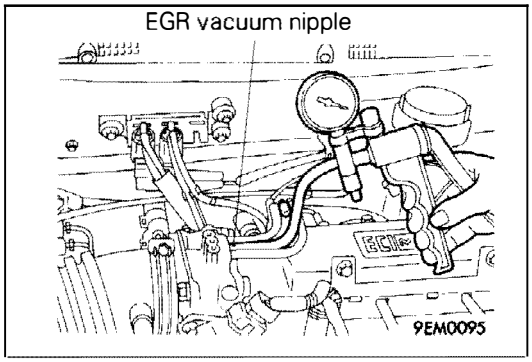
2. Connect a hand vacuum pump to the EGR valve.
3. Apply 67 kPa of vacuum, and check to be sure that the vacuum is maintained.
4. Apply a vacuum and check the passage of air by blowing through one side of the EGR passage.

Vacuum	Passage of air
5.3 kPa or less	Air is not blown out
26 kPa or more	Air is blown out

Installation

Use a new gasket, and tighten to the specified torque.

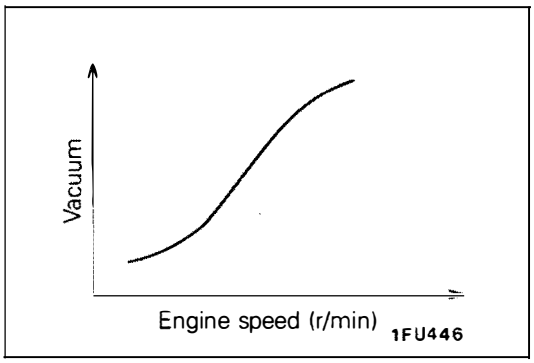
Specified torque: 22 Nm



EGR Port Vacuum Inspection

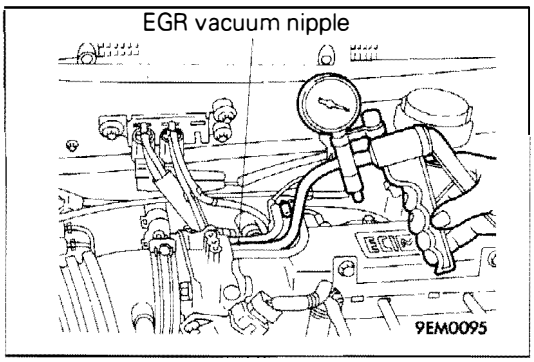
<4G93, 6A12, 6G73>

1. Disconnect the vacuum hose (green stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.



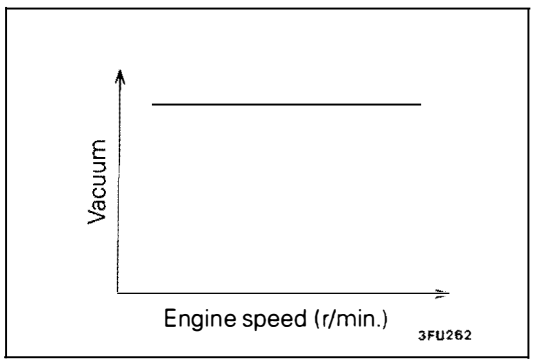
2. Start the engine and check to see that, after raising the engine speed by racing the engine, EGR vacuum raises proportionately with the rise in engine speed.

NOTE
If there is a problem with the change in vacuum, it is possible that the throttle body EGR port may be clogged and require cleaning.



<4G63>

1. Disconnect the vacuum hose (white stripe) from the throttle body EGR vacuum nipple and connect a hand vacuum pump to the nipple.



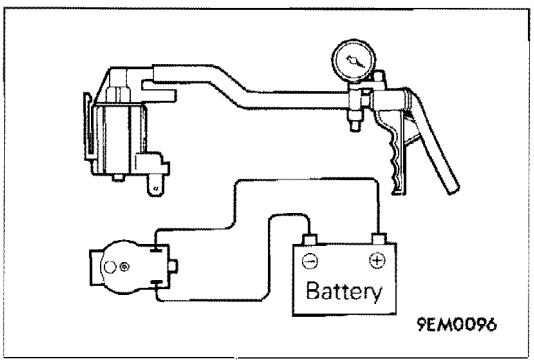
2. Start the engine and check to see that, after raising the engine speed by racing the engine, vacuum remains fairly constant.

EGR Control Solenoid Valve Inspection

<4G93>

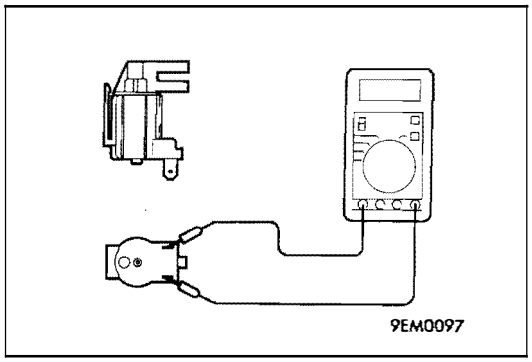
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

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



3. Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Applied	Vacuum leaks
Not applied	Vacuum maintained



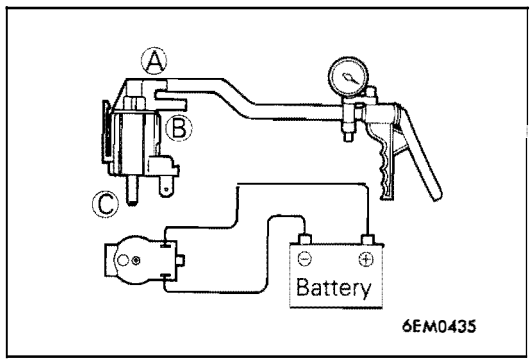
5. Measure the resistance between the terminals of the solenoid valve.

Standard value: 36–44Ω (at 20°C)

<4G63>

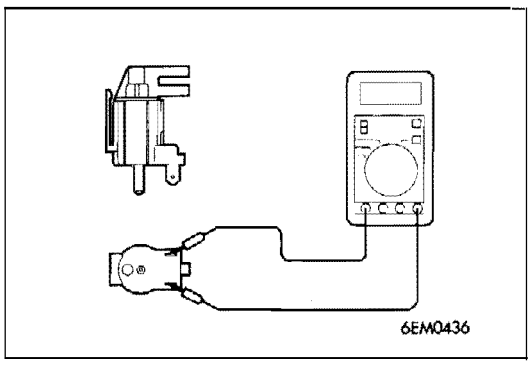
NOTE
When disconnecting the vacuum hose, always make a mark so that it can be reconnected at original position.

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



3. Connect a hand vacuum pump to the nipple to which the white-striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

Battery voltage	B Nipple condition	Normal condition
Not applied	Open	Vacuum maintained
Applied	Open	Vacuum leaks
	Closed	Vacuum maintained



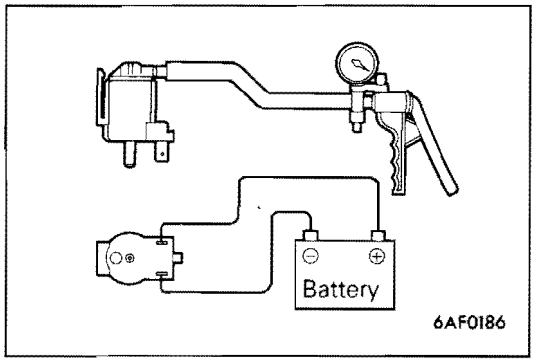
5. Measure the resistance between the terminals of the solenoid valve.

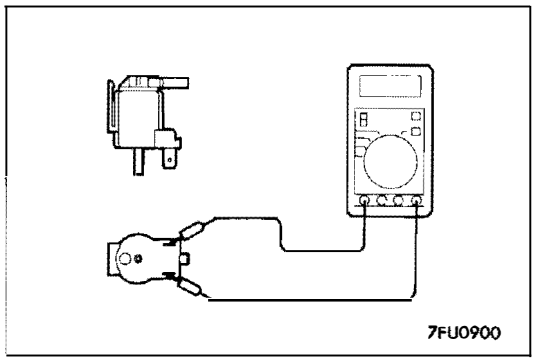
Standard value: 36–44Ω (at 20°C)

<6A12, 6G73>

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

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





3. Connect a hand vacuum pump to the nipple to which the green-striped vacuum hose was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the EGR control solenoid valve and without applying voltage.

Battery voltage	Normal condition
Not applied	Vacuum leaks
Applied	Vacuum maintained

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

Standard value: 36–44Ω (at 20°C)

CATALYTIC CONVERTER

E17AF04AA

GENERAL INFORMATION

The three-way catalytic converter, together with the closed loop air-fuel ratio control based on the oxygen sensor signal, oxidizes carbon monoxides (CO) and hydrocarbons (HC) and reduces nitrogen oxides (NOx).

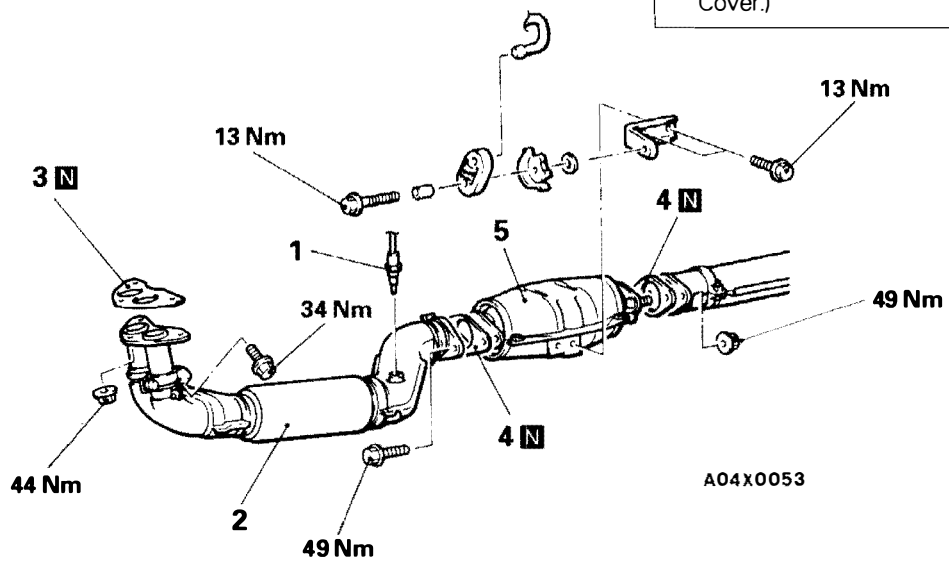
When the mixture is controlled at stoichiometric air-fuel ratio, the three-way catalytic converter provides the highest purification against the three constituents, namely, CO, HC and NOx.

REMOVAL AND INSTALLATION

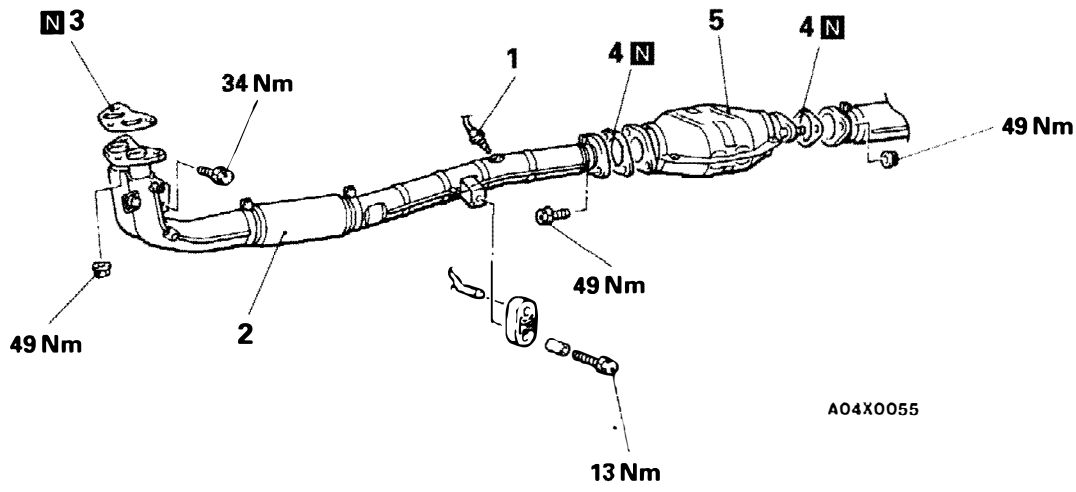
E17AF04BA

<4G93, 4G63-2WD>

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



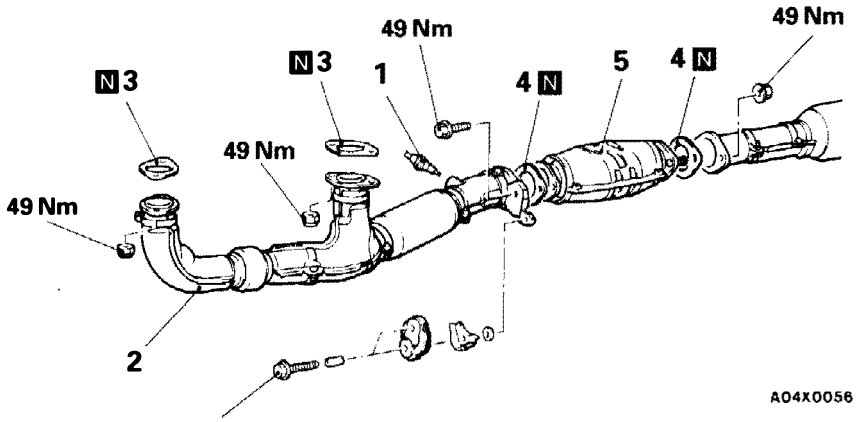
<4G63-4WD>



Removal steps
1. Oxygen sensor
2. Front exhaust pipe
3. Gasket
4. Gasket
5. Catalytic converter

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)

<6A12>



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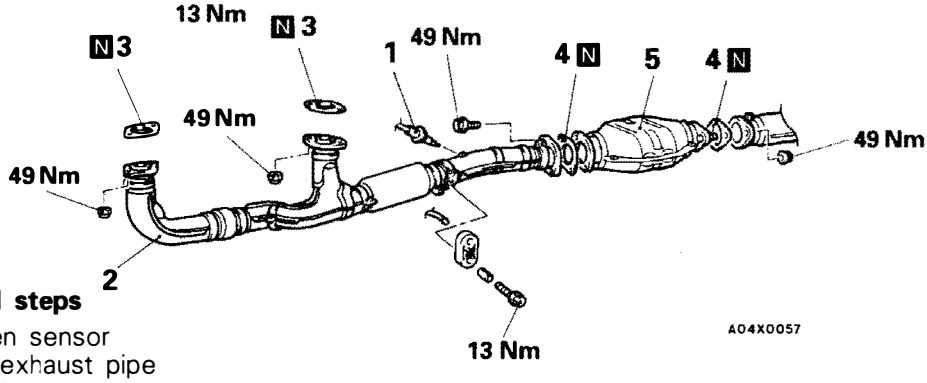


Removal steps
1. Oxygen sensor
2. Front exhaust pipe
3. Gasket
4. Gasket
5. Catalytic converter

INSPECTION E17AF04CA

Inspect for damage, cracking or deterioration. Replace if faulty.

Caution

1. **Operation of any type, including idling, should be avoided if engine misfiring occurs. Under this condition the exhaust system will operate at abnormally high temperature, which may cause damage to the catalyst or under body parts of the vehicle.**
2. **Alteration or deterioration of 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 tune up according to manufacturer's specifications should be made to correct the conditions as soon as possible.**

EMISSION CONTROL <DIESEL>

E17BB00AA

GENERAL INFORMATION

The electronically-controlled EGR system and the fuel injection timing control system (load timer) reduce the level of exhaust gases (NOx). In addition, some models are equipped with a catalytic converter (oxidation catalyst).

Items	Name	Specification
Exhaust emission control system	Exhaust gas recirculation system	
	EGR valve	Single type
	EGR solenoid valve No. 1	Duty cycle solenoid valve
	EGR solenoid valve No. 2	ON-OFF solenoid valve

SERVICE SPECIFICATIONS

E17BC00AA

Item			Standard value
EGR solenoid valve No.1/No. 2 resistance (at 20°C)			36–44
Lever position sensor output voltage	V	Idle position	0.28–0.48
		Fully open	3.2–4.2
Engine speed sensor resistance	kΩ		1.2–1.7
Engine coolant temperature sensor resistance	kΩ	At 20°C	3.3
		At 80°C	0.3

SPECIAL TOOL

E17BD00AA

Tool	Number	Name	Use
	MD998478	Test harness (3P, square)	Inspection of lever position sensor

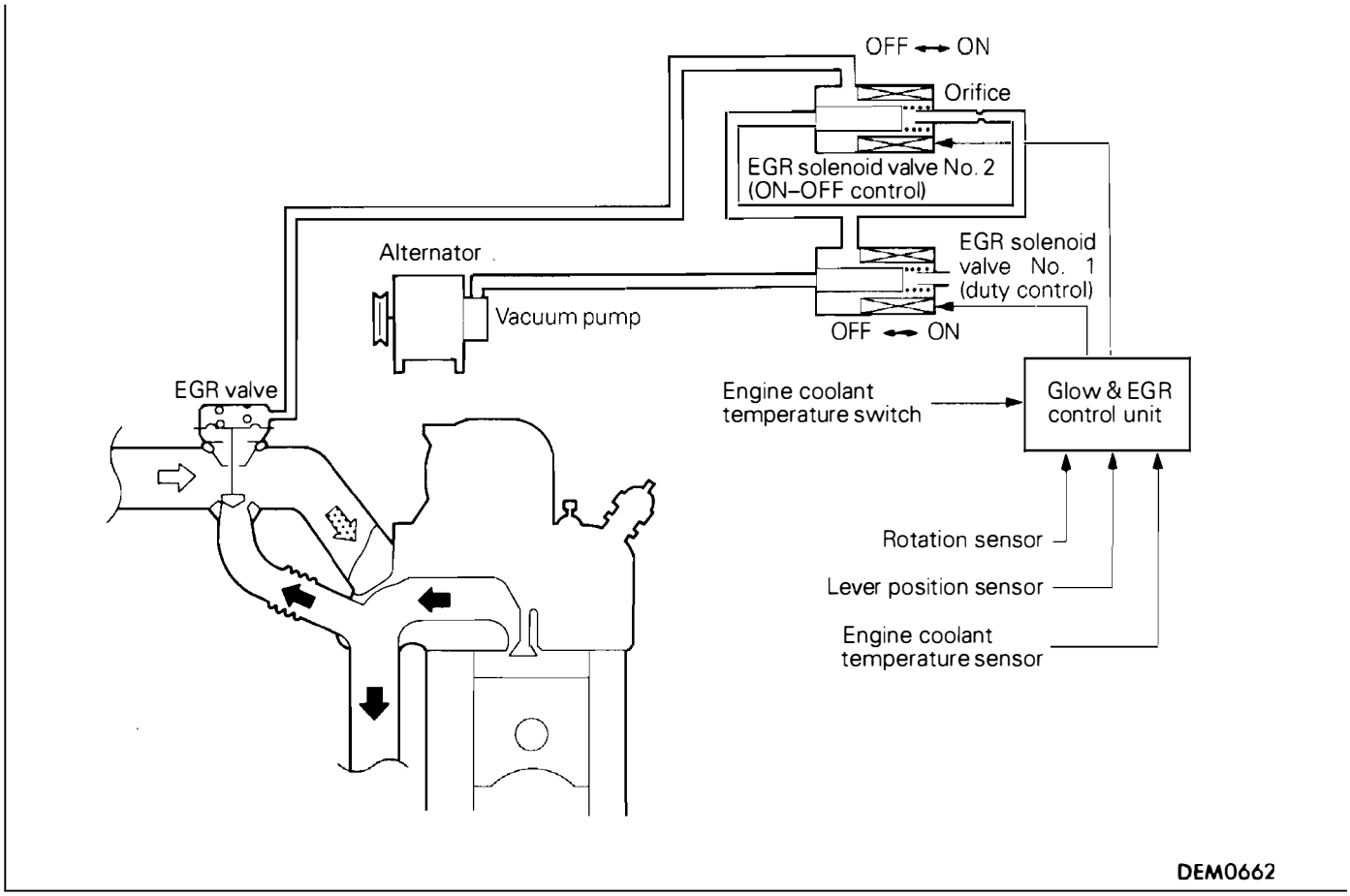
EXHAUST GAS RECIRCULATION (EGR) SYSTEM

E17BF00AA

GENERAL INFORMATION

The electronically-controlled EGR system consists of an EGR valve, vacuum pump, EGR solenoid valves No. 1 and No. 2, glow & EGR control unit and various sensors.
The EGR valve is controlled by the negative pressure inside the valve, which is controlled by EGR solenoid valves No. 1 and No. 2.

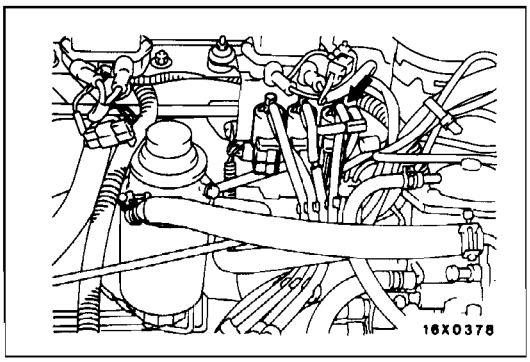
The EGR solenoid valves No. 1 and No. 2 are optimally controlled by the glow & EGR control unit in response to the engine operation conditions, based on data input from each of the sensors.
In this way, the EGR is controlled to reduce NOx emissions while maintaining good engine performance.



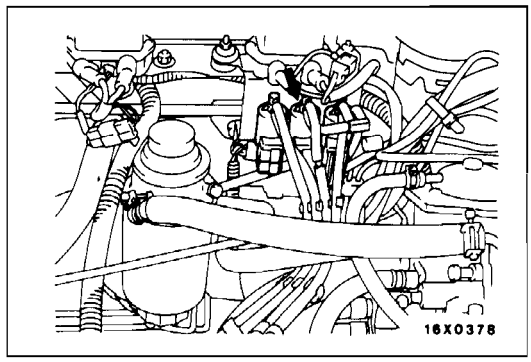
COMPONENT LOCATION

E17BF00BA

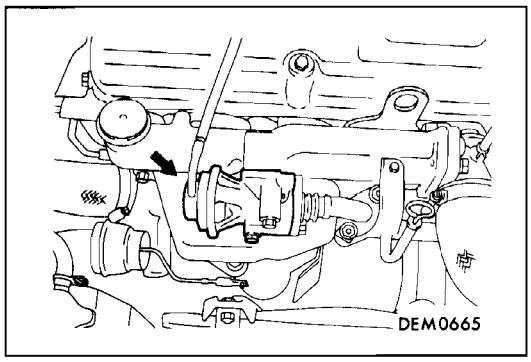
EGR solenoid valve No. 1



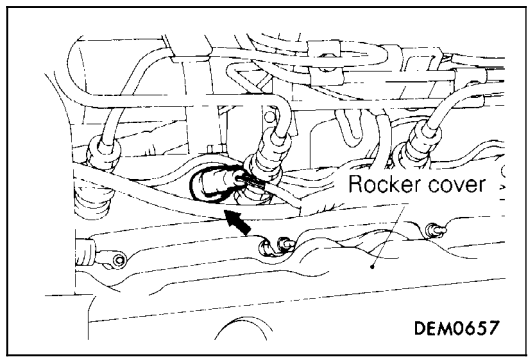
EGR solenoid valve No. 2



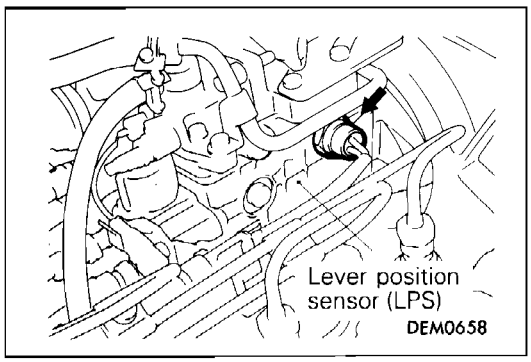
EGR valve



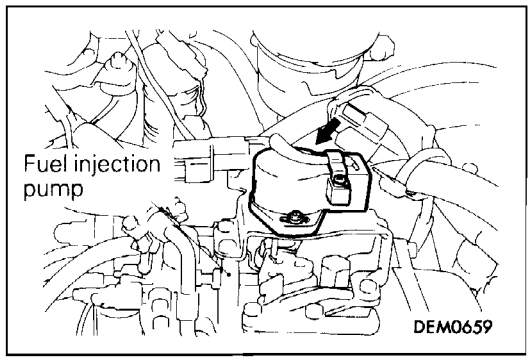
Engine coolant temperature sensor

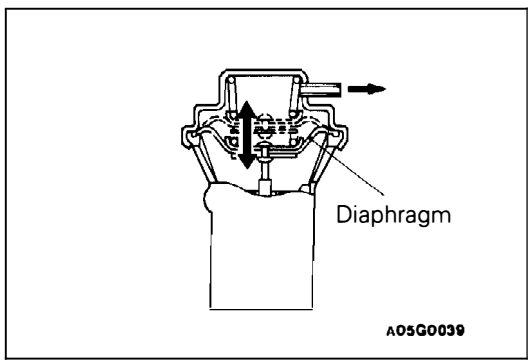


Engine speed sensor



Lever position sensor (LPS)





FUNCTION INSPECTION

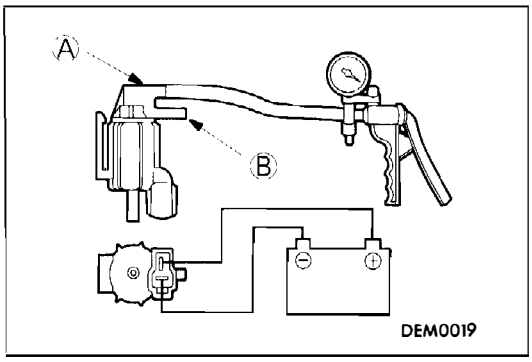
E17BF00CA

1. Start the engine and let it warm up until the engine coolant temperature is 80°C or above.
2. When the engine is raced by suddenly depressing the accelerator pedal, check to be sure that the diaphragm of the EGR valve lifts.

EGR SOLENOID VALVE NO. 1/NO. 2 OPERATION INSPECTION

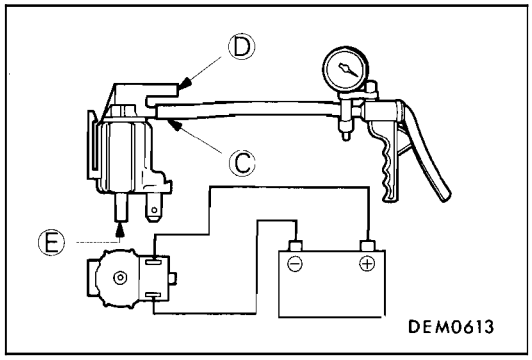
E17BF00DA

1. Remove the EGR solenoid valve No. 1/No. 2 connectors and vacuum hoses.
2. Attach a vacuum pump to each nipple of the EGR solenoid valve No. 1/No. 2 and apply negative pressure. Check that the valves are airtight both when voltage is applied to each terminal of the EGR solenoid valves and when it is not applied.



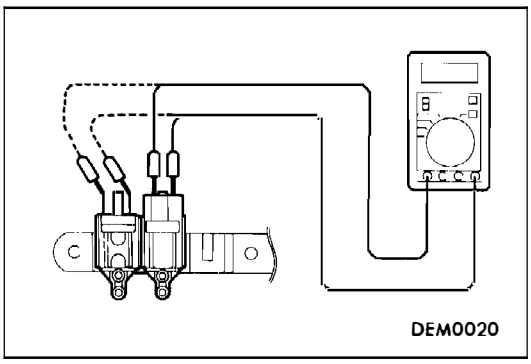
EGR solenoid valve No. 1

Battery voltage	Normal condition
When current is flowing	Vacuum leaks (Vacuum is maintained when nipple B is covered)
When current is not flowing	Vacuum is maintained



EGR solenoid valve No. 2

Battery voltage	Normal condition
When current is flowing	Vacuum leaks (Vacuum is maintained when nipple D is covered)
When current is not flowing	Vacuum leaks (Vacuum is maintained when nipple E is covered)

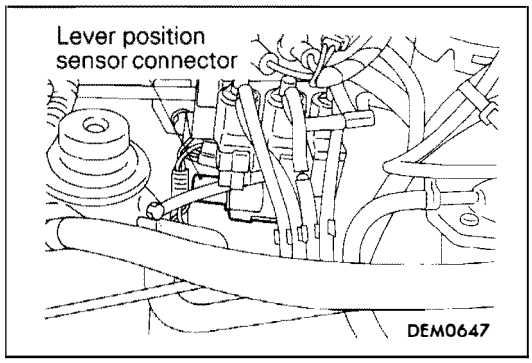


EGR SOLENOID VALVE NO. 1/NO. 2 RESISTANCE INSPECTION

E17BF00EA

Measure the coil resistances of the EGR solenoid valve No. 1/No. 2 with a circuit tester.

	Solenoid valve No. 1/No. 2 resistance Ω
Standard value (at 20°C)	36–44



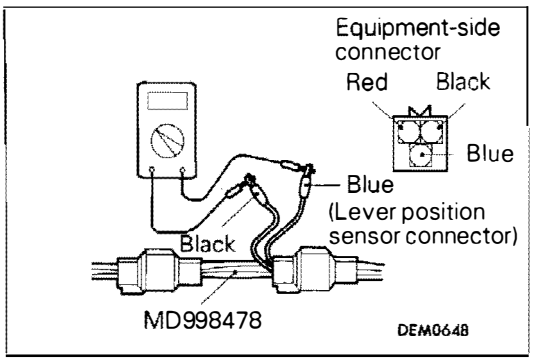
LEVER POSITION SENSOR (LPS)ADJUSTMENT

E17BF00FA

[Condition before adjustment]

- Engine coolant temperature 80–95°C

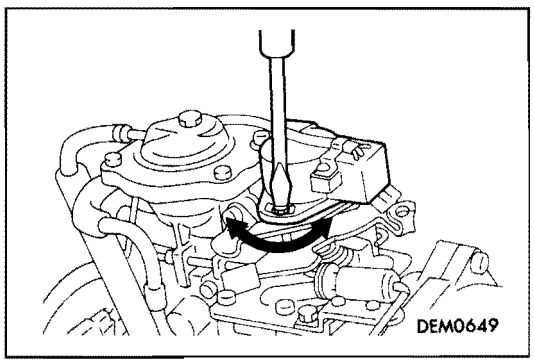
1. Loosen the accelerator cable tension sufficiently.
2. Connect the special tool (test harness) to the lever position sensor connector shown in the illustration.



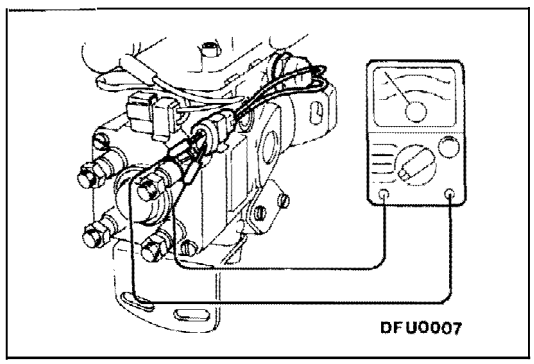
3. Connect a digital-type voltmeter between terminal 1 (red clip) and terminal 3 (blue clip) of the LPS.
4. Turn the ignition switch to ON. (Do not start the engine.)
5. Measure the output voltage of the lever position sensor.

Standard value:

Lever condition	Voltage V
Idle position	0.28–0.48
Fully open	3.2–4.2



6. If the voltage is outside the standard value, adjust by loosening the LPS mounting screw and turning the LPS body. After adjustment, securely tighten the screw.
7. Turn the ignition switch to OFF.
8. Adjust the accelerator cable play.

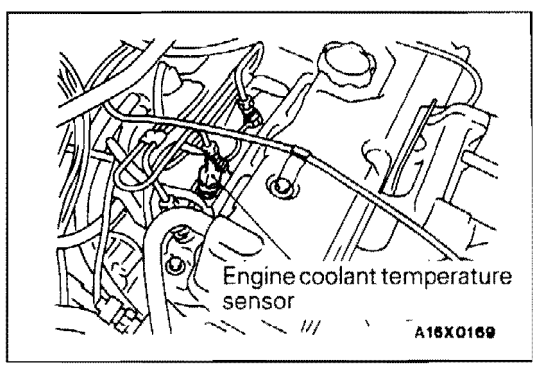


ENGINE SPEED SENSOR INSPECTION

E17BF00GA

1. Disconnect the engine speed sensor connector.
2. Measure the resistance between the engine speed sensor terminals.

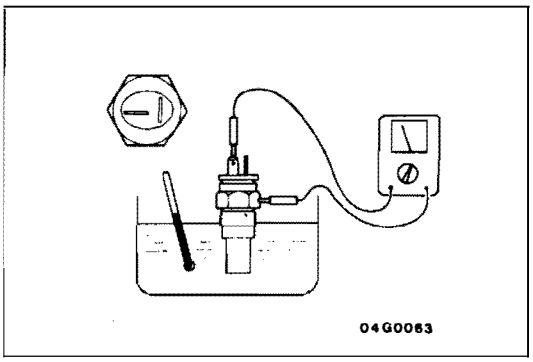
Standard value: 1.2–1.7 kΩ



ENGINE COOLANT TEMPERATURE SENSOR INSPECTION

E17BF00HA

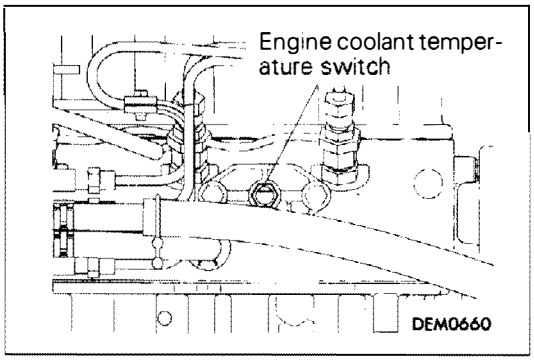
1. Remove the engine coolant temperature sensor.



2. Dip the sensing section of the engine coolant temperature sensor, and measure the resistance.

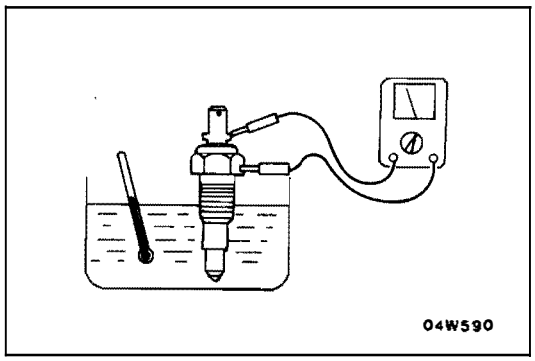
Standard value:

Temperature °C	Resistance value kΩ
0	8.6
20	3.3
40	1.5
80	0.3



ENGINE COOLANT TEMPERATURE SWITCH INSPECTION E17BF00IA

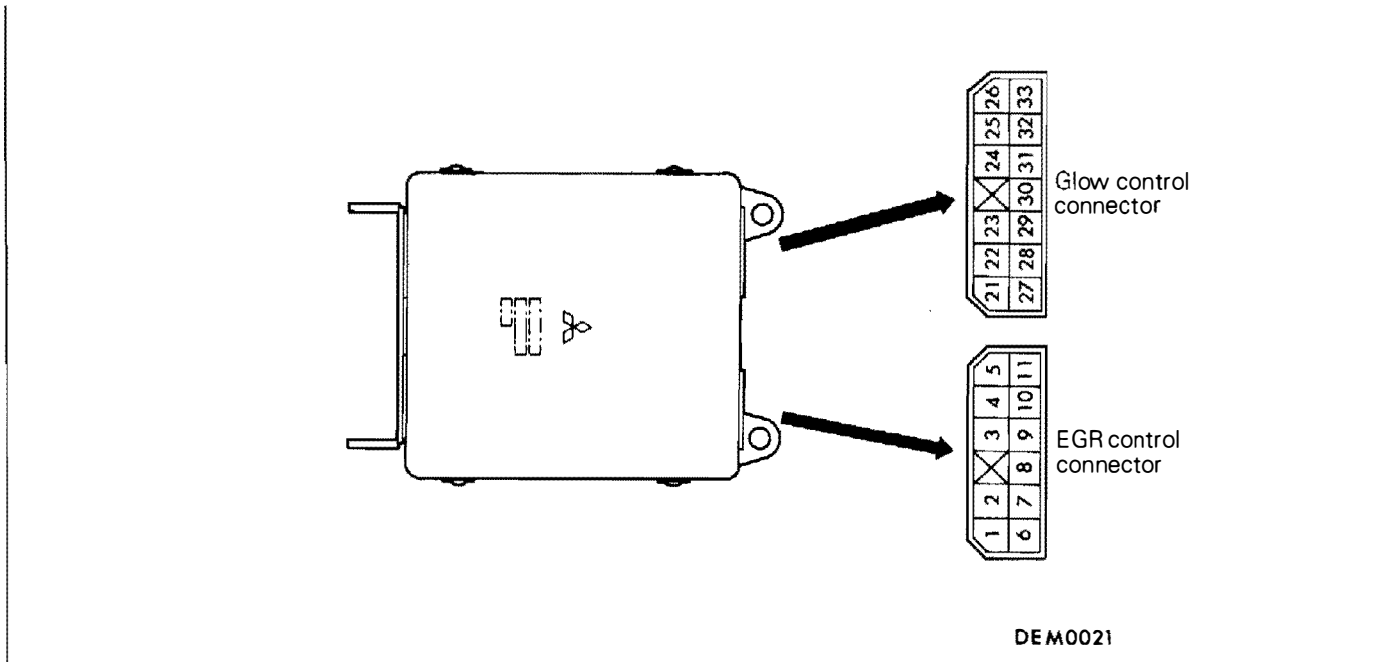
1. Remove the engine coolant temperature switch.



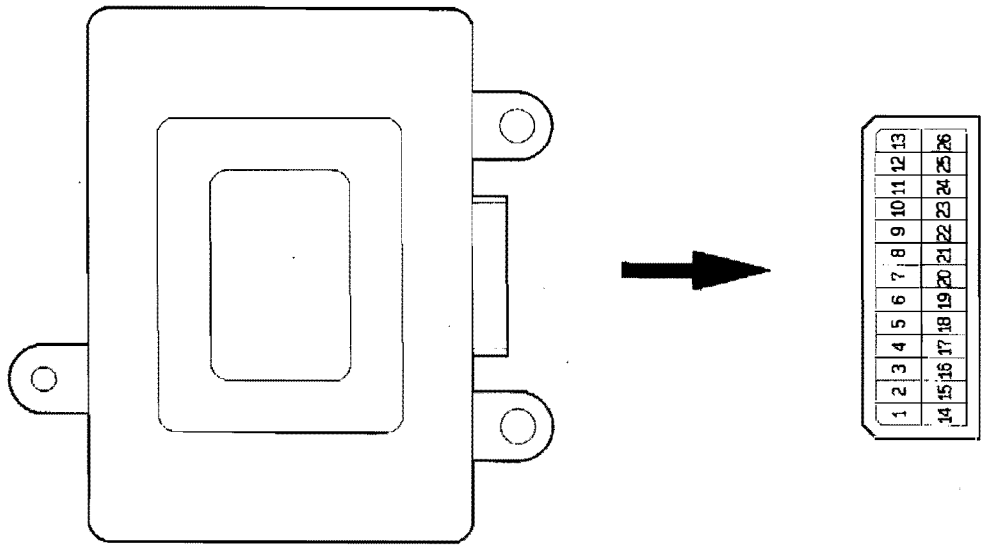
2. Check for continuity while the sensor section of the engine coolant temperature switch is immersed in engine oil.

Temperature °C	Continuity
100°C or less	Does not exist.
120°C or more	Exists.

GLOW & EGR CONTROL UNIT <Up to 1993 models> E17BF00JB



GLOW & EGR CONTROL UNIT <From 1994 models>



DEM0025

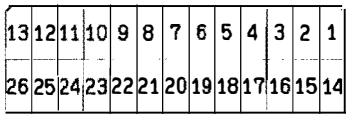
TERMINAL VOLTAGE MEASUREMENT

NOTE
1. Inspect with the glow & EGR control unit connectors still connected.
2. Connect the earth to terminal No. 13 of the glow & EGR control unit terminal when measuring the voltage.

Terminal Voltage Table DEM002

Glow and EGR control unit inspection terminal	Inspection item	Inspection condition		Standard value
3	EGR solenoid valve No. 1	Ignition switch: OFF → ON		Battery voltage
		While engine is idle after having warmed up, suddenly depress the accelerator pedal.		Momentarily increases
6	Lever position sensor	Ignition switch: OFF → ON	Throttle lever: Idle position	0.28–0.48V
			Throttle lever: Fully open position	3.2–5.5 V
7	Sensor applied voltage	Ignition switch: OFF → ON		4.5–5.5 V
16	EGR solenoid valve No. 2	Ignition switch: OFF → ON		Battery voltage
		While engine is idle after having warmed up, suddenly depress the accelerator pedal.		Momentarily decreases
5	Engine coolant temperature switch	Ignition switch: OFF → ON	Engine coolant temperature: 100°C or less	4 V or more
			Engine coolant temperature: 120°C or more	0–1 V
21	Transmission discriminating switch	Manual transmission		4 V or more
		Automatic transmission		0–1 V

Harness side connector



DEM0026

HARNESS CONTINUITY INSPECTION

1. Disconnect the glow & EGR control unit connector.
2. Check to be sure that there is continuity (1.2–1.7 Ω) between the harness side connector terminals 11 and 24.

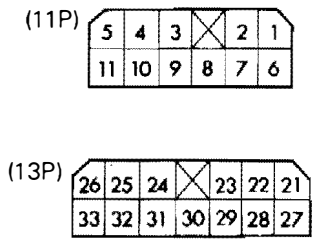
TERMINAL VOLTAGE MEASUREMENT

NOTE
1. Inspect with the glow & EGR control unit connectors still connected.
2. Connect the earth to terminal No. 30 of the glow & EGR control unit terminal when measuring the voltage.

Terminal Voltage Table

Glow and EGR control unit inspection terminal	Inspection item	Inspection condition		Standard value
2	EGR solenoid valve No. 1	Ignition switch: OFF → ON		Battery voltage
		While engine is idle after having warmed up, suddenly depress the accelerator pedal.		Momentarily increases
3	Lever position sensor	Ignition switch: OFF → ON	Throttle lever: Idle position	0.28–0.48V
			Throttle lever: Fully open position	3.2–5.5V
5	Sensor applied voltage	Ignition switch: OFF → ON		4.5–5.5V
8	EGR solenoid valve No. 2	Ignition switch: OFF → ON		Battery voltage
		While engine is idle after having warmed up, suddenly depress the accelerator pedal.		Momentarily decreases
29	Engine coolant temperature switch	Ignition switch: OFF → ON	Engine coolant temperature: 100°C or less	4V or more
			Engine coolant temperature: 120°C or more	0–1V

Glow & EGR control unit harness side connector seen from terminal side



DEM0651

HARNESS CONTINUITY INSPECTION

1. Disconnect the glow & EGR control unit connector.
2. Check to be sure that there is continuity (1.2–1.7Ω) between the harness side connector terminals 11 and 30.

CATALYTIC CONVERTER

E17BF01AA

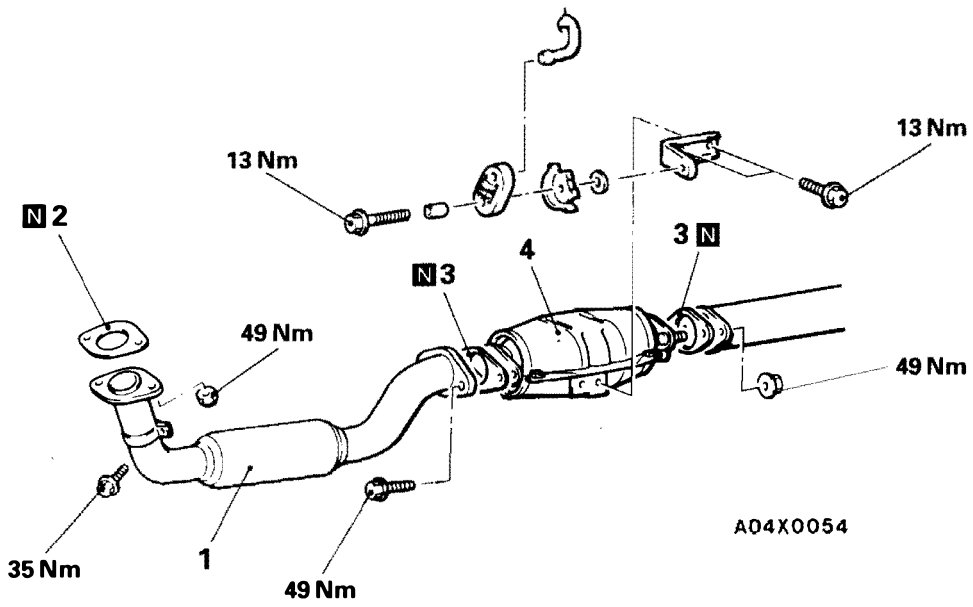
GENERAL INFORMATION

The oxidation catalyst promotes the oxidation of carbon dioxide (CO), hydrocarbons (HC) and unburnt fuel and oil in the exhaust gases.

REMOVAL AND INSTALLATION

E17BF01BA

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)



Removal steps
1. Front exhaust pipe
2. Gasket
3. Gasket
4. Catalytic converter

INSPECTION

E17BF01CA

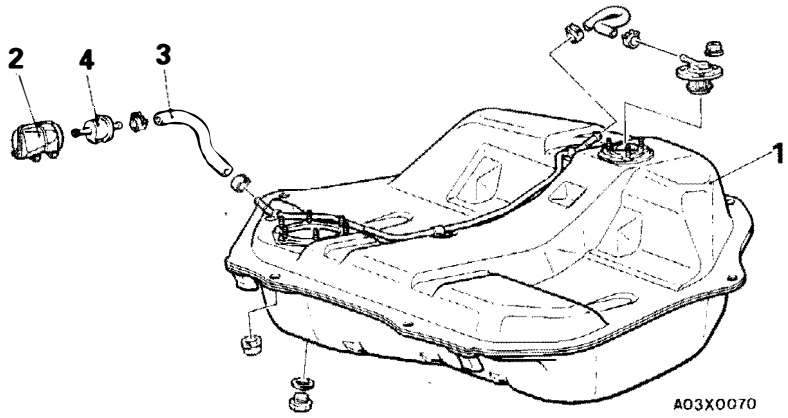
Inspect for damage, cracking or deterioration. Replace if faulty.

Caution
Proper maintenance and tune-up according to manufacturer's specifications should be made to correct the conditions as soon as possible.

TWO-WAY VALVE

E17BF02AA

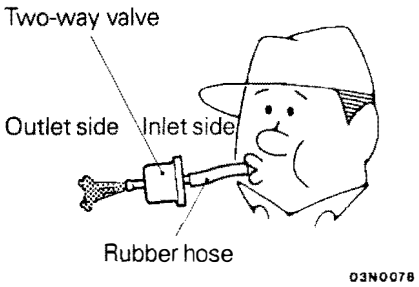
REMOVAL AND INSTALLATION



Removal steps

1. Fuel tank (Refer to GROUP 13F – Fuel tank)
2. Breather case
3. Vapor hose

◆A◆ 4. Two-way valve



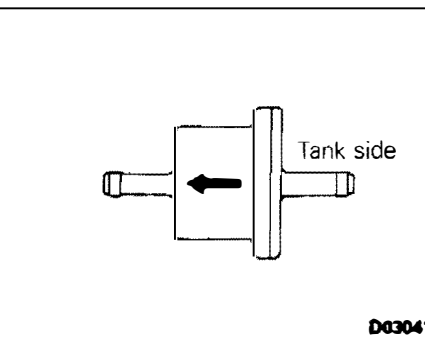
INSPECTION

E17BF02BA

TWO-WAY VALVE SIMPLE CHECK

Attach a clean hose and check the operation of the two-way valve.

Inspection procedure	Normal condition
Lightly blow from inlet side (fuel tank side).	Air passes through with a slight feeling of resistance
Lightly blow from outlet side	Air passes through



INSTALLATION SERVICE POINT

E17BF02CA

◆A◆ TWO-WAY VALVE INSTALLATION

Install so that the installation direction of the two-way valve is correct.

CLUTCH

CONTENTS

E21ZA00BB

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 serice personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

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

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

NOTE

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

GENERAL INFORMATION

E21ZB00BA

The clutch is a dry single-disc, diaphragm type; hydraulic pressure is used for the clutch control.

SERVICE SPECIFICATIONS

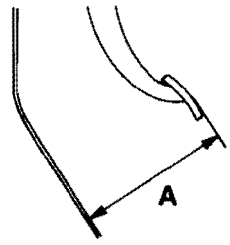
E21ZC00AA

Items		Specifications
Standard value		
Clutch pedal height	mm	175–180
Clutch pedal clevis pin play	mm	1–3
Clutch pedal free play	mm	6–13
Distance between the clutch pedal and the toeboard when the clutch is disengaged	mm	50 or more

LUBRICANTS

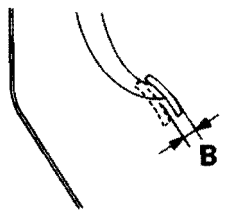
Items	Specified lubricants	Quantity
Clutch fluid	Brake fluid DOT3 or DOT4	As required
Push rod assembly	Rubber grease	As required
Boot	Rubber grease	As required
Release cylinder push rod	MITSUBISHI genuine grease Part No. 0101011	As required

Clutch pedal height



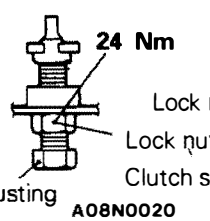
08Y041

Clutch pedal clevis pin play



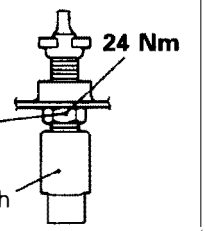
08Y043

Vehicles without auto-cruise control system



A08N0020

Vehicles with auto-cruise control system



A08N0021

SERVICE ADJUSTMENT PROCEDURES

E21ZF00BA

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

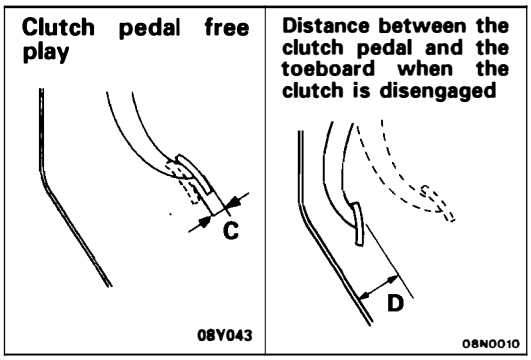
1. Measure the clutch pedal height and the clutch pedal clevis pin play.

   Standard value (A): 175–180 mm
   Standard value (B): 1–3 mm

2. If the height of the clutch pedal is outside the standard value, loosen the lock nut and adjust the pedal height to the standard value using the adjusting bolt (Vehicles without auto-cruise control system) or clutch switch (Vehicles with auto-cruise control system).
3. If the clutch pedal play is outside the standard value, adjust with the push rod.

   Caution
   Do not push in the master cylinder push rod at this time.

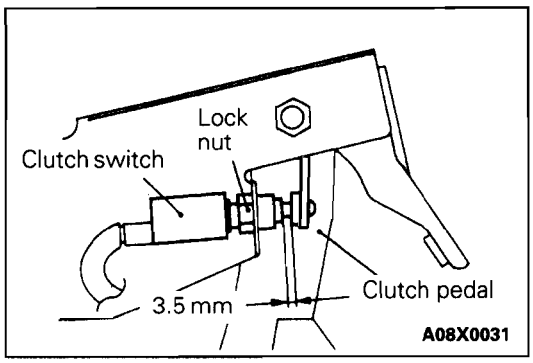
PWDE9211



4. After completing the adjustments, confirm that the clutch pedal free play (measured at the face of the pedal pad) and the distance between the clutch pedal (the face of the pedal pad) and the toeboard when the clutch is disengaged are within the standard value ranges.

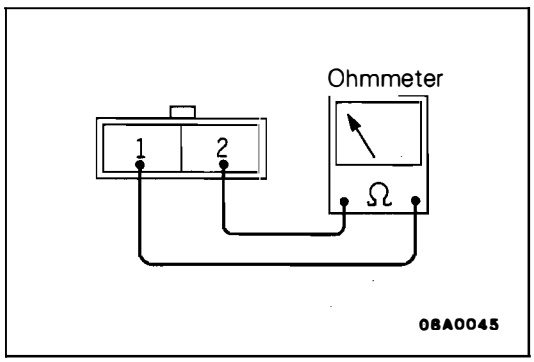
Standard value (C): 6–13 mm
Standard value (D): 50 mm or more

5. If the clutch pedal free play and the distance between the clutch pedal and the toeboard when the clutch is disengaged do not agree with the standard values, it is probably the result of either air in the hydraulic system or a faulty master cylinder or clutch. Bleed the air, or disassemble and inspect the master cylinder or clutch.



CLUTCH SWITCH INSPECTION AND ADJUSTMENT (Vehicles with TCL) E21ZF01AB

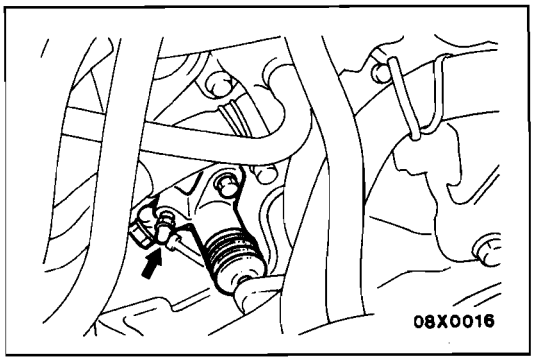
1. Check to be sure that the clutch switch is as shown in the illustration when the clutch pedal is depressed its full stroke (150 mm). If necessary, loosen the lock nut and adjust.



2. Connect an ohmmeter to the clutch switch connector, and then check for continuity when the clutch pedal is fully depressed and when it is released outward.

Terminal / Pedal position	1	2
Fully depressed		
Released	○—	—○

NOTE
○—○ indicates that there is continuity between the terminals.



BLEEDING E21ZF02AA

Specified brake fluid: DOT 3 or DOT 4

Caution
Use the specified brake fluid. Avoid using a mixture of the specified fluid and other fluid.

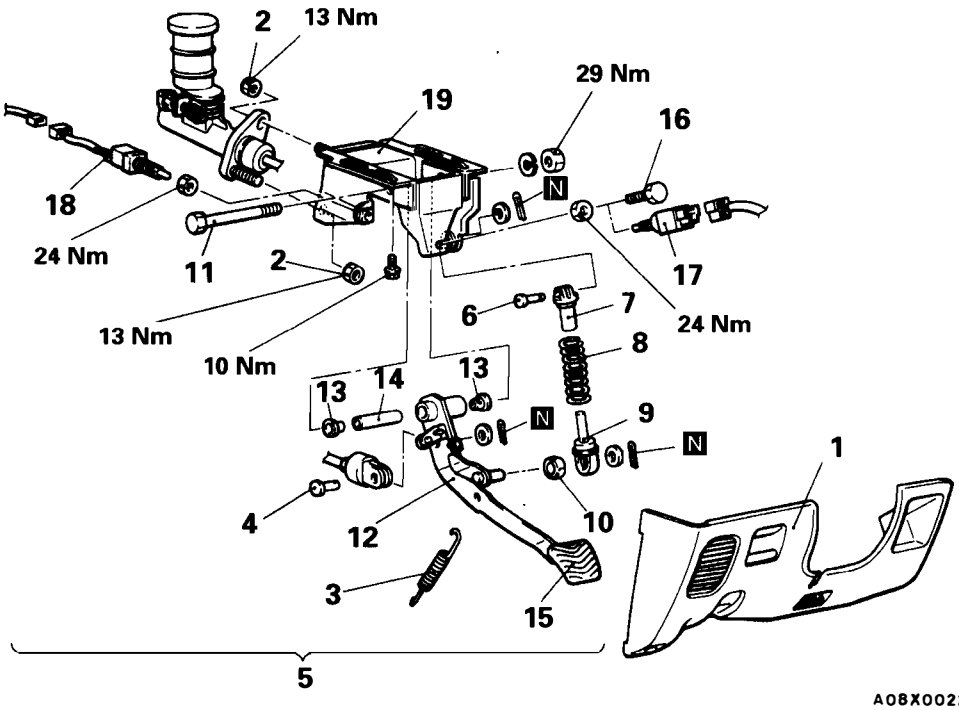
CLUTCH PEDAL

E21ZG01AA

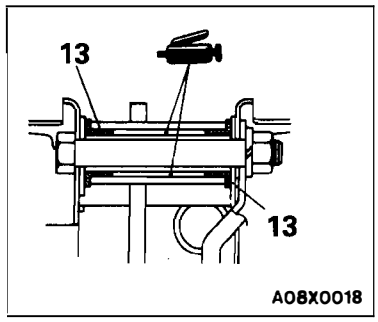
REMOVAL AND INSTALLATION

L.H. drive vehicles

Post-installation Operation
- Clutch Pedal Adjustment (Refer to P.21-2.)



A08X0022



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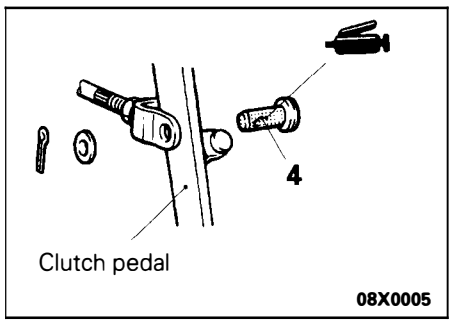

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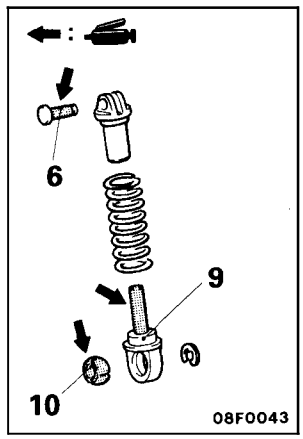


08F0043

Removal steps

1. Instrument under cover (Refer to GROUP 52A – Instrument Panel.)
2. Master cylinder installation nuts
3. Clutch pedal return spring <Except 6G73>
4. Clevis pin
5. Clutch pedal assembly
6. Clevis pin
7. Rod A
8. Turnover spring
9. Rod B
10. Bushing

(6. – 10. <6G73>)

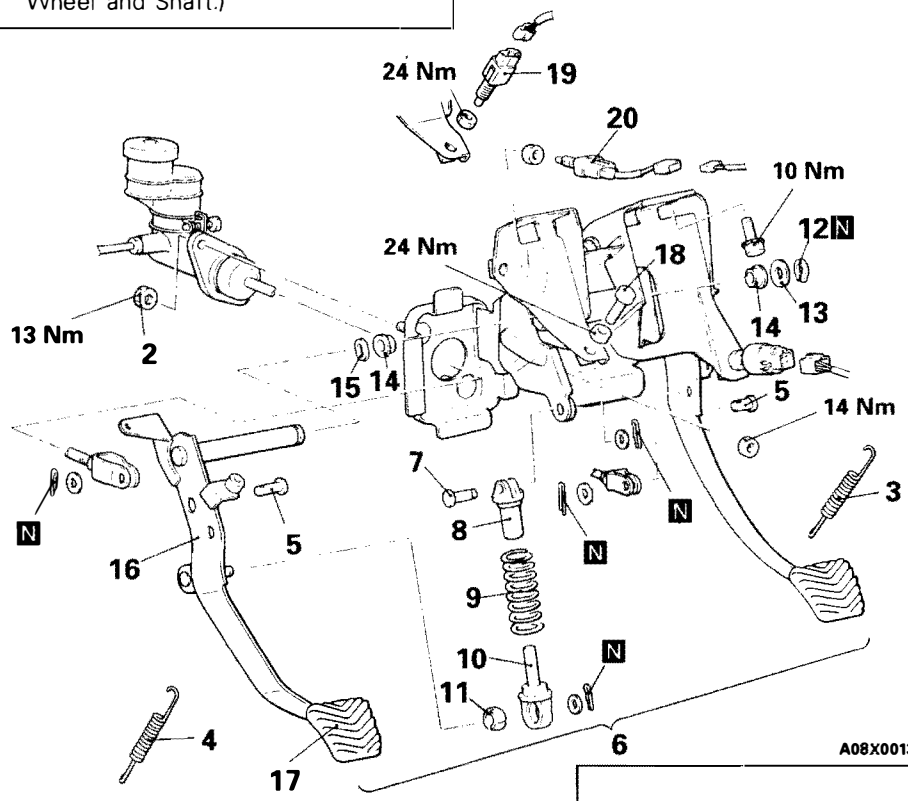
11. Bolt
12. Clutch pedal
13. Bushing
14. Spacer
15. Pedal pad
16. Adjusting bolt <Vehicles without auto-cruise control system>
17. Clutch switch <Vehicles with auto-cruise control system>
18. Clutch switch <Vehicles with TCL>
19. Clutch pedal bracket assembly

R.H. drive vehicles

Pre-removal Operation
- Column Cover Removal (Refer to GROUP 37A – Steering Wheel and Shaft.)

Post-installation Operation
- Clutch Pedal Adjustment (Refer to P.21-2.)
- Column Cover Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)

Caution for SRS
For removal of the steering shaft assembly, refer to GROUP 52B – Air Bag Module and Clock Spring before carrying out the removal operation.



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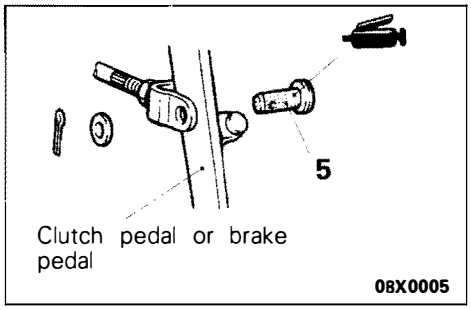

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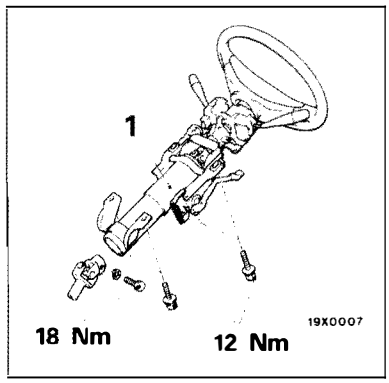

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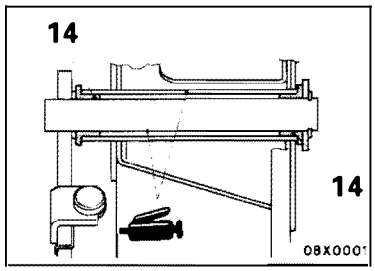
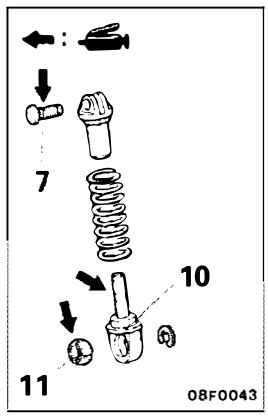


08X0001



08F0043

Removal steps

1. Steering wheel and shaft assembly
2. Master cylinder installation nuts
3. Brake pedal return spring
4. Clutch pedal return spring <Except 6G73>
5. Clevis pin
6. Pedal support member assembly
7. Clevis pin
8. Rod A
9. Turnover spring
10. Rod B
11. Bushing

<7 to 11: <6G73>>

12. Snap ring
13. Plain washer
14. Bushing
15. Wave washer
16. Clutch pedal
17. Pedal pad
18. Adjusting bolt <Vehicles without auto-cruise control system>
19. Clutch switch <Vehicles with auto-cruise control system>
20. Clutch switch <Vehicles with TCL>

CLUTCH CONTROL

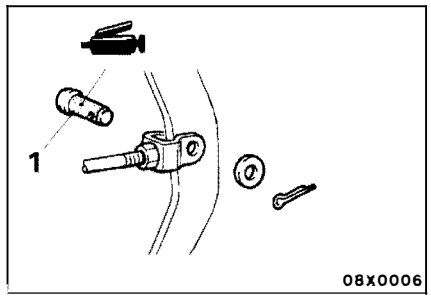
E21ZH01AA

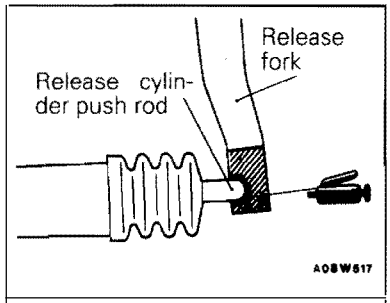
REMOVAL AND INSTALLATION

L.H. drive vehicles

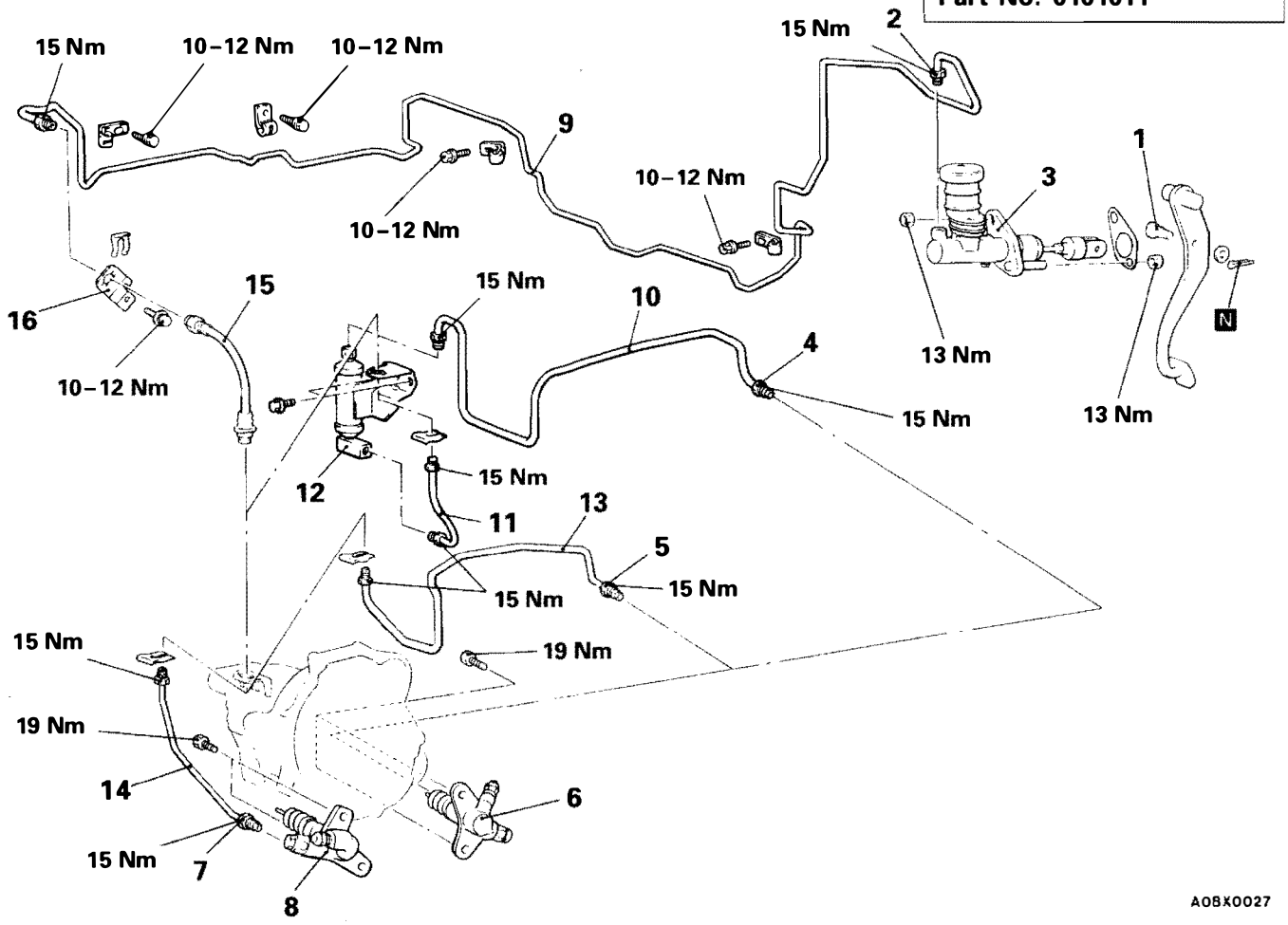
Pre-removal Operation
- Clutch Fluid Draining

Post-installation Operation
- Clutch Fluid Supplying
- Clutch Line Bleeding (Refer to P.21-3.)
- Clutch Pedal Adjustment (Refer to P.21-2.)





Specified grease:
MITSUBISHI genuine grease
Part No. 0101011



Clutch master cylinder removal steps
1. Clevis pin
2. Clutch pipe connection
3. Clutch master cylinder

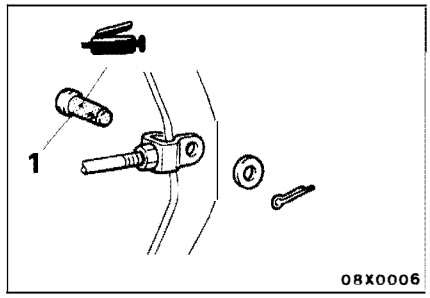
Clutch release cylinder removal steps
4. Clutch pipe connection <6G73>
5. Clutch pipe connection<6A12>
6. Clutch release cylinder <6A12, 6G73>
7. Clutch pipe connection
8. Clutch release cylinder } <4G93, 4G63, 4D68>

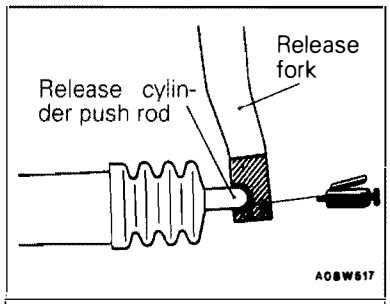
Clutch line removal steps
9. Clutch pipe
10. Clutch pipe <6G73>
11. Clutch pipe (A)
12. Clutch fluid chamber } <6G73, 4D68>
13. Clutch pipe <6A12>
14. Clutch pipe <4G93, 4G63, 4D68>
15. Clutch hose
16. Clutch hose bracket

R.H. drive vehicles

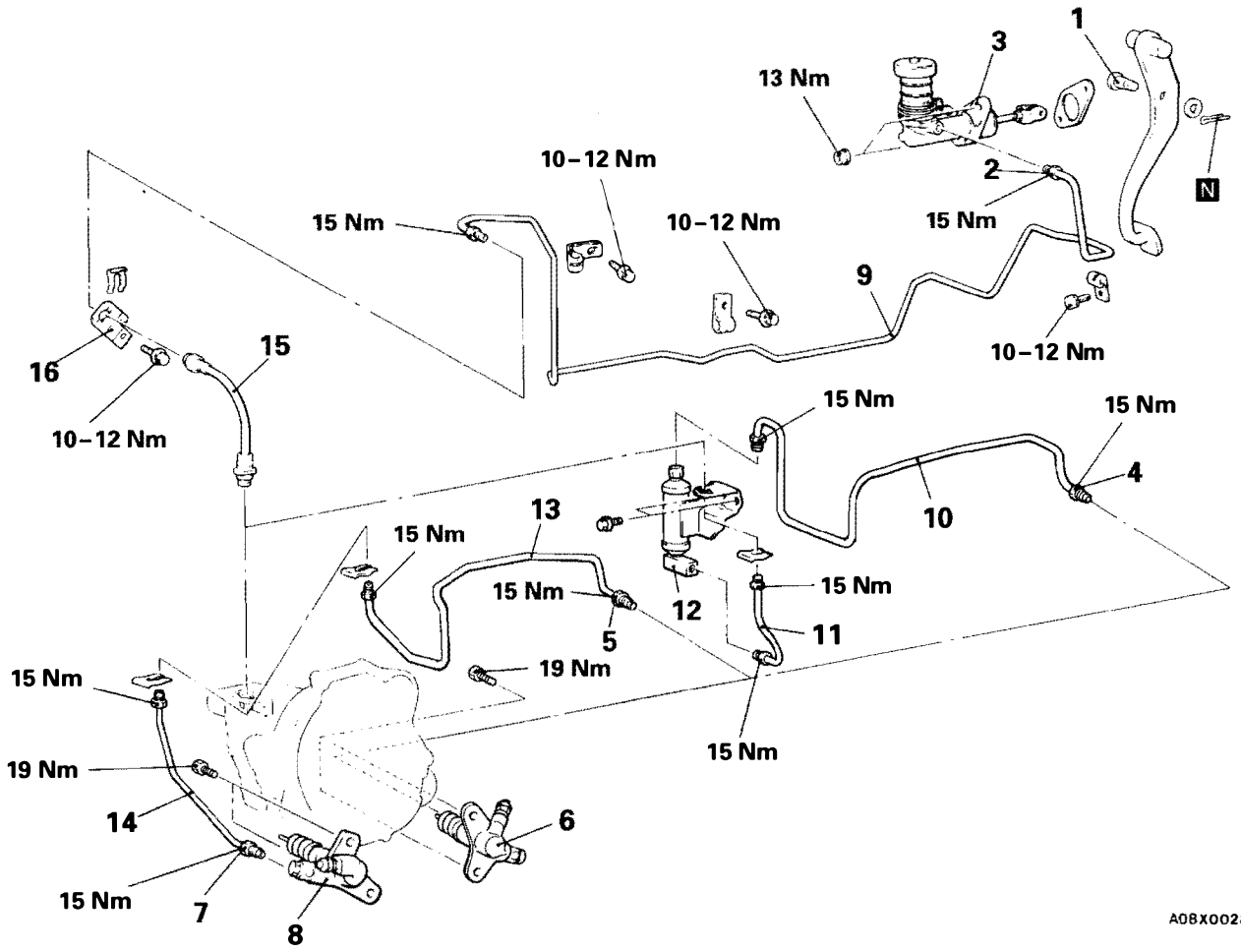
Pre-removal Operation
- Clutch Fluid Draining

Post-installation Operation
- Clutch Fluid Supplying
- Clutch Line Bleeding (Refer to P.21-3.)
- Clutch Pedal Adjustment (Refer to P.21-2.)





Specified grease:
MITSUBISHI genuine grease
Part No. 0101011



Clutch master cylinder removal steps
1. Clevis pin
2. Clutch pipe connection
3. Clutch master cylinder

Clutch release cylinder removal steps
4. Clutch pipe connection <6G73>
5. Clutch pipe connection<6A12>
6. Clutch release cylinder <6A12, 6G73>
7. Clutch pipe connection
8. Clutch release cylinder } <4G93, 4G63, 4D68>

Clutch line removal steps
9. Clutch pipe
10. Clutch pipe <6G73>
11. Clutch pipe (A)
12. Clutch fluid chamber } <6G73, 4D68>
13. Clutch pipe <6A12>
14. Clutch pipe <4G93, 4G63, 4D68>
15. Clutch hose
16. Clutch hose bracket

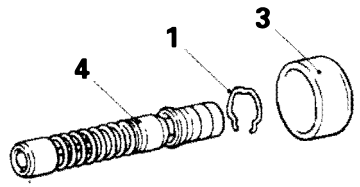
CLUTCH MASTER CYLINDER

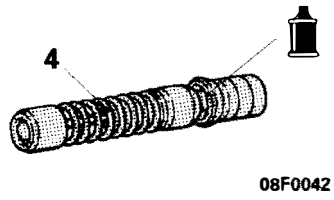
E21ZI00AA

DISASSEMBLY AND REASSEMBLY

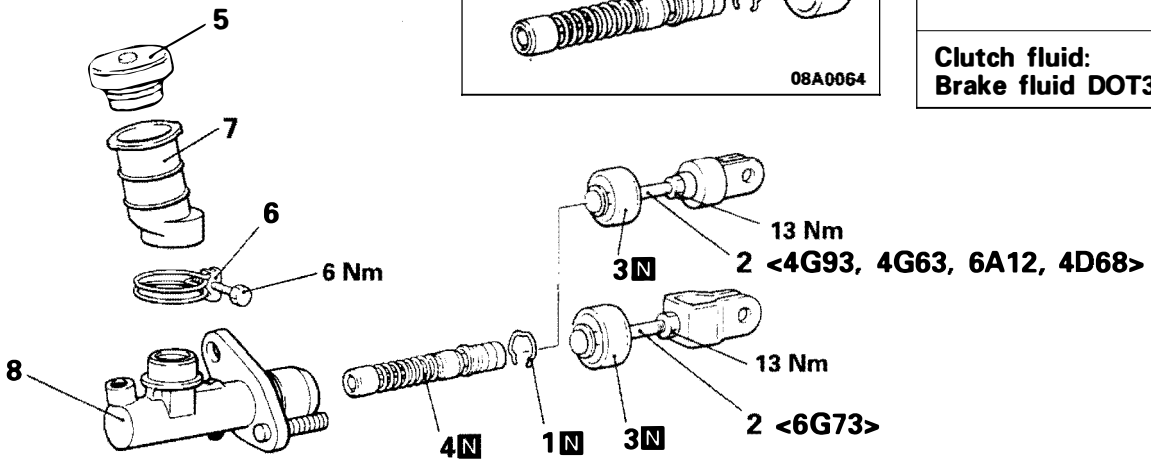
L.H. drive vehicles

Piston repair kit





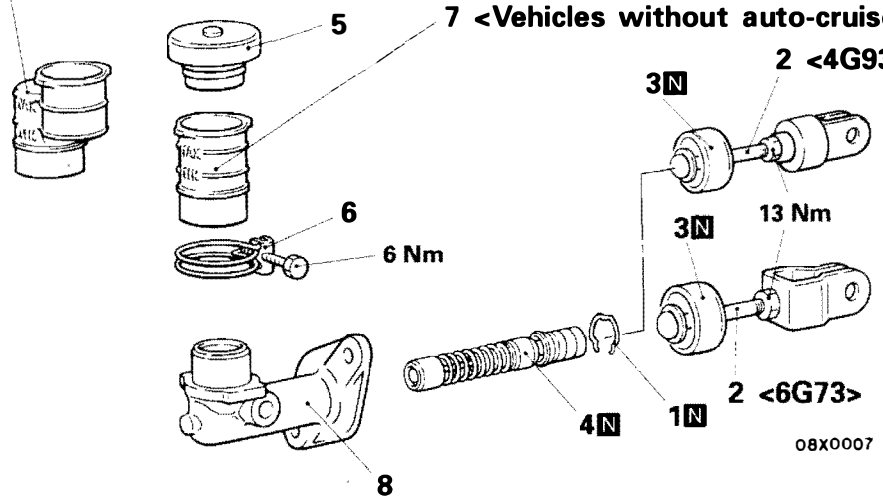
Clutch fluid:
Brake fluid DOT3 or DOT4

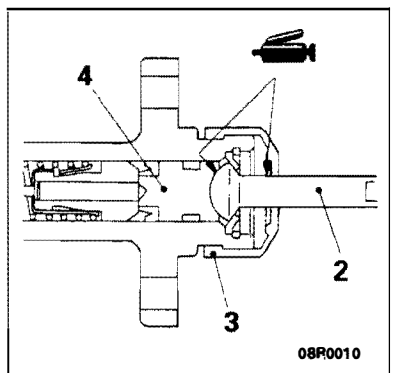


R.H. drive vehicles

7 <Vehicles with auto-cruise control system>

7 <Vehicles without auto-cruise control system>





Grease: Rubber grease

Disassembly steps

1. Piston stopper ring
2. Push rod assembly
3. Boot
4. Piston assembly
5. Reservoir cap
6. Reservoir band
7. Fluid reservoir tank
8. Clutch master cylinder body

Caution
Do not disassembly piston assembly.

MANUAL TRANSMISSION

CONTENTS

E22ZA00BB

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 serice personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

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

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

NOTE

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

 Dec. 1993 PWDE9211-B REVISED

GENERAL INFORMATION

E22ZB00AA

The F5M22 and F5M31 manual transmissions are designed for 2WD vehicles, and the W5M31 and W5M33 manual transmissions are designed for 4WD vehicles.

Items	2WD			
Model	F5M22	F5M22	F5M31	F5M31
Applicable engine	4G93	4G63	6A12	4D68
Type	5-speed floor shift	5-speed floor shift	5-speed floor shift	5-speed floor shift
Gear ratio				
1st	3.363	3.083	3.083	3.250
2nd	1.947	1.947	1.833	1.833
3rd	1.285	1.285	1.217	1.240
4th	0.939	0.939	0.888	0.896
5th	0.756	0.756	0.731	0.666
Reverse	3.083	3.083	3.166	3.166
Final gear ratio	4.322	4.322	4.913	4.322
Speedometer gear ratio (driven/drive)	29/36	29/36	29/36	29/36

Items	4WD	
Model	W5M31	W5M33
Applicable engine	4G63	6G73
Type	5-speed floor shift	5-speed floor shift
Gear ratio		
1st	3.083	2.846
2nd	1.684	1.684
3rd	1.115	1.115
4th	0.833	0.833
5th	0.690	0.651
Reverse	3.166	3.166
Final gear ratio	–	–
Reduction ratio		
Primary	1.680	1.275
Front differential	3.100	4.266
Transfer	1.090	1.090
Speedometer gear ratio (driven/drive)	30/36	29/36

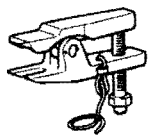
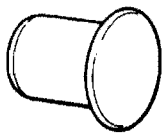
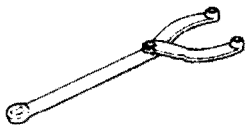
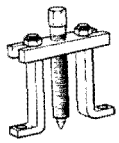
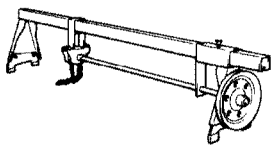
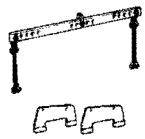
LUBRICANTS

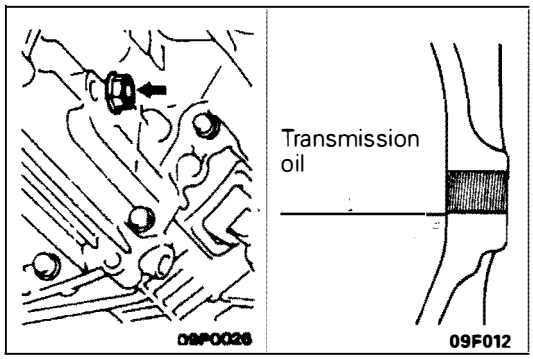
E22ZC00AA

Items	Specified lubricant	Quantity ℓ
Transmission oil	Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API classification GL-4	<2WD-F5M22> 1.8 <2WD-F5M31> 2.1 <4WD> 2.2
Transfer oil		<4WD> 0.5

SPECIAL TOOLS

E22ZD00AA

Tool	Number	Name	Use
	MB991113	Steering linkage puller	• Removal of the tie rod end ball joint and knuckle • Removal of the lateral lower arm ball joint and knuckle • Removal of the compression lower arm ball joint and knuckle
	MB991193	Plug	Preventing foreign substances from entering transfer <4WD>
	MB990767	End yoke holder	Fixing the hub <4WD>
	MB990241	Axle shaft puller	Removal of the drive shaft <4WD>
	GENERAL SERVICE TOOL MZ203827	Mechanic hanger, engine	Supporting the engine assembly during removal and installation of the transmission
	MB991460	Plug	Prevention of entry of foreign objects into the transmission case
	MB991453	Engine hanger assembly	Supporting the engine assembly during removal and installation of the transmission <6A12, 6G73>



SERVICE ADJUSTMENT PROCEDURES

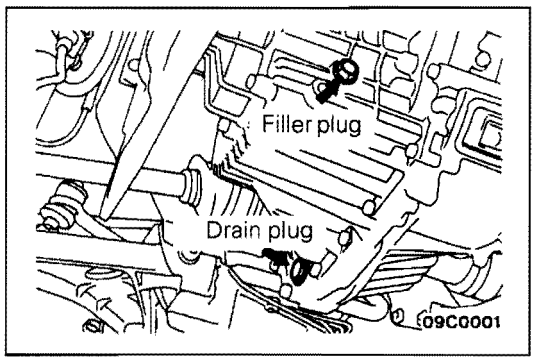
E22ZF00AA

TRANSMISSION OIL LEVEL CHECK

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

1. Oil level should be at the lower portion of the filler plug hole.
2. Check that the transmission oil is not noticeably dirty, and that it has a suitable viscosity.
3. Tighten filler plug to specified torque.

Specified torque: 32 Nm



TRANSMISSION OIL REPLACEMENT E22ZF01AA

1. Remove transmission drain plug.
2. Drain oil.
3. Tighten drain plug to specified torque.

Specified torque: 32 Nm

4. Remove filler plug and fill with specified oil till the level comes to the lower portion of filler plug hole.

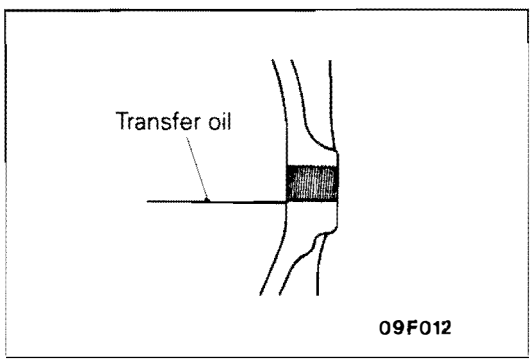
Specified oil: Hypoid gear oil SAE 75W–90 or 75W–85W conforming to API GL-4

Quantity:

<2WD-F5M22>	**1.8 ℓ**
<2WD-F5M31>	**2.1 ℓ**
<4WD>	**2.2 ℓ**

5. Tighten filler plug to specified torque.

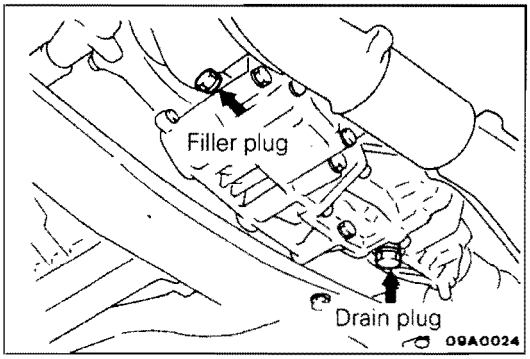
Specified torque: 32 Nm



TRANSFER OIL LEVEL CHECK <4WD> E22ZF02AA

1. Remove the oil filler plug.
2. Check to ensure that the oil level reaches to the bottom edge of the oil filler plug hole.
3. Check to ensure that the oil is not exceptionally dirty, and that it is of sufficient viscosity.
4. Install the oil filler plug, tightening it to the specified torque.

Specified torque: 32 Nm



TRANSFER OIL REPLACEMENT <4WD> E22ZF03AA

1. Remove the oil drain plug and drain the oil.
2. Install the oil drain plug and tighten it to the specified torque.

   Specified torque: 32 Nm

3. Remove the oil filler plug and fill with oil until the level reaches the bottom edge of the oil filler plug hole.

   Specified transmission oil:

   Hypoid gear oil SAE 75W–90 or 75W–85W conforming to API GL-4

   Quantity: 0.5 dm^3

4. Install the oil filler plug and tighten it to the specified torque.

   Specified torque: 32 Nm

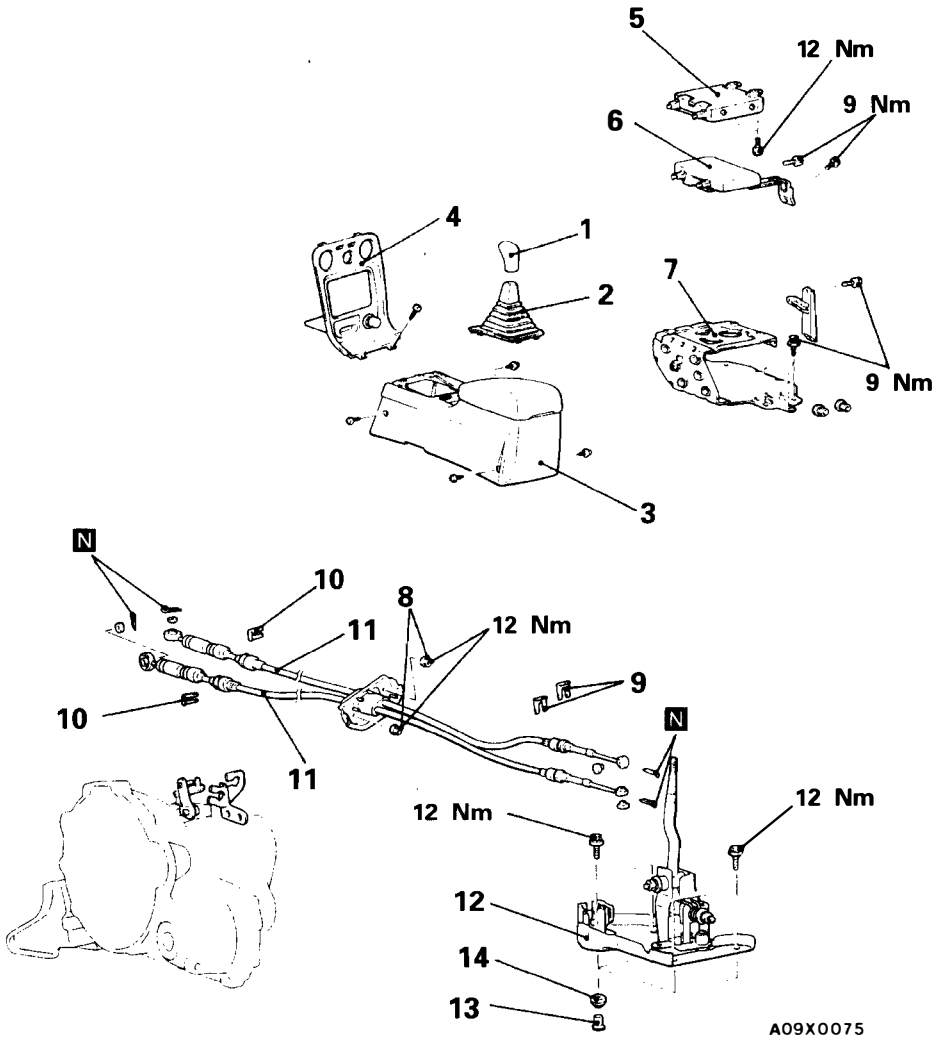
TRANSMISSION CONTROL

E22ZG00AA

REMOVAL AND INSTALLATION

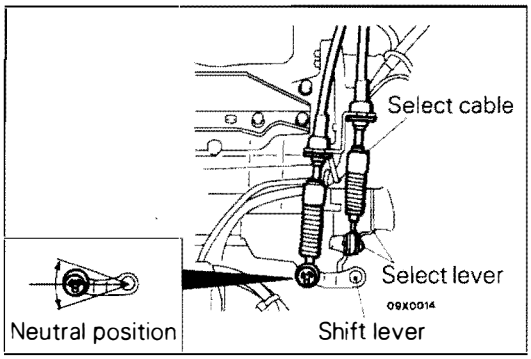
Pre-removal and Post-installation Operation
- Instrument Panel Side Cover A, B Removal and Installation (Refer to GROUP 52A – Instrument Panel.)

Caution: SRS
Be careful not to subject the SRS diagnosis unit to any shocks during removal and installation of the transmission control cable and shift lever assembly.



Transmission control cable assembly removal steps
1. Shift lever knob
2. Shift lever panel
3. Floor console box
4. Center console panel
5. Engine control unit <Petrol-powered vehicles>
6. 4WS control unit
7. ECU bracket
8. Nut
9. Clip (passenger compartment side)
10. Clip (engine room side)
◆A◆ 11. Shift cable and select cable assembly

Shift lever assembly removal steps
1. Shift lever knob
2. Shift lever panel
3. Floor console box
9. Clip (passenger compartment side)
◆A◆ 11. Connection for shift cable and select cable assembly (passenger compartment side)
12. Shift lever assembly
13. Distance piece
14. Bushing



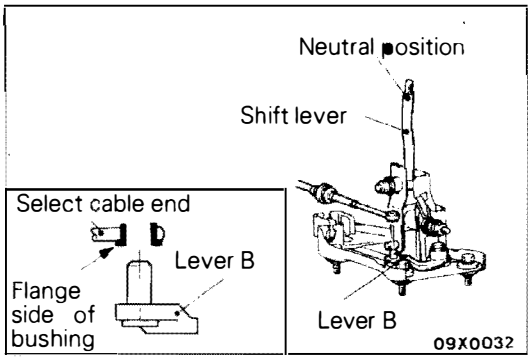
INSTALLATION SERVICE POINT E22ZG01AA

◆A◆ SHIFT CABLE AND SELECT CABLE ASSEMBLY

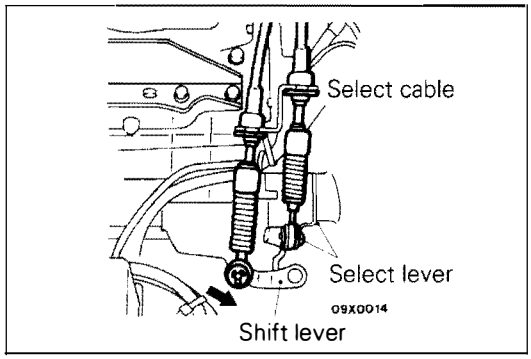
<SELECT CABLE>

(1) Set the shift lever of the transmission side at the neutral position.

NOTE
When the shift lever of the transmission side is set at the neutral position, the select lever of the transmission side is also set at the neutral position.



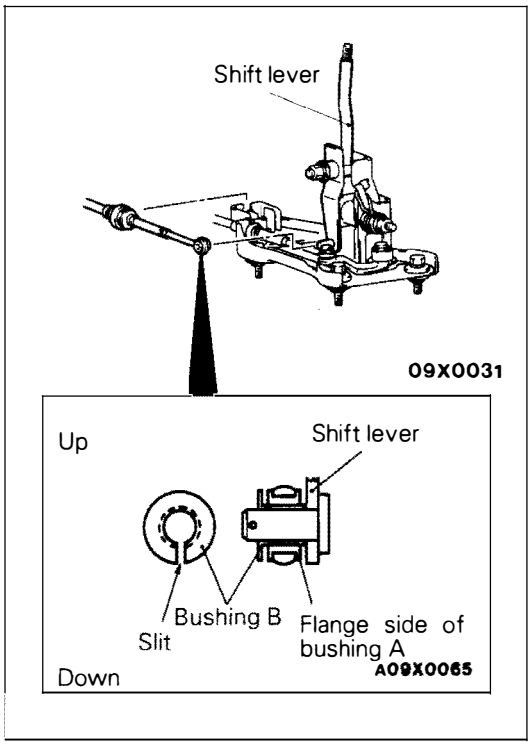
(2) While leaving the shift lever inside the passenger compartment in the neutral position, install the select cable to the passenger compartment side of the shift lever.
(3) Install the select cable so that the flange side of resin bushing is positioned at the edge of lever B side.



<SHIFT CABLE>

(1) While leaving the select lever at the transmission side in the neutral position, move the shift lever at the transmission side in the direction of the arrow in the illustration to set it to 4th gear.

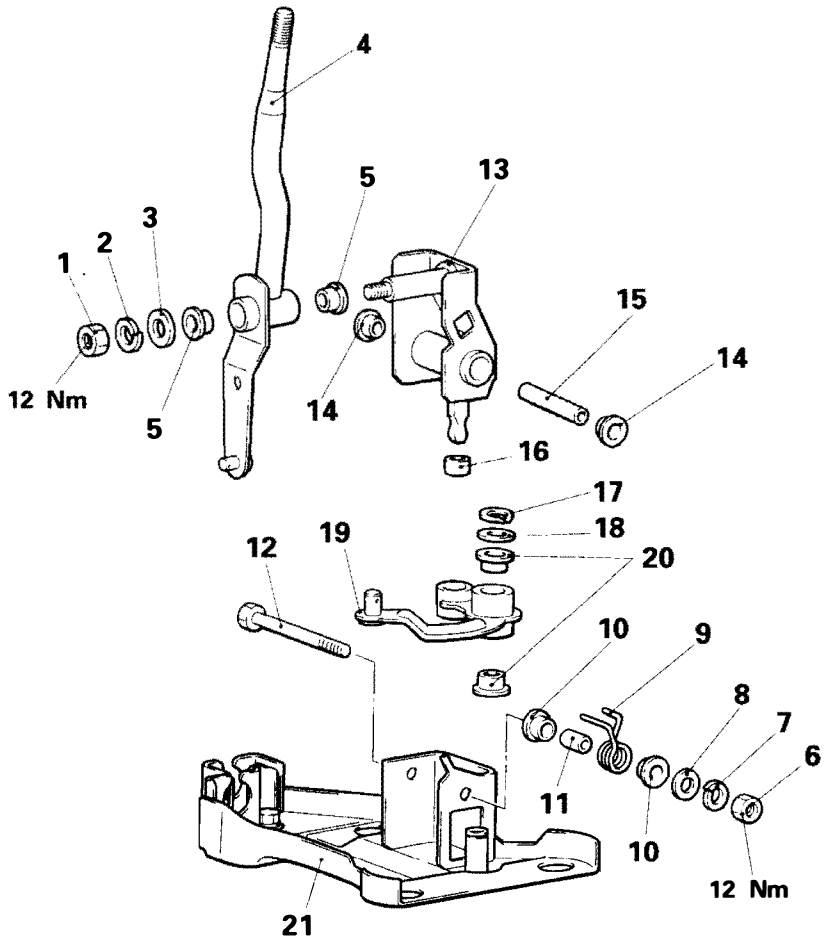
NOTE
If the shift lever does not move easily, depress and hold the clutch pedal.



(2) Pull the shift lever at the passenger compartment side fully in the direction shown in the illustration (4th gear position), and install the shift cable to the shift lever at the passenger compartment side.
Install so that the flange side of plastic bushing A at the end of the shift cable is facing towards the shift lever side and the slit section of plastic bushing B is facing either up or down.
(3) Put the shift lever to all the positions and make sure that the operation is smooth.

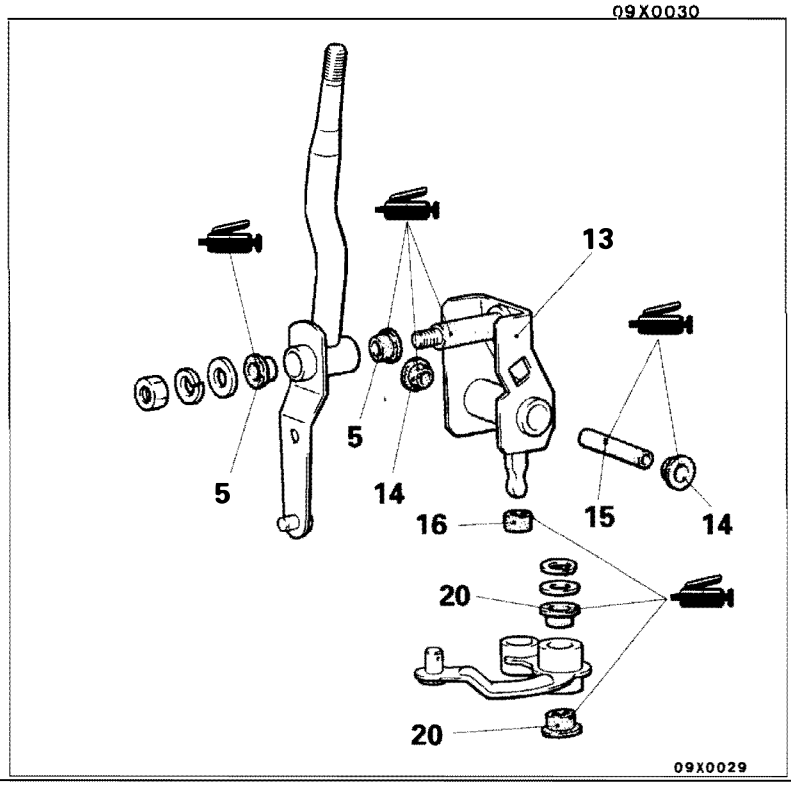
SHIFT LEVER ASSEMBLY
DISASSEMBLY AND REASSEMBLY

E22ZG10AA



Disassembly steps

1. Nut
2. Spring washer
3. Plain washer
4. Shift lever
5. Bushing
6. Nut
7. Spring washer
8. Plain washer
9. Return spring
10. Bushing
11. Pipe
12. Bolt
13. Lever A
14. Bushing
15. Collar
16. Bushing
17. Snap ring
18. Washer
19. Lever B
20. Bushing
21. Bracket assembly



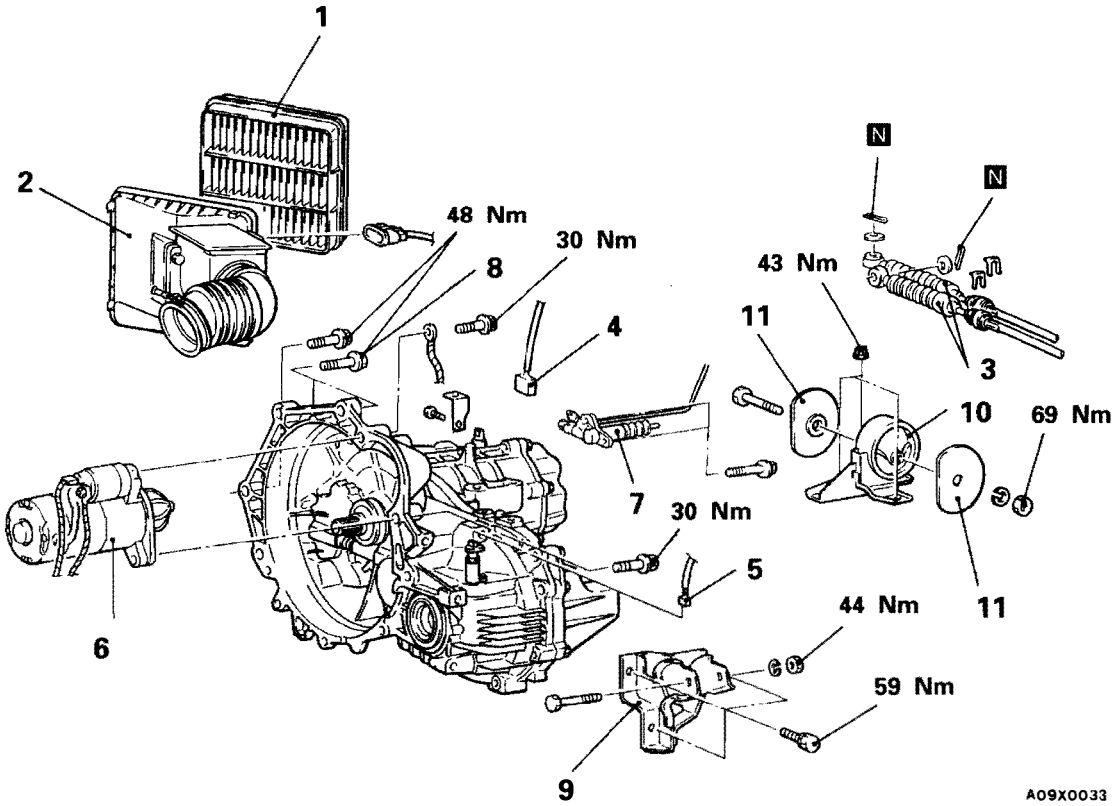
TRANSMISSION ASSEMBLY <VEHICLES WITHOUT INNER SHAFT>

E22ZH00AB

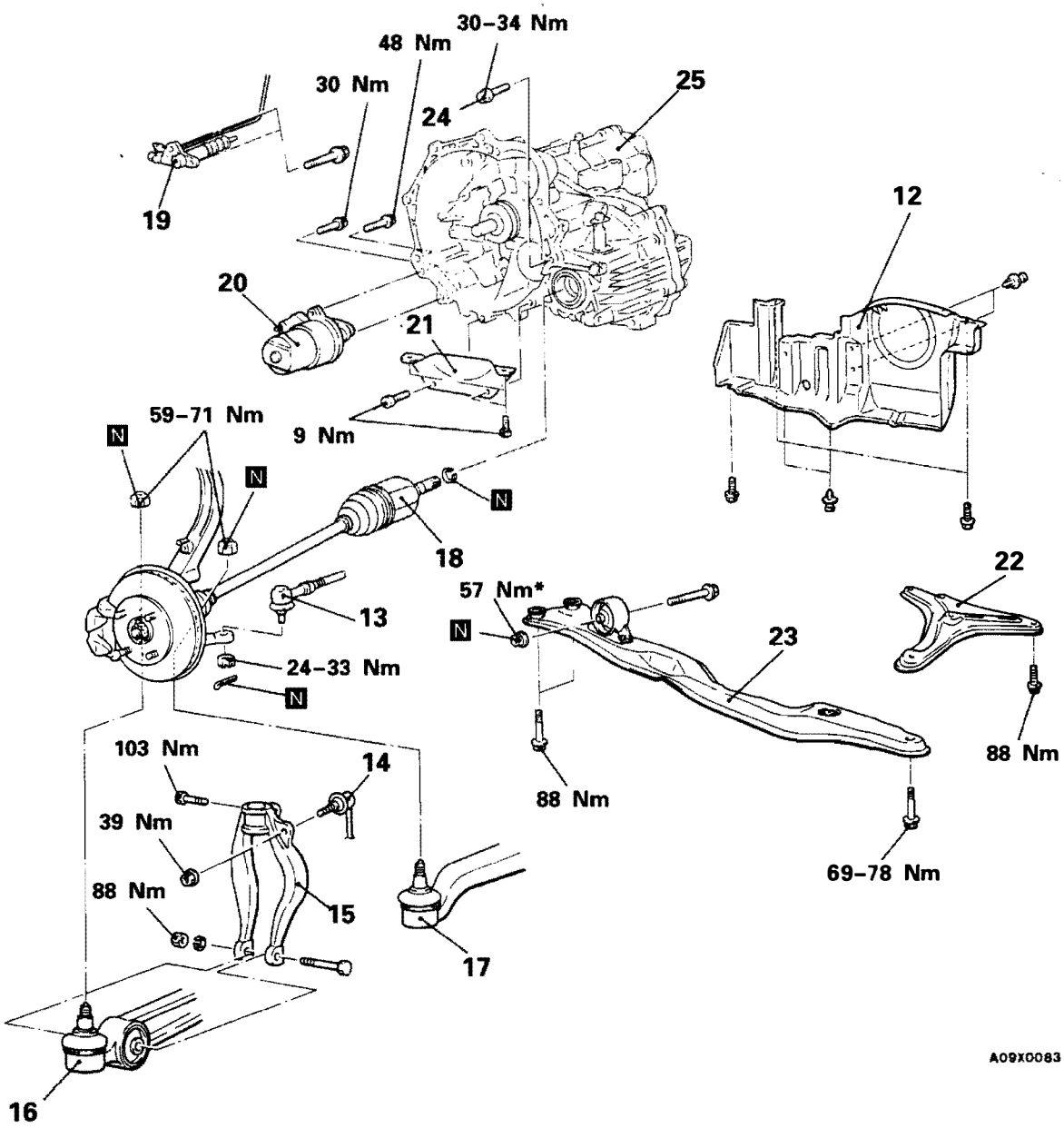
REMOVAL AND INSTALLATION

Pre-removal Operation
- Transmission Oil Draining (Refer to P.22-4.)

Post-installation Operation
(1) Supplying Transmission Oil (Refer to P.22-4.)
(2) Shift Lever Operation Check
(3) Speedometer Operation Check



Removal steps
1. Air cleaner element
2. Air cleaner cover and hose assembly
3. Connection for shift cable and select cable
4. Backup lamp switch connector
5. Speedometer connector
6. Starter motor <4G93, 4G63, 4D68>
〈A〉 7. Connection for clutch release cylinder <6A12>
8. Transmission assembly upper part coupling bolts
9. Rear roll stopper bracket
〈B〉 10. Transmission mount bracket
◆B◆ 11. Transmission mount stopper
〈C〉 • Supporting engine assembly



Lifting up of the vehicle

12. Under cover (R.H.)
◇D◇ 13. Connection for tie rod end
14. Connection for stabilizer link
15. Damper fork
◇E◇ 16. Connection for lateral lower arm
◇F◇ 17. Connection for compression lower arm
◇G◇ ▶A◀ 18. Connection for drive shaft
◇A◇ 19. Connection for clutch release cylinder <4G93, 4G63, 4D68>
◇H◇ 20. Starter motor <6A12>
21. Bell housing cover <4G93, 4G63, 4D68>
22. Stay (R.H.)
23. Center member assembly
24. Transmission assembly lower part coupling bolt
25. Transmission assembly

Caution
Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.

REMOVAL SERVICE POINTS E22ZH01AA

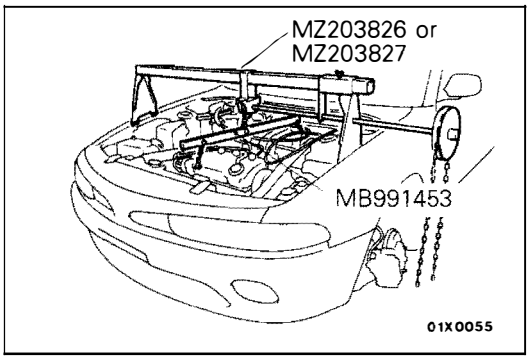
〈A〉 CLUTCH RELEASE CYLINDER REMOVAL

Remove the clutch release cylinder without disconnecting the oil line connection, and fix it to the vehicle chassis.

〈B〉 TRANSMISSION MOUNTING REMOVAL

Jack up the transmission assembly gently with a garage jack, and then remove the transmission mounting.

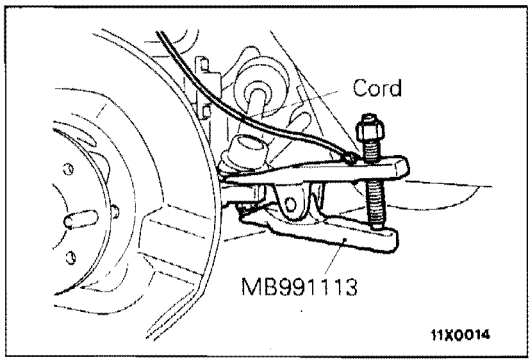
Caution
When jacking up the transmission assembly, support it over a wide area so force is not applied to only one part of it.



〈C〉 ENGINE ASSEMBLY SUPPORTING

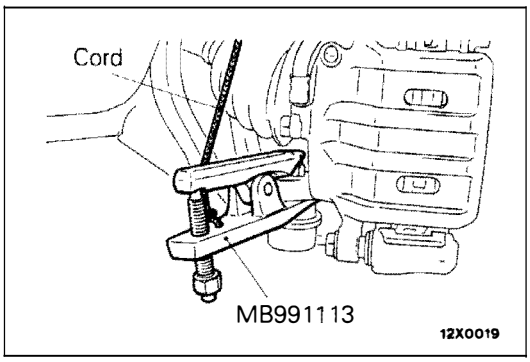
Set the special tool to the vehicle to support the engine assembly.

NOTE
For 6A12 engines, use in conjunction with the special tool (MB991453).



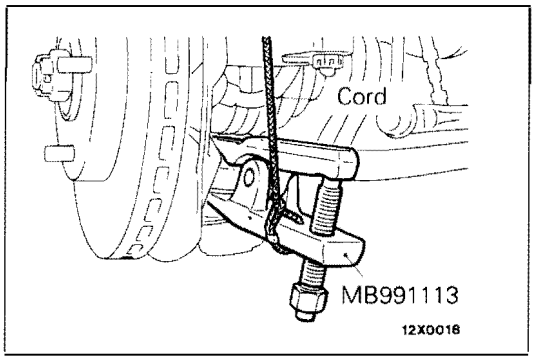
〈D〉 TIE ROD END REMOVAL

Caution
1. **Loosen the nut only, don't remove it from the tie rod end.**
2. **Fix the special tool at the strut, etc. by a cord in order to avoid dropping it.**



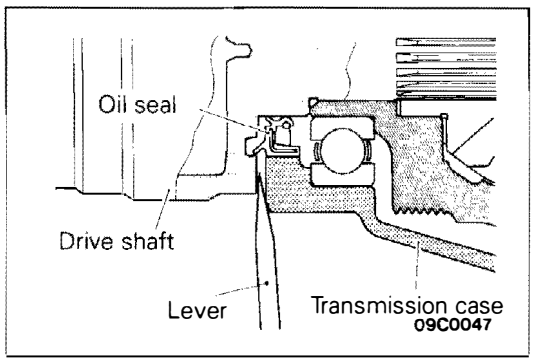
〈E〉 LATERAL LOWER ARM REMOVAL

Caution
1. **Loosen the nut only; do not remove it from the ball joint.**
2. **The special tool should be suspended by a cord to prevent it from coming off.**



◇F◇ COMPRESSION LOWER ARM REMOVAL

Caution
1. **Loosen the nut only, don't remove it from the knuckle.**
2. **Fix the special tool at the strut, etc. by a cord in order to avoid dropping it.**



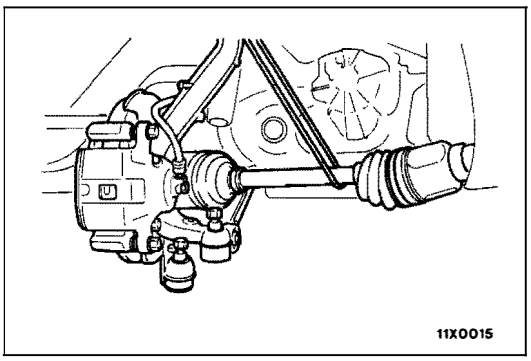
◇G◇ DRIVE SHAFT REMOVAL

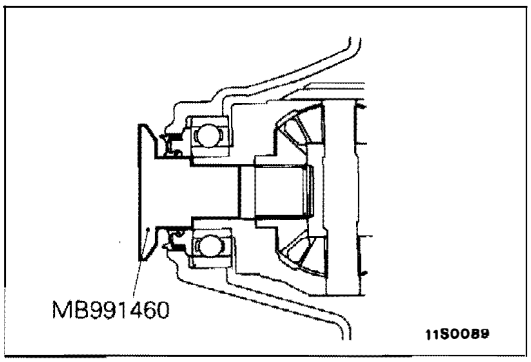
(1) Insert a lever between the transmission case and the drive shaft to remove the drive shaft.

NOTE
The drive shaft should be removed with the hub and knuckle still attached.

Caution
1. **When the drive shaft is removed from the B.J. assembly, there is a danger that the T.J. assembly may be damaged, so always be sure to use a lever.**
2. **Do not insert the lever too far, as it may cause damage to the oil seal.**

(2) Suspend the removed drive shaft with wire so that there are no sharp bends in any of the joints.
(3) Turn the right side of the drive shaft 90? toward the front of the vehicle so that it will not be a hindrance.

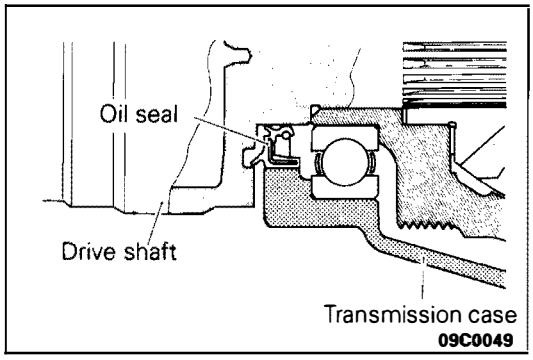


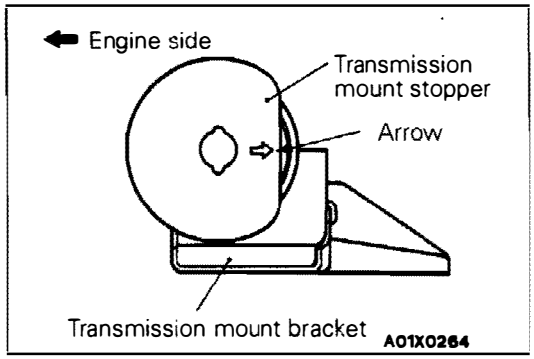


(4) Use the special tool to cover the transmission case to prevent foreign materials from getting into the transmission case.

◇H◇ STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harnesses still connected, and secure it inside the engine compartment.





INSTALLATION SERVICE POINT E22ZH04AB

◗A◖ DRIVE SHAFT INSTALLATION

Provisionally install the drive shaft so that the TJ case of the drive shaft is straight, and not bent relative to the transmission.

Caution
Care must be taken to ensure that the oil seal lip part of the transmission is not damaged by the serrated part of the drive shaft.

◗B◖ TRANSMISSION MOUNT STOPPER INSTALLATION

Clamp the transmission mount stopper so that the arrow points in the direction as shown in the diagram.

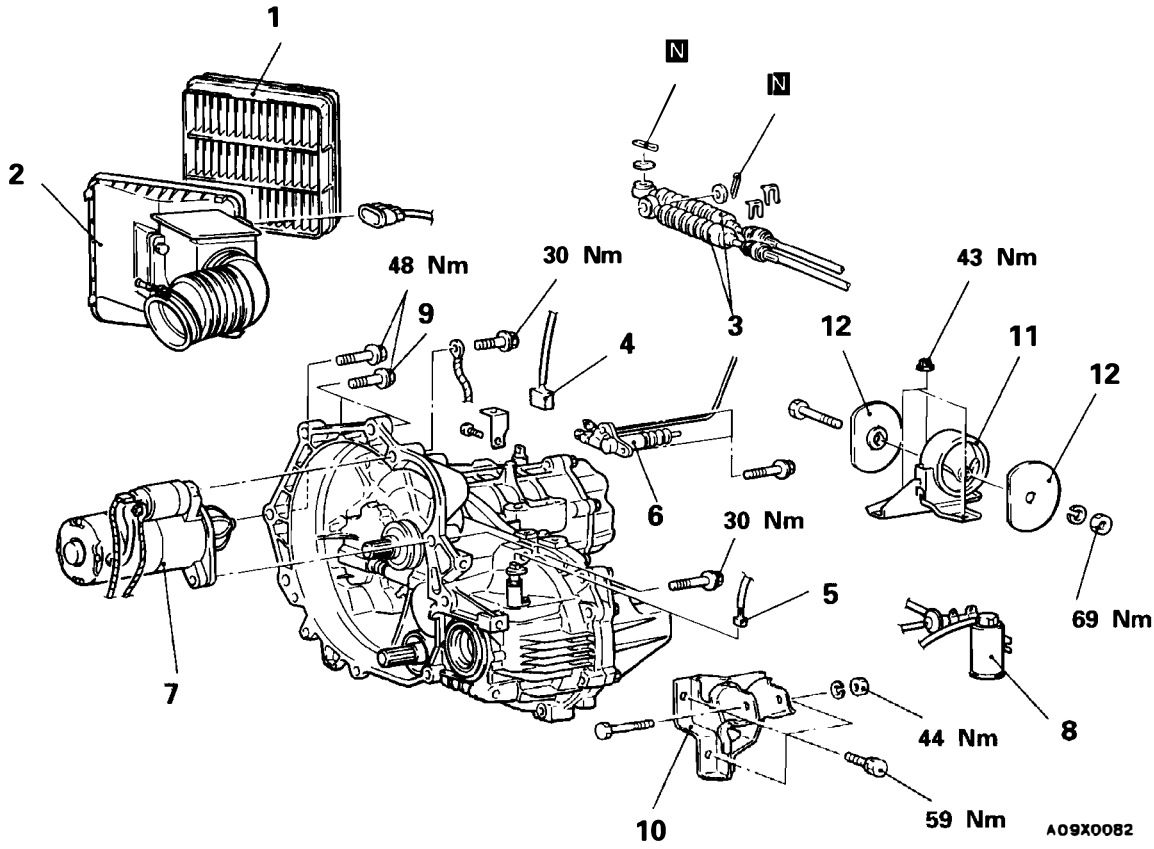
TRANSMISSION ASSEMBLY <VEHICLES WITH INNER SHAFT>

E22ZH10AB

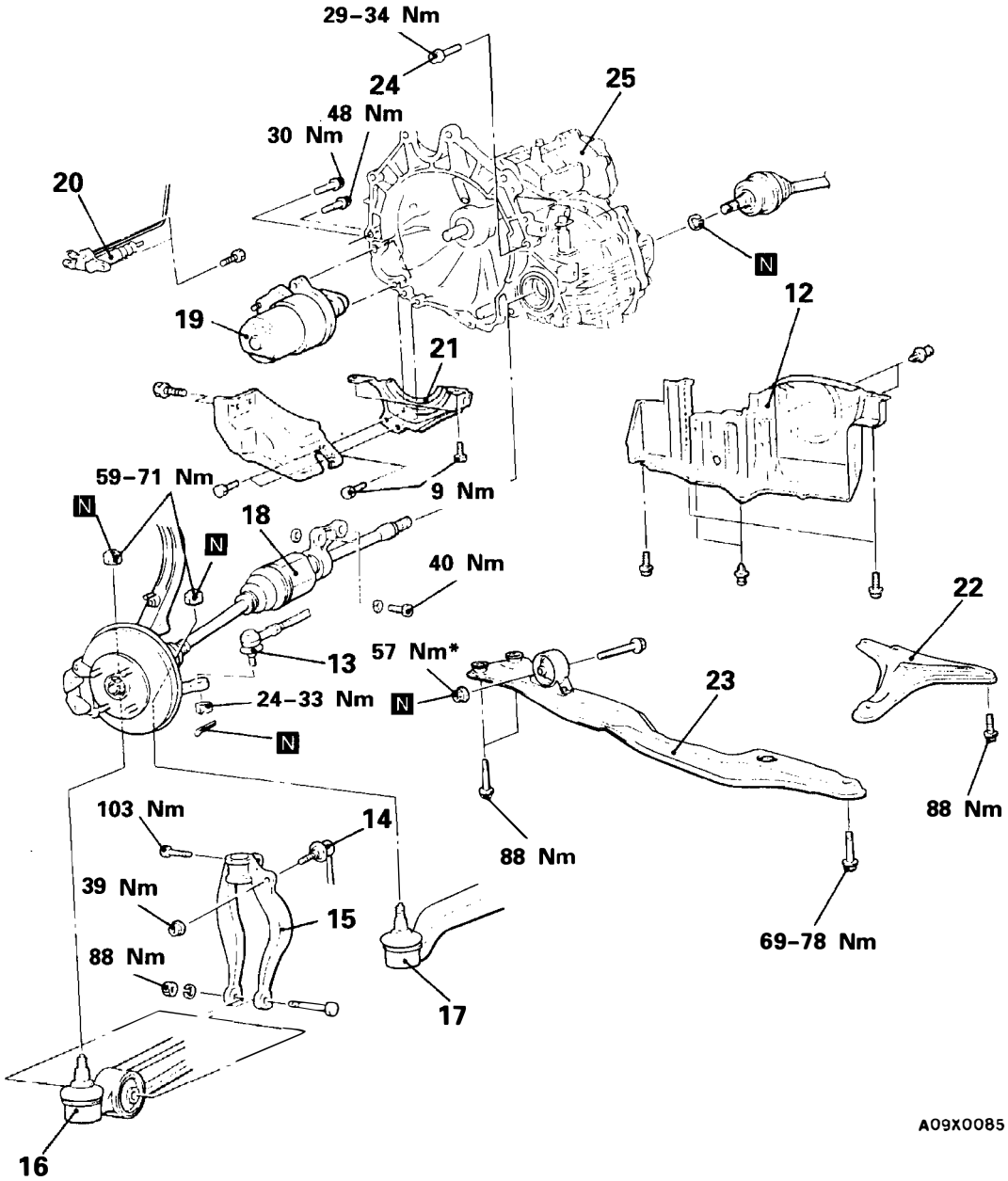
REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Transmission Oil Draining (Refer to P.22-4.)
(2) Front Exhaust Pipe Removal <4WD> (Refer to GROUP 15 – Exhaust Pipe, Muffler)
(3) Transfer Assembly Removal <4WD> (Refer to P.22–19.)

Post-installation Operation
(1) Transmission Oil Supplying (Refer to P.22-4.)
(2) Front Exhaust Pipe Installation <4WD> (Refer to GROUP 15 – Exhaust pipe, Muffler)
(3) Transfer Assembly Installation <4WD> (Refer to P.22-19.)
(4) Shift Lever Operation Check
(5) Speedometer Operation Check



Removal steps
1. Air cleaner element
2. Air cleaner cover and hose assembly
3. Connection for shift cable and select cable
4. Backup lamp switch connector
5. Speedometer connector
〈A〉 6. Connection for clutch release cylinder <6A12, 6G73>
7. Starter motor <4G63>
8. Canister
9. Transmission assembly upper part coupling bolt
10. Rear roll stopper bracket
〈B〉 11. Transmission mount bracket
▶B◀ 12. Transmission mount stopper
〈C〉 ● Supporting engine assembly



Lifting up of the vehicle

12. Under cover (R.H.)
〈D〉 13. Connection for tie rod end
14. Connection for stabilizer link
15. Damper fork
〈E〉 16. Connection for lateral lower arm
〈F〉 17. Connection for compression lower arm
〈G〉 ▶A◀ 18. Connection for drive shaft and inner shaft assembly
〈H〉 19. Starter motor <6A12, 6G73>
〈A〉 20. Connection for clutch release cylinder <4G63>
21. Bell housing cover
22. Stay (R.H.)
23. Center member
24. Transmission assembly lower part coupling bolt
25. Transmission assembly

Caution
Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.

REMOVAL SERVICE POINTS E22ZH11AA

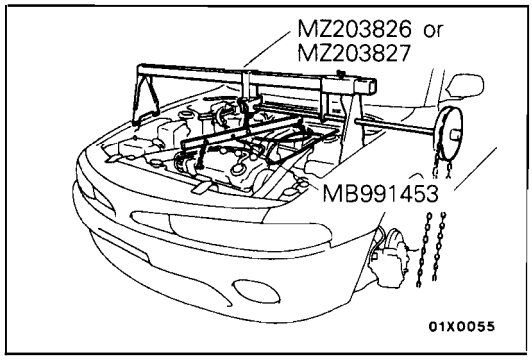
〈A〉 CLUTCH RELEASE CYLINDER REMOVAL

Remove the clutch release cylinder without disconnecting the oil line connection, and fix it to the vehicle chassis.

〈B〉 TRANSMISSION MOUNTING REMOVAL

Jack up the transmission assembly gently with a garage jack, and then remove the transmission mounting.

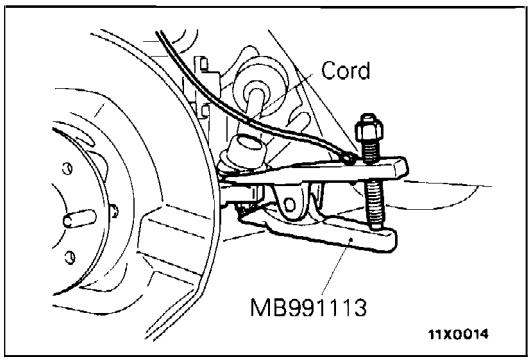
Caution
When jacking up the transmission assembly, support it over a wide area so force is not applied to only one part of it.



〈C〉 ENGINE ASSEMBLY SUPPORTING

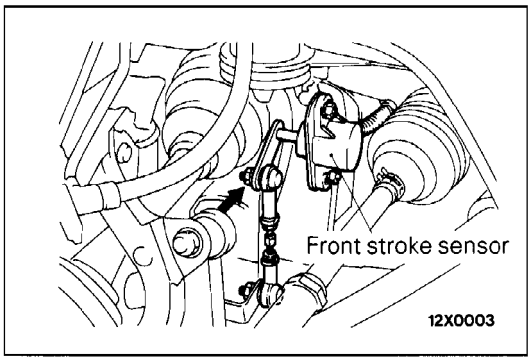
Set the special tool to the vehicle to support the engine assembly.

NOTE
For 6A12 and 6G73 engines, use in conjunction with the special tool (MB991453).



〈D〉 TIE ROD END REMOVAL

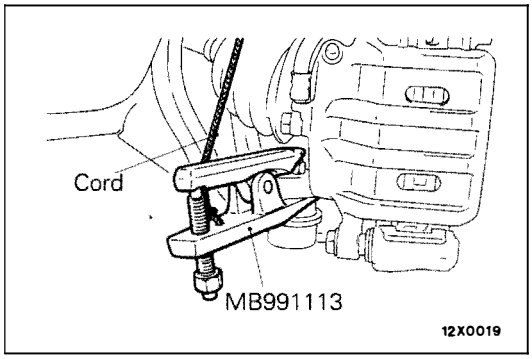
Caution
1. **Loosen the nut only, don't remove it from the tie rod end.**
2. **Fix the special tool at the strut, etc. by a cord in order to avoid dropping it.**



〈E〉 LATERAL LOWER ARM REMOVAL

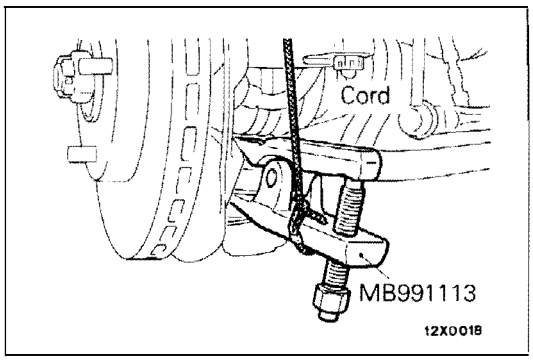
(1) For vehicles with active ECS or ECS, first remove the connection (location indicated by an arrow in the illustration) between the front stroke sensor and sensor-side rod.

Caution
As there is a danger that a malfunction may occur in the front stroke sensor, the lateral lower arm should not be removed with the sensor rod still connected.



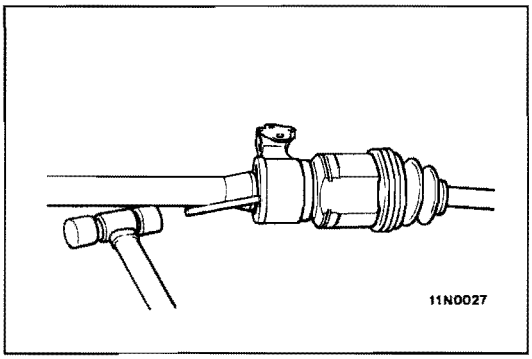
(2) Use the special tool to remove the lateral lower arm from the knuckle.

Caution
1. **Loosen the nut only; do not remove it from the ball joint.**
2. **The special tool should be suspended by a cord to prevent it from coming off.**



◇F◇ COMPRESSION LOWER ARM REMOVAL

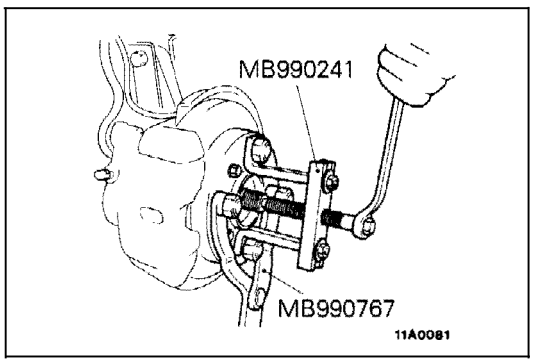
Caution
1. **Loosen the nut only, don't remove it from the knuckle.**
2. **Fix the special tool at the strut, etc. by a cord in order to avoid dropping it.**



◇G◇ DRIVE SHAFT AND INNER SHAFT ASSEMBLY REMOVAL

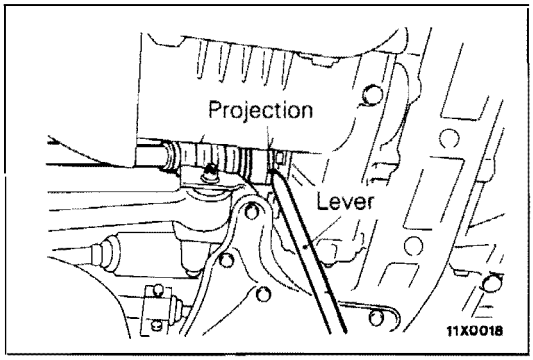
Drive Shaft And Inner Shaft (L.H.)

(1) Lightly tap the center bearing bracket with a plastic hammer or similar tool to remove the inner shaft from the transmission.
(2) Suspend the removed drive shaft with wire so that there are no sharp bends in any of the joints.



Drive Shaft (R.H.)

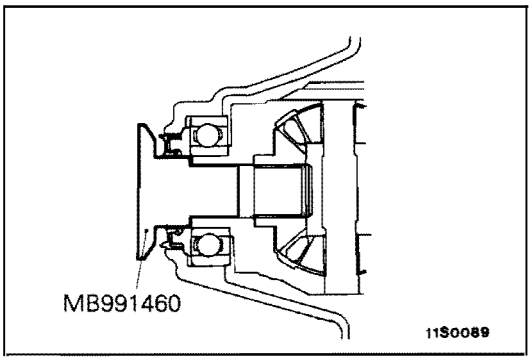
(1) Use the special tool to loosen the drive shaft nut, and remove the drive shaft from the hub.



(2) Set a lever to the projection on the drive shaft, and remove the drive shaft (R.H.) from the transmission.

NOTE
For drive shafts with no projection, refer to P.22-12.

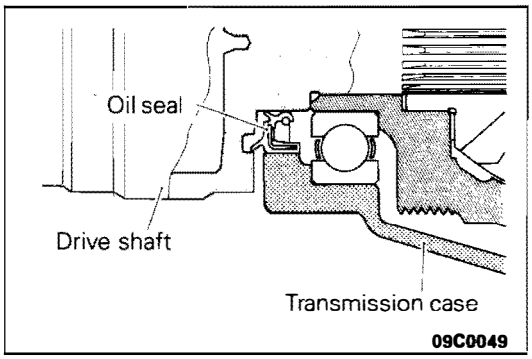
Caution
When the drive shaft is removed from the B.J. assembly side, there is a danger that the T.J. assembly may be damaged, so always be sure to use a lever.



(3) Use the special tool provided as a cover to prevent the entry of foreign objects into the transmission case.

〈H〉 STARTER MOTOR REMOVAL

Remove the starter motor with the starter motor harnesses still connected, and secure it inside the engine compartment.

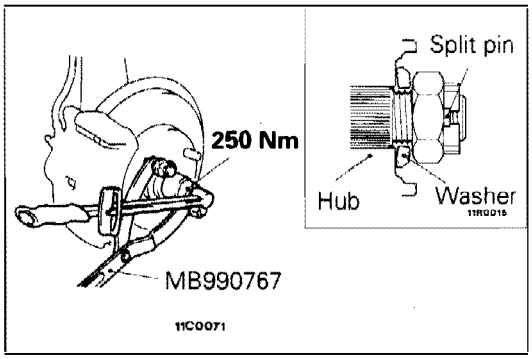


INSTALLATION SERVICE POINT E22ZH14AB

◆A◆ DRIVE SHAFT AND INNER SHAFT ASSEMBLY

(1) Provisionally insert the drive shaft so that the T.J. case and inner shaft are straight toward the transmission.

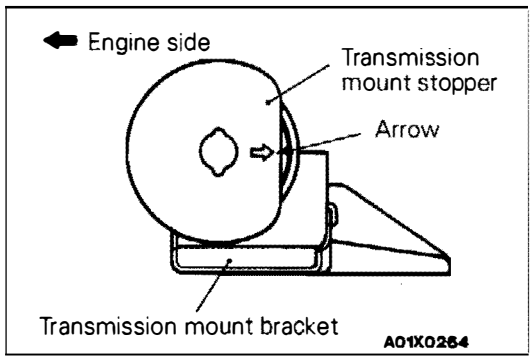
Caution
Care must be taken to ensure that the oil seal lop part of the transmission is not damaged by the serrated part of the drive shaft.



(2) Be sure to install the washer and drive shaft nut in the specified direction.
(3) Using the special tool, tighten the drive shaft nut.

Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

(4) If the position of the split pin holes does not match, tighten the nut up to 250 Nm maximum.
(5) Install the split pin in the first matching holes and bend it securely.



◆B◆ TRANSMISSION MOUNT STOPPER INSTALLATION

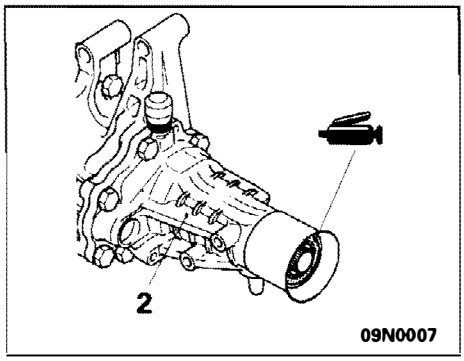
Clamp the transmission mount stopper so that the arrow points in the direction as shown in the diagram.

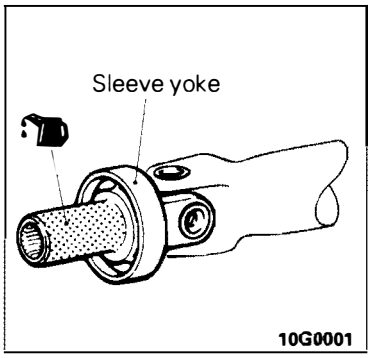
TRANSFER ASSEMBLY

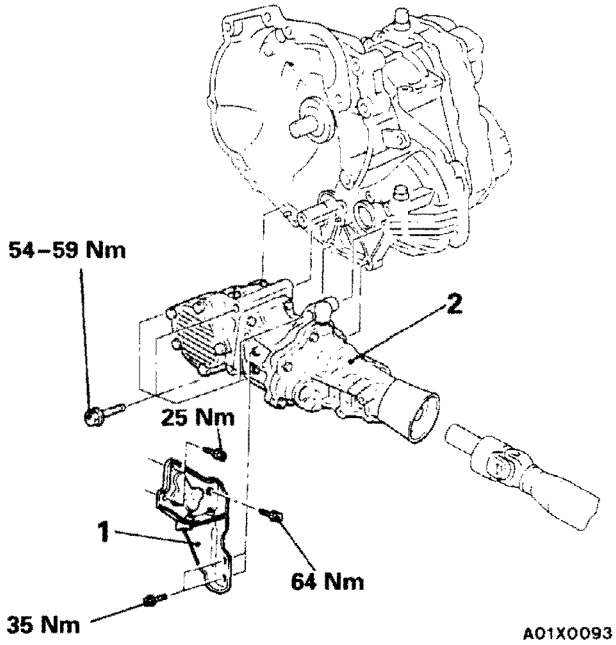
E22ZI00AA

REMOVAL AND INSTALLATION

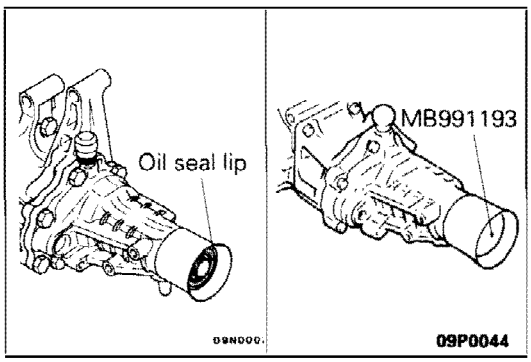
Pre-removal and Post-installation Operation
(1) Transfer Oil Draining and Supplying (Refer to P.22-5.)
(2) Front Exhaust Pipe Removal and Installation (Refer to GROUP 15 – Exhaust Pipe, Muffler)







Removal steps
1. Transfer stay <6G73>
〈A〉 2. Transfer assembly



REMOVAL SERVICE POINTS

E22ZI01AA

〈A〉 TRANSFER ASSEMBLY REMOVAL

Caution
(1) Be careful not to damage the oil seal lip of the transfer.
(2) Use the special tool to cover the transmission case to prevent oil from gushing out or foreign materials from getting into the transmission case.

AUTOMATIC TRANSMISSION

CONTENTS

E23ZA00BB

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 serice personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

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

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

NOTE

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

 Dec. 1993 PWDE9211-B REVISED

GENERAL INFORMATION

E23ZB00AB

The Automatic Transmission Consists of F4A22 and F4A23 Types.

Items	Specifications		
Model	F4A22–2–UPF3	F4A22–2–UQF1	F4A23–2–UPQ*1, F4A23–2–UPF*2 F4A23–2–UPQ1*1, F4A23–2–UPF1*2
Applicable engine	4G93	4G63	6A12
Type	Electronically controlled 4-speed full-automatic	Electronically controlled 4-speed full-automatic	Electronically controlled 4-speed full-automatic
Torque converter			
Type	3-element with damper clutch	3-element with damper clutch	3-element with damper clutch
Engine stall speed	2500–3000 r/min.	2500–3000 r/min.	2500–3000 r/min.
Gear ratio			
1st	2.846	2.846	2.551*1, 2.846*2
2nd	1.581	1.581	1.488*1, 1.581*2
3rd	1.000	1.000	1.000
4th	0.685	0.685	0.685
Reverse	2.176	2.176	2.176
Final gear ratio	4.350	4.350	4.350
Speedometer gear ratio (driven/drive)	29/36	30/36	29/36

NOTE
*1: Up to 1993 models
*2: From 1994 models

SERVICE SPECIFICATIONS

E23ZC00AA

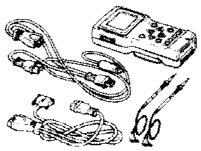
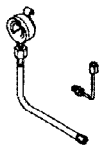
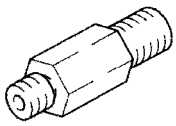
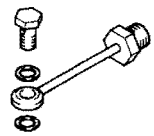
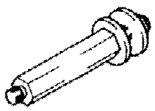
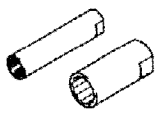
Items		Specifications
Resistance of pulse generators A and B (at 20°C)	Ω	215–275
Resistance of oil temperature sensor (at 0°C)	Ω	16.7–20.5
(at 100°C)	Ω	0.57–0.69
Resistance of damper clutch control solenoid valve coil (at 20°C)	Ω	Approx. 13
Resistance of pressure control solenoid valve coil (at 20°C)	Ω	Approx. 3
Resistance of shift control solenoid valves A and B coils (at 20°C)	Ω	Approx. 22
Line pressure	kPa	870–890
Oil pressure change for each turn of adjustment screw	kPa	38
Reducing pressure	kPa	415–435
Oil pressure change for each turn of adjustment screw	kpa	45
Distance between sleeve and selector lever assembly	mm	15.7–16.4

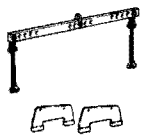
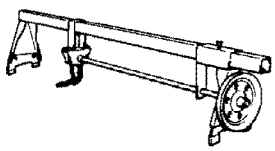
LUBRICANTS

Items	Specified lubricant	Quantity ℓ
Transmission fluid	Dia queen ATF SP or equivalent	6.0

SPECIAL TOOLS

E23ZD00AA

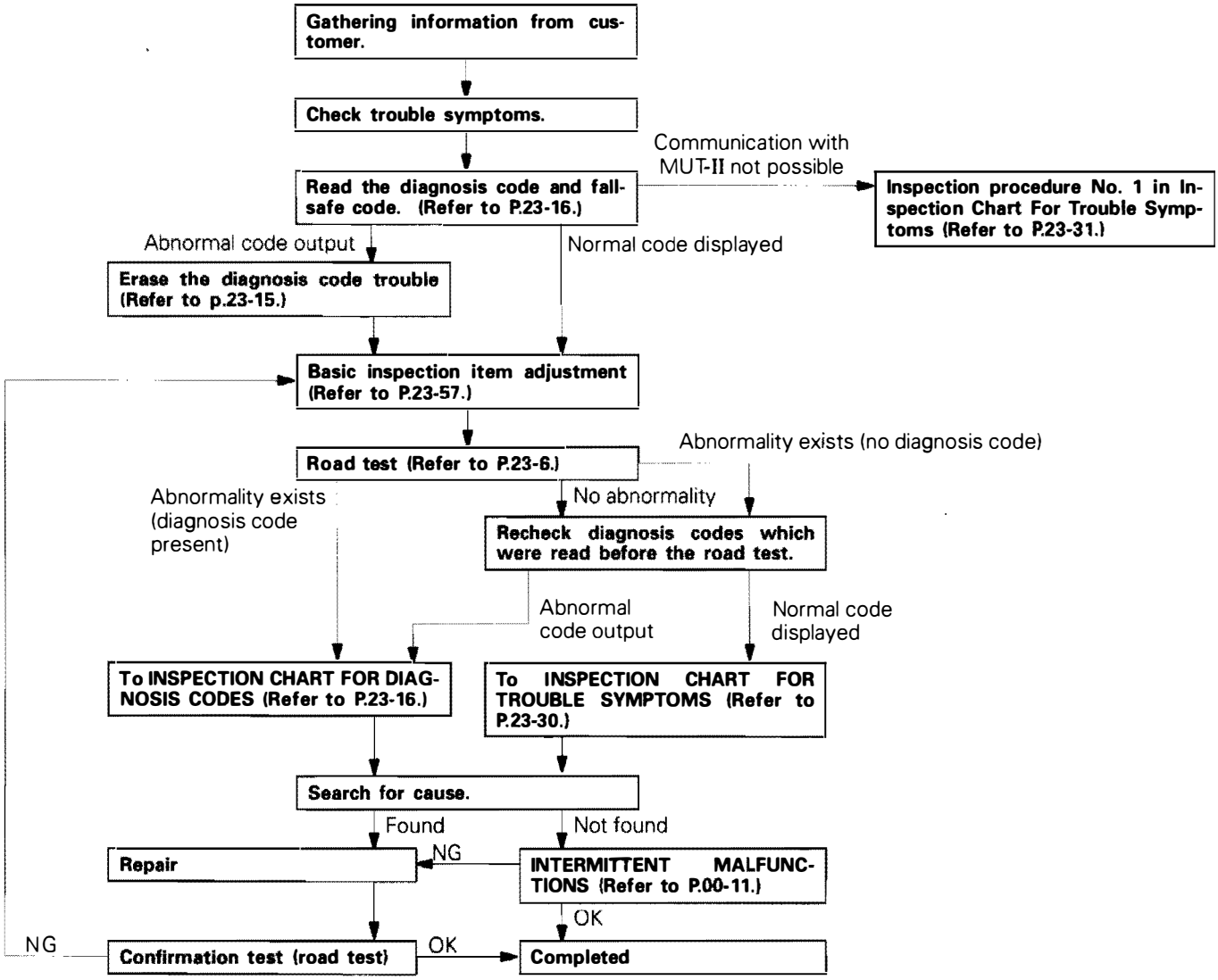
Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	Checking of the diagnosis code, actuator testing, and checking of the service data
		ROM pack	
	MD998330	Oil pressure gauge 3,000 kPa	Measuring oil pressure
	MD998332	Adapter	Connection of the oil pressure gauge
	MD998900	Adapter	Connection of the oil pressure gauge
	MD998915	Kickdown servo wrench adapter	Adjustment of kickdown servo
	MD998916	Kickdown servo adjust wrench set	Adjustment of kickdown servo

Tool	Number	Name	Use
	MD998918	Kickdown servo wrench	Adjustment of kickdown servo
	MD999563	Oil pressure gauge 1,000 kPa	Measuring oil pressure
	MB991113	Steering linkage puller	• Removal of the tie rod end ball joint and knuckle • Removal of the lateral lower arm ball joint and knuckle • Removal of the compression lower arm ball joint and knuckle
	MB991460	Plug	Prevention of entry of foreign objects into the transmission case
	MB991453	Engine hanger assembly	Supporting the engine assembly during removal and installation of the transmission <6A12>
	GENERAL SERVICE TOOL MZ203827	Mechanic hanger, engine	Supporting the engine assembly during removal and installation of the transmission

TROUBLESHOOTING

E23ZE00AA

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



ROAD TEST

E23ZE01AB

☆: Use MUT-II.

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page if there is an abnormality
1	Ignition switch: ON Engine: Stopped	Overdrive switch (1) ON (2) OFF	☆ Data list No. 35 (1) OD (2) OD – OFF	Overdrive switch	Overdrive switch system (P.23-43.)
		Mode selection switch <4G63, 6A12> (1) AUTO (2) HOLD	☆ Data list No. 36 (1) AUTO (2) HOLD	Mode selection switch	Mode selection switch system (P.23-44.)
		Selector lever position (1) P (2) R (3) N (4) D (5) 2 (6) L	☆ Data list No. 37 (1) P, N (2) R (3) P, N (4) D (5) 2 (6) L	Inhibitor switch	Inhibitor switch system (P.23-45.)
		Brake pedal (1) Depressed (2) Released	☆ Data list No. 28 (1) ON (2) OFF	Stop lamp switch <Vehicles without TCL>	Code No. 28 – Stop lamp switch system (P.23-21.)
2	Ignition switch: ST Engine: Stopped	Starting test with lever in P or N range	Starting should be possible	Starting possible or impossible	Starting impossible (P.23-32.)
3	Warming up	Drive for 15 minutes or more so that the automatic transmission fluid temperature becomes 70 – 90°C.	☆ Data list No. 15 Gradually rises to 70 – 90°C	Oil temperature sensor	Code No. 15 – Oil temperature sensor system (P.23-19.)

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page if there is an abnormality
4	Engine: Idling Selector lever position: N	Accelerator pedal (1) Fully closed (2) Depressed (3) Fully open (for at least 2 seconds)	☆ Data list No. 11 (1) 0.4–1.0 V (2) Gradually rises from (1) (2) 4.5–5.5 V	TPS (APS)	Code Nos. 11, 12, 13 – TPS system (P.23-17.) Code Nos. 11, 12, 13, 14 – APS system (P.23-18.)
			☆ Data list No. 25 (1) ON (2) OFF (3) OFF	Idle position switch	Idle position switch system (P.23-46.)
		Selector lever operation (1) N→D shift (2) N→R shift	Should be no abnormal shifting shocks Time lag should be within 2 seconds	Malfunction when starting	Engine stalling during shifting (P.23-35.)
					Shocks when changing from N to D and large time lag (P.23-36.)
					Shocks when changing from N to R and large time lag (P.23-37.)
					Shocks when changing from N to D, N to R and large time lag (P.23-38.)
				Driving impossible	Does not move forward (P.23-33.)
					Does not reverse (P.23-34.)
					Does not move (forward or reverse) (P.23-35.)

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page if there is an abnormality
5	Engine: Idling (vehicle stopped) Selector lever position: D Mode selection <4G63, 6A12>: AUTO	A/C switch (1) ON (2) OFF	☆ Data list No. 26 (1) ON (2) OFF	A/C load signal	A/C load signal system (P.23-47.)
		Accelerator pedal (1) Fully closed (2) Depressed (Driving at Approx. 5 km/h)	☆ Data list No. 45 (1) 55–75 % (2) 90–100 %	Pressure control solenoid valve (PCSV)	Code Nos. 45, 46, 85 – Pressure control solenoid valve system (P.23-26.)
	Engine: Idling (vehicle stopped) Selector lever position: D Mode selection <4G63, 6A12>: AUTO	Accelerator pedal (1) Fully closed (2) Depressed	☆ Data list No. 27 (1) C (2) 1	Shift control solenoid valve A (SCSV-A)	Code Nos. 41, 42, 83 – Shift control solenoid valve A system (P.23-25.)
				Shift control solenoid valve B (SCSV-B)	Code Nos. 43, 44, 84 – Shift control solenoid valve B system (P.23-25.)
			☆ Data list No. 23 (1) 600–900 r/min.	Ignition signal	Code No. 23 – Ignition signal system (P.23-20.)

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page if there is an abnormality
★ 6	Selector lever position: D Mode selection <4G63, 6A12>: AUTO Overdrive : OFF	Engine (1) Idling (vehicle stopped) (2) Driving at 10 km/h (3) Driving at constant speed of 50 km/h (20 seconds or more) (4) Driving at constant speed of 40 km/h with selector lever in 2 range (5) Driving at constant speed of 70 km/h with selector lever in D range	☆ Data list No. 27 (1) C (2) 1 (3) 3 (4) 2	Shift control solenoid valve A (SCSV-A)	Code Nos. 41, 42, 83 – Shift control solenoid valve A system (P.23-25.)
				Shift control solenoid valve B (SCSV-B)	Code Nos. 43, 44, 84 – Shift control solenoid valve B system (P.23-25.)
			☆ Data list No. 21 (1) OFF (2) ON (3) ON (4) OFF	Kickdown servo switch	Code Nos. 21, 22 – Kickdown servo switch system (P.23-20.)
			☆ Data list No. 38 (1) 0 km/h (2) 10 km/h (3) 50 km/h (4) 40 km/h	Vehicle speed sensor	Vehicle speed sensor system (P.23-47.)
			☆ Data list No. 31 (3) 1,800–2,200 r/min.	Pulse generator A (PG-A)	Code Nos. 31, 81 – Pulse generator A system (P.23-24.)
			☆ Data list No. 32 (3) 1,800–2,200 r/min.	Pulse generator B (PG-B)	Code Nos. 32, 82 – Pulse generator B system (P.23-23.)
			☆ Data list No. 47 (3) 100–300 r/min. (5) 0–10 r/min.	Damper clutch control solenoid valve (DCCSV)	Code Nos. 47, 48, 49 – Damper clutch control solenoid valve system (P.23-26.)
			☆ Data list No. 49 (3) 0 % (5) 40–60 %	Damper clutch control solenoid valve (DCCSV)	Code Nos. 47, 48, 49 – Damper clutch control solenoid valve system (P.23-26.)
			For (3) and (5), acceleration should be smooth with no abnormal vibration.	Malfunction while driving	Poor acceleration (P.23-42.) Vibration (P.23-42.)

NOTE
Tests marked with ★ should be carried out on a road that is as straight and level as possible.

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page if there is an abnormality
★ 7	Selector lever position: D Mode selection <4G63, 6A12>: AUTO Overdrive : ON	Engine (1) Driving at constant speed of 50 km/h (20 seconds or more)	☆ Data list No. 27 (1) 4	Shift control solenoid valve A (SCSV-A)	Code Nos. 41, 42, 83 – Shift control solenoid valve A system (P.23-25.)
				Shift control solenoid valve B (SCSV-B)	Code Nos. 43, 44, 84 – Shift control solenoid valve B system (P.23-25.)
			☆ Data list No. 31 (1) 1,200–1,500 r/min.	Pulse generator A (PG-A)	Code Nos. 31, 81 – Pulse generator A system (P.23-22.)
			☆ Data list No. 32 (1) 1,800–2,200 r/min.	Pulse generator B (PG-B)	Code Nos. 32, 82 – Pulse generator B system (P.23-23.)

NOTE
Tests marked with ★ should be carried out on a road that is as straight and level as possible.

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page if there is an abnormality
★ 8	Selector lever position: D Mode selection <4G63, 6A12>: AUTO Overdrive : ON	Monitor MUT-II data list Nos. 27 and 32. (1) Accelerate to 4 range at TPS output of 1.5 V (opening angle 30%). (2) Slowly decelerate to a standstill. (3) Accelerate to 4 range at TPS output of 2.5 V (opening angle 50%). (4) At 50 km/h in 4 range, turn overdrive OFF. (5) At 50 km/h in 3 range, move selector lever to 2 range. (6) At 20 km/h in 2 range, move selector lever to L range.	For (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 be made immediately after operation.	Malfunction when shifting	Shocks and running up (P.23-39.)
				Displaced shifting points	All points (P.23-40.)
					Some points (P.23-41.)
				Does not shift	No fail-safe codes (P.23-41.)
					Code Nos. 31, 81 – Pulse generator A system (P.23-22.)
					Code Nos. 32, 82 – Pulse generator B system (P.23-23.)
					Code Nos. 41, 42, 83 – Shift control solenoid valve A system (P.23-25.)
					Code Nos. 43, 44, 84 – Shift control solenoid valve B system (P.23-25.)
					Code Nos. 45, 46, 85 – Pressure control solenoid valve system (P.23-26.)
					Code Nos. 51, 52, 53, 54, 86 – Incorrect gear ratio (P.23-27, 28.)

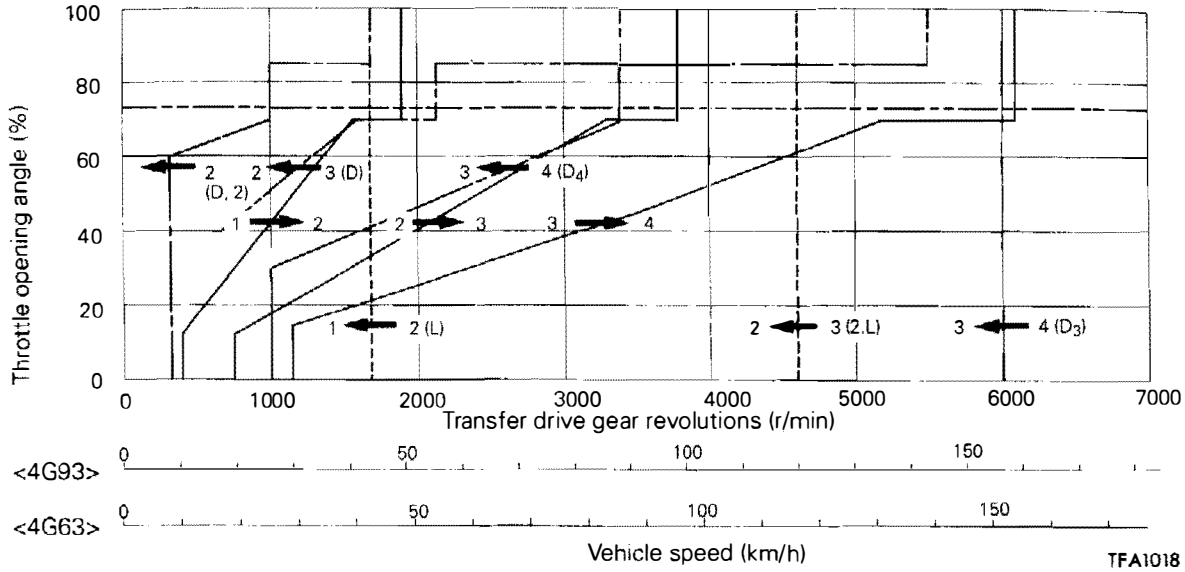
NOTE
Tests marked with ★ should be carried out on a road that is as straight and level as possible.

Procedure	Conditions	Operation	Judgement value	Inspection item	Inspection procedure page if there is an abnormality
9	Selector lever position: D <4G63, 6A12>: HOLD Overdrive : ON	Monitor MUT-II data list Nos. 27 and 32. (1) Accelerate to 4 range at TPS output of 1.5 V (opening angle 30%). (2) Slowly decelerate to a standstill. (3) Accelerate to 4 range at TPS output of 2.5 V (opening angle 50%). (4) At 50 km/h in 4 range, turn overdrive OFF. (5) At 50 km/h in 3 range, move selector lever to 2 range. (6) At 20 km/h in 2 range, move selector lever to L range.	For (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 be made immediately after operation.	Malfunction when shifting	Shocks and running up (P.23-39.)
				Displaced shifting points	All points (P.23-40.)
					Some points (P.23-41.)
				Does not shift	No fail-safe codes (P.23-41.)
					Code Nos. 31, 81 – Pulse generator A system (P.23-22.)
					Code Nos. 32, 82 – Pulse generator B system (P.23-23.)
					Code Nos. 41, 42, 83 – Shift control solenoid valve A system (P.23-25.)
					Code Nos. 43, 44, 84 – Shift control solenoid valve B system (P.23-25.)
					Code Nos. 45, 46, 85 – Pressure control solenoid valve system (P.23-26.)
					Code Nos. 51, 52, 53, 54, 86 – Incorrect gear ratio (P.23-27, 28.)

SHIFT PATTERN

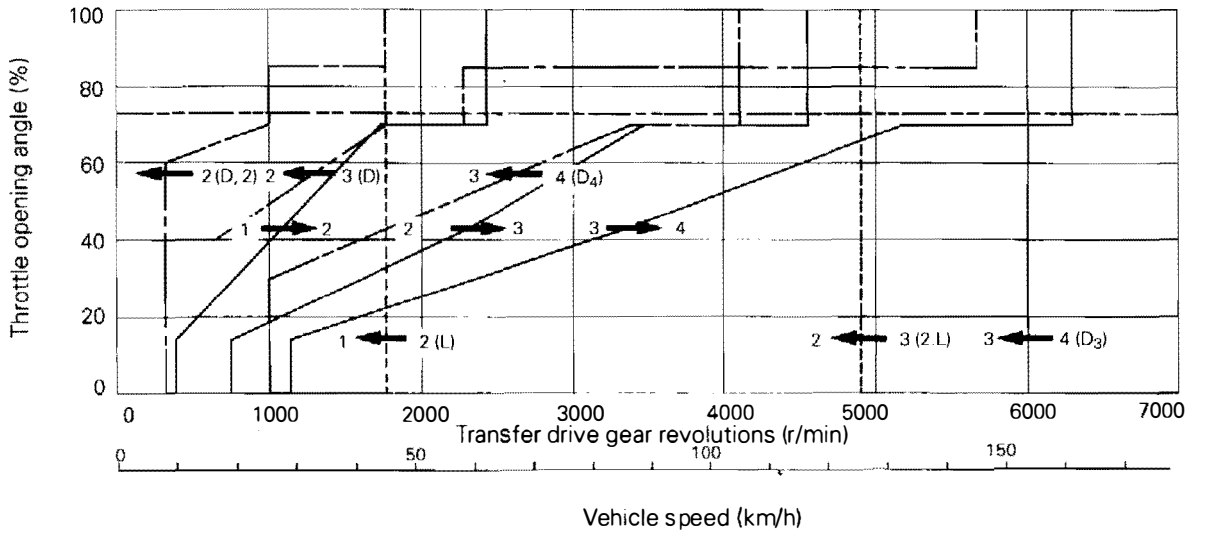
E23ZE02AB

<4G93, 4G63>



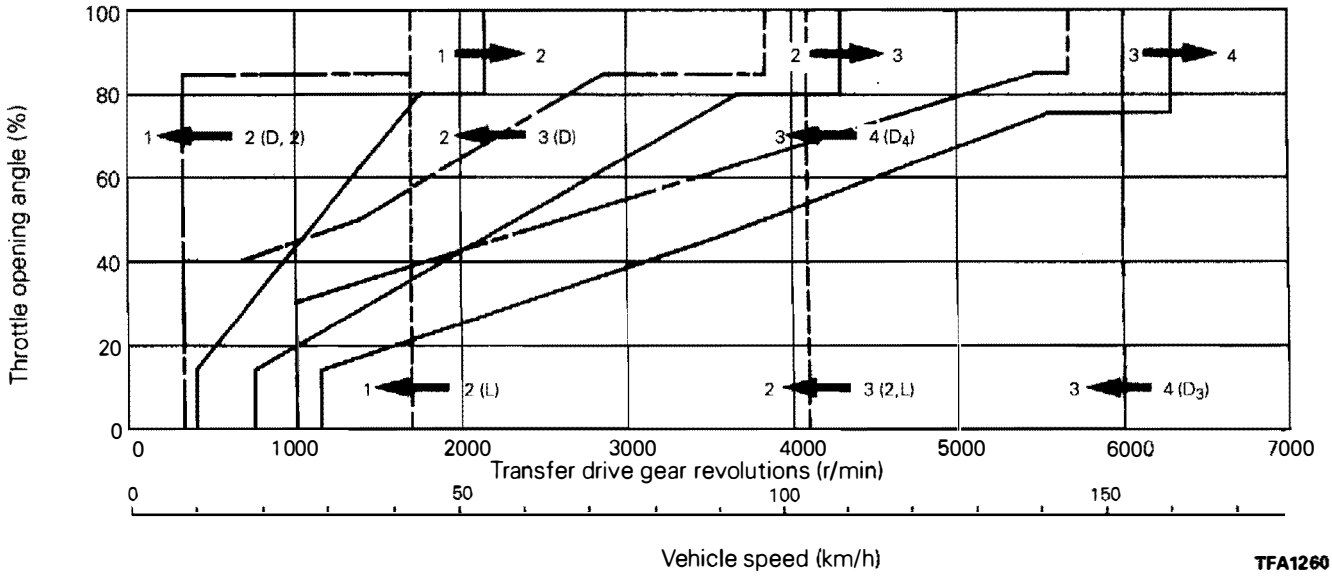
TFA1018

<6A12–Up to 1993 models>



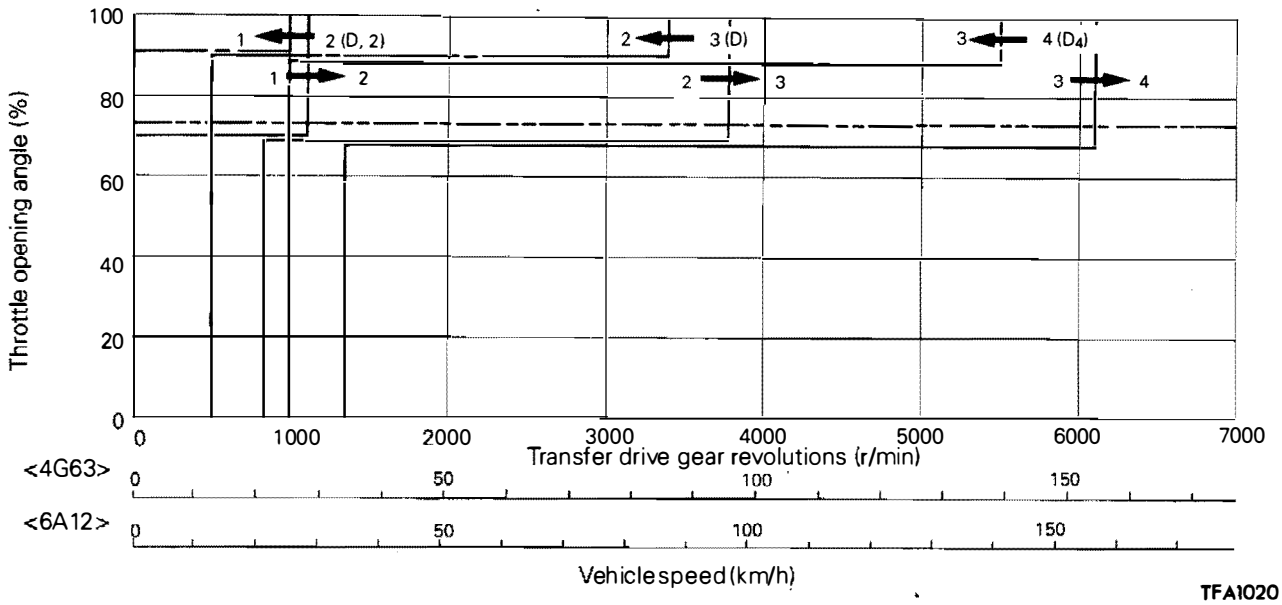
TFA1019

<6A12–From 1994 models>

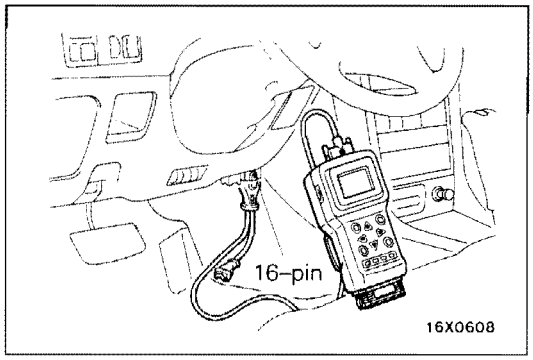


TFA1260

HOLD range <4G63, 6A12 only>



TFA1020



DIAGNOSIS FUNCTION

E23ZE03AA

METHOD OF READING THE DIAGNOSTIC TROUBLE CODES

When using the MUT-II
Connect the MUT-II to the diagnosis connector (16-pin) at the lower of the instrument under cover, and then read the diagnostic trouble codes.

Caution

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

HOW TO ERASE THE DIAGNOSIS CODES

E23ZE03BA

When using the MUT-II

1. Turn the ignition switch to OFF and then back to ON again.
2. Erase the malfunction codes.
3. Check to be sure that everything is normal.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

E23ZE04AA

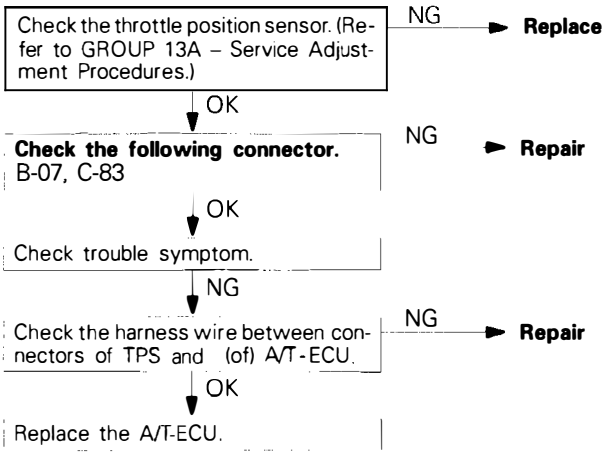
Code	Diagnostic item			Reference page
11	Throttle position sensor (accelerator pedal position sensor) system		Excessive output	P.23-17 P.23-18
12	Throttle position sensor (accelerator pedal position sensor) system		Insufficient output	P.23-17 P.23-18
13	Throttle position sensor (accelerator pedal position sensor) system		Defective sensor	P.23-17 P.23-18
14	Throttle position sensor (accelerator pedal position sensor) system		Defective sensor adjustment	P.23-18
15	Oil temperature sensor system		Open circuit	P.23-19
21	Kickdown servo switch system		Open circuit	P.23-20
22	Kickdown servo switch system		Short circuit	P.23-20
23	Ignition signal system		Open circuit	P.23-20
28	Stop lamp switch system <Vehicles without TCL>		Short circuit	P.23-21
31	Pulse generator A (PG-A) system		Open circuit	P.23-22
32	Pulse generator B (PG-B) system		Open circuit	P.23-23
34	Wide open throttle switch system		Short circuit	P.23-24
41	Shift control solenoid valve A (SCSV-A) system		Open circuit	P.23-25
42	Shift control solenoid valve A (SCSV-A) system		Short circuit	P.23-25
43	Shift control solenoid valve B (SCSV-B) system		Open circuit	P.23-25
44	Shift control solenoid valve B (SCSV-B) system		Short circuit	P.23-25
45	Pressure control solenoid valve (PCSV) system		Open circuit	P.23-26
46	Pressure control solenoid valve (PCSV) system		Short circuit	P.23-26
47	Damper clutch control solenoid valve (DCCSV) system		Open circuit	P.23-26
48	Damper clutch control solenoid valve (DCCSV) system		Short circuit	P.23-26
49	Damper clutch control solenoid valve (DCCSV) system		Defective system	P.23-26
51	1st gear incorrect ratio			P.23-27
52	2nd gear incorrect ratio			P.23-28
53	3rd gear incorrect ratio			P.23-28
54	4th gear incorrect ratio			P.23-28
61	Torque reduction request signal line system	<4G63, 6A12>	Short circuit	P.23-29
	Torque reduction execution signal line system	<4G63, 6A12>	Open circuit	
62	Torque reduction execution signal line system	<4G63, 6A12>	Open circuit	P.23-29

Code	Diagnostic item		Reference page
63	Torque reduction execution signal line system <4G63, 6A12>	Short circuit	P.23-29
65	TCL – A/T communication signal line system <Vehicles with TCL>		P.23-29

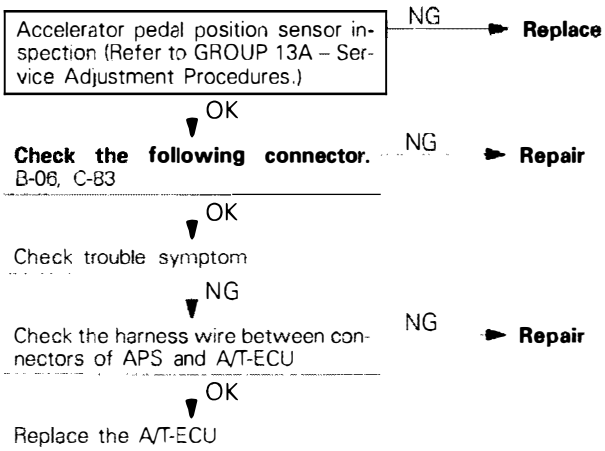
INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

E23ZE06AA

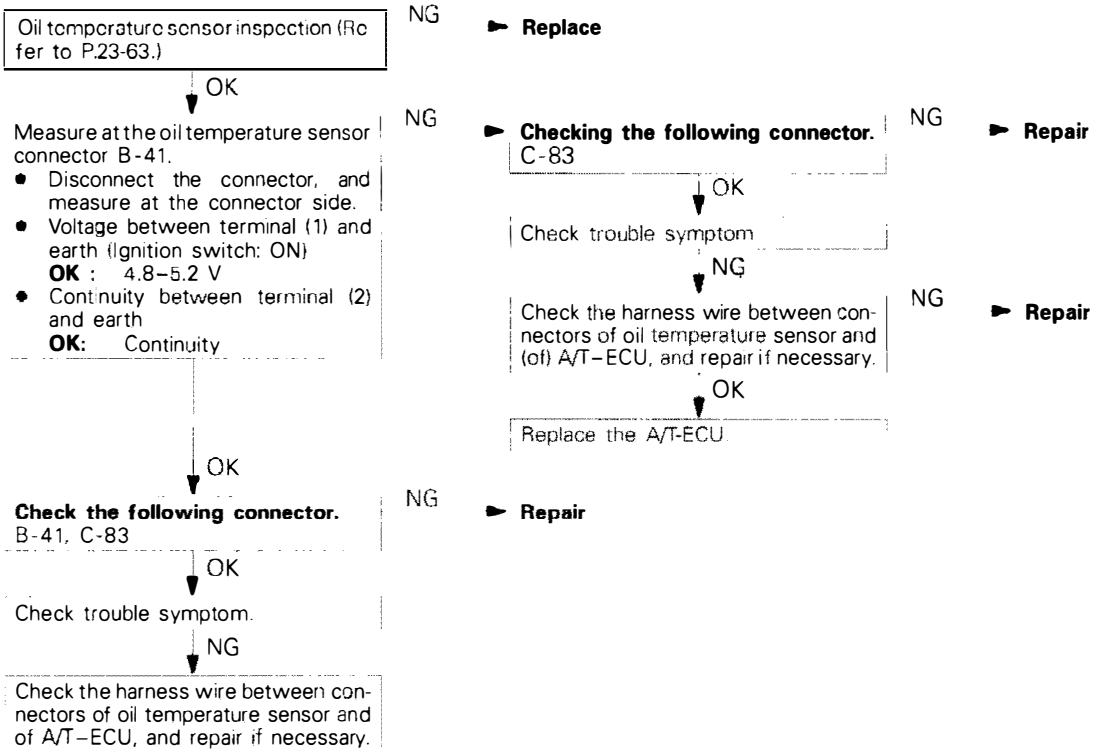
Code No. 11, 12, 13, 14	Throttle position sensor system <Vehicles without TCL>	Probable cause
[Comment]	If the TPS output during idling becomes 4.8 V or more, TPS output is excessive, and diagnosis code No. 11 is output. If the TPS output becomes 0.2 V or less at times other than idling, TPS output is insufficient and diagnosis code No. 12 is output. If the TPS output and the target value inside the A/T-ECU do not match even after compensation is carried out while the engine is idling, the TPS sensor is defective and diagnosis code No. 13 is output. If the TPS voltage becomes 0.2 V or less or 1.2 V or more while the engine is idling, the TPS adjustment is defective and diagnosis code No. 14 is output.	• Malfunction of the throttle position sensor • Malfunction of connector • Malfunction of A/T-ECU



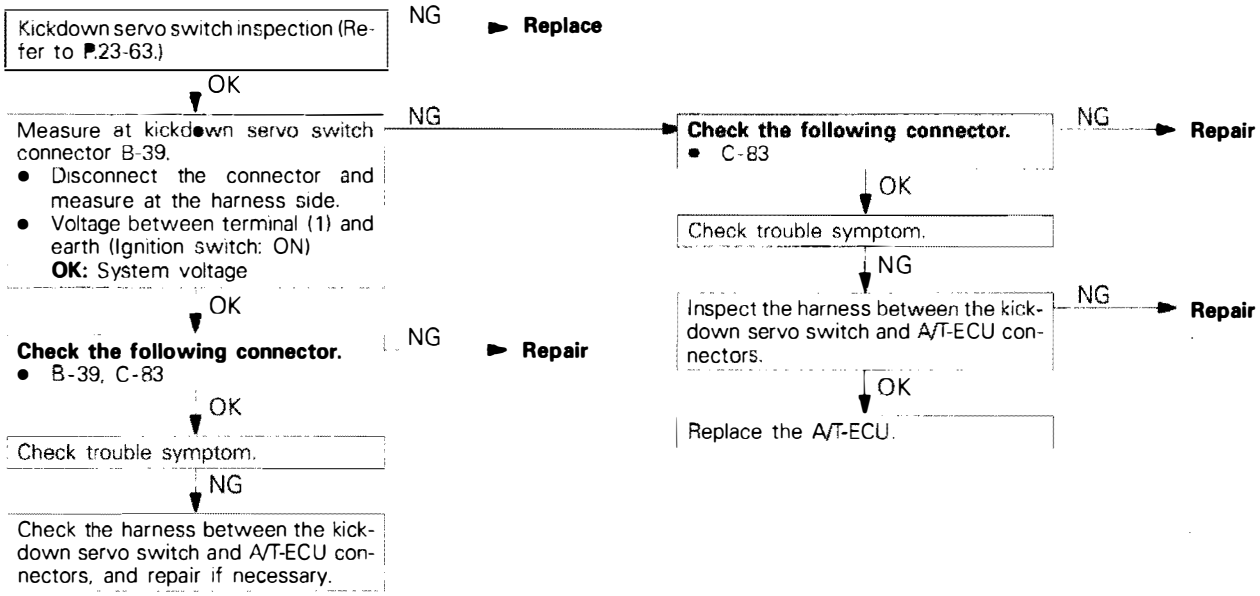
Code No. 11, 12, 13, 14	Accelerator pedal position sensor system <Vehicles with TCL>	Probable cause
[Comment]	If the APS output during idling becomes 4.8 V or more, APS output is excessive, and diagnosis code No. 11 is output. If the APS output becomes 0.2 V or less at times other than idling, APS output is insufficient and diagnosis code No. 12 is output. If the APS output and the target value inside the A/T-ECU do not match even after compensation is carried out while the engine is idling, the APS sensor is defective and diagnosis code No. 13 is output. If the APS voltage becomes 0.2 V or less or 1.2 V or more while the engine is idling, the APS adjustment is defective and diagnosis code No. 14 is output.	• Malfunction of accelerator pedal position sensor • Malfunction of connector • Malfunction of A/T-ECU



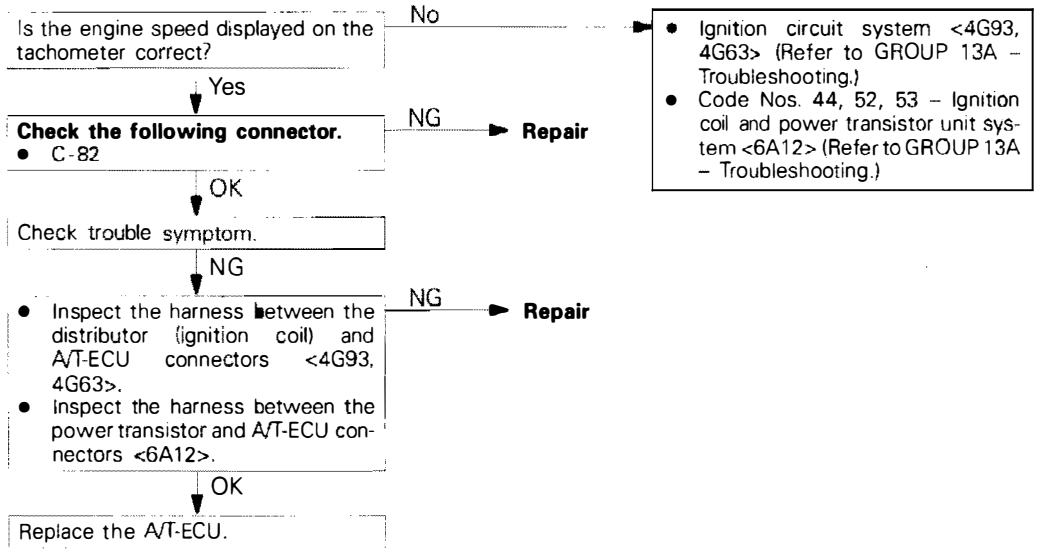
Code No. 15	Oil temperature sensor system	Probable cause
[Comment]	If the oil temperature sensor output is 4.4 V or higher (oil temperature does not increase) even after driving for 10 minutes or more, there is an open circuit in the oil temperature sensor and diagnosis code No. 15 is output.	• Malfunction of oil temperature sensor • Malfunction of connector • Malfunction of A/T-ECU



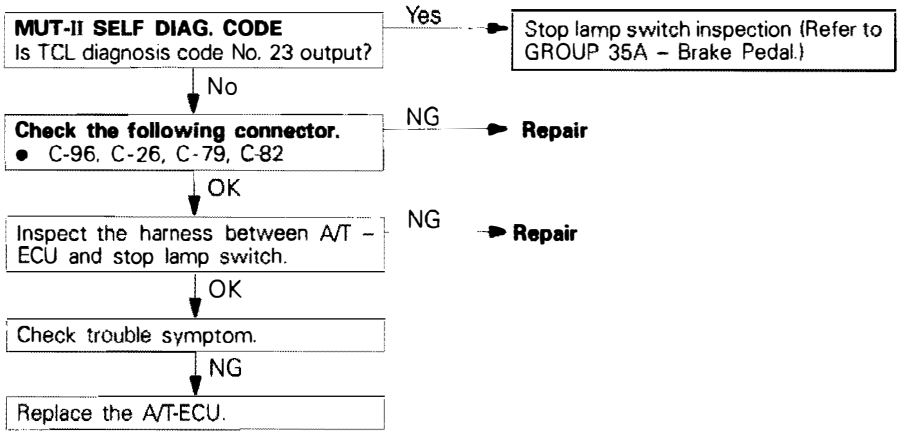
Code No. 21, 22	Kickdown servo switch system	Probable cause
[Comment]	If the kickdown servo switch does not turn ON in 1 and 3 range, there is an open circuit in the kickdown servo switch and diagnosis code No. 21 is output. If the kickdown servo switch does not turn OFF in 2 and 4 range, there is a short circuit in the kickdown servo switch and diagnosis code No. 22 is output.	• Malfunction of kickdown servo switch • Malfunction of connector • Malfunction of A/T-ECU



Code No. 23	Ignition signal system	Probable cause
[Comment]	If ignition pulses are not input to the A/T-ECU while the engine is idling, there is an open circuit in the ignition signal line and diagnosis code No. 23 is output.	• Malfunction of ignition coil • Malfunction of power transistor • Malfunction of connector • Malfunction of A/T-ECU

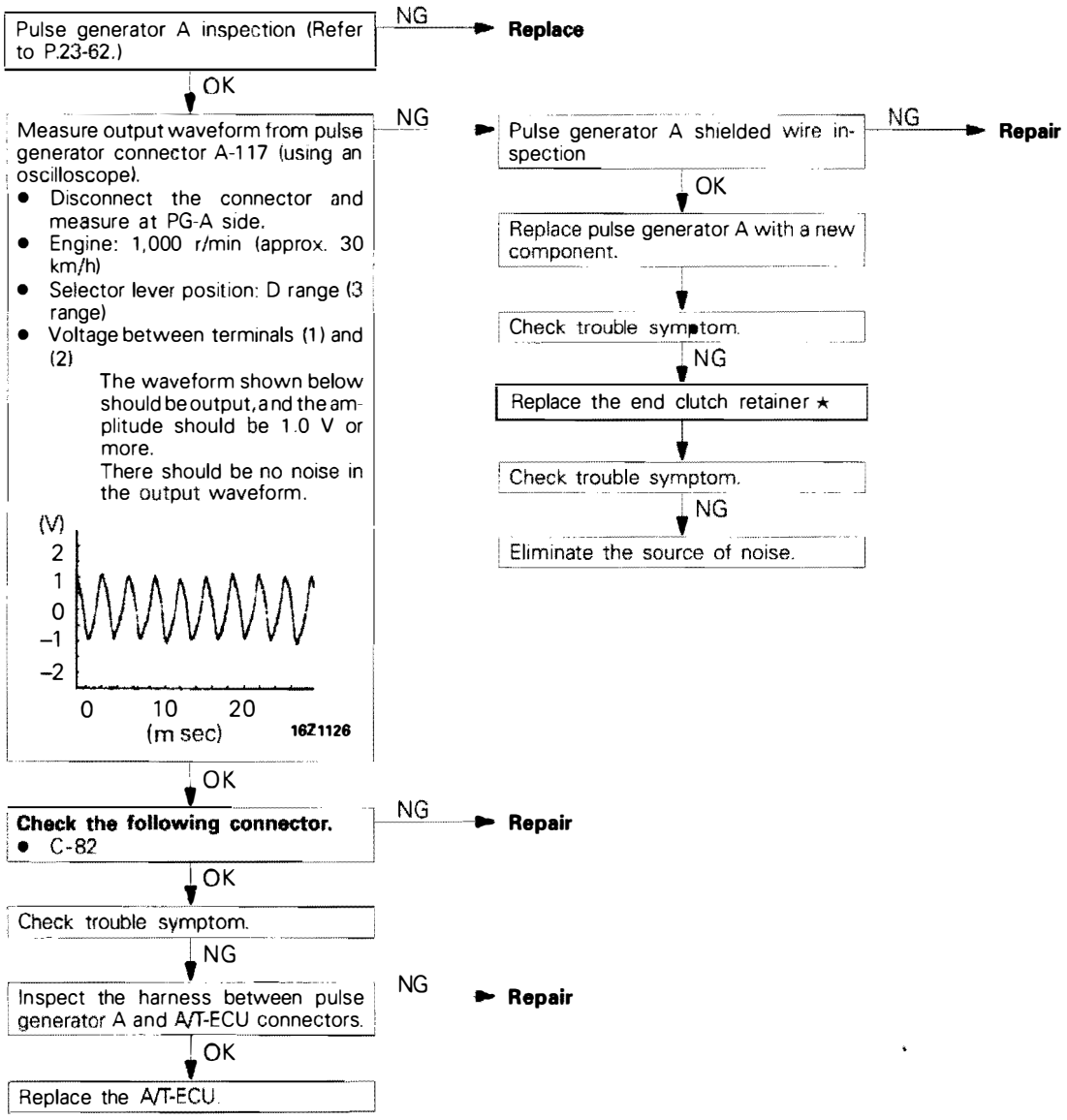


Code No. 28	Stop lamp switch system <Vehicles without TCL>	Probable cause
[Comment]	If the stop lamp switch is ON for 15 minutes or more while driving at 3 km/h or more, there is a short circuit in the stop lamp switch and diagnosis code No. 28 is output.	• Malfunction of stop lamp switch • Malfunction of connector • Malfunction of A/T-ECU



Code No. 31, 81	Pulse generator A system	Probable cause
[Comment]	If there is no pulse generator A output at vehicle speeds of 43 km/h or above, there is an open circuit in pulse generator A and diagnosis code No. 31 is output. In addition, if diagnosis code No. 31 is output 4 times, there is an open circuit in pulse generator A, fail-safe code No. 81 is output and the vehicle is locked in 3 range (D) or 2 range (2, L) as a fail-safe measure.	• Malfunction of pulse generator A • Malfunction of connector • Malfunction of end clutch retainer • Malfunction of A/T-ECU • Noise generated

★: Refer to the Transmission Workshop Manual.



Code No. 32, 82	Pulse generator B system	Probable cause
[Comment]	If pulse generator B output and vehicle speed sensor vary by 30% or more at vehicle speeds of 43 km/h or above, there is an open circuit in pulse generator B and diagnosis code No. 32 is output. In addition, if diagnosis code No. 32 is output 4 times, there is an open circuit in pulse generator B, fail-safe code No. 82 is output and the vehicle is locked in 3 range (D) or 2 range (2, L) as a fail-safe measure.	• Malfunction of pulse generator B • Malfunction of connector • Malfunction of transfer driven gear • Malfunction of A/T-ECU • Noise generated

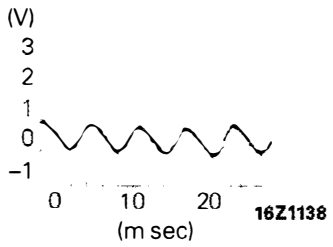
★: Refer to the Transmission Workshop Manual.

Pulse generator B inspection (Refer to P.23-62.)
NG ► **Replace**
OK

Measure output waveform from pulse generator connector A-117 (using an oscilloscope).
- Disconnect the connector and measure at PG-B side.
- Engine: 1,000 r/min (approx. 30 km/h)
- Selector lever position: D range (3 range)
- Voltage between terminals (3) and (4)

The waveform shown below should be output, and the amplitude should be 0.5 V or more.
There should be no noise in the output waveform.

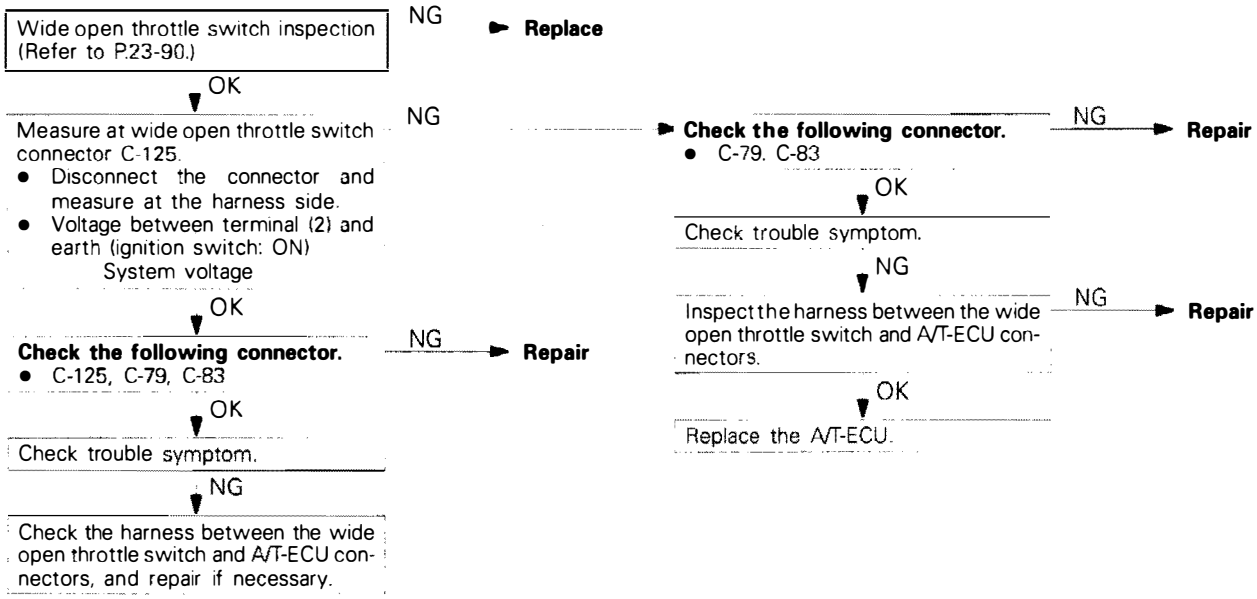
NG ► Pulse generator B shielded wire inspection
NG ► **Repair**
OK
Replace pulse generator B with a new component.
Check trouble symptom.
NG
Replace the transfer driven gear ★
Check trouble symptom.
NG
Eliminate the source of noise.



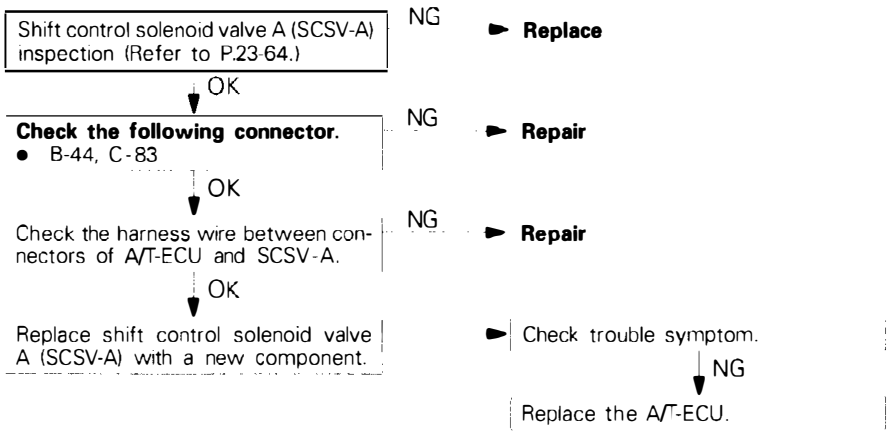
OK
Check the following connector.
- C-82

NG ► **Repair**
OK
Check trouble symptom.
NG
Inspect the harness between pulse generator B and A/T-ECU connectors.
NG ► **Repair**
OK
Replace the A/T-ECU.

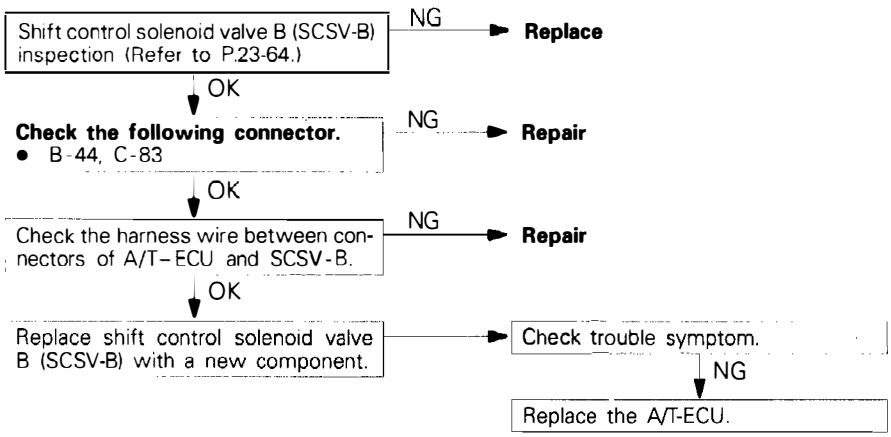
Code No. 34	Wide open throttle switch system	Probable cause
[Comment]	If the wide open throttle switch does not turn OFF when the accelerator pedal is not depressed, there is a short circuit in the wide open throttle switch and diagnosis code No. 34 is output.	• Malfunction of wide open throttle switch • Malfunction of connector • Malfunction of A/T-ECU



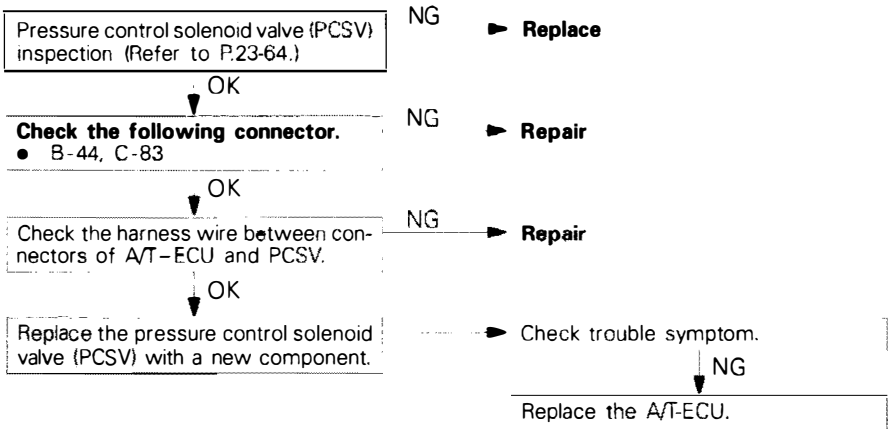
Code No.	Shift control solenoid valve A (SCSV-A) system	Probable cause
41, 42, 83		
[Comment]	If the resistance value of shift control solenoid valve A is large, there is an open circuit in shift control solenoid valve A and diagnosis code No. 41 is output. If the resistance value is small, there is a short circuit in shift control solenoid valve A and diagnosis code No. 42 is output. In addition, if diagnosis code No. 41 or 42 is output 4 times, there is an open or short circuit in shift control solenoid valve A, fail-safe code No. 83 is output and the vehicle is locked in 3 range (D) as a fail-safe measure.	• Malfunction of shift control solenoid valve A • Malfunction of connector • Malfunction of A/T-ECU



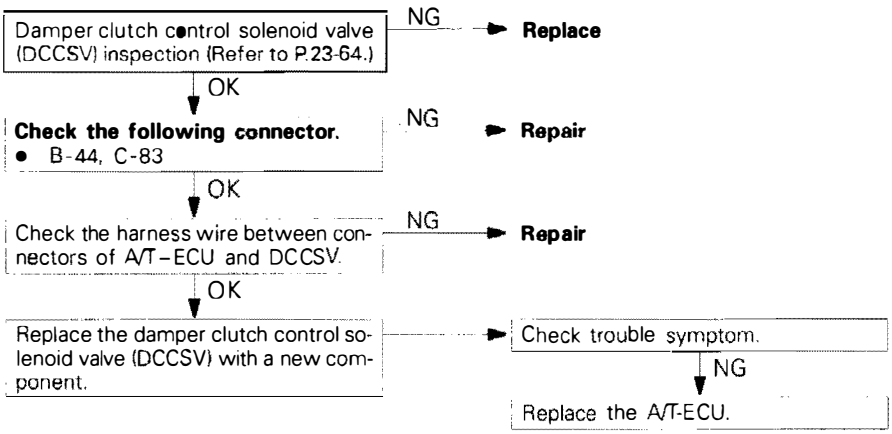
Code No.	Shift control solenoid valve B (SCSV-B) system	Probable cause
43, 44, 84		
[Comment]	If the resistance value of shift control solenoid valve B is large, there is an open circuit in shift control solenoid valve B and diagnosis code No. 43 is output. If the resistance value is small, there is a short circuit in shift control solenoid valve B and diagnosis code No. 44 is output. In addition, if diagnosis code No. 43 or 44 is output 4 times, there is an open or short circuit in shift control solenoid valve B, fail-safe code No. 84 is output and the vehicle is locked in 3 range (D) as a fail-safe measure.	• Malfunction of shift control solenoid valve B • Malfunction of connector • Malfunction of A/T-ECU



Code No. 45, 46, 85	Pressure control solenoid valve (PCSV) system	Probable cause
[Comment]	If the resistance value of the pressure control solenoid valve is large, there is an open circuit in the pressure control solenoid valve and diagnosis code No. 45 is output. If the resistance value is small, there is a short circuit in the pressure control solenoid valve and diagnosis code No. 46 is output. In addition, if diagnosis code No. 45 or 46 is output 4 times, there is an open or short circuit in the pressure control solenoid valve, fail-safe code No. 85 is output and the vehicle is locked in 3 range (D) or 2 range (2, L) as a fail-safe measure.	• Malfunction of pressure control solenoid valve • Malfunction of connector • Malfunction of A/T-ECU



Code No. 47, 48, 49	Damper clutch control solenoid valve (DCCSV) system	Probable cause
[Comment]	If the resistance value of the damper clutch control solenoid valve is large, there is an open circuit in the damper clutch control solenoid valve and diagnosis code No. 47 is output. If the resistance value is small, there is a short circuit in the damper clutch control solenoid valve and diagnosis code No. 48 is output. In addition, if damper clutch control solenoid valve drive duty continues at 100% for 10 seconds or more, there is an abnormality in the damper clutch control system and diagnosis code No. 49 is output.	• Malfunction of damper clutch control solenoid valve • Malfunction of connector • Malfunction of A/T-ECU



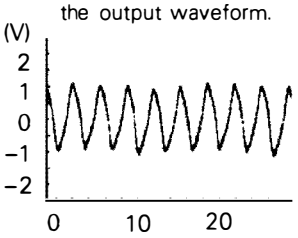
Code No. 51, 86	1st gear incorrect ratio	Probable cause
[Comment]	If the value resulting from dividing the PG-A output (input shaft rotation speed) by the gear ratio in 1 range does not match the PG-B output (output shaft rotation speed) after shifting to 1 range is completed, diagnosis code No. 51 is output. In addition, if related diagnosis codes (Nos. 51, 52, 53 and 54) are output 4 times, there is an incorrect gear ratio, fail-safe code No. 86 is output and the vehicle is locked in 3 range (D) or 2 range (2, L) as a fail-safe measure.	• Malfunction of pulse generator A or B • Malfunction of transfer driven gear • Malfunction of end clutch retainer • Malfunction of rear clutch • Noise generated

★: Refer to the Transmission Workshop Manual.

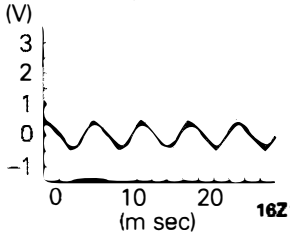
MUT-II SELF DIAG. CODE
Is A/T diagnosis code No. 31 output?
Yes → Code Nos. 31, 81 – Pulse generator A system inspection (Refer to P.23-22.)
↓ No

MUT-II SELF DIAG. CODE
Is A/T diagnosis code No. 32 output?
Yes → Code Nos. 32, 82 – Pulse generator B system inspection (Refer to P.23-23.)
↓ No

Measure output waveform from pulse generator connector A-117 (using an oscilloscope).
- Disconnect the connector and measure at PG-A side.
- Engine: 1,000 r/min (approx. 30 km/h)
- Selector lever position: D range (3 range)
- Voltage between terminals (1) and (2) (PG-A output waveform)
  The waveform shown below should be output, and the amplitude should be 1.0 V or more.
  There should be no noise in the output waveform.



- Voltage between terminals (3) and (4) (PG-B output waveform)
  The waveform shown below should be output, and the amplitude should be 0.5 V or more.
  There should be no noise in the output waveform.

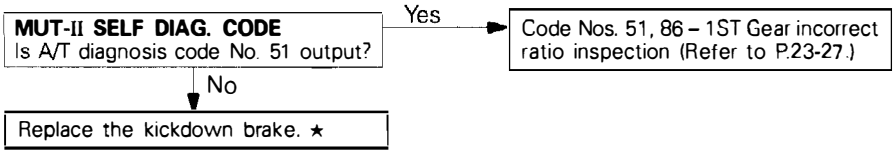


NG → Pulse generator A and B shielded wire inspection
NG → **Repair**
OK ↓
Replace pulse generators A and B with new components.
↓
Check trouble symptom.
NG ↓
Replace the transfer driven gear and end clutch retainer. ★
↓
Check trouble symptom.
NG ↓
Eliminate the source of noise.

OK ↓
Replace the rear clutch. ★

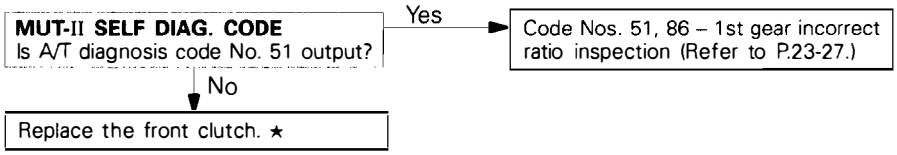
Code No. 52, 86	2nd gear incorrect ratio	Probable cause
[Comment]	If the value resulting from dividing the PG-A output (input shaft rotation speed) by the gear ratio in 2 range does not match the PG-B output (output shaft rotation speed) after shifting to 2 range is completed, diagnosis code No. 52 is output. In addition, if related diagnosis codes (Nos. 51, 52, 53 and 54) are output 4 times, there is an incorrect gear ratio, fail-safe code No. 86 is output and the vehicle is locked in 3 range (D) or 2 range (2, L) as a fail-safe measure.	• Malfunction of pulse generator A or B • Malfunction of transfer driven gear • Malfunction of end clutch retainer • Malfunction of rear clutch • Noise generated • Malfunction of kickdown brake

★: Refer to the Transmission Workshop Manual.



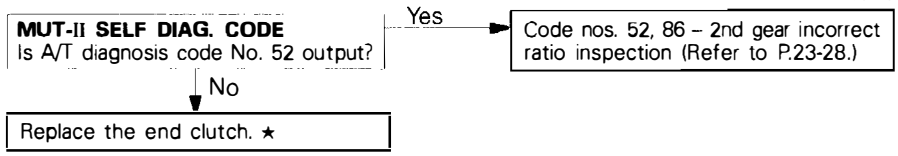
Code No. 53, 86	3rd gear incorrect ratio	Probable cause
[Comment]	If the value resulting from dividing the PG-A output (input shaft rotation speed) by the gear ratio in 3 range does not match the PG-B output (output shaft rotation speed) after shifting to 3 range is completed, diagnosis code No. 53 is output. In addition, if related diagnosis codes (Nos. 51, 52, 53 and 54) are output 4 times, there is an incorrect gear ratio, fail-safe code No. 86 is output and the vehicle is locked in 3 range (D) or 2 range (2, L) as a fail-safe measure.	• Malfunction of pulse generator A or B • Malfunction of transfer driven gear • Malfunction of end clutch retainer • Malfunction of front clutch • Noise generated

★: Refer to the Transmission Workshop Manual



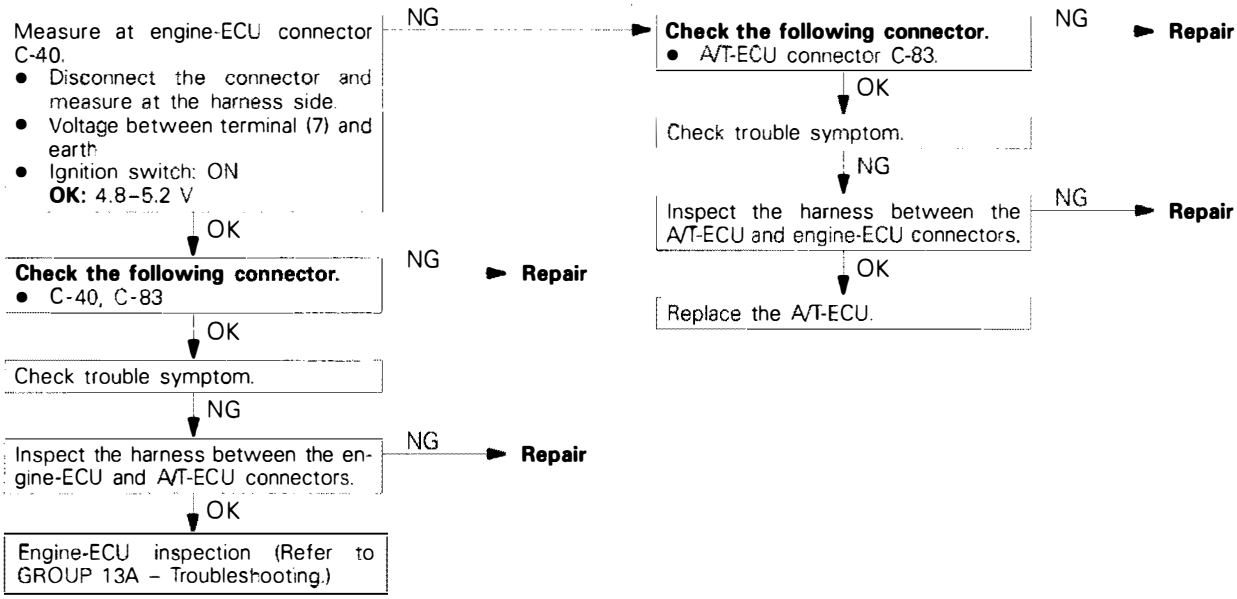
Code No. 54, 86	4th gear incorrect ratio	Probable cause
[Comment]	If the value resulting from dividing the PG-A output (input shaft rotation speed) by the gear ratio in 4 range does not match the PG-B output (output shaft rotation speed) after shifting to 4 range is completed, diagnosis code No. 54 is output. In addition, if related diagnosis codes (Nos. 51, 52, 53 and 54) are output 4 times, there is an incorrect ratio, fail-safe code No. 86 is output and the vehicle is locked in 3 range (D) or 2 range (2, L) as a fail-safe measure.	• Malfunction of pulse generator B • Malfunction of connector • Malfunction of transfer driven gear • Malfunction of end clutch retainer • Malfunction of rear clutch • Noise generated • Malfunction of kickdown brake • Malfunction of end clutch

★: Refer to the Transmission Workshop Manual.



Code No. 61	Torque reduction request signal line and torque reduction execution signal line system <4G63, 6A12>	Probable cause
Code No. 62	Torque reduction request signal line system <4G63, 6A12>	• Malfunction of engine-ECU • Malfunction of A/T-ECU • Malfunction of connector
Code No. 63	Torque reduction request signal line system <4G63, 6A12>	

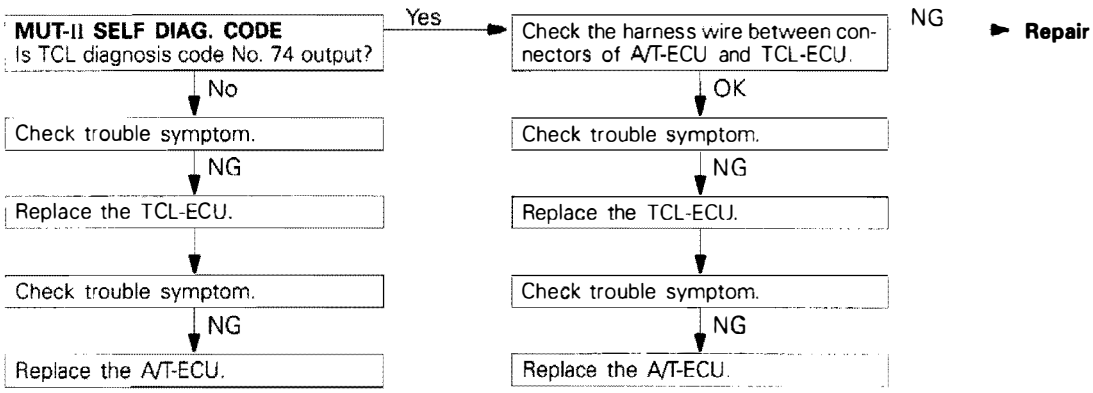
[Comment] If the "torque reduction executing" signal is detected for 0.2 seconds or more while the "no torque reduction request" signal is being output, there is a short circuit in the torque reduction request signal line or an open circuit in the torque reduction execution signal line and diagnosis code No. 61 is output.
If the condition where the "torque reduction request" signal is output but no "torque reduction executing" signal is detected even after 0.1 second has elapsed is detected 4 times, there is an open circuit in the torque reduction request signal line and diagnosis code No. 62 is output. If the transmission output shaft speed is 1,000 r/min or more and if the engine speed is 1,000 r/min or more for an accumulated period of 20 minutes or more after the ignition key is turned to ON but a "torque reduction permissible" signal is not detected, there is a short circuit in the torque reduction execution signal line and diagnosis code No. 63 is output.



Code No. 65	Malfunction of communication between TCL and A/T <Vehicles with TCL>	Probable cause

[Comment] If normal communication is not possible for a period of 1 second or more until the ignition switch is turned to OFF, there is a malfunction of communication between TCL and A/T and diagnosis code No. 65 is output.

- Malfunction of A/T ECU
- Malfunction of TCL-ECU
- Malfunction of connector



INSPECTION CHART FOR TROUBLE SYMPTOMS

E23ZE05AA

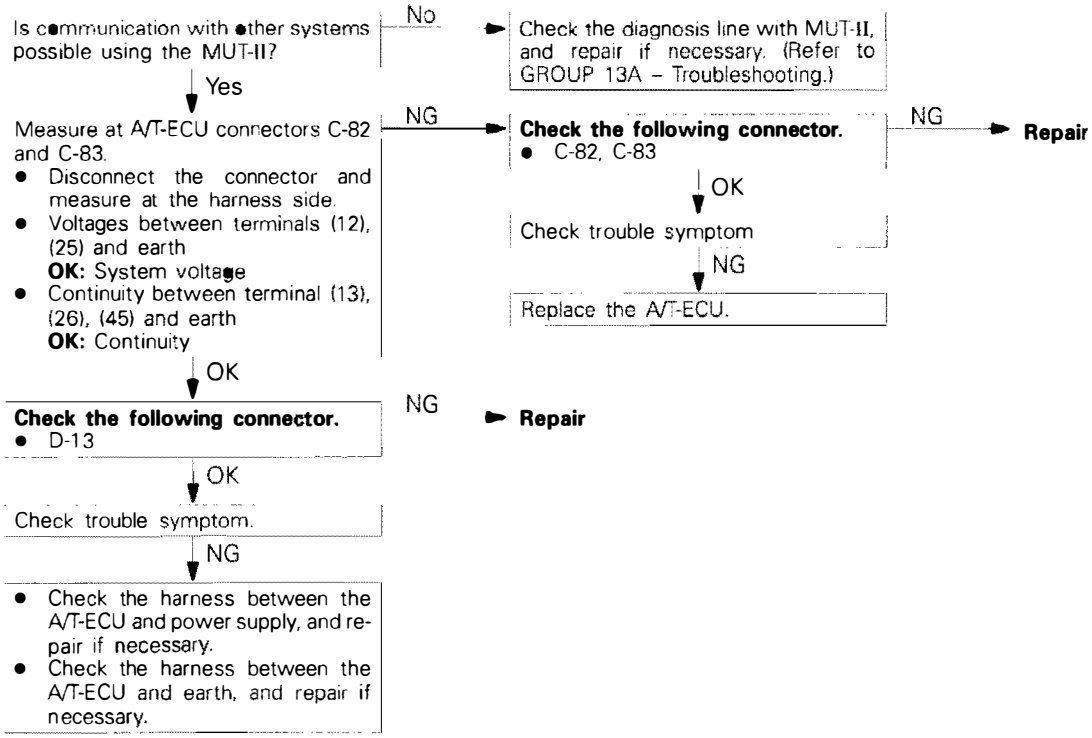
Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible		1	P.23-31
Driving impossible	Starting impossible	2	P.23-32
	Does not move forward)	3	P.23-33
	Does not reverse	4	P.23-34
	Does not move (forward or reverse)	5	P.23-35
Malfunction when starting	Engine stalling during shifting	6	P.23-35
	Shocks when changing from N to D and large time lag	7	23-36
	Shocks when changing from N to R and large time lag	8	P.23-37
	Shocks when changing from N to D, N to R and large time lag	9	P.23-38
Malfunction when shifting	Shocks and running up	10	P.23-39
Displaced shifting points	All points	11	P.23-40
	Some points	12	P.23-41
Does not shift	No fail-safe codes	13	P.23-41
Malfunction while driving	Poor acceleration	14	P.23-42
	Vibration	15	P.23-42
Overdrive switch system		16	P.23-43
Mode selection switch system <4G63, 6A12>		17	P.23-44
Inhibitor switch system		18	P.23-45
Idle position switch system <Vehicles without TCL>		19	P.23-46
Idle position switch system <Vehicles with TCL>		20	P.23-46
A/C load signal system		21	P.23-47
Vehicle speed sensor system		22	P.23-47

INSPECTION CHART FOR TROUBLE SYMPTOMS

E23ZE07AA

INSPECTION PROCEDURE 1

• Communication with MUT-II is not possible	Probable cause
[Comment] If communication with the MUT-II is not possible, the cause is probably a defective diagnosis line or the A/T-ECU is not functioning.	• Malfunction of diagnosis line • Malfunction of A/T-ECU power supply circuit • Malfunction of A/T-ECU earth circuit • Malfunction of A/T-ECU



INSPECTION PROCEDURE 2

• Starting impossible [Comment] Starting is not possible when the selector lever is in P or N range. In such cases, the cause is probably a defective engine system, torque converter or oil pump.	Probable cause • Malfunction of engine system • Malfunction of torque converter • Malfunction of damper clutch • Malfunction of oil pump

★: Refer to the Transmission Workshop Manual.

Engine system inspection
- Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.
- If there is an abnormality, repair or replace the engine system.

↓ After completion

Torque converter inspection
- Check to be sure that the torque converter installation is not defective (inserted at an angle, etc.).
- If there is an abnormality, carry out repairs. However, if the splines are damaged and repairs are not possible, replace the torque converter assembly.

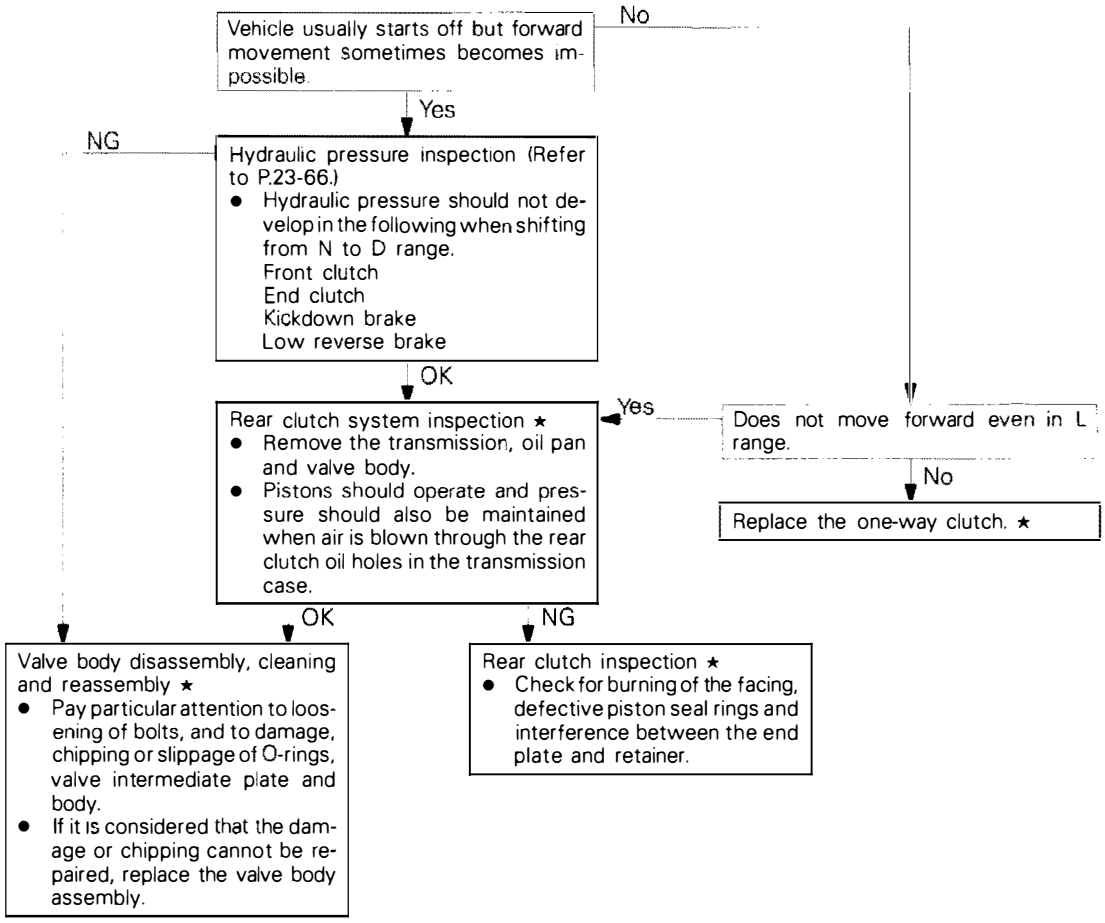
After completion

→ Oil pump inspection ★
- Check to be sure that there are no abnormalities such as oil pump seizure, side clearance abnormalities or loosening of bolts.
- If there is an abnormality, replace the oil pump assembly.

INSPECTION PROCEDURE 3

• Does not move forward	Probable cause
[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 range. In such cases, the cause is probably abnormal line pressure, or a defective rear clutch or one-way clutch.	• Abnormal line pressure • Malfunction of rear clutch • Malfunction of one-way clutch • Malfunction of valve body

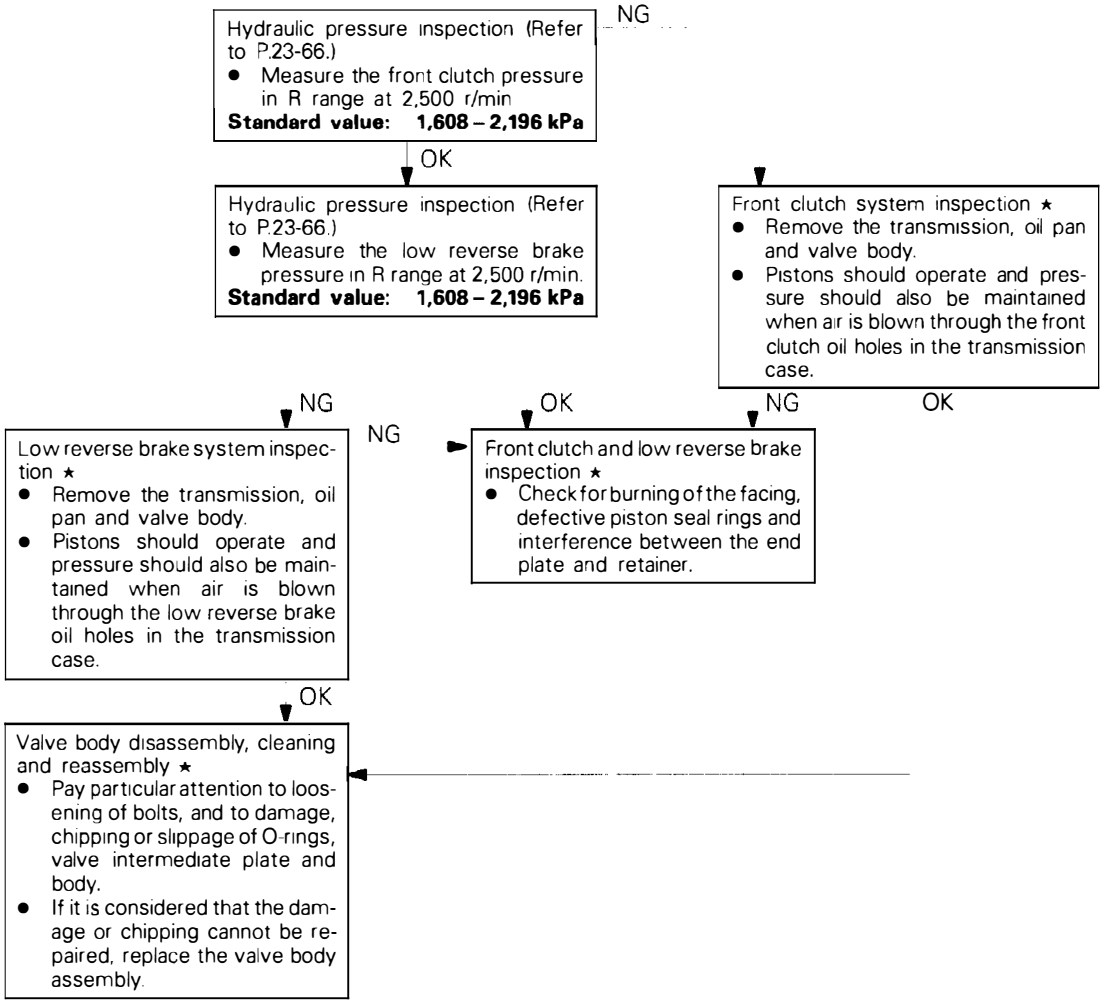
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 4

• Does not reverse	Probable cause
[Comment] When the engine is idling, the vehicle does not reverse even if the selector lever is shifted from N to R range. In such cases, the cause is probably abnormal pressure in the low reverse brake or front clutch, or a defective low reverse brake or front clutch.	• Abnormal low reverse brake pressure • Abnormal front clutch pressure • Malfunction of front clutch • Malfunction of low reverse brake • Malfunction of valve body

★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 5

• Does not move (forward or reverse)	Probable cause
[Comment] When the engine is idling, the vehicle does not move forward or in reverse even if the selector lever is shifted from N to D, 2, L or R range. In such cases, the cause is probably abnormal reducing pressure, or a defective oil pump or power train.	• Abnormal reducing pressure • Malfunction of power train • Malfunction of oil pump • Malfunction of valve body

★: Refer to the Transmission Workshop Manual.

Hydraulic pressure inspection (Refer to P.23-66.)
- Measure the reducing pressure in N range while the engine is idling.

Standard value: 362–480kPa

→ OK → Power train inspection ★
- Disassemble the transmission, check the condition of the planetary carrier, idler gear, output shaft and other parts, and repair or replace if necessary.

↓ NG

Reducing pressure adjustment (Refer to P.23-87.) → OK →

↓ NG

Oil pump inspection ★
- Check to be sure that there are no abnormalities such as oil pump seizure, side clearance abnormalities or loosening of bolts.
- If there is an abnormality, replace the oil pump assembly.

→ After completion → Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
- If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURE 6

• Engine stalling during shifting	Probable cause
[Comment] When the engine is idling, the engine stalls when the selector lever is shifted from N to D, 2, L or R range. In such cases, the cause is probably a defective engine system or damper clutch control solenoid valve	• Malfunction of engine system • Malfunction of damper clutch control solenoid valve • Malfunction of valve body • Malfunction of torque converter

★: Refer to the Transmission Workshop Manual.

Engine system inspection
- Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.
- If there is an abnormality, repair or replace the engine system.

↓ After completion

Solenoid valve connector inspection
- Check to be sure that there is no water in the connector.
- Check to be sure that none of the terminals are shorted to each other.

↓ After completion

Damper clutch control solenoid valve (DCCSV) inspection
- Check to be sure that the valve is not sticking due to foreign materials being clamped.
- If there is an abnormality, replace the solenoid valve assembly.

↓ After completion

Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
- If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

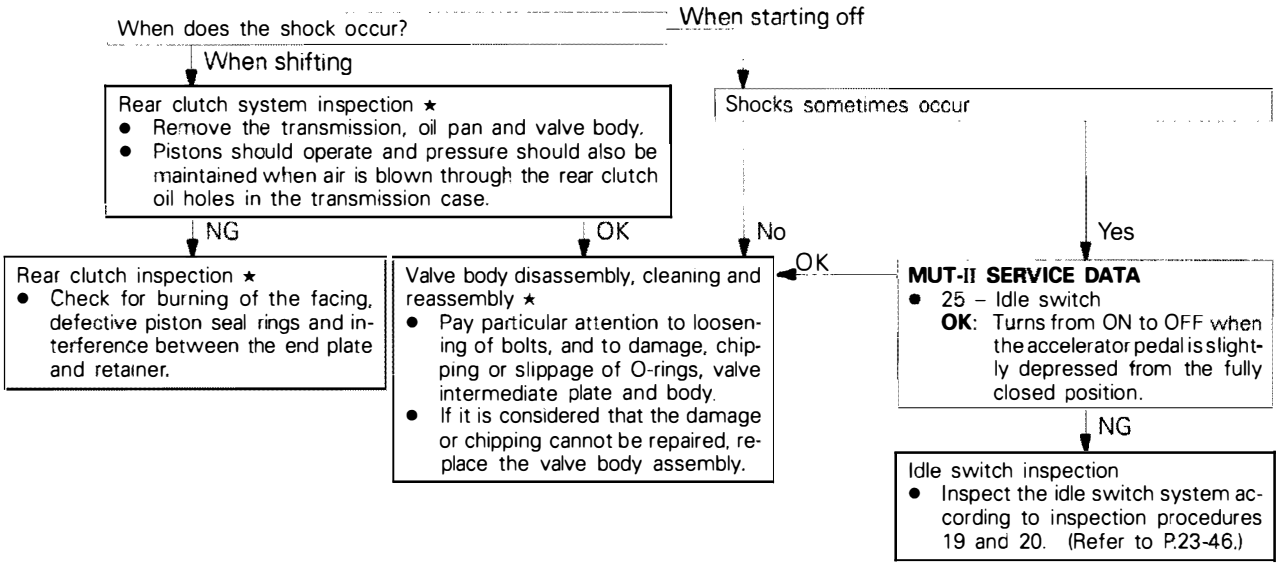
↓ After completion

Torque converter inspection
- Check to be sure that there is no sticking due to separation from the damper clutch.
- If there is an abnormality, replace the torque converter assembly.

INSPECTION PROCEDURE 7

• Shocks when shifting from N to D and large time lag	Probable cause
[Comment] When the engine is idling, abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range. In such cases, the cause is probably a defective rear clutch or valve body	• Malfunction of rear clutch • Malfunction of valve body • Malfunction of idle switch

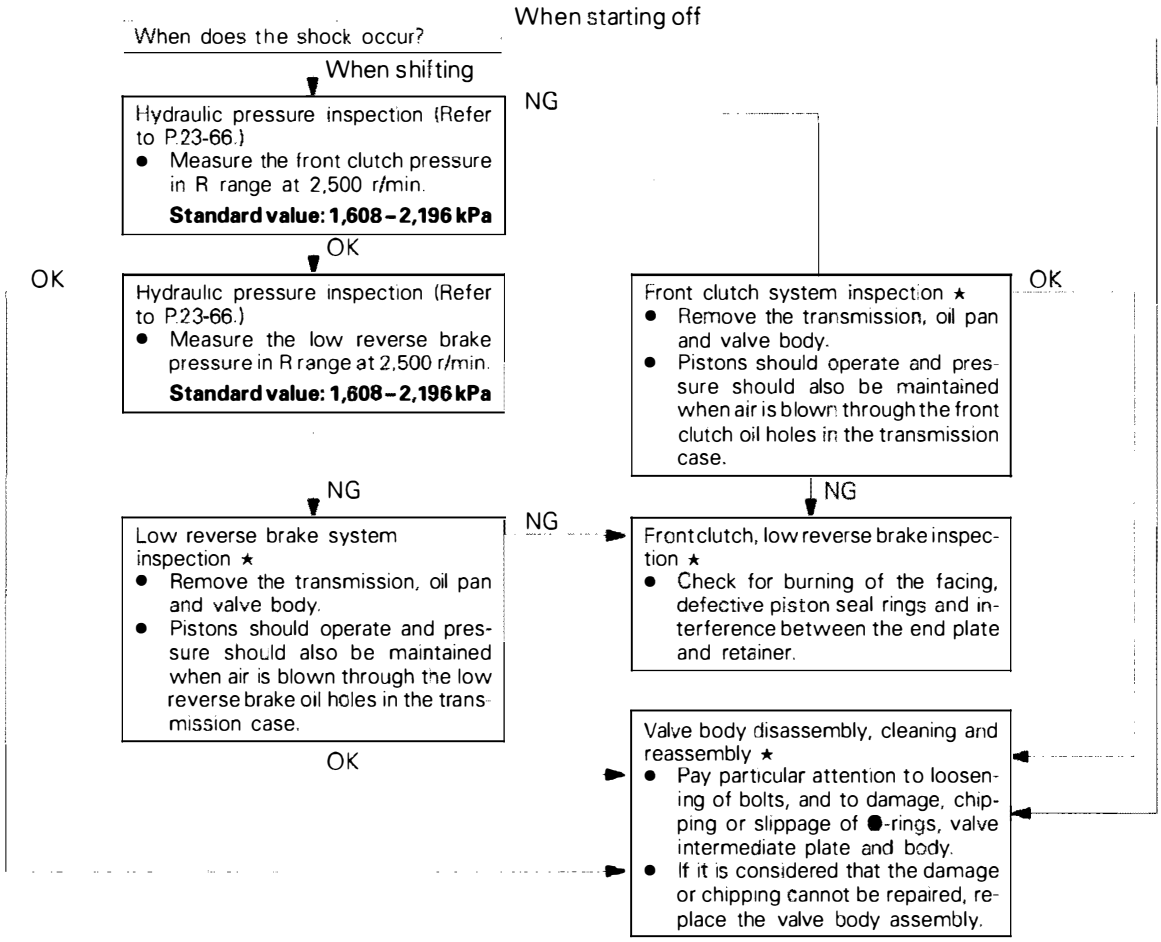
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 8

• Shocks when shifting from N to R and large time lag	Probable cause
[Comment] When the engine is idling, abnormal shocks or a time lag of 2 seconds or more occurs when the selector lever is shifted from N to R range. In such cases, the cause is probably abnormal low reverse brake or front clutch pressure, or a defective low reverse brake or front clutch.	• Abnormal front clutch pressure • Abnormal low reverse brake pressure • Malfunction of front clutch • Malfunction of low reverse brake • Malfunction of valve body

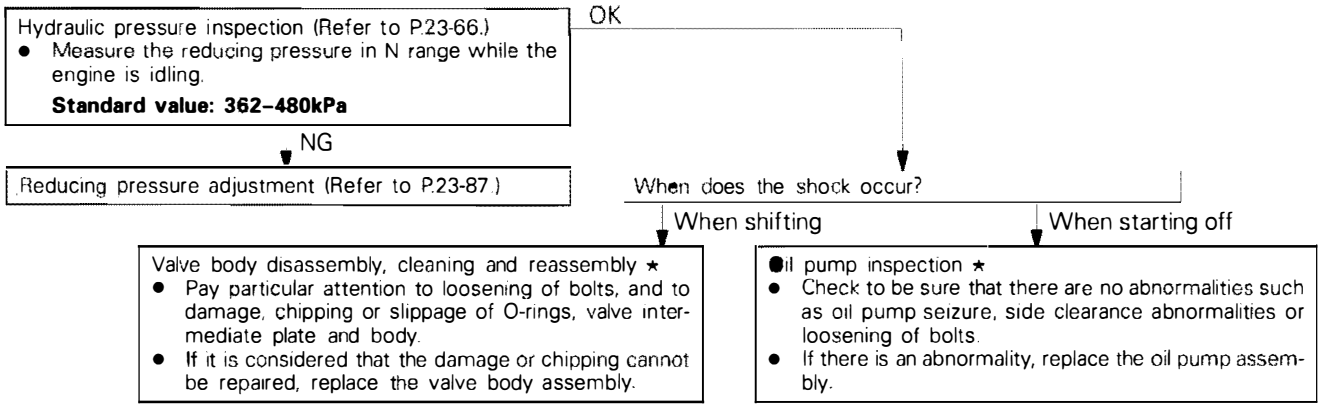
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 9

• Shocks when shifting from N to D, N to R and large time lag [Comment] When the engine is idling, abnormal shocks or a time lag of 2 seconds or more occur when the selector lever is shifted from N to D range and also from N to R range. In such cases, the cause is probably abnormal reducing pressure or a defective oil pump.	Probable cause • Abnormal reducing pressure • Malfunction of oil pump • Malfunction of valve body

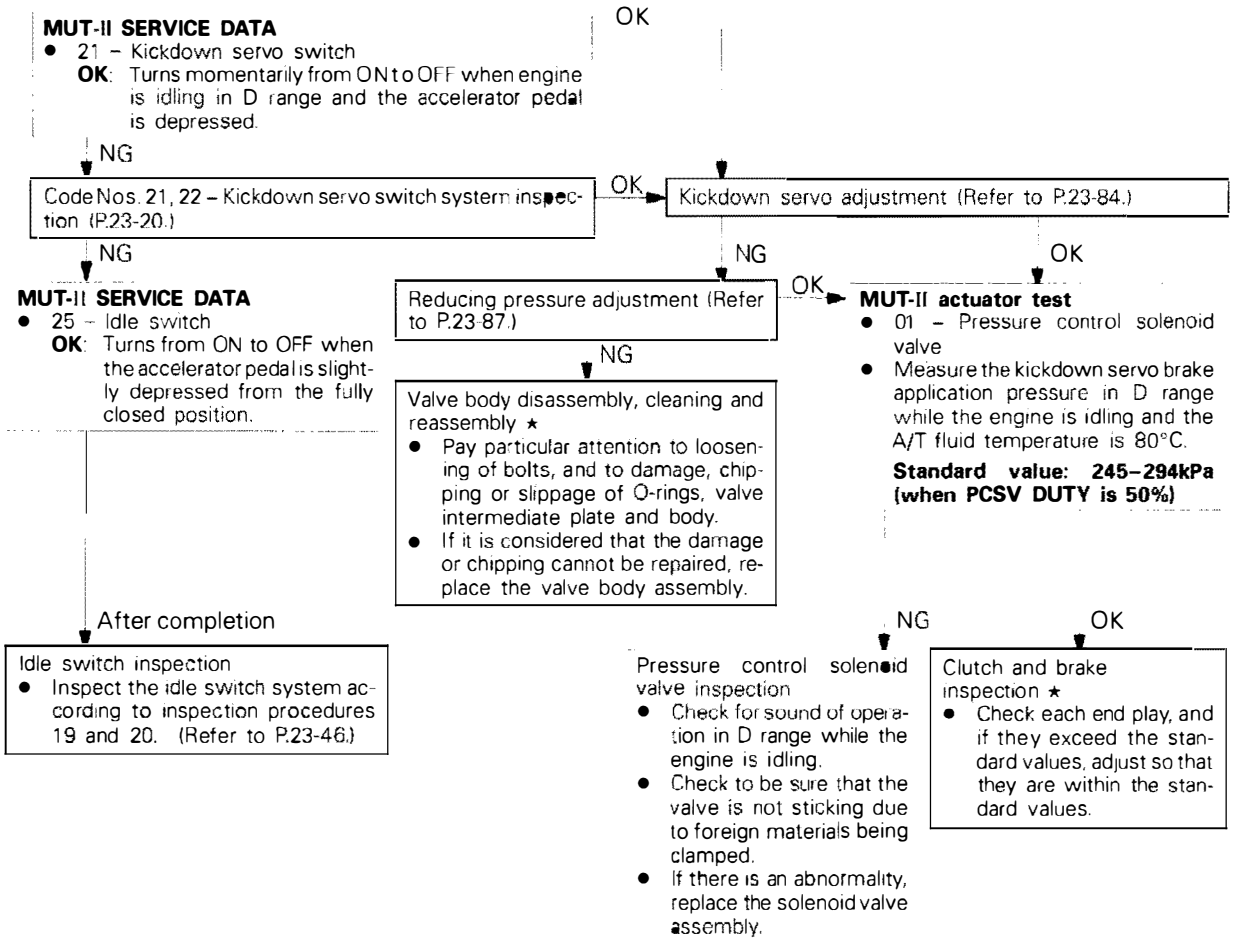
★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 10

• Shocks and running up	Probable cause
[Comment] Shocks occur when driving due to upshifting or downshifting. In addition, the engine speed during shifting increases abnormally in comparison to normal shifting. In such cases, the cause is probably abnormal reducing pressure or a defective kickdown servo switch.	• Malfunction of kickdown servo switch • Abnormal reducing pressure • Malfunction of valve body • Malfunction of idle switch • Malfunction of pressure control solenoid valve • Malfunction of clutches and brakes

★: Refer to the Transmission Workshop Manual.



INSPECTION PROCEDURE 11

• All points (Displaced shifting points)	Probable cause
[Comment] Displacement of all shift points occurs while driving. In such cases, the cause is probably a defective pulse generator B (PG-B) or shift control solenoid valve A or B (SCSV-A, B).	• Malfunction of pulse generator B (PG-B) • Malfunction of shift control solenoid valve A or B (SCSV-A, B) • Malfunction of A/T-ECU • Abnormal reducing pressure or kickdown servo brake application pressure • Malfunction of clutches and brakes • Malfunction of valve body

★: Refer to the Transmission Workshop Manual.

MUT-II SERVICE DATA
- 32 – Pulse generator B (PG-B)
  OK: Increases in proportion to vehicle speed

NG

Code Nos. 32, 82 – Pulse generator B (PG-B) system inspection (Refer to P.23-25.)

OK

MUT-II SERVICE DATA
- 27 – Shift control solenoid valve A and B drive signals
  OK: Shifting command signal matches actual shifting step.

OK

Replace the A/T-ECU.

NG

Hydraulic pressure inspection (Refer to P.23-66.)
- Measure the reducing pressure and kickdown servo brake application pressure in 2 range at 2,500 r/min.

Standard value:
Reducing pressure 362–480kPa
Kickdown servo brake application pressure 813–882kPa

OK

Clutch and brake inspection ★
- Check each end play, and if they exceed the standard values, adjust so that they are within the standard values.

NG

Reducing pressure adjustment (Refer to P.23-87.)

After completion

Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
- If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

INSPECTION PROCEDURES 12

• Some points (Displaced shifting points)	Probable cause
[Comment] Displacement of some shift points occurs while driving. In such cases, the cause is probably a defective valve body, or it is a phenomenon related to control and is not an abnormality.	• Malfunction of valve body

★: Refer to the Transmission Workshop Manual.

Does fuzzy shifting occur normally?
- No → Valve body disassembly, cleaning and reassembly ★
  - Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
  - If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.
- Yes → It is a phenomenon related to control and is not an abnormality.

Completed

INSPECTION PROCEDURE 13

• No fail-safe codes (Does not shift)	Probable cause
[Comment] Shifting does not occur while driving, and no fail-safe codes are output. In such cases, the cause is probably a defective overdrive switch or inhibitor switch.	• Malfunction of overdrive switch • Malfunction of inhibitor switch • Malfunction of power supply circuit • Malfunction of A/T-ECU

Is transmission held at 3rd gear in D range?
- No → Does overdrive operate?
  - Yes →
    MUT-II SERVICE DATA
    - 35 – Overdrive switch
      OK: When overdrive switch turns from OFF to ON, MUT-II display turns from OFF to ON.
    - NG → Inspect the overdrive switch system according to inspection procedure 16. (Refer to P.23-43.)
    - OK → Replace the A/T-ECU.
  - No → **MUT-II SERVICE DATA**
    - 37 – Inhibitor switch
      OK: A/T-ECU input signal and selector lever position should match.
    - OK → Power circuit inspection
      - Pay particular attention to open circuits in the harnesses, defective connector connections and open circuits in fuses.
      - If there is an open circuit in a fuse, the cause of the short should be located and it should be replaced.
    - NG → Inspect the inhibitor switch system according to inspection procedure 18. (Refer to P.23-45.)
- Yes → Check to be sure that backup power is being supplied to the A/T-ECU.
  - OK → Check to be sure that power is being supplied to the A/T-ECU.
    - OK → (see MUT-II SERVICE DATA above)
    - NG → Power circuit inspection
  - NG → Power circuit inspection

INSPECTION PROCEDURE 14

• Poor acceleration	Plobable cause
[Comment] While driving, acceleration is poor even if downshifting is performed. In such cases, the cause is probably a defective clutch or brake, or a defective engine system.	• Malfunction of clutches and brakes • Malfunction of engine system

★: Refer to the Transmission Workshop Manual.

Clutch and brake inspection ★
- Check each end play, and if they exceed the standard values, adjust so that they are within the standard values.
- Check for burning and wear in each facing.

↓ After completion

Engine system inspection
- Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.
- If there is an abnormality, repair or replace the engine system.

INSPECTION PROCEDURE 15

• Vibration	Probable cause
[Comment] Vibration occurs when driving at constant speed or when accelerating in top range. In such cases, the cause is probably abnormal damper clutch pressure or a defective torque converter.	• Abnormal damper clutch pressure • Malfunction of engine system • Malfunction of torque converter • Malfunction of valve body

★: Refer to the Transmission Workshop Manual.

Does the problem occur even when the oil temperature sensor connector is disconnected?

Yes → Engine system inspection
- Check the control system, ignition system, fuel system and main engine system, and confirm that everything is normal.
- If there is an abnormality, repair or replace the engine system.

↓ No

Hydraulic pressure inspection (Refer to P.23-66.)
- Measure the damper clutch pressure in D range at 2,500 r/min (3rd gear).

Standard value: 441–637kPa

↓ NG

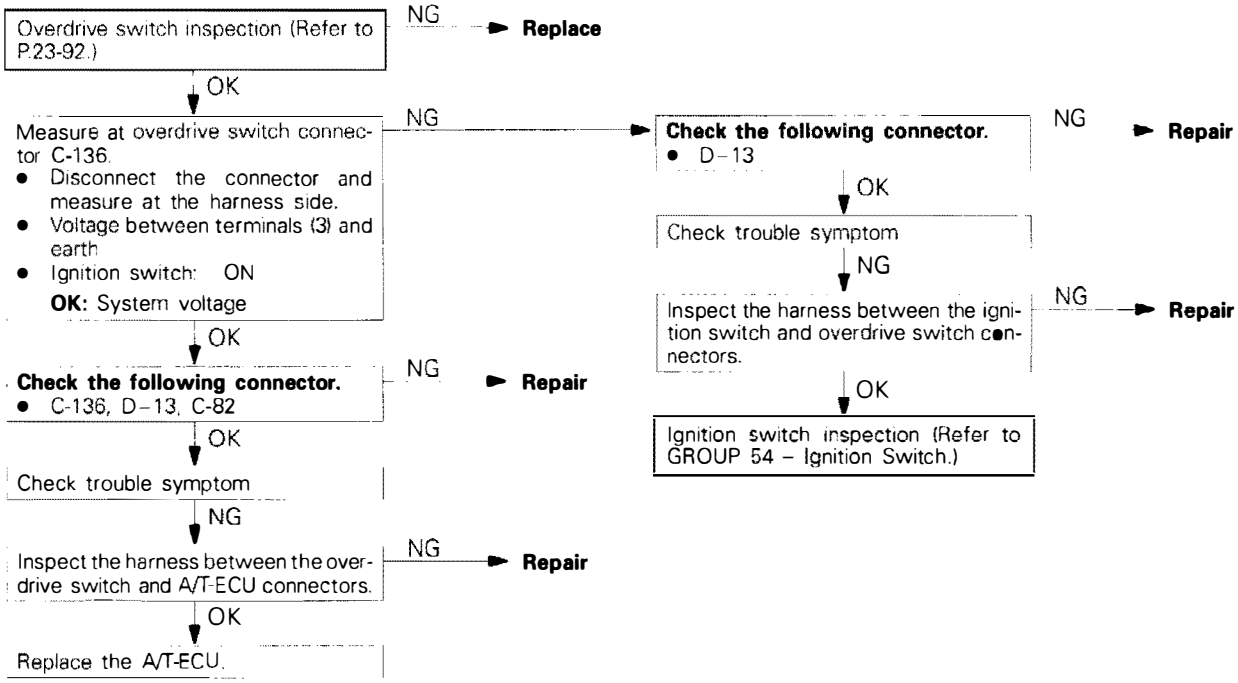
Replace the torque converter assembly.

↓ OK

Valve body disassembly, cleaning and reassembly ★
- Pay particular attention to loosening of bolts, and to damage, chipping or slippage of O-rings, valve intermediate plate and body.
- If it is considered that the damage or chipping cannot be repaired, replace the valve body assembly.

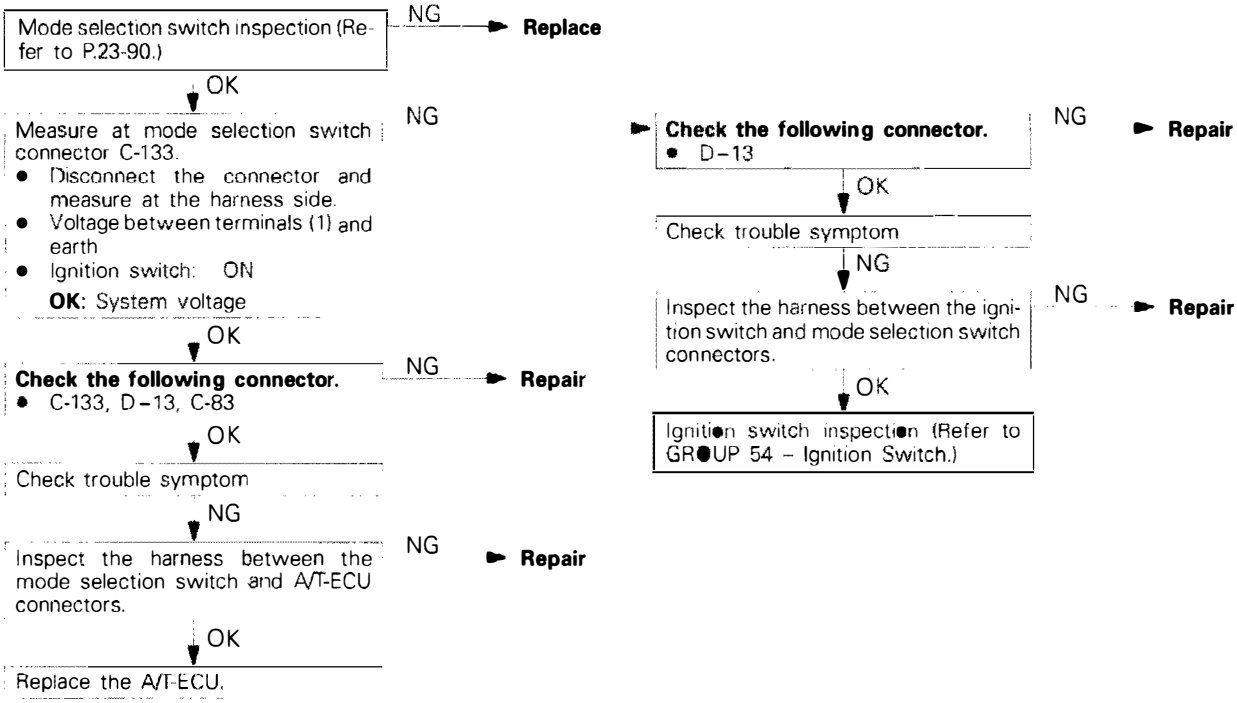
INSPECTION PROCEDURE 16

• Overdrive switch system	Probable cause
[Comment] In cases such as the above, the cause is probably a defective overdrive switch circuit or defective ignition switch circuit.	• Malfunction of overdrive switch • Malfunction of connector • Malfunction of ignition switch • Malfunction of A/T-ECU



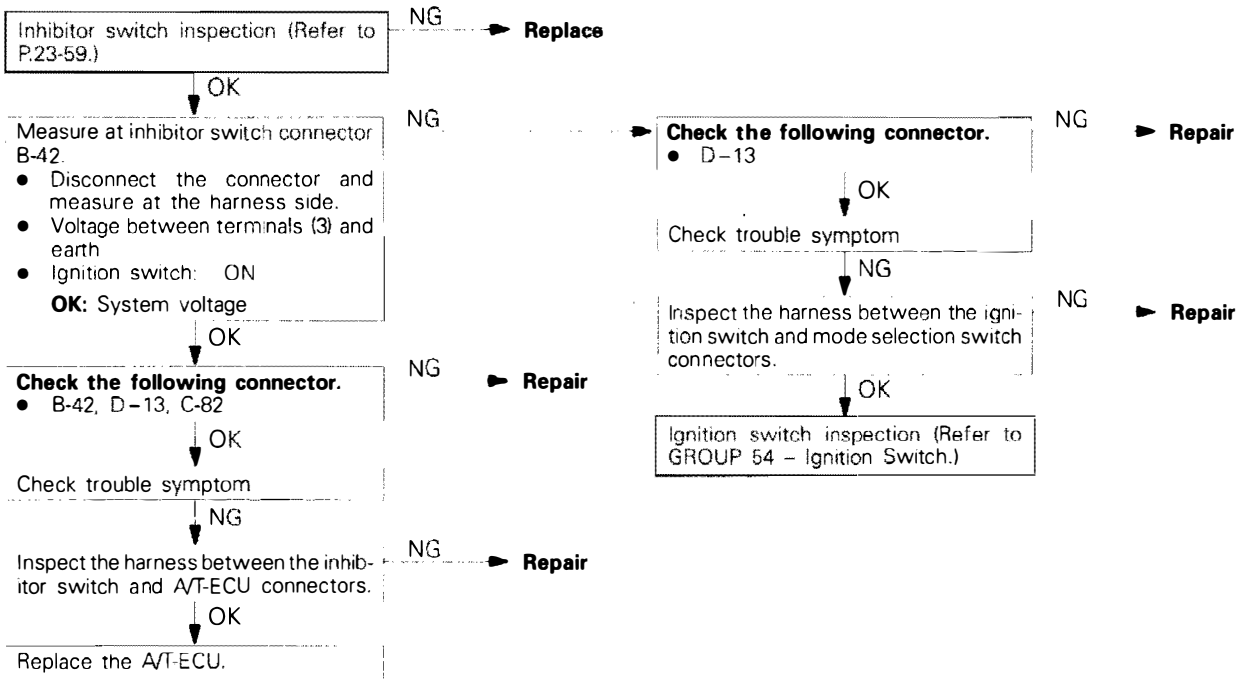
INSPECTION PROCEDURE 17

• Mode selection switch system <4G63, 6A12> [Comment] In cases such as the above, the cause is probably a defective mode selection switch circuit or a defective ignition switch circuit.	Probable cause • Malfunction of mode selection switch • Malfunction of connector • Malfunction of ignition switch • Malfunction of A/T-ECU



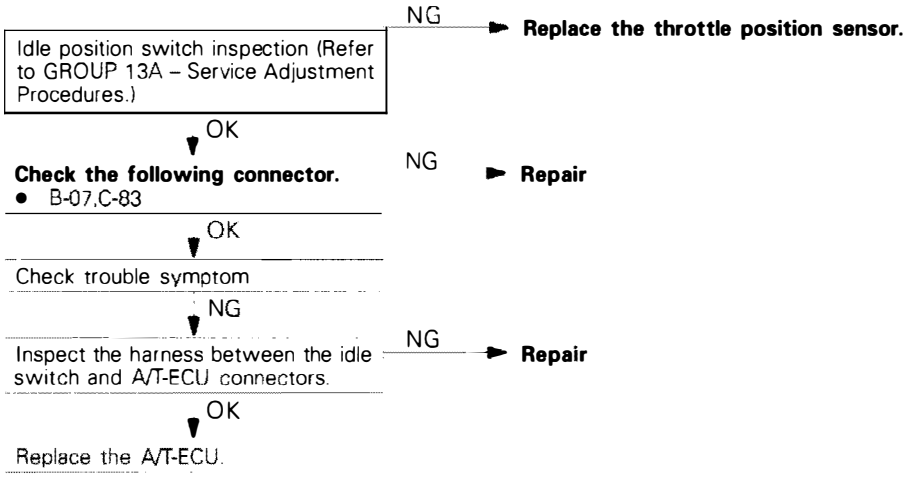
INSPECTION PROCEDURE 18

• Inhibitor switch system	Probable cause
[Comment] In cases such as the above, the cause is probably a defective inhibitor switch circuit or a defective ignition switch circuit.	• Malfunction of inhibitor switch • Malfunction of connector • Malfunction of ignition switch • Malfunction of A/T-ECU



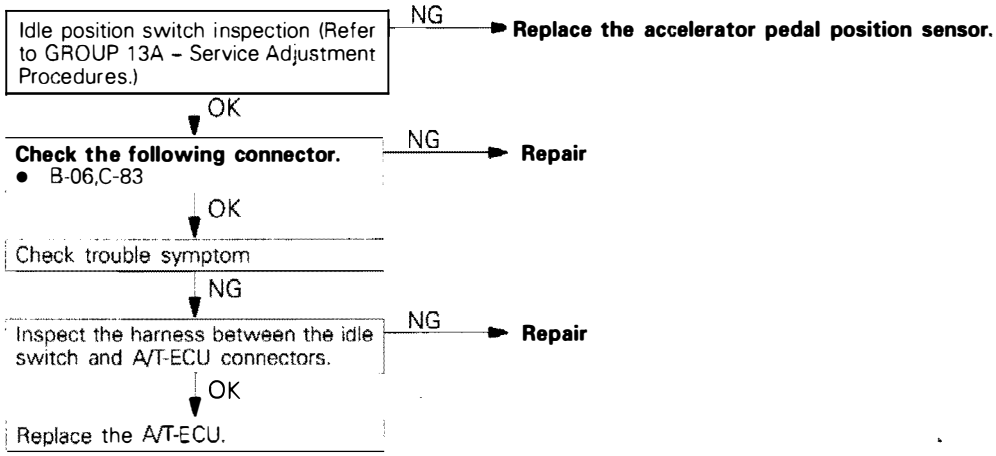
INSPECTION PROCEDURE 19

• Idle position switch system <Vehicles without TCL>	Probable cause
[Comment] In cases such as the above, the cause is probably a defective idle position switch circuit.	• Malfunction of idle position switch • Malfunction of connector • Malfunction of A/T-ECU



INSPECTION PROCEDURE 20

• Idle position switch system <Vehicles with TCL>	Probable cause
[Comment] In cases such as the above, the cause is probably a defective idle position switch circuit.	• Malfunction of idle position switch • Malfunction of connector • Malfunction of A/T-ECU



INSPECTION PROCEDURE 21

• A/C load signal system	Probable cause
[Comment] In cases such as the above, the cause is probably a defective Idle position switch circuit.	• Malfunction of triple pressure switch • Malfunction of connector • Malfunction of A/C system • Malfunction of A/T-ECU

Triple pressure switch inspection (Refer to GROUP 55 – Service Adjustment Procedures.)
NG → **Replace**
OK ↓
Measure at A/T-ECU connector C-83.
- Disconnect the connector and measure at the harness side.
- Ignition switch: ON
- A/C switch: ON
- Voltage between terminals (8) and earth

OK: System voltage

NG → A/C system inspection (Refer to GROUP 55 – Troubleshooting.)

OK ↓
Check the following connector.
- A-62, A-76, C-83

NG → **Repair**
OK ↓
Check trouble symptom
NG ↓
A/C system inspection (Refer to GROUP 55 – Troubleshooting.)
NG → **Repair**
OK ↓
Replace the A/T-ECU.

INSPECTION PROCEDURE 22

• Vehicle speed sensor system	Probable cause
[Comment] In cases such as the above, the cause is probably a defective vehicle speed sensor circuit.	• Malfunction of vehicle speed switch • Malfunction of connector • Malfunction of A/T-ECU

Does the speedmeter operate normally?
NG → Vehicle speed sensor inspection (Refer to GROUP 54 – Combination Meter.)
Yes ↓
Measure at A/T-ECU connector C-82.
- Disconnect the connector and measure at the harness side.
- Voltage between terminals (40) and earth

OK: Repeatedly changes between 0 → 5 V when the vehicle is pushed

NG → **Check the following connector.**
- C-82

NG → **Repair**
OK ↓
Check trouble symptom
NG ↓
Replace the A/T-ECU.

OK ↓
Check the following connector.
- B-40

NG → **Repair**
OK ↓
Check trouble symptom
NG ↓
Check the harness between the A/T-ECU and vehicle speed sensor connectors, and repair if necessary.

SERVICE DATA REFERENCE TABLE

E32ZE08AA

Item No.	Check item	Check conditions		Normal condition
11	Throttle position sensor (accelerator pedal position sensor)	Accelerator pedal position Engine: Idling Selector lever position: N range	Fully closed	0.4–1.0 V
			Depressed	Gradually rises from the above value
			Fully open (for at least 2 seconds)	4.5–5.5 V
15	Oil temperature sensor	Warming up	Drive for 15 minutes or more so that the Automatic transmission fluid temperature becomes 70 – 90°C.	Gradually rises to 70 – 90°C
21	Kickdown servo switch	Selector lever position: L range Mode selection <4G63, 6A12>: AUTO	Idling (vehicle stopped)	ON
			Idling (vehicle stopped)	OFF
		Selector lever position: 2 range Mode selection <4G63, 6A12>: AUTO	Driving at 10 km/h	OFF
			Driving at constant speed of 40 km/h (20 seconds or more)	ON
			Select the HOLD mode, driving at speed of 10 km/h <6A12>	ON
		Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	ON
		Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: ON	Driving at constant speed of 50 km/h (20 seconds or more)	OFF
23	Ignition signal	Selector lever position: L range Mode selection <4G63, 6A12>: AUTO	Idling (vehicle stopped)	600–900 r/min.
		Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	1,800–2,200 r/min.
25	Idle position switch	Accelerator pedal position Engine: Idling Selector lever position: N range	Fully closed	ON
			Depressed	OFF
			Fully open (for at least 2 seconds)	OFF

Item No.	Check item	Check conditions		Normal condition
26	A/C load signal	Engine: Idling Selector lever position: D range Mode selection <4G63, 6A12>: AUTO	A/C switch: ON	ON
			A/C switch: OFF	OFF
		Accelerator pedal position Engine: Idling (vehicle stopped) Selector lever position: D range Mode selection <4G63, 6A12>: AUTO	Fully closed	C
			Depressed slightly	1
		Selector lever position: L range Mode selection <4G63, 6A12>: AUTO	Idling (vehicle stopped)	1
27	Shift control solenoid valve A (SCSV-A) drive signal and shift control solenoid valve B (SCSV-B) drive signal	Selector lever position: 2 range Mode selection <4G63, 6A12>: AUTO	Idling (vehicle stopped)	C
			Driving at 10 km/h	1
			Driving at constant speed of 40 km/h (20 seconds or more)	2
			Select the HOLD mode, driving at speed of 10 km/h <4G63, 6A12>	2
		Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	3
		Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: ON	Driving at constant speed of 50 km/h (20 seconds or more)	4

Item No.	Check item	Check conditions		Normal condition
28	Stop lamp switch <Vehicles without TCL>	Broke pedal position Ignition switch: ON Engine: Stopped	Depressed	ON
			Released	OFF
31	Pulse generator A (PG-A)	Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	1,800–2,200 r/min.
		Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: ON	Driving at constant speed of 50 km/h (20 seconds or more)	1,200–1,500 r/min.
32	Pulse generator B (PG-B)	Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	1,800–2,200 r/min.
		Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: ON	Driving at constant speed of 50 km/h (20 seconds or more)	1,800–2,200 r/min.
35	Overdrive switch	Ignition switch: ON Engine: Stopped	Overdrive switch: ON	OD
			Overdrive switch: OFF	OD–OFF
36	Mode selection switch <4G63, 6A12>	Ignition switch: ON Engine: Stopped	Mode selection switch: AUTO	AUTO
			Mode selection switch: HOLD	HOLD
37	Inhibitor switch	Ignition switch: ON Engine: Stopped	Selector lever: P range Selector lever: R range Selector lever: N range Selector lever: D range Selector lever: 2 range Selector lever: L range	P, N R P, N D 2 L

Item No.	Check item	Check conditions		Normal condition
38	Vehicle speed sensor	Selector lever position: 2 range Mode selection <4G63, 6A12>: AUTO	Idling (vehicle stopped)	0 km/h
			Driving at 10 km/h	10 km/h
			Driving at constant speed of 40 km/h (20 seconds or more)	40 km/h
			Select the HOLD mode, driving at speed of 10 km/h.	10 km/h
		Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	50 km/h
45	Pressure control solenoid valve (PCSV)	Accelerator pedal position Engine: Idling (vehicle stopped) Selector lever position: D range Mode selection <4G63, 6A12>: AUTO	Fully closed	55–75 %
			Depress slightly (Driving at Approx. 5 km/h)	90–100 %
47	Damper clutch control solenoid valve (DCCSV) Amount of Damper clutch slippage	Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	100–300 r/min.
			Driving at constant speed of 70 km/h	0–10 r/min.
49	Damper clutch control solenoid valve (DCCSV) DCCSV duty	Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	0 %
			Driving at constant speed of 70 km/h	40–60 %

ACTUATOR TEST REFERENCE TABLE

E23ZE09AA

Item No.	Check item	Drive contents	Check conditions	Normal condition
01	Pressure control solenoid valve (PCSV)	Current flows to the solenoid valve for 5 seconds at 50% duty	Engine: Idling (Vehicle stopped) Selector lever: D range Throttle opening angle: Fully closed	The kickdown brake hydraulic pressure is measured and the pressure during actuator driving is lowered.

FAIL-SAFE FUNCTION REFERENCE TABLE

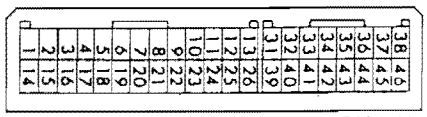
E23ZE10AA

The judgement conditions for fail-safe items are the same as the judgement conditions for the related diagnosis codes. If these related diagnosis codes are output 4 times in succession, a fail-safe item is recorded.
Accordingly, if a fail-safe item is output, the diagnosis codes will also be output at the same time.
In addition, fail-safe codes which lock the transmission in 3rd or 2nd gear will be cancelled if the ignition key is turned to OFF (the record will remain).

Code No.	Item	Fail-safe	Related diagnosis code No.
81	Open circuit in pulse generator A (PG-A)	Hold in 3 range (D) or 2 range (2, L)	31
82	Open circuit in pulse generator B (PG-B)	Hold in 3 range (D) or 2 range (2, L)	32
83	Open or short circuit in shift control solenoid valve (SCSV-A)	Hold in 3 range	41, 42
84	Open or short circuit in shift control solenoid valve (SCSV-B)	Hold in 3 range	43, 44
85	Open or short circuit in pressure control solenoid valve (PCSV)	Hold in 3 range (D) or 2 range (2, L)	45, 46
86	Incorrect gear ratio	Hold in 3 range (D) or 2 range (2, L)	51, 52 ,53, 54

CHECK AT A/T-ECU TERMINALS

E23ZE11AA



TFA0828

Terminal No.	Check item	Check conditions	Normal condition	Remarks
1	Damper clutch control solenoid valve (DCCSV)	Engine: Idling Selector lever position: D range	0 V	
		When damper is operating	Not 0 V	
2	Shift control solenoid valve A (SCSV-A)	Engine: Idling Selector lever position: L range	System voltage	
		Engine: Idling Selector lever position: 2 range	0 V	
4	Communication with engine ECU	Engine: Idling Selector lever position: D range	0 V	4G63, 6A12 only
6	HOLD mode signal	When HOLD is selected	System voltage	4G63, 6A12 only
		When AUTO is selected	0 V	
7	Kickdown servo switch	Engine: Idling Selector lever position: L range	0 V	
		Selector lever position: D range, T/M condition: 2 range	System voltage	
8	A/C relay signal	A/C switch: ON	System voltage	
		A/C switch: OFF	0 V	
9	Diagnosis output terminal	When normal	0 → 5 V Flashing	
10	Pulse generator B (output)	When vehicle is stopped	0 V	Vehicles with TCL only
		When vehicle is driving	Not 0 V	
11	Diagnosis control terminal	–	–	
12	Power supply	Engine: Idling	System voltage	
13	Earth	Engine: Idling	0 V	
14	Pressure control solenoid valve (PCSV)	Engine: Idling Selector lever position: D range	Not 0 V	
15	Shift control solenoid valve B (SCSV-B)	T/M condition: 1st and 2nd gear	System voltage	
		T/M condition: 3rd and 4th gear	0 V	
16	Wide open throttle switch	Accelerator pedal: Fully closed	4.5–5.5V	
		Accelerator pedal: Fully open	Less than 0.4V	
17	Communication with engine-ECU	Engine: Idling apter warmed up Selector lever position: D range	Not 0 V (Approx. 2.5 V)	4G63, 6A12 only

Terminal No.	Check item	Check conditions	Normal condition	Remarks
18	Communication with engine-ECU	Engine: Idling Selector lever position: D range	5 V	4G63, 6A12 only
20	Idle position switch	Engine: Idling	0 V	
		Engine: Condition other than idling	5 V	
21	Throttle position sensor	Accelerator pedal: Fully closed	0.4–1.0 V	
		Accelerator pedal: Fully open	4.5–5.5 V	
22	Communication with TCL-ECU	Engine: Idling Selector lever position: D range	Not 0 V	Vehicles with TCL only
23	Oil temperature sensor	Fluid temperature: 20°C	3.9 V	
		Fluid temperature: 100°C	1.4 V	
24	Sensor earth	Engine: Idling	0 V	
25	Power supply	Engine: Idling	System voltage	
26	Earth	Engine: Idling	0 V	
31	Inhibitor switch (P)	Selector lever position: P range	System voltage	
		Selector lever position: Out of P range	0 V	
32	Inhibitor switch (R)	Selector lever position: R range	System voltage	
		Selector lever position: Out of R range	0 V	
33	Inhibitor switch (N)	Selector lever position: N range	System voltage	
		Selector lever position: Out of N range	0 V	
34	Inhibitor switch (D)	Selector lever position: D range	System voltage	
		Selector lever position: Out of D range	0 V	
35	Inhibitor switch (2)	Selector lever position: 2 range	System voltage	
		Selector lever position: Out of 2 range	0 V	
36	Inhibitor switch (L)	Selector lever position: L range	System voltage	
		Selector lever position: Out of L range	0 V	
37	Overdrive switch	Overdrive switch: ON	System voltage	
		Overdrive switch: OFF	0 V	
38	Stop lamp switch	Brake pedal is depressed	0 V	Vehicles without TCL only
		Brake pedal is released	System voltage	
39	Backup power supply	Ignition switch: OFF	System voltage	
40	Vehicle speed sensor	Vehicle: Slowly moving forward	0 → 5 V Flashing	

Terminal No.	Check item	Check conditions	Normal condition	Remarks
41	Pulse generator B (PG-B)	Measure between terminals (41) and (42) Engine: 3,000 r/min Selector lever position: D range T/M condition: 3rd gear	1.5 V AC or more	
42	Pulse generator B (PG-B)	Measure between terminals (41) and (42) Engine: 3,000 r/min Selector lever position: D range T/M condition: 3rd gear	1.5 V AC or more	
43	Pulse generator A (PG-A)	Measure between terminals (43) and (44) Engine: 3,000 r/min Selector lever position: D range T/M condition: 3rd gear	1.5 V AC or more	
44	Pulse generator A (PG-A)	Measure between terminals (43) and (44) Engine: 3,000 r/min Selector lever position: D range T/M condition: 3rd gear	1.5 V AC or more	
45	Earth	Engine: Idling	0 V	
46	Ignition pulse	Engine: Idling	4–10 V	4G93, 4G63 only
	Ignition pulse	Engine: 3,000 r/min	0.3–3.0 V	6A12 only

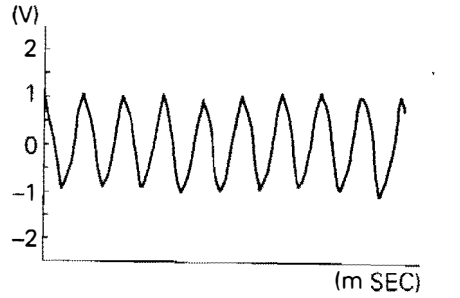
OSCILLOSCOPE INSPECTION PROCEDURE

E23ZE12AA

Check item	Check conditions		Normal condition (waveform sample)
Pulse generator A (PG-A)	Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	Waveform A
Pulse generator B (PG-B)	Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	Waveform B
Vehicle speed sensor	Selector lever position: D range Mode selection <4G63, 6A12>: AUTO Overdrive: OFF	Driving at constant speed of 50 km/h (20 seconds or more)	Waveform C
Pressure control solenoid valve (PCSV)	Accelerator pedal position Engine: Idling (vehicle stopped) Selector lever position: D range Mode selection <4G63, 6A12>: AUTO	Fully closed	Waveform D

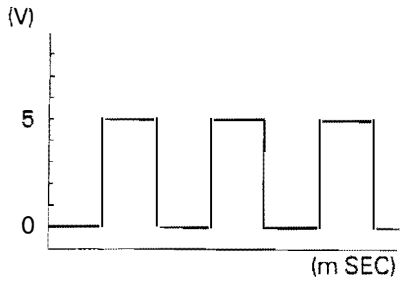
WAVEFORM SAMPLE

Waveform A



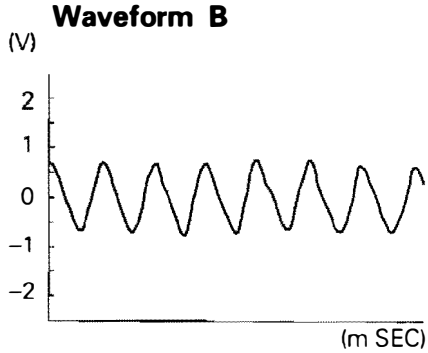
TFA0905

Waveform C



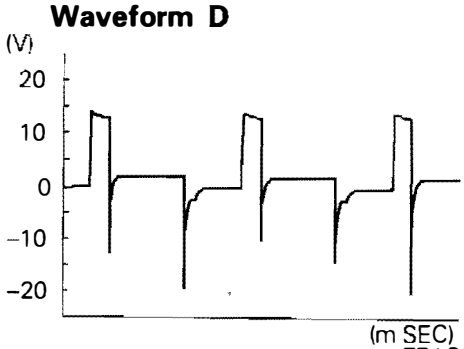
TFA0907

Waveform B



TFA0906

Waveform D



TFA0908

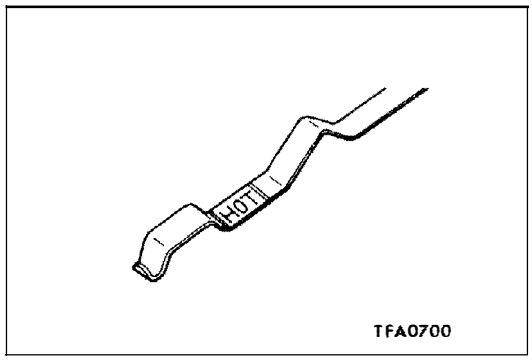
SERVICE ADJUSTMENT PROCEDURES

E23ZF00AA

BASIC INSPECTION

TRANSMISSION FLUID LEVEL INSPECTION

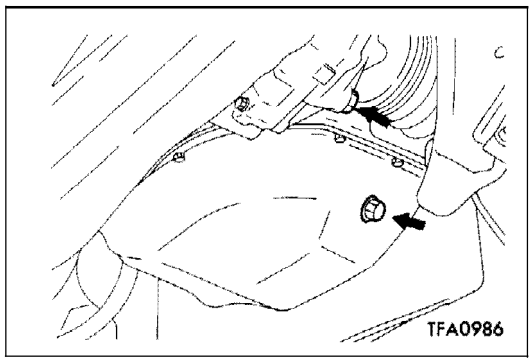
1. Drive until the fluid temperature reaches the usual temperature (70–80°C).
2. Place vehicle on level floor.
3. Move selector lever sequentially to every position to fill torque converter and hydraulic circuit with fluid, then place lever in "N" Neutral position.
4. Before removing level gauge, wipe all dirt from area around level gauge. Then take out the level gauge and check the condition of the fluid.
   The transmission should be overhauled under the following conditions.
   - If there is a "burning" odour.
   - If the fluid colour has become noticeably blacker.
   - If there is a noticeably great amount of metal particles in the fluid.



5. Check to see if fluid level is in "HOT" range on level gauge.
   If fluid level is low, add automatic transmission fluid until level reaches "HOT" range.

   Transmission fluid: Dia Queen ATF SP or equivalent

   Low fluid level can cause a variety of conditions because it allows pump to take in air along with fluid. Air trapped in hydraulic circuit forms bubbles which make fluid spongy. Therefore, pressures will be erratic, causing delayed shift, slippy clutch and brakes, etc.
   Improper filling can also raise fluid level to high. When transmission has too much fluid, gears churn up foam and cause the same conditions which occur with low fluid level, resulting in accelerated deterioration of automatic transmission fluid.
   In either case, air bubbles can cause overheating, fluid oxidation, which can interfere with normal valve, clutch, and servo operation. Foaming can also result in fluid escaping from transmission vent where it may be mistaken for a leak.
6. Be sure to examine fluid on level gauge closely.



TRANSMISSION FLUID REPLACEMENT

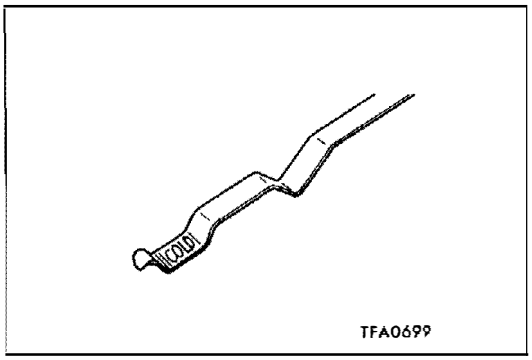
E23ZF00BA

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. Remove drain plugs to let fluid drain.
2. Remove the oil pan.
3. Check the oil filter for clogging and damage and replace if necessary.

4. Clean the inside of oil pan and magnets.
5. Attach the magnets to the concave part of the oil pan.
6. Clean both gasket surfaces of transmission case and oil pan.
7. Install oil pan with new gasket and tighten oil pan bolts.

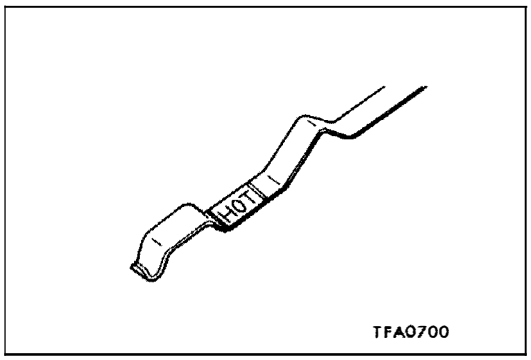
   Oil pan bolt: 11 Nm
8. Tighten drain plug with gasket.

   Drain plug: 39 Nm **Oil pan**
   32 Nm **Transmission case**

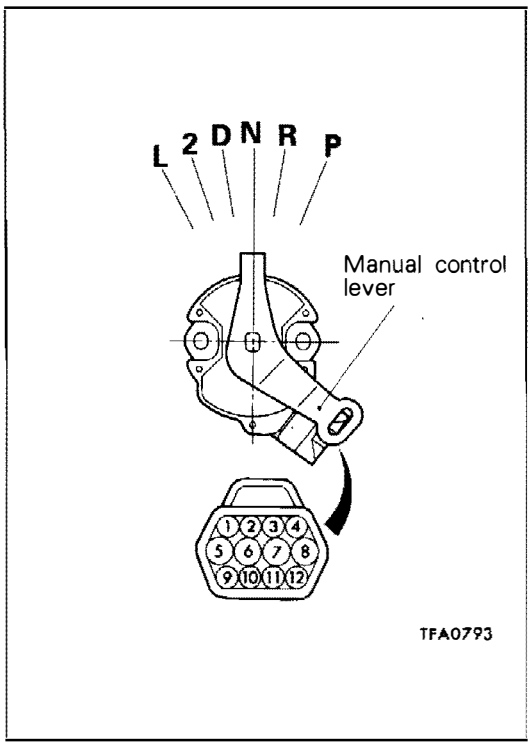


9. Replenish with new automatic transmission fluid as far as the COLD mark on the level gauge.

   Transmission fluid: Dia Queen ATF SP or equivalent
10. Start engine and allow to idle for at least two minutes. Then, with parking brake on, move selector lever momentarily to each position, ending in "N" Neutral position.



11. Check that the automatic transmission fluid is up to the HOT mark on the level gauge.

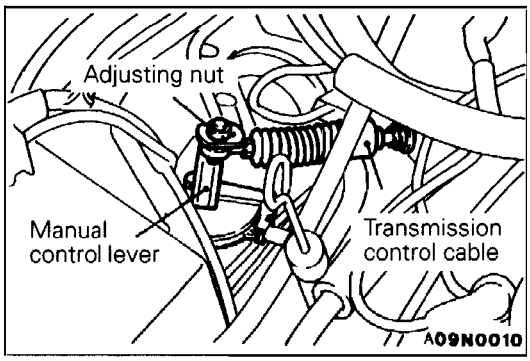


INHIBITOR SWITCH CONTINUITY CHECK E23ZF00CA

Terminal No.	P	R	N	D	2	L
1						
2	●					
3			●			
4					●	●
5	●	●	●	●	●	
6	●		●			
7		●				
8		●				
9	●		●			
10				●		
11		●				●

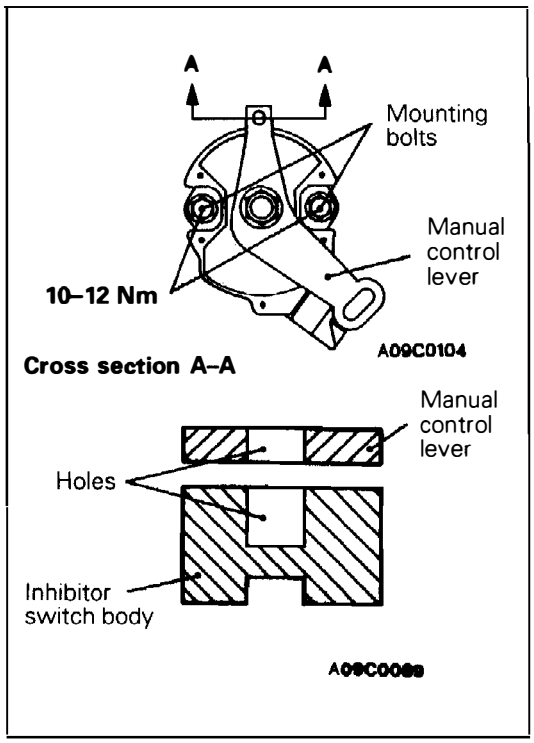
NOTE
○—○ indicates that there is continuity between the terminals.

PWDE9211

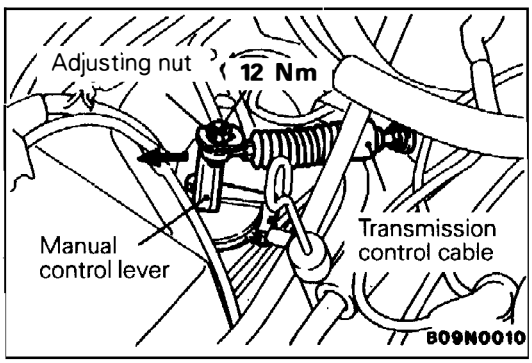


INHIBITOR SWITCH AND CONTROL CABLE ADJUSTMENT

1. Set the selector lever to the "N" position.
2. Loosen the control cable to manual control lever coupling nut to free the cable and lever.
3. Set the manual control lever to the neutral position.



4. Loosen the inhibitor switch body mounting bolts and the turn the inhibitor switch body so the hole in the end of the manual control lever and the hole (cross section A–A in the figure on the left) in the flange of the inhibitor switch body flange are aligned.
5. Tighten the inhibitor switch body mounting bolts to the specified torque. Be careful at this time that the position of the switch body is not changed.



6. Gently pull the transmission control cable in the direction of the arrow, and then tighten the adjusting nut.
7. Check that the selector lever is in the "N" position.
8. Check that each range on the transmission side operates and functions correctly for each position of the selector lever.

THROTTLE POSITION SENSOR (TPS) ADJUSTMENT <VEHICLES WITHOUT TCL> E23ZF00EA

Refer to GROUP 13A – Service Adjustment Procedures.

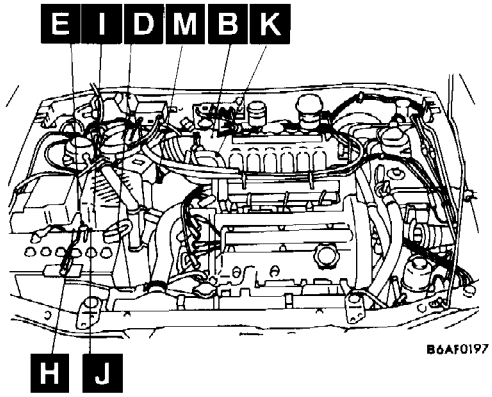
ACCELERATOR PEDAL POSITION SENSOR (APS) ADJUSTMENT <VEHICLES WITH TCL> E23ZF00FA

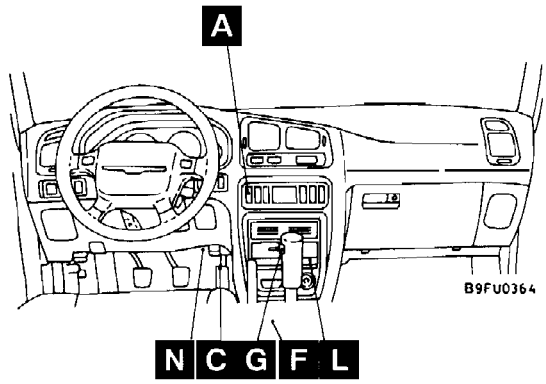
Refer to GROUP 13A – Service Adjustment Procedures.

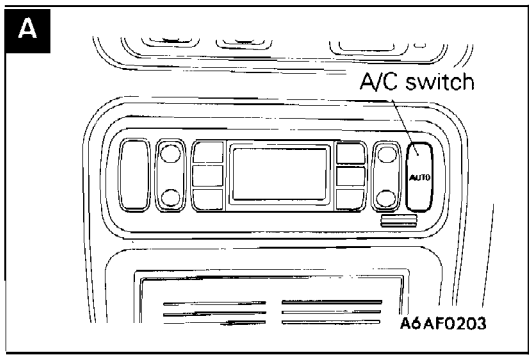
ELC 4-SPEED AUTOMATIC TRANSMISSION CONTROL COMPONENTS LAYOUT

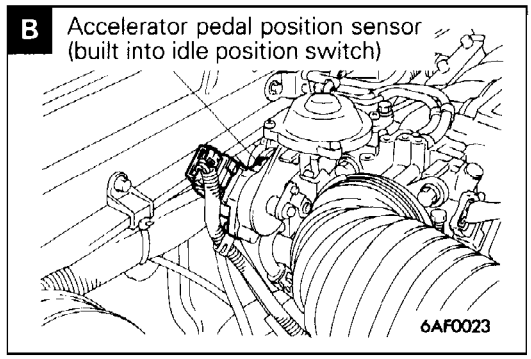
E23ZF01AA

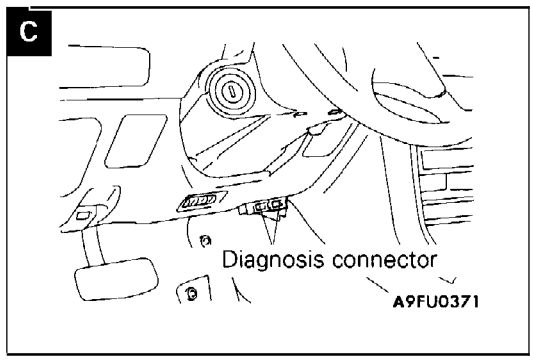
Name	Symbol	Name	Symbol
A/C switch	A	Oil temperature sensor	H
Accelerator pedal position sensor (built into idle position switch) <Vehicles with TCL>	B	Pulse generator A and B	I
Diagnosis connector	C	Solenoid valve	J
Inhibitor switch	D	Throttle position sensor (built into idle position switch) <Vehicles without TCL>	K
Kickdown servo switch	E	Transmission control unit	L
Mode selection switch <4G63, 6A12>	F	Vehicle speed sensor	M
OD-OFF switch	G	Wide open throttle switch	N

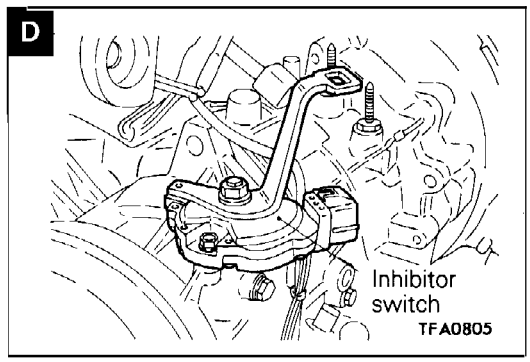












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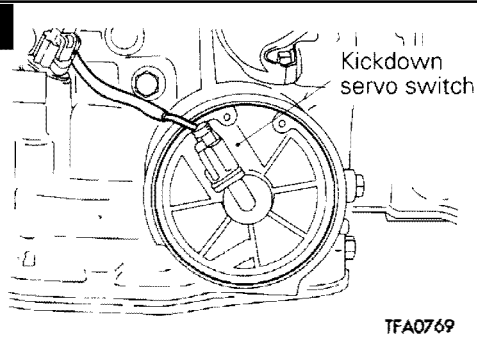

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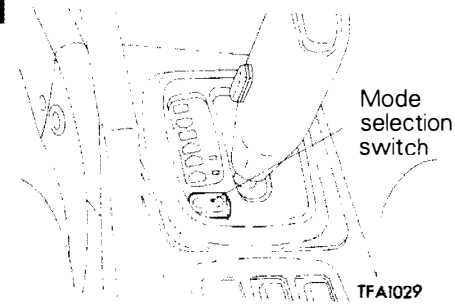

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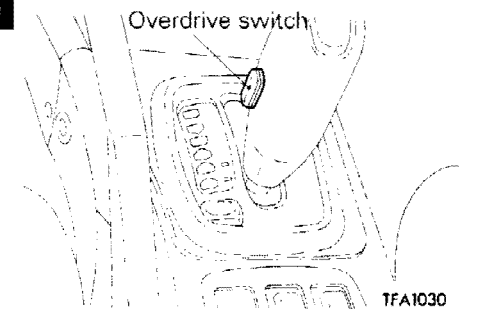

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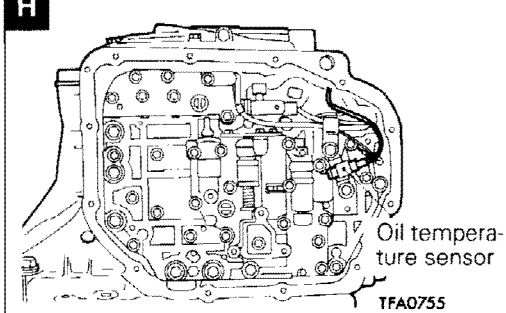

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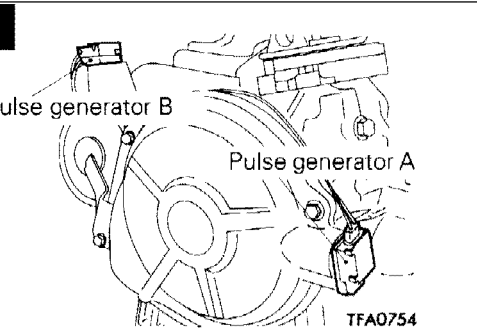

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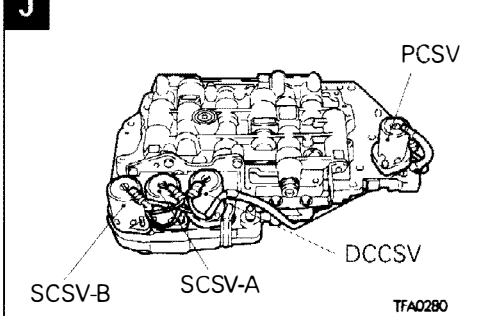

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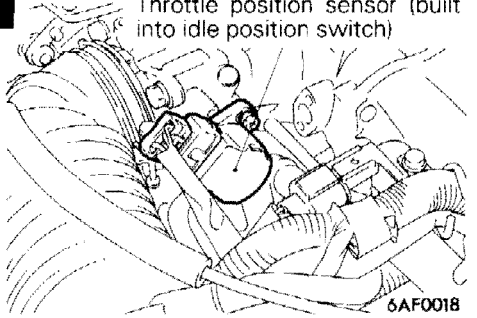

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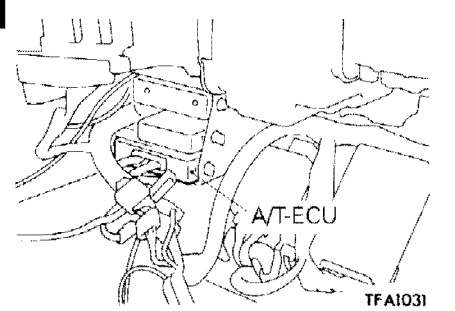

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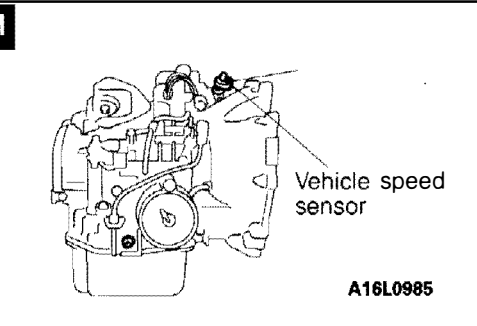

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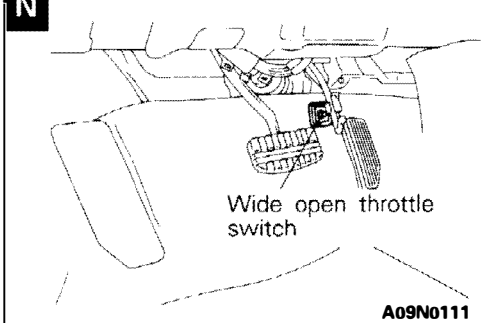
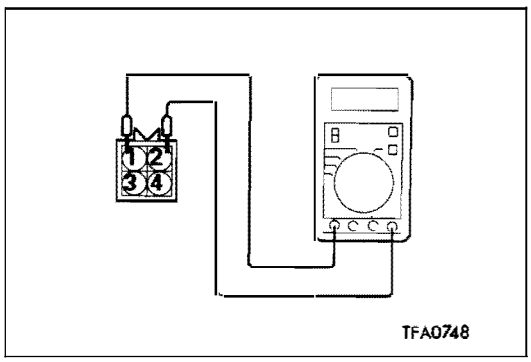
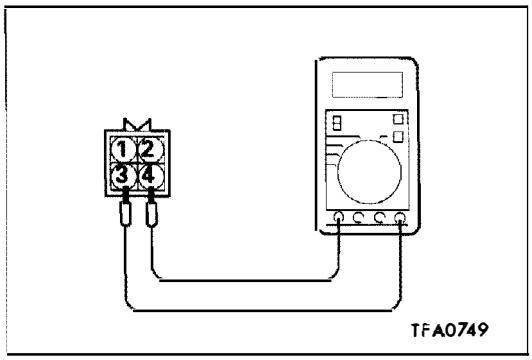






ELC-4A/T CONTROL COMPONENTS INSPECTION

E23ZF02AA

PULSE GENERATOR A INSPECTION

1. Disconnect the pulse generator A connector
2. Measure the resistance between the pulse generator A side connector terminals 1 and 2.

   Standard value: 215–275 Ω (at 20 °C)
3. If the resistance is outside the standard value, replace the pulse generator assembly.

PULSE GENERATOR B INSPECTION E23ZF02BA

1. Disconnect the pulse generator B connector.
2. Measure the resistance between the pulse generator B side connector terminals 3 and 4.

   Standard value: 215–275 Ω (at 20 °C)
3. If the resistance is outside the standard value, replace the pulse generator assembly.

INHIBITOR SWITCH INSPECTION E23ZF02CA

Refer to P.23–59.

OVERDRIVE SWITCH INSPECTION E23ZF02DA

Refer to P.23–92.

THROTTLE POSITION SENSOR (TPS) INSPECTION

E23ZF02EA

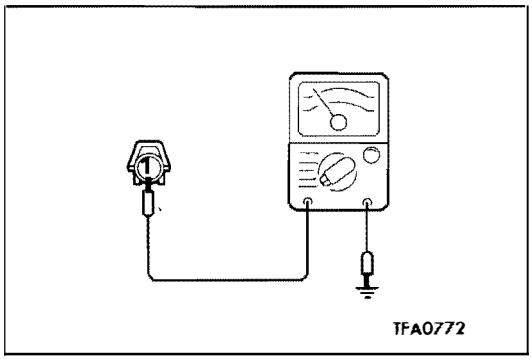
Refer to GROUP 13A – On-vehicle Inspection of MPI Components.

ACCELERATOR PEDAL POSITION SWITCH INSPECTION <VEHICLES WITH TCL> E23ZF02FA

Refer to GROUP 13A – On-vehicle Inspection of MPI Components.

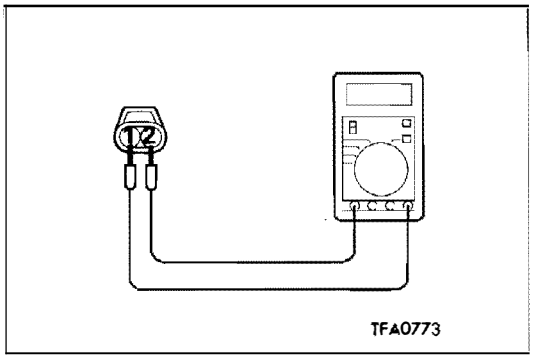
IDLE POSITION SWITCH INSPECTION E23ZF02GA

Refer to GROUP 13A – On-vehicle Inspection of MPI Components.



KICKDOWN SERVO SWITCH INSPECTION E23ZF02HA

1. Disconnect the kickdown servo switch connector.
2. Remove the kickdown servo switch.
3. Check that there is continuity between kickdown servo switch side connector terminal 1 and the metal part inside the kickdown servo switch.
4. If there is no continuity, replace the kickdown servo switch.



OIL TEMPERATURE SENSOR INSPECTION E23ZF02IA

1. Disconnect the oil temperature sensor connector.
2. Measure the resistance between the oil temperature sensor side connector terminals 1 and 2, and check that the values are as shown in the table below.

Standard values:

Oil temperature °C	Resistance value kΩ
0	16.7–20.5
100	0.57–0.69

3. If the values are outside the standard values, replace the oil temperature sensor.

VEHICLE SPEED SENSOR (REED SWITCH) INSPECTION E23ZF02JA

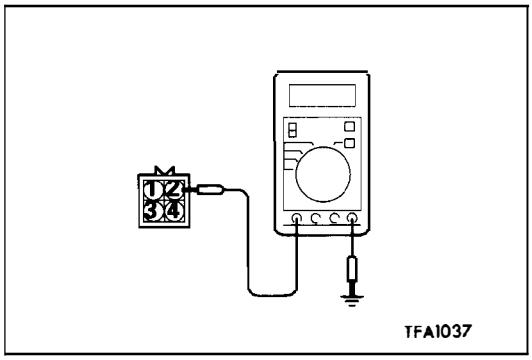
Refer to GROUP 54 – Service Adjustment Procedures.

DUAL PRESSURE SWITCH OR TRIPLE PRESSURE SWITCH (AIR CONDITIONER LOAD) INSPECTION E23ZF02KA

Refer to GROUP 55 – Service Adjustment Procedures.

AUTO/HOLD CHANGEOVER SWITCH CONTINUITY INSPECTION

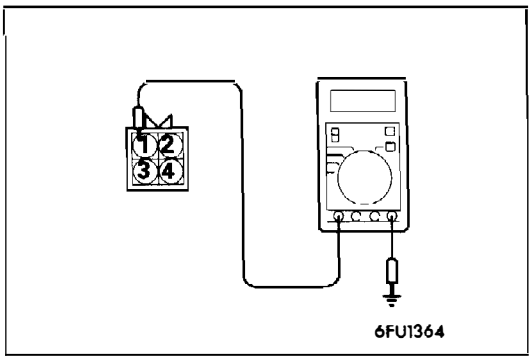
Refer to P.23–90.



DAMPER CLUTCH CONTROL SOLENOID VALVE (DCCSV) INSPECTION E23ZF02MA

1. Disconnect the DCCSV connector.
2. Measure the resistance between the DCCSV side connector terminal 2 and the body earth.

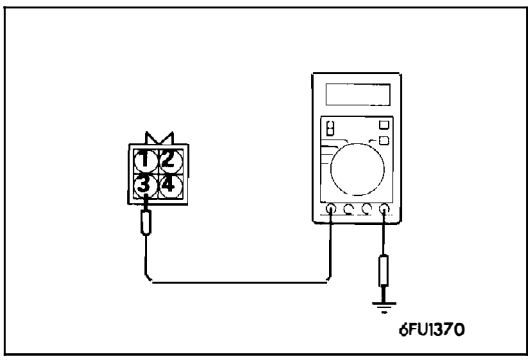
   Standard value: Approx. 13 Ω (at 20 °C)
3. If the resistance is outside the standard value, replace the solenoid valve assembly.



PRESSURE CONTROL SOLENOID VALVE (PCSV) INSPECTION E23ZF02NA

1. Disconnect the PCSV connector.
2. Measure the resistance between the PCSV side connector terminal 1 and the body earth.

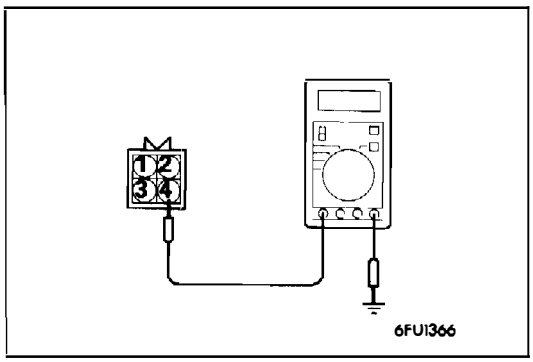
   Standard value: Approx. 3 Ω (at 20 °C)
3. If the resistance is outside the standard value, replace the solenoid valve assembly.



SHIFT CONTROL SOLENOID VALVE A (SCSV-A) INSPECTION E23ZF02OA

1. Disconnect the SCSV-A connector.
2. Measure the resistance between the SCSV-A side connector terminal 3 and the body earth.

   Standard value: Approx. 22 Ω (at 20 °C)
3. If the resistance is outside the standard value, replace the solenoid valve assembly.



SHIFT CONTROL SOLENOID VALVE B (SCSV-B) INSPECTION E23ZF02PA

1. Disconnect the SCSV-B connector.
2. Measure the resistance between the SCSV-B side connector terminal 4 and the body earth.

   Standard value: Approx. 22 Ω (at 20°C)
3. If the resistance is outside the standard value, replace the solenoid valve assembly.

WIDE OPEN THROTTLE SWITCH INSPECTION E23ZF02QA

Refer to P.23–90.

CONVERTER STALL TEST E23ZF03AA

Stall test consist of determining maximum engine speed obtained at full throttle in "D" and "R" positions. This test checks torque converter stator overrunning clutch operation, and holding ability of transmission clutches and low-reverse brake.

Caution
During this test, make sure that no one stand in front of or behind vehicle.

1. Check the transmission fluid level, fluid temperature and engine coolant temperature.
   - Fluid level: At "HOT" position in level gauge
   - Fluid temperature: 70–80°C
   - Engine coolant temperature: 80–90°C
2. Apply chocks to both rear wheels.
3. Attach engine tachometer.
4. Apply parking and service brakes fully.
5. Start engine.
6. With selector lever in "D" position, depress accelerator pedal fully to read engine maximum rpm. Do not hold throttle wide open any longer than is necessary to obtain maximum engine rpm reading, and never longer than 5 seconds at a time. If more than one stall test is required, operate engine at approximately 1,000 r/min in neutral for 2 minutes to cool transmission fluid between tests.

   Standard value: 2500–3000 r/min.
7. Place selector lever to "R" position and perform stall test by the same procedures as in foregoing item.

Stall Speed Above Specification in "D"

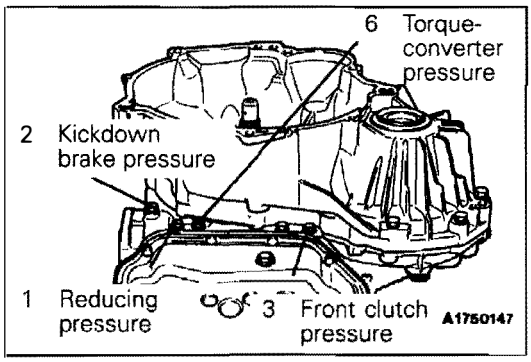
If stall speed is higher than specification, rear clutch or overrunning clutch of transmission is slipping. In this case, perform hydraulic test to locate cause of slippage.

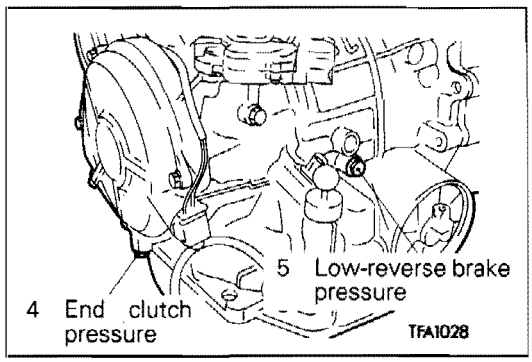
Stall Speed Above Specification in "R"

If stall speed is higher than specification, front clutch of transmission or low-reverse brake is slipping. In this case, perform hydraulic test to locate cause of slippage.

Stall Speed Above Specification in "D" and "R"

If stall speed is lower than specification, insufficient engine output or faulty torque converter is suspected. Check for engine misfiring, ignition timing, valve clearance etc. If these are good, torque converter is faulty.





OIL PRESSURE TEST E23ZF04AA

1. Completely warm up the transmission.
2. Raise the vehicle by using a jack so that the drive wheels can be rotated.
3. Connect an engine tachometer and place it in a position where it's easy to see.
4. Attach the special oil-pressure gauge (MD998330, MD999563) and the adapter (MD998332, MD998900) to each oil-pressure outlet port.
   When the reverse position pressure is to be tested, the 3,000 kPa type of gauge should be used.
5. Measure each oil pressure under the conditions in the standard oil pressure table, and check that they are at the standard values.
6. Use the MUT-II to force-drive the actuator, and measure the kickdown brake pressure (Apply) when the pressure control solenoid valve (PCSV) is at 50 % duty.

   NOTE
   1. Vehicle speed: 0 km/h
   2. Selector lever switch position: "D"
   3. Accelerator condition: Fully closed.
      If all of the above conditions are fulfilled, force-drive the actuator for 5 seconds to bring the PCSV to 50 % duty.
7. If the pressure is outside the standard value, repair according to the hydraulic test diagnosis table.

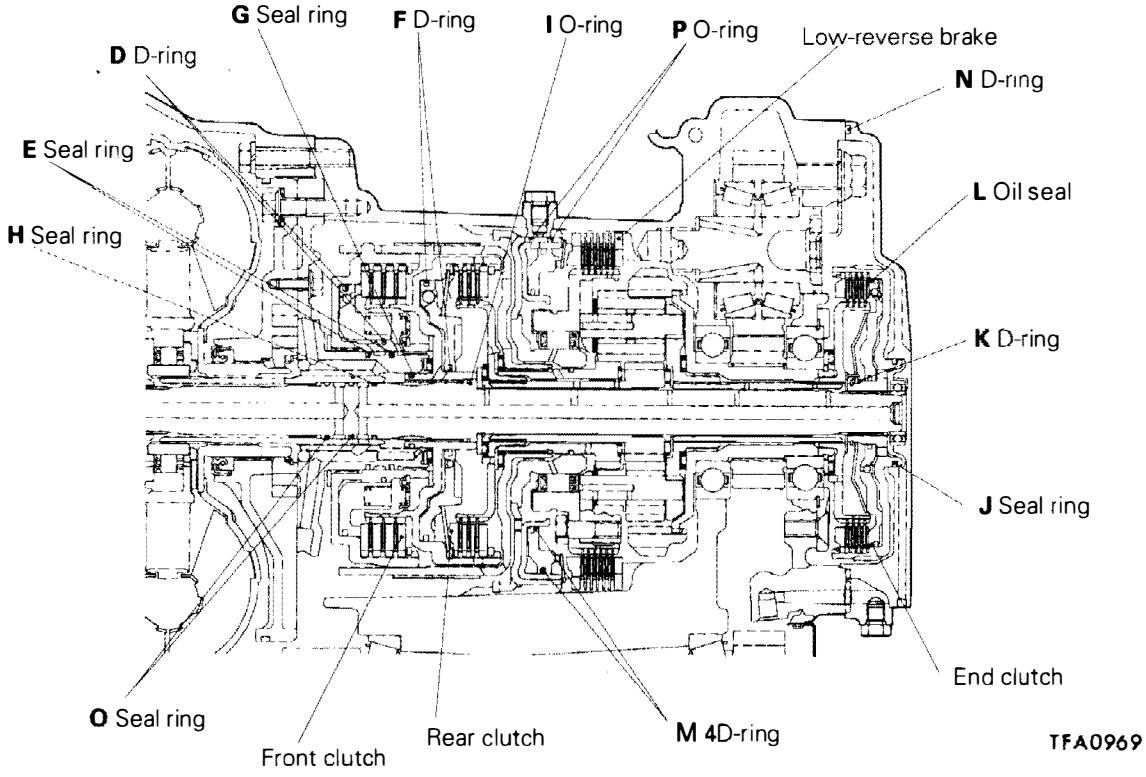
Standard Hydraulic Pressure Table

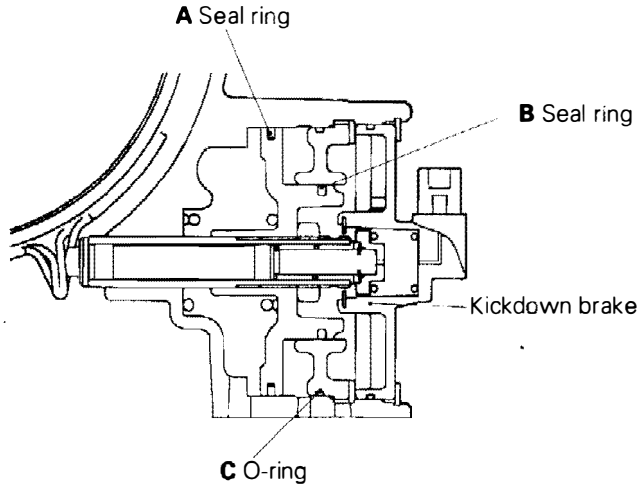
No.	Conditions			Standard oil pressure kPa					
	Select lever position	Engine speed r/min.	Shift position	1 Reducing pressure	2 Kickdown brake pressure (Apply)	3 Front clutch pressure	4 End clutch pressure	5 Low-reverse brake pressure	6 Torque-converter pressure
1	N	Idling	Neutral	370–490	–	–	–	–	*
2	D	Idling (using MUT-II)	2nd gear	370–490	100–210 (250–300)	–	–	–	*
3	D (SW-ON)	Approx. 2,500	4th gear	370–490	830–900	–	830–900	–	450–650
4	D(SW-OFF)	Approx. 2,500	3rd gear	370–490	830–900	830–900	830–900	–	450–650
5	2	Approx. 2,500	2nd gear	370–490	830–900	–	–	–	450–650
6	L	Approx. 1,000	1st gear	370–490	–	–	–	300–450	*
7	R	Approx. 2,500 Approx. 1,000	Reverse	370–490	–	1,640–2,240 1,000 or more	–	1,640–2,240 1,000 or more	450–650

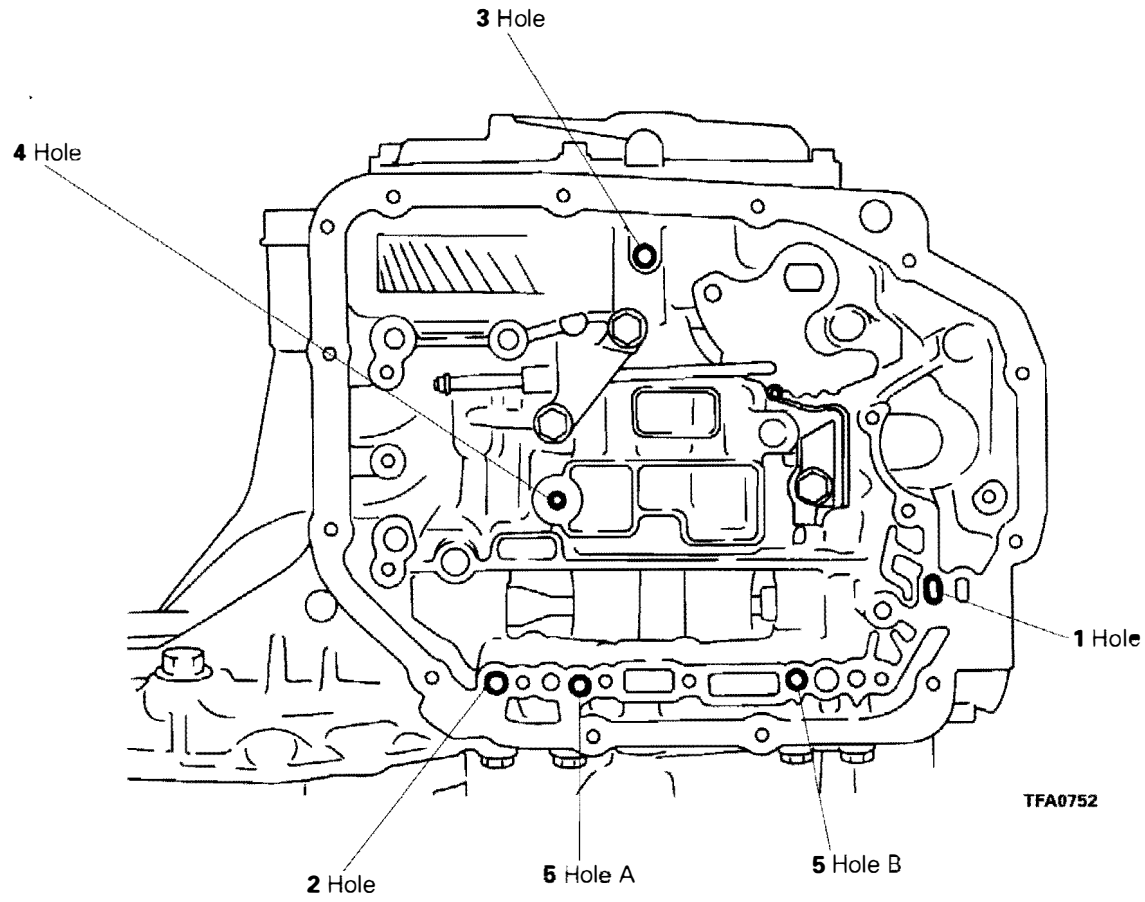
NOTE
– must be 10 kPa or less.
SW-ON: Switch ON the overdrive control switch
SW-OFF: Switch OFF the overdrive control switch
*: Hydraulic pressure is generated, but not the standard value.

Hydraulic Pressure Test Diagnosis Chart

Case	Description	Reference page
1	Nos. 2 , 3 , 4 and 5 hydraulic pressures (line pressure) are all abnormal	P.23–70
2	No. 1 hydraulic pressure (reducing pressure) is abnormal.	P.23–70
3	No. 2 hydraulic pressure (kickdown brake apply pressure) is abnormal	P.23–71
4	No. 3 hydraulic pressure (front clutch pressure) is abnormal	P.23–72
5	No. 4 hydraulic pressure (end clutch pressure) is abnormal	P.23–73
6	No. 5 hydraulic pressure (low-reverse brake pressure) is abnormal	P.23–73
7	No. 6 hydraulic pressure (torque converter pressure) is abnormal	P.23–74
8	Hydraulic pressure appears in places where standard hydraulic pressure is 10 kPa or less	P.23–74

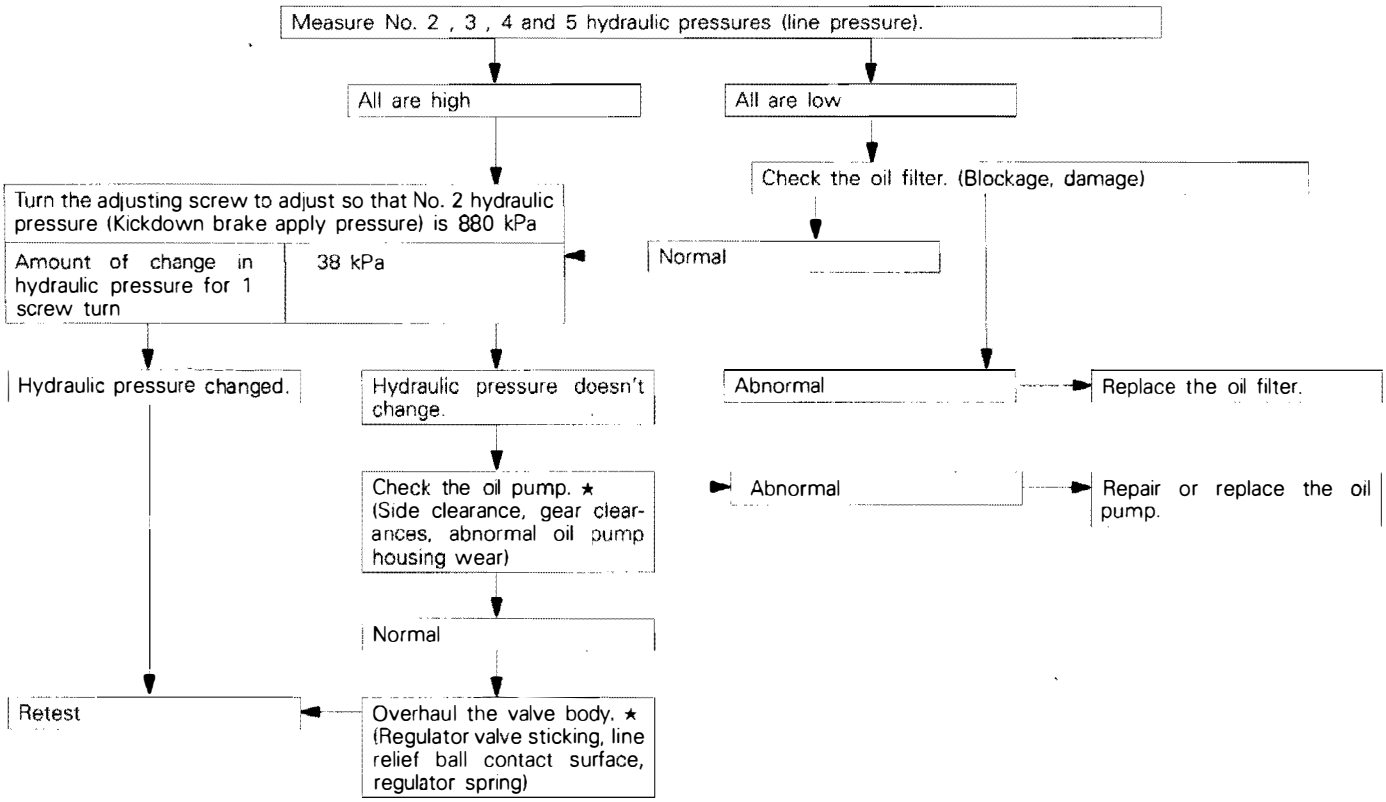

G Seal ring
F D-ring
I O-ring
P O-ring
Low-reverse brake
D D-ring
N D-ring
E Seal ring
L Oil seal
H Seal ring
K D-ring
J Seal ring
End clutch
O Seal ring
Front clutch
Rear clutch
M 4D-ring
TFA0969


A Seal ring
B Seal ring
Kickdown brake
C O-ring
TFA1013



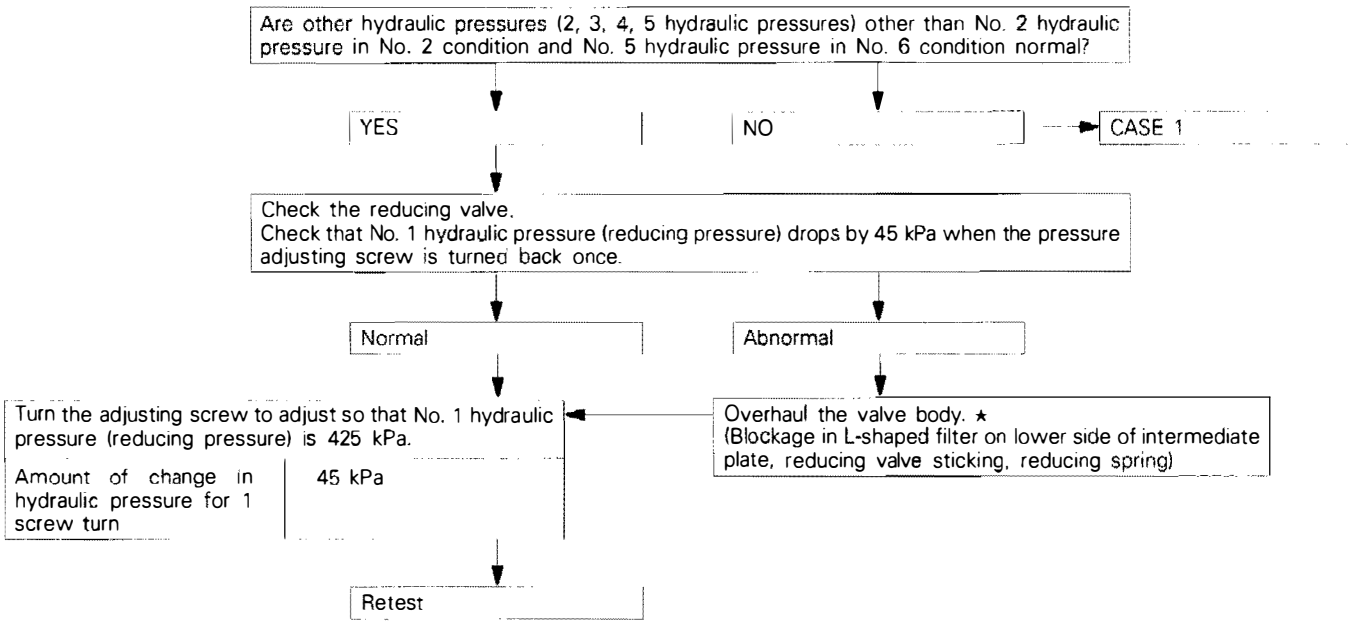
★: Refer to transmission repair manual

CASE 1	No. 2 , 3 , 4 and 5 hydraulic pressures (line pressure) are all abnormal.



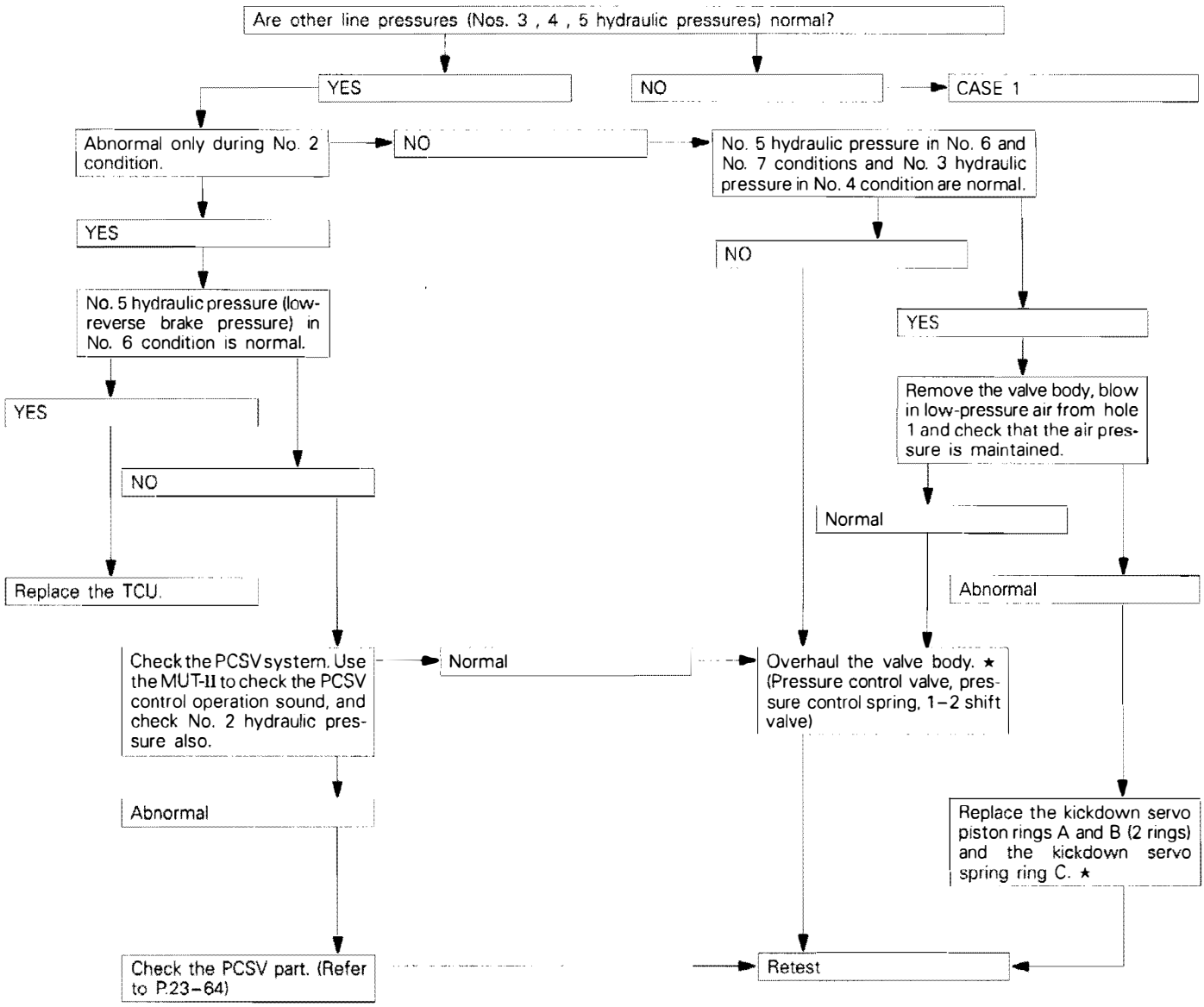
★: Refer to transmission repair manual

CASE 2	No. 1 hydraulic pressure (reducing pressure) is abnormal.



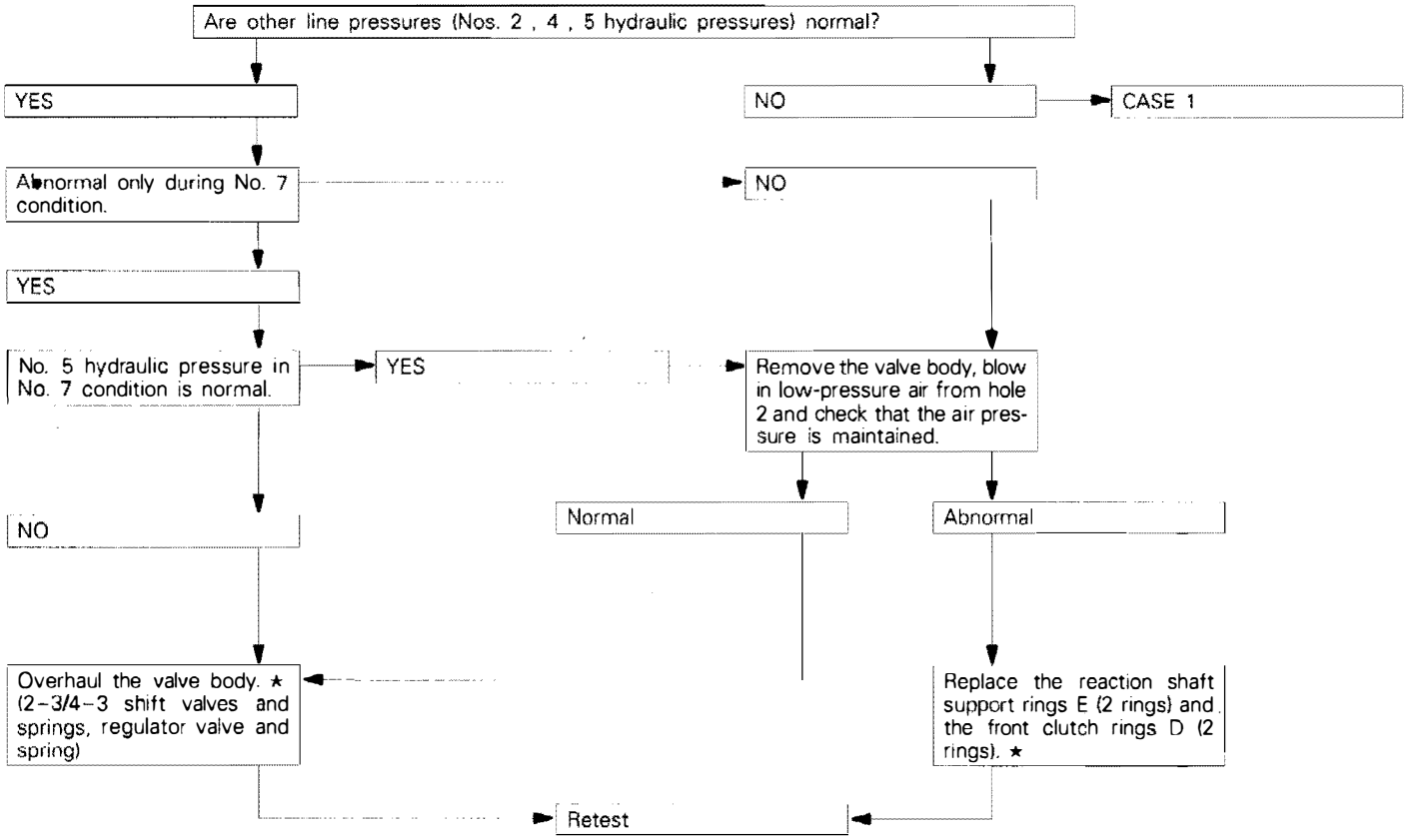
★: Refer to transmission repair manual

CASE 3	No. 2 hydraulic pressure (kickdown brake apply pressure) is abnormal.



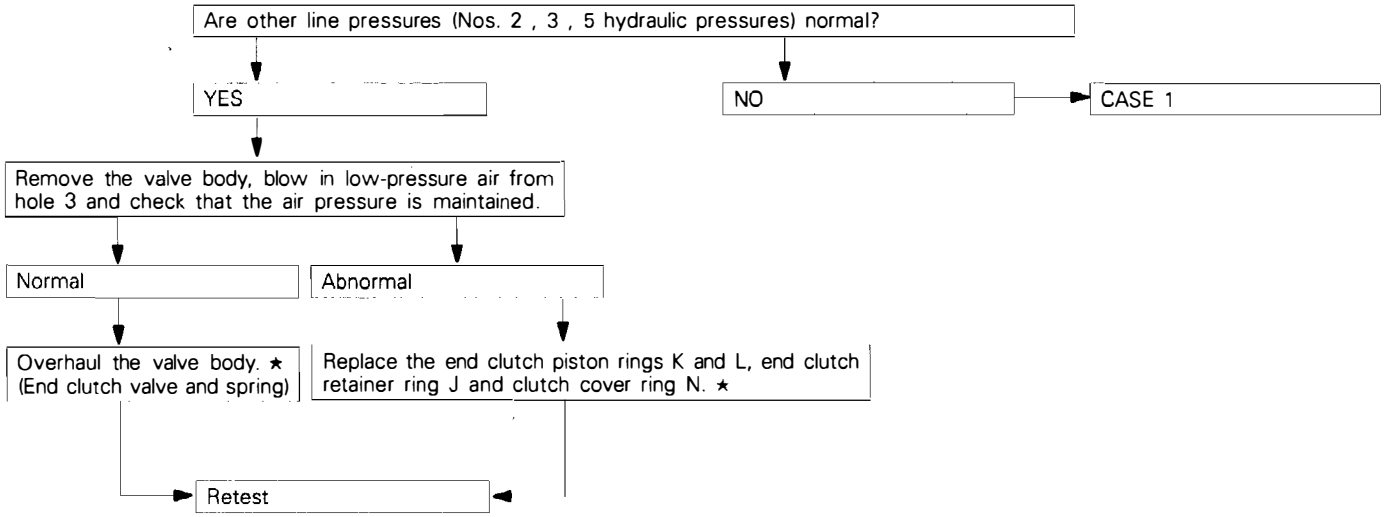
★: Refer to transmission repair manual

CASE 4	No. 3 hydraulic pressure (front clutch pressure) is abnormal.

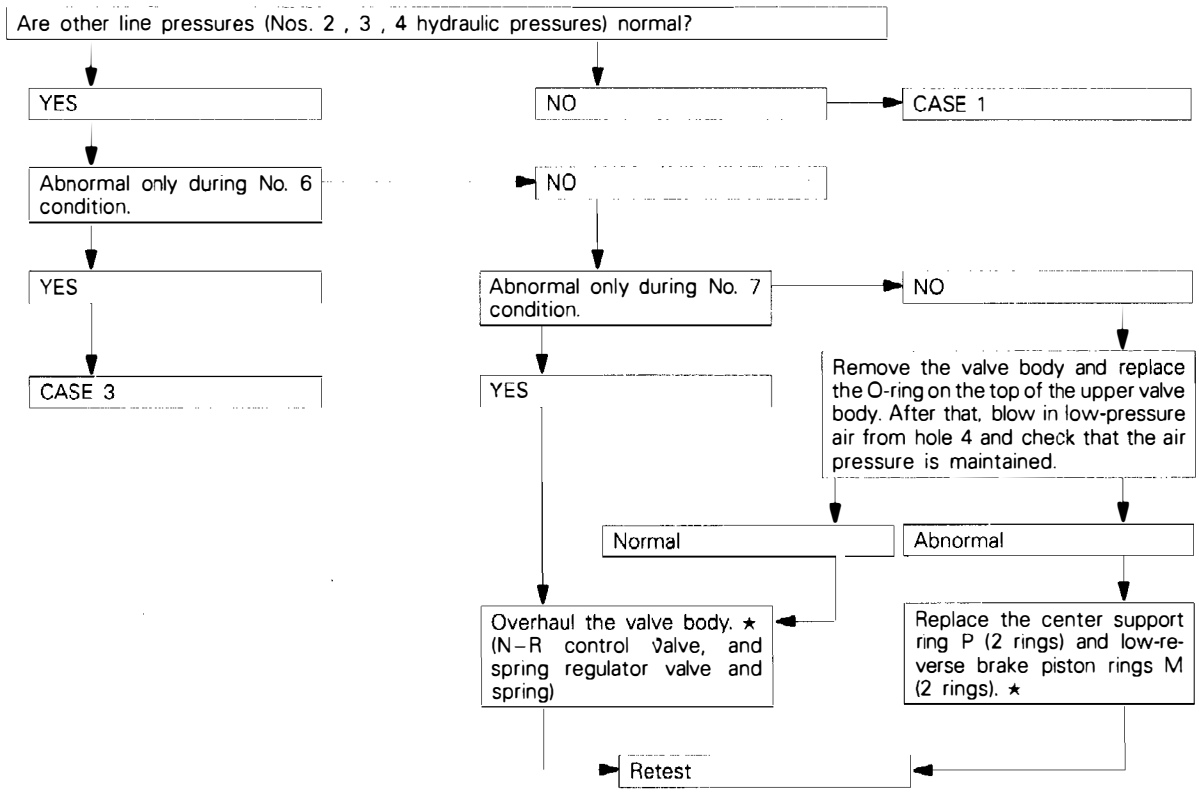


★: Refer to transmission repair manual

CASE 5	No. 4 hydraulic pressure (end clutch pressure) is abnormal.

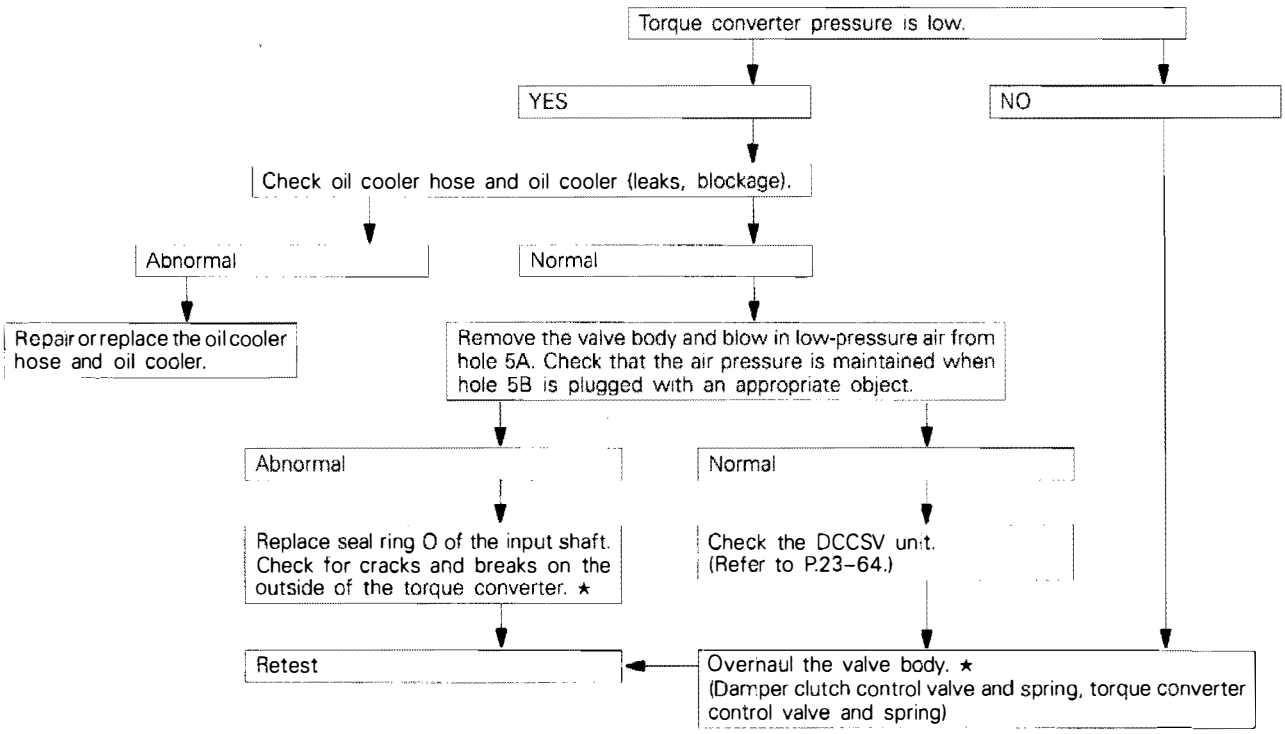


CASE 6	No. 5 hydraulic pressure (low-reverse brake pressure) is abnormal.

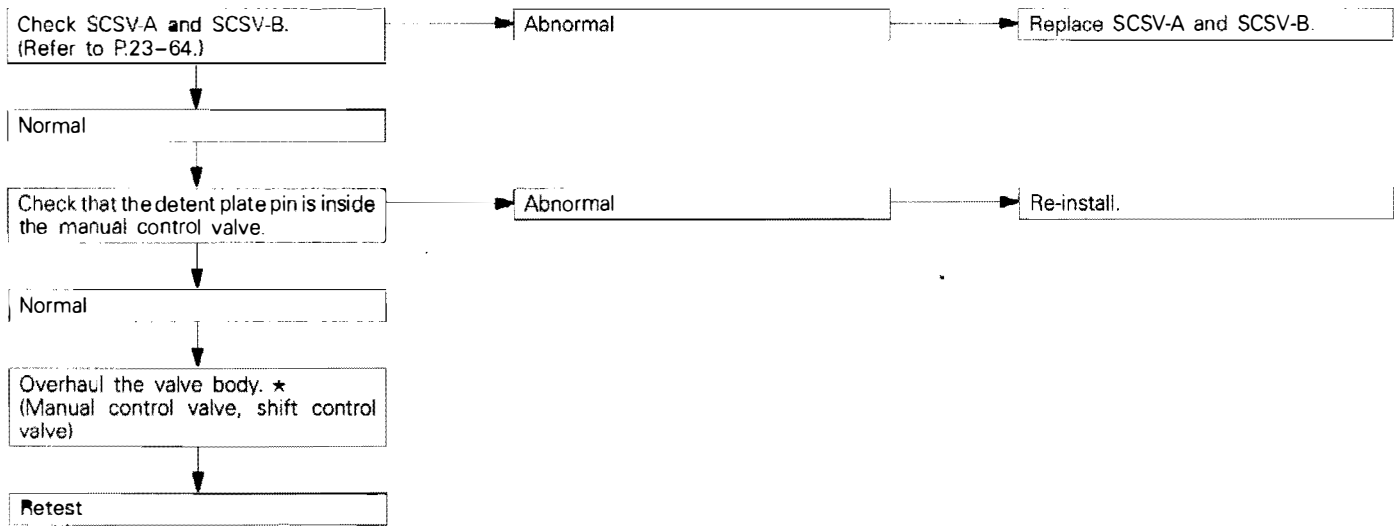


★: Refer to transmission repair manual

CASE 7	No. 6 hydraulic pressure (torque converter pressure) is abnormal.

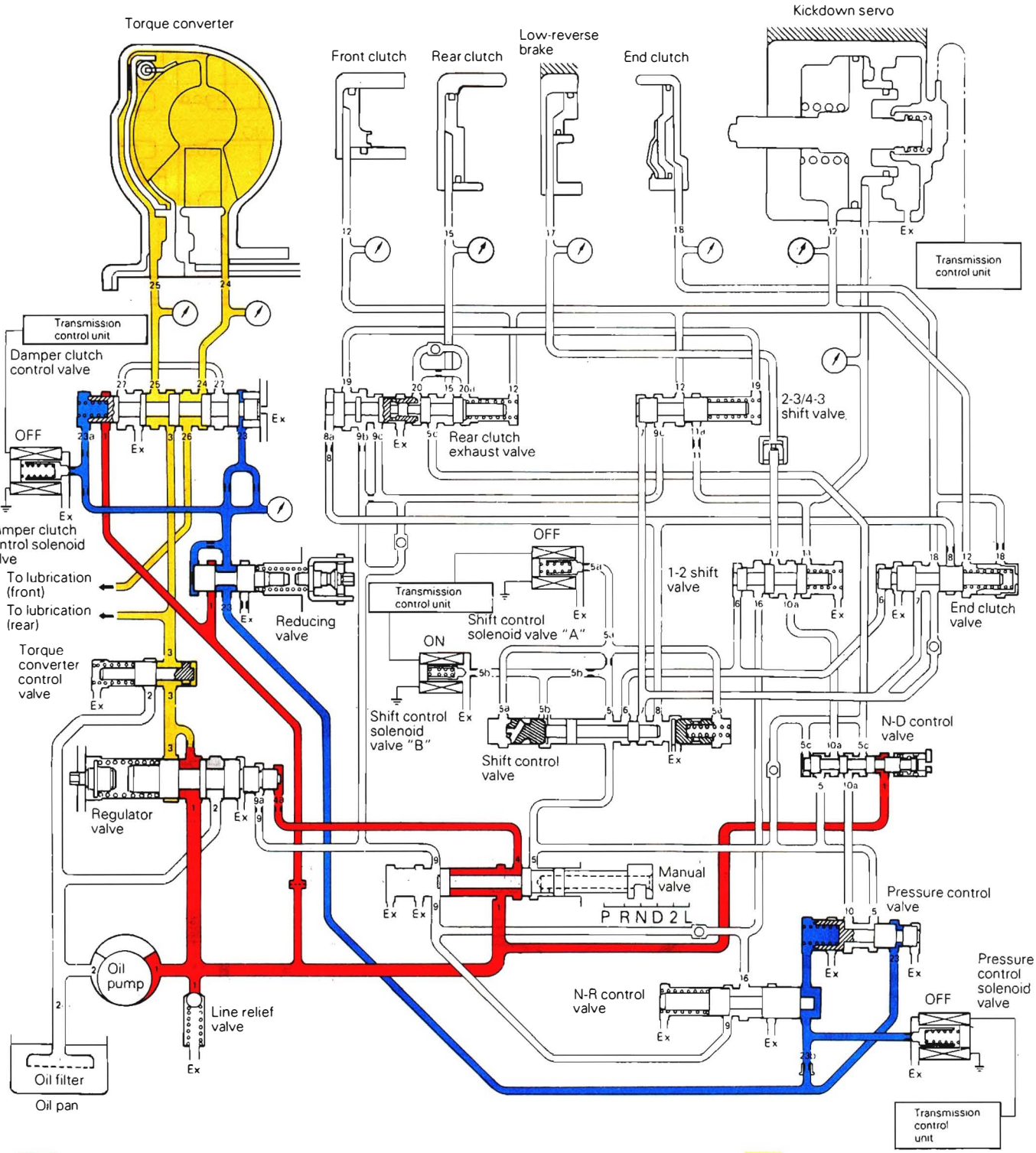


CASE 8	Hydraulic pressure appears in places where standard hydraulic pressure is 10 kPa or less

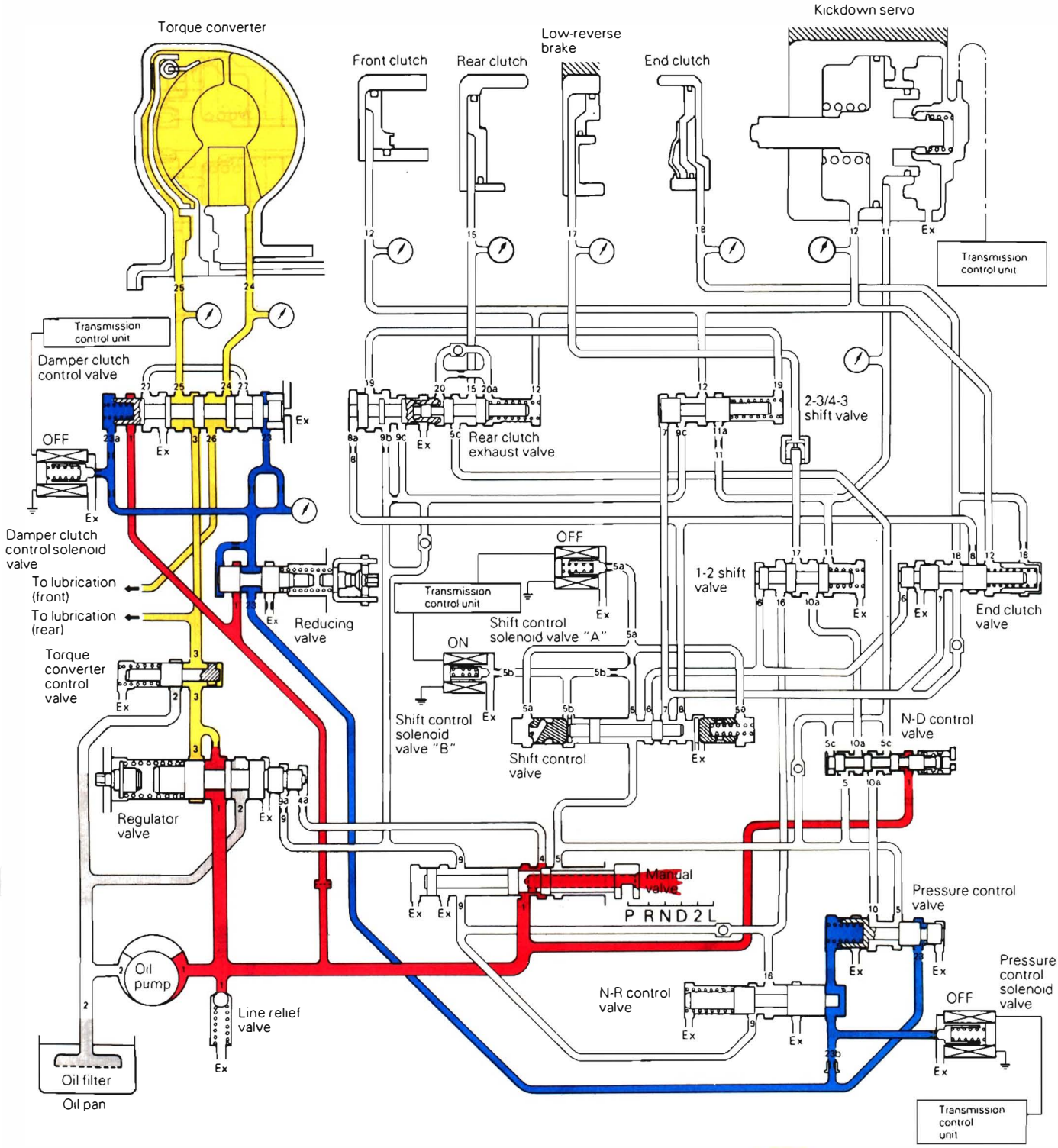


HYDRAULIC CIRCUIT

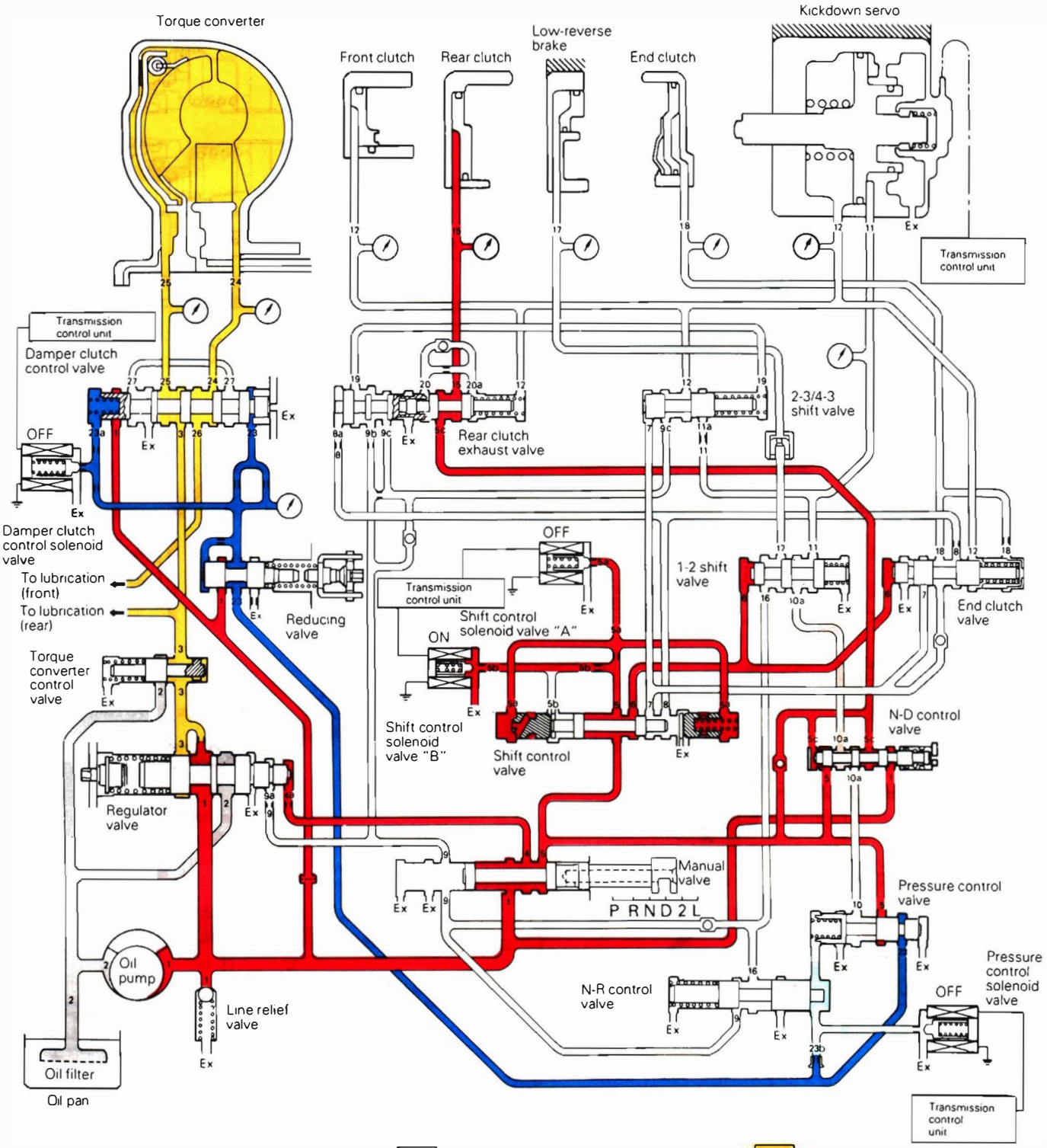
E23ZF05AA

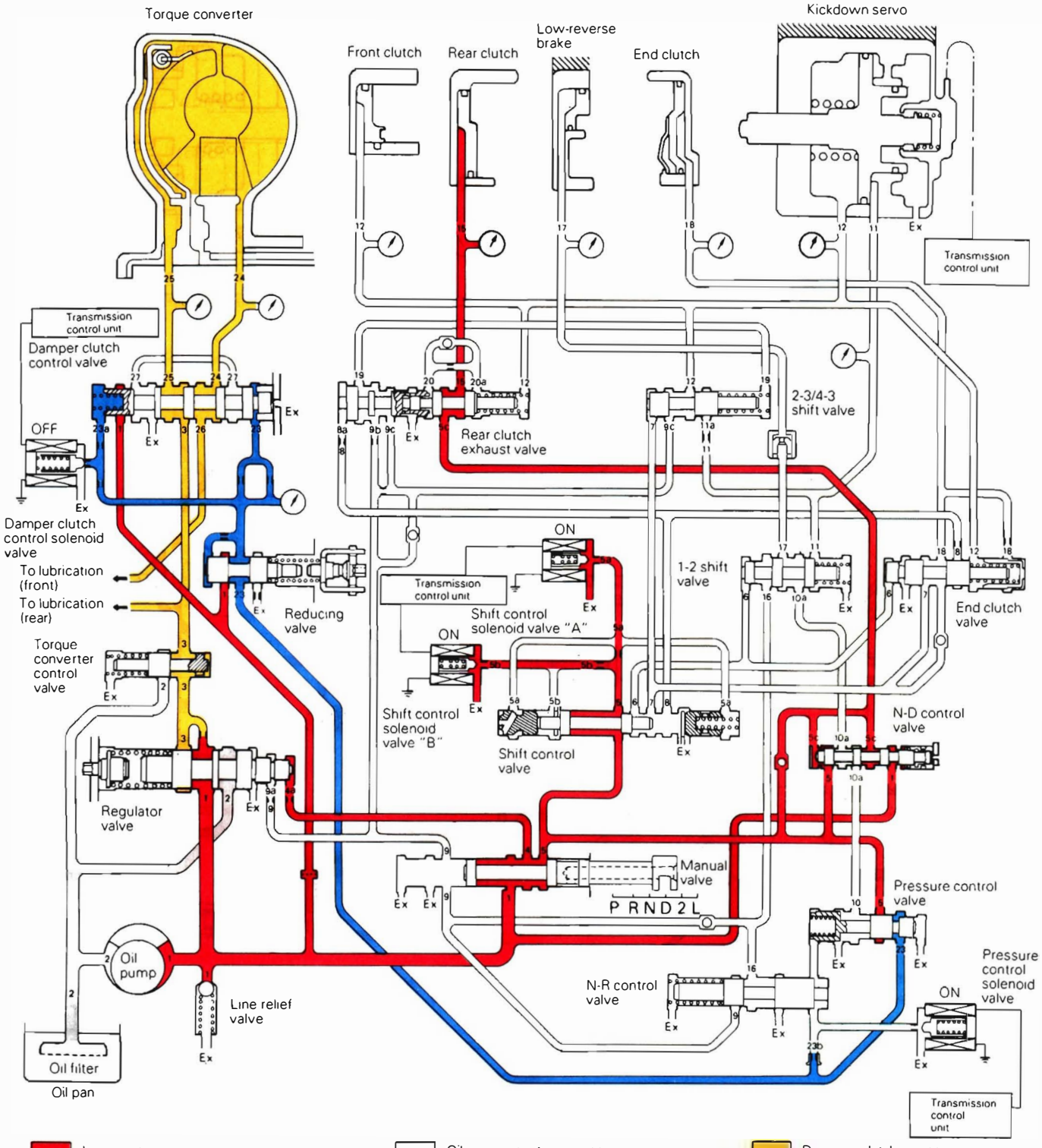


TFA0070

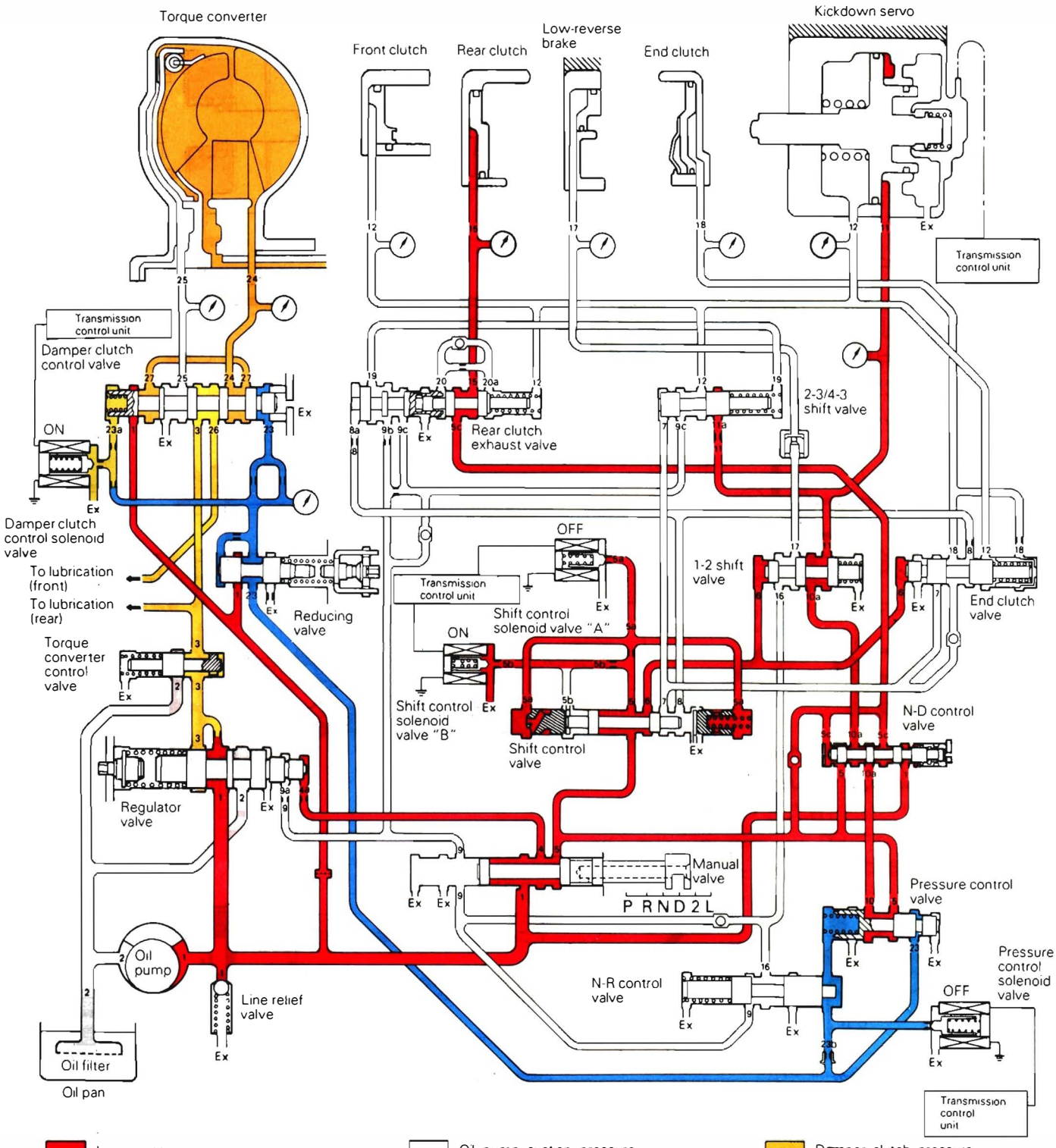

Torque converter
Front clutch
Rear clutch
Low-reverse brake
End clutch
Kickdown servo
Transmission control unit
Damper clutch control valve
OFF
Damper clutch control solenoid valve
To lubrication (front)
To lubrication (rear)
Torque converter control valve
Reducing valve
Rear clutch exhaust valve
2-3/4-3 shift valve
Shift control solenoid valve "A"
Shift control solenoid valve "B"
ON
Shift control valve
1-2 shift valve
End clutch valve
N-D control valve
Regulator valve
Manual valve
P R N D 2 L
Pressure control valve
Pressure control solenoid valve
N-R control valve
Oil pump
Line relief valve
Oil filter
Oil pan
Line pressure
Torque converter and lubrication pressure
Reducing pressure
Oil pump suction pressure
Modulated line pressure
Pressure control solenoid valve pressure
Damper clutch pressure
Damper clutch control solenoid valve pressure
Parking

TFA0071


Torque converter
Front clutch
Rear clutch
Low-reverse brake
End clutch
Kickdown servo
Transmission control unit
Damper clutch control valve
OFF
Ex
Damper clutch control solenoid valve
To lubrication (front)
To lubrication (rear)
Torque converter control valve
Reducing valve
Rear clutch exhaust valve
2-3/4-3 shift valve
Shift control solenoid valve "A"
ON
Shift control solenoid valve "B"
Shift control valve
1-2 shift valve
End clutch valve
N-D control valve
Regulator valve
Manual valve
P R N D 2 L
Pressure control valve
Pressure control solenoid valve
N-R control valve
Oil pump
Line relief valve
Oil filter
Oil pan
Line pressure
Torque converter and lubrication pressure
Reducing pressure
Oil pump suction pressure
Modulated line pressure
Pressure control solenoid valve pressure
Damper clutch pressure
Damper clutch control solenoid valve pressure
Drive (Stop)
TFA0242

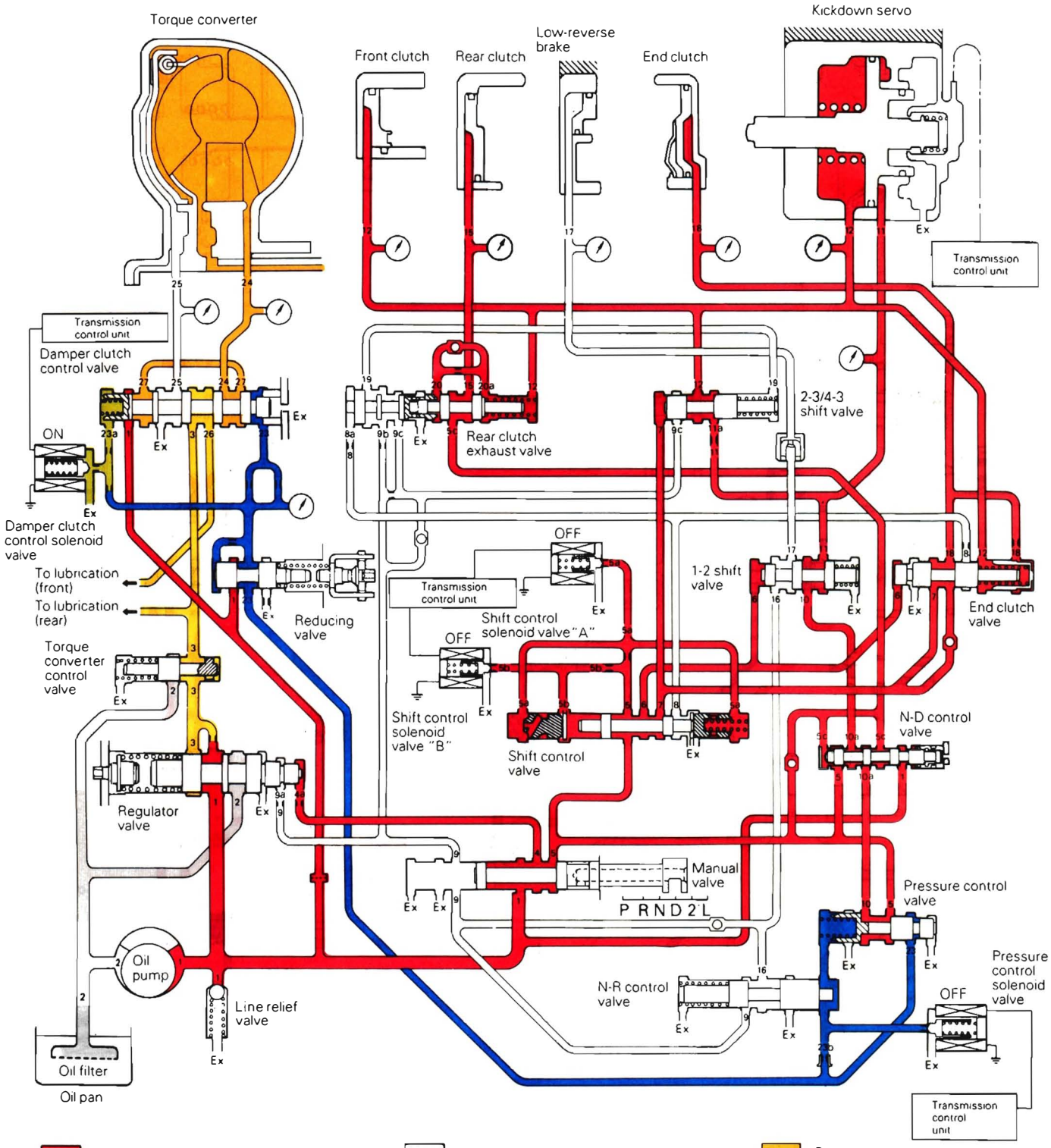

Torque converter
Front clutch
Rear clutch
Low-reverse brake
End clutch
Kickdown servo
Transmission control unit
Damper clutch control valve
OFF
Ex
Damper clutch control solenoid valve
To lubrication (front)
To lubrication (rear)
Torque converter control valve
Reducing valve
Rear clutch exhaust valve
2-3/4-3 shift valve
ON
Shift control solenoid valve "A"
Shift control solenoid valve "B"
Shift control valve
1-2 shift valve
End clutch valve
N-D control valve
Regulator valve
Manual valve
P R N D 2 L
Pressure control valve
Pressure control solenoid valve
N-R control valve
Oil pump
Line relief valve
Oil filter
Oil pan
Line pressure
Torque converter and lubrication pressure
Reducing pressure
Oil pump suction pressure
Modulated line pressure
Pressure control solenoid valve pressure
Damper clutch pressure
Damper clutch control solenoid valve pressure
Drive (First)

TFA0072



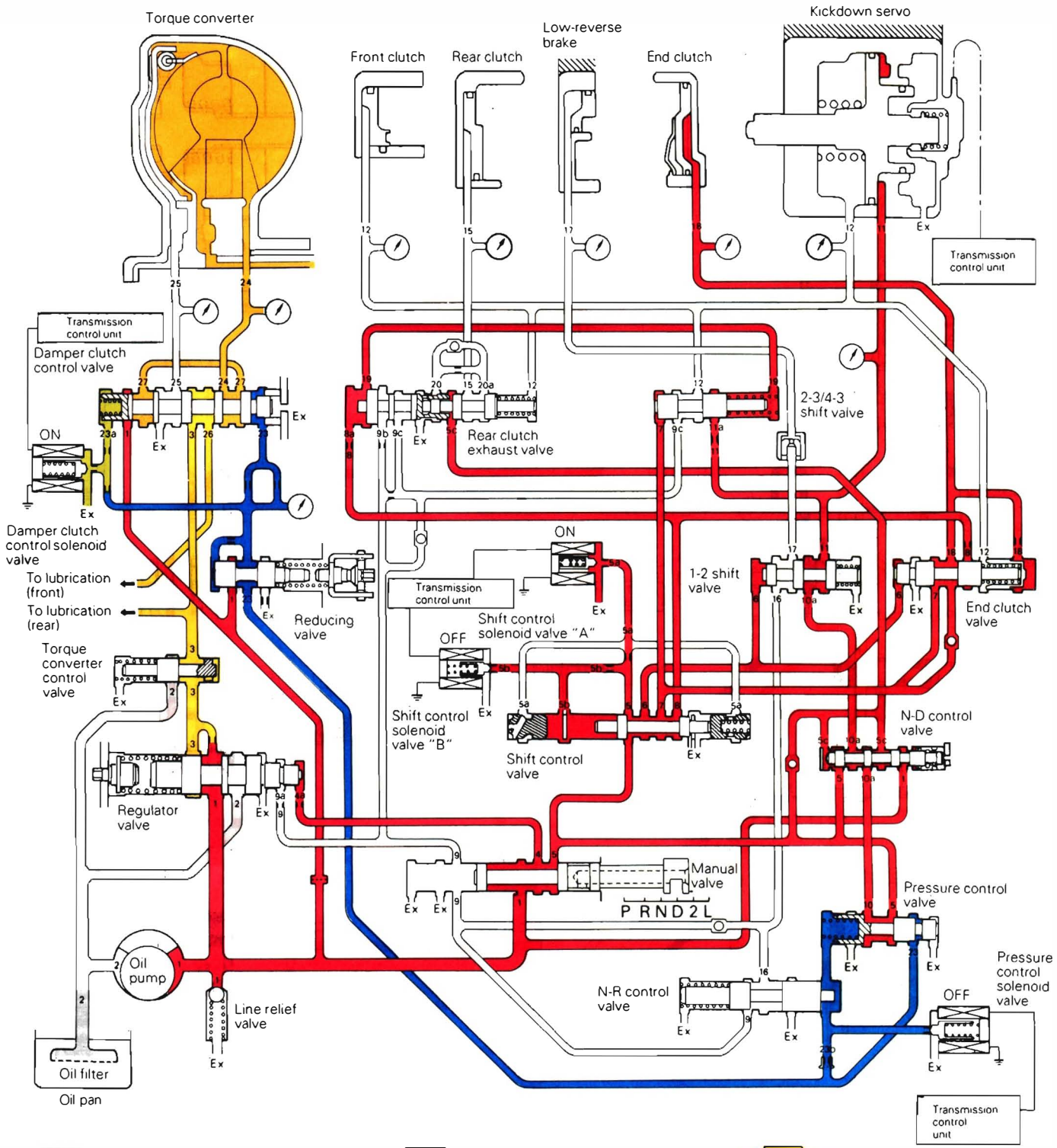
Drive (Second)

TFA0073



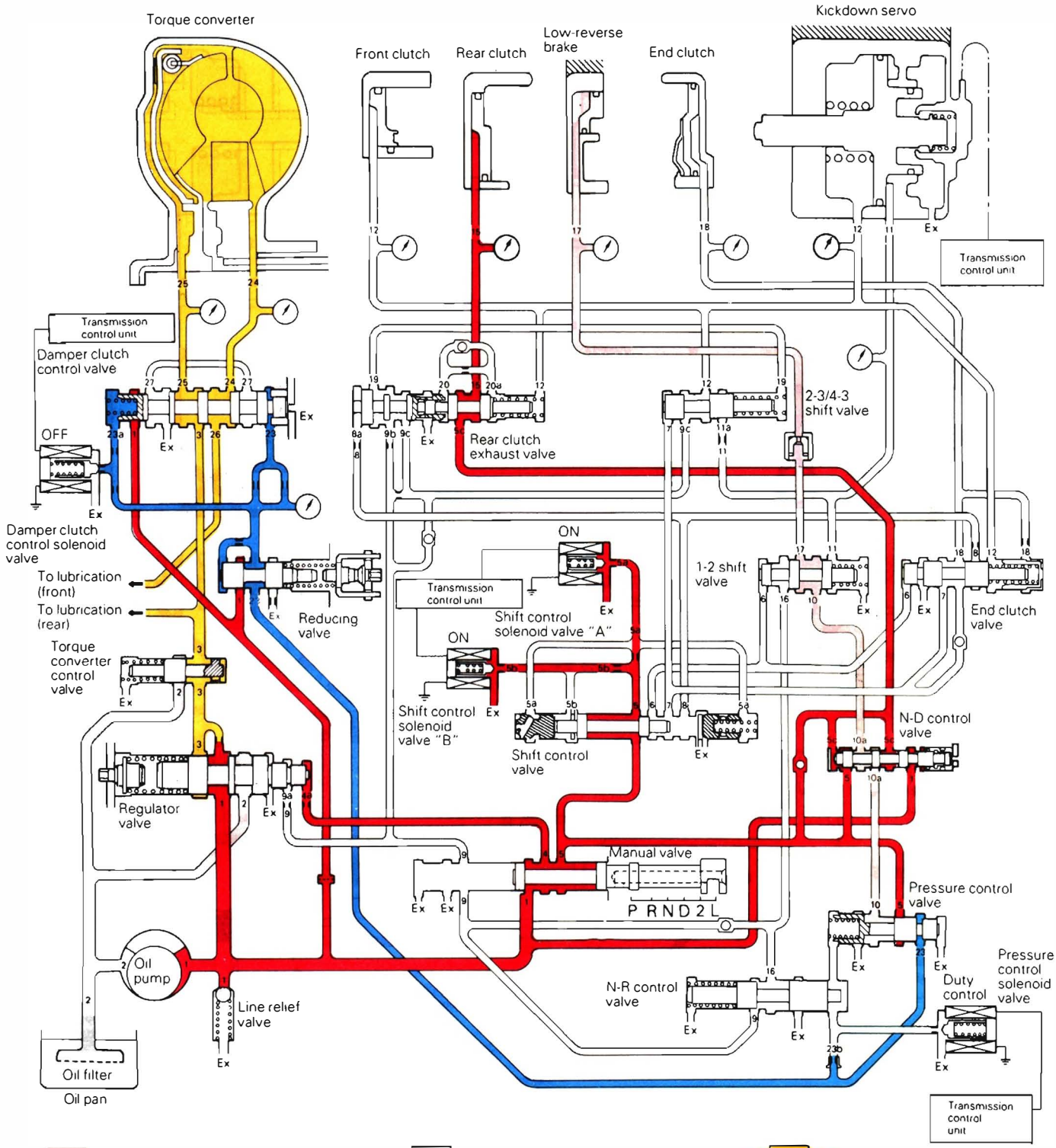
Drive (Third)

TFA0074



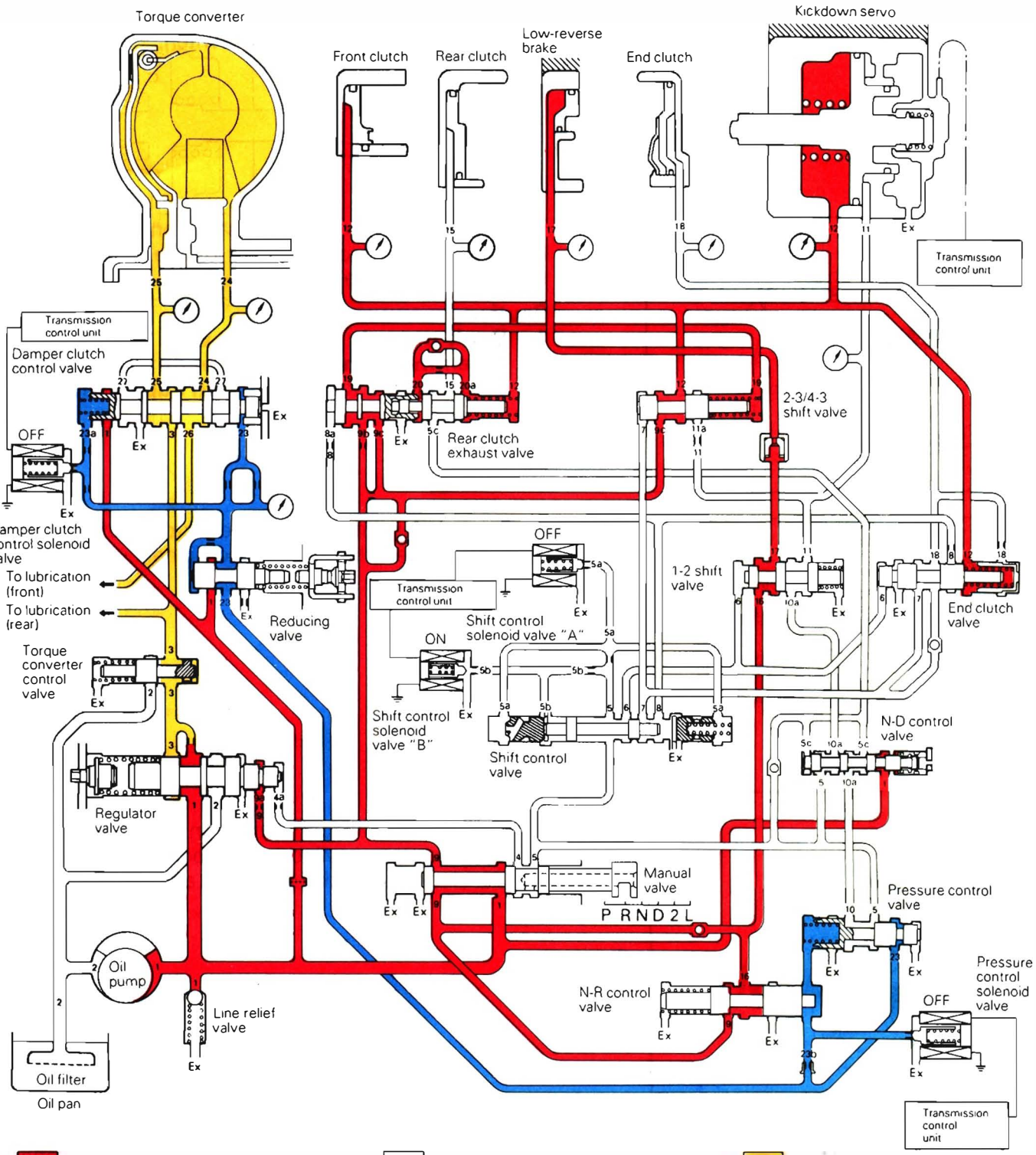
Drive (Fourth)

TFA0075



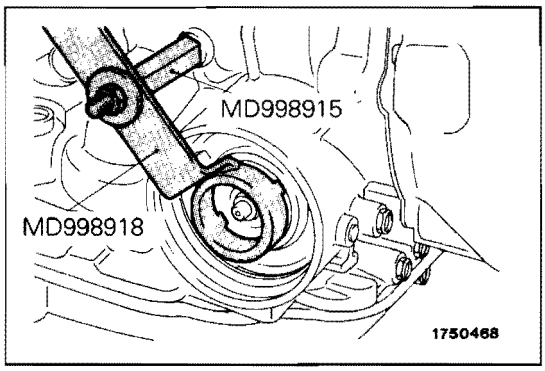
Lock-up (First)

TFA0076



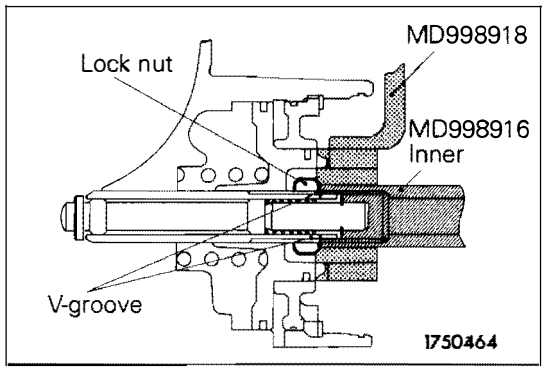
KICKDOWN SERVO ADJUSTMENT E23ZF06AA

1. Completely remove all dirt and other materials adhered around the kickdown servo switch.
2. Remove the snap ring.
3. Remove the kickdown servo switch.

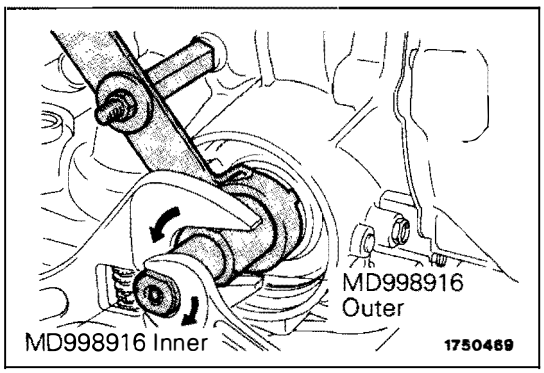


4. To prevent rotation of the piston, engage the pawl of the special tool into the notch of the piston, and using the adapter, fix the piston as shown in the left.

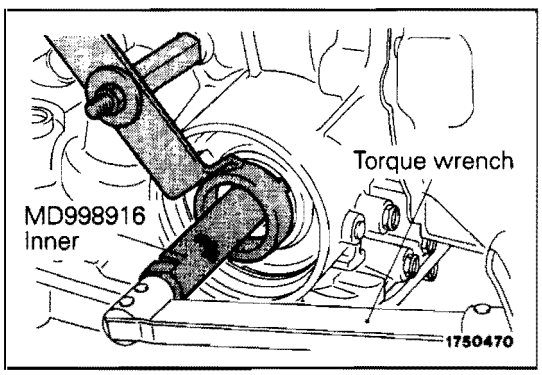
Caution
1 Don't press in the piston with the special tool.
2. When mounting the adapter on the transmission case, tighten it by hand. Don't apply much toque.



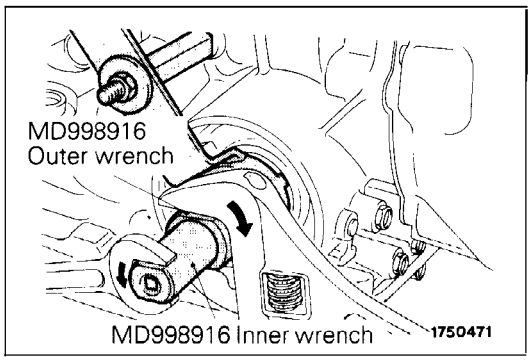
5. Loosen the lock nut to before the V-groove of the adjusting rod, and tighten the special tool (inner) until it contacts the lock nut.



6. Engage the special tool (outer) on the lock nut. Rotating the outer cylinder anticlockwise and the inner cylinder clockwise, lock the lock nut and special tool (inner).

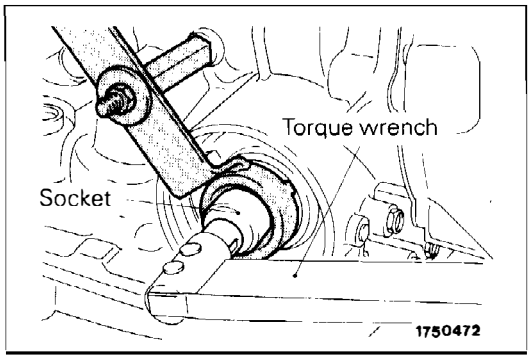


7. Attach a torque wrench to the special tool (inner) and tighten to a torque of 5 Nm after using 10 Nm and repeating "Tighten" and "Loosen" two times. After that, back off the special tool (inner) 2 to 2-1/4 turns.



8. Engage the tool (outer) on the lock nut.
Rotating the outer cylinder clockwise and the inner cylinder anticlockwise, unlock the lock nut and special tool (inner).

Caution
When unlocking the lock, apply equal force to both tools.



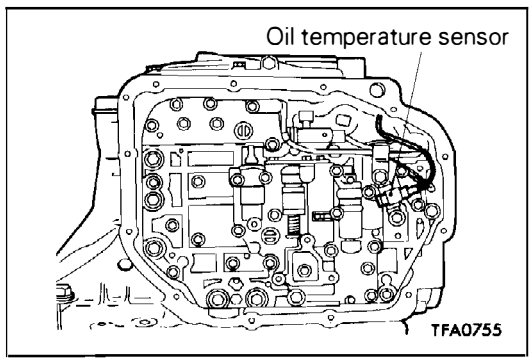
9. Tighten the lock nut by hand until the lock nut contacts the piston. Then using the torque wrench, tighten to the specified torque.

Lock nut: 29Nm

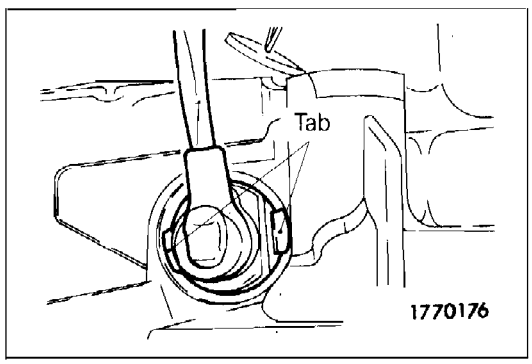
Caution
If it is rapidly tightened with the socket wrench or torque wrench, the lock nut and adjusting rod may rotate together.

10. Remove the special tool which fastens the piston.
Attach the plug to the outlet of the low-reverse pressure.

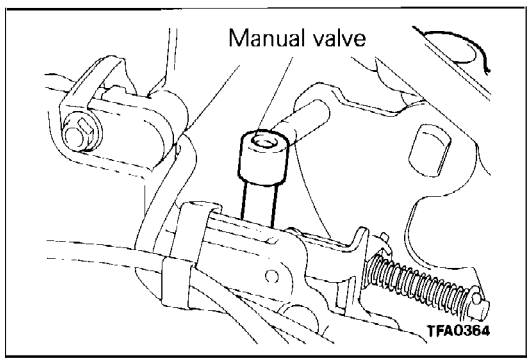
LINE PRESSURE ADJUSTMENT E23ZF07AA



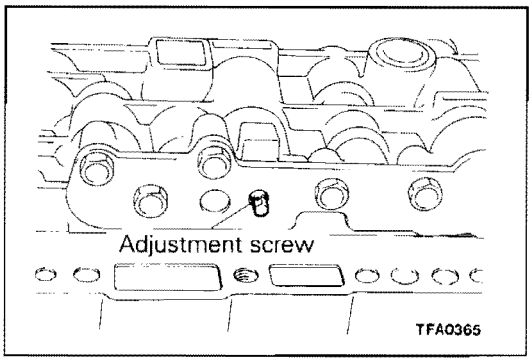
1. Drain out the automatic transmission fluid.
2. Remove the oil pan.
3. Remove the oil filter.
4. Remove the oil temperature sensor.
5. Press the solenoid valve harness grommet and connector into the transmission case.



6. Press the catches of the solenoid valve harness grommets and pass the connector through the case hole.

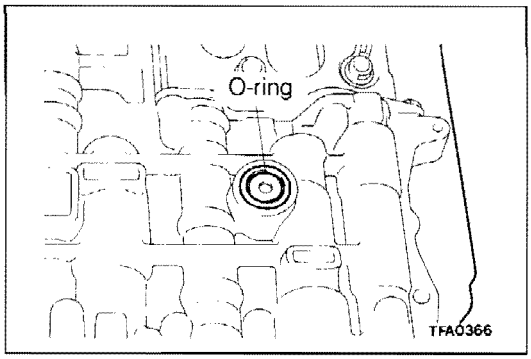


7. Remove the valve body assembly. The manual valve can come out, so be careful not to drop it.

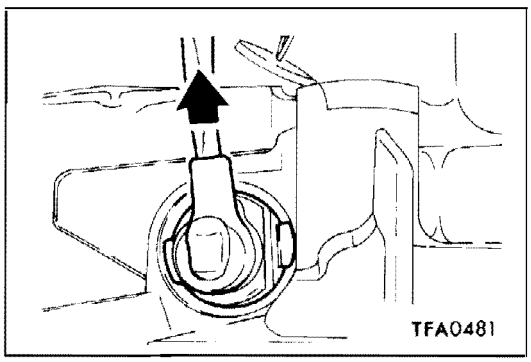


8. Turn the adjustment screw of the regulator valve and adjust so that the line pressure (kickdown brake pressure) becomes the standard value.
   When the adjustment screw is turned to the clockwise, the line pressure becomes lower; when it is turned to anticlockwise, it becomes higher.

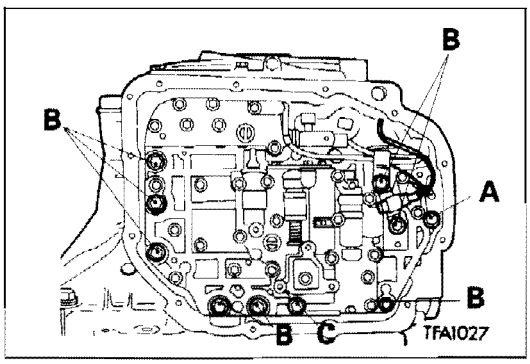
   Standard value: 870–890 kPa
   Oil pressure change for each turn of adjustment screw: 38 kPa



9. Check that the O-ring is installed on the upper surface of the valve body at the place shown in the figure.
10. Replace the O-ring of the solenoid valve harness grommet with a new one.



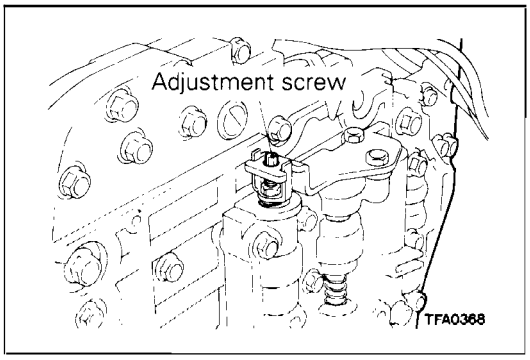
11. Pass the solenoid valve connector through the inside of the hole in the case.



12. Temporarily install the valve body while inserting the detent plate pin in the manual valve groove. Then install the oil temperature sensor and holder and tighten the bolts with the specified torque.

    A bolt: 18 mm long
    B bolt: 25 mm long
    C bolt: 40 mm long
    Valve body assembly mounting bolts: 11 Nm

13. Install the oil filter.
14. Install a new oil pan gasket and oil pan.
15. Pour in the specified amount of ATF.
16. Make the oil pressure test. Readjust if necessary.



REDUCING PRESSURE ADJUSTMENT E23ZF08AA

WHEN MUT-II IS NOT USED

1. Remove parts up to the oil filter in the same way as for adjustment of the line pressure. The valve body need not be removed.
2. Tune the adjustment screw of the lower valve body and adjust so that the reducing pressure is the standard value. When the adjustment screw is turned to the right, the reducing pressure becomes lower; when it is turned to the left, it becomes higher.

   NOTE
   When adjusting the reducing pressure, aim for the center value (425 kPa) of the standard value allowance.

   Standard value: 415–435 kPa
   Oil pressure change for each turn of adjustment screw: 45 kPa

3. Install the oil filter and oil pan in the same way as for adjustment of the line pressure.
4. Make the oil pressure test. Readjust if necessary.

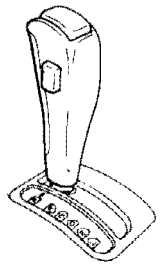
WHEN MUT-II IS USED

1. Use the MUT-II to force-actuate the pressure control solenoid valve to 50 % duty, and measure the kickdown brake apply pressure at that time. If the kickdown brake apply pressure is not within the standard value, adjust using the reducing pressure adjustment screw.

   Standard value: 250–300 kPa
   Oil pressure change for each turn of adjustment screw: 22 kPa

2. Check to be sure, after completing this adjustment, that the reducing pressure is within the range of 370–490 kpa.

   Caution
   The adjustment should be made at an oil temperature of 70–80°C.
   If the adjustment is made at an oil temperature that is too high, the line pressure will decrease during idling, with the result that a correct adjustment cannot be made.



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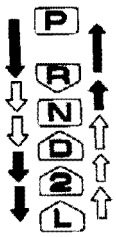
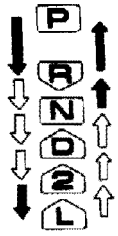
L.H. drivevehicles **R.H. drive vehicles**



09A0048



09A0047

⇦ Button not pressed

⬅ Button pressed

SELECTOR LEVER OPERATION CHECK E23ZF09AA

1. Shift selector lever to each range and check that lever moves smoothly and is controlled. Check that position indicator is correct.
2. Check to be sure the selector lever can be shifted to each position (by button operation as shown in the illustration).
3. Start the engine and check if the vehicle moves forward when the selector lever is shifted from N to D, and moves backward when shifted to R.
4. When the shift lever malfunctions, adjust control cable and selector lever sleeve. Check for worn shift lever assembly sliding parts.

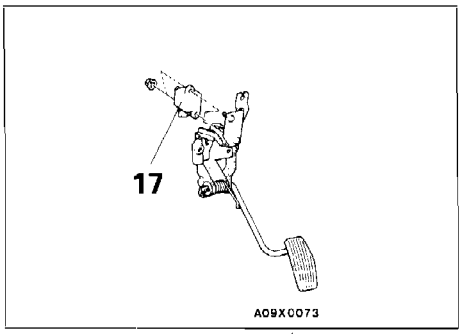
TRANSMISSION CONTROL

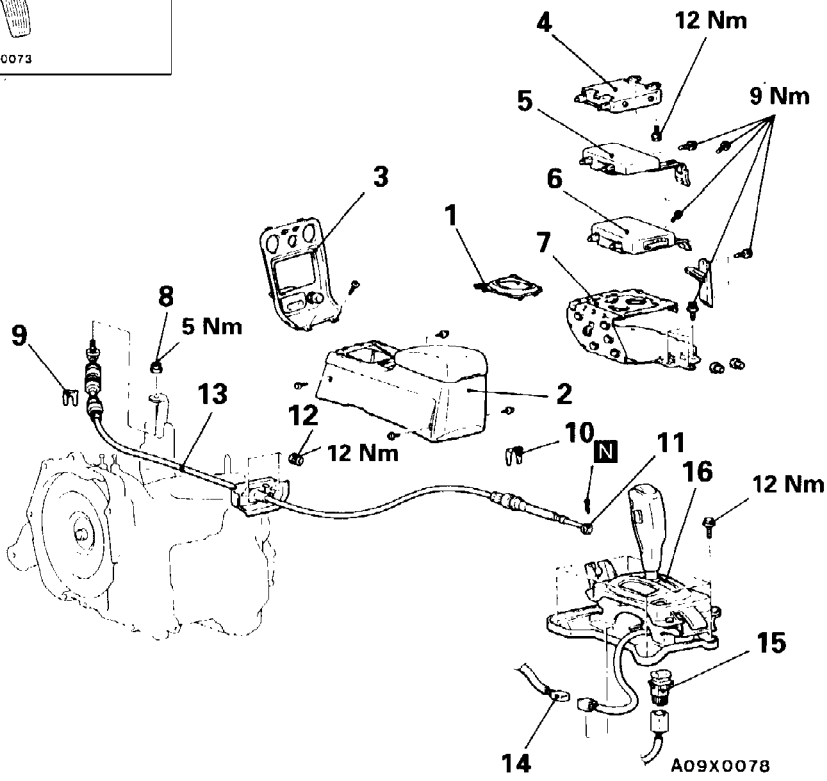
E23ZG00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Instrument Panel Side Cover A, B (Refer to GROUP 52A – Instrument panel.)

Caution: SRS
Be careful not to subject the SRS diagnosis unit to any shocks during removal and installation of the transmission control cable and shift lever assembly.

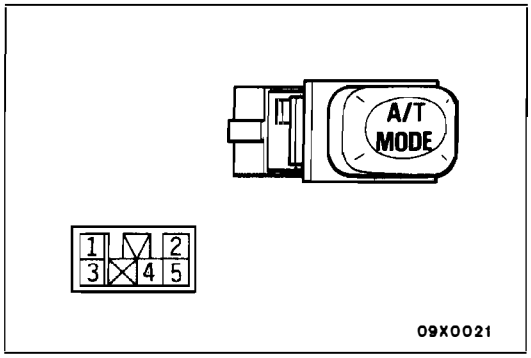




Transmission control cable assembly removal steps
1. Select lever panel
2. Floor console box
3. Center console panel
4. Engine control unit
5. 4WS control unit
6. ELC-4 A/T control unit
7. ECU bracket
◆A◆ 8. Nut
9. Clip (engine compartment side)
10. Clip (passenger compartment side)
11. Transmission control cable connection (selector lever side)
12. Nut
13. Transmission control cable assembly

Selector lever assembly removal steps
1. Select lever panel
2. Floor console box
3. Center console panel
10. Clip (passenger compartment side)
11. Transmission control cable connection (selector lever side)
14. Overdrive switch / position indicator lamp connector
15. AUTO / HOLD chageover switch
16. Selector lever assembly

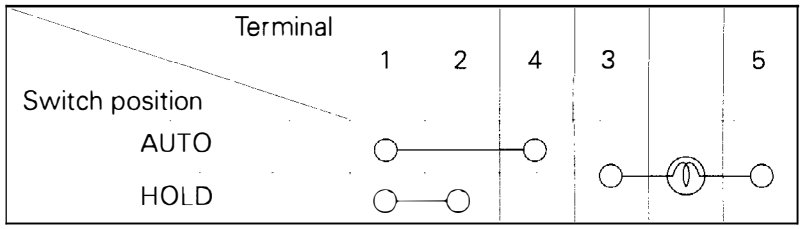
Wide open throttle switch removal
17. Wide open throttle switch



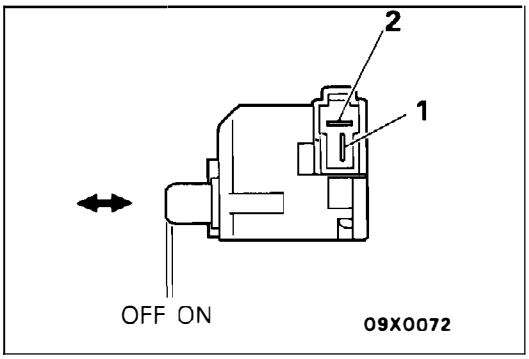
INSPECTION

E23ZG02AA

AUTO/HOLD CHANGEOVER SWITCH CONTINUITY INSPECTION



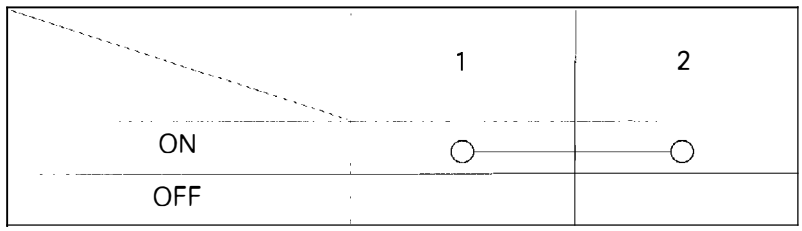
NOTE
○—○ indicates that there is continuity between the terminals.



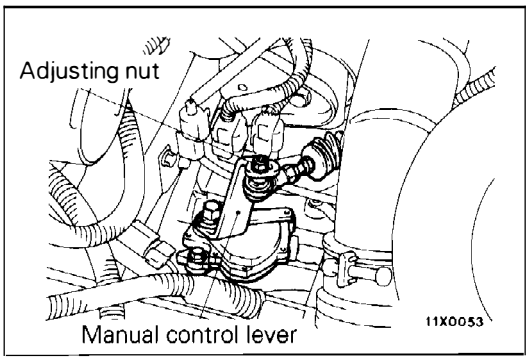
WIDE OPEN THROTTLE SWITCH <R.H. DRIVE VEHICLES>

E23ZG02BA

Check for continuity between terminals when the switch is off and when ON.



NOTE
○—○ indicates that there is continuity between the terminals.



INSTALLATION SERVICE POINTS

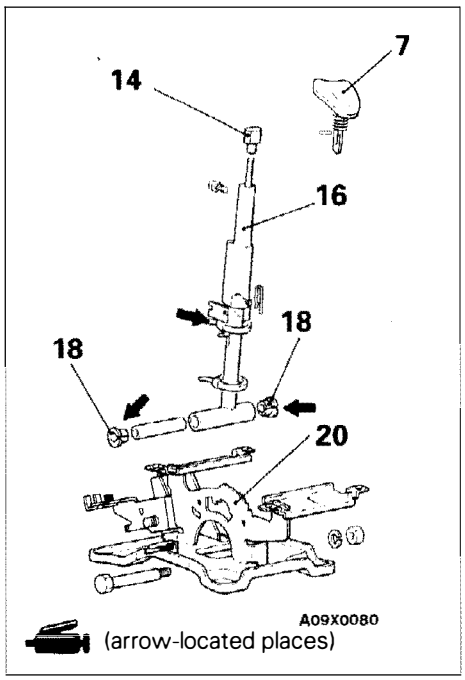
E23ZG04AA

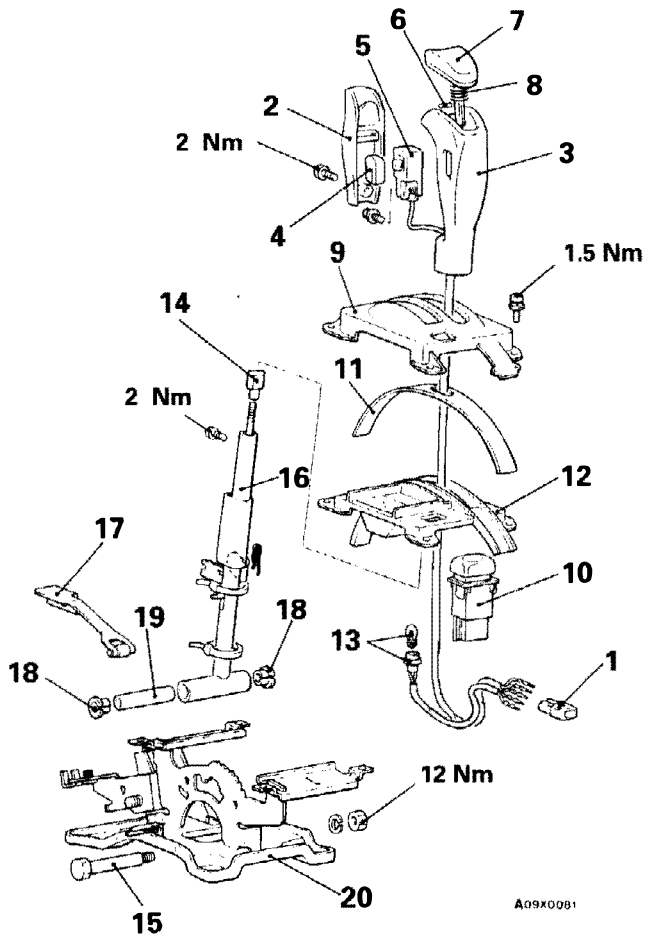
◆A◆ NUT INSTALLATION

(1) Put the selector lever in the "N" position.
(2) Loosen the adjusting nut, gently pull the transmission control cable in the direction of the arrow and tighten the nut.

SELECTOR LEVER ASSEMBLY
DISASSEMBLY AND REASSEMBLY

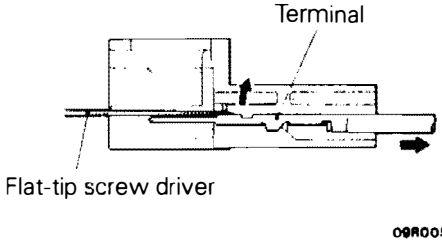
E23ZG10AA





Disassembly steps

- ◇A◇ 1. Overdrive switch / position indicator lamp connector case
- 2. Cover
- 3. Selector knob
- ◇B◇ 4. Overdrive switch button
- ◇B◇ 5. Overdrive switch
- 6. Pin
- 7. Push button
- 8. Spring
- 9. Indicator panel upper
- 10. AUTO / HOLD changeover switch
- 11. Slider
- 12. Indicator panel lower
- 13. Position indicator lamp assembly
- ◆B◆ 14. Sleeve
- 15. Bolt
- 16. Lever assembly
- ◆A◆ 17. Detent spring assembly
- 18. Bushing
- 19. Pipe
- 20. Bracket assembly

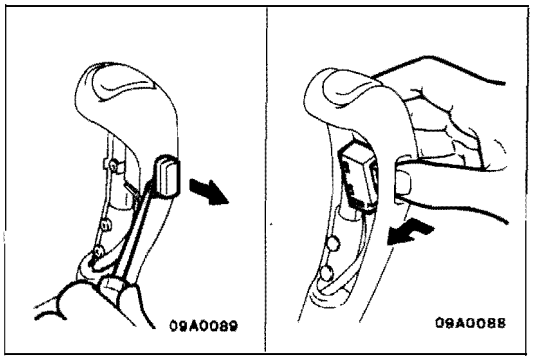


DISASSEMBLY SERVICE POINTS

E23ZG11AA

◇A◇ OVERDRIVE SWITCH / POSITION INDICATOR LAMP CONNECTOR CASE DISASSEMBLY

Use a flat-tip screwdriver or similar tool and pull out the terminal from the overdrive switch/position indicator lamp connector case.

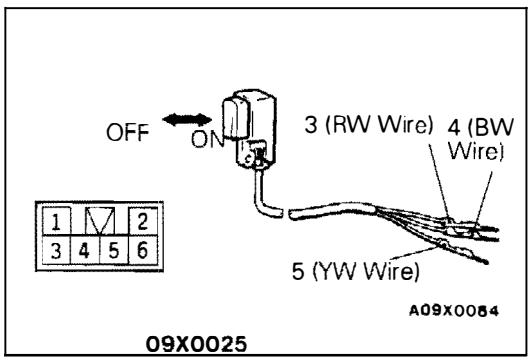


〈B〉 OVERDRIVE SWITCH BUTTON/OVERDRIVE SWITCH REMOVAL

(1) Using the flat-tip screwdriver, remove the overdrive switch button.
(2) Remove the overdrive switch mounting screw.
(3) Pressing the switch, remove the overdrive switch.

INSPECTION E23ZG12AA

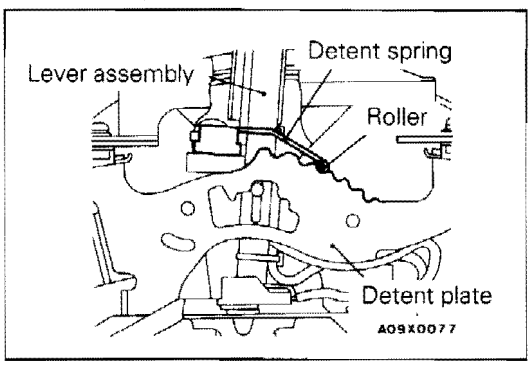
- Check the detent plate for wear.
- Check the bushing for wear or damage.
- Check the spring for damage or deterioration.



OVERDRIVE SWITCH CONTINUITY INSPECTION E23ZG12BA

Terminal / Switch position	3	4	5
OD is operating (ON)		○	○
OD is not operating (OFF)	○		○

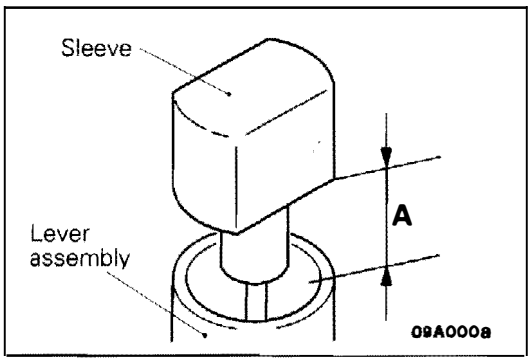
NOTE
○—○ indicates that there is continuity between the terminals.



REASSEMBLY SERVICE POINTS E23ZG14AA

◆A◆ DETENT SPRING ASSEMBLY INSTALLATION

Shift the selector lever to the neutral (N) position, and then install the detent spring assembly so that the roller is in the detent plate groove.



◆B◆ SLEEVE ASSEMBLY

Put the selector lever in the "N" position, turn the sleeve and adjust dimension A between the sleeve and the end of the lever so it reaches the standard value.

Standard value (A): 15.7–16.4 mm

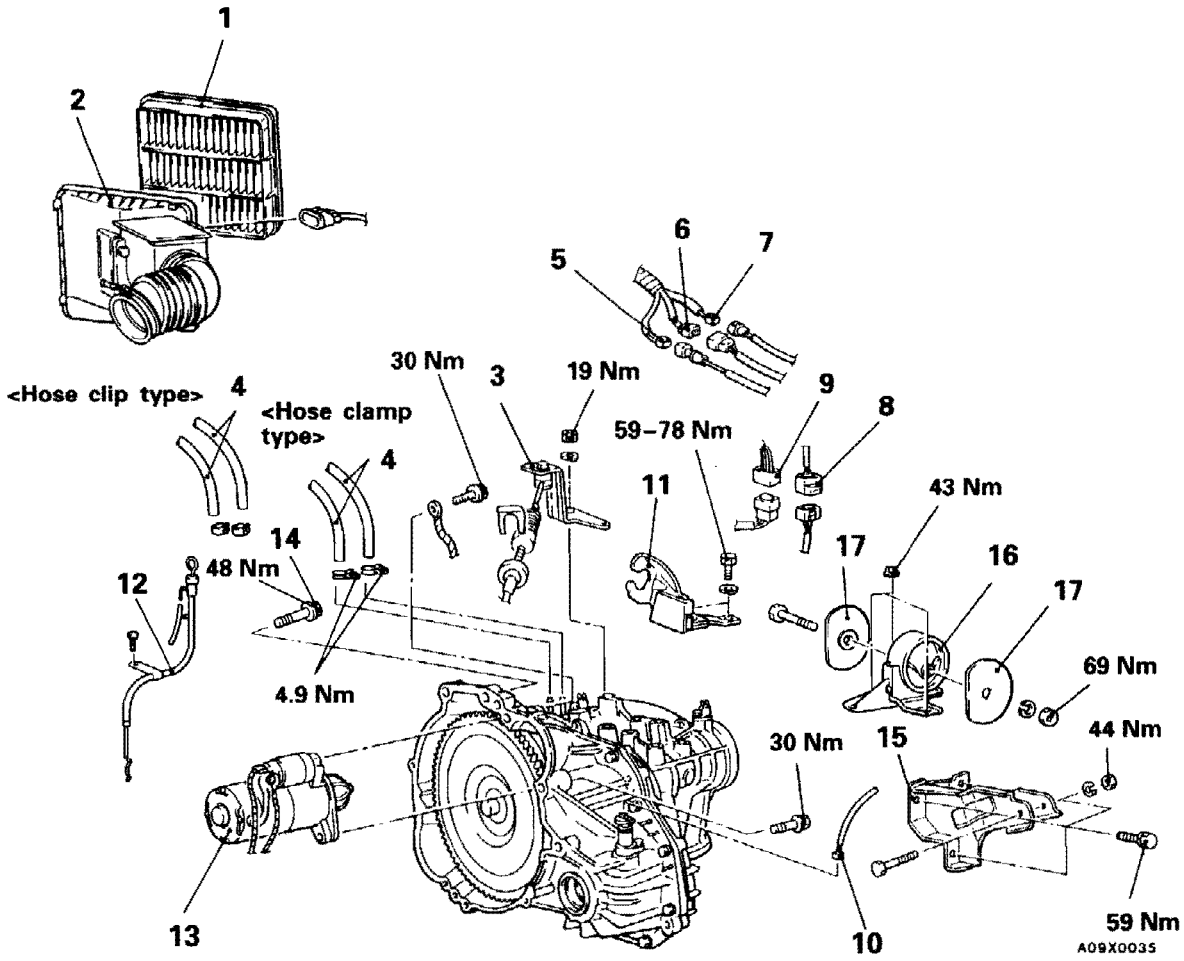
TRANSMISSION ASSEMBLY

E23ZH00AB

REMOVAL AND INSTALLATION

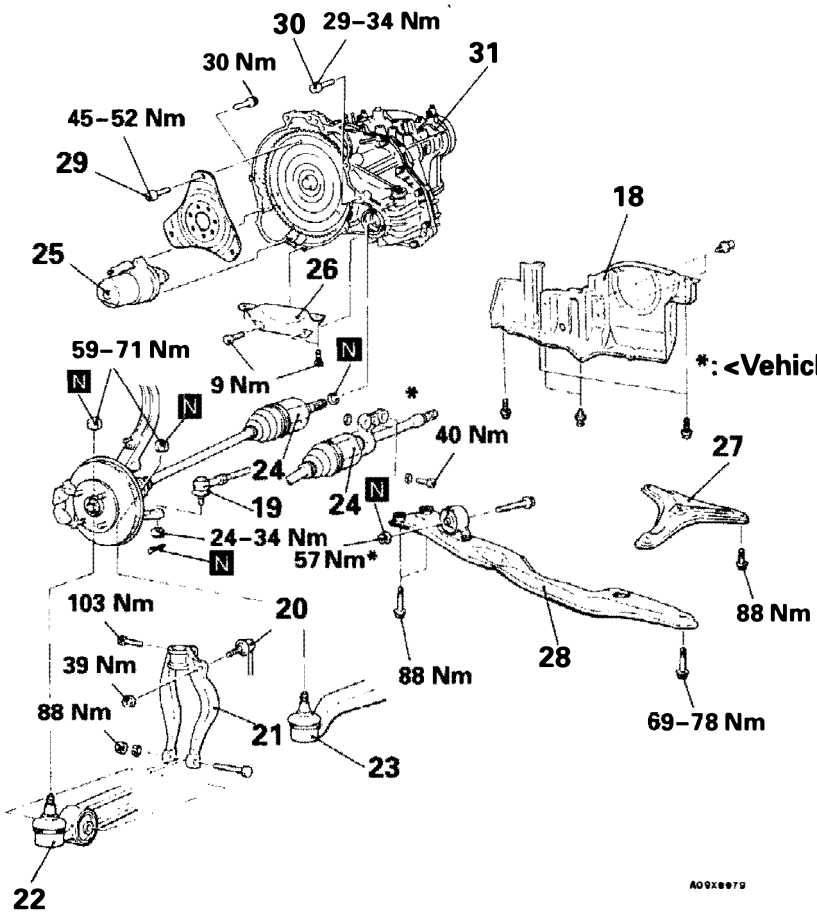
Pre-removal Operation
- Transmission Fluid Draining (Refer to P.23-57.)

Post-installation Operation
(1) Transmission Fluid Supplying (Refer to P.23-57.)
(2) Shift Lever Operation Check
(3) Speedometer Operation Check



Removal steps
1. Air cleaner element
2. Air cleaner cover and hose assembly
3. Manual control lever connection
4. Connection for transmission oil cooler hoses
5. Oil temperature sensor connector
6. Pulse generator connector
7. Kickdown servo switch connector
8. Inhibitor switch connector
9. Solenoid valve connector
10. Speedometer connector
11. Shift cable bracket
12. Oil level gauge and guide assembly
13. Starter motor (4G93, 4G63)
14. Transmission assembly upper part coupling bolts
15. Rear roll stopper bracket
16. Transmission mount bracket
17. Transmission mount stopper

◇A◇ ▶C◀ ◇B◇
- Supporting engine assembly



Lifting up of the vehicles

18. Under cover (R.H.)
◇C◇ 19. Tie rod end connection
20. Stabilizer link connection
21. Damper fork
◇D◇ 22. Lateral lower arm connection
◇E◇ 23. Compression lower arm connection
◇F◇ ▶B◀ 24. Connection for drive shaft and inner shaft assembly
◇G◇ 25. Starter motor <6A12>
26. Bell housing cover
27. Stay (R.H.)
28. Centermember
◇H◇ 29. Drive plate connecting bolts
◇H◇ 30. Transmission assembly lower part coupling bolt
◇H◇ ▶A◀ 31. Transmission assembly

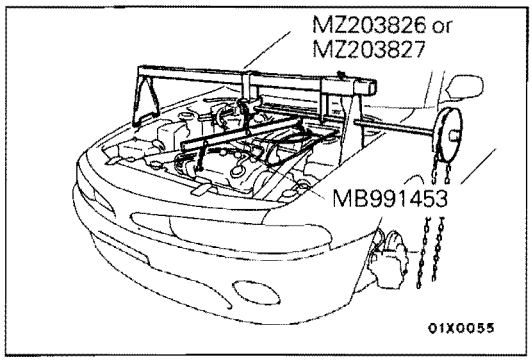
Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

REMOVAL SERVICE POINTS E23ZH01AA

◇A◇ TRANSMISSION MOUNTING REMOVAL

Jack up the transmission assembly gently with a garage jack, and then remove the transmission mounting.

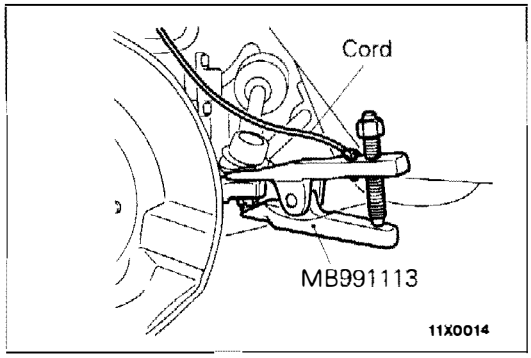
Caution
When jacking up the transmission assembly, support it over a wide area so force is not applied to only one part of it.



〈B〉 SUPPORTING ENGINE ASSEMBLY

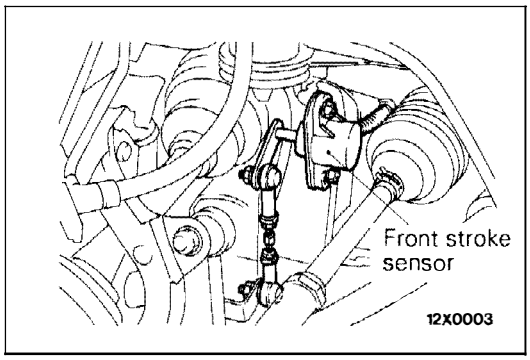
Set the special tool to the vehicle to support the engine assembly.

NOTE
For 6A12 engines, use in conjunction with the special tool (MB991453).



〈C〉 TIE ROD END REMOVAL

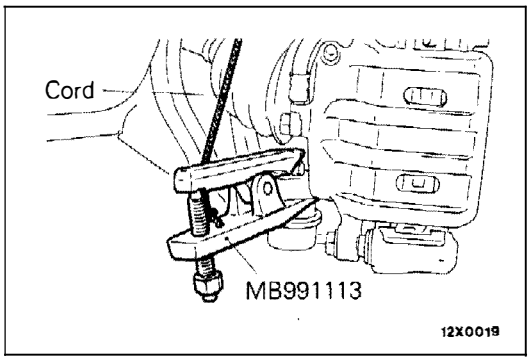
Caution
1. **Loosen the nut only, don't remove it from the tie rod end.**
2. **Fix the special tool at the strut, etc. by a cord in order to avoid dropping it.**



〈D〉 LATERAL LOWER ARM REMOVAL

(1) For vehicles with ACTIVE-ECS, first remove the connection (arrow) between the front stroke sensor and sensor-side rod.

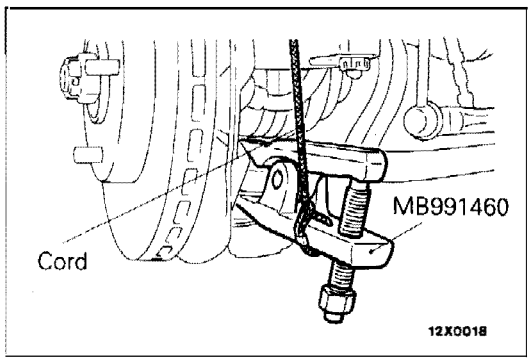
Caution
As there is a danger that a malfunction may occur in the front stroke sensor, the lateral lower arm should not be removed with the sensor rod still connected.



(2) Use the special tool to remove the lateral lower arm from the knuckle.

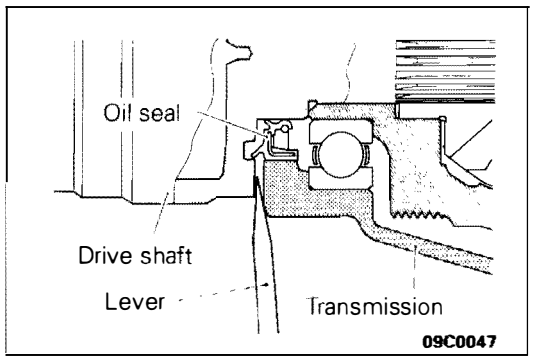
Caution
Loosen the nut only; do not remove it from the ball joint.

The special tool should be suspended by a cord to prevent it from coming off.



〈E〉 COMPRESSION LOWER ARM REMOVAL

Caution
1. **Loosen the nut only, don't remove it from the knuckle.**
2. **Fix the special tool at the strut, etc. by a cord in order to avoid dropping it.**



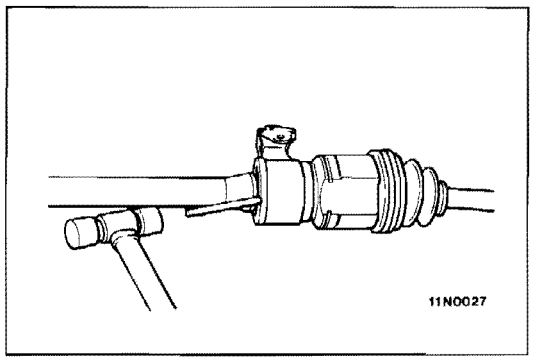
(F) DRIVE SHAFT AND INNER SHAFT ASSEMBLY REMOVAL

<Vehicles without inner shaft>

Insert a lever between the transmission case and the drive shaft to remove the drive shaft.

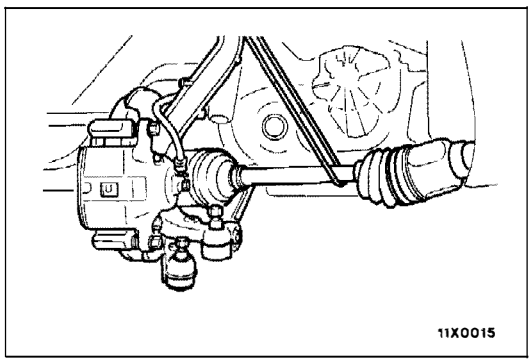
NOTE
The drive shaft should be removed with the hub and knuckle still attached.

Caution
1. **When the drive shaft is removed from the B.J. assembly, there is a danger that the T.J. assembly may be damaged, so always be sure to use a lever.**
2. **Do not insert the lever too far, as it may cause damage to the oil seal.**

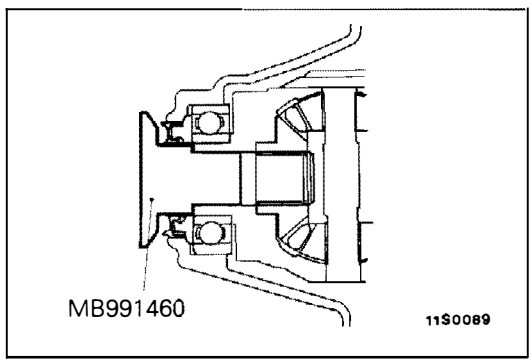


<Vehicles with inner shaft>

Lightly tap the center bearing bracket with a plastic hammer or similar tool to remove the inner shaft from the transmission.



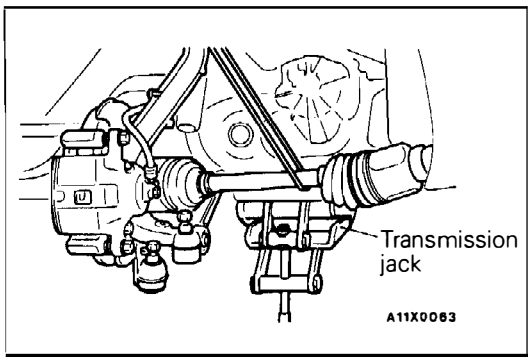
(2) Suspend the removed drive shaft with wire so that there are no sharp bends in any of the joints.
(3) Turn the right hand drive shaft 90° toward the front of the vehicle so that it will not be a hindrance.



(4) Use the special tool provided as a cover to prevent the entry of foreign objects into the transmission case.

〈G〉 STARTER MOTOR REMOVAL

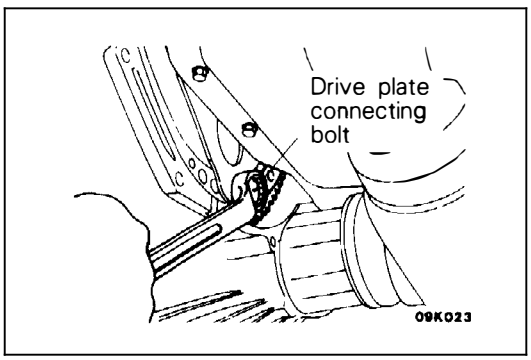
Remove the starter motor with the starter motor harnesses still connected, and secure it inside the engine compartment.



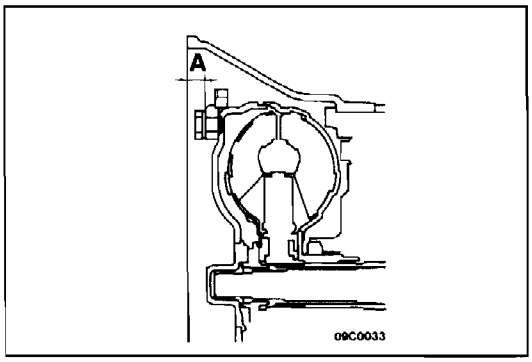
〈H〉 DRIVE PLATE CONNECTING BOLTS/TRANSMISSION ASSEMBLY LOWER PART COUPLING BOLT/TRANSMISSION ASSEMBLY REMOVAL

(1) Support the transmission assembly by using a transmission jack.

Caution
The transmission jack should be used to support the transmission case side, not the oil pan.



(2) Remove the connection bolts while turning the crankshaft.
(3) Press in the torque converter to the transmission side so the torque converter does not remain on the engine side.
(4) Remove the transmission assembly lower connection bolt and lower the transmission assembly.

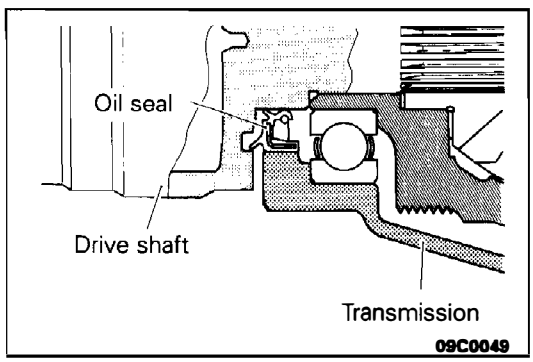


INSTALLATION SERVICE POINTS E23ZH04AB

◆A◆ TRANSMISSION ASSEMBLY INSTALLATION

After securely inserting the torque converter into the transmission side so that the value shown in the illustration becomes the reference value, install the transmission assembly to the engine.

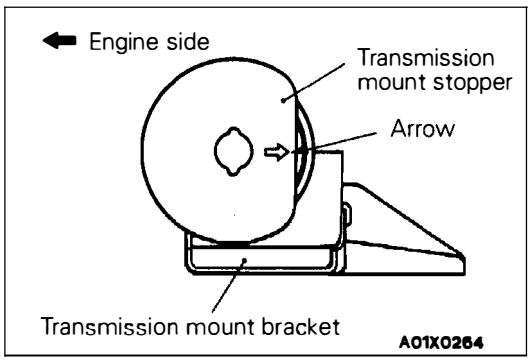
Reference value (A): Approx. 10.5 mm



◆B◆ DRIVE SHAFT AND INNER SHAFT ASSEMBLY INSTALLATION

Provisionally install the drive shaft so that the T.J. case of the drive shaft is straight, and not bent relative to the transmission.

Caution
Care must be taken to ensure that the oil seal lip part of the transmission is not damaged by the serrated part of the drive shaft.



TRANSMISSION MOUNT STOPPER INSTALLATION

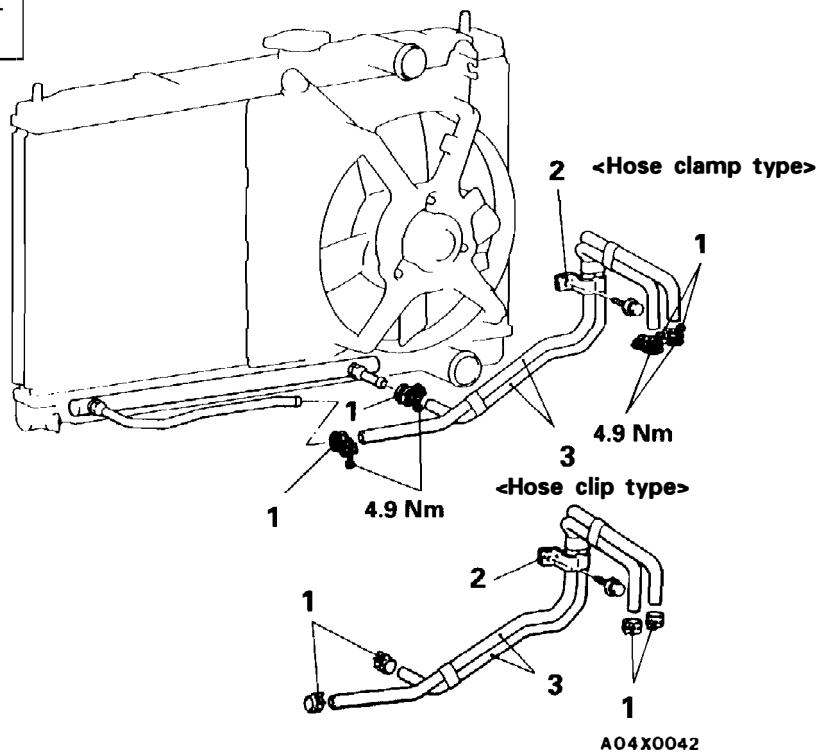
Clamp the transmission mount stopper so that the arrow points in the direction as shown in the diagram.

TRANSMISSION OIL COOLER

E23ZI00AB

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Transmission Fluid Draining and Supplying (Refer to P.23–57.)



Removal steps
1. Hose clip or hose clamp
2. Clamp
3. Hose assembly

PROPELLER SHAFT

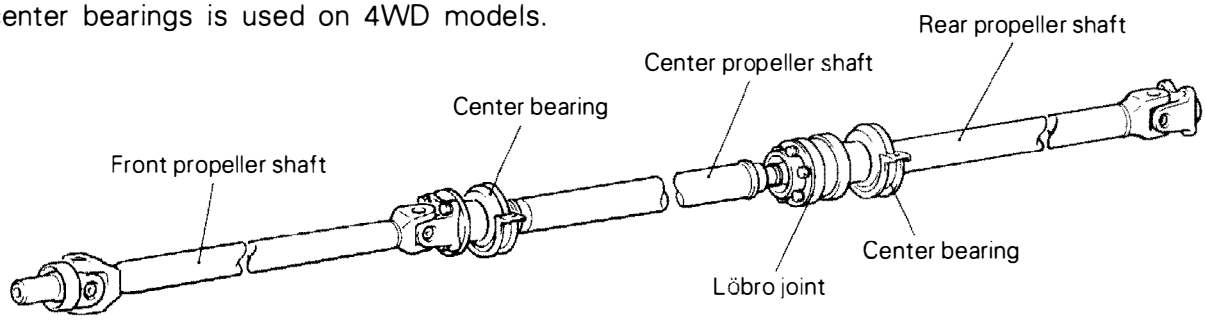
CONTENTS

E25ZA00AA

GENERAL INFORMATION

E25ZB00AA

The three-piece, four-joint type propeller shaft with two center bearings is used on 4WD models.



10N0010A

SERVICE SPECIFICATIONS

E25ZC00AA

Item		Specifications
Limit		
Propeller shaft runout (Dial indicator reading)		
Front	mm	0.6 or less
Center	mm	0.6 or less
Rear	mm	0.6 or less

LUBRICANTS

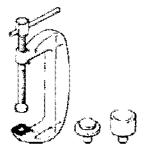
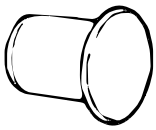
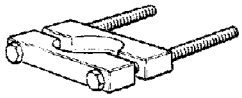
Items	Specified lubricant	Quantity
Sleeve yoke surface	Hypoid gear oil SAE 75W-90 or 75W-85W conforming to API GL-4	As required
Löbro joint assembly		
Outer and inner races ball grooves	Repair kit grease	As required
Löbro joint assembly inner part	Repair kit grease	45–55 g

SEALANT AND ADHESIVES

Item	Specified sealants and adhesives	Remarks
Löbro joint rubber packing	Quick fix adhesive 3M ATD Part No. 8121 or equivalent	Quick-fix adhesive

SPECIAL TOOLS

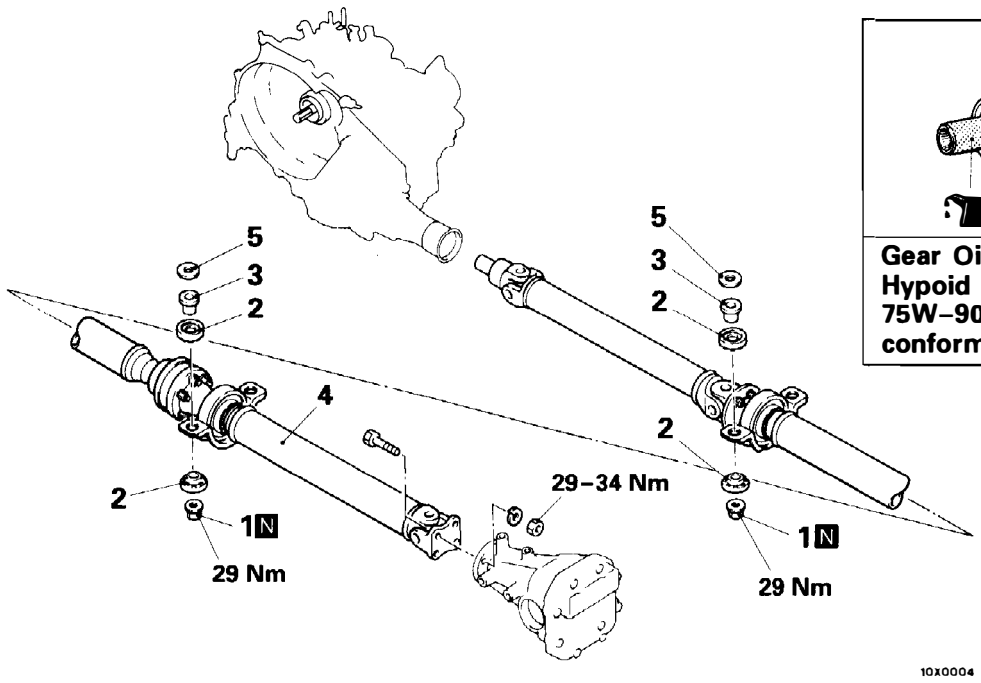
E25ZD00AA

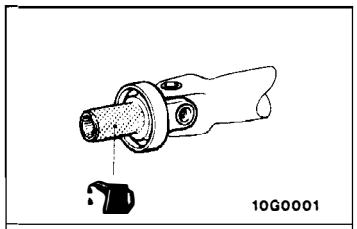
Tool	Number	Name	Use
	MB990840	Universal joint remover and installer	Disassembly/reassembly of the universal joint
	MB991193	Plug	Prevention of entry of foreign objects into the transfer
	MD998801	Bearing remover	Removal of the center bearing assembly

PROPELLER SHAFT

E25ZG00AA

REMOVAL AND INSTALLATION

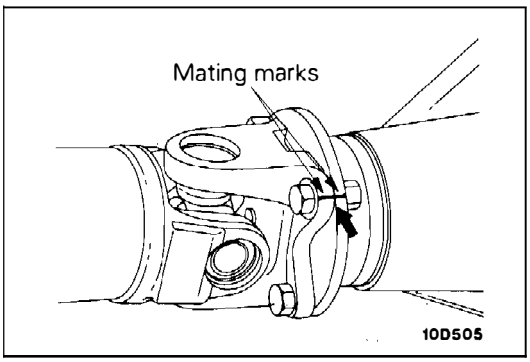


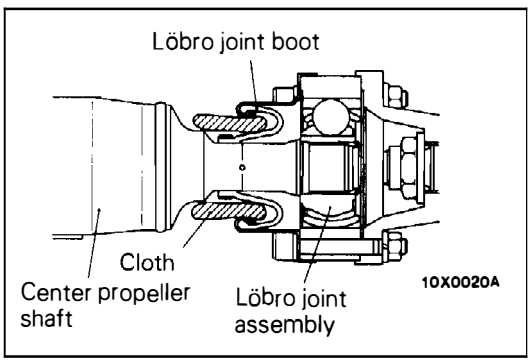


Gear Oil:
Hypoid gear oil SAE 75W–90 or 75W–85W conforming to API GL-4

Removal steps

1. Self-locking nut
2. Insulator
3. Spacer
◇A◇ ◆A◆ 4. Propeller shaft assembly
◇B◇ 5. Spacer





REMOVAL SERVICE POINTS

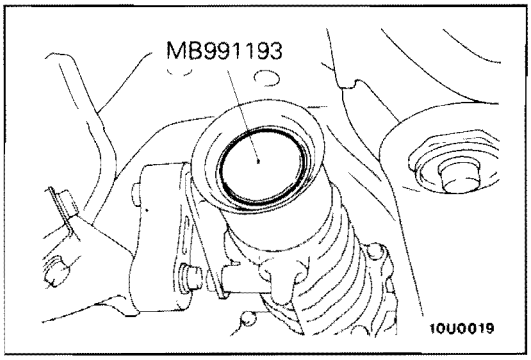
E25ZG01AA

◇A◇ PROPELLER SHAFT ASSEMBLY REMOVAL

(1) Make mating marks on the differential companion flange and flange yoke and remove the propeller shaft.

Caution
Remove the propeller shaft in a straight and level manner so as to ensure that the boot is not damaged through pinching.

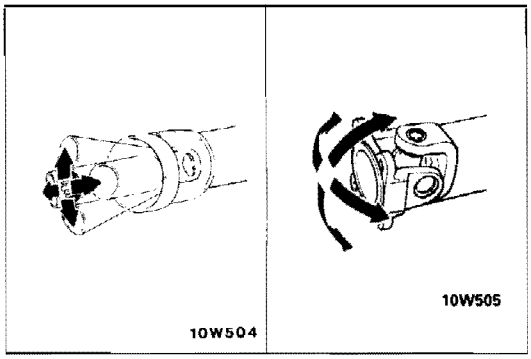
NOTE
Damage to the boot can be avoided, and the work will be easier, if a piece of cloth or similar material is inserted in the boot.



(2) Use the special tool provided as a cover to prevent the entry of foreign objects into the transfer case.

⟨B⟩ SPACER REMOVAL

The number of spacers used on each vehicle differs. Check the number of spacers used and write it down for reference during reassembly.



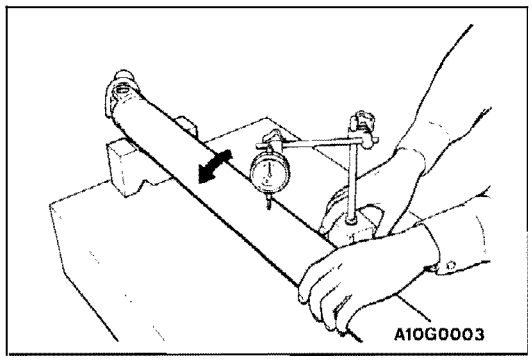
INSPECTION E25ZG02AA

- Check the sleeve yoke, center yoke and flange yoke for wear, damage or cracks.
- Check the propeller shaft yokes for wear, damage or cracks.
- Check the propeller shaft for bends, twisting or damage.
- Check the universal joints for smooth operation in all directions.
- Check the center bearing for smooth movement.
- Check the center bearing mounting rubber for damage or deterioration.

PROPELLER SHAFT RUNOUT E25ZG02BA

Limit:

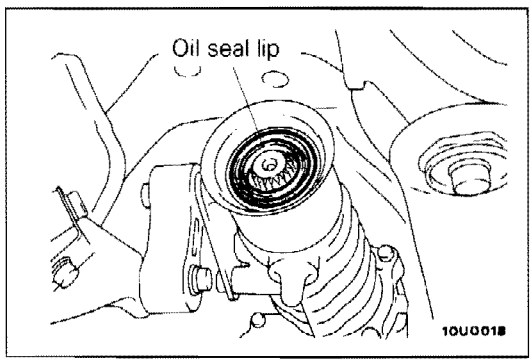
Front propeller shaft	**0.6 mm or less**
Rear propeller shaft	**0.6 mm or less**



INSTALLATION SERVICE POINT E25ZG04AA

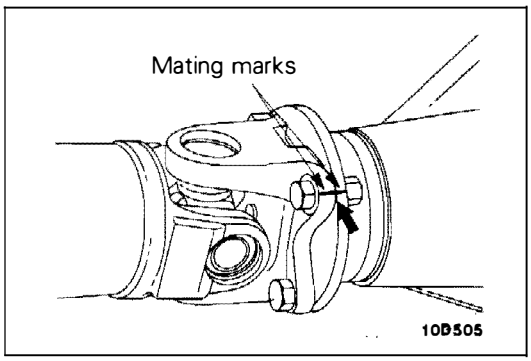
▶A◀ PROPELLER SHAFT ASSEMBLY INSTALLATION

Caution
Be careful not to damage the lip section of the transfer case oil seal when installing the propeller shaft.



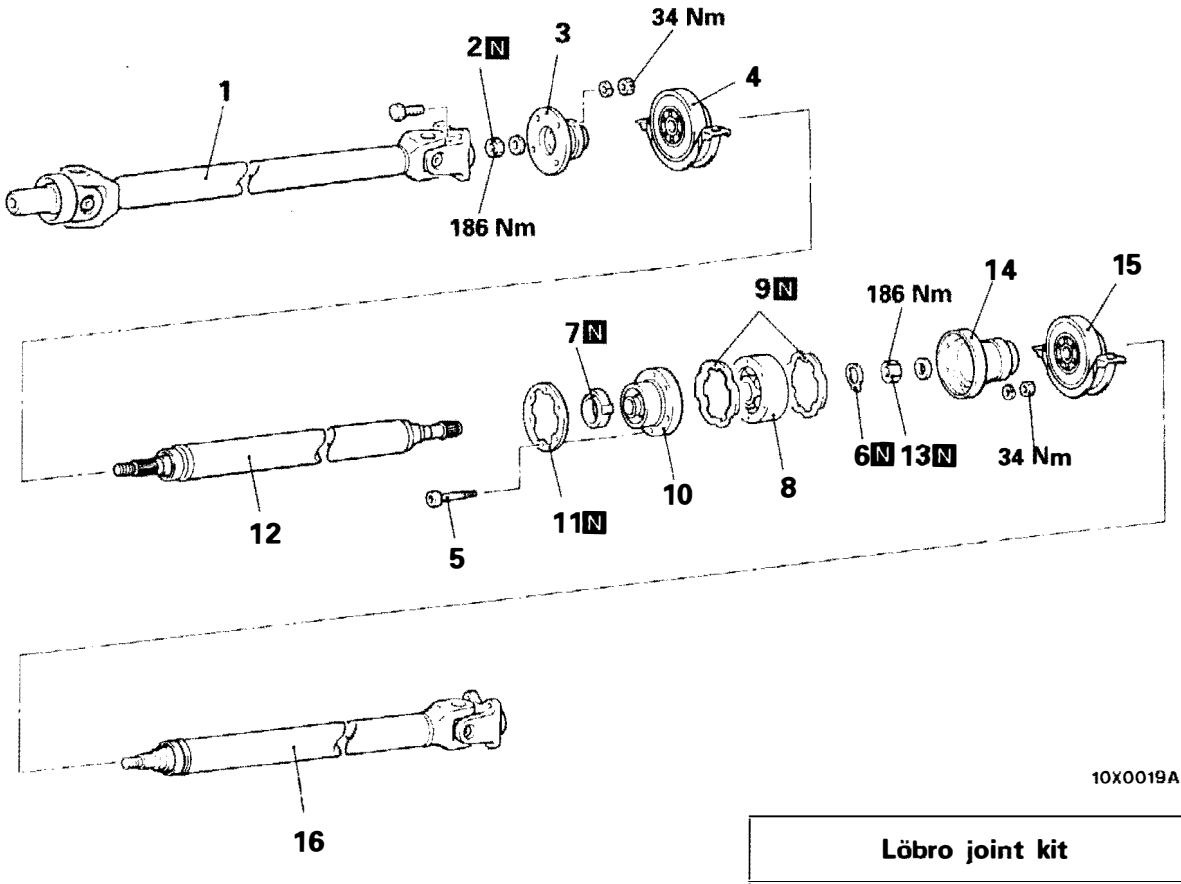
Install the propeller shaft to the companion flange with the mating marks properly aligned.

Caution
Tighten installation bolts after removing oil and grease from threads to prevent them from loosening due to lubrication.



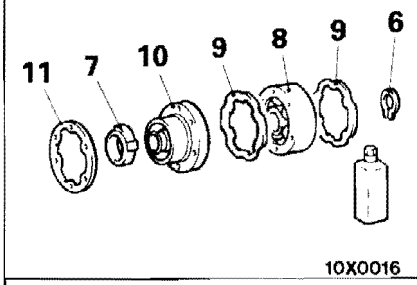
DISASSEMBLY AND REASSEMBLY

E25ZG05AA



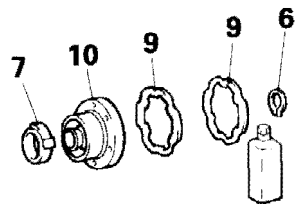
10X0019A

Löbro joint kit



10X0016

Löbro joint boot kit

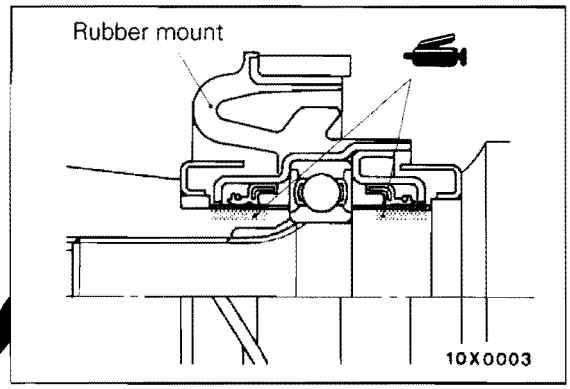


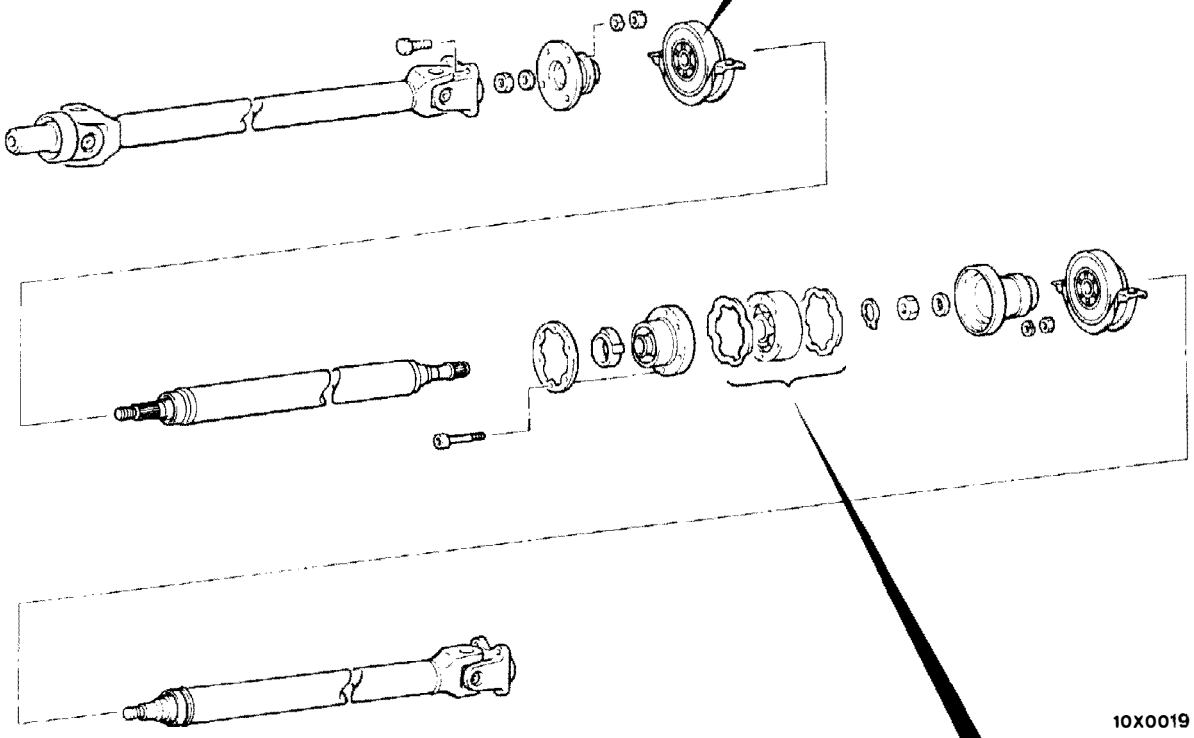
A10X0017

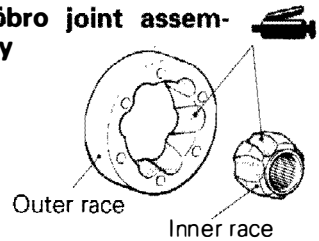
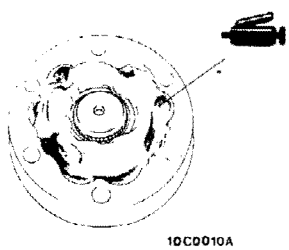
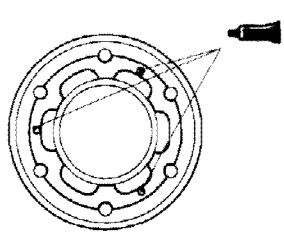
Disassembly steps

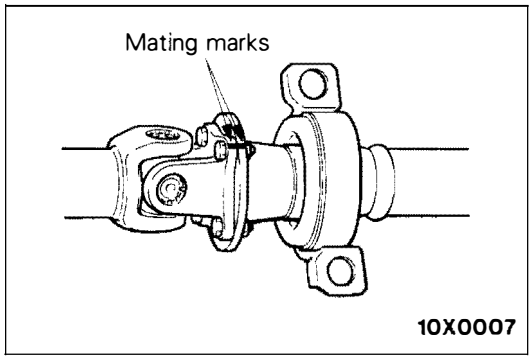
- ◇A◇ 1. Front propeller shaft
- ◆E◆ 2. Self-locking nut
- ◇B◇ ◆E◆ 3. Companion flange
- ◇C◇ ◆E◆ 4. Center bearing assembly
- ◇D◇ 5. Bolts
- 6. Snap ring
- ◆D◆ 7. Boot band
- ◇E◇ ◆C◆ 8. Löbro joint assembly
- 9. Rubber packing
- ◇F◇ ◆B◆ 10. Löbro joint boot
- 11. Washer
- 12. Center propeller shaft
- ◆A◆ 13. Self-locking nut
- ◇G◇ ◆A◆ 14. Companion flange
- ◇C◇ ◆A◆ 15. Center bearing assembly
- 16. Rear propeller shaft

LUBRICATION AND ADHESION POINTS





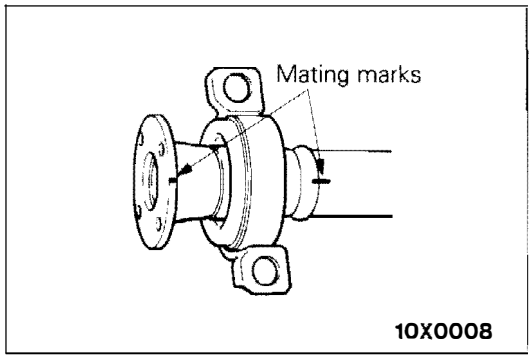
Löbro joint assembly 		
Repair kit grease: 45–55 g		**Adhesive:** **Quick fix adhesive 3M ATD Part No. 8121 or equivalent**



DISASSEMBLY SERVICE POINTS E25ZG06AA

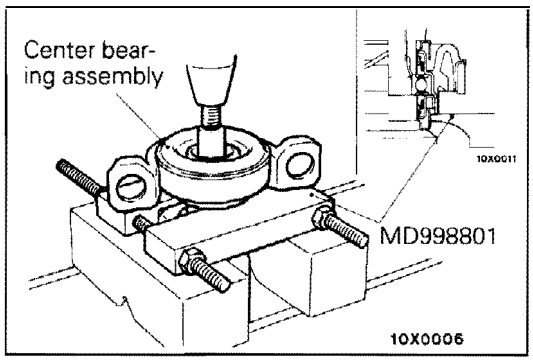
⟨A⟩ FRONT PROPELLER SHAFT ASSEMBLY REMOVAL

Put mating marks on the front propeller shaft flange yoke and the companion flange before removing the front propeller shaft assembly.

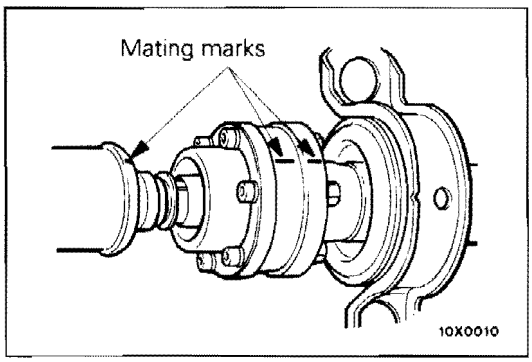


⟨B⟩ COMPANION FLANGE REMOVAL

Put mating marks on the companion flange and the center propeller shaft before removing the companion flange.

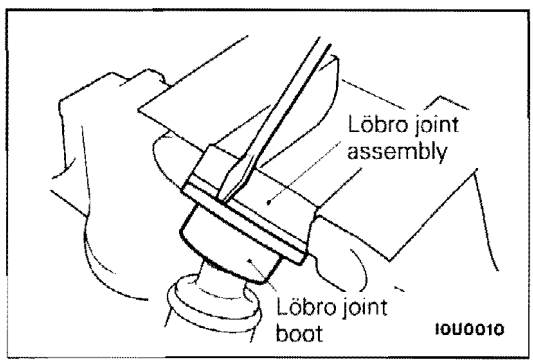


⟨C⟩ CENTER BEARING ASSEMBLY REMOVAL



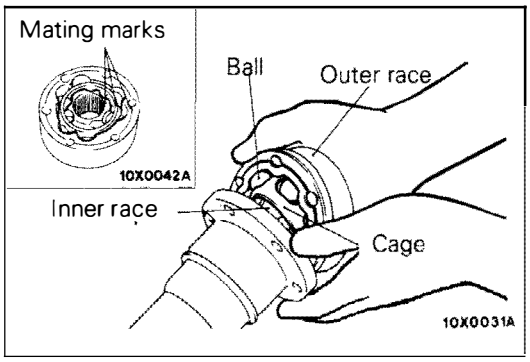
⟨D⟩ BOLT REMOVAL

Put mating marks on the center propeller shaft, the Löbro joint assembly and the companion flange before removing the bolts.



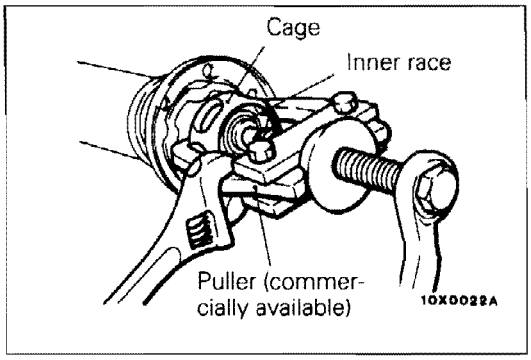
⟨E⟩ LÖBRO JOINT ASSEMBLY REMOVAL

(1) Remove the Löbro joint boot from the Löbro joint assembly.



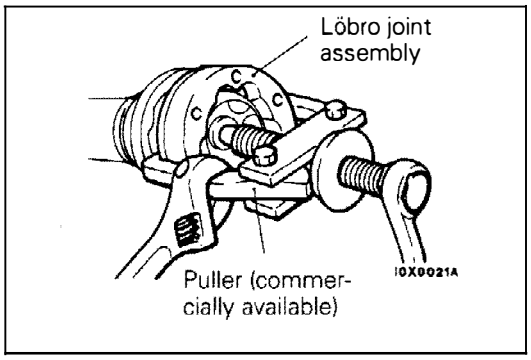
(2) Put mating marks on the outer race, cage and inner race with a scriber.
(3) Remove the outer race and balls.

NOTE
Note the positions of balls so that they can be reinstalled in their original positions.

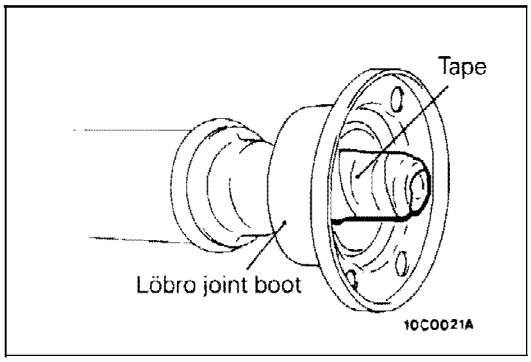


(4) Remove the inner race with cage from the center propeller shaft by using a puller (commercially available).

NOTE
When changing the grease on the Löbro joint assembly, wipe off the grease and clean the outer and inner races, cage and balls.

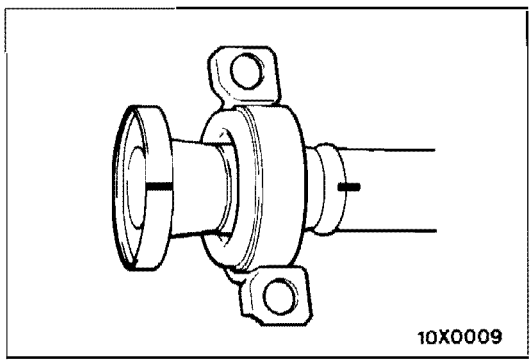


(5) If the outer race cannot be removed, remove the complete Löbro joint assembly from the center propeller shaft by using a puller (commercially available).



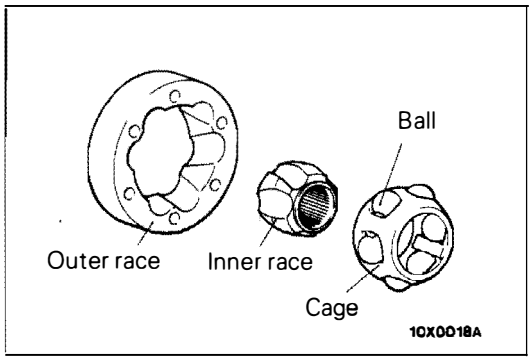
⟨F⟩ LÖBRO JOINT BOOT REMOVAL

When reusing the Löbro joint boot, apply adhesive tape to the spline section of the center propeller shaft before removing.



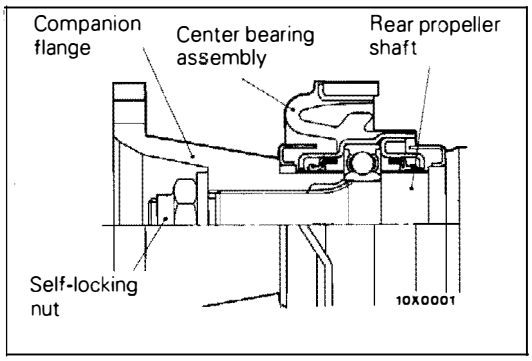
⟨G⟩ COMPANION FLANGE REMOVAL

Put mating marks on the companion flange and the rear propeller shaft before removing the companion flange.



INSPECTION E25ZG07AA

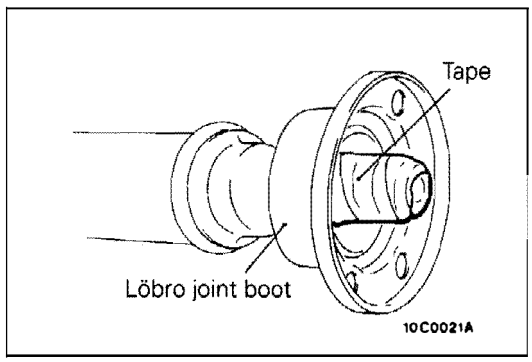
- Check the propeller shaft splines for wear or damage.
- Check the ball grooves in inner and outer races for uneven wear, damage or rust.
- Check ball surface for rust, wear or other damage.
- Check the cage for rust or damage.



REASSEMBLY SERVICE POINTS E25ZG08AA

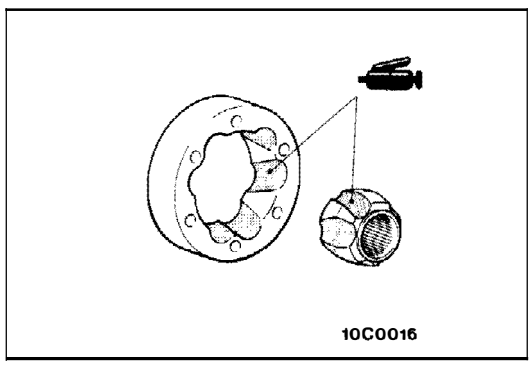
◆A◆ CENTER BEARING ASSEMBLY/COMPANION FLANGE/SELF-LOCKING NUT INSTALLATION

(1) Install the center bearing assembly to the rear propeller shaft as shown in the illustration.
(2) Align the mating marks on the companion flange and rear propeller shaft.
(3) Press-fit the center bearing assembly with the companion flange while tightening the self-locking nut.



◆B◆ LÖBRO JOINT BOOT INSTALLATION

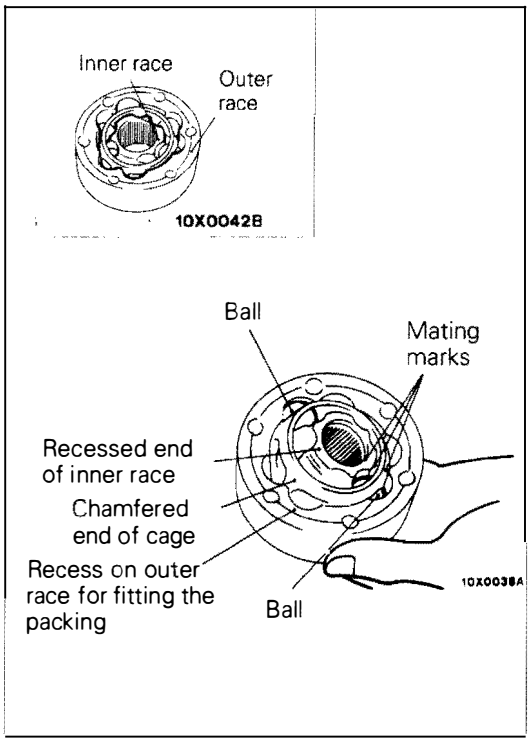
(1) Before installing the Löbro joint boot, insert the boot band.
(2) Wrap the splined end of propeller shaft with adhesive tape and install the Löbro joint boot.



◆C◆ LÖBRO JOINT ASSEMBLY INSTALLATION

Install the Löbro joint assembly as follows:
(1) Apply a thin coat of the specified grease to the ball grooves of the inner and outer races.

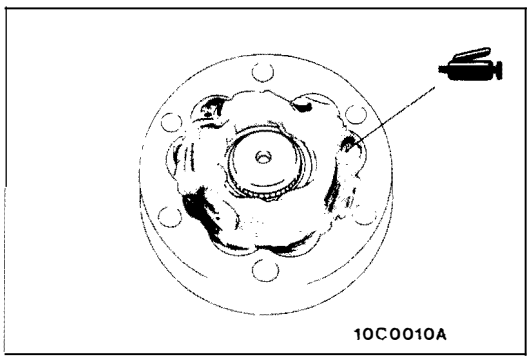
Specified grease: Repair kit grease



(2) Put the cage on the inner race with the mating marks aligned and install two balls, one in a groove and the other in the groove opposite to that groove. Both balls should be placed in the grooves where they were before disassembly.
(3) Assemble the inner race and cage in the outer race with their mating marks aligned.

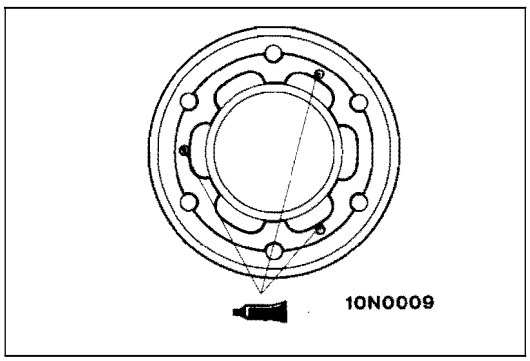
NOTE
Make sure that the recessed end (where snap ring will be fitted) of the inner race, the recessed end (where packing will be fitted) of the outer race, and the chamfered end of the cage are all on the same side. Also ensure that the relative positions of the inner and outer races are as shown in the illustration.

(4) Install the remaining balls in their original positions.
(5) Check that the outer race rotates on the inner race smoothly.



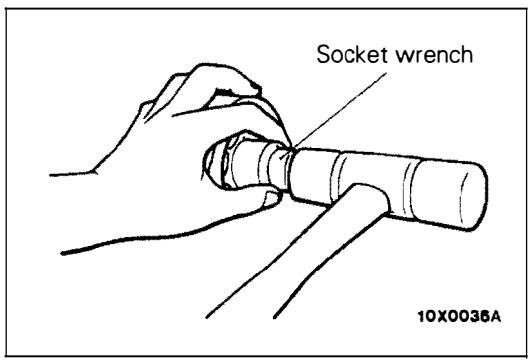
(6) Apply specified grease to the Löbro joint assembly.

Specified grease: Repair kit grease (45–55 g)



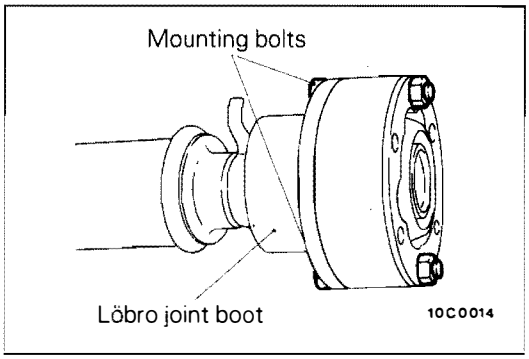
(7) Apply a small amount of specified adhesive in three equally divided places on the surface on the Löbro joint ball groove where there is a stepped section for the Löbro joint assembly packing, and then fit the rubber packing.

Specified adhesive: Quick fix adhesive 3M ATD Part No. 8121 or equivalent

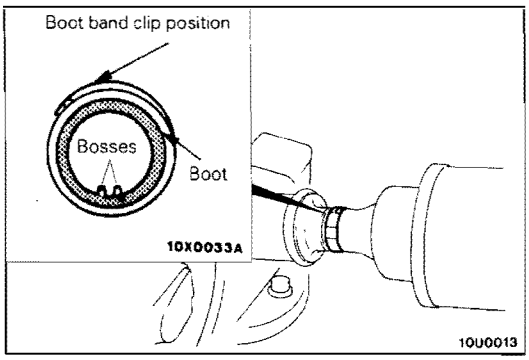


(8) Install the Löbro joint assembly on the center propeller shaft while aligning their bolt holes, and drive the joint assembly with a hammer using a socket wrench on the inner race for complete installation.

NOTE
Install so that the surface where there is a stepped section for the Löbro joint assembly packing is facing toward the Löbro joint boot.

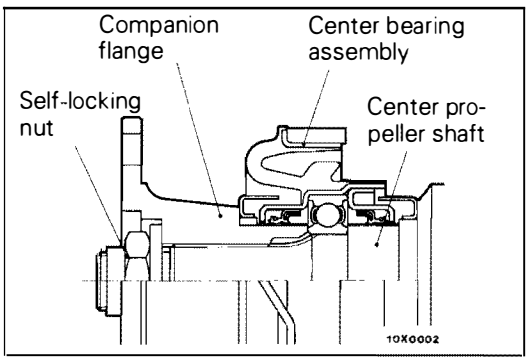


(9) Realign the bolt holes in the boot and Löbro joint assembly utilizing the mounting bolts and fit the boot on the joint assembly.
(10) Fit the rubber packing for the companion flange to the companion flange using the same procedure as in step (7).



◆D◆ BOOT BAND INSTALLATION

Caution
Position the boot band clip on the side opposite to the bosses which are provided in the boot for ventilation. Be sure to remove grease, if present, from around the bosses. Grease obstructs the ventilation air passage.



◆E◆ CENTER BEARING ASSEMBLY/COMPANION FLANGE/SELF-LOCKING NUT INSTALLATION

(1) Install the center bearing assembly to the center propeller shaft as shown in the illustration.
(2) Align the mating marks on the companion flange and center propeller shaft.
(3) Press-fit the center bearing assembly with the companion flange while tightening the self-locking nut.

FRONT AXLE

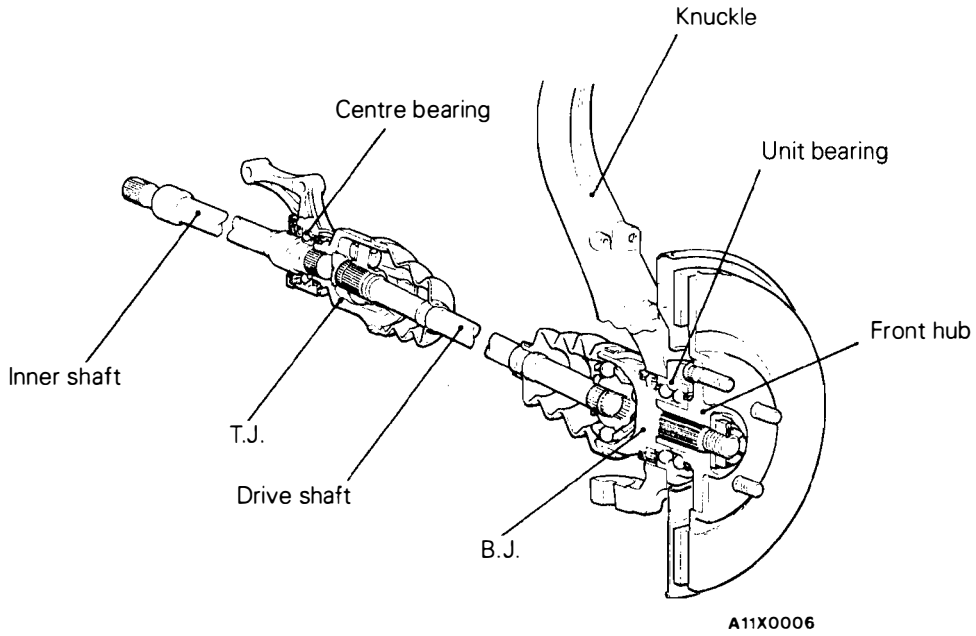
CONTENTS

E26ZA00AA

GENERAL INFORMATION

E26ZB00AA

The front axle consists of a knuckle, front hub, unit bearing and drive shaft. The unit bearing is press-fitted to the front hub and bolted to the kunckle. Also, the unit bearing utilizes a double row angular contact ball bearing. The drive shaft has a tripod joint (T.J.) on the transmission side and a Birfield joint (B.J.) on the wheel side. A center bearing and an inner shaft have been adopted in some models.



SERVICE SPECIFICATIONS

E26ZC00AA

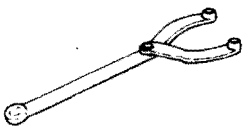
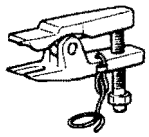
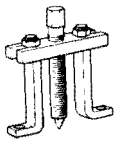
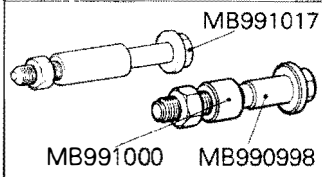
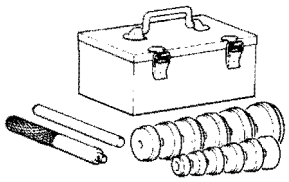
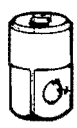
Items		Specifications
Standard value		
Setting of boot length	mm	80 ± 3
Limit		
Hub axial play	mm	0.05
Wheel bearing starting torque	Nm	1.8 or less

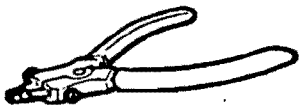
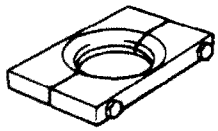
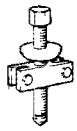
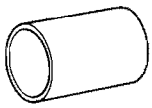
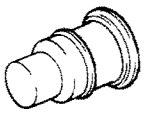
LUBRICANTS

Items	Quantity g	Specified lubricant
T.J. boot grease		
2WD		
	105 <6A12>	Repair kit grease
	120 <4G93, 4G63>	
	130 <4D68>	
4WD		
	105	Repair kit grease
Inner dust seal	7–10	Multi purpose grease
Outer dust seal	4–6	Multi purpose grease

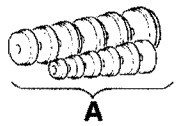
SPECIAL TOOLS

E26ZD00AA

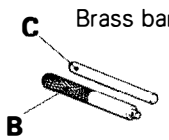
Tool	Number	Name	Use
	MB990767	End yoke holder	Fixing of the hub
	MB991113	Steering linkage puller	• Removal of the upper arm ball joint and knuckle • Removal of the compression lower arm ball joint and knuckle • Removal of the lateral lower arm ball joint and knuckle • Removal of the tie rod end ball joint and knuckle
	MB990241	Axle shaft puller	Removal of the drive shaft
	MB990998, MB991017	Front hub remover and installer	Provisional holding of the wheel bearing Use MB991000 (Supplementary part to MB990998) as the spacer
	MB990925	Bearing and oil seal installer set	• Press-out of center bearing MB990932 MB990938 • Press-fitting of center bearing MB990932 MB990938 • Press-fitting of dust seal outer MB990931 MB990938 • Press-fitting of the dust seal inner MB990933 MB990938
	MB990685	Torque wrench	Measurement of the wheel bearing starting torque
	MB990326	Preload socket	

Tool	Number	Name	Use
	MB990628	Snap ring pliers	To remove and install the snap ring of the drive shaft
	MB991248	Inner shaft remover	Press-out of the inner shaft and press-fitting seal plate.
	MB990197	Puller body	Press-out of the inner shaft
	MB990302	Hook	Press-out of the inner shaft
	MB991172	Adapter	Press-fitting of the inner shaft
	MB991460	Plug	Preventing of entry of foreign objects into the transmission case

MB990925

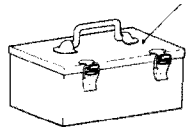


Installer adapter

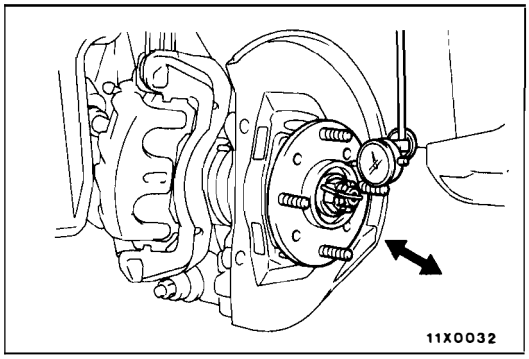


Brass bar

Bar (snap-in type)


Tool box

Type	Tool number	O.D. mm	Type	Tool number	O.D. mm
A	MB990926	39	A	MB990933	63.5
	MB990927	45		MB990934	67.5
	MB990928	49.5		MB990935	71.5
	MB990929	51		MB990936	75.5
	MB990930	54		MB990937	79
	MB990931	57	B	MB990938	–
	MB990932	61	C	MB990939	–



SERVICE ADJUSTMENT PROCEDURES

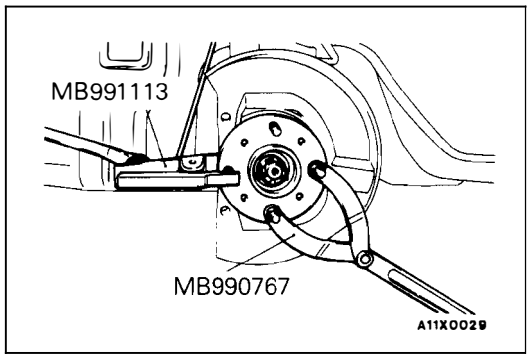
E26ZF00AA

HUB AXIAL PLAY CHECK

1. Remove the disc brake caliper and suspend it with a wire.
2. Remove the brake disc from the front hub.
3. Attach a dial gauge as shown in the illustration, and then measure the axial play while moving the hub in the axial direction.

   Limit: 0.05 mm

4. If end play exceeds the limit, replace the front hub assembly.

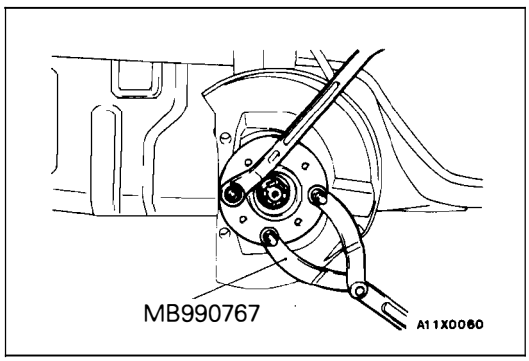


HUB BOLT REPLACEMENT

E26ZF01AA

1. Remove the caliper assembly and secure it with wire so that it does not fall.
2. Remove the brake disc.
3. Use the special tools to remove the hub bolts.

   Caution
   The special tool should be suspended by a cord to prevent it from coming off.

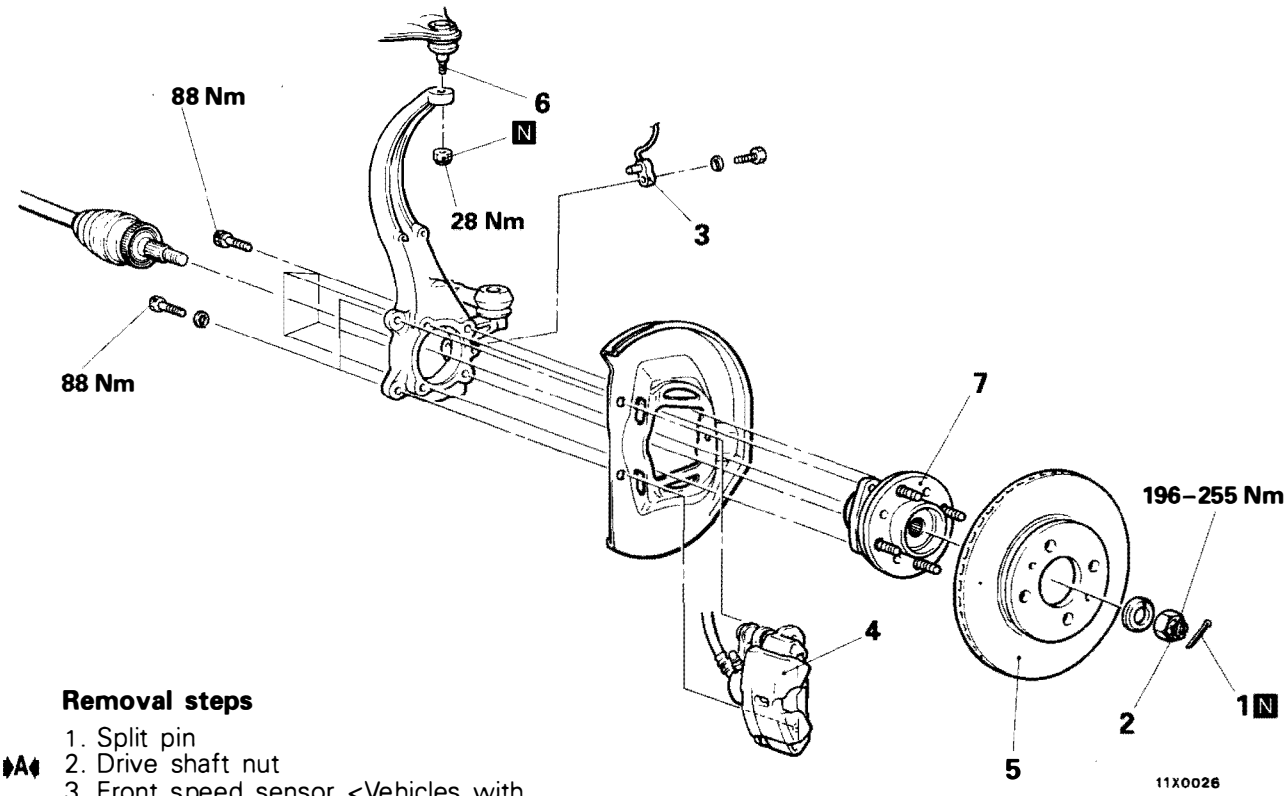


4. Use the wheel nuts to securely install the new hub bolts, while being careful of the serrations of the hub bolts and hub.

FRONT HUB ASSEMBLY

REMOVAL AND INSTALLATION

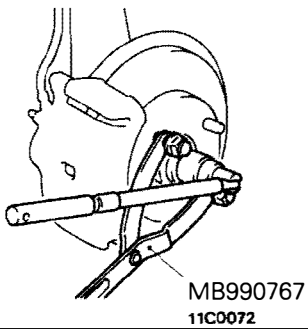
E26ZG00AA

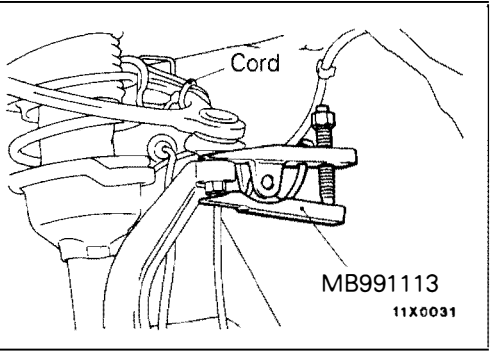


Removal steps

1. Split pin
◇A◇ ▶A◀ 2. Drive shaft nut
3. Front speed sensor <Vehicles with A.B.S.>
◇B◇ 4. Caliper assembly
5. Brake disc
◇C◇ 6. Connection for upper arm
◇D◇ 7. Front hub assembly

Caution
The front hub assembly should not be disassembled.





REMOVAL SERVICE POINTS

E26ZG00AA

◇A◇ DRIVE SHAFT NUT REMOVAL

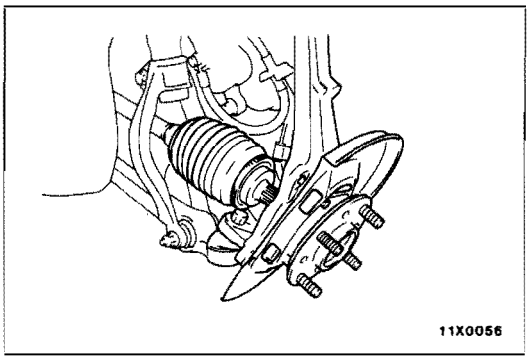
◇B◇ CALIPER ASSEMBLY REMOVAL

Secure the removed caliper assembly with wire so that it does not fall.

◇C◇ UPPER ARM REMOVAL

Caution

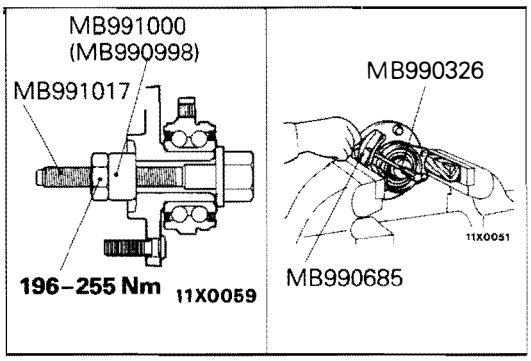
1. **Be sure to tie the cord of the special tool to the nearby part.**
2. **Loosen the nut but do not remove it.**



◇D◇ FRONT HUB ASSEMBLY REMOVAL

Shift the knuckle to the outside in order to maintain the clearance between the front hub assembly mounting bolts and the drive shaft.

Caution
1. **Do not damage the ball joint boot.**
2. **For vehicles with ABS, be careful not to damage the rotor.**



INSPECTION E26ZG02AA

WHEEL BEARING STARTING TORQUE CHECK

(1) Tighten the special tool to the front hub assembly to the specified torque (196–255 Nm).
(2) Use the special tool to measure the hub rotation starting torque.

Limit: 1.8 Nm or less

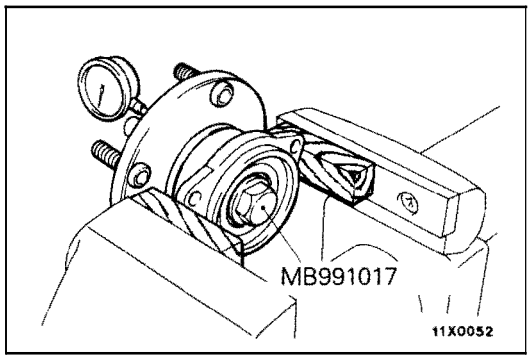
(3) The hub rotation starting torque should be within the limit value range, and there should be no engagement or feeling of roughness.

HUB AXIAL PLAY CHECK E26ZG02BA

(1) Tighten the special tool to the front hub assembly to the specified torque (196–255 Nm).
(2) Measure the play in the hub axial direction.

Limit: 0.05 mm

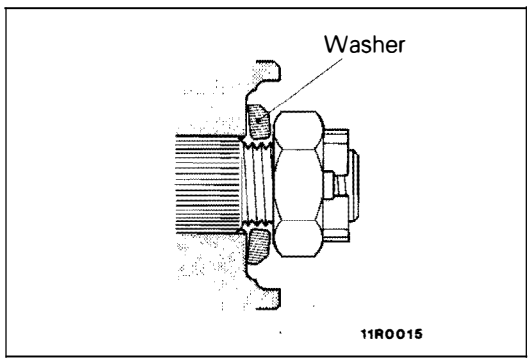
(3) If the limit value of hub axial play cannot be obtained, replace the front hub assembly.



INSTALLATION SERVICE POINTS E26ZG04AA

◆A◆ DRIVE SHAFT NUT INSTALLATION

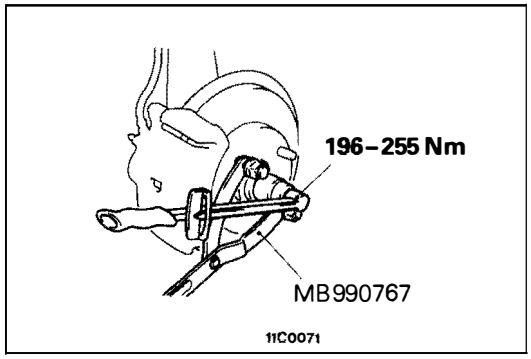
(1) Be sure to install the drive shaft washer in the specified direction.



(2) Using the special tool, tighten the drive shaft nut.

Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

(3) If the position of the split pin holes does not match, tighten the nut up to 255 Nm in maximum.
(4) Install the split pin in the first matching holes and bend it securely.

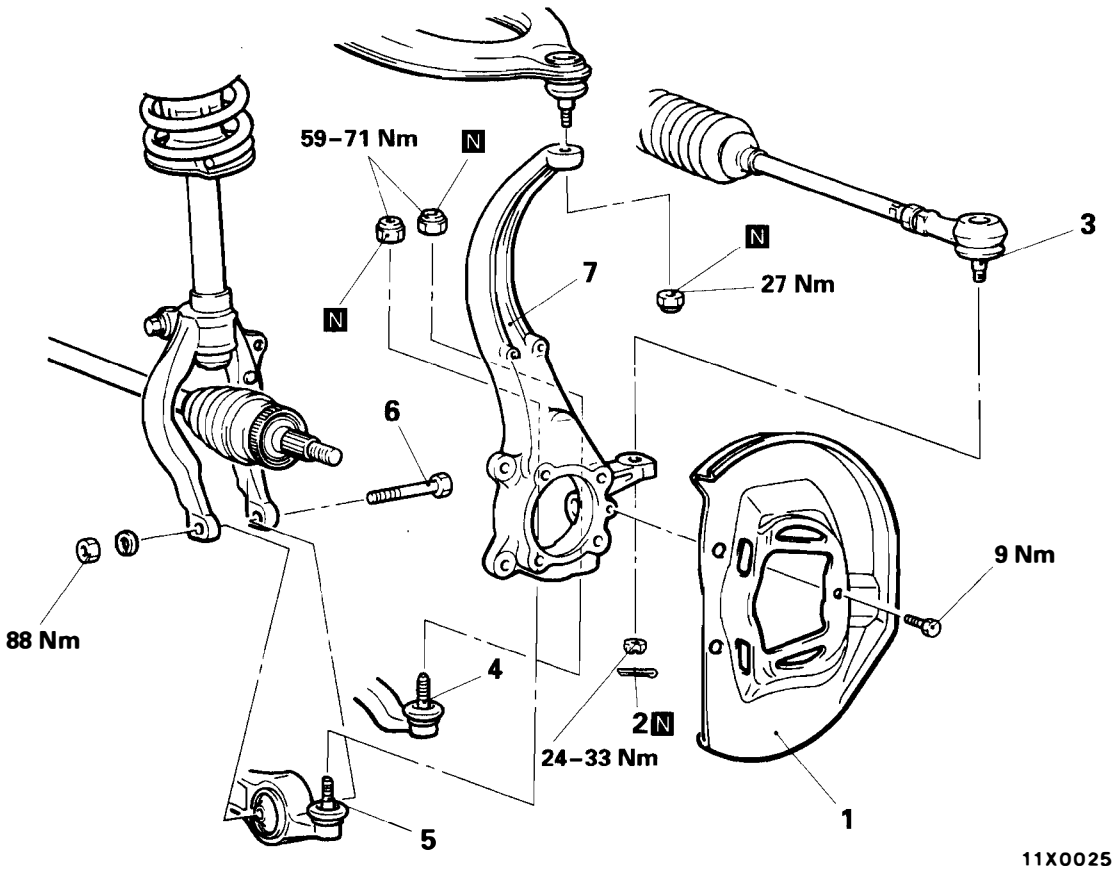


KNUCKLE

REMOVAL AND INSTALLATION

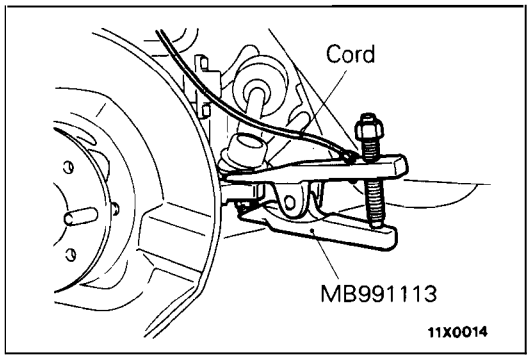
E26ZH00AA

Pre-removal and Post-installation Operation
- Front Speed Sensor Removal and Installation <Vehicles with A.B.S.>
- Front Hub Assembly Removal and Installation (Refer to P.26-6.)



Removal steps

1. Dust shield
2. Split pin
◇A◇ 3. Connection for tie rod end
◇B◇ 4. Connection for compression lower arm
◇C◇ 5. Connection for lateral lower arm
6. Connection bolt of damper fork and lateral lower arm
7. Knuckle



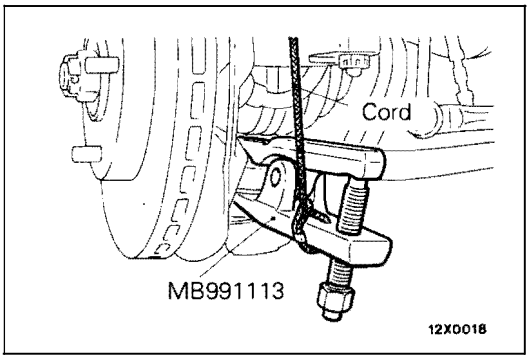
REMOVAL SERVICE POINTS

E26ZH01AA

◇A◇ TIE ROD END REMOVAL

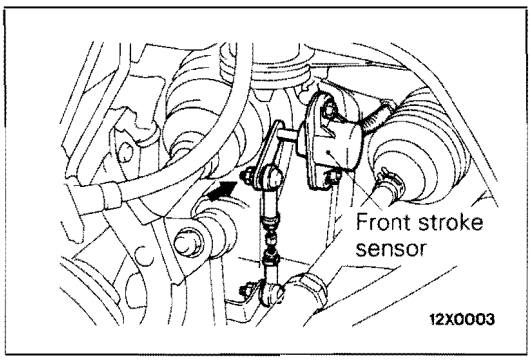
Caution

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



⟨B⟩ COMPRESSION LOWER, ARM REMOVAL

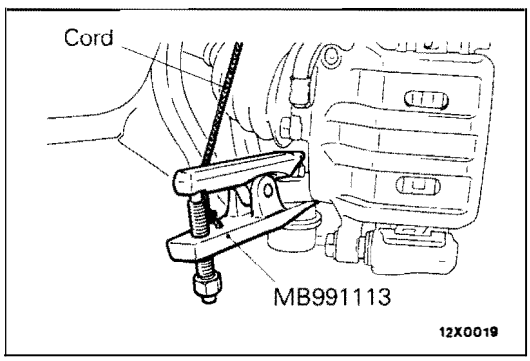
Caution
1. **Be sure to tie the cord of the special tool to the nearby part.**
2. **Loosen the nut but do not remove it.**



⟨C⟩ LATERAL LOWER ARM REMOVAL

(1) For vehicles with active ECS or ECS, first remove the connection (location indicated by an arrow in the illustration) between the front stroke sensor and sensor-side rod.

Caution
As there is a danger that a malfunction may occur in the front stroke sensor, the lateral lower arm should not be removed with the sensor rod still connected.



(2) Use the special tool to remove the lateral lower arm from the knuckle.

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

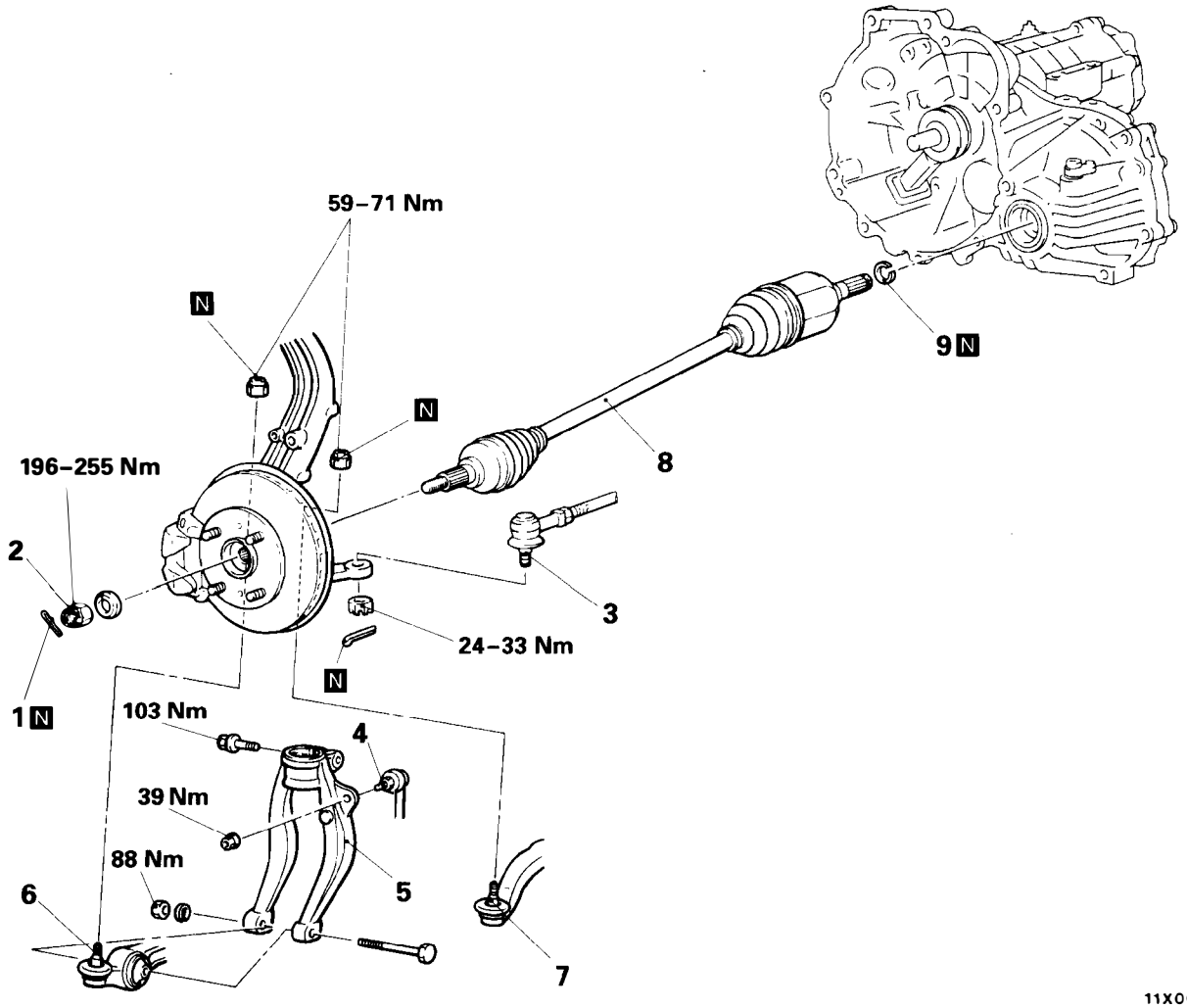
INSPECTION E26ZH02AA

- Check the knuckle for damage, bending or cracking.

DRIVE SHAFT <VEHICLES WITHOUT INNER SHAFT>

REMOVAL AND INSTALLATION

E26ZI00AA

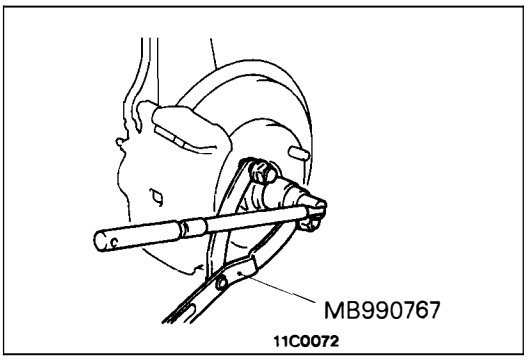


11X0023

Removal steps

1. Split pin
2. Drive shaft nut
3. Connection for tie rod end
4. Connection for stabilizer link
5. Damper fork
6. Connection for lateral lower arm
7. Connection for compression lower arm
8. Drive shaft
9. Circlip

〈A〉 ▶A◀ 〈B〉 〈C〉 〈D〉 〈E〉

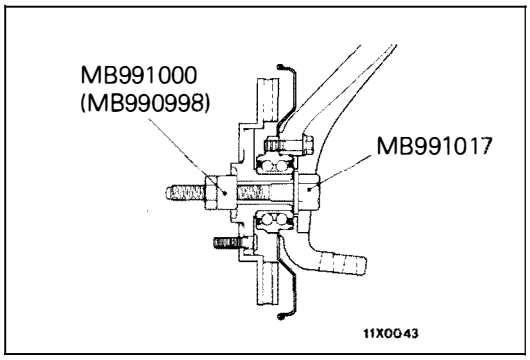


11C0072

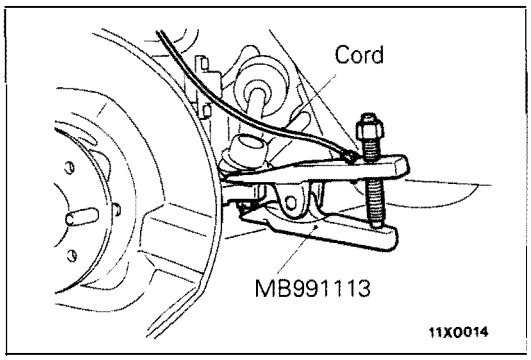
REMOVAL SERVICE POINTS

E26ZI01AA

〈A〉 DRIVE SHAFT NUT REMOVAL

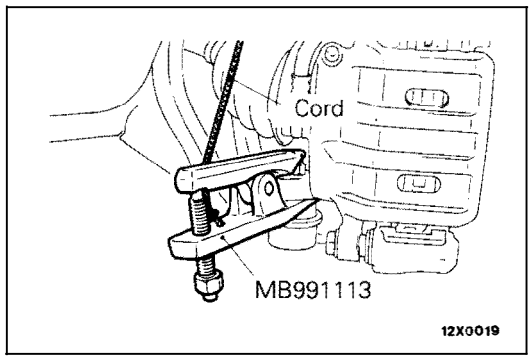


Caution
Do not apply the vehicle weight to the wheel bearing while loosening the drive shaft nut. If, however, the vehicle weight must be applied to the bearing (because of moving the vehicle), temporarily secure the wheel bearing by using the special tool, MB990998, etc.



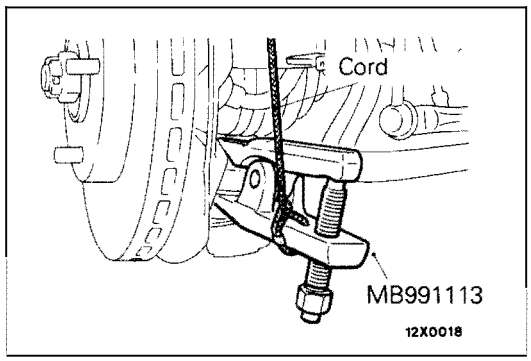
〈B〉 TIE ROD END REMOVAL

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



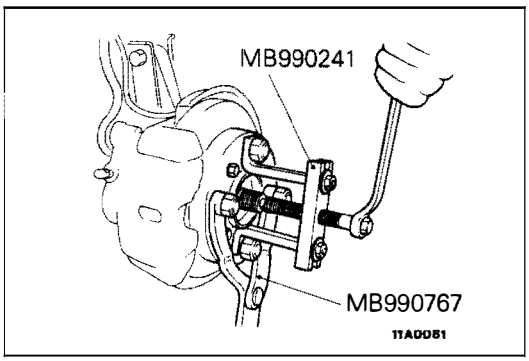
〈C〉 LATERAL LOWER ARM REMOVAL

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



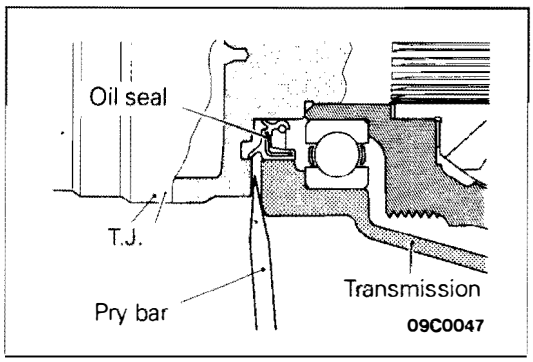
〈D〉 COMPRESSION LOWER ARM REMOVAL

Caution
1. **Loosen the nut only; do not remove it from the ball joint.**
2. **The special tool should be suspended by a cord to prevent it from coming off.**



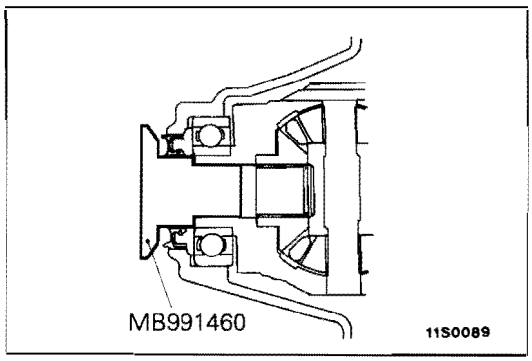
〈E〉 DRIVE SHAFT REMOVAL

(1) Use the special tools to push out the drive shaft from the hub.



(2) Insert a pry bar between the transmission case and the drive shaft, and then pry the drive shaft from the transmission.

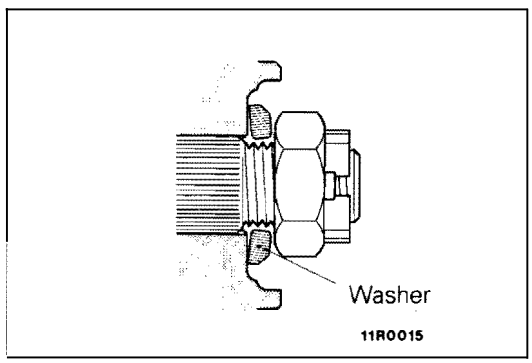
Caution
1. **Do not pull on the drive shaft; doing so will damage the T.J.; be sure to use the pry bar.**
2. **Do not insert the pry bar so deep as to damage the oil seal.**



(3) Use the special tool provided as a cover to prevent the entry of foreign objects into the transmission case.

INSPECTION E26ZI02AA

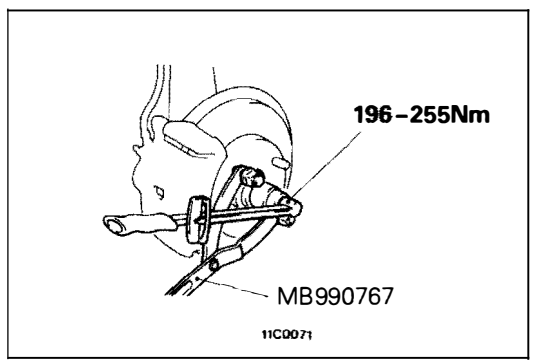
- Check the drive shaft boot for damage or deterioration.
- Check the ball joints for wear or operating condition.
- Check the spline part for wear or damage.



INSTALLATION SERVICE POINTS E26ZI04AA

◆A◆ DRIVE SHAFT NUT INSTALLATION

(1) Be sure to install the drive shaft washer in the specified direction.



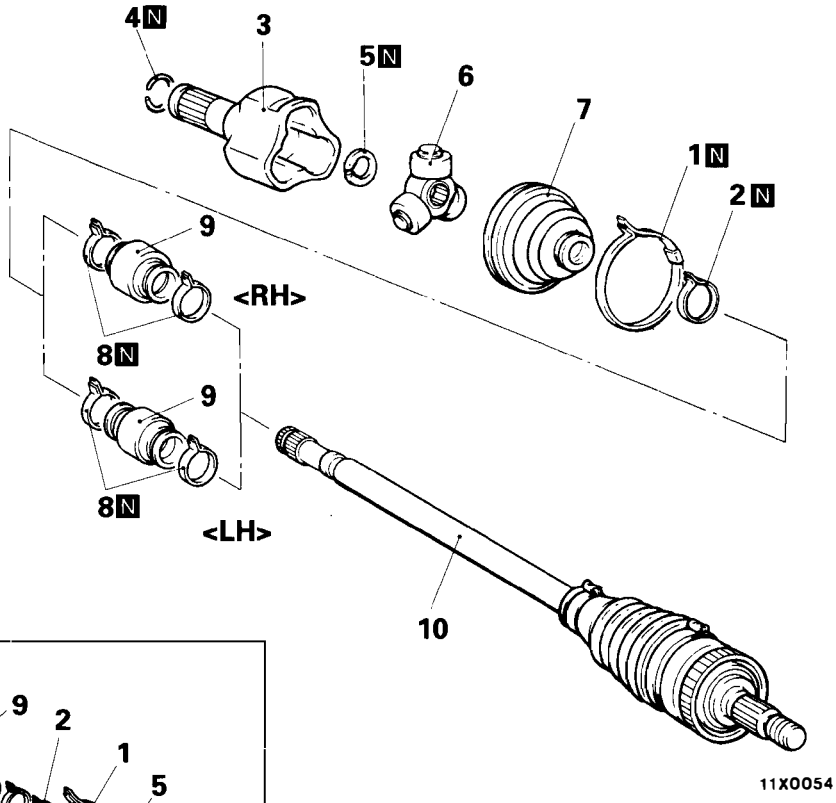
(2) Using the special tool, tighten the drive shaft nut.

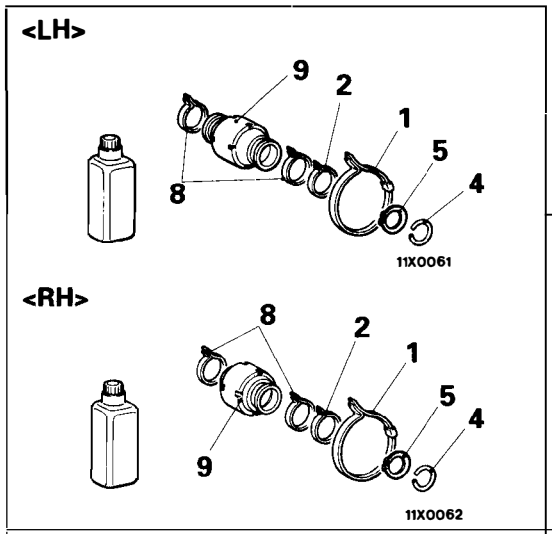
Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

(3) If the position of the split pin holes does not match, tighten the nut up to 255 Nm in maximum.
(4) Install the split pin in the first matching holes and bend it securely.

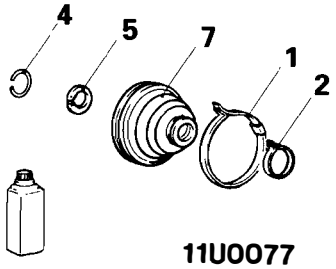
DISASSEMBLY AND REASSEMBLY

E26ZI05AA

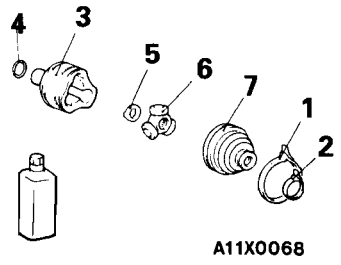




Damper kit



T.J. boot repair kit



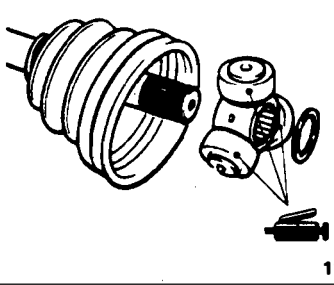
T.J. repair kit

Disassembly steps

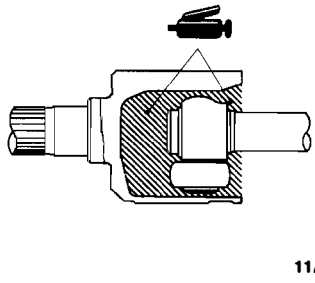
- ◆D◆ 1. T.J. boot band (large)
- ◆D◆ 2. T.J. boot band (small)
- ◇A◇ ◆C◆ 3. T.J. case
- 4. Circlip
- ◇B◇ 5. Snap ring
- ◇B◇ ◆C◆ 6. Spider assembly
- ◇C◇ ◆B◆ 7. T.J. boot
- 8. Damper band
- ◆A◆ 9. Dynamic damper
- 10. B.J. assembly

Caution
Do not disassemble the B.J. assembly.

LUBRICANT POINTS



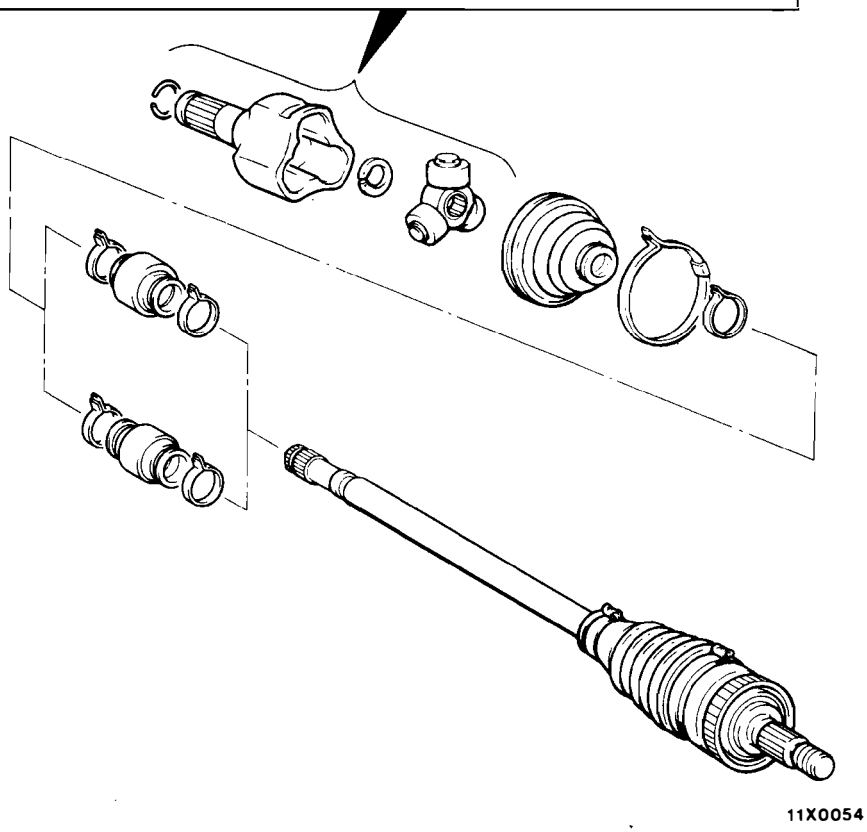
11E560



11A0084

Grease: Repair kit grease	Grease: Repair kit grease 105g <6A12> 120g <4G93, 4G63> 130g <4D68>

Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.

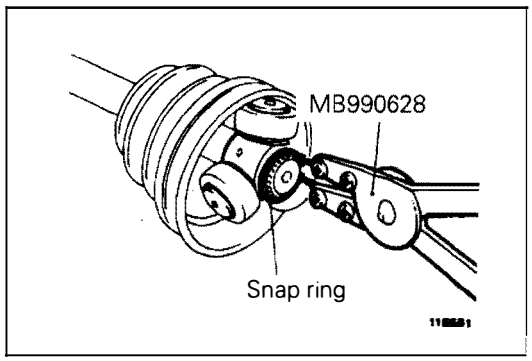


11X0054

DISASSEMBLY SERVICE POINTS E26ZI06AA

◇A◇ T.J. CASE REMOVAL

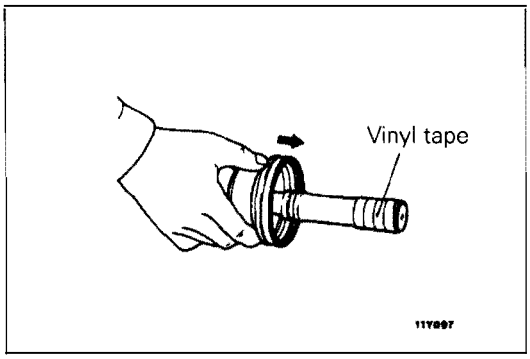
Remove the T.J. case from the B.J. assembly, and wipe off the grease inside the T.J. case.



〈B〉 SNAP RING/SPIDER ASSEMBLY REMOVAL

(1) Remove the snap ring from the drive shaft with the special tool.
(2) Take out the spider assembly from the drive shaft.
(3) Clean the spider assembly.

Caution
1. Do not disassemble the spider assembly.
2. Use care in handling so as not to damage the drive shaft.



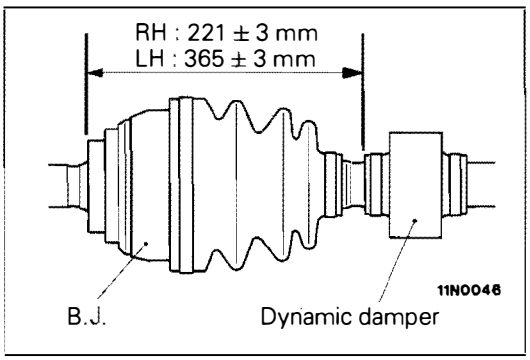
〈C〉 T.J. BOOT REMOVAL

(1) Wipe the grease off of the spline portion.
(2) Remove the T.J. boot.

NOTE
If the boot is reused, wrap vinyl tape around the drive shaft spline so that the boot is not damaged when it is removed.

INSPECTION E26ZI07AA

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft spline part for wear or damage.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear of corrosion.
- Check the dynamic damper for damage or cracking.
- Check the boots for deterioration, damage or cracking.



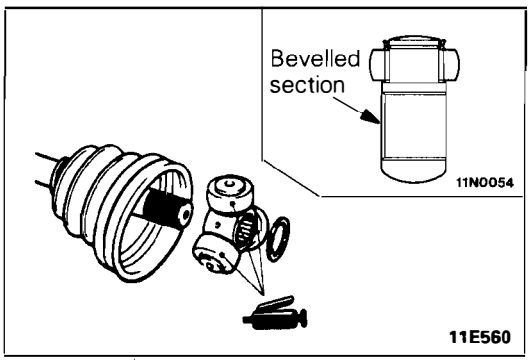
REASSEMBLY SERVICE POINTS E26ZI08AA

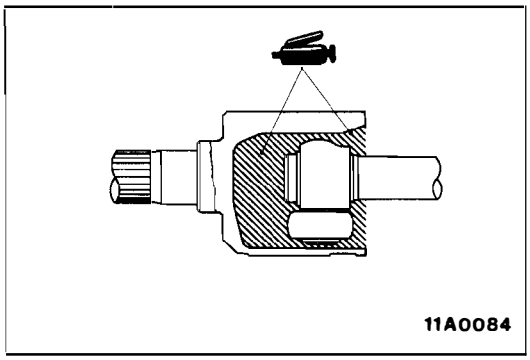
◆A◆ DYNAMIC DAMPER INSTALLATION

Install the dynamic damper in the position shown in the illustration.

◆B◆ T.J. BOOT INSTALLATION

Wrap vinyl tape around the spline part on the drive shaft, and then install the T.J. boot band (small) and T.J. boot.





◗C◖ SPIDER ASSEMBLY/T.J. CASE INSTALLATION

(1) Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.

Specified grease : Repair kit grease

Caution
1. **The drive shaft joint uses special grease. Do not mix old and new or different types of grease.**
2. **If the spider assembly has been cleaned, take special care to apply the specified grease.**

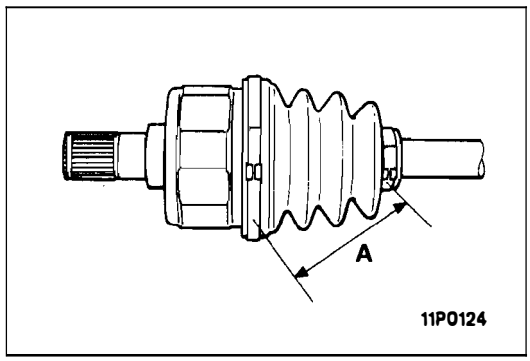
(2) Install the spider assembly to the shaft from the direction of the spline bevelled section.

(3) After applying specified grease to the T.J. case, insert the drive shaft and apply grease one more time.

Specified grease : Repair kit grease
105g <6A12>
120g <4G93, 4G63>
130g <4D68>

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint use special grease. Do not mix old and new or different types of grease.



◗D◖ T.J. BOOT BAND (SMALL)/T.J. BOOT BAND (LARGE) INSTALLATION

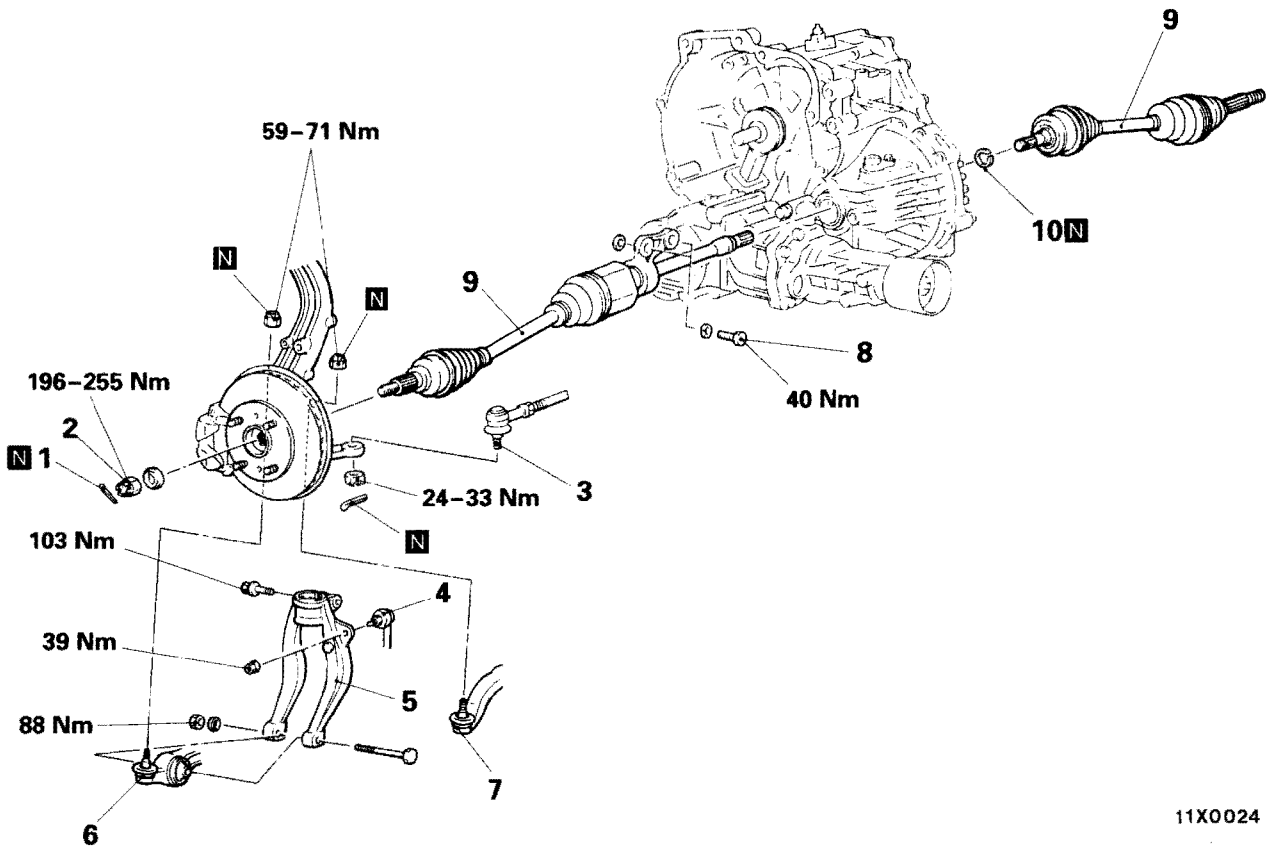
Set the T.J. boot bands at the specified distance in order to adjust the amout of air inside the T.J. boot, and then tighten the T.J. boot bands securely.

Standard value: 80 ± 3 mm

DRIVE SHAFT <VEHICLES WITH INNER SHAFT>

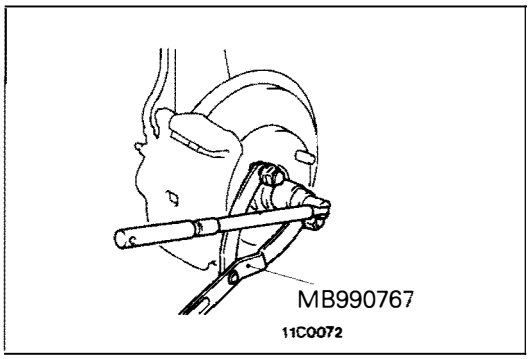
E26ZI10AA

REMOVAL AND INSTALLATION



Removal steps

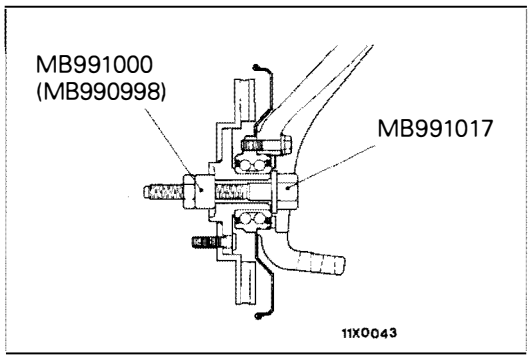
1. Split pin
◇A◇ ◆A◆ 2. Drive shaft nut
◇B◇ 3. Connection for tie rod end
4. Connection for stabilizer link
5. Damper fork
◇C◇ 6. Connection for lateral lower arm
◇D◇ 7. Connection for compression lower arm
8. Bolt
◇E◇ 9. Drive shaft and inner shaft (LH) or drive shaft (RH)
10. Circlip



REMOVAL SERVICE POINTS

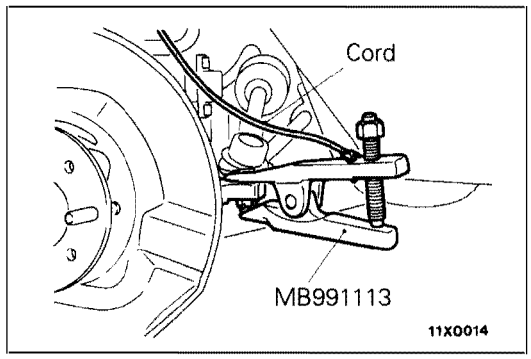
E36ZI11AA

〈A〉 DRIVE SHAFT NUT REMOVAL



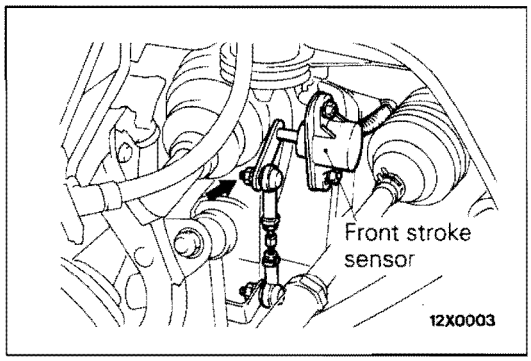
Caution
Do not apply the vehicle weight to the wheel bearing while loosening the drive shaft nut. If, however, the vehicle weight must be applied to the bearing (because of moving the vehicle), temporarily secure the wheel bearing by using the special tool, MB990998, etc.

〈B〉 TIE ROD END REMOVAL



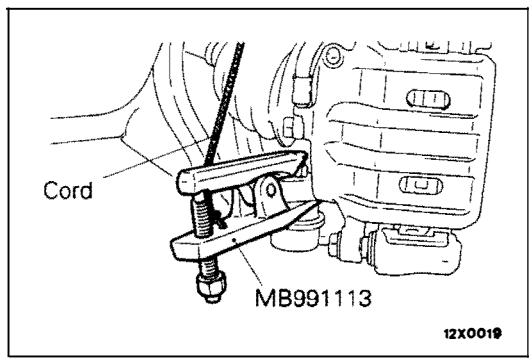
Caution
1. **Be sure to tie the cord of the special tool to the nearby part.**
2. **Loosen the nut but do not remove it.**

〈C〉 LATERAL LOWER ARM REMOVAL



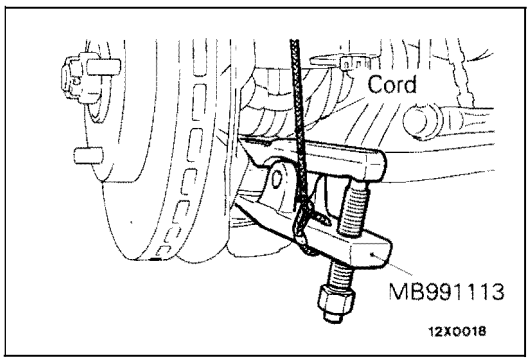
(1) For vehicles with active ECS or ECS, first remove the connection (location indicated by an arrow in the illustration) between the front stroke sensor and sensor-side rod.

Caution
As there is a danger that a malfunction may occur in the front stroke sensor, the lateral lower arm should not be removed with the sensor rod still connected.



(2) Use the special tool to remove the lateral lower arm from the knuckle.

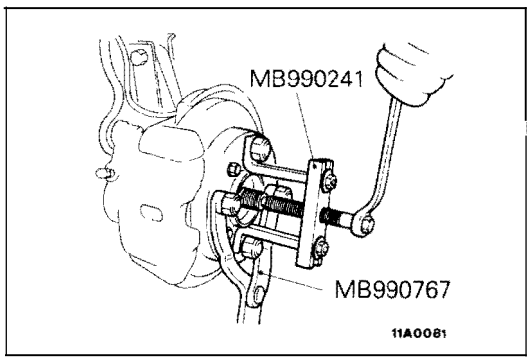
Caution
1. **Be sure to tie the cord of the special tool to the nearby part.**
2. **Loosen the nut but do not remove it.**



◇D◇ COMPRESSION LOWER ARM REMOVAL

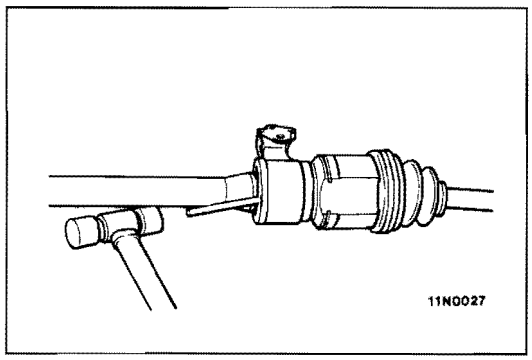
Caution

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

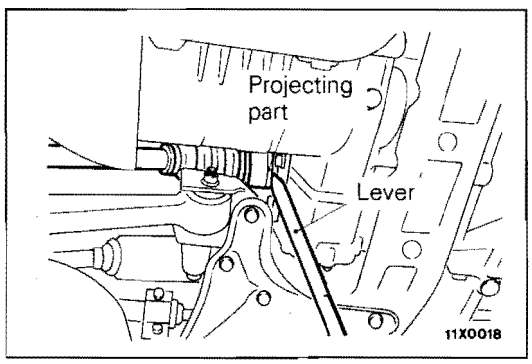


◇E◇ DRIVE SHAFT AND INNER SHAFT (LH) OR DRIVE SHAFT (RH) REMOVAL

(1) Use the special tools to push out the drive shafts from the hub.



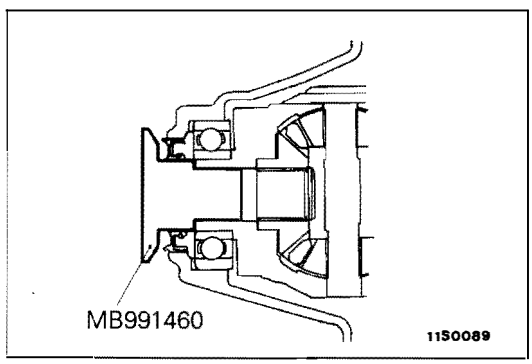
(2) If the inner shaft and transmission are tightly joined, tap the center bearing bracket lightly with a plastic hammer, etc. to remove the drive shaft and inner shaft (LH) from the transmission.



(3) Apply a lever to the projecting part of the drive shaft to remove the drive shaft (RH) from the transmission.

NOTE
For drive shafts which have no projecting part, refer to P. 26-12.

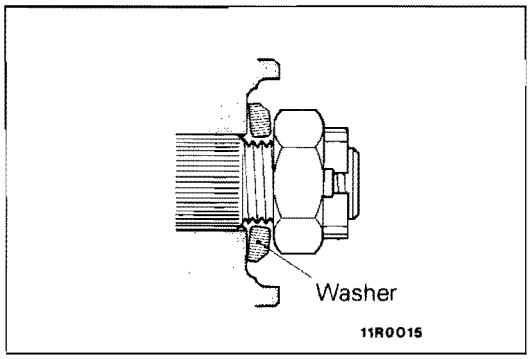
Caution
Do not pull on the drive shaft; doing so will damage the T.J. be sure to use the pry bar.



(4) Use the special tool provided as a cover to prevent the entry of foreign objects into the transmission case.

INSPECTION E26ZI12AA

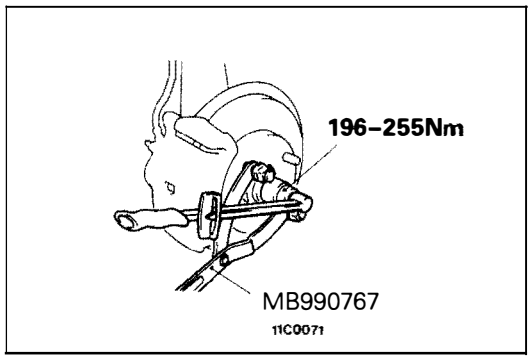
- Check the drive shaft boot for damage or deterioration.
- Check the ball joints for wear or operating condition.
- Check the spline part for wear or damage.



INSTALLATION SERVICE POINTS E26ZI4AA

◆A◆ DRIVE SHAFT NUT INSTALLATION

(1) Be sure to install the drive shaft washer in the specified direction.



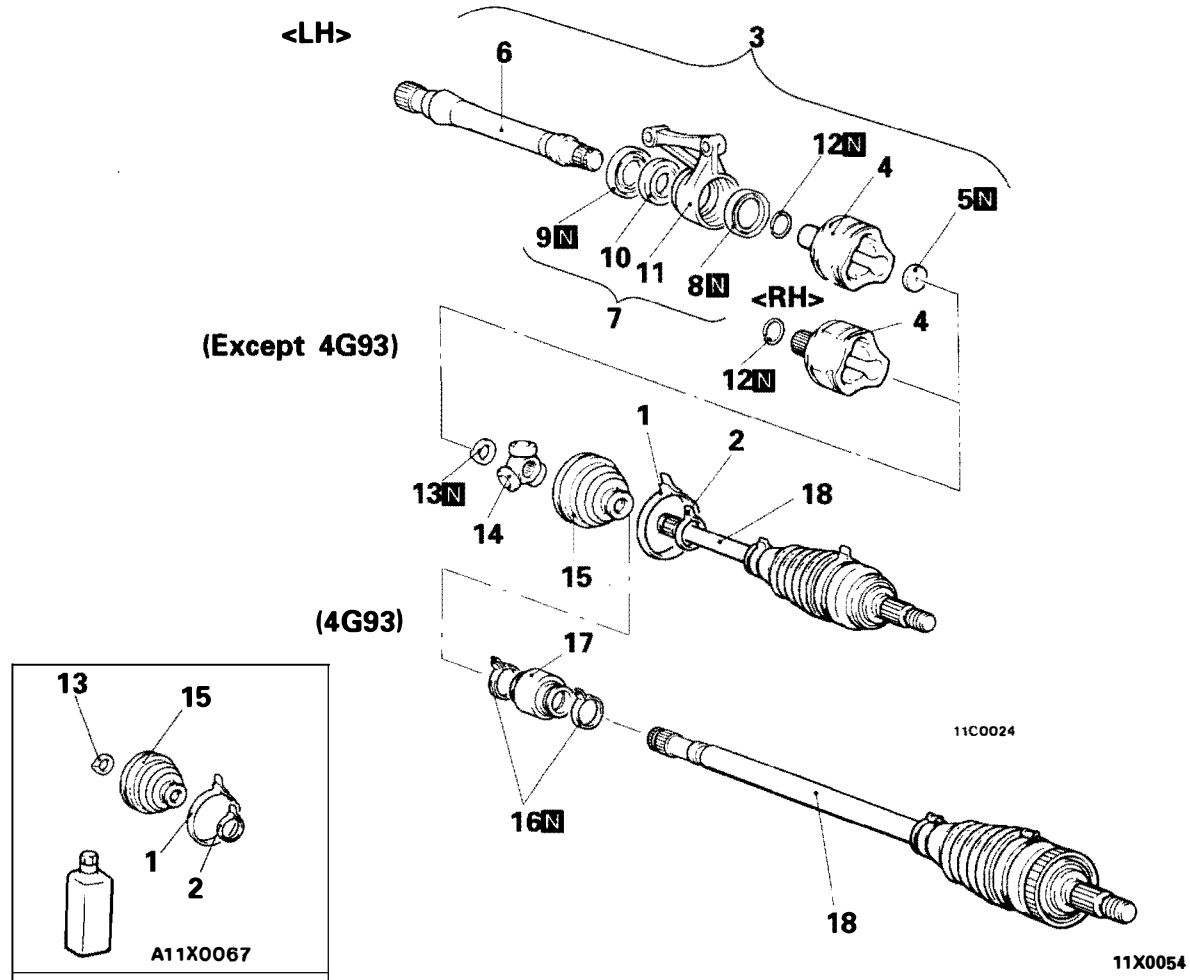
(2) Using the special tool, tighten the drive shaft nut.

Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

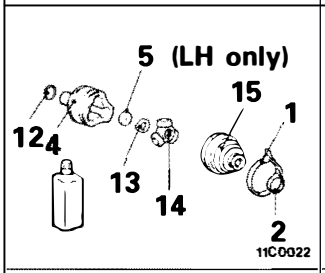
(3) If the position of the split pin holes does not match, tighten the nut up to 255 Nm in maximum.
(4) Install the split pin in the first matching holes and bend it securely.

DISASSEMBLY AND REASSEMBLY

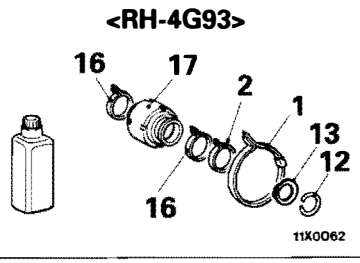
E26ZI15AA



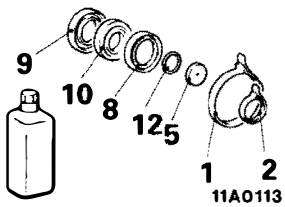
T.J. boot repair kit



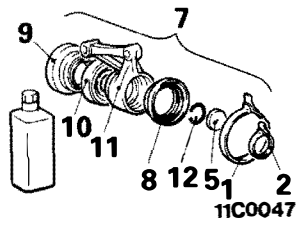
T.J. repair kit



Dumper kit



Bearing dust seal repair kit



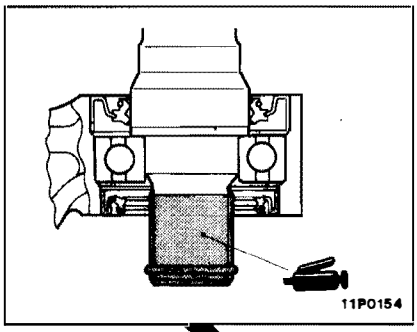
Bracket assembly repair kit

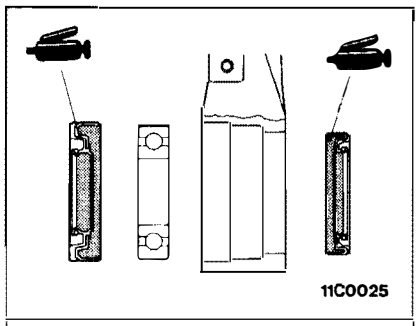
Disassembly steps

- ◗H◖ 1. T.J. boot band
- ◗H◖ 2. T.J. boot band(small)
- ◗G◖ 3. T.J.case and inner shaft assembly
- ◇A◇ 4. T.J. case
- 5. Seal plate
- ◇B◇ ◗F◖ 6. Inner shaft
- 7. Bracket assembly
- ◗E◖ 8. Dust seal outer
- ◗E◖ 9. Dust seal inner
- ◇C◇ ◗D◖ 10. Center bearing
- 11. Center bearing bracket
- 12. Circlip
- ◇D◇ 13. Snap ring
- ◇D◇ ◗C◖ 14. Spider assembly
- ◇E◇ ◗B◖ 15. T.J. boot
- 16. Dynamic dumper band <RH-4G93>
- ◗A◖ 17. Dynamic dumper <RH-4G93>
- 18. B.J. assembly

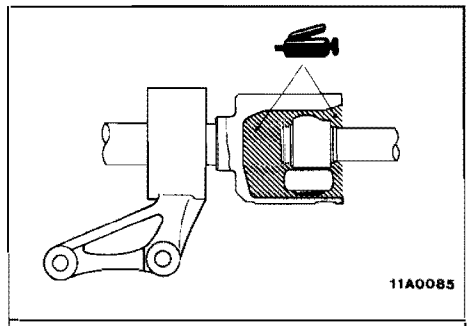
Caution
Do not disassemble the B.J. assembly.

LUBRICANT POINTS

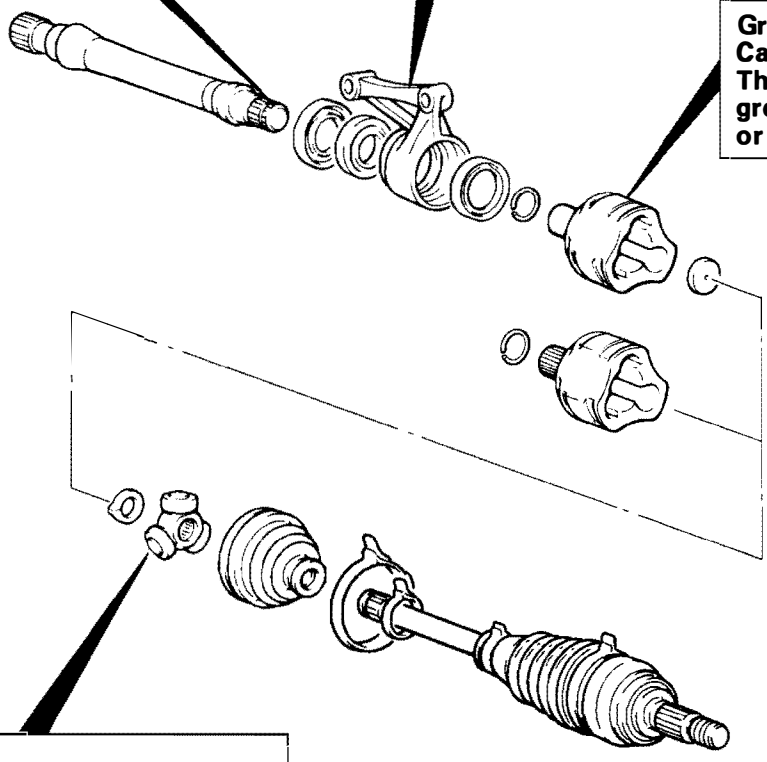


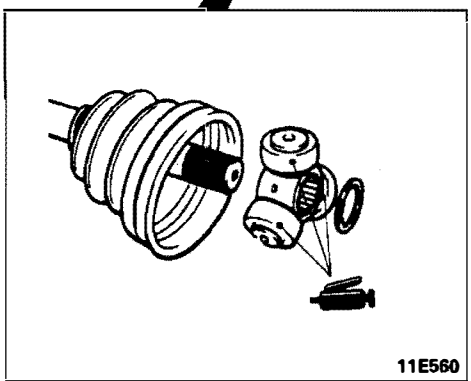


Dust seal inner : 7–10 g
Dust seal outer : 4–6 g



Grease : Repair kit grease 105 g
Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.





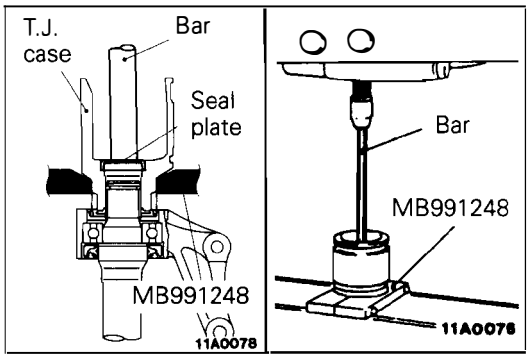
Grease : Repair kit grease

11C0024

DISASSEMBLY SERVICE POINTS E26ZI16AA

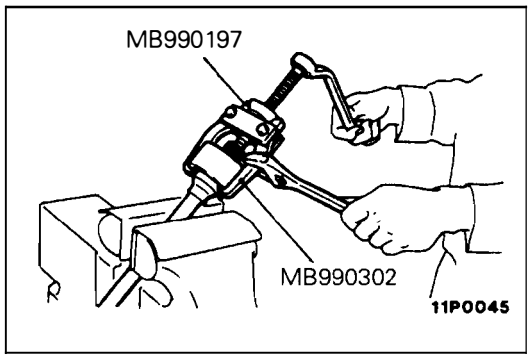
〈A〉 T.J. CASE REMOVAL

After removing the T.J. case from the B.J. assembly, wipe off the grease on the T.J. case

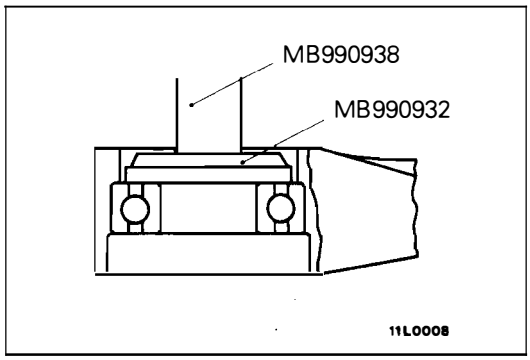


〈B〉 INNER SHAFT REMOVAL

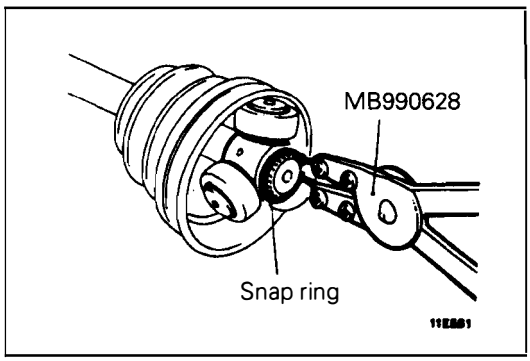
(1) Using the special tool, remove the inner shaft assembly, together with the seal plate, from the T.J. case.



(2) Use the special tools to remove the inner shaft from the bracket.



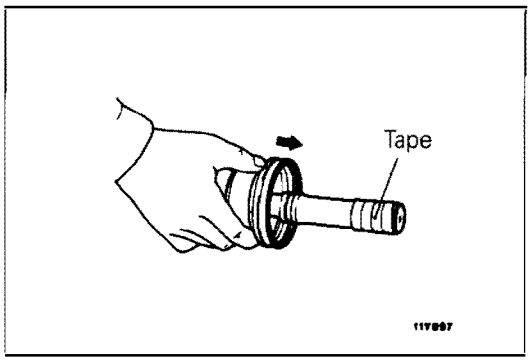
〈C〉 CENTER BEARING REMOVAL



〈D〉 SNAP RING/SPIDER ASSEMBLY REMOVAL

(1) Remove the snap ring from the drive shaft with the special tool.
(2) Take out the spider assembly from the drive shaft.
(3) Clean the spider assembly.

Caution
1. Do not disassemble the spider assembly.
2. Use care in handling so as not to damage the drive shaft.



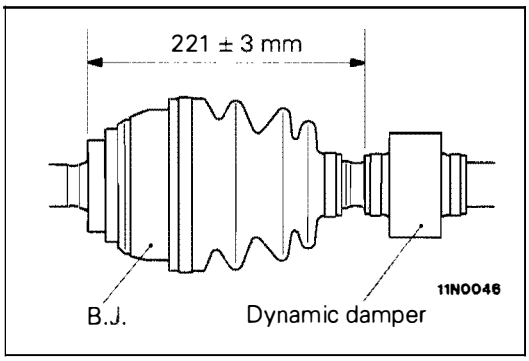
⟨E⟩ T.J. BOOT REMOVAL

(1) Wipe the grease off of the spline portion.
(2) Remove the T.J. boot.

NOTE
If the boot is reused, wrap vinyl tape around the drive shaft spline so that the boot is not damaged when it is removed.

INSPECTION E26ZI17AA

- Check the drive shaft for damage, bending or corrosion.
- Check the inner shaft for damage, bending or corrosion.
- Check the drive shaft splines for wear or damage.
- Check the inner shaft splines for wear or damage.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear or corrosion.
- Check the boots for deterioration, damage or cracking.
- Check the center bearing for seizure, discoloration or roughness of rolling surface.
- Check the dust cover for damage or deterioration.

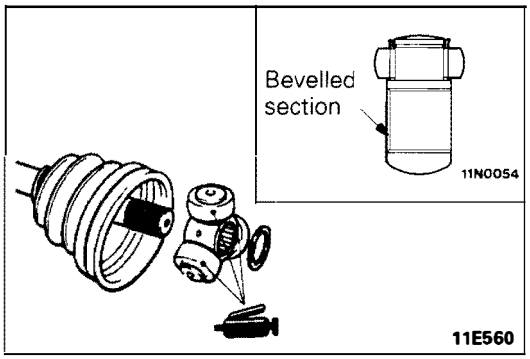


REASSEMBLY SERVICE POINTS E26ZI18AA

◗A◖ DYNAMIC DUMPER INSTALLATION

◗B◖ T.J. BOOT INSTALLATION

Wrap vinyl tape around the spline part on the drive shaft, and then install the B.J. boot and T.J. boot, in that order.



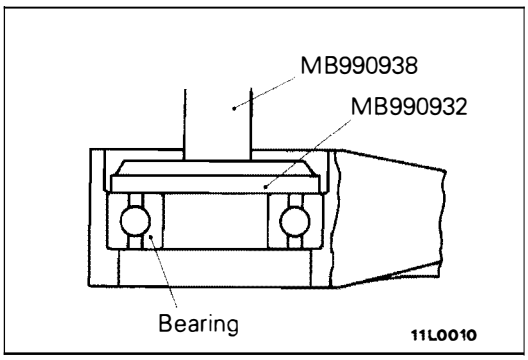
◗C◖ SPIDER ASSEMBLY INSTALLATION

(1) Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.

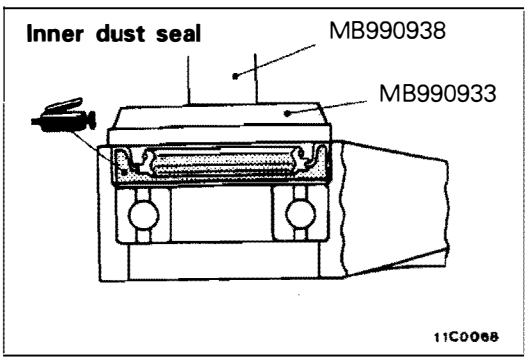
Specified grease : Repair kit grease

Caution
1. **The drive shaft joint uses special grease. Do not mix old and new or different types of grease.**
2. **If the spider assembly has been cleaned, take special care to apply the specified grease.**

(2) Install the spider assembly to the shaft from the direction of the spline bevelled section.



◗D◖ CENTER BEARING INSTALLATION



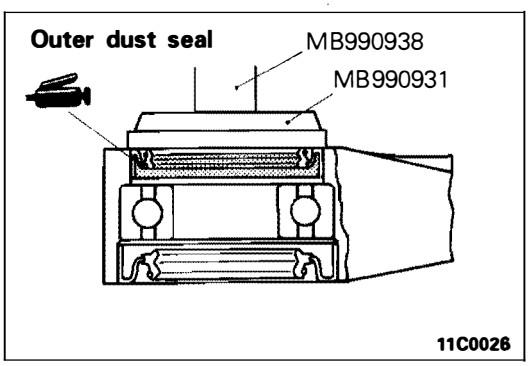
◗E◖ DUST SEAL INSTALLATION

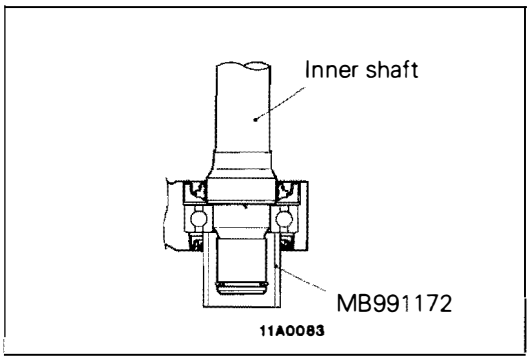
(1) Apply multipurpose grease to the rear surfaces of all dust seals.

Inner dust seal	**7–10 g**
Outer dust seal	**4–6 g**

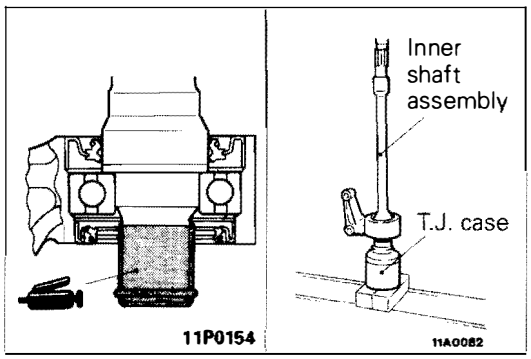
(2) Use the special tools to install the dust seal so that its surface runs even with that of the center bearing bracket.
(3) Apply multipurpose grease to the lip of each dust seal.

NOTE
When applying grease, make sure that it does not adhere to anything outside the lip.



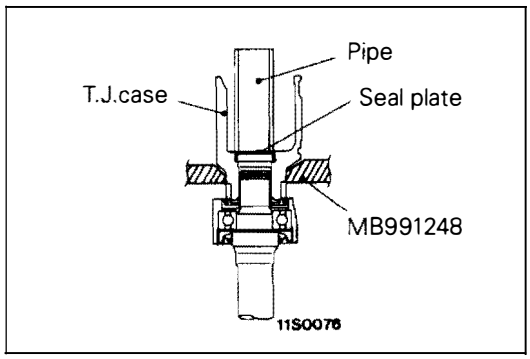


◗F◖ INNER SHAFT INSTALLATION

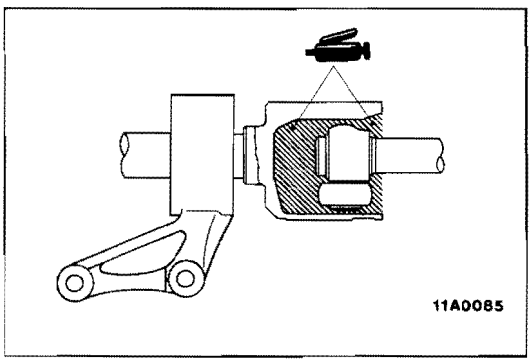


◗G◖ INNER SHAFT ASSEMBLY INSTALLATION

(1) Apply multipurpose grease to the inner shaft spline, then press fit into the T.J. case.



(2) Use the special tool secure the T.J. case
(3) Use a pipe (Ø 30mm) to press the seal plate into the T.J. case.

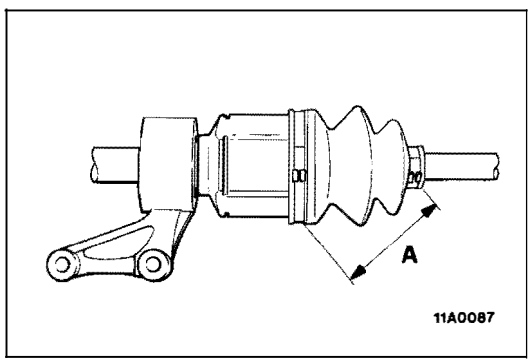


(4) Fill the specified grease furnished in the repair kit to the T.J. case.

Specified grease : Repair kit grease 105 g

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint uses special grease. Do not mix old and new or different types of grease.



◗H◖ T.J. BOOT BAND (SMALL) / T.J. BOOT BAND INSTALLATION

Set the T.J. boot bands at the specified distance in order to adjust the amount of air inside the T.J. boot, and then tighten the T.J. boot band securely.

Standard value (A) : 80 ± 3 mm

REAR AXLE

CONTENTS

E27ZA00AA

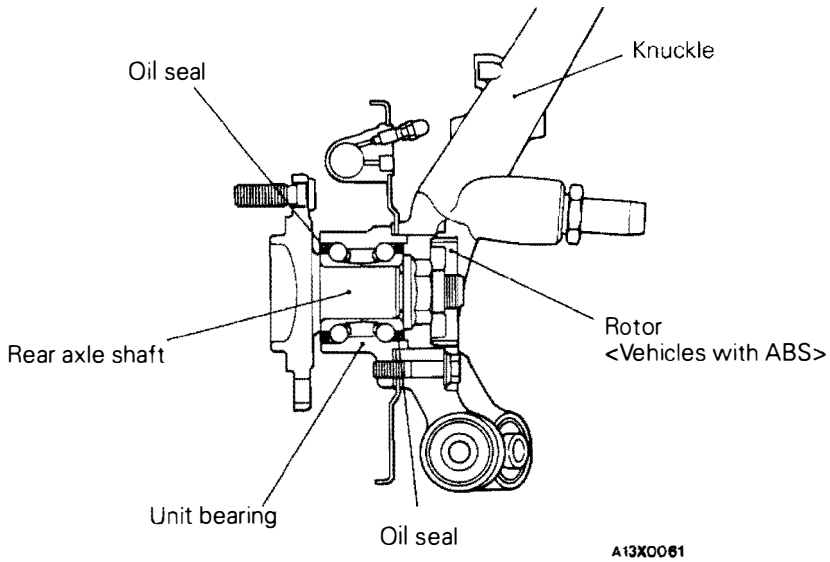
 PWDE9211

REAR AXLE<2WD>

GENERAL INFORMATION

E27ZB00AA

The rear axle consists of a knuckle, rear hub, unit bearing and axle shaft. The unit bearing is press-fitted to the rear axle shaft and bolted to the knuckle. Also, the unit bearing utilizes the same type of double row angular contact ball bearing as does the front axle. In vehicles with ABS, a rotor for detecting the vehicle speed is located on the rear axle shaft, and a speed sensor is located on the knuckle.



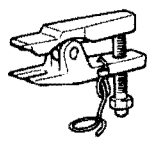
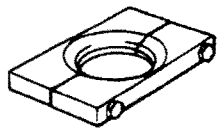
SERVICE SPECIFICATIONS

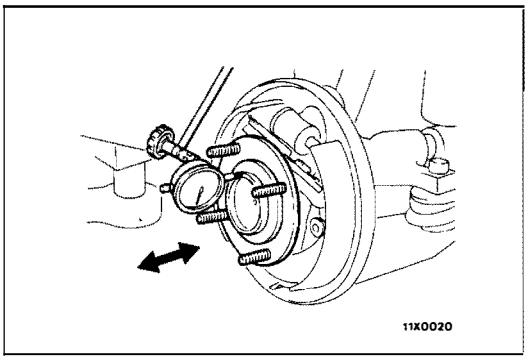
E27ZC00AA

Items		Specifications
Limit		
Wheel bearing axial play	mm	0.05
Wheel bearing rotary-sliding resistance	N	18

SPECIAL TOOLS

E27ZD00AA

Tool	Number	Name	Use
	MB991113	Steering linkage puller	Removal of the toe control arm ball joint and knuckle
	MB991248	Inner shaft remover	Removal of the rotor (Vehicles with ABS)



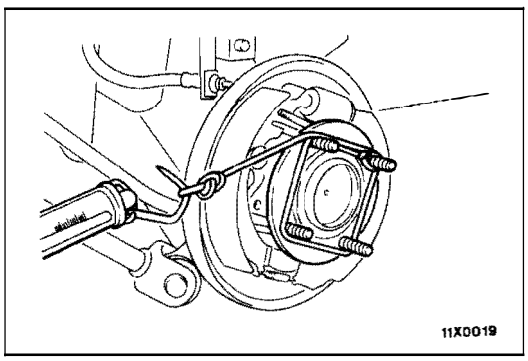
SERVICE ADJUSTMENT PROCEDURES

E27ZF00AA

WHEEL BEARING AXIAL PLAY CHECK

1. Release the parking brake.
2. Remove the brake drum.
3. For vehicles with rear disc brake, remove the caliper assembly and the brake disc.
4. Check the bearing's axial play
   Place a dial gauge against the hub surface; then move the hub in the axial direction and check whether or not there is axial play.

   Limit: 0.05 mm
5. If the play exceeds the limit value, replace the rear hub assembly.



REAR HUB ROTARY-SLIDING RESISTANCE CHECK

E27ZF01AA

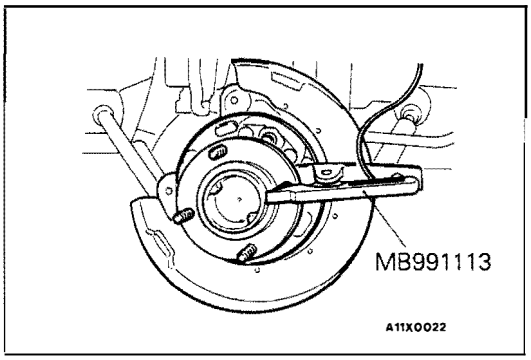
1. Release the parking brake.
2. Remove the brake drum.
3. For vehicles with rear disc brake, remove the caliper assembly and the brake disc.
4. After turning the hub a few times to seat the bearing, wind a rope around the hub bolt and turn the hub by pulling at a 90° angle with a spring balance. Measure to determine whether or not the rotary-sliding resistance of the rear hub is at the limit value.

   Limit: 18 N or less
5. If the rotary-sliding resistance exceeds the limit value, replace the rear hub assembly.

HUB BOLT REPLACEMENT

E27ZF03AA

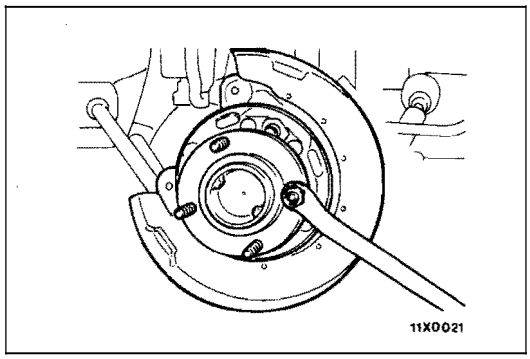
1. Remove the caliper assembly and support it with wire so that it does not fall.
2. Remove the brake drum and brake disc.
3. For vehicles with disc brakes, remove the shoe and lining assembly.



4. Pull the hub bolt out using the special tool.

   NOTE
   For vehicles with drum brakes, the hub bolts should be removed near the retainer spring installation position in order to maintain enough clearance for removal.

   Caution
   The special tool should be suspended by a cord to prevent it from coming off.



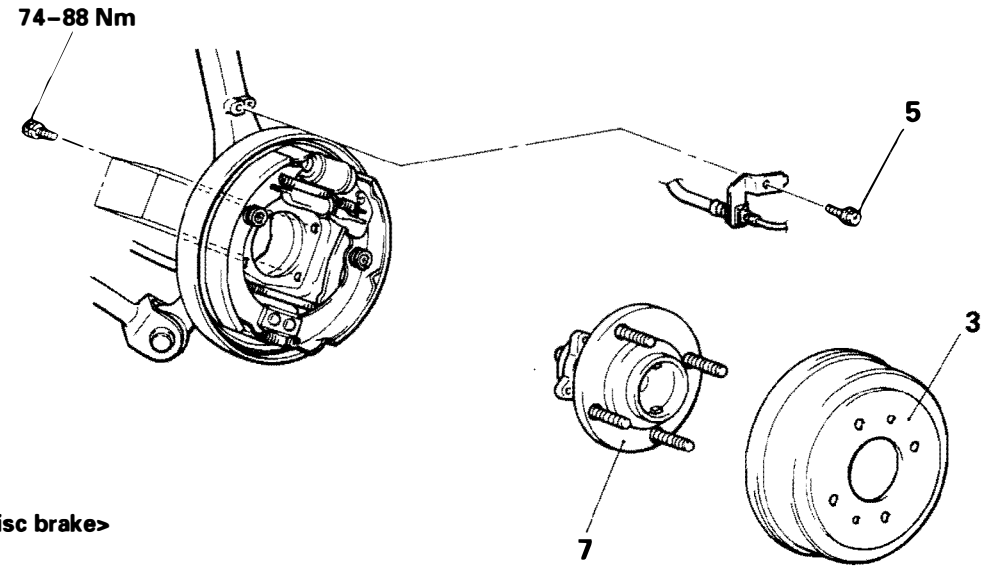
5. Use the wheel nuts to securely install the new hub bolts, while being careful of the serrations of the hub bolts and hub.

REAR HUB ASSEMBLY

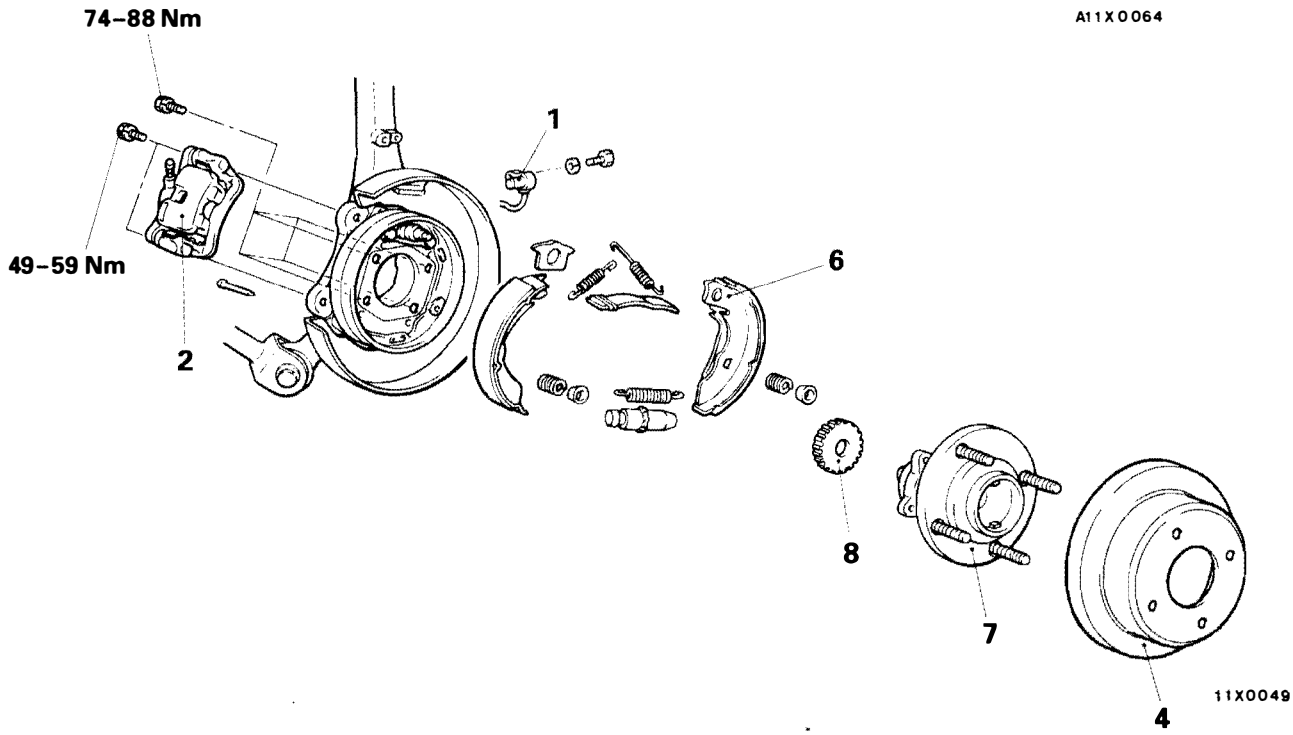
REMOVAL AND INSTALLATION

E27ZG00AA

<Vehicles with drum brake>



<Vehicles with disc brake>



Removal steps

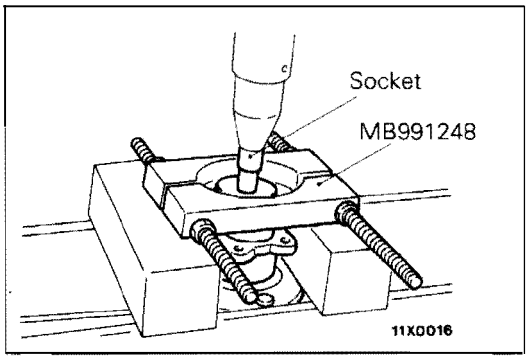
1. Rear speed sensor <Vehicles with A.B.S.> (Refer to GROUP 35B – Wheel Speed Sensor.)
〈A〉 2. Caliper assembly
3. Brake drum
4. Brake disc
5. Clip mounting bolt
6. Shoe and lining assembly (Refer to GROUP 36 – Parking Brake <Drum in disc brake>.)
7. Rear hub assembly
〈B〉 ◗A◖ 8. Rotor<Vehicles with A.B.S.>

Caution
The rear hub assembly should not be disassembled.

REMOVAL SERVICE POINTS E27ZG01AA

〈A〉 CALIPER ASSEMBLY REMOVAL

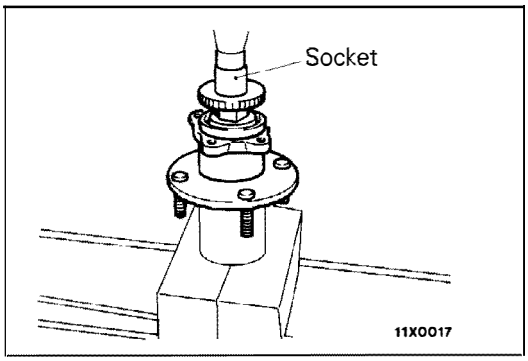
Remove the caliper assembly and suspend it.



〈B〉 ROTOR REMOVAL

INSPECTION E27ZG02AA

- Check the oil seal for crack or damage.
- Check the rear rotor for chipped teeth.



INSTALLATION SERVICE POINTS E27ZG04AA

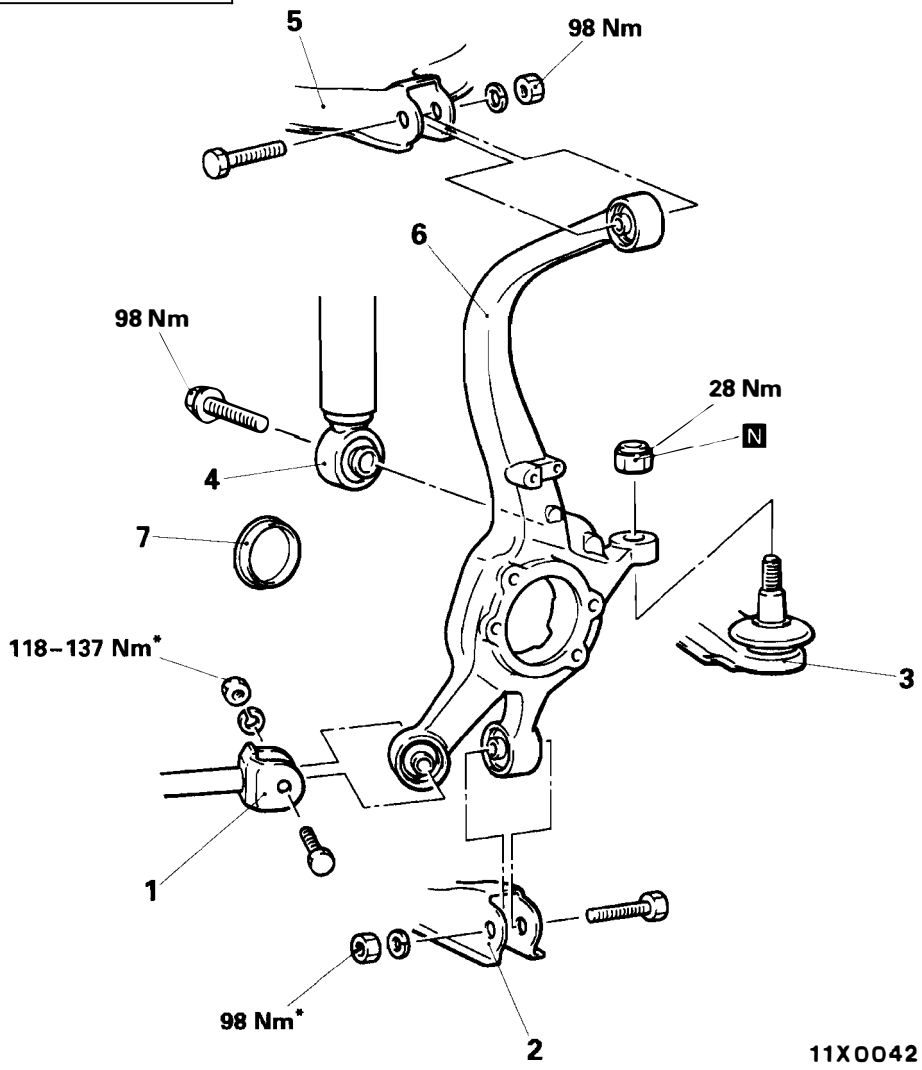
▶A◀ ROTOR INSTALLATION

KNUCKLE

REMOVAL AND INSTALLATION

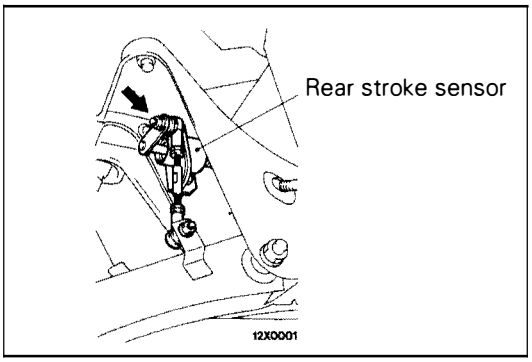
E27ZH00AB

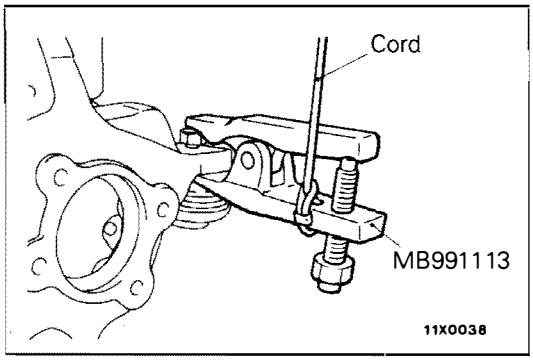
Pre-removal and Post-installation Operation
(1) Rear Speed sensor Removal and Installation <Vehicles with A.B.S.>
(2) Rear Hub Assembly Removal and Installation <Refer to P. 27-5.>



Removal steps
1. Connection for trailing arm
◇A◇ 2. Connection for lower arm
◇B◇ 3. Connection for toe control arm
4. Connection for shock absorber
5. Connection for upper arm
6. Knuckle
7. Hub cap <Vehicles without A.B.S.>

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**





REMOVAL SERVICE POINTS E27ZH01AA

◇A◇ LOWER ARM REMOVAL

For vehicles with active ECS, first remove the connection (location indicated by an arrow in the illustration) between the rear stroke sensor and sensor-side rod.

Caution
As there is a danger that a malfunction may occur in the rear stroke sensor, the lateral lower arm should not be removed with the sensor rod still connected.

◇B◇ TOE CONTROL ARM REMOVAL

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

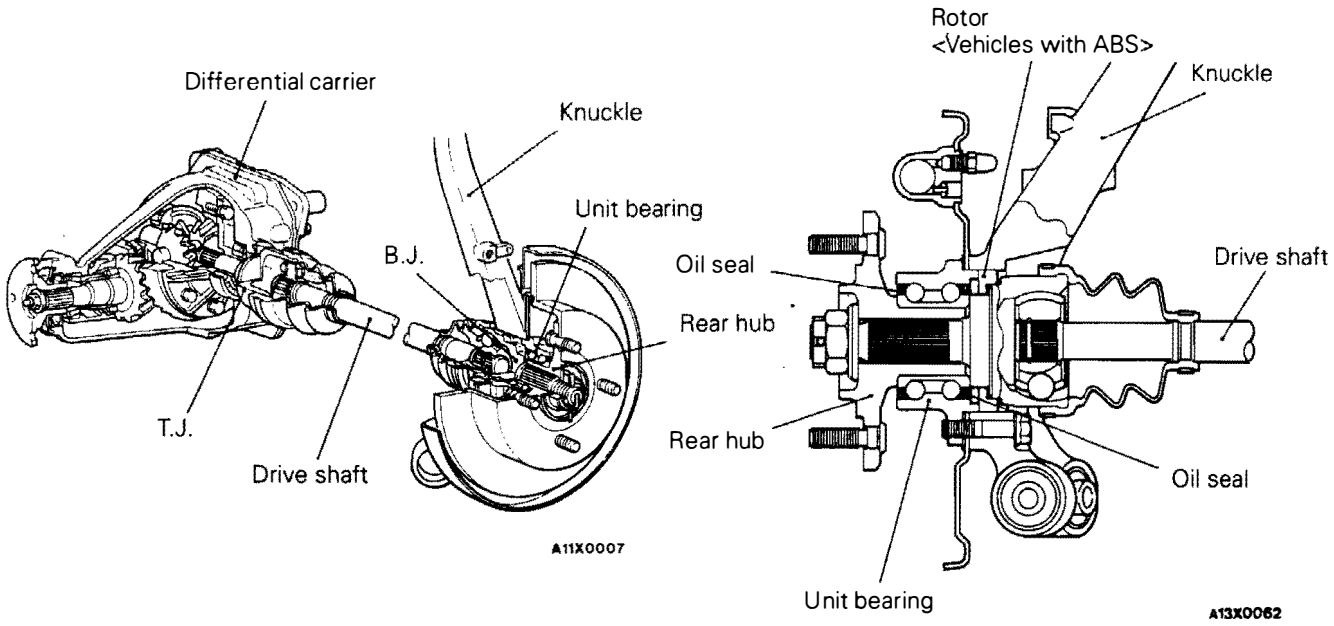
REAR AXLE <4WD>

E27ZB00BA

GENERAL INFORMATION

In the rear axle structure, the unit bearing is press-fitted to the rear hub and bolted to the knuckle. Also, the unit bearing utilizes a double row angular contact ball bearing. The drive shaft has a T.J. on the differential side and a B.J. constant-velocity joint on the wheel side. In vehicles with ABS, a rotor for detecting the vehicle speed is located on the outer ring of the drive shaft B.J., and a speed sensor is located on the knuckle.
The differential carrier provides elastic support by means of a bushing.

Items		Conventional differential	
		4G63 Engine	6G73 Engine
Reduction gear type		Hypoid gear	
Reduction ratio		2.846	3.545
Differential gear type (Type × number of gears)	Side gear	Straight bevel gear × 2	
	Pinion gear	Straight bevel gear × 2	
Number of teeth	Drive gear	37	39
	Drive pinion	13	11
	Side gear	14	
	Pinion gear	10	
Bearing (outside diameter × inside diameter) mm	Side	72 × 35	
	Front	62 × 25	
	Rear	72 × 35	



SERVICE SPECIFICATIONS

E27ZC00BA

Items			Specifications
Standard value			
Setting of T.J. boot length		mm	79 ± 3
Final drive gear backlash		mm	0.11 – 0.16
Differential gear backlash		mm	0 – 0.076
Drive pinion turning torque		Nm	
Without oil seal	New bearing		0.9 – 1.2*1
	New/reused bearing		0.4 – 0.5*2
With oil seal	New bearing		1.0 – 1.3*1
	New/reused bearing		0.5 – 0.6*2
Limit			
Rear axle total backlash		mm	5
Rear wheel bearing axial play		mm	0.05
Wheel bearing starting torque		Nm	1.1 or less
Drive gear runout		mm	0.05
Differential gear backlash		mm	0.2

NOTE
*1: When replacing with a new bearing (with rust-prevention oil)
*2: When using a new bearing or when reusing (gear oil application)

LUBRICANTS

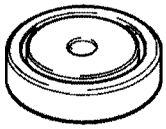
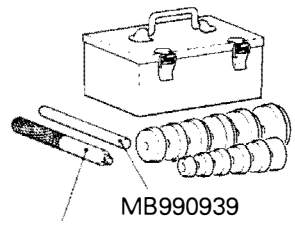
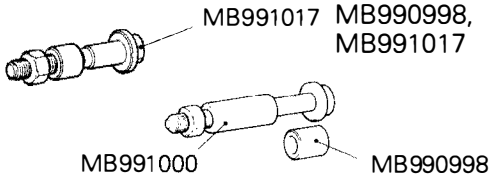
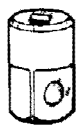
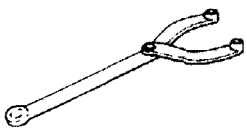
Items	Quantity	Specified lubricant
Rear axle gear oil	0.8 ℓ	Hypoid gear oil SAE No. 90 conforming to API classification GL-5 or higher
T.J. boot grease	95 g	Repair kit grease
B.J. boot grease	75 g	Repair kit grease

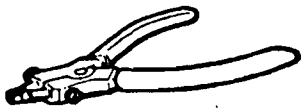
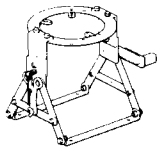
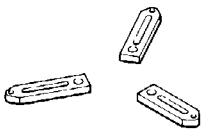
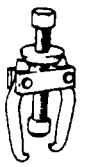
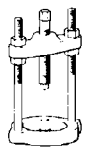
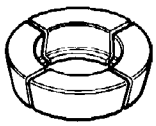
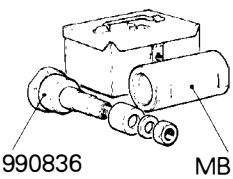
SEALANTS AND ADHESIVES

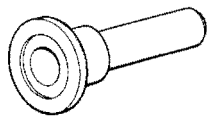
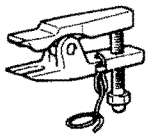
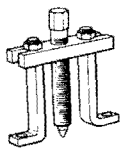
Items	Specified sealants and adhesives	Remarks
Threaded holes of the drive gear	3M Stud Locking Part No. 4170 or equivalent	Anaerobic adhesive
Vent plug installation surface (to differential carrier)	3M ATD Part No. 8663 or equivalent	Semi-drying sealant
Differential cover installation surface (to gear carrier)	3M ATD Part No. 8663 or equivalent	Semi-drying sealant

SPECIAL TOOLS

E27ZD00BA

Tool	Number	Name	Use
	MB991115	Oil seal installer	Press-fitting of the differential side oil seal (Use in conjunction with MB990938)
	MB990925	Bearing and oil seal installer set	• Press-fitting of the drive pinion rear bearing outer race MB990935, MB990938 • Press-fitting of the drive pinion front bearing outer race MB990932, MB990938 • Press-fitting of the differential side oil seal MB990938 (Use in conjunction with MB991115) • Measurement of the tooth contact of differential final gear • Driving-out the oil seal, drive pinion front bearing and drive pinion rear bearing outer race MB990939 Refer to GROUP 26.
	MB990998, MB991017	Front hub remover and installer	• Measurement of the starting torque of the wheel bearing • Provisional holding of the wheel bearing
	MB990685	Torque wrench	• Measurement of the starting torque of the wheel bearing • Measurement of the drive pinion preload
	MB990326	Preload socket	
	MB990767	End yoke holder	Fixing of the hub

Tool	Number	Name	Use
	MB990628	Snap ring pliers	To remove and install the snap ring of the drive shaft
	MB990909	Working base	Supporting of the differential carrier
	MB991116	Working base adapter	
	MB990810	Side bearing puller	• Removal of the side bearing inner race • Removal of the companion flange
	MB990850	End yoke holder	Removal and installation of the companion flange
	MB990339	Bearing puller	Removal of the drive pinion rear bearing inner race
	MB990374	Pinion bearing remover	
 MB990836 MB990392	MB990835	Drive pinion setting gauge set	Measurement of the drive pinion height

Tool	Number	Name	Use
	MB990728	Bearing installer	• Press-fitting of the drive pinion rear bearing inner race • Press-fitting of the side bearing inner race
	MB990031 or MB990699	Drive pinion oil seal installer	Press-fitting of the drive pinion oil seal
	MB991460	Plug	Prevention of entry of foreign objects into the differential carrier
	MB991113 or MB990635	Steering linkage puller	Removal of toe control arm ball joint and knuckle
	MB990813	Tap	Removal of sealant
	MB990241	Axle shaft puller	Removal of drive shaft

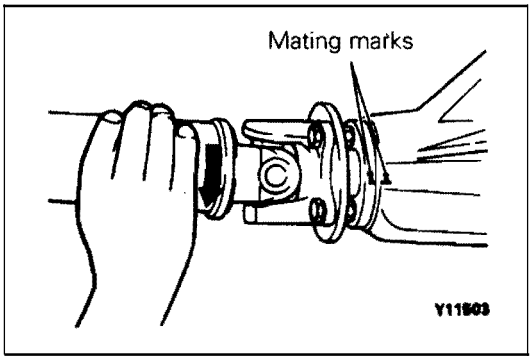
SERVICE ADJUSTMENT PROCEDURES

E27ZF02BA

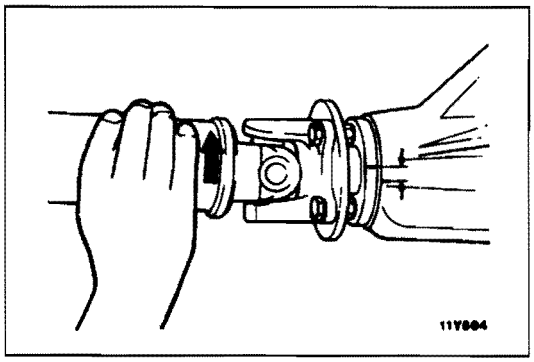
REAR AXLE TOTAL BACKLASH CHECK

If the vehicle vibrates and produces a booming sound due to an imbalance of the driving system, measure the rear axle total backlash by the following procedures to see if the differential carrier assembly requires removal.

1. Place the gearshift lever in the neutral position, apply the parking brake and jack up the vehicle.



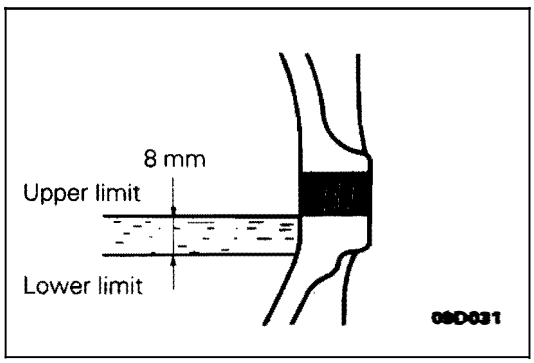
2. Manually turn the propeller shaft clockwise as far as it will go and make mating marks on the companion flange dust cover and the differential carrier.



3. Manually turn the propeller shaft counterclockwise as far as it will go and measure the movement of the mating marks.

   Limit: 5 mm

4. If the backlash exceeds the limit, remove the differential carrier assembly and adjust the backlash. (Refer to P.27-30 and 31.)

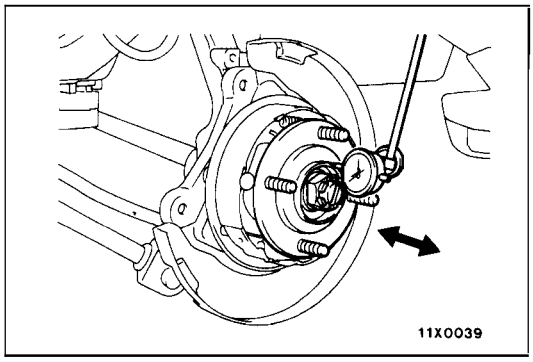


GEAR OIL LEVEL CHECK

E27ZF04BA

1. Remove the filler plug, and check the oil level.
2. The oil level is sufficient if it reaches the filler plug hole.

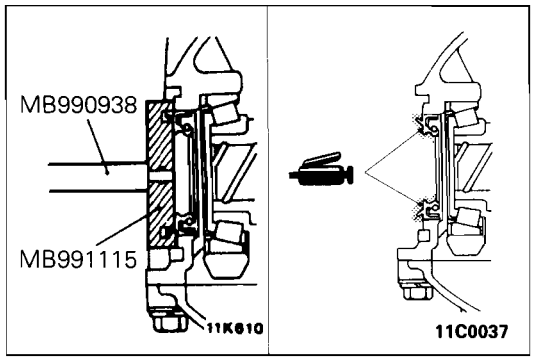
   Specified gear oil:
   Hypoid gear oil SAE No. 90 conforming to API GL-5 or higher (0.8 ℓ)



WHEEL BEARING AXIAL PLAY CHECK E27ZF00BA

1. Jack up the vehicle and remove the rear wheel.
2. Release the parking brake.
3. Remove the caliper assembly and the brake disc or brake drum.
4. Set a dial gauge as shown in the illustration, and then move the hub in the axial direction and measure the play.

   Limit value: 0.05 mm
5. If the play exceeds the limit value, replace the rear hub assembly.



REPLACEMENT OF DIFFERENTIAL CARRIER OIL SEAL E27ZF05BA

1. Remove the drive shaft. (Refer to P.27-19.)
2. Remove the oil seal of the differential carrier.
3. Use the special tool to tap on a new oil seal as far as the end of the differential carrier.
4. Apply multipurpose grease to the lip section of the oil seal and to the oil seal contact surface of the drive shaft.
5. Replace the circlip on the drive shaft with a new one, and then install the drive shaft onto the differential carrier.
6. Check the wheel alignment. (Refer to GROUP 34 – Service Adjustment Procedures.)

HUB BOLT REPLACEMENT E27ZF03BA

Refer to P.27-3.

REAR HUB ASSEMBLY

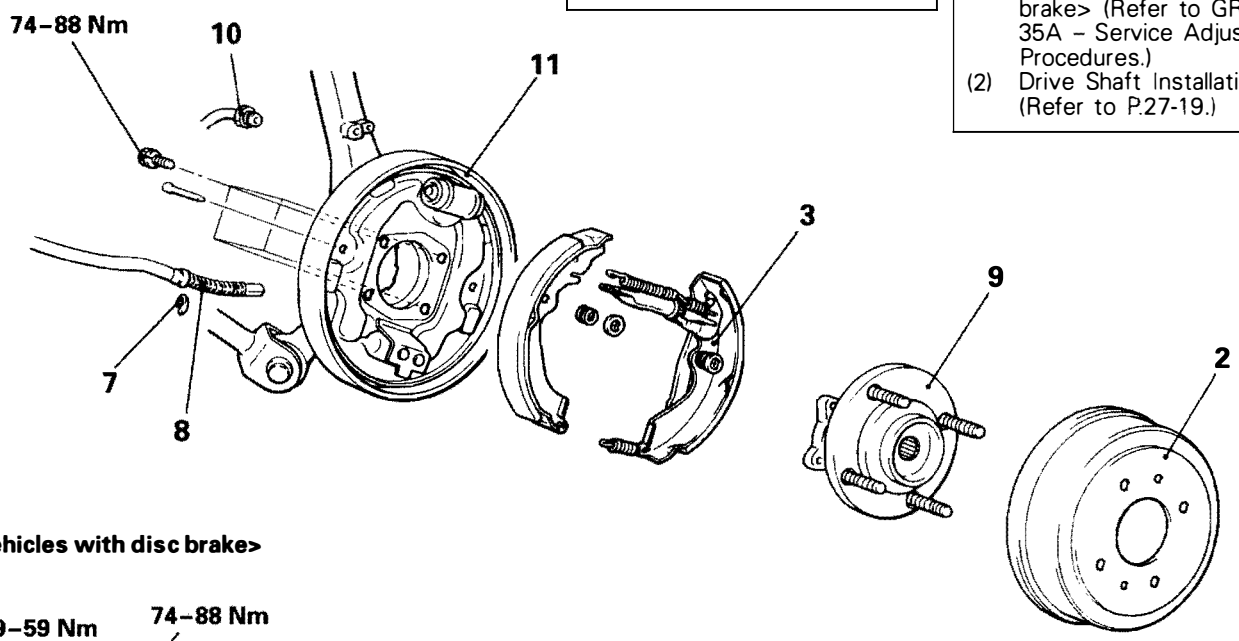
REMOVAL AND INSTALLATION

E27ZG00BA

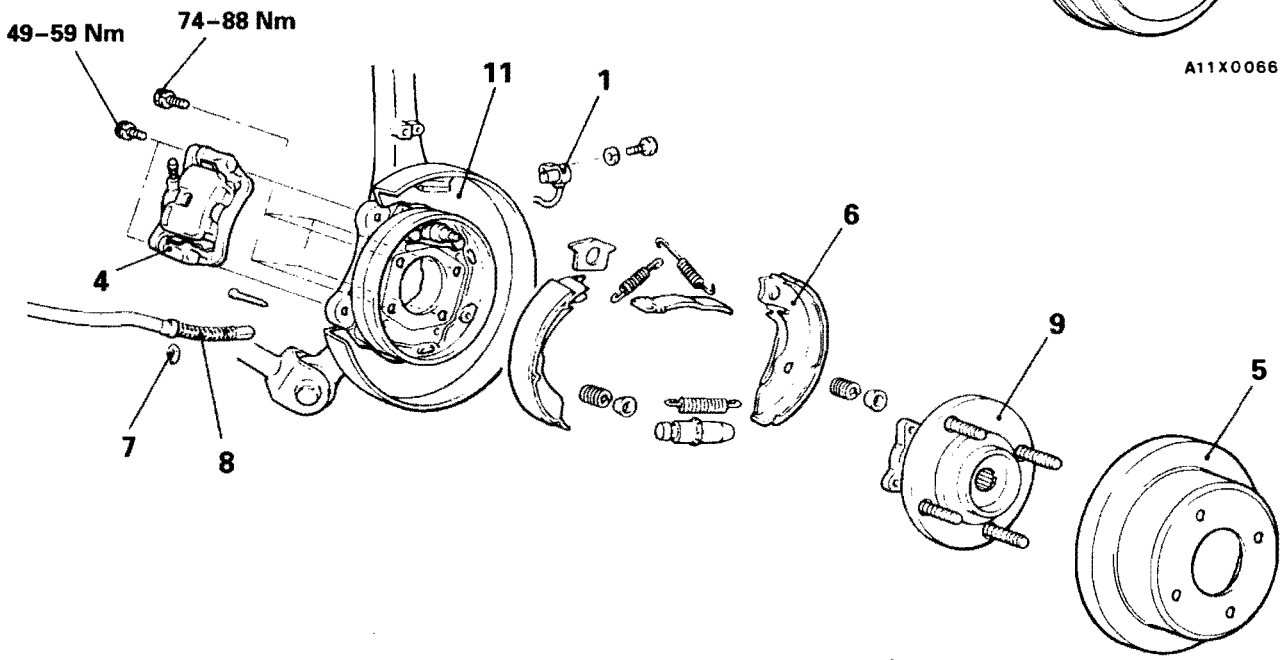
<Vehicles with drum brake>

Pre-removal operation
- Drive Shaft Removal (Refer to P.27-19.)

Post-installation operation
(1) Brake Line Bleeding <Vehicles with drum brake> (Refer to GROUP 35A – Service Adjustment Procedures.)
(2) Drive Shaft Installation (Refer to P.27-19.)



<Vehicles with disc brake>



A11X0066

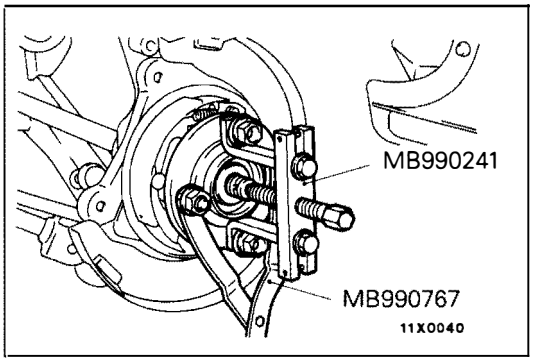
Removal steps

A11X0050

1. Rear speed sensor <Vehicles with A.B.S.> (Refer to GROUP 35C – Wheel Speed Sensor.)
2. Brake drum
3. Shoe and lever assembly
4. Caliper assembly (Refer to P.27-6.)
5. Brake disc
6. Shoe and lining assembly (Refer to GROUP 36 – Parking Brake <Drum in disc brake>.)
7. Clip
8. Parking brake cable
9. Rear hub assembly
10. Connection for brake pipe
11. Dust seal

〈A〉

Caution
The rear hub assembly should not be disassembled.

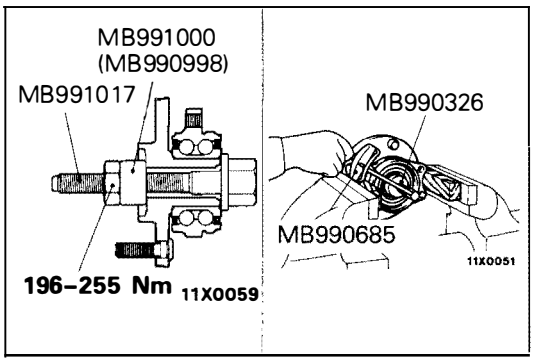


REMOVAL SERVICE POINTS E27ZG01BA

〈A〉 REAR HUB ASSEMBLY REMOVAL

INSPECTION E27ZG02BA

- Check the oil seal for crack or damage.
- Check the rear hub spline for wear or damage.

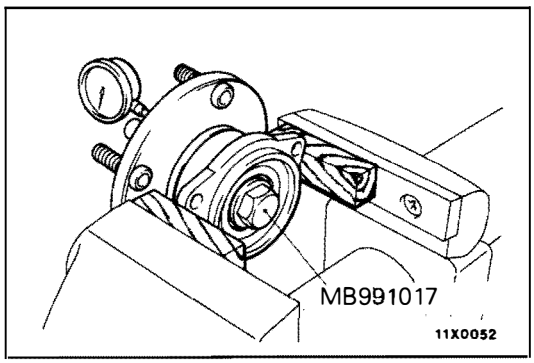


WHEEL BEARING STARTING TORQUE CHECK E27ZG02CA

(1) Tighten the special tool to the front hub assembly at the specified torque (196–255 Nm).
(2) Use the special tool to measure the hub rotation starting torque.

Limit: 1.1 Nm or less

(3) The hub rotation starting torque should be within the limit value range, and there should be no engagement or feeling of roughness.



HUB AXIAL PLAY CHECK E27ZG02DA

(1) Measure the play in the hub axial direction.

Limit: 0.05 mm

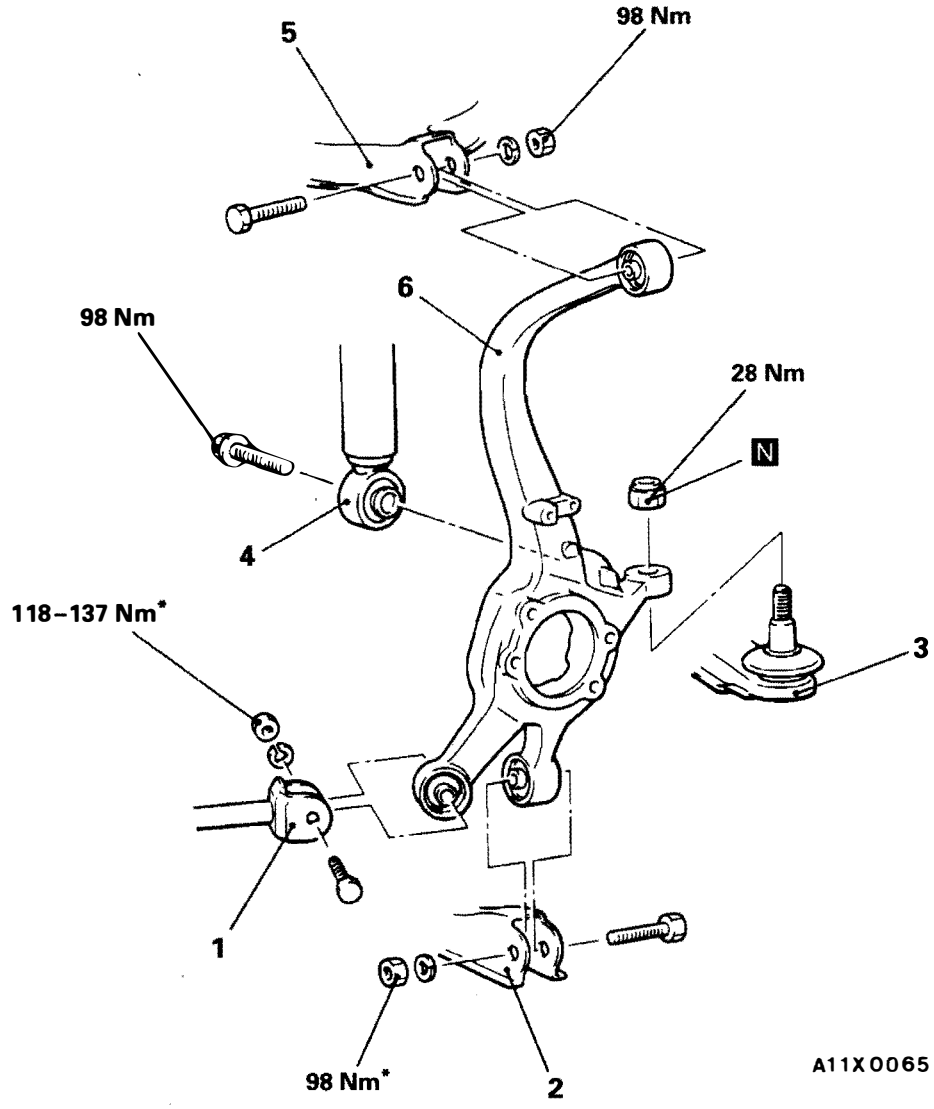
(2) If the limit value of hub axial play cannot be obtained within the specified tightening torque range of 196–255 Nm, replace the front hub assembly.

KNUCKLE

REMOVAL AND INSTALLATION

E27ZH00BB

Pre-removal and Post-installation Operation
(1) Rear Speed Sensor Removal and Installation <Vehicles with A.B.S.>
(2) Rear Hub Assembly Removal and Installation (Refer to P.27-16.)



Removal steps
1. Connection for trailing arm
2. Connection for lower arm
3. Connection for toe control arm (Refer to P.27-8.)
4. Connection for shock absorber
5. Connection for upper arm
6. Knuckle

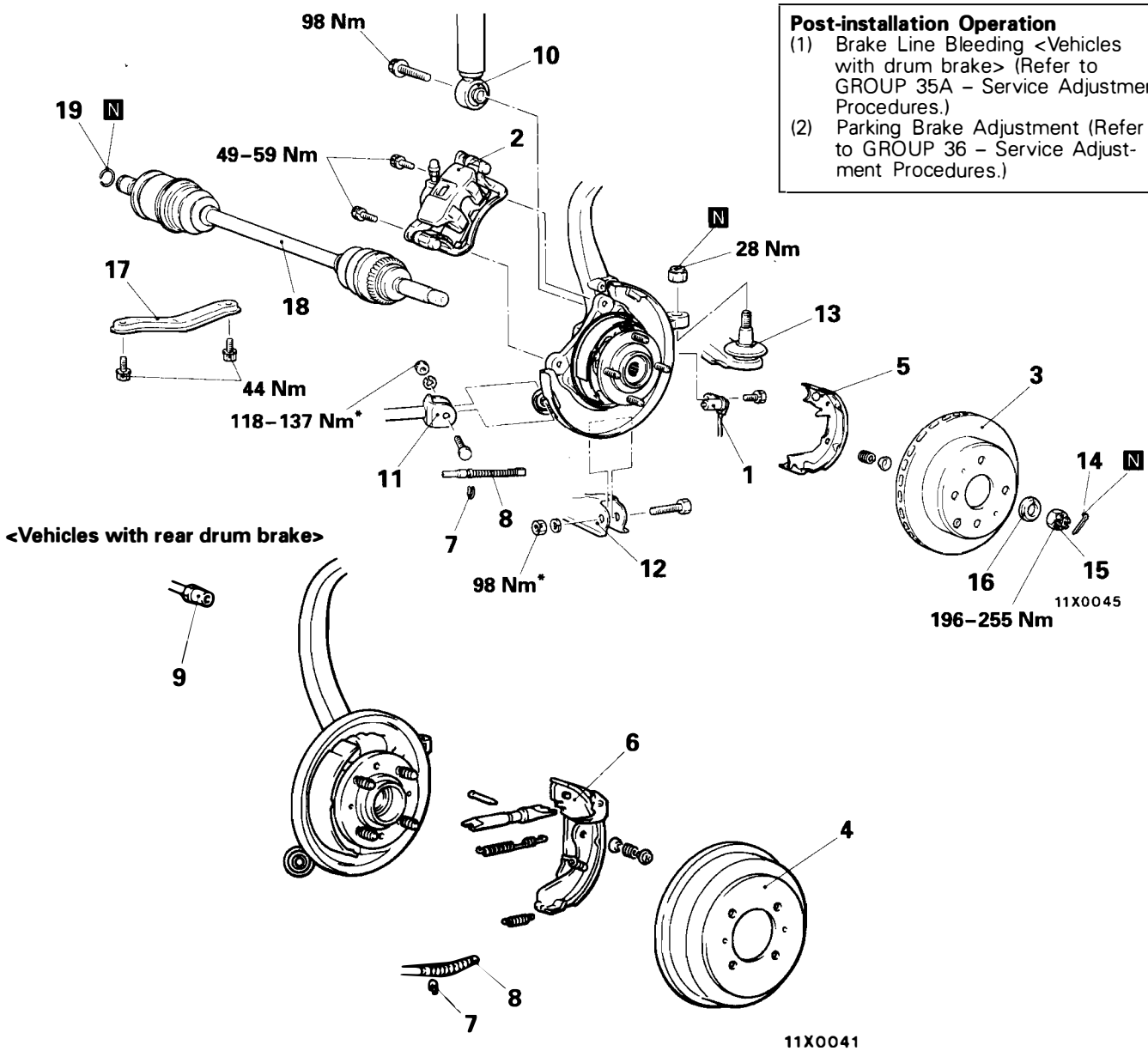
Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

DRIVE SHAFT

REMOVAL AND INSTALLATION

E27ZI00BB

Post-installation Operation
(1) Brake Line Bleeding <Vehicles with drum brake> (Refer to GROUP 35A – Service Adjustment Procedures.)
(2) Parking Brake Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)



Removal steps

1. Rear speed sensor <Vehicles with A.B.S.>
2. Caliper assembly (Refer to P.27-6.)
3. Brake disc
4. Brake drum
5. Shoe and lining assembly (Refer to GROUP 36 – Parking Brake <Drum in disc brake>.)
6. Shoe and lever assembly
7. Clip
8. Parking brake cable
9. Connection for brake pipe
10. Connection for shock absorber
11. Connection for trailing arm
12. Connection for lower arm
13. Connection for toe control arm (Refer to P.27-8.)
14. Split pin

◇A◇ ◆A◆ 15. Drive shaft nut

16. Washer
17. Differential mount support

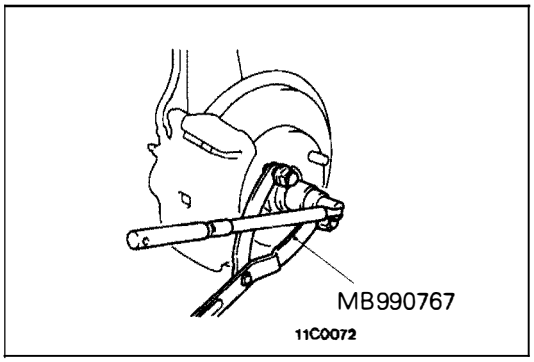
◇B◇ 18. Drive shaft

19. Circlip

Caution

1. For vehicles with ABS, be careful not to damage the drive shaft rotor.

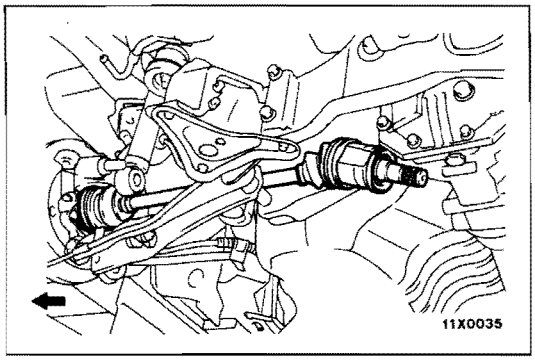
2. *: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.



REMOVAL SERVICE POINTS

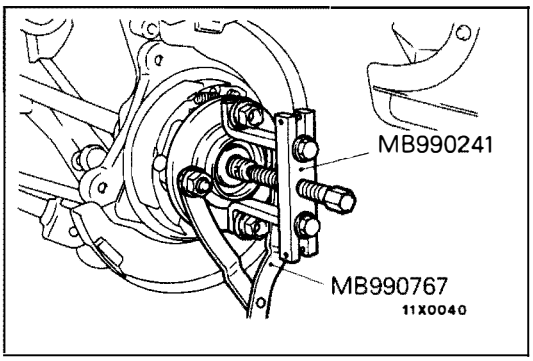
E27ZM01BA

〈A〉 DRIVE SHAFT NUT REMOVAL

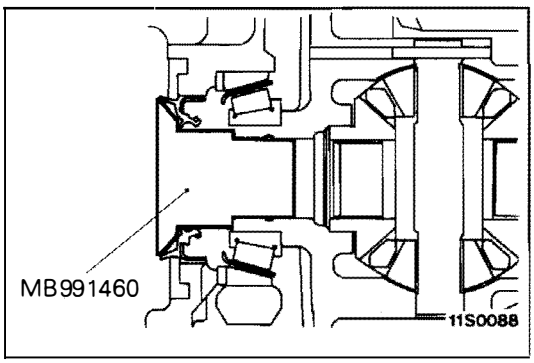


〈B〉 DRIVE SHAFT REMOVAL

(1) Push the lower part of the knuckle to the outside of the vehicle, and then separate the drive shaft from the differential carrier. At this time, use a tyre lever or similar to separate the drive shaft connection.



(2) Use the special tool to remove the drive shaft from the rear hub.

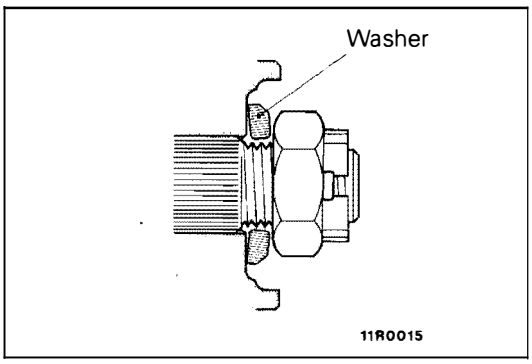


(3) Use the special tool provided as a cover to prevent the entry of foreign objects into the differential carrier.

INSPECTION

E27ZM02BA

- Check the drive shaft boots for damage or deterioration.
- Check the ball joints (B.J. and T.J.) for excessive play or check operation.
- Check the drive shaft spline for wear or damage.



INSTALLATION SERVICE POINTS E27ZI04BA

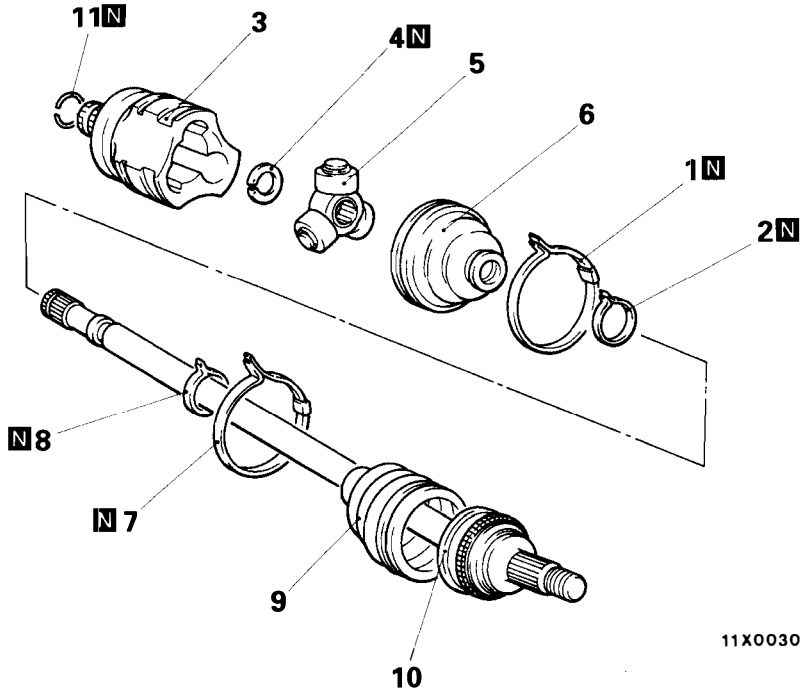
◆A◆ DRIVE SHAFT NUT INSTALLATION

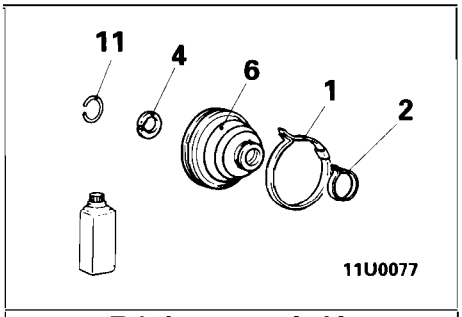
(1) Be sure to install the washer and drive shaft nut in the specified direction.
(2) Use the special tool (MB990767), tighten the drive shaft nut.
(3) If the position of the split pin holes does not match, tighten the nut up to 255 Nm in maximum.
(4) Install the split pin in the first matching holes and bend it securely.

Caution
Before securely tightening the drive shaft nuts, make sure there is no load on the wheel bearings.

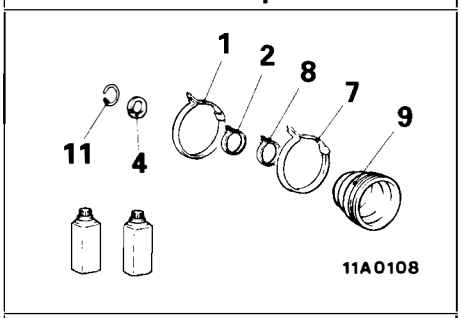
DISASSEMBLY AND REASSEMBLY

E27ZI05BA

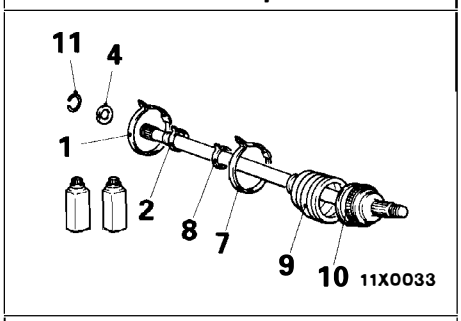




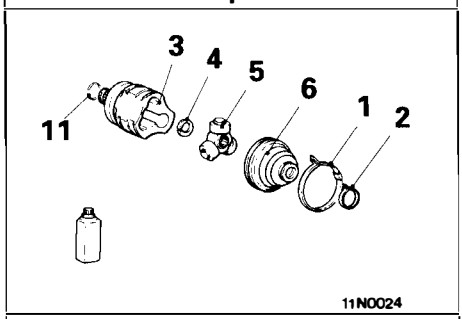
T.J. boot repair kit



B.J. boot repair kit



B.J. repair kit



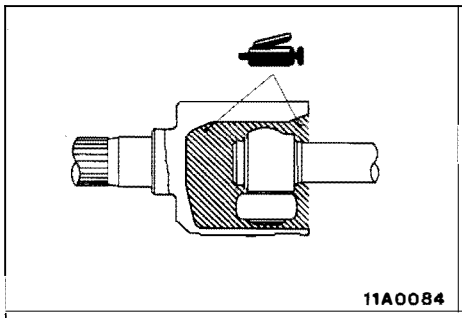
T.J. repair kit

Disassembly steps

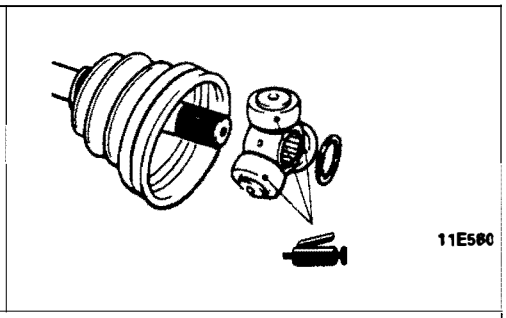
- ◗C◖ 1. T.J. boot band
- ◗C◖ 2. Boot band (small)
- ◗B◖ 3. T.J. case
- ◇A◇ 4. Snap ring
- ◇A◇ ◗B◖ 5. Spider assembly
- ◇B◇ ◗A◖ 6. T.J. boot
- 7. B.J. boot band
- 8. Boot band (small)
- ◇B◇ ◗A◖ 9. B.J. boot
- 10. B.J. assembly
- 11. Circlip

Caution
Do not disassemble the B.J. assembly.

LUBRICATION POINTS



11A0084

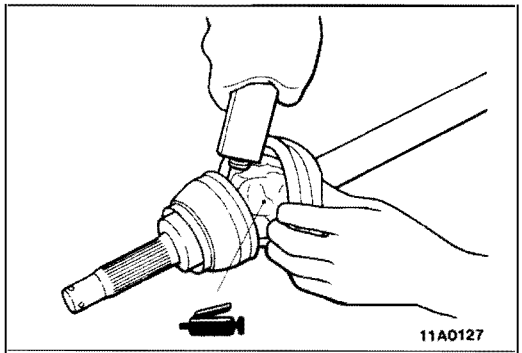


11E560

Grease: Repair kit grease

Amount of grease to be used: 95 g

Caution
A special type of grease is used on the joint. Be cautious to ensure that no other grease is allowed to come in contact with the joint.

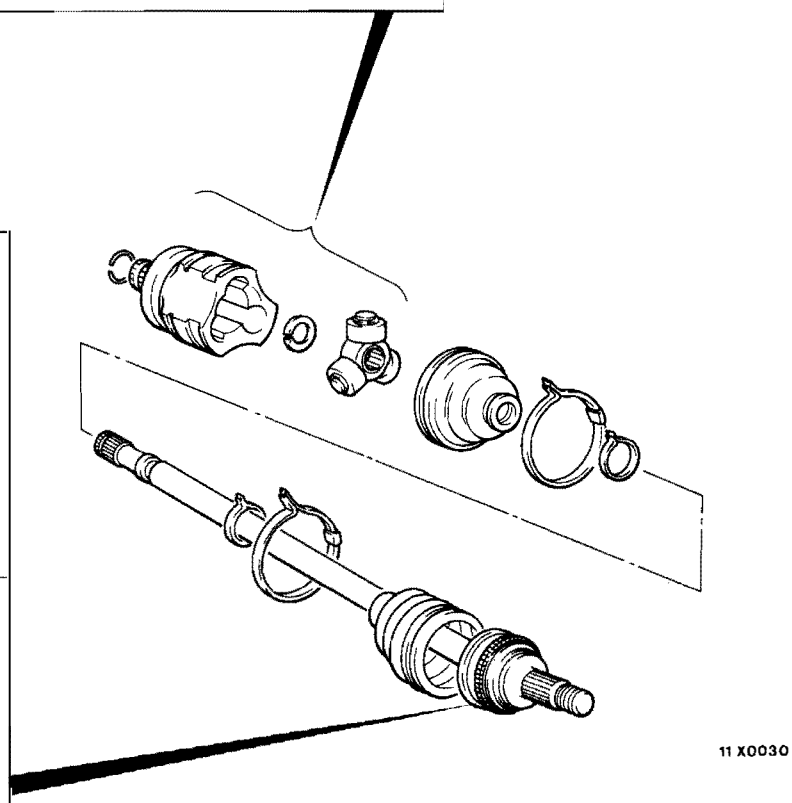


11A0127

Grease: Repair kit grease

Amount of grease to be used: 75 g

Caution
A special type of grease is used on the joint. Be cautious to ensure that no other grease is allowed to come in contact with the joint.

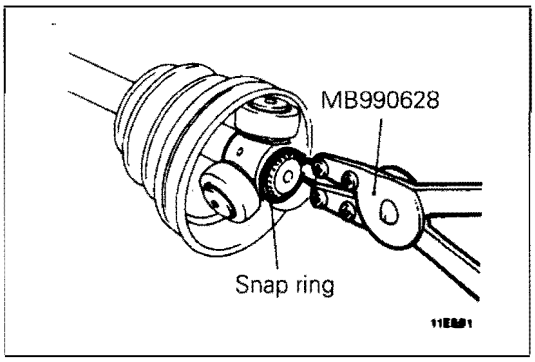


11 X0030

DISASSEMBLY SERVICE POINTS E27ZI06BA

◇A◇ SNAP RING/SPIDER ASSEMBLY REMOVAL

(1) Wipe out the grease in the T.J. case.

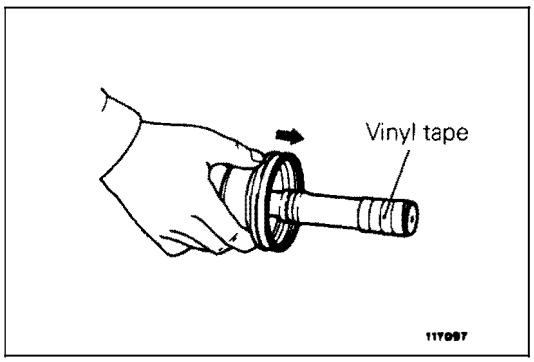


(2) Remove the snap ring with the special tool and then remove the spider assembly.

Caution
Do not disassemble the spider assembly.

(3) In case foreign objects such as water or dust is mixed in the grease, be sure to wash the spider assembly.

Caution
In case of having washed the spider assembly, when assembling it, make sure to push enough grease between the spider axle and the roller so that grease may not run out.



〈B〉 T.J. BOOT/B.J. BOOT REMOVAL

(1) Wipe the grease off of the spline portion.
(2) Remove the T.J. boot and B.J. boot.

NOTE
If the boots are reused, wrap vinyl tape around the drive shaft spline so that the boots are not damaged when they are removed.

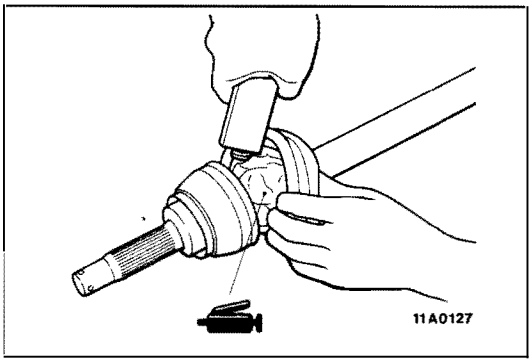
INSPECTION E27ZI07BA

- Check the drive shaft for damage, bending or corrosion.
- Check the drive shaft spline part for wear or damage.
- Check for entry of water and/or foreign material into B.J.
- Check the spider assembly for roller rotation, wear or corrosion.
- Check the groove inside T.J. case for wear or corrosion.
- Check the boots for deterioration, damage or cracking.

REASSEMBLY SERVICE POINTS E27ZI08BA

◆A◆ B.J. BOOT/T.J. BOOT INSTALLATION

(1) Wrap vinyl tape around the drive shaft spline.
(2) Insert the drive shaft in B.J. boot, T.J. boot in that sequence.

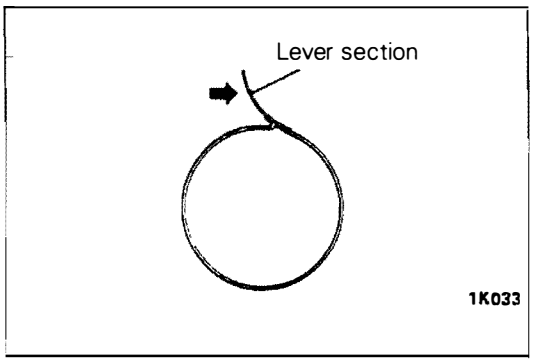


(3) Fill the inside of the B.J. and B.J. boot with the specified grease.

Specified grease: Repair kit grease 75 g

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

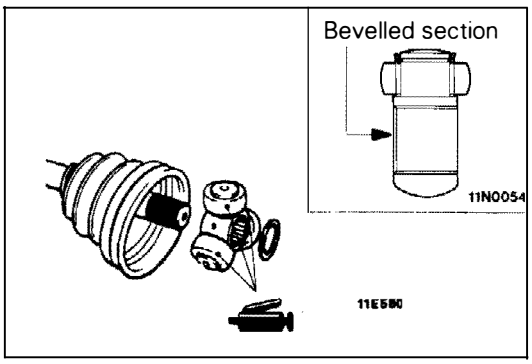
Caution
A special type of grease is used on the joint. Be cautious to ensure that no other grease is allowed to come in contact with the joint.



(4) Tighten the boot band.

Caution
1. **In order to fill the B.J. boot with a specified amount of air, installation should be made with the drive shaft having 0 degree bending angle.**
2. **Distinguish the difference between B.J. boot band and T.J. boot band by the identification numbers stamped on their lever sections, and be careful not to make an erroneous installation.**

Models / Items	Identification number
B.J. boot band	20 – 110# BJ 87
B.J. boot band (small)	20 – 83 # BJ 82
T.J. boot band	20 – 98 # BJ 82
T.J. boot band (small)	20 – 83# BJ 82



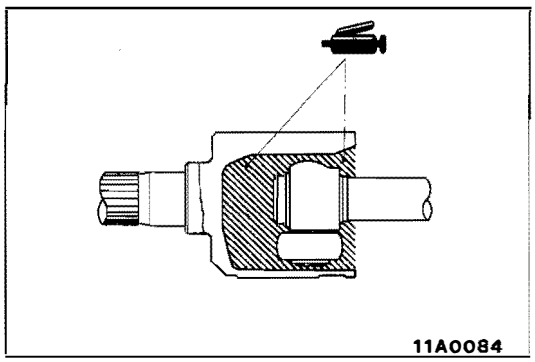
◆B◆ SPIDER ASSEMBLY/T.J. CASE INSTALLATION

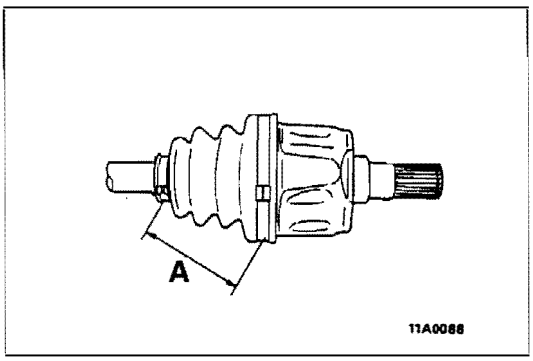
(1) Apply the specified grease furnished in the repair kit to the spider assembly between the spider axle and the roller.

Specified grease: Repair kit grease

Caution
1. **The drive shaft joint uses special grease. Do not mix old and new or different types of grease.**
2. **If the spider assembly has been cleaned, take special care to apply the specified grease.**

(2) Install the spider assembly to the shaft from the direction of the spline bevelled section.





(3) After applying specified grease to the T.J. case, insert the drive shaft and apply grease one more time.

Specified grease: Repair kit grease 95 g

NOTE
The grease in the repair kit should be divided in half for use, respectively, at the joint and inside the boot.

Caution
The drive shaft joint use special grease. Do not mix old and new or different types of grease.

◆C◆ BOOT BAND (SMALL)/T.J. BOOT BAND INSTALLATION

Set the T.J. boot bands at the specified distance in order to adjust the amount of air inside the T.J. boot, and then tighten the T.J. boot bands securely.

Standard value (A): 79 ± 3 mm

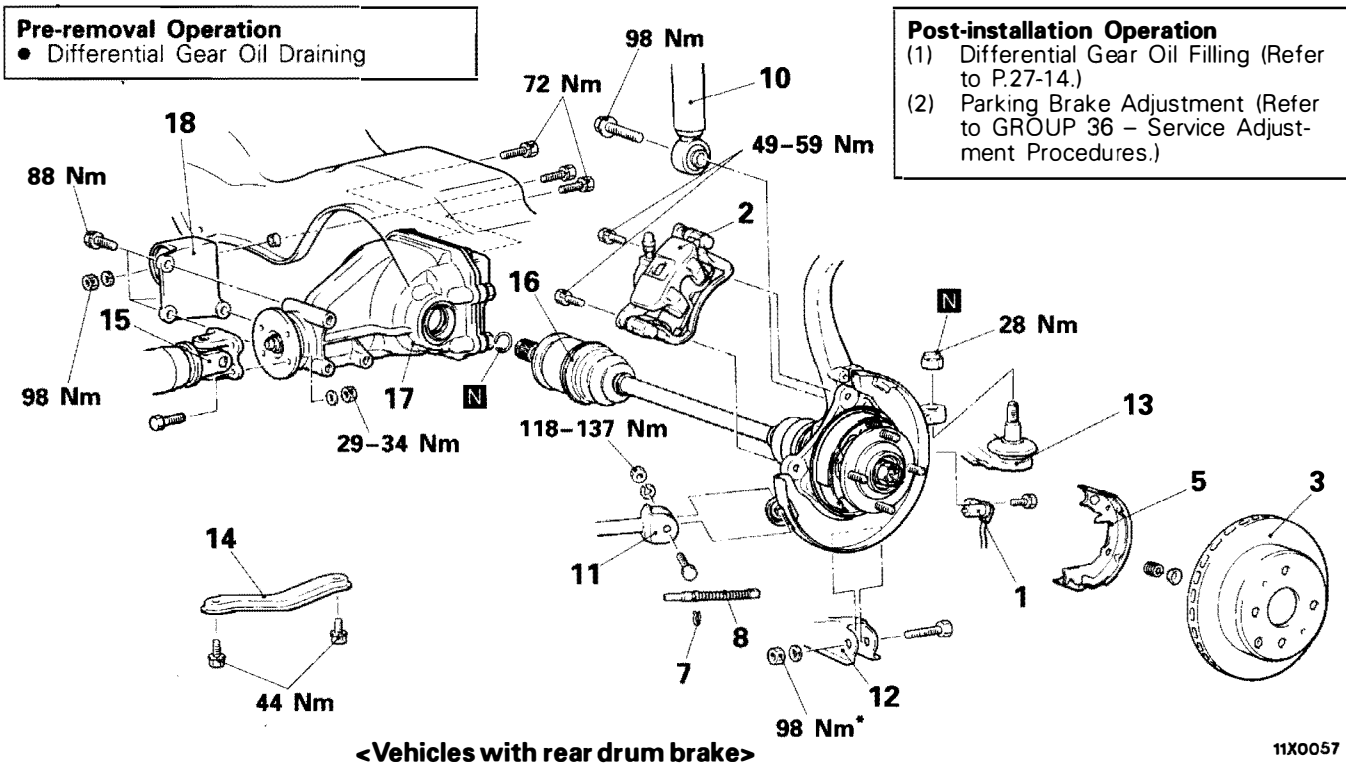
DIFFERENTIAL CARRIER

REMOVAL AND INSTALLATION

E27ZJ00BB

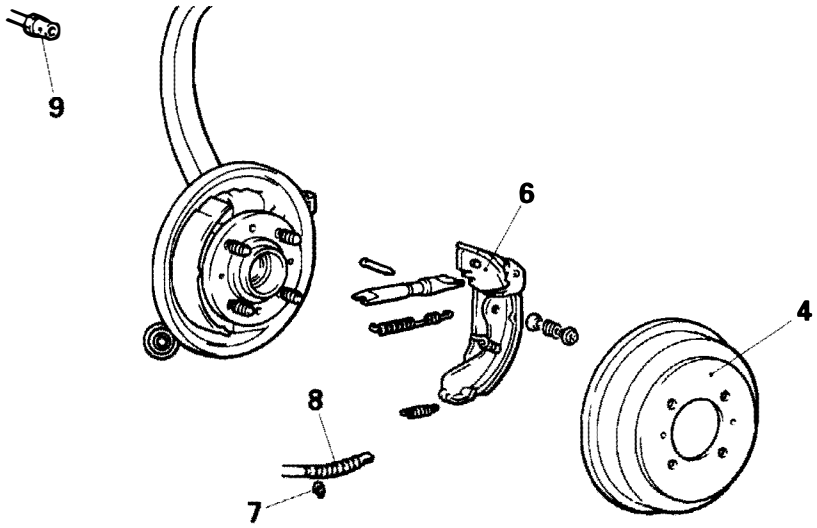
Pre-removal Operation
- Differential Gear Oil Draining

Post-installation Operation
(1) Differential Gear Oil Filling (Refer to P.27-14.)
(2) Parking Brake Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)



11X0057

<Vehicles with rear drum brake>

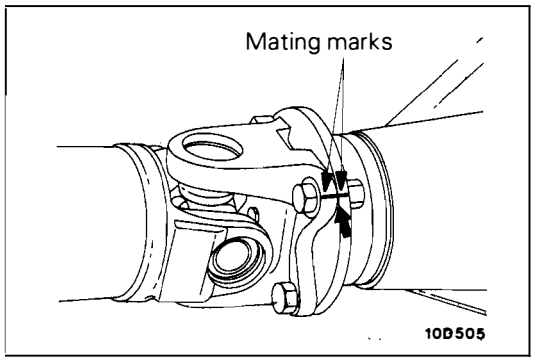


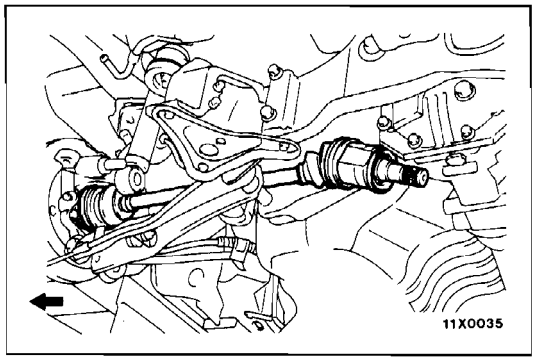
11X0041

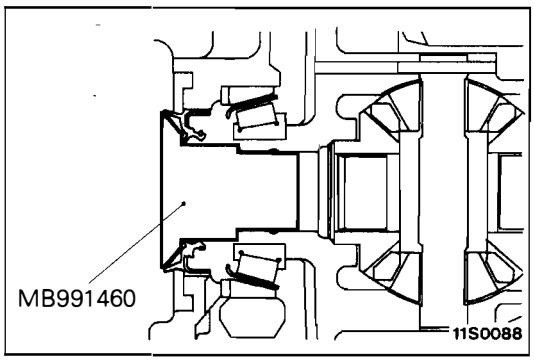
Removal steps

1. Rear speed sensor <Vehicles with A.B.S.>
2. Caliper assembly (Refer to P.27-6.)
3. Brake disc
4. Brake drum
5. Shoe and lining assembly (Refer to GROUP 36 – Parking Brake <Drum in disc brake>.)
6. Shoe and lever assembly
7. Clip
8. Parking brake cable
9. Connection for brake pipe
10. Connection for shock absorber
11. Connection for trailing arm
12. Connection for lower arm
13. Connection for toe control arm (Refer to P.27-8.)
14. Differential mount support
15. Connection for propeller shaft ◇A◇ ▶B◀
16. Connection for drive shaft ◇B◇ ▶A◀
17. Differential carrier ◇C◇
18. Differential mount bracket assembly

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**







REMOVAL SERVICE POINTS E27ZJ01BA

〈A〉 PROPELLER SHAFT REMOVAL

(1) Make mating marks on the differential companion flange and flange yoke, and then separate the differential carrier assembly and the propeller shaft.
(2) Suspend the propeller shaft from the body with wire, etc, so that there are no sharp bends.

Caution
Be careful that there are no sharp bends in the propeller shaft, as they may damage the Löbro joint.

〈B〉 DRIVE SHAFT REMOVAL

(1) Push the lower part of the knuckle to the outside of the vehicle, and then separate the drive shaft from the differential carrier. At this time, use a tyre lever or similar to separate the drive shaft connection.
(2) Support the separated drive shaft with wire or similar so as not to damage the joint.

(3) Use the special tool provided as a cover to prevent the entry of foreign objects into the differential carrier.

〈C〉 DIFFERENTIAL CARRIER REMOVAL

Support the differential carrier with a jack. Then remove the connecting bolt between it and the rear crossmember and remove the differential carrier.

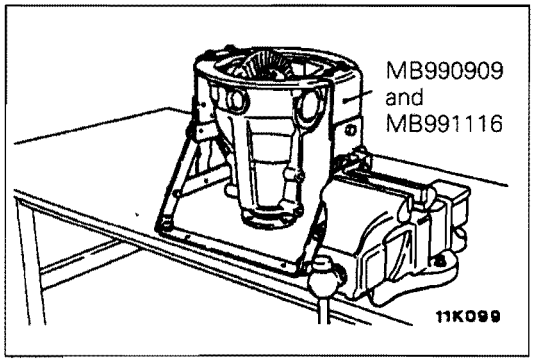
INSTALLATION SERVICE POINTS E27ZJ04BA

▶A◀ DRIVE SHAFT INSTALLATION

Caution
Do not damage the differential carrier oil seal.

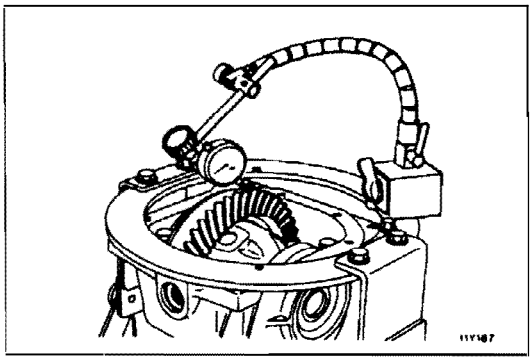
▶B◀ PROPELLER SHAFT INSTALLATION

Install the propeller shaft so that the mating marks on the differential companion flange and the flange yoke are aligned.



INSPECTION BEFORE DISASSEMBLY E27ZJ10BA

Hold the special tool in a vice, and attach the differential carrier to the special tool.



FINAL DRIVE GEAR BACKLASH E27ZJ10CA

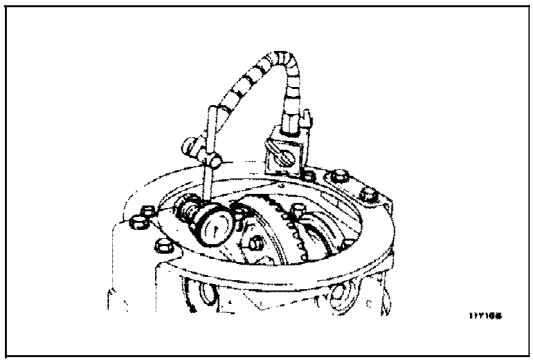
(1) With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

NOTE
Measure at four points or more on the circumference of the drive gear.

Standard value: 0.11 – 0.16 mm

(2) If the backlash is outside the standard value, adjust using the side bearing spacer.

NOTE
After adjustment, inspect the contact of the final drive gear.



DRIVE GEAR RUNOUT E27ZJ10DA

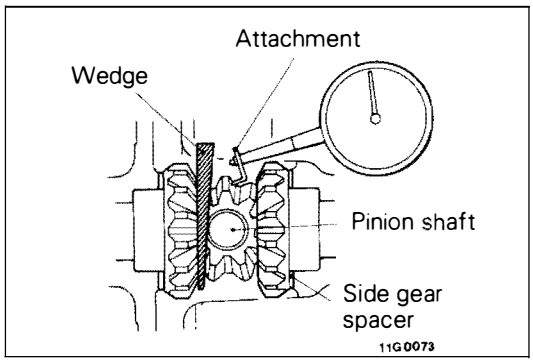
(1) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

Limit: 0.05 mm

(2) If the runout exceeds the limit value, check that there is no foreign material between the reverse side of the drive gear and the differential case, or that there is no looseness in the drive gear mounting bolt.

(3) If step (2) is normal, change the assembly position of the drive gear and differential case, and then take another measurement.

NOTE
If adjustment is impossible, replace the differential case or the drive gear and drive pinion as a set.



DIFFERENTIAL GEAR BACKLASH E27ZJ10EA

(1) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

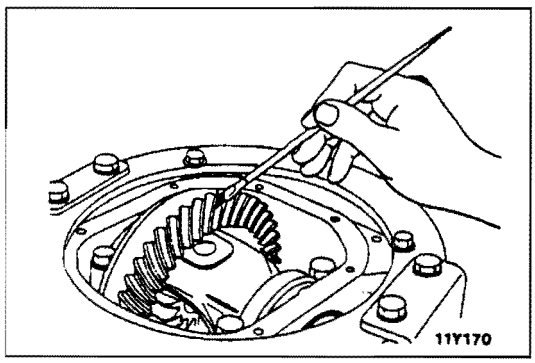
NOTE
Take the measurements at two places (4 places for LSD) on the pinion gear.

Standard value: 0 – 0.076 mm

Limit: 0.2 mm

(2) If the backlash exceeds the limit value, adjust using the side bearing spacer.

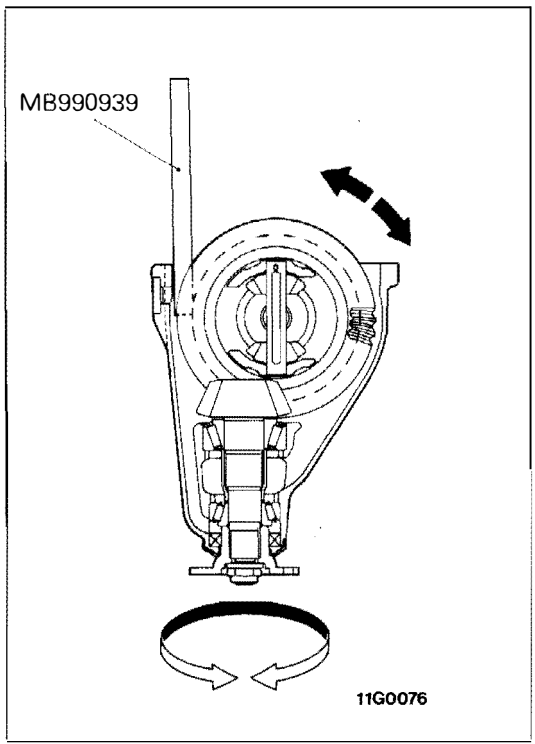
NOTE
If adjustment is impossible, replace the side gear and pinion gear as a set.



FINAL DRIVE GEAR TOOTH CONTACT E27ZJ10FA

Check the final drive gear tooth contact by following the steps below.

(1) Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.



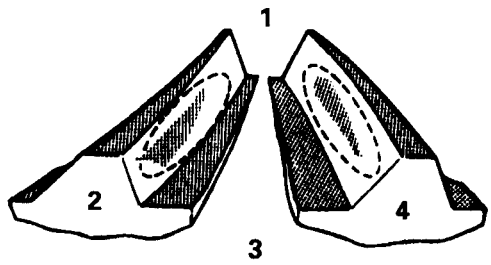
(2) Insert a special tool between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear, so that the revolution torque (approximately 2.5 – 3.0 Nm) is applied to the drive pinion.

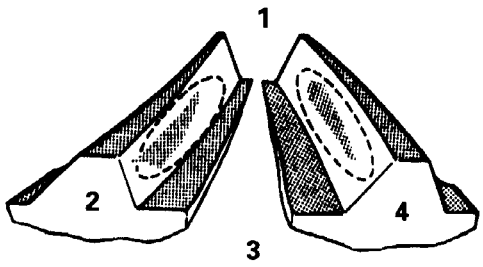
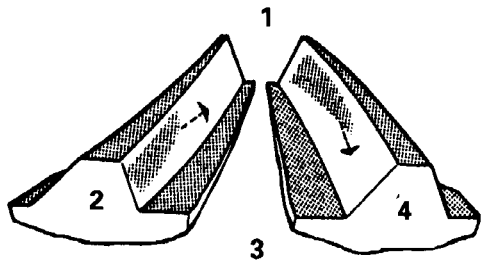
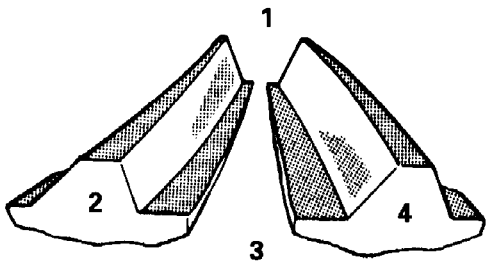
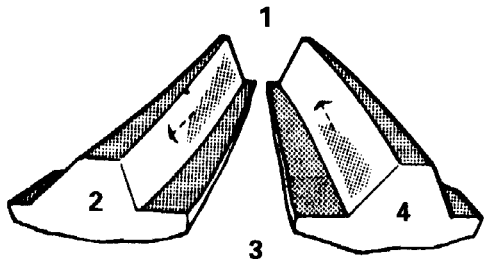
Caution
If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.

(3) Check the tooth contact condition of the drive gear and drive pinion.

Standard tooth contact pattern

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)



Problem	Solution
Tooth contact pattern resulting from excessive pinion height	
	
The drive pinion is positioned too far from the centre of the drive gear.	Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the centre of the drive gear. Also, for backlash adjustment, position the drive gear farther from the drive pinion.
Tooth contact pattern resulting from insufficient pinion height	
	
The drive pinion is positioned too close to the centre of the drive gear.	Decrease the thickness of the pinion height adjusting shim, and position the drive pinion farther from the centre of the drive gear. Also, for backlash adjustment, position the drive gear closer to the drive pinion.

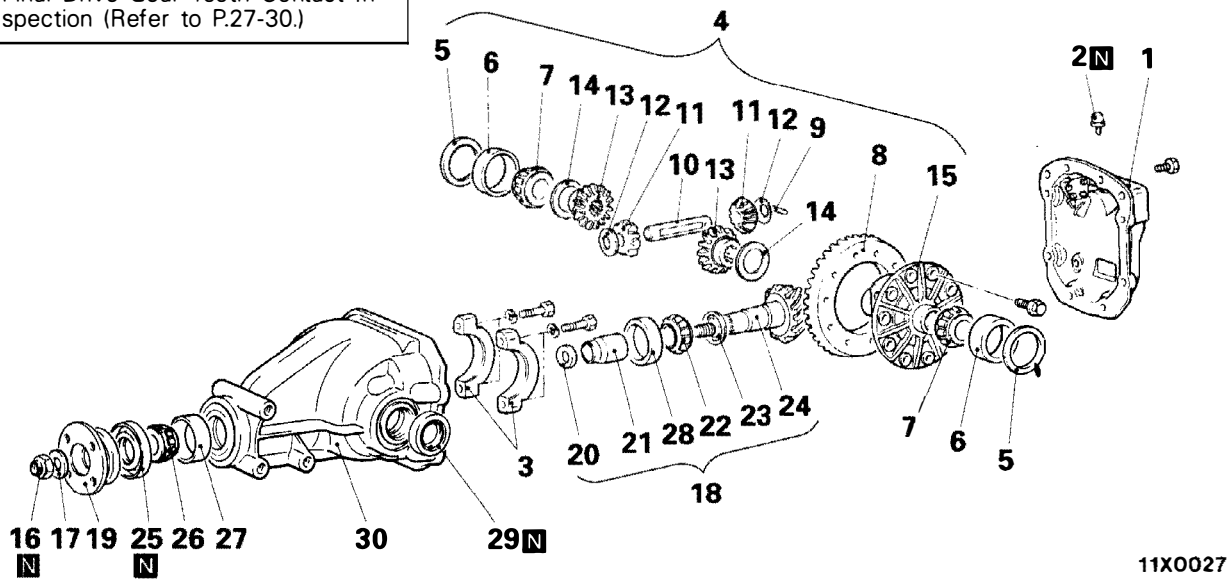
11S642

NOTE
(1) Tooth contact pattern is a method for judging the result of the adjustment of drive pinion height and final drive gear backlash. The adjustment of drive pinion height and final drive gear backlash should be repeated until tooth contact patterns bear a similarity to the standard tooth contact pattern.
(2) When adjustment is not able to obtain a correct pattern, it may be judged that the drive gear and drive pinion have exceed their usage limits and both gears should be replaced as a set.

DISASSEMBLY

E27ZJ11BA

Pre-disassembly Inspections
(1) Final Drive Gear Backlash Inspection (Refer to p.27-29.)
(2) Drive Gear Run-out Inspection (Refer to P.27-29.)
(3) Differential Gear Backlash Inspection (Refer to P.27-30.)
(4) Final Drive Gear Tooth Contact Inspection (Refer to P.27-30.)



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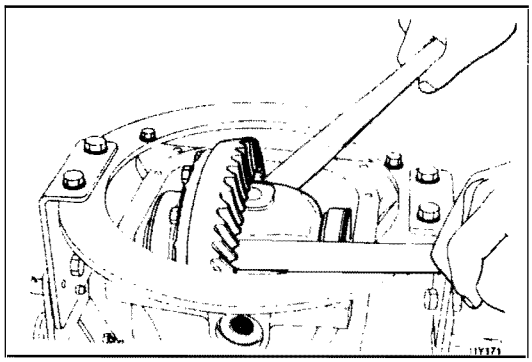
Disassembly steps

1. Differential cover assembly
2. Vent plug
3. Bearing cap
◇A◇ 4. Differential case assembly
5. Side bearing spacer
6. Side bearing outer race
◇B◇ 7. Side bearing inner race
◇C◇ 8. Drive gear
◇D◇ 9. Lock pin
10. Pinion shaft
11. Pinion gear
12. Pinion washer
13. Side gear
14. Side gear spacer
15. Differential case
◇E◇ 16. Self-locking nut
17. Washer
◇F◇ 18. Drive pinion assembly
19. Companion flange
20. Drive pinion front shim (for preload adjustment)
21. Drive pinion spacer
◇G◇ 22. Drive pinion rear bearing inner race
23. Drive pinion rear shim (for pinion height adjustment)
24. Drive pinion
◇H◇ 25. Oil seal
◇H◇ 26. Drive pinion front bearing inner race
◇H◇ 27. Drive pinion front bearing outer race
◇I◇ 28. Drive pinion rear bearing outer race
29. Oil seal
30. Gear carrier

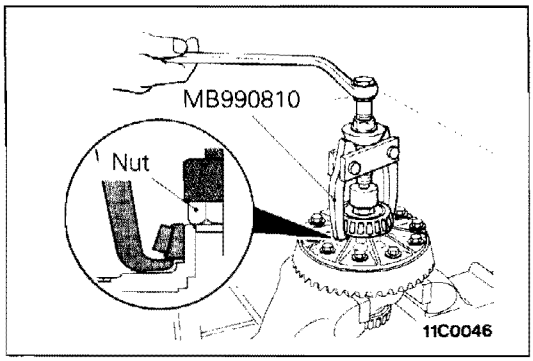


DISASSEMBLY SERVICE POINTS E27ZJ12BA

〈A〉 DIFFERENTIAL CASE ASSEMBLY REMOVAL

Caution
When removing the differential case assembly, the removal should be accomplished slowly and carefully and caution paid to ensure that the side bearing outer race is not dropped.

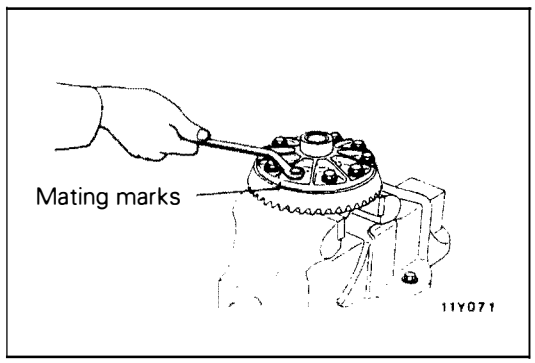
NOTE
Keep the right and left side bearings separate, so that they do not become mixed at the time of reassembly.



〈B〉 SIDE BEARING INNER RACE REMOVAL

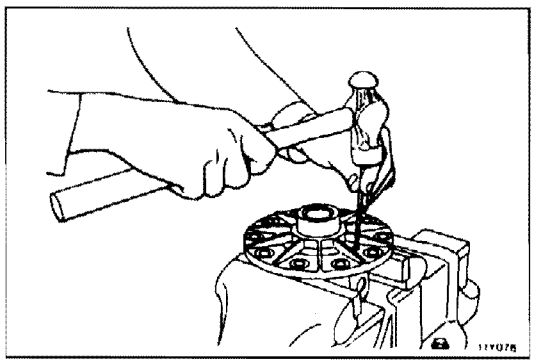
Place the nut on top of the differential case, and then use the special tool to remove the side bearing inner race.

NOTE
Attach the prongs of the special tool to the inner race of the side bearing through the openings in the differential case.

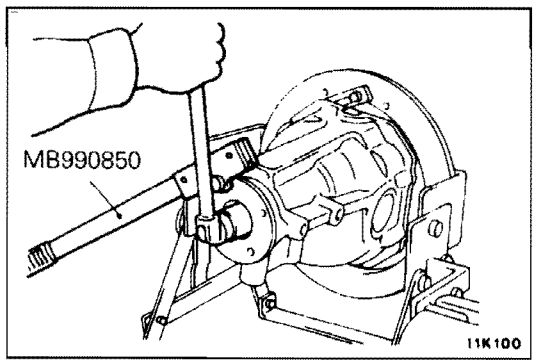


〈C〉 DRIVE GEAR REMOVAL

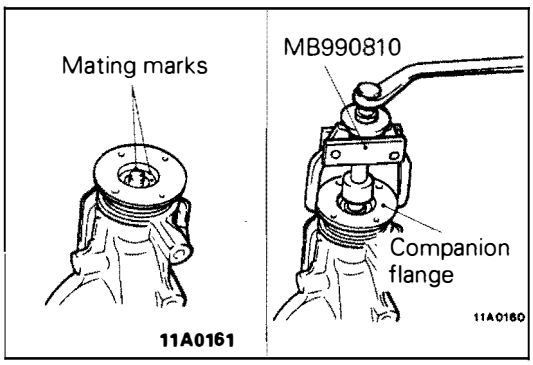
(1) Make the mating marks to the differential case and the drive gear.
(2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.



〈D〉 LOCK PIN REMOVAL



〈E〉 SELF-LOCKING NUT REMOVAL

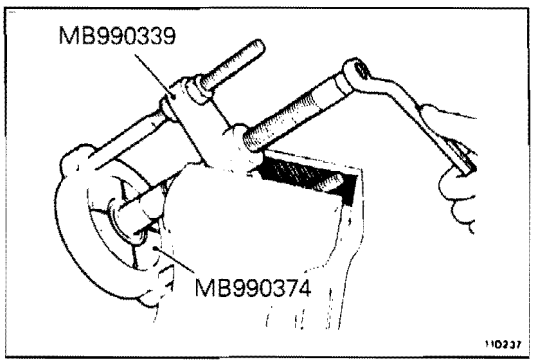


◇F◇ DRIVE PINION ASSEMBLY REMOVAL

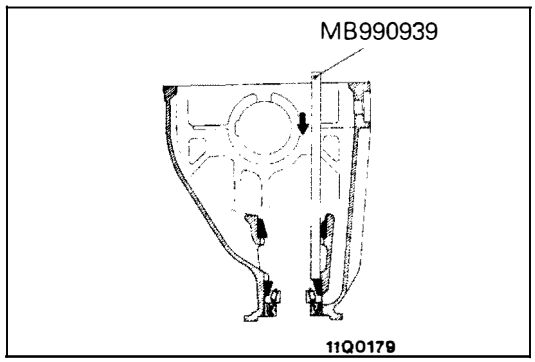
(1) Make the mating marks to the drive pinion and companion flange.

Caution
Mating marks should not be made to the contact surfaces of companion flange and propeller shaft.

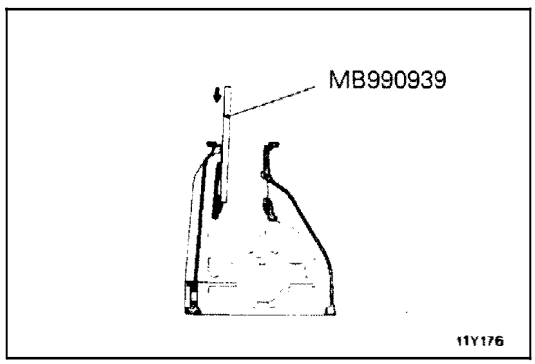
(2) Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.



◇G◇ DRIVE PINION REAR BEARING INNER RACE REMOVAL



◇H◇ OIL SEAL/DRIVE PINION FRONT BEARING INNER RACE/DRIVE PINION FRONT BEARING OUTER RACE REMOVAL



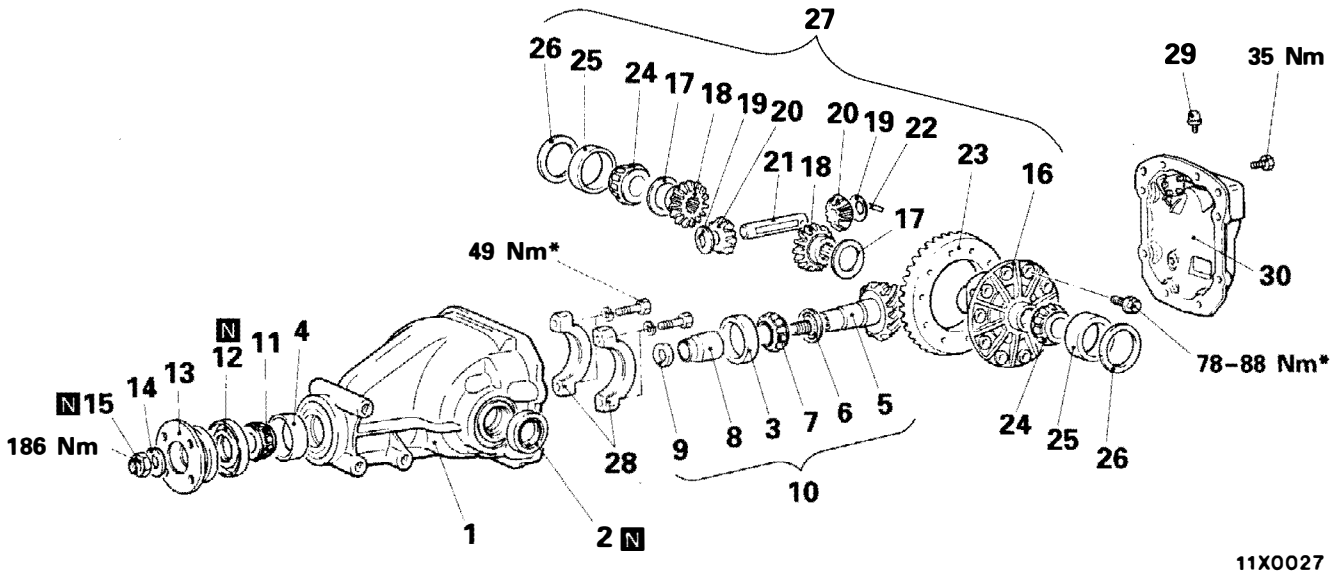
◇I◇ DRIVE PINION REAR BEARING OUTER RACE REMOVAL

INSPECTION E27ZJ13BA

- Check the companion flange for wear or damage.
- 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.

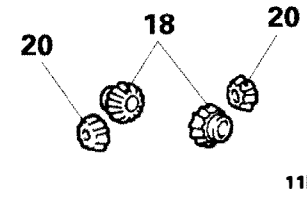
REASSEMBLY

E27ZJ14BA

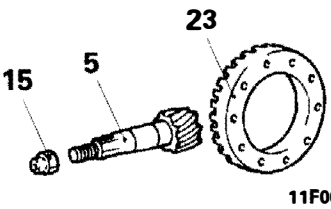


Reassembly steps

1. Gear carrier
◆A◆ 2. Oil seal
◆B◆ 3. Drive pinion rear bearing outer race
◆B◆ 4. Drive pinion front bearing outer race
◆C◆ ● Pinion height adjustment
5. Drive pinion
6. Drive pinion rear shim (for pinion height adjustment)
7. Drive pinion rear bearing inner race
8. Drive pinion spacer
◆D◆ ● Drive pinion preload adjustment
9. Drive pinion front shim (for preload adjustment)
10. Drive pinion assembly
11. Drive pinion front bearing inner race
12. Oil seal
13. Companion flange
14. Washer
15. Self-locking nut
16. Differential case
◆E◆ ● Differential gear backlash adjustment
17. Side gear spacer
18. Side gear
19. Pinion washer
20. Pinion gear
21. Pinion shaft
◆F◆ 22. Lock pin
◆G◆ 23. Drive gear
◆H◆ 24. Side bearing inner race
25. Side bearing outer race
◆I◆ ● Final drive gear backlash adjustment
26. Side bearing spacer
27. Differential case assembly
28. Bearing cap
29. Vent plug
30. Differential cover assembly



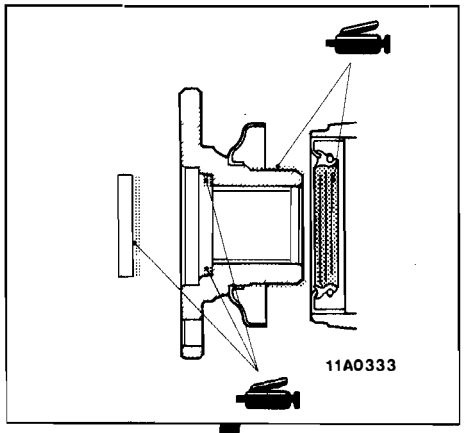
Differential gear set

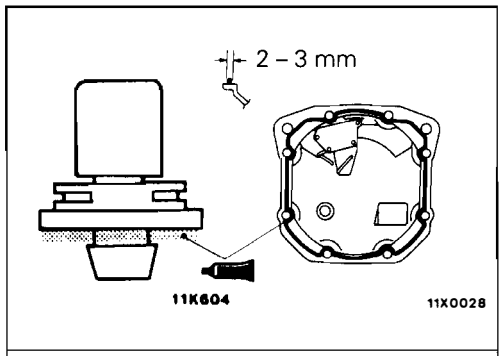


Final drive gear set

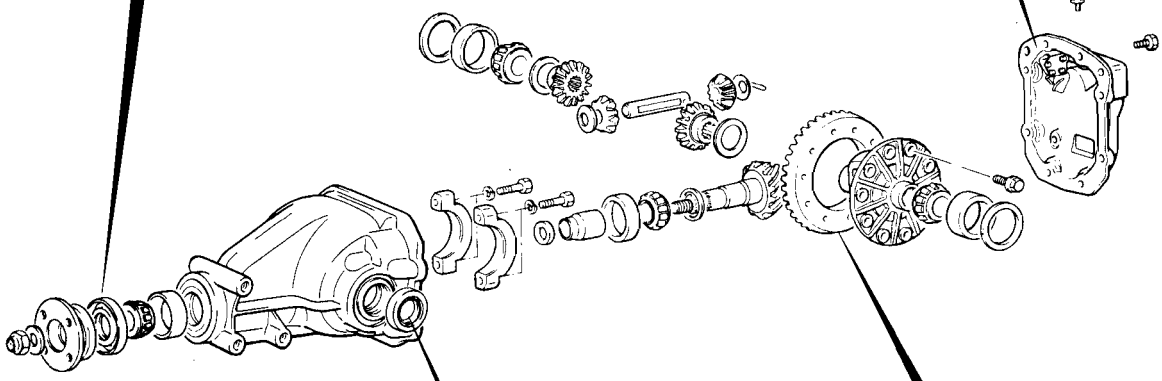
NOTE
*: Tightening torque with gear oil applied

LUBRICATION AND ADHESION POINTS

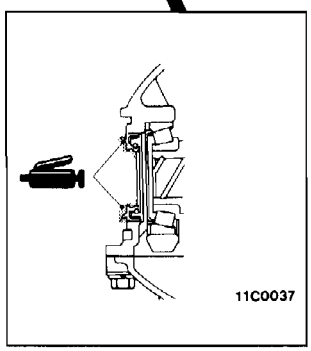


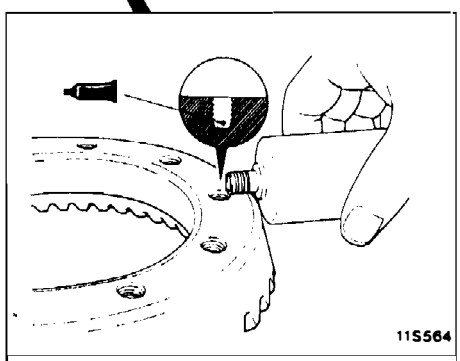


Sealant: 3M ATD Part No. 8663 or equivalent

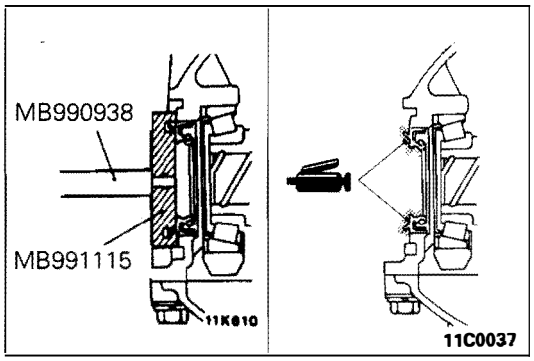


11X0027





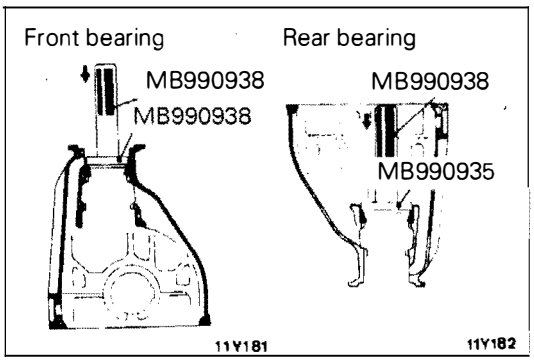
Adhesive: 3M Stud Locking Part No. 4170 or equivalent



REASSEMBLY SERVICE POINTS E27ZJ15BA

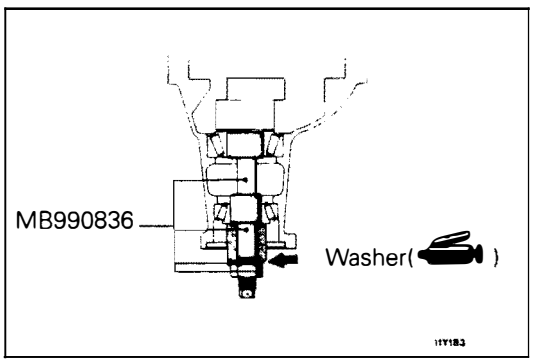
◆A◆ OIL SEAL PRESS FITTING

(1) With the special tool, press fit the oil seal until it is flush with the end of the gear carrier.
(2) Apply multipurpose grease to the oil seal lip.



◆B◆ DRIVE PINION REAR BEARING OUTER RACE/DRIVE PINION FRONT BEARING OUTER RACE INSTALLATION

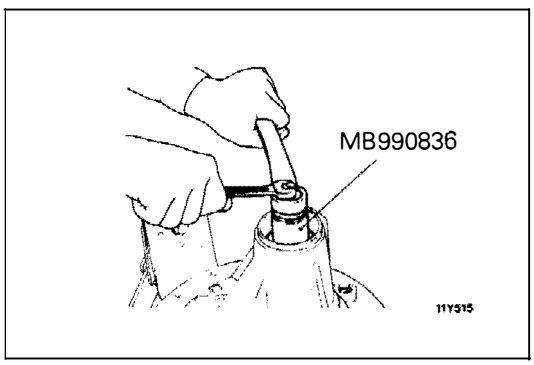
Caution
Be careful not to press in the outer race at an angle.



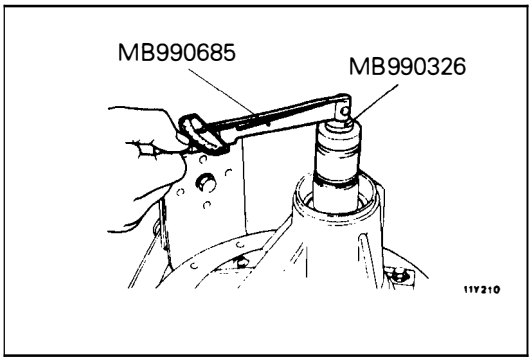
◆C◆ PINION HEIGHT ADJUSTMENT

Adjust the drive pinion height by the following procedures:
(1) Install special tools and drive pinion front and rear bearing inner races on the gear carrier in the sequence shown in the illustration.

NOTE
Apply a thin coat of the multipurpose grease to the mating face of the washer of the special tool.



(2) Tighten the nut of the special tool until the standard value of drive pinion turning torque is obtained.

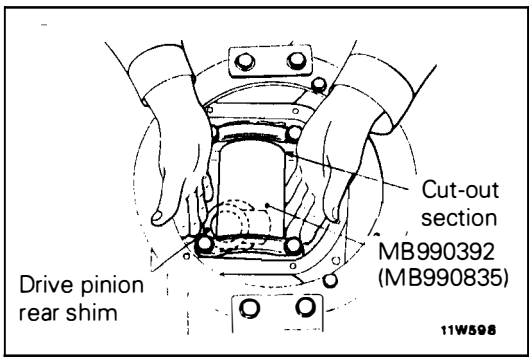


(3) Measure the drive pinion turning torque (without the oil seal) by using the special tools.

Standard value:

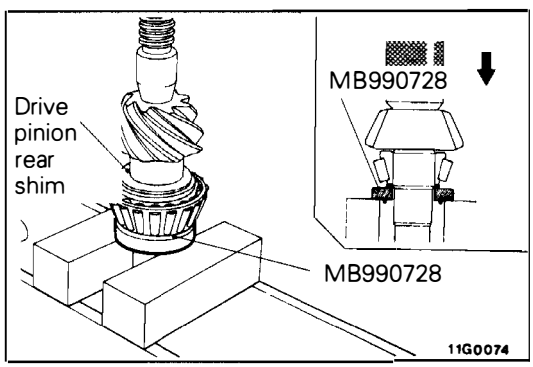
Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm
New	None (with rust-prevention oil)	0.9 – 1.2
New/reused	Gear oil application	0.4 – 0.5

NOTE
1. Gradually tighten the nut of the special tool while checking the drive pinion turning torque
2. Because the special tool cannot be turned one turn, turn it several times within the range that it can be turned; then, after fitting to the bearing, measure the rotation torque.

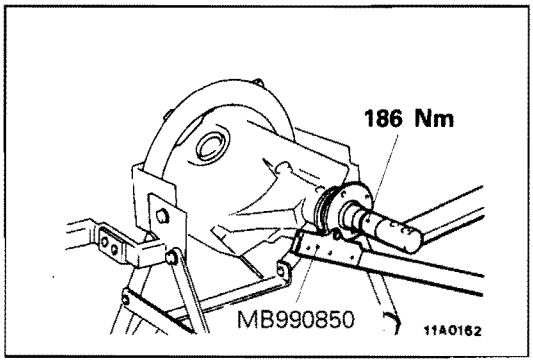


(4) Position the special tool in the side bearing seat of the gear carrier, and then select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

NOTE
Clean the side bearing seat thoroughly. When positioning the special tool, be sure that the cut-out sections of the special tool are in the position shown in the illustration, and also confirm that the special tool is in close contact with the side bearing seat.
When selecting the drive pinion rear shims, keep the number of shims to a minimum.



Fit the selected drive pinion rear shim(s) to the drive pinion, and press-fit the drive pinion rear bearing inner race by using the special tool.



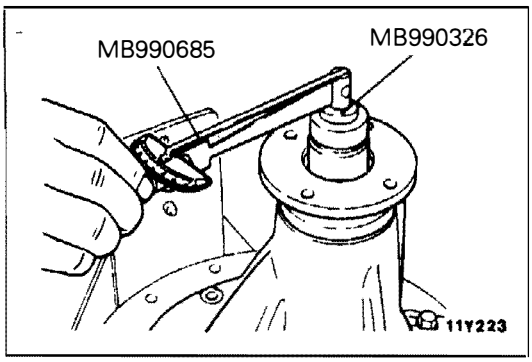
◆D◆ DRIVE PINION PRELOAD ADJUSTMENT

Adjust the drive pinion turning torque by using the following procedures:

(1) Fit the drive pinion front shim(s) between the drive pinion spacer and the drive pinion front bearing inner race.

(2) Tighten the companion flange to the specified torque by using the special tools.

NOTE
Do not install the oil seal.



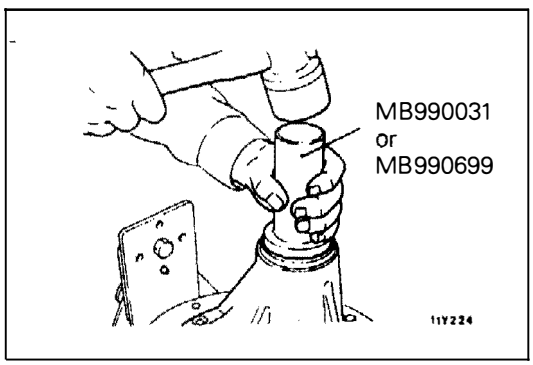
(3) Measure the drive pinion turning torque (without the oil seal) by using the special tools.

Standard value:

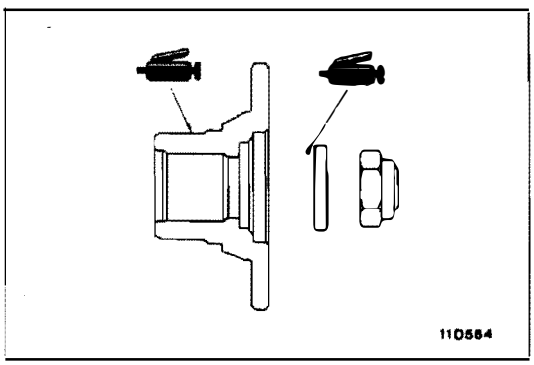
Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm
New	None (with rust-prevention oil)	0.9 – 1.2
New/reused	Gear oil application	0.4 – 0.5

(4) If the drive pinion turning torque is not within the range of the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

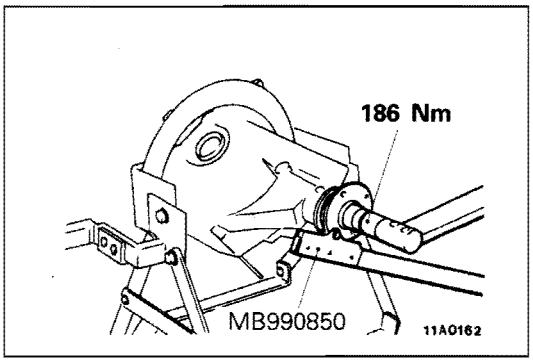
NOTE
When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.



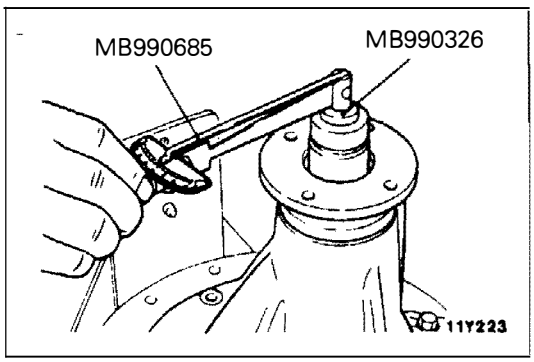
(5) Remove the companion flange and drive pinion once again. Drive the oil seal into the gear carrier front lip by using the special tool.
Apply multipurpose grease to the oil seal lip.



(6) Apply a thin coat of multipurpose grease to the companion flange contacting surface of the washer and oil seal contacting surface before installing drive pinion assembly.



(7) Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.

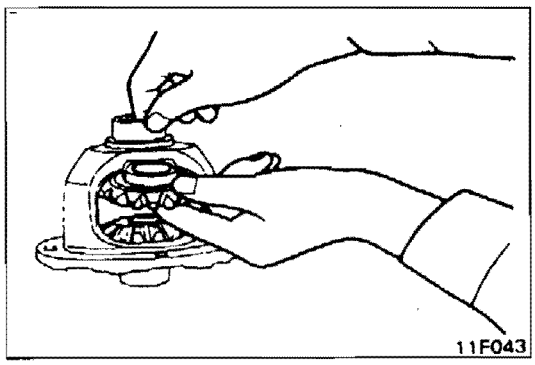


(8) Measure the drive pinion turning torque (with oil seal) by using the special tools to verify that the drive pinion turning torque complies with the standard value.

Standard value:

Bearing classification	Bearing lubrication	Rotation torque (starting friction torque) Nm
New	None (with rust-prevention oil)	1.0 – 1.3
New/reused	Gear oil application	0.5 – 0.6

If there is a deviation from the standard value, check whether or not there is incorrect tightening torque of the companion flange tightening self-lock nut, or incorrect fitting of the oil seal.



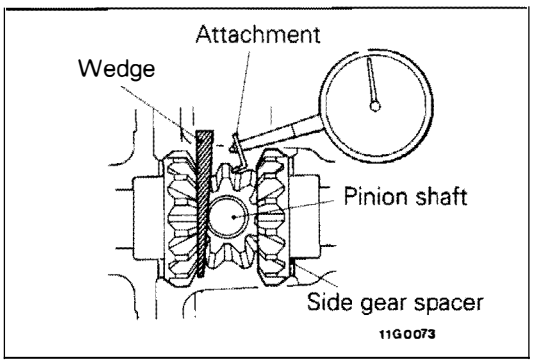
◆E◆ DIFFERENTIAL GEAR BACKLASH ADJUSTMENT

Adjust the differential gear backlash by the following procedures:

(1) Assemble the side gears, side gear spacers, pinion gears, and pinion washers into the differential case.

(2) Temporarily install the pinion shaft.

NOTE
Do not drive in the lock pin yet.



(3) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

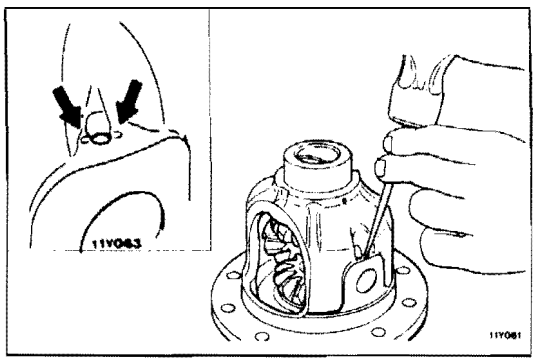
NOTE
The measurement should be made for both pinion gears individually.

Standard value: **0 – 0.076 mm**

Limit: **0.2 mm**

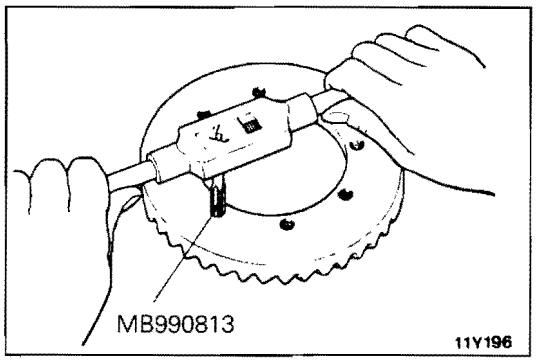
(4) If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear spacers.
(5) Measure the differential gear backlash once again, and confirm that it is within the limit.

NOTE
1. After adjustment, check that the backlash is less than the limit and differential gear rotates smoothly.
2. When adjustment is impossible, replace the side gear and the pinion gear as a set.



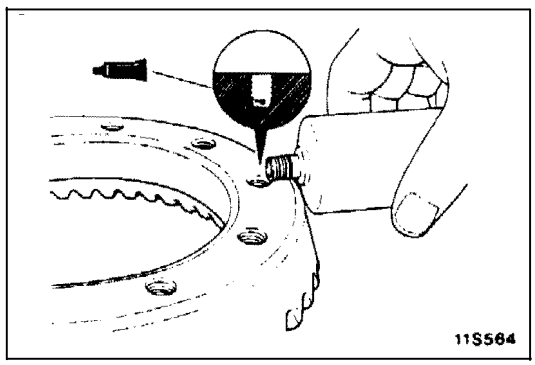
◆F◆ LOCK PIN INSTALLATION

(1) Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.
(2) Stake the lock pin with a punch at two points.



◆G◆ DRIVE GEAR INSTALLATION

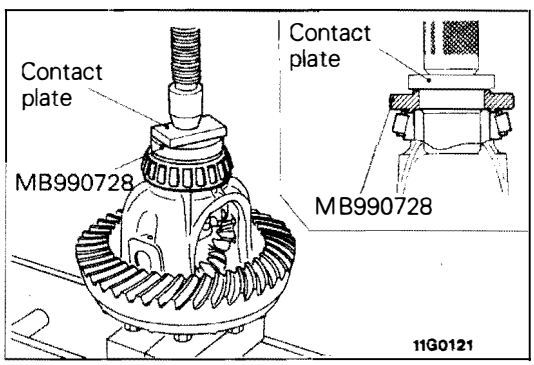
(1) Clean the drive gear attaching bolts.
(2) Remove the adhesive adhering to the threaded holes of the drive gear by turning the special tool (tap M10 × 1.25), and then clean the threaded holes by applying compressed air.



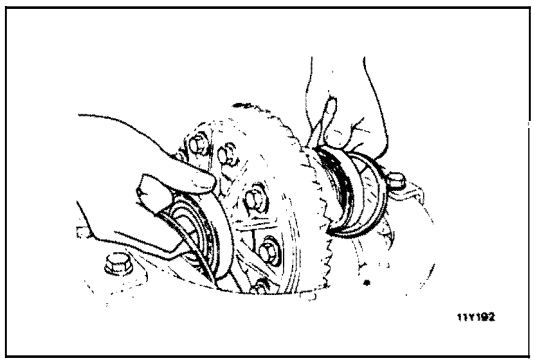
(3) Apply the specified adhesive to the threaded holes of the drive gear.

Specified adhesive:
3M Stud Locking Part No. 4170 or equivalent

(4) Install the drive gear onto the differential case with the mating marks properly aligned. Tighten the bolts to the specified torque (80 – 90 Nm) in a diagonal sequence.



◆H◆ SIDE BEARING INNER RACE PRESS-FITTING

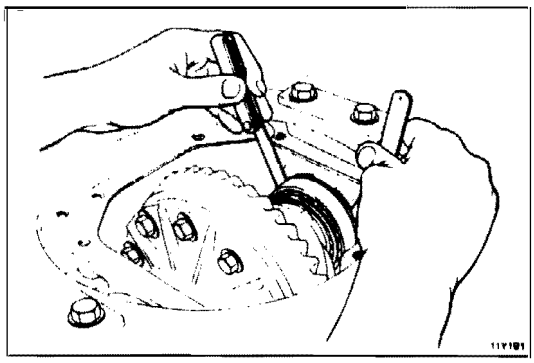


FINAL DRIVE GEAR BACKLASH ADJUSTMENT

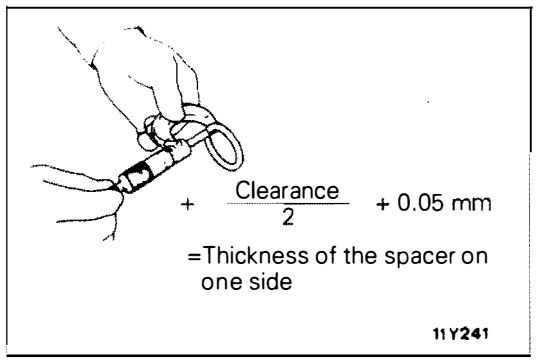
Adjust the final drive gear backlash by the following procedures:

(1) Install the side bearing spacers, which are thinner than those removed, to the side bearing outer races, and then mount the differential case assembly into the gear carrier.

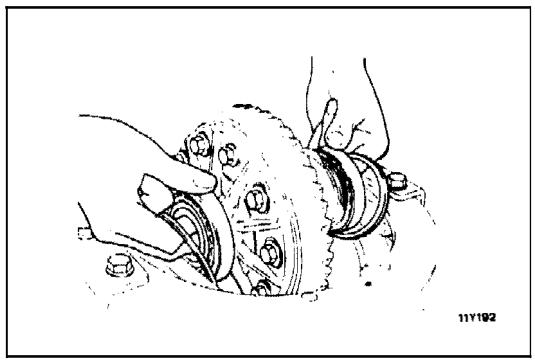
NOTE
Select side bearing spacers with the same thickness for both the drive pinion side and the drive gear side.



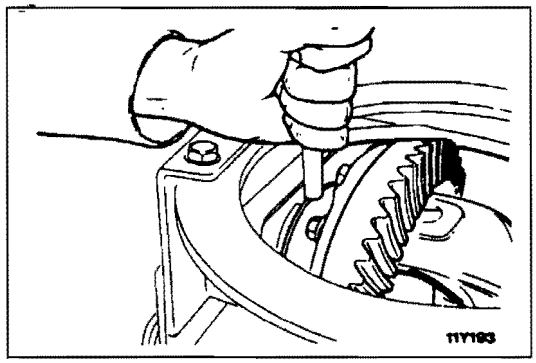
(2) Push the differential case to one side, and measure the clearance between the gear carrier and the side bearing.



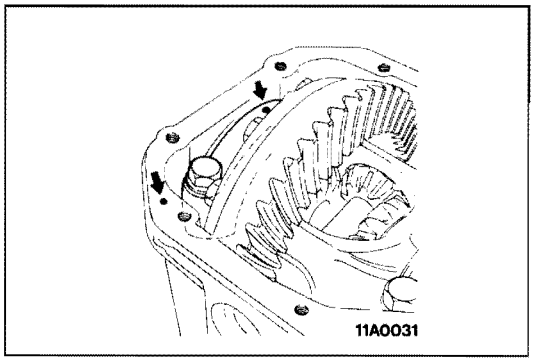
(3) Measure the thickness of the side bearing spacers on one side, select two pairs of spacers which correspond to that thickness plus one half of the clearance plus 0.05 mm, and then install one pair each to the drive pinion side and the drive gear side.



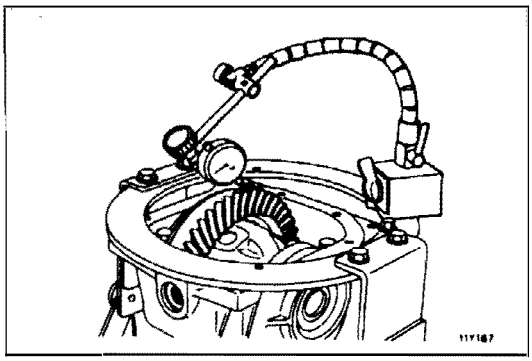
(4) Install the side bearing spacers and differential case assembly, as shown in the illustration, to the gear carrier.



(5) Tap the side bearing spacers with a brass bar to fit them to the side bearing outer race.



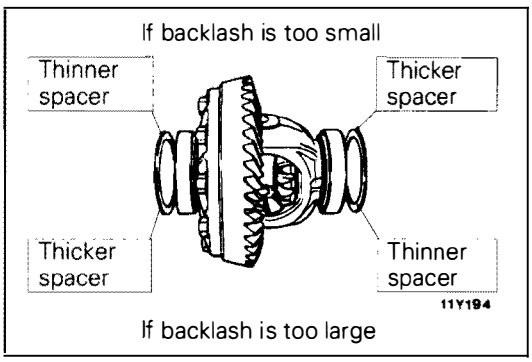
(6) Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.



(7) With the drive pinion locked in place, measure the 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.

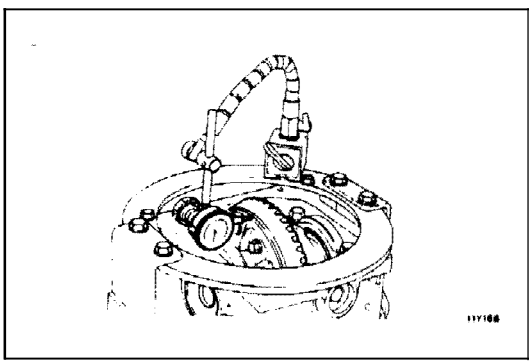
Standard value: 0.11 – 0.16 mm



(8) Change the side bearing spacers as illustrated, and then adjust the final drive gear backlash between the drive gear and the drive pinion.

NOTE
When increasing the number of side bearing spacers, use the same number for each, and as few as possible.

(9) Check the drive gear and drive pinion for tooth contact. If poor contact is evident, make adjustment. (Refer to P.27-30.)



(10) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

Limit: 0.05 mm

(11) If the drive gear runout exceeds the limit, reinstall by changing the phase of the drive gear and differential case, and remeasure.

WHEEL AND TYRE

CONTENTS

E31ZA00AA

 Dec. 1992 PWDE9211

GENERAL INFORMATION

E31ZB00AB

Both steel type and aluminium type wheels have been adopted. The type of wheel used depends on the vehicle model.
A compact spare tyre has been adopted as the spare tyre in some models.

Vehicles for Europe <2WD> (Up to 1993 models)

Items	1800	2000-SOHC	2000-DOHC	Diesel-powered vehicles
Wheel (except spare wheel)				
Tyre size	185/70R14 87H	195/65R14 89V	195/60R15 87V	185/70R14 87H
Wheel type	Steel type	Steel type	Aluminium type	Steel type
Wheel size	14×5 1/2JJ	14×5 1/2JJ	15×6JJ	14×5 1/2JJ
Amount of wheel offset mm	46	46	46	46
Spare wheel				
Type size	185/70R14 87H*1 T125/70D15*2	195/65R14 89V*1 T125/70D15*2	195/60R15 87V*1 T125/70D15*2	185/70R14 87H*1 T125/70D15*2
Wheel type	Steel type	Steel type	Steel type*2 Aluminium type*1	Steel type
Wheel size	14×5 1/2JJ*1 15×4.0T*2	14×5 1/2JJ*1 15×4.0T*2	15×6JJ*1 15×4.0T*2	14×5 1/2JJ*1 15×4.0T*2
Amount of wheel offset mm	46	46	46	46
Wheel (except spare wheel) [Option]				
Tyre size	185/70R14 87H	195/65R14 89V	—	185/70R14 87H
Wheel type	Steel type or Aluminium type*3	Steel type or Aluminium type*3 *5	—	Steel type or Aluminium type*6
Wheel size	14×5 1/2JJ	14×5 1/2JJ	—	14×5 1/2JJ
Amount of wheel offset mm	46	46	—	46
Spare wheel [option]				
Tyre size	185/70R14 87H or T125/70D16*2	195/65R14 89V or T125/70D16*2	195/60R15 87V or T125/70D16	185/70R14 87H or T125/70D16*2
Wheel type	Steel type or Aluminium type*4	Steel type *2 Aluminium type *1 *5	Steel type *2	Steel type or Aluminium type*7
Wheel size	14×5 1/2JJ or 16×4.0T*2	14×5 1/2JJ or 16×4.0T*2	15×6JJ or 16×4.0T	14×5 1/2JJ or 16×4.0T*2
Amount of wheel offset mm	46	46	46	46

NOTE
(1) The indices in the table indicate the following.
*1 : R.H. drive vehicles
*2 : L.H. drive vehicles
*3 : GLSI
*4 : R.H. drive vehicles (GLSI)
*5 : Except E55ASNJEQR6, E55ALNJEQR6
*6 : E57ASNHFL6, E57ASNHFR6, E57ASNHFQL6, E57ALNHFL6, E57ALNHFR6
*7 : E57ASNHFR6, E57ALNHFR6
(2) Some wheels and tyres have duplicated standard and optional specifications. This indicates different manufacturers for these items.

Vehicles for Europe <2WD> (From 1994 models)

Items	1800	2000-SOHC	2000-DOHC	Diesel-powered vehicles
Wheel (except spare wheel)				
Tyre size	185/70R14 87H	195/65R14 89V	195/60R15 88V	185/70R14 87H
Wheel type	Steel type	Steel type	Aluminium type	Steel type
Wheel size	14×5 1/2JJ	14×5 1/2JJ	15×6JJ	14×5 1/2JJ
Amount of wheel offset mm	46	46	46	46
Spare wheel				
Type size	185/70R14 87H*1 T125/70D15*2	195/65R14 89V*1 T125/70D15*2	195/60R15 88V*1 T125/70D15*2	185/70R14 87H*1 T125/70D15*2
Wheel type	Steel type	Steel type	Steel type*2 Aluminium type*1	Steel type
Wheel size	14×5 1/2JJ*1 15×4.0T*2	14×5 1/2JJ*1 15×4.0T*2	15×6JJ*1 15×4.0T*2	14×5 1/2JJ*1 15×4.0T*2
Amount of wheel offset mm	46	46	46	46
Wheel (except spare wheel) [Option]				
Tyre size	185/70R14 88H or 185/70R14 87H	195/65R14 90V*2 195/65R14 89V*5	—	185/70R14 88H or 185/70R14 87H
Wheel type	Steel type or Aluminium type*3	Steel type *5 Aluminium type*3	—	Steel type or Aluminium type*6
Wheel size	14×5 1/2JJ	14×5 1/2JJ	—	14×5 1/2JJ
Amount of wheel offset mm	46	46		46
Spare wheel [option]				
Tyre size	185/70R14 88H, 185/70R14 87H or T125/70D16*2	195/65R14 90V*2 195/65R14 89V*5 T125/70D16*2	195/60R15 88V or T125/70D16	185/70R14 88H, 185/70R14 87H or T125/70D16*2
Wheel type	Steel type or Aluminium type*4	Steel type *5 Aluminium type *4	Steel type	*2 Steel type or Aluminium type*7
Wheel size	14×5 1/2JJ or 16×4.0T*2	14×5 1/2JJ or 16×4.0T*2	15×6JJ or 16×4.0T	14×5 1/2JJ or 16×4.0T*2
Amount of wheel offset mm	46	46	46	46

NOTE
(1) The indices in the table indicate the following.
*1 : R.H. drive vehicles
*2 : L.H. drive vehicles
*3 : GLSI
*4 : R.H. drive vehicles (GLSI)
*5 : Except E55ASNJEQR6, E55ALNJEQR6
*6 : GLS
*7 : E57ASNHFR6, E57ALNHFR6
(2) Some wheels and tyres have duplicated standard and optional specifications. This indicates different manufacturers for these items.

Vehicles for Europe <4WD> (Up to 1993 models)

Items		2000	2500
Wheel (except spare wheel)			
Tyre size		195/65R14 89V	205/60R15 91V
Wheel type		Steel type	Aluminium type
Wheel size		14×5 1/2JJ	15×6JJ
Amount of wheel offset	mm	46	46
Spare wheel			
Tyre size		195/65R14 89V*1	205/60R15 91V*1
		T135/70D16*2	T135/70D16*2
Wheel type		Steel type	Steel type*2
			Aluminium type*1
Wheel size		14×5 1/2JJ*1	15×6JJ*1
		16×4.0T*2	16×4.0T*2
Amount of wheel offset	mm	46	46
Wheel (except spare wheel)[Option]			
Tyre size		195/65R14 89V	—
Wheel type		Steel type or Aluminium type*2	—
Wheel size		14×5 1/2JJ	—
Amount of wheel offset	mm	46	—
Spare Wheel [Option]			
Tyre size		195/65R14 89V	205/60R15 91V
Wheel type		Steel type*2	Steel type
		Aluminium type*1	*2
Wheel size		14×5 1/2JJ	15×6JJ
Amount of wheel offset	mm	46	46

NOTE
(1) The indices in the table indicate the following.
*1 : R.H. drive vehicles
*2 : L.H. drive vehicles
(2) Some wheels and tyres have duplicated standard and optional specifications. This indicates different manufacturers for these items.

Vehicles for Europe <4WD> (From 1994 models)

Items		2000	2500
Wheel (except spare wheel)			
Tyre size		195/65R14 89V	205/60R15 91V
Wheel type		Steel type	Aluminium type
Wheel size		14×5 1/2JJ	15×6JJ
Amount of wheel offset	mm	46	46
Spare wheel			
Tyre size		195/65R14 89V*1	205/60R15 91V*1
		T135/70D16*2	T135/70D16*2
Wheel type		Steel type	Steel type*2
			Aluminium type*1
Wheel size		14×5 1/2JJ*1	15×6JJ*1
		16×4.0T*2	16×4.0T*2
Amount of wheel offset	mm	46	46
Wheel (except spare wheel)[Option]			
Tyre size		195/65R14 90V*2 or	—
		195/65R14 89V	
Wheel type		Steel type or	—
		Aluminium type	
Wheel size		14×5 1/2JJ	—
Amount of wheel offset	mm	46	—
Spare Wheel [Option]			
Tyre size		195/65R14 90V*2 or	
		195/65R14 89V	205/60R15 91V
Wheel type		Steel type*2	Steel type
		Aluminium type*1	*2
Wheel size		14×5 1/2JJ	15×6JJ
Amount of wheel offset	mm	46	46

NOTE
(1) The indices in the table indicate the following.
*1 : R.H. drive vehicles
*2 : L.H. drive vehicles
(2) Some wheels and tyres have duplicated standard and optional specifications. This indicates different manufacturers for these items.

6B models

Items		1800	2000
Wheel (except spare wheel)			
Tyre size		185/70R14 87H*1 185/70R14 88H*2	195/65R14 89V
Wheel type		Steel type	Steel type
Wheel size		14×5 1/2JJ	14×5 1/2JJ
Amount of wheel offset	mm	46	46
Spare wheel			
Tyre size		185/70R14 87H*1 185/70R14 88H*2	195/65R14 89V
Wheel type		Steel type	Steel type
Wheel size		14×5 1/2JJ	14×5 1/2JJ
Amount of wheel offset	mm	46	46
Wheel (except spare wheel)[Option]			
Tyre size		185/70R14 87H*1 185/70R14 88H*2	195/65R14 89V
Wheel type		Aluminium type	Aluminium type
Wheel size		14×5 1/2JJ	14×5 1/2JJ
Amount of wheel offset	mm	46	46
Spare wheel [Option]			
Tyre size		185/70R14 87H*1 185/70R14 88H*2	195/65R14 89V*1
Wheel type		Aluminium type*1 Steel type*2	Aluminium type*1
Wheel size		14×5 1/2JJ	14×5 1/2JJ*1
Amount of wheel offset	mm	46	46*1

NOTE
(1) The indices in the table indicate the following.
*1 : Up to 1993 models
*2 : From 1994 models
(2) Some wheels and tyres have duplicated standard and optional specifications. This indicates different manufacturers for these items.

SERVICE SPECIFICATIONS

E31ZC00AA

<1800, Diesel-powered vehicles>

Items		Specifications
Standard value		
Tyre inflation pressure	kPa	
Standard type		
Front		220
Rear		200
Compact spare tyre		420*
Limit		
Tread depth of tyre	mm	1.6
Wheel runout		
Radial runout	mm	
Steel wheel		1.2 or less
Aluminium wheel		1.0 or less
Lateral runout	mm	
Steel wheel		1.2 or less
Aluminium wheel		1.0 or less

NOTE
* : Except 6B models

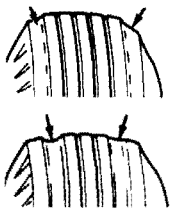
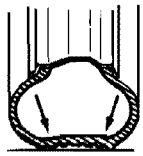
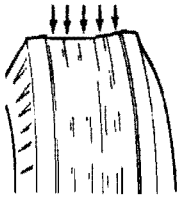
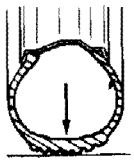
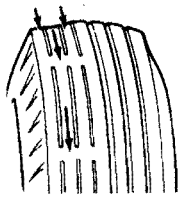
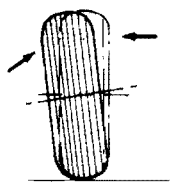
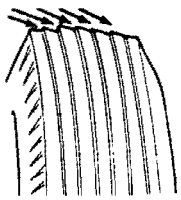
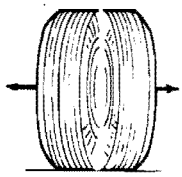
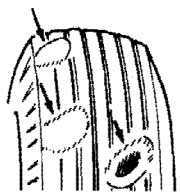
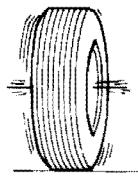
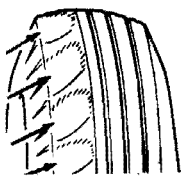
<2000, 2500>

Items		2000	2500
Standard value			
Tyre inflation pressure	kPa		
Standard type			
Up to 3 persons			
Front		220	230
Rear		200	210
Full laden			
Front		230	250
Rear		210	230
Compact spare tyre		420*	420
Limit			
Tread depth of tyre	mm	1.6	1.6
Wheel runout			
Radial runout	mm		
Steel wheel		1.2 or less	1.2 or less
Aluminium wheel		1.0 or less	1.0 or less
Lateral runout	mm		
Steel wheel		1.2 or less	1.2 or less
Aluminium wheel		1.0 or less	1.0 or less

NOTE
* : Except 6B models

TROUBLESHOOTING

E31ZE00AA

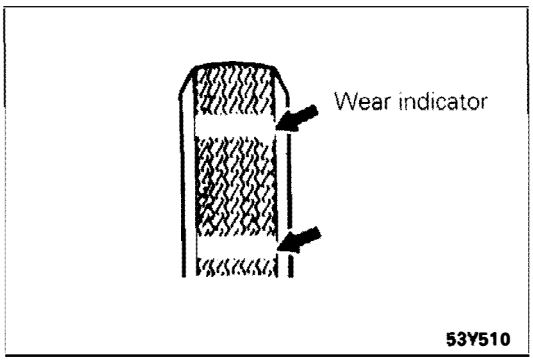
Symptom	Probable cause	Remedy	Reference page
Rapid wear at shoulders 	Under-inflation or lack of rotation 	Adjust the tyre pressure.	Refer to P.31-5.
Rapid wear at centre 	Over-inflation or lack of rotation 		
Cracked treads 	Under-inflation		
Wear on one side 	Excessive camber 	Inspect the camber.	Refer to GROUP 33A – Service Adjustment Procedures.
Featherd edge 	Incorrect toe-in 	Adjust the toe-in.	
Bald spots 	Unbalanced wheel 	Adjust the imbalanced wheels.	—
Scalloped wear 	Lack of rotation of tyres or worn or out-of-alignment suspension	Rotate the tyres, inspect the front suspension alignment.	Refer to GROUP 33A – Service Adjustment Procedures.

SERVICE ADJUSTMENT PROCEDURES

E31ZF00AA

TYRE INFLATION PRESSURE CHECK

Check the inflation pressure of the tyres. If it is not within the standard value, make the necessary adjustment.



TYRE WEAR CHECK

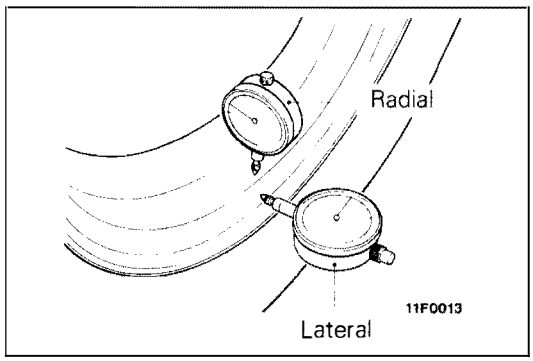
E31ZF01AA

Measure the tread depth of tyres.

Limit: 1.6 mm

If the remaining tread depth is less than the limit, replace the tyre.

NOTE
When the tread depth of tyres is reduced to 1.6 mm or less, wear indicators will appear.



WHEEL RUNOUT CHECK

E31ZF02AA

Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, measure wheel runout with a dial indicator.

Limit: Radial runout	**1.2 mm or less (Steel wheel)**
	1.0 mm or less (Aluminium wheel)
Lateral runout	**1.2 mm or less (Steel Wheel)**
	1.0 mm or less (Aluminium Wheel)

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TYRE

E31ZG01AA

INSTALLATION SERVICE POINT

Tighten the wheel nut to the specified torque.

Tightening torque: 88–108 Nm

POWER PLANT MOUNT

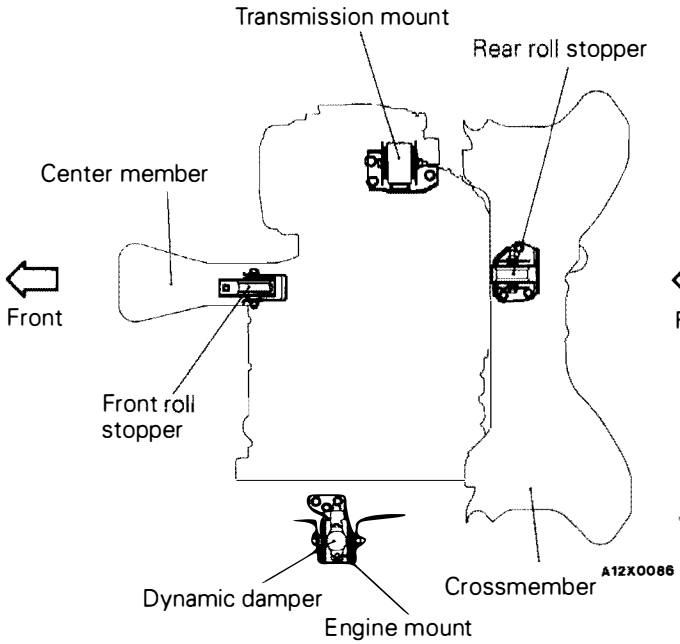
CONTENTS

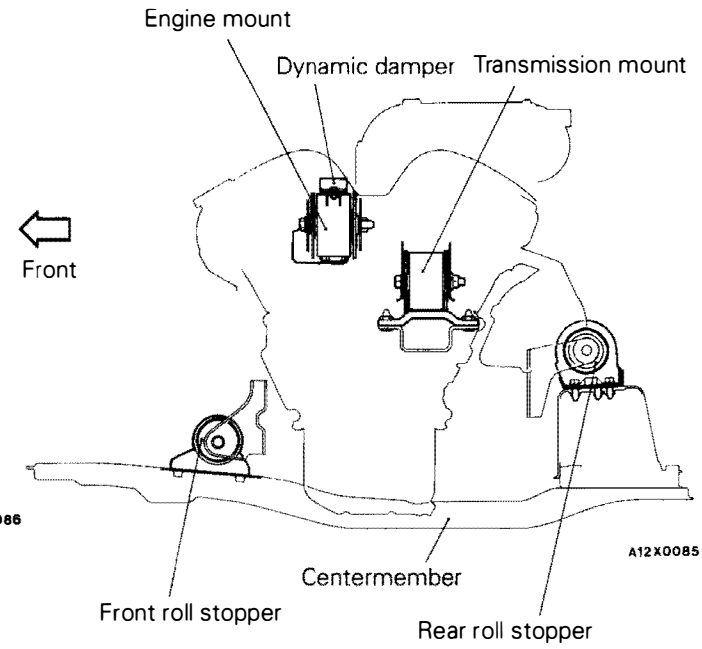
E32ZA00AA

GENERAL INFORMATION

E32ZB00AA

The engine-transmission mount is of an inertial axis supporting type whose excellent features have already been proven in many Mitsubishi vehicles. The inertial axis supporting type mount supports the front upper part of the engine at the front and the rear upper part of the transmission at the rear. This arrangement effectively suppresses the engine vibration.





NOTE
The engine diagram shows the 6A12 engine.

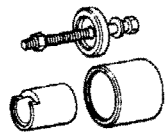
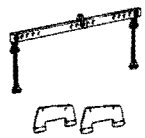
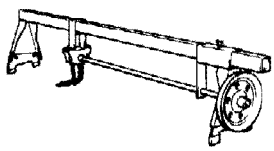
SERVICE SPECIFICATIONS

E32ZC00AA

Items		Specifications
Standard Value		
Installation dimension of front roll stopper bracket assembly	mm	43±3
Crossmember		
Bushing (A) projection	mm	9.0±1.0
Bushing (B) projection	mm	4.0±1.0
Bushing (C) projection	mm	4.0±0.5

SPECIAL TOOLS

E32ZD00AA

Tool	Number	Name	Use
	MB991045	Bushing remover and installer	Driving out and press-fitting of crossmember bushing A and B
	MB990828	Bushing remover and installer	Driving out and press-fitting of crossmember bushing C
	MB991453	Engine hanger	To support the engine assembly during removal and installation of the centermember
	GENERAL SERVICE TOOL MZ203827	Mechanic hanger, engine	

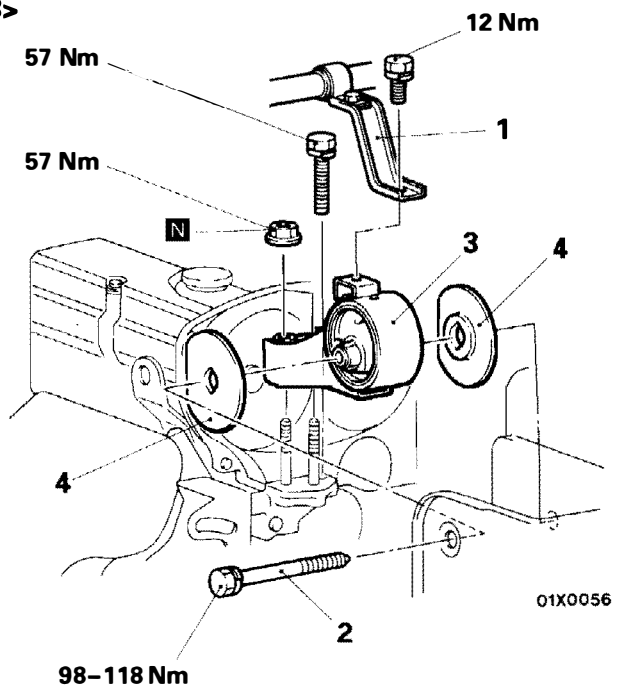
ENGINE MOUNTING

E32ZG00AA

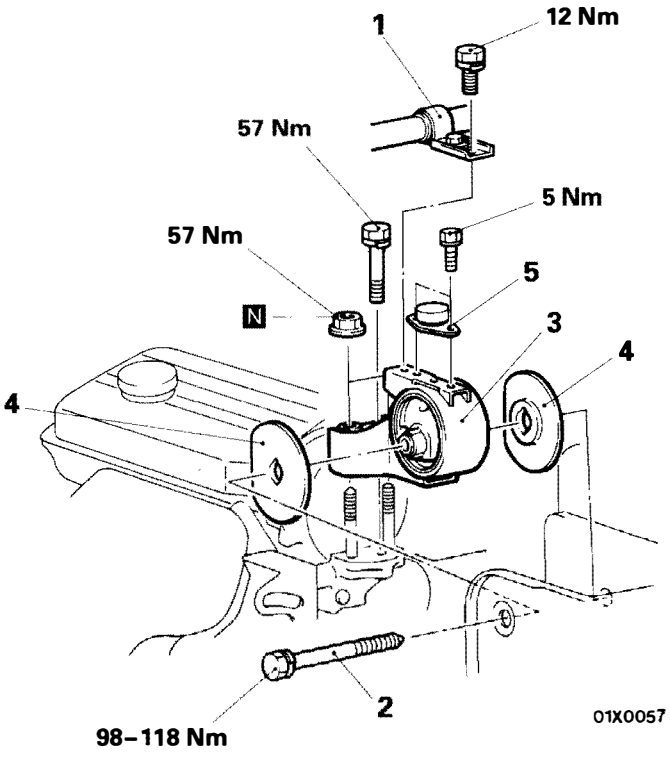
REMOVAL AND INSTALLATION

Pre-removal Operation
- Jack Up the Engine and Transmission Assembly Until There is no Weight on the Engine Mount Bracket Insulator.

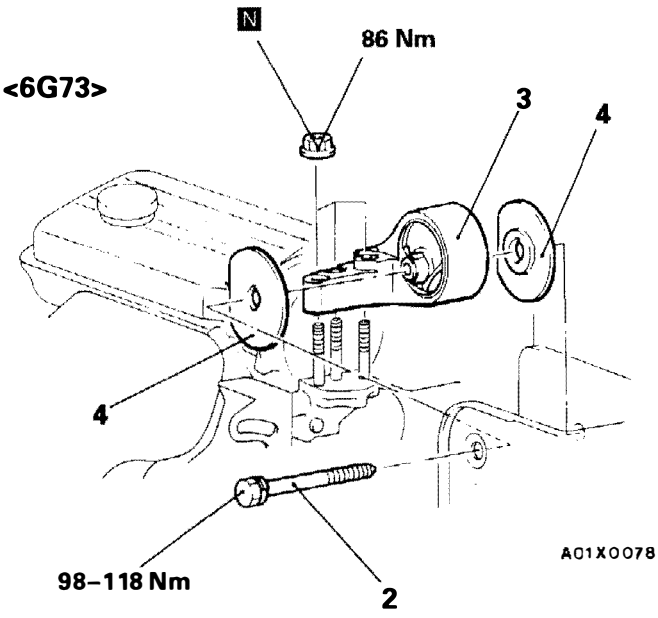
<4G93>



<4D68, 6A12, 4G63>



<6G73>

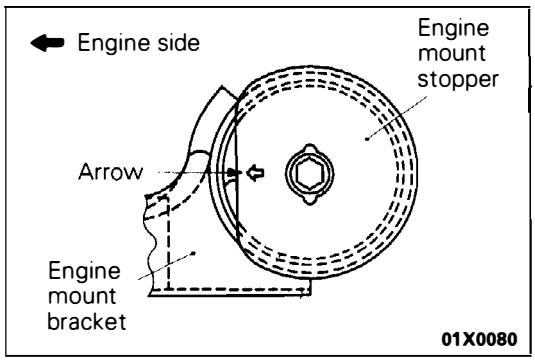


Removal steps

1. Pressure hose bracket
2. Engine mount insulator mounting bolt
3. Engine mount bracket
◆A◆ 4. Engine mount stopper
5. Dynamic damper

INSPECTION E32ZG02AA

- Check each insulator for cracks or damage.
- Check each bracket for deformations or damage.



INSTALLATION SERVICE POINTS E32ZG04AA

◆A◆ ENGINE MOUNT STOPPER INSTALLATION

Clamp the engine mount stopper so that the arrow points in the direction as shown in the diagram.

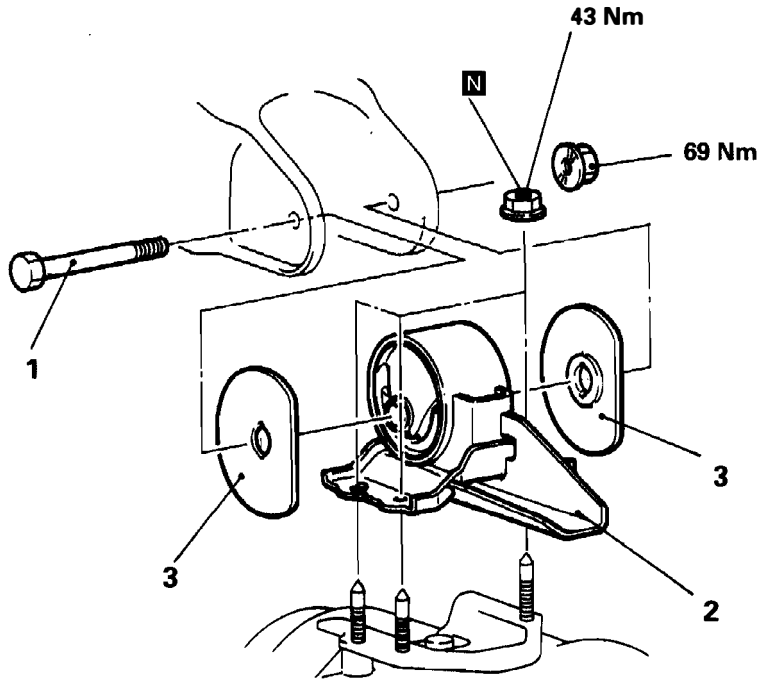
TRANSMISSION MOUNTING

E32ZH00AB

REMOVAL AND INSTALLATION

Pre-removal Operation
(1) Air Cleaner Assembly Removal
(2) Jack Up the Engine and Transmission Assembly Until There is no Weight on the Transmission Mount Bracket Insulator.

Post-installation Operation
- Air Cleaner Assembly Installation

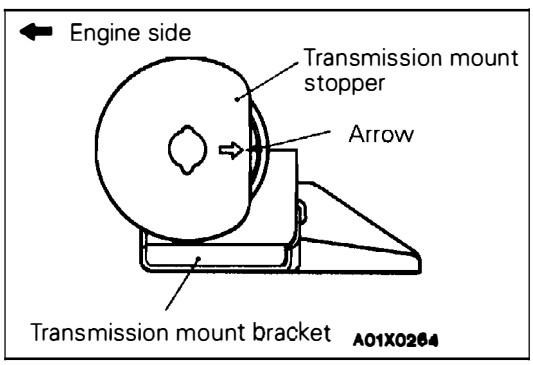


Removal steps
1. Transmission mount insulator mounting bolt
2. Transmission mount bracket
◆A◆ 3. Transmission mount stopper

INSPECTION

E32ZG02AA

- Check each insulator for cracks or damage.
- Check each bracket for deformation or damage.



INSTALLATION SERVICE POINTS

E32ZH04AA

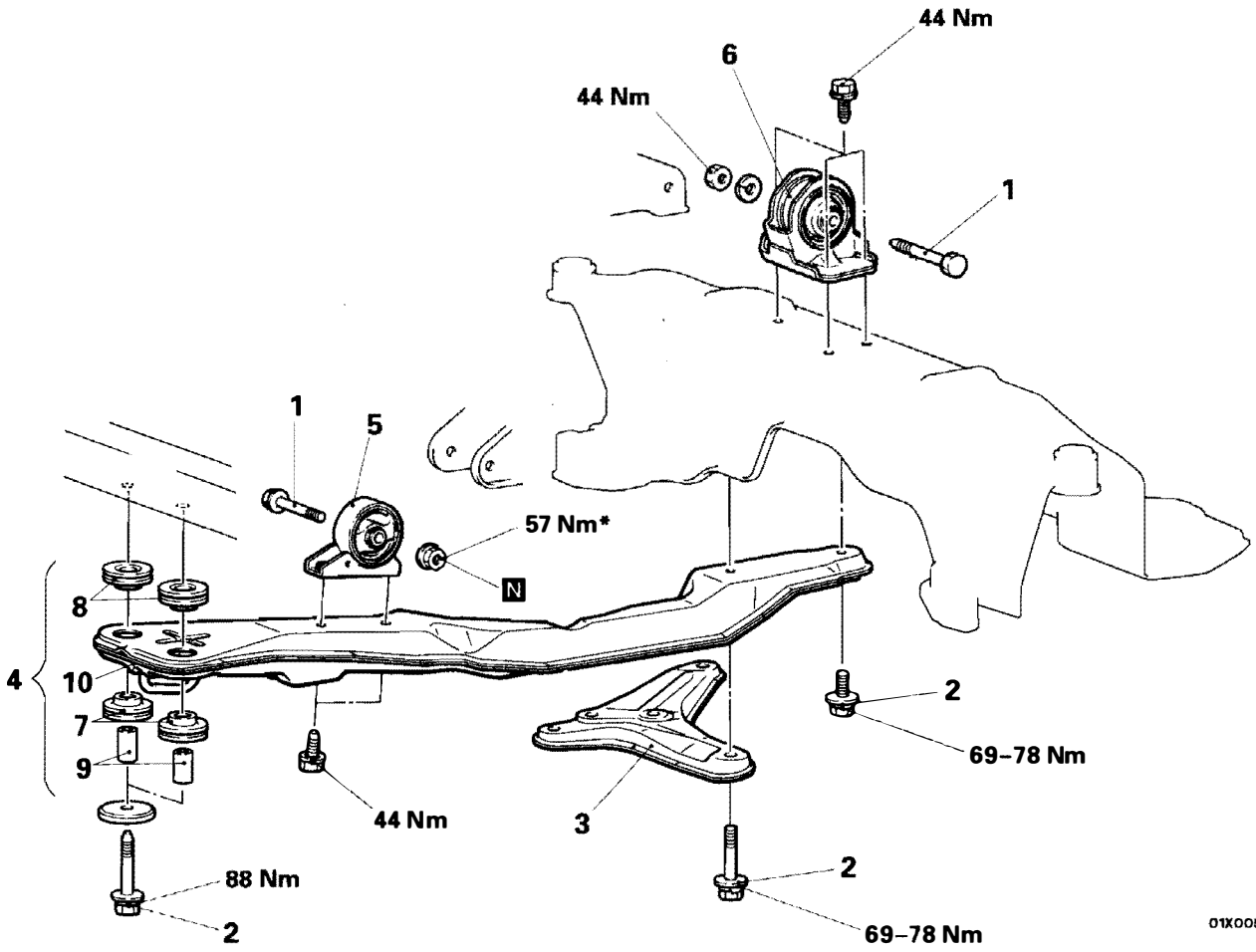
◆A◆ TRANSMISSION MOUNT STOPPER INSTALLATION

Clamp the transmission mount stopper so that the arrow points in the direction as shown in the diagram.

ENGINE ROLL STOPPER, CENTERMEMBER

E32ZI00AA

REMOVAL AND INSTALLATION



Centermember assembly removal steps

1. Bolt
2. Bolt
3. Stay
◇A◇ 4. Centermember assembly

Roll stopper removal steps

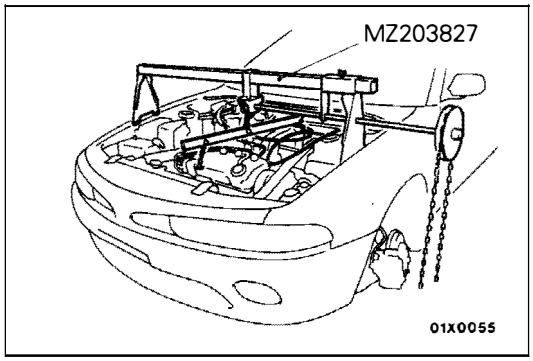
◆A◆ 5. Front roll stopper bracket assembly
6. Rear roll stopper bracket assembly

Centermember removal steps

7. Bushing (lower)
8. Bushing (upper)
9. Collar
10. Centermember

Caution

*** : Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.**



REMOVAL SERVICE POINTS E32ZI01AA

◇A◇ CENTERMEMBER ASSEMBLY REMOVAL

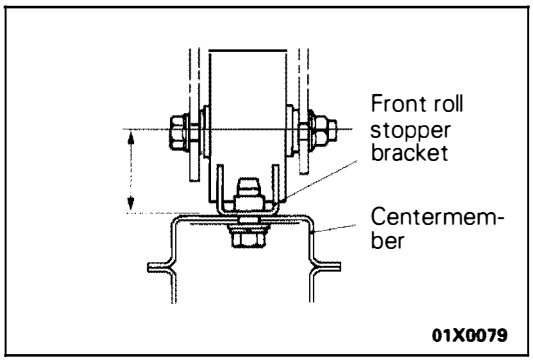
(1) Set the special tool to the vehicle to support the engine assembly.

NOTE
For the 6A12 engine, use the special tool (MB991453).

(2) Remove the centermember assembly.

INSPECTION E32ZG02AA

- Check each insulator for cracks or damage.
- Check each bracket for deformation or damage.



INSTALLATION SERVICE POINTS E32ZI04AA

▶A◀ FRONT ROLL STOPPER BRACKET ASSEMBLY INSTALLATION

If the dimension shown in the illustration is outside the standard value when the weight of the engine is on the body, replace the front roll stopper bracket assembly.

Standard value : 43±3 mm

CROSSMEMBER

E32ZJ00AA

REMOVAL AND INSTALLATION

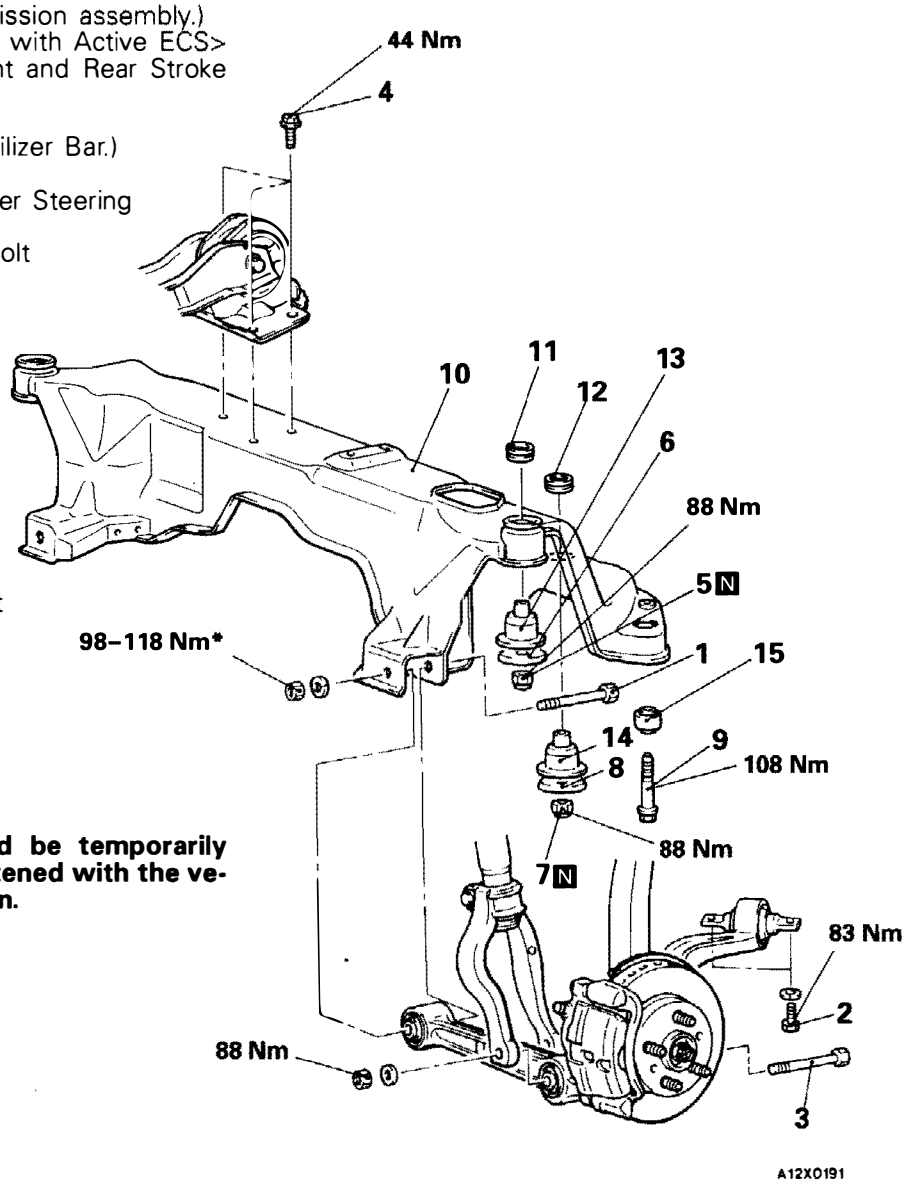
Pre-removal Operation
- Power Steering Fluid Draining (Refer to GROUP 37A – Service Adjustment Procedures.)

Post-installation Operation
- Supplying of Engine Oil <4WD> (Refer to GROUP 22 – Service Adjustment Procedures.)
- Power Steering Fluid Supplying (Refer to GROUP 37A – Service Adjustment Procedures.)
- NORMAL Vehicle Height Checking <Vehicles with Active ECS> (Refer to GROUP 33C – Service Adjustment Procedures.)

Removal steps for crossmember
- Centermember (Refer to P.32-7.)
- Front exhaust pipe (Refer to GROUP 15 – Exhaust Pipe and Muffler.)
- Transfer assembly <4WD> (Refer to GROUP 22 –Transmission assembly.)
- Front stroke sensor <Vehicles with Active ECS> (Refer to GROUP 33C – Front and Rear Stroke Sensors.)
- Stabilizer bar (Refer to GROUP 33A – Stabilizer Bar.)
- Steering gear box (Refer to GROUP 37A – Power Steering Gear and Linkage.)

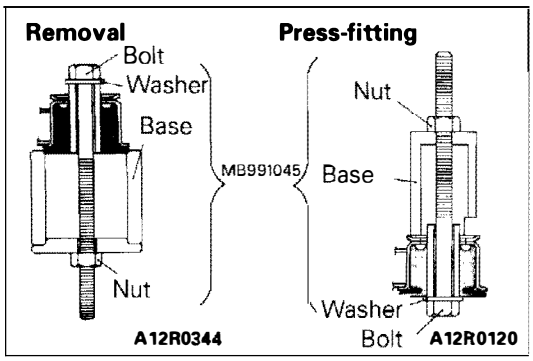
1. Lateral lower arm mounting bolt
2. Compression lower arm mounting bolt
3. Shock absorber lower mounting bolt
4. Rear roll stopper bracket attachment bolt
5. Crossmember attachment self-locking nut
6. Lower plate
7. Crossmember attachment self-locking nut
8. Lower plate
9. Crossmember attachment bolt
10. Crossmember
11. Stopper B
12. Stopper A
13. Bushing B
14. Bushing A
15. Bushing C

Caution
*** : Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.**



INSPECTION E32ZJ02AA

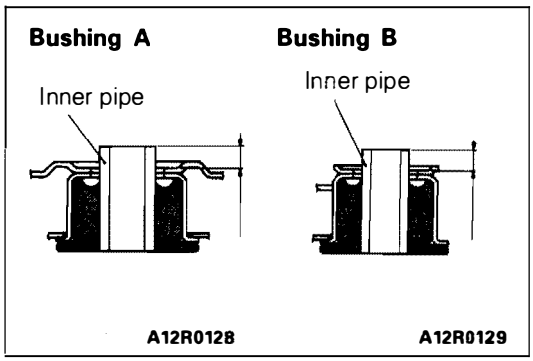
- Check the crossmember for cracks or deformation.
- Check the bushings for cracks or deterioration.



CROSSMEMBER BUSHING REPLACEMENT E32ZJ09AA

CROSSMEMBER BUSHING A AND B

(1) Apply soapy water to the contact surface of the bush when press-fitting the bush.

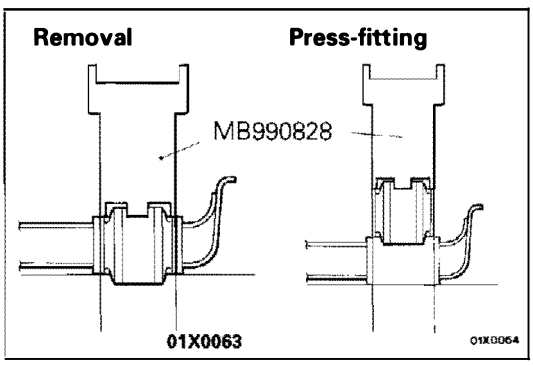


(2) The bush should be press-fitted so that the inner pipe projection is at the standard length.

Standard values
Bushing A: 9.0±1.0 mm
Bushing B: 4.0±1.0 mm

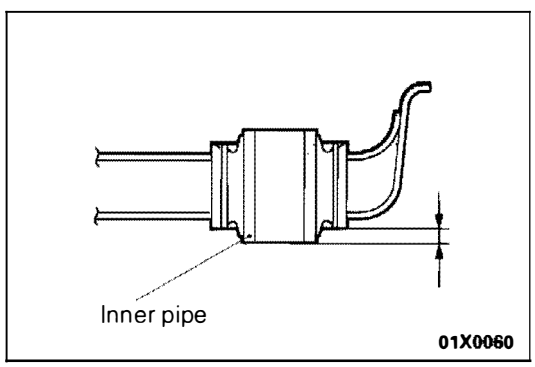
CROSSMEMBER BUSHING C

(1) Use the special tool to drive out and press-fit the crossmember bushing C.



(2) The bush should be press-fitted so that the inner pipe projection is at the standard length.

Standard value : 4.0±0.5 mm



FRONT SUSPENSION

CONTENTS

E33ZA00AA

 PWDE9211

NOTES

FRONT SUSPENSION

CONTENTS

E33AA00AA

GENERAL INFORMATION

E33AB00AB

The front suspension is of a multi-link construction with two lower arms which create the ideal virtual kingpin axis for the suspension system. In addition, by mounting the upper arm in a higher position than the tyres, excellent steering stability and ride comfort are obtained.

Items	2WD	
	4G93	4D68
Coil spring		
Wire dia. × O.D. × free length mm	12.3 × 70.3–110.3 × 366.0 12.1 × 70.1–110.1 × 357.5*1 12.8 × 70.8–110.8 × 348.0*2	12.9 × 70.9–110.9 × 355.0 12.8 × 70.8–110.8 × 348.0*3
Identification colour	Blue Orange*1, Brown*2	Pink Brown*3
Spring constant N/mm	30.4, 37.2*2	37.2
Shock absorber		
Stroke mm	120	
Damping force (at 0.3 m/sec.)		
Expansion N	922–1236	
Contraction N	520–755	

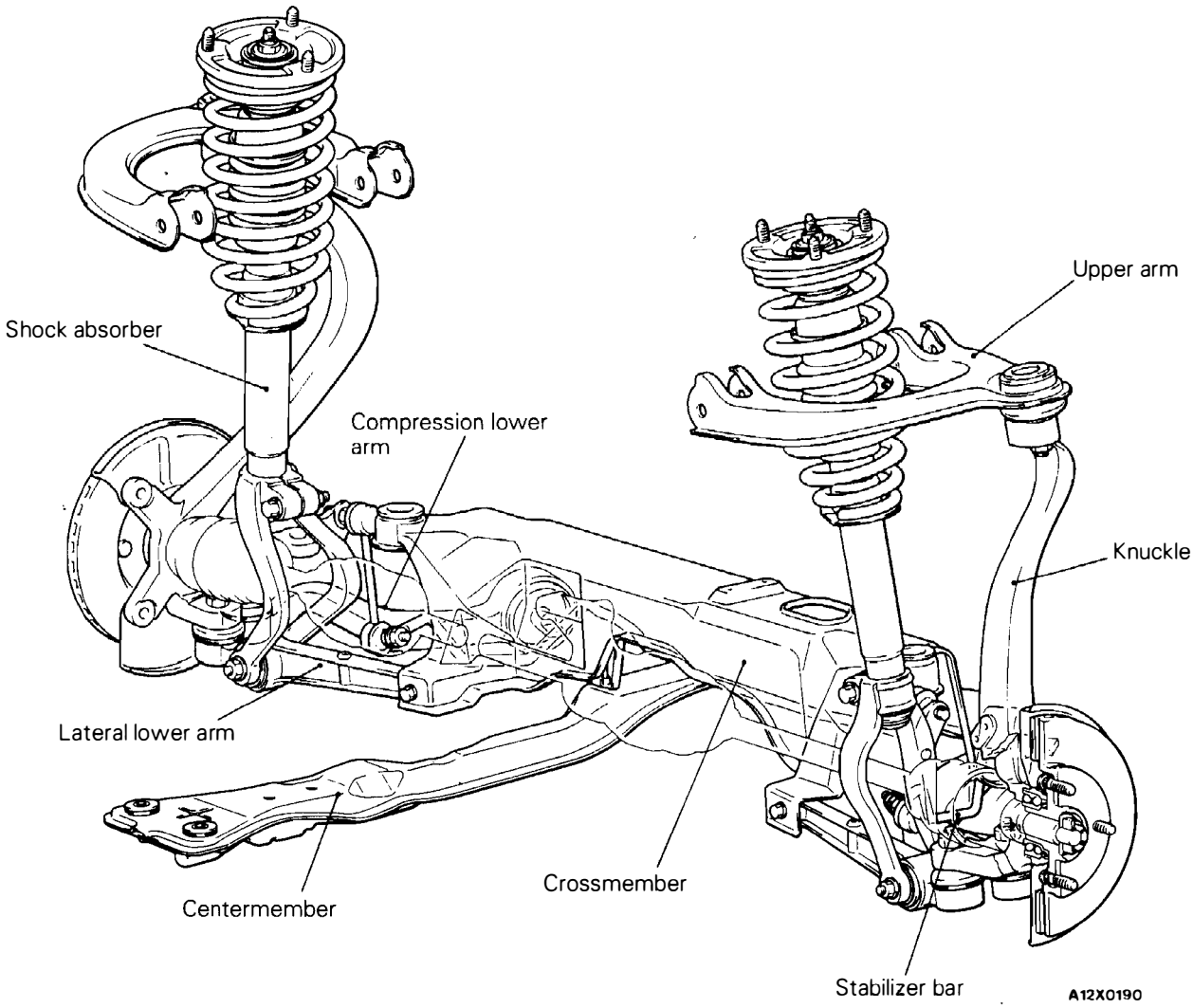
Items	2WD	
	4G63–M/T	4G63–A/T
Coil spring		
Wire dia × O.D. × free length mm	12.3 × 70.3–110.3 × 366.0 12.8 × 70.8–110.8 × 348.0*4	12.8 × 70.8–110.8 × 348.0 12.9 × 70.9–110.9 × 355.0*5
Identification colour	Blue Brown*4	Brown Pink*5
Spring constant N/mm	30.4 37.2*4	37.2
Shock absorber		
Stroke mm	120	
Damping force (at 0.3 m/sec.)		
Expansion N	1304–1736*6, 834–1128*7	
Contraction N	628–922*6, 490–726*7	

NOTE
*1: E52ALNJEQL6, E52ALNJEQR6, E52ALNJESL6
*2: E52ASNJEQL6B, E52ASRHEQL6B
*3: E57ALNJFL6, E57ALNJFR6, E57ALNJFQL6
*4: E55ALNHEQL6, E55ALNHEQR6
*5: High ground-clearance suspension
*6: Up to 1993 models
*7: From 1994 models

Items	2WD	
	6A12–M/T	6A12–A/T
Coil spring		
Wire dia. × O.D. × free length mm	12.8 × 70.8–110.8 × 348.0 12.9 × 70.9–110.9 × 355.0*8	12.9 × 70.9–110.9 × 355.0 12.8 × 70.8–110.8 × 348.0*9
Identification colour	Brown, Pink*8	Pink, Brown*9
Spring constant N/mm	37.2	37.2
Shock absorber		
Stroke mm	120	
Damping force (at 0.3 m/sec.)		
Expansion N	1304–1735	
Contraction N	628–922	

Items	4WD	
	4G63	6G73
Coil spring		
Wire dia. × O.D. × free length mm	12.8 × 70.8–110.8 × 356.0	13.1 × 71.1–111.1 × 370.0
Identification colour	Brown × 2	Gray × 2
Spring constant N/mm	37.2	37.2
Shock absorber		
Stroke mm	120	
Damping force (at 0.3 m/sec.)		
Expansion N	1304–1735	
Contraction N	628–922	

NOTE
*8: E64ALNGMQL6
*9: E64ALRGMQL6



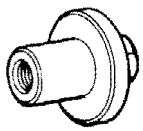
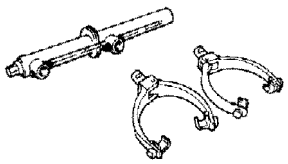
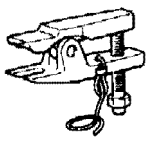
SERVICE SPECIFICATIONS

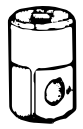
E33AC00AA

Items		Specifications
Standard value		
Toe-in		
At the centre of tyre tread	mm	0 ± 3
Toe angle (per wheel)		0 ± 9'
Toe-out angle on turns (inner wheel when outer wheel at 20°)		22°
Steering angle		
Inner wheel		39°00' ± 2°
Outer wheel		30°30'
Camber		
2WD		0°00' ± 30'
4WD		0°10' ± 30'
Caster		4°20' ± 1°30'
Kingpin inclination		7°20' ± 1°30'
Upper arm ball joint starting torque	Nm	0.3–1.5
Compression lower arm ball joint starting torque	Nm	0.5–2.5
Lateral lower ball joint starting torque	Nm	1.0–3.5 (When load is 3727 N)
Stabilizer link ball joint starting torque	Nm	0.5–1.5

SPECIAL TOOLS

E33AD00AA

Tool	Number	Name	Use
	MB991004	Wheel alignment gauge attachment	Measurement of the wheel alignment
	MB991237 MB991238	Spring compressor body Arm set	Compression of the front coil spring
	MB991113	Steering linkage puller	Removal of the lower arm ball joint

Tool	Number	Name	Use
	MB990326	Preload socket	Measurement of the lower arm ball joint starting torque Measurement of the stabilizer link rotation-starting torque
	MB990968	Torque wrench	
	MB990800	Ball joint remover and installer	Installation of the dust cover

SERVICE ADJUSTMENT PROCEDURES

E33AF00AA

FRONT WHEEL ALIGNMENT INSPECTION AND ADJUSTMENT

Measure the wheel alignment with the vehicle parked on a level surface.
The front suspension, steering system, and wheels should be serviced to normal condition prior to measurement of wheel alignment.

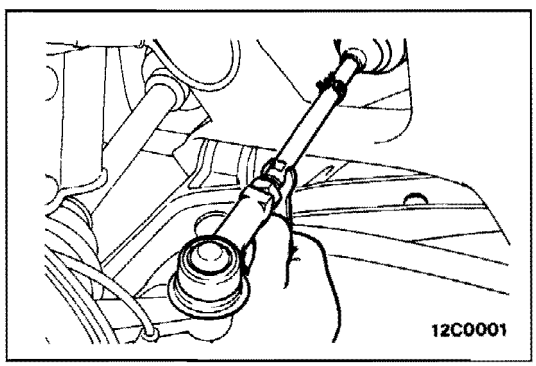
TOE-IN

E33AF00BB

Toe-in adjustment should be carried out after confirming that the rear suspension wheel alignment is normal.

Standard value:

At the centre of tyre tread	**0 ± 3 mm**
Toe angle (per wheel)	**0 ± 9′**



NOTE
1. If the toe-in is not within the standard value, adjust the toe-in by undoing the clips and turning the left and right tie rod turnbuckles by the same amount (in opposite directions).
2. The toe will move out as the left turnbuckle is turned toward the front of the vehicle and the right turnbuckle is turned toward the rear of the vehicle.

TOE-OUT ANGLE ON TURNS E33AF00CA

To check the steering linkage, especially after the vehicle has been involved in an accident or if an accident is presumed, it is advisable to check the toe-out angle on turns in addition to the wheel alignment.
Conduct this test on the left turn as well as on the right turn.

Standard value: 22°

STEERING ANGLE E33AF00DA

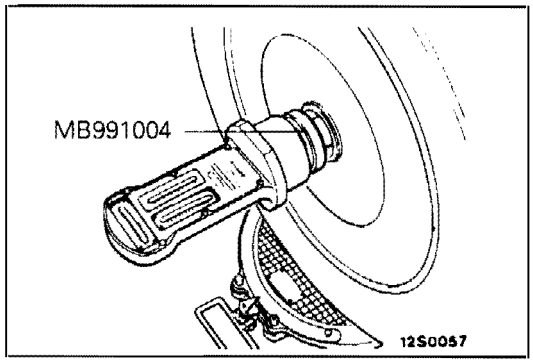
Standard value:

Inner wheel	**39°00′ ± 2°**
Outer wheel	**30°30′**

CAMBER, CASTER AND KINGPIN INCLINATION E33AF00EA

Standard value:

Camber	**0° ± 30′ <2WD>**
	0°10′ ± 30′ <4WD>
Caster	**4°20′ ± 1°30′**
Kingpin inclination	**7°20′ ± 1°30′**



NOTE
1. Camber and caster are preset at the factory and cannot be adjusted.
2. If camber is not within the standard value, check and replace bent or damaged parts.
3. For vehicles with aluminium type wheels, attach the camber/caster/kingpin gauge to the drive shaft by using the special tool. Tighten the special tool to the same torque (196–255 Nm) as the drive shaft nut.

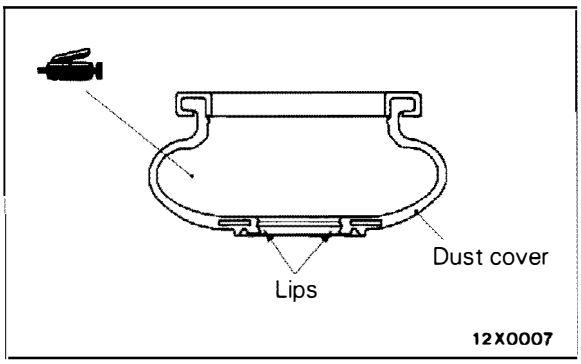
Caution
Never subject the wheel bearings to the vehicle load when the drive shaft nuts are loosened.

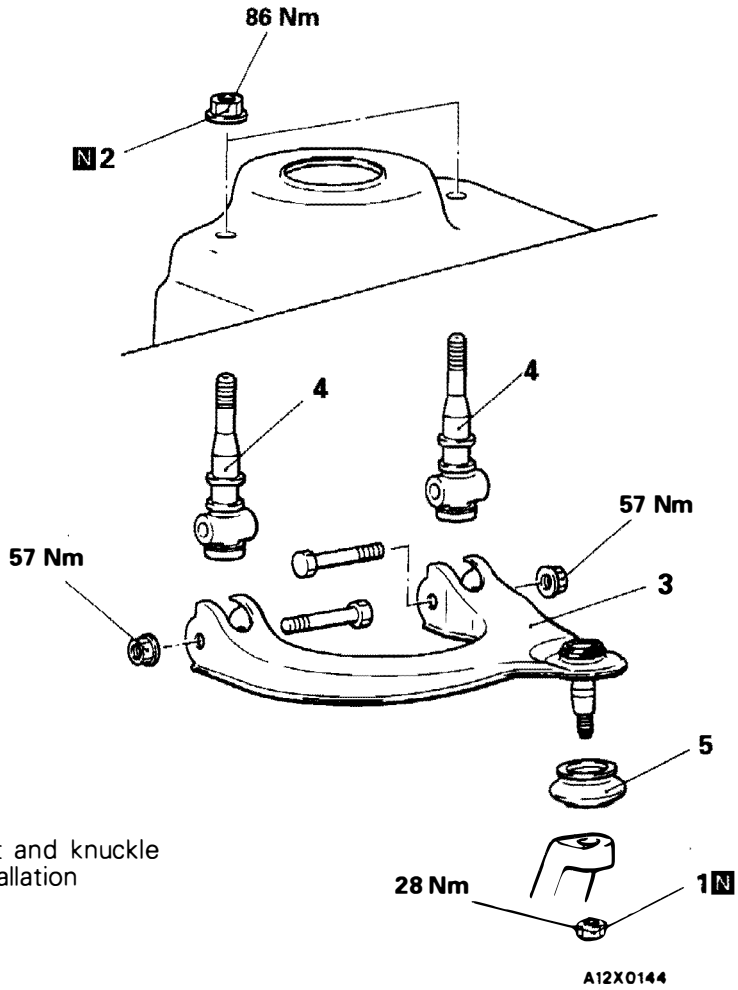
UPPER ARM ASSEMBLY

E33AG00AA

REMOVAL AND INSTALLATION

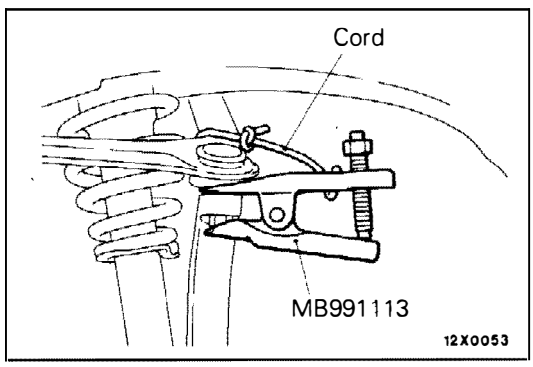
Post-installation Operation
- Front Wheel Alignment Adjustment (Refer to P. 33A–6.)





Removal steps

◇A◇ 1. Connection for upper arm ball joint and knuckle
2. Self-locking nut for upper arm installation
3. Upper arm assembly
▶A◀ 4. Upper arm shaft assembly
5. Dust cover



REMOVAL SERVICE POINTS

E33AG01AA

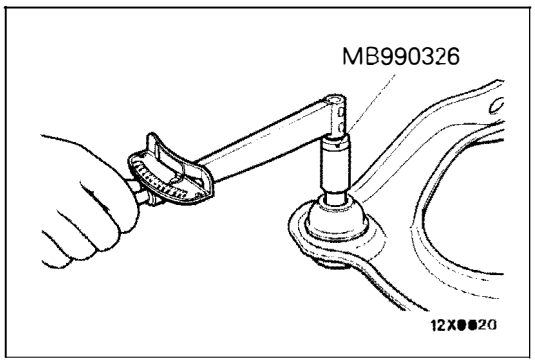
◇A◇ DISCONNECTION OF UPPER ARM BALL JOINT AND KNUCKLE

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

INSPECTION

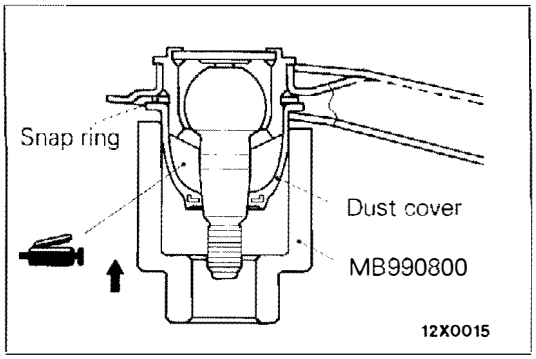
E33AG02AA

- Check the bushings for wear and deterioration.
- Check the upper arm for bends or damage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



BALL JOINT FOR STARTING TORQUE CHECK E33AG02BA

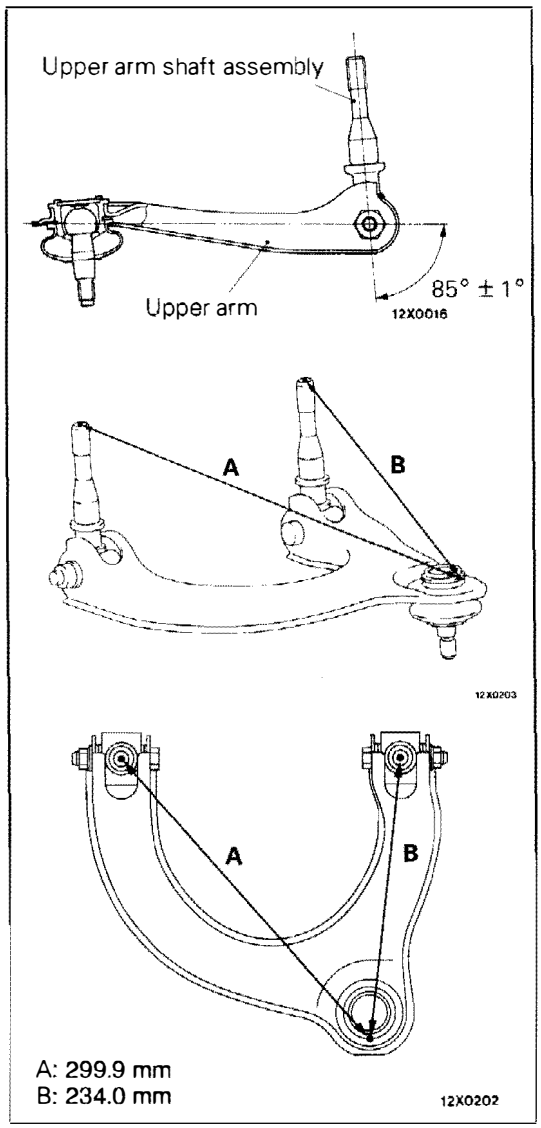
Standard value: 0.3–1.5 Nm



BALL JOINT DUST COVER REPLACEMENT

E33AG03AA

(1) Remove the dust cover.
(2) Apply multipurpose grease to the lip and inside of the dust cover.
(3) Drive in the dust cover with special tool until it is fully seated.



INSTALLATION SERVICE POINTS E33AG04AB

◆A◆ UPPER ARM SHAFT ASSEMBLY INSTALLATION

Install the upper arm shaft assembly at the angle shown in the illustration.

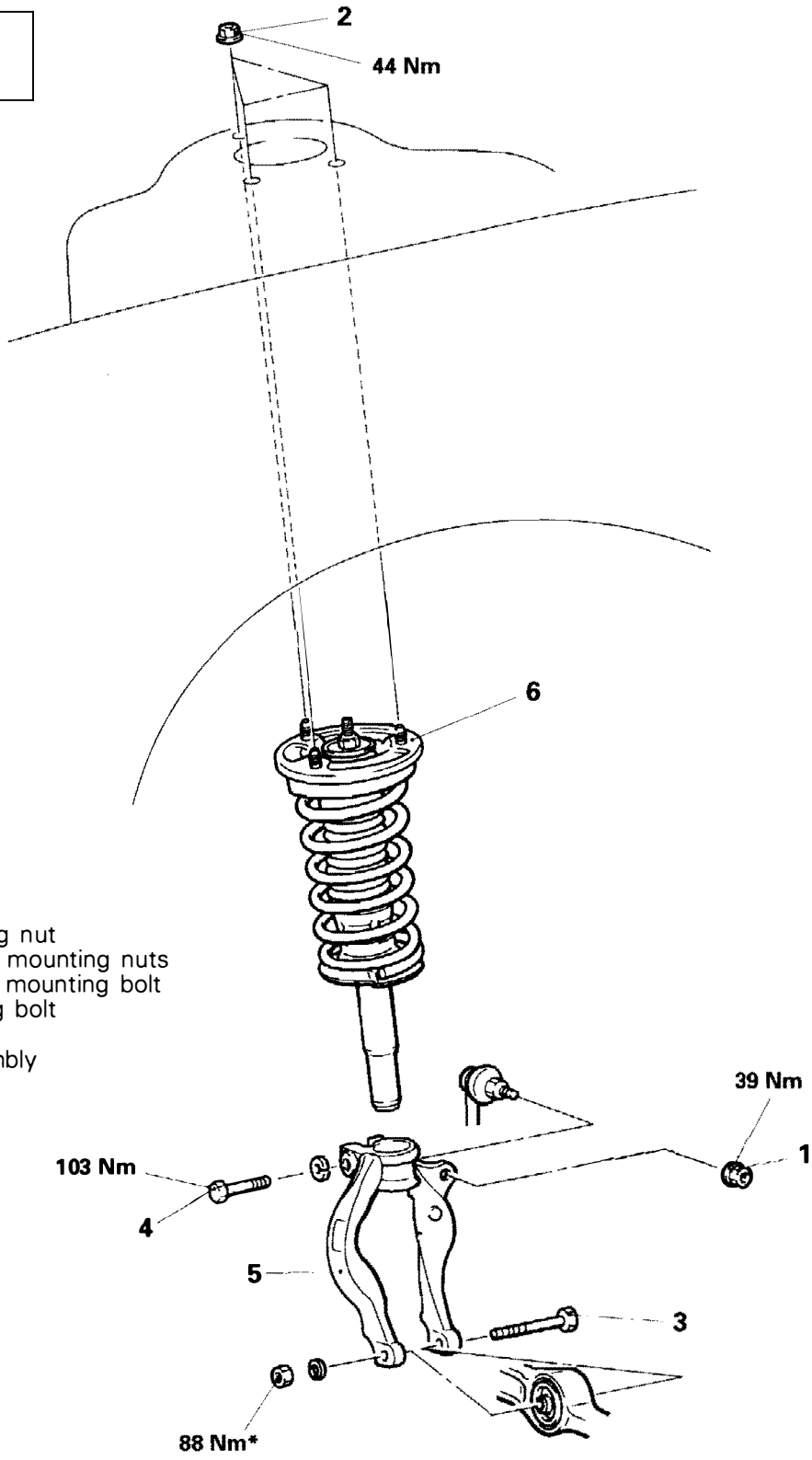
NOTE
Refer to the distances A and B shown in the illustration to check the installation angle of the upper arm shaft assembly.

SHOCK ABSORBER ASSEMBLY

E33AH00AB

REMOVAL AND INSTALLATION

Post-installation Operation
- Front Wheel Alignment Adjustment (Refer to P. 33A-6.)

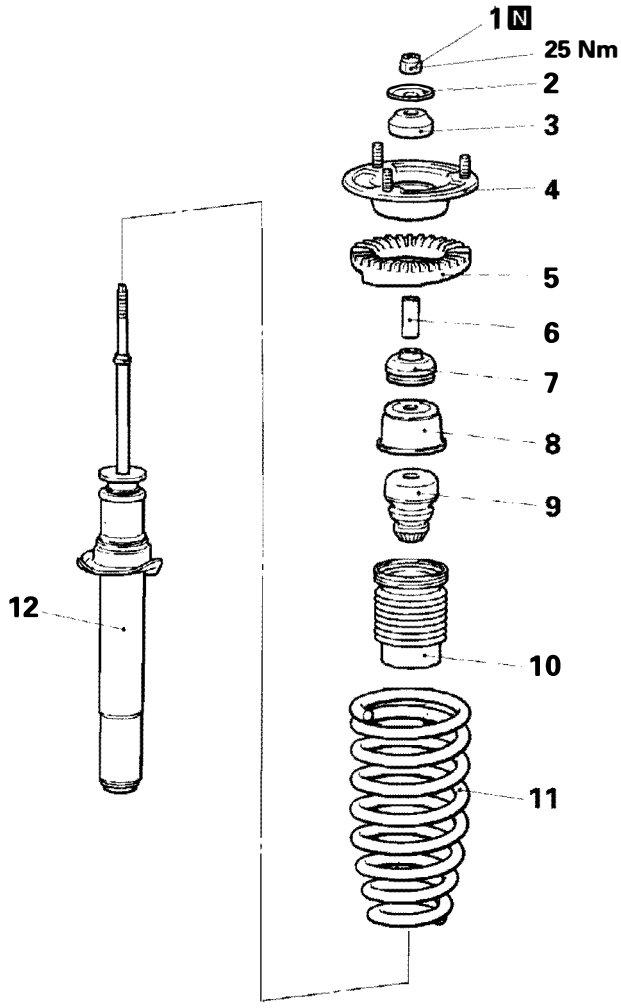


Removal steps
1. Stabilizer link mounting nut
2. Shock absorber upper mounting nuts
3. Shock absorber lower mounting bolt
4. Damper fork mounting bolt
5. Damper fork
6. Shock absorber assembly

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.**

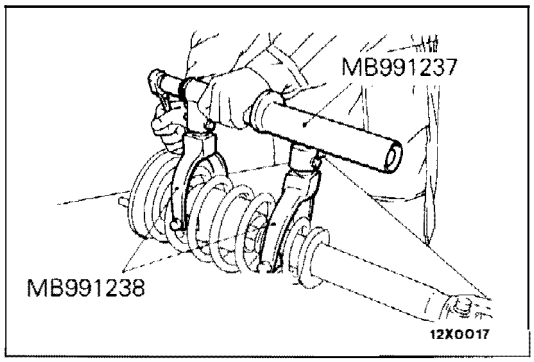
DISASSEMBLY AND REASSEMBLY

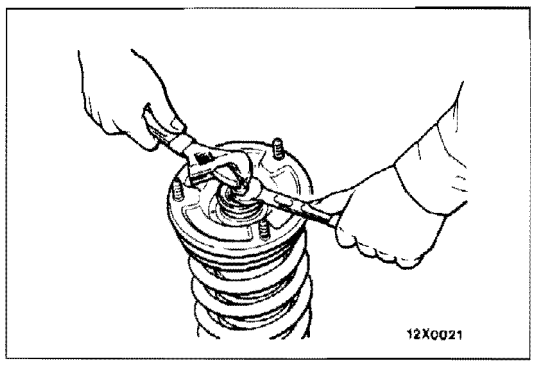
E33AH05AA



Disassembly steps

〈A〉 ◆C◆ 1. Self-locking nut
2. Washer
3. Upper bushing A
◆B◆ 4. Upper bracket assembly
5. Upper spring pad
6. Collar
7. Upper bushing B
8. Cup assembly
9. Bump rubber
10. Dust cover
◆A◆ 11. Coil spring
12. Shock absorber assembly





DISASSEMBLY SERVICE POINTS

E33AH06AA

〈A〉 SELF-LOCKING NUT REMOVAL

(1) Compress the coil spring using the special tools.

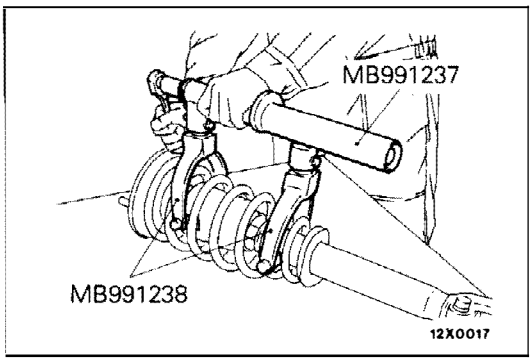
NOTE
Install the special tools evenly so that the maximum length will be attained within the installation range.

Caution
An air tool should not be used for the tightening of the special tool bolt.

(2) While holding the piston rod, remove the self-locking nut.

INSPECTION E33AH07AA

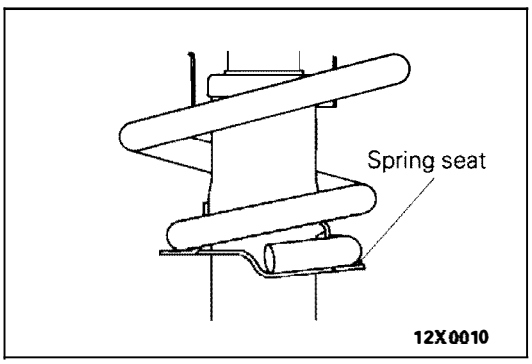
- Check the rubber parts for damage or deterioration.
- Check the spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.



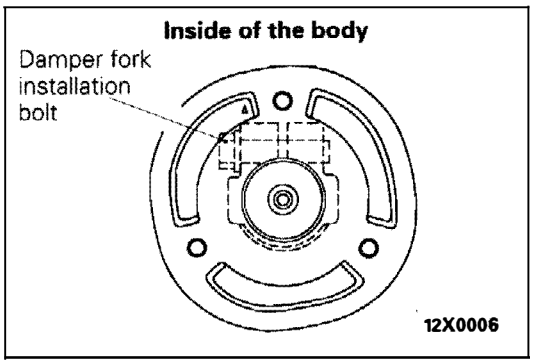
REASSEMBLY SERVICE POINTS E33AH08AA

◆A◆ COIL SPRING INSTALLATION

(1) Use the special tools to compress the coil spring and install it to the shock absorber.



(2) Align the edge of the coil spring to the stepped part of the shock absorber spring seat.



◆B◆ UPPER BRACKET ASSEMBLY INSTALLATION

Install so that the position of the three bolts are as shown in the illustration with respect to the damper fork installation bolt.

◆C◆ SELF-LOCKING NUT INSTALLATION

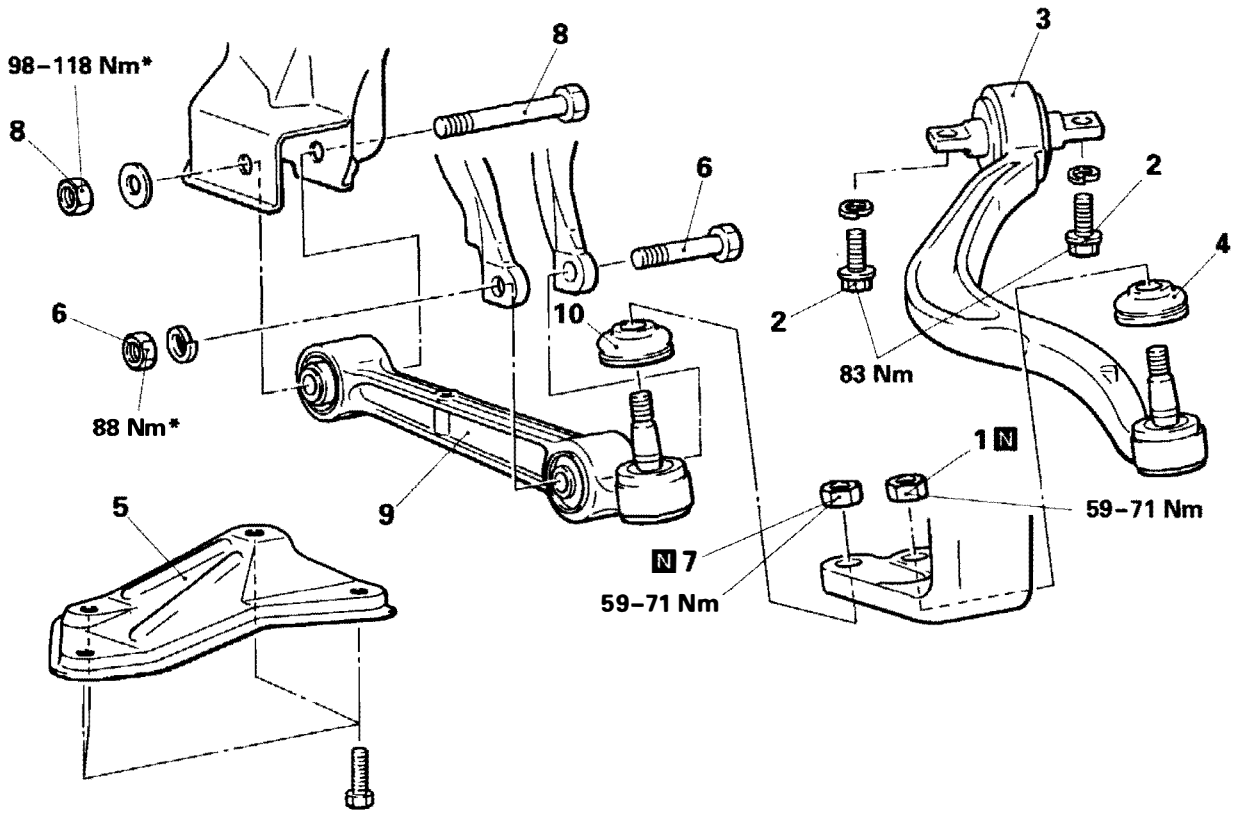
(1) Temporarily tighten the self-locking nut.
(2) Remove the special tools (MB991237, MB991238), and tighten the self-locking nut at the specified torque.

COMPRESSION LOWER ARM AND LATERAL LOWER ARM ASSEMBLIES

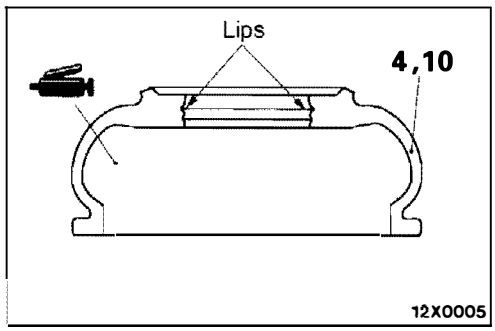
E33AI00AA

REMOVAL AND INSTALLATION

Post-installation Operation
- Front Wheel Alignment Adjustment (Refer to P. 33A-6.)



12X0143



Compression lower arm assembly removal steps

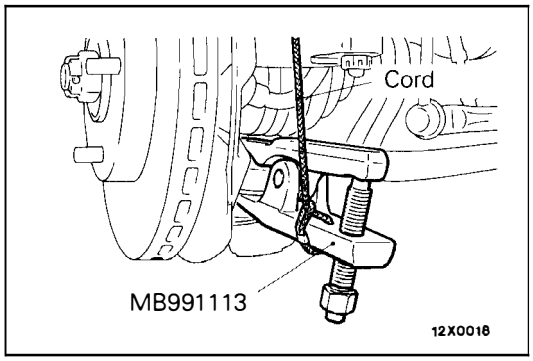
◊A◊ 1. Connection for compression lower arm ball joint and knuckle
2. Compression lower arm mounting bolt
3. Compression lower arm assembly
4. Dust cover

Lateral lower arm assembly removal steps

◊B◊ • Connection for front stroke sensor and rod (sensor side)<Vehicles with ACTIVE-ECS or ECS>

◊C◊ 5. Stay
6. Shock absorber lower mounting bolt and nut
7. Connection for lateral lower arm ball joint and knuckle
8. Lateral lower arm mounting bolt and nut
9. Lateral lower arm assembly
10. Dust cover

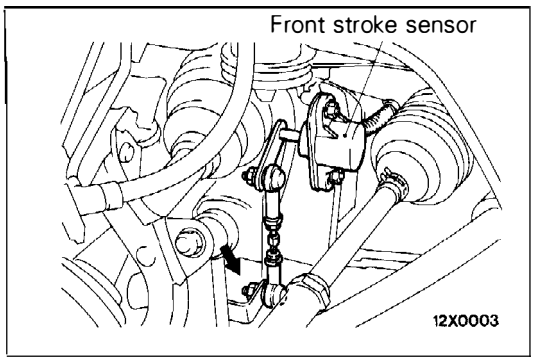
Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.**



REMOVAL SERVICE POINTS E33AI01AA

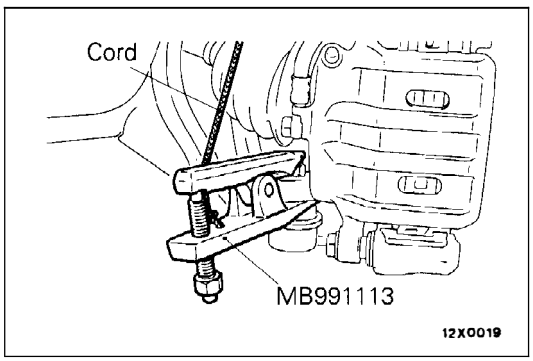
◇A◇ DISCONNECTION OF COMPRESSION LOWER ARM BALL JOINT AND KNUCKLE

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



◇B◇ DISCONNECTION OF FRONT STROKE SENSOR AND ROD (SENSOR SIDE)

Caution
Because there is the possibility that the front stroke sensor may generate an abnormality, the front stroke sensor rod connection (indicated by an arrow in the illustration) should first be disconnected.

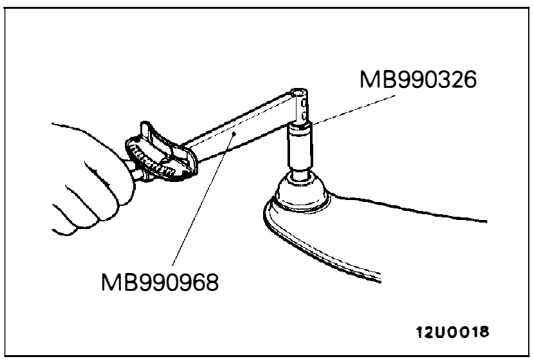


◇C◇ DISCONNECTION OF LATERAL LOWER ARM BALL JOINT AND KNUCKLE

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

INSPECTION E33AI02AA

- Check the bushings for wear and deterioration.
- Check the lower arm for bends or damage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



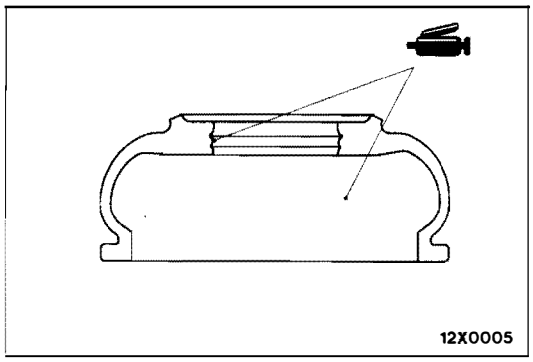
BALL JOINT STARTING TORQUE CHECK E33AI02BA

Compression lower arm ball joint

Standard value: 0.5–2.5 Nm

Lateral lower arm ball joint (When load is 3727 N)

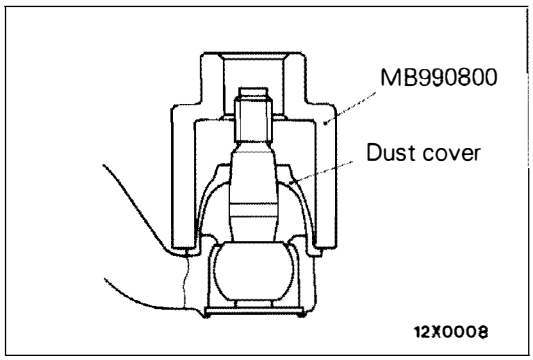
Standard value: 1.0–3.5 Nm



BALL JOINT DUST COVER REPLACEMENT

E33AI03AA

(1) Remove the dust cover.
(2) Apply multipurpose grease to the lip and inside of the dust cover.

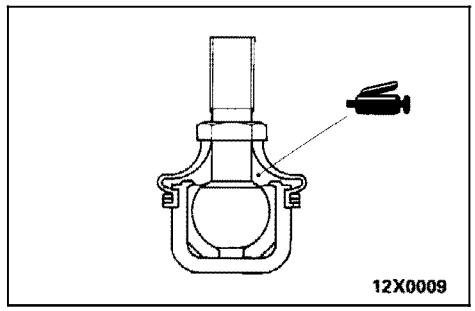


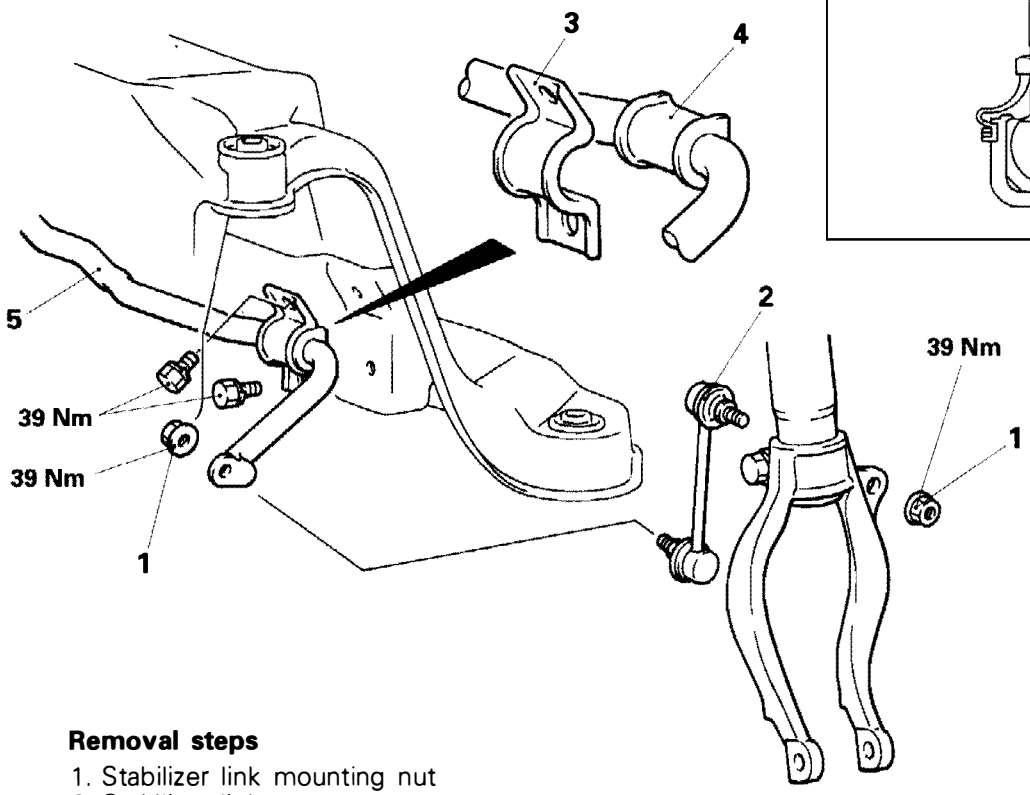
(3) Using the special tool, drive in the dust cover to the position shown in the illustration.

STABILIZER BAR

E33AJ00AA

REMOVAL AND INSTALLATION





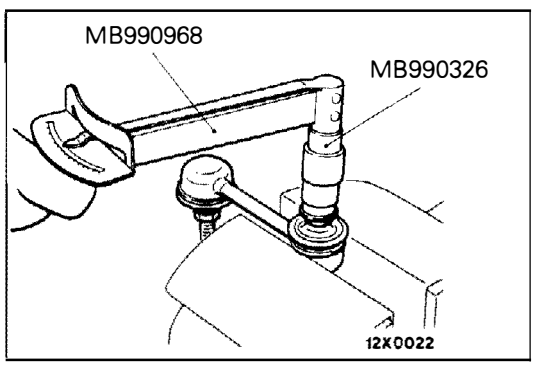
Removal steps

1. Stabilizer link mounting nut
2. Stabilizer link
◆A◆ 3. Stabilizer bar bracket
4. Bushing
5. Stabilizer bar

INSPECTION

E33AJ02AA

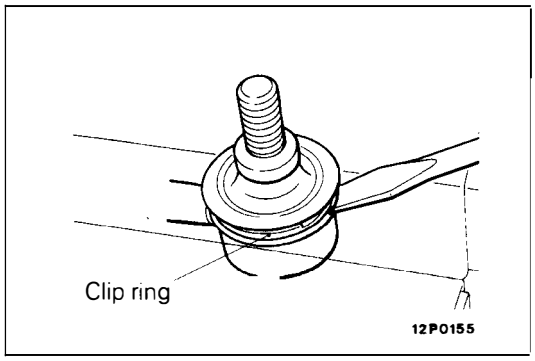
- Check the bushings for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check the stabilizer link ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



STABILIZER LINK BALL JOINT FOR STARTING TORQUE CHECK

E33AJ02BA

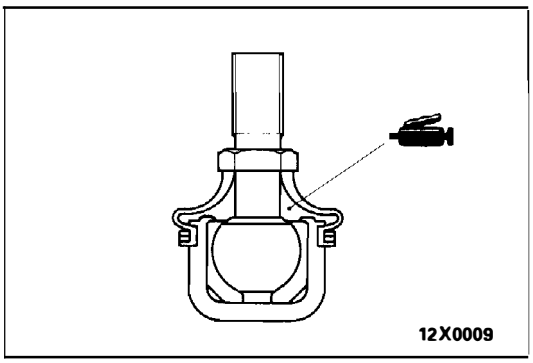
Standard value: 0.5–1.5 Nm



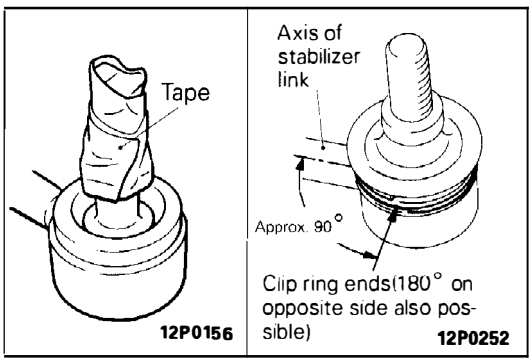
BALL JOINT DUST COVER REPLACEMENT

E33AJ03AA

(1) Remove the clip ring and the dust cover.

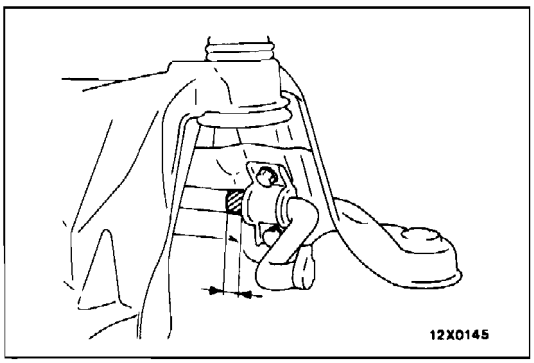


(2) Apply multipurpose grease to the lip and inside of the dust cover.



(3) Use vinyl tape to tape the stabilizer link where shown in the illustration, and then install the dust cover to the stabilizer link.
(4) Secure the dust cover by the clip ring.

NOTE
When installing the clip ring, align it so that its ends are located at a 90° angle from the axis of the stabilizer link.



INSTALLATION SERVICE POINTS

E33AJ04AA

◆A◆ 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

ELECTRONIC CONTROL SUSPENSION (ECS)

CONTENTS

E33BA00BA

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) – AIR BAG

(1) An SRS air bag for the driver's side is optional equipment in this vehicle.
(2) The SRS includes the following components: impact sensors, SRS diagnosis unit, SRS warning lamp, air bag module, clock spring, 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 (*).

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), before beginning any service or maintenance of any component of the SRS or any SRS-related component.

 PWDE9211

GENERAL INFORMATION

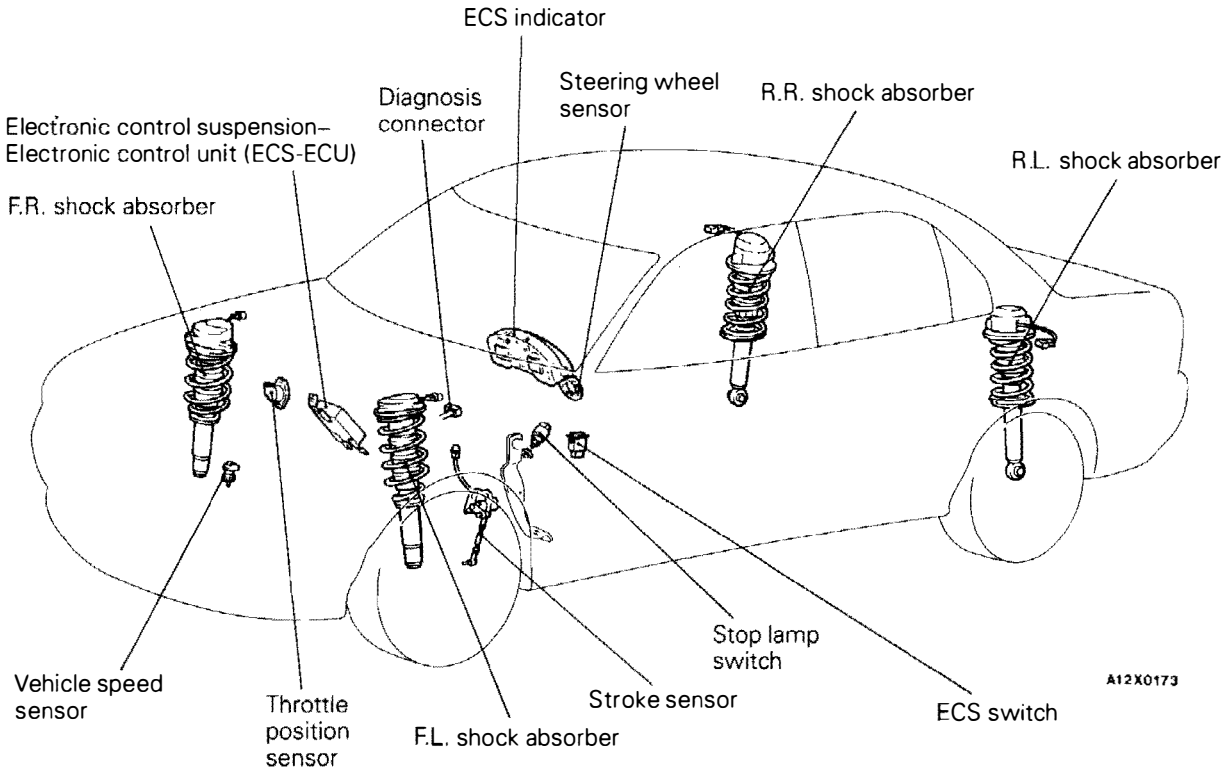
E33BB00AA

The conventional ECS function whereby the damping force of the shock absorbers is switched to the optimum setting depending on the driving conditions and the condition of the road surface has been enhanced by the addition of fuzzy logic control*. As a result, it is now possible for the system to make judgements about the road surface and the road environment, further improving riding comfort and steering stability.

NOTE
*: Control whereby the period of the suspension stroke and the stroke amount are inferred by fuzzy logic according to rules, and the damping force is consequently switched to obtain the optimum riding comfort.

Items	Front suspension	Rear suspension
Coil spring		
Wire dia. x O.D. x free length mm	12.7 x 70.7–110.7 x 350.0	10.9 x 95.9–103.9 x 366.5*1 11.0 x 96.0–104.0 x 376.0*2
Coil spring identification colour	Yellow green + Gray	Cream + Orange*1 Cream + Gray*2
Spring constant N/mm	37.2	21.0
Shock absorber		
Stroke mm	120	186
Damping force (at 0.3 m/sec.)		
Expansion N		
HARD	1961	1471
MEDIUM	1079	981
SOFT	588	490
Contraction N		
HARD	932	785
MEDIUM	637	490
SOFT	343	294

NOTE
*1: Sedan
*2: Hatchback



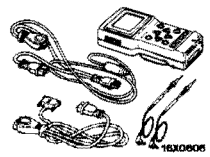
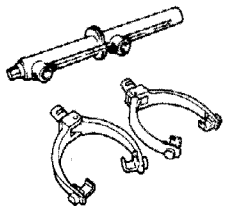
SERVICE SPECIFICATIONS

E33BC00AA

Items		Specifications
Standard value		
Toe		
At the centre of tyre tread	mm	0 ± 3
Toe angle (per wheel)		0 ± 9′
Toe-out angle on turn (inner wheel when outer wheel at 20°)		22°
Camber		0°10′ ± 30′
Caster		4°20′ ± 1°30′
Kingpin inclination		7°20′ ± 1°30′
Side slip	mm	0 ± 3
Wheel arch height to centre of wheel	mm	
Front		393 – 403
Rear		377 – 387

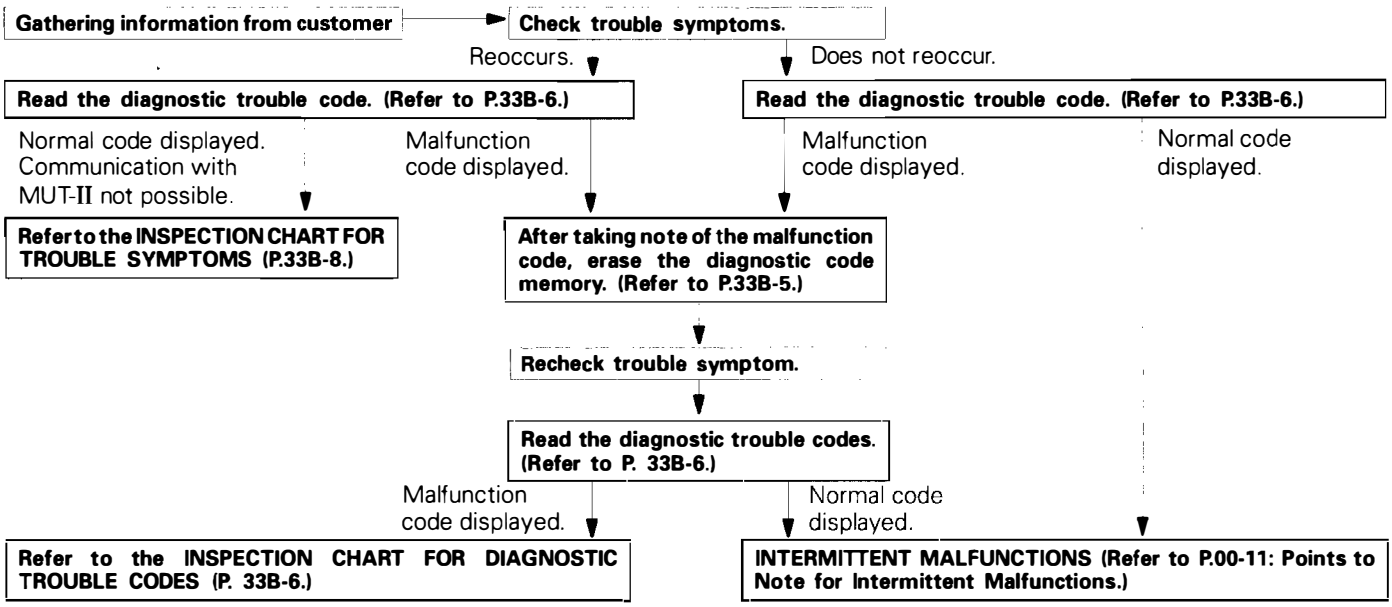
SPECIAL TOOLS

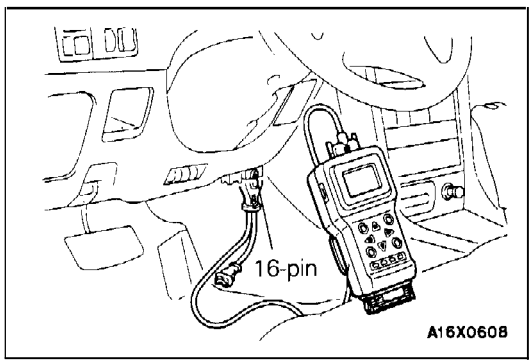
E33BD00AA

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Checking of diagnosis codes • Read-out of service data • Testing of the actuator
 16X0607		ROM pack	
	MB991237 MB991238 MB991239	Spring compressor body Arm set	• Compression of the front coil spring (MB991237, MB991238) • Compression of the rear coil spring (MB991237, MB991239)

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING E33BE00AA





DIAGNOSTIC FUNCTIONS E33BE01AA

METHOD OF READING THE DIAGNOSTIC TROUBLE CODES

Connect the MUT-II to the diagnostic connector under the instrument under cover, and then read the diagnostic trouble codes.

METHOD OF ERASING THE DIAGNOSTIC TROUBLE CODES

When Using the MUT-II

Connect the MUT-II to the diagnostic connector, and erase the diagnostic trouble codes.

When not Using the MUT-II

After removing the battery cable from the battery (–) terminal for 10 seconds or more, reconnect the cable.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODE

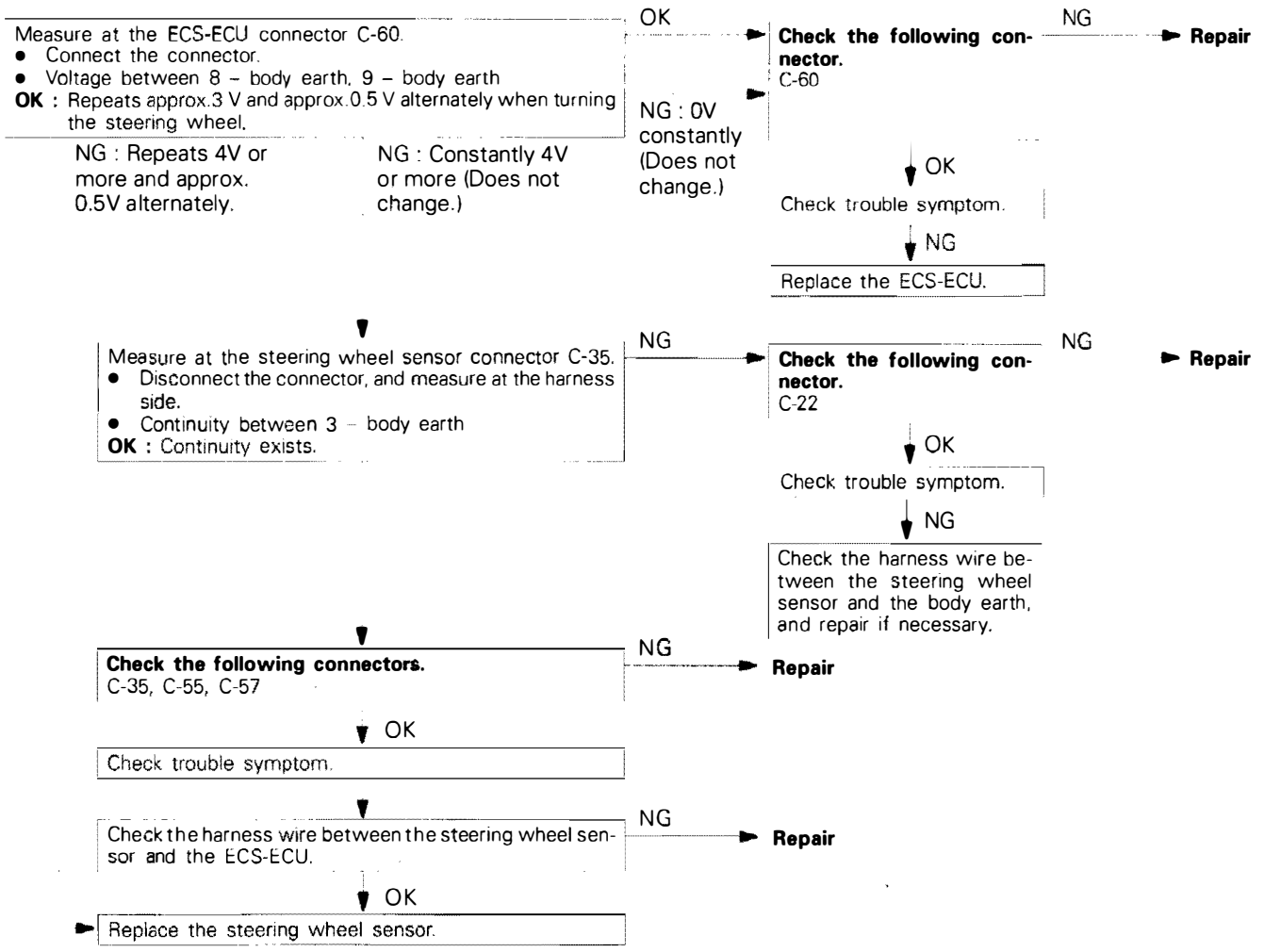
E33BE03AA

Code No.	Diagnostic item	Reference page	Code No.	Diagnostic item	Reference page
21	Steering wheel sensor system	P. 33B-6	24	Vehicle speed sensor system	P. 33B-7
22	Stroke sensor system	P. 33B-7	41	Actuator system	P. 33B-8

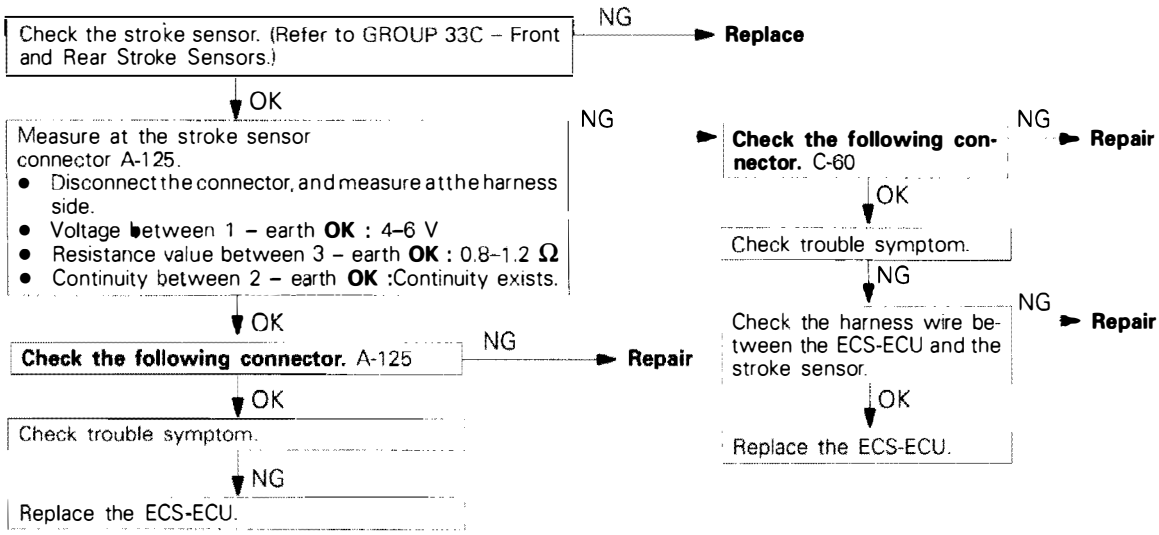
INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

E33BE04AA

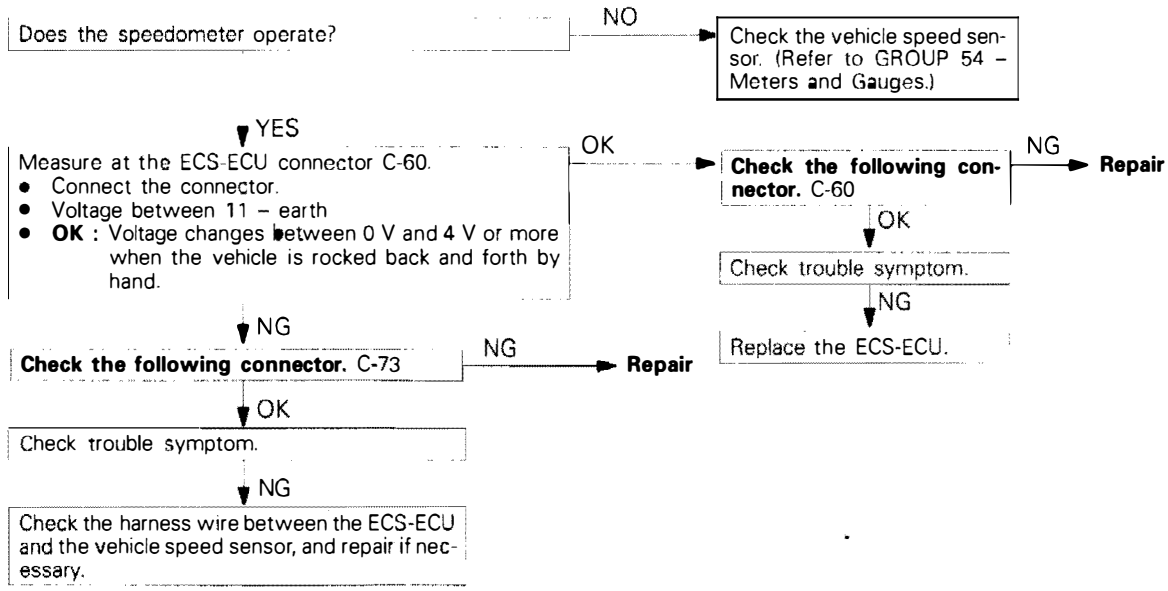
Code No. 21 **Steering wheel sensor system**	**Probable cause**
[Comment] This code is displayed when there is an open circuit in the output line of the steering wheel sensor circuit.	• Malfunction of the steering wheel sensor • Malfunction of the connector or harness wire • Malfunction of the ECS-ECU



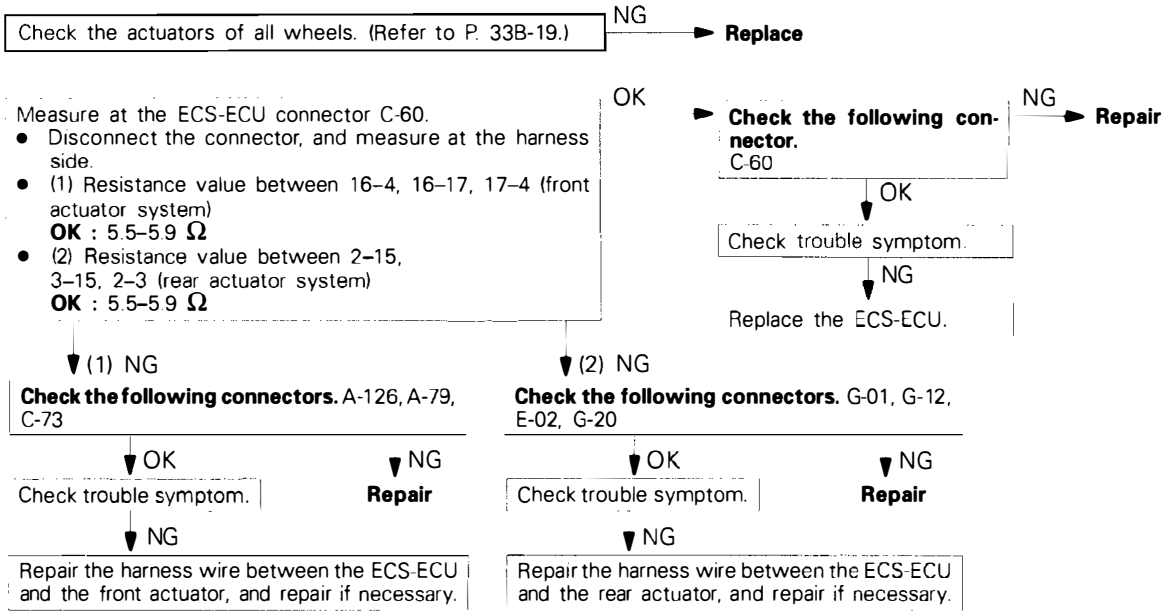
Code No. 22	Stroke sensor system	Probable cause
[Comment] This code is displayed when there is an open circuit or a short circuit in the stroke sensor circuit system.		• Malfunction of the stroke sensor • Malfunction of the connector or harness wire • Malfunction of the ECS-ECU



Code No. 24	Vehicle speed sensor system	Probable cause
[Comment] If a vehicle speed pulse is not detected when the throttle position opening angle is 30% or more for a continuous period of 60 seconds or more.		• Malfunction of the vehicle speed sensor • Malfunction of the connector or harness wire • Malfunction of the ECS-ECU



Code No. 41	Actuator circuit system	Probable cause
[Comment] This code is displayed when there is an open circuit or a short circuit in the actuator circuit system.		• Malfunction of the actuator • Malfunction of the connector or harness wire • Malfunction of the ECS-ECU.



INSPECTION CHART FOR TROUBLE SYMPTOMS

E33BE05AA

Trouble symptom		Inspection procedure	Reference page
Communication with MUT-II not possible	Communication with all systems is not possible.	1	P.33B-9
	Communication with ECS only is not possible.	2	P.33B-9
Troubles related to the ECS indicator lamp	The indicator lamp does not illuminate when the ignition key is turned to the ON position.	3	P. 33B-9
	The indicator lamp goes on and off.	Check diagnostic trouble code.	P. 33B-5
	The indicator lamp does not switch when the ECS switch is operated.	4	P. 33B-10
Variable shock absorber control does not function.	No vehicle speed switch control	5	P. 33B-10
	No anti-rolling control	6	P. 33B-11
	No anti-dive control	7	P.33B-11
	No anti-squat control	8	P. 33B-12
	Poor riding comfort	9	P. 33B-13
	The sound of the stopper hitting can be heard when riding over large bumps.	9	P. 33B-13

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE SYMPTOMS

E33BE06AA

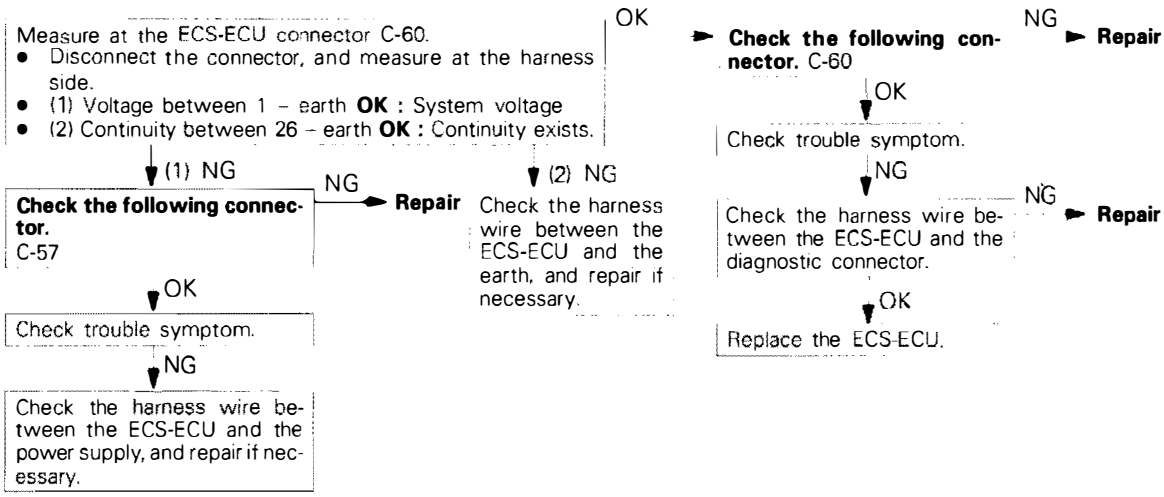
INSPECTION PROCEDURE 1

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

Refer to GROUP 13A – Troubleshooting.

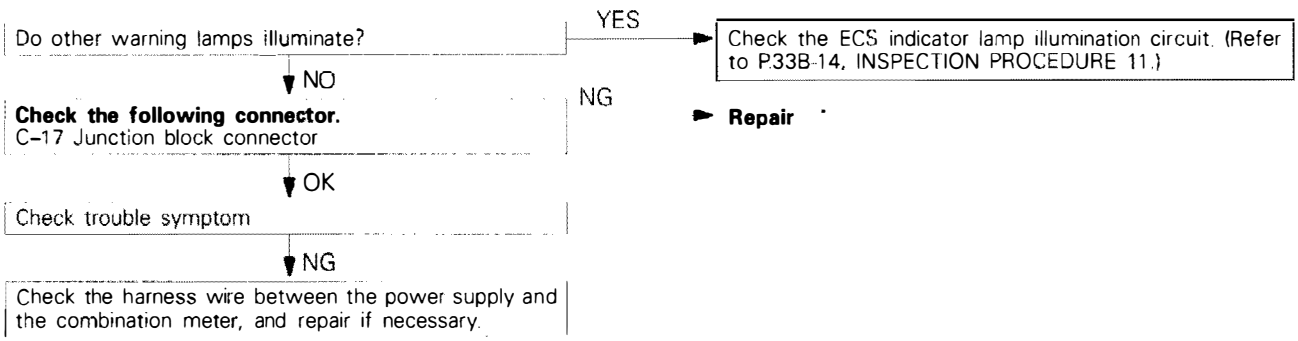
INSPECTION PROCEDURE 2

Communication with MUT-II not possible (Communication with ECS only is not possible.)	Probable cause
[Comment] If communication with the MUT-II is not possible, the reason is probably that diagnosis line is defective or the ECS-ECU is not functioning.	• Malfunction in the diagnostic line • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU



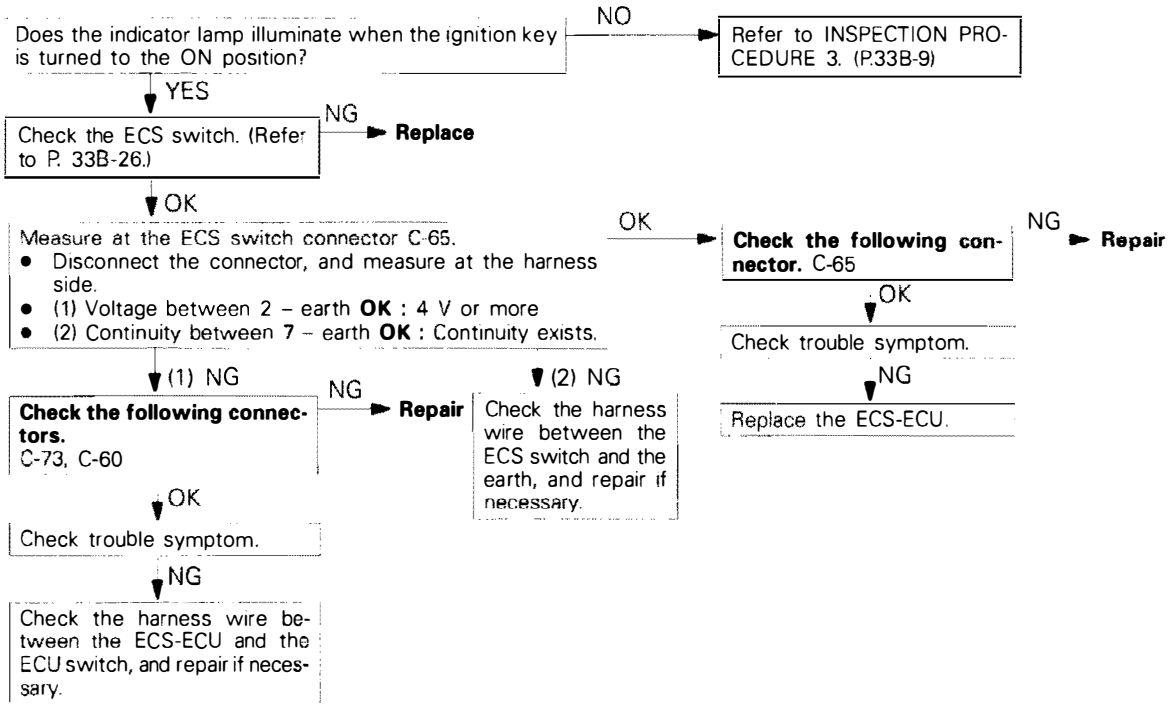
INSPECTION PROCEDURE 3

The indicator lamp does not illuminate when the ignition key is turned to the ON position.	Probable cause
[Comment] The reason is probably that the indicator lamp is blown or the ECS-ECU is malfunctioning.	• Burnt out indicator lamp bulb • Malfunction of the combination meter • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU



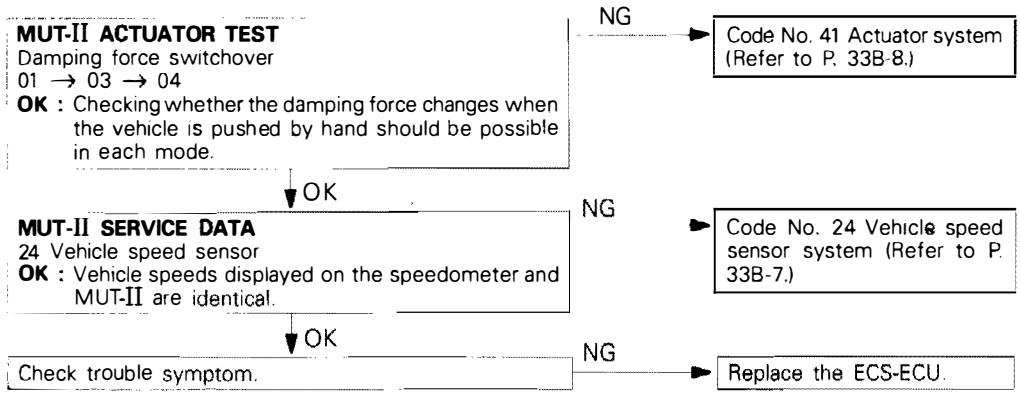
INSPECTION PROCEDURE 4

The indicator lamp does not switch when the ECS switch is operated.	**Probable cause**
[Comment] The reason is probably a defective switch, indicator lamp or ECS-ECU.	• Malfunction of the ECS switch • Malfunction of the indicator lamp • Malfunction of the connector or the hamess wire • Malfunction of the ECS-ECU



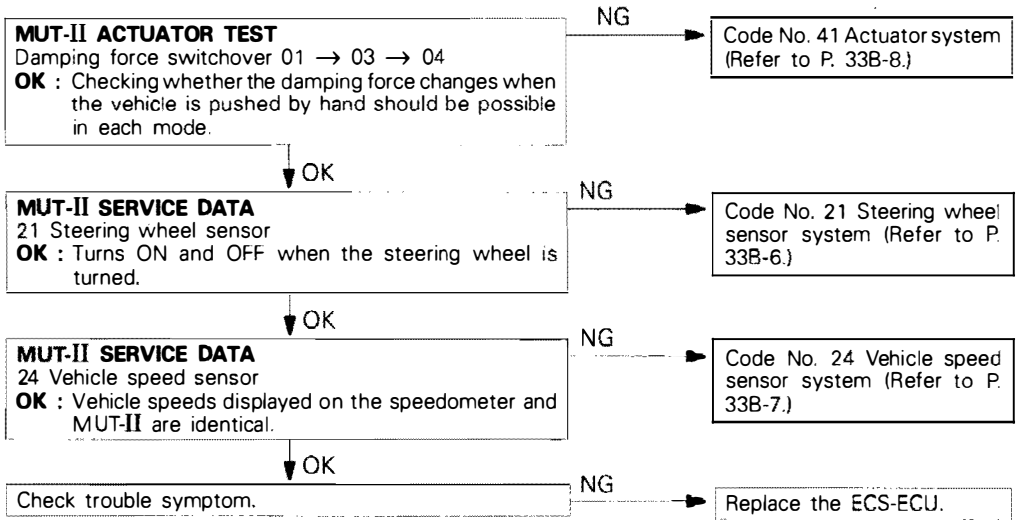
INSPECTION PROCEDURE 5

No vehicle speed switch control	**Probable cause**
[Comment] The reason why the damping force is not switching in response to vehicle speed is probably a defective damping force switching actuator or a defective vehicle speed sensor.	• Malfunction of the actuator • Malfunction of the vehicle speed sensor • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU



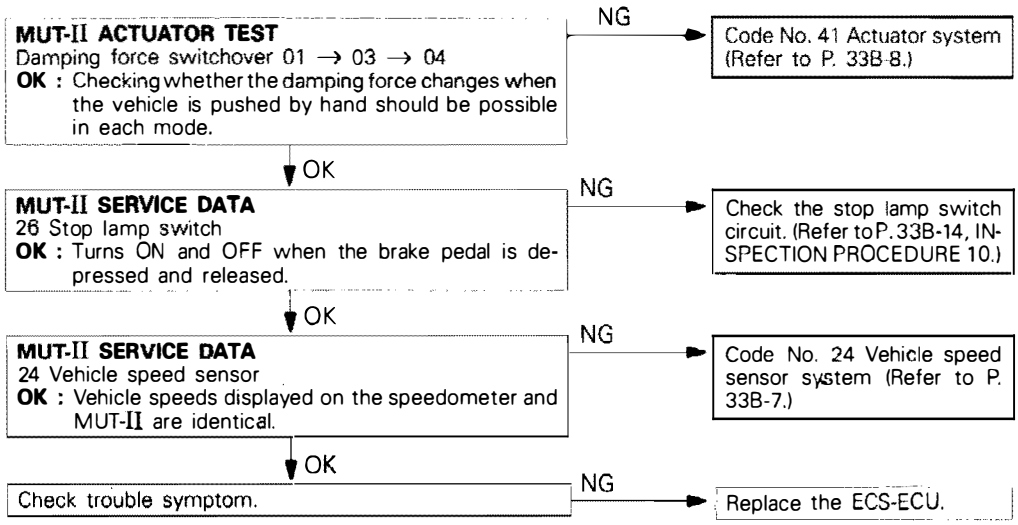
INSPECTION PROCEDURE 6

No anti-rolling control	Probable cause
[Comment] If anti-roll control does not function, the reason is probably a defective steering wheel sensor, vehicle speed sensor or actuator.	• Malfunction of the actuator • Malfunction of the steering wheel sensor • Malfunction of the vehicle speed sensor • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU



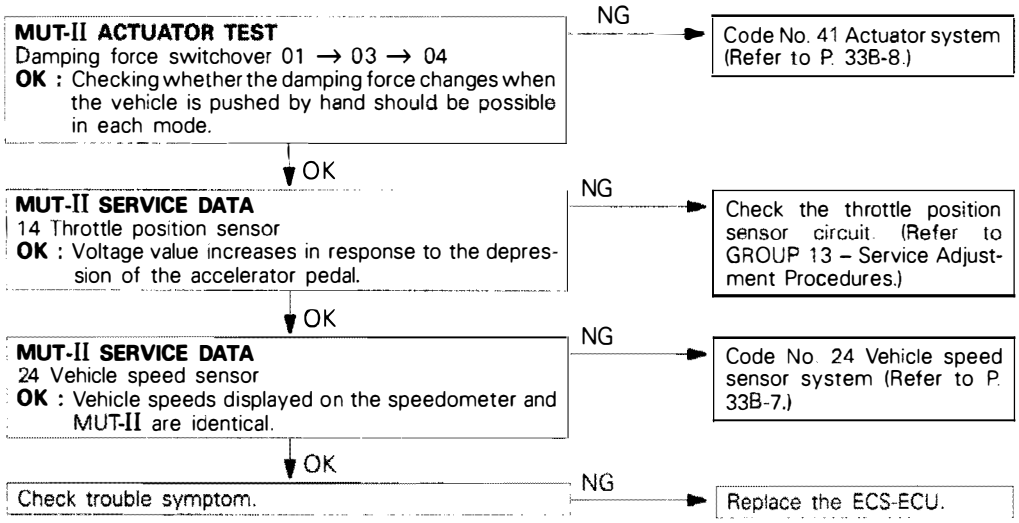
INSPECTION PROCEDURE 7

No anti-dive control	Probable cause
[Comment] If anti-dive control does not function, the reason is probably a defective stop lamp switch, vehicle speed sensor or actuator.	• Malfunction of the actuator • Malfunction of the stop lamp switch • Malfunction of the vehicle speed sensor • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU



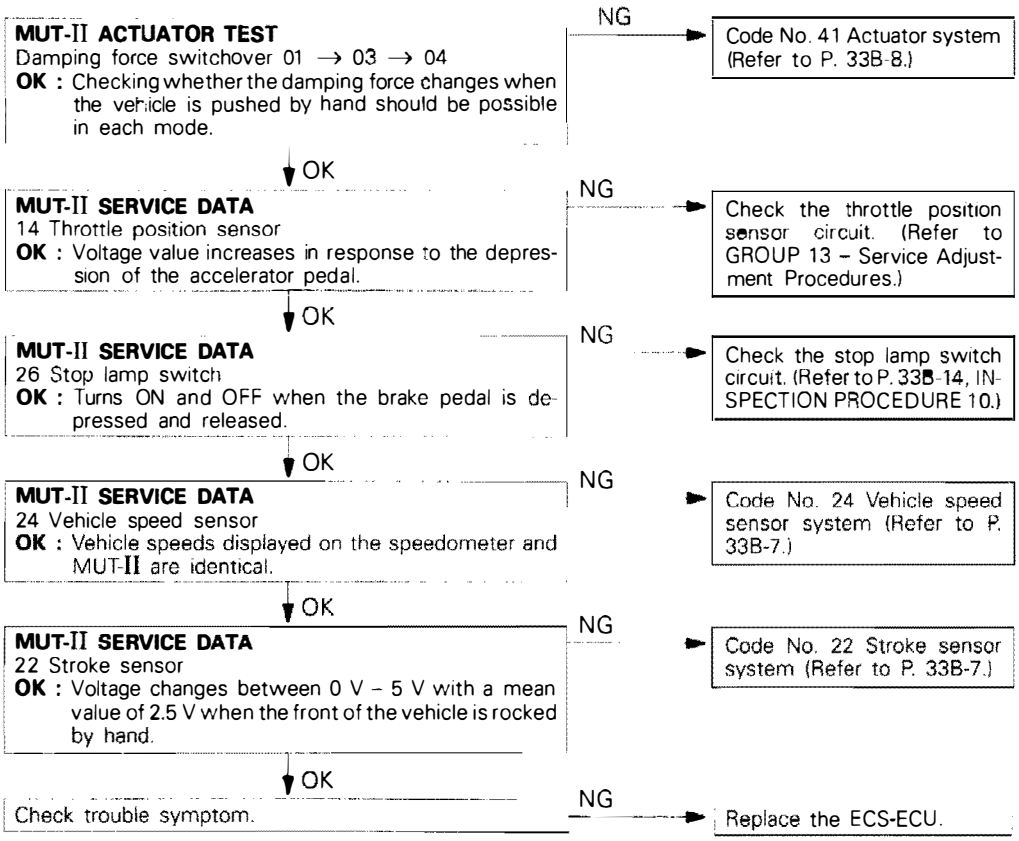
INSPECTION PROCEDURE 8

No anti-squat control	Probable cause
[Comment] If anti-squat control does not function, the reason is probably a defective actuator, throttle position sensor or vehicle speed sensor.	• Malfunction of the actuator • Malfunction of the throttle position sensor • Malfunction of the vehicle speed sensor • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU.



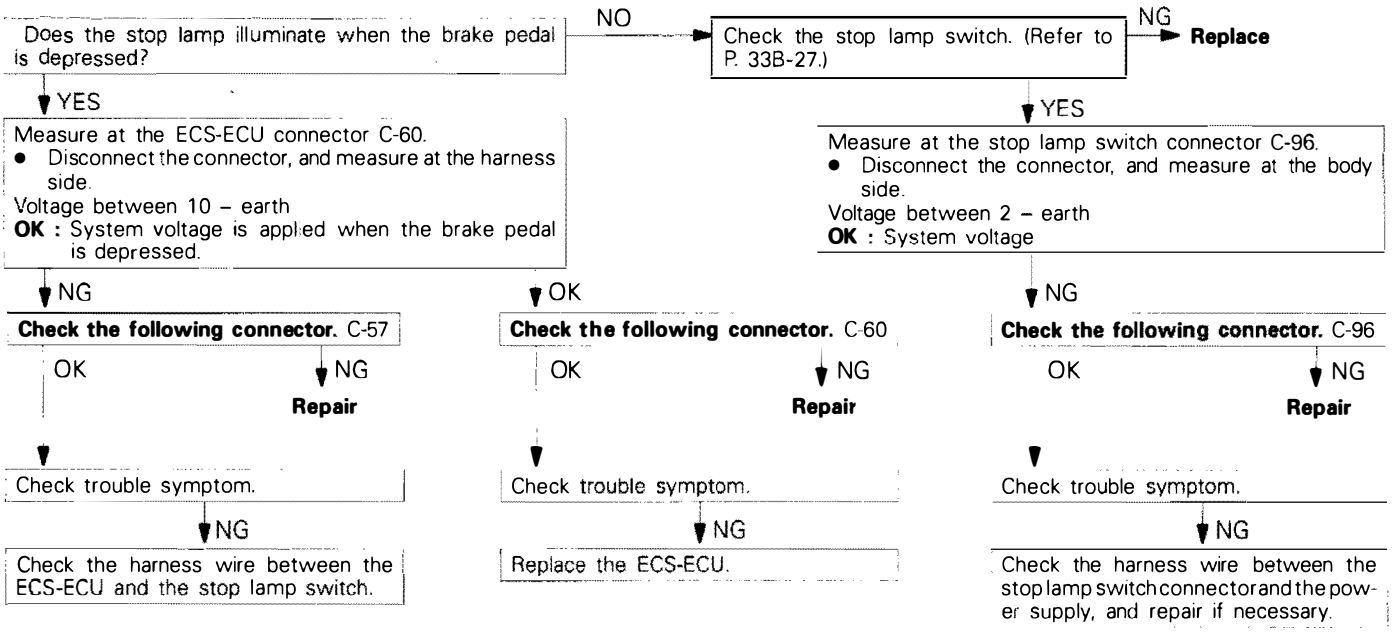
INSPECTION PROCEDURE 9

Poor riding comfort **The sound of the stopper hitting can be heard when riding over large bumps.**	**Probable cause**
[Comment] If riding comfort seems to be worsening, inspect all of the sensor and actuator systems.	• Malfunction of the actuator • Malfunction of the throttle position sensor • Malfunction of the stop lamp switch • Malfunction of the vehicle speed sensor • Malfunction of the stroke sensor • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU



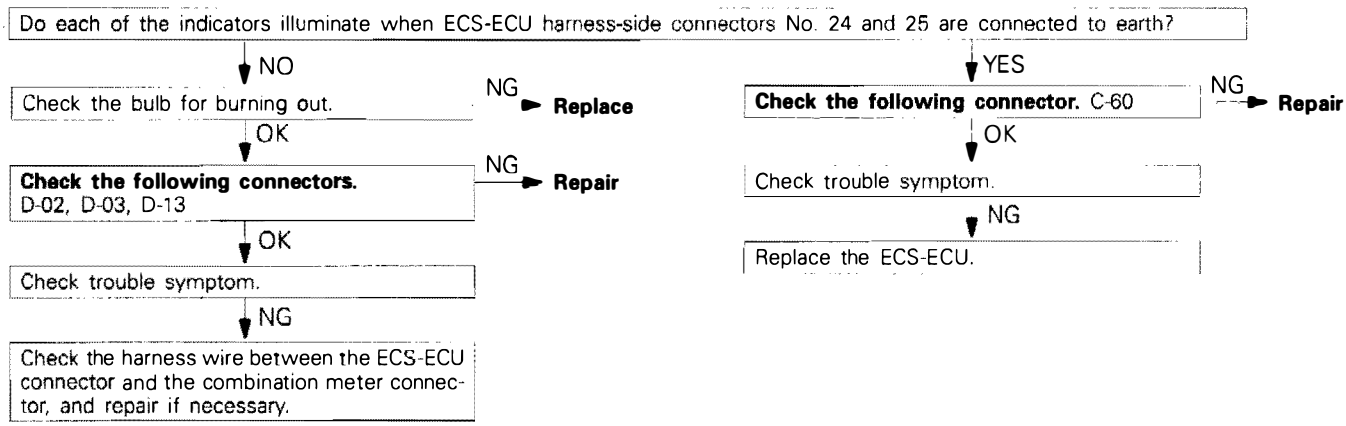
INSPECTION PROCEDURE 10

Stop lamp switch circuit inspection



INSPECTION PROCEDURE 11

ECS indicator illumination circuit inspection



SERVICE DATA REFERENCE CHART

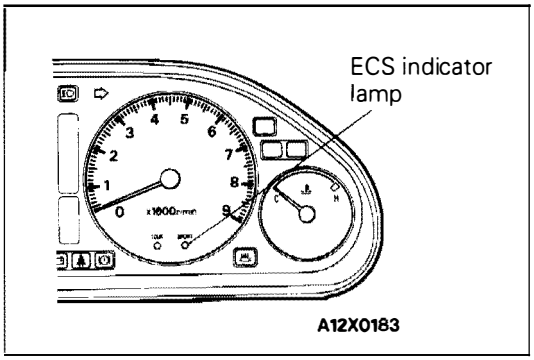
E33BE07AA

Item No.	Check item	Check condition	Normal condition
14	Throttle position sensor	Throttle valve is fully closed.	300–1 000 mV
		Depress the accelerator pedal slowly.	Voltage increases gradually.
		Throttle valve is fully opened.	4 500–5 500 mV
21	Steering wheel sensor	When the steering wheel is gently turned to the right, the ST1 and ST2 displays change as shown at right.	ST1 ON ON OFF OFF ST2 ON OFF OFF ON
		When the steering wheel is gently turned to the left, the ST1 and ST2 displays change as shown at right.	ST1 ON OFF OFF ON ST2 ON ON OFF OFF
22	Stroke sensor	Rock the front of the vehicle by hand to change the vehicle height.	Changes within the range below. 0–5V
24	Vehicle speed sensor	Carry out a road test.	Vehicle speeds displayed on the speedometer and MUT-II are identical.
26	Stop lamp switch	Brake pedal depressed	ON
		Brake pedal not depressed	OFF

CHECK AT THE ECU TERMINALS

E33BE08AA

Terminal No.	Check item	Item	Check condition	Normal condition
1	Power supply voltage	Voltage	Ignition switch: ON	System voltage
2	Rear actuator	Resistance	Between terminal No. 2 and No. 3	5.5–5.9 Ω
			Between terminal No. 2 and No.15	
3	Rear actuator	Resistance	Between terminal No. 3 and No. 15	5.5–5.9 Ω
4	Front actuator	Resistance	Between terminal No. 4 and No. 16	5.5–5.9 Ω
			Between terminal No. 4 and No. 17	
7	Stroke sensor	Voltage	Ignition switch: ON	4–6 V
8	Steering wheel sensor	Voltage	Turn the steering wheel.	Repeat approx. 3V and approx. 0.5V alternately.
9	Steering wheel sensor	Voltage	Turn the steering wheel.	Repeat approx. 3V and approx. 0.5V alternately.
10	Stop lamp switch	Voltage	Brake pedal depressed	5V
11	Vehicle speed sensor	Voltage	Push the vehicle by hand.	Repeat approx. 4V or more and 0V alternately.
13	Diagnostic output	—		
14	Power supply for memory back-up	Voltage	Ignition switch: OFF	System voltage
16	Front actuator	Voltage	Between terminal No. 16 and No. 17	5.5–5.9 Ω
19	Diagnosis control input	Voltage	Ignition switch: ON	4–5 V
20	ECS switch	Continuity	Press the ECS switch.	Continuity exists.
21	Stroke sensor	Resistance	Resistance between sensor and terminal (7) changes as the vehicle body moves up and down.	
23	Throttle position sensor	Resistance	Resistance between sensor and earth changes as the accelerator pedal is depressed and released.	
24	Indicator lamp	Voltage	Ignition switch: ON	System voltage
25	Indicator lamp	Voltage	Ignition switch: ON	System voltage
26	GND	Continuity	Constantly	Continuity exists.



SERVICE ADJUSTMENT PROCEDURES

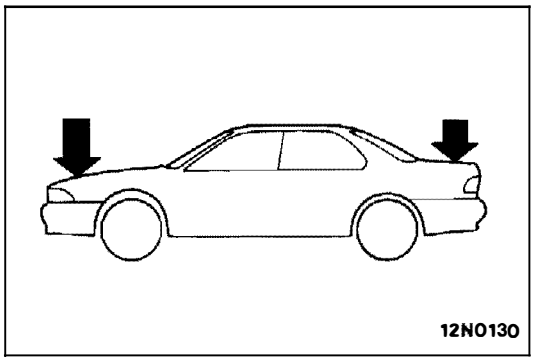
E33BF00AA

WARNING DISPLAY BY MEANS OF THE ECS INDICATOR LAMP

If an abnormality occurs in one of the following items, the ECS indicator lamp (Tour and Sport) inside the combination meter will flash at 0.5-second intervals.
At the same time, diagnosis codes corresponding to the trouble symptoms will be output to the diagnosis connector.

WARNING DISPLAY ITEMS

Malfunction of the steering wheel sensor system
Malfunction of the stroke sensor system
Malfunction of the vehicle speed sensor system
Malfunction of the actuator system



DAMPING FORCE CHECK

E33BF01AA

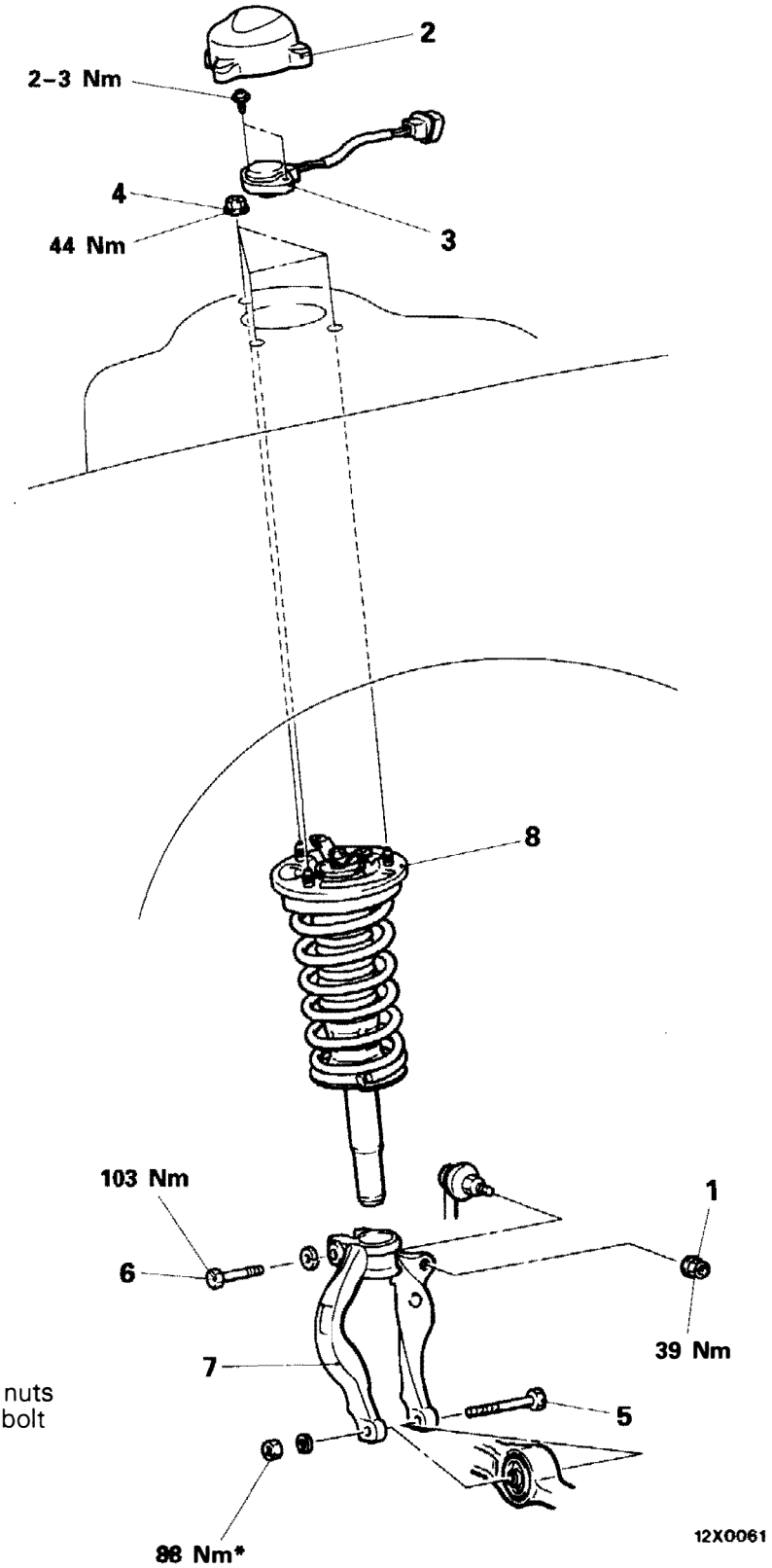
1. Turn the ignition switch to ON.
2. Press the ECS switch to set the control mode to TOUR.
3. Rock the front and rear of the vehicle strongly and check to be sure that the damping force is at SOFT.
4. Press the ECS switch to switch the control mode to SPORT.
5. Rock the front and rear of the vehicle strongly once more and check to be sure that the damping force is firmer compared to the SOFT condition.

FRONT SHOCK ABSORBER ASSEMBLY

REMOVAL AND INSTALLATION

E33BG00AC

Post-installation Operation
- Front Wheel Alignment Adjustment (Refer to GROUP 33A – Service Adjustment Procedures.)



Removal steps
1. Stabilizer link mounting nut
2. Front actuator cover
3. Actuator assembly
4. Shock absorber upper mounting nuts
5. Shock absorber lower mounting bolt
6. Damper fork mounting bolt
7. Damper fork
8. Shock absorber assembly

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

INSPECTION

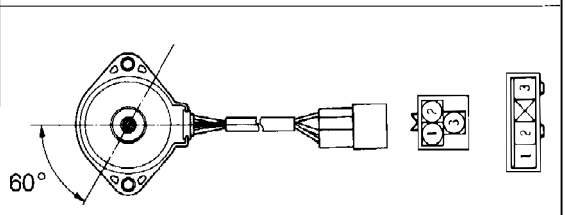
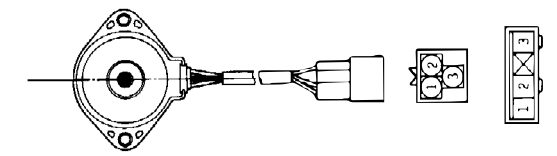
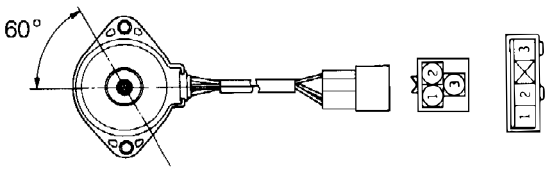
E33BG02AA

- Check for oil leaks from the shock absorber assembly.
- Check the shock absorber for damage or deformation.

ACTUATOR CHECK

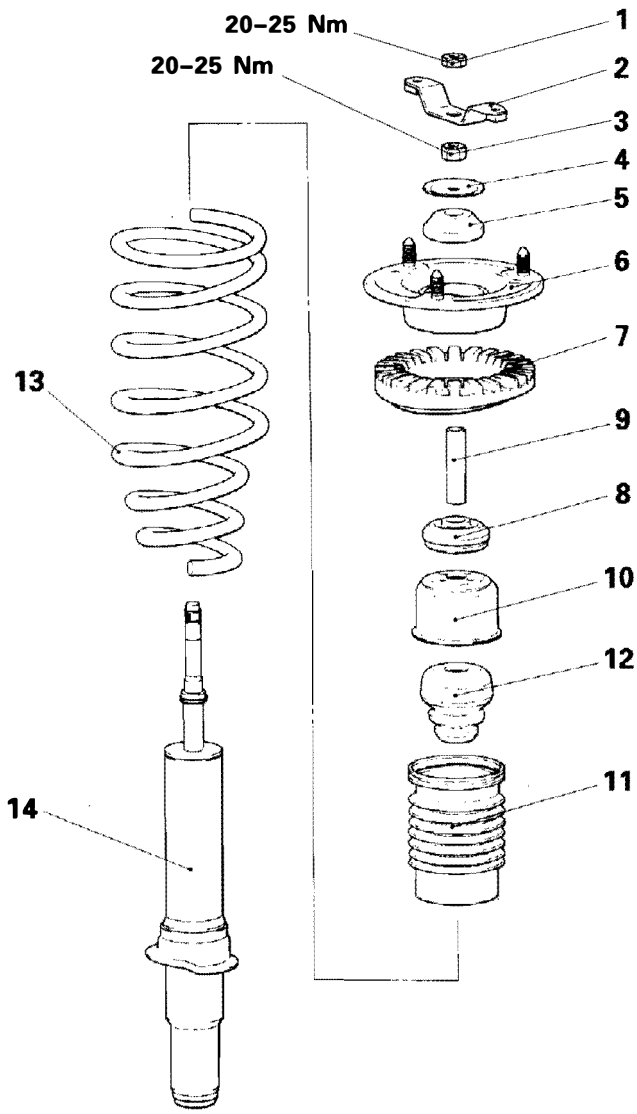
E33BG02BA

Check to be sure that the actuator output shaft is in the position shown in the illustration below when battery voltage is applied between the actuator connector terminals.

Terminal	Voltage	Actuator output shaft position
1 (White)	–	
2 (Black)	None	
3 (Red)	+	
1 (White)	+	
2 (Black)	–	
3 (Red)	None	
1 (White)	None	
2 (Black)	+	
3 (Red)	–	

DISASSEMBLY AND REASSEMBLY

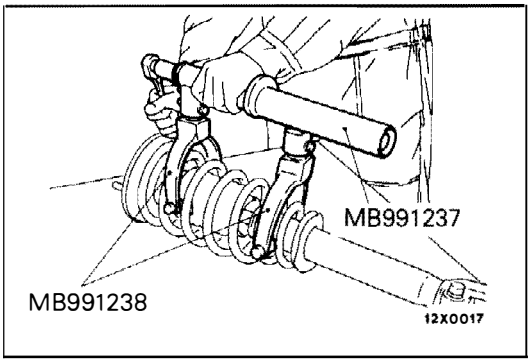
E33BG05AA



12X0060

Disassembly steps

1. Nut
2. Actuator bracket
◇A◇ ◆C◆ 3. Nut
4. Washer
5. Upper bushing A
◆B◆ 6. Upper bracket assembly
7. Upper spring pad
8. Upper bushing B
9. Collar
10. Cup assembly
11. Dust cover
12. Bump rubber
◆A◆ 13. Coil spring
14. Shock absorber assembly



DISASSEMBLY SERVICE POINTS

E33BG06AA

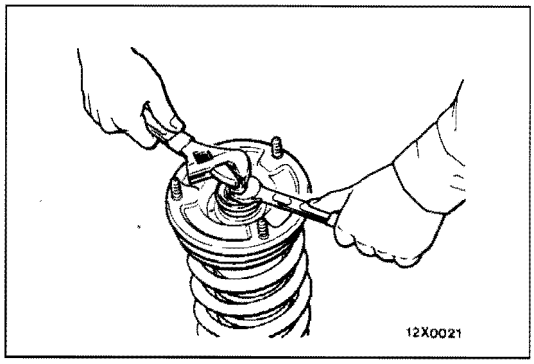
◇A◇ NUT REMOVAL

(1) Compress the coil spring using the special tools.

NOTE
Install the special tools evenly, and so that the maximum length will be attained within the installation range.

Caution
An air tool should not be used for the tightening of the special tool bolt.

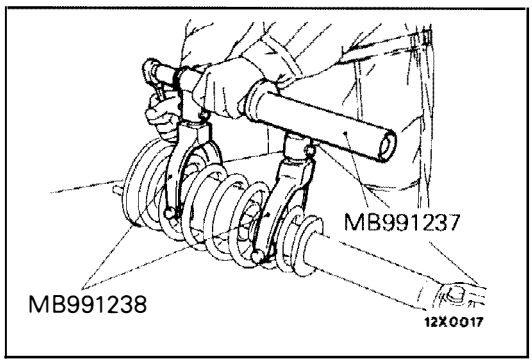
PWDE9211



(2) While holding the piston rod, remove the nut.

INSPECTION E33BG07AA

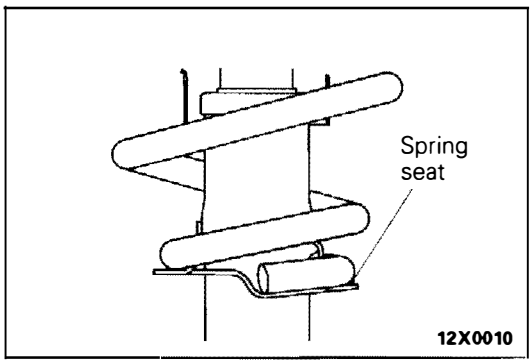
- Check the rubber parts for damage or deterioration.
- Check the coil spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.



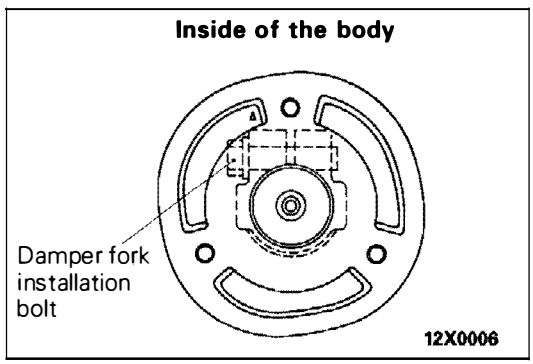
REASSEMBLY SERVICE POINTS E33BG08AA

◗A◖ COIL SPRING INSTALLATION

(1) Use the special tools to compress the coil spring and install it to the shock absorber.



(2) Align the edge of the coil spring to the stepped part of the shock absorber spring seat.



◗B◖ UPPER BRACKET ASSEMBLY INSTALLATION

Install so that the position of the three bolts are as shown in the illustration with respect to the damper fork installation bolt.

◗C◖ NUT INSTALLATION

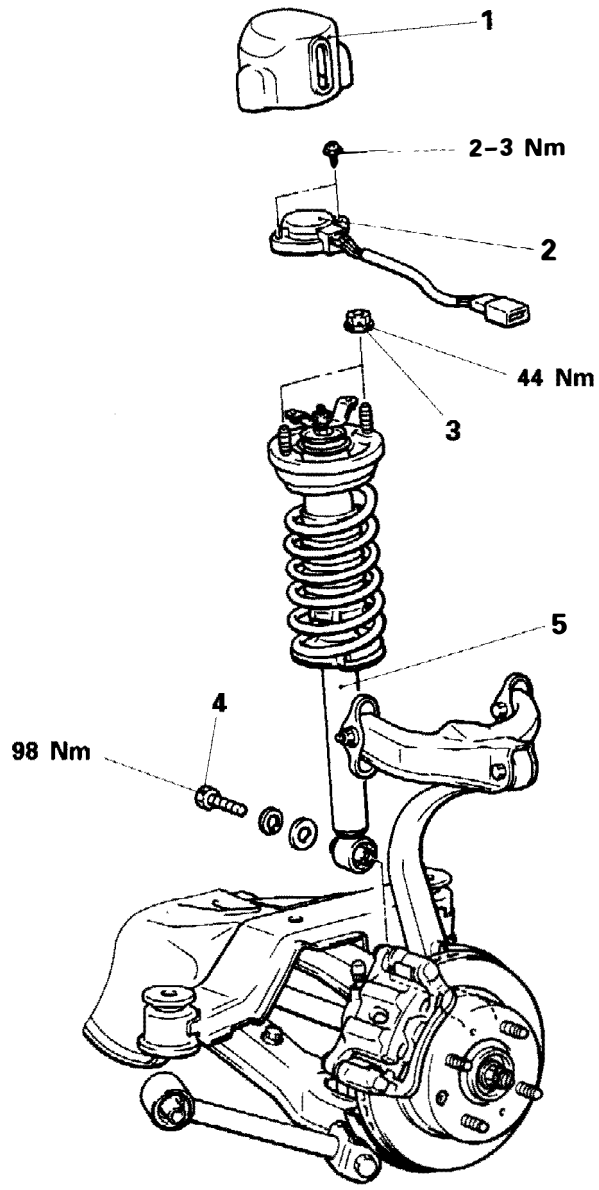
(1) Temporarily tighten the nut.
(2) Remove the special tools (MB991237, MB991238), and tighten the nut at the specified torque.

REAR SHOCK ABSORBER ASSEMBLY

REMOVAL AND INSTALLATION

E33BH00AA

Pre-removal and Post-installation Operation
- Front Shelf Cover Removal and Installation <Sedan> (Refer to GROUP 52A – Trims.)
- Absorber Lid Removal and Installation <Hatchback> (Refer to GROUP 52A – Trims.)



Removal steps
1. Rear actuator cover
2. Actuator assembly
3. Flange nut
4. Bolt
5. Shock absorber assembly

INSPECTION

E33BH02AA

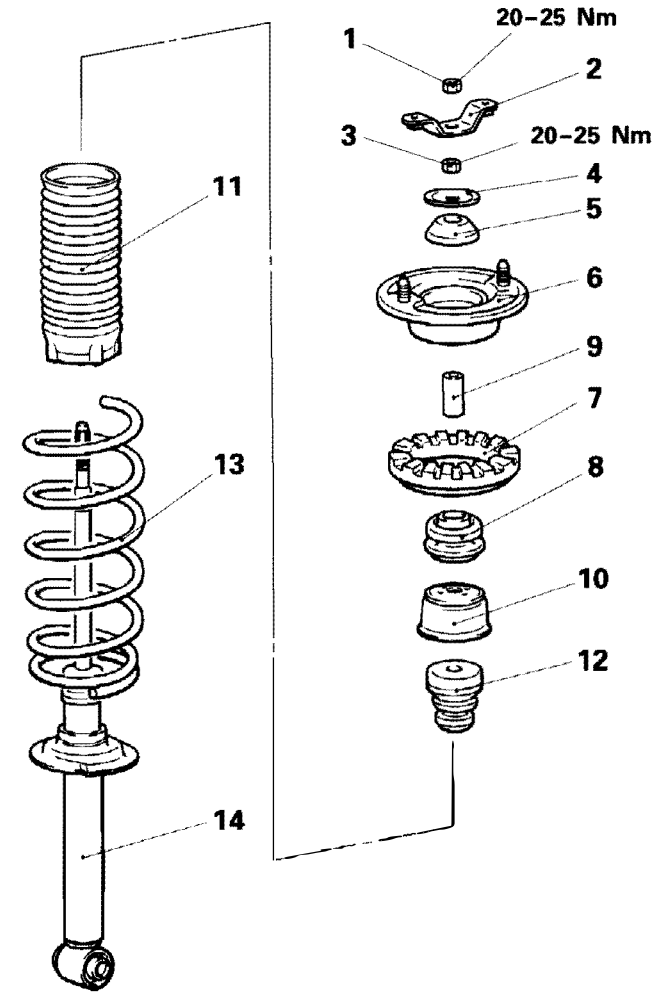
- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage or abnormal noise.

ACTUATOR CHECK

Refer to P. 33B-19.

DISASSEMBLY AND REASSEMBLY

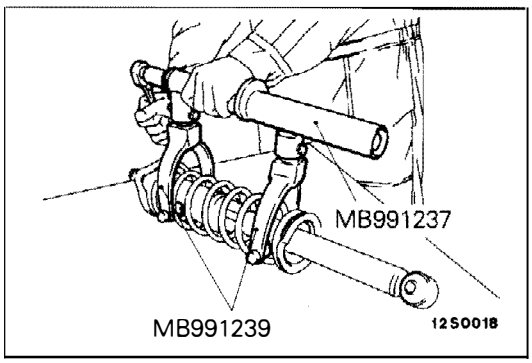
E33BH05AA

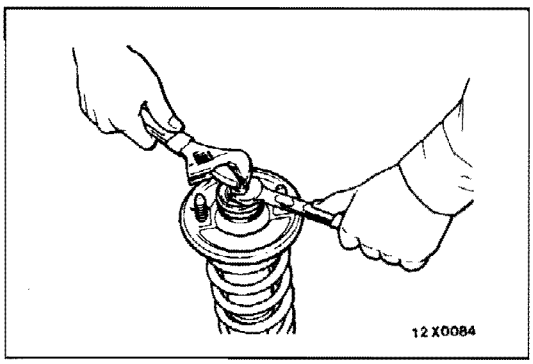


12X0062

Disassembly steps

1. Nut
2. Actuator bracket
3. Nut
4. Washer
5. Upper bushing A
6. Bracket assembly
7. Spring pad
8. Upper bushing B
9. Collar
10. Cup
11. Dust cover
12. Bump rubber
13. Coil spring
14. Shock absorber assembly





DISASSEMBLY SERVICE POINTS

E33BH06AA

⟨A⟩ NUT REMOVAL

(1) Compress the coil spring using the special tools.

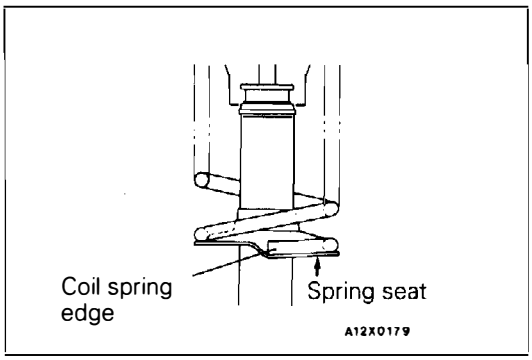
NOTE
Install the special tools evenly and so that the maximum length will be attained within the installation range.

Caution
An air tool should not be used for the tightening of the special tool bolt.

(2) While holding the piston rod, remove the nut.

INSPECTION E33BH07AA

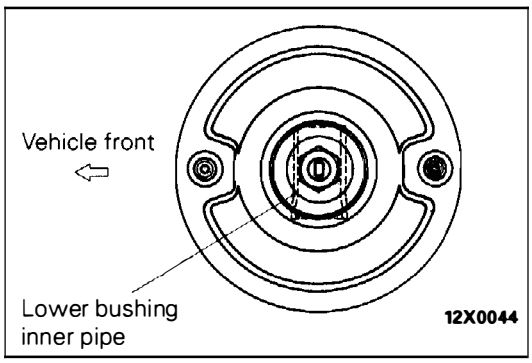
- Check the rubber parts for damage
- Check the coil springs for crack, damage or deterioration.
- Check the shock absorber for oil leakage malfunction and abnormal sound.



REASSEMBLY SERVICE POINTS E33BH08AA

◗A◖ COIL SPRING INSTALLATION

(1) Use the special tools (MB991237 and MB991239) to compress the coil spring and install it to the shock absorber seat.
(2) Align the edge of the coil spring to the stepped part of the shock absorber spring seat.



◗B◖ BRACKET ASSEMBLY INSTALLATION

Install the bracket assembly so that its position is as shown in the illustration.

◗C◖ NUT INSTALLATION

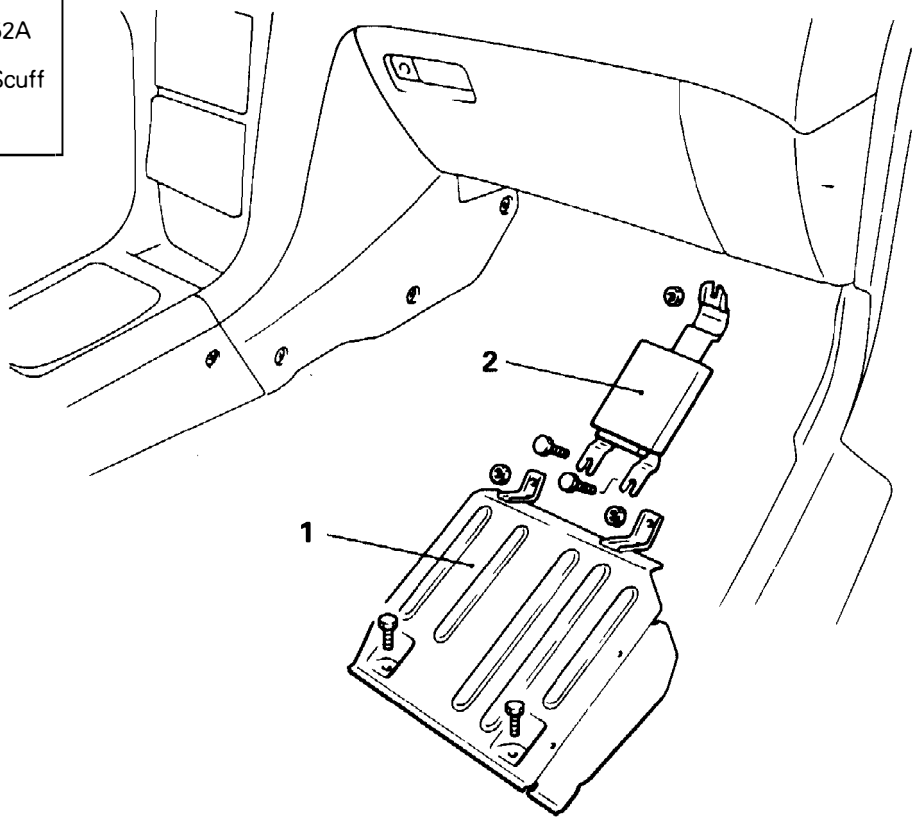
(1) Temporarily tighten the nut.
(2) Remove the special tools (MB991237, MB991238), and tighten the nut at the specified torque.

ECS-ECU

REMOVAL AND INSTALLATION

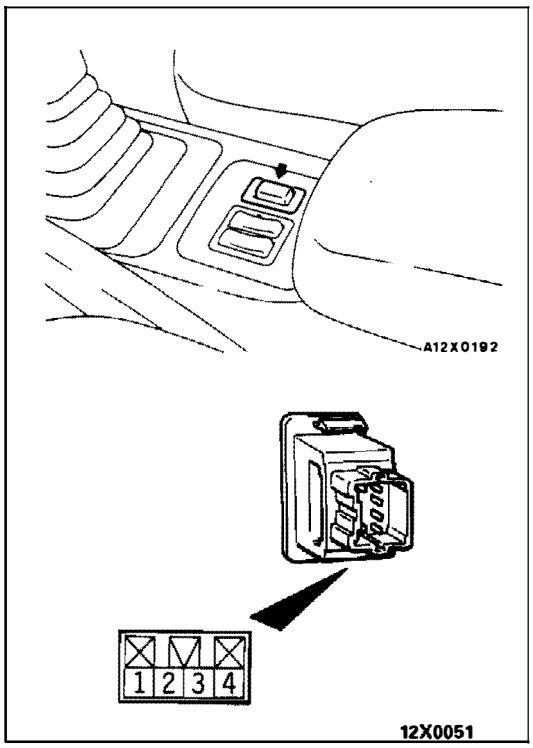
E33BI00AA

Pre-removal and Post-installation Operation
Removal and Installation
- Under Cover (Refer to GROUP 52A – Instrument Panel.)
- Cowl Side Trim (RH) and Front Scuff Plate (Refer to GROUP 52A – Trims.)



Removal steps
1. Control unit cover
2. ECS-ECU

A12X0186



SWITCH AND SENSOR E33BJ10AA

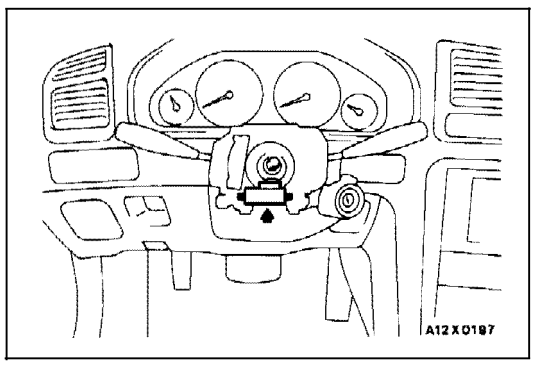
ECS SWITCH

INSPECTION

(1) Remove the ECS switch from the floor console. (Refer to GROUP 52A – Console Box.)
(2) Operate the switch and check for continuity between the terminals.

Switch position		Terminal 2	4	1	3
ECS switch	ON	○—○		○—○	
	OFF	○—○			

NOTE
○—○ indicates that there is continuity between the terminals.



STEERING WHEEL SENSOR E33BJ11AA

For removal and installation, refer to GROUP 33C – ACTIVE ECS Sensor and Switch.

Caution: SRS
When removing the air bag module and clock spring, refer to GROUP 52B – SRS Air Bag Precautions Before Service and GROUP 52B – Air Bag Module and Clock Spring before carrying out these operations.

INSPECTION

Refer to GROUP 13H – Troubleshooting.

VEHICLE SPEED SENSOR E33BJ12AA

For removal, installation and inspection, refer to GROUP 54 – Meters and Gauges.

STROKE SENSOR E33BJ13AA

For removal, installation and inspection, refer to GROUP 33C – Front and Rear Stroke Sensors.

THROTTLE POSITION SENSOR E33BJ14AA

INSPECTION AND ADJUSTMENT

Refer to GROUP 13A – Service Adjustment Procedures, Sensor Inspection and Adjustment of Throttle Position Sensor.

STOP LAMP SWITCH E33BJ15AA

For removal, installation and inspection, refer to GROUP 35A – Brake Pedal.

ECS INDICATOR LAMP E33BJ16AA

For removal and installation, refer to GROUP 54 – Meters and Gauges.

ELECTRONIC CONTROL SUSPENSION (ACTIVE-ECS)

CONTENTS

E33CA00BA

CONTINUED ON NEXT PAGE

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) – AIR BAG

(1) An SRS air bag for the driver's side seat is optional equipment in this vehicle.
(2) The SRS includes the following components: impact sensors, SRS diagnosis unit, SRS warning lamp, air bag module, clock spring, 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 (*).

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), before beginning any service or maintenance of any component of the SRS or any SRS-related component.

 PWDE9211

GENERAL INFORMATION

E33CB00AA

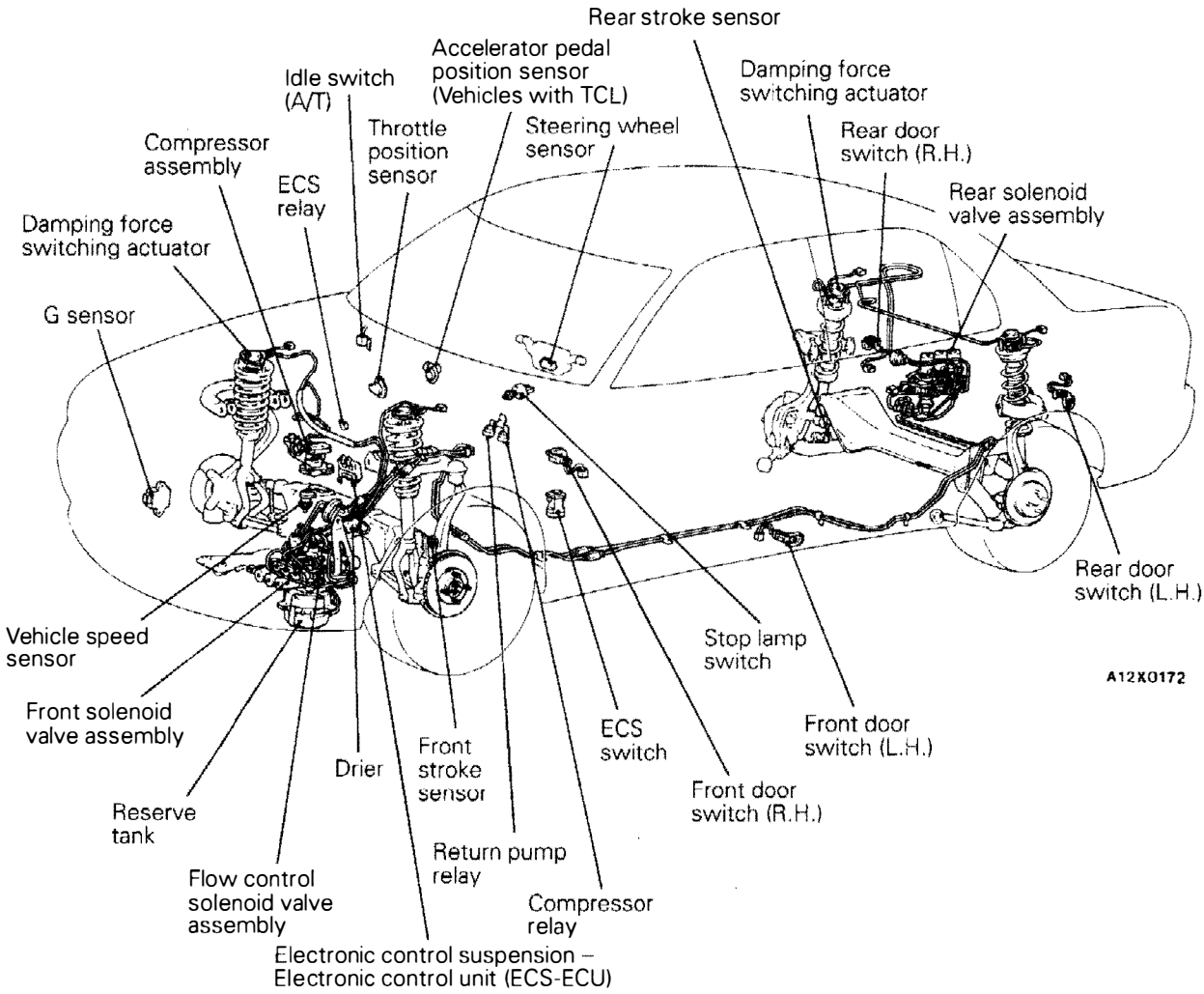
The conventional Active ECS function which actively controls the vehicle posture in accordance with the road and driving conditions has been enhanced by the addition of fuzzy logic control. As a result, it is now possible for the system to make judgements about the road surface and the road environment, further improving riding comfort and steering stability.

Fuzzy Logic Control

The degrees of buoyancy and stiffness are judged by analyzing the frequency of the suspension stroke, and the damping force is controlled by fuzzy logic based on this analysis in order to obtain the optimum riding comfort. In addition, in order to obtain the best steering characteristics that correspond to driving conditions inferred from the gradient of the road surface and the frequency of movement of the steering wheel, the timing by which anti-roll control is carried out between the front and rear wheels is varied, and this variation in timing is also controlled by fuzzy logic.

Items	Front Suspension	Rear Suspension
Coil spring		
Wire dia × O.D. × free length	11.7 × 117.0–122.0 × 325.5*1	8.6 × 115.0 × 422.5*3
mm	11.9 × 117.0–122.0 × 334.6*2	8.9 × 115.0 × 410.0*4
Coil spring identification colour	Blue*1	Violet*3
	Gray*2	Blue*4
Spring constant N/mm	22.0	6.0*3
		8.0*4
Shock absorber		
Stroke mm	101	143
Damping force (at 0.3 m/sec.)		
Expansion N		
HARD	1,863	1,422
MEDIUM	1,402	932
SOFT	461	294
SUPER SOFT	137	137
Contraction N		
HARD	932	706
MEDIUM	794	559
SOFT	441	343
SUPER SOFT	196	196

NOTE
*1: M/T
*2: A/T
*3: Sedan
*4: Hatchback


Rear stroke sensor
Accelerator pedal position sensor (Vehicles with TCL)
Idle switch (A/T)
Damping force switching actuator
Compressor assembly
Throttle position sensor
Steering wheel sensor
Rear door switch (R.H.)
ECS relay
Rear solenoid valve assembly
Damping force switching actuator
G sensor
Rear door switch (L.H.)
Vehicle speed sensor
Stop lamp switch
A12X0172
Front solenoid valve assembly
ECS switch
Front door switch (L.H.)
Drier
Front stroke sensor
Front door switch (R.H.)
Reserve tank
Return pump relay
Flow control solenoid valve assembly
Compressor relay
Electronic control suspension – Electronic control unit (ECS-ECU)

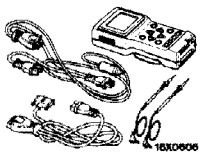
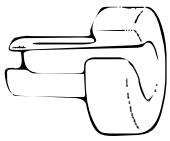
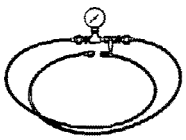
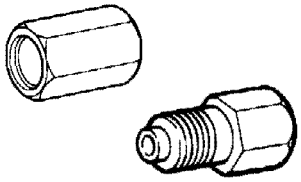
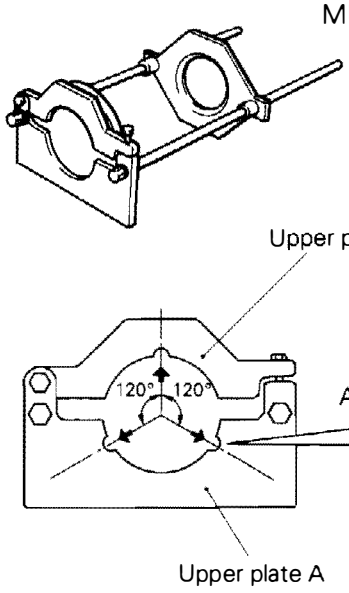
SERVICE SPECIFICATIONS

E33CC00AA

Items		Specifications
Standard value		
Toe		
At the centre of tyre tread	mm	0 ± 3
Toe angle (per wheel)		0 ± 9′
Toe-out angle on turn (inner wheel when outer wheel at 20°)		22°
Camber		0° ± 30′
Caster		4°20′ ± 1°30′
Kingpin inclination		7°20′ ± 1°30′
Side slip	mm	0 ± 3
Wheel arch height to centre of wheel	mm	
Front		393–403
Rear		377–387
High-pressure switch		
Pressure switch shut-off pressure	kPa	883 or more
Pressure switch operation pressure	kPa	696–794
Low-pressure switch		
Return pump activation pressure	kPa	108–166
Return pump stop pressure	kPa	40 or less
Air compressor relief pressure	kPa	1,050–1,350

SPECIAL TOOLS

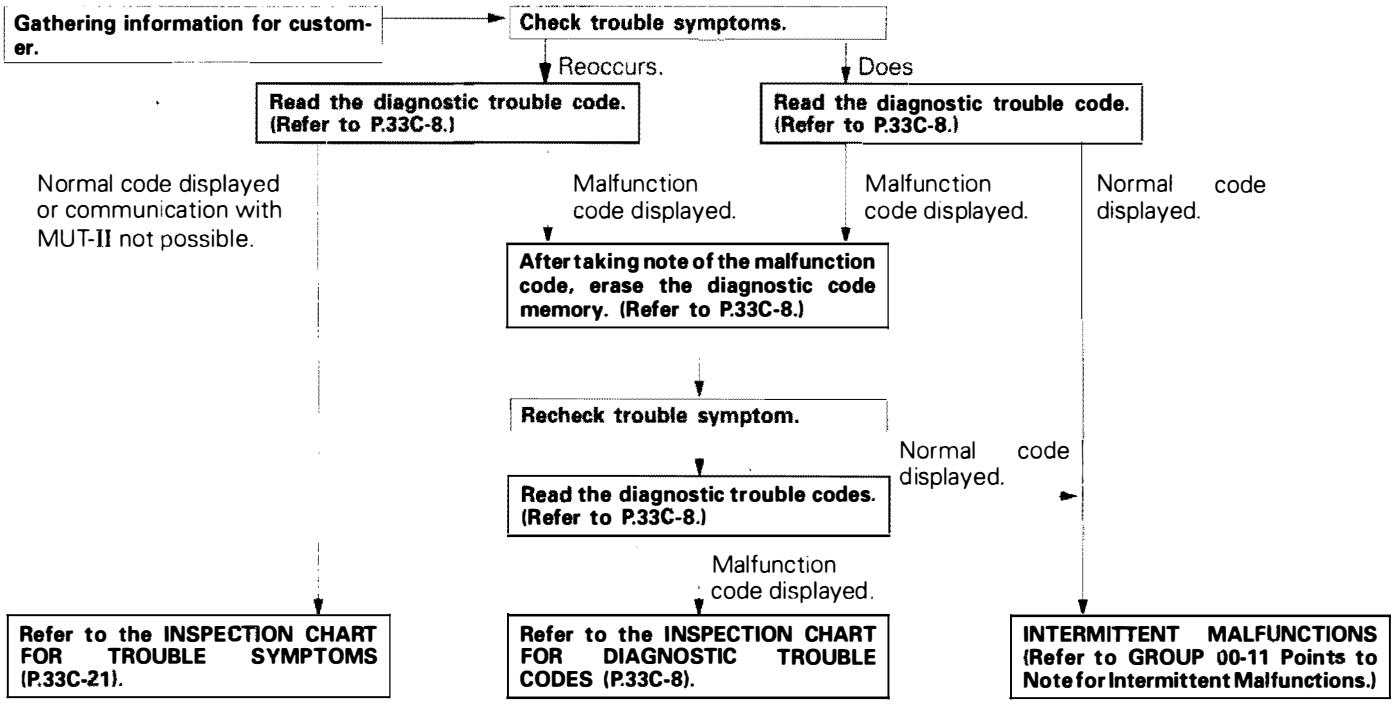
E33CD00AA

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Checking of diagnosis codes • Read-out service data • Testing of the actuator • ACTIVE-ECS – Service Adjustment Procedures
 16X0607		ROM pack	
	MB991229	Air tube releaser	• Removal/installation of the air tube
	MB991075	Air pressure gauge	• To check air pressure
	MB991226 MB991227 MB991228 MB991477 MB991475 MB991476	Adaptor set Adaptor E Adaptor F Adaptor set Adaptor G Adaptor H	
 12X0123	MB991043	Spring compressor	• Compression of the coil spring NOTE When compressing the front coil spring, spaces should be ground on the insulator side for the bolts (3 places shown in the illustration) before use.

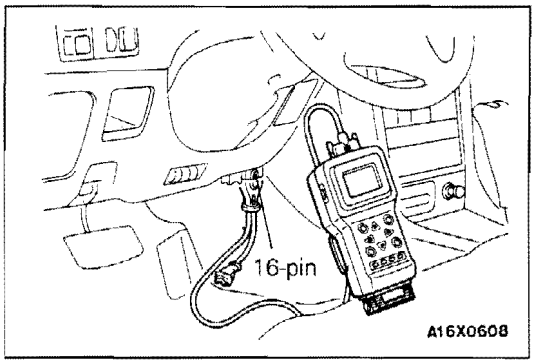
TROUBLESHOOTING

E33CE00AA

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



NOTE
(1) Before carrying out diagnosis, check to be sure that the tyre size and tyre pressures are normal, and that there is no uneven tyre wear.
(2) Even if the system is normal, the warning lamp may illuminate in the following cases.
- Overloading
  Stop the engine once, take out excess luggage and then start the engine again. (Vehicle height adjustment will not be complete until 3 minutes have elapsed.)
- Vehicle is parked on steep slopes with the engine running
  Move to a level surface, stop the engine and then start it again.
- Vehicle height adjustment is carried out frequently under high summer temperatures, etc.
  After stopping the engine, open the engine hood to let the compressor inside the engine compartment cool, and then restart the engine. (The compressor has been running for a continuous period of 4 minutes, or because the compressor thermo switch is OFF and the compressor does not operate, the air pressure is insufficient and thus vehicle height adjustment is not complete even after 3 minutes have elapsed.)



DIAGNOSTIC FUNCTION E33CE01AA

METHOD OF READING THE DIAGNOSTIC TROUBLE CODES

Connect the MUT-II to the diagnostic connector under the instrument under cover, and then read the diagnostic trouble codes.

METHOD OF ERASING THE DIAGNOSTIC TROUBLE CODES

When Using the MUT-II

Connect the MUT-II to the diagnostic connector, and erase the diagnostic trouble codes.

When not Using the MUT-II

After removing the battery cable from the battery (–) terminal for 10 seconds or more, reconnect the cable.

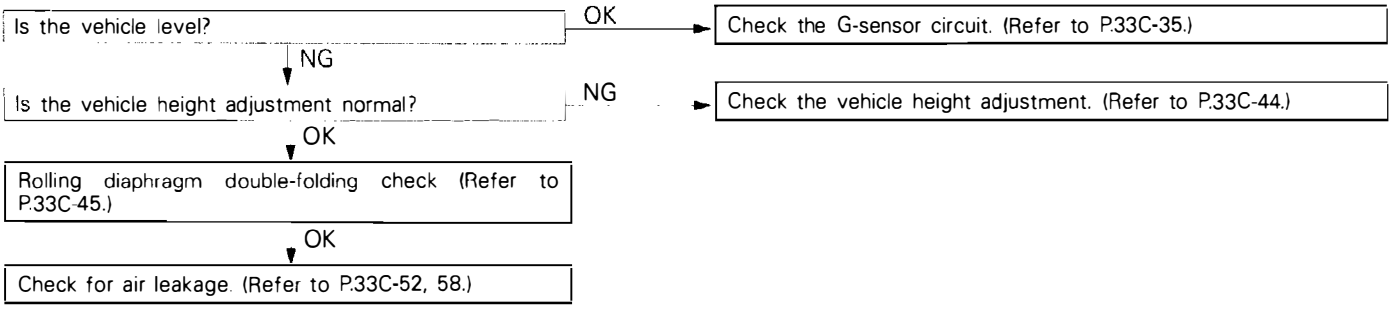
INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES E33CE02AA

Code No.	Diagnostic item	Reference page
11	G-sensor system	P.33C-9
13	Low pressure switch system	P.33C-9
21	Steering wheel sensor system	P.33C-10
22	Front stroke sensor system	P.33C-11
23	Rear stroke sensor system	P.33C-11
24	Vehicle speed sensor system	P.33C-12
25	Rear pressure sensor system	P.33C-13
38	Ignition pulse (engine speed) system	P.33C-14
41	Damping force switching actuator system	P.33C-14
42	ECS relay system	P.33C-15
43	Compressor relay system	P.33C-15
44	Return pump relay system	P.33C-16
45	Exhaust valve system for vehicle height adjustment	P.33C-16
46	Flow-rate switchover valve system	P.33C-17
47	Exhaust valve system	P.33C-17
51	Air supply valve system	P.33C-18
52	Front valve system	P.33C-19
53	Rear valve system	P.33C-19
54	Malfunction of vehicle height adjustment (when high pressure switch is OFF)	P.33C-20
55	Malfunction of vehicle height adjustment (when high pressure switch is ON)	P.33C-20
56	Air leakage from front or rear valve	P.33C-20

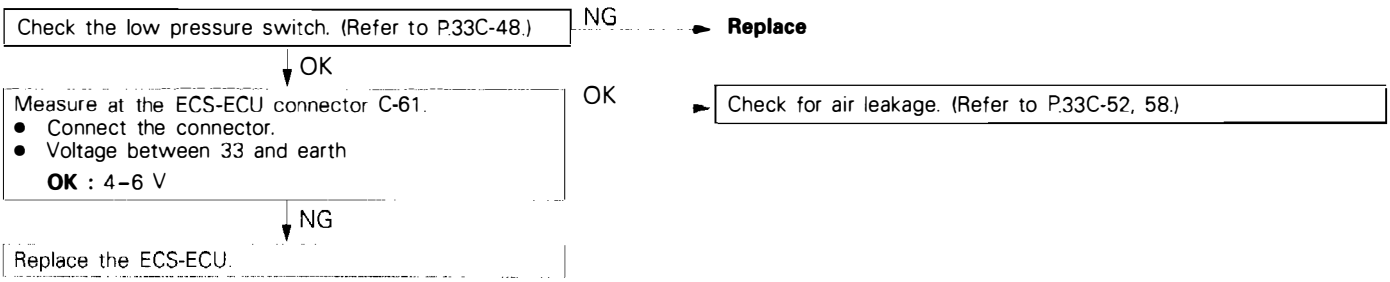
INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

E33CE03AA

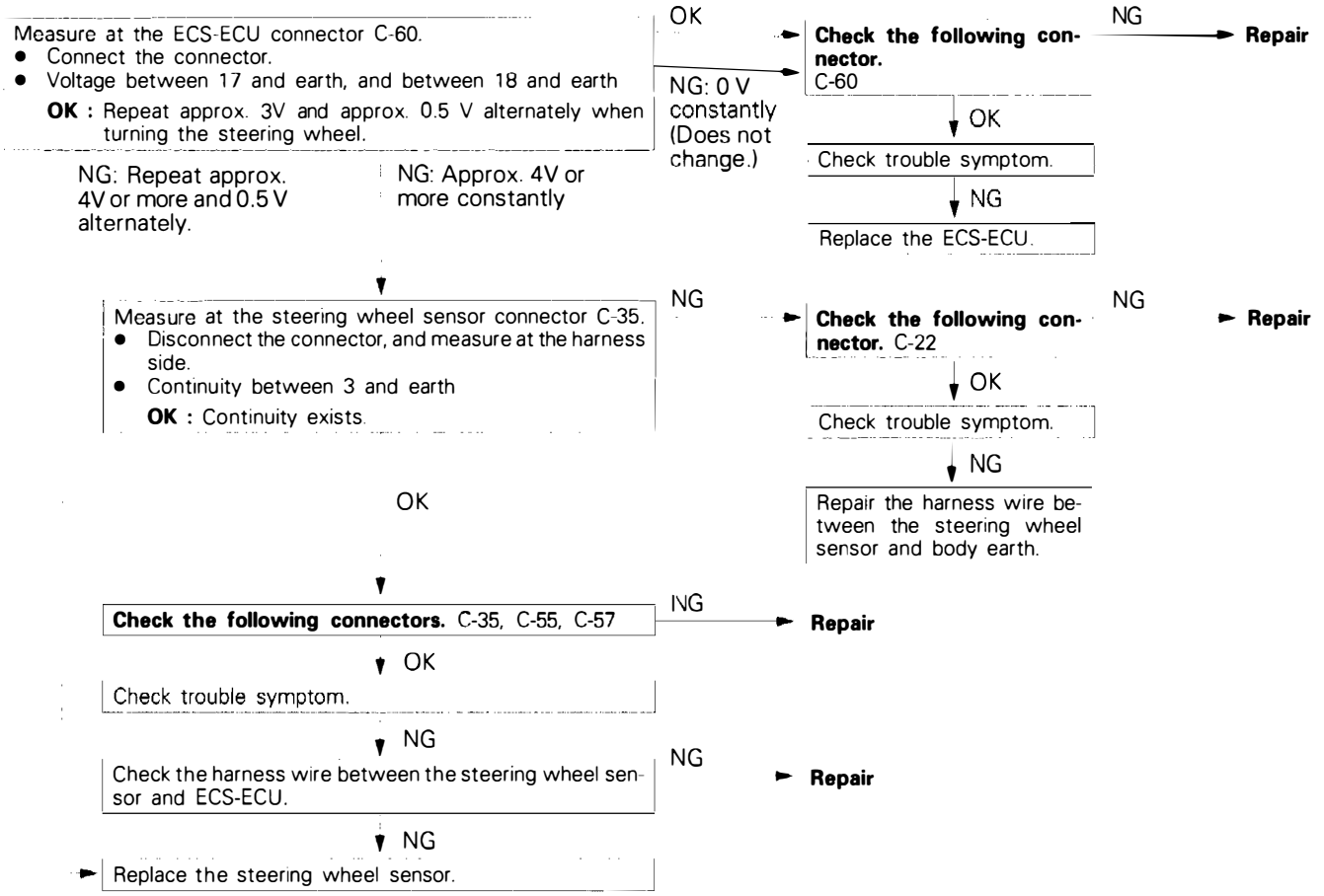
Code No.11 G-sensor system	Probable cause
[Comment] This diagnosis code is output if the G sensor input voltage value is less than 0.5 V or more than 4.5 V for a continuous period of 2 minutes, or if roll control is carried out continuously for 3 minutes in a single direction.	• Malfunction of the G-sensor circuit harness or connector • Improper installation of the G-sensor • Malfunction of the G-sensor • Maladjustment of the vehicle height • Malfunction of the rolling diaphragm • Air leakage



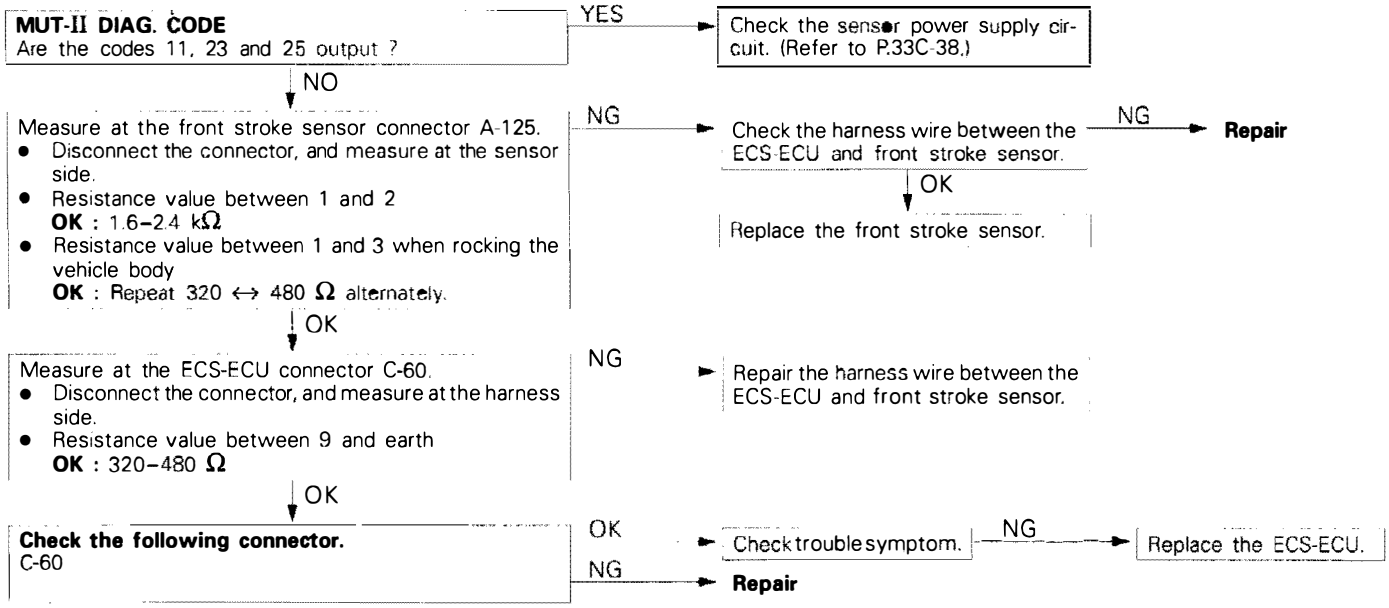
Code No.13 Low pressure switch system	Probable cause
[Comment] This diagnosis code is output if the low pressure switch does not switch OFF even after exhaust control (posture control) is repeated 30 times, or if the return pump repeats a cycle of 2 minutes continuous operation and 2 minutes stopped 10 times (open circuit in harness).	• Malfunction of the low pressure switch circuit harness or connector • Malfunction of the low pressure switch(ON) • Air leakage • Malfunction of the ECS-ECU



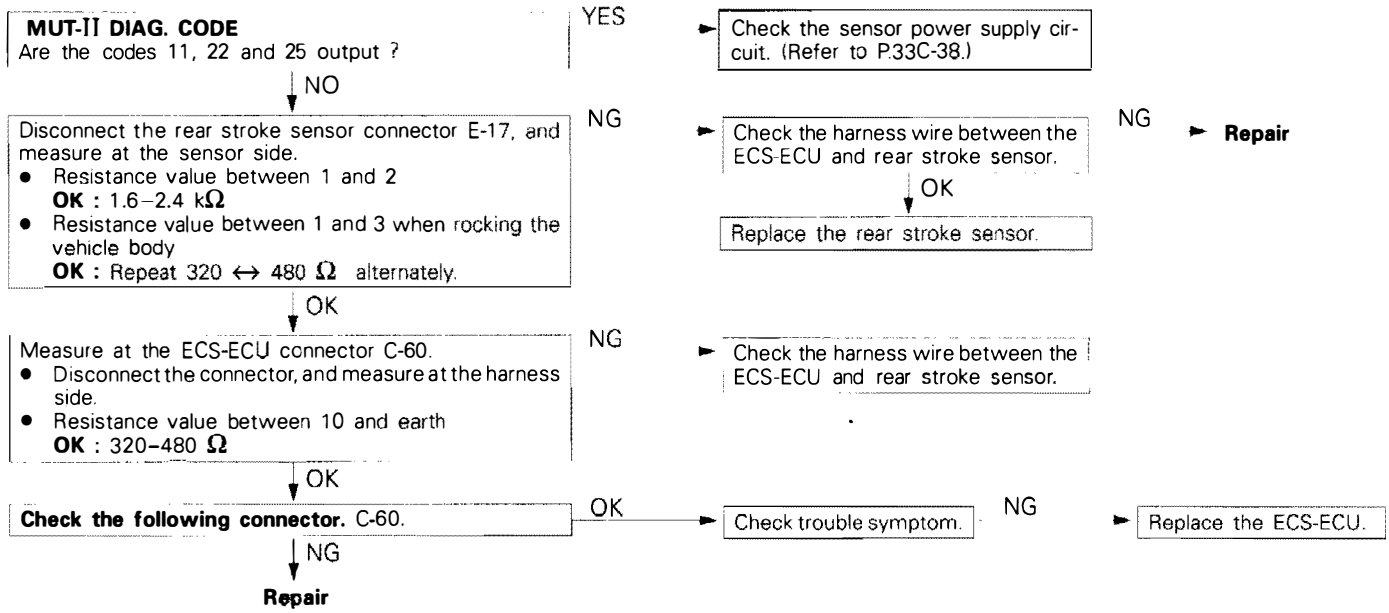
Code No.21	Steering wheel sensor system	Probable cause
[Comment] This diagnosis code is output if there is an open circuit in either the ST1, ST2 or STN of the steering wheel sensor, or if there is an open circuit in the steering wheel sensor earth wire. In addition, if a diagnosis code is also being output from the steering wheel sensor system of the TCL, it can be assumed that there is a malfunction in the harnesses or connectors between the sensor and the junction for the signal to each ECU.		• Malfunction of the steering wheel sensor • Malfunction of the steering wheel sensor circuit harness or connector • Malfunction of the ECS-ECU



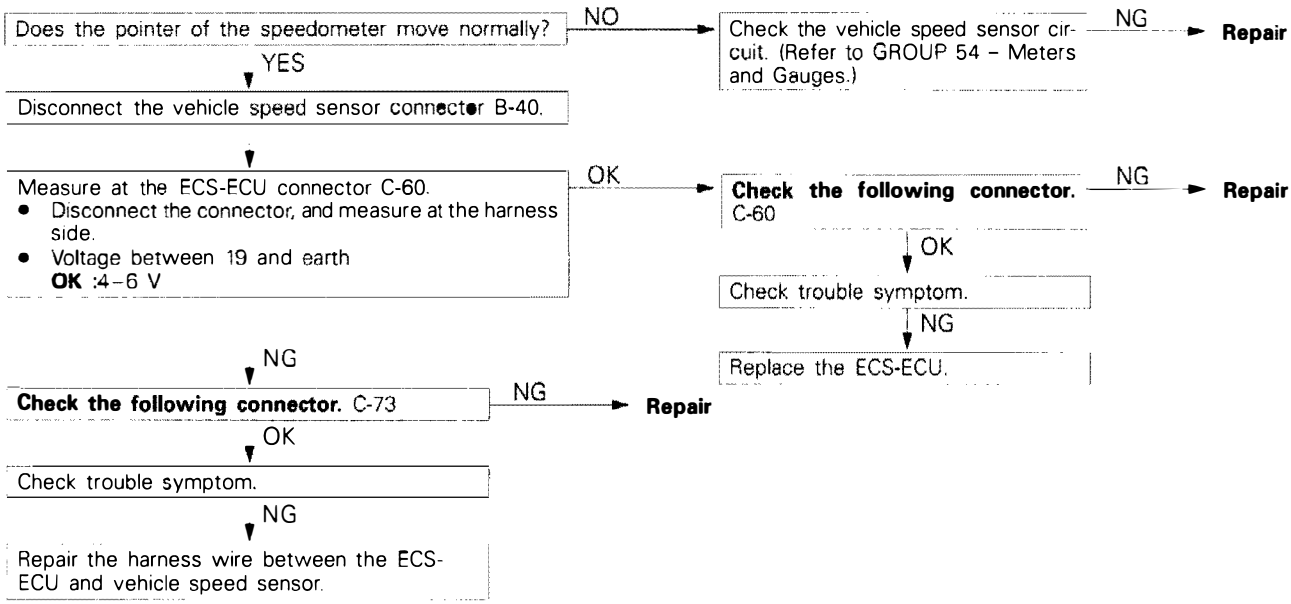
Code No.22	Front stroke sensor system	Probable cause
[Comment] This diagnosis code is output if there is an open circuit (input voltage value is 4.5 V or more) or short (input voltage value is 0.5 V or less) in the front stroke sensor circuit system.		• Malfunction of the front stroke sensor • Malfunction of the front stroke sensor circuit harness or connector • Malfunction of the ECS-ECU



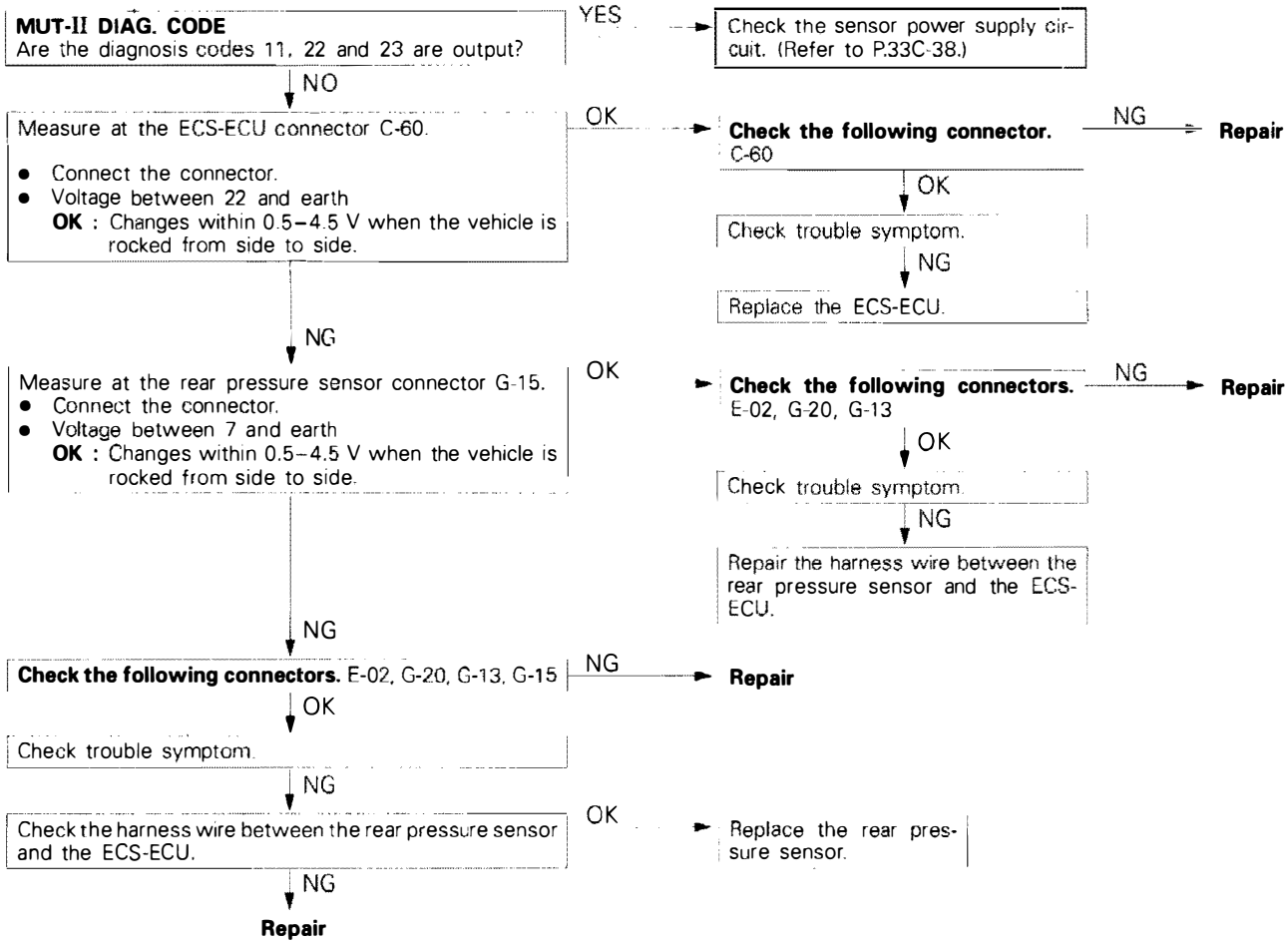
Code No.23	Rear stroke sensor system	Probable cause
[Comment] This diagnosis code is output if there is an open circuit (input voltage value is 4.5 V or more) or short (input voltage value is 0.5 V or less) in the rear stroke sensor circuit system.		• Malfunction of the rear stroke sensor • Malfunction of the rear stroke sensor circuit harness or connector • Malfunction of the ECS-ECU



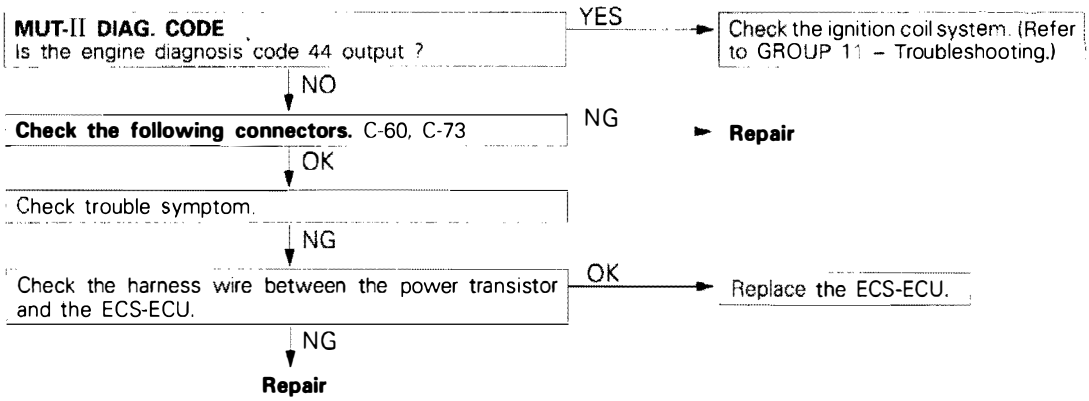
Code No.24 Vehicle speed sensor system	Probable cause
[Comment] This diagnosis code is output if there is an open circuit in the vehicle speed sensor circuit system.	• Malfunction of the vehicle speed sensor • Malfunction of the vehicle speed sensor circuit harness or connector • Malfunction of the ECS-ECU • Malfunction of ECU related to the vehicle speed sensor • Malfunction of the speedometer



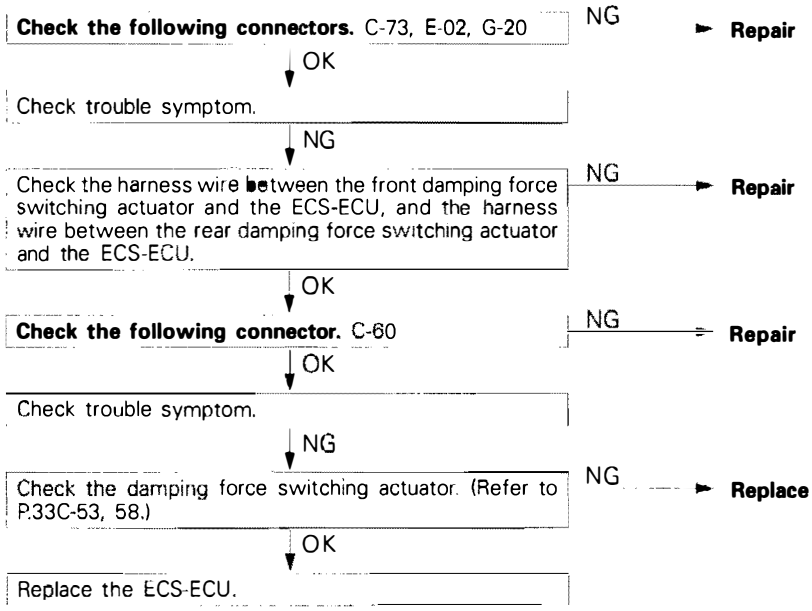
Code No.25	Rear pressure sensor system	Probable cause
[Comment] This diagnosis code is output if the average input voltage value for the rear pressure sensor(over 12 seconds) exceeds 4.0 V during a period of 1 minute 5 times in succession, or if it exceeds 4.0 V once at a vehicle speed of 20 km/h or less.		• Malfunction of connector or harness wire for rear pressure sensor circuit • Malfunction of rear pressure sensor • Malfunction of ECS-ECU



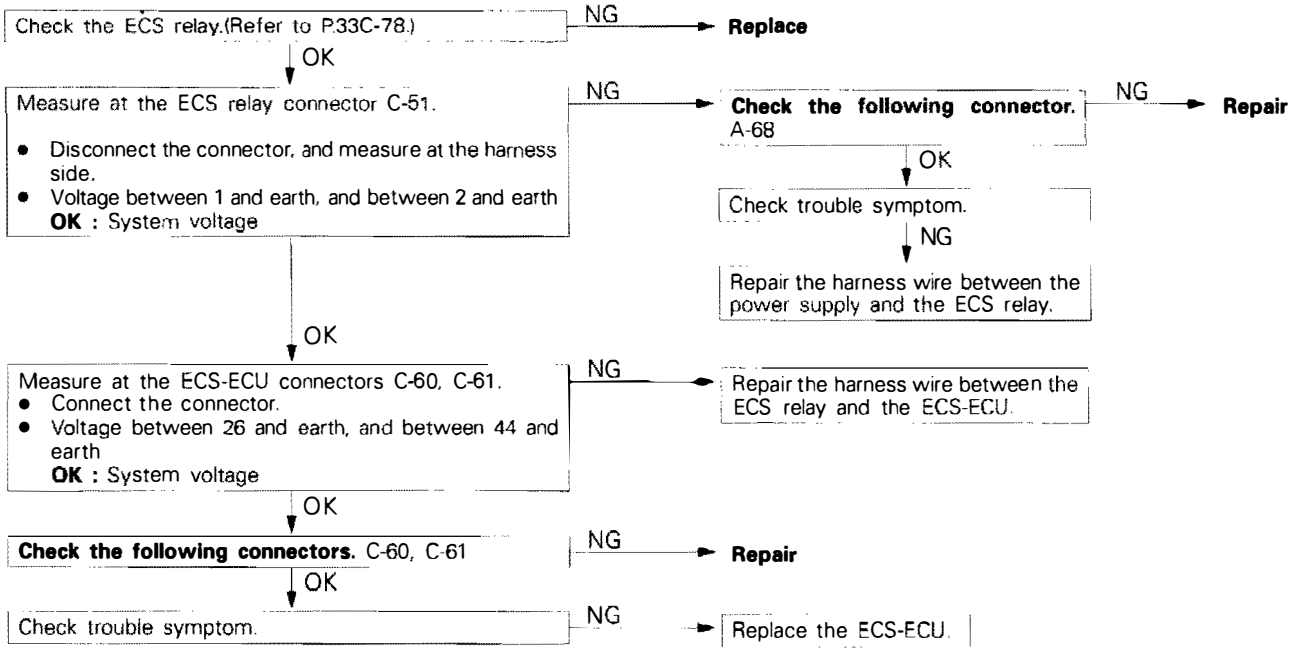
Code No.38	Ignition pulse (engine speed) system	Probable cause
[Comment] This diagnosis code is output if the engine speed is judged to be 320 r/min or less at a vehicle speed of 40 km/h or more.		• Malfunction of connector or harness wire for ignition pulse (engine speed) circuit • Malfunction of ECS-ECU



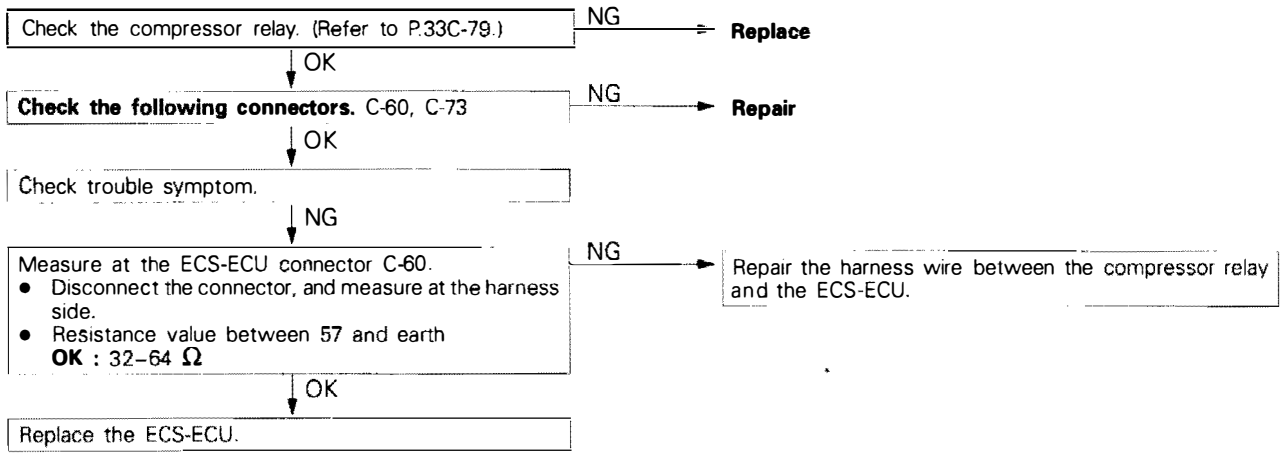
Code No.41	Damping force switching actuator system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the front or rear damping force switching actuator circuit system.		• Malfunction of connector or harness wire for damping force switching actuator circuit • Malfunction of damping force switching actuator • Malfunction of ECS-ECU



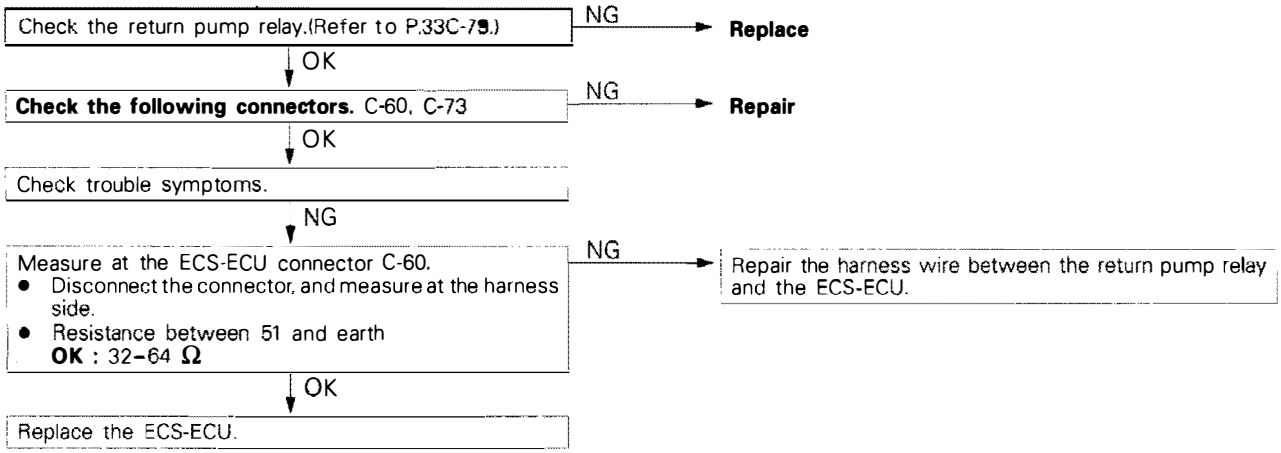
Code No.42	ECS relay system	Probable cause
[Comment] This diagnosis code is output if no power is supplied to the ECS for 3 minutes while the ECS relay is ON, or if power is supplied to the ECS for 3 minutes or more while the ECS relay is OFF.		• Malfunction of connector or harness wire for ECS relay circuit • Malfunction of ECS relay • Malfunction of ECS-ECU



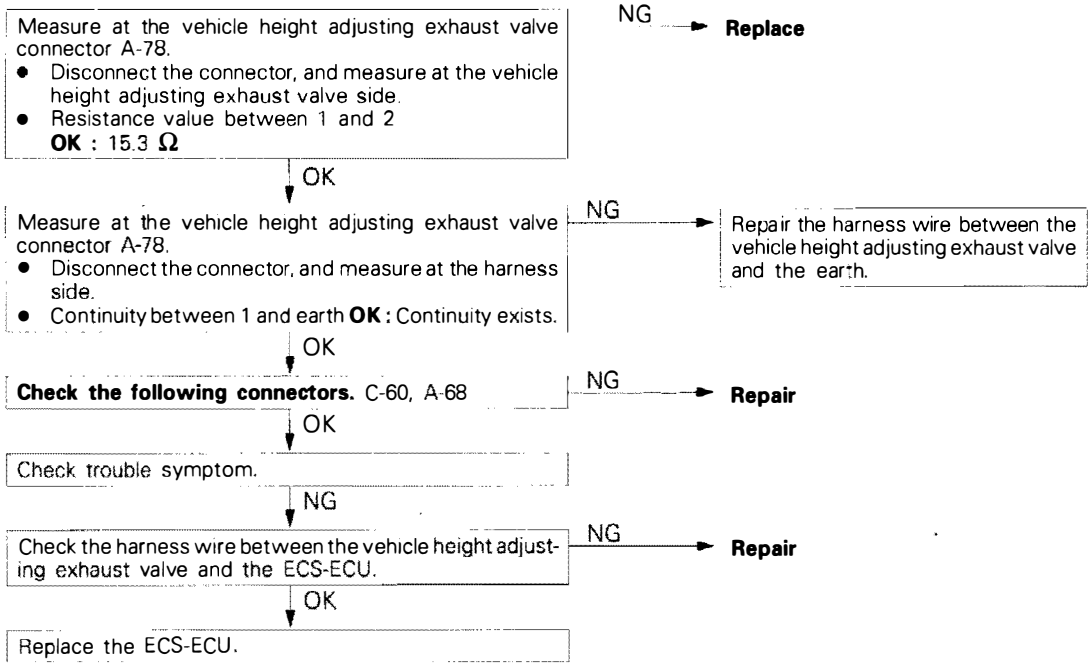
Code No.43	Compressor relay system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the compressor relay circuit system, or if there is an OFF malfunction in the transistor inside the ECS-ECU.		• Malfunction of connector or harness wire for compressor relay circuit • Malfunction of compressor relay • Malfunction of ECS-ECU



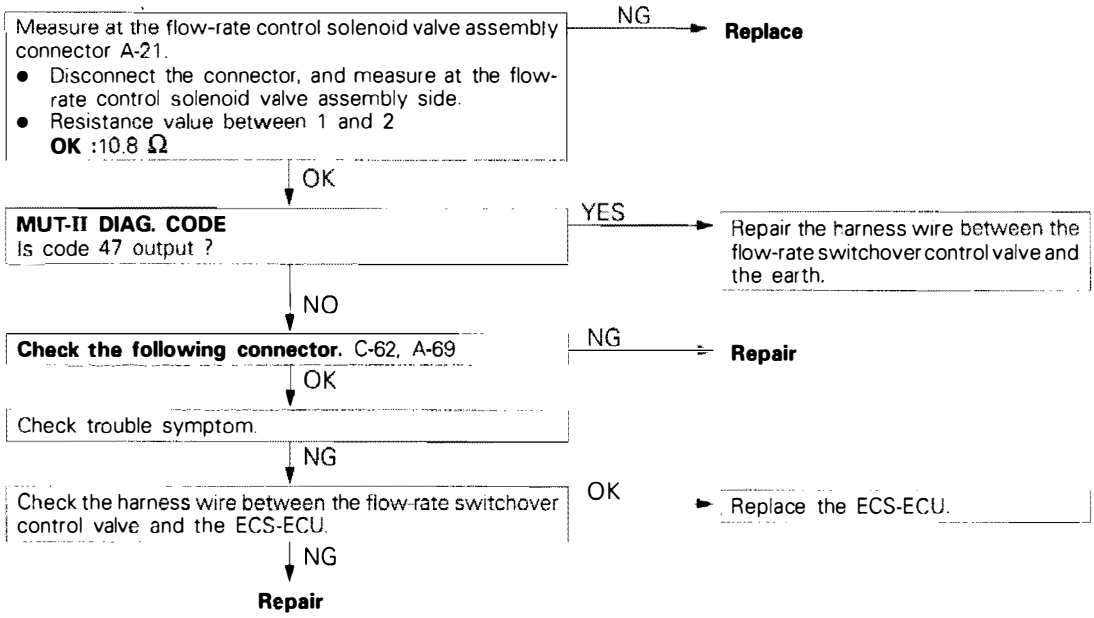
Code No.44	Return pump relay system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the return pump relay circuit system, or if there is an OFF malfunction in the transistor inside the ECS-ECU.		• Malfunction of connector or harness wire for return pump relay circuit • Malfunction of return pump relay • Malfunction of ECS-ECU



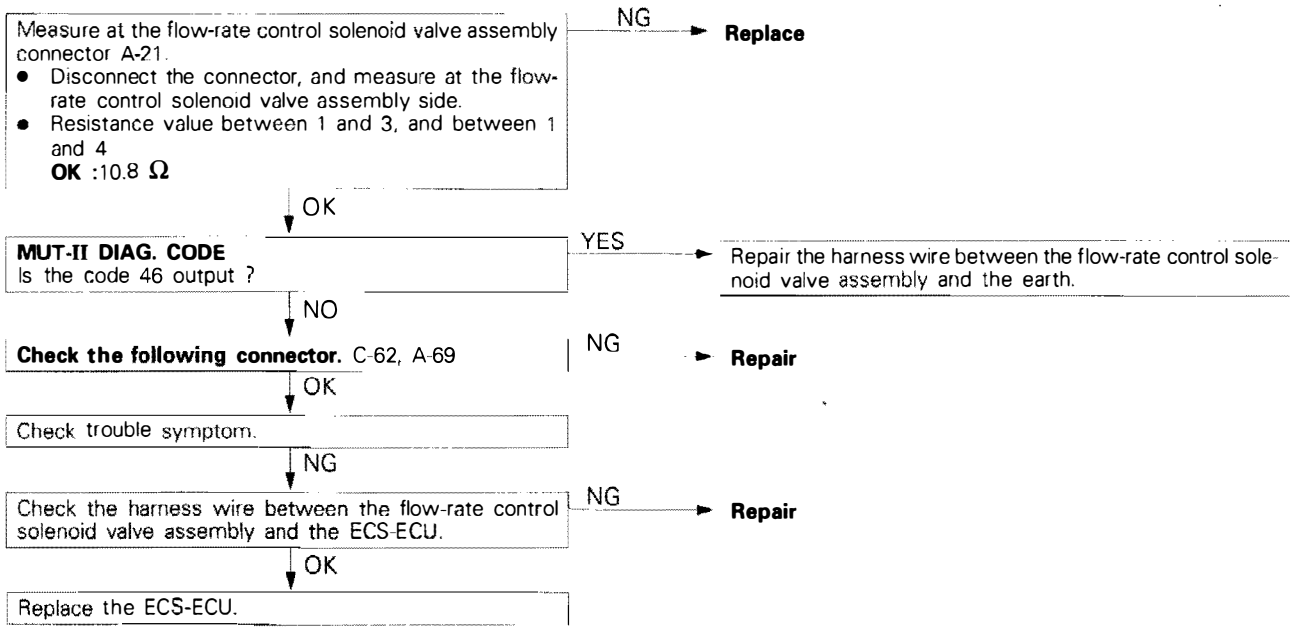
Code No.45	Vehicle height adjusting exhaust valve system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the circuit system of the exhaust gas valve for vehicle height adjustment.		• Malfunction of connector or harness wire for vehicle height adjusting exhaust valve circuit • Malfunction of vehicle height adjusting exhaust valve • Malfunction of ECS-ECU



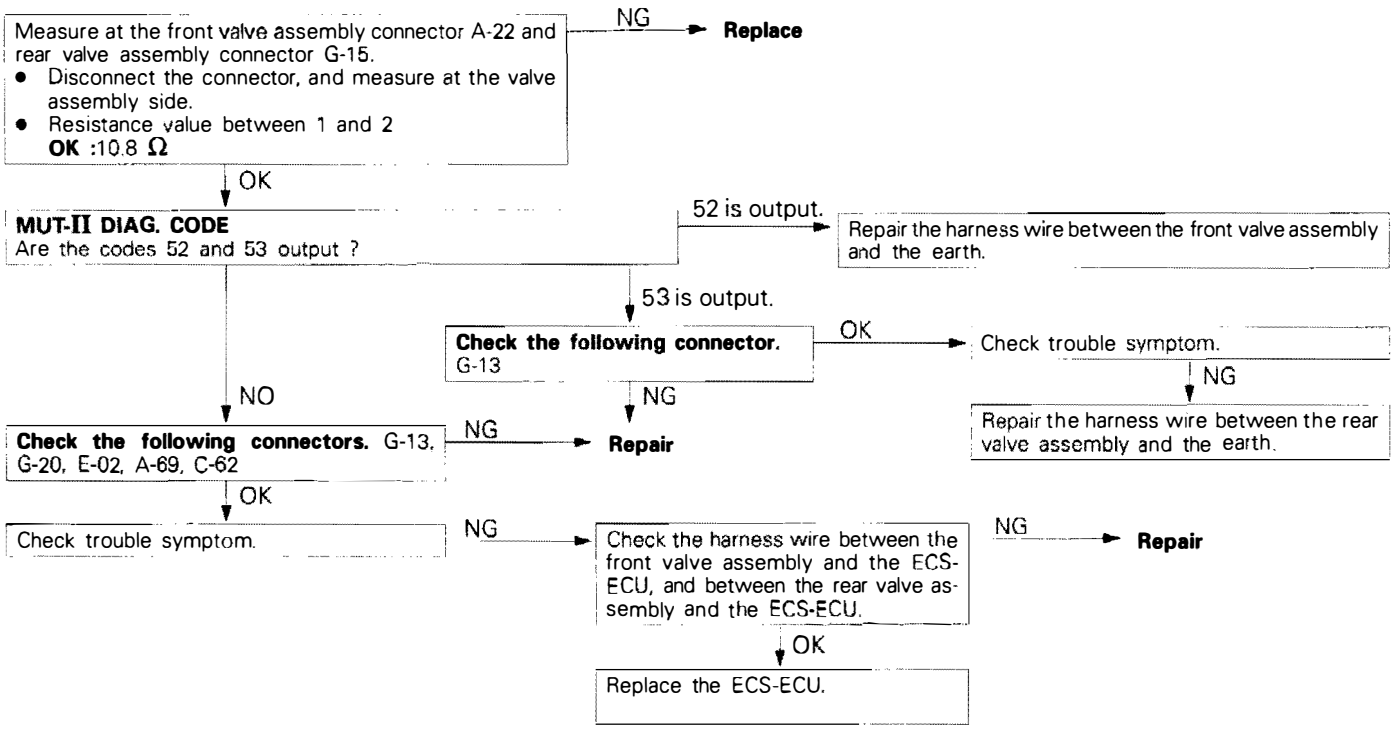
Code No.46	Flow-rate switchover valve system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the flow rate switchover valve circuit system.		• Malfunction of connector or harness wire for flow-rate switchover valve circuit • Malfunction of flow-rate switchover valve • Malfunction of ECS-ECU



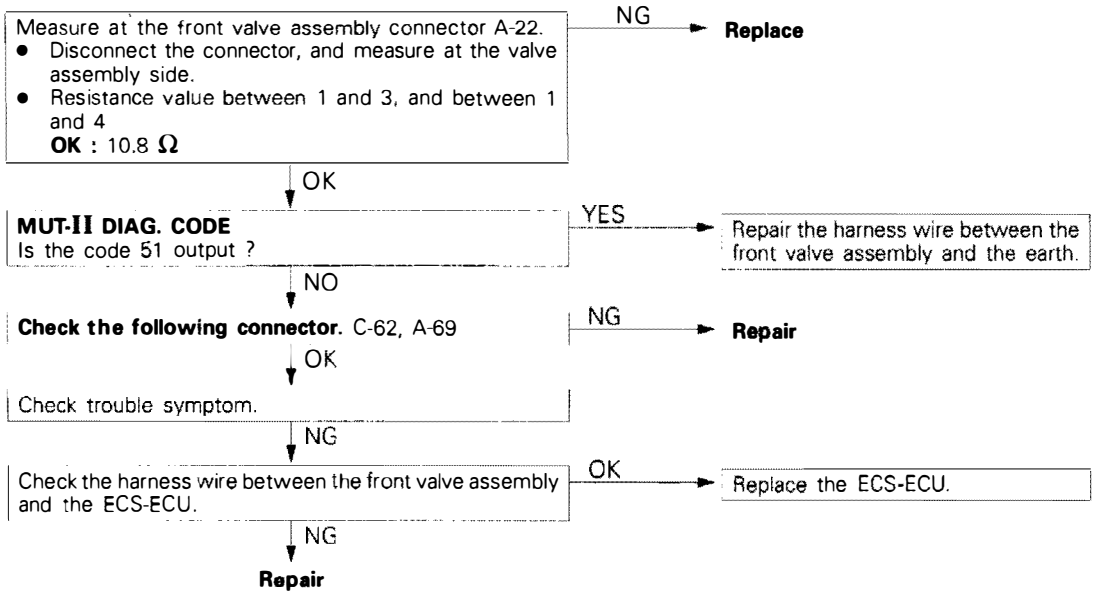
Code No.47	Exhaust valve system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the exhaust valve circuit system.		• Malfunction of connector or harness wire for exhaust valve circuit • Malfunction of exhaust valve • Malfunction of ECS-ECU



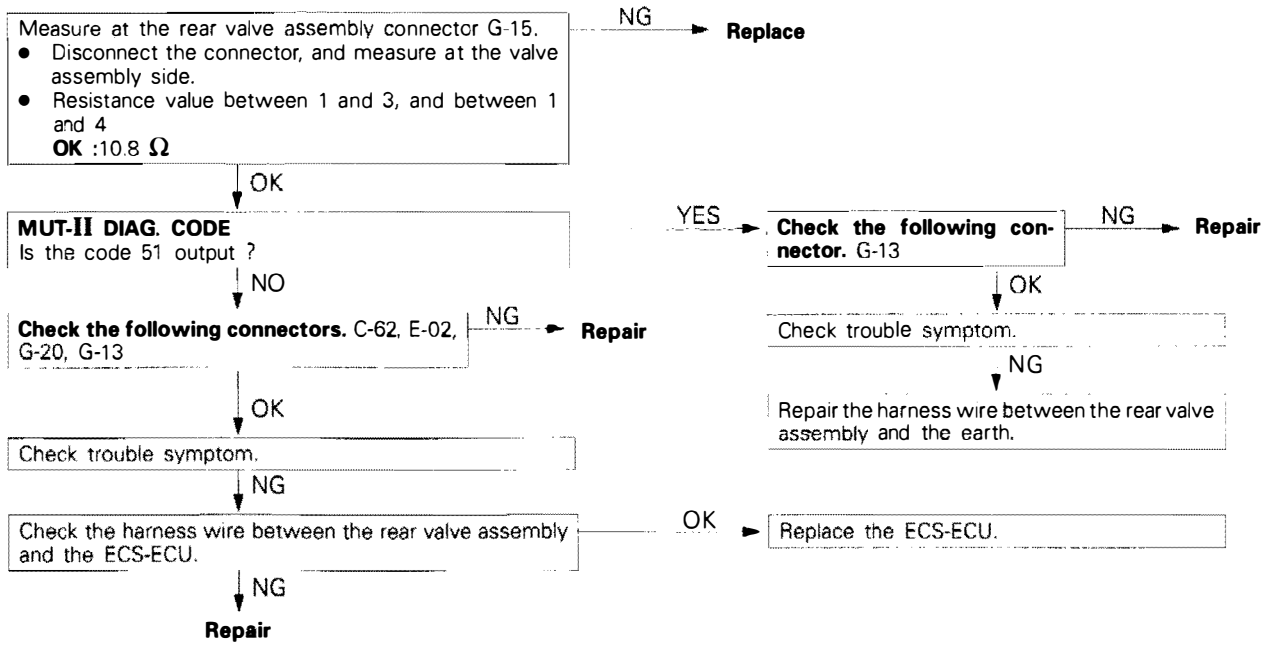
Code No.51	Air supply valve system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the air supply valve circuit system.		• Malfunction of connector or harness wire for air supply valve (front valve assembly and rear valve assembly) circuit • Malfunction of air supply valve (front valve assembly and rear valve assembly) • Malfunction of ECS-ECU



Code No.52	Front valve system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the front valve circuit system.		• Malfunction of connector or harness wire for front valve assembly circuit • Malfunction of front valve assembly • Malfunction of ECS-ECU



Code No.53	Rear valve system	Probable cause
[Comment] This diagnosis code is output if there is an open or short circuit in the rear valve circuit system.		• Malfunction of connector or harness wire for rear valve assembly circuit • Malfunction of rear valve assembly • Malfunction of ECS-ECU



Code No. 54	Abnormal vehicle-height adjustment (When the high-pressure switch is OFF.)	Probable cause
[Comment] This diagnosis code is output if front and rear vehicle height adjustment both continue for 3 minutes or more when the high pressure switch is OFF (there is sufficient pressure inside the reserve tank).		• Overloading • Malfunction of front or rear stroke sensor system • Air-pressure line is clogged. • Malfunction of front strut or rear shock absorber air spring

As the reason is probably a defective air pressure line, carry out the following inspections in the order given.
- Vehicle load (including passengers) inspection
- Front stroke sensor system check (Refer to P.33C-11.)
- Rear stroke sensor system check (Refer to P.33C-11.)
- Check if air-pressure line is clogged.
- Front shock absorber or rear shock absorber air-spring check

Code No. 55	Abnormal vehicle-height adjustment (When the high-pressure is switch ON.)	Probable cause
[Comment] This diagnosis code is output if front and rear vehicle height adjustment both continue for 3 minutes or more when the high pressure switch is ON (pressure inside the reserve tank is low), or if the compressor has been running for a continuous period of 4 minutes or more.		• Malfunction of compressor relay system • Malfunction of compressor • Malfunction of high-pressure switch • Air leakage from high-pressure tank

As the reason is probably a defective high pressure tank, carry out the following inspections in the order given.
- Compressor relay system check (Refer to P.33C-15.)
- Compressor operation check (Refer to P.33C-63.)
- High-pressure switch check (Refer to P.33C-61.)
- Check if the air in the high-pressure tank is leaked (improper sealed to the low-pressure tank)

Code No. 56	Air leakage from front or rear valve	Probable cause
[Comment] This diagnosis code is output if the return pump starts and stops 8 times in succession even though vehicle posture control and vehicle height control are not being carried out.		• Air leakage from front valve • Air leakage from rear valve • Air leakage from exhaust valve • Air leakage from air-supply valve • Air leakage from low-pressure tank • Air leakage from air-pressure line

As the reason is probably an air leak in the somewhere in the air pressure line, carry out the following inspections in the order given.
- Front valve air-leakage check (Refer to P.33C-68.)
- Rear valve air-leakage check (Refer to P.33C-69.)
- Exhaust valve air-leakage check (Refer to P.33C-65.)
- Air-supply valve air-leakage check (Refer to P.33C-65.)
- Low-pressure tank air-leakage check (Refer to P.33C-62.)
- Air-pressure line air-leakage check (Refer to P.33C-71.)

INSPECTION CHART FOR TROUBLE SYMPTOMS

E33CE04AA

Trouble symptom		Inspection procedure	Reference page
Communication with MUT-II impossible	Communication with all systems is not possible.	1	P.33C-21
	Communication with active-ECS only is not possible.	2	P.33C-22
Troubles related to the indicator lamp	The indicator lamp does not illuminate.	3	P.33C-23
	The warning lamp remains illuminating.	4	P.33C-23
	The indicator lamp does not switch when the ECS switch is operated. An unexpected indicator lamp illuminates.	5	P.33C-24
Improper static attitude control	The body remains tilted.	6	P.33C-24
	If vehicle is left to stand, vehicle height increases.	7	P.33C-24
	If vehicle is left to stand, vehicle height decreases.	8	P.33C-25
	Vehicle height changes after anti-roll control.	9	P.33C-26
Improper ACTIVE controls	No anti-rolling control	10	P.33C-27
	No anti-dive control	11	P.33C-28
	No anti-squat control	12	P.33C-29
	No control against pitching and bouncing	13	P.33C-30
	Damping force switching does not function.	14	P.33C-30
	Excessive rolling when turning	15	P.33C-31
Improper vehicle-height control	No control when getting on and off	16	P.33C-31
	No control when the switch is operated.	17	P.33C-32
	The vehicle height does not decrease at the rear when it is set to the LOW position and headlamps are on.	18	P.33C-32
	No vehicle height adjustment according to vehicle speed	19	P.33C-33
	No quick vehicle height control	20	P.33C-33
Other malfunctions	Unstable vehicle height	21	P.33C-33
	Excessive compressor driving frequency	22	P.33C-34
	Vehicle height overshoots its target when adjusted.	23	P.33C-34
	Improper control during reverse	24	P.33C-34

INSPECTION CHART FOR TROUBLE SYMPTOMS

E33CE05AA

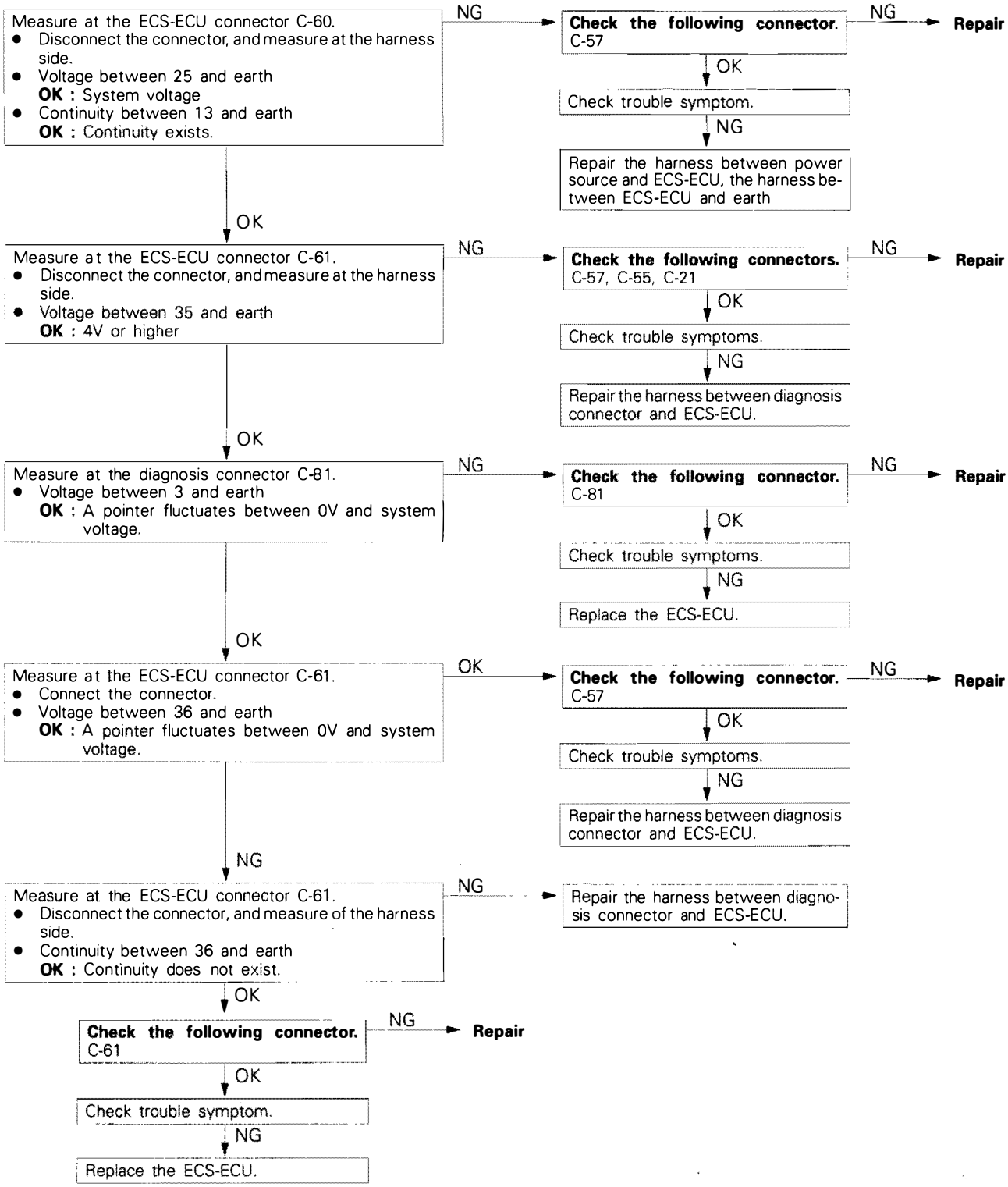
INSPECTION PROCEDURE 1

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

Refer to GROUP 13A – Troubleshooting.

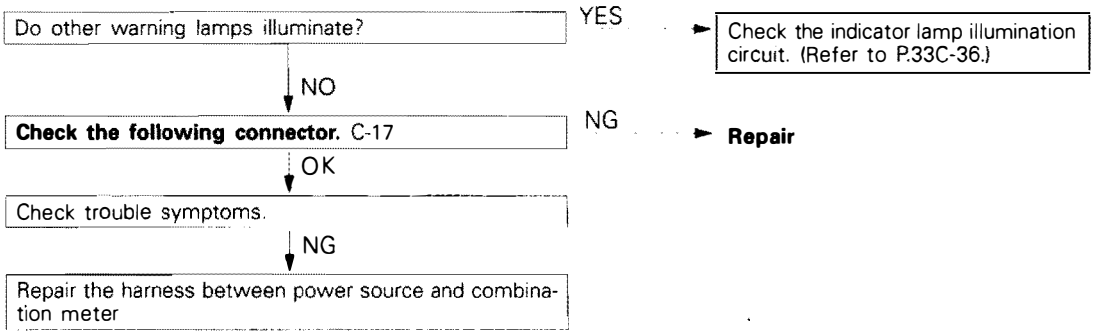
INSPECTION PROCEDURE 2

Communication with MUT-II impossible (Communication with active-ECS only is not possible.)	Probable cause
[Comment] If communication with the MUT-II is not possible, the reason is probably a defect in the diagnosis line, ECS-ECU power supply circuit, ECS-ECU earth circuit, or in the ECS-ECU.	• Malfunction of diagnosis line • Malfunction of ECS-ECU power source circuit • Malfunction of ECS-ECU earth circuit • Malfunction of ECS-ECU



INSPECTION PROCEDURE 3

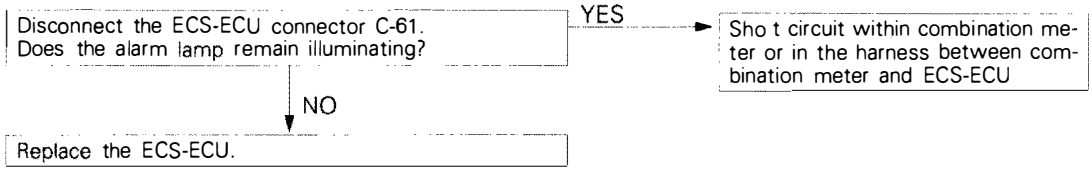
The indicator lamp does not illuminate when ignition switch is ON.	Probable cause
[Comment] It is suspected that a lamp bulb is burnt out, or combination meter or ECS-ECU is faulty.	• Burnt out indicator lamp bulb • Malfunction of combination meter • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU



INSPECTION PROCEDURE 4

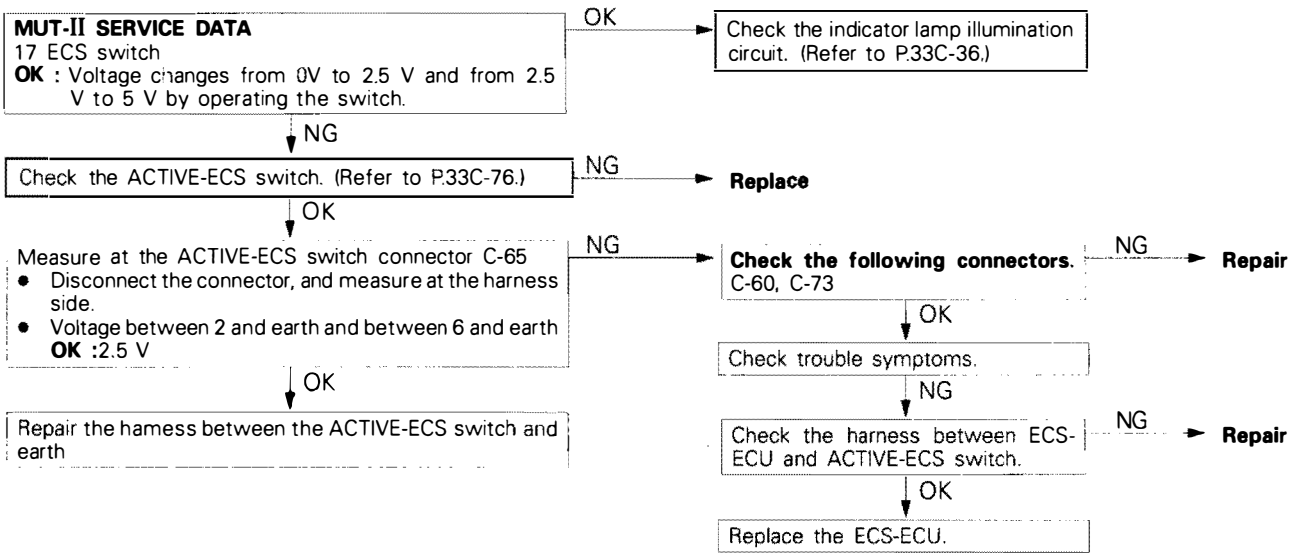
The alarm lamp remains illuminating.	Probable cause
[Comment] The reason is probably that the system is still in the fail-safe mode, or there is a malfunction in the harness, connectors or combination meter.	• System is still in fail-safe mode • Malfunction of the connector or the harness wire • Malfunction of combination meter • Malfunction of the ECS-ECU

If MUT-II DIAG. CODE is not output, check as follows.



INSPECTION PROCEDURE 5

The indicator lamp never changes when the ACTIVE-ECS switch is operated. An unexpected indicator lamp illuminates.	Probable cause
[Comment] The cause is likely to be a burnt-out bulb, malfunction of ECS switch circuit or indicator illumination circuit.	• Malfunction of the ACTIVE-ECS switch • Burnt-out bulb • Malfunction of the combination meter • Malfunction of the connector or the harness wire • Malfunction of the ECS-ECU



INSPECTION PROCEDURE 6

The body remains tilted.	Probable cause
[Comment] The cause is likely to be either a double-folded rolling diaphragm or a faulty rear pressure sensor	• Improper vehicle height adjustment • Double-folded diaphragm • Malfunction of the rear pressure sensor

Check the following items.
- System operation check (Refer to P.33C-46.)
- Rolling diaphragm check (Refer to P.33C-45.)
- Rear pressure sensor check (Refer to P.33C-66.)

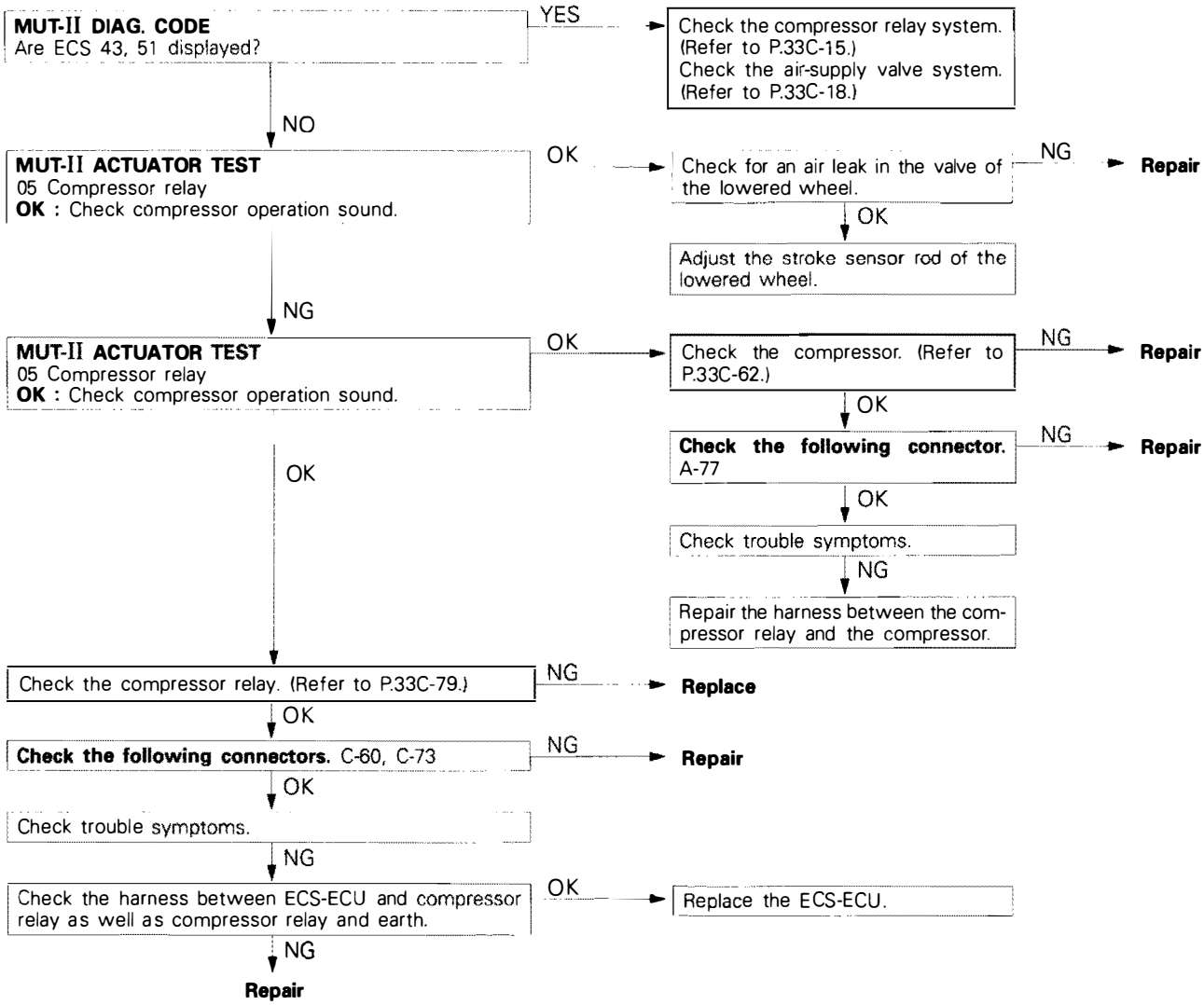
INSPECTION PROCEDURE 7

If vehicle is left to stand, vehicle height increases.	Probable cause
[Comment] The cause is likely to be malfunction of the front or rear solenoid valve or valve seat	• Improper seal of front solenoid valve or valve seat • Improper seal of rear solenoid valve or valve seat

Check the following items.
- Front solenoid valve check (Refer to P.33C-68.) (Air leakage from valve seat)
- Rear solenoid valve check (Refer to P.33C-69.) (Air leakage from valve seat)

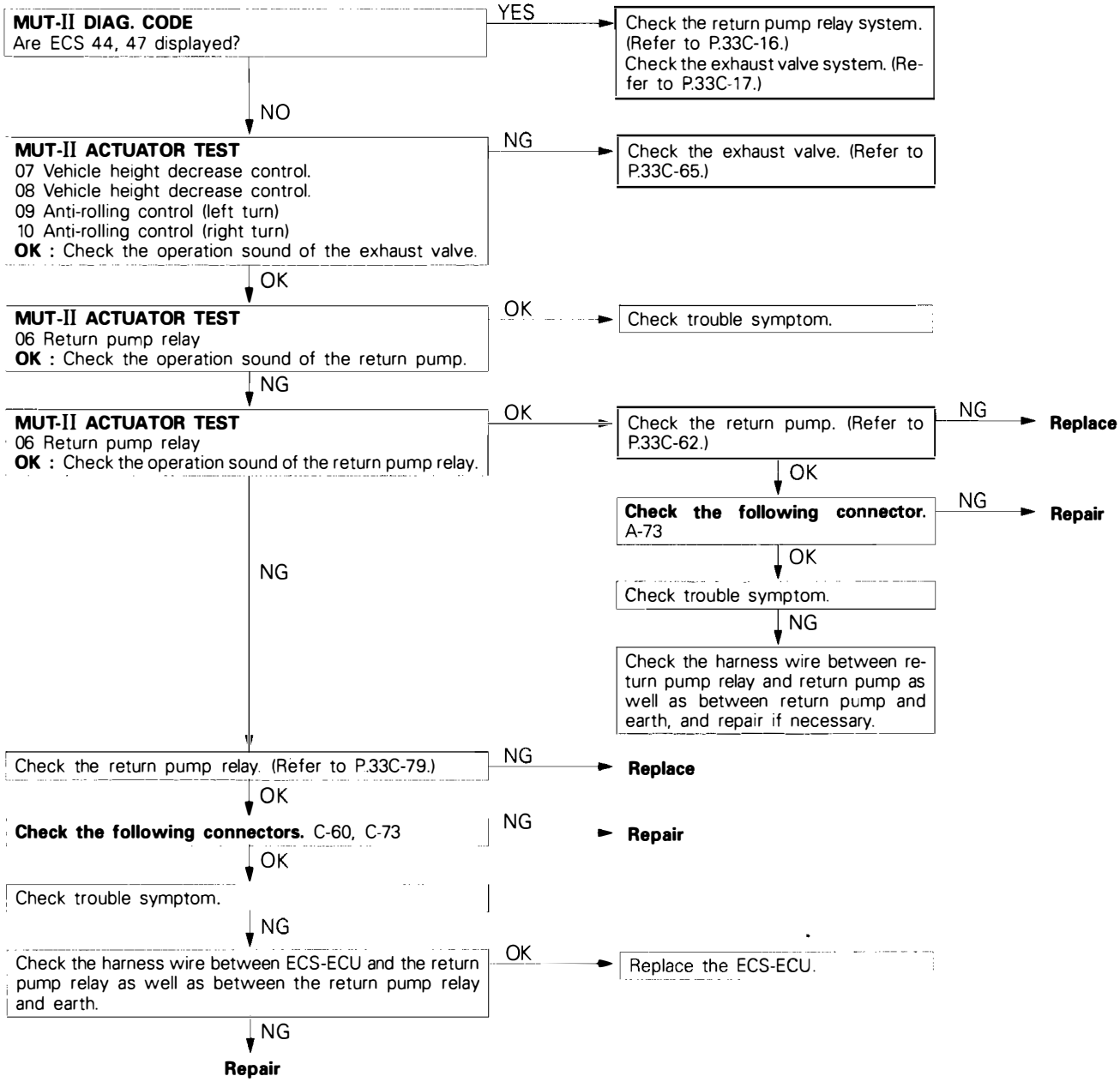
INSPECTION PROCEDURE 8

If vehicle is left to stand, vehicle height decreases.	Probable cause
[Comment] The cause is likely to be air leakage from control valves, maladjustment of the stroke sensor or malfunction of the compressor.	The vehicle height decreases either at front side or at rear side. ● Air leakage from solenoid valve ● Air leakage from flow-rate switchover The vehicle height decreases at one wheel only. ● Improper seal or air leakage of control valve seats ● Maladjustment of the front stroke sensor rod ● Maladjustment of the rear stroke sensor rod ● Stuck compressor



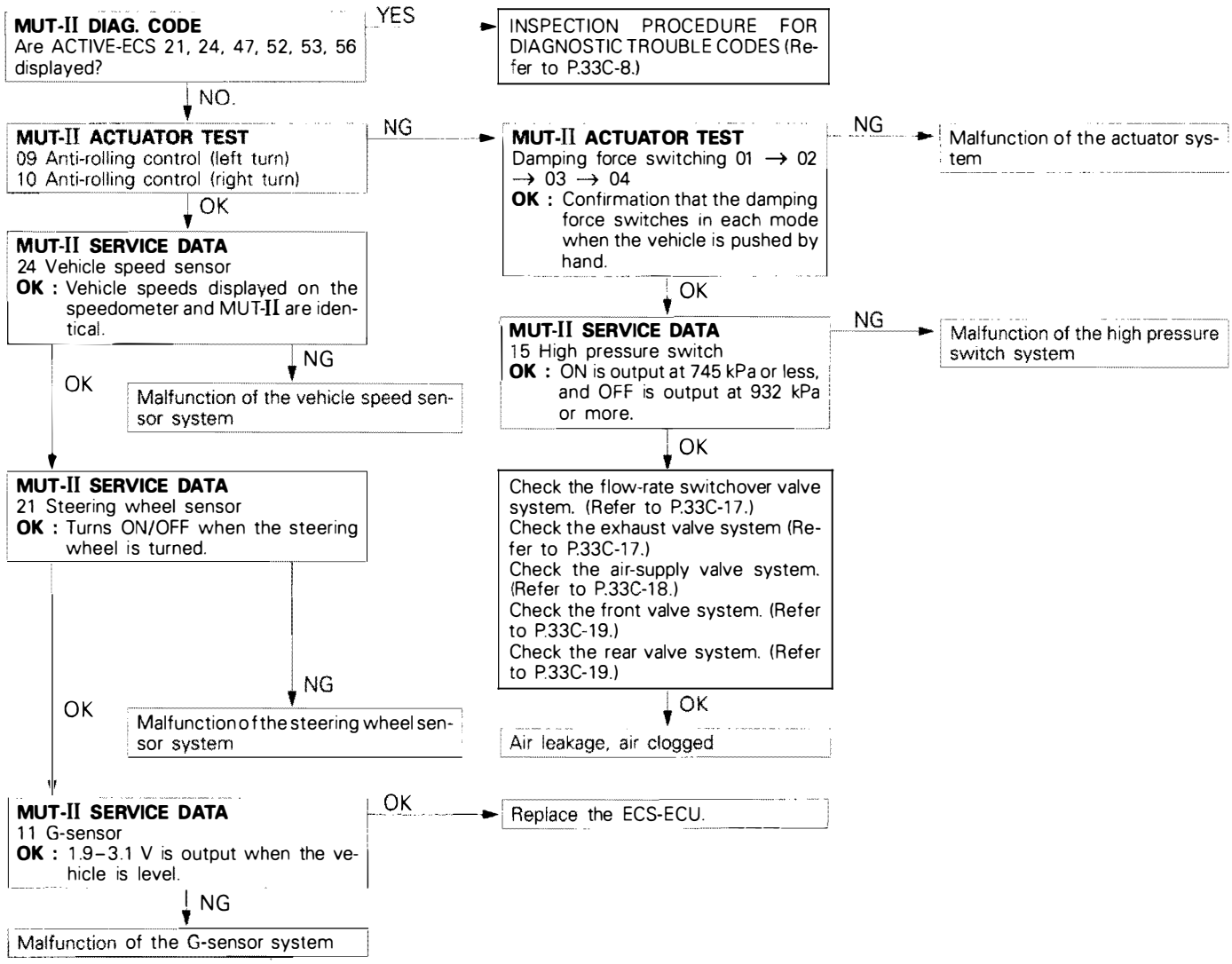
INSPECTION PROCEDURE 9

The vehicle height changes after the anti-rolling control action.	Probable cause
[Comment] If the above malfunction occurs, the reason is probably a defective exhaust valve system.	The vehicle height increases. ● Exhaust valve (front) stuck, open. ● Exhaust valve (rear) stuck, open. ● Return pump stuck. The vehicle height decreases. ● Exhaust valve (front) harness short-circuit, stuck, closed. ● Exhaust valve (rear) harness short-circuit, stuck, closed.



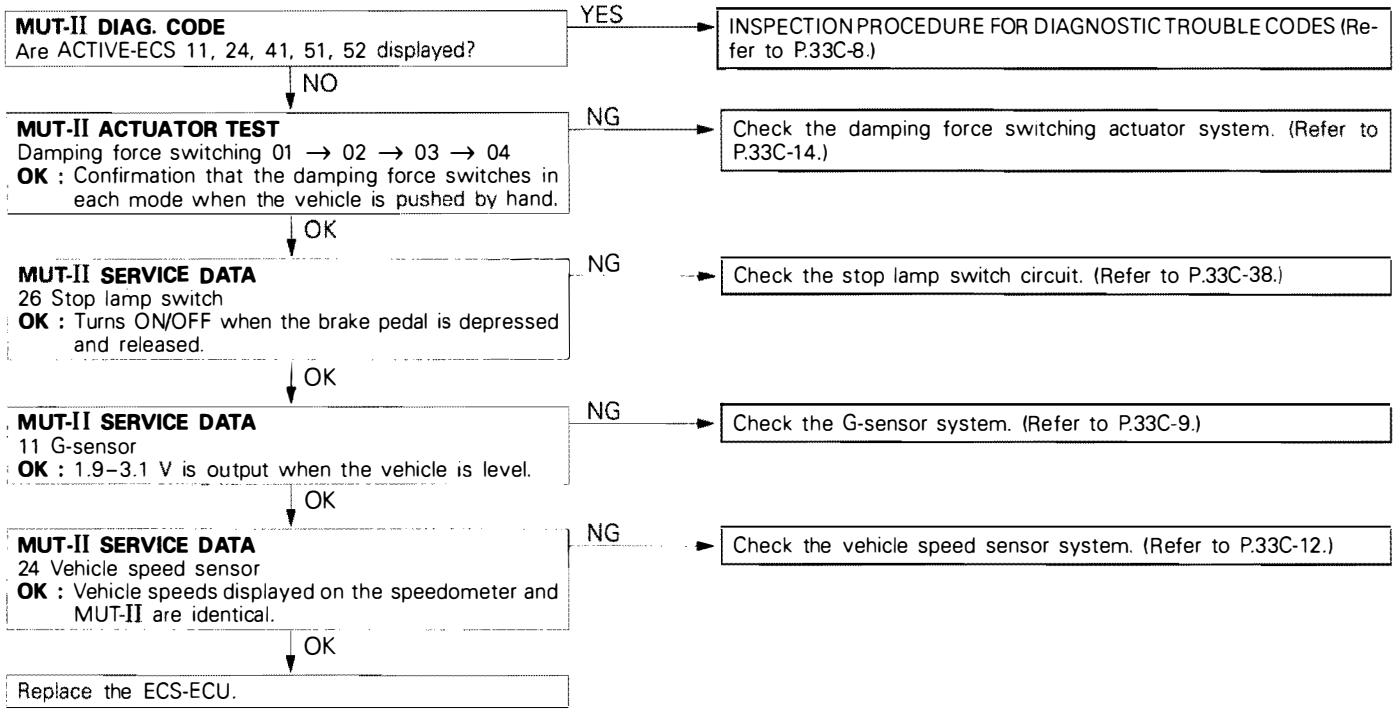
INSPECTION PROCEDURES 10

Malfunction of the anti-rolling control.	Probable cause
[Comment] If the anti-roll control is defective, the reason is probably a defective steering wheel sensor, vehicle speed sensor, actuator, high pressure switch, G sensor or valve.	• Malfunction of the actuator. • Malfunction of the steering wheel sensor. • Malfunction of the vehicle speed sensor. • Malfunction of the G-sensor. • High-pressure switch (air leakage) • Exhaust valve (stuck, closed) • Air tube (air leakage, clogged) • Malfunction of the flow-rate switchover valve. • Malfunction of the front/rear valve • Malfunction of ECS-ECU



INSPECTION PROCEDURE 11

No anti-dive control	Probable cause
[Comment] If the anti-dive control is defective, the reason is probably a defective stop lamp switch, vehicle speed sensor, G sensor, actuator, front valve or air supply valve.	• Malfunction of the actuator • Malfunction of the stop lamp switch • Malfunction of the vehicle speed sensor • Malfunction of the G-sensor • Malfunction of the front valve • Malfunction of the air-supply valve



INSPECTION PROCEDURE 12

No anti-squat control	Probable cause
[Comment] If the anti-squat control is defective, the reason is probably a defective actuator, throttle position sensor, vehicle speed sensor, stop lamp switch, air supply valve or exhaust valve.	• Malfunction of the actuator • Malfunction of the throttle position sensor. • Malfunction of the vehicle speed sensor • Malfunction of the stop lamp switch • Malfunction of the air-supply valve • Malfunction of the exhaust valve

MUT-II DIAG. CODE
Are ACTIVE-ECS 24, 41, 47, 51, 56 displayed?
YES → INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES (Refer to P.33C-8.)
NO ↓

MUT-II ACTUATOR TEST
Damping force switching
01 → 02 → 03 → 04
OK : Confirmation that the damping force switches in each mode when the vehicle is pushed by hand.
NG → Check the damping force switching actuator system. (Refer to P.33C-14.)
OK ↓

MUT-II SERVICE DATA
14 Throttle position sensor
OK : Voltage value increases as the accelerator pedal is depressed.
NG → Check the throttle position sensor circuit. (Refer to GROUP 13A – Troubleshooting.)
OK ↓

MUT-II SERVICE DATA
26 Stop lamp switch
OK : Turns ON/OFF when the brake pedal is depressed and released.
NG → Check the stop lamp switch circuit. (Refer to P.33C-38.)
OK ↓

MUT-II SERVICE DATA
24 Vehicle speed sensor
OK : Vehicle speeds displayed on the speedometer and MUT-II are identical.
NG → Check the vehicle speed sensor system. (Refer to P.33C-12.)
OK ↓

Check the air-supply valve system. (Refer to P.33C-18.)
Check the exhaust valve system. (Refer to P.33C-17.)

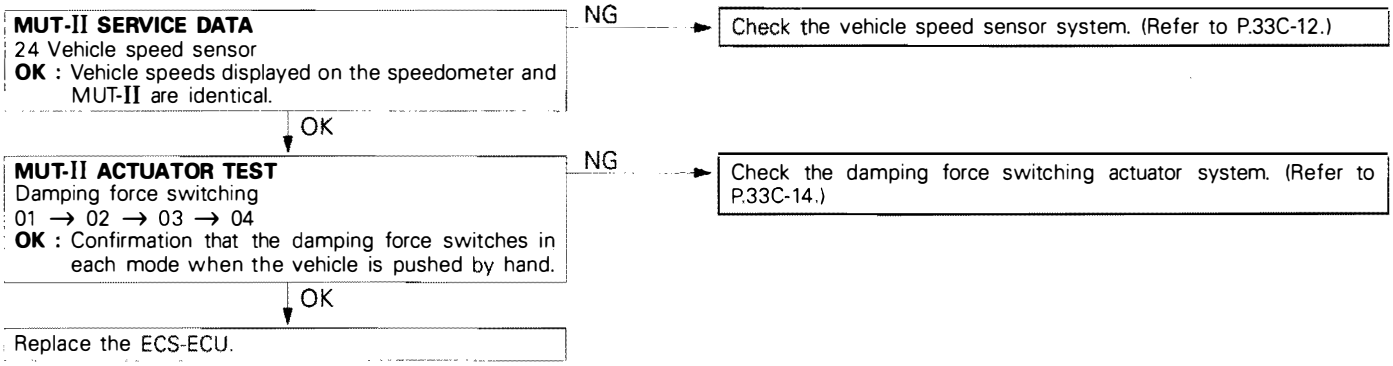
INSPECTION PROCEDURE 13

Pitching-bouncing control system	Probable cause
[Comment] If pitching bouncing control is not possible, the reason is probably a defective vehicle speed sensor, front stroke sensor, rear stroke sensor, air supply valve, exhaust valve for vehicle height adjustment or flow rate switchover valve.	• Malfunction of the vehicle speed sensor • Malfunction of the front stroke sensor • Malfunction of the rear stroke sensor • Malfunction of the air-supply valve • Malfunction of the exhaust valve • Malfunction of the exhaust valve for vehicle height adjustment • Malfunction of the flow-rate switchover valve

Check the following items.
- Vehicle speed sensor (Refer to GROUP 54 – Meters and Gauges.)
- Front stroke sensor (Refer to P.33C-73.)
- Rear stroke sensor (Refer to P.33C-73.)
- Air-supply valve (Refer to P.33C-65.)
- Exhaust valve (Refer to P.33C-65.)
- Exhaust valve for vehicle height adjustment (Refer to P.33C-65.)
- Flow-rate switchover valve (Refer to P.33C-65.)

INSPECTION PROCEDURE 14

No damping force switching according to vehicle speed	Probable cause
[Comment] If damping force switching by the vehicle speed is not possible, the reason is probably a defective vehicle speed sensor or damping force switching actuator.	• Malfunction of the vehicle speed sensor • Malfunction of the damping force switching actuator



INSPECTION PROCEDURE 15

High degree of rocking when vehicle is turned	Probable cause
[Comment] If there is a high degree of rocking when vehicle is turned, the reason is probably a defective damping force switching actuator.	• Malfunction of the damping force switching actuator

MUT-II ACTUATOR TEST
Damping force switching
01 → 02 → 03 → 04
OK : Confirmation that the damping force switches in each mode when the vehicle is pushed by hand.

NG → Check the damping force switching actuator. (Refer to P.33C-14.)

↓ OK

Replace the ECS-ECU.

INSPECTION PROCEDURE 16

No vehicle height control when getting on and off	Probable cause
[Comment] If vehicle height control is defective when getting in and out of the vehicle, the reason is probably a defective door switch, rear pressure switch or vehicle speed sensor.	• Malfunction of the door switch • Malfunction of the rear pressure switch • Malfunction of the vehicle speed sensor

MUT-II SERVICE DATA
33 Door switch
OK : ON and OFF display alternate when opening and closing the door.

NG → Check the door switch circuit. (Refer to P.33C-37.)

↓ OK

MUT-II SERVICE DATA
25 Rear pressure sensor
OK : 0.5–4.5 V is output when the vehicle is rocked from side to side.

NG → Check the rear pressure sensor system. (Refer to P.33C-13.)

↓ OK

MUT-II SERVICE DATA
24 Vehicle speed sensor
OK : Vehicle speeds displayed on the speedometer and MUT-II are identical.

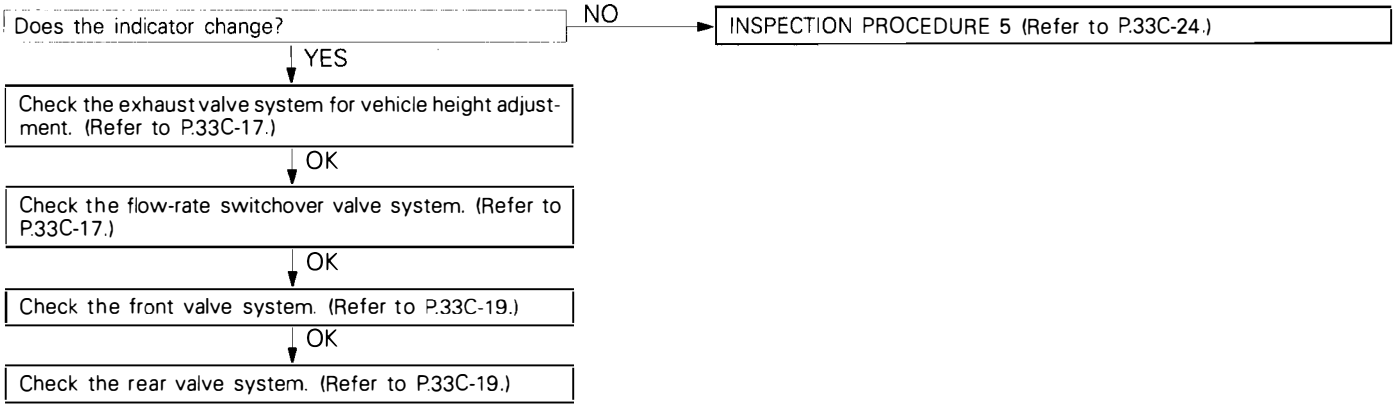
NG → Check the vehicle speed sensor system. (Refer to P.33C-12.)

↓ OK

Replace the ECS-ECU.

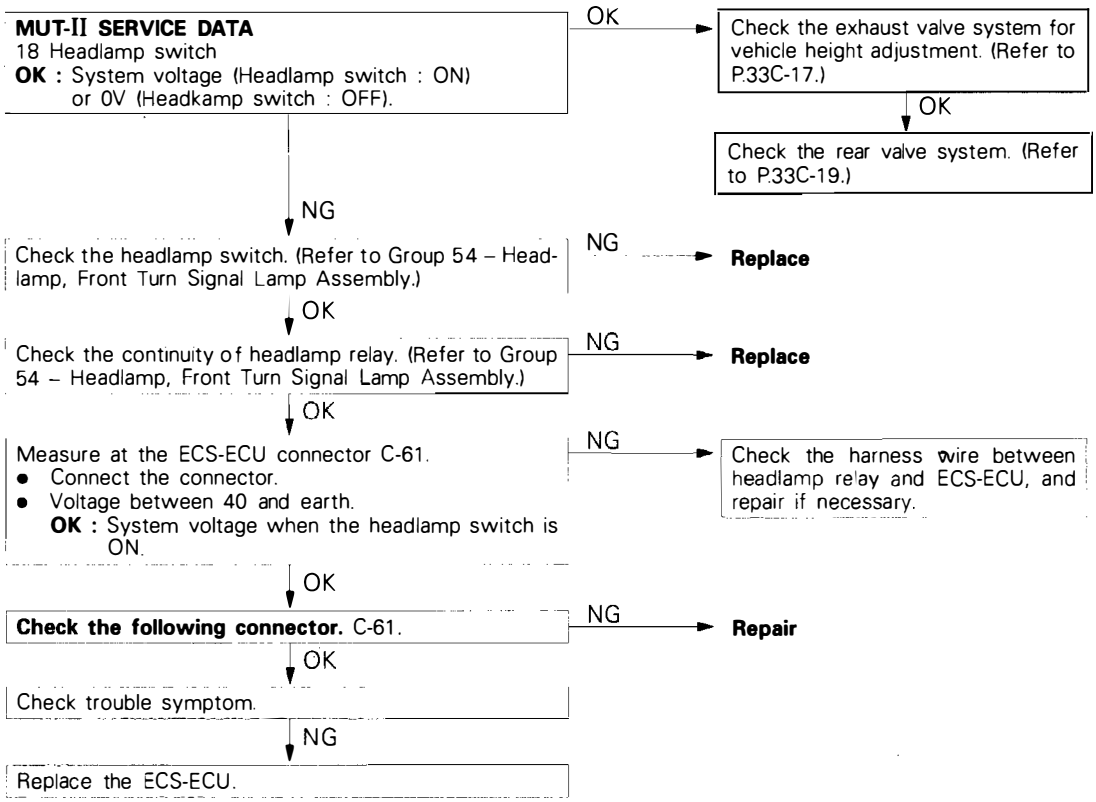
INSPECTION PROCEDURE 17

No vehicle height adjustment control according to switch	Probable cause
[Comment] If vehicle height adjustment is not possible by means of switch operation, the reason is probably a defective ECS switch, exhaust valve for vehicle height adjustment, flow rate switchover valve, front valve or rear valve.	• Malfunction of the ECS switch • Malfunction of the exhaust valve for vehicle height adjustment • Malfunction of the flow-rate switchover valve • Malfunction of the front valve • Malfunction of the rear valve



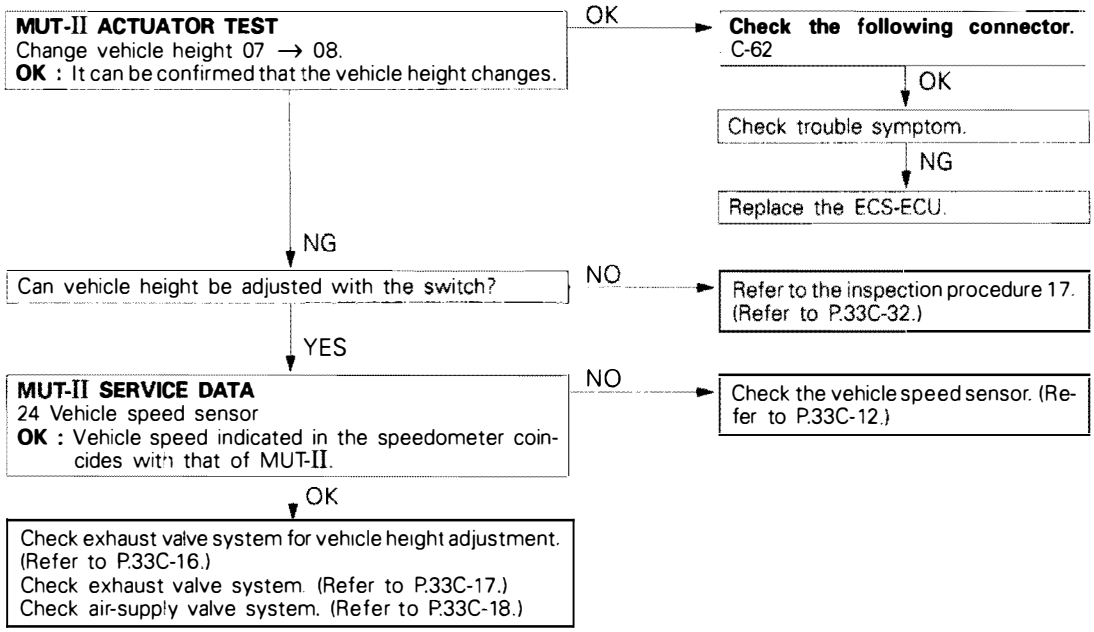
INSPECTION PROCEDURE 18

Rear is not lowered when vehicle height is LOW and headlamps are on.	Probable cause
[Comment] If the rear of the vehicle is not lowered when the vehicle height is LOW and the headlamps are on, the reason is probably a defective headlamp switch, exhaust valve for vehicle height adjustment or rear valve.	• Malfunction of the headlamp switch • Malfunction of exhaust valve for vehicle height adjustment • Malfunction of the rear valve



INSPECTION PROCEDURE 19

Vehicle height adjustment is not possible according to vehicle speed.	Probable cause
[Comment] If vehicle height adjustment according to vehicle speed is not possible, the reason is probably a defective vehicle speed sensor, exhaust valve for vehicle height adjustment or ECS-ECU, etc.	• Malfunction of vehicle height sensor • Malfunction of exhaust valve for vehicle height adjustment • Malfunction of ECS-ECU



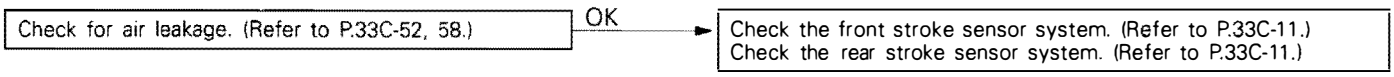
INSPECTION PROCEDURE 20

Rapid vehicle height control does not occur	Probable cause
[Comment] If rapid vehicle height control does not occur, the reason is probably a defective front stroke sensor, rear stroke sensor or rear pressure switch.	• Malfunction of front stroke sensor. • Malfunction of rear stroke sensor. • Malfunction of rear pressure switch.

Check the following items.
- Check the front stroke sensor. (Refer to P.33C-73.)
- Check the rear stroke sensor. (Refer to P.33C-73.)
- Check the rear pressure switch. (Refer to P.33C-62.)

INSPECTION PROCEDURE 21

Vertical vehicle height hunting occurs.	Probable cause
[Comment] If vertical vehicle height hunting occurs, the reason is probably a defective front stroke sensor or rear stroke sensor, or an air leak.	• Air leakage • Malfunction of front stroke sensor • Malfunction of rear stroke sensor



INSPECTION PROCEDURE 22

High frequency of compressor operation	Probable cause
[Comment] If the compressor operates frequently, the reason is probably air leaks in each section.	• Air leakage

Check for air leakage from the following parts.
- Front solenoid valve assembly (Refer to P.33C-65.)
- Rear solenoid valve assembly (Refer to P.33C-65.)
- Control valve assembly (Refer to P.33C-67.)
- Exhaust valve for vehicle height adjustment (Refer to P.33C-65.)
- Compressor (Refer to P.33C-63.)
- Air tube (Refer to P.33C-71.)

INSPECTION PROCEDURE 23

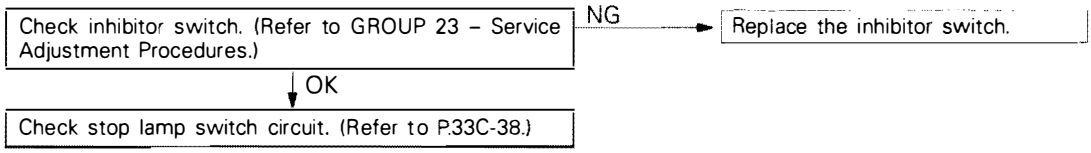
Vehicle height overshoots its target when adjusted.	Probable cause
[Comment] If there is an overshoot in vehicle height lift adjustment, the reason is probably that the flow rate switchover valve is stuck in the closed position.	• Malfunction of flow-rate switchover valve

Check the flow-rate switchover valve. (Refer to P.33C-65.)

INSPECTION PROCEDURE 24

Defective control when reversing	Probable cause
[Comment] If control is defective when reversing, the reason is probably a defective inhibitor switch <A/T> or backup lamp switch <M/T>.	• Malfunction of inhibitor switch <A/T> • Malfunction of back-up lamp switch <M/T>

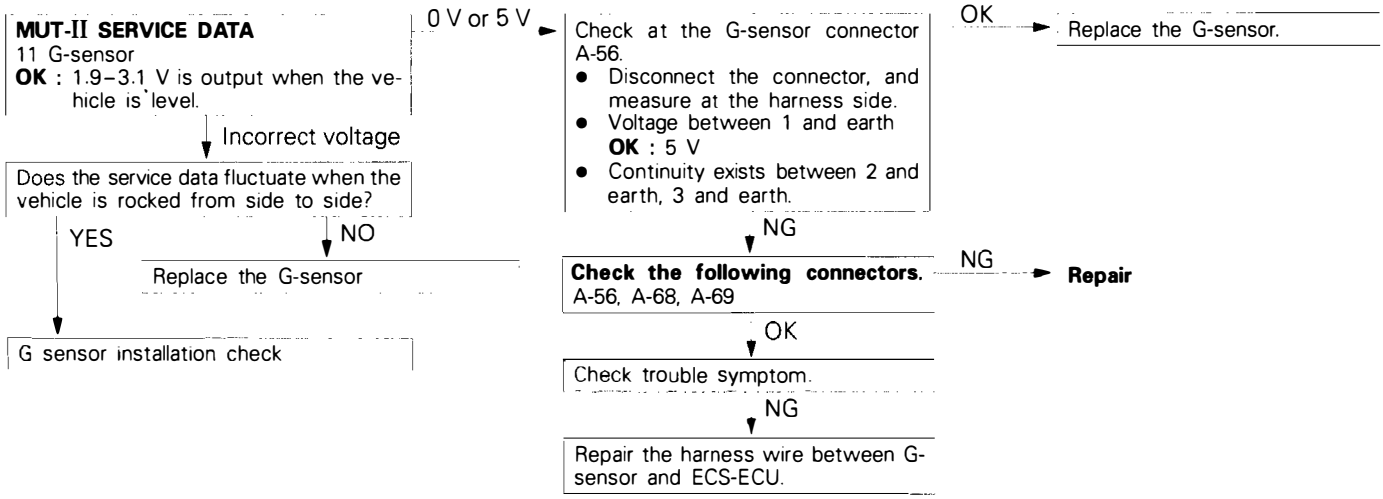
<A/T>



<M/T>
Check the back-up lamp switch circuit. (Refer to P.33C-37.)

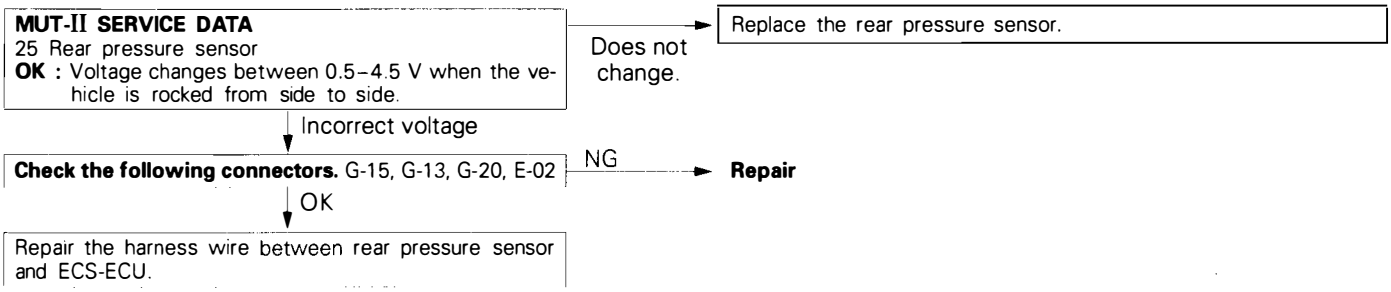
INSPECTION PROCEDURE 25

Check the G-sensor circuit.



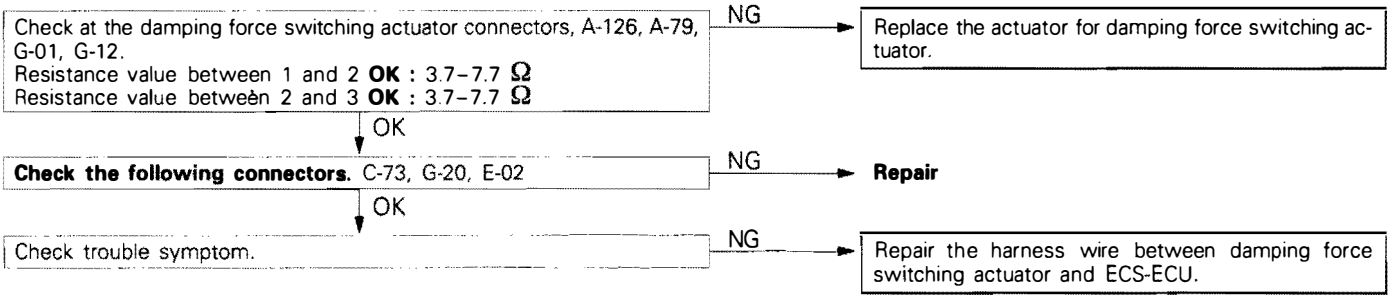
INSPECTION PROCEDURE 26

Check the rear pressure sensor circuit.



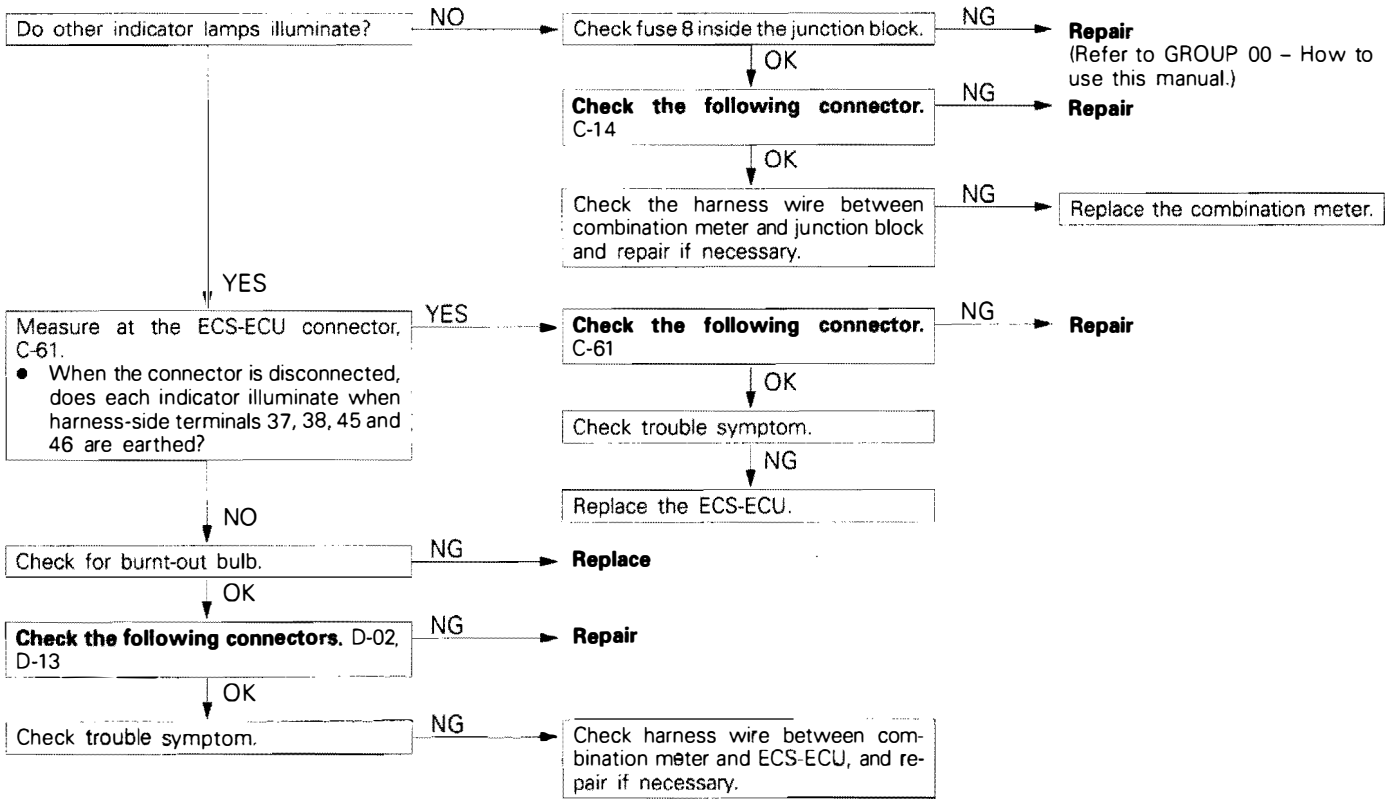
INSPECTION PROCEDURE 27

Check the circuit of damping force switching actuator.



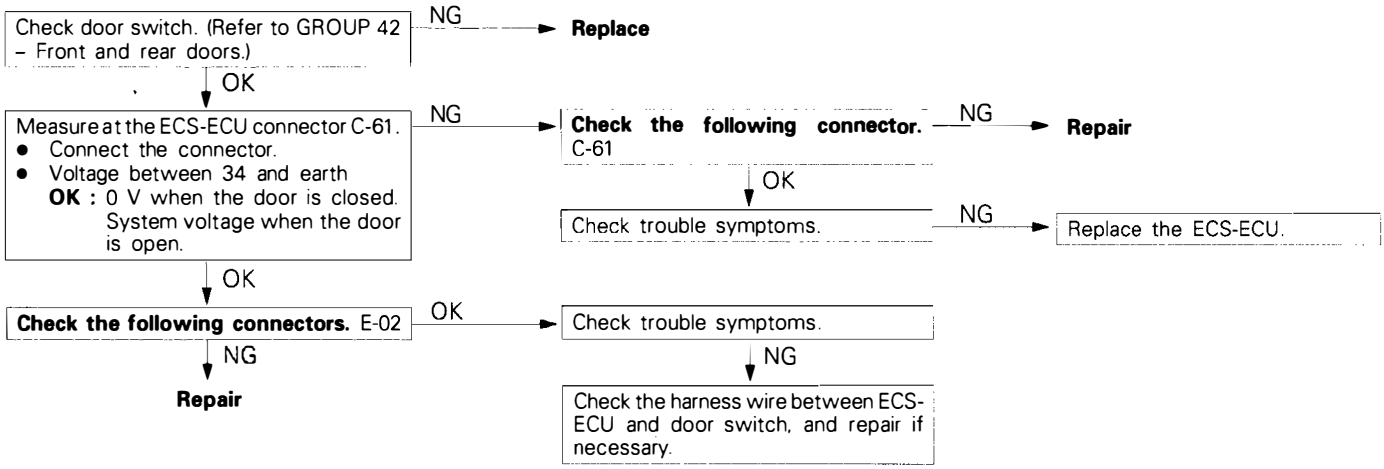
INSPECTION PROCEDURE 28

Indicator illumination circuit inspection



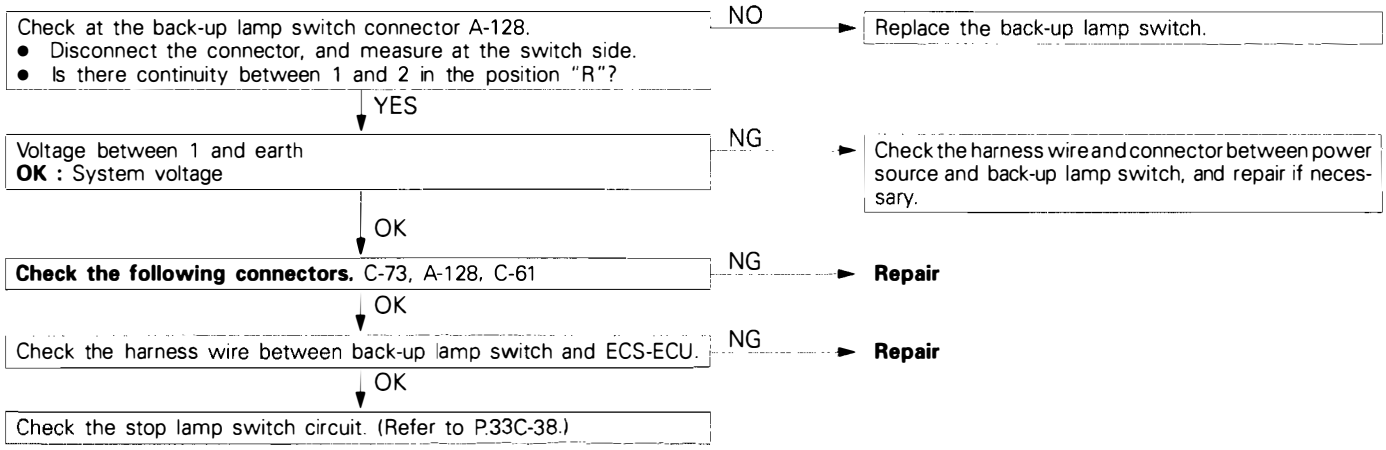
INSPECTION PROCEDURE 29

Check door switch circuit.



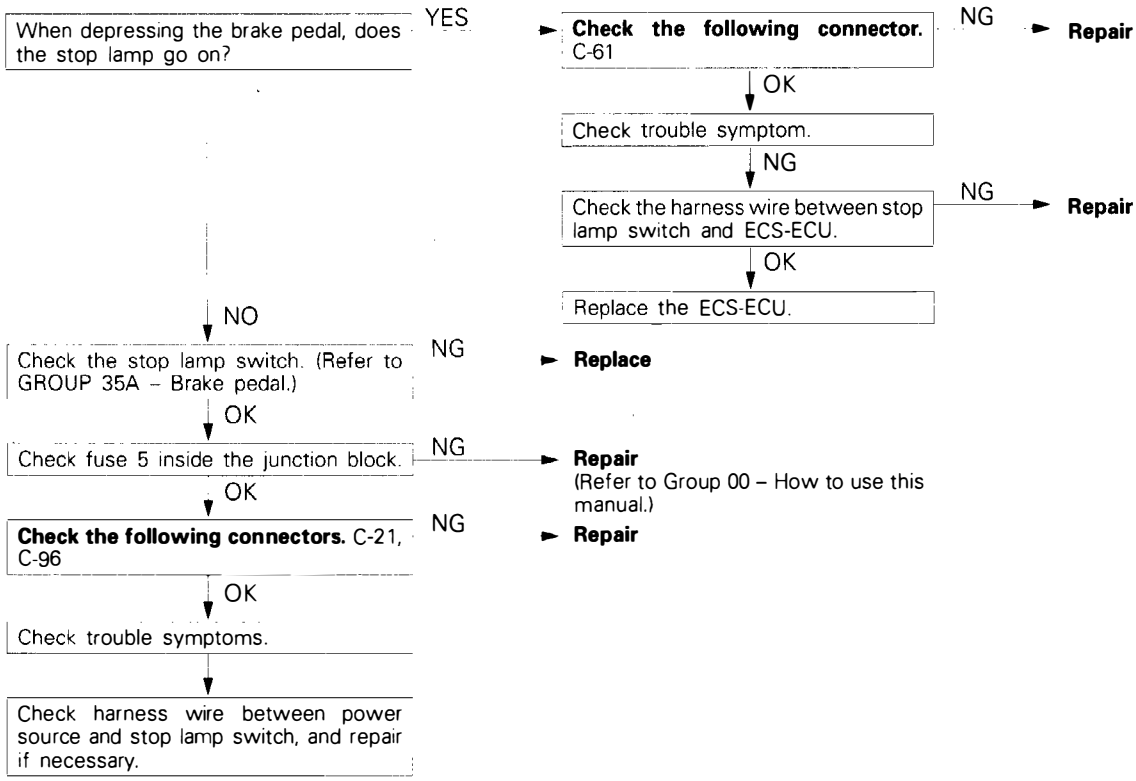
INSPECTION PROCEDURE 30

Check the back-up lamp switch circuit.



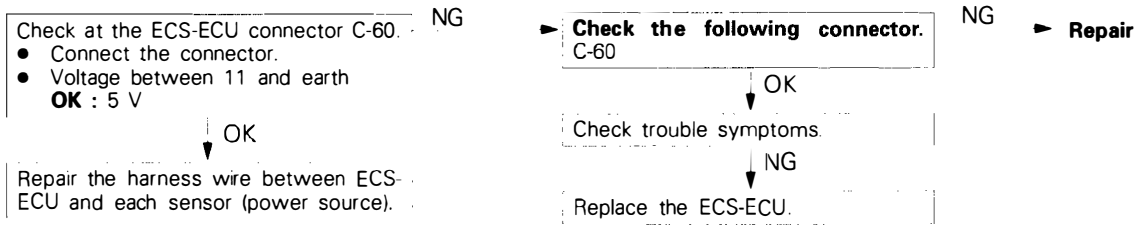
INSPECTION PROCEDURE 31

Check the stop lamp switch circuit.



INSPECTION PROCEDURE 32

Check the sensor power source circuit.



SERVICE DATA REFERENCE TABLE

E33CE06AA

Item No.	Check item	Check condition		Normal condition
11	G-sensor	When vehicle is level		1.9–3.1 V
13	Low pressure switch	69 kPa or less		ON
		137 kPa or more		OFF
14	Throttle position sensor	Throttle valve is fully closed.		300–1,000 mV
		Depress the accelerator pedal slowly.		Voltage increases gradually.
		Throttle valve is fully opened.		4,500–5,500 mV
15	High pressure switch	745 kPa or less		ON
		932 kPa or more		OFF
16	Ignition switch	Ignition switch: ON		ON
		Ignition switch: OFF		OFF
17	ECS switch	Switch is not engaged(neutral).		4–6V
		SPORT switch: ON		0 V
		HIGH switch: ON		2–3 V
18	Headlamp switch	Headlamp switch: ON		System voltage
		Headlamp switch: OFF		0 V
21	Steering wheel sensor	When the steering wheel is gently turned to the right, the ST1 and ST2 displays change as shown at right.	ST1	ON → ON → OFF → OFF
			ST2	ON → OFF → OFF → ON
		When the steering wheel is gently turned to the left, the ST1 and ST2 displays change as shown at right.	ST1	ON → OFF → OFF → ON
			ST2	ON → ON → OFF → OFF
22	Front stroke sensor	Rock the front of the vehicle by hand to change the vehicle height.		Changes at the following range. 0–5 V
23	Rear stroke sensor	Rock the rear of the vehicle by hand to change the vehicle height.		Changes at the following range. 0–5 V
24	Vehicle speed sensor	Carry out a road test.		Vehicle speeds displayed on the speedometer and MUT-II are identical.
25	Rear pressure sensor	Rock the vehicle by hand.		Changes at the following range. 0.5–4.5 V
26	Stop lamp switch	Brake pedal depressed.		ON
		Brake pedal not depressed.		OFF
31	Inhibitor switch (A/T)	R position		ON
		Any position other than R position		OFF
32	Backup lamp switch (M/T)	Backup lamp switch: ON		ON
		Backup lamp switch: OFF		OFF
33	Door switch	Door switch: ON		ON
		Door switch: OFF		OFF
37	Idle switch	Accelerator pedal not depressed.		ON
		Accelerator pedal depressed.		OFF
38	Ignition pulse (engine rpm)	Start the engine.		Speed displayed is the same as engine speed.
58	Communication with TCL	When the system is normal.		ON
		Transmission abnormality, open harness or short, or no TCL setting		OFF

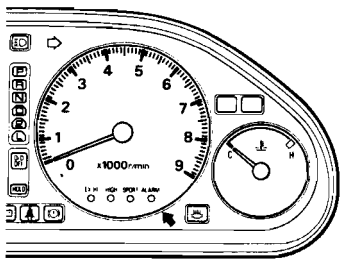
CHECK AT THE ECU TERMINALS

E33CE07AA

Terminal No.	Check item	Check condition		Normal condition
1	Damping force switching actuator (front)	When the actuator does not operate.		4–6 V
		When the actuator operates.		0 ↔ System voltage
2	Damping force switching actuator (rear)	When the actuator does not operate.		4–6 V
		When the actuator operates.		0 ↔ System voltage
3	Damping force switching actuator (rear)	When the actuator does not operate.		4–6 V
		When the actuator operates.		0 ↔ System voltage
4	Engine speed	Start the engine. (idling)		4–6 V
7	G-sensor input	When vehicle is level		1.9–3.1 V
8	TSP	Accelerator pedal depressed.		0–5 V
9	Front stroke sensor input	Rock the front of the vehicle by hand to change the vehicle height.		0–5 V
10	Rear stroke sensor input	Rock the rear of the vehicle by hand to change the vehicle height.		0–5 V
11	Sensor power supply	When the ECU operates.		4.5–5.5 V
12	ECU power supply	When IG2 is ON.		System voltage
13	ECU earth	Constantly		0 V
14	Damping force switching actuator (front)	When the actuator does not operate.		4–6 V
		When the actuator operates.		0 ↔ System voltage
15	Damping force switching actuator (front)	When the actuator does not operate.		4–6 V
		When the actuator operates.		0 ↔ System voltage
16	Damping force switching actuator (rear)	When the actuator does not operate.		4–6 V
		When the actuator operates.		0 ↔ System voltage
17	Steering wheel sensor(ST1) input	Steering wheel is at the neutral position. (photo-interruptor: ON)		0.5 V or less
		Other than above (photo-interruptor: OFF)		2.5–3.5 V
18	Steering wheel sensor(ST2) input	Steering wheel is at the neutral position. (photo-interruptor: ON)		0.5 V or less
		Other than above (photo-interruptor: OFF)		2.5–3.5 V
19	Vehicle speed sensor input	Turns ON and OFF repeatedly when the vehicle is moved back or forth.	When sensor is ON.	0 V
			When sensor is OFF.	4.5 V or more

Terminal No.	Check item	Check condition		Normal condition
20	TCL data input	Vehicles equipped with TCL		2.5–3.5 V
		Vehicles not equipped with TCL		4.5–5.5 V
22	Pressure sensor input	When the rear air spring pressure is low.		0.5 V or more
		When the rear air spring pressure is high.		4.5 V or more
23	ECS switch (AUTO/SPORT)	When AUTO		0 V
		When SPORT		2–3 V
24	ECS switch (AUTO/HIGH)	When AUTO		0 V
		When HIGH		2–3 V
25	ECU power supply	Constantly		System voltage
26	ECS relay	Constantly		System voltage
31	Sensor earth	Constantly		0 V
32	High pressure switch	When switch is ON.		System voltage
		When switch is OFF.		0 V
33	Low pressure switch	When switch is ON.		System voltage
		When switch is OFF.		0 V
34	Door switch	When door is open (at least one door)		0 V
		When doors are closed		System voltage
35	Diagnosis	When normal		4 V or more
36	MUT-II	When normal		System voltage
37	EX HI lamp	When the lamp does not illuminate.		0 V
		When the lamp illuminates.		System voltage
38	SPORT lamp	When the lamp does not illuminate.		0 V
		When the lamp illuminates.		System voltage
39	Sensor earth	Constantly		0 V
40	Headlamp switch	When the headlamp switch is ON.		System voltage
		When the headlamp switch is OFF.		0 V
41	Stop lamp switch	When the stop lamp switch is ON.		System voltage
		When the stop lamp switch is OFF.		0 V
42	Reverse signal	Inhibitor switch or backup lamp switch	When ON	System voltage
			When OFF	0 V
43	Throttle position sensor	When idling		0–1 V
		When the throttle valve is fully opened.		4.5–5.5 V
44	ECS relay	Constantly		System voltage
45	HI lamp	When the lamp does not illuminate.		0 V
		When the lamp illuminates.		System voltage
46	ALARM lamp	When the lamp does not illuminate.		0 V
		When the lamp illuminates.		System voltage

Terminal No.	Check item	Check condition	Normal condition
51	Return pump	When the return pump relay is ON.	System voltage
		When the return pump relay is OFF.	0 V
52	Exhaust valve for vehicle height adjustment	When the valve is ON.	System voltage
		When the valve is OFF.	0 V
53	Front exhaust valve	When the valve is ON.	System voltage
		When the valve is OFF.	0 V
54	Rear valve (right)	When the valve is ON.	System voltage
		When the valve is OFF.	0 V
55	Rear air supply valve	When the valve is ON.	System voltage
		When the valve is OFF.	0 V
56	Front valve (right)	When the valve is ON.	System voltage
		When the valve is OFF.	0 V
57	Compressor	When the compressor relay is ON.	System voltage
		When the compressor relay is OFF.	0 V
58	Flow-rate control solenoid valve	When the solenoid valve is ON.	System voltage
		When the solenoid valve is OFF.	0 V
59	Rear exhaust valve	When the valve is ON.	System voltage
		When the valve is OFF.	0 V
60	Rear valve (left)	When the valve is ON.	System voltage
		When the valve is OFF.	0 V
61	Front air supply valve	When the valve is ON.	System voltage
		When the valve is OFF.	0 V
62	Front valve (left)	When the valve is ON.	System voltage
		When the valve is OFF.	0 V


A12X0184

SERVICE ADJUSTMENT PROCEDURES

ALARM LAMP CHECK E33CF00AA

Check if the alarm lamp illuminates for approximately 0.5 second when the ignition key is turned to ON and the engine has been started.

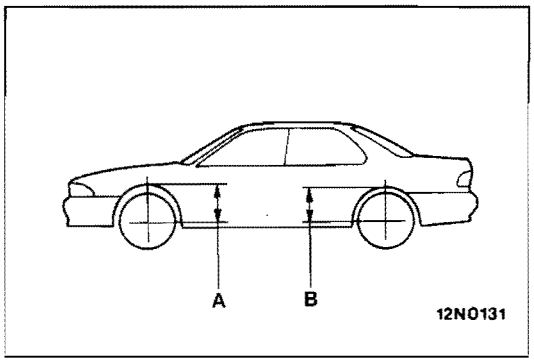
SYSTEM CHECKING BY USING ALARM LAMP E33CF01AA

1. After checking the alarm lamp bulb to be sure it has not failed, let the engine idle for approximately 4 minutes or more to check to be sure that the alarm lamp does not illuminate.
2. While the alarm lamp is on, connect the MUT-II to the diagnosis check terminal of the wiring harness and check the diagnosis output code.

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

NOTE
Although the alarm lamp illuminates under the following circumstances, there is no actual malfunction if, after the following procedures have been followed and then the alarm lamp does not illuminate after waiting about four minutes or more.

1. When the vehicle is stopped (with the engine running) on a steep hill or slope.
   Move the vehicle to a horizontal place and stop; then stop the engine and restart it.
2. When vehicle-height adjustments are made frequently. After stopping the engine, open the hood and allow the compressor to cool; then restart the engine.
3. When the vehicle is driven on winding roads in the mountains continuously for 40 minutes or longer. To protect the return pump from damage, stop the engine and then restart it.



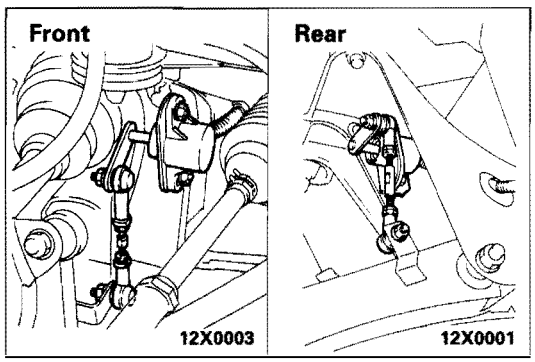
NORMAL VEHICLE HEIGHT CHECK AND ADJUSTMENT

E33CF02AA

1. Park the vehicle on a flat surface.
2. With the vehicle unladen, start the engine, and after vehicle height adjustment is completed, check if the vehicle height is at NORMAL.
3. Measure the distance between the wheel arch and the center of the axle for both the right front and left rear.

Standard value:

A (Front)	**393–403 mm**
B (rear)	**377–387 mm**

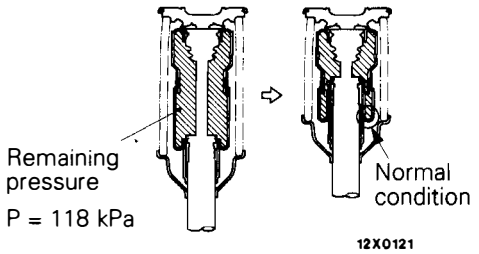


4. If the vehicle height is not within the standard value, loosen the turnbuckles of the front and rear height sensor rods, and then make the adjustment by changing the length of the rods.(One turn of the nut will raise or lower the front vehicle height by approximately 10 mm, and the rear vehicle height by approximately 9 mm.) The vehicle height becomes higher when the rods are lengthened.

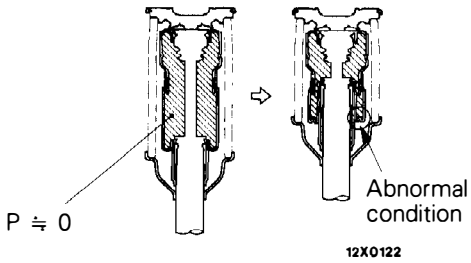
Caution

1. **Both the front and rear heights must be checked, because, even though only the front or the rear is adjusted, the other height (rear or front) is also changed.**
2. **The adjustments of the vehicle height must be made while the engine is idling (vehicle stopped).**

Without disconnecting the air tubing



By disconnecting the air tubing



ROLLING DIAPHRAGM CHECK E33CF03AA

Under normal conditions, the rolling diaphragm is as shown in the "normal condition" half of the figure. If, however, the vehicle is jacked up while there is no air in the air springs and then let down suddenly, the diaphragm may become double folded, as shown in the "abnormal condition" half of the illustration.
If the vehicle is driven in abnormal condition, the diaphragm will soon be damaged, so the procedure below should be followed to prevent this.

Checking method

Front: Jack the front end up and check visually or feel the diaphragm.
Rear: Check to be sure that movement is smooth when the rear part of the body is bounced up and down.

Repair method

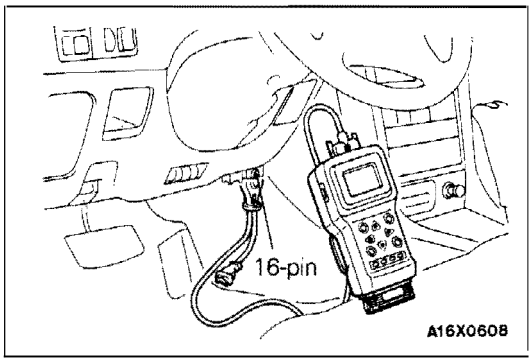
1. Jack up the vehicle and start the engine.
2. Press the HIGH vehicle-height switch for two seconds or longer so as to set to the EXTRA HIGH vehicle-height.
3. Supply air to each air spring so as to return the diaphragm to the normal form.

NOTE
The diaphragm will return easily if a solution of soap and water is applied to the diaphragm.

Caution
In order to prevent double-folding of the diaphragm, be sure, if the air tubing is disconnected in the course of servicing, to follow step 2 above after connecting the tubing in order to introduce air into the air springs.

SYSTEM OPERATION CHECK E33CF04AA

The checking procedures described below are for the purpose of actually activating the system so as to verify whether or not the system's function is normal.

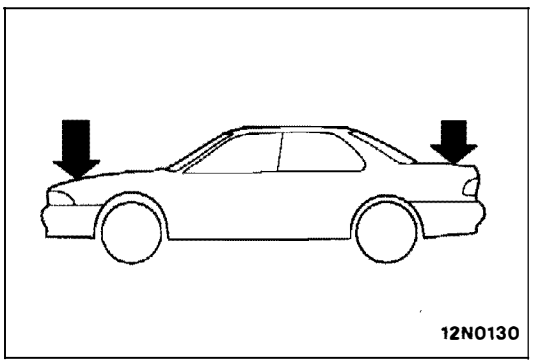


Caution

1. **For checks conducted by an actual road test, do so in a safe place and observe the speed limit.**
   For tests that require high-speed driving, such tests can be conducted while the vehicle is stopped by using the MUT-II to input simulated vehicle-speed signals. Connection and disconnection of the MUT-II should always be made with the ignition switch in the OFF position.
2. **Never drive the vehicle while the simulated vehicle-speed signals are still being used.**

DAMPING FORCE E33CF04BA

1. Move the wheel to the straight-ahead position.
2. Start the engine.
3. Set to the AUTO mode (normal vehicle height).
4. Input a simulated vehicle-speed signal of 3 km/h or more.



5. Press the control mode switch and check to be sure that there is a difference of the damping force for each control mode when the vehicle is moved up and down at a rate of twice per second.

Control mode	Damping force
AUTO	SOFT
SPORT	MEDIUM

ANTI-ROLLING FUNCTION E33CF04CA

1. Move the wheels to the straight-ahead position.
2. Turn the ignition key to ON.
3. When simulated vehicle-speed signals of 35 km/h or higher are input and the steering wheel is turned 45° or more, check that the damping force changes to MEDIUM or HARD, depending on the speed at which the steering wheel is turned.
   Check to be sure that this sensitivity increases (for each control mode) as the vehicle speed increases.

ANTI-DIVE FUNCTION E33CF04DA

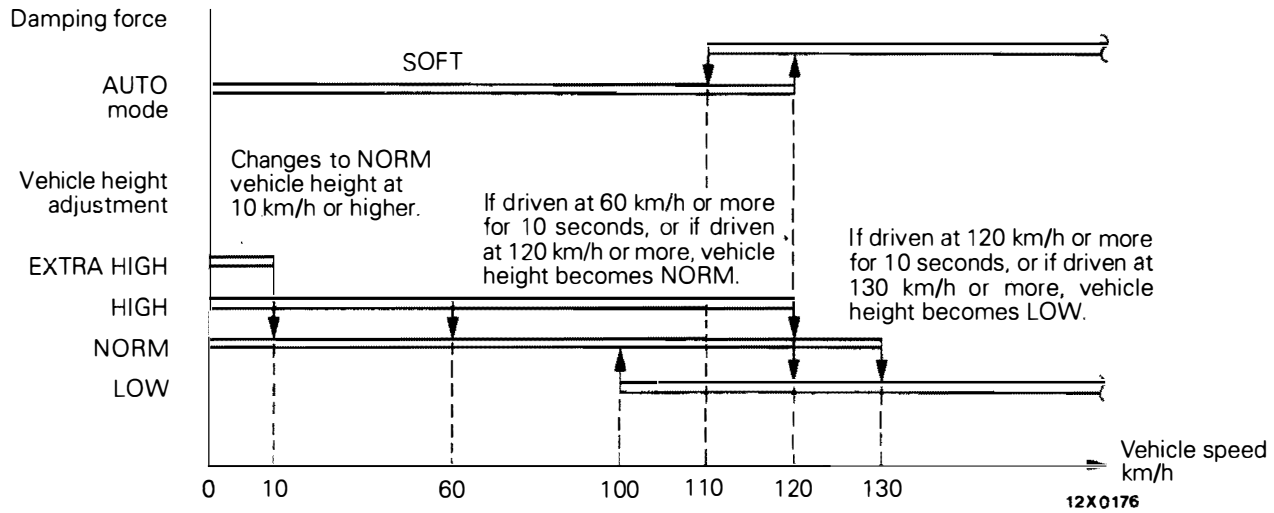
1. Turn the ignition key to ON.
2. Input a simulated vehicle-speed signal of 3 km/h or more.
3. With the brake pedal depressed (the stop lamp is ON), check that the damping force changes to HARD when the simulated vehicle-speed input signal is suddenly decreased from 100 km/h or higher, and that there is air supply at the front and exhaust at the rear.

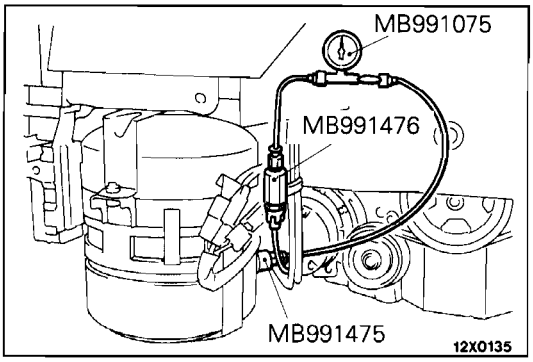
ANTI-SQUAT FUNCTION E33CF04EA

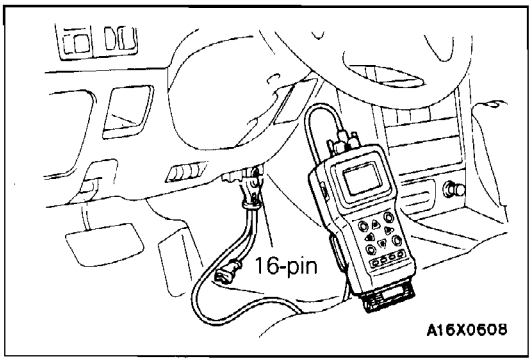
1. Turn the ignition key to ON.
2. Input a simulated vehicle-speed signal that is 3 km/h or higher and is less than 100 km/h.
3. Check if the damping force changes to HARD when the accelerator pedal is suddenly depressed, and that there is air exhaust at the front and supply at the rear.

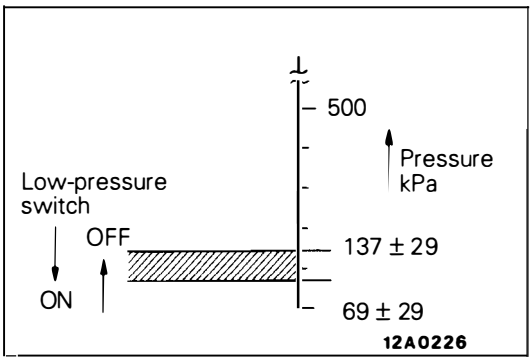
VEHICLE-SPEED RESPONSE FUNCTION E33CF04FA

1. Start the engine.
2. Input simulated vehicle-speed signals and check whether or not there are changes of the damping force and of the vehicle height (as shown in the diagram below) according to changes in the vehicle speed.









LOW-PRESSURE SWITCH (LOW-PRESSURE TANK SIDE) ACTUATION PRESSURE CHECK

E33CF05AA

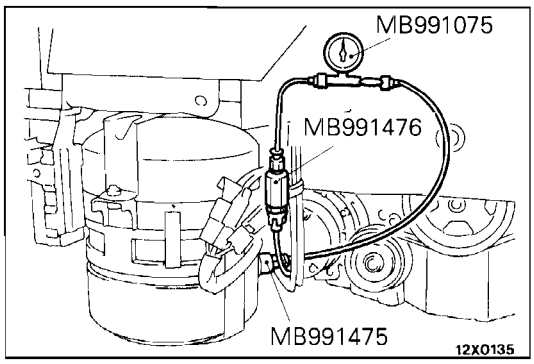
1. Disconnect the air tube with the pink mark from the reserve tank assembly.
2. Connect the special tool (air pressure gauge) between the removed air tube and the reserve tank assembly via the special tools (MB991475 - Adapter G, MB991476 - Adapter H).
3. Connect the MUT-II, start the engine, and wait until the compressor stops (the high-pressure switch is OFF).

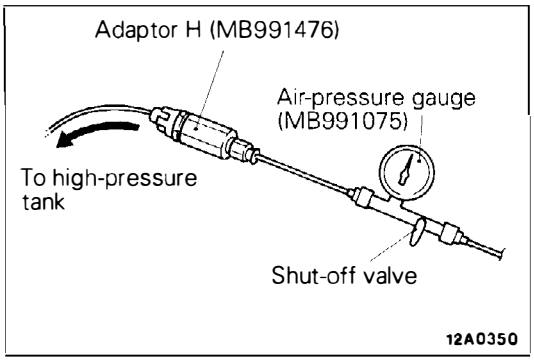
   Caution
   Connection and disconnection of the MUT-II should always be made with the ignition switch in the OFF position.
4. Input simulated vehicle-speed signals (3 km/h or higher).
5. With the simulated vehicle-speed signals still being input conduct actuator test No. 09 (left turn) or No. 10 (right turn) so as to increase the pressure within the low pressure tank chamber.
6. During the actuator test, monitor the pressure gauge indication and check whether or not the pressure when the return pump activation starts (i.e., the maximum gauge reading) and the pressure when the return pump stops are both within the standard value.

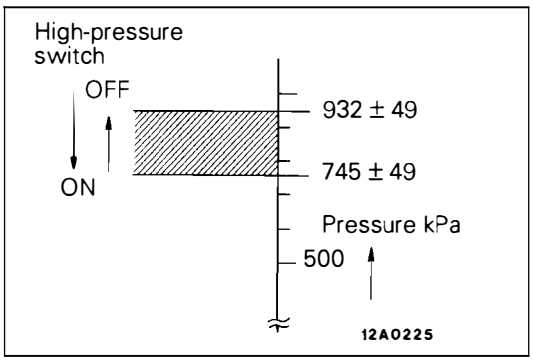
   Standard value:

   Return pump actuation pressure
   137 ± 29 kPa

   Return pump cut-off pressure
   69 ± 29 kPa or lower
7. If the internal pressure of the low-pressure tank is not within the standard values when the return pump operation is actuated (i.e., the low-pressure switch is OFF) or when the operation of the return pump is stopped (low-pressure switch ON), remove the reserve tank assembly and replace the low-pressure switch.







HIGH-PRESSURE SWITCH (HIGH-PRESSURE TANK SIDE) ACTUATION PRESSURE CHECK

E33CF06AA

1. Disconnect the air tube with the yellow mark from the reserve tank assembly.
2. Connect the special tool (air pressure gauge) between the removed air tube and the reserve tank assembly via the special tools (MB991475 - Adapter G, MB991476 - Adaptor H).

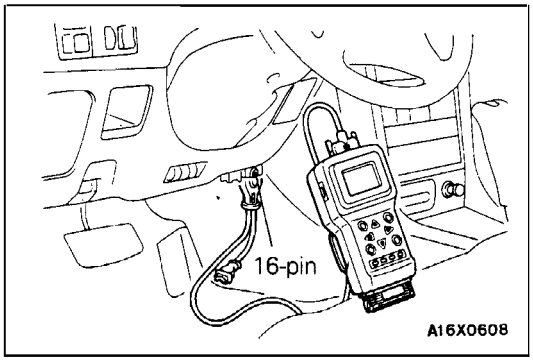
   NOTE
   The shut-off valve of the air-pressure gauge should be closed.
3. Start the engine and activate the compressor.

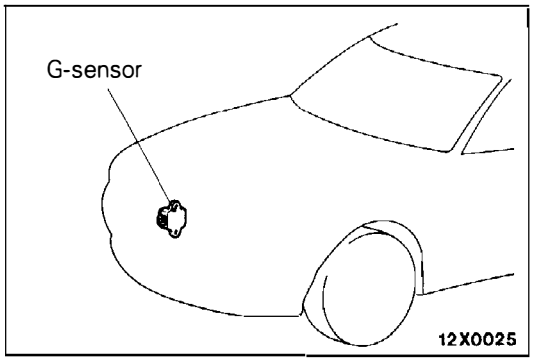
   NOTE
   If the system is in normal condition, the compressor will be activated after the engine is started, because the pressure within the high-pressure tank has decreased.
4. After activation of the compressor, the pressure within the high-pressure tank will increase; check whether or not the pressure is the standard value when the compressor is stopped.

   Standard value: 932 ± 49 kPa
5. Gradually open the shut-off valve of the air-pressure gauge while watching the indicator of the air-pressure gauge; check whether or not the pressure that actuates the compressor's operation (when the pressure within the high-pressure tank has dropped) is within the standard value range.

   Standard value: 745 ± 49 kPa

   NOTE
   The ON/OFF status of the high-pressure switch at this time can be checked by the MUT-II.
6. If the pressure within the high-pressure tank is not within the standard value range when the compressor is stopped (high-pressure switch OFF) or the compressor is activated (high-pressure switch ON), remove the reserve tank assembly and replace the high-pressure switch.





G-SENSOR OUTPUT VOLTAGE CHECK E33CF07AA

1. Unload the vehicle and move it to a horizontal surface.
2. Connect the MUT-II and start the engine.

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

3. Check whether the G-sensor output voltage is within the standard value range when the vehicle-height is the NORMAL vehicle-height.

Standard value: 2.5 ± 0.1V

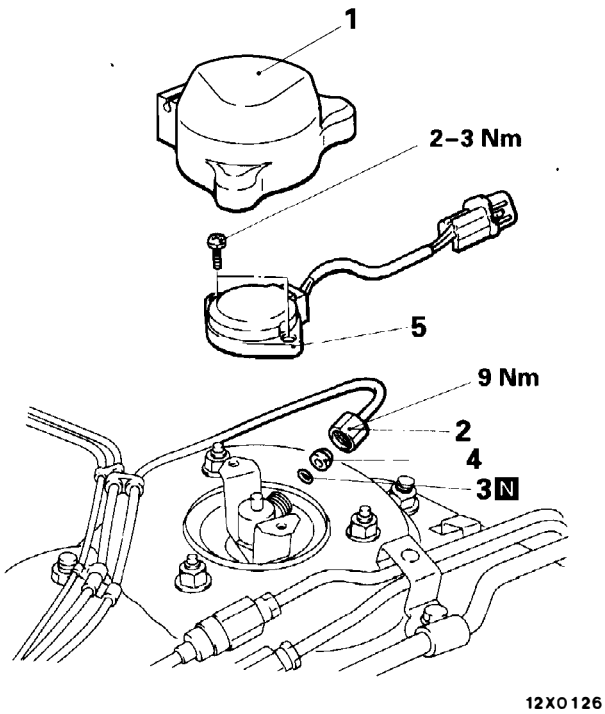
4. If the G-sensor output voltage is not within the standard value range, check the installation condition of the G sensor; if there is bolt loose, deformation of the body, etc., repair it. If the problem is not repairable, replace the G sensor.

NOTE
If the G-sensor installation surface is at an angle (tilted) due to body deformation or some other cause, a washer(s) or shim(s) may be used to make an adjustment so that the output voltage is within the standard value range.

FRONT SHOCK ABSORBER ASSEMBLY

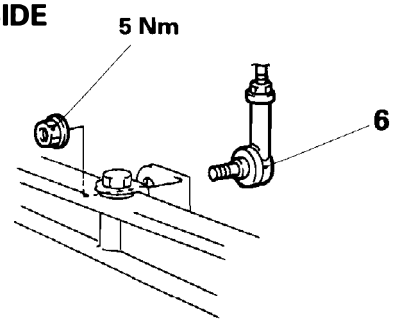
REMOVAL AND INSTALLATION

E33CG00AC

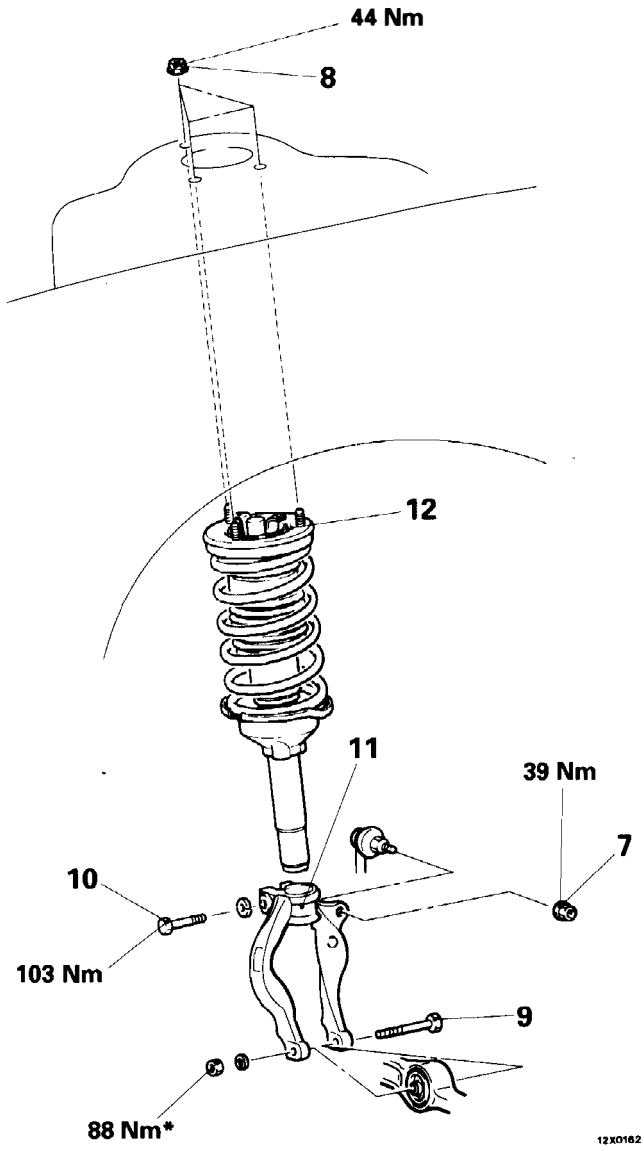


12X0126

LEFT SIDE



12X0139



12X0162

Removal steps

1. Front actuator cover
2. ◆A◆ Air tube
3. O-ring
4. Bushing
5. Actuator assembly
6. Front stroke sensor rod
7. Stabilizer link mounting nut
8. Shock absorber upper mounting nuts
9. Shock absorber lower mounting bolt
10. Damper fork mounting bolt
11. Damper fork
12. Shock absorber assembly

Post-installation Operation

- ACTIVE ECS System Operation Check (Refer to P.33C-46.)
- Front Wheel Alignment Adjustment (Refer to GROUP 33A – Service Adjustment Procedures.)

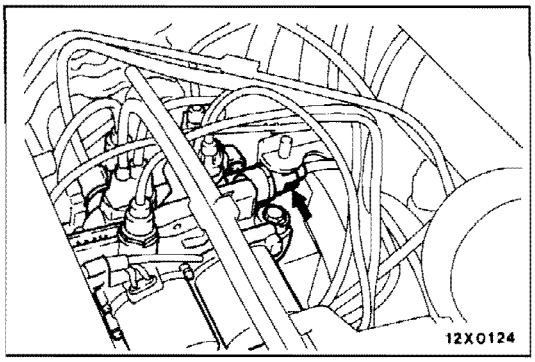
Caution

***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**

INSPECTION

E33CG02AA

- Check for oil leaks from the shock absorber assembly.
- Check the shock absorber for damage or deformation.

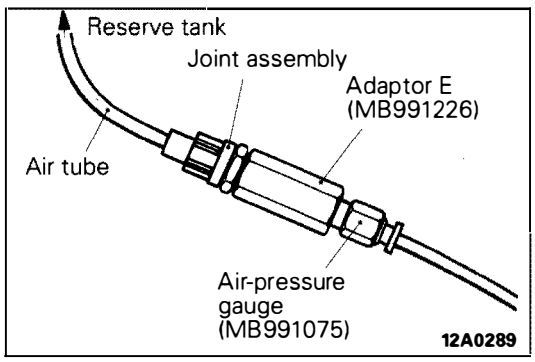


SHOCK ABSORBER ASSEMBLY AIR LEAKAGE CHECK

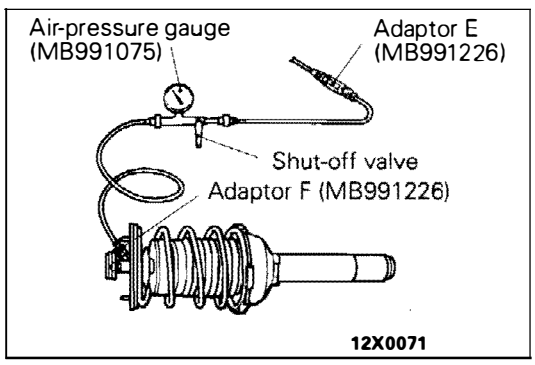
E33CG02BA

(1) Disconnect the flow-control solenoid valve's air tube (connected to the high-pressure side of the reservoir tank) shown in the illustration, and then take off the joint assembly.

NOTE
This air tube is connected, via the reservoir tank and the dryer, to the compressor assembly.



(2)Install the removed joint assembly to the special tool (adaptor set) and then connect to the disconnected air tube.

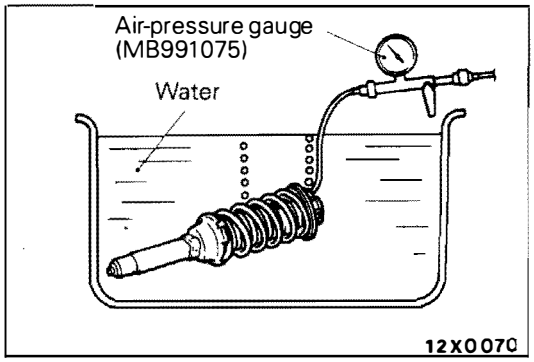


(3) Connect the air tube at the shut-off valve side of the special tool (air-pressure gauge) to the air tube side, and the other one to the shock absorber assembly.
The installation at the shock absorber side is done by using the special tool (adaptor set).

Caution
To prevent the entry of moisture during the shock absorber assembly air leak check, utilize air from the dryer.

(4) Remove the compressor connector, then operate it by connecting it directly to the battery.

NOTE
Refer to P.33C-63 for compressor connector array.



(5) Insert the shock absorber assembly into a water tank and check for air leakage at a pressure of about 500 kPa.

Caution

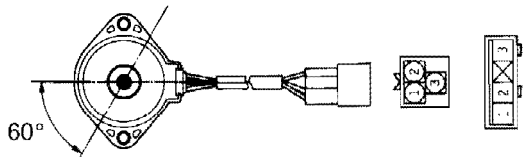
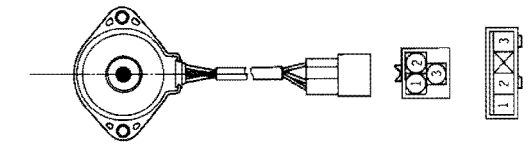
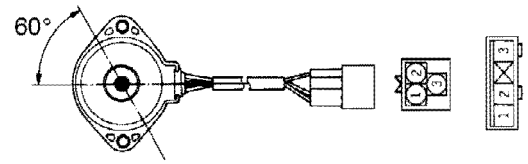
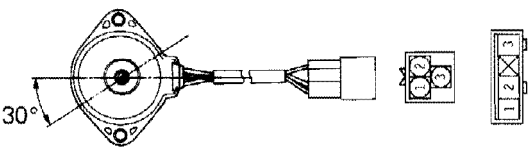
1. **Don't mistake the rise of bubbles attached to the outside of the shock absorber for air leakage.**
2. **Dry the shock absorber with an air blower after the check has been completed.**

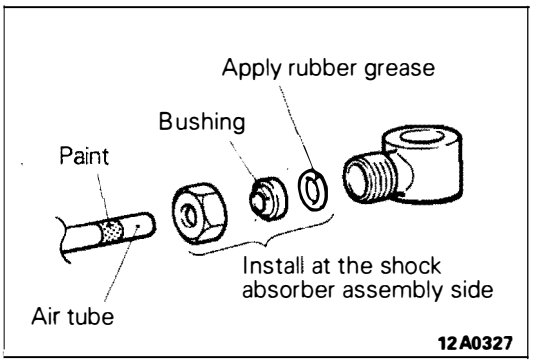
(6) When air leakage is found, check the shock absorber assembly and replace it as necessary.

ACTUATOR CHECK

E33CG02CA

Check to be sure that the actuator output shaft is in the position shown in the illustration below when battery voltage is applied between the actuator connector terminals.

Terminal	Voltage	Actuator output shaft position
1 (White)	–	
2 (Black)	None	
3 (Red)	+	
1 (White)	+	
2 (Black)	–	
3 (Red)	None	
1 (White)	None	
2 (Black)	+	
3 (Red)	–	
1 (White)	None	
2 (Black)	–	
3 (Red)	+	12X0147



INSTALLATION SERVICE POINT E33CG04AA

◆A◆ AIR TUBE INSTALLATION

(1) After coating the O-ring with rubber grease, install the O-ring, bushing and flare nut to the shock absorber assembly.

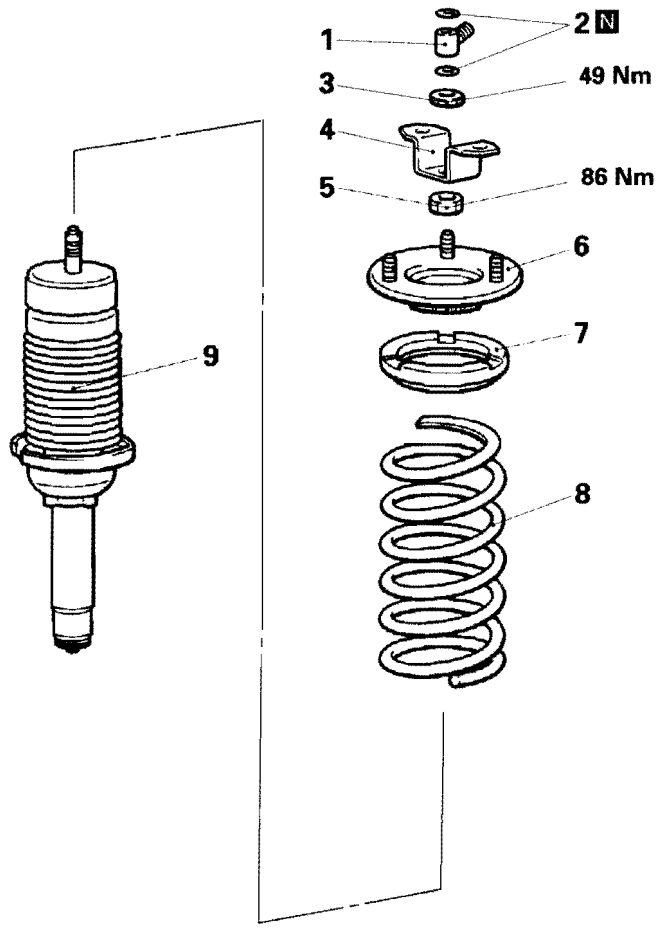
Caution
1. **The O-ring may be damaged if it is installed at the air tube side when the connection is made.**
2. **The bushing must be installed so that the projection part is facing in the direction indicated in the illustration.**

(2) First insert the air tube until resistance is felt, and then push the tube in until the painted place on the air tube.

Caution
Air leakage may occur if the air tube connection is not complete and secure.

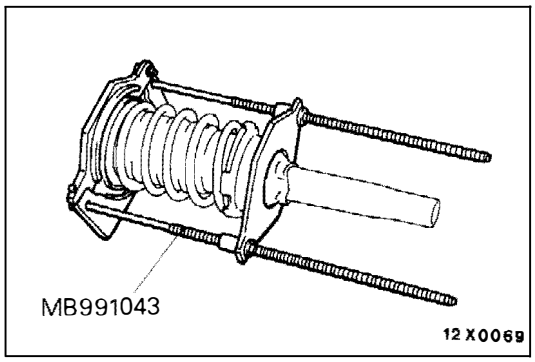
(3) After connecting the air tube, in order to prevent double-folding of the diaphragm, while still in the lifted condition, press the vehicle-height switch (HIGH switch) for two seconds or longer to select the EXTRA HIGH mode so that air will be supplied to the air springs.

DISASSEMBLY AND REASSEMBLY E33CG05AA



Disassembly steps

1. Joint
2. O-ring
3. Actuator bracket mounting nut
4. Actuator bracket
〈A〉 ◗C◖ 5. Front insulator mounting nut
◗B◖ 6. Front insulator
7. Upper spring pad
◗A◖ 8. Front coil spring
9. Front shock absorber



DISASSEMBLY SERVICE POINTS E33CG06AA

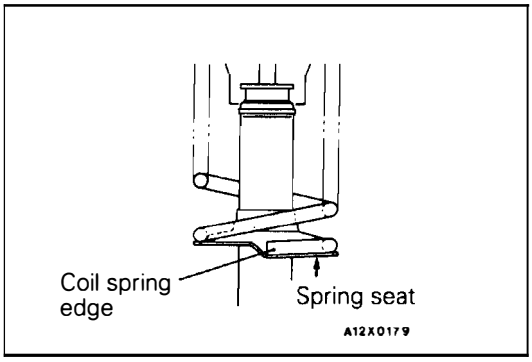
〈A〉 FRONT INSULATOR MOUNTING NUT REMOVAL

Use the special tool to compress the coil spring, and then remove the front insulator mounting nut.

NOTE
Refer to the special tools on P.33C-6.

INSPECTION E33CG07AA

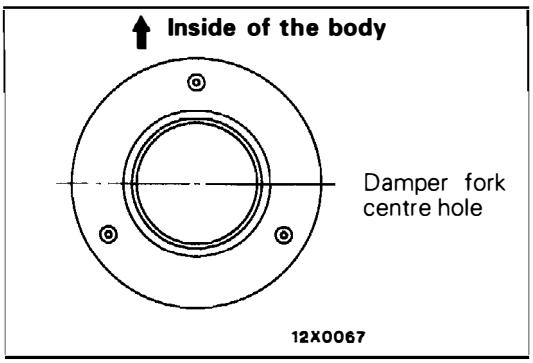
- Check the rubber parts for damage or deterioration.
- Check the coil spring for deformation, deterioration or damage.
- Check the shock absorber for deformation.



REASSEMBLY SERVICE POINTS E33CG08AA

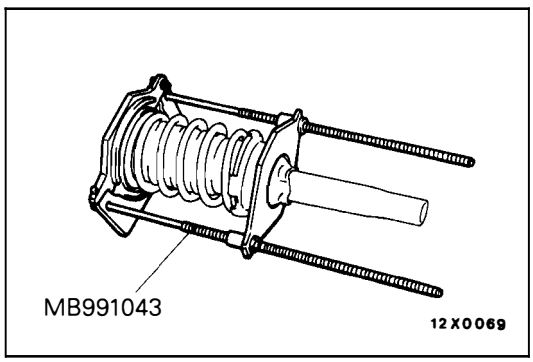
◆A◆ FRONT COIL SPRING POSITIONING

Place the edge of the coil spring along the shock absorber spring seat as shown in the illustration.



◆B◆ FRONT INSULATOR INSTALLATION

Install the front insulator so that the damper fork centre hole is in the position shown in the illustration.



◆C◆ FRONT INSULATOR MOUNTING NUT INSTALLATION

Use the special tool to compress the coil spring, and then install the front insulator mounting nut.

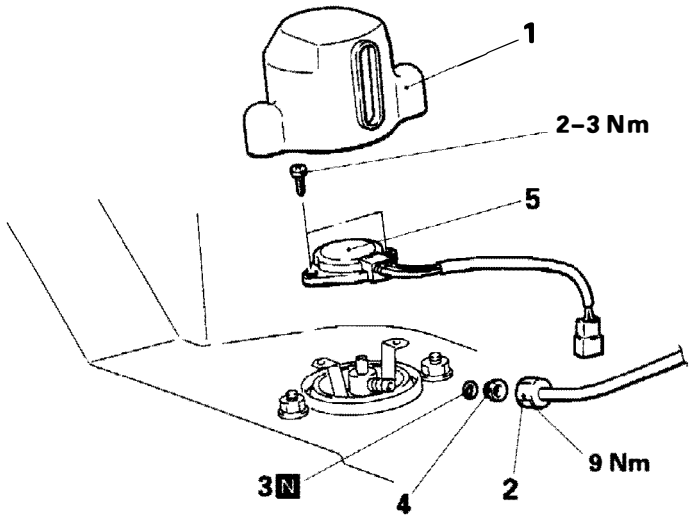
UPPER ARM ASSEMBLY/COMPRESSION LOWER ARM ASSEMBLY/LATERAL LOWER ARM ASSEMBLY/STABILIZER BAR E33CG10AA

Refer to GROUP 33A – Front Suspension.

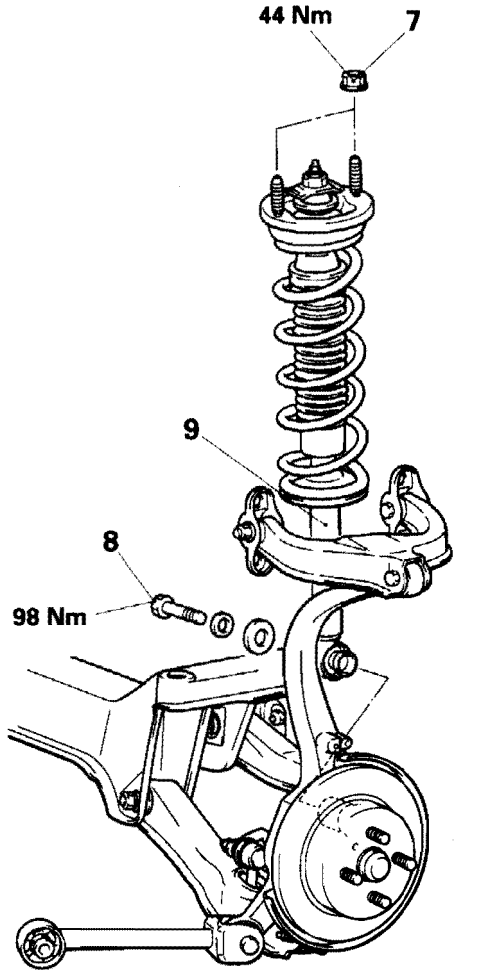
REAR SHOCK ABSORBER ASSEMBLY

REMOVAL AND INSTALLATION

E33CH00AA

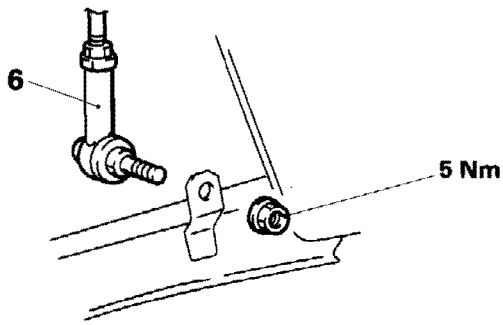


12X0136



12X0130

RIGHT SIDE



12X0138

Pre-removal Operation
- Front Shelf Cover Removal <Sedan> (Refer to GROUP 52A – Trims.)
- Absorber Lid Removal <Hatchback> (Refer to GROUP 52A – Trims.)

Post-installation Operation
- Front Shelf Cover Installation <Sedan> (Refer to GROUP 52A – Trims.)
- Absorber Lid Installation <Hatchback> (Refer to GROUP 52A – Trims.)
- ACTIVE ECS System Operation Check (Refer to P.33C-46.)

Removal steps

1. Rear actuator cover
◆A◆ 2. Air tube
3. O-ring
4. Bushing
5. Actuator assembly
6. Rear stroke sensor rod
7. Shock absorber upper mounting nuts
8. Shock absorber lower mounting bolt
9. Shock absorber assembly

INSPECTION E33CH02AA

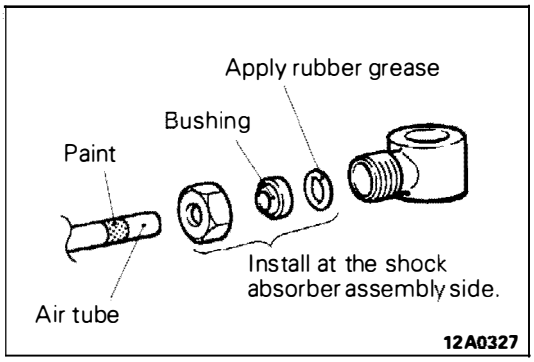
- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage or abnormal noise.

SHOCK ABSORBER ASSEMBLY AIR LEAKAGE CHECK

Refer to P.33C-52.

ACTUATOR CHECK

Refer to P.33C-53.



INSTALLATION SERVICE POINTS E33CH04AA

◆A◆ AIR TUBE CONNECTION

(1) After applying a coating of rubber grease to the O-ring, install the O-ring, bushing and joint at the shock absorber assembly side.

Caution
1. The O-ring might be damaged if it is installed at the air tube side and then insertion is made.
2. The bushing must be installed so that the projection part is facing in the direction indicated in the illustration.

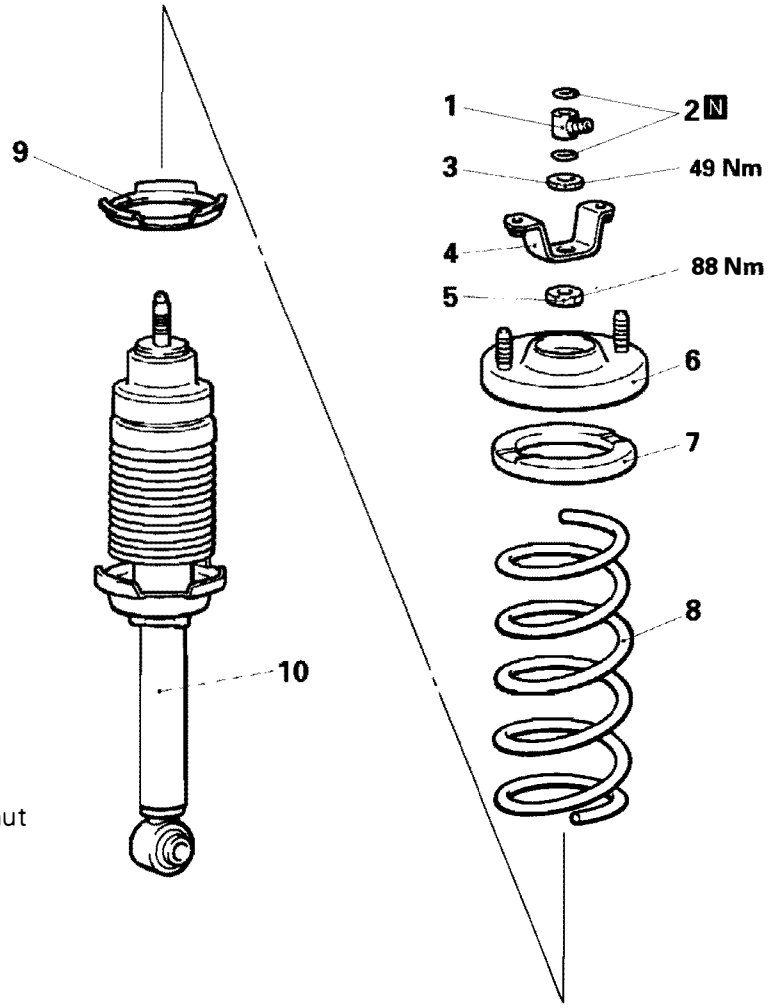
(2) First insert the air tube until resistance is felt, and then push in the tube until the painted place on the air tube.

Caution
Air leakage may occur if the air tube connection is not complete and secure.

(3) After connecting the air tube, in order to prevent double-folding of the diaphragm, while still in the lifted condition, press the vehicle-height switch (HIGH switch) for two seconds or longer to select the EXTRA HIGH mode so that air will be supplied to the air springs.

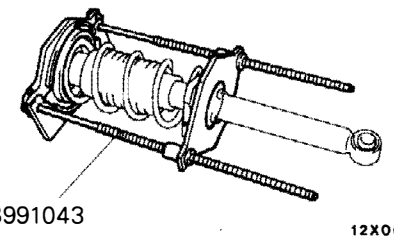
DISASSEMBLY AND REASSEMBLY

E33CH05AA



Disassembly steps

1. Joint
2. O-ring
3. Actuator bracket mounting nut
4. Actuator bracket
5. 〈A〉 ◆C◆ Rear insulator mounting nut
6. ◆B◆ Rear insulator
7. Upper spring pad
8. ◆A◆ Rear coil spring
9. Spring seat pad
10. Rear shock absorber



DISASSEMBLY SERVICE POINTS

E33CH06AA

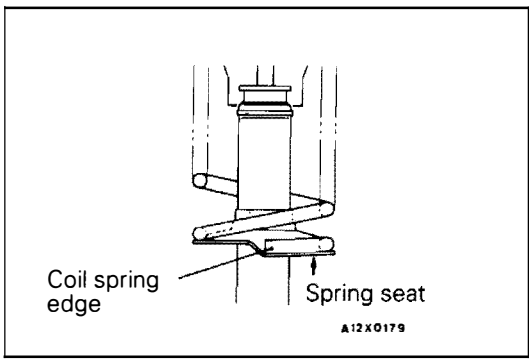
〈A〉 REAR INSULATOR MOUNTING NUT REMOVAL

Use the special tool to compress the coil spring, and then remove the rear insulator mounting nut.

INSPECTION

E33CH07AA

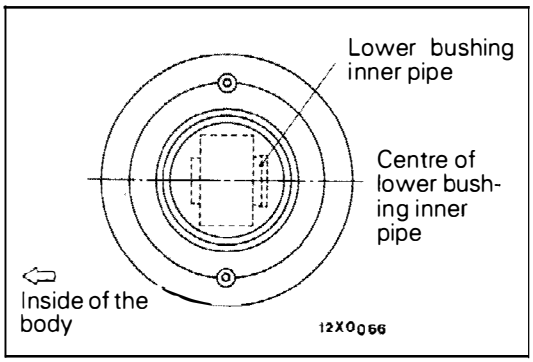
- Check the rubber parts for damage.
- Check the coil springs for crack, damage or deterioration.
- Check the shock absorber for oil leakage malfunction and abnormal sound.



REASSEMBLY SERVICE POINTS E33CH08AA

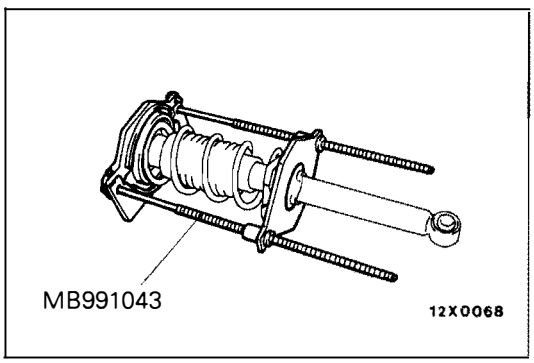
◆A◆ REAR COIL SPRING POSITIONING

Place the edge of the coil spring along the shock absorber spring seat as shown in the illustration.



◆B◆ REAR INSULATOR INSTALLATION

Install the rear insulator so that the lower bushing inner pipe is in the position shown in the illustration.



◆C◆ REAR INSULATOR MOUNTING NUT INSTALLATION

Use the special tool to compress the coil spring, and then install the rear insulator mounting nut.

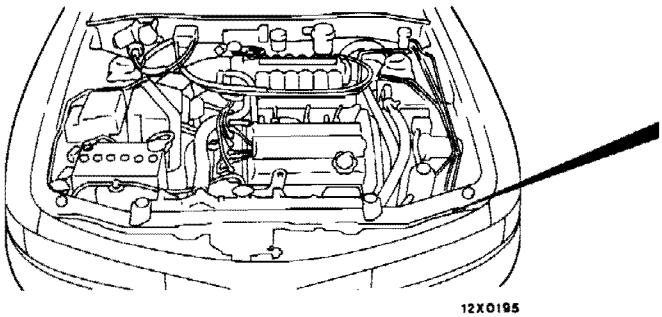
REAR SUSPENSION ASSEMBLY/UPPER ARM ASSEMBLY/ TRAILING ARM ASSEMBLY/LOWER ARM ASSEMBLY/TOE CONTROL ARM ASSEMBLY/STABILIZER BAR E33CH10AA

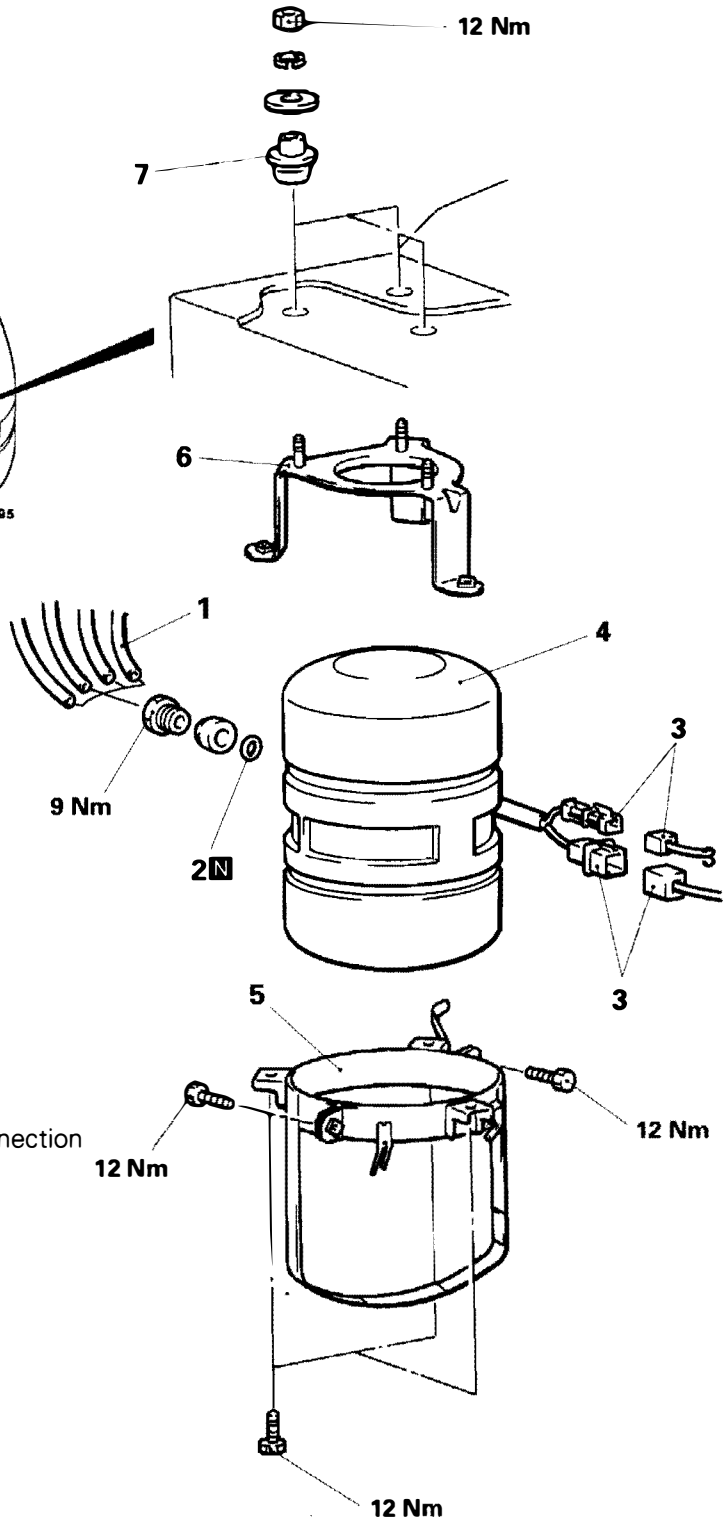
Refer to GROUP 34 – Rear Suspension.

RESERVE TANK ASSEMBLY

REMOVAL AND INSTALLATION

E33CI00AA





Removal steps

◆A◆ 1. Air tube and reserve tank connection
2. O-ring
3. Pressure switch connector
4. Reserve tank assembly
5. Tank holder
6. Tank bracket
7. Bushing

Pre-removal Operation
- Splash Shield Removal (Refer to GROUP 42 – Fender.)

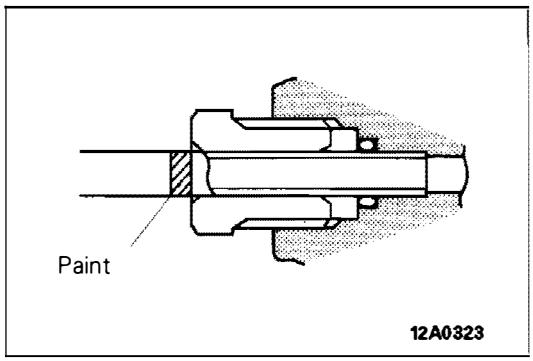
Post-installation Operation
- Splash Shield Installation (Refer to GROUP 42 – Fender.)
- ACTIVE ECS System Operation Check (Refer to P.33C-46.)

12X0128

INSPECTION

E33CI02AA

For detailed information concerning the checking of the return pump, the high-pressure switch and the low-pressure switch, refer to the troubleshooting guide and service adjustment procedures section.



INSTALLATION SERVICE POINTS

E33CI04AA

◆A◆ AIR TUBE AND RESERVE TANK CONNECTION

Connect the air tube securely, all the way to the painted mark.

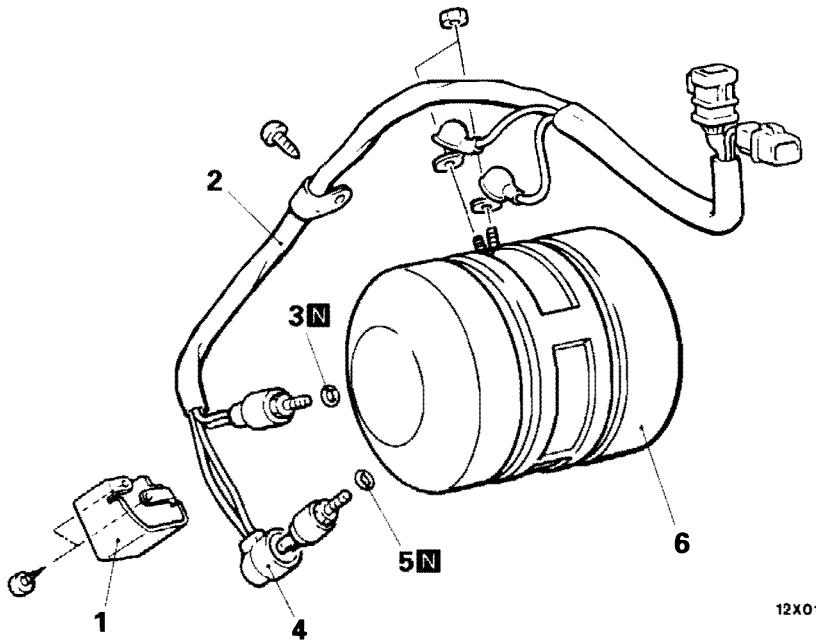
Caution
Be sure that the connection is secure; if it is not, an air leak may result.

DISASSEMBLY AND REASSEMBLY

E33CI05AA

Disassembly steps

1. Cover
2. Wiring harness (incorporated with high pressure switch)
3. O-ring
4. Low pressure switch
5. O-ring
6. Reserve tank



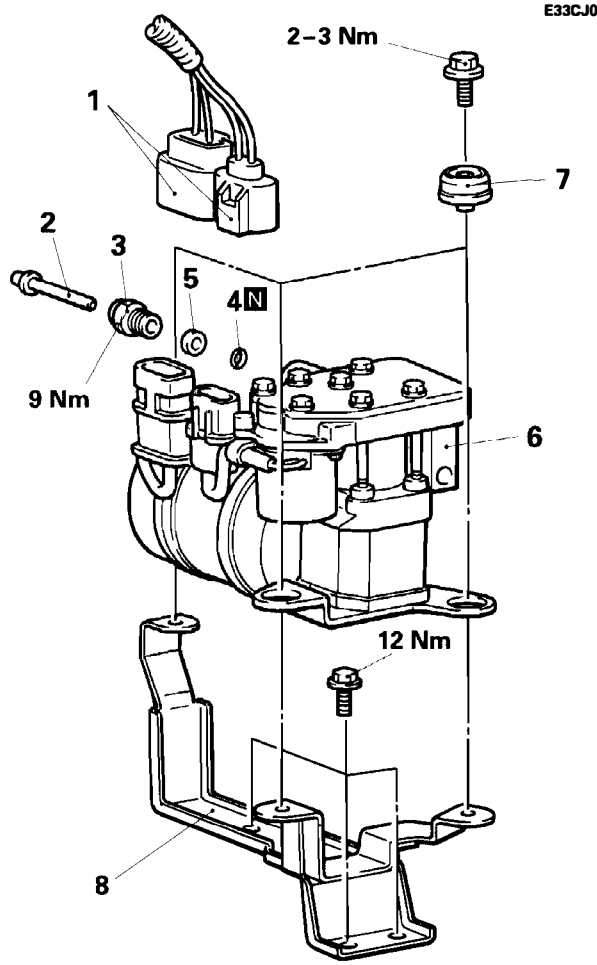
AIR COMPRESSOR ASSEMBLY

REMOVAL AND INSTALLATION

E33CJ00AA

Pre-removal Operation
- Air Cleaner Removal (Refer to GROUP 15 – Air Cleaner.)

Post-installation Operation
- Air Cleaner Installation (Refer to GROUP 15 – Air Cleaner.)
- ACTIVE-ECS System Operation Check (Refer to P.33C-46.)



Removal steps

1. Compressor connector
〈A〉 〈A〉 2. Air tube
3. Joint
4. O-ring
5. Connector
6. Air compressor assembly
7. Compressor mounting rubbers
8. Compressor mount bracket

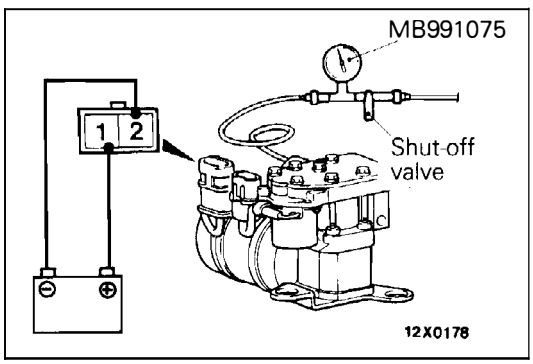
REMOVAL SERVICE POINTS

E33CJ01AA

〈A〉 AIR TUBE REMOVAL

Caution

1. **In order to prevent dust, dirt and other foreign material from getting into the air tube and air compressor openings, cover these opening with vinyl tape or similar material.**
2. **Be careful not to bend the air tubes.**

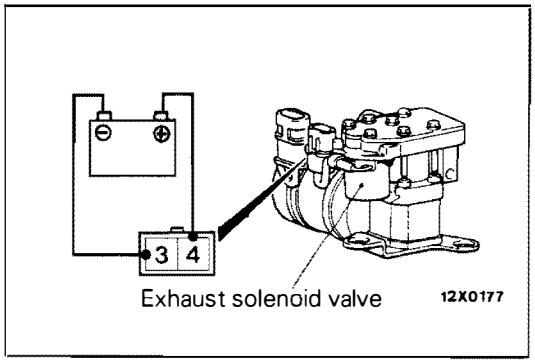


INSPECTION

E33CJ02AA

(1) Using special tool (adaptor C), connect the air tube on the gauge side of the special tool to the air compressor.
(2) Apply battery voltage (12V) between terminals (1) and (2) compressor.
(3) Check whether the relief pressure of the air compressor is the standard value.

Standard value: 1,050–1,350 kPa

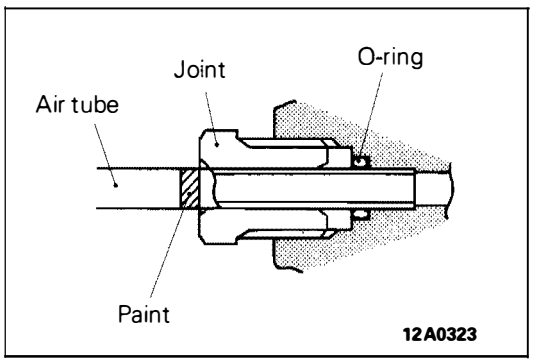


NOTE
Because of pulsation caused by the opening and closing of the exhaust solenoid valve combined with the relief valve, the gauge's indicator will show a reading which fluctuates within a range of 200–300 kPa. Use the mid-point of this fluctuation to make the gauge reading.

(4) Stop the air compressor and, with the pressure held, apply battery voltage between air compressor terminals (3) and (4). At this time, check to be sure that the exhaust solenoid valve makes a "click" sound and the pressure is gradually decreasing.

(5) If air compressor relief pressure is not within the standard value, or if there is a malfunction of the exhaust solenoid valve, replace the air compressor.

Caution
When the air compressor is replaced, first check to be sure that there is no air leakage at air tube joints, no poor contacts of wiring, and that the thermo switch is not in operation.



INSTALLATION SERVICE POINTS E33CJ04AA

◆A◆ AIR TUBE INSTALLATION

(1) First insert the air tube at the lower part of the dryer until resistance is felt, and then press the tube further inward to the paint mark on the air tube.

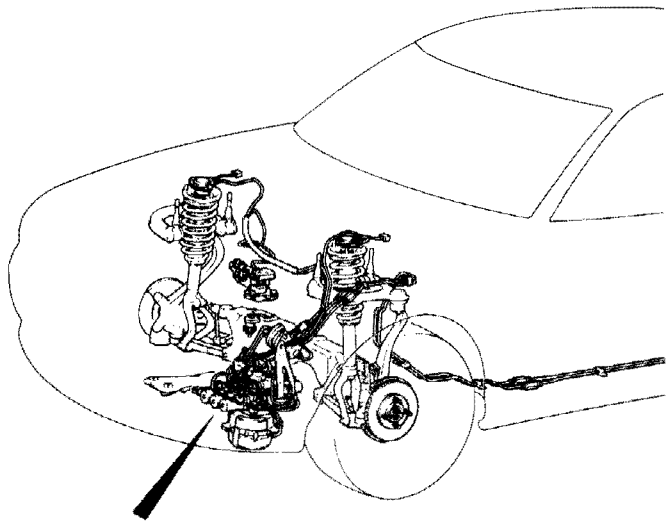
Caution
Air leakage may occur if the air tube connection is not complete and secure.

(2) Connect air tubes correctly to the air compressor. Apply a soap-and-water solution to the air tube connections to check to be sure that there is no air leakage.

SOLENOID VALVE ASSEMBLY AND DRYER ASSEMBLY

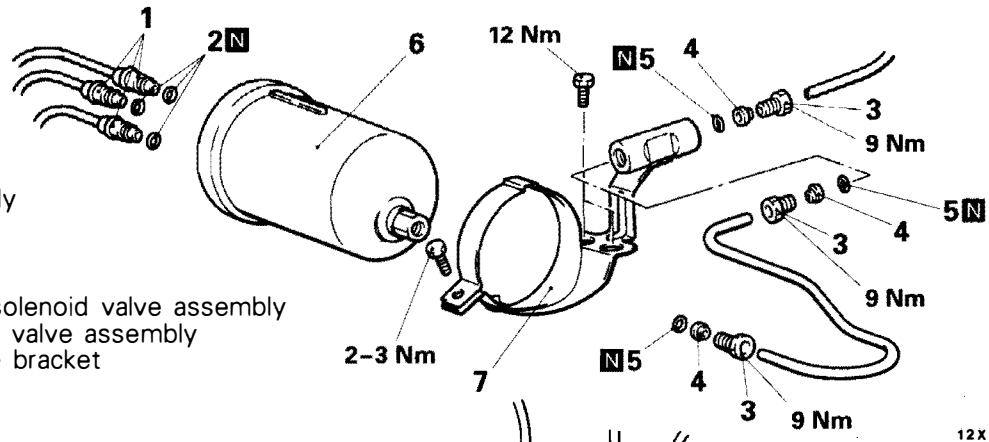
REMOVAL AND INSTALLATION

E33CK00AA

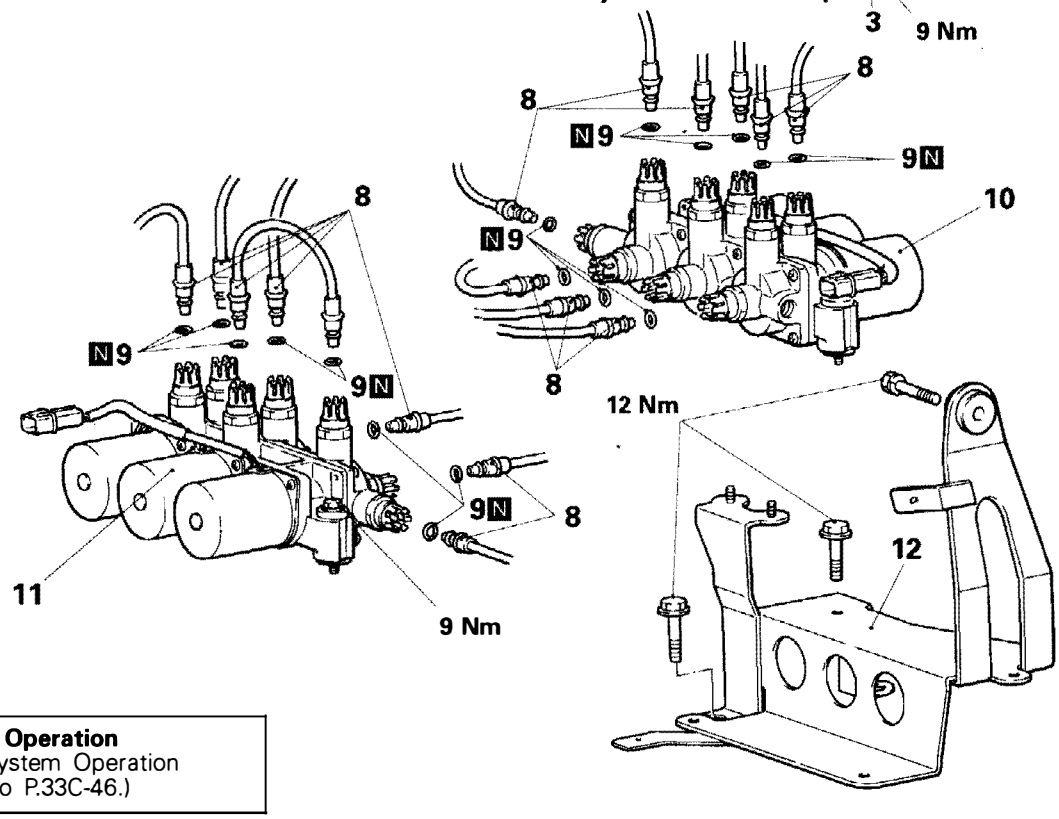


Dryer assembly, Flow control solenoid valve assembly, Front solenoid valve assembly removal steps

◇A◇ ▶A◀ 1. Air tube
2. O-rings
3. Joint assembly
4. Bushing
5. O-rings
6. Dryer assembly
7. Dryer holder
◇A◇ ▶A◀ 8. Air tube
9. O-rings
10. Flow control solenoid valve assembly
11. Front solenoid valve assembly
12. Solenoid valve bracket

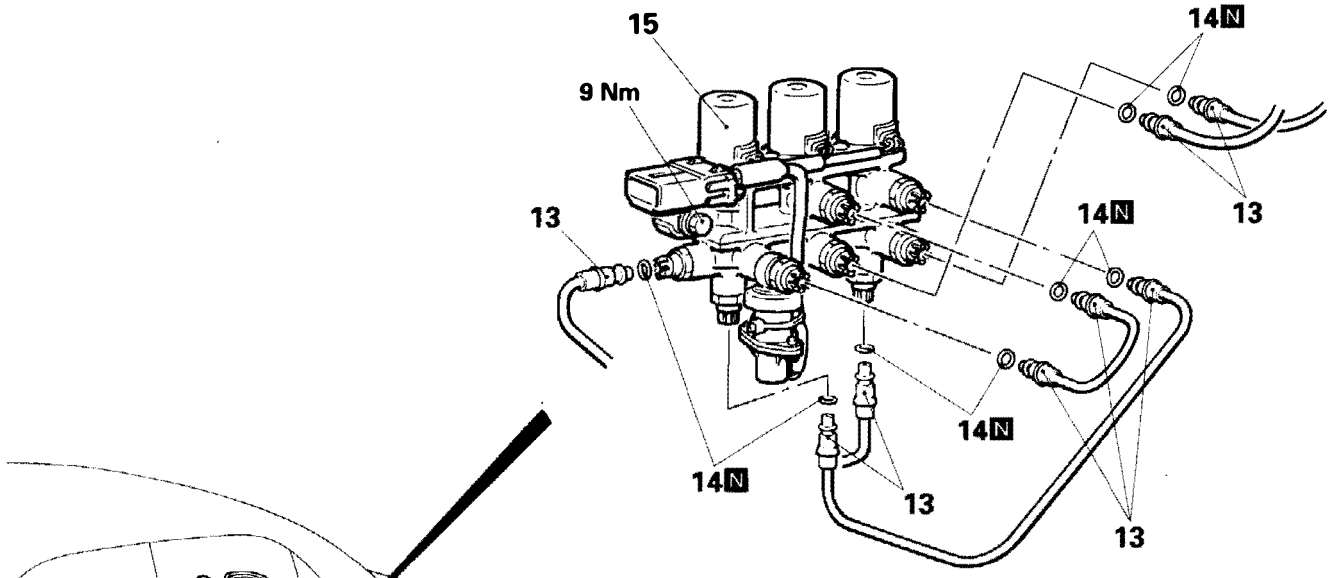


12X0127

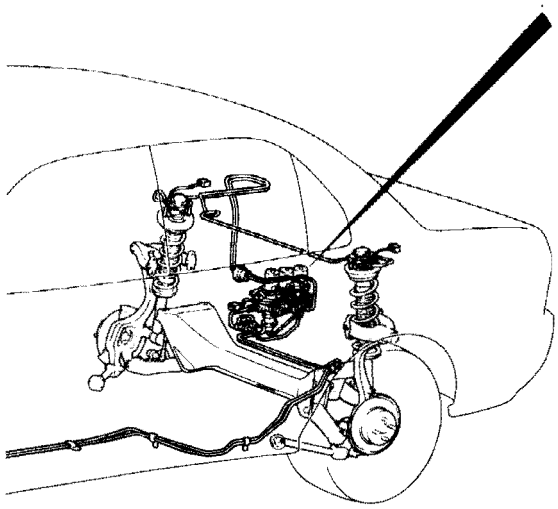


Post-installation Operation
- ACTIVE-ECS System Operation Check (Refer to P.33C-46.)

12X0129



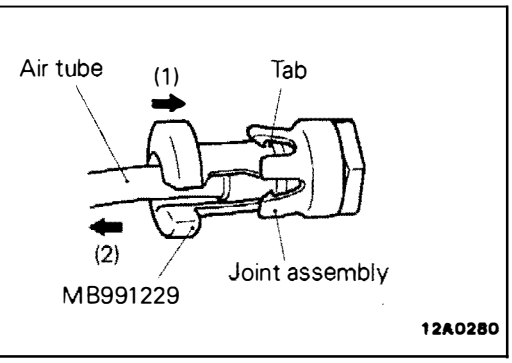
12X0140



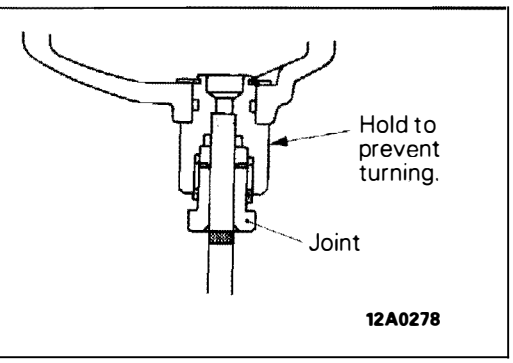
12X0158

Rear solenoid valve removal steps

◇A◇ ◆A◆ 13. Air tube
14. O-rings
15. Rear solenoid valve assembly



12A0280



12A0278

REMOVAL SERVICE POINTS E33CK01AA

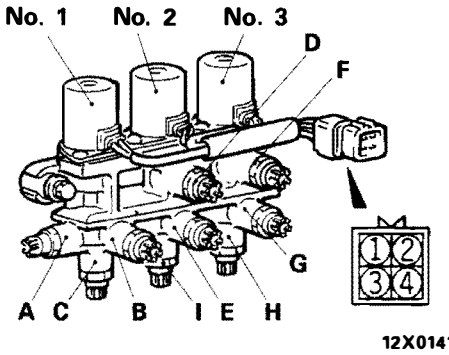
◇A◇ AIR TUBE REMOVAL

(1) Push the special tool inward, in direction (1) shown in the figure, in order to expand the tabs of the joint.
(2) Pull out the air tube, together with the special tool, in direction (2).

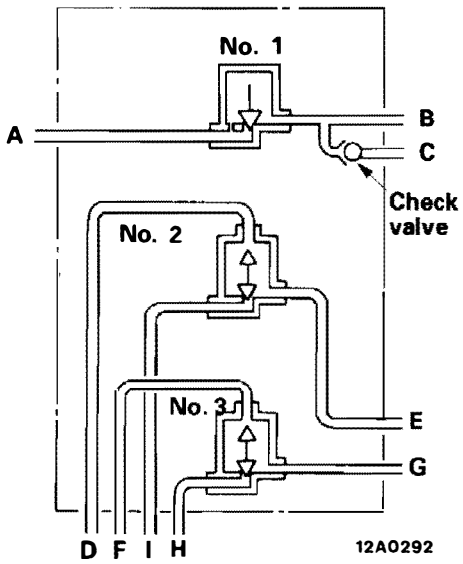
Caution
In order to prevent dust, dirt and other foreign material from getting into the air tube, solenoid valve and dryer openings. Cover these openings with vinyl tape or similar material.

(3) For the air tube at the lower part of the dryer, loosen the joint, and then pull off.

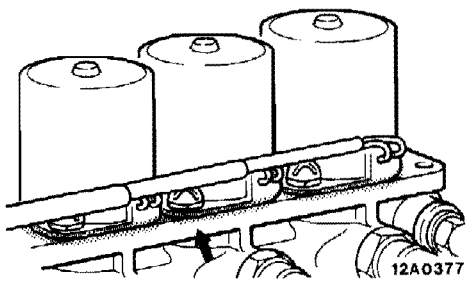
NOTE
When loosening the joint, use a spanner at the hexagonal part of the joint installation part so as to prevent it from turning.



12X0141



12A0292



Coat with soap-and-water solution.

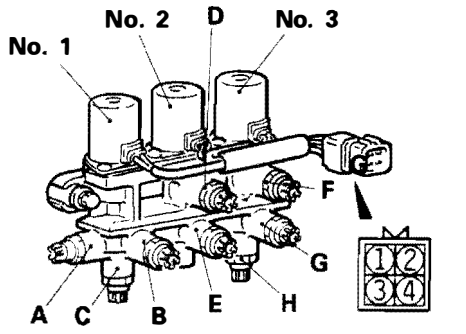
INSPECTION

E33CK02AA

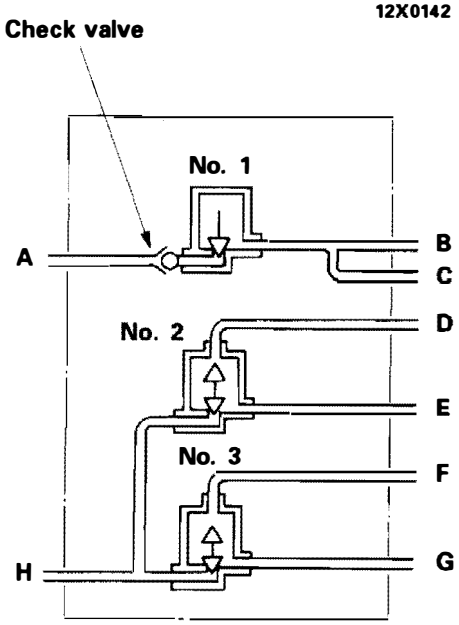
FLOW CONTROL SOLENOID VALVE

Check the No. 1–3 solenoid valves shown in the figure for correct operation and air leakage.

Check item	Condition	Result
Inject air from Part A and apply battery voltage to terminal (2) and then earth terminal (1).	A "click" noise will be heard, and the volume of air blown out from joints B and C will become greater.	Good
	Other than as described above.	Malfunction of No. 1 solenoid valve
Blow air in at joint E, apply battery voltage to terminal (4), and then earth terminal (1).	A "click" noise will be heard, and the air being blown out will change from joint D to joint I.	Good
	Other than as described above	Malfunction of No. 2 solenoid valve
Inject air from part G and apply battery voltage to terminal (3), and then earth terminal (1).	A "click" noise will be heard, and the air being blown out will change from joint F to joint H.	Good
	Other than as described above.	Malfunction of No. 3 solenoid valve
Inject air from part C.	Air is not blown out.	Good
	Air is blown out from joint B.	Malfunction of check valve
With an air pressure of 1,000 kPa from parts B, H and I, apply a soap-and-water solution where shown in the illustration.	No air leakage.	Good
	Air leakage	Malfunction of solenoid valve seal



12X0142



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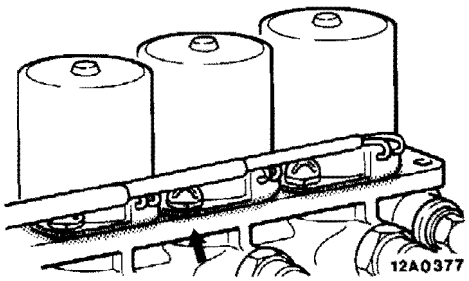


12A0377

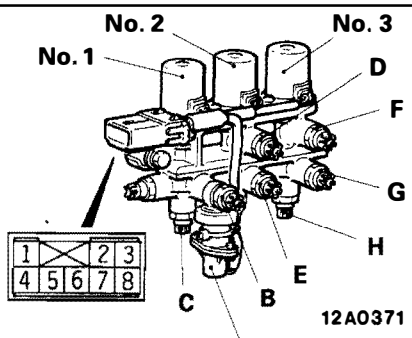
Coat with soap-and-water solution

FRONT SOLENOID VALVE

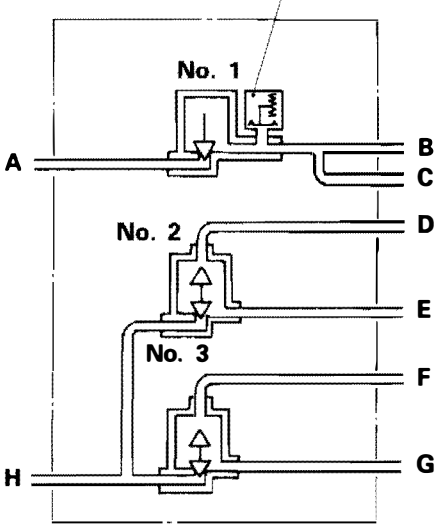
E33CK02BA

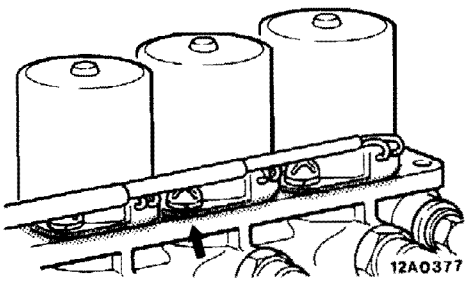
Check the No. 1–3 solenoid valves shown in the figure for correct operation and air leakage.

Check item	Condition	Result
Inject air from Part A and apply battery voltage to terminal (2) and then earth terminal (1).	A "click" noise will be heard, and the volume of air blown out from joints B and C will become greater.	Good
	Other than as described above.	Malfunction of No. 1 solenoid valve
Blow air in at joint E, apply battery voltage to terminal (4), and then earth terminal (1).	A "click" noise will be heard, and the air being blow out will change from joint D to joint H.	Good
	Other than as described above	Malfunction of No. 2 solenoid valve
Inject air from part G and apply battery voltage to terminal (3), and then earth terminal (1).	A "click" noise will be heard, and the air being blown out will change from joint F to joint H.	Good
	Other than as described above.	Malfunction of No. 3 solenoid valve
Apply battery voltage to terminal (2) and, with terminal (1) earthed, blow air in at joint B or C.	Air is not blown out from joint A.	Good
	Air is blown out from joint A.	Malfunction of check valve
With an air pressure of 1,000 kPa from parts A and H, apply a soap-and-water solution where shown in the illustration.	No air leakage.	Good
	Air leakage	Malfunction of solenoid valve seal



Rear pressure sensor





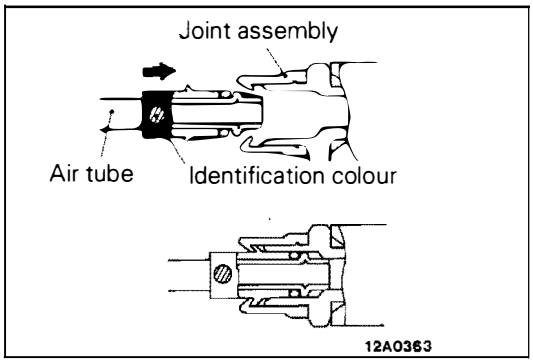
Coat with soap-and-water solution.

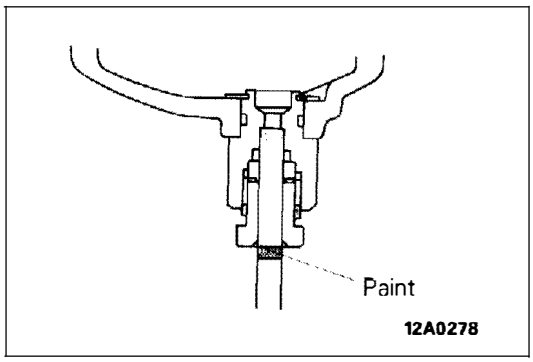
REAR SOLENOID VALVE

E33CK02CA

Check the No. 1–3 solenoid valves shown in the figure for correct operation and air leakage.

Check item	Condition	Result
Inject air from Part A and apply battery voltage to terminal (2) and then earth terminal (1).	A "click" noise will be heard, and the air will be blown out from joints B and C.	Good
	Other than as described above.	Malfunction of No. 1 solenoid valve
Blow air in at joint E, apply battery voltage to terminal (4), and then earth terminal (1).	A "click" noise will be heard, and the air being blown out will change from joint D to joint H.	Good
	Other than as described above	Malfunction of No. 2 solenoid valve
Inject air from part G and apply battery voltage to terminal (3), and then earth terminal (1).	A "click" noise will be heard, and the air being blown out will change from joint F to joint H.	Good
	Other than as described above.	Malfunction of No. 3 solenoid valve
With an air pressure of 1,000 kPa from parts A and H, apply a soap-and-water solution where shown in the illustration.	No air leakage.	Good
	Air leakage	Malfunction of solenoid valve seal





INSTALLATION SERVICE POINTS E33CK04AA

◆A◆ AIR TUBES INSTALLATION

(1)1 For the one-touch type of air tube, press in to the joint assembly at the device side until a "click" is heard, and then check that the tabs of the joint assembly are securely affixed to the air tube.

Caution
Before connecting the air tube, check that the identification colour of the tube and the colour at the joint agree.

(2) First insert the air tube at the lower part of the dryer until resistance is felt, and then press the tube further inward to the paint mark on the air tube.

Caution
Air leakage may occur if the air tube connection is not complete and secure.

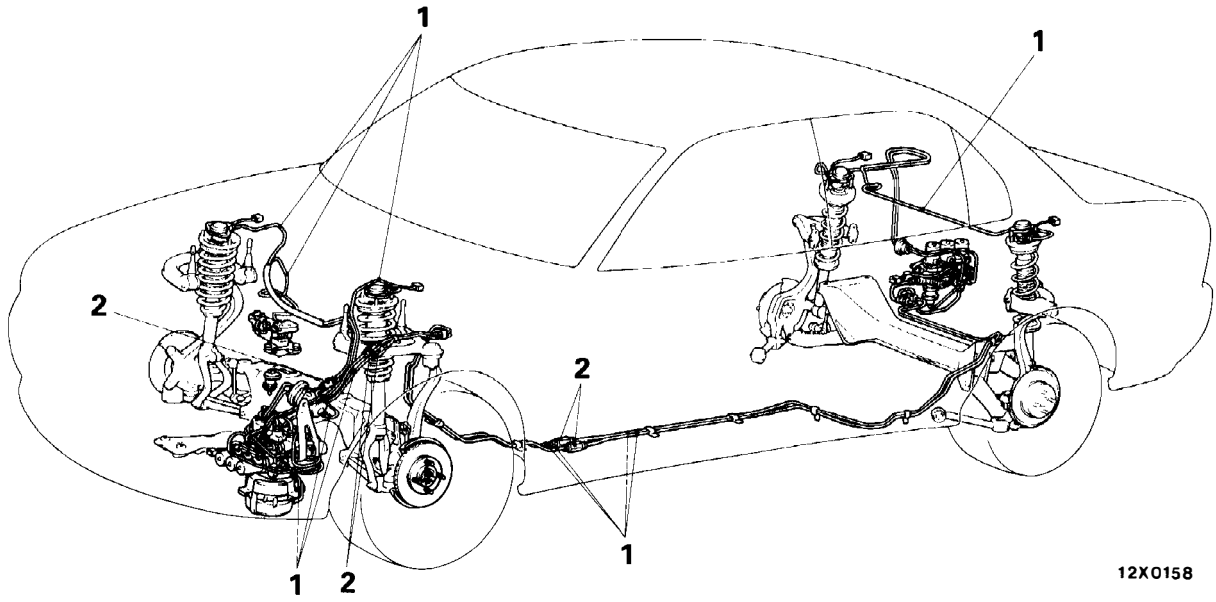
(3) After connection of the air tube, check for double-folding of the rolling diaphragm.(Refer to P.33C-45.)

AIR TUBE

REMOVAL AND INSTALLATION

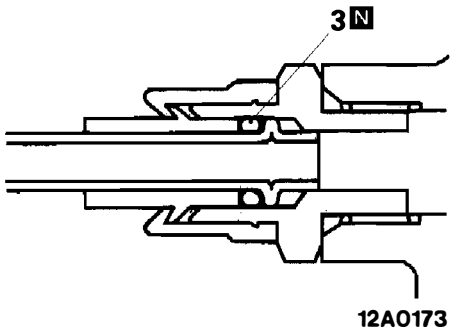
E33CL00AA

Post-installation Operation
- ACTIVE-ECS System Operation Check (Refer to P.33C-46.)

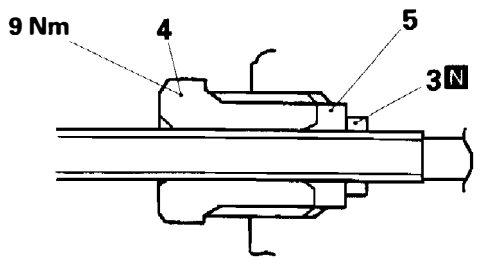


Cross-section of air tube joint

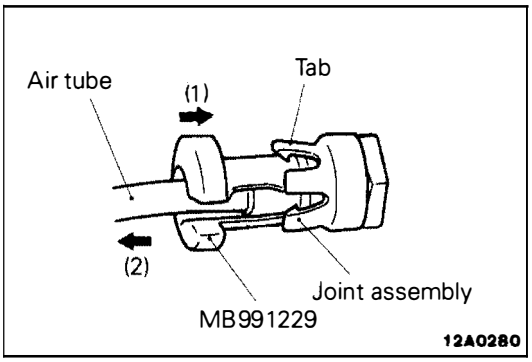
<One-touch type>

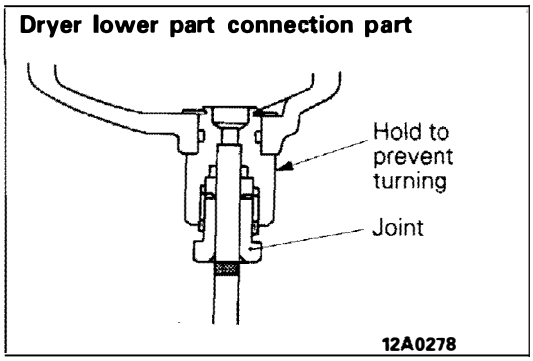


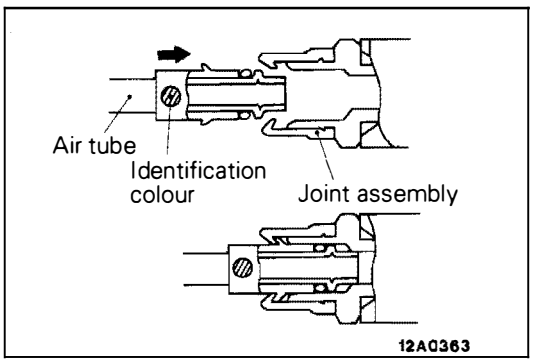
<Flare-nut type>

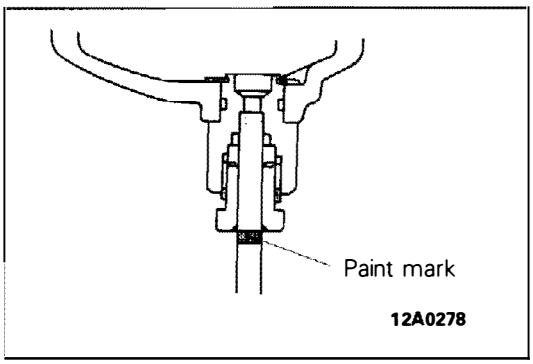


◇A◇ ◆A◆ 1. Air tube
2. Union joint
3. O-ring
4. Joint
5. Bushing









REMOVAL SERVICE POINTS E33CL01AA

◇A◇ AIR TUBES REMOVAL

One-touch type

(1) Push the special tool inward, in direction (1) shown in the figure, in order to expand the tabs of the joint.
(2) Pull out the air tube, together with the special tool, in direction (2).

Flare-nut type

Loosen the joint and pull out the air tube.

NOTE
When loosening the joint at the lower part of the dryer, use a spanner to hold the hexagonal part of the joint installation part to prevent it from turning.

Caution
In order to prevent the entry of dust, foreign material, etc., use vinyl tape or similar material to close the end of the air tube and the opening at the device side.

INSTALLATION SERVICE POINTS E33CL04AA

◆A◆ AIR TUBES INSTALLATION

One-touch type

Push the air tube in the joint assembly at the device side until a "click" is heard, and then check to be sure that the tabs of the joint assembly are securely affixed to the air tube.

Caution
Before connecting the air tube, check to be sure that the identification colour of the tube and the colour at the joint agree.

Flare-nut type

First insert the air tube until resistance is felt, and then press the tube further inward to the paint mark on the air tube.

Caution
Air leakage may occur if the air tube connection is not complete and secure.

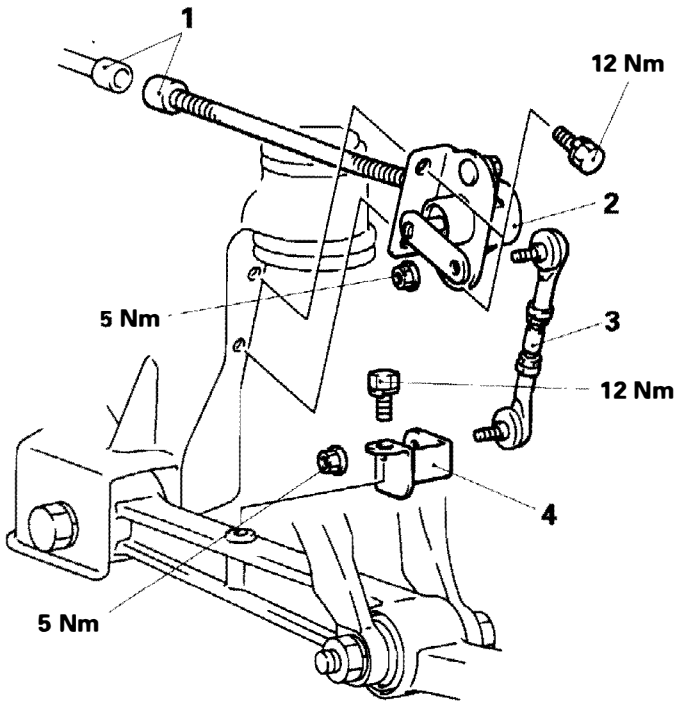
INSPECTION AFTER AIR TUBE INSTALLATION E33CL04BA

(1) Check for double-folding at the rolling diaphragm. (refer to P.33C-45.)
(2) Apply a soap-and-water solution to the joint part to check for air leakage; also visually check the air tube for breakage, crushing, pinching, etc.

FRONT AND REAR STROKE SENSORS

REMOVAL AND INSTALLATION

E33CM00AA



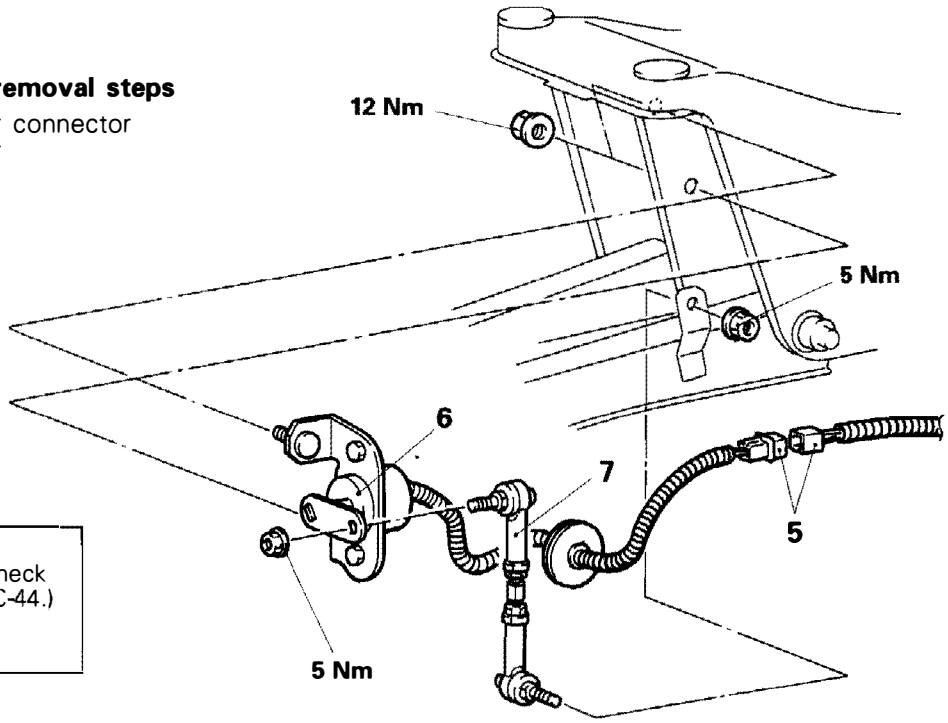
12X0073

Front stroke sensor removal steps

1. Front stroke sensor connector
2. Front stroke sensor
◆A◆ 3. Front rod assembly
4. Sensor bracket

Rear stroke sensor removal steps

5. Rear stroke sensor connector
6. Rear stroke sensor
◆A◆ 7. Rear rod assembly



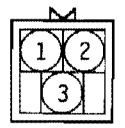
12X0137

Post-installation Operation
- The NORMAL Vehicle-height Check and Adjustment (Refer to P.33C-44.)
- ACTIVE-ECS System Operation Check (Refer to P.33C-46.)

INSPECTION E33CM02AA

- Check the rod and link plate for bending or damage.
- Check the rod adjustment lock nut for looseness.

Sensor connector terminal layout



1. Power supply 2. Earth 3. Output

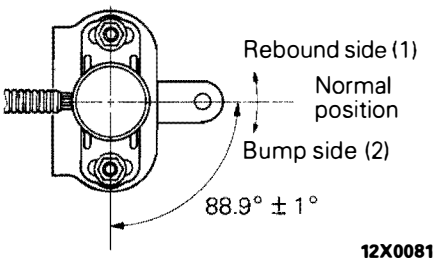
12X0171

THE SENSOR TERMINAL VOLTAGE CHECK E33CM02BA

If the terminal voltage changes as shown in the table below when the stroke sensor is connected to the chassis side of the harness, the ignition switch is turned ON and the link plate is turned, then the condition is normal.

NOTE
To check the sensor terminal voltage, one method which can be used is to move the rod up and down while the sensor is installed to the chassis.

Front stroke sensor position



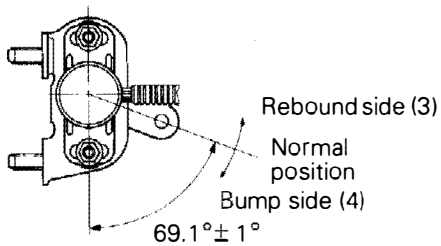
12X0081

Front stroke sensor terminal voltage

[V]

Vehicle height	Sensor link position	Terminal voltage
Higher than normal	(1)	1.15–2.73
Lower than normal	(2)	2.43–3.99

Rear stroke sensor position



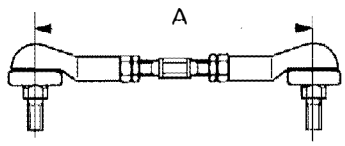
12X0082

Rear stroke sensor terminal voltage

[V]

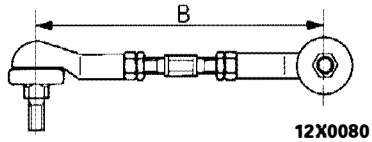
Vehicle height	Sensor link position	Terminal voltage
Higher than normal	(3)	1.03–2.65
Lower than normal	(4)	2.35–4.36

Front



12X0074

Rear



12X0080

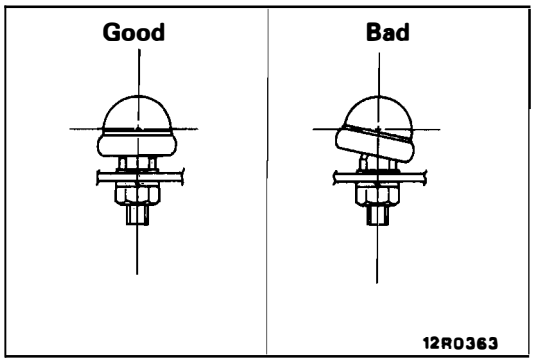
INSTALLATION SERVICE POINTS E33CM04AA

◆A◆ REAR ROD ASSEMBLY/ FRONT ROD ASSEMBLY INSTALLATION

Install the rod assemblies so that the dimensions in the illustration at left are as shown below.

Front (A) 115 mm

Rear (B) 115 mm

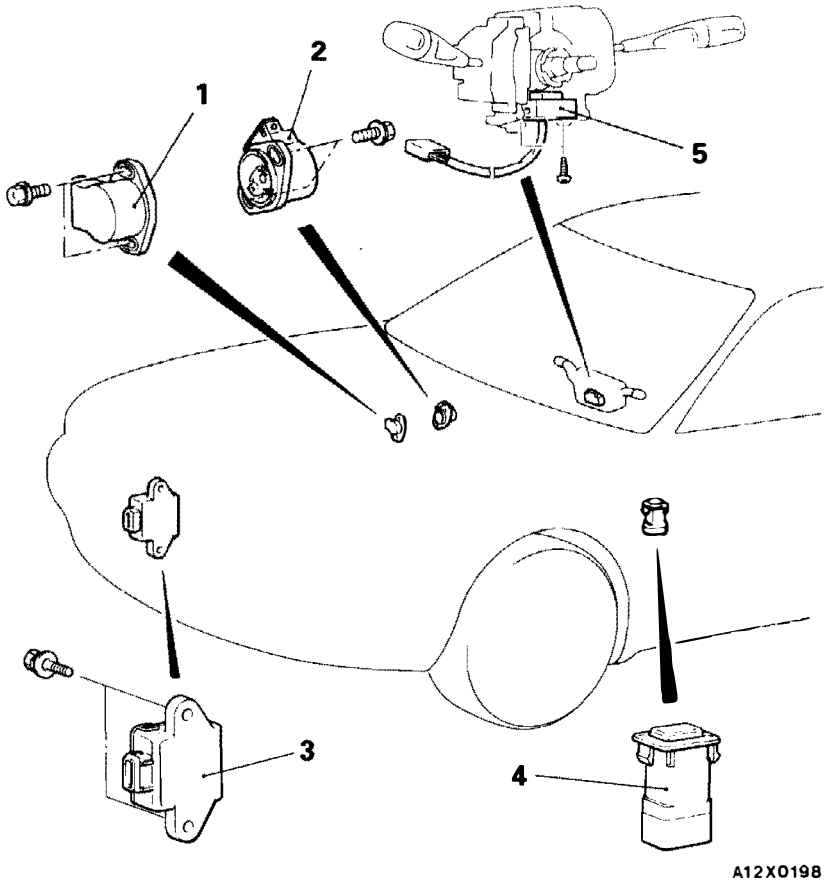


Caution
The rods should be installed so that the ball joint is at the swing centre.

ACTIVE-ECS SENSOR AND SWITCH

REMOVAL AND INSTALLATION

E33CN00AA



A12X0198

1. Throttle position sensor
2. Accelerator pedal position sensor (Vehicles equipped with TCL)
〈A〉 3. G sensor
4. ACTIVE-ECS switch

Steering wheel sensor removal steps

Caution : SRS
When removing the air bag module and clock spring, refer to GROUP 52B - SRS Air Bag Precautions Before Service and GROUP 52B - Air Bag Module and Clock Spring before carrying out these operations.

- Steering wheel and column cover removal (Refer to GROUP 37A – Steering wheel and Shaft.)
- Column switch removal (Refer to GROUP 51 – Windshield wiper and washer.)

〈B〉 5. Steering wheel sensor

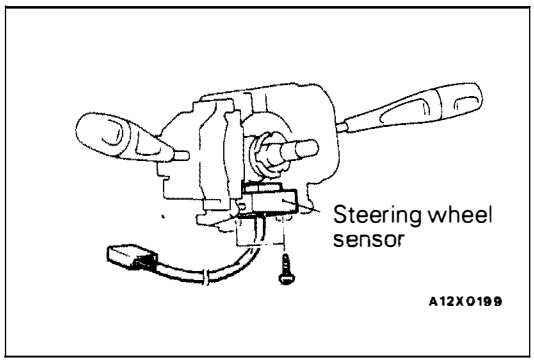
REMOVAL SERVICE POINTS

E33CN01AA

〈A〉 G SENSOR REMOVAL

Disconnect the connection of the harness connector, and then remove the G sensor.

Caution
When removing the G sensor, take care not to drop it or subject it to severe impact.

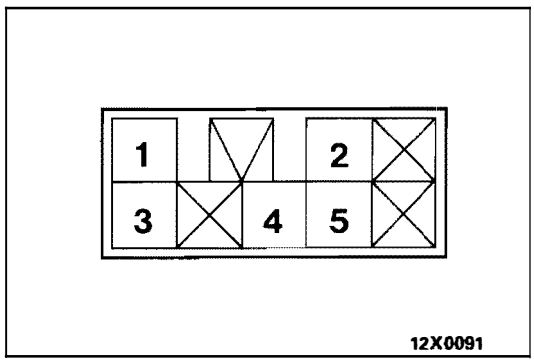


⟨B⟩ STEERING WHEEL SENSOR REMOVAL

Remove the pin terminal from the column switch connector, then remove the steering wheel sensor from the column switch.

Caution

1. **The steering wheel sensor utilizes a photo coupler and care should be paid to ensure that no dust or grease are allowed to come into contact with it.**
2. **Be careful and ensure that the column switch side slit panel is not bent nor oil allowed to come into contact with it.**



INSPECTION

E33CN02AA

ACTIVE-ECS SWITCH INSPECTION

Activate the switch, and check for continuity between the terminals.

Terminal \ Operation	No operation	Switched to HI	Switched to SP
1		○	○
2		○	
3	○	○	○
4			○
5	○	○	○

NOTE

○—○ indicates that there is continuity between the terminals.

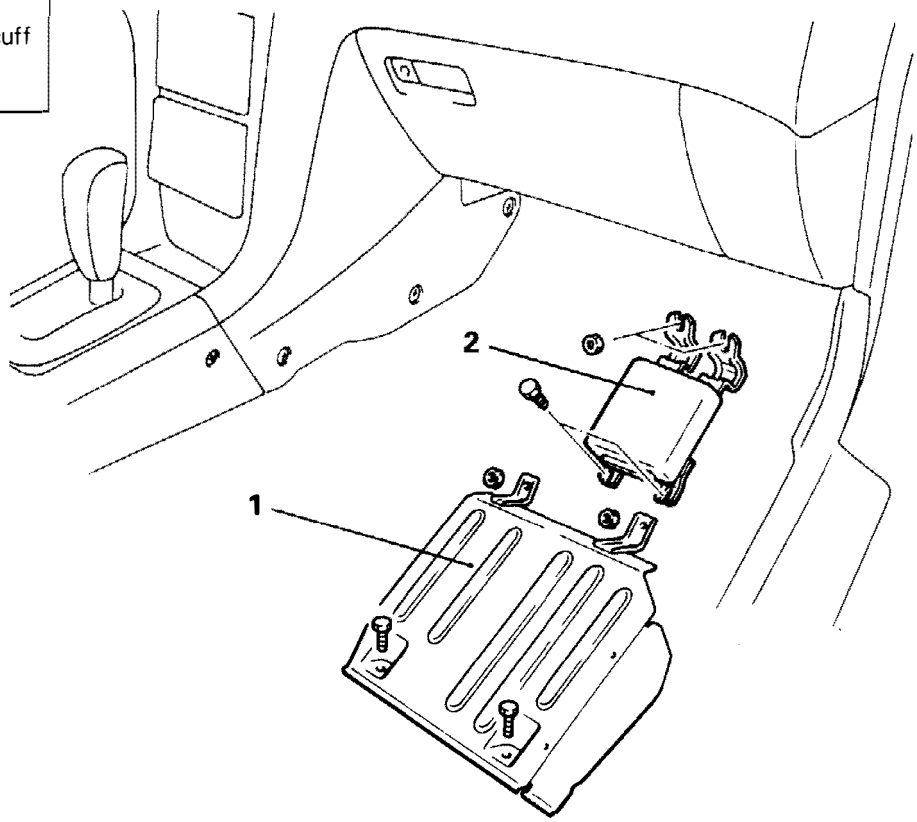
For inspection of the steering wheel sensor, refer to GROUP 13H - Troubleshooting. For inspection of other sensors, refer to the Troubleshooting section in this chapter (P.33C-7).

ECS-ECU

REMOVAL AND INSTALLATION

E33CO00AA

Pre-removal and Post-installation Operation
Removal and Installation
- Under Cover (Refer to GROUP 52A – Instrument Panel.)
- Cowl Side Trim (RH) and Front Scuff Plate (Refer to GROUP 52A – Trims.)



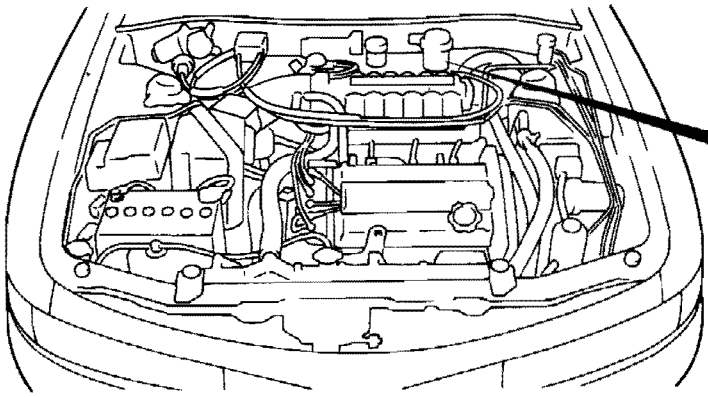
Removal steps
1. Control unit cover
2. ECS-ECU

A12X0185

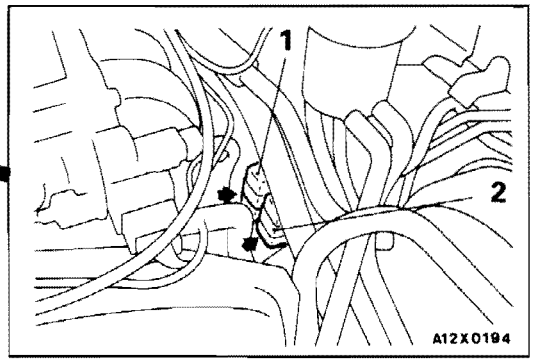
ACTIVE-ECS RELAY

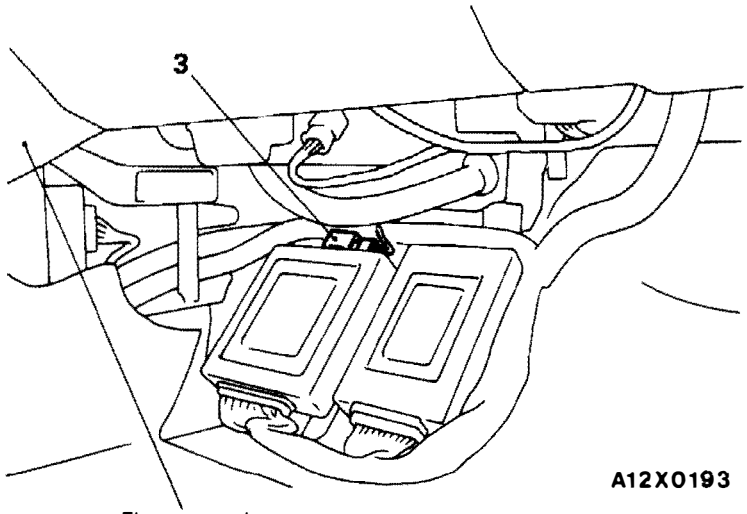
REMOVAL AND INSTALLATION

E33CP00AA



12X0195



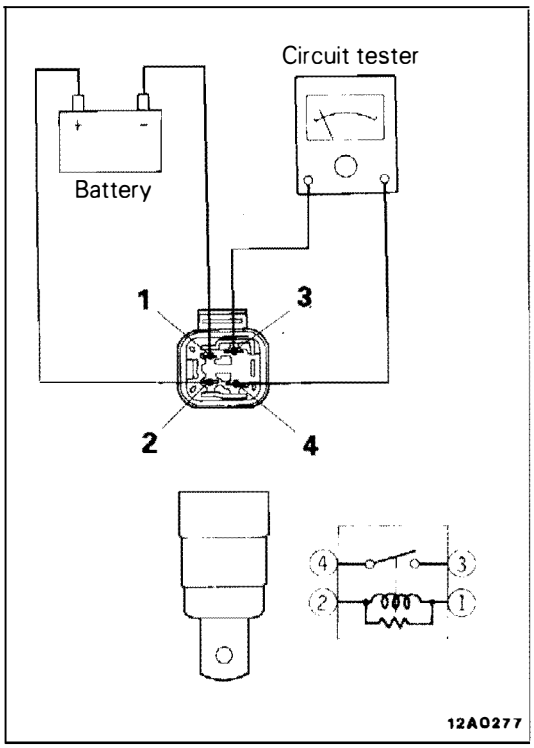


1. Compressor relay
2. Return pump relay

ACTIVE-ECS relay removal steps

- Control unit cover removal (Refer to P.33C-78.)

3. ACTIVE-ECS relay



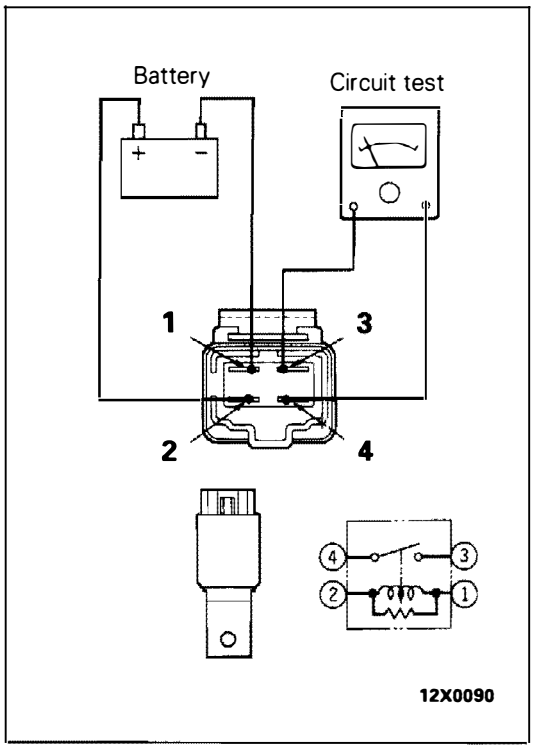
INSPECTION

E33CP02AA

COMPRESSOR RELAY/RETURN PUMP RELAY

Connect battery power source to terminal 1. Check circuit between terminals with terminal 2 earthed.

Power is supplied	Between 3–4 terminals	Continuity
Power is not supplied	Between 1–2 terminals	Continuity
	Between 3–4 terminals	No continuity



ACTIVE-ECS RELAY

E33CP02BA

Connect battery power source to terminal 1. Check circuit between terminals with terminal 2 earthed.

Power is supplied	Between 3–4 terminals	Continuity
Power is not supplied	Between 1–2 terminals	Continuity
	Between 3–4 terminals	No continuity

REAR SUSPENSION

CONTENTS

E34ZA00AA

GENERAL INFORMATION

E34ZB00AB

A newly-developed multi-link type of suspension has been adopted for the rear suspension. The lay-out of each arm and the rigidity balance of each bushing have been rationalized to provide both excellent steering stability and riding comfort. Furthermore, for vehicles with 4WS, the power cylinder tie rod is installed to the knuckle instead of the toe control arm.

<2WD – Sedan>

Items		4G93, 4D68	4G63, 6A12
Coil spring			
Wire dia. × O.D. × free length	mm	10.3 × 95.3–103.3 × 356.5 10.4 × 95.4–103.4 × 364.5*1 10.8–11.7 × 83.5–94.5 × 330.5*	10.3 × 95.3–103.3 × 356.5 10.4 × 95.4–103.4 × 364.5*2 10.8–11.7 × 83.5–94.5 × 330.5*1
Identification colour		Brown Pink*1 Red + Pink*	Brown Pink*2 Red + Pink*1
Spring constant	N/mm	18	18
Shock absorber			
Stroke	mm	183	183
Damping force (at 0.3 m/sec.)			
Expansion	N	637–873 834–1128	834–1128 530–745*3
Contraction	N	392–588	392–588 265–422*3

NOTE
*: Heavy duty suspension
*1: E52ASNJEQL6B, E52ASRHEQL6B
*2: 6A12, E55ASRHEQL6B
*3: 1993 models with 4G63 and 1994 models with 2WD–4G63 (except 6B models)

<2WD – Hatchback>

Items		4G93, 4D68	4G63, 6A12
Coil spring			
Wire dia. × O.D. × free length	mm	10.4 × 95.4–103.4 × 364.5 10.8–11.8 × 83.5–94.5 × 343.5*1	10.8 × 95.8–103.8 × 354.5 10.7 × 95.7–103.7 × 347.5*2 10.8–11.8 × 83.5–94.5 × 343.5*1 10.9 × 95.9–103.9 × 361.5*3
Identification colour		Pink Red + Orange*1	Yellow green + Orange Yellow green + Pink*2 Red + Orange*1 Yellow green + Gray*3
Spring constant	N/mm	18 23–29*1	21 23–29*1

NOTE
*1: Heavy duty suspension
*2: E55ALNJEQL6, E55ALNJEQR6
*3: High ground-clearance suspension

Items		Sedan	Hatchback
Shock absorber			
Stroke	mm	183	183
Damping force (at 0.3 m/sec.)			
Expansion	N	637–873 834–1128	834–1128 530–745*4
Contraction	N	392–588	392–588 265–422*4

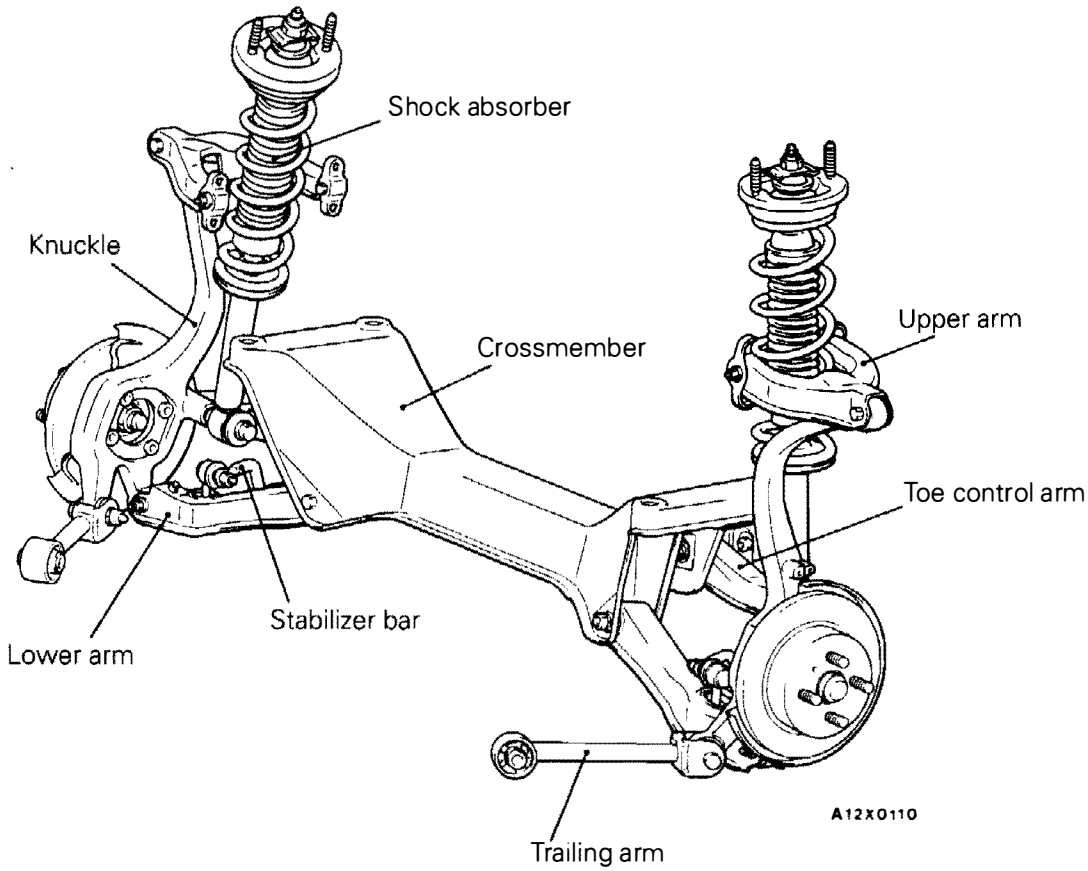
NOTE
*4: 1993 models with 4G63 and 1994 models with 2WD–4G63 (without high ground-clearance suspension)

<4WD>

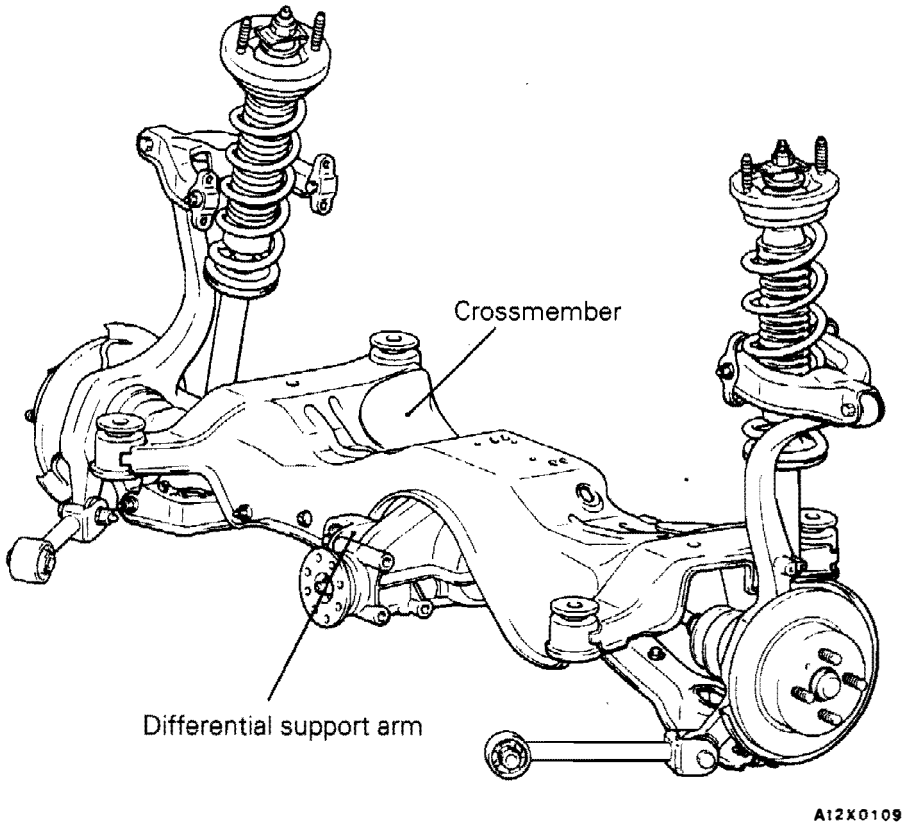
Items		Sedan	Hatchback
Coil spring			
Wire dia. × O.D. × free length	mm	10.9 × 95.9–103.9 × 366.5 10.8–12.1 × 83.5–94.5 × 355.5*	11.0 × 96.0–104.0 × 376.0 10.8–12.1 × 83.5–94.5 × 364.5*
Identification colour		Cream + Orange Red + Gray*	Cream + Gray Red + Light blue*
Spring constant	N/mm	21 23–29*	21 23–29*1
Shock absorber			
Stroke	mm	183	
Damping force (at 0.3 m/sec.)			
Expansion	N	834–1128	
Contraction	N	392–588	

NOTE
* : Heavy duty suspension

<2WD>



<4WD>



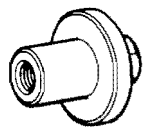
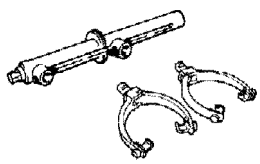
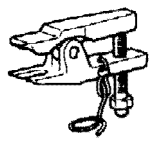
SERVICE SPECIFICATIONS

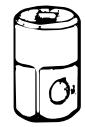
E34ZC00AA

Items		Specifications
Standard value		
Toe-in		
At the centre of tyre tread	mm	
2WS		3 ±3
4WS		0±3
Toe angle (per wheel)		
2WS		9′ ± 9′
4WS		0 ± 9′
Camber		
2WD		−1°10′ ± 30′
4WD		−55′ ± 30′
Toe control arm ball joint starting torque	Nm	0.1 – 2.65
Stabilizer link ball joint starting torque	Nm	0.5–1.5

SPECIAL TOOLS

E34ZD00AA

Tool	Number	Name	Use
	MB991004	Wheel alignment gauge attachment	Measurement of the wheel alignment (Vehicles with aluminium type wheels)
	MB991237 MB991239	Spring compressor body Arm set	Removal and installation of the coil spring
	MB991113	Steering linkage puller	Disconnection of ball joint

Tool	Number	Name	Use
	MB990326	Preload socket	Checking of the ball joint rotating torque
	MB990968	Torque wrench	
	MB990800	Ball joint remover and installer	Installation of the dust cover

SERVICE ADJUSTMENT PROCEDURES

E34ZF00AA

REAR WHEEL ALIGNMENT INSPECTION AND ADJUSTMENT

Measure the wheel alignment with the vehicle parked on level ground.
The rear suspension and wheels should be serviced to the normal condition prior to measurement of wheel alignment.

TOE-IN E34ZF01AA

Standard value:

At the centre of tyre tread

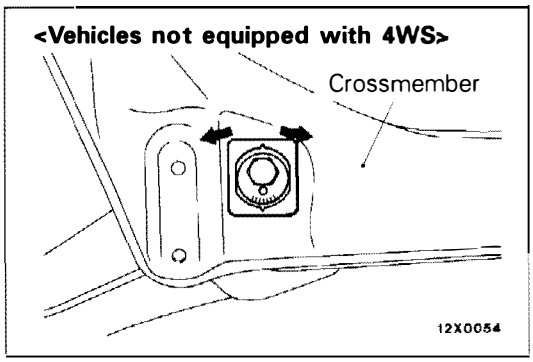
3 ± 3 mm <2WS>

0 ± 3 mm <4WS>

Toe angle (per wheel)

9′ ± 9′ <2WS>

0 ± 9′ <4WS>



<Vehicles not equipped with 4WS>

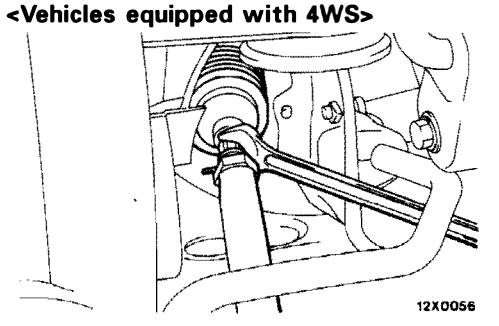
Adjustment is carried out by turning the toe control arm mounting bolt to the left or right by equal amounts.

L.H.: Turning clockwise **toe-out direction**

R.H.: Turning clockwise **toe-in direction**

Furthermore, toe adjustment can be made at graduations of approximately 1.3 mm.

<Vehicles equipped with 4WS>



<Vehicles equipped with 4WS>

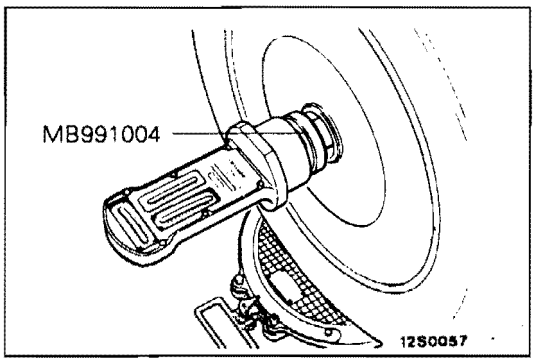
Adjustment is carried out by loosening the bellows clip of the tie rod and turning the left and right tie rods by equal amounts (in reverse directions).

CAMBER

E34ZF02AA

Standard value: **–1°10′ ± 30′ <2WD>**
–55′ ± 30′ <4WD>

NOTE
1. Camber is preset at the factory and cannot be adjusted.
2. If camber is not within the standard value, check and replace bent or damaged parts.



3. For vehicles with aluminium type wheels, attach the camber/caster/kingpin gauge to the drive shaft by using the special tool. Tighten the special tool to the same torque 196–225 Nm as the drive shaft nut.

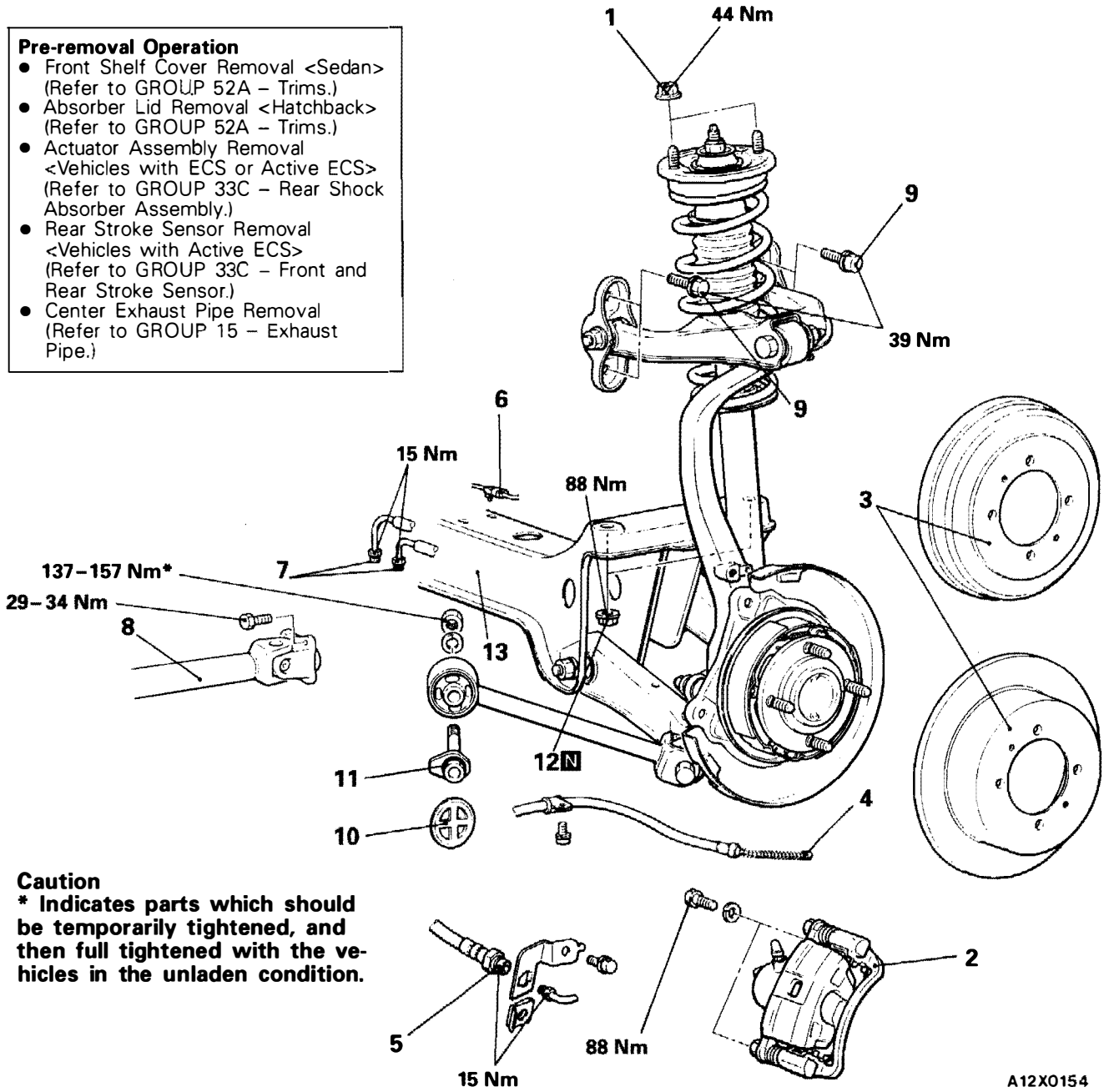
Caution
Never subject the wheel bearings to the full vehicle load when the flange nuts (2WD) or drive shaft nuts (4WD) are loosened.

REAR SUSPENSION ASSEMBLY

E34ZG00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Front Shelf Cover Removal <Sedan> (Refer to GROUP 52A – Trims.)
- Absorber Lid Removal <Hatchback> (Refer to GROUP 52A – Trims.)
- Actuator Assembly Removal <Vehicles with ECS or Active ECS> (Refer to GROUP 33C – Rear Shock Absorber Assembly.)
- Rear Stroke Sensor Removal <Vehicles with Active ECS> (Refer to GROUP 33C – Front and Rear Stroke Sensor.)
- Center Exhaust Pipe Removal (Refer to GROUP 15 – Exhaust Pipe.)



Caution
*** Indicates parts which should be temporarily tightened, and then full tightened with the vehicles in the unladen condition.**

Removal steps

1. Shock absorber mounting nuts
2. Brake caliper assembly <Vehicle with disc brake>
3. Brake disc <Vehicles with disc brake> or brake drum <Vehicles with drum brake>
4. Parking brake cable end (Refer to GROUP 36 – Parking brake)
5. Brake hose connection <Vehicles with drum brake>
6. Rear speed sensor connector <Vehicles with ABS>
7. Power cylinder and oil line connection <Vehicles with 4WS>

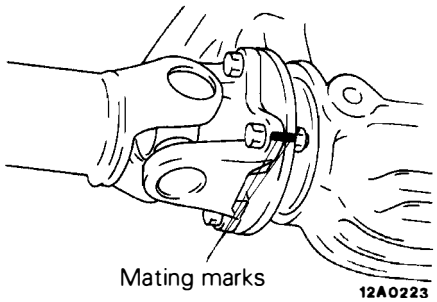
〈A〉 ◆A◆ 8. Propeller shaft connection <4WD>

9. Upper arm bracket mounting bolt
10. Grommet
11. Trailing arm mounting bolt

〈B〉 12. Crossmember mounting self-locking nuts

13. Rear suspension assembly

Post-installation Operation
- Center Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe.)
- Brake Line Bleeding <Vehicles with drum brake> (Refer to GROUP 35A – Service Adjustment Procedures.)
- Rear Stroke Sensor Installation <Vehicles with Active ECS> (Refer to GROUP 33C – Front and Rear Stroke Sensors.)
- Actuator Assembly Installation <Vehicles with ECS or Active ECS> (Refer to GROUP 33C – Rear Shock Absorber Assembly.)
- Front Shelf Cover Installation <Sedan> (Refer to GROUP 52A – Trims.)
- Absorber Lid Installation <Hatchback> (Refer to GROUP 52A – Trims.)
- Power Steering Fluid Filling and Bleeding <Vehicles with 4WS> (Refer to GROUP 37A – Service Adjustment Procedures.)
- 4WS Bleeding (Refer to GROUP 37C – Service Adjustment Procedures.)
- 4WS Operation Check (Refer to GROUP 37C – Service Adjustment Procedures.)
- Parking Brake Lever Stroke Check (Refer to GROUP 36 – Service Adjustment Procedures.)
- Wheel Alignment Inspection and Adjustment (Refer to P.34-6.)

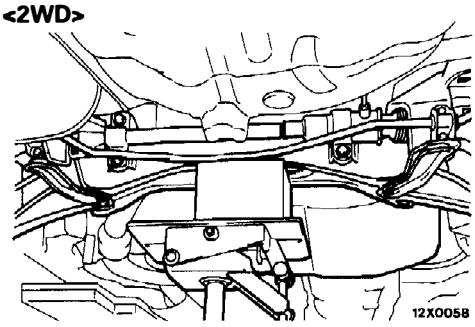


REMOVAL SERVICE POINTS E34ZG01AA

◇A◇ PROPELLER SHAFT DISCONNECTION

(1) Make mating marks on the companion flange of the differential carrier and on the flange yoke of the propeller shaft.
(2) Remove the differential carrier and propeller shaft mounting bolts and nuts.

<2WD>



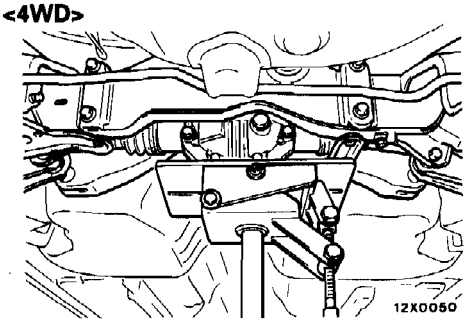
◆B◇ CROSSMEMBER MOUNTING SELF-LOCKING NUT REMOVAL

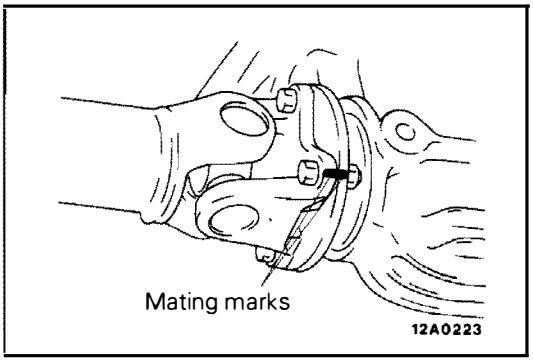
After supporting the crossmember in 2WD vehicles or the differential case in 4WD vehicles with a garage jack or transmission jack respectively, remove the crossmember mounting nuts.

INSPECTION E34ZG02AA

- **Check crossmember for cracks or other damage.**

<4WD>





INSTALLATION SERVICE POINTS E34ZG04AA

◆A◆ PROPELLER SHAFT INSTALLATION

Install with the mating marks of the differential carrier and propeller aligned.

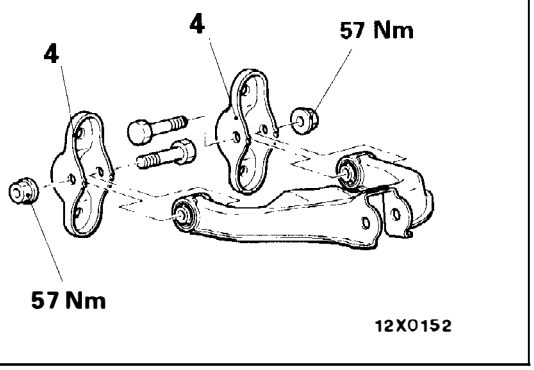
Caution
Tighten installation bolts and nuts after removing oil and grease from threads to prevent them from loosening.

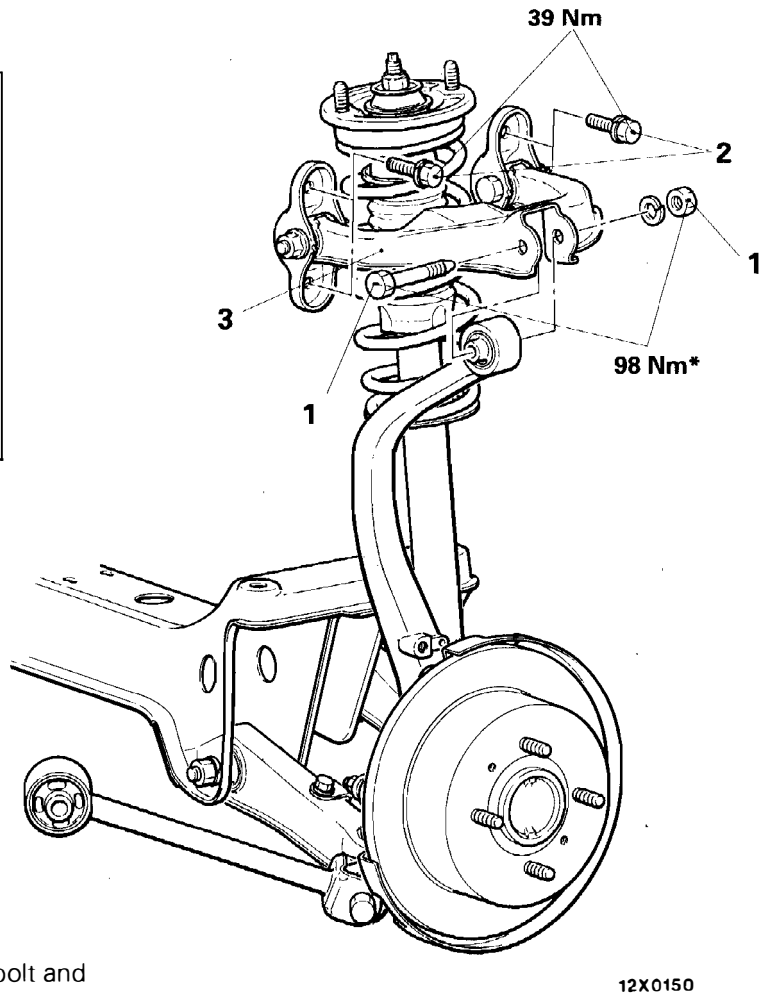
UPPER ARM ASSEMBLY

E34ZH00AB

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Alignment Inspection and Adjustment (Refer to P.34-6.)





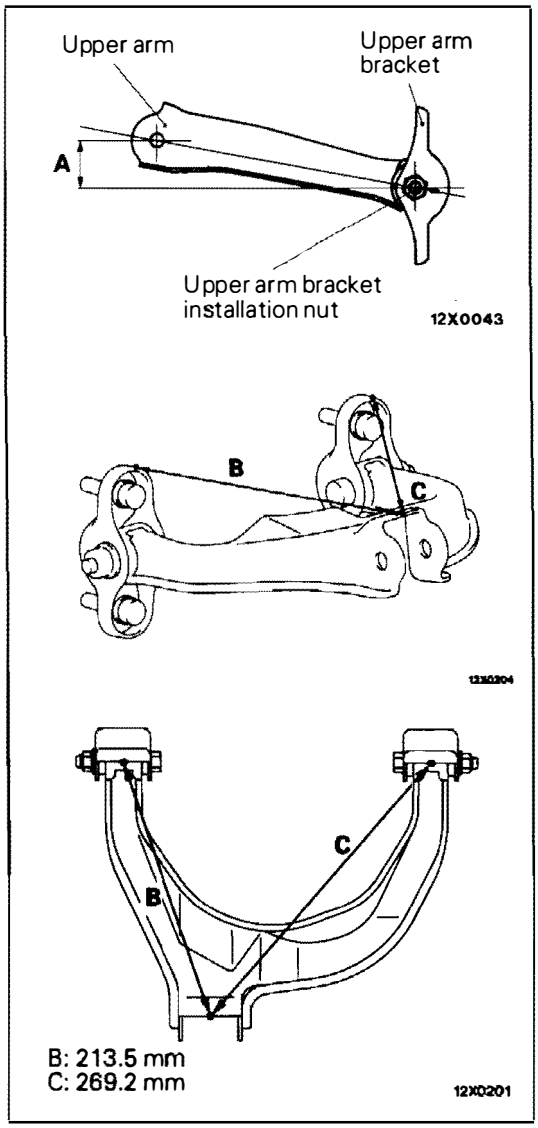
Removal steps
1. Upper arm and knuckle connecting bolt and nut
2. Upper arm assembly mounting bolts
3. Upper arm assembly
◆A◆ 4. Upper arm bracket

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.**

INSPECTION

E34ZH02AA

- Check the bushings for wear and deterioration.
- Check the upper arm for bends or damage.
- Check all bolts for condition and straightness.



INSTALLATION SERVICE POINTS E34ZH04AB

◆A◆ UPPER ARM BRACKET INSTALLATION

Tighten the upper arm bracket installation nut and bolt so that the dimension shown in the illustration is at the standard value.

Standard value (A) : 37.2 ± 2 mm

NOTE
Refer to the distances B and C shown in the illustration to check the installation angle of the upper arm bracket.

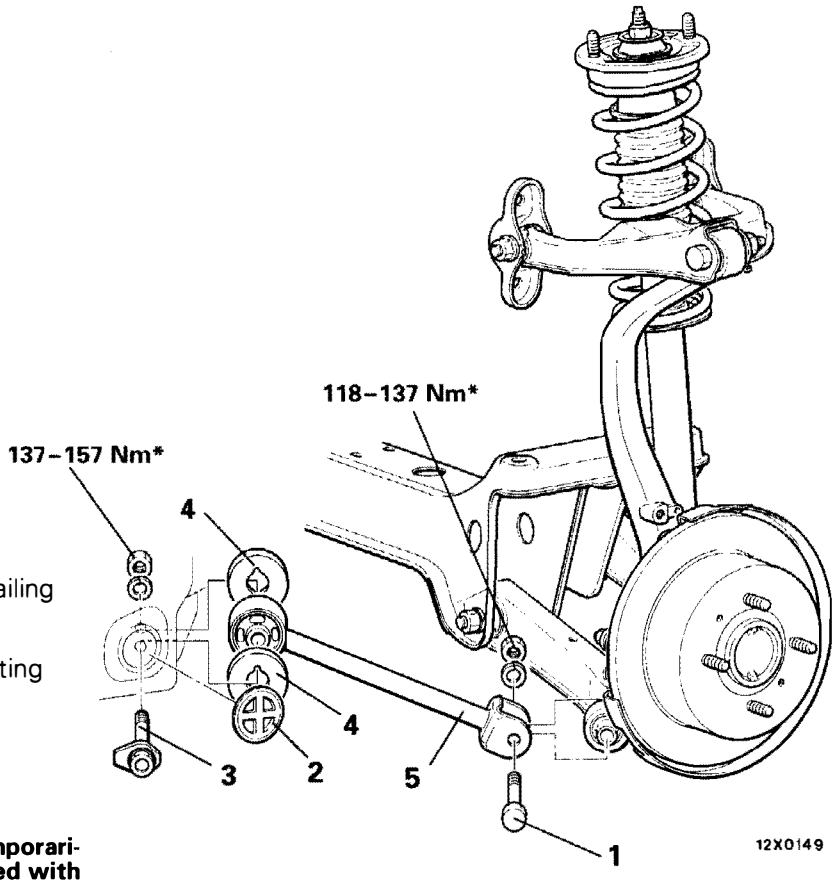
NOTES

TRAILING ARM ASSEMBLY

E34ZI00AA

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Alignment Inspection and Adjustment (Refer to P.34-6.)



Removal steps
1. Connection for knuckle and trailing arm assembly
2. Grommet
3. Trailing arm assembly mounting bolt
4. Stopper
5. Trailing arm assembly

Caution
*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicles in the unladen condition.**

INSPECTION

E34ZI02AA

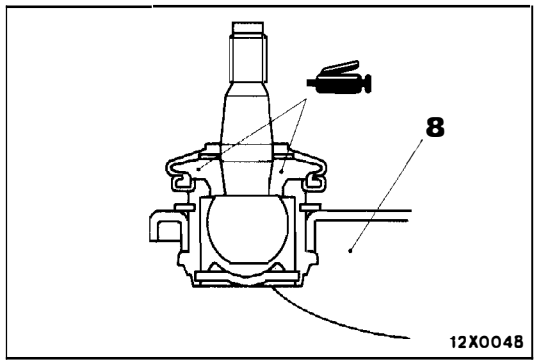
- Check the bushings for wear and deterioration.
- Check the trailing arm for bends or damage.

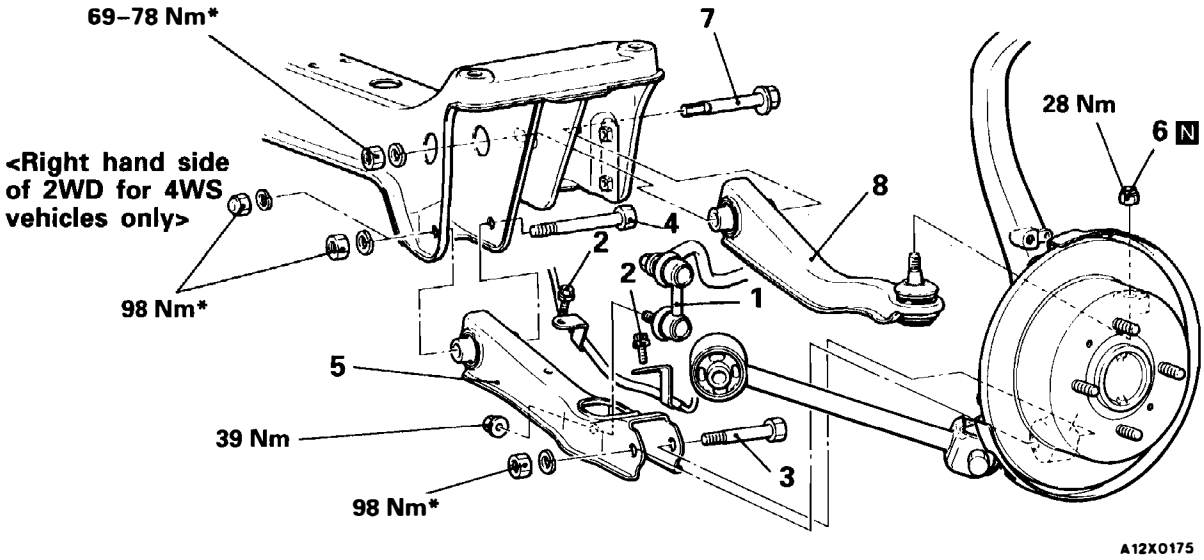
LOWER ARM AND TOE CONTROL ARM ASSEMBLIES

E34ZJ00AA

REMOVAL AND INSTALLATION

Post-installation Operation
- Wheel Alignment Inspection and Adjustment
(Refer to P.34-6.)

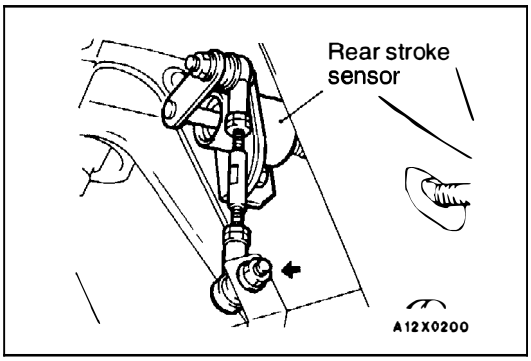




Lower arm assembly removal steps
1. Stabilizer link
2. ABS speed sensor clamp bolts <Vehicles with ABS>
3. Lower arm assembly and knuckle connection
4. Lower arm assembly mounting bolt
5. Lower arm assembly

Toe control arm assembly removal steps <Vehicles with 2WS>
- 〈A〉 Connection for rear stroke sensor and rod (sensor side) <Vehicles with Active ECS>
- 〈B〉 6. Connection for toe control arm ball joint joint and knuckle
- 〈C〉 7. Toe control arm assembly mounting bolt
8. Toe control arm assembly

Caution
*** Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.**

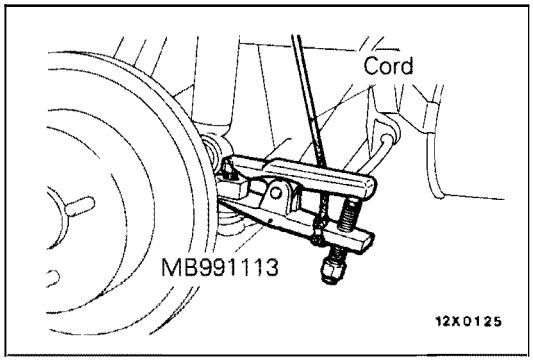


REMOVAL SERVICE POINTS

E34ZJ01AA

〈A〉 DISCONNECTION OF REAR STROKE SENSOR AND ROD (SENSOR SIDE)

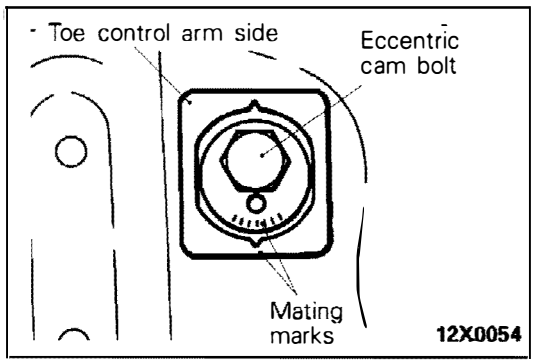
Caution
Because there is the possibility that the rear stroke sensor may generate an abnormality, the rear stroke sensor rod connection (indicated in the illustration) should first be disconnected.



〈B〉 DISCONNECTION OF TOE CONTROL ARM BALL JOINT AND KNUCKLE

Caution

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

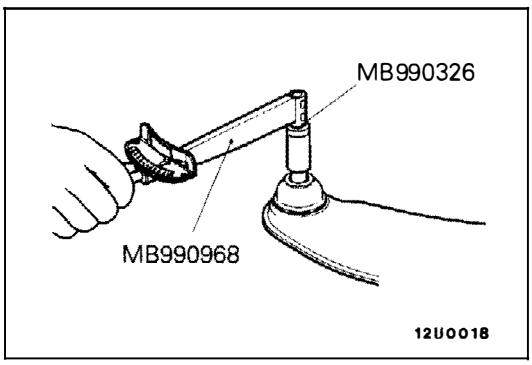


〈C〉 TOE CONTROL ARM ASSEMBLY MOUNTING BOLT REMOVAL

Make mating marks on the toe control arm and eccentric cam bolt before removing the bolt.

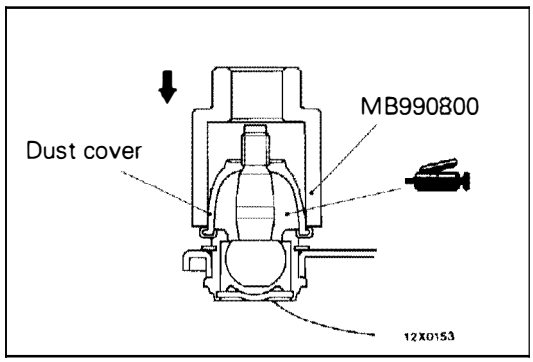
INSPECTION E34ZJ02AA

- Check the bushings for wear and deterioration.
- Check the lower arm or toe control arm for bends or damage.
- Check the ball joint dust cover for cracks.
- Check all bolts for condition and straightness.



BALL JOINT STARTING TORQUE CHECK E34ZJ02BA

Standard value: 0.1–2.65 Nm



BALL JOINT DUST COVER REPLACEMENT

E34ZJ03AA

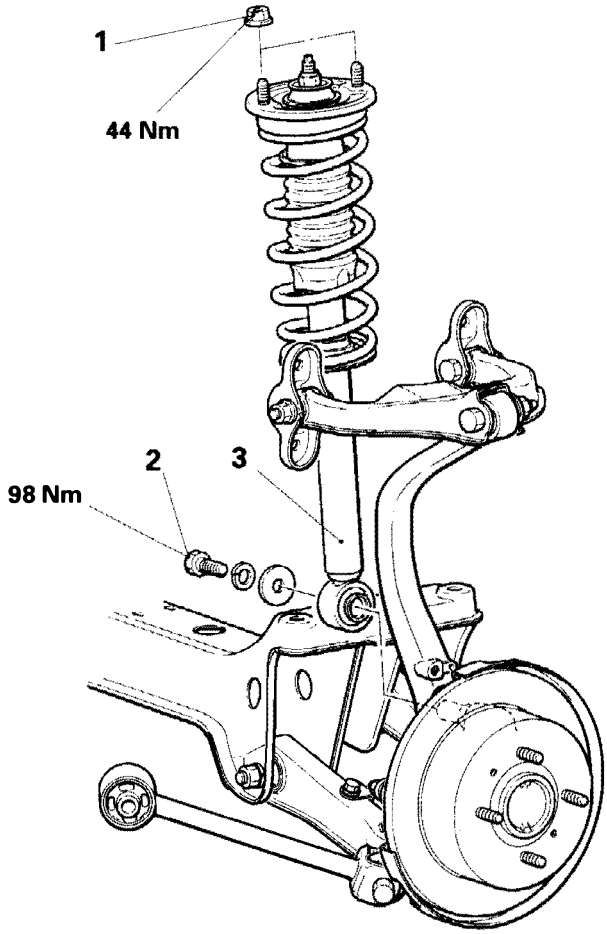
(1) Remove the dust cover.
(2) Apply multipurpose grease to the lip and inside of the dust cover.
(3) Drive in the dust cover with special tool until it is fully seated.

SHOCK ABSORBER ASSEMBLY

E34ZK00AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Shelf Cover Removal and Installation <Sedan> (Refer to GROUP 52A – Trims.)
- Absorber Lid Removal and Installation <Hatchback> (Refer to GROUP 52A – Trims.)



Removal steps
1. Flange nut
2. Bolt
3. Shock absorber

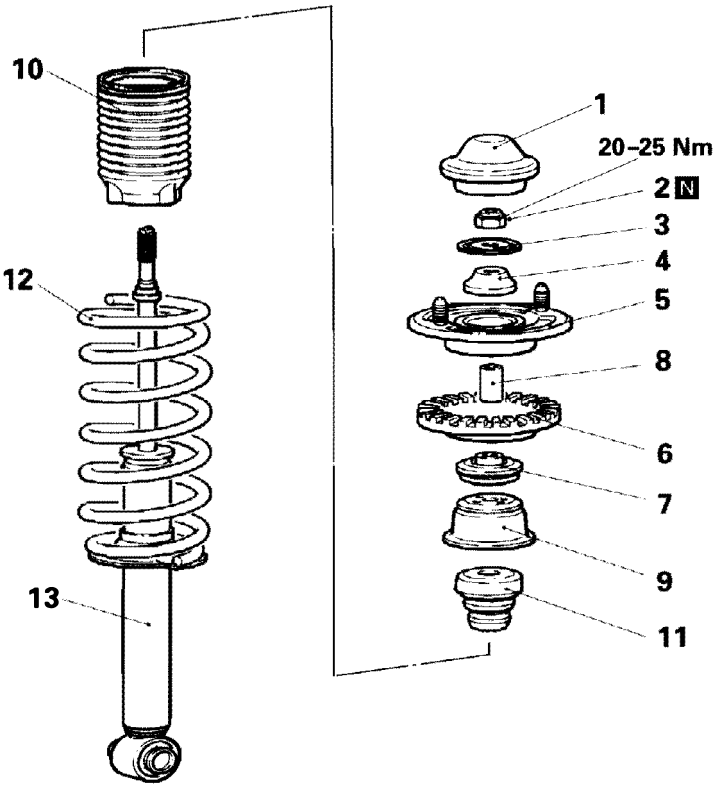
INSPECTION

E34ZK02AA

- Check the rubber parts for cracks and wear.
- Check the shock absorber for malfunctions, oil leakage or abnormal noise.

DISASSEMBLY AND REASSEMBLY

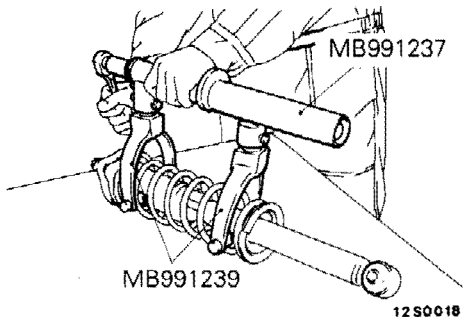
E34ZK05AA



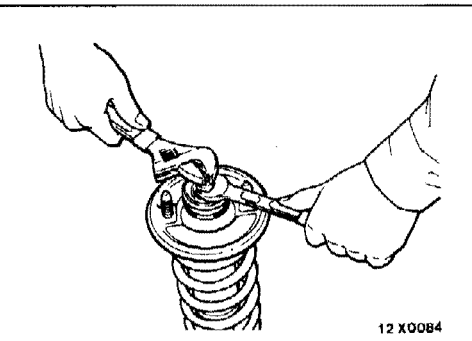
12X0083

Disassembly steps

1. Cap
〈A〉 ◆C◆ 2. Self-locking nut
3. Washer
4. Upper bushing A
◆B◆ 5. Bracket
6. Spring pad
7. Upper bushing B
8. Collar
9. Cup
10. Dust cover
11. Bump rubber
◆A◆ 12. Coil spring
13. Shock absorber assembly



12S0018



12 X0084

DISASSEMBLY SERVICE POINTS

E34ZK06AA

〈A〉 SELF LOCKING NUT REMOVAL

(1) Compress the coil spring using the special tools.

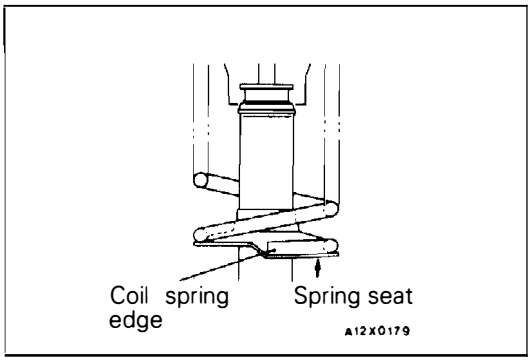
NOTE
Install the special tools evenly, and so that the maximum length will be attained within the installation range.

Caution
An air tool should not be used for the tightening of the special tool bolt.

(2) While holding the piston rod, remove the self-locking nut.

INSPECTION E34ZK07AA

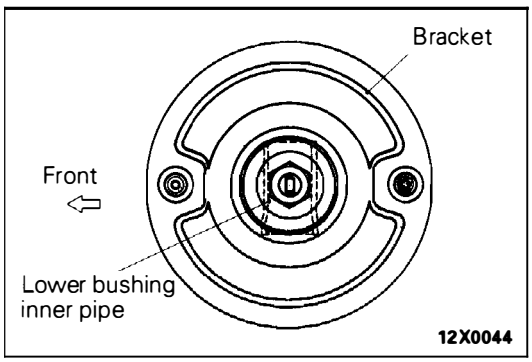
- Check the rubber parts for damage.
- Check the coil springs for crack, damage or deterioration.



REASSEMBLY SERVICE POINTS E34ZK08AA

◗A◖ COIL SPRING INSTALLATION

(1) Use the special tools (MB991237 and MB991239) to compress the coil spring and install it to the shock absorber seat.
(2) Align the edge of the coil spring to the stepped part of the shock absorber spring seat.



◗B◖ BRACKET INSTALLATION

Install the bracket as shown in the illustration.

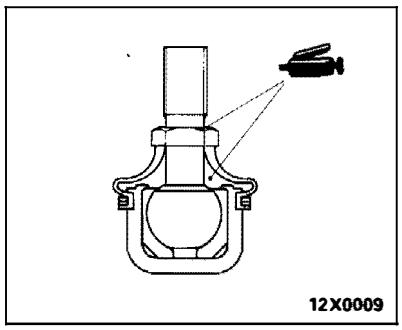
◗C◖ SELF-LOCKING NUT INSTALLATION

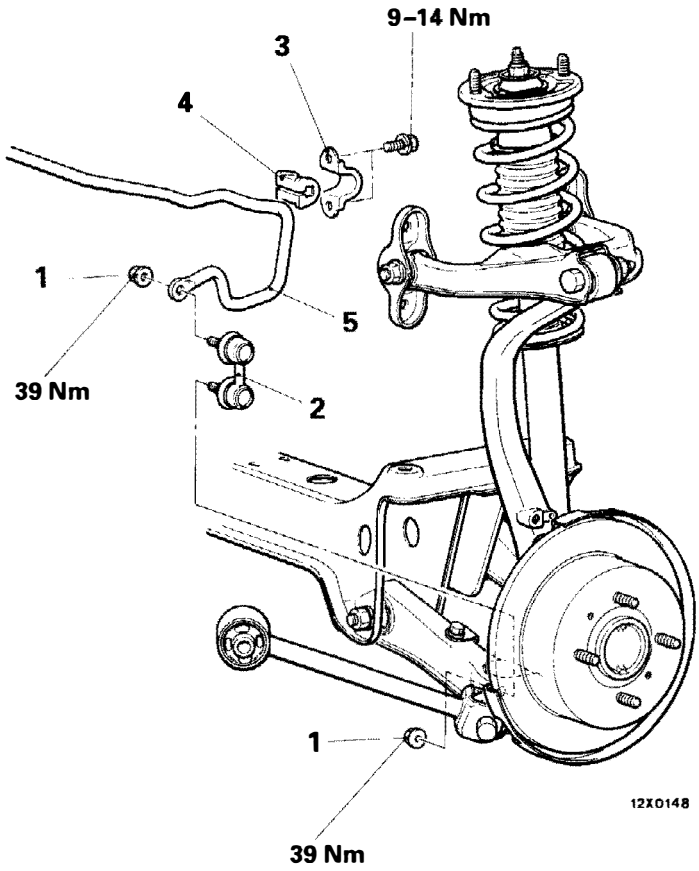
(1) Temporarily tighten the self-locking nut.
(2) Remove the special tools (MB991237, MB991239), and tighten the self-locking nut at the specified torque.

STABILIZER BAR

E34ZL00AA

REMOVAL AND INSTALLATION





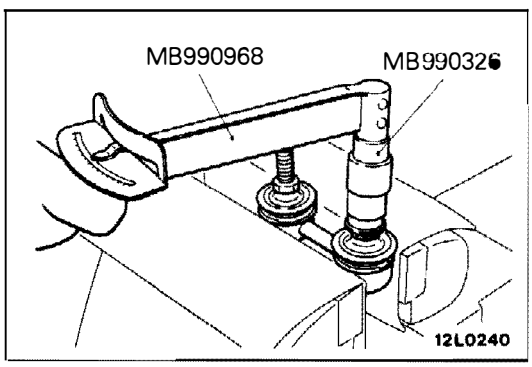
Removal steps

1. Stabilizer link mounting nuts
2. Stabilizer link
◆A◆ 3. Stabilizer bar brackets
◆A◆ 4. Bushing
◆A◆ 5. Stabilizer bar

INSPECTION

E34ZL02AA

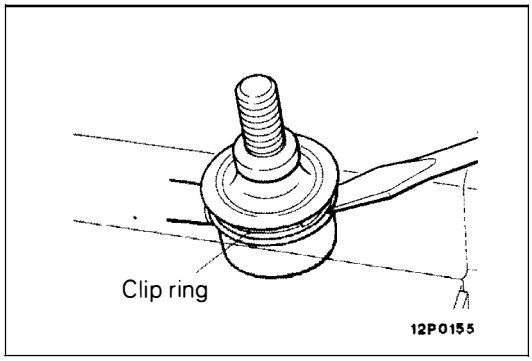
- Check the bushings for wear and deterioration.
- Check the stabilizer bar for deterioration or damage.
- Check the stabilizer link ball joint dust cover for crack.
- Check all bolts for condition and straightness.



STABILIZER LINK BALL JOINT FOR STARTING TORQUE CHECK

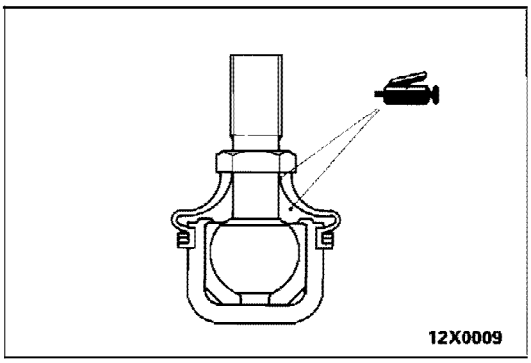
E34ZL02BA

Standard value: 0.5–1.5 Nm

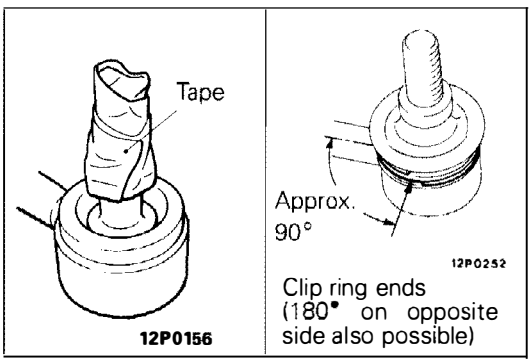


BALL JOINT DUST COVER REPLACEMENT E34ZL03AA

(1) Remove the clip ring and the dust cover.

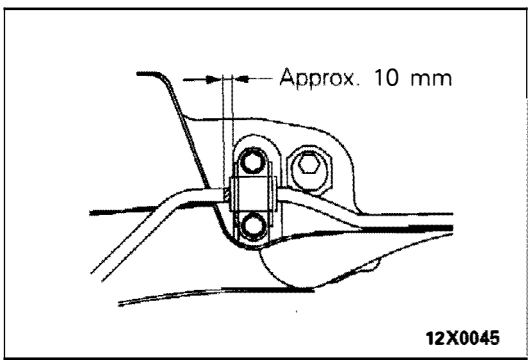


(2) Apply multi-purpose grease to the lip and inside of the dust cover.



(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 E34ZL04AA

◆A◆ STABILIZER BAR/ BUSHING / STABILIZER BAR BRACKET INSTALLATION

Set the stabilizer bar so that the identification mark is at the left, and then install the bushing so that the dimension is as shown in the illustration.

SERVICE BRAKES

CONTENTS

E35ZA00AA

PWDE9211

NOTES

BASIC BRAKE SYSTEM

CONTENTS

E35AA00AA

 Dec. 1992 PWDE9211

GENERAL INFORMATION

E35AB00AA

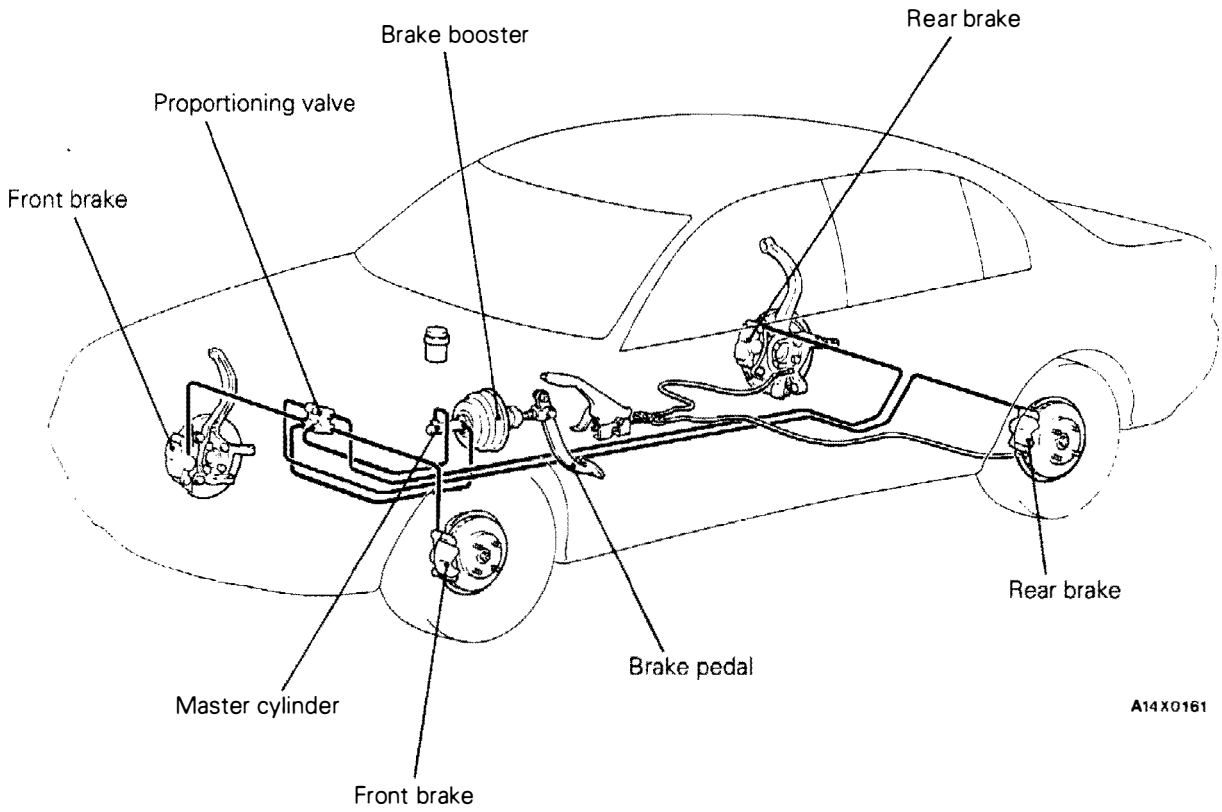
The brake system has high reliability and durability which maintains excellent braking performance and brake feeling. The main features are as follows.

- A dual type master cylinder is equipped in all models.
- Both a single type and a tandem type brake booster have been adopted.
- Floating caliper, double-piston, ventilated disc (M-R56W) brakes have been adopted as the front brakes in vehicles with 6G72 engine. In other models, floating caliper, single-piston, ventilated disc (M-R44V, M-R46V) brakes have been adopted as the front brakes.
- Both disc brakes and drum brakes have been adopted as the rear brakes. Floating caliper, single-piston, ventilated disc (M-R58V) brakes have been adopted as the disc brakes in vehicles with 6G72 engine, and floating caliper, single-piston, solid disc (M-R45S) brakes have been adopted in other vehicles. Leading-trailing type brakes have been adopted as the drum brakes.

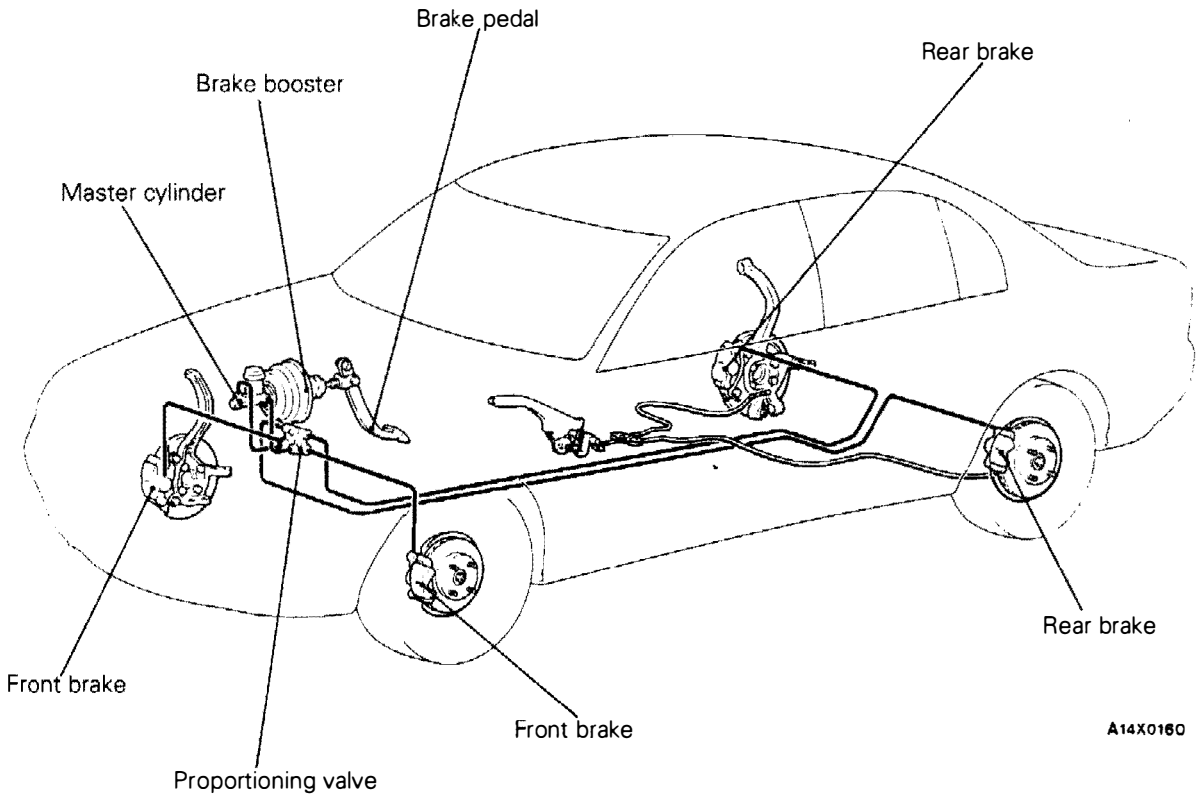
Items	2WD			4WD	
	4G93	4G63, 6A12	4D68	4G63	6G73
Master cylinder					
I.D. mm	22.2	23.8 25.4*1	22.2	23.8 25.4*1	25.4
Brake booster					
Effective dia. of power cylinder mm	230 180 + 205*1 205 + 230*3	230 205 + 230*1	205 180 + 205*1	180 + 205 205 + 230*1	205 + 230
Boosting ratio	6.0 6.5*1 7.0*3	6.0 7.0*1	5.5 6.5*1	6.5 7.0*1	7.0
Proportioning valve					
Decompression ratio	0.25	0.25	0.25	0.25	0.25
Front brakes					
Disc effective dia. mm	204	204	204	204	227
Wheel cylinder I.D. mm	53.9 60.3*2	60.3	53.9 60.3*1	60.3*1	42.9×2
Rear drum brakes					
Drum I.D. mm	203	–	203	–	–
Wheel cylinder I.D. mm	20.6	–	20.6	–	–
Lining thickness mm	4.4	–	4.4	–	–
Rear disc brakes					
Disc effective dia. mm	222*2	222	222*1	222	237
Wheel cylinder I.D. mm	34.9*2	34.9	34.9*1	34.9	38.1

NOTE
*1: Vehicles with ABS.
*2: 6B models without ABS and models other than 6B with ABS.
*3: 6B models with ABS.

<L.H. drive vehicles>



<R.H. drive vehicles>



SERVICE SPECIFICATIONS

E35AC00AA

Items		Specifications
Standard value		
Brake pedal height	mm	175–180
Brake pedal free play	mm	3–8
Brake pedal to floorboard clearance	mm	90 or more
Output pressure of proportioning valve	MPa	
<Split point>		
Vehicles without ABS		
4G93, 4D68		2.2–2.7
4G63 <2WD>, 6A12		3.7–4.2
4G63 <4WD>		3.2–3.7
Vehicles with ABS		
4G93, 4D68, 4G63 <2WD>, 6A12		3.7–4.2
4G63 <4WD>		3.2–3.7
6G73		2.7–3.2
<Input fluid pressure set in the following>		
Vehicles without ABS		
4G93, 4D68: 6.1–6.6 MPa		3.4–3.9
4G63 <2WD>, 6A12: 7.6–8.1 MPa		4.9–5.4
4G63 <4WD>: 7.1–7.6 MPa		4.4–4.9
Vehicles with ABS		
4G93, 4D68, 4G63 <2WD>, 6A12: 7.6–8.1 MPa		4.7–5.1
4G63 <4WD>: 7.1–7.6 MPa		4.2–4.7
6G73: 6.6–7.1 MPa		3.9–4.4
Front disc brake pad thickness	mm	10
Front disc brake drag force (tangential force of wheel mounting bolts)	N	69 or less
Front brake disc thickness	mm	24
Rear disc brake pad thickness	mm	10
Rear disc brake drag force (tangential force of wheel mounting bolts)	N	69 or less
Rear brake disc thickness	mm	
Solid type		10
Ventilated type		20
Booster push rod to master cylinder piston clearance	mm	
Single brake booster		
Petrol-powered vehicles		0.60–0.80
Diesel-powered vehicles		0.55–0.75
Dual tandem brake booster		
Petrol-powered vehicles		0.40–0.60
Diesel-powered vehicles		0.50–0.70
Limit		
Left/right proportioning valve output pressure difference	MPa	0.4
Pad thickness	mm	2.0
Front brake disc thickness	mm	22 4
Front brake disc runout	mm	0.08

Items		Specifications
Front hub end play	mm	0.05
Rear brake lining thickness	mm	1.0
Rear drum inside diameter	mm	205
Rear brake disc thickness	mm	
Solid type		8.4
Ventilated type		18.4
Rear brake disc runout	mm	0.08

LUBRICANTS

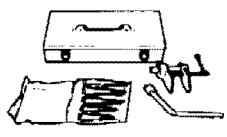
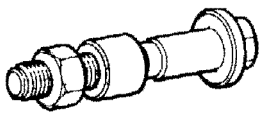
Items	Specified lubricant
Brake fluid	DOT3 or DOT4
Brake piston seal Slide pin boot and slide pin bush inner surfaces Brake piston boot inner surfaces Lock pin boot inner surfaces Guide pin boot inner surfaces Pad assembly and shim contact surface Piston boot mounting grooves Piston cup surface	Repair kit grease (orange)
Rear brake shoe and backing plate contact surfaces Shoe and lining assembly and auto adjuster assembly contact surfaces Shoe and lever assembly and auto adjuster assembly contact surfaces	Brake grease SAE J310, NLGI No. 1

SEALANT AND ADHESIVES

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Vacuum switch	3M ATD Part No. 8661 or equivalent	Semi-drying sealant

SPECIAL TOOLS

E35AD00AA

Tool	Number	Name	Use
	MB990964 MB990520 MB990620	Brake tool set	Pushing-in of the front disc brake piston Installation of drum brake wheel cylinder piston cup
	MB990998	Front hub remover and installer	Removal or press-in the hub

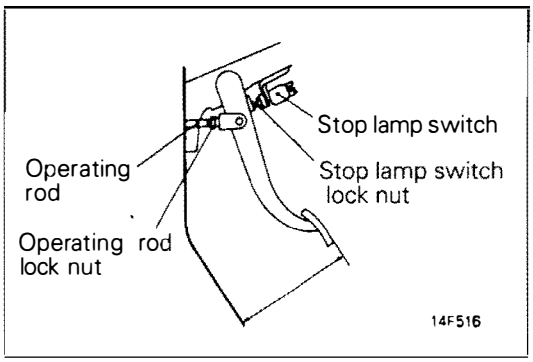
TROUBLESHOOTING

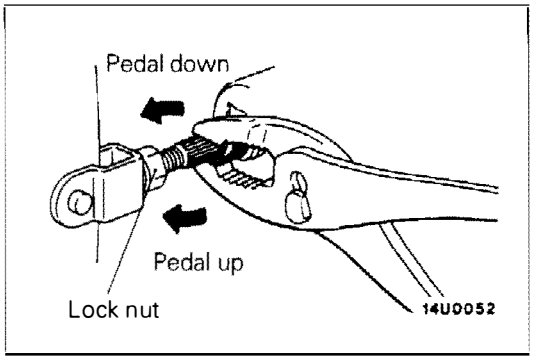
E35AE00AA

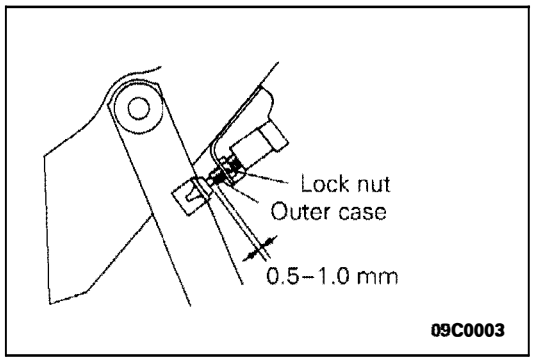
Symptom	Probable cause	Remedy
Vehicle pulls to one side when brakes are applied	Grease or oil on pad or lining surface	Replace
	Inadequate contact of pad or lining	Correct
	Auto adjuster malfunction	Adjust
	Drum eccentricity or uneven wear	Repair or replace as necessary
Insufficient braking power	Low or deteriorated brake fluid	Refill or change
	Air in brake system	Bleed air
	Overheated brake rotor due to dragging of pad or lining	Correct
	Inadequate contact of pad or lining	
	Brake booster malfunction	
	Clogged brake line	
	Grease or oil on pad or lining surface	Replace
	Proportioning valve malfunction	
	Auto adjuster malfunction	Adjust
Increased pedal stroke (Reduced pedal to floorboard clearance)	Air in brake system	Bleed air
	Worn lining or pad	Replace
	Broken vacuum hose	
	Faulty master cylinder	
	Brake fluid leaks	Correct
	Auto adjuster malfunction	Adjust
	Excessive push rod to master cylinder clearance	
Brake drag	Incomplete release of parking brake	Correct
	Clogged master cylinder return port	
	Incorrect parking brake adjustment	Adjust
	Improper push rod to master cylinder clearance	
	Faulty master cylinder piston return spring	Replace
	Worn brake pedal return spring	
	Broken rear drum brake shoe return spring	
	Lack of lubrication in sliding parts	Lubricate

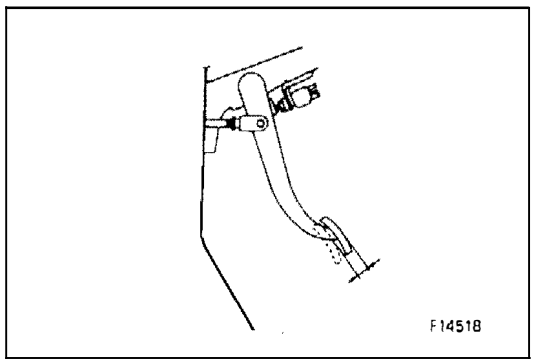
Symptom	Probable cause	Remedy
Insufficient parking brake function	Worn brake lining or pad	Replace
	Grease or oil on lining or pad surface	
	Parking brake cable sticking	
	Stuck wheel cylinder or caliper piston	
	Excessive parking brake lever stroke	Adjust the parking brake lever stroke or check the parking brake cable routing
Scraping or grinding noise when brakes are applied	Auto adjuster malfunction	Adjust
	Worn brake lining or pad	Replace
	Caliper to wheel interference	Correct or replace
	Dust cover to disc interference	
	Bent brake backing plate	
	Cracked drums or brake disc	
Squealing, groaning or chattering noise when brakes are applied	Disc brakes-missing or damaged brake pad anti-squeak shim	Replace
	Brake drums and linings, discs and pads worn or scored	Correct or replace
	Improper lining parts	
	Disc brake-burred or rusted calipers	Clean or deburr
	Dirty, greased, contaminated or glazed linings	Clean or replace
	Drum brakes-weak, damaged or incorrect shoe hold-down springs, loose or damaged shoe hold-down pins and springs	Correct or replace
	Incorrect brake pedal or booster push rod	Adjust

Symptom	Probable cause	Remedy
Squealing, noise when brakes are not applied	Bent or warped backing plate causing interference with drum	Replace
	Drum brakes-weak, damaged or incorrect shoe-to-shoe spring	
	Poor return of brake booster or master cylinder or wheel cylinder	
	Loose or extra parts in brakes	Retighten
	Improper positioning of pads in caliper	Correct
	Improper installation of support mounting to caliper body	
	Improper machining of drum causing interference with backing plate or shoe	Replace drum
	Disc brakes-rusted, stuck	Lubricate or replace
	Worn, damaged or insufficiently lubricated wheel bearings	
	Incorrect brake pedal or booster push-rod	Adjust
Groaning clicking or rattling noise when brakes are not applied	Stones or foreign material trapped inside wheel covers	Remove stones, etc.
	Loose wheel nuts	Retighten
	Disc brakes-loose installation bolt	
	Worn, damaged or dry wheel bearings	Lubricate or replace
	Disc brakes-failure of shim	Replace
	Disc brakes-wear on sleeve	
	Incorrect brake pedal or booster push-rod	Adjust









SERVICE ADJUSTMENT PROCEDURES

E35AF00AA

BRAKE PEDAL INSPECTION AND ADJUSTMENT

1. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, adjust as follows.

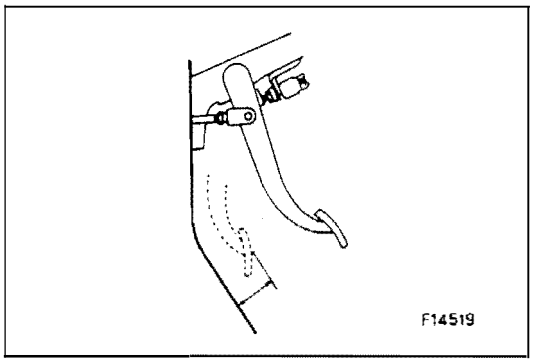
   Standard value: 175–180 mm

   (1) Disconnect the stop lamp switch connector, loosen the lock nut, and move the stop lamp switch to a position where it dose not contact the brake pedal arm.
   (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.
   (3) After screwing in the stop lamp switch until it contacts the brake pedal stopper (just before the brake pedal is caused to move), return the stop lamp switch 1/2 to 1 turn and secure by tightening the lock nut.
   (4) Connect the connector of the stop lamp switch.
   (5) Check to be sure that the stop lamp is not illuminated with the brake pedal unpressed.

2. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.

   Standard value: 3–8 mm

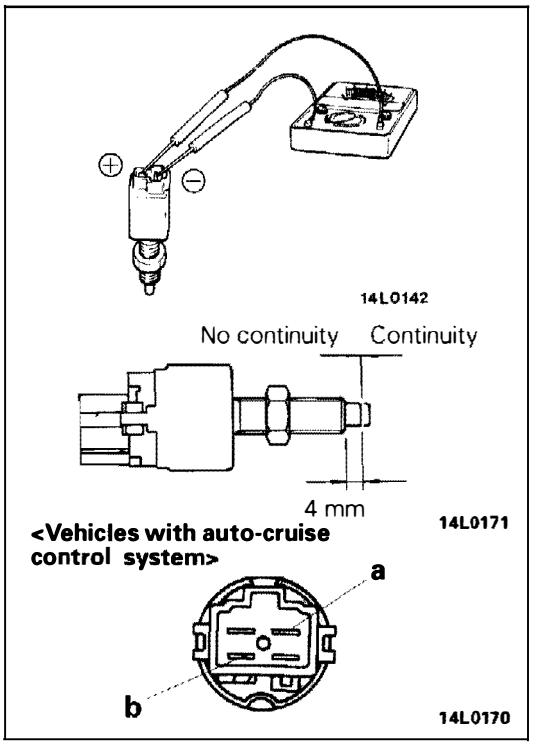
   If the free play exceeds the standard value, it is probably due to excessive play between the clevis pin and brake pedal arm.
   Check for excessive clearance and replace faulty parts as required.



3. Start the engine, depress the brake pedal with approximately 490 N of force, and measure the clearance between the brake pedal and the floorboard.

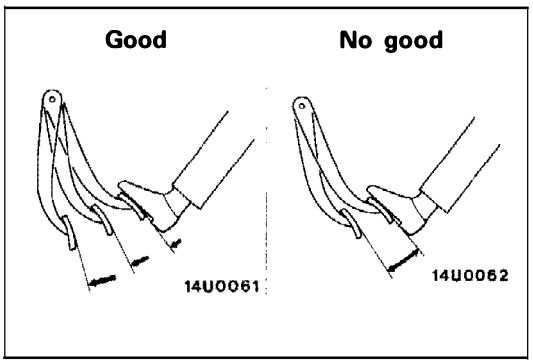
   Standard value: 90 mm or more

   If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake.
   Adjust and replace defective parts as required.



STOP LAMP SWITCH INSPECTION E35AF01AA

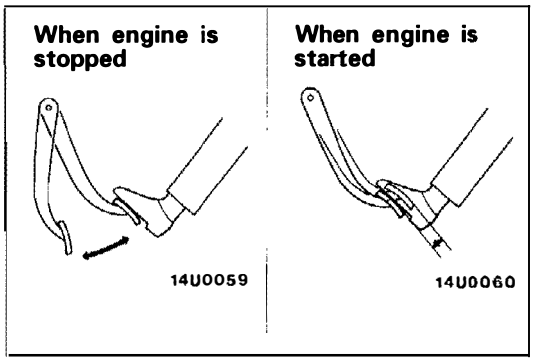
Connect a circuit tester to the stop lamp switch, and check whether or not there is continuity when the plunger of the stop lamp switch is pushed in and when it is released.
The stop lamp switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm from the outer case edge surface, and if there is continuity when it is released.
For vehicles with auto-cruise control system, the check for continuity should be mode at connectors "a" and "b" of the stop lamp switch.



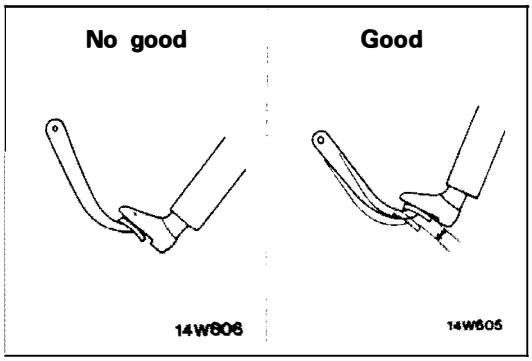
BRAKE BOOSTER OPERATING TEST E35AF02AA

For simple checking of the brake booster operation, carry out the following tests:

1. Run the engine for one or two minutes, and then stop it.
   If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is defective.



2. With the engine stopped, step on the brake pedal several times.
   Then step on the brake pedal and start the engine.
   If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.



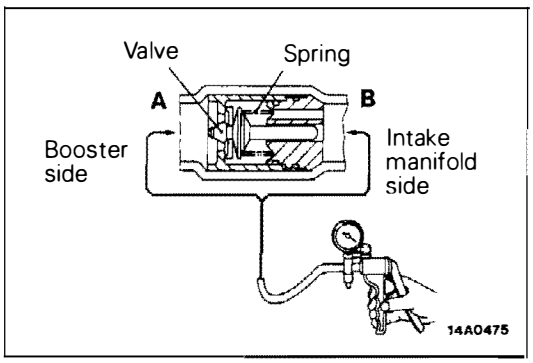
3. With the engine running, step on the brake pedal and then stop the engine.
   Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.
   If the above three tests are okay, the booster performance can be determined as good.
   If one of the above three tests in not okay at last, the check valve, vacuum hose, or booster will be defective.

CHECK VALVE OPERATION CHECK E35AF03AA

When checking the check valve, keep the check valve fit in the vacuum hose.

1. Remove the vacuum hose.

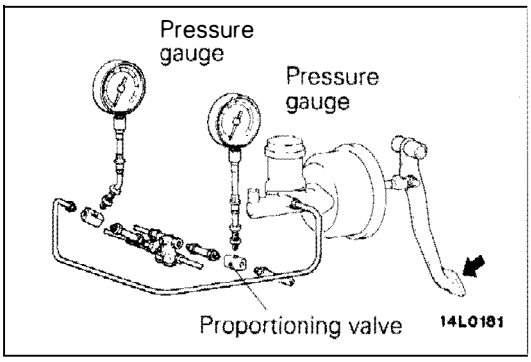
   NOTE
   The check valve is press-fitted inside the vacuum hose at the position of the marking.



2. Check the operation of the check valve by using a vacuum pump.

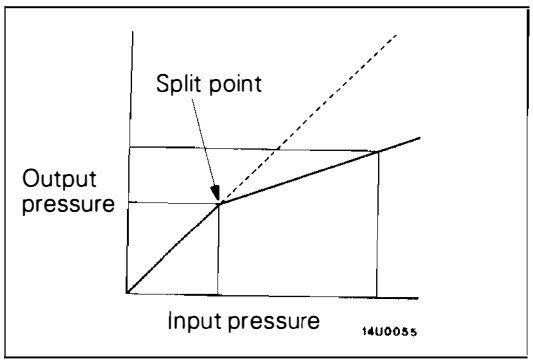
Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side (A)	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side (B)	A negative pressure (vacuum) is not created.

Caution
If the check valve is defective, replace it as an assembly unit together with the vacuum hose.



PROPORTIONING VALVE FUNCTION TEST E35AF04AA

1. Connect two pressure gauges, one each to the input side and output side of the proportioning valve, as shown.
2. Air bleed the brake line and the pressure gauge.
3. While gradually depressing the brake pedal, make the following measurements and check to be sure that the measured values are within the allowable range.



(1) Output pressure begins to drop relative to input pressure (split point).

Standard value:

MPa

	Vehicles without ABS			Vehicles with ABS		
	4G93, 4D68	4G63 <2WD>, 6A12	4G63 <4WD>	4G93, 4D68, 4G63 <2WD>, 6A12	4G63 <4WD>	6G73
Split point	2.2 – 2.7	3.7 – 4.2	3.2 – 3.7	3.7 – 4.2	3.2 – 3.7	2.7 – 3.2

(2) Check to be sure that the output fluid pressure is at the standard value when the pedal depression force is increased so that the input fluid pressure is at the values shown in the table below.

Standard value:

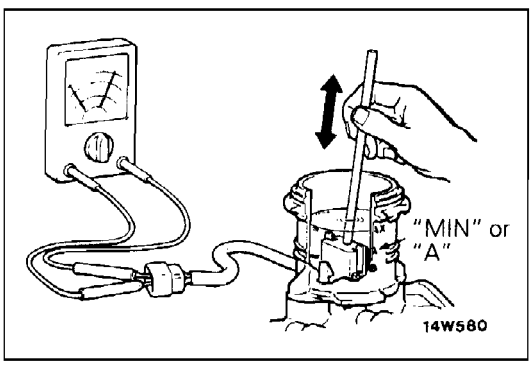
MPa

	Vehicles without ABS			Vehicles with ABS		
	4G93, 4D68	4G63 <2WD>, 6A12	4G63 <4WD>	4G93, 4D68, 4G63 <2WD>, 6A12	4G63 <4WD>	6G73
Input fluid pressure	6.1 – 6.6	7.6 – 8.1	7.1 – 7.6	7.6 – 8.1	7.1 – 7.6	6.6 – 7.1
Output fluid pressure	3.4 – 3.9	4.9 – 5.4	4.4 – 4.9	4.7 – 5.1	4.2 – 4.7	3.9 – 4.4

(3) Output pressure difference between left and right brake lines

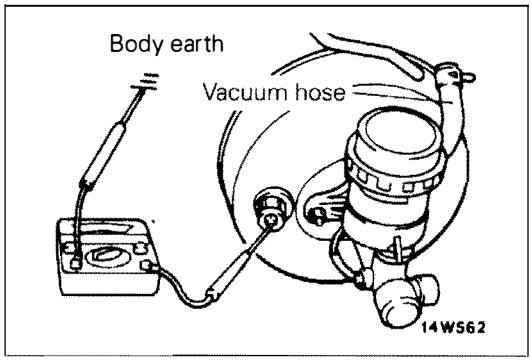
Limit: 0.4 MPa

4. If the measured pressures are not within the permissible ranges, replace the proportioning valve.



BRAKE FLUID LEVEL SENSOR CHECK E35AF05AA

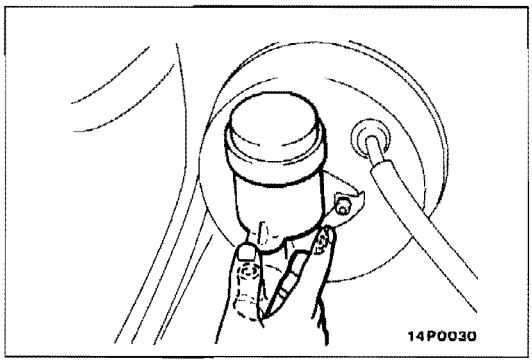
The brake fluid level sensor is in good condition if there is no continuity when the float surface is above "MIN" or "A" and if there is continuity when the float surface is below "MIN" or "A".



BRAKE BOOSTER VACUUM SWITCH CHECK <4D68>

E35AF06AA

1. Connect an ohmmeter to the connector of the vacuum switch.
2. Start the engine and check for continuity when the vacuum hose is connected and when it is disconnected.
   The vacuum switch is in good condition if there is no continuity when the vacuum hose is connected, and if there is continuity when it is not connected.



BLEEDING

E35AF07AA

Caution
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

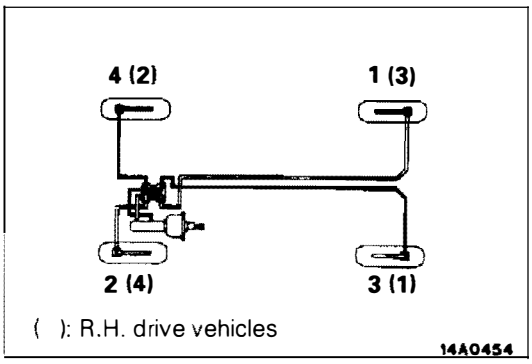
Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING

E35AF07BA

The master cylinder used has no check valve, so if bleeding is carried out by the following procedure, bleeding of air from the brake pipeline will become easier. (When brake fluid is not contained in the master cylinder.)

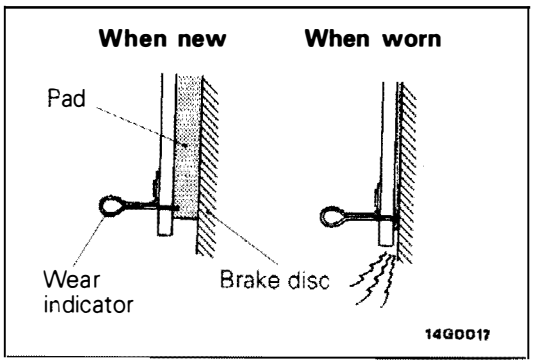
(1) Fill the reserve tank with brake fluid.
(2) Keep the brake pedal depressed.
(3) Have another person cover the master cylinder outlet with a finger.
(4) With the outlet still closed, release the brake pedal.
(5) Repeat steps 2. –4. three or four times to fill the inside of the master cylinder with brake fluid.



BRAKE PIPE LINE BLEEDING

E35AF07CA

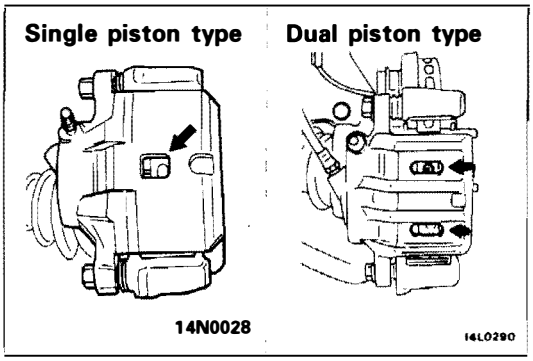
Start the engine and bleed the air in the sequence shown in the figure.



FRONT DISC BRAKE PAD CHECK AND REPLACEMENT

E35AF08AA

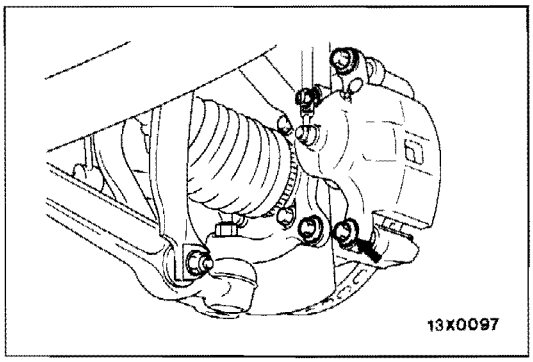
NOTE
The brake pads have wear indicators that contact the brake disc when the brake pad thickness becomes 2 mm, and emit a squealing sound to warn the driver.



1. Check brake pad thickness through caliper body check port.

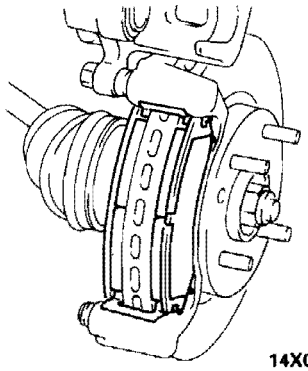
Standard value: 10.0 mm
Limit: 2.0 mm

Caution
1. When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.
2. If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.



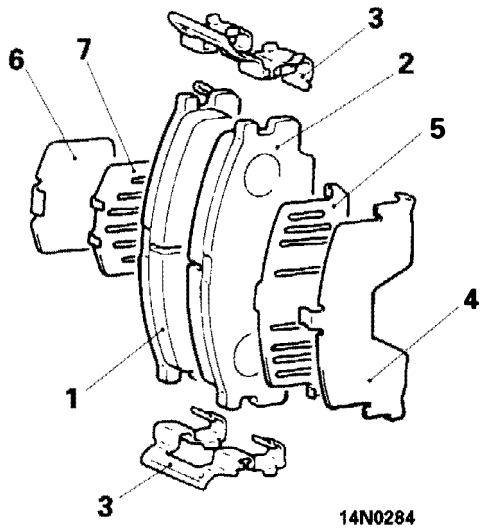
2. Remove guide pin. Lift caliper assembly and retain with wires.

Caution
Do not wipe off the special grease that is on the guide pin or allow it to contaminate the lock pin.

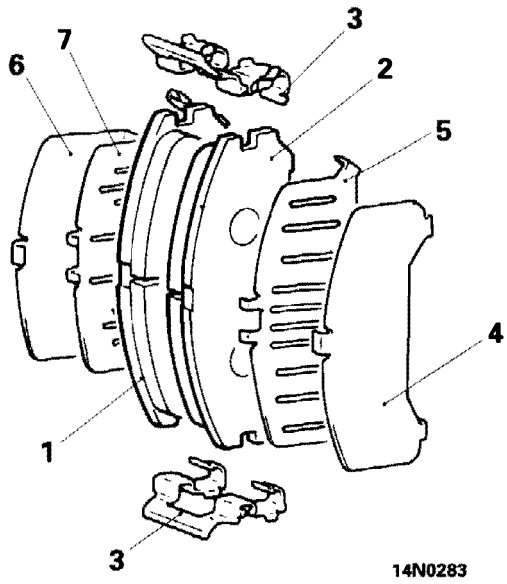


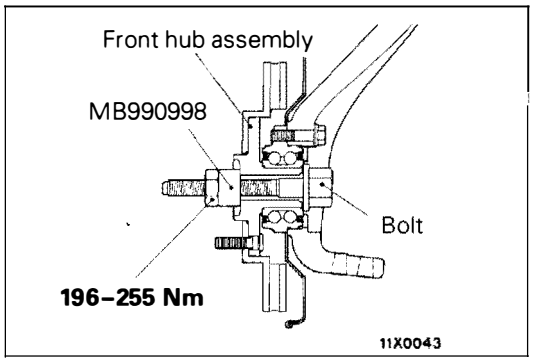
3. Remove the following parts from caliper support.
   1. Pad & wear indicator assembly
   2. Pad assembly
   3. Clip
   4. Outer shim (stainless)
   5. Outer shim (coated with rubber)
   6. Inner shim (stainless)
   7. Inner shim (coated with rubber)

Vehicles with single piston type disc brake

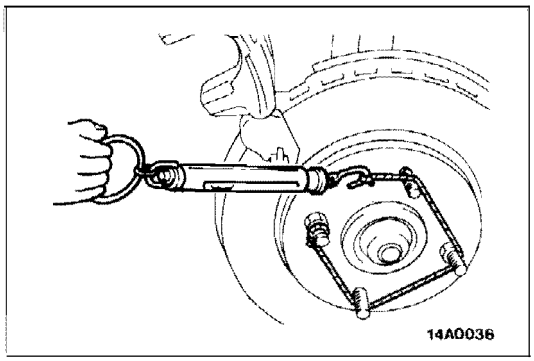


Vehicles with dual piston type disc brake



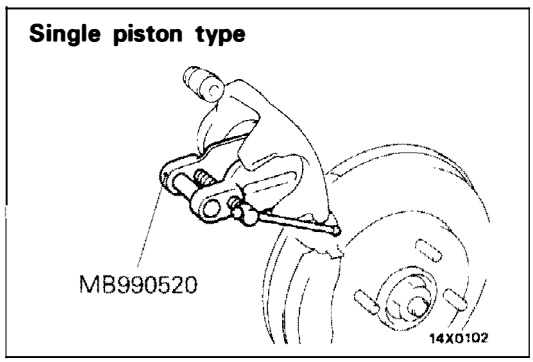


4. Take out the drive shaft. (Refer to GROUP 26 – Drive Shaft.)
5. Set the special tool to the front hub assembly as shown in the illustration.

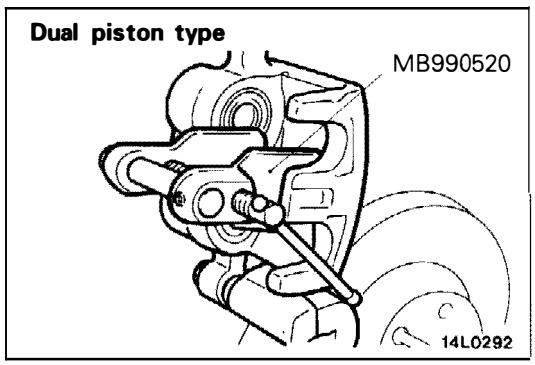


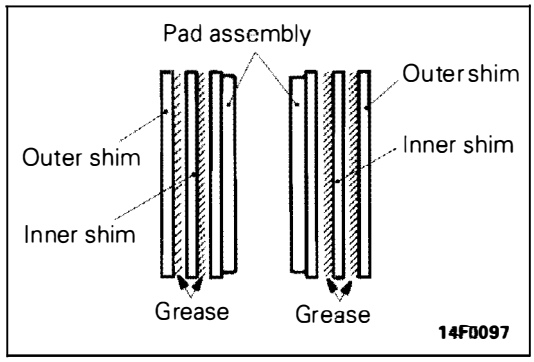
6. Measure hub torque (A) with pad removed to measure brake drag torque after pad installation.

   NOTE
   Tighten the nuts in order to secure the disc to the hub.
7. Securely attach the pad clip to the caliper support.



8. Clean piston and insert into cylinder with special tool.

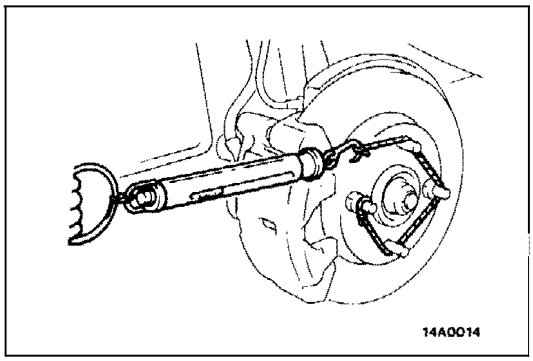




9. Apply repair kit grease to the attaching faces of pad and inner shim and to the attaching faces of inner and outer shims.
   Apply so as not to spread it out from the edge of shim.

   Caution
   1. **Do not deposit grease or other dirt on pad or brake disc friction surfaces.**
   2. **The grease should be applied so that it does not protrude from the shim surfaces.**

10. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the lock pin.
11. Check brake drag torque as follows.
    (1) Start engine and hold brake pedal down for 5 seconds. (Pedal depression force approx. 196 N)
    (2) Stop engine.
    (3) Turn brake disc forward 10 times.



    (4) Check hub torque (B) with spring balance.
    (5) Calculate the drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

    Standard value: 69 N [4 Nm] or less

12. If the difference between brake drag torque and hub torque exceeds the standard value, disassemble piston and clean the piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

FRONT DISC BRAKE ROTOR INSPECTION

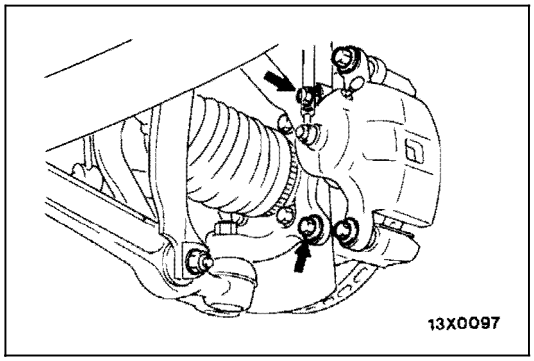
E35AF03AA

CAUTION

When servicing disc brakes, it is necessary to exercise caution to keep the disc brake within the allowable service values in order to maintain normal brake operation.

Before re-finishing or re-processing the brake disc surface, the following conditions should be checked.

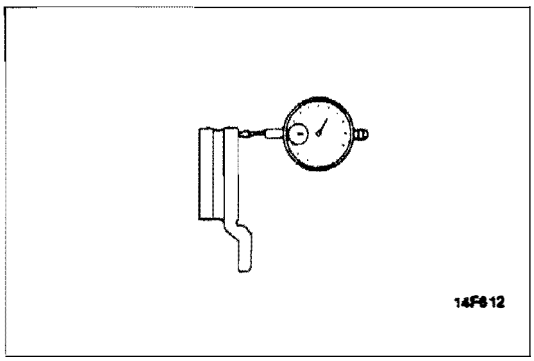
Inspection items	Remarks
Scratches, rust, saturated lining materials and wear	• If the vehicle is not driven for a certain period, the sections of the discs that are not in contact with lining will become rusty, causing noise and shuddering. • If grooves resulting from excessive disc wear and scratches are not removed prior to installing a new pad assembly, there will momentarily be inappropriate contact between the disc and the lining (pad).
Run-out or drift	Excessive run-out or drift of the discs will increase the pedal depression resistance due to piston knock-back.
Change in thickness (parallelism)	If the thickness of the disc changes, this will cause pedal pulsation, shuddering and surging.
Inset or warping (flatness)	Overheating and improper handling while servicing will cause inset or warping.



RUN-OUT CHECK

E35AF10AA

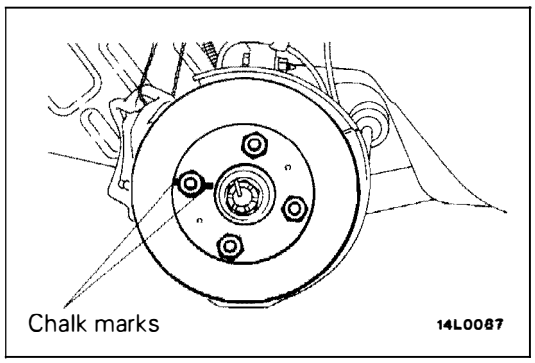
1. Remove the caliper support; then raise the caliper assembly upward and secure by using wire.
2. Inspect the disc surface for grooves, cracks, and rust. Clean the disc thoroughly and remove all rust.



3. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the runout of the disc.

   Limit: 0.08 mm

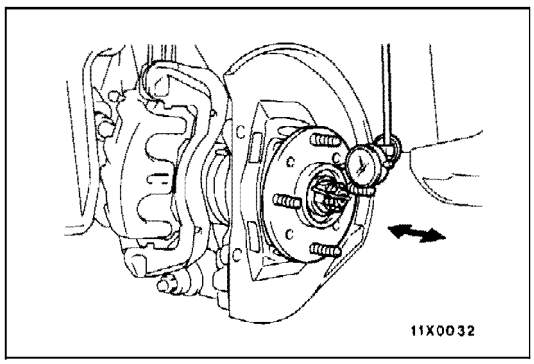
   NOTE
   Tighten the nuts in order to secure the disc to the hub.



RUN-OUT CORRECTION

E35AF11AA

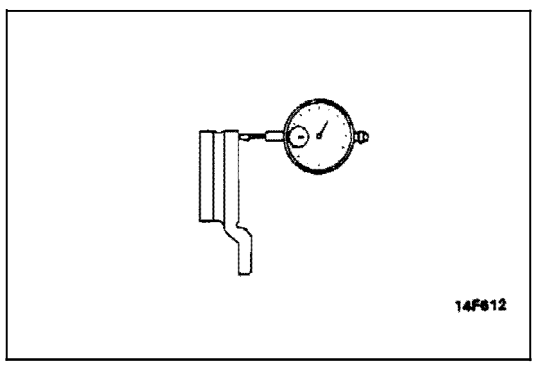
1. If the run-out the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.
   (1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which run-out is greatest.



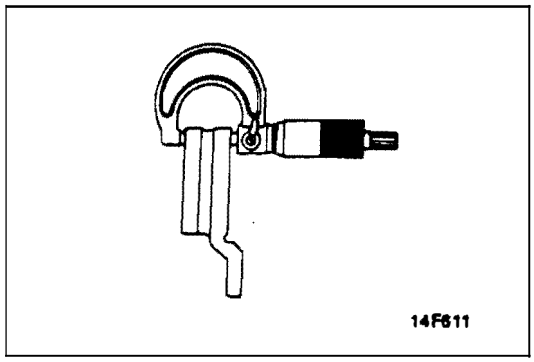
   (2) Remove the brake disc, and then place a dial gauge as shown in the illustration; then move the hub in the axial direction and measure the play.

   Limit: 0.05 mm

   If the play is equivalent to or exceeds the limit, disassemble the hub knuckle and check each part.



   (3) If the play does not exceed the limit specification, install the brake disc at a position 180° away from the chalk mark, and then check the run-out of the brake disc once again.
2. If the run-out cannot be corrected by changing the phase of the brake disc, replace the brake disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).

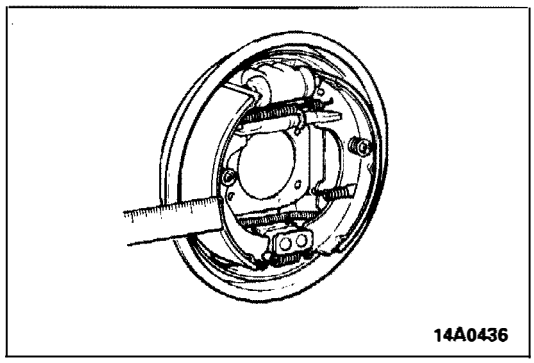

14F611

THICKNESS CHECK E35AF12AA

1. Using a micrometer, measure disc thickness at eight positions, approximately 45° apart and 10 mm in from the outer edge of the disc.

   Brake disc thickness
   Standard value: 24 mm
   Limit: 22.4 mm

   Thickness variation (at least 8 position)
   The difference between any thickness measurements should not be more than 0.015 mm.
2. If the disc is beyond the limits for thickness, remove it and install a new one. If thickness variation exceeds the specification, replace the brake disc or turn rotor with on the car type brake lathe ("MAD, DL-8700PF" or equivalent).


14A0436

BRAKE LINING THICKNESS CHECK E35AF13AA

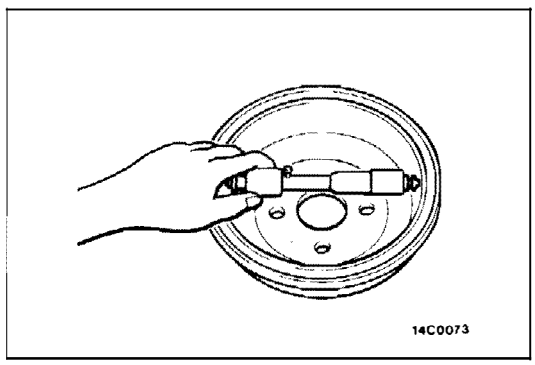
<VEHICLES WITH REAR DRUM BRAKE>

1. Remove the brake drum.
2. Measure the wear of the brake lining at the place worn the most.

   Limit: 1.0 mm

   Replace the shoe and lining assembly if brake lining thickness is less than the limit if it is not worn evenly. For information concerning the procedures for installation of the shoe and lining assembly, refer to P. 35A-44.

   Caution
   1. Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent car from pulling to one side when braking.
   2. If there is a significant difference in the thicknesses of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.

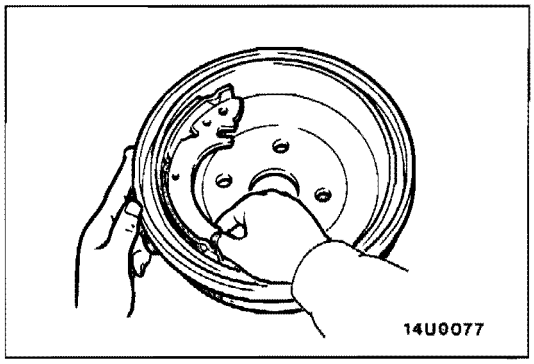

14C0073

BRAKE DRUM INSIDE DIAMETER CHECK E35AF14AA

<VEHICLES WITH REAR DRUM BRAKE>

1. Remove the brake drum.
2. Measure the inside diameter of the hub and drum at two or more locations.

   Limit: 205 mm
3. Replace brake drums, shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.



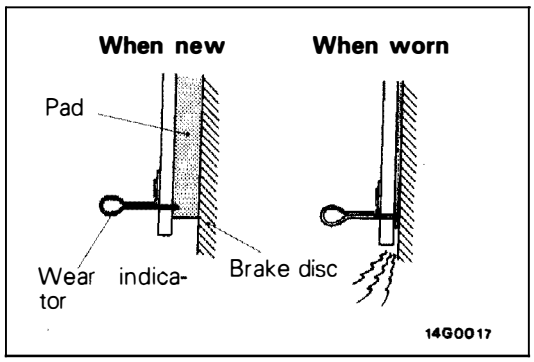
BRAKE LINING AND BRAKE DRUM CONNECTION CHECK

E35AF15AA

<VEHICLES WITH REAR DRUM BRAKE>

1. Remove the brake drum.
2. Remove the shoe and lining assembly. (Refer to P. 35A-44.)
3. Chalk inner surface of brake drum and rub with shoe and lining assembly.
4. Replace shoe and lining assembly or brake drums if very irregular contact area.

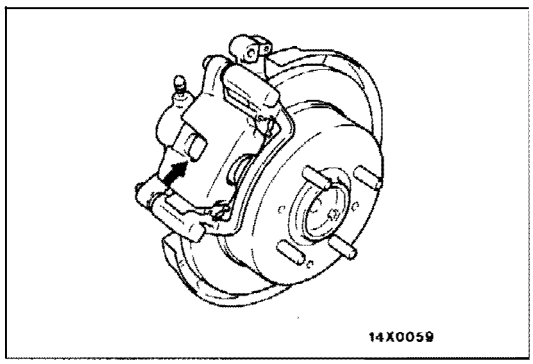
NOTE
Clean off chalk after check.



REAR DISC BRAKE PAD CHECK AND REPLACEMENT

E35AF16AA

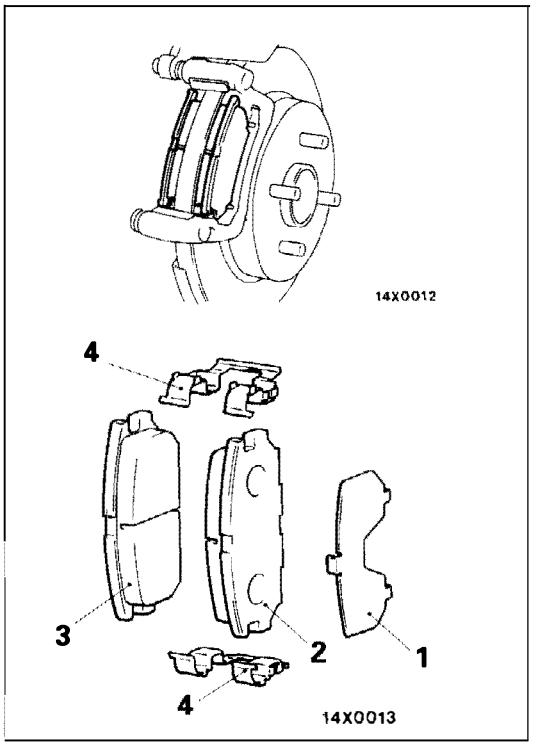
NOTE
The brake pads have wear indicators that contact the brake disc when the brake pad thickness becomes 2 mm, and emit a squealing sound to warn the driver.



1. Check brake pad thickness through caliper body check port.

Standard value: 10 mm
Limit: 2.0 mm

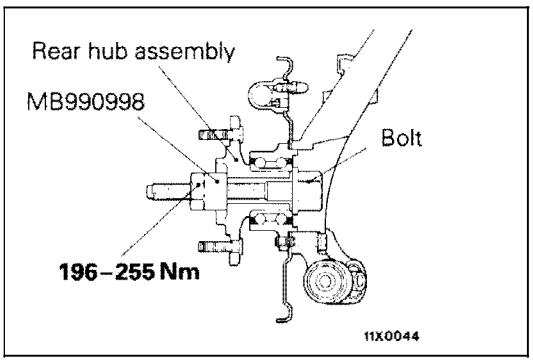
Caution
1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin sleeve and guide pin sleeve.**



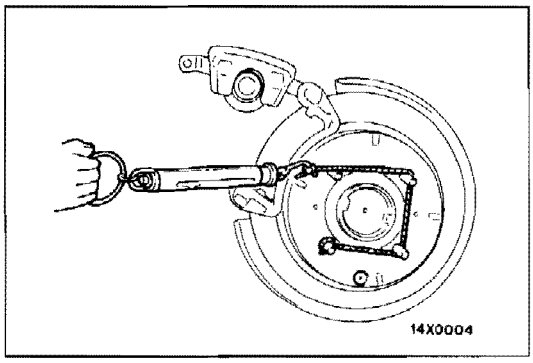
2. Remove guide pin. Lift caliper assembly and retain with wires.

Caution
Do not wipe off the special grease that is on the guide pin or allow it to contaminate the guide pin.

3. Remove the following parts from caliper support.
   1. Outer shim
   2. Pad assembly
   3. Pad & wear indicator assembly
   4. Clip



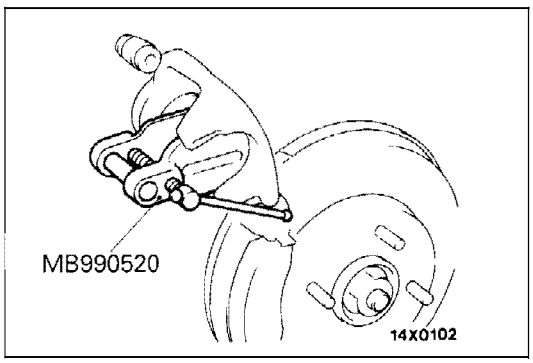
4. For vehicles with 4WD, remove the drive shaft from the rear hub assembly, and then set the special tool as shown in the illustration and tighten it to the specified torque.



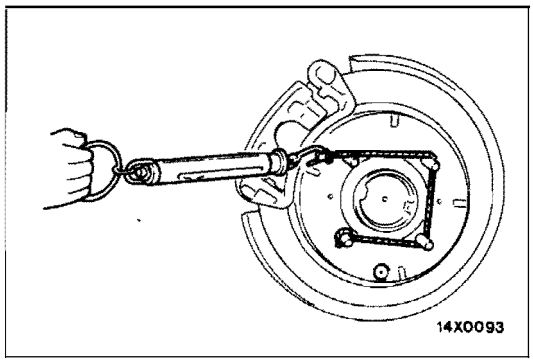
5. Measure hub torque (A) with pad removed to measure brake drag torque after pad installation.

   NOTE
   To secure the disc to the hub, tighten the nuts.

6. Securely attach the pad clip to the caliper support.



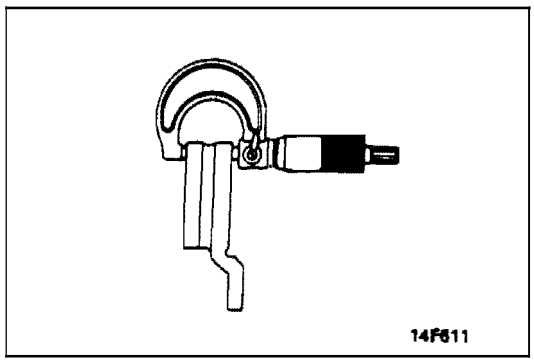
7. Clean the piston; then use the special tool to thread the piston into the cylinder.
8. Be careful that the piston boot does not become caught, when lowering the caliper assembly and install the lock pin.



9. Check brake drag torque as follows.
   (1) Start engine and hold brake pedal down for 5 seconds. (Pedal depression force approx. 196N)
   (2) Stop engine.
   (3) Turn brake disc forward 10 times.
   (4) Check brake hub torque (B) with spring balance.
   (5) Calculate the drag torque of the disc brake [difference between hub torque (B) and hub torque (A)].

   Standard value: 69 N [4 Nm] or less

10. If the difference between brake drag torque and hub torque exceeds the standard value, disassemble piston and clean piston. Check for corrosion or worn piston seal, and check the sliding condition of the lock pin and guide pin.

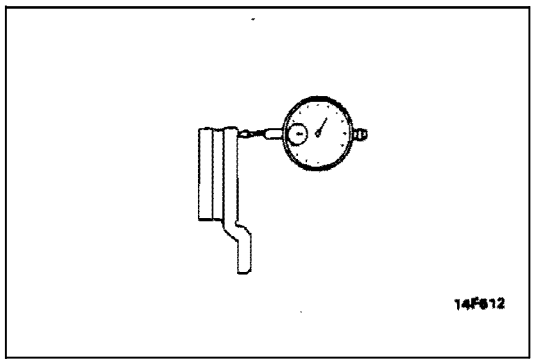


REAR BRAKE DISC THICKNESS CHECK E35AF17AA

1. Remove dirt and rust from brake disc surface.
2. Measure disc thickness at 4 locations or more.

   Standard value: <Solid type> 10 mm
   <Ventilated type> 20 mm
   Limit: <Solid type> 8.4 mm
   <Ventilated type> 18.4 mm

   Replace the discs and pad assembly for both sides left and right of the vehicle if they are worn beyond the specified limit.



REAR BRAKE DISC RUN-OUT CHECK E35AF18AA

1. Remove the caliper support, raise the caliper assembly, and secure it by using a wire, etc.
2. Place a dial gauge approximately 5 mm from the outer circumference of the brake disc, and measure the run-out of the disc.

   Limit: 0.08 mm

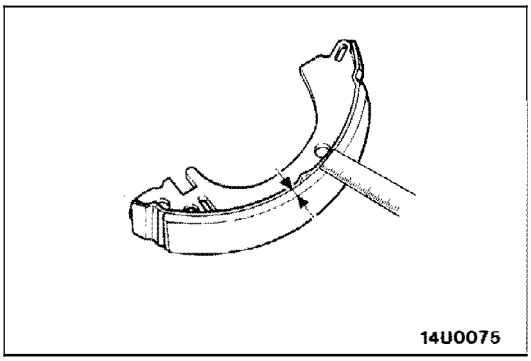
   NOTE
   To secure the disc to the hub, tighten the nuts.

REAR BRAKE DISC RUN-OUT CORRECTION E35AF19AA

1. If the run-out of the brake disc is equivalent to or exceeds the limit specification, change the phase of the disc and hub, and then measure the run-out again.

NOTE
The procedures for checking by changing the installation phase of the disc are the same as those for the front brake discs. However, the play (limit value) in the hub axial direction is different. (Refer to P. 35A-17.)
Limit: 1.0 mm

2. If the problem cannot be corrected by changing the phase of the brake disc, replace the disc.



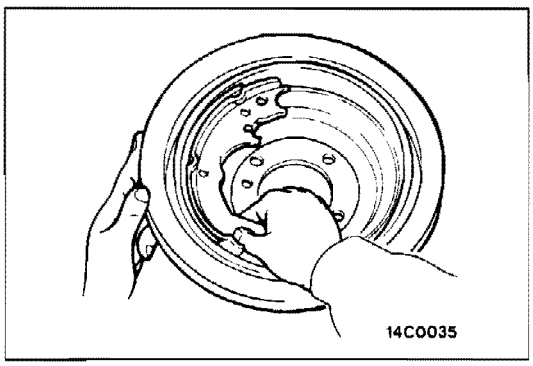
BRAKE LINING THICKNESS CHECK E35AF20AA

1. Remove the rear brake assembly, raise the rear brake assembly and secure it by using a wire, etc.
2. Remove the brake disc.
3. Measure the wear of the brake lining at the place worn the most.

   Limit: 1.0 mm

4. Replace the shoe and lining assembly if brake lining thickness is less than the limit if it is not worn evenly.

   Caution
   Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent car from pulling to one side when braking.



BRAKE LINING AND BRAKE DRUM CONNECTION CHECK E35AF21AA

1. Remove the rear brake assembly, raise the rear brake assembly and secure it by using a wire, etc.
2. Remove the brake drum.
3. Remove the shoe and lining assembly.
4. Chalk inner surface of brake drum and rub with shoe and lining assembly.
5. Replace shoe and lining assembly or brake drums if very irregular contact area.

   NOTE
   Clean off chalk after check.

BRAKE PEDAL <M/T>

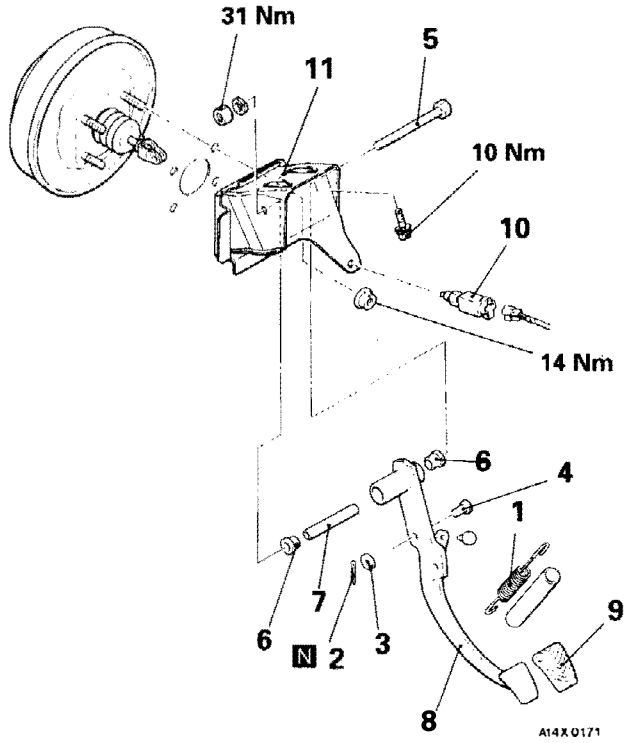
E35AG00AA

REMOVAL AND INSTALLATION <L.H. drive vehicles>

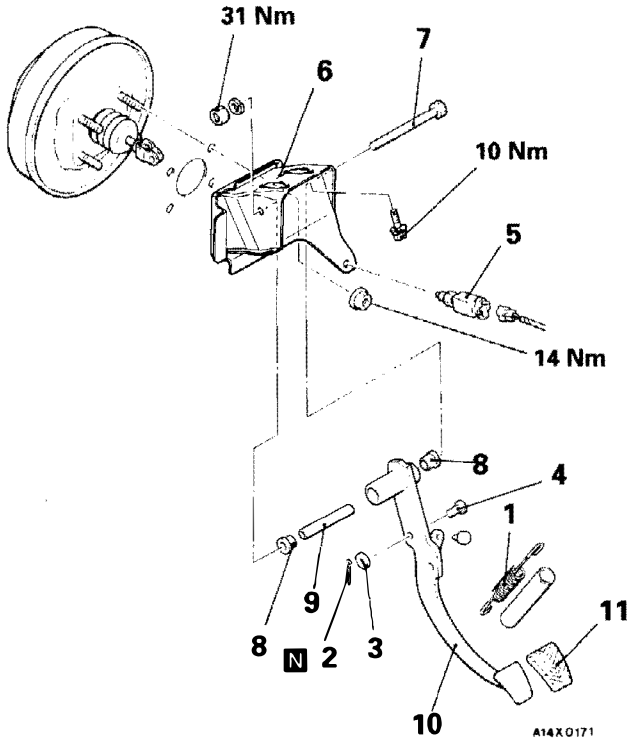
Pre-removal Operation
- Distribution Duct and Lap Cooler Duct Removal
  (Refer to GROUP 55 – Duct.)

Post-installation Operation
- Distribution Duct and Lap Cooler Duct Installation
  (Refer to GROUP 55 – Duct.)
- Brake Pedal Adjustmen
  (Refer to P.35A-9.)

<Vehicles without high tilt steering>

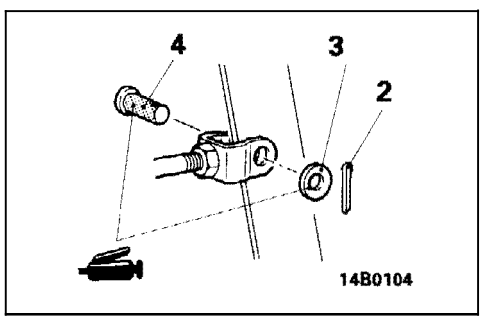


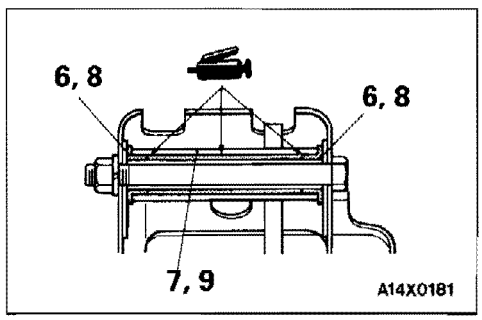
<Vehicles with high tilt steering>



Removal steps <Vehicles without high tilt steering>
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Brake pedal shaft bolt
6. Bushing
7. Spacer
8. Brake pedal
9. Pedal pad
10. Stop lamp switch
11. Pedal support member assembly

Removal steps <Vehicles with high tilt steering>
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Stop lamp switch
6. Pedal support member assembly
7. Brake pedal shaft bolt
8. Bushing
9. Spacer
10. Brake pedal
11. Pedal pad

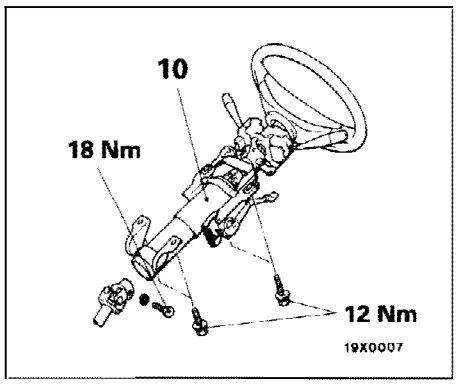


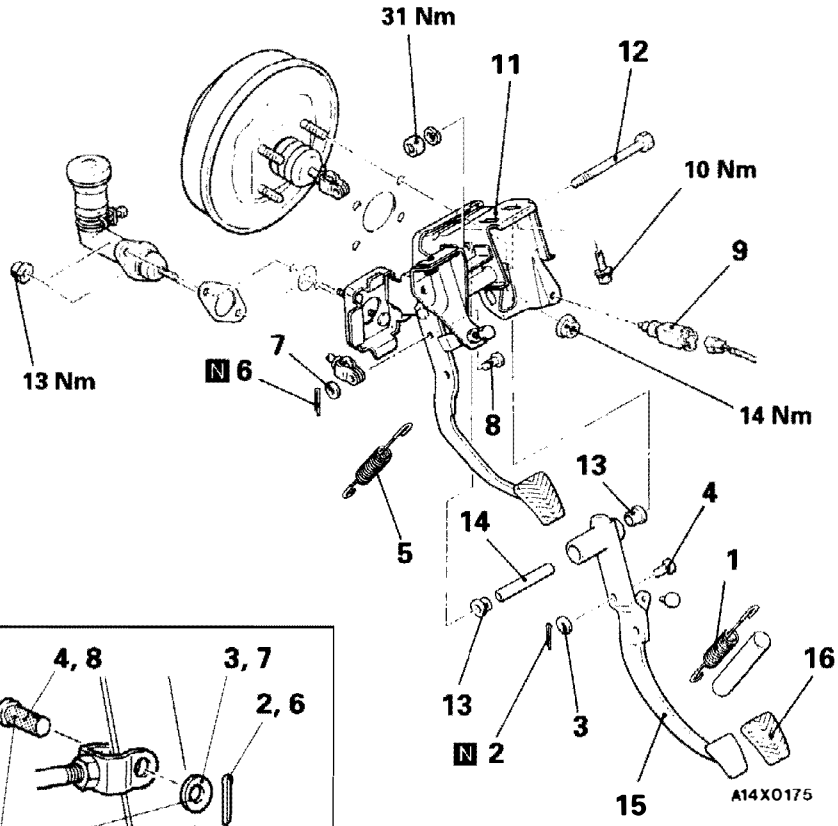


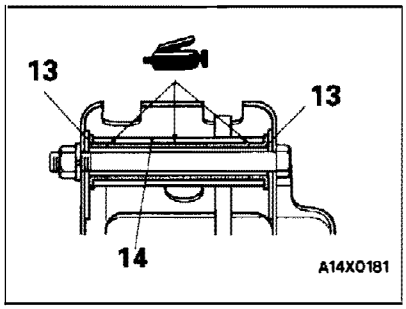
REMOVAL AND INSTALLATION <R.H. drive vehicles>

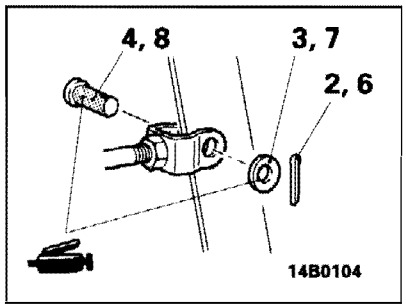
Pre-removal Operation
- Instrument Under Cover Removal (Refer to GROUP 52A – Instrument Panel.)
- Distribution Duct and Lap Cooler Duct Removal (Refer to GROUP 55 – Duct.)
- Column Cover Removal (Refer to GROUP 37A – Steering Wheel and Shaft.)

Post-installation Operation
- Instrument Under Cover Installation (Refer to GROUP 52A – Instrument Panel.)
- Distribution Duct and Lap Cooler Duct Installation (Refer to GROUP 55 – Duct.)
- Column Cover Installation (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Brake Pedal Adjustment (Refer to P.35A-9.)









Removal steps
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Clutch pedal return spring <Except 6G73>
6. Split pin
7. Washer
8. Clevis pin
9. Stop lamp switch
10. Steering column assembly
11. Pedal support member assembly
12. Brake pedal shaft bolt
13. Bushing
14. Spacer
15. Brake pedal
16. Pedal pad

BRAKE PEDAL <A/T>

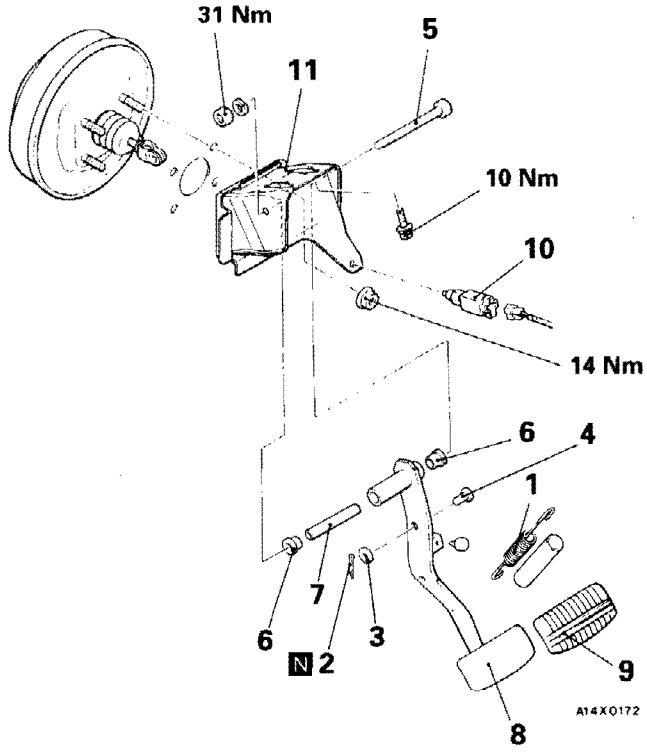
E35AG10AA

REMOVAL AND INSTALLATION

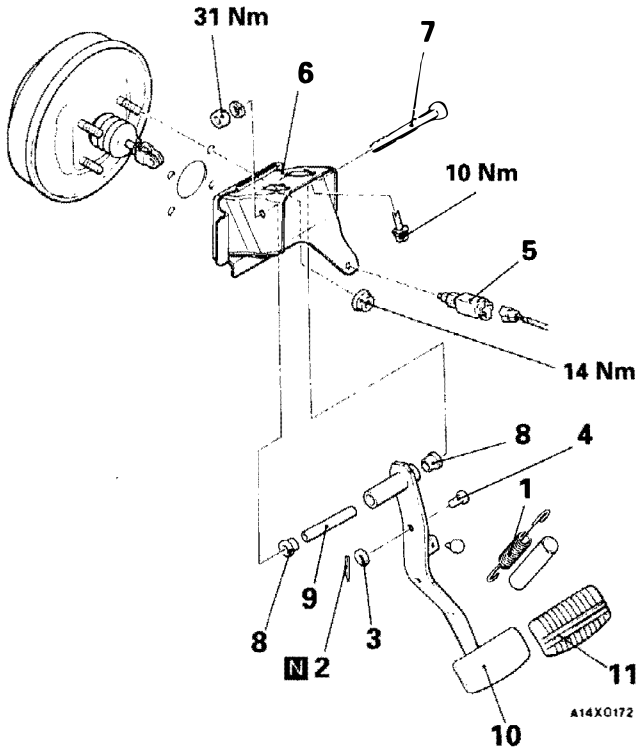
Pre-removal Operation
- Distribution Duct and Lap Cooler Duct Removal
  (Refer to GROUP 55 – Duct.)

Post-installation Operation
- Distribution Duct and Lap Cooler Duct Installation
  (Refer to GROUP 55 – Duct.)
- Brake Pedal Adjustment
  (Refer to P.35A-9.)

<Vehicles without high tilt steering>

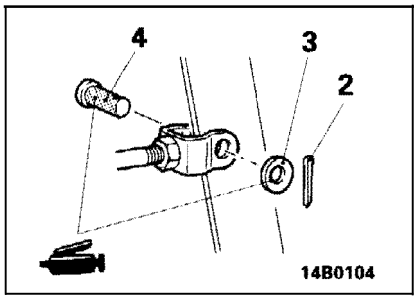


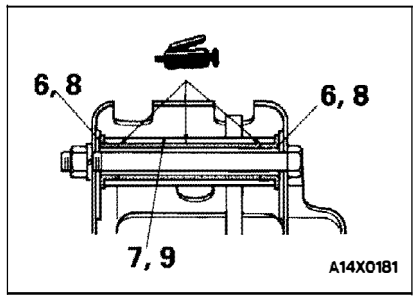
<Vehicles with high tilt steering>



Removal steps <Vehicles without high tilt steering>
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Brake pedal shaft bolt
6. Bushing
7. Spacer
8. Brake pedal
9. Pedal pad
10. Stop lamp switch
11. Pedal support member assembly

Removal steps <Vehicles with high tilt steering>
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Stop lamp switch
6. Pedal support member assembly
7. Brake pedal shaft bolt
8. Bushing
9. Spacer
10. Brake pedal
11. Pedal pad





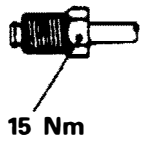
MASTER CYLINDER AND BRAKE BOOSTER <L.H. drive vehicles> E35AH00AA

REMOVAL AND INSTALLATION

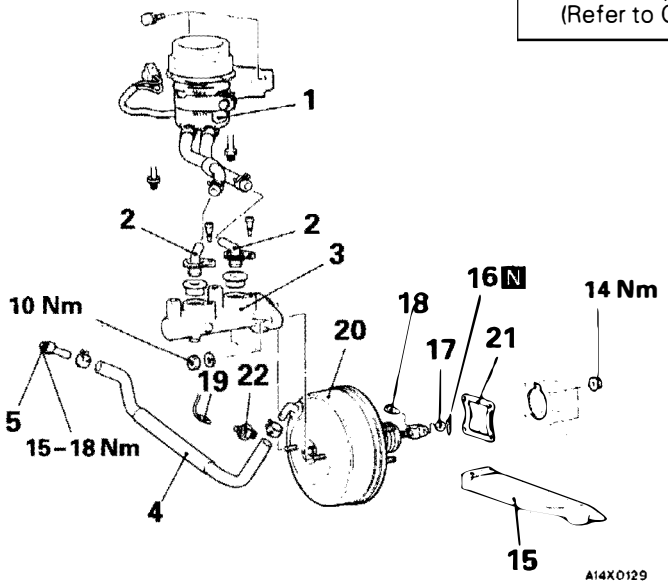
Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <MPI>
- Front Exhaust Pipe Removal (Refer to GROUP 15 – Exhaust Pipe and Main Muffler.)
- Front Propeller Shaft Removal (Refer to GROUP 25 – Propeller Shaft.)

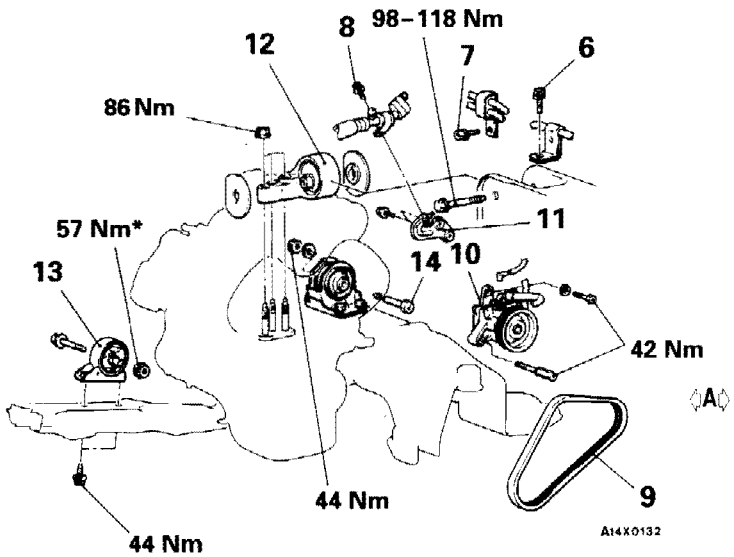
Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P. 35A-13.)
- Brake Pedal Adjustment (Refer to P.35A-9.)
- Air Intake Hose Installation <MPI>
- Front Exhaust Pipe Installation (Refer to GROUP 15 – Exhaust Pipe and Main Muffler.)
- Front Propeller Shaft Installation (Refer to GROUP 25 – Propeller Shaft.)

Flared brake line nuts



14F038





Master cylinder removal steps

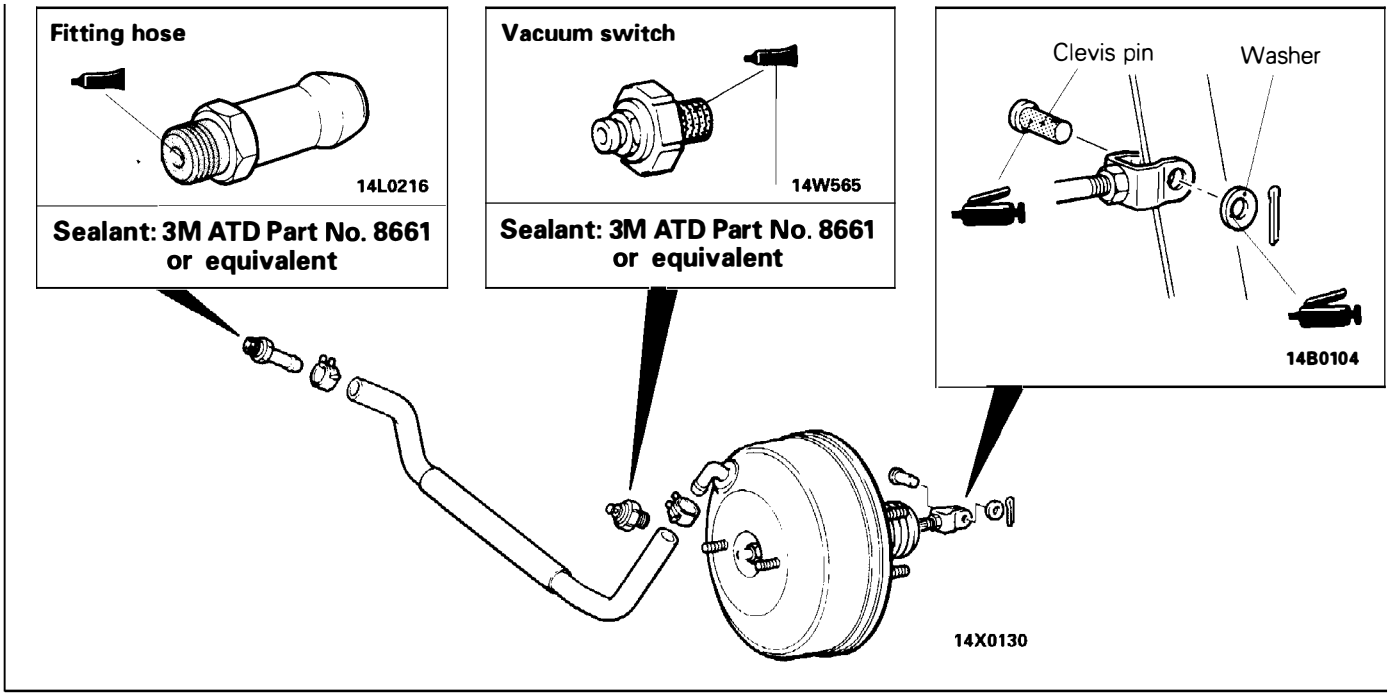
1. Reservoir
2. Nipple
3. Master cylinder
   - Adjustment of clearance between brake booster push rod and primary piston

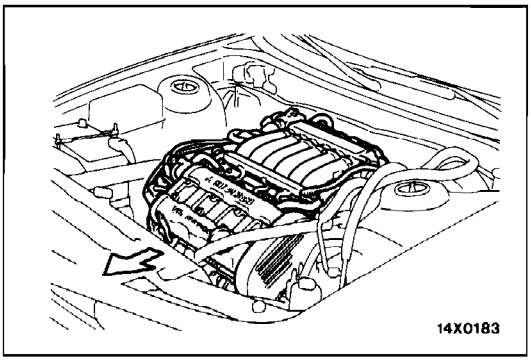
Brake booster removal steps

3. Master cylinder
   - Adjustment of clearance between brake booster push rod and primary piston
4. Vacuum hose (With built-in check valve)
5. Fitting hose
6. Return pipe installation bolt (Power steering)
7. Front pressure pipe assembly (4WS) } <6A1, 6G73>
8. Bolt
9. V-belt
10. Oil pump
11. Bracket
12. Engine mount bracket } <6G73>
13. Front roll stopper bracket assembly
14. Bolt
15. Shower foot duct
16. Split pin
17. Washer
18. Clevis pin
19. Vacuum switch connector <4D68>
20. Brake booster
21. Sealer
22. Vacuum switch <4D68>

Caution
1. **The check valve should not be removed from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.**
2. ***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle in the unladen condition.**

Grease points

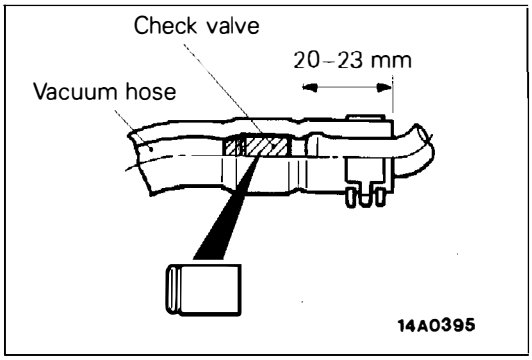




REMOVAL SERVICE POINTS E35AH01AA

〈A〉 BRAKE BOOSTER REMOVAL <6G73>

Slide the engine forward and remove the brake booster from the body.



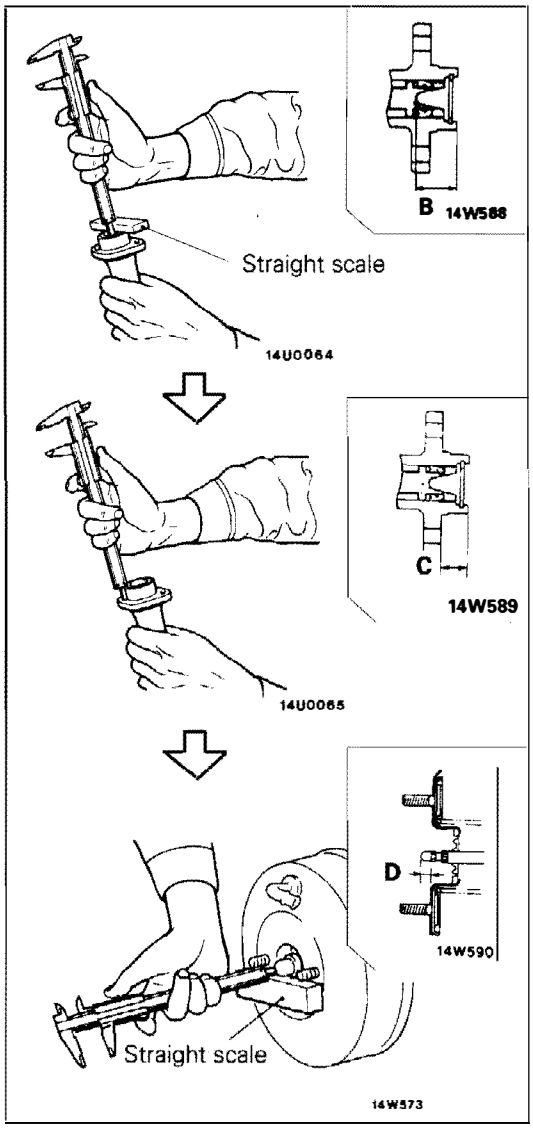
INSTALLATION SERVICE POINTS E35AH04AA

▶A◀ VACUUM HOSE CONNECTION

(1) Install to the pipe part of the brake booster so that the amount of insertion of the vacuum hose is as shown in the figure.

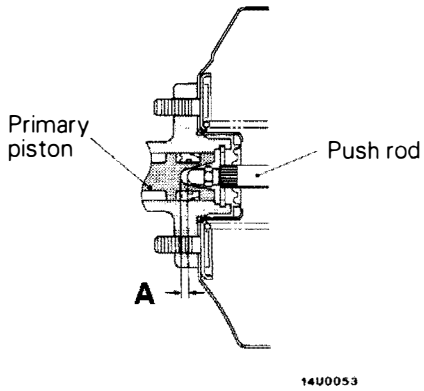
Caution
The check valve and the pipe part of the brake booster must not contact each other.

(2) Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.



CLEARANCE ADJUSTMENT BETWEEN BRAKE BOOSTER PUSH ROD AND PRIMARY PISTON E35AH03AA

Adjust the clearance (A) between the brake booster push rod and primary piston as follows:

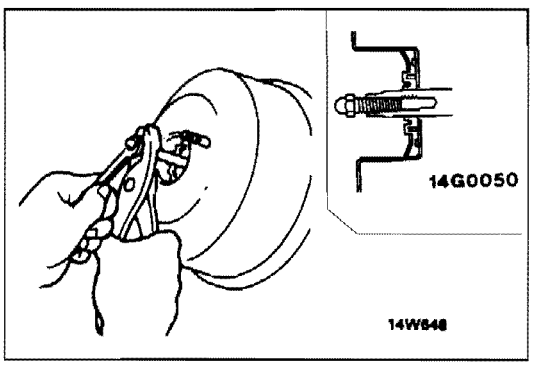


Calculate clearance A from the B, C and D measurements.
A = B – C – D

Standard value:

Brake booster size		Clearance A standard value mm
Single brake booster	Petrol-powered vehicles	0.60–0.80
	Diesel-powered vehicles	0.55–0.75
Dual tandem brake booster	Petrol-powered vehicles	0.40–0.60
	Diesel-powered vehicles	0.50–0.70

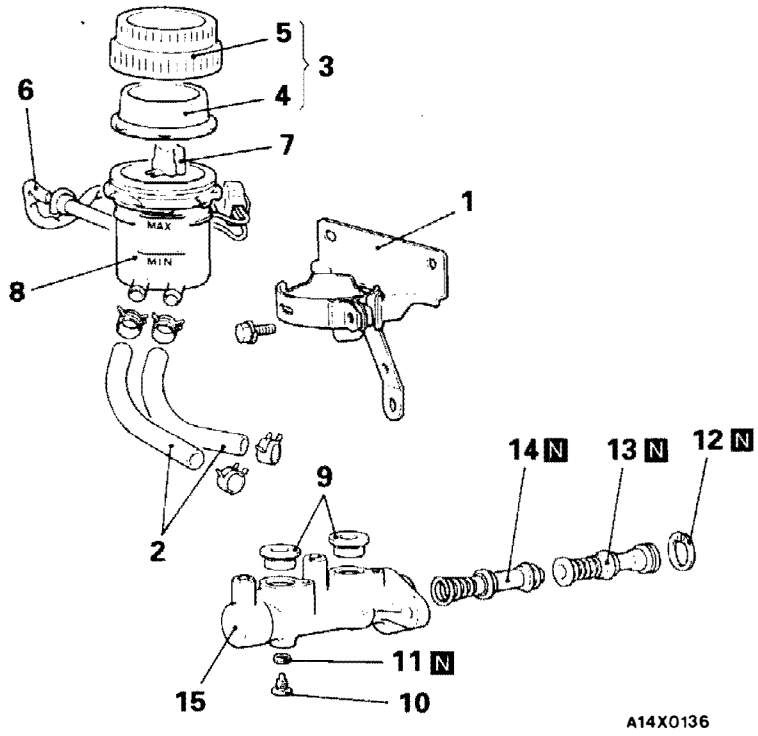
NOTE
When brake booster negative pressure (diesel-powered vehicles:–66.7 kPa, petrol-powered vehicles:–93.3 kPa) is applied, clearance value will become 0.05–0.30 mm



If the clearance is not within the standard value range, adjust by changing the push rod length by turning the screw of the push rod.

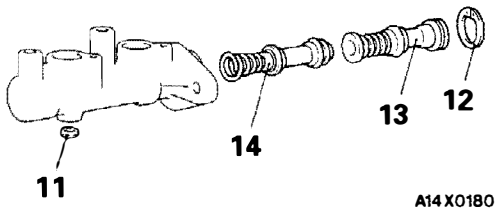
MASTER CYLINDER
DISASSEMBLY AND REASSEMBLY

E35AH05AA

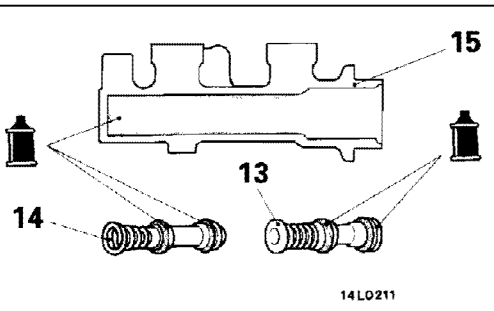


A14X0136

Master cylinder kit



A14X0180



14L0211

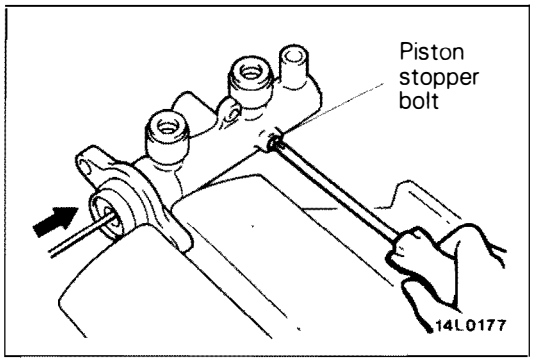
Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir bracket
2. Reservoir hose
3. Reservoir cap assembly
4. Diaphragm
5. Reservoir cap
6. Brake fluid level sensor
7. Float
8. Reservoir
9. Reservoir seal
10. Piston stopper bolt
11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body

◇A◇
◇B◇

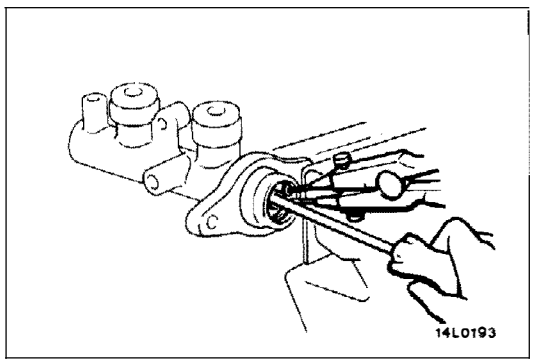
Caution
Do not disassemble the primary and secondary piston assembly.



DISASSEMBLY SERVICE POINTS E35AH06AA

〈A〉 PISTON STOPPER BOLT DISASSEMBLY

Remove the piston stopper bolt, while depressing the piston.



〈B〉 PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION E35AH07AA

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear, damage or wear.
- Check the diaphragm for cracks and wear.

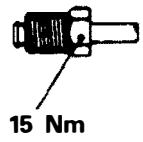
MASTER CYLINDER AND BRAKE BOOSTER <R.H. drive vehicles> E35AH10AA

REMOVAL AND INSTALLATION

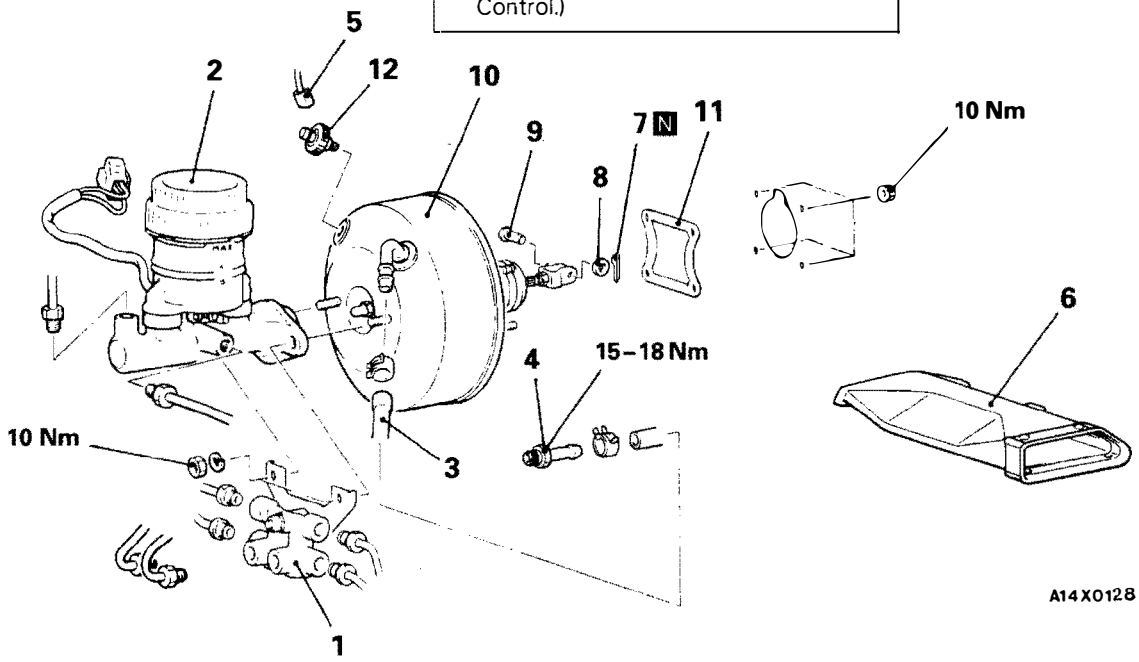
Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <MPI>
- Link Assembly and Vacuum Pump Assembly Removal
  <Vehicles with Auto-cruise Control>
  (Refer to GROUP 13G – Auto-cruise Control.)

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding
  (Refer to P.35A-13.)
- Brake Pedal Adjustment
  (Refer to P.35A-9.)
- Air Intake Hose Installation <MPI>
- Link Assembly and Vacuum Pump Assembly Installation
  <Vehicles with Auto-cruise Control>
  (Refer to GROUP 13G – Auto-cruise Control.)

Flared brake line nuts



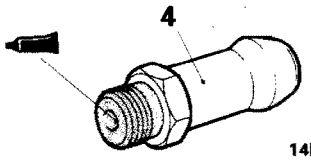
14F038



A14X0128

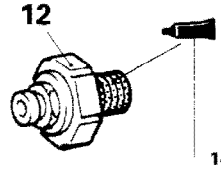
Removal steps

1. Proportioning valve
2. Master cylinder assembly
   - Adjustment of clearance between brake booster push rod and primary piston (Refer to P.35A-28.)
3. ◆A◆ Vacuum hose (With built-in check valve)
4. Fitting
5. Vacuum switch connector <4D68>
6. Shower foot duct
7. Split pin
8. Washer
9. Clevis pin
10. Brake booster
11. Sealer
12. Vacuum switch <4D68>



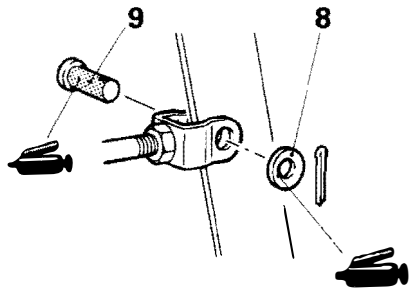
14L0216

Sealant: 3M ATD Part No. 8661 or equivalent



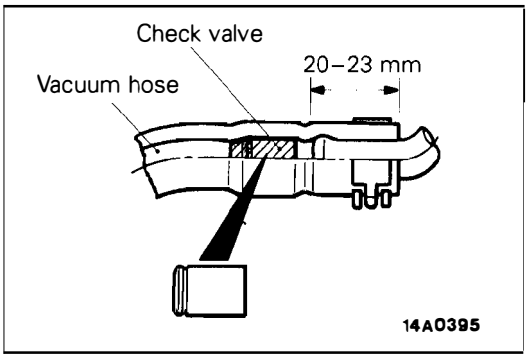
14W565

Sealant: 3M ATD Part No. 8661 or equivalent



14B0104

Caution
The check valve should not be removed from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.



INSTALLATION SERVICE POINTS E35AH04AA

◆A◆ VACUUM HOSE CONNECTION

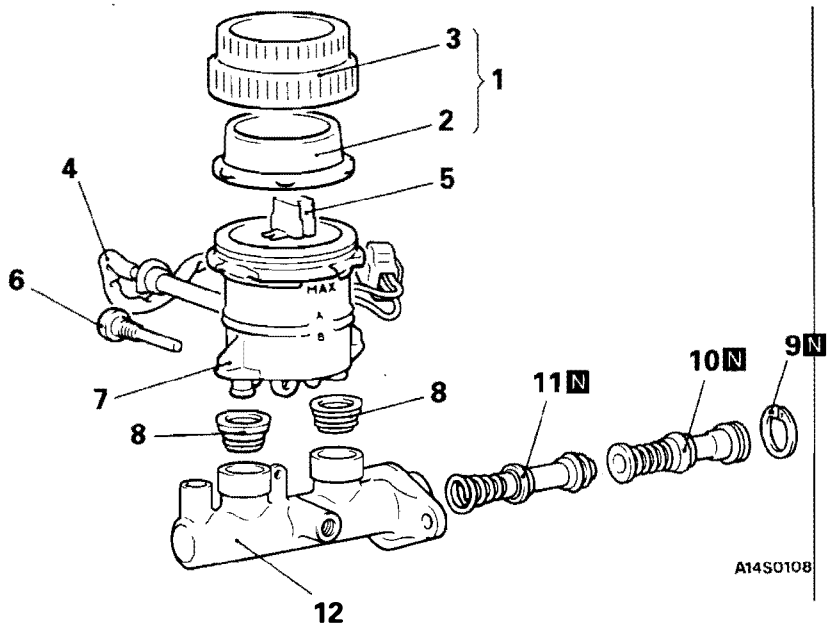
(1) Install to the pipe part of he brake booster so that the amount of insertion of the vacuum hose is as shown in the figure.

Caution
The check valve and the pipe part of the brake booster must not contact each other.

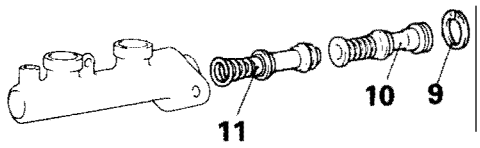
(2) Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.

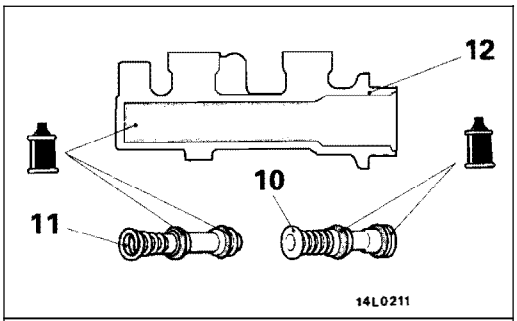
MASTER CYLINDER
DISASSEMBLY AND REASSEMBLY

E35AH15AA



Master cylinder kit



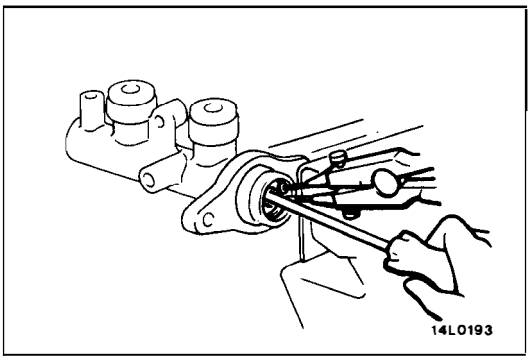


Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir cap assembly
2. Diaphragm
3. Reservoir cap
4. Brake fluid level sensor
5. Float
6. Reservoir stopper bolt
7. Reservoir
8. Reservoir seal
◇A◇ 9. Piston stopper ring
10. Primary piston assembly
11. Secondary piston assembly
12. Master cylinder body

Caution
Do not disassemble the primary and secondary piston assembly.



DISASSEMBLY SERVICE POINTS E35AH06AA

〈A〉 PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION E35AH07AA

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, wear, damage or wear.
- Check the diaphragm for cracks and wear.

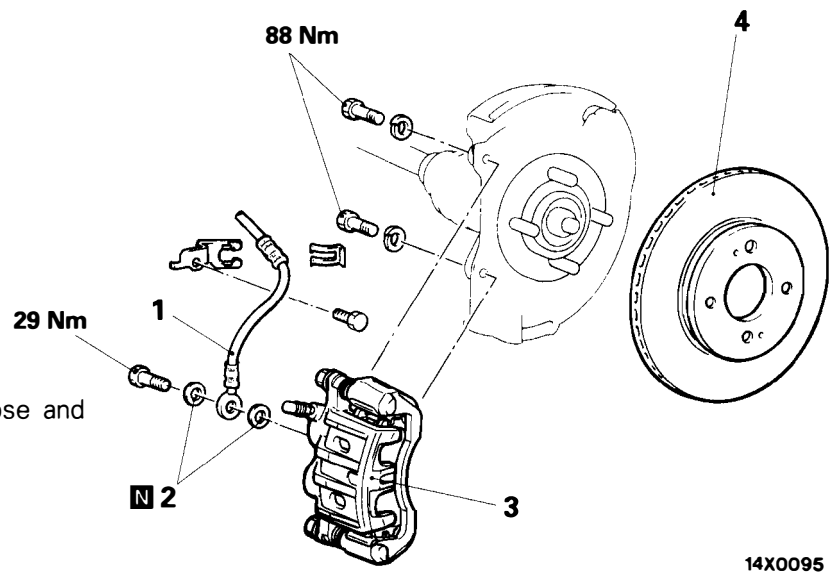
FRONT DISC BRAKE

E35AI00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding
  (Refer to P. 35A-13.)



Removal steps
1. Connection for the brake hose and the brake assembly
2. Gasket
◆A◆ 3. Front brake assembly
4. Brake disc

INSPECTION

E35AI02AA

Check the brake disc for damage.

INSTALLATION SERVICE POINTS

E35AI04AA

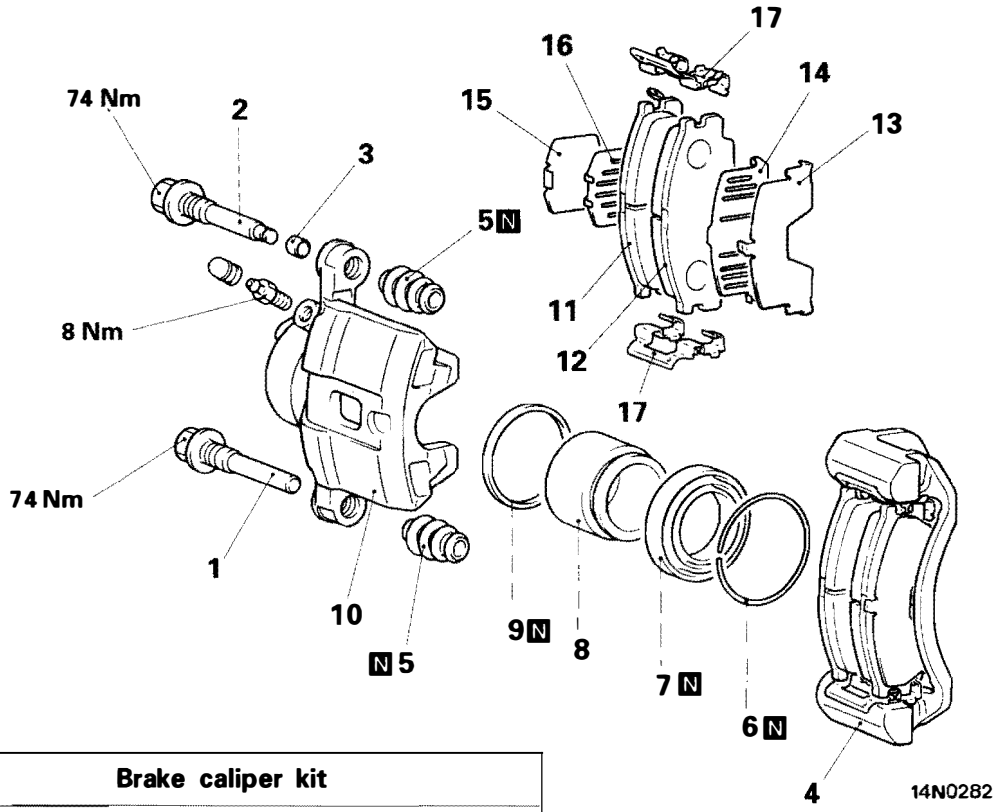
◆A◆ FRONT BRAKE ASSEMBLY INSTALLATION

Install the front brake assembly and measure the disc brake drag torque.(Refer to P.35A-16.)

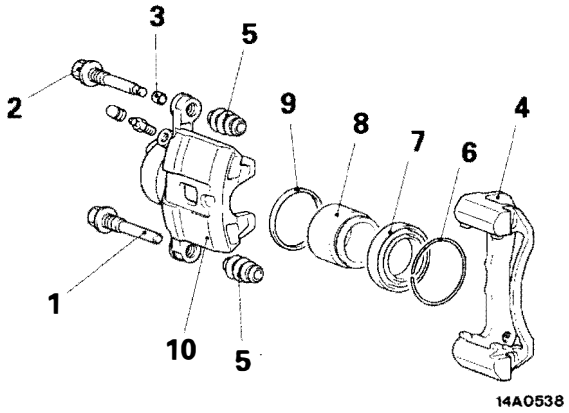
DISASSEMBLY AND REASSEMBLY

E35AI05AA

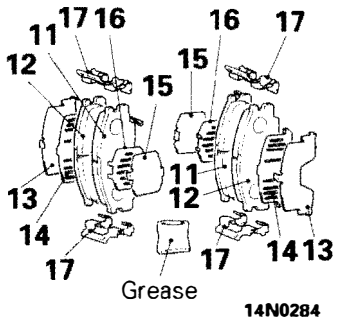
<SINGLE PISTON TYPE DISC BRAKE>



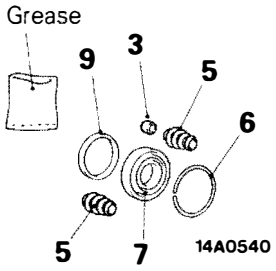
Brake caliper kit



Pad repair kit



Seal and boots repair kit



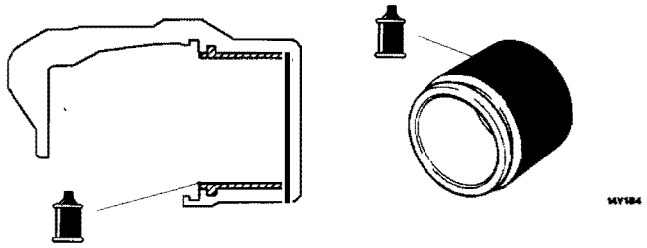
Caliper assembly disassembly steps

- ◗A◖ 1. Guide pin
- ◗A◖ 2. Lock pin
- 3. Bushing
- 4. Caliper support (pad, clip, shim)
- 5. Boot
- 6. Boot ring
- ◇A◇ 7. Piston boot
- ◇A◇ 8. Piston
- ◇B◇ 9. Piston seal
- 10. Caliper body

Pad assembly disassembly steps

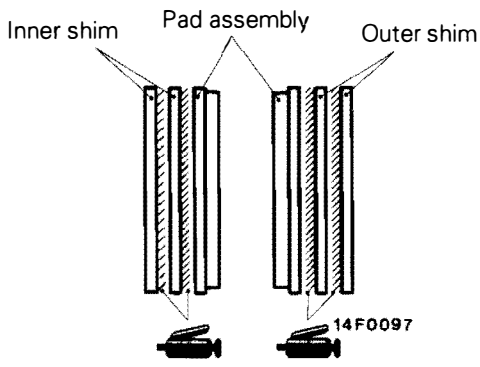
- ◗A◖ 1. Guide pin
- ◗A◖ 2. Lock pin
- 3. Bushing
- 4. Caliper support (pad, clip, shim)
- 11. Pad and wear indicator assembly
- 12. Pad assembly
- 13. Outer shim (stainless)
- 14. Outer shim (coated with rubber)
- 15. Inner shim (stainless)
- 16. Inner shim (coated with rubber)
- 17. Clip

LUBRICATION POINTS

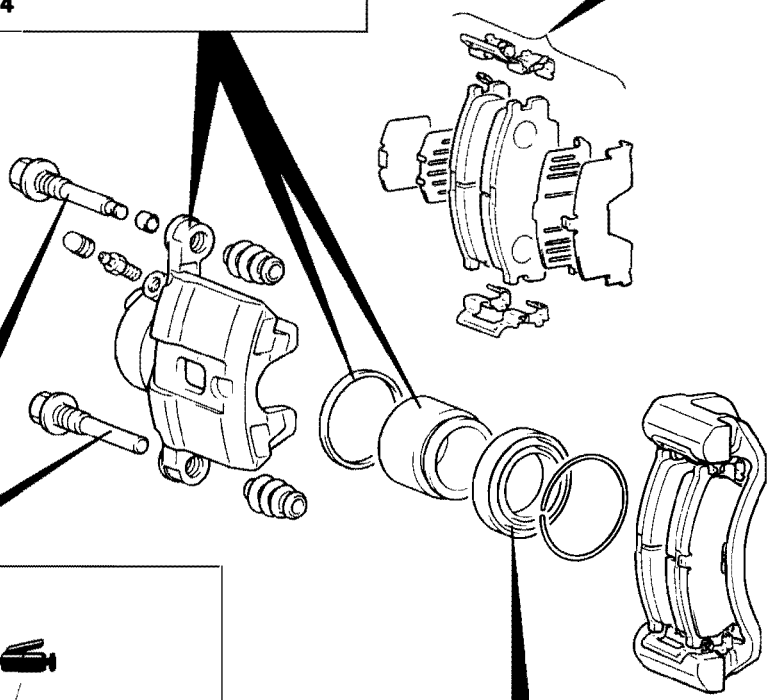


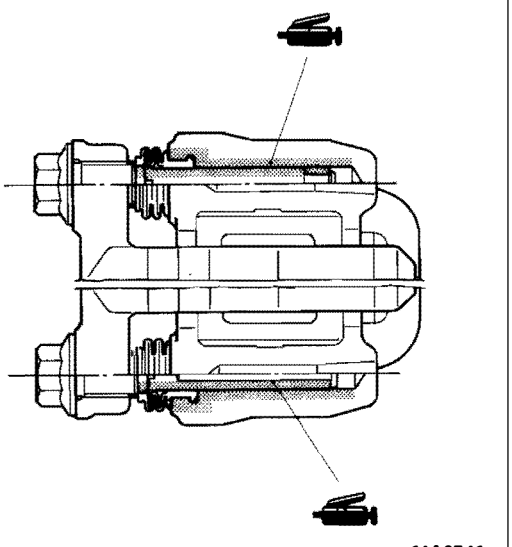
Caution
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off.

Brake fluid: DOT3 or DOT4

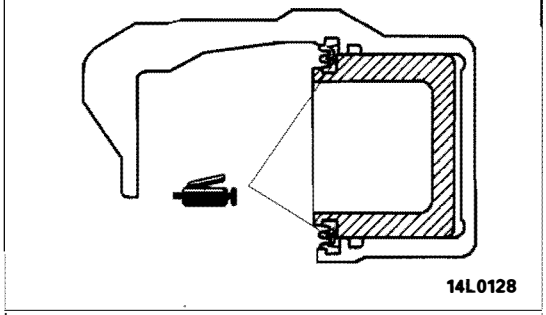


Grease: Repair kit grease (orange)





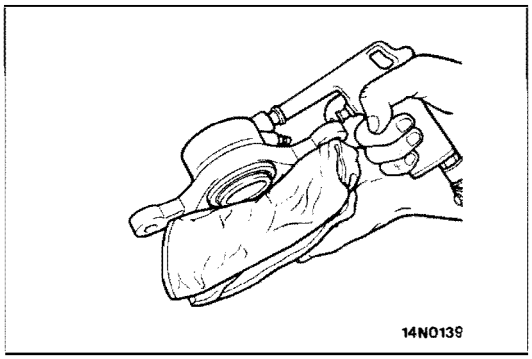
Grease: Repair kit grease (orange)



Grease: Repair kit grease (orange)

DISASSEMBLY SERVICE POINTS E35AI06AA

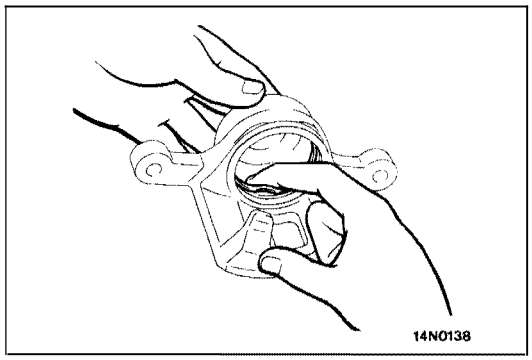
When disassembling the disc brakes, disassemble both sides (left and right) as a set.



〈A〉 PISTON BOOT/PISTON REMOVAL

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow compressed air gently.



〈B〉 PISTON SEAL REMOVAL

(1) Remove piston seal with finger tip.

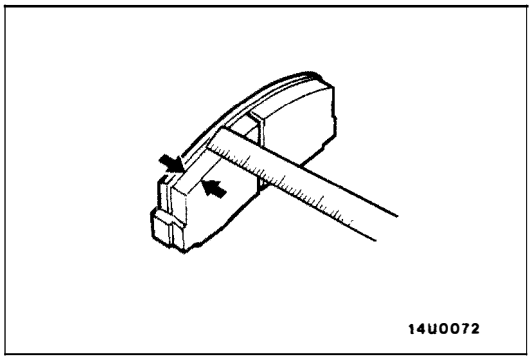
Caution
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloro-ethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION E35AI07AA

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.

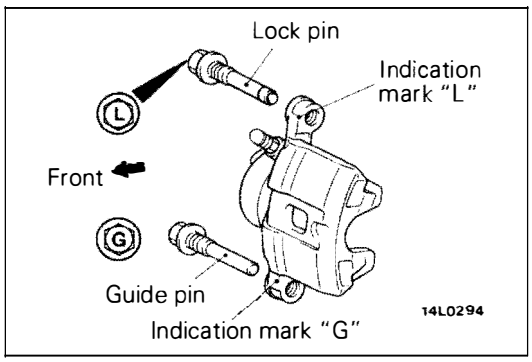


PAD WEAR CHECK E35AI07BA

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

Standard value: 10 mm
Limit value: 2.0 mm

Caution
1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**



REASSEMBLY SERVICE POINTS E35AI08AA

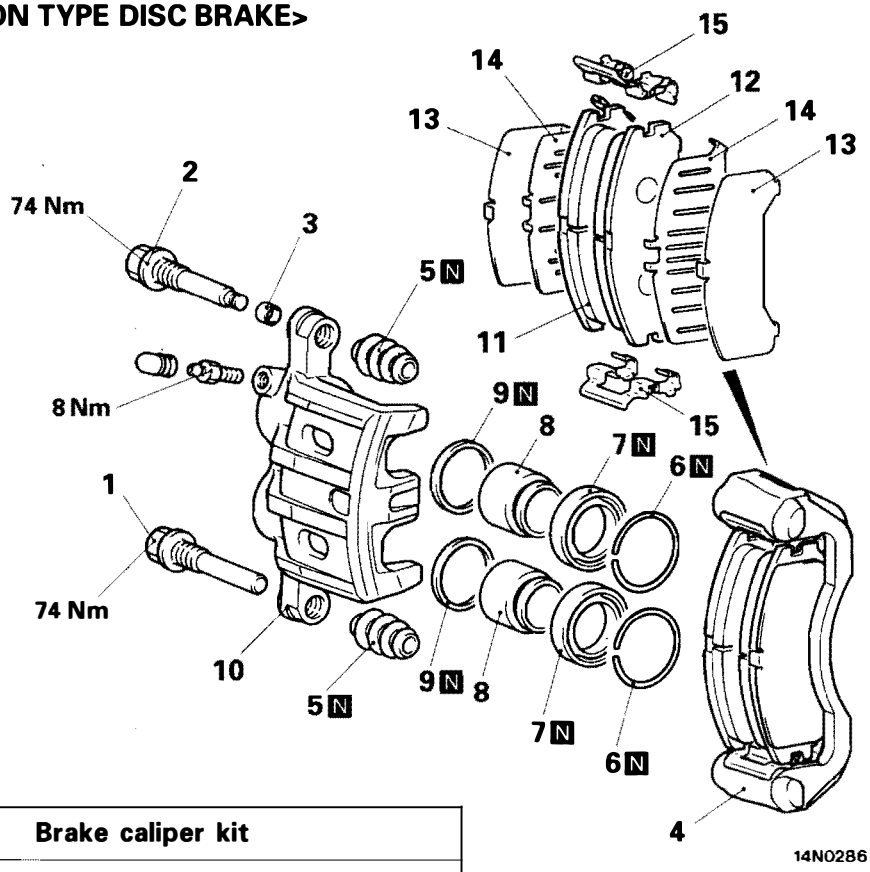
◆A◆ LOCK PIN/GUIDE PIN INSTALLATION

Install the guide pin and lock pin as illustrated so that each head mark of the guide pin and the lock pin matches the indication mark located on the caliper body.

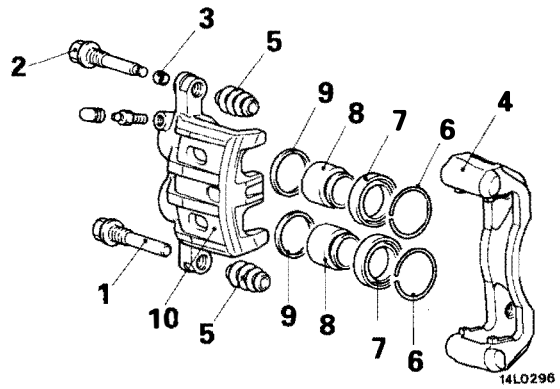
DISASSEMBLY AND REASSEMBLY

E35AI15AA

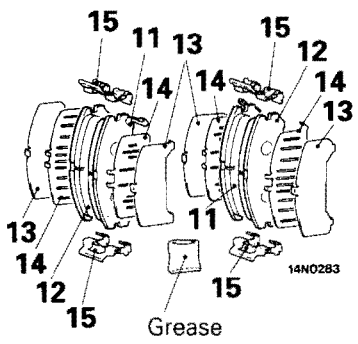
<DUAL PISTON TYPE DISC BRAKE>



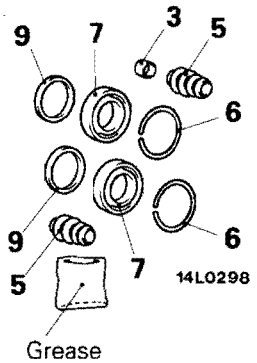
Brake caliper kit



Pad repair kit



Seal and boots repair kit



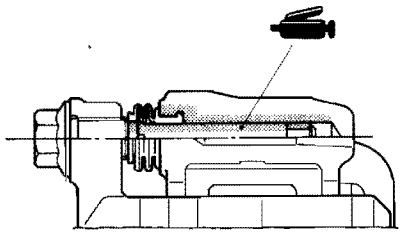
Caliper assembly disassembly steps

- ◆A◆ 1. Guide pin
- ◆A◆ 2. Lock pin
- ◆A◆ 3. Bushing
- 4. Caliper support (pad, clip, shim)
- ◆A◆ 5. Boot
- 6. Boot ring
- 〈A〉 7. Piston boot
- 〈A〉 8. Piston
- 〈B〉 9. Piston seal
- 10. Caliper body

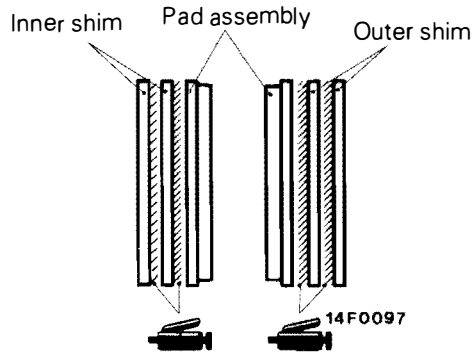
Pad assembly disassembly steps

- ◆A◆ 1. Guide pin
- ◆A◆ 2. Lock pin
- ◆A◆ 3. Bushing
- 4. Caliper support (pad, clip shim)
- 11. Pad assembly (with wear indicator)
- 12. Pad assembly
- 13. Outer shim
- 14. Inner shim
- 15. Clip

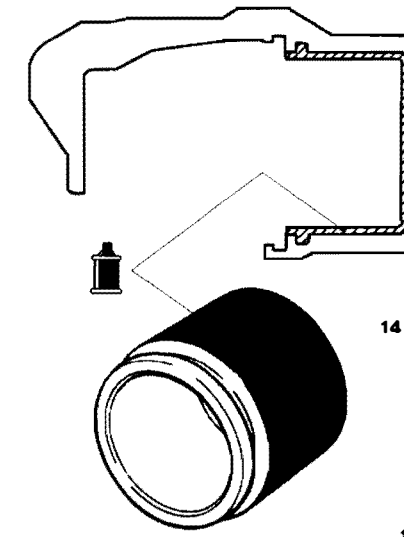
LUBRICATION POINTS



Grease: Repair kit grease (orange)

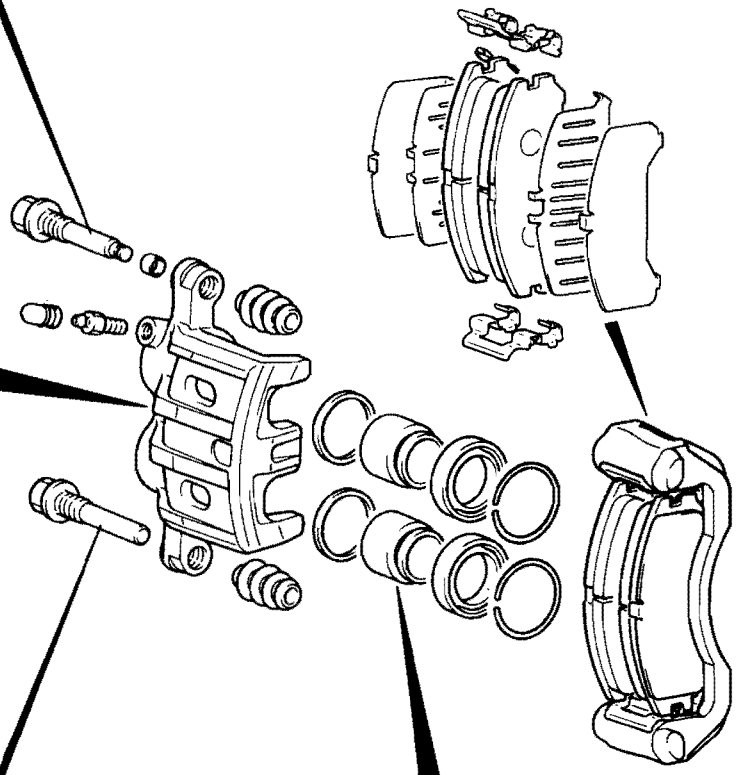


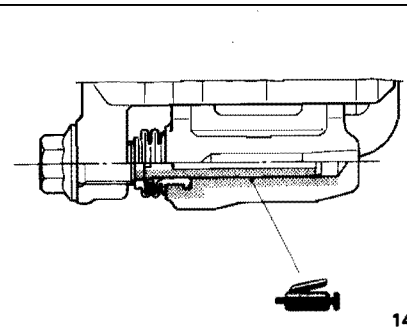
Grease: Repair kit grease (orange)



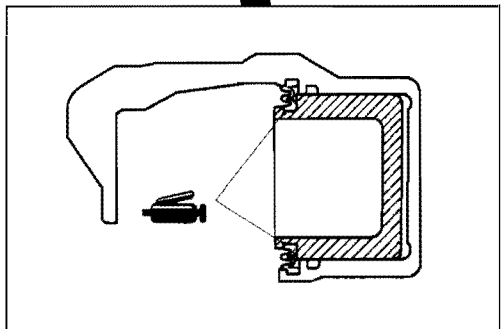
Caution
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off.

Brake fluid: DOT3 or DOT4

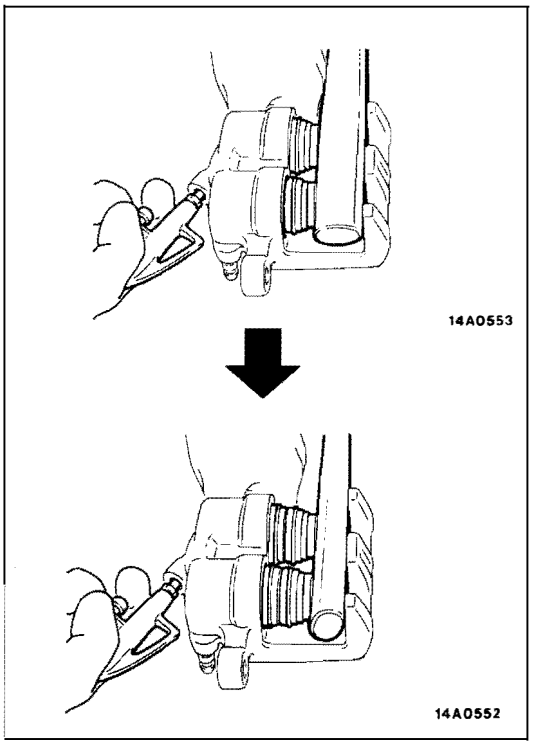




Grease: Repair kit grease (orange)



Grease: Repair kit grease (orange)



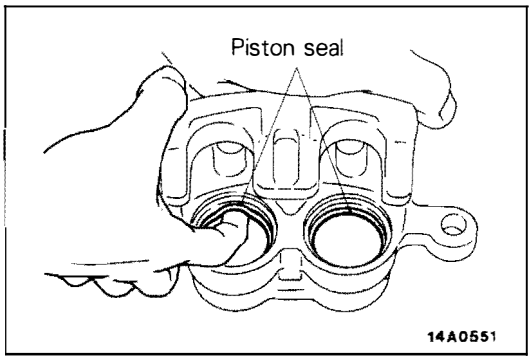
DISASSEMBLY SERVICE POINTS E35AI16AA

When disassembling the disc brakes, disassemble both sides (left and right) as a set.

〈A〉 PISTON BOOT/PISTON REMOVAL

Pump in compressed air through the brake hose installation hole and remove the pistons and piston boot.

Caution
When removing the pistons, be sure to use the handle of a plastic hammer and adjust the height of the two pistons while pumping in air slowly in so that the pistons protrude evenly.
Do not remove one piston completely before trying to remove the other piston because it will become impossible to remove the second piston.



〈B〉 PISTON SEAL REMOVAL

(1) Remove piston seal with finger tip.

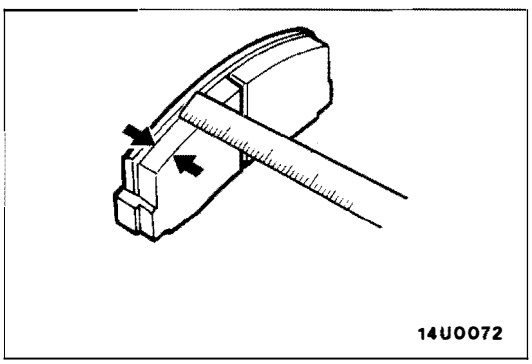
Caution
Do not use a screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloro-ethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION E35AI07AA

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.



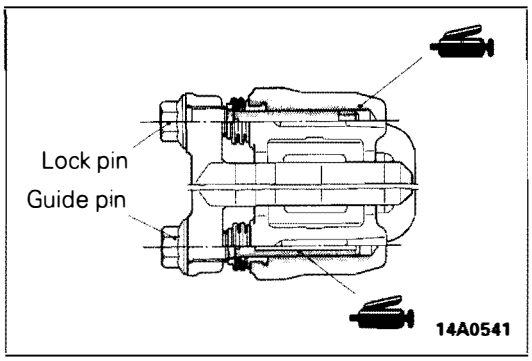
PAD WEAR CHECK E35AI07BA

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

Standard value: 10 mm
Limit value: 2.0 mm

Caution

1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**

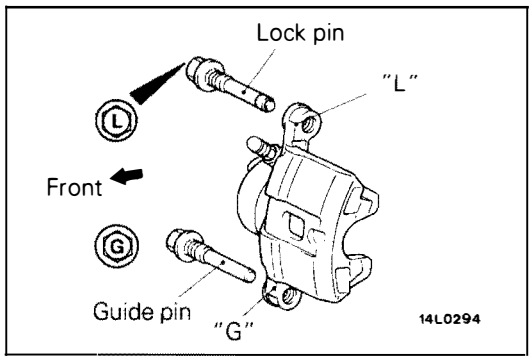


REASSEMBLY SERVICE POINTS E35AI18AA

◆A◆ BOOT/BUSHING/LOCK PIN/GUIDE PIN INSTALLATION

(1) Grease parts as illustrated with specified grease.

Specified grease: Repair kit grease (orange)



(2) Install the guide pin and lock pin as illustrated 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.

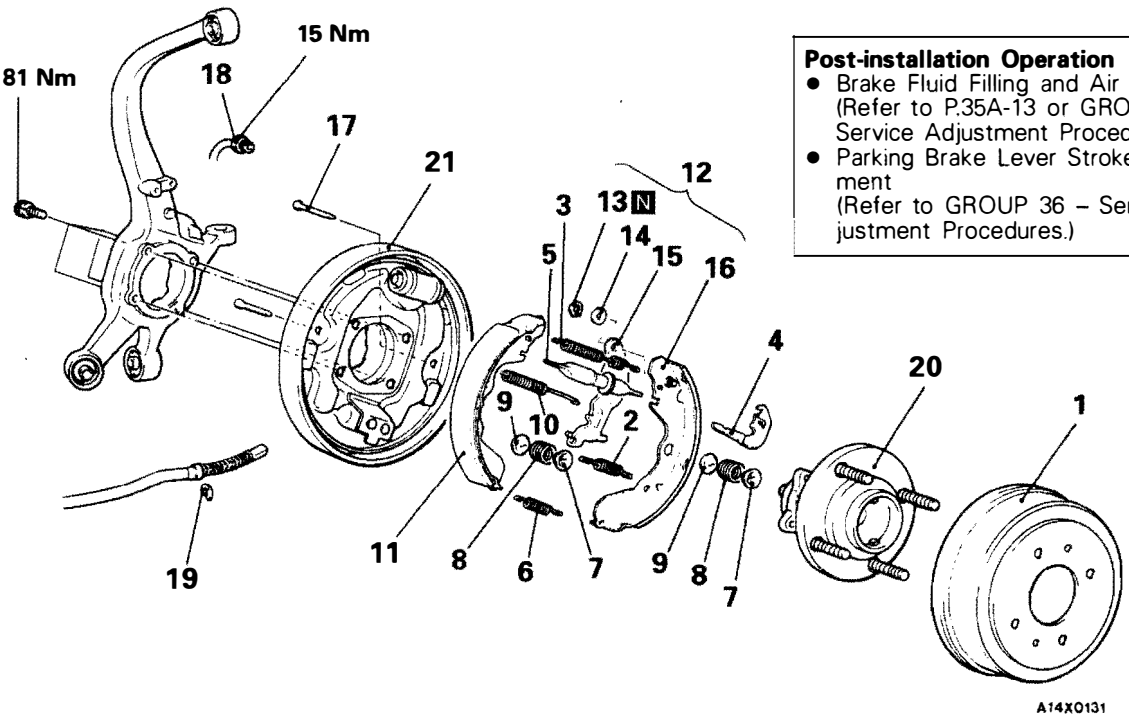
REAR DRUM BRAKE SHOE

E35AJ00AA

REMOVAL AND INSTALLATION

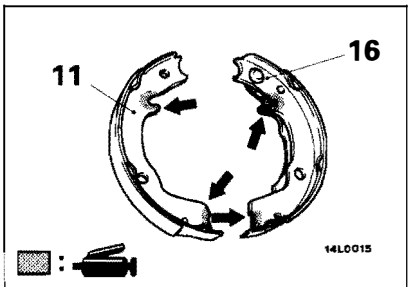
Pre-removal Operation
- Loosening the Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Filling and Air Bleeding (Refer to P.35A-13 or GROUP 35B – Service Adjustment Procedures.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)

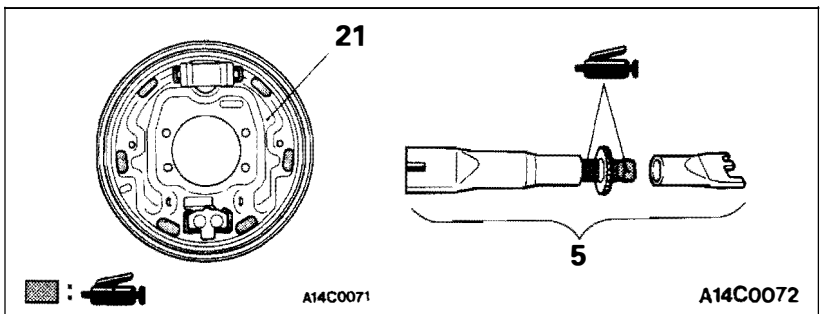


A14X0131

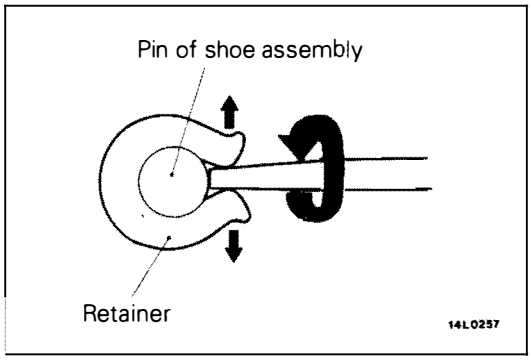
Removal steps
1. Brake drum
2. Lever return spring
3. Shoe-to-lever spring
4. Adjuster lever
5. Auto adjuster assembly
6. Retainer spring
7. Shoe hold-down cup
8. Shoe hold-down spring
9. Shoe hold-down cup
10. Shoe-to-shoe spring
11. Shoe and lining assembly
12. Shoe and lever assembly
13. ◇A◇ ◆B◆ Retainer
14. ◆A◆ Wave washer
15. Parking lever
16. Shoe and lining assembly
17. Shoe hold-down pin
18. Connection for the brake pipe
19. Snap ring
20. Rear hub assembly
21. Backing plate



: **Specified grease: Brake grease SAE J310, NLGI No. 1**



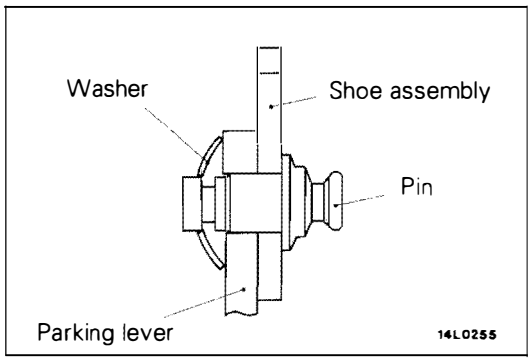
: **Specified grease: Brake grease SAE J310, NLGI No. 1**



REMOVAL SERVICE POINTS E35AJ01AA

◇A◇ RETAINER REMOVAL

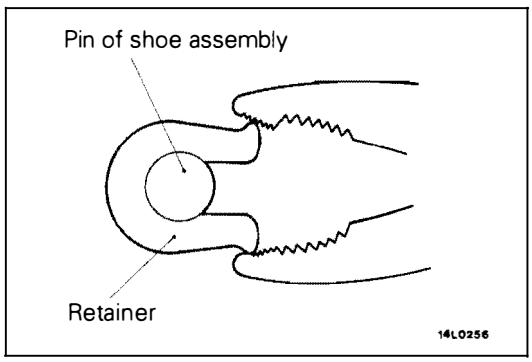
Use standard screwdriver or the like to open up the retainer joint, and remove the retainer.



INSTALLATION SERVICE POINTS E35AJ04AA

◆A◆ WAVE WASHER INSTALLATION

Install the washer in the direction shown in the illustration.



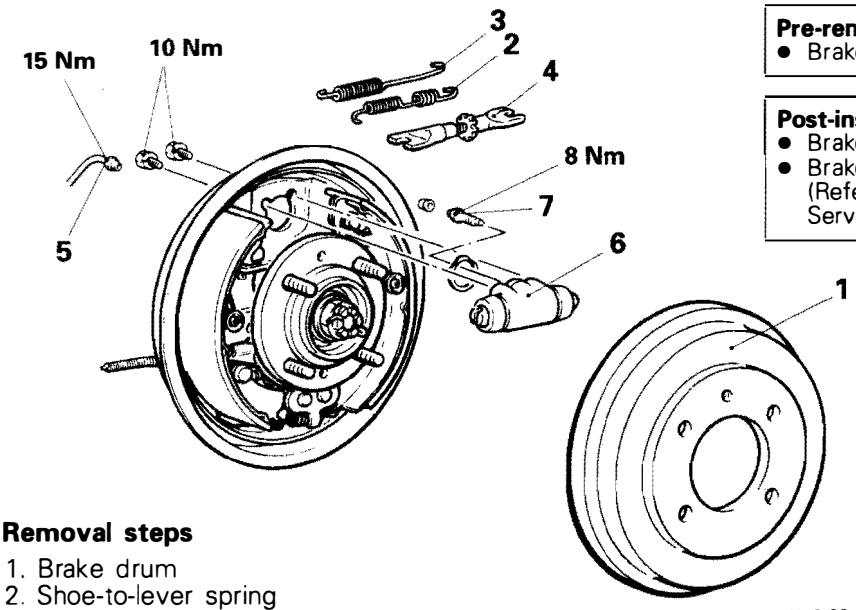
◆B◆ RETAINER INSTALLATION

Use pliers or the like to install the retainer or the pin positively.

REAR DRUM BRAKE WHEEL CYLINDER

E35AK00AA

REMOVAL AND INSTALLATION



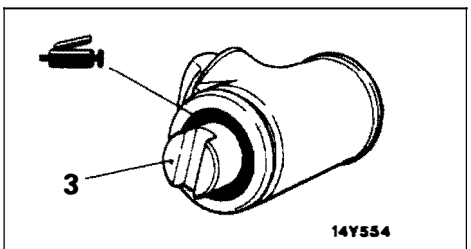
Pre-removal Operation
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Filling
- Brake Line Bleeding
(Refer to P.35A-13 or GROUP 35B – Service Adjustment Procedures.)

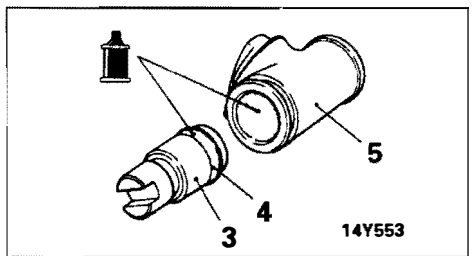
Removal steps
1. Brake drum
2. Shoe-to-lever spring
3. Shoe-to-shoe spring
4. Auto adjuster assembly
5. Connection for the brake pipe
6. Wheel cylinder
7. Bleeder screw

DISASSEMBLY AND REASSEMBLY

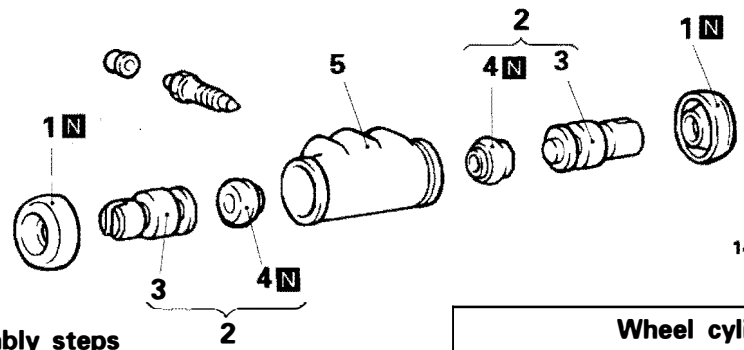
E35AK05AA



Grease: Repair kit grease (orange)

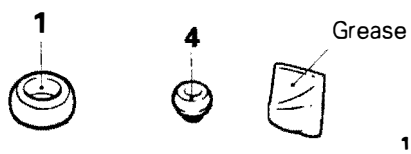


Brake fluid: DOT3 or DOT4



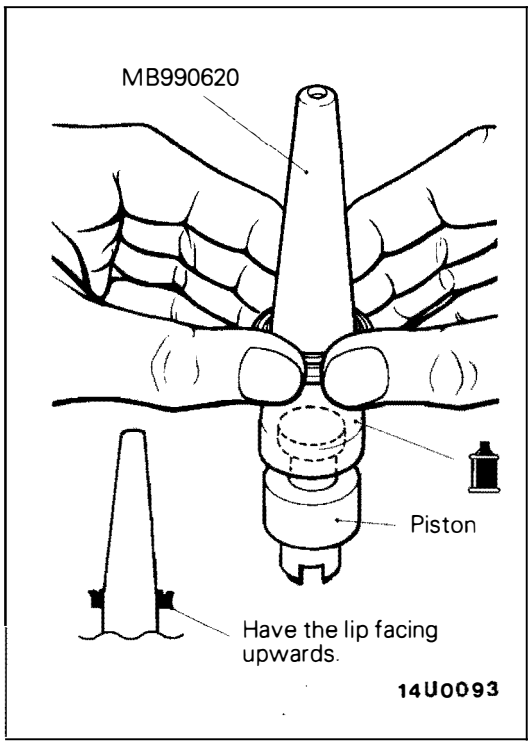
Disassembly steps
1. Boots
2. Piston assembly
◆A◆ 3. Pistons
◆A◆ 4. Piston cups
5. Wheel cylinder body

Wheel cylinder repair kit



INSPECTION E35AK07AA

Check the piston and wheel cylinder walls for rust or damage, and if there is any abnormality, replace the entire wheel cylinder assembly.



REASSEMBLY SERVICE POINTS E35AK08AA

◆A◆ PISTON CUP/PISTON REASSEMBLY

(1) Use alcohol or specified brake fluid to clean the wheel cylinder and the piston.
(2) Apply the specified brake fluid to the piston cups and the special tool.

Specified brake fluid: DOT3 or DOT4

(3) Set the piston cup on the special tool with the lip of the cup facing up, fit the cup onto the special tool, and then slide it down the outside of the tool into the piston groove.

Caution
In order to keep the piston cup from becoming twisted or slanted, slide the piston cup down the tool slowly and carefully, without stopping.

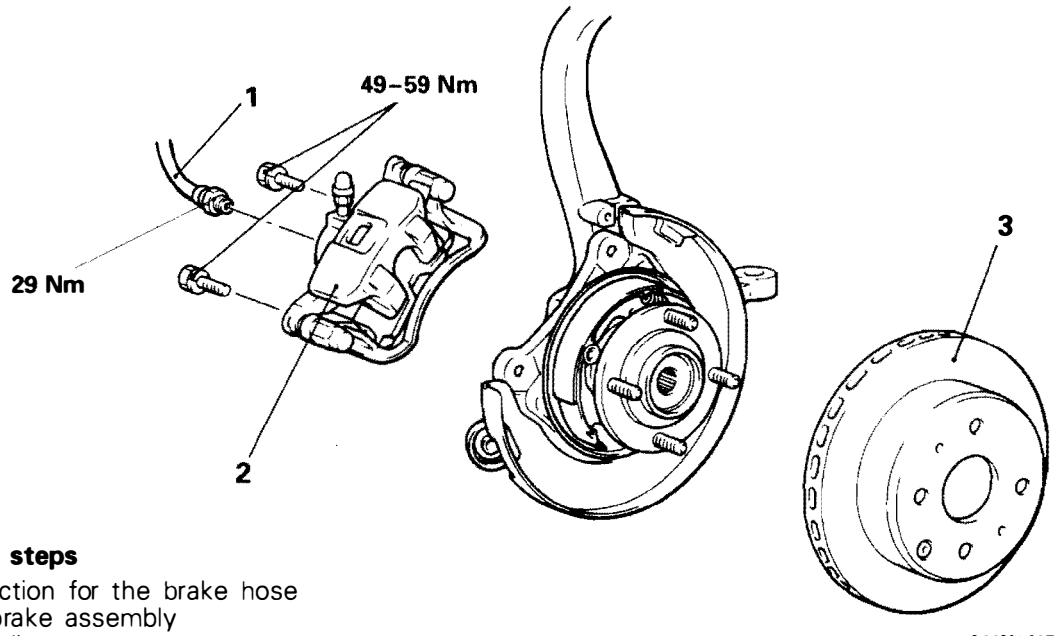
REAR DISC BRAKE

E35AL00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Loosening Parking Brake Cable Adjusting Nut.
- Brake Fluid Draining

Post-installation Operation
- Brake Fluid Filling and Air Bleeding (Refer to P.35A-13 or GROUP 35B – Service Adjustment Procedures.)
- Parking Brake Lever Stroke Adjustment (Refer to GROUP 36 – Service Adjustment Procedures.)



A14X0115

Removal steps
1. Connection for the brake hose
◆A◆ 2. Rear brake assembly
3. Brake disc

INSPECTION

E35AL02AA

- Check the brake disc for damage.
- Check the brake disc for thickness.
- Check the brake disc for run-out.

INSTALLATION SERVICE POINTS

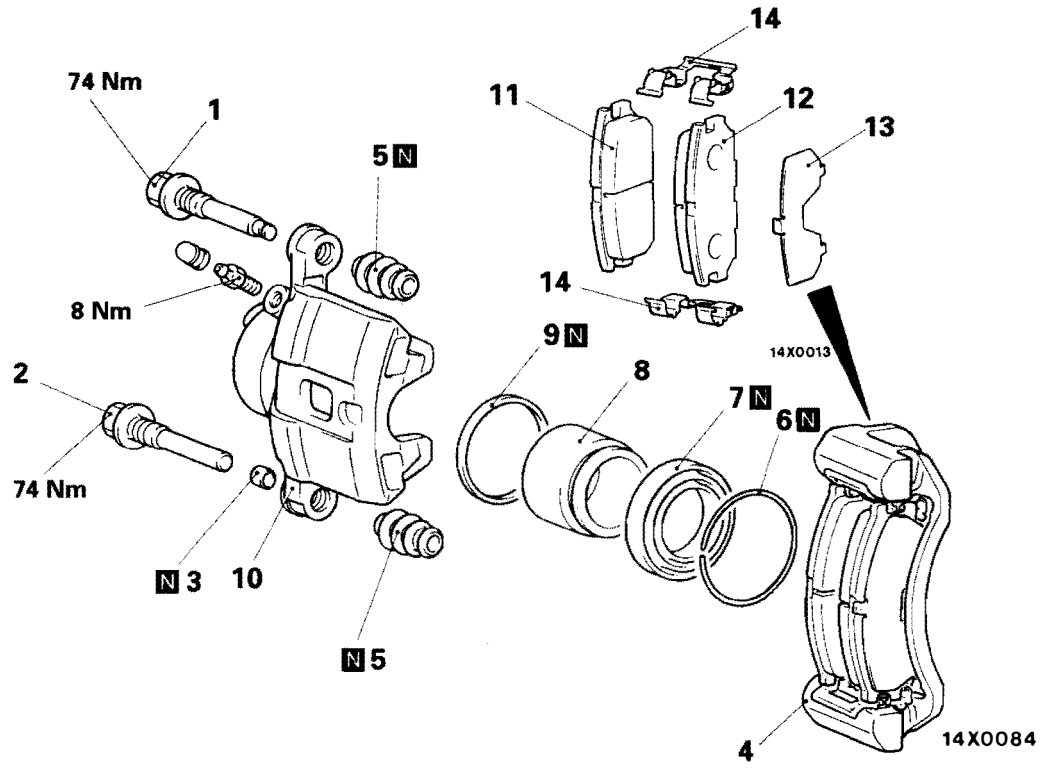
E35AL04AA

◆A◆ REAR BRAKE ASSEMBLY INSTALLATION

Install the rear brake assembly and measure the disc brake drag torque. (Refer P.35A-21.)

DISASSEMBLY AND REASSEMBLY

E35AL05AA



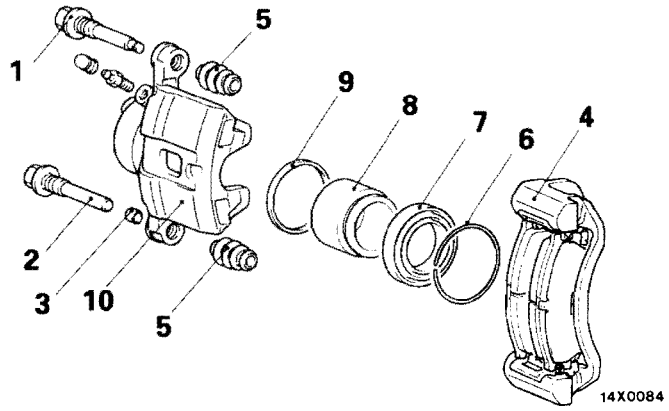
Caliper assembly disassembly steps

- ◆A◆ 1. Guide pin
- ◆A◆ 2. Lock pin
- 3. Bushing
- 4. Caliper support (pad, clip, shim)
- 5. Boot
- 6. Boot ring
- 〈A〉 7. Piston boot
- 〈A〉 8. Piston
- 〈B〉 9. Piston seal
- 10. Caliper body

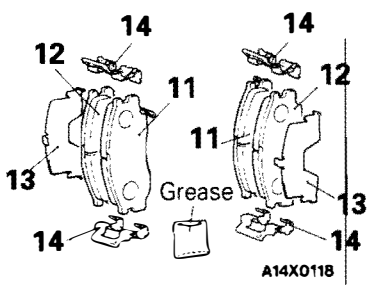
Pad assembly disassembly steps

- ◆A◆ 1. Guide pin
- ◆A◆ 2. Lock pin
- 3. Bushing
- 4. Caliper support (pad, clip shim)
- 11. Pad and wear indicator assembly
- 12. Pad assembly
- 13. Outer shim
- 14. Clip

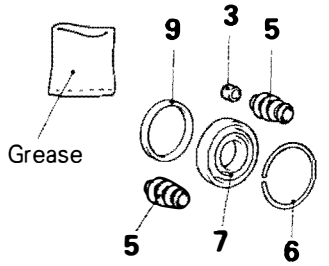
Brake caliper kit



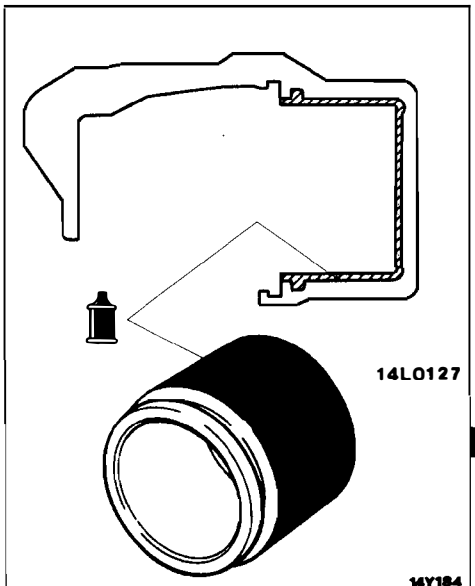
Pad repair kit



Seal and boots repair kit

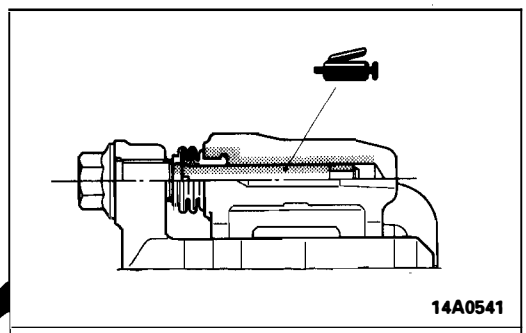


LUBRICATION POINTS

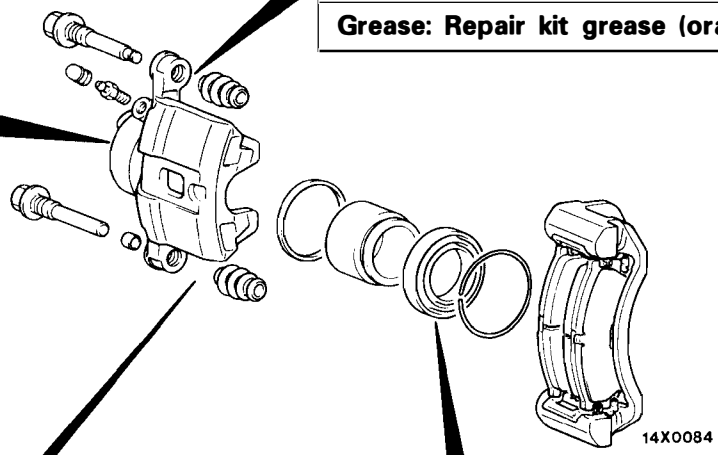


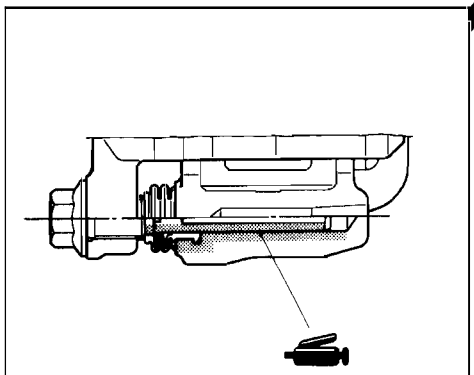
Caution
The piston seal inside the seal and boot kit is coated with special grease, so do not wipe this grease off

Brake fluid: DOT3 or DOT4

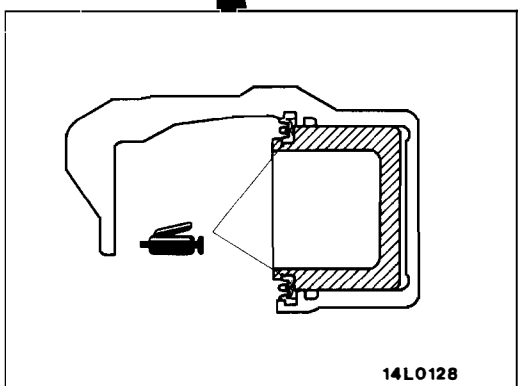


Grease: Repair kit grease (orange)





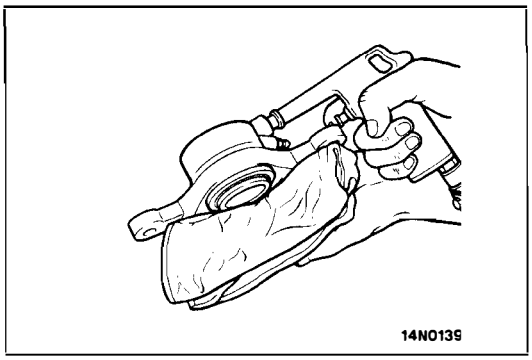
Grease: Repair kit grease (orange)



Grease: Repair kit grease (orange)

DISASSEMBLY SERVICE POINTS E35AI06AA

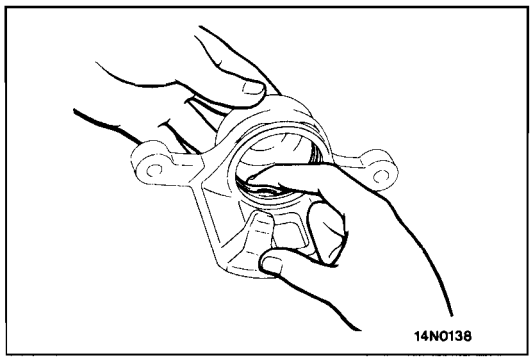
When disassembling the disc brakes, disassemble both sides (left and right) as a set.



〈A〉 PISTON BOOT/PISTON REMOVAL

Protect caliper body with cloth. Blow compressed air through brake hose to remove piston boot and piston.

Caution
Blow compressed air gently.



〈B〉 PISTON SEAL REMOVAL

(1) Remove piston seal with finger tip.

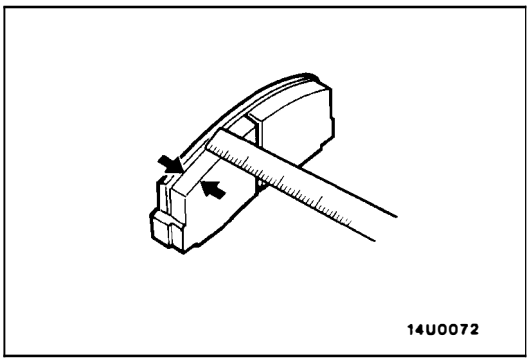
Caution
Do not use a flat-tipped screwdriver or other tool to prevent damage to inner cylinder.

(2) Clean piston surface and inner cylinder with trichloro-ethylene, alcohol or specified brake fluid.

Specified brake fluid: DOT3 or DOT4

INSPECTION E35AI07AA

- Check cylinder for wear, damage or rust.
- Check piston surface for wear, damage or rust.
- Check caliper body or sleeve for wear.
- Check pad for damage or adhesion of grease, check backing metal for damage.



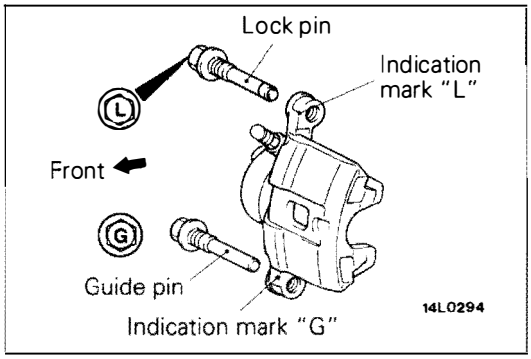
PAD WEAR CHECK E35AI07BA

Measure thickness at the thinnest and worn area of the pad. Replace pad assembly when pad thickness is less than the limit value.

Standard value: 10 mm
Limit value: 2.0 mm

Caution

1. **When the limit is exceeded, replace the pads at both sides, and also the brake pads for the wheels on the opposite side at the same time.**
2. **If there is a significant difference in the thicknesses of the pads on the left and right sides, check the sliding condition of the piston, lock pin and guide pin.**



REASSEMBLY SERVICE POINTS E35AI08AA

◆A◆ LOCK PIN/GUIDE PIN INSTALLATION

Install the guide pin and lock pin as illustrated so that each head mark of the guide pin and the lock pin matches the indication mark located on the caliper body.

PROPORTIONING VALVE

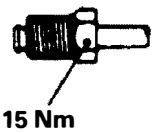
E35AM00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <MPI>

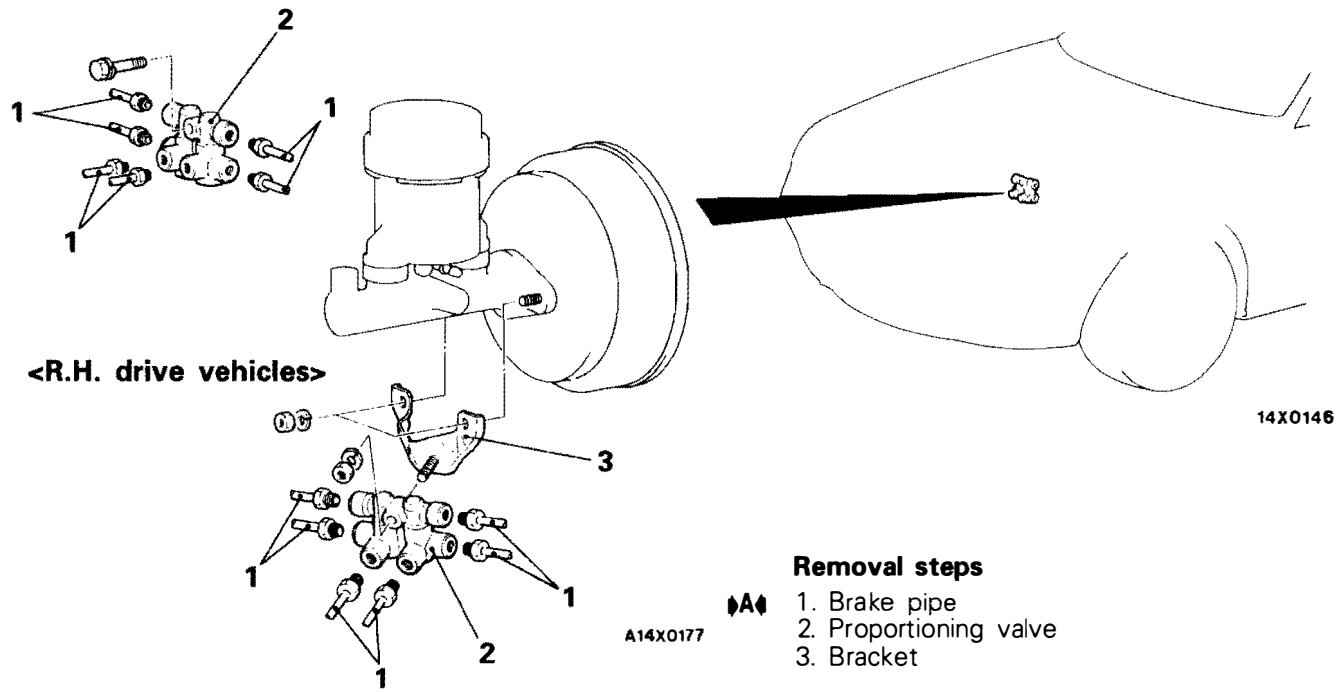
Post-installation Operation
- Brake Fluid Supplying
- Brake Line Bleeding (Refer to P.35A-13.)
- Air Intake Hose Installation <MPI>

Flared brake line nuts



14F038

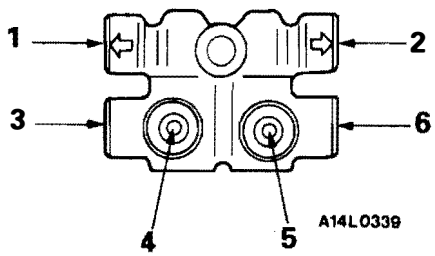
<L.H. drive vehicles>



14X0146

Removal steps

◆A◆ 1. Brake pipe
2. Proportioning valve
3. Bracket



INSTALLATION SERVICE POINTS

E35AM04AA

◆A◆ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

1. Proportioning valve – Rear brake (R.L.)
2. Proportioning valve – Rear brake (R.R.)
3. Proportioning valve – Front brake (F.R.)
4. Proportioning valve – Front brake (F.L.)
5. Proportioning valve – Master cylinder (for right front and left rear)
6. Proportioning valve – Master cylinder (for left front and right rear)

ANTI-LOCK BRAKING SYSTEM (ABS) <2WD>

CONTENTS

E35BA00AA

 Dec. 1992 PWDE9211

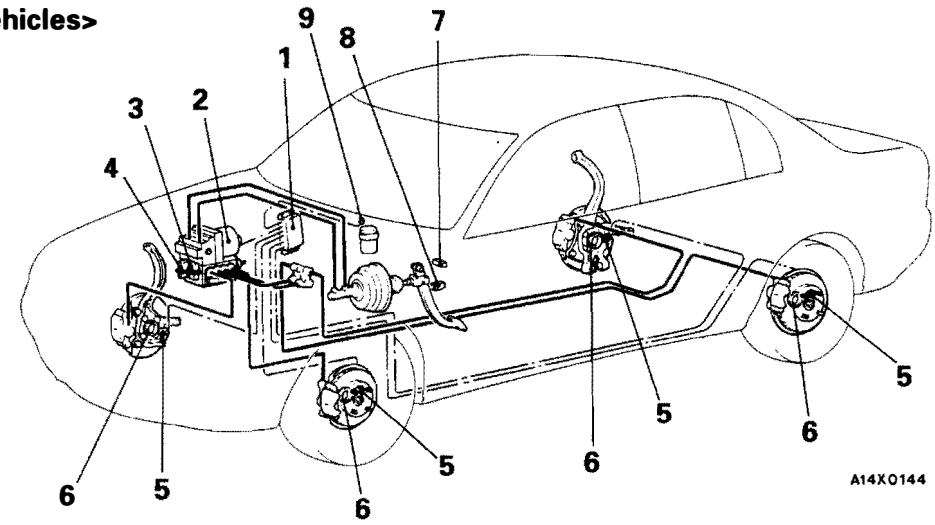
GENERAL INFORMATION

E35BB00AA

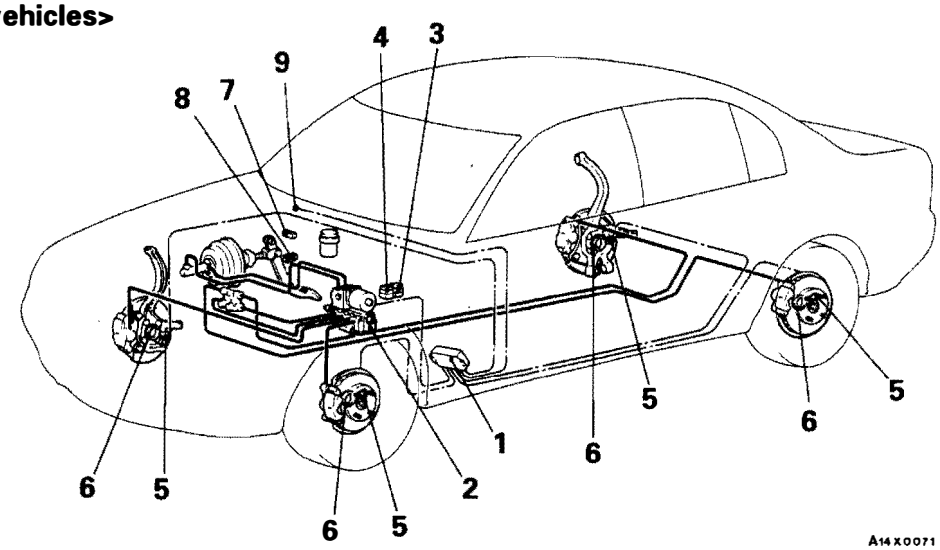
The ABS consists of wheel speed sensors, pedal stroke sensor, hydraulic unit and the ABS-ECU. If a problem occurs in the system, the malfunctioning system can be identified by means of the diagnosis function; and the trouble symptom memory will not be erased even if the ignition switch is turned to OFF. (However, it will be erased if the battery is disconnected.)
In addition, reading of diagnosis codes and service data and actuator testing are possible using the MUT-II.

Items	Specifications
Speed sensor Type	Magnet coil type
Rotor teeth Front Rear	 43 43

<L.H. drive vehicles>



<R.H. drive vehicles>



1. ABS-ECU
2. Hydraulic unit
3. ABS valve relay
4. ABS motor relay
5. Wheel speed sensor
6. Rotor
7. Diagnosis connector
8. Pedal stroke sensor
9. ABS warning lamp

SERVICE SPECIFICATIONS

E35BC00AA

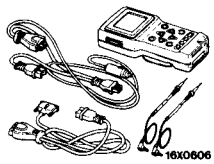
Items		Specifications
Standard value		
Hydraulic unit solenoid valve internal resistance	Ω	5.5–6.5
Hydraulic unit motor sensor internal resistance	Ω	10–13
Speed sensor's internal resistance	kΩ	1.0–1.2
Clearance between the wheel speed sensor and the toothed rotor	mm	28.2–28.5

SEALANT AND ADHESIVES

Items	Specified sealant	Remarks
Thread part fitting	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Vacuum switch	3M ATD Part No. 8661 or equivalent	Semi-drying sealant

SPECIAL TOOLS

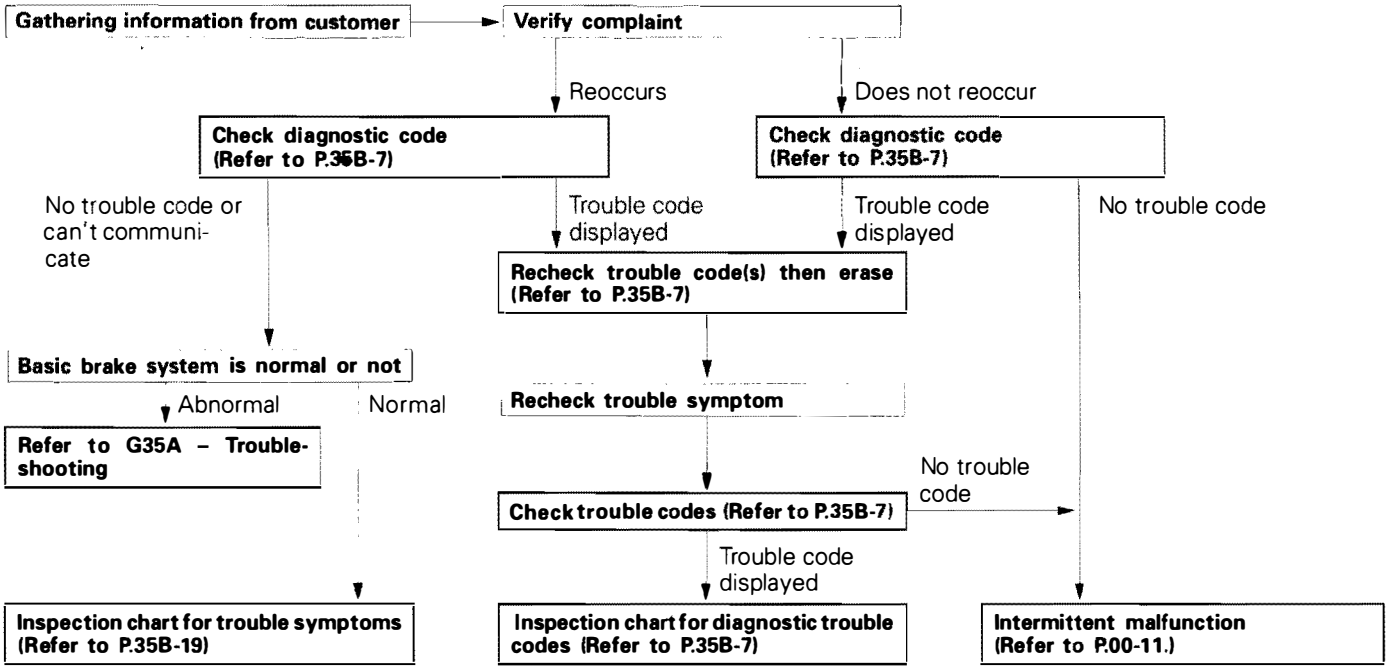
E35BD00AA

Tool	Number	Name	Use
 16X0606	MB991502	MUT-II sub assembly	For checking of ABS
 16X0607		ROM pack	

TROUBLESHOOTING

E35BE00AA

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

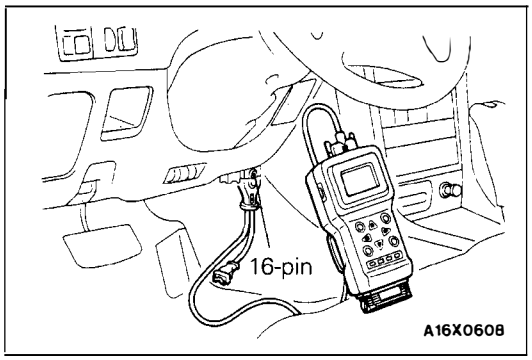


NOTES WITH REGARD TO DIAGNOSIS

The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation of phenomenon
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this because the system operation check is being performed, and is not an abnormality.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operating (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)
ABS operation (Long braking distance)	For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.

Diagnosis detection condition can vary depending on the diagnosis code.
When checking to see if the trouble symptom reoccurs after the diagnosis code has been erased, check the detection timing column in the diagnosis trouble chart (refer to P.35B-7) and the detention conditions recorded in the "Comments" column of the inspection procedure chart for diagnostic trouble codes in order to carry out testing under driving conditions which satisfy each of the given conditions.



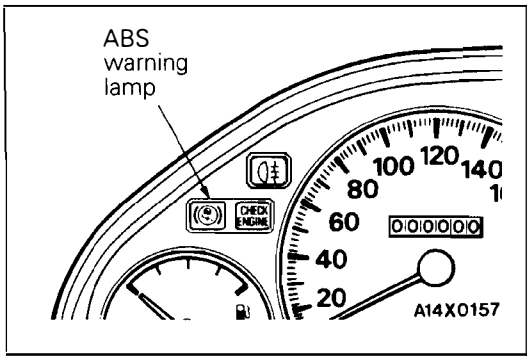
DIAGNOSTIC FUNCTION

E35BE01AA

DIAGNOSTIC CODES CHECK

With the MUT-II

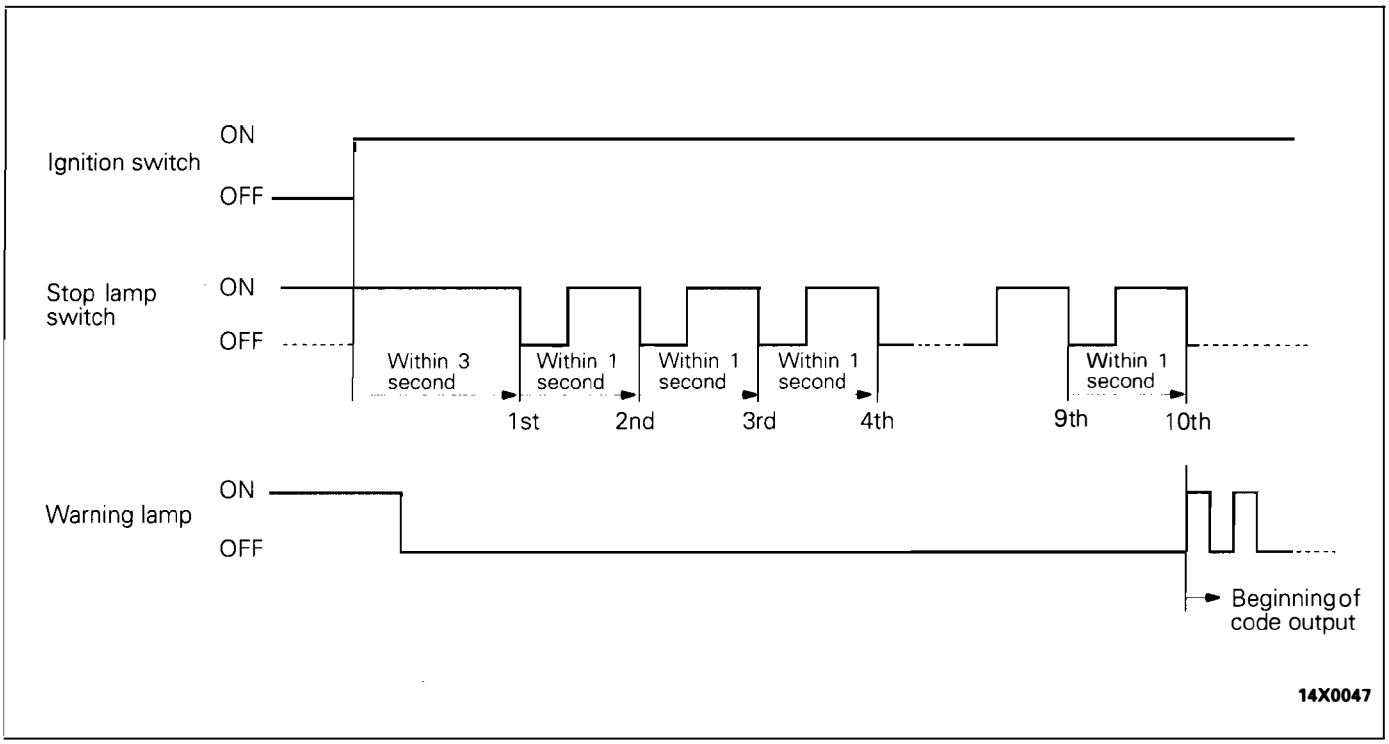
Connect the MUT-II to the diagnosis connector (16-pin) at the lower of the instrument under cover, then check diagnostic codes.



Without the MUT-II

Turn the ignition key to "ON" and repeatedly turn the stop lamp switch ON and OFF 10 times according to the timing shown in the illustration.
After this, take a note of the flashing pattern output from the ABS warning lamp.

NOTE
If there is no change in the input (ON/OFF) to the stop lamp switch within 3 seconds or 1 second, the system will return to normal mode, and no codes will be output until the ignition key is turned OFF and back to ON again.



ERASING DIAGNOSTIC CODES

With the MUT-II

Connect the MUT-II to the diagnosis connector (16-pin), then erase the diagnostic codes.

Without the MUT-II

Removing the battery cable from the battery (–) terminal for 10 seconds or more, then reconnect the cable.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

E35BE02AB

Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code no.	Inspection item	Diagnosis content	Detection timing				Reference page
			A	B	C	D	
11	Front right wheel speed sensor	Open circuit		○	○		P.35B-8
12	Front left wheel speed sensor						
13	Rear right wheel speed sensor						
14	Rear left wheel speed sensor						
16	Power supply system		○	○	○	○	P.35B-9
21	Front right wheel speed sensor	Short circuit		○	○		P.35B-9
22	Front left wheel speed sensor						
23	Rear right wheel speed sensor						
24	Rear left wheel speed sensor						
25	Front right wheel speed sensor	Excessive gap		○	○		P.35B-10
26	Front left wheel speed sensor						
27	Rear right wheel speed sensor						
28	Rear left wheel speed sensor						
31	Pedal stroke sensor circuit system			○	○		P.35B-10
32	Pedal stroke sensor abnormality			○	○		P.35B-32
33	Stop lamp switch system			○	○		P.35B-33
34	Pedal stroke sensor and pump system			○			P.35B-12
35	Front right wheel speed sensor	Pulse processing (wheel speed input corresponding to a vehicle speed of 300 km/h or more)		○	○		P.35B-13
36	Front left wheel speed sensor						
37	Rear right wheel speed sensor						
38	Rear left wheel speed sensor						
41	Front right solenoid valve (inside)			○	○		P.35B-14
42	Front left solenoid valve (inside)						
43	Rear right solenoid valve (inside)						
44	Rear left solenoid valve (inside)						
45	Front right solenoid valve (outside)						
46	Front left solenoid valve (outside)						
47	Rear right solenoid valve (outside)						
48	Rear left solenoid valve (outside)						
51	Valve relay	ON impossible	○	○	○		P.35B-15
52	Valve relay	OFF impossible	○				P.35B-16
53	Motor relay	ON impossible		○			P.35B-17
54	Motor relay	OFF impossible		○	○		P.35B-18
56*	Solenoid valve 1 (TCL valve)			○	○		P.35B-18
57*	Solenoid valve 2 (TCL valve)			○	○		P.35B-18

NOTE
* : Vehicles with TCL

Caution
Diagnosis code Nos. 56 and 57 for the MUT-II cannot be read from ABS-ECU's which have an asterisk on the parts label. Therefore, check the ECU parts label before carrying out inspection.

Detection timing

A: During system check immediately after starting
B: While ABS control is not operating
C: While ABS control is operating
D: During diagnosis inspection using the ABS warning lamp.

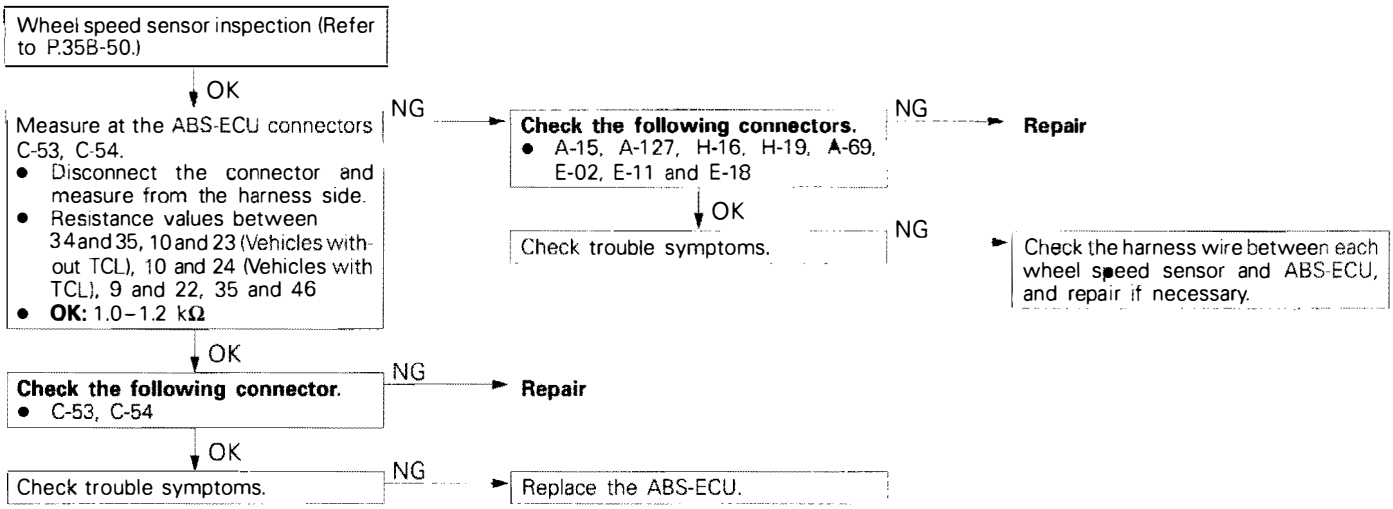
NOTES

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE CODES

E35BE03AA

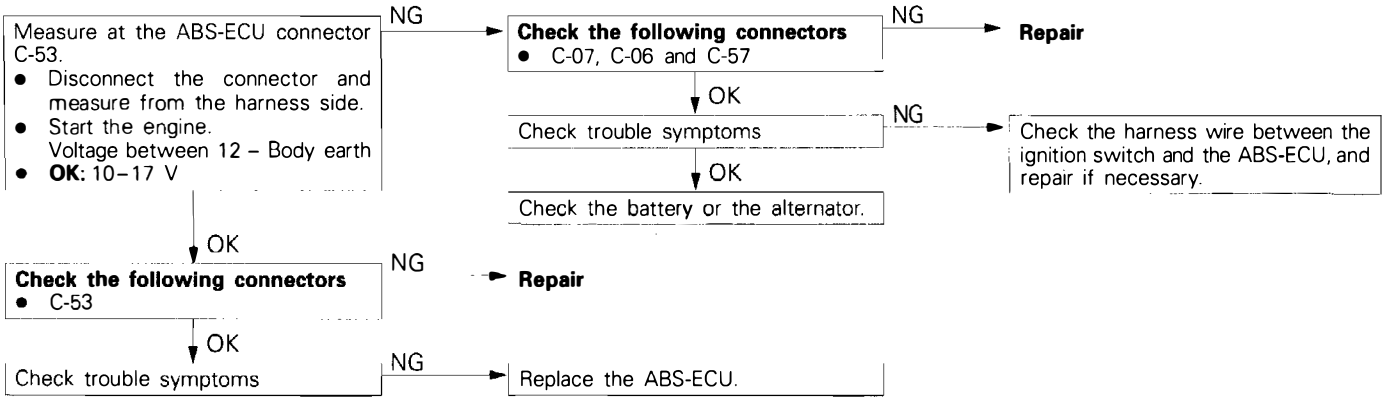
Code No. 11, 12, 13, 14	Wheel speed sensor open circuit	Probable cause
[Comment] These codes are displayed when the sensor with the open circuit can be distinguished.		• Malfunction of wheel speed sensor (Open circuit) • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

Caution
Because diagnosis code No. 12 is also used when incorrect assembly of the ABS-ECU is detected, if code No. 12 is output immediately after replacing the ABS-ECU, first check the parts number of the ABS-ECU.



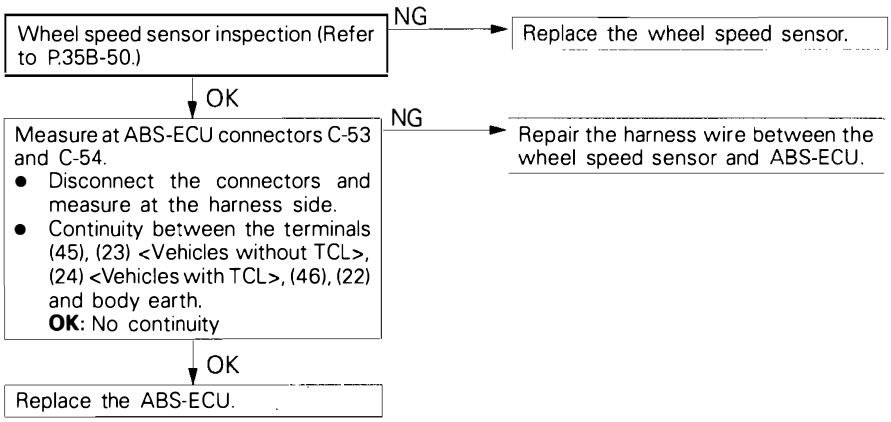
Code No. 16	Power supply system	Probable cause
[Comment] This malfunction code is output when the ABS-ECU power voltage is outside the standard value. Furthermore, if the voltage returns to the standard voltage, this malfunction code will not be output.		• Malfunction of wiring harness or connector. • Malfunction of battery or alternator • Malfunction of ABS-ECU

Caution
If the battery voltage drops during inspection, this code will be output as a current problem, and correct diagnosis of the problem cannot be made.
Before carrying out the following inspection, check the battery level, and refill it if necessary.



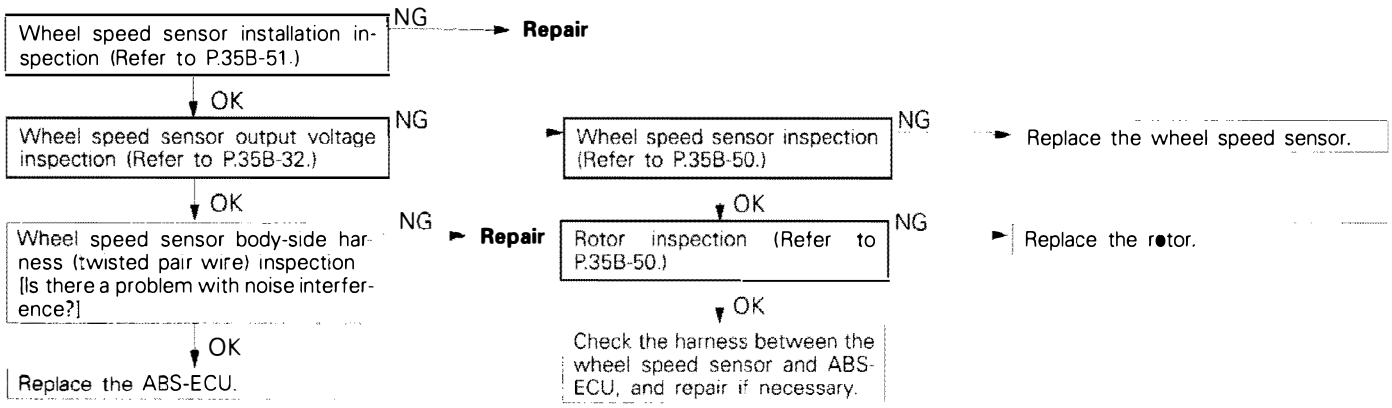
Code No. 21, 22, 23, 24	Wheel speed sensor short circuit	Probable cause
[Comment] These codes are displayed when the sensor with the short circuited can be distinguished.		• Malfunction of wheel speed sensor (short at (+) side or rare short) • Malfunction of wiring harness • Malfunction of ABS-ECU

NOTE
Short circuit is not detected when IG power voltage drops.



Code No. 25, 26, 27, 28	Wheel speed sensor excessive gap	Probable cause
[Comment] These malfunction codes are output when the detection speed of the wheel speed sensors is below the standard value.		• Improper installation of wheel speed sensor • Malfunction of wheel speed sensor (intermittent open circuit or short circuit) • Malfunction of rotor (chipped tooth or rotor not installed) • Noise interference in wheel speed sensor • Malfunction of ABS-ECU

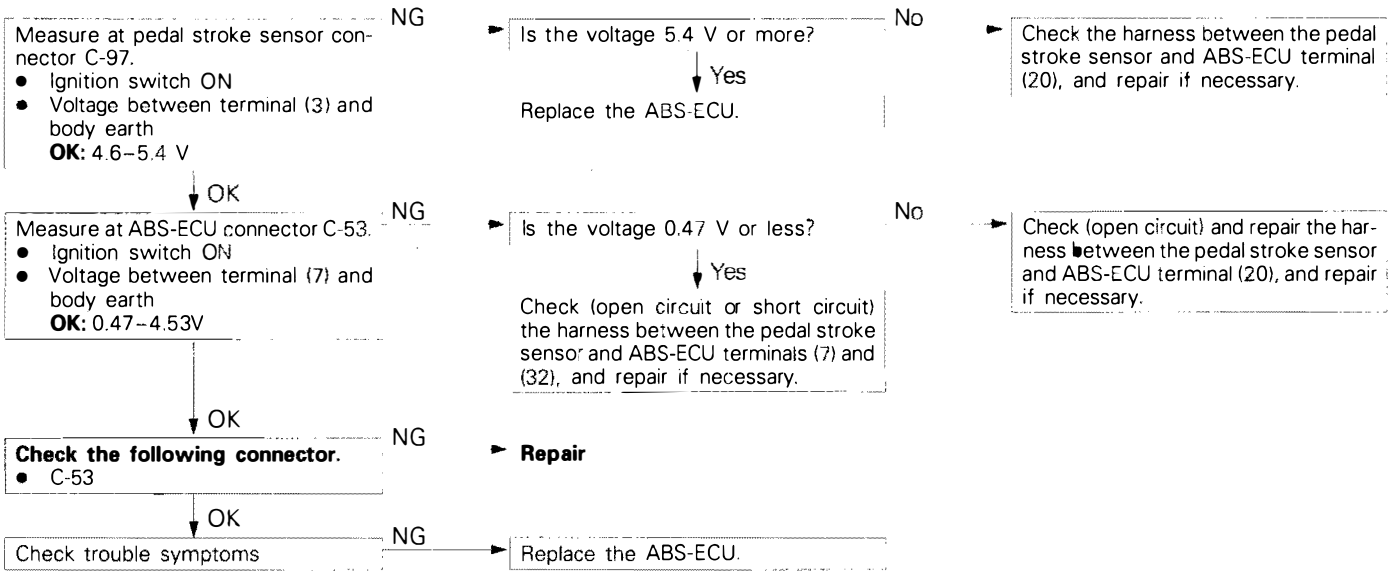
NOTE
Momentary interruptions within approximately 100 ms are not detected.



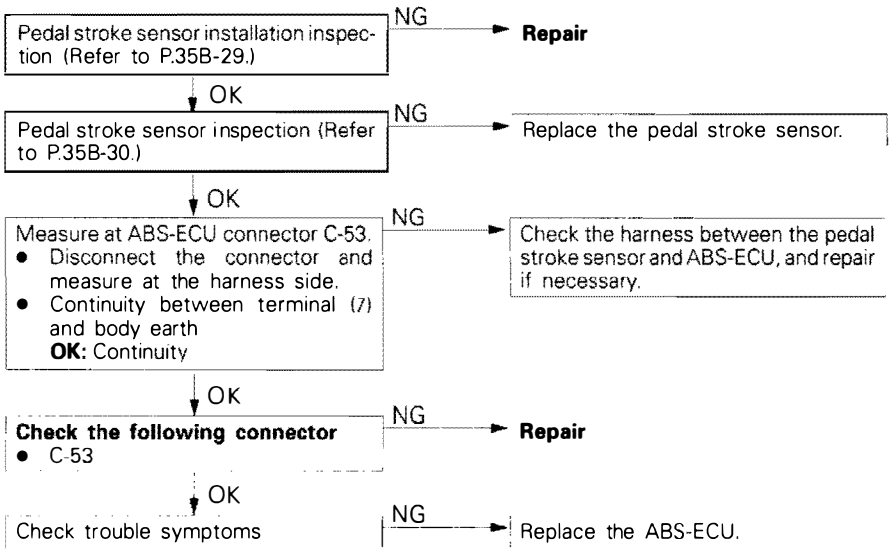
NOTE
To inspect the twisted pair wires in the wheel speed sensor, check if there is any damage to the cables, and flex the cables to check for any open circuits.

Code No. 31	Pedal stroke sensor circuit system	Probable cause
[Comment] This diagnosis code is output if the pedal stroke sensor supply voltage or input voltage is outside the specified value.		• Malfunction of wiring harness or connector • Malfunction of pedal stroke sensor • Malfunction of ABS-ECU

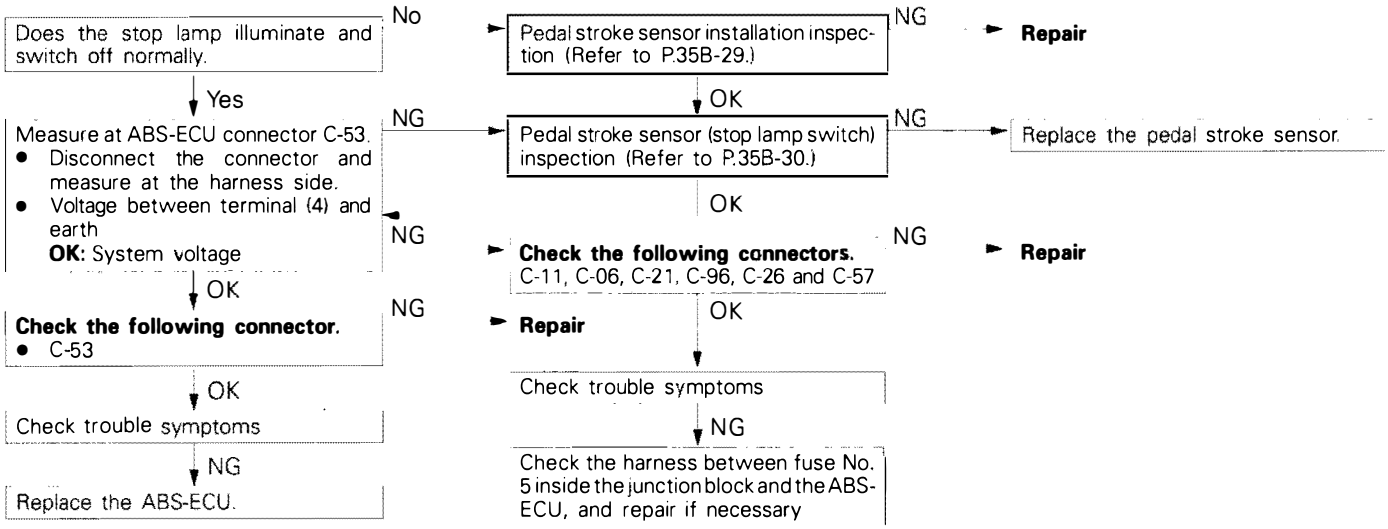
NOTE
1. Malfunction code No. 31 may be output if an OFF malfunction in the stop lamp switch (remains OFF) is detected while the brake pedal is depressed.
2. Short circuit is not detected when IG power voltage drops.



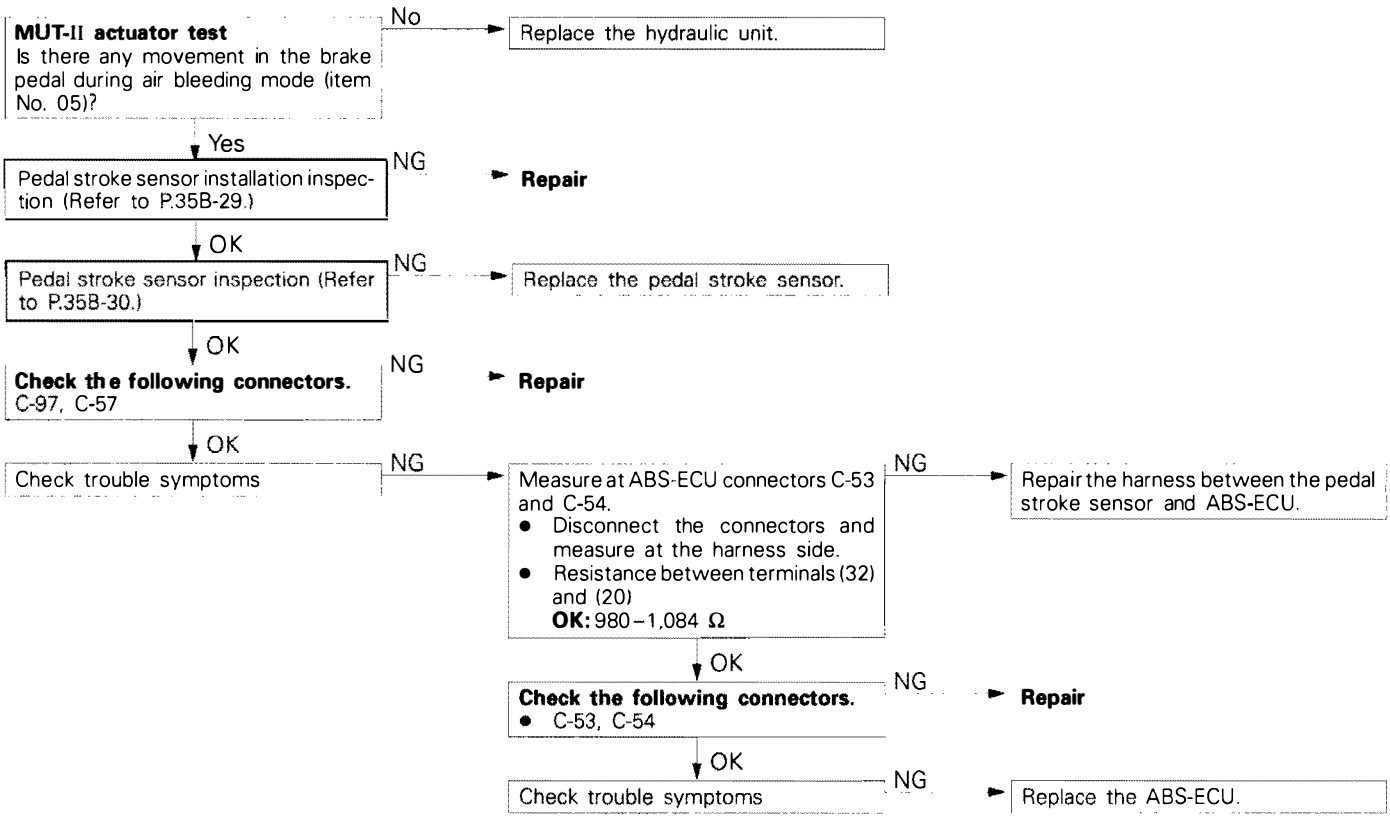
Code No. 32	Pedal stroke sensor abnormality	Probable cause
[Comment] This diagnosis code is output if vehicle acceleration (or deceleration) which is above the specified value with respect to the pedal stroke sensor input voltage continues for 10 seconds or more, or if the input voltage is above the specified value for a continuous period of 15 minutes.		• Improper installation of pedal stroke sensor • Malfunction of pedal stroke sensor • Malfunction of rotor • Malfunction of wiring harness • Malfunction of ABS-ECU



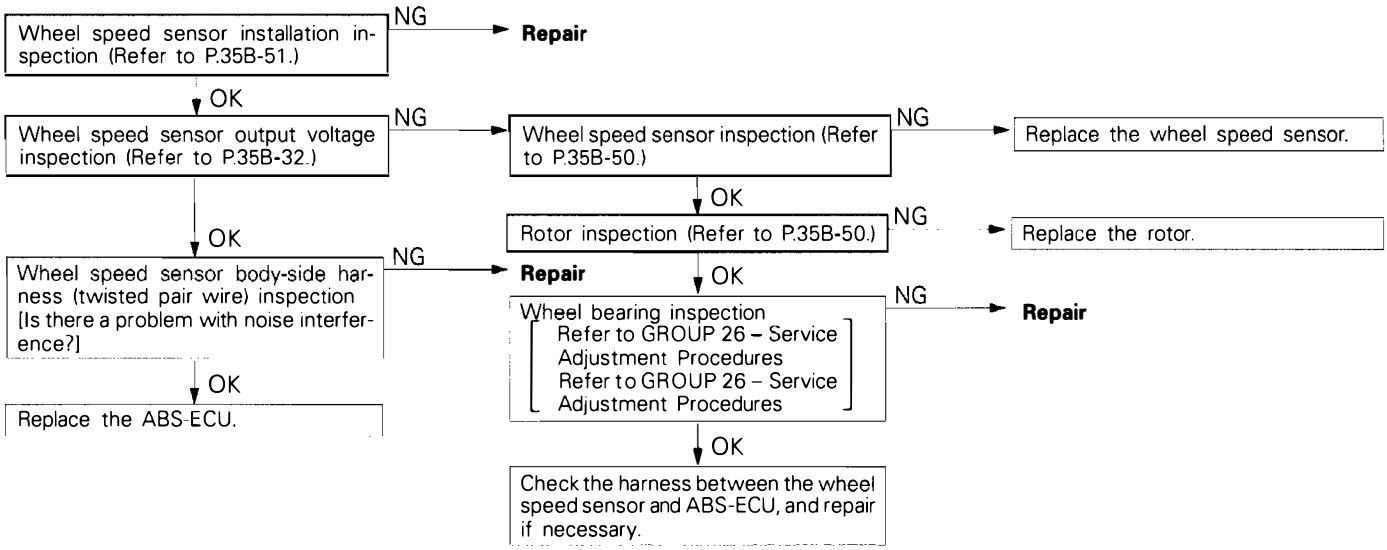
Code No. 33	Stop lamp switch system	Probable cause
[Comment] This diagnosis code is output if it is judged to be an open circuit when the stop lamp switch is ON for a continuous period of 15 minutes or more, or if it is judged to be a short circuit when the pedal stroke sensor output voltage is above the specified value and the switch is OFF for a constant period of time.		• Malfunction of wiring harness or connector • Malfunction of pedal stroke sensor (ON or OFF malfunction of stop lamp switch) • Malfunction of ABS-ECU



Code No. 34	Pedal stroke sensor and pump system	Probable cause
[Comment] This diagnosis code is output if a motor pump ON instruction has been given but the output voltage of the pedal stroke sensor does not change.		• Malfunction of hydraulic unit • Malfunction of pedal stroke sensor • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



Code No. 35, 36, 37, 38	Wheel speed sensor pulse processing	Probable cause
[Comment] These malfunction codes are output if a sensor pulse corresponding to a vehicle speed of 300 km/h or more is input to the wheel speed signal circuit due to ignition noise or excessive axle vibration.		• Malfunction of wiring harness • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Noise interference in wheel speed signal • Malfunction of ABS-ECU

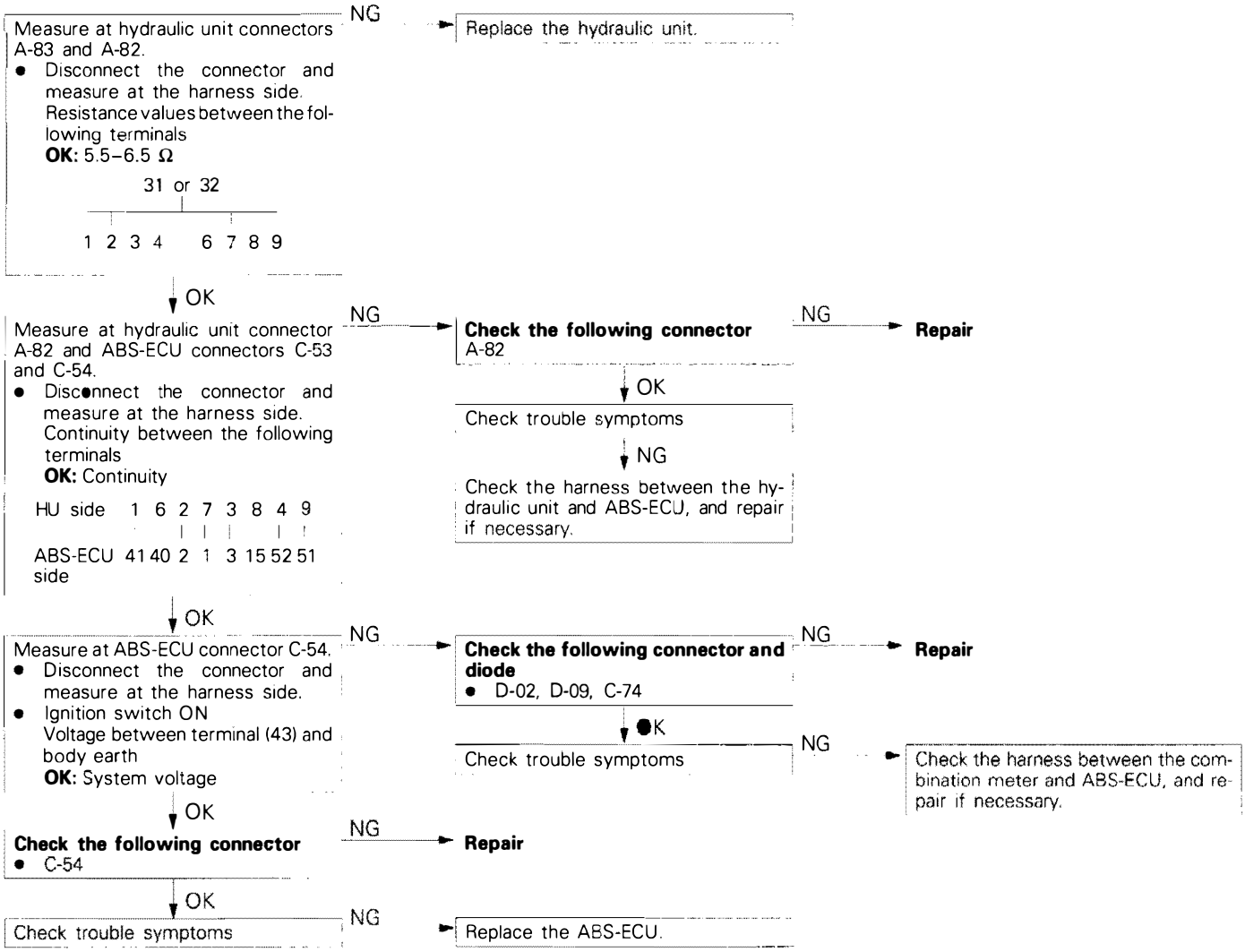


NOTE
To inspect the twisted pair wires in the wheel speed sensors, check if there is any damage to the cables, and flex the cables to check for any open circuits.

Code No. 41, 42, 43, 44, 45, 46, 47, 48,	Solenoid valve	Probable cause
[Comment] The ABS-ECU normally monitors the solenoid valve drive circuit. If there is no current flowing to the solenoid even when the solenoid is ON, or the current continues to flow to the solenoid even when the solenoid is OFF, the ABS-ECU diagnoses a open circuit or short in the solenoid coil or a open circuit or short in the harness, and this malfunction code is output.		• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of ABS-ECU

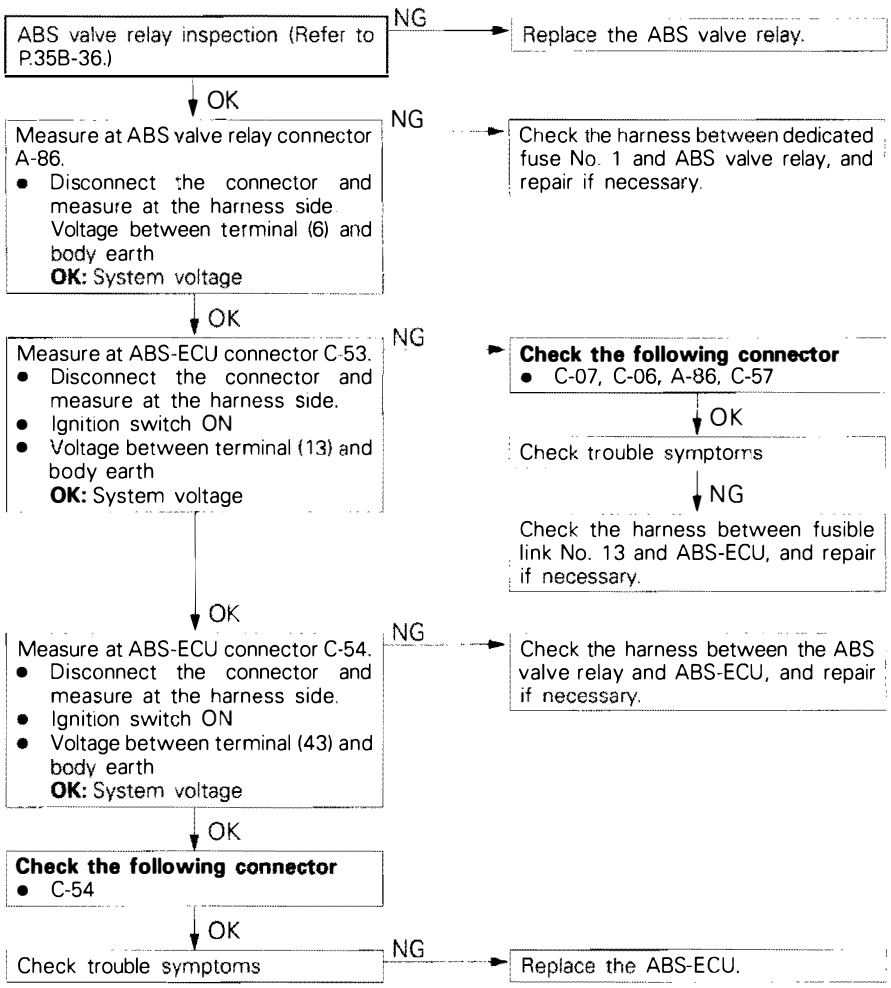
Caution

- **A valve malfunction is not detected when IG power voltage drops (less than 9 V).**
- **If power is not being supplied to the solenoid valve because connector A-83 is disconnected, all malfunction codes except code Nos. 41 and 46 will be output.**

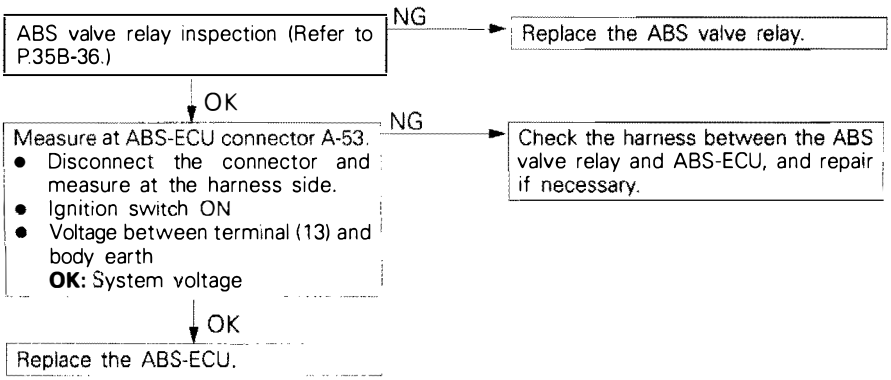


Code No. 51	Valve relay ON impossible	Probable cause
[Comment] During the initial check when the ignition switch is turned to "ON", if power is not being supplied to the solenoid when the valve relay is ON, the ABS-ECU diagnoses an OFF problem in the valve relay (not turned ON), and outputs this malfunction code.		• Malfunction of ABS valve relay • Malfunction of wiring harness or connector • Malfunction of ABS-ECU

NOTE
A valve malfunction is not detected when IG power voltage drops (less than 9 V).

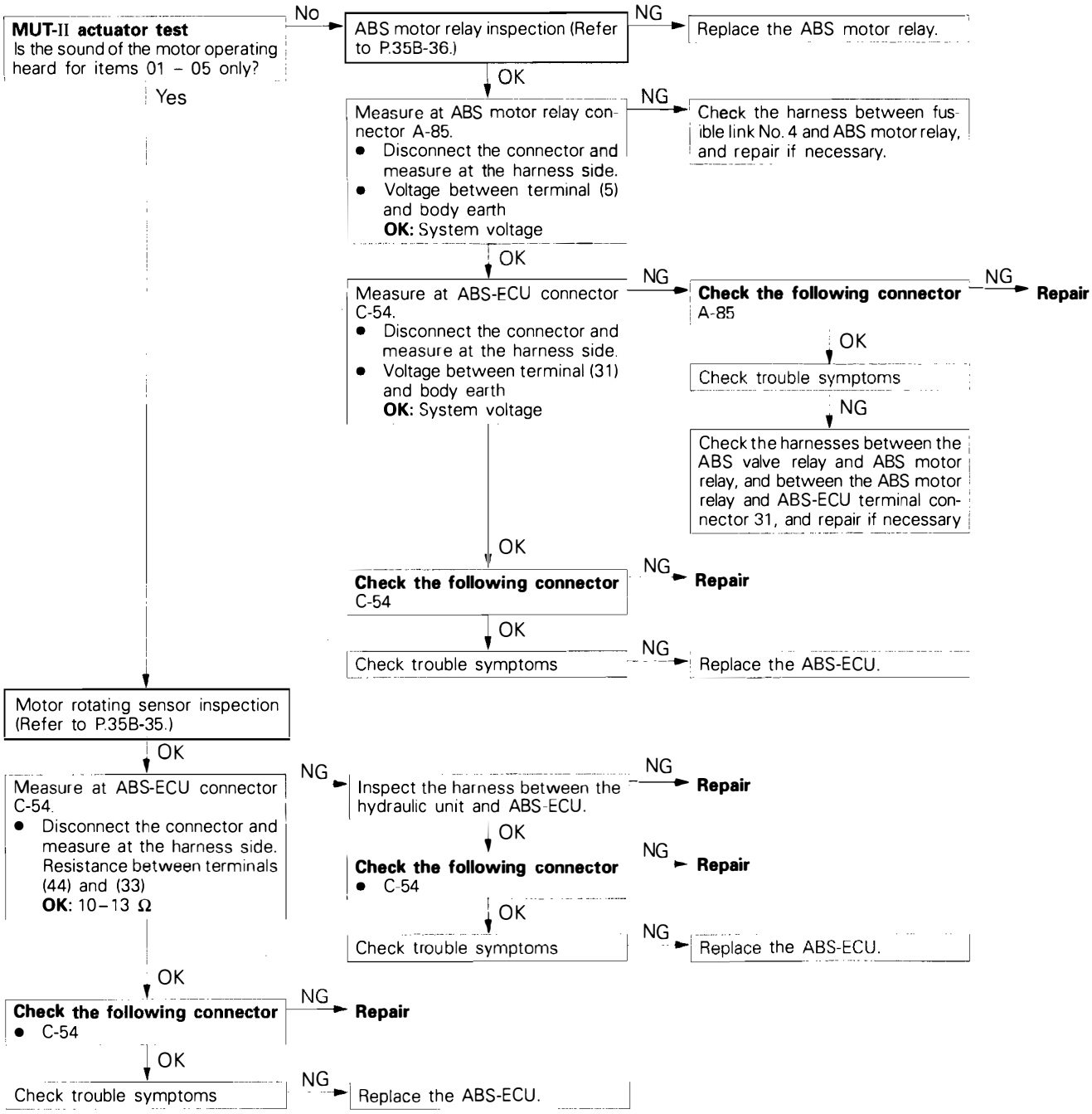


Code No. 52	Valve relay OFF impossible	Probable cause
[Comment] During the initial check when the ignition switch is turned to "ON", if power is being supplied to the solenoid when the valve relay is OFF, the ABS-ECU diagnoses a melted relay contact or a short in the valve relay drive circuit, and this malfunction code is output.		• Malfunction of ABS valve relay • Malfunction of wiring harness (Short circuited) • Malfunction of ABS-ECU



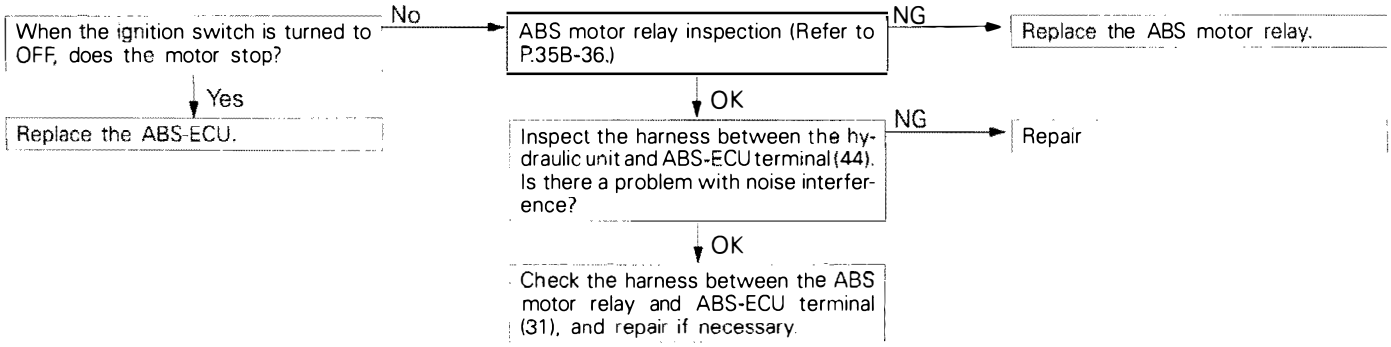
Code No. 53	Motor relay, motor ON impossible	Probable cause
[Comment] This diagnosis code is output if a motor relay ON instruction has been given but the motor rotating sensor signal has not risen above 150 Hz.		• Malfunction of ABS motor relay • Malfunction of wiring harness or connector • Malfunction 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.



Code No. 54	Motor relay, motor OFF impossible	Probable cause
[Comment] This diagnosis code is output if a signal of 150 Hz or above is input to the ABS-ECU from the motor rotating sensor even though the motor relay is OFF.		• Malfunction of wiring harness or connecter • Malfunction of hydraulic unit • Malfunction of ABS motor relay • Noise interference in motor rotating sensor circuit • Malfunction of ABS-ECU

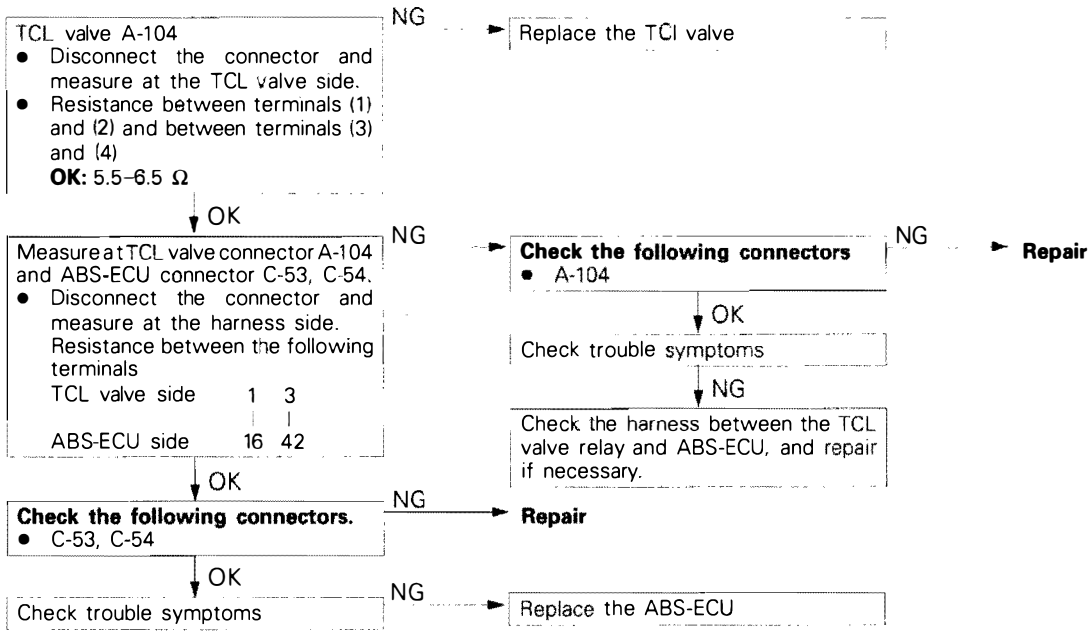
Caution
If there is a melted contact in the motor relay, the motor will keep turning, even if the ignition switch is turned to OFF. In such a case, immediately remove the fusible link No. 4 or disconnect the hydraulic unit connector. Excessive running of the motor will consume a battery.

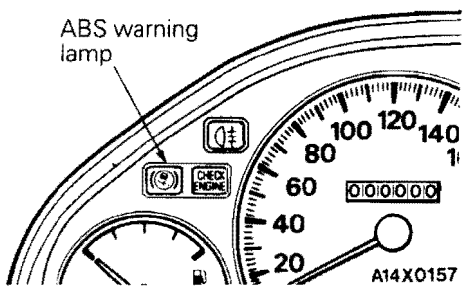


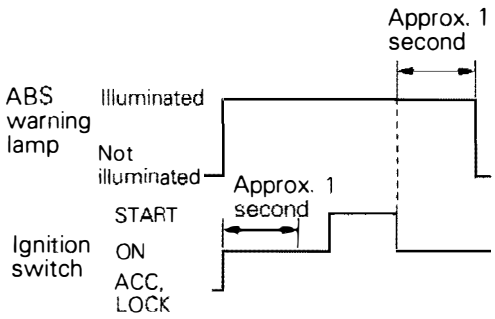
NOTE
To inspect the harnesses, check if there is any damage to the cables, and flex the cables to check for any open circuits.

Code No. 56, 57	Solenoid valve 1, 2 (TCL valve)	Probable cause
[Comment] The ABS-ECU normally monitors the solenoid valve drive circuit. If there is no current flowing to the solenoid even when the solenoid is ON, or the current continues to flow to the solenoid even when the solenoid is OFF, the ABS-ECU diagnoses a open circuit or short in the solenoid coil or a open circuit or short in the harness, and this malfunction code is output.		• Malfunction of wiring harness • Malfunction of TCL valve relay • Malfunction of ABS-ECU

Caution
A valve malfunction is not detected when IG power voltage drops (less than 9 V).





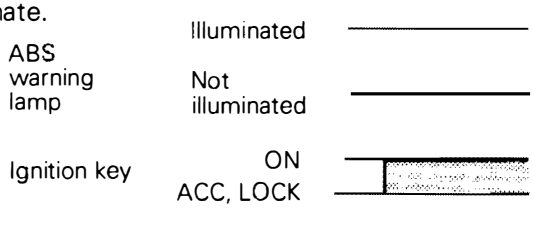
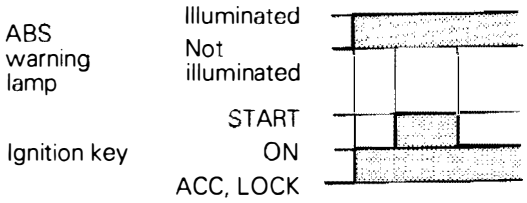
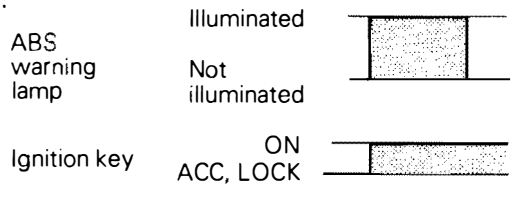


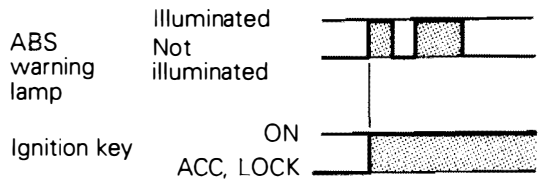
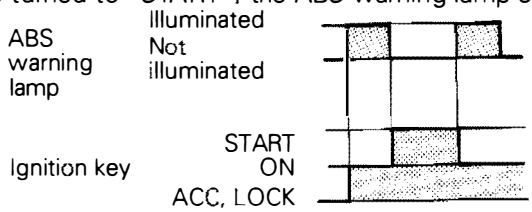
ABS WARNING LAMP INSPECTION E35BE04AA

Check that the ABS warning lamp illuminates as follows.
1. When the ignition switch is turned to "ON", the ABS warning lamp illuminate.
2. When the ignition switch is turned to "START" to start the engine, the ABS warning lamp switch off after approx. 1 second.
3. If the illumination is other than the above, check the diagnosis codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS E35BE04BA

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	P.35B-21
	Communication with ABS only is not possible.	2	P.35B-21
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate. 		3	P.35B-22
After the engine starts, the lamp remains illuminated. 		4	P.35B-23
The ABS warning lamp switches off approximately 1 second after the ignition key is turned to "ON". 		5	P.35B-23

Trouble symptom		Inspection procedure No.	Reference page
After the ignition key is turned to "ON", the ABS warning lamp flashes. ABS warning lamp: Illuminated / Not illuminated Ignition key: ON / ACC, LOCK  14N0169		6	P.35B-24
When the ignition key is turned to "START", the ABS warning lamp switches off. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14N0171		7	P.35B-24
Faulty ABS operation	Unequal braking power on both sides	8	P.35B-25
	Insufficient braking power		
	ABS operates under normal braking conditions		
	ABS operates before vehicle stops under normal braking conditions		
	Large brake pedal vibration when ABS operates		
	Large brake pedal vibration (Caution 2.)	–	–

Caution

1. **If steering movements are made when driving at high speed, or when driving on road surfaces with low frictional resistance, or when passing over bumps, the ABS may operate even though sudden braking is not being applied. Because of this, when getting information from the customer, check if the problem occurred while driving under such conditions as these.**
2. **During ABS operation, changes in the feeling of the brake pedal (vibration may occur or pedal may not be able to be depressed). Such changes are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking, and is not an abnormality.**

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

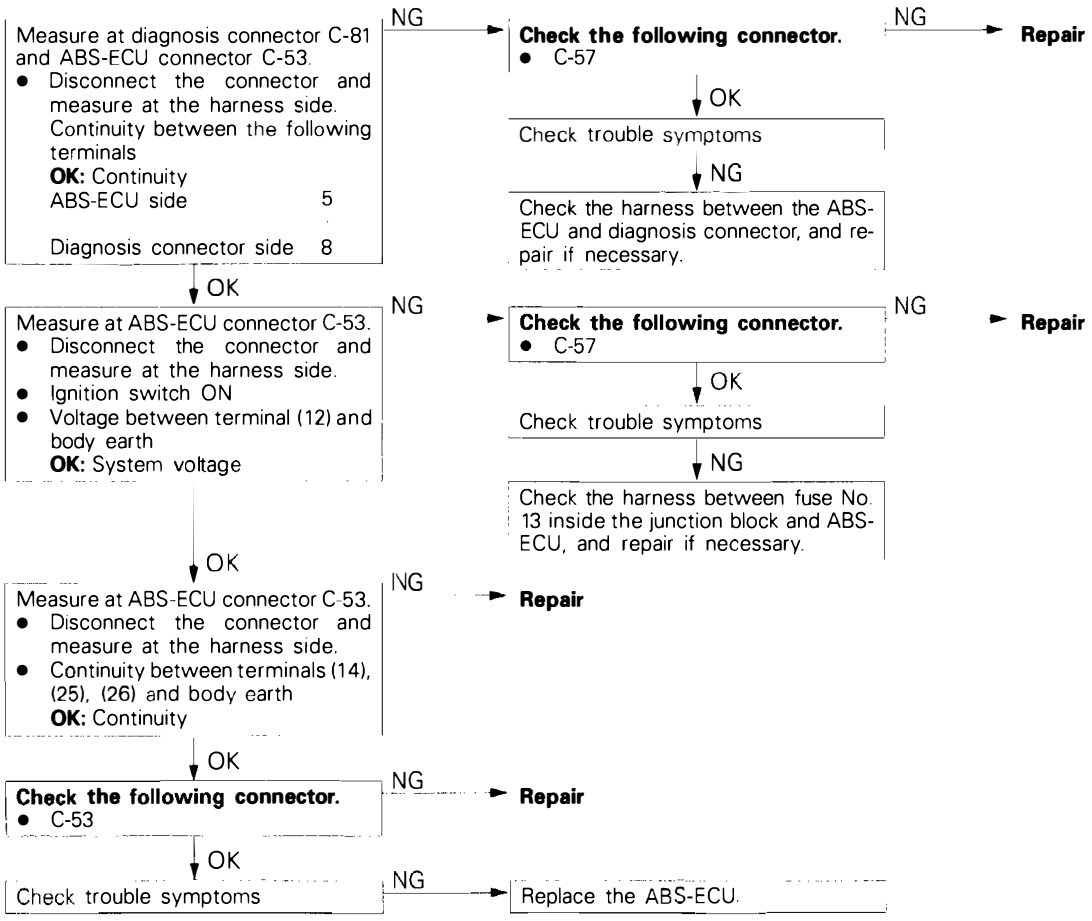
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting

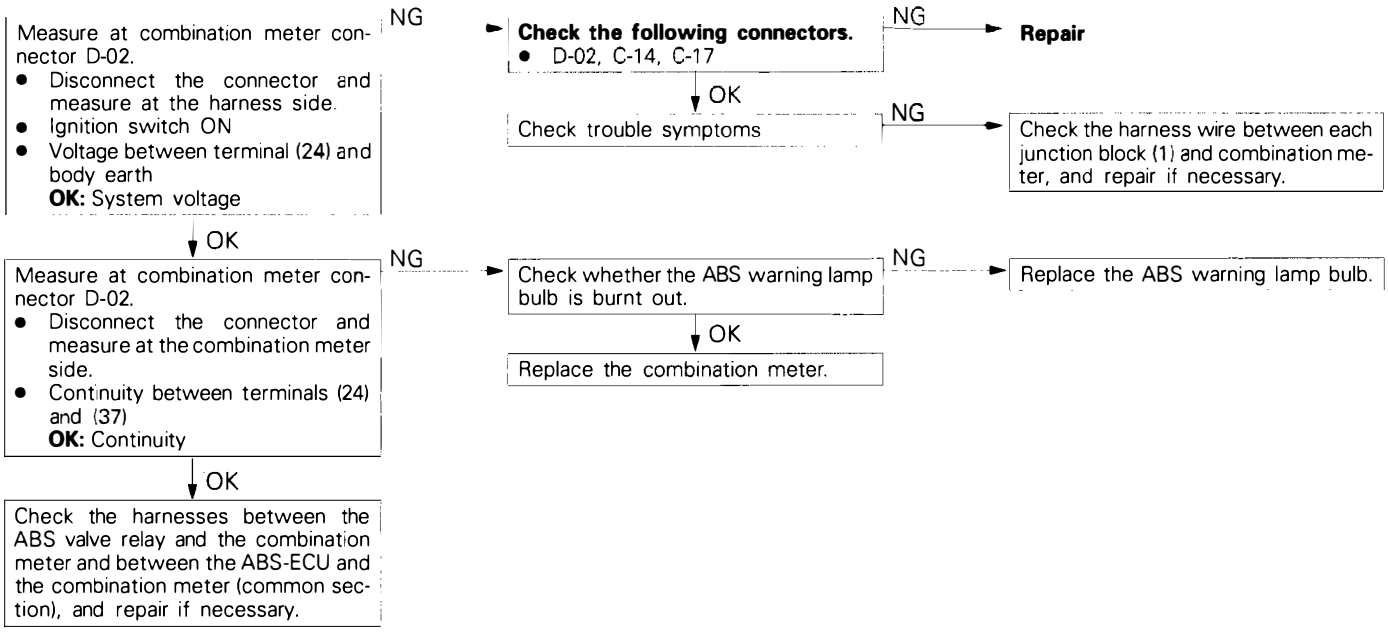
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication with ABS only is not possible.)	Probable cause
[Comment] When communication with the MUT-II is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnosis output circuit.	• Blown fuse • Malfunction of wiring harness or connecter • Malfunction of ABS power relay • Malfunction of ABS-ECU



Inspection Procedure 3

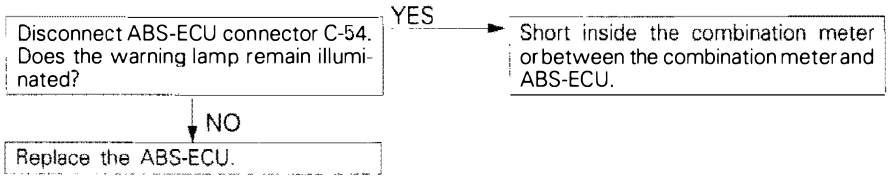
When ignition key is turned to "ON" (engine stopped), ABS warning lamp does not illuminate	Probable cause
[Comment] When power is supplied to the ABS-ECU, the ABS valve relay turns from OFF to ON by the initial check. Thus, even if there is a problem with the circuit between the ABS warning lamp and the ABS-ECU, the ABS warning lamp will illuminate once when the ABS valve relay is OFF. [Hint] 1. If the lamp does not illuminate when the ignition switch is turned ON, the cause is probably an open circuit in the lamp power supply, a burnt out lamp bulb or an open circuit in both the circuit between bulb or an open circuit in both the circuit between the ABS warning lamp and the ABS-ECU and in the circuit between the ABS warning lamp and the ABS valve relay. 2. When other warning lamps also do not illuminate, the cause is probably a blown fuse. [Note] If the IG2 terminal is shorted to another battery terminal, the power supply to the ABS-ECU will be normal. In such a case, the ABS warning lamp will remain switched off.	• Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector



Inspection Procedure 4

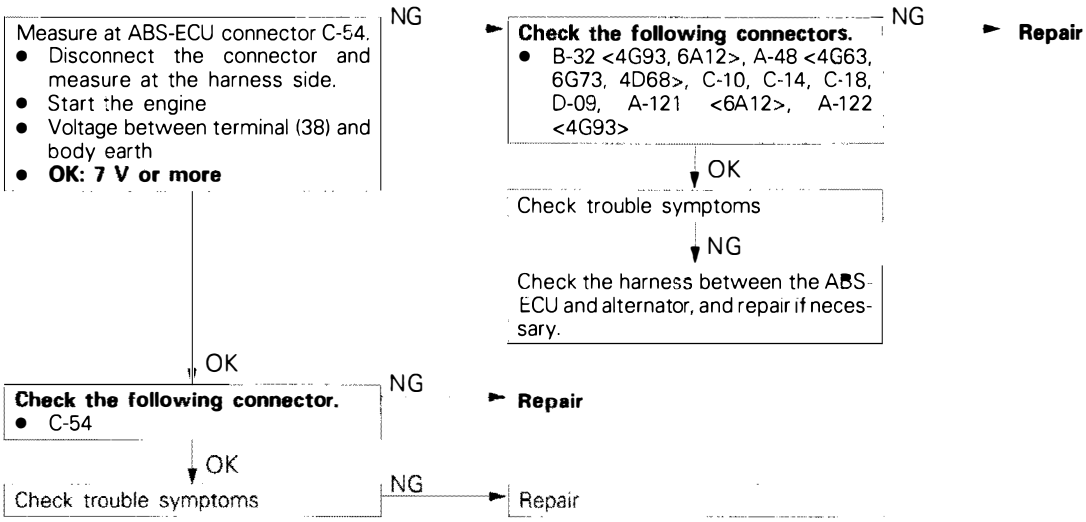
Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
[Comment] There is probably a short in the ABS warning lamp illumination circuit. In addition, if the charge lamp is illuminated at the same time, the cause is likely to be the warning lamp illumination circuit between the alternator and the ABS-ECU.	• Malfunction of combination meter • Malfunction of ABS valve relay • 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

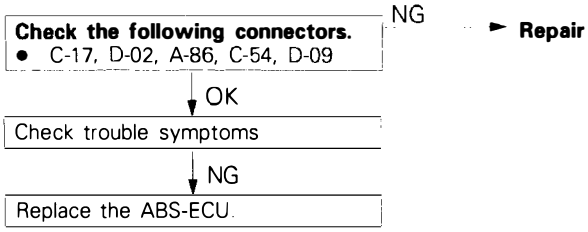
The ABS warning lamp switches OFF approximately 1.0 second after the ignition key is turned to "ON".	Probable cause
[Comment] The ABS-ECU monitors the voltage of the alternator L terminal, and when the engine is not running, the voltage of the L terminal is low, and thus the ABS warning lamp illuminates. [Hint] Accordingly, when the ignition key is turned to "ON", if the lamp turns off after the initial check (which takes about 1.0 second), there is a problem in the ABS warning lamp illumination function resulting from the alternator L terminal monitor.	• Malfunction of wiring harness or connector • Malfunction of alternator • Malfunction of ABS-ECU



Inspection Procedure 6

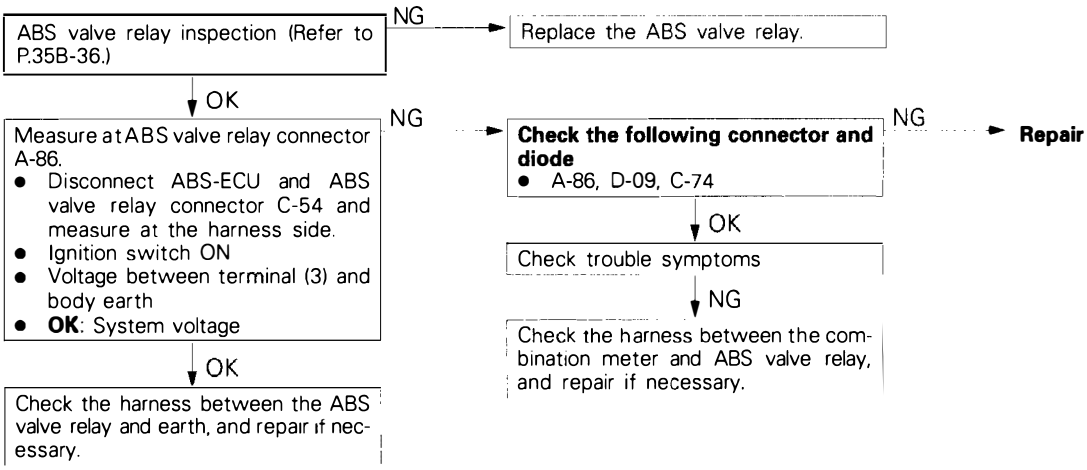
The ABS warning lamp flashes when the ignition switch is turned to "ON"	Probable cause
[Hint] The cause is probably an open circuit (defective contact) in the ABS warning lamp circuit.	• Malfunction of connector

NOTE
If the ABS warning lamp is flashing, the reason may be that the diagnosis display mode using the warning lamp is active. (Diagnosis display mode using the warning lamp can be cancelled by turning the ignition switch to OFF or driving the car forward until the vehicle speed reaches 10 km/h.)



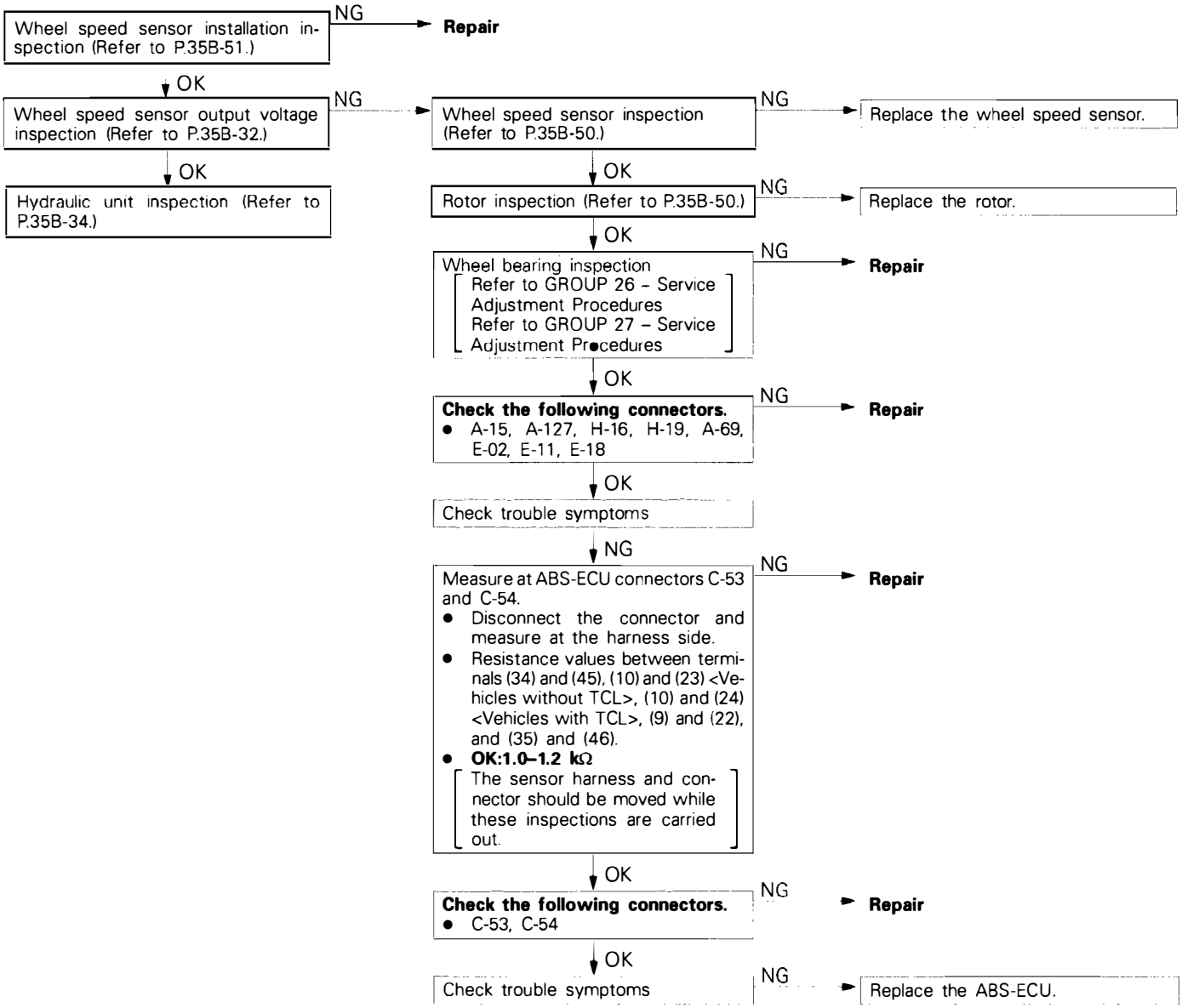
Inspection Procedure 7

When ignition key is turned to "START", ABS warning lamp switches off	Probable cause
[Comment] The ABS-ECU uses the power to the IG2 which is cut when the ignition switch is turned to "START". The ABS warning lamp uses IG1 power which is not cut even when the ignition switch is turned to "START". [Hint] Accordingly, because the power to the ABS-ECU is stopped in "START" position, if the warning lamp switches off at this time, the cause is a problem in the lamp illumination circuit in the valve relay.	• Malfunction of wiring harness or connecter • Malfunction of ABS valve relay • Malfunction of ignition switch



Inspection Procedure 8

Brake operation is abnormal	Probable cause
[Comment] This varies depending on the driving conditions and the road surface conditions, so problem diagnosis is difficult. However, if a normal diagnosis code is displayed, carry out the following inspection.	• Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU



SERVICE DATA OUTPUT CHECK

E35BE05AA

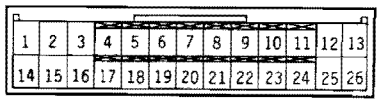
With the MUT-II, check the service data.

SERVICE DATA INSPECTION LIST

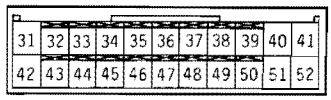
Item No.	Check point	Check condition	Normal condition
11	Front right wheel speed sensor	Check by actually operating vehicle.	Speedometer indication and MUT-II indication coincide.
12	Front left wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
16	System voltage	IG power voltage and valve monitor voltage	9–16 V
31	Pedal stroke sensor	Changes in accordance with the amount of pedal depression.	0.47–4.53 V
33	Stop lamp switch	Depress brake pedal.	ON
		Do not depress brake pedal.	OFF
53	Motor (Hydraulic unit)	While ABS is operating (when one wheel or more is in pressure increase mode)	ON
		At other times	OFF

ECU-TERMINAL INSPECTION

E35BE06AA



14X0187



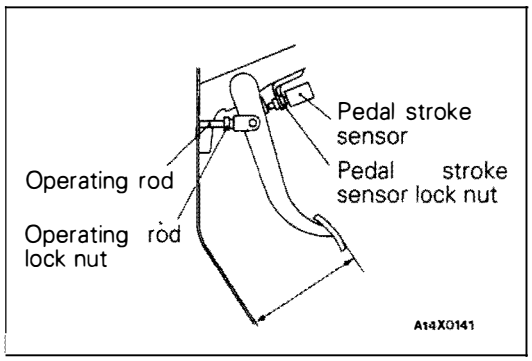
14X0186

Item No.	Check point	Check condition	Normal condition
1	F.R. solenoid valve <Outside> (Output) of hydraulic unit	Ignition switch: ON (when solenoid valve turns OFF approximately 1 second after the engine is started)	System voltage
2	F.R. solenoid valve <Inside> (Output) of hydraulic unit		
3	R.L. solenoid valve <Inside> (Output) of hydraulic unit		
4	Stop lamp switch (Input)	Ignition switch: ON (Stop lamp switch ON)	System voltage
		Ignition switch: ON (Stop lamp switch OFF)	1.0 V or less
5	Diagnosis communication (Input/ Output)	MUT-II: Connected	Serial communication with MUT-II
		MUT-II: Disconnected	1 V or less
7	Pedal stroke sensor (Input)	Changes in accordance with the amount of pedal depression.	0.47–4.53 V

Item No.	Check point	Check condition		Normal condition
8	Wheel speed sensor data (Output)	Vehicle with 4WS	When vehicle is stopped	0 V – System voltage
			When vehicle is moving (voltage changes in accordance with the wheel speed)	
9	Rear right wheel speed sensor <+ Wire>	Ignition switch: OFF Between terminals No. 9 and No. 22		1.0–1.2 kΩ
10	Front left wheel speed sensor <– Wire>	At any time		Continuity
11	Memory power supply	At any time		System voltage
12	ECU power supply	Ignition switch: ON		System voltage
13	Valve relay (Output)	Ignition switch: ON	When relay turns ON approximately 1 second after the engine is started	0 V
			When system abnormality detection relay is OFF	System voltage
14	Earth	At any time		Continuity
15	R.L. solenoid valve <Outside> (Output) of hydraulic unit	Ignition switch: ON (when solenoid valve turns OFF approximately 1 second after the engine is started)		System voltage
20	Pedal stroke sensor	At any time		Continuity
21*	TCL data (Input)	Vehicles with TCL		0 V – System voltage
22	Rear right wheel speed sensor <– Wire>	At any time		Continuity
23	Front left wheel speed sensor <+ Wire>	Ignition switch: OFF Between terminals No. 23 and No. 10		1.0–1.2 kΩ
24*	Front left wheel speed sensor <+ Wire>	Ignition switch: OFF Between terminals No. 24 and No. 10		1.0–1.2 kΩ
25 26	Earth	At any time		Continuity
31	Motor relay (Output)	Ignition switch: ON (when approximately 1 second passed after the engine is started)	Motor: ON	0 V
			Motor: OFF	System voltage
32	Pedal stroke sensor power supply	Ignition switch: ON		5 V
33	Motor sensor	Ignition switch: ON Between terminals No. 33 and No. 44		10–13 Ω
34	Front right wheel speed sensor <– Wire>	At any time		Continuity

Item No.	Check point	Check condition		Normal condition
35	Rear left wheel speed sensor <+ Wire>	Ignition switch: OFF Between terminal No. 35 and No. 46		1.0–1.2 kΩ
36*	TCL data (Input)	Vehicles with TCL		0 V – System voltage
37*	TCL data (Input)	Vehicle with TCL	When ABS fails	0 V
			At any time	System voltage
38	Alternator (Input)	Ignition switch: ON (while engine is stopped)		2–5 V
		Ignition switch: ON (while engine is running)		System voltage
39	ABS warning lamp (Output)	Ignition switch: ON	When lamp is switched off	System voltage
			When lamp is illuminated	0–2 V
40	F.L. solenoid valve <Outside> (Output) of hydraulic unit	Ignition switch: ON (when solenoid valve turns OFF approximately 1 second after the engine is started)		System voltage
41	F.L. solenoid valve <Inside> (Output) of hydraulic unit			
43	Valve relay monitor (Input)	Ignition switch: OFF		Continuity
		Ignition switch: ON		System voltage
44	Motor sensor	At any time		Continuity
45	Front right wheel speed sensor <+ Wire>	Ignition switch: OFF Between terminals No. 45 and No. 34		1.0–1.2 kΩ
46	Rear left wheel speed sensor <– Wire>	At any time		Continuity
47*	TCL data (Input)	Vehicle with TCL		0 V – System voltage
48*	TCL data (Input)	Vehicles with TCL	When ABS operates	0 V
			At any time	System voltage
51	R.R. solenoid valve <Outside> (Output) of hydraulic unit	Ignition switch: ON (when solenoid valve turns OFF approximately 1 second after the engine is started)		System voltage
52	R.R. solenoid valve <Inside> (Output) of hydraulic unit			

NOTE
* :Vehicles with TCL



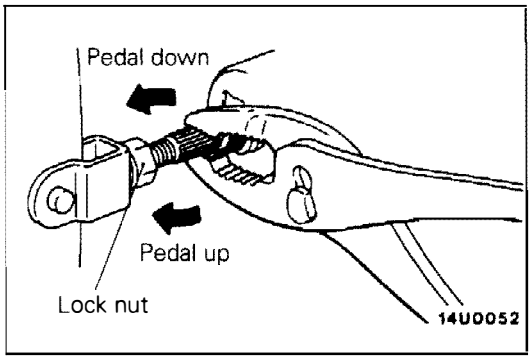
SERVICE ADJUSTMENT PROCEDURES

E35BF00AA

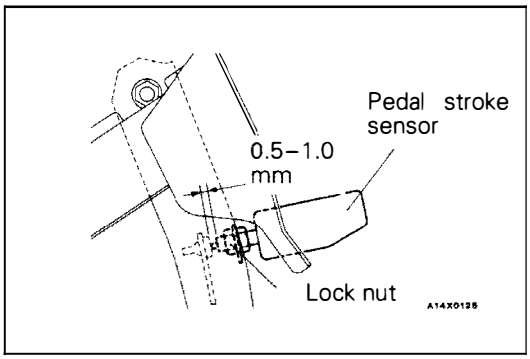
BRAKE PEDAL INSPECTION AND ADJUSTMENT

1. Measure the brake pedal height as illustrated. If the brake pedal height is not within the standard value, adjust as follows.

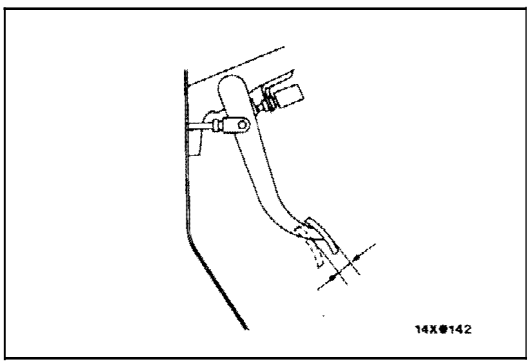
   Standard value: 175–180 mm



   (1) Disconnect the pedal stroke sensor connector, loosen the lock nut, and move the pedal stroke sensor to a position where it does not contact the brake pedal arm.
   (2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.



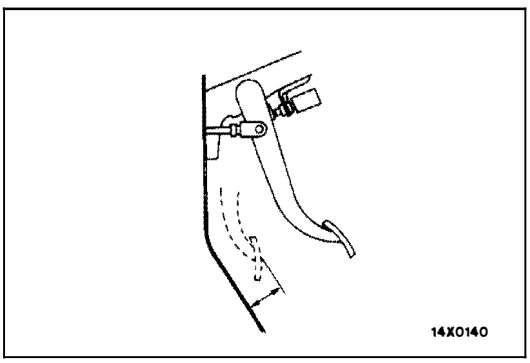
   (3) Push in the pedal stroke sensor until the plunger dimension is as shown in the illustration, and then secure the pedal stroke sensor with the lock nut.
   Install so that the pedal stroke sensor connector is at the right aside at this time.
   (4) Connect the connector of the pedal stroke sensor.
   (5) Check to be sure that the stop lamp is not illuminated with the brake pedal unpressed.



2. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value range.

   Standard value: 3–8 mm

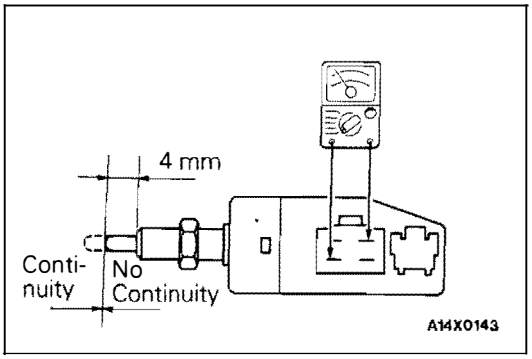
   If the free play exceeds the standard value, it is probably due to excessive play between the clevis pin and brake pedal arm. Check for excessive clearance and replace faulty parts as required.



3. Start the engine, depress the brake pedal with approximately 490 N of force, and measure the clearance between the brake pedal and the floorboard.

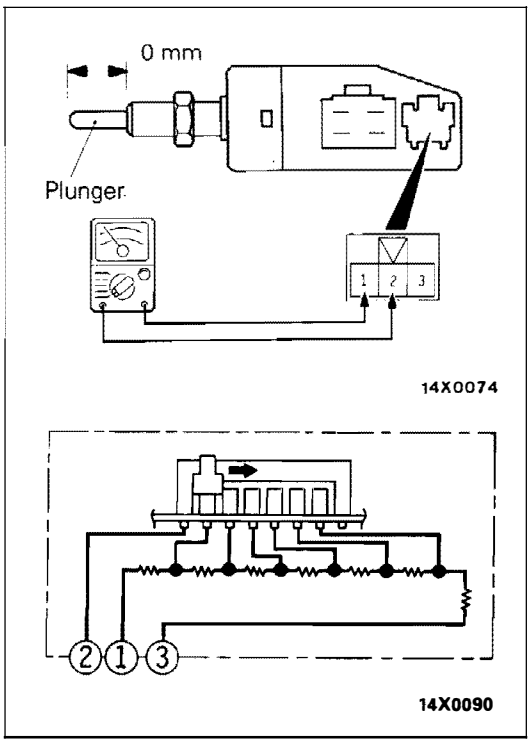
   Standard value: 90 mm or more

   If the clearance is outside the standard value, check for air trapped in the brake line, clearance between the lining and the drum and dragging in the parking brake.
   Adjust and replace defective parts as required.



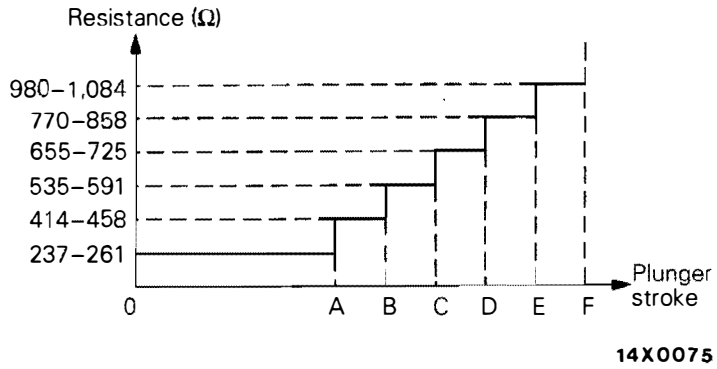
STOP LAMP SWITCH INSPECTION E35BF01AA

Connect a circuit tester to the connector for the stop lamp switch in the pedal stroke sensor and check whether or not there is continuity when the plunger of the stop lamp switch is pushed in and when it is released.
The stop lamp switch is in good condition if there is no continuity when the plunger is pushed in to a depth of within 4 mm from the outer case edge surface, and if there is continuity when it is released.



PEDAL STROKE SENSOR INSPECTION E35BF30AA

1. Check if the plunger of the pedal stroke sensor moves smoothly. If it is defective, replace the pedal stroke sensor.
2. Check that the resistance changes as follows when the plunger is moved. If it is defective, replace the pedal stroke sensor.



	Plunger stroke (mm)		Plunger stroke (mm)
A	3.5–4.5	D	12.9–13.9
B	6.7–7.7	E	16.0–17.0
C	9.8–10.8	F	17.5–18.5

BLEEDING E35AF07AA

Caution
Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

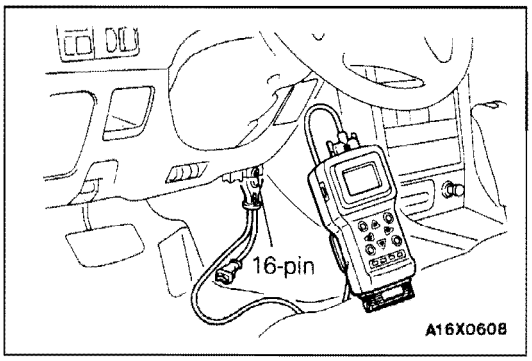
Specified brake fluid: DOT3 or DOT4

MASTER CYLINDER BLEEDING E35BF07BA

Refer to GROUP 35A – Service Adjustment Procedures.

HYDRAULIC UNIT (HU) BLEEDING E35BF07CA

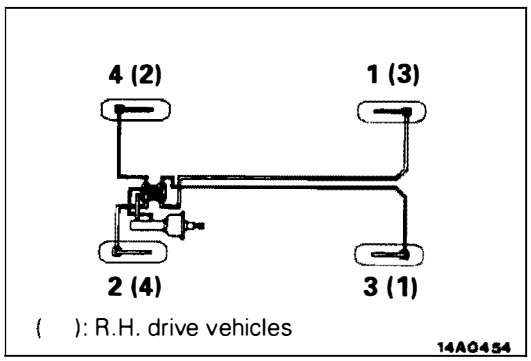
Caution
1. **When replacing the hydraulic unit or if the system is being left for a long period of time with no brake fluid, the MUT-II should be used to bleed the air from the hydraulic unit.**
2. **Connection and disconnection of the MUT-II should always be carried out with the ignition switch in the OFF position.**



1. Set the MUT-II as shown in the illustration.
2. Start the engine and run it at idle.
3. Operate the MUT-II to force-drive the actuator (item No. 05) in order to bleed the air from the hydraulic unit.

Caution
1. **While bleeding the air, some brake fluid should be added so that there is always some fluid inside the reservoir tank.**
2. **A filter should be installed to the reservoir tank when adding the brake fluid.**
3. **After bleeding the air from the hydraulic unit, always be sure to bleed the air from the brake line.**

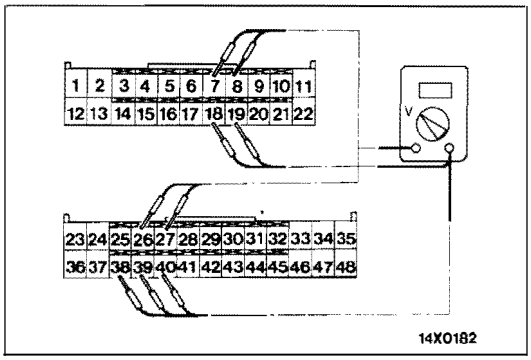
NOTE
If the function is stopped by the fail-safe, forced driving of the actuator cannot be carried out.



BRAKE PIPE LINE BLEEDING E36BF07DA

Start the engine and bleed the air in the sequence shown in the figure.

Caution
For vehicles with ABS, be sure to install a filter to the master cylinder reservoir tank when supplying brake fluid.



ABS OPERATION CHECK

E35BF31AA

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ECU harness connector and measure from the harness side connector.

Caution
Be sure to remove the connector double lock and insert the probe into the harness side. Inserting it into the terminal side will result in a bad connection.

3. Rotate the wheel to be measured at approximately 1/2–1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

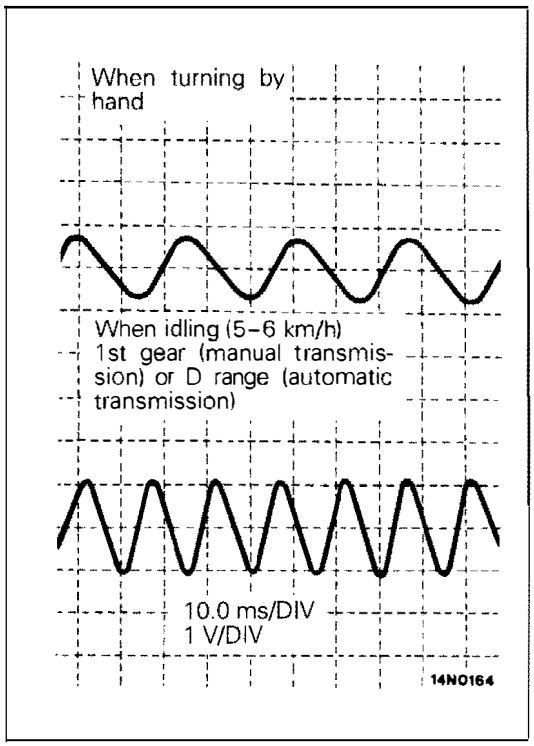
	Front left	Front right	Rear left	Rear right
Terminal No.	26	8	27	7
	39, 38*	19	40	18

NOTE
* :Vehicles with TCL.

Output voltage
When measuring with a circuit tester:
70 mV or more
When measuring with an oscilloscope:
200 mV p-p or more

4. If the output voltage is lower than the above values, the reason could be as follow:
   - Faulty wheel speed sensor.

   So replace the wheel speed sensor.



Inspecting Wave Forms With An Oscilloscope

Use the following method to observe the output voltage wave form from each wheel sensor with an oscilloscope

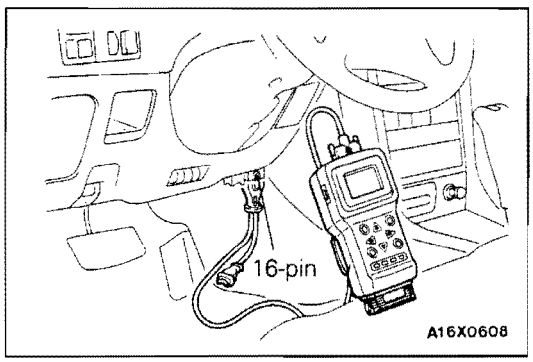
- Start the engine, and rotate the front wheels by engaging 1st gear (vehicles with manual transmission) or D range (vehicles with automatic transmission). Turn the rear wheels manually so that they rotate at a constant speed.

NOTE
1. Check the connection of the sensor harness and connector before using the oscilloscope.
2. The wave form measurements can also be taken while the vehicle is actually moving.
3. The output voltage will be small when the wheel speed is low, and similarly it will be large when the wheel speed is high.

Points In Waveform Measurement

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
Waveform amplitude fluctuates excessively (this is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
Noisy or disturbed waveform	Open circuit in sensor	Replace sensor
	Open circuit in harness	Correct harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	Rotor with missing or damaged teeth	Replace rotor

NOTE
The wheel speed sensor cable moves following motion of the front or rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads and it functions normally on ordinary roads. It is, therefore, recommended to observe sensor output voltage waveform also under special conditions, such as rough road driving.



HYDRAULIC UNIT (HU) INSPECTION E35BF32AA

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

1. Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

   Caution
   1. The roller of the braking force tester and the tyre should be dry during testing.
   2. When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.

2. Release the parking brake, and feel the drag force (drag torque) on each road wheel.
   When using the braking force tester, take a reading of the brake drag force.
3. Turn the ignition key to the OFF position and set the MUT-II as shown in the diagram.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.

   NOTE
   1. At this time, the ABS system will switch to the MUT-II mode and the ABS warning lamp will illuminate.
   2. When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.

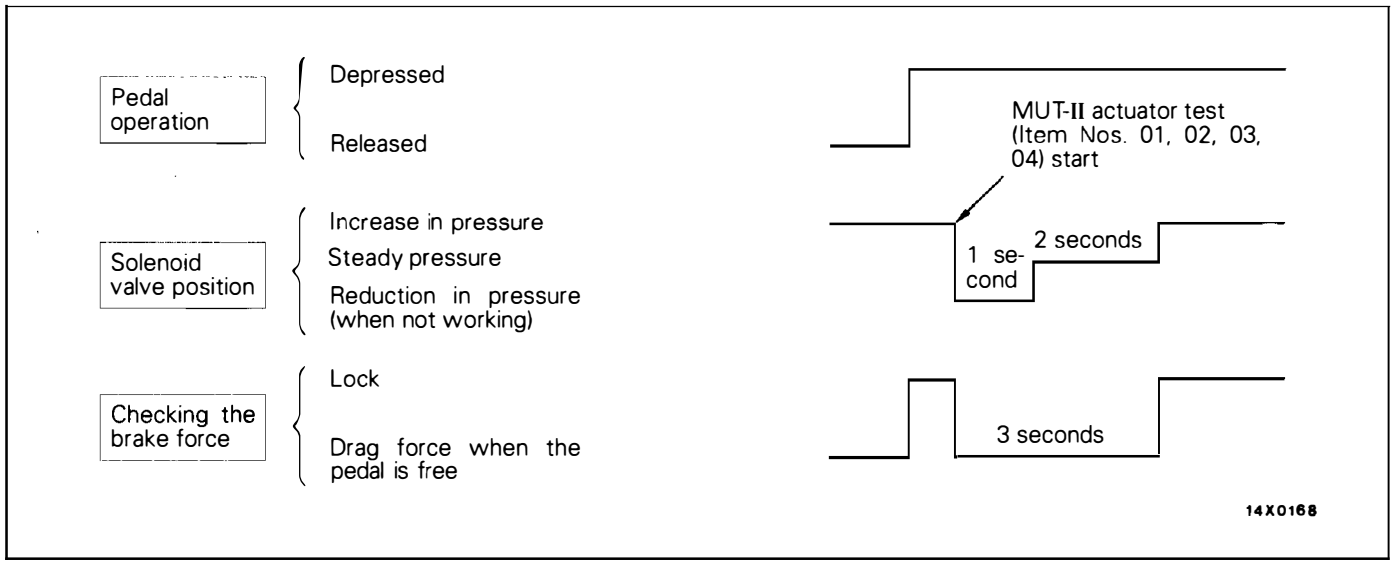
5. Use the MUT-II to force-drive the actuator.

6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed.
When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check to be sure that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven.

N

Front wheel	785–981
Rear wheel	588–785

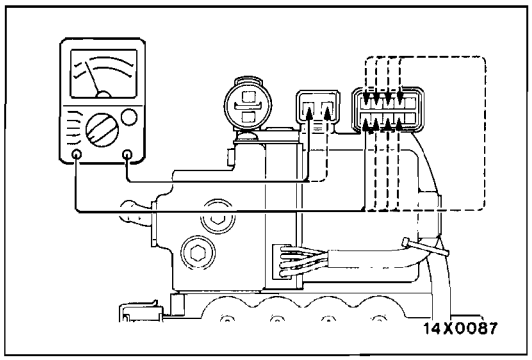
The result should be as shown in the following diagram.
7. If the result of inspection is abnormal, correct according to the "Diagnosis Table."



Diagnosis Table

No.	Operation	Judgement		Probable cause	Remedy
		Normal	Abnormal		
01	(1) Depress brake pedal to lock wheel. (2) Using the MUT-II, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel manually to check the change of brake force.	Brake force released for 3 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than HU	Check and clean brake line
02				Clogged hydraulic circuit in HU	Replace HU assembly
03			Brake force is not released	Incorrect HU brake tube connection	Connect correctly
04				HU solenoid valve not functioning correctly	Replace HU assembly

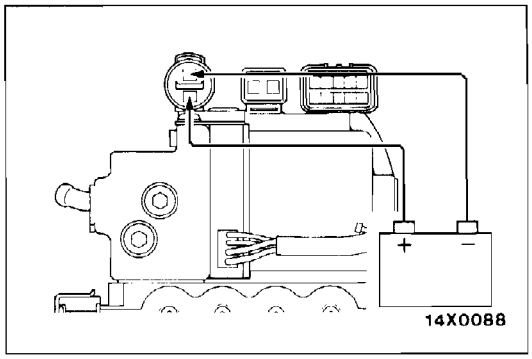
8. After inspection, disconnect the MUT-II immediately after turning the ignition switch to OFF.



SOLENOID VALVE CHECK E35BF33AA

Measure the resistance between terminals.

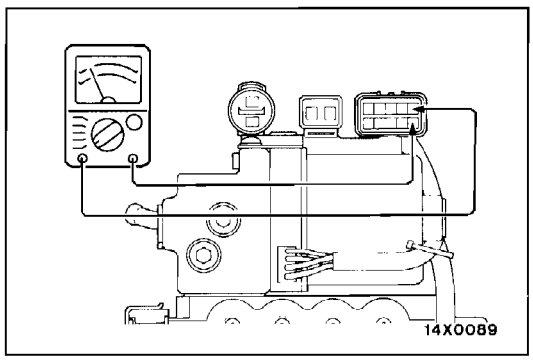
Standard value: 5.5–6.5Ω



MOTOR OPERATION CHECK E35BF34AA

Connect the battery and check to be sure that the sound of the hydraulic unit motor operating can be heard.

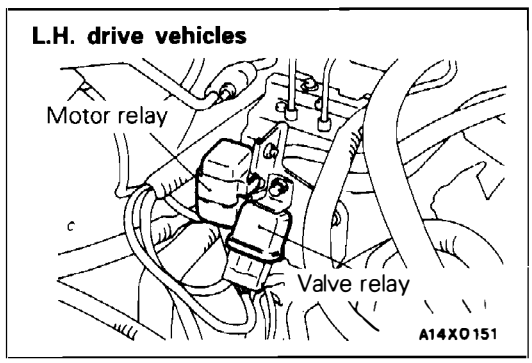
Caution
The battery power should not be applied for more than 1 second.



MOTOR REVOLUTION SENSOR CHECK E35BF35AA

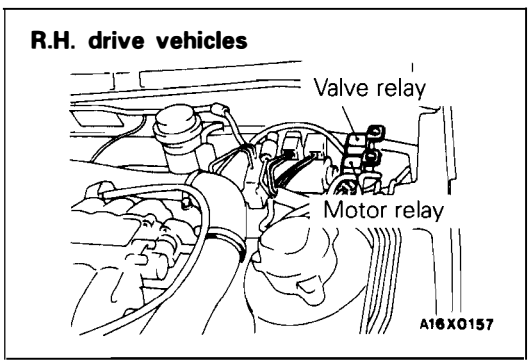
Measure the resistance between terminals.

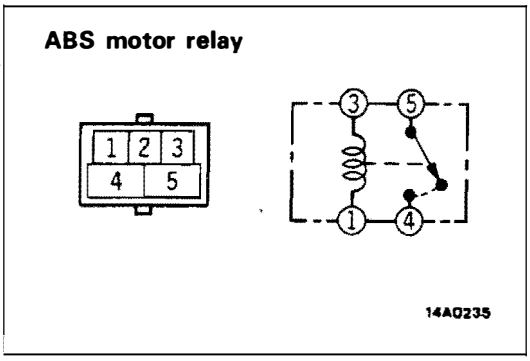
Standard value: 10–13Ω



MOTOR RELAY AND VALVE RELAY INSPECTION E35BF36AA

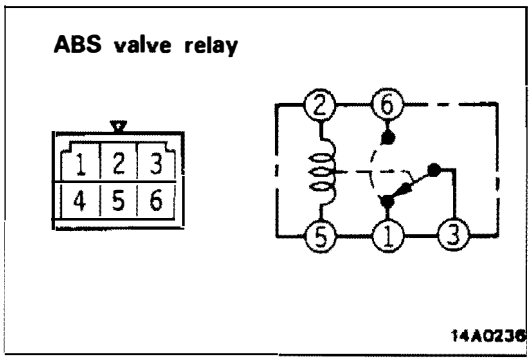
Check for continuity between the terminals of the relay with and without power as shown in the chart overleaf.





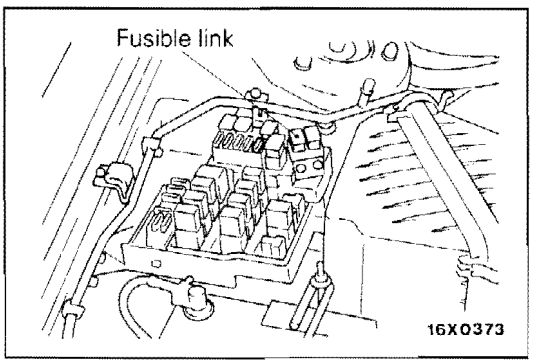
ABS motor relay <when energizing coil is at normal temperature (20°±15°C)>

When there is no current	Between terminals 3 and 1	74±25Ω
	Between terminals 4 and 5	No continuity (∞ Ω)
When there is current between terminals 3 and 1	Between terminals 4 and 5	Continuity (approx. 0Ω)



ABS valve relay <when energizing coil is at normal temperature (20°±15°C)>

When there is no current	Between terminals 2 and 5	80±25Ω
	Between terminals 1 and 3	Continuity (approx. 0Ω)
	Between terminals 3 and 6	No continuity (∞ Ω)
When there is current between terminals 2 and 5	Between terminals 1 and 3	No continuity (∞ Ω)
	Between terminals 3 and 6	Continuity (approx. 0Ω)



REMEDY FOR A FLAT BATTERY E35BF37AA

When booster cables are used to start the engine when the battery is completely flat and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire, and driving might not be possible.

This happens because ABS consumes a great amount of current for its self-check function; the remedy is to either allow the battery to recharge sufficiently, or to remove the fusible link for ABS circuit, thus disabling the anti-skid brake system. The ABS warning lamp will illuminate when the fusible link (for ABS) is removes.

After the battery has sufficiently charged, install the fusible link (for ABS) and restart the engine; then check to be sure the ABS warning lamp is not illuminated.

BRAKE PEDAL <M/T>

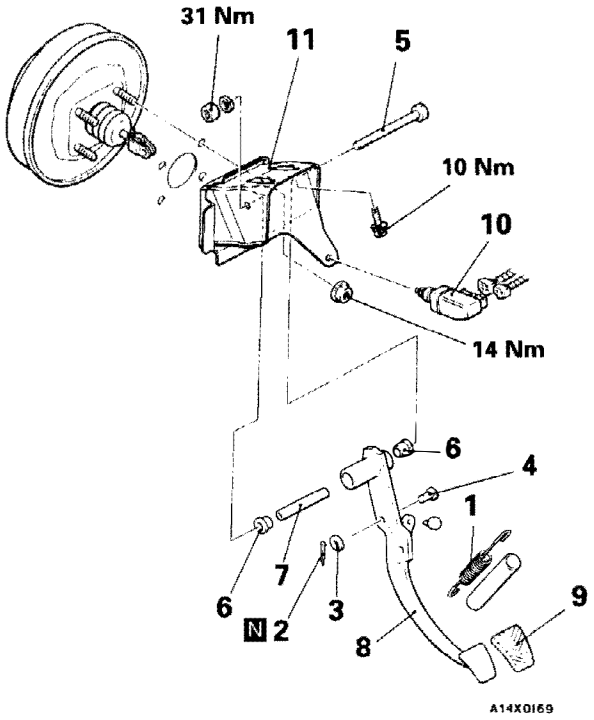
E35BG00AA

REMOVAL AND INSTALLATION <L.H. drive vehicles>

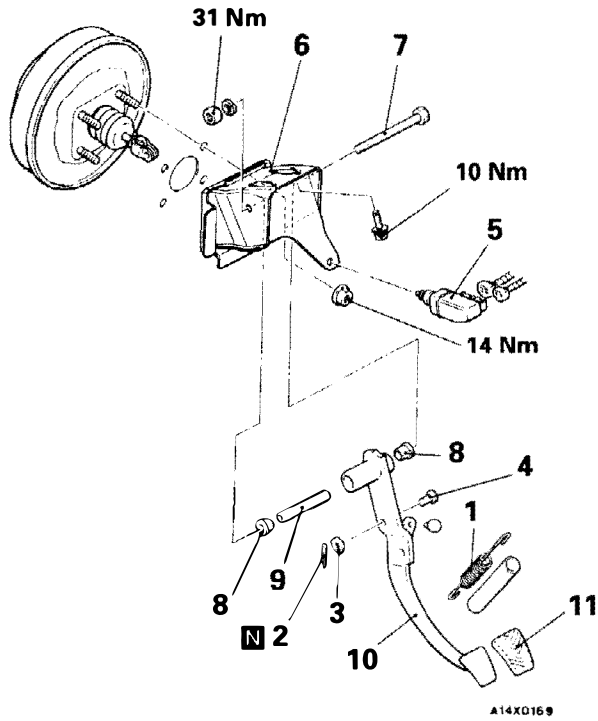
Pre-removal Operation
- Distribution Duct and Lap Cooler Duct Removal (Refer to GROUP 55 – Duct.)

Post-installation Operation
- Distribution Duct and Lap Cooler Duct Installation (Refer to GROUP 55 – Duct.)
- Brake Pedal Adjustment (Refer to P.35B-29.)

<Vehicles without high tilt steering>

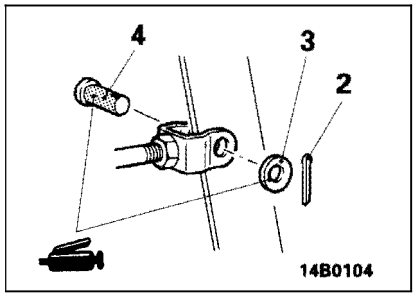


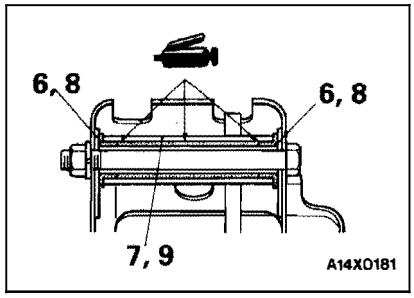
<Vehicles with high tilt steering>



Removal steps <Vehicles without high tilt steering>
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Brake pedal shaft bolt
6. Bushing
7. Spacer
8. Brake pedal
9. Pedal pad
10. Pedal stroke sensor
11. Pedal support member assembly

Removal steps <Vehicles with high tilt steering>
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Pedal stroke sensor
6. Pedal support member assembly
7. Brake pedal shaft bolt
8. Bushing
9. Spacer
10. Brake pedal
11. Pedal pad

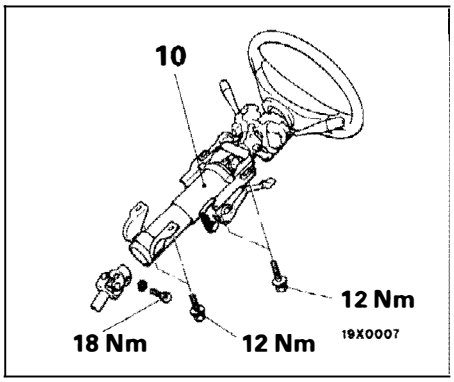


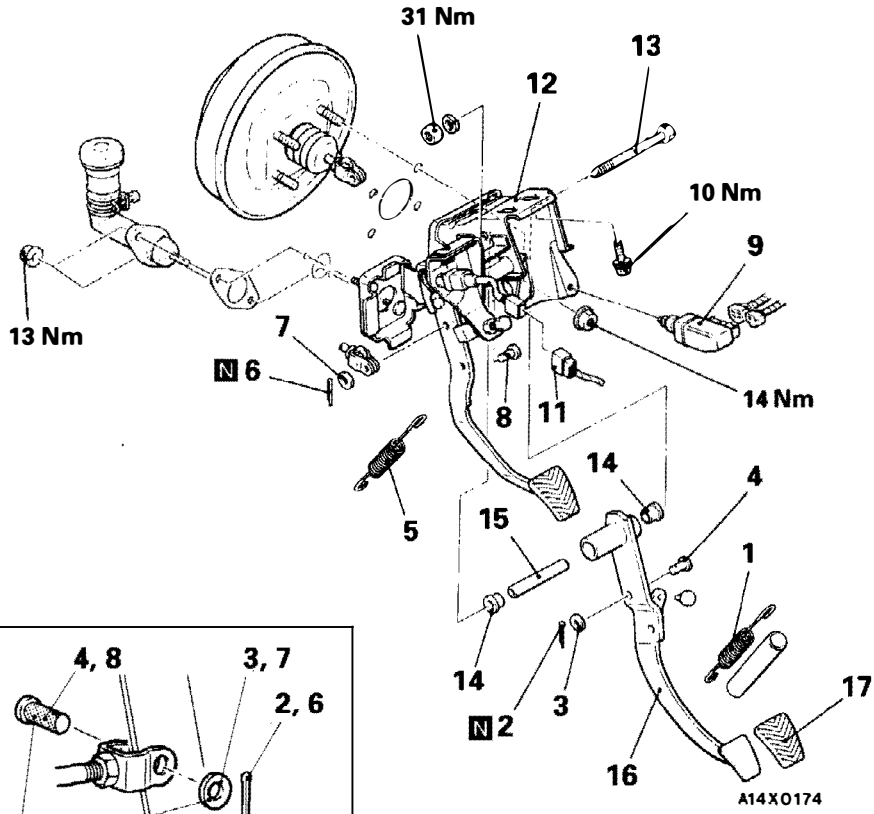


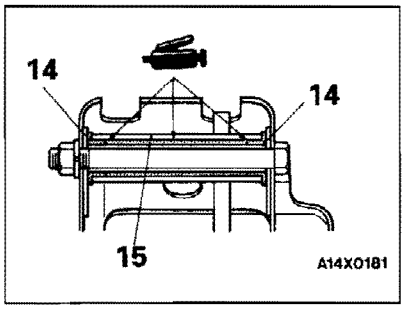
REMOVAL AND INSTALLATION <R.H. drive vehicles>

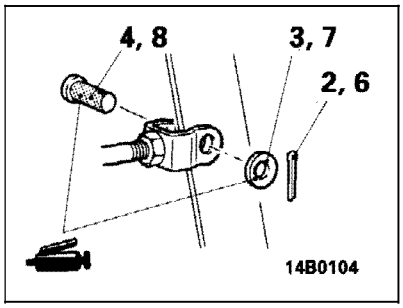
Pre-removal Operation
- Instrument Under Cover Removal (Refer to GROUP 52A – Instrument Panel.)
- Distribution Duct and Lap Cooler Duct Removal (Refer to GROUP 55 – Duct.)
- Column Cover Removal (Refer to GROUP 37A – Steering wheel and Shaft.)

Post-installation Operation
- Instrument Under Cover Installation (Refer to GROUP 52A – Instrument Panel.)
- Distribution Duct and Lap Cooler Duct Installation (Refer to GROUP 55 – Duct.)
- Column Cover Installation (Refer to GROUP 37A – Steering wheel and Shaft.)
- Brake Pedal Adjustment (Refer to P.35B-29.)









Removal steps
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Clutch pedal return spring <Except 6G73>
6. Split pin
7. Washer
8. Clevis pin
9. Pedal stroke sensor
10. Steering column assembly
11. Switch connector <Vehicles with TCL>
12. Pedal support member assembly
13. Brake pedal shaft bolt
14. Bushing
15. Spacer
16. Brake pedal
17. Pedal pad

BRAKE PEDAL <A/T>

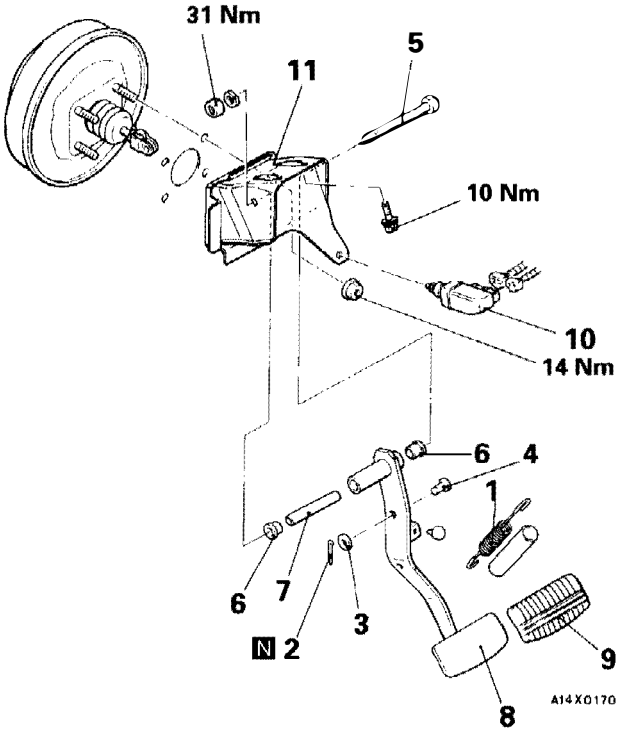
E35BG10AA

REMOVAL AND INSTALLATION

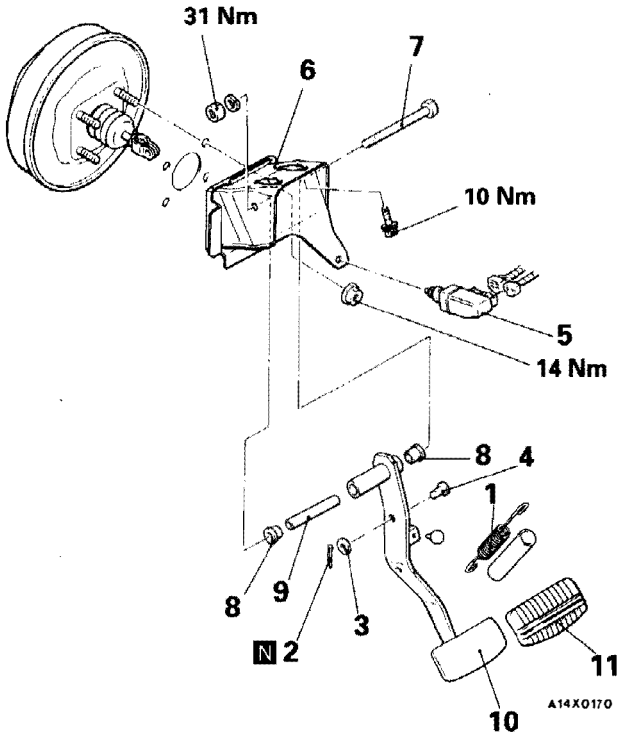
Pre-removal Operation
- Distribution Duct and Lap Cooler Duct Removal (Refer to GROUP 55 – Duct.)

Post-installation Operation
- Distribution Duct and Lap Cooler Duct Installation (Refer to GROUP 55 – Duct.)
- Brake Pedal Adjustment (Refer to P.35B-29.)

<Vehicles without high tilt steering>

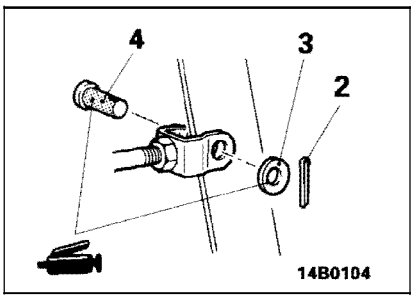


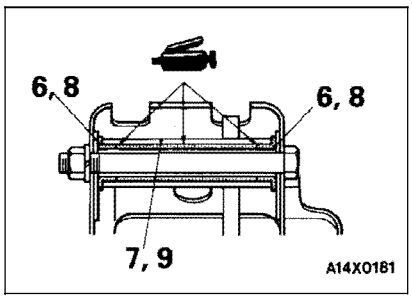
<Vehicles with high tilt steering>



Removal steps <Vehicles without high tilt steering>
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Brake pedal shaft bolt
6. Bushing
7. Spacer
8. Brake pedal
9. Pedal pad
10. Pedal stroke sensor
11. Pedal support member assembly

Removal steps <Vehicles with high tilt steering>
1. Brake pedal return spring
2. Split pin
3. Washer
4. Clevis pin
5. Pedal stroke sensor
6. Pedal support member assembly
7. Brake pedal shaft bolt
8. Bushing
9. Spacer
10. Brake pedal
11. Pedal pad





MASTER CYLINDER AND BRAKE BOOSTER <L.H. drive vehicles>

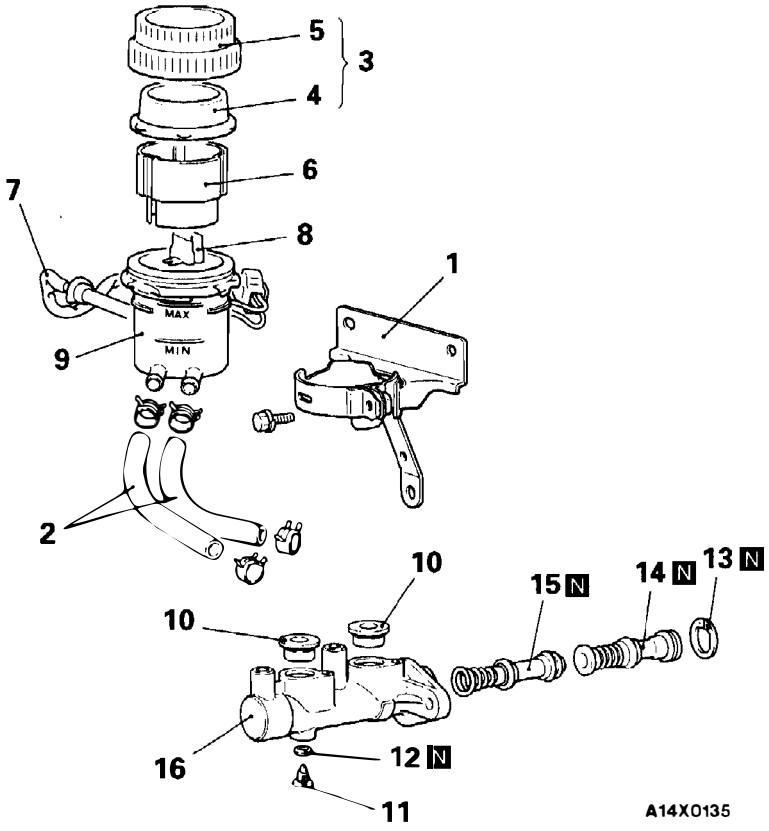
E35BH00AA

REMOVAL AND INSTALLATION

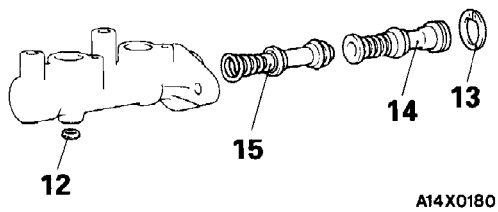
(Refer to GROUP 35A – Master Cylinder and Brake Booster <L.H. drive vehicles>)

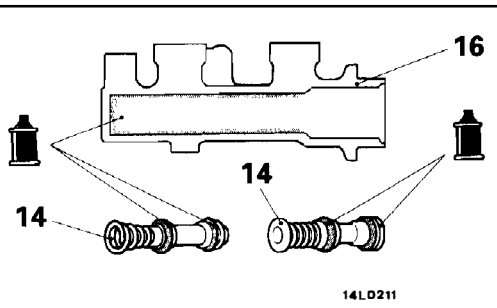
MASTER CYLINDER DISASSEMBLY AND REASSEMBLY

E35BH05AA



Master cylinder kit



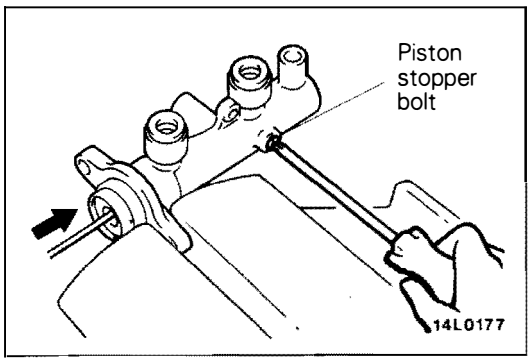


Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir bracket
2. Reservoir hose
3. Reservoir cap assembly ◇A◇
4. Diaphragm
5. Reservoir cap ◇B◇
6. Filter
7. Brake fluid level sensor
8. Float
9. Reservoir
10. Reservoir seal
11. Piston stopper bolt
12. Gasket
13. Piston stopper ring
14. Primary piston assembly
15. Secondary piston assembly
16. Master cylinder body

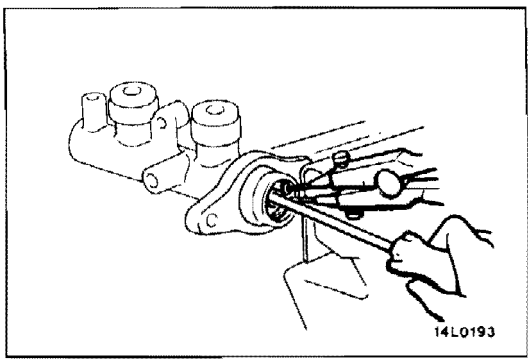
Caution
Do not disassemble the primary and secondary piston assembly.



DISASSEMBLY SERVICE POINTS E35AH06AA

◇A◇ PISTON STOPPER BOLT DISASSEMBLY

Remove the piston stopper bolt, while depressing the piston.



◇B◇ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION E35AH07AA

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, damage or wear.
- Check the diaphragm for cracks and wear.

MASTER CYLINDER AND BRAKE BOOSTER <R.H. drive vehicles>

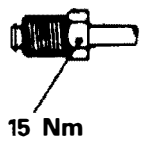
E35BH10AA

REMOVAL AND INSTALLATION

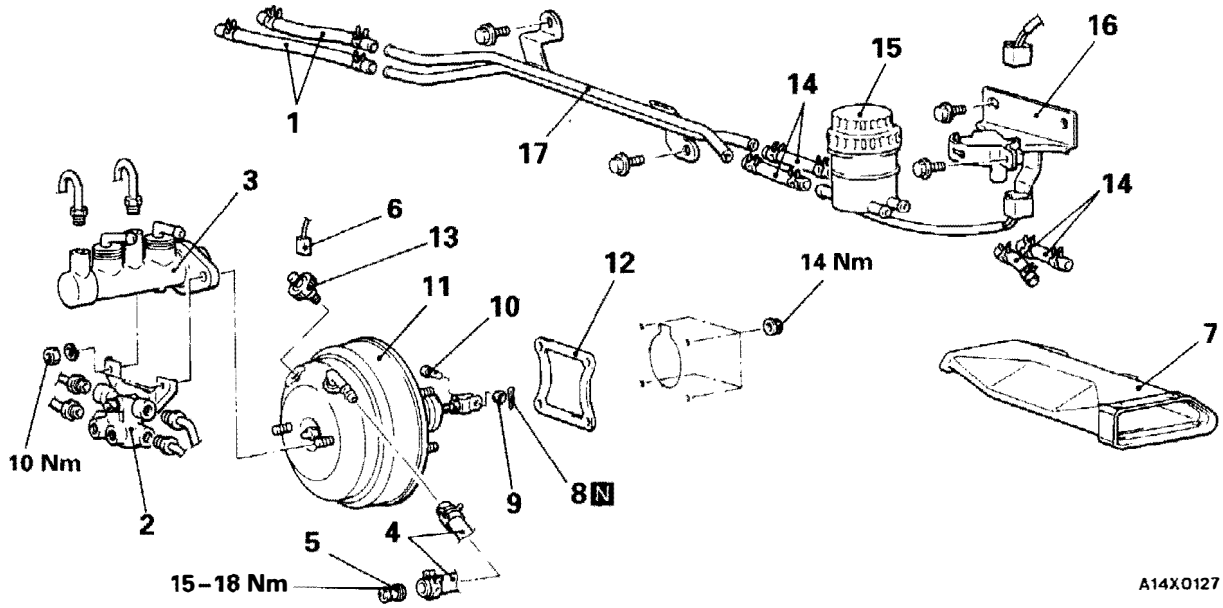
Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <MPI>
- Link Assembly and Vacuum Pump Assembly Removal
  <Vehicles with Auto-cruise Control>
  (Refer to GROUP 13G – Auto-cruise Control)

Post-installation Operation
- Brake Fluid Supplying
- Brake Lines Bleeding (Refer to P.35B-31.)
- Brake Pedal Adjustment
  (Refer to P.35B-29.)
- Air Intake Hose Installation <MPI>
- Link Assembly and Vacuum Pump Assembly Installation
  <Vehicles with Auto-cruise Control>
  (Refer to GROUP 13G – Auto-cruise Control)

Flared brake line nuts



14F038



A14X0127

Master cylinder removal steps
1. Brake hose
2. Proportioning valve
3. Master cylinder
- Adjustment of clearance between brake booster push rod and primary piston
  (Refer to GROUP 35A – Master Cylinder Brake Booster <L.H.>)

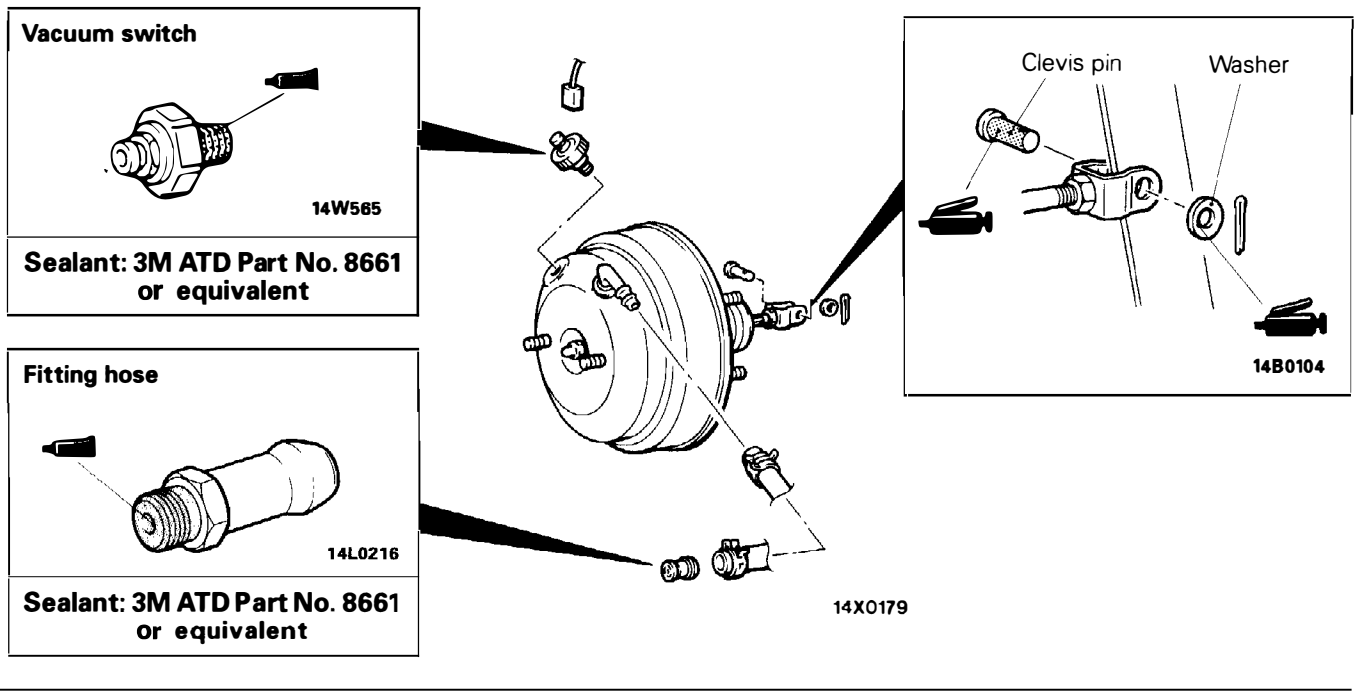
Reservoir tank removal steps
14. Brake hose
15. Reservoir
16. Reservoir tank bracket

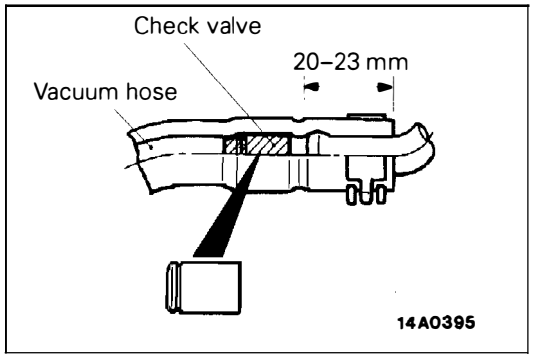
Caution
The check valve should not be removed from the vacuum hose. If the check valve is defective, replace it together with the vacuum hose.

Reservoir pipe assembly removal steps
1. Brake hose
14. Brake hose
17. Reservoir pipe assembly

Brake booster removal steps
3. Master cylinder assembly
4. Vacuum hose (With built-in check valve)
5. Fitting
6. Vacuum switch connector <4D68>
7. Shower foot duct
8. Split pin
9. Washer
10. Clevis pin
11. Brake booster
12. Sealer
13. Vacuum switch <4D68>

Grease points





INSTALLATION SERVICE POINTS E35AH04AA

◆A◆ VACUUM HOSE CONNECTION

(1) Install to the pipe part of the brake booster so that the amount of insertion of the vacuum hose is as shown in the figure.

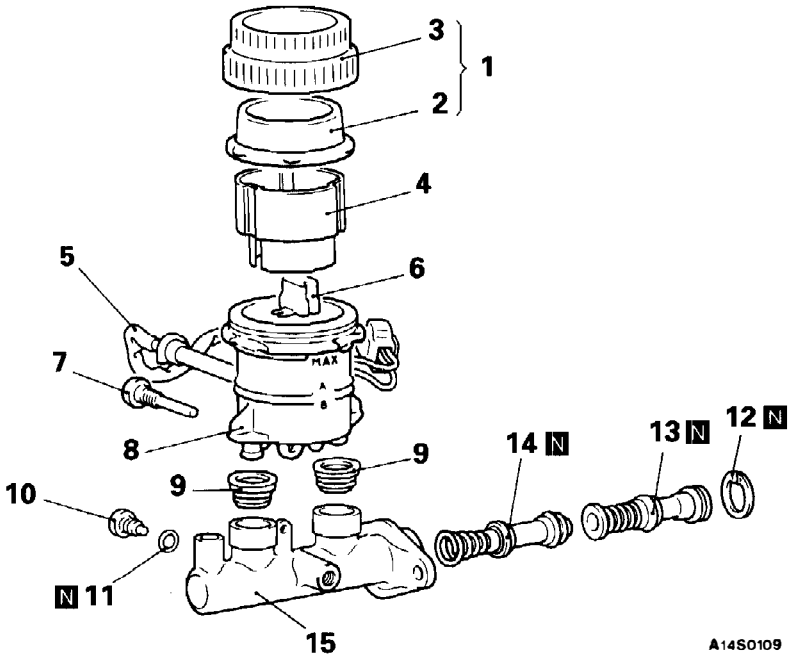
Caution
The check valve and the pipe part of the brake booster must not contact each other.

(2) Insert securely and completely until the vacuum hose at the engine side contacts the edge of the hexagonal part of the fitting, and then secure by using the hose clip.

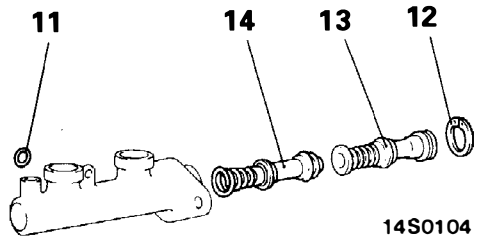
MASTER CYLINDER

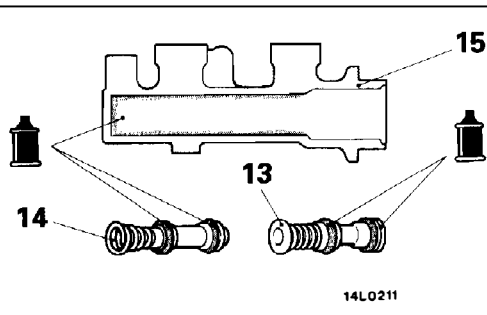
E35BH15AA

DISASSEMBLY AND REASSEMBLY



Master cylinder kit





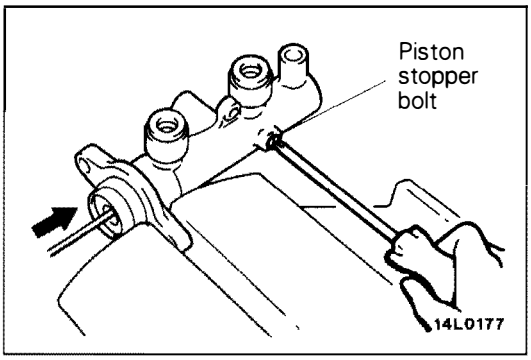
Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir cap assembly
2. Diaphragm
3. Reservoir cap
4. Filter
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt
8. Reservoir
9. Reservoir seal
10. Piston stopper bolt
11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body

〈A〉
〈B〉

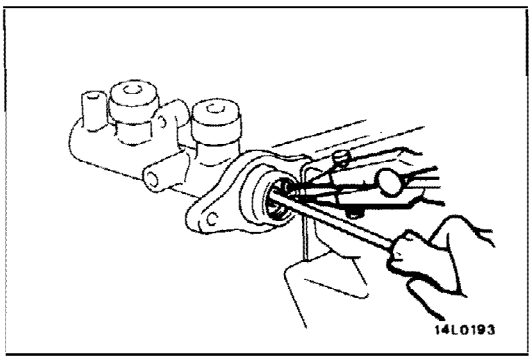
Caution
Do not disassemble the primary and secondary piston assembly.



DISASSEMBLY SERVICE POINTS E35AH06AA

◇A◇ PISTON STOPPER BOLT DISASSEMBLY

Remove the piston stopper bolt, while depressing the piston.



◇B◇ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION E35AH07AA

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, damage or wear.
- Check the diaphragm for cracks and wear.

PROPORTIONING VALVE

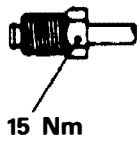
E35BM00AA

REMOVAL AND INSTALLATION

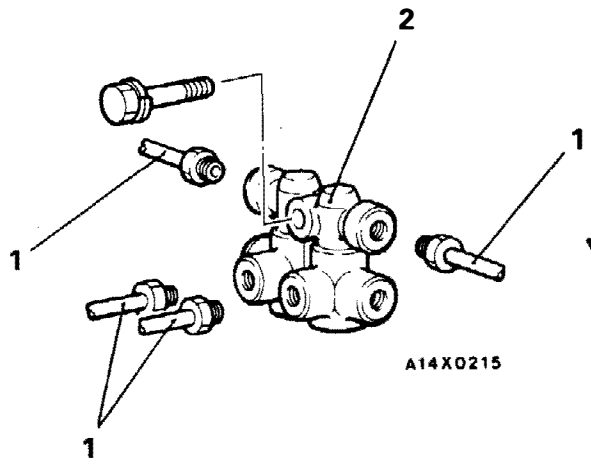
Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <MPI>

Post-installation Operation
- Brake Fluid Supplying
- Brake Lines Bleeding (Refer to P.35B-31.)
- Air Intake Hose Installation <MPI>

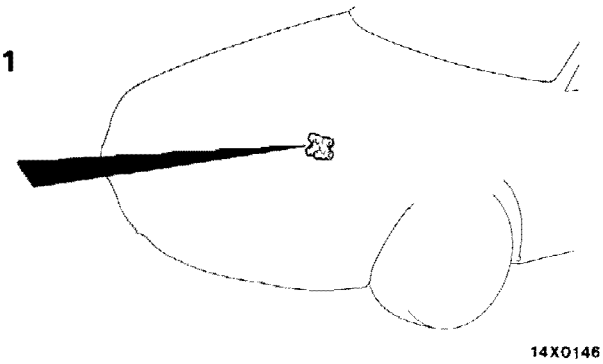
Flared brake line nuts



14F038



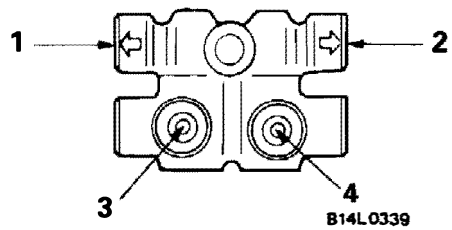
A14X0215



14X0146

Removal steps

◆A◆ 1. Brake pipe
2. Proportioning valve
3. Bracket



B14L0339

INSTALLATION SERVICE POINTS

E35BM04AA

◆A◆ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.
1. Proportioning valve – Rear brake (L.H.)
2. Proportioning valve – Rear brake (R.H.)
3. Proportioning valve – Hydraulic unit
4. Proportioning valve – Hydraulic unit

HYDRAULIC UNIT

E35BN00AA

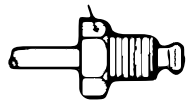
REMOVAL AND INSTALLATION

Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <MPI – L.H. drive vehicles>

Post-installation Operation
- Installation of the Air Intake Hose Removal <MPI – L.H. drive vehicles>
- Brake Fluid Supplying
- Brake Lines Bleeding (Refer to P.35B-31.)
- Hydraulic Unit Checking (Refer to P.35B-34.)

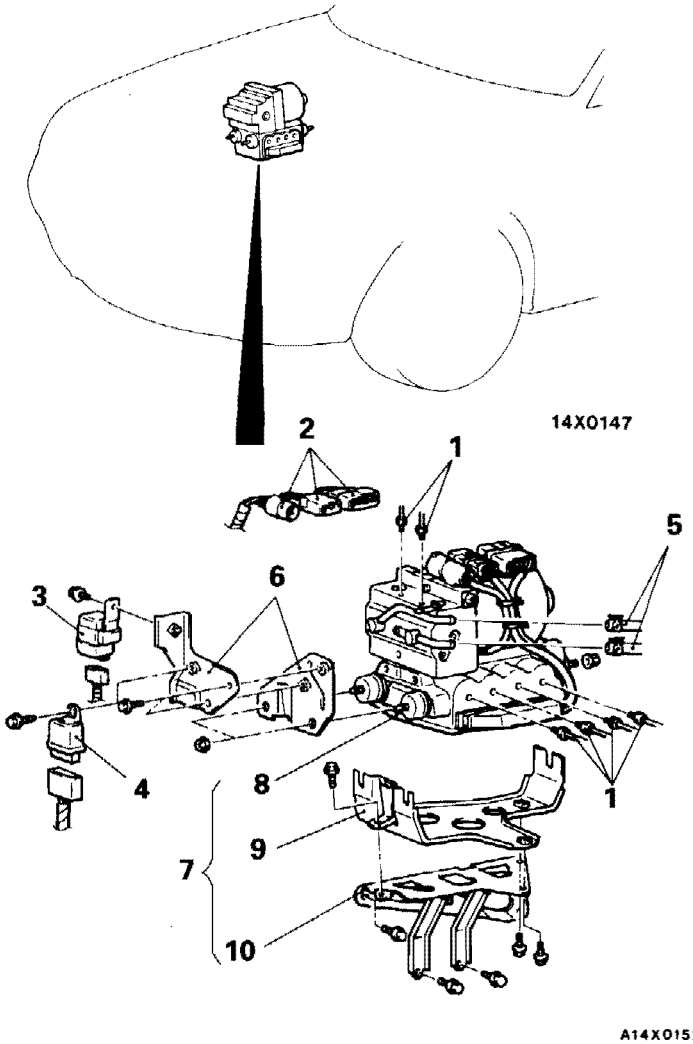
Flared brake line nuts

15 Nm

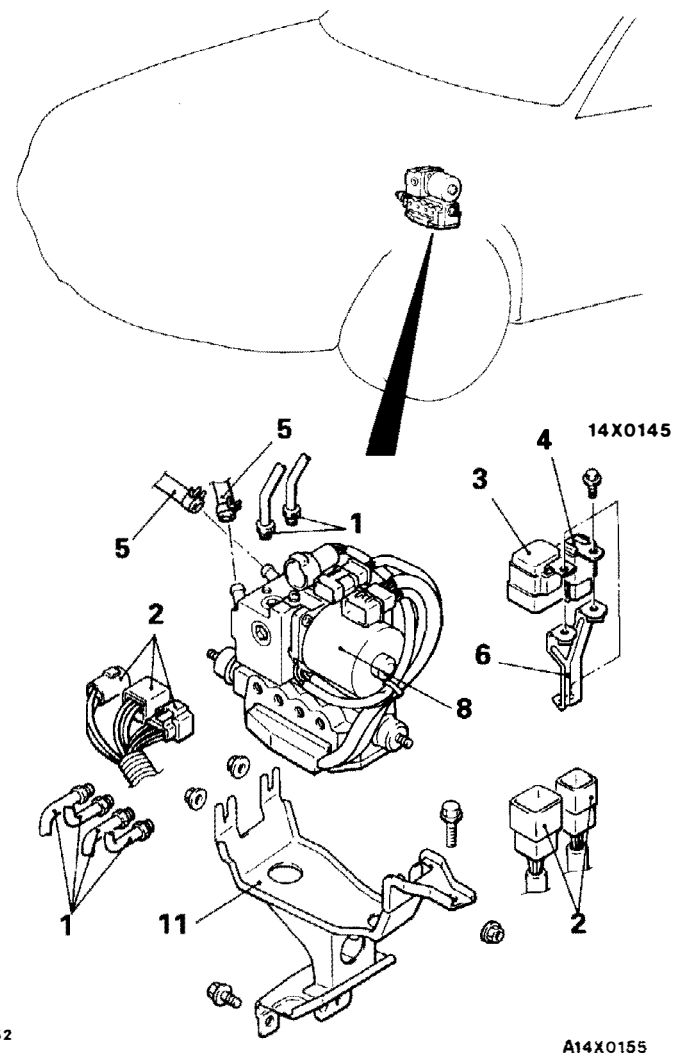


14S0035

<L.H. drive vehicles>



<R.H. drive vehicles>



Removal steps

◆A◆ 1. Connection for brake pipe
2. Connection for harness connector
3. Motor relay
4. Valve relay
5. Connection for brake hose
6. Bracket
7. Hydraulic unit assembly
◇A◇ 8. Hydraulic unit
9. Hydraulic unit bracket (A)
10. Hydraulic unit bracket (B)
11. Hydraulic unit bracket

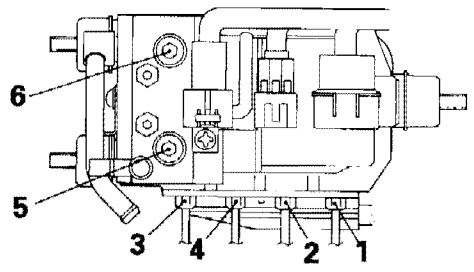
REMOVAL SERVICE POINTS E35BN01AA

〈A〉 HYDRAULIC UNIT REMOVAL

Caution

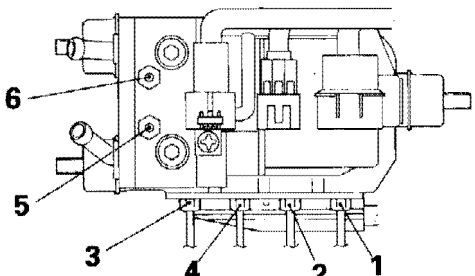
1. **The hydraulic unit is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit is not to be disassembled; its nuts and bolts should absolutely not be loosened.**
3. **The hydraulic unit must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit must not be turned upside down or laid on its side.**

<L.H. drive vehicles>



A14X0138

<R.H. drive vehicles>



A14X0137

INSTALLATION SERVICE POINTS E35BN04AA

◗A◖ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

1. Hydraulic unit – Front brake (L.H.)
2. Hydraulic unit – Rear brake (R.H.)
3. Hydraulic unit – Front brake (R.H.)
4. Hydraulic unit – Rear braker (L.H.)
5. Hydraulic unit – Master cylinder (for left front and right rear)
6. Hydraulic unit – Master cylinder (for right front and left rear)

WHEEL SPEED SENSOR

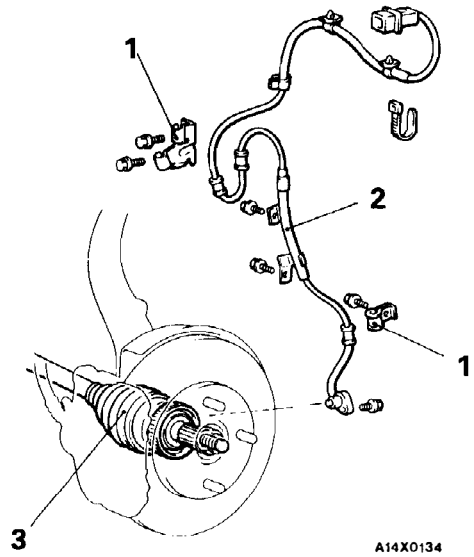
E35BO00AA

REMOVAL AND INSTALLATION

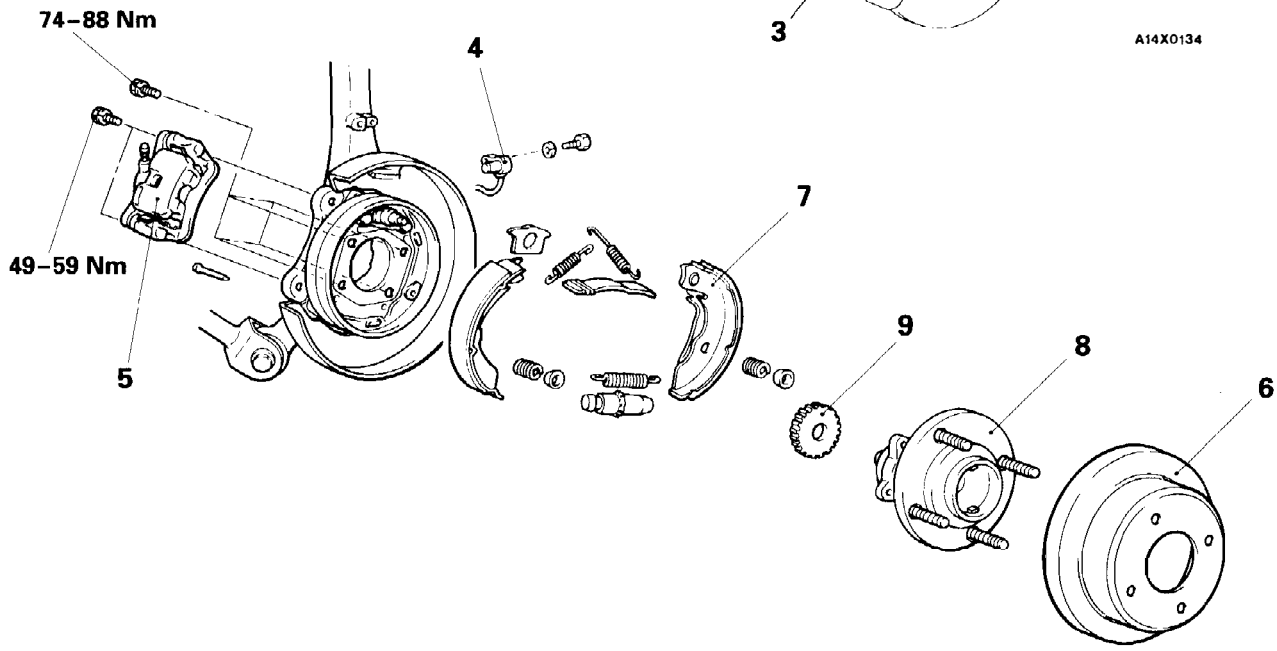
Pre-removal Operation
- Splash Shield Removal <Front only> (Refer to GROUP 42 – Fender.)

Post-installation Operation
- Wheel Speed Sensor Output Voltage Checking (Refer to P.35B-32.)
- Installation Splash Shield <Front only> (Refer to GROUP 42 – Fender.)

Front



Rear



Front speed sensor removal steps

◆A◆ 1. Clip
2. Front speed sensor

Front rotor removal

3. Drive shaft <Front rotor> (Refer to GROUP 26 – Drive shaft.)

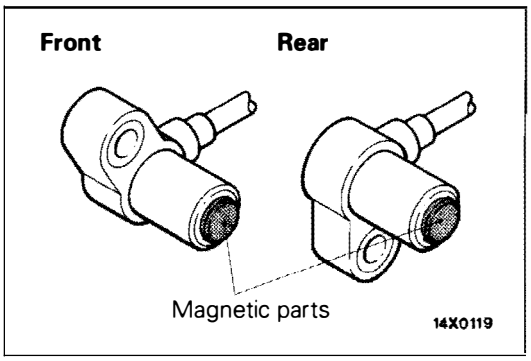
Rear speed sensor removal

◆A◆ 4. Rear speed sensor

Rear rotor removal step

5. Caliper assembly
6. Brake disc
7. Shoe and lining assembly (Refer to GROUP 36 – Parking Brakes <Drum in Disc Brake>.)
8. Rear hub assembly
9. Rotor

NOTE
The front rotor is integarted with the drive shaft and is not disassembled.

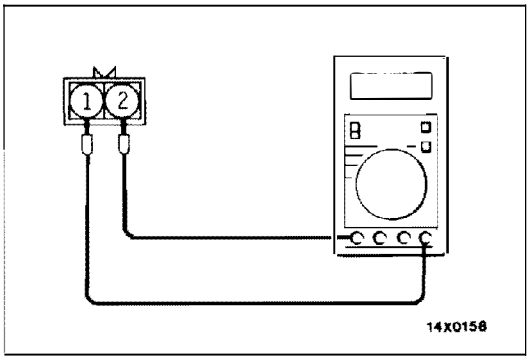


INSPECTION E35BO02AA

SPEED SENSOR

(1) Check whether any metallic foreign material has adhered to the parts shown in the illustration at the speed sensor tip, and is so, remove it.

NOTE
The section shown in the illustration can become magnetized because of the magnet built into the speed sensor, with the result that foreign metallic material easily adheres to it.



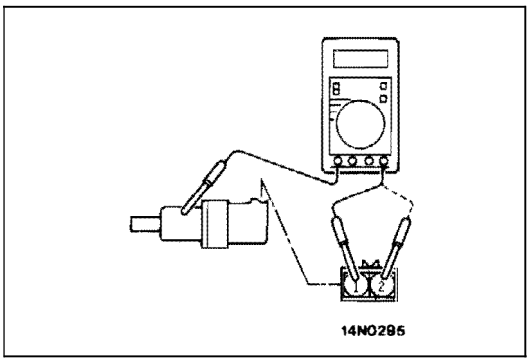
(2) Measure the resistance between the speed sensor terminals.

Standard value: 1.0–1.2 kΩ

If the internal resistance of the speed sensor is not within the standard value, replace with a new speed sensor.

(3) Check the speed sensor cable for breakage, damage or disconnection; replace with a new one if a problem is found.

NOTE
When checking for cable damage, remove the cable clamp part from the body and then bend and pull the cable near the clamp to check whether or not temporary disconnection occurs. Check the connector connection and the terminal insertion.

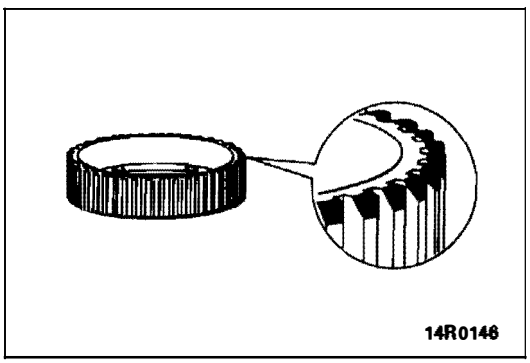


SPEED SENSOR INSULATION INSPECTION E35BO02BA

(1) Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

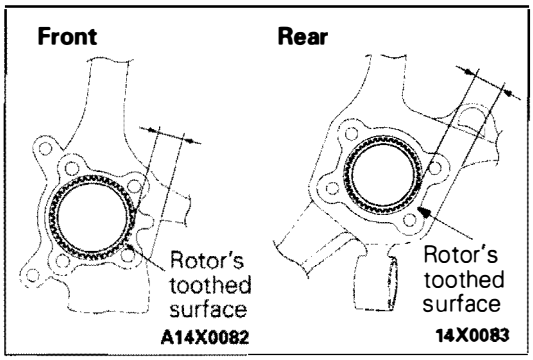
Standard value: 100 kΩ or more

(2) If the speed sensor insulation resistance is outside the standard value range, replace with a new speed sensor.



TOOTHED ROTOR E35BO02CA

Check whether rotor teeth are broken or deformed, and, if so, replace the rotor.



INSTALLATION SERVICE POINTS E35B004AA

◆A◆ FRONT SPEED SENSOR/REAR SPEED SENSOR INSTALLATION

The clearance between the speed sensor and the rotor's toothed surface is not adjustable, but measure the distance between the sensor installation surface and the rotor's toothed surface.

Standard value: 28.2–28.5 mm

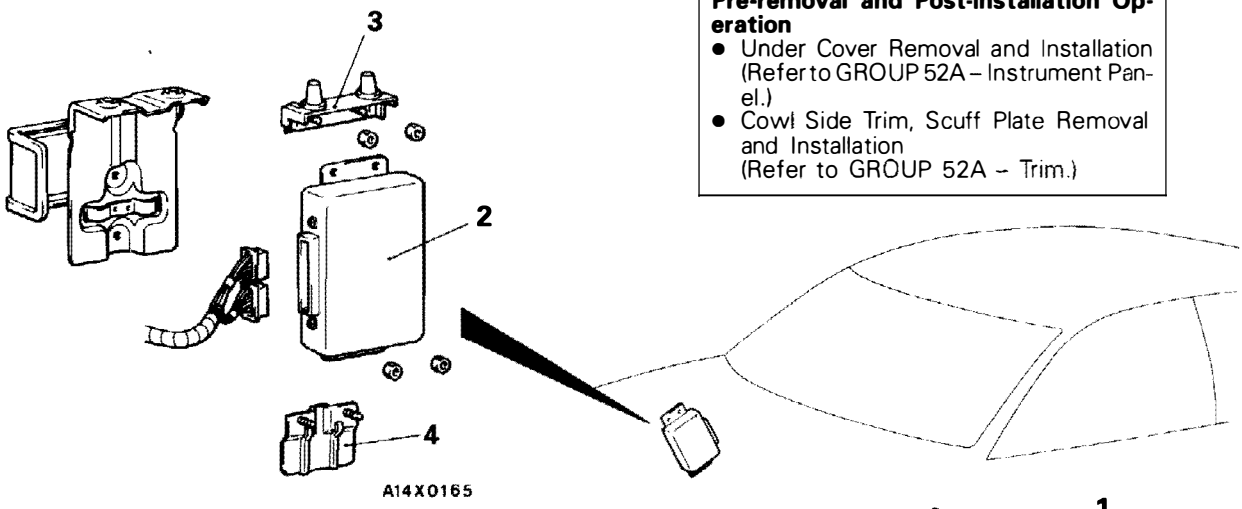
ELECTRONIC CONTROL UNIT

E35BP00AA

REMOVAL AND INSTALLATION

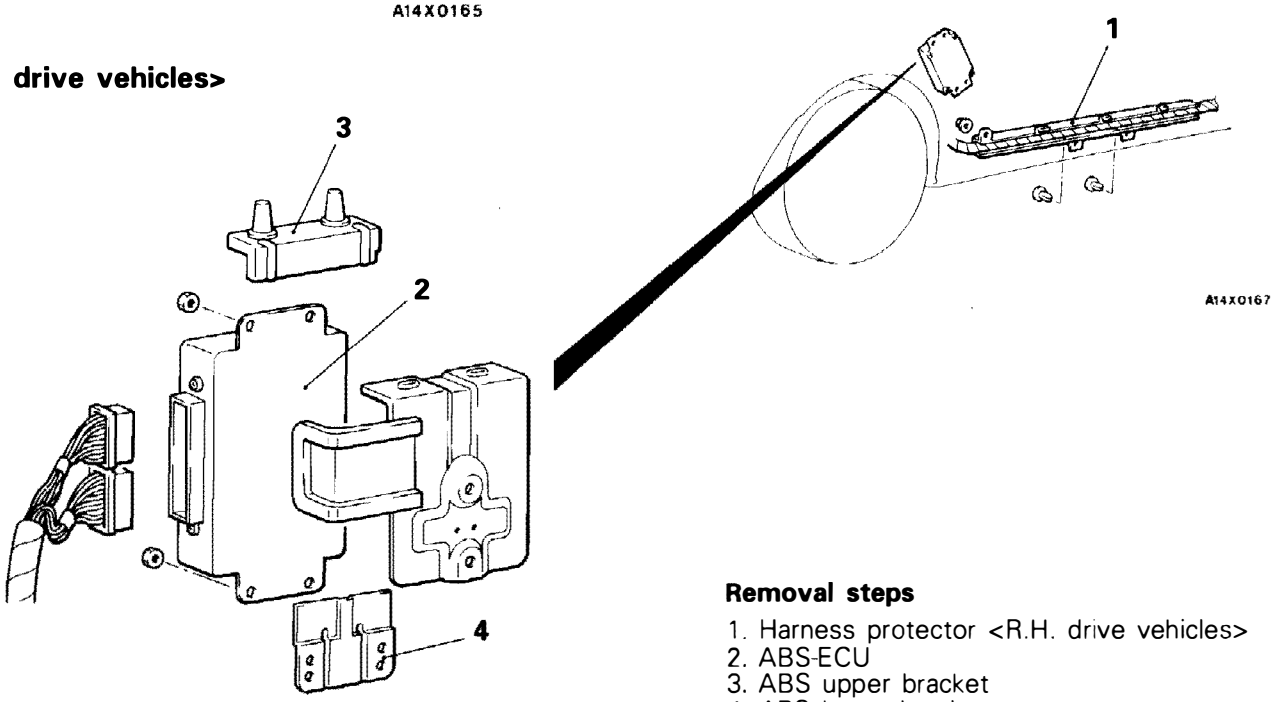
<L.H. drive vehicles>

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation (Refer to GROUP 52A – Instrument Panel.)
- Cowl Side Trim, Scuff Plate Removal and Installation (Refer to GROUP 52A – Trim.)



A14X0165

<R.H. drive vehicles>



A14X0167

A14X0163

Removal steps
1. Harness protector <R.H. drive vehicles>
2. ABS-ECU
3. ABS upper bracket
4. ABS lower bracket

INSPECTION

E35BP02AA

Refer to P.35B-26.

ANTI-LOCK BRAKING SYSTEM (ABS) <4WD>

CONTENTS

E35CA00AA

SUPPLEMENTAL RESTRAINT SYSTEM (SRS) – AIR BAG

(1) An SRS air bag for the driver's side seat is optional equipment in this vehicle.
(2) The SRS includes the following components: impact sensors, SRS diagnosis unit, SRS warning light, air bag module, clock spring, 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 (*).

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), before beginning any service or maintenance of any component of the SRS or any SRS-related component.

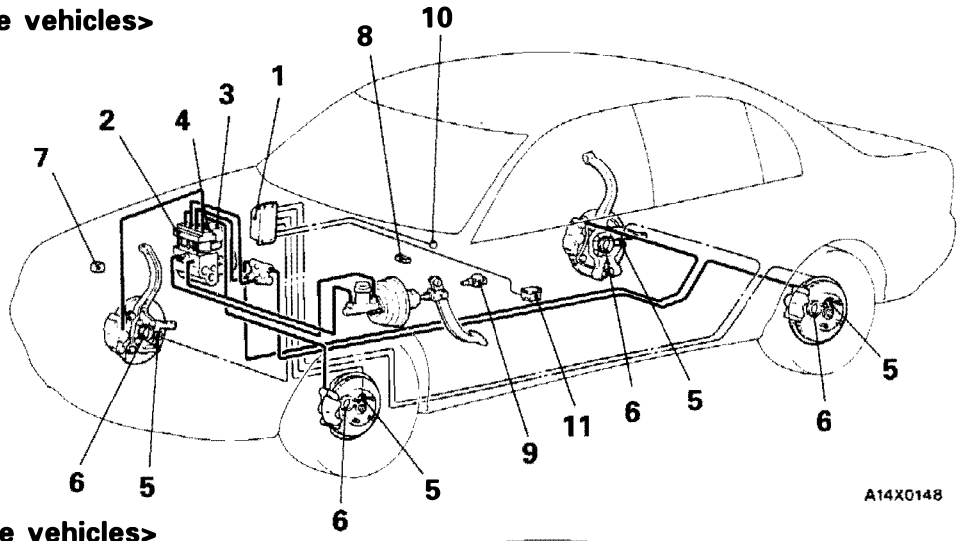
GENERAL INFORMATION

E35CB00AA

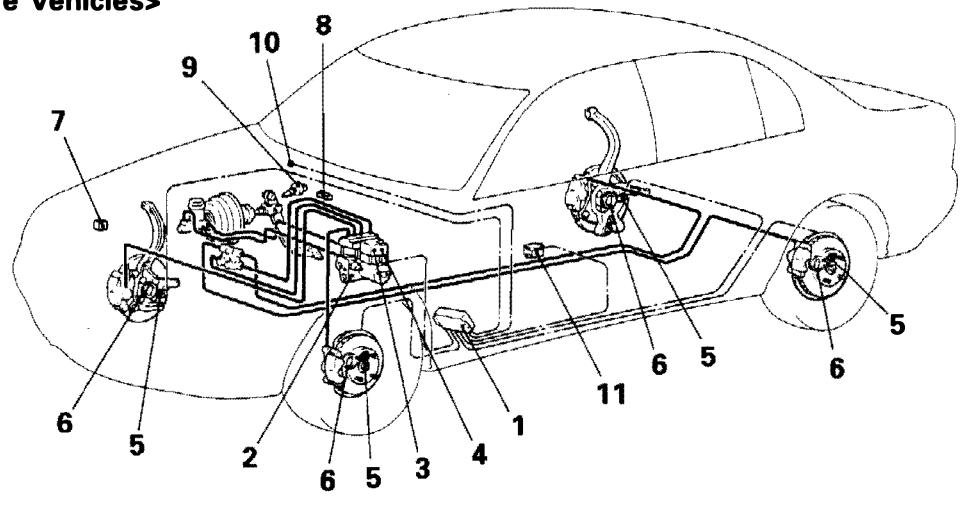
The ABS consists of wheel speed sensors, stop lamp switch, hydraulic unit and the ABS-ECU. If a problem occurs in the system, the malfunctioning system can be identified by means of the diagnosis function, and the trouble symptom memory will not be erased even if the ignition switch is turned to OFF. (However, it will be erased if the battery is disconnected.)
In addition, reading of diagnosis codes and service data and actuator testing are possible using the MUT-II.

Items	Specification
Speed sensor Type	Magnet coil type
Rotor teeth Front Rear	 43 43

<L.H. drive vehicles>



<R.H. drive vehicles>



1. ABS-ECU
2. Hydraulic unit
3. ABS valve relay
4. ABS motor relay
5. Wheel speed sensor
6. Rotor
7. ABS power relay
8. Diagnosis connector
9. Stop lamp switch
10. ABS warning lamp
11. G-sensor

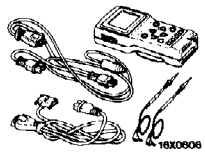
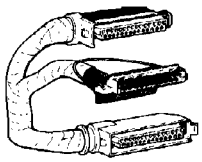
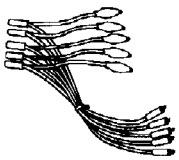
SERVICE SPECIFICATIONS

E35CC00AA

Items	Specifications
Standard value Hydraulic unit solenoid valve internal resistance Ω	1.0–1.3

SPECIAL TOOLS

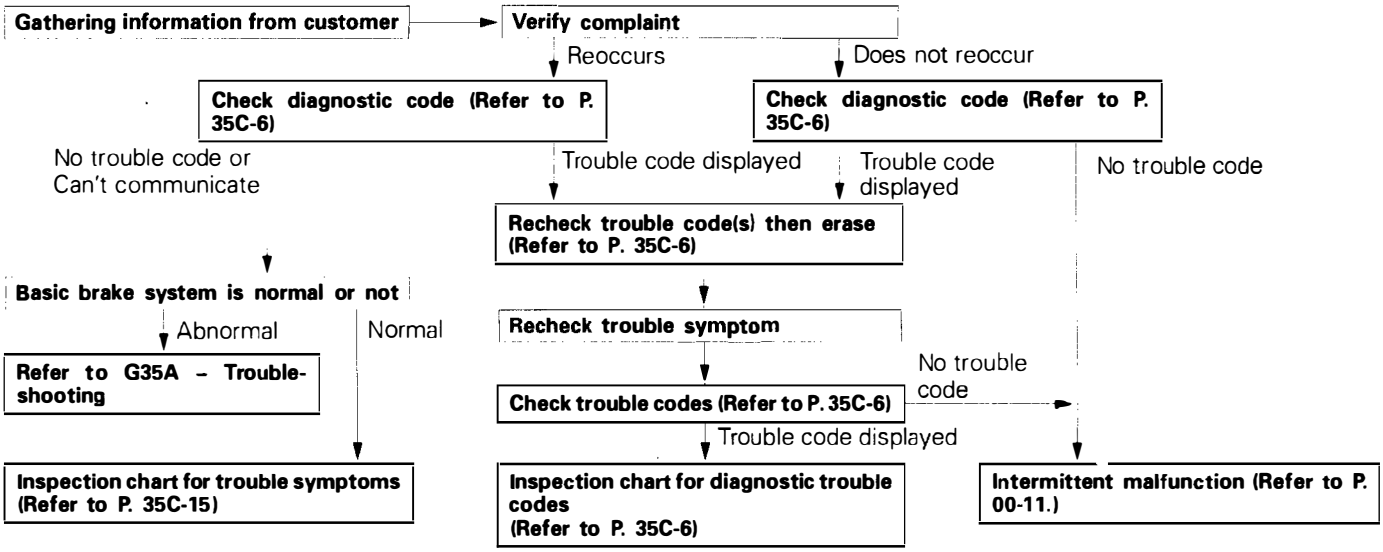
E35CD00AA

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	For checking of ABS
 16X0607		ROM pack	
	MB991356	ABS check harness	Measurement of ABS control unit terminal voltage
	MB991348	Test harness set	For checking of G sensor

TROUBLESHOOTING

E35CE00AA

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

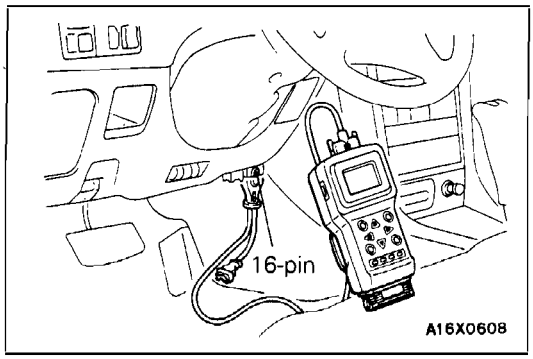


NOTES WITH REGARD TO DIAGNOSIS

- The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation of phenomenon
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment, but this because the system operation check is being performed, and is not an abnormality.
ABS operation sound	1. Sound of the motor inside the ABS hydraulic unit operating (whine) 2. Sound is generated along with vibration of the brake pedal. (scraping) 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump: suspension; squeak: tyres)
ABS operation (Long braking distance)	For road surfaces such as snow-covered roads and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed and not being too overconfident.

- Diagnosis detection condition can vary depending on the diagnosis code.
  When checking to see if the trouble symptom reoccurs after the diagnosis code has been erased, check the detection timing column in the diagnosis trouble chart (refer to P. 35C-6) and the detention conditions recorded in the "Comments" column of the inspection procedure chart for diagnostic trouble codes in order to carry out testing under driving conditions which satisfy each of the given conditions.



DIAGNOSTIC FUNCTION

E35CE01AA

DIAGNOSTIC CODES CHECK

Connect the MUT-II to the diagnosis connector (16-pin) at the lower of the instrument under cover, then check diagnostic codes.

ERASING DIAGNOSTIC CODES

Connect the MUT-II to the diagnosis connector (16-pin) then erase the diagnostic codes.

INSPECTION CHART FOR DIAGNOSIS CODE

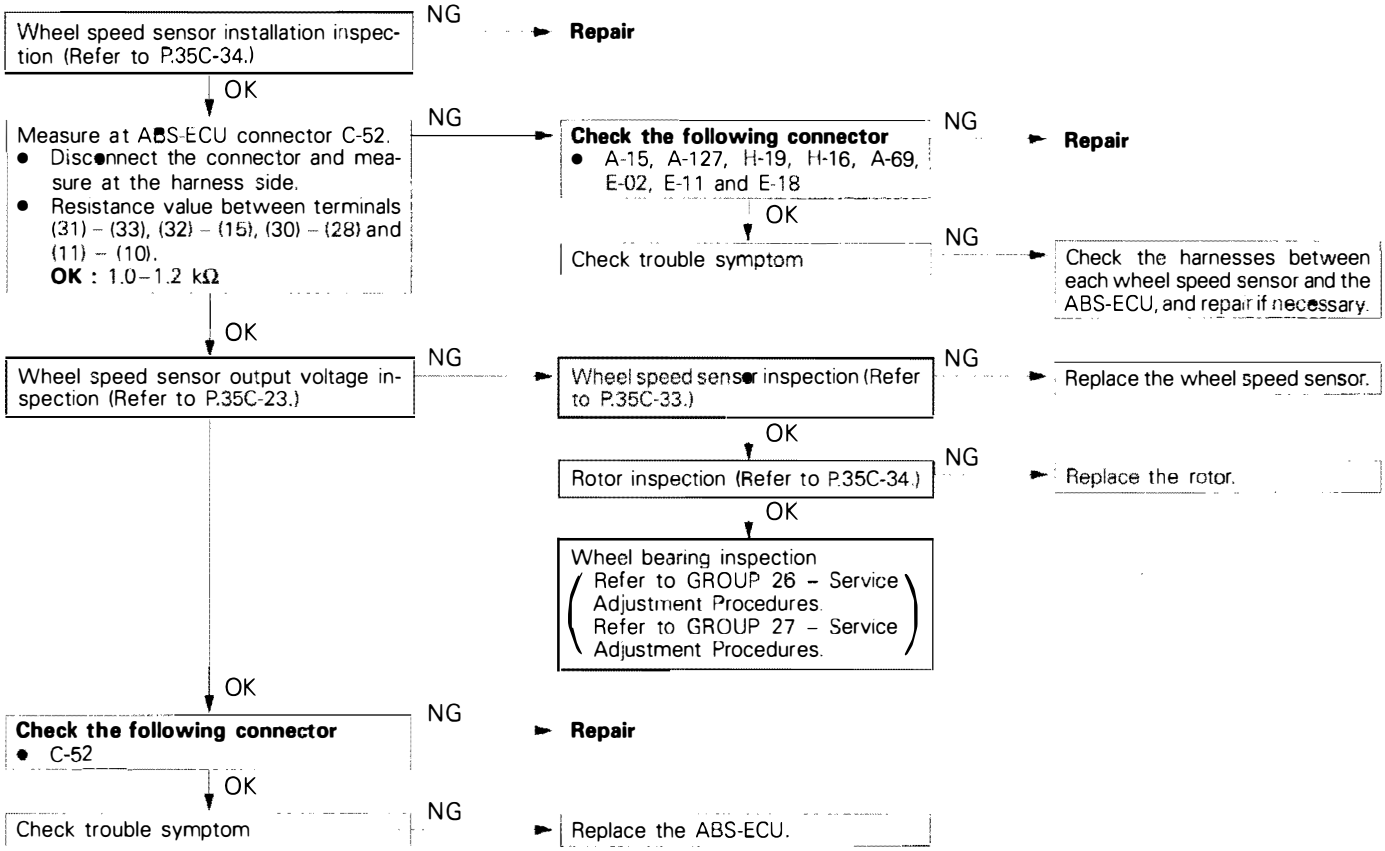
Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code No.	Inspection item	Diagnosis content	Reference page
11	Front left wheel speed sensor	Open circuit or short in + wire	P.35C-7
12	Front right wheel speed sensor		
13	Rear right wheel speed sensor		
14	Rear left wheel speed sensor		
15	Wheel speed sensor	Abnormal output signal	P.35C-8
21	G-sensor	Abnormal output signal	P.35C-9
22	Stop lamp switch	Open circuit or ON malfunction	P.35C-10
41	Front left solenoid valve	No response to solenoid valve drive signal	P.35C-11
42	Front right solenoid valve		
43	Solenoid valve drift	Current value in both valves is different when in same mode	
51	Valve relay	No response in valve relay to solenoid valve drive signal	P.35C-12
52	Motor relay, motor	No response in motor relay and motor to motor drive signal	P.35C-13

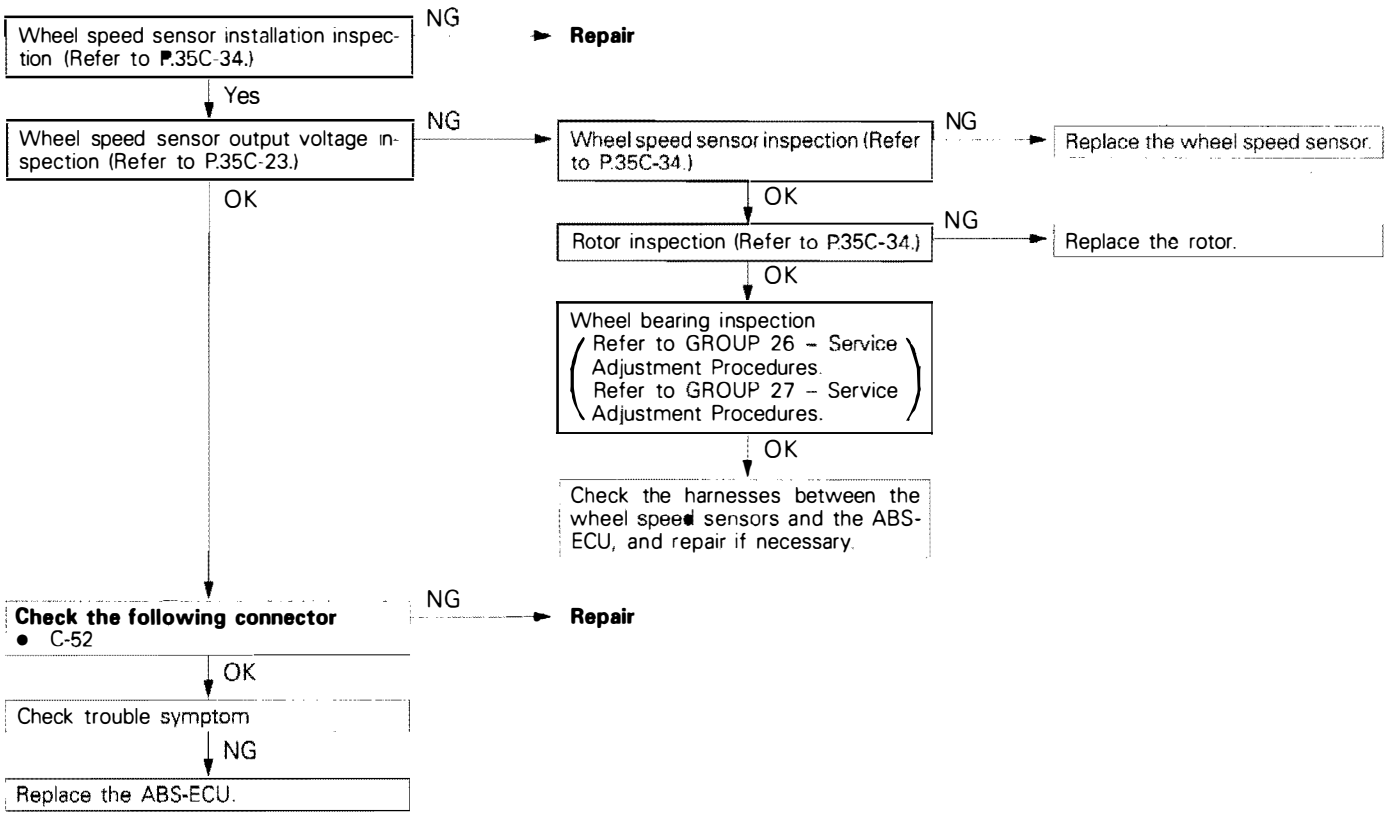
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSTIC TROUBLE

E35CE02AA

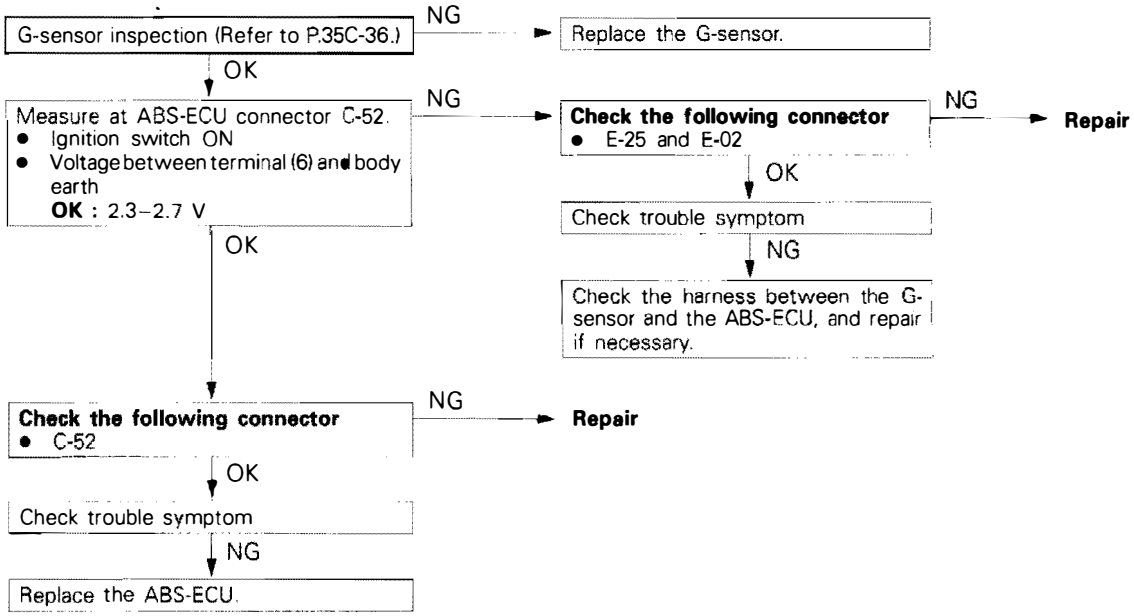
Code No. 11, 12, 13, 14	Wheel speed sensor open circuit or short + wire	Probable cause
[Comment] The ABS-ECU detects breaks in the wheel speed sensor wire. This malfunction code is output if the wheel speed sensor signal is not input (or short circuited) or if its output is low when starting to drive or while driving. [Hint] In addition to an open or short circuit in the wheel speed sensor, also check whether the sensor gap is too large, sensor harness wire is broken, or sensor harness and body connector are not properly connected.		• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of rotor • Malfunction of ABS-ECU



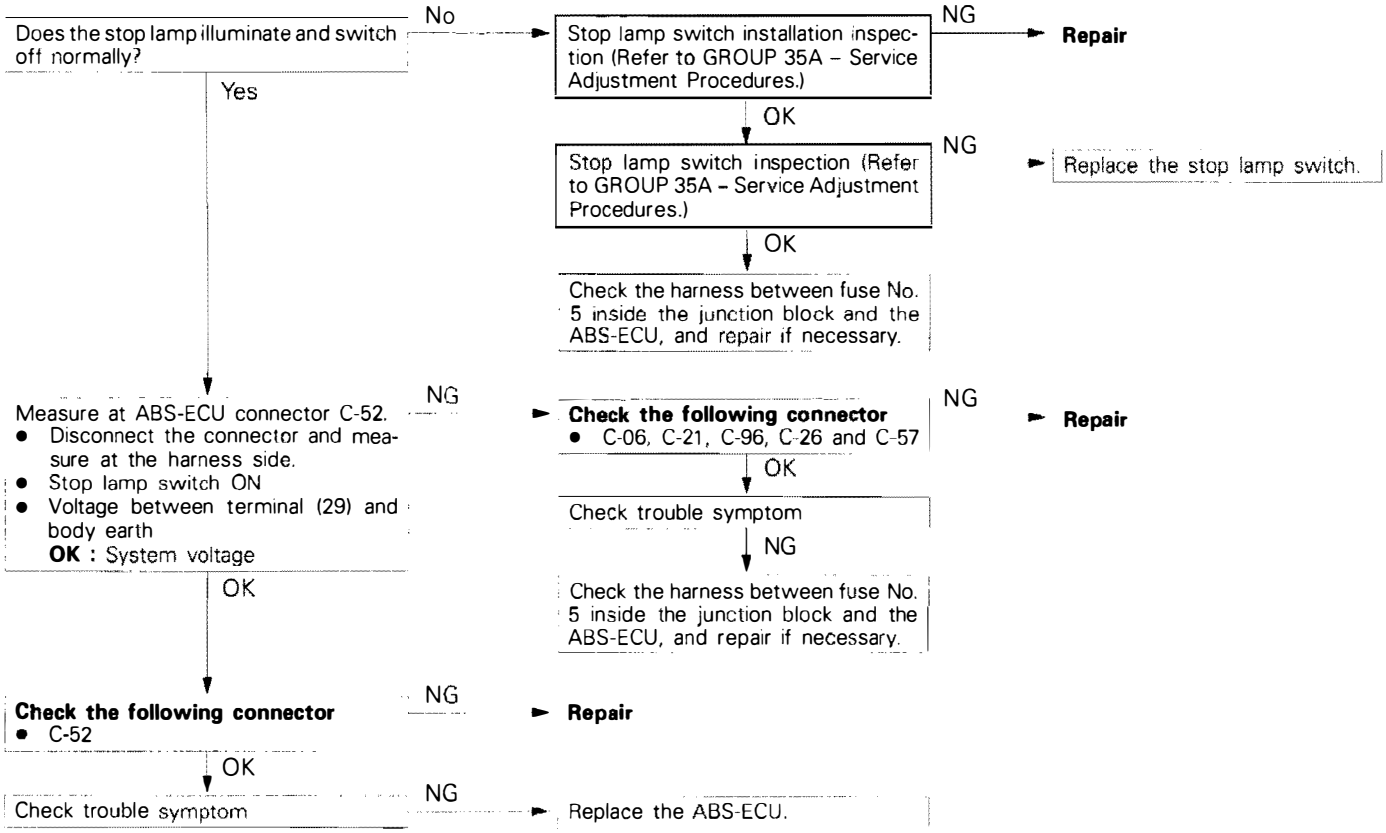
Code No. 15	Wheel speed sensor system	Probable cause
[Comment] This malfunction code is output when there is an abnormality (other than broken wire or short circuit) in any of the wheel speed sensor output signals while driving. [Hint] The following can be considered as the cause of the wheel speed sensor output abnormality. ● Distortion of rotor, teeth missing ● Low frequency noise interference when sensor harness wire is broken ● Noise interference in sensor signal ● Sensor output signal is below the standard value or amplitude modulation is over the standard value. Using an oscilloscope to measure the wave shape of the wheel speed sensor output signal is very effective. ● Broken sensor harness ● Poor connection of connector		● Malfunction of wheel speed sensor ● Malfunction of wiring harness ● Malfunction of rotor ● Malfunction of wheel bearing ● Malfunction of ABS-ECU



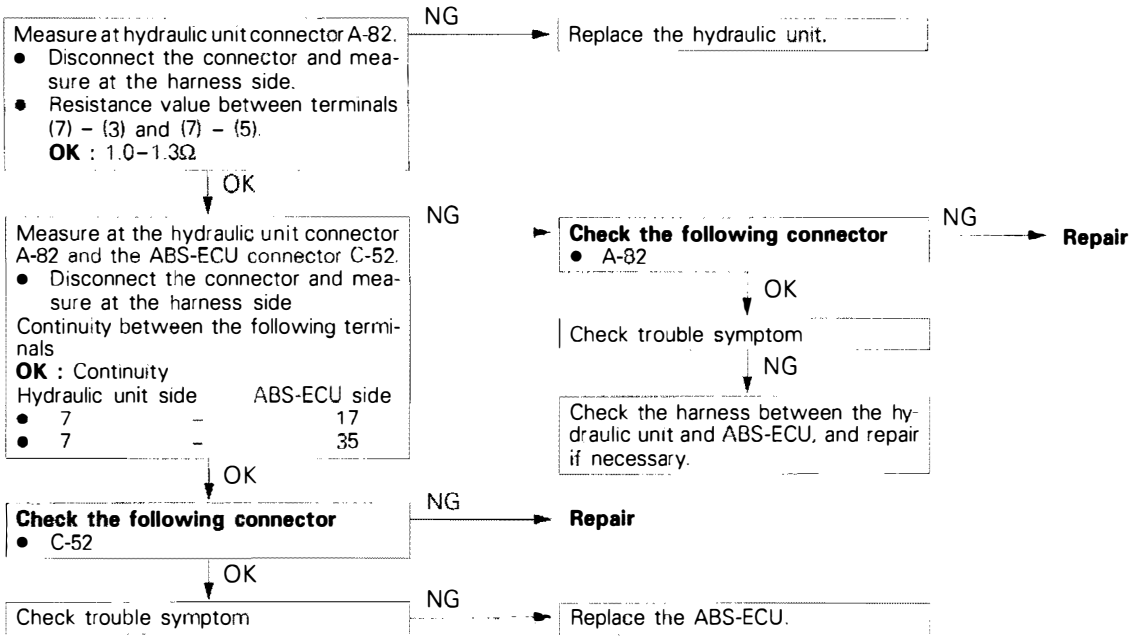
Code No. 21	G-sensor system	Probable cause
[Comment] The ABS-ECU outputs this malfunction code in the following cases. ● When an abnormal electrical signal is output from the G-sensor for 500 ms or more. ● When there is an open or short circuit in the harness for the G-sensor system.		● Malfunction of G-sensor ● Malfunction of wiring harness or connector ● Malfunction of ABS-ECU



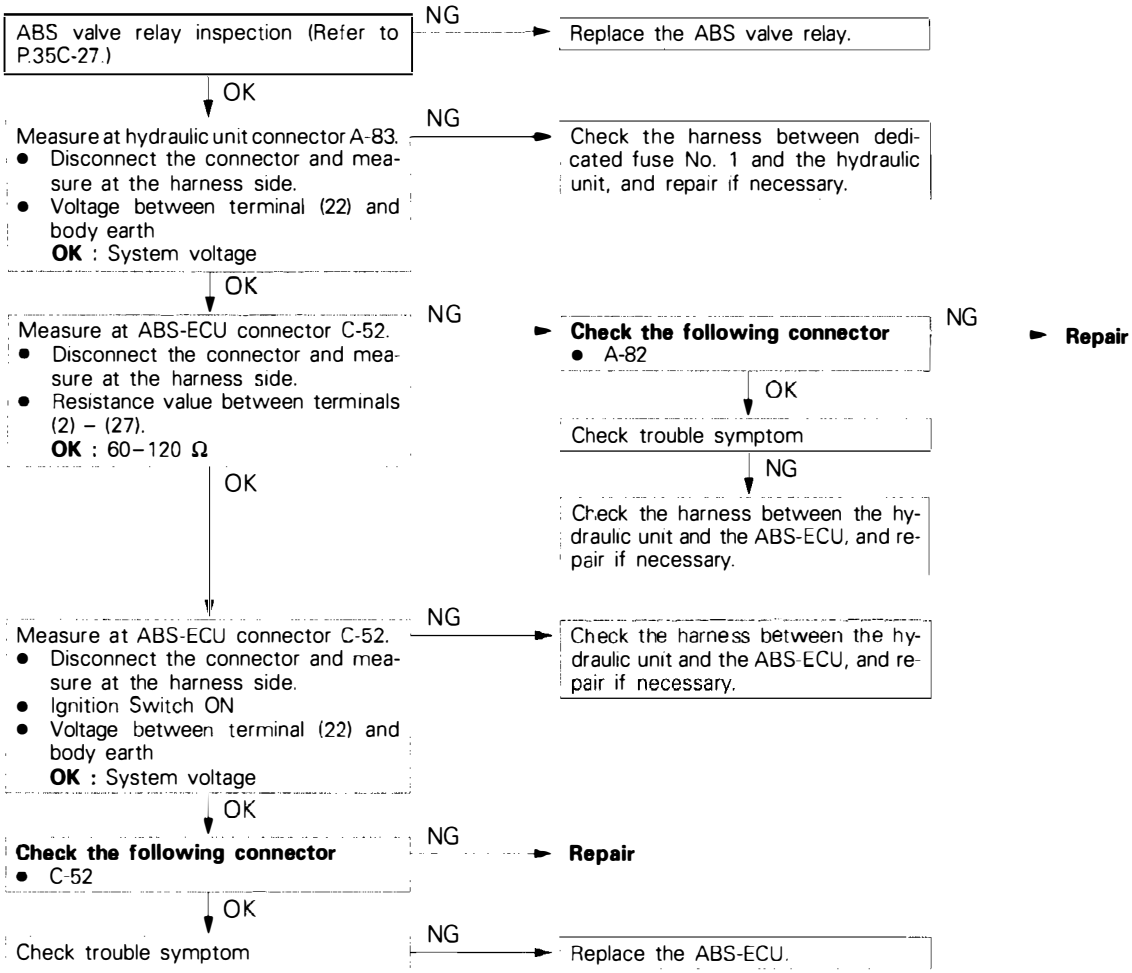
Code No. 22	Stop lamp switch system	Probable cause
[Comment] The ABS-ECU outputs this malfunction code in the following cases. • Stop lamp switch remains on for more than 15 minutes while the ABS is not functioning. • The harness wire for the stop lamp switch may be open. [Hint] If the stop lamp operates normally, there is an open circuit in the harness for the stop lamp switch input circuit is broken or there is a malfunction in the ABS-ECU.		• Malfunction of stop lamp switch • Malfunction of harness or connector • Malfunction of ABS-ECU



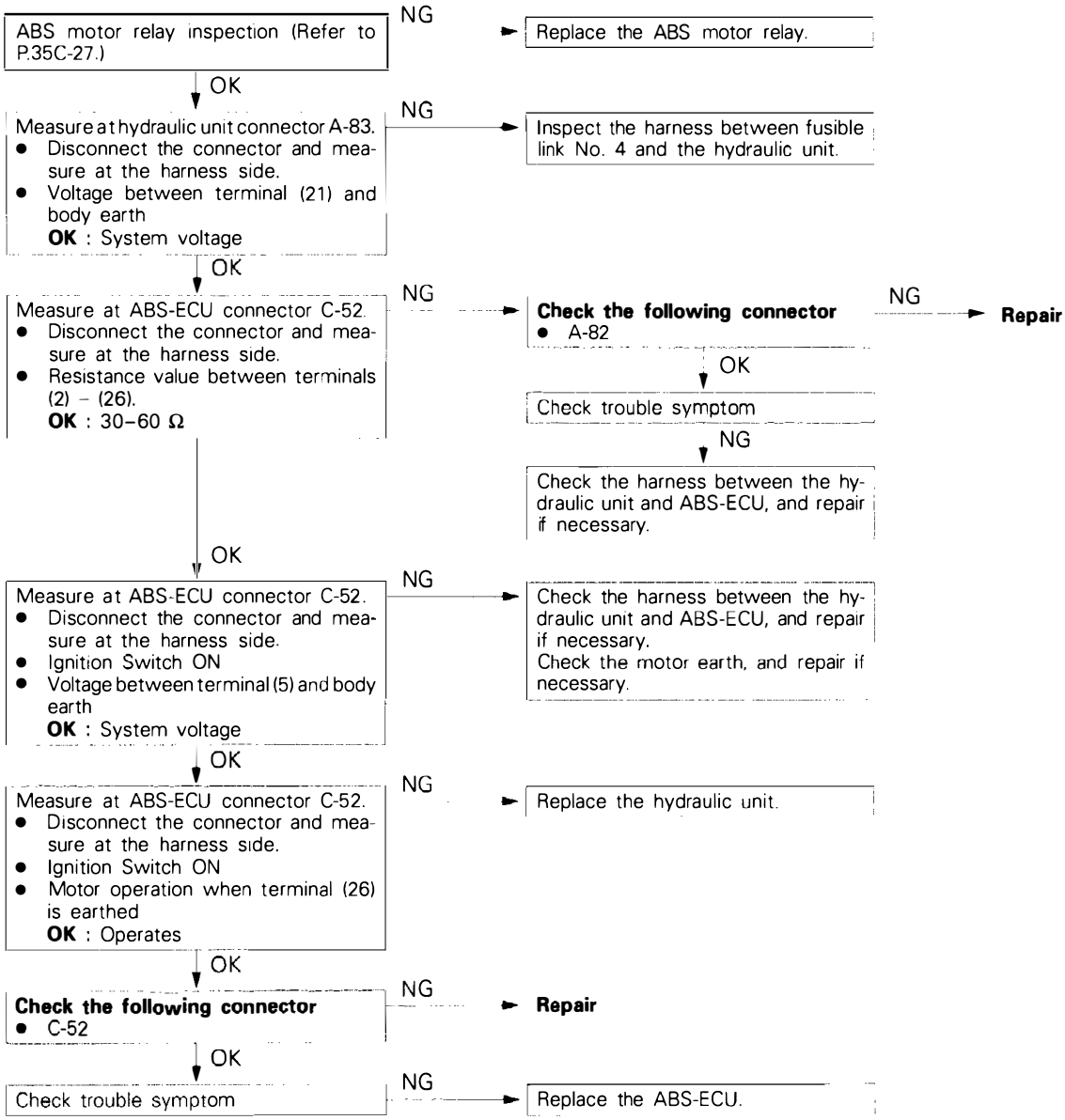
Code No. 41, 42, 43	Solenoid valve system	Probable cause
[Comment] The ABS-ECU normally monitors the solenoid valve drive circuit. If no current flows in the solenoid even if the ECU turns the solenoid ON or if it continues to flow even when turned OFF, the ECU determines the solenoid coil wire is broken/short-circuited or the harness is broken/ short-circuited, and then these malfunction codes are output.		• Malfunction of hydraulic unit • Malfunction of wiring harness or connector • Malfunction of ABS-ECU



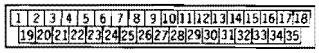
Code No. 51	Valve relay system	Probable cause
[Comment] When the ignition switch is turned ON, the ABS-ECU switches the valve relay OFF and ON for an initial check, compares the voltage of the signal to the valve relay and valve power monitor line voltage to check whether the valve relay operation is normal. In addition, normally it monitors whether or not there is power in the valve power monitor line since the valve relay is normally ON. If the supply of power to the valve power monitor line is interrupted, this malfunction code will be output.		• Malfunction of ABS valve relay • Malfunction of wiring harness or connecter • Malfunction of hydraulic unit • Malfunction of ABS-ECU



Code No. 52	Motor relay, motor system	Probable cause
[Comment] The ABS-ECU outputs this malfunction code for the motor relay and motor in the following cases. ● When motor relay is ON and no signal is input to the motor monitor line (when motor is not operating, etc.) ● When motor relay is OFF and signal is input to the motor monitor line for approximately 5 seconds or more (when motor continues operating, etc.) ● When the motor relay does not function		● Malfunction of ABS motor relay ● Malfunction of wiring harness or connector ● Malfunction of hydraulic unit ● Malfunction of ABS-ECU

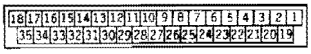


Connector terminal arrangement for troubleshooting



14X0184

Terminal arrangement shown on the special tool connector



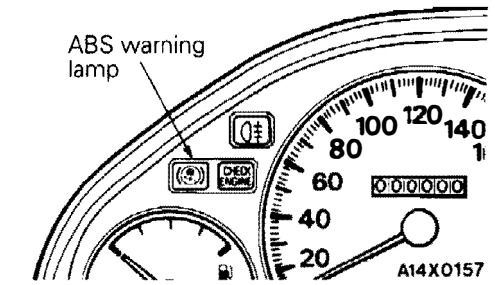
14X0185

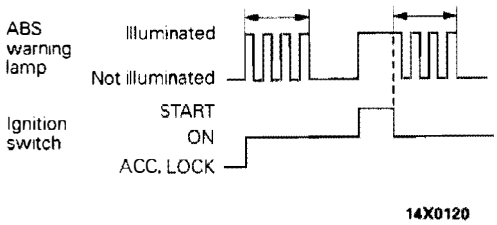
Caution

1. **When carrying out inspection of the ABS-ECU terminal voltage and resistance, the special tool (MB991356) should be used.**
2. **Because the ABS-ECU connector terminal arrangement for troubleshooting is different from the terminal arrangement shown on the special tool connector, when using the special tool for inspecting, take the readings from the terminal numbers of the special tool.**

Example

ABS-ECU connector terminal number for troubleshooting	Terminal number shown on the special tool connector
18	1





14X0120

ABS WARNING LAMP INSPECTION E35CE03AA

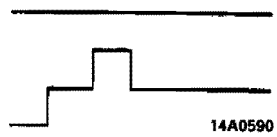
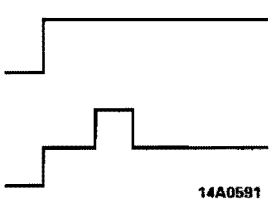
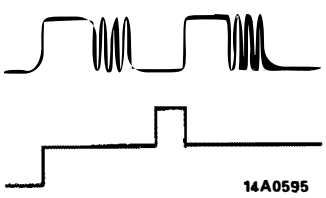
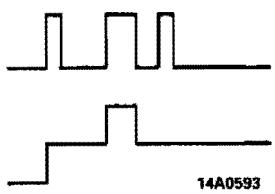
Check that the ABS warning lamp illuminates as follows.

1. When the ignition switch is turned to "ON", the ABS warning lamp flashes 4 times during a 0.6 to 0.8 second period and then the lamp switches off.
2. When the ignition switch is turned to "START", the ABS warning lamp remains illuminated.
3. When the ignition switch is turned back to the "ON", the ABS warning lamp flashes 4 times and then the lamp stays switched off.
4. If the illumination is other than the above, check the diagnosis codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

E35CE03BA

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-16
	Communication with ABS only is not possible.	2	P.35C-17
When the ignition key is turned to "ON" (engine stopped), the ABS warning lamp does not illuminate. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14A0590		3	P.35C-18
After the engine starts, the lamp remains illuminated. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14A0591		4	P.35C-18
When the ignition key is turned to "START", the ABS warning lamp does not illuminate. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14A0595		5	P.35C-19
After the ignition key is turned to "ON", the ABS warning lamp blinks once, and when turned to "START", it illuminates. When returned to "ON", the lamp flashes once, and then switches off. ABS warning lamp: Illuminated / Not illuminated Ignition key: START / ON / ACC, LOCK  14A0593		6	P.35-19
Faulty ABS operation	Unequal braking power on both sides	7	P.35C-20
	Insufficient braking power		
	ABS operates under normal braking conditions		
	ABS operates before vehicle stops under normal braking conditions		
	Large brake pedal vibration (Caution 2.)	—	P.35C-16

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

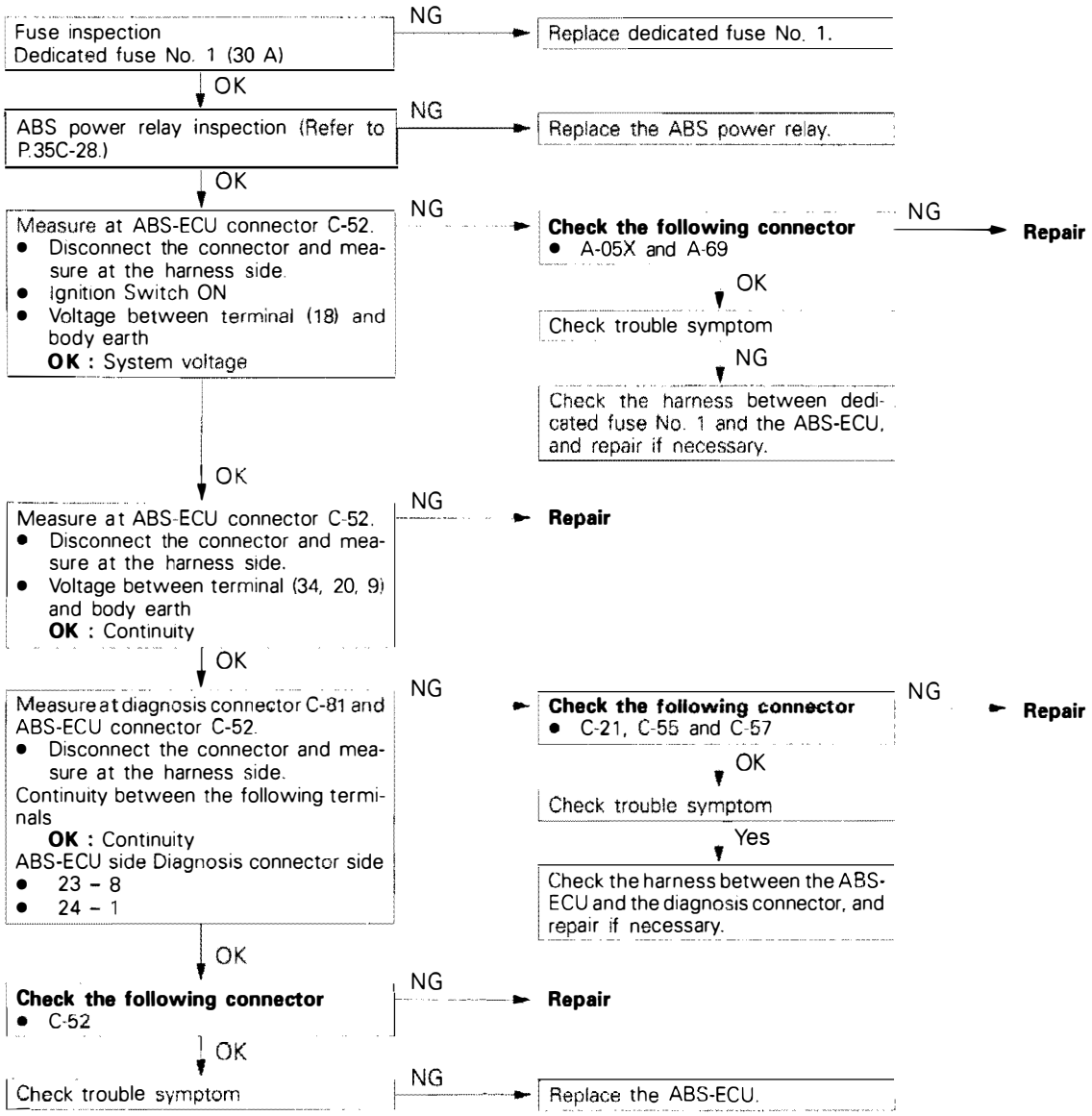
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting

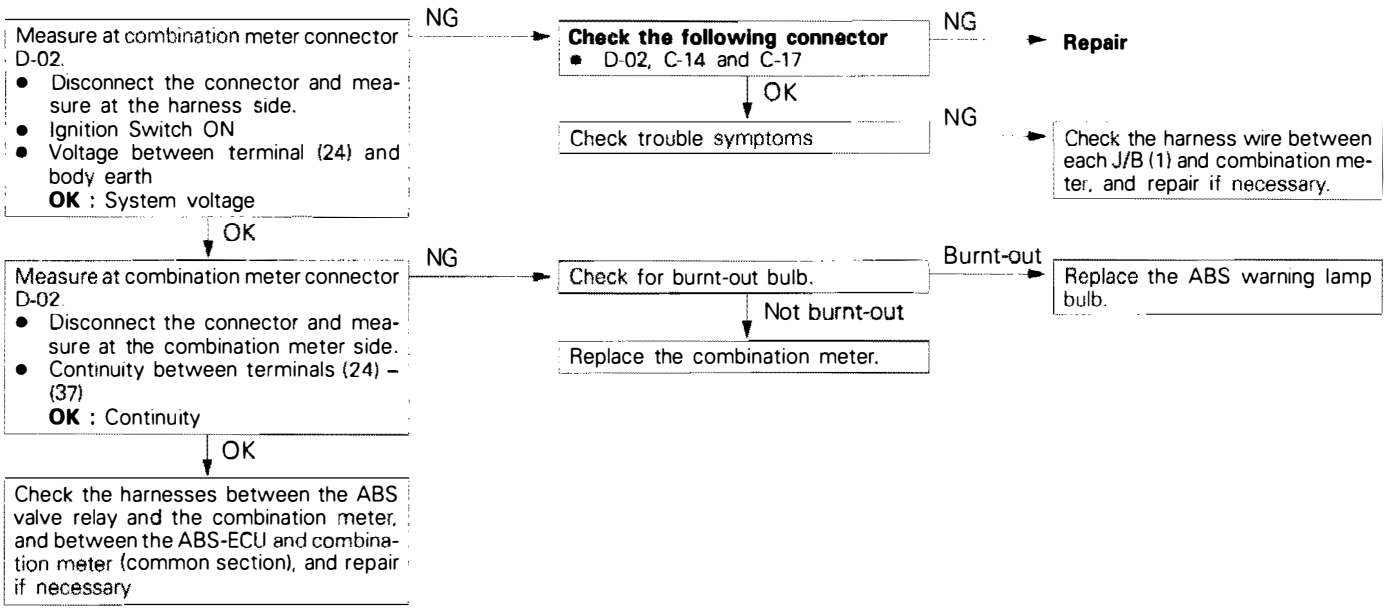
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication with only ABS is not possible.)	Probable cause
[Comment] When communication with the MUT-II is not possible, the cause is probably an open circuit in the ABS-ECU power circuit or an open circuit in the diagnosis output circuit.	• Blown fuse • Malfunction of wiring harness • Malfunction of ABS power relay • Malfunction of ABS-ECU



Inspection Procedure 3

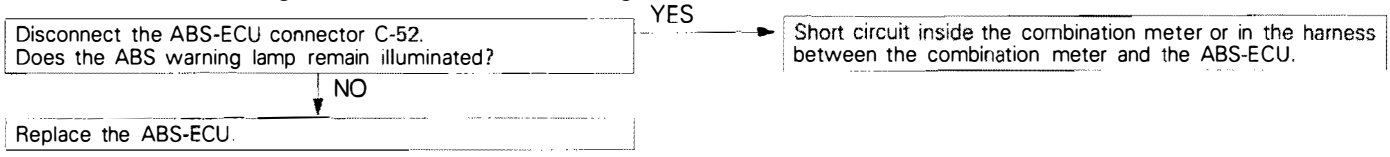
When ignition key is turned to "ON" (engine stopped), ABS warning lamp does not illuminate	Probable cause
[Comment] When power is supplied to the ABS-ECU, the valve relay changes from ON to OFF → ON by the initial check, and thus even if there is a problem with the circuit between ABS warning lamp and ABS-ECU, the lamp will illuminate once when the valve relay is OFF. [Hint] Accordingly, the cause of the lamp not illuminating is probably an open circuit in the lamp power circuit, a blown lamp bulb, or an open circuit in both the circuit between the ABS warning lamp and the ABS-ECU and the circuit between the ABS warning lamp and the ABS valve relay. When other warning lamps also do not illuminate, the cause is probably a blown fuse.	• Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector



Inspection Procedure 4

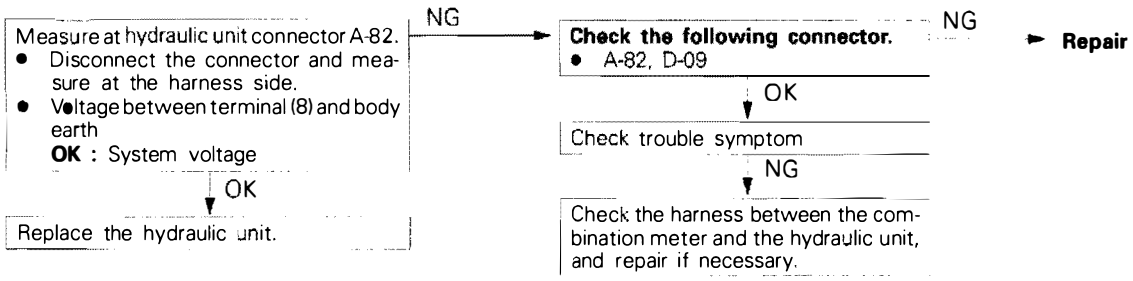
Even after the engine is started, the ABS warning lamp remains illuminated.	Probable cause
[Comment] There is probably a short in the ABS warning lamp illumination circuit.	• Malfunction of combination meter • Malfunction of ABS valve relay • Malfunction of ABS-ECU • Malfunction of wiring

NOTE
This trouble symptom is limited to cases where communication with the MUT-II is possible (ABS-ECU power supply is normal) and the diagnosis code is a normal diagnosis code.



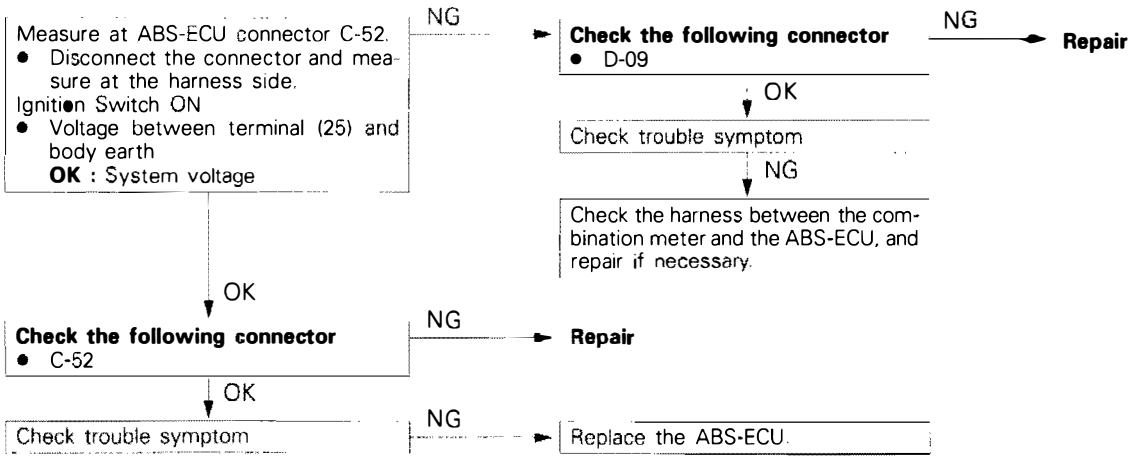
Inspection Procedure 5

When ignition key is turned to "START", ABS warning lamp does not illuminate.	Probable cause
[Comment] The ABS-ECU uses the power to the IG2 which is cut when the ignition switch is turned to "START". The ABS warning lamp uses IG1 power which is not cut even when the ignition switch is turned to "START". [Hint] Accordingly, because the power to the ABS-ECU is stopped in "START" position, if the warning lamp does not illuminate at this time, the cause is a problem in the lamp illumination circuit in the valve relay.	• Malfunction of wiring harness or connector • Malfunction of hydraulic unit



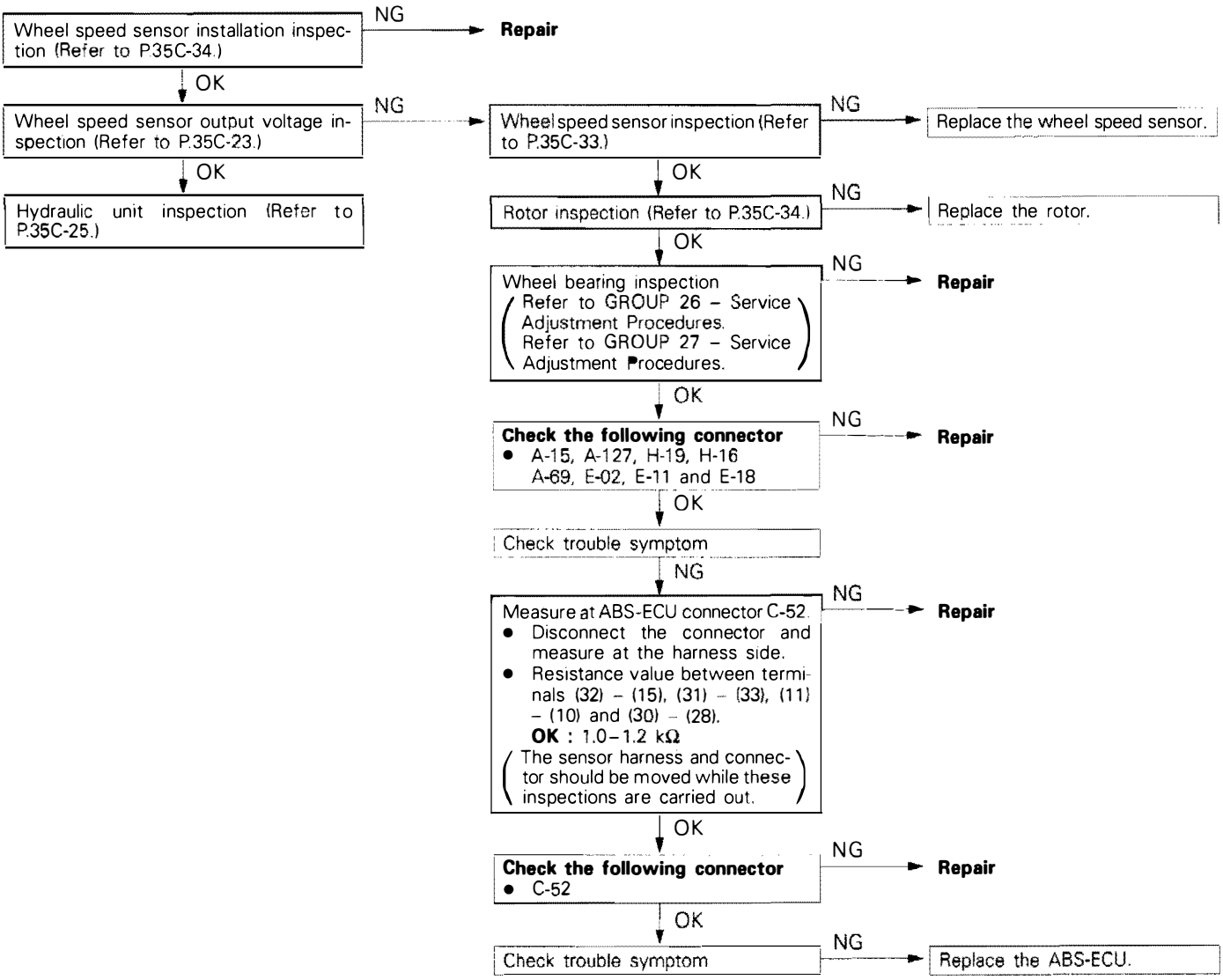
Inspection Procedure 6

The ABS warning lamp flashes once after the ignition key is turned to "ON". The lamp illuminates when the ignition key is turned to "START", and when the key is returned to "ON", it flashes once.	Probable cause
[Comment] When power flows, the ABS-ECU turns on the warning lamp for approximately 1 second while it performs a valve relay test. If there is a break in the harness between the ECU and the warning lamp illuminates only when the valve relay is off in the valve relay test, etc.	• Malfunction of wiring harness or connector • Malfunction of ABS-ECU



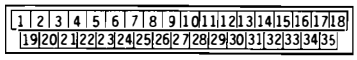
Inspection Procedure 7

Break operation is abnormal	Probable cause
[Comment] This varies depending on the driving conditions and the road surface conditions, so problem diagnosis is difficult. However, if a normal diagnosis code is displayed, carry out the following inspection.	• Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of ABS-ECU



ECU-TERMINAL INSPECTION

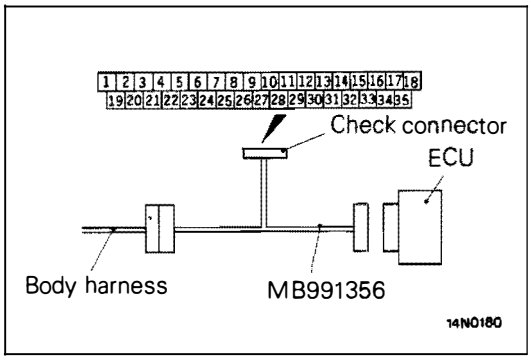
E35CE04AA



14X0184

Terminal No.	Check point	Check condition	Normal condition
2	Relay power supply output	Ignition switch : OFF	No continuity
		Ignition switch : ON	System voltage
5	Motor monitor	Ignition switch : OFF	Continuity
6	G sensor input	Ignition switch : ON (Vehicle parked on a level surface)	2.3 V–2.7 V
9	Earth	At all times	Continuity
10	RL sensor (– wire)	At all times	Continuity
11	RL sensor (+ wire)	Ignition switch : OFF; between terminal (10)	1.0–1.2 kΩ
14	FL sensor (– wire)	At all times	Continuity
15	FL sensor (+ wire)	Ignition switch : OFF; between terminal (14)	1.0 – 1.2 kΩ
17	FL (RR) solenoid valve output	Ignition switch : OFF	Continuity
		Ignition switch : ON	System voltage
18	Ignition switch input	Ignition switch : ON	System voltage
		Ignition switch : START	0 V
20	G sensor earth	At all times	Continuity
22	Valve relay monitor input	Ignition switch : OFF	Continuity
		Ignition switch : ON	System voltage
23	Diagnosis communication input/output	When MUT-II is connected	Serial communication with MUT-II
		When MUT-II is not connected	1 V or less
24	Diagnosis selection input	When MUT-II is connected	0 V
		When MUT-II is not connected	Approx. 12 V
25	ABS warning lamp output	Ignition switch : ON	System voltage
26	Motor relay	Ignition switch : OFF; between terminal (2)	Approx. 50 Ω
27	Valve relay	Ignition switch : OFF; between terminal (2)	Approx. 100 Ω
28	RR sensor (+ wire)	Ignition switch : OFF; between terminal (30)	1.0–1.2 kΩ
29	Stop lamp switch input	Ignition switch : ON (stop lamp switch ON)	5 V or more
		Ignition switch : OFF (stop lamp switch OFF)	1.5 V or more

Terminal No.	Check point	Check condition	Normal condition
30	RR sensor (– wire)	At all times	Continuity
31	FR sensor (– wire)	At all times	Continuity
33	FR sensor (+ wire)	Ignition switch : OFF; between terminal (31)	1.0–1.2 kΩ
34	Earth	At all times	Continuity
35	FR (RR) solenoid valve output	Ignition switch : OFF	Continuity
		Ignition switch : ON	System voltage



SERVICE ADJUSTMENT PROCEDURES

E35CF31AA

ABS OPERATION CHECK

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Lift up the vehicle and release the parking brake.
2. Disconnect the ECU harness connector and measure from the harness side connector.

Caution
Set the special tool and use the inspection connector to Inspect. Do not connect the connector (Special Tool) marked with "*" except when recording the waveform on a driving test. In such a case, connect the connector to the ECU.

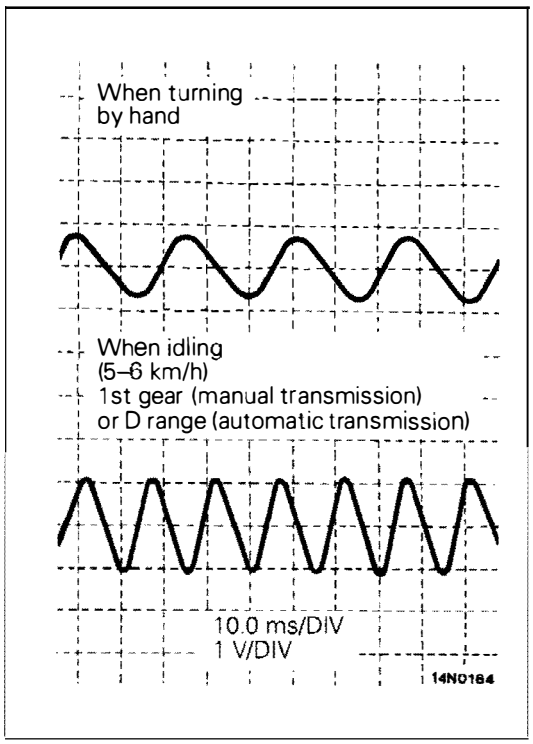
3. Rotate the wheel to be measured at approximately 1/2 - 1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

	Front left	Front right	Rear left	Rear right
Terminal No.	4	21	9	26
	5	23	8	24

Output voltage
When measuring with a circuit tester:
70 mV or more
When measuring with an oscilloscope:
200 mV p-p or more

4. If the output voltage is lower than the above values, the reason could be as follows:
   - Faulty wheel speed sensor.

   So replace the wheel speed sensor.



Inspecting Wave Forms With An Oscilloscope

Use the following method to observe the output voltage wave form from each wheel sensor with an oscilloscope.

- Start the engine, and engage 1st gear (vehicles with manual transmission) or D range (vehicles with automatic transmission).

NOTE
1. Check the connection of the sensor harness and connector before using the oscilloscope.
2. The wave form measurements can also be taken while the vehicle is actually moving.
3. The output voltage will be small when the wheel speed is low, and similarly it will be large when the wheel speed is high.

Points In Waveform Measurement

Symptom	Probable causes	Remedy
Too small or zero waveform amplitude	Faulty wheel speed sensor	Replace sensor
Waveform amplitude fluctuates excessively (this is no problem if the minimum amplitude is 100 mV or more)	Axle hub eccentric or with large runout	Replace hub
Noisy or disturbed waveform	Open circuit in sensor	Replace sensor
	Open circuit in harness	Correct harness
	Incorrectly mounted wheel speed sensor	Mount correctly
	Rotor with missing or damaged teeth	Replace rotor

NOTE
The wheel speed sensor cable moves following motion of the front of rear suspension. Therefore, it is likely that it has an open circuit only when driving on rough roads and it functions normally on ordinary roads. It is, therefore, recommended to observe sensor output voltage waveform also under special conditions, such as rough road driving.

HYDRAULIC UNIT (HU) INSPECTION E35CF32AA

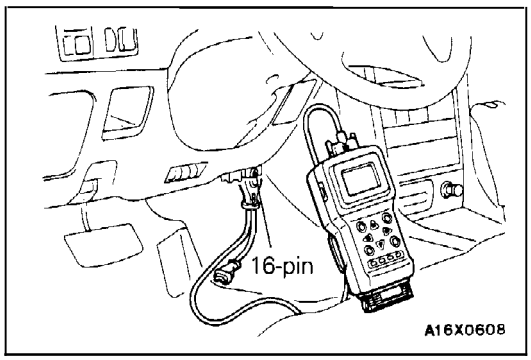
Caution
Connection and disconnection of the MUT-II should always be made with the ignition switch in the OFF position.

If the MUT-II is disconnected while the ignition switch is ON, the ABS diagnosis codes will be memorized and the ABS warning lamp may illuminate.

1. Jack up the vehicle and support the vehicle with rigid racks placed at the specified jack-up points or place the wheels which are checked on the rollers of the braking force tester.

   Caution
   1. The roller of the braking force tester and the tyre should be dry during testing.
   2. When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.

2. Release the parking brake, and feel the drag force (drag torque) on each road wheel.
   When using the braking force tester, take a reading of the brake drag force.



3. Turn the ignition key to the OFF position and set the MUT-II as diagram.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.

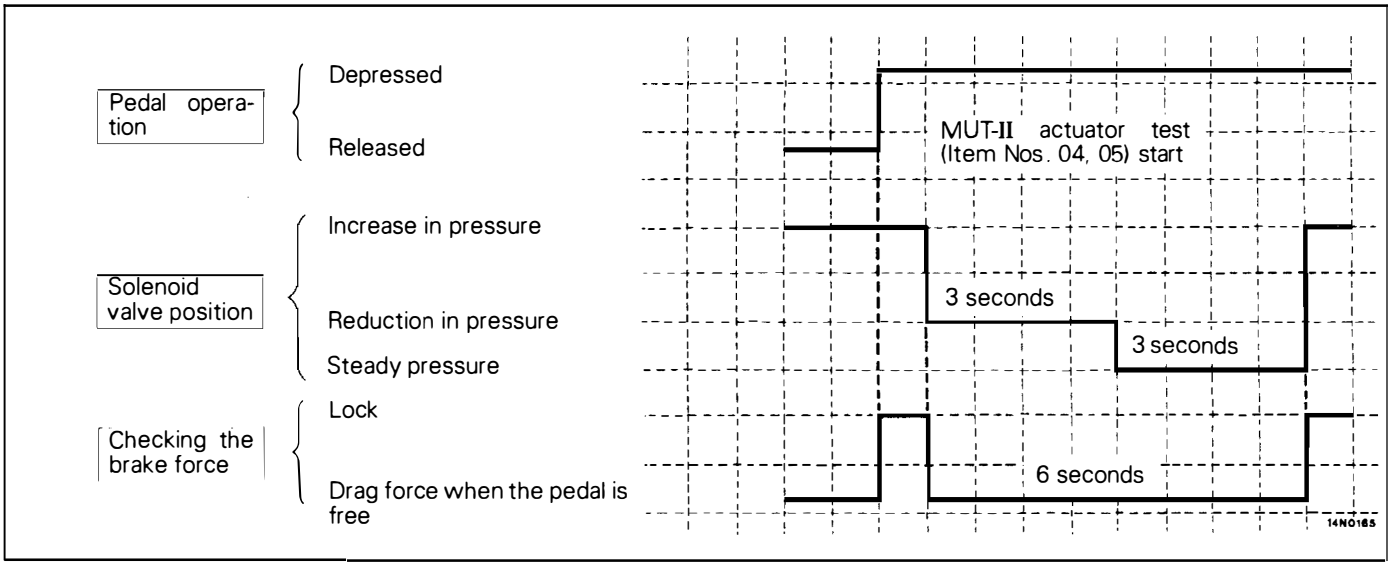
   NOTE
   1. At this time, the ABS system will switch to the MUT-II mode and the ABS warning lamp will illuminate.
   2. When the ABS has been interrupted by the fail-safe function, the MUT-II actuator testing cannot be used.

5. Use the MUT-II to force-drive the actuator.
6. Turn the wheel by hand and check the change in braking force when the brake pedal is depressed.
   When using the braking force tester, depress the brake pedal until the braking force is at the following values, and check to be sure that the braking force changes to the brake drag force inspected in step 2 when the actuator is force-driven.

N

Front wheel	785–981
Rear wheel	588–785

The result should be as shown in the following diagram.

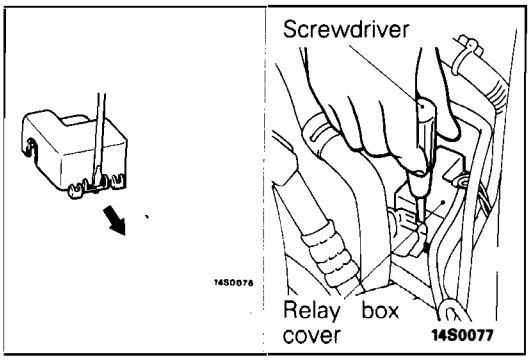


7. If the result of inspection is abnormal, correct according to the "Diagnosis Table."

Diagnosis Table

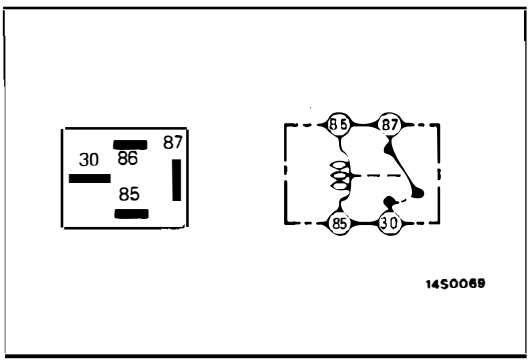
No.	Operation	Judgement		Probable cause	Remedy
		Normal	Abnormal		
04	(1) Depress brake pedal to lock wheel. (2) Using the MUT-II, select the wheel to be checked and force the actuator to operate. (3) Turn the selected wheel manually to check the change of brake force.	Brake force released for 6 seconds after locking.	Wheel does not lock when brake pedal is depressed.	Clogged brake line other than HU	Check and clean brake line
				Clogged hydraulic circuit in HU	Replace HU assembly
05			Brake force is not released.	Incorrect HU brake tube connection	Connect correctly
				HU solenoid valve not functioning correctly	Replace HU assembly

8. After inspection, disconnect the MUT-II immediately after turning the ignition switch to OFF.



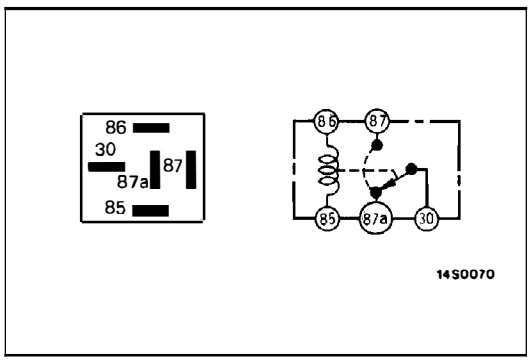
ABS RELAY INSPECTION E35CF40AA

1. Insert the tip of a screwdriver into the space between the hydraulic unit and the relay box cover and use it to open the tab at one place, and then remove the cover.
2. Take out all of the relays from the relay box and check the continuity between the terminals when power is not supplied and when power is supplied.



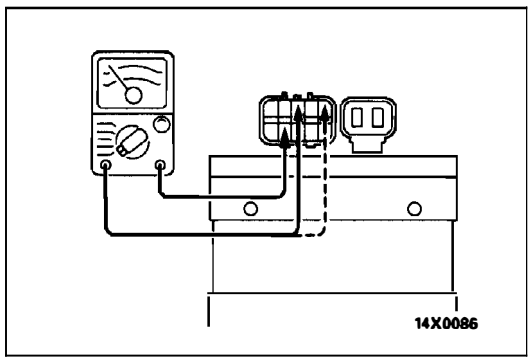
Motor Relay

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

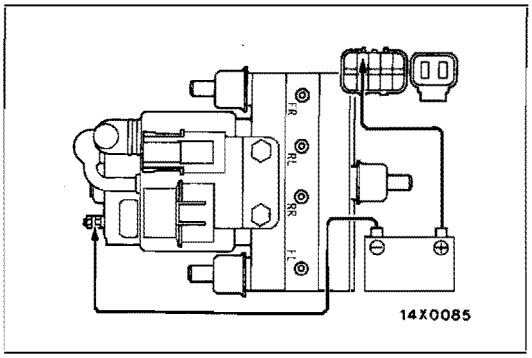
When no current flows	Between terminals85–86	60–120 Ω)
	Between terminals 30–87a	Continuity (approx. 0 Ω)
	Between terminals 30–87	No continuity (∞ Ω)
When current flows between terminals 85–86	Between terminals 30 – 87a	Continuity (∞ Ω)
	Between terminals 30 – 87	Continuity (approx. 0 Ω)



SOLENOID VALVE INSPECTION E35CF33AA

Measure the resistance between terminals.

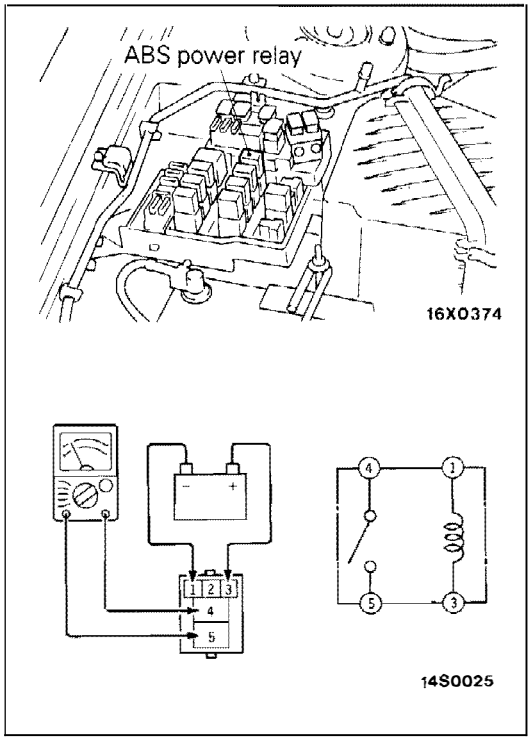
Standard value: 1.0–1.3 Ω



MOTOR OPERATION CHECK E35CF34AA

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.

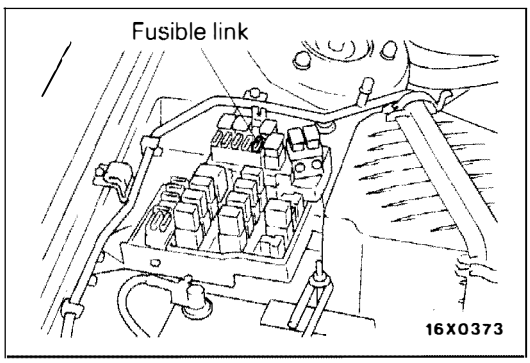


POWER RELAY INSPECTION E35CF41AA

Remove the instrument under cover and remove the power relay.

Terminal / Battery voltage	4	1	5	3
Continuity no voltage		○		○
Continuity with voltage	○	⊕	○	⊖

NOTE
(1) ●—○ indicates that there is continuity between the terminals.
(2) ⊕- -⊖ indicates connection of battery voltage.



REMEDY FOR A FLAT BATTERY E35BF37AA

When booster cables are used to start the engine when the battery is completely flat and then the vehicle is immediately driven without waiting for the battery to recharge itself to some extent, the engine may misfire, and driving might not be possible.
This happens because ABS consumes a great amount of current for its self-check function; the remedy is to either allow the battery to recharge sufficiently, or to remove the fusible link for ABS circuit, thus disabling the anti-skid brake system.
The ABS warning lamp will illuminate when the fusible link (for ABS) is removes.
After the battery has sufficiently charged, install the fusible link (for ABS) and restart the engine; then check to be sure the ABS warning lamp is not illuminated.

MASTER CYLINDER AND BRAKE BOOSTER <R.H. drive vehicles>

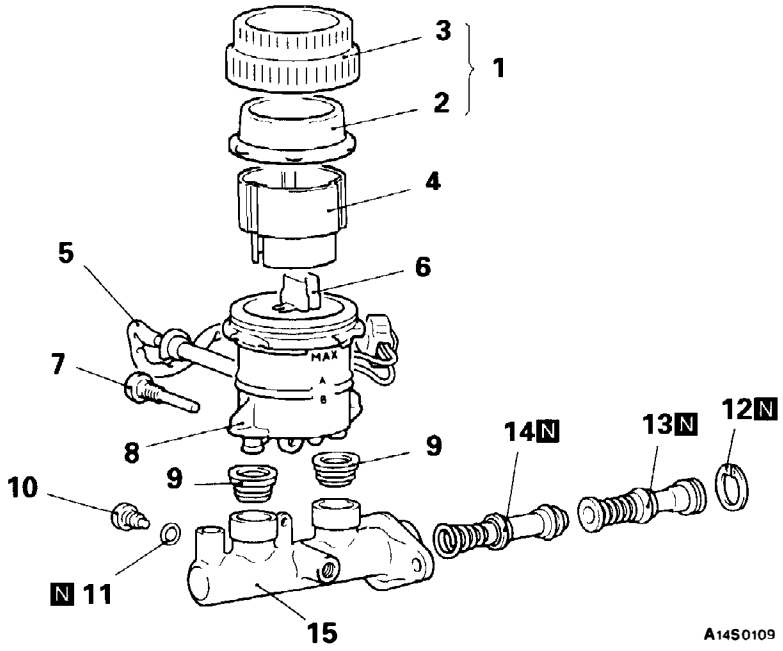
E35CH10AA

REMOVAL AND INSTALLATION

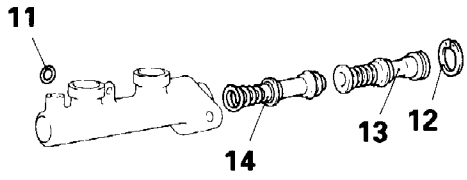
Refer to GROUP 35A – Master Cylinder and Brake Booster <R.H. drive vehicles>

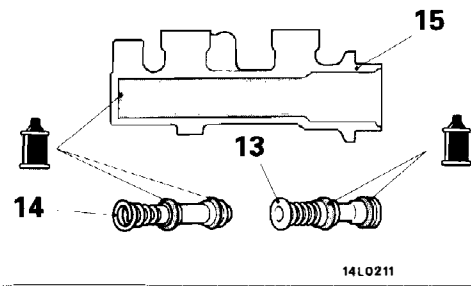
MASTER CYLINDER DISASSEMBLY AND REASSEMBLY

E35CH15AA



Master cylinder kit





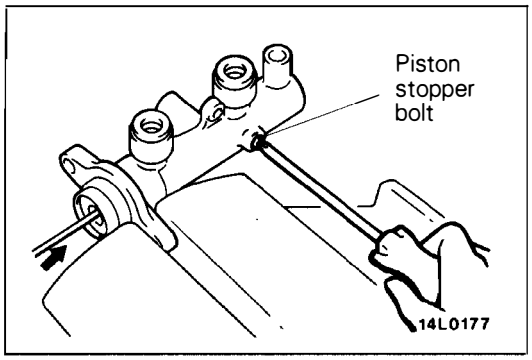
Brake fluid: DOT3 or DOT4

Disassembly steps

1. Reservoir cap assembly
2. Diaphragm
3. Reservoir cap
4. Filter
5. Brake fluid level sensor
6. Float
7. Reservoir stopper bolt
8. Reservoir
9. Reservoir seal
10. Piston stopper bolt
11. Gasket
12. Piston stopper ring
13. Primary piston assembly
14. Secondary piston assembly
15. Master cylinder body

◇A◇
◇B◇

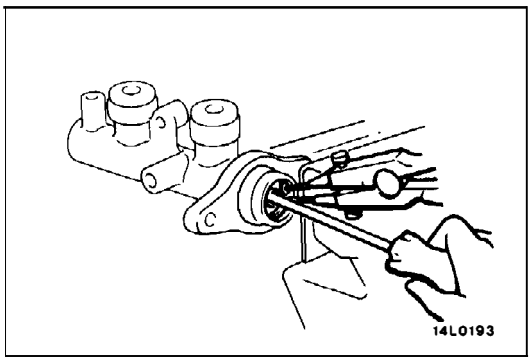
Caution
Do not disassemble the primary and secondary piston assembly.



DISASSEMBLY SERVICE POINTS E35AH06AA

◇A◇ PISTON STOPPER BOLT DISASSEMBLY

Remove the piston stopper bolt, while depressing the piston.



◇B◇ PISTON STOPPER RING DISASSEMBLY

Remove the piston stopper ring, while depressing the piston.

INSPECTION E35AH07AA

- Check the inner surface of master cylinder body for rust or pitting.
- Check the primary and secondary pistons for rust, scoring, damage or wear.
- Check the diaphragm for cracks and wear.

HYDRAULIC UNIT

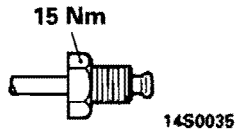
REMOVAL AND INSTALLATION

E35CN00AA

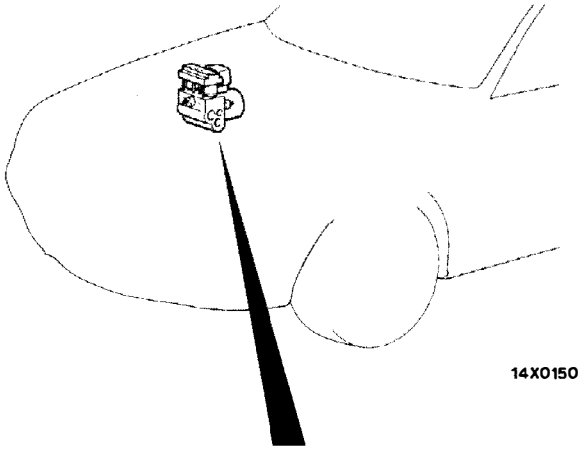
Pre-removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <MPI – L.H. drive vehicles>

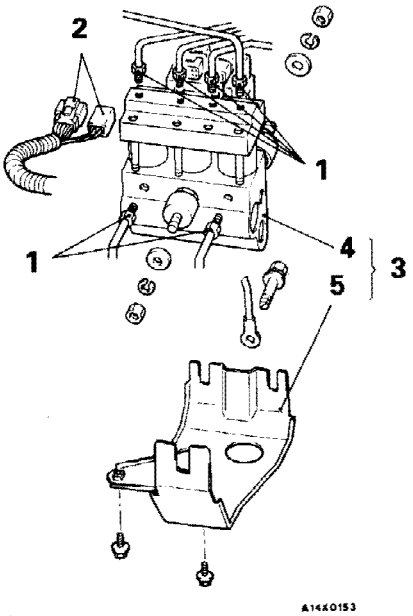
Post-installation Operation
- Installation of the Air Intake Hose Removal <MPI – L.H. drive vehicles>
- Brake Fluid Supplying
- Brake Lines Bleeding (Refer to GROUP 35A – Service Adjustment Procedures.)
- Hydraulic Unit Checking (Refer to P.35C-25.)

Flared brake line nuts

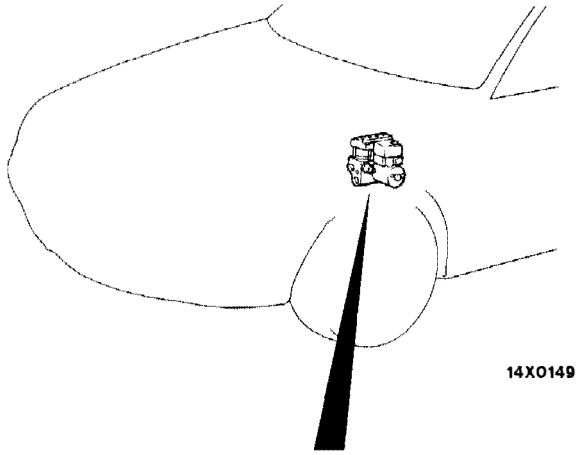


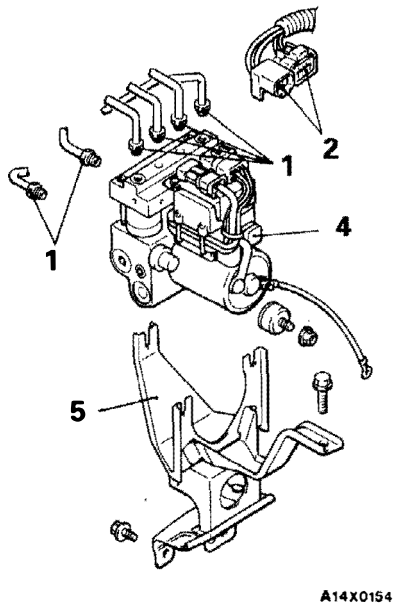
<L.H. drive vehicles>





<R.H. drive vehicles>





Removal steps

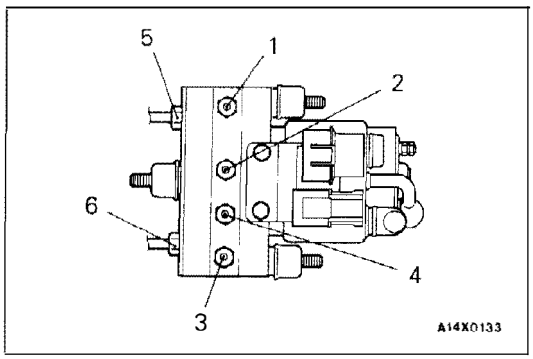
▶A◀ 1. Connection for brake pipe
2. Connection for harness connector
3. Hydraulic unit assembly
◇A◇ 4. Hydraulic unit
5. Hydraulic unit bracket

REMOVAL SERVICE POINTS E35BN01AA

〈A〉 HYDRAULIC UNIT REMOVAL

Caution

1. **The hydraulic unit is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit is not to be disassembled; its nuts and bolts should absolutely not be loosened.**
3. **The hydraulic unit must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit must not be turned upside down or laid on its side.**



INSTALLATION SERVICE POINTS E35BN04AA

◆A◆ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

1. Hydraulic unit – Front brake (L.H.)
2. Hydraulic unit – Rear brake (R.H.)
3. Hydraulic unit – Front brake (R.H.)
4. Hydraulic unit – Rear brake (L.H.)
5. Hydraulic unit – Master cylinder (for left front and right rear)
6. Hydraulic unit – Master cylinder (for right front and left rear)

WHEEL SPEED SENSOR

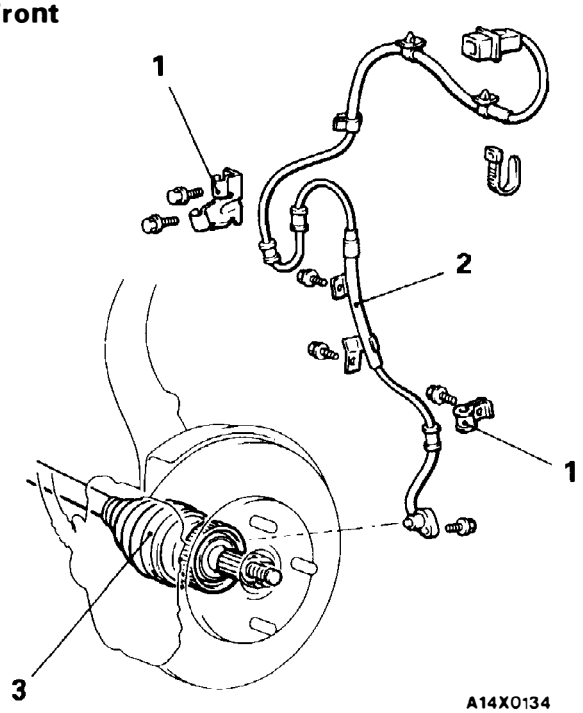
REMOVAL AND INSTALLATION

E35CO00AA

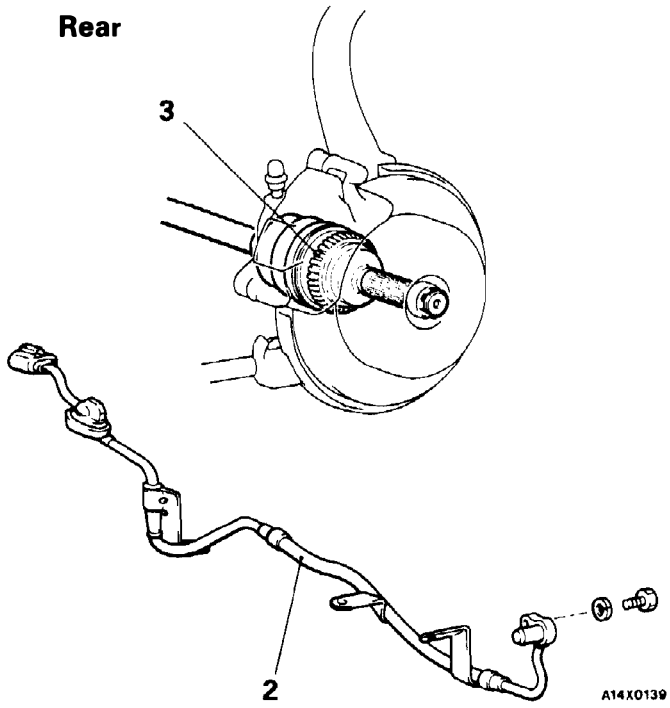
Pre-removal Operation
- Splash Shield Removal <Front only> (Refer to GROUP 42 – Fender.)

Post-installation Operation
- Wheel Speed Sensor Output Voltage Checking (Refer to P.35C-23.)
- Installation Splash Shield <Front only> (Refer to GROUP 42 – Fender.)

Front



Rear



Speed sensor removal steps

1. Clip
◆A◆ 2. Speed sensor

3. Rotor removal

3. Drive shaft (Refer to GROUP 26 – Drive Shaft or refer to GROUP 27 – Drive Shaft)

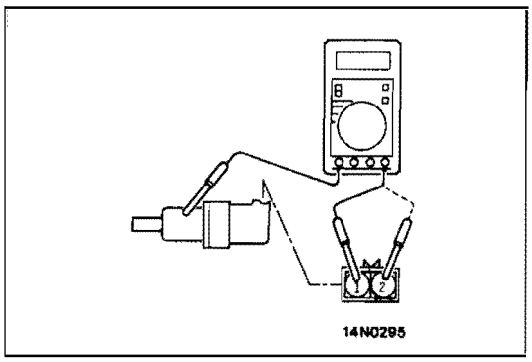
NOTE
The rotor is integrated with the drive shaft and is not disassembled.

INSPECTION

E35CO02AA

SPEED SENSOR

Refer to GROUP 35B – Wheel Speed Sensor.

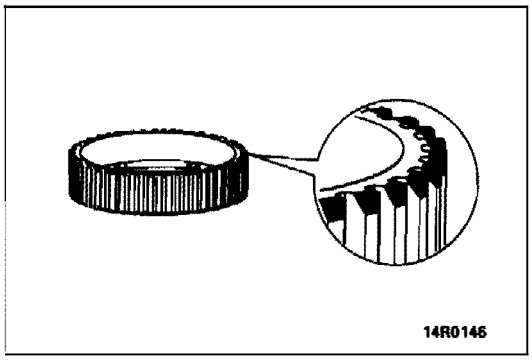


SPEED SENSOR INSULATION INSPECTION E36BO02BA

(1) Remove all connections from the speed sensor, and then measure the resistance between terminals (1) and (2) and the body of the speed sensor.

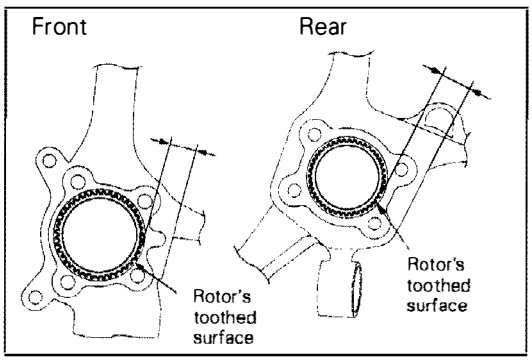
Standard value: 100 kΩ or more

(2) If the speed sensor insulation resistance is outside the standard value range, replace with a new speed sensor.



TOOTHED ROTOR E35BO02CA

Check whether rotor teeth are broken or deformed, and, if so, replace the rotor.



INSTALLATION SERVICE POINTS E35BO04AA

◆A◆ FRONT SPEED SENSOR / REAR SPEED SENSOR INSTALLATION

The clearance between the speed sensor and the rotor's toothed surface is not adjustable, but measure the distance between the sensor installation surface and the rotor's toothed surface.

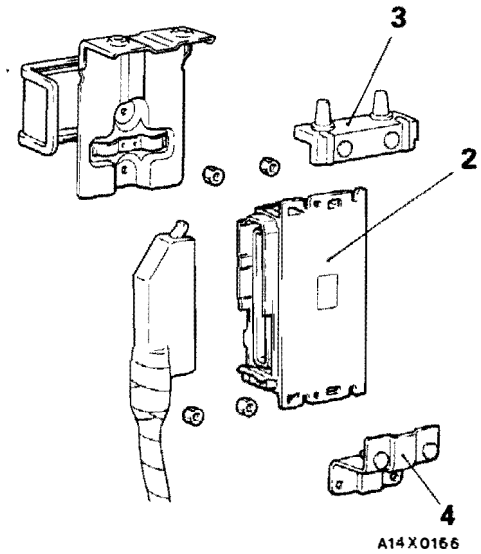
Standard value: 28.2–28.5 mm

ELECTRONIC CONTROL UNIT

REMOVAL AND INSTALLATION

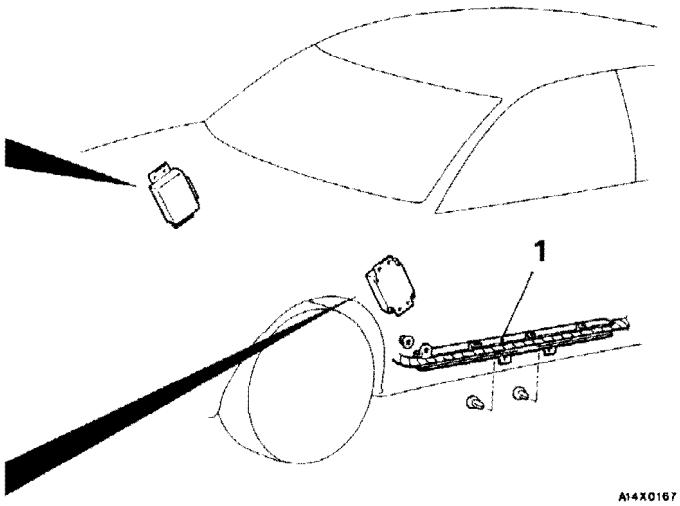
E35CP00AA

<L.H. drive vehicles>



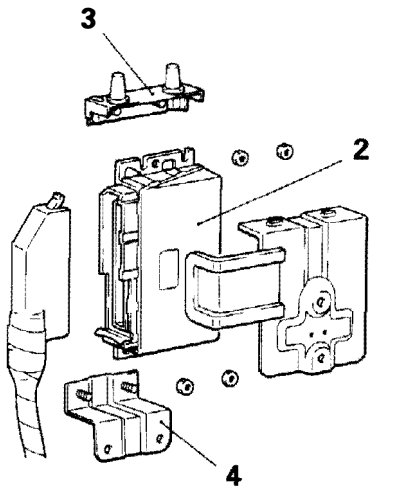
A14X0166

Pre-removal and Post-installation Operation
- Under Cover Removal and Installation. (Refer to GROUP 52A – Instrument Panel.)
- Cowl Side Trim, Scuff Plate Removal and Installation (Refer to GROUP 52A – Trim.)



A14X0167

<R.H. drive vehicles>



A14X0164

Removal steps
1. Harness protector (R.H. drive vehicles)
2. ABS-ECU
3. ABS upper bracket
4. ABS lower bracket

INSPECTION

E35CP02AA

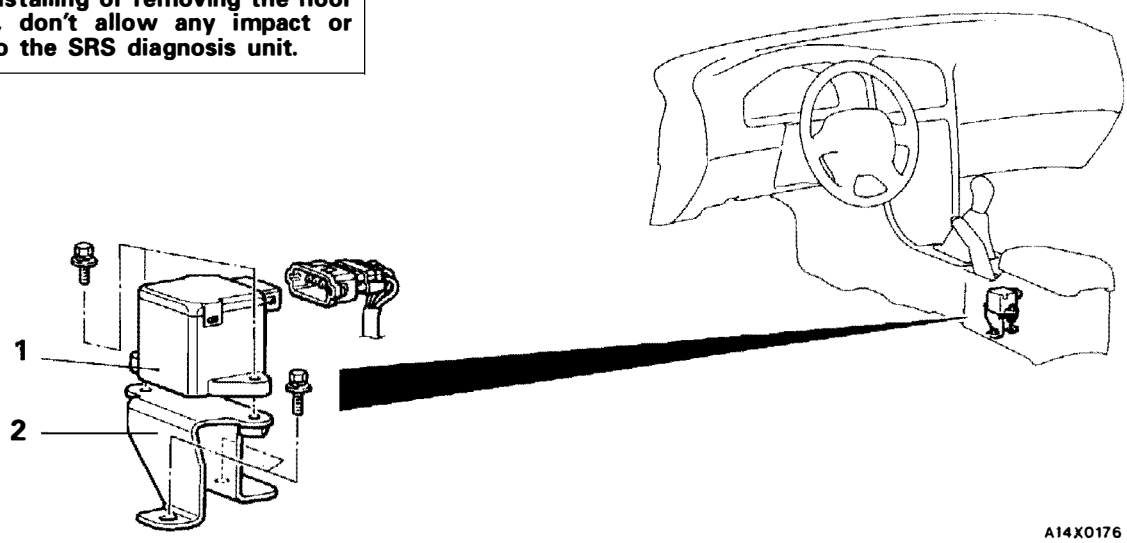
Refer to P.35C-21.

G-SENSOR

REMOVAL AND INSTALLATION

E35CQ00AA

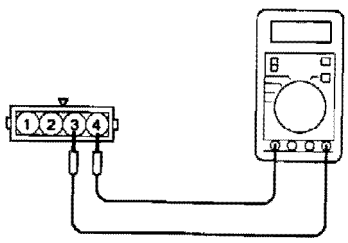
Pre-removal and Post-installation Operation
Removal and Installation of Floor Console Assembly
CAUTION: SRS
When installing or removing the floor console, don't allow any impact or shock to the SRS diagnosis unit.



A14X0176

Removal steps
1. G-sensor
2. G-sensor bracket

Caution
Do not drop the G-sensor or subject it to shocks.



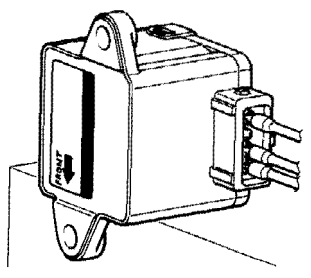
09X0062

INSPECTION

E35CQ02AA

(1) Disconnect the G-sensor connector and connect the special tool (test harness set: MB991348) between the terminals of the disconnected connector.
(2) Turn the ignition switch to ON and take a reading of the following output voltage.
Between terminals (3) and (4)

Standard value: 2.3–2.7 V



09X0063

(3) With the special tool still connected, secure the G-sensor so that the FRONT mark on the sensor mounting surface is facing straight down, and then take a reading of the following output voltage.
Between terminals (3) and (4)

Standard value: 3.1–3.9 V

(4) If the voltage is outside the standard value, after checking to be sure that there is no abnormality in the power supply and earth wires, replace the G-sensor.

PARKING BRAKES

CONTENTS

E36ZA00BB

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 serice personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

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

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

NOTE

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

 Dec. 1993 PWDE9211-B REVISED

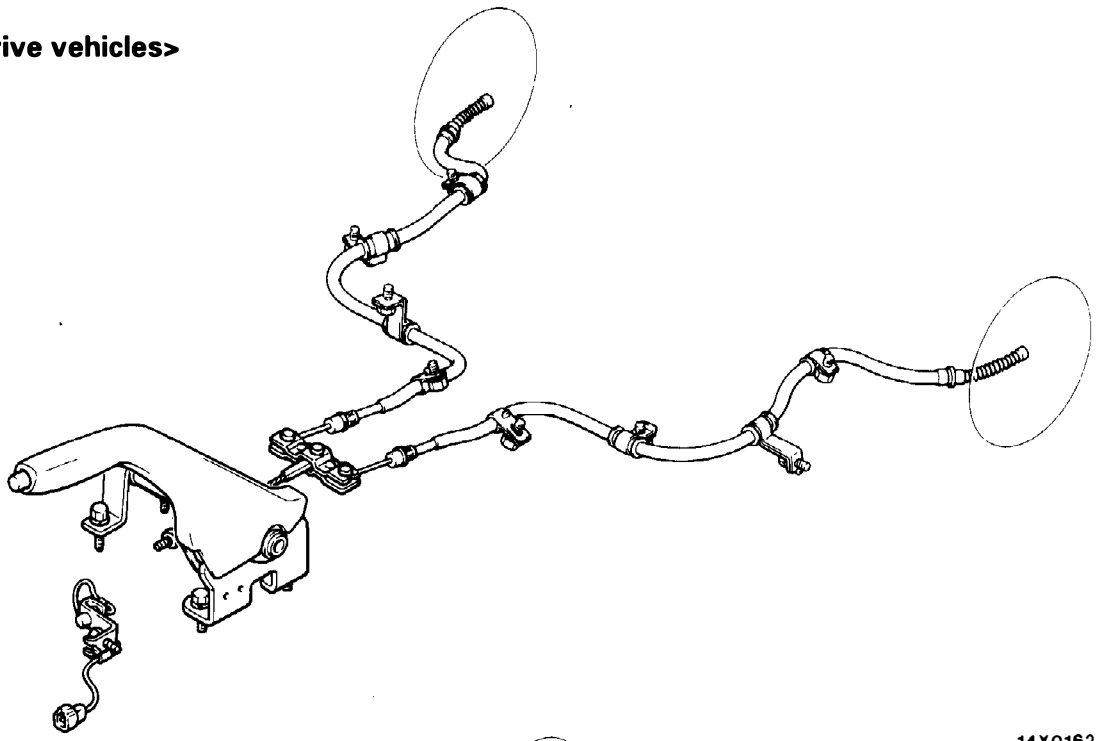
GENERAL INFORMATION

E36ZB00AA

The parking brake is of a mechanical rear-wheel brake construction in all vehicles. Drum-type or drum in disc-type brakes are employed depending on the vehicle model.

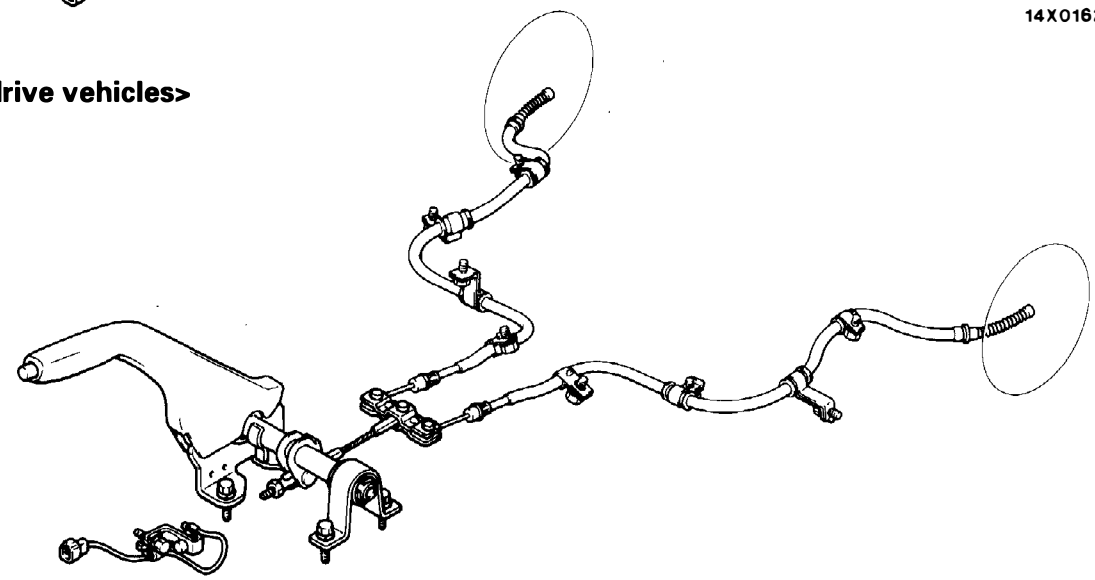
The operation method utilizes a parking brake lever which is in an offset position at the driver's side.

<L.H. drive vehicles>



14X0162

<R.H. drive vehicles>



14X0067

SERVICE SPECIFICATIONS

E36ZC00AA

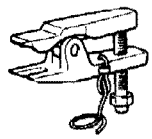
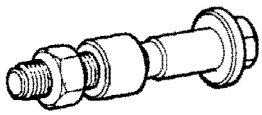
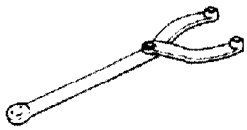
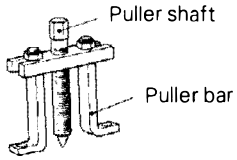
Item		Specifications
Standard value		
Parking brake lever stroke		3–5 notches <Vehicles with drum in disc brake>
		5–7 notches <Vehicles with drum brake>
Brake lining thickness	mm	2.8
Brake drum inside diameter	mm	168
Limit		
Brake lining thickness	mm	1.0
Brake drum inside diameter	mm	169

LUBRICANTS

Items	Specified lubricants
Backing plate Shoe and lining assembly Adjuster	Brake grease SAE J310, NLGI No. 1

SPECIAL TOOLS

E36ZD00AA

Tool	Number	Name	Use
	MB991113 or MB990635	Steering linkage puller	Removal of the knuckle and toe control arm ball joint
	MB990998	Front hub remover and installer	Removal or press-in the hub
	MB990767	End yoke holder	Removal of the drive shaft NOTE Three puller bars (MB990244) are used
	MB990241	Axle shaft puller (MB990244 : Puller bar MB990242 : Puller shaft)	

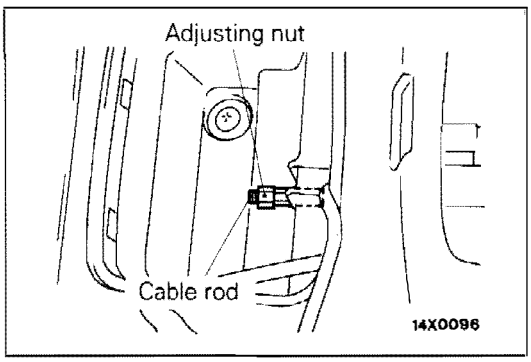
SERVICE ADJUSTMENT PROCEDURES

E36ZF00AA

PARKING BRAKE LEVER STROKE CHECK

1. Pull the parking brake lever with a force of approx. 196 N and count the number of notches.

Caution
The 196 N force of the parking brake lever must be strictly observed.



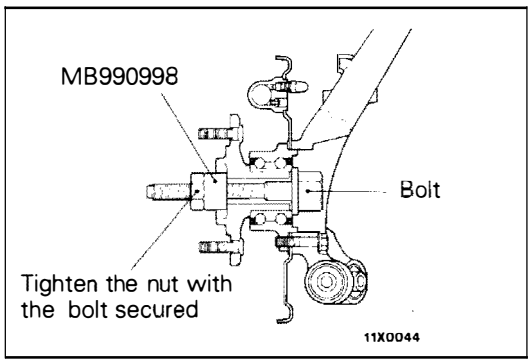
Standard value: 3–5 notches <Vehicles with drum in disc brake>
5–7 notches <Vehicles with drum brake>

2. If the parking brake lever stroke is not the standard value, adjust as described below.
   (1) Remove the inner compartment mat of the floor console.
   (2) Loosen the adjusting nut to the end of the cable rod, thus freeing the parking brake cable.

<Vehicles with drum brake>

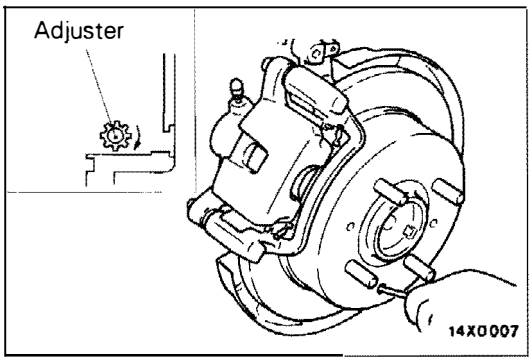
- With the engine idling, forcefully depress the brake pedal five of six times and confirm that the pedal stroke stops changing.

NOTE
If the pedal stroke stops changing, the automatic-adjustment mechanism is functioning normally, and the clearance between the shoe and drum is correct.

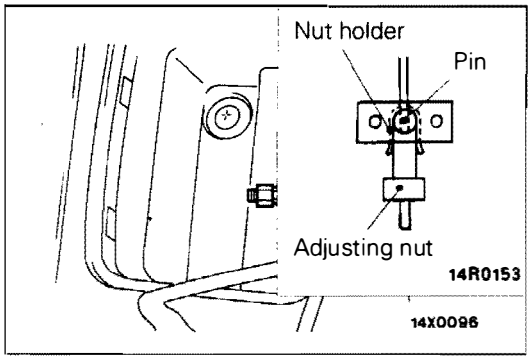


<Vehicles with drum in disc brake>

1. For vehicles with 4WD, pull the drive shaft out from the hub. (Refer to GROUP 27 – Drive Shaft.) Set the special tool to the hub as shown in the illustration.



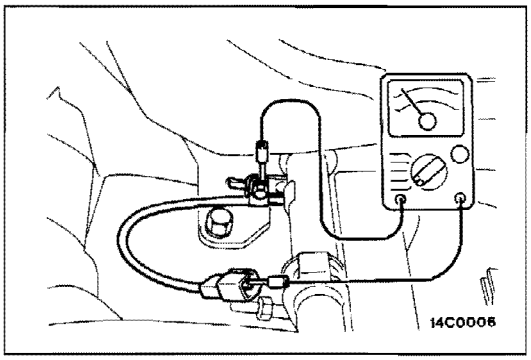
2. Remove the adjustment hole plug, and then use a flat-tip (–) screwdriver to turn the adjuster in the direction of the arrow (the direction which expands the shoe) so that the disc will not rotate.
3. Return the adjuster five notches in the direction opposite to the direction of the arrow.



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 to be sure 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.



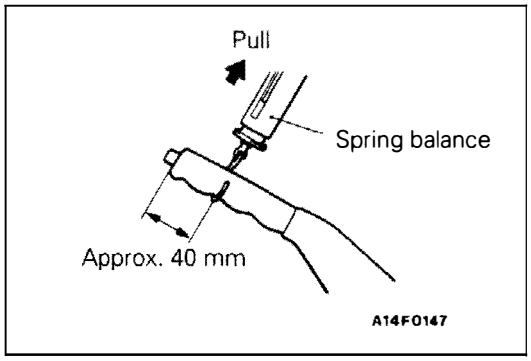
PARKING BRAKE SWITCH CHECK E36ZF01AA

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 E36ZF02AA

<Vehicles with drum in disc brake>

Carry out running-in by the following procedure when replacing the parking brake linings or the rear brake disc rotors, or when brake performance is insufficient.



(1) Adjust the parking brake stroke to the speified value.
(2) Hook a spring balance onto the centre of the parking brake lever grip and pull it with a force of 98–147 N in a direction perpendicular to the handle.

(3) Drive the vehicle at a constant speed of 35–50 km/h for 100 metres.
(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

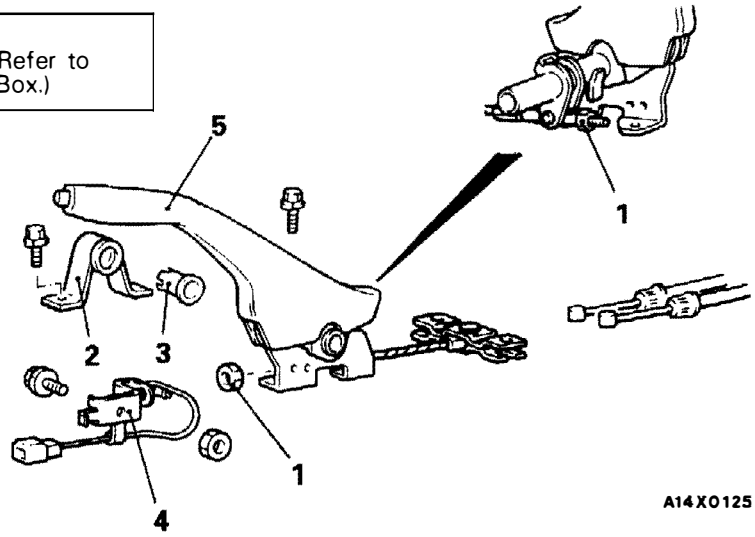
E36ZG00AA

REMOVAL AND INSTALLATION

CAUTION: SRS
1. **When removing and installing the floor console in vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit or other components.**
2. **Before removal of SRS diagnosis unit, refer to GROUP 52B – SRS Diagnosis Unit.**

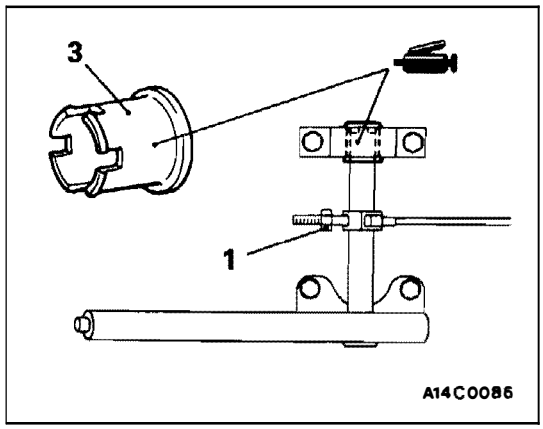
Pre-removal Operation
- Floor Console Removal (Refer to GROUP 52A – Console Box.)

Post-installation Operation
- Parking Brake Lever Stroke Adjustment (Refer to P. 36-4.)
- Floor Console Installation (Refer to GROUP 52A – Console Box.)

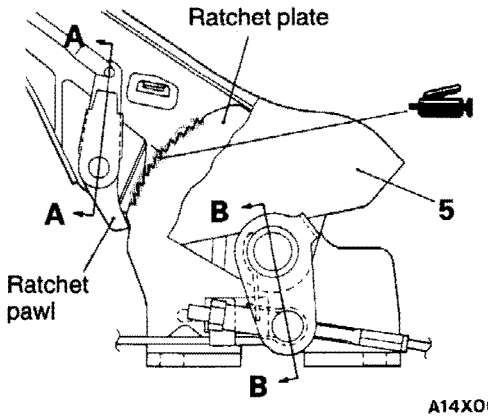


A14X0125

Removal steps
1. Adjusting nut
2. Parking brake stay
3. Bushing
4. Parking brake switch
5. Parking brake lever

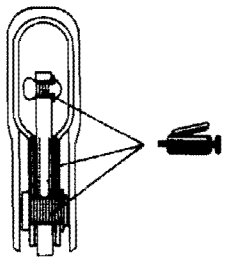


A14C0086



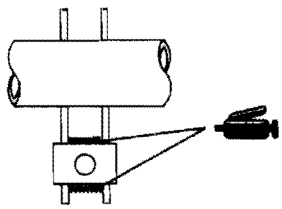
A14X0099

Section A-A



A14X0010

Section B-B



A14X0009

PARKING BRAKE CABLE <DRUM BRAKE>

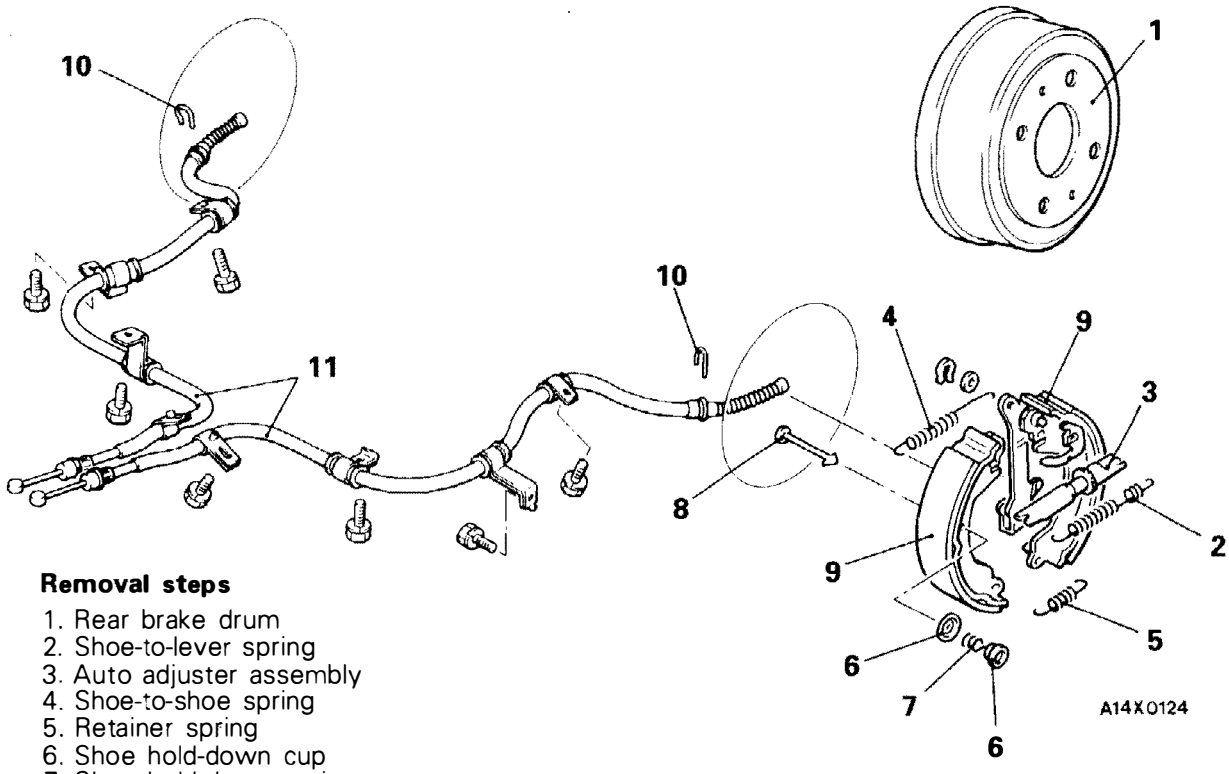
E36ZH00AA

REMOVAL AND INSTALLATION

CAUTION: SRS
1. **When removing and installing the floor console in vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit or other components.**
2. **Before removal of SRS diagnosis unit, refer to GROUP 52B – SRS Diagnosis Unit.**

Pre-removal Operation
- Floor Console Removal (Refer to GROUP 52A – Console Box.)

Post-installation Operation
- Parking Brake Lever Stroke Adjustment (Refer to P.36-4.)
- Floor Console Installation (Refer to GROUP 52A – Console Box.)



Removal steps
1. Rear brake drum
2. Shoe-to-lever spring
3. Auto adjuster assembly
4. Shoe-to-shoe spring
5. Retainer spring
6. Shoe hold-down cup
7. Shoe hold-down spring
8. Shoe hold-down pin
9. Shoe and lining assembly
10. Clip
11. Parking brake cable

PARKING BRAKE CABLE <DRUM IN DISC BRAKE>

E36ZI00AA

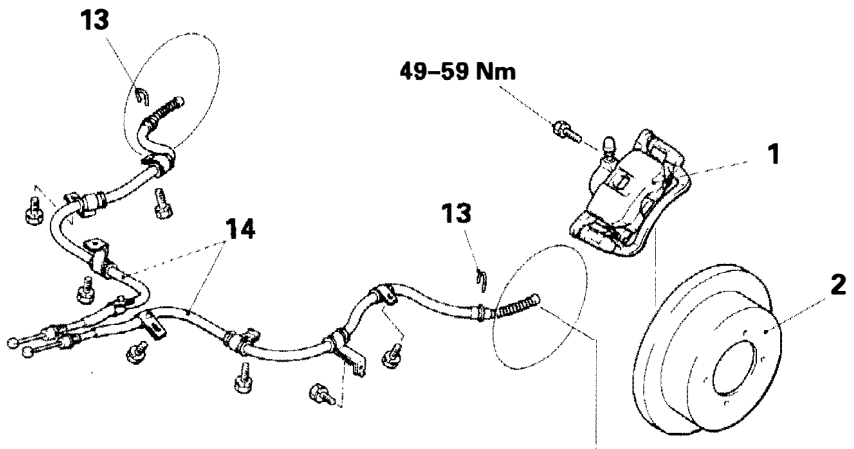
REMOVAL AND INSTALLATION

CAUTION: SRS
1. **When removing and installing the floor console in vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit or other components.**
2. **Before removal of SRS diagnosis unit, refer to GROUP 52B – SRS Diagnosis Unit.**

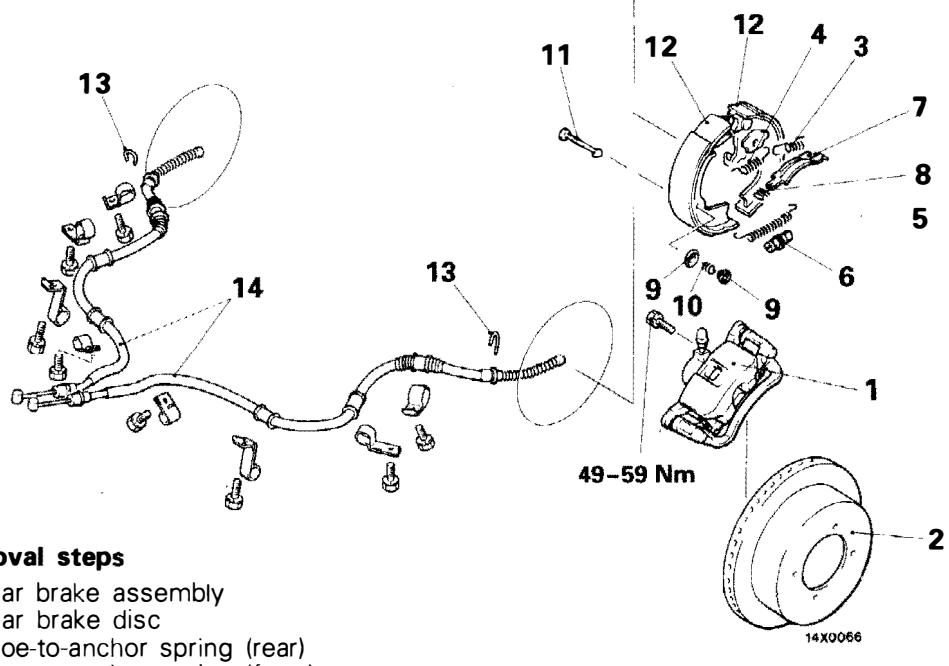
Pre-removal Operation
- Floor Console Removal (Refer to GROUP 52A – Console Box.)

Post-installation Operation
- Parking Brake Lever Stroke Adjustment (Refer to P.36-4.)
- Floor Console Installation (Refer to GROUP 52A – Console Box.)

<2WD>

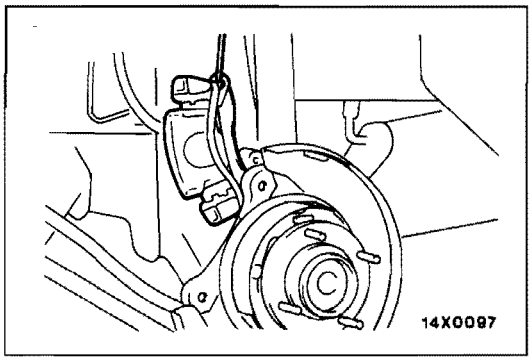


<4WD>



Removal steps

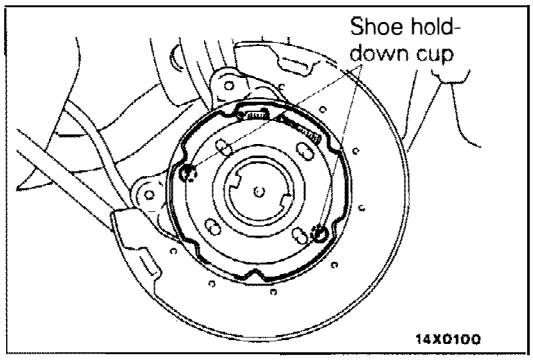
〈A〉 1. Rear brake assembly
2. Rear brake disc
●B● 3. Shoe-to-anchor spring (rear)
●B● 4. Shoe-to-anchor spring (front)
5. Adjusting wheel spring
●A● 6. Adjuster
7. Strut
8. Strut return spring
〈B〉 9. Shoe hold-down cup
10. Shoe hold-down spring
11. Shoe hold-down pin
12. Shoe and lining assembly
13. Clip
14. Parking brake cable



REMOVAL SERVICE POINTS E36ZI01AA

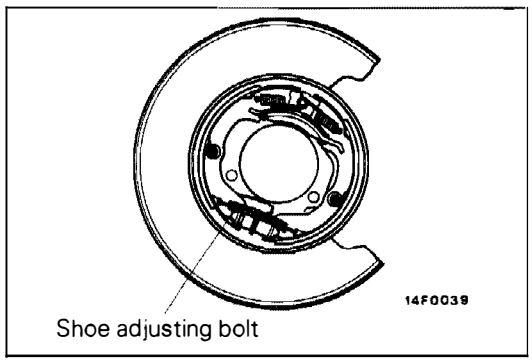
◇A◇ REAR BRAKE ASSEMBLY REMOVAL

Remove the rear brake assembly and support it with wire or similar.



◇B◇ SHOE HOLD-DOWN CUP REMOVAL

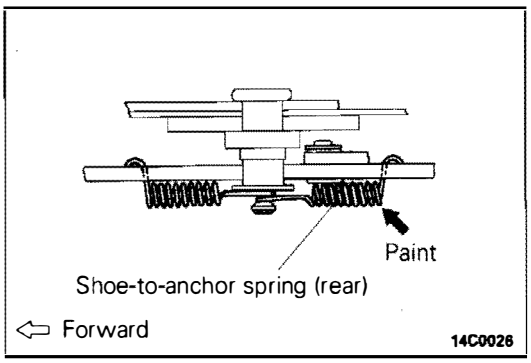
Extend the shoe and lining assembly, and remove the shoe hold-down cup.



INSTALLATION SERVICE POINTS E36ZI04AA

◆A◆ ADJUSTER INSTALLATION

Install the adjuster so that the shoe adjusting bolt of left hand wheel is attached towards the front of the vehicle, and the shoe adjusting bolt of right hand wheel is towards the rear of the vehicle.



◆B◆ SHOE-TO-ANCHOR SPRING

The load on the respective shoe-to-anchor springs is different, so the spring in the figure has been painted.

NOTE
The figure shows the left wheel; for the right wheel, the position is symmetrical.

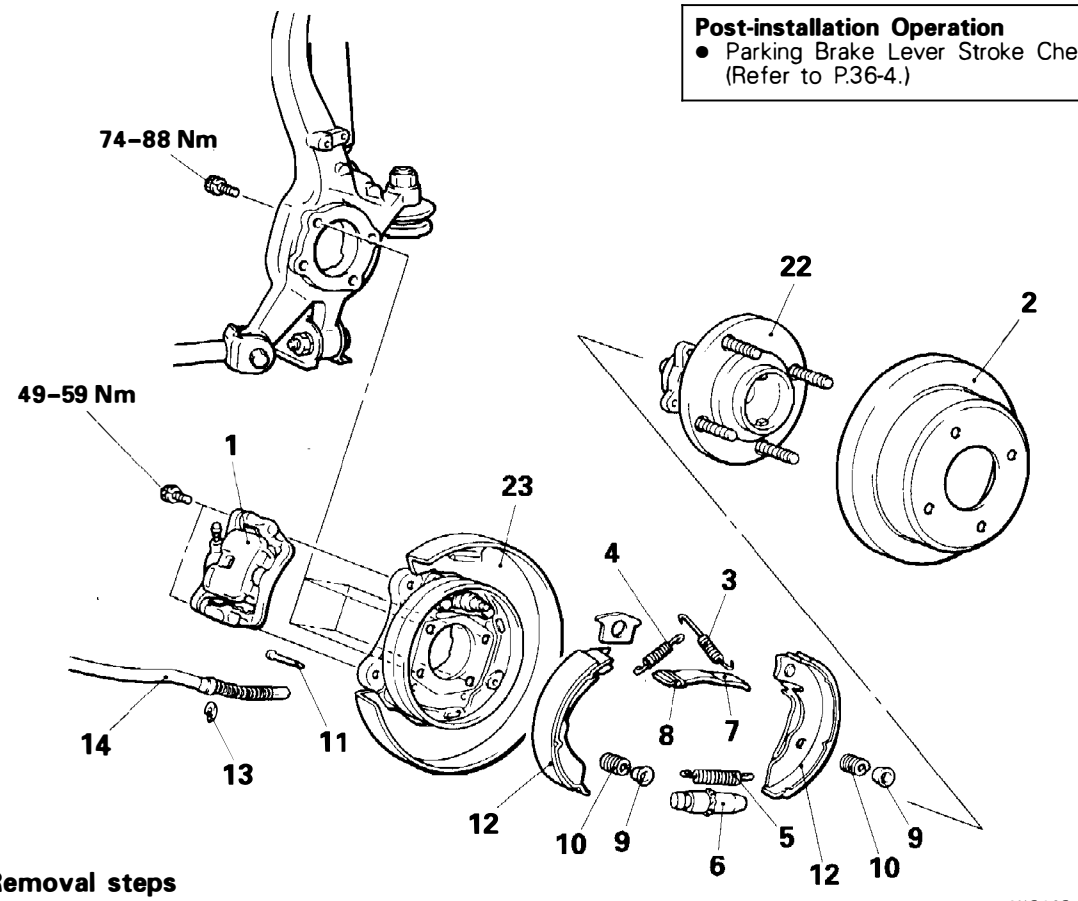
PARKING BRAKE DRUM

E36ZJ00AB

REMOVAL AND INSTALLATION

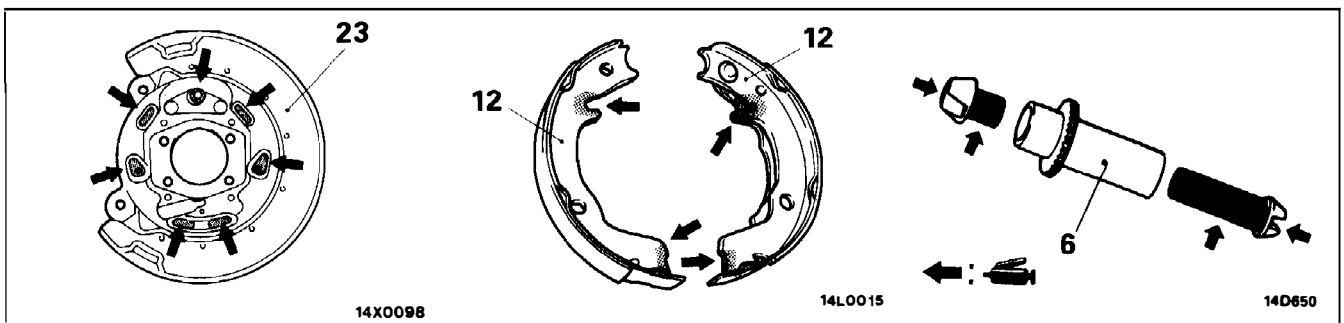
<2WD>

Post-installation Operation
- Parking Brake Lever Stroke Check (Refer to P.36-4.)



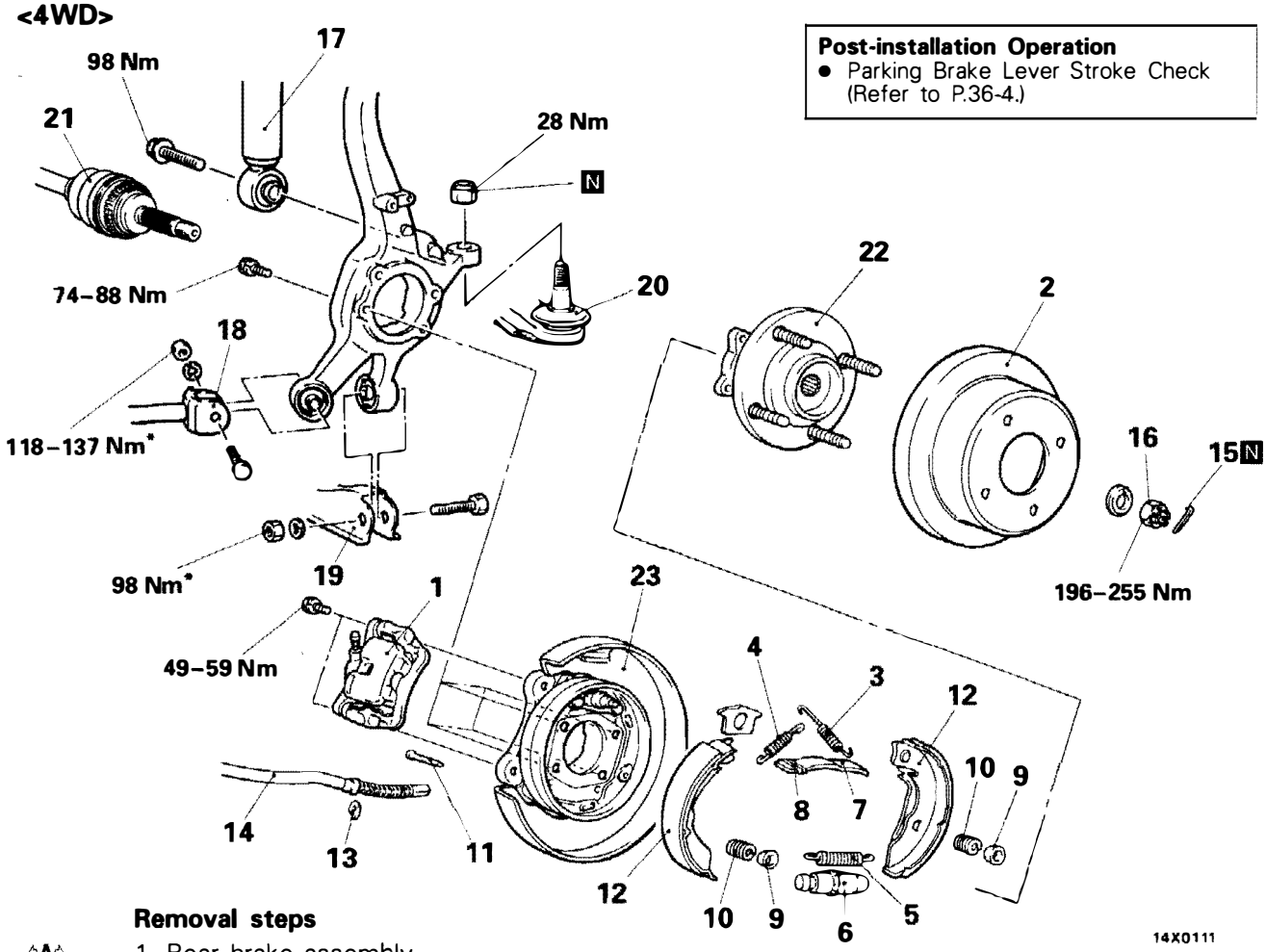
Removal steps

〈A〉 1. Rear brake assembly
2. Rear brake disc
◆C◆ 3. Shoe-to-anchor spring (rear)
◆C◆ 4. Shoe-to-anchor spring (front)
5. Adjusting wheel spring
◆B◆ 6. Adjuster
7. Strut
8. Strut return spring
〈B〉 9. Shoe hold-down cup
10. Shoe hold-down spring
11. Shoe hold-down pin
12. Shoe and lining assembly
13. Clip
14. Parking brake cable
22. Rear hub assembly
23. Backing plate



Brake grease: SAE J310, NLGI No. 1

<4WD>

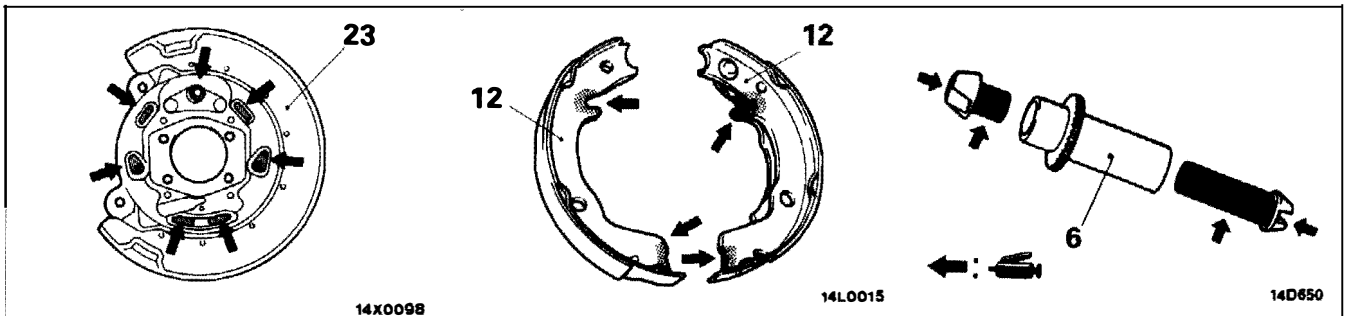


Post-installation Operation
- Parking Brake Lever Stroke Check (Refer to P.36-4.)

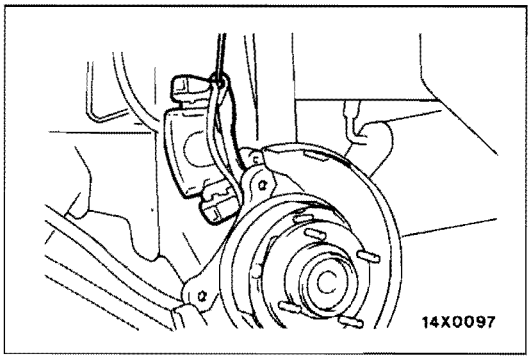
Removal steps

◇A◇ 1. Rear brake assembly
2. Rear brake disc
●C● 3. Shoe-to-anchor spring (rear)
●C● 4. Shoe-to-anchor spring (front)
5. Adjusting wheel spring
●B● 6. Adjuster
7. Strut
8. Strut return spring
◇B◇ 9. Shoe hold-down cup
10. Shoe hold-down spring
11. Shoe hold-down pin
12. Shoe and lining assembly
13. Clip
14. Parking brake cable
15. Split pin
◇C◇ ●A● 16. Drive shaft nut
17. Shock absorber connection
18. Trailing arm connection
19. Lower arm connection
◇D◇ 20. Toe control arm connection
◇E◇ 21. Drive shaft
22. Rear hub assembly
23. Backing plate

Caution
***: Indicates parts which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**



Brake grease: SAE J310, NLGI No. 1

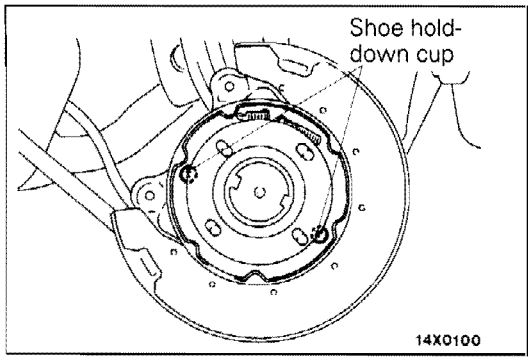


REMOVAL SERVICE POINTS E36ZJ01AA

〈A〉 REAR BRAKE ASSEMBLY REMOVAL

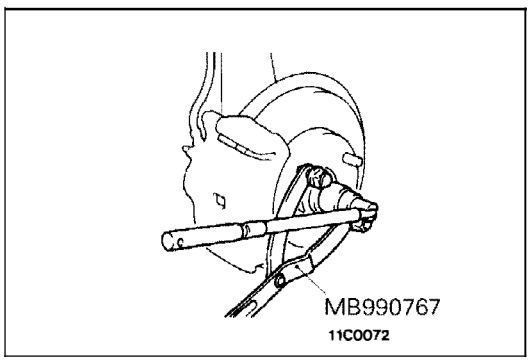
Remove the rear brake assembly and support it with wire or similar.

NOTE
For vehicles with 4WD, when taking out the drive shaft, loosen the drive shaft nut before removing the rear brake assembly.

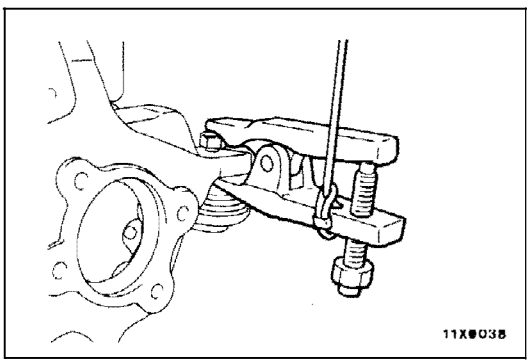


〈B〉 SHOE HOLD-DOWN CUP REMOVAL

Extend the shoe and lining assembly, and remove the shoe hold-down cup.

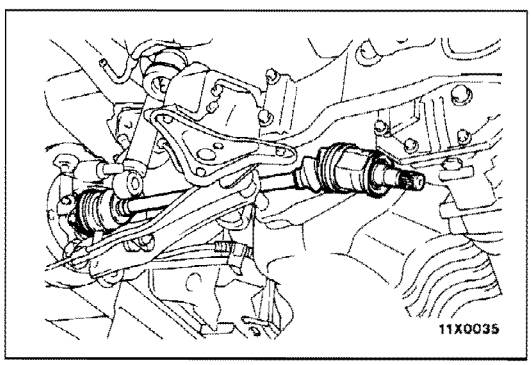


〈C〉 DRIVE SHAFT NUT REMOVAL



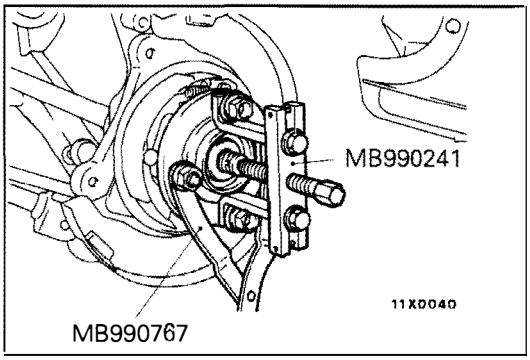
〈D〉 TOE CONTROL ARM DISCONNECTION

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.**

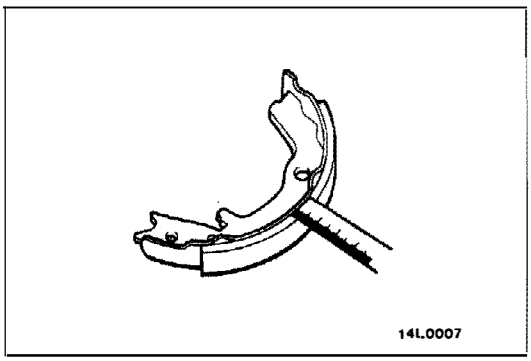


〈E〉 DRIVE SHAFT REMOVAL

(1) Push out the knuckle toward the outside of the vehicle, and then separate the drive shaft from the differential carrier. At this time, use a lever or similar to separate the drive shaft connection.



(2) Use the special tools to push out the drive shafts from the hub.



INSPECTION E36ZJ02AA

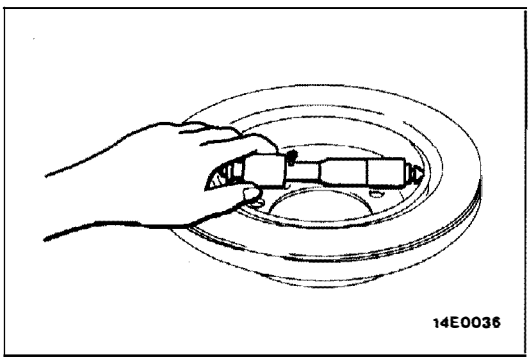
BRAKE LINING AND BRAKE DRUM CHECK

(1) Measure the thickness of the brake lining at several places.

Standard value: 2.8 mm

Limit: 1.0 mm

Caution
Replace the brake shoes if the thickness of the brake lining is the limit value or less.

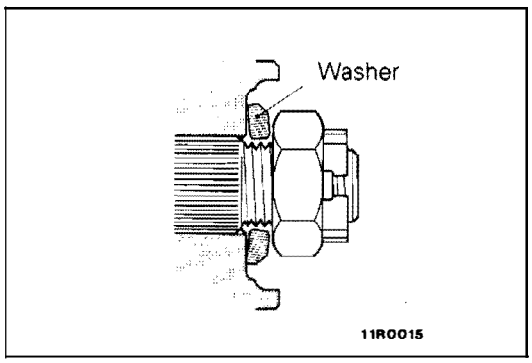


(2) Using a dial gauge caliper or micrometer (for inner side), measure the brake disc drum inner diameter at two or more places.

Standard value: 168.0 mm

Limit: 169.0 mm

Caution
Replace if the brake disc drum inner diameter is the limit value or more.

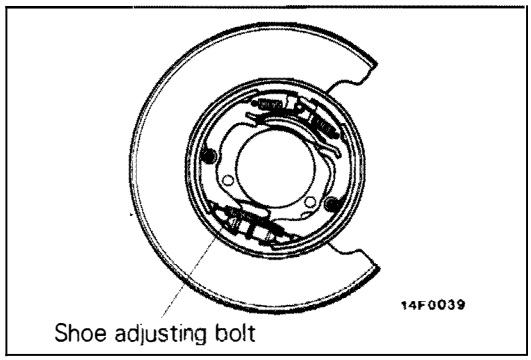


INSTALLATION SERVICE POINTS E36ZJ04AA

◆A◆ DRIVE SHAFT NUT INSTALLATION

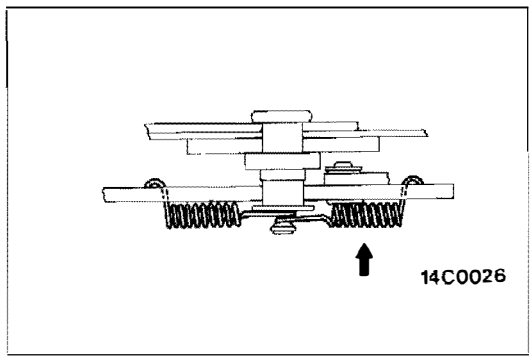
(1) Be sure to install the washer and drive shaft nut in the specified direction.
(2) Use the special tool (MB990767), tighten the drive shaft nut.
(3) If the position of the split pin holes does not match, tighten the nut up to 255 Nm in maximum.
(4) Install the split pin in the first matching holes and bend it securely.

Caution
Before securely tightening the drive shaft nuts, make sure that there is no load on the wheel bearings.



◗B◖ ADJUSTER INSTALLATION

Install the adjuster so that the shoe adjusting bolt of left hand wheel is attached towards the front of the vehicle, and the shoe adjusting bolt of right hand wheel is towards the rear of the vehicle.



◗C◖ SHOE-TO-ANCHOR SPRING INSTALLATION

The load on the respective shoe-to-anchor springs is different, so the spring in the figure has been painted.

NOTE
The figure shows the left wheel; for the right wheel, the position is symmetrical.

STEERING

CONTENTS

E37ZA00AA

NOTE
Group that has been shaded is not contained in this manual.

 PWDE9211

NOTES

STEERING

CONTENTS

E37ZA00AB

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 serice personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

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

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

NOTE

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

 Dec. 1993 PWDE9211-B REVISED

GENERAL INFORMATION

E37AB00AB

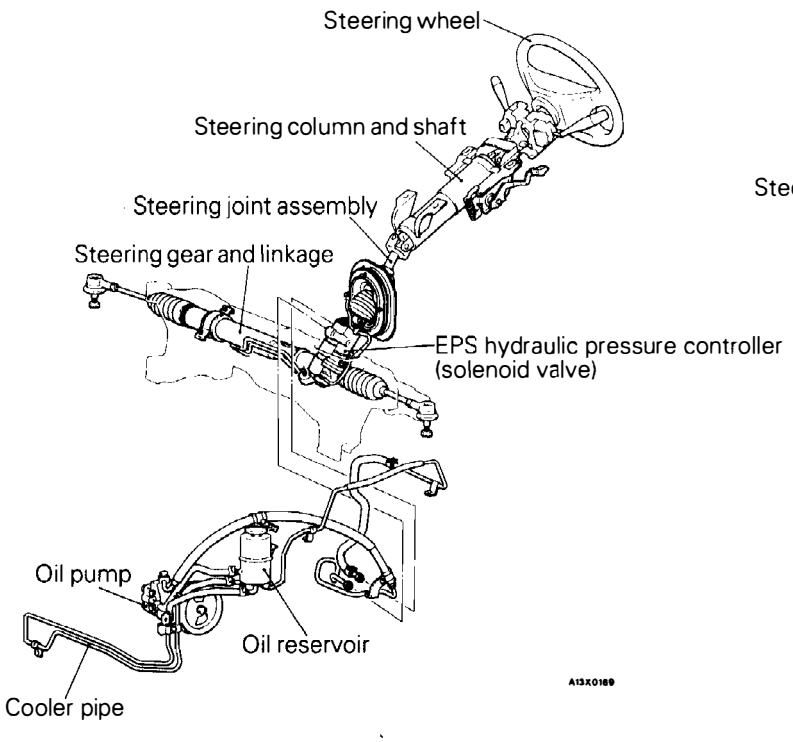
Power steering has been adopted in all models. There are two types of power steering – one that is responsive to engine speed and one (electronically controlled) that is responsive to vehicle speed.
The main features are as follows.
Both three-spoke and four-spoke steering wheels have ben adopted. In addition, SRS (Supplemental Restraint System) is provided as an option in all vehicles.

The steering column in all vehicles has a shock absorber mechanism and a tilt steering mechanism.
A vane-type oil pump with a fluid flow control system included has been adopted.
The steering gear and linkage is an integral rack and pinion type, with EPS (Electronic control Power Steering) adopted in some models.

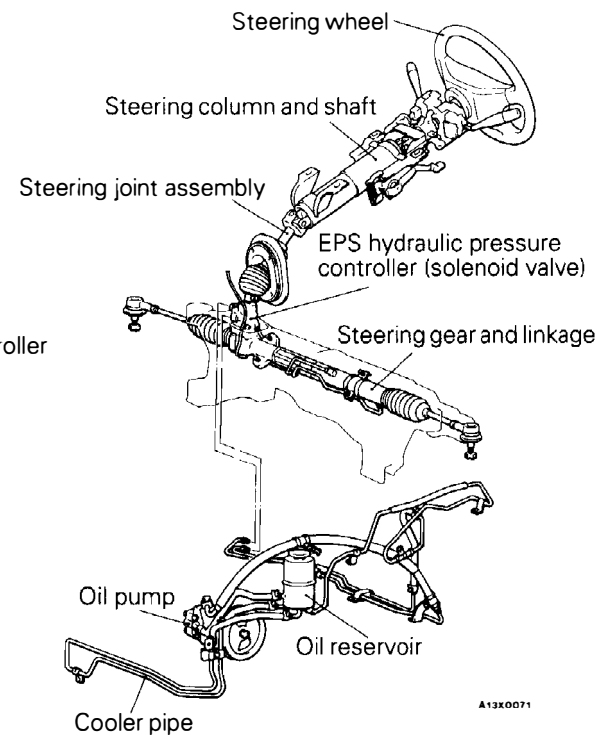
Items		Specifications
Gear box		
Steering gear type		Rack and pinion
Oil pump		
Oil pump type		Vane type
Displacement	ℓ /rev.	
2WS		9.6
4WS		8.1
Relief set pressure	MPa	
2WS		
4G9, 4D6		7.8, 8.8*
4G6, 6A1		8.8
4WS		
Up to 1993 models		10.8
From 1994 models		11.8

NOTE
* : Vehicles with 4D6 built from August 1993.

<L.H. drive vehicles>



<R.H. drive vehicles>



SERVICE SPECIFICATIONS

E37AC00AB

Items		Specifications
Standard value		
Steering wheel free play (with engine stopped)	mm	15 or less
Steering angle		
Inner wheel		39°00′ ± 2°
Outer wheel		39°30′
Tie rod end ball joint starting torque	Nm	0.5–2.5
Stationary steering effort	N	34 or less
Oil pump pressure	MPa	
Oil pump relief pressure		
2WS		
4G9, 4D6		7.3–8.0
4G6, 6A1		8.5–9.0
4WS		10.3–11.3
Pressure under no-load conditions		0.8–1.0
Steering gear retention hydraulic pressure		
2WS		
4G9, 4D6		7.3–8.0
4G6, 6A1		8.5–9.0
4WS		10.3–11.3
Oil pressure switch operating pressure	MPa	
OFF → ON		1.5–2.0
ON → OFF		0.7–1.2
Total pinion preload	Nm	
2WS		0.6–1.4
4WS		
Up to 1993 models		0.6–1.5
From 1994 models		0.7–1.3
Tie-rod joint swing resistance	N	
2WS		8–28
4WS		
Up to 1993 models		8–28
From 1994 models		11–28
Tie-rod joint swing torque	Nm	
2WS		1.5–5.0
4WS		
Up to 1993 models		1.5–5.0
From 1994 models		2.0–5.0
Limit		
Steering wheel free play (when hydraulic operation)	mm	30
Oil pump pulley assembly backlash	mm	0.1

LUBRICANTS

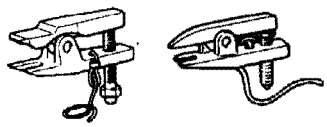
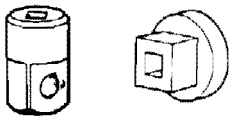
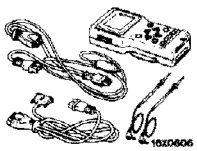
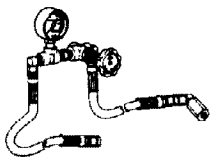
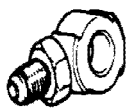
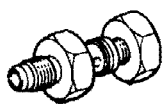
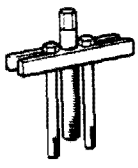
Items	Specified lubricants	Quantity
Power steering gear box		
Bearing	Automatic transmission fluid DEXRON or DEXRON II	As required
O-ring	Automatic transmission fluid DEXRON or DEXRON II	As required
Oil seal	Automatic transmission fluid DEXRON or DEXRON II	As required
Special tool (MB991214)	Automatic transmission fluid DEXRON or DEXRON II	As required
Pinion and valve assembly seal ring part	Automatic transmission fluid DEXRON or DEXRON II	As required
Bellows	Silicone grease	As required
Oil pump		
Power steering fluid	Automatic transmission fluid DEXRON or DEXRON II	0.9 ℓ
Flow control valve	Automatic transmission fluid DEXRON or DEXRON II	As required
Friction surface of rotor, vane, cam ring and pump cover	Automatic transmission fluid DEXRON or DEXRON II	As required
O-ring	Automatic transmission fluid DEXRON or DEXRON II	As required

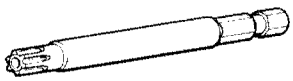
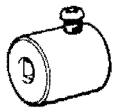
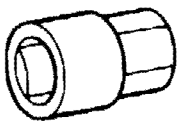
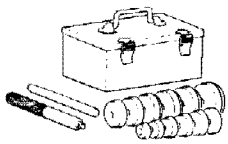
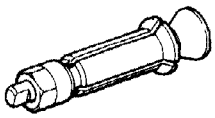
SEALANT AND ADHESIVES

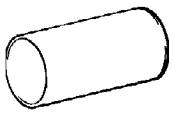
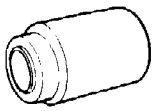
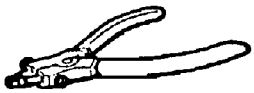
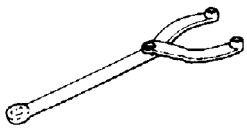
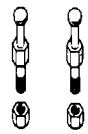
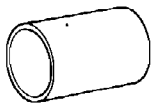
Items	Specified sealant and adhesive	Remarks
Power steering gear box End plug screw Power steering rack support cover screw Dust cover lip for tie rod end ball joint	3M ATD Part No. 8661 or equivalent	Semi-drying sealants

SPECIAL TOOLS

E37AD00AA

Tool	Number	Name	Use
	MB991113 or MB990635	Steering linkage puller	Disconnection of tie-rod end
	MB990685	Torque wrench	Measurement of the ball joint starting torque Measurement of the pinion shaft preload
	MB990326 or CT-1046	Preload socket	Measurement of the ball joint starting torque
	MB991502	MUT-II sub assembly	Checking the stationary steering effort Checking the diagnosis codes
 16X0607		ROM pack	
	MB990662	Oil pressure gauge assembly	Measurement of oil pressure
	MB990993 or MB991217	Power steering oil pressure gauge adapter (pump side)	
	MB990994	Power steering oil pressure gauge adapter (hose side)	
	MB990803	Steering wheel puller	Disconnection of the steering wheel

Tool	Number	Name	Use
	MB990826	Torque wrench	Removal and installation of the tilt bracket or upper bracket
	MB991006	Preload socket	Measurement of the pinion shaft preload
	MB991204	Torque wrench socket	Adjustment of rack support Removal of rack support cover
	MB990925	Bearing and oil seal installer set (Refer to GROUP 26)	Installation of the oil seal and bearing MB990926 MB990927 MB990938 MB990939
	MB991120	Needle bearing puller	Removal of rack housing needle bearing
	MB991197	Bar (long type)	To press in the oil seal for the rack
	MB991199	Oil seal installer	To press in the oil seal for the rack
	MB991202	Oil seal & bearing installer	Press fitting of rack housing bearing
	MB991214	Rack installer	Rack installation

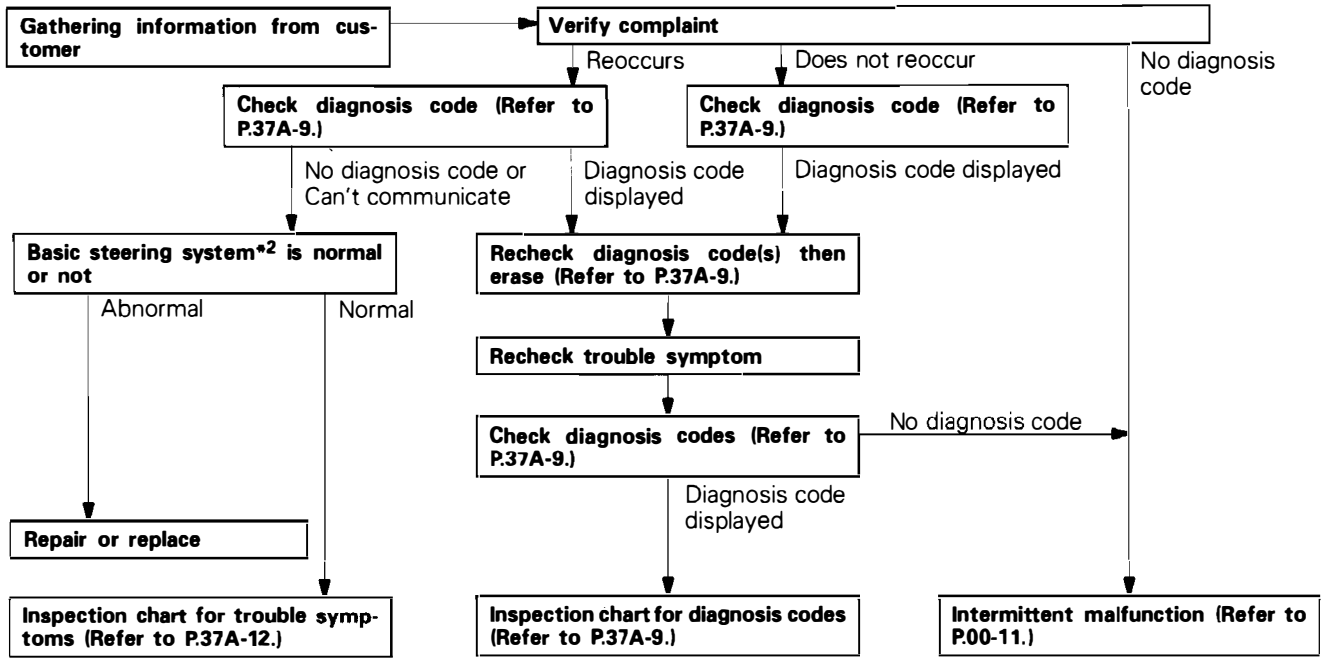
Tool	Number	Name	Use
	MB991203	Oil seal & bearing installer	To press in the valve housing oil seal and bearing
	MB991317	Seal ring installer	Compression of the seal rings after replacement of the pinion seal rings
	MB990776	Front axle base	Installation of dust cover for tie rod end ball joint
	MB990628	Snap ring pliers	To remove and install the snap ring of the pulley and shaft
	MB990767	End york holder	Securing the drive pulley
	MD998719 or MD998754	Crankshaft pulley holder pin	
	MB990956	Needle bearing installer	Removal of drive shaft assembly
	MB991172	Adapter	

TROUBLESHOOTING (Up to 1993 models*1)

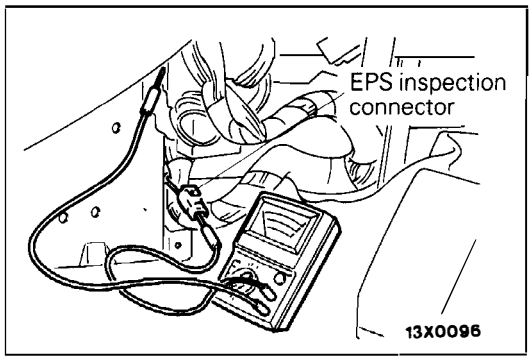
E37AE00AB

NOTE
*1: Sometimes a diagnosis code may not be output after replacing the EPS control unit (EPS-ECU) or the control wiring harness. In such a case, refer to TROUBLESHOOTING (FROM 1994 MODELS) on P.37A-14-1.

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



NOTE
*2: Basic steering system refers to steering systems other than the EPS system.



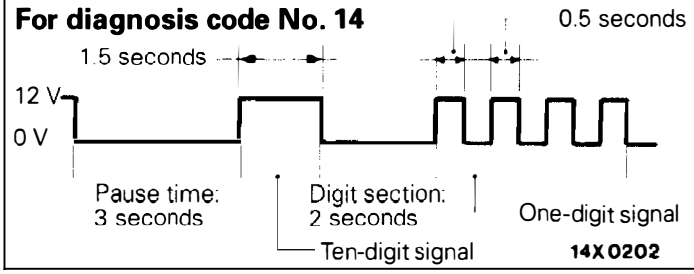
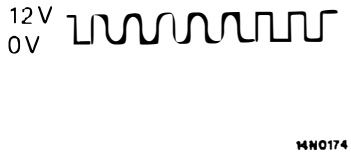
DIAGNOSTIC FUNCTION

E37AE01AA

DIAGNOSTIC CODE CHECK

1. Remove the instrument panel side cover.
2. Connect the (+) terminal of the voltmeter to the EPS inspection connector, and connect the (–) terminal to earth.
3. With the ignition switch in the ON position, take a reading of the diagnosis codes from the movement of the needle on the voltmeter.

DIAGNOSIS RESULT DISPLAY METHOD

Example of diagnosis code voltage waveform	Normal voltage waveform
For diagnosis code No. 14  	 Continuous ON and OFF signals at intervals of 0.5 seconds

NOTE
Other diagnosis items are also output as voltage waveforms corresponding to diagnosis code numbers.

ERASING DIAGNOSTIC CODE

If the ignition switch is turned to OFF, the diagnosis codes will be erased.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

E37AE02AA

Inspect according to the inspection chart that is appropriate for the malfunction code.

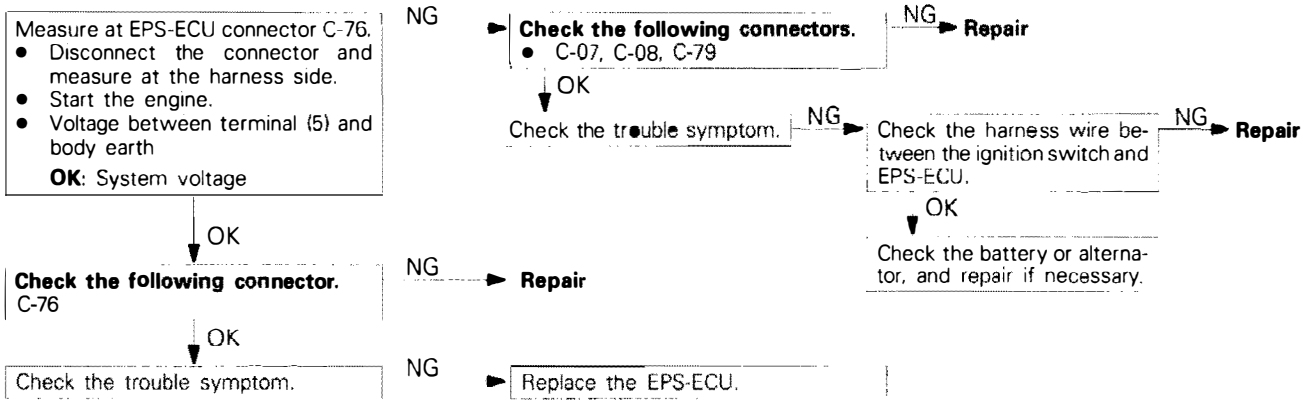
Diagnosis code No.	Inspection item	Reference page
11	Power supply system	P.37A-10.
12	Vehicles speed sensor system	P.37A-10.
13	Solenoid valve system	P.37A-11.
14	EPS-ECU system	P.37A-11.

INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSTIC TROUBLE

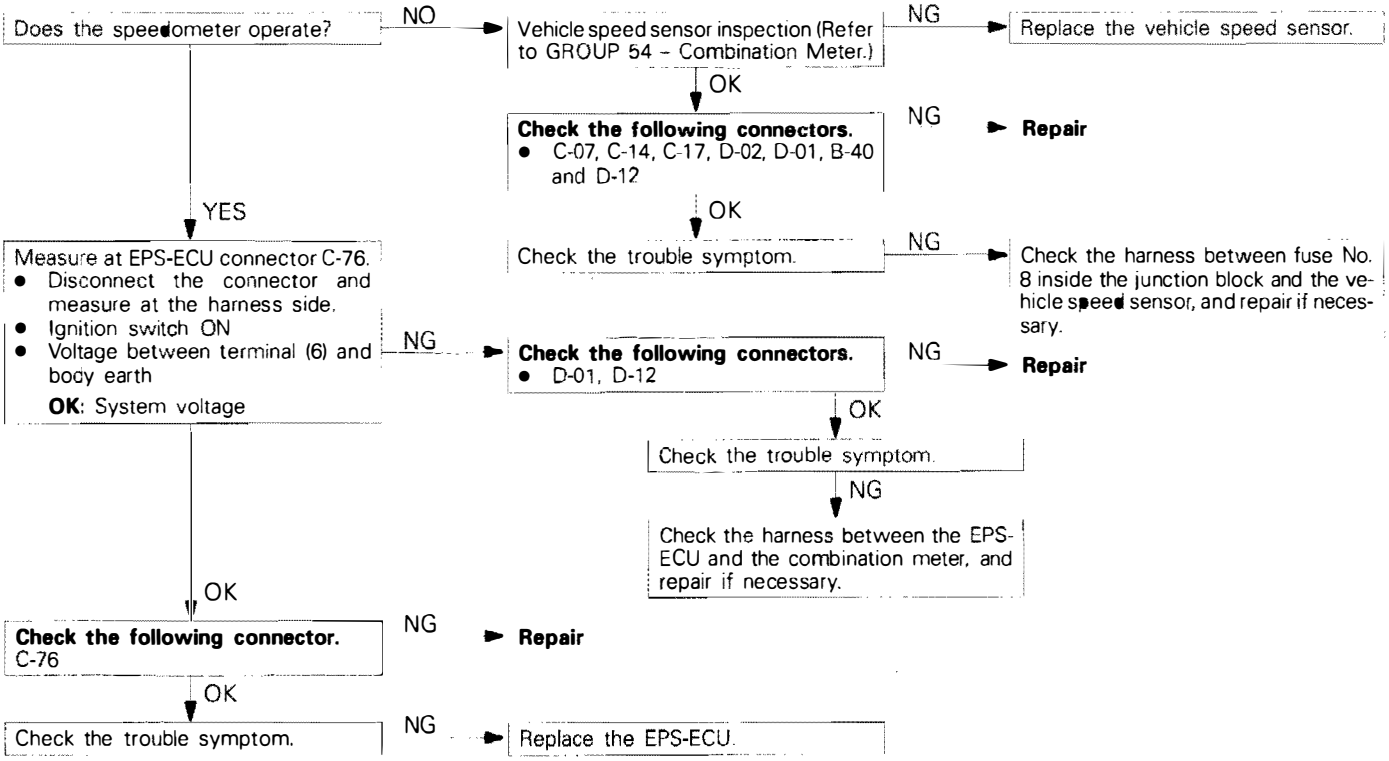
E37AE03AA

Code No. 11	Power supply system	Probable cause
[Comment]	This diagnosis code is output if the EPS-ECU power supply voltage is outside the specified value. Furthermore, if the voltage returns to the specified value, this diagnosis code is not output.	• Malfunction of harness or connector • Malfunction of battery or alternator • Malfunction of EPS-ECU

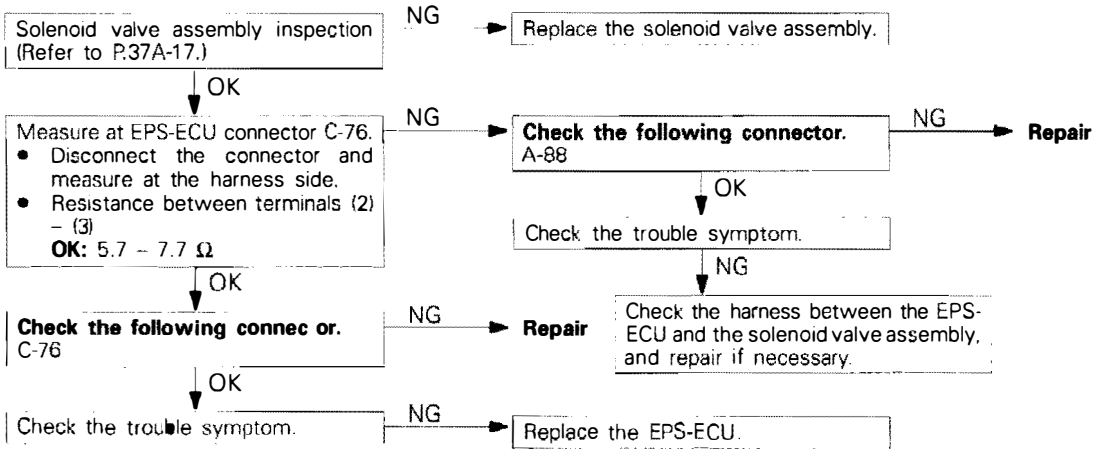
Caution
If the battery voltage drops during inspection, this diagnosis code will be output as a current problem, and correct diagnosis of the problem cannot be made. Before carrying out the following inspection, check the battery condition, and charge it if necessary.



Code No. 12	Vehicle speed sensor system	Probable cause
[Comment]	This diagnosis code is output if a signal from the vehicle speed sensor is not input for a period of 1 minute or more while the vehicle is driving (throttle valve is open). Furthermore, if the vehicle speed signal returns to normal, this diagnosis code is not output.	• Malfunction of vehicle speed sensor • Malfunction of harness or connector • Malfunction of EPS-ECU



Code No.13	Solenoid valve system	Probable cause
[Comment]	This diagnosis code is output if current corresponding to the vehicle speed is output from the EPS-ECU to the solenoid valve assembly and the resulting feedback current is outside the standard value.	• Malfunction of solenoid valve assembly • Malfunction of harness or connector • Malfunction of EPS-ECU



Code No. 14	EPS-ECU system	Probable cause
[Comment]	This diagnosis code is output if a current that is higher than the specified current is detected in the power detection circuit when the power interrupt circuit (transistor) inside the EPS-ECU is turned off immediately after the ignition switch is turned to ON. Furthermore, output of this diagnosis code indicates a malfunction inside the EPS-ECU.	• Malfunction of EPS-ECU

INSPECTION CHART FOR TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

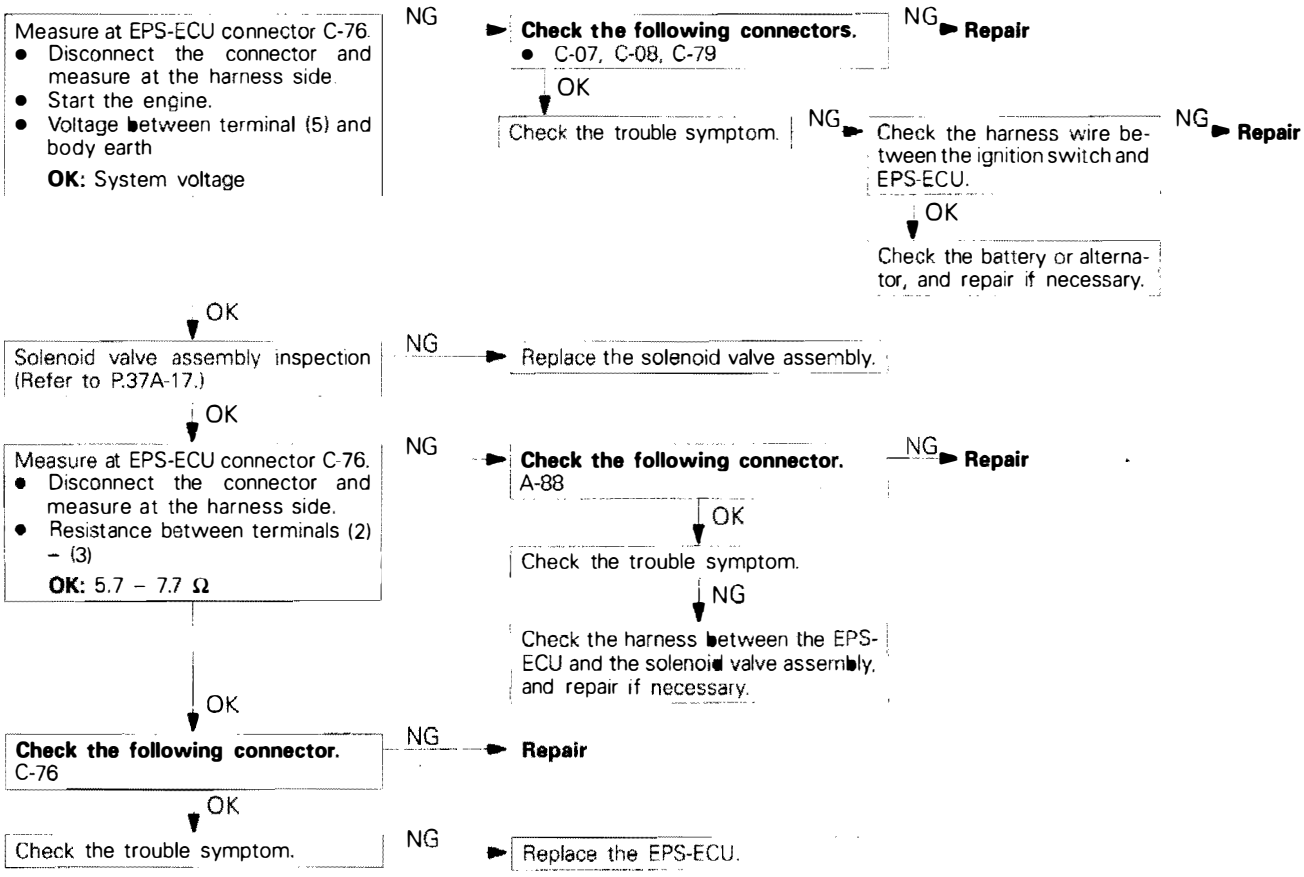
Trouble symptom	Inspection procedure No.	Reference page
Steering wheel operation is heavy.	1	P.37A-12.
Steering remains light when driving at medium or high speed.	2	P.37A-13.

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1.

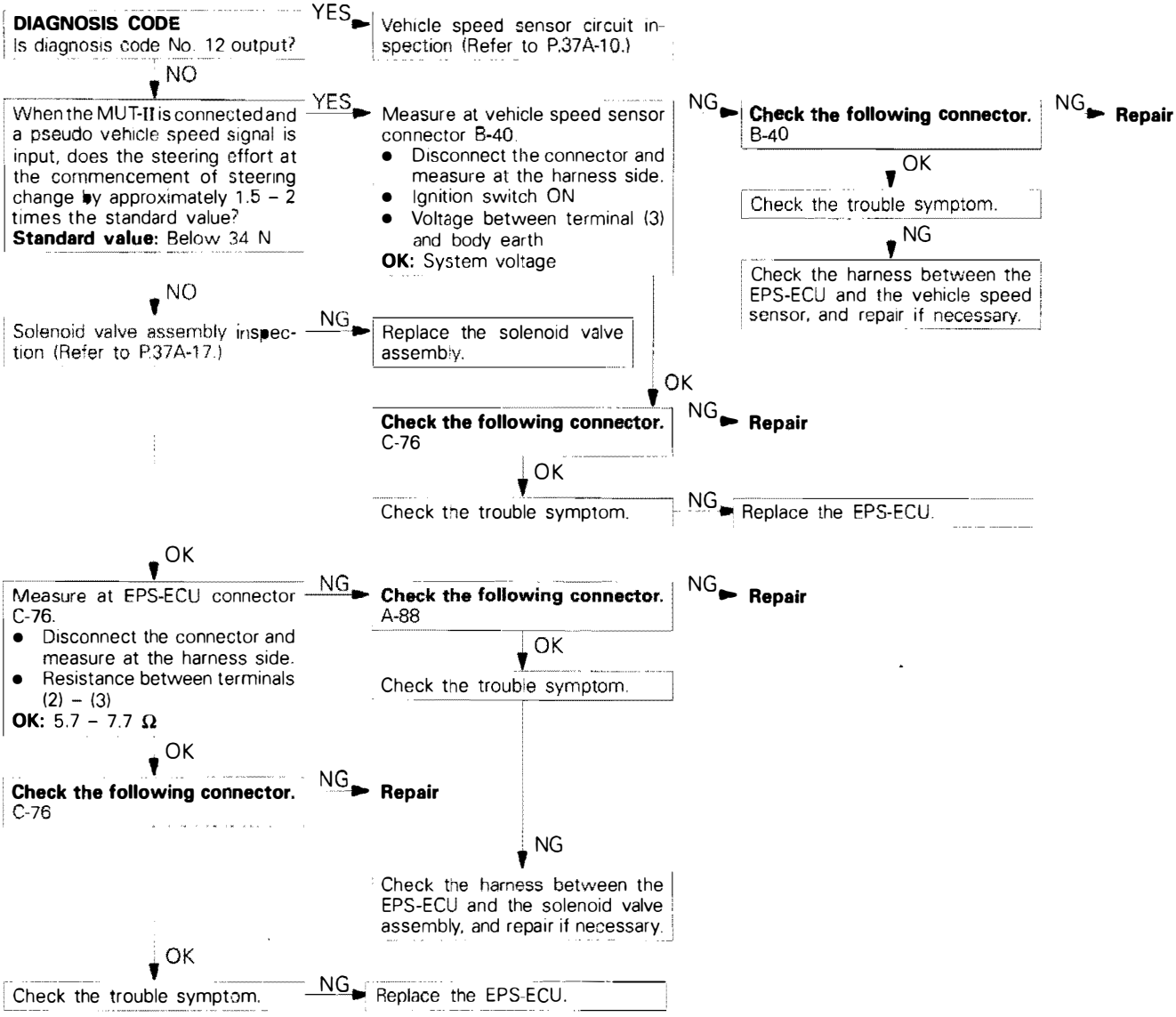
Steering wheel operation is heavy (stationary steering effort).		Probable cause
[Comment]	The EPS steering effort changes according to the increase or decrease in the current flowing to the solenoid valve assembly from the EPS-ECU. Because of this, if the current flowing from the EPS-ECU is below the specified value, steering will become heavy.	• Malfunction of solenoid valve assembly • Malfunction of harness or connector • Malfunction of EPS-ECU

NOTE
Before carrying out the following inspection, check that the fail-safe is not operating.



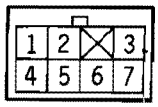
Inspection Procedure 2

Steering remains light when driving at medium or high speed.		Probable cause
[Comment]	If no signal is input from the vehicle speed sensor, the EPS-ECU judges that the vehicle speed is 0 km/h, and controls the current flowing to the solenoid valve assembly to be the same as when the vehicle is stationary. Because of this, if the signal from the vehicle speed sensor is not present while driving at medium or high speed, the steering will remain light.	• Malfunction of vehicle speed sensor • Malfunction of harness or connector • Malfunction of solenoid valve assembly • Malfunction of EPS-ECU



ECU-TERMINAL INSPECTION

E37AE04AA



13X0199

Terminal No.	Inspection Item	Inspection Conditions		Standard Value
1	Throttle position sensor input	Changes in correspondence to the throttle opening angle.		0.4 – 1.0 V
2	Solenoid valve (+)	IG ON		6 V or more
3	Solenoid valve (–)	At all times		Continuity
4	Earth	At all times		Continuity
5	EPS-ECU power supply	IG ON		System voltage
6	Vehicle speed sensor input	When vehicle is moved forwards and backwards, sensor turns ON and OFF repeatedly.	When sensor is ON	0 V
			When sensor is OFF	4.5 V or more
7	Diagnosis data output	Needle swings between 0 and 5 V		–

TROUBLESHOOTING (From 1994 models)

E37AE00AC

INSPECTION CHART FOR TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

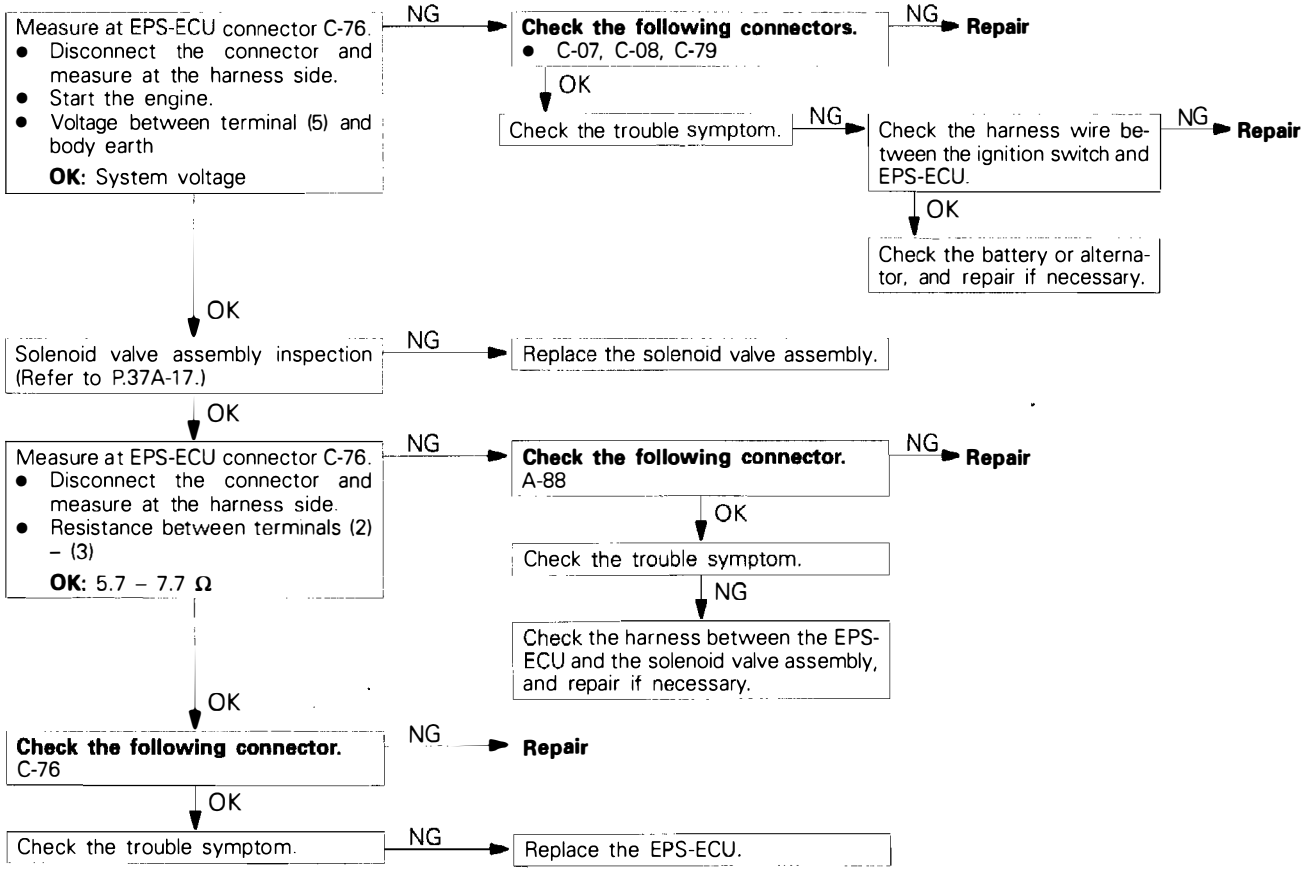
Trouble symptom	Inspection procedure No.	Reference page
Steering wheel operation is heavy.	1	P.37A-14-1.
Steering remains light when driving at medium or high speed.	2	P.37A-14-2.

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1.

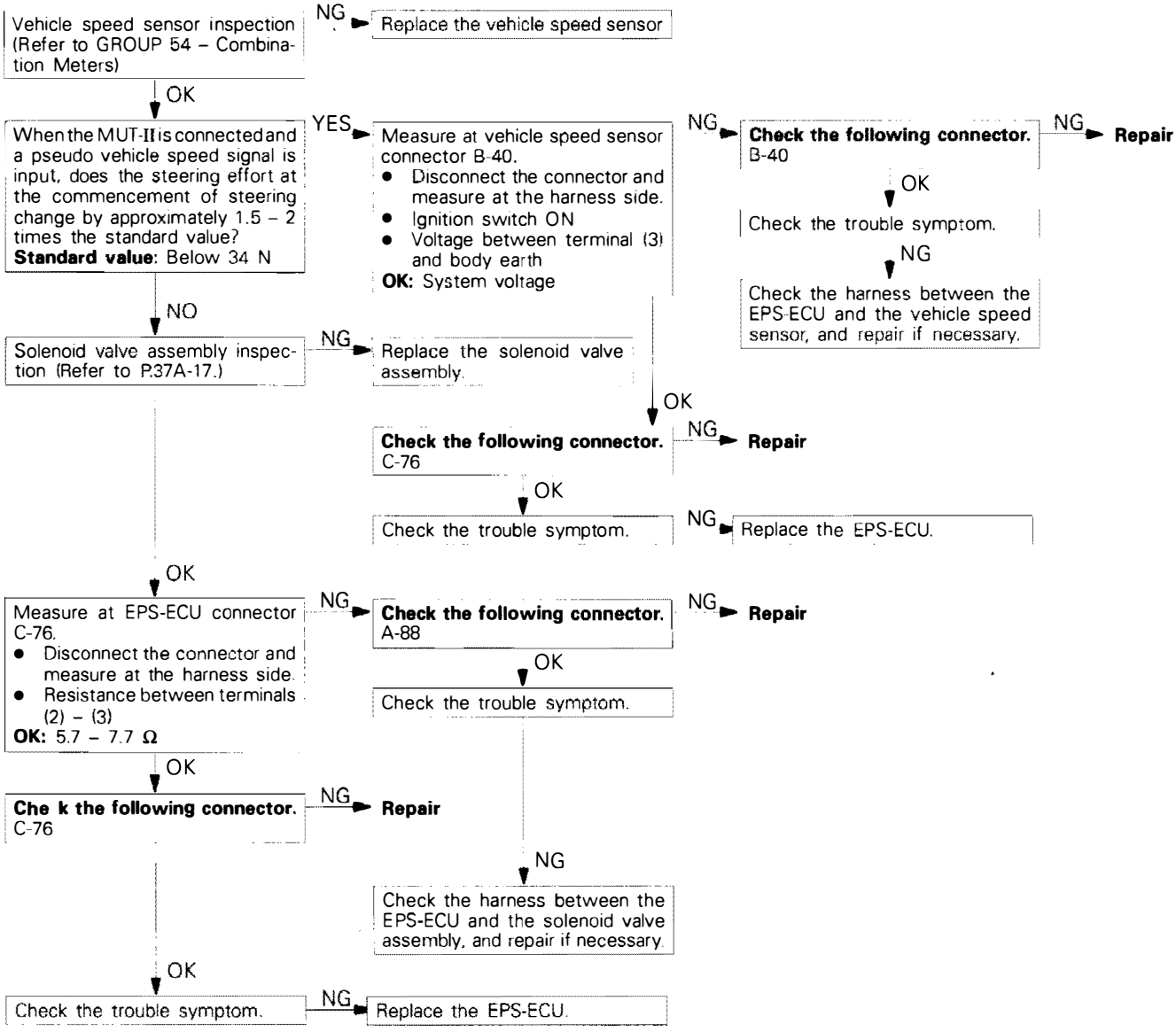
Steering wheel operation is heavy (stationary steering effort).		Probable cause
[Comment]	The EPS steering effort changes according to the increase or decrease in the current flowing to the solenoid valve assembly from the EPS-ECU. Because of this, if the current flowing from the EPS-ECU is below the specified value, steering will become heavy.	• Malfunction of solenoid valve assembly • Malfunction of harness or connector • Malfunction of EPS-ECU

NOTE
Before carrying out the following inspection, check that the fail-safe is not operating.



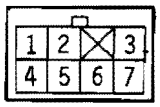
Inspection Procedure 2

Steering remains light when driving at medium or high speed.		Probable cause
[Comment]	If no signal is input from the vehicle speed sensor, the EPS-ECU judges that the vehicle speed is 0 km/h, and controls the current flowing to the solenoid valve assembly to be the same as when the vehicle is stationary. Because of this, if the signal from the vehicle speed sensor is not present while driving at medium or high speed, the steering will remain light.	• Malfunction of vehicle speed sensor • Malfunction of harness or connector • Malfunction of solenoid valve assembly • Malfunction of EPS-ECU



ECU-TERMINAL INSPECTION

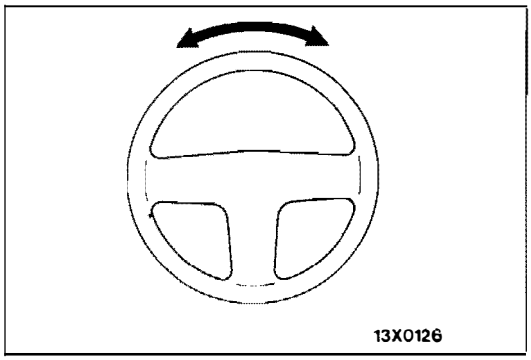
E37AE04AB

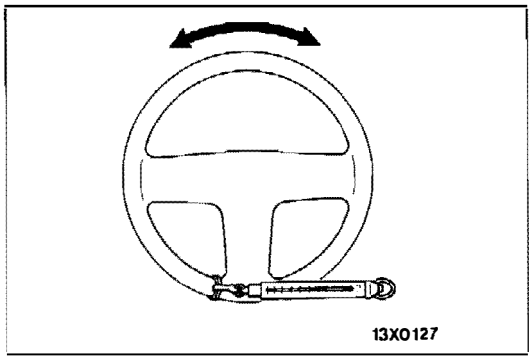


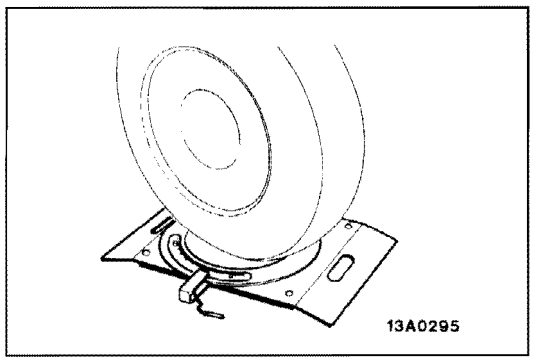
13X0199

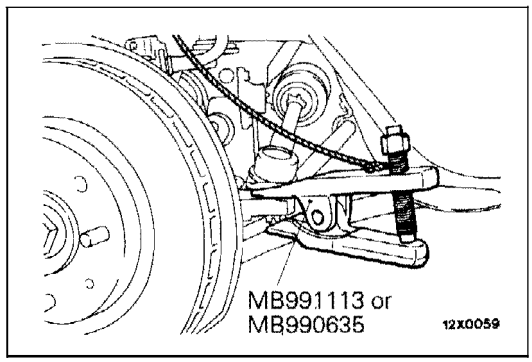
Terminal No.	Inspection Item	Inspection Conditions		Standard Value
1	Throttle position sensor input	Changes in correspondence to the throttle opening angle.		0.4 – 1.0 V
2	Solenoid valve (+)	IG ON		6 V or more
3	Solenoid valve (–)	At all times		Continuity
4	Earth	At all times		Continuity
5	EPS-ECU power supply	IG ON		System voltage
6	Vehicle speed sensor input	When vehicle is moved forwards and backwards, sensor turns ON and OFF repeatedly.	When sensor is ON	0 V
			When sensor is OFF	4.5 V or more
7	–	–		–

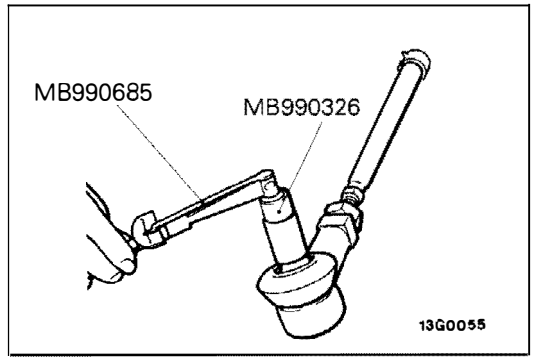
NOTES











SERVICE ADJUSTMENT PROCEDURES

E37AF00AA

STEERING WHEEL FREE PLAY CHECK

1. With engine running (hydraulic operation), set front wheels straight ahead.
2. Measure the play on steering wheel circumference before wheels start to move when slightly moving steering wheel in both directions.

   Limit: 30 mm

3. When play exceeds the limit, check for play on steering shaft connection and steering linkage. Correct or replace.
4. If the free play still exceeds the limit value, set steering wheel straight ahead with engine stopped. Load 5 N towards steering wheel circumference and check play.

   Standard value (steering wheel play with engine stopped): 15 mm or less

   If the play exceeds the standard value, remove steering gear box and check total pinion torque.

STEERING ANGLE CHECK

E37AF01AA

1. Locate front wheels on turning radius gauge and measure steering angle.

   Standard value:

Inside wheel	**39°00′ ± 2°**
Outside wheel	**39°30′**

2. When the angle is not within the standard value, the toe is probably incorrect. Adjust toe (Refer to GROUP 33A – Service Adjustment Procedures) and recheck steering angle.

TIE ROD END BALL JOINT STARTING TORQUE CHECK

E37AF02AA

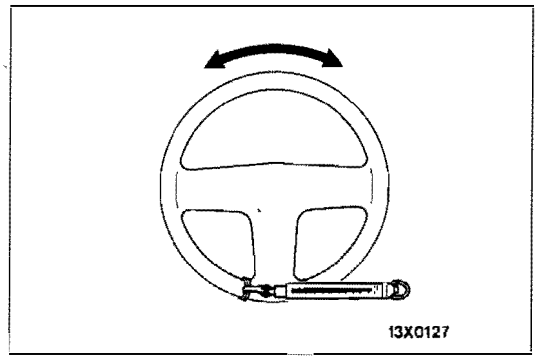
1. Disconnect tie rod and knuckle with special tool.

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

2. Move ball joint stud several times and install nut on stud. Measure ball joint starting torque with special tools.

   Standard value: 0.5–2.5 Nm

3. When the starting torque exceeds the standard value, replace tie rod end.
4. When the starting torque is under the standard value, check ball joint for end play or ratcheting. If none of these, the joint is still serviceable.



STATIONARY STEERING EFFORT CHECK E37AF03AA

1. With the vehicle stopped on a flat, paved surface, turn the steering wheel to the straight ahead position.
2. Start the engine and set it to 1,000 ± 100 r/min.

   Caution
   After checking the engine r/min., there must be a return to the standard idling r/min.

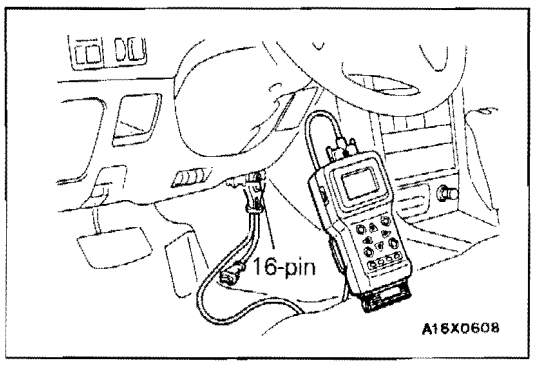
3. Attach a spring balance to the outer circumference of the steering wheel and measure the steering force required to turn the steering wheel from the straight ahead position to the left and right (within a range of 1.5 turns). Also check to be sure that there is no significant fluctuation of the required steering force.

   Standard value:

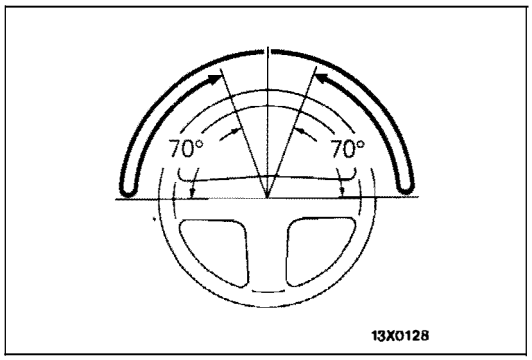
Steering effort:	**34 N or less**
Fluctuation allowance:	**5.9 N or less**

4. If the measured force exceeds the standard value, refer to the troubleshooting and make the checks and adjustments described there.
5. For vehicles with EPS, use the MUT-II to input a pseudo vehicle speed signal in order to check the stationary steering effort when driving at high speed.
   (1) Momentarily turn the ignition key to the ACC or LOCK position, and then restart the engine.

   NOTE
   If the engine is raced at 2300 r/min or higher for approximately 50 seconds, the fail-safe will operate. However, the fail-safe is cancelled when the engine is restarted.



(2) Connect the MUT-II to the diagnosis connector.
(3) Set the MUT-II to a pseudo vehicle speed of 180 km/h or more and check if the steering effort at the beginning is 1.5 to 2 times that of the standard value in step 3.
(4) If there is no change in the steering effort, check each section while referring to Troubleshooting.
(5) If a pseudo vehicle speed signal is input when the engine speed is 3000 r/min or more, the signals from the transmission-side vehicle speed sensor (pulse generator A and B) and the chassis-side vehicle speed sensor will be different, and the fail-safe will cause the transmission to stay in 3rd gear. Accordingly, after inspection is completed, always be sure to disconnect the battery (–) terminal for 10 seconds or more to erase the self-diagnosis memory and to release the transmission from 3rd gear.



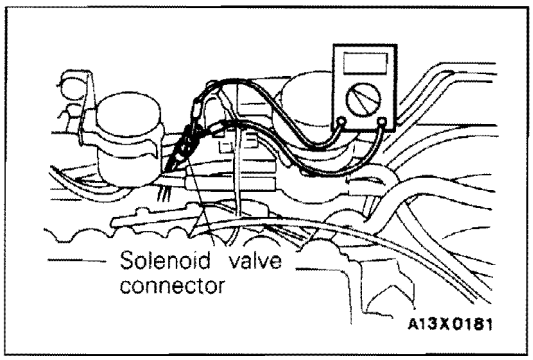
CHECKING STEERING WHEEL RETURN TO CENTRE

E37AF04AA

To make this test, conduct a road test and check as follows.

1. Make both gradual and sudden turns and check the steering "feeling" to be sure that there is not difference in the steering force required and the wheel return between left and right turns.
2. At a speed of 20–30 km/h, turn the steering wheel 90°, and release the steering wheel after 1 or 2 seconds. If the steering wheel then returns 70° or more, the return can be judged to the satisfactory.

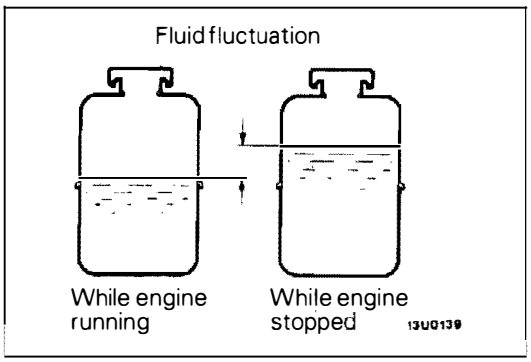
   NOTE
   There will be a momentary feeling or "heaviness" when the wheel is turned quickly, but this is not abnormal. (This is because the oil pump discharge amount is especially apt to be insufficient during idling.)



EPS SOLENOID CHECK

E37AF05AA

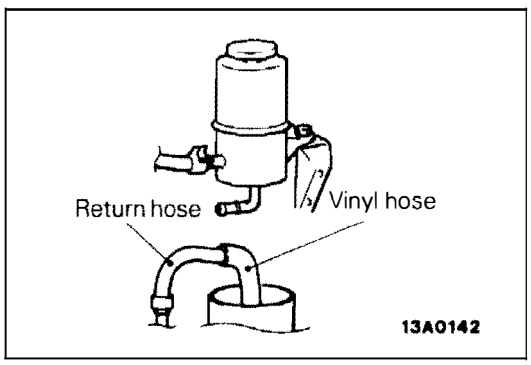
Check for continuity, by using an ohmmeter, between the solenoid valve terminal and the disconnection of the solenoid valve connector.



FLUID LEVEL CHECK

E37AF06AA

1. Park the vehicle on a flat, level surface, start the engine, and then turn the steering wheel several times to raise the temperature of the fluid to approximately 50–60°C.
2. With the engine running, turn the wheel all the way to the left and right several times.
3. Check the fluid in the oil reservoir for foaming or milkiness. Check the difference of the fluid level when the engine is stopped, and while it is running. If the fluid level changes considerably, air bleeding should be done.



FLUID REPLACEMENT

E37AF07AA

1. Raise the front wheels on a jack, and then support them with rigid racks.
2. Disconnect the return hose connection.
3. Connect a vinyl hose to the return hose, and drain the oil into a container.
4. Disconnect the high-tension cable, and then while operating the starting motor intermittently, turn the steering wheel all the way to the left and right several times to drain all of the fluid.

Caution
Be careful not to position the high-tension cable near the carburettor or the delivery pipe.

5. Connect the return hoses securely, and then secure it with the clip.
6. Fill the oil reservoir with the specified fluid up to the lower position of the filter, and then bleed the air.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

BLEEDING

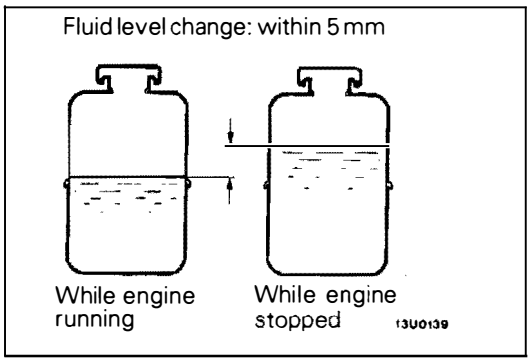
E37AF08AA

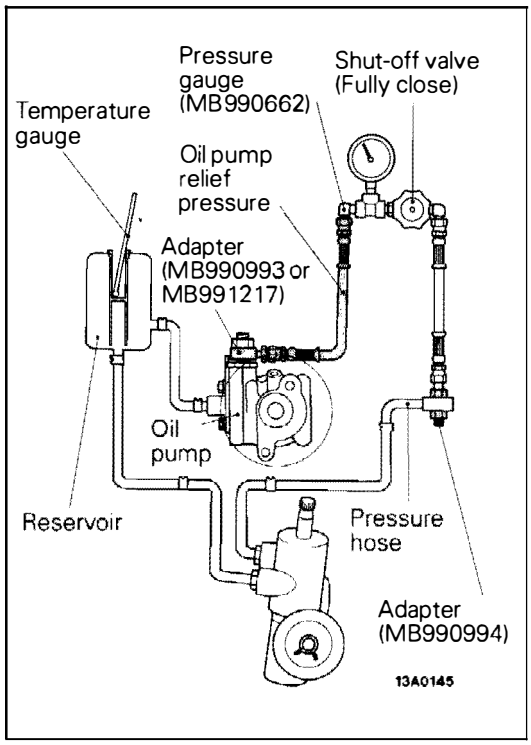
1. Jack up the front wheels and support them by using a rigid rack.
2. Manually turn the oil pump pulley a few times.
3. Turn the steering wheel all the way to the left and to the right five or six time.
4. Disconnect the high-tension cable, and then, while operating the starting motor intermittently, turn the steering wheel all the way to the left and right five or six times (for 15 to 20 seconds).

Caution
1. **During air bleeding, replenish the fluid supply so that the level never falls below the lower position of the filter.**
2. **If air bleeding is done while engine is running, the air will be broken up and absorbed into the fluid; be sure to do the bleeding only while cranking.**

5. Connect the ignition cable, and then start the engine (idling).
6. Turn the steering wheel to the left and right until there are no air bubbles in the oil reservoir.
7. Confirm that the fluid is not milky, and that the level is up to the specified position on the level gauge.
8. Confirm that there is very little change in the fluid level when the steering wheel is turned left and right.
9. Check whether or not the change in the fluid level is within 5 mm when the engine is stopped and when it is running.

Caution
1. **If the change of the fluid level is 5 mm or more, the air has not been completely bled from the system, and thus must be bled completely.**
2. **If the fluid level rises suddenly after the engine is stopped, the air has not been completely bled.**
3. **If air bleeding is not complete, there will be abnormal noises from the pump and the flow-control valve, and this condition could cause a lessening of the life of the pump, etc.**





OIL PUMP PRESSURE TEST

CHECKING THE OIL PUMP RELIEF PRESSURE E37AF09AA

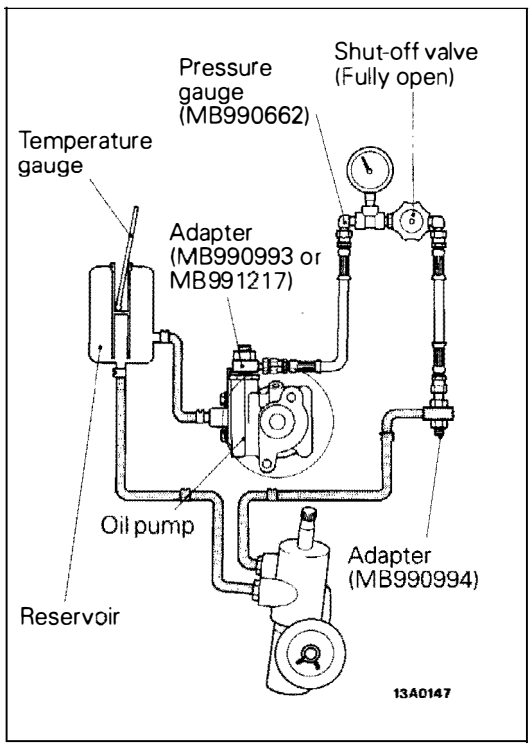
1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at 1,000 ± 100 r/min.
4. Fully close the shut-off valve of the pressure gauge and measure the oil pump relief pressure to confirm that it is within the standard value range.

Standard value:

2WS	4G9, 4D6	7.3–8.0 MPa
	4G6, 6A1	8.5–9.0 MPa
4WS		10.3–11.3 MPa

Caution
Pressure gauge shut off valve must not remain closed for more than 10 seconds.

5. If it is not within the standard value, overhaul the oil pump.
6. Remove the special tools, and the tighten the pressure hose to the specified torque.
7. Bleed the system.

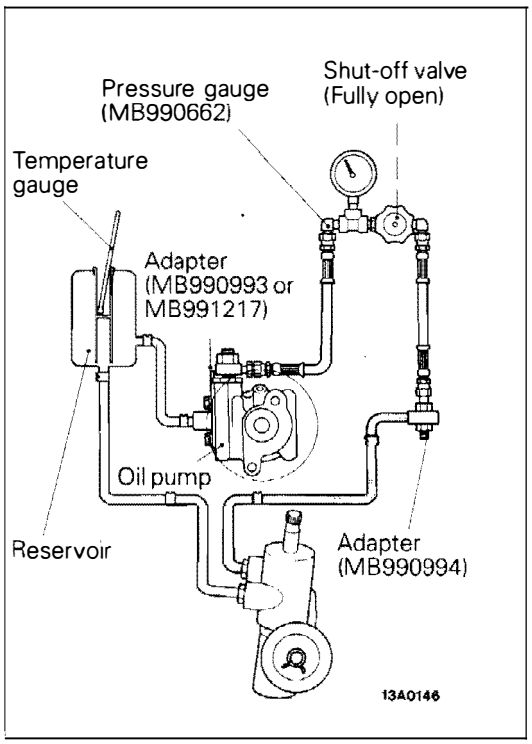


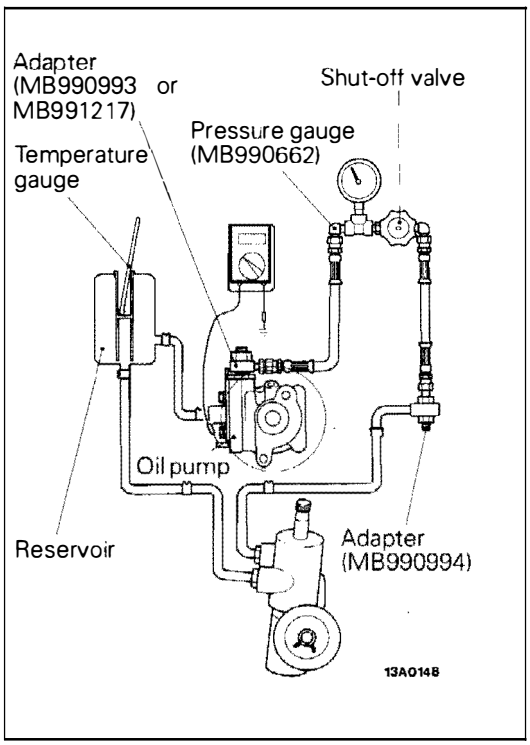
CHECKING THE PRESSURE UNDER NO-LOAD CONDITIONS E37AF09BA

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at 1,000 ± 100 r/min.
4. Check whether or not the hydraulic pressure is the standard value when no-load conditions are created by fully opening the shut-off valve of the pressure gauge.

Standard value: 0.8–1.0 MPa

5. If it is not within the standard value, the probable cause is a malfunction of the oil line or steering gear box, so check these parts and repair as necessary.
6. Remove the special tools, and then tighten the pressure hose to the specified torque.
7. Bleed the system.





CHECKING THE STEERING GEAR RETENTION HYDRAULIC PRESSURE

E37AF09CA

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. Start the engine and idle it at 1,000 ± 100 r/min.
4. Fully close and fully open the shut-off valve of the pressure gauge.
5. Turn the steering wheel all the way to the left or right; then check whether or not the retention hydraulic pressure is the standard value.

Standard value:

2WS	4G9, 4D6	7.3–8.0 MPa
	4G6, 6A1	8.5–9.0 MPa
4WS		10.3–11.3 MPa

6. When not within the standard value, overhaul the steering gear box.
   Remeasure fluid pressure.
7. Remove the special tools, and the tighten the pressure hose to the specified torque.
8. Bleed the system.

POWER STEERING OIL PRESSURE SWITCH CHECK

E37AF10AA

1. Disconnect the pressure hose from the oil pump, and then connect the special tools.
2. Bleed the air, and then turn the steering wheel several times while the vehicle is not moving so that the temperature of the fluid rises to approximately 50–60°C.
3. The engine should be idling.
4. Disconnect the connection of the connector for the oil pressure switch, and place an ohmmeter in position.
5. Gradually close the shut-off valve of the pressure gauge and increase the hydraulic pressure then check whether or not the hydraulic pressure that activates the switch is the standard value.

Standard value: 1.5–2.0 MPa

6. Gradually open the shut-off valve and reduce the hydraulic pressure; then check whether or not the hydraulic pressure that deactivates the switch is the standard value.

Standard value: 0.7–1.2 MPa

7. Remove the special tools, and then tighten the pressure hose to the specified torque.
8. Bleed the system.

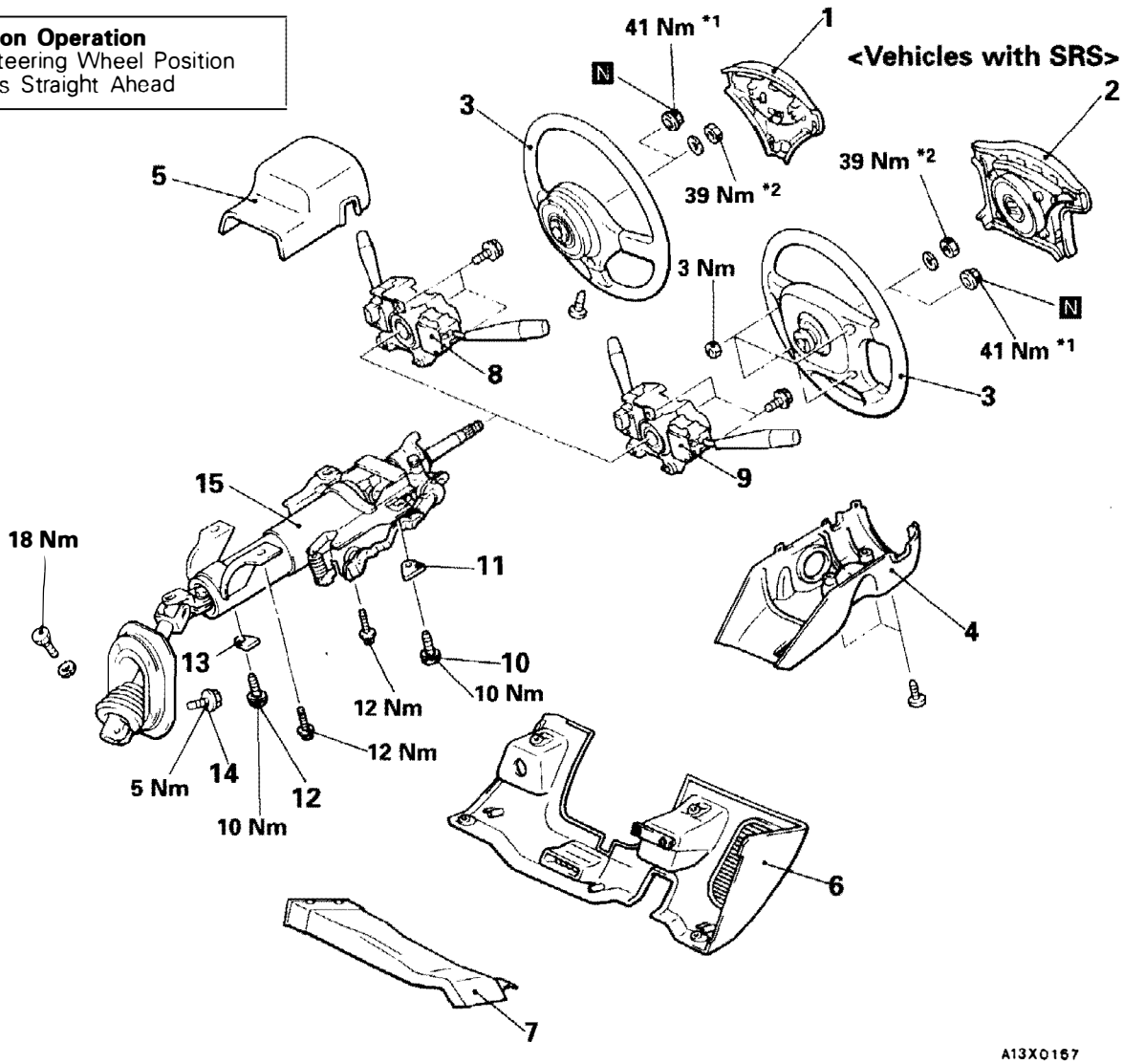
STEERING WHEEL AND SHAFT

E37AG00AA

REMOVAL AND INSTALLATION

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
- Checking Steering Wheel Position with Wheels Straight Ahead

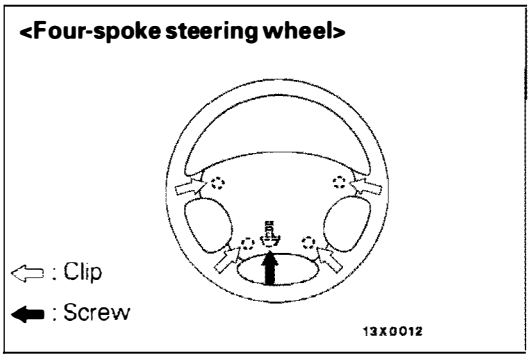


A13X0167

Removal steps

〈A〉 ◆C◆ 1. Horn pad <Vehicles without SRS>
2. Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
〈B〉 ◆B◆ 3. Steering wheel
4. Lower column cover
5. Upper column cover
6. Instrument under cover (Refer to GROUP 52A – Instrument Panel)
7. Foot shower duct
8. Column switch assembly
9. Clock spring and column switch assembly (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
〈C〉 ◆A◆ 10. Special screw } <Vehicles without high tilt steering>
11. Special washer }
〈C〉 ◆A◆ 12. Special screw } <Vehicles with high tilt steering>
13. Special washer }
14. Retainer attachment bolt
15. Steering column assembly

NOTE
*1: Case of self locking nut
*2: Case of nut and spring washer

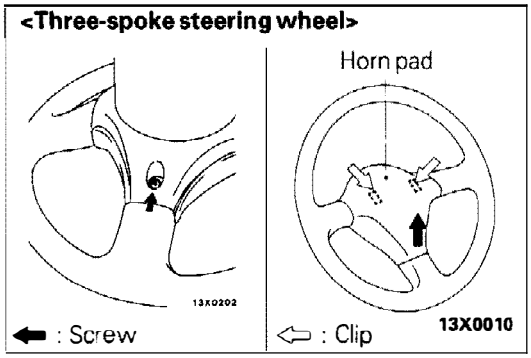


REMOVAL SERVICE POINTS E37AG01AA

〈A〉 HORN PAD REMOVAL

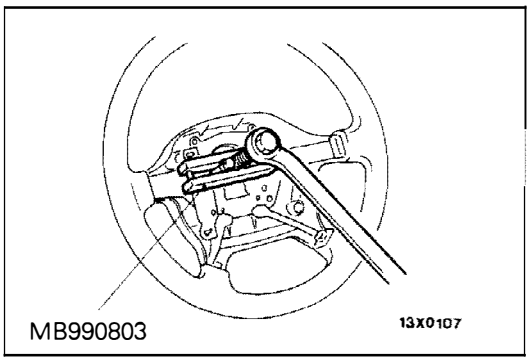
<Four-spoke steering wheel>

After removing the screw from the hole at the lower part of the horn pad, remove the horn pad.

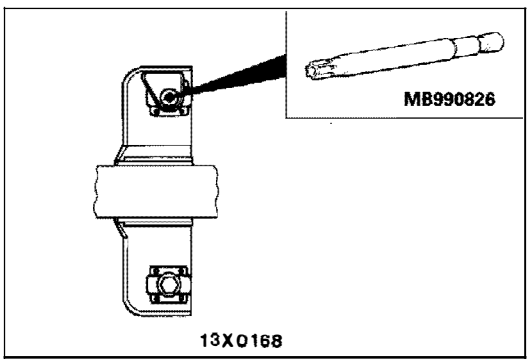


<Three-spoke steering wheel>

Remove the screw from the reverse side of the steering wheel, and then pull the horn pad in the direction of the arrows shown in the illustration to remove it.



〈B〉 STEERING WHEEL REMOVAL



〈C〉 SPECIAL SCREW REMOVAL

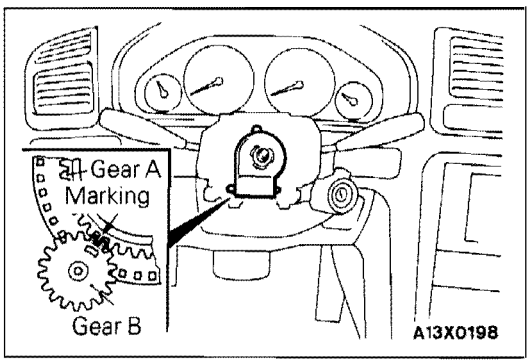
INSTALLATION SERVICE POINTS E37AG04AA

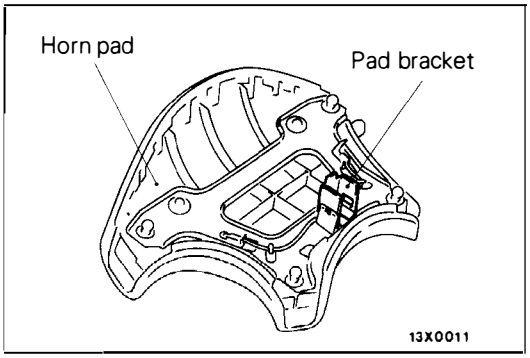
◗A◖ SPECIAL SCREW INSTALLATION

Tighten the special screw using the special tool (MB990826).

◗B◖ STEERING WHEEL INSTALLATION

For vehicles with 4WS, align the positions of the markings on gears A and B of the steering angular velocity sensor as shown in the illustration.

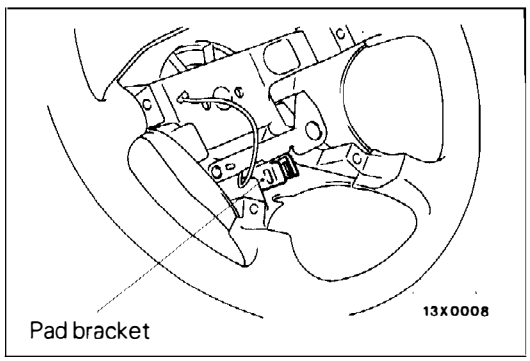




◗C◖ HORN PAD INSTALLATION

<Four-spoke steering wheel>

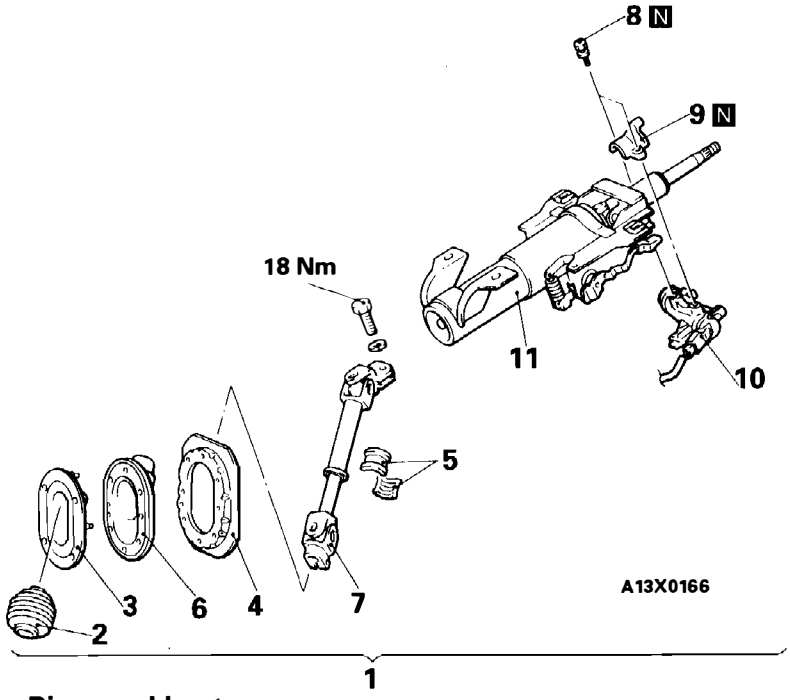
(1) Remove the pad bracket from the horn pad.

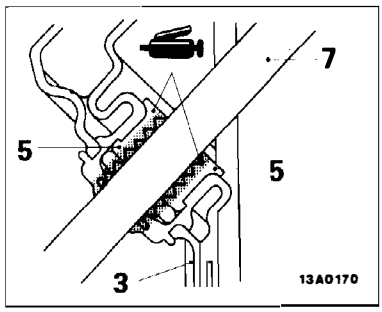


(2) After installing the pad bracket to the steering wheel, install the horn pad to the steering wheel.

DISASSEMBLY AND REASSEMBLY

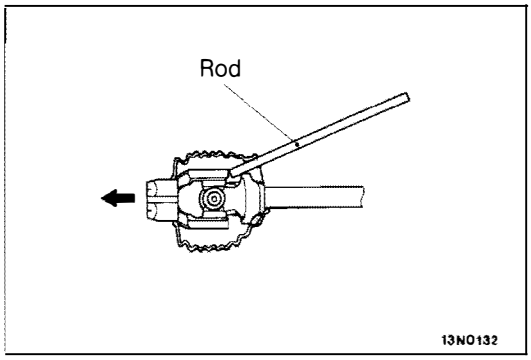
E37AG05AA





Disassembly steps

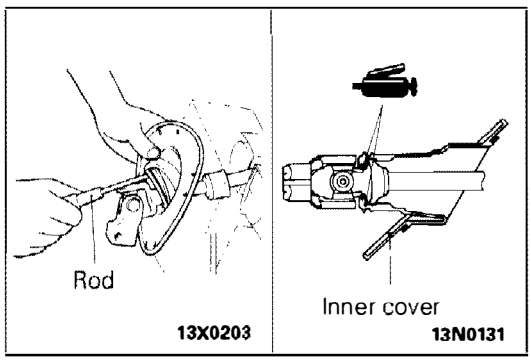
1. Joint assembly
◇A◇ ◗D◖ 2. Boot
3. Outer cover
4. Retainer
◗C◖ 5. Bearing
◇B◇ ◗B◖ 6. Inner cover
7. Joint
◗A◖ 8. Special bolts
◇C◇ ◗A◖ 9. Steering lock bracket
◇C◇ ◗A◖ 10. Steering lock cylinder
11. Steering column assembly



DISASSEMBLY SERVICE POINTS E37AG06AA

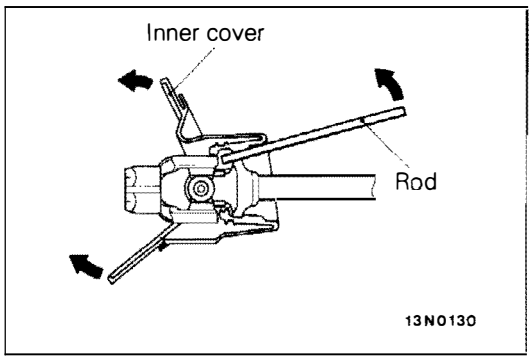
〈A〉 BOOT REMOVAL

(1) Apply grease to the inside lip of the boot.
(2) Remove the boot while using a rod to widen the lip section.

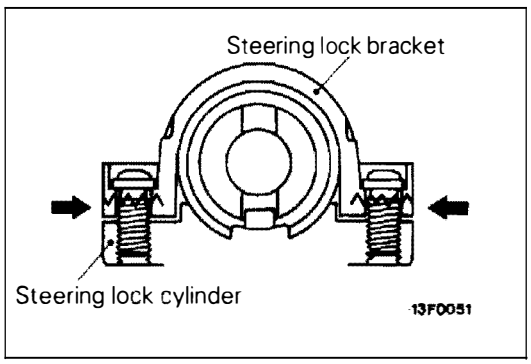


〈B〉 INNER COVER REMOVAL

(1) Apply grease to the inside lip of the inner cover.
(2) Cover the joint while using a rod to widen the lip section.

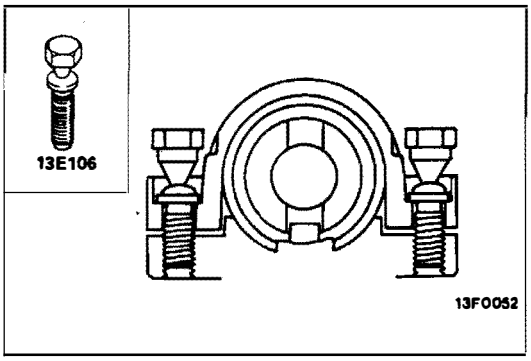


(3) While using the rod to widen the inner cover from behind, pull the cover to remove it from the joint.



〈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.

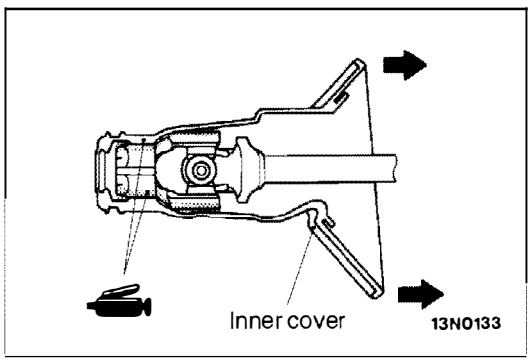


REASSEMBLY SERVICE POINTS E37AG08AA

◆A◆ STEERING LOCK CYLINDER/STEERING LOCK BRACKET/SPECIAL BOLT INSTALLATION

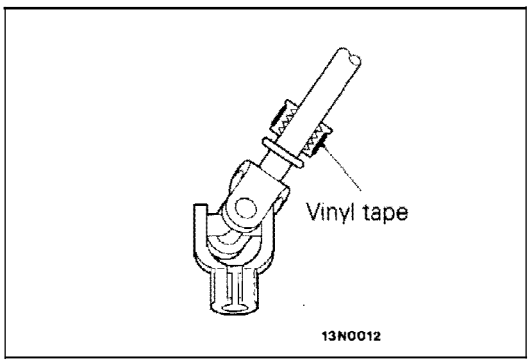
(1) When installing the steering lock and steering lock bracket to the column tube, temporarily install the steering lock in alignment with the column boss.
(2) After checking that the lock works properly, tighten the special bolts until the head twists off.

Caution
The steering lock bracket and bolts must be replaced with new ones when the steering lock is installed.



◆B◆ INNER COVER INSTALLATION

Cover the inside lip of the inner cover with grease and pull the outside of the cover onto the joint.



◆C◆ BEARING INSTALLATION

(1) Fill the inside of the bearing with multipurpose grease.
(2) Install the bearings to the shaft on the joint assembly.
(3) Wrap vinyl tape approximately one and one-half times around the concave circumferences of the bearings, and then press fit the bearings into the cover assembly.

◆D◆ BOOT INSTALLATION

Apply grease to the inside of the lip section of the boot, and then install the boot to the joint.

POWER STEERING GEAR BOX

E37AH00AA

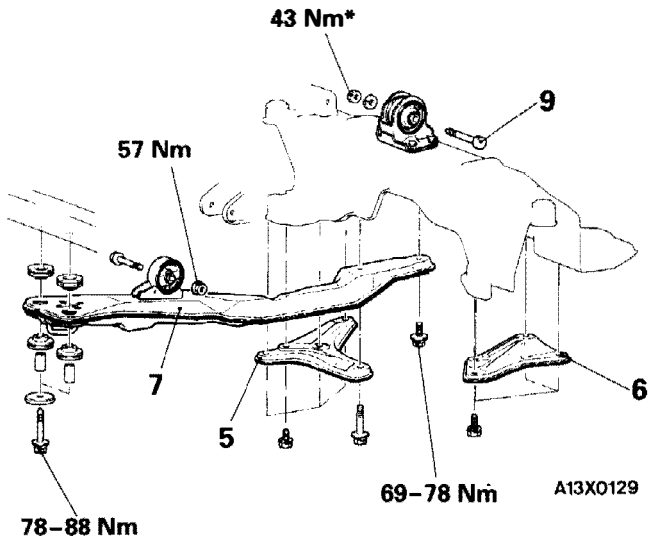
REMOVAL AND INSTALLATION

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 injury.

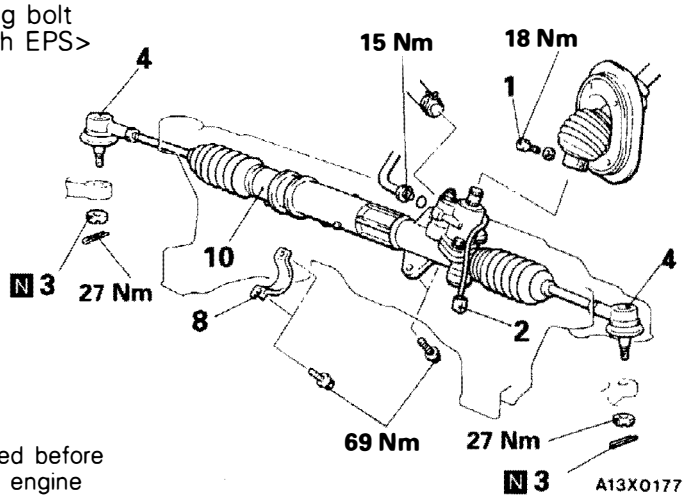
Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-17.)
- Stabilizer Bar Removal (Refer to GROUP 33A – Stabilizer Bar)
- Front Exhaust Pipe and Exhaust Manifold Connection Removal <2WD – 6A1, 6G7> (Refer to GROUP 15 – Exhaust Pipe and Main Muffler)
- Front Exhaust Pipe Removal <4WD> (Refer to GROUP 15 – Exhaust Pipe and Main Muffler)
- Transfer Assembly Removal <4WD> (Refer to GROUP 22 – Transfer Assembly)
- Air Intake Hose Removal <MPI–R.H. drive vehicles>

Post-installation Operation
- Air Intake Hose Installation <MPI–R.H. drive vehicles>
- Transfer Assembly Installation <4WD> (Refer to GROUP 22 – Transfer assembly)
- Front Exhaust Pipe Installation <4WD> (Refer to GROUP 15 – Exhaust Pipe and Main Muffler)
- Front Exhaust Pipe and Exhaust Manifold Connection Installation <2WD – 6A1, 6G7> (Refer to GROUP 15 – Exhaust Pipe and Main Muffler)
- Stabilizer Bar Installation (Refer to GROUP 33A – Stabilizer Bar)
- Power Steering Fluid Supplying (Refer to P.37A-17.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-18.)
- Steering Wheel Position with Wheels Straight Ahead Checking
- Front Wheel Alignment Adjustment (Refer to GROUP 33A – Service Adjustment Procedures.)

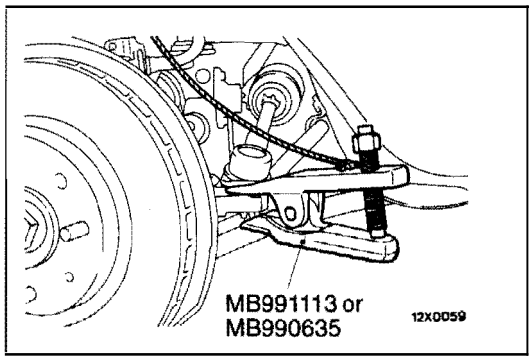


Removal steps

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



NOTE
The fasteners marked * should be temporarily tightened before they are finally tightened once the total weight of the engine has been placed on the vehicle body.



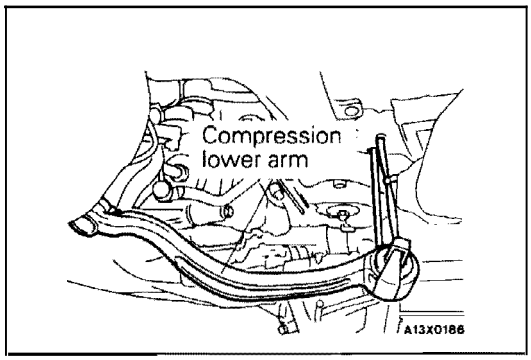
REMOVAL SERVICE POINTS E37AH01AA

〈A〉 TIE-ROD END DISCONNECTION

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

〈B〉 BOLT REMOVAL

Remove the bolt of the rear roll stopper bracket assembly and lower the rear of the engine to make a gap between the transfer assembly and crossmember so that the gear box assembly can be removed.



〈C〉 GEAR BOX ASSEMBLY REMOVAL

(1) Remove the installation section (vehicle side) of the compression lower arm (left side in L.H. drive vehicles and right side in R.H. drive vehicles).

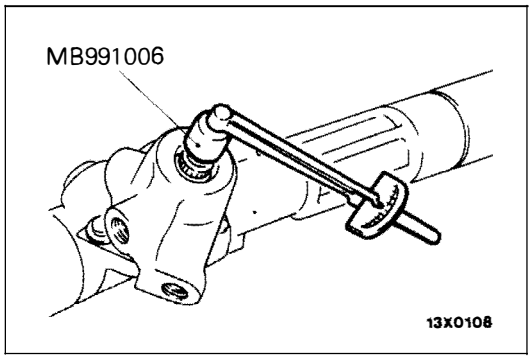
Caution
The compression lower arm should be suspended so that undue force is not applied to the ball joint.

(2) Remove the connection between the gear box assembly and joint assembly, and remove the gear box assembly from the crossmember at the left side (L.H. drive vehicles) or right side (R.H. drive vehicles).

Caution
Be careful not to damage the bellows and the tie-rod end dust cover when removing the gear box assembly.

INSPECTION E37AH02AB

- Check the rubber parts for cracks and breakage.



GEAR BOX TOTAL PINION TORQUE

Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value:

2WS

0.6–1.4 Nm [Change in torque: 0.4 Nm]

4WS

Up to 1993 models

0.6–1.5 Nm [Change in torque: 0.4 Nm]

From 1994 models

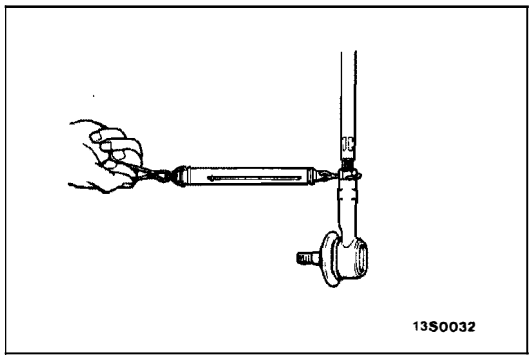
0.7–1.3 Nm [Change in torque: 0.3 Nm]

NOTE

When measuring, remove the bellows from the rack housing. Measure the pinion torque through the whole stroke of the rack.

If the measured value is not within the standard range, first adjust the rack support cover, and then check the total pinion starting torque again.

If the total pinion starting torque cannot be adjusted to within the standard range by adjusting the rack support cover, check the rack support cover, rack support spring, rack support and replace any parts necessary.



CHECK THE TIE ROD FOR SWING RESISTANCE E37AH02BB

(1) Give 10 hard swings to the tie rod.

(2) Measure the tie rod swing resistance with a spring balance.

Standard value:

2WS

8–28 N [1.5–5.0 Nm]

4WS

Up to 1993 models

8–28 N [1.5–5.0 Nm]

From 1994 models

11–28 N [2.0–5.0 Nm]

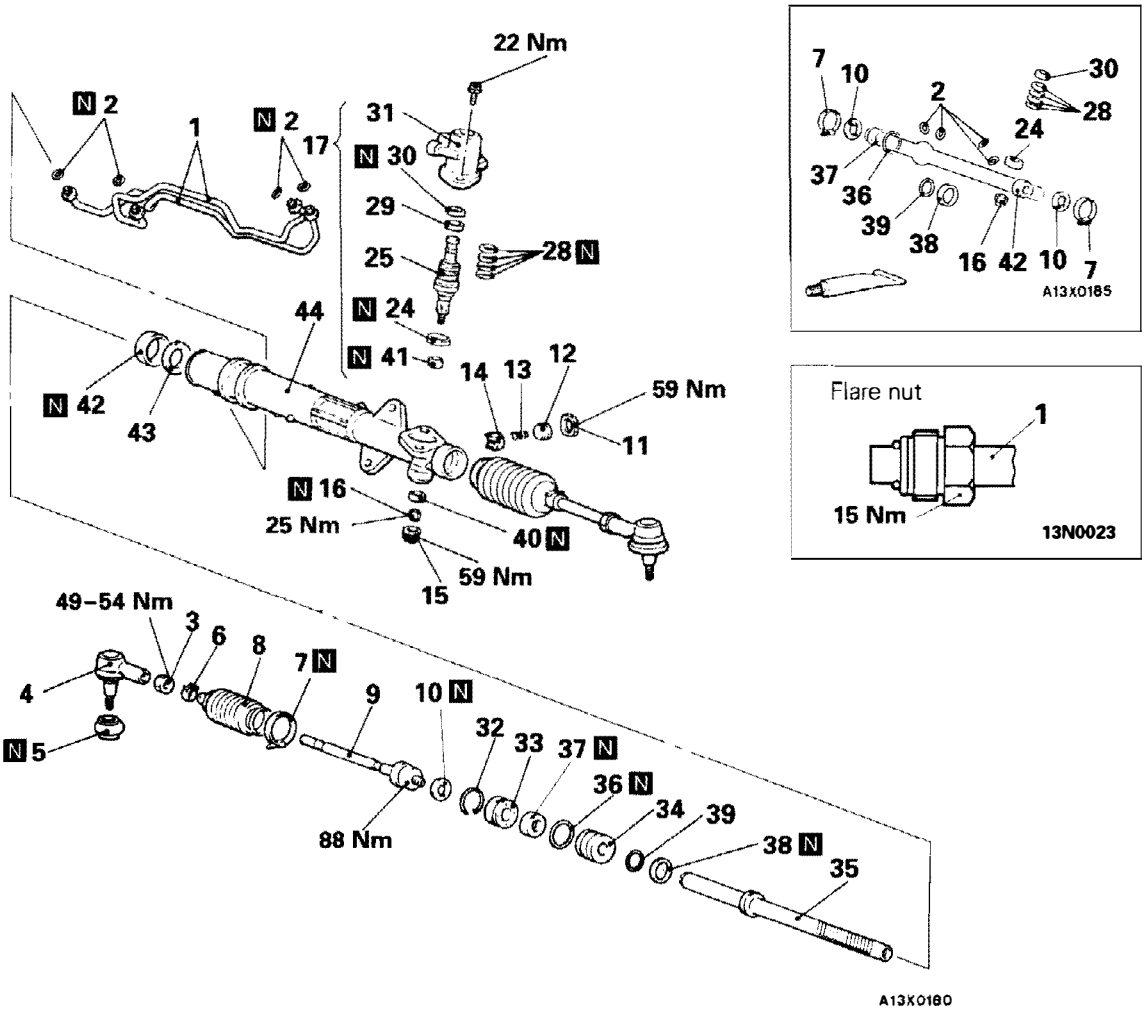
(3) If the measured value exceeds the standard value, replace tie rod assembly.

(4) Even if the measured value is below the standard value, the tie rod which swings smoothly without excessive play may be used.

DISASSEMBLY AND REASSEMBLY

E37AH05AA

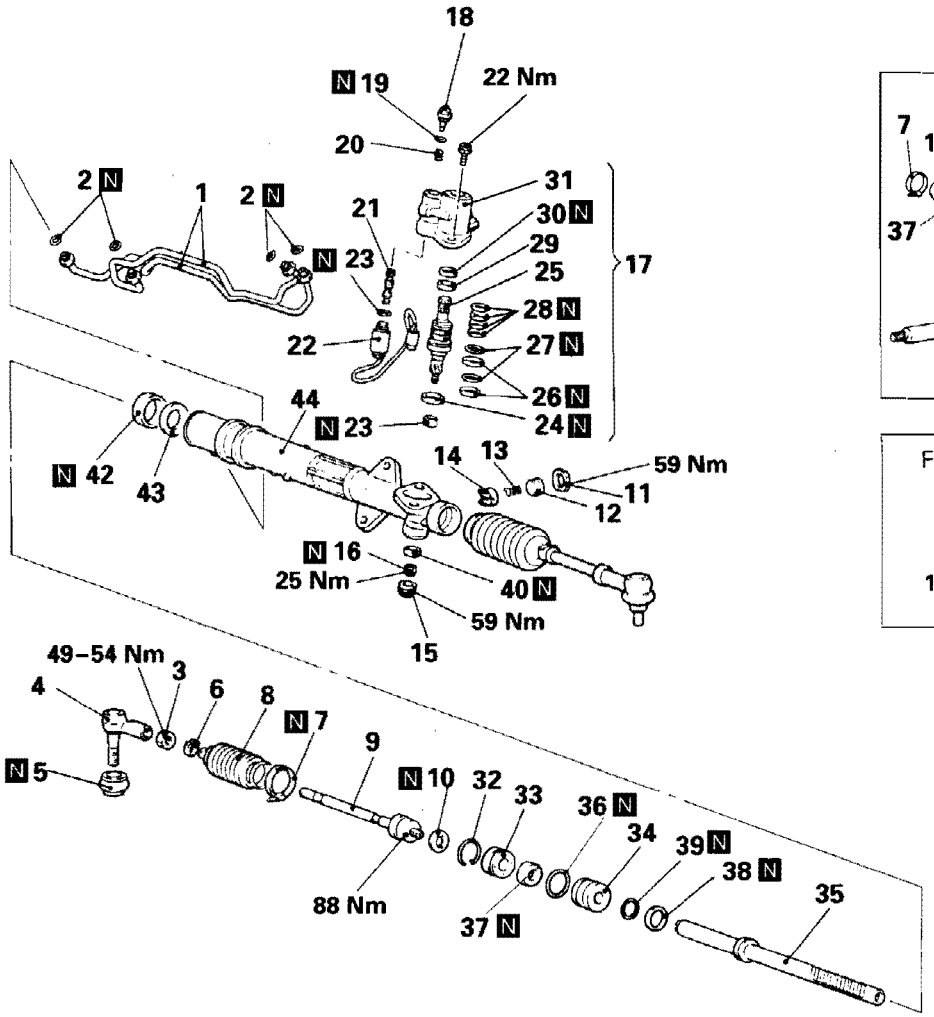
<Conventional power steering gear box>



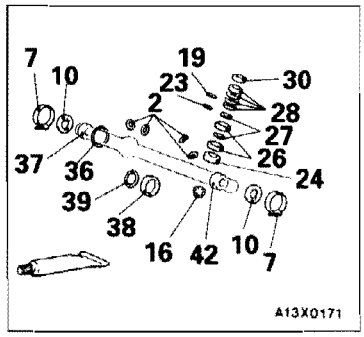
Disassembly steps

1. Feed tube
2. O-ring
3. Tie rod end locking nut
◆P◆ 4. Tie rod end
◆O◆ 5. Dust cover
6. Bellows clip
◆N◆ 7. Bellows band
8. Bellows
◇A◇ ◆M◆ 9. Tie rod
◇A◇ ◆M◆ 10. Tab washer
● Total pinion torque adjustment
11. Locking nut
◇B◇ 12. Rack support cover
13. Rack support spring
14. Rack support
◆L◆ 15. End plug
16. Self-locking nut
17. Valve housing assembly
◇C◇ ◆K◆ 24. Oil seal
◇C◇ 25. Pinion and valve assembly
◆J◆ 26. Seal ring
27. O-ring
◇D◇ ◆J◆ 28. Seal ring
◇E◇ ◆I◆ 29. Ball bearing
◇E◇ ◆H◆ 30. Oil seal
31. Valve housing
◇F◇ ◆G◆ 32. Circlip
33. Rack stopper
◆F◆ 34. Rack bushing
◇G◇ ◆E◆ 35. Rack
◆D◆ 36. O-ring
◇H◇ ◆D◆ 37. Oil seal
38. Seal ring
39. O-ring
◇I◇ ◆C◆ 40. Ball bearing
◇J◇ ◆B◆ 41. Needle roller bearing
◇K◇ ◆A◆ 42. Oil seal
◇K◇ ◆A◆ 43. Back-up washer
44. Rack housing

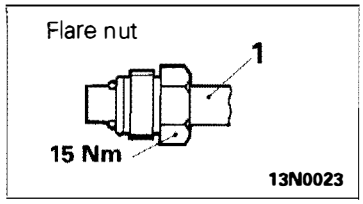
<EPS gear box>



A13X0133



A13X0171



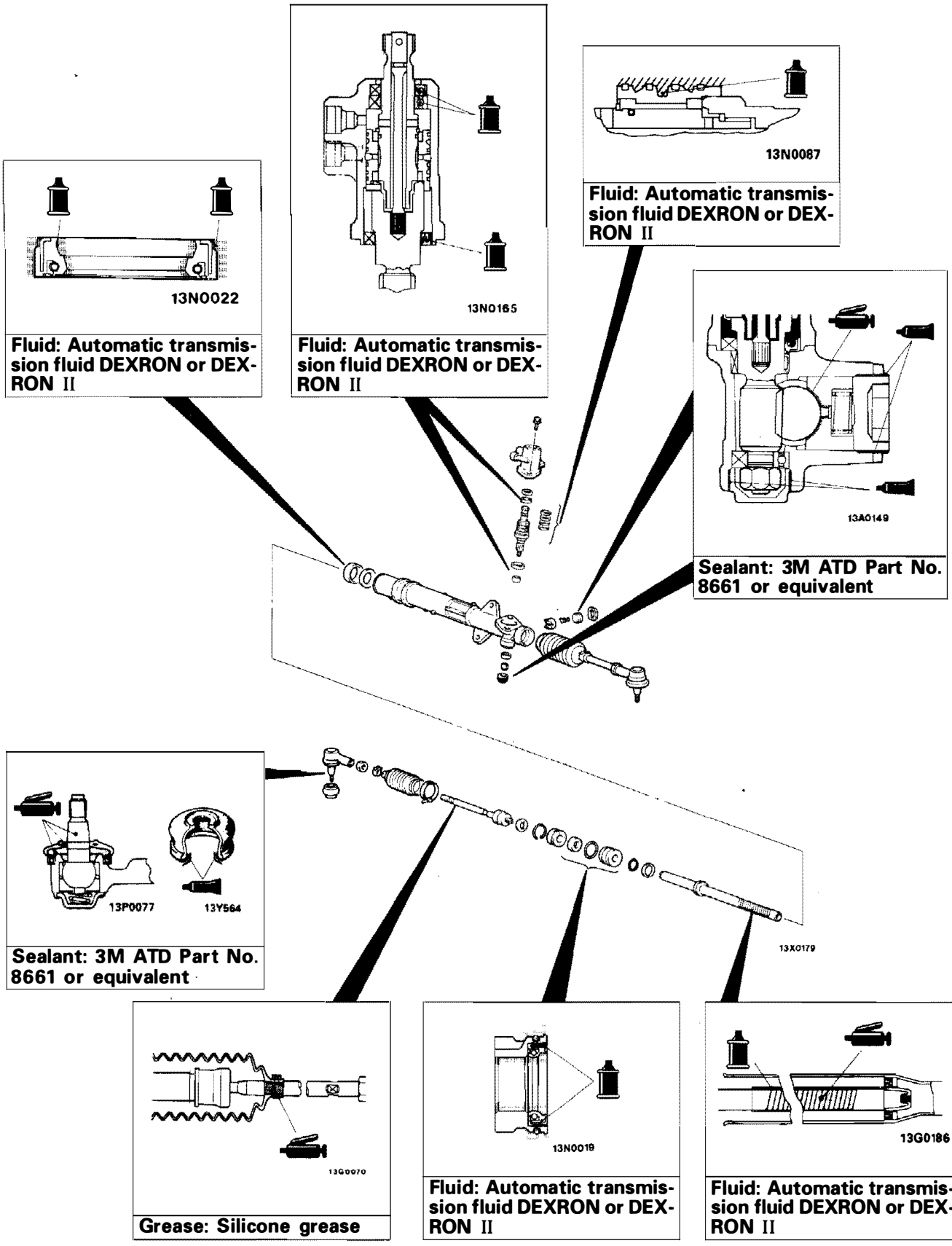
13N0023

Disassembly steps

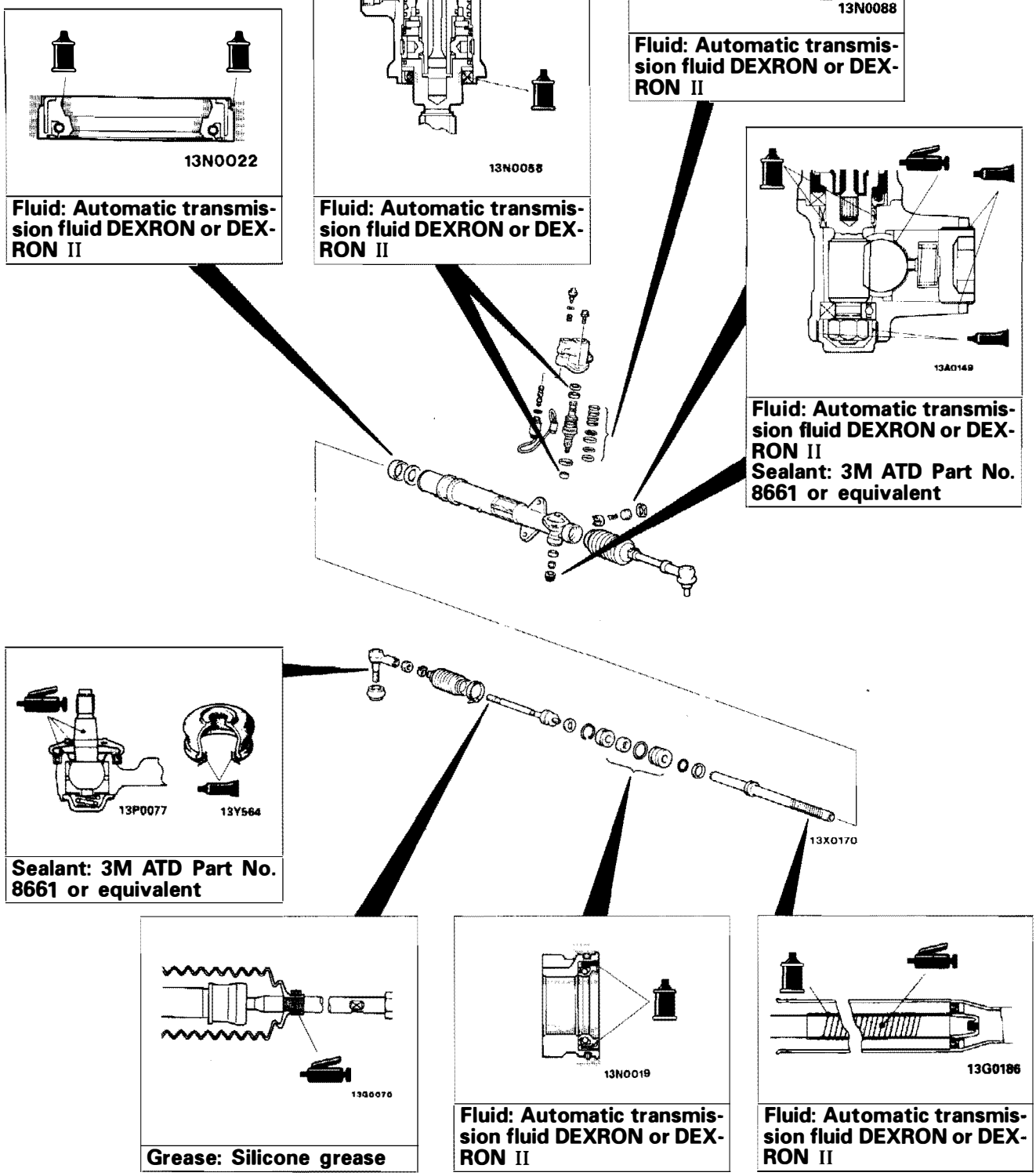
1. Feed tube
2. O-ring
3. Tie rod end locking nut
◗P◖ 4. Tie rod end
◗O◖ 5. Dust cover
6. Bellows clip
◗N◖ 7. Bellows band
8. Bellows
◇A◇ ◗M◖ 9. Tie rod
◇A◇ ◗M◖ 10. Tab washer
● Total pinion torque adjustment
11. Locking nut
◇B◇ 12. Rack support cover
13. Rack support spring
14. Rack support
◗L◖ 15. End plug
16. Self-locking nut
17. Valve housing assembly
18. P.C.V. cap
19. O-ring
20. P.C.V. spring
21. Solenoid valve
22. P.C.V.
23. O-ring
◇C◇ ◗K◖ 24. Oil seal
◇C◇ 25. Pinion and valve assembly
◗J◖ 26. Seal ring
27. O-ring
◇D◇ ◗J◖ 28. Seal ring
◇E◇ ◗I◖ 29. Ball bearing
◇E◇ ◗H◖ 30. Oil seal
31. Valve housing
◇F◇ ◗G◖ 32. Circlip
33. Rack stopper
◗F◖ 34. Rack bushing
◇G◇ ◗E◖ 35. Rack
◗D◖ 36. O-ring
◇H◇ ◗D◖ 37. Oil seal
38. Seal ring
39. O-ring
◇I◇ ◗C◖ 40. Ball bearing
◇J◇ ◗B◖ 41. Needle roller bearing
◇K◇ ◗A◖ 42. Oil seal
◇K◇ ◗A◖ 43. Back-up washer
44. Rack housing

LUBRICATION AND SEALING POINTS

<Conventional power steering gear box>



<EPS gear box>



Fluid: Automatic transmission fluid DEXRON or DEXRON II

Fluid: Automatic transmission fluid DEXRON or DEXRON II

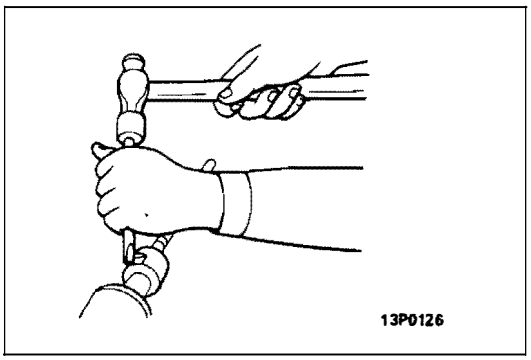
Fluid: Automatic transmission fluid DEXRON or DEXRON II
Sealant: 3M ATD Part No. 8661 or equivalent

Sealant: 3M ATD Part No. 8661 or equivalent

Grease: Silicone grease

Fluid: Automatic transmission fluid DEXRON or DEXRON II

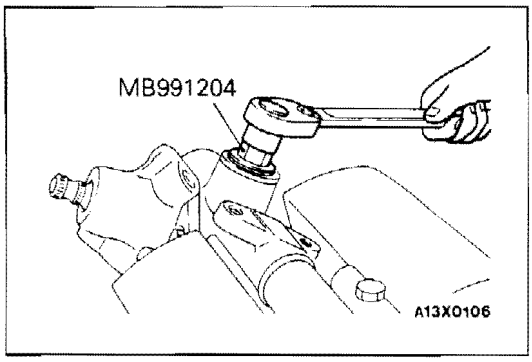
Fluid: Automatic transmission fluid DEXRON or DEXRON II



DISASSEMBLY SERVICE POINTS E37AH06AA

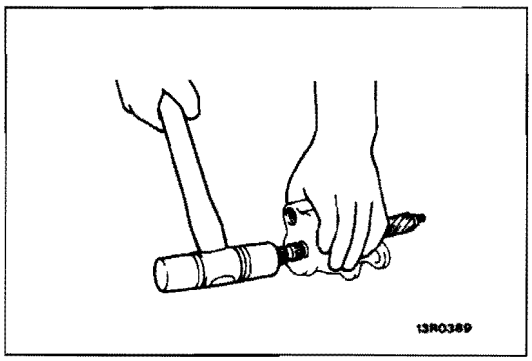
〈A〉 TIE ROD/TAB WASHER REMOVAL

Unstake the tab washer which fixes the tie rod and rack with a chisel.



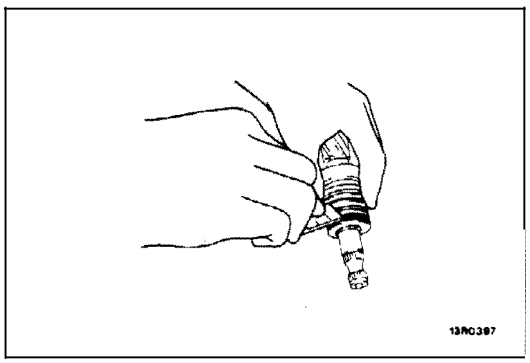
〈B〉 RACK SUPPORT COVER REMOVAL

Using the special tool, remove the rack support cover from the gear box.



〈C〉 OIL SEAL/PINION AND VALVE ASSEMBLY REMOVAL

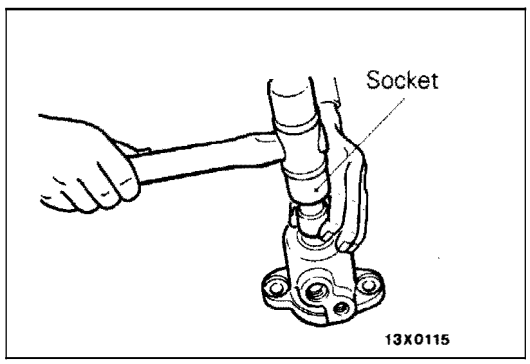
Using a plastic hammer, gently tap the pinion to remove it.



〈D〉 SEAL RING REMOVAL

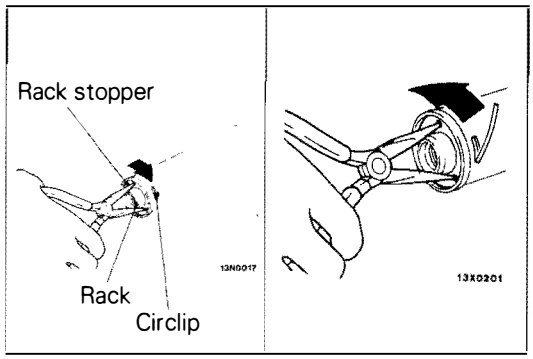
Cut the seal ring and remove it from the pinion and valve assembly and the rack.

Caution
When cutting the seal ring, be careful not to damage the pinion and valve assembly or the rack.



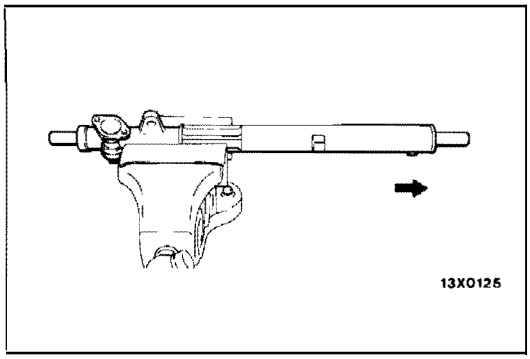
〈E〉 BALL BEARING/OIL SEAL REMOVAL

Using a socket, remove the oil seal and the ball bearing from the valve housing simultaneously.



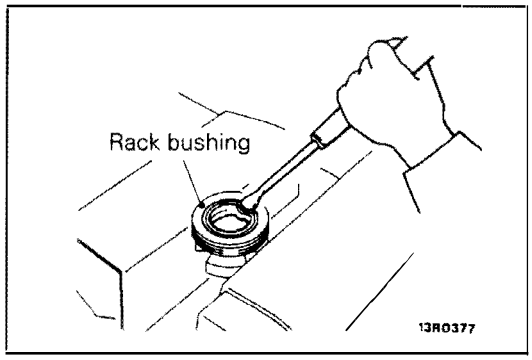
⟨F⟩ CIRCLIP REMOVAL

(1) Turn the rack stopper clockwise until the end of the circlip comes out of the slot in the rack housing.
(2) Turn the rack stopper anticlockwise to remove the circlip.



⟨G⟩ RACK REMOVAL

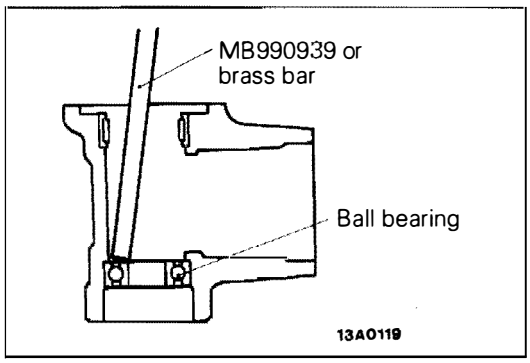
Pull out the rack slowly.
At this time also take out the rack stopper and the rack bushing simultaneously.



⟨H⟩ OIL SEAL REMOVAL

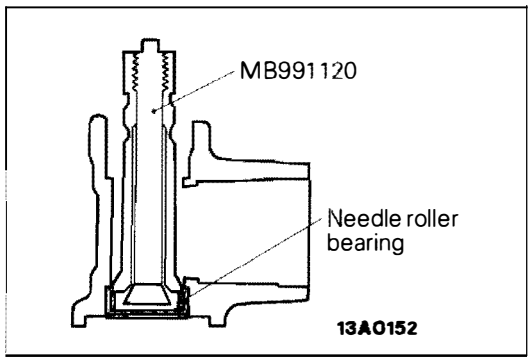
Partially bend oil seal and remove from rack bushing.

Caution
Do not damage oil seal press fitting surface.



⟨I⟩ BALL BEARING REMOVAL

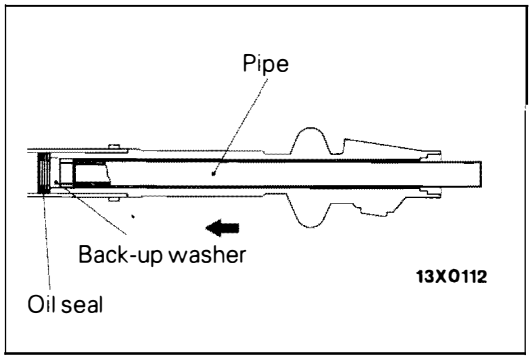
Use a brass bar or special tool to remove the ball bearing from the gear housing.



⟨J⟩ NEEDLE ROLLER BEARING REMOVAL

Use the special tool to remove the needle roller bearing from the rack housing.

Caution
Do not open special tool excessively to prevent damaging housing interior.



◇K◇ OIL SEAL/BACK-UP WASHER REMOVAL

Use a piece of pipe or similar tool to remove the back-up washer and oil seal from the gear housing.

Caution
Be careful not to damage the inner surface of the rack cylinder of the gear housing.

INSPECTION E37AH07AA

RACK

- Check the rack tooth surfaces for damage or wear.
- Check the oil seal contact surfaces for uneven wear.
- Check the rack for bends.

PINION AND VALVE ASSEMBLY E37AH07BA

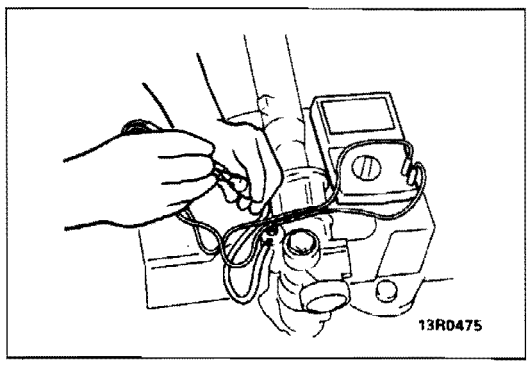
- Check the pinion gear tooth surfaces for damage or wear.
- Check for worn or defective seal ring.

BEARING E37AH07CA

- Check for roughness or abnormal noise during bearing operation.
- Check the bearing for play.
- Check the needle roller bearings for roller slip-off.

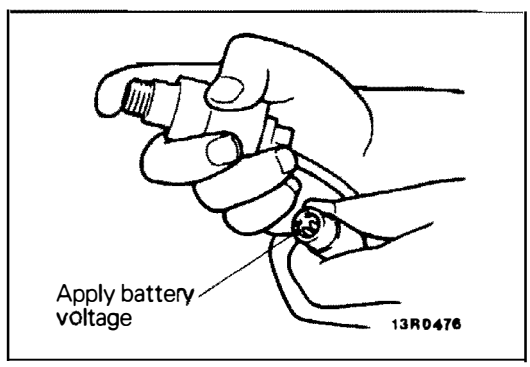
OTHERS E37AH07DA

- Check the cylinder inner surface of the rack housing for damage.
- Check the boots for damage, cracking or deterioration.
- Check the rack support for uneven wear or dents.
- Check the rack bushing for uneven wear or damage.

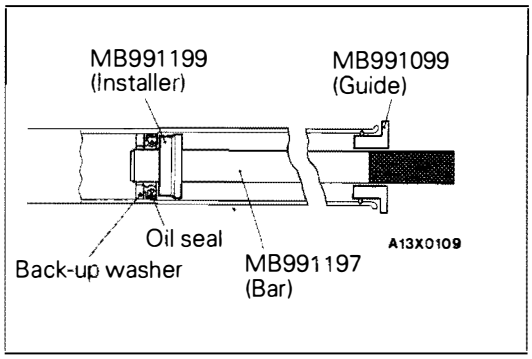


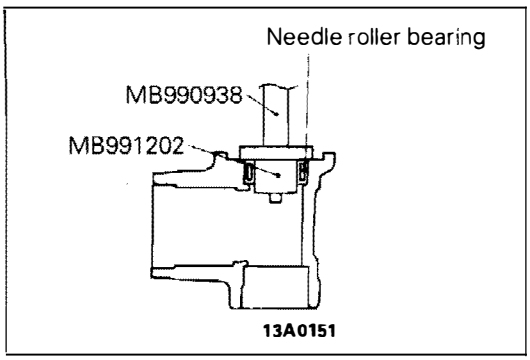
SOLENOID VALVE E37AH07EA

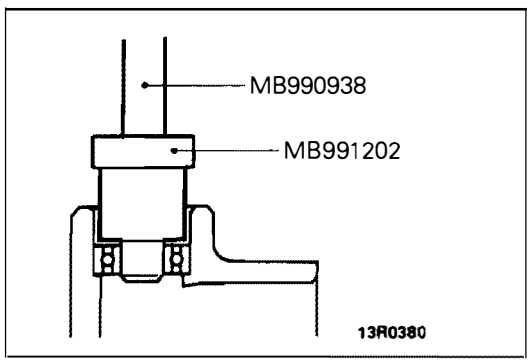
(1) Remove the solenoid valve connector, and then check whether or not there is continuity between the two terminals.

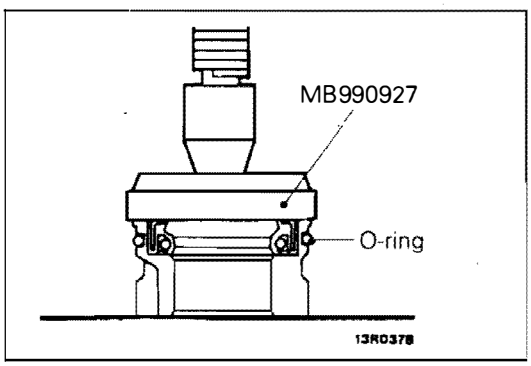


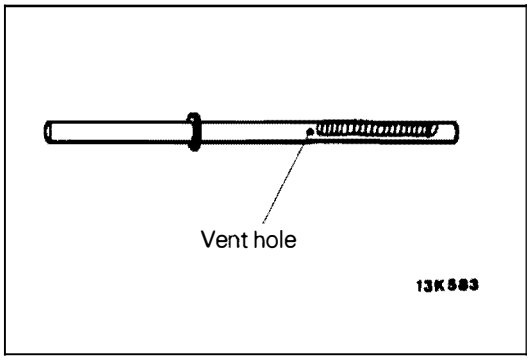
(2) While pressing the solenoid end inward by using a finger, connect to the battery and then check whether or not the solenoid is pushed out.











REASSEMBLY SERVICE POINTS E37AH08AA

◆A◆ BACK-UP WASHER/OIL SEAL INSTALLATION

(1) Apply a coating of the specified fluid to the outside of the oil seal.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

(2) Using the special tools, press the back-up washer and the oil seal into the rack housing to the specified position (where the upper surface of press-in guide coincides with the stepped part of the press-in tool).

◆B◆ NEEDLE ROLLER BEARING INSTALLATION

(1) Apply specified fluid to housing, bearing and oil seal press fitting surface.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

(2) Press fit needle roller bearing with special tools.

Caution
Press fit straight as valve housing is aluminum.

◆C◆ BALL BEARING INSTALLATION

◆D◆ OIL SEAL/O-RING INSTALLATION

(1) Apply a coating of the specified fluid to the outside of the oil seal and O-ring.

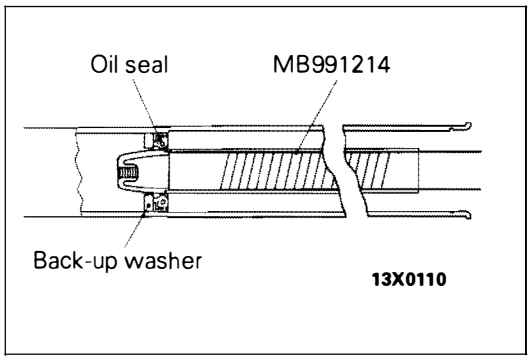
Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

(2) Use special tool to press fit oil seal until touches rack bush end.

◆E◆ RACK INSTALLATION

(1) Apply a coating of multipurpose grease to the rack teeth face.

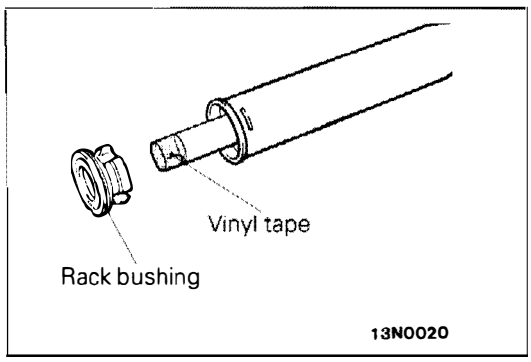
Caution
Do not close the vent hole in the rack with grease.



(2) Cover rack serrations with special tool.
(3) Apply specified fluid on special tool.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

(4) Match oil seal centre with rack to prevent retainer spring from slipping and slowly insert rack from power cylinder side.

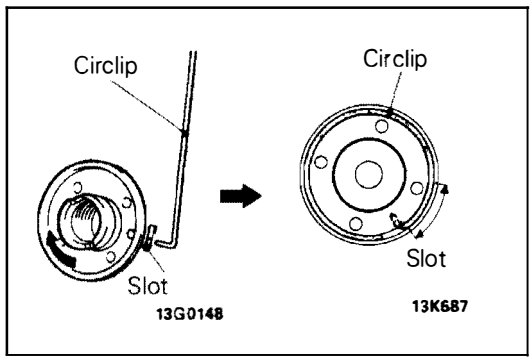


◆F◆ RACK BUSHING INSTALLATION

Wrap the rack end with vinyl tape, apply a coating of the specified fluid, and then install the rack bushing and rack stopper.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

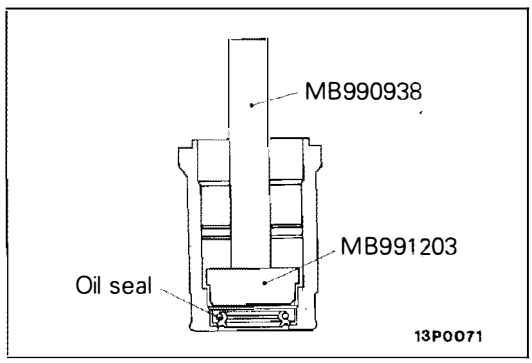
Caution
Do not allow oil seal retainer spring to slip out.



◆G◆ CIRCLIP INSTALLATION

Insert circlip to rack stopper hole through cylinder hole. Turn rack stopper clockwise and insert circlip firmly.

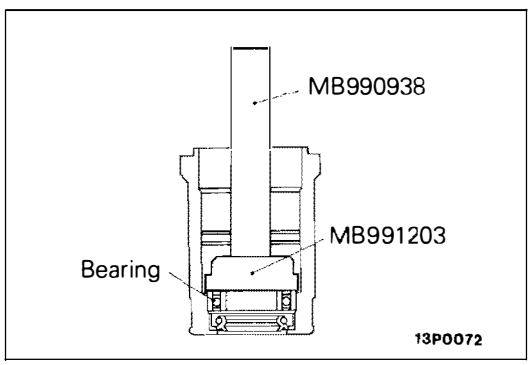
Caution
Insert circlip to rack stopper hole whilst turning rack stopper clockwise.



◆H◆ OIL SEAL INSTALLATION

Apply a coating of the specified fluid to the outside of the oil seal. Using the special tools, press the oil seal into the valve housing.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

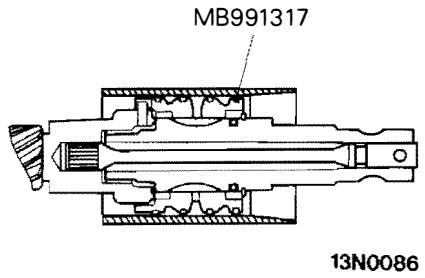


◆I◆ BALL BEARING INSTALLATION

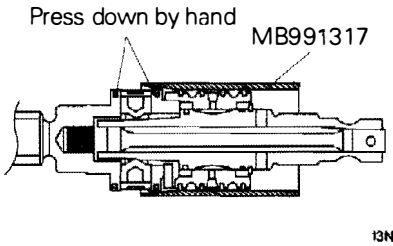
Apply a coating of the specified fluid to the outside of the ball bearing. Using the special tools, press the oil seal into the valve housing.

Specified fluid: Automatic transmission fluid DEXRON or DEXRON II

Conventional power steering gear box

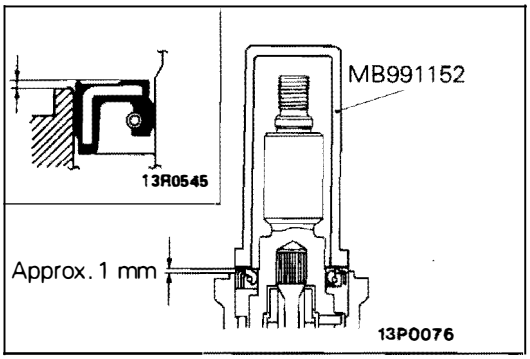


EPS gear box



◆J◆ SEAL RING INSTALLATION

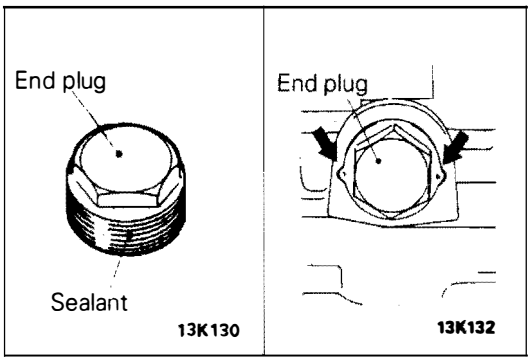
Because the seal rings expand at the time of installation, tighten after installation by using the special tool to compress the rings, or press down by hand.



◆K◆ OIL SEAL INSTALLATION

Using the special tool, press the oil seal into the valve housing.

Caution
In order to eliminate a seal malfunction at the valve housing alignment surface, the upper surface of the oil seal should project outward approximately 1 mm from the housing edge surface.

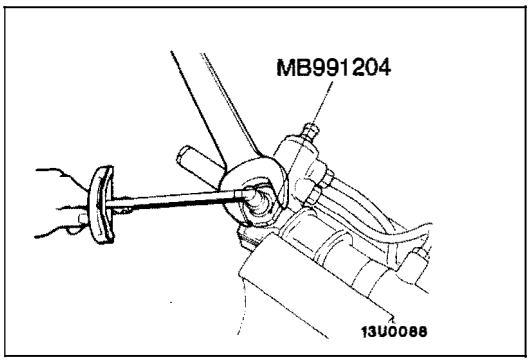


◆L◆ END PLUG INSTALLATION

(1) Apply the specified sealant to the threaded part of the end plug.

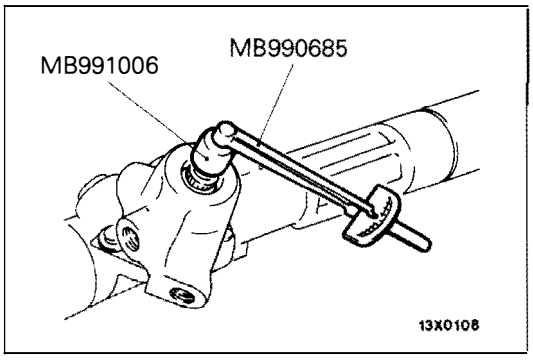
Specified fluid: 3M ATD Part No. 8661 or equivalent

(2) Secure the threaded portion of the end plug at two places by using a punch.



• TOTAL PINION TORQUE ADJUSTMENT

(1) Position rack at its centre. Tighten rack support cover to 15 Nm.
(2) In neutral position, rotate pinion shaft clockwise one turn/4–6 seconds with special tool. Return rack support cover 30°–60° and adjust torque to the standard value.



E37AH08AB

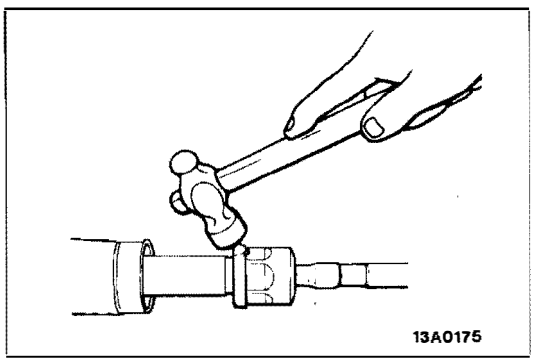
(3) Using the special tools, rotate the pinion gear at the rate of one rotation in approximately 4 to 6 seconds to check the total pinion torque.

Standard value:
2WS
0.6–1.4 Nm [Change in torque: 0.4 Nm]
4WS
Up to 1993 models
0.6–1.5 Nm [Change in torque: 0.4 Nm]
From 1994 models
0.7–1.3 Nm [Change in torque: 0.3 Nm]

Caution
1. **When adjusting, set the standard value at its highest value.**
2. **Assure no ratcheting or catching when operating rack towards the shaft direction.**

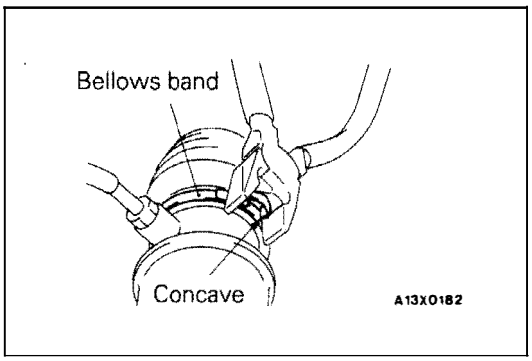
NOTE
When it cannot be adjusted within the specified return angle, check rack support cover components or replace.

(4) After adjusting, lock rack support cover with lock nut.



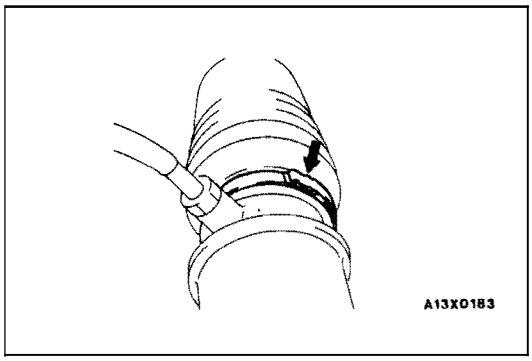
◆M◆ TAB WASHER/TIE ROD INSTALLATION

After installing tie-rod to rack, fold tab washer end (2 locations) to tie rod notch.

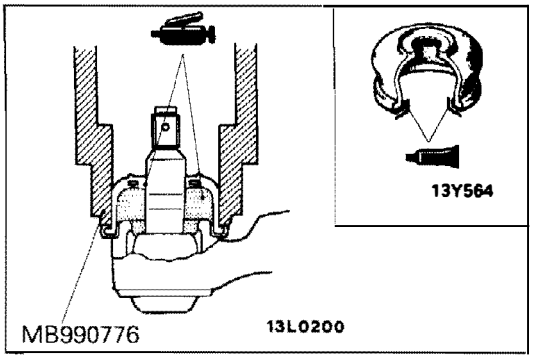


◆N◆ BELLOWS BAND INSTALLATION

(1) Touch pliers against the concave section of the bellows band and tighten the bellows band.



(2) Use a plastic hammer or similar to bend the convex section of the bellows band as shown in the illustration.

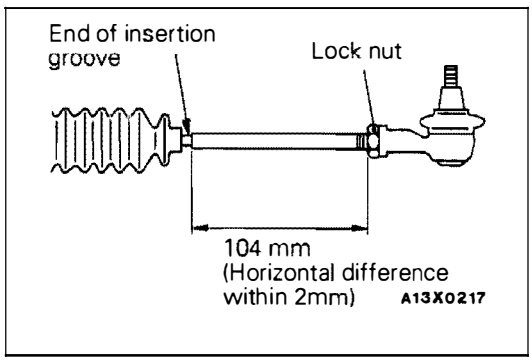


◆O◆ DUST COVER INSTALLATION

(1) Pack dust cover interior with multipurpose grease.
(2) Apply specified sealant to dust cover lip.

Specified fluid: 3M ATD Part No. 8661 or equivalent

(3) Using the special tool, install the dust cover to the tie rod end ball joint.



◆P◆ TIE ROD END INSTALLATION

Screw in tie-rod end to have its right and left length as illustrated. Lock with lock nut.

POWER STEERING OIL PUMP

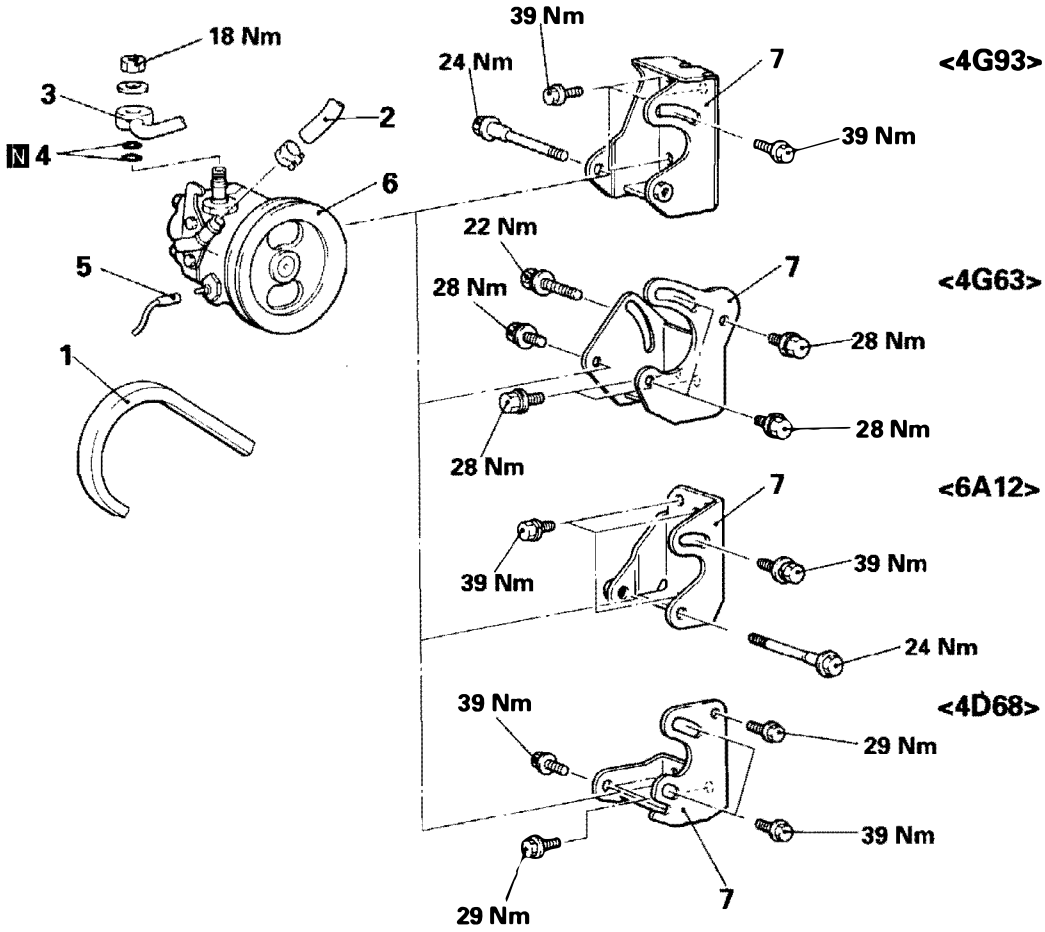
E37AI00AA

REMOVAL AND INSTALLATION

Pre-removal Operation
- Power Steering Fluid Draining (Refer to P.37A-17.)
- Under Cover Side Panel Removal <6G73> (Refer to GROUP 42 – Under Cover)

Post-installation Operation
- Power Steering Fluid Supplying (Refer to P.37A-17.)
- Drive-belt Tension Adjusting (Refer to GROUP 11 – Service Adjustment Procedures.)
- Power Steering Fluid Line Bleeding (Refer to P.37A-18.)
- Oil Pump Pressure Check (Refer to P.37A-19.)
- Under Cover Side Panel Installation <6G73> (Refer to GROUP 42 – Under Cover)

<Except 6G73>

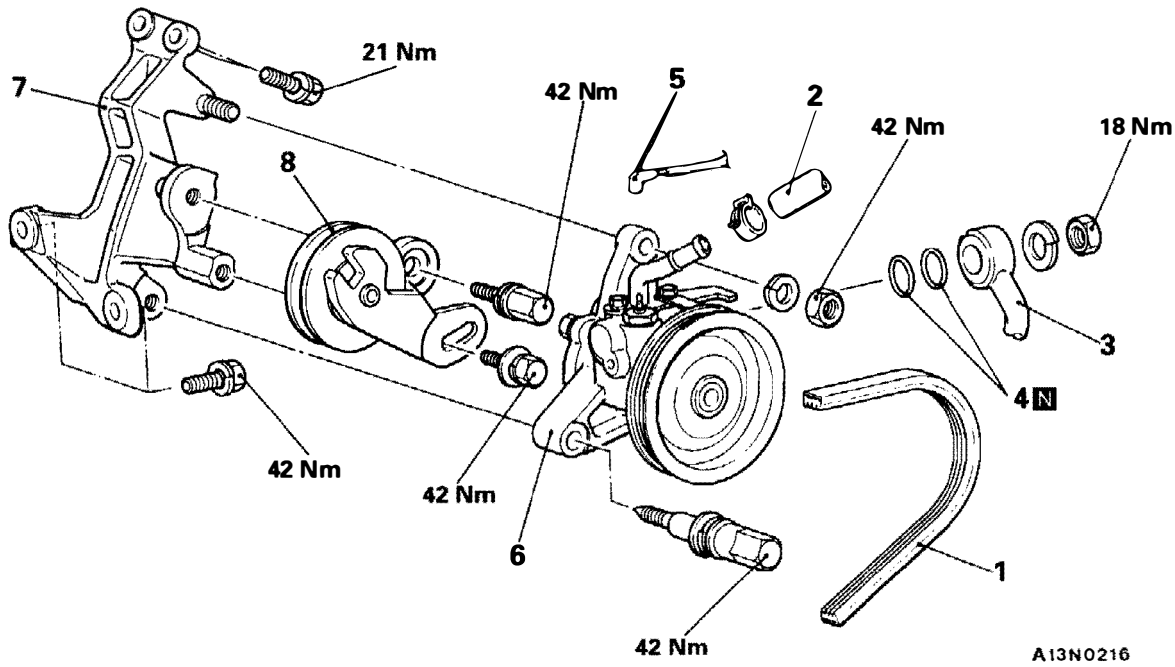


A13X0190

Removal steps

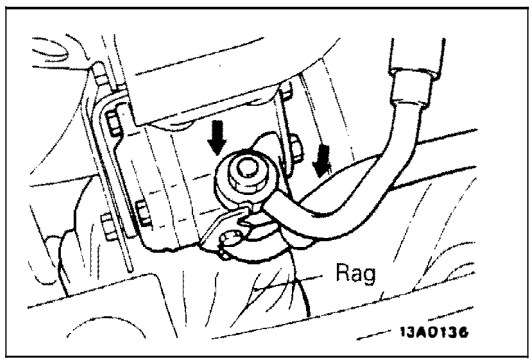
1. Drive-belt
◇A◇ 2. Suction hose
◇A◇ ◆B◆ 3. Pressure hose
4. O-ring
5. Pressure switch connector <4G93, 4G63, 6A12>
◆A◆ 6. Oil pump
7. Oil pump bracket

<6G73>



Removal steps

1. Drive belt
2. Suction hose
◆B◆ 3. Pressure hose
4. O-ring
5. Pressure switch connector
6. Oil pump
7. Oil pump bracket
8. Tensioner pulley



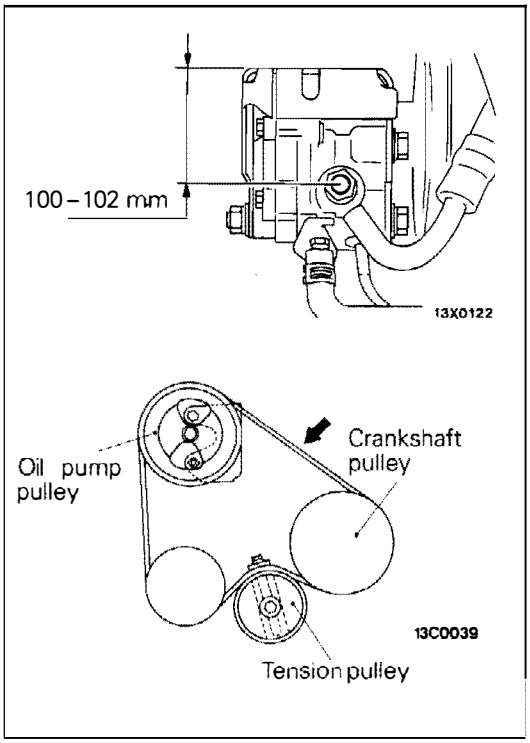
REMOVAL SERVICE POINT E37AI01AA

◇A◇ SUCTION HOSE/PRESSURE HOSE REMOVAL <4G63, 4D68>

Caution
Alternator is below the oil pump, so cover the alternator with a rag before removing any of the hoses.

INSPECTION E37AI02AA

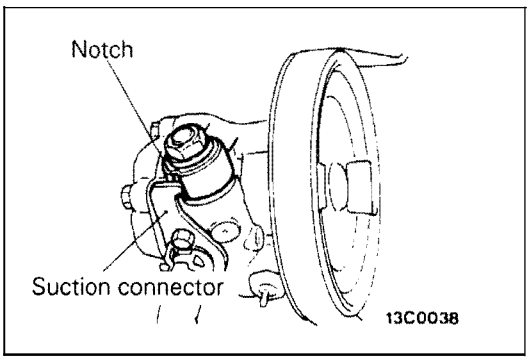
- Check the drive-belt for cracks
- Check the pulley assembly for uneven rotation.



INSTALLATION SERVICE POINTS E37AI04AA

◗A◖ OIL PUMP INSTALLATION <6A12 (Vehicles with A/C)>

For 2WS vehicles, secure the oil pump as shown in the illustration and adjust the belt tension with the tension pulley. (Refer to GROUP 11G – Service Adjustment Procedures.)



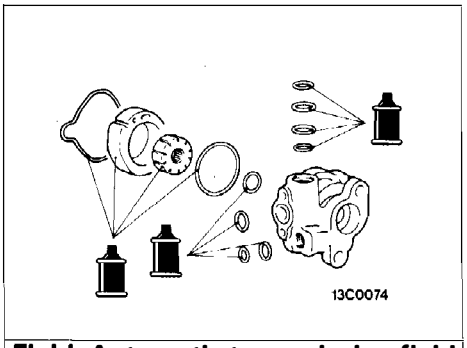
◗B◖ PRESSURE HOSE INSTALLATION

Connect the pressure hose so that its notch part contacts the suction connector.

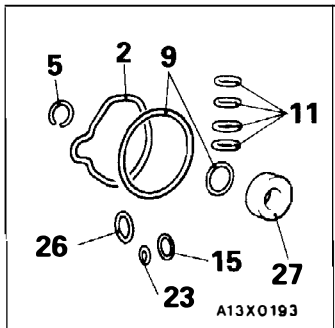
DISASSEMBLY AND REASSEMBLY

E37AI05AA

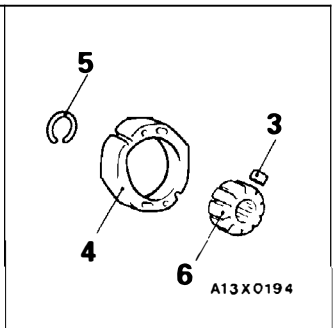
<4G93, 6A12, 4D68>



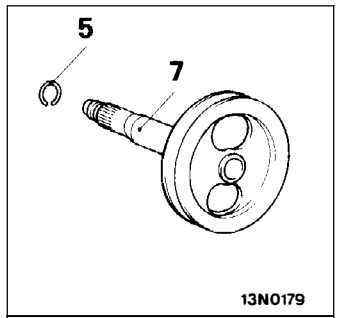
Fluid: Automatic transmission fluid DEXRON or DEXRON II



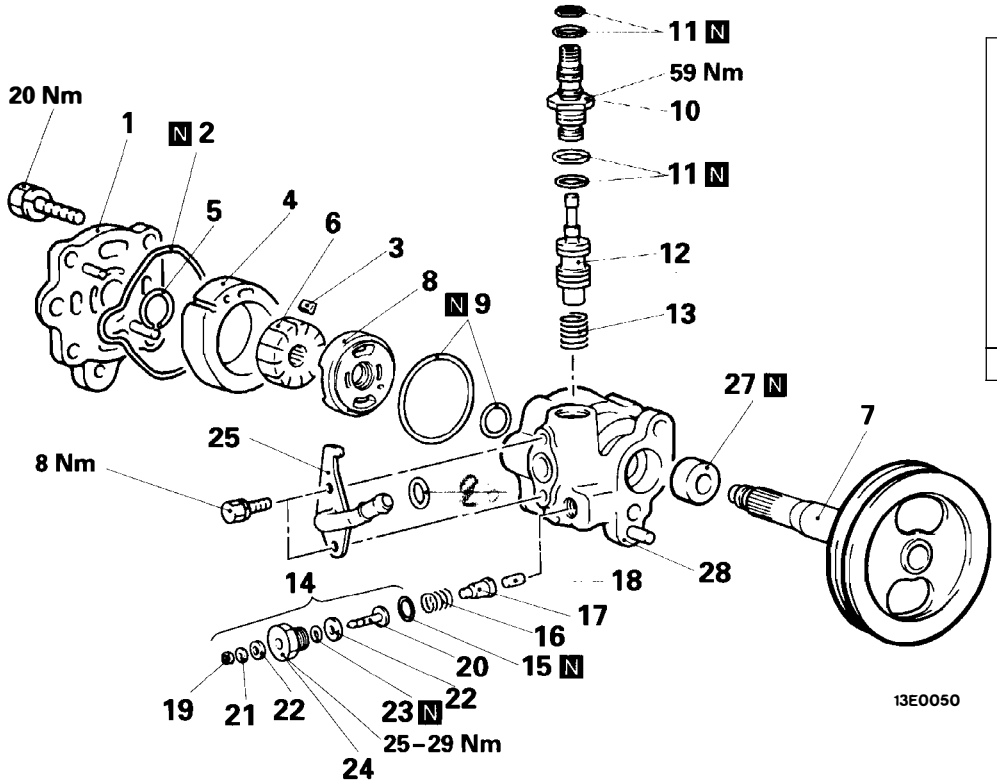
Oil pump seal kit



Oil pump cartridge kit



Pulley and shaft kit



Disassembly steps

1. Pump cover
2. O-ring
3. Vanes ◆I◆
4. Cam ring ◆H◆
5. Snap ring ◇B◇ ◆G◆
6. Rotor ◆F◆
7. Pulley assembly
8. Side plate ◆E◆
9. O-ring ◆C◆
10. Connector
11. O-ring ◆C◆
12. Flow control valve
13. Flow control spring
14. Terminal assembly
15. O-ring ◆C◆

<4G93, 6A12>

16. Spring ◆D◆
17. Plunger
18. Piston rod
19. Snap ring
20. Terminal
21. Washer
22. Insulator
23. O-ring ◆C◆
24. Plug
25. Suction connector

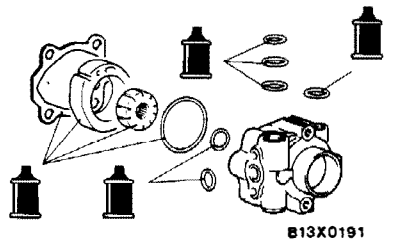
<4G93, 6A12>

26. O-ring ◆C◆
27. Oil seal ◆A◆
28. Oil pump body

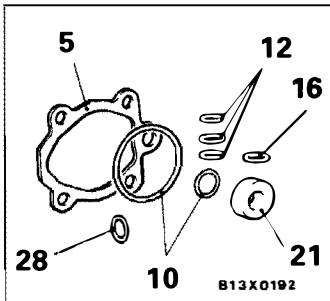
Caution
Do not disassemble the flow control valve.

<4G63>

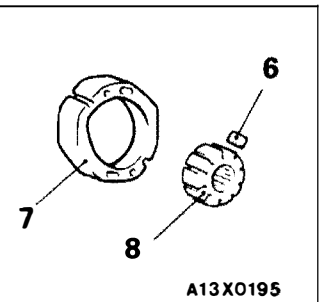
E37AI05AB



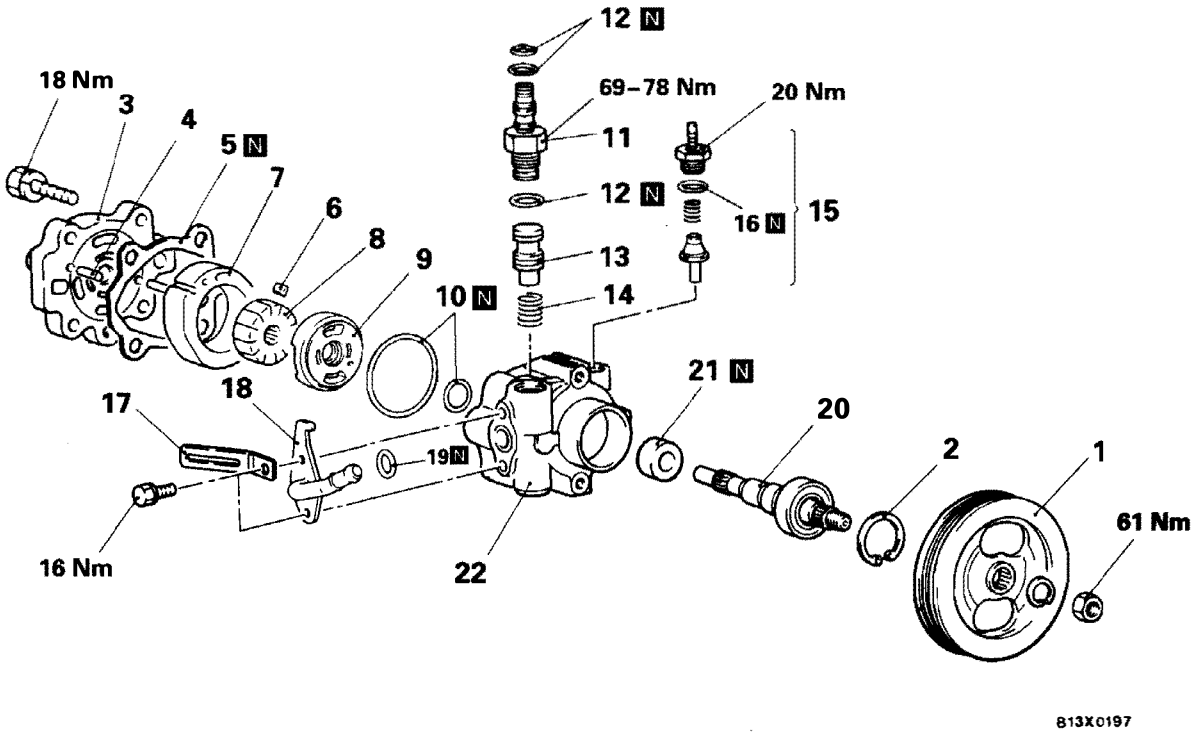
Fluid: Automatic transmission fluid DEXRON or DEXRON II



Oil pump seal kit



Oil pump cartridge kit

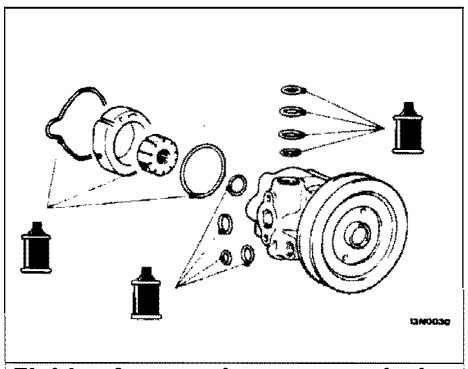


Disassembly steps

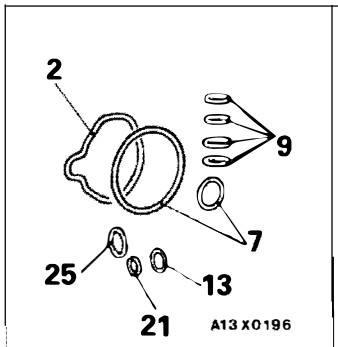
◇A◇ ◆J◆ 1. Drive pulley
2. Snap ring
3. Pump cover
4. Lock pin
5. Seal washer
◆I◆ 6. Vanes
◆H◆ 7. Cam ring
◆F◆ 8. Rotor
9. Side plate
◆C◆ 10. O-ring
11. Connector
◆C◆ 12. O-ring
13. Flow control valve
14. Flow control spring
15. Pressure switch assembly
◆C◆ 16. O-ring
17. Clip
18. Suction connector
◆C◆ 19. O-ring
◆B◆ 20. Drive shaft assembly
◆A◆ 21. Oil seal
22. Oil pump body

Caution
Do not disassemble the flow control valve.

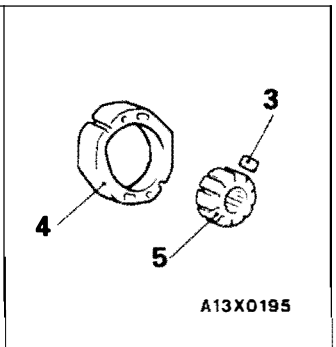
<6G73>



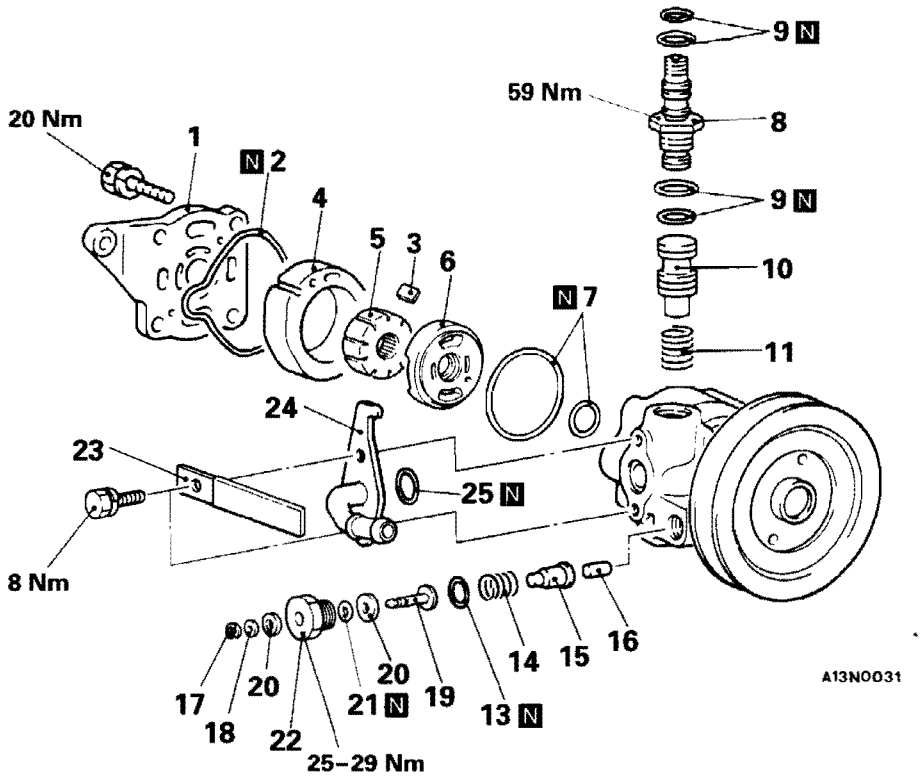
Fluid: Automatic transmission fluid DEXRON or DEXRON II



Oil pump seal kit



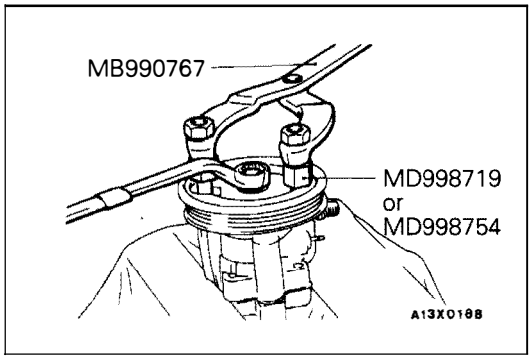
Oil pump cartridge kit



Disassembly steps

1. Pump cover
2. O-ring
3. Vanes
4. Cam ring
5. Rotor
6. Side plate
7. O-ring
8. Connector
9. O-ring
10. Flow control valve
11. Flow control spring
12. Terminal assembly
13. O-ring
14. Spring
15. Plunger
16. Piston rod
17. Snap ring
18. Terminal
19. Washer
20. Insulator
21. O-ring
22. Plug
23. Clip
24. Suction connector
25. O-ring
26. Oil pump body and pulley assembly

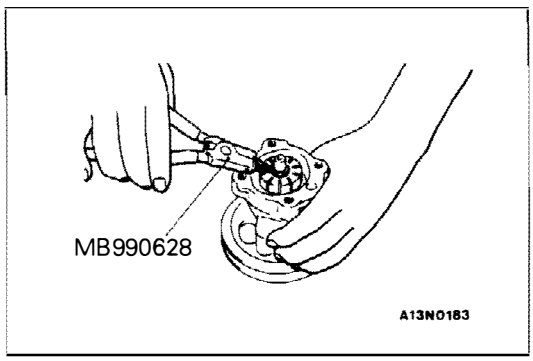
Caution
Do not disassemble the flow control valve.



DISASSEMBLY SERVICE POINT E37AI06AA

〈A〉 DRIVE PULLEY REMOVAL <4G63>

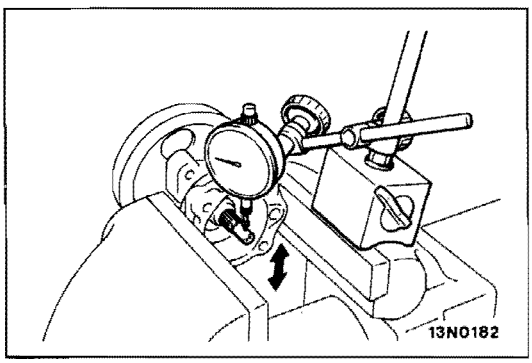
Use the special tool to secure the drive pulley, and then remove the drive pulley mounting nuts.



〈B〉 SNAP RING REMOVAL <4G93, 6A12, 4D68>

INSPECTION E37AI07AA

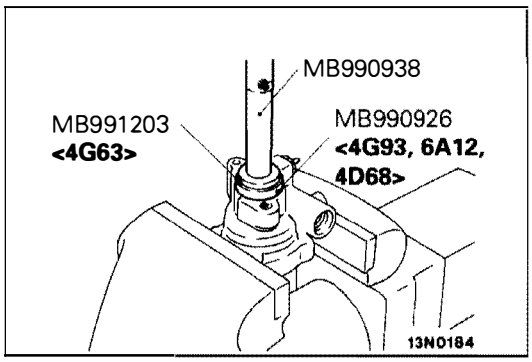
- Check the flow control valve for clogging.
- Check the pulley assembly for wear or damage.
- Check the groove of rotor and vane for "Stepped" wear.
- Check the contact surface of cam ring and vanes for "stepped" wear.
- Check the vanes for damage.



CLEARANCE BETWEEN SHAFT AND PUMP BODY E37AI07BA

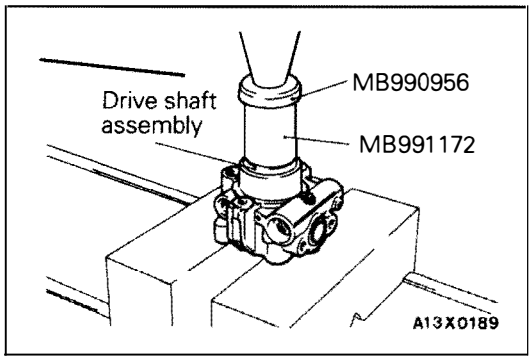
(1) Place the dial gauge against the end of the pulley assembly's shaft.
(2) Move the pulley assembly up and down and measure the play.

Limit: 0.1 mm



REASSEMBLY SERVICE POINTS E37AI08AA

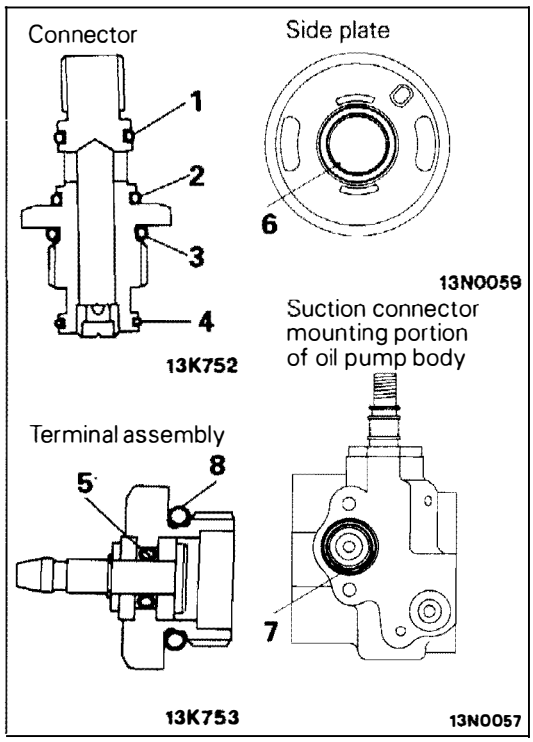
◆A◆ OIL SEAL INSTALLATION <Except 6G73>



E37AI08AB

◆B◆ DRIVE SHAFT ASSEMBLY INSTALLATION <4G63>

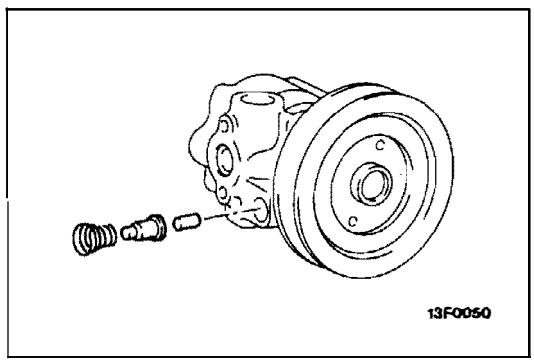
Use the special tool to press-fit the drive shaft assembly.



◆C◆ O-RINGS INSTALLATION

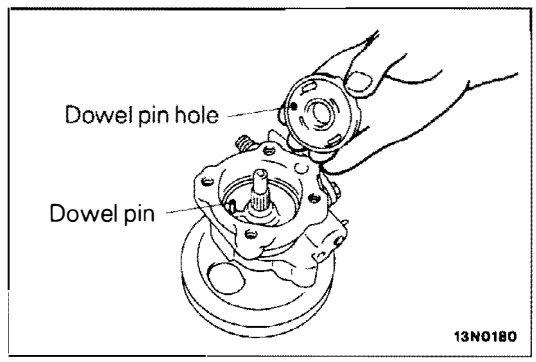
Apply specified fluid on O-rings to install.

No.	Except 4G63 I.D.xWidth mm	4G63 I.D.xWidth mm
1	11×1.9	11×1.9
2	13×1.9	13×1.9
3	17.8×2.4	15.5×2.4
4	13.5×1.5	–
5	3.8×1.9	–
6	16.8×2.4	14.8×2.4
7	17.8×2.4	19.4×1.9
8	13.0×1.9	11.0×1.9



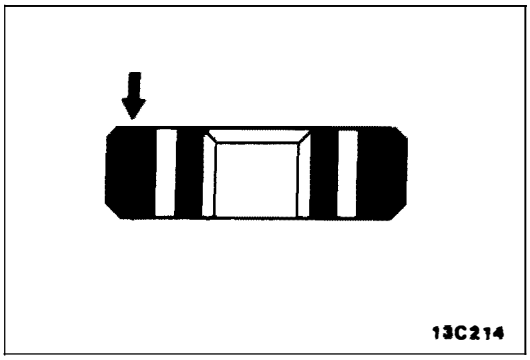
◆D◆ SPRING INSTALLATION

Fit the spring to the oil pump body with the larger diameter end at the terminal assembly side.



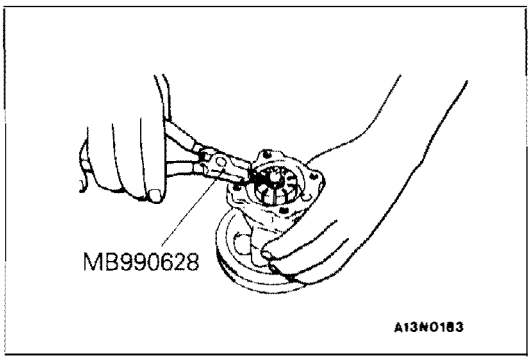
◆E◆ SIDE PLATE INSTALLATION <Except 4G63>

Line up the dowel pin hole of the side plate with the dowel pin of the pump body when installing the side plate.

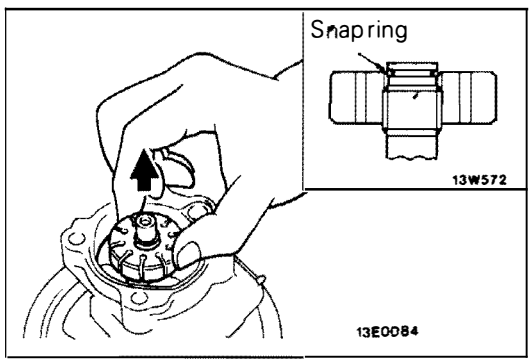


◆F◆ ROTOR INSTALLATION

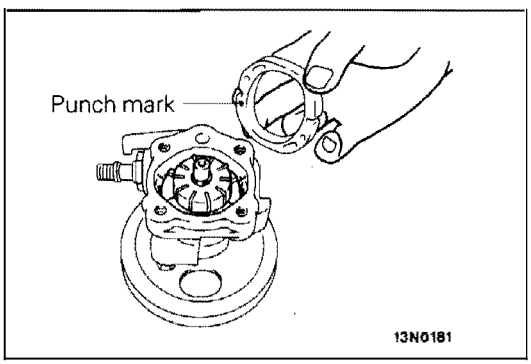
Install the rotor to the pulley assembly so that the rotor's punch mark is at the pump cover side.



◆G◆ SNAP RING INSTALLATION <4G93, 6A12, 4D68>

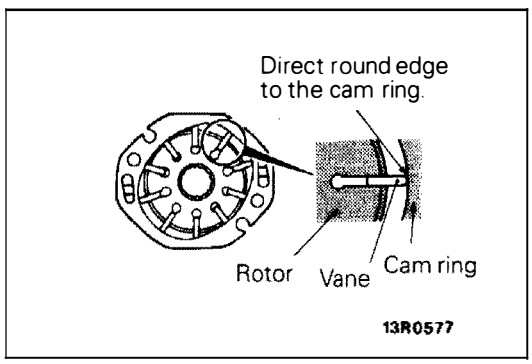


After installation of the snap ring, lift the rotor and check that the snap ring has entered the countersunk part.



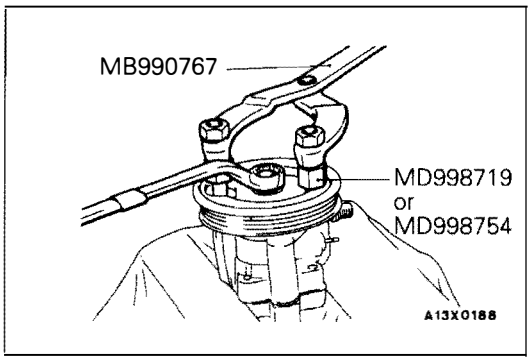
◆H◆ CAM RING INSTALLATION

Install the cam ring with the punch mark facing the side plate.



◆I◆ VANE INSTALLATION

Install the vanes on the rotor, paying close attention to the installation direction.



◆J◆ DRIVE PULLEY INSTALLATION <4G63>

Use the special tool to secure the drive pulley, and then install the drive pulley mounting nuts.

POWER STEERING HOSES

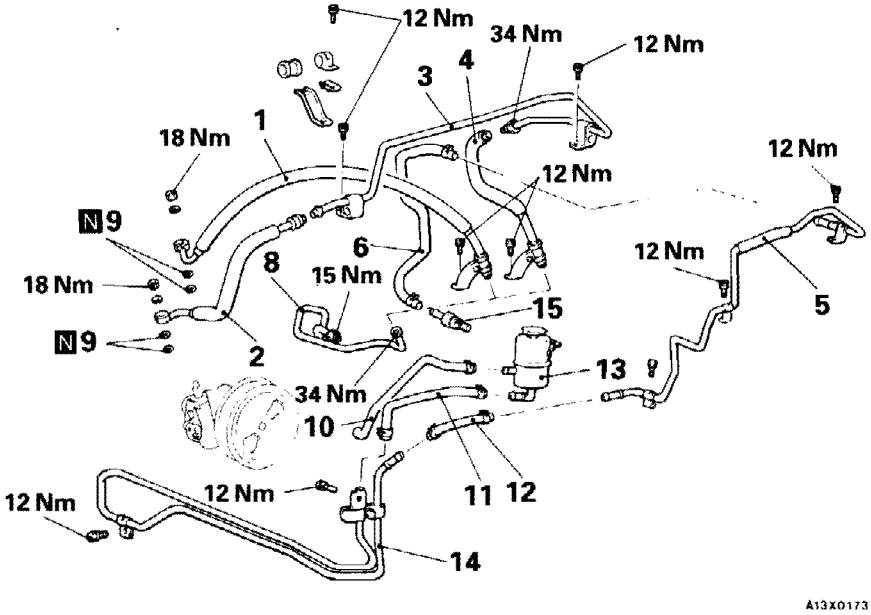
E37AJ00AA

REMOVAL AND INSTALLATION <2WS>

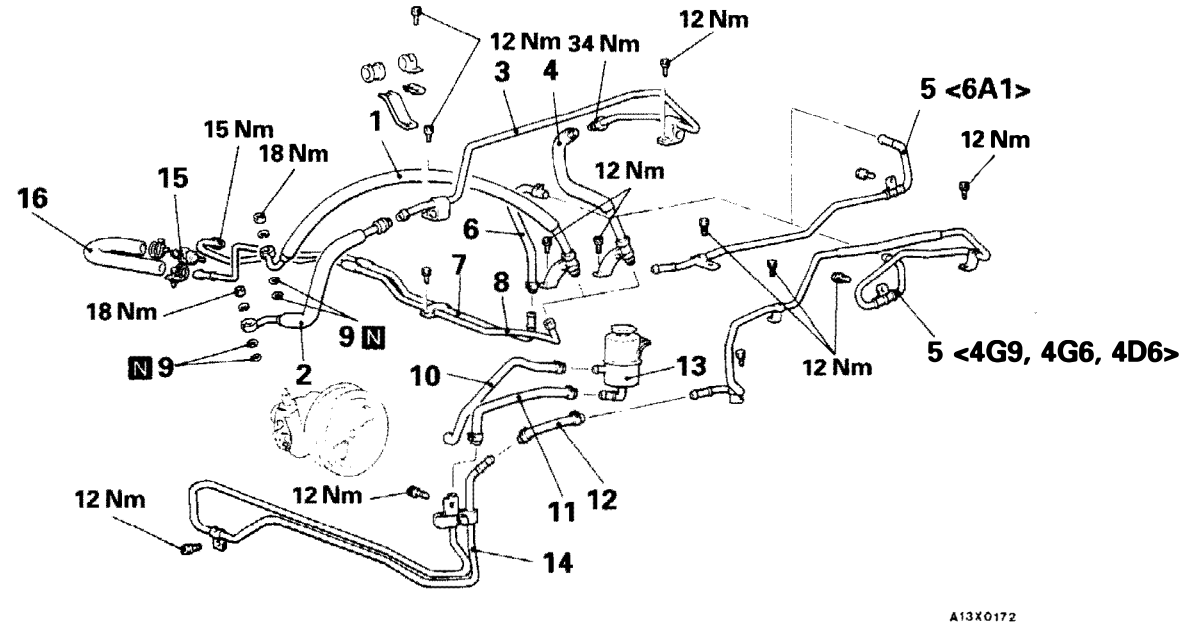
Pre-removal Operation
- Power Steering Fluid Draining
- Front Bumper Removal (Refer to GROUP 51 – Front Bumper)

Post-installation Operation
- Front Bumper Installation (Refer to GROUP 51 – Front Bumper)
- Power Steering Fluid Supplying
- Power Steering Fluid Line Bleeding (Refer to P.37A-18.)

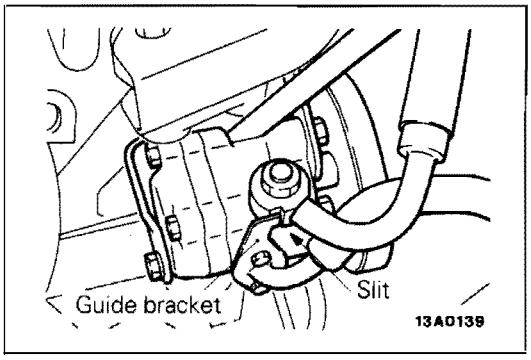
<L.H. drive vehicles>



<R.H. drive vehicles>



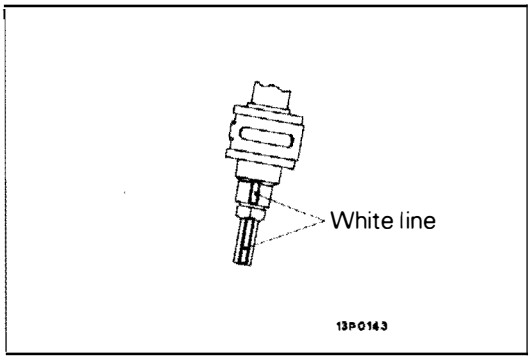
◆A◆ 1. Pressure hose <4G9, 6A1>
◆A◆ 2. Pressure hose
3. Pressure pipe <4G6, 4D6>
◆A◆ 4. Pressure hose
5. Return pipe
6. Return hose
7. Return pipe
8. Pressure pipe
9. O-ring
10. Suction hose
11. Return hose
12. Return hose
13. Oil reservoir
14. Cooler pipe
15. Return pipe
16. Return hose



INSTALLATION SERVICE POINT E37AJ04AA

◆A◆ PRESSURE HOSE INSTALLATION

(1) Connect the pressure hose so that its slit part contacts the oil pump's guide bracket.



(2) When the pressure hose is installed, align the white line on the pressure hose with the white line on the pressure tube so that together they form a straight line.

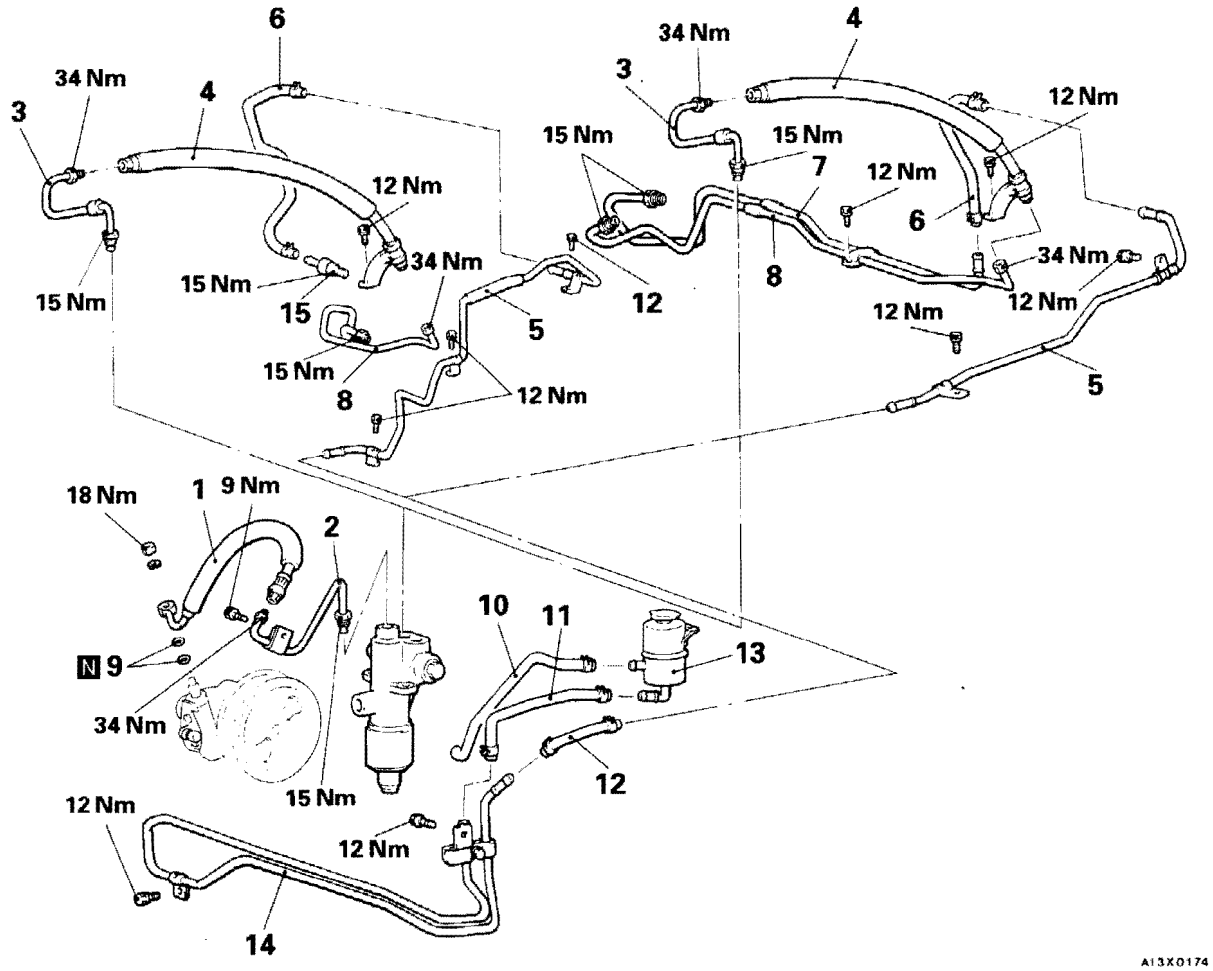
REMOVAL AND INSTALLATION <4WS>

E37AJ00BA

Pre-removal Operation
- Power Steering Fluid Draining
- Front Bumper Removal (Refer to GROUP 51 – Front Bumper)

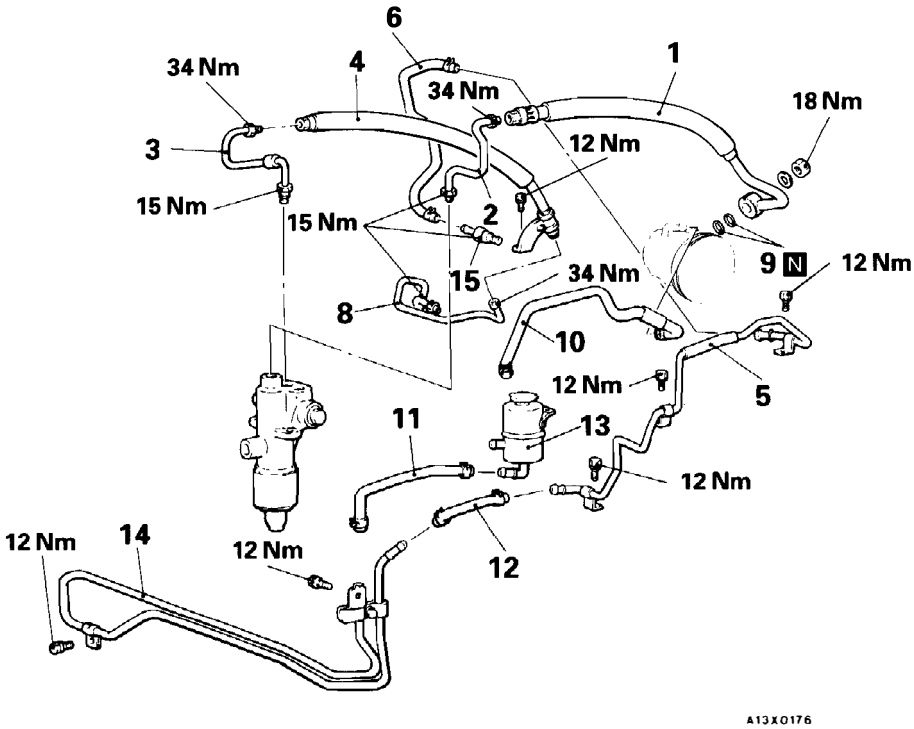
Post-installation Operation
- Front Bumper Installation (Refer to GROUP 51 – Front Bumper)
- Power Steering Fluid Supplying
- Power Steering Fluid Line Bleeding (Refer to P.37A-18.)

<6A1 engine (L.H. drive vehicles)> **<6A1 engine (R.H. drive vehicles)>**

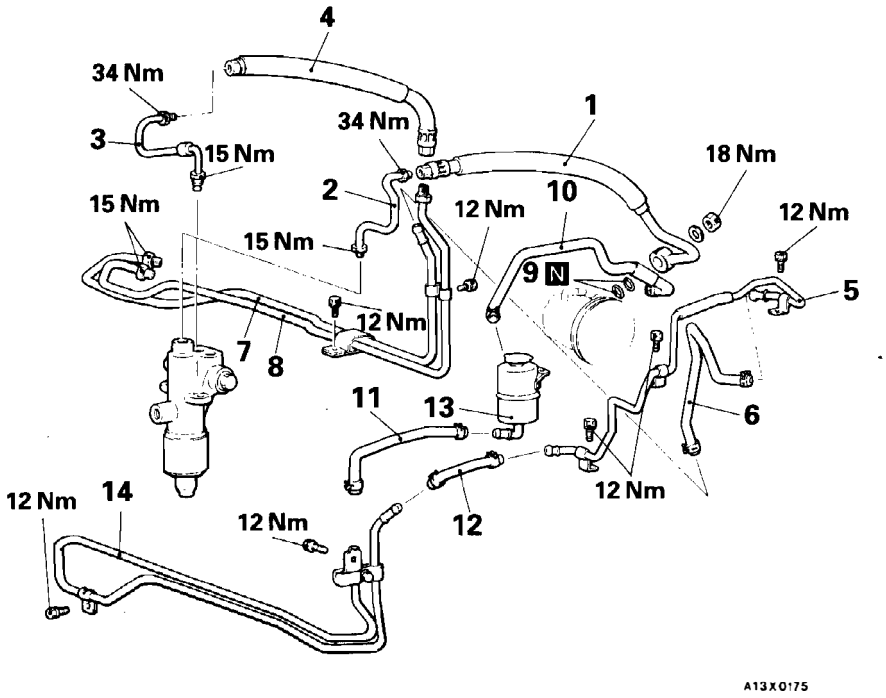


◆A◆ 1. Pressure hose
◆A◆ 2. Pressure pipe
3. Pressure pipe
◆A◆ 4. Pressure hose
5. Return pipe
6. Return hose
7. Return pipe
8. Pressure pipe
9. O-ring
10. Suction hose
11. Return hose
12. Return hose
13. Oil reservoir
14. Cooler pipe
15. Return pipe

<6G7 engine (L.H. drive vehicles)>

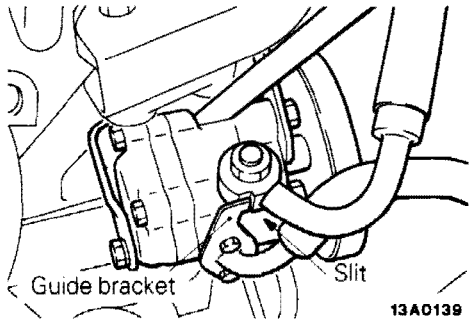


<6G7 engine (R.H. drive vehicles)>

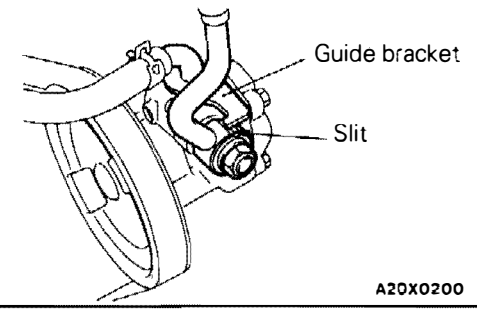


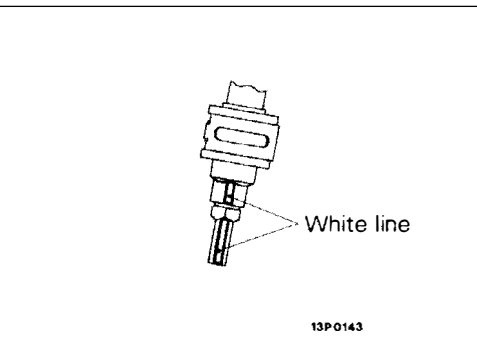
◆A◆ 1. Pressure hose
◆A◆ 2. Pressure pipe
3. Pressure pipe
◆A◆ 4. Pressure hose
5. Return pipe
6. Return hose
7. Return pipe
8. Pressure pipe
9. O-ring
10. Suction hose
11. Return hose
12. Return hose
13. Oil reservoir
14. Cooler pipe
15. Return pipe

<6A1 engine>



<6G7 engine>





INSTALLATION SERVICE POINT E37AJ04BA

◆A◆ PRESSURE HOSE INSTALLATION

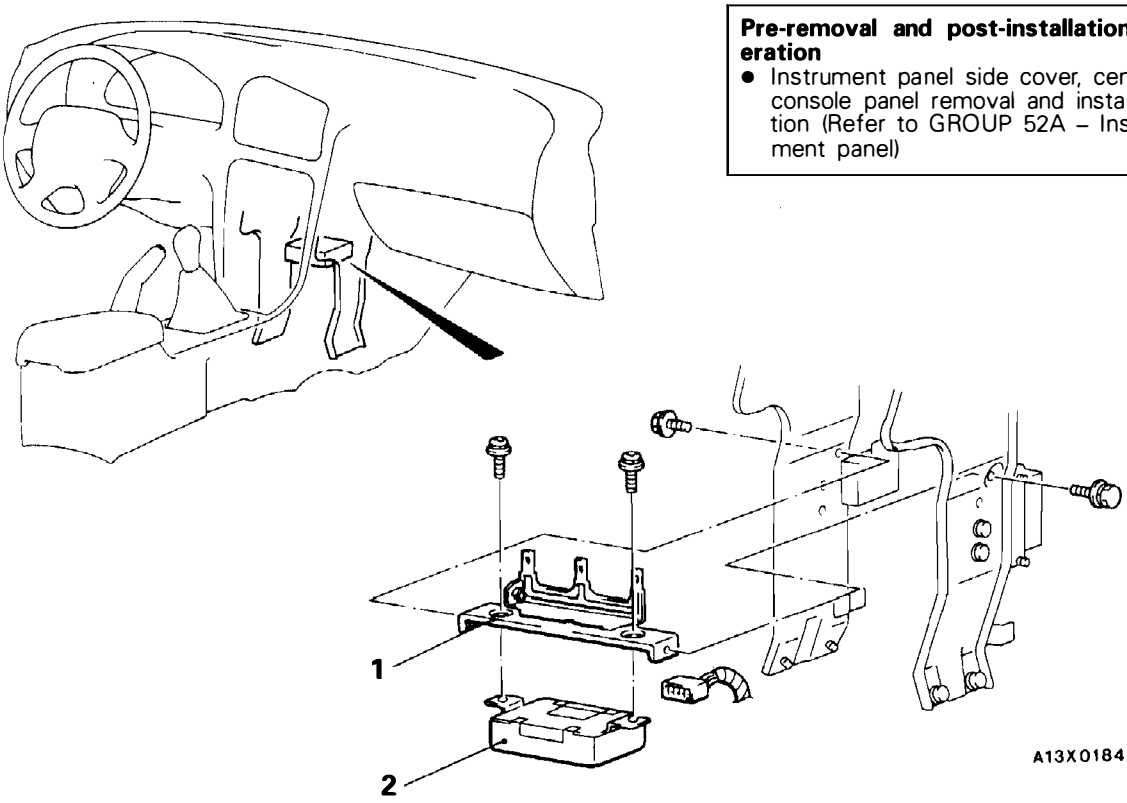
(1) Connect the pressure hose so that its slit part contacts the oil pump's guide bracket.

(2) When the pressure hose is installed, align the white line on the pressure hose with the white line on the pressure tube so that together they form a straight line.

EPS–ECU

E37AK00AA

REMOVAL AND INSTALLATION



Pre-removal and post-installation operation
- Instrument panel side cover, center console panel removal and installation (Refer to GROUP 52A – Instrument panel)

Removal steps
1. Stay
2. EPS–ECU

INSPECTION

E37AK02AA

To inspect the control unit, measure the voltages at each terminal and the solenoid valve current, while referring to Troubleshooting.

ACTIVE 4-WHEEL STEERING SYSTEM (ACTIVE 4WS)

CONTENTS

E37CA00AA

 PWDE9211

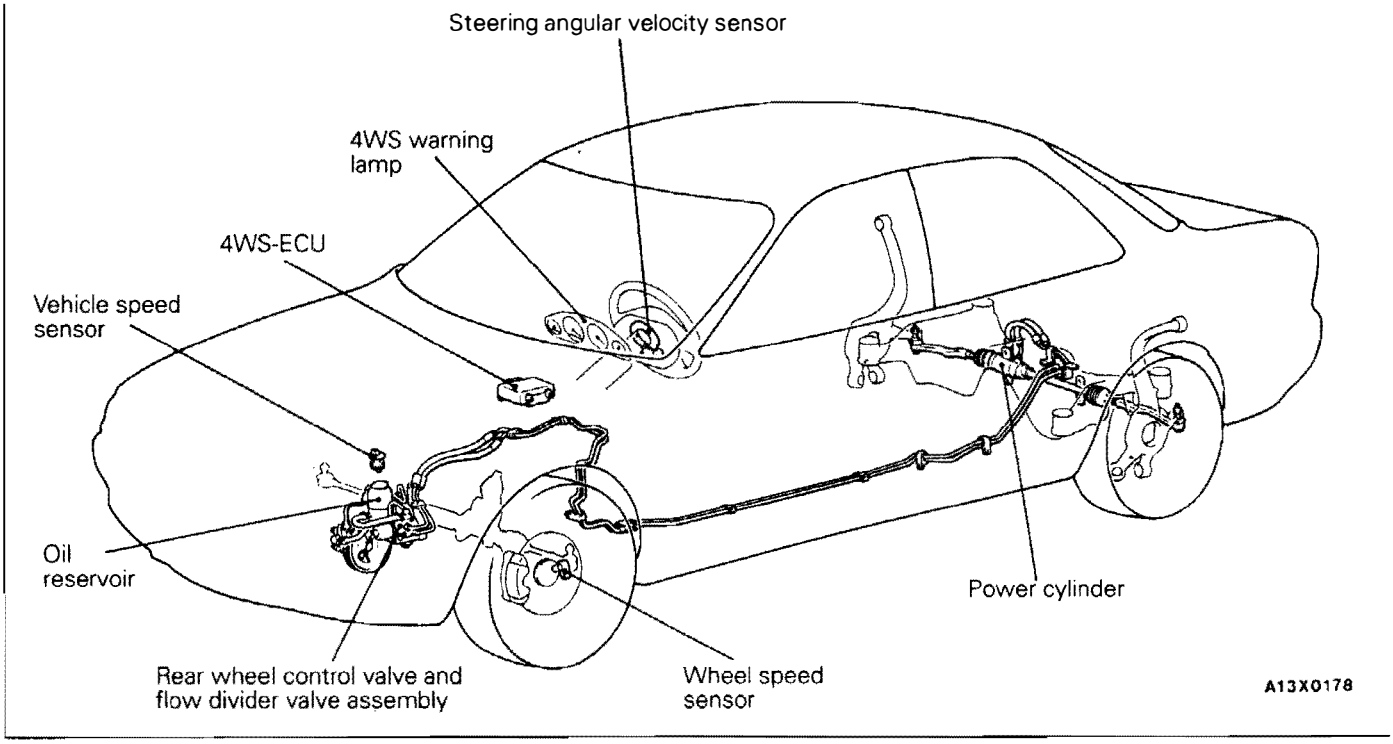
GENERAL INFORMATION

E37CB00AA

The active 4WS system electronically controls the hydraulic pressure generated by the engine-driven oil pump by means of the rear wheel control valve and drives a power cylinder.

The power cylinder tie rod end is installed to the rear knuckle in place of the toe control arm which is a part of the rear suspension of 2WS vehicles.

Items		Specifications
Power steering gear box		
Type		Rack and pinion
Oil pump		
Type		Vane type
Displacement	cm^3/rev.	9.6
Relief set pressure	MPa	8
Power cylinder		
Type		Hydraulic double action type
Stroke	mm	3.6 ± 0.2 (one side 1.8 ± 0.1)
Cylinder bore	mm	46
Max. rear wheel steering angle	deg.	0.8



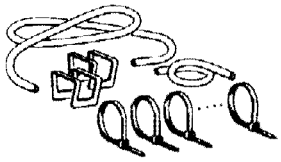
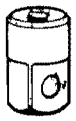
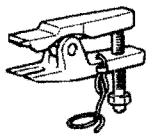
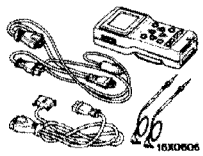
SERVICE SPECIFICATIONS

E37CC00AA

Items	Specifications
Standard value	
Power cylinder ball joint rotation starting torque Nm	0.5–2.5
Power cylinder tie rod swing torque N (Nm)	30–76 (2–5)

SPECIAL TOOLS

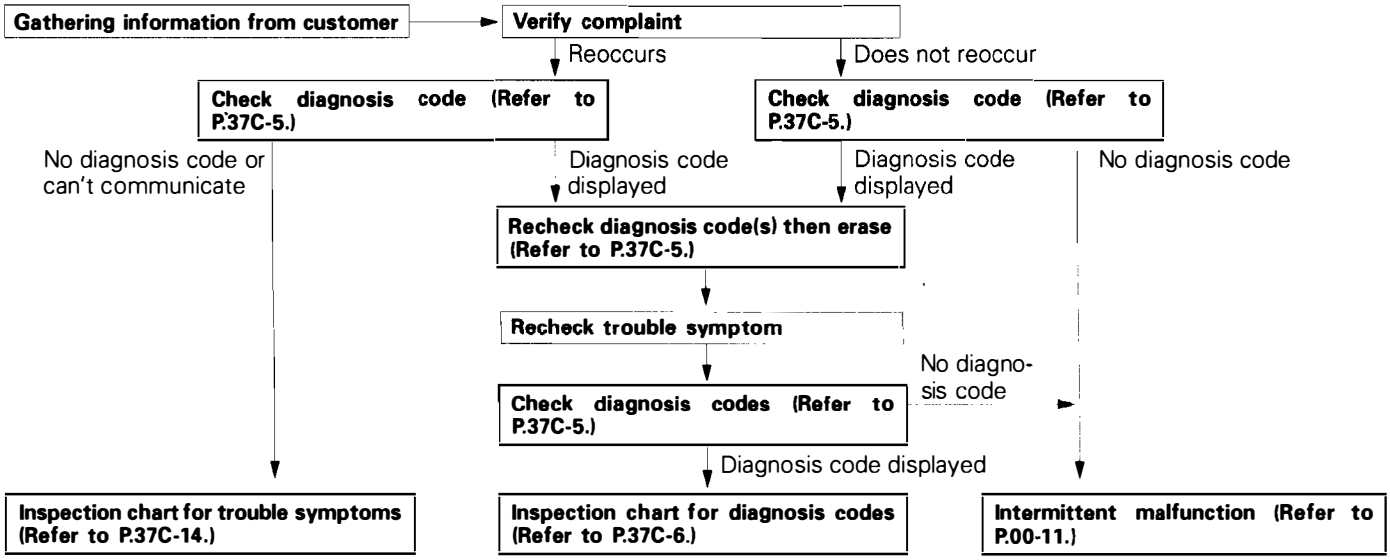
E37CD00AB

Tool	Number	Name	Use
	MB991230	Air bleeder set	Air bleed
	MB990685 MB991151	Torque wrench	Measurement of the ball joint starting torque
	MB990326	Preload socket	Measurement of the power cylinder ball joint rotation-starting torque
	MB991113 or MB990635	Steering linkage puller	Disconnection of tie-rod end
	MB991502	MUT-II sub assembly	Checking the flow divider valve assembly function Checking the function of the ACTIVE 4WS Bleeding
 16X0607		ROM pack	

TROUBLESHOOTING

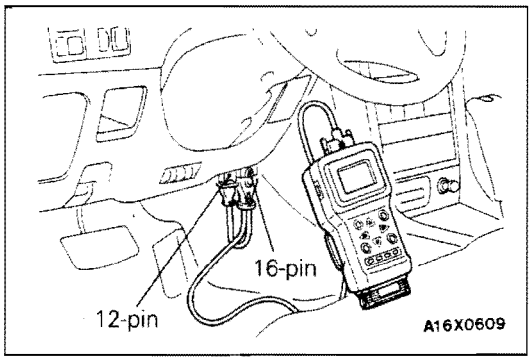
STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

E37CE00AA



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

1. Has the suspension been reconstructed?
2. Is the wheel alignment normal?
3. Are the specifications of the steering wheel correct?
4. Has the steering wheel been correctly installed to the straight-ahead position of the steering column shaft?
5. Are the size, specifications, air pressure, balance and wear conditions of the tyres and wheels normal?
6. Is the tension of the power steering belt appropriate?
7. Is the amount of power steering oil appropriate?
8. Are there any oil leaks coming from connections between the oil lines and valves?



DIAGNOSTIC FUNCTION E37CE01AA

DIAGNOSTIC CODES CHECK

Connect the MUT-II to the diagnosis connector at the lower of the instrument under cover, then check diagnostic codes.

ERASING DIAGNOSTIC CODES

With the MUT-II

Connect the MUT-II to the diagnosis connector (16-pin) then erase the diagnostic codes.

Without the MUT-II

Removing the battery cable from the battery (–) terminal for 10 seconds or more, then reconnect the cable.

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES E37CE02AA

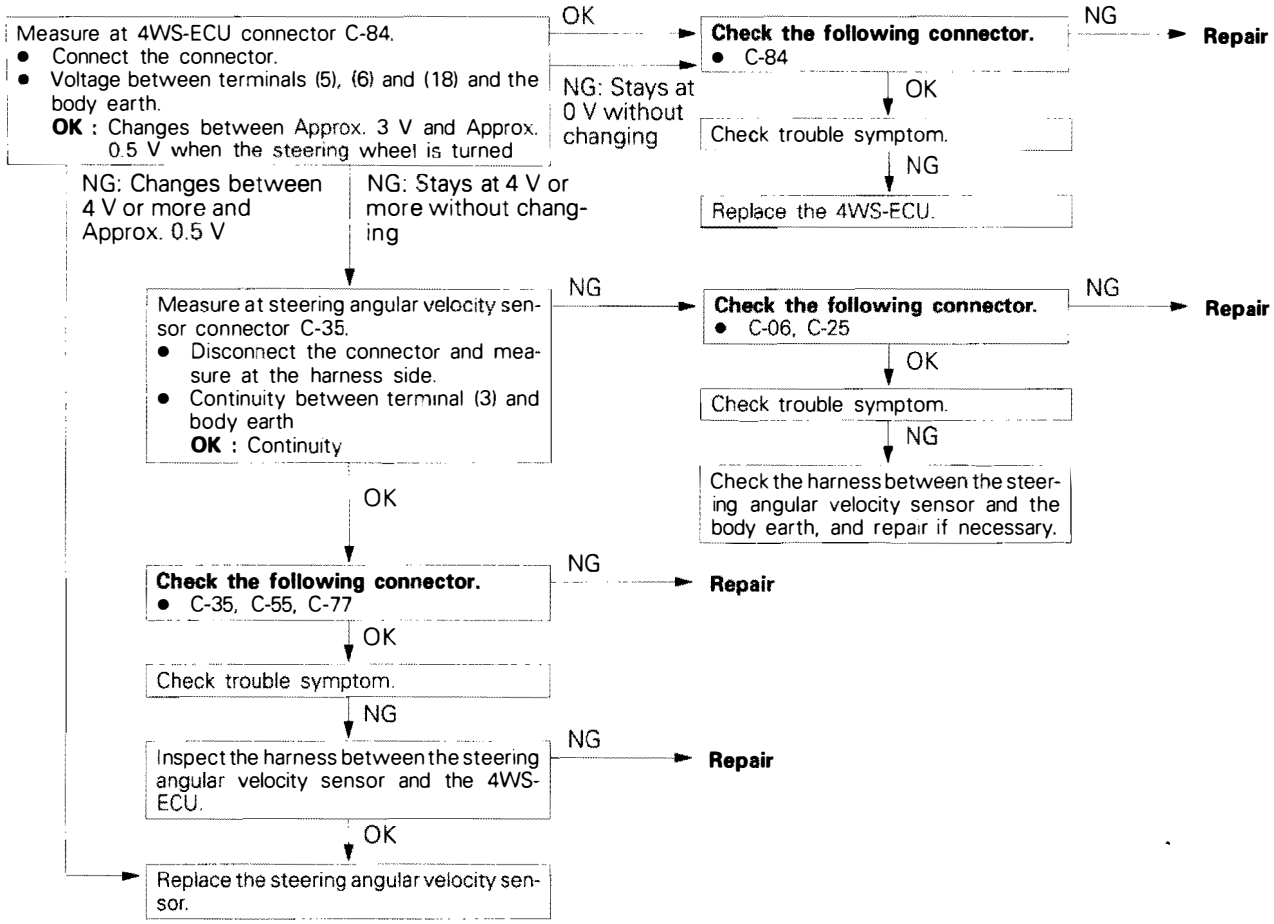
Inspect according to the inspection chart that is appropriate for the malfunction code.

Diagnosis code No.	Inspection item	Reference page
14	Steering angular velocity sensor system	P.37C-6
15	Steering angular velocity sensor STN signal system	P.37C-7
16	Straight-ahead position detection signal system of steering angular velocity sensor	P.37C-8
21	Wheel speed sensor system	P.37C-9
22	Vehicle speed sensor system	P.37C-10
24	Rear wheel control valve continuous operation (60 seconds or more) and oil pressure switch system	P.37C-11
31	Rear wheel control valve (right) system	P.37C-12
32	Rear wheel control valve (left) system	P.37C-12
33	Flow dividing valve system	P.37C-13
34	Control valve drive power supply system	P.37C-13
35	Power supply interrupt circuit system	P.37C-13

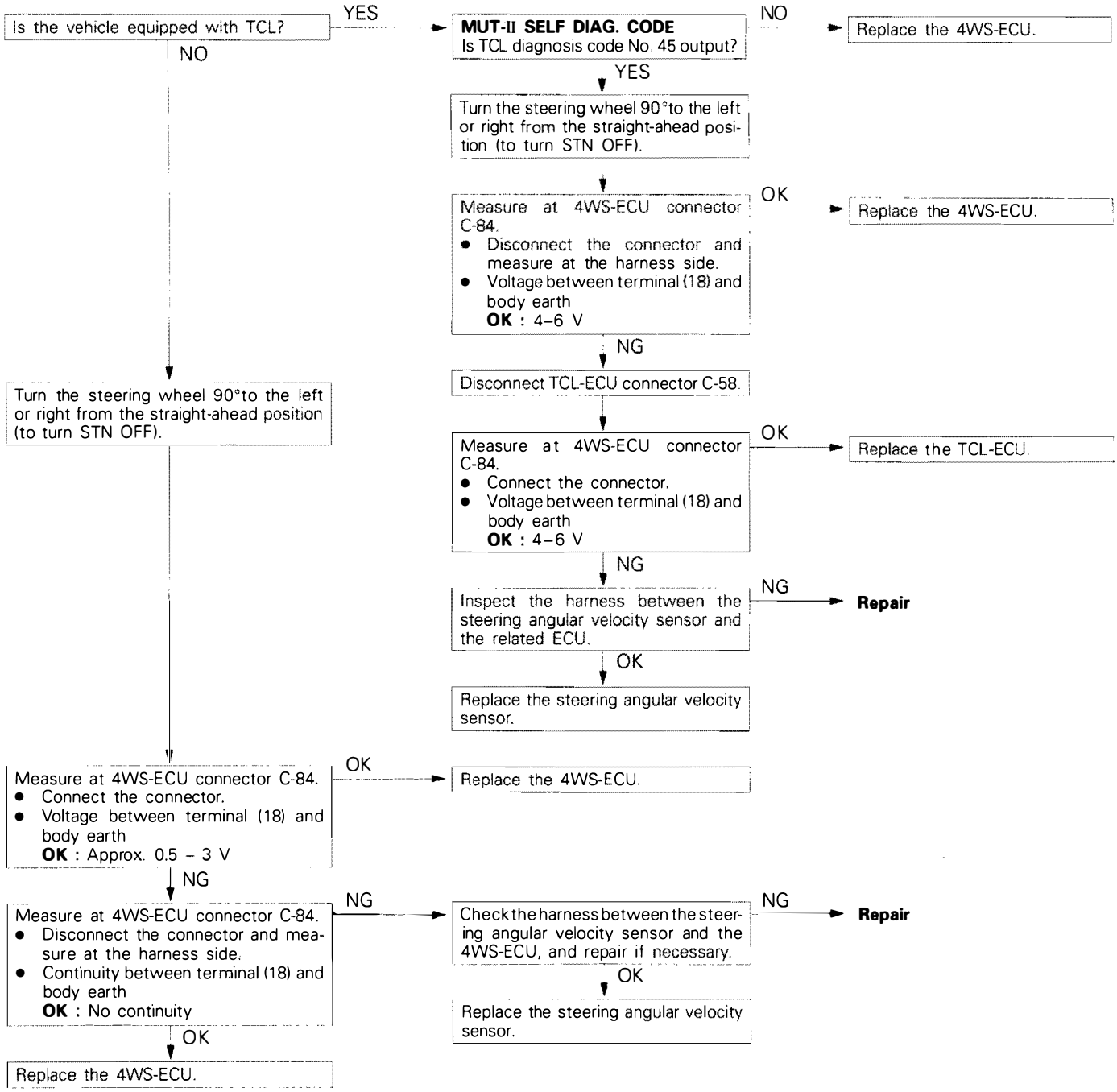
INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSTIC TROUBLE

E37CE03AA

Code No. 14	Steering angular velocity sensor system	Probable cause
[Comment] This diagnosis code is output if there is an open circuit in either ST1, ST2 or STN of the steering angular velocity sensor, or if there is an open circuit in the steering angular velocity sensor 'earth circuit. In addition, if steering angular velocity sensor system diagnosis codes are being output from the TCL and ECS also, it can be determined that there is a malfunction of the sensor body or of the harnesses or connectors which distribute signals from the sensor to each ECU.		• Malfunction of steering angular velocity sensor • Malfunction of harness or connector • Malfunction of 4WS-ECU



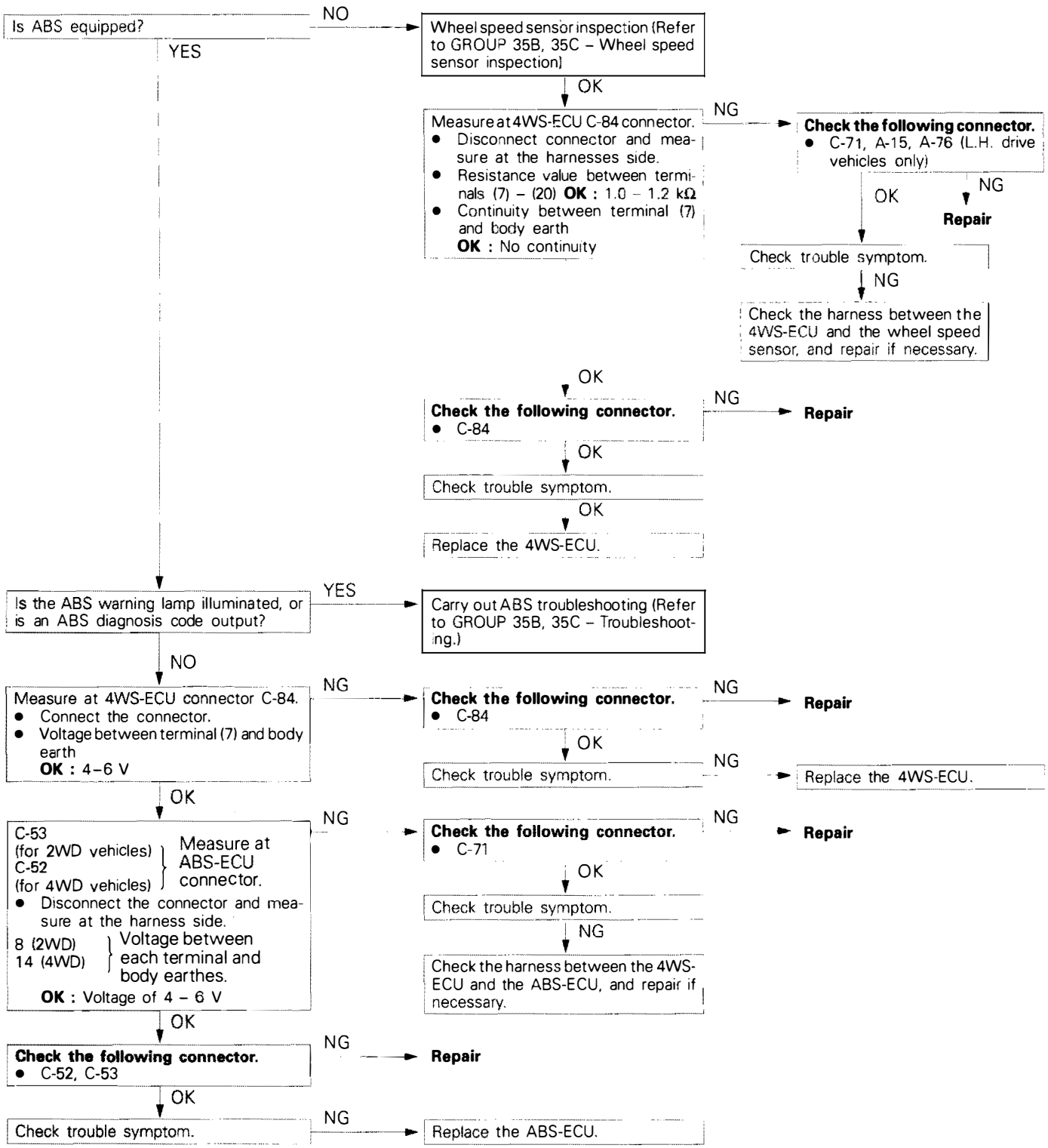
Code No. 15	Steering angular velocity sensor STN signal system	Probable cause
[Comment] This diagnosis code is output if STN is ON (low voltage) and it is determined from ST1 and ST2 that the steering wheel has been turned 40 degrees or more and the oil pressure switch in the oil pump is ON at this time. This corresponds to the situation where the steering wheel is turned while there is a short in the STN signal wire.		• Malfunction of steering angular velocity sensor • Malfunction of harness or connector • Malfunction of 4WS-ECU • Malfunction of TCL-ECU



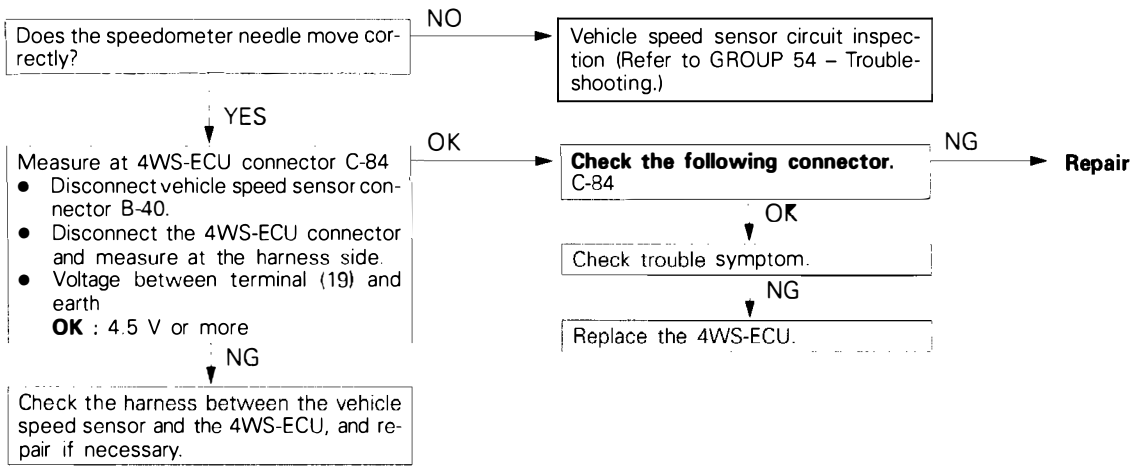
Code No. 16	Straight-ahead position detection signal system of steering angular velocity sensor	Probable cause
[Comment:] This diagnosis code is output if there is an indication that the STN signal and either the ST1 or ST2 signal of the steering angular velocity sensor are simultaneously ON when the steering wheel is turned approximately 360° from the straight-ahead position to either the left or right. This corresponds to the situation where the steering angular velocity sensor for 2WS vehicles has been installed by mistake, or the steering wheel is turned while there is a short in the STN signal wire.		• Malfunction of steering angular velocity sensor • Malfunction of wiring harness or connector • Malfunction of 4WS-ECU

NOTE
If diagnosis code No. 15 is output simultaneously, refer to the STN signal system circuit (P.37C-7.).

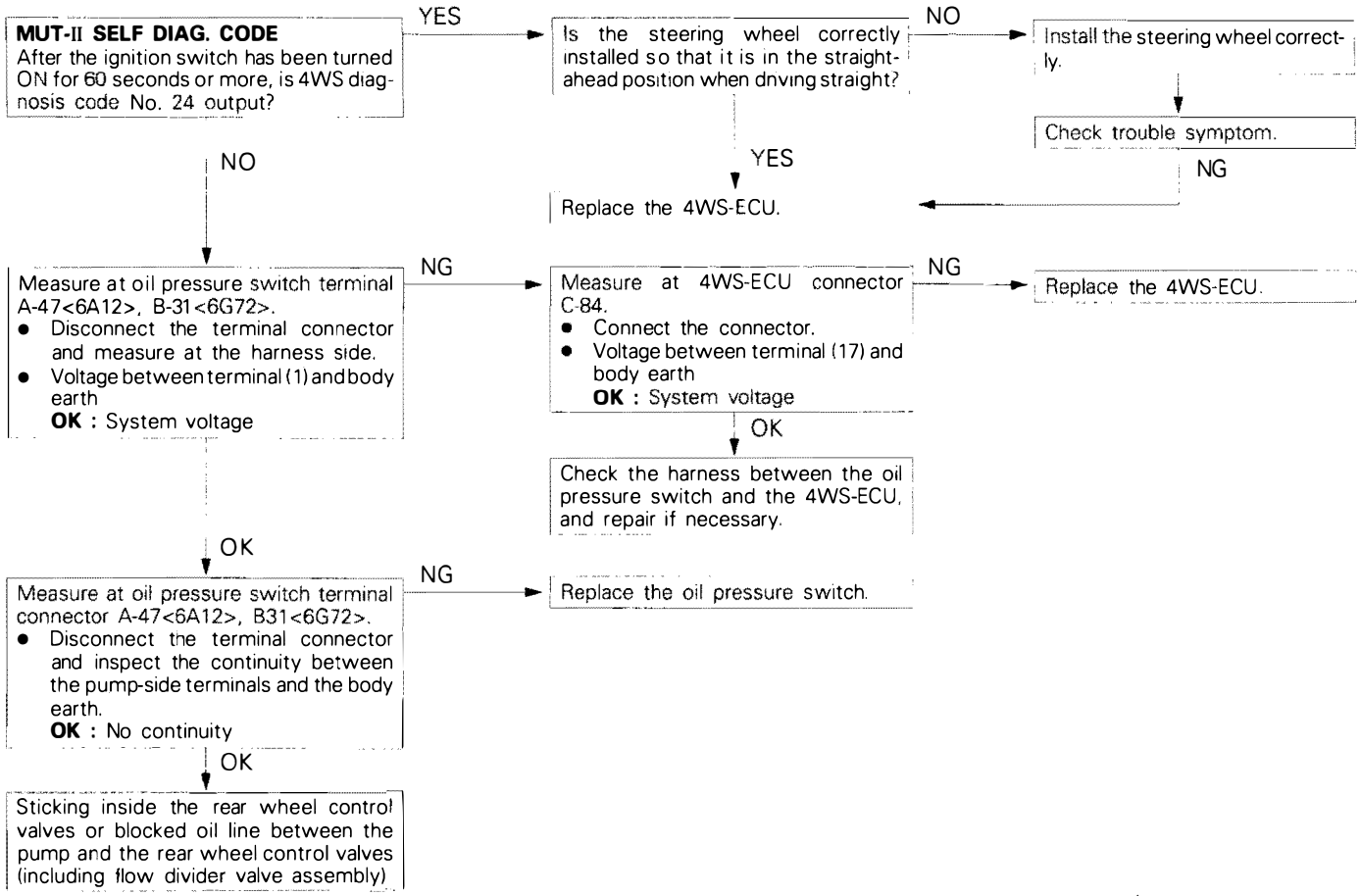
Code No. 21	Wheel speed sensor system	Probable cause
[Comment] This diagnosis code is output if the vehicle speed sensor (for speedometer) output is 20 km/h or more greater than the wheel speed sensor output for a continuous period of 60 seconds or more. This corresponds to the situation where the vehicle speed reaches 20 km/h or more when there is an open or short circuit in a wheel speed sensor.		• Malfunction of wheel speed sensor • Malfunction of ABS • Malfunction of harness or connector • Malfunction of 4WS-ECU • Malfunction of ABS-ECU • Malfunction of TCL-ECU



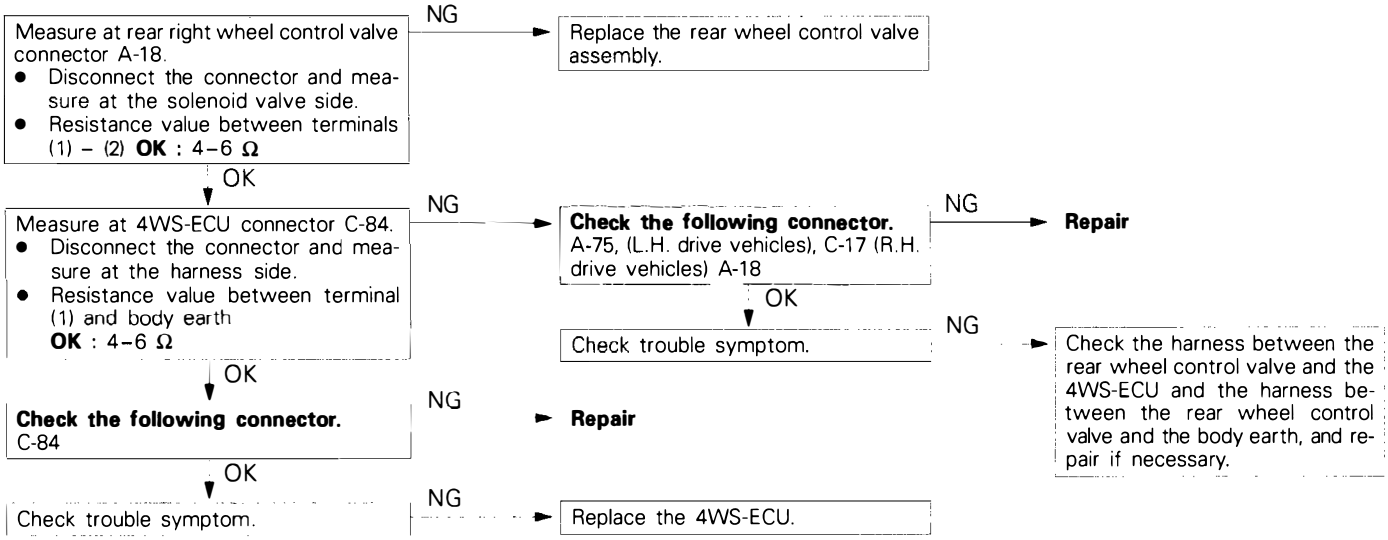
Code No. 22	Vehicle speed sensor system	Probable cause
[Comment] This diagnosis code is output if a wheel speed sensor output is 20 km/h or more greater than the vehicle speed sensor (for speedometer) output for a continuous period of 60 seconds or more. This corresponds to the situation where the vehicle speed reaches 20 km/h or more when there is an open or short circuit in the vehicle speed sensor.		• Malfunction of wheel speed sensor • Malfunction of harness or connector • Malfunction of 4WS-ECU • Malfunction of the ECU related to the vehicle speed sensor • Malfunction of speedometer



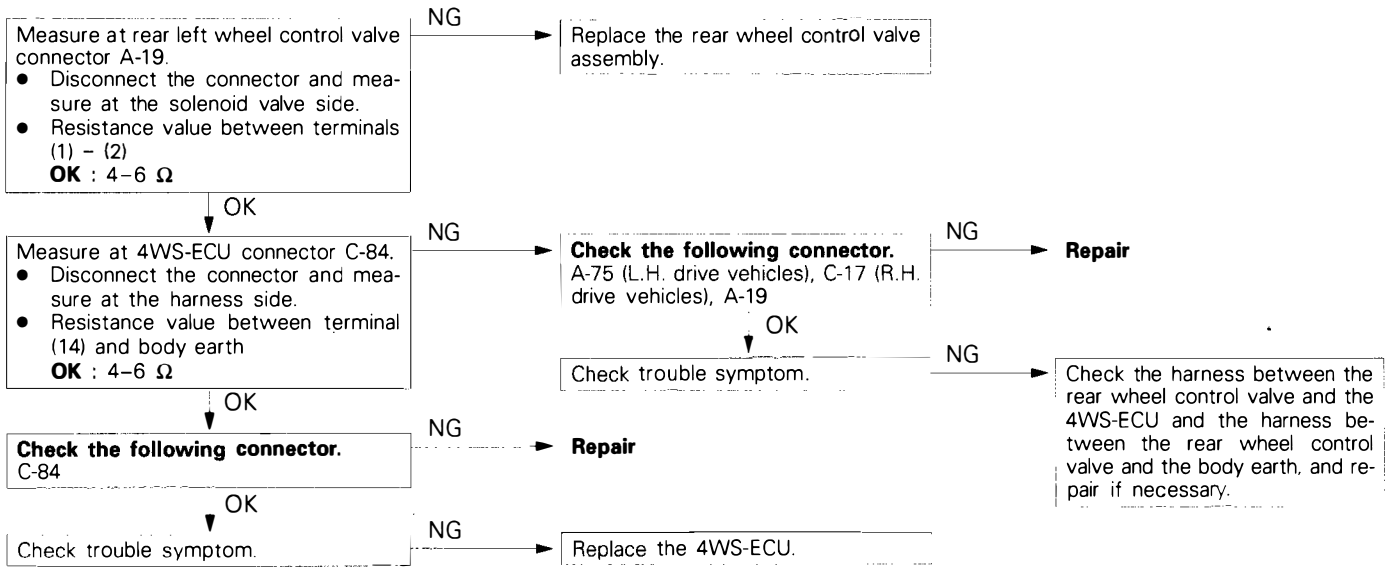
Code No. 24	Rear wheel control valve continuous operation (60 seconds or more) and oil pressure switch system	Probable cause
[Comment] This diagnosis code is output if the oil pressure switch is ON for a continuous period of 60 seconds or more at a vehicle speed of 30 km/h or higher. This code is also output if there is a short in the oil pressure switch system (judgement time is 10 seconds), and if straight-ahead driving continues for 60 seconds or more at a vehicle speed of 60 km/h or more with the steering wheel and steering column shaft installed in such a way that the straight-ahead positions are not aligned. In addition to this, this code is also output if the rear wheel control valves are stuck in a position other than the straight-ahead position.		• Incorrect steering wheel installation • Malfunction of oil pressure switch • Malfunction of harness or connector • Malfunction of rear wheel speed sensor • Malfunction of 4WS-ECU • Blocked oil line (including flow divider valve assembly)



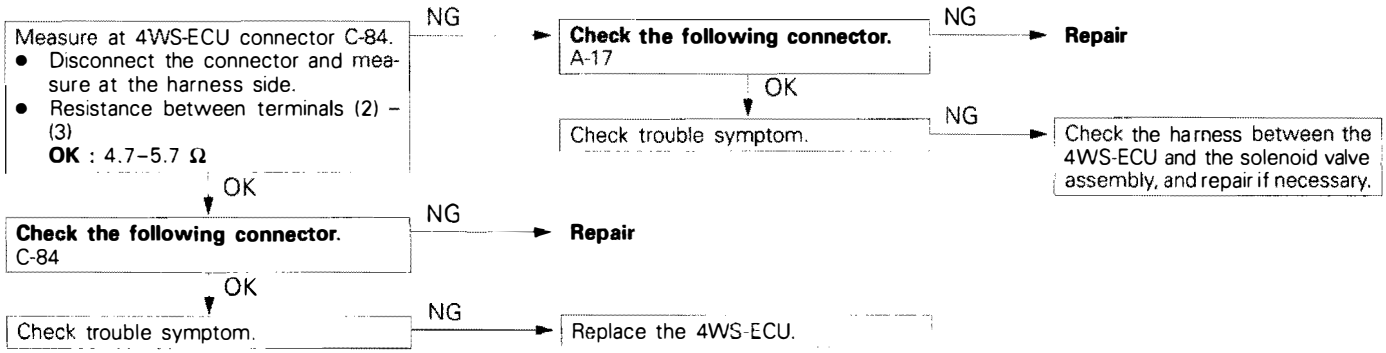
Code No. 31	Rear wheel control valve (right) system	Probable cause
[Comment] This diagnosis code is output if an abnormality occurs in the control current to the rear right wheel control valve.		• Malfunction of rear right wheel control solenoid valve • Malfunction of harness or connector • Malfunction of 4WS-ECU



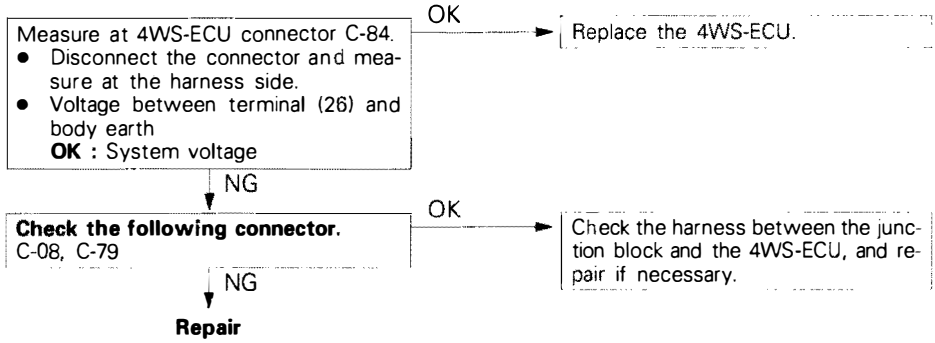
Code No. 32	Rear wheel control valve (left) system	Probable cause
[Comment] This diagnosis code is output if an abnormality occurs in the control current to the rear left wheel control valve.		• Malfunction of rear left wheel control valve • Malfunction of harness or connector • Malfunction of 4WS-ECU



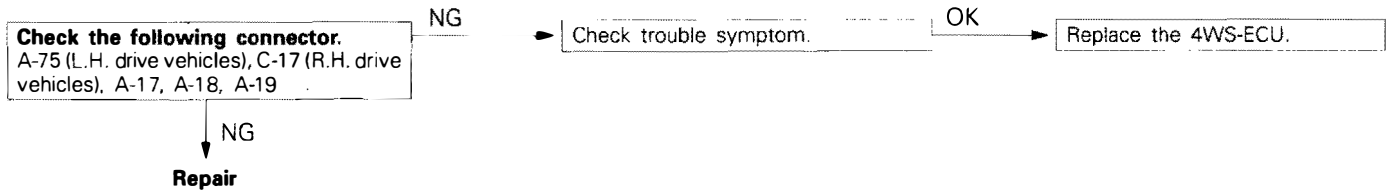
Code No. 33	Flow divider valve system	Probable cause
[Comment] This diagnosis code is output if the current from the 4WS-ECU corresponding to the vehicle speed is output to the flow divider valve assembly and the feedback current is outside the specified value.		• Malfunction of flow divider valve assembly • Malfunction of harness or connector • Malfunction of 4WS-ECU



Code No. 34	Control valve drive power supply system	Probable cause
[Comment] This diagnosis code is output if the voltage of the control valve drive power supply drops below 9 V.		• Burnt-out multi-purpose fuse • Malfunction of harness or connector • Malfunction of 4WS-ECU



Code No. 35	Power supply interrupt circuit system	Probable cause
[Comment] This diagnosis code is output if the ECU performs an initial check of the system immediately after the ignition switch is turned ON, but the ECU monitors the output terminals of each control valve and determines that the control valve power supply is ON when it is actually OFF.		• All control valve connectors disconnected • Malfunction of 4WS-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection procedure chart No.	Reference page
Communication with the MUT-II is not possible.	Communication with all systems is not possible.	1	P.37C-14
	Communication with ACTIVE 4WS only is not possible.	2	P.37C-15
When the ignition key is turned to "ON" (Immediately after the ignition key is turned to ON), the 4WS warning lamp does not illuminate. 4WS warning lamp: Illuminated / Not illuminated Ignition key: ON / ACC, LOCK 14N0167		3	P.37C-16
The 4WS warning lamp switches off approximately 2.0 second after the ignition key is turned to "ON". 4WS warning lamp: Illuminated / Not illuminated Ignition key: ON / ACC, LOCK 14N0168		4	P.37C-16
Malfunction of 4WS operation (Use the MUT-II to carry out forced driving of the actuator and check operation. Refer to P.37C-23.)	Rear wheels do not steer.	5	P.37C-17
	Rear wheels only steer to one side.	6	P.37C-18
	Rear wheel movement is delayed (response of the rear wheels is slow with respect to the front wheels).	7	P.37C-18
	Front wheels return to the straight-ahead position, but rear wheels do not.	8	P.37C-19

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

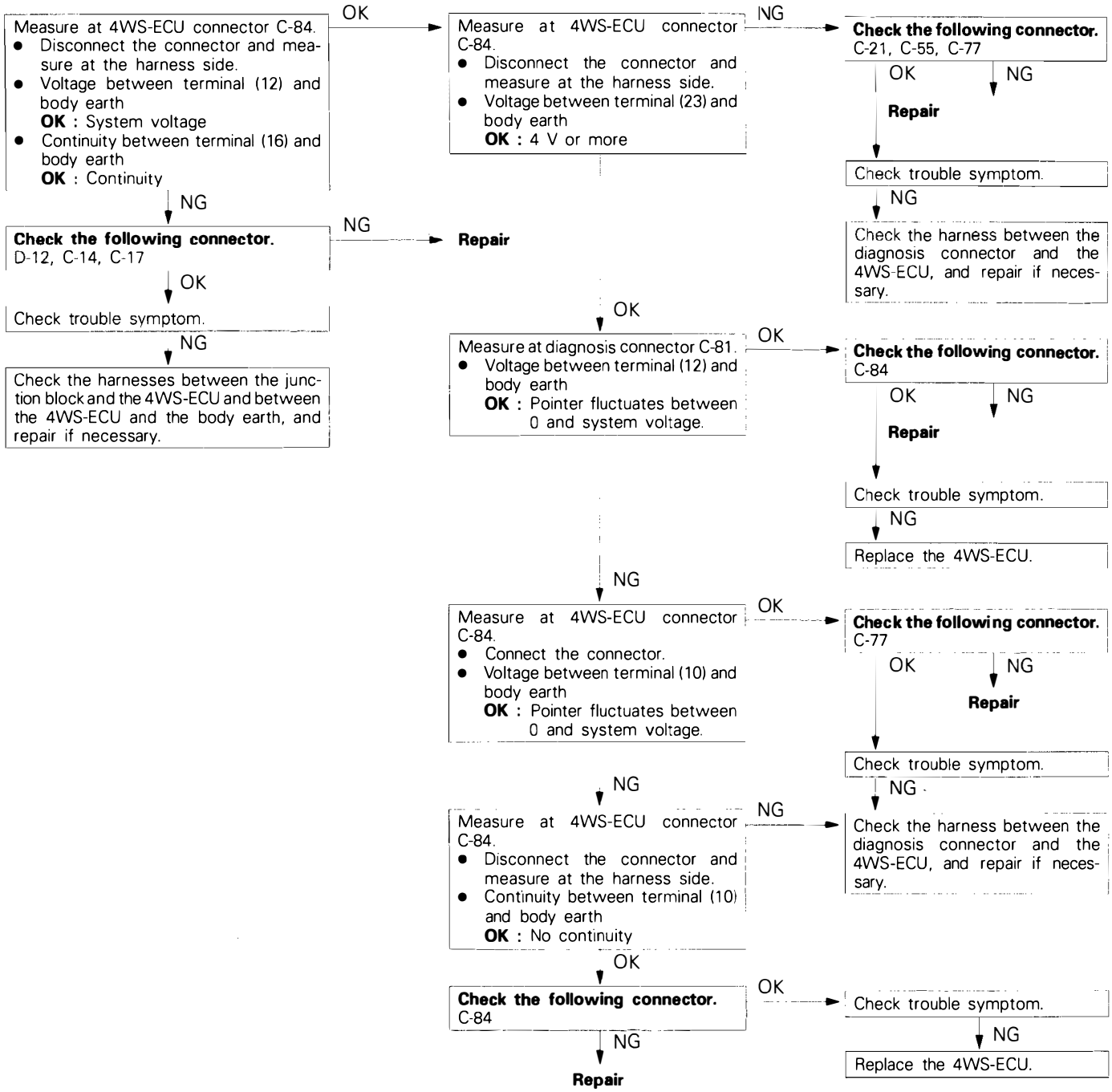
Inspection procedure 1.

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

Refer to GROUP 13A – Troubleshooting

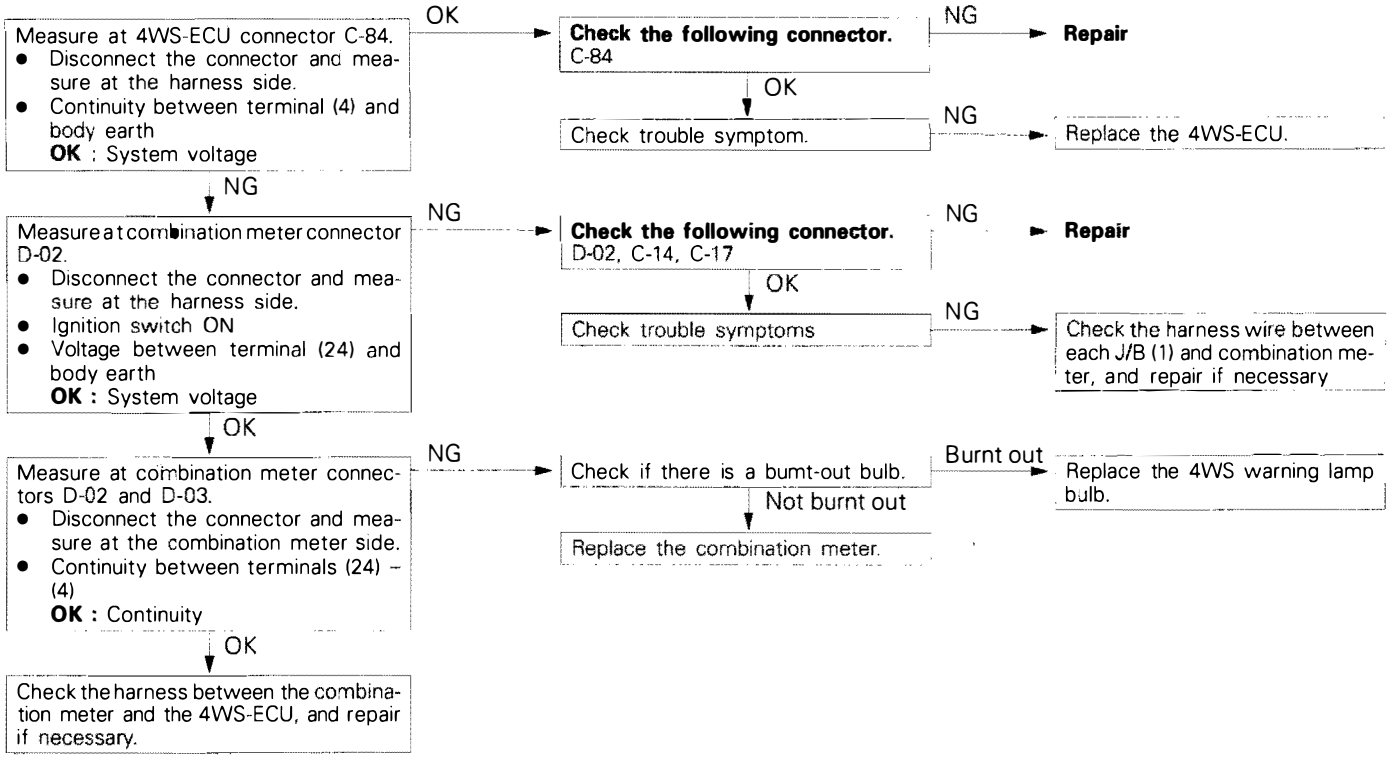
Inspection procedure 2.

Communication with the MUT-II is not possible. (Communication with 4WS-ECU only is not possible.)	Probable cause
[Comment] If communication with all other systems is also not possible, there is a high possibility that there is a malfunction of diagnosis line. If communication with 4WS only is not possible, the cause is probably a malfunction of power supply system (including earth), in addition to a malfunction of diagnosis line.	• Malfunction of harness or connector • Malfunction of 4WS-ECU



Inspection procedure 3.

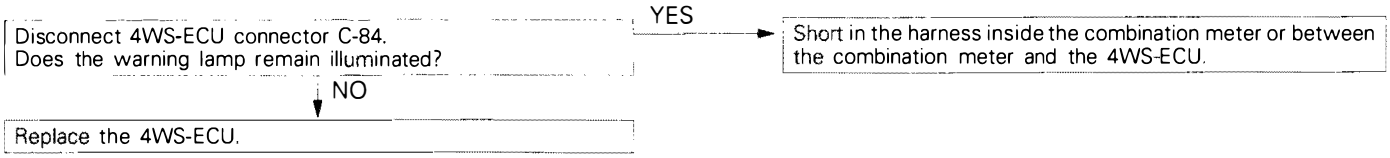
Warning lamp does not illuminate immediately after the ignition switch is turned to ON	Probable cause
[Comment] The cause is probably a burnt-out waming lamp or a malfunction of warning lamp drive circuit. If other warning lamps except the door open warning lamp also do not illuminate at the same time, there is a high possibility that multi-purpose fuse No. 8 is burnt out.	• Burnt-out warning lamp • Malfunction of harness or connector • Malfunction of 4WS-ECU • Malfunction of combination meter



Inspection procedure 4.

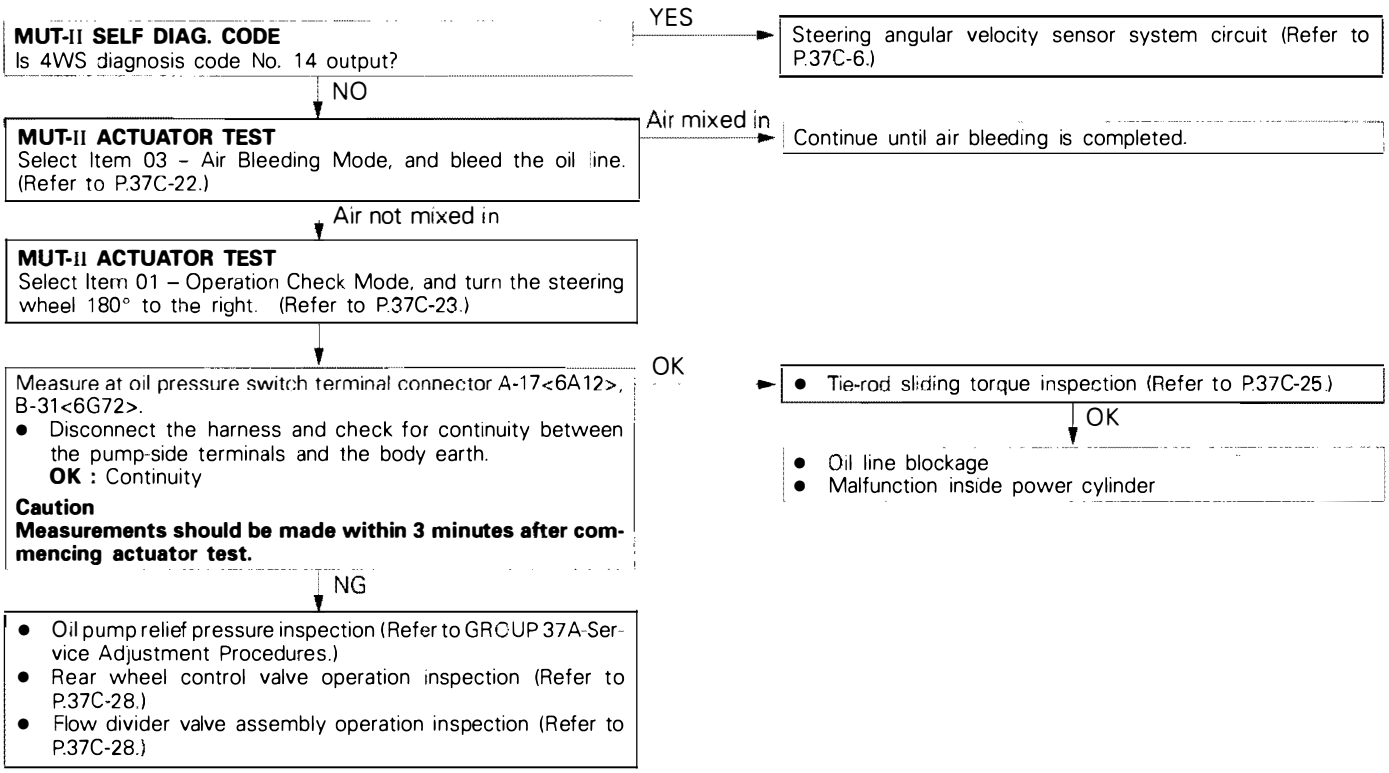
The warning lamp does not illuminate even after 2 seconds have passed since the ignition switch was turned ON.	Probable cause
[Comment] The cause is probably that the system is in fail-safe mode, or there is a short in the warning lamp drive circuit.	• System in fail-safe mode • Malfunction of harness • Malfunction of 4WS-ECU • Malfunction of combination meter

NOTE
This trouble symptom is limited to cases where communication with the MUT-II is possible (4WS-ECU power supply is normal) and the diagnosis code is a normal diagnosis code.



Inspection procedure 5.

Rear wheels do not steer	Probable cause
[Comment] The cause is probably a malfunction of sensor system or a hydraulic system failure. In addition, if the sliding resistance of the power cylinder is excessive, steering of the rear wheels will become impossible.	• Malfunction of steering angular velocity sensor • Malfunction of harness or connector • Hydraulic system failure • Malfunction of power cylinder • Malfunction of 4WS-ECU • Incorrect bleeding of air



Inspection procedure 6.

Rear wheels only steer to one side.	Probable cause
[Comment] The cause is probably a malfunction of rear wheel control valve or a malfunction inside the power cylinder.	• Malfunction of rear wheel control valve • Malfunction of power cylinder • Incorrect bleeding of air

MUT-II ACTUATOR TEST
Select Item 03 – Air Bleeding Mode, and bleed the oil line. (Refer to P.37C-22.)

Air mixed in → Continue until air bleeding is completed.

Air not mixed in ↓

MUT-II ACTUATOR TEST
Select Item 01 – Operation Check Mode, and turn the steering wheel 180° to the right. (Refer to P.37C-23.)

↓

Measure at oil pressure switch terminal connector A-17<6A12>, B-31<6G72>.
- Disconnect the harness and check for continuity between the pump-side terminals and the body earth.
  OK : Continuity

Caution
Measurements should be made within 3 minutes after commencing atuator test.

NG → Rear wheel control valve operation inspection (Refer to P.37C-28.)

OK ↓

Malfunction of power sylinder

Inspection procedure 7.

Rear wheel movement is delayed.	Probable cause
[Comment] This occurs if the electronic system is normal and there is a hydraulic system failure or if the power cylinder sliding resistance is excessive.	• Hydraulic system failure • Malfunction of power sylinder • Incorrect bleeding of air

MUT-II ACTUATOR TEST
Select Item 03 – Air Bleeding Mode, and check whether there is any air mixed into the oil line.

Air mixed in → Bleed the air.

Air not mixed in ↓

- Tie-rod sliding torque inspection (Refer to P.37C-25.)

OK →
- Leak inside either the rear wheel control valve, flow divider valve assembly or power cylinder.
- Oil line blockage

Inspection procedure 8.

Front wheels return to the straight-ahead position, but rear wheels do not	Probable cause
[Comment] This occurs because rear wheel control valves or power cylinder do not return correctly to the straight-ahead positions.	• Malfunction of rear wheel control valve • Malfunction of power cylinder

- Rear wheel control valve operation inspection (Refer to P.37C-28.)
- Tie-rod sliding torque inspection (Refer to P.37C-25.)

SERVICE DATA OUTPUT CHECK

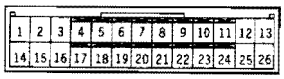
E37CE04AA

With the MUT-II, check the service data.

Item	Check point	Check condition			Normal condition
14	Steering angular velocity sensor	Steering wheel is turned to the left and right			Steering wheel turning angle and turning direction are indicated.
15	Steering angular velocity sensor (STN signal)	Steering wheel straight-ahead position			ON
		Steering wheel out of straight-ahead position.			OFF
18	Steering angular velocity sensor (ST1 signal)	When the steering wheel is gently turned, ST1 and ST2 change as shown at right in accordance with the steering direction.	Turned right	ST1	ON → ON → OFF → OFF
				ST2	ON → OFF → OFF → ON
19	Steering angular velocity sensor (ST2 signal)		Turned left	ST1	ON → OFF → OFF → ON
				ST2	ON → ON → OFF → OFF
21	Wheel speed sensors	While driving			Display of speedometer and MUT-II meets
22	Vehicle speed sensor	While driving			Display of speedometer and MUT-II meets
23	Oil pressure switch	When rear wheels are straight-ahead			OFF
		When rear wheels are turned			ON
26	Communication with TCL-ECU	Vehicles with TCL			ON
		Vehicles without TCL			OFF

ECU-TERMINAL INSPECTION

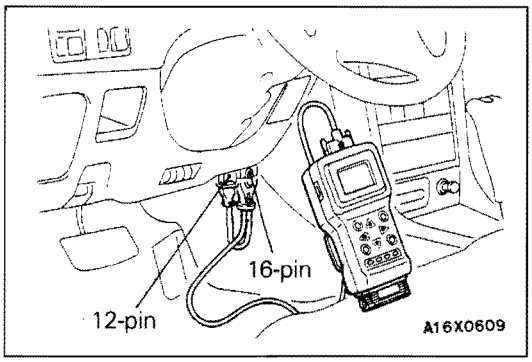
E37CE05AA



14X0187

Terminal No.	Check point	Check condition		Normal condition
1	Rear right wheel control valve output	When rear wheels are straight-ahead		0 V
		When rear wheels are turned to the right (voltage changes in accordance with steering amount)		0–5 V
2	Flow divider valve assembly (+) output	When system is normal		8–13 V
		When system is in fail-safe mode		0 V
3	Flow divider valve assembly (–)	When system is normal		0–0.5 V
		When system is in fail-safe mode		0 V
4	Alarm lamp output	When switched off (when system is normal)		System voltage
5	Steering angular velocity sensor (ST1) input	When steering wheel is turned, needle moves between 0 V and 3.5 V	When photo interrupter is OFF	2.5–3.5 V
			When photo interrupter is ON	0.5 V or less
6	Steering angular velocity sensor (ST2) input		When photo interrupter is OFF	2.5–3.5 V
			When photo interrupter is ON	0.5 V or less
7	Wheel speed sensor input	While vehicle is stopped		4–6 V
		While vehicle is driving (voltage changes in accordance with vehicle speed)		0–0.5 V
10	Diagnosis data output	Needle moves between 0 V and system voltage		—
11	TCL data input	Vehicles with TCL		2.5–3.5 V
		Vehicles without TCL		4–6 V
12	ECU power supply	When ignition switch is ON		System voltage
13	Control valve drive power supply	When ignition switch is ON		System voltage
14	Rear left control valve output	When rear wheels are straight-ahead		0 V
		When rear wheels are turned to the left (voltage changes in accordance with steering amount)		0–5 V
16	Earth	—		—
17	Oil pump pressure switch input	When rear wheels are straight-ahead		System voltage
		When rear wheels are turned		0.5 V or less
18	Steering angular velocity sensor (STN) input	Steering wheel straight-ahead position (when photo interrupter is ON)		0.5 V or less
		Steering wheel out of straight-ahead position (when photo interrupter is OFF)		2.5–3.5 V

Terminal No.	Check point	Check condition		Normal condition
19	Vehicle speed sensor	When vehicle is moved forwards and backwards, sensor turns ON and OFF repeatedly.	When sensor is ON	0 V
			When sensor is OFF	4.5 V or more
20	Wheel speed sensor earth	—		—
23	Diagnosis control input	When ignition switch is ON		4 V or more
24	ECU backup power supply	At all times		System voltage
25	ECU power supply	When ignition switch is ON		System voltage
26	Control valve drive power supply	When ignition switch is ON		System voltage



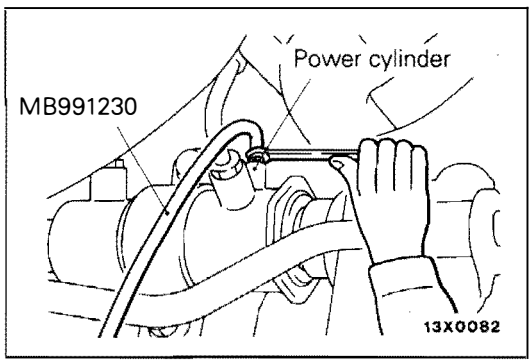
SERVICE ADJUSTMENT PROCEDURES

E37CF00AA

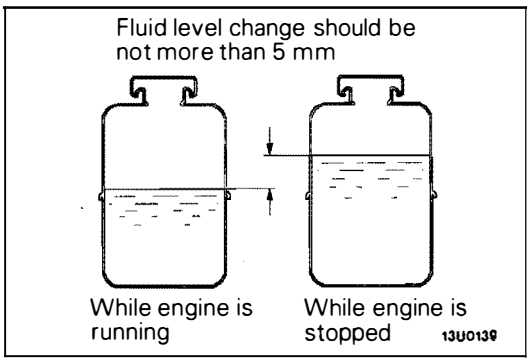
BLEEDING

1. Bleed the air from the power steering system. (Refer to GROUP 37A – Service Adjustment Procedures.)
2. Raise the vehicle.
3. Set the MUT-II as shown in the illustration.
4. Start the engine and run it at idle.
5. Operate the MUT-II to force-drive the actuator (item No. 03).

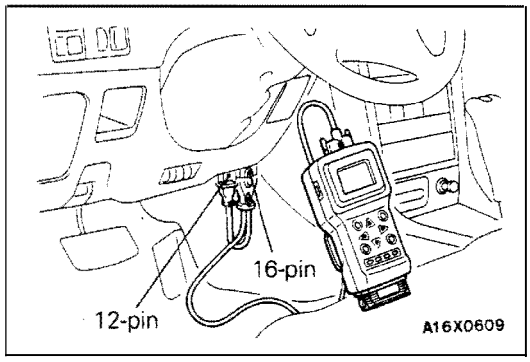
NOTE
1. Force-driving of the actuator (air bleeding mode) will continue for 5 minutes and will then stop automatically. In addition, operation can be forcibly stopped while force-driving is being carried out by means of item No. 04.
2. If the function is stopped by the fail-safe, force-driving of the actuator cannot be carried out.
3. After the item number has been input, the letters "FINISHED" appear on the MUT-II monitor, and then force-driving commences. While force-driving is being carried out, the warning indicator will flash.
   During force-driving (while the indicator is flashing), other forced-driving cannot be carried out, with the exception of item No. 04 (drive OFF).



6. Loosen the bleeder screw on the left side of the power cylinder, and connect a PVC hose.
7. Turn the steering wheel approximately 1/2 a turn to the left from the straight-forward position. Check to be sure that air is discharged along with fluid at this time.
8. Repeat the operation in step (7) two or three times to confirm that no air remains in the fluid.
9. Repeat the operation in steps (6) – (8) for the right-side bleeder screw, while turning the steering wheel to the right instead of the left.



10. Check to be sure that the level of fluid changes by no more than 5 mm when the engine is stopped and when it is running.
    If the fluid level changes by more than 5 mm, bleeding of air from the system was insufficient, so the air bleeding procedure should be repeated.

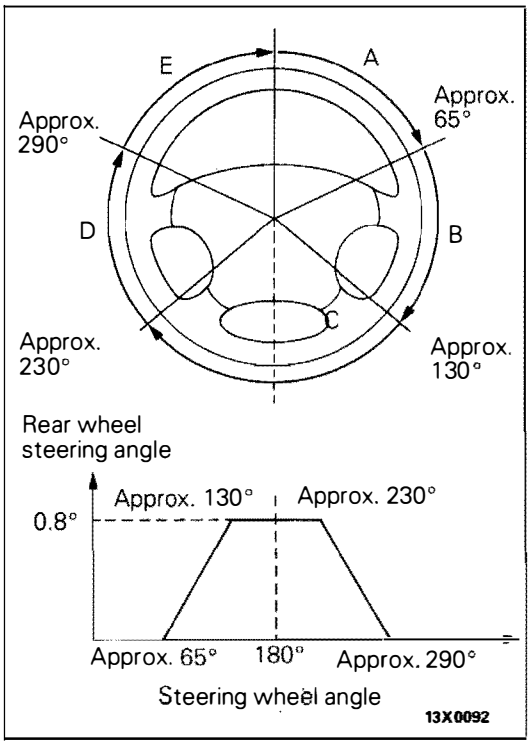


FUNCTION CHECK

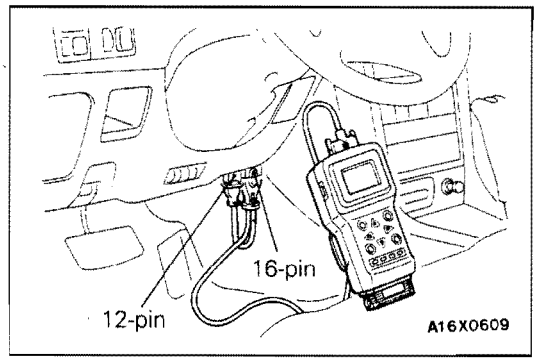
E37CF01AA

1. Raise the vehicle.
2. Set the MUT-II as shown in the illustration.
3. Start the engine and run it at an engine speed of 1000±100 r/min.
4. Operate the MUT-II to force-drive the actuator (item No. 01).

   NOTE
   1. Force-driving of the actuator (function check mode) will continue for 3 minutes and will then stop automatically. In addition, can be stopped automatically while force-driving is being carried out by means of item No. 04.
   2. If the function is stopped by the fail-safe, force-driving of the actuator cannot be carried out.
   3. After the item number has been input, the letters "FINISHED" appear on the MUT-II monitor, and then force-driving commences. While force-driving is being carried out, the warning indicator will flash. During force-driving (while the warning indicator is flashing), other forced-driving cannot be carried out, with the exception of item No. 04 (drive OFF).



5. Turn the steering wheel to the right from the straight-forward position. Check to be sure that the rear wheels start to turn when the steering wheel angle exceeds approximately 65°, and that the maximum rear wheel steering angle is reached when the steering wheel angle is approximately 130°. Turn the steering wheel further, and check to be sure that the steering angle of the rear wheels starts to lessen when the steering wheel angle exceeds approximately 230°, and that they are straight again when the steering wheel angle is approximately 290°.



FLOW DIVIDER VALVE ASSEMBLY FUNCTION CHECK

E37CF02AA

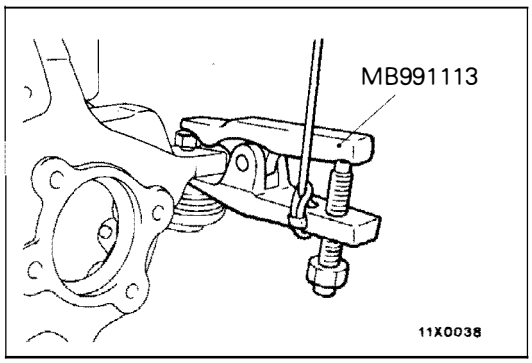
1. Raise the vehicle.
2. Set the MUT-II as shown in the illustration.
3. Start the engine and run it at an engine speed of 1000±100 r/min.
4. Operate the MUT-II to force-drive the actuator (item No. 02).

   NOTE
   1. Force-driving of the actuator (flow divider valve assembly check mode) will continue for 1 minute and will then stop automatically. In addition, operation can be forcibly stopped while force-driving is being carried out by means of item No. 04.
   2. If the function is stopped by the fail-safe, force-driving of the actuator cannot be carried out.
   3. After the item number has been input, the letters "FINISHED" appear on the MUT-II monitor, and then force-driving commences. While force-driving is being carried out, the warning indicator will flash.
      During force-driving (while the warning indicator is flashing), other forced-driving cannot be carried out, with the exception of item No. 04 (drive OFF).
5. Turn the steering wheel to the right and left in the same way as for the function check. Check to be sure that the rear wheels do not turn at this time.

OIL PUMP PRESSURE TEST

E37CF03AA

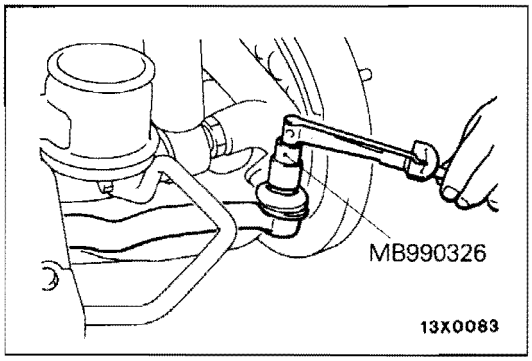
Refer to GROUP 37A – Service Adjustment Procedures.



BALL JOINT ROTATION STARTING TORQUE CHECK

E37CF04AA

1. Disconnect the tie rod and rear knuckle arm.



2. After swinging the ball joint stud several times, install the stud nut, then measure the ball joint rotation starting torque with the special tool.

   Standard value: 0.5–2.5 Nm or less
3. If the rotation starting torque exceeds the standard value, replace the tie rod end.
4. If the rotation starting torque is less than the standard value, check that the ball joint is not loose and operates smoothly. If not, it may be reused.

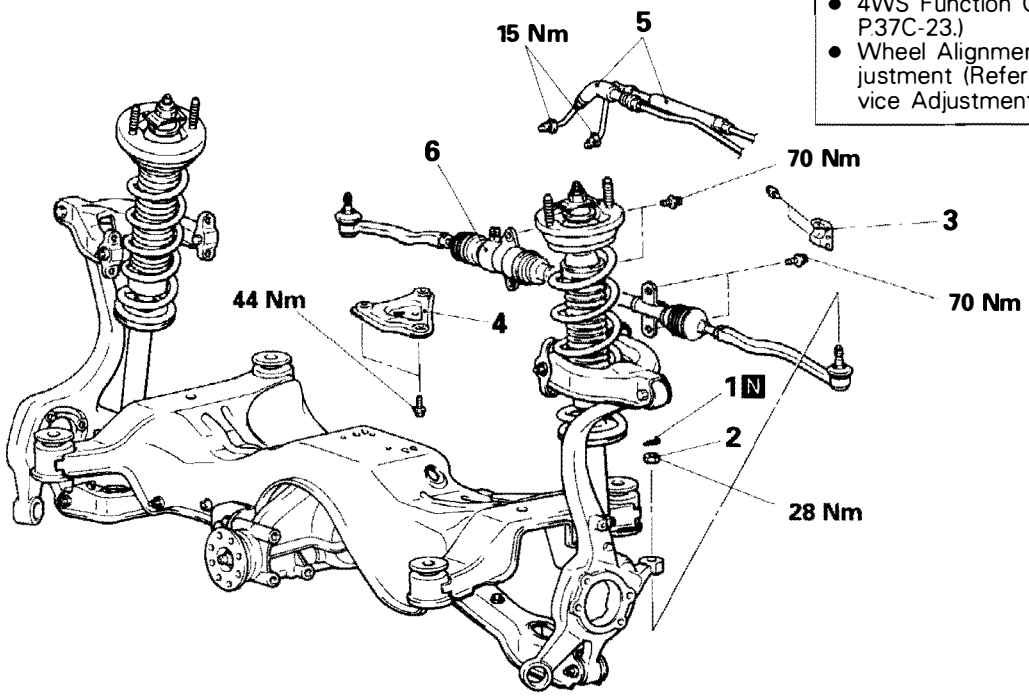
POWER CYLINDER

REMOVAL AND INSTALLATION

E37CG00AA

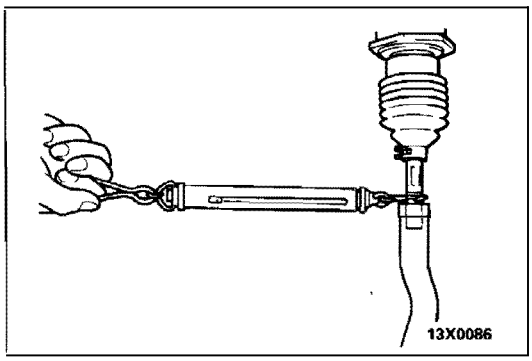
Pre-removal Operation
- Steam Cleaning of Tubing
- Power Steering Fluid Draining

Post-installation Operation
- Power Steering Fluid Supply
- Power Steering Fluid Line Bleeding (Refer to P.37C-22.)
- 4WS Function Check (Refer to P.37C-23.)
- Wheel Alignment Inspection and Adjustment (Refer to GROUP 34 – Service Adjustment Procedures.)



13X0002

Removal steps
1. Split pin
2. Nut
3. Protecter
4. Stay
5. Pressure pipe assembly
◆A◆ 6. Power cylinder



INSPECTION

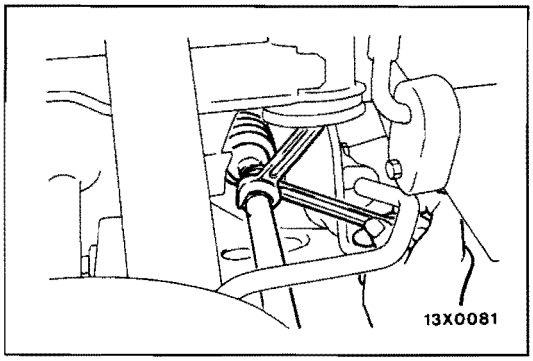
E37CG02AA

TIE ROD SWING TORQUE INSPECTION

(1) Swing the tie rod ten times, hard.
(2) Point the tie rod end down, then attach a spring balance as shown in the illustration to measure swing resistance (swing torque).

Standard value: 31–77 N (2–5 Nm)

(3) If the swing resistance exceeds the standard value, replace the tie rod.
(4) If the swing resistance is less than the standard value, the ball joint may be reused as long as it is not loose and operates smoothly.



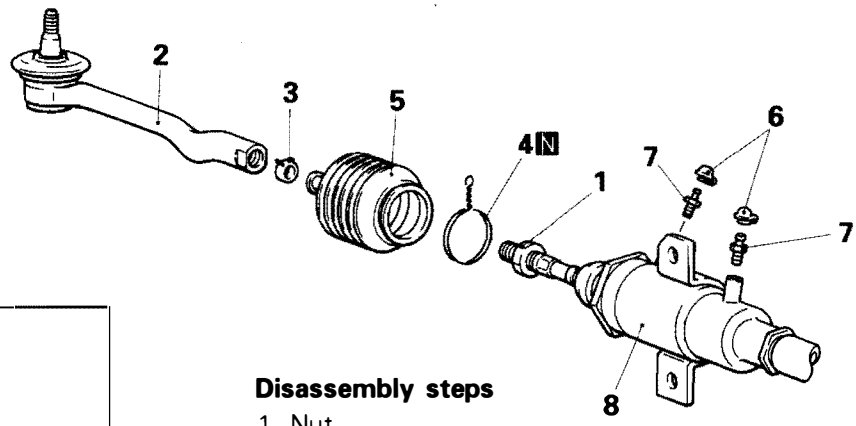
INSTALLATION SERVICE POINTS E37CG04AA

◆A◆ POWER CYLINDER INSTALLATION

(1) Secure the power cylinder to the crossmember.
(2) When the tie rod ends and the installation holes at the rear knuckle arm do not meet, loosen the tie rod end securing nut, then adjust the length. The dust cover fastener clip should be removed for this.
(3) The difference between the lengths of the left and right tie rods should be less than 1 mm.

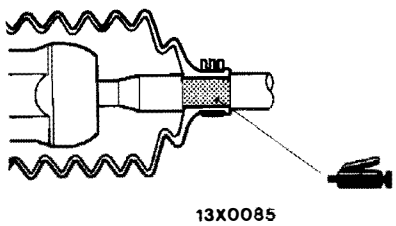
NOTE
The threads of the tie rod ends may be used as a guide for this.

DISASSEMBLY AND REASSEMBLY E37CG05AA

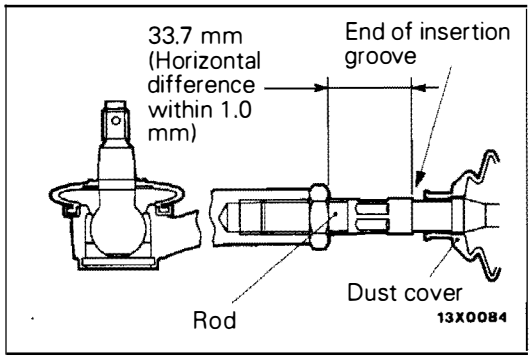


Disassembly steps

1. Nut
◆A◆ 2. Tie rod end assembly
3. Clip
4. Wire
5. Dust cover
6. Bleeder caps
7. Bleeder screws
8. Cylinder assembly



Silicone grease



REASSEMBLY SERVICE POINTS E37CG08AA

◆A◆ TIE ROD END ASSEMBLY INSTALLATION

Temporarily attach the tie rod end assembly to the cylinder assembly at the place of dimension as illustrated.

NOTE
To adjust the assembly dimensions of the tie rod end assembly, remove the dust cover clip and rotate the rod.

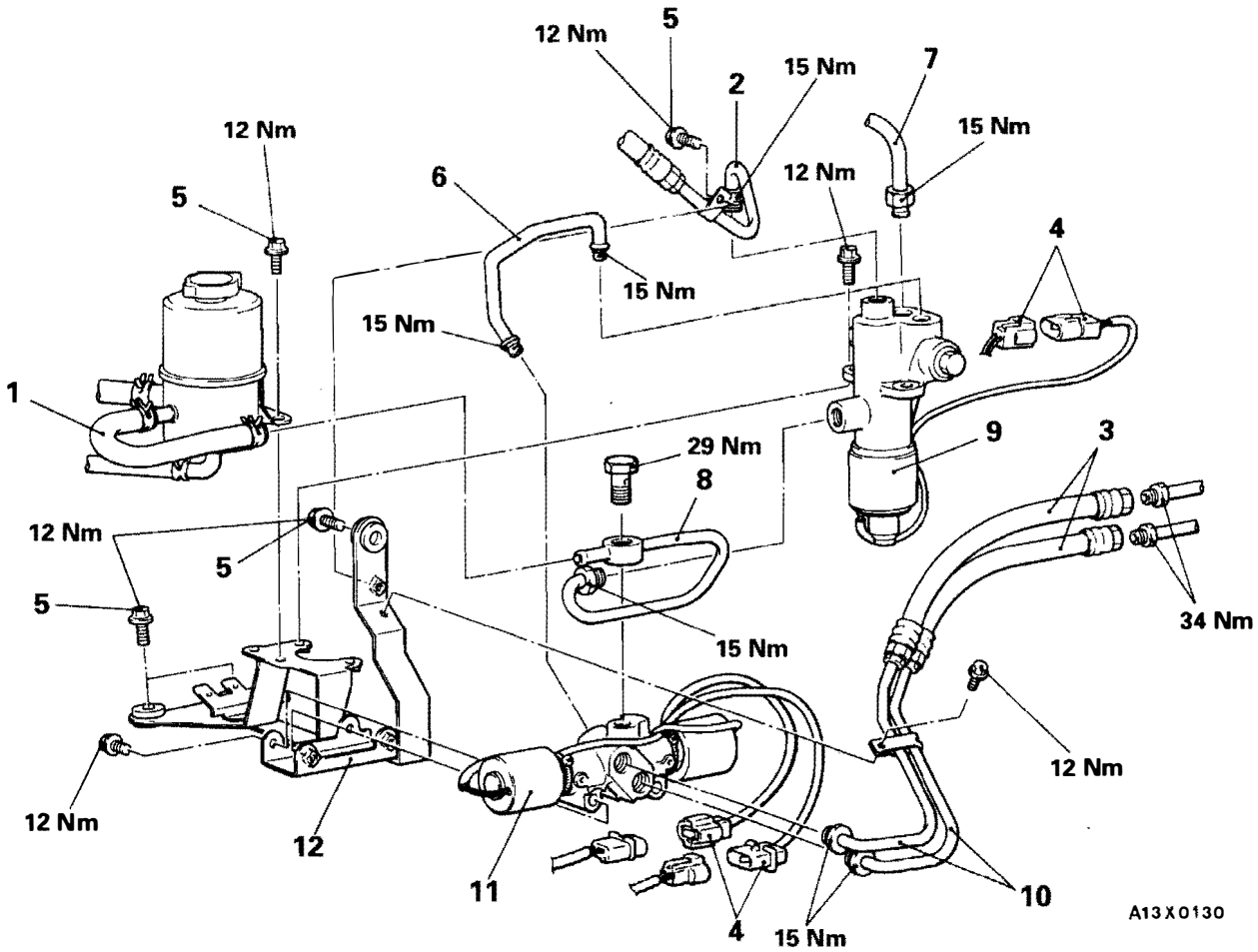
REAR WHEEL CONTROL VALVE

REMOVAL AND INSTALLATION

E37CH00AA

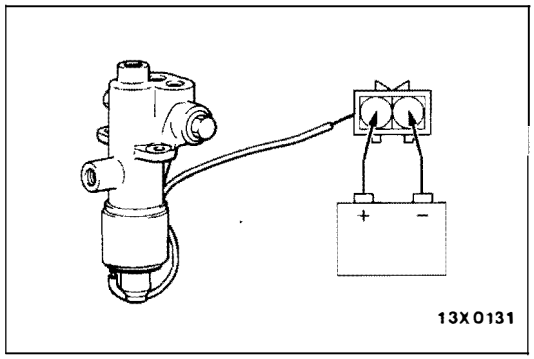
Pre-removal Operation
- Steam Cleaning of Tubing
- Power Steering Fluid Draining

Post-installation Operation
- Power Steering Fluid Supply
- Power Steering Fluid Line Bleeding (Refer to P.37C-22.)
- 4WS Function Check (Refer to P.37C-23.)
- Wheel Alignment Inspection and Adjustment (Refer to GROUP 34 – Service Adjustment Procedures.)



Removal steps

1. Return hose connection
2. Pressure pipe connection
3. Pressure hose connection
4. Harness connector
5. Bolts
6. Pressure pipe assembly
7. Pressure pipe assembly
8. Return pipe
9. Flow divider assembly
10. Pressure pipe assembly
11. Rear wheel control valve assembly
12. Bracket



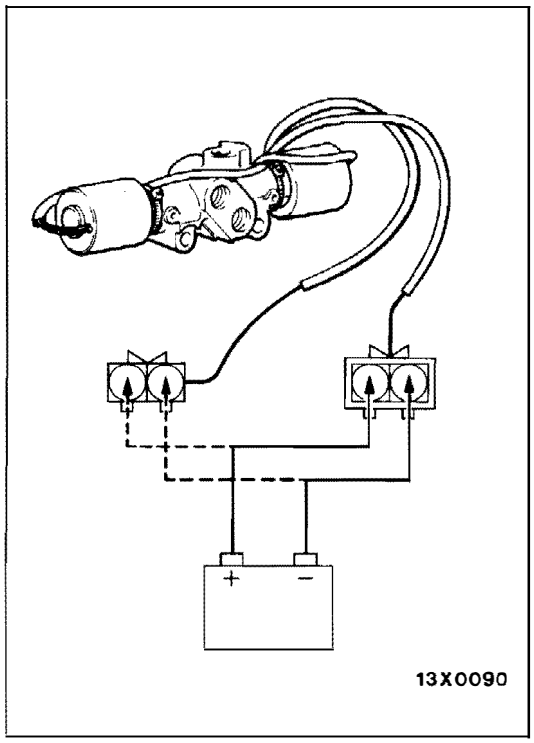
INSPECTION

E37CH02AA

VALVE ASSEMBLY INSPECTION

Apply battery voltage to the valve assembly and check if the sound of operation can be heard.

Caution
Battery voltage should not be applied for more than 1 second.



REAR WHEEL CONTROL VALVE ASSEMBLY INSPECTION

E37CH02BA

Apply battery voltage to the rear wheel control valve assembly and check to be sure that the valve inside the housing moves horizontally.

Caution
Battery voltage should not be applied for more than 1 second.

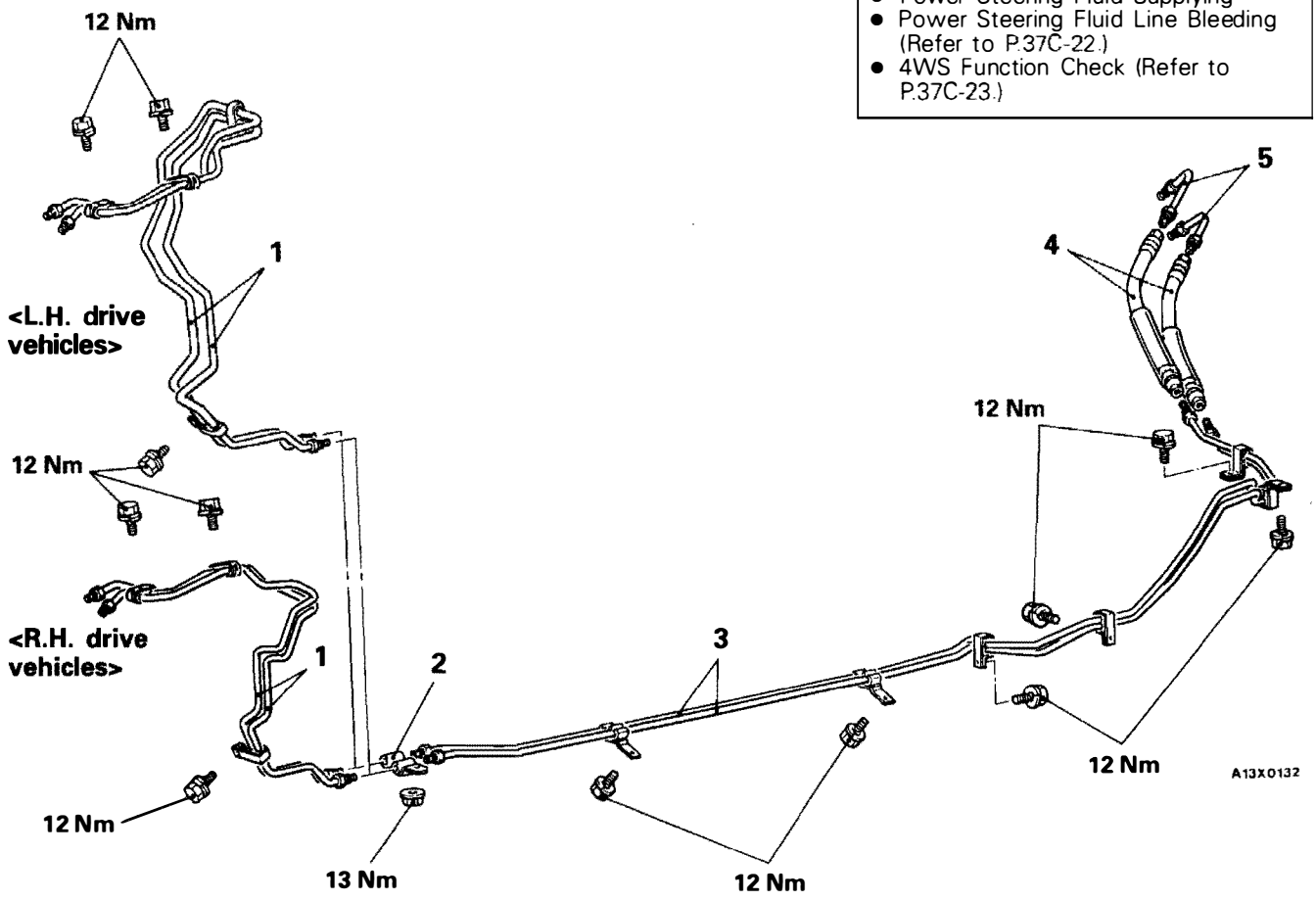
REAR OIL LINE

REMOVAL AND INSTALLATION

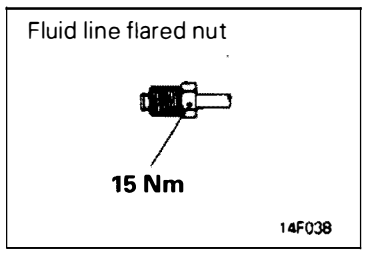
E37CI00AA

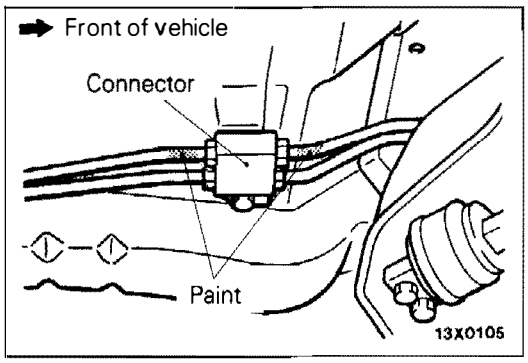
Pre-removal Operation
- Steam Cleaning of Piping
- Power Steering Fluid Draining

Post-installation Operation
- Power Steering Fluid Supplying
- Power Steering Fluid Line Bleeding (Refer to P.37C-22.)
- 4WS Function Check (Refer to P.37C-23.)



Removal steps
- ◆A◆ 1. Front pressure pipe assembly
- 2. Connector
- ◆A◆ 3. Rear pressure pipe assembly
- 4. Pressure hose
- 5. Pressure pipe assembly





INSTALLATION SERVICE POINTS

E37CI04AA

◆A◆ REAR PRESSURE PIPE ASSEMBLY/FRONT PRESSURE PIPE ASSEMBLY INSTALLATION

Caution
Install the front pressure pipe assembly and rear pressure pipe assembly so that the pipes with paint in the positions shown in the illustration are matched.

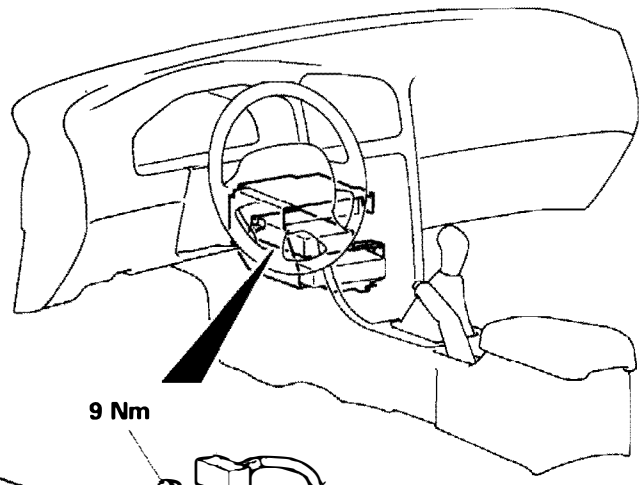
ACTIVE 4WS CONTROL UNIT

REMOVAL AND INSTALLATION

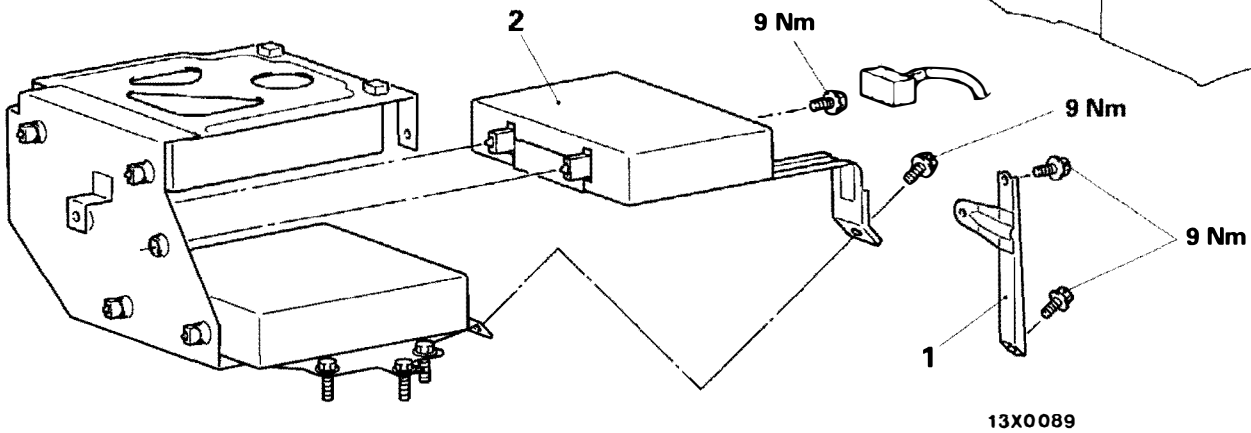
E37CJ00AA

Pre-removal Operation
- Instrument Panel Side Cover Removal (Refer to GROUP 52A – Instrument Panel)

Post-installation Operation
- Instrument Panel Side Cover Installation (Refer to GROUP 52A – Instrument Panel)
- 4WS Function Check (Refer to P.37C-23.)



13X0165



13X0089

Removal steps
1. ECU Stay
2. 4WS Control unit

INSPECTION

E37CJ02AA

Refer to P.37C-20.

BODY

CONTENTS

E42ZA00AA

SERVICE SPECIFICATIONS

E42ZC00AB

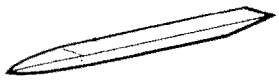
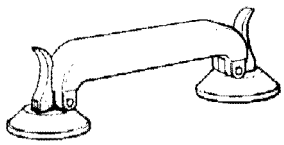
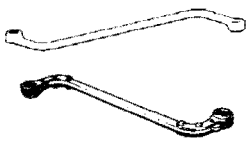
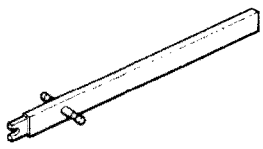
Items		Specifications
Standard value		
Inside handle play	mm	
Front door		5.5–16.0
Rear door		8.4–18.0
Outside handle play	mm	
Front door		4.6–7.0
Rear door		5.2–9.0
Sunroof sliding resistance	N	118
Slipping force of sunroof motor clutch	N	34–43

SEALANT AND ADHESIVE

Items	Specified sealant and adhesive	Characteristics
Fender to body panel Tailgate hinge to body panel <Hatchback> Sunroof assembly (weatherstrip cutting section)	3M ATD Part No. 8531 or 3M Part No. 8646 or equivalent	Body sealer
Splash shield to fender Waterproof film	3M ATD Part No. 8625 or equivalent	Ribbon sealer
Mad guard to body panel	3M ATD Part No. 8625 or equivalent (Vehicles built up to June 1993)	Ribbon sealer
Windshield Quarter window glass <Hatchback> Rear window glass <Sedan> Tailgate window glass <Hatchback>	3M ATD Part No. 8609 Super Fast Urethane Auto Glass sealant or equivalent	—

SPECIAL TOOLS

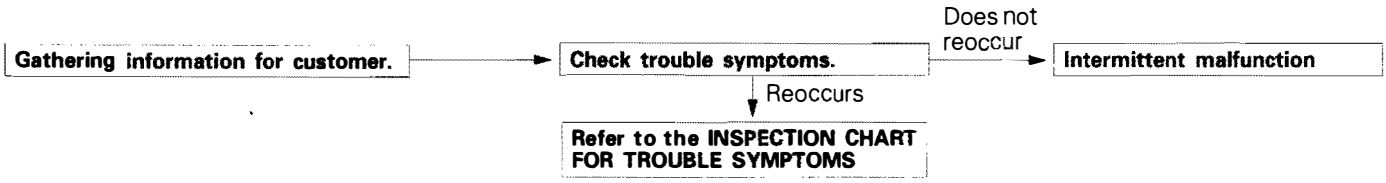
E42ZD00AA

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch, trim, etc.
	MB990480	Glass holder	Removal an installation of window glass
	MB990449	Window moulding remover	Removal of the window moulding
	MB990900 or MB991164	Door adjusting wrench	Adjustment of door fit
	MB991244	Torsion bar remover and installer	Removal and installation of trunk lid torsion bar

TROUBLESHOOTING

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

E42ZE00AA



SUNROOF

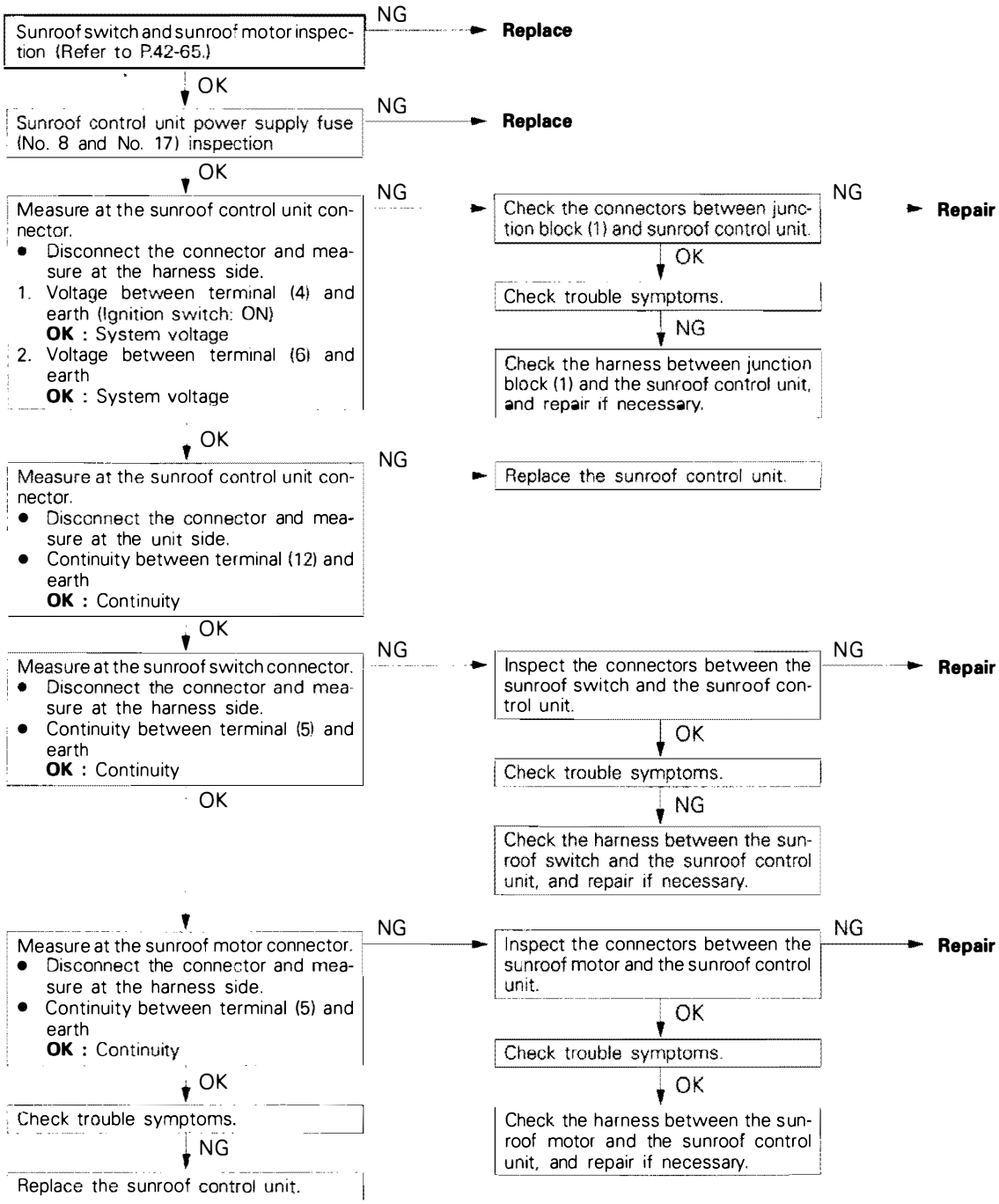
E42ZE01AA

INSPECTION CHART FOR TROUBLE SYMPTOMS

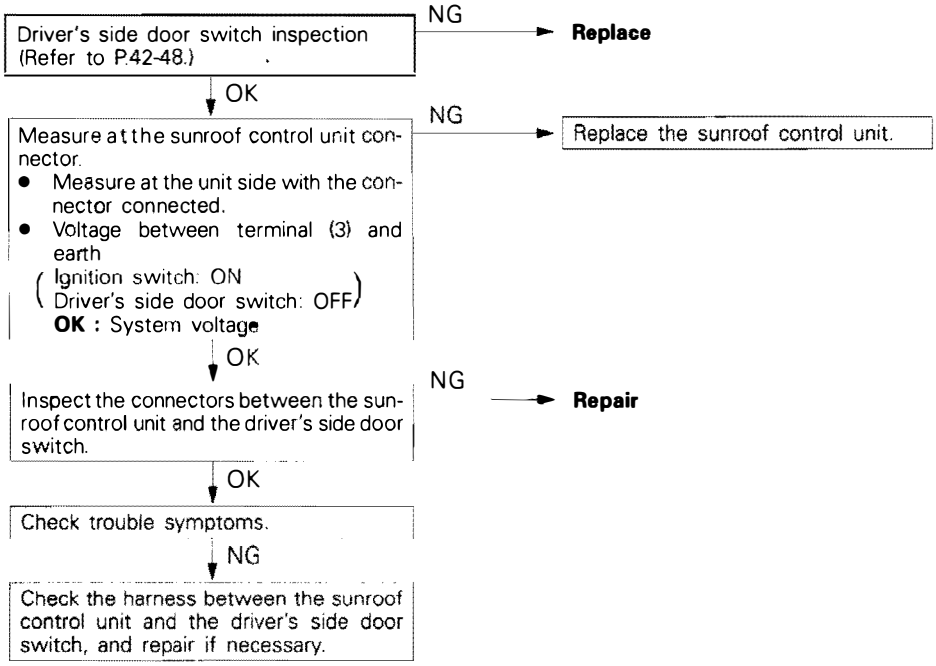
Trouble symptom	Probable cause	Remedy
When ignition switch is turned to ON, sunroof does not operate.	• Broken wire in sunroof control unit circuit or in each harness. • Sunroof switch is faulty. • Sunroof motor is faulty. • Sunroof control unit is faulty.	Inspect according to Flow Chart A (P.42-5).
When closing sunroof, motor does not reverse when a load of 265N or more is applied.	• Sunroof control unit is faulty.	Replace sunroof control unit.
Sunroof will not close fully.	• Limit switch contact is faulty.	Replace sunroof motor.
When sunroof switch is pressed, motor operates for 0.6 seconds and then stops.	• Lock plate is damaged.	Replace sunroof motor.
Opening or closing of the sunroof is possible immediately after turning the ignition switch to OFF, but even if the driver's side door is opened within 30 seconds, the timer function does not operate continuously for another 30 seconds.	• Broken wire in input circuit in driver's side door switch. • Driver's side door switch is faulty. • Sunroof control unit is faulty.	Inspect according to Flow Chart B (P.42-6).
After turning the ignition switch to OFF, sunroof operation is possible even after timer operation period has elapsed.	• Sunroof control unit is faulty.	Replace sunroof control unit.
After turning the ignition switch to OFF, the timer does not operate.	• Sunroof control unit is faulty.	Replace sunroof control unit.

TROUBLE SYMPTOM INSPECTION CHART

A	When ignition switch is turned to ON, sunroof does not operate.



B	**Opening or closing of the sunroof is possible immediately after turning the ignition switch to OFF, but even if the driver's side door is opened within 30 seconds, the timer function does not operate continuously for another 30 seconds.**



POWER WINDOW

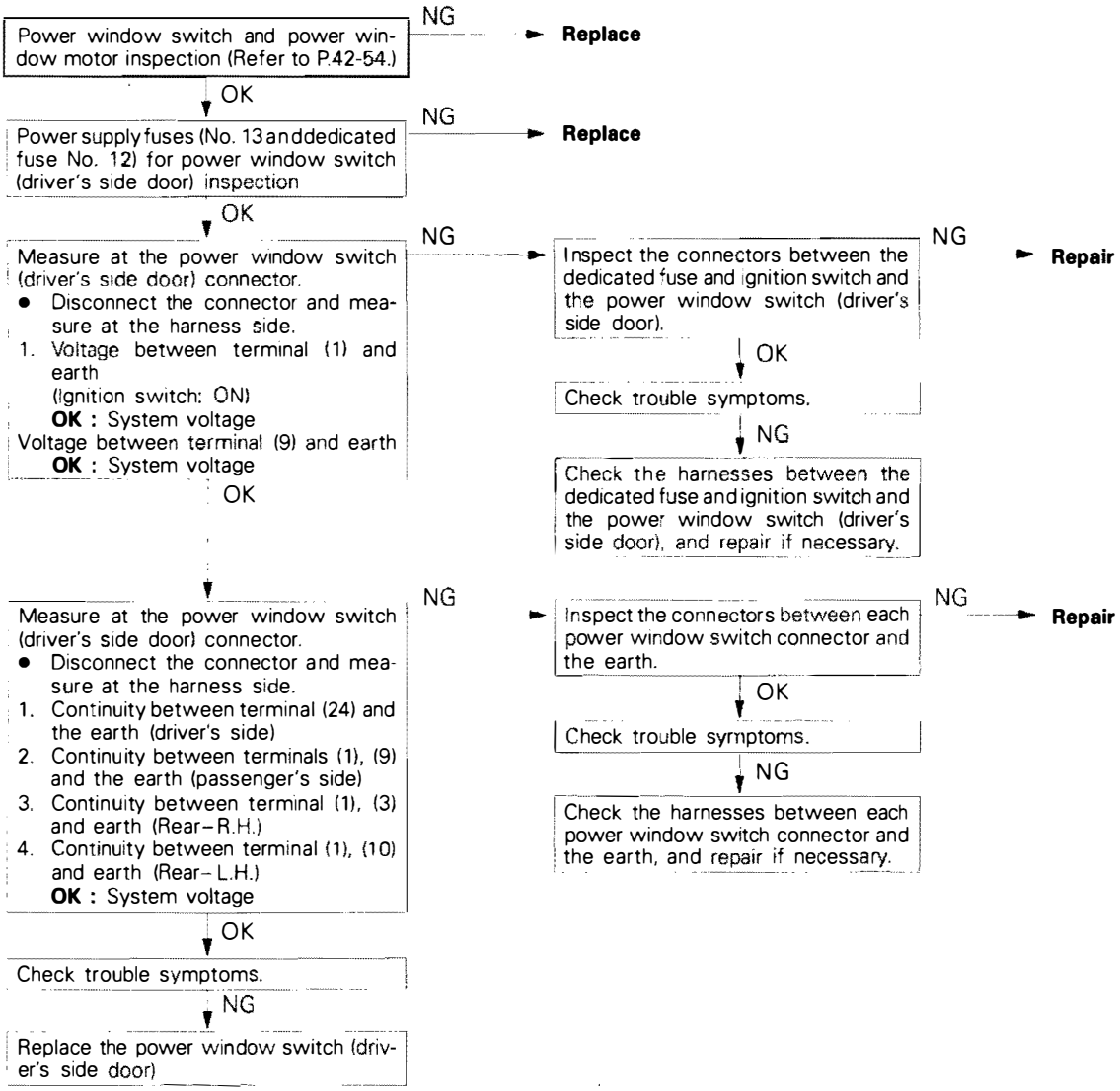
E42ZE02AA

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Probable cause	Remedy
When ignition switch is turned to ON, power window does not operate.	● Broken wire in power window control unit circuit or in each harness. ● Power window switch is faulty. ● Power window motor is faulty.	Inspect according to Flow Chart A (P.42-7).
Opening and closing of the power windows is possible with each seat switch, but operation from the power window main switch (driver's side door) is not possible.	● Short circuit in data line ● Open circuit in data line ● Malfunction of power window main switch	Inspect according to Flow Chart B (P.42-8).
Opening and closing of the power windows is possible with the power window main switch, but operation from each sub switch is not possible.	● Malfunction of sub switch	Replace the respective sub switch.

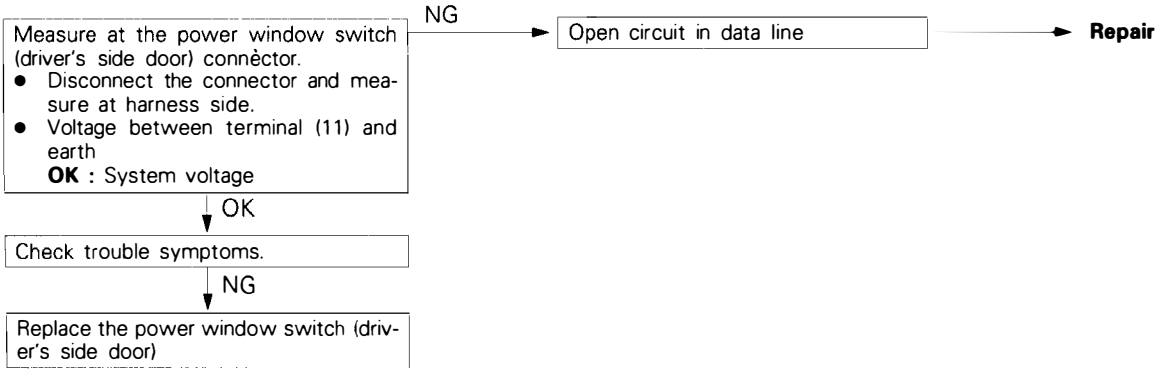
TROUBLE SYMPTOM INSPECTION CHART

A	When ignition switch is turned to ON, power window does not operate.

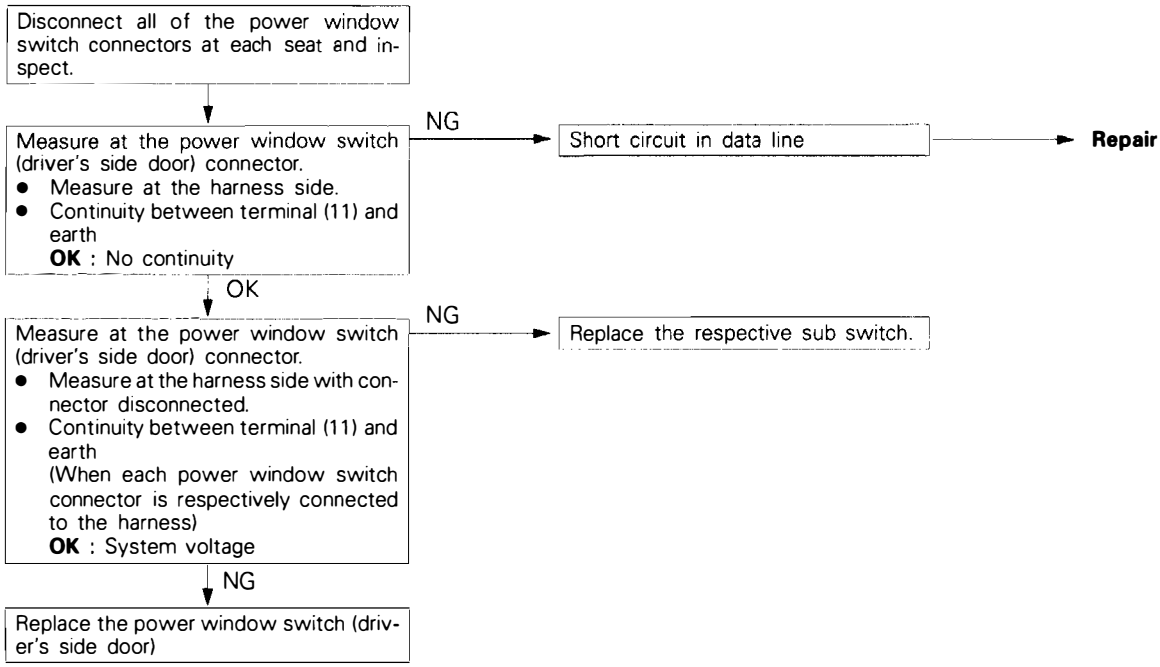


B	**Opening and closing of the power windows is possible with each seat's switch, but operation from the power window main switch (driver's side door) is not possible.**

Data Line Open Circuit Inspection



Data Line Short Circuit Inspection



CENTRAL DOOR LOCKING SYSTEM

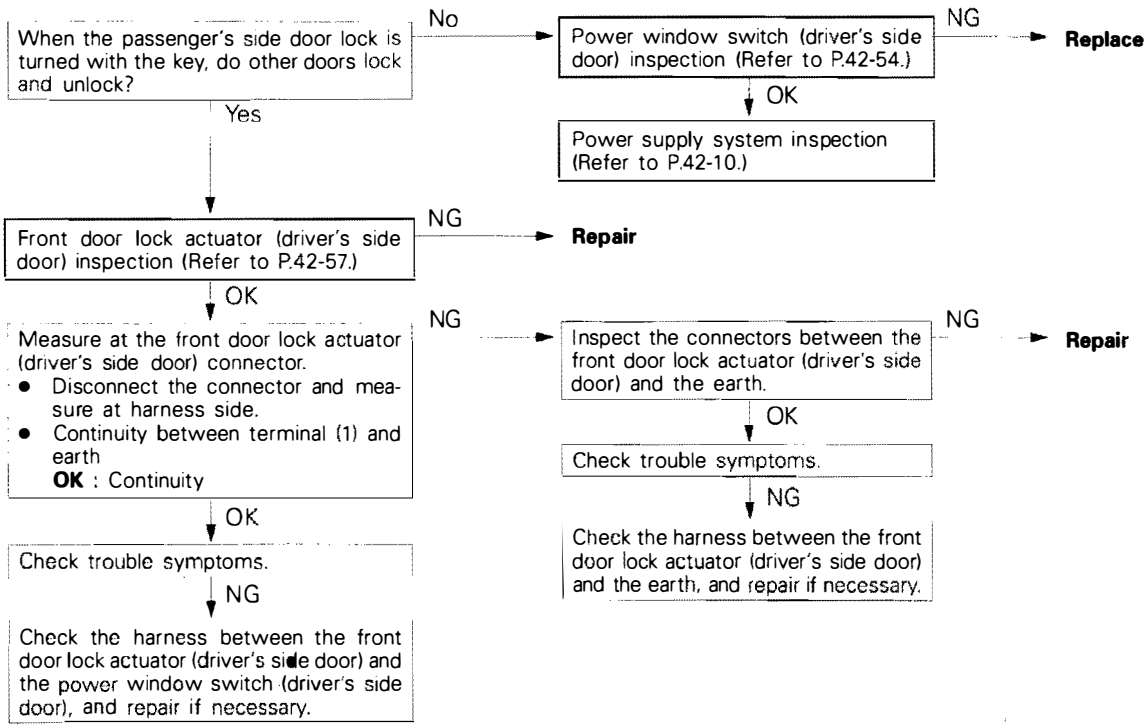
E42ZE03AA

INSPECTION CHART FOR TROUBLE SYMPTOM

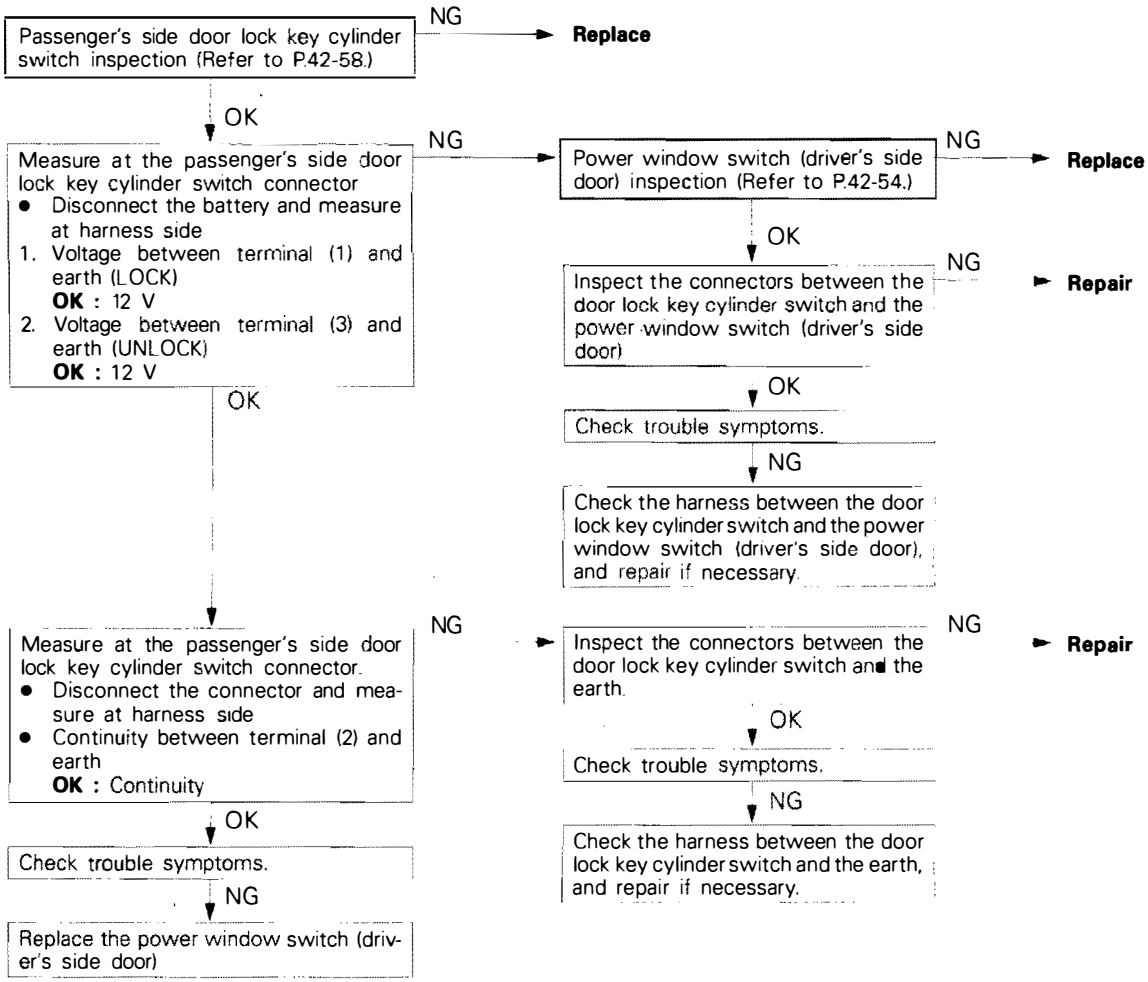
Trouble symptom	Probable cause	Remedy
When the driver's side door lock is turned with the key or if the driver's side door inside door lock knob is operated, other doors do not lock or unlock.	• Incorrect connector connection or malfunction of harness • Malfunction of door lock actuator • Malfunction of driver's side door actuator switch • Malfunction of power window switch (driver's side door) <Vehicles with power windows> • Malfunction of door lock control unit <Vehicles without power windows	Inspect according to Flow Chart A
When the passenger's side door lock is turned with the key, other doors do not lock or unlock. (Doors lock and unlock when the driver's side door lock is turned with the key.)	• Incorrect connector connection or malfunction of harness • Malfunction of passenger's side door key cylinder switch • Malfunction of door lock actuator	Inspect according to Flow Chart B (P.42-10)

TROUBLE SYMPTOM INSPECTION CHART <Vehicles with power window>

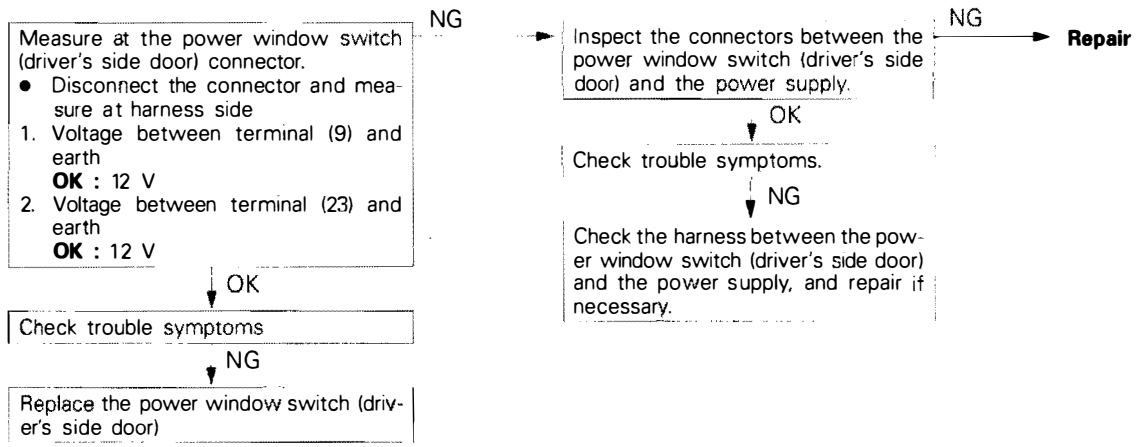
A	**When the driver's side door lock is turned with the key or if the driver's side door inside door lock knob is operated, other doors do not lock or unlock.**



B **When the passenger's side door lock is turned with the key, other doors do not lock or unlock. (Doors lock and unlock when the driver's side door lock is turned with the key.)**

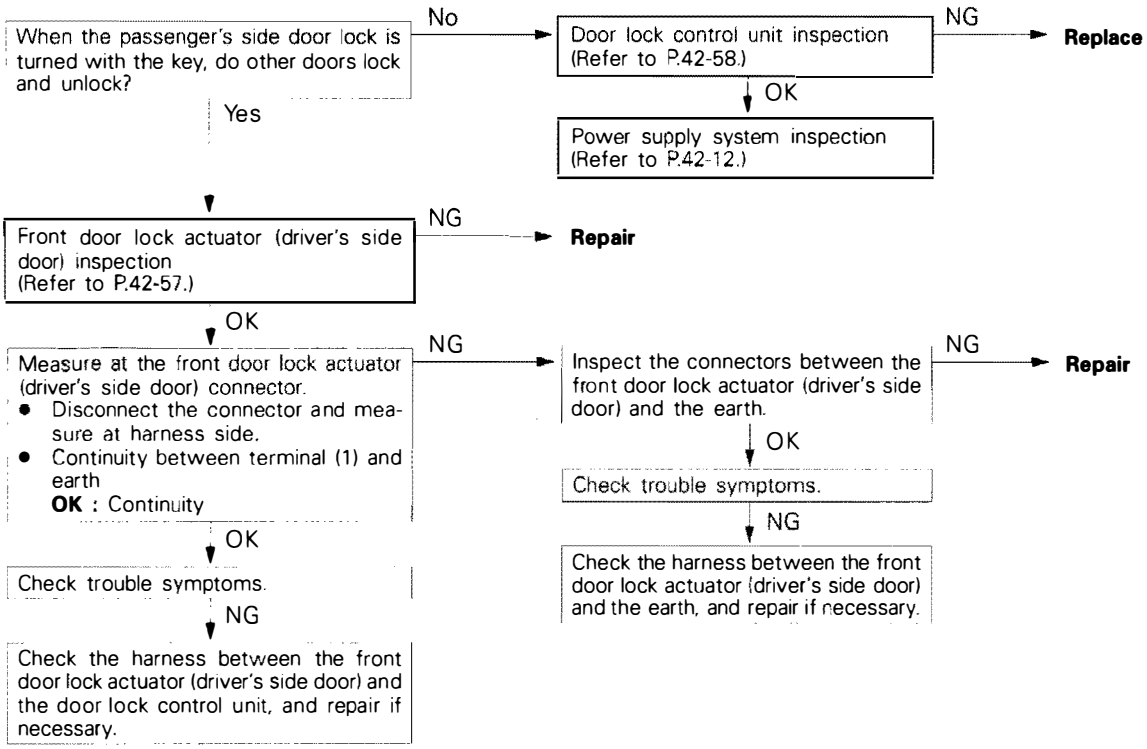


Power supply system inspection (central door locking system does not operate at all)

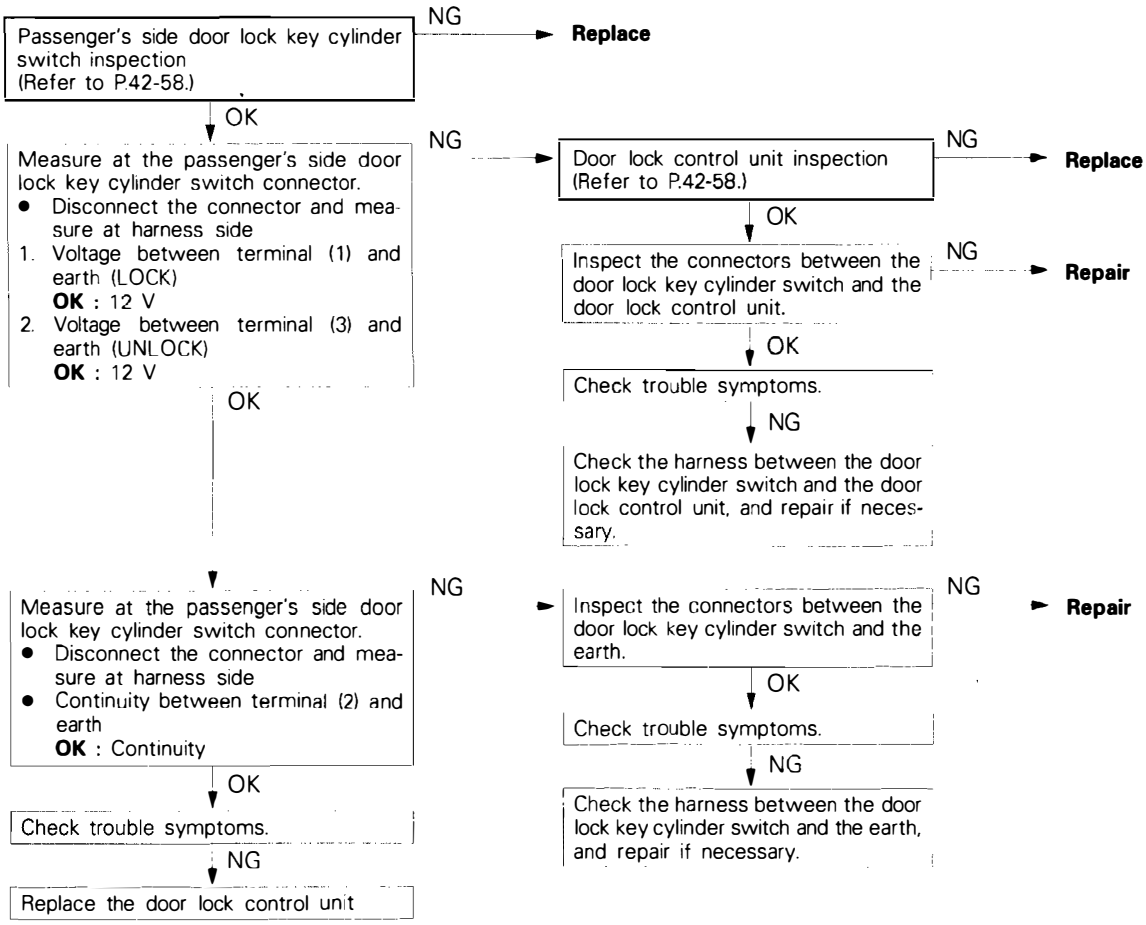


TROUBLE SYMPTOM INSPECTION CHART <Vehicles without power window>

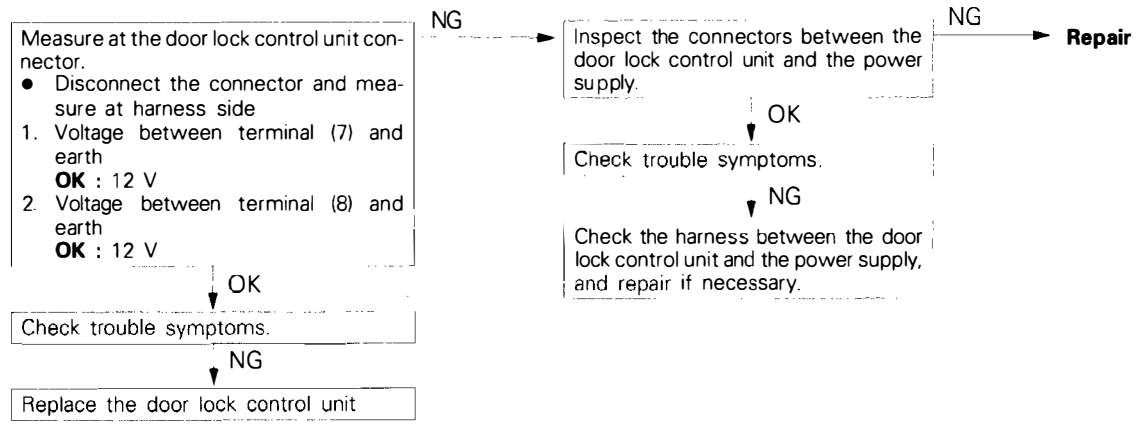
A	**When the driver's side door lock is turned with the key or if the driver's side door inside door lock knob is operated, other doors do not lock or unlock.**



B	When the passenger's side door lock is turned with the key, other doors do not lock or unlock. (Doors lock and unlock when the driver's side door lock is turned with the key.)



Power supply system inspection (central door locking system does not operate at all)



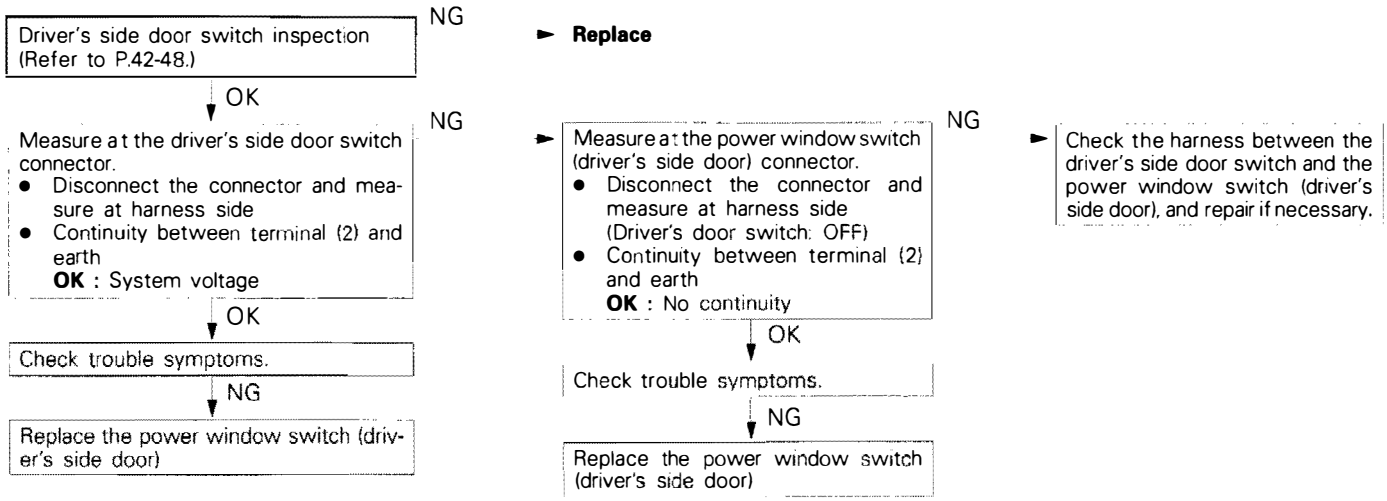
KEY REMINDER SYSTEM

E42ZE04AA

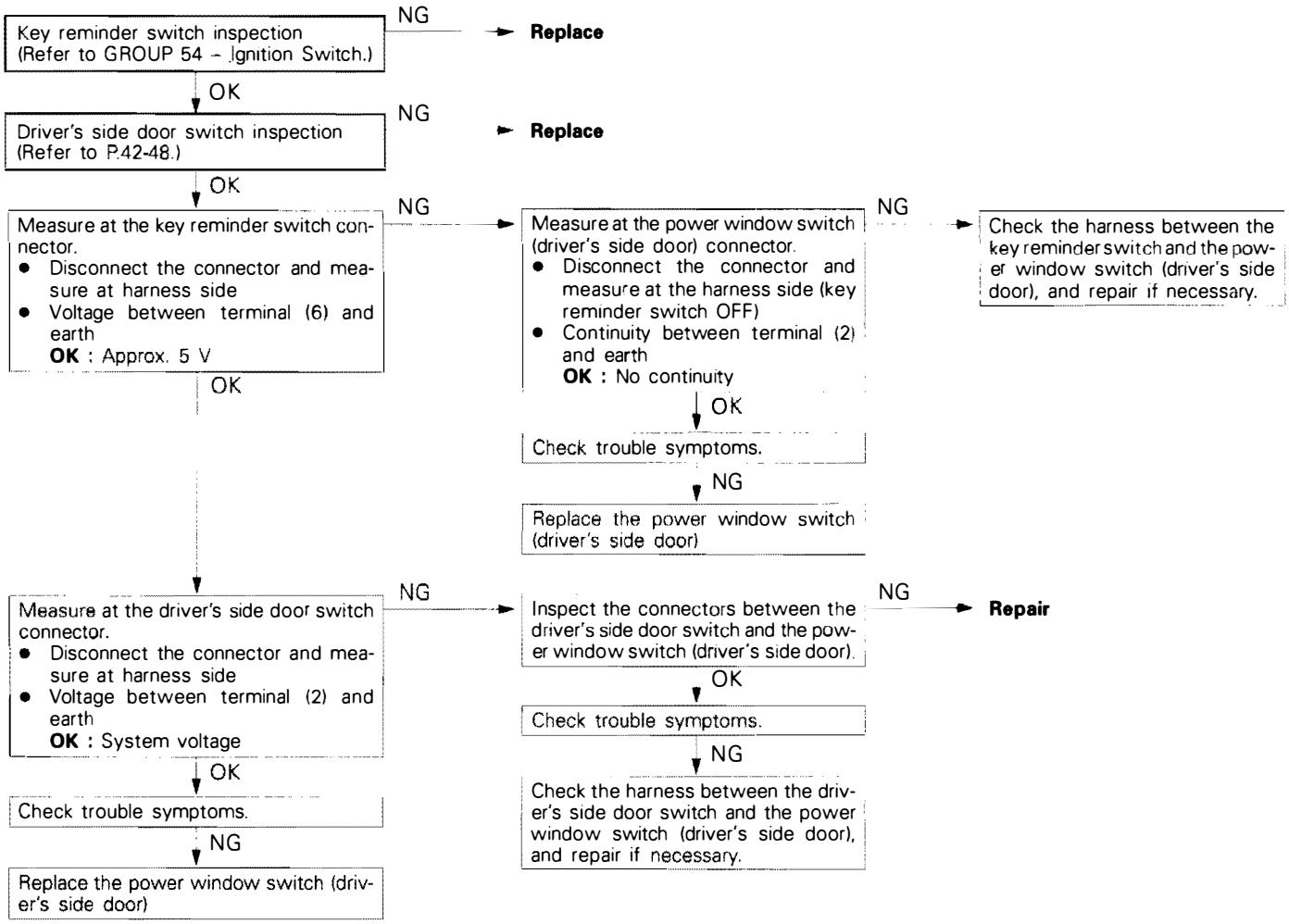
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Probable cause	Remedy
If the door is closed while the ignition key is inserted in the ignition key cylinder and the driver's side inside door lock knob is pushed to the LOCK position, the door is prevented from locking.	• Broken wire in input circuit in driver's door switch. • Driver's door switch is faulty. • Malfunction of power window switch (driver's side)	Inspect according to Flow Chart A
If the door is opened while the ignition key is inserted in the ignition key cylinder and the driver's side inside door lock knob is pushed to the LOCK position, the door locks without the key reminder system operating	• Broken wire in input circuit in driver's door switch. • Broken wire in input circuit in key reminder switch. • Driver's door switch is faulty. • Key reminder switch is faulty. • Malfunction of power window switch (driver's side)	Inspect according to Flow Chart B (P.42-14).
If the door is opened when the ignition key is not inserted in the ignition key cylinder and the driver's side inside door lock knob is pushed to the LOCK position, the door is prevented from locking.	• Broken wire in input circuit in key reminder switch. • Key reminder switch is faulty. • Malfunction of power window switch (driver's side)	Inspect according to Flow Chart C (P.42-15).

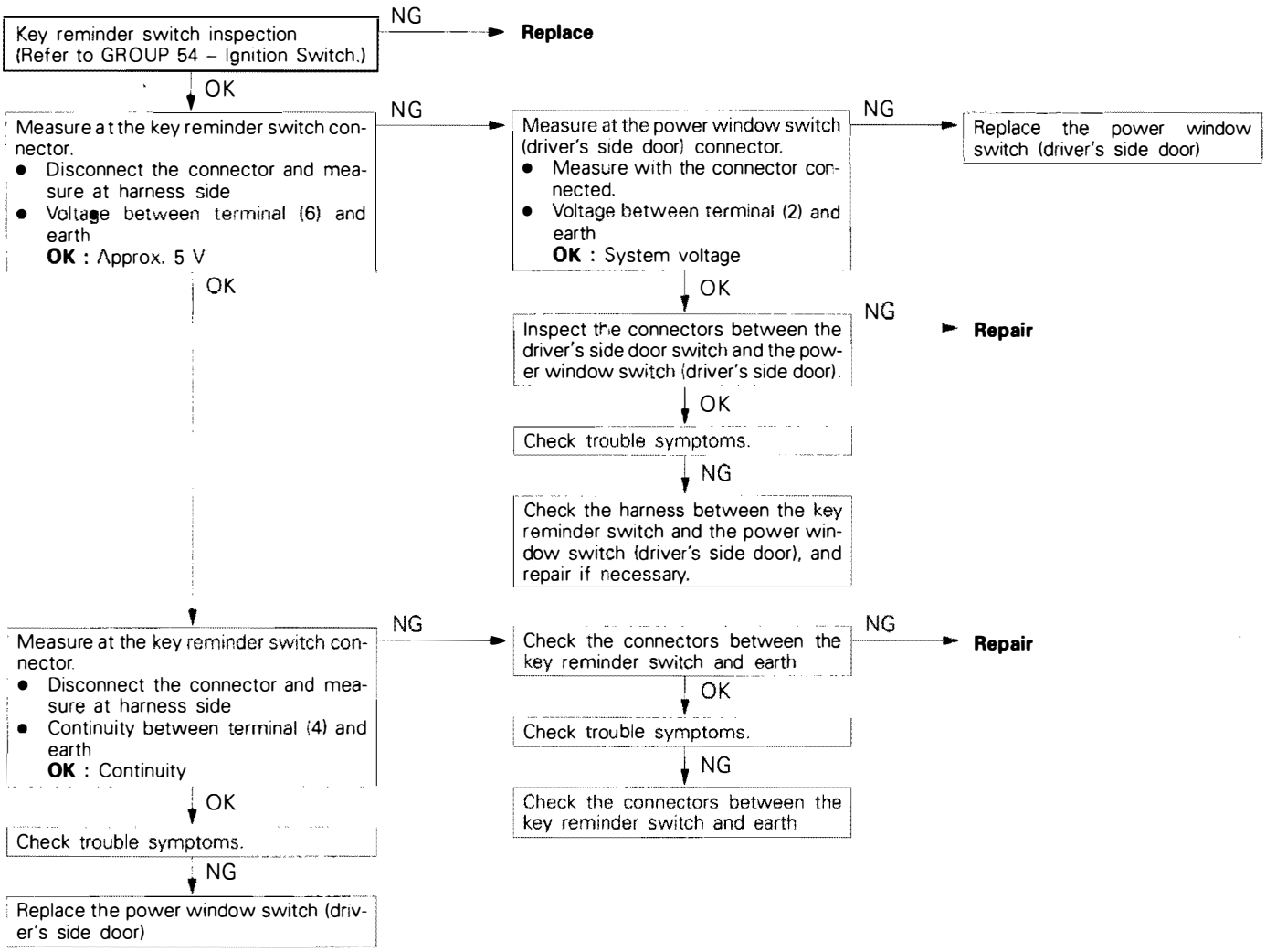
A **If the door is closed while the ignition key is inserted in the ignition key cylinder and the driver's side inside door lock knob is pushed to the LOCK position, the door is prevented from locking.**

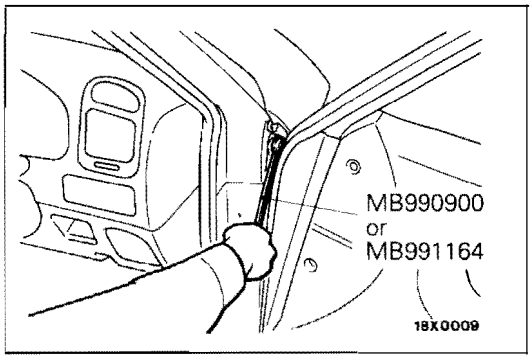


B	**If the door is opened while the ignition key is inserted in the ignition key cylinder and the driver's side inside door lock knob is pushed to the LOCK position, the door locks without the key reminder system operating**



B	**If the door is opened when the ignition key is not inserted in the ignition key cylinder and the driver's side inside door lock knob is pushed to the LOCK position, the door is prevented from locking.**





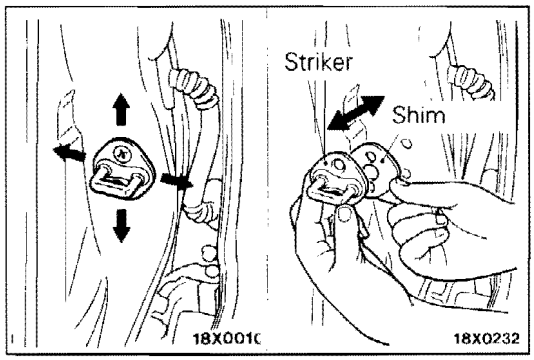
SERVICE ADJUSTMENT PROCEDURES

DOOR FIT ADJUSTMENT E42ZF00AA

1. Use the special tool to loosen the hinge mounting bolts on the body side, and then adjust the clearance around the door so that it is uniform on all sides.
2. When there is a stepped section in the door and body, use the special tool to loosen the door hinge mounting bolt on the door side and adjust the door fit.

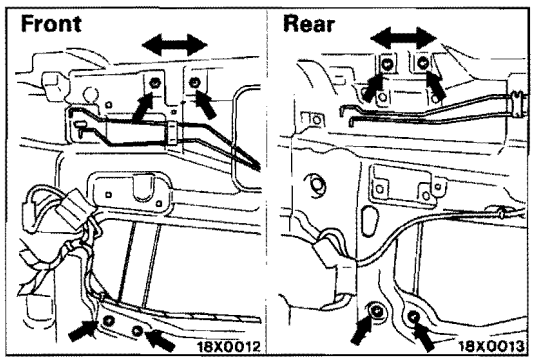
Caution
Attach protection tape to the fender edges where the hinge is installed.

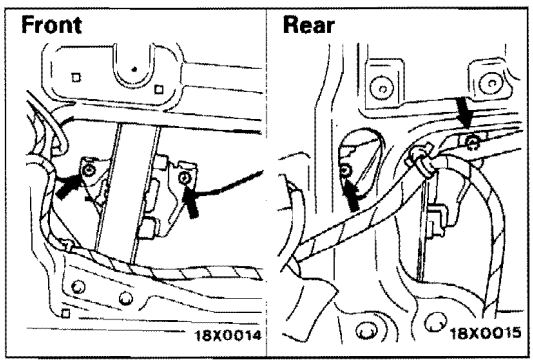
3. If the door opening an closing is stiff, adjust the linking of the striker and the door latch using the shim, while moving the striker up and down, or left and right.



DOOR GLASS ADJUSTMENT E42ZF01AA

1. Remove the door trim and waterproof film. (Refer to P.42-50.)
2. Loosen the installation bolt of the window regulator assembly; then move the upper installation back and forth and adjust the tilted angle of the glass.





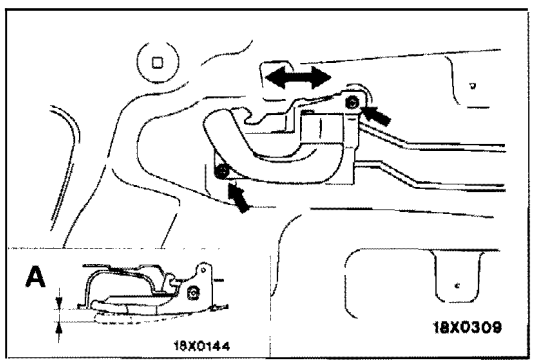
3. Lower the door window glass to the position of the access hole.
4. Loosen the door glass installation screw, and adjust the forward/backward position of the glass.

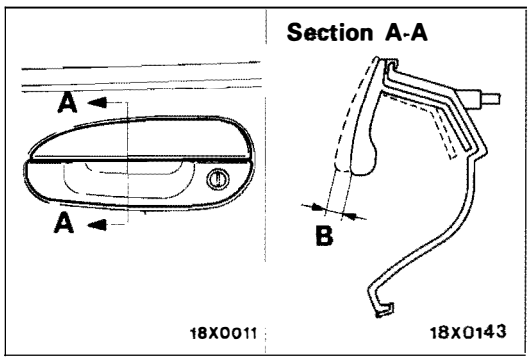
INSIDE HANDLE PLAY ADJUSTMENT E42ZF02AA

1. Remove the door trim and waterproof film. (Refer to P.42A-50.)
2. Move the door inside handle installation position back and forth to adjust so that the inside handle play allowance agrees with the standard value.

Standard value (A):

Front	**5.5–16.0 mm**
Rear	**8.4–18.0 mm**



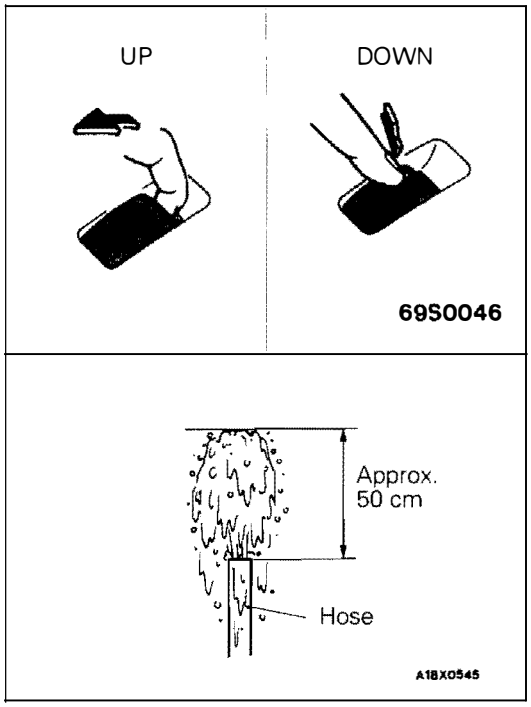


OUTSIDE HANDLE PLAY CHECK E42ZF02BA

If the door outside handle play does not conform to the standard value, check the door outside handle or door latch assembly, and replace if necessary.

Standard value (B):

Front	**4.6–7.0 mm**
Rear	**5.2–9.0 mm**

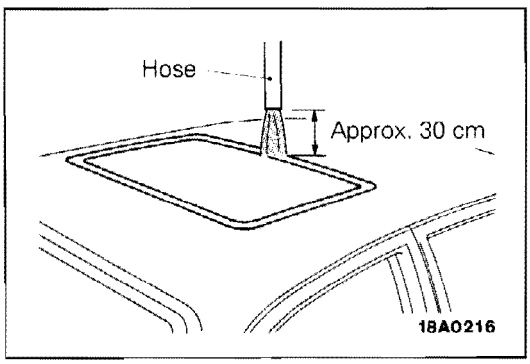


CIRCUIT BREAKER (INCORPORATED IN THE POWER WINDOW MOTOR) INSPECTION E42ZF03AA

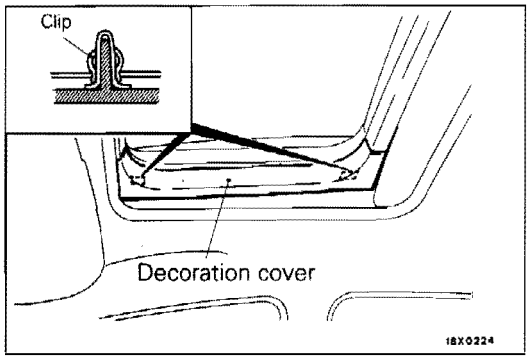
1. Lift the UP switch to fully close the window glass, and continue to lift the switch for 40 seconds.
2. At the moment that the UP switch is released, press the DOWN switch. The circuit breaker can be considered good if at this time the door window glass begins to open within 60 seconds.

WATER TEST E42ZF04AA

1. Close roof lid tightly.
2. Hold hose upward and adjust water fountain to about 50 cm high.



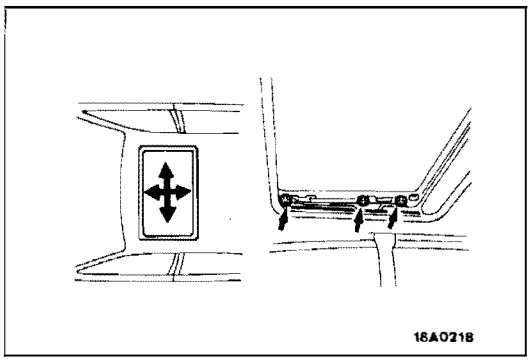
3. Pour water over the roof from about 30 cm above roof for more than 5 minutes.
4. While pouring water, check for leak around roof lid.
5. In the event of leakage, check drain pipe, weatherstrip contact and others.



SUNROOF FIT ADJUSTMENT E42ZF04BA

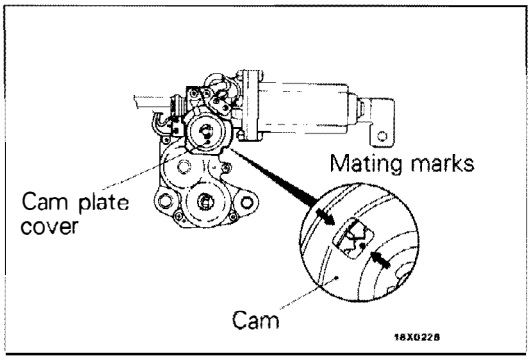
FORWARD, BACKWARD AND SIDEWAYS ADJUSTMENT OF THE SUNROOF GLASS

1. Fully close the roof lid glass.
2. Fully open the sun shade.
3. Remove the decoration cover.



4. Loosen the 6 roof lid glass mounting nuts and adjust the glass forward, backward or sideways.

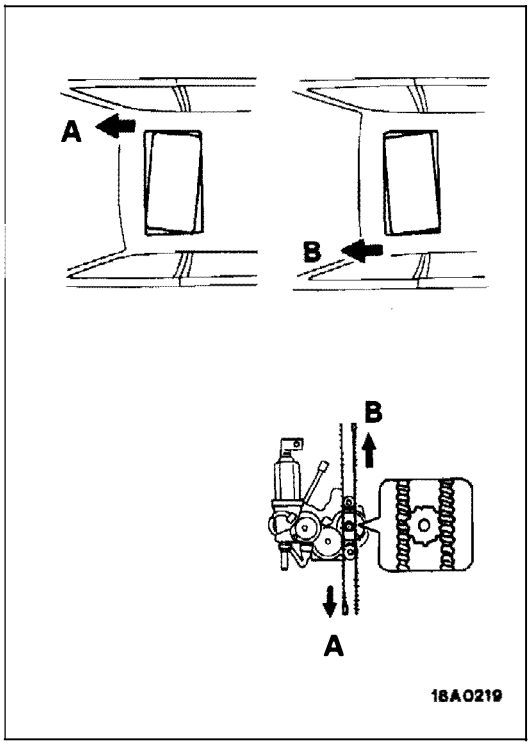
NOTE
If the adjustment cannot be made by loosening the mounting nuts, the roof lid glass or the motor have not been fully closed, so they should be adjusted to the fully closed positions.



SUNROOF GLASS CLOSED POSITION ADJUSTMENT

E42ZF04CA

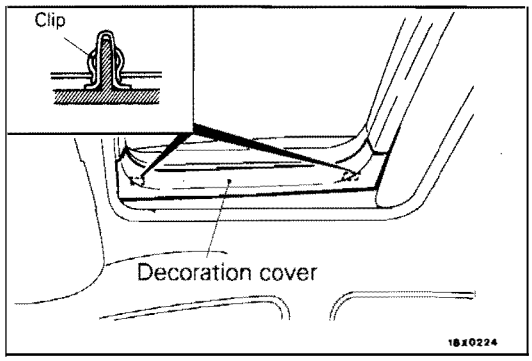
1. Remove the head lining. (Refer to GROUP 52A - Headlining.)
2. Fit the on-board tool (hexagonal wrench) onto the sunroof motor drive shaft and adjust the position of the roof lid glass manually.
3. Remove the sunroof motor, and then remove the cam plate cover.
4. Turn the drive shaft with the hexagonal wrench to align the cam mating marks, and then install the sunroof motor (sunroof motor fully closed position).



SUNROOF GLASS PARALLELISM ADJUSTMENT E42ZF04DA

1. If the deviation is approximately 1 mm, make the forward/backward or left/right adjustment by the same procedure.
2. If the deviation is approximately 2 mm, remove the motor and advance the cable (at the side where the gap is larger) one pitch.

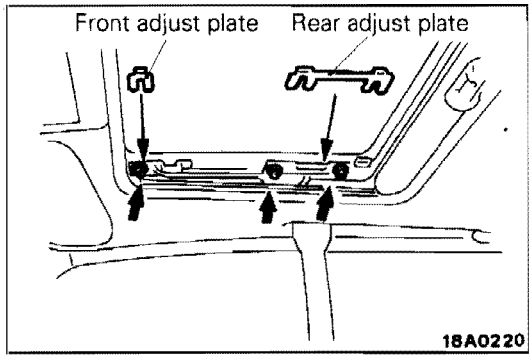
NOTE
There will be movement of 2.5 mm for one pitch of the cable.



HEIGHT ADJUSTMENT OF THE ROOF LID GLASS AND THE ROOF

E42ZF04EA

1. Fully close the roof lid glass.
2. Fully open the sun shade.
3. Remove the decoration cover.

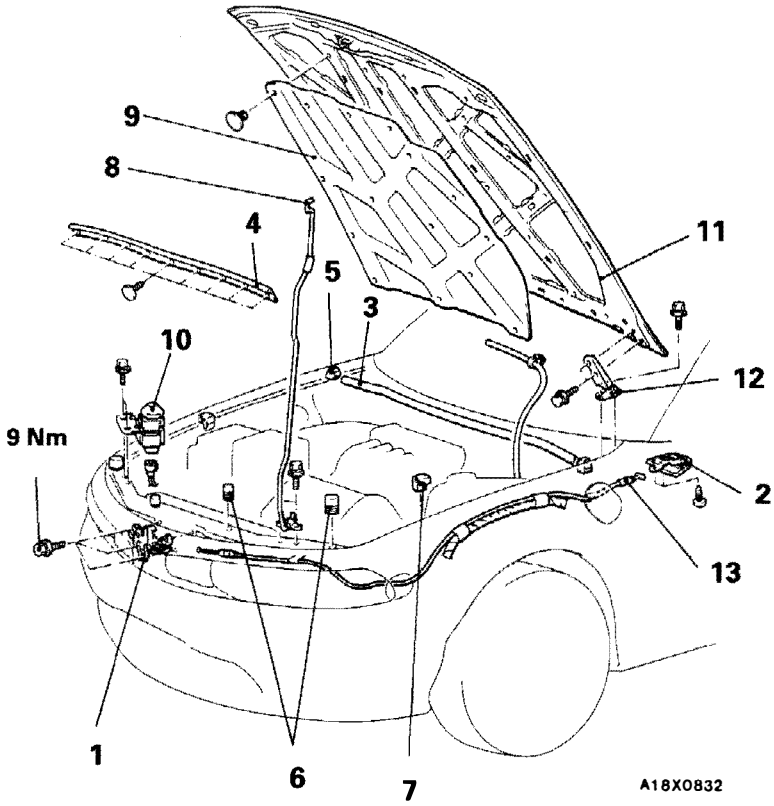


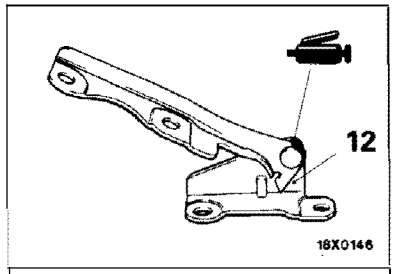
4. Loosen the six nuts.
5. Adjust by increasing or decreasing the number of adjustment plates.

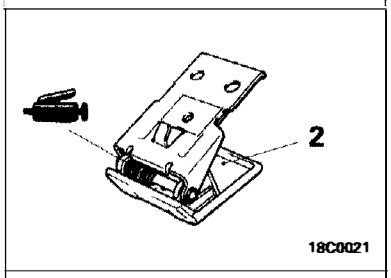
HOOD

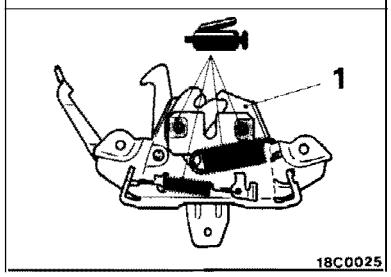
REMOVAL AND INSTALLATION

E42ZG00AB









1. Hood latch
2. Hood lock release handle
3. Hood weatherstrip
4. Hood front weatherstrip
5. Hood side weatherstrip
6. Bumper
7. Damper
8. Hood support rod
9. Hood heat protector
10. Hood switch
    <Vehicles with theft-alarm system>

Removal steps of hood and hood hinge

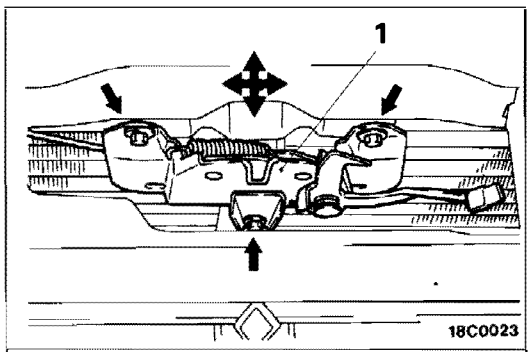
- Washer hose connection

11. Hood
12. Hood hinge

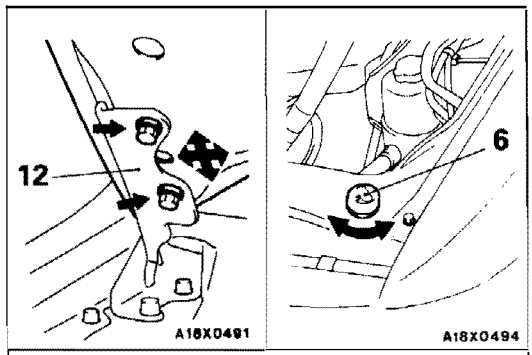
Removal steps of hood lock release cable

- Front bumper and splash shield (driver's side)
  (Refer to GROUP 51 – Front Bumper.)
- Headlamp (driver's side)
  (Refer to GROUP 54 – Headlamp)

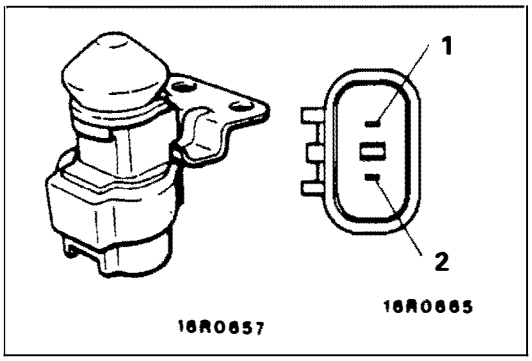
1. Hood latch
2. Hood lock release handle
13. Hood lock release cable



Adjustment of hood step and hood striker linkage



Adjustment of clearance around hood and height



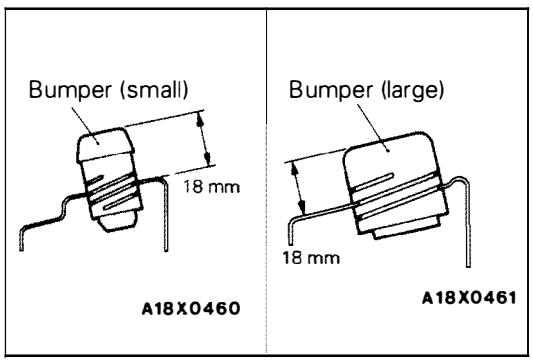
INSPECTION E42ZH22AA

HOOD SWITCH <VEHICLES WITH THEFT-ALARM SYSTEM>

(1) Disconnect the hood switch connector.
(2) Check the continuity between the terminal.

Terminal	1	2
Hood switch unpressed		○—○
Hood switch depressed		

NOTE
○—○ indicates that there is continuity between the terminals.



INSTALLATION SERVICE POINTS E42ZG01AA

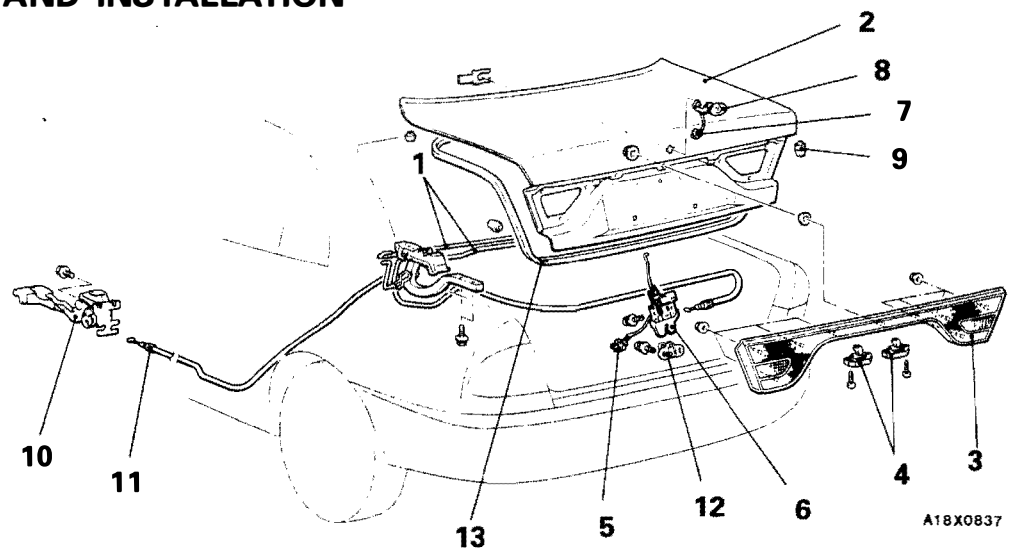
◆A◆ BUMPER INSTALLATION

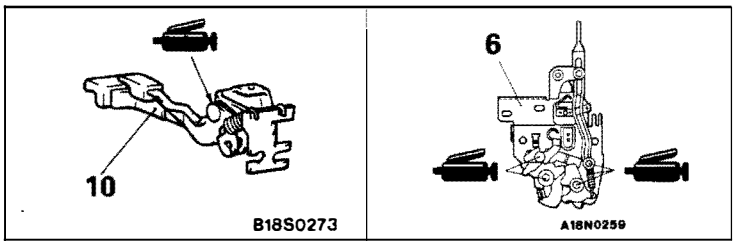
Install the bumper as shown in the diagram.

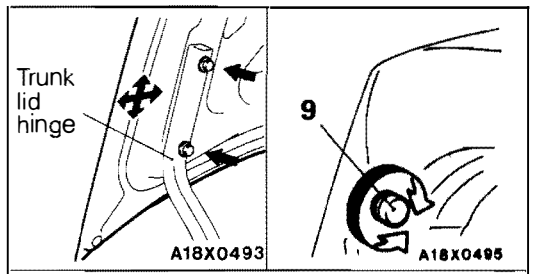
TRUNK LID <Sedan>

REMOVAL AND INSTALLATION

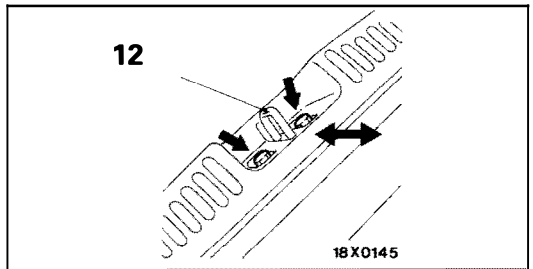
E42ZH00AB







Adjustment of clearance around tailgate



Adjustment of tailgate step and tailgate striker linkage

Removal steps of trunk lid

- Trunk lid trim (Refer to GROUP 52A – Trims.)
- Rear lid harness connection
- Trunk lid lock release cable connection

◇A◇ ◆C◆ 1. Trunk lid torsion bar
2. Trunk lid panel
3. Rear lid lamp
4. License plate lamp
5. Luggage compartment lamp switch connector
   <Vehicles with theft-alarm system>
6. Trunk lid latch
7. Trunk lid lock cylinder switch connector
   <Vehicles with theft-alarm system>
8. Trunk lid lock cylinder

◆B◆ 9. Bumper

Removal steps of trunk lid lock release handle and cable

- Front seat (driver's side) } (Refer to GROUP 52A – Seat.)
- Rear seat
- Center pillar lower trim } (Refer to GROUP 52A – Trims.)
- Front scuff plate (driver's side)
- Rear scuff plate (driver's side)
- Trunk lid trim

10. Trunk lid lock release handle
11. Trunk lid lock release cable

Removal steps of trunk lid latch

- Trunk lid trim (Refer to GROUP 52A – Trims.)

5. Luggage compartment lamp switch connector
   <Vehicles with theft-alarm system>
6. Trunk lid latch

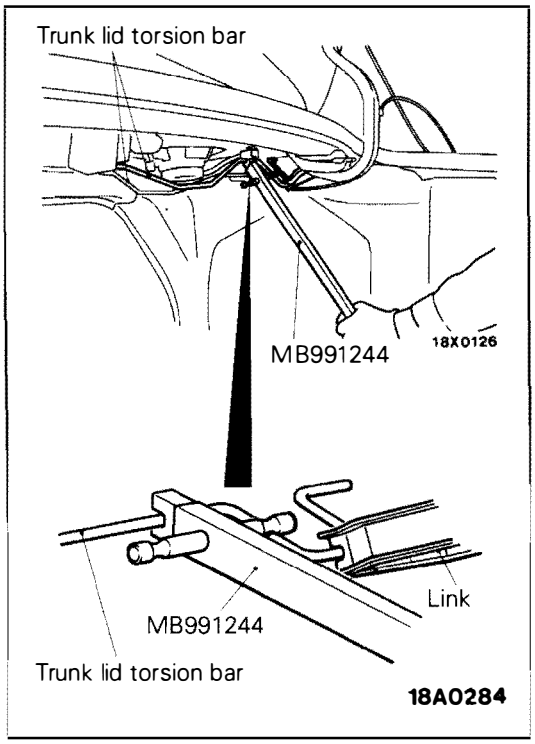
Removal steps of trunk lid striker

- Trunk rear trim cover (Refer to GROUP 52A – Trims.)

12. Trunk lid striker

Removal of trunk lid weatherstrip

◆A◆ 13. Trunk lid weatherstrip



REMOVAL SERVICE POINTS E42ZH01AA

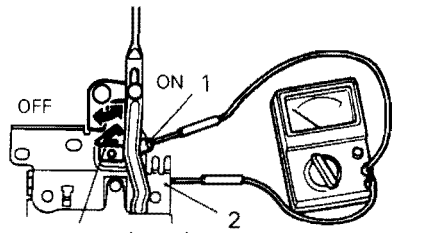
〈A〉 TRUNK LID TORSION BAR REMOVAL

(1) Disconnect the body harness and the harness connector of the rear shelf lower panel.
(2) Attach the special tool to the link side of the torsion bar as shown in the figure, and push downwards to remove the torsion bar from the link.

NOTE
When removing the torsion bars, the left and right torsion bars cross at the centre, so the bar that is towards you at the crossed section should be removed first.

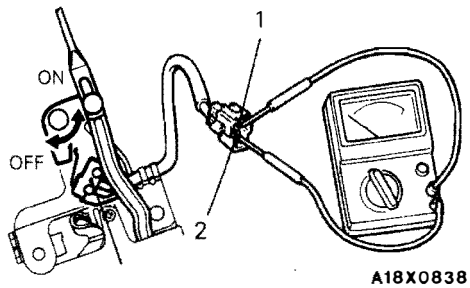
Caution
Be sure to attach the special tool properly, as the body or parts could be damaged when the torsion bar is removed from the special tool.

<Vehicles without theft-alarm system>



Luggage compartment lamp switch

<Vehicles with theft-alarm system>



Luggage compartment lamp switch

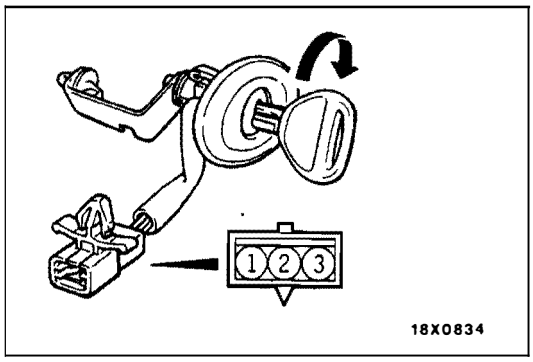
INSPECTION E42ZH02AB

LUGGAGE COMPARTMENT LAMP SWITCH (INCLUDING TRUNK LID LATCH)

Open and shut the trunk lid latch to operate the luggage compartment lamp switch, and check the continuity between the terminals.

Switch position \ Terminal	1	2	Body earth
ON (Latch open)	○	○ *2	○ *1
OFF (Latch shut)			

NOTE
(1) ○—○ indicates that there is continuity between the terminals.
(2) *1 : Vehicles without theft-alarm system.
(3) *2 : Vehicles with theft-alarm system.

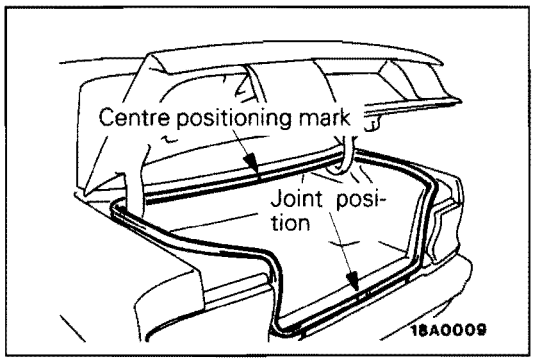


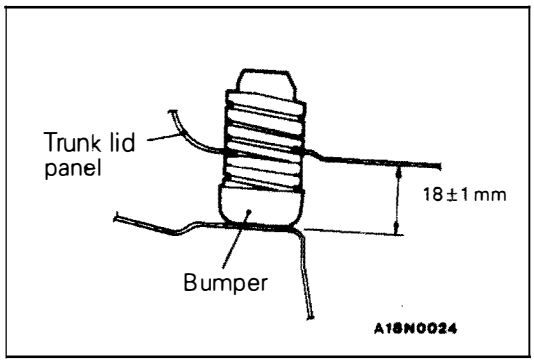
TRUNK LID LOCK CYLINDER SWITCH <VEHICLES WITH THEFT-ALARM SYSTEM>

(1) Turn the key and unlock the lock cylinder.
(2) Check for continuity between the terminals.

Key position \ Terminal	1	2	3
Neutral (OFF)			
UNLOCK (ON)	○		○

NOTE
○—○ indicates that there is continuity between the terminals.





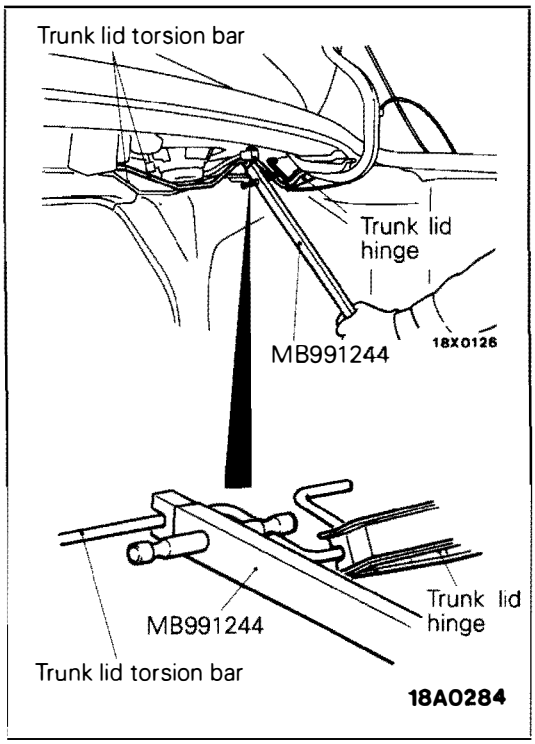
INSTALLATION SERVICE POINTS E42ZH04AA

◆A◆ TRUNK LID WEATHERSTRIP INSTALLATION

Install the trunk lid weatherstrip so that the marked part is at the position shown in the illustration.

◆B◆ BUMPER INSTALLATION

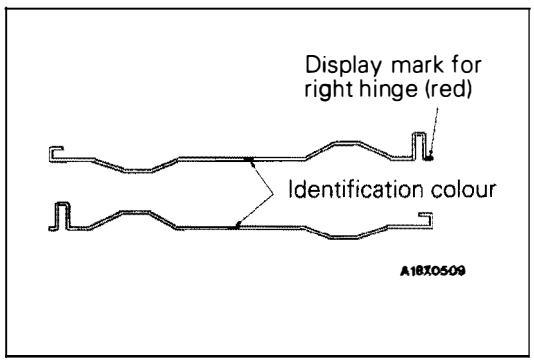
Install the bumper as shown in the figure.



◆C◆ TRUNK LID TORSION BAR INSTALLATION

(1) Insert the end of the torsion bar through the link side mounting hole.
(2) Attach the special tool as shown in the figure.

Caution
Be sure to attach the special tool properly, as the body or parts could be damaged when the torsion bar is removed from the special tool.



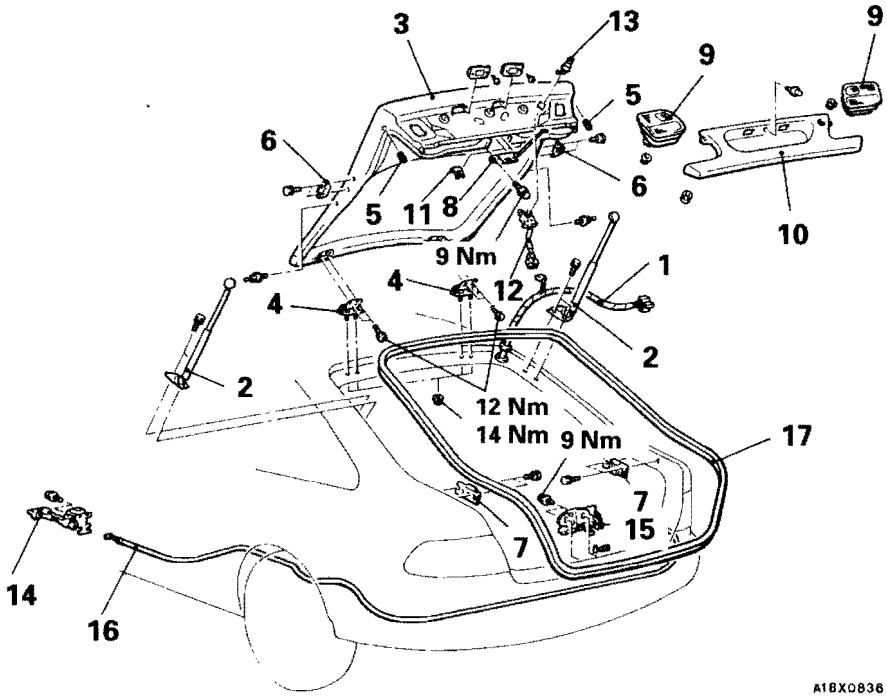
NOTE
The identification colour in the middle of the torsion bar indicates a difference in specifications.

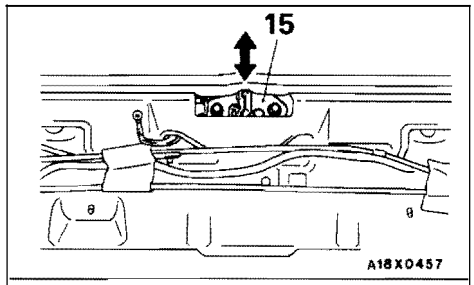
NOTE

TAILGATE <Hatchback>

REMOVAL AND INSTALLATION

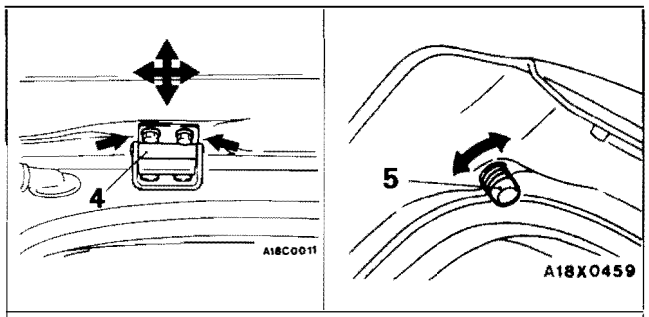
E42ZH10AB





Adjustment of tailgate step and tailgate striker linkage

A18X0836



Adjustment of clearance around tailgate

Pre-removal and Post-installation Operation Removal and Installation <Tailgate>
- Rear Wiper and Motor (Refer to GROUP 51 – Rear Wiper and Washer.)

Tailgate and tailgate hinge removal steps
- Tailgate trim (Refer to GROUP 52A – Trims.)

1. Harness connection
◆C◆ 2. Tailgate gas spring
3. Tailgate panel
- Rear roof rail trim (Refer to GROUP 52A – Headlining.)

4. Tailgate hinge
◆B◆ 5. Bumper
6. Damper upper
7. Damper lower

Tailgate latch and tailgate lock cylinder removal steps
- Tailgate lower trim (Refer to GROUP 52A – Trims.)

8. Tailgate latch
9. Rear combination lamp
10. Tailgate garnish (Refer to GROUP 51 – Grill and Garnishes)
11. Cylinder lock retainer
12. Tailgate lock cylinder switch <Vehicles with theft-alarm system>
13. Tailgate lock cylinder

Tailgate lock release handle and cable removal steps
- Front seat
- Side seatback assembly

} (Refer to GROUP 52A – Front Seat and Rear Seat.)
- Scuff plate
- Rear end trim
- Rear side trim

} (Refer to GROUP 52A – Trims.)

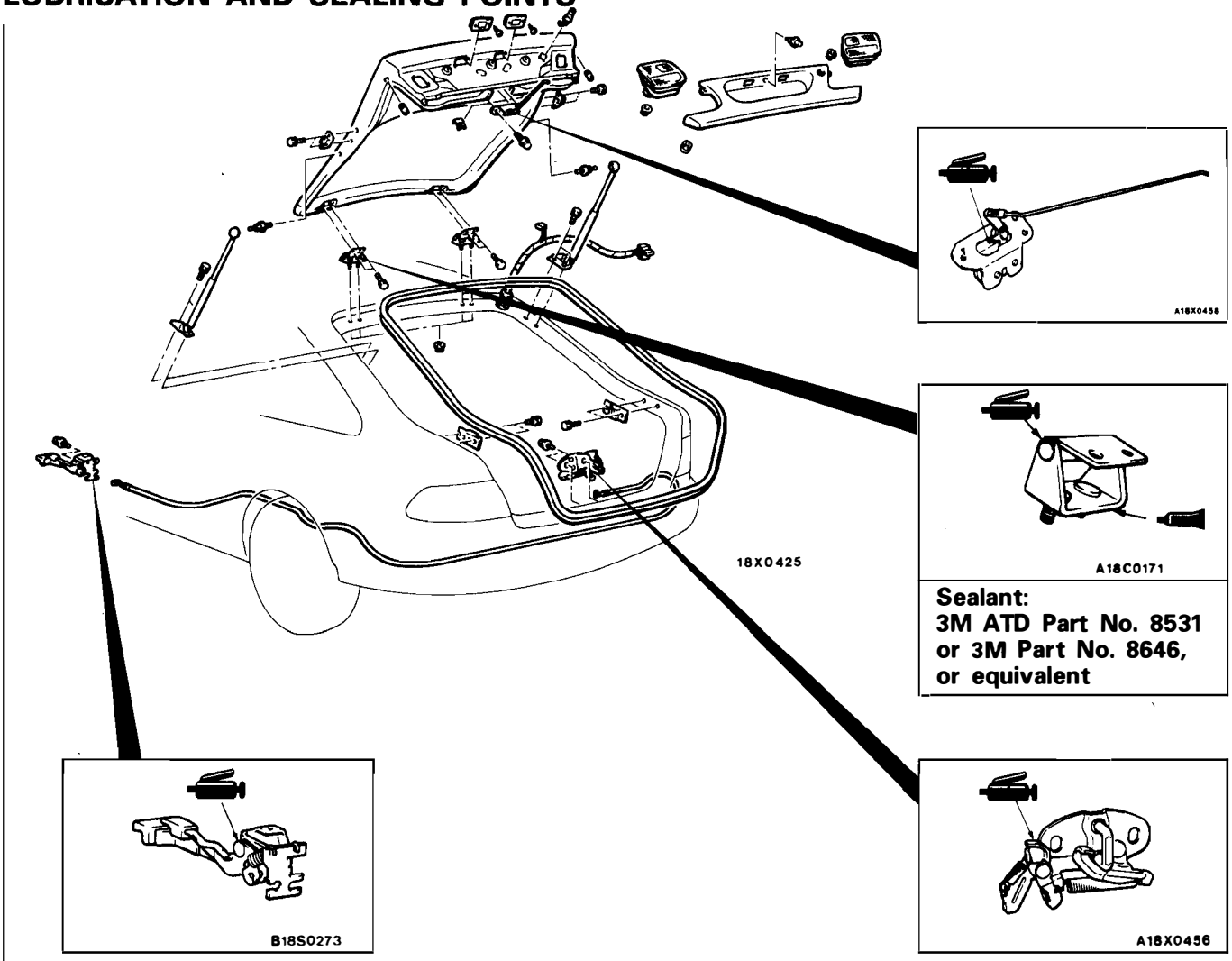
14. Tailgate lock release handle
15. Tailgate striker
16. Tailgate lock release cable

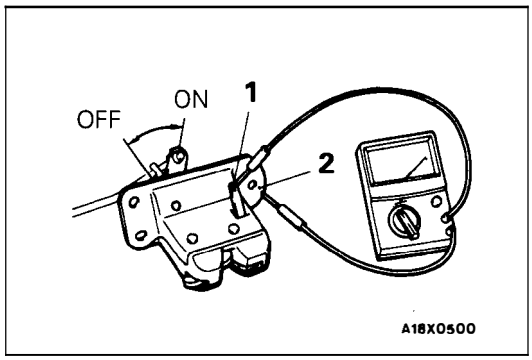
Tailgate opening weatherstrip removal steps

◆A◆ 17. Tailgate opening weatherstrip

Caution
1. **Never try to disassemble the tailgate gas spring or burn it.**
2. **Always bore a hole in the tailgate gas spring to release the interior gas before the gas spring is discarded.**

LUBRICATION AND SEALING POINTS





INSPECTION

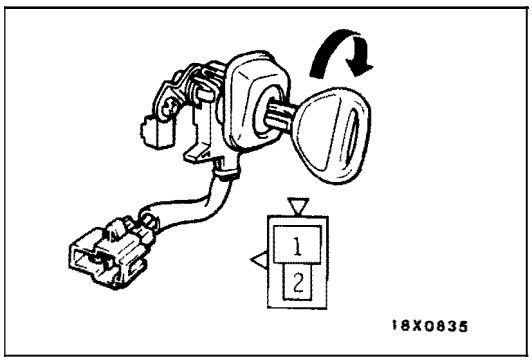
E42ZH12AB

LUGGAGE COMPARTMENT LAMP SWITCH (INCLUDING TAILGATE LATCH)

Open and shut the tailgate latch to operate the luggage compartment lamp switch, and check the continuity between the terminals.

Terminal / Switch position	1	2 (Body earth)
ON (Latch open)	○———	———○
OFF (Latch shut)		

NOTE
○—○ indicates that there is continuity between the terminals.

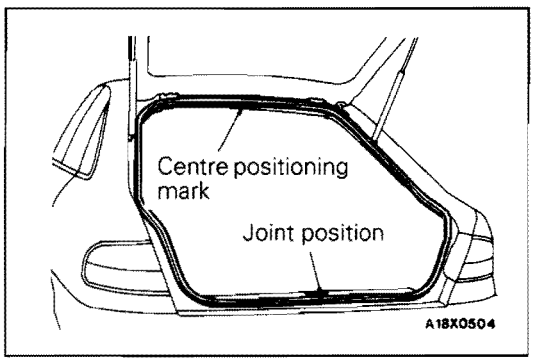


TAILGATE LOCK CYLINDER SWITCH <VEHICLES WITH THEFT-ALARM SYSTEM>

(1) Turn the key and unlock the lock cylinder.
(2) Check for continuity between the terminals.

Terminal / Key position	1	2
Neutral (OFF)		
UNLOCK (ON)	○	○

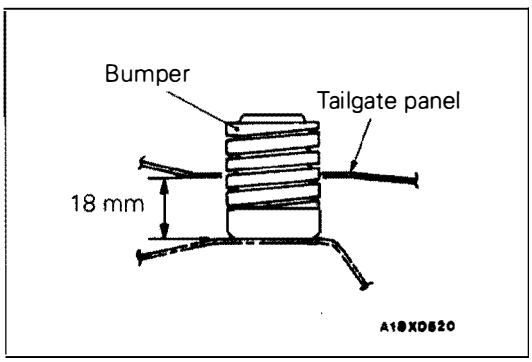
NOTE
○—○ indicates that there is continuity between the terminals.



INSTALLATION SERVICE POINTS E42ZH14AA

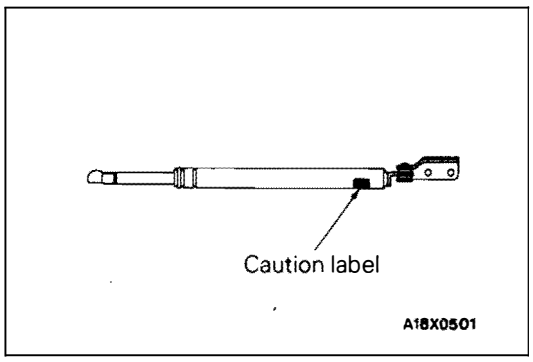
◆A◆ TAILGATE OPENING WEATHERSTRIP INSTALLATION

Install the tailgate opening weatherstrip so that the marked part is at the position shown in the illustration.



◆B◆ BUMPER INSTALLATION

Install the bumper so that the amount of projection from the tailgate panel is as shown in the illustration.



◆C◆ TAILGATE GAS SPRING INSTALLATION

Specifications can be differentiated by the colour of the caution label on the tailgate gas spring.

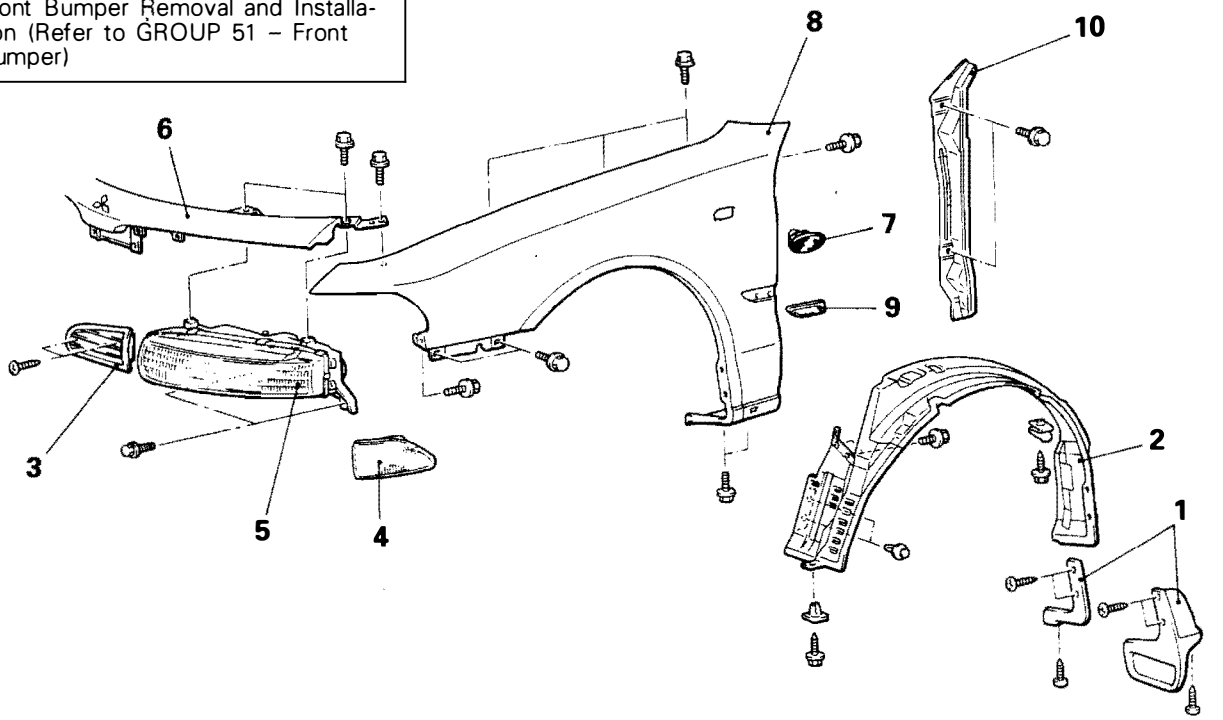
Caution label colour	Specifications
Gold	Vehicles without rear spoiler
Silver	Vehicles with rear spoiler

FENDER

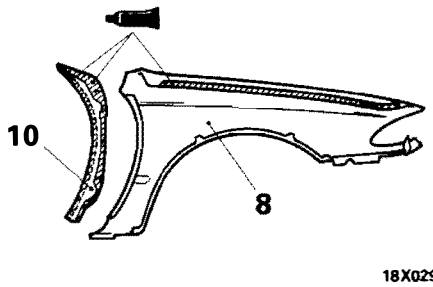
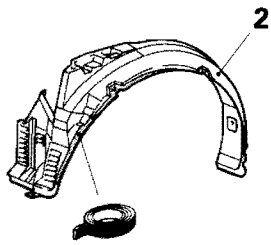
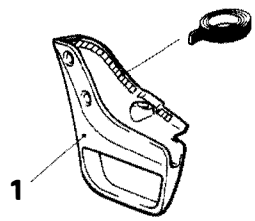
REMOVAL AND INSTALLATION

E42ZI00AB

Pre-removal and Post-installation Operation
- Front Bumper Removal and Installation (Refer to GROUP 51 – Front Bumper)



A18X0423

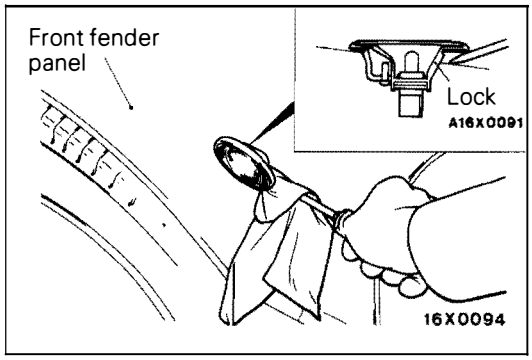
 18X0299	 18X0215	 18X0270
Sealant : 3M ATD Part No. 8531 or 3M Part No. 8646, or equivalent	**Sealant : 3M ATD Part No. 8625 or equivalent**	**Sealant : 3M ATD Part No. 8625 or equivalent (Vehicles built up to June 1993)**

Removal steps

1. Stone guard or front mud guard
2. Splash shield
3. Radiator grille
4. Front turn signal lamp
5. Headlamp assembly
6. Header panel assembly (Refer to P.42-68)

◇A◇ ◆A◆ 7. Side turn signal lamp

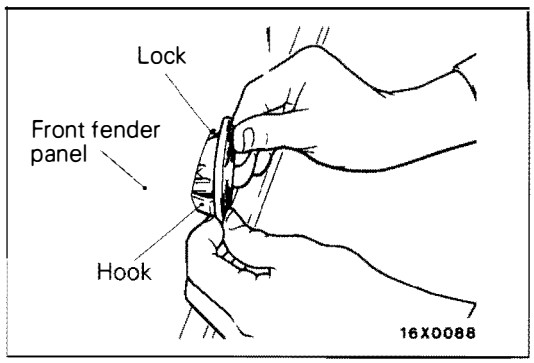
8. Front fender panel
9. Side protector moulding (Refer to GROUP 51 – Mouldings)
10. Front fender insulator



REMOVAL SERVICE POINTS E42ZI01AA

◇A◇ SIDE TURN SIGNAL LAMP REMOVAL

Use a flat-tipped (–) screwdriver or similar tool to remove the lock from the fender panel, and then remove the side turn signal lamp.



INSTALLATION SERVICE POINTS E42ZI04AA

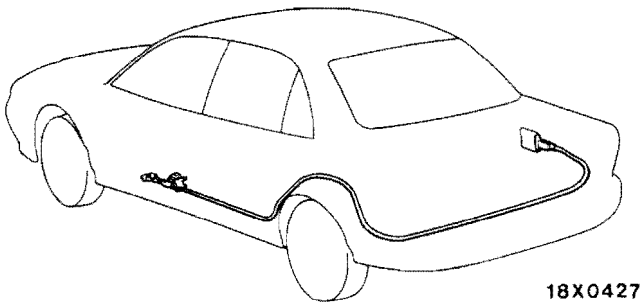
◆A◆ SIDE TURN SIGNAL LAMP INSTALLATION

(1) Fit the lock into the fender panel.
(2) Push the side turn signal lamp in from the fender panel side, and secure it with the hook.

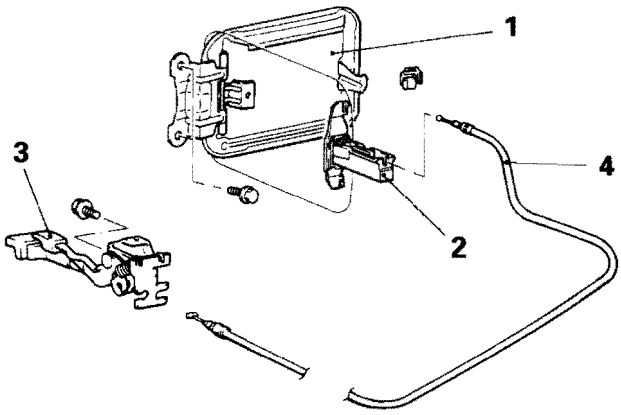
FUEL FILLER DOOR

REMOVAL AND INSTALLATION

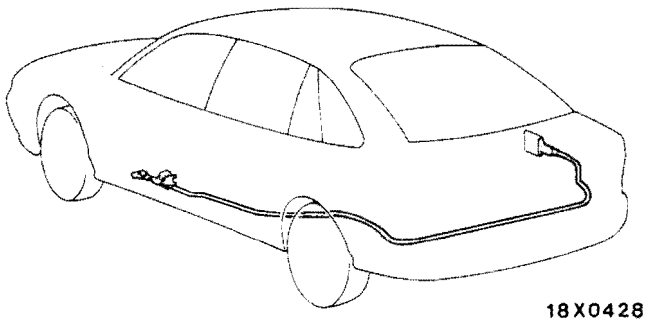
E42ZJ00AA



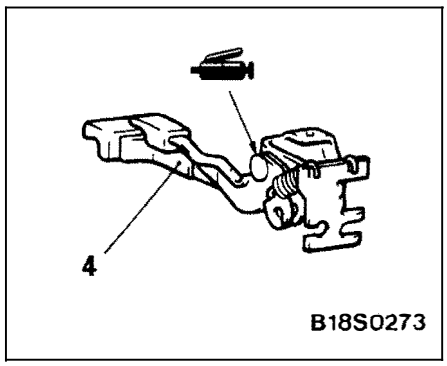
18X0427



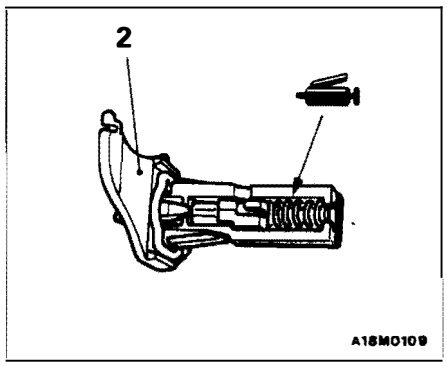
A18X0426



18X0428



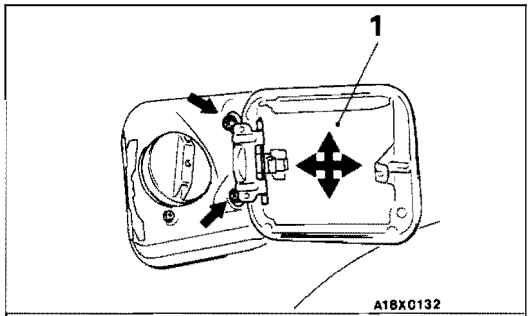
B18S0273



A18M0109

Pre-removal and Post-installation Operation
<Sedan>
- Front Seat (driver's side), Rear Seat Removal and Installation (Refer to GROUP 52A – Seat.)
- Centre Pillar Lower Trim (driver's side), Front Scuff Plate (driver's side), Rear Scuff Plate (driver's side), Trunk Side Trim, Rear End Trim Cover, Trunk Rear Trim Removal and Installation (Refer to GROUP 52A – Trims.)
- Trunk Side Box and Corner Plate Removal and Installation (Refer to GROUP 52A – Trims.)

<Hatchback>
- Front Seat (driver's side), Rear Seat Removal and Installation (Refer to GROUP 52A – Seat.)
- Centre Pillar Lower Trim (driver's side), Front Scuff Plate (drive's side), Rear Scuff Plate (driver's side), Rear End Trim, Rear Side Trim Removal and Installation (Refer to GROUP 52A – Trims.)
- Corner Plate Removal and Installation (Refer to GROUP 52A – Trims.)



A18X0132

Adjustment of step and clearance around fuel filler door

Removal steps

1. Fuel filler door assembly
2. Fuel filler door lock hook assembly
3. Lid lock release handle
4. Fuel filler door release cable

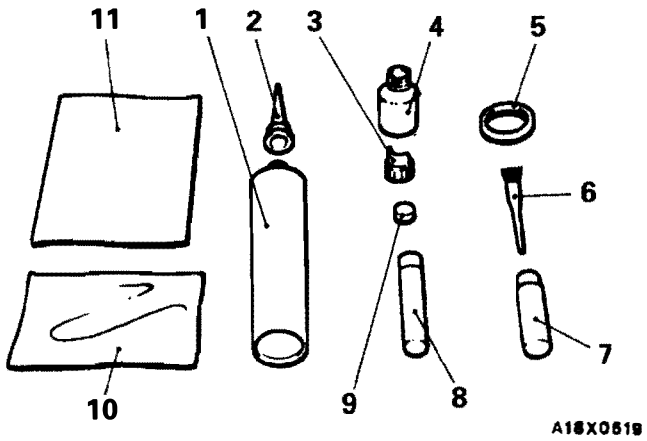
WINDOW GLASS

E42ZK00AA

WINDOW REPAIR

- Adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent
  Primer: 3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent
- Auto Window Sealer Kit TEROSON-127, 37V

1. Sealer
2. Nozzle
3. Primer container
4. Primer container cap
5. Piano wire
6. Brush
7. Cleaner
8. Primer
9. Filter
10. Gauze
11. Instruction manual



NOTE
When using TEROSON-127, 37V, follow the instructions of the manual included in the kit.

Additional material required	
Spacers	Available as service part
Dam	Available as service part
Anti-rust solvent (or Tectyl 506T....Valvoline Oil Company)	For rust prevention
Isopropyl alcohol	For grease removal from bonded surface
Steel piano wire	Dia. × length....0.6 mm × 1 m
	For cutting adhesive
Adhesive gun	For pressing-out adhesive

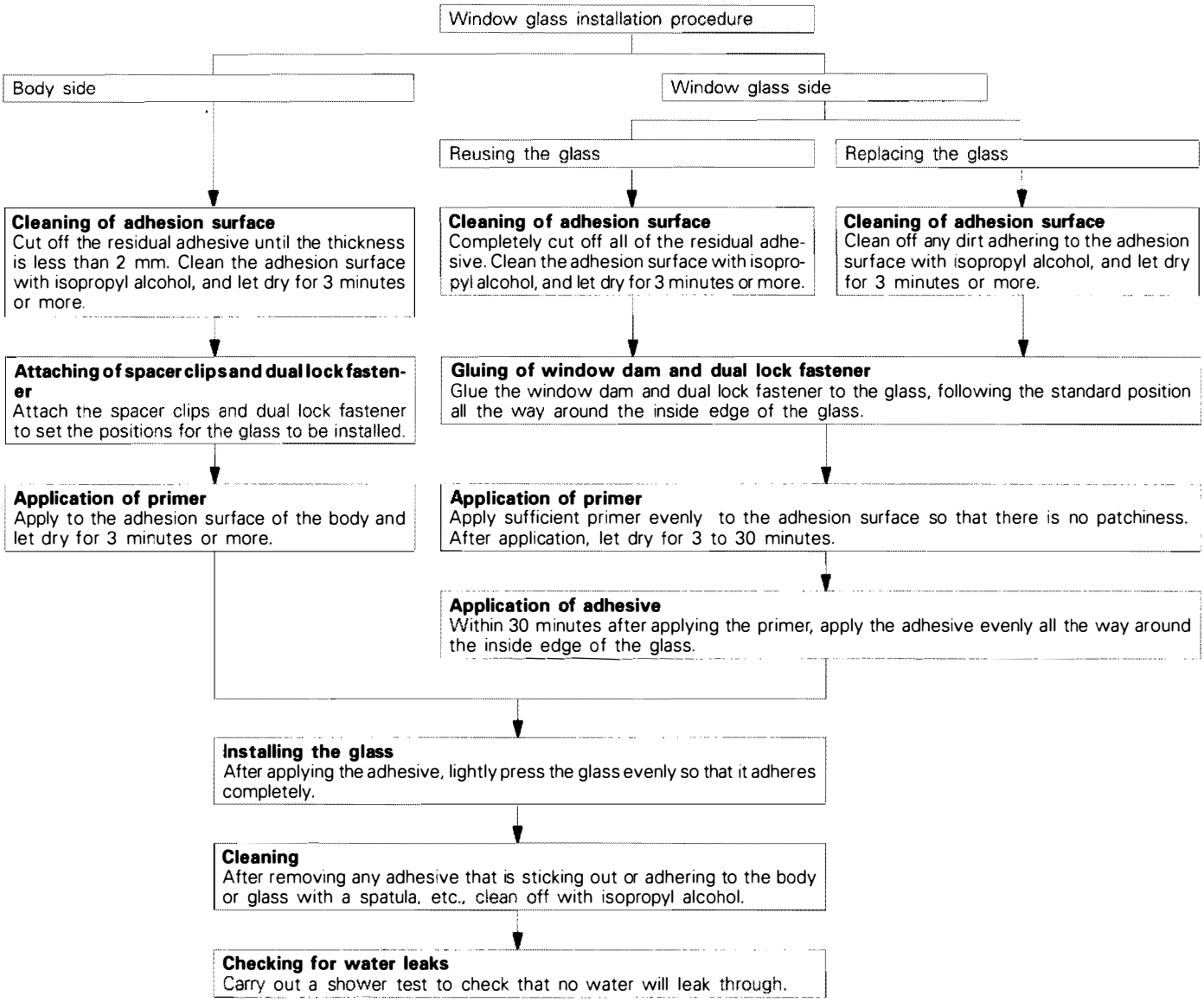
HANDLING OF AUTO WINDOW SEALER

Keep the sealant in a cool place, not exposed to the direct rays of the sun.
Do not place any heavy article on the sealant nor press it, otherwise it will become deformed.
Avoid storing the sealant for more than 6 months, because it will lose its sealing effect.

BODY PINCH-WELD FLANGE SERVICING

Before servicing the body pinch-weld flange, remove old adhesive completely.
If the flange requires painting, bake it after painting is completed.

WORKING PROCESS



WINDSHIELD

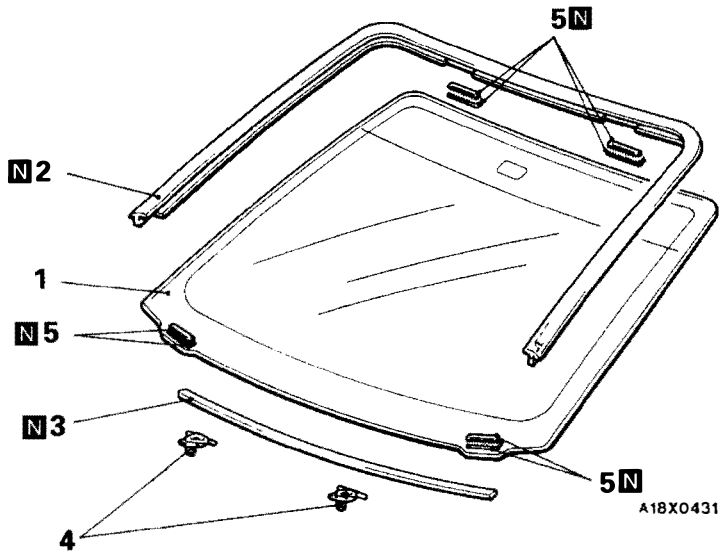
REMOVAL AND INSTALLATION

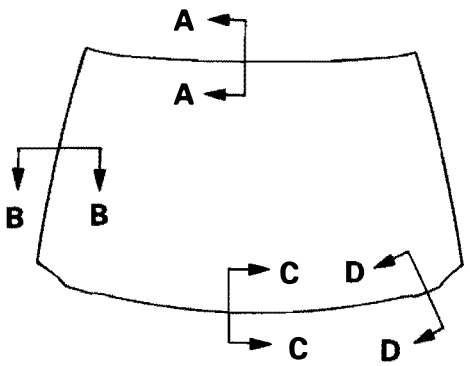
E42ZK00BB

Pre-removal and Post-installation Operation
Removal and Installation
- Front Deck Garnish (Refer to GROUP 51 – Grille and Garnishes.)
- Roof moulding (Refer to GROUP 51 – Mouldings.)
- Front Pillar Trim (Refer to GROUP 52A – Trims.)
- Headlining (Refer to GROUP 52A – Headlining.)

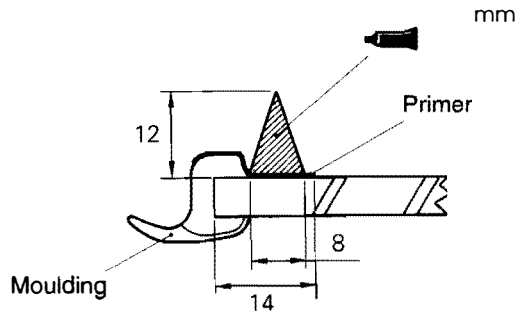
Removal steps

〈A〉 ▶B◀ 1. Windshield
2. Moulding
3. Window dam
4. Spacer clip
▶A◀ 5. Dual-lock fastener

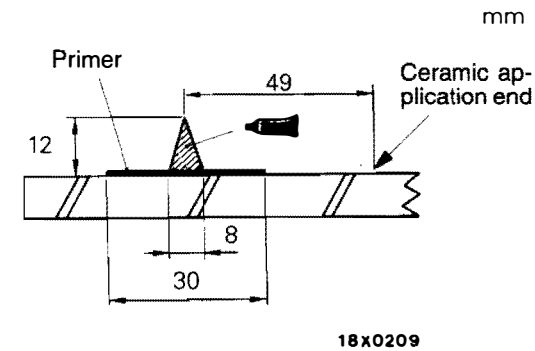




Section A – A, B – B



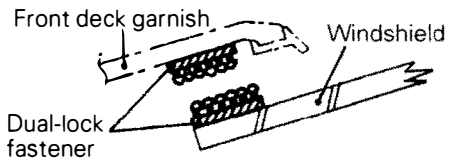
Section C – C



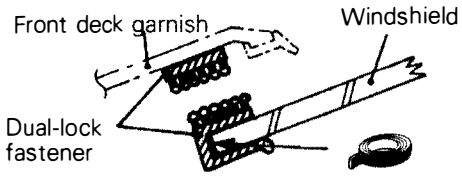
Adhesive :
3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent

Section D – D

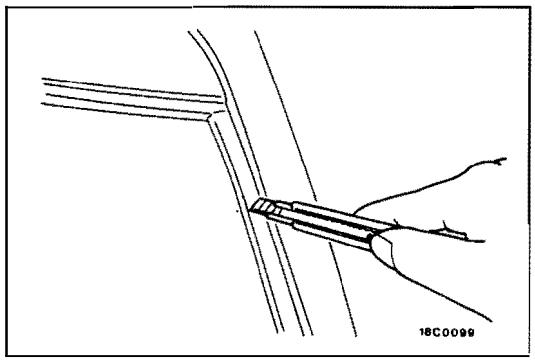
(Vehicles built up to April 1993)



(Vehicles built from May 1993)



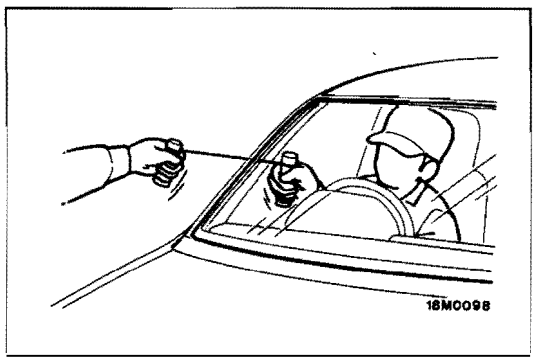
Adhesive tape :
Both-side tape 20 mm wide and 1.2 mm thick



REMOVAL SERVICE POINTS E42ZK01AA

◇A◇ WINDSHIELD GLASS REMOVAL

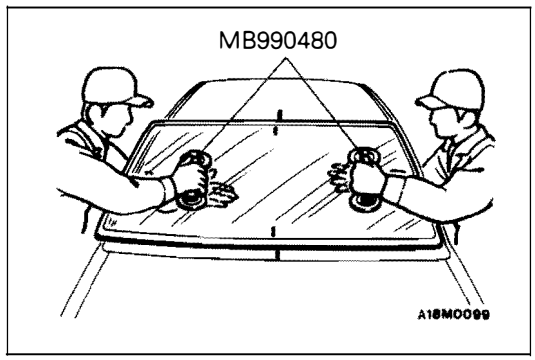
(1) In order to protect the body (paint surface), apply cloth tape to all body areas around the installed windshield glass.
(2) Cut the moulding with a cutter knife.



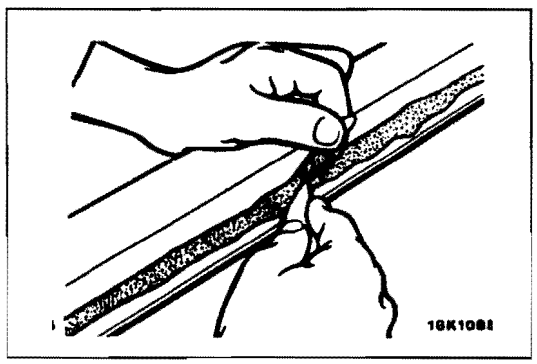
(3) Using a sharp-point drill, make hole in the windshield glass adhesive.
(4) Pass the piano wire from the inside of the vehicle through the hole.
(5) Pull the piano wire alternately from the inside and outside along the windshield glass to cut the adhesive.

Caution
Do not let the piano wire touch the edge of the windshield glass.

(6) Make mating marks on the windshield glass and body.



(7) Use the special tool to remove the windshield glass.

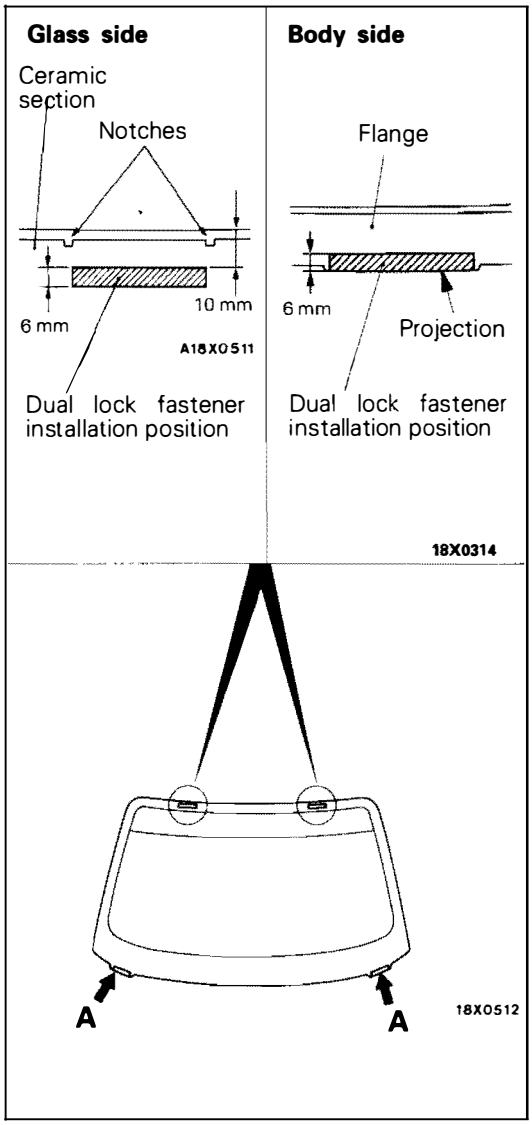


(8) Use a knife to cut away the remaining adhesive so that the thickness is within 2 mm around the entire circumference of the body flange.
(9) Finish the flange surfaces so that they are smooth.

Caution
1. **Be careful not to remove more adhesive than is necessary.**
2. **Be careful also not damage the paintwork on the body surface with the knife. If the paintwork is damaged, repair the damaged area with repair paint or anti-rust agent.**

(10) When reusing the glass, remove the adhesive still adhering to the glass, and clean with isopropyl alcohol.
(11) Clean the body side in the same way.

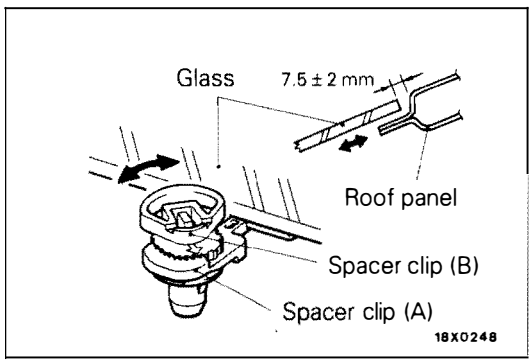
Caution
Let the cleaned places stand for 3 minutes or more, and carry out the next procedures after they have dried. Also, do not touch any surface that has been cleaned.



INSTALLATION SERVICE POINTS E42ZK04AA

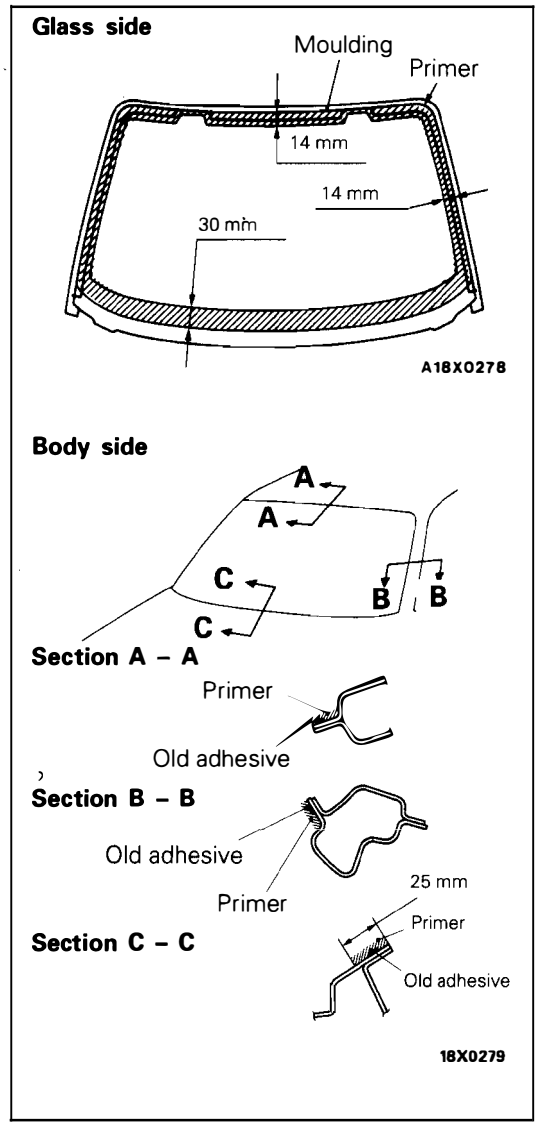
◗A◖ DUAL LOCK FASTENER INSTALLATION

(1) Wipe the windshield glass section in the figure with isopropyl alcohol to clean it and to remove all grease, etc.
(2) Attach the dual lock fastener in the places shown in the illustration so that there are no bends or wrinkles on the inside of the windshield glass or the body
(3) Attach the dual lock fastener (for attaching the front deck garnish) to the outside of the windshield at section A.



◗B◖ WINDSHIELD GLASS INSTALLATION

(1) Adjust spacer clip (B) so that the distance between the top edge of the glass and the body is as shown in the illustration.

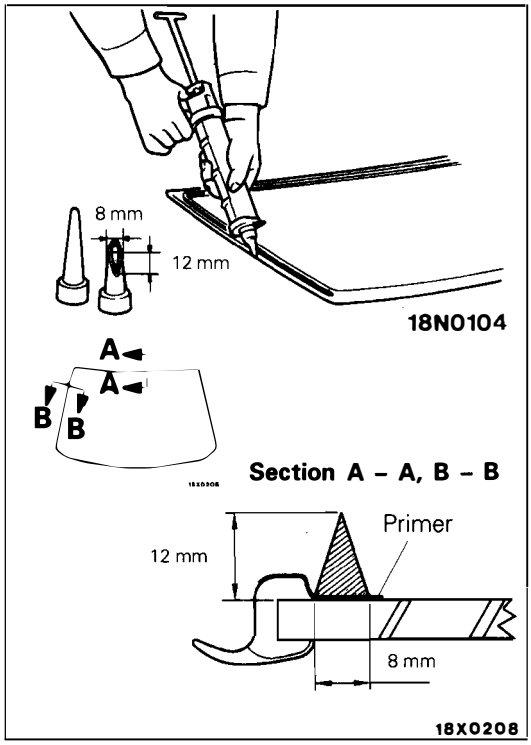


(2) Soak a sponge in the primer, and apply evenly to the glass and the body in the places shown in the illustration.

Specified primer:
3M Super Fast Urethane 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. But, a too thick application will cause lowering of the adhesive strength.**
2. **Do not touch the coated surface.**

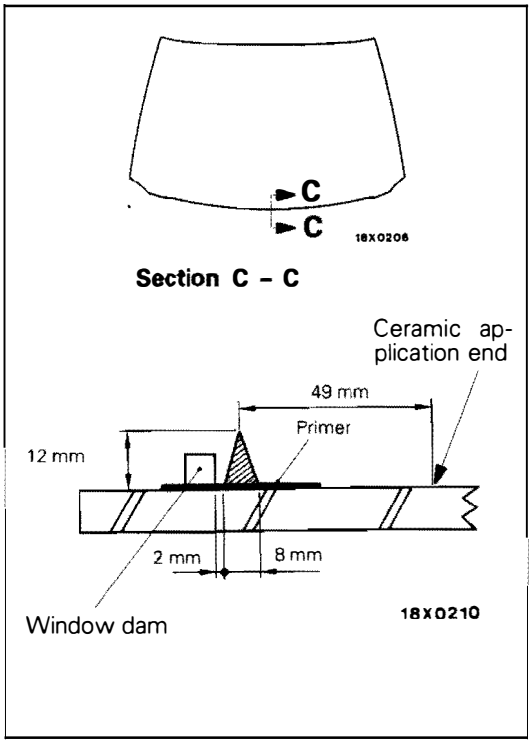
(3) After applying the primer, let it dry for 3 to 30 minutes.

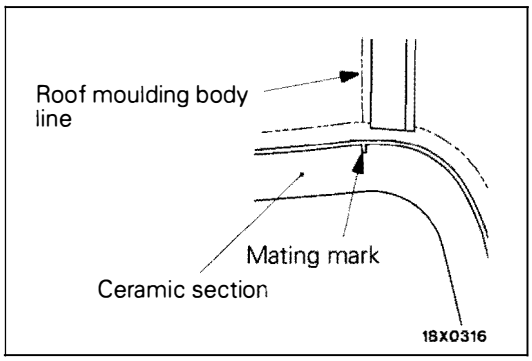


(4) Within 30 minutes after applying the primer, fill the sealant gun with adhesive and apply the adhesive evenly around the entire circumference of the windshield.

Specified adhesive:
3M Super Fast Urethane 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.





(5) After applying the adhesive, match up the marks on the glass and the body.
(6) After removing any adhesive that is sticking out or adhering to the body or glass with a spatula, etc., clean off with isopropyl alcohol.
(7) After completion of this operation (after installing the glass), place it somewhere where it will not be disturbed, until the adhesive sets.

Caution
It heat is applied with an infra-red lamp to shorten the setting time, keep the surface temperature of the adhesive below 60°C

(8) After attaching the windshield glass to the body, let it stand for 30 minutes or more, and then test for water leakage.

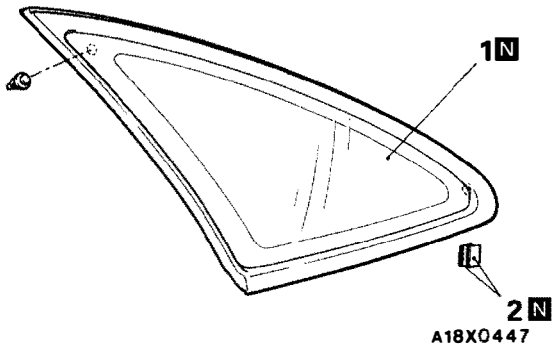
Caution
1. **If moving the vehicle, it should be done gently.**
2. **When testing for water leakage, do not pinch the end of the hose to spray the water.**

QUARTER WINDOW GLASS <Hatchback>

REMOVAL AND INSTALLATION

E42ZK10AA

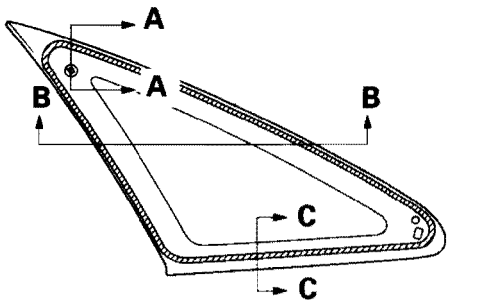
Pre-removal and Post-installation Operation
- Rear Pillar Trim Removal and Installation (Refer to GROUP 52A – Trims.)



A18X0447

Removal steps

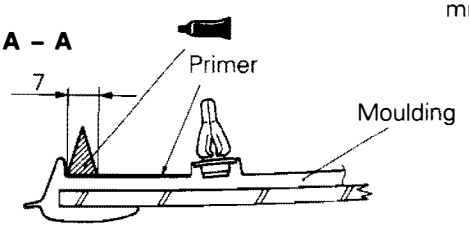
〈A〉 〈B〉 1. Quarter window glass and moulding assembly
〈A〉 2. Dual-lock fastener



18X0435

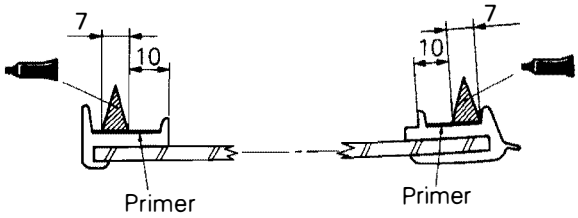
mm

Section A – A



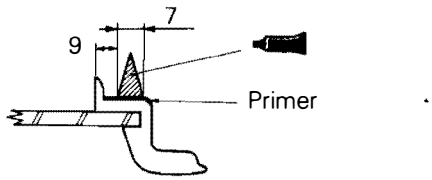
A18X0437

Section B – B



A18X0438

Section C – C



A18X0439

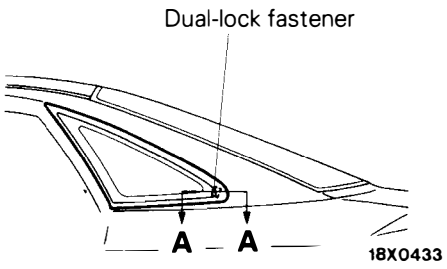
Adhesive:
3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent

REMOVAL SERVICE POINTS

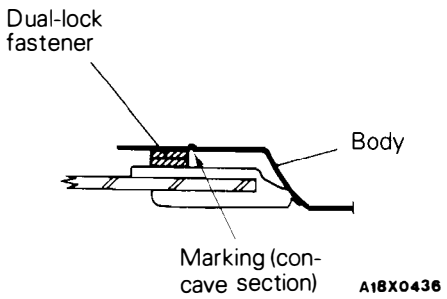
E42ZK11AA

〈A〉 QUARTER WINDOW GLASS AND MOULDING ASSEMBLY REMOVAL

(1) Apart from the quarter window glass and moulding assembly clip, remove by the same procedure as for the windshield. (Refer to P.42-34.)
(2) Press the quarter window glass and moulding assembly from the passenger compartment and remove the clip section while removing the quarter window glass and moulding assembly.



Section A – A

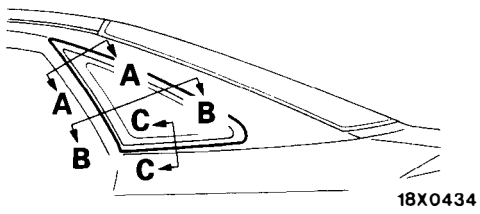


INSTALLATION SERVICE POINTS E42ZK14AA

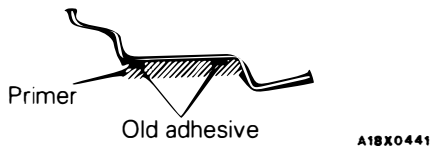
◆A◆ DUAL LOCK FASTENER INSTALLATION

Clean all grease from the quarter window moulding and body flange shown in the illustration with isopropyl alcohol, and install the dual lock fastener.

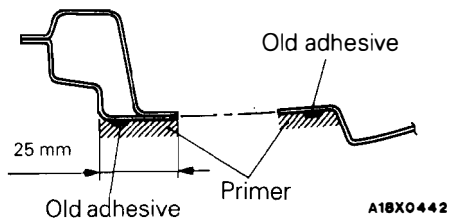
Body side



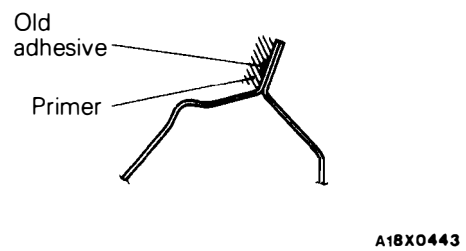
Section A – A



Section B – B



Section C – C



◆B◆ REAR QUARTER WINDOW GLASS INSTALLATION

(1) Clean with isopropyl alcohol.
(2) Soak a sponge in the primer, and apply evenly to the glass moulding and the body in the places shown in the illustration.

Caution
1. The primer strengthens the adhesive strength, so be sure to apply it evenly around the entire circumference. But, a too thick application will cause lowering of the adhesive strength.
2. Do not touch the coated surface.

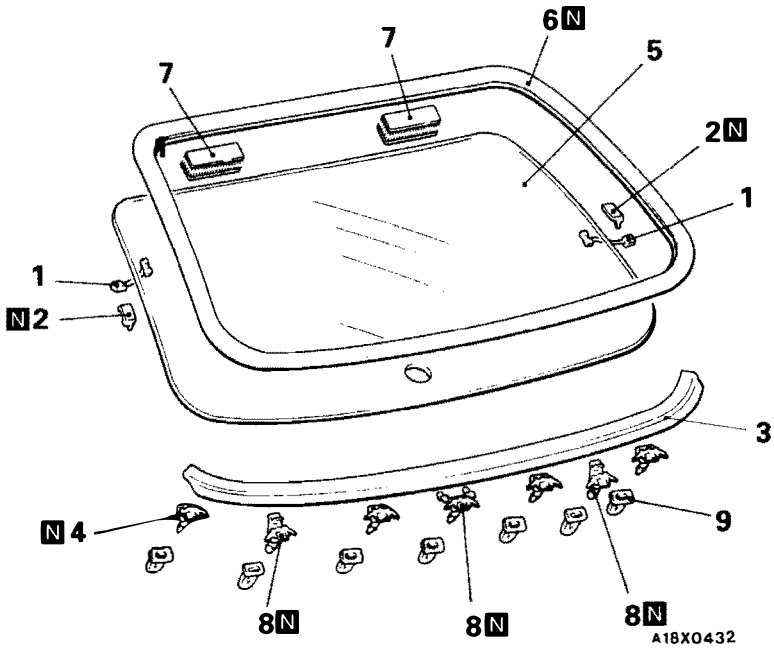
(3) After applying the primer, let it dry for 3 to 30 minutes.
(4) After this, install by the same procedure as that for the windshield.

REAR WINDOW GLASS <Sedan>

REMOVAL AND INSTALLATION

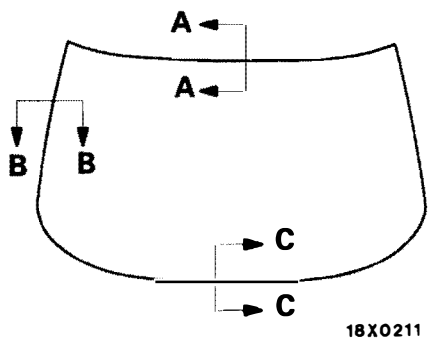
E42ZK20AA

Pre-removal and Post-installation Operation
Removal and Installation
- Trunk Lid (Refer to P.42-22.)
- Rear wiper arm (Refer to GROUP 51 – Rear Wiper and Washer.)
- Roof moulding (Refer to GROUP 51 – Mouldings.)
- Rear shelf trim (Refer to GROUP 52A – Trims.)
- Rear Pillar Trim (Refer to GROUP 52A – Trims.)
- Headlining (Refer to GROUP 52A – Headlining.)

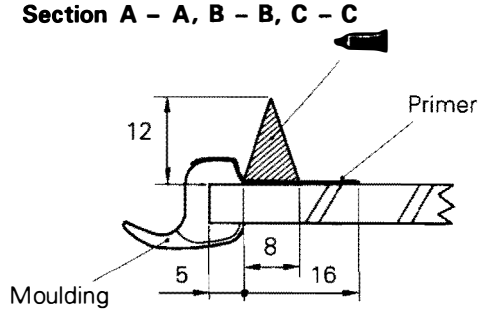


Removal steps
1. Harness connector
2. Side spacer clip
〈A〉 3. Moulding cover
4. Moulding cover clip
〈B〉 ◗B◖ 5. Rear window glass
6. Moulding
◗A◖ 7. Dual-lock fastener
8. Spacer clip
9. Grommet clip

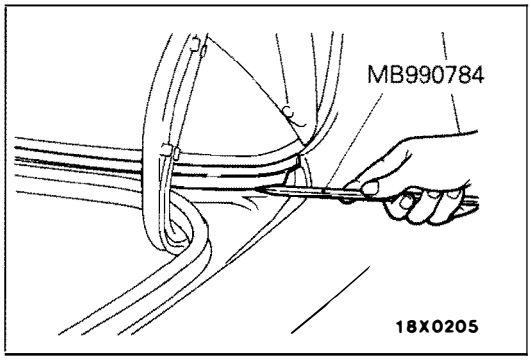
mm



Section A – A, B – B, C – C



Adhesive:
3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent



REMOVAL SERVICE POINTS

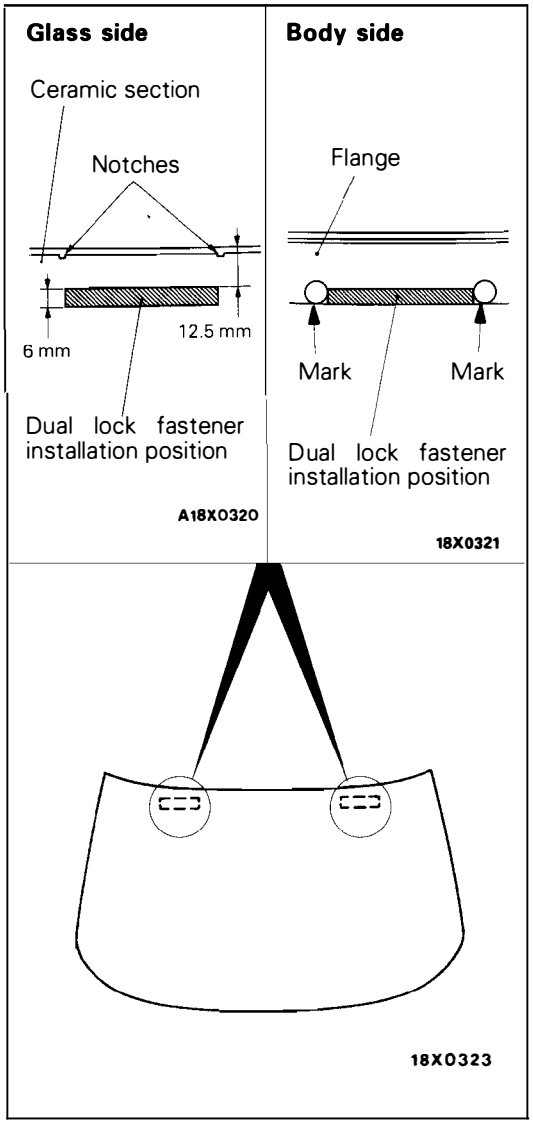
E42ZK21AA

〈A〉 MOULDING COVER REMOVAL

Remove by using the special tool to lever out the moulding cover.

〈B〉 REAR WINDOW GLASS REMOVAL

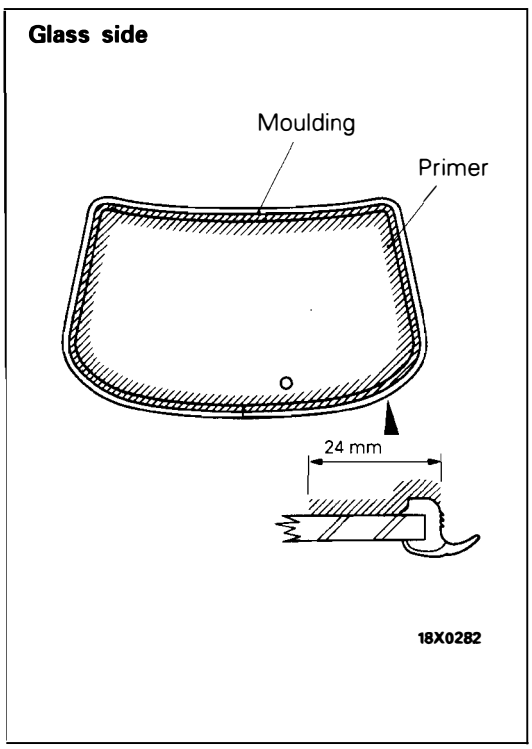
Remove the window glass by the same procedure as for the windshield. (Refer to P.42-34.)



INSTALLATION SERVICE POINTS E42ZK24AA

◗A◖ DUAL LOCK FASTENER INSTALLATION

(1) Wipe the windshield glass section in the figure with isopropyl alcohol to clean it and to remove all grease, etc.
(2) Attach the dual lock fastener in the places shown in the illustration so that there are no bends or wrinkles on the inside of the windshield glass or the body.



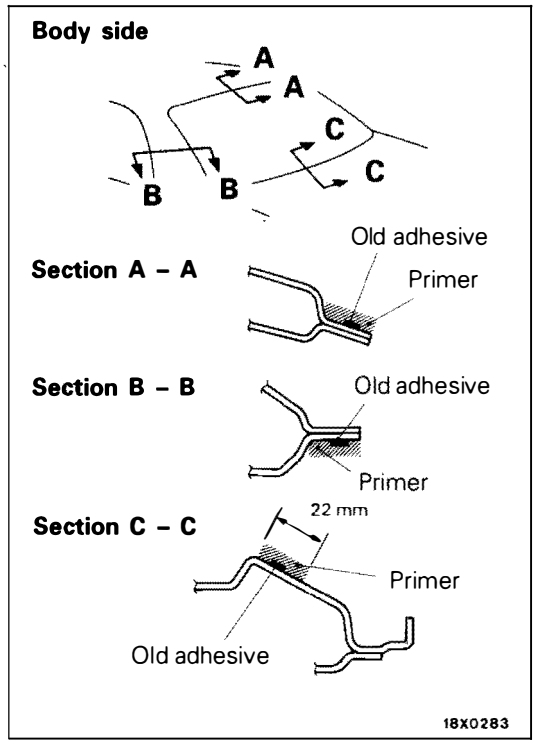
◗B◖ REAR WINDOW GLASS INSTALLATION

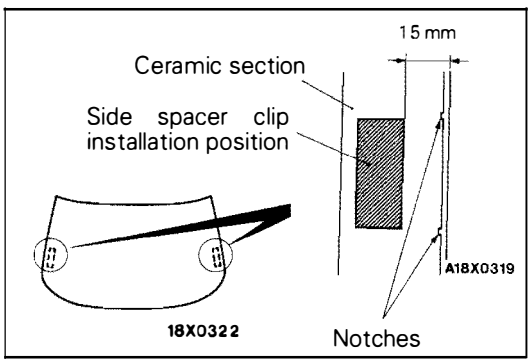
(1) Soak a sponge in the primer, and apply evenly to the glass and the body in the places shown in the illustration.

Specified primer:
3M Super Fast Urethane Primer Part No. 8608 or equivalent

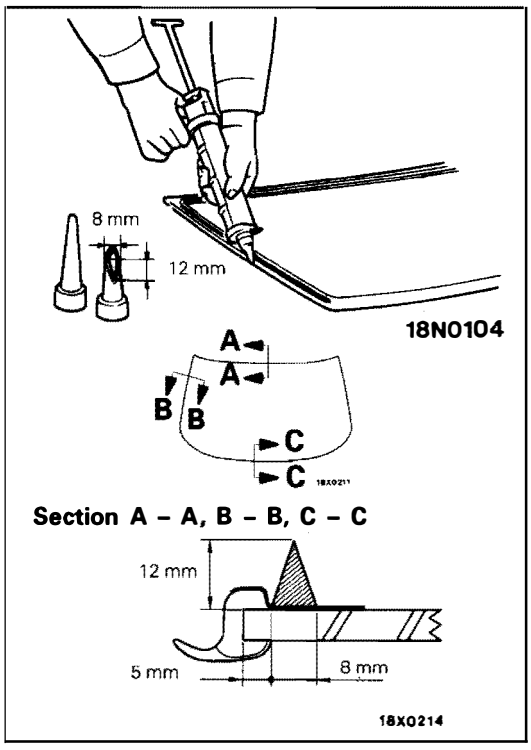
Caution
1. **The primer strengthens the adhesive strength, so be sure to apply it evenly around the entire circumference. But, a too thick application will cause lowering of the adhesive strength.**
2. **Do not touch the coated surface.**

(2) After applying the primer, let it dry for 3 to 30 minutes.





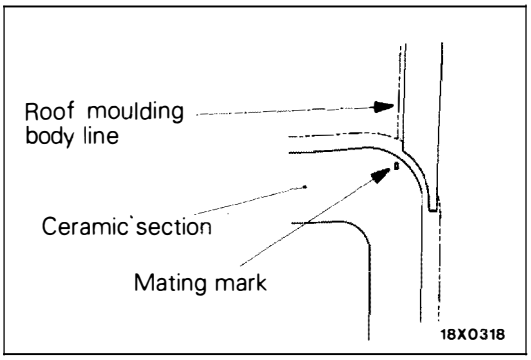
(3) Attach the specified both-side tape to the side spacer clips, and then install the side spacer clips to the window glass in the positions shown in the illustration.



(4) Within 30 minutes after applying the primer, fill the sealant gun with adhesive and apply the adhesive evenly around the entire circumference of the rear window glass

Specified adhesive:
3M Super Fast Urethane 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.



(5) After applying the adhesive, match up the marks on the glass and the body.
(6) After removing any adhesive that is sticking out or adhering to the body or glass with a spatula, etc., clean off with isopropyl alcohol.
(7) 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 60°C.

(8) After attaching the rear window glass to the body, let it stand for 30 minutes or more, and then test for water leakage.

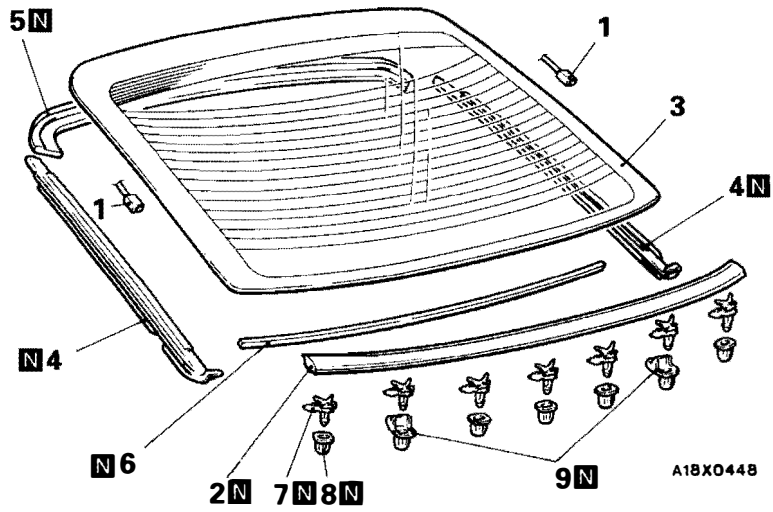
Caution
1. **If moving the vehicle, it should be done gently.**
2. **When testing for water leakage, do not pinch the end of the hose to spray the water.**

TAILGATE WINDOW GLASS <Hatchback>

REMOVAL AND INSTALLATION

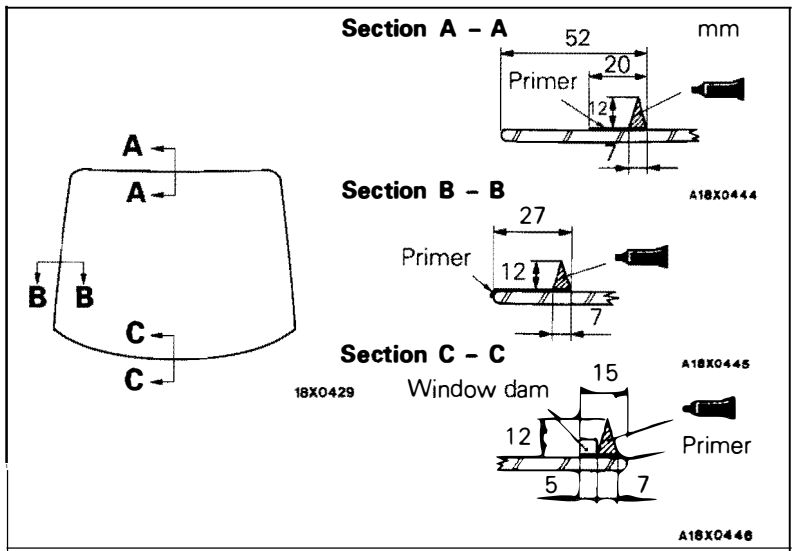
E42ZK30AA

Pre-removal and Post-installation Operation
Removal and Installation
- Tailgate Trim (Refer to GROUP 52A – Trims.)
- High Mounted Stop Lamp <L.H. drive vehicles> (Refer to GROUP 51 – Aero Parts.)

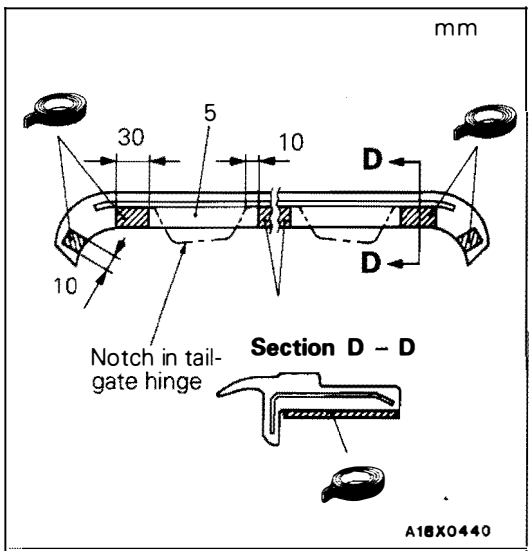


Removal steps

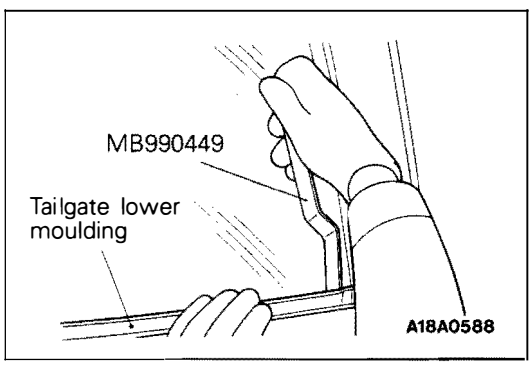
1. Harness connector
◇A◇ 2. Tailgate lower moulding
◇B◇ ▶A◀ 3. Tailgate window glass
4. Tailgate side moulding
5. Tailgate upper moulding
6. Window dam
7. Tailgate lower moulding clip
8. Grommet clip A
9. Grommet clip B



Adhesive:
3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent



Adhesive tape:
Both-side tape 14 mm wide and 0.8 mm thick

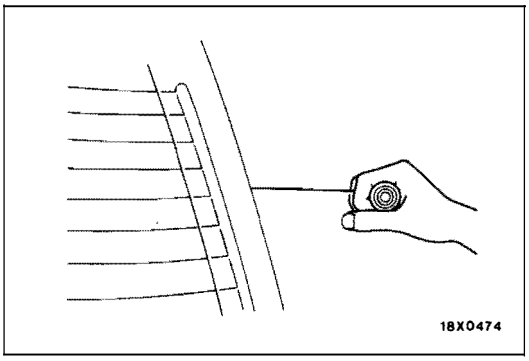


REMOVAL SERVICE POINTS

E42ZK31AA

◇A◇ TAILGATE LOWER MOULDING REMOVAL

Remove by using the special tool to lever out the tailgate lower moulding

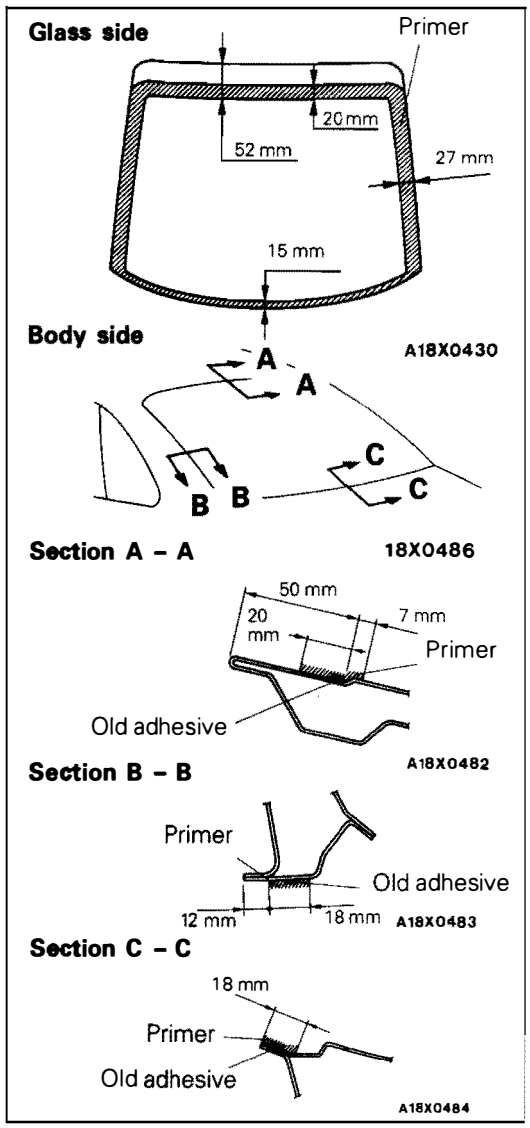


〈B〉 TAILGATE WINDOW GLASS REMOVAL

(1) To protect the tailgate (painted surface), apply protective tape to the entire circumference of the tailgate in the glass installation position.
(2) Using a sharp-point drill, make hole in the tailgate window glass adhesive.
(3) Pass the piano wire from the inside of the vehicle through the hole.

NOTE
There are location pins at the centre of the top of the tailgate window glass. These are used in the assembly line only, and are not necessary when re-installing the glass.

(4) Remove the tailgate window glass by the same procedure as for the windshield (Refer to P.42-34.)



INSTALLATION SERVICE POINTS E42ZK34AA

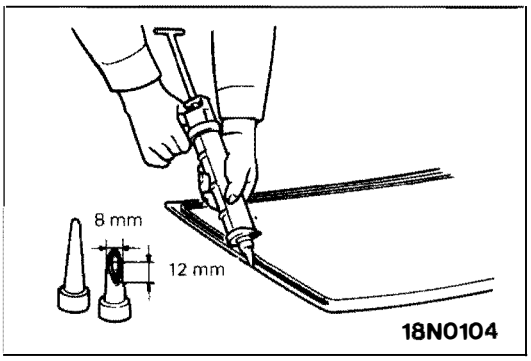
▶A◀ TAILGATE WINDOW GLASS INSTALLATION

(1) Soak a sponge in the primer, and apply evenly to the glass and the tailgate in the places shown in the illustration.

Specified primer:
3M Super Fast Urethane 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. But, a too thick application will cause lowering of the adhesive strength.**
2. **Do not touch the coated surface.**

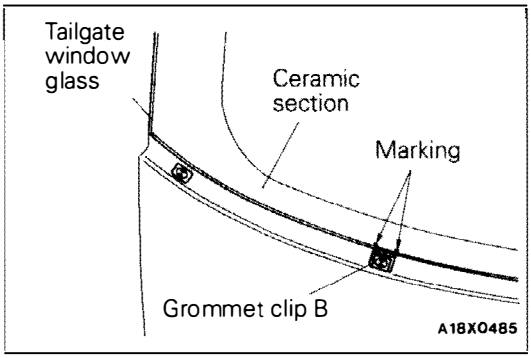
(2) After applying the primer, let it dry for 3 to 30 minutes.



(3) Within 30 minutes after applying the primer, fill the sealant gun with adhesive and apply the adhesive evenly around the entire circumference of the tailgate window glass.

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.



(4) After applying the adhesive, align the mating marks at the lower part of the tailgate window glass with both sides of grommet clip B, and then press the tailgate window glass evenly and gently to attach it completely.
(5) After removing any adhesive that is sticking out or adhering to the body or glass with a spatula, etc., clean off with isopropyl alcohol.
(6) After completion of this operation (after installing the glass), place it somewhere where it will not be disturbed, until the adhesive sets.

Caution
It heat is applied with an infra-red lamp to shorten the setting time, keep the surface temperature of the adhesive below 60°C

(7) After attaching the tailgate window 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.**

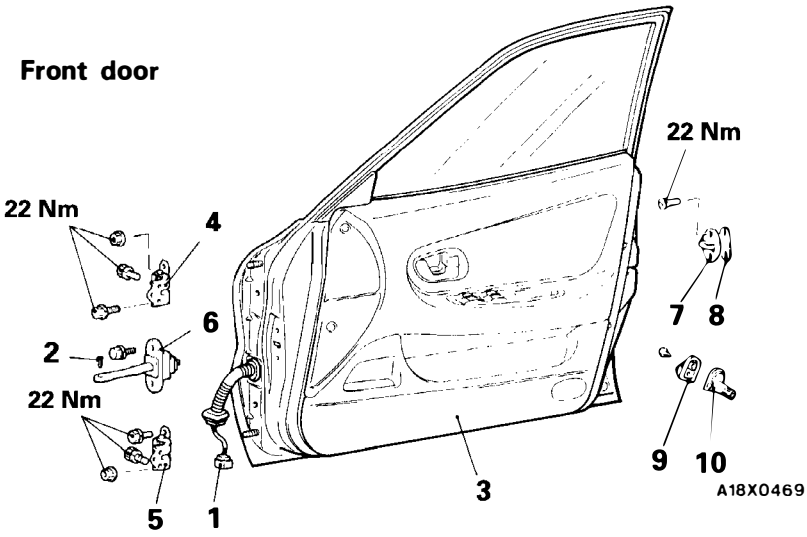
DOOR ASSEMBLY

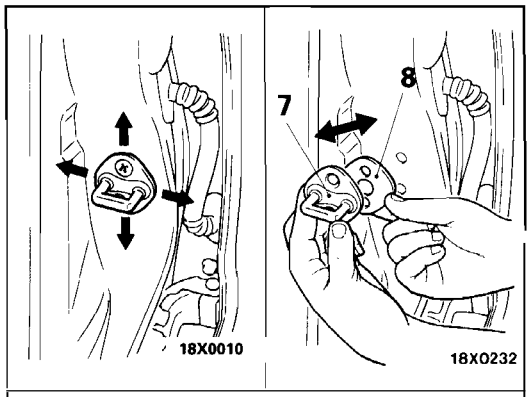
REMOVAL AND INSTALLATION

E42ZL00AA

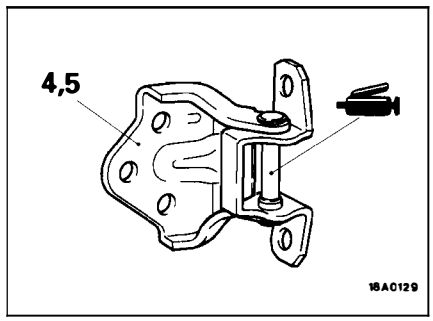
Door Post-installation Operation
- Door Adjustment (Refer to P.42-16.)

Front door

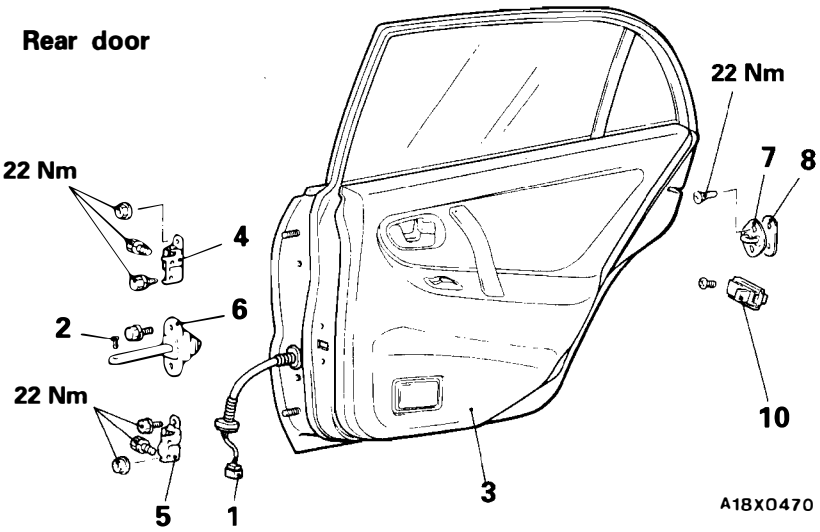


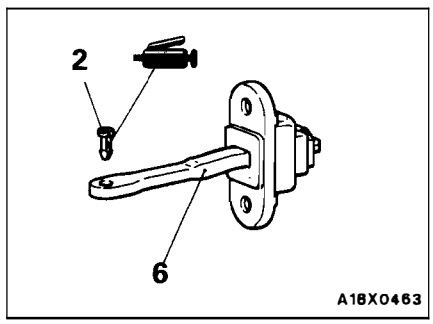


Adjustment of the door stepping and the door latch linkage



Rear door





Door assembly removal steps
1. Harness connector
2. Spring pin
〈A〉 ◆C◆ 3. Door assembly
◆B◆ 4. Door upper hinge
◆B◆ 5. Door lower hinge

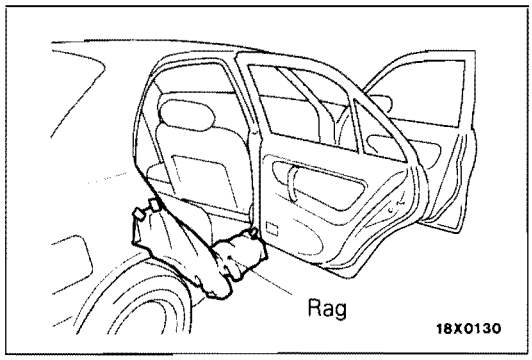
Door check removal steps
- Door trim
- Waterproof film

} (Refer to P.42-50.)

2. Spring pin
◆A◆ 6. Door check

Striker removal steps
7. Striker
8. Striker shim

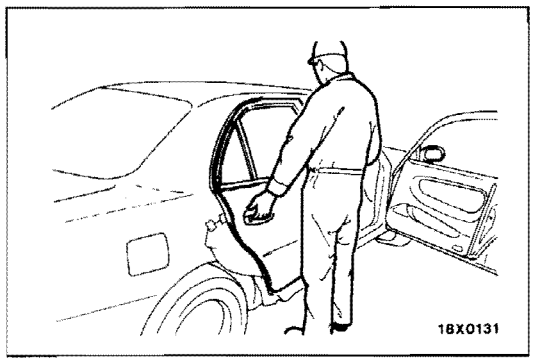
Door switch removal steps
9. Door switch cap
10. Door switch



REMOVAL SERVICE POINTS E42ZL01AA

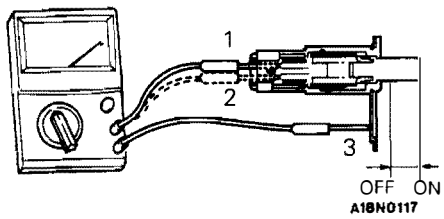
〈A〉 DOOR ASSEMBLY REMOVAL <REAR DOOR>

(1) Attach a rag to the rear door body panel to prevent scratches, lower the rear door window as far as possible, and close the rear door.

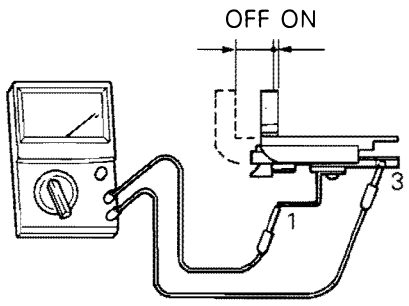


(2) Remove the rear door hinge mounting bolt, pull the outer handle to open the latch, and remove the rear door.

Front door switch



Rear door switch



INSPECTION E42ZL02AA

DOOR SWITCH

Operate the switch, and check the continuity between the terminals.

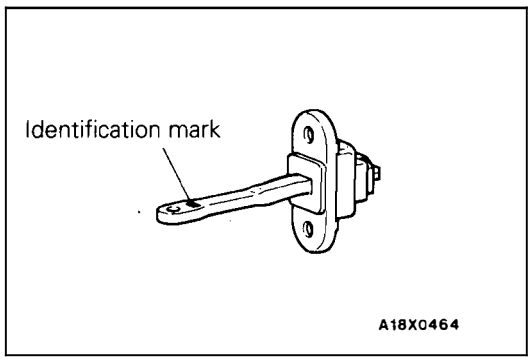
Driver's door switch

Terminal / Switch position	1	2	3
Open (ON)	○	○	○
Depressed (OFF)			

Passenger's door switch

Terminal / Switch position	1	3
Open (ON)	○	○
Depressed (OFF)		

NOTE
○—○ indicates that there is continuity between the terminals.

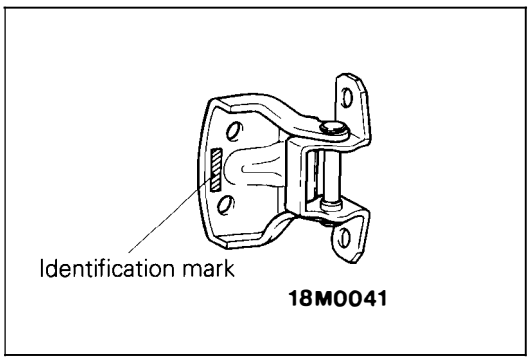


INSTALLATION SERVICE POINTS E42ZL04AA

◆A◆ DOOR CHECK INSTALLATION

Install the door check so that the identification mark faces upwards.

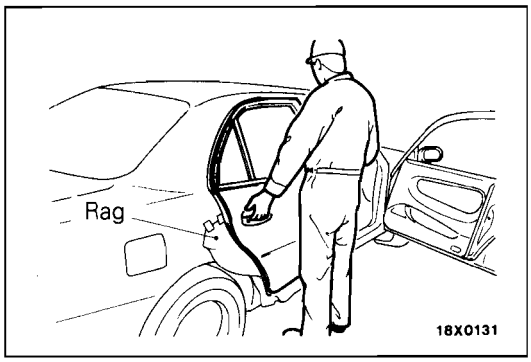
Applicable location		Identification mark
RH	Front door	UR
	Rear door	VR
LH	Front door	UL
	Rear door	VL



◆B◆ DOOR LOWER HINGE <REAR DOOR>/DOOR UPPER HINGE INSTALLATION <REAR DOOR>

The rear door hinges differ according to where they are used, so check the identification mark before installation.

Applicable location		Identification mark
Right side	Upper hinge	N1
	Lower hinge	P1
Left side	Upper hinge	M1
	Lower hinge	ϕ1



◆C◆ DOOR ASSEMBLY INSTALLATION <REAR DOOR>

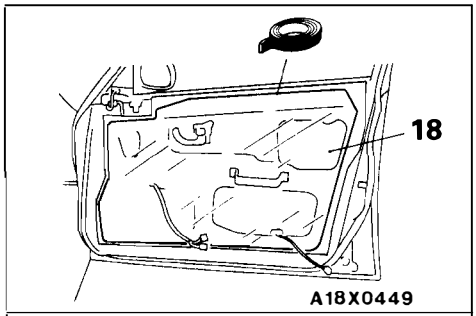
(1) Attach a rag so that the clearance between the body and the door is uniform, and then engage the rear door latch.
(2) Install the rear door hinge mounting bolt.
(3) Open the rear door and remove the rag attached to the body panel.

DOOR TRIM AND WATERPROOF FILM

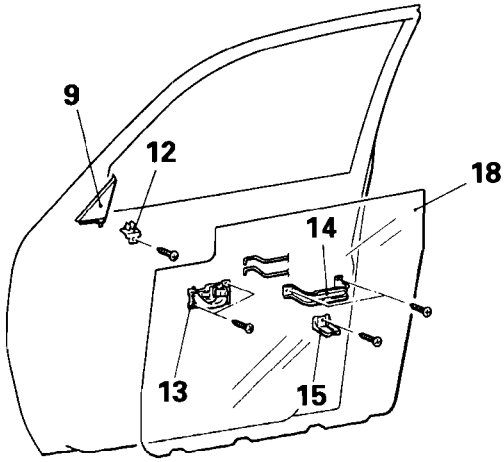
REMOVAL AND INSTALLATION

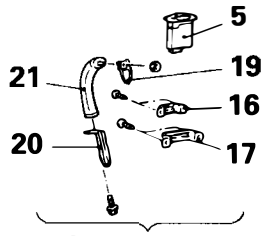
E42ZL10AA

Front door

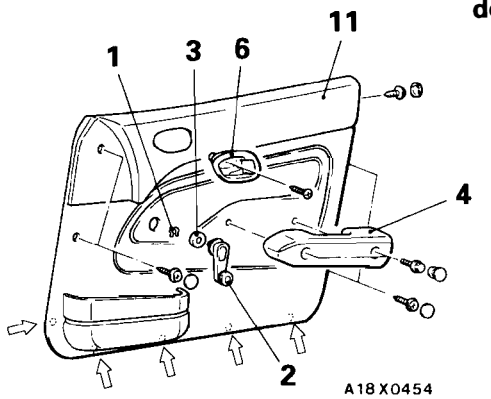


Sealant:
3M ATD Part No. 8625 or equivalent

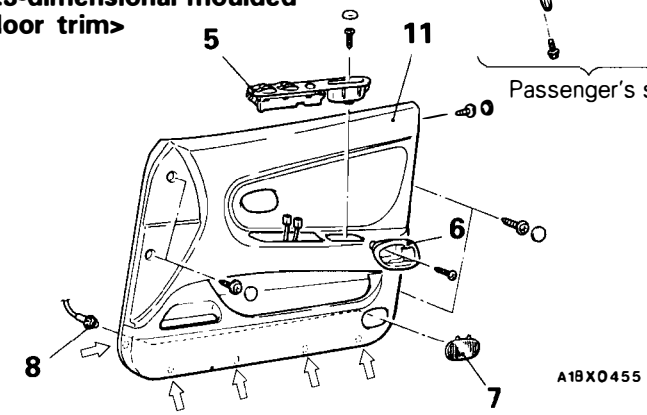




<Flat door trim>



<3-dimensional moulded door trim>



Flat door trim removal steps

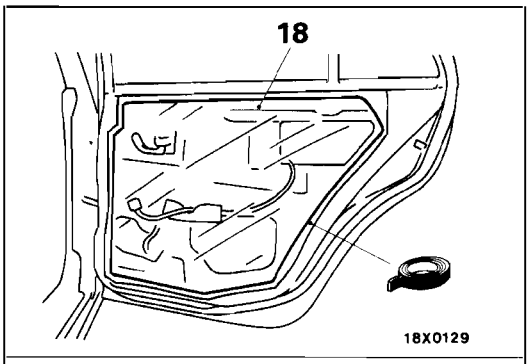
- 1. Clip
- ◗A◖ 2. Regulator handle
- 3. Escutcheon
- 4. Armrest
- ◇B◇ 6. Cover
- 9. Corner panel
- ◇D◇ 11. Door trim
- 12. Door trim guide
- 13. Door inside handle
- 18. Waterproof film

NOTE
⇦ : Indicates the clip positions

3-dimensional moulded door trim removal steps

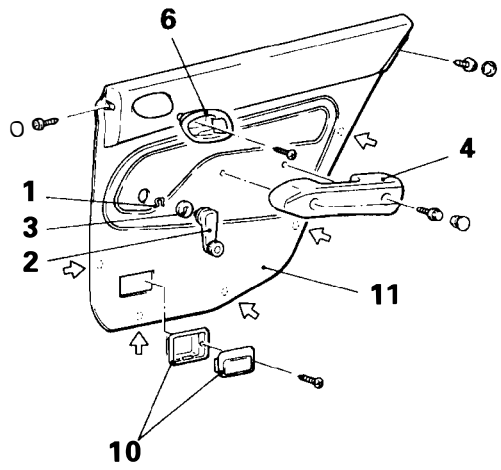
- 5. Power window switch
- ◇B◇ 6. Cover
- ◇C◇ 7. Door lamp lens
- 8. Door lamp socket
- 9. Corner panel
- ◇D◇ 11. Door trim
- 12. Door trim guide
- 13. Door inside handle
- 14. Pull handle bracket A <Driver's side>
- 15. Pull handle bracket B <Driver's side>
- 16. Door grip retainer upper <Passenger's side>
- 17. Door grip retainer lower <Passenger's side>
- 18. Waterproof film
- 19. Door grip upper bracket <Passenger's side>
- 20. Door grip lower bracket <Passenger's side>
- 21. Door grip <Passenger's side>

Rear door

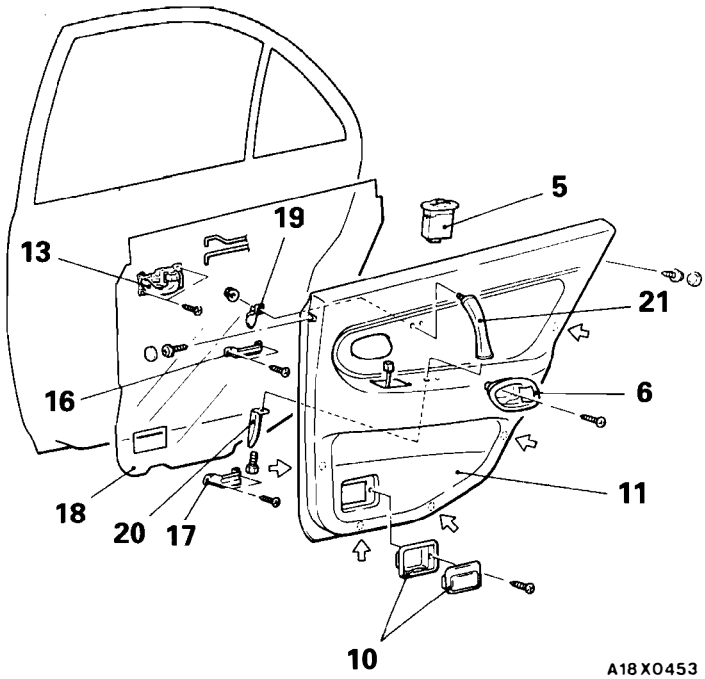


Sealant:
3M ATD Part No. 8625 or equivalent

<Flat door trim>



<3-dimensional moulded door trim>



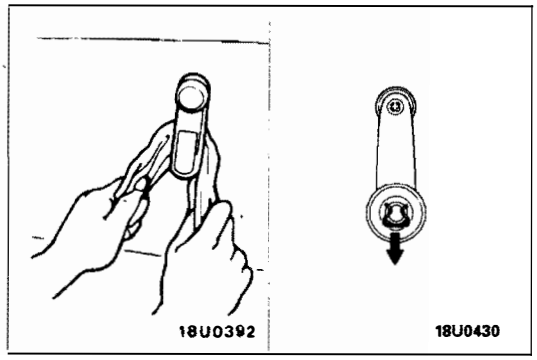
Flat door trim removal steps

〈A〉 1. Clip
▶A◀ 2. Regulator handle
3. Escutcheon
4. Armrest
〈B〉 6. Cover
10. Ashtray
〈D〉 11. Door trim
13. Door inside handle
18. Waterproof film

NOTE
⇦ : Indicates the clip positions

3-dimensional moulded door trim removal steps

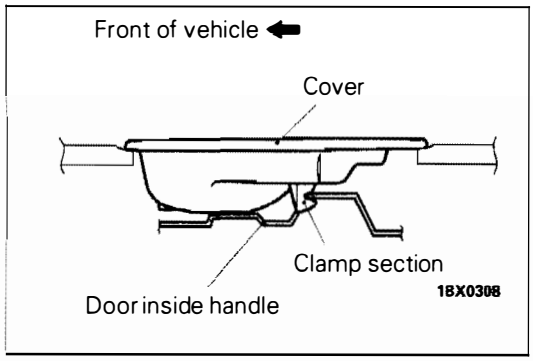
5. Power window switch
〈B〉 6. Cover
10. Ashtray
〈D〉 11. Door trim
13. Door inside handle
16. Door grip retainer upper
17. Door grip retainer lower
18. Waterproof film
19. Door grip upper bracket
20. Door grip lower bracket
21. Door grip <Passenger's side>



REMOVAL SERVICE POINTS E42ZL11AA

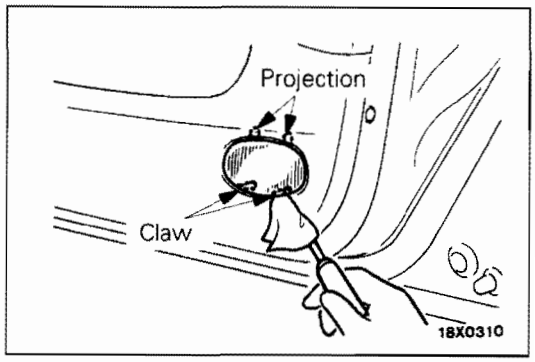
〈A〉 CLIP REMOVAL

Remove the clip by using a rag, and then remove the regulator handle



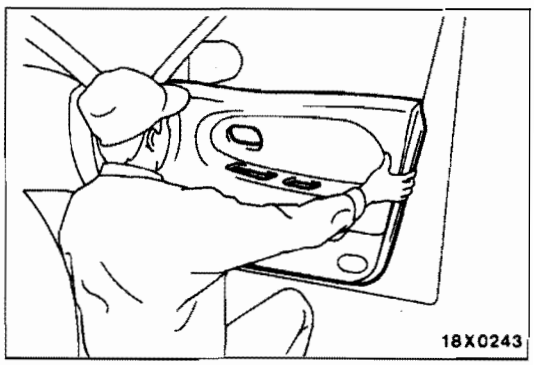
〈B〉 COVER REMOVAL

Remove the cover mounting screw and remove the cover by pushing it towards the front of the vehicle to remove the clamp section from the door inside handle.



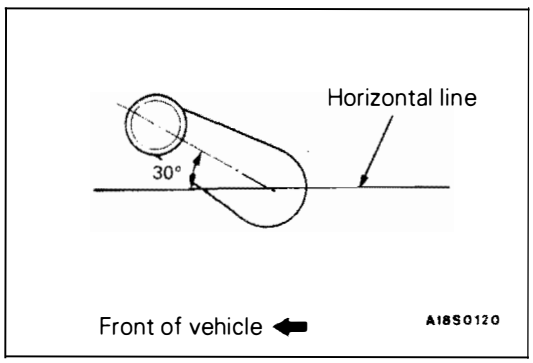
〈C〉 DOOR LAMP LENS REMOVAL

Use a flat-tipped screwdriver or similar tool to prise off the lower part of the room lamp lens, and remove the claw and projection.



〈D〉 DOOR TRIM REMOVAL

After removing the trim mounting screws and clips, push up the trim to remove it from the door window inner weather-strip clips.



INSTALLATION SERVICE POINTS E42ZL14AA

◗A◖ REGULATOR HANDLE INSTALLATION

(1) Install the escutcheon and the clip to the regulator handle.
(2) Fully close the front door glass, and install the regulator handle so that it faces as shown in the illustration.

DOOR GLASS AND REGULATOR

REMOVAL AND INSTALLATION

E42ZL20AA

Pre-removal Operation
- Door Trim and Waterproof Film Removal (Refer to P.42-50.)

Post-installation Operation
- Door Window Glass Adjustment (Refer to P.42-16.)
- Door Trim and Waterproof Film Installation (Refer to P.42-50.)

Front window regulator assembly removal steps

1. Door window inner weatherstrip
2. Belt line moulding
◇A◇ 3. Door window glass
4. Door glass holder
5. Window regulator assembly

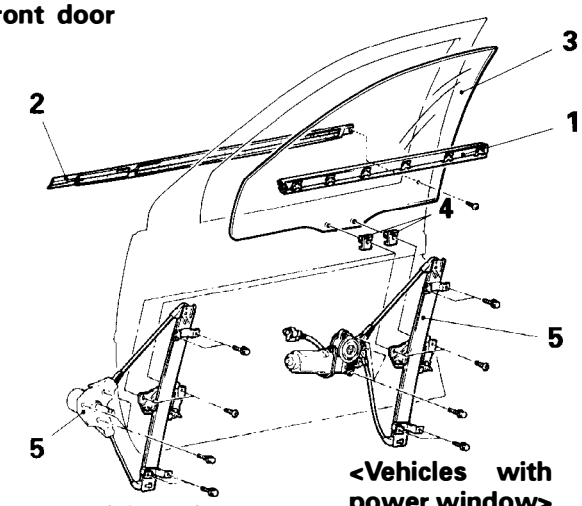
Rear window regulator assembly removal steps

1. Door window inner weatherstrip
2. Belt line moulding
◇A◇ 3. Door window glass
4. Door window glass holder
5. Window regulator assembly

Stationary window glass removal steps

1. Door window inner weatherstrip
2. Belt line moulding
◇A◇ 3. Door window glass
◇B◇ 6. Door centre sash
7. Stationary window glass and weatherstrip assembly
8. Stationary window glass
9. Stationary window weatherstrip

Front door

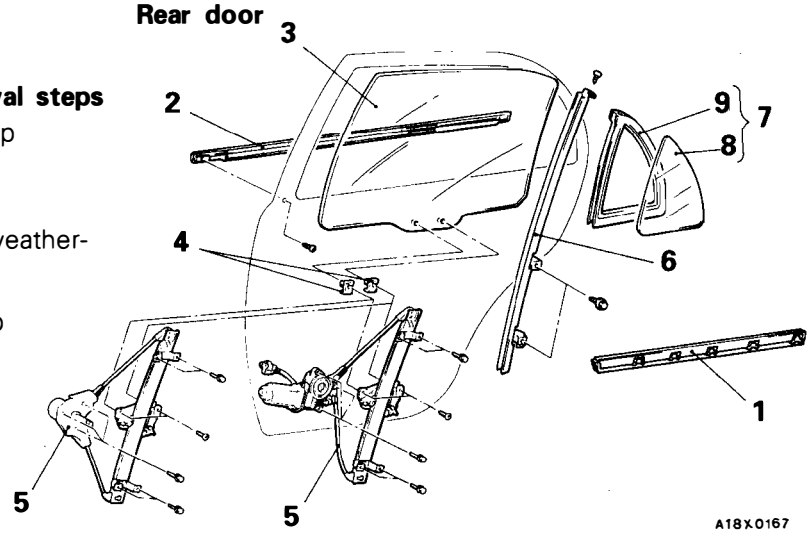


<Vehicles without power window>

<Vehicles with power window>

18X0166

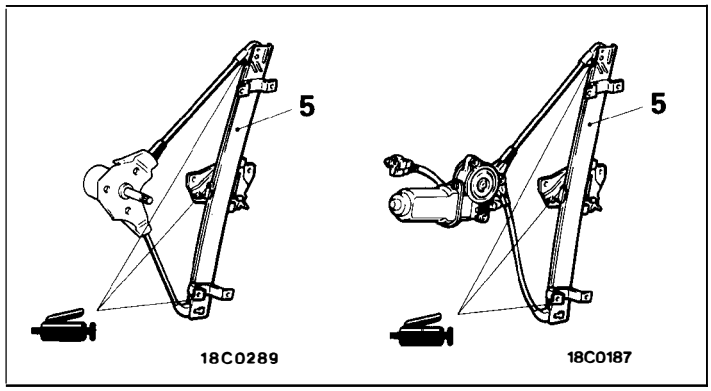
Rear door

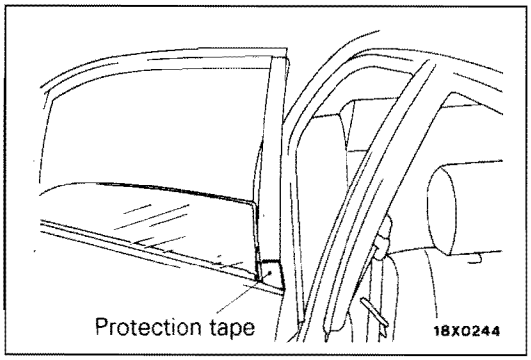


A18X0167

<Vehicles without power window>

<Vehicles with power window>

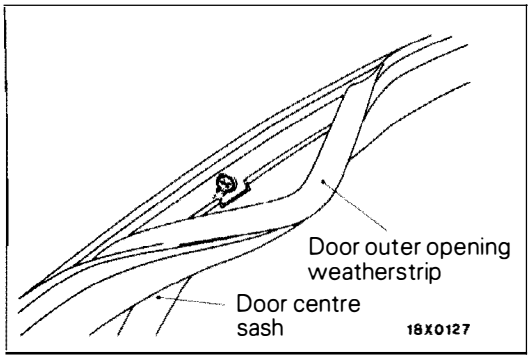




REMOVAL SERVICE POINTS E42ZL21AA

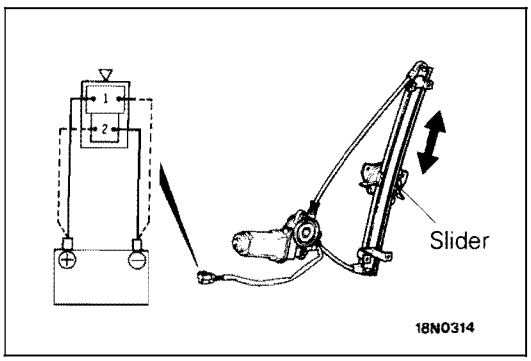
◇A▶ DOOR WINDOW GLASS REMOVAL

When removing the door window glass, attach protection tape in the place shown in the illustration so as not to damage the rear door window sash assembly.



◇B◇ DOOR CENTRE SASH REMOVAL

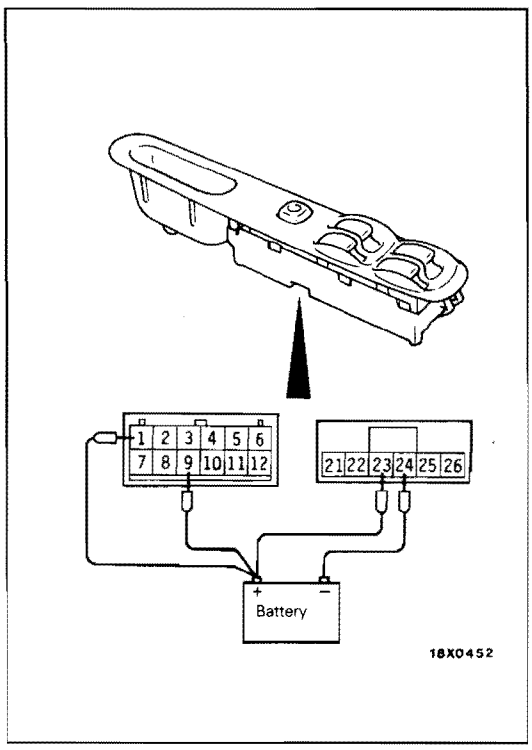
Remove the portion of the door outer opening weatherstrip which is shown in the illustration and remove the door centre sash mounting screw.



INSPECTION E42ZL22AA

POWER WINDOW MOTOR

(1) Check if the slider moves smoothly when the battery is directly connected to the motor terminals.
(2) Check if the slider moves in the opposite direction when the battery is connected with the polarities reversed.



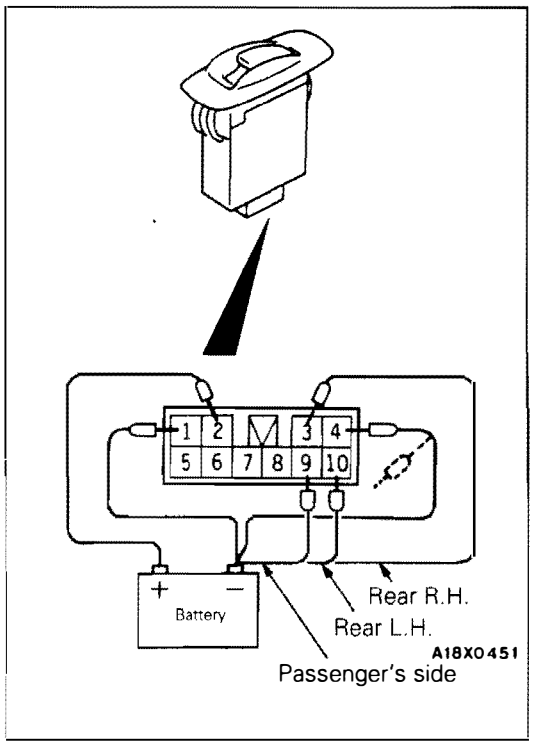
POWER WINDOW SWITCH E42ZL22BA

Main switch

(1) Apply battery voltage to terminals 1, 9, 23 and 24.
(2) Operate the switch and check continuity between the terminals.

Switch position / Terminal			Power window switch		
			UP	OFF	DOWN
Front (Driver's side)		21	○	○	○
		22	○		
		23	○		○
		24	○	○	○
Front (Passenger's side), Rear (R.H., L.H.)	Normal	10	○	○	○
		11	○		○
		24	○	○	○
	Lock	11	○		○
		24	○		○

NOTE
○—○ indicates that there is continuity between the terminals.



Sub switch

(1) Connect the battery (+) terminal to terminal 2 and the battery (-) terminal to terminals 1, 4 and 9 (passenger's side), 3 (rear R.H.) and 10 (rear L.H.).
(2) Check to be sure that the sub switch turns OFF when terminal 4 is disconnected from earth.

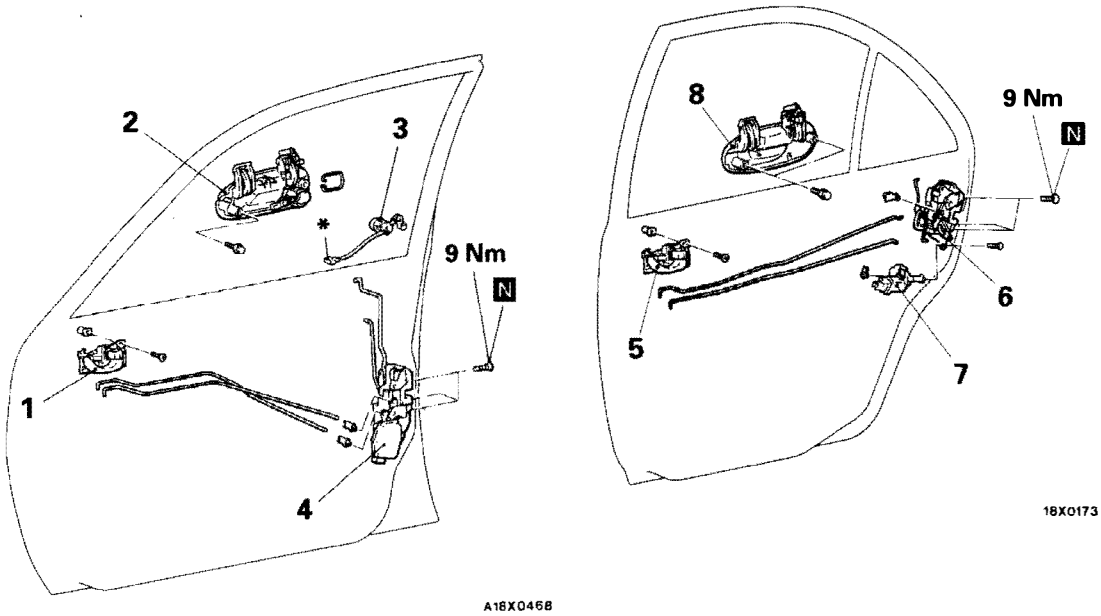
Switch position / Terminal		Sub switch UP	Sub switch OFF	Sub switch DOWN
Sub switch	1	○—○		○ ○
	2	○ ○—○		○ ○—○
	7	○—○	○—○	
	8	○	○	○

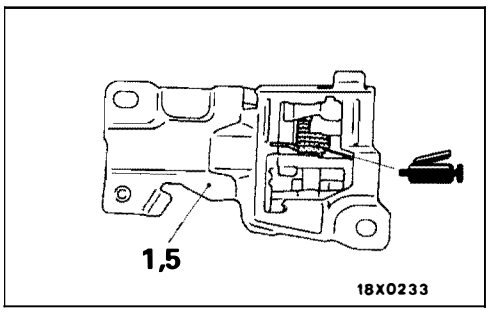
NOTE
○—○ indicates that there is continuity between the terminals.

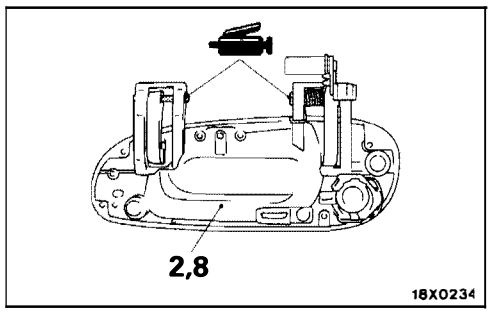
DOOR HANDLE AND LATCH

REMOVAL AND INSTALLATION

E42ZL30AA







NOTE
Door key switch marked with * is for passenger's side door only.

Pre-removal Operation
- Door Trim Removal (Refer to P.42-50, 51.)

Post-installation Operation
- Inside Handle Play Adjustment (Refer to P.42-16.)
- Door Trim Installation (Refer to P.42-50, 51.)

Front door inside handle removal

1. Front door inside handle

Front door outside handle and door latch assembly removal steps

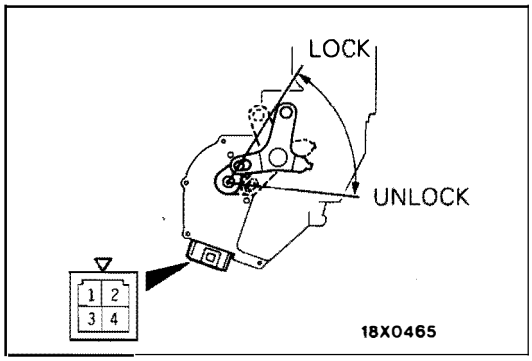
1. Front door inside handle
- Waterproof film (Refer to P.42-50.)
2. Front door outside handle
3. Door lock key cylinder
4. Front door latch assembly

Rear door inside handle removal

5. Rear door inside handle

Rear door outside handle and door latch assembly removal steps

5. Rear door inside handle
- Waterproof film (Refer to P.42-51.)
- Rear door window glass } (Refer to
- Door centre sash } P.42-53.)
6. Rear door latch assembly
7. Rear door lock actuator
8. Rear door outside handle



INSPECTION E42ZL32AA

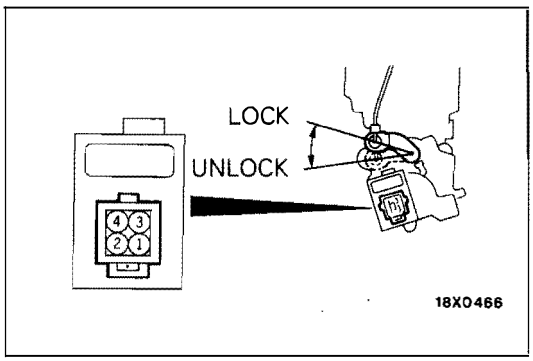
FRONT DOOR LOCK ACTUATOR

<Driver's side>

(1) After setting the rod to the LOCK position, apply battery voltage to terminal 3 (L.H. drive vehicles) or terminal 4 (R.H. drive vehicles) and check if the rod moves as far as the UNLOCK position when terminal 4 (L.H. drive vehicles) or terminal 3 (R.H. drive vehicles) is earthed.
(2) After setting the rod to the UNLOCK position and applying battery voltage to terminal 4 (L.H. drive vehicles) or terminal 3 (R.H. drive vehicles), check if the rod moves as far as the LOCK position when terminal 3 (L.H. drive vehicles) or terminal 4 (R.H. drive vehicles) is earthed.
(3) When the rod is set to the UNLOCK position, check if there is continuity between terminal 1 and terminal 2, and when the rod is set to the LOCK position, check that there is no continuity.

<Passenger's side>

(1) After setting the rod to the LOCK position, apply battery voltage to terminal 4 (L.H. drive vehicles) or terminal 3 (R.H. drive vehicles) and check if the rod moves as far as the UNLOCK position when terminal 3 (L.H. drive vehicles) or terminal 4 (R.H. drive vehicles) is earthed.
(2) After setting the rod to the UNLOCK position and applying battery voltage to terminal 3 (L.H. drive vehicles) or terminal 4 (R.H. drive vehicles), check if the rod moves as far as the LOCK position when terminal 4 (L.H. drive vehicles) or terminal 3 (R.H. drive vehicles) is earthed.



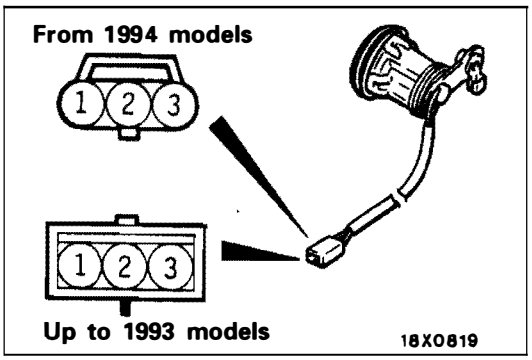
REAR DOOR LOCK ACTUATOR E42ZL32BA

<L.H.>

(1) After setting the rod to the LOCK position, apply battery voltage to terminal 1 and check if the rod moves to the UNLOCK position when terminal 3 is earthed.
(2) After setting the rod to the UNLOCK position and applying battery voltage to terminal 3, check if the rod moves to the LOCK position when terminal 1 is earthed.

<R.H.>

(1) After setting the rod to the LOCK position and applying battery voltage to terminal 3, check if the rod moves to the UNLOCK position when terminal 1 earthed.
(2) After setting the rod to the UNLOCK position and applying battery voltage to terminal 1, check if the rod moves to the LOCK position when terminal 3 is earthed.



DOOR LOCK KEY CYLINDER SWITCH E42ZL32CB

Operate the switch and check for continuity between the terminals.

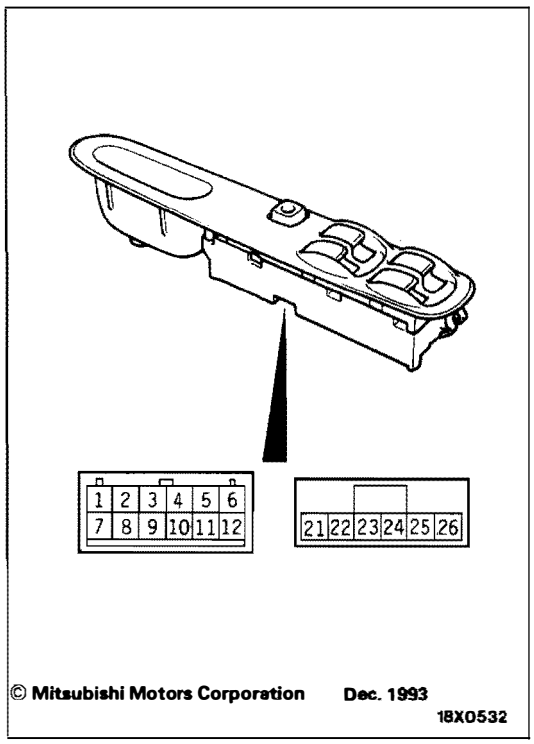
Front passenger's side door for L.H. drive vehicles* and driver's side door for R.H. drive vehicles

Switch position \ Terminal	1	2	3
LOCK	○	—○	
Neutral (OFF)			
UNLOCK		○	—○

Driver's side door for L.H. drive vehicles* and front passenger's side door for R.H. drive vehicles

Switch position \ Terminal	1	2	3
LOCK		○	—○
Neutral (OFF)			
UNLOCK	○	—○	

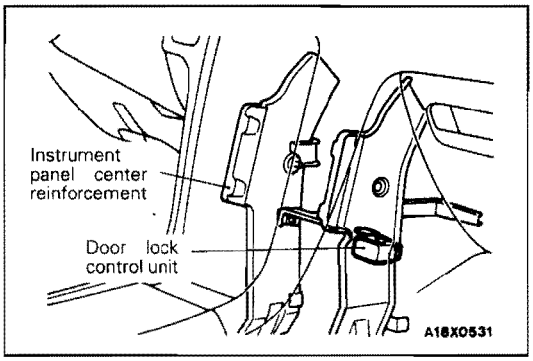
NOTE
(1) ○—○ indicates that there is continuity between the terminals.
(2)* : Vehicles with theft-alarm system.



POWER WINDOW SWITCH (BUILT IN DOOR LOCK CONTROL UNIT) <Vehicles with power window> E42ZL32EA

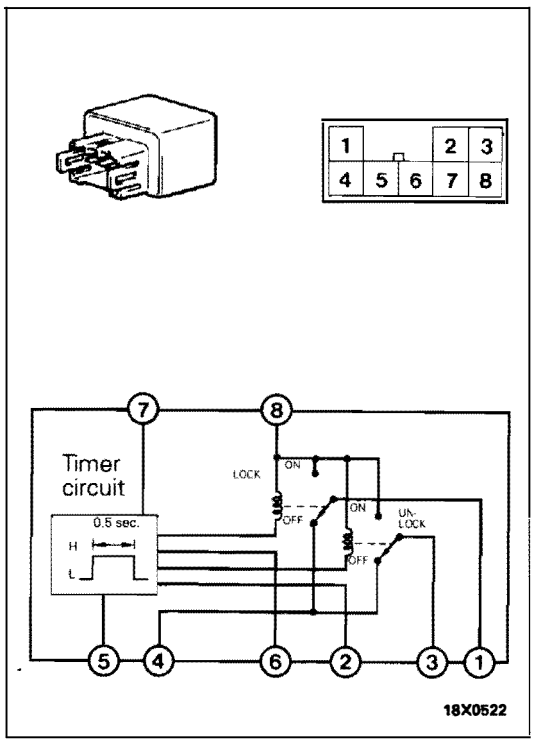
(1) Apply battery power to terminals 9 and 23, and earth terminals 5 and 24.
(2) Connect a needle-type circuit tester between terminal 25 and the earth, and after switching it to the DCV range, and check if the needle moves at the instant when the connection at terminal 5 is removed.
(3) Next, connect the needle-type circuit tester between terminal 26 and the earth, and check if the needle moves at the instant when the connection at terminal 5 that was removed in (2) above is reconnected.
(4) Also, check if there is a voltage of 12V between terminal 7 and the earth, and between terminal 8 and the earth.

NOTE
The reason why the needle of the circuit tester moves in (2) and (3) above is because battery voltage appears between terminals 25 and 26 and the earth for approximately 0.5 seconds.



DOOR LOCK CONTROL UNIT <Vehicles without power window> E42ZL32DA

(1) Remove the door lock control unit from the instrument panel center reinforcement.



(2) Apply battery power to terminals 7 and 8, and earth terminals 4 and 5.
(3) Connect a needle-type circuit tester between terminal 1 and the earth, and after switching it to the DCV range, and check if the needle moves at the instant when the connection at terminal 5 is removed.
(4) Next, connect the needle-type circuit tester between terminal 3 and the earth, and check if the needle moves at the instant when the connection at terminal 5 that was removed in (3) above is reconnected.
(5) Also, check if there is a voltage of 12V between terminal 6 and the earth, and between terminal 2 and the earth.

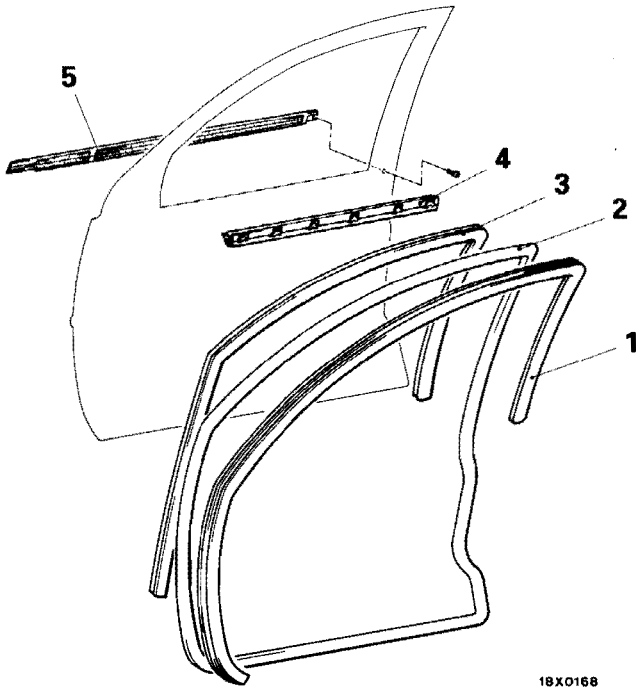
NOTE
The reason why the needle of the circuit tester moves in (3) and (4) above is because battery voltage appears between terminals 1 and 3 and the earth for approximately 0.5 seconds.

WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP

REMOVAL AND INSTALLATION

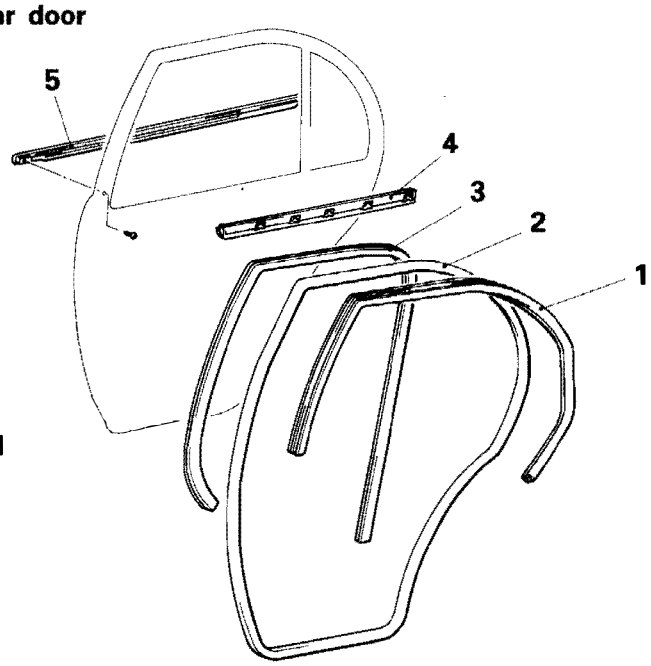
E42ZL40AA

Front door



18X0168

Rear door



18X0169

Door inner opening weatherstrip removal steps

- Centre pillar trim (lower)
- Front scuff plate
- Rear scuff plate

(Refer to GROUP 52A – Trims.)

1. Door inner opening weatherstrip

Door outer opening weatherstrip removal

◇A◇ ◆A◆ 2. Door outer opening weatherstrip

Window glass runchannel removal

3. Window glass runchannel

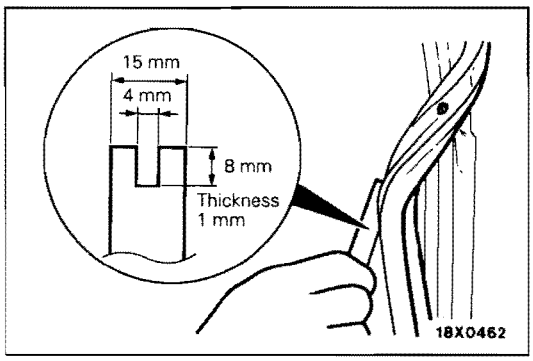
Door window inner weatherstrip removal steps

- Door trim (Refer to P.42-50, 51.)

4. Door window inner weatherstrip

Beltline moulding removal

5. Beltline moulding



REMOVAL SERVICE POINTS

E42ZL41AA

◇A◇ DOOR OUTER OPENING WEATHERSTRIP REMOVAL

Make a tool as shown in the illustration to remove the door opening weatherstrip.

INSTALLATION SERVICE POINTS E42ZL44AA

◆A◆ DOOR OUTER OPENING WEATHERSTRIP INSTALLATION

The clip colour identifies the left and right weatherstrips, so be sure to use the colours so as to install correctly.

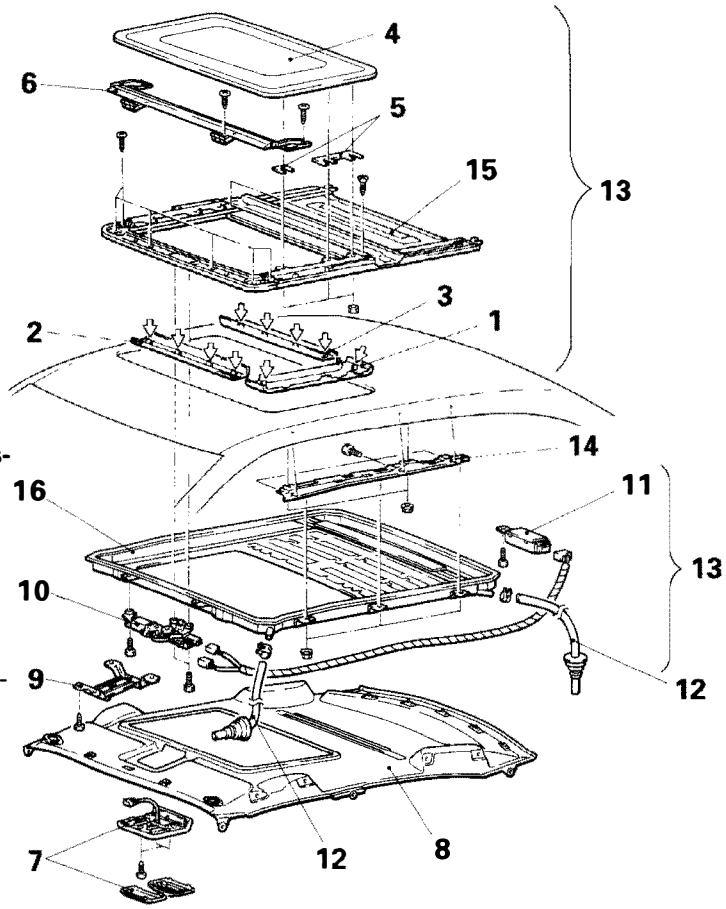
Applicable side	Identification colour
Left door	Yellow
Right door	Light blue

SUNROOF

REMOVAL AND INSTALLATION

E42ZM00AA

Post-installation Operation
- Sunroof Fit Adjustment (Refer to P.42-17.)
- Water Test (Refer to P.42-17.)



Roof lid glass removal steps
- 〈A〉 1. Side decoration cover
- 4. Roof lid glass assembly
- 5. Adjust plate

Sliding roof assembly and housing assembly removal steps
- 〈A〉 1. Side decoration cover
- 〈A〉 2. Front decoration cover
- 〈A〉 3. Rear decoration cover
- 4. Roof lid glass assembly
- 5. Adjust plate
- 6. Deflector
- 7. Sunroof switch and room lamp assembly
- 8. Headlining (Refer to GROUP 52A – Headlining.)
- 9. Room lamp bracket
- 〈B〉 ▶B◀ 10. Sunroof motor
- 12. Drain hose connection
- 〈D〉 15. Sliding roof assembly
- 16. Housing assembly

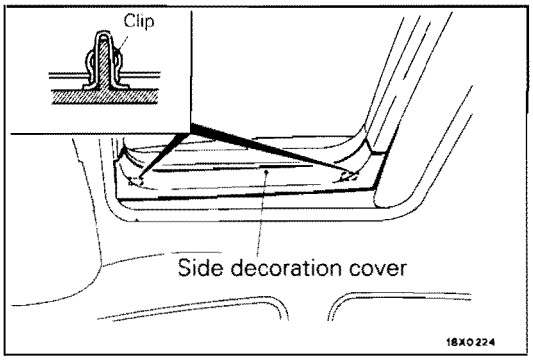
Deflector removal steps
- ● Fully open roof lid glass
- 6. Deflector

Sunroof motor and sunroof control unit removal steps
- 7. Sunroof switch and room lamp assembly
- 8. Headlining (Refer to GROUP 52A – Headlining.)
- 9. Room lamp bracket
- 〈B〉 ▶B◀ 10. Sunroof motor
- 11. Sunroof control unit

Sunroof assembly removal steps
- 7. Sunroof switch and room lamp assembly
- 8. Headlining (Refer to GROUP 52A – Headlining.)
- 9. Room lamp bracket
- 12. Drain hose connection
- 13. Sunroof assembly
- 14. Set bracket

NOTE
⇦ : Indicates the clip positions

Drain hose removal steps
- ● Splash shield <Front drain hose> (Refer to P.42-69.)
- ● Rear side trim <Hatchback> (Refer to GROUP 52A – Trims)
- ● Trunk side box <Sedan> (Refer to GROUP 52A – Trims)
- ● Rear washer tank (Refer to GROUP 51 – Rear Wiper and Washer)
- 7. Sunroof switch and room lamp assembly
- 8. Headlining (Refer to GROUP 52A – Headlining.)
- 〈C〉 ▶A◀ 12. Drain hose



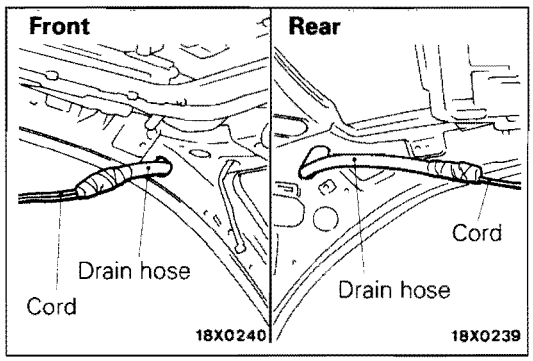
REMOVAL SERVICE POINTS E42ZM01AA

〈A〉 SIDE DECORATION COVER/FRONT DECORATION COVER/REAR DECORATION COVER REMOVAL

There are clips in the positions shown in the illustration, so be careful of them while pushing the decoration cover downwards with your hand to remove it.

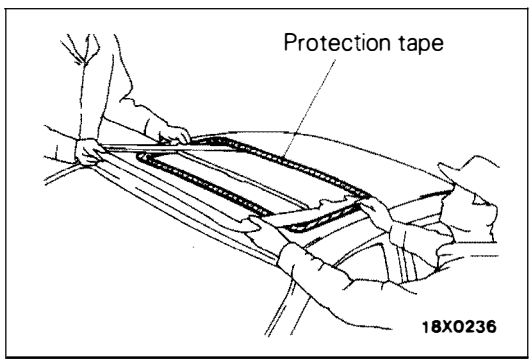
〈B〉 SUNROOF MOTOR REMOVAL

Caution
When removing the sunroof motor, always be sure to fully close the roof lid glass.
If the roof lid glass and the sunroof motor are not both in the fully-closed positions, the sunroof will not operate properly.



〈C〉 DRAIN HOSE REMOVAL

Remove the grommet. Tie a cord to the end of the drain hose, wind tape around it so that there is no unevenness, and pull the drain hose out into the wheel house.



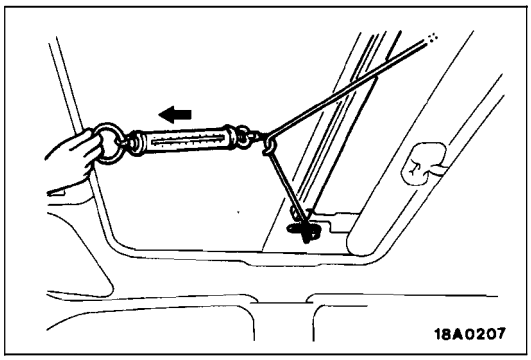
〈D〉 SLIDING ROOF ASSEMBLY REMOVAL

(1) Attach protection tape around the opening of the roof panel.
(2) Pull out, being careful not to strike the opening of the roof panel.

INSPECTION E42ZM02AA

SLIDING RESISTANCE OF ROOF LID GLASS CHECK

Check the sliding resistance of the roof lid glass by following the procedures below.
(1) Remove the decoration cover.
(2) Loosen the nut at the front end of the roof lid glass installation, and then tie with a cord.
(3) Remove the motor after opening the roof lid glass.

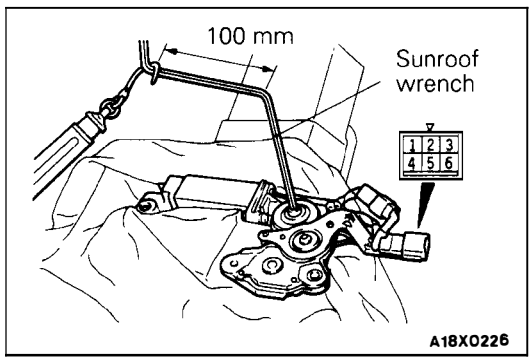


(4) Using a spring scale, measure the sliding resistance of the roof lid glass.

Standard value: 118 N or less

(5) If the sliding resistance of the roof lid glass exceeds the standard value, check the following.
   1. Check the installed condition of the sunroof assembly, and check for deformation, or clogging due to foreign material.
   2. Check for sticking of the drive cable
   3. Check for an offset position of the roof lid glass.

(6) When installing the sunroof motor, install the roof lid glass and the sunroof motor in the fully open position.



SLIDING FORCE OF SUNROOF MOTOR'S CLUTCH CHECK

E42ZM02BA

Inspect the sliding force of the clutch by the following procedure.

(1) Place the sunroof wrench from the on-board tools into the hexagonal socket of the sunroof motor drive shaft, and set a spring balance in a position 100 mm from the drive shaft.

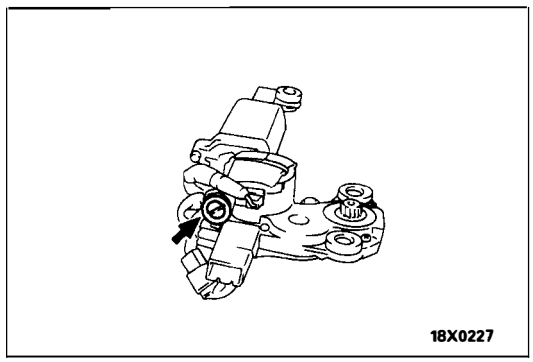
(2) Connect the battery to sunroof motor connector terminals 1 and 4 to rotate the sunroof motor.

(3) Measure the spring balance reading when the rotating force of the sunroof motor equals the spring force of the spring balance.

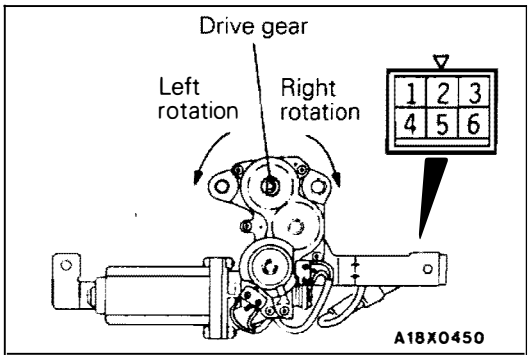
Standard value: 34–43 N

Caution

1. **The spring balance should be kept a right angle to the sunroof wrench.**
2. **If a wrench other than that in the on-board tools is used, the value for the clutch sliding force will be different, so only the on-board tool should be used.**



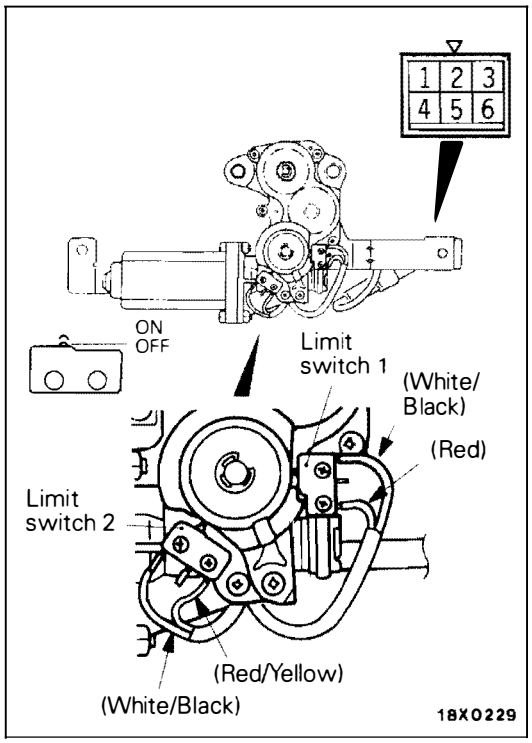
(4) If the clutch sliding force is outside the standard value, turn the motor adjuster to adjust it.



SUNROOF MOTOR CHECK E42ZM02CA

Check the direction of rotation of the drive gear when the battery is connected to the connector.

Terminal 1	Terminal 4	Drive gear rotation direction
–	+	Right
+	–	Left



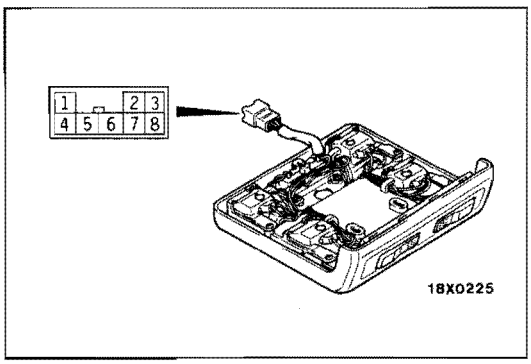
LIMIT SWITCH CHECK E42ZM02DA

(1) Remove the limit switch from the sunroof motor; then operate the limit switch and check for continuity between the terminals.

Switch		Terminal 3	5	6
Limit switch 1	ON	○	○	
	OFF			
Limit switch 2	ON		○	○
	OFF			

NOTE
○—○ indicates that there is continuity between the terminals.

(2) When installing the limit switch, check the wire colours for the limit switches 1 and 2, and install so that the position and direction are as shown in the illustration.

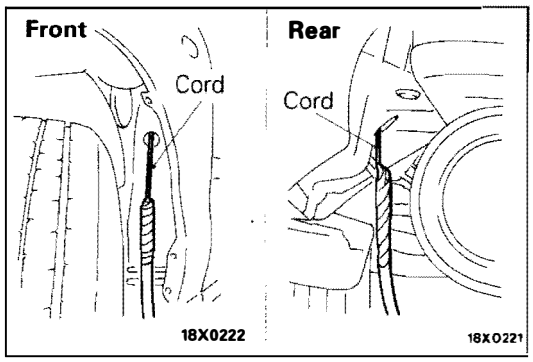


SUNROOF SWITCH CHECK E42ZM02EA

Operate the switch and check for continuity between the terminals.

Switch		Terminal 2	3	5	7	8
Slide switch	Open	○		○		
	Close			○	○	
Tilt switch	Up		○	○		
	Down			○		○

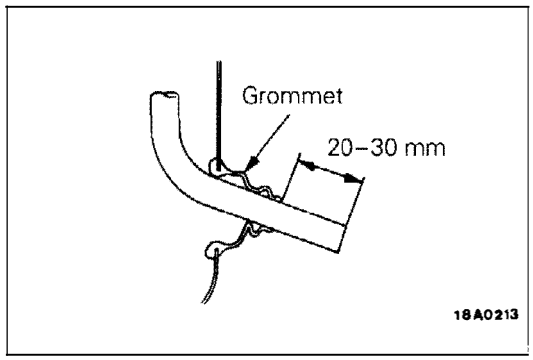
NOTE
○—○ indicates that there is continuity between the terminals.



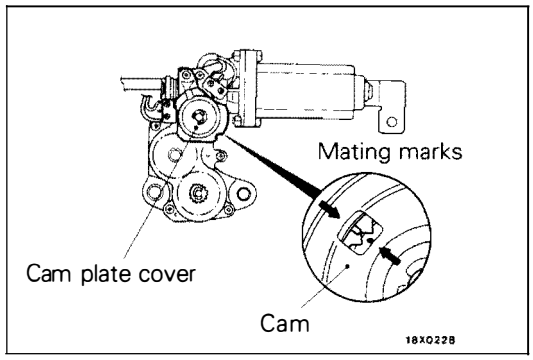
INSTALLATION SERVICE POINTS E42ZM04AA

◆A◆ DRAIN HOSE INSTALLATION

(1) Tie the cord that was used during removal to the end of the drain hose, and wind tape around it so that there is no unevenness.
(2) Pull the cord to pull through the drain hose



(3) Make the protrusion from the drain hose grommet as shown in the illustration.



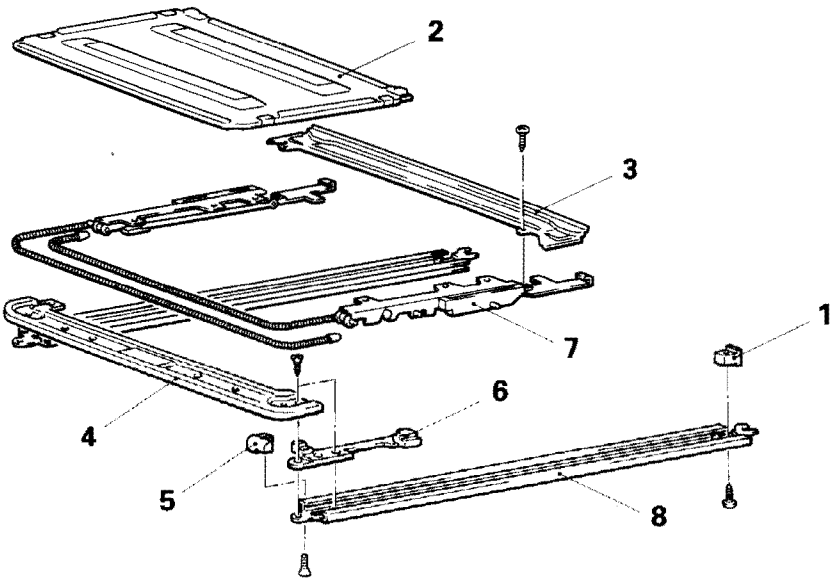
◆B◆ SUNROOF MOTOR INSTALLATION

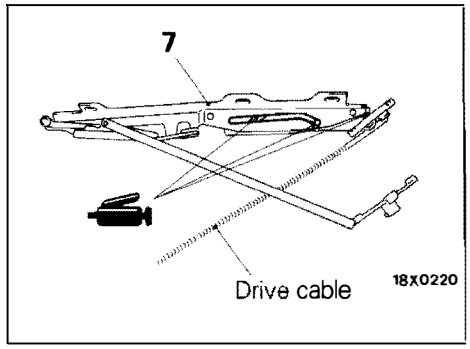
Set the sunroof motor to the fully-closed position by the following procedure.
(1) Remove the cam plate cover.
(2) Fit the on-board tool (hexagonal wrench) onto the sunroof motor drive shaft and turn the cam to align the mating marks.

NOTE
If the roof lid glass is not fully closed, provisionally install the sunroof motor and fully close the glass using the hexagonal wrench. Then, remove the motor again and align the cam mating marks.

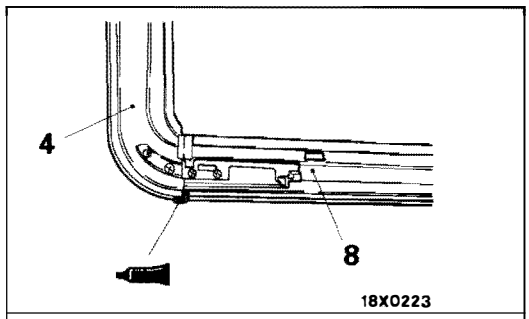
DISASSEMBLY AND REASSEMBLY

E42ZM05AA





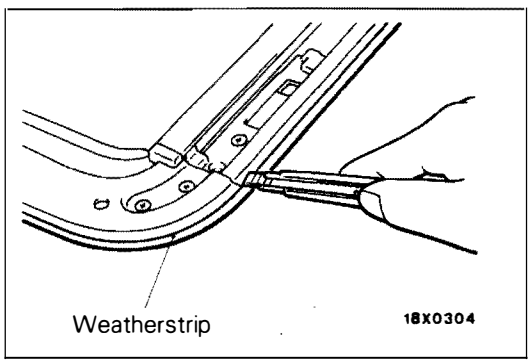
18X0175



Sealant:
3M ATD Part No. 8531 or 3M Part No.8646, or equivalent

Disassembly steps

1. Stopper
2. Sun shade
3. Roof drip rear channel
〈A〉 4. Sliding roof cable guide casing
5. Stopper
6. Sliding roof guide block
〈B〉 7. Sliding roof drive cable assembly
8. Guide rail

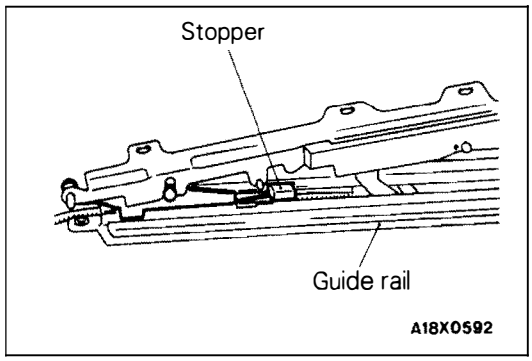


DISASSEMBLY SERVICE POINTS

E42ZM06AA

〈A〉 SLIDING ROOF CABLE GUIDE CASING REMOVAL

(1) Use a cutter knife to cut the weatherstrip connecting the guide rail and sliding roof cable guide casing.
(2) Pull the sliding roof cable guide casing forward and remove the drive cable.



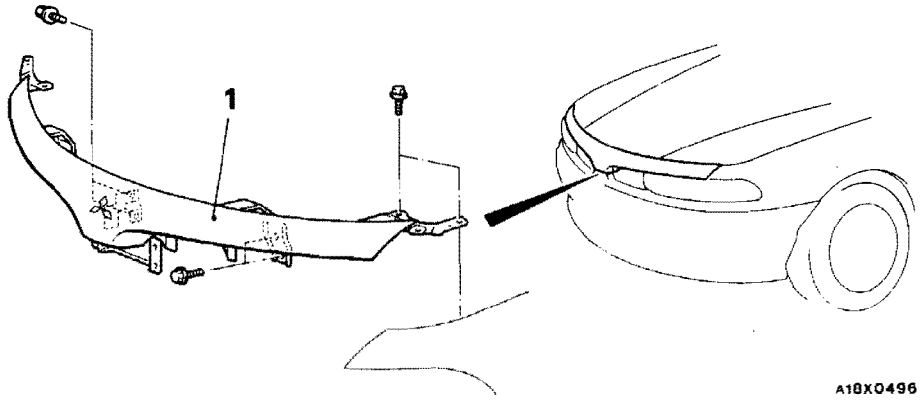
〈B〉 SLIDING ROOF DRIVE CABLE ASSEMBLY REMOVAL

Press the stopper in the notch of the guide rail to remove the sliding roof drive cable assembly from the guide rail.

HEADER PANEL

REMOVAL AND INSTALLATION

E42ZN00AA



Removal steps

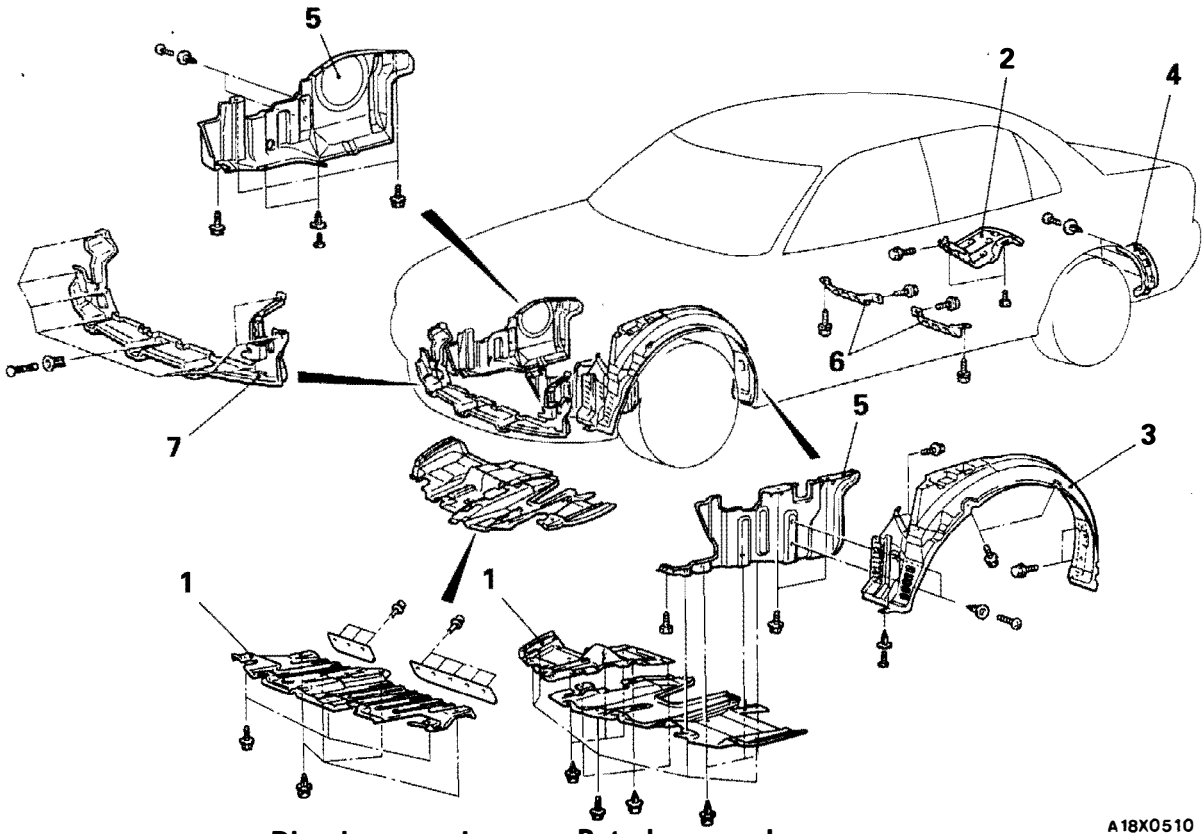
- Front bumper (Refer to GROUP 51 – Front Bumper)
- Headlamp (Refer to GROUP 54 – Headlamp)

1. Header panel

UNDER COVER

REMOVAL AND INSTALLATION

E42ZO00AA



<Diesel-powered vehicles>

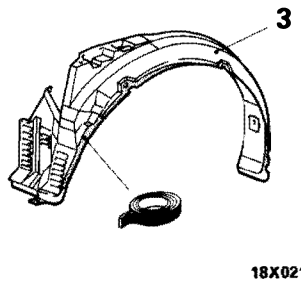
<Petrol-powered vehicles>

1. Front under cover panel
2. Rear floor under cover panel
3. Front splash shield
4. Rear splash shield
5. Under cover side panel
6. Rear seat pan under cover panel

Air guide panel removal steps

- Front bumper (Refer to GROUP 51 – Front Bumper)

7. Air guide panel



Sealant:
3M ATD Part No. 8625 or equivalent

EXTERIOR

CONTENTS

E51ZA00BB

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 serice personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

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

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

NOTE

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

 Dec. 1993 PWDE9211-B REVISED

SERVICE SPECIFICATIONS

E51ZC00AA

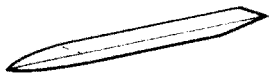
Items		Specifications
Standard value		
Windshield wiper blade installation position	mm	15 ± 5
Rear wiper blade installation position	mm	10 ± 5

SEALANT AND ADHESIVE

Items	Specified sealant and adhesive	Characteristics
Mud guard to body panel	3M ATD Part No. 8625 or equivalent	Ribbon sealer
Side protector moulding to body panel Side airdam to body panel	3M ATD Part No. 8609 Super Fast Urethane Auto Glass sealant or equivalent	–

SPECIAL TOOLS

E51ZD00AA

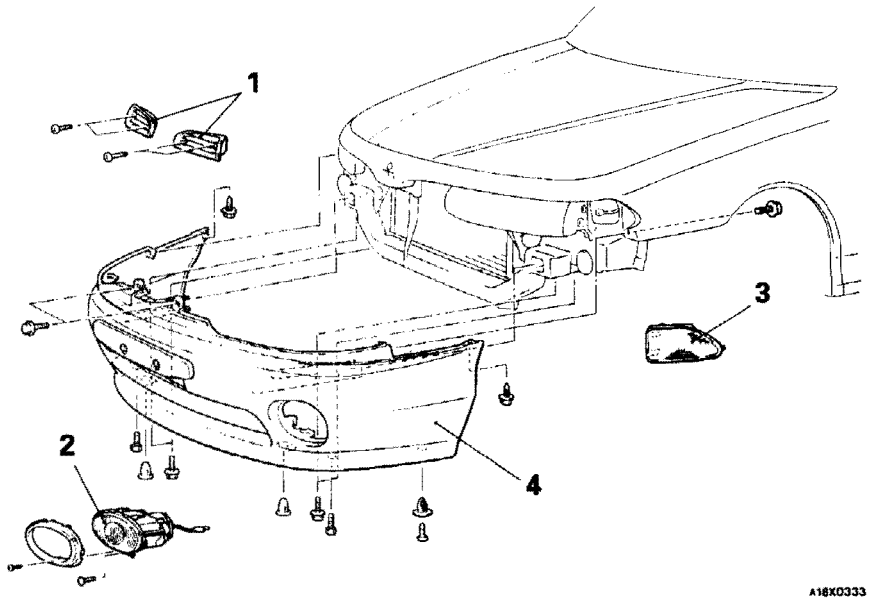
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of rear wiper and washer switch and door mirror control switch.
	MB990449	Window moulding remover	Removal of roof drip moulding, etc.

FRONT BUMPER

E51ZG00AA

REMOVAL AND INSTALLATION

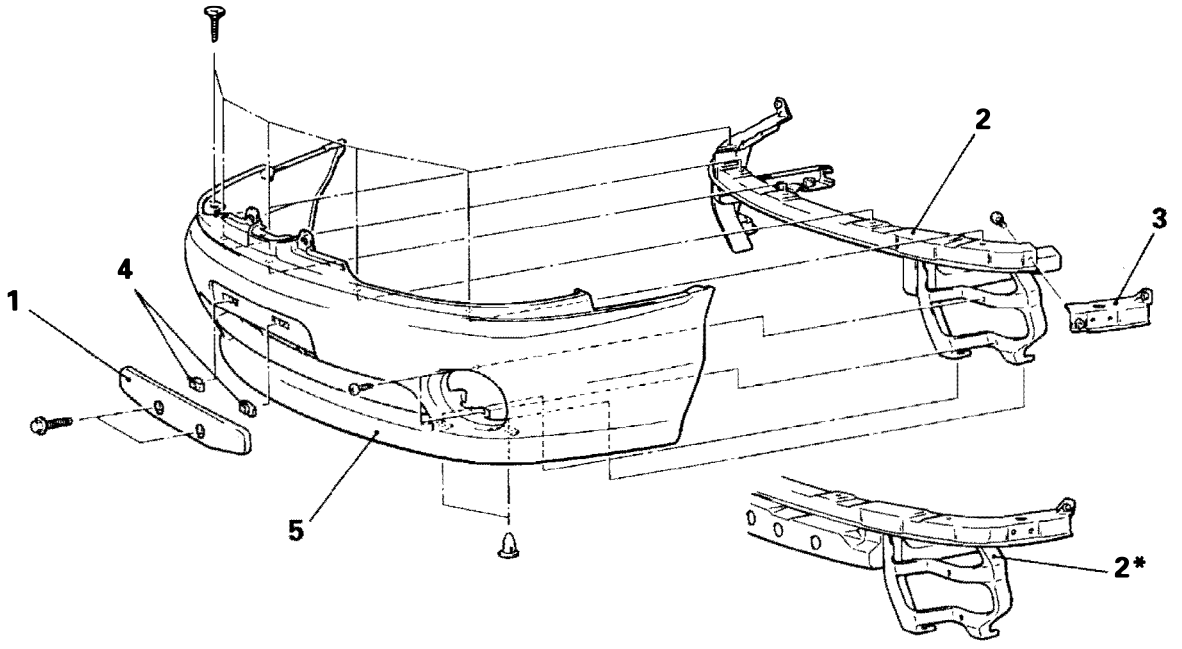
Pre-removal and Post-installation Operation
- Front Under Cover Panel Removal and Installation
  (Refer to GROUP 42 – Under Cover.)



A18X0333

Removal steps
1. Radiator grille
2. Fog lamp
3. Front turn signal lamp
4. Bumper assembly

DISASSEMBLY AND REASSEMBLY



A18X0332

Disassembly steps
1. License plate bracket
2. Bumper reinforcement
3. Side reinforcement
4. Bumper license bracket
5. Bumper face

NOTE
*: Vehicles with SRS

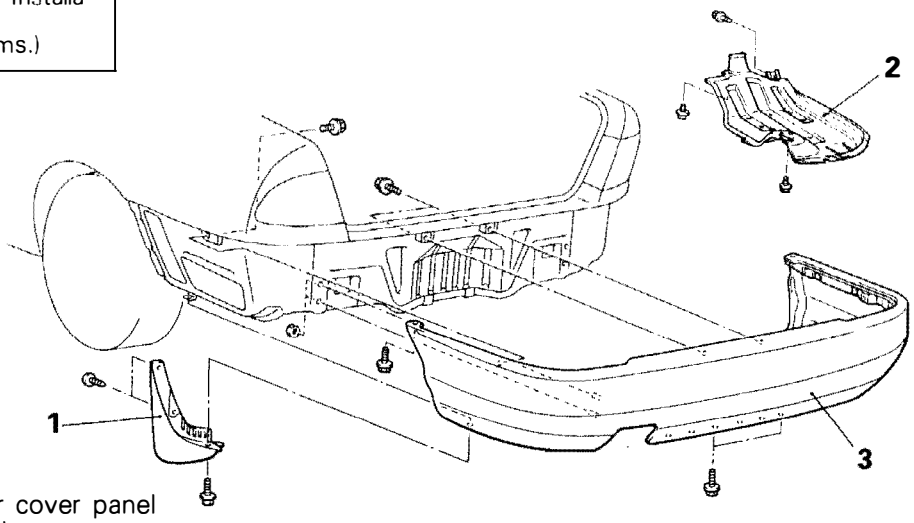
REAR BUMPER

E51ZG10AA

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
<Sedan>
- Trunk Rear Trim and Trunk Side Trim Removal and Installation (Refer to GROUP 52A –Trims.)

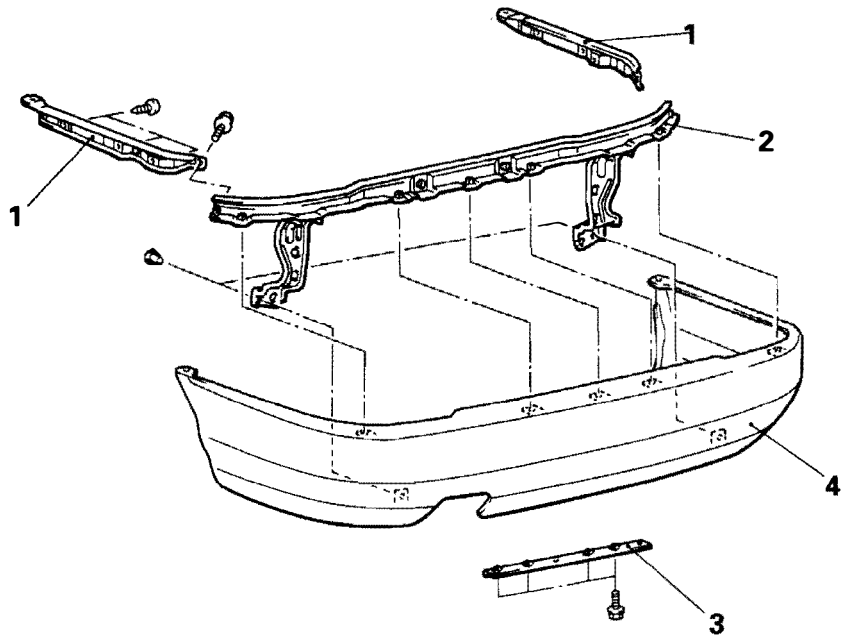
<Hatchback>
- Rear End Trim Removal and Installation (Refer to GROUP 52A – Trims.)



A18X0177

Removal steps
1. Mud guard
2. Rear floor under cover panel
3. Bumper assembly

DISASSEMBLY AND REASSEMBLY



A18X0178

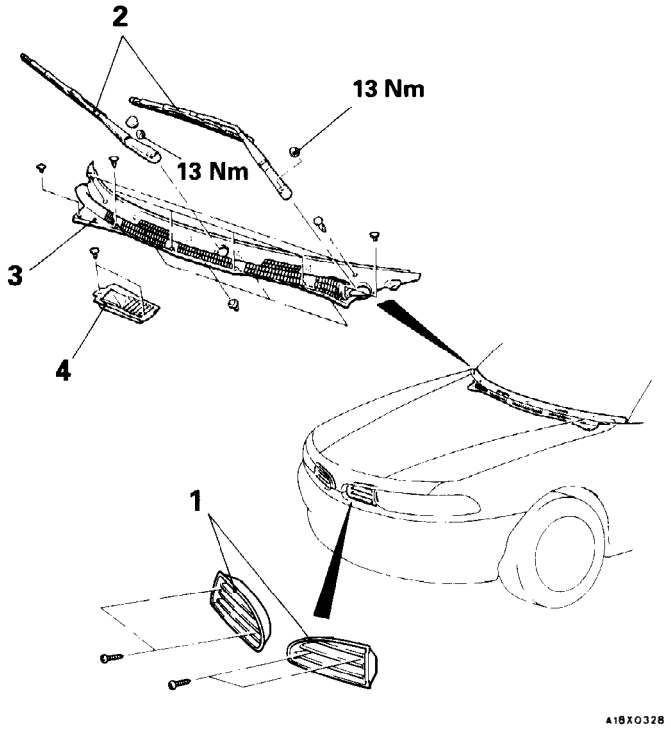
Disassembly steps
1. Side reinforcement
2. Bumper reinforcement
3. Lower bumper plate
4. Bumper face

GRILLES AND GARNISHES

E51ZH00AA

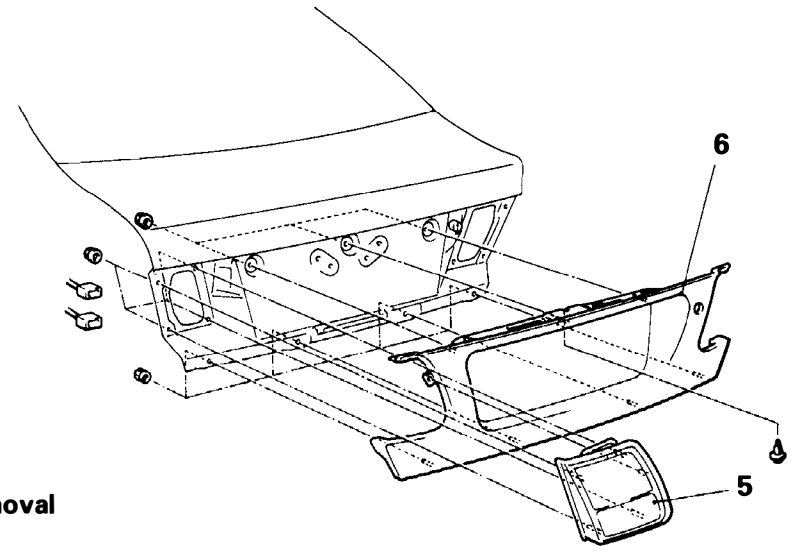
REMOVAL AND INSTALLATION

<Sedan, Hatchback>



A18X0328

<Hatchback>



A18X0412

Radiator grille removal

1. Radiator grille

Air inlet grille removal steps

2. Wiper arm assembly
3. Front deck garnish
4. Air intake garnish

Tailgate removal steps

- Tailgate lower trim
  (Refer to GROUP 52A – Trims.)

5. Rear combination lamp
6. Tailgate garnish

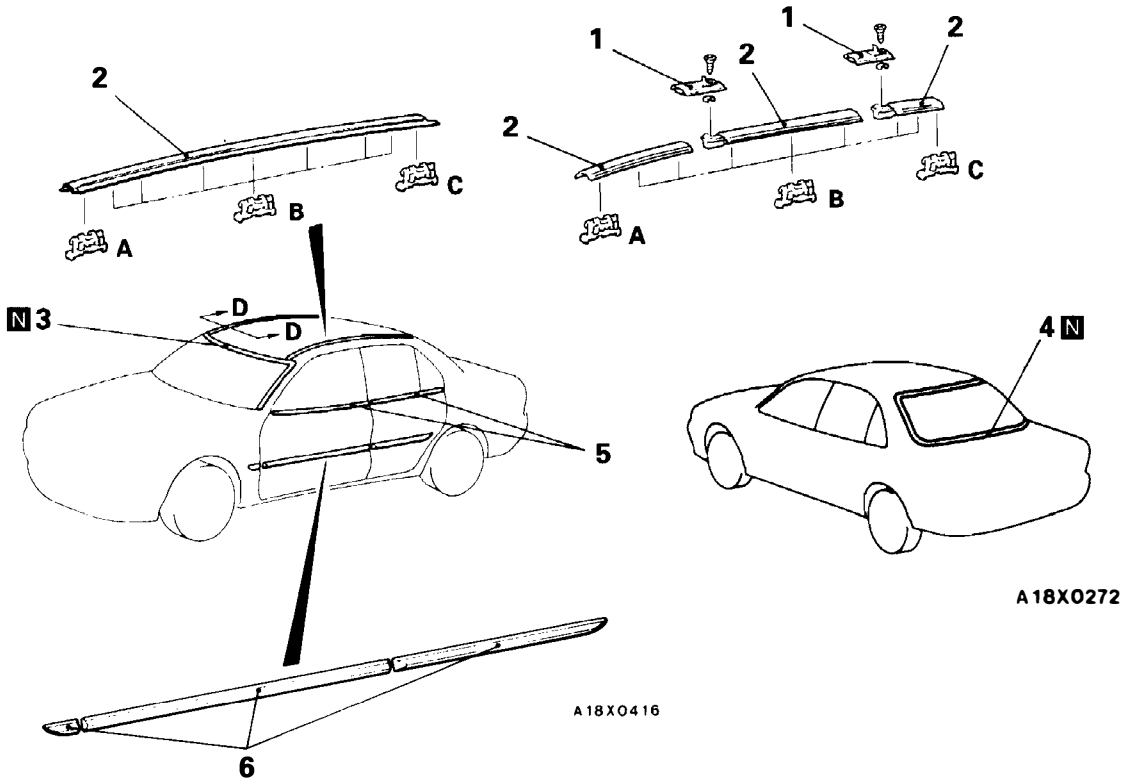
MOULDINGS

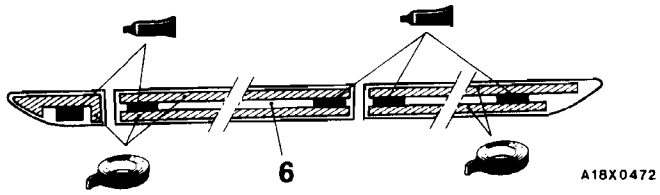
E51ZI00AA

REMOVAL AND INSTALLATION

<Sedan>

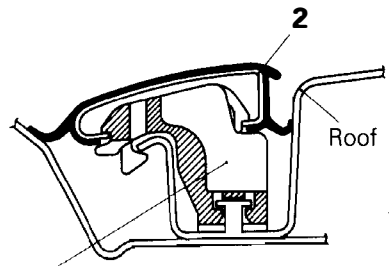
<Vehicles without roof carrier cap> **<Vehicles with roof carrier cap>**





Adhesive tape: Both-side tape
8 mm wide and 0.8 mm thick
Adhesive: 3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent and 3M ATD Part No. 8609 Super Fast Urethane Auto Glass sealant or equivalent

Section D–D



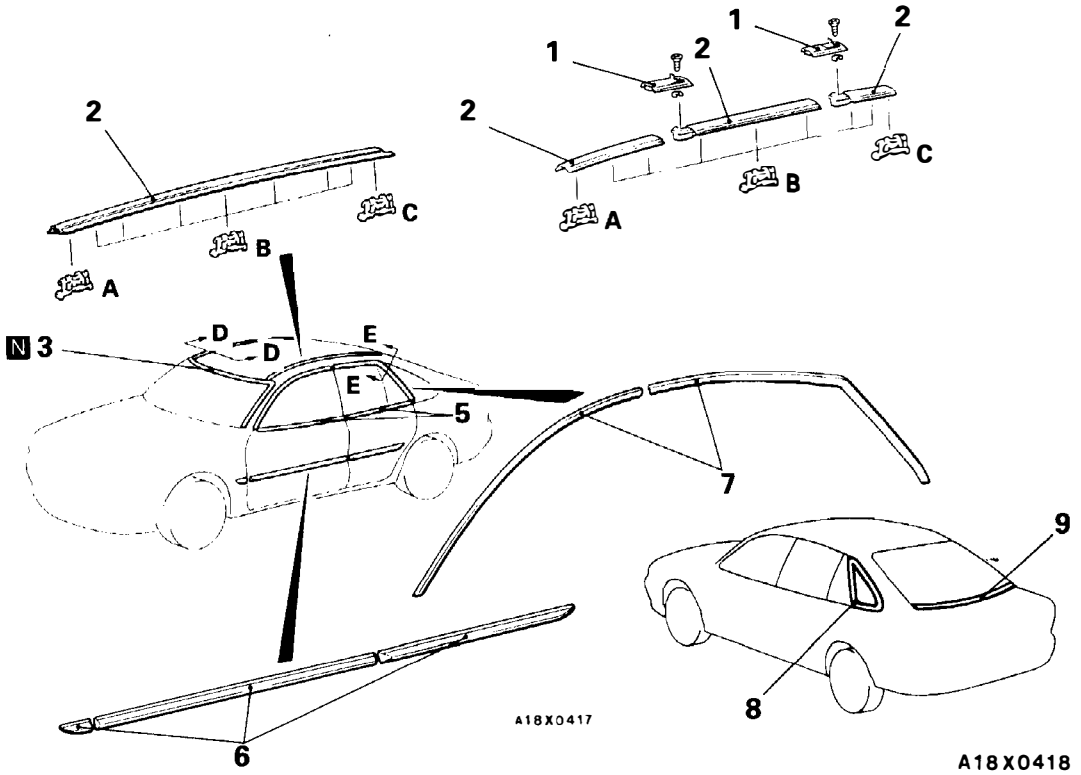
1. Roof carrier caps
〈A〉 〉B〈 2. Roof moulding
3. Windshield moulding
(Refer to GROUP 42 – Windshield.)
4. Rear window moulding
(Refer to GROUP 42 – Rear Window Glass.)
5. Belt line moulding
(Refer to GROUP 42 – Weatherstrip, Door Window Glass Runchannel and Belt Line Moulding.)
〈B〉 〉A〈 6. Side protector moulding

NOTE
The roof moulding clips A, B and C can be identified by colours as indicated below.
A: Blue
B: Natural
C: Black

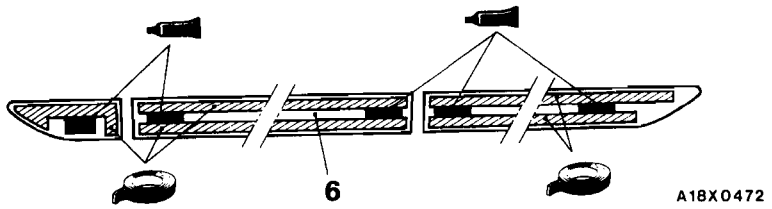
<Hatchback>

<Vehicles without roof carrier cap>

<Vehicles with roof carrier cap>

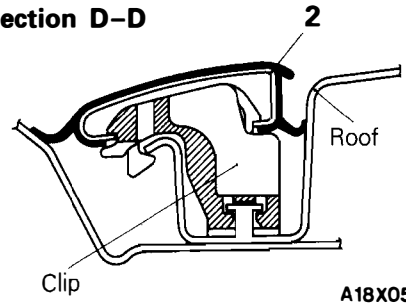


A18X0418



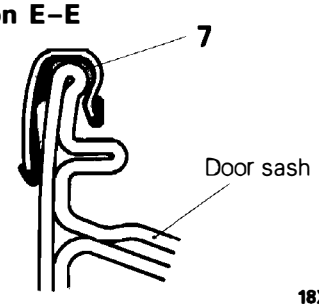
Adhesive tape: Both-side tape
8 mm wide and 0.8 mm thick
Adhesive: 3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent and 3M ATD Part No. 8609 Super Fast Urethane Auto Glass sealant or equivalent

Section D–D



A18X0507

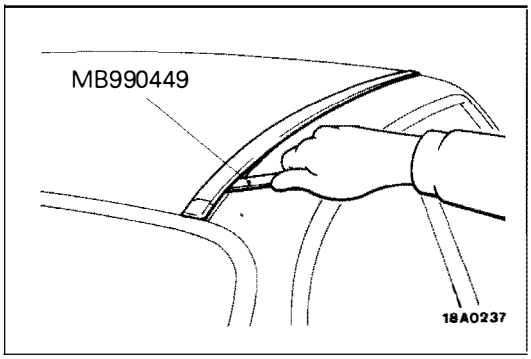
Section E–E



18X0275

1. Roof carrier caps
◇A◇ ◆B◆ 2. Roof moulding
3. Windshield moulding (Refer to GROUP 42 – Windshield.)
5. Belt line moulding (Refer to GROUP 42 – Weatherstrip, Door Window Glass Runchannel and Belt Line Moulding.)
◇B◇ ◆A◆ 6. Side protector moulding
7. Door sash moulding
8. Quarter window glass moulding (Refer to GROUP 42 – Quarter Window Glass.)
9. Tailgate lower moulding (Refer to GROUP 42 – Tailgate Window Glass.)

NOTE
Roof moulding clip identification colours
A: Blue
B: Natural
C: Yellow

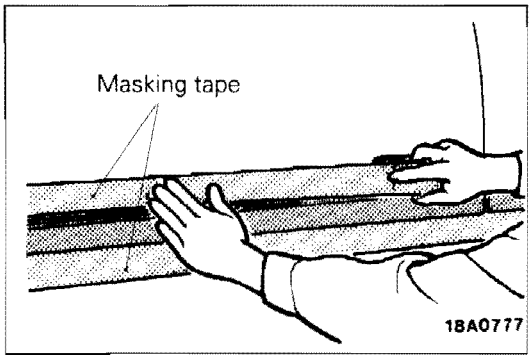


REMOVAL SERVICE POINTS E51ZI01AA

〈A〉 ROOF MOULDING REMOVAL

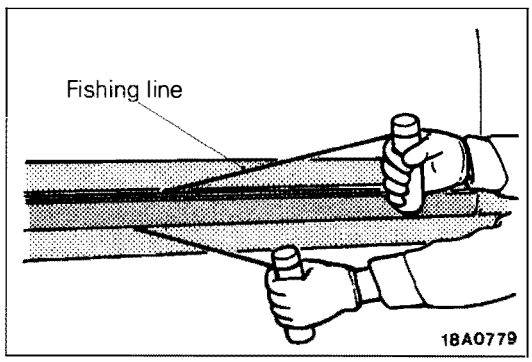
Use the special tool to lever out the moulding.

Caution
If the moulding has become warped, it should not be reused.



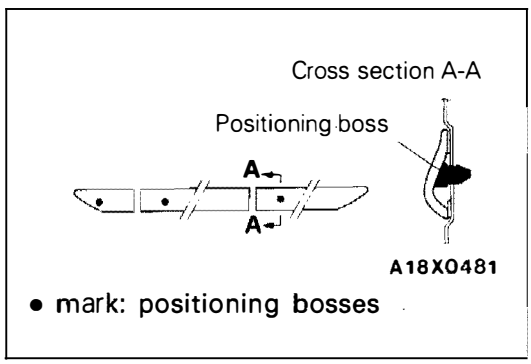
〈B〉 SIDE PROTECTOR MOULDING REMOVAL

(1) Apply masking tape to the outside circumference of the side protector moulding.

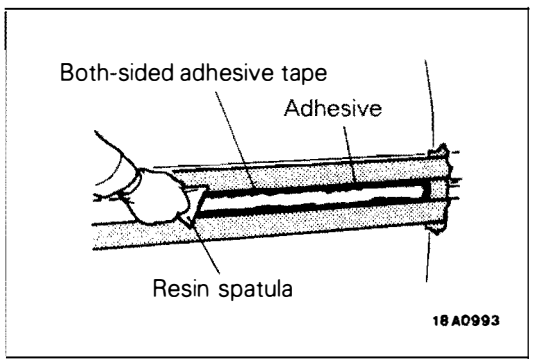


(2) Insert fishing line (ø0.8 mm) in between the body and the side protector moulding, and pull both ends alternately to cut the adhesive section and remove the side protector moulding.

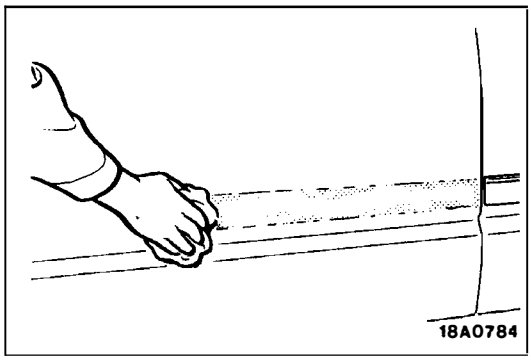
Caution
1. **When reusing the side protector moulding, pull the fishing line along the edge of the body so as not to damage the edge of the side protector moulding.**
2. **If the adhesive is difficult to remove, heat it to 40°C.**



(3) Pull the section of the side protector moulding with the positioning bosses towards you to remove the bosses from the mounting holes.



(4) Scrape off the both-sided adhesive tape with a resin spatula.
(5) Tear off the masking tape.
(6) Scrape off a small amount of the adhesive with a cutter knife.



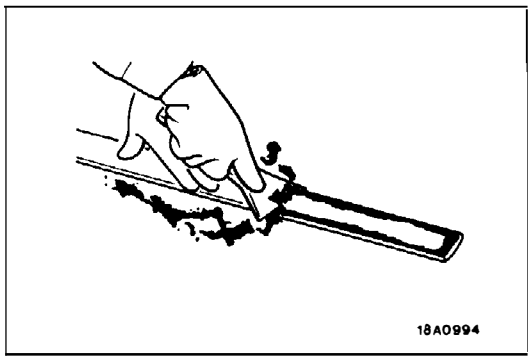
(7) Wipe the body surface clean with a rag moistened with isopropyl alcohol.

INSTALLATION SERVICE POINTS E51ZI04AA

◆A◆ SIDE PROTECTOR MOULDING INSTALLATION

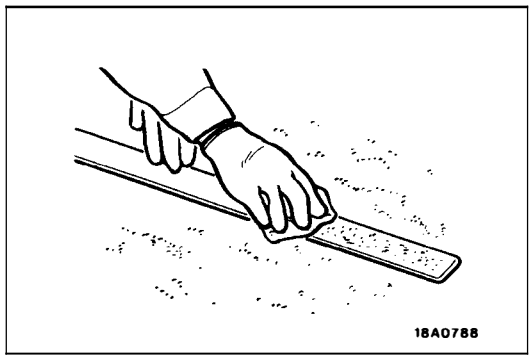
Both-sided tape affixing to the side protector moulding (when reusing)

(1) Scrape off the both-sided adhesive tape with a resin spatula or gasket scraper.



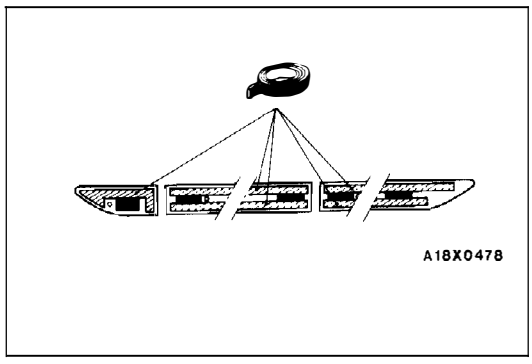
(2) Wipe the moulding adhesion surface clean with a rag moistened with isopropyl alcohol.
(3) Remove a small portion of the residual adhesive.

Caution
Do not remove all of the residual adhesive.



(4) Heat the adhesive surface of the both-side tape on the side protector moulding to about 40–60°C.
(5) Affix the specified both-sided adhesive tape to the side protector moulding.

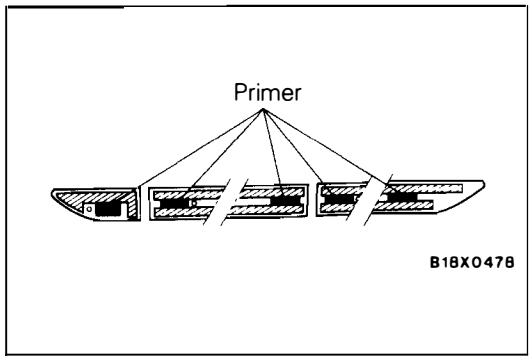
Adhesive tape: Both-side tape
8 mm wide and 0.8 mm thick



Side protector moulding installation

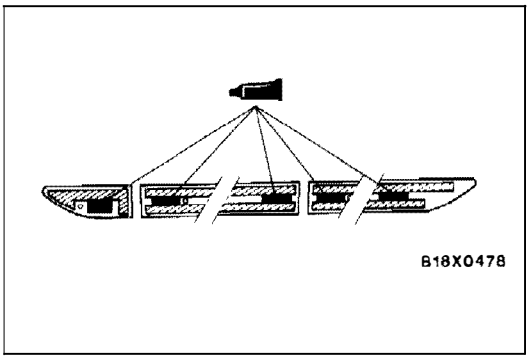
(1) Soak a sponge in the primer, and apply evenly to the side protector moulding in the places shown in the illustration.

Specified primer: 3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent



Caution
1. **The primer strengthens the adhesive strength, so be sure to apply it evenly around the entire circumference. Also, a too thick application will cause lowering of the adhesive strength.**
2. **Do not touch the coated surface.**

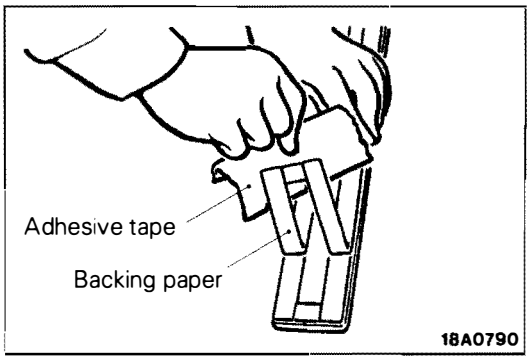
(2) After applying the primer, let it dry for 3 to 30 minutes.



(3)Apply adhesive to the side protector moulding.

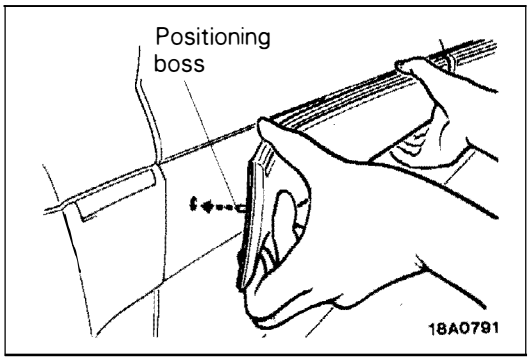
Specified adhesive: 3M ATD Part No. 8609 Super Fast Urethane Auto Glass Sealant or equivalent

NOTE
When reusing the side protector moulding, remove some of the residual adhesive, and apply the new adhesive over the top.



(4) Tear off the both-sided tape backing paper.

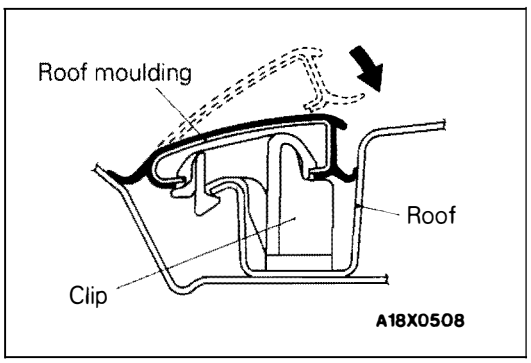
NOTE
If you attach the adhesive tape to the edge of the backing paper, it will be easy to tear off.



(5) Install the side protector moulding so that the positioning bosses match the body holes.

NOTE
If the both-sided adhesive tape is difficult to affix during winter, etc., warm the bonding surfaces of the body and the side protector moulding to about 40–60°C before affixing the tape.

(6) Firmly press in the side protector moulding.



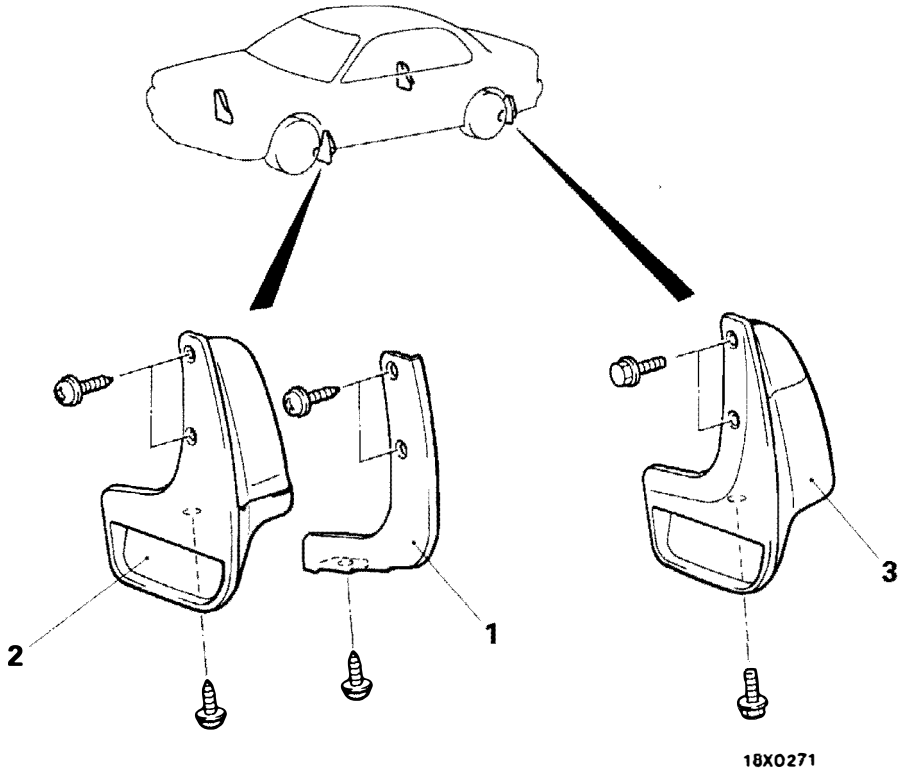
◆B◆ ROOF MOULDING INSTALLATION

(1) Install the clips to the clip installation bosses on the roof.
(2) Install the roof moulding with the clips.

MUD GUARD AND STONE GUARD

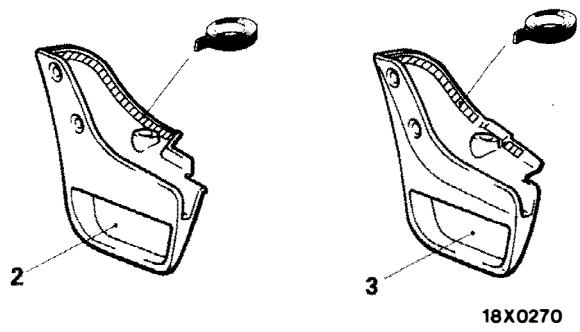
E51ZJ00AA

REMOVAL AND INSTALLATION



18X0271

1. Stone guard
2. Front mud guard
3. Rear mud guard



18X0270

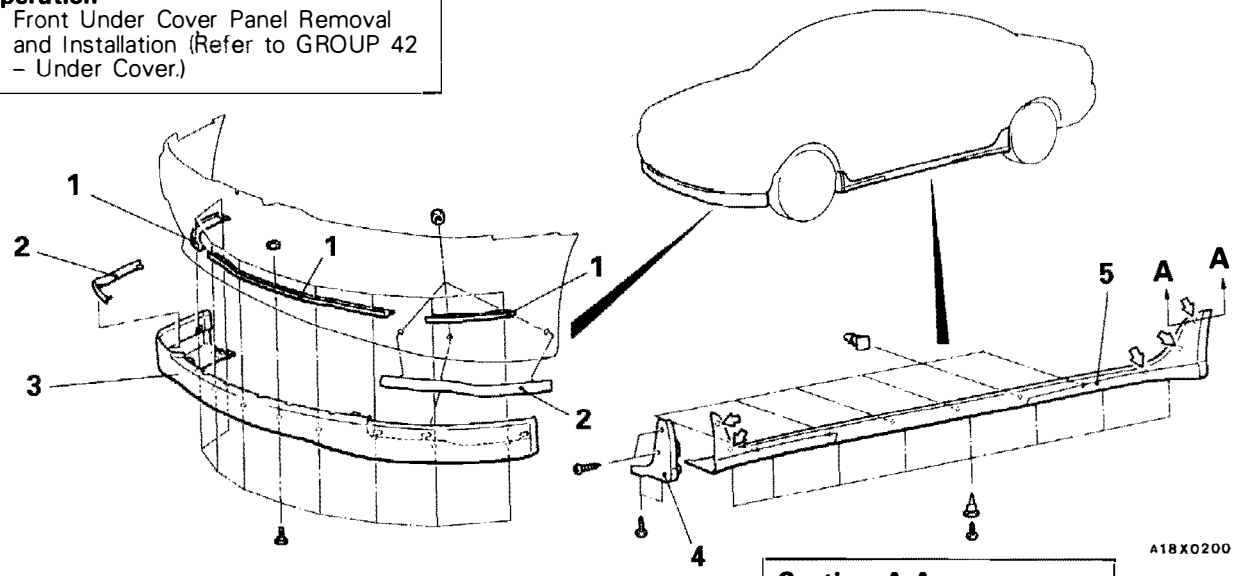
Sealant:
3M ATD Part No. 8625 or equivalent

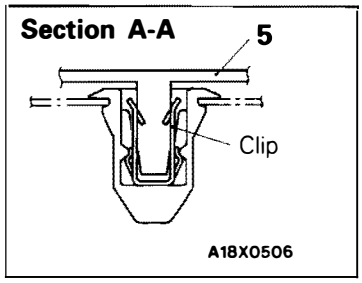
AERO PARTS

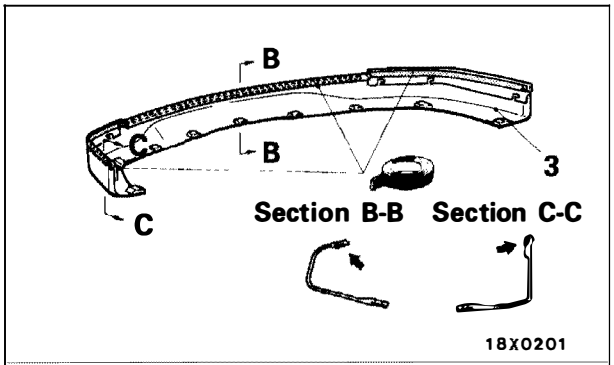
E51ZK00AA

REMOVAL AND INSTALLATION

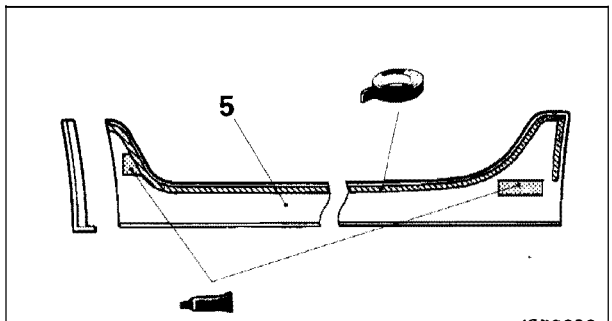
Pre-removal and Post-installation Operation
- Front Under Cover Panel Removal and Installation (Refer to GROUP 42 – Under Cover.)







Adhesive tape : Both-side tape
12 mm wide and 1 mm thick



Adhesive tape : Both-side tape
8 mm wide and 1.2 mm thick
Adhesive: 3M ATD Part No. 8608 Super Fast Urethane Primer or equivalent and 3M ATD Part No. 8609 Super Fast Urethane Auto Glass sealant or equivalent

Airdam panel removal steps
1. Airdam lower plate
2. Airdam upper plate

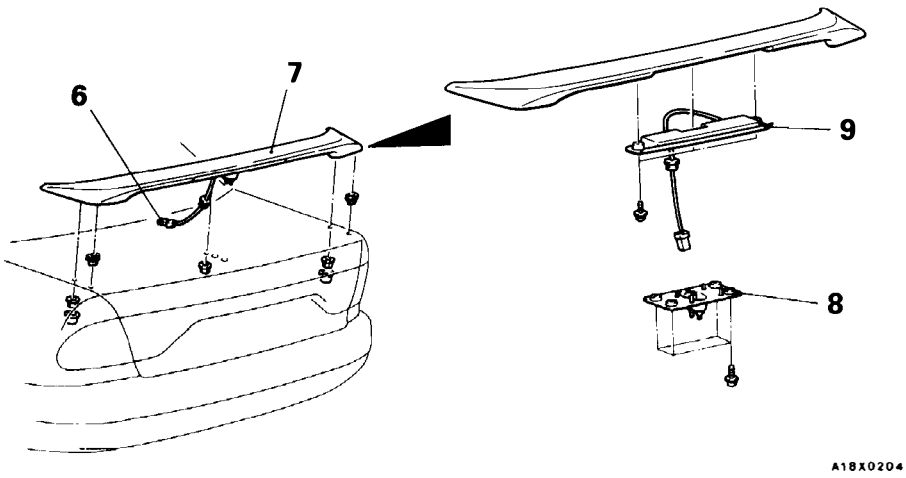
◇A◇ ◆A◆ 3. Airdam panel

Side airdam removal steps
4. Side airdam front

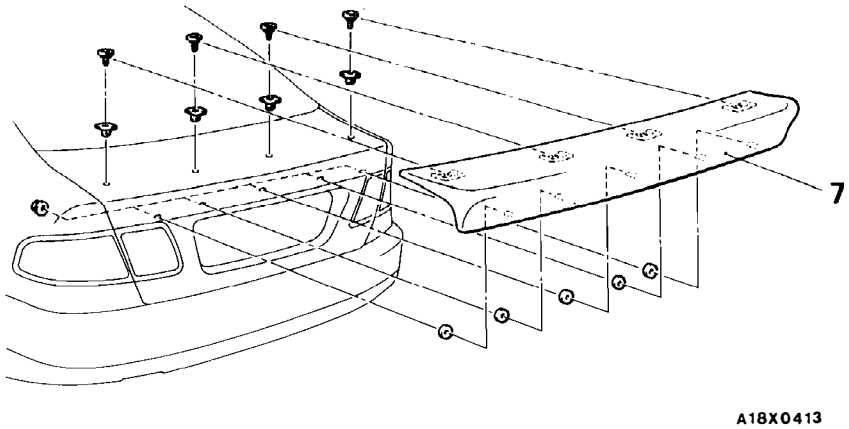
◇A◇ ◆A◆ 5. Side airdam rear

NOTE:
⇦: metal clip position

<Sedan>



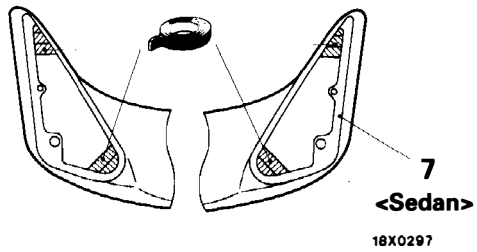
<Hatchback>



Rear spoiler removal steps

- Trunk lid trim <Sedan> (Refer to GROUP 52A – Trims.)
- Tailgate lower trim <Hatchback> (Refer to GROUP 52A – Trims.)

6. Harness connector <Sedan> (L.H. drive vehicles)
7. Rear spoiler
8. Center cover <Sedan>
9. High mounted stop lamp <Sedan> (L.H. drive vehicles)



Adhesive tape: Both-side tape 20 mm wide and 1.6 mm thick

REMOVAL AND INSTALLATION SERVICE POINTS

E51ZK01AA

〈A〉▶A◀ AIRDAM PANEL/SIDE AIRDAM REAR REMOVAL AND INSTALLATION

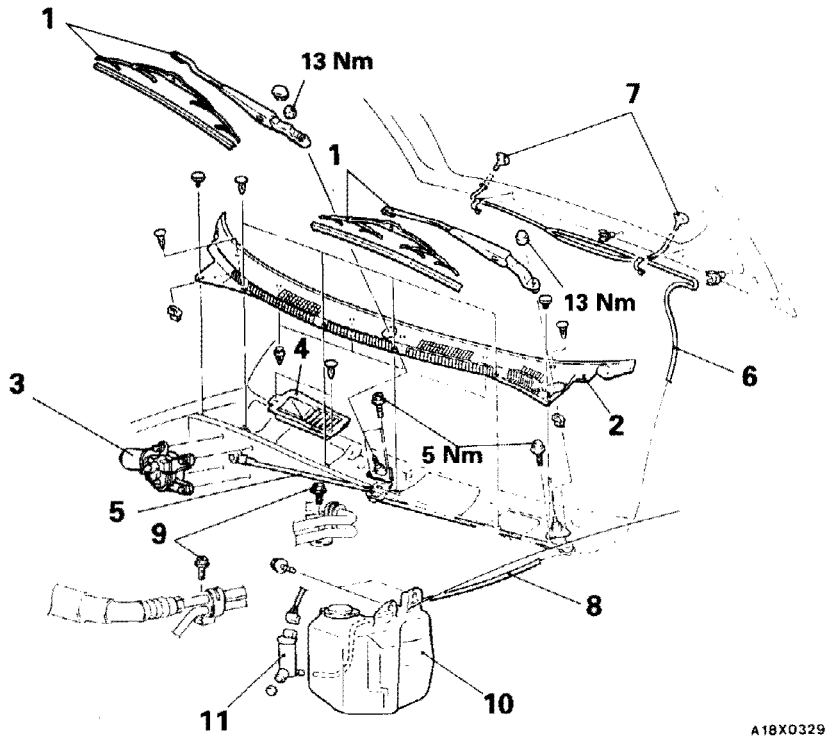
Remove and install by the same procedure as for the side protector moulding. (Refer to P.51-8.)

WINDSHIELD WIPER AND WASHER

E51ZL00AA

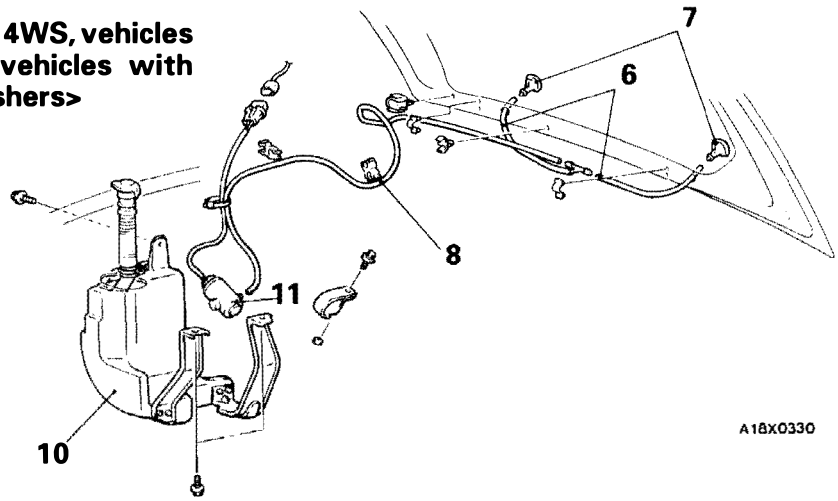
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Auto-Cruise Vacuum Pump Assembly Removal and Installation <Vehicles with auto-cruise control system> (Refer to GROUP 13G – Auto-Cruise Control.)



A18X0329

<Vehicles with 4WS, vehicles with ECS or vehicles with headlamp washers>



A18X0330

Wiper motor and linkage removal steps

A 1. Wiper arm and blade assembly
2. Front deck garnish
A 3. Wiper motor
4. Air intake garnish
5. Linkage

Washer nozzle removal steps

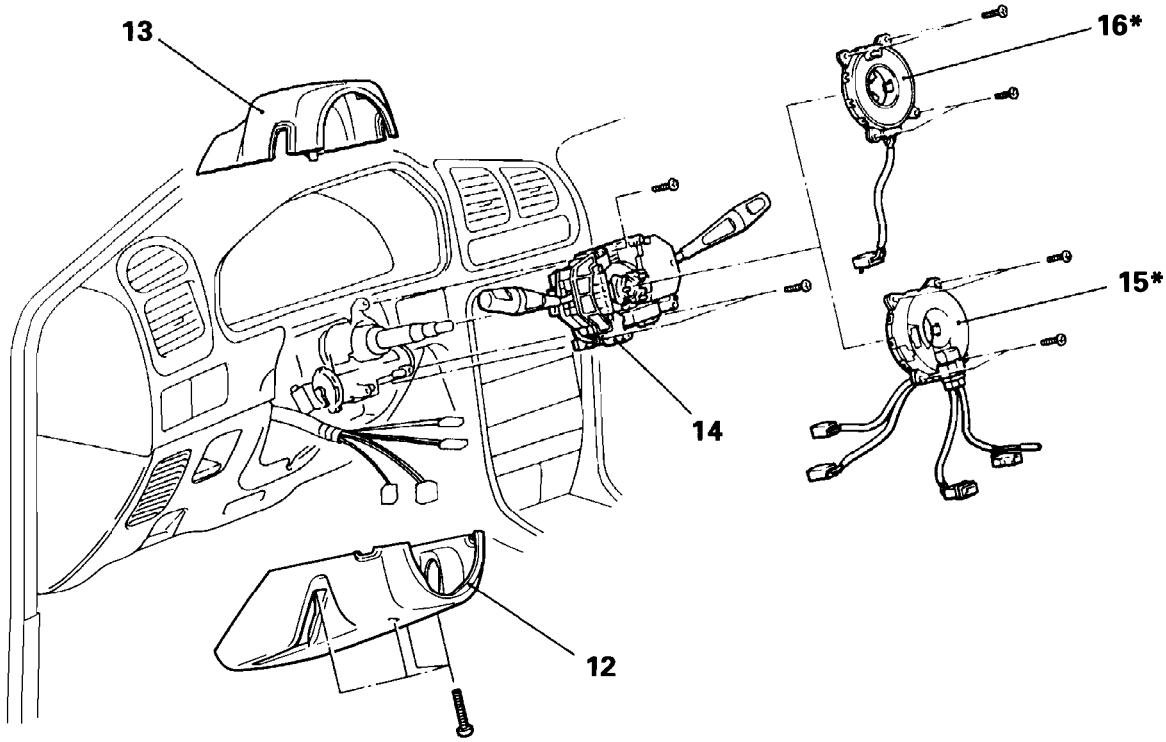
6. Washer hose
7. Washer nozzle

Washer tank removal steps

- Front bumper <Vehicles with 4WS, vehicles with ECS or vehicles with headlamp washers> (Refer to P.51-3.)

8. Washer hose
9. A/C hose installation bolt <vehicle with A/C>
10. Washer tank
11. Washer motor

CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



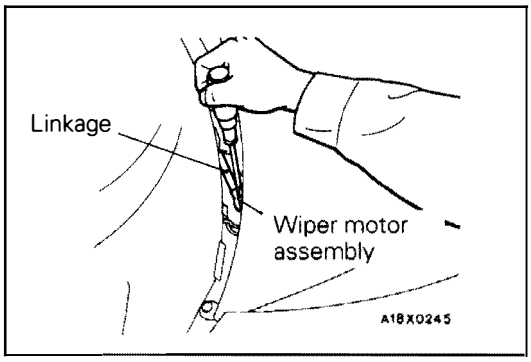
A16X0624

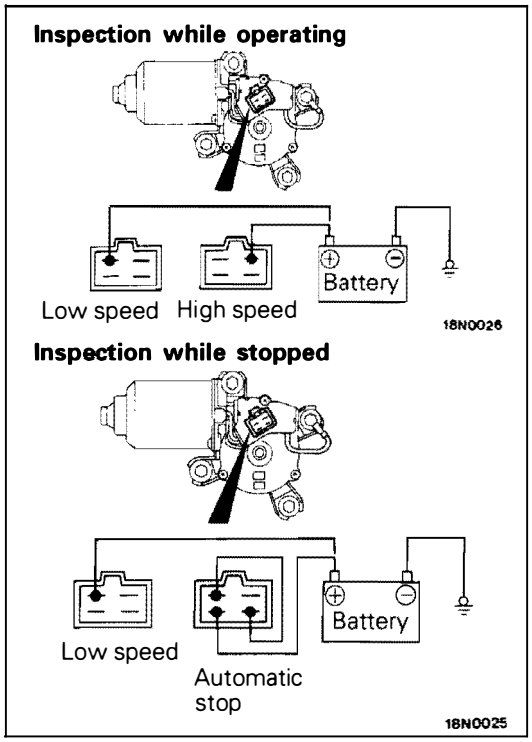
Column switch removal steps

- Horn pad (Refer to GROUP 37A – Steering Wheel and Shaft.)
- Air bag module (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

12. Column cover lower
13. Column cover upper
14. Column switch assembly (with built-in wiper and washer switch, and wiper relay)
15. Clock spring* <Vehicles with SRS> (Refer to GROUP 52B – Air Bag Module and Clock Spring.)
16. Slip ring* <Vehicles with auto-cruise control system>

NOTE
Parts marked with * should not be removed from the column switch except when removal is absolutely necessary.





REMOVAL SERVICE POINTS E51ZL01AA

〈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 E51ZL02AA

WIPER MOTOR

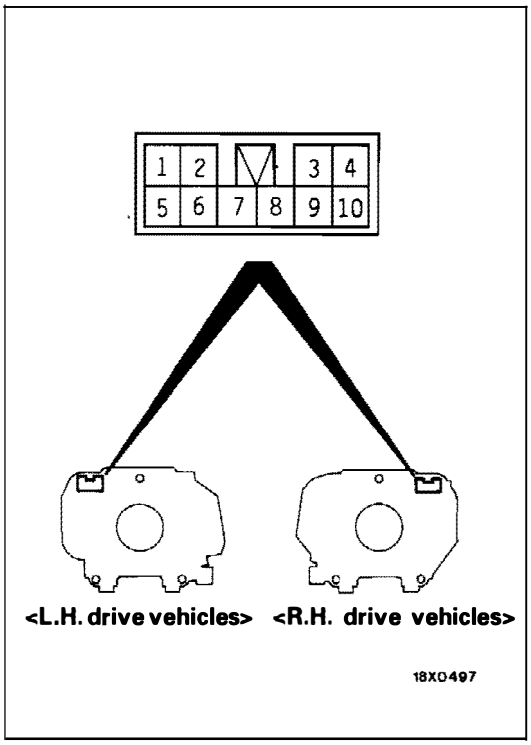
Check the wiper motor after disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

Wiper Motor at Low Speed and High Speed Operation

Connect a battery to the wiper motor as shown in the illustration and inspect motor operation at low speed and high speed.

Wiper Motor at Stop Position Operation

(1) Run the wiper motor at low speed, disconnect the battery, and stop the motor.
(2) Reconnect the battery as shown in the illustration, and confirm that after the motor starts turning at low speed, it stops at the automatic stop position.



COLUMN SWITCH

E51ZL02BA

Wiper and Washer Switch

Operate switch and check for continuity between terminals.

<L.H. drive vehicles>

Switch position	Terminal	5	6	7	8	9
Wiper switch	OFF		○	○		
	1 (LO)			○		○
	2 (HI)				○	○
Washer switch	ON	○				○

<R.H. drive vehicles>

Switch position	Terminal	6	7	8	9	10
Wiper switch	OFF			○	○	
	1 (LO)	○		○		
	2 (HI)	○	○			
Washer switch	ON	○				○

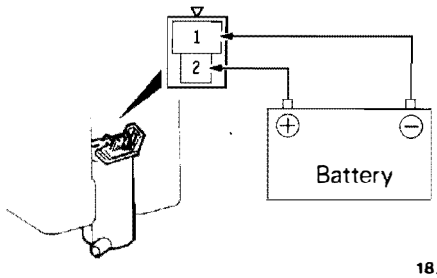
NOTE
○—○ indicates that there is continuity between the terminals.

Intermittent Wiper Relay (Intermittent Operation Inspection)

(1) Connect the column switch connector.
(2) Turn the ignition switch to ACC.
(3) Inspect the intermittent operation time when the wiper switch is turned to INT.

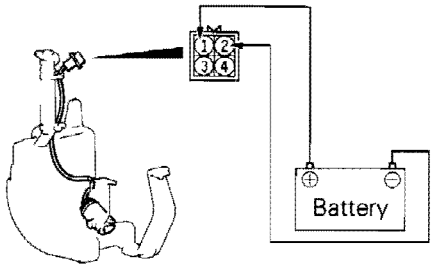
Vehicles with variable intermittent control
FAST: Approx. 3 seconds
SLOW: Approx. 12 seconds

<Vehicles except those equipped with 4WS, ECS or headlamp washers>

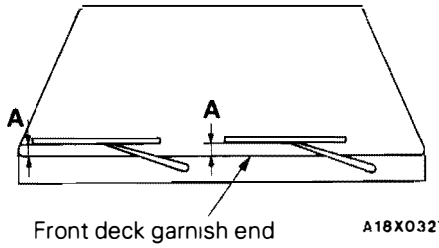


18X0276

<Vehicles with 4WS, ECS or headlamp washers>



18X0505



A18X0327

WASHER MOTOR

E51ZL02CA

(1) With the washer motor installed to the washer tank, fill the washer tank with water.
(2) When the battery is connected as shown in the figure, check that the water squirts out strongly.

INSTALLATION SERVICE POINTS

E51ZL04AA

◆A◆ WIPER ARM AND BLADE ASSEMBLY INSTALLATION

(1) The movements of the left and right wiper arms are different, so check the identification marks.
(2) Install the wiper blade in the specified position (standard value) as shown in the illustration.

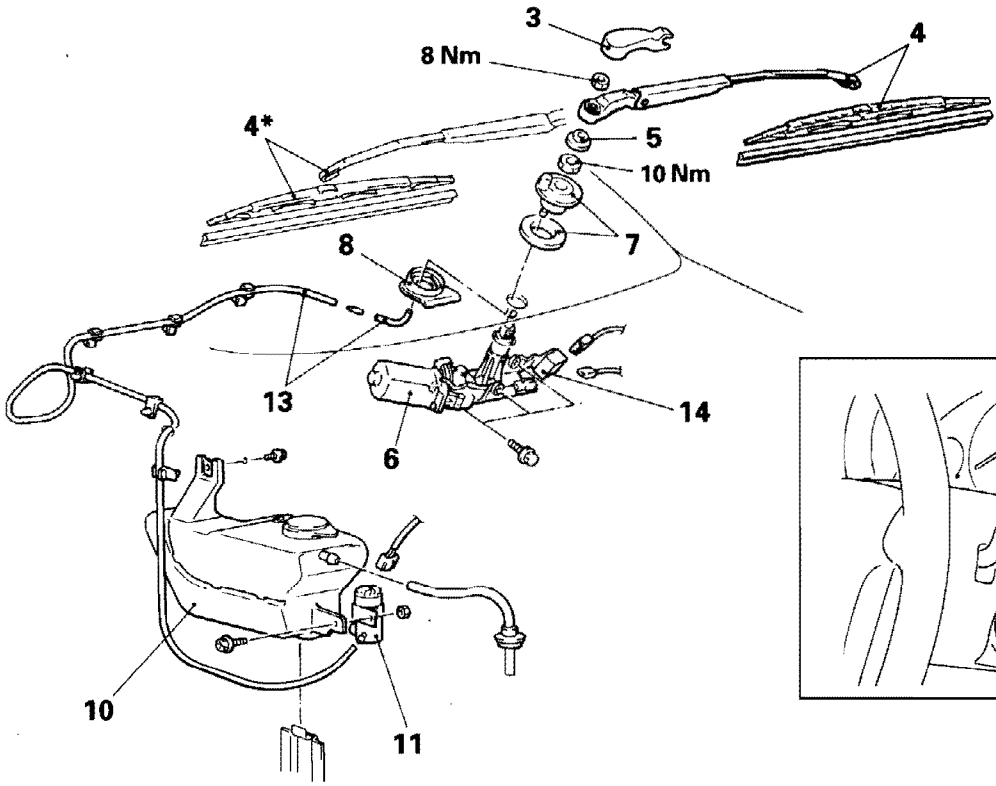
Standard value (A): 15 ±5 mm

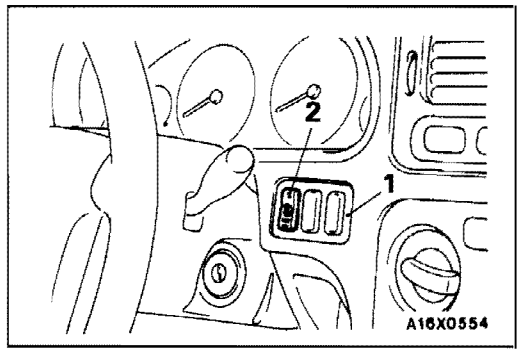
REAR WIPER AND WASHER

E51ZM00AA

REMOVAL AND INSTALLATION

<Sedan>





A18X0331

Rear wiper and washer switch removal steps

1. Instrument panel switch assembly (LH)
2. Rear wiper and washer switch

Wiper motor removal steps

3. Cover
◇A◇ ◆A◆ 4. Wiper arm and blade
5. Shield cap
6. Wiper motor
7. Washer nozzle and collar assembly
8. Packing and washer assembly

Rear washer hose and washer tank removal steps

3. Cover
◇A◇ ◆A◆ 4. Wiper arm and blade
5. Shield cap
7. Washer nozzle and collar assembly
- Trunk side trim
- Corner plate

} (Refer to GROUP 52A – Trims.)

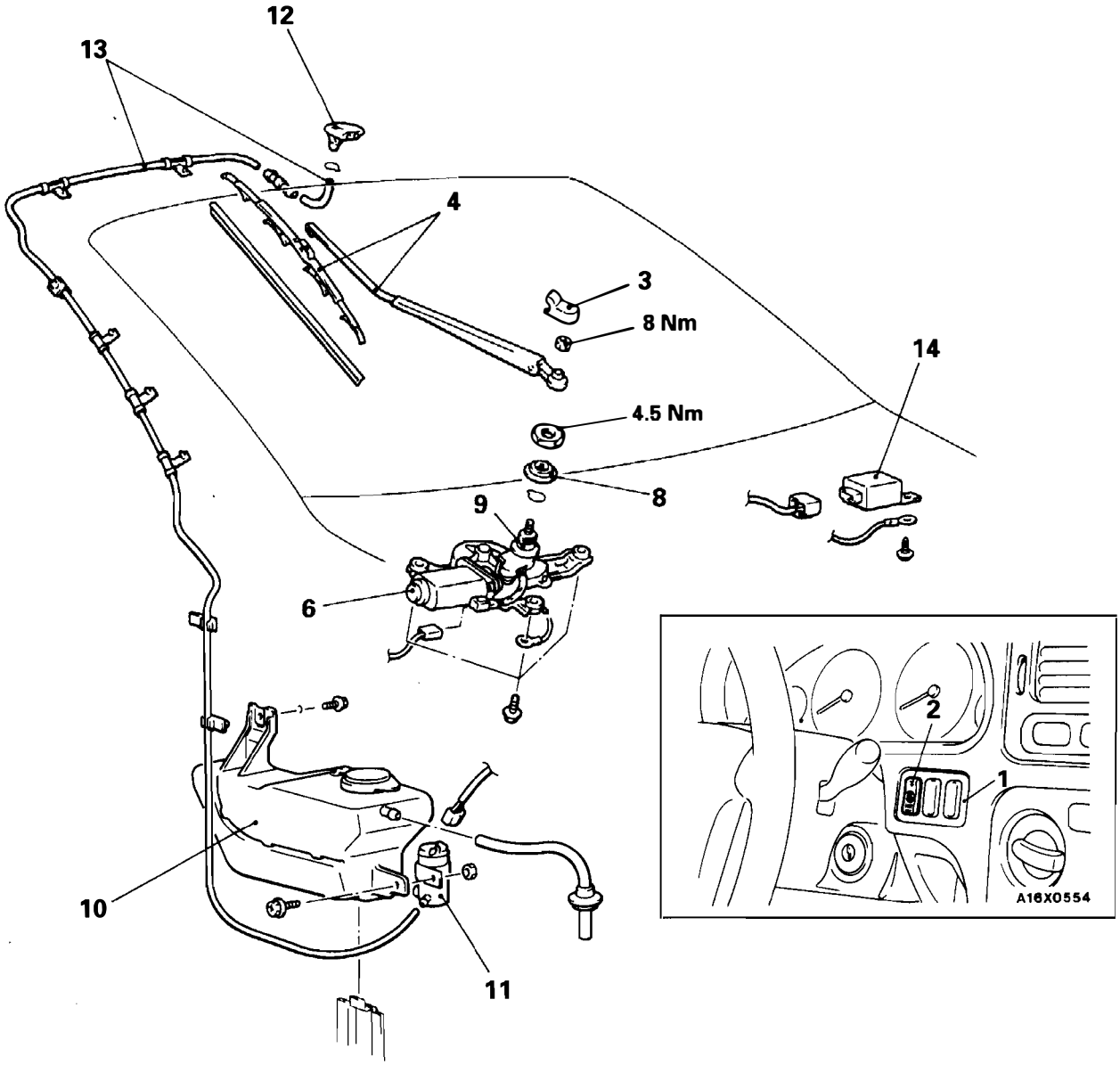
10. Washer tank assembly
11. Washer motor
13. Washer hose

Rear intermittent wiper relay removal

14. Rear intermittent wiper relay

NOTE
The * mark indicates the installation position for vehicles with a high mounted stop lamp on the rear shelf.

<Hatchback>



A18X0414

Rear wiper and washer switch removal steps

1. Instrument panel switch assembly (LH)
2. Rear wiper and washer switch

Wiper motor removal steps

3. Cover
◇A◇ ◆A◆ 4. Wiper arm and blade
- Tailgate lower trim (Refer to GROUP 52A – Trims.)

6. Wiper motor
8. Packing and washer assembly
9. Holder

Rear intermittent wiper relay removal

- Tailgate lower trim (Refer to GROUP 52A – Trims.)

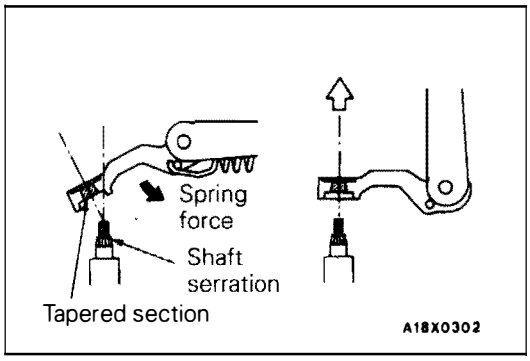
14. Rear intermittent wiper relay

Rear washer hose and washer tank removal steps

- Rear side trim (LH) } (Refer to GROUP
- Corner plate (LH) } 52A – Trims.)

10. Washer tank
11. Washer motor
- Rear pillar trim (Refer to GROUP 52A – Trims.)
- Headlining (Refer to GROUP 52A – Headlining.)

12. Washer nozzle
13. Washer hose

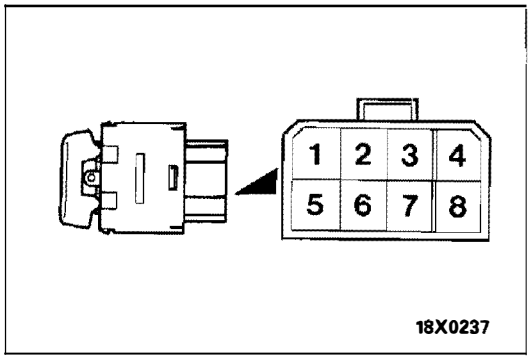


REMOVAL SERVICE POINT E51ZM01AA

⟨A⟩ WIPER ARM AND BLADE REMOVAL

Remove the wiper arm from the shaft while the wiper arm is raised.

Caution
If the wiper arm is forced while it is still lowered, the tapered section of the wiper arm will be scraped by the shaft serrations and the diameter of the tapered section will become too big, so sufficient care should be exercised.



INSPECTION E51ZM02AA

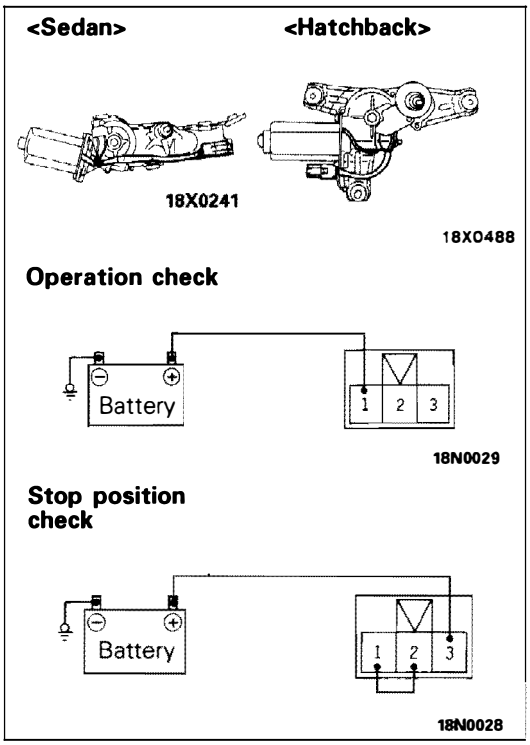
REAR WIPER AND WASHER SWITCH

Rear Wiper and Washer Switch Continuity Inspection

Operate the switch, and check the continuity between the terminals.

Switch position \ Terminal	1	2	3	4	6	7	IND	5	ILL	8
OFF				○		○		○	○	○
INT	○			○	○		○	○	○	○
ON	○	○	○			○	○	○	○	○

NOTE
○—○ indicates that there is continuity between the terminals.



WIPER MOTOR E51ZM02BA

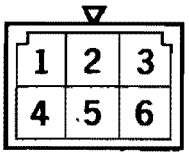
Check the wiper motor after first disconnecting the wiring harness connector, and with the wiper motor remaining installed to the body.

Wiper Motor Operation

Connect a battery to the wiper motor as shown in the illustration and inspect the motor operation.

Wiper Motor at Stop Position Operation

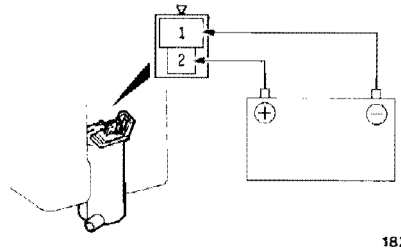
(1) Run the wiper motor, disconnect the battery, and stop the motor.
(2) Reconnect the battery as shown in the illustration, and confirm that after the motor starts turning, it stops at the automatic stop position.



16L0300

INTERMITTENT WIPER RELAY E51ZM02CA

(1) Check to be sure that there is continuity between terminals (1) – (2).
(2) Connect terminal (4) to the battery (+) terminal.
(3) Check that there is battery voltage at terminal (2) for intermittent periods of 8 seconds when terminal (5) is connected to the battery (–) terminal.



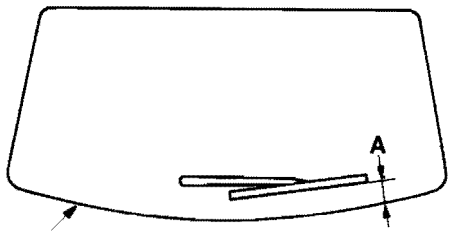
18X0276

WASHER MOTOR E51ZM02DA

(1) With the washer motor installed to the washer tank, fill the washer tank with water.
(2) When the battery is connected as shown in the figure, check that the water squirts out strongly.

<Sedan>

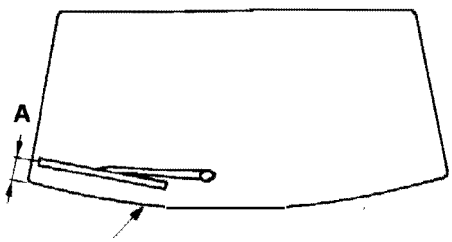
Vehicles without high-mounted stop lamp on rear shelf



Rear window moulding end

18N0005

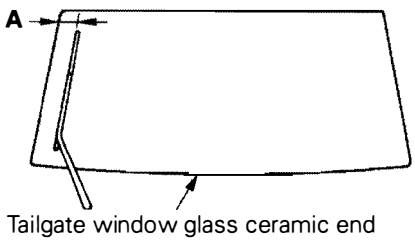
Vehicles with high-mounted stop lamp on rear shelf



Rear window moulding end

18X0287

<Hatchback>



Tailgate window glass ceramic end

A18X0326

INSTALLATION SERVICE POINTS E51ZM04AA

◆A◆ WIPER ARM ASSEMBLY INSTALLATION

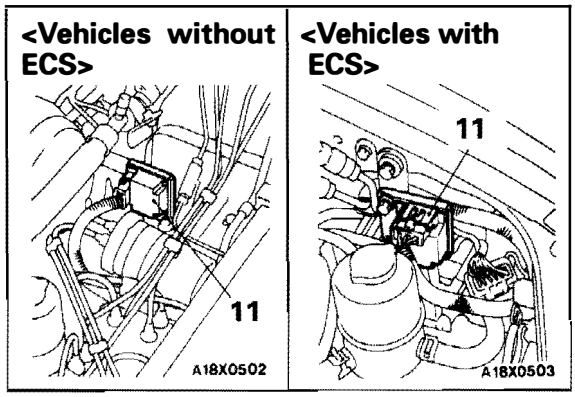
Install the wiper arm to the pivot shaft so that the wiper blade's stop position is the position (standard value) shown in the illustration.

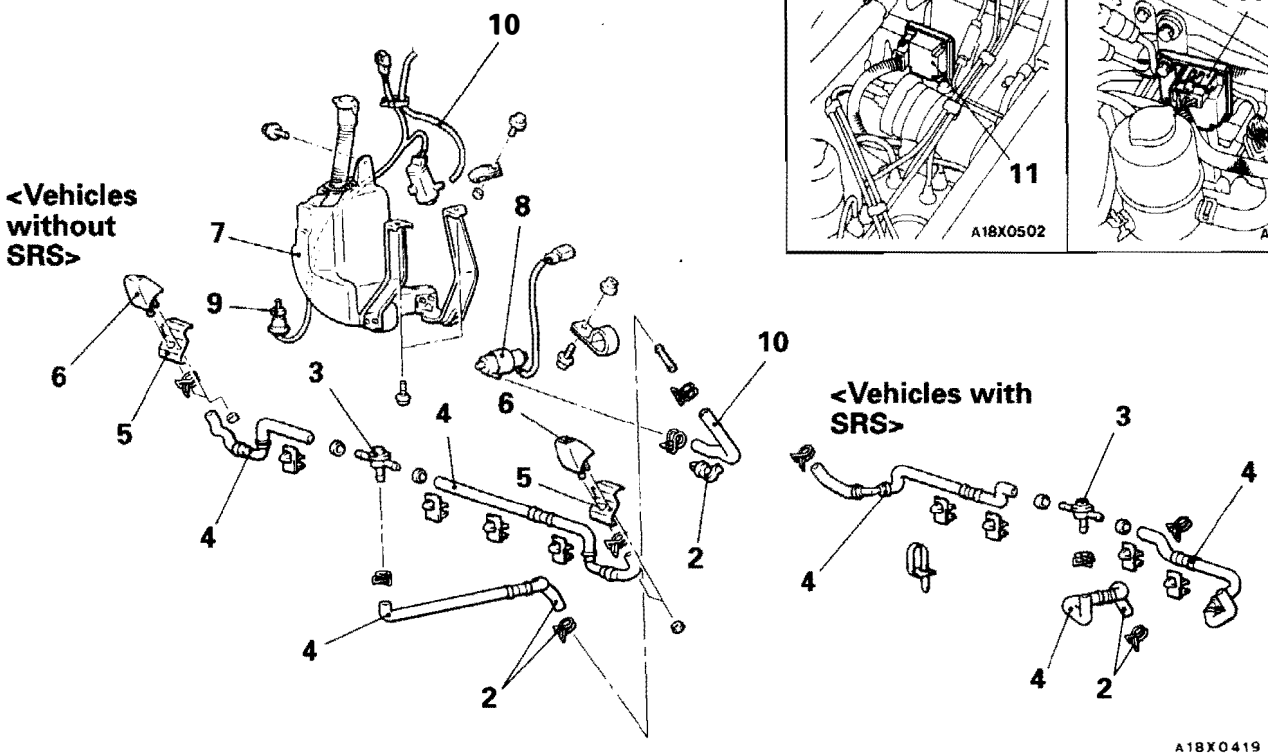
Standard value (A): 10 ± 5 mm

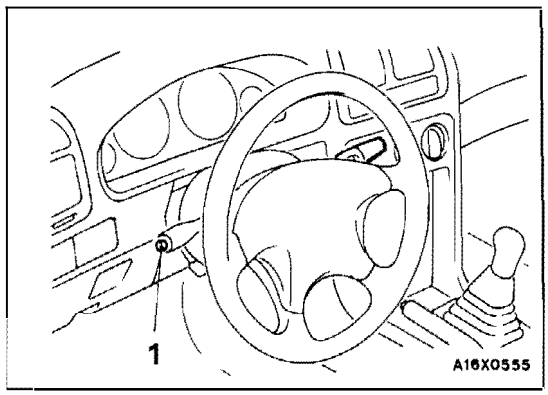
HEADLAMP WASHER

E51ZN00AA

REMOVAL AND INSTALLATION







Column switch (with built-in headlamp switch) removal

1. Column switch assembly (Refer to P.51-15.)

Nozzle and check valve removal steps

2. Washer hose connection
- Front bumper (Refer to P.51-3.)
- Draining of washer fluid

3. Check valve
4. Washer hose assembly
5. Bracket
6. Nozzle

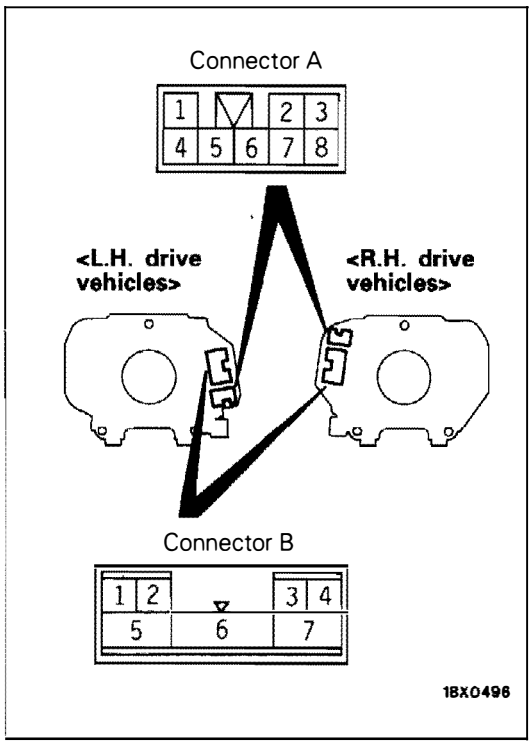
Washer tank removal steps

2. Washer hose connection
- Draining of washer fluid
- Front bumper (Refer to P.51-3.)

7. Washer tank assembly
8. Headlamp washer motor
9. Washer motor and washer fluid level switch
10. Washer hose

Headlamp washer relay removal

11. Headlamp washer relay



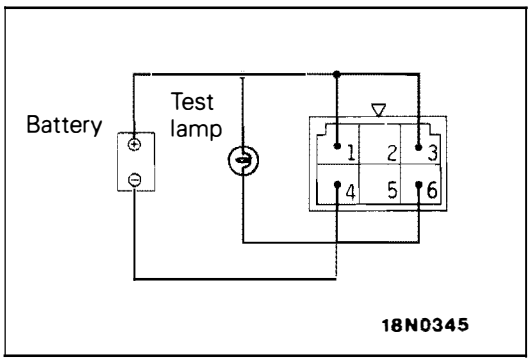
INSPECTION E51ZN02AA

HEADLAMP WASHER SWITCH

Operate switch and check for continuity between terminals.

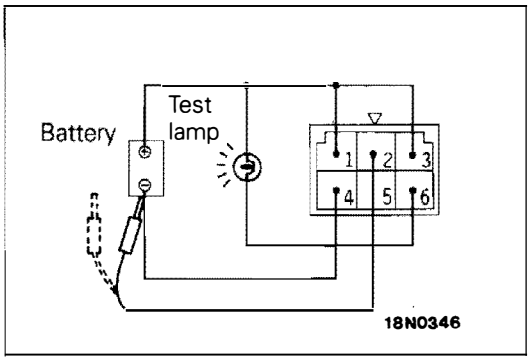
Connector / Terminal / Switch position	A	B
	6	2
OFF		
ON	○—○	

NOTE
○—○ Indicates that there is continuity between the terminals.

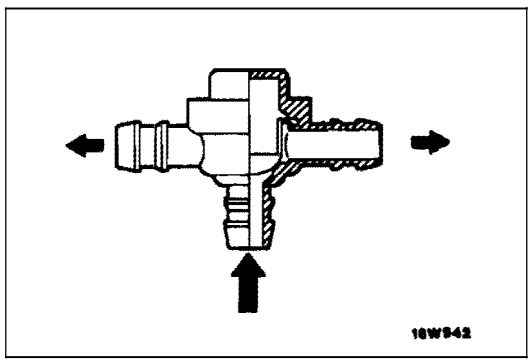


HEADLAMP WASHER RELAY E51ZN02BA

(1) Connect battery and test lamp to the relay as illustrated.



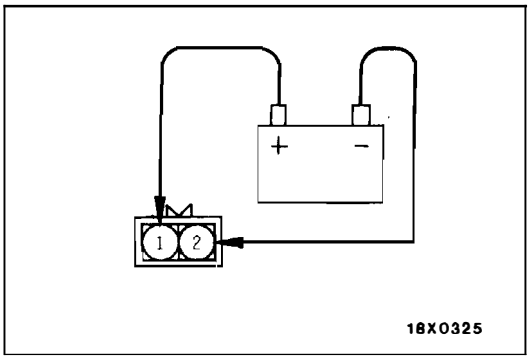
(2) The relay is normal if the lamp lights for approximately 0.5 second upon connection of terminal (2) to battery (–).



CHECK VALVE E51ZN02CA

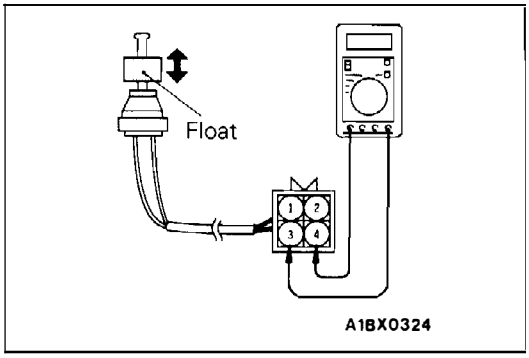
Apply pressure to the inlet of the check valve to check its opening pressure.

Opening pressure: 78 kPa



HEADLAMP WASHER MOTOR E51ZN02DA

(1) With the washer motor installed to the washer tank, fill the washer tank with water.
(2) Connect battery (+) and (–) cables to terminals (2) and (1) respectively to see that the washer motor runs and water is injected.



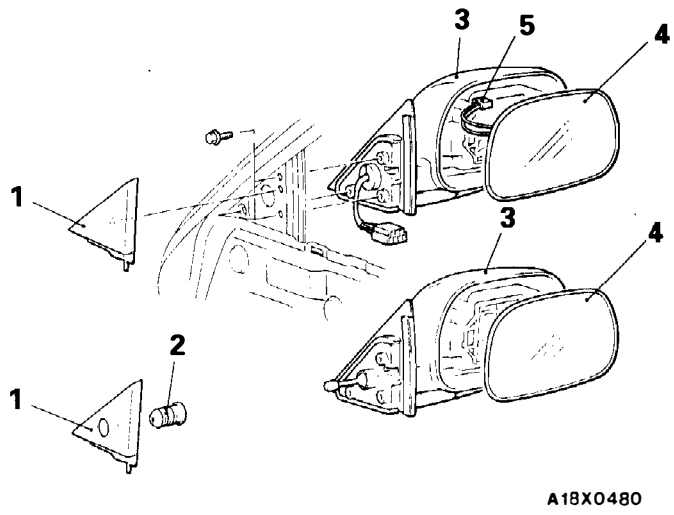
WASHER FLUID LEVEL SWITCH E51ZN02EA

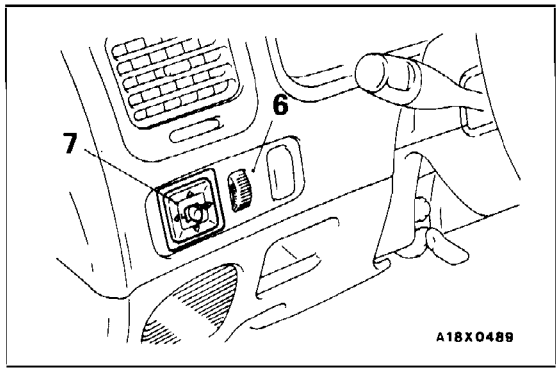
(1) Remove the washer fluid level switch from the washer tank.
(2) Connect a circuit tester to the connector of washer fluid level switch.
(3) Move the float up and down
(4) Check to be sure that there is continuity between the terminals when the float is down.

DOOR MIRROR

E51ZO00AA

REMOVAL AND INSTALLATION





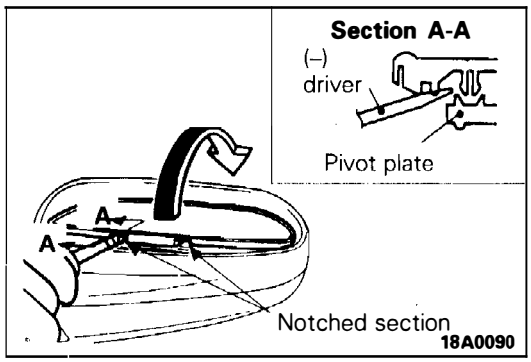
Door mirror removal steps

- Front door trim (Refer to GROUP 42 – Door Trim and Waterproof film.)

1. Delta cover inner
2. Boot
3. Door mirror
〈A〉 4. Mirror
5. Harness connector

Door mirror control switch removal steps

6. Instrument panel switch assembly
7. Door mirror control switch

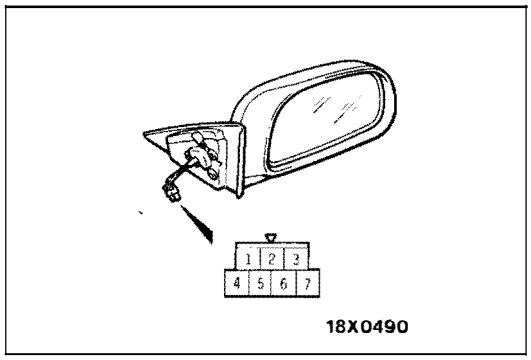


REMOVAL SERVICE POINTS

E51ZO01AA

〈A〉 MIRROR REMOVAL

Turn the mirror by hand so that it faces upwards, insert the (–) driver wound with masking tape into the notched section, and lever out the mirror to remove it.



INSPECTION E51ZO02AA

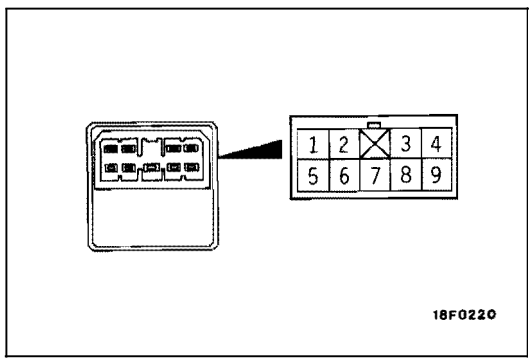
REMOTE CONTROL MIRROR ASSEMBLY

(1) Check to be sure that the mirror moves as described in the table when each terminal is connected to the battery.
(2) Check if there is continuity between terminals (1) and (4).

Connection / Direction of operation	Battery ⊕	Battery ⊖	Terminal 5	Terminal 6	Terminal 7	Terminal 1	Terminal 4
UP	○		○		○		
DOWN	○		○		○		
LEFT	○		○	○			
RIGHT	○		○	○			

Printed heating wire

NOTE
○—○ indicates each terminal is connected to the battery.



DOOR MIRROR CONTROL SWITCH E51ZO028A

Operate switch and check for continuity between terminals

Terminal / Direction	Left side 3	Left side 4	Left side 6	Left side 7	Left side 8	Right side 2	Right side 4	Right side 6	Right side 7	Right side 9
UP		○		○	○	○	○			
			○	○				○	○	
DOWN		○		○			○		○	
			○		○	○		○		
LEFT		○		○			○		○	
	○		○					○		○
RIGHT	○	○					○		○	○
			○	○				○	○	

NOTE
○—○ indicates that there is continuity between the terminals.

SWITCH AND RELAY OF DOOR MIRROR PRINTED HEATING WIRE E51ZO02CA

The printed heating wire of the door mirror operates in conjunction with the rear window defogger.
The switch and relay are used for the rear window defogger also, so refer to GROUP 54 – Rear Window Defogger for inspection service points.

INTERIOR

CONTENTS

E52ZA00AA

 PWDE9211

NOTES

 Dec. 1992 PWDE9211

INTERIOR

CONTENTS

E52AA00BB

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 serice personnel (from inadvertent firing of the air bag) or to the driver and passenger (from rendering the SRS inoperative).

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

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

NOTE

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

SERVICE SPECIFICATIONS

E52AC00AA

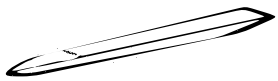
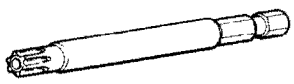
Items	Specifications
Standard value	
Heated seats	
Seatback heater resistance (between terminals) Ω (When ambient temperature is 20°C)	6.2–6.4
Seat cushion heater resistance (between terminals) Ω (When ambient temperature is 20°C)	
Between terminals 1 and 3	0.2–0.3
Between terminals 2 and 3	6.6–7.1
Between terminals 1 and 2	6.7–7.1

ADHESIVES

Item	Specified adhesive	Remarks
Front seat Lower rail and nut housing mounting bolts	3M Stud Locking Part No. 4170 or equivalent	Anaerobic sealant

SPECIAL TOOLS

E52AD00AA

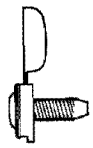
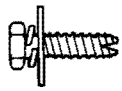
Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of switch, trim, etc.
	MB990826	Torx wrench	Removal and installation of steering column

INSTRUMENT PANEL

E52AG00AB

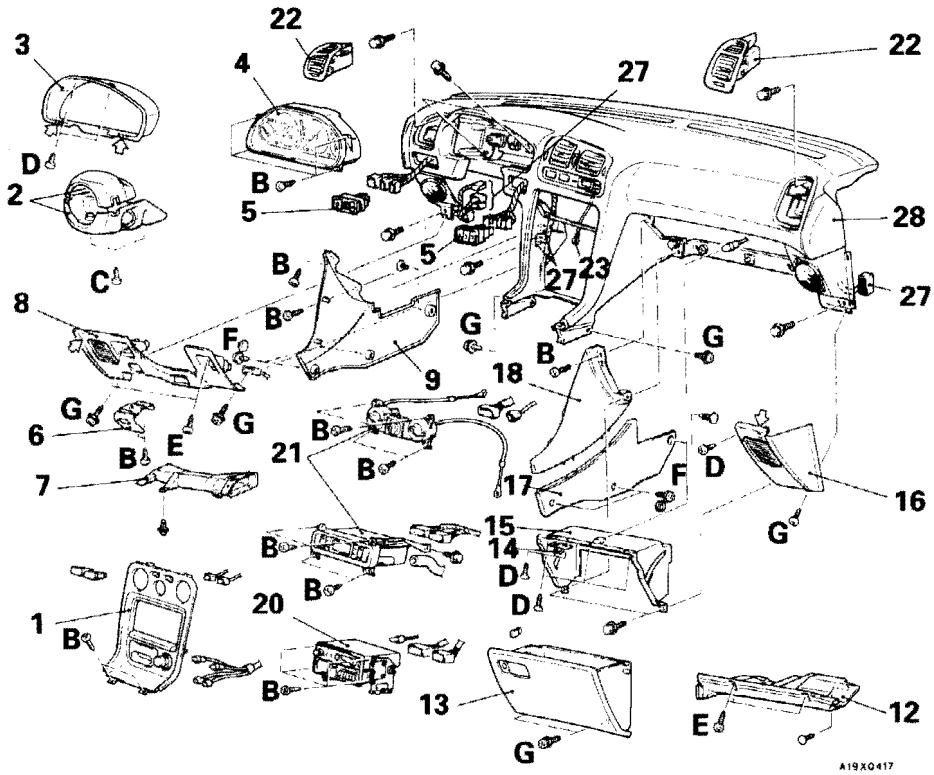
(Up to 1993 models)

For installation of the instrument panel, the bolts and screws described below are used. They are indicated by symbols in the illustration.

Name	Symbol	Size mm (D × L)	Colour	Shape	Name	Symbol	Size mm (D × L)	Colour	Shape
Tapping screw	A	4 × 16	–		Cap asembled screw	F	5 × 16	–	
	B	5 × 16	–						
	C	5 × 25	–		Washer asembled screw	G	5 × 20	–	
	D	5 × 16	Black						
	E	5 × 16	Black		Washer asembled bolt	H	6 × 16	–	

D = Thread diameter
L = Effective thread length

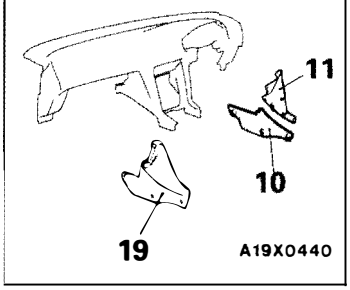
REMOVAL AND INSTALLATION

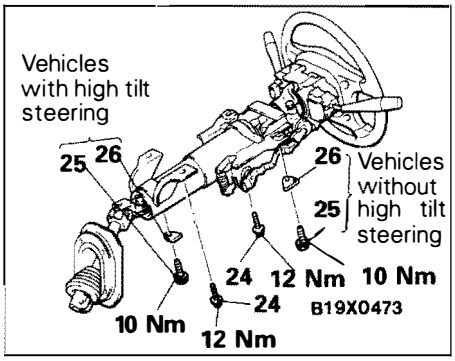


Pre-removal and Post-installation Operation
- Floor Console Assembly Removal and Installation (Refer to P. 52A-8.)

CAUTION: SRS
When removing and installing the floor console from vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit.

R.H. drive vehicles





Removal steps

1. Center console panel
2. Column cover
3. Meter bezel
4. Combination meter
5. Instrument panel switch
6. Hood lock release handle
7. Shower foot duct
8. Instrument under cover
9. Side cover B <L.H. drive vehicles>
10. Side cover lower A <R.H. drive vehicles>
11. Side cover upper A <R.H. drive vehicles>
12. Under cover
13. Glove box
14. Glove box striker
15. Glove box cover
16. Corner panel
17. Side cover lower A <L.H. drive vehicles>
18. Side cover upper A <L.H. drive vehicles>
19. Side cover B <R.H. drive vehicles>
20. Radio and tape player, and box
21. ◇A◇ Heater control assembly
22. Side air outlet assembly
23. ◇B◇ ▶B◀ Cool air bypass damper lever cable connection
24. Steering column assembly installation bolts
25. ◇C◇ ▶A◀ Special bolt
26. Special washer
27. Harness connector
28. Instrument panel assembly

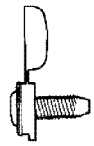
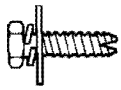
NOTE
⇦ : metal clip position

INSTRUMENT PANEL

E52AG00AC

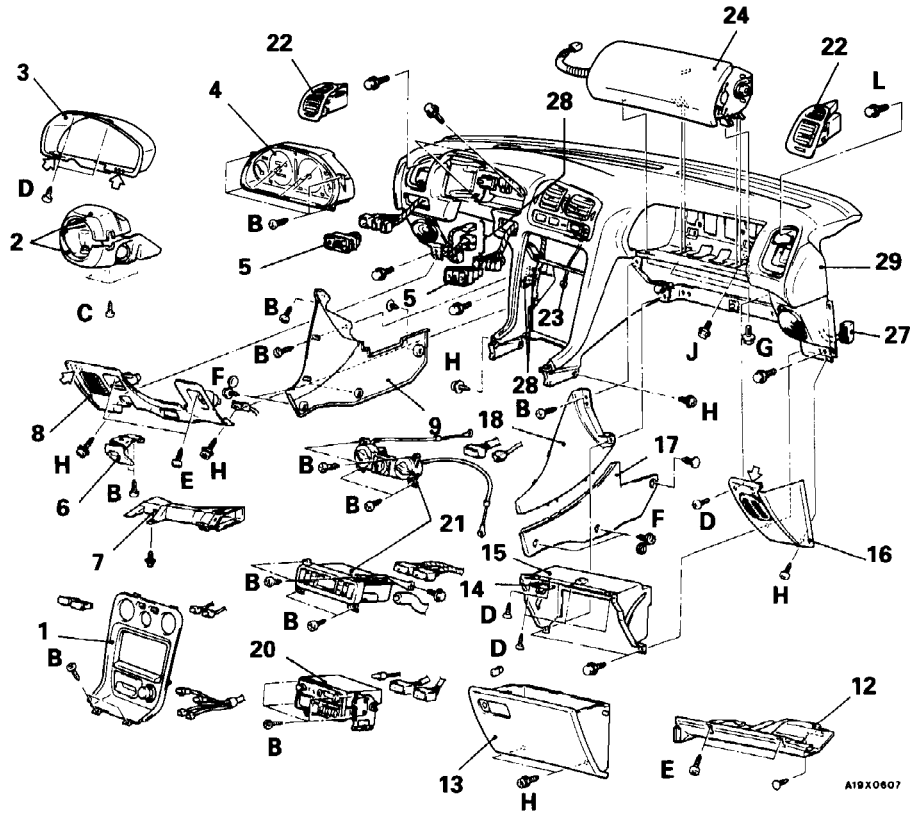
(From 1994 models)

For installation of the instrument panel, the bolts and screws described below are used. They are indicated by symbols in the illustration.

Name	Symbol	Size mm (D × L)	Colour	Shape
Tapping screw	A	4 × 10	–	
	B	5 × 16	–	
	C	5 × 25	–	
	D	5 × 16	Black	
	E	5 × 16	Black	
Cap assembled screw	F	5 × 16	–	
Washer assembled screw	G	5 × 16	–	
	H	5 × 20	–	
Washer assembled bolt	I	6 × 16	–	
	J	6 × 20	–	

D = Thread diameter
L = Effective thread length

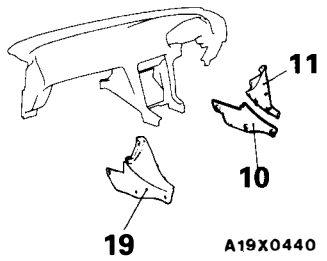
REMOVAL AND INSTALLATION

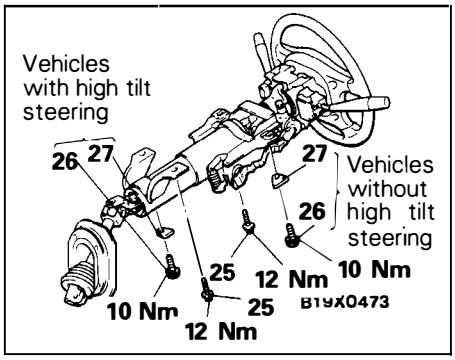


Pre-removal and Post-installation Operation
- Floor Console Assembly Removal and Installation (Refer to P. 52A-8.)

CAUTION: SRS
(1) When removing and installing the floor console (vehicles equipped with SRS), do not let it bump against the SRS diagnostic unit.
(2) For the passenger side air bag module removal/installation, always observe the service procedures of GROUP 52B – SRS Air Bag and Air Bag Module.

R.H. drive vehicles

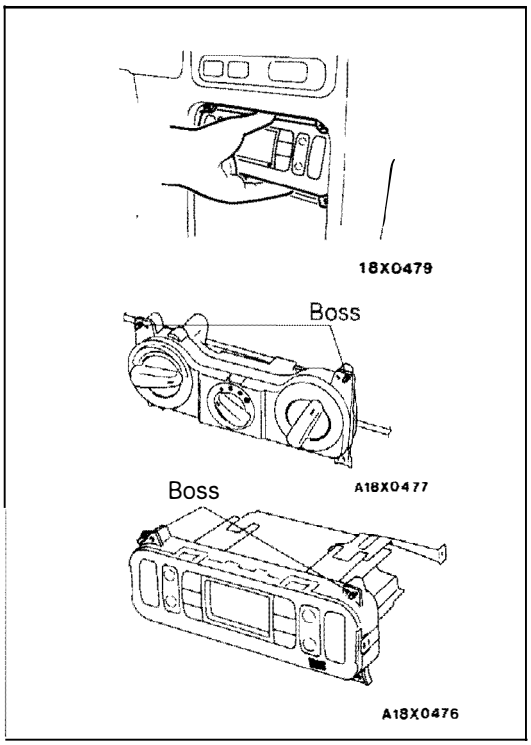




Removal steps

1. Center console panel
2. Column cover
3. Meter bezel
4. Combination meter
5. Instrument panel switch
6. Hood lock release handle
7. Shower foot duct
8. Instrument under cover
9. Side cover B <L.H. drive vehicles>
10. Side cover lower A <R.H. drive vehicles>
11. Side cover upper A <R.H. drive vehicles>
12. Under cover
13. Glove box
14. Glove box striker
15. Glove box cover
16. Corner panel
17. Side cover lower A <L.H. drive vehicles>
18. Side cover upper A <L.H. drive vehicles>
19. Side cover B <R.H. drive vehicles>
20. Radio and tape player, and box
◇A◇ 21. Heater control assembly
22. Side air outlet assembly
◇B◇ ◆B◆ 23. Cool air bypass damper lever cable connection
24. Front passenger's air bag module assembly
25. Steering column assembly installation bolts
◇C◇ ◆A◆ 26. Special bolt
27. Special washer
28. Harness connector
29. Instrument panel assembly

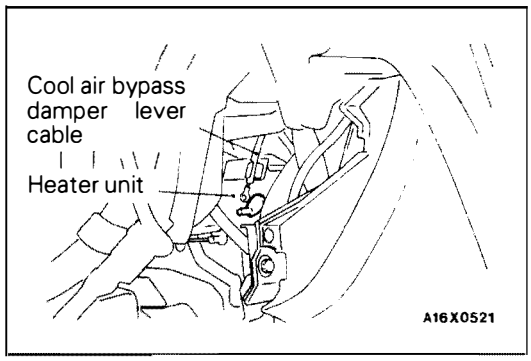
NOTE
⇦ : metal clip position



REMOVAL SERVICE POINTS E52AG01AA

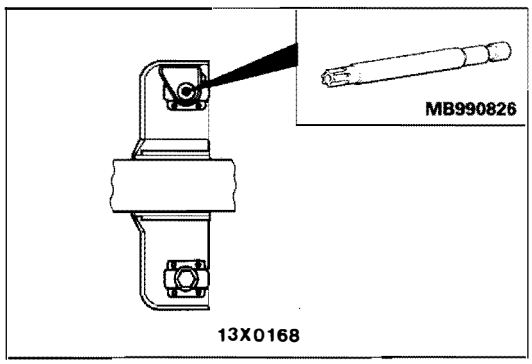
〈A〉 HEATER CONTROL ASSEMBLY REMOVAL

(1) Remove each of the heater control assembly damper cables from the heater unit (dial type).
(2) Remove the heater control assembly mounting screws.
(3) After removing the boss at the top of the heater control assembly from the instrument panel, pull the heater control assembly forward to remove it.



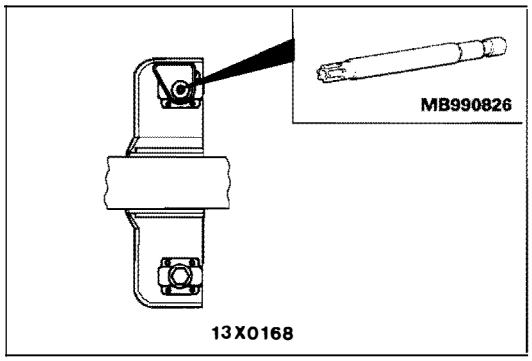
〈B〉 COOL AIR BYPASS DAMPER LEVER CABLE DISCONNECTION

Remove the cool air bypass lever damper cable of the air outlet center panel assembly at the heater unit side.



〈C〉 SPECIAL BOLT REMOVAL

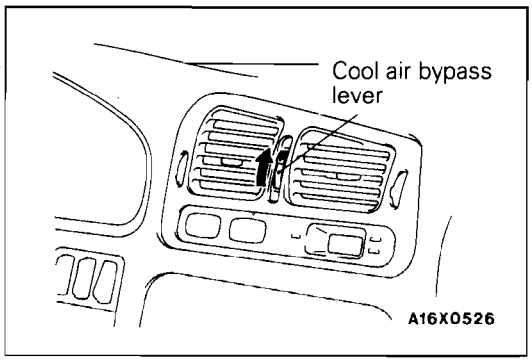
Steering column assembly is installed with a special bolt. Remove it by using the special tool.



INSTALLATION SERVICE POINTS E52AG04AA

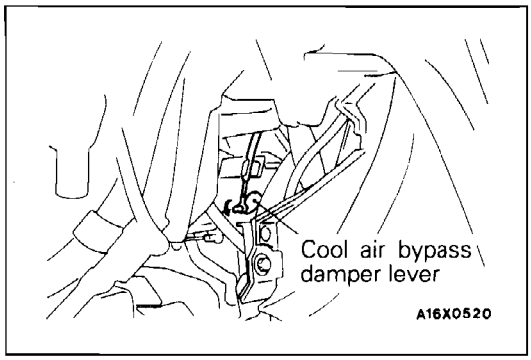
◆A◆ SPECIAL BOLT INSTALLATION

Tighten the special bolt using the special tool.



◆B◆ COOL AIR BYPASS DAMPER LEVER CABLE CONNECTION

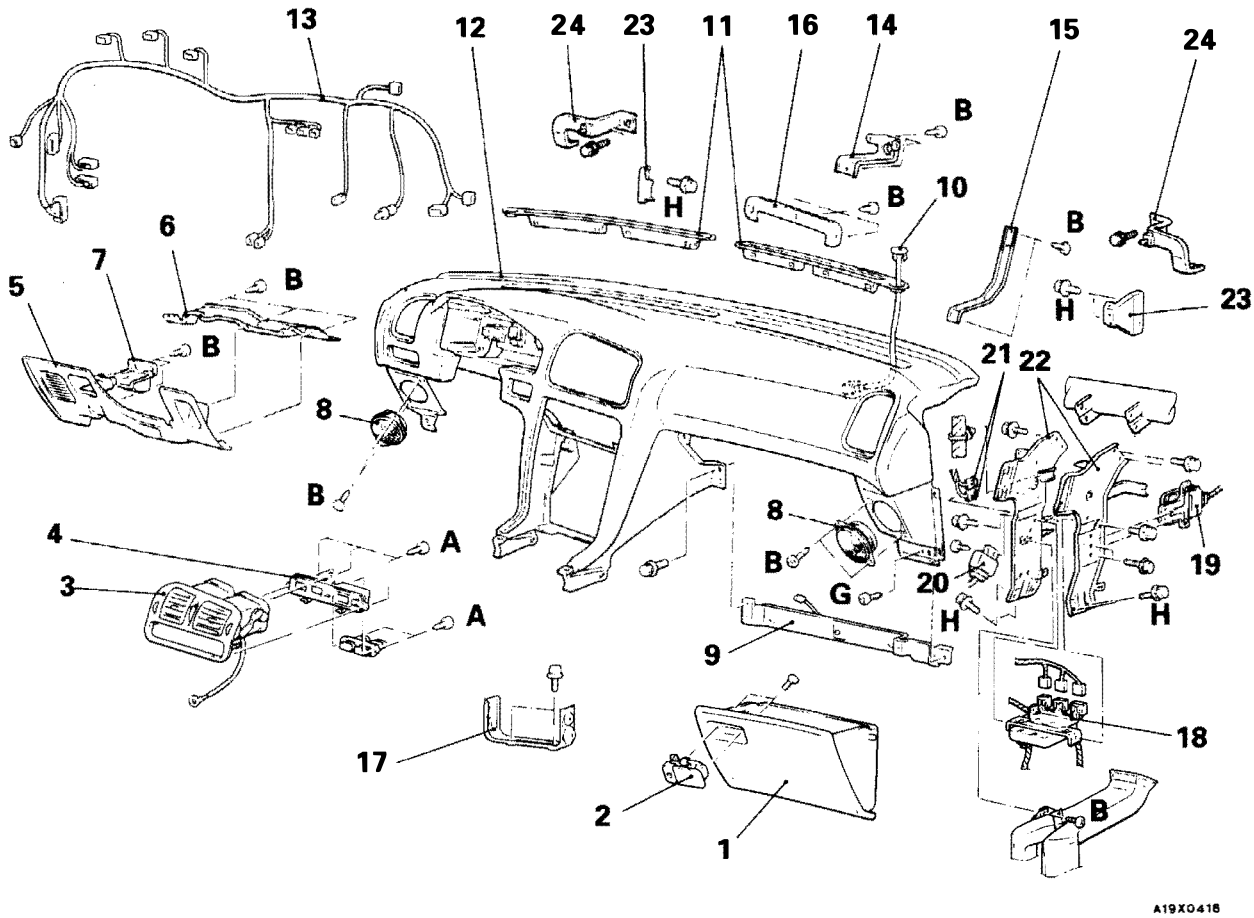
(1) Turn the cool air bypass lever of the air outlet center panel assembly fully upward.



(2) Turn the cool air bypass damper lever at the heater unit side fully downward, and install the cool air bypass lever cable.

DISASSEMBLY AND REASSEMBLY (Up to 1993 models)

E52AG05AB

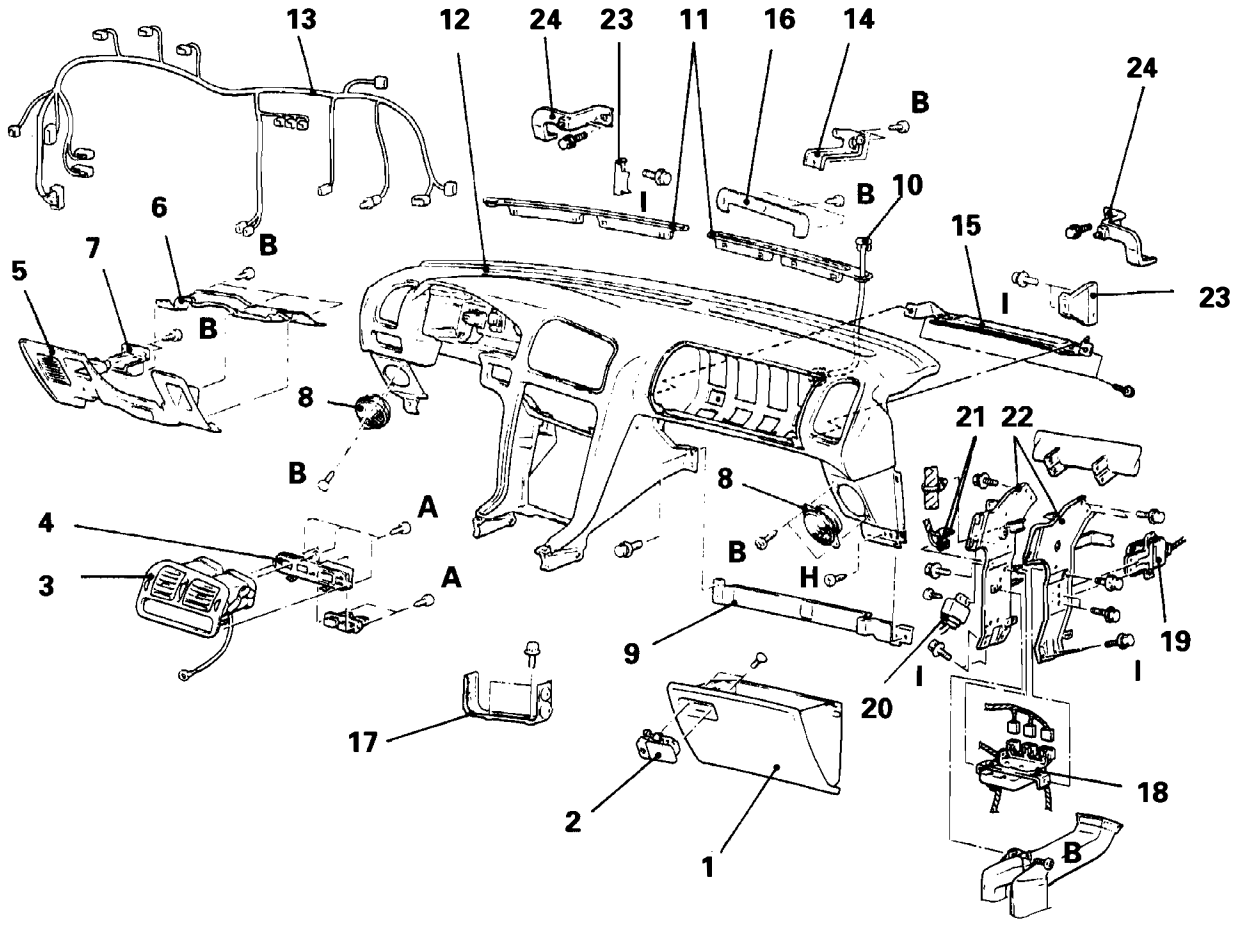


Disassembly steps

1. Glove box
2. Glove box lock assembly
3. Air outlet center assembly
4. Clock and center switch assembly
5. Instrument under cover
6. Under cover frame
7. Coin box
8. Speaker
9. Glove box frame
10. Photo sensor
11. Defroster garnish
12. Instrument panel
    - Heater ducts (Refer to GROUP 55 – Duct)
13. Instrument panel wiring harness
14. Instrument panel center bracket
15. Passenger side reinforcement
16. Center bracket
17. Backbone bracket
18. E.P.S. Control unit bracket
19. Auto-cruise control unit
20. Engine control relay
21. Control wiring harness connector
22. Center reinforcement
23. Instrument panel lower bracket
24. Instrument panel upper bracket

DISASSEMBLY AND REASSEMBLY (From 1994 models)

E52AG05AC



Disassembly steps

1. Glove box
2. Glove box lock assembly
3. Air outlet center assembly
4. Clock and center switch assembly
5. Instrument under cover
6. Under cover frame
7. Coin box
8. Speaker
9. Glove box frame
10. Photo sensor
11. Defroster garnish
12. Instrument panel
    - Heater ducts (Refer to GROUP 55 – Duct)
13. Instrument panel wiring harness
14. Instrument panel center bracket
15. Instrument panel air bag lower reinforcement
16. Center bracket
17. Backbone bracket
18. E.P.S. Control unit bracket
19. Auto-cruise control unit
20. Engine control relay
21. Control wiring harness connector
22. Center reinforcement
23. Instrument panel lower bracket
24. Instrument panel upper bracket

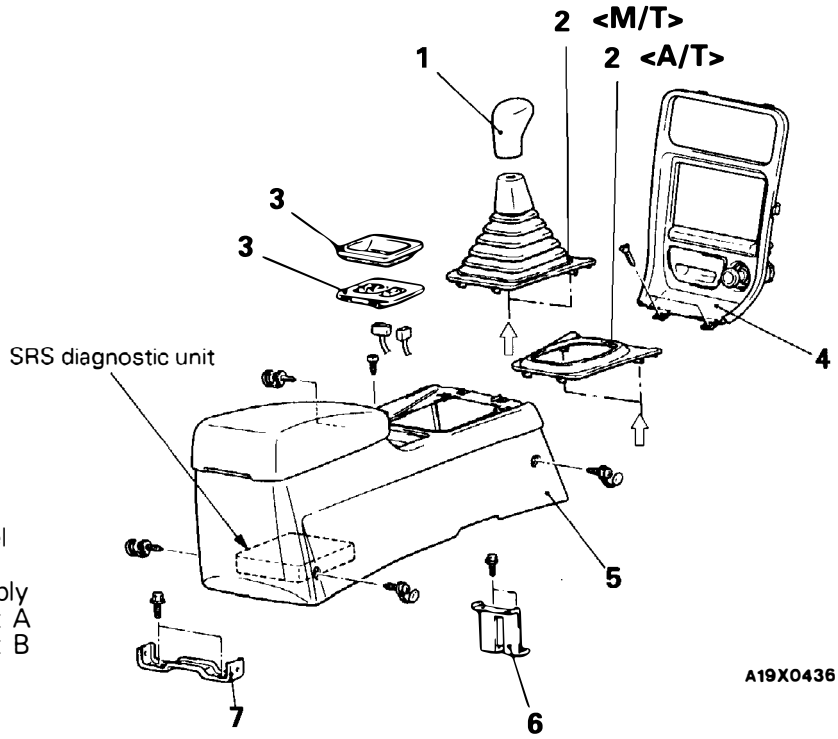
NOTES

FLOOR CONSOLE

E52AH00AA

REMOVAL AND INSTALLATION

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



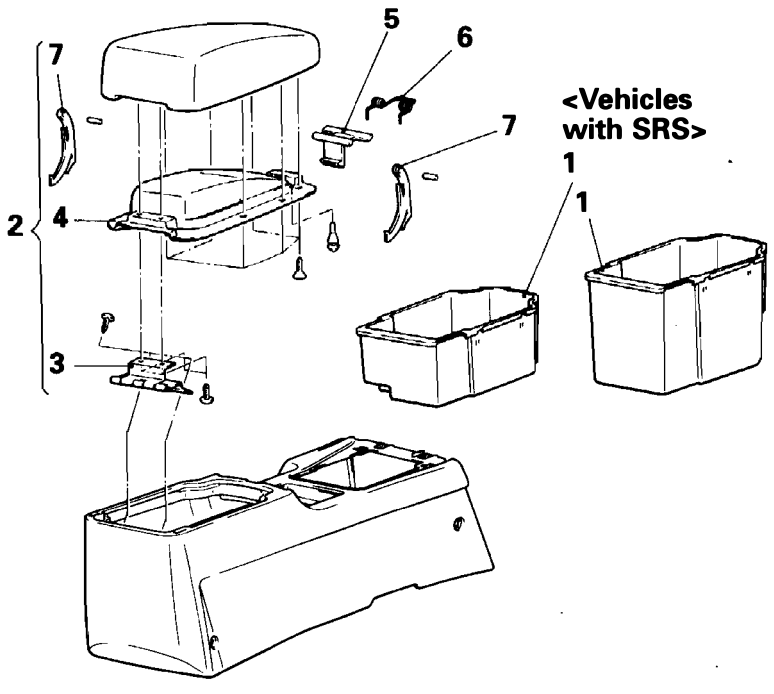
Removal steps

1. Shift lever knob <M/T>
2. Shift lever panel
3. Box panel or switch panel
4. Center console panel
5. Front console box assembly
6. Floor console box bracket A
7. Floor console box bracket B

NOTE
⇦ : metal clip position

DISASSEMBLY AND REASSEMBLY

E52AH05AA



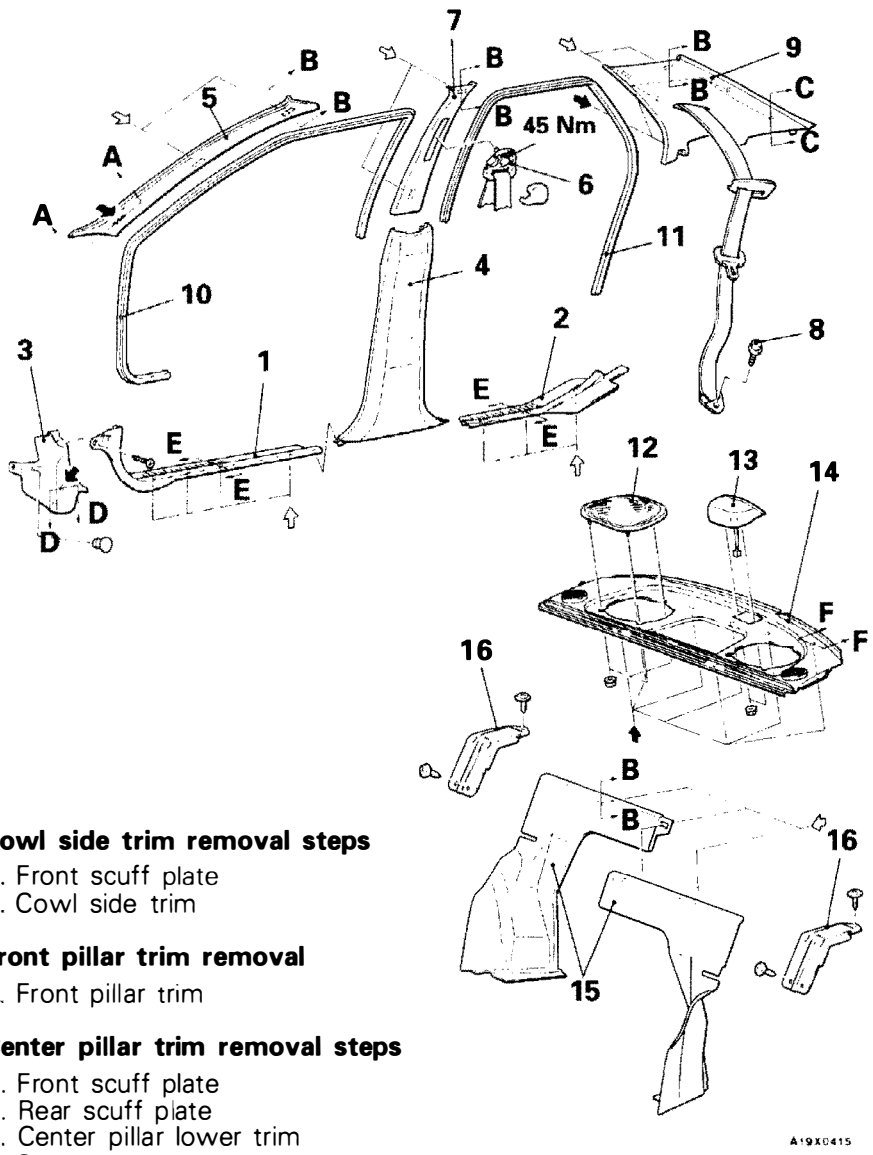
Disassembly steps

1. Inner box
2. Floor console lid assembly
3. Hinge assembly
4. Inner lid
5. Lock lever
6. Spring
7. Stopper

TRIMS <Sedan>

E52AI00AA

REMOVAL AND INSTALLATION



Cowl side trim removal steps
1. Front scuff plate
3. Cowl side trim

Front pillar trim removal
5. Front pillar trim

Center pillar trim removal steps
1. Front scuff plate
2. Rear scuff plate
4. Center pillar lower trim
6. Sash guide
7. Center pillar upper trim

Rear pillar trim removal steps
- Rear seat assembly (Refer to P.52A-22.)

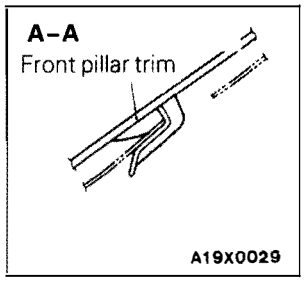
8. Rear seatbelt anchor plate
9. Rear pillar trim

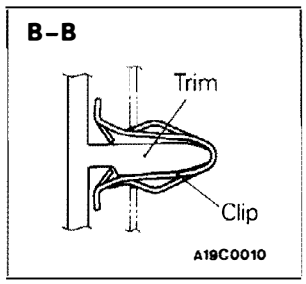
Door opening trim removal
10. Front door opening trim
11. Rear door opening trim

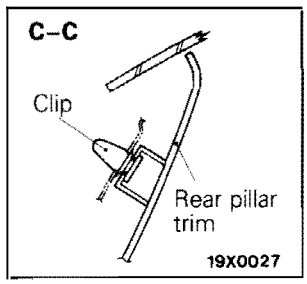
Rear shelf trim removal steps
- Rear seat assembly (Refer to P.52A-22.)

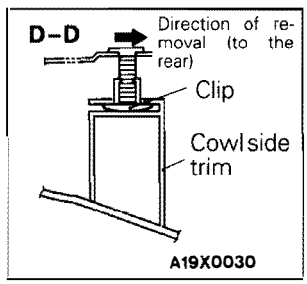
12. Speaker garnish
13. High mounted stop lamp
14. Rear shelf trim
15. Shelf front cover
16. Shelf cover bracket

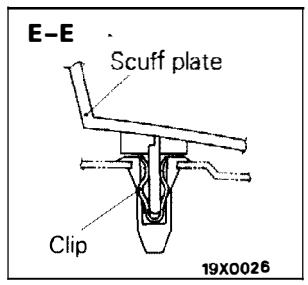
NOTE
(1) ⇦: metal clip position
(2) ⬅ : resin clip position

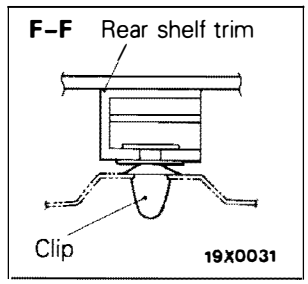


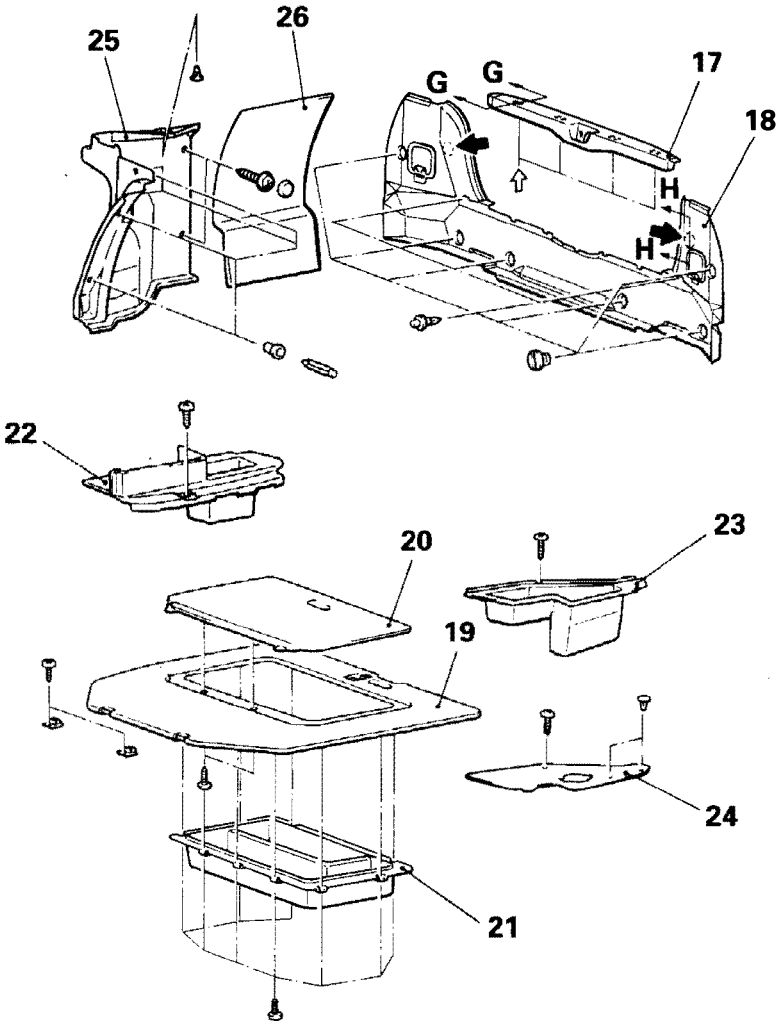




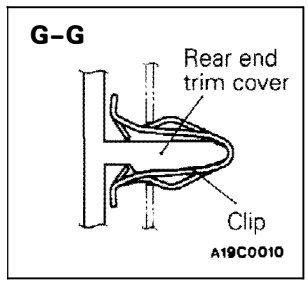


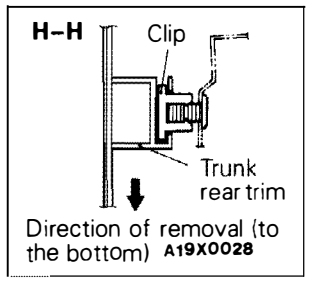


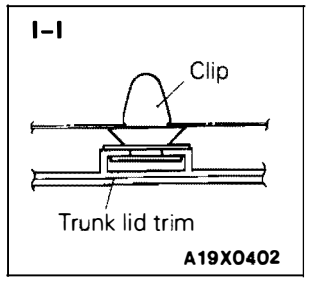


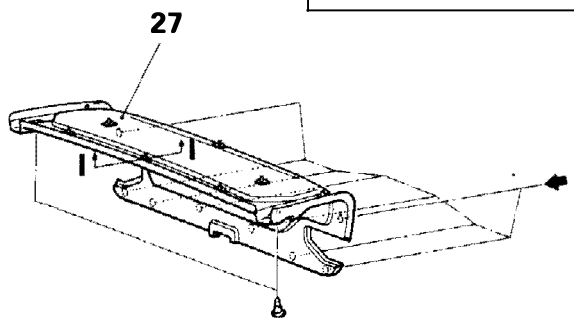


A19X0420









A19X0418

Trims rear trim removal steps

17. Rear end trim cover
18. Trunk rear trim

Trunk floor board removal steps

19. Trunk floor board assembly
20. Lid
21. Box <L.H. drive vehicles>

Trunk side trim removal steps

22. Trunk side box (R.H.)
23. Trunk side box (L.H.)
    <Vehicles without rear wiper>
24. Corner plate
25. Trunk side trim
26. Trunk side extension trim

Trunk lid trim removal

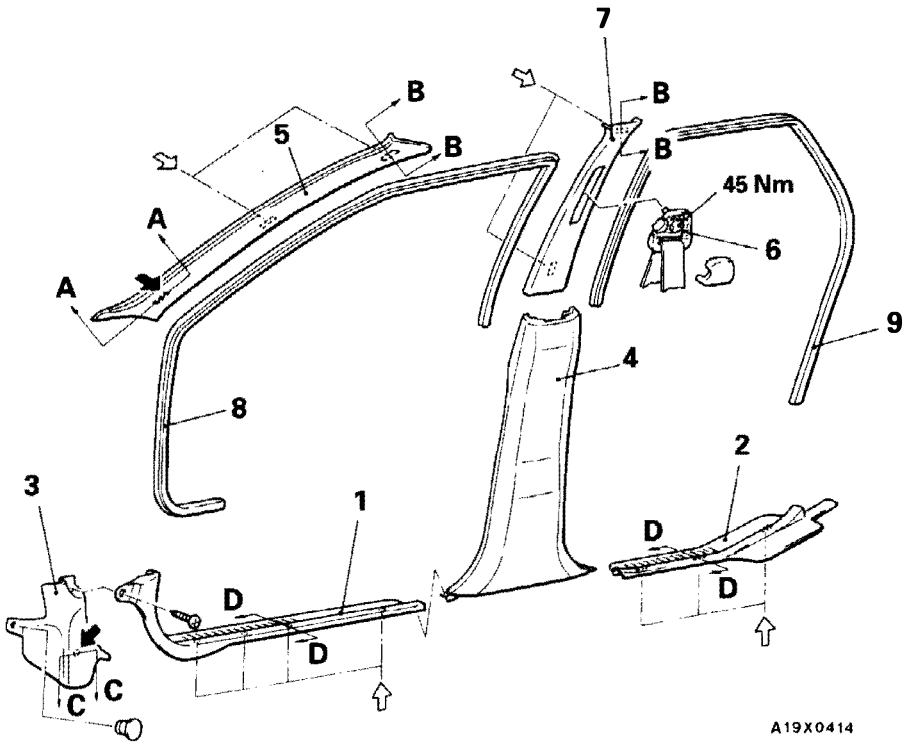
27. Trunk lid trim

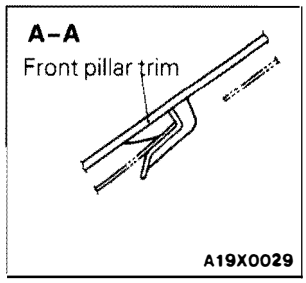
NOTE
(1) ⇦ : metal clip position
(2) ⬅ : resin clip position

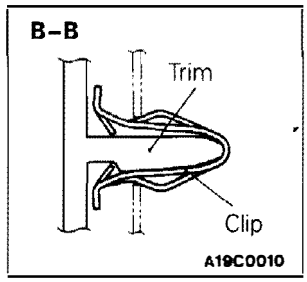
TRIMS <Hatchback>

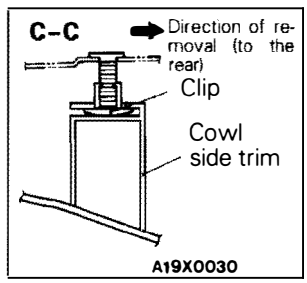
E52AI10AA

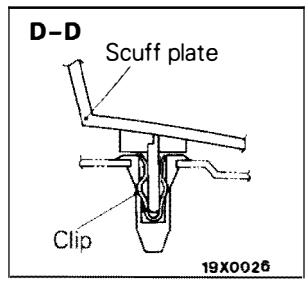
REMOVAL AND INSTALLATION











Cowl side trim removal steps

1. Front scuff plate
3. Cowl side trim

Front pillar trim removal

5. Front pillar trim

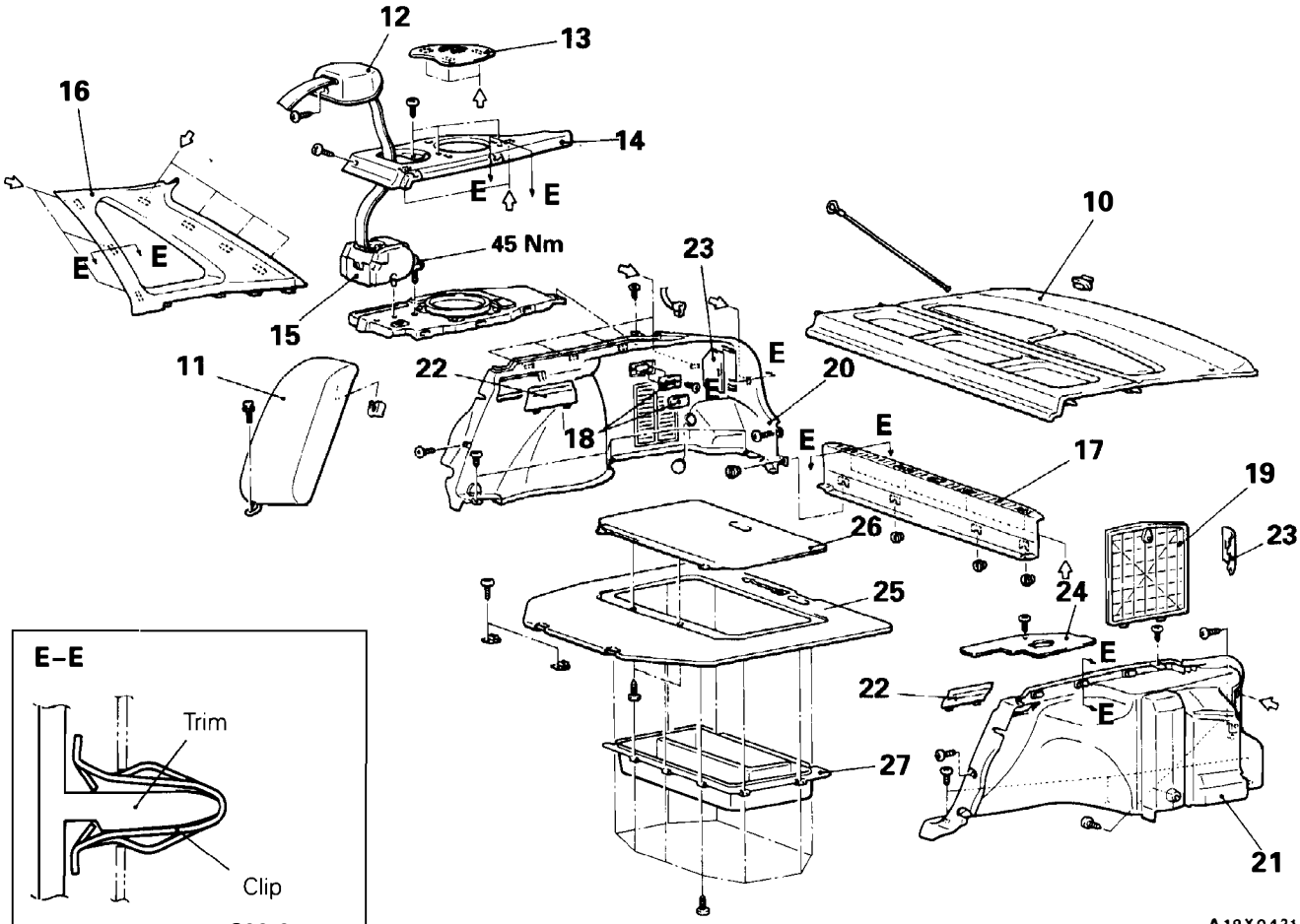
Center pillar trim removal steps

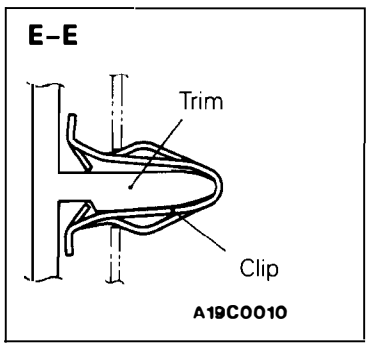
1. Front scuff plate
2. Rear scuff plate
4. Center pillar lower trim
6. Sash guide
7. Center pillar upper trim

Door opening trim removal

8. Front door opening trim
9. Rear door opening trim

NOTE
(1) ⇦ : metal clip position
(2) ⬅ : resin clip position





Shelf trim and rear pillar trim removal steps

10. Center shelf
11. Side seatback
12. Retractor cover
13. Speaker garnish
14. Side shelf
15. Rear seat belt retractor
16. Rear pillar trim

Rear side trim removal steps

10. Center shelf
11. Side seatback
12. Retractor cover
13. Speaker garnish
14. Side shelf
17. Rear end trim
18. Luggage compartment lamp (When removing and installing R.H. rear side trim)
19. Box lid (When removing and installing L.H. rear side trim)
20. Rear side trim (R.H.)
21. Rear side trim (L.H.)
22. Absorber lid
23. Lamp lid A
24. Corner plate

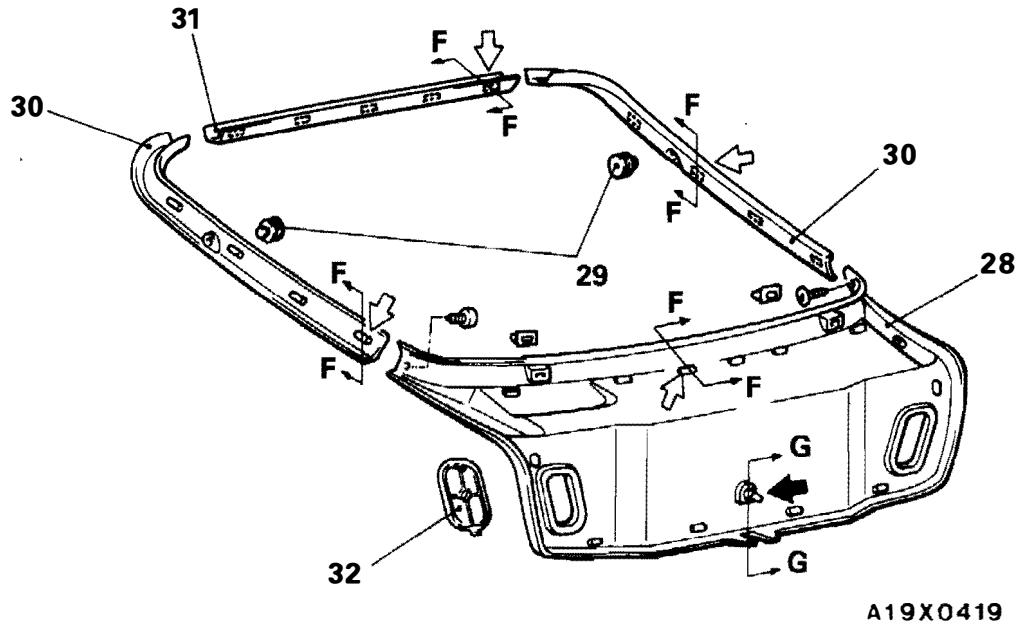
Rear end trim removal

17. Rear end trim

Trunk floor board removal steps

25. Trunk floor board assembly
26. Lid
27. Box <L.H. drive vehicles>

NOTE
⇦ : metal clip position



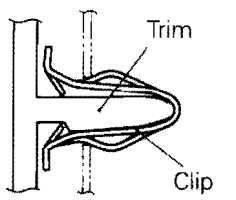
A19X0419

Tailgate trim removal steps

28. Tailgate lower trim
29. Tailgate trim hook
30. Tailgate side trim
31. Tailgate upper trim
32. Lamp lid B

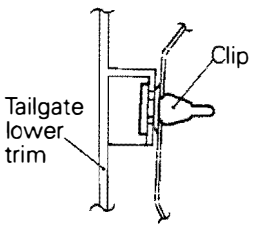
NOTE
(1) ⇦ : metal clip position
(2) ⬅ : resin clip position

F–F



A19C0010

G–G



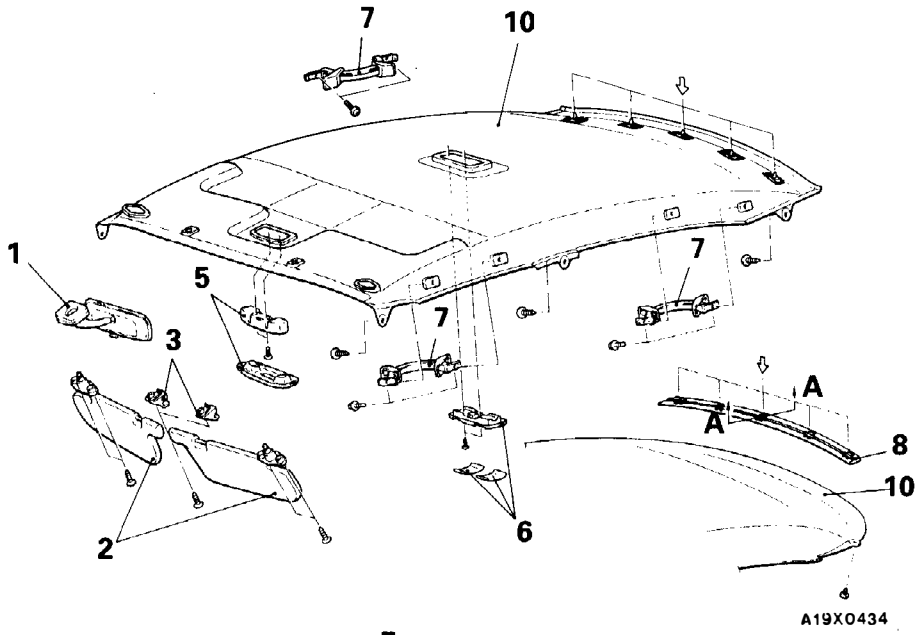
A19X0441

HEADLINING AND INSIDE REAR VIEW MIRROR

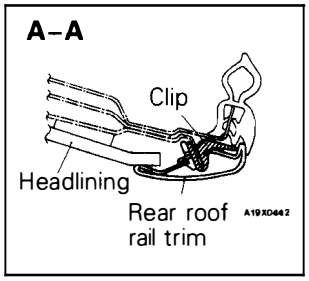
E52AJ00AA

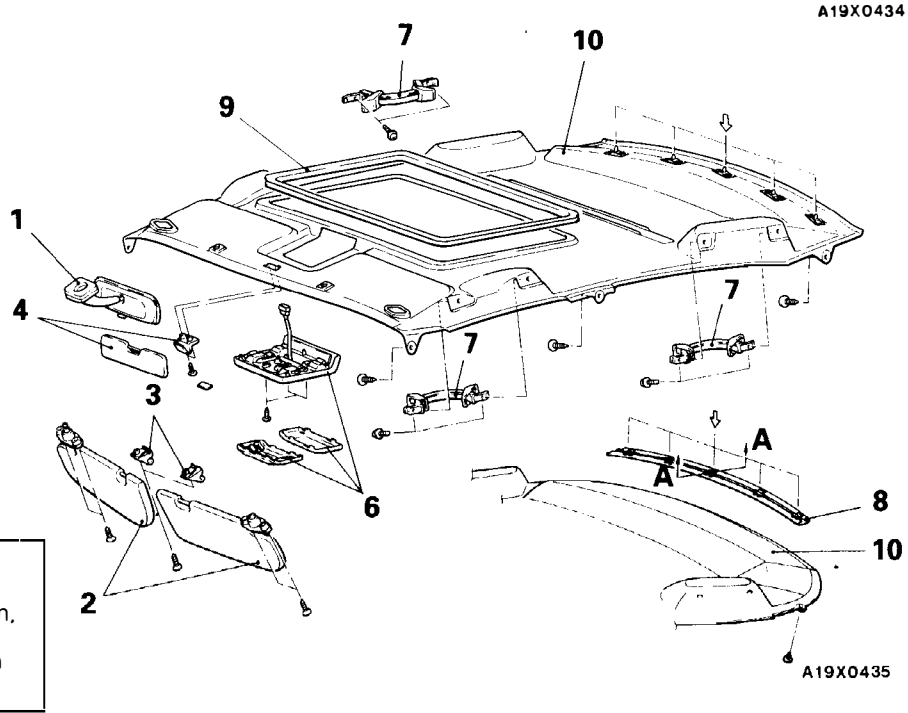
REMOVAL AND INSTALLATION

<Vehicles without sunroof>



<Vehicles with sunroof>





Pre-removal and Post-installation Operation <Headlining>
- Door opening trim, Front Pillar Trim, Center Pillar Upper Trim and Rear Pillar Trim Removal and Installation (Refer to P.52A-9, 11, 12.)

Inside rear view mirror removal

◊A◊ 1. Inside rear view mirror

Headlining removal steps

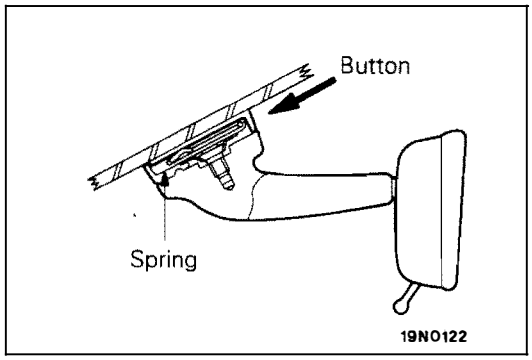
2. Sunvisor assembly
3. Sunvisor holder
4. Center visor
5. Map lamp

◊B◊ 6. Room lamp assembly

7. Assist grip
8. Rear roof rail trim <Hatchback>
9. Headlining trim

◊C◊ 10. Headlining

NOTE
⇦ : resin clip position

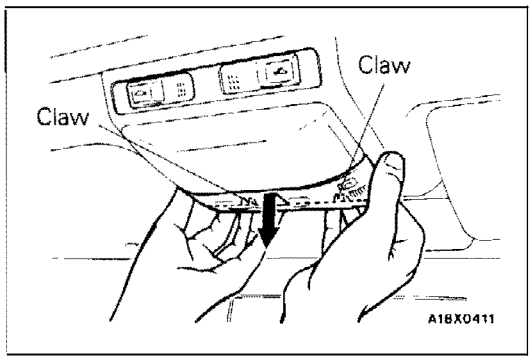


REMOVAL SERVICE POINT E52AJ01AA

〈A〉 INSIDE REAR VIEW MIRROR REMOVAL

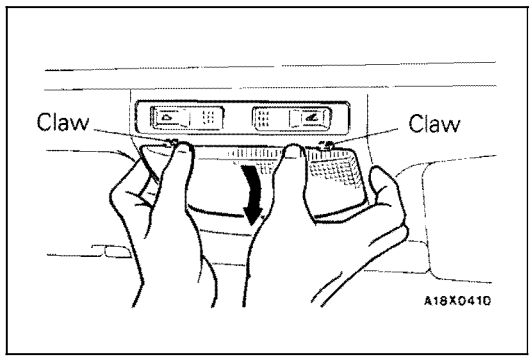
Remove by pushing in the direction of the arrow in the illustration.

NOTE
(1) The mirror spring fits firmly in the groove of the button that is attached to the glass.
(2) The mirror breaking load is within 450 N.

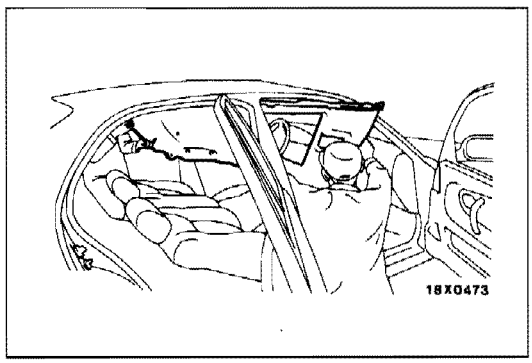


〈B〉 ROOM LAMP ASSEMBLY REMOVAL <Vehicles with sunroof>

(1) While pushing the claws of the room lamp switch cover, pull the cover downwards to remove it.



(2) While pushing the claws of the room lamp lens, pull the lens downwards to remove it.



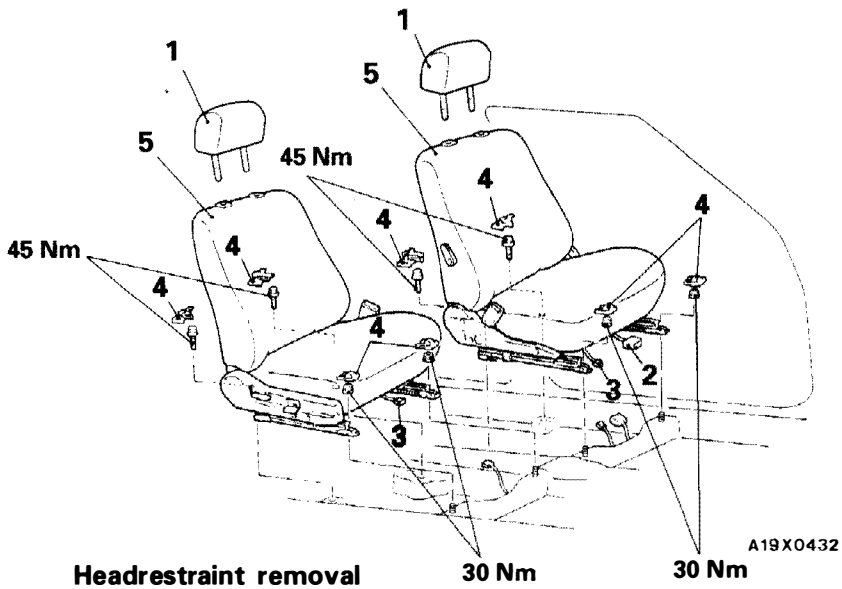
〈C〉 HEADLINING REMOVAL <Sedan>

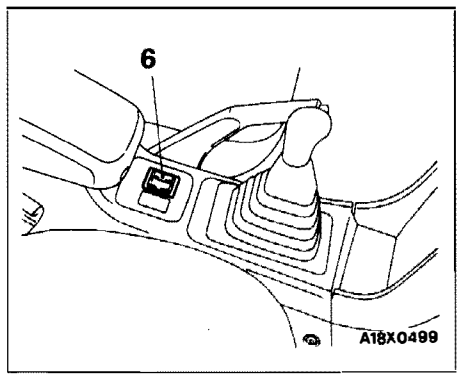
While bending the headlining slightly, pull it through the front door opening to the outside of the vehicle.

FRONT SEAT

E52AK00AA

REMOVAL AND INSTALLATION





Headrestraint removal

1. Headrestraint

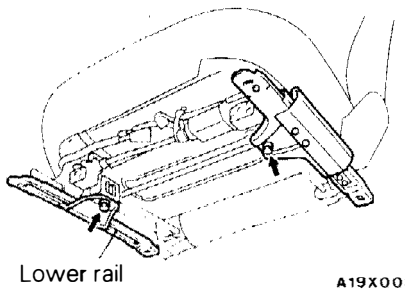
Front seat assembly removal steps

2. Harness connector <vehicles with power seat>
3. Harness connector <vehicles with heated seat>
4. Seat anchor cover
5. Front seat assembly

Heated seat switch removal

6. Heated seat switch

NOTE
After provisionally tightening the seat assembly mounting nuts and bolts in every installation location, fully tighten them to the specified torque.

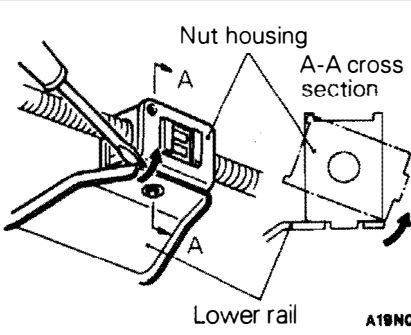


REMOVAL AND INSTALLATION POINTS OF FRONT SEAT ASSEMBLY WHEN THERE IS A MALFUNCTION IN THE POWER SEAT SLIDE MECHANISM

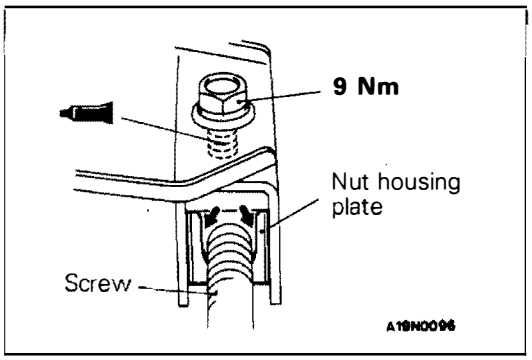
E52AK01AA

If removal of the seat mounting nut and bolt is impossible when there is a malfunction in the slide motor or the slide switch and the seat cannot slide, remove and install the front seat assembly by the following procedure.

(1) Remove the bolts below the seat cushion as shown in the illustration.



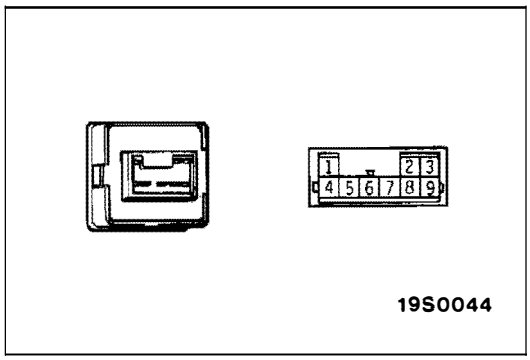
(2) Insert a flat-tipped screwdriver in between the lower rail and the nut housing, and detach the nut hosing from the lower rail hole and turn it.
(3) Slide the seat, and remove the seat mounting nuts and bolts.



(4) When reusing the power height adjuster assembly, apply specified adhesive to the mounting bolt, and tighten to the specified torque.

Specified adhesive: 3M Stud Locking Part No.4170 or equivalent

Caution
1. **Match to the left and right nut hosing positions.**
2. **Install so that the screw and nut hosing plate do not cause interference.**

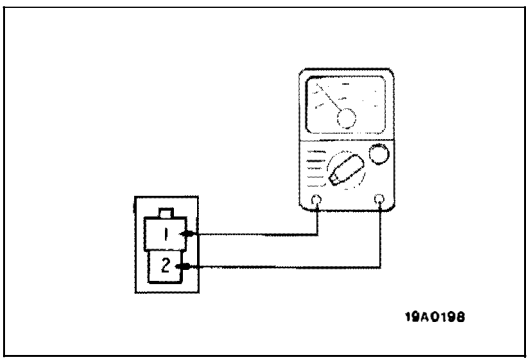


INSPECTION E52AK02AA

HEATED SEAT SWITCH

Switch position		Terminal No. 1	3	4	5	7	8	9	2	6
Driver's seat switch	HI	●	○		○	IND	○		ILL	
	LO		○		○	IND	○			
Passenger's seat switch	HI			○	○	IND	○	○		
	LO				○	IND	○	○		
OFF										

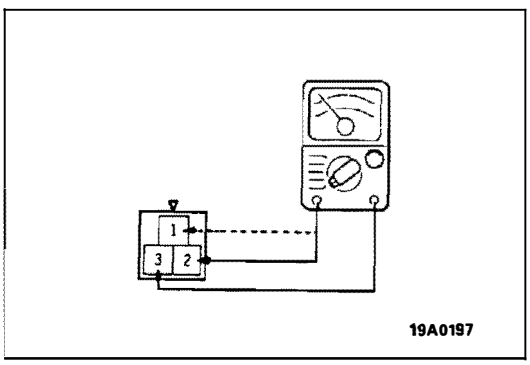
NOTE
○—○ indicates there is continuity between the terminals.



SEATBACK HEATER E52AK02BA

Measure the resistance between terminals.

Standard value (When ambient temperature is 20°C) :
Between terminals 6.2–6.4 Ω



SEAT CUSHION HEATER E52AK02CA

Measure the resistance between terminals.

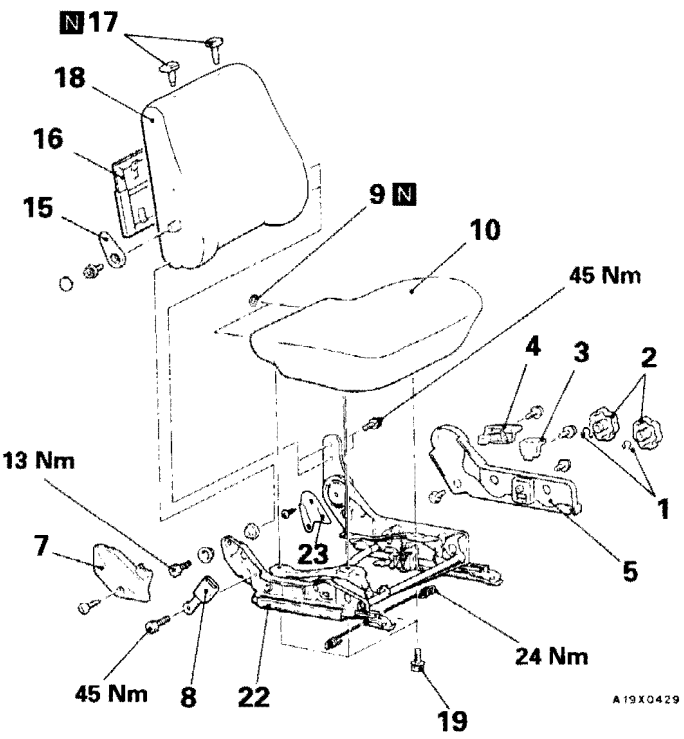
Standard value (When ambient temperature is 20°C):

Between terminals 1 and 3	**0.2–0.3 Ω**
Between terminals 2 and 3	**6.6–7.1 Ω**
Between terminals 1 and 2	**6.7–7.1 Ω**

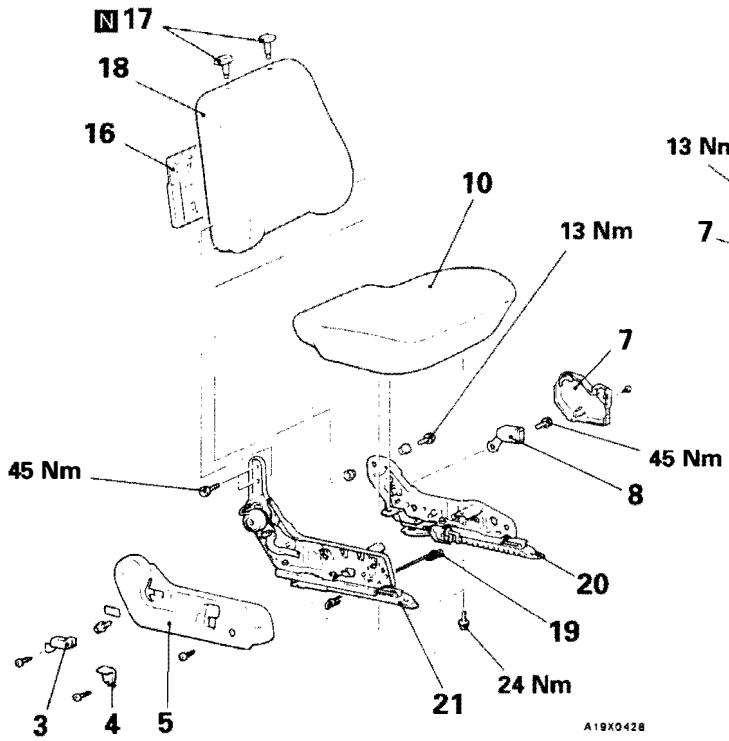
DISASSEMBLY AND REASSEMBLY

E52AK05AA

<Manual driver's seat>



<Manual front passenger seat>



Manual driver's seat disassembly steps

1. Shaft snap ring
2. Height adjuster knob
3. Seat adjuster lever
4. Reclining lever
5. Front seat side shield cover
7. Front seat hinge cover
8. Innerseat belt
9. Hog ring
10. Seat cushion assembly
15. Lumber support lever

〈A〉 16. Front-back panel assembly

17. Headrestraint guide
18. Seatback assembly
19. Pull wire
22. Height adjuster assembly
23. Reclining adjuster inner cover

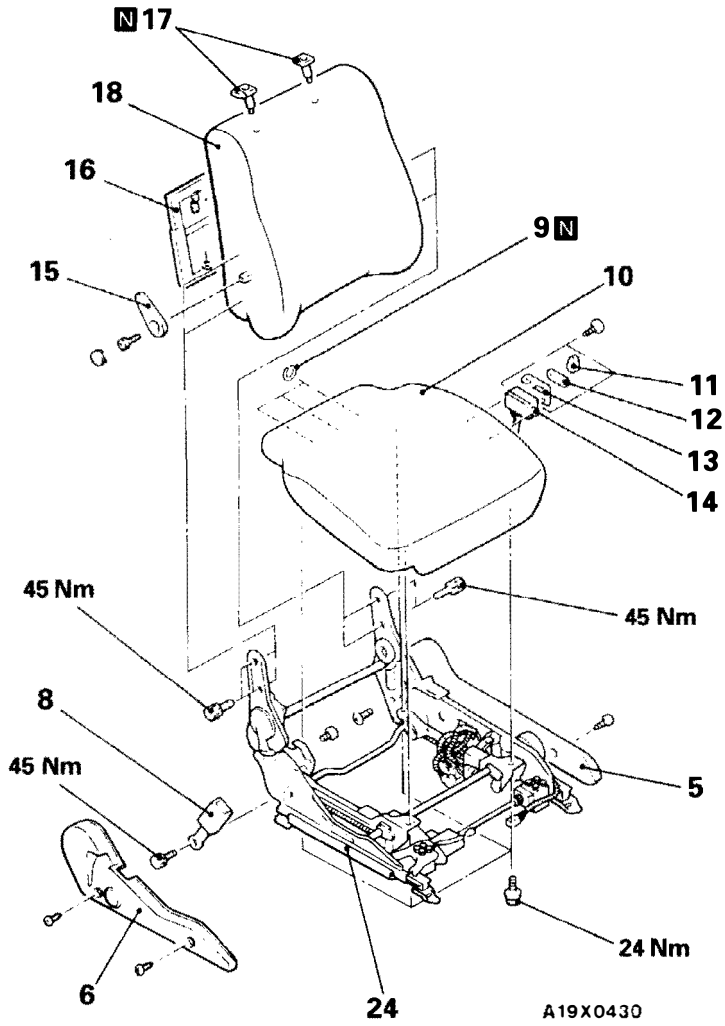
Manual front passenger seat disassembly steps

5. Front seat side shield cover
3. Seat adjuster knob
4. Reclining lever
7. Front seat hinge cover
8. Inner seat belt
10. Seat cushion assembly

〈A〉 16. Front-back panel assembly

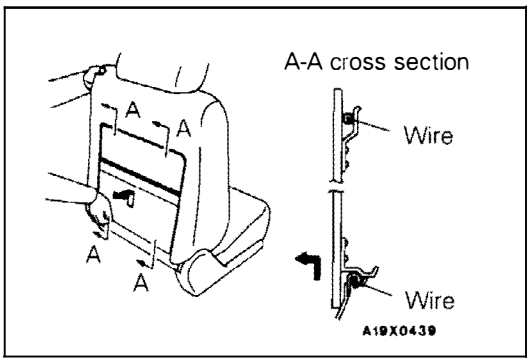
17. Headrestraint guide
18. Seatback assembly
19. Pull wire
20. Seat inner adjuster
21. Seat outer adjuster
27. Under tray rail

<Power seat>



Power seat disassembly steps

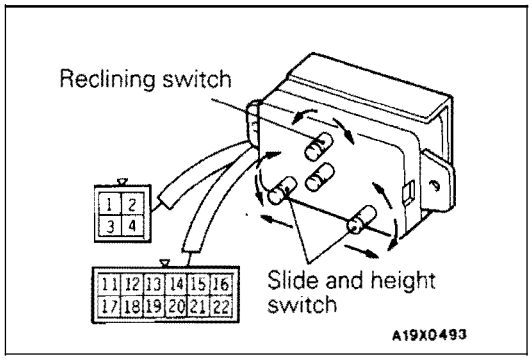
5. Front seat side shield cover
6. Reclining adjuster cover
8. Inner seat belt
9. Hog ring
10. Seat cushion assembly
11. Power seat reclining lever
12. Power seat adjuster lever
13. Garnish
14. Power seat switch
15. Lumber support lever (driver's seat only)
〈A〉 16. Front-back panel assembly
17. Headrestraint guide
18. Seatback assembly
23. Reclining adjuster inner cover
24. Power height adjuster assembly



DISASSEMBLY SERVICE POINT E52AK06AA

〈A〉 FRONT-BACK PANEL ASSEMBLY REMOVAL

Lift the front-back panel assembly upwards, and pull the lower portion towards you to remove.



INSPECTION

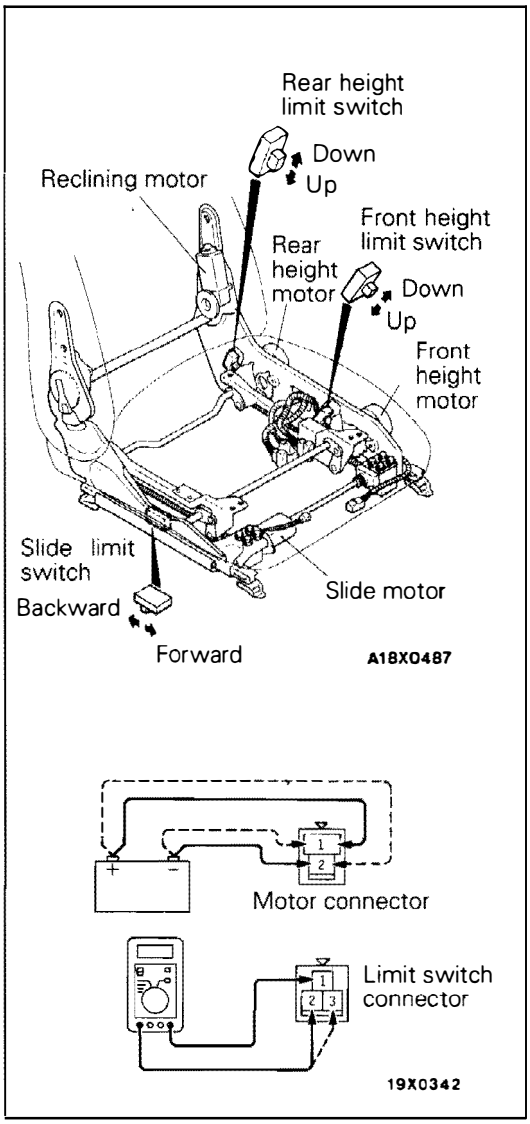
E52AK07AA

POWER SEAT SWITCH

Operate the power seat switch and check for continuity.

Switch position		Terminal No. 1	2	3	4	11	12	13	14	15	16	17	18	19	20	21	22
Reclining switch	Forward										○				○	○	○
	Backward										○				○	○	○
Slide switch	Forward	○		○	○												○
	Backward		○	○	○												○
Height switch (Front)	Up					○			○								○
	Down						○	○	○								○
Height switch (Rear)	Up									○		○	○				○
	Down									○				○			○
All switches	OFF	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	

NOTE
○—○ indicates that there is continuity between the terminals.



MOTORS FOR THE POWER SEAT E52AK07BA

Inspect the operation of each motor according to the following procedures.

(1) Disconnect the connectors for each motor.
(2) When the battery is connected directly to the motor terminals, check if the motors run smoothly, and check if each setting mechanism runs in the directions shown in the table below for each motor.
(3) If there is an abnormality, replace the power height adjuster assembly.

Name of Motor	Direction of Operation	Terminal No. 1	Terminal No. 2	Stop Position
Front height, Rear height	Down	⊕	⊖	Stops when limit switch is OFF
	Up	⊖	⊕	
Slide	Backward	⊕	⊖	
	Forward	⊖	⊕	
Reclining	Backward	⊕	⊖	Stops at operating range limit
	Forward	⊖	⊕	

POWER SEAT LIMIT SWITCHES E52AK07CA

(1) Disconnect each limit switch connection and connect a circuit tester to the terminals.
(2) Operate each switch and check for continuity between the terminals.
(3) If there is an abnormality, replace the power height adjuster assembly.

Switch	Switch position	Terminal No. 1	2	3
Slide limit switch	Forward	○	○	
	Backward	○		○
Front height, rear height limit switches	Up	○		○
	Down	○	○	
All limit switches	Middle (ON)	○	○	○

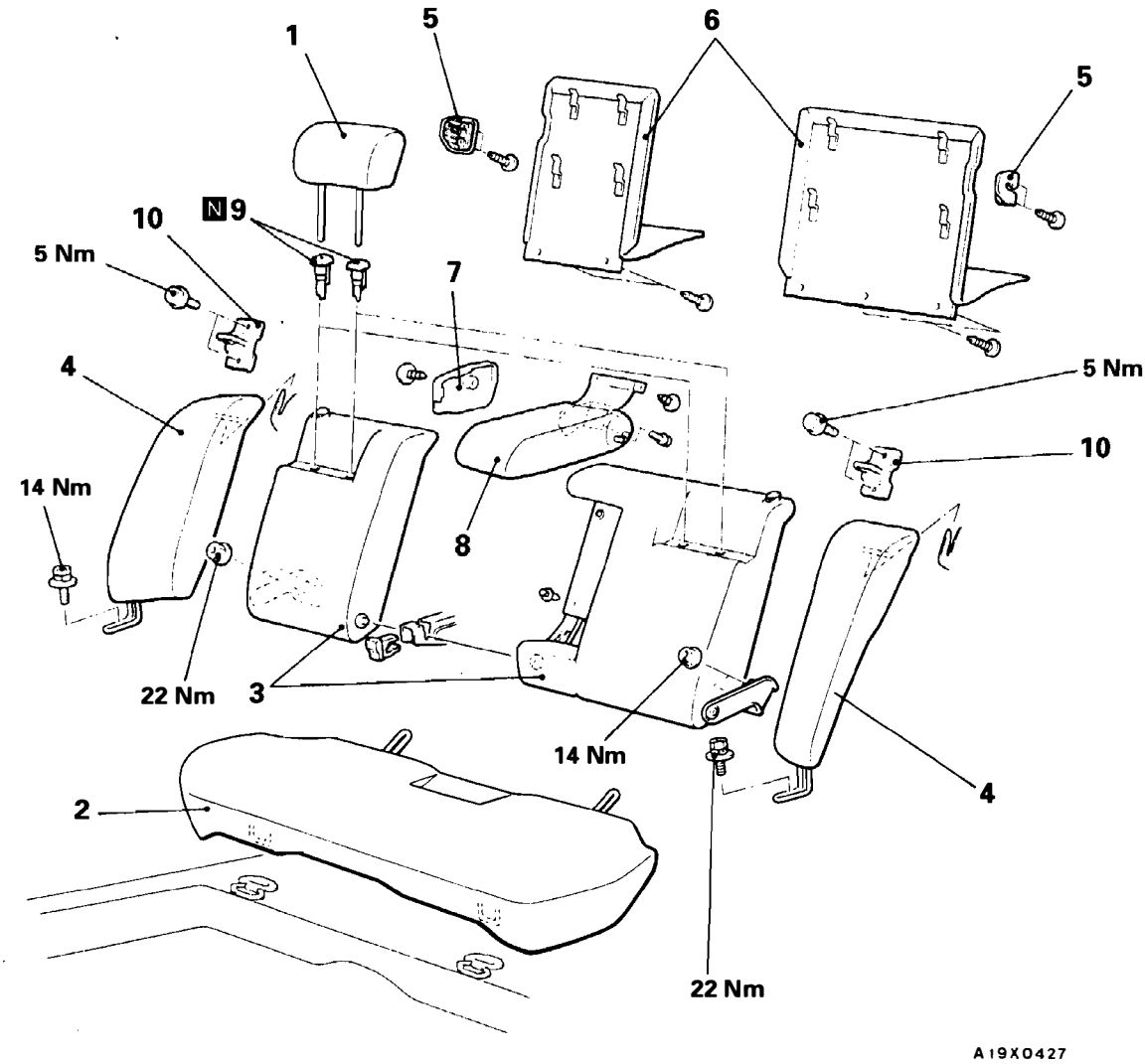
NOTE.
○—○ indicates there is continuity between the terminals.

REAR SEAT

E52AK10AA

REMOVAL AND INSTALLATION

<Sedan>



Headrestraint removal

1. Headrestraint

Seat cushion removal

◇A◇ ◆C◆ 2. Seat cushion

Rear seatback removal

◆B◆ 3. Rear seatback assembly

Side seatback assembly removal steps

◇A◇ ◆C◆ 2. Seat cushion
◆A◆ 4. Side seatback assembly

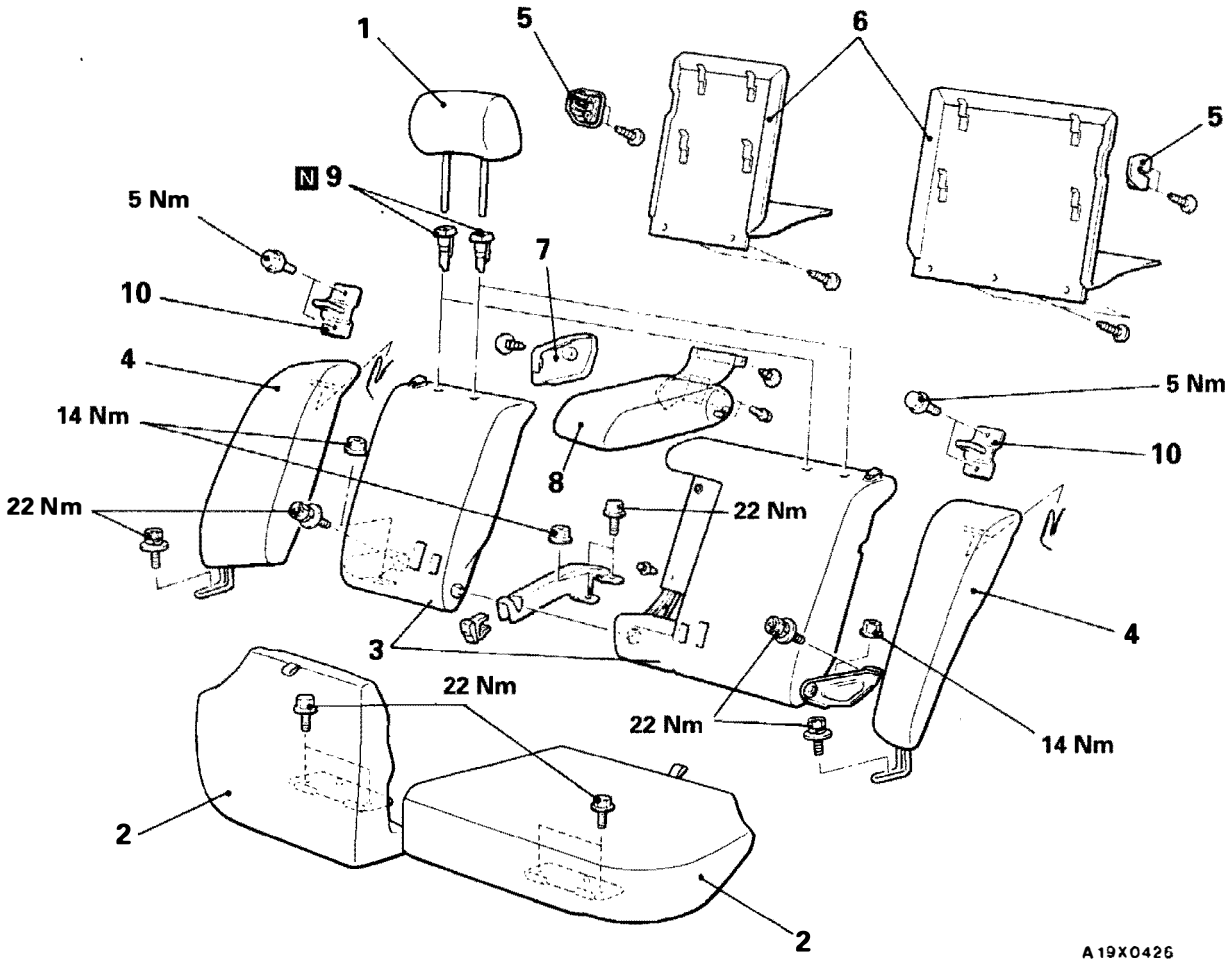
Arm rest and headrestraint guide removal steps

◆B◆ 3. Rear seatback assembly
5. Cover
6. Back board assembly
7. Arm rest hinge cover
8. Arm rest
9. Headrestraint guide

Rear seat striker removal steps

◇A◇ ◆C◆ 2. Seat cushion
◆A◆ 4. Side seatback assembly
● Shelf front cover (Refer to P.52A-9.)
10. Rear seat striker

<Hatchback>



Headrestraint removal
1. Headrestraint

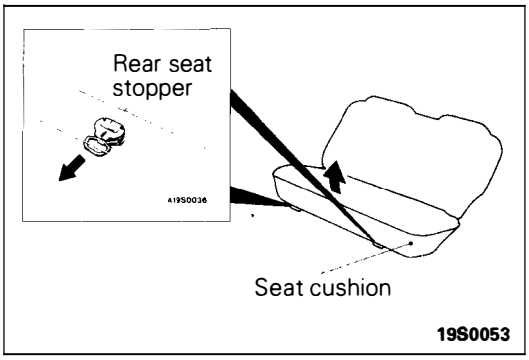
Seat cushion removal
2. Seat cushion

Rear seatback removal
◆B◆ 3. Rear seatback assembly

Side seatback assembly removal steps
◆A◆ 4. Side seatback assembly

Arm rest and headrestraint guide removal steps
◆B◆ 3. Rear seatback assembly
5. Cover
6. Back board assembly
7. Arm rest hinge cover
8. Arm rest
9. Headrestraint guide

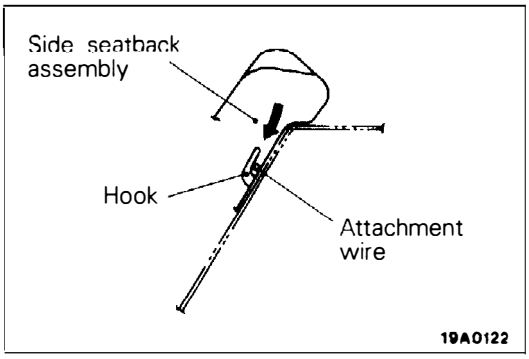
Rear seat striker removal steps
◆A◆ 4. Side seatback assembly
● Rear side trim (Refer to P.52A-12.)
10. Rear seat striker



REMOVAL SERVICE POINTS E52AK11AA

〈A〉 SEAT CUSHION REMOVAL <Sedan>

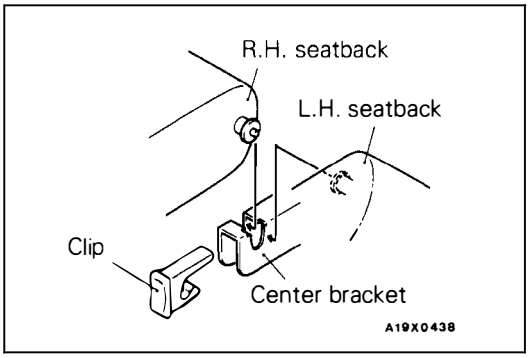
While keeping the rear seat stopper pulled, lift up the cushion to remove it.



INSTALLATION SERVICE POINTS E52AK14AA

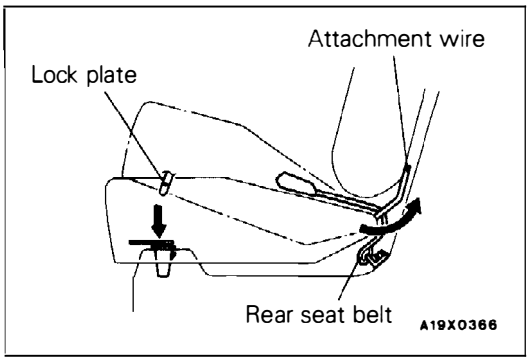
◗A◖ SIDE SEATBACK ASSEMBLY INSTALLATION

Push the side seatback assembly in the direction indicated in the illustration; then securely attach the attachment wire to the body side hook and install the side seatback assembly.



◗B◖ REAR SEATBACK ASSEMBLY INSTALLATION

(1) Insert the R.H. seatback and the L.H. seatback of the seatback assembly into the center bracket notches in that order.
(2) Secure with the clips.
(3) Install the brackets at both sides of the seatback assembly.



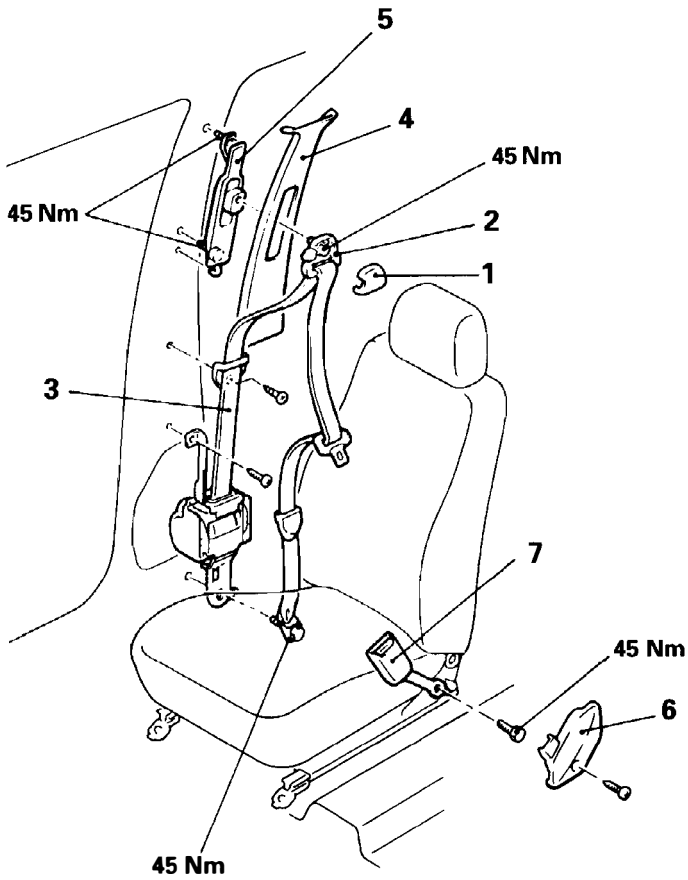
◗C◖ SEAT CUSHION INSTALLATION <Sedan>

(1) Pull the rear seat belt on top of the seat cushion.
(2) Insert the seat cushion attachment wire securely below the seatback.
(3) Insert the seat cushion lock plate securely into the floor holes.

FRONT SEAT BELT

E52AL00AA

REMOVAL AND INSTALLATION



Outer seat belt removal steps

- Front scuff plate and rear scuff plate (Refer to P.52A-9, 11.)
- Center pillar lower trim (Refer to P.52A-9, 11.)

1. Sash guide cover
2. Sash guide
3. Outer seat belt
4. Center pillar upper trim (Refer to P.52A-9, 11.)
5. Adjustable seat belt anchor

Inner seat belt removal steps

- Front seat assembly (Refer to P.52A-16.)

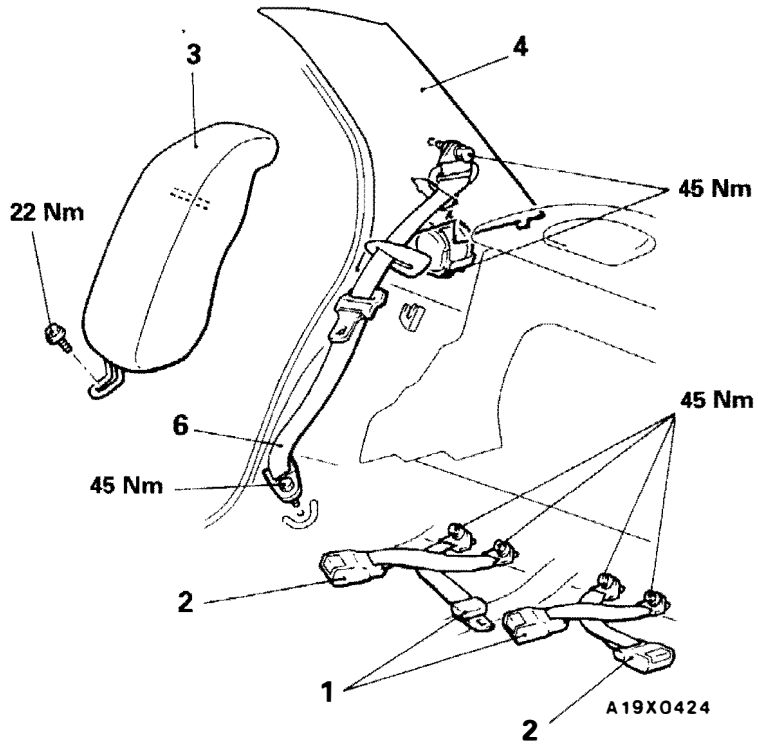
6. Front seat hinge cover
7. Inner seat belt

REAR SEAT BELT

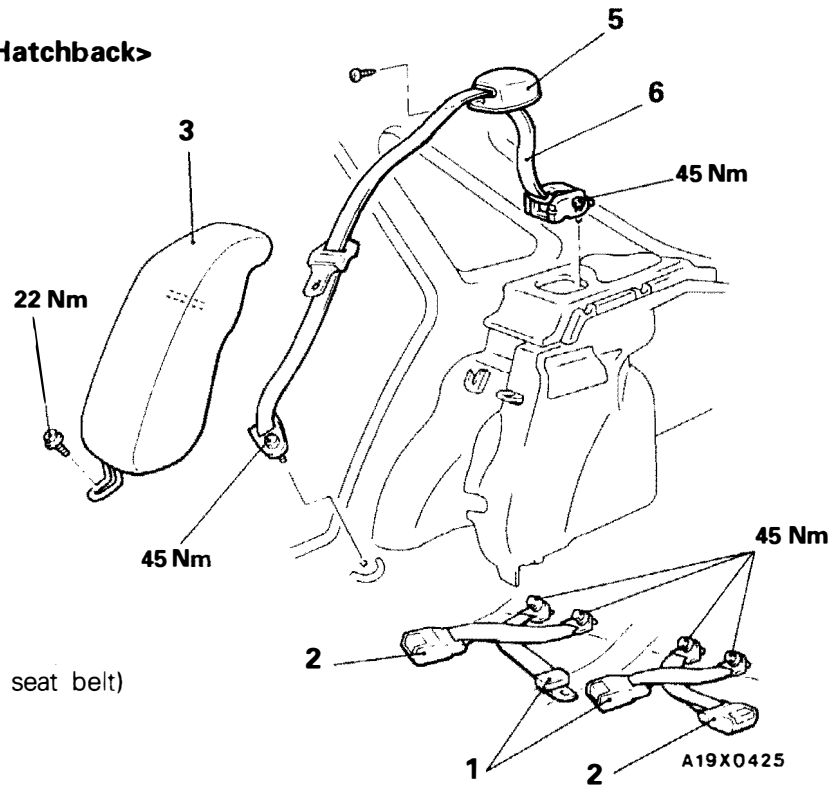
E52AL10AA

REMOVAL AND INSTALLATION

<Sedan>



<Hatchback>



Removal steps

- Rear seat cushion <Sedan> (Refer to P.52A-22.)

1. Inner, outer seat belt (center seat belt)
2. Inner seat belt
3. Side seatback assembly (Refer to P.52A-22, 23.)
4. Rear pillar trim <Sedan> (Refer to P.52A-9.)
5. Retractor cover <Hatchback>
6. Outer seat belt

SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

CONTENTS

E52BA00AB

CAUTION

- **Carefully read and observe the information in the SRS SERVICE PRECAUTIONS (P.52B-4.) Prior to any service.**
- **For information concerning troubleshooting or maintenance, always observe the procedures in the Troubleshooting (P.52B-9.) or the SRS Maintenance (P.52B-33.) 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-40.) for the components involved.**
- **If you have any questions about the SRS, please contact your local distributor.**

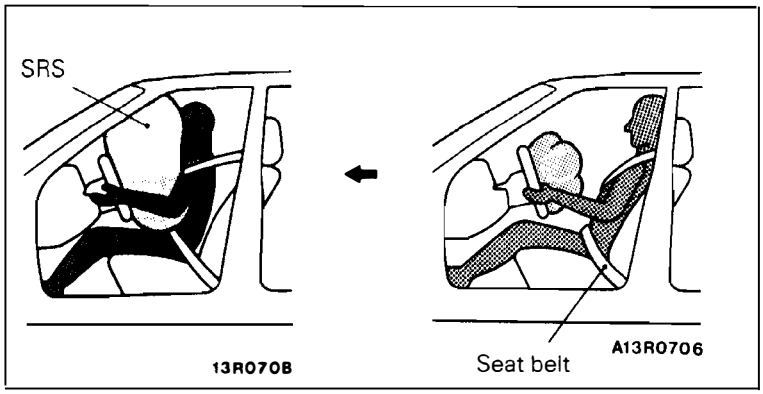
GENERAL INFORMATION

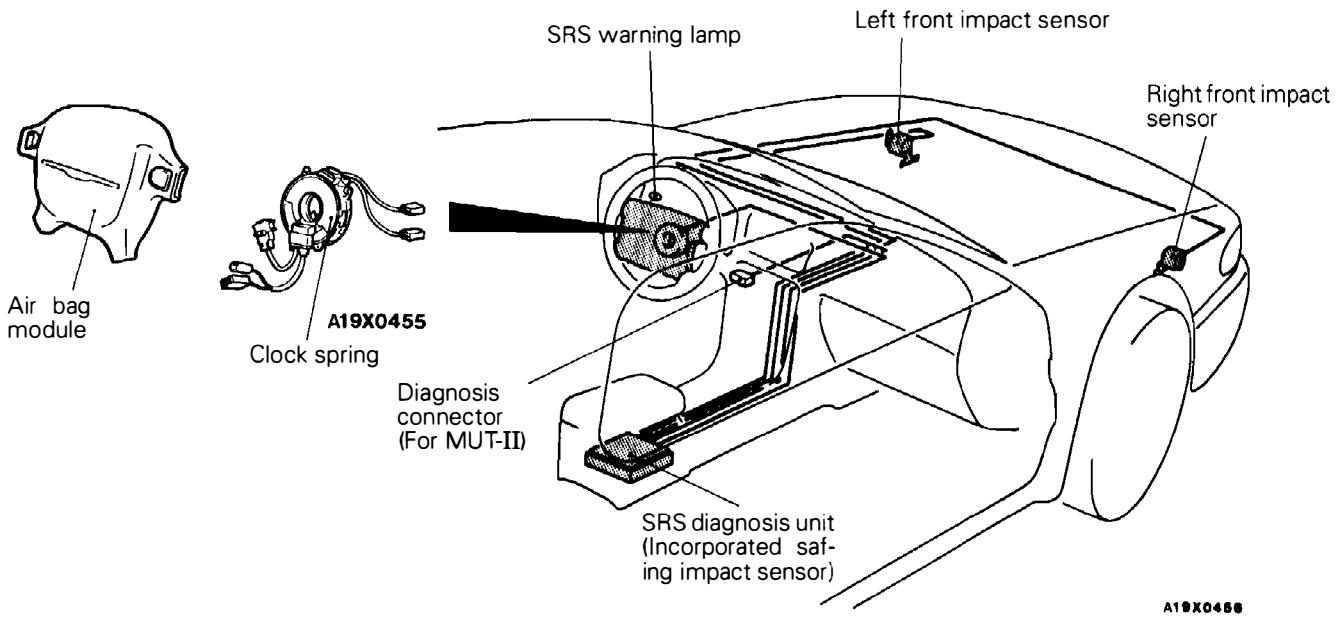
E00AF10AB

<Vehicles without front passenger's air bag>

The Supplemental Restraint System (SRS) is designed to supplement the driver's seat belt to help reduce the risk or severity of injury to the driver by activating and deploying an air bag in certain frontal collisions.
The SRS consists of: left front and right front impact sensors located on the right and left front upper frame (lower); an air bag module located in the centre of the steering wheel, which contains the folded air bag and an inflator unit; the SRS diagnosis unit located under the floor console assembly, which monitors the system, and which contains a safing impact sensor; an SRS warning lamp located on the instrument panel, which indicates the operational status of the SRS: a clock spring interconnection located within the steering column; and wiring.

The SRS is designed so that the air bag will deploy when the safing sensor, plus either or both of the left front and right front impact sensors simultaneously activate while the ignition switch is "ON". That is designed to occur in frontal or near-frontal impacts of moderate to severe force.
Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work. Extreme care must be used when servicing the SRS to avoid injury to the service personnel (by inadvertent deployment of the air bag) or the driver (by rendering the SRS inoperative).



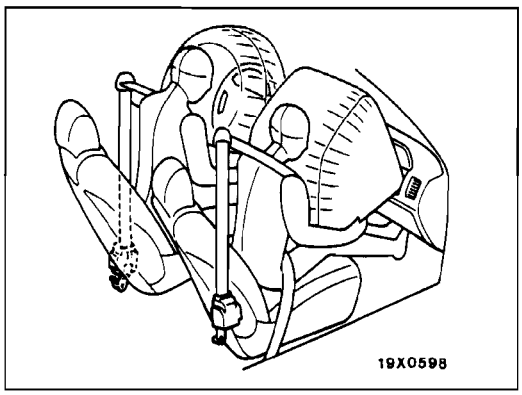


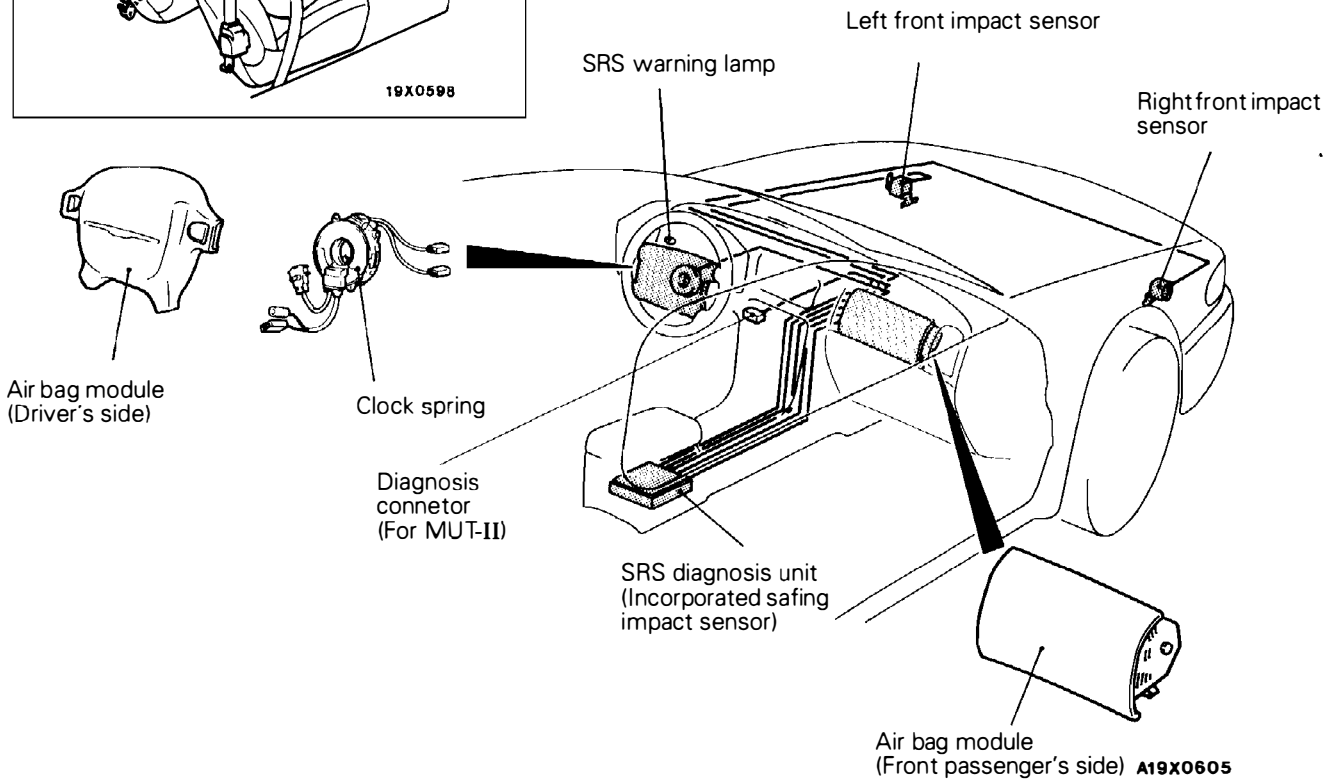
GENERAL INFORMATION

E00AF10AC

<Vehicles with front passenger's air bag>

The Supplemental Restraint System (SRS) is designed to supplement the driver's and front passenger's seat belt to help reduce the risk or severity of injury to the driver and front passenger by activating and deploying two air bags in certain frontal collisions.
The SRS consista of: left front and right front impact sensors located on the right and left front upper frame (lower); air bag modules for the driver located in the centre of the steering wheel and for the front passenger located above the glove box, which contains the folded air bag and an inflator unit; the SRS diagnosis unit located under the floor console assembly, which monitors the system, and which contains a safing impact sensor; an SRS warning lamp located on the instrument panel, which indicates the operational status of the SRS; a clock spring interconnection located within the steering column; 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 "ON". That is designed to occur in frontal or near-frontal impacts of moderate to severe force.
Only authorized service personnel should do work on or around the SRS components. Those service personnel should read this manual carefully before starting any such work. Extreme care must be used when servicing the SRS to avoid injury to the service personnel (by inadvertent deployment of the air bags) or the driver (by rendering the SRS inoperative).





SRS SERVICE PRECAUTIONS

E52BB10AB

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-7.
   Never use an analogue ohmmeter.
3. **Never Attempt to Repair the Following Components:**
   - Front Impact Sensors
   - SRS Diagnosis Unit (SDU)
   - Clock Spring
   - Air Bag Module (Driver's side or front passenger's side*)

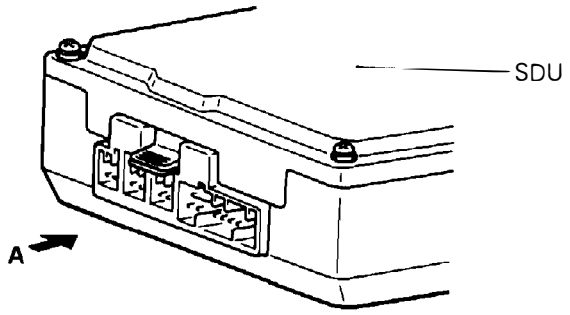
   NOTE
   * : Vehicles with front passenger's air bag

   If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENTS SERVICE procedures in this manual, starting at page 52B-49.
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, Colour)	Destination of Harness		Corrective Action
1 2	2 pins, red	Dash wiring harness → Clock spring → Air bag module (Driver's side)		Correct or replace each wiring harness Replace clock spring
5*1 6*2	2 pins, green	Dash wiring harness → Air bag module (Front passenger's side)		Correct or replace each wiring harness
7 and 8	14 pins, red	–		–
9		Dash wiring harness → Diagnosis connector		Correct or replace each wiring harness
10		Dash wiring harness → Control wiring harness → Dash wiring harness → Ignition switch (ST)		
11		Dash wiring harness → Junction block (fuse No. 4)		
12		Dash wiring harness → Junction block (fuse No. 8)		
13 14		Dash wiring harness → Instrument panel wiring harness → Combination meter (SRS warning lamp)		
15 16		Dash wiring harness → Front wiring harness → Front impact sensor (+)	RH LH	Replace with sensor cable*2
17 18		Dash wiring harness → Front wiring harness → Front impact sensor (–)	LH RH	

SDU Terminal No.	Harness Connector (No. of Terminals, Colour)	Destination of Harness	Corrective Action
19 20	14 pins, red	Dash wiring harness → Earth	Correct or replace each wiring harness

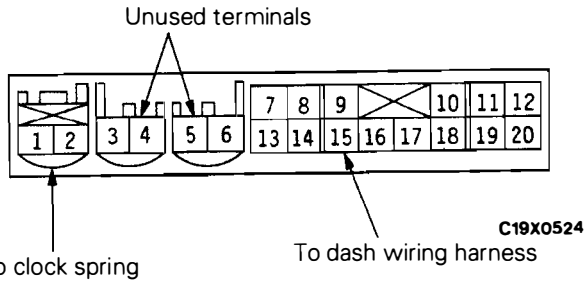
NOTE
(1) *1 :Vehicles with front passenger's air bag.
(2) The sensor cable marked with*2 is available as service part.
(3) The sensor cable used as a replacement part is routed along the dash wiring harness and front wiring harness.

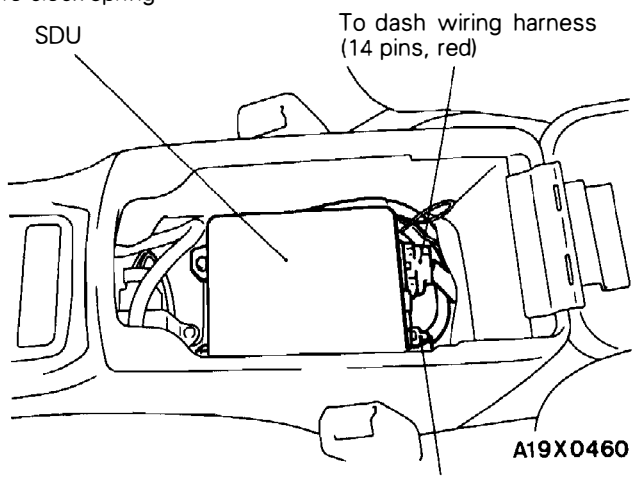


A13R0704

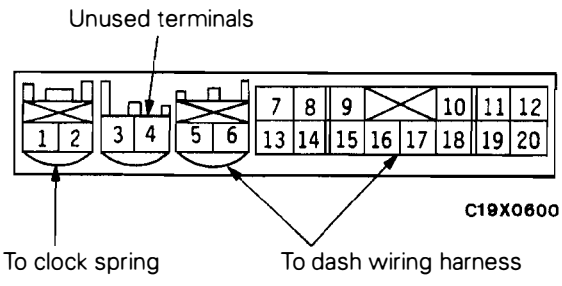
View A

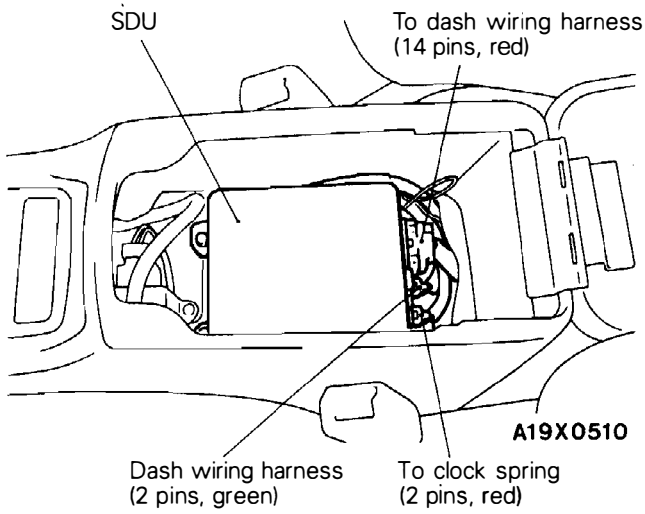
<Vehicles without front passenger's air bag>





<Vehicles with front passenger's air bag>





5. **After disconnecting the battery cable, wait 60 seconds or more before proceeding with the following work. The SRS system is designed to retain enough voltage to deploy the air bag for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cables are disconnected.**
6. SRS components should not be subjected to heat over 93°C, so remove the front impact sensors, SRS diagnosis unit, air bag module and clock spring before drying or baking the vehicle after painting. Recheck SRS system operability after re-installing the components.
7. If SDUs which have been manufactured up to Jan., 1994 are connected to wiring harnesses in vehicles manufactured from Feb., 1994, the air bag may be operated by mistake. Consequently, be sure to use only air bags with compatible manufacturing dates.
8. Whenever you finish servicing the SRS, check the SRS warning lamp operation to make sure that the system functions properly. (Refer to P.52B-33.)
9. Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.
10. If you have any questions about the SRS, please contact your local distributor.

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

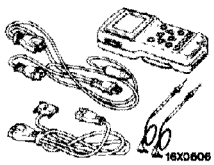
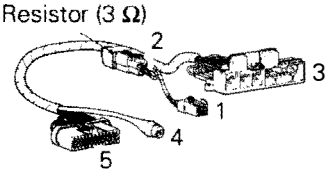
SERVICE SPECIFICATIONS

E52BC00AA

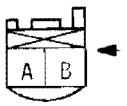
Items		Specifications
Standard value		
Front impact sensor resistance	Ω	2,000 ± 20
Clock spring resistance	Ω	Less than 0.4

SPECIAL TOOLS AND TEST EQUIPMENT

E52BD00AB

Tool	Number	Name	Use
 16X0606	MB991502	MUT-II sub assembly	• Reading diagnosis codes • Erasing diagnosis code • Reading trouble period • Reading erase times [Refer to MUT-II INSTRUCTION MANUAL]
 16X0607		ROM pack	
Resistor (3 Ω) 	MB991349	SRS Check Harness	<Vehicles without front passenger's air bag> • 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-11 – P. 52B-32.)

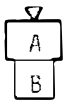
1



To SDU connector for clock spring

19X0463

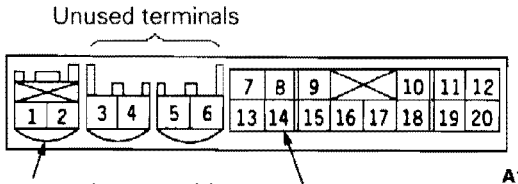
2



(connected 3 Ω resistor)

19X0464

3

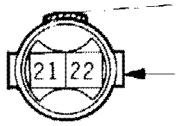


A19X0524

Connect to harness-side clock spring connector (2-pin, red)

Connect to harness-side dash wiring harness connector (14-pin, red)

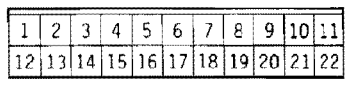
4



To clock spring connector for air bag module

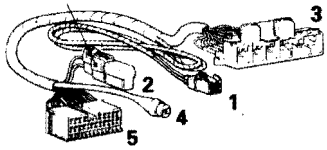
19X0462

5

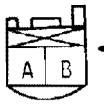


(check connector)

19X0546

Tool	Number	Name	Use
Resistor (3 Ω)  	MB991530	SRS Check Harness	<Vehicles with front passenger's air bag> • 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-11 – P. 52B-32.)

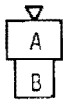
1



To SDU connector for clock spring

19X0463

2



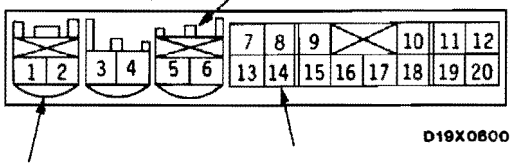
(connected 3 Ω resistor)

19X0464

3

Unused terminals

Connect to harness side dash wiring harness connector (2-pin, green)



D19X0600

Connect to harness-side clock spring connector (2-pin, red)

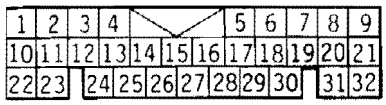
Connect to harness-side dash wiring harness connector (14-pin, red)

4

To clock spring connector for air bag module

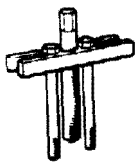
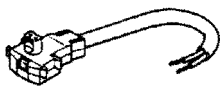
19X0462

5



(check connector)

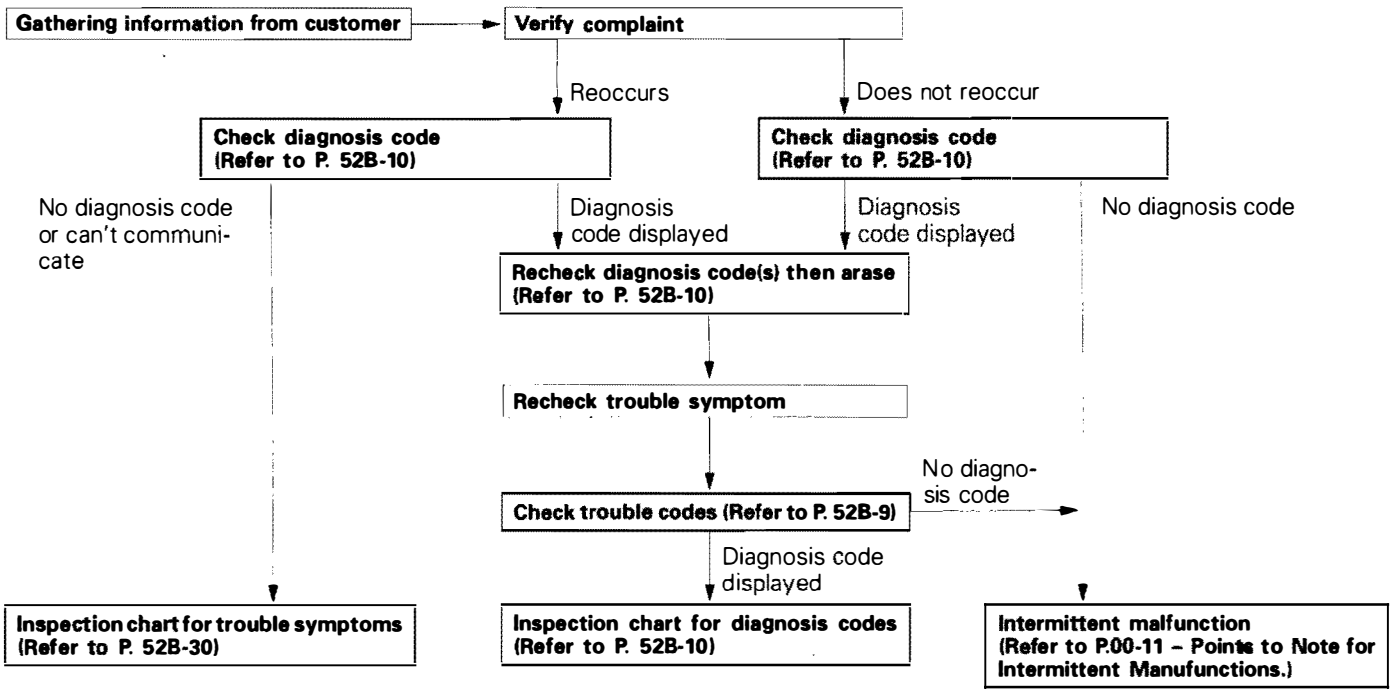
19N0325

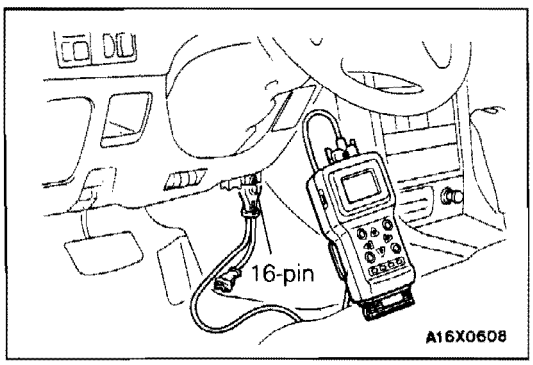
 13R0748		Digital multi-meter Use a multi-meter for which the maximum test current is 2 mA or less at the minimum range of resistance measurement	Checking the SRS electrical circuitry with SRS Check Harness
	MB990803	Steering wheel puller	Removal of steering wheel
 13R0732	MB686560	SRS air bag adapter harness A	• Deployment of driver's side and front passenger's side air bag module inside the vehicle • Deployment of front passenger's side air bag module outside the vehicle
 13R0751	MB628919	SRS air bag adapter harness B	Deployment of driver's side air bag module outside the vehicle

TROUBLESHOOTING

E52BE00AB

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING





DIAGNOSTIC FUNCTION

E52BE01AA

DIAGNOSIS CODES CHECK

Connect the MUT-II to the diagnosis connector (16-pin) under the instrument under cover, then check diagnosis codes.

ERASING DIAGNOSIS CODES

Connect the MUT-II to the diagnosis connector (16-pin) then erase the diagnosis codes.

INSPECTION CHART FOR DIAGNOSIS CODES

E52BE02AB

Inspect according to the inspection chart that is appropriate for the malfunction code.

Code No.	Diagnosis item		Reference page
11	Front impact sensor system		P. 52B-11
12			
13			
21	Driver's side air bag module (squib) system		P. 52B-13
22			
24*1	Front passenger's side air bag module (squib)		P. 52B-15
25*1			
31	SDU capacitor system		P. 52B-17
32			
33*2	Cranking signal system		P. 52B-18
34*2	Connector lock system		P. 52B-20
41*2,*3	IG_1 (A) power circuit system		P. 52B-21
42*2,*3	IG_1 (B) power circuit system		P. 52B-23
43	SRS warning lamp drive circuit system	Lamp does not illuminate	P. 52B-25
		Lamp does not switch off	P. 52B-27
44	SRS warning lamp drive circuit system		P. 52B-28
45	SDU non-volatile memory (EEPROM) and A/D converter system		P. 52B-29

NOTE
*1 : Vehicles with front passenger's air bag.
*2 : If the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, the diagnosis code will be automatically erased, and the SRS warning lamp will return to normal.
*3 : If the vehicle has a discharged battery it will store the fault codes 41 or 42. When these diagnosis codes are displayed, check the battery.

INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSTIC TROUBLE

E52BE03AB

Code No. 11, 12 or 13	Front impact sensor system	Probable cause

[Comment]
(1) These diagnosis codes are output if there is abnormal resistance between the input terminals of the front impact sensor.
The trouble causes for each code No. are as follows.

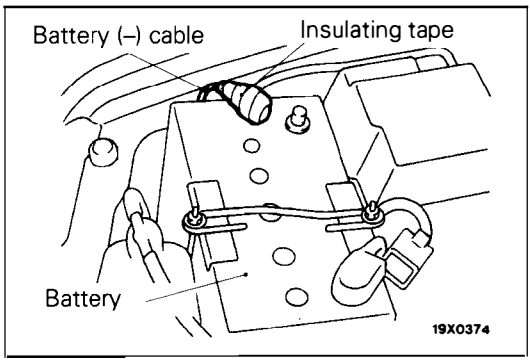
Code No.	Trouble Symptom
11	• Short in front impact sensor or harness short • Short in front impact sensor or air bag module (squib) harnesses leading to the vehicle body earth • Short in front impact sensor or air bag module (squib) harnesses leading to the power supply
12	• Open circuit in either left or right front impact sensor or open harness • Short in front impact sensor or air bag module (squib) harnesses leading to the power supply
13	• Open circuit in both left and right front impact sensors or open harness • Short in front impact sensor or air bag module (squib) harnesses leading to the power supply

(2) Diagnosis codes 11, 12 and 13 are sometimes generated in combination with malfunction codes relating to the air bag module (squib) (code Nos. 21 and 22), but sometimes only one may be output instead of both being memorised. Because of this, the air bag module should also be inspected at the same time.
The relationships between the codes are as follows.

		Front impact sensor		
		Short	Open circuit (1 sensor)	Open circuit (2 sensors)
Air bag module (driver's side squib)	Short	11 or 21	12 or 21	13 or 21
	Open circuit	11 or 22	12 or 22	13 or 22
Air bag module (front passenger's side squib)*	Short	11 or 24	12 or 24	13 or 24
	Open circuit	11 or 25	12 or 25	13 or 25

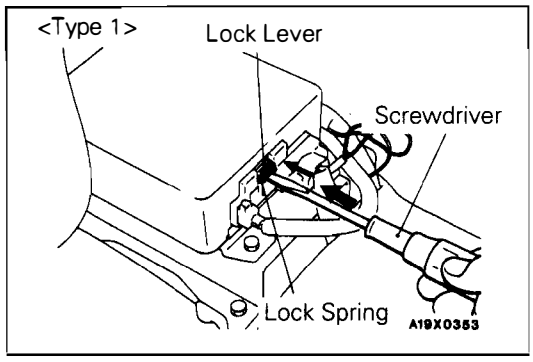
NOTE
* : Vehicles with front passenger's air bag.

- Malfunction of front impact sensor
- Malfunction of harnesses or connectors
- Malfunction of SDU

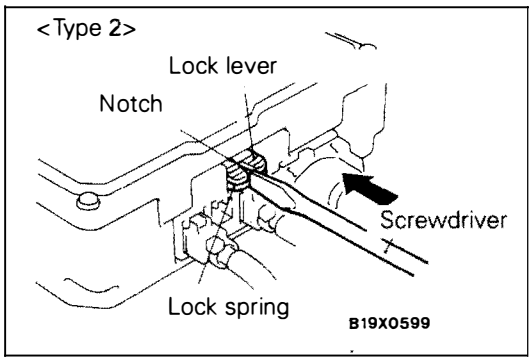


Caution

1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)



2. Remove the SDU connector lock by the following procedure.
If there is no notch in the connector lock lever (Type 1)
Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.
(1) Do not use excessive force to raise the lock lever.
(2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.

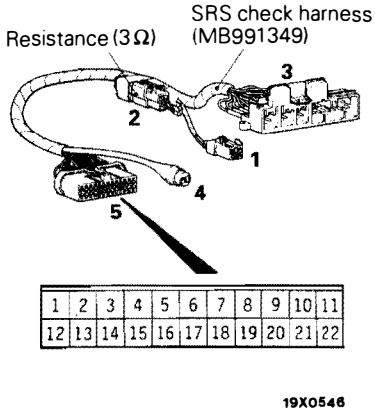


If there is a notch in the connector lock lever (Type 2)
Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.
- **Do not use excessive force to raise the lock lever.**

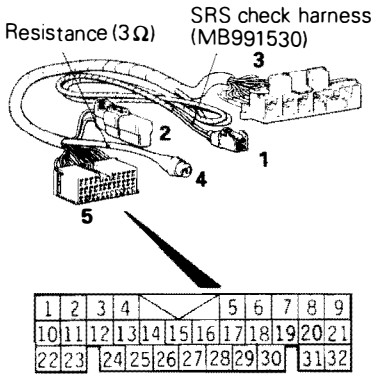
Inspection of front impact sensor (Refer to P. 52B-41.) NG → **Replace**

OK ↓

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



Measure at SRS check harness connector (5).
- Disconnect SDU connector C-131.
- 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

NG → **Check the following connectors**
C-131, C-86, A-20 and A-72 NG → **Repair**

OK ↓

Check trouble symptom

NG ↓

Inspect harness between SDU and front impact sensor.

NG ↓

Replace the sensor harness.

OK ↓

- Inspect the air bag module (driver's side squib) system (Refer to P. 52B-46.)
- Inspect the air bag module (front passenger's side squib) system* (Refer to P. 52B-47)

OK ↓

Replace the SDU.

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

Code No. 21 or 22	Air bag module (driver's side squib) system	Probable cause

[Comment]

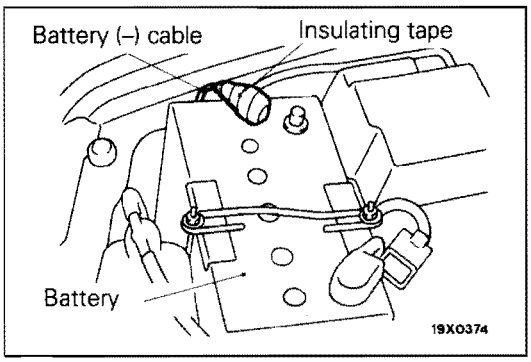
(1) These diagnosis codes are output if there is abnormal resistance between the input terminals of the air bag module (driver's side squib).
The trouble causes for each code No. are as follows.

Code No.	Trouble Symptom
21	• Short in air bag module (driver's side squib) or harness short • Short in clock spring • Short in air bag module (driver's side squib) or front impact sensor harnesses leading to the power supply
22	• Open circuit in air bag module (driver's side squib) or open harness • Open circuit in clock spring • Malfunction of connector contact • Short in air bag module (driver's side squib) or front impact sensor harnesses leading to the power supply

(2) Diagnosis codes 21 and 22 are sometimes generated in combination with malfunction codes relating to the front impact sensor (code Nos. 11, 12 and 13), but sometimes only one may be output instead of both being memorised. Because of this, the front impact sensor should also be inspected at the same time.
The relationships between the codes are as follows.

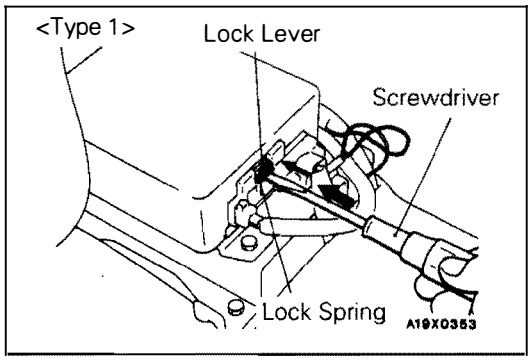
		Front impact sensor		
		Short	Open circuit (1 sensor)	Open circuit (2 sensors)
Air bag module (driver's side squib)	Short	11 or 21	12 or 21	13 or 21
	Open circuit	11 or 22	12 or 22	13 or 22

Probable cause
- Malfunction of clock spring
- Malfunction of harnesses or connectors
- Malfunction of air bag module (driver's side squib)
- Malfunction of SDU

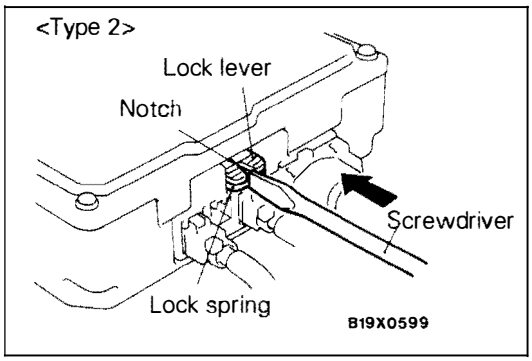


Caution

1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)

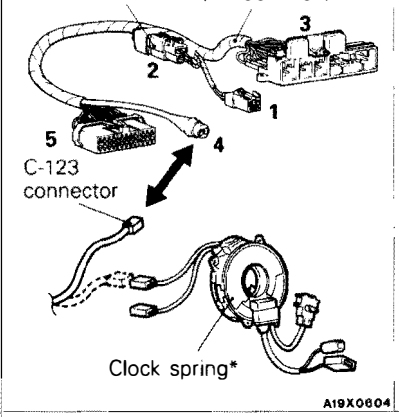


2. Remove the SDU connector lock by the following procedure.
If there is no notch in the connector lock lever (Type 1)
Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.
(1) Do not use excessive force to raise the lock lever.
(2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.

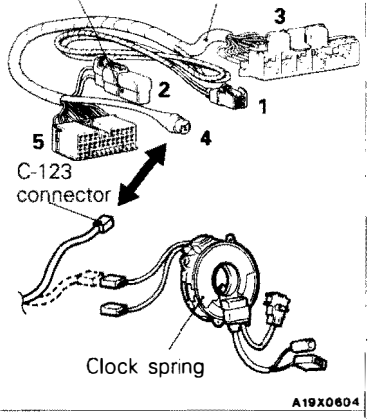


If there is a notch in the connector lock lever (Type 2)
Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.
- **Do not use excessive force to raise the lock lever.**

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



MUT-II DIAGNOSIS CODE
- Disconnect clock spring connector C-123.
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

Are code Nos. 21 and 22 output?

No → Clock spring inspection (Refer to P. 52B-49.) NG → **Replace**

OK ↓

Check the following connectors. C-132 and C-123 NG → **Repair**

OK ↓

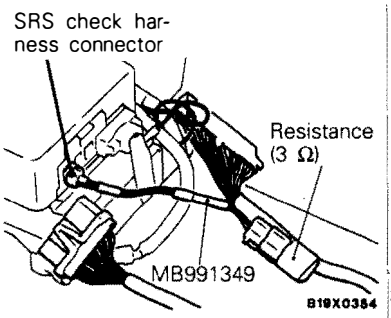
Check trouble symptom

NG ↓

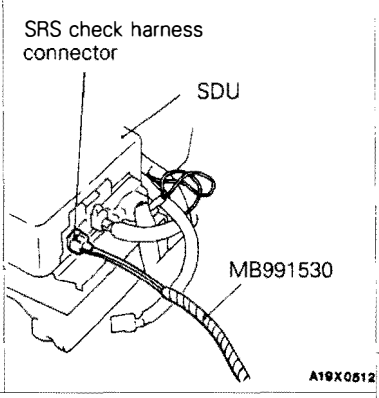
Replace the air bag module (driver's side squib).

Yes ↓

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



MUT-II DIAGNOSIS CODE
- Connect clock spring connector C-123
- Disconnect SDU connector C-132
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

Are code Nos. 21 and 22 output?

No → Check the harness between the SDU and clock spring, and repair if necessary.

Yes → Inspect the front impact sensor system (Refer to P. 52B-11.)

OK ↓

Replace the SDU.

Code No. 24 or 25	Air bag module (front passenger's side squib) system <Vehicles with front passenger's air bag>	Probable cause

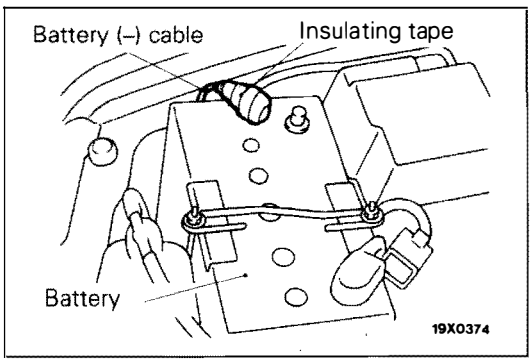
[Comment]
(1) These diagnosis codes are output if there is abnormal resistance between the input terminals of the air bag module (front passenger's side squib).
The trouble causes for each code No. are as follows.

Code No.	Trouble Symptom
24	• Short in air bag module (front passenger's side squib) or harness short • Short in air bag module (front passenger's side squib) or front impact sensor harnesses leading to the power supply
25	• Open circuit in air bag module (front passenger's side squib) or open harness • Malfunction of connector contact • Short in air bag module (front passenger's side squib) or front impact sensor harnesses leading to the power supply

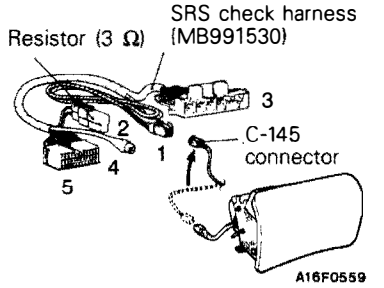
(2) Diagnosis codes 24 and 25 are sometimes generated in combination with malfunction codes relating to the front impact sensor (code Nos. 11, 12 and 13), but sometimes only one may be output instead of both being memorised. because of this, the front impact sensor should also be inspected at the same time.
The relationships between the codes are as follows.

		Front impact sensor		
		Short	Open circuit (1 sensor)	Open circuit (2 sensors)
Air bag module (front passenger's side squib)	Short	11 or 24	12 or 24	13 or 24
	Open circuit	11 or 25	12 or 25	13 or 25

- Malfunction of harnesses or connectors
- Malfunction of air bag module (front passenger's side squib)
- Malfunction of SDU



Caution
1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)



MUT-II SELF DIAG. CODE

- Disconnect air bag module (front passenger's side) connector C-145
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

Are code Nos. 24 and 25 output?

NG → **Check the following connectors.**
C-1 5 and C-146 → NG → **Repair**

OK ↓

Check trouble symptom

NG ↓

Replace the air bag module (front passenger's side squib).

Yes ↓

Inspect harness between SDU and air bag moduel (front passenger's side) → NG → **Repair**

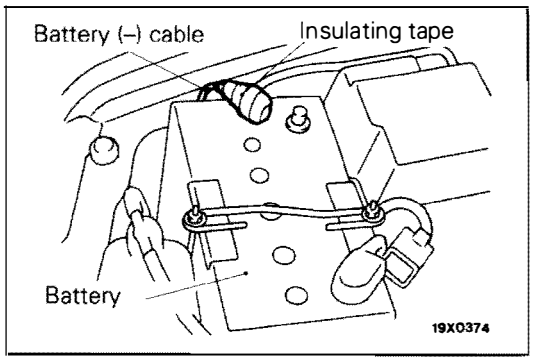
Yes ↓

Inspect the front impact sensor system (Refer to P. 52B-11.)

OK ↓

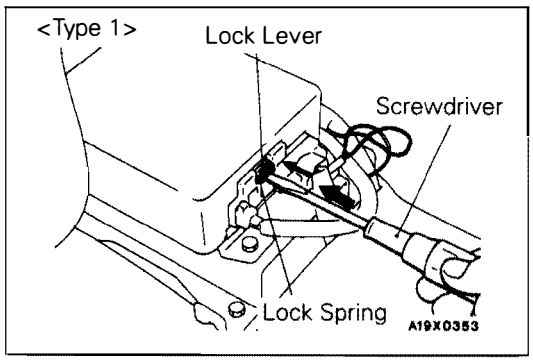
Replace the SDU.

Code No. 31 or 32	SDU capacitor system	Probable cause
[Comment] These diagnosis codes are output if the voltage at the SDU capacitor terminals is higher (No. 31) or lower (No. 32) than the specified value for 5 seconds or more. However, if diagnosis code Nos. 41 and 42 are being output due to a drop in battery voltage, code No. 32 will not be detected.		• Malfunction of front impact sensor • Malfunction of SDU

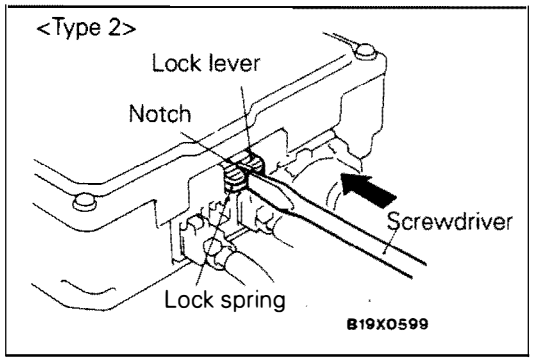


Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)**



2. **Remove the SDU connector lock by the following procedure.**
   If there is no notch in the connector lock lever (Type 1)
   Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.
   (1) Do not use excessive force to raise the lock lever.
   (2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.

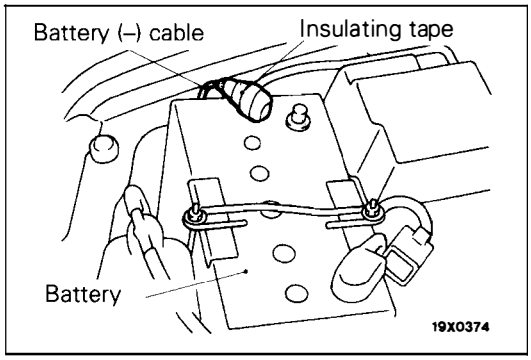


   If there is a notch in the connector lock lever (Type 2)
   Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.

   - **Do not use excessive force to raise the lock lever.**

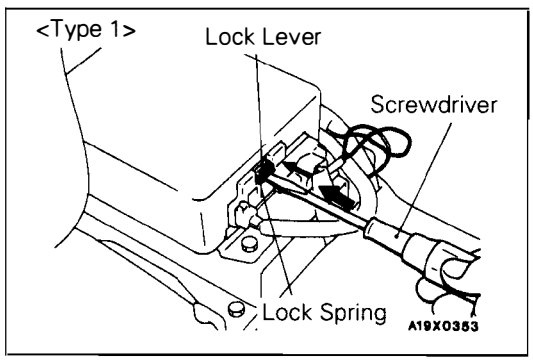
The capacitor inside the SDU is probably defective, so replace the SDU. However, code No. 32 could also be a result of a short in the front impact sensor, so inspection of the front impact sensor system should also be carried out. (Refer to P. 52B-11.)

Code No. 33	Cranking signal system	Probable cause
[Comment] The cranking signal is provided in order to prevent mistaken detection of power supply voltage drops at the IG1 terminal during cranking. This diagnosis code is output if the cranking signal is output for a continuous period of 45 seconds or more (cranking signal harness is shorted to the power supply). However, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds (except when cranking), diagnosis code No. 33 will be automatically erased, and the SRS warning lamp will switch off.		• Malfunction of harnesses or connectors • Malfunction of SDU



Caution

1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)



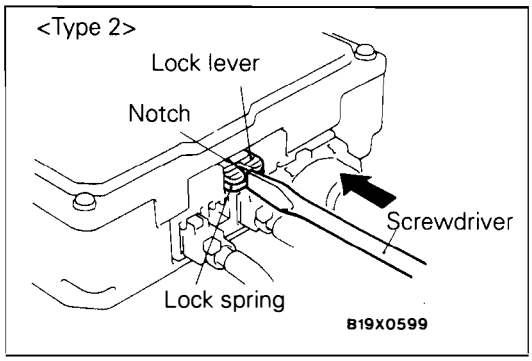
2. Remove the SDU connector lock by the following procedure.

If there is no notch in the connector lock lever (Type 1)

Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.

(1) Do not use excessive force to raise the lock lever.

(2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.



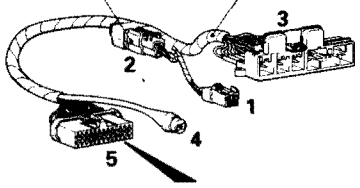
If there is a notch in the connector lock lever (Type 2)

Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.

- **Do not use excessive force to raise the lock lever.**

<Vehicles without front passenger's air bag>

Resistance (3 Ω) SRS check harness (MB991349)

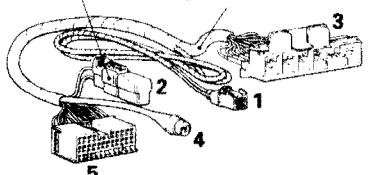


1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

19X0546

<Vehicles with front passenger's air bag>

Resistance (3 Ω) SRS check harness (MB991530)



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

19N0325

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connectors.** C-131 NG → **Repair**

OK ↓

Check brouble symptoms

NG ↓

Check the harness wire between each, SDU and earth, and repair if necessary

OK ↓

Measure at SRS check harness connector (5).
- Ignition switch ON
- Voltage between terminal (10) and body earth

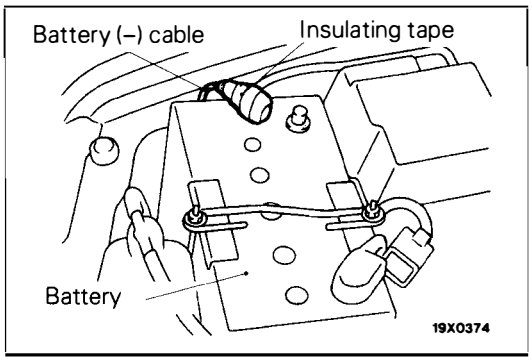
OK: 0 V

OK → Replace the SDU

NG ↓

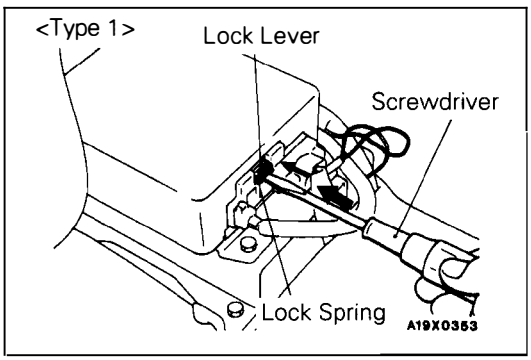
Check the harness between the SDU and ignition switch (ST), and repair if necessary.

Code No. 34	Connector lock system	Probable cause
[Comment] This diagnosis code is output if the double lock shorting bar of the SDU connector is detected to be open. However, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, diagnosis code No. 34 will be automatically erased, and the SRS warning lamp will switch off.		• Malfunction of connectors • Malfunction of SDU

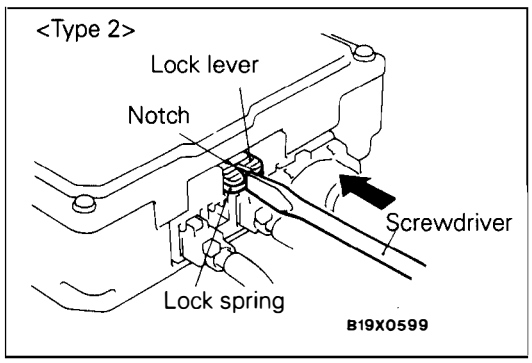


Caution

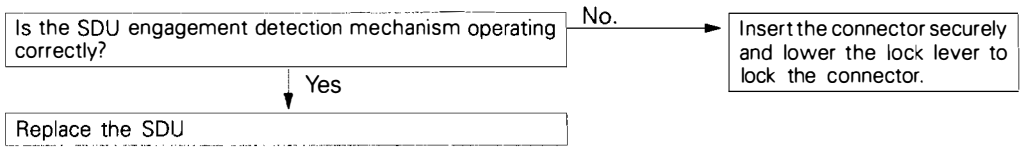
1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)**



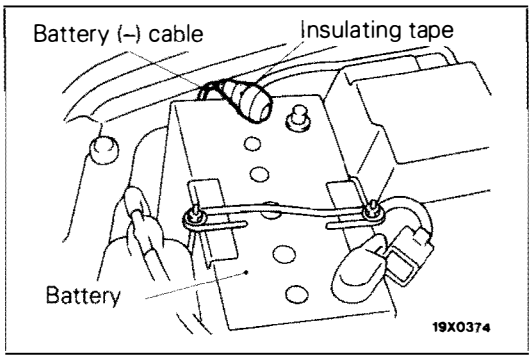
2. **Remove the SDU connector lock by the following procedure.**
   If there is no notch in the connector lock lever (Type 1)
   Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.
   (1) Do not use excessive force to raise the lock lever.
   (2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.



   If there is a notch in the connector lock lever (Type 2)
   Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.
   • Do not use excessive force to raise the lock lever.

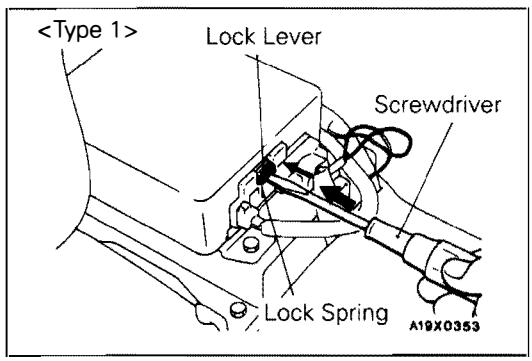


Code No. 41	IG_1 (A) power circuit system	Probable cause
[Comment] This diagnosis code is output if the voltage between the IG_1 (A) terminal and the earth is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, diagnosis code No. 41 will be automatically erased, and the SRS warning lamp will switch off.		• Malfunction of harnesses or connectors • Malfunction of SDU



Caution

1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)



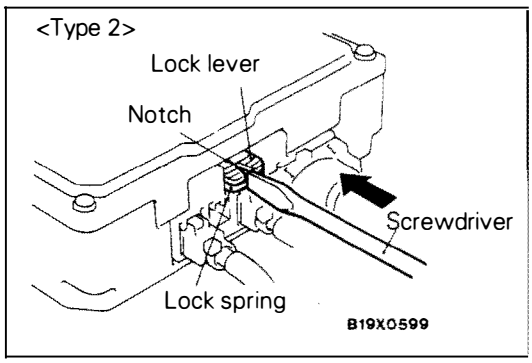
2. Remove the SDU connector lock by the following procedure.

If there is no notch in the connector lock lever (Type 1)

Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.

(1) Do not use excessive force to raise the lock lever.

(2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.

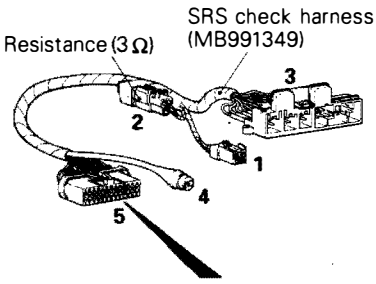


If there is a notch in the connector lock lever (Type 2)

Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.

- **Do not use excessive force to raise the lock lever.**

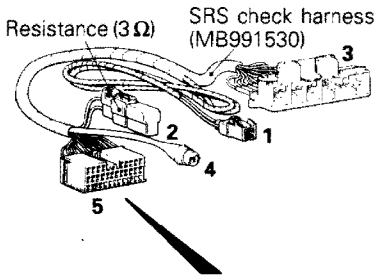
<Vehicles without front passenger's air bag>



1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

19X0546

<Vehicles with front passenger's air bag>



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	

19N0325

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connector.** C-131 — NG → **Repair**

OK ↓

Check trouble symptom

NG ↓

Check the harness between the SDU and earth, and repair if necessary.

OK ↓

Measure at SRS check harness connector (5).
- Ignition switch ON
- Voltage between terminal (12) and body earth

OK: 9 V or more

NG → **Check the following connector** C-07, C-06 and C-25 — NG → **Repair**

OK ↓

Check trouble symptom

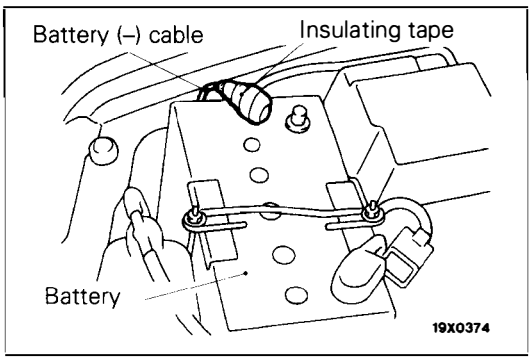
NG ↓

Check the harness between the SDU and ignition switch IG1 (A), and repair if necessary.

OK ↓

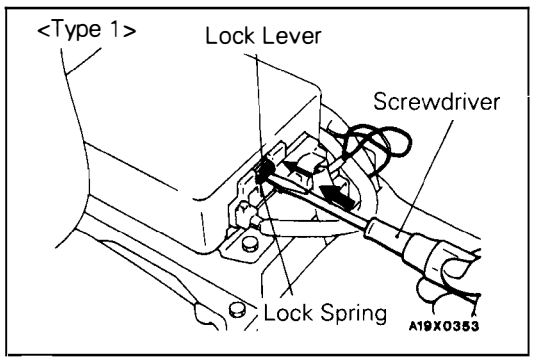
Replace the SDU.

Code No. 42	IG_1 (B) power circuit system	Probable cause
[Comment] This diagnosis code is output if the voltage between the IG_1 (B) terminal and the earth is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, diagnosis code No. 41 will be automatically erased, and the SRS warning lamp will switch off.		• Malfunction of harnesses or connectors



Caution

1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)



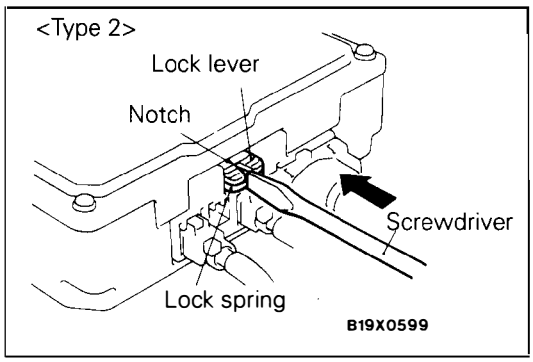
2. Remove the SDU connector lock by the following procedure.

If there is no notch in the connector lock lever (Type 1)

Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.

(1) Do not use excessive force to raise the lock lever.

(2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.

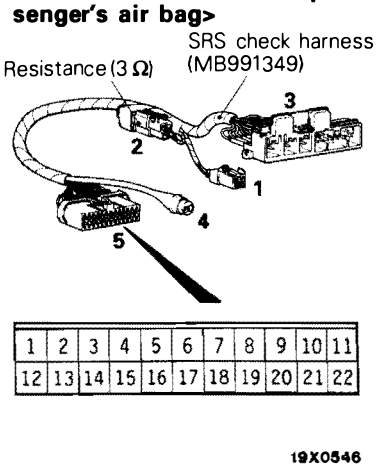


If there is a notch in the connector lock lever (Type 2)

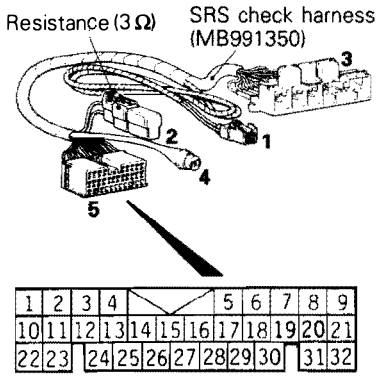
Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.

- **Do not use excessive force to raise the lock lever.**

<Vehicles without front passenger's air bag>



<Vehicles with front passenger's air bag>



Measure at SRS check harness connector (5).
- Disconnect SDU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connector.** C-131 → NG → **Repair**

OK → Check trouble symptom → NG → Check the harness between the SDU and earth, and repair if necessary.

OK → Measure at SRS check harness connector (5).
- Ignition switch: ON
- Voltage between the terminal (11) and body earth.

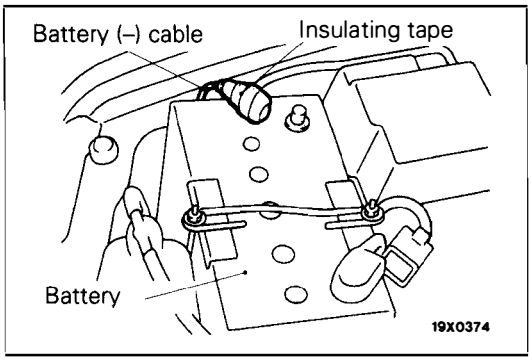
OK: 9 V or more

NG → **Check the following connectors.** C-07, C-14, C-17 and D-15 → NG → **Repair**

OK → Replace the SDU.

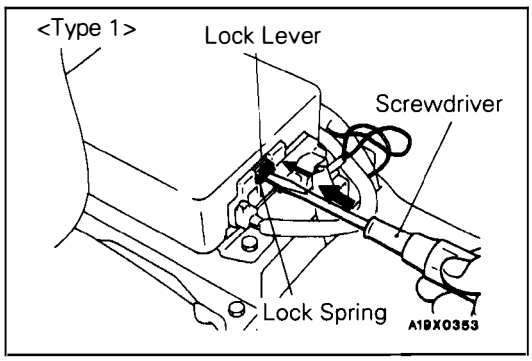
OK → Check trouble symptom → NG → Check the harness between the SDU and ignition switch IG1 (B), and repair if necessary.

Code No. 43	SRS warning lamp drive circuit system (Lamp does not illuminate.)	Probable cause
[Comment] This diagnosis code is output when an open circuit occurs for a continuous period of 5 seconds while the SDU is monitoring the SRS warning lamp and the lamp is OFF (transistor OFF). However, if this code is output due to an open circuit, if the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, this diagnosis code will be automatically erased, and the SRS warning lamp will return to normal.		• Malfunction of harnesses or connectors • Blown bulb • Malfunction of SDU • Malfunction of combination meter

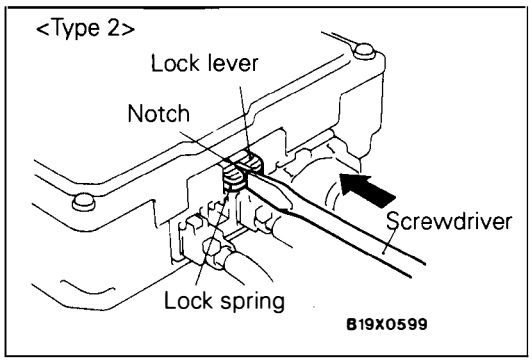


Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)**



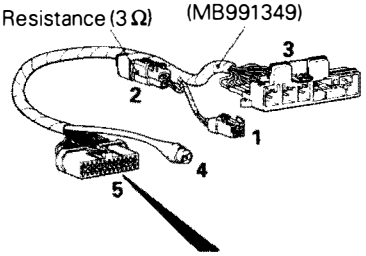
2. **Remove the SDU connector lock by the following procedure.**
   If there is no notch in the connector lock lever (Type 1)
   Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.
   (1) Do not use excessive force to raise the lock lever.
   (2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.



   If there is a notch in the connector lock lever (Type 2)
   Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.
   - **Do not use excessive force to raise the lock lever.**

<Vehicles without front passenger's air bag>

Resistance (3 Ω) SRS check harness (MB991349)

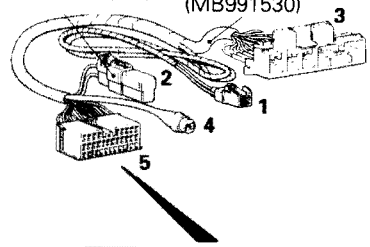


1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

19X0548

<Vehicles with front passenger's air bag>

Resistance (3 Ω) SRS check harness (MB991530)



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	

19N0325

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)

OK: Continuity

NG → **Check the following connector.** C-131 NG → **Repair**

OK ↓

Check trouble symptom

NG ↓

Check the harness between the SDU and earth, and repair if necessary.

OK ↓

Measure at SRS check harness connector (5).
- Ignition switch ON
- Connect terminal (13) to the body earth
  OK: Lamp illuminates
- Connect terminal (14) to the body earth
  OK: Lamp illuminates

NG → Blown bulb inspection NG → **Repair**

OK ↓

Check the following connector D-02, D-03, C-17, C-07 and C-14 NG → **Repair**

OK ↓

Check trouble symptom

NG ↓

Check the harness between the SDU and ignition switch (IG1), and repair if necessary. NG → **Repair**

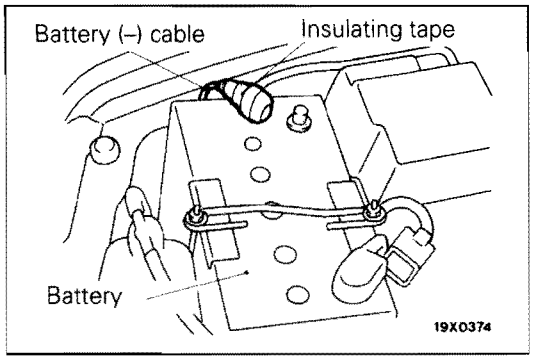
OK ↓

Replace the combination meter.

OK ↓

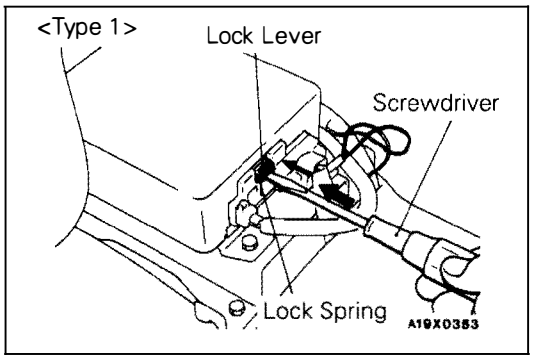
Replace the SDU

Code No. 43	SRS warning lamp drive circuit system (Lamp does not switch off.)	Probable cause
[Comment] This diagnosis code is output when a short to earth occurs in the harness between the lamp and the SDU while the SDU is monitoring the SRS warning lamp and the lamp is ON.		• Malfunction of harnesses or connectors • Malfunction of SDU

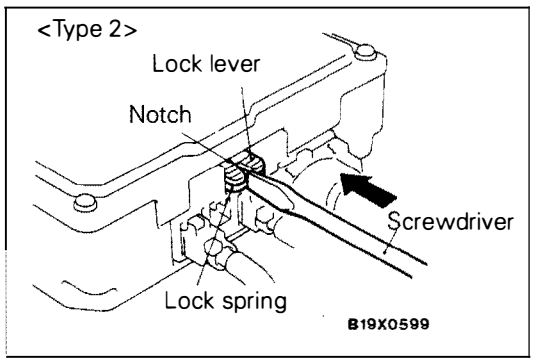


Caution

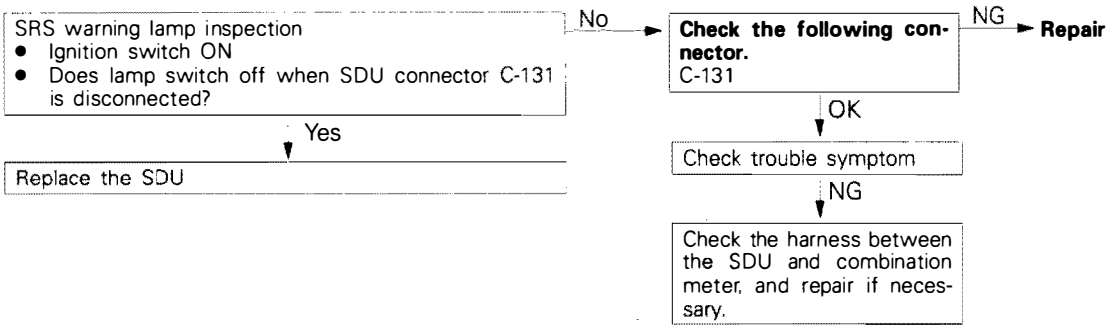
1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)**



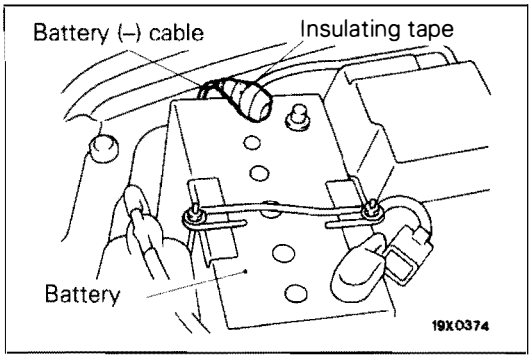
2. **Remove the SDU connector lock by the following procedure.**
   If there is no notch in the connector lock lever (Type 1)
   Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.
   (1) Do not use excessive force to raise the lock lever.
   (2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.



   If there is a notch in the connector lock lever (Type 2)
   Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.
   • **Do not use excessive force to raise the lock lever.**

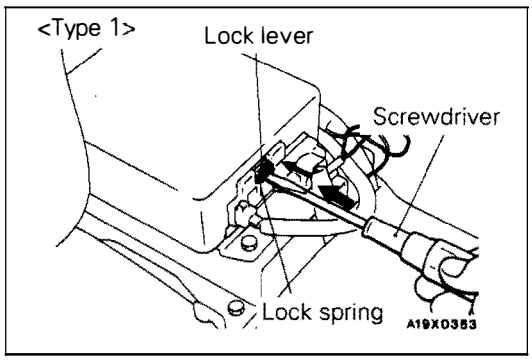


Code No. 44	SRS warning lamp drive circuit system	Probable cause
[Comment] This diagnosis code is output when a short occurs in the lamp drive circuit or a malfunction of the output transistor inside the SDU is detected while the SDU is monitoring the SRS warning lamp drive circuit.		• Malfunction of harnesses or connectors • Malfunction of SDU

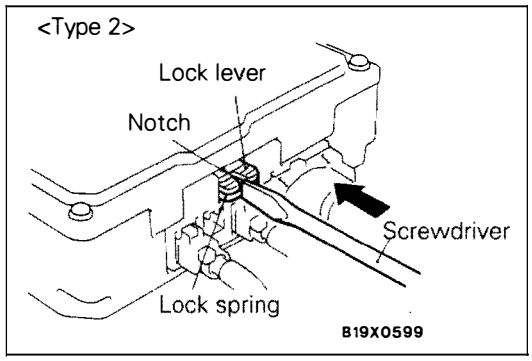


Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)**



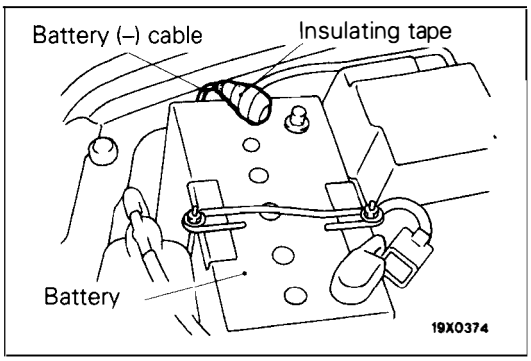
2. **Remove the SDU connector lock by the following procedure.**
   If there is no notch in the connector lock lever (Type 1)
   Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.
   (1) Do not use excessive force to raise the lock lever.
   (2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.



   If there is a notch in the connector lock lever (Type 2)
   Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.
   - **Do not use excessive force to raise the lock lever.**

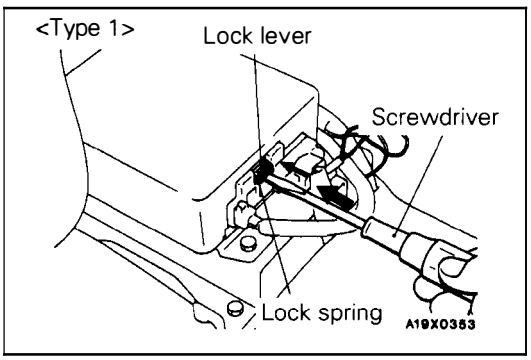
If the results of inspection of the SRS warning lamp drive circuit system (refer to P.52B-25) are normal, the transistor inside the SDU is probably defective, so replace the SDU.

Code No. 45	SDU non-volatile memory (EEPROM) and A/D converter system	Probable cause
[Comment] This diagnosis code is output if there is a malfunction in the SDU non-volatile memory (EEPROM) or A/D converter.		• Malfunction of SDU

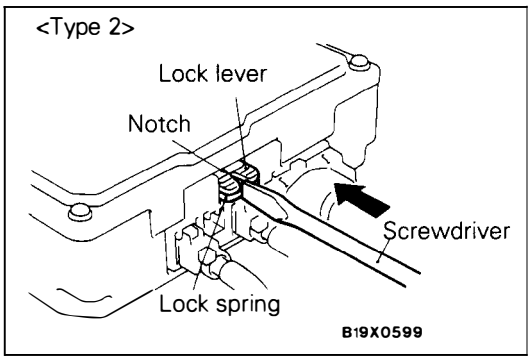


Caution

1. **Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)**

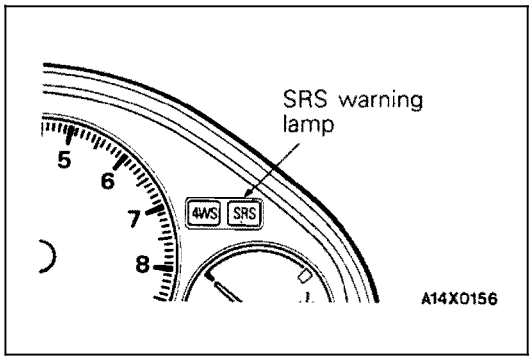


2. **Remove the SDU connector lock by the following procedure.**
   If there is no notch in the connector lock lever (Type 1)
   Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.
   (1) Do not use excessive force to raise the lock lever.
   (2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.



   If there is a notch in the connector lock lever (Type 2)
   Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.
   • Do not use excessive force to raise the lock lever.

The SDU non-volatile memory (EEPROM) or A/D converter is probably defective, so replace the SDU.

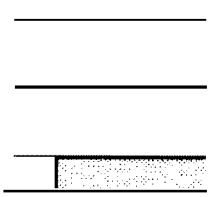
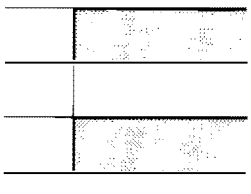


SRS WARNING LAMP INSPECTION E52BE04AB

1. Check to be sure that the SRS warning lamp illuminates when the ignition switch is in the ON position.
2. Check to be sure that it illuminates for approximately 7 seconds and then switches off.
3. If the above is not the case, inspect 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. 52B-31
	Communication is not possible with SRS only	2	P. 52B-31
When the ignition key is turned to "ON" (engine stopped), the SRS warning lamp does not illuminate. SRS warning lamp: Illuminated / Not illuminated Ignition key: ON / ACC, LOCK  14N0167		Refer to diagnosis code No. 43.	P. 52B-25
After the ignition switch is turned to ON, the SRS warning lamp is still on after approximately 7 seconds have passed. SRS warning lamp: Illuminated / Not illuminated Ignition key: ON / ACC, LOCK  14N0166		Refer to diagnosis code No. 43.	P. 52B-27

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

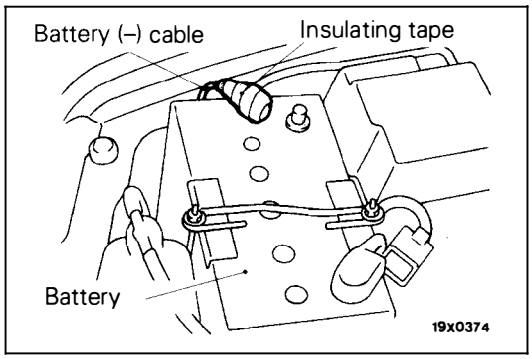
Inspection Procedure 1

Communication with MUT-II is not possible. (Communication with all system is not possible)	Probable cause
[Comment] The cause is probably a power supply system (including earth circuit) of the diagnosis line.	• Malfunction of connectors • Malfunction of harness

Refer to GROUP 13A – Troubleshooting

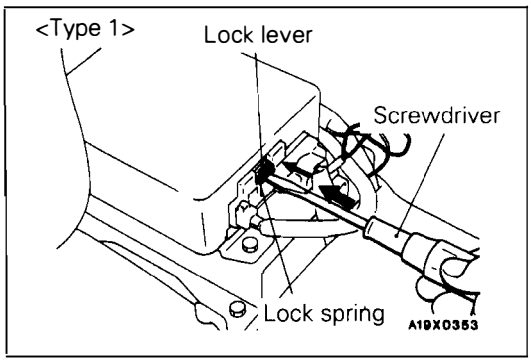
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication is not possible with SRS only)	Probable cause
[Comment] If communication is not possible with the SRS only, the cause is probably an open circuit in the diagnosis output circuit of the SRS or in the power circuit (including earth circuit).	• Malfunction of harnesses or connectors • Malfunction of SDU



Caution

1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal. Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)



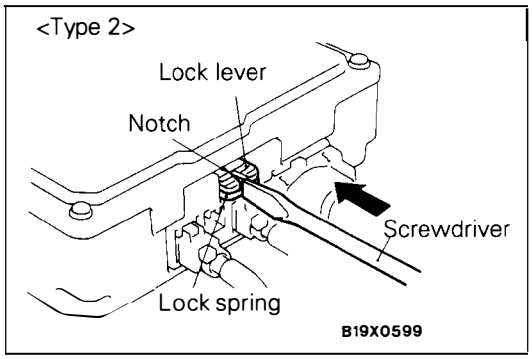
2. Remove the SDU connector lock by the following procedure.

If there is no notch in the connector lock lever (Type 1)

Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.

(1) Do not use excessive force to raise the lock lever.

(2) Do not insert the screwdriver into the gap between the lock lever and the lock spring.

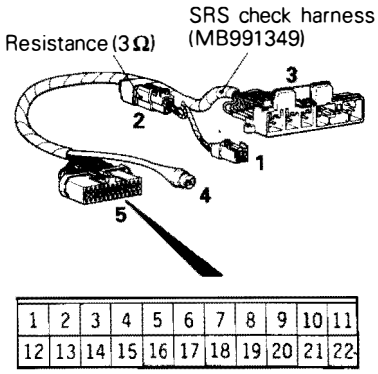


If there is a notch in the connector lock lever (Type 2)

Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.

- **Do not use excessive force to raise the lock lever.**

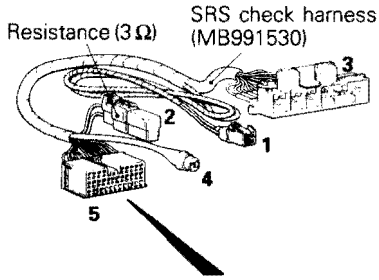
<Vehicles without front passenger's air bag>



1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

19X0546

<Vehicles with front passenger's air bag>



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	

19N0325

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (19) – (20)
  OK: Continuity

NG → **Check the following connector.** C-131 NG → **Repair**

OK ↓

Check Trouble symptom

NG ↓

Check the harness between the SDU and earth, and repair if necessary.

OK ↓

Measure at SRS check harness connector (5).
- Disconnect SDU connector C-131.
- Connect SRS check harness connector (3).
- Voltage between the terminal (11) and body earth.
  OK: 9 V or more
- Voltage between the terminal (12) and body earth
  OK: 9 V or more

NG → **Check the following connector.** C-07, C-06, C-14, C-17 and C-25 NG → **Repair**

OK ↓

Check trouble symptom

NG ↓

Check the harness between the SDU and ignition switch IG1 (A) or ignition switch IG1 (B), and repair if necessary.

OK ↓

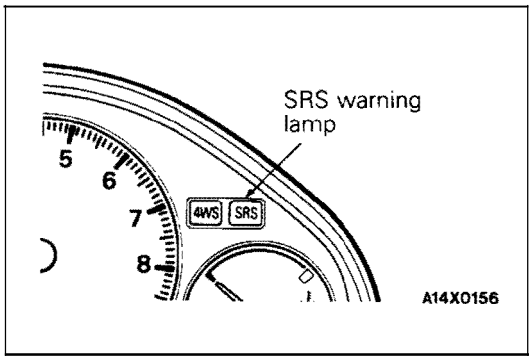
Inspect the harness between the SDU and diagnosis connector. NG → **Repair**

OK ↓

Replace the SDU

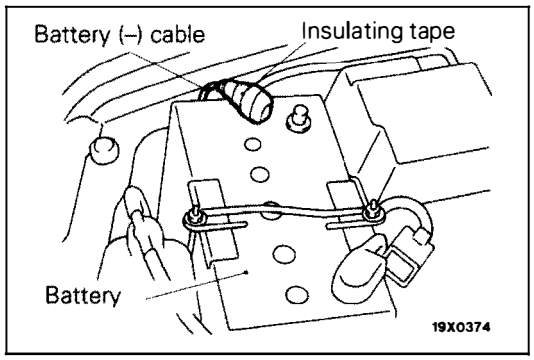
SRS MAINTENANCE E52BF00AA

The SRS must be inspected by an authorized dealer 10 years after the date of vehicle registration.



"SRS" WARNING LAMP CHECK E52BF01AA

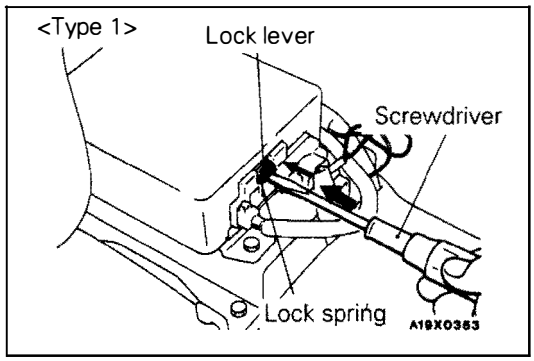
Turn the ignition with the key "ON" position. Does the "SRS" warning lamp illuminate for about 7 seconds, turn OFF and then remain extinguished for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-8.



SRS COMPONENTS VISUAL CHECK E52BF03AB

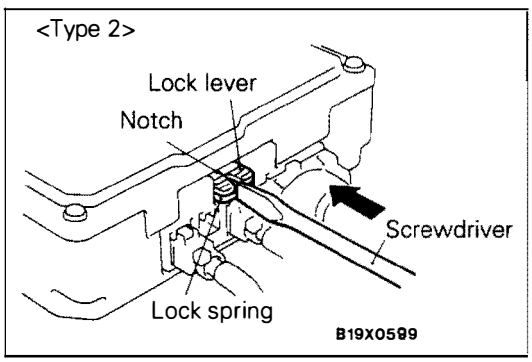
1. Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal.

   Caution
   Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6)



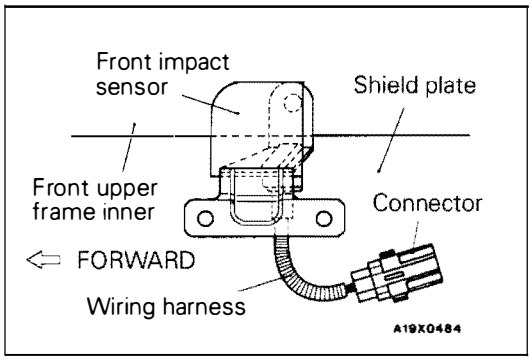
2. Remove the SDU connector lock by the following procedure.
   If there is no notch in the connector lock lever (Type 1)
   Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.

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



   If there is a notch in the connector lock lever (Type 2) Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.

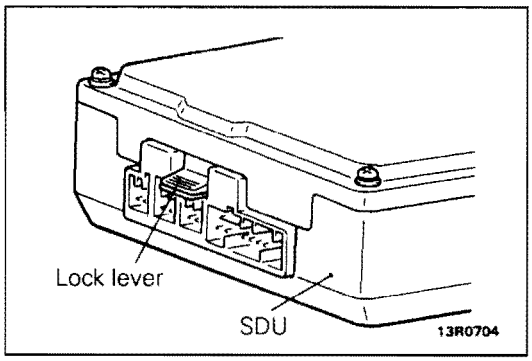
   Caution
   Do not use excessive force to raise the lock lever.



FRONT IMPACT SENSORS E52BF03BB

1. Check sensors to ensure the arrow marks face the front of the vehicle.
2. Check front upper frame inner, shield plate and front impact sensor for deformation or rust.

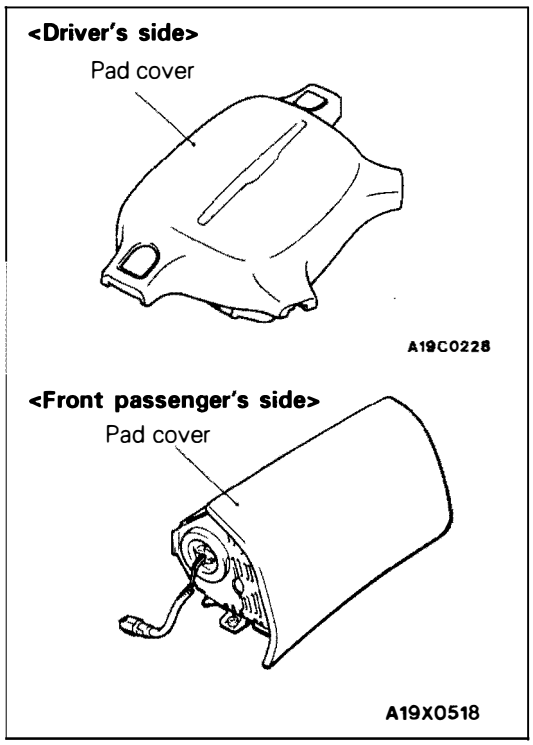
   Caution
   The SRS may not activate if a front impact sensor is not installed properly, which could result in serious injury or death to the vehicles driver or front passenger.
3. Check wiring harness (for front impact sensor) for binds, connector for damage, and terminals for deformities. Replace sensor and /or wiring harness if it fails visual check. (Refer to P. 52B-4 and P. 52B-41.)



SRS DIAGNOSIS UNIT (SDU) E52BF03CB

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

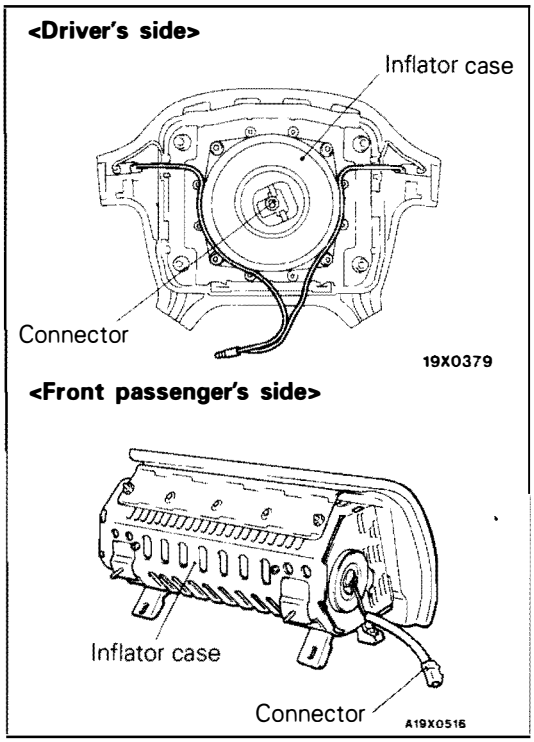
   Caution
   The SRS may not activate if a front impact sensor is not installed properly, which could result in serious injury or death to the vehicles driver or front passenger.
2. Check connectors and lock lever for damage, and terminals for deformation or rust.
   Replace SDU if it fails visual check. (Refer to P.52B-43.)



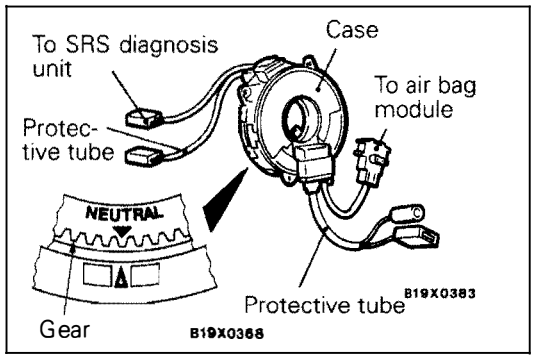
AIR BAG MODULES, STEERING WHEEL AND CLOCK SPRING E52BF03DB

1. Remove the air bag modules, steering wheel and clock spring. (Refer to P. 52B-46.)

   Caution
   The removed air bag modules should be stored in a clean, dry place with the pad cover face up.
2. Check pad cover for dents, cracks or deformation.

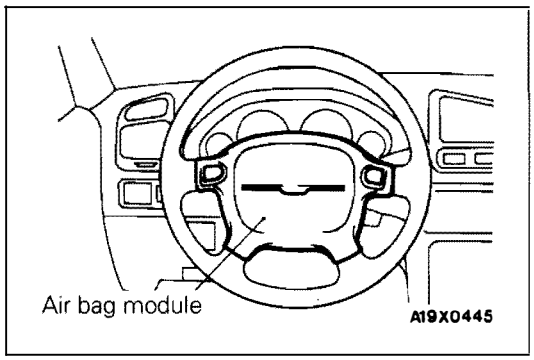


3. Check connector for damage, terminals deformities, and harness for binds.
4. Check air bag inflator case for dents, cracks or deformities.
5. Check harness and connectors for damage, and terminals for deformation.



6. Check clock spring connectors and protective tube for damage, and terminals for deformation.
7. Visually check the clock spring case and the gears for damage.
8. Align the mating mark and "NEUTRAL" position indicator and, after turning the vehicle's front wheels to straighta-head 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 or front passenger.



9. Install the steering column covers, steering wheel and the air bag module.
10. Check steering wheel for noise, binds of difficult operation.
11. Check steering wheel for excessive free play.

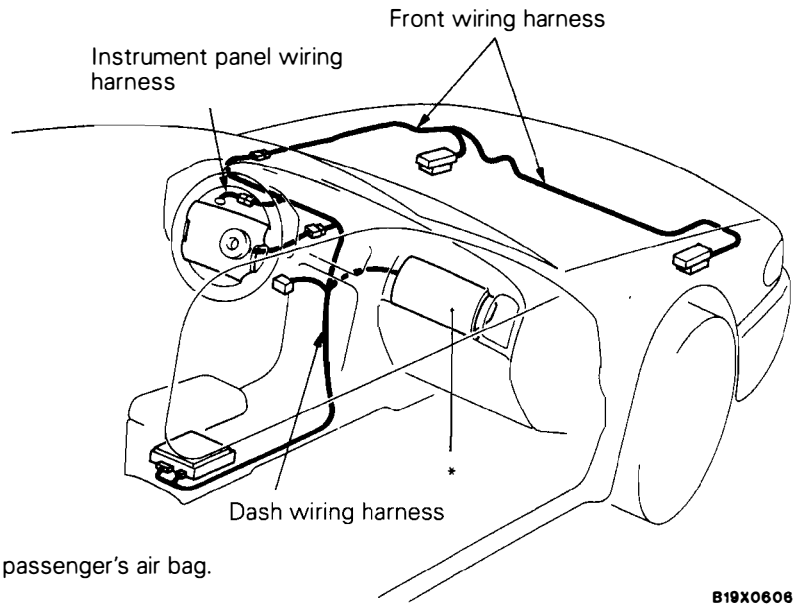
REPLACE ANY VISUALLY INSPECTED PART IF IT FAILS THAT INSPECTION.

(Refer to P.52B-46.)

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

FRONT WIRING HARNESS, INSTRUMENT PANEL WIRING HARNESS AND DASH WIRING HARNESS

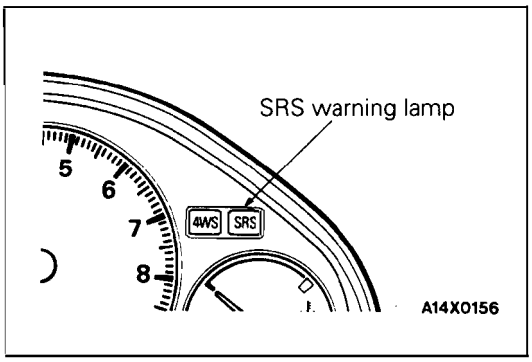
E52BF03EB



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

1. Check connector for poor connection.
2. Check harnesses for binds, connectors for damage, and terminals for deformation.
   REPLACE ANY CONNECTORS OR HARNESS THAT FAIL THE VISUAL INSPECTION.
   (Refer to P.52B-4.)

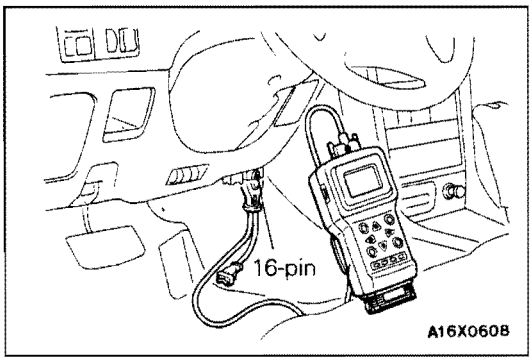
Caution
The SRS may not activate if SRS harnesses or connectors are damaged or improperly connected, which could result in serious injury or death to the vehicle's driver or front passenger.



POST-INSTALLATION INSPECTION

E52BF04AA

Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the "SRS" warning lamp illuminate for about 7 seconds, turn OFF and then remain extinguished for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-9.)



POST-COLLISION DIAGNOSIS E13BF20AA

To inspect and service the SRS after a collision (whether or not the air bags have deployed), perform the following steps.

SRS DIAGNOSIS UNIT MEMORY CHECK E13BF21AA

1. Connect the MUT-II to the diagnosis connector (16-pin) located at the right or left side of the junction block.

   Caution
   Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.

2. Read (and write down) all displayed diagnosis codes. (Refer to P. 52B-10.)

   NOTE
   If the battery power supply has been disconnected or disrupted by the collision, the MUT-II cannot communicate with the SRS diagnosis unit. Inspect and, if necessary, repair the body wiring harness before proceeding further.

3. Read the service data (fault duration and how many times memories are erased) using the MUT-II.

   NOTE
   - Maximum stored period: 9999 minutes (approximately 7 days)
   - Maximum number of times to be stored: 250

4. Erase the diagnosis codes and after waiting 45 seconds or more read (and write down) all displayed diagnosis codes. (Refer to P. 52B-10.)

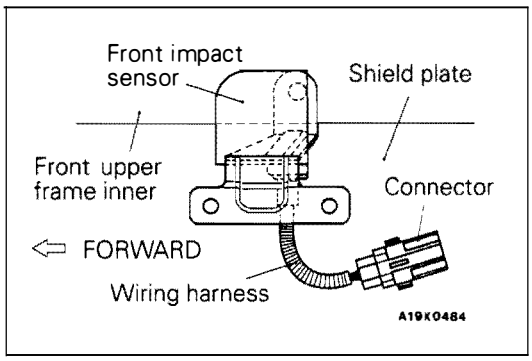
REPAIR PROCEDURE E13BF22AA

WHEN AIR BAG DEPLOYS IN A COLLISION.

1. Replace the following parts with new ones.
   - Front impact sensors (Refer to P. 52B-41.)
   - SRS diagnosis unit (SDU)(Refer to P. 52B-43.)
   - Air bag module (Refer to P. 52B-46, 47.)
   - Clock spring (Refer to P. 52B-46.)
   - Steering wheel, steering column and intermediate joint (Refer to GROUP 37A – Steering wheel and Shaft.)
2. Check harnesses for binding, connectors for damage, poor connections, and terminals for deformation. (Refer to P. 52B-4.)

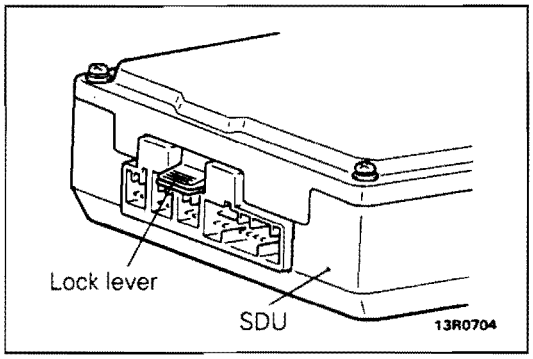
WHEN AIR BAG DOES NOT DEPLOY IN LOW-SPEED COLLISION.

Check the SRS components.
If the SRS components are showing any visible damage such as dents, cracks, or deformation, replace them with new ones.
Concerning parts removed for inspection, replacement with new parts and cautionary points for working, refer to appropriate INDIVIDUAL COMPONENT SERVICE, P. 52B-40.



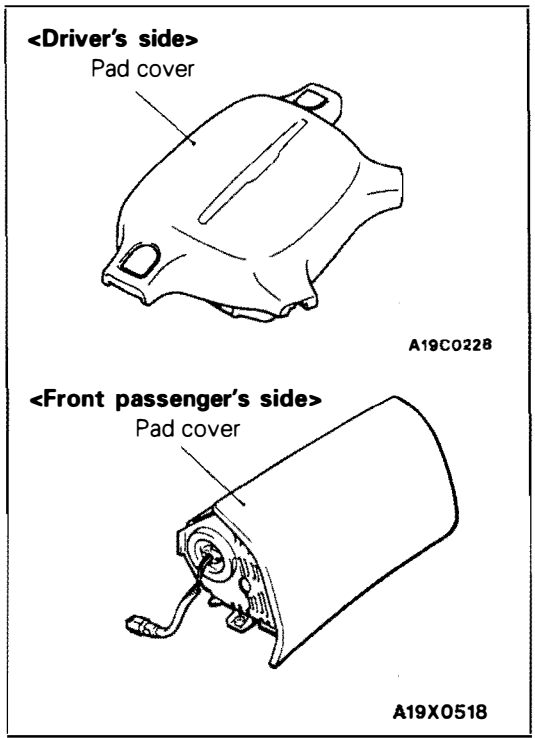
Front impact sensors E52BF23AA

1. Check front upper frame inner, shield plate for deformation or rust.
2. Check front impact sensor for dents, cracks, deformation or rust.
3. Check sensor harnesses for binds, connectors for damage, and terminals for deformation.



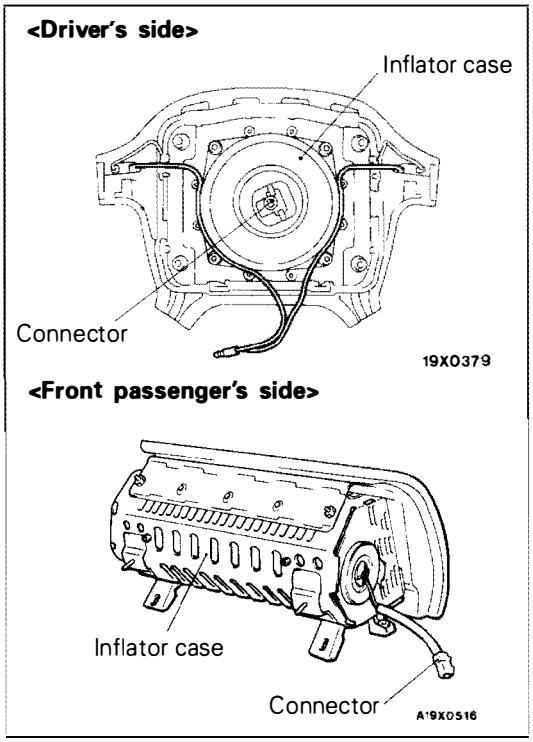
SRS diagnosis unit (SDU) E52BF24AB

1. Check SDU case and brackets for dents, cracks or deformation.
2. Check connectors and lock lever for damage, and terminals for deformation.

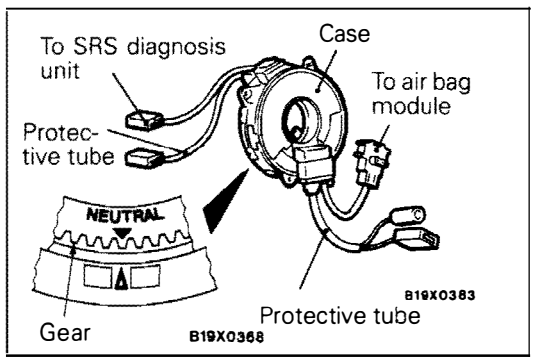


Air bag modules E52BF25AB

1. Check pad cover for dents, cracks or deformation.



2. Check connector for damage, terminals deformities, and harness for binds.
3. Check air bag inflator case for dents, cracks or deformities.
4. Install air bag module to steering wheel to check fit or alignment with the wheel.



Clock spring E52BF26AB

1. Check clock spring connectors and protective tube for damage, and terminals for deformation.
2. Visually check the case and the gear for damage.

Steering wheel, steering column and intermediate joint E52BF27AA

1. Check wiring harness (built into steering wheel) and connectors for damage, and terminals for deformation.
2. Install air bag module to check fit or alignment with steering wheel.
3. Check steering wheel for noise, binds or difficult operation and excessive free play.

Harness connector (body and front wiring harness) E52BF28AA

Check harnesses for binding, connectors for damage, poor connections, and terminals for deformation. (Refer to P. 52B-4.)

INDIVIDUAL COMPONENT SERVICE

E52BF40AA

If the SRS components are to be removed or replaced as a result of maintenance, troubleshooting, etc., follow each procedure (P. 52B-41 – P. 52B-52.)

Caution

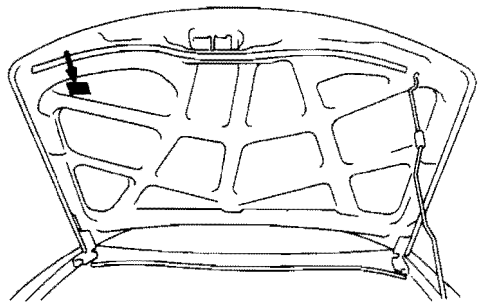
1. **SRS components should not be subjected to heat over 93°C, so remove the front impact sensors, SRS diagnosis unit and air bag module and clock spring before drying or baking the vehicle after painting. Recheck SRS system operability after re-installing them.**
2. **If the SRS components are removed for the purpose of check, sheet metal repair, painting, etc., they should be stored in a clean, dry place until they are reinstalled.**

WARNING/CAUTION LABELS

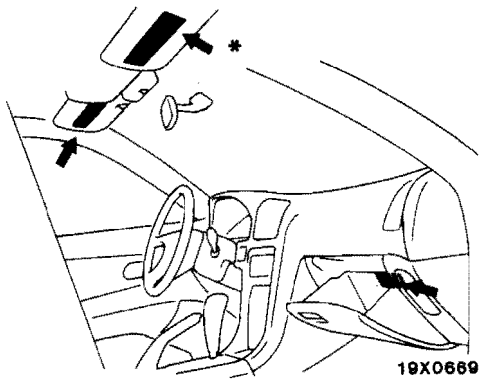
E52BF41AB

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.

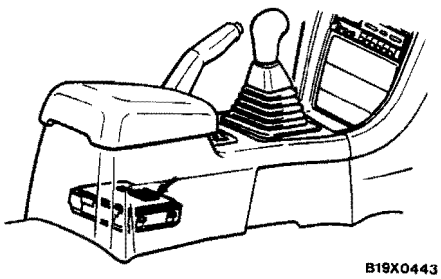
If labels are dirty or damaged, replace them with new ones.



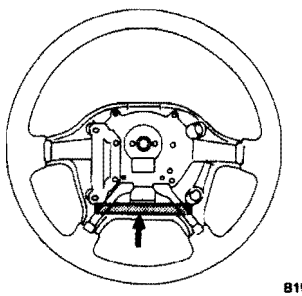
B19X0413



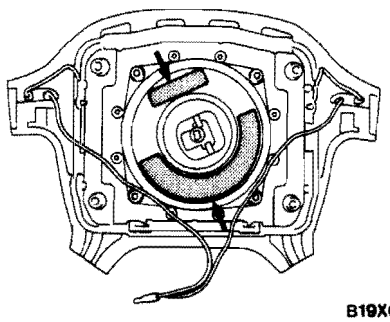
19X0669



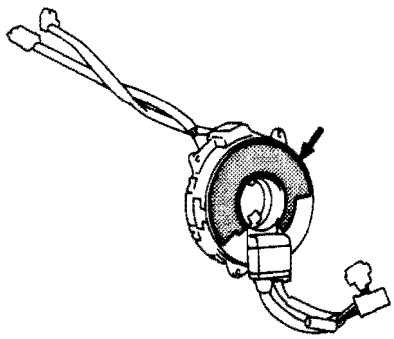
B19X0443



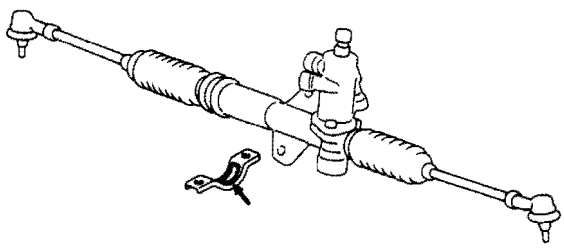
B19X0014



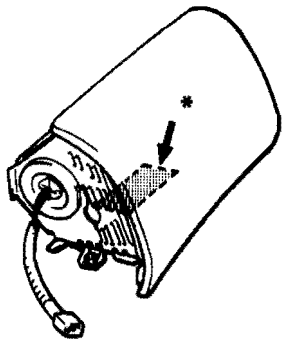
B19X0016



B19X0015



B13X0187



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

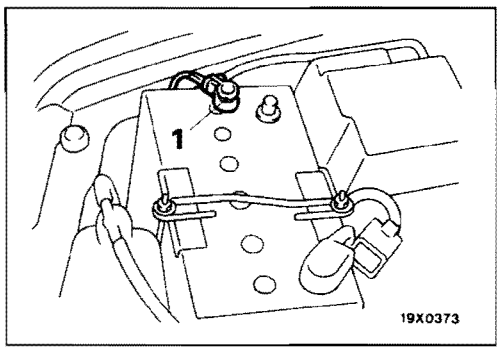
B19X0515

FRONT IMPACT SENSORS

E52BG00AA

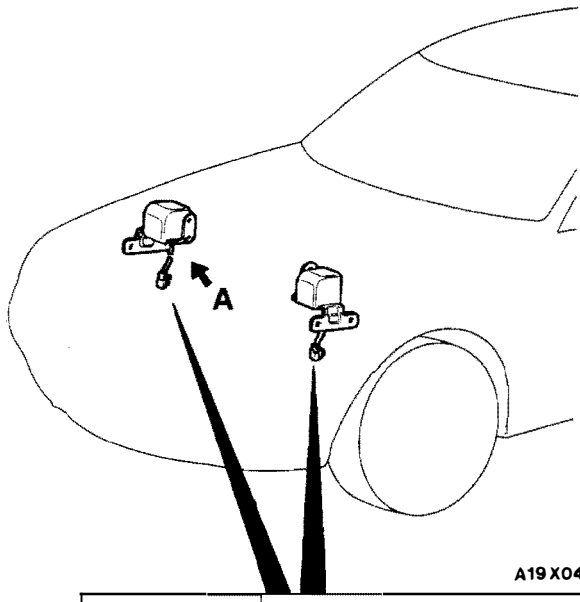
Caution
1. **Never repair or disassemble a front impact sensor. If faulty, replace it.**
2. **Handle the front impact sensors very carefully, taking care not to drop them or otherwise subject them to impact. If a sensor is seen to be dented, cracked, deformed or rusted, replace it with a new one**
3. **Replace sensors with new ones after the air bag has deployed.**

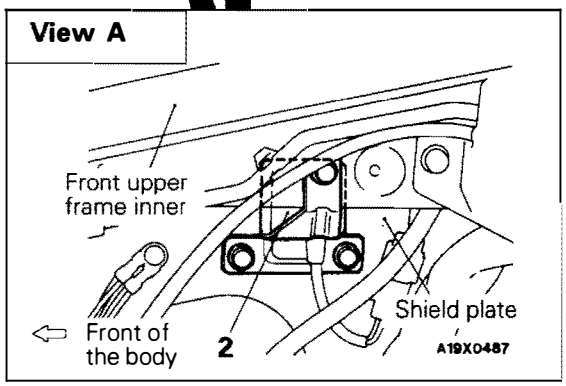
REMOVAL AND INSTALLATION



Pre-removal Operation
- Turn the ignition key to the "LOCK" position
- Battery removal (R.H. impact sensor)
- Air cleaner removal <MPI> (R.H. impact sensor)

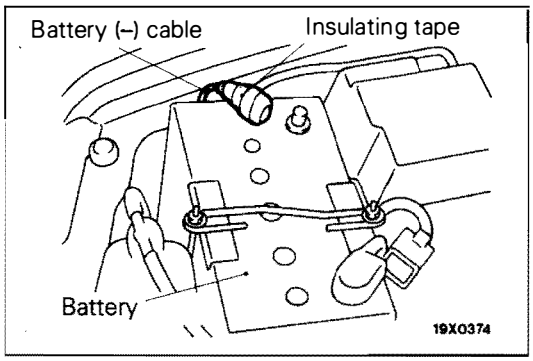
Post-installation Operation
- Air cleaner installation <MPI> (L.H. impact sensor)
- Battery installation (R.H. impact sensor)





Removal steps

◆C◆ ● Post-installation inspection
〈A〉 1. Connection of the negative (–) battery cable to the battery
◆B◆ 2. Front impact sensor
◆A◆ ● Pre-installation inspection



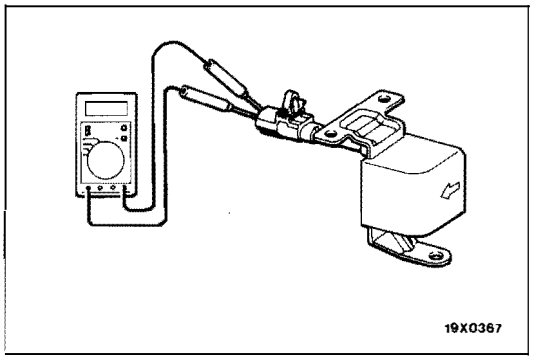
REMOVAL SERVICE POINTS

E52BG01AA

〈A〉 NEGATIVE (–) BATTERY CABLE FROM THE BATTERY DISCONNECTION

Disconnect the negative battery cable and tape the terminal.

Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6.)



INSPECTION E52BG02AA

(1) Check upper frame and sensor brackets for deformation or rust.
(2) Check sensor harness for binds, connectors for damage, and terminals for deformation.
(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.

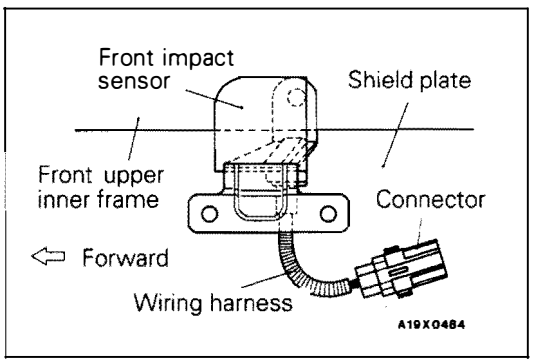
Standard value: 2,000 ± 20 Ω

Caution
Always replace the sensor with a new one if the resistance is not within the standard value.

INSTALLATION SERVICE POINT E52BG04AB

◆A◆ PRE-INSTALLATION INSPECTION

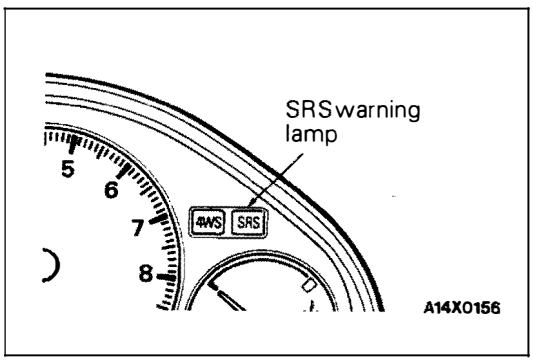
To mount the new front impact sensor, visually check it and measure the resistance between the terminals. (Refer to the previous item "INSPECTION")



◆B◆ FRONT IMPACT SENSOR INSTALLATION

(1) Securely connect the connector.
(2) Set the front impact sensor 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 serious injury or death to the vehicle's driver or front passenger.



◆C◆ POST-INSTALLATION INSPECTION

Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the "SRS" warning lamp illuminate for about 7 seconds, turn OFF and then remain extinguished for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-9.

SRS DIAGNOSIS UNIT (SDU)

E52BH00AB

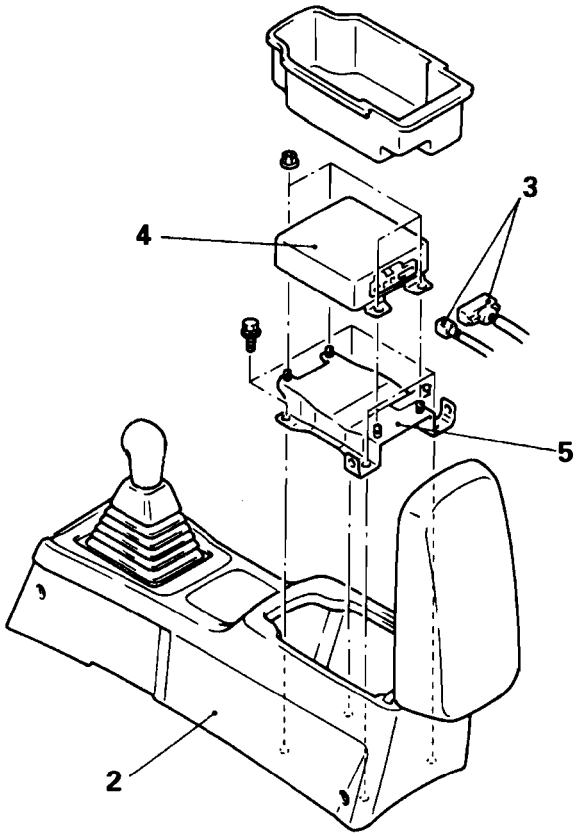
Caution

1. **Never attempt to disassemble or repair the SDU. If faulty, replace it.**
2. **Do not drop or subject the SDU to impact or vibration.**
   If denting , cracking, deformation, or rust are discovered in the SDU, replace it with a new SDU. Discard the old one.
3. **After deployment of an air bag, replace the SDU with a new one.**
4. **Never use an ohmmeter on or near the SDU, and use only the special test equipment described on P. 52B-7.**

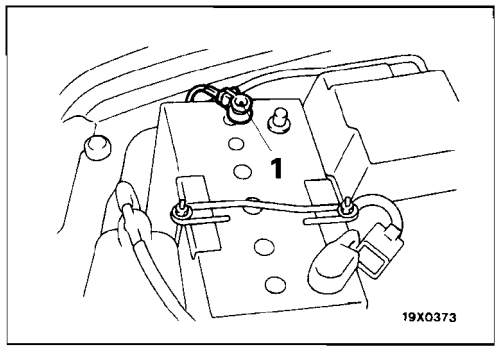
REMOVAL AND INSTALLATION

Pre-removal Operation
- Turn the ignition key to the "LOCK" position

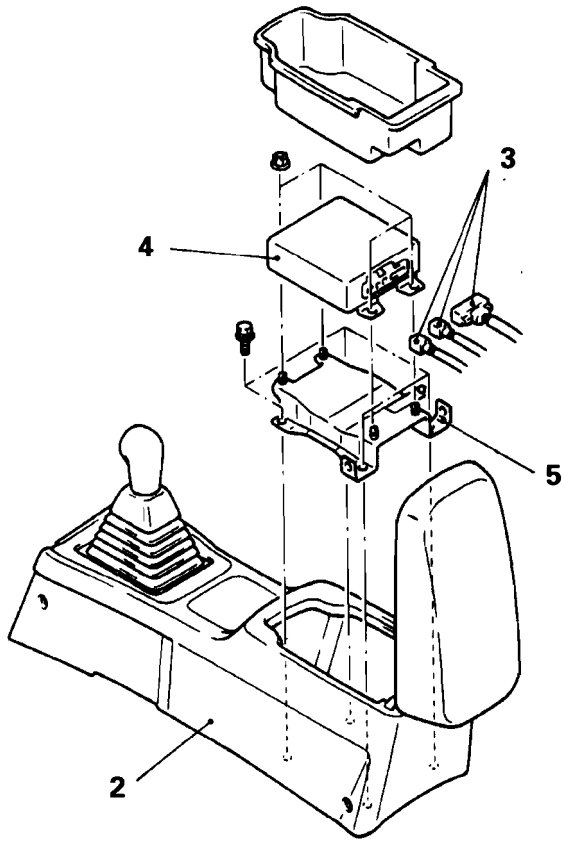
<Vehicles without front passenger's air bag>



A19X0461



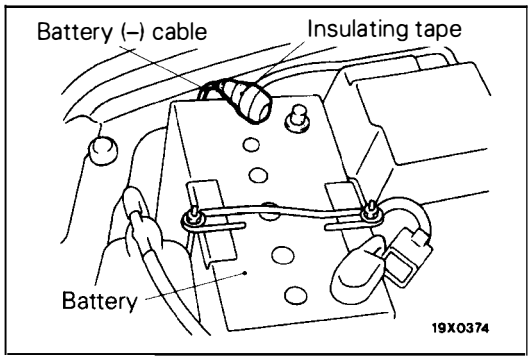
<Vehicles with front passenger's air bag>

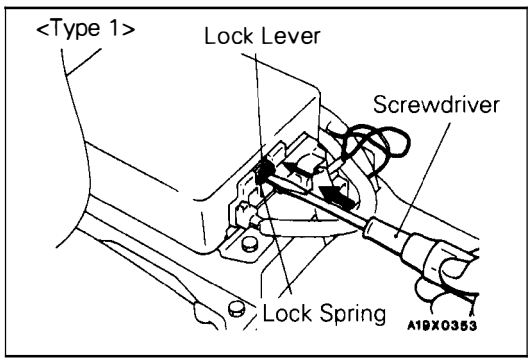


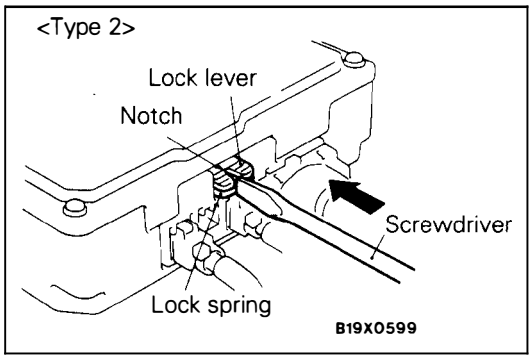
A19X0514

Removal steps

- ◆C◆ ● Post-installation inspection
- ◇A◇ 1. Negative (–) battery cable connection
- 2. Floor console assembly (Refer to GROUP 52A – Floor Console)
- ◇B◇ ◆B◆ 3. SRS diagnosis unit and each harness connector connection
- ◆A◆ 4. SRS diagnosis unit (SDU)
- 5. Bracket







REMOVAL SERVICE POINTS E52BH01AB

◇A◇ NEGATIVE (–) BATTERY CABLE DISCONNECTION

Disconnect the negative battery cable from the battery and tape the terminal.

Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6.)

◇B◇ SDU AND EACH HARNESS CONNECTOR DISCONNECTION

(1) Remove the SDU connector lock by the following procedure.
If there is no notch in the connector lock lever (Type 1)
Place a (–) screwdriver against the lock spring (metal section) of the connector lock lever as shown in the illustration, and push the spring horizontally toward the inside of the unit.

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

If there is a notch in the connector lock lever (Type 2)
Place a (–) screwdriver against the lock spring (metal section) at the lock lever notch as shown in the illustration, and push the spring toward the unit.

Caution
Do not use excessive force to raise the lock lever.

(2) While pushing the locks of each connector downwards, remove each connector from the SDU.

Caution
Because a double lock mechanism is employed for the SDU connectors, be careful not to exert undue force to remove the connectors, as this will damage them.

INSPECTION E52BH02AA

- Check the SDU case and brackets for dents, cracks or deformation.
- Check connectors and lock lever for damage, and terminals for deformation.

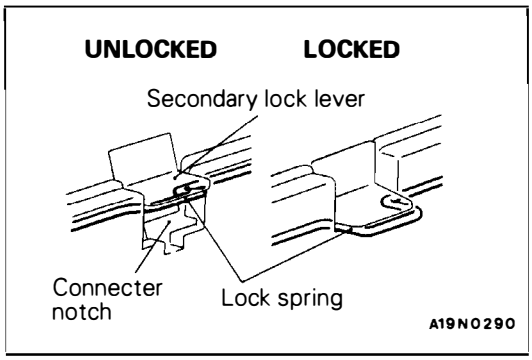
Caution
If a dent, crack, deformation or rust is discovered, replace the SDU with a new one.

NOTE
For checking of the SDU other than described above, refer to the section concerning troubleshooting. (Refer to P. 52B-9.)

INSTALLATION SERVICE POINTS E52BH04AB

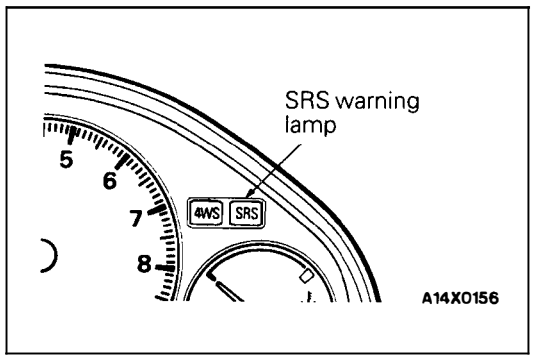
◗A◖ SRS DIAGNOSIS UNIT (SDU) INSTALLATION

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



◗B◖ SDU AND EACH HARNESS CONNECTOR CONNECTION

After connecting each harness connector securely and correctly to the SDU, be sure to press down the lock lever of the SDU.



◗C◖ POST INSTALLATION INSPECTION

Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the "SRS" warning lamp illuminated for about 7 seconds, turn OFF and then remain extinguished for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-9.

AIR BAG MODULES AND CLOCK SPRING

E52BI00AB

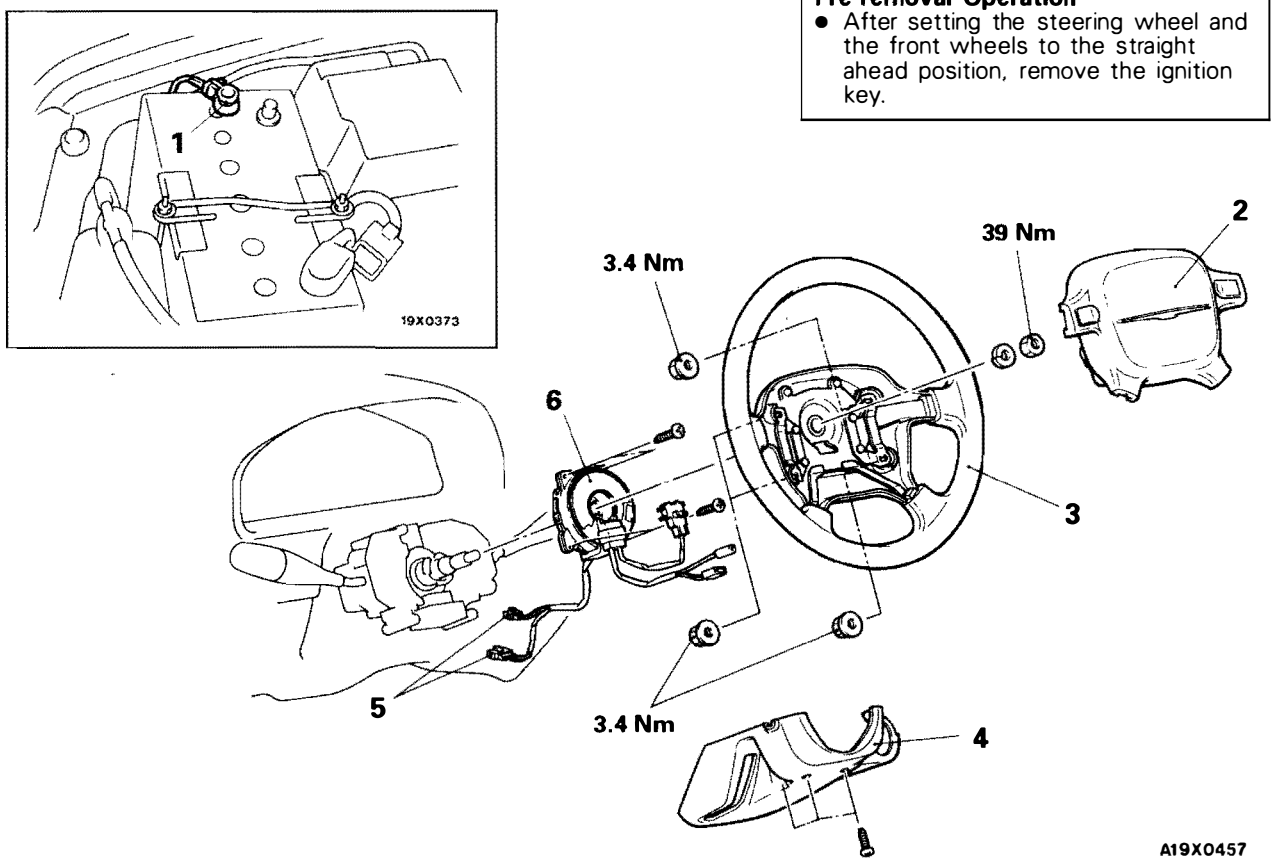
Caution

1. **Never attempt to disassemble or repair the air bag modules or clock spring. If faulty, replace it.**
2. **Do not drop the air bag modules or clock spring or allow contact with water, grease or oil. Replace it if a dent, crack, deformation or rust is detected.**
3. **The air bag modules should be stored on a flat surface and placed so that the pad surface is facing upward. Do not place anything on top of it.**
4. **Do not expose the air bag modules to temperatures over 93°C**
5. **After deployment of an air bags, replace the clock spring with a new one.**
6. **Wear gloves and safety glasses when handling air bags that have already deployed.**
7. **An undeployed air bag modules should only be disposed of in accordance with the procedures [P. 52B-53 – P. 52B-58.].**

REMOVAL AND INSTALLATION

<Driver's side>

Pre-removal Operation
- After setting the steering wheel and the front wheels to the straight ahead position, remove the ignition key.



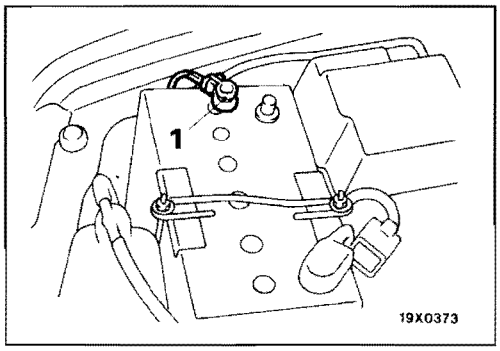
Clock spring removal steps

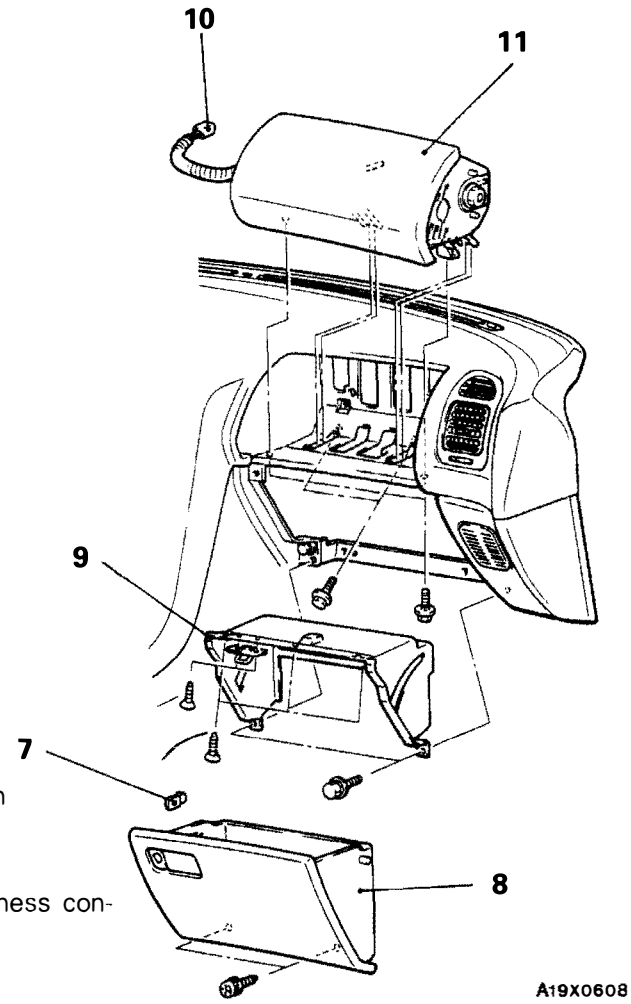
- ◗E◖ ● Post-installation inspection
- 〈A〉 1. Negative (–) battery cable connection
- 2. Air bag module
- 〈B〉 ◗D◖ 3. Steering wheel
- 〈C〉 ◗C◖ 4. Column cover lower
- 5. Clock spring and body wiring harness connection
- 6. Clock spring
- ◗B◖ ● Pre-installation inspection
- ◗A◖

Air bag module removal steps

- ◗E◖ ● Post-installation inspection
- 1. Negative (–) battery cable connection
- ◗D◖ 2. Air bag module
- ◗A◖ ● Pre-installation inspection

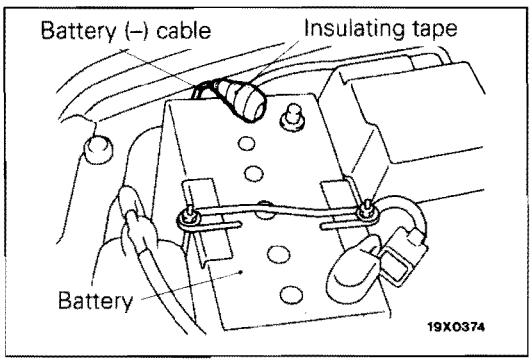
<Front passenger's side>

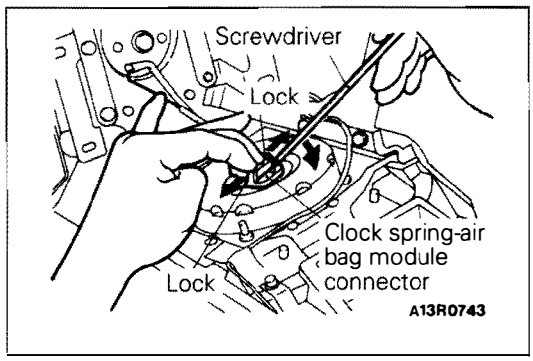




Air bag module removal steps

- ◆E◆ ● Post-installation inspection
- ◇A◇ 1. Negative (–) battery cable connection
- 7. Stopper
- 8. Glove box
- 9. Glove box cover
- 10. Air bag module and dash wiring harness connection
- ◇B◇ ◆A◆ 11. Air bag module
- ● Pre-installation inspection





REMOVAL SERVICE POINTS E52BI01AB

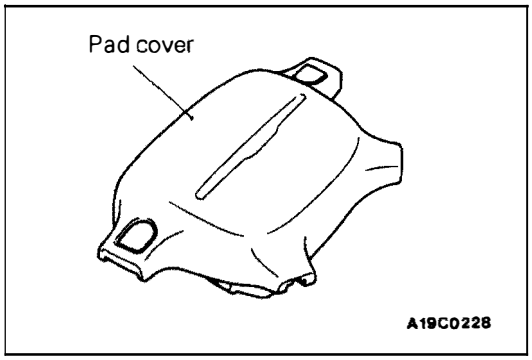
◇A◇ NEGATIVE (–) BATTERY CABLE DISCONNECTION

Caution
Disconnect the negative battery cable from the battery and tape the terminal.
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6.)

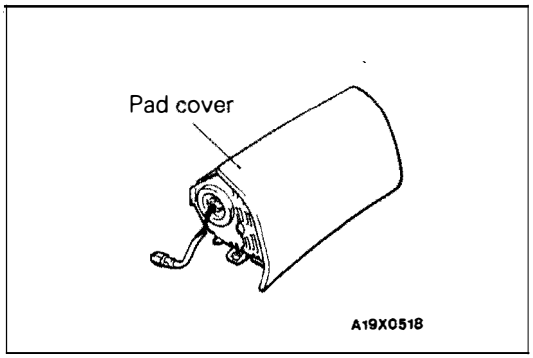
◇B◇ AIR BAG MODULE REMOVAL (DRIVER'S SIDE)

(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. When disconnecting the air bag module-clock spring connector, take care not to apply excessive force to it.

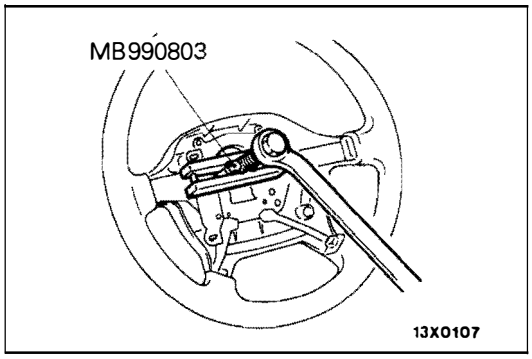


2. **The removed air bag module should be stored in a clean, dry place with the pad cover face up.**



◇B◇ AIR BAG MODULE REMOVAL (FRONT PASSENGER'S SIDE)

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



◇C◇ STEERING WHEEL REMOVAL

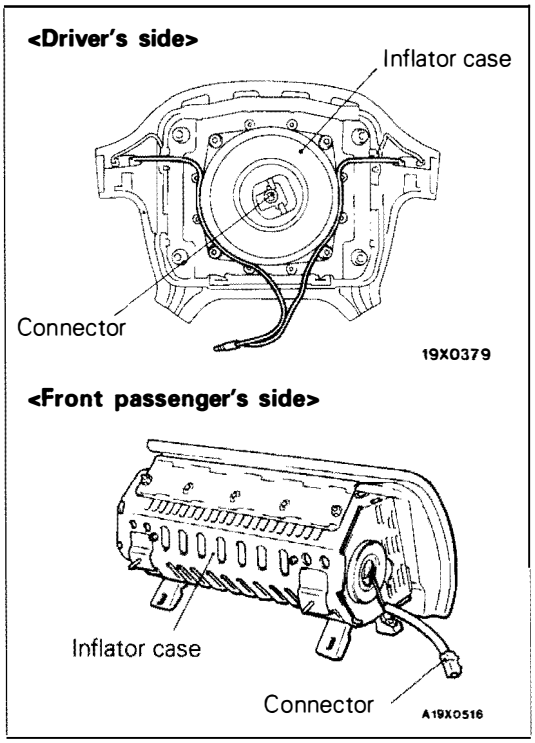
Caution
Do not hammer on the steering wheel. Doing so may damage the collapsible column mechanism.

INSPECTION E52B102AB

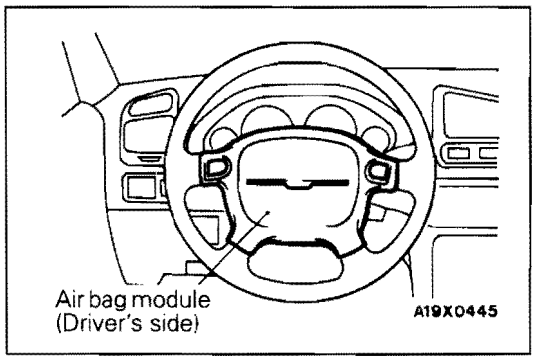
AIR BAG MODULES

If any improper part is found during the following inspection, replace the air bag modules with a new one.
Dispose of the old one according to the specified procedure. (Refer to P. 52B-53.)

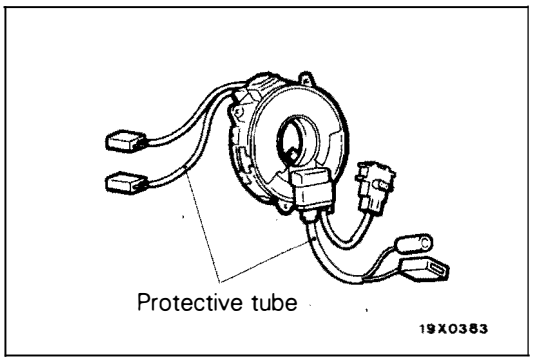
Caution
Never attempt to measure the circuit resistance of the air bag modules (squib) even if you are using the specified tester. If the circuit resistance is measured with a tester, accidental air bags deployment will result in serious personal injury.



(1) Check pad cover for dents, cracks or deformation.
(2) Check the air bag module for denting, cracking or deformation.
(3) Check hooks and connectors for damage, terminals for deformation, and harness for binds.
(4) Check air bag inflator case for dents, cracks or deformation.

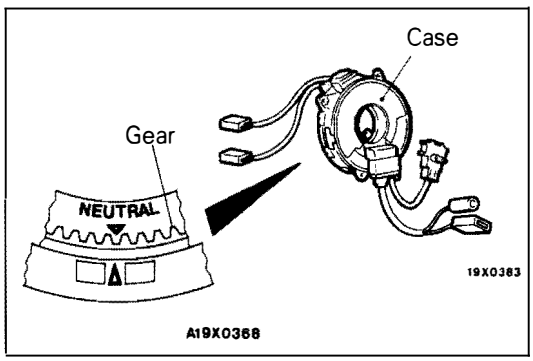


(5) Install the air bag module (driver's side) to steering wheel to check fit or alignment with the wheel.

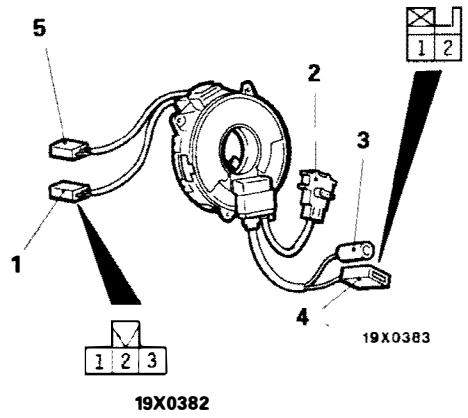


CLOCK SPRING E52BI02BB

If, as result of following checks, even one abnormal point is discovered, replace the clock spring with a new one.
(1) Check connectors and protective tube for damage, and terminals for deformation.



(2) Visually check the case and the gears for damage.



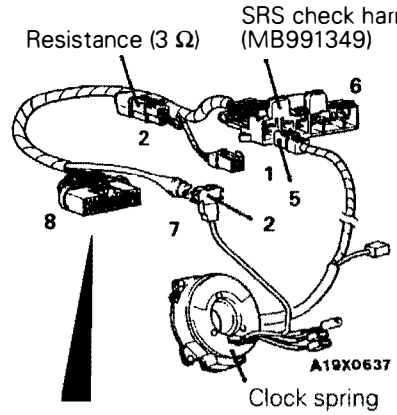
19X0382

(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	

NOTE
○—○ indicates that there is continuity between the terminals.

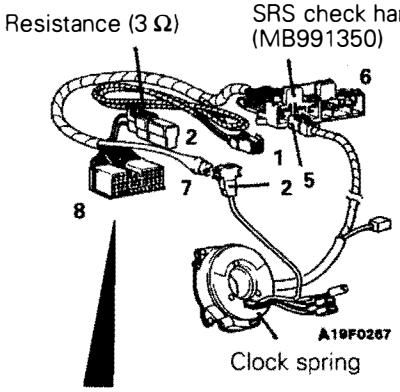
<Vehicles without front passenger's air bag>



1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22

19X0546

<Vehicles with front passenger's air bag>



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	

19N0325

(4) Check of resistance between the terminals.
a. Joint the No. 2 connector and No. 5 connector of the clock spring to connector No. 7 and connector No. 6, respectively, of the SRS Check Harness.
b. Check for continuity between terminal 1 and terminal 22, and terminal 2 and terminal 21, of SRS Check Harness connector No. 8, using a digital multi-meter.

Standard value: Less than 0.4 Ω

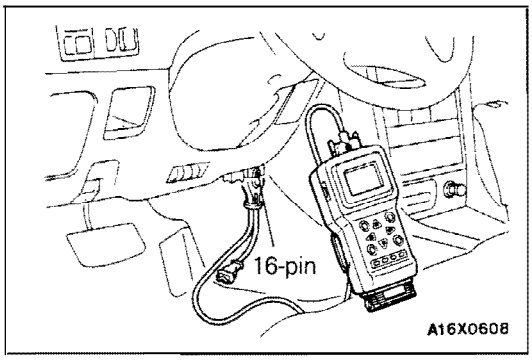
INSTALLATION SERVICE POINTS E52BI04AB

◆A◆ PRE-INSTALLATION INSPECTION

(1) When installing the new air bag modules and clock spring, refer to "INSPECTION"

Caution
Dispose of air bag modules only according to the specified procedure. (Refer to P. 52B-53.)

(2) Connect the battery (–) terminal.

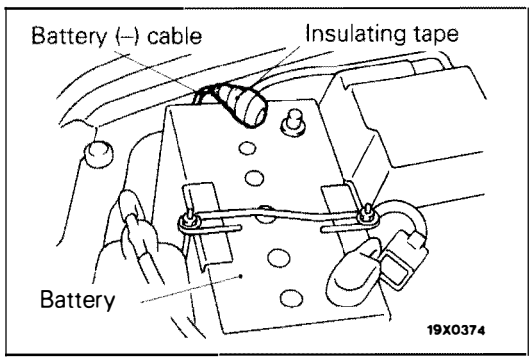


(3) Connect the MUT-II to the diagnosis connector (16-pin) located at the right or left side of the junction block.

Caution
Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.

(4) Reconnect negative terminal of battery, and turn the ignition key to the "ON" position.

(5) Conduct self-diagnosis using the MUT-II to ensure entire SRS operates properly, except open circuit of air bag modules (Diagnosis code No.22, No.25).(Refer to P. 52B-10.)

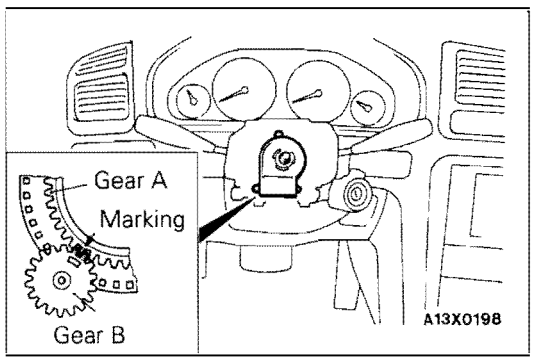


(6) Turn the ignition key to the "LOCK" position, disconnect the negative battery cable and tape the terminal.

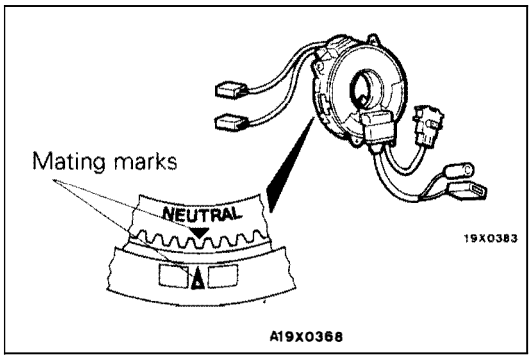
Caution
Wait at least 60 seconds after disconnecting the battery cable before doing any further work. (Refer to P. 52B-6.)

◆B◆ CLOCK SPRING INSTALLATION

(1) For vehicles with 4WS, align the positions of the markings on gears A and B of the steering angular velocity sensor as shown in the illustration.



(2) Align the mating mark and "NEUTRAL" position indicator of the clock spring, and, after turning the front wheels to the straight-ahead position, install the clock spring to the column switch.



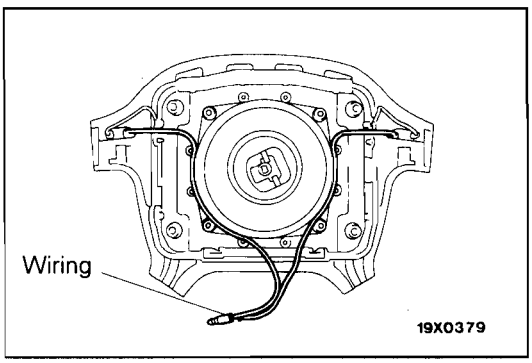
Caution
If the clock spring's mating mark is not properly aligned, the steering wheel may not be completely rotational during a turn, or the flat cable within the clock spring may be severed, obstructing normal operation of the SRS and possibly leading to serious injury to the vehicle's driver.

◗C◖ STEERING WHEEL INSTALLATION

(1) Before 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.

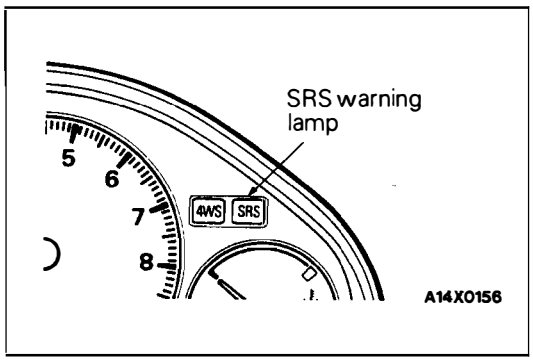
Caution
Be sure when installing the steering wheel, that the harness of the clock spring does not become caught or tangled.

(2) After clamping, turn the steering wheel all the way in both directions to confirm that steering is normal.



◗D◖ AIR BAG MODULE INSTALLATION

Install the air bag module, taking care that no wiring is caught by it.



◗E◖ POST-INSTALLATION INSPECTION

(1) After installing the clock spring, the steering wheel, the column covers and the air bag module, check steering wheel of noise, binds or difficult operation. (Driver's side only)
(2) Reconnect the negative battery terminal. Turn the ignition key to the "ON" position. Does the "SRS" warning lamp illuminate for about 7 seconds, turn OFF and then remain extinguished for at least 45 seconds? If yes, SRS system is functioning properly. If no, consult page 52B-9.

AIR BAG MODULE DISPOSAL PROCEDURES

E52BF50AB

Before either disposing of a vehicle equipped with air bags, or prior to disposing of the air bag modules, be sure to first follow the procedures described below to deploy the air bags.

UNDEPLOYED AIR BAG MODULE DISPOSAL

E52BF51AB

Caution

1. **If the vehicle is to be scrapped, or otherwise disposed of, deploy the air bags inside the vehicle.**
   If the vehicle will continue to be operated and only the air bag modules are to be disposed of, deploy the air bags outside the vehicle.
2. **Since a large amount of smoke is produced when the air bags are deployed, select a well-ventilated site. Moreover, never attempt the test near a smoke sensor.**
3. **Since there is a loud noise when the air bags are deployed, avoid residental 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.**

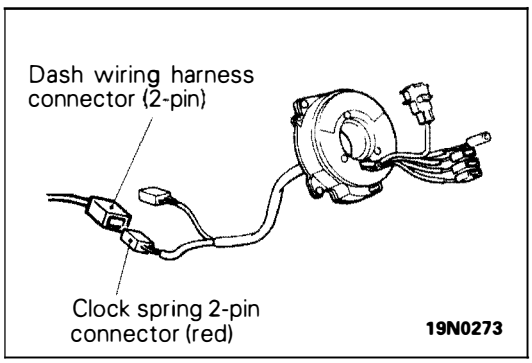
DEPLOYMENT INSIDE THE VEHICLE

E52BF51BB

(when disposing of a vehicle)

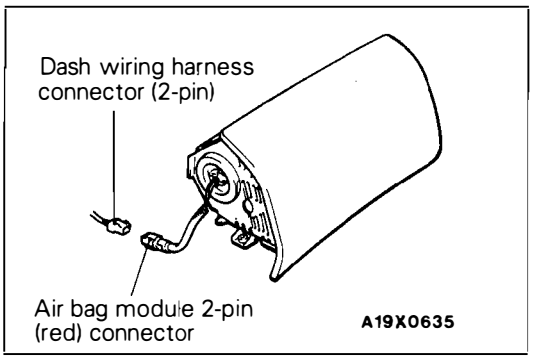
(1) Open all windows and doors of the vehicle. Move the vehicle to an isolated spot.
(2) Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

Caution
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P. 52B-6.)

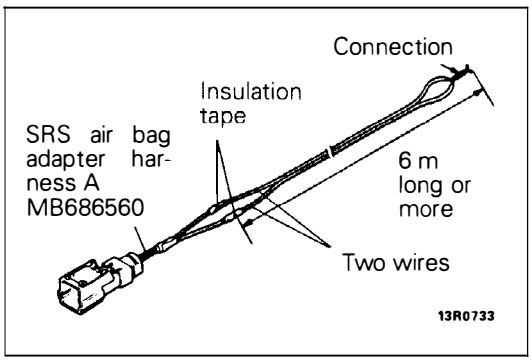


(3) To deploy the air bag module (driver's side):
1. Remove the steering column cover lower.
2. Remove the connection between the clock spring 2-pin connector (red) and the dash wiring harness connector.

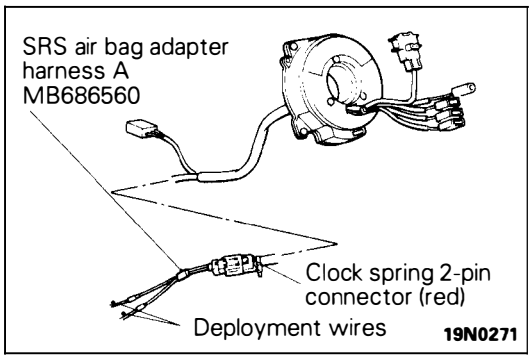
NOTE
If the clock spring connector is disconnected from the dash wiring harness, both electrodes of the clock spring connector will be automatically shorted to prevent unintended deployment of the air bag due to static electricity, etc.



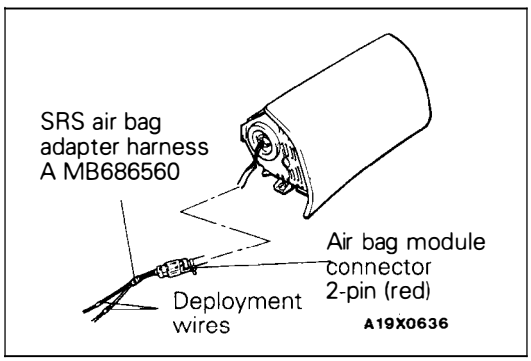
(4) To deploy the air bag module (front passenger's side):
1. Remove the glove box and glove box cover. (Refer to P. 52B-47).
2. Remove the connection between the air bag module (front passenger's side) connector (red 2-pin) and the dash wiring harness connector.



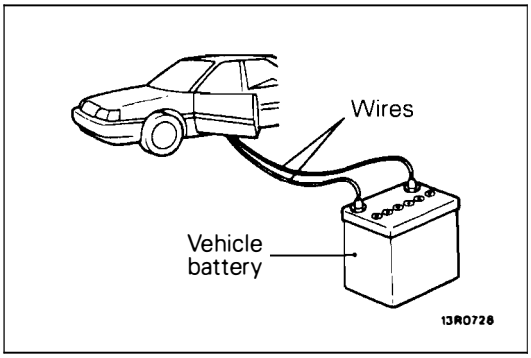
(5) Connect two wires, each six meters long or more, to the two leads of SRS air bag adapter harnness A and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.



(6) To deploy the air bag module (driver's side):
Connect the clock spring 2-pin connector (red) to SRS air bag adapter harness A and pass the deployment wires out of the vehicle.



(7) To deploy the air bag module (front passenger's side):
Connect the air bag module (front passenger's side) 2-pin connector (red) to SRS air bag adapter harness A and pass the deployment wires out of the vehicles.



(8) At a location as far away from the vehicle as possible, disconnect the two connected wires from each other, and connect them to the two terminals of the battery (removed from the vehicle) to deploy the air bag.

Caution

1. **Before deploying the air bag in this manner, first check to be sure that there is no one in or near the vehicle. Wear safety glasses.**
2. **The inflator will be quite hot immediately following the deployment, so wait at least 30 minutes to allow it to cool before attempting to handle it.**

Although not poisonous, do not inhale gas from air bag deployment.
See Deployed Air Bag Module Disposal Procedures (P. 52B-58.) 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.**

(9) Dispose of the air bag module after deployment according to the Deployed Air Bag Module Disposal Procedures. (Refer to P. 52B-58.)

DEPLOYMENT OUTSIDE THE VEHICLE E52BF51CA

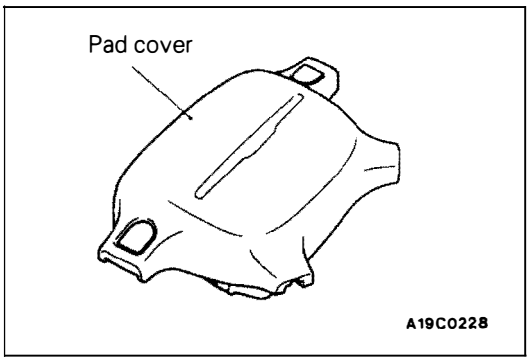
Caution

1. **Should be carried out in a wide, flat area at least 6 m away from obstacles and other people.**
2. **Do not perform deployment outside, if a strong wind is blowing, and if there is even a slight breeze, the air bag module should be placed and deployed downwind from the battery.**

To deploy the air bag module (driver's side):

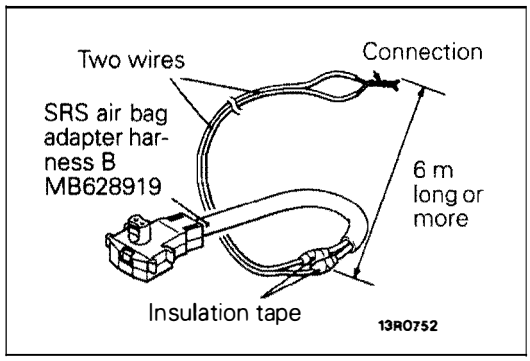
(1) Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle

Caution
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P. 52B-5.)

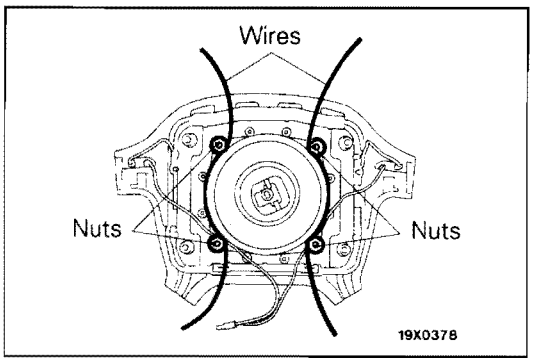


(2) Remove the air bag module for the vehicle. (Refer to P. 52B-46.)

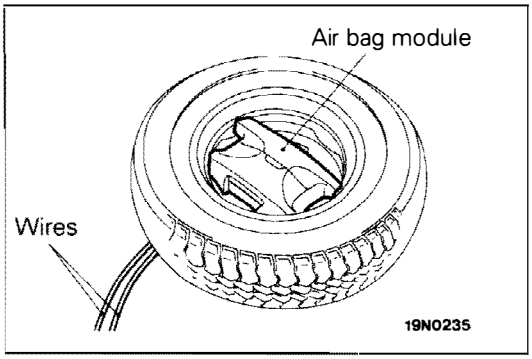
Caution
The air bag module should be stored on a flat surface and placed so that the pad cover face up. Do not place anything on top of it.



(3) Connect two wires, each six meters long or more, to the two leads of SRS air bag adapter harness B, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.

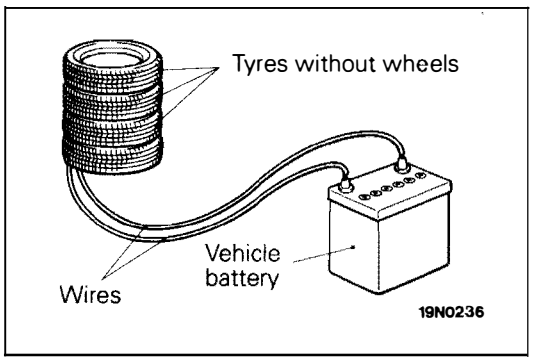


(4) Install nuts that are no longer needed to the four bolts on the rear side of the air bag module, and tie on some thick wire to secure to the wheel.
(5) Take the SRS air bag adaptor harness B that is connected to the wires, pass it beneath the tyre attached to a wheel, and connect it to the air bag module.



(6) Insert the air bag module into the wheel, and secure it with the wires that are tied to the bolts, with the air bag facing upward.

Caution
Leave some space below the wheel for the adaptor harness. If there is no space, the reaction when the air bag deploys could damage the adaptor harness.



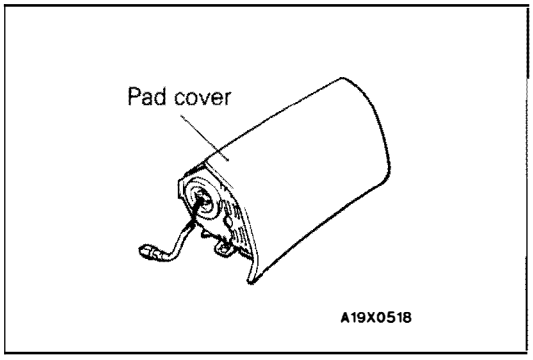
(7) Place three old tyres with no wheels on top of the tyre secured to the air bag module.
(8) At a location as far away from the air bag module as possible, and from a shielded position, if possible, disconnect the two connected wires from each other and connect them to the two terminals of the battery (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.**

To deploy the air bag module (front passenger's side):

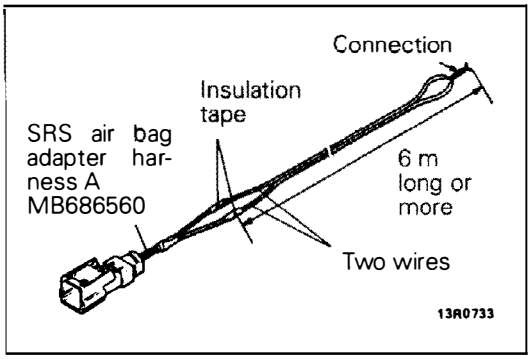
(1) Disconnect the negative (–) and positive (+) battery cables from the battery terminals, and then remove the battery from the vehicle.

Caution
Wait at least 60 seconds after disconnecting the battery cables before doing any further work. (Refer to P. 52B-6.)

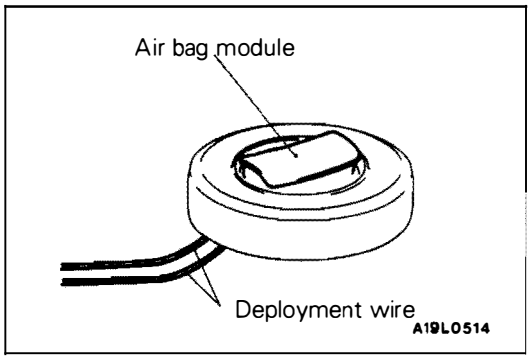


(2) Remove the air bag module for the vehicle. (Refer to P. 52B-47.)

Caution
The air bag module should be stored on a flat surface and placed so that the pad cover face up. Do not place anything on top of it.

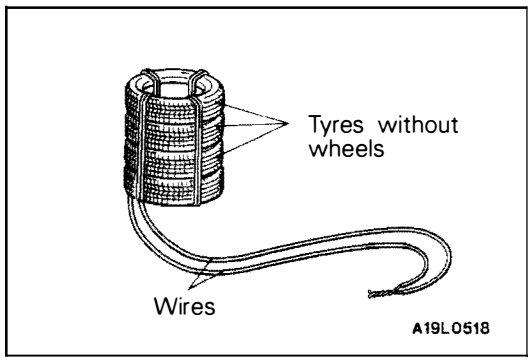


(3) Connect two wires, each six meters long or more, to the two leads of SRS air bag adapter harness A, and cover the connections with insulation tape. The other ends of the two wires should be connected to each other (short-circuited), to prevent sudden unexpected deployment of the air bag.



(4) Connect the deployment wires to the SRS air bag adaptor harness A, pass it beneath the tyre, and wheel assembly, and connect it to the air bag module.
(5) Pass the thick wires into the hole of the air bag module bracket, and secure it to the wheel of the old tyre with wheel (4 locations), with the air bag facing upwards.

Caution
1. **Leave some space below the wheel for the deployment wires.**
   If there is no space, the reaction of the air bag deployment could result in damage of the adaptor harness.
2. **While deployment takes place, do not have the connector of the SRS air bag adaptor harness A inserted between the tyres.**



(6) Place three old tyres with no wheels on top of the tyre secured to the air bag module, and secure all tyres with ropes (4 locations).

(7) At a location as far away from the air bag module as possible, and from a shielded position, if possible, disconnect the two connected wires from each other and connect them to the two terminals of the battery (removed from the 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.**

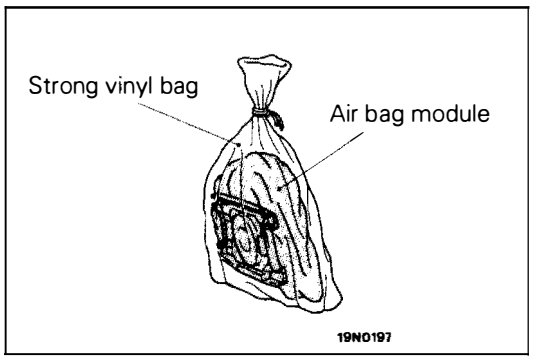
(8) Dispose of the air bag module after deployment according to the Deployed Air Bag Module Disposal Procedures.

DEPLOYED AIR BAG MODULE DISPOSAL PROCEDURES

E52BF52AA

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.

CHASSIS ELECTRICAL

CONTENTS

E54AA00BB

CONTINUED ON NEXT PAGE

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

WARNING!

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

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

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

NOTE

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

 Dec. 1993 PWDE9211-B REVISED

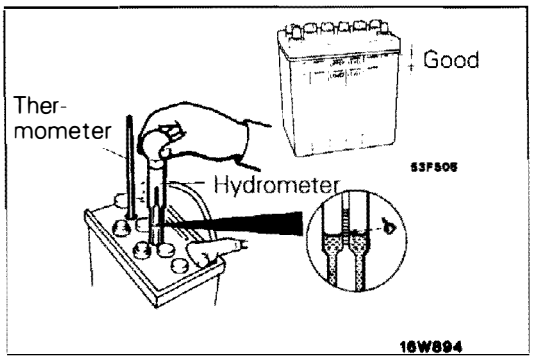
CONTINUED ON NEXT PAGE

BATTERY

E54CC00AA

SERVICE SPECIFICATION

Item	Specification
Specific gravity of the battery fluid	1.220–1.290 [20°C]



SERVICE ADJUSTMENT PROCEDURES

FLUID LEVEL AND SPECIFIC GRAVITY INSPECTION

E54CF00AA

1. Inspect whether or not the battery fluid is between the UPPER LEVEL and LOWER LEVEL marks.
2. Use a hydrometer and thermometer to check the specific gravity of the battery fluid.

   Standard value: 1.220–1.290 [20°C]

   The specific gravity of the battery fluid varies with the temperature, so use the following formula to calculate the specific gravity for 20°C. Use the calculated value to determine whether or not the specific gravity is satisfactory.

   D20=Dt+0.0007 (t–20)
   D20: Specific gravity of the battery fluid calculated for 20°C.
   Dt: actually measured specific gravity
   t: actually measured temperature

VISUAL INSPECTION

E54CF01AA

Inspect after removing the battery.

Caution
If battery fluid has leaked from the battery, use rubber gloves to protect your hands when removing the battery.

1. If there is corrosion of the battery stays or battery brackets from the battery fluid, clean by washing in warm or cold water.
2. If there is a leak from a crack in the battery case, replace the battery.
3. Clean the battery terminals with a wire brush, and replace any parts that are damaged.

CHARGING

E54CF02AA

1. When charging a battery while still installed in the vehicle, disconnect the battery cables to prevent damage to electrical parts.
2. The current normally used to charged a battery should be approximately 1/10th the battery capacity.
3. When quick charging due to lack of time, etc., the charging current should never exceed the battery capacity as indicated in amperes.
4. Determining if charging is completed.
   (1) If the specific gravity of the battery fluid reaches 1.250 – 1.290 and remains constant for at least one hour.
   (2) If the voltage of each cell reaches 2.5–2.8 V and remains constant for at least one hour.

Caution

1. **Take care since the battery fluid level may rise during charging.**
2. **Keep all sources of fire away while charging because there is a danger of explosion.**
3. **Take care not to do anything that could generate sparks while charging.**
4. **When charging is completed, replace the battery caps, pour clean water over the battery to remove any sulfuric acid and dry.**

BATTERY TEST

E54CF03AB

TEST STEP	RESULT		ACTION TO TAKE
A0: VISUAL INSPECTION • Remove negative cable, then positive cable. • Check for dirty or corroded connections.		~~OK~~	Clean terminals and clamps. Go to A1.
		OK	Go to A1
A1: LOOSE BATTERY POST • Check for loose battery post.		~~OK~~	Replace battery
		OK	Go to A2.
A2: CRACKED BATTERY COVER • Remove hold-downs and shields. • Check for broken/cracked case or cover.		~~OK~~	Replace battery.
		OK	Go to A3.
A3: OPEN CIRCUIT VOLTAGE TEST. • Turn headlamps on for 15 seconds. • Turn headlamps off for 2 minutes to allow battery voltage to stabilize. • Disconnect cables. • Read open circuit voltage	Open circuit voltage is less than 12.4 V	~~OK~~	Charge battery at 5 amps. Go to A3.
	Open circuit voltage is more than 12.4 V	OK	Go to A4.
A4: LOAD TEST • Connect a load tester to the battery. • Load the battery at the recommended discharge rate (See LOAD TEST RATE CHART) for 15 seconds. • Read voltage after 15 seconds, then remove load.	Voltage is less than minimum listed	~~OK~~	Replace battery.
	Voltage is more than minimum listed	OK	Battery OK.

Up to 1993 models

LOAD TEST RATE CHART			
Load test (amps)	Cranking rating [–18°C]	Reserve capacity (min.)	Application
190	390	71	50B24R
170	356	99	55D23R
210	420	111	65D23R
240	490	123	75D26R
310	622	159	95D31R

From 1994 models

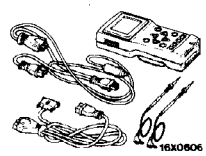
LOAD TEST RATE CHART			
Load test (amps)	Cranking rating [–18°C]	Reserve capacity (min.)	Application
210	420	111	65D23R
240	490	123	75D26R
310	622	159	95D31R

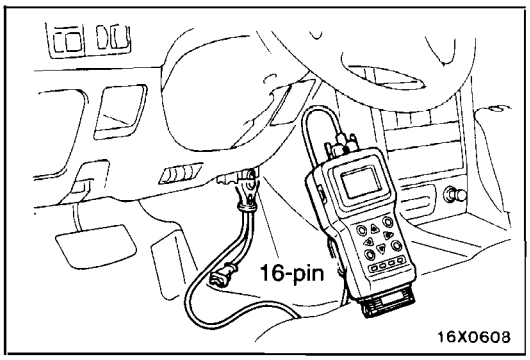
LOAD TEST CHART	
Minimum voltage	Temperature °C
9.6	21 and above
9.5	16
9.4	10
9.3	4
9.1	–1
8.9	–7
8.7	–12
8.5	–18

IGNITION SWITCH

E54DD00AA

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	ETACS–ECU input signal checking
 16X0607		ROM pack	



TROUBLESHOOTING

E54DE00AA

DIAGNOSIS FUNCTION

INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

1. Connect the MUT-II to the diagnosis connector.
2. If buzzer of the MUT-II sounds once when a switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

INSPECTION CHART FOR TROUBLE SYMPTOMS

E54DE01AA

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible. <Vehicles with ETACS-ECU>	Communication with all systems is not possible.	1	P. 54-8
	Communication with the one-shot pulse input signal only is not possible.	2	P. 54-8
While key hole illumination lamp is illuminated, ignition key is turned to the ON position but key hole illumination lamp does not switch off. (However, it switches off after 10 seconds.)		3	P. 54-8
Key hole illumination lamp remains illuminated.		4	P. 54-9
Even if driver's side door is opened, key hole illumination lamp does not illuminate.		5	P. 54-9

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

E54DE02AA

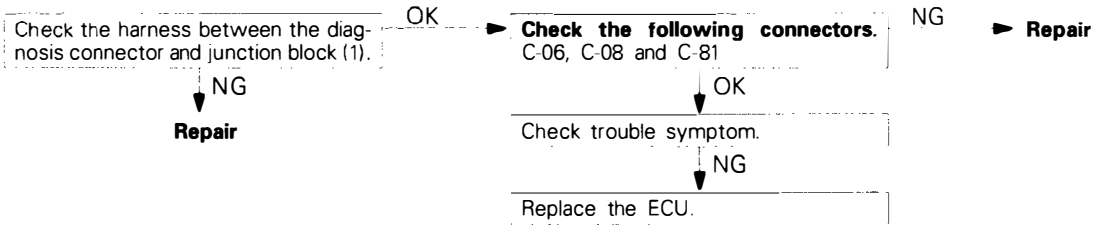
Inspection Procedure 1

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

Refer to GROUP 13A – Trouble-shooting.

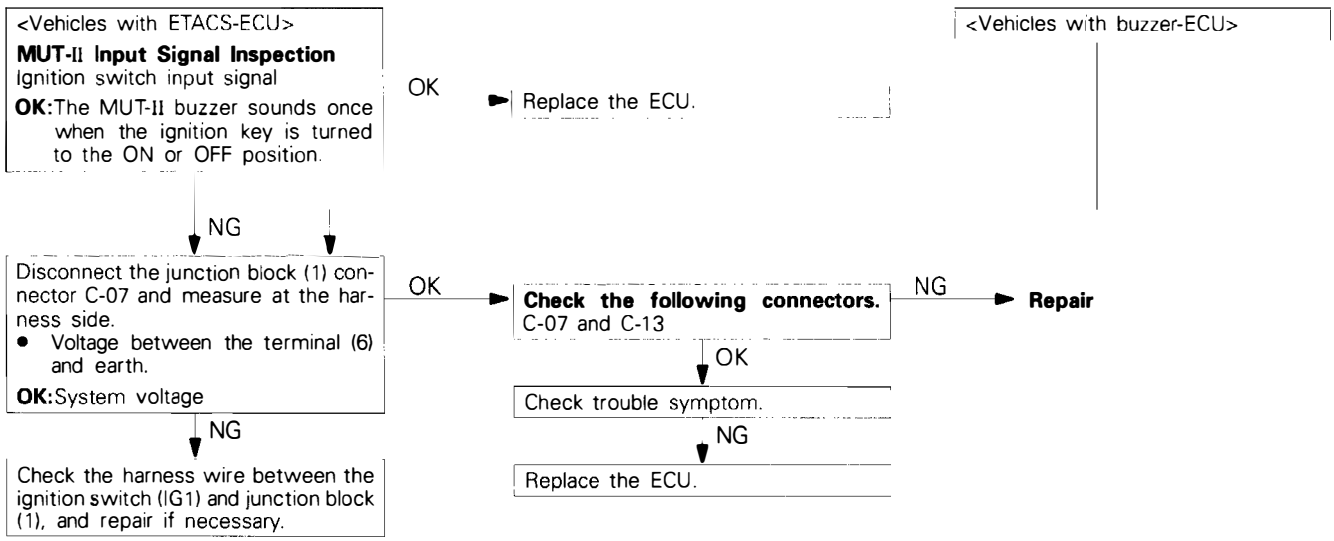
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication with the one-shot pulse input signal only is not possible.)	Probable cause
[Comment] The cause is probably a defective one-shot pulse input signal circuit system of the diagnosis line.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



Inspection Procedure 3

While key hole illumination lamp is illuminated, ignition key is turned to the ON position but key hole illumination lamp does not switch off. (However, it switches off after 10 seconds.)	Probable cause
[Comments] The cause is probably a defective ignition switch input circuit or a defective ECU.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



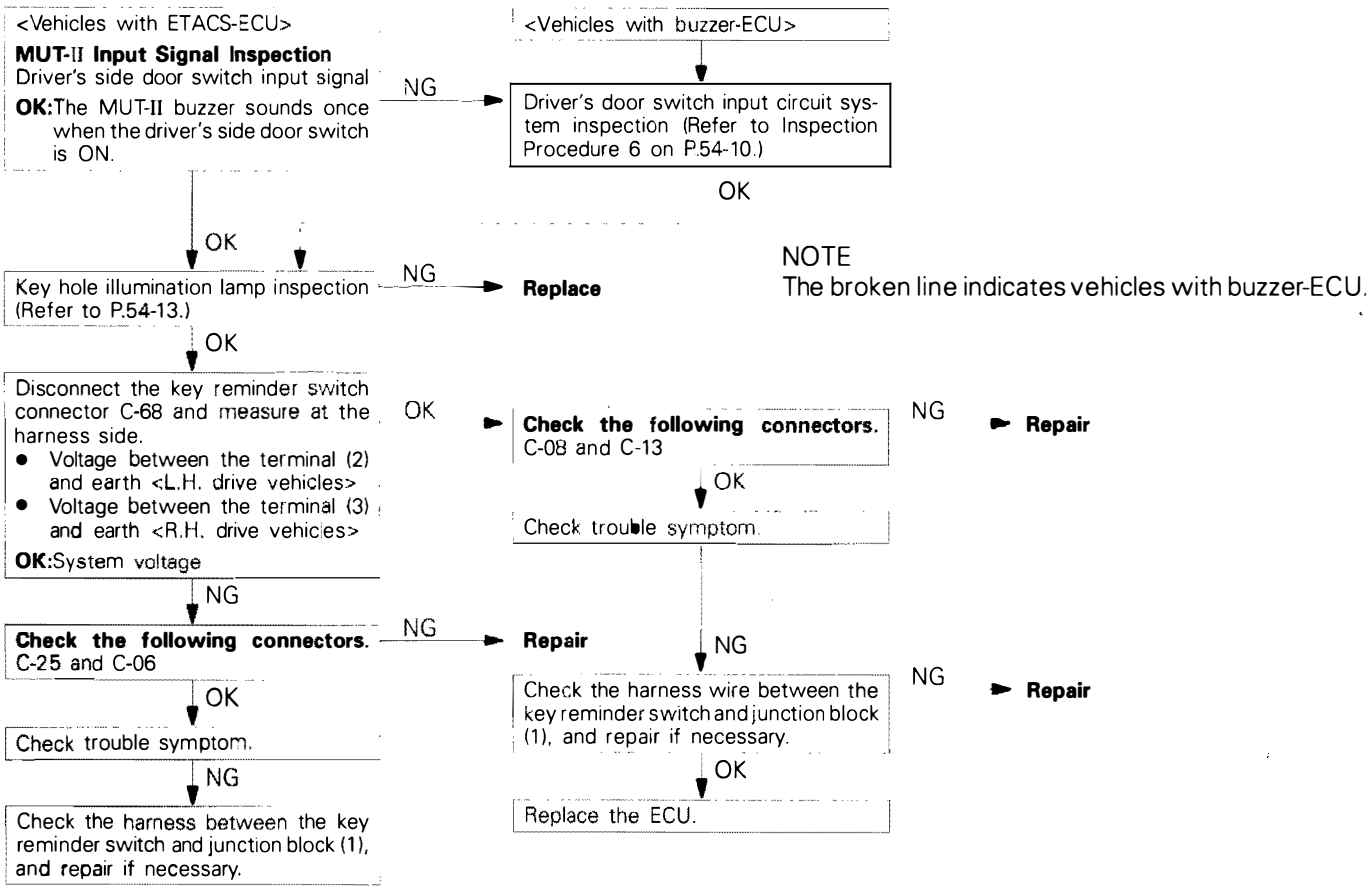
Inspection Procedure 4

Key hole illumination lamp remains illuminated.	Probable cause
[Comment] The cause is probably a harness short or a defective ECU.	• Malfunction of harness wire • Malfunction of ECU

When the connector C-08 of the junction block (1) is disconnected, does the lamp switch off?
- NO → Check the harness wire between the key reminder switch and junction block (1), and repair if necessary.
- YES → Replace the ECU.

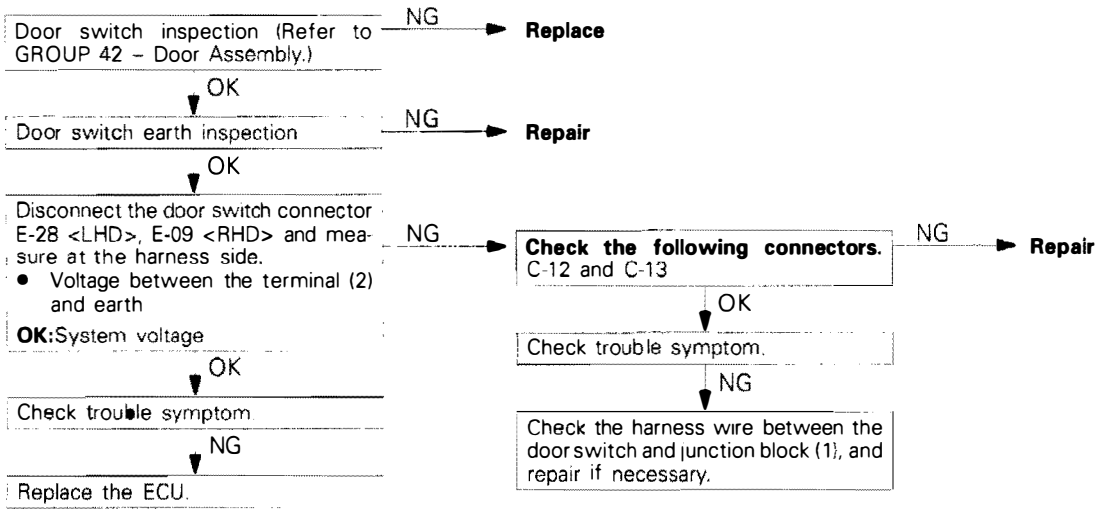
Inspection Procedure 5

Even if driver's side door is opened, key hole illumination lamp does not illuminate.	Probable cause
[Comment] The cause is probably a defective key hole illumination lamp circuit system or a defective driver's side door switch input circuit system.	• Malfunction of driver's side door switch • Malfunction of bulb • Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



Inspection Procedure 6

Driver's side door switch input circuit system inspection



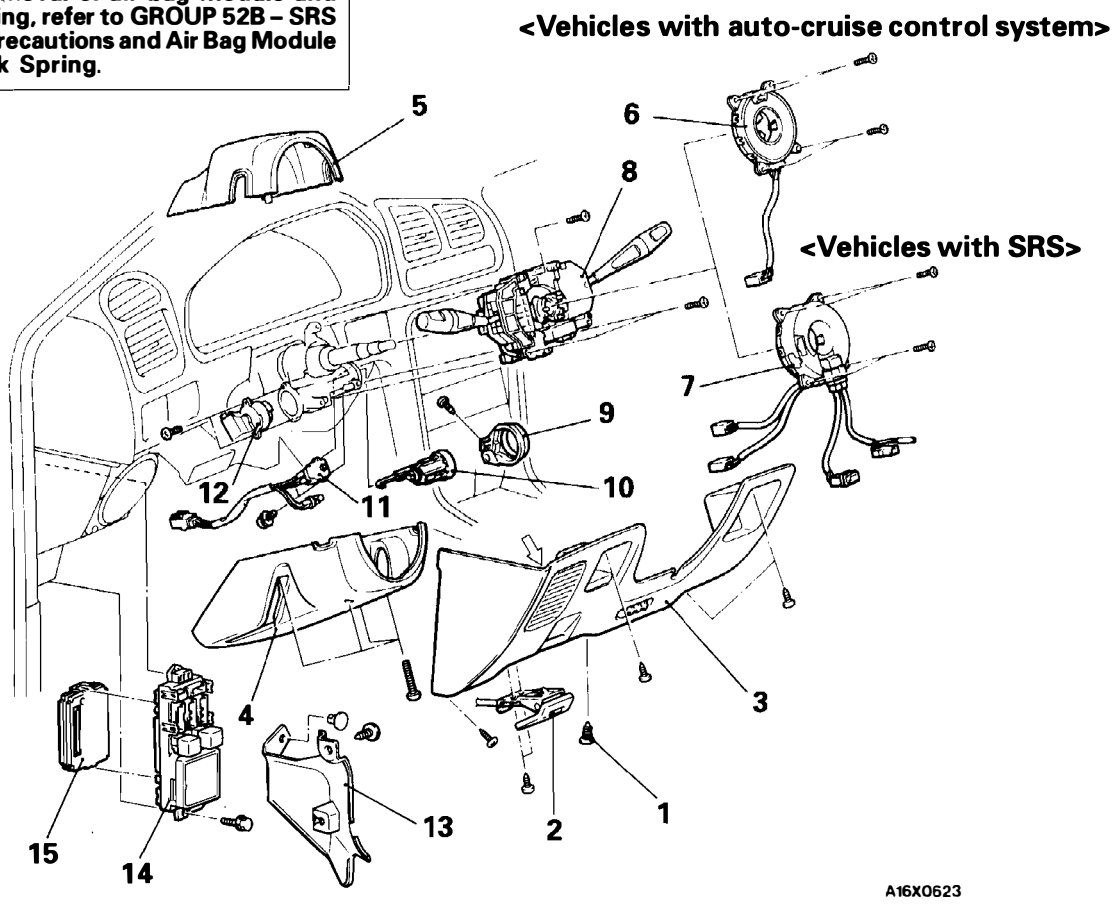
IGNITION SWITCH

E54DG00AA

REMOVAL AND INSTALLATION

<LH drive vehicles>

CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



Steering lock cylinder removal steps

- Steering wheel (Refer to GROUP 37A – Steering Wheel and Shaft.)

1. Clip
2. Hood lock release handle
3. Instrument under cover
4. Column cover lower
5. Column cover upper
6. Slip ring <Vehicles with auto-cruise control system>
7. Clock spring <Vehicles with SRS>
8. Column switch
9. Ignition key illumination ring or ring cover

◊A◊ 10. Steering lock cylinder

NOTE
The⇦ mark indicates the sheet metal clip position.

Key reminder switch or key hole illumination lamp removal steps

4. Column cover lower
5. Column cover upper
11. Key reminder switch or key hole illumination lamp

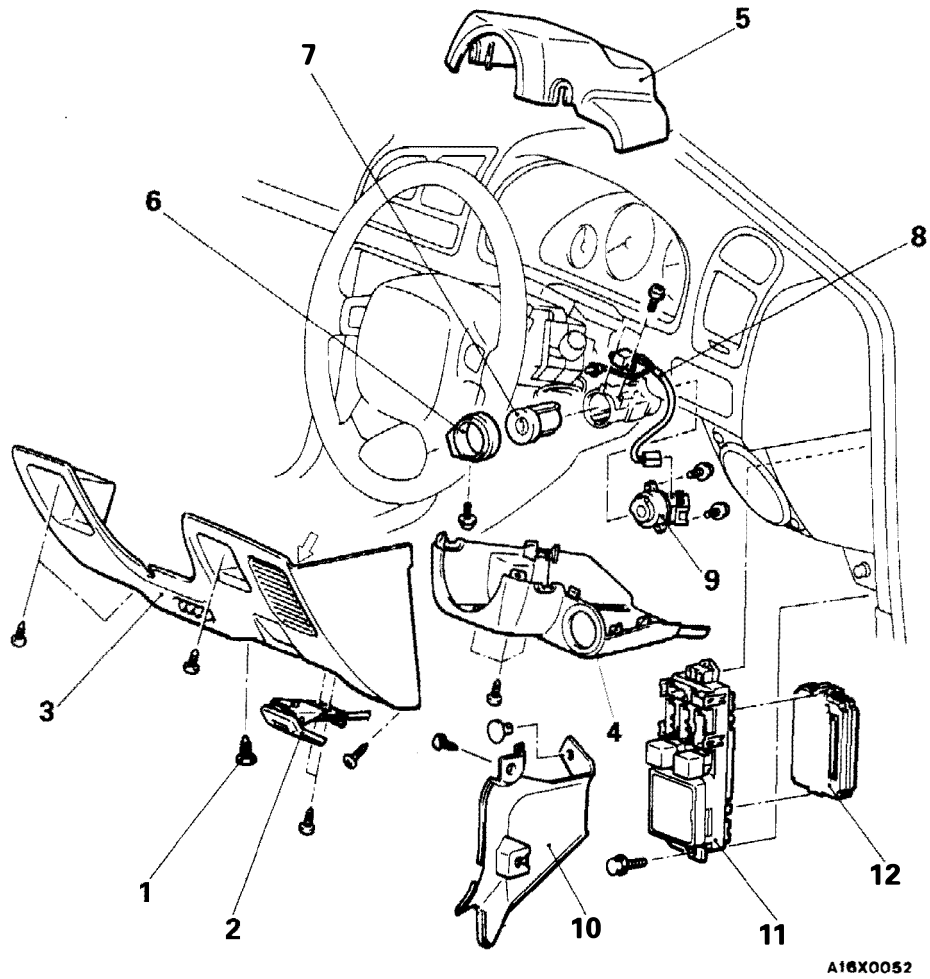
Ignition switch removal steps

4. Column cover lower
5. Column cover upper
12. Ignition switch

BUZZER-ECU or ETACS-ECU removal steps

13. Cowl side trim (LH)
14. Junction block
15. BUZZER-ECU or ETACS-ECU

<R.H. drive vehicles>



Steering lock cylinder removal steps

1. Clip
2. Hood lock release handle
3. Instrument under cover
4. Column cover lower
5. Column cover upper
6. Ignition key illumination ring or ring cover
〈A〉 7. Steering lock cylinder

Key reminder switch or key hole illumination lamp removal steps

1. Clip
2. Hood lock release handle
3. Instrument under cover
4. Column cover lower
5. Column cover upper
8. Key reminder switch or key hole illumination lamp

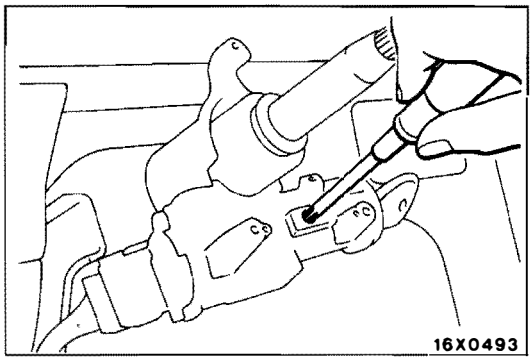
Ignition switch removal steps

1. Clip
2. Hood lock release handle
3. Instrument under cover
4. Column cover lower
5. Column cover upper
9. Ignition switch

BUZZER-ECU or ETACS-ECU removal steps

10. Cowl side trim (RH)
11. Junction block
12. BUZZER-ECU or ETACS-ECU

NOTE
The⇦ mark indicates the sheet metal clip position.

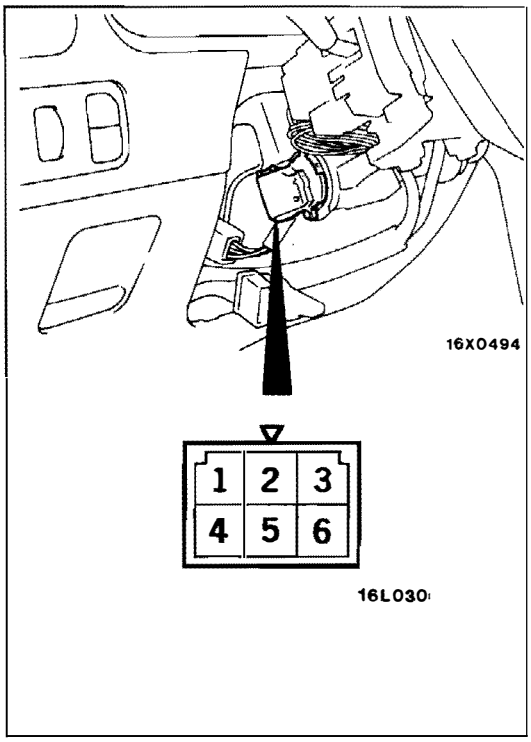


REMOVAL SERVICE POINT

E54DG01AA

◇A◇ STEERING LOCK CYLINDER REMOVAL

(1) Insert the key in the steering lock cylinder and turn it to the "ACC" position.
(2) Using a cross-tip (+) screwdriver (small) or a similar tool, push the lock pin of the steering lock cylinder inward and then pull the steering lock cylinder toward you.



INSPECTION

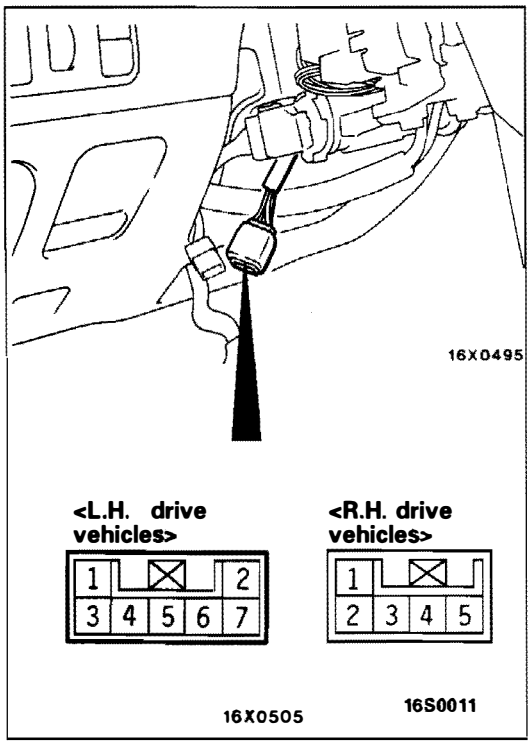
E54DG02AA

IGNITION SWITCH

(1) Remove the instrument under cover. <RH drive vehicles>
(2) Remove the column cover lower and upper.
(3) Disconnect the wiring connector from the ignition switch.
(4) Operate the switch, and check the continuity between the terminals.

Terminal No. / Ignition key position	1	2	3	4	5	6
LOCK						
ACC	○					○
ON	○	○		○		○
START	○	○	○		○	

NOTE
○—○ indicates that there is continuity between the terminals.



KEY REMINDER SWITCH, KEY HOLE ILLUMINATION LAMP

E54DG02BB

(1) Remove the instrument under cover. <R.H. drive vehicles>
(2) Remove the column cover lower and upper.
(3) Disconnect the wiring connector from the key reminder switch or from the key hole illumination lamp.
(4) Check the continuity between the terminals when the ignition key is pulled out of and inserted into the steering lock cylinder

Terminal No. / Ignition key	Key reminder switch				Key hole illumination lamp	
	3*	4 (2)	6 (5)	7*	1 (3)	2 (4)
Removed	○	○	○	○	○	○
Inserted						

NOTE
(1) The terminal numbers inside ( ) indicate RH drive vehicles.
(2) The terminal number's* indicate vehicles with theft-alarm system.
(3) ○—○ indicates that there is continuity between the terminals.

COMBINATION METERS

E54EC00AB

SERVICE SPECIFICATIONS

Items		Specifications
Standard value		
Speedometer indication error	km/h (mph)	
40 (20)		40–48 (20–25)
80 (40)		80–92 (40–47)
120 (60)		120–136 (60–69)
160 (80)		160–180 (80–91)
–(100)	r/min	–(100–114)
Tachometer indication error		
<6,000 r/min display tachometer, 8,000 r/min display tachometer>		
700		± 100
3,000		± 150
5,000		± 250
6,000		± 300
<9,000 r/min display tachometer>		
700		±100
3,000		+225 −100
5,000		+325 −125
7,000		+400 −100
Fuel gauge unit resistance	Ω	
<2WD>		
Float point "F"		4±2
Float point "E"		112±7
<4WD-Main>		
Float point "F"		2±1
Float point "E"		56.9±1
<4WD-Sub>		
Float point "F"		2±1
Float point "E"		50.1±1
Fuel gauge unit float height	mm	
<2WD>		
A (Float point "F")		4.6
B (Float point "E")		135.6
<4WD-Main>		
A (Float point "F")		4.5
B (Float point "E")		128.7
<4WD-Sub>		
A (Float point "F")		12.2*1, 27.5*2
B (Float point "E")		135.4*1, 158.8*2
Fuel gauge resistance	Ω	
power supply and earth		225
power supply and fuel gauge		104
fuel gauge and earth		122
Engine coolant temperature gauge resistance	Ω	
power supply and earth		176
power supply and engine coolant temperature gauge		54
engine coolant temperature gauge and earth		230
Engine coolant temperature gauge unit resistance (at 70°C)	Ω	104±13.5

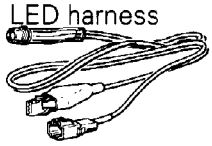
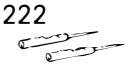
NOTE
*1: Up to 1993 models
*2: From 1994 models

SEALANT AND ADHESIVES

Items	Specified sealant and adhesive	Remark
Engine coolant temperature gauge unit threaded portion	3M Adhesive nut locking No. 4171 or equivalent	Drying sealant

SPECIAL TOOLS

E54ED00AA

Tool	Number	Name	Use
	MB991223	Harness set	• Fuel gauge simple inspection • Engine coolant temperature gauge simple inspection <Diesel-powered vehicles>
MB991219 Test harness 	MB991220 LED harness 	MB991221 LED harness adapter  MB991222 probe 	MB991219 Connector pin contact pressure inspection MB991220, MB991221 Power circuit inspection MB991222 Commercial tester connection
	MB990784	Ornament remover	Removal of meter bezel

TROUBLESHOOTING

E54EE02AA

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

Inspection Procedure 1

Speedometer does not operate.

[Comment] The cause is probably a defective vehicle speed sensor circuit system or a defective speedometer.
Vehicle speed sensor is co-used among the engine ECU, A/T ECU, ECS-ECU, 4WS-ECU, ABS-ECU, EPS-ECU and ECU of auto-cruise control system.

Probable cause

- Malfunction of vehicle speed sensor
- Malfunction of speedometer
- Malfunction of harness wire
- Malfunction of connector

Disconnect the combination meter connectors D-01 or D-02 and measure at the harness sides.
1. Measure the voltage between terminal (49) and earth when the vehicle is moved forward and backward.
   OK:4.7 V or more
2. Voltage between the terminal (24) and earth
   OK: System voltage

1. NG → Vehicle speed sensor circuit system inspection

2. NG → **Check the following connectors.** C-17, C-14 and C-07 NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness wire between the power supply and combination meter, and repair if necessary.

OK ↓

Check trouble symptom.

NG ↓

Replace the speedometer.

Inspection Procedure 2

Vehicle speed sensor circuit system inspection

Vehicle speed sensor inspection (Refer to P.54-23.) NG → **Replace**

OK ↓

Disconnect the vehicle speed sensor connector B-40 and measure at the harness side.
1. Voltage between the terminal (3) and earth
   OK:4.5 V or more
2. Continuity between terminal (2) and earth
   OK: Continuity
3. Voltage between the terminal (1) and earth
   OK: System voltage

1. NG → Check the harness wire between the vehicle speed sensor and combination meter, and repair if necessary.

2. NG → Check the harness wire between the vehicle speed sensor and earth, and repair if necessary.

3. NG → **Check the following connector.** C-76 NG → **Repair**

OK ↓

Check the following connector. D-18 NG → **Repair**

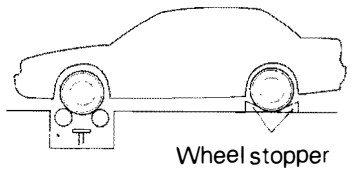
OK ↓

Check trouble symptom.

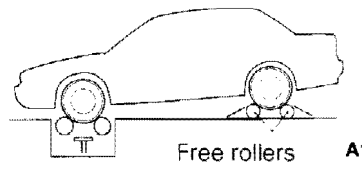
NG ↓

Check the harness wire between the vehicle speed sensor and power supply, and repair if necessary.

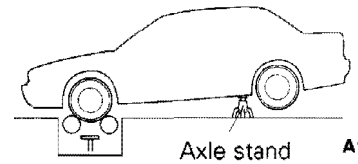
<2WD>

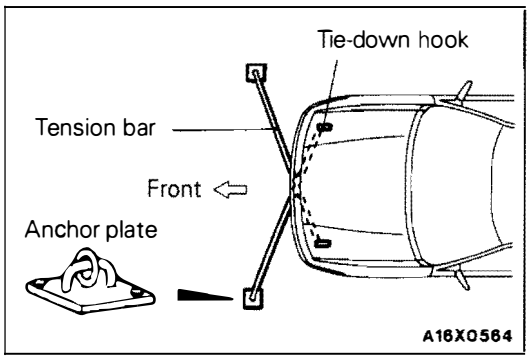


<4WD>
Rear wheel free roller type



Rear wheel jack up type





SERVICE ADJUSTMENT PROCEDURES

E54EF00AA

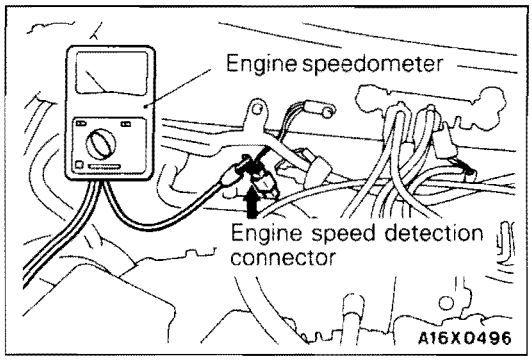
SPEEDOMETER INSPECTION

1. Adjust the pressure of the tyres to the specified level. (Refer to GROUP 31 – Service Specifications.)
2. Place the vehicle on a speedometer tester drum. <2WD>
3. Make sure the parking brake has been set. <4WD>
   Place securely the free rollers to the floor, under the rear wheels so that they are fitted for the wheel base and the wheel tread. <Rear wheel free roller type>
   Jack up the rear wheels and place the axle stands in the specified places. <Rear wheel jack-up type>
4. Turn the TCL switch OFF. <Vehicles with TCL system>
5. To prevent the front wheel from moving from side to side, attach tension bars to the tie-down hook, and secure both ends to anchor plates.
6. To prevent the vehicles from starting, attach a chain or wire to the rear retraction hook, and make sure the end of the chain or wire is secured firmly.
7. Check if the speedometer indicator range is within the standard values.

Caution
Do not operate the clutch suddenly or increase/decrease speed rapidly while testing.

Standard values:

Standard indication km/h (mph)	Allowable range km/h (mph)
40 (20)	40–48 (20–25)
80 (40)	80–92 (40–47)
120 (60)	120–136 (60–69)
160 (80)	160–180 (80–91)
–(100)	–(100–114)



TACHOMETER INSPECTION E54EF01AA

<Petrol-powered vehicles>

1. Insert a paper clip in the engine speed detection connector from the harness side, and attach the engine speedometer.

   NOTE
   For tachometer inspection, use of a fluxmeter-type engine speedometer is recommended. (Because a fluxmeter only needs to be clipped to the high tension cable.)

2. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variations are within the standard values.

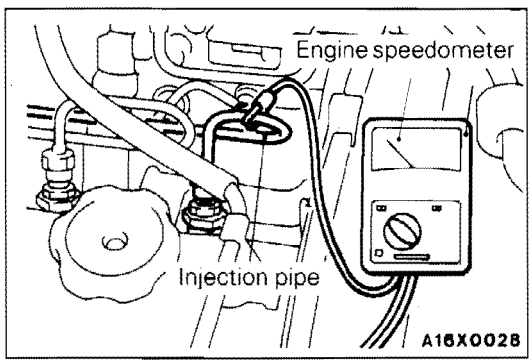
   Standard values:

   <8,000 r/min display tachometer>

Engine speed	Indicated variation
700 r/min.:	±100 r/min.
3,000 r/min.:	±150 r/min.
5,000 r/min.:	±250 r/min.
6,000 r/min.:	±300 r/min.

   <9,000 r/min display tachometer>

Engine speed	Indicated variation
700 r/min.:	±100 r/min.
3,000 r/min.:	+225 r/min. −100 r/min.
5,000 r/min.:	+325 r/min. −125 r/min.
7,000 r/min.:	+400 r/min. −100 r/min.



<Diesel-powered vehicles> E54EF01BA

1. Connect the engine speedometer to the injection pipe.
2. Compare the readings of the engine speedometer and the tachometer at every engine speed, and check if the variations are within the standard values.

   Standard values:

   <6,000 r/min display tachometer>

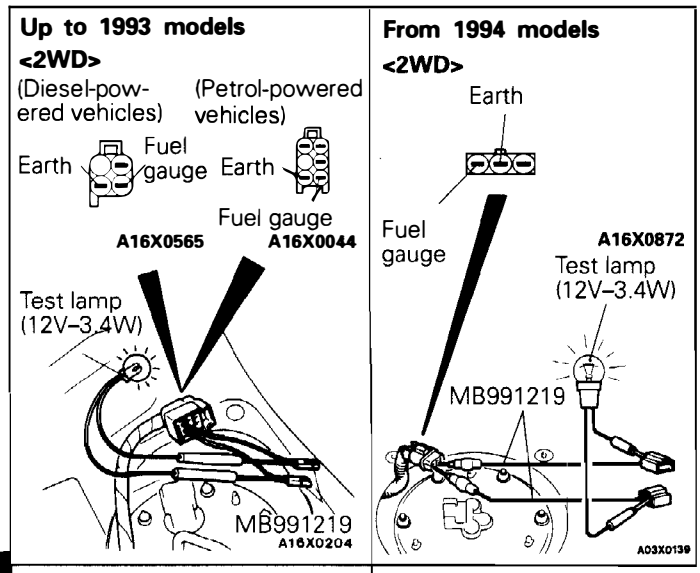
Engine speed	Indicated variation
700 r/min.:	±100 r/min.
3,000 r/min.:	±150 r/min.
5,000 r/min.:	±250 r/min.
6,000 r/min.:	±300 r/min.

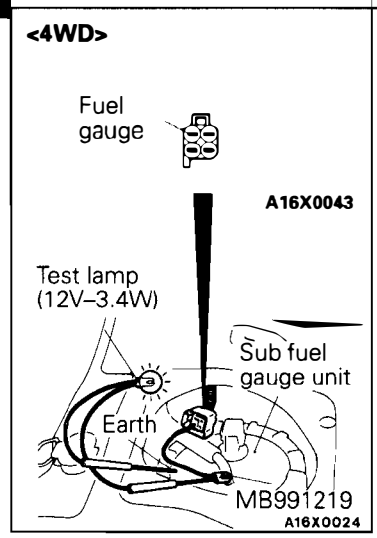
FUEL GAUGE SIMPLE INSPECTION

E54EF02AB

Remove the fuel gauge unit connector. (Refer to GROUP 13F – Fuel Tank.)

Connect a test lamp to the harness side connector.





NOTE
For 4WD, inspect from the sub fuel gauge unit side.

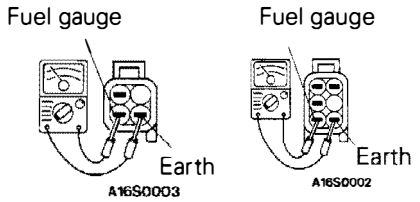
Turn the ignition switch to ON.

Check the condition of the test lamp and the gauge.

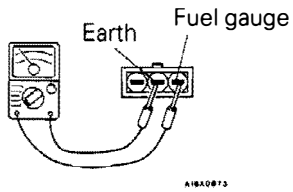
1. Test lamp is illuminated (Gauge needle is not moving) → Replace the fuel gauge.
2. Test lamp is illuminated (Gauge needle is moving) → Replace the fuel gauge unit.
3. Test lamp is not illuminated (Gauge needle is not moving) → Repair the harness.

<2WD>
Up to 1993 models

(Diesel-powered vehicles) (Petrol-powered vehicles)

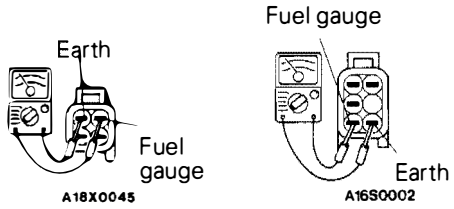


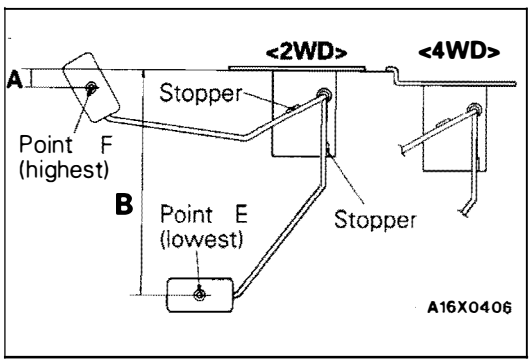
From 1994 models



<4WD>

(Sub) (Main)





FUEL GAUGE UNIT INSPECTION E54EP03AB

To check, remove fuel gauge unit from fuel tank. (Refer to GROUP 13F – Fuel Tank.)

FUEL GAUGE UNIT RESISTANCE E54EF03BA

1. Check that resistance value between the fuel gauge terminal and earth terminal is at standard value when fuel gauge unit float is at point F (highest) and point E (lowest).

Standard value:

<2WD>	**POINT F:**	**4±2 Ω**
	POINT E:	**112±7 Ω**
<4WD-Main>	**POINT F:**	**2±1 Ω**
	POINT E:	**56.9±1 Ω**
<4WD-Sub>	**POINT F:**	**2 ±1 Ω**
	POINT E:	**50.1±1 Ω**

2. Check that resistance value changes smoothly when float moves slowly between point F (highest) and point E (lowest.)

FUEL GAUGE UNIT FLOAT HEIGHT E54EF03CB

Move float and measure the height A at point F (highest) and B at point E (lowest) with float arm touching stopper.

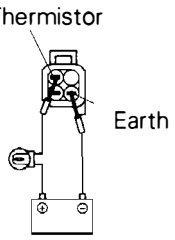
Standard value:

<2WD>
Up to 1993 models
A: 4.6 mm
B: 135.6 mm
From 1994 models
A: 27.5 mm
B: 158.8 mm
<4WD-Main> A: 4.5 mm
B:128.7 mm
<4WD-Sub> A: 12.2 mm
B:135.4 mm

<2WD>

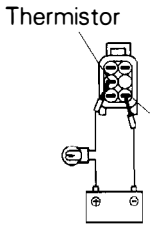
Up to 1993 models

Diesel-powered vehicles



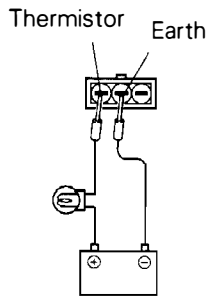
A16S0015

Petrol-powered vehicles



A16S0013

From 1994 models



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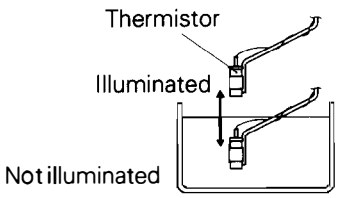
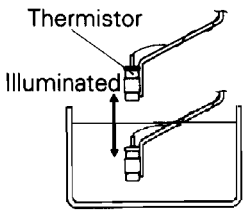


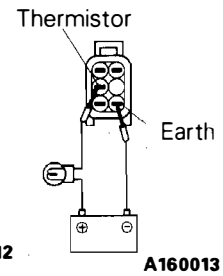
A16S0012

<4WD>

Main

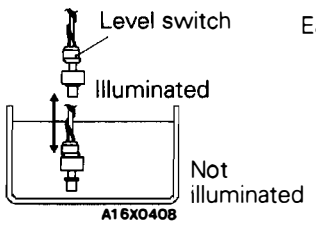


A16S0012

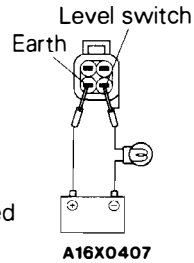


A160013

Sub



A16X0408



A16X0407

THERMISTOR, LEVEL SWITCH E54EF03DB

1. Connect fuel gauge unit (thermistor or level switch) to battery via test light (12V–3.4W). Immerse in water.
2. Condition good if light goes off when thermistor or level switch is in water and lights when it is removed from water.

Caution
After completing this test, wipe the unit dry and install it in the fuel tank.

ENGINE COOLANT TEMPERATURE GAUGE SIMPLE INSPECTION

E54EF04AA

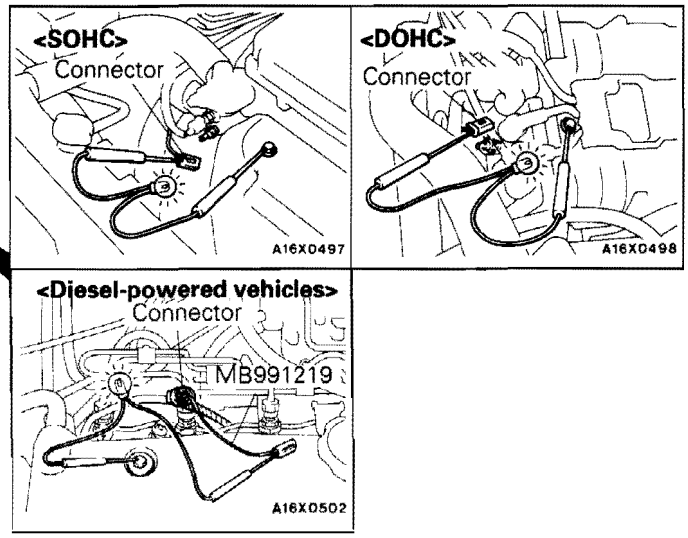
Remove the engine coolant gauge unit connector.

↓

Connect a test lamp (12V–3.4W) between the harness side connector and the earth.

↓

Turn the ignition switch ON.

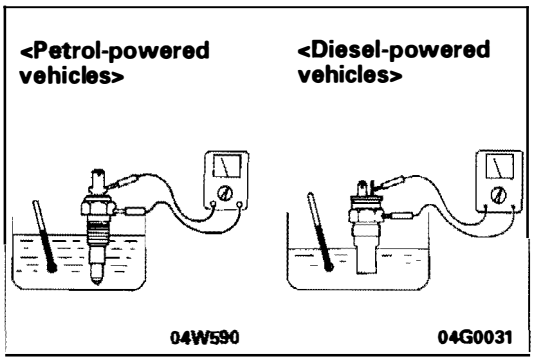


NOTE
Check the Diesel-powered vehicles using a special tool.

↓

Check the condition of the test lamp and the gauge.

1. Test lamp is illuminated (Gauge needle is not moving) → Replace the engine coolant temperature gauge.
2. Test lamp is illuminated (Gauge needle is moving) → Replace the engine coolant temperature gauge unit.
3. Test lamp is not illuminated (Gauge needle is not moving) → Repair the harness.

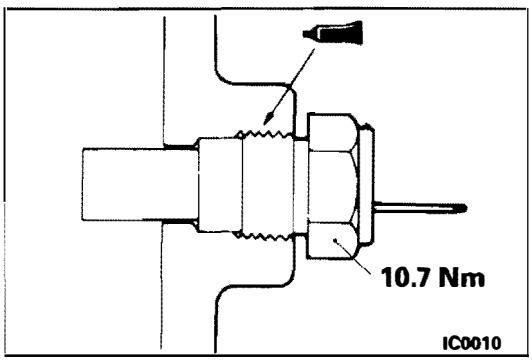


ENGINE COOLANT TEMPERATURE GAUGE UNIT INSPECTION

E54EF05AA

1. Bleed the engine coolant. (Refer to GROUP 14 – Service Adjustment Procedures.)
2. Remove the engine coolant temperature gauge unit.
3. Immerse the unit in 70°C water to measure the resistance.

   Standard value: 104±13.5 Ω



4. After checking, apply the specified adhesive around the thread of engine coolant temperature gauge unit.

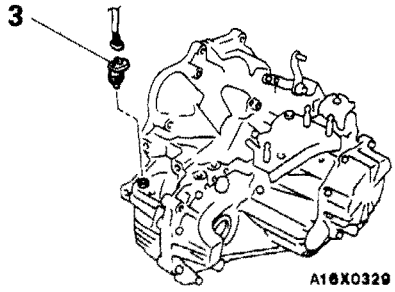
   Specified sealant: 3M Adhesive Nut Locking No. 4171 or equivalent

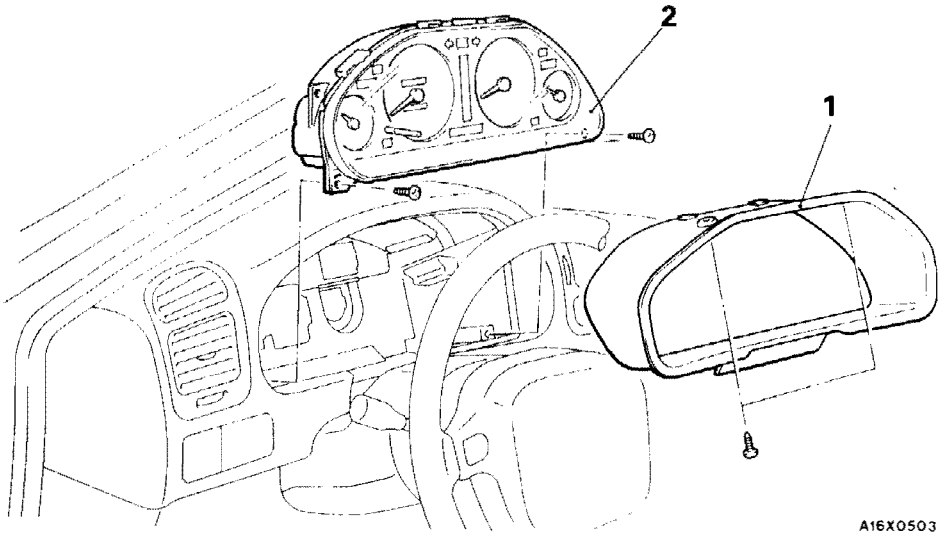
5. Add engine coolant. (Refer to GROUP 14 – Service Adjustment Procedures.)

COMBINATION METERS

E54EG00AA

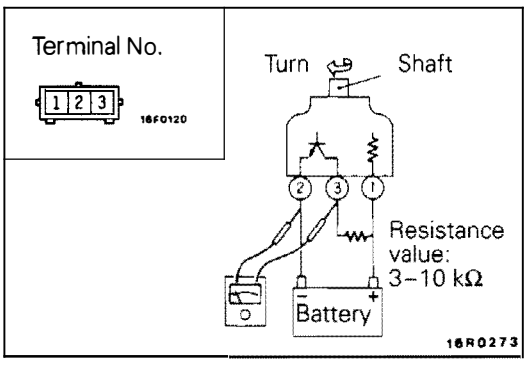
REMOVAL AND INSTALLATION





Removal steps

1. Meter bezel
2. Combination meter
3. Vehicles speed sensor

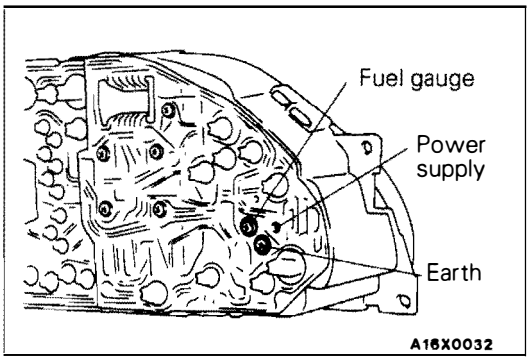


INSPECTION

E54EG02AA

VEHICLES SPEED SENSOR

(1) Remove the vehicle speed sensor and connect a 3–10 kΩ resistance as shown in the illustration at left.
(2) Turn the shaft of the vehicle speed sensor and check to be sure that there is voltage between terminals 2 – 3. (1 turn = 4 pulses)



FUEL GAUGE RESISTANCE

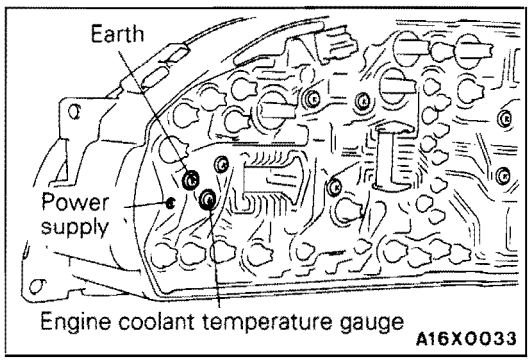
E54EG02BA

(1) Remove the power supply tightening screw.
(2) Use a circuit tester to measure the resistance value between the terminals.

Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.

Standard value:

Power supply – Earth:	**225 Ω**
Power supply – Fuel gauge:	**104 Ω**
Fuel gauge – Earth:	**122 Ω**



ENGINE COOLANT TEMPERATURE GAUGE RESISTANCE

E54EG02CA

(1) Remove the power supply tightening screw.
(2) Use a circuit tester to measure the resistance value between the terminals.

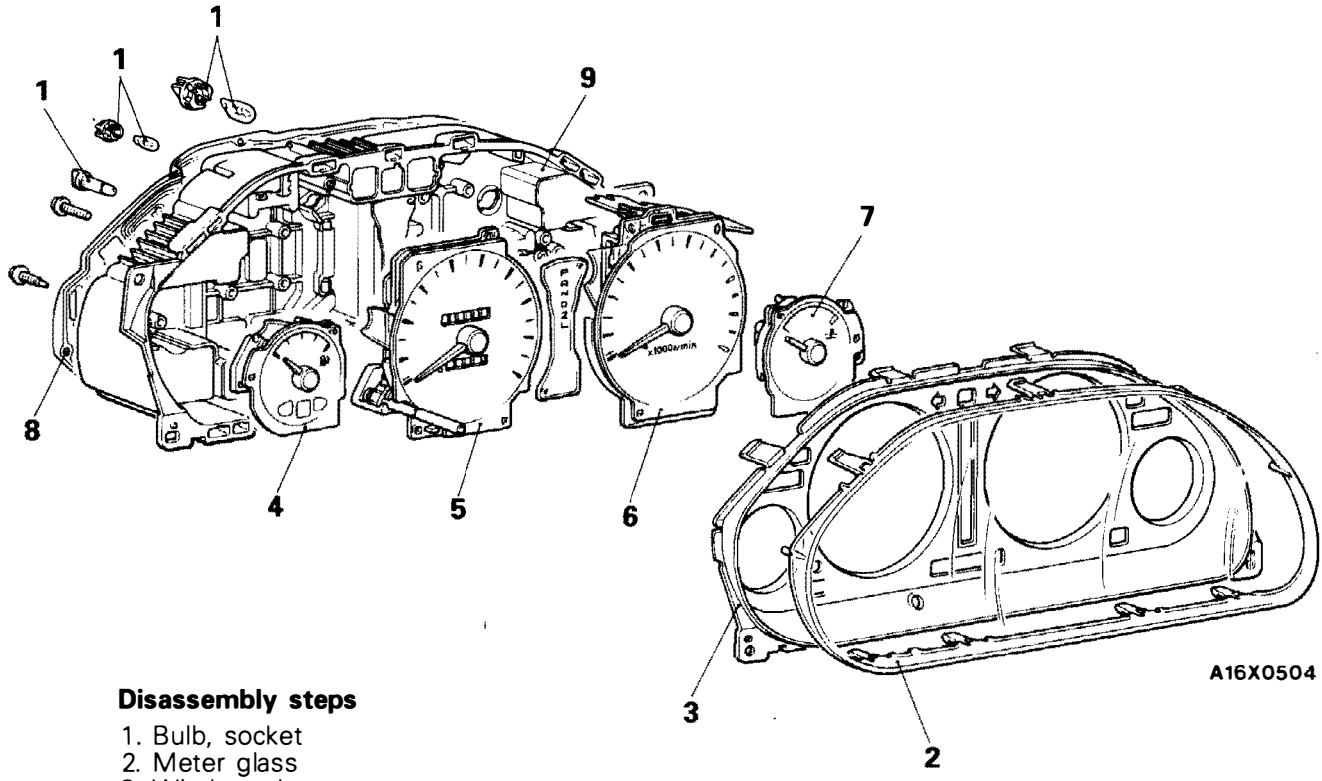
Caution
When inserting the testing probe into the power supply terminal, be careful not to touch the printed board.

Standard value:

Power supply – Earth:	**176 Ω**
Power supply – Engine coolant temperature gauge:	**54 Ω**
Engine coolant temperature gauge – Earth:	**230 Ω**

DISASSEMBLY AND REASSEMBLY

E54EG05AA



Disassembly steps

1. Bulb, socket
2. Meter glass
3. Window plate
4. Fuel gauge
5. Speedometer
6. Tachometer
7. Engine coolant temperature gauge
8. Printed-circuit board
9. Meter case

INDICATORS AND WARNING LAMPS

E54EG05BB

Unit: W

Items	Specifications
Upper-beam indication lamp	1.4
Turn-signal indication lamp	3.4 or 3.0
Hazard indication lamp	1.4
Rear fog lamp indication lamp	1.4
Overdrive off indication lamp (A/T)	1.12
Power/Hold indication lamp (A/T)	1.12
Automatic transmission indication lamp	1.12
Auto-cruise control indication lamp	1.4
Traction control indication lamp	1.4
ECS indication lamp	1.4
Oil pressure warning lamp	1.4
Brake warning lamp	1.4
Charge warning lamp	1.4
Low fuel warning lamp	3.4 or 3.0
Door ajar warning lamp	1.4
Low washer fluid warning lamp	1.4
Check engine warning lamp	1.4
Fuel filter warning lamp <Diesel-powered vehicles>	1.4
Anti-skid braking system warning lamp	1.4
Low engine oil warning lamp	1.4
Supplemental restraint system warning lamp	1.4
4 wheel steering warning lamp	1.4
Security indication lamp*	1.4
Diesel preheat indication lamp*	1.4

NOTE
* : From 1994 models

HEADLAMP

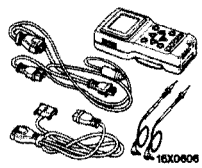
E54FC00AA

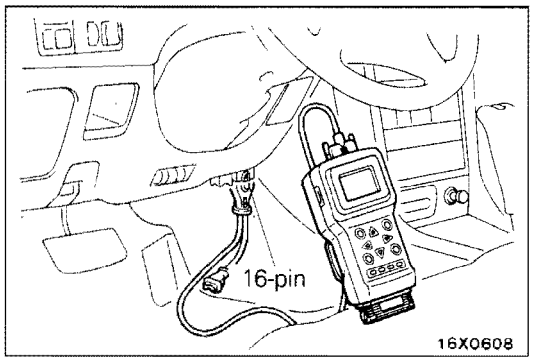
SERVICE SPECIFICATIONS

Items	Specifications
Standard value	
Headlamp aiming	
For lower beam adjustment	
Vertical direction	60 mm below horizontal (H)
Horizontal direction	Position where the 15° sloping section intersects the vertical line (V)
For upper beam adjustment	
Vertical direction	22 mm below horizontal (H)
Horizontal direction	Parallel to direction of vehicle travel.
Resistance between resistor terminals <R.H. drive vehicles with dim-dip lamp>	Approx. 1 Ω
Limit	
Headlamp intensity	30,000 cd or more

SPECIAL TOOLS

E54FD00AA

Tool	Number	Name	Use
 16X0606	MB991502	MUT-II sub assembly	ETACS-ECU input signal checking
 16X0607		ROM pack (For the number, refer to GROUP 00 – Precautions Before Service.)	



TROUBLESHOOTING

E54FE00AA

DIAGNOSIS FUNCTION

INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

1. Connect the MUT-II to the diagnosis connector.
2. If buzzer of the MUT-II sounds once when a switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

INSPECTION CHART FOR TROUBLE SYMPTOMS

E54FE01AA

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible. <Vehicles with ETACS-ECU>	Communication with all systems is not possible.	1	P. 54-28
	Communication with one-shot pulse input signal only is not possible.	2	P. 54-28
While the tail lamps or headlamps are illuminated, driver's side door is opened but the light reminder warning buzzer does not sound.		3	P. 54-29

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

E54FE02AA

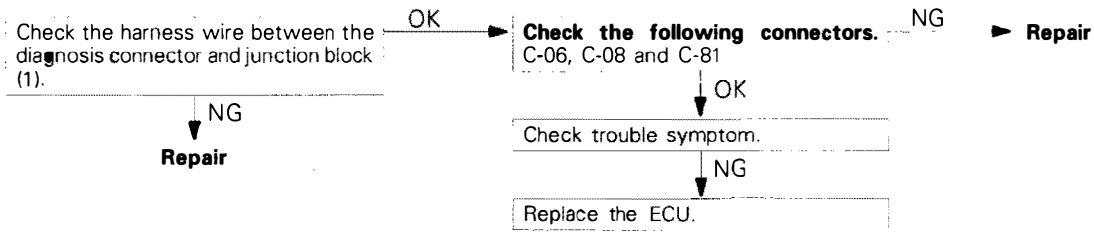
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting.

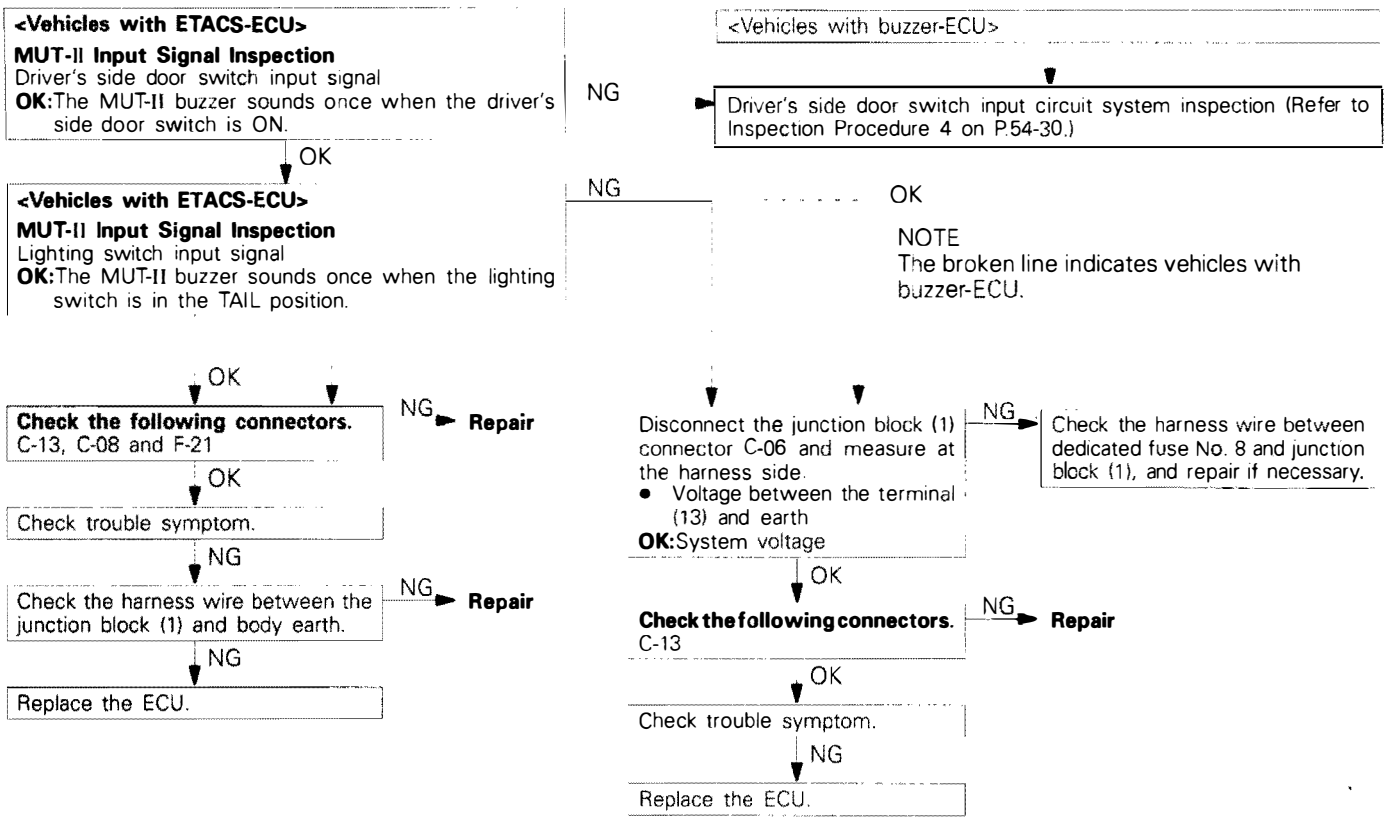
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication with the one-shot pulse input signal only is not possible.)	Probable cause
[Comment] The cause is probably a defective one-shot pulse input circuit system of the diagnosis line.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



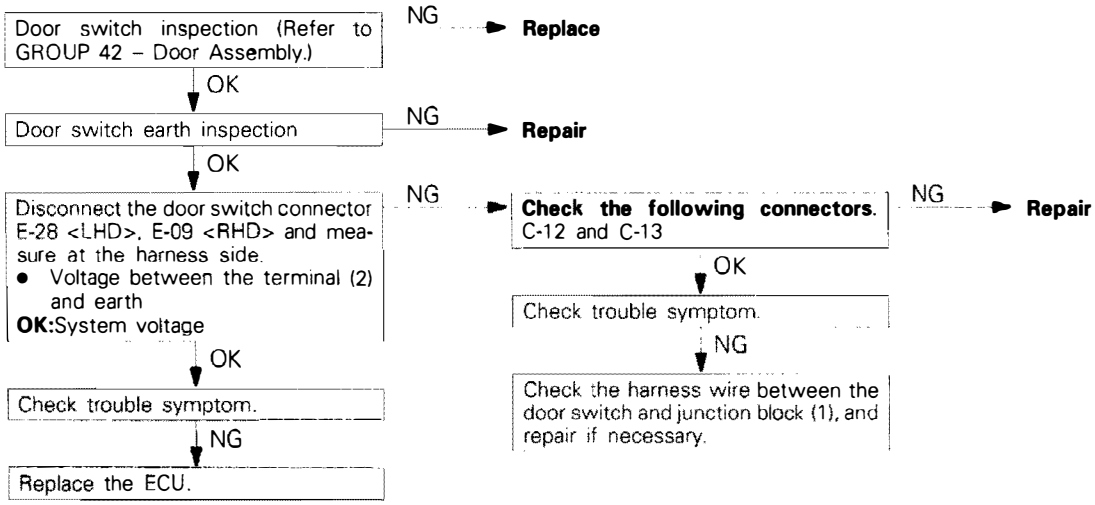
Inspection Procedure 3

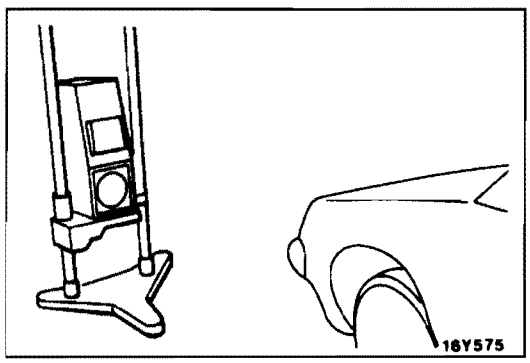
While the tail lamps or headlamps are illuminated, driver's side door is opened but the light reminder warning buzzer does not sound. [Comment] The cause is probably a defective lighting switch input circuit system or a defective driver's side door switch input circuit system.	Probable cause • Malfunction of driver's side door switch • Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



Inspection Procedure 4

Driver's side door switch input circuit system inspection





SERVICE ADJUSTMENT PROCEDURES

E54FF00AA

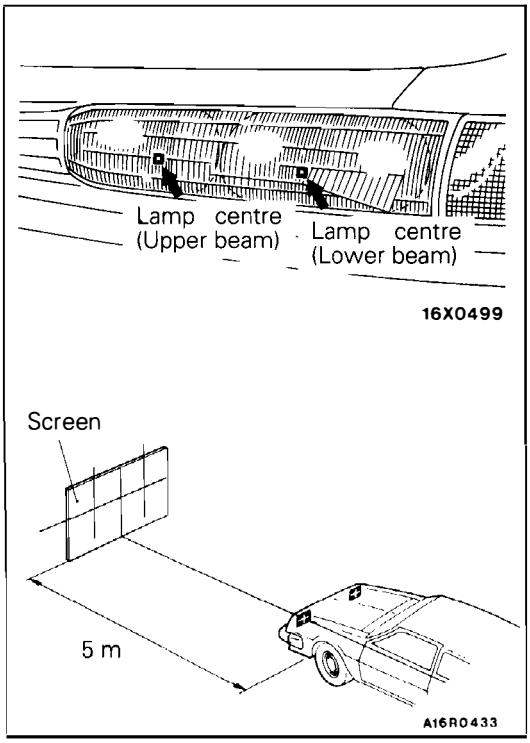
HEADLAMP AIMING

<USING A BEAMSETTING EQUIPMENT>

1. The headlamps should be aimed with the proper beamsetting equipment, and in accordance with the equipment manufacture's instructions.

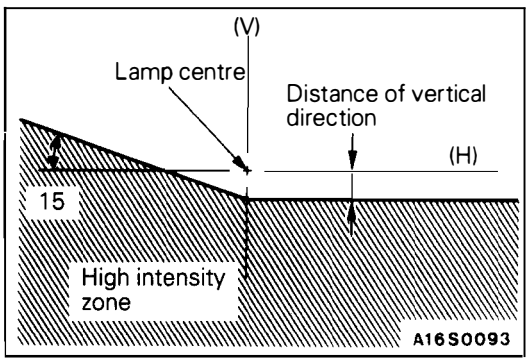
   NOTE
   If there are any regulations pertinent to the aiming of headlamps in the area where the vehicle is to be used, adjust so as to meet those requirements.

2. Alternately turn the adjusting screw to adjust the headlamp aiming. (Refer to P.54-32.)



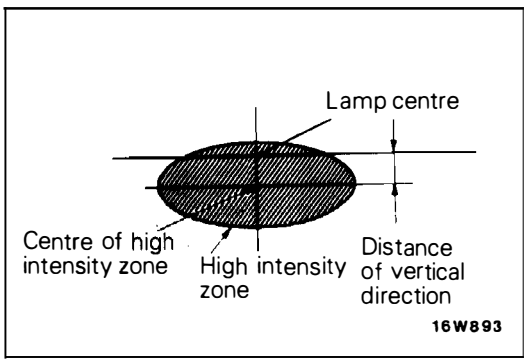
<USING A SCREEN> E54FF00BA

1. Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in driver's position.
2. Set the distance between the screen and the centre marks of the headlamps as shown in the illustration.
3. With the engine running at 2,000 r/min. aim the headlamps.



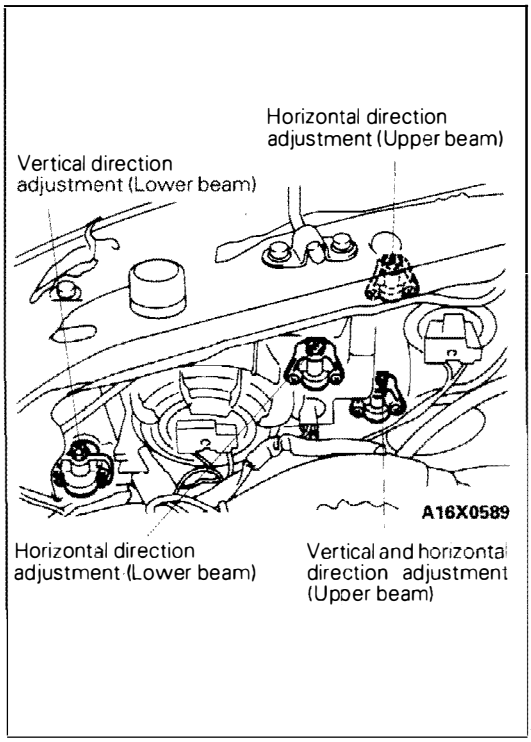
4. Check if the beam shining onto the screen is at the standard value.

Standard value: <For lower beam adjustment>
(Vertical direction)
60 mm below horizontal (H)
(Horizontal direction)
Position where the 15° sloping section intersects the vertical line (V)



Standard value: <For upper beam adjustment>
(Vertical direction)
22 mm below horizontal (H)
(Horizontal direction)
Parallel to direction of vehicle travel

Caution
1. **When making the aiming adjustment, be sure to mask those lamps which are not being adjusted.**
2. **When it is difficult, because of outside light, to distinguish the light/dark dividing line, use a curtain, screen or similar material to reduce the effects of the outside light.**



5. Alternately turn the adjusting screw to adjust the headlamp aiming.

Caution
Be sure to adjust the aiming adjustment screw in the tightening direction.

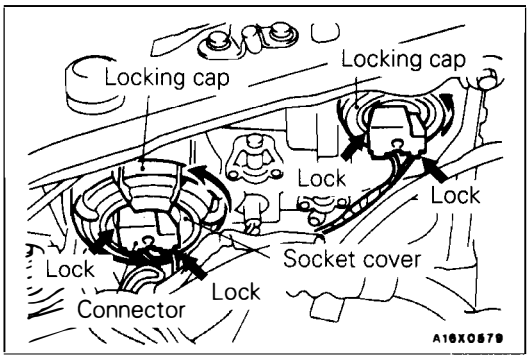
INTENSITY MEASUREMENT E54FF01AA

Using a photometer, and following its manufacture's instruction manual, measure the headlamp intensity and check to be sure that the limit value is satisfied.

Limit: 30,000 cd or more

NOTE
1. When measuring the intensity, maintain an engine speed of 2,000 r/min., with the battery in the charging condition.
2. There may be special local regulations pertaining to headlamp intensity; be sure to make any adjustments necessary to satisfy such regulations.
3. If an illuminometer is used to make the measurements, convert its values to photometer values by using the following formula.

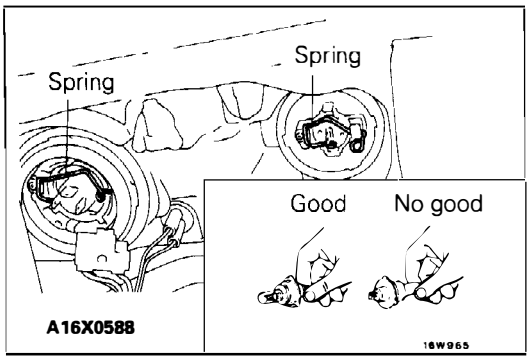
$I = Er^2$ Where: I = intensity (cd)
E = illumination (lux)
r = distance (m) from headlamps to illuminometer



BULB REPLACEMENT E54FF02AA

<Headlamp Bulb>

1. Remove the reserve tank from the bracket. (When replacing only the upper beam right side)
2. Remove the connector lock and disconnect the headlamp connector.
3. Turn the locking cap to the left to remove it. (Upper beam only)
4. Turn the locking cap to the left, and then remove the socket cover. (Lower beam only)

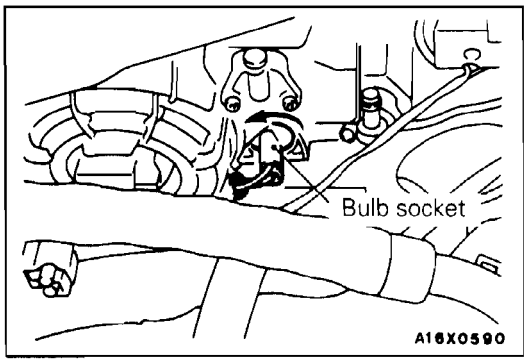


5. Remove the bulb attachment spring and pull out the bulb.

Caution
Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.

6. After replacing the bulb, securely install the socket cover. (Lower beam only)

Caution
If the socket cover is not securely installed, the lens will be out of focus, or water will get inside the lamp unit, so the cover should be securely installed.



<Position Lamp Bulb> E54FF02BA

1. Remove the reserve tank from the bracket. (When replacing only the right side)
2. Turn the bulb socket to the left to remove it, and then take out the bulb.

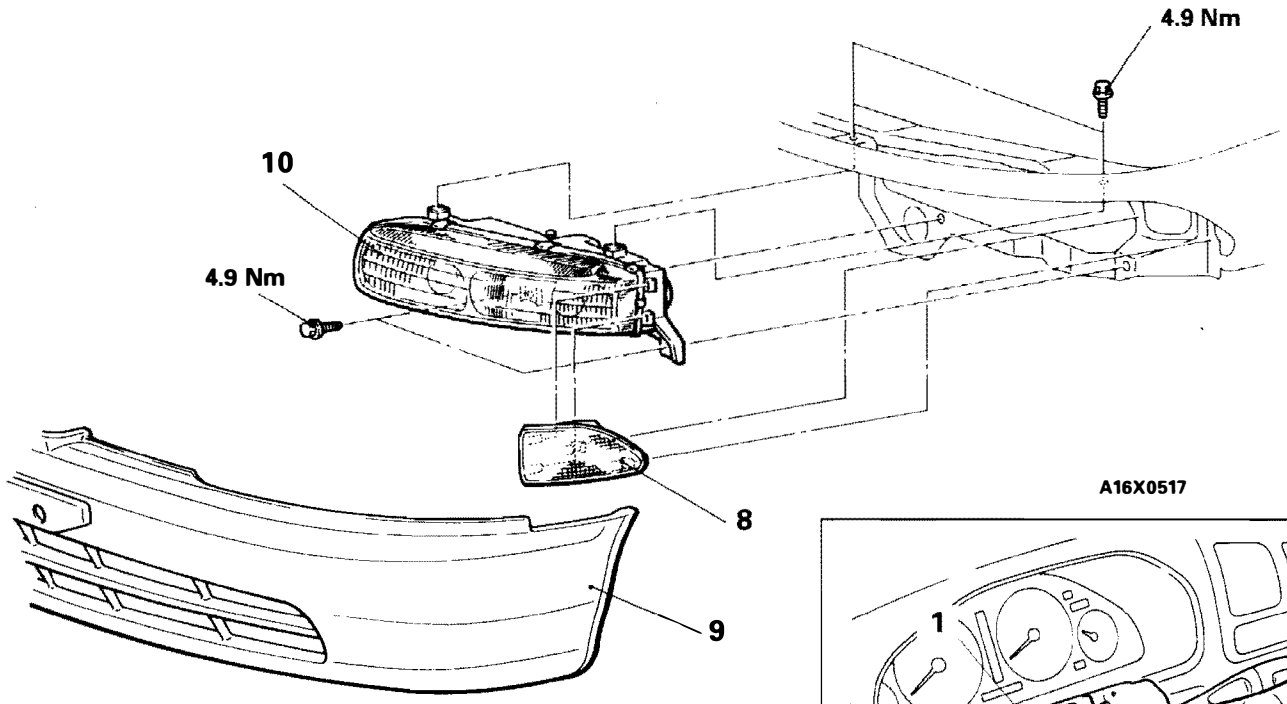
HEADLAMP

E54FG00AA

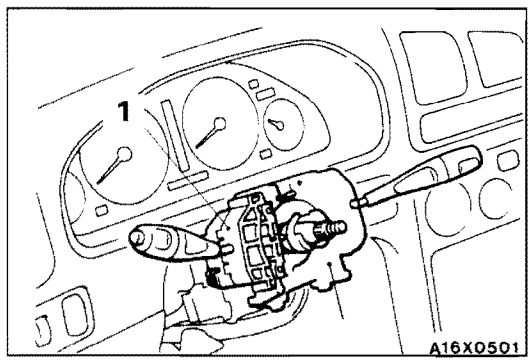
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and installation of battery (When replacing only right side headlamp)

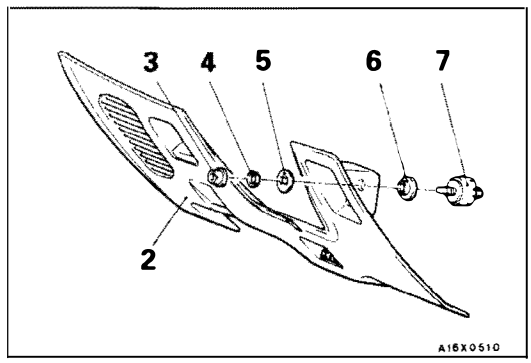
CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



A16X0517



A16X0501



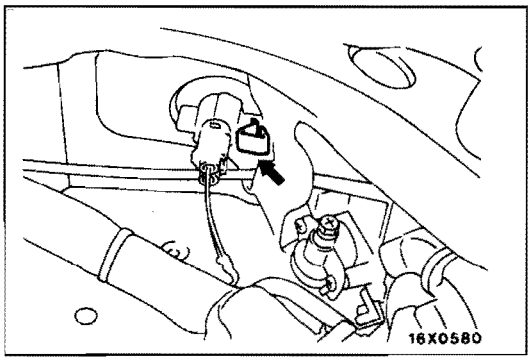
A16X0510

Headlamp leveling switch removal steps
2. Instrument under cover (Refer to P.54-11.)
3. Knob
4. Nut
5. Plate
6. Spacer
7. Headlamp leveling switch

Headlamp removal steps

〈A〉 8. Front turn-signal lamp
9. Front bumper (Refer to GROUP 51 – Front Bumper.)
10. Headlamp

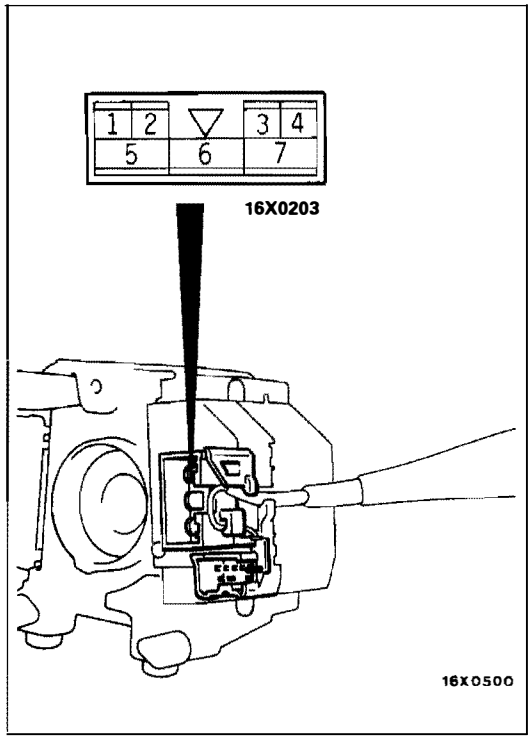
Column switch removal step
1. Column switch <Lighting switch and dimmer/passing switch> (Refer to GROUP 51 – Windshield Wiper and Washer)



REMOVAL SERVICE POINT E54FG01AA

〈A〉 FRONT TURN-SIGNAL LAMP REMOVAL

Remove the front turn-signal lamp setting hooks, and remove the front turn-signal lamp by pulling it towards the front of the vehicle.

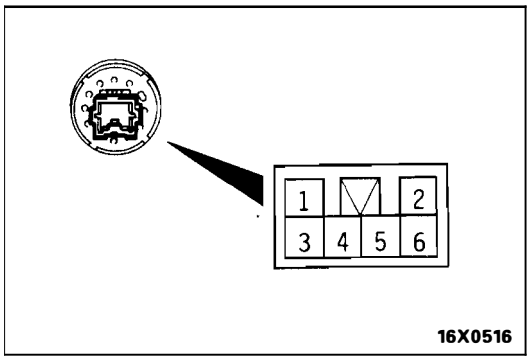


INSPECTION E54FG02AA

LIGHTING SWITCH AND DIMMER/PASSING SWITCH

Switch position		Terminal No. 1	2	3	4	5	6	7
LIGHTING SWITCH	OFF							
	TAIL		○	—	○			
	HEAD		○	—	○			
DIMMER/ PASSING SWITCH	LOWER						○	— ○
	UPPER					○	—	○
	PASSING	○	—	○		— ○	(○	— ○)*1
						(○	— ○)*2	

NOTE
1. ○—○ indicates that there is continuity between the terminals.
2. *1 indicates continuity when the dimmer switch is in the lower position.
3. *2 indicates continuity when the dimmer switch is in the upper position.

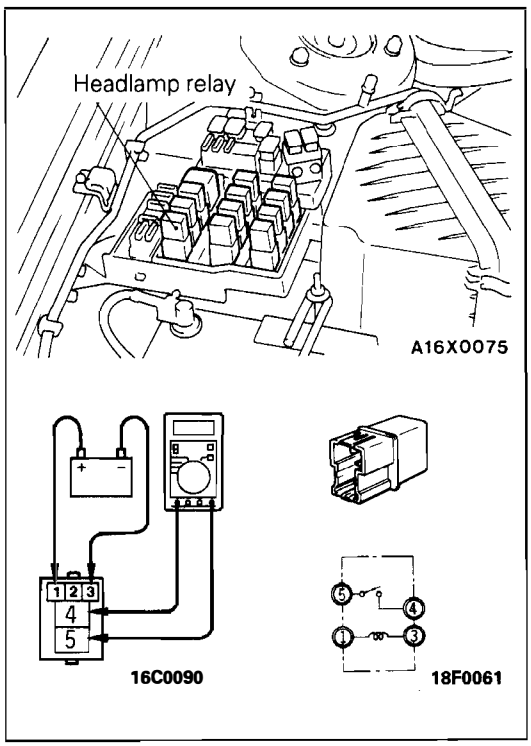


HEADLAMP LEVELING SWITCH

E54FG02BA

Switch position \ Terminal No.	1	2	3	4	5	6
0	○	○				
1	○	○				○
2	○	○			○	
3	○	○		○		
4	○	○	○			

NOTE
○—○ indicates that there is continuity between the terminals.

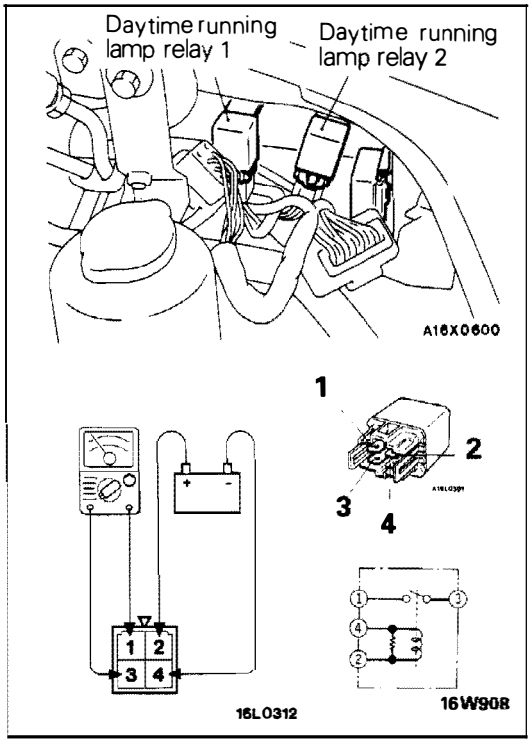


HEADLAMP RELAY

E54FG02CA

Apply battery voltage to terminal 1, and check the continuity between the terminals when terminal 3 is earthed.

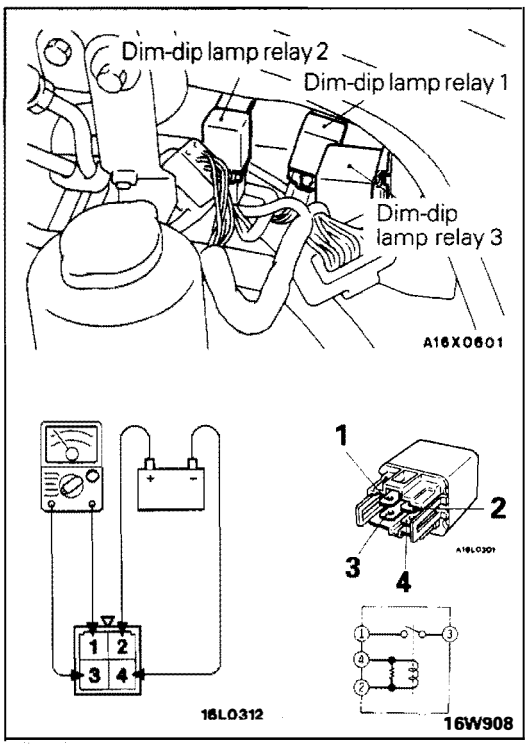
Power is supplied	4–5 terminals	Continuity
Power is not supplied	4–5 terminals	No continuity
	1–3 terminals	Continuity



DAYTIME RUNNING LAMP RELAY 1, 2 <Vehicles for Norway, Sweden and Iceland> E54FG02DA

Apply battery voltage to terminal 2, and check the continuity between the terminals when terminal 4 is earthed.

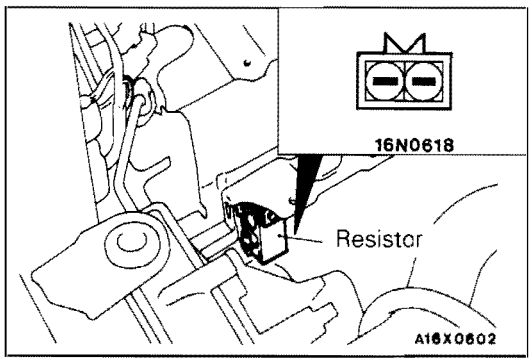
Power is supplied	1–3 terminals	Continuity
Power is not supplied	1–3 terminals	No continuity
	2–4 terminals	Continuity



DIM-DIP LAMP RELAY 1, 2, 3 <R.H. Drive Vehicles> E54FG02EA

Apply battery voltage to terminal 2, and check the continuity between the terminals when terminal 4 is earthed.

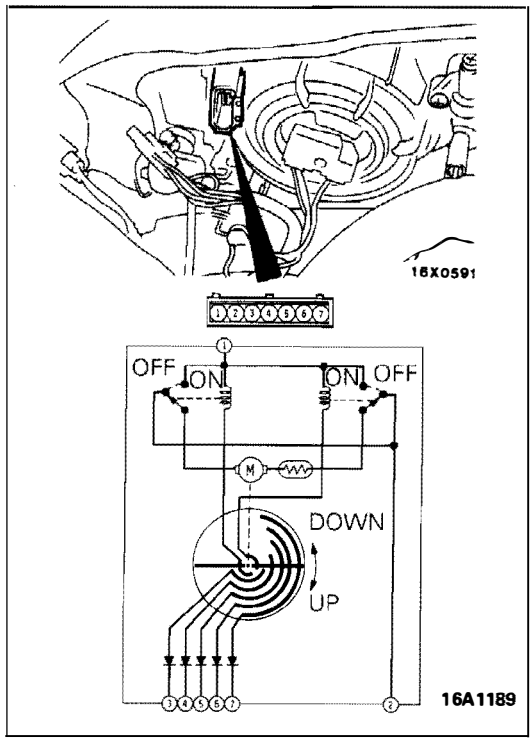
Power is supplied	1–3 terminals	Continuity
Power is not supplied	1–3 terminals	No continuity
	2–4 terminals	Continuity



RESISTOR <R.H. drive vehicles> E54FG02FA

Disconnect the resistor's connector, and then measure the resistance between terminals.

Resistance between terminals: Approx. 1 Ω



HEADLAMP LEVELING UNIT E54FG02GA

Set the switch to "0" before inspecting.

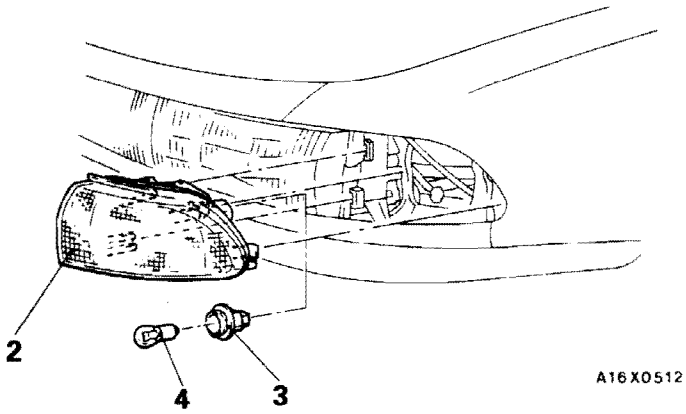
(1) Check to be sure there is no continuity between terminals 1 and 2.
(2) Connect terminal 1 to the battery and connect terminal 2 to earth.
(3) Check to make sure the motor is activated (headlamp reflector operates) for 0.6 to 1.0 second when terminals 4, 5, 6 and 7 are connected to earth in this order.
(4) Next, check to make sure the motor is activated [headlamp reflector operates in reverse order of (3) above] for 0.6 to 1.0 second when terminals 6, 5, 4 and 3 are connected to earth in this order.
(5) If the headlamp leveling unit is defective, replace the entire headlamp assembly.

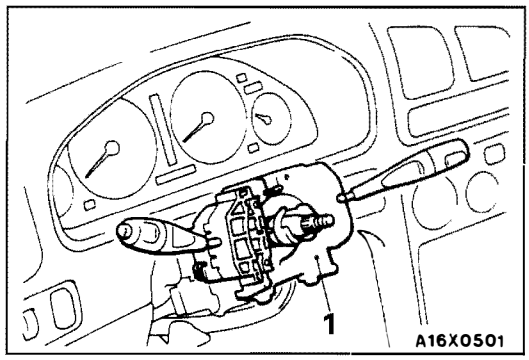
FRONT TURN-SIGNAL LAMP

E54FG10AA

REMOVAL AND INSTALLATION

CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



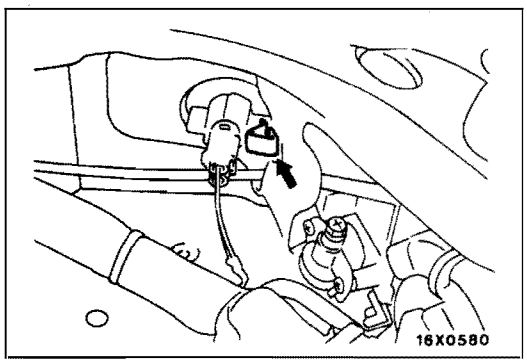


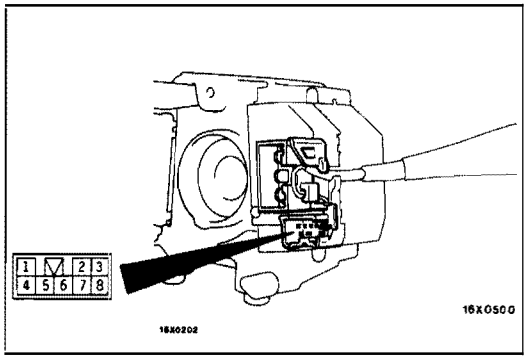
Column switch removal step

1. Column switch <Turn-signal lamp switch> (Refer to GROUP 51 – Windshield Wiper and Washer)

Front turn-signal lamp removal steps

〈A〉 2. Front turn-signal lamp
3. Bulb socket
4. Bulb





REMOVAL SERVICE POINT

E54FG11AA

〈A〉 FRONT TURN-SIGNAL LAMP REMOVAL

Remove the front turn-signal lamp setting hooks, and remove the front turn-signal lamp by pulling it towards the front of the vehicle.

INSPECTION

E54FG12AA

TURN-SIGNAL LAMP SWITCH

Terminal No. / Switch position	5	7	8
RH	○		○
OFF			
LH		○	○

NOTE
○—○ indicates that there is continuity between the terminals.

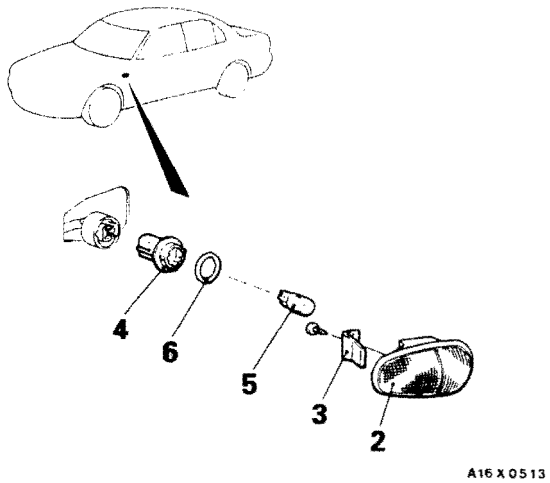
PWDE9211

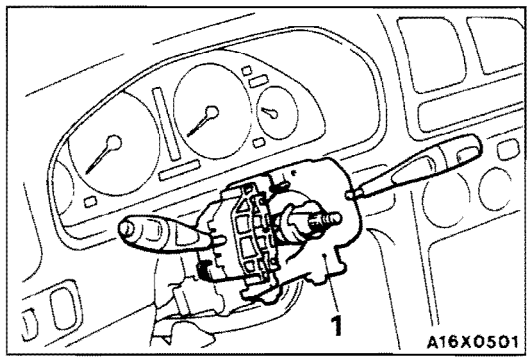
SIDE TURN-SIGNAL LAMP

E54FG20AA

REMOVAL AND INSTALLATION

CAUTION:SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



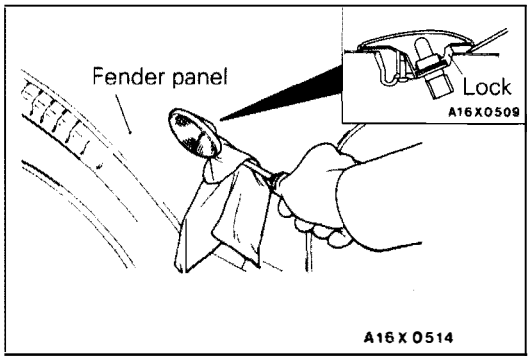


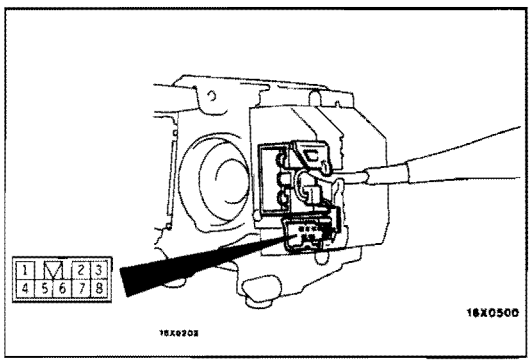
Side turn-signal lamp removal steps

◇A◇ ◆A◆ 2. Side turn-signal lamp
3. Hook
4. Bulb socket
5. Bulb
6. Packing

Column switch removal step

1. Column switch <Turn-signal lamp switch> (Refer to GROUP 51 – Windshield Wiper and Washer)





REMOVAL SERVICE POINT

E54FG21AA

◇A◇ SIDE TURN-SIGNAL LAMP REMOVAL

Use a flat-tipped screwdriver or similar tool to remove the lock from the fender panel, and then remove the side turn-signal lamp.

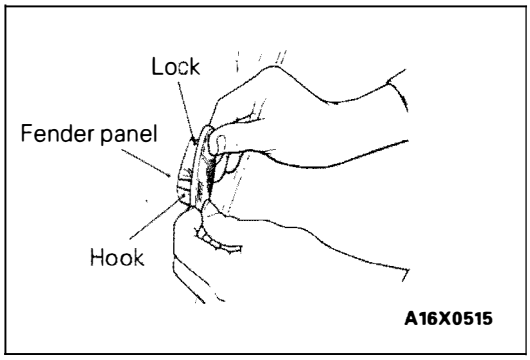
INSPECTION

E54FG22AA

TURN-SIGNAL LAMP SWITCH

Terminal No. / Switch position	5	7	8
RH	○		○
OFF			
LH		○	○

NOTE
○—○ indicates that there is continuity between the terminals.



INSTALLATION SERVICE POINT E54FG24AA

◆A◆ SIDE TURN-SIGNAL LAMP INSTALLATION

(1) Fit the lock into the fender panel.
(2) Push the side turn-signal lamp into the fender, and secure it with the hook.

FRONT FOG LAMP

E54FC30AA

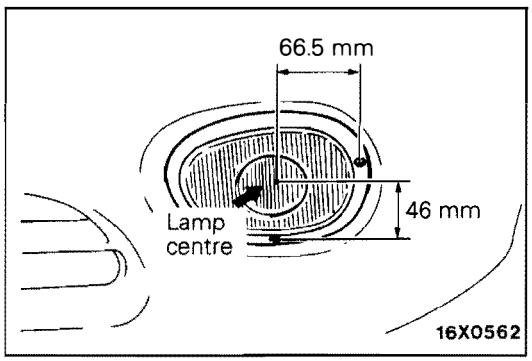
SERVICE SPECIFICATIONS

Items	Specifications
Standard value	
Front fog lamp aiming	
Vertical direction	100 mm below horizontal (H)
Horizontal direction	Parallel to direction of vehicle travel

SPECIAL TOOL

E54FD30AA

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of instrument panel switch

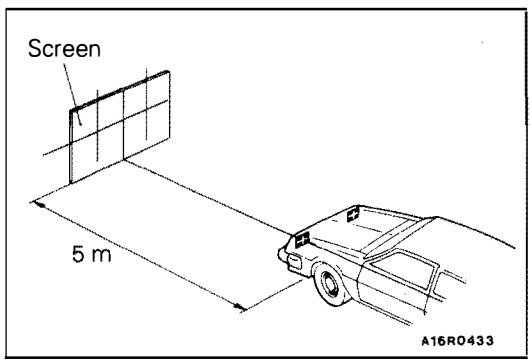


SERVICE ADJUSTMENT PROCEDURES

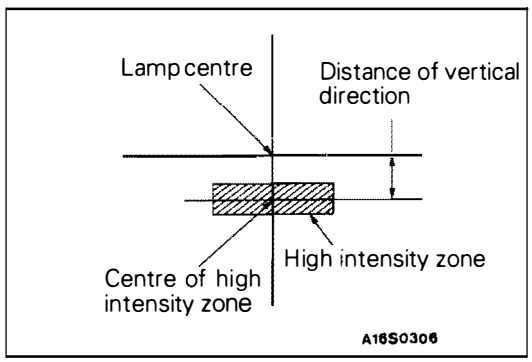
FRONT FOG LAMP AIMING

E54FF30AA

(1) Measure the centre of the fog lamps, as shown in the illustration.

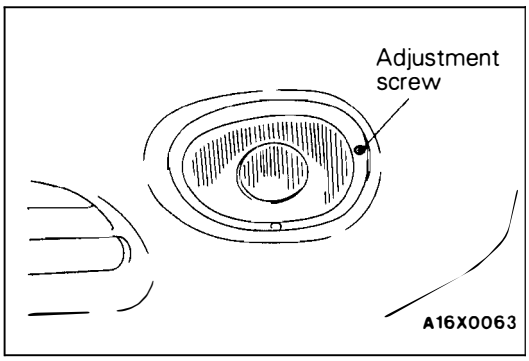


(2) Set the distance between the screen and the centre of the fog lamps as shown in the illustration.
(3) Inflate the tyres to the specified pressures and there should be no other load in the vehicles other than driver or substituted weight of approximately 75 kg placed in the driver's position.
(4) With the engine running at 2,000 r/min., aim the fog lamp.



(5) Check if the beam shining onto the screen is at the standard value.

Standard value:
(Vertical direction)
100 mm below horizontal (H)
(Horizontal direction)
Parallel to direction of vehicle travel



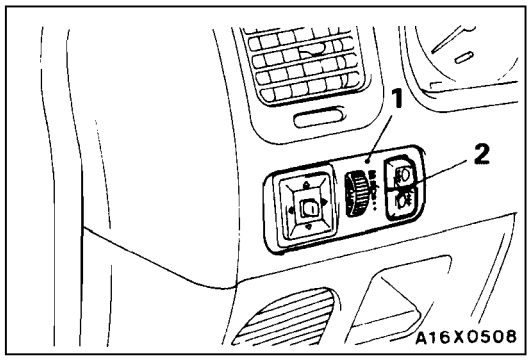
NOTE
The horizontal direction is non-adjustable. If the deviation of the light beam axis exceeds the standard value, check to be sure that the mounting location or some other point is not defective.

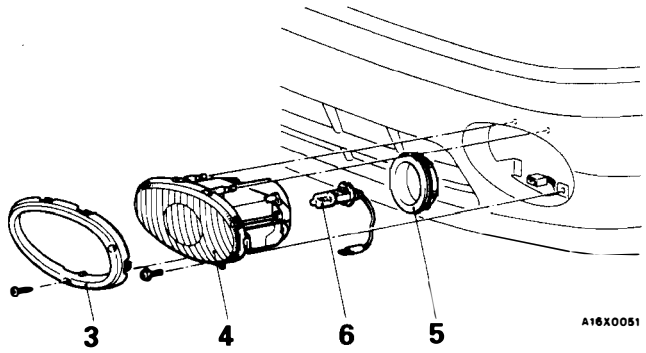
Caution
When making the aiming adjustment, be sure to mask those lamps which are not being adjusted.

FRONT FOG LAMP

E54FG30AA

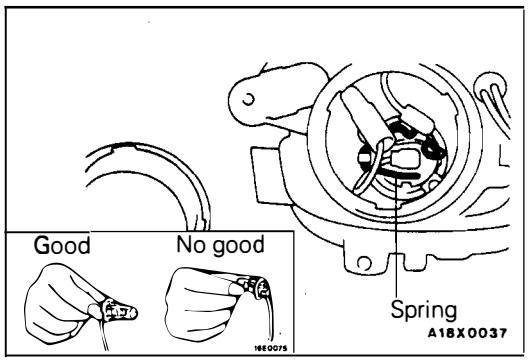
REMOVAL AND INSTALLATION





Front fog lamp switch removal steps
1. Instrument panel switch
2. Front and rear fog lamp switch

Front fog lamp removal steps
3. Fog lamp bezel
4. Fog lamp
◆A◆ 5. Socket cover
〈A〉 6. Bulb



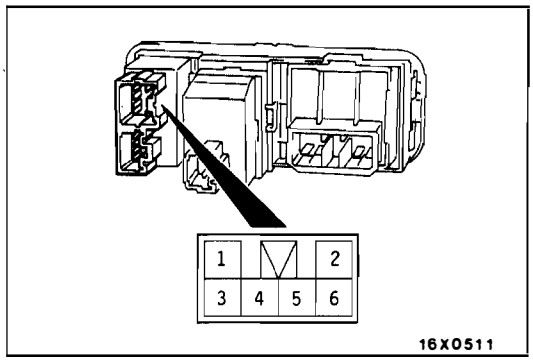
REMOVAL SERVICE POINT

E54FG31AA

〈A〉 BULB REMOVAL

Remove the bulb attachment spring and pull out the bulb.

Caution
Do not touch the surface of the bulb with hands or dirty gloves. If the surface does become dirty, clean it with alcohol or thinner, and let it dry thoroughly before installing.



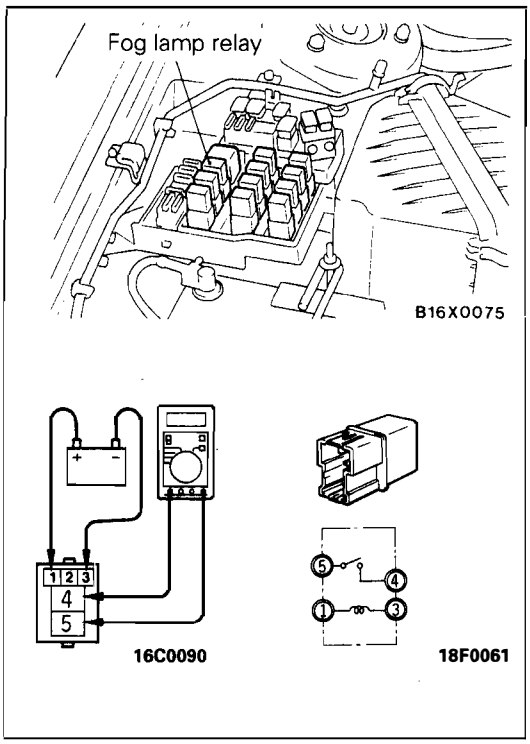
INSPECTION

FRONT FOG LAMP SWITCH

E54FG32AA

Terminal No. / Switch position	1		2	3	4	5	6
OFF		ILL					
ON		ILL					

NOTE
○—○ indicates that there is continuity between the terminals.



FRONT FOG LAMP RELAY

E54FG32BA

Apply battery voltage to terminal 1, and check the continuity between the terminals when terminal 3 is earthed.

Power is supplied	4–5 terminals	Continuity
Power is not supplied	4–5 terminals	No continuity
	1–3 terminals	Continuity

INSTALLATION SERVICE POINT

E54FG34AA

◆A◆ SOCKET COVER INSTALLATION

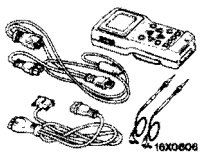
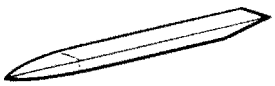
Install the socket cover securely.

Caution
If the socket cover is not securely installed, the lens will be out of focus, or water will get inside the lamp unit, so the socket cover should be securely installed.

REAR COMBINATION LAMP, REAR LID LAMP

E54FD40AA

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	ETACS-ECU input signal checking
 16X0607	(For the number, refer to GROUP 00 – Precautions Before Service.)	ROM pack	
	MB990784	Ornament remover	Removal of instrument panel switch

TROUBLESHOOTING

E54FE40AA

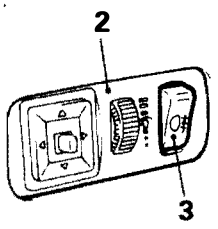
For troubleshooting for the light reminder warning buzzer, refer to P.54-28.

REAR COMBINATION LAMP, REAR LID LAMP

E54FG40AA

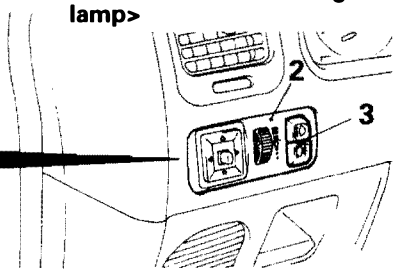
REMOVAL AND INSTALLATION

<Vehicles without rear fog lamp>



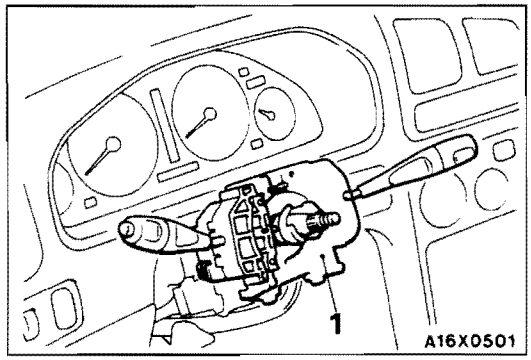
A16X0507

<Vehicles with rear fog lamp>



A16X0508

CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.



A16X0501

Rear combination lamp removal steps

4. Lamp lid A <Hatchback>
5. Socket holder/bulb assembly <Sedan>
6. Bulb <Hatchback>
◇A◇ 7. Rear combination lamp
8. Gasket A

Rear lid lamp removal steps

9. Lamp lid B <Hatchback>
10. Socket holder/bulb assembly <Sedan>
11. Bulb socket <Hatchback>
12. Bulb <Hatchback>
- Trunk lid trim (Refer to GROUP 52A – Trim) <Sedan>

13. Rear lid lamp
14. Gasket B

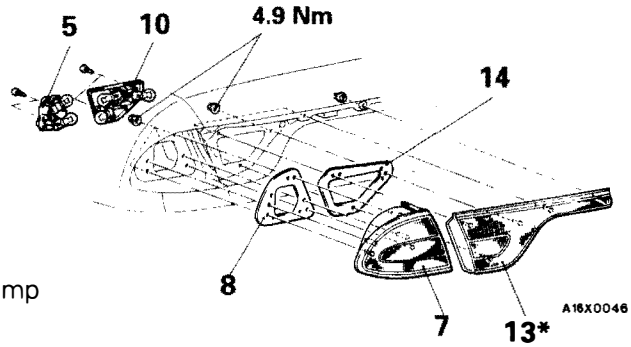
Rear fog lamp switch removal steps

2. Instrument panel switch
3. Rear fog lamp switch or front and rear fog lamp switch

Column switch removal step

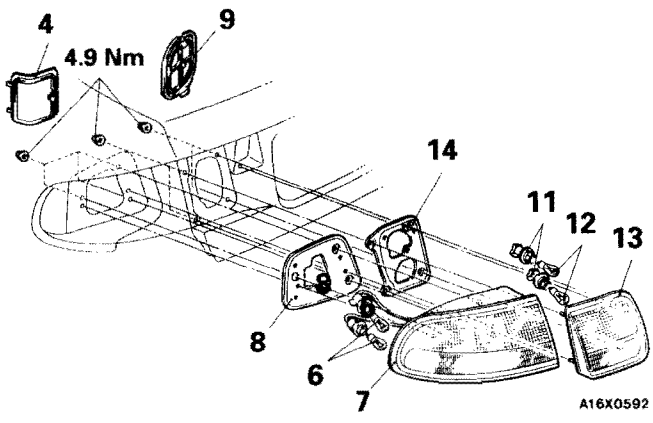
1. Column switch <Lighting switch and turn-signal lamp switch> (Refer to GROUP 51 – Windshield Wiper and Washer.)

<Sedan>



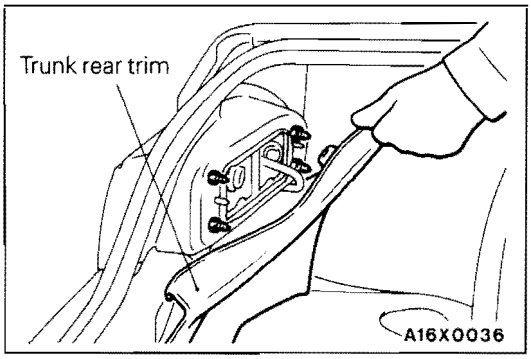
A16X0046

<Hatchback>



A16X0592

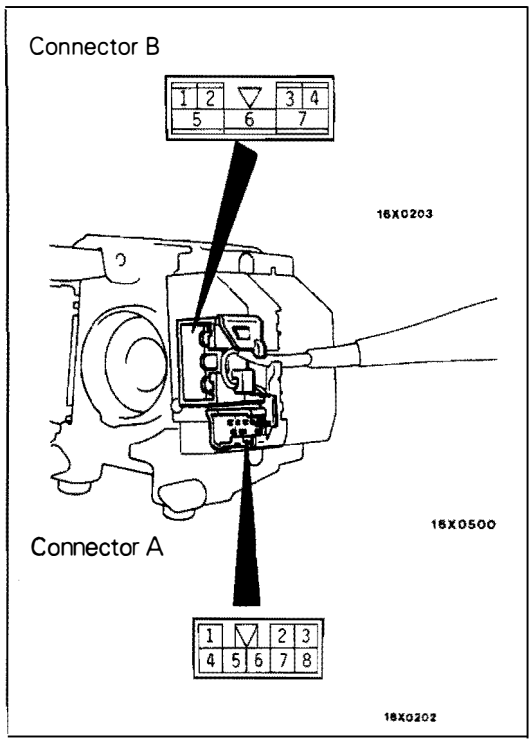
NOTE
The rear lid lamp <Sedan> marked with * is shown for the left side only. Installation positions for the right and left are symmetrical.



REMOVAL SERVICE POINT E54FG41AA

◇A◇ REAR COMBINATION LAMP REMOVAL <Sedan>

Remove the clip, pull the trunk rear trim into the passenger compartment as shown in the figure, and remove the mounting nuts.

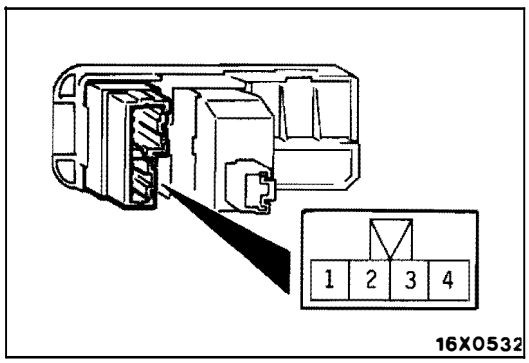


INSPECTION E54FG42AA

LIGHTING SWITCH AND TURN-SIGNAL LAMP SWITCH

Switch position		Terminal No. Connector A 2	3	4	Connector B 5	7	8
LIGHTING SWITCH	OFF						
	TAIL	○		○			
	HEAD	○	○	○			
TURN-SIGNAL LAMP SWITCH	RH				○		○
	OFF						
	LH					○	○

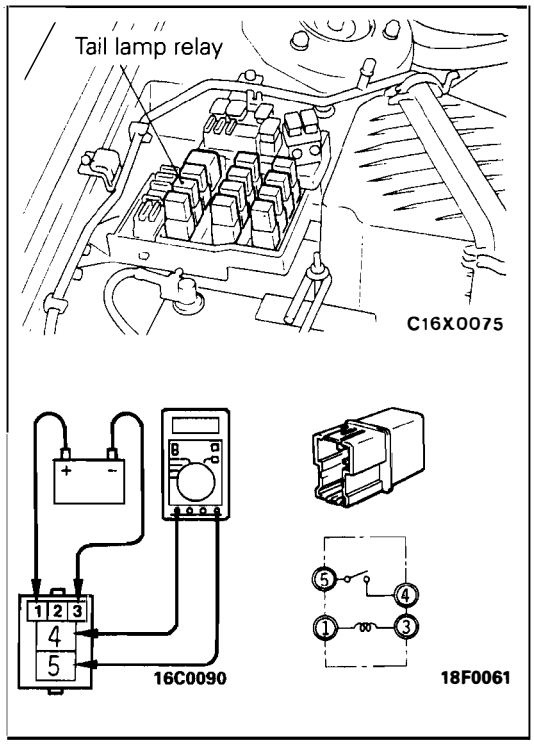
NOTE
○—○ indicates that there is continuity between the terminals.



REAR FOG LAMP SWITCH E54FG42BA

Switch position	Terminal No. 1	2	3		4
OFF			○	ILL	○
ON	○	○	○	ILL	○

NOTE
○—○ indicates that there is continuity between the terminals.



TAIL LAMP RELAY

E54FG42CA

Apply battery voltage to terminal 1, and check the continuity between the terminals when terminal 3 is earthed.

Power is supplied	4–5 terminals	Continuity
Power is not supplied	4–5 terminals	No continuity
	1–3 terminals	Continuity

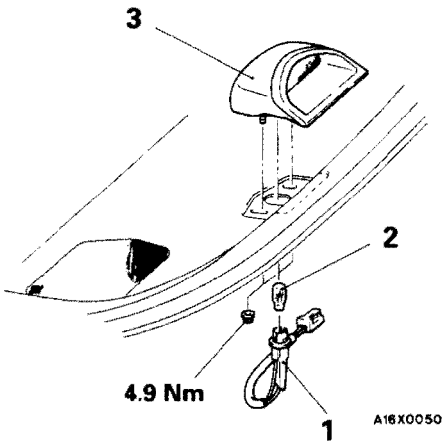
HIGH MOUNTED STOP LAMP

E54FG50AA

REMOVAL AND INSTALLATION

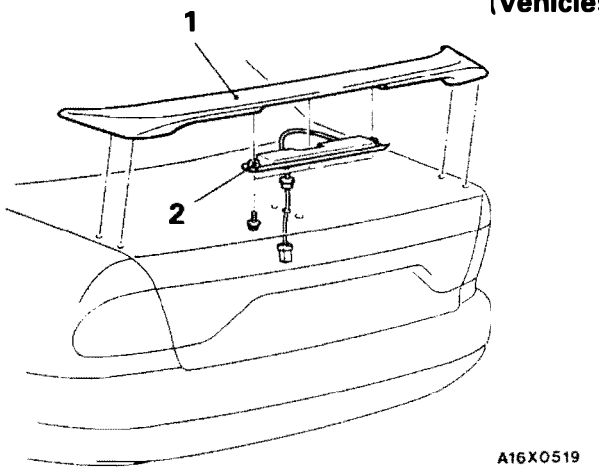
<Sedan>

(Vehicles with rear shelf type)



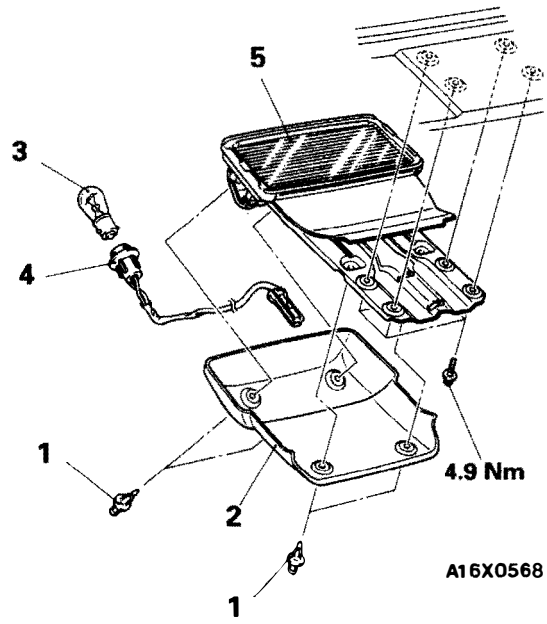
Removal steps
1. Socket assembly
2. Bulb
3. High mounted stop lamp

(Vehicles with rear spoiler type)



Removal steps
1. Rear spoiler (Refer to GROUP 51 – Aero parts)
2. High mounted stop lamp

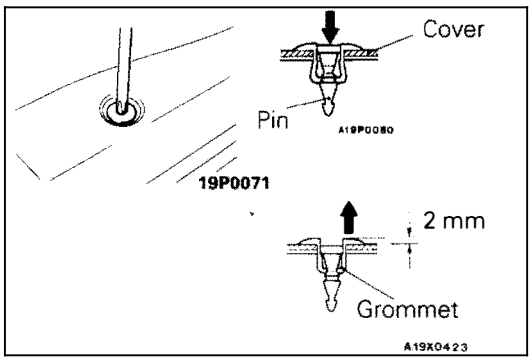
<Hatchback>

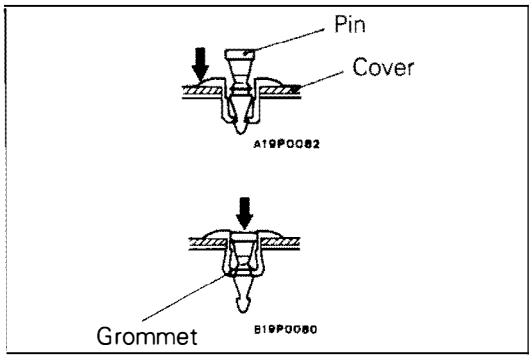


Removal steps

〈A〉 ▶A◀
1. Clip
2. Cover
3. Bulb
- Tailgate trim lower (Refer to GROUP 52A – Trim)

4. Socket assembly
5. High mounted stop lamp





REMOVAL SERVICE POINTS E54FG51AA

〈A〉 CLIP REMOVAL

(1) Use a cross-tip (+) screwdriver to push inward the pin (at the center of the clip) to a depth of about 2 mm.
(2) Pull the clip outward to remove it.

Caution
Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, if pushed too far.

INSTALLATION SERVICE POINT E54FG54AA

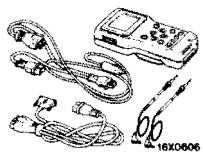
◆A◆ CLIP INSTALLATION

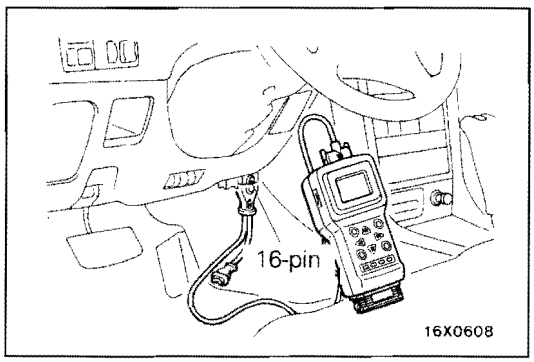
(1) With the pin pulled out, insert the clip into the hole in the cover.
(2) Push the pin inward until the pin's head is flush with the grommet.
(3) Check whether the cover is secure.

INTERIOR LAMP

E54FD60AA

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	ETACS-ECU input signal checking
 16X0607		ROM pack	
	(For the number, refer to GROUP 00 – Precautions Before Service.)		



TROUBLESHOOTING

E54FE60AA

DIAGNOSIS FUNCTION

INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

1 Connect the MUT-II to the diagnosis connector.
2 If buzzer of the MUT-II sounds once when a switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

INSPECTION CHART FOR TROUBLE SYMPTOMS

E54FE61AA

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	P. 54-52
	Communication with one-shot pulse input signal only is not possible.	2	P. 54-52
While the room lamp is dimmed, the ignition key is turned to the ON position but the room lamp does not switch off. (However, it switches off after dimming.)		3	P. 54-52
When the room lamp switch is in the DOOR position, any door is opened but the room lamp does not illuminate.		4	P. 54-53
Even if all doors are closed, the room lamp switches off immediately and does not become dimmed.		5	P. 54-53
When the room lamp switch is in the DOOR position, all doors are closed but the room lamp remains illuminated. (However, the room lamp switches off when the room lamp switch is turned to the OFF position.)		6	P. 54-54

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

E54FE62AA

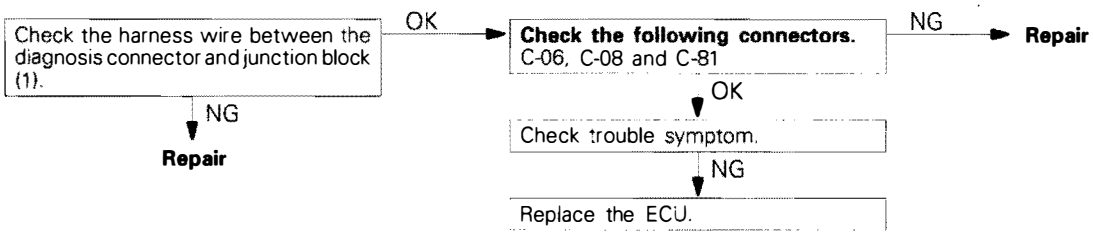
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting.

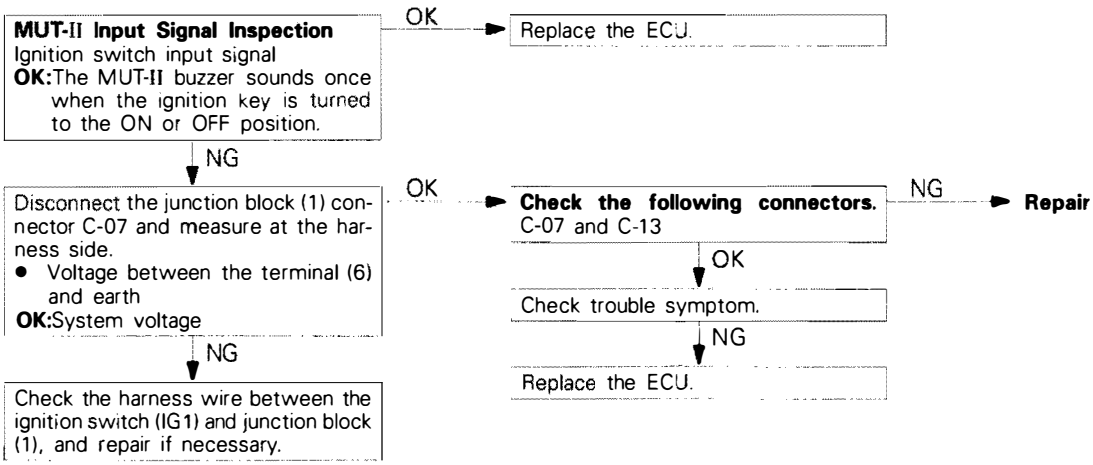
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication with one-shot pulse input signal only is not possible.)	Probable cause
[Comment] The cause probably a defective one-shot pulse input signal circuit system of the diagnosis line.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



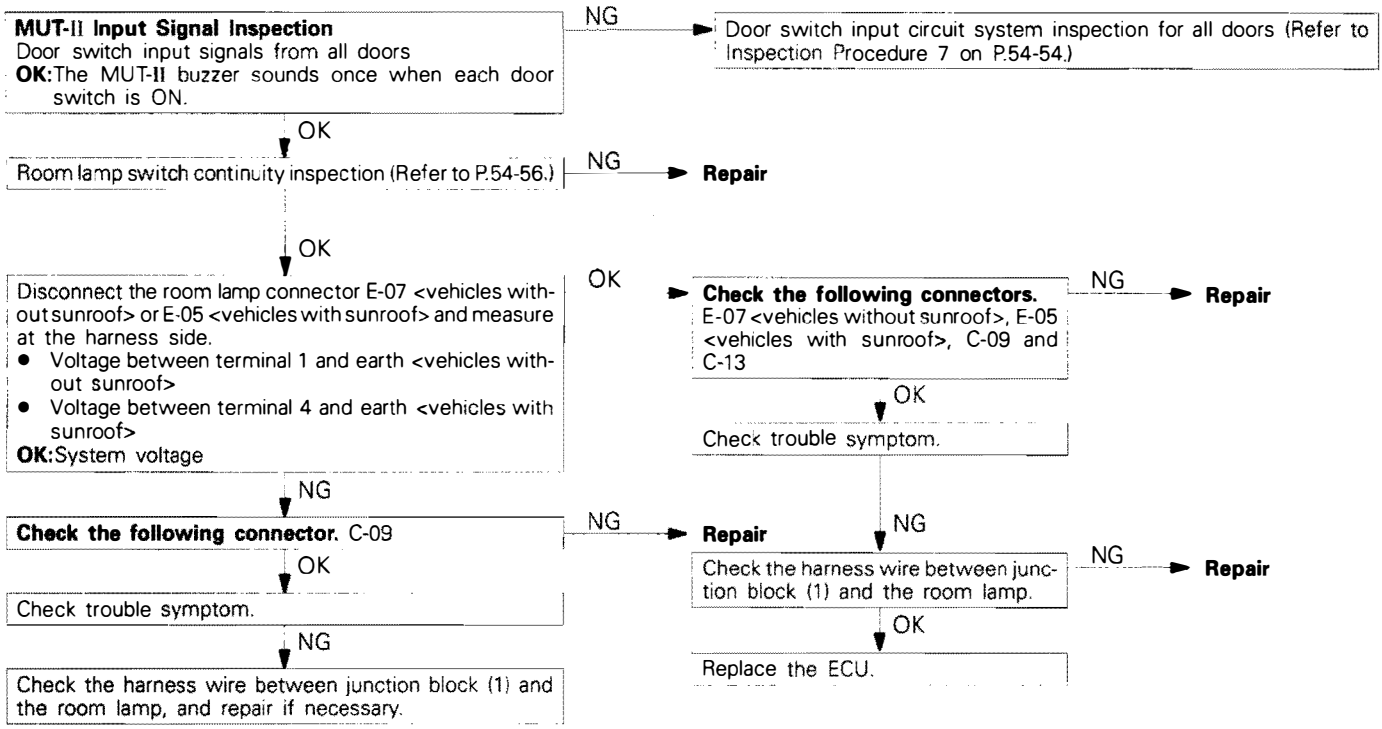
Inspection Procedure 3

While the room lamp is dimmed, the ignition key is turned to the ON position but the room lamp does not switch off. (However, it switches off after dimming.)	Probable cause
[Comment] The cause is probably a defective ignition circuit system or a defective ECU. In addition, if there is a defective fuse, the indicator lamp mechanism inside the combination meter will also become defective, so the cause might also be a harness short.	• Malfunction of fuse • Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



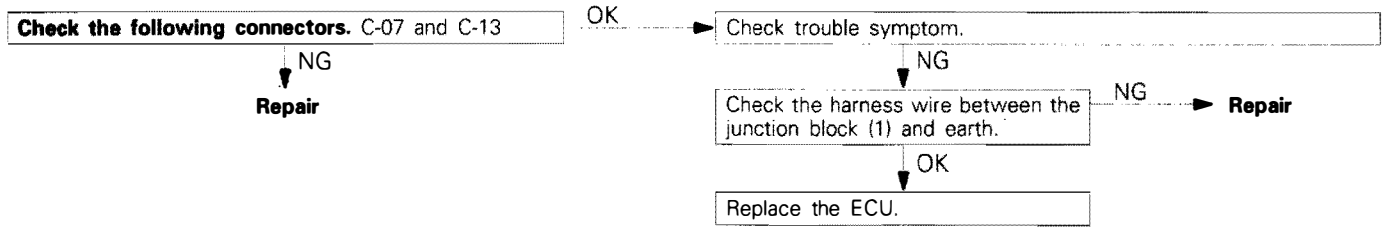
Inspection Procedure 4

When the room lamp switch is in the DOOR position, any door is opened but the room lamp does not illuminate.	Probable cause
[Comment] The cause is probably defective door switch circuit systems in all doors or a defective room lamp illumination circuit system.	• Malfunction of room lamp • Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



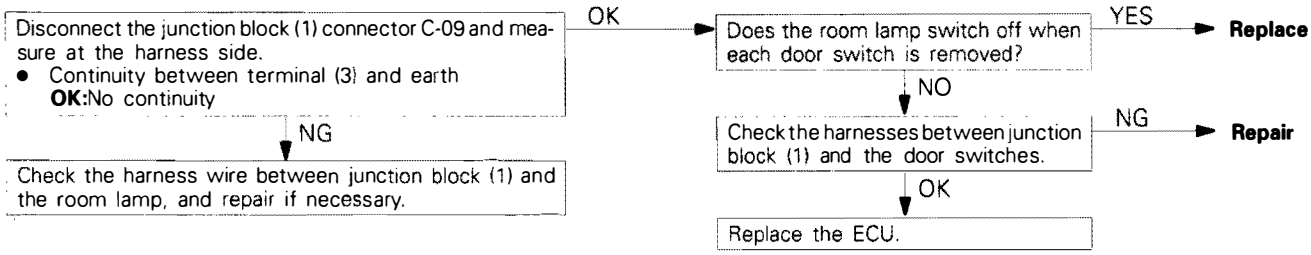
Inspection Procedure 5

Even if all doors are closed, the room lamp switches off immediately and does not become dimmed.	Probable cause
[Comment] The cause is probably a defective earth circuit harness or a defective ECU.	• Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



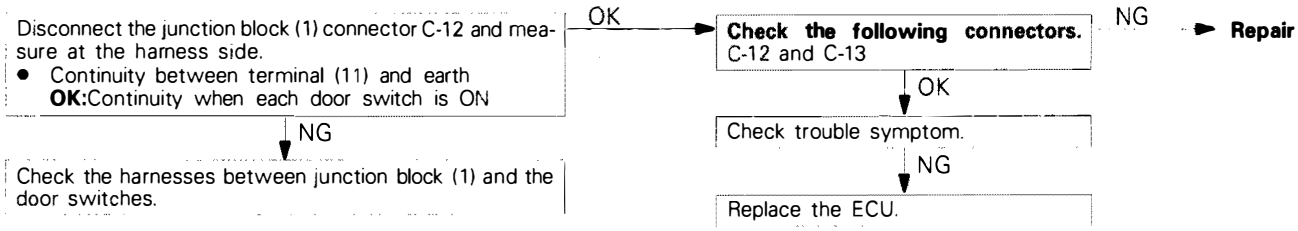
Inspection Procedure 6

When the room lamp switch is in the DOOR position, all doors are closed but the room lamp remains illuminated. (However, the room lamp switches off when the room lamp switch is turned to the OFF position.)	Probable cause
[Comment] The cause is probably a harness short, a defective ECU or a defective door switch in one of the doors.	• Malfunction of door switch • Malfunction of ECU • Malfunction of harness wire



Inspection Procedure 7

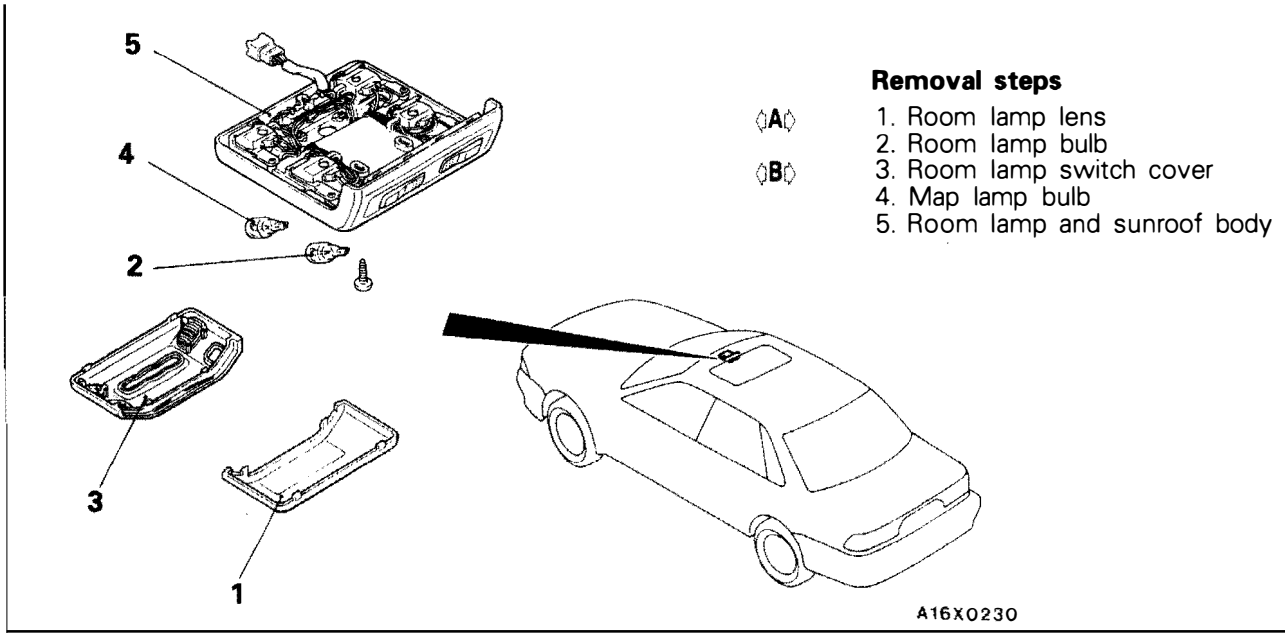
Door switch input circuit system inspection for all doors



INTERIOR LAMP

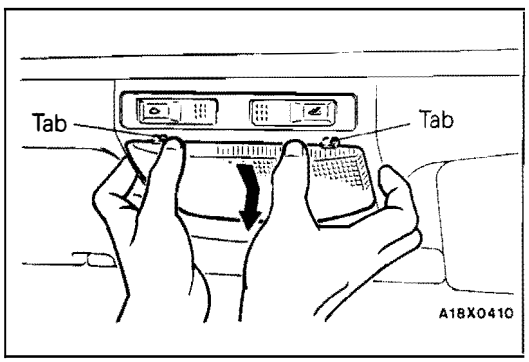
E54FG60AA

REMOVAL AND INSTALLATION <Vehicles With Sunroof>



Removal steps

〈A〉 1. Room lamp lens
2. Room lamp bulb
〈B〉 3. Room lamp switch cover
4. Map lamp bulb
5. Room lamp and sunroof body

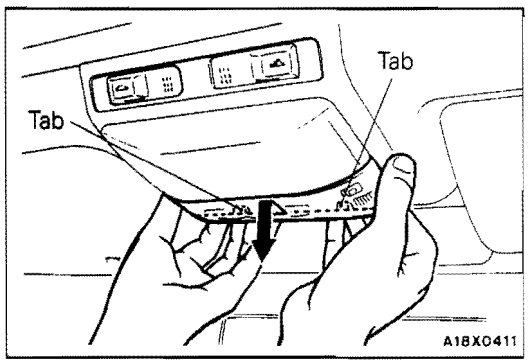


REMOVAL SERVICE POINTS

E54FG61AA

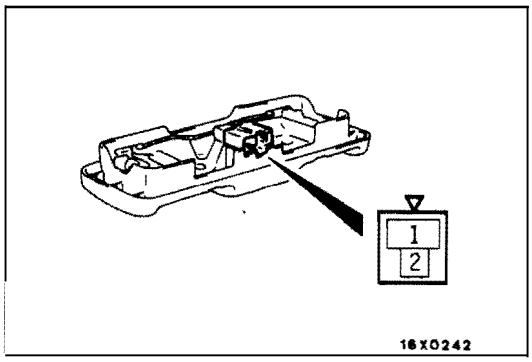
〈A〉 ROOM LAMP LENS REMOVAL

To remove, press the room lamp tab while pulling downwards.



〈B〉 ROOM LAMP SWITCH COVER REMOVAL

To remove, press the room lamp switch cover tab while pulling downwards.



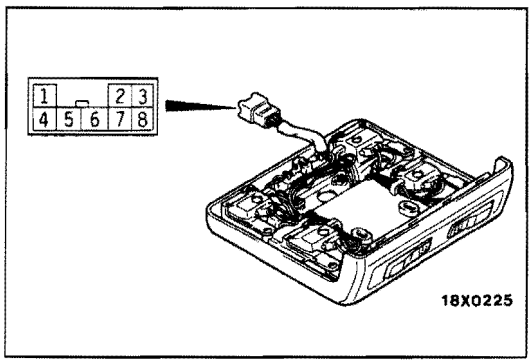
INSPECTION

E54FG62AA

ROOM LAMP SWITCH <Vehicles Without Sunroof>

Switch position \ Terminal No.	1	2
OFF		
ON	○—⏚ Body earth	
DOOR	○—	—○

NOTE
○—○ indicates that there is continuity between the terminals.



<Vehicles With Sunroof>

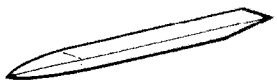
Switch position \ Terminal No.	1	4
OFF		
ON	○—⏚ Body earth	
DOOR	○—	—○

NOTE
○—○ indicates that there is continuity between the terminals.

RHEOSTAT

E54GD00AA

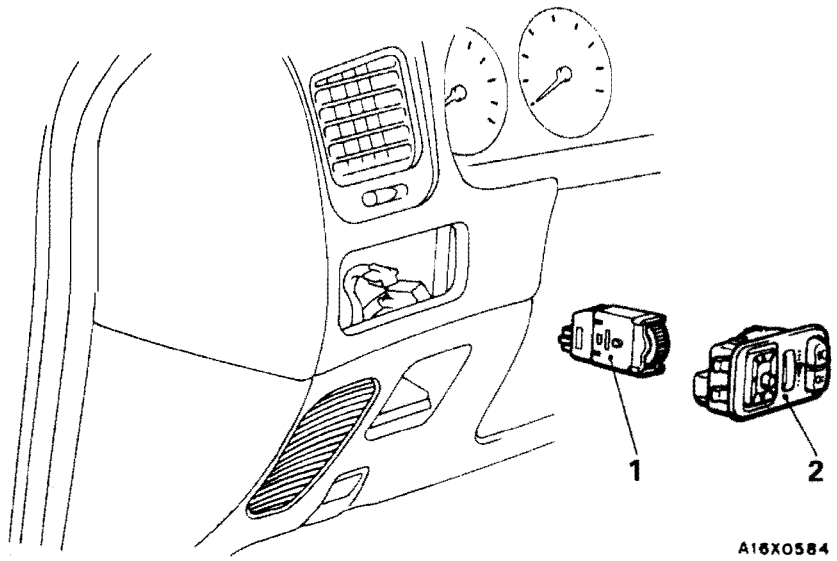
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of instrument panel switch

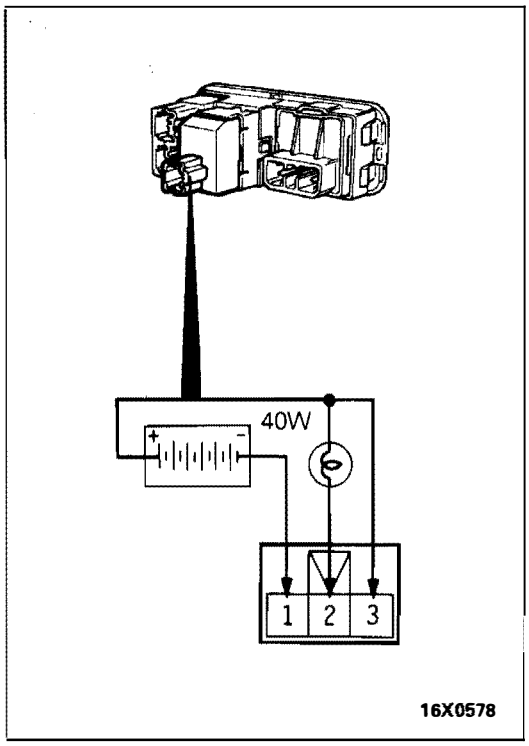
RHEOSTAT

E54GG00AA

REMOVAL AND INSTALLATION



Removal steps
1. Instrument panel switch
2. Rheostat



INSPECTION

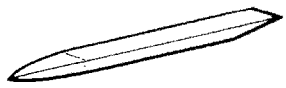
E54GG02AA

(1) Connect the battery and the test bulb (40W) as shown in the illustration.
(2) Operate the rheostat, and if the brightness changes smoothly without switching off, then the rheostat function is normal.

HAZARD LAMP SWITCH

E54HD00AA

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of air outlet center assembly

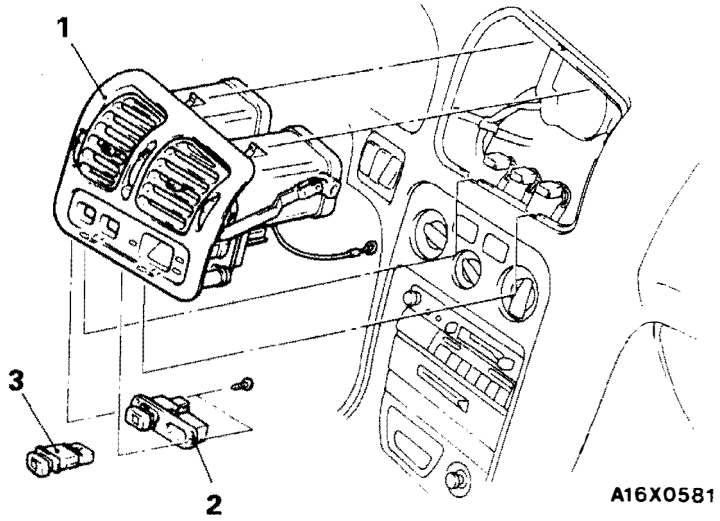
HAZARD LAMP SWITCH

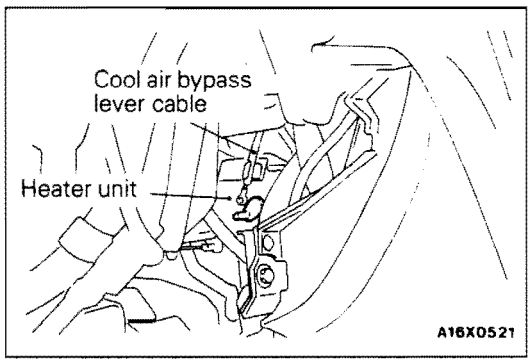
E54HG00AA

REMOVAL AND INSTALLATION

Removal steps

◇A◇ ◆A◆ 1. Air outlet centre assembly
2. Switch case
3. Hazard lamp switch



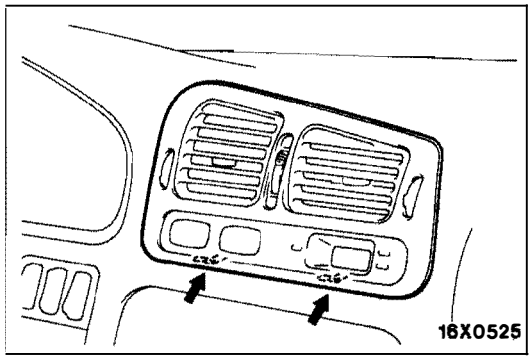


REMOVAL SERVICE POINTS

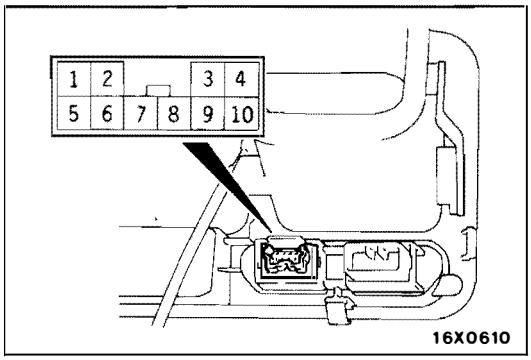
E54HG01AA

◇A◇ **AIR OUTLET CENTER ASSEMBLY REMOVAL**

(1) Remove the cool air bypass lever cable of the air outlet center assembly at the heater unit side.



(2) Push the springs upwards and remove the air outlet center assembly.

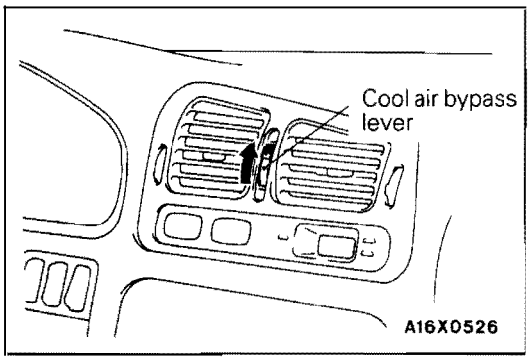


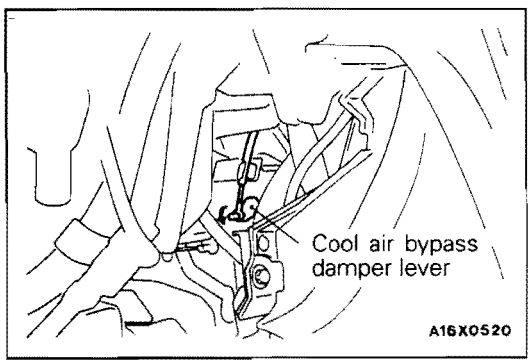
INSPECTION

E54HG02AA

Terminal No. / Switch position	1	2	3	4	5	6	7	8	9		10
OFF					○	○		○	○	ILL	○
ON	○	○	○	○	○	○			○	ILL	○

NOTE
○—○ indicates that there is continuity between the terminals.





INSTALLATION SERVICE POINTS

E54HG04AA

◆A◆ AIR OUTLET CENTER ASSEMBLY INSTALLATION

(1) Install the air outlet center assembly to the instrument panel.
(2) Turn the cool air bypass lever of the air outlet center assembly fully upward (in the direction of the arrow).

(3) Turn the cool air bypass damper lever at the heater unit side fully downward (in the direction of the arrow), and install the cool air bypass lever cable.

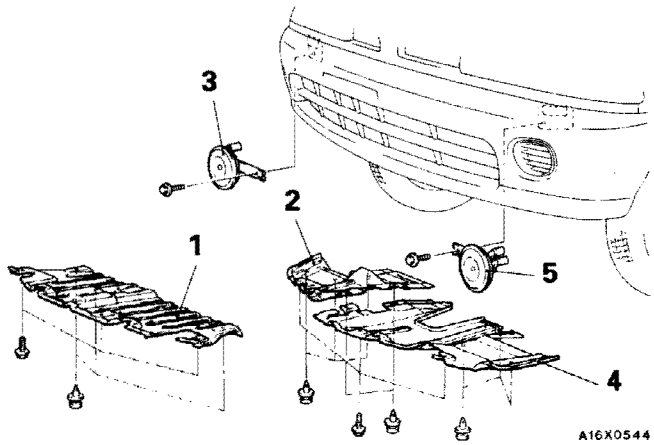
HORN

E54IG00AA

REMOVAL AND INSTALLATION

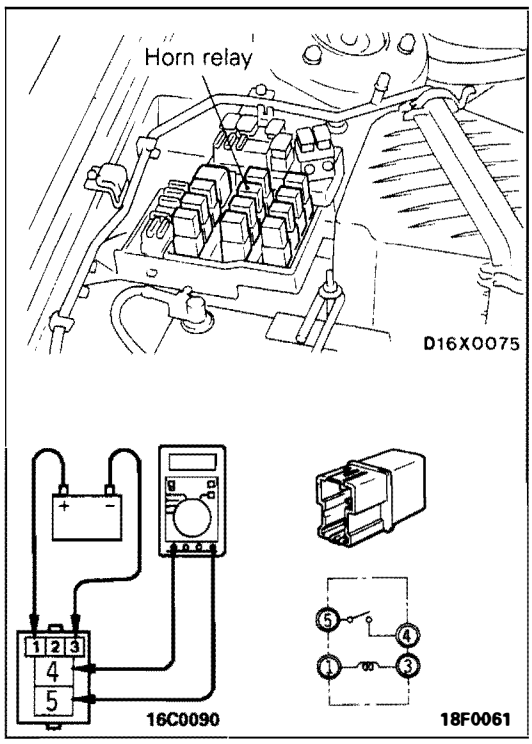
Removal steps

1. Front under cover panel <Diesel-powered vehicles>
2. Front under cover panel (RH) <Petrol-powered vehicles>
3. Horn (RH)
4. Front under cover panel (LH) <Petrol-powered vehicles>
5. Horn (LH)



<Diesel-powered vehicles>

<Petrol-powered vehicles>



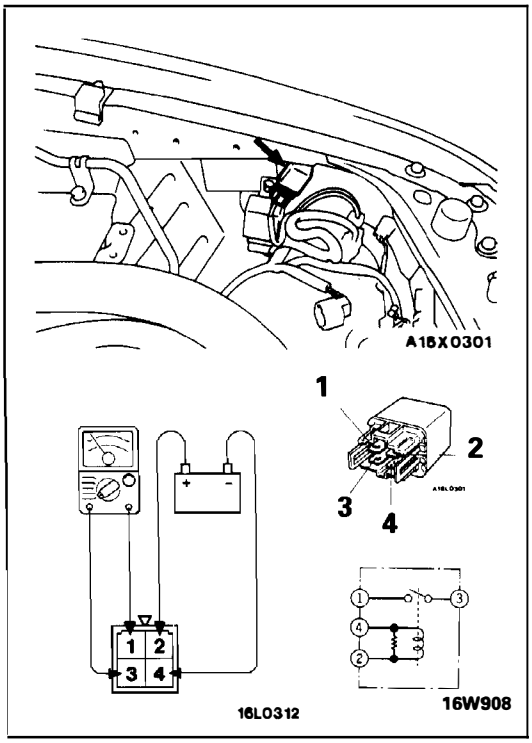
INSPECTION

E54IG02AB

HORN RELAY <Vehicles with SRS>

Apply battery voltage to terminal 1, and check the continuity between the terminals when terminal 3 is earthed.

Power is supplied	4–5 terminals	Continuity
Power is not supplied	4–5 terminals	No continuity
	1–3 terminals	Continuity



THEFT-ALARM HORN RELAY <Vehicles with theft-alarm system>

Apply battery voltage to terminal 2, and check the continuity between the terminals when terminal 4 is earthed.

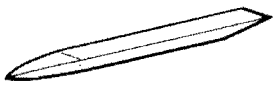
Power is supplied	1–3 terminals	Continuity
Power is not supplied	1–3 terminals	No continuity
	2–4 terminals	Continuity

NOTES

CIGARETTE LIGHTER

E54JD00AA

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of center console panel

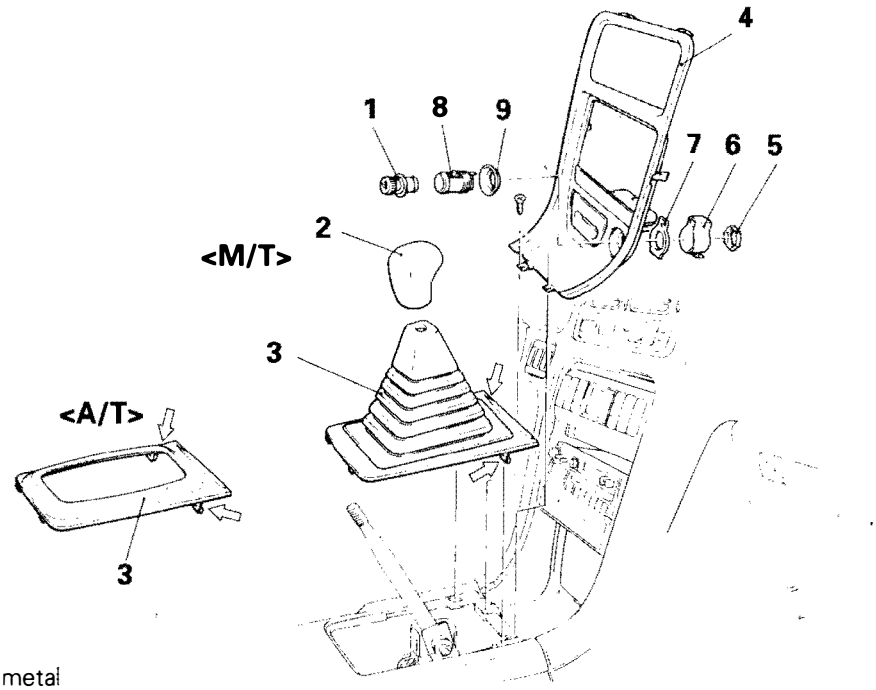
CIGARETTE LIGHTER

E54JG00AA

REMOVAL AND INSTALLATION

Removal steps

1. Plug
2. Shift lever knob
3. Shift lever panel
4. Centre console panel
5. Fixing ring
6. Socket case
7. Plate
8. Socket
9. Protector



NOTE
The⇦ mark indicates the sheet metal clip position.

A16X0530

INSPECTION

E54JG02AA

- Take out the plug, and check for a worn edge on the element spot connection, and for shreds of tobacco or other material on the element.
- Using a circuit tester, check the continuity of the element.

CAUTIONS FOR USE OF THE CIGARETTE LIGHTER SOCKET AS AUXILIARY POWER SOURCE

E54JG02BA

1. **When using a "plug-in" type of accessory, do not use anything with a load of more than 120W.**
2. **It is recommended that only the lighter be inserted in the receptacle.**

   Use of "plug-in" type accessories may damage the receptacle and result in poor retention of the lighter.
3. **The specified load should be strictly observed, because overloaded cord burns the ignition switch and harness.**

CLOCK

E54KD00AA

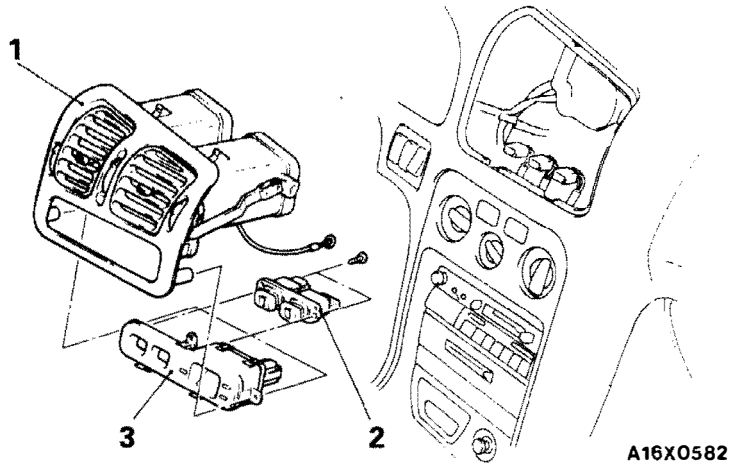
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of air outlet center assembly

CLOCK

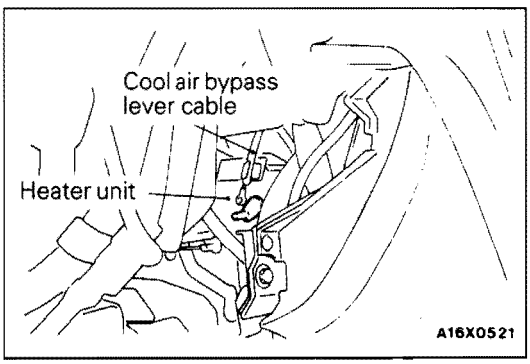
E54KG00AA

REMOVAL AND INSTALLATION



Removal steps

◇A◇ ◆A◆ 1. Air outlet center assembly
2. Center switch assembly
3. Clock

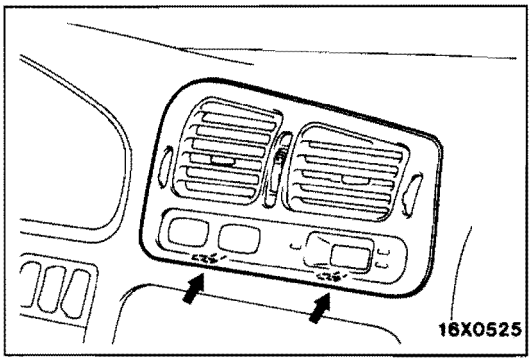


REMOVAL SERVICE POINTS

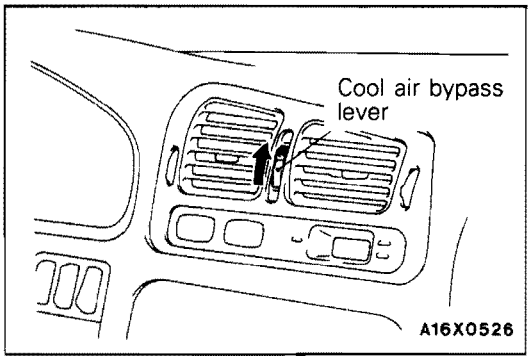
E54KG01AA

◇A◇ AIR OUTLET CENTER ASSEMBLY REMOVAL

(1) Remove the cool air bypass lever cable of the air outlet center assembly at the heater unit side.



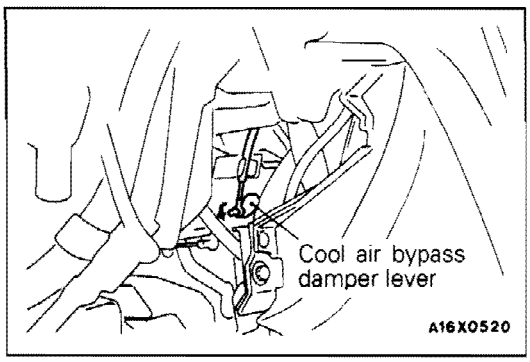
(2) Push the springs upwards and remove the air outlet center assembly.



INSTALLATION SERVICE POINTS E54KG04AA

◆A◆ AIR OUTLET CENTER ASSEMBLY INSTALLATION

(1) Install the air outlet center assembly to the instrument panel.
(2) Turn the cool air bypass lever of the air outlet center assembly fully upward (in the direction of the arrow).

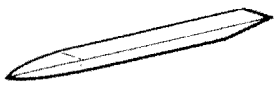


(3) Turn the cool air bypass damper lever at the heater unit side fully downward (in the direction of the arrow), and install the cool air bypass lever cable.

RADIO AND TAPE PLAYER

E54LD00AA

SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of center console panel

TROUBLESHOOTING

E54LE00AA

QUICK-REFERENCE TROUBLESHOOTING CHART

Items	Problem symptom	Relevant chart
Noise	Noise appears at certain places when travelling (AM).	A–1
	Noise appears at certain places when travelling (FM).	A–2
	Mixed with noise, only at night (AM).	A–3
	Broadcasts can be heard but both AM and FM have a lot of noise	A–4
	There is more noise either on AM or on FM.	A–5
	There is noise when starting the engine.	A–6
	Some noise appears when there is vibration or shocks during traveling	A–7
	Noise sometimes appears on FM during traveling.	A–8
	Ever-present noise.	A–9
Radio	When switch is set to ON, no power is available.	B–1
	No sound from one speaker.	B–2
	There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.	B–3
	Insufficient sensitivity.	B–4
	Distortion on AM or on both AM and FM.	B–5
	Distortion on FM only.	B–6
	Too few automatic select stations.	B–7
	Insufficient memory (preset stations are erased).	B–8

NOTE
Refer to problem symptoms of AM radio for LW and MW radio.

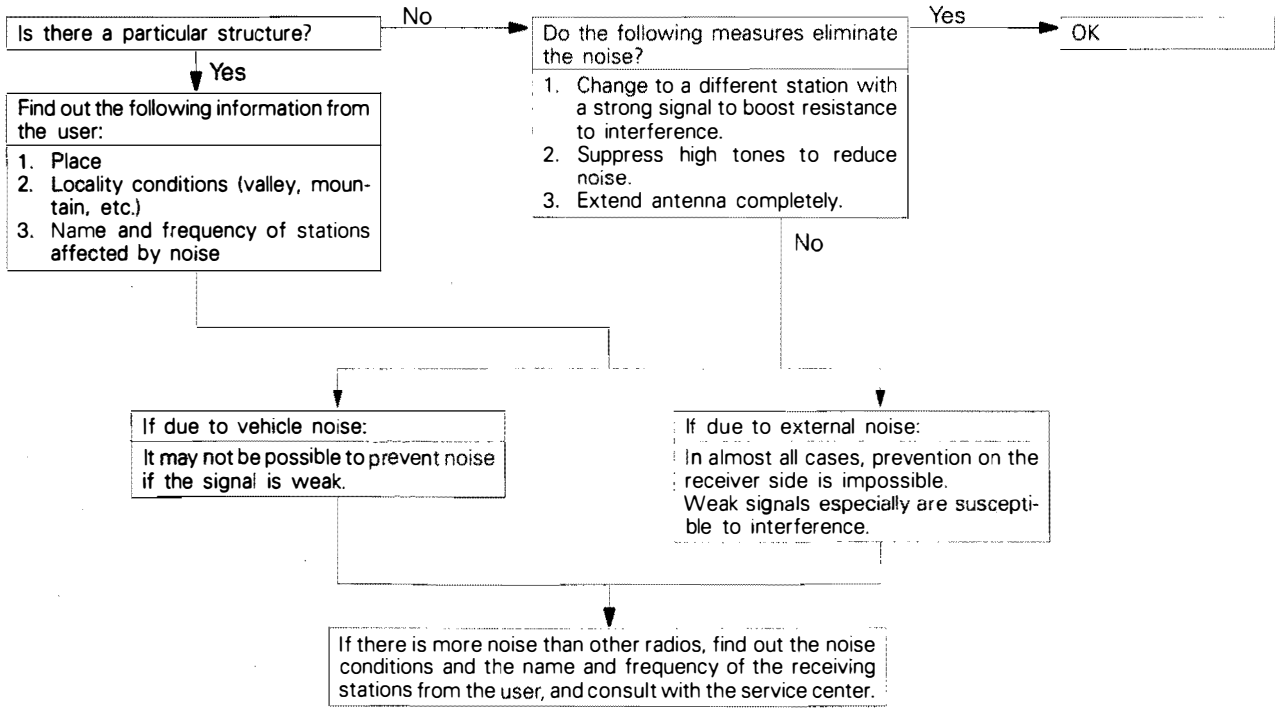
Items	Problem symptom	Relevant chart
Tape player	Cassette tape will not insert.	C–1
	No sound.	C–2
	No sound from one speaker.	C–3
	Sound quality is poor, or sound is weak.	C–4
	Cassette tape will not eject.	C–5
	Uneven revolution. Tape speed is fast or slow.	C–6
	Faulty auto reverse.	C–7
	Tape gets caught in mechanism.	C–8
Motor antenna	Motor antenna won't extend or retract.	D–1
	Motor antenna extends and retracts but does not receive.	D–2

CHART

E54LE01AA

A. NOISE

A–1 Noise appears at certain places when traveling (AM).



A–2	Noise appears at certain places when traveling (FM).

Do the following measures eliminate the noise? → Yes → OK

- Change to a different station with a strong signal to boost resistance to interference.
- Suppress high tones to reduce noise.
- Extend antenna completely.

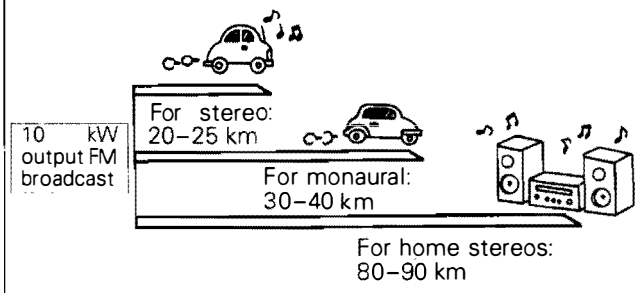
↓ No

If there is more noise than other radios, find out the noise conditions and the name and frequency of the receiving stations from the user, and consult with the service center.

NOTE
About FM waves:
FM waves have the same properties as light, and can be deflected and blocked. Wave reception is not possible in the shadow of obstructions such as buildings or mountains.

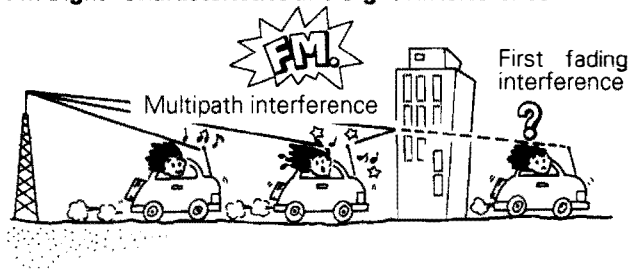
1. The signal becomes weak as the distance from the station's transmission antenna increases. Although this may vary according to the signal strength of the transmitting station and intervening geographical formation or buildings, the area of good reception is approx. 20–25 km for stereo reception, and 30–40 km for monaural reception.
2. The signal becomes weak when an area of shadow from the transmitting antenna (places where there are obstructions such as mountains or buildings between the antenna and the car), and noise will appear. <This is called first fading, and gives a steady buzzing noise.>
3. If a direct signal hits the antenna at the same time as a signal reflected by obstructions such as mountains or buildings, interference of the two signals will generate noise. During travelling, noise will appear each time the vehicle's antenna passes through this kind of obstructed area. The strength and interval of the noise varies according to the signal strength and the conditions of deflection. <This is called multipath noise, and is a repetitious buzzing.>
4. Since FM stereo transmission and reception has a weaker field than monaural, it is often accompanied by a hissing noise.

FM Broadcast Good Reception Areas



16A0663

FM Signal Characteristics and Signal Interference

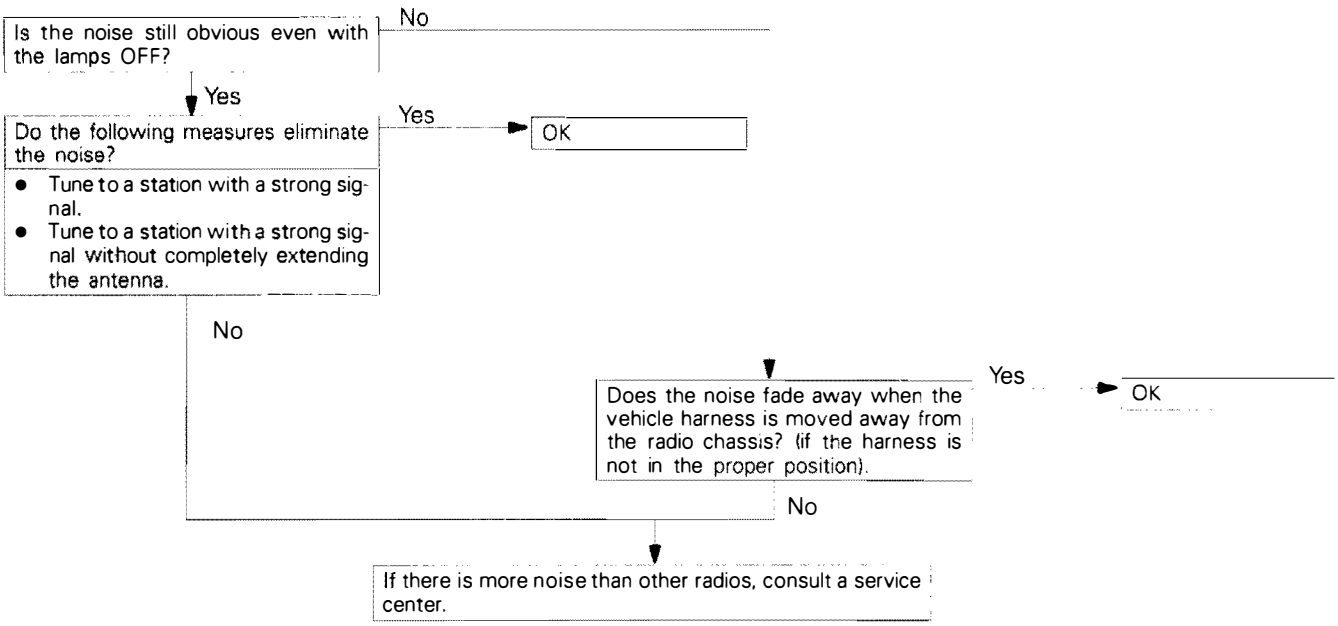


16A0664

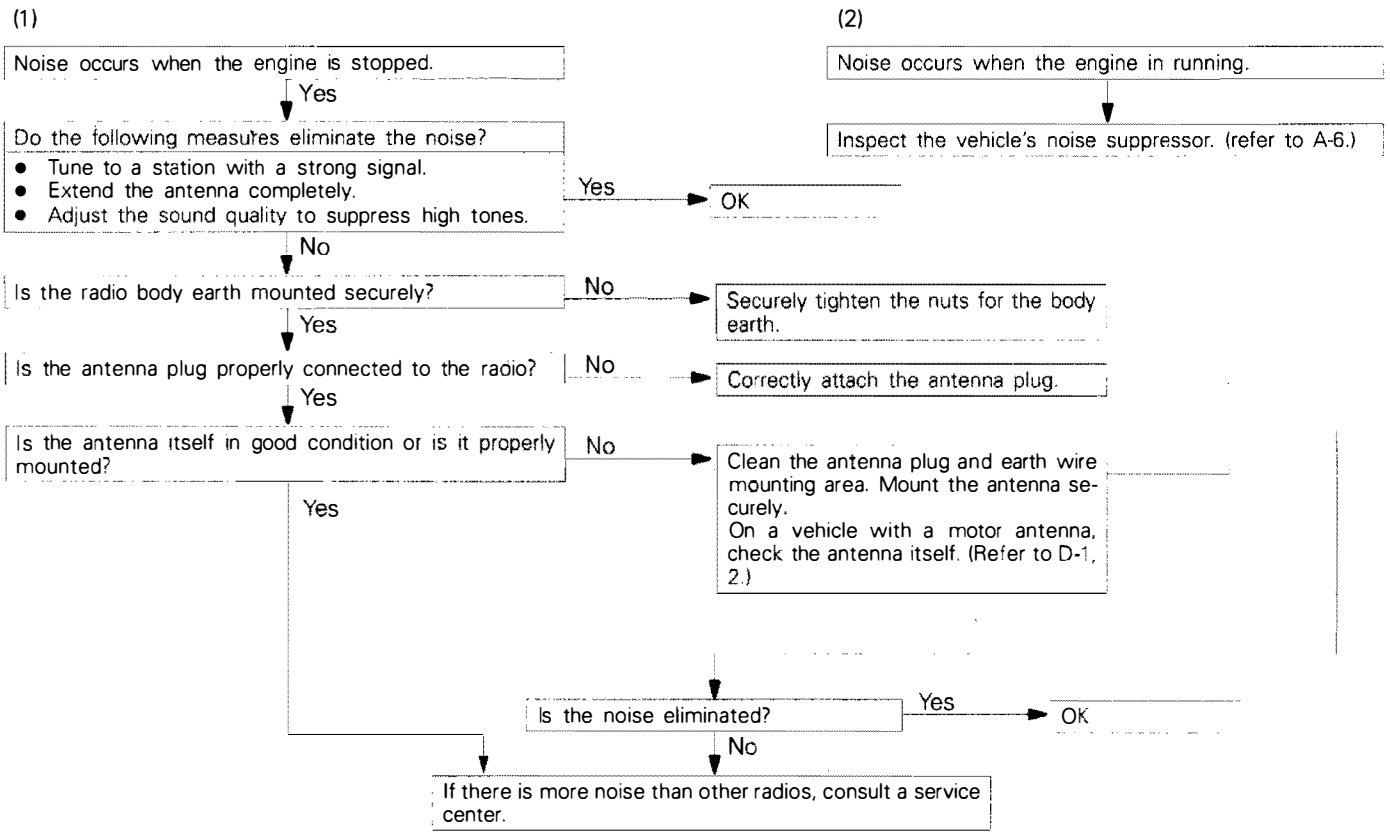
A–3	Mixed with noise, only at night (AM).

The following factors can be considered as possible causes of noise appearing at night.

1. Factors due to signal conditions: Due to the fact that long-distance signals are more easily received at night, even stations that are received without problem during the day may experience interference in a general worsening of reception conditions. The weaker a station is the more susceptible it is to interference, and a change to a different station or the appearance of a beating sound* may occur.
   Beat sound*: Two signals close in frequency interfere with each other, creating a repetitious high-pitched sound. This sound is generated not only by sound signals but by electrical waves as well.
2. Factors due to vehicle noise: Alternator noise may be a cause.



A–4 Broadcasts can be heard but both AM and FM have a lot of noise.

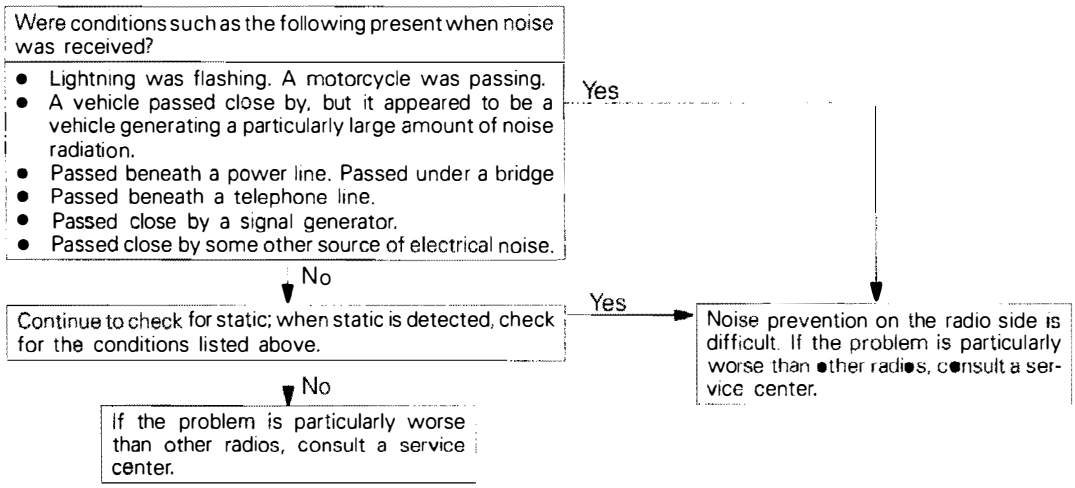


NOTE
About noise encountered during FM reception only. Due to differences in FM and AM systems, FM is not as susceptible as AM to interference from engines, power lines, lightning, etc. On the other hand, there are cases due to the characteristics of FM waves of noise or distortion generated by typical noise interference (first fading and multipath). (Refer to A-2.)

<Noise (hissing) occurs in weak signal areas such as mountainous regions, but this is not due to a problem with the radio.>

A-5	There is more noise either on AM or on FM.

1. There is much noise only on AM
   Due to differences in AM and FM systems, AM is more susceptible to noise interference.



2. There is much noise only on FM
   Due to differences in FM and AM systems, FM is not as susceptible as AM to interference from engines, power lines, lightning, etc. On the other hand, there are cases due to the characteristics of FM waves of noise or distortion generated by typical noise interference (first fading and multipath). (Refer to A-2) <Noise (hissing) occurs in weak signal areas such as mountainous regions, but this is not due to a problem with the radio.>

A–6	There is noise when starting the engine.

Noise type Sounds are in parentheses ( ).	Conditions	Cause	Inspection or replacement	
			Noise-preventive part	Mounting place (next page)
AM, FM: Ignition noise (Popping, Snapping, Cracking, Buzzing)	• Increasing the engine speed causing the popping sound to speed up, and volume decreases. • Disappears when the ignition switch is turned to ACC.	• Mainly due to the spark plugs. • Due to the engine noise.	• Earth cable • Noise capacitor	2 1, 3
Other electrical components	–	Noise may appear as electrical components become older.	Repair or replace electrical components.	
Static electricity (Cracking, Crinkling)	• Disappears when the vehicle is completely stopped. • Severe when the clutch is engaged.	Occurs when parts or wiring move for some reason and contact metal parts of the body.	Return parts or wiring to their proper position.	
	• Various noises are produced depending on the body part of the vehicle.	Due to detachment from the body of the front hood, bumpers, exhaust pipe and muffler, suspension, etc.	Earth parts by bonding. Cases where the problem is not eliminated by a single response to one area are common, due to several body parts being imperfectly earthed.	

Caution

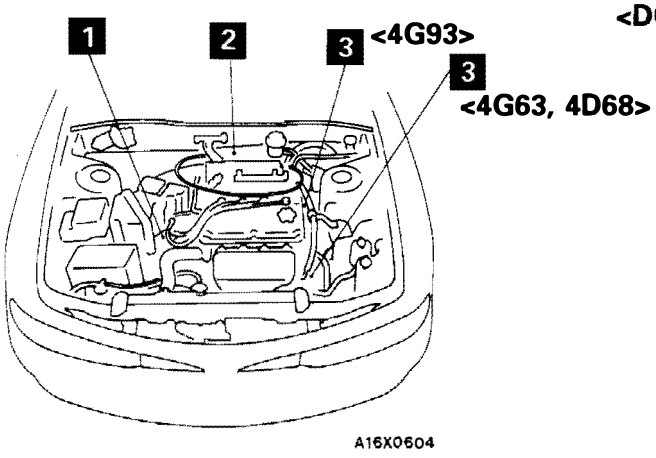
1. **Connecting a high tension cable to the noise filter may destroy the noise filter and should never be done.**
2. **Check that there is no external noise. Since failure due this may result in misdiagnosis due to inability to identify the noise source, this operation must be performed.**
3. **Noise prevention should be performed by suppressing strong sources of noise step by step.**

NOTE

1. Capacitor
   The capacitor does not pass D.C. current, but as the number of waves increases when it passes A.C. current, impedance (resistance against A.C.) decreases, and current flow is facilitated. A noise suppressing condenser which takes advantage of this property is inserted between the power line for the noise source and the earth. This suppresses noise by earthing the noise component (A.C. or pulse signal) to the body of the vehicle.
2. Coil
   The coil passes D.C. current, but impedance rises as the number of waves increases relative to the A.C. current. A noise suppressing coil which takes advantage of this property is inserted into the power line for the noise source, and works by preventing the noise component from flowing or radiating out of the line.

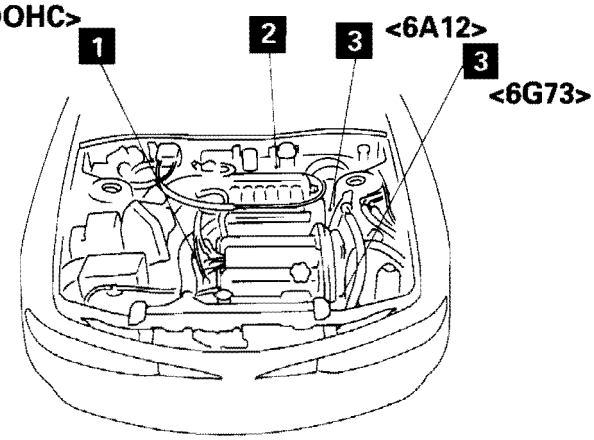
NOISE SUPPRESSOR MOUNTING LOCATION

<SOHC>



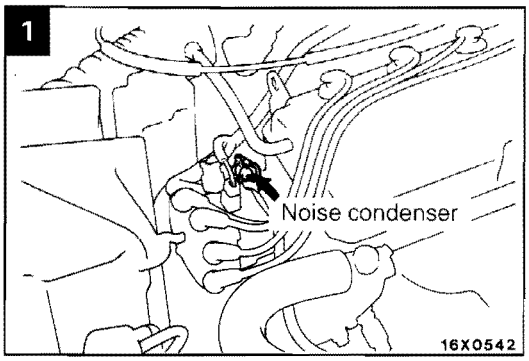
A16X0604

<DOHC>

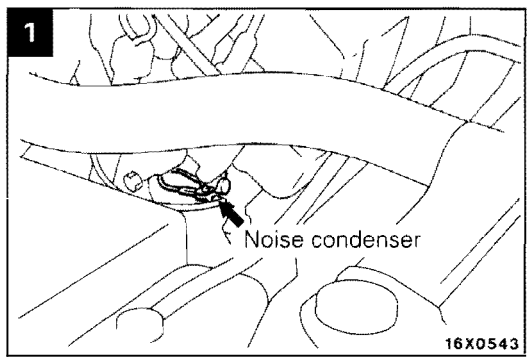


A16X0605

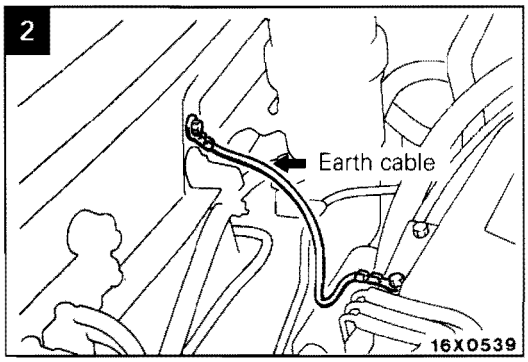
<SOHC>



<DOHC>



<SOHC>



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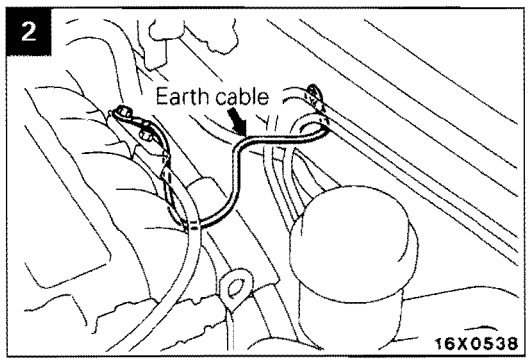
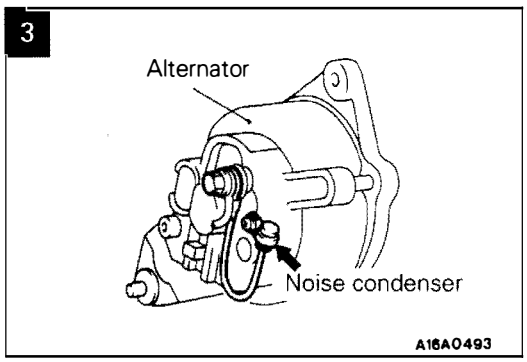
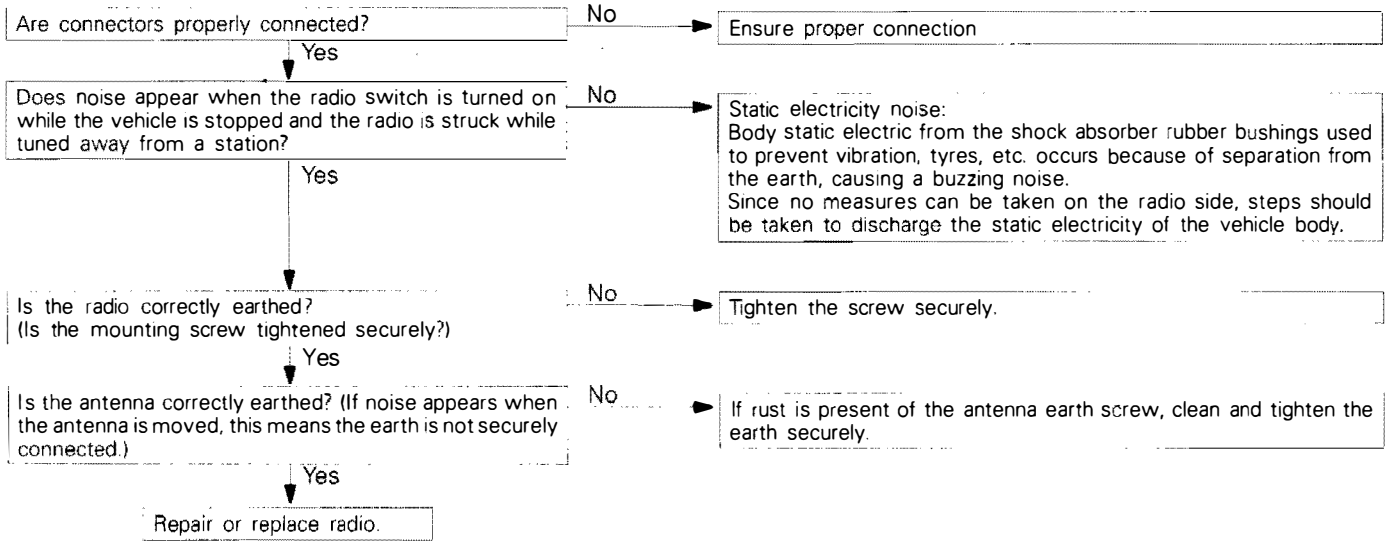


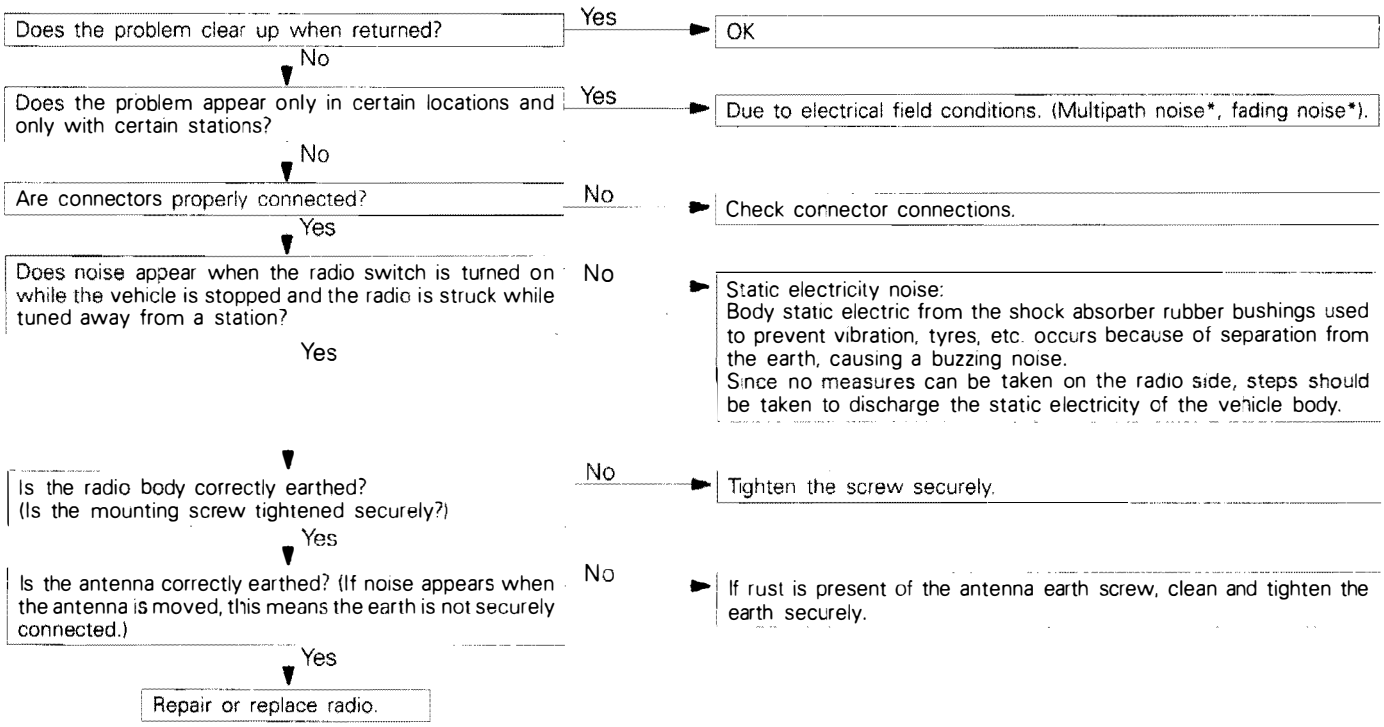
<Vehicles with LW/MW/FM radio>



A–7 Some noise appears when there is vibration or shocks during traveling.



A-8 Noise sometimes appears on FM during traveling.



* About multipath noise and fading noise
Because the frequency of FM waves is extremely high, it is highly susceptible to effects from geological formations and buildings. These effects disrupt the broadcast signal and obstruct reception in several ways.

- Multipath noise
  This describes the echo that occurs when the broadcast signal is reflected by a large obstruction and enters the receiver with a slight time delay relative to the direct signal (repetitious buzzing).
- Fading noise
  This is a buzzing noise that occurs when the broadcast beam is disrupted by obstructing objects and the signal strength fluctuates intricately within a narrow range.

A–9	Ever-present noise.

Noise is often created by the following factors, and often the radio is OK when it is checked individually.

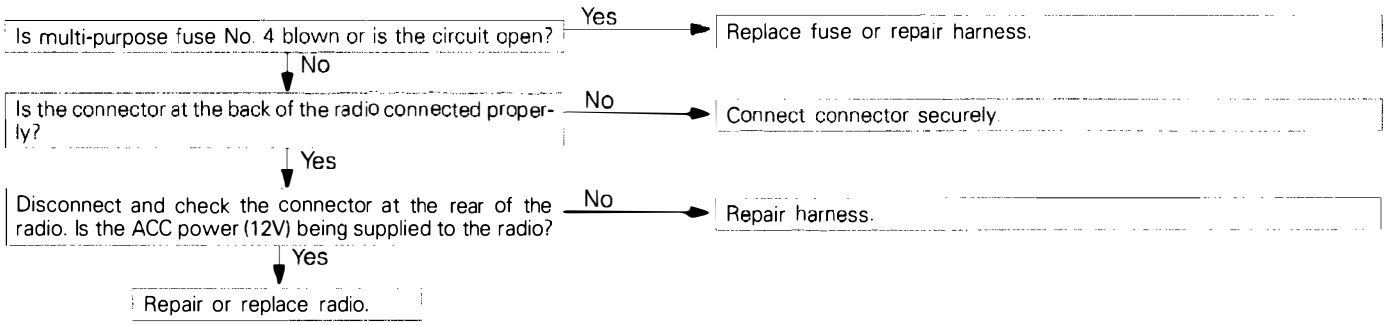
- Traveling conditions of the vehicle
- Terrain of area traveled through
- Surrounding buildings
- Signal conditions
- Time period

For this reason, if there are still problems with noise even after the measures described in steps A-1 to A-8 have been taken, get information on the factors listed above as well as determining whether the problem occurs with AM or FM, the station names, frequencies, etc., and contact a service center.

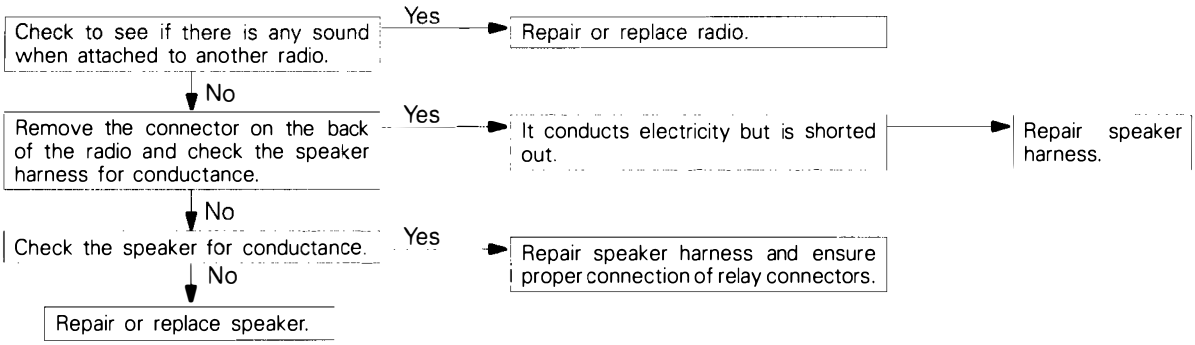
B. RADIO

E54LE02AA

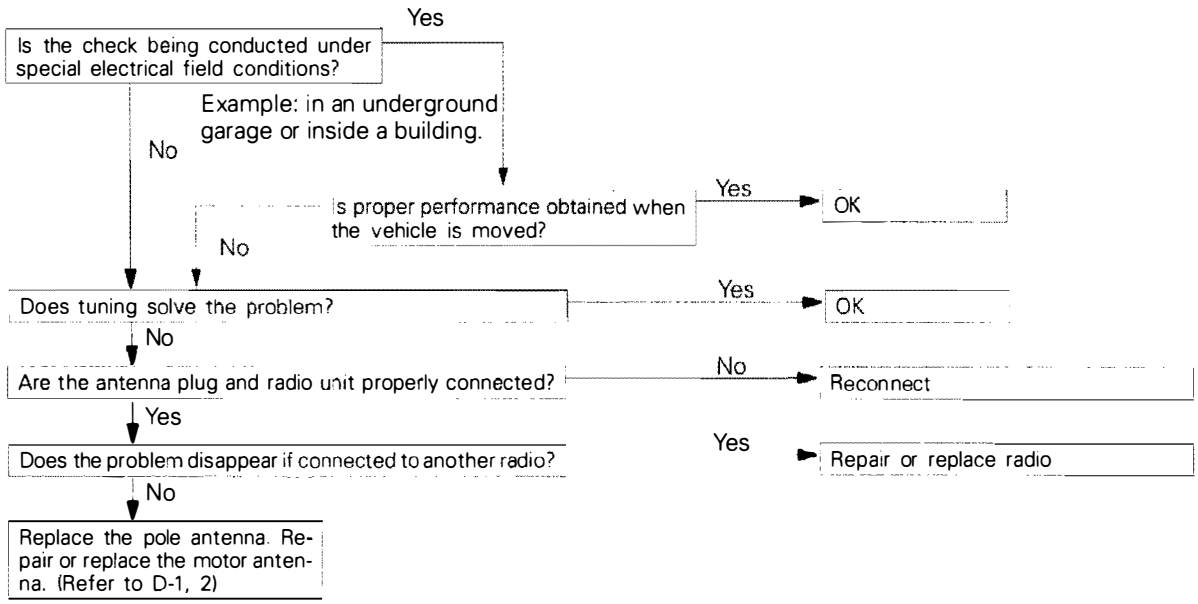
B–1	No power is supplied when the switch is set to ON.



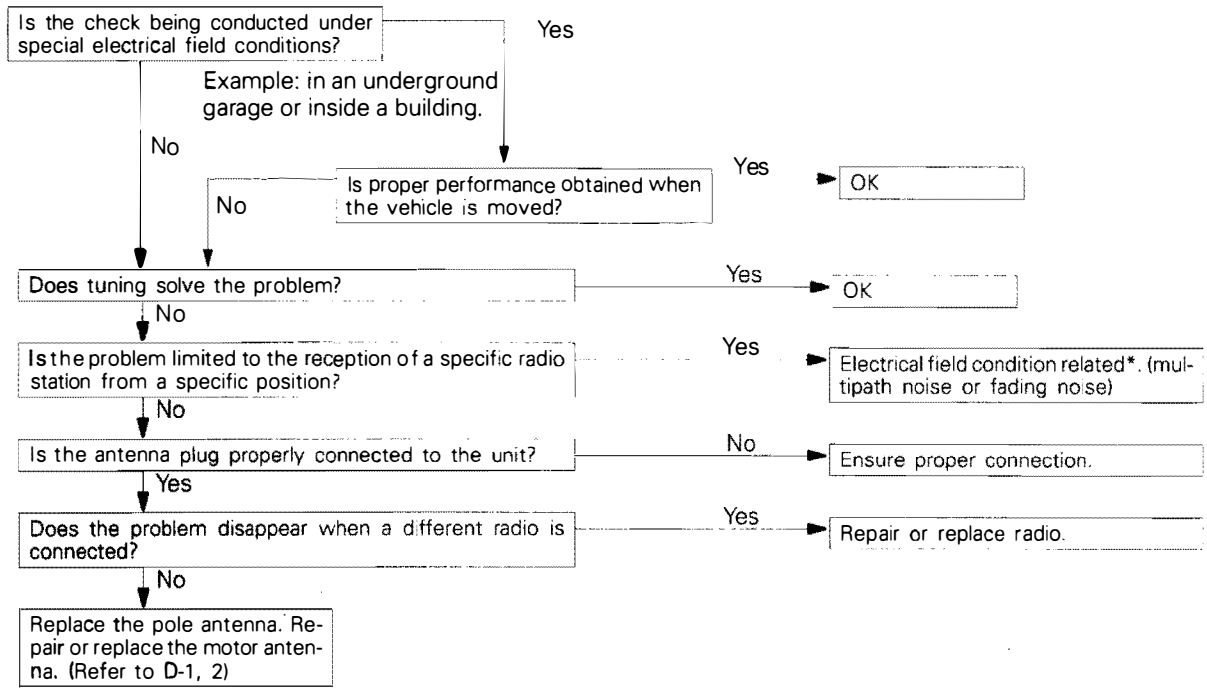
B–2	No sound from one speaker.



B-3 There is noise but no reception for both AM and FM or no sound from AM, or no sound from FM.

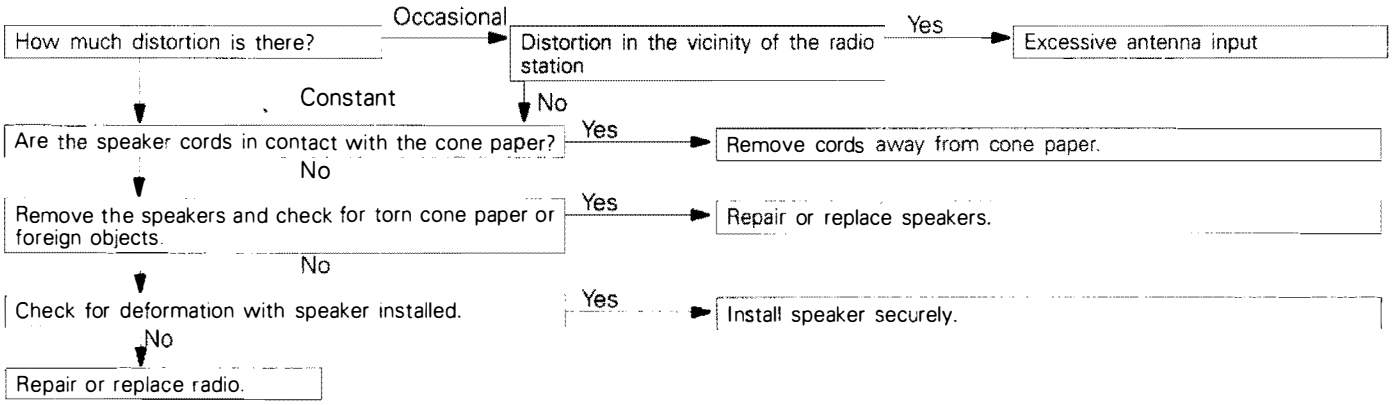


B-4 Insufficient sensitivity.

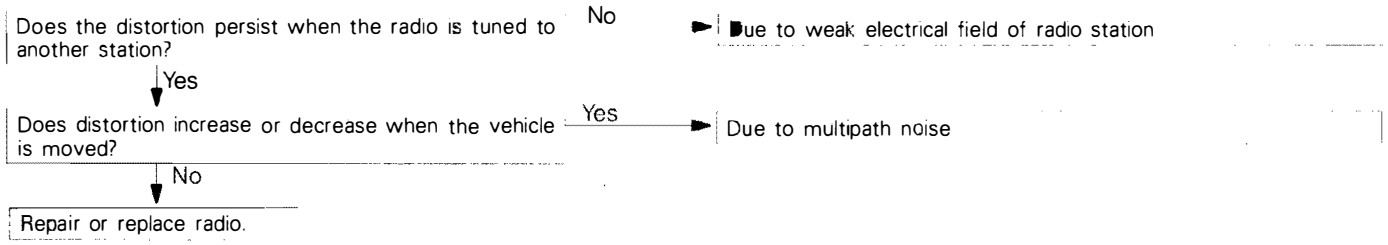


* For multipath noise and fading noise problems, refer to P.54-73.

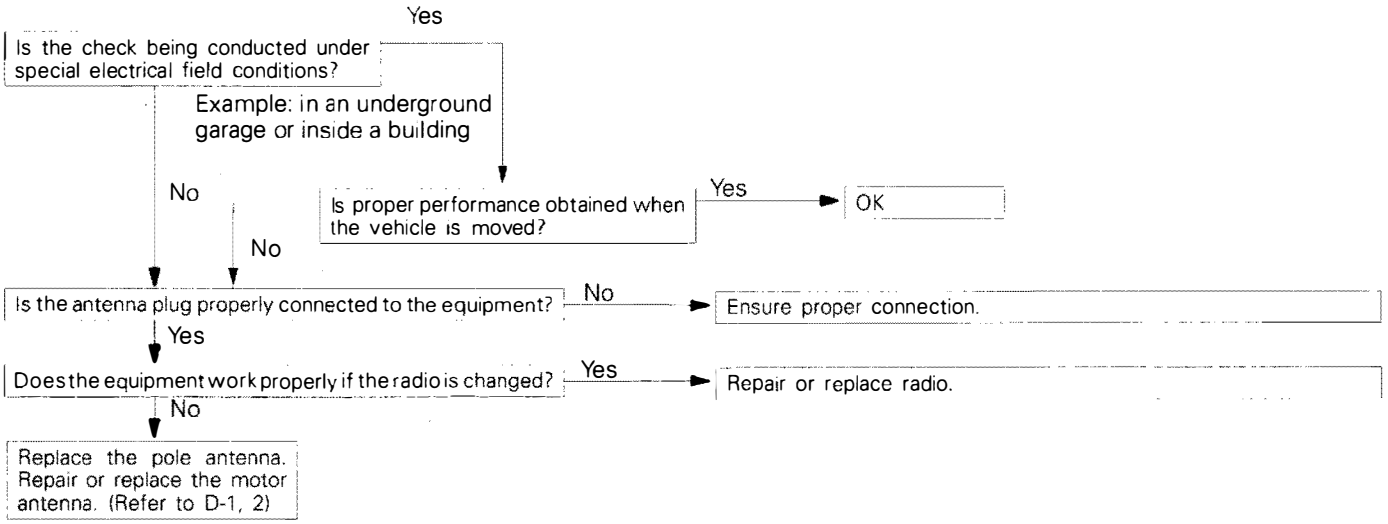
B-5 Distortion on AM or on both AM and FM.



B-6 Distortion on FM only



B-7 Too few automatic select stations.



B-8	Insufficient memory (preset stations are erased).

Is dedicated fuse No. 12 blown or is the circuit open? — Yes → Replace fuse or repair harness.

No

Disconnect and check the connector at the rear of the radio. Is the memory backup (battery) power being supplied? — No → Repair harness.

Yes

Repair or replace radio.

C. TAPE PLAYER

E54LE03AA

C-1	Cassette tape will not be inserted.

Are there any foreign objects in the tape player? — Yes → Remove the object(s)*1

No

*1
Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the tape player may damage the mechanism. The player should be taken to a service dealer for repair.

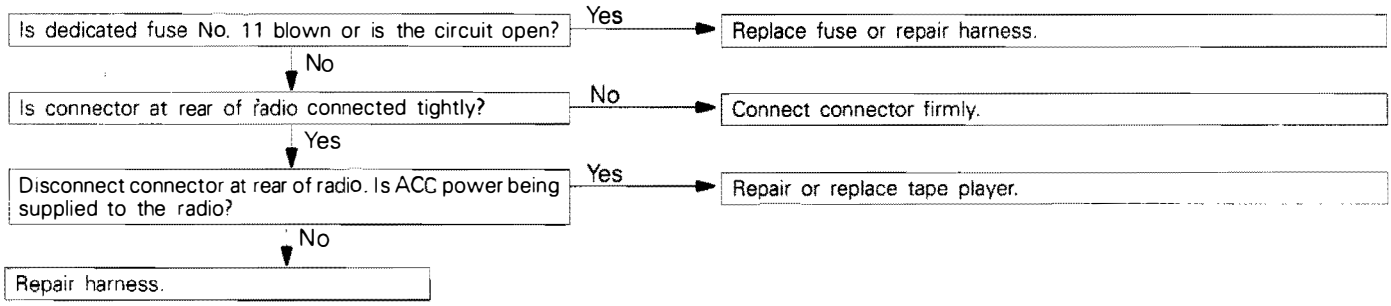
Does the tape player work if another tape is inserted? — Yes → Replace tape*2

No

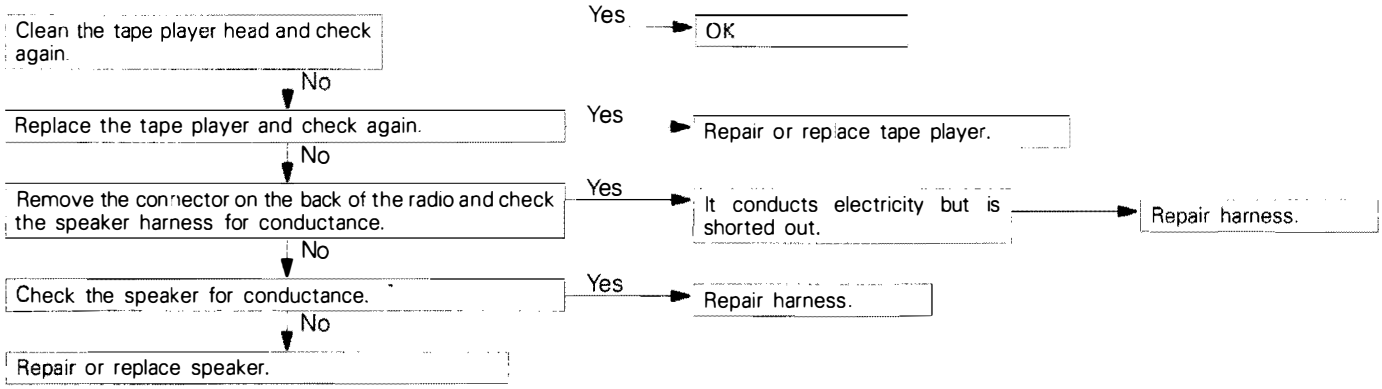
*2
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

Repair or replace tape player

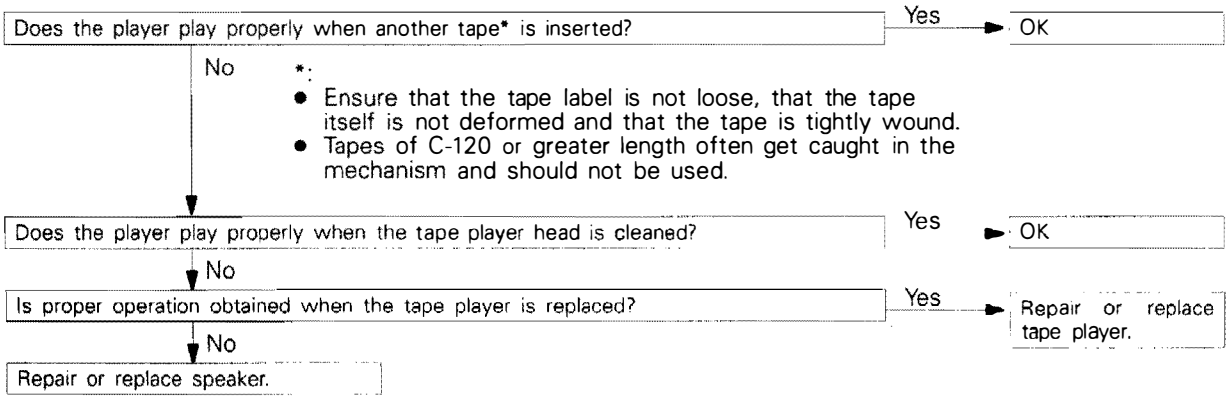
C-2 No sound (even after a tape has been inserted).



C-3 No sound from one speaker.



C-4 Sound quality is poor, or sound is weak.



C-5 Cassette tape will not eject.

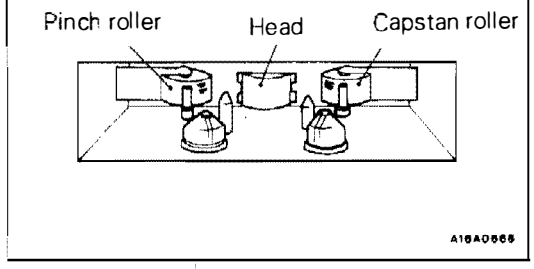
The problems covered here are all the result of the use of a bad tape (deformed or not properly tightened) or of a malfunction of the tape player itself. Malfunctions involving the tape becoming caught in the mechanism and ruining the case are also possible, and attempting to force the tape out of the player can cause damage to the mechanism. The player should be take to a service dealer for repair.

C-6 Uneven revolution. Tape speed is fast or slow.

Does the player play OK if the tape*1 is changed?
- Yes → OK
- No ↓

Are there any foreign objects *2 inside the tape player?
- Yes → Remove foreign object(s)
- No ↓

Is the head or capstan roller dirty?
- Yes → Clean.
- No ↓



Repair or replace tape player.

*1
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tape of C-120 or greater length often get caught in the mechanism and should not be used.

*2
Attempting to force a foreign object (e.g., a coin or clip, etc.) out of the tape player may damage the mechanism. The player should be taken to a service dealer for repair.

C-7 Faulty auto reverse.

Does the player play OK if the tape* is changed?
- Yes → OK
- No ↓

*:
- Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound.
- Tapes of C-120 or greater length often get caught in the mechanism and should not be used.

Does the problem only occur while the vehicle is being driven?
- No → Repair or replace tape player.
- Yes ↓

Is the tape player properly installed to the vehicle?
- No → Ensure tape player installation.
- Yes ↓

Repair or replace tape player.

C-8	Tape gets caught in mechanism*1.

*1
When the tape is caught in the mechanism, the case may not eject. When this occurs, do not try to force the tape out as this may damage the tape player mechanism. Take the cassette to a service dealer for repair.

Does the player play OK if the tape*2 is changed?
- Yes → Tape used is bad.
- No → Repair or replace tape player.

*2
Ensure that the tape label is not loose, that the tape itself is not deformed and that the tape is tightly wound. Also, tapes of C-120 or greater length often get caught in the mechanism and should not be used.

D. MOTOR ANTENNA

E54LE04AA

D-1	Motor antenna won't extend or retract.

Clean and polish the surface of the antenna rod.

Is the radio power switch ON?
- No → Switch it ON.
- Yes ↓

Is voltage (approx. 12V) emitted to the radio's motor antenna terminal?
- No → Repair or replace the radio.
- Yes ↓

Is the antenna bent?
- Yes → Repair the bend, or replace the antenna mast.
- No ↓

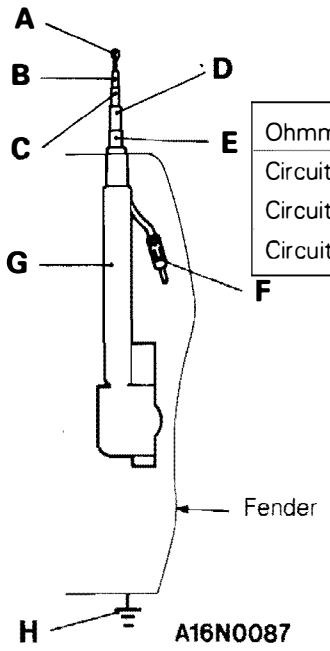
Is the antenna relay OK?
- No → Replace the antenna relay.
- Yes ↓

Is the motor OK?
- No → Replace the motor.
- Yes ↓

Repair the harness.

D-2	Motor antenna extends and retracts but does not receive.

Is the antenna itself OK?



Ohmmeter measurement locations	Result
Circuits from F to A, B, C, D and E	Continuity
Circuit between G and H	Continuity
Circuits from H to A, B, C, D and E	No continuity

No → Repair or replace it.

Yes ↓

Is operation normal when a new antenna assembly is directly installed to the radio?

No → Refer to B "Radio troubleshooting".

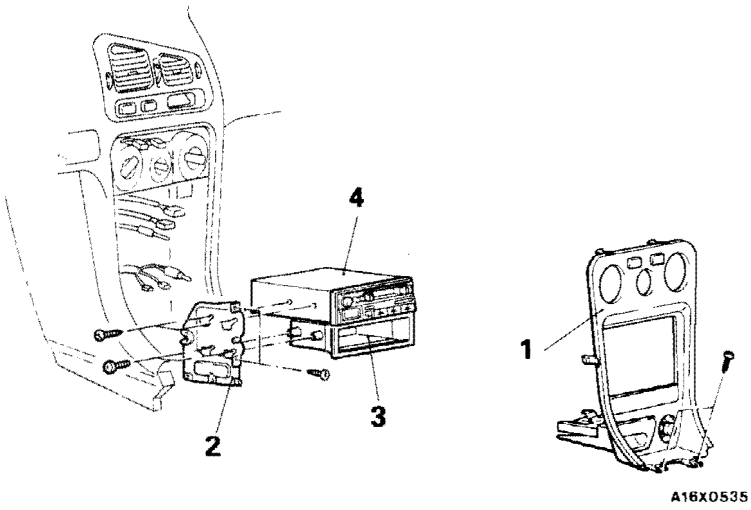
Yes ↓

Replace the feeder cable.

RADIO AND TAPE PLAYER

E54LG00AA

REMOVAL AND INSTALLATION



Removal steps

- Shift lever panel (Refer to GROUP 52A – Floor Console.)

1. Center console panel
2. Radio bracket
3. Box
4. Radio and tape player

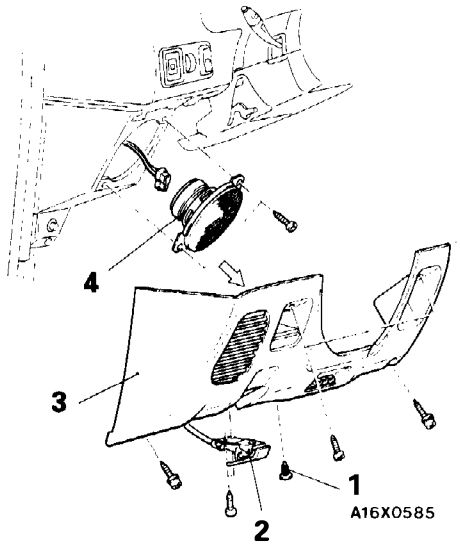
SPEAKER

E54LG20AA

FRONT SPEAKER

REMOVAL AND INSTALLATION

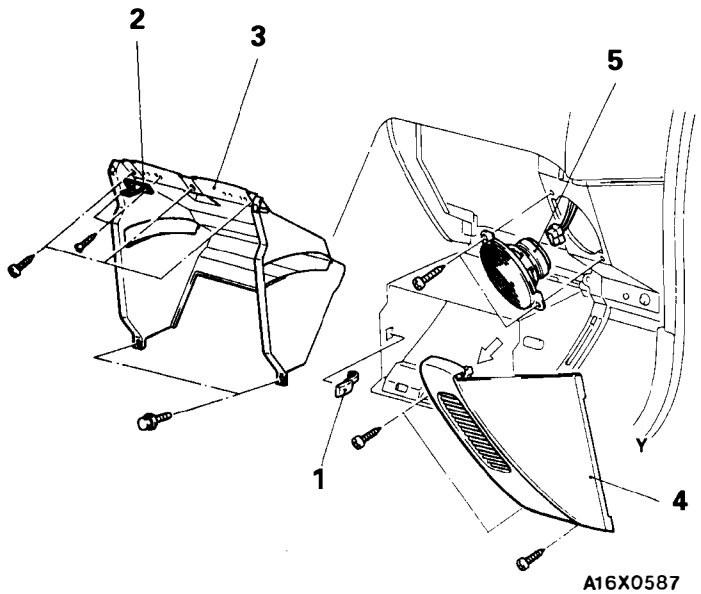
<Driver's side>



Removal steps
1. Clip
2. Hood lock release handle
3. Instrument under cover
4. Speaker

NOTE
The ⇦ mark indicates the sheet metal clip position.

<Passenger's side>



Removal steps
1. Stopper
2. Glove box striker
3. Glove box cover
4. Corner panel
5. Speaker

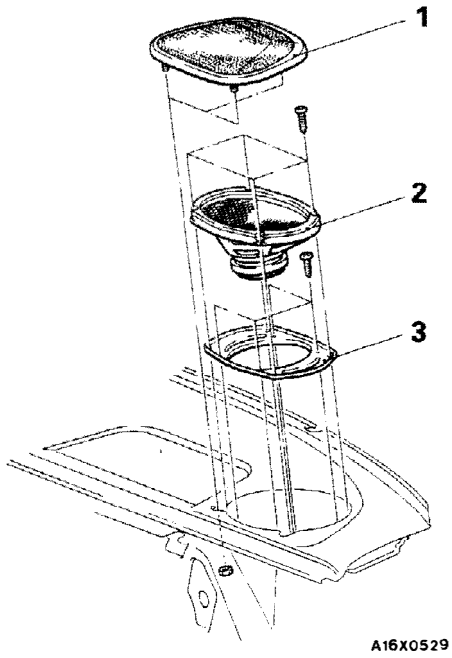
NOTE
The ⇦ mark indicates the sheet metal clip position.

REAR SPEAKER

E54LG20BA

REMOVAL AND INSTALLATION

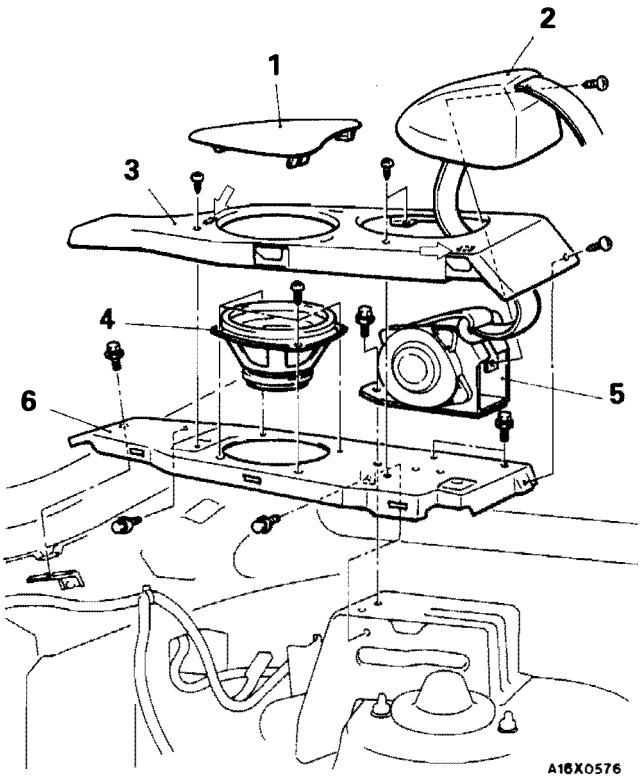
<Sedan>



Removal steps

1. Speaker garnish
2. Speaker
3. Speaker bracket

<Hatchback>



Removal steps

- Side seat back (Refer to GROUP 52A – Rear Seat)

1. Speaker garnish
2. Retractor cover
3. Side shelf
4. Speaker
5. Rear seat belt retractor

- Rear side trim (Refer to GROUP 52A – Trim)

6. Speaker bracket

NOTE
The⇦ mark indicates the sheet metal clip position.

ANTENNA

E54LD30AA

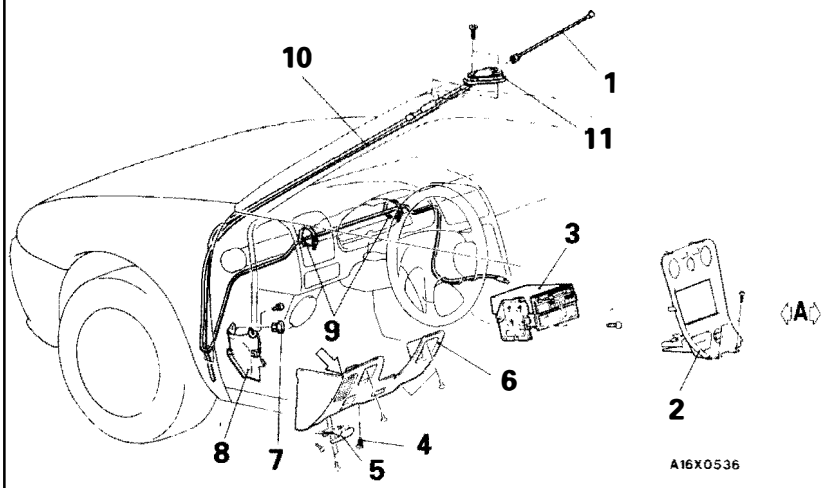
SPECIAL TOOL

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of center console panel

POLE ANTENNA

E54LG30AA

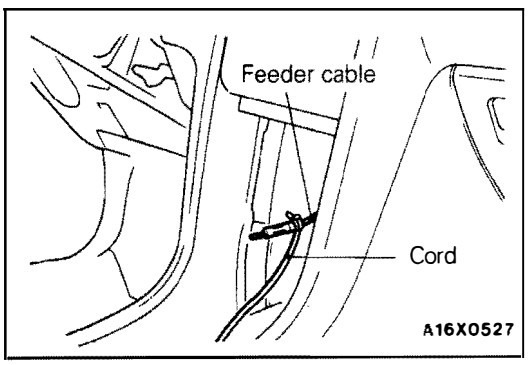
REMOVAL AND INSTALLATION



Removal steps

1. Pole
- Shift lever panel (Refer to GROUP 52A – Floor Console)
2. Center console panel
3. Radio and tape player
4. Clip
5. Hood lock release handle
6. Instrument under cover
7. Clip
8. Cowl side trim (driver's side)
9. Cable band
10. Antenna base
11. Base

NOTE
The ⇦ mark indicates the sheet metal clip position.



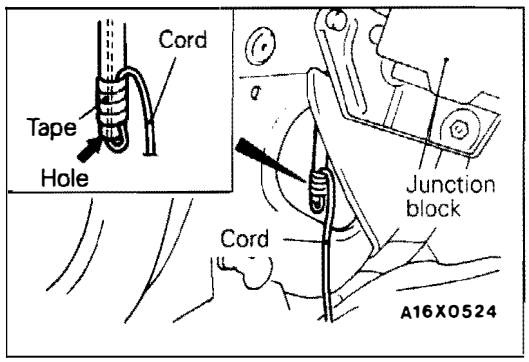
REMOVAL SERVICE POINTS

E54LG31AA

〈A〉 ANTENNA BASE REMOVAL

When installing, carry out the following procedure in order to make laying of the antenna base feeder cable easier.

(1) Tie a cord to the end of the feeder cable.



(2) Pull out the antenna base until the end of the drain pipe can be seen.

(3) Pass the cord through the hole in the end of the drain pipe and wrap it with vinyl tape.

Caution
Wrap it securely so that the cord will not come off.

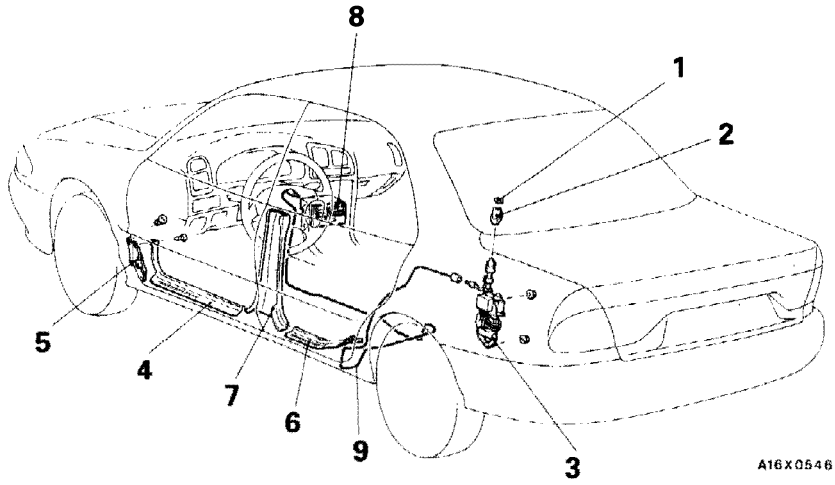
(4) Pull out the antenna base little by little to remove it.

MOTOR ANTENNA

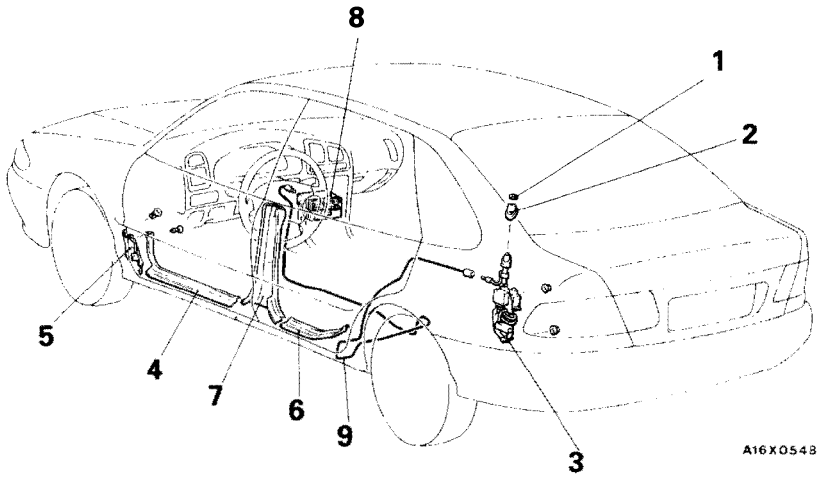
E54LG40AA

REMOVAL AND INSTALLATION

<Sedan>



<Hatchback>



Antenna feeder cable removal steps

- Console box (Refer to GROUP 52A – Floor Console.)
- Front seat (Driver's side) (Refer to GROUP 52A – Front Seat)
- Rear seat assembly <Sedan>
- Rear seat back (LH) and rear seat cushion (LH) <Hatchback>

(Refer to GROUP 52A – Rear Seat.)

4. Front scuff plate (LH)
5. Cowl side trim (LH)
6. Rear scuff plate (LH)
7. Center pillar trim lower (LH)

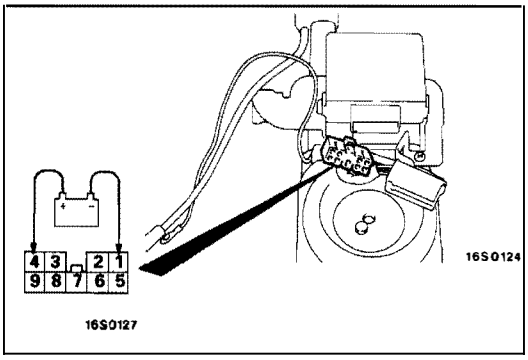
(Refer to GROUP 52A – Trim.)

8. Radio and tape player
   - Trunk side trim (LH) <Sedan>
   - Rear side trim (LH) <Hatchback>

   (Refer to GROUP 52A – Trim.)
9. Antenna feeder cable

Motor antenna assembly removal steps

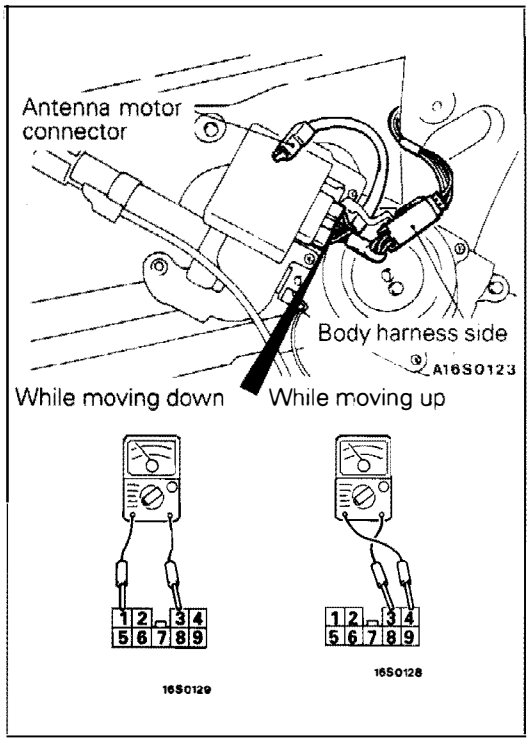
1. Ring nut
2. Base
   - Trunk side trim (LH) (Refer to GROUP 52A – Trim)
3. Motor antenna assembly



INSPECTION E54LG42AA

ANTENNA MOTOR

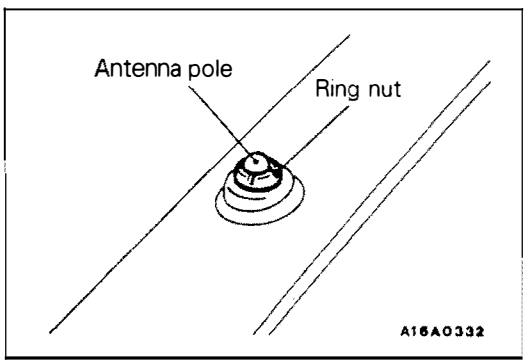
Remove the motor antenna control unit connector and check if the antenna goes up when the battery (+) side is connected to terminal 4, and the battery (–) side to terminal 1, and check if it goes down when the connections are reversed.



MOTOR ANTENNA CONTROL UNIT E54LG42BA

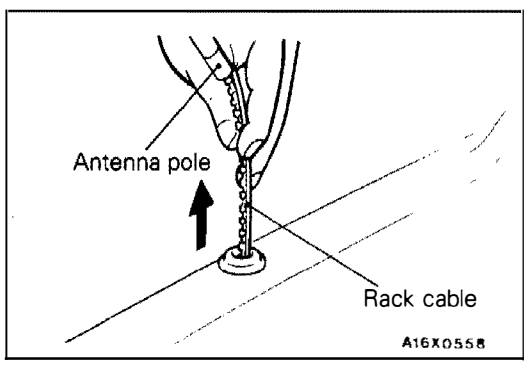
(1) Connect the antenna to the harness connector (Trunk room harness).
(2) Remove the antenna motor connector.
(3) With the ignition switch turned to ACC or ON, operate the radio switch and check the voltage between the terminals while the antenna is moving up and down.

Antenna Operation Direction	Measurement Terminals	Voltage (V)
While moving down	1–3	10–13
While moving up	3–4	10–13

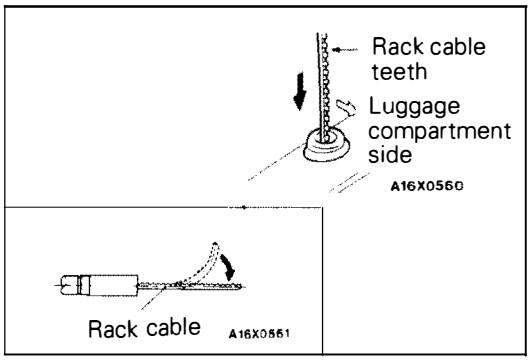


ANTENNA POLE REPLACEMENT E54LG43AA

(1) Remove the ring nut.



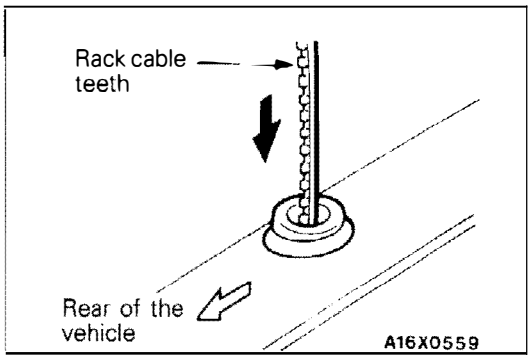
(2) After turning the ignition switch to ACC or ON, turn the radio switch to ON to raise the antenna pole, and remove it, together with the rack cable.



(3) Draw out the antenna pole to the maximum extension.

NOTE
If there is a bend in the motor end of the rack cable, remove the bend.

(4) Insert the rack cable into the motor assembly with the rack cable teeth facing the luggage compartment side.

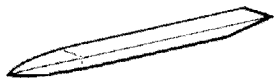
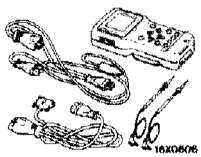


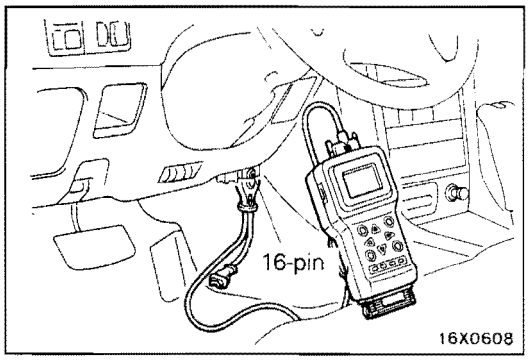
(5) Turn the rack cable teeth towards the rear of the vehicle (right 90°) so that the rack cable meshes with the motor gear.
(6) If the rack cable pulls out with no resistance when it is lightly pulled, then the cable is not meshed with the motor gear, so check that there are no bends in the end of the rack cable, and then repeat steps (4) and (5) above.
(7) Set the antenna pole vertically and turn the radio switch OFF to wind up the rack cable. Insert the antenna to the motor antenna side to align it with the wound-up rack cable.
(8) After tightening the ring nut, check the movement of the antenna by turning the radio switch ON and OFF.

REAR WINDOW DEFOGGER

E54MD00AA

SPECIAL TOOLS

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of air outlet center assembly
	MB991502	MUT-II sub assembly	ETACS-ECU input signal checking
 16X0607		ROM pack	
	(For the number, refer to GROUP 00 – Precautions Before Service.)		



TROUBLESHOOTING

E54ME00AA

DIAGNOSIS FUNCTION

INPUT SIGNAL INSPECTION POINTS <VEHICLES WITH ETACS-ECU>

(1) Connect the MUT-II to the diagnosis connector.
(2) If buzzer of the MUT-II sounds once when a switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.

INSPECTION CHART FOR TROUBLE SYMPTOMS

E54ME01AA

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is not possible. <Vehicles with ETACS-ECU>	Communication with all systems is not possible.	1	P. 54-90
	Communication with one-shot pulse input signal only is not possible.	2	P. 54-90
Even if defogger switch is ON, defogger does not operate.		3	P. 54-90

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

E54ME02AA

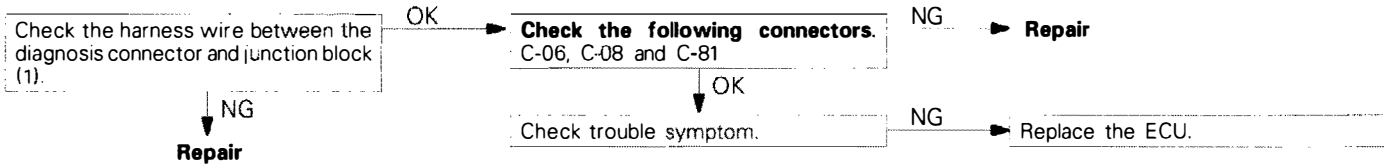
Inspection Procedure 1

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

Refer to GROUP 13A – Troubleshooting.

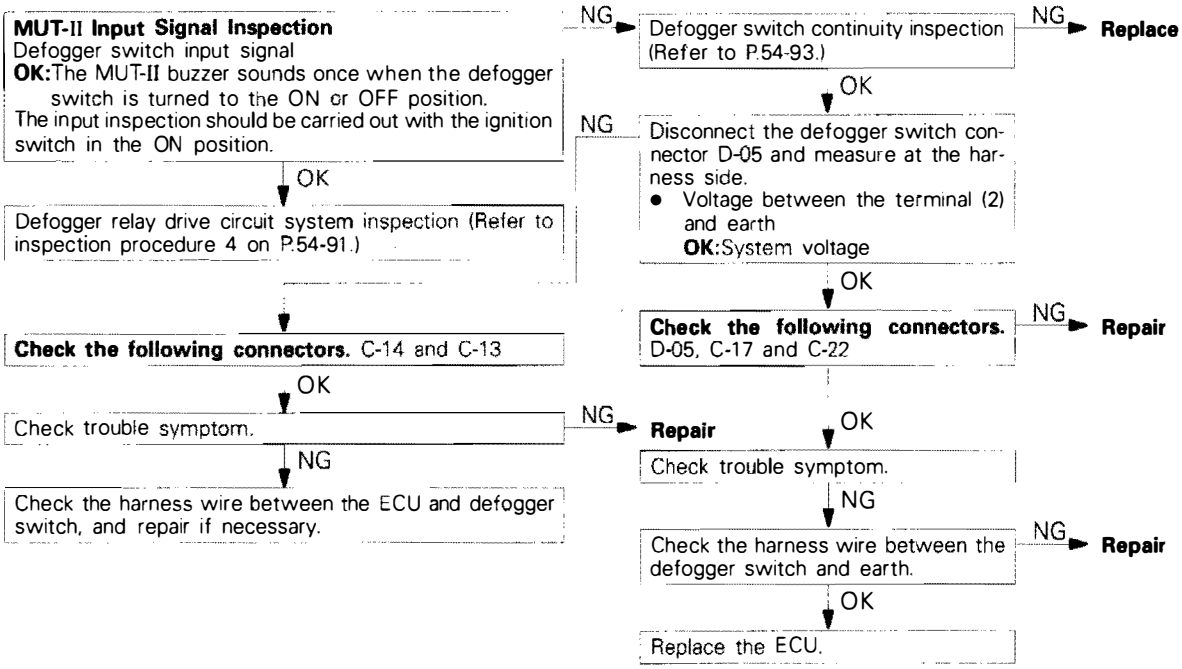
Inspection Procedure 2

Communication with MUT-II is not possible. (Communication with one-shot pulse input signal only is not possible.)	Probable cause
[Comment] The cause is probably a defective one-shot pulse input signal circuit system of the diagnosis line.	• Malfunction of connector • Malfunction of harness • Malfunction of ECU



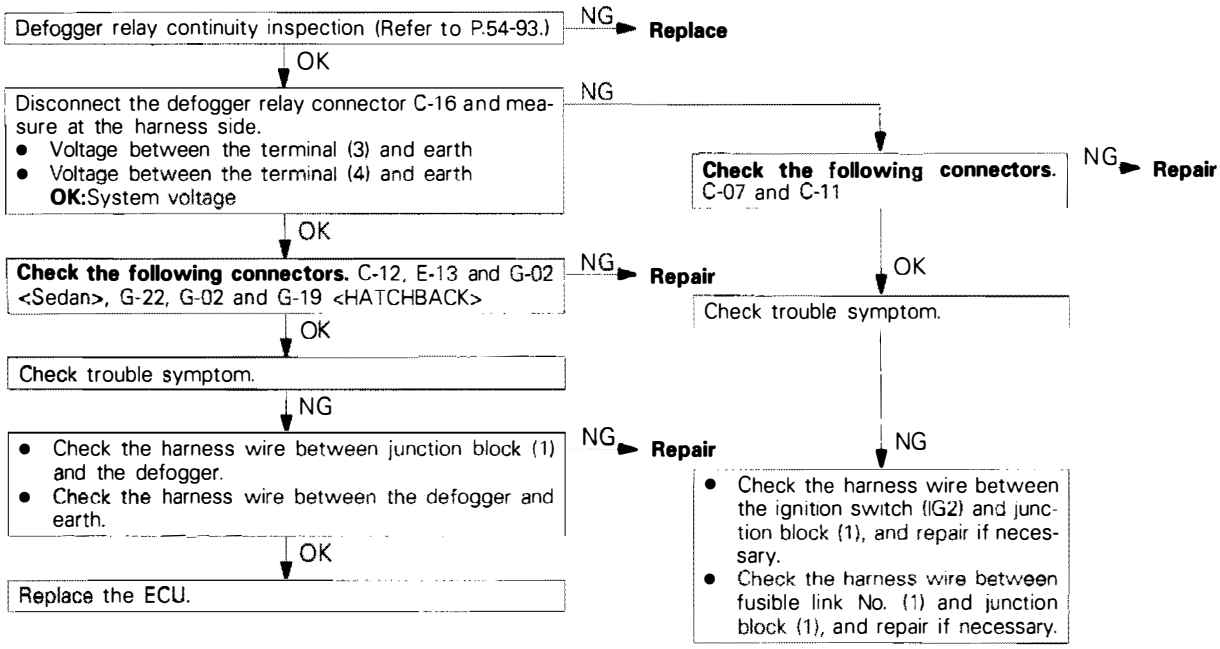
Inspection Procedure 3

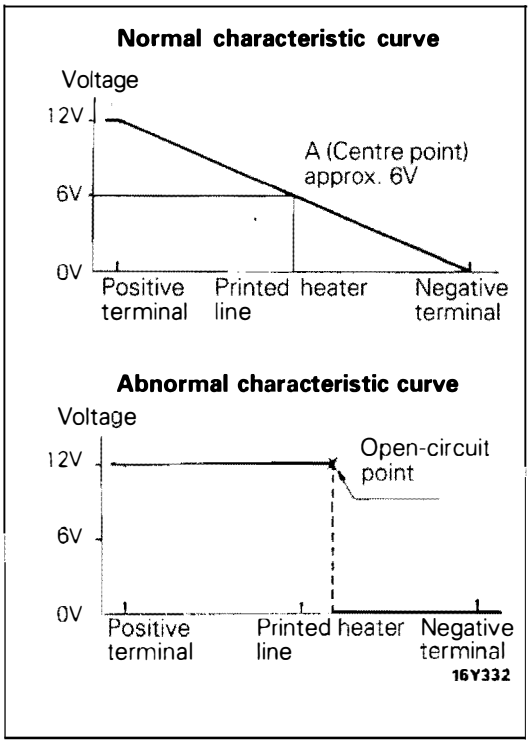
Even if defogger switch is ON, defogger does not operate.	Probable cause
[Comment] The cause is probably a defective defogger switch circuit system or a defective defogger relay drive circuit system. In addition, if there is a defective fuse, the cause might also be a harness short.	• Malfunction of fuse • Malfunction of defogger switch • Malfunction of defogger relay • Malfunction of connector • Malfunction of harness wire • Malfunction of ECU



Inspection Procedure 4

Defogger relay drive circuit system inspection





SERVICE ADJUSTMENT PROCEDURE

E54MF00AA

PRINTED-HEATER LINE INSPECTION

(1) Run engine at 2,000 r/min. Check heater element with battery at full.
(2) Turn ON rear window defogger switch. Measure heater element voltage with circuit tester at rear window glass centre A.
Condition good of indicating about 6V.
(3) If 12V is indicated at A, there is a break in the negative terminals from A.
Move test bar slowly to negative terminal to detect where voltage changes suddenly (0V).
(4) If 0V is indicated at A, there is a break in the positive terminals from A. Defect where the voltage changes suddenly (12V) with the same method described.

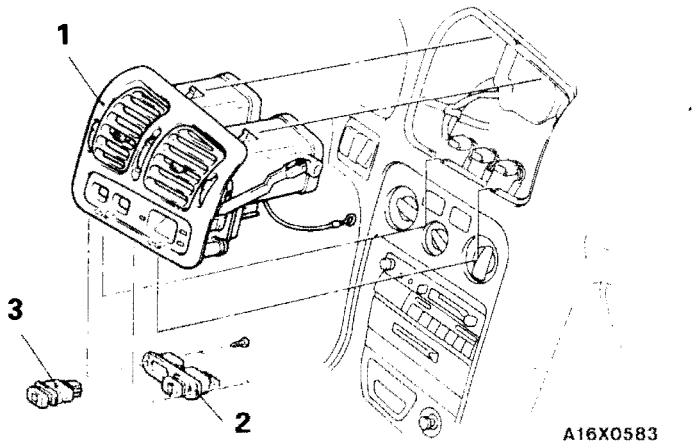
REAR WINDOW DEFOGGER

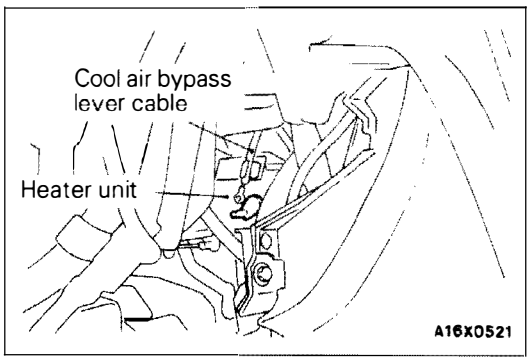
E54MG00AA

REMOVAL AND INSTALLATION

Removal steps

〈A〉 ▶A◀ 1. Air outlet center assembly
2. Center switch assembly
3. Rear window defogger switch



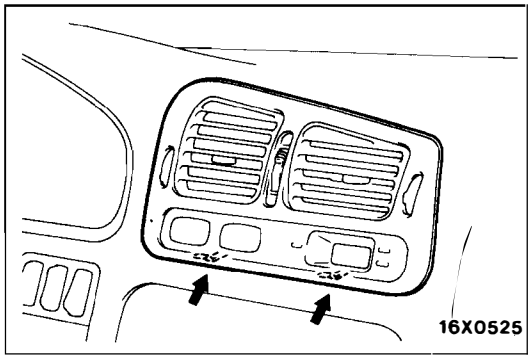


REMOVAL SERVICE POINTS

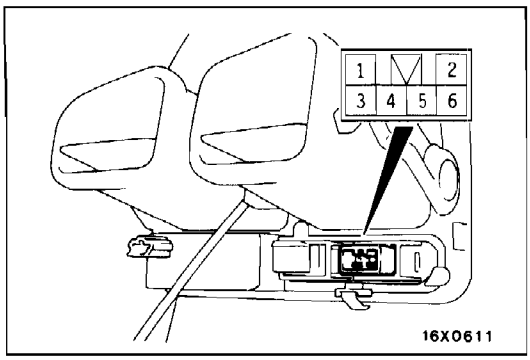
E54MG01AA

〈A〉 AIR OUTLET CENTER ASSEMBLY REMOVAL

(1) Remove the cool air bypass lever cable of the air outlet center assembly at the heater unit side.



(2) Push the springs upwards and remove the air outlet center assembly.



INSPECTION E54MG02AA

DEFOGGER SWITCH

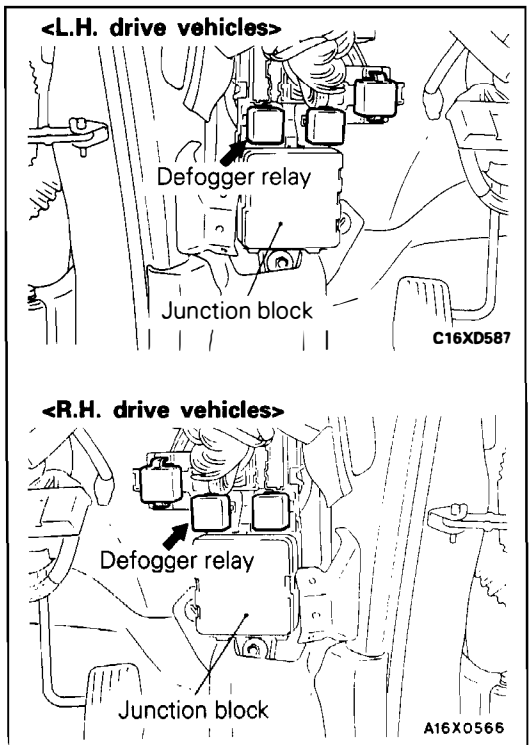
Terminal No. / Switch position	1	3	2	4	6
OFF	ILL				
ON	ILL			IND	

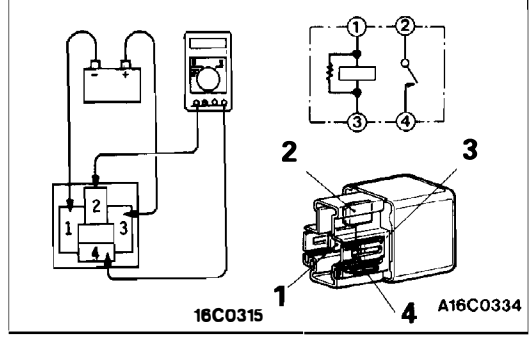
NOTE
○—○ indicates that there is continuity between the terminals.

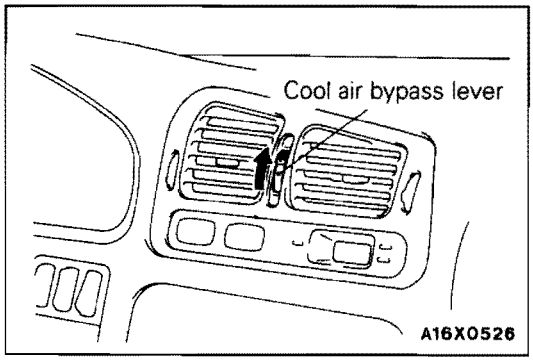
DEFOGGER RELAY E54MG02BA

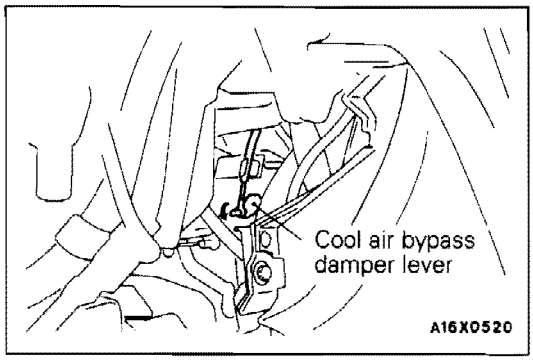
Apply voltage to terminal 1, and check the continuity between the terminals when terminal 3 is earthed.

Power is supplied	2–4 terminals	Continuity
Power is not supplied	2–4 terminals	No continuity
	1–3 terminals	Continuity









INSTALLATION SERVICE POINTS E54MG04AA

◆A◆ AIR OUTLET CENTER ASSEMBLY INSTALLATION

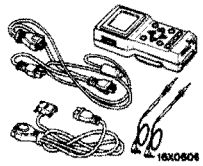
(1) Install the air outlet center assembly to the instrument panel.
(2) Turn the cool air bypass lever of the air outlet center assembly fully upward (in the direction of the arrow).

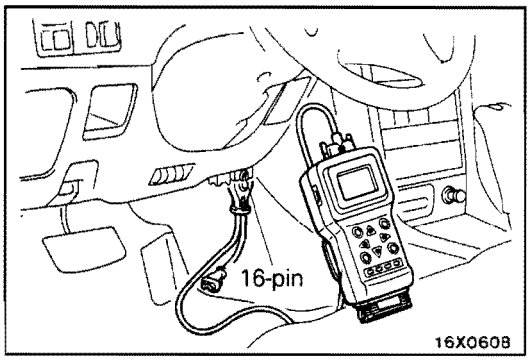
(3) Turn the cool air bypass damper lever at the heater unit side fully downward (in the direction of the arrow), and install the cool air bypass lever cable.

THEFT-ALARM SYSTEM

E54ND00AA

SPECIAL TOOLS

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	ETACS–ECU input signal checking
 16X0607		ROM pack	



TROUBLESHOOTING

E54NE00AA

DIAGNOSIS FUNCTION

INPUT SIGNAL INSPECTION POINTS

1. Connect the MUT-II to the diagnosis connector.
2. If buzzer of the MUT-II sounds once when a switch is operated (ON/OFF), the ETACS-ECU input signal for that switch circuit system is normal.
   - Driver and front passenger door switches
   - Door lock actuator switches (All doors)
   - Hood switch
   - Luggage compartment lamp switch
   - Driver and front passenger door key cylinder switches
   - Trunk lid lock cylinder switch <Sedan>
   - Tailgate lock cylinder switch <Hatchback>
   - Key reminder switch

TROUBLESHOOTING QUICK-REFERENCE TABLE

1. ARMING / DISARMING RELATIONSHIP

E54NE01AA

Trouble symptom	Cause	Check method	Remedy
The system is not armed (The SECURITY lamp doesn't illuminate, and the alarm doesn't function.) (The central door locking system functions normally.)	Damaged or disconnected wiring of ECU power supply circuit	Check by using check chart No. 1.	Replace the fusible link No. 1 or the dedicated fuse No. 12. Repair the harness.
	Damaged or disconnected wiring of door switch input circuit	If input checks indicate a malfunction, check by using check chart No. 4.	Repair the harness or replace the door switch.
The arming procedures are followed, but the SECURITY lamp does not illuminate. (There is an alarm, however, when an alarm test is conducted after about 20 seconds have passed.)	Damaged or disconnected wiring of SECURITY lamp avtivation circuit.	Check by using check chart No. 8.	Replace the fusible link No. 1 or the fuse No. 12. Repair the harness
	Blown SECURITY lamp bult		Replace the bulb.
	Malfunction of the ECU.	–	Replace the ECU.
The alarm sounds in error when, while the system is armed, a door or the trunk lid <SEDAN>, tailgate <HATCHBACK> is unlocked by using the key.	Damaged or disconnected wiring of a door lock key cylinder or the trunk lid lock cylinder switch <SEDAN>, tailgate lock cylinder switch <HATCHBACK> input circuit.	If input checks indicate a malfunction, check by using check chart No. 6.	Repair the harness or replace a door lock key cylinder or the trunk lid lock cylinder switch <SEDAN>, tailgate lock cylinder switch <HATCHBACK>.
	Malfunction of a door lock key cylinder or the trunk lid lock cylinder switch <SEDAN>, tailgate lock cylinder switch <HATCHBACK>.		
	Malfunction of the ECU.	–	Replace the ECU.

2. ACTIVATION / DEACTIVATION RELATIONSHIP

Trouble symptom	Cause	Check method	Remedy
There is no alarm when, as an alarm test, a door is opened without using the key. (The arming and disarming are normal, and the alarm is activated when the trunk lid <SEDAN>, tailgate <HATCHBACK> or hood is opened.)	Damaged or disconnected wiring of door switch input circuit	If input checks indicate a malfunction, check by using check chart No. 4.	Repair the harness or replace the door switch.
	Malfunction of the door switch		
	Malfunction of the ECU	–	Replace the ECU.
There is no alarm when, as an alarm test, the trunk lid <SEDAN>, tailgate <HATCHBACK> is opened without using the key. (The alarm is activated, however, by opening a door or the hood.)	Damaged or disconnected wiring of luggage compartment lamp switch input circuit	If input checks indicate a malfunction, check by using check chart No. 7.	Repair the harness or replace the luggage compartment lamp switch.
	Malfunction of the luggage compartment lamp switch		
	Malfunction of the ECU.	–	Replace the ECU.

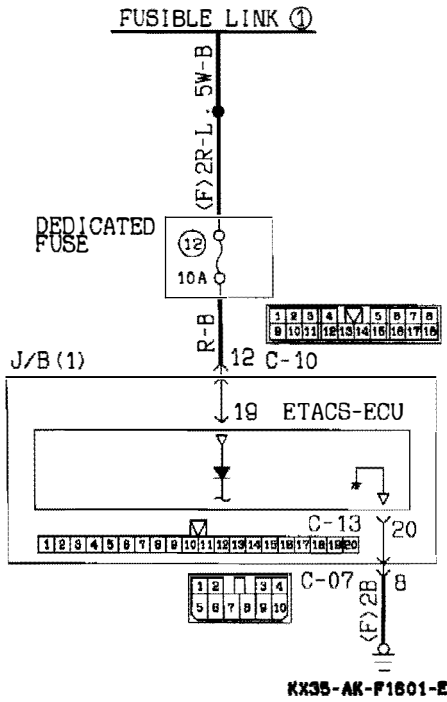
Trouble symptom	Cause	Check method	Remedy
There is no alarm when, as an alarm test the hood is opened from within the vehicle. (The alarm is activated, however, by opening a door or the trunk lid <SEDAN>, tailgate <HATCHBACK>.)	Damaged or disconnected wiring of hood switch input circuit.	If input checks indicate a malfunction, check by using check chart No. 3.	Repair the harness or replace the hood switch.
	Malfunction of the hood switch.		
	Malfunction of the ECU.	–	Replace the ECU.
Engine does not start even when the theft-alarm starter relay switch is ON (normal closed condition).	• Malfunction of the key reminder switch • Malfunction of the theft-alarm starter relay • Damage or disconnected wiring of theft-alarm starter relay activation circuit. • Damage or disconnected wiring of key reminder switch input circuit.	If input checks indicate a malfunction, check by using check chart No. 2. Check by using check chart No. 11.	Repair the harness. Replace the theft-alarm starter relay. Replace the key reminder switch.
	Malfunction of the ECU.		Replace the ECU.
The theft-alarm horn does not sound when testing the alarm. The theft-alarm horn does not sound.	Damaged or disconnected wiring of the theft-alarm horn relay power supply circuit or the theft-alarm horn activation circuit.	Check by using check chart No. 9, 10.	Repair the harness. Replace the theft-alarm horn. Replace the theft-alarm horn relay.
	Malfunction of the ECU.		Replace the ECU.
The system is not deactivated when, during an alarm test in which the alarm is intentionally activated, the door or trunk lid <SEDAN>, tailgate <HATCHBACK> is unlocked by using the key. (The system also cannot be disarmed.)	Damaged or disconnected wiring of door lock key cylinder or trunk lid lock cylinder switch <SEDAN>, tailgate lock cylinder switch <HATCHBACK> input circuit	If input checks indicate a malfunction, check by using check chart No. 6.	Repair the harness. Replace the key lock cylinder switch or the trunk lid lock cylinder switch <SEDAN>, tailgate lock cylinder switch <HATCHBACK>.
	Malfunction of door lock key cylinder or trunk lid lock cylinder switch <SEDAN>, tailgate lock cylinder switch <HATCHBACK>.		
	Malfunction of the ECU.		Replace the ECU.

ECU: ETACS unit

CHECKING THE CIRCUIT AND INDIVIDUAL PART

1. ETACS POWER-SUPPLY AND GROUND CIRCUITS

E54NE02AA



KX35-AK-F1601-EC

Description of operation

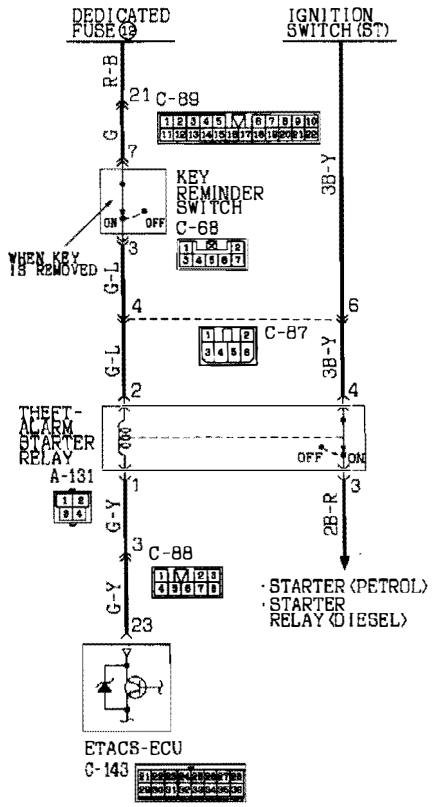
The battery supplies a stabilized 5 V power supply to the ECU, via the constant-voltage circuit and terminal 19 (which is directly connected to the battery).
Terminal voltage (Disconnect the connector of the ECU and check at the wiring harness side.)

Terminal No.	Signal	Condition	Terminal voltage
19	ECU power supply	At all times	System voltage

checking the earth circuit (Disconnect the connector and check at the wiring harness side.)

Terminal No.	Connected to / measured component	Measurement	Tester connection	Check condition	Standard
20	ECU earth	Resistance	20 -earth	At all times	Continuity

2. KEY-REMINDER SWITCH INPUT CIRCUIT



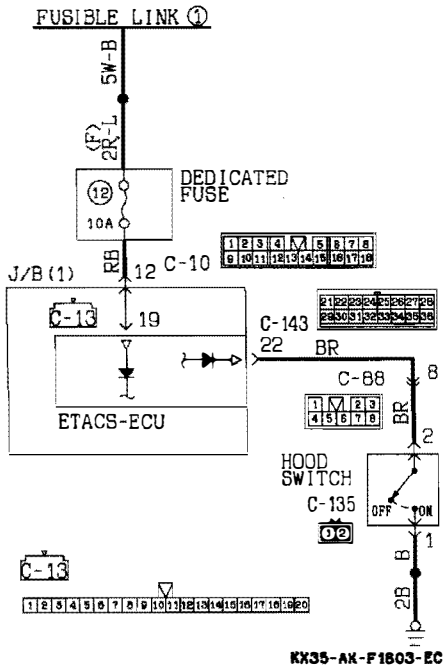
KX35-AK-F1602-EC

Description of operation

The key-reminder switch is switched OFF and HIGH-level signals are sent to the ECU when the key is inserted into the ignition key cylinder: when the key is removed, the keyreminder switch is switched ON and LOW-level signals are sent to the ECU.
Terminal voltage (Connection condition of the connector).

Terminal No.	Signal	Condition	Terminal voltage
23	Key-reminder switch	Key removed	system voltage
		Key inserted	0V

3. HOOD SWITCH INPUT CIRCUIT



Description of operation

When the hood is closed (the hood switch is switched OFF), HIGH-level signals are sent to the ECU:
When the hood is opened (the hood switch is switched ON), LOW-level signals are sent to the ECU.
Terminal voltage (Connection condition of the connector).

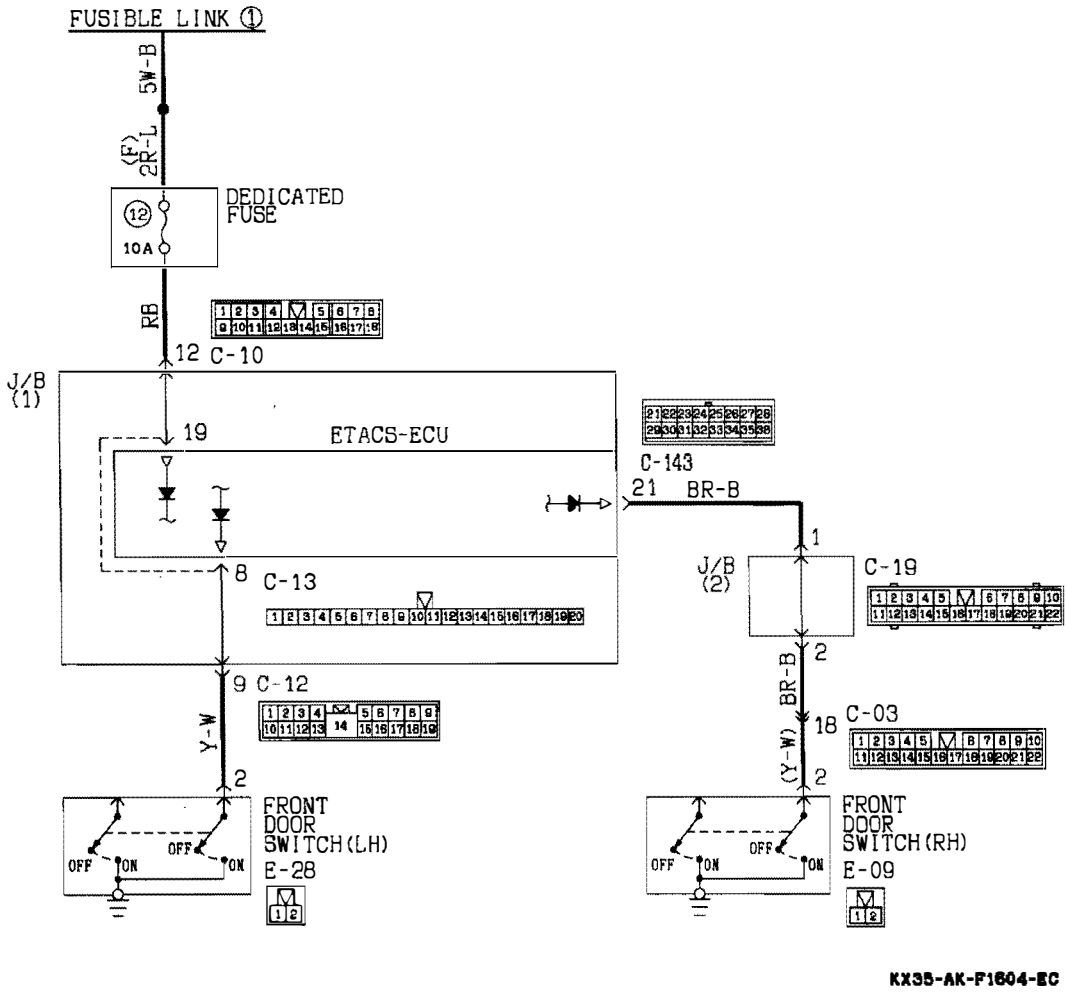
Terminal No.	Signal	Condition		Terminal voltage
22	Hood switch	Hood	Open (ON)	0V
			Closed (OFF)	5V*

* Measurement is not possible by using a voltmeter, but is possible by using an oscilloscope.

Checking the hood switch circuit (Disconnect the connector and check at the wiring harness side.)

Terminal No.	Connected to/measured part	Measurement	Tester connection	Check condition		Standard
22	Hood switch	Resistance	22 -earth	Hood	Closed (OFF)	No continuity
					Open (ON)	Continuity

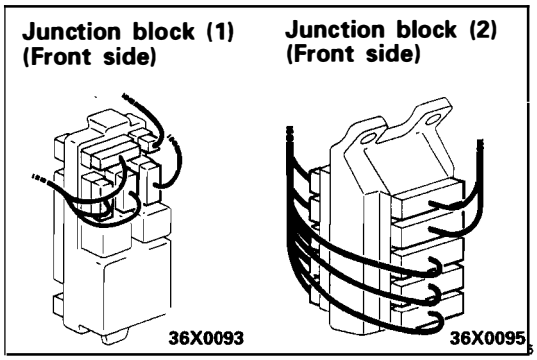
4. DOOR SWITCH INPUT CIRCUIT



Description of operation

When the door is closed (the door switch is switched OFF), HIGH-level signals are sent to the ECU:
When the door is opened (the door switch is switched ON), LOW-level signals are sent to the ECU.
Terminal voltage (Connection condition of the connector).

Terminal No.	Signal	Condition		Terminal voltage
9	Door switch (LH)	Door	Open (ON)	0V
21	Door switch (RH)		Closed (OFF)	System voltage*



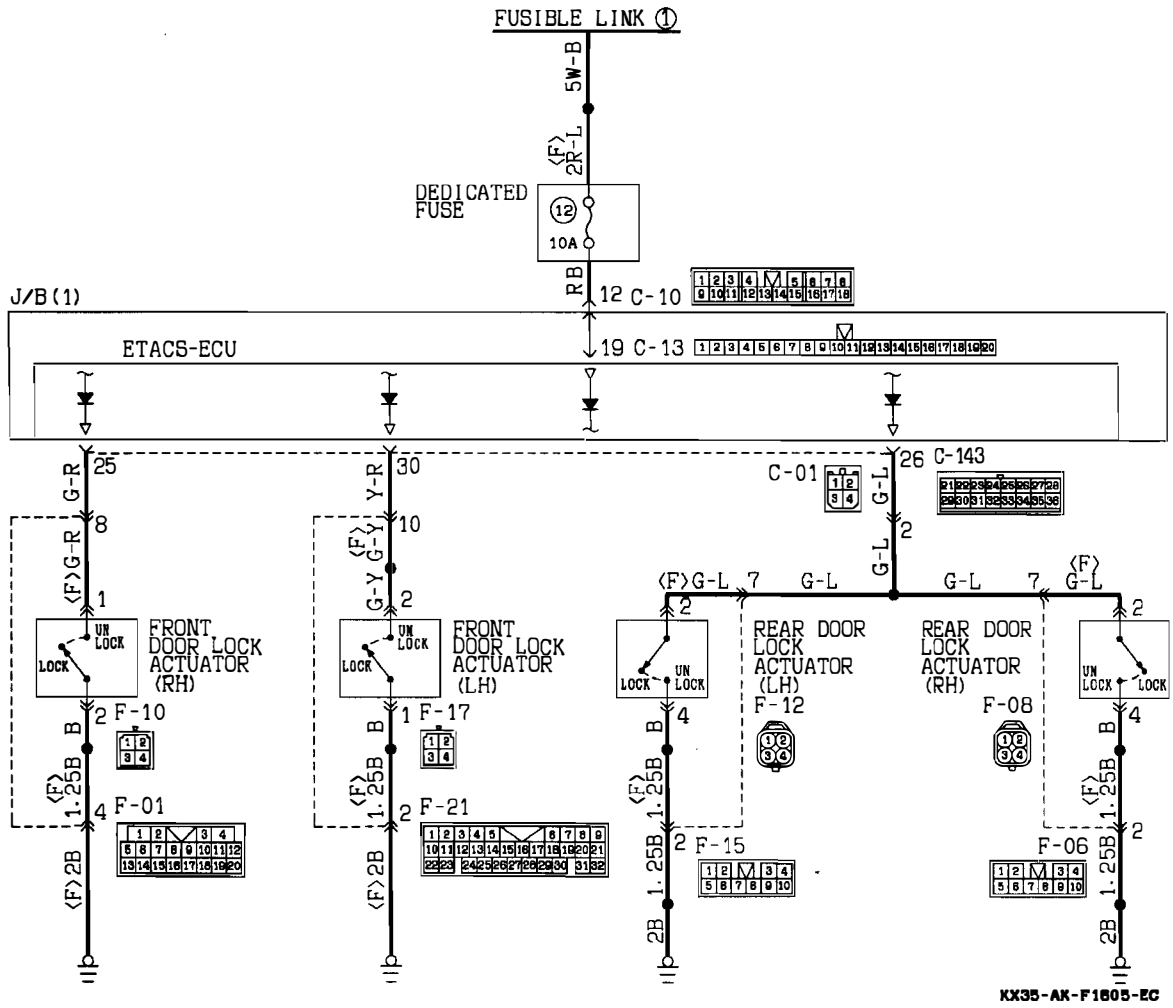
* 1. Both the ECU and the door-ajar warning lamp of the combination meter are connected to the door switch. Because of this, the power supply voltage of the door-ajar warning lamp is detected as the ECU terminal voltage.
2. When the junction block (1) or (2) (which is located at the left, under of the instrument panel) connector, indicated in the figure is disconnected, ECU voltage, 5 V (pulse), is detected. As measurement is not possible by using a voltmeter, but is possible by using an oscilloscope.

NOTE
When measuring terminal (9), disconnect the connector of junction block (1), and when measuring terminal (21), disconnect the connector of junction block (2).

Checking the door switch circuit (disconnect the connector and check at the wiring harness side.)

Terminal No.	Connected to/ measured part	Measurement	Tester connection	Check condition		((30)
9	Door switch (LH)	Resistance	9-earth	Door	Closed (OFF)	No continuity
21	Door switch (RH)		21-earth		Open (ON)	Continuity

5. DOOR LOCK ACTUATOR SWITCH INPUT CIRCUIT



Description of operation

When a door is locked by the lock knob or the key, the door lock actuator switch is switched OFF, and HIGH-level signals are sent to the ECU. These signals active the timer circuit of the ECU, there by causing the activation circuit to function, thus activating the door lock actuator of all doors.
Terminal voltage (Connection condition of the connector).

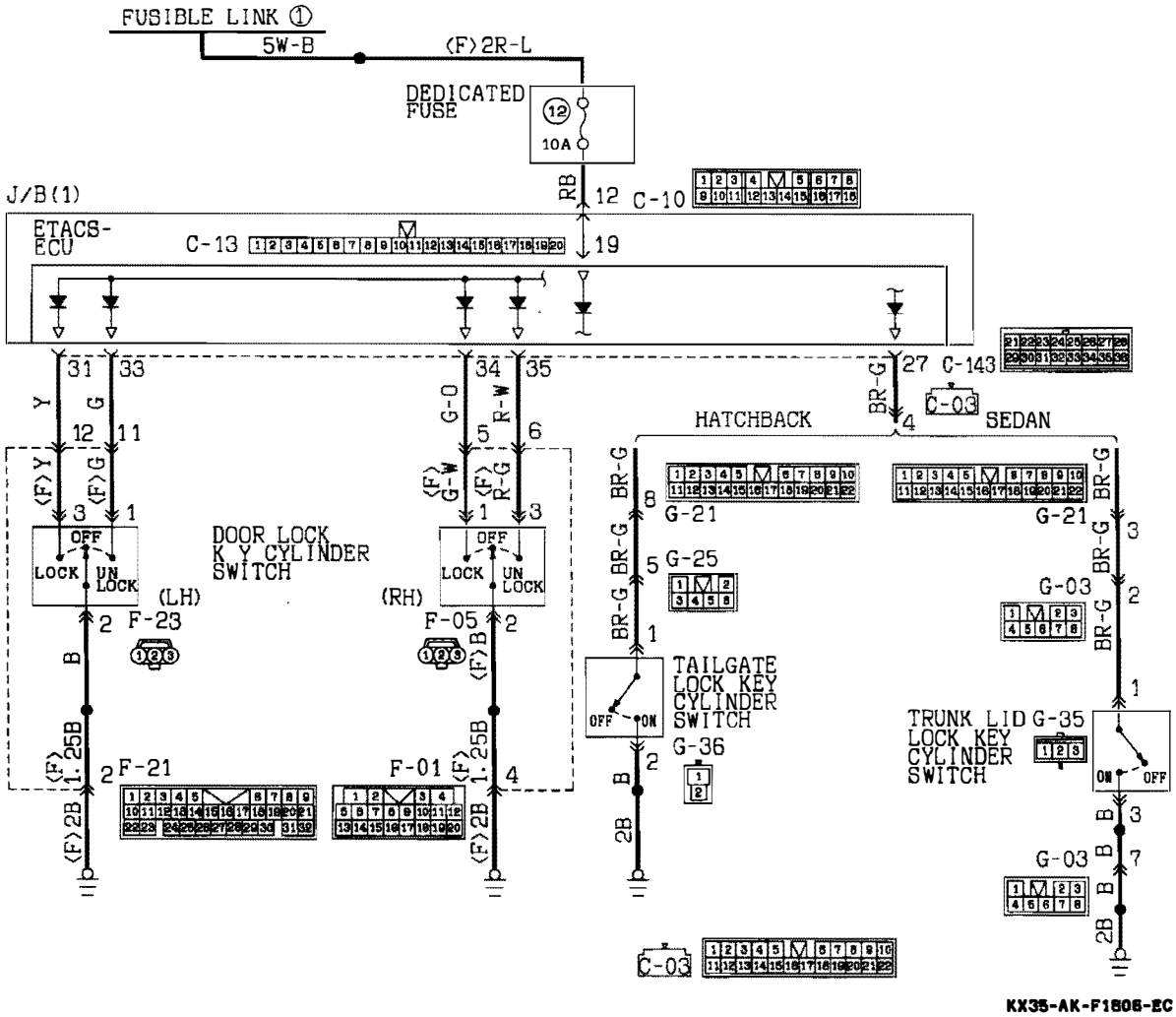
Terminal No.	signal	condition		Terminal voltage
25	Front door lock actuator switch (RH)	Door lock actuator switch	Lock: OFF	5V*
30	Front door lock actuator switch (LH)			
26	Rear door lock actuator switch (LH or RH)		Unlock: ON	0V

* Measurement is not possible by using a voltmeter, but is possible by using an oscilloscope.

Checking the door lock switch circuit (Disconnect the connector and check at the wiring harness side.)

Terminal No.	Connected to/ measured part	Measurement	Tester connection	Check condition		Standard
25	Front door lock actuator switch (RH)	Resistance	25 -earth	Door lock actuator switch	Lock: OFF	No continuity
30	Front door lock actuator switch (LH)		30 -earth			
26	Rear door lock actuator switch (LH or RH)	Resistance	26 -earth		Unlock: ON	Continuity

6. DOOR LOCK KEY CYLINDER OR TRUNK LID LOCK CYLINDER SWITCH <SEDAN>, TAILGATE LOCK CYLINDER SWITCH <HATCHBACK> INPUT CIRCUIT



KX35-AK-F1606-EC

Description of operation

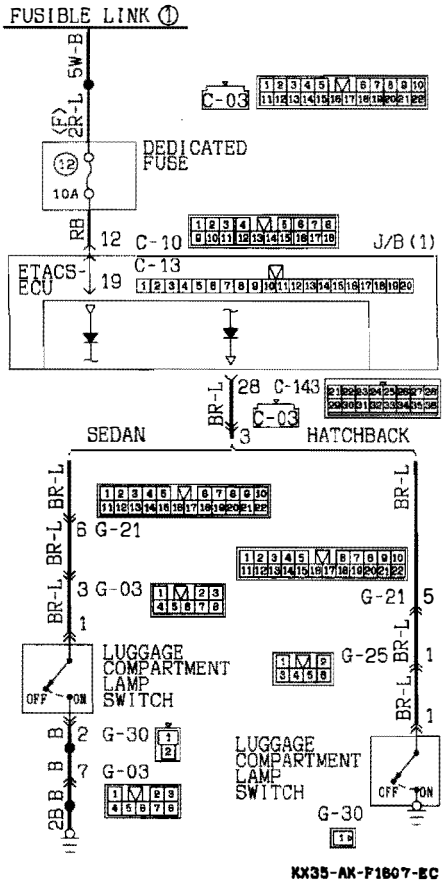
When the door lock key is rotated or the key is unlocked. LOW-level signals are sent to the ECU.
Terminal voltage (Connection condition of the connector).

Terminal No.	Signal	Condition		Terminal voltage
31	Door lock key cylinder switch (LH)	Door lock key cylinder	Neutral	5V
33			Lock or Unlock	0V
34	Door lock key cylinder switch (RH)	Door lock key cylinder	Neutral	5V
35			Lock or Unlock	0V
27	Trunk lid lock cylinder switch <Sedan> or tailgate lock cylinder switch <Hatchback>	Trunk lid <Sedan> or tailgate <Hatch-back>	OFF	5V
			ON	0V

Checking the door lock key cylinder and trunk lid lock cylinder switch <Sedan>, tailgate lock cylinder switch <Hatchback> circuit.
(Disconnect the connector and check at the wiring harness side.)

Terminal No.	Connected to/measured part	Measurement	Tester connection	Check condition		Standard
31	Door lock key cylinder switch (LH)	Resistance	31 -earth	Door lock key cylinder (LH)	Neutral	No continuity
33			33 -earth		Lock or Unlock	Continuity
34	Door lock key cylinder switch (RH)	Resistance	34 -earth	Door lock key cylinder (RH)	Neutral	No continuity
35			35 -earth		Lock or Unlock	Continuity
27	Trunk lid lock cylinder switch <Sedan> or tailgate lock cylinder switch <Hatchback>	Resistance	27 -earth	Trunk lid <Sedan> or tailgate <Hatch-back>	OFF	No continuity
					ON	Continuity

7. LUGGAGE COMPARTMENT LAMP SWITCH INPUT CIRCUIT



Description of operation

When the trunk lid is closed <Sedan> or tailgate <Hatchback> (the luggage compartment lamp switch is switched OFF), HIGH-level signals are sent to the ECU.
When the trunk lid is opened <Sedan> or tailgate <Hatchback> (the luggage compartment lamp switch is switched ON), LOW-level signals are sent to the ECU.
Terminal voltage (Connection condition of the connector).

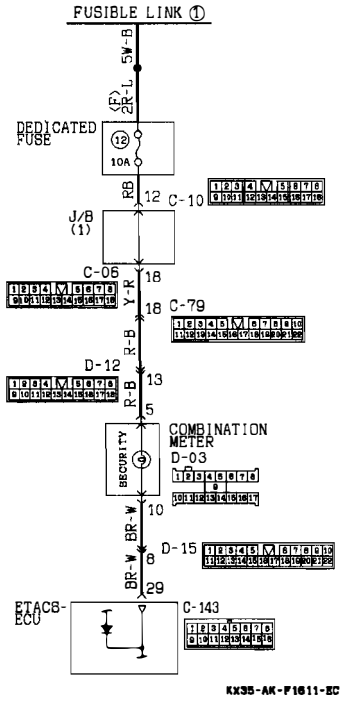
Terminal No.	Signal	Condition		Terminal voltage
28	Luggage compartment lamp switch	Trunk lid <Sedan> or tailgate <Hatchback>	Open (ON)	0V
			Closed (OFF)	system voltage*

* 1. Both the ECU and the luggage compartment lamp are connected to the luggage compartment lamp switch.
Because of this, the power supply voltage of the luggage compartment lamp is detected as the ECU terminal voltage.
2. When the connection of the luggage compartment lamp is disconnected, the ECU voltage, 5 V (pulse), is detected. As measurement is not possible by using a voltmeter, but is possible by using an oscilloscope.

Checking the liftgate switch circuit (Disconnect the connector and check at the wiring harness side.)

Terminal No.	Connected to/measured part	Measurement	Tester connection	Check condition		Standard
28	Luggage compartment lamp switch	Resistance	28 -earth	Trunk lid <Sedan> or tailgate <Hatchback>	Closed (OFF)	No continuity
					Open (ON)	Continuity

8. SECURITY LIGHT ACTIVATION CIRCUIT

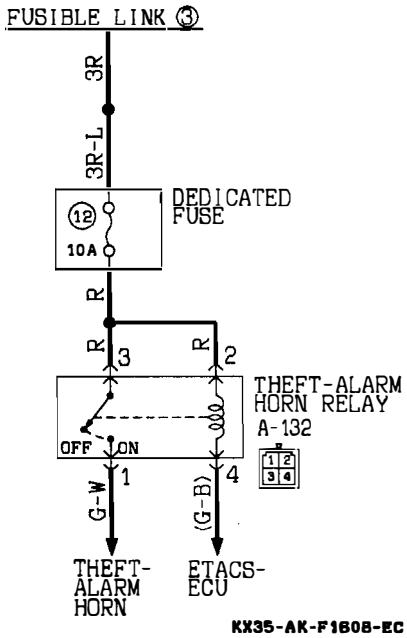


Description of operation

If all doors are in locked state after key locking or key-less locking, the ECU transistor is turned on and the security lamp comes on.
Checking the security lamp activation circuit (Disconnect the connector and check at the wiring harness side.)

Step	Check object	Judgement		Cause	Remedy
		Normal	Mal-function		
1	D-03 connector terminal voltage 5	System voltage	0V	fuse 12 damaged or disconnected	Replace the fuse
				Harness damaged or disconnected, or short-circuit	Repair the harness
2	D-03 connector terminal voltage 10	system voltage	0V	Damaged or disconnected wiring of SECURITY lamp bulb	Replace the bulb
				Harness damaged or disconnected	Repair the harness
3	ECU terminal voltage 29	System voltage	0V	Harness damaged or disconnected, or short-circuit	Repair the harness

9. THEFT ALARM HORN RELAY POWER-SUPPLY CIRCUIT

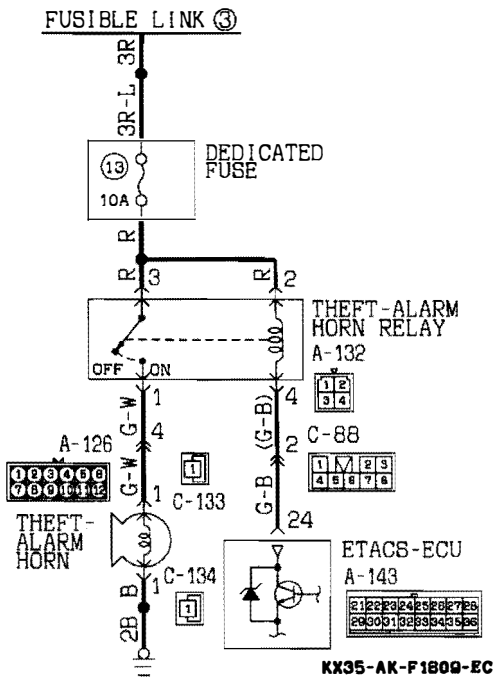


Description of operation

Power voltage is always supplied to the theft-alarm horn relay.
Checking the horn relay power-supply circuit (Disconnect the theft-alarm horn relay)

Check object	Judgement		Cause	Remedy
	Normal	Mal-function		
THEFT-ALARM HORN RELAY connector terminal voltage 2 or 3	System voltage	0V	Fuse 12 damaged or disconnected	Replace the fuse
			Damaged or disconnected harness	Repair the harness

10. THEFT-ALARM HORN ACTIVATION CIRCUIT

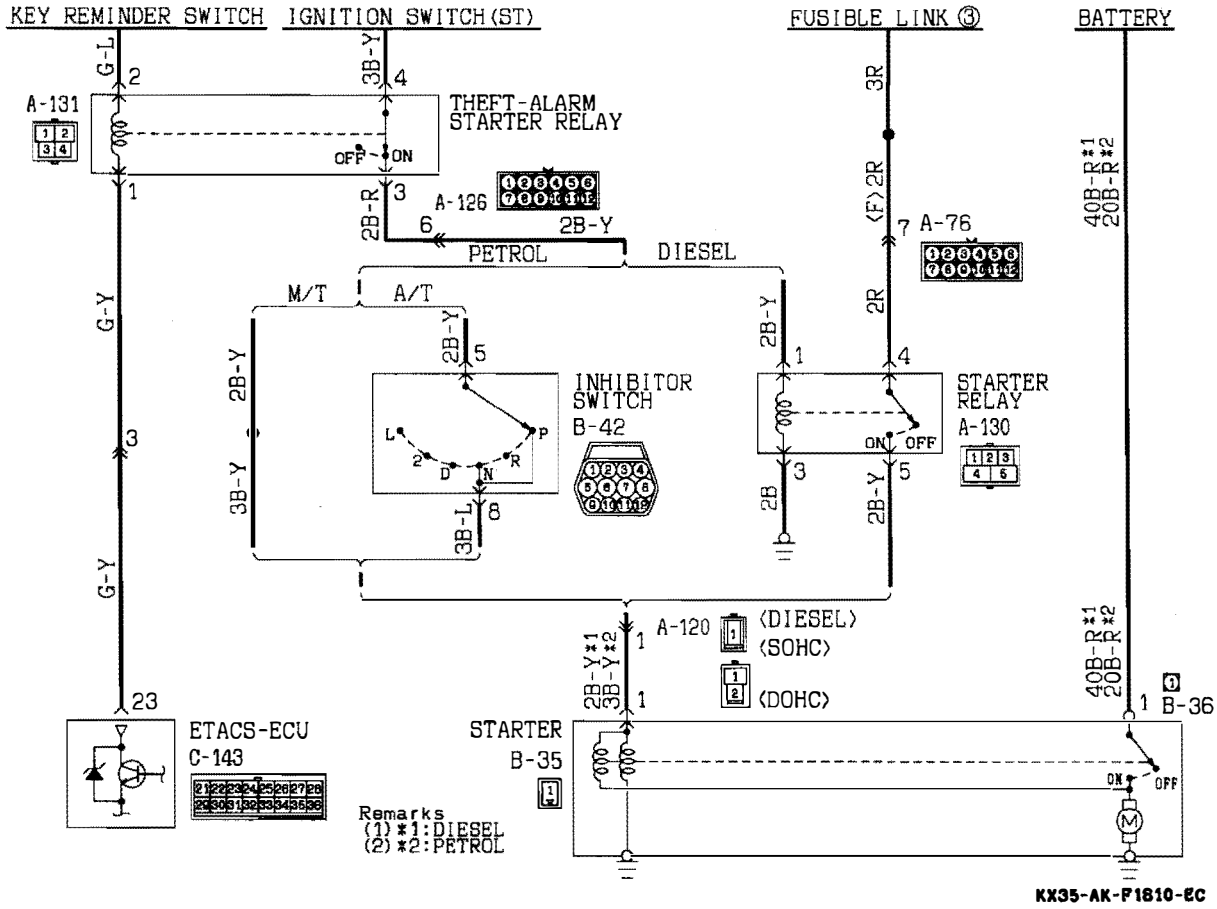


Description of operation

The ECU transistor is turned ON if the vehicle door, etc. are opened without use of the key.
This energizes the horn relay to activate the horn.
Checking the horn activation circuit (disconnect the connector of the ECU, then short-circuit terminal connector No. 24.)

Step	Check object	Judgement		Cause	Remedy
		Normal	Mal-function		
1	A-132 connector terminal voltage 4	System voltage	0V	Malfunction of the horn relay Harness damaged or disconnected	Check the horn relay or repair the harness
2	C-133 connector terminal voltage 1	System voltage	0V	Harness damaged or disconnected	Repair the harness
3	C-134 connector terminal voltage (1' -earth)	–	Horn doesn't sound (0 V)	Malfunction of the horn	Replace the horn
		Horn sounds (0 V)	–	Damaged or disconnected wiring of earth circuit	Repair the harness

11. THEFT-ALARM STARTER RELAY ACTIVATION CIRCUIT



Description of operation

The ECU transistor is turned ON if the vehicle door etc. are opened without use of the key. This turns OFF the theft-alarm starter relay and power ceases to be supplied to the starter magnet switch.
Checking the theft-alarm starter relay activation circuit (Disconnect the connector of the ECU)

Step	Check object	Judgement		Cause	Remedy
		Normal	Malfunction		
1	Theft-alarm starter relay terminal voltage 3	System voltage	0V	Malfunction of the theft-alarm starter relay	Check the theft-alarm starter relay
2	Starter motor terminal 1	System voltage	0V	Harness damaged or disconnected Malfunction of the starter relay <DIESEL>	Repair the harness Check the starter relay <DIESEL>

NOTE

HEATER, AIR CONDITIONER AND VENTILATION

CONTENTS

E55ZA00BB

CONTINUED ON NEXT PAGE

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

WARNING!

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

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

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

NOTE

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

MANUAL AIR CONDITIONER

GENERAL INFORMATION

E55AB00AB

The heater system uses a two-way-flow full-air-mix system that features high performance and low operating noise, and includes an independent face air blowing function and a cool air bypass function. The A/C system is basically the same as the conventional system, but a new refrigerant system has been adopted as a response to restrictions on the use of chlorofluorocarbons. In addition, an air purifier which carries out fine A/C control has been included.

Items		Specifications
Heater unit		
Type		Two-way-flow full-air-mix system
Heater control assembly		Dial type
Compressor		
Model		
Up to 1993 models		Scroll type <AX105VS or AX105VSL>
From 1994 models		Scroll type <MSC105CVS>
Triple pressure switch (Up to 1993 models)	kPa	
High pressure switch		OFF: 3,140, ON: 2,550
Medium pressure switch		OFF: 1,470, ON: 1,770
Low pressure switch		OFF: 200, ON: 220
Dual pressure switch (From 1994 models)	kPa	
High pressure switch		OFF: 3,140, ON: 2,550
Low pressure switch		OFF: 200, ON: 220
Refrigerant and quantity	g	R-134a (HFC-134a), Approx. 630 – 670

SAFETY PRECAUTIONS

E55AB00BA

Because R-134a refrigerant is a hydrofluorocarbon (HFC) which contains hydrogen atoms in place of chlorine atoms, it will not cause damage to the ozone layer.
Refrigerant R-134a is transparent and colourless in both the liquid and vapour state. Since it has a boiling point of – 29.8°C, at atmospheric pressure, it will be a vapour at all normal temperatures and pressures. The vapour is heavier than air, non-flammable, and nonexplosive. The following precautions must be observed when handling R-134a.

Caution
Wear safety goggles when servicing the refrigeration system.

R-134a evaporates so rapidly at normal atmospheric pressures and temperatures that it tends to freeze anything it contacts. For this reason, extreme care must be taken to prevent any liquid refrigerant from contacting the skin and especially the eyes. Always wear safety goggles when servicing the refrigeration part of the A/C system. Keep a bottle of sterile mineral oil handy when working on the refrigeration system. Should any liquid refrigerant get into the eyes, use a few drops of mineral oil to wash them out. R-134a is rapidly absorbed by the oil. Next splash the eyes with plenty of cold water. Call your doctor immediately even though irritation has ceased after treatment.

Caution
Do not heat R-134a above 40°C

In most instances, moderate heat is required to bring the pressure of the refrigerant in its container above the pressure of the system when charging or adding refrigerant.
A bucket or large pan of hot water not over 40°C is all the heat required for this purpose. Do not heat the refrigerant container with a blow torch or any other means that would raise temperature and pressure above this temperature. Do not weld or steam clean on or near the system components or refrigerant lines.

Caution
Keep R-134a containers upright when charging the system.

When metering R-134a into the refrigeration system keep the supply tank or cans in an upright position. If the refrigerant container is on its side or upside down, liquid refrigerant will enter the system and damage the compressor.

Caution
1. **The leak detector for R-134a should be used to check for refrigerant gas leaks.**
2. **Do not allow liquid refrigerant to touch bright metal.**

Refrigerant will tarnish bright metal and chrome surfaces, and in combination with moisture can severely corrode all metal surfaces.

SERVICE SPECIFICATIONS

E55AC00AB

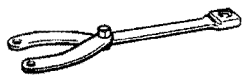
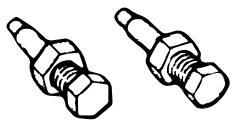
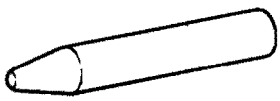
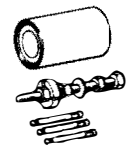
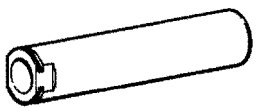
Items		Specifications
Standard value		
Idle speed	r/min	
4G93		800 ± 50
4G63		750 ± 50
4D68		750 ± 30
Idle up speed	r/min	
4G93, 4G63		850
4D68		850 ± 50
Idle-up solenoid valve <4D68>	Ω	Approx. 40
Resistor (for blower motor)	Ω	
LO		2.3
ML		1.1
MH		0.4
Refrigerant temperature switch		
Up to 1993 models		
ON (continuity) temperature		Approx. 155°C or less
OFF (no continuity) temperature		Approx. 155°C or more (until the temperature drops to approx. 110°C when OFF)
From 1994 models		
ON (continuity) temperature		Approx. 165°C or less
OFF (no continuity) temperature		Approx. 165°C or more (until the temperature drops to approx. 110°C when OFF)
Air gap (Magnetic clutch)	mm	0.4–0.65
Engine coolant temperature switch <4D68>		
ON (continuity) temperature		Approx. 115°C or less
OFF (no continuity) temperature		Approx. 115°C or more (until the temperature drops to approx. 108°C when OFF)
Resistor (for condenser fan motor)	Ω	
Up to 1993 models		0.29 (6B models)
		0.45 (Other models)
From 1994 models		0.45

LUBRICANTS

Items	Specified lubricants	Quantity
Each connection of refrigerant line Lip seal of the compressor	SUN PAG 56	As required
Compressor refrigerant unit lubricant m ℓ	SUN PAG 56	160<4G93> 150<4G63, 4D68>

SPECIAL TOOLS

E55AD00AA

Tool	Number	Name	Use
	MB991367	Special spanner	Removal and installation of armature mounting nut of compressor
	MB991386	Pin	
	MB991459	Lip seal installer guide	Installation of lip seal
	MB991456	Bearing puller	Removal of compressor bearing
	MB991458	Lip seal installer and remover	Removal and installation of lip seal

TROUBLESHOOTING

TROUBLESHOOTING PROCEDURES

E55AE00AB

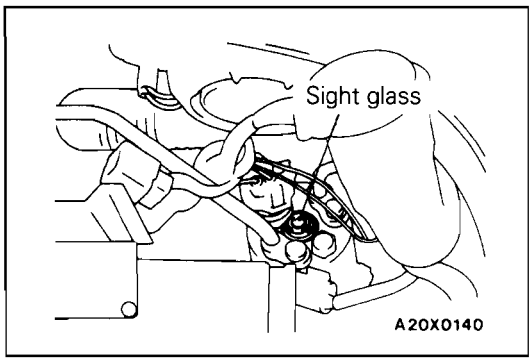
Trouble symptom	Problem cause	Remedy	Reference page
When the ignition switch is "ON", the A/C does not operate.	A/C compressor relay is defective	Replace A/C compressor relay	P.55-17
	Magnetic clutch is defective	Replace the armature plate, rotor or clutch coil	P.55-40
	Refrigerant leak or overfilling of refrigerant	Replenish the refrigerant, repair the leak or take out some of the refrigerant	P.55-11
	Triple pressure switch is defective (Up to 1993 models)	Replace the triple pressure switch	P.55-45, 46
	Dual pressure switch is defective (From 1994 models)	Replace the dual pressure switch	P.55-45, 46
	A/C switch is defective	Replace the A/C switch	P.55-24
	Blower switch is defective	Replace the blower switch	P.55-23
	Air thermo sensor is defective	Replace the sensor	P.55-32
	Fin thermo sensor is defective		
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	P.55-40
	Engine coolant temperature switch (for A/C cut) is defective <DIESEL>	Replace the engine coolant temperature switch	P.55-47
	Auto compressor-ECU is defective	Replace the auto compressor ECU	P.55-28
When the A/C is operating, temperature inside the passenger compartment doesn't decrease (cool air is not emitted).	Refrigerant leak	Replenish the refrigerant and repair the leak	P.55-11
	Triple pressure switch is defective (Up to 1993 models)	Replace the triple pressure switch	P.55-45, 46
	Dual pressure switch is defective (From 1994 models)	Replace the dual pressure switch	P.55-45, 46
	Air thermo sensor is defective	Replace the sensor	P.55-32
	Fin thermo sensor is defective		
	Refrigerant temperature switch is defective	Replace the refrigerant temperature switch	P.55-40
	Engine coolant temperature switch (for A/C cut) is defective <DIESEL>	Replace the engine coolant temperature switch	P.55-47
	Auto compressor ECU is defective	Replace the auto compressor ECU	P.55-28

Trouble symptom	Problem cause	Remedy	Reference page
Blower fan and motor doesn't turn	Blower relay is defective	Replace the blower relay	P.55-17
	Blower fan and motor is defective	Replace the blower fan and motor	P.55-28
	Resistor (for blower motor) is defective	Replace the resistor	P.55-28
	Blower switch is defective	Replace the blower switch	P.55-23
Blower fan and motor doesn't stop turning.	Short circuit of the harness between the blower fan and motor and the blower switch	Repair the harness	—
	Blower switch is defective	Replace the blower switch	P.55-23
	Blower relay is defective	Replace the blower relay	P.55-17
When the A/C is operating, condenser fan does not turn.	Condenser fan motor is defective	Replace the condenser fan motor	P.55-48
	Condenser fan relay (LO) is defective	Replace the condenser fan relay (LO)	P.55-17
	Condenser fan relay (HI) is defective	Replace the condenser fan relay (HI)	P.55-17
	Triple pressure switch is defective <DIESEL> (Up to 1993 models)	Replace the triple pressure switch	P.55-45, 46
	Dual pressure switch is defective <DIESEL> (From 1994 models)	Replace the dual pressure switch	P.55-45, 46
	Engine coolant temperature switch (for driving condenser fan motor) is defective <DIESEL>	Replace the engine coolant temperature switch	P.55-47
	Resistor (for condenser fan relay LO side) is defective <MPI>	Replace the resistor	P.55-28
Air purifier does not operate.	Collector is defective	Replace the collector	P.55-34
	Ionizer is defective	Replace the ionizer	
	Transformer unit is defective	Replace the transformer unit	
A/P indicator lamp does not illuminate.	Indicator lamp bulb is defective	Replace the bulb	P.55-23

INSPECTION AT THE AUTO COMPRESSOR-ECU TERMINAL

E55AE01AA

Terminal No.	Name of Signal	Condition	Terminal voltage
1	Auto compressor ECU power supply	The ignition switch is ON	System voltage
2	Auto compressor ECU power supply (ECONO mode)	When the ignition switch and the blower switch are ON, and the A/C switch has been turned to the first level	System voltage
6	A/C compressor relay	When the compressor ON conditions are satisfied	System voltage
7	Auto compressor ECU power supply (DRY mode)	When the ignition switch and the blower switch are ON, and the A/C switch has been turned to the second level	System voltage
8,9	Auto compressor ECU earth	At all time	0V
21	Air thermo sensor	Sensor temperature is 25°C [1.0 kΩ]	Approx. 4V
22	Fin thermo sensor	Sensor temperature is 25°C [4.0 kΩ]	Approx. 2.5V
23	Air thermo sensor power supply	The ignition switch, blower switch and A/C switch are all ON	5V
26	Fin thermo sensor power supply	The ignition switch, blower switch and A/C switch are all ON	5V



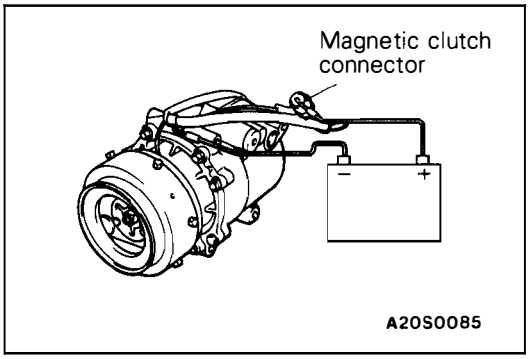
SERVICE ADJUSTMENT PROCEDURES

E55AF00AA

SIGHT GLASS REFRIGERANT LEVEL TEST

The sight glass is a refrigerant level indicator. To check the refrigerant level, clean the sight glass and start the vehicle engine. Push the A/C button to operate the compressor, place the blower switch to high and move the temperature control lever to max cool. After operating for a few minutes in this manner, check the sight glass.

1. If the sight glass is clear, the magnetic clutch is engaged, the compressor discharge line is warm and the compressor inlet line is cool; the system has a full charge.
2. If the sight glass is clear, the magnetic clutch is engaged and there is no significant temperature difference between compressor inlet and discharge lines; the system has lost some refrigerant.
3. If the sight glass shows foam or bubbles, the system could be low on charge. The system has to be recharged with refrigerant.



MAGNETIC CLUTCH TEST

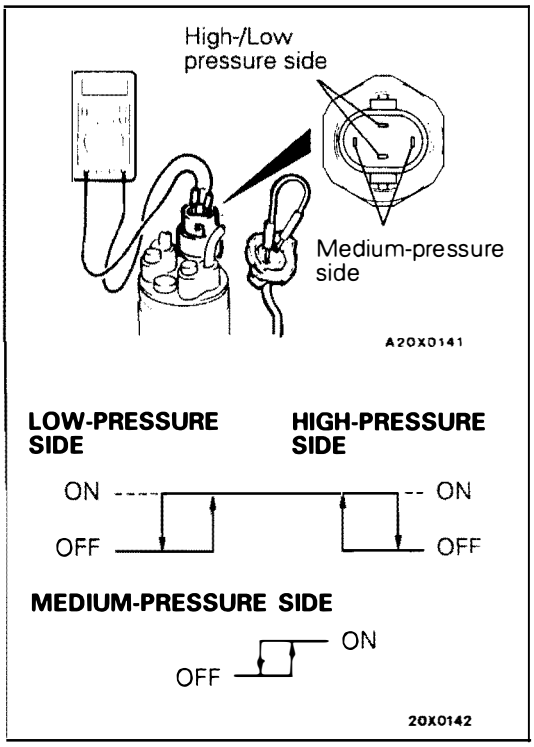
E55AF01AA

1. Disconnect the connector (1P) to the magnetic clutch.
2. Connect battery (+) voltage directly to the connector for the magnetic clutch.
3. If the magnetic clutch is normal, there will be a "click". If the pulley and armature do not make contact ('click'), there is a malfunction.

RECEIVER DRIER TEST

E55AF02AA

1. Operate the unit and check the piping temperature by touching the receiver drier outlet and inlet.
   If there is a difference in the temperatures, the receiver drier is restricted.
   Replace the receiver drier.



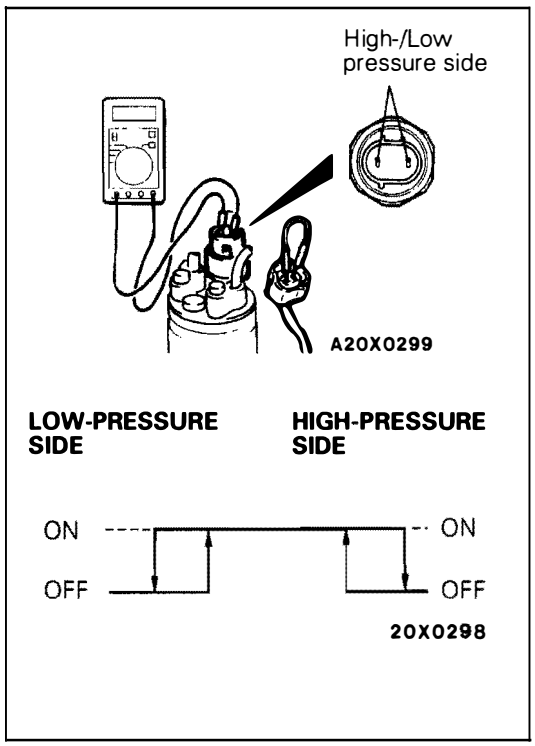
TRIPLE PRESSURE SWITCH CHECK (Up to 1993 models)

E55AF03AB

1. Remove the triple pressure switch connector and connect the high/low pressure side terminals located on the harness side as shown in the illustration.
2. Install a gauge manifold to the high pressure side service valve of the refrigerant line. (Refer to Performance Test.)
3. When the high/low and medium pressure sides of the triple pressure switch are at operation pressure (ON) and there is continuity between the respective terminals, then the condition is normal. If there is no continuity, replace the switch.

Unit: kPa

Items \ Switch position	OFF → ON	ON → OFF
Low-pressure side	220	200
High-pressure side	2,550	3,140
Medium-pressure side	1,770	1,470



DUAL PRESSURE SWITCH CHECK (From 1994 models)

E55AF03AC

1. Remove the dual pressure switch connector and connect the high/low pressure side terminals located on the harness side as shown in the illustration.
2. Install a gauge manifold to the high pressure side service valve of the refrigerant line. (Refer to Performance Test.)
3. When the high/low pressure sides of the dual pressure switch are at operation pressure (ON) and there is continuity between the respective terminals, then the condition is normal. If there is no continuity, replace the switch.

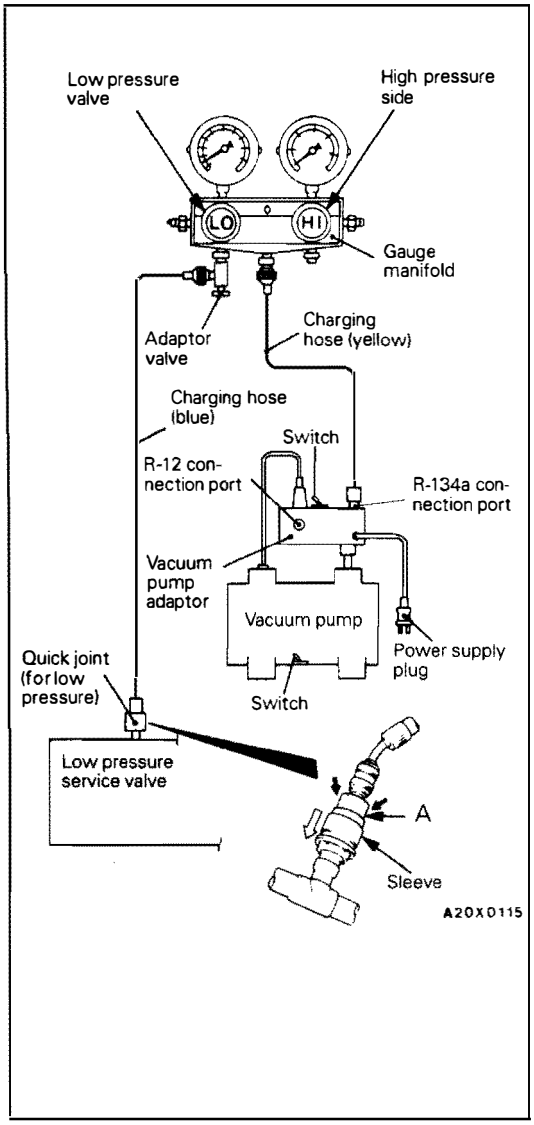
Unit: kPa

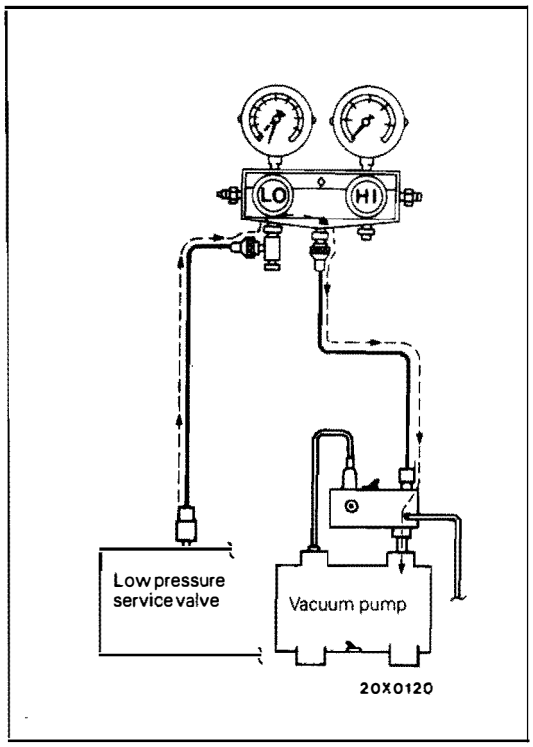
Items \ Switch position	OFF → ON	ON → OFF
Low-pressure side	220	200
High-pressure side	2,550	3,140

COMPRESSOR DRIVE BELT ADJUSTMENT

E55AF04AA

Refer to GROUP 11 – Service Adjustment Procedures.





CHARGING

E55AF05AA

1. With the handles turned back all the way (valve closed), install the adaptor valve to the low-pressure side of the gauge manifold.
2. Connect the charging hose (blue) to the adaptor valve.
3. Connect the quick joint (for low pressure) to the charging hose (blue).
4. Connect the quick joint (for low pressure) to the low pressure service valve.

   NOTE
   The low-pressure service valve should be connected to the suction hose.

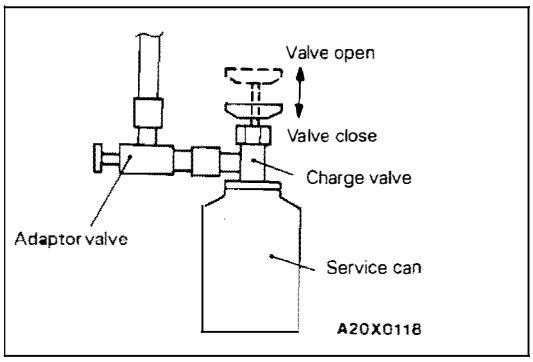
   Caution
   1. Use tools that are suited to R-134a.
   2. To install the quick joint, press section A firmly against the service valve until a click is heard. When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.
5. Close the high and low pressure valves of the gauge manifold.
6. Install the vacuum pump adaptor to the vacuum pump.
7. Connect the vacuum pump plug to the vacuum pump adaptor.
8. Connect the charging hose (yellow) to the R-134a connection port of the vacuum pump adaptor.
9. Tighten the adaptor valve handle (valve open).
10. Open the low pressure valve of the gauge manifold.
11. Turn the power switch of the vacuum pump to the ON position.

    NOTE
    Even if the vacuum pump power switch is turned ON, the vacuum pump will not operate because of the power supply connection in step (7).
12. Turn the vacuum pump adaptor switch to the R-134a side to start the vacuum pump.

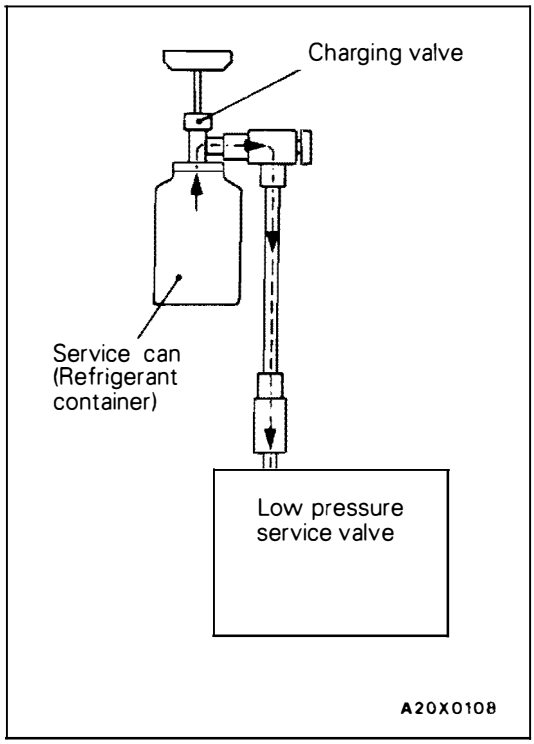
    Caution
    Do not operate the compressor for evacuation.
13. Evacuate to a vacuum reading of 100 kPa or higher (takes approx. 10 minutes).
14. Turn the vacuum pump adaptor switch OFF and allow to stand it for 5 minutes.

    Caution
    Do not operate the compressor in the vacuum condition; damage may occur.
15. Carry out a leak test. (Good if the negative pressure does not drop.)

    Caution
    If the negative pressure drops, increase the tightness of the connections, and then repeat the evacuation procedure from step (12).



16. With the handle turned back all the way (valve open), install the charging valve to the service can.
17. Turn the handle of the adaptor valve back all the way (valve closed), remove it from the gauge manifold and install the service can.
18. Tighten the handle of the charging valve (valve closed) to puncture the service can.



19. Turn the handle of the charging valve back (valve open) and tighten the handle of the adaptor valve (valve open) to charge the system with refrigerant.

    Caution
    If the service can is inverted, liquid refrigerant may be drawn into the compressor damaging it by liquid compression. Keep the service can upright to ensure that refrigerant is charged in gas state.

20. If the refrigerant is not drawn in, turn the handle of the adaptor valve back all the way (valve closed).
21. Check for gas leaks using a leak detector.
    If a gas leak is detected, re-tighten the connections, and then repeat the charging procedure from evacuation in step (12).

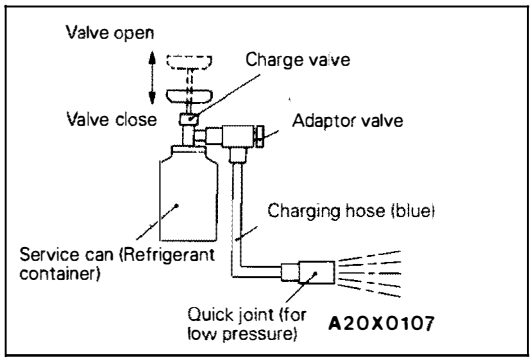
    Caution
    The leak detector for R-134a should be used.

22. Start the engine.
23. Operate the A/C and set to the lowest temperature (MAX. COOL).
24. Fix the engine speed at 1,500 r/min.
25. Tighten the handle of the adaptor valve (valve open) to charge the required volume of refrigerant.

    Caution
    If the service can is inverted, liquid refrigerant may be drawn into the compressor damaging it by liquid compression. Keep the service can upright to ensure that refrigerant is charged in gas state.

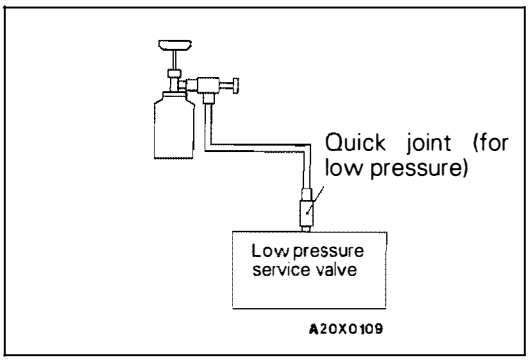
26. After charging with refrigerant, turn the handle of the adaptor valve back all the way (valve closed).
27. Tighten the charging valve handle (valve closed).
    Remove the quick joint (for low pressure) from the low-pressure service valve.

    NOTE
    If the service can is not emptied completely, keep the handles of the charging valve and adaptor valve closed for the next charging.



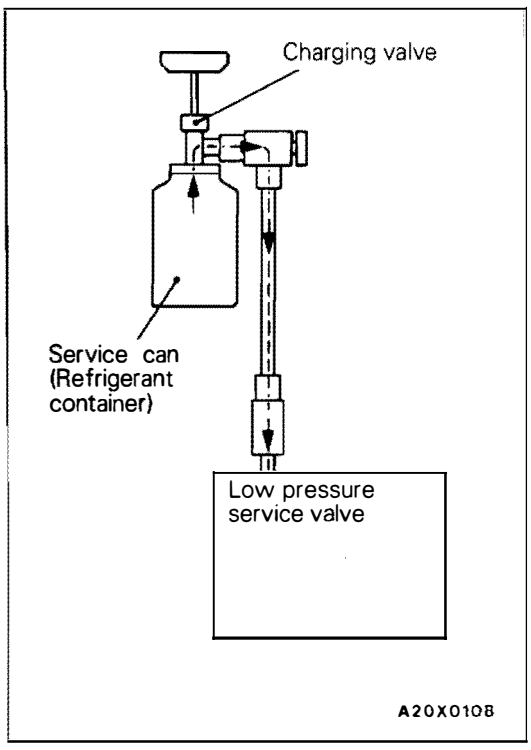
CORRECTING LOW REFRIGERANT LEVEL IN CASE THE SERVICE CAN IS USED E55AF05BA

1. Install the charge valve with the handle turned all the way back (valve open) to the service can.
2. Install the adaptor value with the handle turned all the way back (valve close) to the charging valve.
3. Connect the charging hose (blue) to the adaptor valve.
4. Connect the charging hose (blue) to the quick joint (for low pressure).
5. Tighten the handle of the charge valve (valve close), and pierce the service can.
6. Turn the handle of the adaptor valve to bleed the air.



7. Install the quick joint (for low pressure) to the low pressure service valve.

   NOTE
   The low-pressure service valve should be connected to the suction hose.

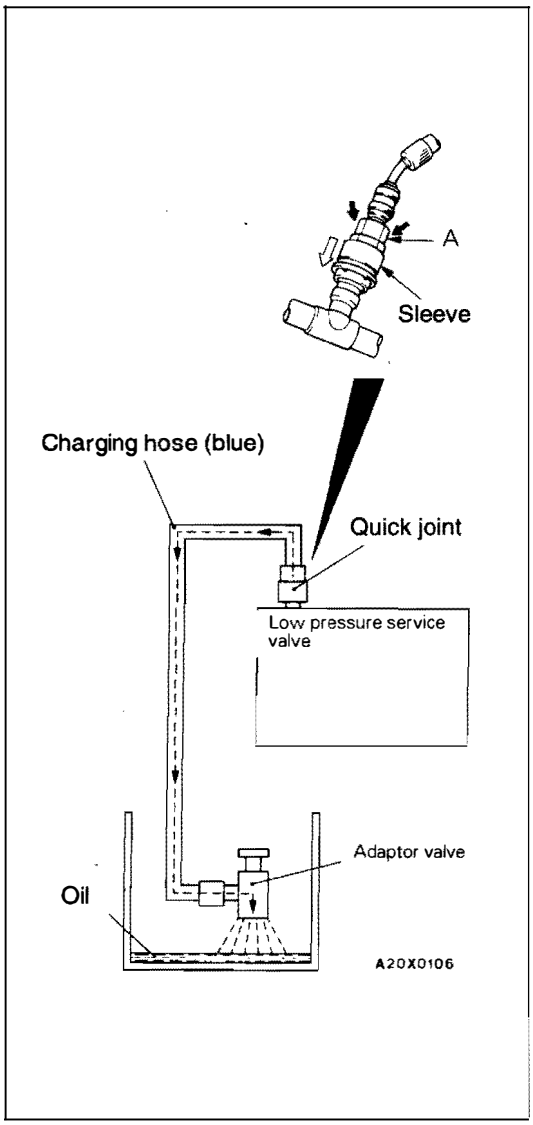


8. Start the engine.
9. Operate the air conditioner and set at the lowest temperature (MAX. COOL).
10. Fix the engine speed at 1,500 r/min.
11. Tighten the handle of the adaptor valve (valve open), and replenish refrigerant checking the quantity through the sight glass.

    Caution
    If the service can is inverted, liquid refrigerant may be draw into the compressor damaging it by liquid compression. Keep the service can upright to ensure that refrigerant is charged in gas state.

12. After replenishing is completed, turn the handle of the adaptor valve all the way back (valve close), and remove the quick joint.

    NOTE
    When there is remainder of refrigerant in the service can, keep it for next use with the charge value and the valve of the adaptor valve being closed.



DISCHARGING SYSTEM E55AF05CA

1. Run the engine at an engine speed of 1200–1500 r/min for approximately 5 minutes with the A/C operating to return the oil.

   NOTE
   Returning the oil will be more effective if it is done while driving.
2. Stop the engine.
3. Connect the charging hose (blue) to the adaptor valve with its handle turned back all the way (valve closed).
4. Connect the quick joint to the charging hose (blue).
5. Install the quick joint to the low pressure service valve.

   NOTE
   The low-pressure service valve should be connected to the suction hose.

   Caution
   To connect the quick joint, press section A firmly against the service valve until a click is heard.
   When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.
6. Place the adaptor valve inside the container and discharge the refrigerant by opening the handle gradually so that oil does not gush out.

   NOTE
   Any oil remaining in the container should be returned to the A/C system.

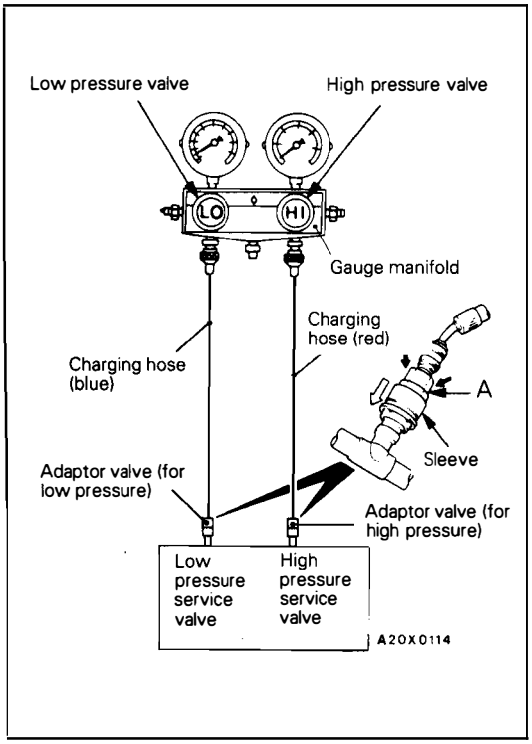
REFILLING OF OIL IN THE A/C SYSTEM E55AF05DB

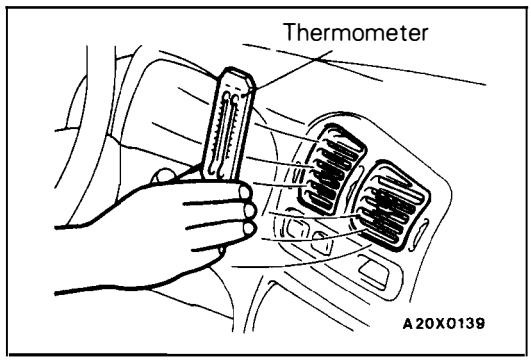
Too little oil will provide inadequate compressor lubrication and cause a compressor failure. Too much oil will increase discharge air temperature.
When a compressor is installed at the factory, it contains 160 mℓ <4G93>, 150 mℓ <4G63, 4D68> of refrigerant oil. While the A/C system is in operation, the oil is carried through the entire system by the refrigerant. Some of this oil will be trapped and retained in various parts of the system.
When the following system components are charged, it is necessary to add oil to the system to replace the oil being removed with the component.

Compressor oil: SUN PAG 56

Quantity

Condenser:	**15 mℓ**
Evaporator:	**60 mℓ**
Suction hose:	**10 mℓ**
Receiver:	**10 mℓ**





PERFORMANCE TEST E55AF06AA

1. The vehicles to be tested should be in a place that is not in direct sunlight.
2. Close the high and low pressure valve of the gauge manifold.
3. Connect the charging hose (blue) to the low pressure valve and connect the charging hose (red) to the high pressure valve of the gauge manifold.
4. Install the quick joint (for low pressure) to the charging hose (blue), and connect the quick joint (for high pressure) to the charging hose (red).
5. Connect the quick joint (for low pressure) to the low-pressure service valve and connect the quick joint (for high pressure) to the high-pressure service valve.

   NOTE
   The high-pressure service valve is on discharge pipe B, and the low-pressure service valve is on the suction hose.

   Caution
   To connect the quick joint, press section A firmly against the service valve until a click is heard. When connecting, run your hand along the hose while pressing to ensure that there are no bends in the hose.
6. Start the engine.
7. Set the controls to the A/C as follows:
   A/C switch: A/C – ON position
   Mode selection: Face position
   Temperature control: Max. cooling position
   Air selection: Recirculation position
   Blower switch: HI (Fast) position
8. Adjust engine speed to 1,000 r/min with A/C clutch engaged.
9. Engine should be warmed up with doors and windows closed.
10. Insert a thermometer in the left center A/C outlet and operate the engine for 20 minutes.
11. Note the discharge air temperature.

    NOTE
    If the clutch cycles, take the reading before the clutch disengages.

Performance Temperature Chart

Garage ambient temperature °C	20	25	35	40
Discharge air temperature °C	2.5–4.5	2.5–4.5	4.0–6.5	6.5–9.0
Compressor high pressure kPa	765–960	765–960	1,325–1,420	1,570–1,765
Compressor low pressure kPa	40–135	40–135	80–175	155–255

REFRIGERANT LEAK REPAIR E55AF07AA

LOST CHARGE

If the system has lost all charge due to a leak:
1. Evacuate the system. (See procedure.)
2. Charge the system with approximately one pound of refrigerant.
3. Check for leaks.
4. Discharge the system.
5. Repair leaks.
6. Replace receiver drier.

Caution
Replacement filter-drier units must be sealed while in storage. The drier used in these units will saturate water quickly upon exposure to the atmosphere. When installing a drier, have all tools and supplies ready for quick reassembly to avoid keeping the system open any longer than necessary.

7. Evacuate and charge system.

LOW CHARGE E55AF07BA

If the system has not lost all of its refrigerant charge; locate and repair all leaks. If it is necessary to increase the system pressure to find the leak (because of an especially low charge) add refrigerant. If it is possible to repair the leak without discharging the refrigerant system, use the procedure for correcting low refrigerant level.

COMPRESSOR NOISE E55AF08AA

You must first know the conditions when the noise occurs. These conditions are: weather, vehicle speed, in gear or neutral, engine temperature or any other special conditions.
Noises that develop during A/C operation can often be misleading. For example: what sounds like a failed front bearing or connecting rod, may be caused by loose bolts, nuts, mounting brackets, or a loose clutch assembly. Verify accessory drive belt tension (power steering or alternator).
Improper accessory drive belt tension can cause a misleading noise when the compressor is engaged and little or no noise when the compressor is disengaged.
Drive belts are speed-sensitive. That is, at different engine speeds, and depending upon belt tension, belts can develop unusual noises that are often mistaken for mechanical problems within the compressor.

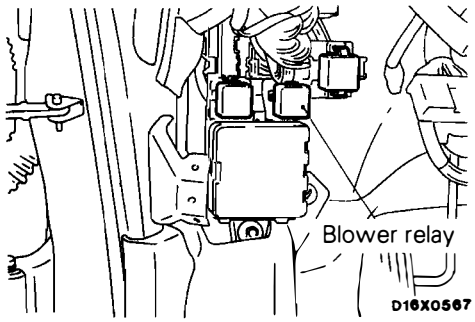
HANDLING TUBING AND FITTINGS E55AF07CA

Kinks in the refrigerant tubing or sharp bends in the refrigerant hose lines will greatly reduce the capacity of the entire system. High pressures are produced in the system when it is operating. Extreme care must be exercised to make sure that all connections are pressure tight. Dirt and moisture can enter the system when it is opened for repair or replacement of lines or components. The following precautions must be observed. The system must be completely discharged before opening any fitting of connection in the refrigeration system. Open fittings with caution even after the system has been discharged. If any pressure is noticed as a fitting is loosened, allow trapped pressure to bleed off very slowly.
Never attempt to rebend formed lines to fit. Use the correct line for the installation you are servicing. A good rule for the flexible hose lines is keep the radius of all bends at least 10 times the diameter of the hose.
Sharper bends will reduce the flow of refrigerant. The flexible hose lines should be routed so that they are at least 80 mm from the exhaust manifold. It is good practice to inspect all flexible hose lines at least once a year to make sure they are in good condition and properly routed.
Unified plumbing connections with O-ring, these O-rings are not reusable.

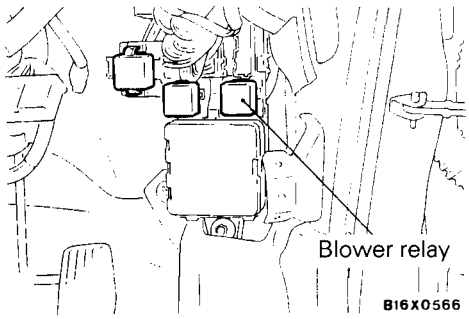
ADJUSTMENT E55AF08BA

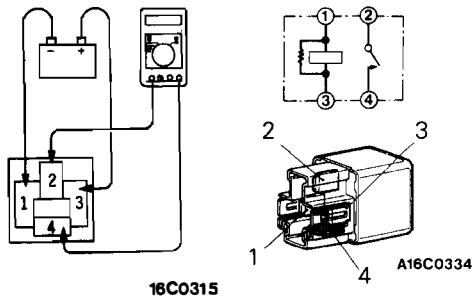
1. Select a quiet area for testing. Duplicate conditions as much as possible. Switch compressor on and off several times to clearly identify compressor noise. To duplicate high ambient conditions (high head pressure), restrict air flow through condenser. Install manifold gauge set to make sure discharge pressure doesn't exceed 2,070 kPa.
2. Tighten all compressor mounting bolts, clutch mounting bolt, and compressor drive belt. Check to assure clutch coil is tight (no rotation or wobble).
3. Check refrigerant hoses for rubbing or interference that can cause unusual noises.
4. Check refrigerant charge. (See "Charging System".)
5. Recheck compressor noise as in Step 1.
6. If noise still exists, loosen compressor mounting bolts and retorque. Repeat Step 1.
7. If noise continues, replace compressor and repeat Step 1.

<L.H. drive vehicles>



<R.H. drive vehicles>





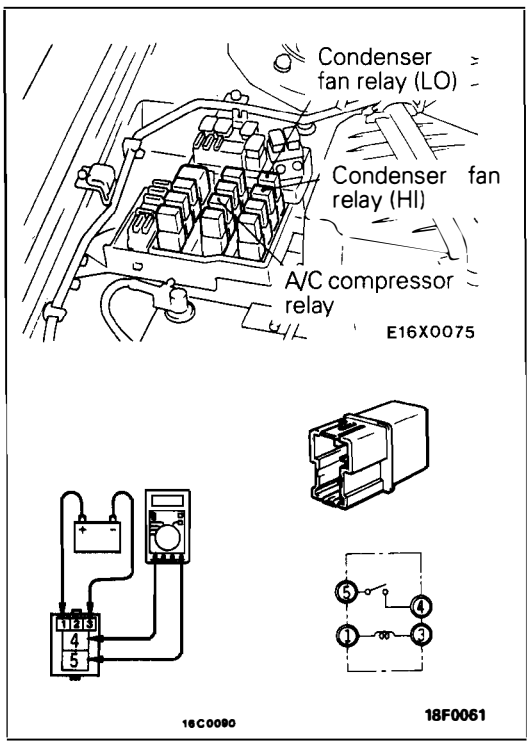
POWER RELAY CHECK

BLOWER RELAY

E55AF09AA

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

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



A/C COMPRESSOR RELAY, CONDENSER FAN RELAY (LO) AND (HI)

E55AF09BA

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

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

IDLE-UP OPERATION CHECK

<Petrol-powered vehicles> E55AF10AA

1. Before inspection and adjustment, set vehicle in the following condition:
   - Engine coolant temperature: 80–90°C
   - Lights, electric cooling fan and accessories: Set to OFF
   - Transmission: Neutral (N or P for vehicles with A/T)
   - Steering wheel: Straightforward
2. Check whether or not the idling speed is the standard value.

   Standard value:
   800 ± 50 r/min. <4G93>
   750 ± 50 r/min. <4G63>
3. When the A/C is running after turning the A/C switch to ON, and the blower switch to the MH or HI position, check to be sure that the idle speed is at the standard value.

   Standard value:
   850 ± 50 r/min. <4G93, 4G63>

   NOTE
   There is no necessity to make an adjustment, because the idling speed is automatically adjusted by the ISC system. If, however, there occurs a deviation from the standard value for some reason, check the ISC system. (Refer to GROUP 13A – Service Adjustment Procedures.)

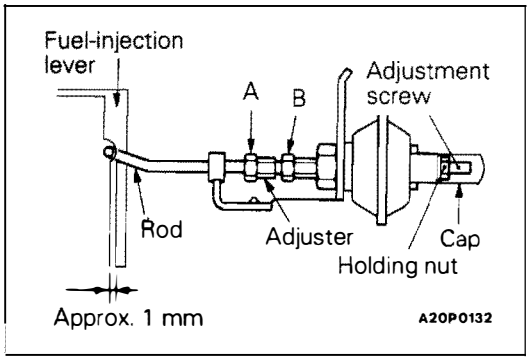
<Diesel-powered vehicles> E55AF10BA

1. Before inspection and adjustment set vehicle in the following conditions:
   - Engine coolant temperature: 80–90°C
   - Transmission: Neutral position
   - Steering wheel: Straightforward
   - Lights, electric cooling fan and accessories: Set to OFF
2. Check whether or not the idling speed is the standard value.

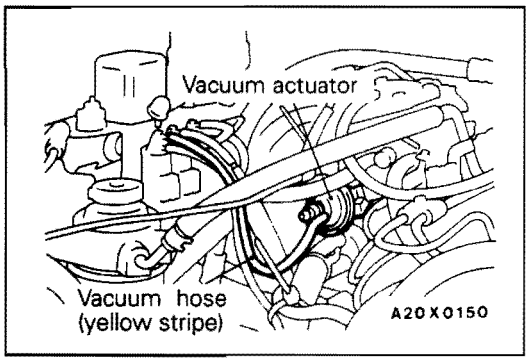
   Standard value: 750 ± 30 r/min.

   NOTE
   If there is a deviation of the idling speed from the standard value, make the adjustment of the idling speed. (Refer to GROUP 11J – Service Adjustment Procedures.)
3. Check to be sure that the idling speed becomes the standard value when the A/C switch is switched ON and the A/C is activated.

   Standard value: 850 ± 50 r/min.



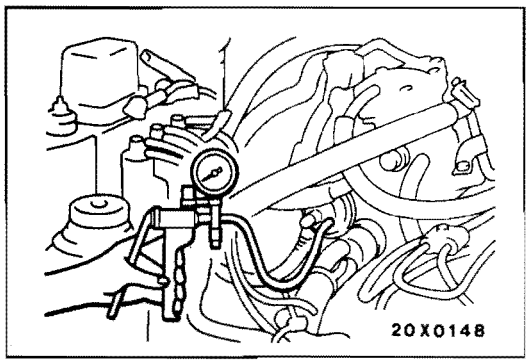
4. If there is a deviation of the idling speed from the standard value, make the adjustment of the idling speed by following the procedures described below.
   (1) Loosen nuts (A) and (B).
   (2) Adjust, by using the adjuster, so that the end of the vacuum actuator's rod is at the position indicated in the illustration.
   (3) Securely tighten nuts (A) and (B).
   (4) After activating the vacuum actuator, check to be sure that the rod and the lever do not contact when the activation is cancelled.
   (5) Remove the cap and loosen the nut for holding.
   (6) Adjust to the specified r/min. by turning the adjustment screw.
   (7) Securely tighten the holding nut, and then attach the cap.



VACUUM ACTUATOR CHECK

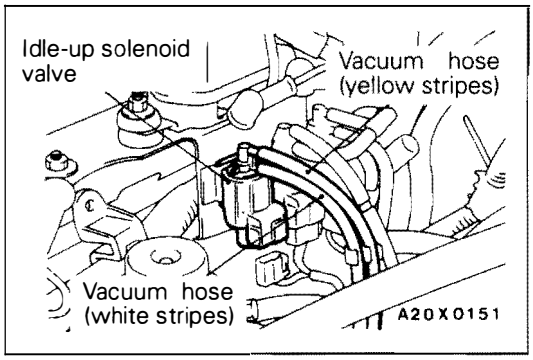
<Diesel-powered vehicles> E55AF11AA

1. Pull off the vacuum hose (yellow stripe) connected to the vacuum actuator.



2. Connect a manual vacuum pump to the nipple of the vacuum actuator.
3. Check to be sure that the vacuum actuator rod starts to contract when 33.3 kPa of negative pressure is applied, and that the rod contracts to its full stroke when 46.7 kPa of negative pressure is applied.
4. Disconnect the manual vacuum pump from the vacuum actuator, and connect the vacuum hose (yellow stripe) to the vacuum actuator.

   NOTE
   Be careful, when connecting the vacuum hose not to damage it.

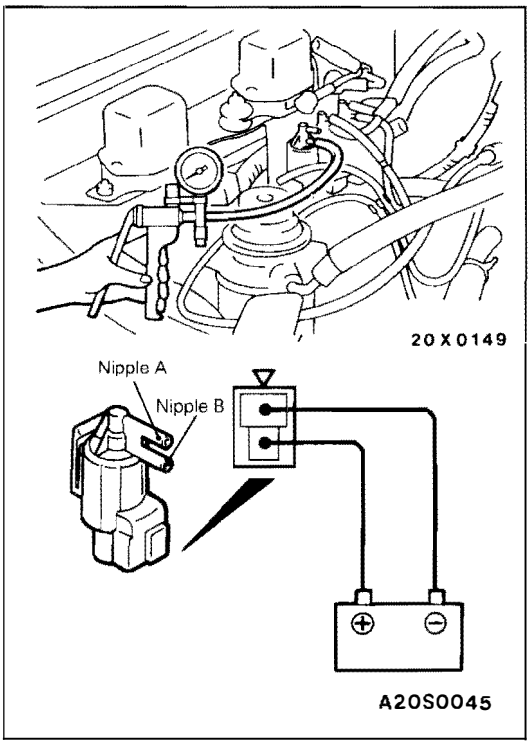


IDLE-UP SOLENOID VALVE CHECK <Diesel-powered vehicles>

E55AF12AA

1. Disconnect the vacuum hose (white stripes, yellow stripes) from the solenoid valve.

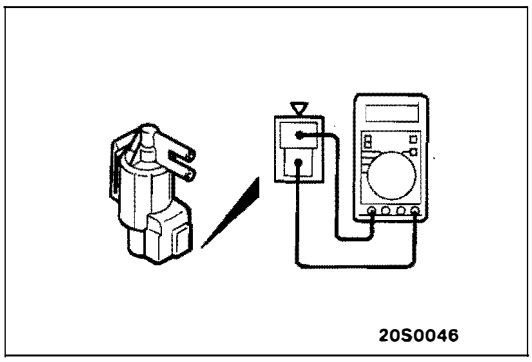
   NOTE
   When disconnecting the vacuum hose, always make a mark so that the hose can be reconnected at original position.
2. Disconnect the harness connector.



3. Connect a manual vacuum pump to the nipple to which the vacuum hose with white stripes was connected.
4. Check airtightness by applying a vacuum with voltage applied directly from the battery to the solenoid valve terminal and without applying voltage.

Battery voltage	Nipple 8	Vacuum condition
Applied	Open	Vacuum leaks from nipple B
	Blocked with finger*1	Vacuum is maintained
Not applied	Open	Vacuum is maintained
	Blocked with finger*2	

NOTE
In case of mark *1, a vacuum can be felt but in case of mark *2, a vacuum can not be felt.



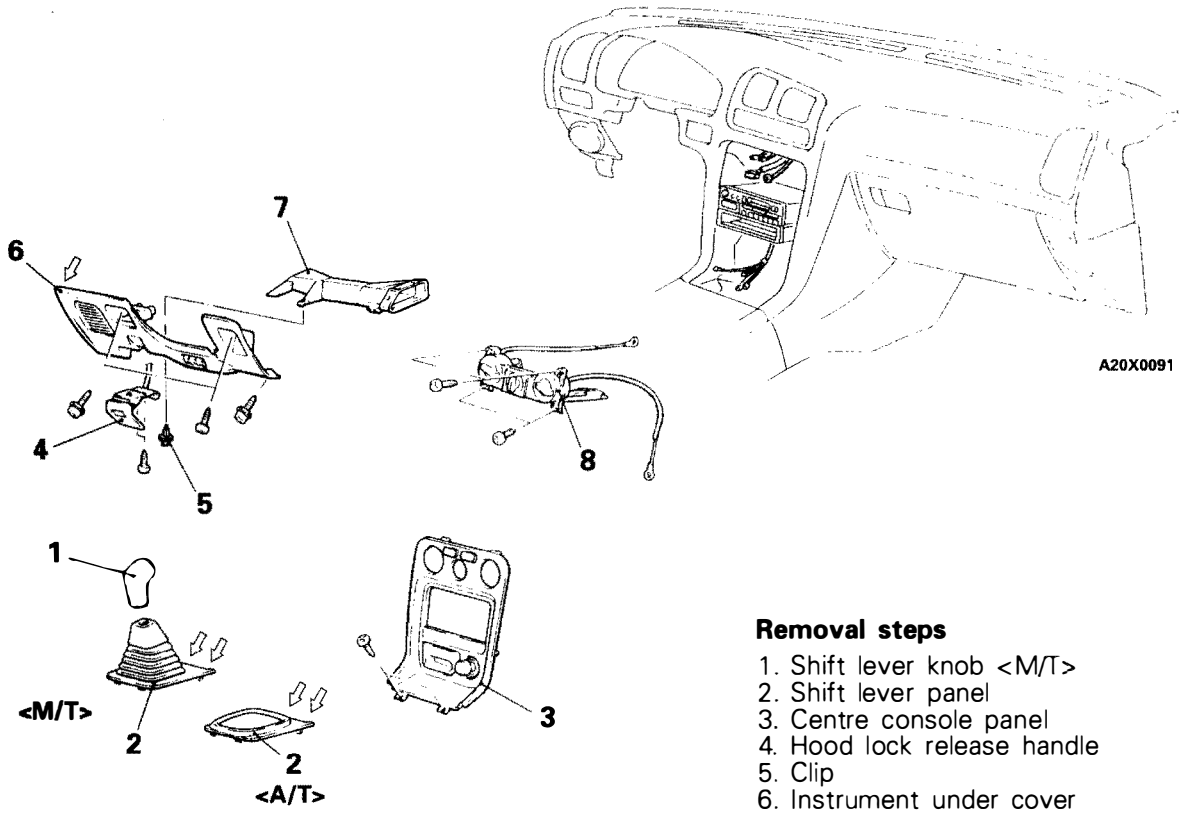
5. Measure the resistance of the solenoid valve.

   Standard value: Approx. 40 Ω

HEATER CONTROL ASSEMBLY

REMOVAL AND INSTALLATION

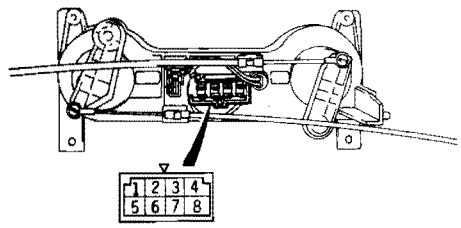
E55AG00AA

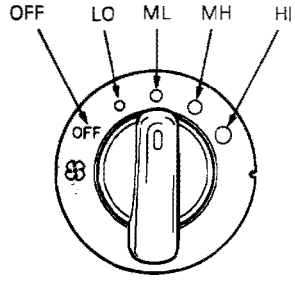


Removal steps

1. Shift lever knob <M/T>
2. Shift lever panel
3. Centre console panel
4. Hood lock release handle
5. Clip
6. Instrument under cover
7. Shower foot duct
▶A◀ 8. Heater control assembly

NOTE
⇦ indicates sheet metal clip positions.





INSPECTION

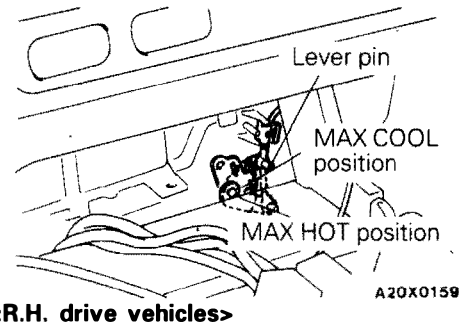
E55AG02AA

BLOWER SWITCH

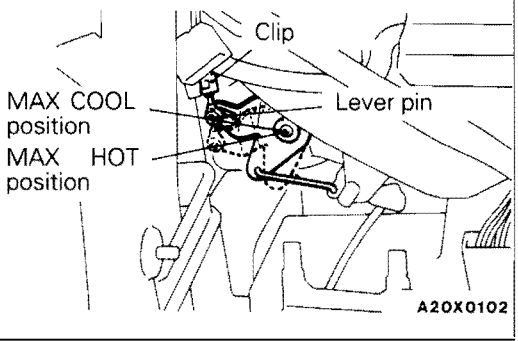
Switch position \ Terminal No.	1	2	3	4	5	6	7	8
OFF					○			
• (LO)	○		○		○			○
• (ML)	○				○	○		○
● (MH)	○	○		○	○			○
● (HI)	○			○	○		○	○

NOTE
○—○ indicates that there is continuity between the terminals.

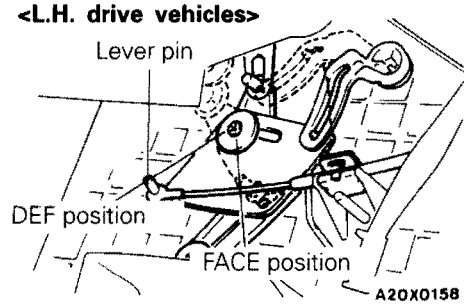
<L.H. drive vehicles>



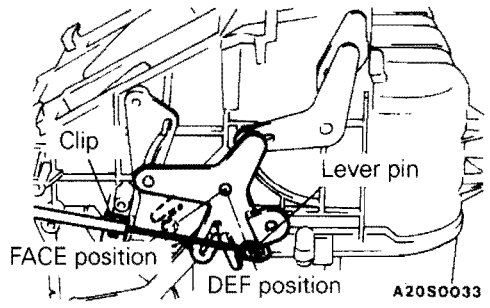
<R.H. drive vehicles>



<L.H. drive vehicles>



<R.H. drive vehicles>



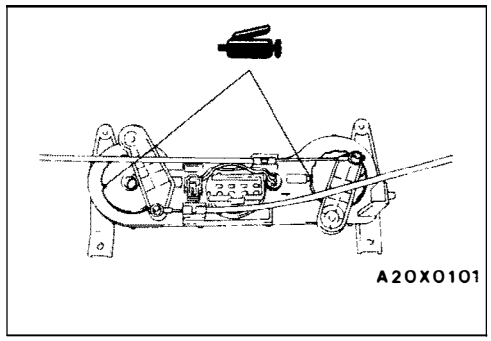
INSTALLATION SERVICE POINTS E55AG04AA

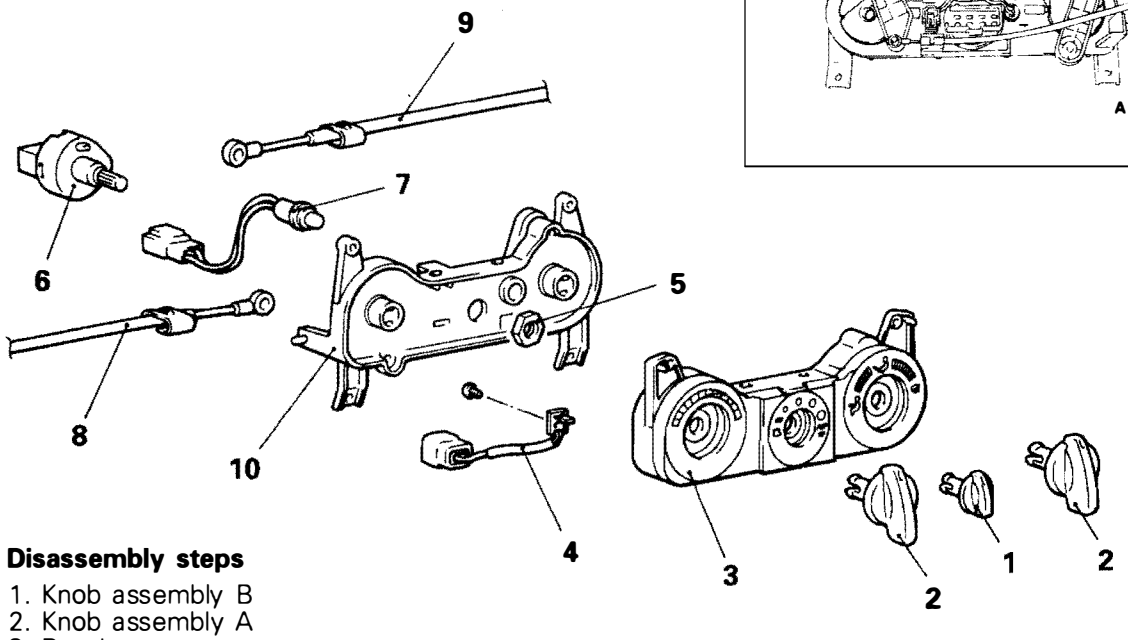
◆A◆ HEATER CONTROL ASSEMBLY INSTALLATION

(1) Set the temperature control knob on the heater control assembly to MAX COOL.
(2) Set the air mix damper lever at the bottom of the heater unit to the MAX COOL position, and install the cable to the lever pin.
(3) Push the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.
(4) Set the knob for the air outlet changeover on the heater control assembly to the DEF position.
(5) Set the air outlet changeover damper lever of the heater unit to DEF position and install the cable to the lever pin.
(6) Push the outer cable in the direction of the arrow so that there is no looseness, and then secure it with the clip.

DISASSEMBLY AND REASSEMBLY

E55AG05AA

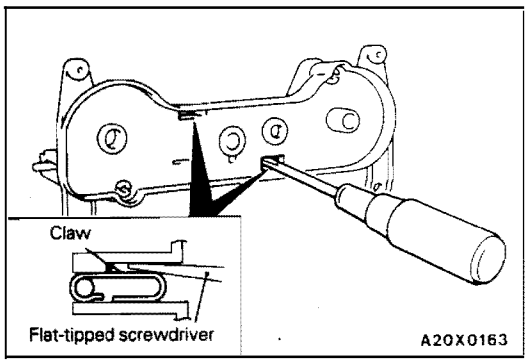




A20X0190

Disassembly steps

1. Knob assembly B
2. Knob assembly A
3. Panel case
4. A/P indicator lamp assembly
5. Nut
6. Blower switch
7. Bulb and socket assembly
◇A◇ 8. Air outlet changeover damper cable
◇A◇ 9. Air mix damper cable
10. Control base



DISASSEMBLY SERVICE POINT

E55AG06AA

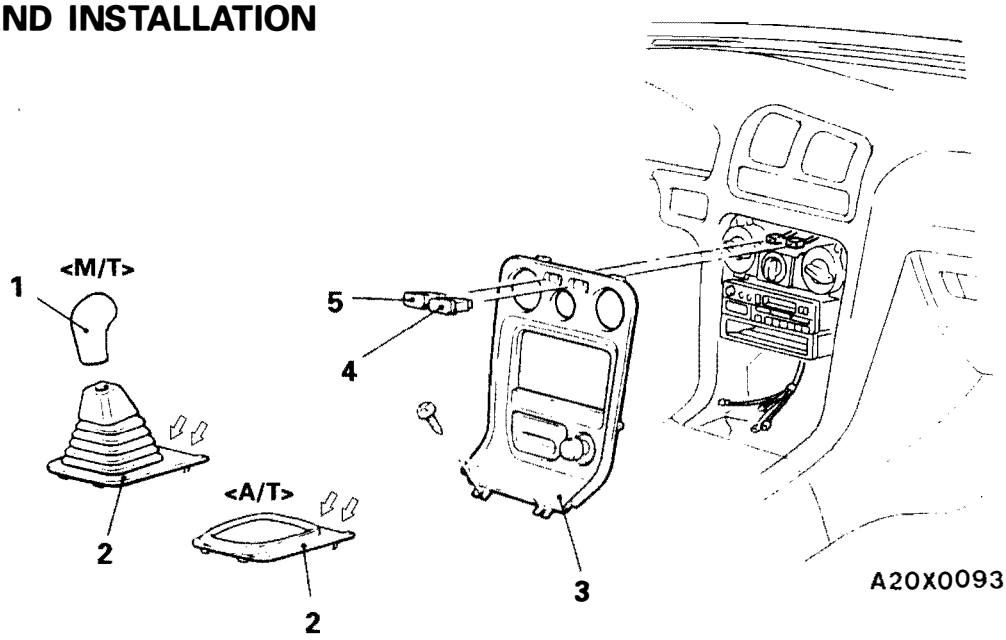
◇A◇ AIR OUTLET CHANGEOVER DAMPER CABLE/AIR MIXING DAMPER CABLE REMOVAL

Insert a flat-tipped screwdriver to disengage the claws, and then remove the cables.

INSIDE/OUTSIDE AIR CHANGEOVER SWITCH AND AIR CONDITIONER SWITCH

E55AH00AA

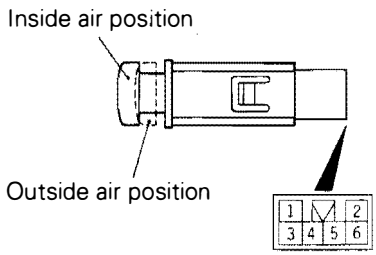
REMOVAL AND INSTALLATION



Removal steps

1. Shift lever knob <M/T>
2. Shift lever panel
3. Centre console panel
4. Inside/outside air changeover switch
5. A/C switch

NOTE
⇦ : indicates sheet metal clip positions.



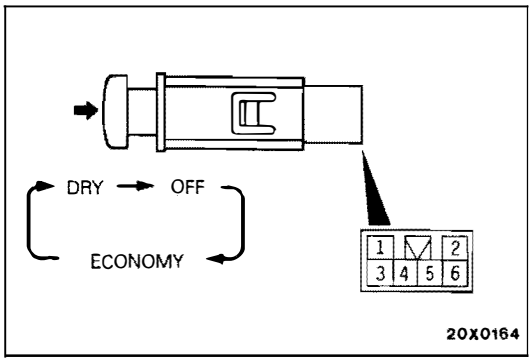
INSPECTION

E55AH02AA

INSIDE/OUTSIDE AIR CHANGEOVER SWITCH

Switch position \ Terminal No.	2	4		5	6	1		3
Inside air	○	○	IND	○	○	○	ILL	○
Outside air	○	○		○	○	○	ILL	○

NOTE
The ○—○ symbol indicates continuity.



A/C SWITCH

E55AH02BA

Switch position \ Terminal No.	1	2	4		5	3		6
OFF								
ECONOMY	○		○	IND		○	ILL	○
	○			○	○		○	
DRY	○	○	○	IND		○	ILL	○
		○		○	○		○	

NOTE
The ○—○ symbol indicates continuity.

HEATER UNIT AND HEATER CORE

REMOVAL AND INSTALLATION

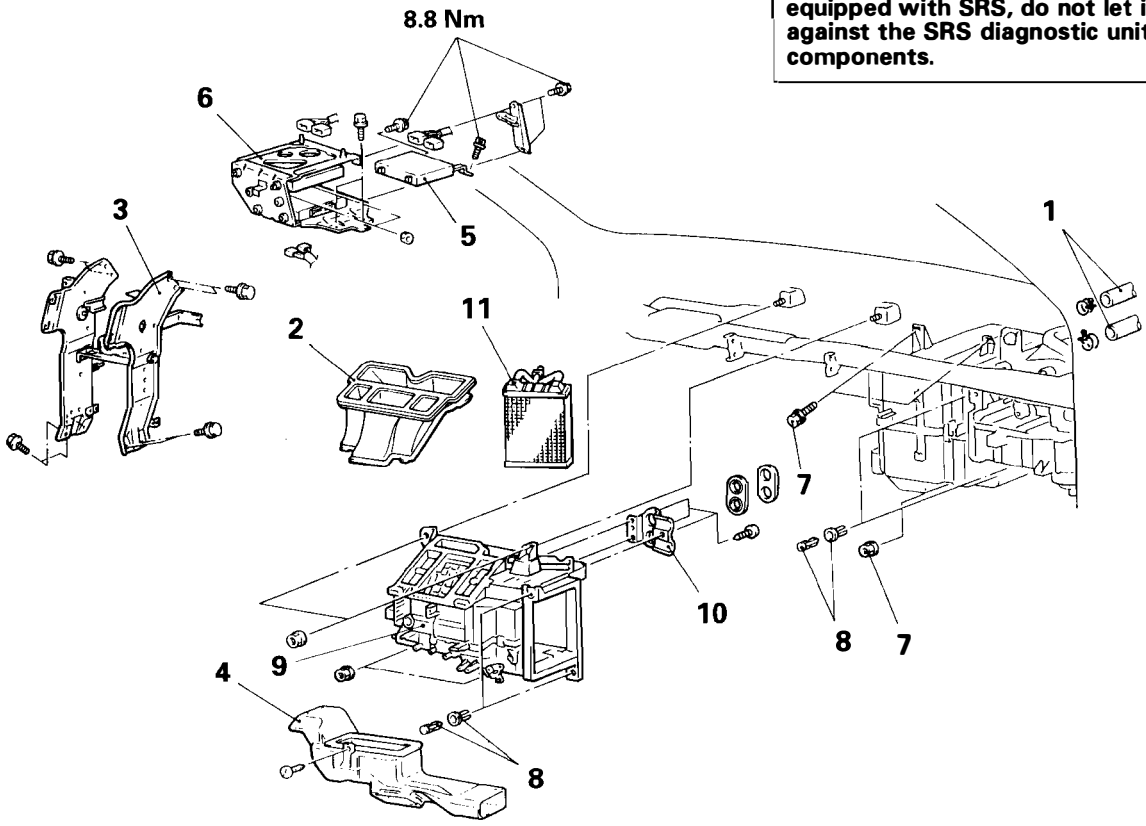
E55AI00AB

Post-installation Operation

Refilling Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

CAUTION: SRS

When removing and installing the floor console assembly from vehicles equipped with SRS, do not let it bump against the SRS diagnostic unit or the components.



A20X0171

Removal steps

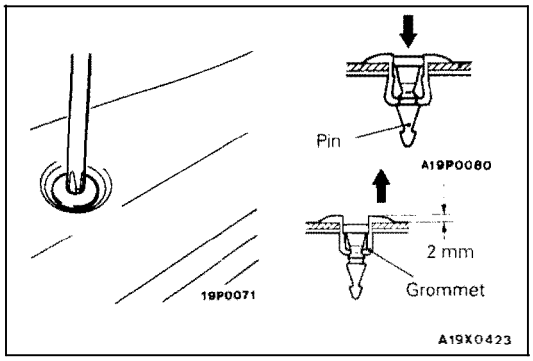
- Instrument panel (Refer to GROUP 52A – Instrument Panel.)

1. Heater hose connection
2. Centre ventilation duct
3. Centre reinforcement
4. Foot distribution duct
5. 4WS-ECU <Vehicles with 4WS>
6. ECU bracket
7. Evaporator installation bolt and nut

〈A〉 ▶A◀ 8. Clip [Applicable to vehicles built up to the middle of Feb. 1993]

〈B〉 9. Heater unit

10. Plate <R.H. drive vehicles>
11. Heater core

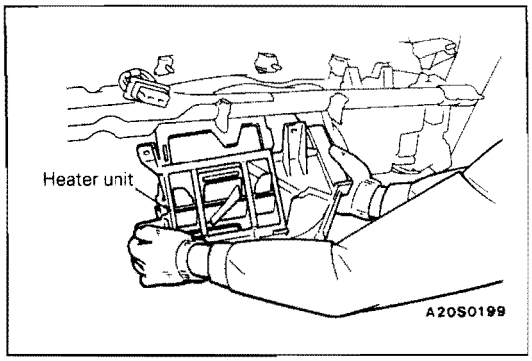


REMOVAL SERVICE POINTS E55AI01AA

〈A〉 CLIP REMOVAL

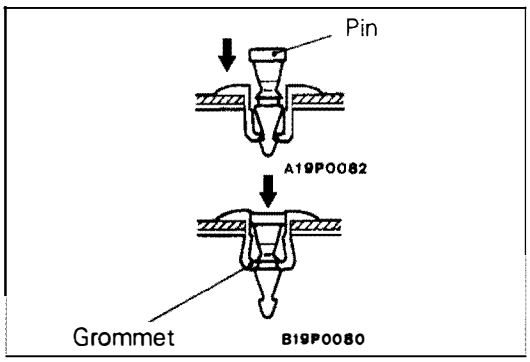
(1) Use a cross-tip (+) screwdriver to push inward the pin (at the centre of the clip) to a depth of about 2 mm.
(2) Pull the clip outward to remove it.

Caution
Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, if pushed too far.



〈B〉 HEATER UNIT REMOVAL

After sliding the cooling unit towards you slightly, remove the heater unit.



INSTALLATION SERVICE POINT E55AI04AA

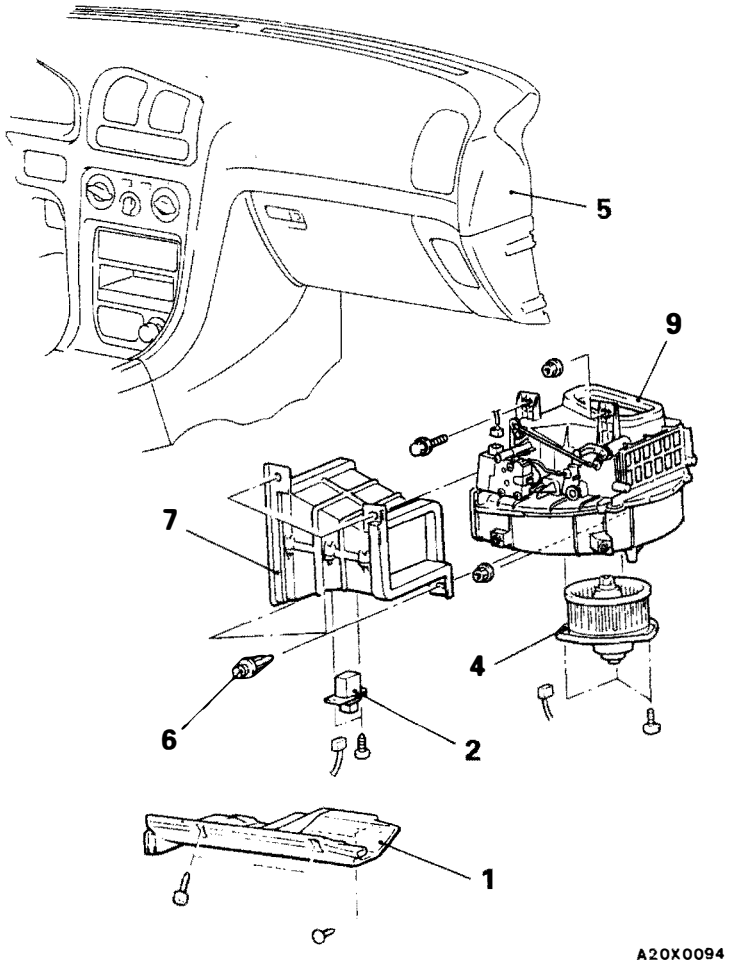
◆A◆ CLIP INSTALLATION

(1) With the pin pulled out, insert the clip into the hole.
(2) Push the pin inward until the pin's head is flush with the grommet.

BLOWER ASSEMBLY AND RESISTOR

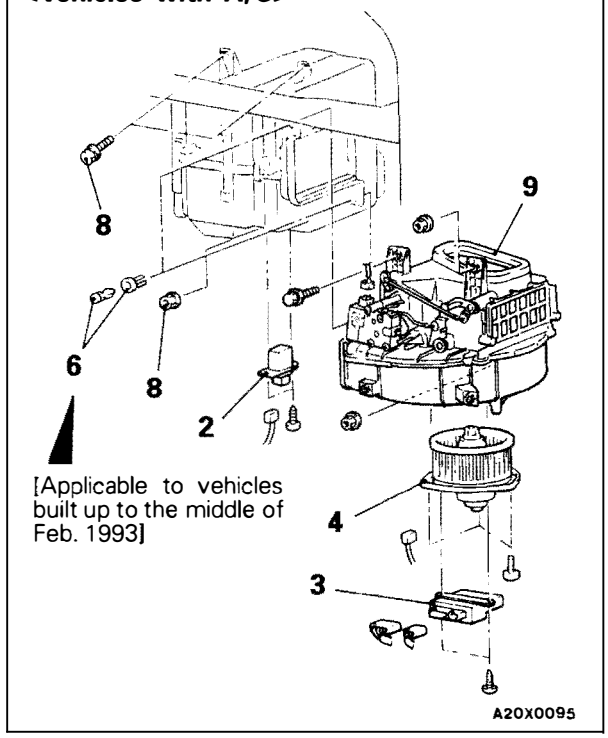
REMOVAL AND INSTALLATION

E55AJ00AB



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

<Vehicles with A/C>



[Applicable to vehicles built up to the middle of Feb. 1993]

Resistor removal steps

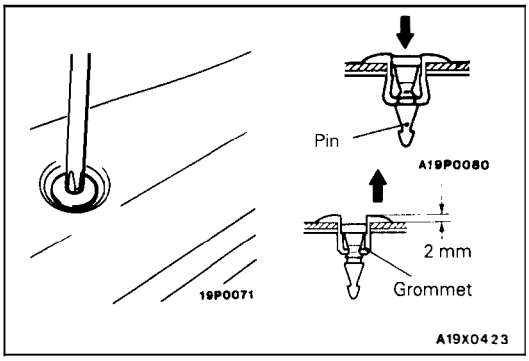
1. Under cover
2. Resistor

Blower fan and motor removal steps

1. Under cover
3. Auto compressor ECU <Vehicles with A/C>
4. Blower fan and motor

Blower unit removal steps

5. Instrument panel (Refer to GROUP 52A – Instrument Panel)
◇A◇ ▶A◀ 6. Clip
7. Joint duct <Vehicles without A/C>
8. Evaporator installation bolts and nut <Vehicles with A/C>
9. Blower unit assembly

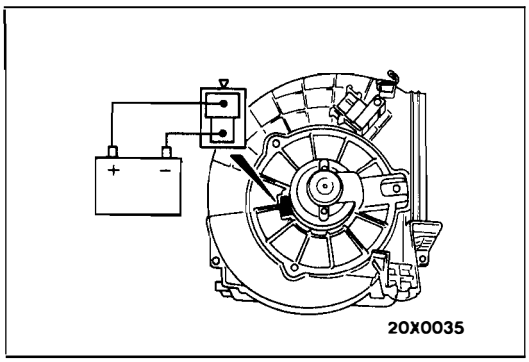


REMOVAL SERVICE POINTS E55AI01AA

〈A〉 CLIP REMOVAL

(1) Use a cross-tip (+) screwdriver to push inward the pin (at the centre of the clip) to a depth of about 2 mm.
(2) Pull the clip outward to remove it.

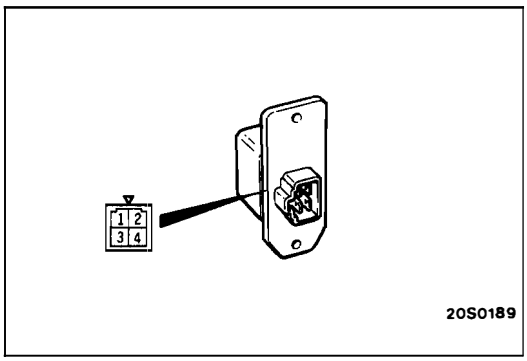
Caution
Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, if pushed too far.



INSPECTION E55AJ02AA

BLOWER FAN AND MOTOR

When battery voltage is applied between the terminals, check to be sure that the motor operates. Also, check to be sure that there is no abnormal noise.

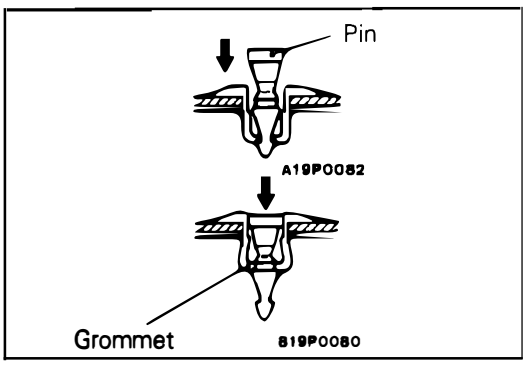


RESISTOR E55AJ02BA

Use a circuit tester to measure the resistance between the terminals as indicated below. Check to be sure that the measured value is at the standard value.

Standard value:

Measurement terminal	Standard value Ω
Between terminals 3–2 (LO)	2.30
Between terminals 3–4 (ML)	1.10
Between terminals 3–1 (MH)	0.40



INSTALLATION SERVICE POINT E55AI04AA

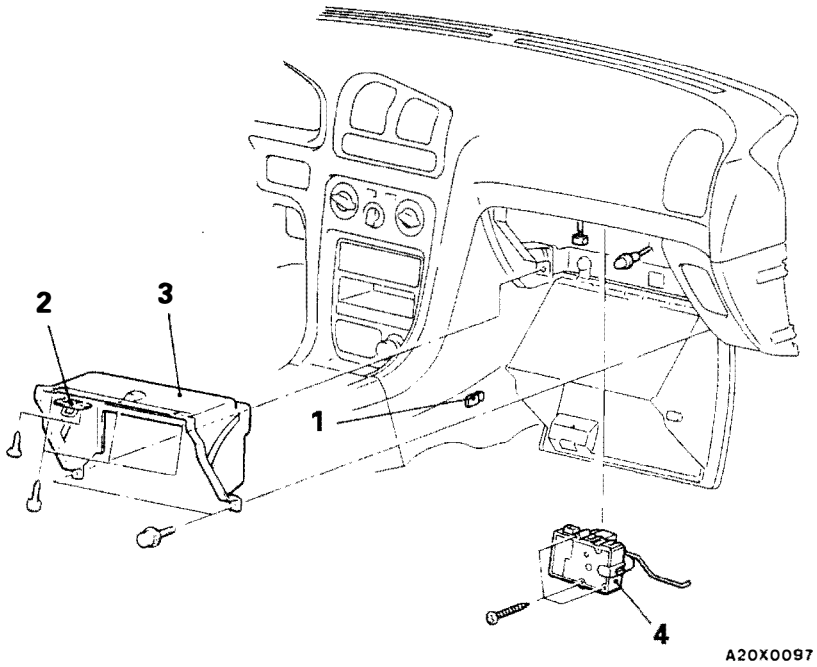
◆A◆ CLIP INSTALLATION

(1) With the pin pulled out, insert the clip into the hole.
(2) Push the pin inward until the pin's head is flush with the grommet.

INSIDE/OUTSIDE AIR CHANGEOVER DAMPER MOTOR ASSEMBLY

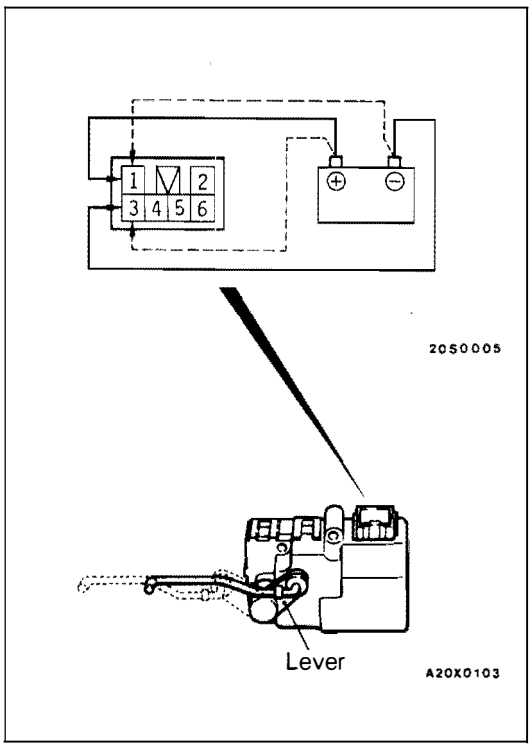
REMOVAL AND INSTALLATION

E55AK00AA



Removal steps

1. Stopper
2. Glove box striker
3. Glove box cover
4. Inside/outside air changeover damper motor assembly



INSPECTION

E55AJ02AA

Check that the lever move when battery voltage is applied across terminals 1 and 3 of motor assembly side connector. Check also that the lever move in the backward direction when polarity is changed.

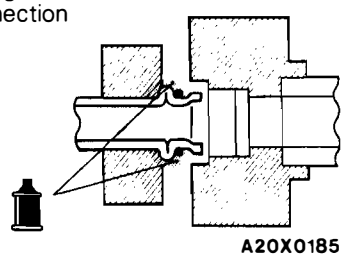
Caution

1. **Cut off the voltage when the damper is in the inside air position or outside air position.**
2. **Cut off the voltage if the motor does not turn when battery voltage is applied.**

EVAPORATOR

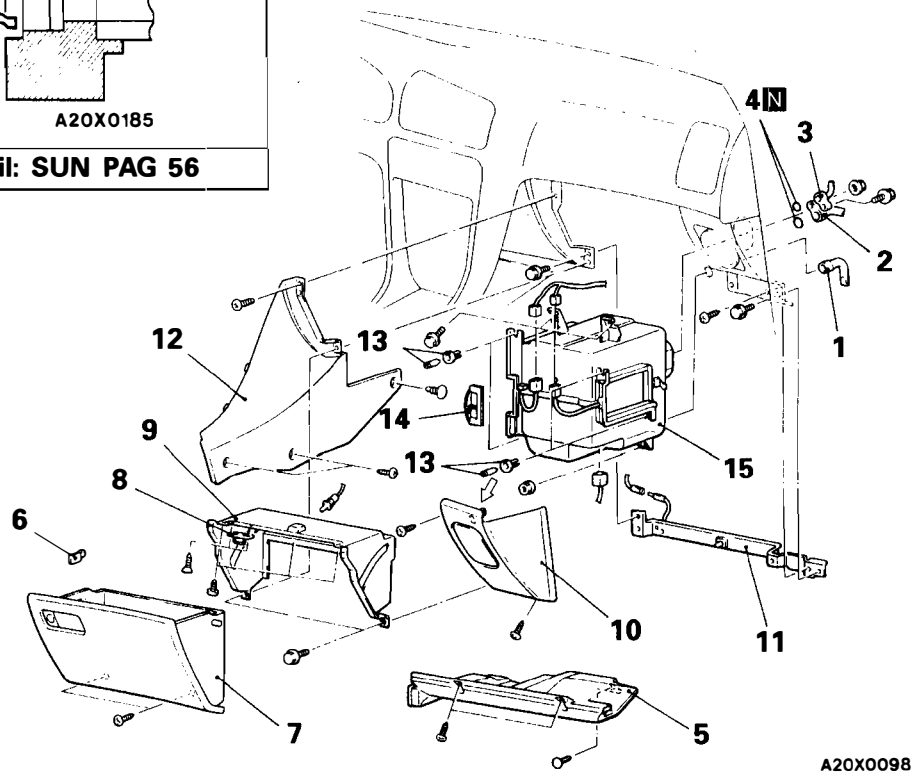
REMOVAL AND INSTALLATION

E55AL00AC



Compressor oil: SUN PAG 56

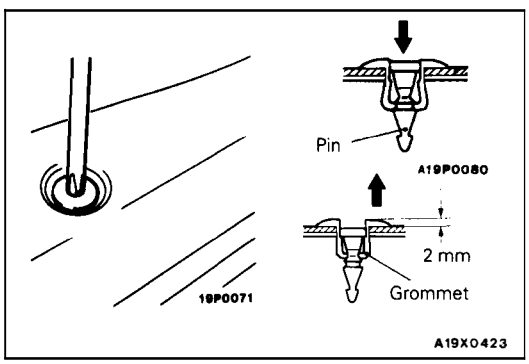
Pre-removal and Post-installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-11, 14.)



NOTE
⇦ indicates sheet metal clip positions.

Evaporator removal steps

1. Drain hose
2. Suction hose connection
3. Discharge pipe connection
4. O-ring
5. Under cover
6. Stopper
7. Glove box
8. Glove box striker
9. Glove box cover
10. Corner panel
11. Glove box frame
12. Side cover A
13. 〈A〉 〉A〈 Clip [Applicable to vehicles built up to the middle of Feb. 1993]
14. Plate
15. Evaporator



REMOVAL SERVICE POINTS

E55AI01AA

〈A〉 CLIP REMOVAL

(1) Use a cross-tip (+) screwdriver to push inward the pin (at the centre of the clip) to a depth of about 2 mm.
(2) Pull the clip outward to remove it.

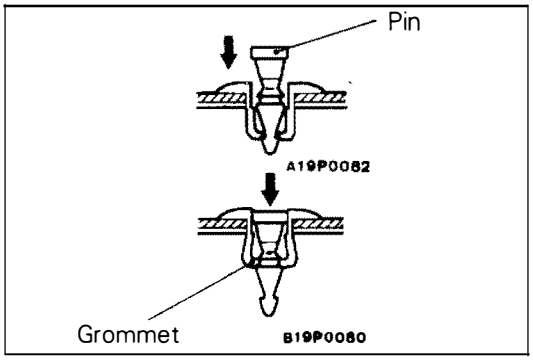
Caution
Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, if pushed too far.

INSTALLATION SERVICE POINTS E55AI04AB

◗A◖ EVAPORATOR INSTALLATION

When replacing the evaporator, refill it with a specified amount of compressor oil and install it (to the vehicle).

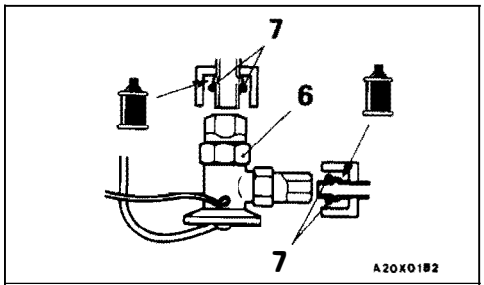
Compressor oil: SUN PAG 56
Quantity: 60 m ℓ



◗B◖ CLIP INSTALLATION

(1) With the pin pulled out, insert the clip into the hole.
(2) Push the pin inward until the pin's head is flush with the grommet.

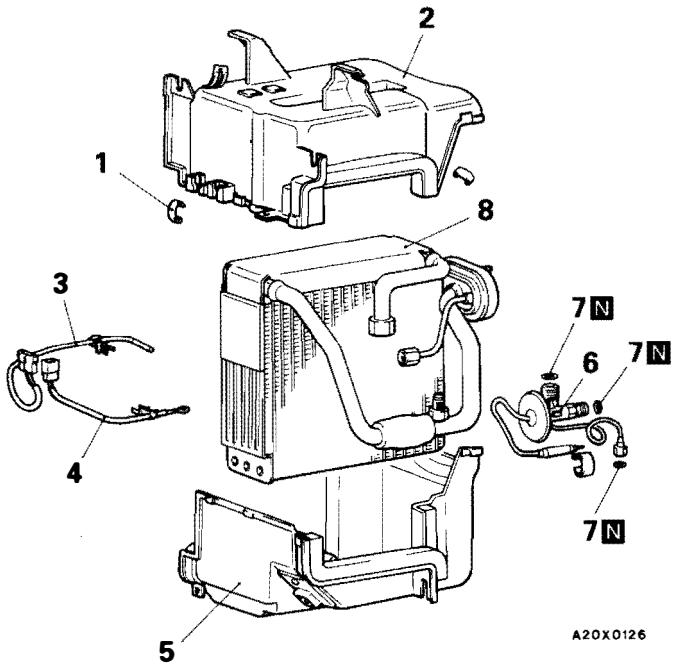
DISASSEMBLY AND REASSEMBLY E55AL05AA

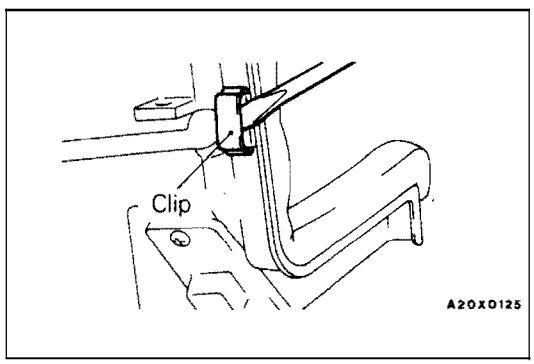


Compressor oil: SUN PAG 56

Disassembly steps

◇A◇ 1. Clip
2. Evaporator case (upper)
3. Fin thermo sensor
4. Air thermo sensor
5. Evaporator case (lower)
6. Expansion valve
7. O-ring
8. Evaporator



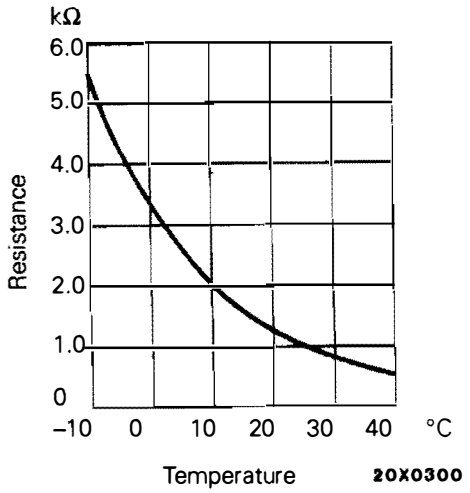


DISASSEMBLY SERVICE POINT E55AL06AA

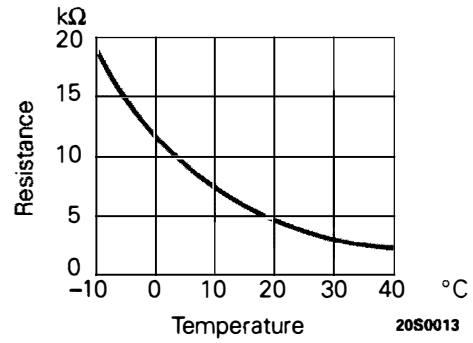
◇A◇ CLIP REMOVAL

Remove the clips with a flat-tipped screwdriver covered with a shop towel to prevent damage to case surfaces.

Air thermo sensor



Fin thermo sensor



INSPECTION

E55AL07AB

AIR THERMO SENSOR, FIN THERMO 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.

NOTES

AIR PURIFIER ASSEMBLY

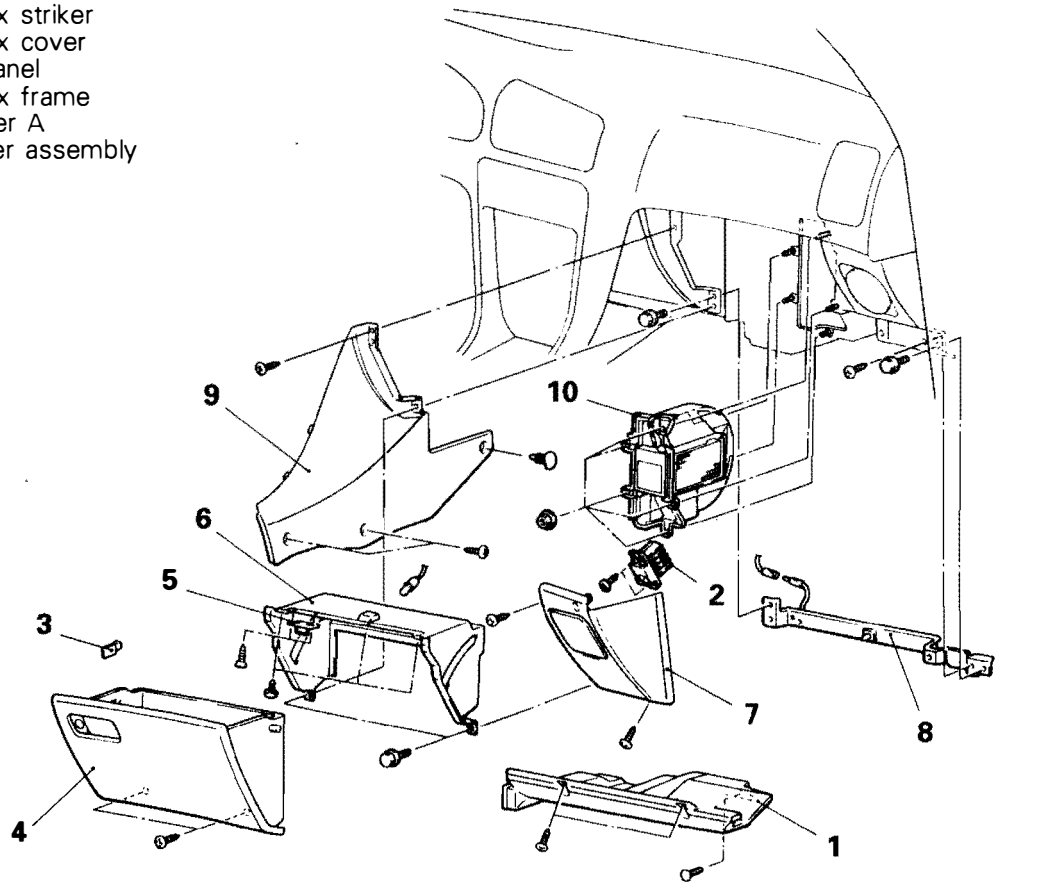
REMOVAL AND INSTALLATION

E55AM00AA

Removal steps

1. Under cover
2. Power transistor
3. Stopper
4. Glove box
5. Glove box striker
6. Glove box cover
7. Corner panel
8. Glove box frame
9. Side cover A

◇A◇ 10. Air purifier assembly



A20X0147

REMOVAL SERVICE POINT

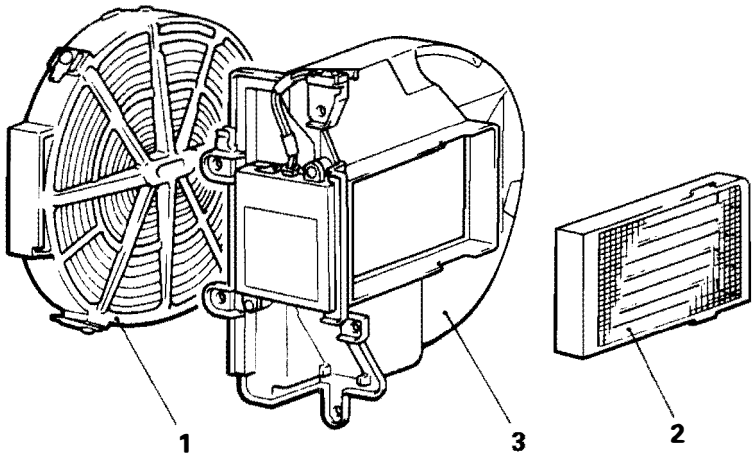
E55AM01AA

◇A◇ AIR PURIFIER ASSEMBLY REMOVAL

Caution
After the power supply is turned OFF (blower switch is in OFF position or ignition switch is in ACC or LOCK position), the air purifier will still be at high pressure for approximately 5 seconds.
Accordingly, wait for 5 seconds after turning off the power supply before removing the air purifier.

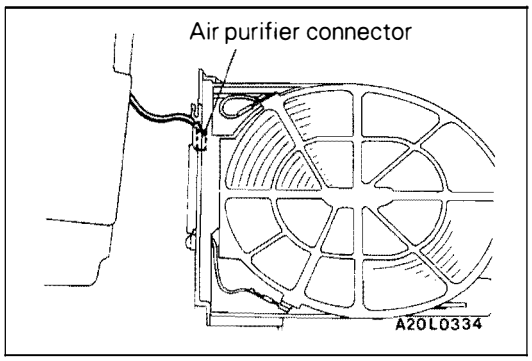
DISASSEMBLY AND REASSEMBLY

E55AM05AA



Disassembly steps

1. Collector
2. Ionizer
3. Transformer unit



INSPECTION

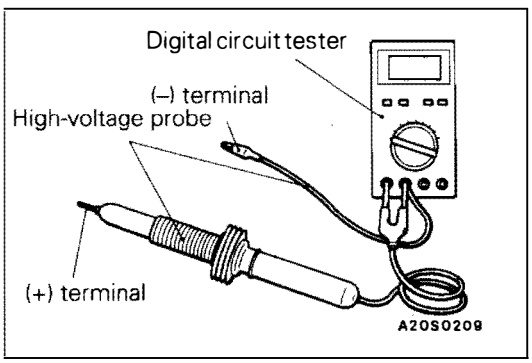
E55AM07AA

APPROPRIATE VOLTAGE FOR COLLECTOR AND IONIZER

Measure the voltages at the collector and ionizer by the following procedure.

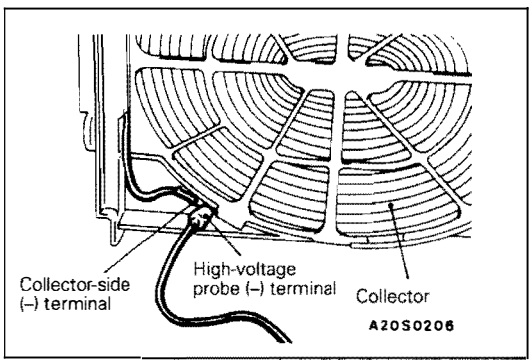
(1) Turn the air purifier in the opposite direction and reconnect the connector so that the unit can operate.

Caution
The power transistor should not be connected.

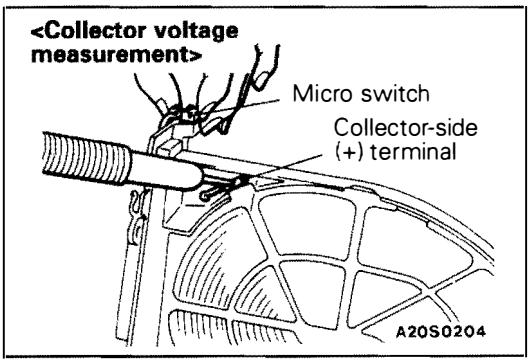


(2) Connect a high-voltage probe (one that can measure up to 10,000 V DC) to a digital circuit tester.

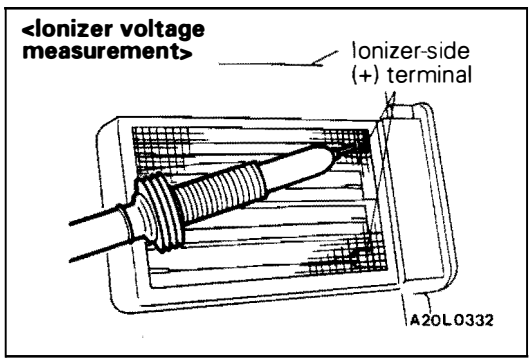
Caution
1. **When measuring, take sufficient care not to short the terminals.**
2. **A probe which is made by the same manufacturer as the digital circuit tester should be used.**



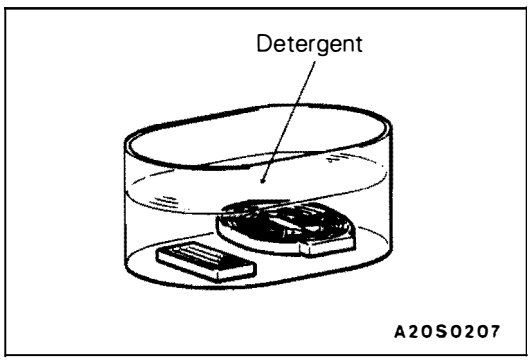
(3) Start the engine and set the blower switch to HI. Connect the (–) terminal of the high-voltage probe to the (–) terminal on the collector side.



(4) Clamp the micro switch on top of the air purifier between your fingers to turn the air purifier ON.
(5) If the voltage measured when the (+) terminal of the high-voltage probe is touched against the collector-side (+) terminal is 2,000 V or higher, then the collector is normal.



(6) If the voltage measured when the (+) terminal of the high-voltage probe is touched against the ionizer-side (+) terminal is 4,000 V or higher, then the ionizer is normal.



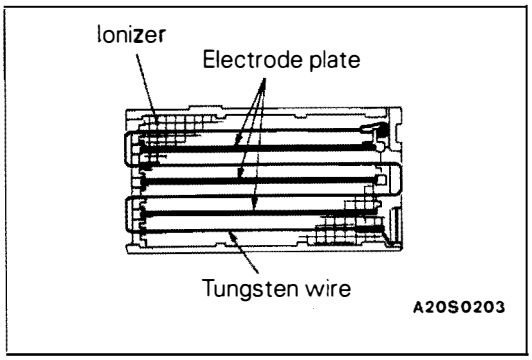
COLLECTOR AND IONIZER CLEANING E55AM07BA

(1) Mix a weak alkali or alkali detergent into warm water (60°C or less) in a container, and dip the collector and ionizer into the solution and leave them in for approximately 10 minutes.

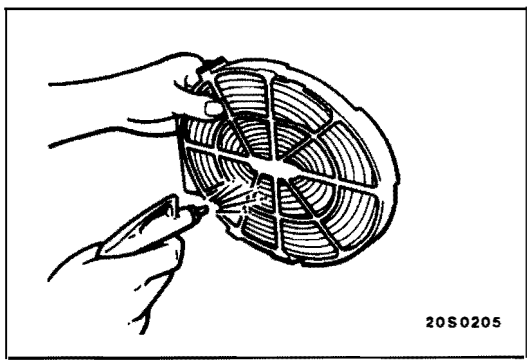
NOTE
The cleaning liquid should be mixed to about 1 part detergent to 20 parts water (by weight).

(2) After this, shake the collector and ionizer around in the detergent for 2–3 minutes to remove all dirt.

NOTE
If the electrode plate of the ionizer is extremely dirty, scrub off all dirt using a soft brush, while being careful not to break the tungsten wires.



(3) Throw away the detergent in the container, refill with clean water and then immerse the collector and ionizer in the water for approximately 2 minutes to rinse them.



(4) After rinsing, dry off all of the water using an air blower.

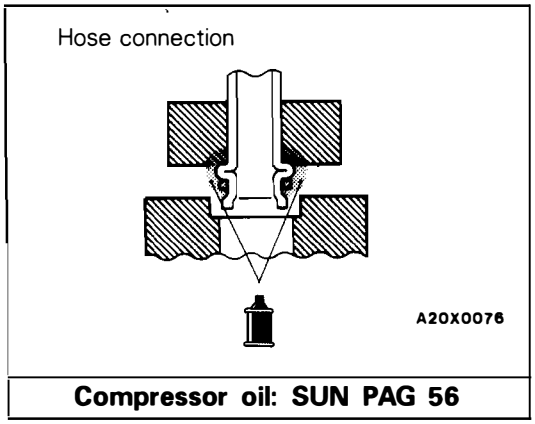
Caution
If the parts are dried by heating with a drier or similar, there is the danger that plastic components may become deformed, so such a drying method should not be used.

COMPRESSOR AND TENSION PULLEY

E55AN00AA

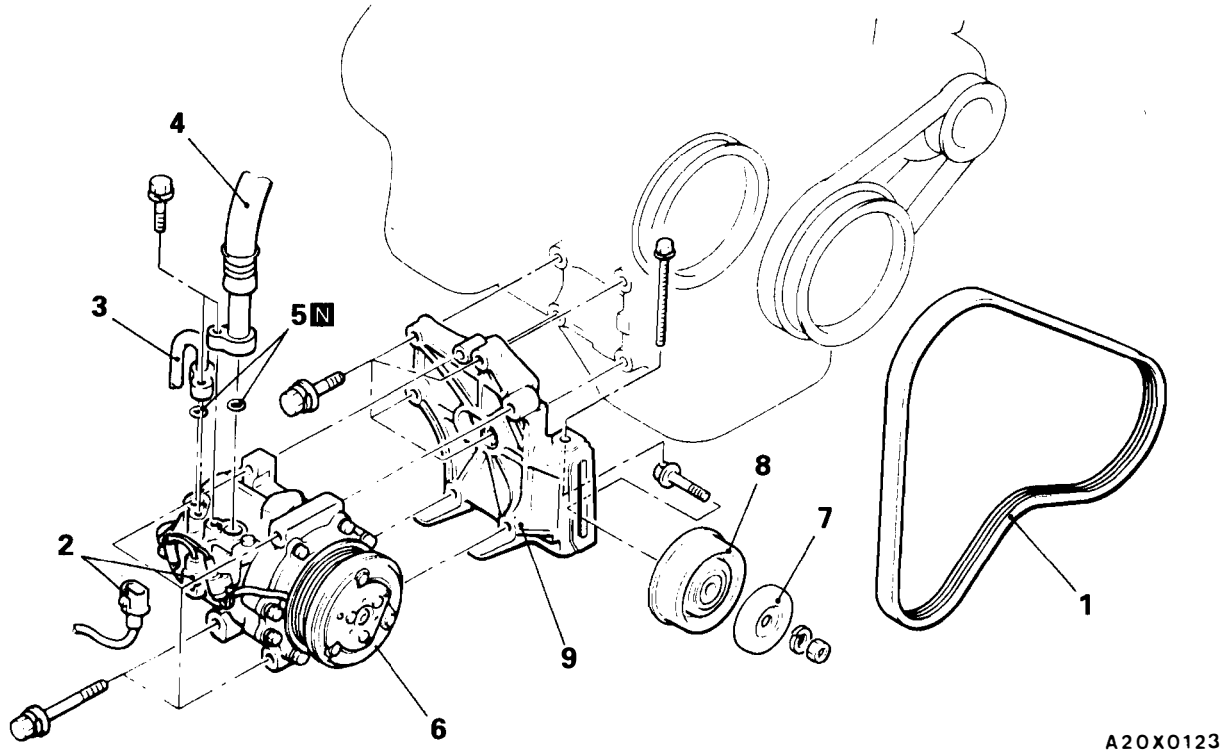
REMOVAL AND INSTALLATION

<4G93>



Compressor oil: SUN PAG 56

Pre-removal and Post-installation Operation
- Refrigerant Discharging and Charging (Refer to P.55–11, 14.)
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)
- Compressor Drive Belt Adjustment (Refer to GROUP 11E – Service Adjustment Procedures.)



Tension pulley removal steps

〈A〉 1. Compressor drive belt
7. Cover
8. Tension pulley

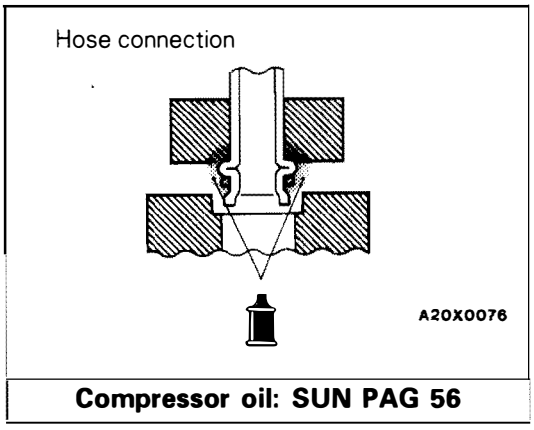
Compressor and compressor bracket removal steps

〈A〉 1. Compressor drive belt
2. Compressor connector
3. Discharge hose connection
4. Suction hose connection
5. O-ring
〈B〉 ▶A◀ 6. Compressor
7. Cover
8. Tension pulley
9. Compressor bracket

REMOVAL AND INSTALLATION

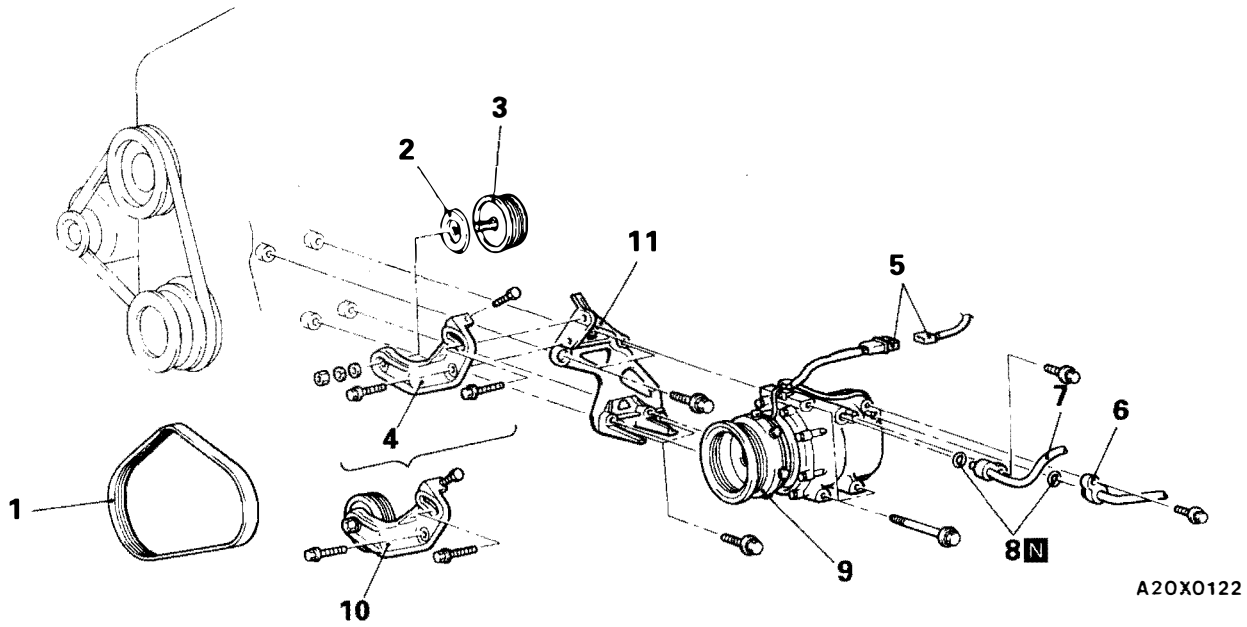
<4G63>

E55AN00BA



Compressor oil: SUN PAG 56

Pre-removal and Post-installation Operation
- Refrigerant Discharging and Charging (Refer to P.55-11, 14.)
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)
- Compressor Drive Belt Adjustment (Refer to GROUP 11D – Service Adjustment Procedures.)



Tension pulley and tension pulley bracket removal steps

〈A〉 1. Compressor drive belt
2. Cover
3. Tension pulley
4. Tension pulley bracket

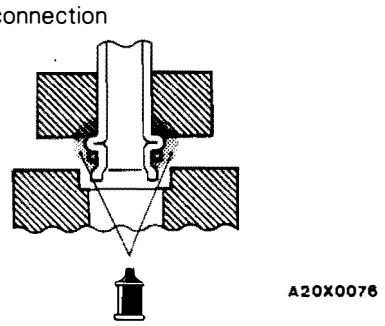
Compressor and compressor bracket removal steps

〈A〉 1. Compressor drive belt
5. Compressor connecto
6. Discharge hose connection
7. Suction hose connection
8. O-ring
〈B〉 ◆A◆ 9. Compressor
10. Tension pulley and tension pulley bracket assembly
11. Compressor bracket

REMOVAL AND INSTALLATION

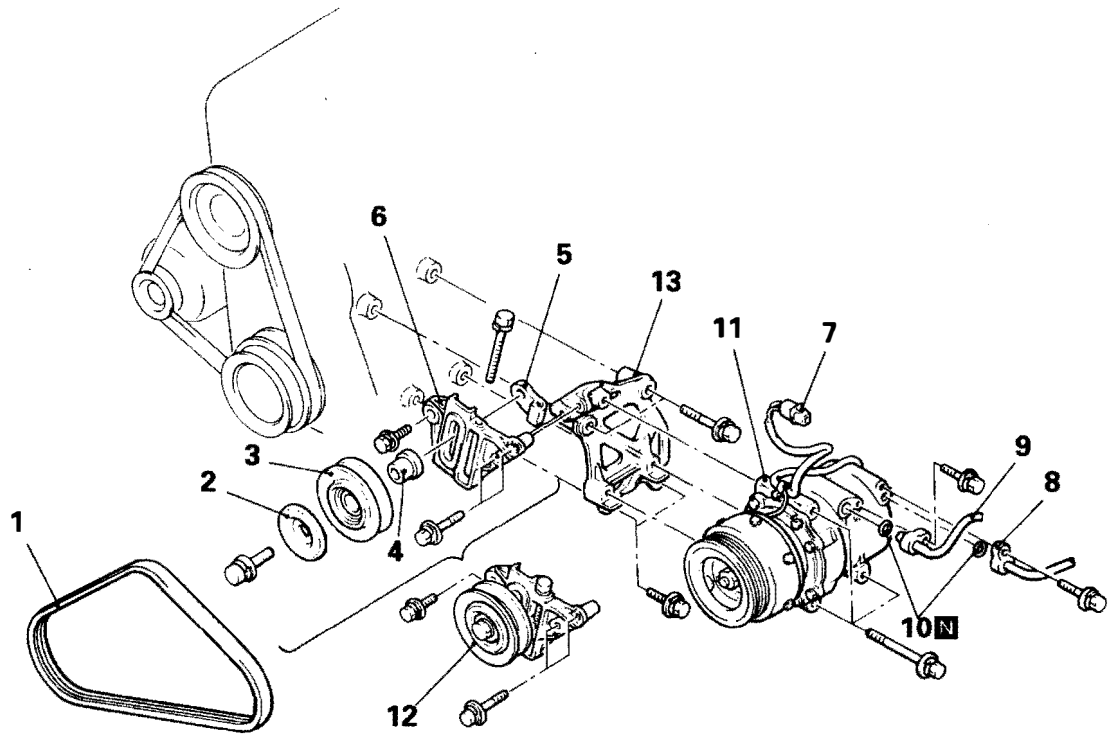
<4D68>

E55AN00CA



Compressor oil: SUN PAG 56

Pre-removal and Post-installation Operation
- Refrigerant Discharging and Charging (Refer to P.55-11, 14.)
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)
- Compressor Drive Belt Adjustment (Refer to GROUP 11J – Service Adjustment Procedures.)

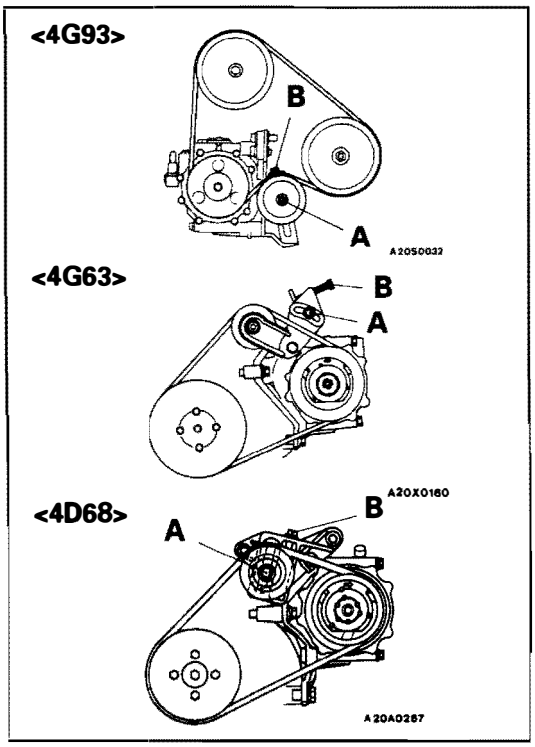


Tension pulley and tension pulley bracket removal steps

◇A◇ 1. Compressor drive belt
2. Cover
3. Tension pulley
4. Collar
5. Adjust plate
6. Tension pulley bracket

Compressor and compressor bracket removal steps

◇A◇ 1. Compressor drive belt
7. Compressor connector
8. Discharge hose connection
9. Suction hose connection
10. O-ring
◇B◆ ◆A◆ 11. Compressor
12. Tension pulley and tension pulley bracket assembly
13. Compressor bracket



REMOVAL SERVICE POINTS E55AN01AA

◇A◇ COMPRESSOR DRIVE BELT REMOVAL

(1) Loosen nut "A" for holding the tension pulley.
(2) Loosen bolt "B" for adjustment.
(3) Loosen the power steering oil pump fixing bolt. <4G93> (Refer to GROUP 37A – Service Adjustment Procedures.)
(4) Remove the compressor drive belt.

◇B◇ COMPRESSOR REMOVAL

When doing this work, be careful not to spill the compressor oil.

INSPECTION E55AN02AA

- Check for heat damage of the tension pulley.
- Check for excessive play or deflection of the tension pulley.
- Check for unusual wear of the tension pulley.
- Check for hardening of the compressor drive belt.
- Check for unusual wear or abrasion of the compressor drive belt.

INSTALLATION SERVICE POINTS E55AN04AB

◆A◆ COMPRESSOR INSTALLATION

If a new compressor is installed, first adjust the amount of oil according to the procedures described below, and then install the compressor.

(1) Measure the amount (X mℓ) of oil within the removed compressor.
(2) Remove (from the new compressor) the amount of oil calculated according to the following formula, and then install then new compressor.
New compressor oil amount
<4G93>: 160 mℓ – X mℓ = Y mℓ
<4G63, 4D68>: 150 mℓ – X mℓ = Y mℓ

NOTE
(1) Y mℓ indicates the amount of oil in the refrigerant line, the condenser, the evaporator etc.
(2) When replacing the following parts at the same times as the compressor, subtract the rated oil amount of the each part from Y mℓ and discharge from the new compressor.

Quantity

Evaporator:	**60 mℓ**
Condenser:	**15 mℓ**
Suction hose:	**10 mℓ**
Receiver:	**10 mℓ**

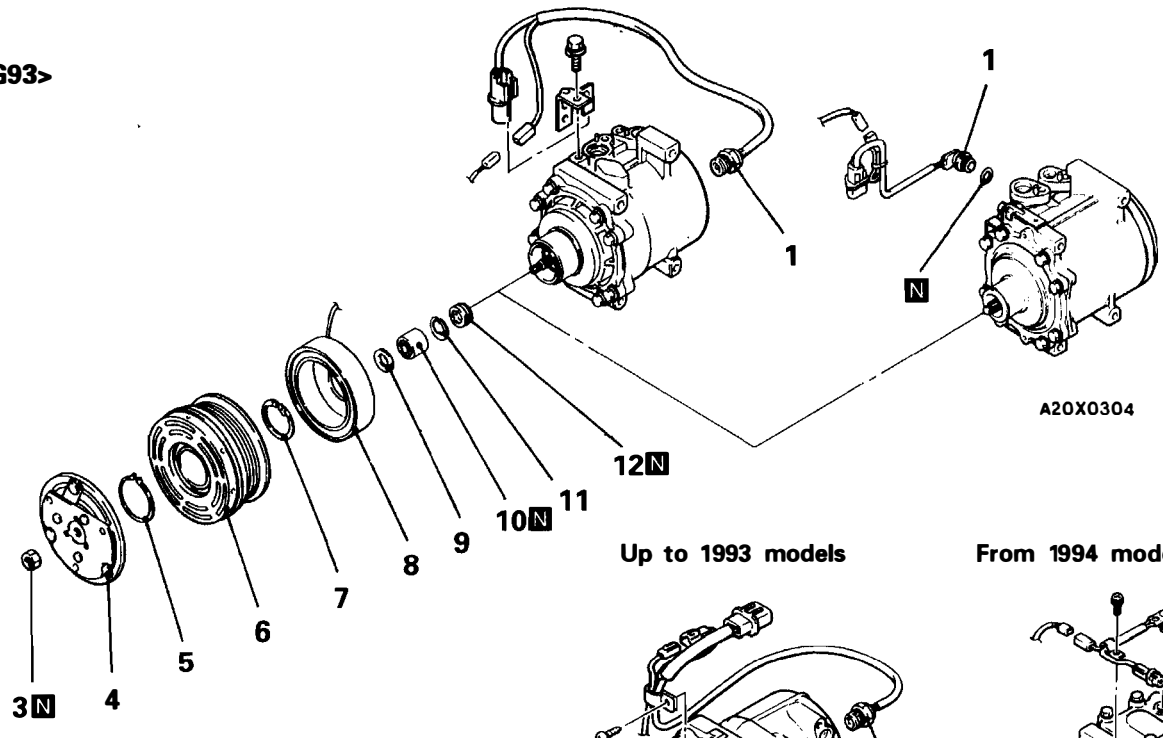
DISASSEMBLY AND REASSEMBLY

E55AN05AA

<4G93>

Up to 1993 models

From 1994 models

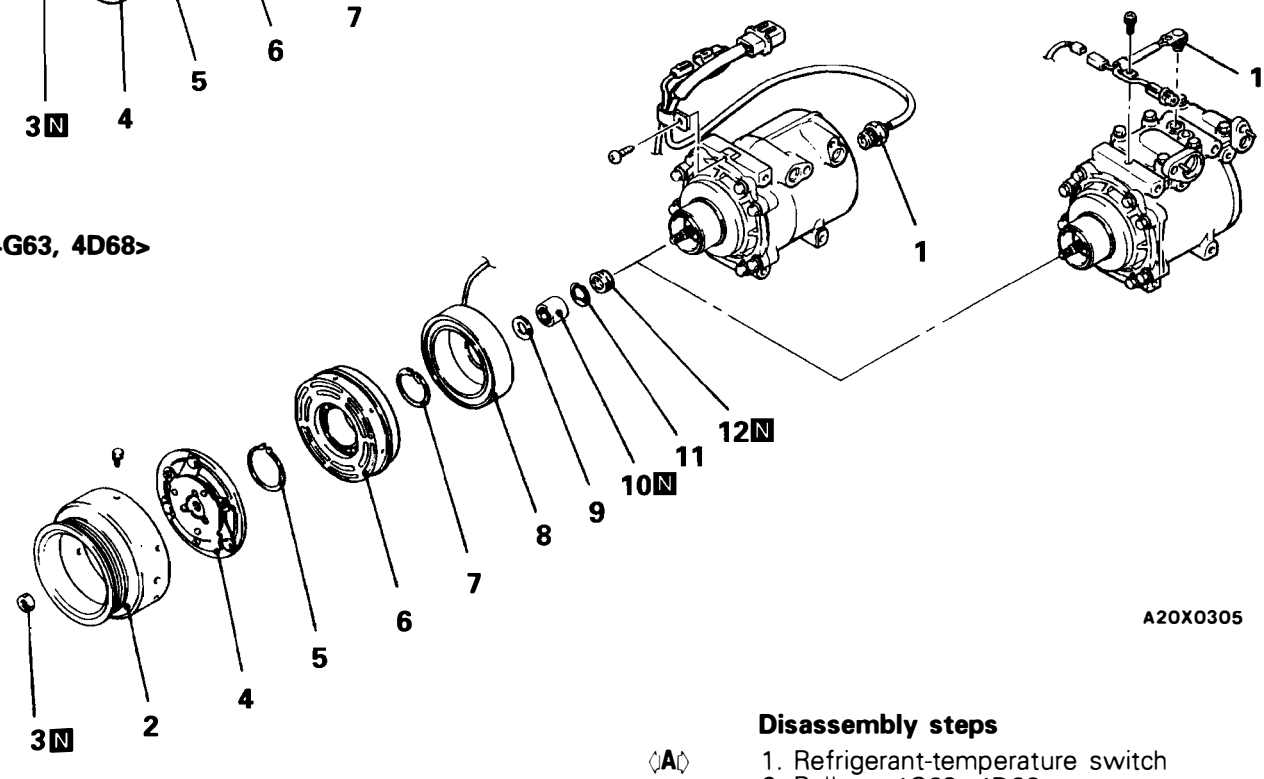


A20X0304

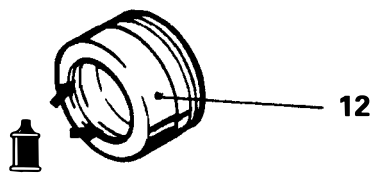
<4G63, 4D68>

Up to 1993 models

From 1994 models



A20X0305

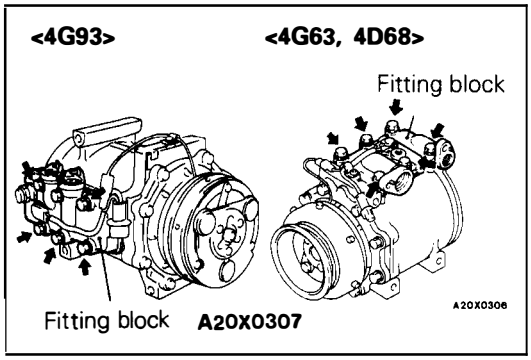


A20S0164

Compressor oil: SUN PAG 56

Disassembly steps

◇A◇ 1. Refrigerant-temperature switch
2. Pulley <4G63, 4D68>
◇B◇ ◆F◆ 3. Nut
◆E◆ 4. Armature plate
5. Snap ring
6. Rotor
◆D◆ 7. Snap ring
◆C◆ 8. Clutch coil
9. Shims
◇C◇ ◆B◆ 10. Bearing
11. Snap ring
◇D◇ ◆A◆ 12. Lip seal

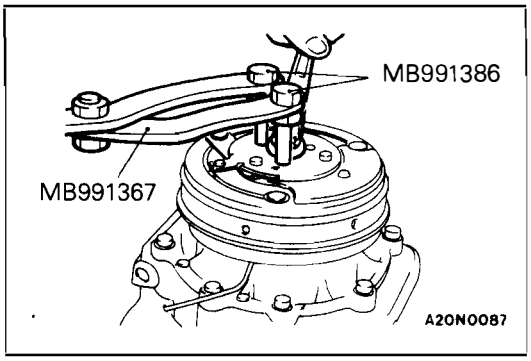


A20X0307

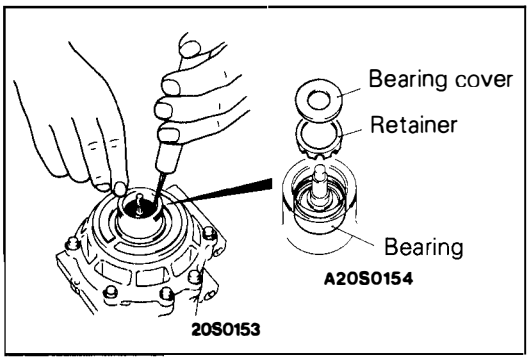
DISASSEMBLY SERVICE POINTS E55AN06AB

◇A◇ REFRIGERANT-TEMPERATURE SWITCH REMOVAL (From 1994 models)

(1) Remove the fitting block of the compressor.
(2) Remove the snap ring from inside the fitting block, and then remove the refrigerant-temperature switch.

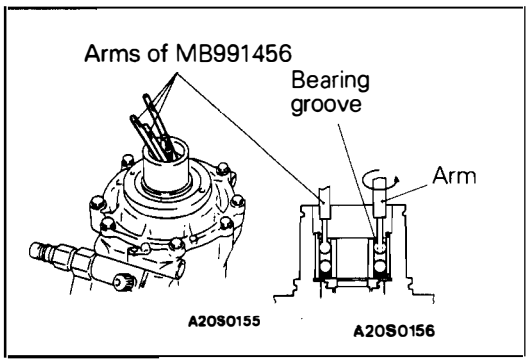


◇B◇ NUT REMOVAL

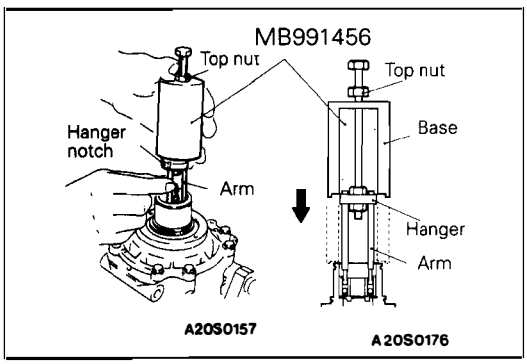


◇C◇ BEARING REMOVAL

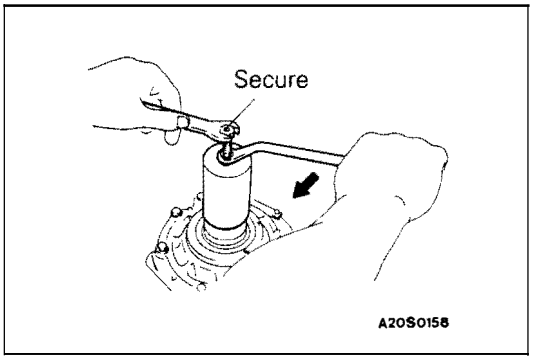
(1) Use a pointed tool such as an awl to remove the bearing cover and retainer.



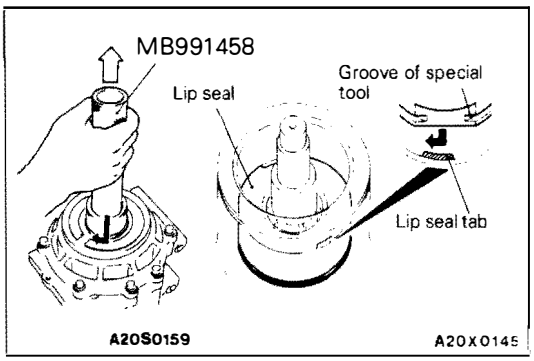
(2) Insert the arms (3) of the special tool into the bearing groove at regular intervals.
(3) Turn the arms 90° to secure the arms to the bearing.



(4) Set the 3 arms installed to the bearing into the notches (3 places) located on the hanger of the special tool.
(5) Lower the base of the special tool to cover the hanger, and tighten the top nut until it touches the base.

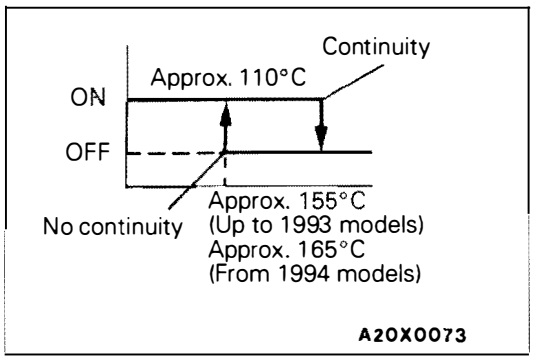


(6) Next, with the bolt of the special tool secured, tighten the nut, and remove the bearing from the compressor.



◇D◇ LIP SEAL REMOVAL

Catch the groove of the special tool on the lip seal tab, and slowly pull the lip seal straight upwards.



INSPECTION E55AN07AA

REFRIGERANT-TEMPERATURE SWITCH

(1) Immerse the refrigerant-temperature switch in engine oil.
(2) Use a circuit tester to confirm the continuity condition when the engine oil has become heated.

Standard value:
Up to 1993 models

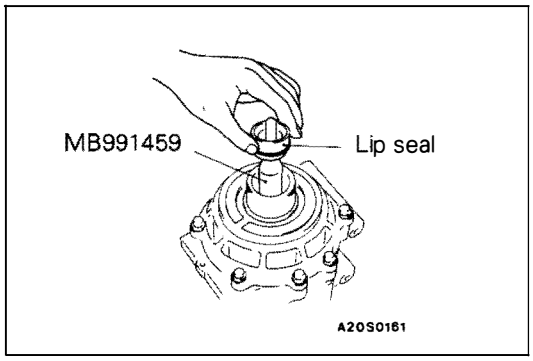
Item	Temperature
Continuity (ON)	Less than approx. 155°C
No continuity (OFF)	Approx. 155°C or more (until the temperature drops to approx. 110°C when OFF)

From 1994 models

Item	Temperature
Continuity (ON)	Less than approx. 165°C
No continuity (OFF)	Approx. 165°C or more (until the temperature drops to approx. 110°C when OFF)

Caution
Do not heat the oil more than necessary.

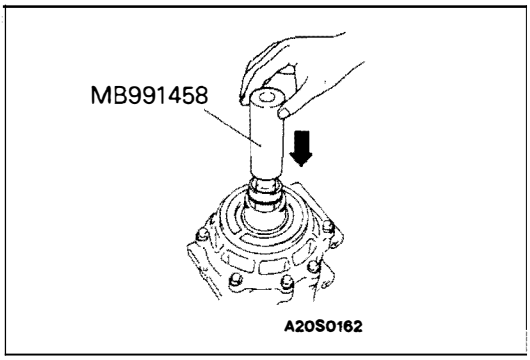
- Check the surface of the armature for scoring or bluing.
- Check the surface of the rotor for scoring or bluing.
- Check the sealing surfaces for cracks, scratches and deformation.
- Check the front housing for cracks or scoring on the sealing surfaces.
- Check the compressor shaft for scoring.



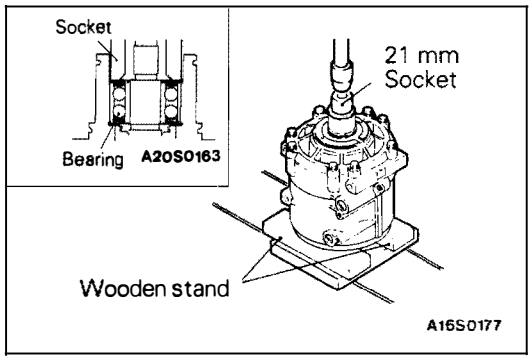
REASSEMBLY SERVICE POINTS E55AN08AA

◆A◆ LIP SEAL INSTALLATION

(1) Install the special tool to the compressor crank shaft.
(2) Apply compressor oil to the sliding surface of the lip seal and the O-ring, and insert the lip seal.

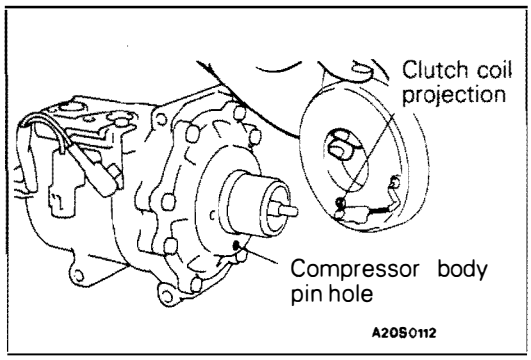


(3) Use the special tool to insert the lip seal.



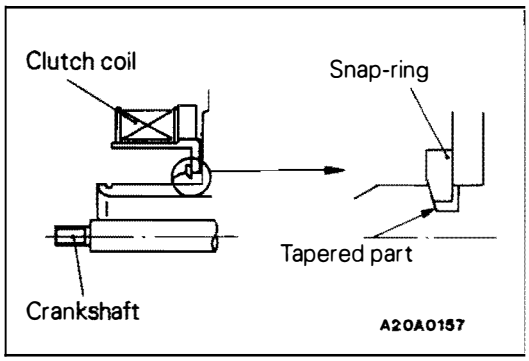
◆B◆ BEARING INSTALLATION

Use a wooden stand and a 21 mm socket to insert the bearing into the compressor.



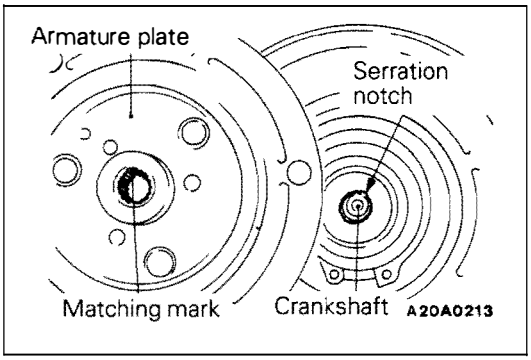
◆C◆ CLUTCH COIL INSTALLATION

When installing the clutch coil to the A/C compressor body, install so that the pin hole of the A/C compressor body and the clutch coil projection are aligned.



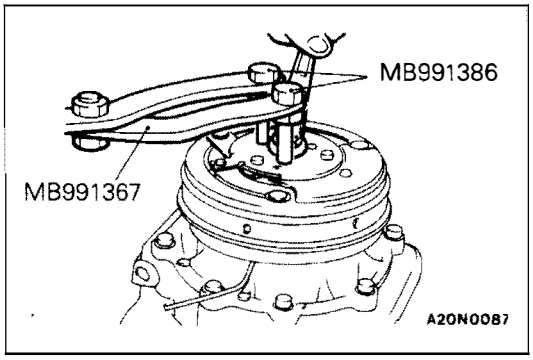
◆D◆ SNAP RING INSTALLATION

Install the snap ring so that the tapered surface is at the outer side.

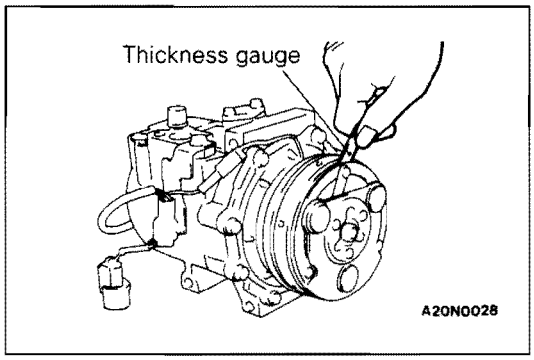


◗E◖ ARMATURE PLATE INSTALLATION

Align the mating mark of the crankshaft spline and the mating mark of the armature plate, and then fit them together.



◗F◖ NUT INSTALLATION



- **AIR GAP ADJUSTMENT**

  Check whether or not the air gap of the clutch is within the standard value.

  Standard value: 0.4–0.65 mm

  NOTE
  If there is a deviation of the air gap from the standard value, make the necessary adjustment by adjusting the number of shims.

REFRIGERANT LINE

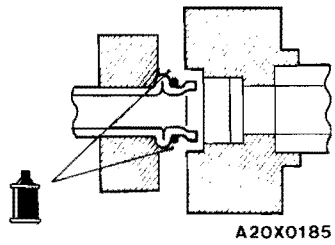
E55A000AA

REMOVAL AND INSTALLATION

<L.H. DRIVE VEHICLES>

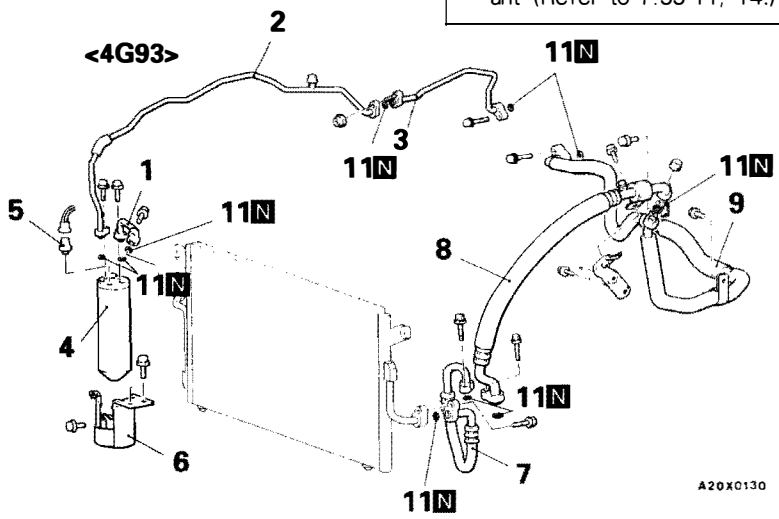
Pre-removal and Post-installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-11, 14.)

Piping or hose connection

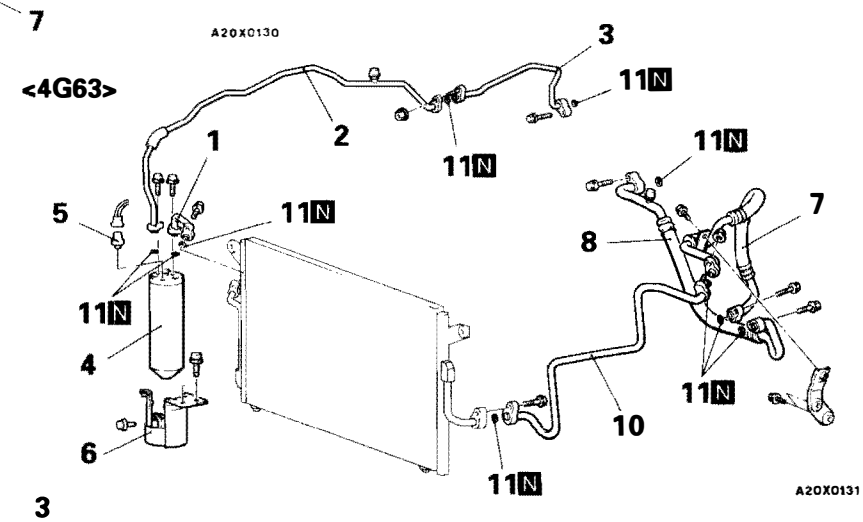


Compressor oil: SUN PAG 56

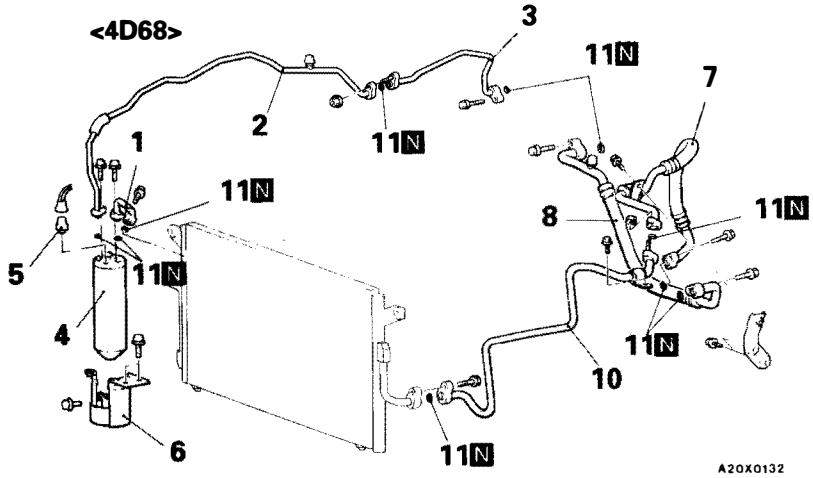
<4G93>



<4G63>



<4D68>



Removal steps

1. Discharge pipe A
2. Discharge pipe B
3. Discharge pipe C
◆A◆ 4. Receiver assembly
5. Triple pressure switch
6. Receiver bracket
7. Discharge hose
◆A◆ 8. Suction hose
◆A◆ 9. Suction hose B <4G93>
10. Discharge pipe <4D68, 4G63>
11. O-ring

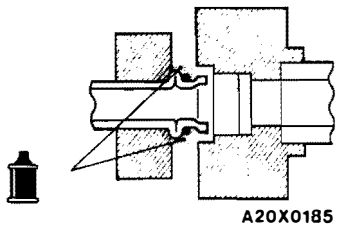
REMOVAL AND INSTALLATION

E55A000BA

<R.H. DRIVE VEHICLES>

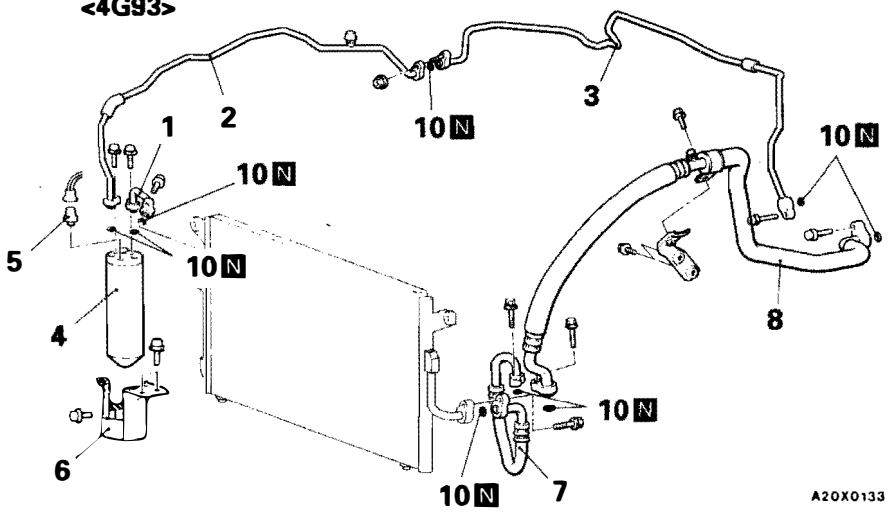
Pre-removal and Post-installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-11, 14.)

Piping or hose connection

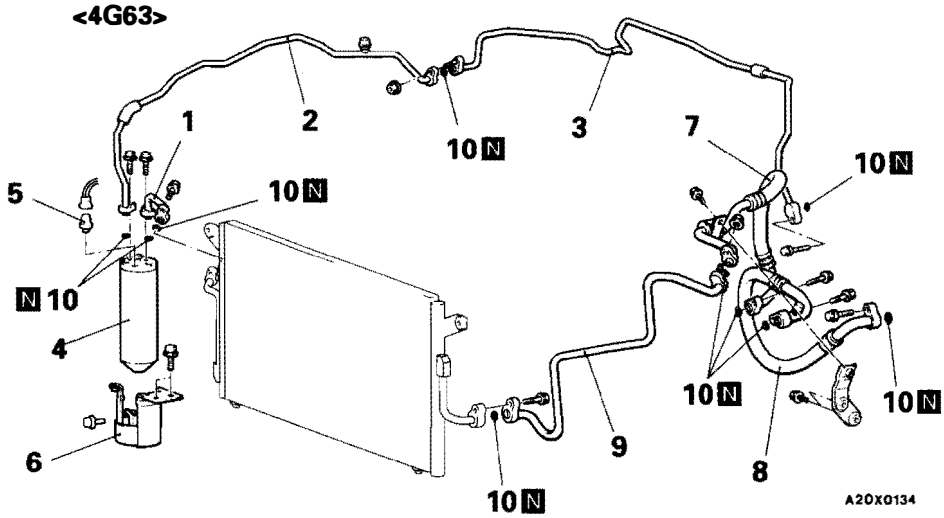


Compressor oil: SUN PAG 56

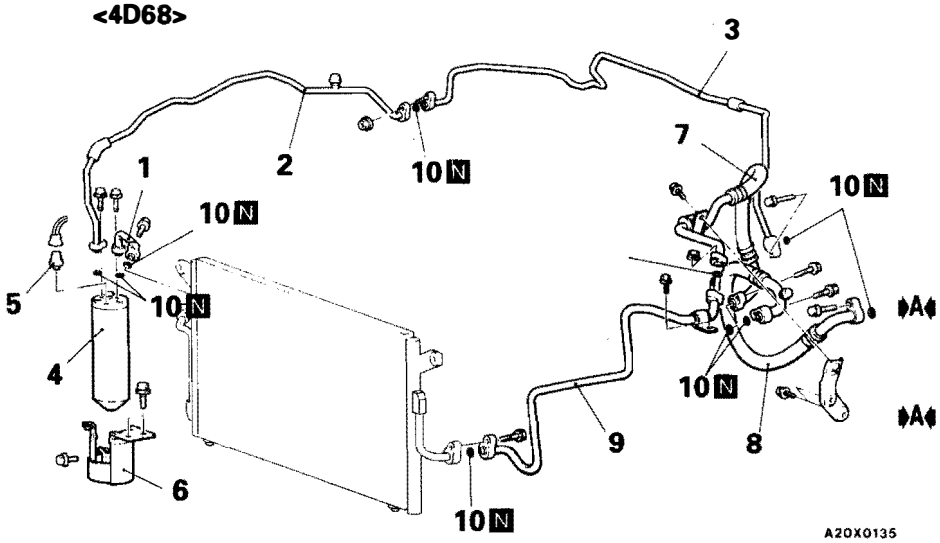
<4G93>



<4G63>



<4D68>



Removal steps
1. Discharge pipe A
2. Discharge pipe B
3. Discharge pipe C
4. Receiver assembly
5. Triple pressure switch
6. Receiver bracket
7. Discharge hose
8. Suction hose
9. Discharge pipe <4D68, 4G63>
10. O-ring

INSTALLATION SERVICE POINT E55A004AA

◆A◆ SUCTION HOSE, RECEIVER ASSEMBLY INSTALLATION

When replacing the suction hose or receiver assembly, refill them with a specified amount of compressor oil, and then install them.

Compressor oil: SUN PAG 56
Quantity:
Suction hose: 10 mℓ
Receiver: 10 mℓ

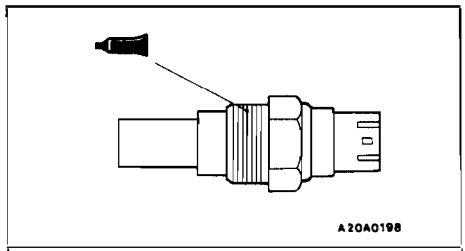
NOTES

ENGINE COOLANT TEMPERATURE SWITCH <Diesel-Powered Vehicles>

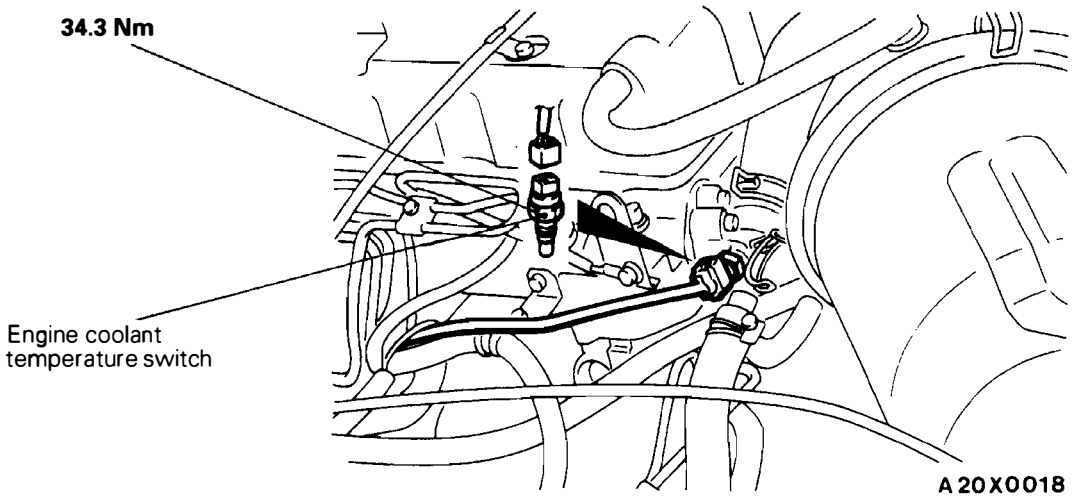
REMOVAL AND INSTALLATION

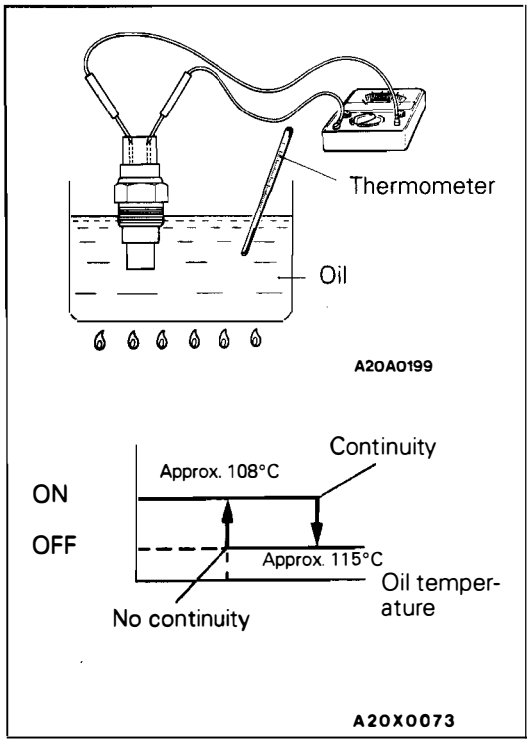
E55AP00AA

Post-installation Operation
- Refilling Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)



3M Adhesive Nut locking No. 4171 or equivalent





INSPECTION

E55AP02AA

(1) Immerse the engine coolant temperature switch in engine oil as shown in the illustration.
(2) Check the continuity with the circuit tester when the temperature of the oil has been changed. The condition is normal if there is continuity within the following ranges of temperature.

Standard values:

Item	Temperature
Continuity (ON)	Approx. 115°C or less
No continuity (OFF)	Approx. 115°C or more (Until temperature drops to 108°C when engine coolant temperature switch is OFF)

Caution
Use engine oil for this test; stir it well while heating, and do not heat more than necessary.

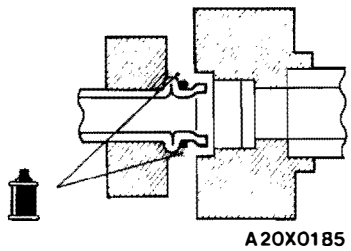
CONDENSER AND CONDENSER FAN MOTOR

REMOVAL AND INSTALLATION

E55AQ00AA

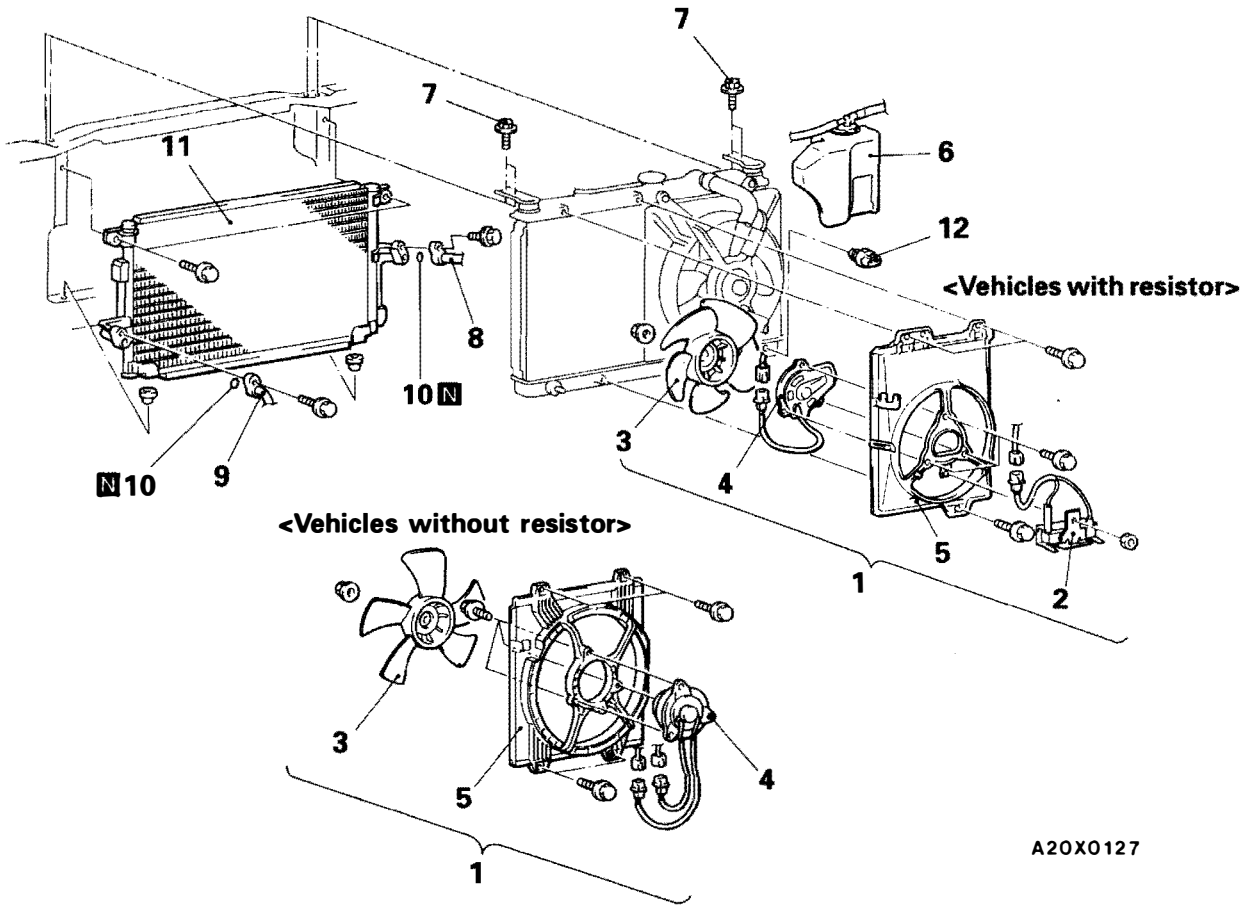
Pre-removal and Post-installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-11, 14.)

Piping or hose connection



A20X0185

Compressor oil: SUN PAG 56



A20X0127

Condenser removal steps

6. Reserve tank
7. Upper insulator installation bolts
8. Discharge pipe
9. Discharge hose
10. O-ring

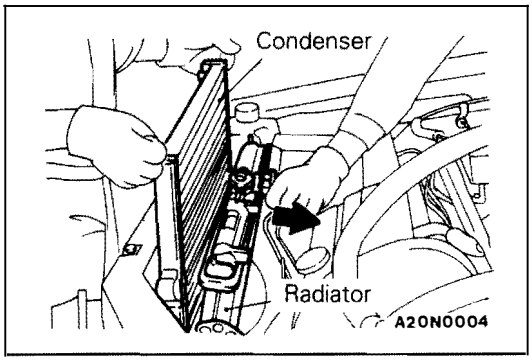
◆A◇ ◆A◆ 11. Condenser

Condenser fan motor removal steps

1. Condenser fan motor and shroud assembly
2. Resistor
3. Condenser fan
4. Condenser fan motor
5. Shroud

Engine coolant temperature switch (for condenser fan) removal

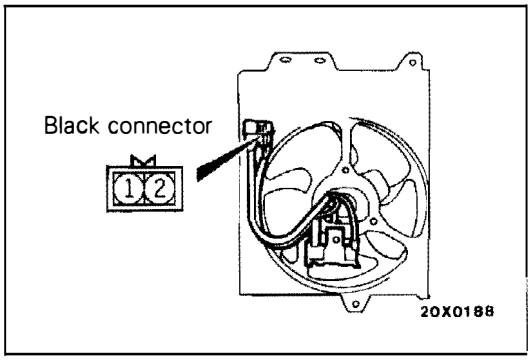
12. Engine coolant temperature switch <4D68>



REMOVAL SERVICE POINT E55AQ01AA

〈A〉 CONDENSER REMOVAL

Move the radiator to the engine side and then lift up the condenser to remove it.

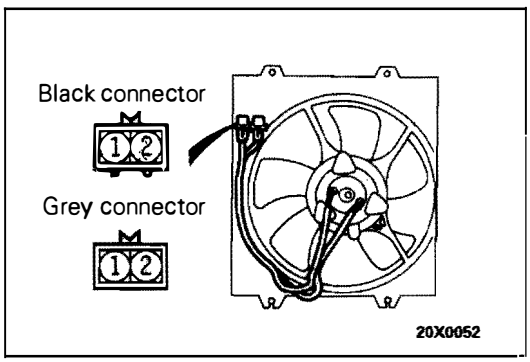


INSPECTION E55AQ02AA

CONDENSER FAN MOTOR

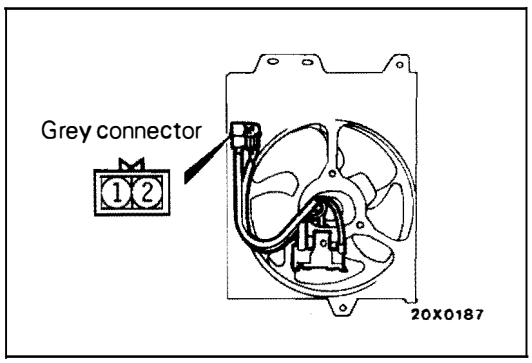
<Vehicles with resistor>

Check to be sure that the condenser fan motor operates when battery voltage is applied to terminal 1 of the black connector and terminal 2 is earthed.



<Vehicles without resistor>

(1) Check to be sure that the condenser fan motor operates when battery voltage is applied to terminal 1 of the grey connector and terminal 2 is earthed.
(2) In this same condition, apply battery voltage to terminal 1 of the black connector and earth terminal 2. Check to be sure that the condenser fan motor operates faster at this time.



RESISTOR <Vehicles with resistor> E55AQ02BB

Use a circuit tester to measure the resistance between terminals 1 – 2 of the grey connector. Check to be sure that the measured value at this time is at the standard value.

Standard Value: Up to 1993 models
0.29 Ω (6B models)
0.45 Ω (Other models)
From 1994 models
0.45 Ω

ENGINE COOLANT TEMPERATURE SWITCH <4D68>

E55AQ02CA

Refer to GROUP 14 – Radiator.

INSTALLATION SERVICE POINT

E55AP04AA

◆A◆ CONDENSER INSTALLATION

When replacing the condenser, refill it with a specified amount of compressor oil and install it (to the vehicle).

Compressor oil: SUN PAG 56
Quantity: 15 mℓ

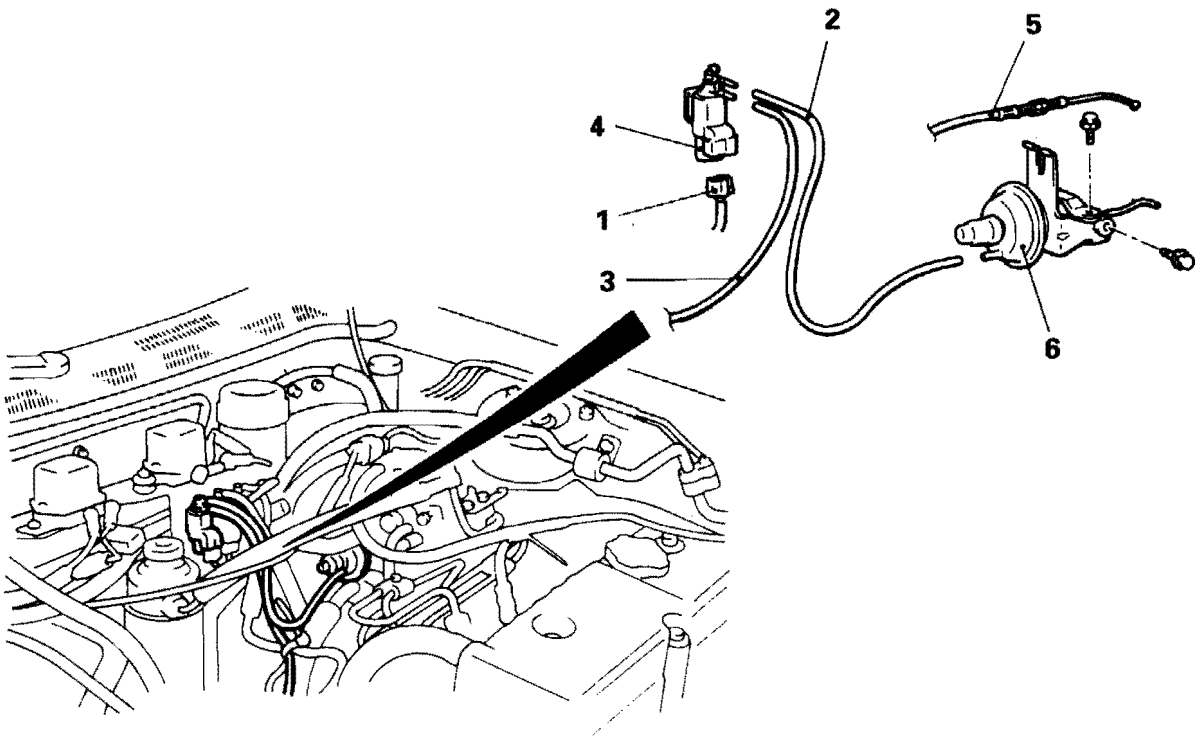
NOTES

IDLE-UP SYSTEM <Diesel-Powered Vehicles>

REMOVAL AND INSTALLATION

E55AR00AA

Post-installation Operation
- Checking of Accelerator Cable Play (Refer to GROUP 13F – Service Adjustment Procedure.)



A20X0152

Idle-up solenoid valve removal steps
1. Idle-up solenoid valve connector
2. Vacuum hose (yellow stripe) connection
3. Vacuum hose (white stripes) connection
4. Idle-up solenoid valve

Vacuum actuator assembly removal steps
2. Vacuum hose (yellow stripe) connection
5. Accelerator cable
6. Vacuum actuator assembly

INSPECTION

E55AR02AA

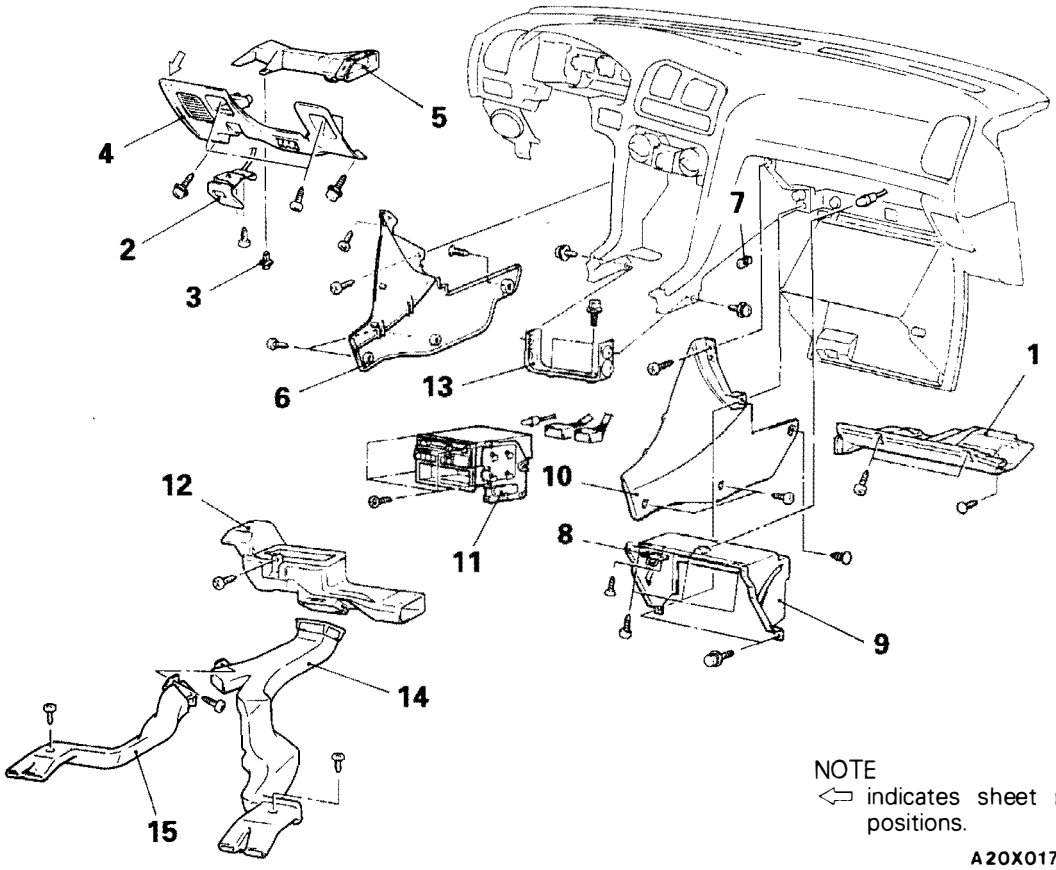
For information concerning the checking of the vacuum actuator and the idle-up solenoid valve, refer to P.55-19, 20 – Service Adjustment Procedures.

VENTILATORS

E55AS00AA

(FLOOR)

REMOVAL AND INSTALLATION



NOTE
⇦ indicates sheet metal clip positions.

A20X0174

Shower foot duct removal steps

1. Under cover
2. Hood lock release handle
3. Clip
4. Instrument under cover
5. Shower foot duct

Foot distribution duct removal steps

2. Hood lock release handle
3. Clip
4. Instrument under cover
6. Side cover B
7. Stopper
8. Glove box striker
9. Glove box cover
10. Side cover A
11. Radio and tape player (Refer to GROUP 54 – Radio and Tape Player.)
12. Foot distribution duct

Rear heater duct (RH) removal steps

- Shift lever assembly (Refer to GROUPS 22, 23 – Transmission Control.)

11. Radio and tape player
13. Backbone bracket

- Front seat (Refer to GROUP 52A – Front Seat.)

14. Rear heater duct (RH)

Rear heater duct (LH) removal steps

2. Hood lock release handle
3. Clip
4. Instrument under cover
6. Side cover B

} <LHD>

7. Stopper
8. Glove box striker
9. Glove box cover
10. Side cover A

} <RHD>

11. Radio and tape player (Refer to GROUP 54 – Radio and Tape Player.)

- Front seat (Refer to GROUP 52A – Front Seat.)

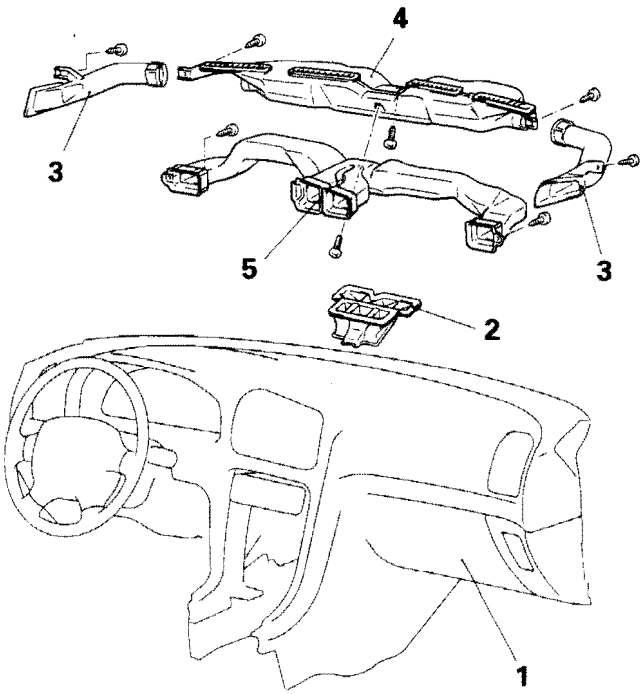
15. Rear heater duct (LH)

(INSTRUMENT PANEL)

REMOVAL AND INSTALLATION

E55AS00BA

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



A20X0072

Removal steps

1. Instrument panel (Refer to GROUP 52A – Instrument Panel.)
2. Center ventilation duct
3. Side defroster duct
4. Defroster duct
5. Distribution duct

(AIR INLET AND AIR OUTLET)

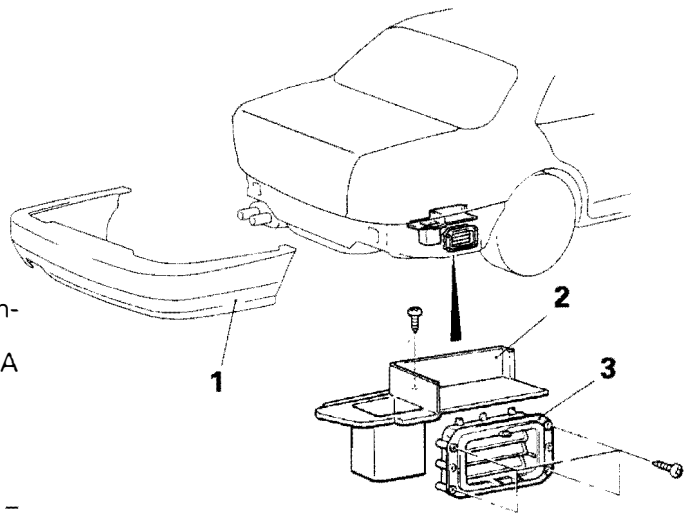
REMOVAL AND INSTALLATION

E55AS00CA

Removal steps

1. Rear bumper (Refer to GROUP 51 – Bumper.)
- Trunk room side trim (Refer to GROUP 52A – Trims.) <Hatchback>
2. Side box (RH) <Sedan>
3. Rear ventilation duct

NOTE
For the front deck garnish, refer to GROUP 51 – Windshield Wiper and Washer.



A20X0177

FULL AUTOMATIC AIR CONDITIONER

GENERAL INFORMATION

E55BB00AB

The heater system uses a two-way-flow full-air-mix system that features high performance and low operating noise, and includes an independent face-directed air flow function and a cool air bypass function.
An air purifier which carries out fine A/C control has been included.

The A/C system is basically the same as the manual air conditioner in which a new refrigerant system has been adopted. However, an A/C control panel with a reduced number of buttons and a more compact arrangement of necessary functions owing to more functions being assigned to each button has been adopted.

Items		Specifications
Heater unit		
Type		Two-way-flow full-air-mix system
Heater control assembly		Push button type
Compressor		
Model		
Up to 1993 models		Scroll type <AX105VS>
From 1994 models		Scroll type <MSC105CVS>
Triple pressure switch (Up to 1993 models)	kPa	
High-pressure switch		OFF: 3,140, ON: 2,550
Medium-pressure switch		OFF: 1,470, ON: 1,770
Low-pressure switch		OFF: 200, ON: 220
Dual pressure switch (From 1994 models)	kPa	
High-pressure switch		OFF: 3,140, ON: 2,550
Low-pressure switch		OFF: 200, ON: 220
Refrigerant and quantity	g	R-134a (HFC-134a), Approx. 630–670

SERVICE SPECIFICATIONS

E55BC00AA

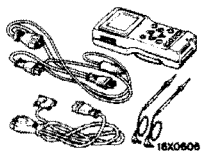
Items		Specifications
Standard value		
Idle speed	r/min.	700 ± 50
Idle up speed	r/min.	900
Air mix damper motor potentiometer	kΩ	
MAX. HOT position		Approx. 4.8
MAX. COLD position		Approx. 0.2
Outlet air changeover damper motor potentiometer	kΩ	
DEF position		Approx. 4.8
FACE position		Approx. 0.2
Revolution pick up sensor	Ω	450 ± 35 (at 20°C)

LUBRICANTS

Items	Specified lubricants	Quantity
Each connection of refrigerant line	SUN PAG 56	As required
Compressor refrigerant unit lubricant m ℓ	SUN PAG 56	160

SPECIAL TOOLS

E55BD00AA

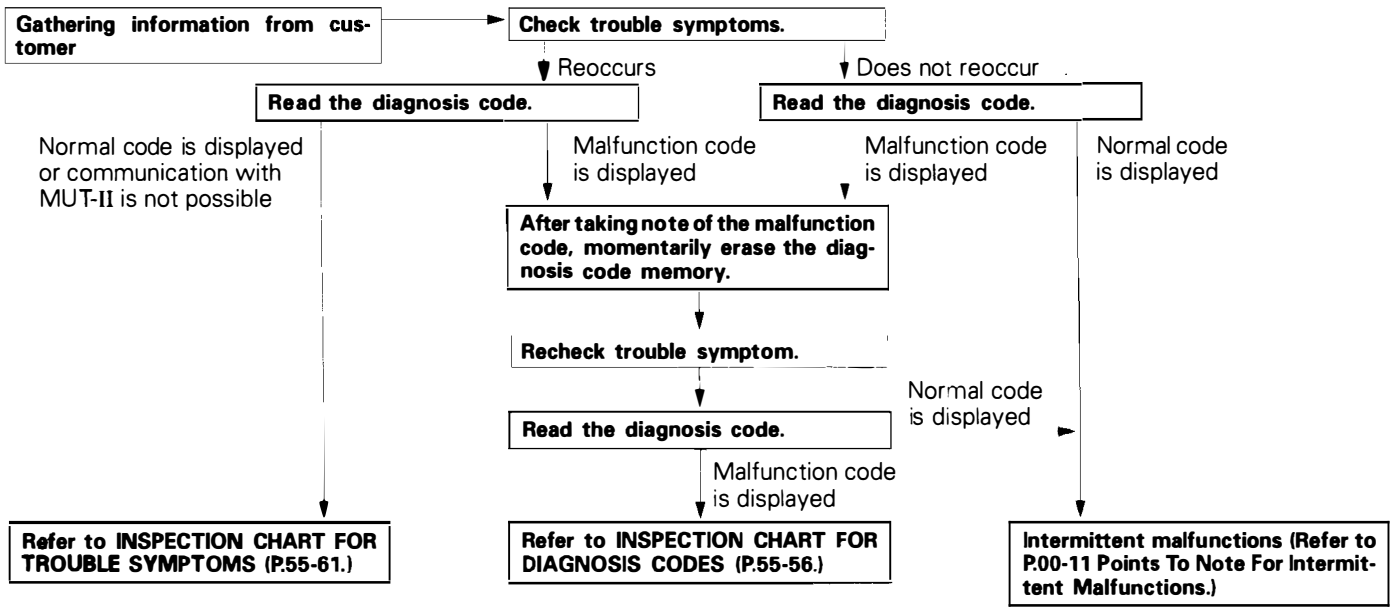
Tool	Number	Name	Use
 16X0606	MB991502	MUT-II sub-assembly	• Checking of diagnosis codes • Read-out of service data • Testing of the actuator
 16X0607		ROM pack	

NOTE
Other special tools are the same as for the manual A/C.

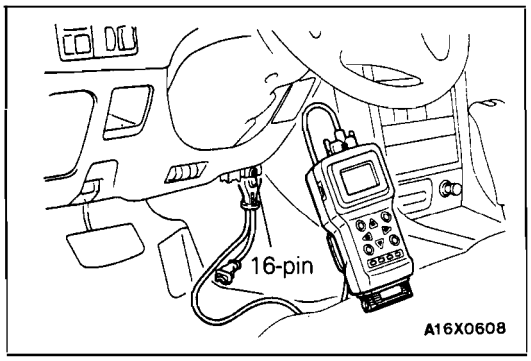
TROUBLESHOOTING

E55BE00AA

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING



NOTE
Before carrying out diagnostic troubleshooting, check to be sure that all of the following are normal.
(1) Is the refrigerant level appropriate?
(2) Is the tension of the A/C compressor drive belt at the standard value?
(3) Are the air ducts and rods secure in their positions?
(4) Are the damper motor and rods correctly connected?
(5) Are any fuses blown?



DIAGNOSTIC FUNCTION

E55BE01AA

METHOD OF READING THE DIAGNOSIS CODES

Connect the MUT-II to the diagnostic connector under the instrument under cover.

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

METHOD OF ERASING THE DIAGNOSIS CODES

Disconnect the (–) cable from the battery for 10 seconds or more, and then reconnect it.

INSPECTION CHART FOR DIAGNOSIS CODES

E55BE02AA

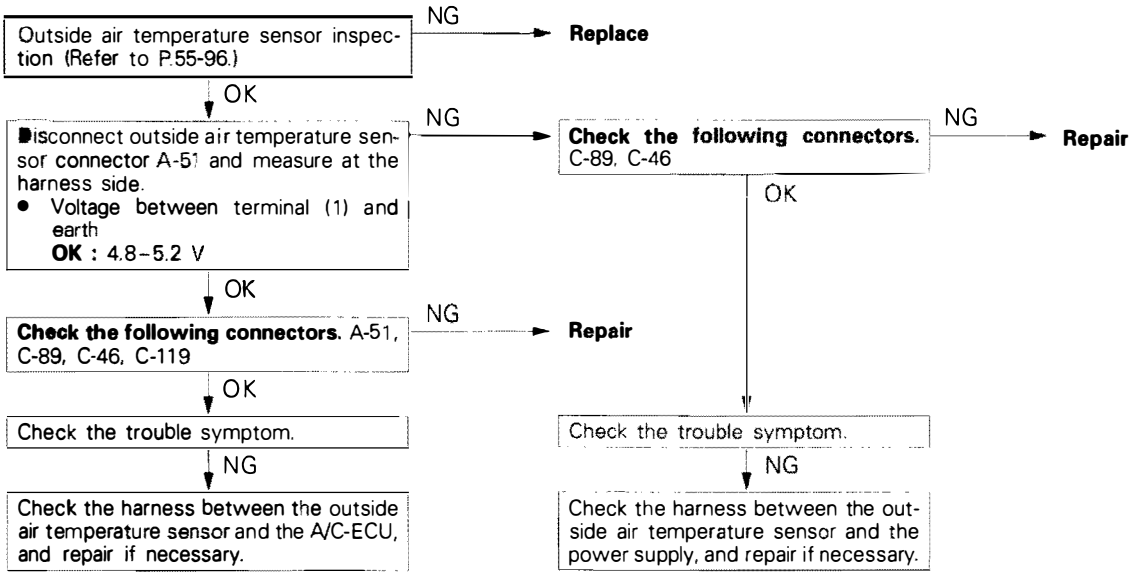
Code No.	Diagnosis Item	Reference Page
11	Inside air temperature sensor system (open circuit)	P.55-57
12	Inside air temperature sensor system (short circuit)	P.55-57
13	Outside air temperature sensor system (open circuit)	P.55-57
14	Outside air temperature sensor system (short circuit)	P.55-57
15	Engine coolant temperature sensor system (open circuit)	P.55-58
16	Engine coolant temperature sensor system (short circuit)	P.55-58
21	Fin thermo sensor system (open circuit)	P.55-58
22	Fin thermo sensor system (short circuit)	P.55-58
31	Potentiometer system of air mix damper motor assembly	P.55-59
32	Potentiometer system of air outlet changeover damper motor assembly	P.55-59
41	Drive system of air mix damper motor assembly	P.55-60
42	Drive system of air outlet changeover damper motor assembly	P.55-60

INSPECTION PROCEDURES FOR DIAGNOSTIC TROUBLE CODES

Code No. 11 or 12	Inside air temperature sensor system	Probable Cause
[Comment] This diagnosis code is output if the inside air temperature sensor inside the A/C-ECU is defective.		• Malfunction of A/C-ECU

Replace the A/C-ECU.

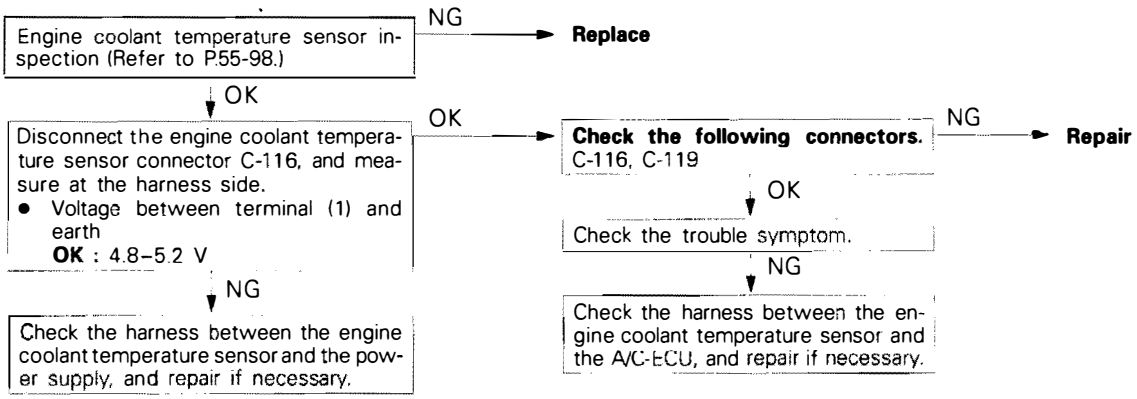
Code No.13	Outside air temperature sensor system (open circuit)	Probable Cause
[Comment] This diagnosis code is output if there is a defective connector connection, or if there is an open circuit in the harness.		• Malfunction of connector • Malfunction of harness



Code No.14	Outside air temperature sensor system (short circuit)	Probable Cause
[Comment] This diagnosis code is output if there is a short circuit in the outside air temperature sensor input circuit.		• Malfunction of harness

Check the harness between the outside air temperature sensor and the A/C-ECU, and repair if necessary.

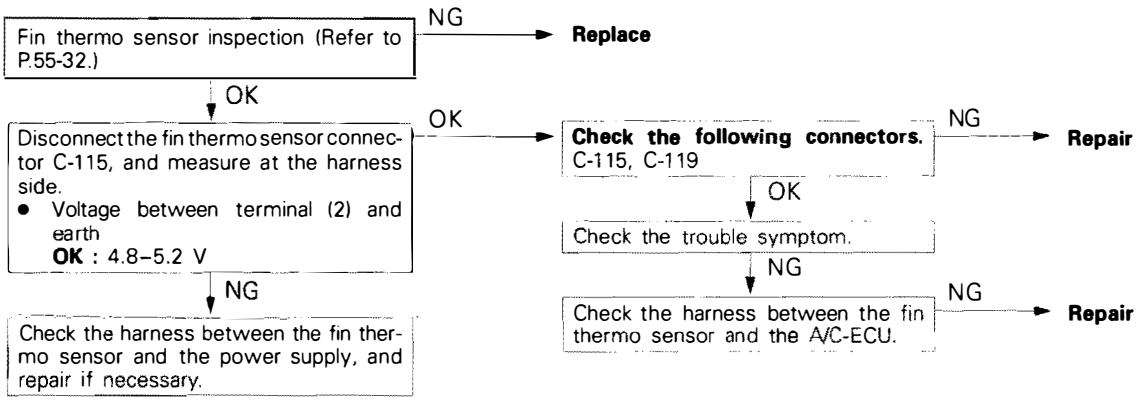
Code No.15	Engine coolant temperature sensor system (open circuit)	Probable Cause
[Comment] This diagnosis code is output if there is a defective connector connection or an open circuit in the harness.		• Malfunction of connector • Malfunction of harness



Code No.16	Engine coolant temperature sensor system (short circuit)	Probable Cause
[Comment] This diagnosis code is output if there is a short circuit in the engine coolant temperature sensor input circuit.		• Malfunction of harness

Check the harness between the engine coolant temperature sensor and the A/C-ECU, and repair if necessary.

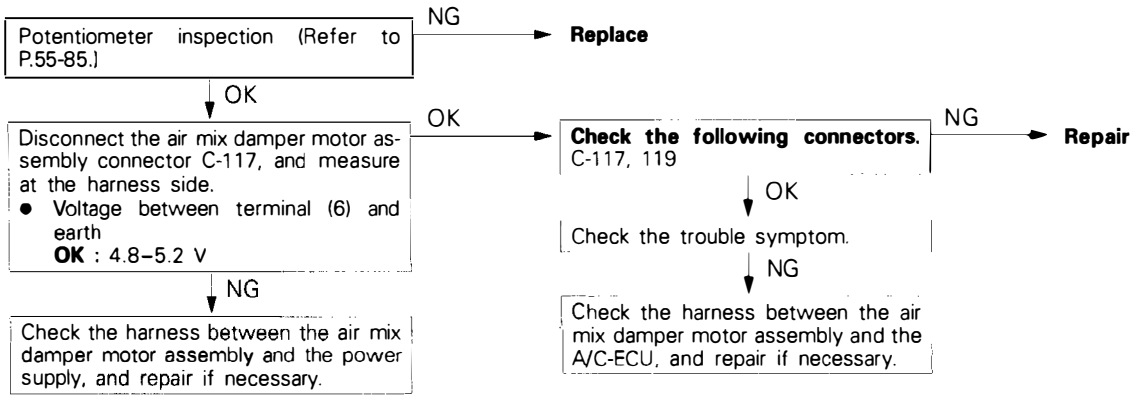
Code No.21	Fin thermo sensor system (open circuit)	Probable Cause
[Comment] This diagnosis code is output if there is a defective connector connection or an open circuit in the harness.		• Malfunction of connector • Malfunction of harness



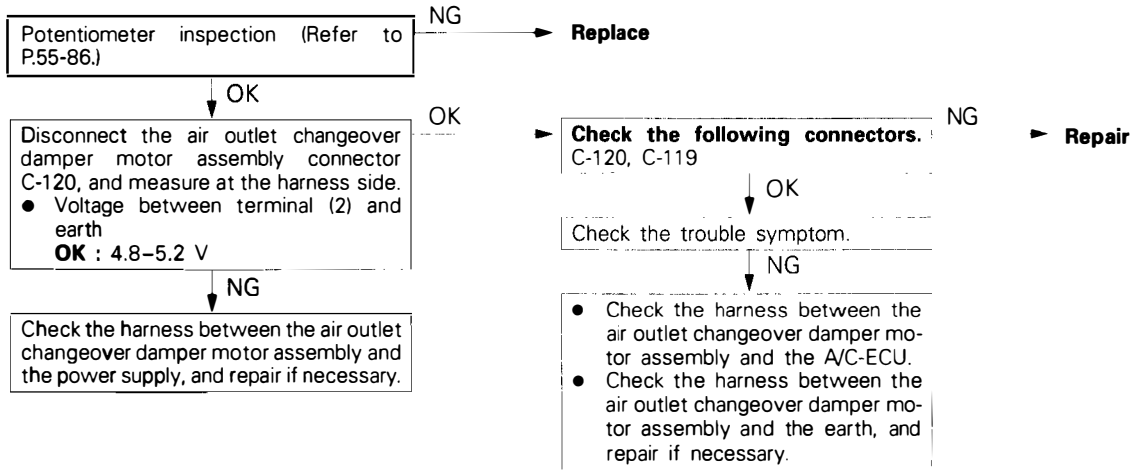
Code No.22	Fin thermo sensor system (short circuit)	Probable Cause
[Comment] This diagnosis code is output if there is a short circuit in the fin thermo sensor input circuit.		• Malfunction of harness

Check the harness between the fin thermo sensor and the A/C-ECU, and repair if necessary.

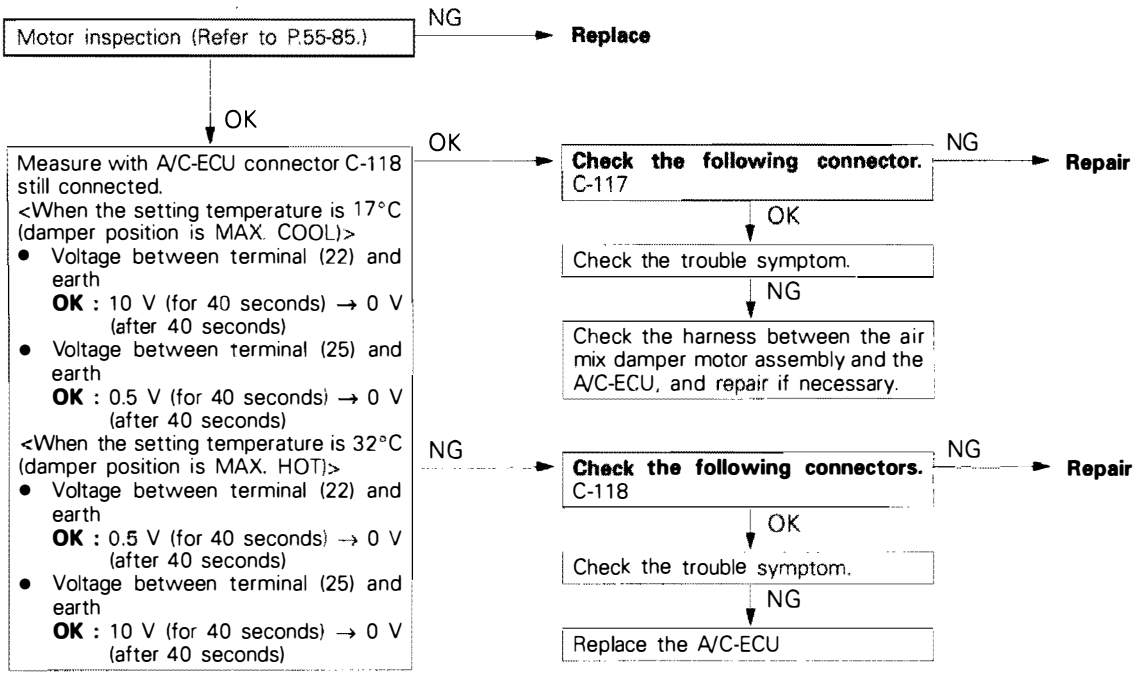
Code No.31	Potentiometer system of air mix damper motor assembly	Probable Cause
[Comment] This diagnosis code is output if there is an open or short circuit in the potentiometer input circuit, or if there is an open circuit in the power circuit or earth circuit.		• Malfunction of air mix damper motor assembly • Malfunction of connector • Malfunction of harness



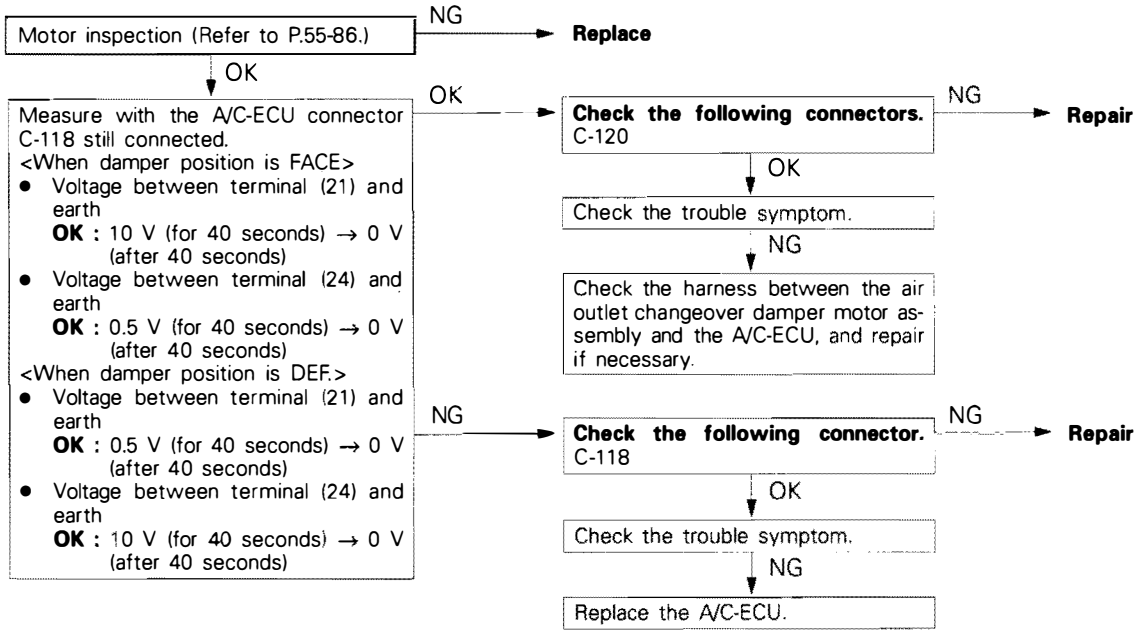
Code No.32	Potentiometer system of air outlet changeover damper motor assembly	Probable Cause
[Comment] This diagnosis code is output if there is an open or short circuit in the potentiometer input circuit, or if there is an open circuit in the power circuit or earth circuit.		• Malfunction of air outlet changeover damper motor assembly • Malfunction of connector • Malfunction of harness



Code No.41	Drive system of air mix damper motor assembly	Probable Cause
[Comment] This diagnosis code is output if the motor drive circuit is defective.		• Malfunction of air mix damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of the A/C-ECU



Code No.42	Drive system of air outlet changeover damper motor assembly	Probable Cause
[Comment] This diagnosis code is output if the motor drive circuit is defective.		• Malfunction of air outlet changeover damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



INSPECTION CHART FOR TROUBLE SYMPTOMS

E55BE03AA

Trouble Symptom		Inspection procedure No.	Reference Page
Communication with the MUT-II is not possible.	Communication with all systems is not possible.	1	P.55-62
	Communication with A/C system only is not possible.	2	P.55-62
Blowing of air does not stop even if blower switch is OFF.		3	P.55-62
No air is blown out from the air outlet even if blower switch is ON.		4	P.55-63
Inside/outside air changeover is not possible.		5	P.55-64
Air outlet is not changed over even if air outlet changeover switch is pressed.		6	P.55-64
When ignition switch and fan switch are ON, A/C does not operate even if A/C switch is turned to ON.		7	P.55-65
A/C is operated but inside air temperature is not lowered.		8	P.55-66
Setting display temperature returns to 25°C when ignition switch is turned ON or OFF.		9	P.55-67
Setting temperature is increased but inside air temperature does not rise.		10	P.55-67
Window glass becomes cloudy although operation is in AUTO mode.		11	P.55-68
Outside air temperature display does not change from 20°C.		12	P.55-69
Condenser fan does not operate.	<6A12 – M/T>	13	P.55-69
	<6A12 – A/T, 6G73>	14	P.55-70
Condenser fan does not operate at low speed.	<6A12 – M/T>	15	P.55-71
	<6A12 – A/T, 6G73>	16	P.55-72
Condenser fan does not operate at high speed.	<6A12 – M/T>	17	P.55-73
	<6A12 – A/T, 6G73>	18	P.55-74
Air purifier does not operate.		19	P.55-75
Air purifier indicator lamp (A/P) does not illuminate.		20	P.55-75
Belt lock indicator lamp flashes.		21	P.55-76

INSPECTION PROCEDURE FOR DIAGNOSTIC TROUBLE SYMPTOMS

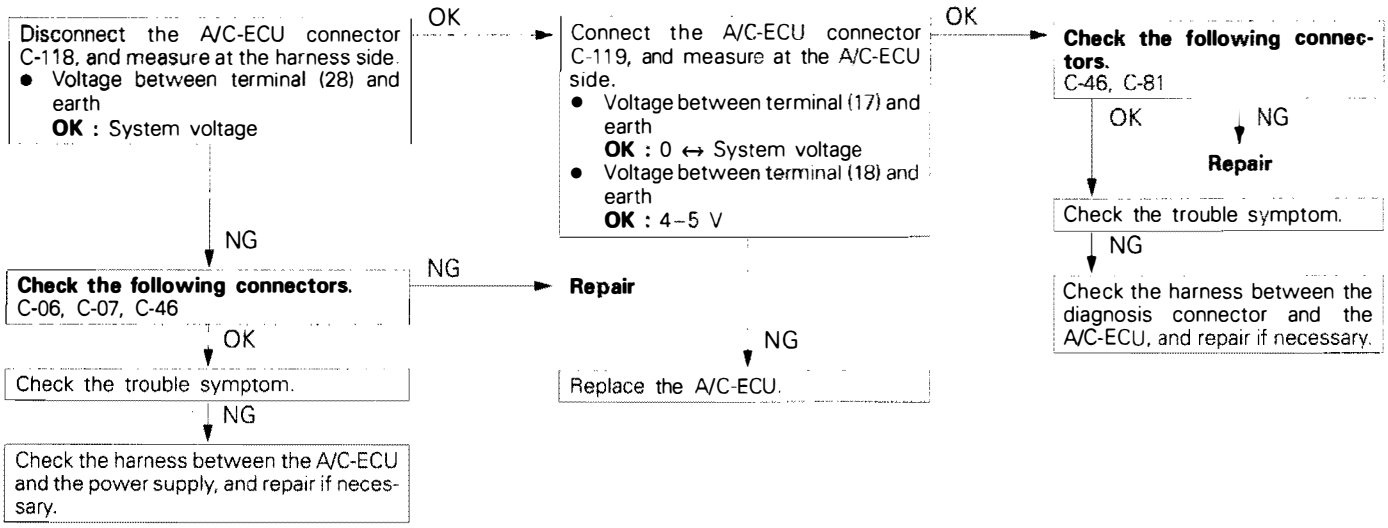
Inspection procedure 1

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

Refer to GROUP 13A – Troubleshooting.

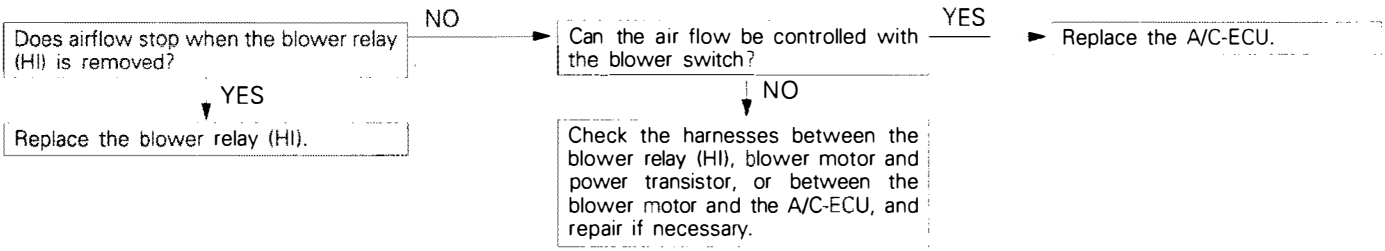
Inspection procedure 2

Communication with A/C system only is not possible.	Probable Cause
[Comment] The cause is probably a defective A/C-ECU power supply circuit or earth circuit, or a defective diagnosis line circuit.	• Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



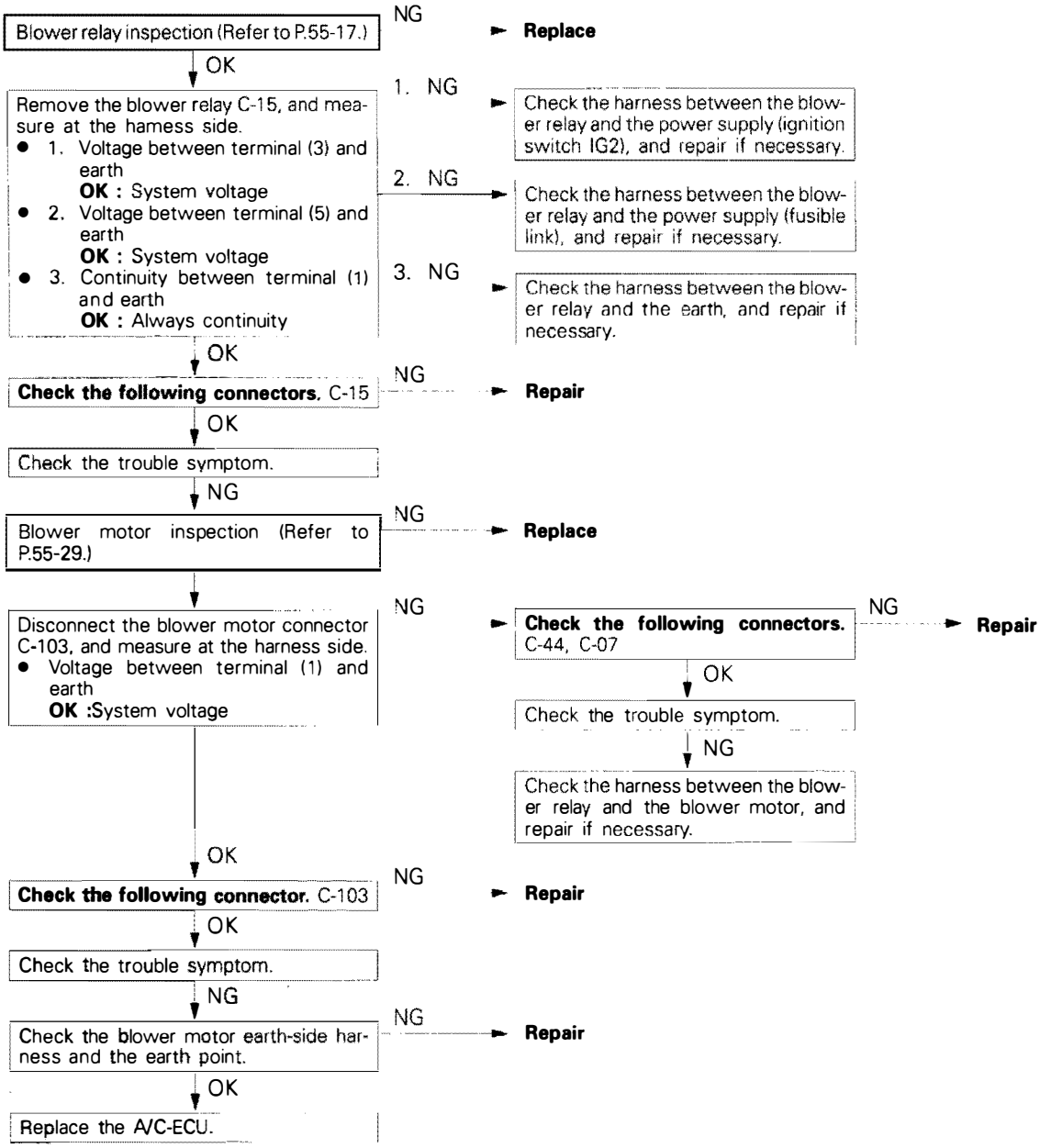
Inspection procedure 3

Blowing of air does not stop even if blower switch is OFF.	Probable Cause
[Comment] There is a high possibility that the blower relay (HI) is defective or there is a defective harness. If the airflow volume can be controlled with the blower switch, the cause is probably a defective A/C-ECU.	• Malfunction of blower relay (HI) • Malfunction of harness • Malfunction of A/C-ECU



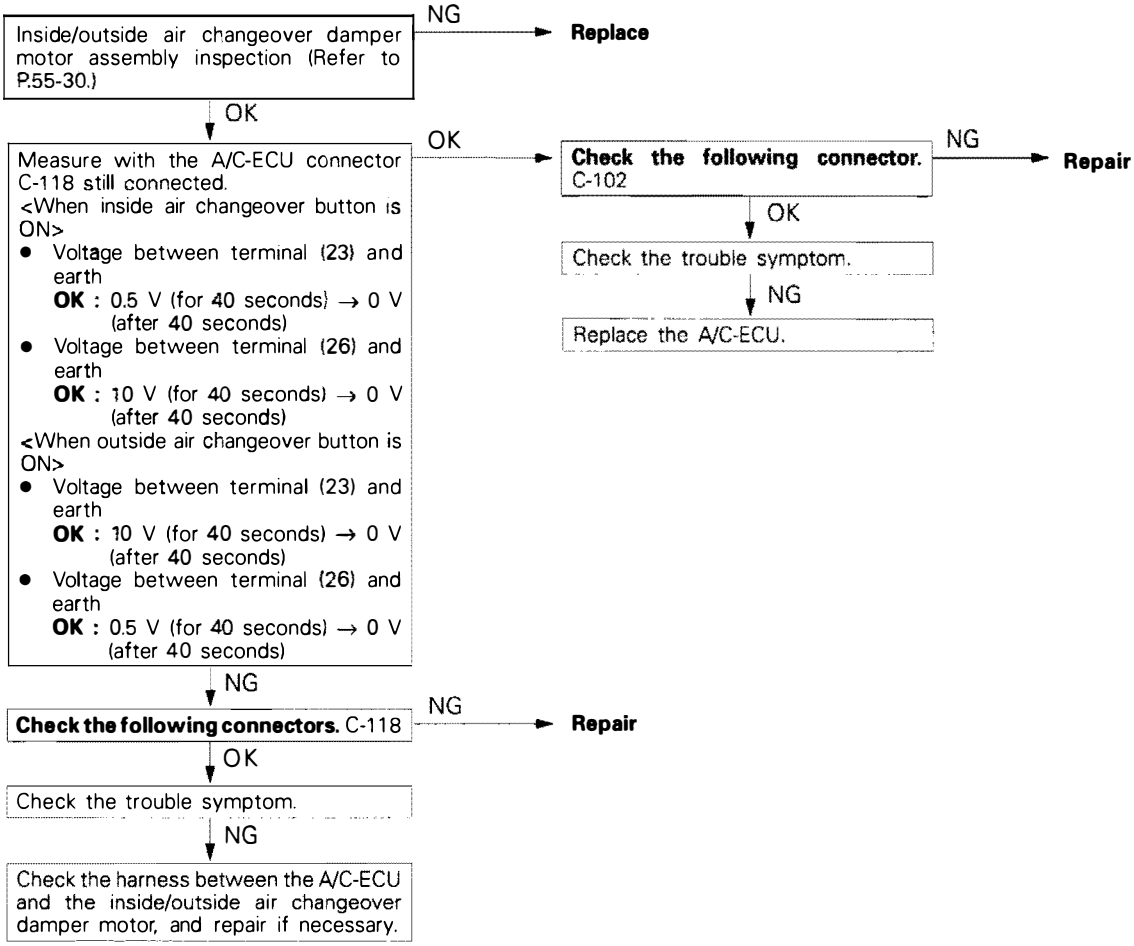
Inspection procedure 4

No air is blown out from the air outlet even if blower switch is ON.	Probable Cause
[Comment] The cause is probably a defective blower motor or a defective blower relay.	• Malfunction of blower motor • Malfunction of blower relay • Malfunction of A/C-ECU



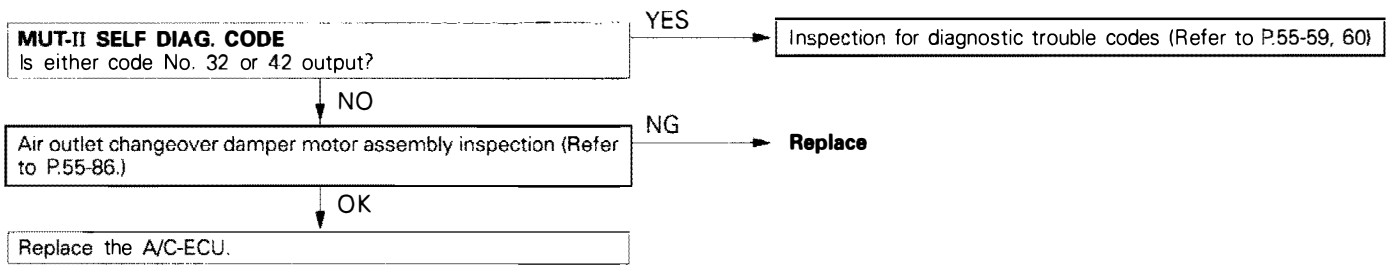
Inspection procedure 5

Inside/outside air changeover is not possible.	Probable Cause
[Comment] The cause is probably a defective inside/outside air changeover damper motor assembly or a defective connector or harness.	• Malfunction of inside/outside air changeover damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



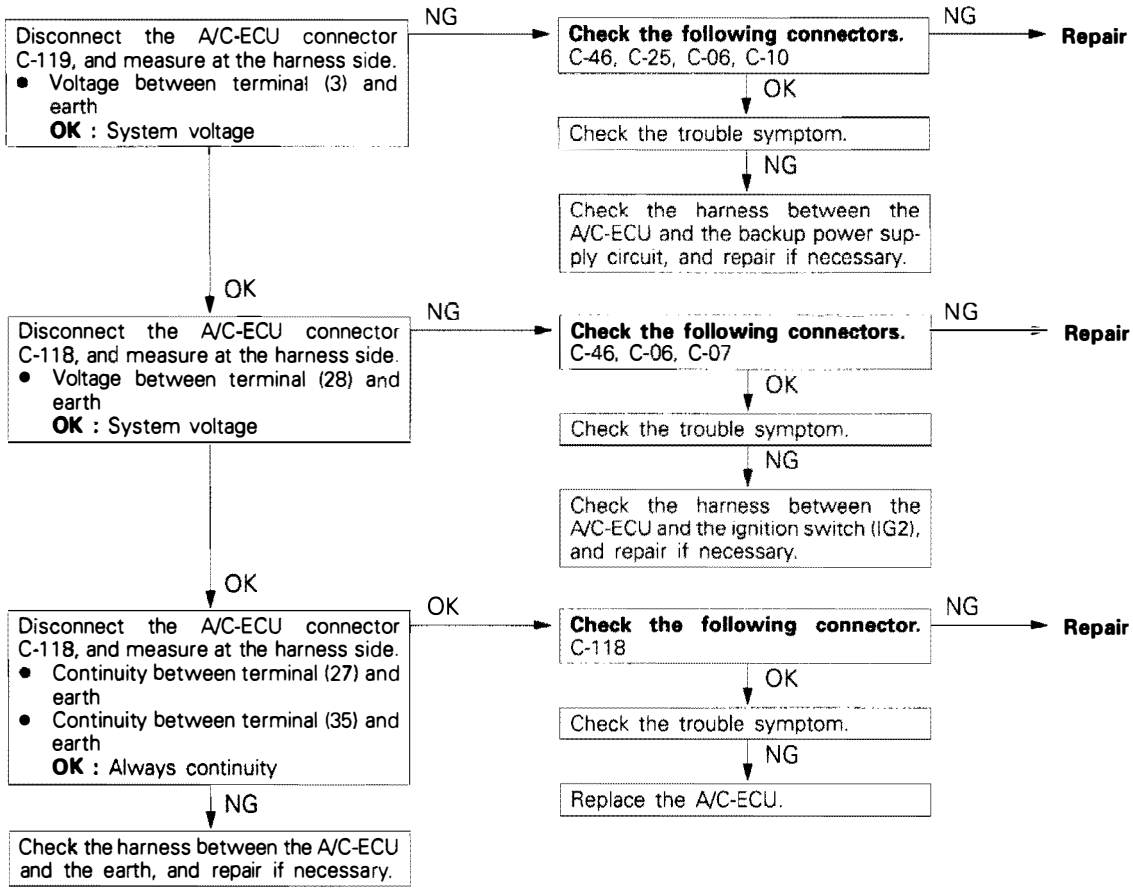
Inspection procedure 6

Air outlet is not changed over even if air outlet changeover switch is pressed.	Probable Cause
[Comment] The cause is probably a defective air outlet changeover damper motor assembly or a defective connector or harness. In this case, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes.	• Malfunction of air outlet changeover damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



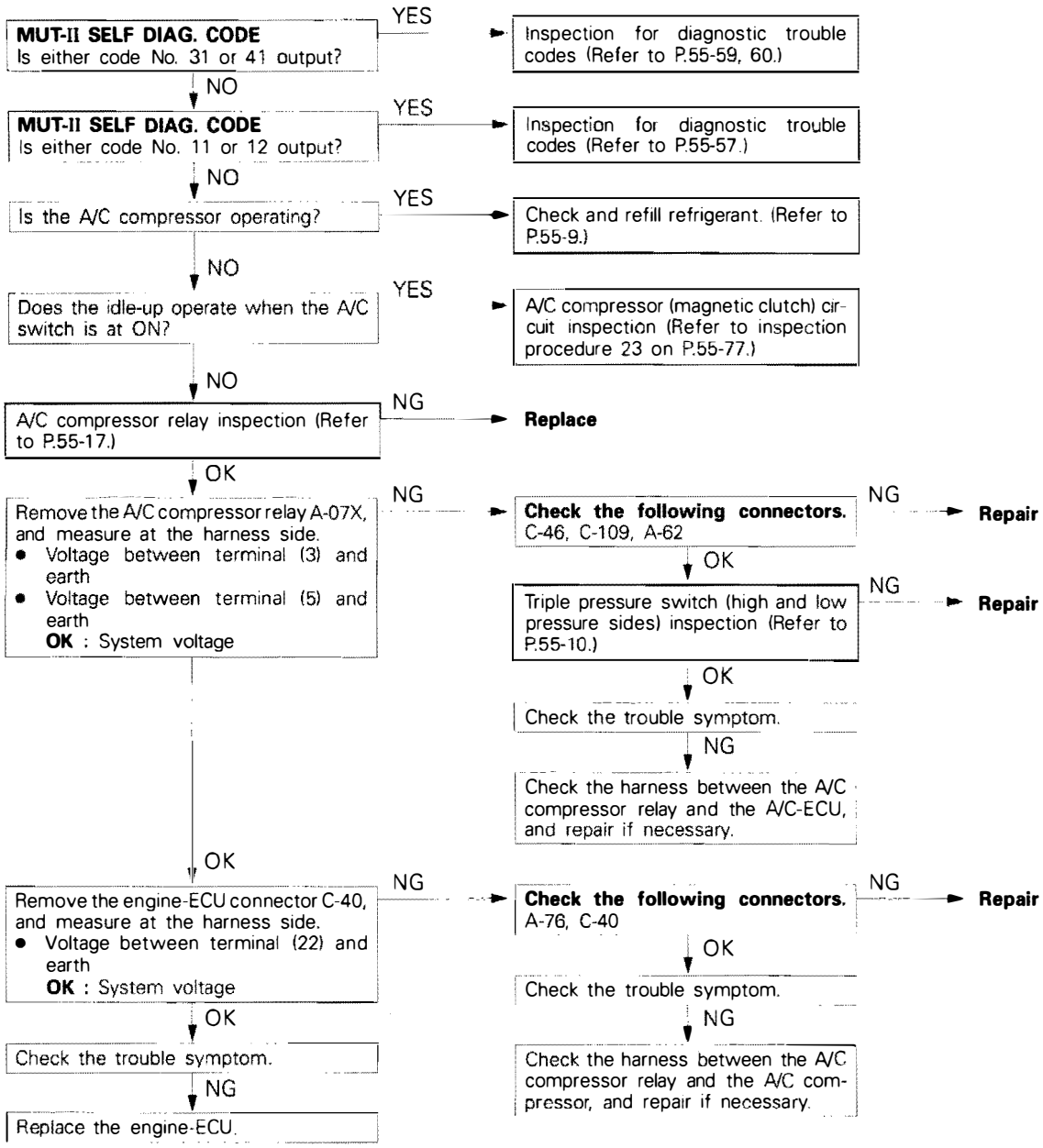
Inspection procedure 7

When ignition switch and fan switch are ON, A/C does not operate even if A/C switch is turned to ON.	Probable Cause
[Comment] The cause is probably a defective A/C-ECU power supply system (including earth).	• Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



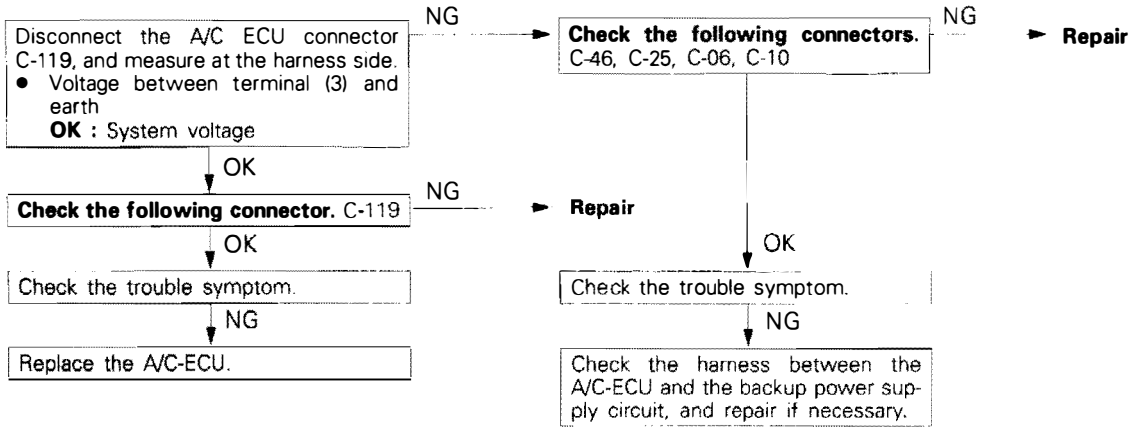
Inspection procedure 8

A/C is operated but inside air temperature is not lowered (cool air does not blow out).	Probable Cause
[Comment] The cause is probably a defective A/C compressor (magnetic clutch), a defective air mix damper motor assembly or a defective sensor. In this case, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes.	• Malfunction of A/C compressor (magnetic clutch) • Malfunction of refrigerant temperature switch • Malfunction of A/C compressor relay • Malfunction of triple pressure switch • Malfunction of air mix damper motor assembly • Malfunction of fin thermo sensor • Malfunction of A/C-ECU • Malfunction of engine-ECU



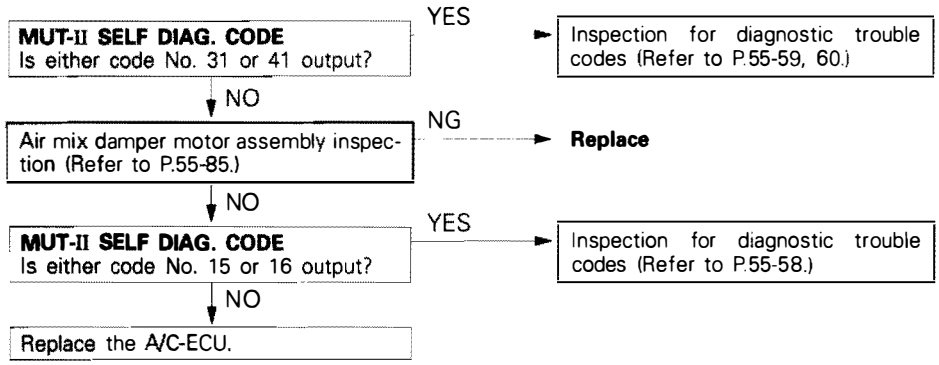
Inspection procedure 9

Setting display temperature returns to 25°C when ignition switch is turned ON or OFF.	Probable Cause
[Comment] The cause is probably a defective A/C-ECU or a defective connector or harness.	• Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



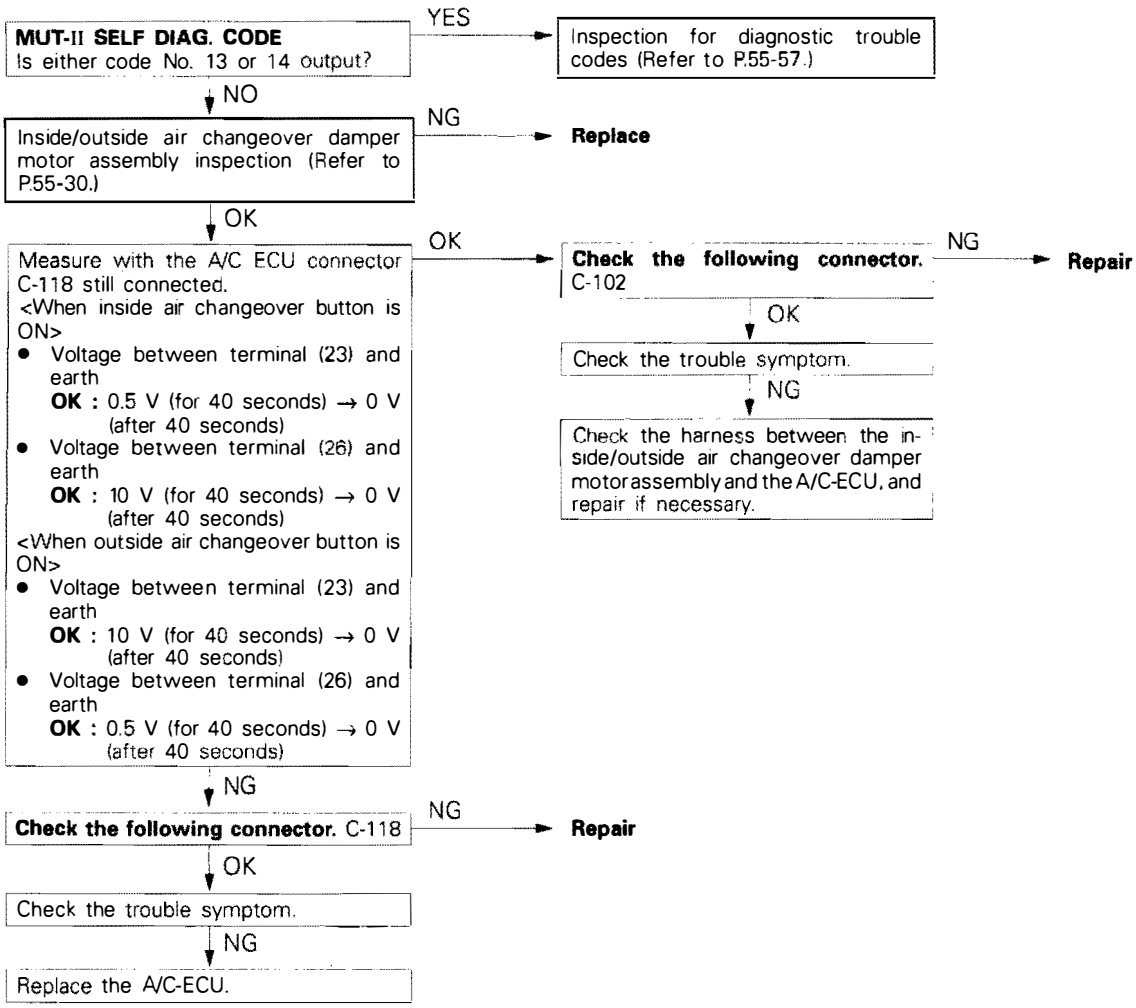
Inspection procedure 10

Setting temperature is increased but inside air temperature does not rise (warm air does not blow out.)	Probable Cause
[Comment] The cause is probably a defective air mix damper motor assembly, or a defective engine coolant temperature sensor. In this case, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes.	• Malfunction of air mix damper motor assembly • Malfunction of engine coolant temperature sensor • Malfunction of A/C control unit



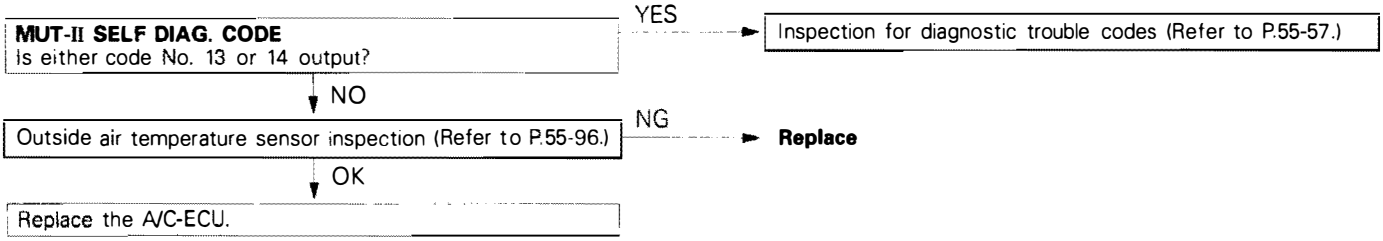
Inspection procedure 11

Window glass becomes cloudy although operation is in AUTO mode.	Probable Cause
[Comment] If the diagnosis codes are investigated and the outside air temperature sensor code is output, the cause is probably a defective outside air temperature sensor system. Alternatively, the cause may also be a defective inside/outside air changeover damper motor assembly system.	• Malfunction of outside air temperature sensor • Malfunction of inside/outside air changeover damper motor assembly • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



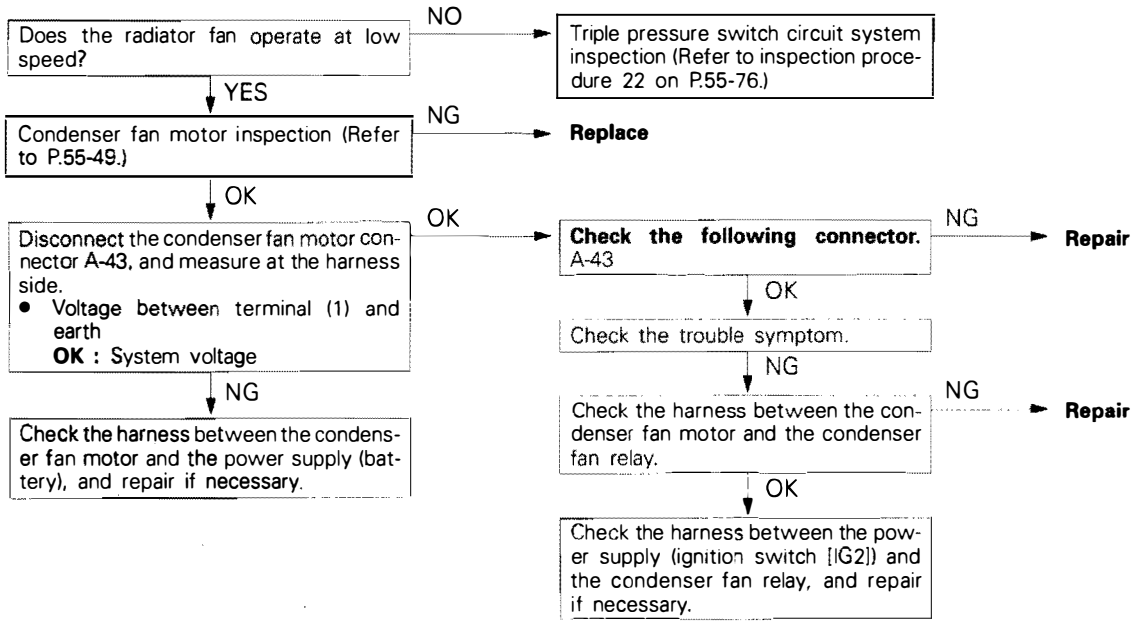
Inspection procedure 12

Outside air temperature display does not change from 20°C.	Probable Cause
[Comment] The cause is probably a defective outside air temperature sensor system or a defective A/C-ECU. Furthermore in cases where the outside air temperature sensor system is defective, the MUT-II can be used to check the trouble symptoms in each system by inspecting the diagnosis codes.	• Malfunction of outside air temperature sensor • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



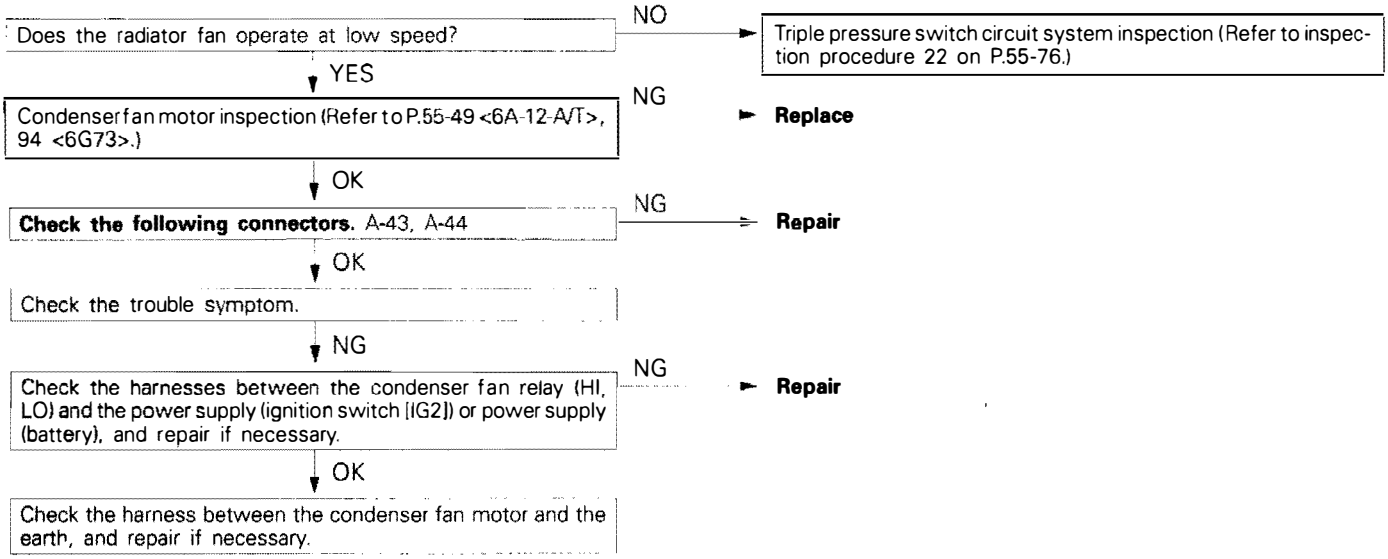
Inspection procedure 13

Condenser fan does not operate (when A/C is operated, cool air soon stops blowing out). <6A12 – M/T>	Probable Cause
[Comment] The cause is probably a defective condenser fan motor or a defective motor power supply system. Furthermore, if the radiator fan does not operate either, the cause is probably a defective triple pressure switch (intermediate) circuit system.	• Malfunction of condenser fan motor • Malfunction of triple pressure switch • Malfunction of engine-ECU • Malfunction of connector • Malfunction of harness



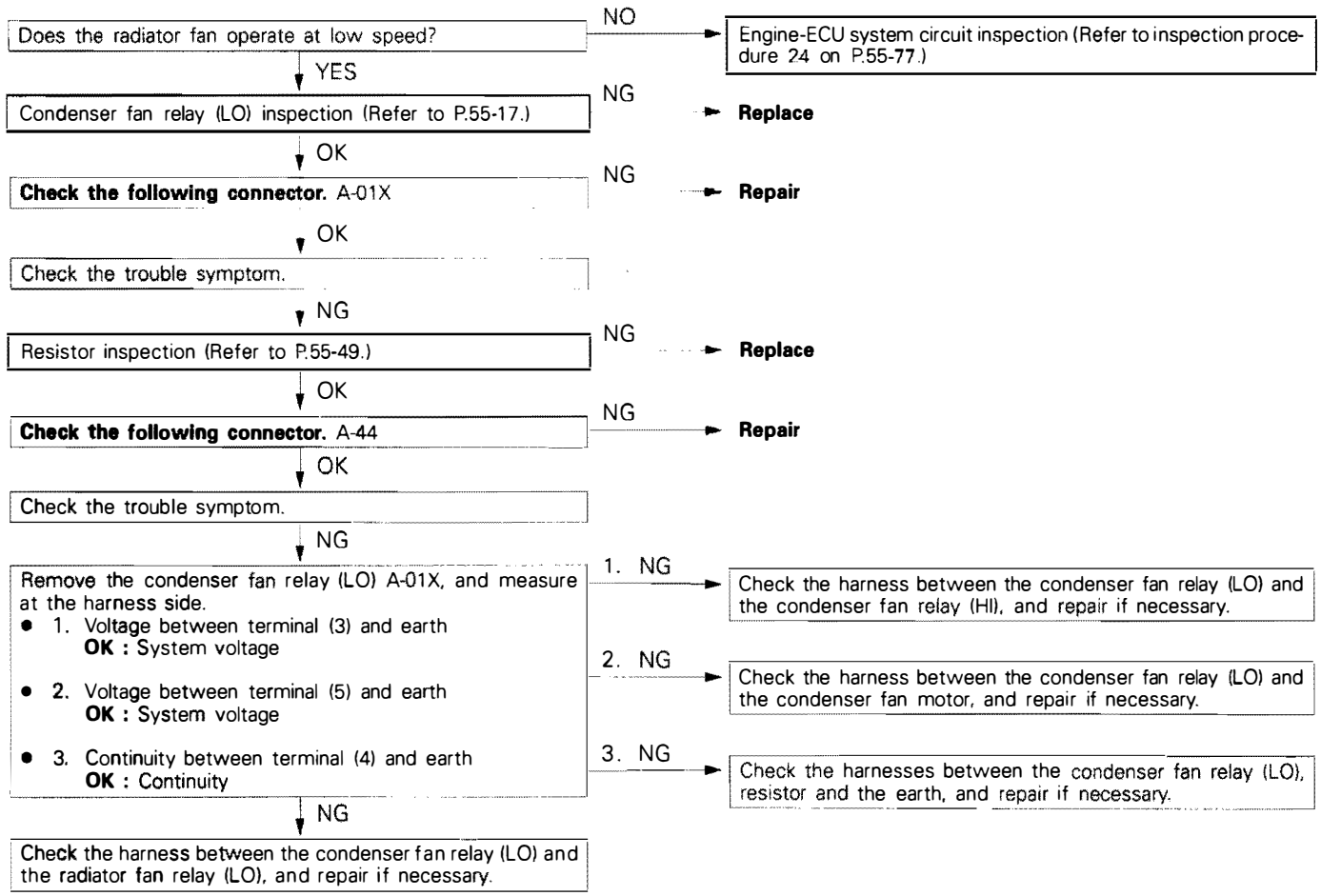
Inspection procedure 14

Condenser fan does not operate (when A/C is operated, cool air soon stops blowing out). <6A12 – A/T, 6G73>	Probable Cause
[Comment] The cause is probably a defective condenser fan motor or a defective motor circuit system. Furthermore, if the radiator fan does not operate either, the cause is probably a defective triple pressure switch (intermediate) circuit system.	• Malfunction of condenser fan motor • Malfunction of triple pressure switch • Malfunction of engine-ECU • Malfunction of harness



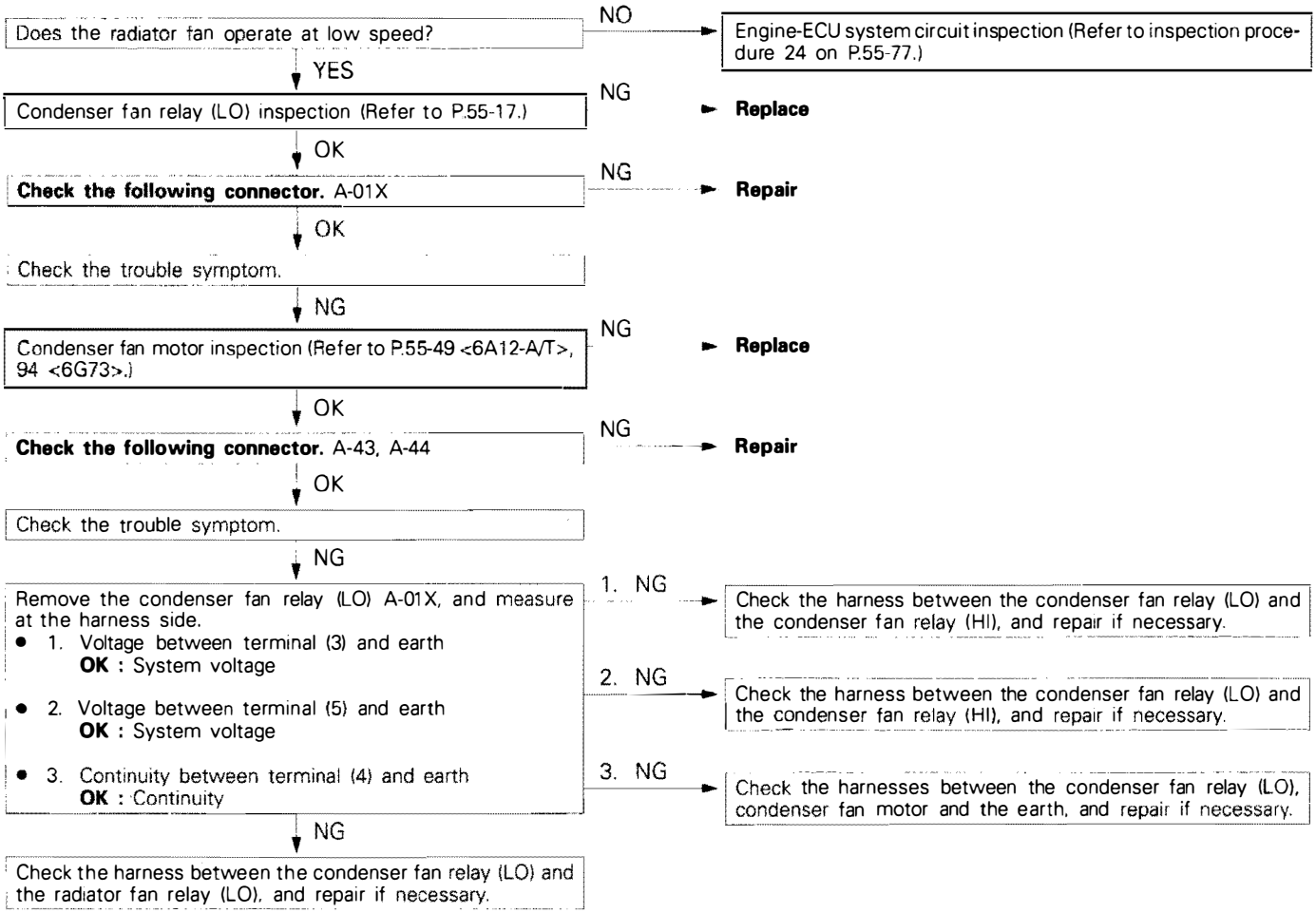
Inspection procedure 15

Condenser fan does not operate at low speed (however, it operates at high speed). <6A12 – M/T>.	Probable Cause
[Comment] The cause is probably a defective condenser fan relay (LO) or a defective resistor. The condenser fan operates together with the radiator fan, so if the radiator fan does not operate at low speed either, the cause is probably a defective engine-ECU system.	• Malfunction of condenser fan relay (LO) • Malfunction of resistor • Malfunction of connector • Malfunction of harness • Malfunction of engine-ECU



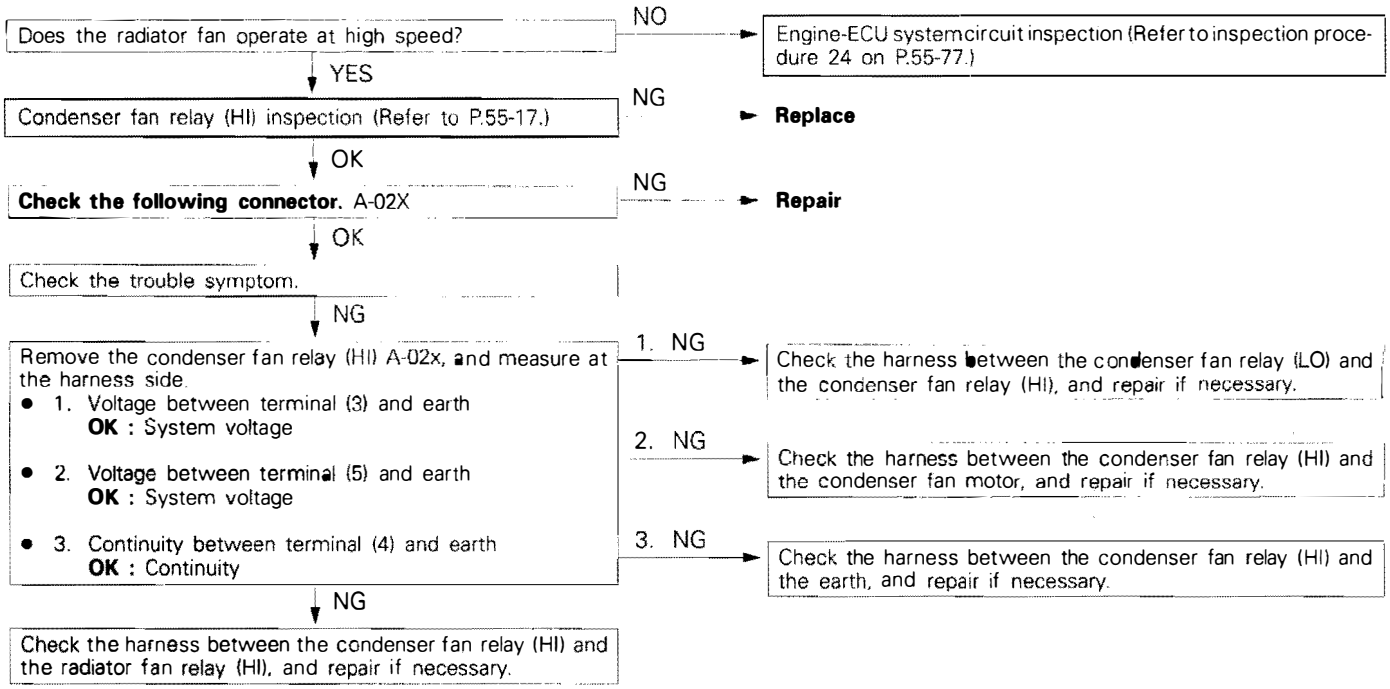
Inspection procedure 16

Condenser fan does not operate at low speed (however, it operates at high speed). <6A12 – A/T, 6G73>	Probable Cause
[Comment] The cause is probably a defective condenser fan relay (LO) or a defective condenser fan motor. The condenser fan operates together with the radiator fan, so if the radiator fan does not operate at low speed either, the cause is probably a defective engine-ECU system.	• Malfunction of condenser fan relay (LO) • Malfunction of condenser fan motor • Malfunction of connector • Malfunction of harness • Malfunction of engine-ECU



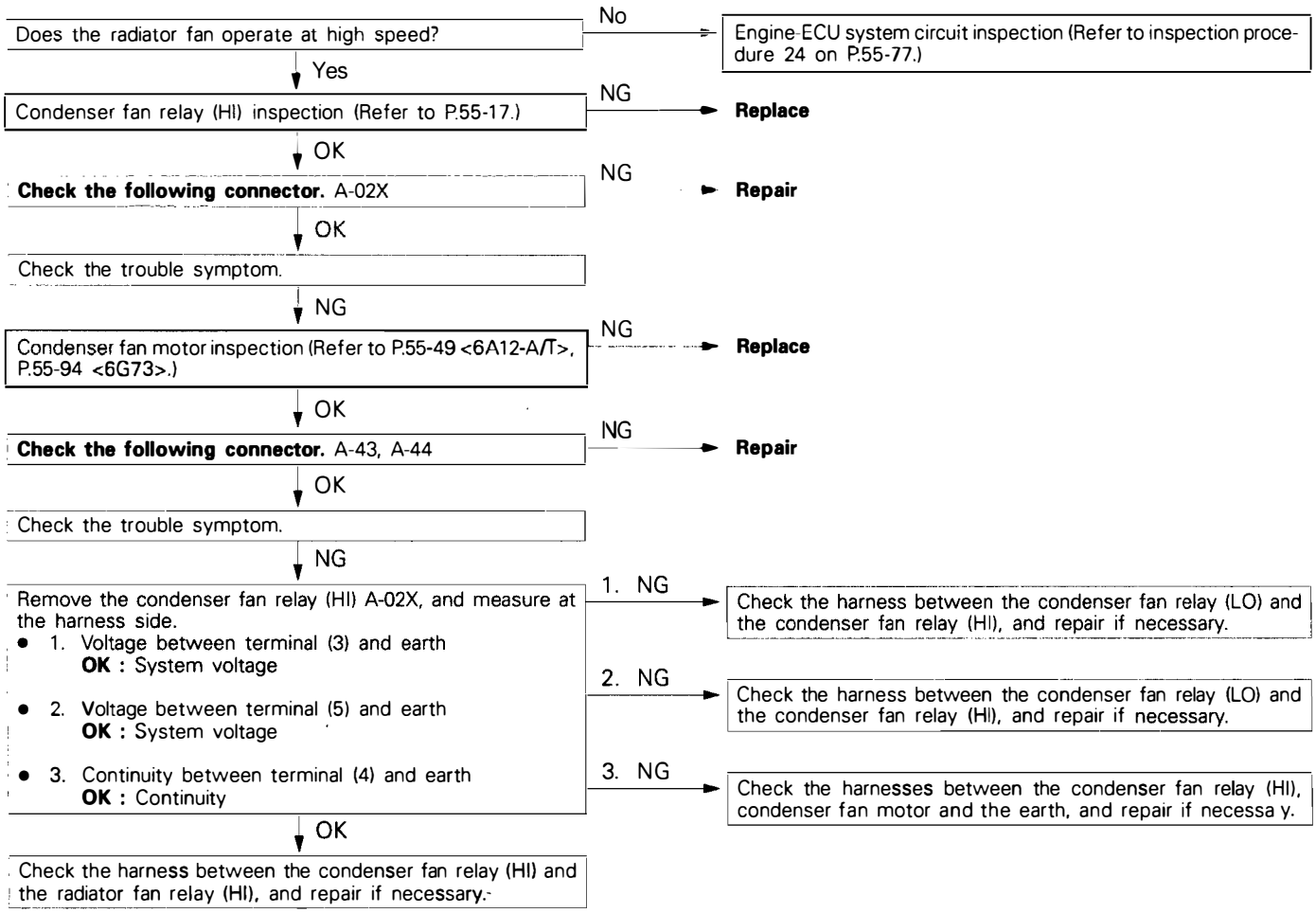
Inspection procedure 17

Condenser fan does not operate at high speed (however, it operates at low speed). <6A12 – M/T>.	Probable Cause
[Comment] The cause is probably a defective condenser fan relay (HI). The condenser fan operates together with the radiator fan, so if the radiator fan does not operate at high speed either, the cause is probably a defective engine-ECU system.	• Malfunction of condenser fan relay (HI) • Malfunction of connector • Malfunction of harness • Malfunction of engine-ECU



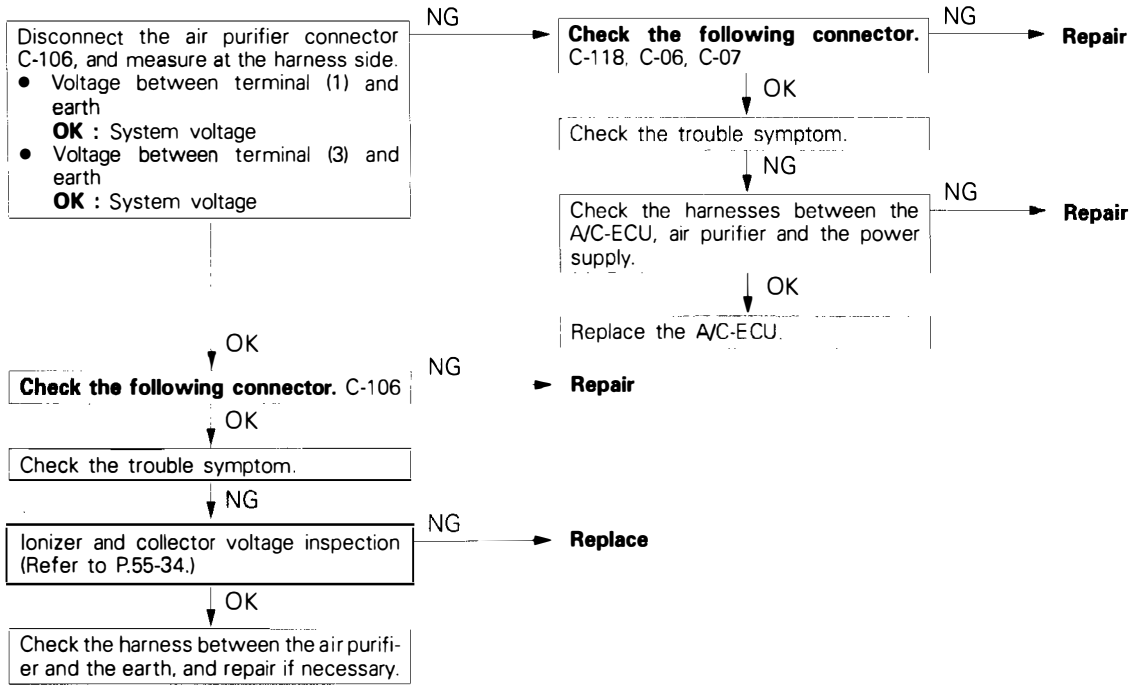
Inspection procedure 18

Condenser fan does not operate at high speed (however, it operates at low speed). <6A12 – A/T, 6G73>	Probable Cause
[Comment] The cause is probably a defective condenser fan relay (HI) or a defective condenser fan motor. The condenser fan operates together with the radiator fan, so if the radiator fan does not operate at high speed either, the cause is probably a defective engine-ECU system.	• Malfunction of condenser fan relay (HI) • Malfunction of condenser fan motor • Malfunction of connector • Malfunction of harness • Malfunction of engine-ECU



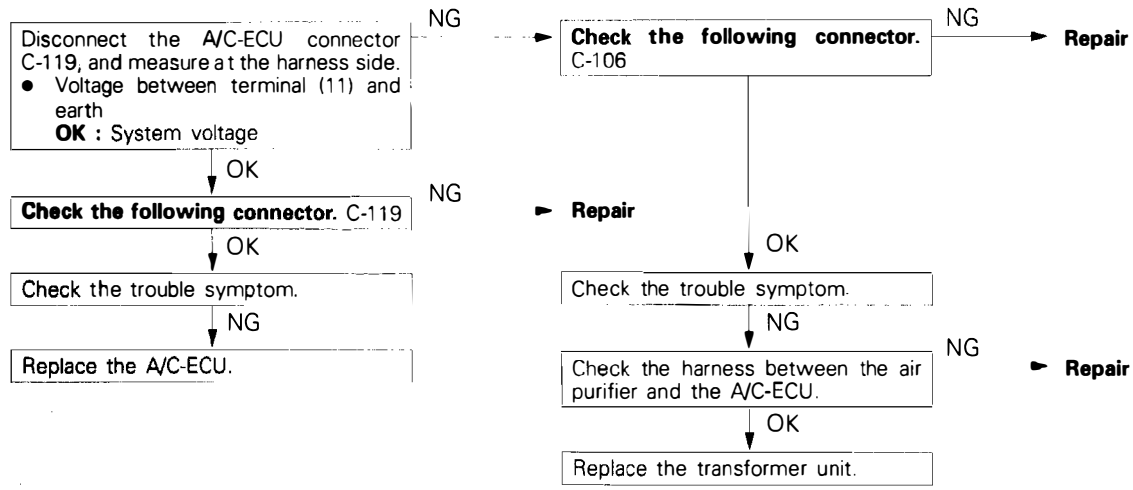
Inspection procedure 19

Air purifier does not operate.	Probable Cause
[Comment] The air purifier operates when the ignition switch is at the ON position and the blower switch is turned to ON. Accordingly, if only the blower fan operates, the cause is probably a defective air purifier power supply circuit.	• Malfunction of ionizer • Malfunction of collector • Malfunction of transformer unit • Malfunction of connector • Malfunction of harness • Malfunction of A/C-ECU



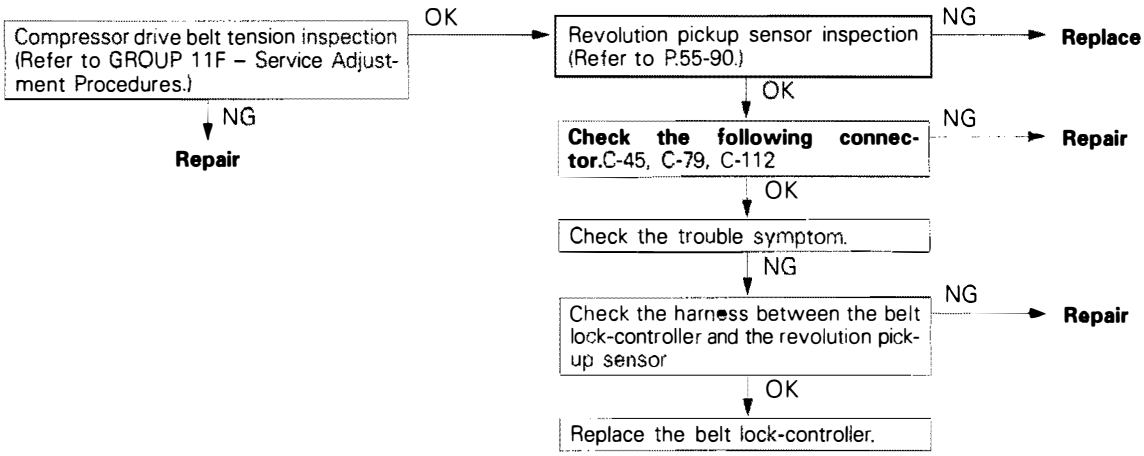
Inspection procedure 20

Air purifier indicator lamp (A/P) does not illuminate (however, air purifier is operating).	Probable Cause
[Comment] The cause is probably an open circuit in the harness between the air purifier and the A/C-ECU, or a defective air purifier or A/C-ECU.	• Malfunction of connector • Malfunction of harness • Malfunction of transformer unit • Malfunction of A/C-ECU



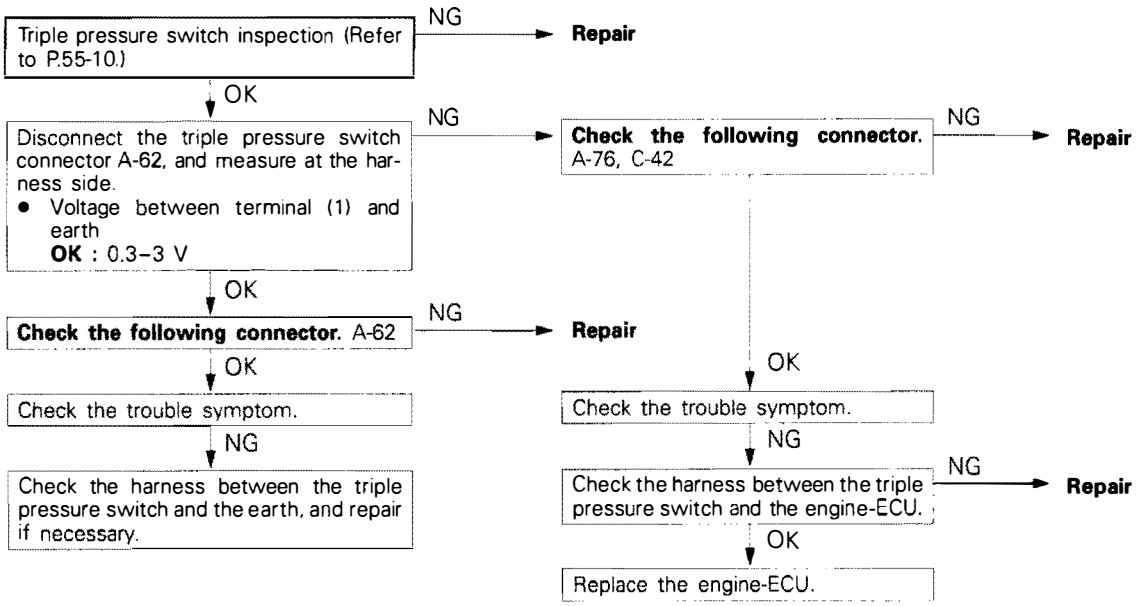
Inspection procedure 21

Belt lock indicator lamp flashes. <6G73>	Probable Cause
[Comment] When the difference between the engine speed and the compressor speed exceeds 90%, the belt lock indicator lamp flashes. In addition, the A/C system is stopped at the same time to protect the compressor belt.	• Incorrect compressor belt tension • Malfunction of revolution pickup sensor • Malfunction of harness or connector • Malfunction of belt lock-controller



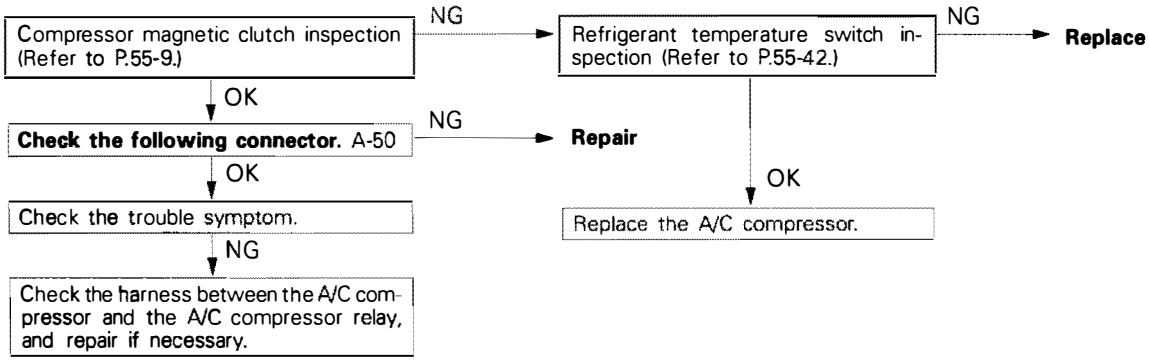
Inspection procedure 22

Triple pressure switch circuit inspection



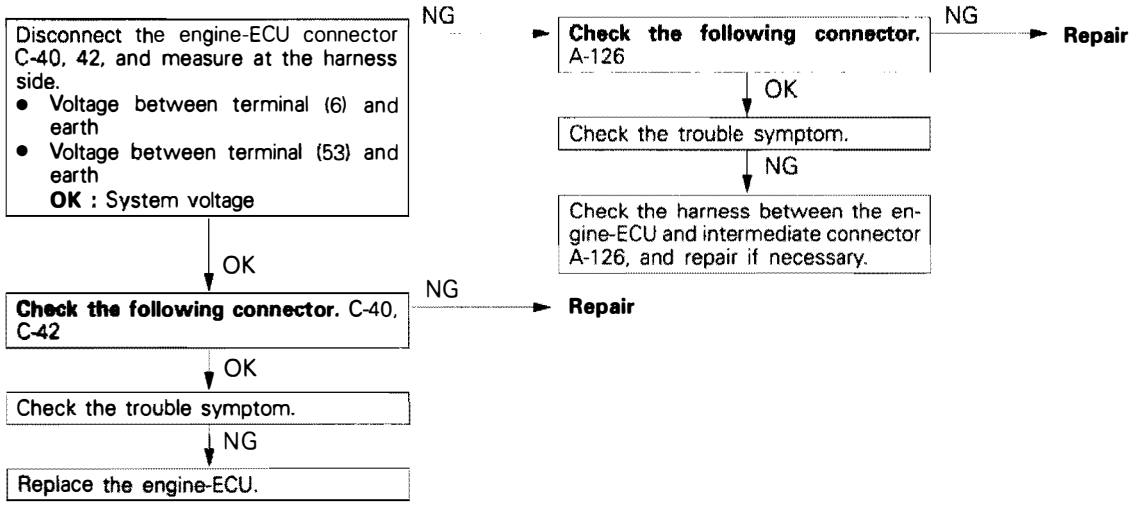
Inspection procedure 23

A/C compressor (magnetic clutch) circuit inspection



Inspection procedure 24

Engine-ECU system circuit inspection



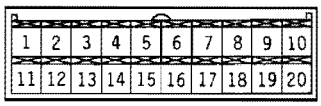
SERVICE DATA REFERENCE TABLE

E55BE04AA

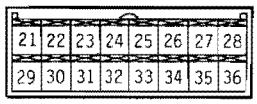
Item No.	Check Item	Check Condition		Normal Condition
11	Inside air temperature sensor	Ignition switch: ON		Inside air temperature and temperature displayed on the MUT-II are identical.
13	Outside air temperature sensor	Ignition switch: ON		Outside air temperature and temperature displayed on the MUT-II are identical.
15	Engine coolant temperature switch	Ignition switch: ON		ON when heater core wall temperature is 30°C or higher
21	Fin thermo sensor	Ignition switch: ON		Evaporator surface temperature and temperature displayed on the MUT-II are identical.
25	Photo sensor	Ignition switch: ON		Amount of incident light is proportional to voltage displayed on the MUT-II.
31	Potentiometer of air mix damper motor	Ignition switch: ON	Damper position	Opening degree (%)
			MAX. HOT	Approx. 100
			MAX. COOL	Approx. 0
32	Potentiometer of air outlet changeover damper motor	Ignition switch: ON	Damper position	Opening degree (%)
			FACE	Approx. 0
			FOOT	Approx. 50
			FOOT / DEF.	Approx. 75
			DEF.	Approx. 100

CHECK AT THE A/C-ECU TERMINALS

E55BE05AA



20X0191



20X0192

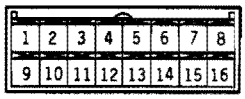
Terminal No.	Check Item	Check Condition	Normal Condition
1	Power transistor collector	When blower switch is at OFF	System voltage
		When blower switch is at LO	Approx. 7 V
		When blower switch is at HI	0 V
2	Power transistor base	When blower switch is at OFF	0 V
		When blower switch is at LO	Approx. 1.3 V
		When blower switch is at HI	Approx. 2.5 V
3	A/C-ECU backup power supply	At all times	System voltage

Terminal No.	Check Item	Check Condition	Normal Condition
4	Engine coolant temperature sensor input	When sensor section temperature is 25°C (4 kΩ)	2.3–2.9 V
5	Air mix damper motor potentiometer input	When air mix damper is at MAX. COOL position	0.1–0.3 V
		When air mix damper is at MAX. HOT position	4.7–5.0 V
6	Air outlet changeover damper motor potentiometer input	When air outlet changeover damper is at FACE position	0.1–0.3 V
		When air outlet changeover damper is at DEF. position	4.8–5.2 V
7	Outside air temperature sensor input	When sensor section temperature is 25°C (4 kΩ)	2.3–2.9 V
8	Fin thermo sensor input	When A/C is OFF and sensor section temperature is 25°C (4 kΩ)	2.3–2.9 V
9	Photo sensor (–)	At luminous intensity of 100,000 lux or more	–0.1–0.2 V
		At luminous intensity of 0 lux	0 V
10	Sensor power supply	At all times	4.8–5.2 V
11	A/P indicator input	When blower switch is at ON	System voltage
12	Blower relay (HI)	When blower switch is at HI	1.5 V or less
		When blower switch is at ME, LO or OFF	System voltage
13	Earth	At all times	Continuity
15	Inside air temperature sensor input	When sensor section temperature is 25°C (4 kΩ)	2.3–2.9 V
16	A/C-ECU power supply	When ignition switch is ON	System voltage
17	Diagnosis data output	0 ↔ System voltage	—
18	Diagnosis control input	When ignition switch is ON	4–5 V
19	Photo sensor (+)	At all times	0 V
20	Air mix damper motor and air outlet changeover damper motor potentiometers	At all times	0 V
21	Air outlet changeover damper motor (+)	Set to FACE position (OFF after 40 seconds of output)	10 V
		Set to DEF. position (OFF after 40 seconds of output)	0.5 V
22	Air mix damper motor (–)	Set the setting temperature to 17°C and set to MAX. COOL position (OFF after 40 seconds of output)	10 V
		Set the setting temperature to 32°C and set to MAX. HOT position (OFF after 40 seconds of output)	0.5 V

Terminal No.	Check Item	Check Condition	Normal Condition
23	Inside/outside air changeover damper motor (–)	Set to inside air position (OFF after 40 seconds of output)	0.5 V
		Set to outside air position (OFF after 40 seconds of output)	10 V
24	Air outlet changeover damper motor (–)	Set to FACE position (OFF after 40 seconds of output)	0.5 V
		Set to DEF. position (OFF after 40 seconds of output)	10 V
25	Air mix damper motor (+)	Set the setting temperature to 17°C and set to MAX. COOL position (OFF after 40 seconds of output)	0.5 V
		Set the setting temperature to 32°C and set to MAX. HOT position (OFF after 40 seconds of output)	10 V
26	Inside/outside air changeover damper motor (+)	Set to inside air position (OFF after 40 seconds of output)	10 V
		Set to outside air position (OFF after 40 seconds of output)	0.5 V
27	Earth	At all times	Continuity
28	A/C-ECU power supply	When ignition switch is ON	System voltage
29	ILL earth (rheostat)	At all times	Continuity
30	ILL power supply	When lighting switch is at ON	System voltage
33	Air purifier	When blower switch is at ON	System voltage
34	A/C-ECU power supply	When ignition switch is ON	System voltage
35	Earth	At all times	Continuity

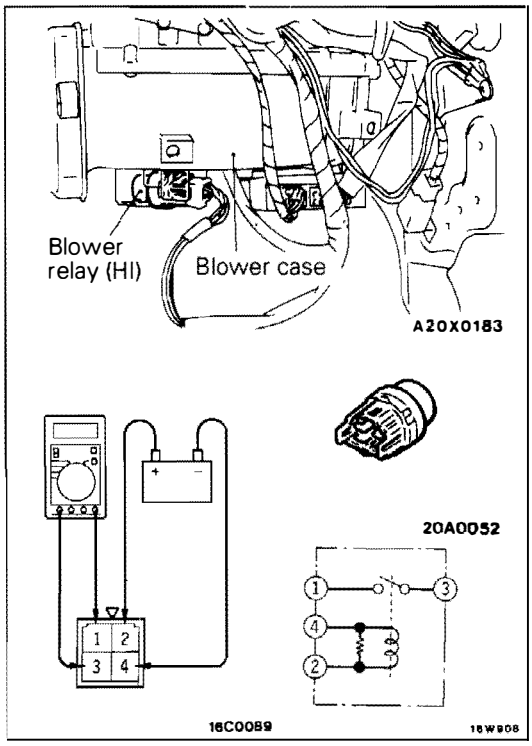
CHECK AT THE BELT LOCK-CONTROLLER TERMINALS

E55BE06AA



20X0193

Terminal No.	Check Item	Check Condition	Normal Condition
1	Revolution pickup (+)	When engine is idling	2 V
2	Earth	At all times	Continuity
3	Belt lock-controller power supply	When ignition switch is ON	System voltage
5	Indicator lamp output	When belt lock is normal	0.7 – 1.0 V
7	Ignition pulse	When engine is idling	0.7–1.0 V
9	Revolution pickup (–)	When engine is idling	2 V
10	Earth	At all times	Continuity
11	Belt lock-controller power supply	When ignition switch is ON	System voltage
13	Compressor signal	When ignition switch is ON	System voltage
14	A/C input	When compressor is ON	System voltage
15	A/C output	When compressor is ON	System voltage



SERVICE ADJUSTMENT PROCEDURES

E55BF09AA

POWER RELAY CHECK

BLOWER RELAY (HI)

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

NOTE
○—○ indicates that there is continuity between the terminals.
●- -○ indicates terminals to which battery voltage is applied.

IDLE-UP OPERATION CHECK

E55BF10AA

1. Before inspection and adjustment, set vehicle in the following condition:
   - Engine coolant temperature: 80–90°C
   - Lights, electric cooling fan and accessories: Set to OFF
   - Transmission: Neutral (N or P for vehicles with A/T)
   - Steering wheel: Straightforward
2. Check whether or not the idling speed is the standard value.

   Standard value: 700 ± 50 r/min.
3. When the A/C is running after turning the A/C switch to ON, and the blower switch to the MH or HI position, check to be sure that the idle speed is at the standard value.

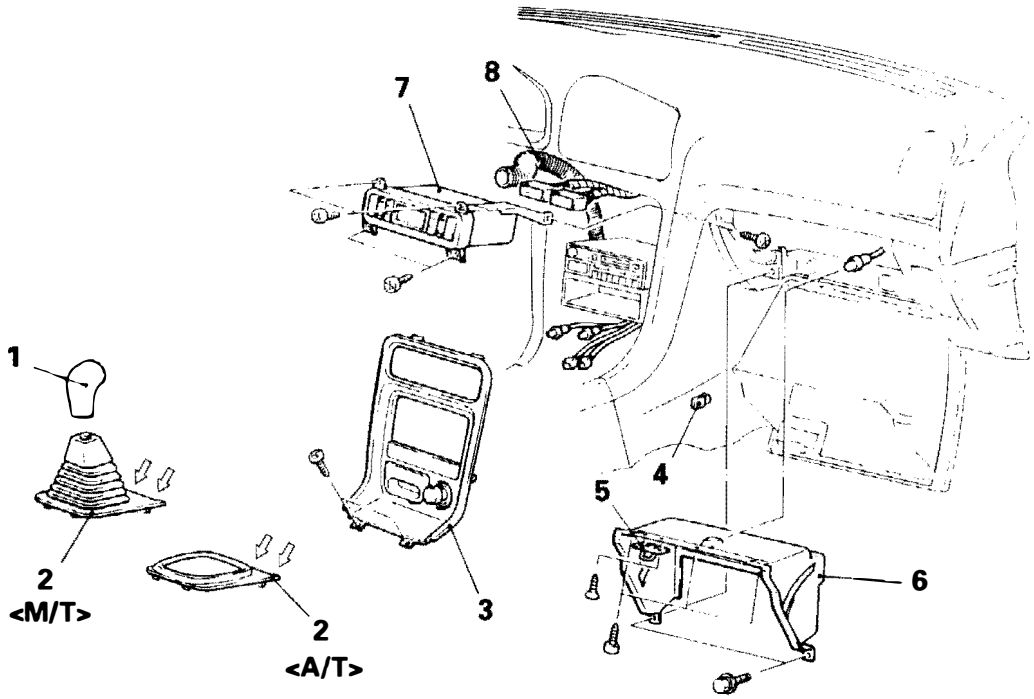
   Standard value: 900 r/min.

   NOTE
   There is no necessity to make an adjustment, because the idling speed is automatically adjusted by the ISC system. If, however, there occurs a deviation from the standard value for some reason, check the ISC system. (Refer to GROUP 13A – Service Adjustment Procedures.)

AIR CONDITIONER CONTROL PANEL AND ECU ASSEMBLY

REMOVAL AND INSTALLATION

E55BG00AA



NOTE
⇦ indicates sheet metal clip positions.

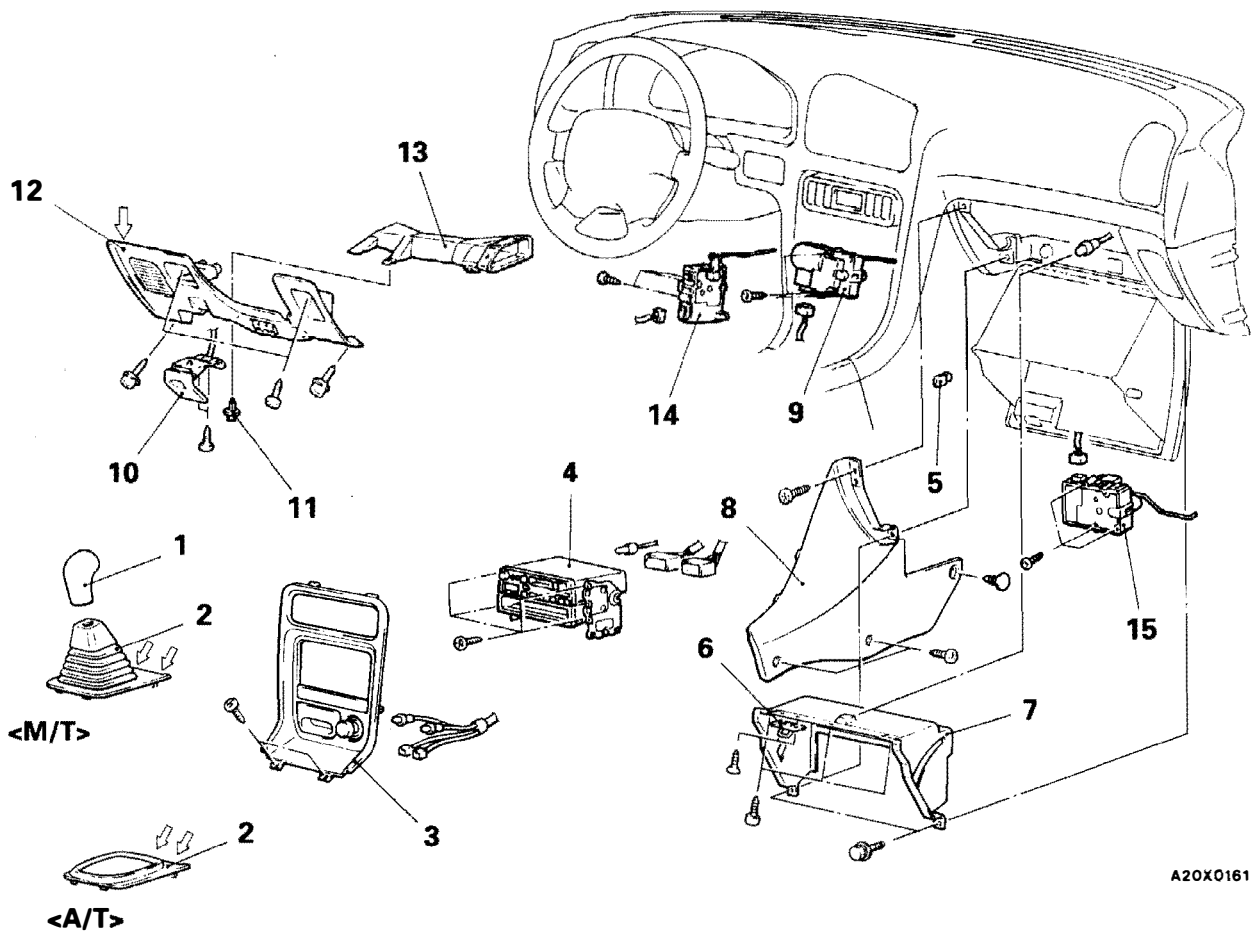
A/C control panel and ECU assembly removal steps

1. Shift lever knob
2. Shift lever panel
3. Center console panel
4. Stopper
5. Glove box striker
6. Glove box cover
7. A/C control panel and ECU assembly
8. Aspirator hose

DAMPER MOTOR ASSEMBLY

REMOVAL AND INSTALLATION

E55BH00AA



Air mix damper motor assembly removal steps

1. Shift lever knob <M/T>
2. Shift lever panel
3. Center console panel
4. Radio and tape player
5. Stopper
6. Glove box striker
7. Glove box cover
8. Side cover A
9. Air mix damper motor assembly

NOTE
⇦ : indicates sheet metal clip positions.

Outlet air changeover damper motor assembly removal steps

10. Hood lock release handle
11. Clip
12. Instrument under cover
13. Shower foot duct
14. Outlet air changeover damper motor assembly

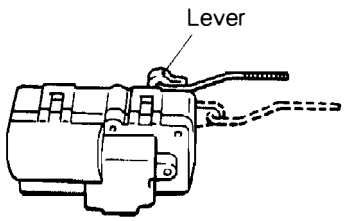
Inside/outside air changeover damper motor assembly removal steps

5. Stopper
6. Glove box striker
7. Glove box cover
15. Inside/outside air changeover damper motor assembly

INSPECTION E55BH02AA

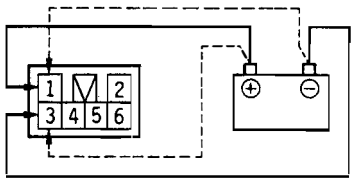
INSIDE/OUTSIDE AIR CHANGEOVER DAMPER MOTOR ASSEMBLY

For inspection service points, refer to P.55-30 for heater and manual A/C.



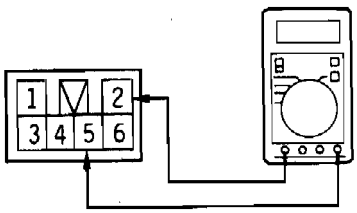
A20X0166

MOTOR



20S0005

POTENTIOMETER



20S0007

AIR MIX DAMPER MOTOR ASSEMBLY E55BH02BA

Motor

Check that the lever moves when battery voltage is applied across terminals 1 and 3 of motor assembly side connector. Check also that the lever moves in the backward direction when polarity is changed.

Caution

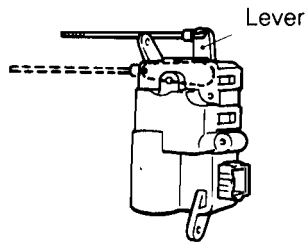
1. **Cut off the voltage when the damper is in the MAX. HOT or MAX. COOL position.**
2. **Cut off the voltage if the motor does not turn when battery voltage is applied.**

Potentiometer

Connect a circuit tester across terminals 2 and 5 of the motor assembly connector and check that resistance gradually changes as the damper is moved from MAX. HOT to MAX. COOL position.

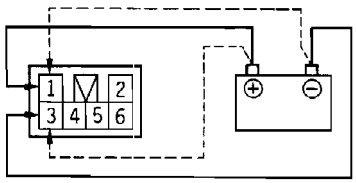
Standard value:

MAX. HOT position: Approx. 4.8 kΩ
MAX. COOL position: Approx. 0.2 kΩ



A20X0165

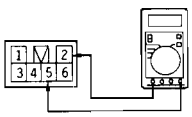
MOTOR



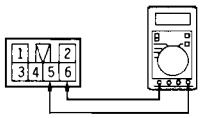
20S0005

POTENTIOMETER

<L.H. drive vehicles> <R.H. drive vehicles>



20S0007



20S0006

AIR OUTLET CHANGEOVER DAMPER MOTOR ASSEMBLY

E55BH02CA

Motor

Check that the lever moves when battery voltage is applied across terminals 1 and 3 of the motor assembly connector. Check also that the lever moves in the backward direction when polarity is changed.

Caution

1. **Cut off the voltage when the damper is in the DEF. or FACE position.**
2. **Cut off the voltage if the motor does not turn when battery voltage is applied.**

Potentiometer

Connect a circuit tester across terminals 2 and 5 <L.H. drive vehicles>, 5 and 6 <R.H. drive vehicles> of the motor assembly connector and check that resistance gradually changes as the damper is moved from DEF. to FACE position.

Standard value:

DEF. position: Approx. 4.8 kΩ

FACE position: Approx. 0.2 kΩ

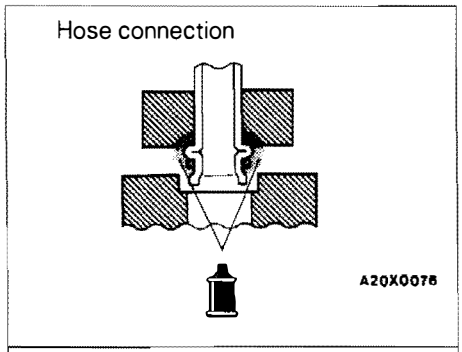
COMPRESSOR AND TENSION PULLEY

REMOVAL AND INSTALLATION

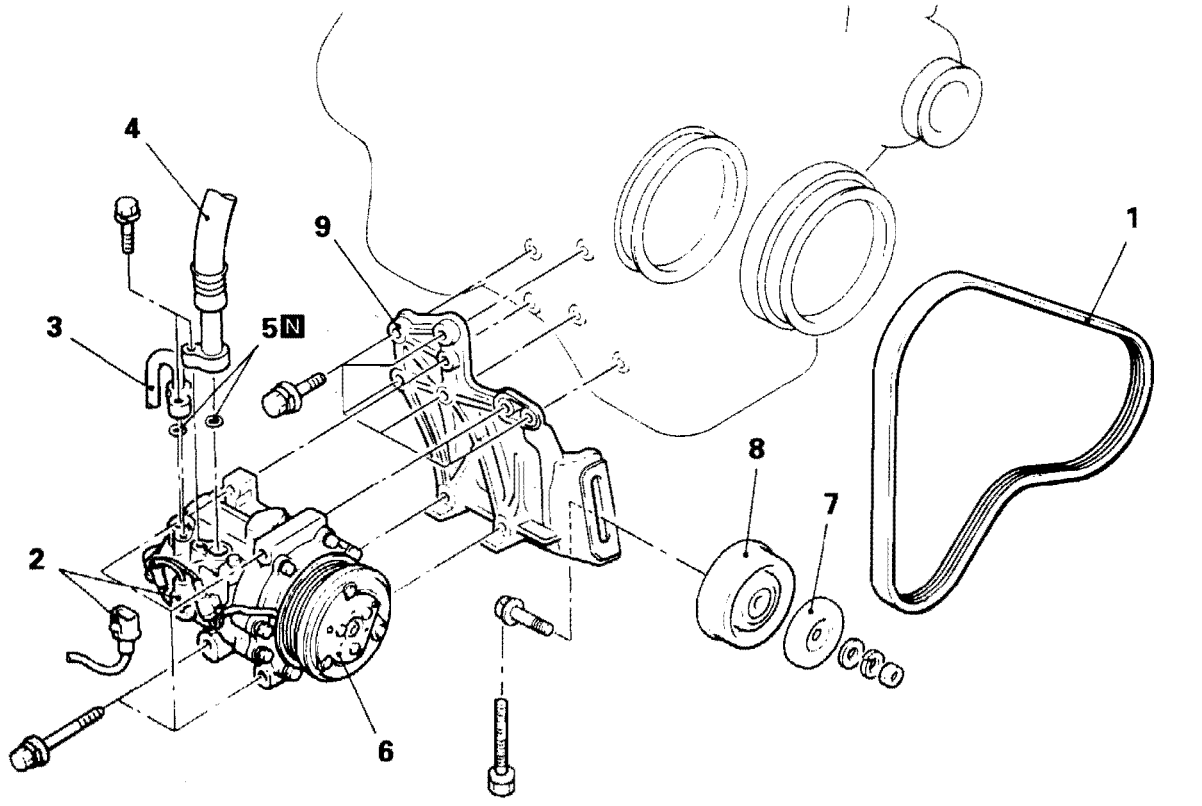
E55BI00AA

<6A12>

Pre-removal and Post-installation Operations
- Refrigerant Discharging and Charging (Refer to P.55-11, 14.)
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)
- Compressor Drive Belt Adjustment (Refer to GROUP 11G – Service Adjustment Procedures.)



Compressor oil: SUN PAG 56



Compressor removal steps

◇A◇ 1. Compressor drive belt
2. Compressor connector
3. Discharge hose connection
4. Suction hose connection
5. O-ring
◇B◇ ▶A◀ 6. Compressor

Tension pulley removal steps

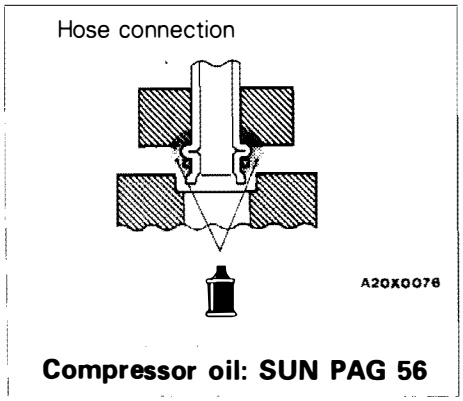
◇A◇ 1. Compressor drive belt
7. Cover
8. Tension pulley
9. Compressor bracket

REMOVAL AND INSTALLATION

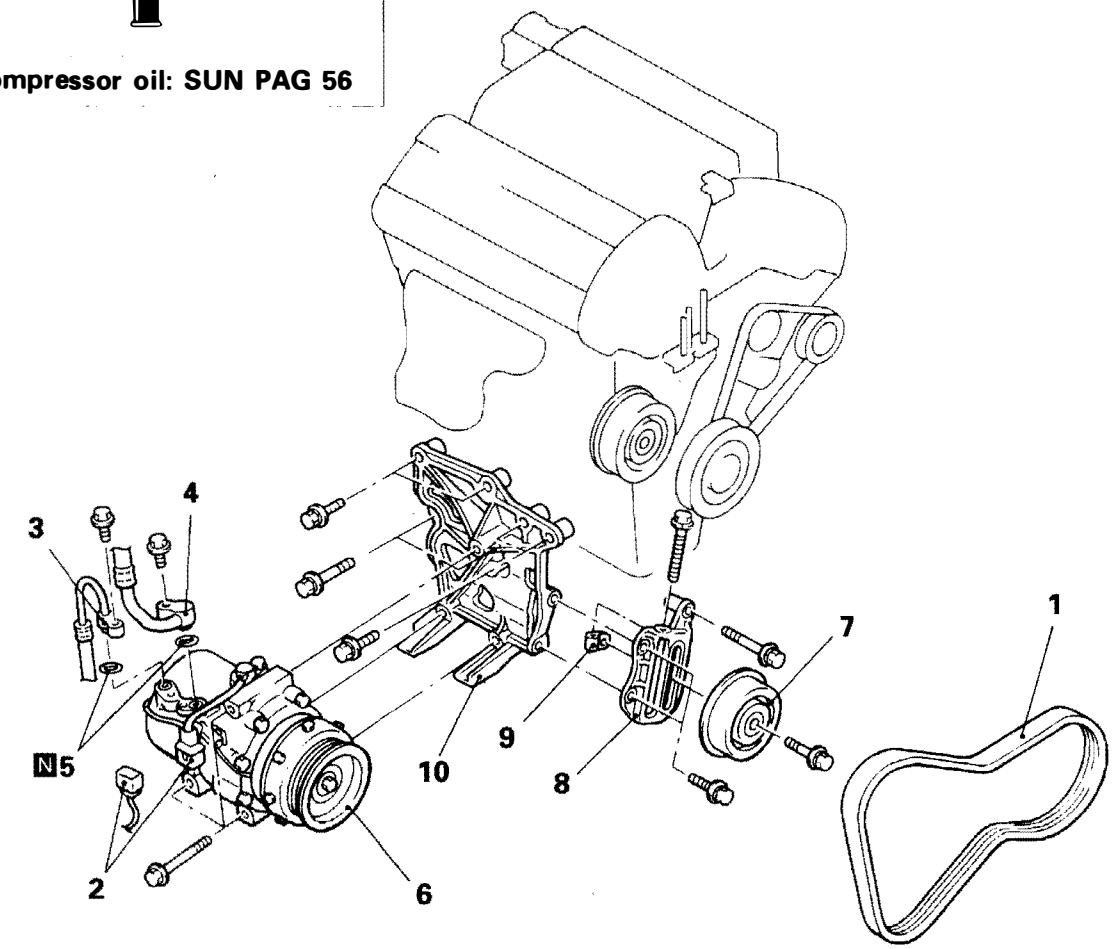
E55BI00BA

<6G73>

Pre-removal and Post-installation Operations
- Refrigerant Discharging and Charging (Refer to P.55-11, 14.)
- Under Cover Removal and Installation (Refer to GROUP 42 – Under Cover.)
- Compressor Drive Belt Adjustment (Refer to GROUP 11F – Service Adjustment Procedures.)



Compressor oil: SUN PAG 56



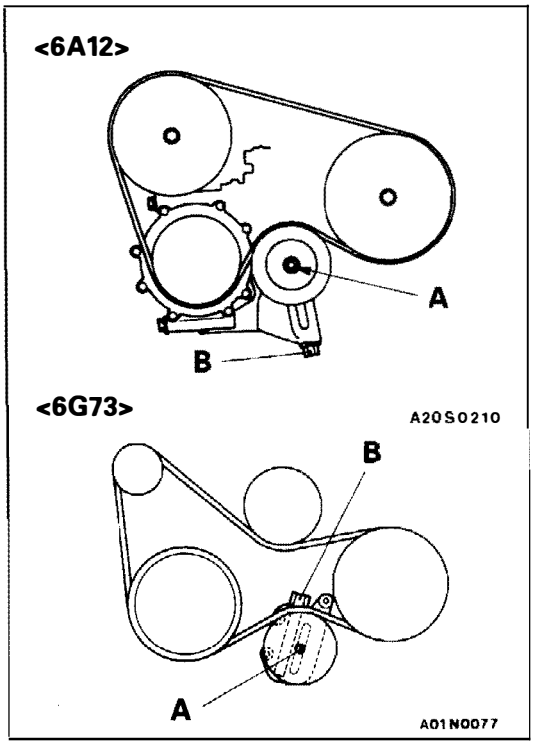
A20X0153

Compressor removal steps

〈A〉 1. Compressor drive belt
2. Compressor connector
3. Discharge hose connection
4. Suction hose connection
5. O-ring
〈B〉 ◗A◖ 6. Compressor

Tension pulley removal steps

〈A〉 1. Compressor drive belt
7. Tension pulley
8. Tension pulley bracket
9. Adjust plate
● Alternator (Refer to GROUP 16 – Alternator.)
10. Compressor bracket



REMOVAL SERVICE POINTS E55BH01AA

〈A〉 COMPRESSOR DRIVE BELT REMOVAL

(1) Loosen nut "A" for holding the tension pulley.
(2) Loosen bolt "B" for adjustment.
(3) Loosen the power steering oil pump fixing bolt. <6A12> (Refer to GROUP 37A – Service Adjustment Procedures.)
(4) Remove the compressor drive belt.

〈B〉 COMPRESSOR REMOVAL

When doing this work, be careful not to spill the compressor oil.

INSTALLATION SERVICE POINTS E55BH04AB

▶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 m ℓ) of oil within the removed compressor.
(2) Remove (from the new compressor) the amount of oil calculated according to the following formula, and then install the new compressor.
New compressor oil amount
160 m ℓ – X m ℓ = Y m ℓ

NOTE
(1) Y m ℓ indicates the amount of oil in the refrigerant line, the condenser, the evaporator, etc.
(2) When replacing the following parts at the same times as the compressor, subtract the rated oil amount of the each part from Y m ℓ and discharge from the new compressor.

Quantity

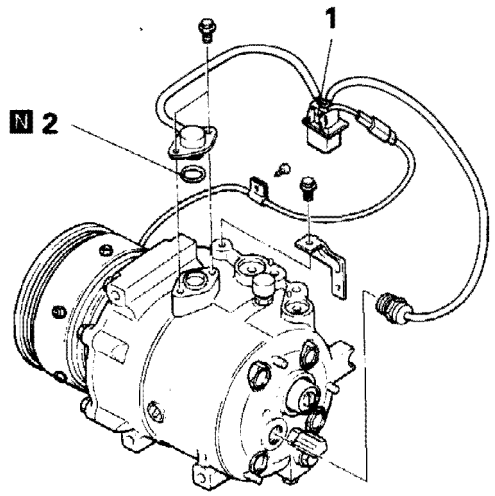
Evaporator:	**60 m ℓ**
Condenser:	**15 m ℓ**
Suction hose:	**10 m ℓ**
Receiver:	**10 m ℓ**

REVOLUTION PICK-UP SENSOR AND REFRIGERANT TEMPERATURE SWITCH

E55BJ00AB

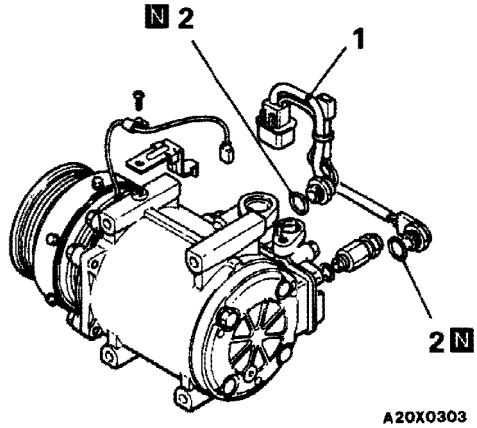
<6G73>

Up to 1993 models



A20X0170

From 1994 models

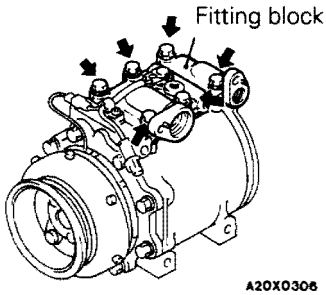


A20X0303

Removal steps

- Compressor (Refer to P.55-88.)

◇A◇ 1. Revolution pick-up sensor and refrigerant temperature switch
2. O-ring



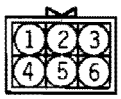
A20X0306

◇A◇REVOLUTION PICK-UP SENSOR AND REFRIGERANT – TEMPERATURE SWITCH REMOVAL

E55BJ01AA

From 1994 models

(1) Remove the fitting block of the compressor.
(2) Remove the snap ring from inside the fitting block, and then remove the refrigerant-temperature switch.



20X0178

INSPECTION

E55BJ02AA

REVOLUTION PICK-UP SENScd OR

Check the resistance value between terminals (2)-(5).

Standard value: 405±35 Ω (at 20°C)

NOTE
For inspection of the refrigerant temperature switch, refer to the manual A/C.

REFRIGERANT LINE

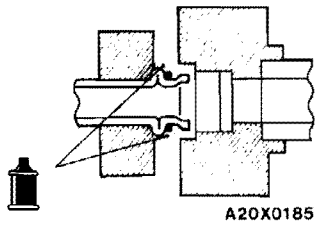
REMOVAL AND INSTALLATION

E55BK00AA

<L.H. DRIVE VEHICLES>

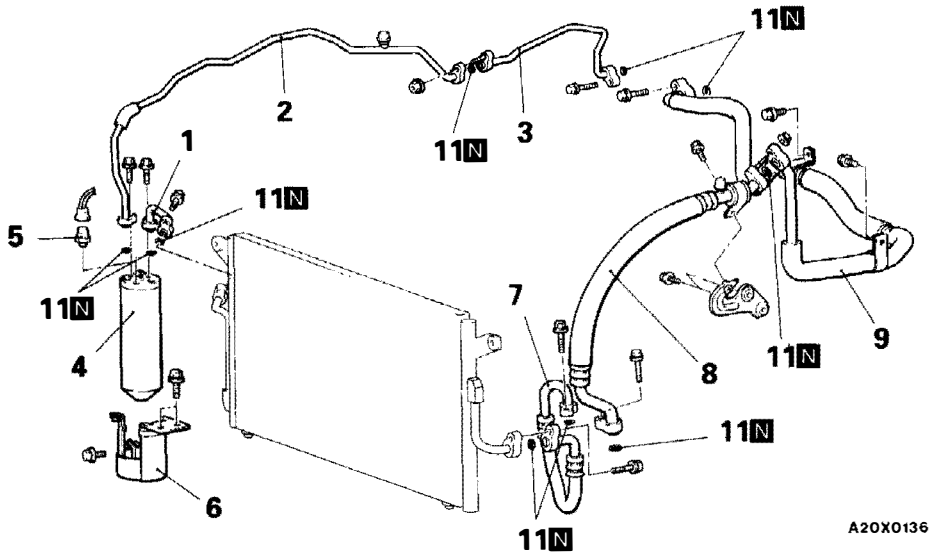
Pre-removal and Post-installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-11, 14.)

Piping or hose connection

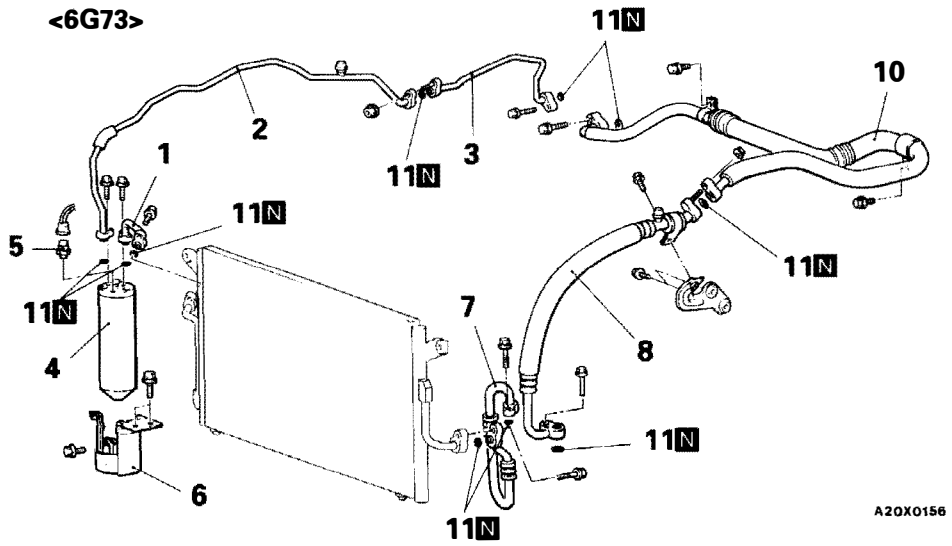


Compressor oil: SUN PAG 56

<6A12>



<6G73>



Removal steps

1. Discharge pipe A
2. Discharge pipe B
3. Discharge pipe C
◆A◆ 4. Receiver assembly
5. Triple pressure switch
6. Receiver bracket
7. Discharge hose
◆A◆ 8. Suction hose
◆A◆ 9. Suction hose B <6A12>
◆A◆ 10. Suction pipe <6G73>
11. O-ring

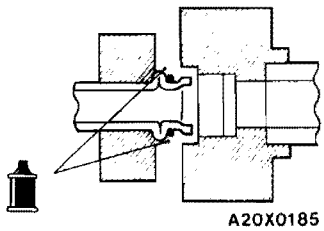
REMOVAL AND INSTALLATION

<R.H. DRIVE VEHICLES>

E55BK00BA

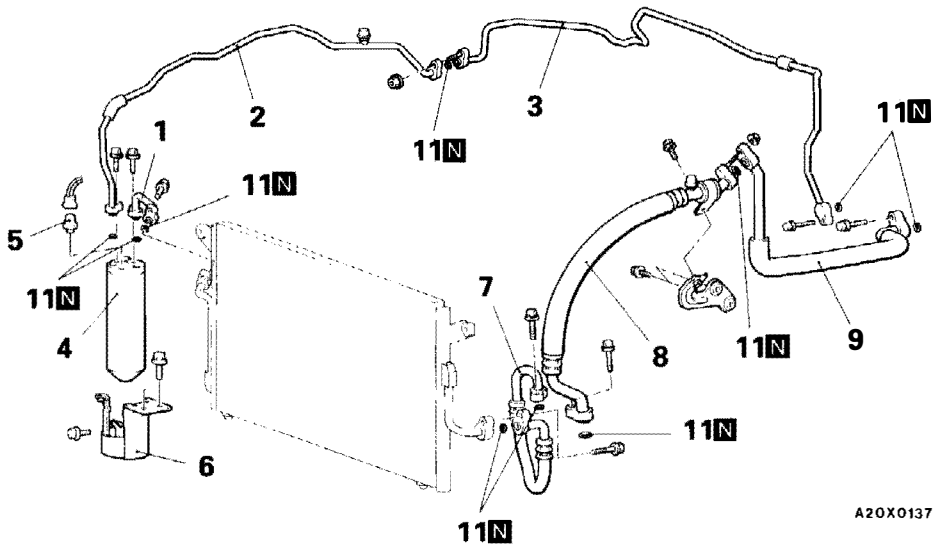
Pre-removal and Post-installation Operation
- Discharge and Charging of Refrigerant (Refer to P.55-11, 14.)

Piping or hose connection

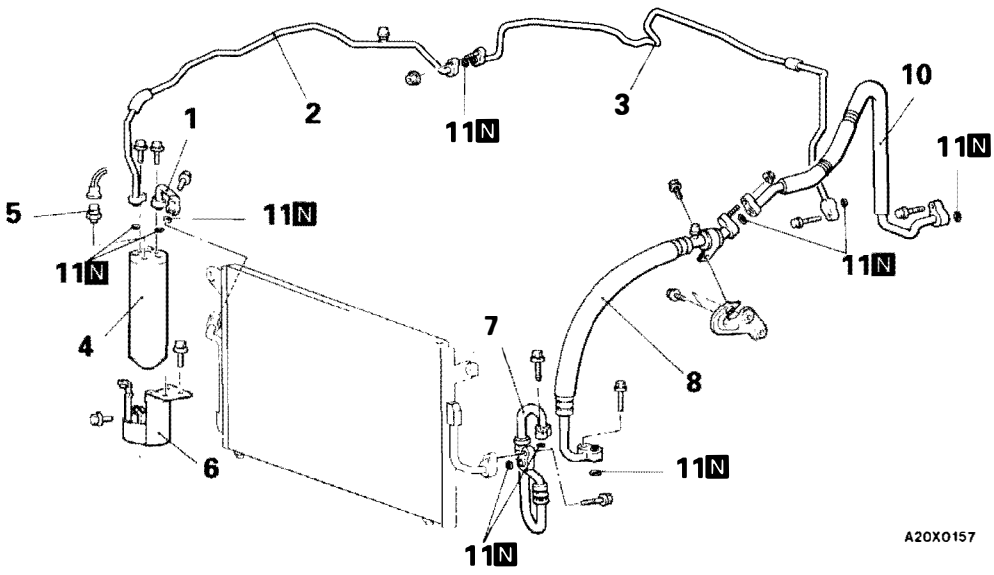


Compressor oil: SUN PAG 56

<6A12>



<6G73>



Removal steps

1. Discharge pipe A
2. Discharge pipe B
3. Discharge pipe C
◆A◆ 4. Receiver assembly
5. Triple pressure switch
6. Receiver bracket
7. Discharge hose
◆A◆ 8. Suction hose
◆A◆ 9. Suction pipe <6A12>
◆A◆ 10. Suction hose B <6G73>
11. O-ring

INSTALLATION SERVICE POINT E55AQ04AA

◆A◆ SUCTION HOSE, RECEIVER ASSEMBLY INSTALLATION

When replacing the suction hose or receiver assembly, refill them with a specified amount of compressor oil, and then install them.

Compressor oil: SUN PAG 56
Quantity
Suction hose: 10 mℓ
Receiver: 10 mℓ

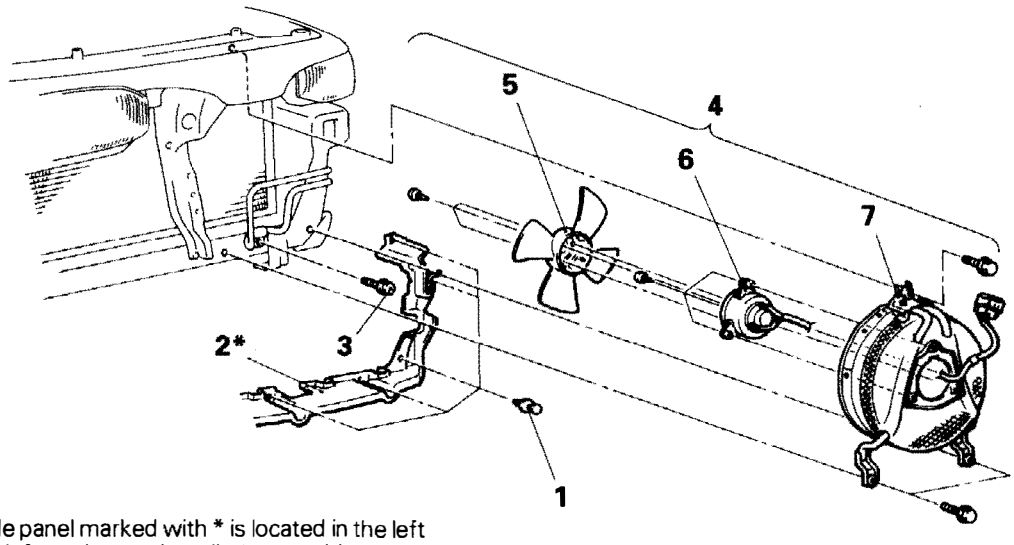
NOTES

CONDENSER FAN MOTOR

REMOVAL AND INSTALLATION

E55BL00AA

<6G73>



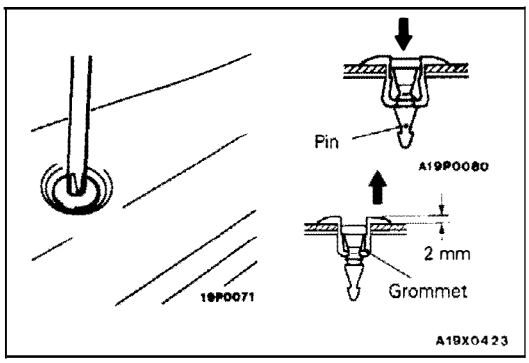
NOTE:
The air guide panel marked with * is located in the left half. The left and right installation positions are symmetrical to each other.

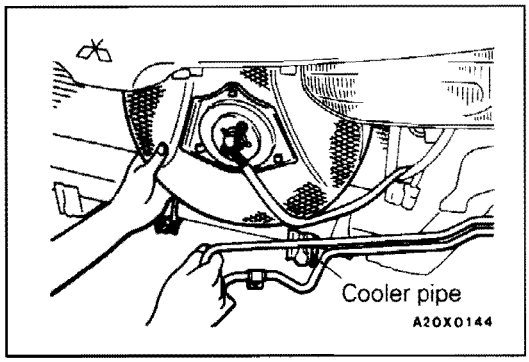
A20X0146

Removal steps

- Front bumper (Refer to GROUP 51 – Front Bumper.)

◇A◇ ▶A◀ 1. Clip
2. Air guide panel*
3. Cooler pipe clamp bolt (for power steering)
◇B◇ 4. Condenser fan motor and shroud assembly
5. Condenser fan
6. Condenser fan motor
7. Shroud





REMOVAL SERVICE POINTS

E55BL01AA

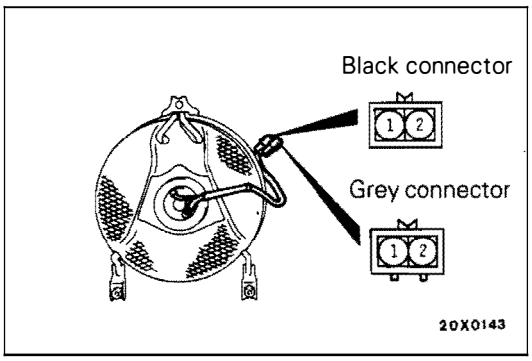
◇A◇ CLIP REMOVAL

(1) Use a cross-tip (+) screwdriver to push inward the pin (at the centre of the clip) to a depth of about 2 mm.
(2) Pull the clip outward to remove it.

Caution
Do not push the pin inward more than necessary because it may damage the grommet, or the pin may fall in, if pushed too far.

◇B◇ CONDENSER FAN MOTOR AND SHROUD ASSEMBLY

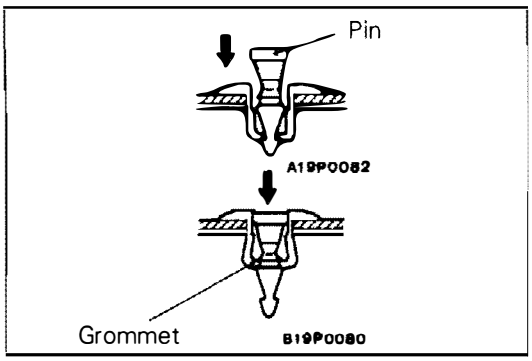
While pulling the cooler pipe towards you slightly, remove the condenser fan motor and shroud assembly.



INSPECTION

E55BL02AA

(1) Check to be sure that the condenser fan motor operates when battery voltage is applied to terminal No.1 of the grey connector and terminal No.2 is earthed.
(2) In this same condition, apply battery voltage to terminal No.1 of the black connector and earth terminal No.2. Check to be sure that the condenser fan motor operates faster at this time.



INSTALLATION SERVICE POINT

E55BL04AA

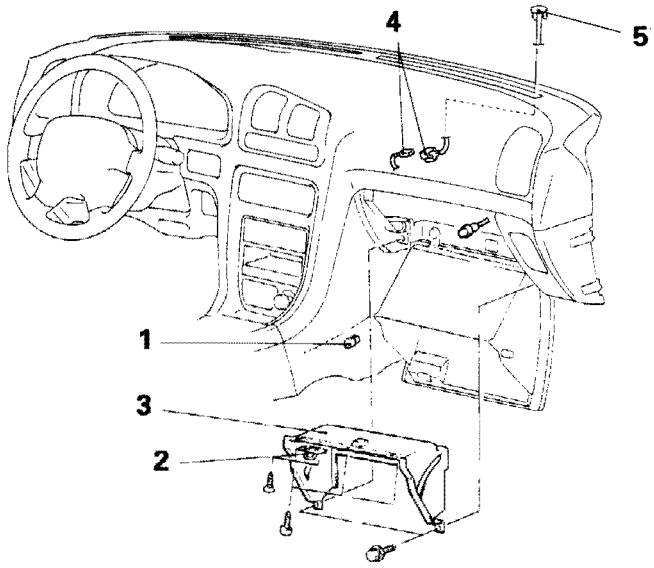
◆A◆ CLIP INSTALLATION

(1) With the pin pulled out, insert the clip into the hole.
(2) Push the pin inward until the pin's head is flush with the grommet.

PHOTO SENSOR

REMOVAL AND INSTALLATION

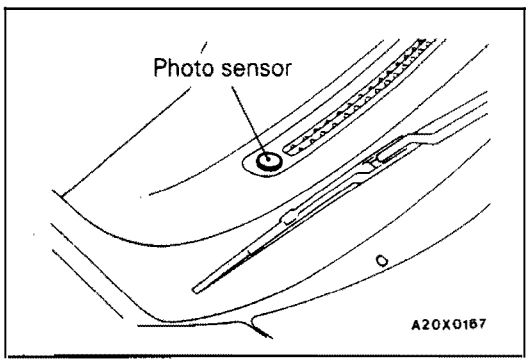
E55BM00AA



A20X0168

Removal steps

1. Stopper
2. Glove box striker
3. Glove box cover
4. Photo sensor connector
5. Photo sensor



INSPECTION

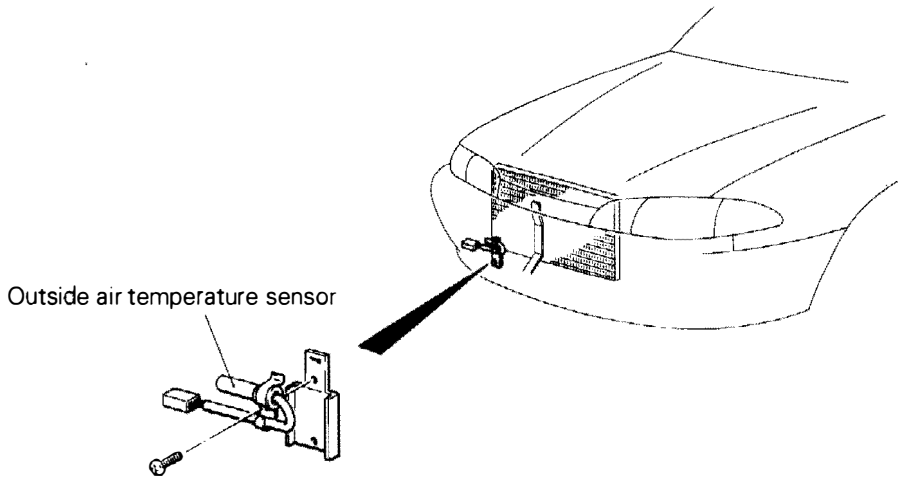
E55BM02AA

If the blower speed drops when the receiver section of the photo sensor is covered with your hand, then the photo sensor is normal. If the speed does not drop, replace the photo sensor.

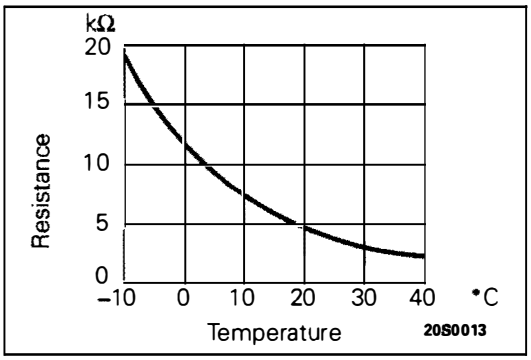
OUTSIDE AIR TEMPERATURE SENSOR

REMOVAL AND INSTALLATION

E55BN00AA



A2QX0041



INSPECTION

E55BN02AA

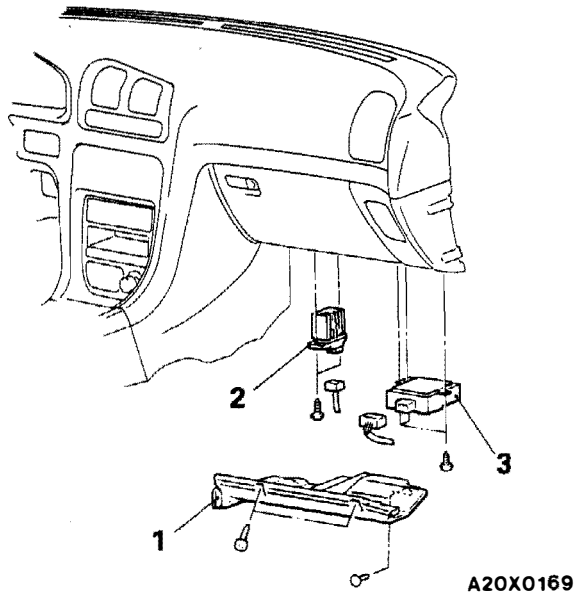
When the resistance value between the sensor terminals is measured under two or more temperature conditions, the resistance value should be close to the values shown in the graph.

NOTE
The temperature conditions when testing should not exceed the range of the characteristic curve in the graph.

BELT LOCK CONTROLLER <6G73> AND POWER TRANSISTOR

REMOVAL AND INSTALLATION

E55BO00AA



A20X0169

Power transistor removal steps

1. Upper cover
2. Power transistor

Belt lock controller removal steps

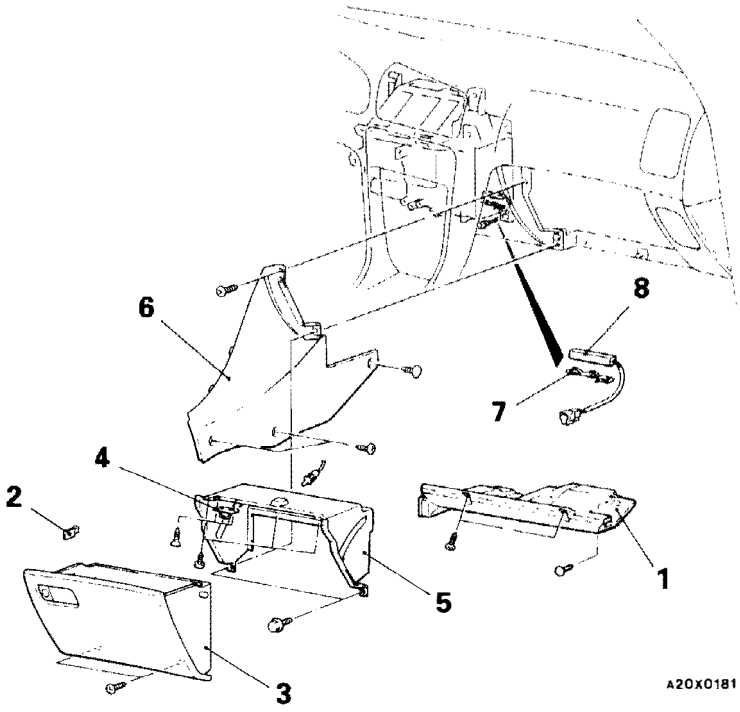
1. Under cover
3. Belt lock controller

ENGINE COOLANT TEMPERATURE SENSOR

REMOVAL AND INSTALLATION

E55BP00AA

<L.H. DRIVE VEHICLES>

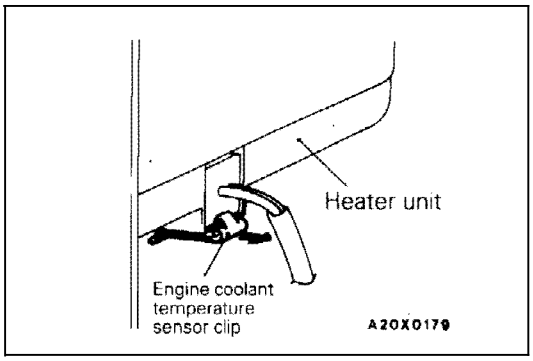


Removal steps

1. Under cover
2. Stopper
3. Glove box
4. Glove box striker
5. Glove box cover
6. Side cover A

〈A〉 ▶A◀ 7. Engine coolant temperature sensor clip

▶A◀ 8. Engine coolant temperature sensor

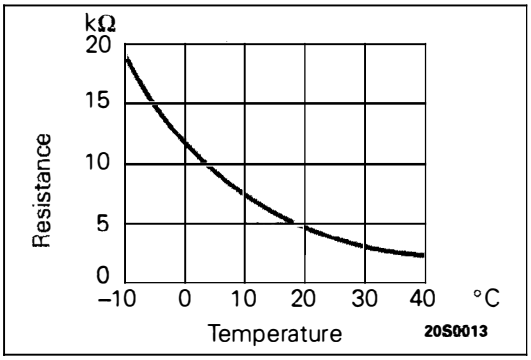


REMOVAL SERVICE POINT

E55BP01AA

〈A〉 ENGINE COOLANT TEMPERATURE SENSOR CLIP REMOVAL

Take the engine coolant temperature sensor clip from the base of the heater unit out to the front of the vehicle.

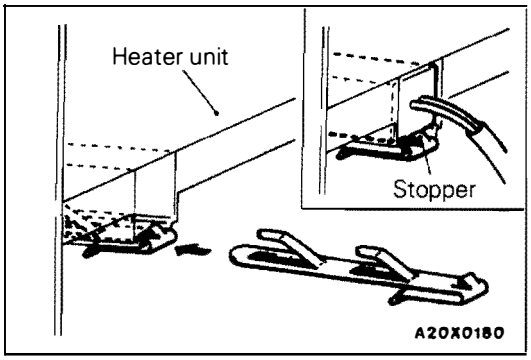


INSPECTION

E55BN02AA

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.



INSTALLATION SERVICE POINT

E55BP04AA

◆A◆ ENGINE COOLANT TEMPERATURE SENSOR CLIP INSTALLATION/ENGINE COOLANT TEMPERATURE SENSOR INSTALLATION

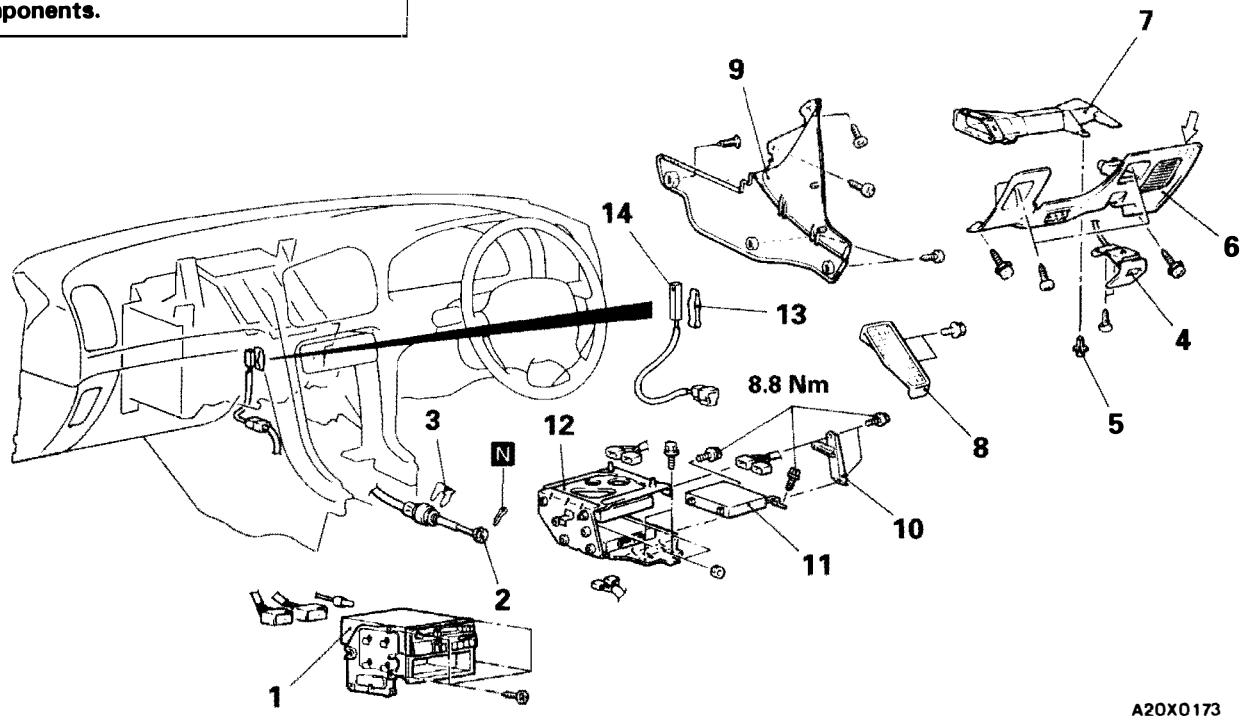
(1) Insert the engine coolant temperature sensor clip into the heater unit.
(2) Push in the engine coolant temperature sensor until the end touches against the stopper of the engine coolant temperature sensor clip.

REMOVAL AND INSTALLATION

<R.H. DRIVE VEHICLES>

E55BP10AA

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



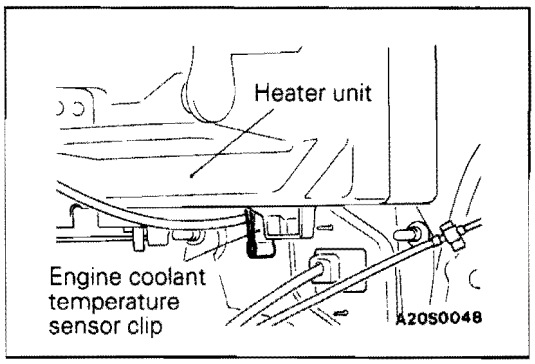
NOTE
⇦ : indicates sheet metal clip positions.

Removal steps

- Floor console (Refer to GROUP 52A – Floor Console.)

1. Radio and tape player
2. Transmission control cable connection <A/T vehicles with 4WS>
3. Clip <A/T vehicles with 4WS>
4. Hood lock release handle
5. Clip
6. Instrument under cover
7. Shower foot duct
8. Footrest
9. Side cover B
10. ECU stay
11. 4WS-ECU <Vehicles with 4WS>
12. ECU bracket

◆A◆ 13. Engine coolant temperature sensor clip
14. Engine coolant temperature sensor



REMOVAL SERVICE POINT

E55BP11AA

◇A◇ ENGINE COOLANT TEMPERATURE SENSOR CLIP REMOVAL

Take the engine coolant temperature sensor clip downwards from the base of the heater unit.

INSPECTION

E55BP12AA

Refer to P.55-98 for L.H. drive vehicles.

OTHER MAINTENANCE SERVICE POINTS

E55800AA

The following maintenance service points are the same as for the manual A/C.

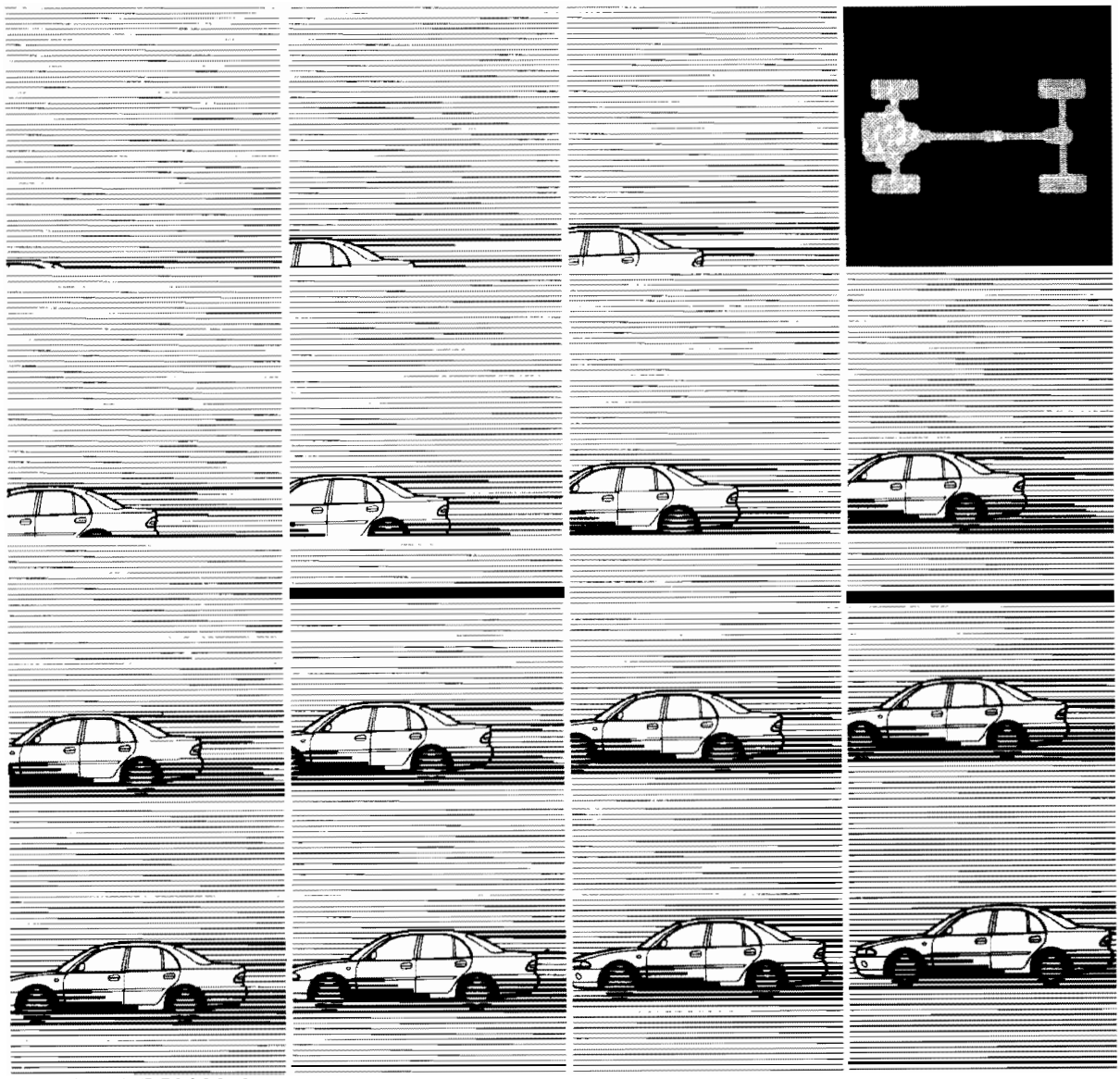
MITSUBISHI MOTORS

Workshop Manual

chassis

SUPPLEMENT

MITSUBISHI GALANT '95



Pub. No. PWDE9211-C

MITSUBISHI GALANT GALANT HATCHBACK

WORKSHOP MANUAL

FOREWORD

This Workshop Manual contains procedures for service mechanics, including removal, disassembly, inspection, adjustment, reassembly and installation. Use the following manuals in combination with this manual as required.

TECHNICAL INFORMATION MANUAL	PYDE9203
WORKSHOP MANUAL	
ENGINE GROUP	PWEE ☐☐☐☐ (Looseleaf edition)
ELECTRICAL WIRING	PHDE9220 PHDE9220-C (Supplement)
BODY REPAIR MANUAL	PBDE9210
PARTS CATALOGUE	B808F1024☐ BFA8F604A1

All information, illustrations and product descriptions contained in this manual are current as at the time of publication. We, however, reserve the right to make changes at any time without prior notice or obligation.

MITSUBISHI MOTORS CORPORATION

HOW TO USE THIS MANUAL

EXPLANATION OF MANUAL CONTENTS

120000612

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

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

Indicates (by symbols) where lubrication is necessary.

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

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

Classifications of Major Maintenance / Service Points

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

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

Symbols for Lubrication, Sealants and Adhesives

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

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

 : Sealant or adhesive

 : Brake fluid or automatic transmission fluid

 : Engine oil, gear oil or air conditioner compressor oil

 : Adhesive tape or butyl rubber tape

Indicates the group title.

Indicates the section title.

Indicates the group number.

Indicates the page number.

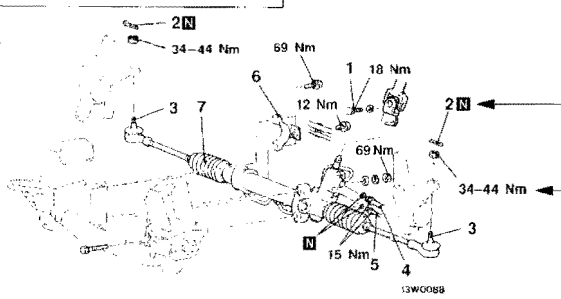
STEERING – Power Steering Oil Pump 37A-29

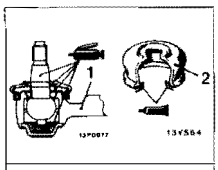
POWER STEERING GEAR BOX

REMOVAL AND INSTALLATION

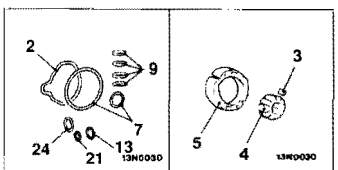
Pre-removal Operation
(1)Power Steering Fluid Draining (Refer to P. 37A-10.)
(2)Air Cleaner Assembly Removal
(3)Under Cover Removal (Refer to GR●UP 42 Under Cover.)

<2WD>





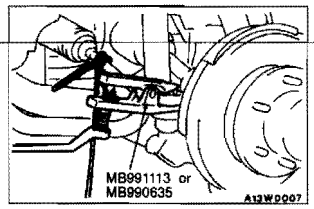
Sealant: 3M ATD Part No. 8661 or equivalent



Oil pump seal kit | Oil pump cartridge kit

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

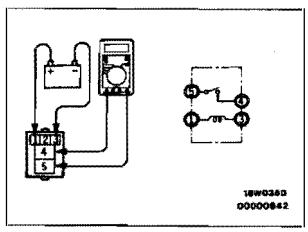
◀A▶ ◀B▶



REMOVAL SERVICE POINTS

◀A▶ TIE-ROD END DISCONNECTION

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

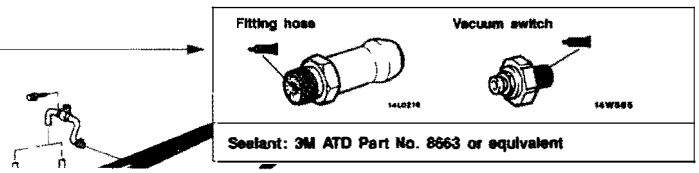


HEADLAMP RELAY CONTINUITY INSPECTION

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

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

Lubrication and sealing points



Sealant: 3M ATD Part No. 8663 or equivalent

00002471

Denotes non-reusable part.

Denotes tightening torque.

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

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

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

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

GROUP 00
GENERAL

VEHICLE IDENTIFICATION

MODELS

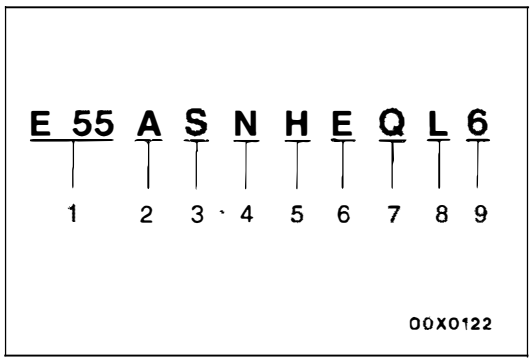
<Sedan>

Model Code		Engine model	Transmission model	Fuel supply system
E52A	SNJEQL6/R6	4G93 (1,834 ml)	F5M22 (2WD–5M/T)	MPI
	SNHEQL6/R6			
	SNJESL6			
	SNHESL6			
	SRHEQL6/R6		F4A22 (2WD –4A/T)	
	SRHESL6			
E55A	SNJEQL6/R6	4G63 (1,997 ml)	F5M22 (2WD–5M/T)	
	SNHEQL6/R6			
	SRHEQL6/R6		F4A22 (2WD–4A/T)	
E54A	SNGMQL6/R6	6A12 (1,999 ml)	F5M31 (2WD–5M/T)	
	SRGMQL6/R6		F4A23 (2WD–4A/T)	
E57A	SNJFL6/R6	4D68 (1,998 ml) turbocharger with inter-cooler	F5M31 (2WD–5M/T)	Diesel fuel injection
	SNHFL6/R6			
	SNHFQL6			
E75A	SNHEQL6	4G63 (1,997 ml)	W5M31 (4WD–5M/T)	MPI
E88A	SNGMQL6	6G73 (2,497 ml)	W5M33 (4WD–5M/T)	
E52A	SRHEQL6B	4G93 (1,834 ml)	F4A22 (2WD–4A/T)	
	SNJEQL6B			
E55A	SRHEQL6B	4G63 (1,997 ml)		

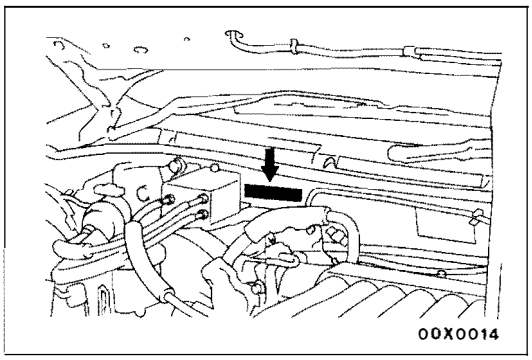
<Hatchback>

Model Code		Engine model	Transmission model	Fuel supply system
E52A	LNJEQL6/R6	4G93 (1,834 ml)	F5M22 (2WD–5M/T)	MPI
	LNHEQL6/R6			
	LNJESL6			
	LNHESL6			
	LRHEQL6/R6		F4A22 (2WD–4A/T)	
	LRHESL6			
E55A	LNJEQL6/R6	4G63 (1,997 ml)	F5M22 (2WD–5M/T)	
	LNHEQL6/R6			
	LRHEQL6/R6		F4A22 (2WD–4A/T)	
E54A	LNGMQL6/R6	6A12 (1,999 ml)	F5M31 (2WD–5M/T)	
	LRGMQL6/R6		F4A23 (2WD–4A/T)	
E57A	LNJFL6/R6	4D68 (1,998 ml) turbocharger with inter-cooler	F5M31 (2WD–5M/T)	Diesel fuel injection
	LNHFL6/R6			
E75A	LNHEQL6	4G63 (1,997 ml)	W5M31 (4WD–5M/T)	MPI
E88A	LNGMQL6/R6	6G73 (2,497 ml)	W5M33 (4WD–5M/T)	

MODEL CODE

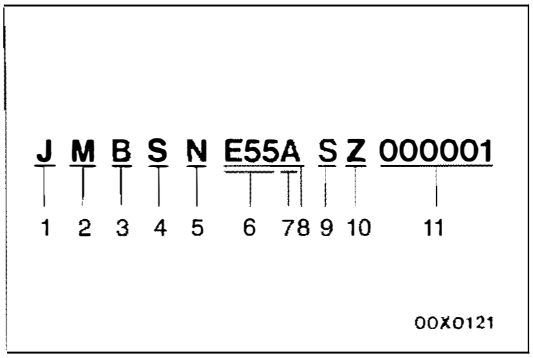


No.	Items		Contents
1	Development order	E52	1800–SOHC
		E55	2000–SOHC
		E54	2000–DOHC
		E57	2000–Diesel
		E75	2000–SOHC–4WD
		E88	2500–DOHC–4WD
2	Sort	A	Passenger car
3	Body style	S	4–door sedan
		L	4–door hatchback
4	Transmission type	N	5–speed manual transmission
		R	4–speed automatic transmission
5	Trim level	J	GLI
		H	GLSI
		G	V6–24
6	Specified engine feature	E	MPI–SOHC
		F	Turbocharger with intercooler
		M	MPI–DOHC
7	Exhaust system specification	Q	With catalytic converter
		None	Without catalytic converter
8	Steering wheel location	L	Light hand
		R	Right hand
9	Destination	6	For Europe



CHASSIS NUMBER

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



No.	Items		Contents
1	Fixed figure	J	Asia
2	Distribution channel	M	MITSUBISHI channel
3	Destination	A	For Europe, right hand drive
		B	For Europe, left hand drive
4	Body style	S	4–door sedan
		L	4–door hatchback
5	Transmission type	N	5–speed manual transmission
		R	4–speed automatic transmission
6	Development order	E52	1800–SOHC
		E55	2000–SOHC
		E54	2000–DOHC
		E57	2000–Diesel
		E75	2000–SOHC–4WD
		E88	2500–DOHC–4WD
7	Sort	A	Passenger car
8	Vehicle type	E50	GALANT
9	Model year	S	1995
10	Plant	Z	Okazaki Plant of Nagoya Motor Vehicle Works
		Y	Ooe Plant of Nagoya Motor Vehicle Works
		U	Mizushima Motor Vehicle Works
11	Serial number	–	–

GROUP 12
LUBRICATION

GENERAL

OUTLINE OF CHANGES

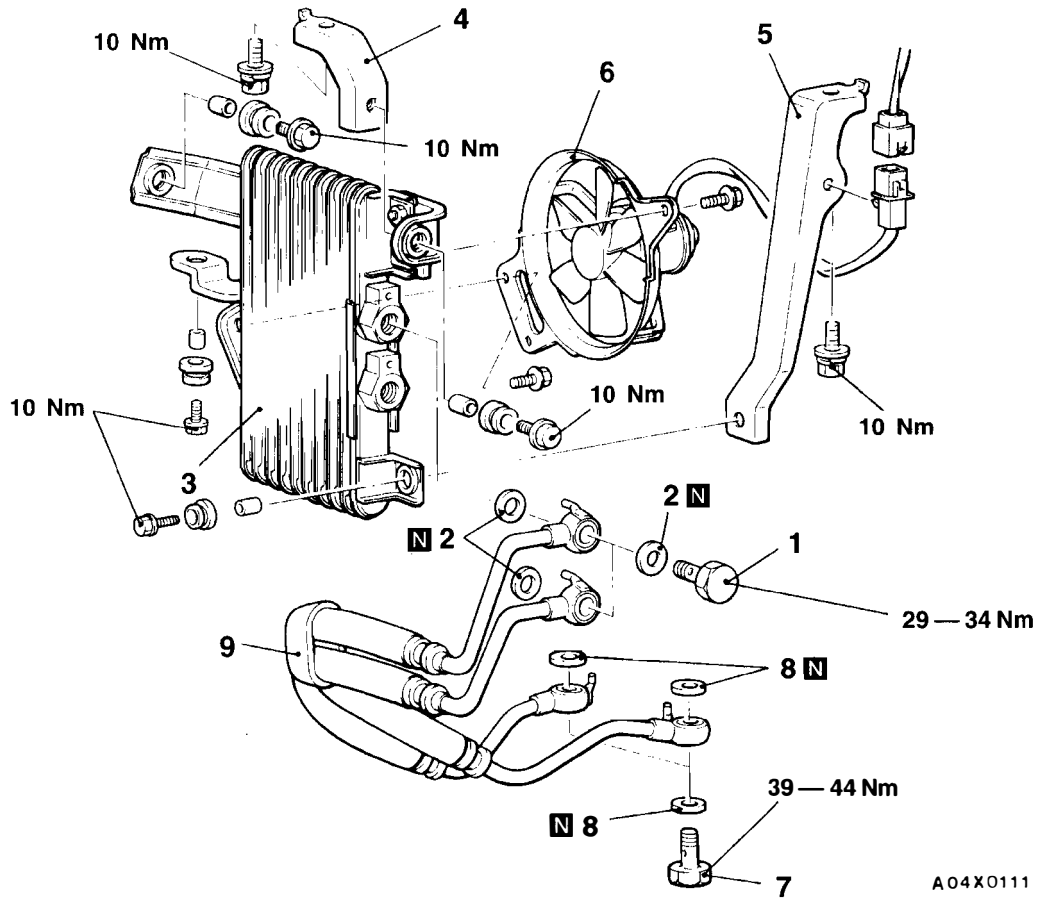
- A blower has been added to the engine oil cooler in 6G73 engines. Maintenance service points for the engine oil cooler have been changed to correspond to this.

ENGINE OIL COOLER

REMOVAL AND INSTALLATION

Pre–removal Operation
Front Bumper Removal
(Refer to GROUP 51 — Front Bumper.)

Post–installation Operation
(1) Front Bumper Installation
(Refer to GROUP 51 — Front Bumper.)
(2) Oil Checking and Supplying

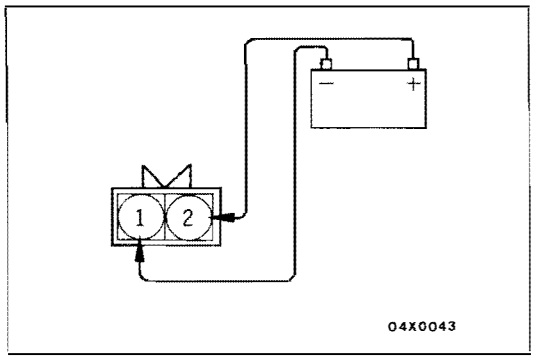


Removal steps

1. Eye bolt
2. Gasket
3. Oil cooler
4. Bracket
5. Bracket
6. Blower assembly
7. Eye bolt
8. Gasket
▶A◀ 9. Hose assembly

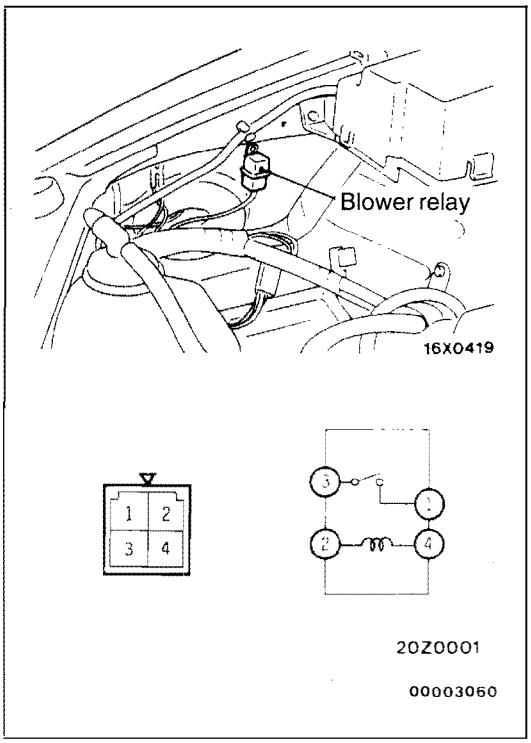
INSPECTION

- Check for foreign material between oil cooler fins.
- Check the oil cooler fins for bend or damage.
- Check the oil cooler hoses for crack, damage, clogging or deterioration.
- Check the eye bolts for clogging or deformation.



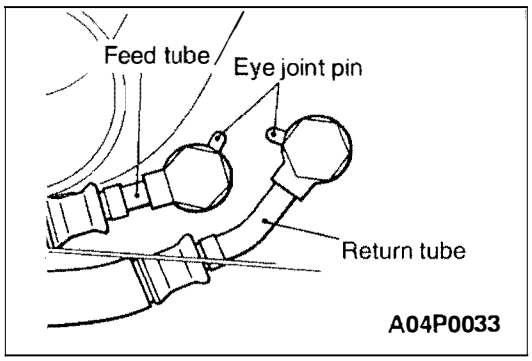
BLOWER MOTOR

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



BLOWER RELAY

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



INSTALLATION SERVICE POINT

▶A◀ HOSE ASSEMBLY INSTALLATION

Insert the eye joint pin into the oil filter bracket hole and install the hose assembly.

GROUP 35B
ANTI–SKID BRAKE SYSTEM (ABS) <2WD>

GENERAL

OUTLINE OF CHANGES

- The following maintenance service points have been established to correspond to changes in the ABS. Maintenance service points which are not listed below are the same as before.

MASTER CYLINDER AND BRAKE BOOSTER

- This is the same as the previous procedures for the basic brakes.

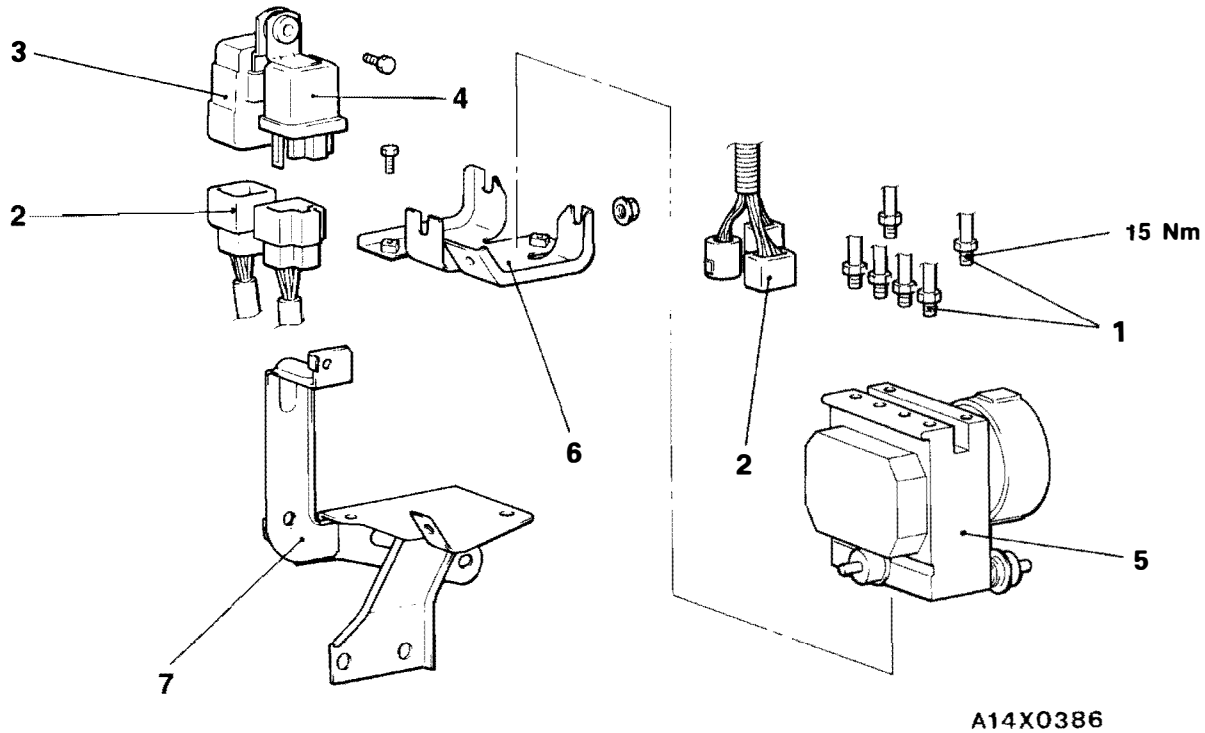
HYDRAULIC UNIT

REMOVAL AND INSTALLATION

Pre–removal Operation
- Brake Fluid Draining
- Air Intake Hose Removal <MPI — L.H. drive vehicles>

Post–installation Operation
- Air Intake Hose Installation <MPI — L.H. drive vehicles>
- Brake Fluid Supplying
- Brake Lines Bleeding
- Hydraulic Unit Checking

<L.H. drive vehicles>

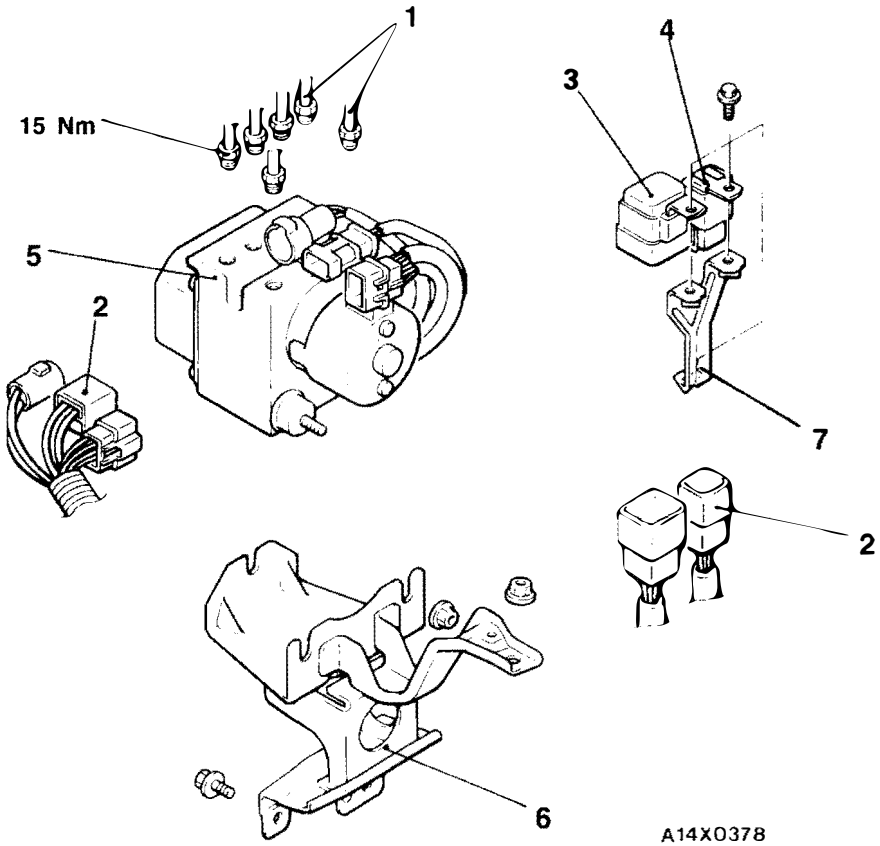


Removal steps

▶A◀ 1. Connection for brake pipe
2. Connection for harness connector
3. Motor relay
4. Valve relay

◀A▶ 5. Hydraulic unit
6. Hydraulic unit bracket assembly, lower
7. Hydraulic unit bracket assembly, upper

<R.H. drive vehicles>



Removal steps

▶A◀ 1. Connection for brake pipe
2. Connection for harness connector
3. Motor relay
4. Valve relay

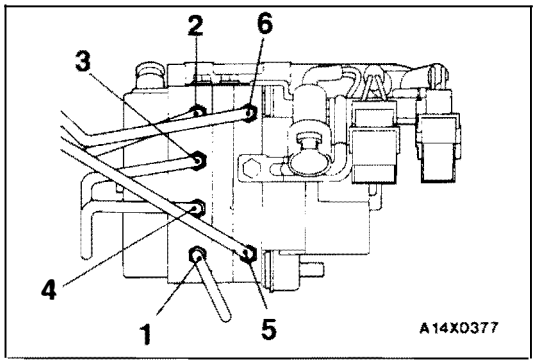
◀A▶ 5. Hydraulic unit
6. Hydraulic unit bracket assembly
7. Relay bracket

REMOVAL SERVICE POINT

◀A▶ HYDRAULIC UNIT REMOVAL

Caution

1. **The hydraulic unit is heavy, and so care should be taken when removing it.**
2. **The hydraulic unit is not to be disassembled; its nuts and bolts should absolutely not be loosened.**
3. **The hydraulic unit must not be dropped or otherwise subjected to impact shocks.**
4. **The hydraulic unit must not be turned upside down or laid on its side.**



INSTALLATION SERVICE POINT

▶A◀ BRAKE PIPE CONNECTION

Connect the pipes to the hydraulic unit as shown in the illustration.

1. Hydraulic unit — Front brake (L.H.)
2. Hydraulic unit — Front brake (R.H.)
3. Hydraulic unit — Rear brake (L.H.)
4. Hydraulic unit — Rear brake (R.H.)
5. Master cylinder — Hydraulic unit (for left front and right rear)
6. Master cylinder — Hydraulic unit (for right front and left rear)

GROUP 51
EXTERIOR

GENERAL

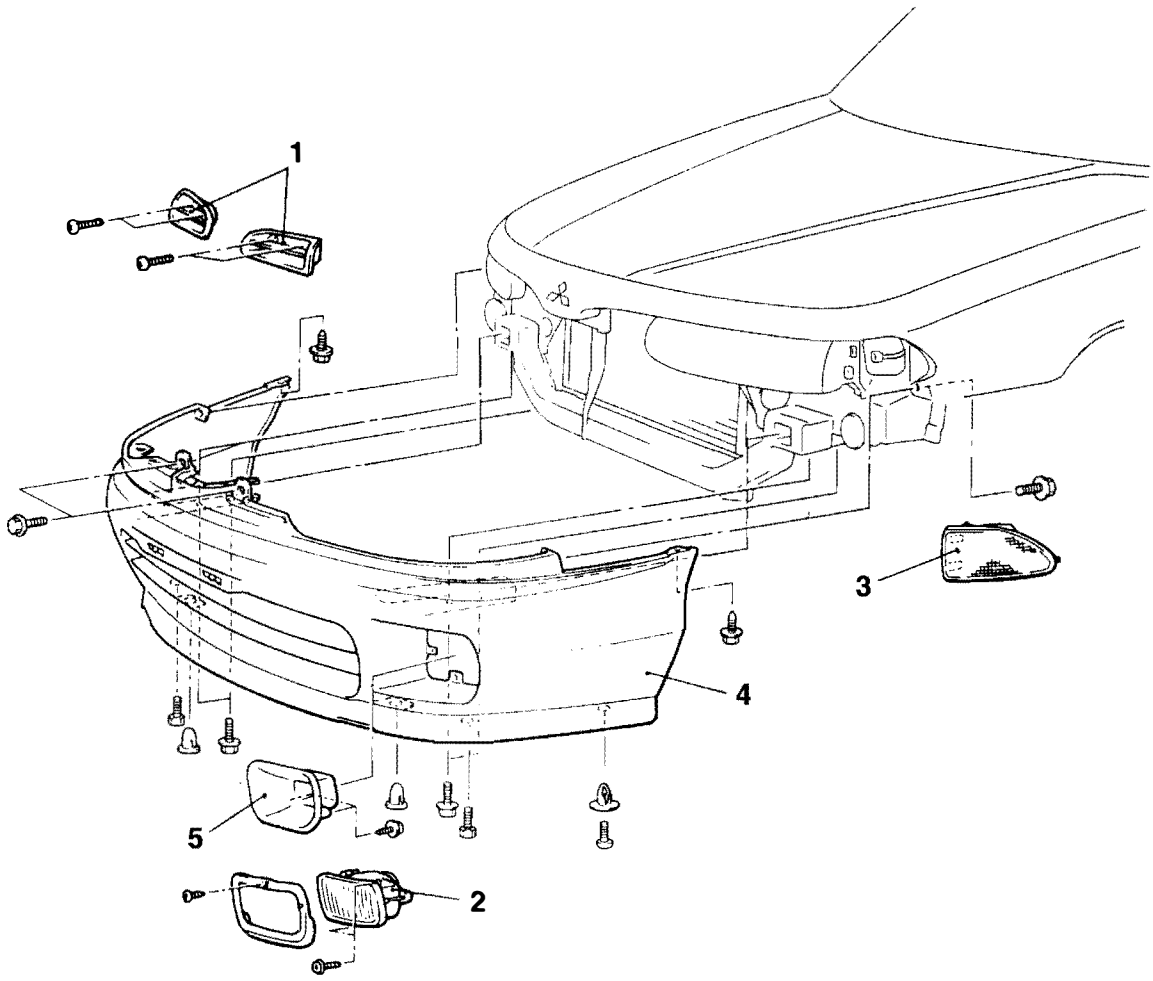
OUTLINE OF CHANGES

- The following maintenance service points have been established to correspond to changes in the front bumper, radiator grille and air inlet garnish. <Vehicles with V6 engine>

FRONT BUMPER

REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Front Under Cover Panel Removal and Installation



18X1001

Removal steps
1. Radiator grille
2. Fog lamp
3. Front turn signal lamp
4. Front bumper
5. Air inlet garnish

GROUP 52B
SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

GENERAL

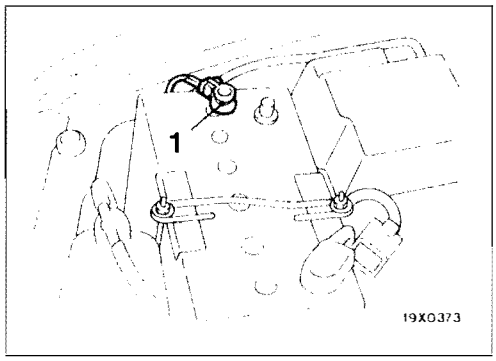
OUTLINE OF CHANGES

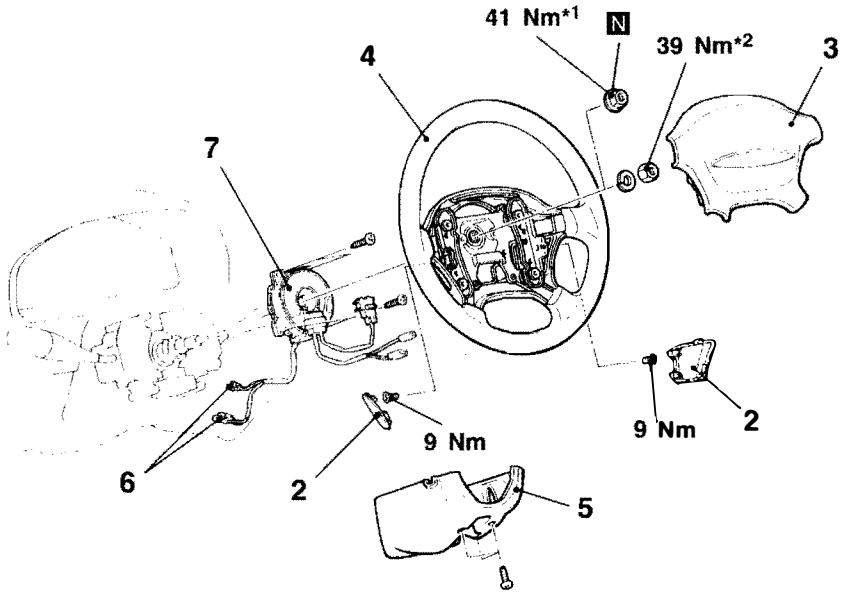
- The shape and method of installation of the air bag module have been changed. Procedures which are not listed below are the same as before.

AIR BAG MODULE

REMOVAL AND INSTALLATION

Pre–removal Operation
- After setting the steering wheel and the front wheels to he straight ahead position, remove the ignition key.





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Clock spring removal steps

▶F◀ • Post–installation inspection
◀A▶ 1. Connection for the negative (–) battery cable
2. Steering wheel lower cover
◀B▶ ▶E◀ 3. Air bag module (Driver's side)
◀C▶ ▶D◀ 4. Steering wheel
5. Column cover, lower
6. Clock spring and body wiring harness connection
▶C◀ 7. Clock spring
▶A◀ • Pre–installation inspection

Air bag module removal steps (Driver's side)

▶F◀ • Post–installation inspection
◀A▶ 1. Connection for the negative (–) battery cable
◀B▶ ▶E◀ 3. Air bag module (Driver's side)
▶A◀ • Pre–installation inspection

NOTE
*1: In case of self locking nut
*2: In case of nut and spring washer
Removal and installation service points are the same as before.

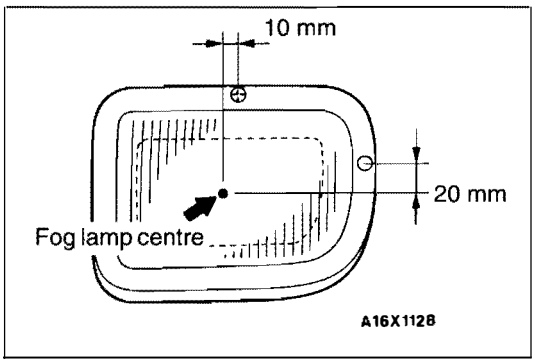
GROUP 54
CHASSIS ELECTRICAL

FRONT FOG LAMP

GENERAL

OUTLINE OF CHANGES

- The following maintenance service points have been established to correspond to changes in the front fog lamp. Procedures which are not listed below are the same as before. <Vehicles with V6 engine>



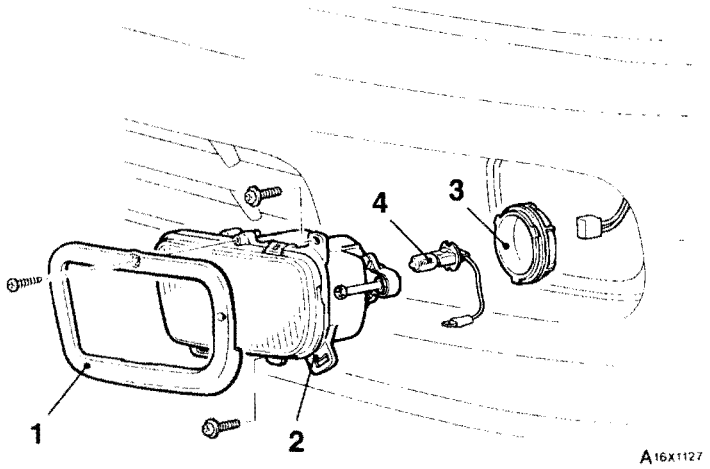
SERVICE ADJUSTMENT PROCEDURES

FRONT FOG LAMP AIMING

Measure the centre of the fog lamps, as shown in the illustration.

FRONT FOG LAMP

REMOVAL AND INSTALLATION



Removal steps

1. Fog lamp bezel
2. Fog lamp
3. Socket cover
4. Bulb

GROUP 55
HEATER, AIR CONDITIONER AND VENTILATION

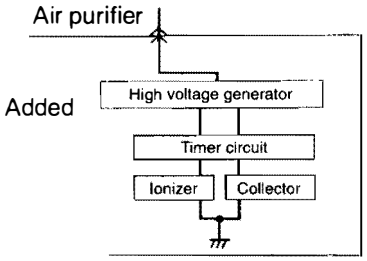
GENERAL

OUTLINE OF CHANGES

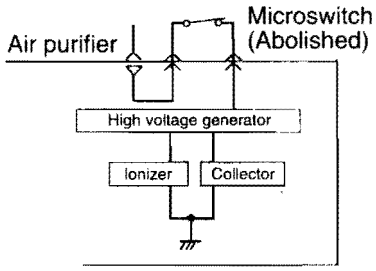
- A timer function has been added to inform the driver when it is time to clean the air purifier assembly. Furthermore, the microswitch has been abolished and the tungsten wire in the ionizer has been changed to a needle–type electrode.

AIR PURIFIER ASSEMBLY

New



Old



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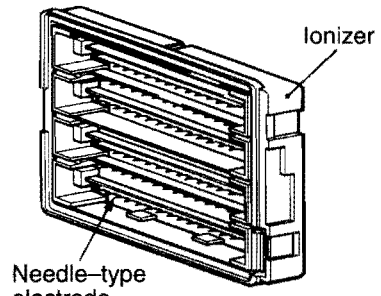
New



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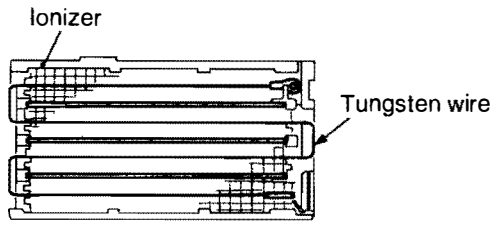
Old



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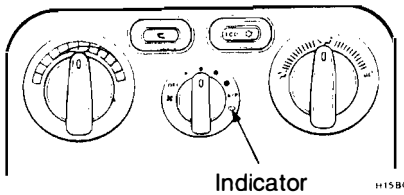
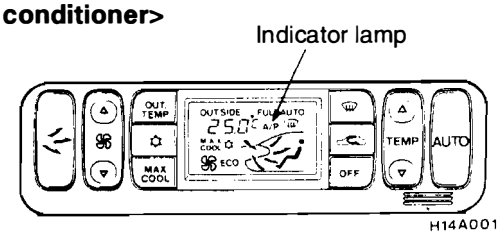
<Vehicles with manual air conditioner>



<Vehicles with full–automatic air conditioner>



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OPERATION

When the air purifier operates, the A/P indicator lamp on the heater control assembly or the A/C control panel illuminates. If there is a problem with the air purifier assembly itself or if the timer period has elapsed, the indicator lamp switches off. After this, the A/P indicator lamp illuminates for approximately 60 seconds and then flashes for approximately a further 60 seconds next time the blower switch is turned on.

TROUBLESHOOTING

Resetting the timer or changing the timer setting are not possible after the timer has switched off the air purifier.	**Probable cause**
The cause is probably an incorrect timer setting or a malfunction of the timer circuit inside the transformer unit.	• Incorrect timer setting • Malfunction of the transformer unit

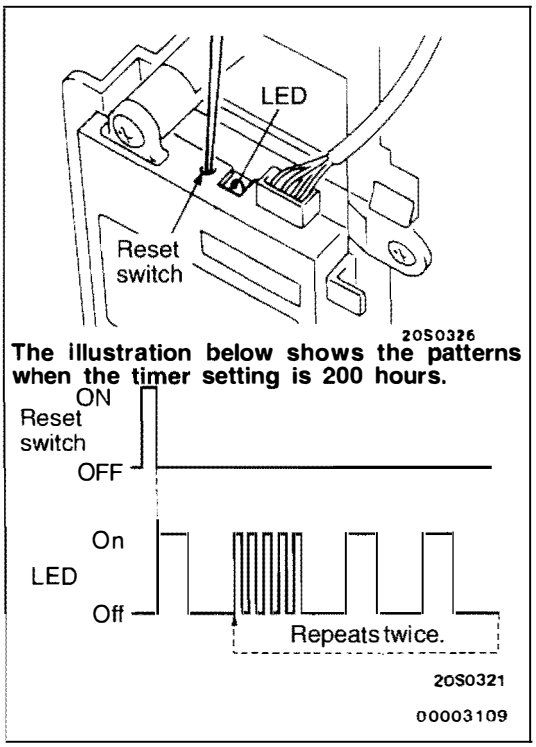
While keeping the reset switch pressed down, turn the blower switch from off to on, and then keep pressing the reset switch for a further two seconds or more*. Does the indicator lamp illuminate for approximately 60 seconds and then flash for approximately 60 seconds ?

No → Replace the transformer unit.

Yes ↓

Incorrect timer setting

NOTE
*: indicates the time when the reset switch is being pressed.



SERVICE ADJUSTMENT PROCEDURES

TIMER RESETTING PROCEDURE AFTER THE TIMER HAS SWITCHED OFF THE AIR PURIFIER

After cleaning the collector and the ionizer, reset by the following procedure.
(1) Turn the ignition key to ON.
(2) Turn the blower switch to OFF.

Caution
- **Be sure to turn the blower switch to OFF before resetting, because high voltage is generated in the collector and ionizer.**

(3) Use a tool with a sharpened point to press the reset switch once to turn it on.

NOTE
The LED will turn on and off according to the pattern in the illustration. It will repeat this pattern twice.

(4) Turn the ignition key to OFF. This completes the resetting procedure.
(5) Turn the ignition key to ON and the blower switch to ON, and check that the air purifier operates.

TIMER SETTING AND CHANGING

Because the timer can be set in five different ways, set the timer by the following procedure after finding out from the customer what the usage conditions will be.

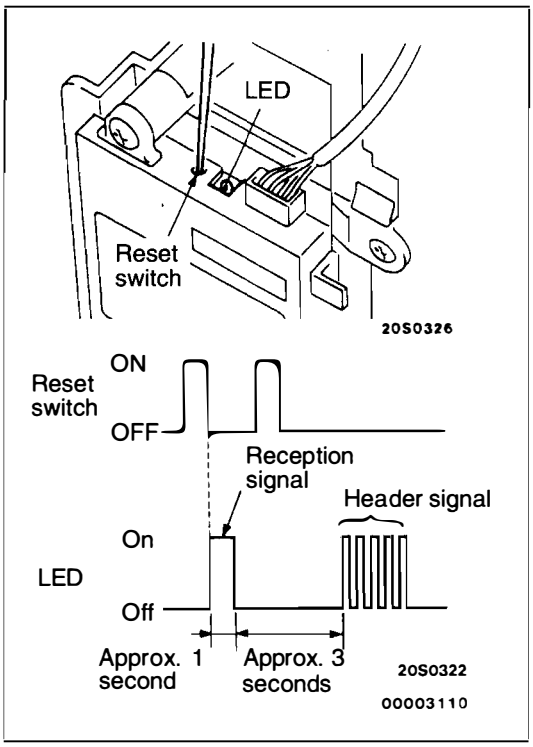
NOTE
The default timer setting is 200 hours.

STANDARD TIMER SETTING TIMES

Air quality: Clean ◄——► Dirty				
Normal roads		Highway		Roads with large amounts of diesel exhaust
350 hours	300 hours	250 hours	200 hours	150 hours

(1) Turn the ignition key to ON.
(2) Turn the blower switch to OFF.

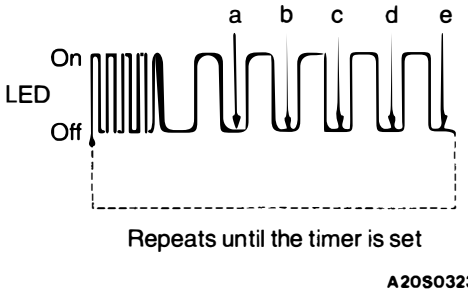
Caution
Be sure to turn the blower switch to OFF before resetting, because high voltage is generated in the collector and ionizer.



(3) Use a tool with a sharpened point to press the reset switch once to turn it on. The LED will illuminate for approximately 1 second as the reception signal is transmitted, and will then switch off. Then, within three seconds, press the reset switch once more to turn it on again before the header signal is transmitted.

NOTE
If the header signal is transmitted before the reset switch is pressed the second time, turn the ignition key back to OFF and then repeat the procedure from step (1).

LED flashing pattern in timer setting mode

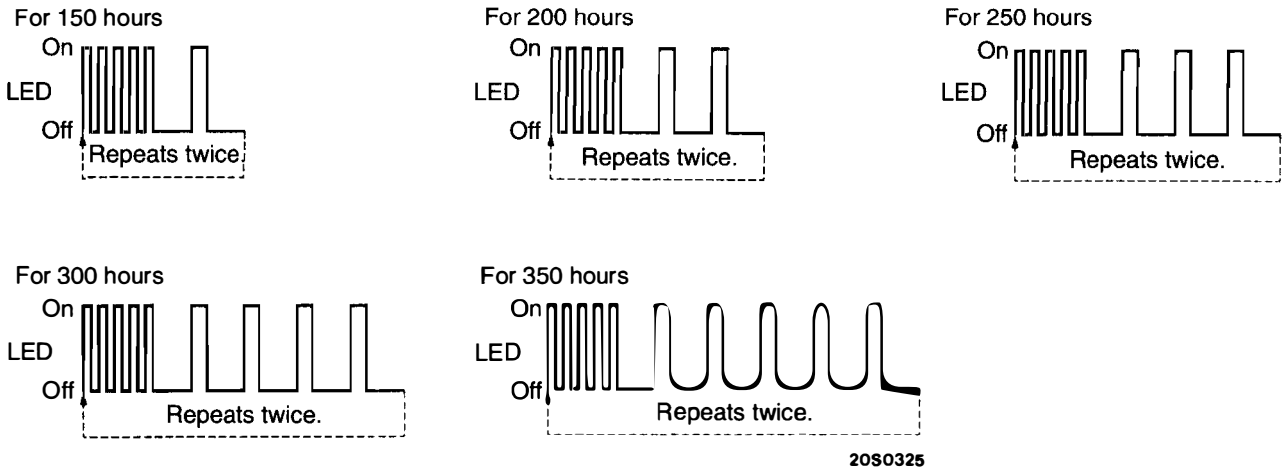


(4) The timer setting mode starts, and the LED will flash in the pattern shown in the illustration. Press the reset switch at the point that corresponds to the time you wish to set.
a: For 150 hours
b: For 200 hours
c: For 250 hours
d: For 300 hours
e: For 350 hours

NOTE
To cancel timer setting mode, turn the ignition key to OFF and then press the reset switch.

(5) Once the setting signal from the reset switch has been received, the flashing of the LED will change to the pattern which corresponds to the time setting selected, and this pattern will be repeated twice.

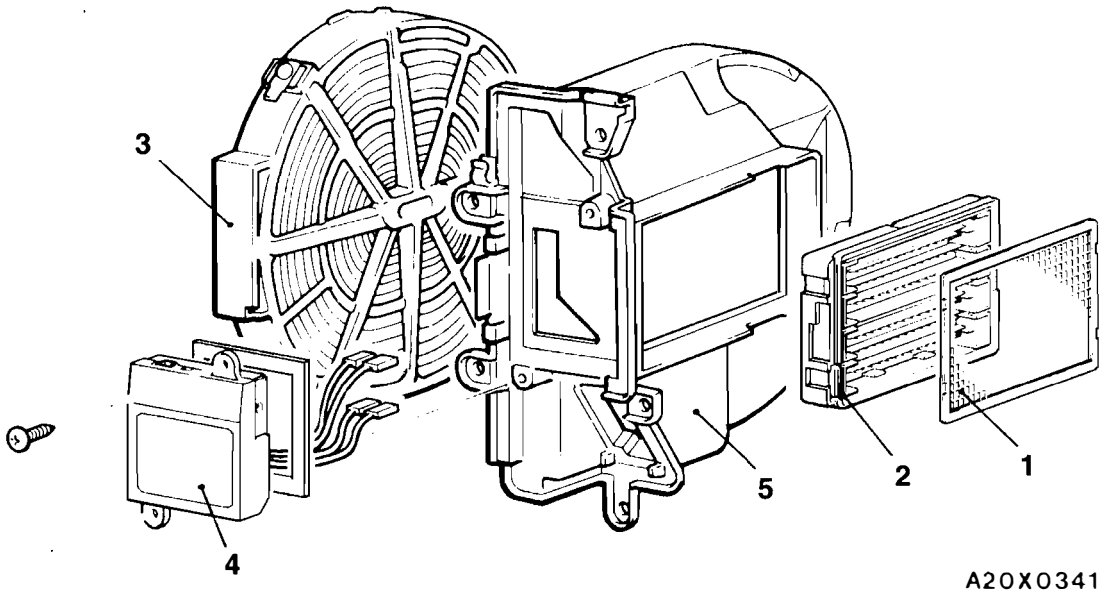
LED flashing pattern after setting signal has been received from the reset switch



(6) Turn the ignition key to OFF. This completes the timer setting.
(7) Turn the ignition key to ON and the blower switch to ON, and check that the air purifier operates.

AIR PURIFIER ASSEMBLY

DISASSEMBLY AND REASSEMBLY



NOTE
Removal and installation service points are the same as before.

Disassembly steps

1. Prefilter
2. Ionizer
3. Collector
4. Transformer unit
5. Case

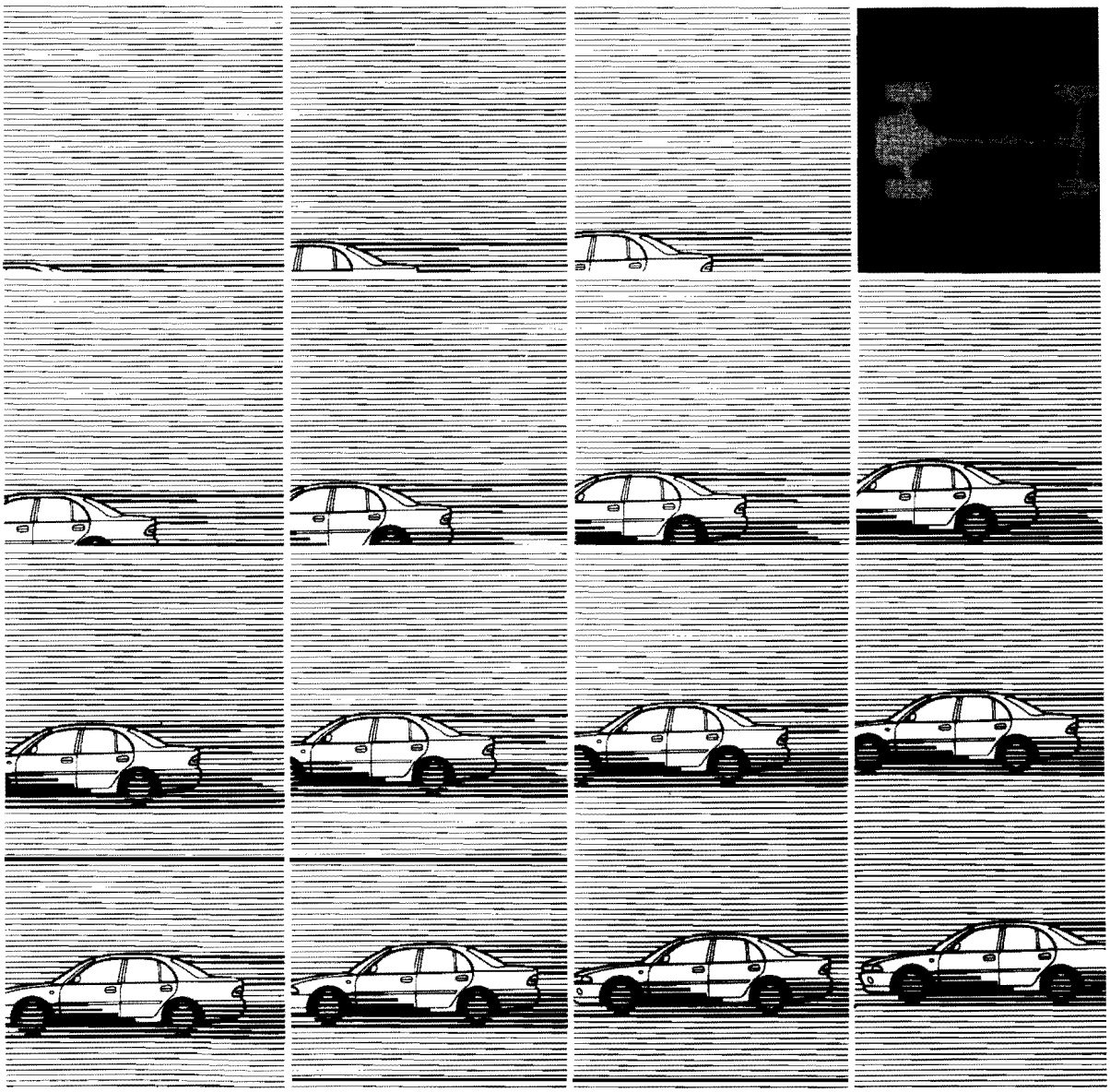
MITSUBISHI MOTORS

Workshop Manual

chassis

SUPPLEMENT

MITSUBISHI GALANT '96



Pub. No. PWDE9211-D

MITSUBISHI GALANT GALANT HATCHBACK

WORKSHOP MANUAL

FOREWORD

This Workshop Manual contains procedures for service mechanics, including removal, disassembly, inspection, adjustment, reassembly and installation. Use the following manuals in combination with this manual as required.

TECHNICAL INFORMATION MANUAL	PYDE9203
WORKSHOP MANUAL	PWDE9211 (Looseleaf edition)
	PWDE9211-C (Supplement)
ENGINE GROUP	PWEE □□□□ (Looseleaf edition)
ELECTRICAL WIRING	PHDE9220
	PHDE9220-C (Supplement)
BODY REPAIR MANUAL	PBDE9210
PARTS CATALOGUE	B808F1024□
	BFA8F604A1

All information, illustrations and product descriptions contained in this manual are current as at the time of publication. We, however, reserve the right to make changes at any time without prior notice or obligation.

MITSUBISHI MOTORS CORPORATION

GROUP 00
GENERAL

VEHICLE IDENTIFICATION

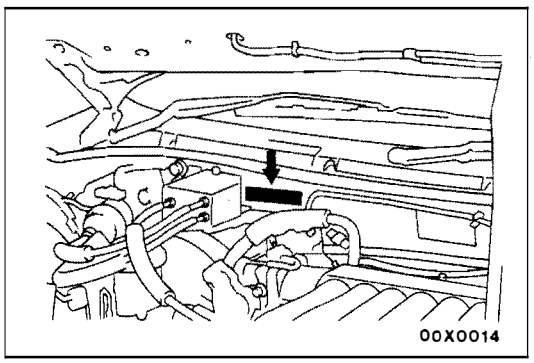
MODELS

<Sedan>

Model Code		Engine model	Transmission model	Fuel supply system
E52A	SNJEQL6/R6	4G93 (1,834 ml)	F5M22 (2WD–5M/T)	MPI
	SNHEQL6/R6			
	SNJESL6			
	SNHESL6			
	SRHEQL6/R6		F4A22 (2WD –4A/T)	
	SRHESL6			
E55A	SNJEQL6/R6	4G63 (1,997 ml)	F5M22 (2WD–5M/T)	
	SNHEQL6/R6			
	SRHEQL6/R6		F4A22 (2WD–4A/T)	
E54A	SNGMQL6/R6	6A12 (1,999 ml)	F5M31 (2WD–5M/T)	
	SRGMQL6/R6		F4A23 (2WD–4A/T)	
E57A	SNJFL6/R6	4D68 (1,998 ml) turbocharger with inter-cooler	F5M31 (2WD–5M/T)	Diesel fuel injection
	SNHFL6/R6			
	SNHFQL6			
E75A	SNHEQL6	4G63 (1,997 ml)	W5M31 (4WD–5M/T)	
E88A	SNGMQL6	6G73 (2,497 ml)	W5M33 (4WD–5M/T)	
E52A	SRHEQL6B	4G93 (1,834 ml)	F4A22 (2WD–4A/T)	MPI
	SNJEQL6B		F5M22 (2WD–5M/T)	
	SNHEQL6B			
E55A	SRHEQL6B	4G63 (1,997 ml)	F4A22 (2WD–4A/T)	

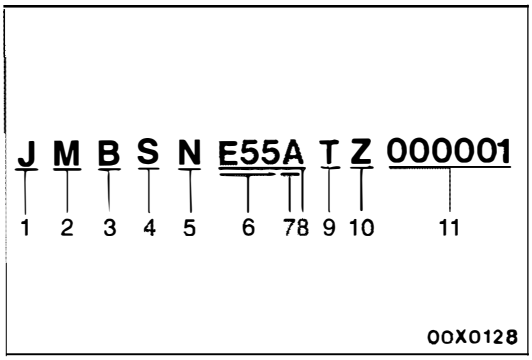
<Hatchback>

Model Code		Engine model	Transmission model	Fuel supply system
E52A	LNJEQL6/R6	4G93 (1,834 ml)	F5M22 (2WD–5M/T)	MPI
	LNHEQL6/R6			
	LNJESL6			
	LNHESL6			
	LRHEQL6/R6		F4A22 (2WD–4A/T)	
	LRHESL6			
E55A	LNJEQL6/R6	4G63 (1,997 ml)	F5M22 (2WD–5M/T)	
	LNHEQL6/R6			
	LRHEQL6/R6		F4A22 (2WD–4A/T)	
E54A	LNGMQL6/R6	6A12 (1,999 ml)	F5M31 (2WD–5M/T)	
	LRGMQL6/R6		F4A23 (2WD–4A/T)	
E57A	LNJFL6/R6	4D68 (1,998 ml) turbocharger with inter-cooler	F5M31 (2WD–5M/T)	Diesel fuel injection
	LNHFL6/R6			
E75A	LNHEQL6	4G63 (1,997 ml)	W5M31 (4WD–5M/T)	MPI
E88A	LNGMQL6/R6	6G73 (2,497 ml)	W5M33 (4WD–5M/T)	



CHASSIS NUMBER

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



No.	Items		Contents
1	Fixed figure	J	Asia
2	Distribution channel	M	MITSUBISHI channel
3	Destination	A	For Europe, right hand drive
		B	For Europe, left hand drive
4	Body style	S	4–door sedan
		L	4–door hatchback
5	Transmission type	N	5–speed manual transmission
		R	4–speed automatic transmission
6	Development order	E52	1800–SOHC
		E55	2000–SOHC
		E54	2000–DOHC
		E57	2000–Diesel
		E75	2000–SOHC–4WD
		E88	2500–DOHC–4WD
7	Sort	A	Passenger car
8	Vehicle type	E50	GALANT
9	Model year	T	1996*
10	Plant	Z	Okazaki Plant of Nagoya Motor Vehicle Works
		Y	Ooe Plant of Nagoya Motor Vehicle Works
		U	Mizushima Motor Vehicle Works
11	Serial number	–	–

NOTE
* indicates change

FUEL

CONTENTS

NOTE
Groups that have been shaded are not contained in this manual.

NOTES

MULTIPOINT INJECTION (MPI)

CONTENTS

MULTIPOINT INJECTION (MPI)

GENERAL

OUTLINE OF CHANGES

Service points of maintenance for places which are different from previous vehicles have been established to correspond to the addition of vehicles with immobilizer system.
The points of difference are given below.

- An engine warning lamp illumination topic has been added.
- A diagnosis topic has been added.
- Part of the terminal layout for the engine ECU has been changed.
- The power supply for the MPI system is now controlled by the engine ECU.

GENERAL INFORMATION

GENERAL SPECIFICATIONS

Vehicles with immobilizer system

Items			Specifications
Engine ECU	Identification model No.	4G93	E2T65377 (except Germany and Austria) E2T65378 (Germany and Austria)
		4G63 <2WD-M/T>	E2T65374
		4G63 <2WD-A/T>	E2T65375
		4G63 <4WD>	E2T65376
		6A12 <Vehicles without TCL>	E2T65972
		6G73	E2T65971

TROUBLESHOOTING

DIAGNOSIS FUNCTION

ENGINE WARNING LAMP (CHECK ENGINE LAMP)

Engine warning lamp inspection items

Following item has been added.

Immobilizer system

INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code for immobilizer system has been added.

Code No.	Diagnosis item	Reference page
54	Immobilizer system	GROUP 54 – Ignition switch and immobilizer system

INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom		Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	Communication with all systems is not possible.	1	13A-41*
	Communication with engine ECU only is not possible.	2	13A-4
Starting	No initial combustion (starting impossible)	5	13A-5
	Initial combustion but no complete combustion (starting impossible)	6	13A-44*
	Long time to start (improper starting)	7	13A-45*

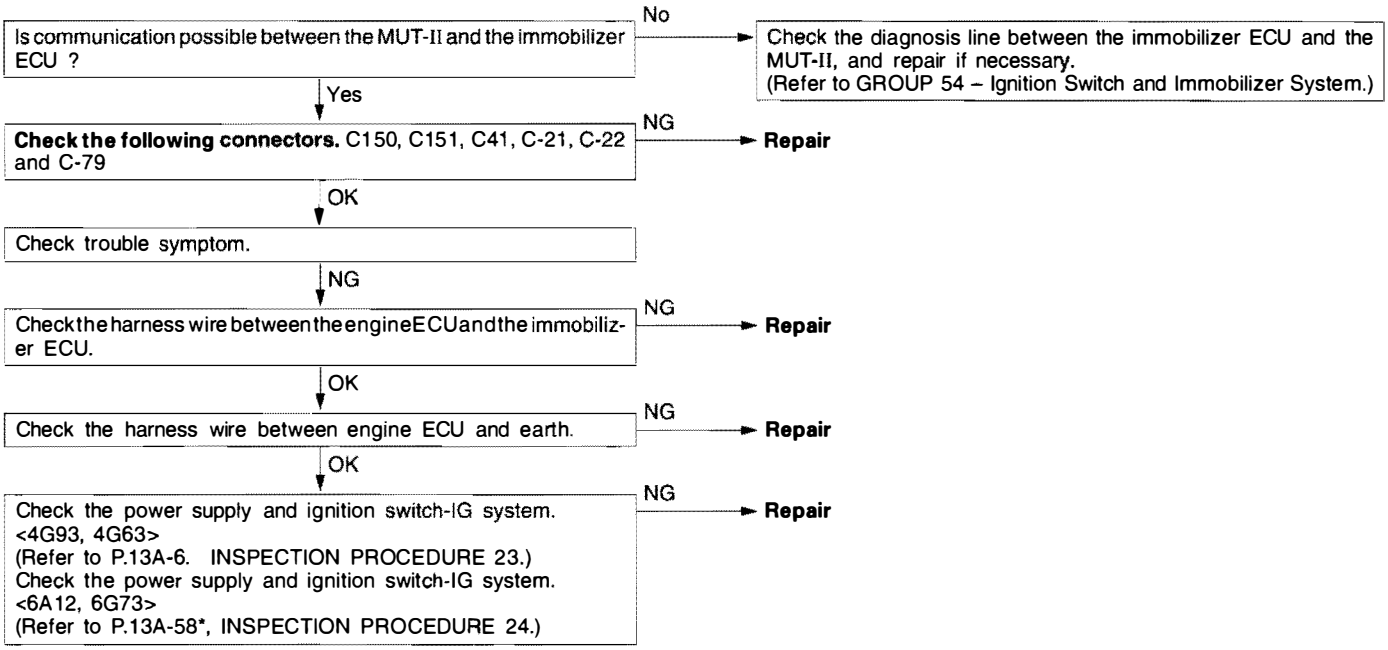
NOTE
*: Refer to GALANT/GALANT HATCHBACK Workshop Manual (Pub. No. PWDE9211).

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

- Inspection procedures 2 and 5 have been changed to correspond to changes in the wiring between the diagnosis connector and the engine ECU.
- Inspection procedures 31 and 52 have been changed to correspond to the changes in the terminal layout for the engine ECU.
- Inspection procedures 23 and 49 have been changed to correspond to the adoption of a method whereby the power supply for the MPI system in 4G93 and 4G63 engines is controlled by the engine ECU (in the same way as for the 6A1 and 6G73 engines).

INSPECTION PROCEDURE 2

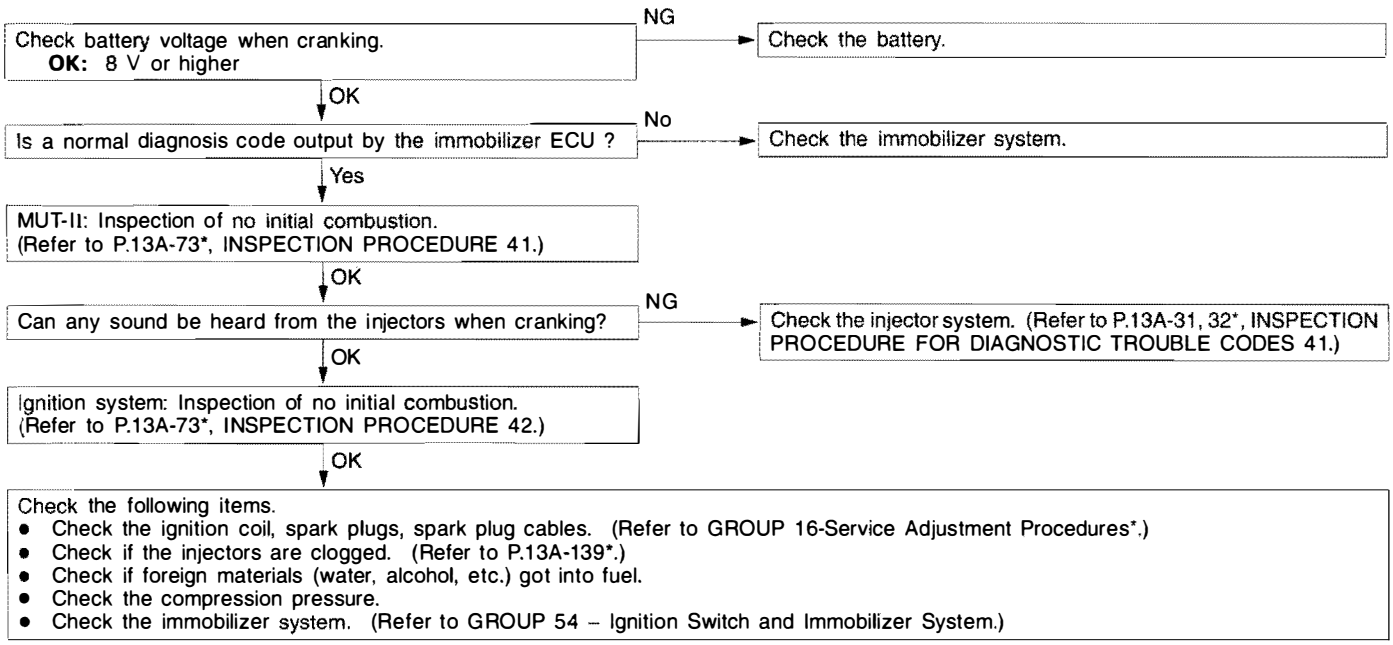
MUT-II communication with engine ECU is Impossible.	Probable cause
One of the following causes may be suspected. • No power supply to engine ECU • Defective earth circuit of engine ECU • Defective engine ECU • Improper communication line between engine ECU and MUT-II	• Malfunction of engine ECU power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



NOTE
*: Refer to GALANT/GALANT HATCHBACK Workshop Manual (Pub. No. PWDE9211).

INSPECTION PROCEDURE 5

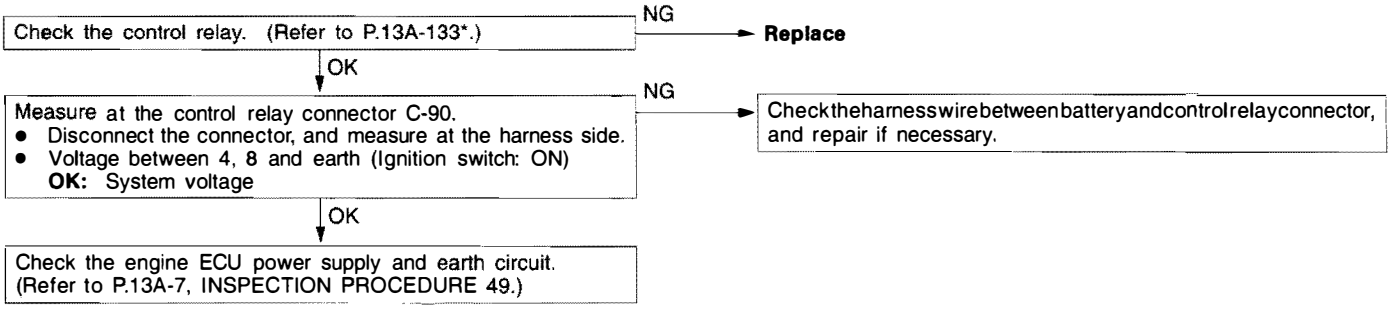
No initial combustion (starting impossible)	Probable cause
In cases such as the above, the cause is probably that a spark plug is defective, or that the supply of fuel to the combustion chamber is defective. In addition, foreign materials (water, kerosene, etc.) may be mixed with the fuel.	• Malfunction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



NOTE
*: Refer to GALANT/GALANT HATCHBACK Workshop Manual (Pub. No. PWDE9211).

INSPECTION PROCEDURE 23

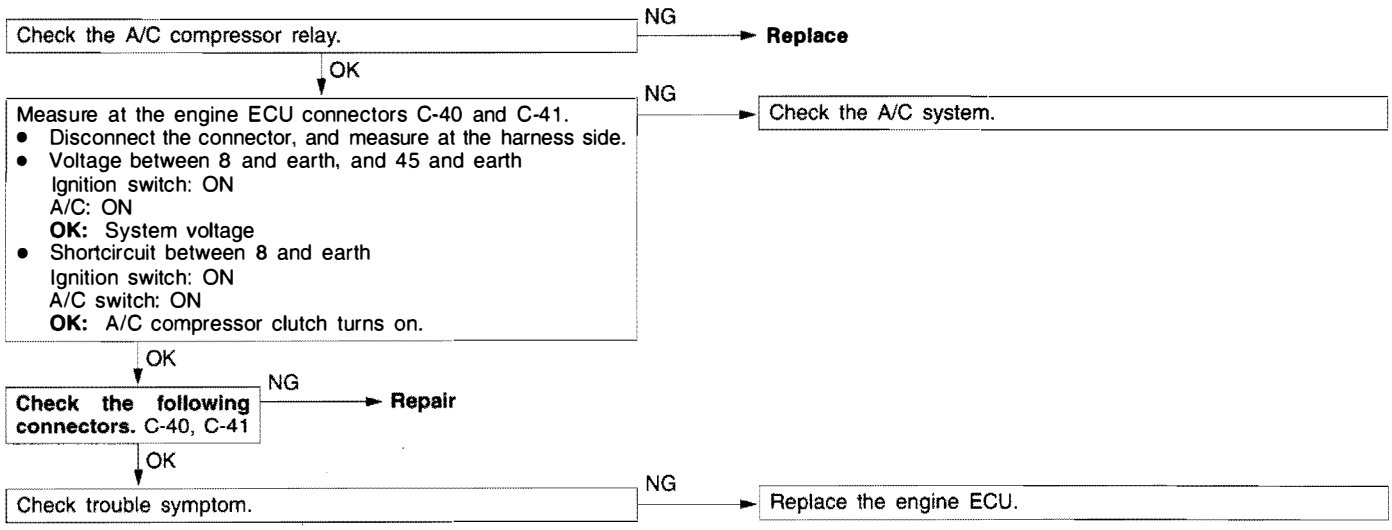
Power supply system and ignition switch-IG system <4G93, 4G63>	Probable cause
When an ignition switch ON signal is input to the engine ECU, the engine ECU turns the control relay ON. This causes battery voltage to be supplied to the engine ECU, injectors and air flow sensor.	• Malfunction of the ignition switch • Malfunction of the control relay • Improper connector contact, open circuit or short-circuited harness wire • Disconnected engine ECU earth wire • Malfunction of the engine ECU



NOTE
*: Refer to GALANT/GALANT HATCHBACK Workshop Manual (Pub. No. PWDE9211).

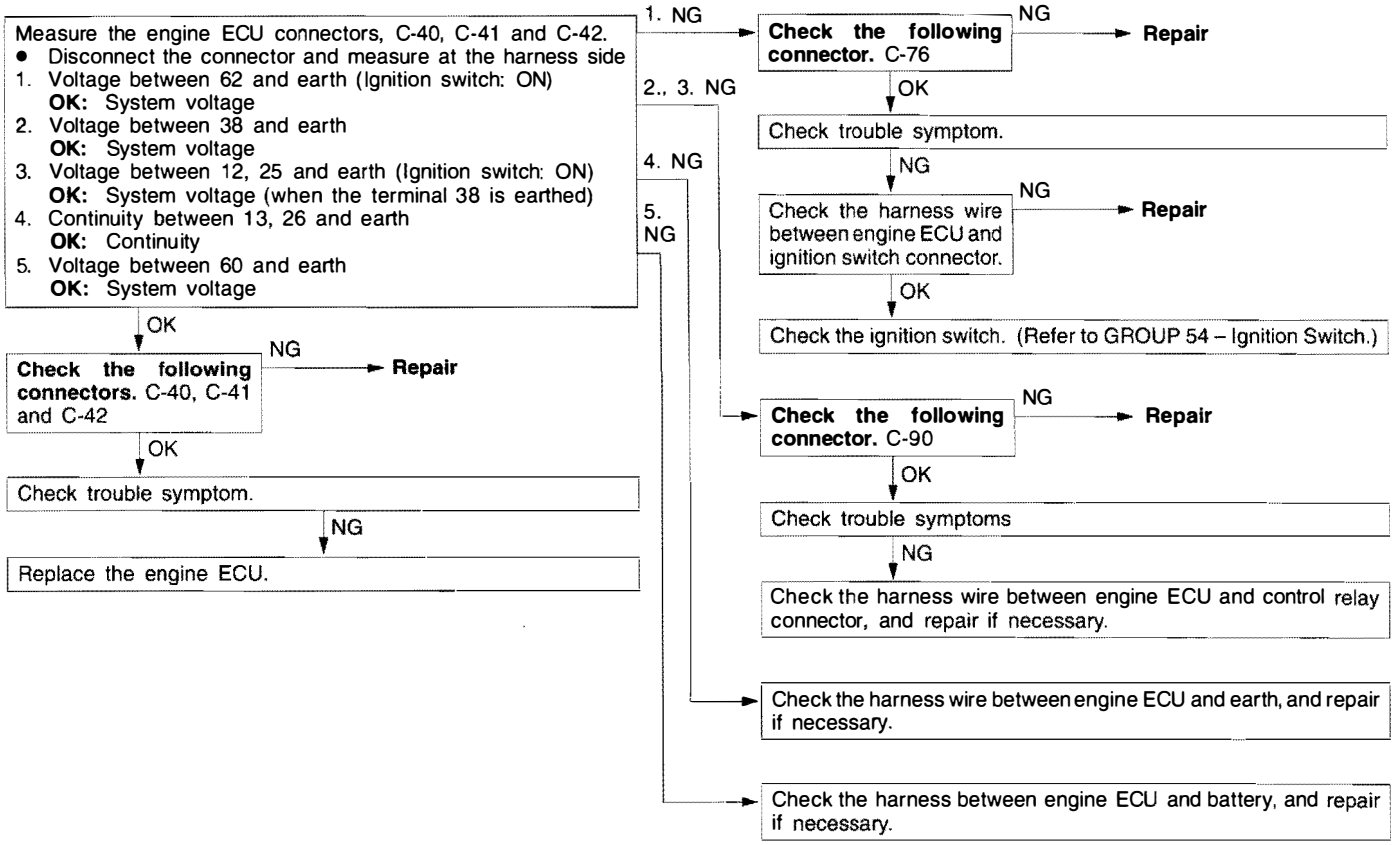
INSPECTION PROCEDURE 31

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



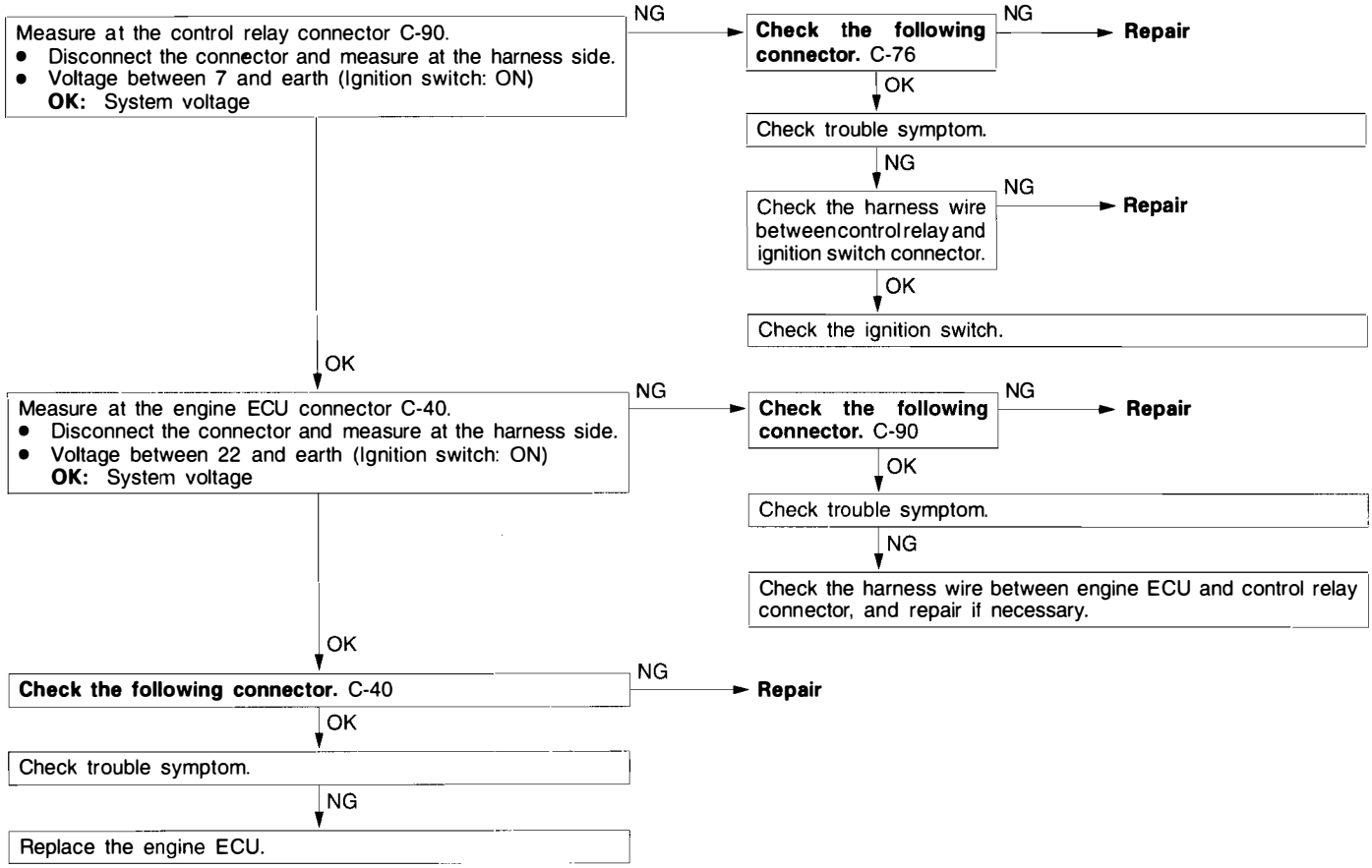
INSPECTION PROCEDURE 49

Check the engine ECU power supply and earth circuit. <4G93, 4G63>



INSPECTION PROCEDURE 52

Check the fuel pump drive control circuit.



SERVICE DATA REFERENCE TABLE

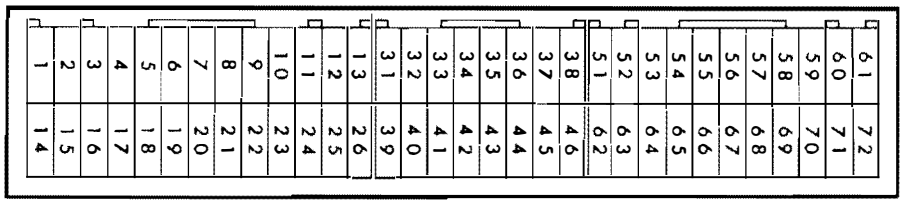
Item No.	Inspection item	Inspection contents		Normal condition	Inspection procedure No.	Reference page
49	A/C relay	Engine: After having warmed up/Engine is idling	A/C switch: OFF	OFF (Compressor clutch is not operating)	Procedure No. 31	P.13A-6
			A/C switch: ON	ON (Compressor clutch is operating)		

CHECK AT THE ENGINE ECU TERMINALS

TERMINAL VOLTAGE CHECK CHART

- Terminal Nos. of the A/C relay and control relay (fuel pump) have been changed.
- Check items of the control relay (power supply and ignition switch-IG have been added.

Engine ECU Connector Terminal Arrangement



9FU0101

Terminal No.	Check item	Check condition (Engine condition)	Normal condition
8	A/C relay	• Engine: Idle speed • A/C switch: OFF → ON (A/C compressor is operating)	SV or momentarily 6 V or more → 0 – 3 V
22	Control relay (Fuel pump)	Ignition switch: ON	SV
		Engine: Idle speed	0 – 3 V
38	Control relay (Power supply)	Ignition switch: OFF	SV
		Ignition switch: ON	0 – 3 V
62	Ignition switch-IG	Ignition switch: ON	SV

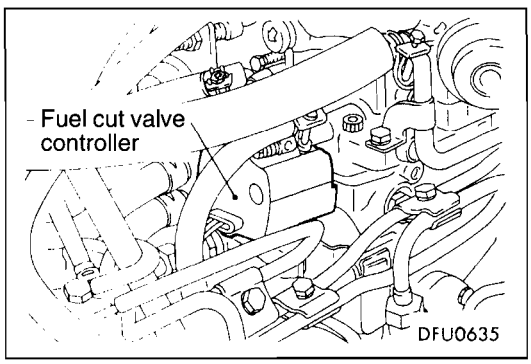
GROUP 13E

DIESEL FUEL

GENERAL

OUTLINE OF CHANGE

The fuel cut valve controller with integrated fuel cut solenoid valve has been installed to the fuel injection pump to correspond to the addition of vehicles with immobilizer system.



SERVICE ADJUSTMENT PROCEDURES

FUEL INJECTION PUMP INSPECTION

Service points of inspection have been changed to correspond to the addition of an immobilizer system.

INSPECTION OF FUEL CUT VALVE CONTROLLER OPERATION

When a sound scope is held against the fuel cut solenoid valve controller and the ignition switch is turned to "ON", check that the sound of the valve operating can be heard. If no operating sound can be heard, check the immobilizer system while referring to GROUP 54 – Ignition Switch and Immobilizer System.

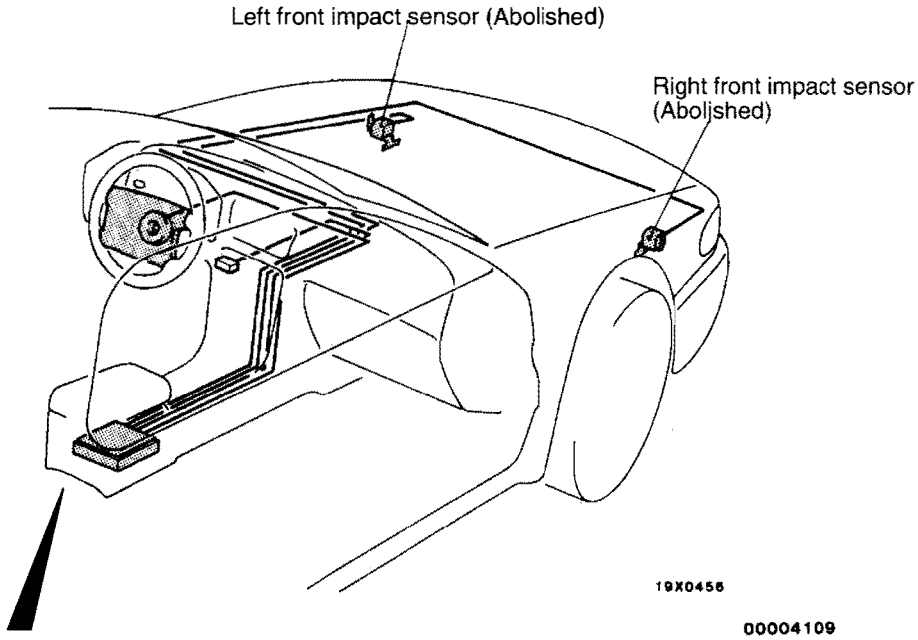
GROUP 52B
SUPPLEMENTAL RESTRAINT SYSTEM (SRS)

GENERAL

OUTLINE OF CHANGES

The following changes have been made to the SRS. Items other than these are the same as before.

- The front impact sensors have been abolished.
- The special tool has been changed and the removal procedures for the SRS-ECU connector have become simpler as a result of the SRS diagnosis unit being changed to a SRS-ECU.



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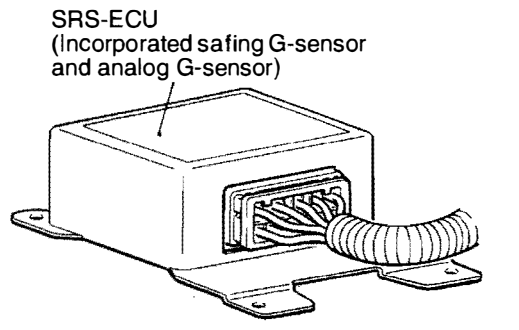
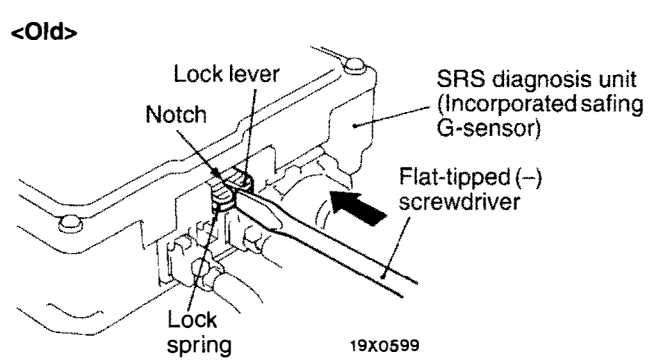
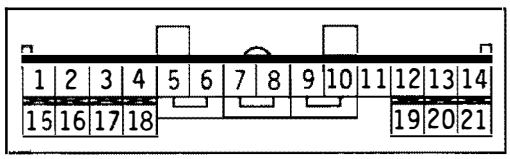


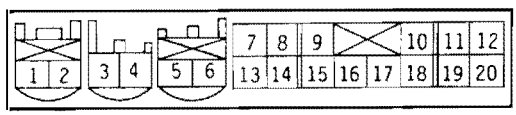


SRS-ECU side connector



19X0739

SDU side connector



19X0600

NOTE
The illustration shows the case where the SRS has been installed for the driver's seat. However, the indications are the same if the SRS has been installed for both the driver's and passenger's seats.

SRS SERVICE PRECAUTIONS

1. In order to avoid injury to yourself or others from accidental deployment of the air bag during servicing, read and carefully follow all the precautions and procedures described in this manual.
2. Do not use any electrical test equipment on or near SRS components, except those specified on basic manual.
   Never use an analog ohmmeter.
3. **Never attempt to repair the following components:**
   - SRS-ECU
   - Clock Spring
   - Air Bag Module
     (Driver's side or front passenger's side)

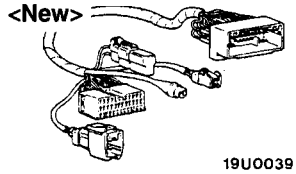
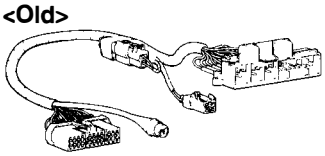
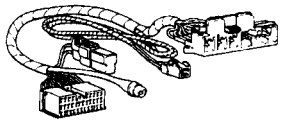
   If any of these components are diagnosed as faulty, they should only be replaced, in accordance with the INDIVIDUAL COMPONENTS SERVICE procedures in basic manual.
4. Do not attempt to repair the wiring harness connectors of the SRS. If any of the connectors are diagnosed as faulty, replace the wiring harness. If the wires are diagnosed as faulty, replace or repair the wiring harness according to the following table.

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

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 bags for a short time even after the battery has been disconnected, so serious injury may result from unintended air bag deployment if work is done on the SRS system immediately after the battery cables are disconnected.**
6. SRS components should not be subjected to heat over 93°C, so remove the front impact sensors, SRS diagnosis unit, air bag module and clock spring before drying or baking the vehicle after painting.
7. Whenever you finish servicing the SRS, check the SRS warning lamp operation to make sure that the system functions properly. (Refer to GALANT/GALANT HATCHBACK Workshop Manual (Pub. No. PWDE9211).)
8. Make certain that the ignition switch is OFF when the MUT-II is connected or disconnected.
9. If you have any questions about the SRS, please contact your local distributor.

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

SPECIAL TOOLS

Tool	Number	Name	Use
<New>  19U0039	MB991613	SRS Check Harness	• Checking the SRS electrical circuitry with a digital multi-meter (For both vehicles with driver's side air bag only and vehicles with both driver's side and front passenger's side air bags)
<Old> 	MB991349	SRS Check Harness	• Checking the SRS electrical circuitry with a digital multi-meter <Vehicles without front passenger's air bag>
<Old> 	MB991530	SRS Check Harness	• hecking the SRS electrical circuitry with a digital multi-meter <Vehicles with front passenger's air bag>

INSPECTION CHART FOR DIAGNOSIS CODES

Inspect according to the inspection chart that is appropriate for the malfunction code.

Code No.	Diagnosis item		Reference page
14	Analog G-sensor system in the SRS-ECU		52B-6
15, 16	Safing G-sensor system in the SRS-ECU		52B-6
21, 22, 61, 62	Driver's side air bag module (squib) system		52B-7
24, 25, 64, 65	Front passenger's side air bag module (squib)		52B-8
31, 32	SRS-ECU capacitor system		52B-9
34*	Connector lock system		52B-9
35	SRS-ECU (deployed air bag) system		52B-9
41*	IG_1 (A) power circuit system		52B-9
42*	IG_1 (B) power circuit system		52B-11
43	SRS warning lamp drive circuit system	Lamp does not illuminate*	52B-12
		Lamp does not switch off	52B-13
44	SRS warning lamp drive circuit system		52B-13
45	SRS-ECU non-volatile memory (EEPROM) and A/D converter system		52B-13
51, 52	Driver's side air bag module (squib ignition drive circuit) system		52B-14
54, 55	Front passenger's side air bag module (squib ignition drive circuit) system		52B-14

NOTE

(1)* If the vehicle condition returns to normal for a continuous period of 5 ± 0.2 seconds, the diagnosis code will be automatically erased, and the SRS warning lamp will return to normal.

(2) If the vehicle has a discharged battery it will store the fault codes 41 or 42. When these diagnosis codes are displayed, check the battery.

INSPECTION PROCEDURE CLASSIFIED BY DIAGNOSIS CODE

Code No. 14 Analog G-sensor system in the SRS-ECU	Probable cause
The SDU monitors the output of the analog G-sensor inside the SRS-ECU. It outputs this code when any of the following are detected. • When the analog G-sensor is not operating • When the characteristics of the analog G-sensor are abnormal • When the output from the analog G-sensor is abnormal	• Malfunction of SRS-ECU

Replace the SRS-ECU.

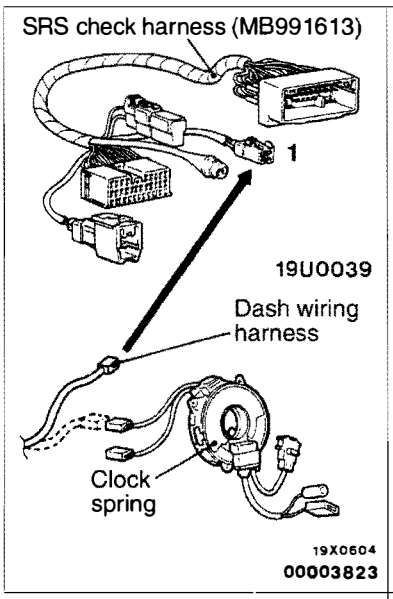
Code No.15 or 16 Safing G-sensor system in the SRS-ECU	Probable cause
This code is output if there is a short or open circuit between the terminals of the safing G-sensor inside the SRS-ECU. The trouble causes for each diagnosis code No. are as follows.	• Malfunction of SRS-ECU

Code No.	Trouble Symptom
15	Short circuit in the safing G-sensor
16	Open circuit in the safing G-sensor

Replace the SRS-ECU.

Code No. 21, 22, 61 or 62 Air bag module (driver's side squib) system	Probable cause
These diagnosis codes are output if there is abnormal resistance between the input terminals of the air bag module (driver's side squib). The trouble causes for each code No. are as follows.	• Malfunction of clock spring • Malfunction of harnesses or connectors • Malfunction of air bag module (driver's side squib) • Malfunction of SRS-ECU

Code No.	Trouble Symptom
21	• Short in air bag module (driver's side squib) or harness short • Short in clock spring
22	• Open circuit in air bag module (driver's side squib) or open harness • Open circuit in clock spring • Malfunction of connector contact
61	• Short in air bag module (driver's side squib) harness leading to the power supply
62	• Short in air bag module (driver's side squib) harness leading to the earth



MUT-II SELF DIAG. CODE
- Disconnect clock spring connector C-123
- Connect SRS check harness connector (1)
- Erase diagnosis code memory

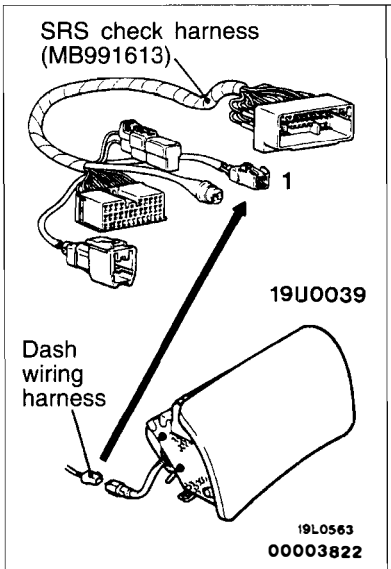
Are code Nos. 21, 22, 61 or 62 output?

Yes → **Check the following connectors:** C-123, C-131 — NG → **Repair**
OK ↓
Check trouble symptom.
NG ↓
Check the harness between the SRS-ECU and clock spring. — NG → **Repair**
OK ↓
Replace the SRS-ECU.

No ↓
Check the clock spring (Refer to P.52B-17.) — NG → **Repair**
OK ↓
Replace the driver's air bag module.

Code No. 24, 25, 64 or 65 Air bag module (front passenger's side squib) system <Vehicles with front passenger's air bag>	Probable cause
These diagnosis codes are output if there is abnormal resistance between the input terminals of the air bag module (front passenger's side squib). The trouble causes for each code No. are as follows.	• Malfunction of harnesses or connectors • Malfunction of air bag module (front passenger's side squib) • Malfunction of SRS-ECU

Code No.	Trouble Symptom
24	• Short in air bag module (front passenger's side squib) or harness short
25	• Open circuit in air bag module (front passenger's side squib) or open harness • Malfunction of connector contact
64	• Short in air bag module (front passenger's side squib) harness leading to the power supply
65	• Short in air bag module (front passenger's side squib) harness leading to the earth



MUT-II SELF DIAG. CODE
- Disconnect front passenger's air bag module connector C-145
- Connect SRS check harness connector (1).
- Erase diagnosis code memory.

Are code Nos. 24, 25, 64 or 65 output?

Yes → **Check the following connectors:** C-131, C-145 — NG → **Repair**

OK ↓

Check trouble symptom.

NG ↓

Check the harness between the front passenger's air bag module (squib) and SRS-ECU. — NG → **Repair**

OK ↓

Replace the SRS-ECU.

No ↓

Replace the front passenger's air bag module.

Code. No. 31 or 32 SRS-ECU capacitor system	Probable cause
These diagnosis codes are output if the voltage at the SRS-ECU capacitor terminals is higher (No. 31) or lower (No. 32) than the specified value for 5 seconds or more. However, if diagnosis code Nos. 41 and 42 are being output due to a drop in battery voltage, code No. 32 will not be detected.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

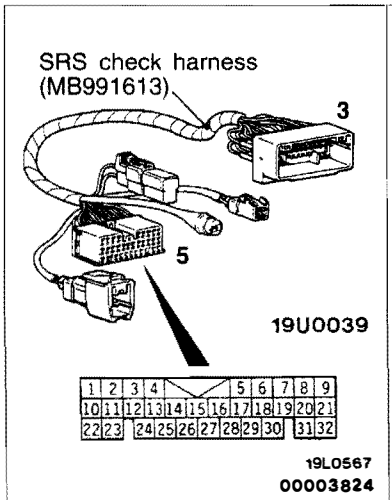
Code No. 34 Connector lock system	Probable cause
This diagnosis code is output if a poor connection of the SRS-ECU is detected. However, if the vehicle condition returns to normal, diagnosis code No. 34 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of connectors • Malfunction of SRS-ECU

Check the following connector.
C-131
NG → **Repair**
OK ↓
Replace the SRS-ECU.

Code No. 35 SRS-ECU (deployed air bag) system	Probable cause
This code is output after the air bag deploys. If this code is output before the air bag has deployed, the cause is probably a malfunction inside the SRS-ECU.	• Malfunction of SRS-ECU

Replace the SRS-ECU

Code No. 41 IG_1 (A) power circuit system	Probable cause
This diagnosis code is output if the voltage between the IG_1 (A) terminal and the earth is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnosis code No. 41 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of harnesses of connectors • Malfunction of SRS-ECU



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (20) – (21)

OK: Continuity

NG → **Check the following connector.** C-131 NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the SRS-ECU and earth, and repair if necessary.

OK ↓

Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector C-131.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Voltage between terminal (14) and body earth

OK: 9 V or more

NG → **Check the following connectors.** C-07, C-06 and C-25 NG → **Repair**

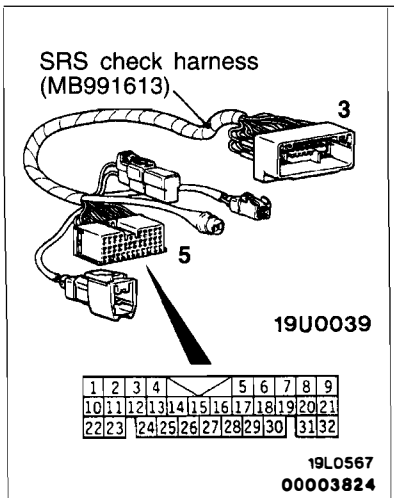
OK → Check trouble symptom.

NG → Check the harness between the SRS-ECU and ignition switch IG_1, and repair if necessary.

OK ↓

Replace the SRS-ECU

Code No. 42 IG_1 (B) power circuit system	Probable cause
This diagnosis code is output if the voltage between the IG_1 (B) terminal and the earth is lower than the specified value for a continuous period of 5 seconds or more. However, if the vehicle condition returns to normal, diagnosis code No. 42 will be automatically erased, and the SRS warning lamp will switch off.	• Malfunction of harnesses or connectors



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (20) – (21)
  OK: Continuity

NG → **Check the following connector.** C-131 → NG → **Repair**

OK → Check trouble symptom → NG → Check the harness between the SRS-ECU and earth, and repair if necessary.

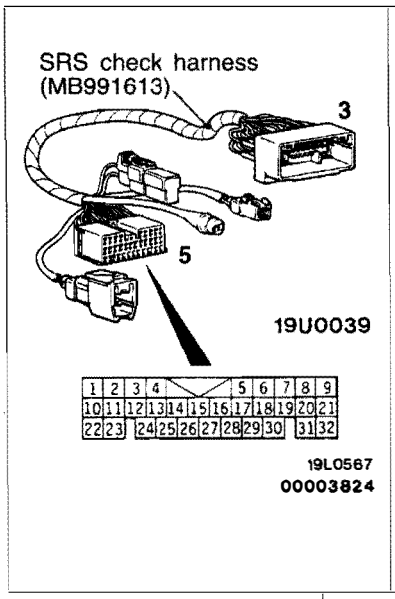
OK → Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector C-131.
- Connect SRS-ECU check harness connector (3).
- Ignition switch: ON
- Voltage between the terminal (13) and body earth.
  OK: 9 V or more

NG → **Check the following connectors.** C-07, C-14, C-17 and D-15 → NG → **Repair**

OK → Replace the SRS-ECU

OK → Check trouble symptom. → NG → Check the harness between the SRS-ECU and ignition switch IG_1, and repair if necessary.

Code No. 43 SRS warning lamp drive circuit system (Lamp does not illuminate.)	Probable cause
This diagnosis code is output when an open circuit occurs for a continuous period of 5 seconds while the SRS-ECU in monitoring the SRS warning lamp and the lamp is OFF (transistor OFF). However, if this code is output due to an open circuit, if the vehicle condition returns to normal, this diagnosis code No. 43 will be automatically erased, and the SRS warning lamp will return to normal.	• Malfunction of harnesses or connectors • Blown bulb • Malfunction of SRS-ECU • Malfunction of combination meter



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (20) – (21)

OK: Continuity

NG → **Check the following connector.** C-131 NG → **Repair**

OK → Check trouble symptom

NG → Check the harness between the SRS-ECU and earth, and repair if necessary.

OK → Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connect C-131.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Connect terminal (15) to the body earth.

OK: Lamp illuminates

NG → Blown bulb inspection NG → **Repair**

OK → **Check the following connectors.** D-15, D-02, D-03, C-17*, C-07 and C-14 NG → **Repair**

OK → Check trouble symptom.

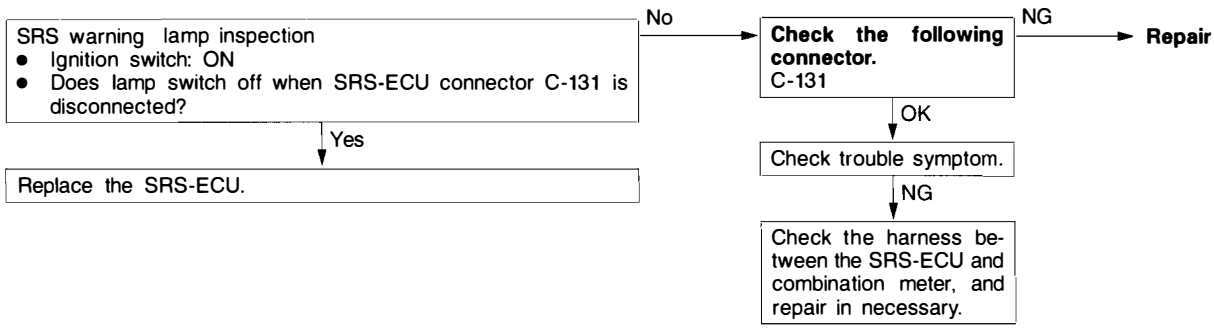
NG → Check the harness between the SRS-ECU and ignition switch (IG1). NG → **Repair**

OK → Replace the combination meter.

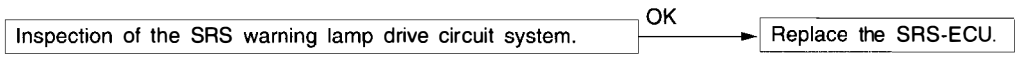
OK → Replace the SRS-ECU.

NOTE
*: RH drive vehicle.

Code No. 43 SRS warning lamp drive circuit system (Lamp does not switch off.)	Probable cause
This diagnosis code is output when a short to earth occurs in the harness between the lamp and the SRS-ECU while the SRS-ECU is monitoring the SRS warning lamp and the lamp is ON.	• Malfunction of harnesses or connectors • Malfunction of SRS-ECU • Malfunction of combination meter



Code No. 44 SRS warning lamp drive circuit system	Probable cause
This diagnosis code is output when a short occurs in the lamp drive circuit or a malfunction of the output transistor inside the SRS-ECU is detected while the SRS-ECU is monitoring the SRS warning lamp drive circuit.	• Malfunction of harnesses or connectors • Malfunction of SRS-ECU



Code No. 45 SRS-ECU non-volatile memory (EEPROM) and A/D converter system	Probable cause
This diagnosis code is output if there is a malfunction in the SRS-ECU non-volatile memory (EEPROM) or A/D converter.	• Malfunction of SRS-ECU

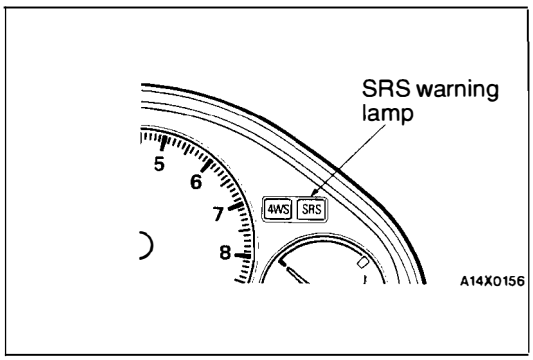
Replace the SRS-ECU.

Code No. 51 or 52 Driver's side air bag module (squib ignition drive circuit) system	Probable cause
This code output if a short (No. 51) or an open circuit (No. 52) is detected in the circuit for the driver's seat.	• Malfunction of SRS-ECU

Replace the SRS-ECU.

Code No. 54 or 55 Front passenger's side air bag module (squib ignition drive circuit) system	Probable cause
This code is output if a short (No. 54) or open circuit (No. 55) is detected in the circuit for the passenger's seat.	• Malfunction of SRS-ECU

Replace the SRS-ECU.



SRS WARNING LAMP INSPECTION

1. Check to be sure that the SRS warning lamp illuminates when the ignition switch is in the ON position.
2. Check to be sure that it illuminates for approximately 7 seconds and then switches off.
3. If the above is not the case, inspect the diagnosis codes.

INSPECTION CHART FOR TROUBLE SYMPTOMS

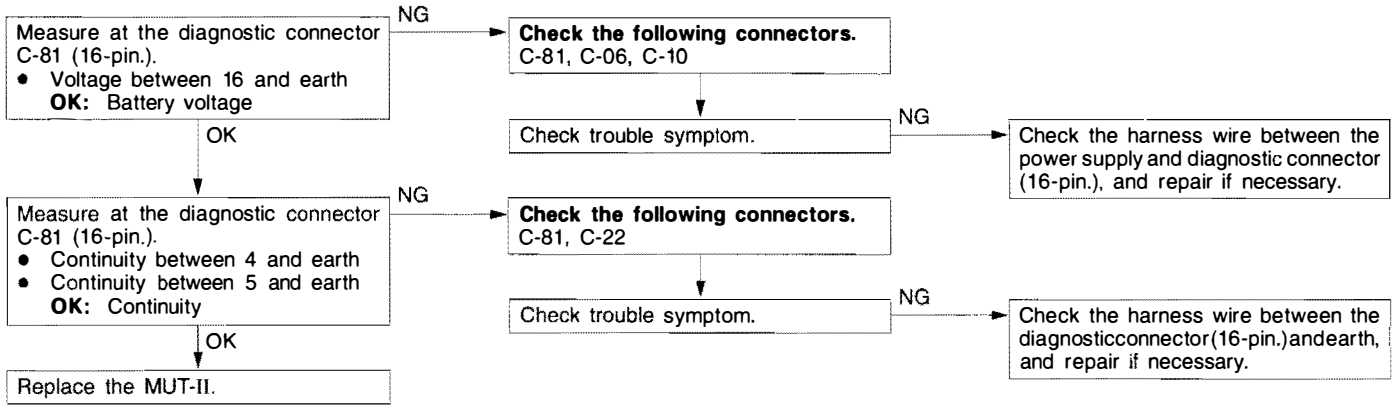
Get an understanding of the trouble symptoms and check according to the inspection procedure chart.

Trouble symptom		Inspection Procedure No.	Reference page
Communication with MUT-II is not possible.	Communication with all systems is not possible.	1	52B-15
	Communication is not possible with SRS only	2	52B-16
When the ignition key is turned to "ON" (engine stopped), the SRS warning lamp does not illuminate.		Refer to diagnosis code No. 43.	52B-13
After the ignition switch is turned to ON, the SRS warning lamp is still on after approximately 7 seconds have passed.		Refer to diagnosis code No. 43.	52B-13

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

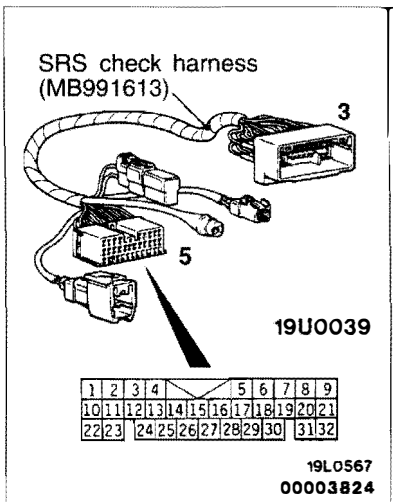
Inspection Procedure 1

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



Inspection Procedure 2

Communication with MUT-II is not possible. (Communication is not possible with SRS only)	Probable cause
If communication is not possible with the SRS only, the cause is probably an open circuit in the diagnosis output circuit of the SRS or in the power circuit (including earth circuit).	• Malfunction of harnesses or connectors • Malfunction of SRS-ECU



Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector C-131.
- Connect SRS check harness connector (3)
- Continuity between terminals (20) – (21)
  OK: Continuity

NG → **Check the following connector.** C-131 → NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the SRS-ECU and earth, and repair if necessary.

OK → Measure at SRS check harness connector (5).
- Disconnect SRS-ECU connector C-131.
- Connect SRS check harness connector (3).
- Ignition switch: ON
- Voltage between the terminal (13) and body earth.
  OK: 9 V or more
- Voltage between the terminal (14) and body earth
  OK: 9 V or more

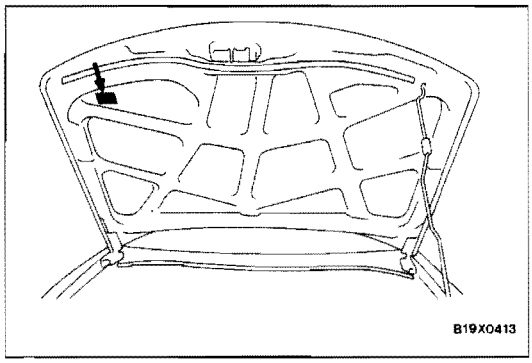
NG → **Check the following connectors.** D-15, C-07, C-06, C-14, C-17 and C-25 → NG → **Repair**

OK → Check trouble symptom.

NG → Check the harness between the SRS-ECU and ignition switch IG_1 or ignition switch IG_1 (B), and repair if necessary.

OK → Check the harness between the SRS-ECU and diagnosis connector. → NG → **Repair**

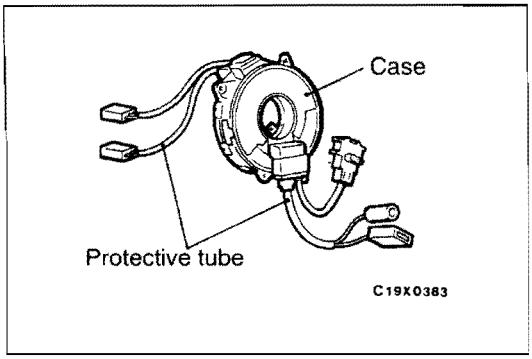
OK → Replace the SRS-ECU.



WARNING/CAUTION LABELS

FOOD

Caution label inside the hood panel has been abolished to correspond to abolition of front impact sensor.

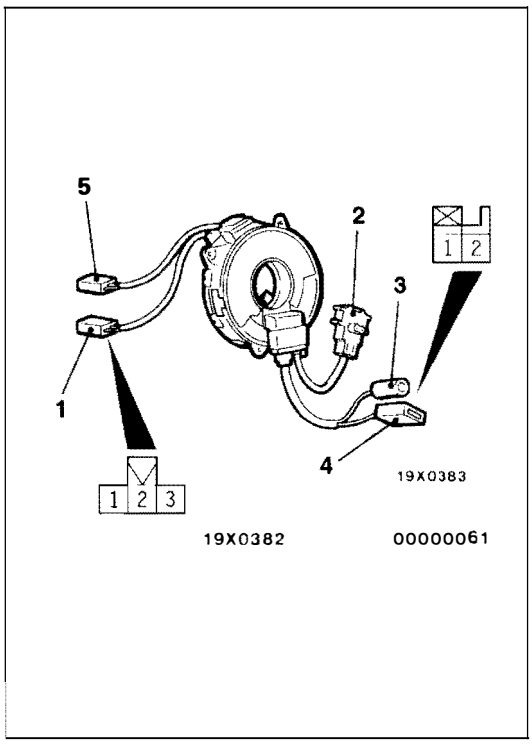


CLOCK SPRING

INSPECTION

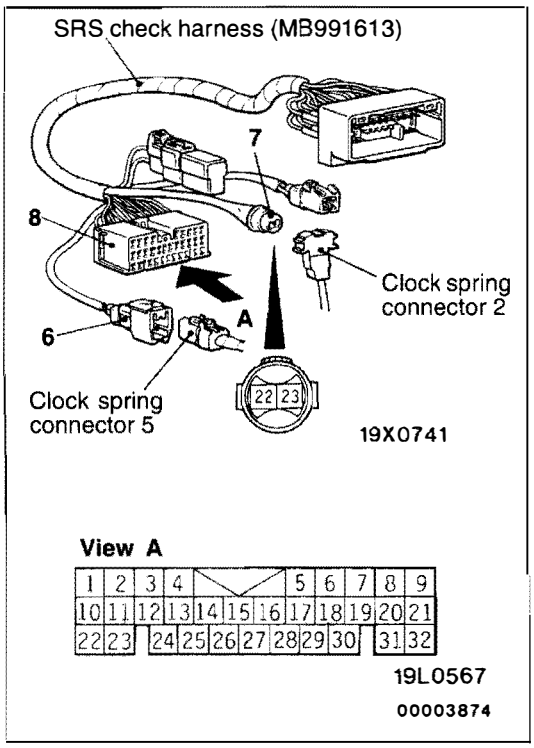
CLOCK SPRING

(1) Check connectors and protective tube for damage, and terminals for deformation.
(2) Visually check the case for damage.



(3) Check for continuity between the No. 1 connector of the clock spring and connectors No. 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 the resistance between the terminals.
   a. Joint the No. 2 connector and No. 5 connector of the clock spring to connector No. 7 and connector No. 6, respectively, of the SRS check hamess.

      NOTE
      When joining SRS Check Harness connector No. 7 align its white paint with the hollow portion of the No. 2 connector of the clock spring.

   b. Check for continuity between terminal 22 and terminal 25, and terminal 23 and terminal 24, of SRS Check Harness connector No. 8, using a digital multi-meter.

      Standard value: Less than 0.4 Ω

GROUP 54
CHASSIS ELECTRICAL

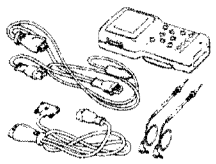
GENERAL

OUTLINE OF CHANGE

- Immobilizer system has been established as an option.

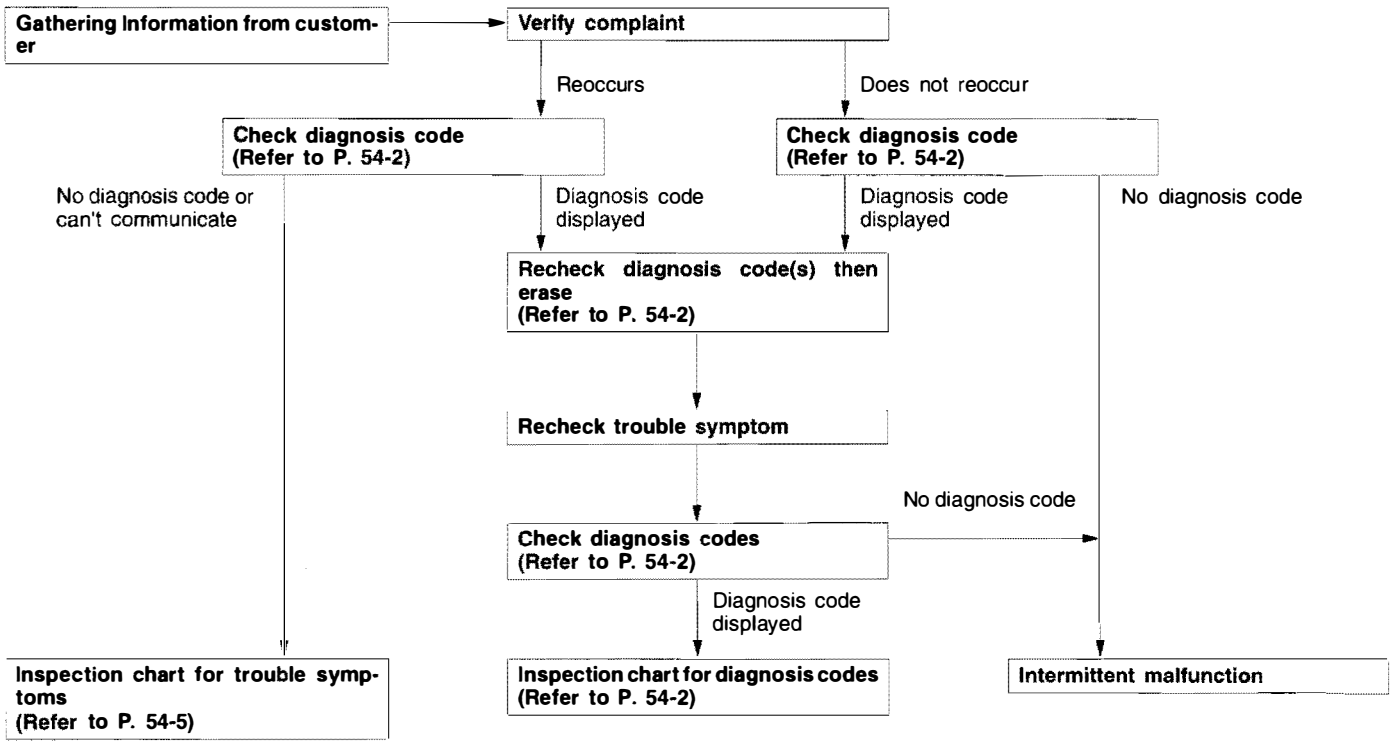
IGNITION SWITCH AND IMMOBILIZER SYSTEM

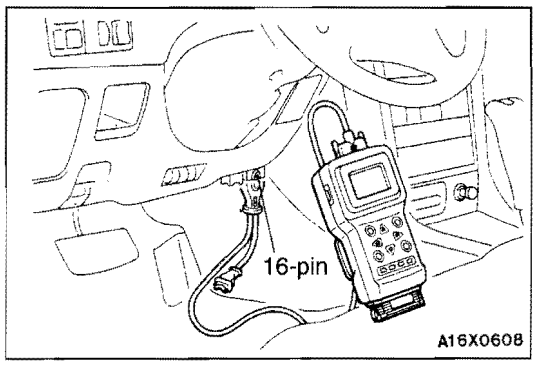
SPECIAL TOOL

Tool	Number	Name	Use
	MB991502	MUT-II sub assembly	• Immobilizer system check (Diagnosis display using the MUT-II) • Registration of the ID code

TROUBLESHOOTING <PETROL-POWERED VEHICLES>

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING





DIAGNOSIS FUNCTION

DIAGNOSIS CODES CHECK

Connect the MUT-II to the diagnosis connector (16-pin) at the lower of the instrument under cover, then check diagnostic codes.

ERASING DIAGNOSIS CODES

Connect the MUT-II to the diagnosis connector (16-pin) then erase the diagnosis codes.

Caution

- **The diagnosis codes which result from disconnecting the battery cables cannot be erased.**

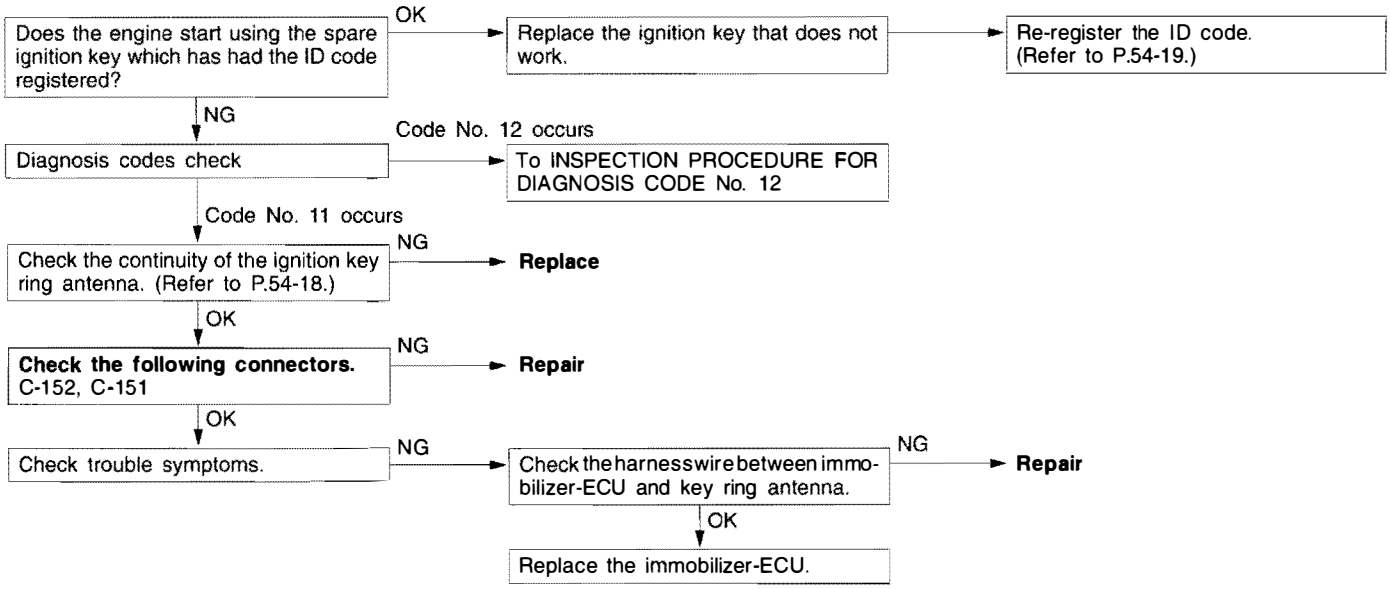
INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code No.	Inspection items	Reference page
11	Transponder communication system	54-3
12*	ID code are not the same or are not registered	54-3
21	Communication system between MUT-II and engine-ECU	54-4
31	EEPROM abnormality inside immobilizer-ECU	54-4
32	Ignition switch IG signal circuit system	54-5

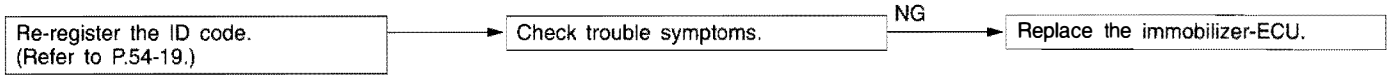
NOTE
*: Diagnosis code No. 12 is not recorded.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

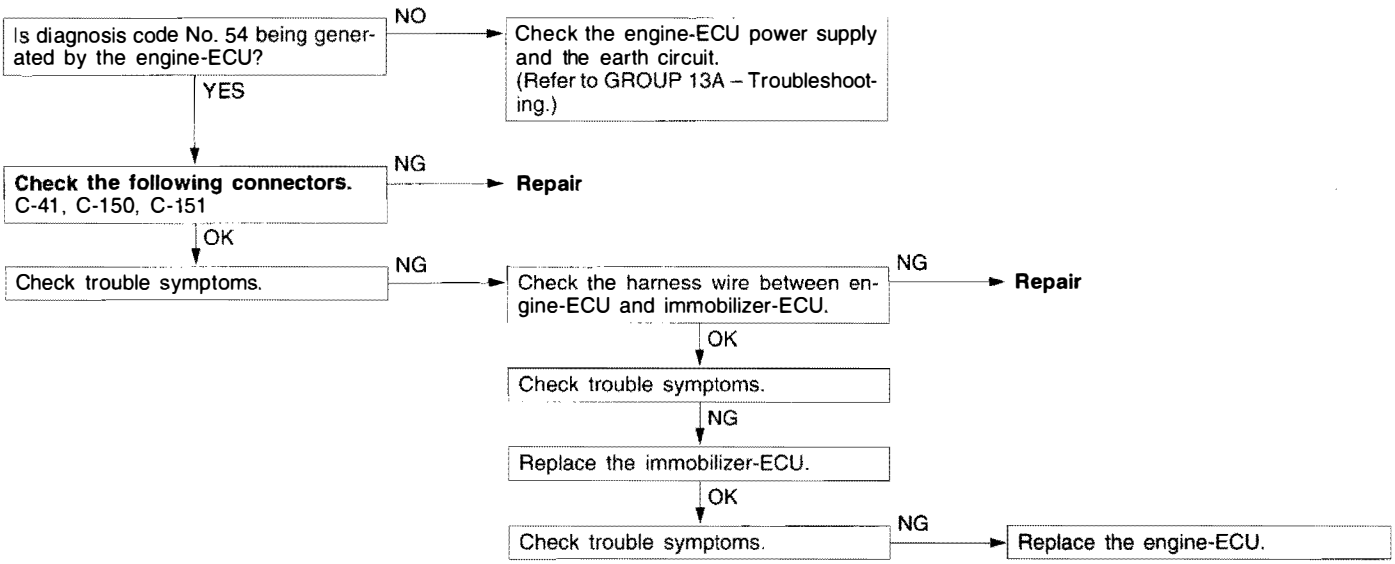
Code No. 11 Transponder communication system	Probable cause
The ID code of the transponder is not sent to the immobilizer-ECU immediately after the ignition switch is turned to the ON position.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



Code No. 12 ID code are not the same or are not registered	Probable cause
The ID code which is sent from the transponder is not the same as the ID code which is registered in the immobilizer-ECU.	• The ID code in the ignition key being used has not been properly registered. • Malfunction of the immobilizer-ECU

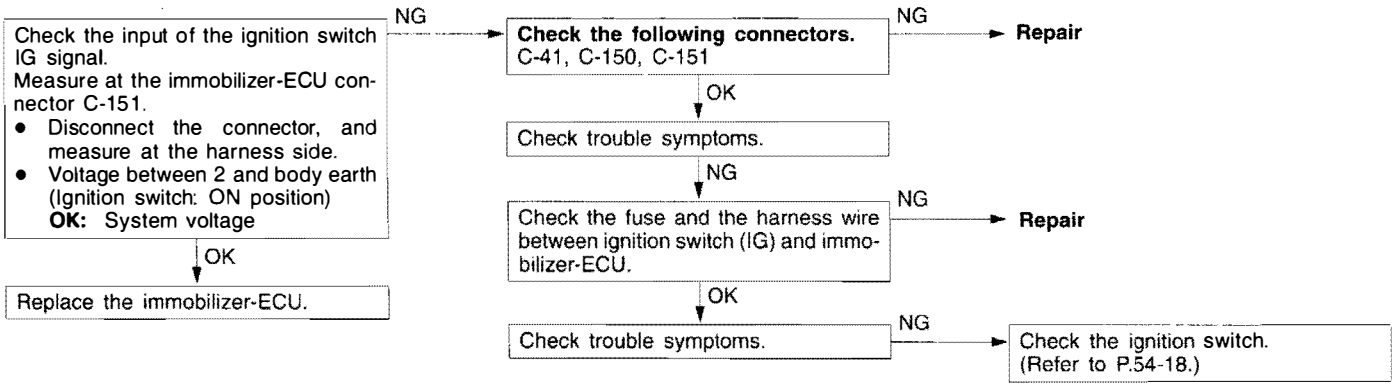


Code No. 21 Communication system between MUT-II and engine-ECU	Probable cause
After the ignition switch is turned to the ON position, the confirmation code is not received from the engine-ECU within the allowable time, or an abnormal code is received.	• Malfunction of harness or connector • Malfunction of the engine-ECU • Malfunction of the immobilizer-ECU



Code No. 31 EEPROM abnormality inside immobilizer-ECU	Probable cause
No data has been written to the EEPROM inside the immobilizer-ECU.	• Malfunction of the immobilizer-ECU

Code No. 32 Ignition switch IG signal circuit system	Probable cause
The ignition switch signal is not being input to the immobilizer-ECU.	• Malfunction of harness or connector • Malfunction of the ignition switch • Malfunction of the immobilizer-ECU



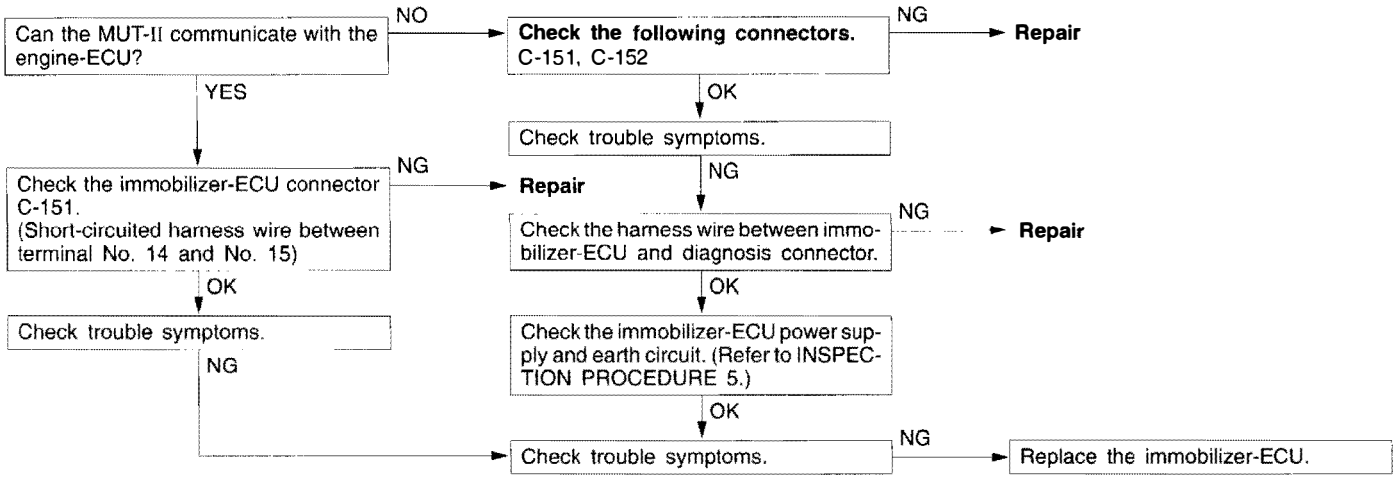
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure No.	Reference page
Communication with MUT-II is impossible.	1	54-6
Diagnosis code No. 54 has been generated by the engine-ECU.	2	54-7
ID code cannot be registered using the MUT-II.	3	54-7
Engine does not start (Cranking but no initial combustion).	4	54-8
Malfunction of the immobilizer-ECU power supply and earth circuit	5	54-9

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

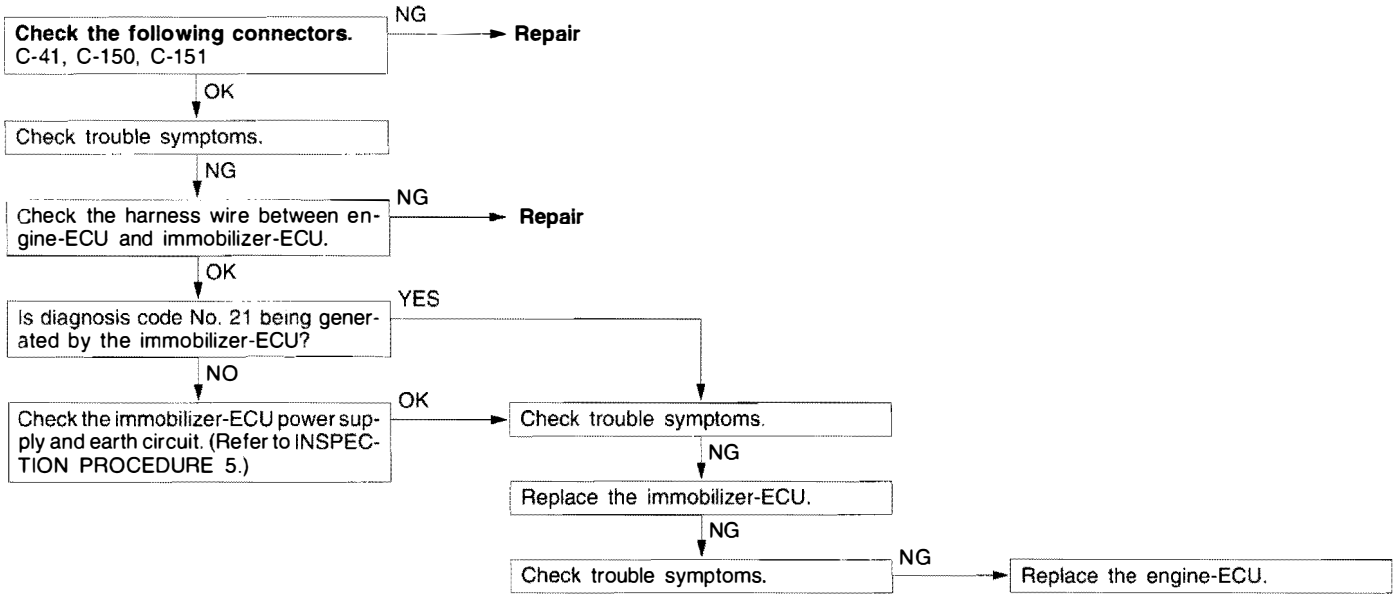
Inspection Procedure 1

Communication with MUT-II is impossible.	Probable cause
The cause is probably that a malfunction of the diagnosis line or the immobilizer-ECU is not functioning.	• Malfunction of the diagnosis line • Malfunction of harness or connector • Malfunction of the immobilizer



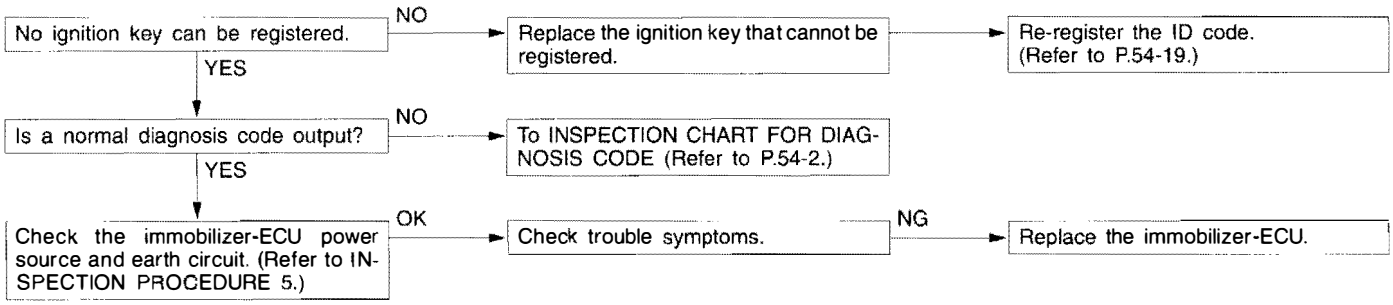
Inspection Procedure 2

Diagnosis code No. 54 has been generated by the engine-ECU.	Probable cause
There is a problem with communication between the engine-ECU and the immobilizer-ECU.	• Malfunction of harness or connector • Malfunction of the immobilizer-ECU • Malfunction of the engine-ECU



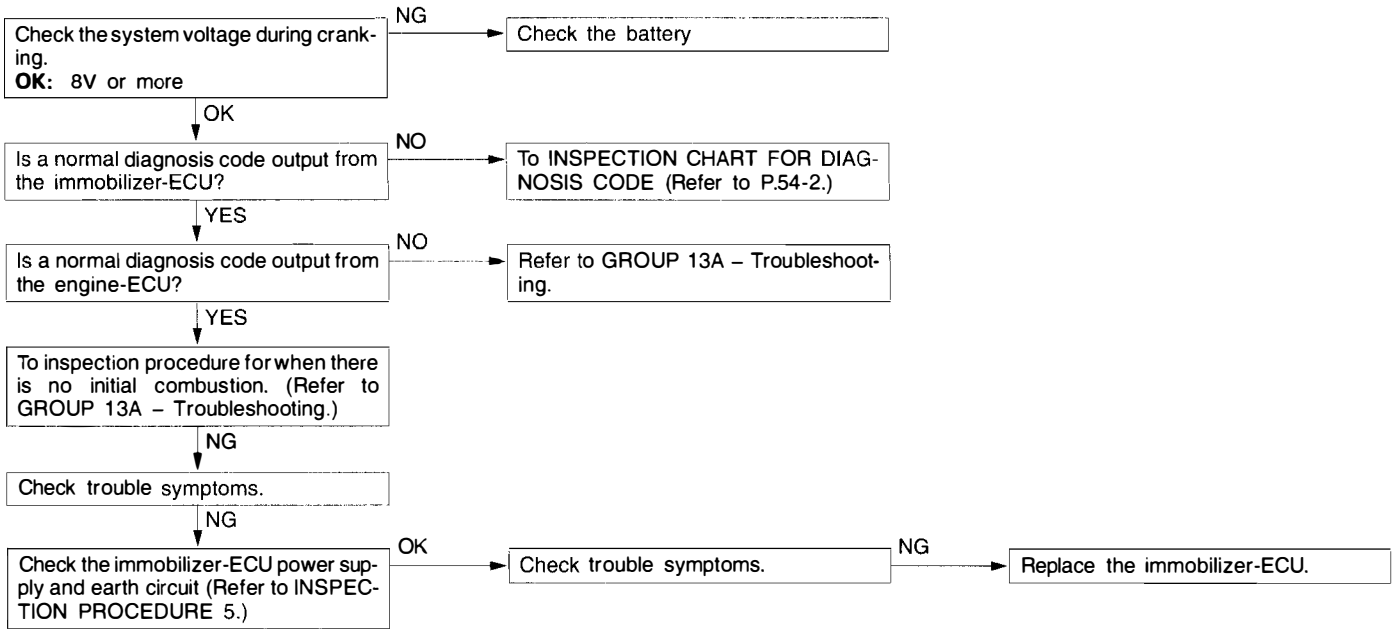
Inspection Procedure 3

ID code cannot be registered using the MUT-II.	Probable cause
The cause is probably that there is no ID code registered in the immobilizer-ECU, or there is a malfunction of the immobilizer-ECU.	• Malfunction of the transponder • Malfunction of the ignition key ring antenna • Malfunction of harness or connector • Malfunction of the immobilizer-ECU



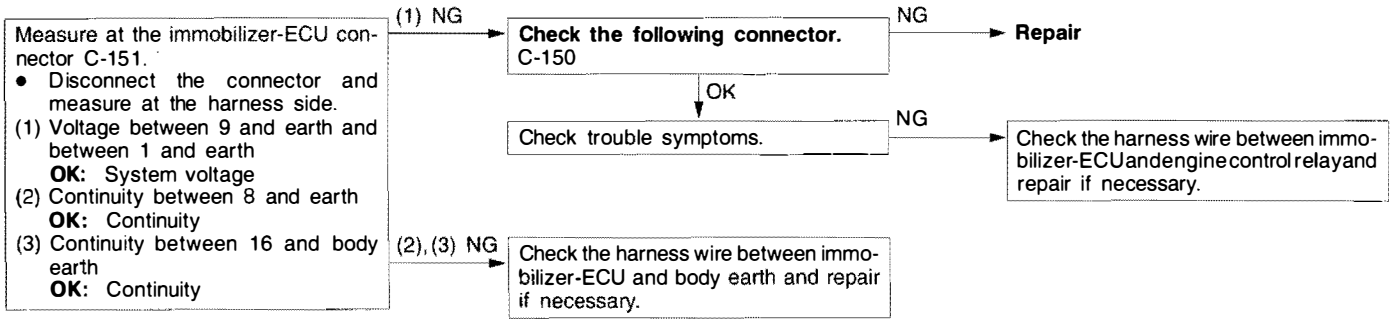
Inspection Procedure 4

Engine does not start (cranking but no initial combustion).	Probable cause
If the fuel injectors are not operating, there might be a problem with the MPI system in addition to a malfunction of the immobilizer system. It is normal for this to occur if an attempt is made to start the engine using a key that has not been properly registered.	• Malfunction of the MPI system • Malfunction of the immobilizer-ECU



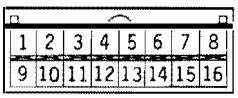
Inspection Procedure 5

Malfunction of the immobilizer-ECU power supply and earth circuit



CHECK AT IMMOBILIZER-ECU

TERMINAL VOLTAGE CHECK CHART



16W0390

Terminal No.	Signal	Check requirements	Terminal voltage
1	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
2	Ignition switch-IG	Ignition switch: OFF	0V
		Ignition switch: ON	System voltage
8	Immobilizer-ECU earth	–	0V
9	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
16	Immobilizer-ECU earth	–	0V

TROUBLESHOOTING <DIESEL-POWERED VEHICLES>

STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING

Refer to 54-1.

Caution
- **If the immobilizer ECU has been replaced, you will need to re-register the ignition key ID codes and to reset the code for the fuel cut valve ECU to the factory setting.**
- **If the fuel cut valve ECU has been replaced with another ECU that is not anew part, you will need to re-register the ignition key ID codes and to reset the code for the fuel cut valve ECU to the factory setting.**

DIAGNOSIS FUNCTION

Refer to 54-2.

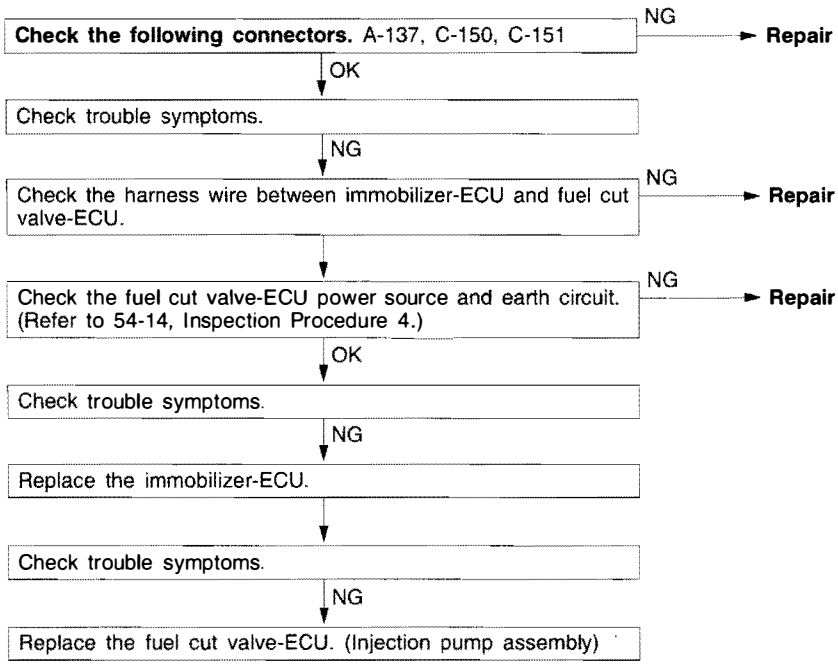
INSPECTION CHART FOR DIAGNOSIS CODES

Diagnosis code	Inspection items	Reference page
11	Transponder communication system	54-3
12*	ID codes are not the same or are not registered.	54-3
21	Communication system between fuel cut valve-ECU and immobilizer-ECU	54-11
22	Fuel cut valve-ECU system	54-12
23	Starting permission codes are not identical	54-12
31	EEPROM abnormality inside the immobilizer-ECU	54-4

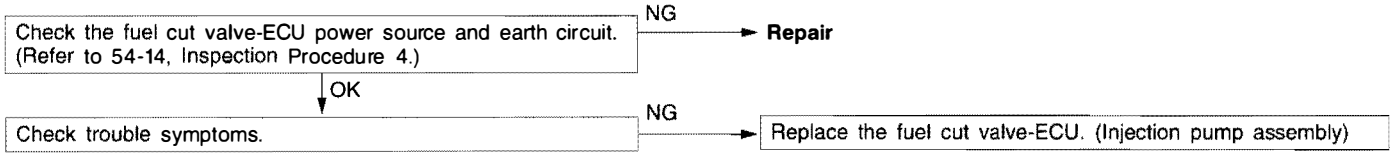
NOTE
*: Diagnosis code No. 12 is not recorded.

INSPECTION PROCEDURE FOR DIAGNOSIS CODES

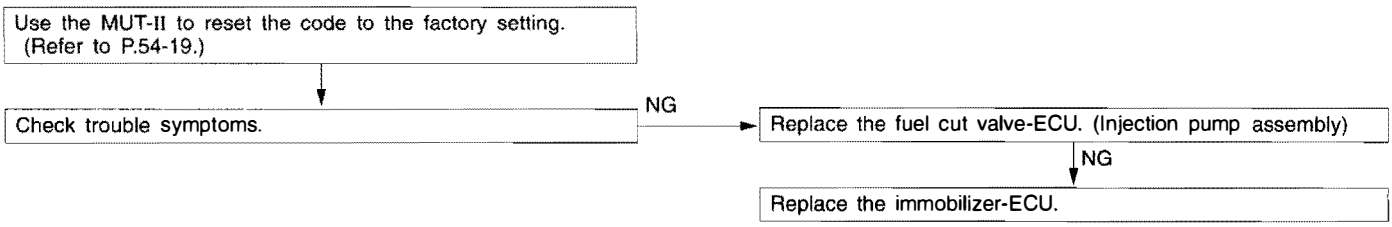
Code No. 21 Communication system between fuel cut valve-ECU and immobilizer-ECU	Probable cause
The confirmation code is not sent from the fuel cut valve ECU within the specified time after the ignition key is turned to ON, or an incorrect code is sent.	• Open or short communication line, poor contact of connector • Malfunction of fuel cut valve-ECU • Malfunction of immobilizer-ECU



Code No. 22 Fuel cut valve-ECU system	Probable cause
The immobilizer-ECU is receiving an abnormal signal from the fuel cut valve ECU.	• Malfunction of fuel cut valve-ECU



Code No. 23 Starting permission codes are not identical	Probable cause
The starting permission code received from the immobilizer-ECU is not identical to the starting permission code that has been recorded in the fuel cut valve ECU.	• Resetting the code to the factory setting is not made using the MUT-II. • Malfunction of fuel cut valve-ECU



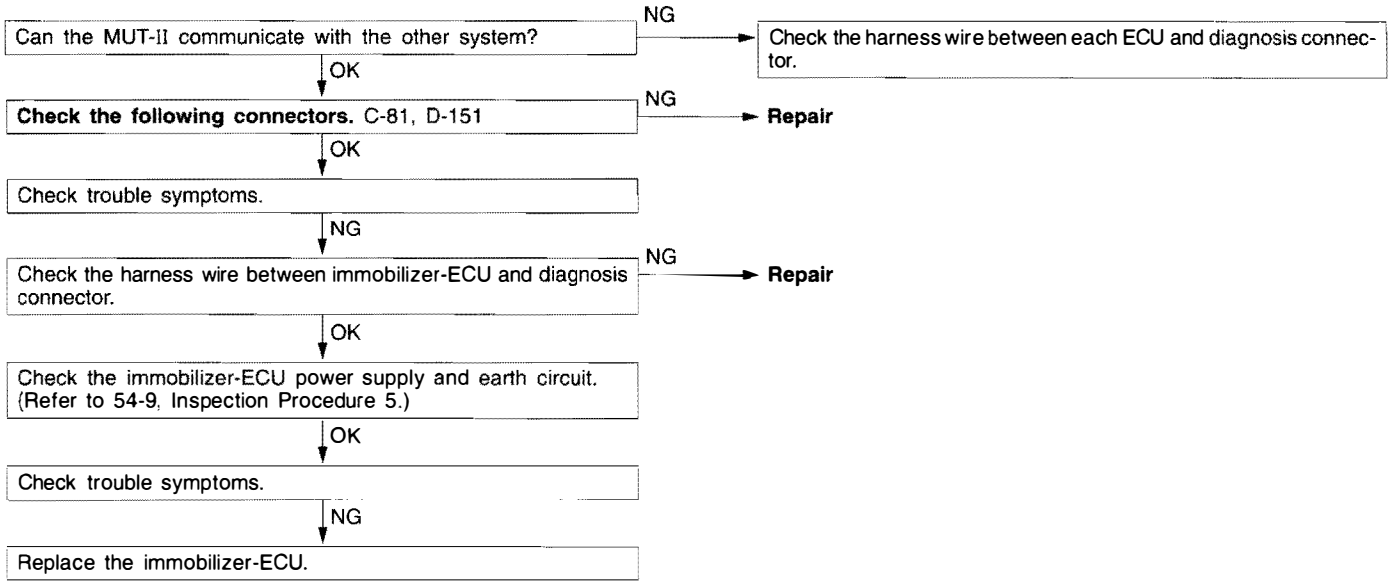
INSPECTION CHART FOR TROUBLE SYMPTOMS

Trouble symptom	Inspection procedure	Reference page
Communication with MUT-II is impossible.	1	54-13
ID code cannot be registered using the MUT-II.	2	54-7
Engine does not start. (Cranking but no initial combustion)	3	54-14
Fuel cut valve-ECU power supply and earth circuit	4	54-14

INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS

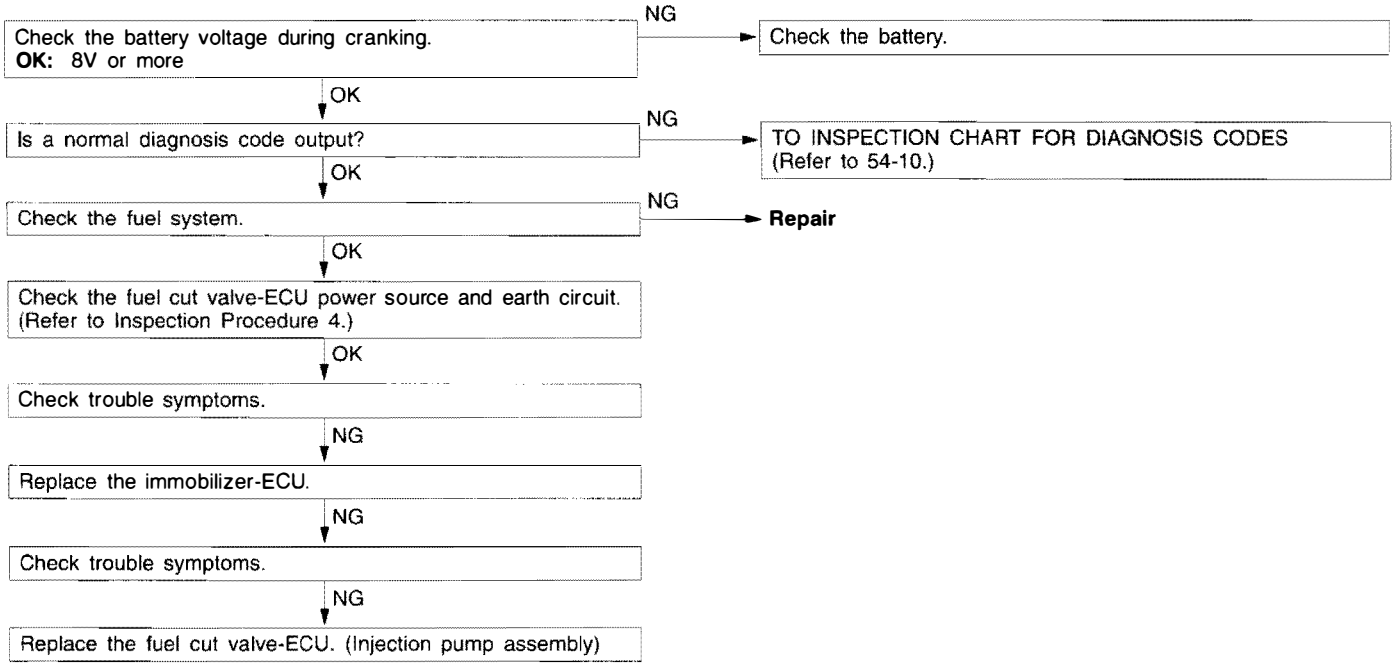
Inspection procedure 1

Communication with MUT-II is impossible.	Probable cause
The cause is probably that a malfunction of the diagnosis line or the immobilizer-ECU is not functioning.	• Malfunction of connector • Malfunction of diagnosis line • Malfunction of immobilizer-ECU power source • Malfunction of immobilizer-ECU



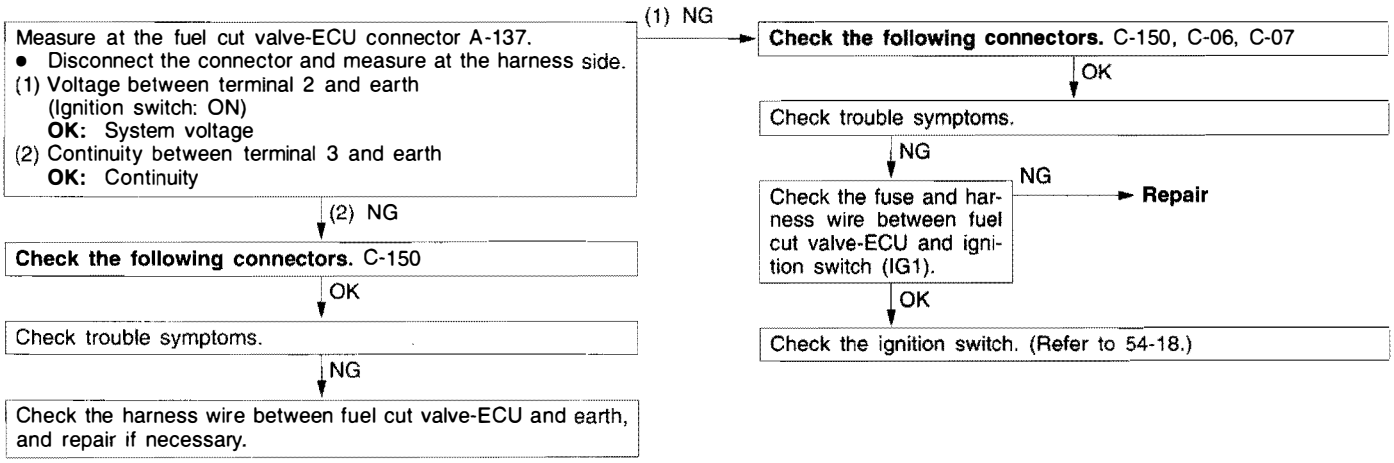
Inspection procedure 3

Engine does not start. (Cranking but no initial combustion)	Probable cause
If the fuel injectors are not operating, there might be a problem with the fuel system in addition to a malfunction of the immobilizer system.It is normal for this to occur if an attempt is made to start the engine using the key that has not been properly registered.	• Malfunction of fuel system • Malfunction of immobilizer system



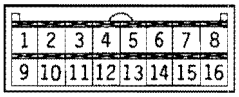
Inspection procedure 4

Fuel cut valve-ECU power supply and earth circuit



CHECK AT IMMOBILIZER-ECU

TERMINAL VOLTAGE CHECK CHART



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Terminal No.	Signal	Check requirements	Terminal voltage
1	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
2	Ignition switch-IG	Ignition switch: OFF	0V
		Ignition switch: ON	System voltage
8	Immobilizer-ECU earth	–	0V
9	Immobilizer-ECU power supply	Ignition switch: ON	System voltage
16	Immobilizer-ECU earth	–	0V

IGNITION SWITCH AND IMMOBILIZER-ECU

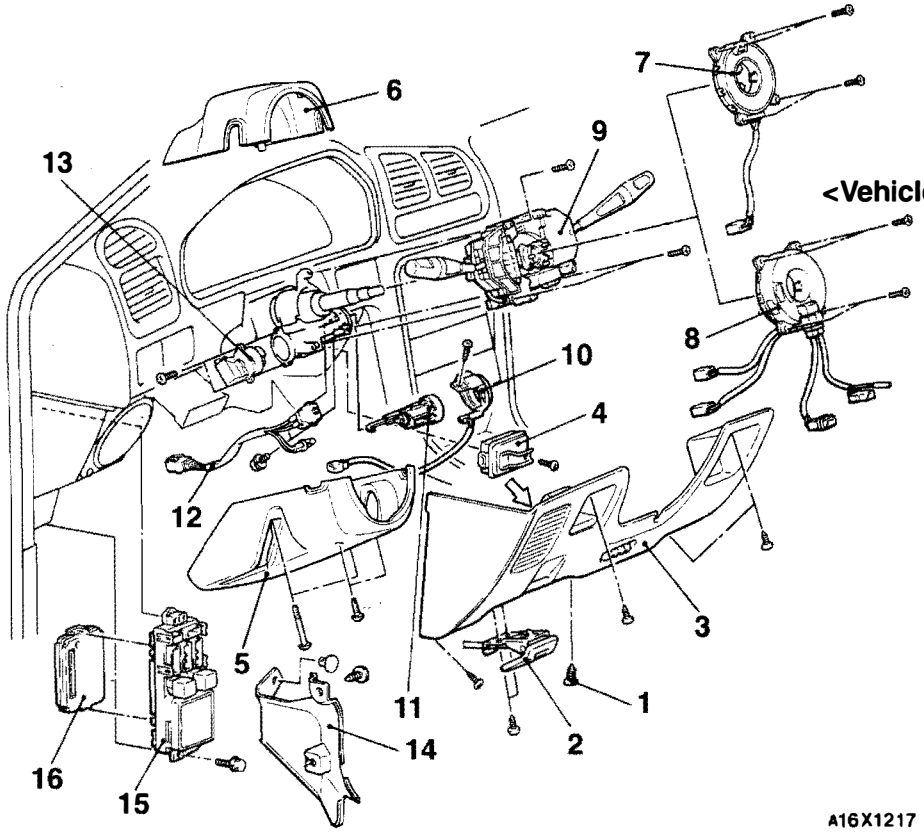
REMOVAL AND INSTALLATION

<LH drive vehicles>

CAUTION: SRS
Before removal of air bag module and clock spring, refer to GROUP 52B – SRS Service Precautions and Air Bag Module and Clock Spring.

<Vehicles with auto-cruise control system>

<Vehicles with SRS>



NOTE
The ⇦ mark indicates the sheet metal clip position.

Steering lock cylinder and immobilizer-ECU removal steps

- Steering wheel
1. Clip
2. Hood lock release handle
3. Instrument under cover
4. Immobilizer-ECU
5. Column cover lower
6. Column cover upper
7. Slip ring <Vehicles with auto-cruise control system>
8. Clock spring <Vehicles with SRS>
9. Column switch
10. Ignition key illumination ring or ring antenna.

◀A▶ 11. Steering lock cylinder

Key reminder switch or key hole illumination lamp removal steps

4. Column cover lower
5. Column cover upper
6. Key reminder switch or key hole illumination lamp

Ignition switch removal steps

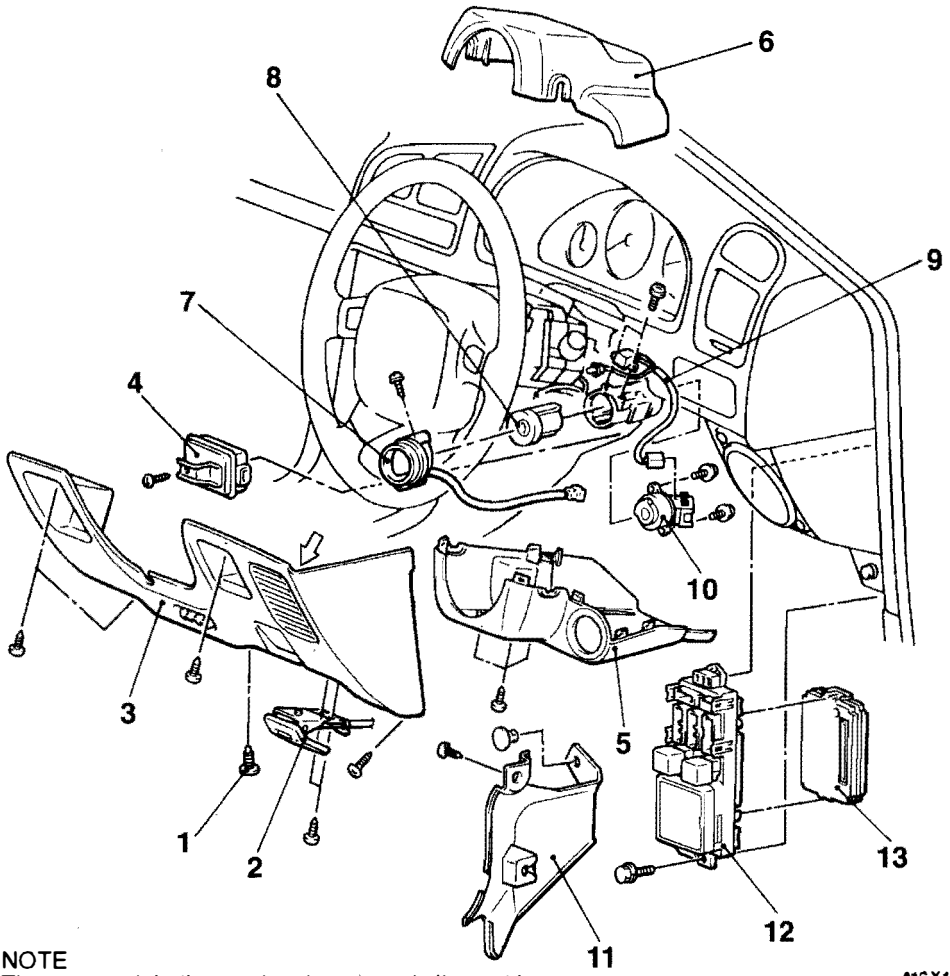
4. Column cover lower
5. Column cover upper
13. Ignition switch

BUZZER-ECU or ETACS-ECU removal steps

14. Cowl side trim (LH)
15. Junction block
16. BUZZER-ECU or ETACS-ECU

NOTE
Removal service points are the same as before.

<R.H. drive vehicles>



NOTE
The ⇦ mark indicates the sheet metal clip position.

A16X1218

Steering lock cylinder and immobilizer-ECU removal steps

1. Clip
2. Hood lock release handle
3. Instrument under cover
4. Immobilizer-ECU
5. Column cover lower
6. Column cover upper
7. Ignition key illumination ring or ring antenna

◀A▶ 8. Steering lock cylinder

Key reminder switch or key hole illumination lamp removal steps

1. Clip
2. Hood lock release handle
3. Instrument under cover
5. Column cover lower
6. Column cover upper
9. Key reminder switch or key hole illumination lamp

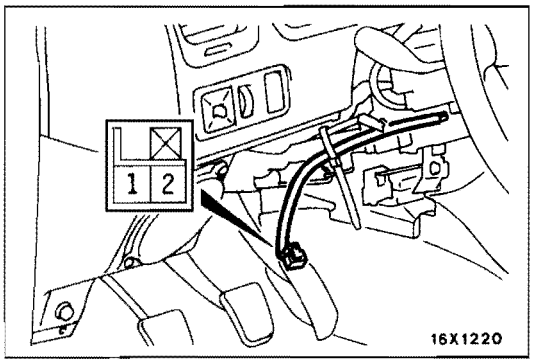
Ignition switch removal steps

1. Clip
2. Hood lock release handle
3. Instrument under cover
5. Column cover lower
6. Column cover upper
10. Ignition switch

BUZZER-ECU or ETACS-ECU removal steps

11. Cowl side trim (RH)
12. Junction block
13. BUZZER-ECU or ETACS-ECU

NOTE
Removal service points are the same as before.



INSPECTION

Inspections for other components except following are the same as before.

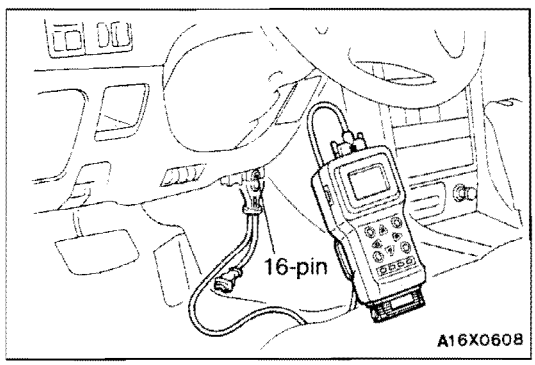
IGNITION KEY RING ANTENNA CONTINUITY CHECK

Use a circuit tester to check the continuity between the terminals.

ID CODE REGISTRATION METHOD

If using an ignition key that has just been newly purchased, or if the immobilizer-ECU has been replaced, you will need to register the ID codes for each ignition key being used into the immobilizer-ECU. (A maximum of eight different ID codes can be registered.)
Moreover, when the immobilizer-ECU has been replaced, you will need to use the MUT-II to register the ID number that the user specifies into the immobilizer-ECU. (Refer to the MUT-II instruction manual for instructions on using the MUT-II.)

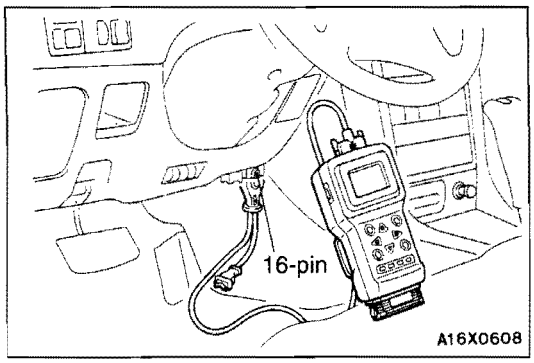
Caution
Because registering or the ID codes is carried out after all previously-registered codes have been erased, you should have ready all of the ignition keys that have already been registered.



(1) Connect the MUT-II to the diagnosis connector.

Caution
Connection and disconnection of the MUT-II should always be carried out with the ignition switch in the OFF position.

(2) Use the ignition key that is to be registered to turn the ignition switch to the ON position.
(3) Use the MUT-II to register the ID code. If you are registering two or more codes, use the next key to be registered to turn the ignition switch to the ON position without disconnecting the MUT-II.
(4) Disconnect the MUT-II. This completes the registration operation.



RESETTING THE CODE TO THE FACTORY SETTING <DIESEL-POWERED VEHICLES>

If the immobilizer-ECU in diesel-powered vehicles is replaced, it is necessary to reset the factory code that has been recorded in the fuel cut valve ECU to make starting possible at all times, in addition to re-registering the ignition key ID code. This is also necessary if the fuel cut valve ECU has been replaced with another ECU that is not a new part.

NOTE
It is necessary to re-register the ignition key ID code and to reset the factory code, but it does not matter which one is done first.

(1) Connect the MUT-II to the diagnosis connector.

Caution
Connection and disconnection of the MUT-II should always be carried out with the ignition switch in the OFF position.

(2) Turn the ignition switch to the ON position.
(3) Use the MUT-II to reset the factory code.

NOTE
It takes a total of approximately 16 minutes for the factory code to be reset.

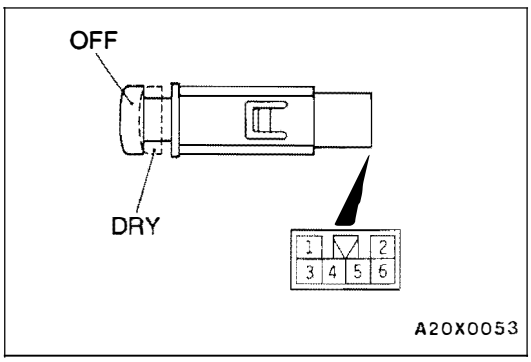
GROUP 55
HEATER, AIR CONDITIONER AND VENTILATION

GENERAL

OUTLINE OF CHANGE

The following changes have been made to the manual A/C.

- The economy mode setting has been removed from the A/C switch, and service points of inspection for the A/C switch have been changed.
- The auto compressor ECU has been changed to correspond to the abolition of economy mode.



INSIDE/OUTSIDE AIR CHANGEOVER SWITCH AND AIR CONDITIONING SWITCH

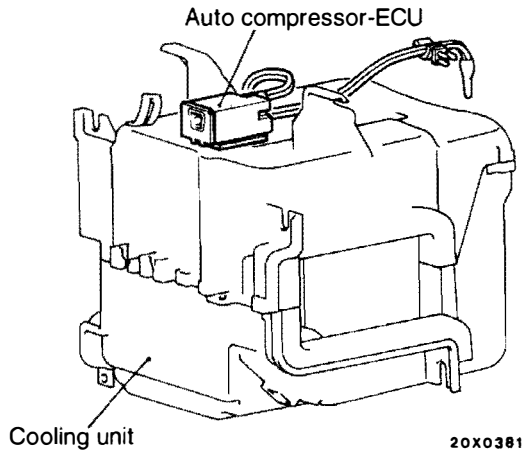
INSPECTION

A/C SWITCH CONTINUITY CHECK

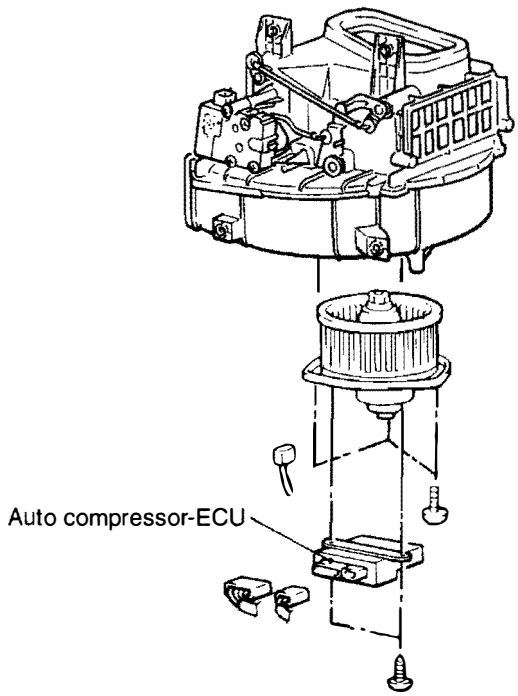
Switch position	Terminal No.							
	1	2	4		5	3		6
OFF								
DRY	○—○			IND			ILL	
		○		○	○	○	○	○

AUTO COMPRESSOR-ECU

<New>



<Old>



INSPECTION AT THE AUTO COMPRESSOR-ECU TERMINAL

Terminal No.	Signal	Check requirements	Terminal voltage
1	A/C compressor relay	When the compressor ON conditions are satisfied	System voltage
2	Auto compressor-ECU power supply (DRY mode)	When the ignition switch and the blower switch are ON, and the A/C switch has been turned to the second level	System voltage
3	Auto compressor-ECU earth	–	0V